# TRAI Audit Wireless Report for Gujarat Circle

**QE June 2016**

**WEST ZONE**

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Submitted to:

TRAI
Telecom Regulatory Authority of India

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# 2 INTRODUCTION

## 2.1 ABOUT TRAI

TRAI's mission is to create and nurture conditions for growth of telecommunications in the country in a manner and at a pace that will enable India to play a leading role in the emerging global information society. One of the main objectives of TRAI is to provide a fair and transparent policy environment which promotes a level playing field and facilitates fair competition.

In pursuance of above objective, TRAI has been issuing regulations, order and directives to deal with the issues or complaints raised by the operators as well as the consumers. These regulations, order and directives have helped to nurture the growth of multi operator multi service - an open competitive market from a government owned monopoly. Also, the directions, orders and regulations issued cover a wide range of subjects including tariff, interconnection and quality of service as well as governance of the Authority.

TRAI initiated a regulation - The Standard of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service regulations, 2009 (7 of 2009) dated December 20, 2009 and Quality of Service of Broadband Service Regulations, 2006 (11 of 2006) dated October 6, 2006 that provide the benchmarks for the parameters on customer perception of service to be achieved by service provider.

In order to assess the above regulations, TRAI has commissioned a third party agency to conduct the audit of the service providers and check the performance of the operators on the various benchmarks set by Telecom Regulatory Authority of India (TRAI).

## 2.2 OBJECTIVES

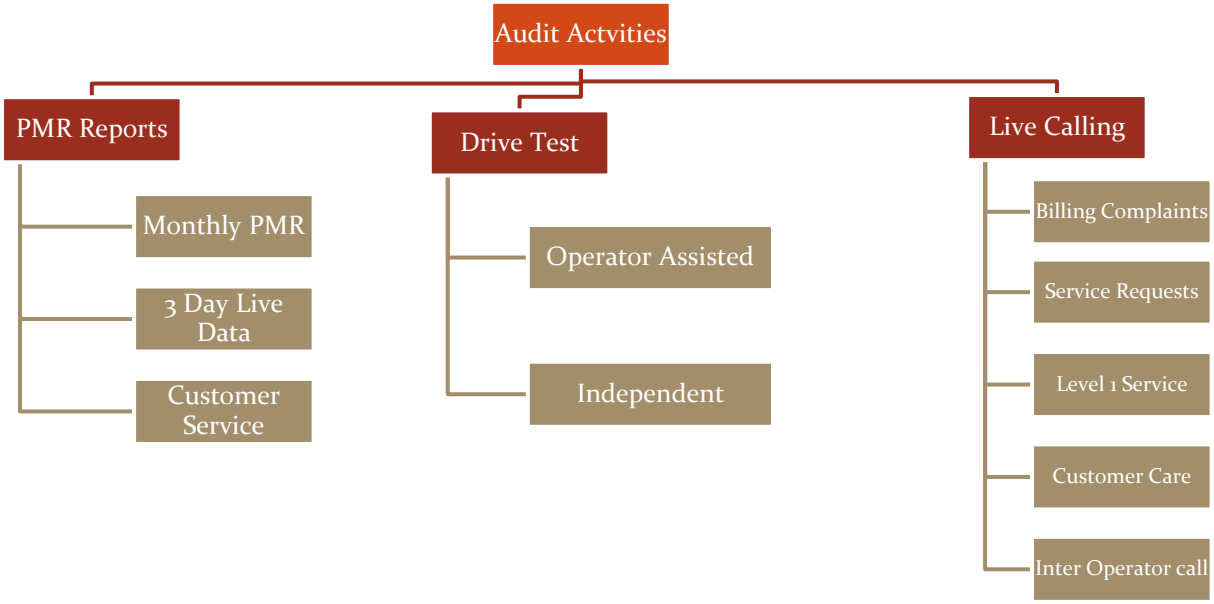
The primary objective of the Audit module is to-

- Audit and Assess the Quality of Services being rendered by Basic (Wireline), Cellular Mobile (Wireless), and Broadband service against the parameters notified by TRAI. (The parameters of Quality of Services (QoS) have been specified by in the respective regulations published by TRAI).
- This report covers the audit results of the audit conducted for Cellular Mobile (Wireless) services in Gujarat circle.

## 2.3 COVERAGE

The audit was conducted in Gujarat circle covering all the SSAs (Secondary Switching Areas).


## 2.4 FRAMEWORK USED

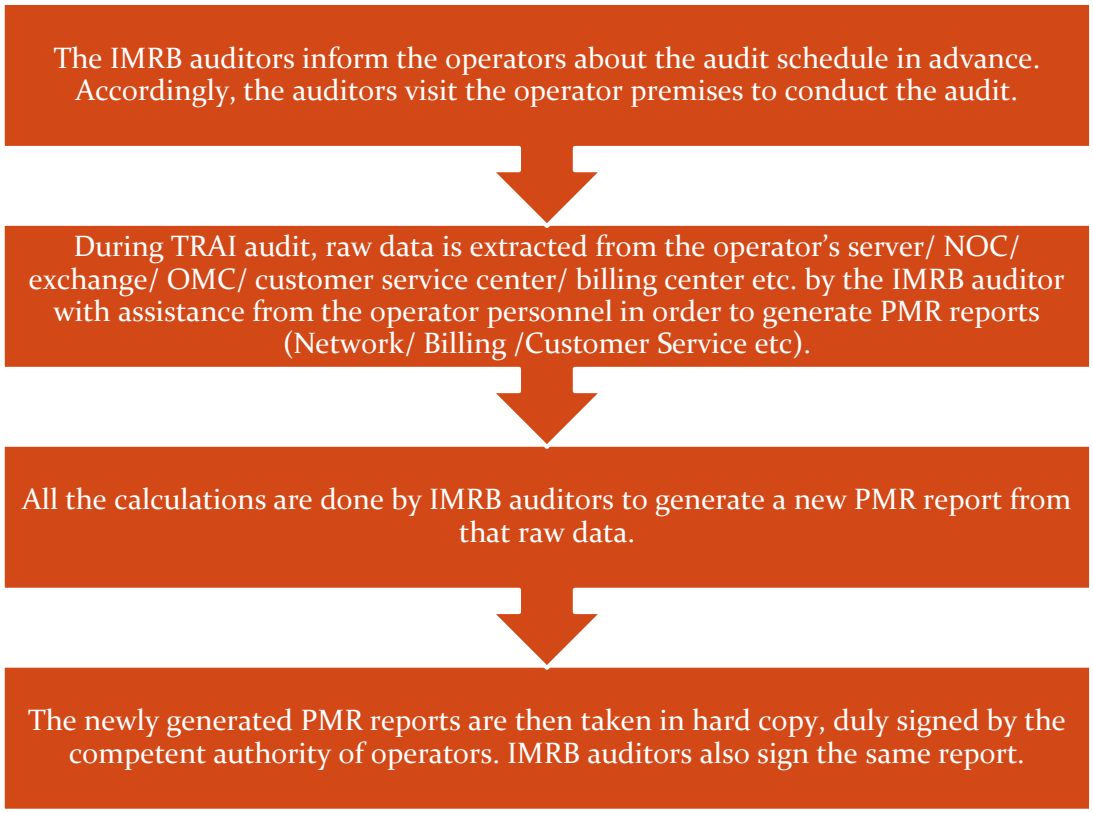



Let's discuss each of the activity in detail and the methodology adopted for each of the module.

### 2.4.1 PMR REPORTS

#### 2.4.1.1 SIGNIFICANCE AND METHODOLOGY

PMR or Performance Monitoring Reports are generated to assess the various Quality of Service parameters involved in the mobile telephony service, which indicate the overall health of service for an operator.




The PMR report for network parameters is taken for each month of the audit quarter and is extracted and verified in the first week of the subsequent month of the audit month. For example, April 2016 audit data was collected in the month of May 2016.

The PMR report for customer service parameters is extracted from Customer Service Center and verified once every quarter in the subsequent month of the last month of the quarter. For example, data for quarter ending June 2016 (AMJ'16) was collected in the month of July 2016.

The raw data extracted from operator's systems is used to create PMR in the following three formats.

- Monthly PMR (Network Parameters & Wireless Data Services) – 2G & 3G
- 3 Day Live Measurement Data (Network Parameters & Wireless Data Services) – 2G & 3G
- Customer Service Data

Let us understand these formats in detail.

#### 2.4.1.2 MONTHLY PMR 2G

This involved calculation of the various 2G Quality of Service network parameters through monthly Performance Monitoring Reports (PMR). The PMR reports were generated from the data extracted from operator's systems by the IMRB representative with the assistance of the operator at the operator's premises for the month of April, May and June 2016. The performance of operators on various parameters was assessed against the benchmarks. Parameters include-

**Network Availability**

- BTS accumulated downtime
- Worst affected BTS due to downtime

**Connection Establishment (Accessibility)**

- Call Set Up success Rate (CSSR)

**Network Congestion Parameters**

- SDCCH/Paging Channel Congestion
- TCH Congestion
- Point of Interconnection

**Connection Maintenance**

- Call Drop rate
- Worst affected cells having more than 3% TCH drop

**Voice Quality**

- % Connections with good voice quality

All the parameters have been described in detail along with key findings of the parameters in section 5 of the report. The benchmark values for each parameter have been given in the table below.

### 2.4.1.3 AUDIT PARAMETERS – NETWORK 2G

Let us now look at the various parameters involved in the audit reports.

**Network Related**

| Network Parameters - 2G | | |
|---|---|---|
| **Parameter Category** | **Parameter** | **Benchmark** |
| **Network Availability** | **BTSs Accumulated downtime (not available for service)** | **≤ 2%** |
| | **Worst affected BTSs due to downtime** | **≤ 2%** |
| **Connection Establishment (Accessibility)** | **Call Set-up Success Rate (within licensee's own network)** | **≥ 95%** |
| | **SDCCH/ Paging Chl. Congestion (%age)** | **≤ 1%** |
| | **TCH Congestion (%age)** | **≤ 2%** |
| **Connection Maintenance (Retainability)** | **Call Drop Rate (%age)** | **≤ 2%** |
| | **Worst affected cells having more than 3% TCH drop** | **≤ 3%** |
| | **%age of connection with good voice quality** | **≥ 95%** |
| | **Point of Interconnection (POI)** | **≤ 0.5%** |

#### 2.4.1.4 MONTHLY PMR 3G

This involved calculation of the various 3G Quality of Service network parameters through monthly Performance Monitoring Reports (PMR). The PMR reports were generated from the data extracted from operator's systems by the IMRB representative with the assistance of the operator at the operator's premises for the month of April, May and June 2016. The performance of operators on various parameters was assessed against the benchmarks. Parameters include-

**Network Availability**

- Node Bs accumulated downtime
- Worst affected Node Bs due to downtime

**Connection Establishment (Accessibility)**

- Call Set Up success Rate (CSSR)

**Network Congestion Parameters**

- RRC Congestion
- Circuit Switched RAB Congestion
- Point of Interconnection

**Connection Maintenance**

- Circuit Switched Voice Drop rate
- Worst affected cells having more than 3% Circuit switched Voice drop rate

**Voice Quality**

- % Connections with good Circuit Switched Voice Quality

All the parameters have been described in detail along with key findings of the parameters in section 5 of the report. The benchmark values for each parameter have been given in the table below.

### 2.4.1.5 AUDIT PARAMETERS – NETWORK 3G

Let us now look at the various parameters involved in the audit reports.

**Network Related**

| Network Parameters - 3G | | |
|---|---|---|
| **Network Availability** | **Node Bs downtime (not available for service)** | **≤ 2%** |
| | **Worst affected Node Bs due to downtime** | **≤ 2%** |
| **Connection Establishment (Accessibility)** | **Call Set-up Success Rate (within licensee's own network)** | **≥ 95%** |
| | **RRC Congestion** | **≤ 1%** |
| | **Circuit Switched RAB Congestion** | **≤ 2%** |
| **Connection Maintenance (Retainability)** | **Circuit Switched voice drop rate** | **≤ 2%** |
| | **Worst affected cells having more than 3% Circuit switched voice drop rate** | **≤ 3%** |
| | **%age of connection with good circuit switched voice quality** | **≥ 95%** |
| | **Point of Interconnection (POI)** | **0.5%** |

### 2.4.1.6 MONTHLY PMR – WIRELESS DATA SERVICES (2G & 3G)

The PMR report for wireless data service (2G and 3G) is extracted at the operator premises and verified every month of the quarter. This includes three parameters-

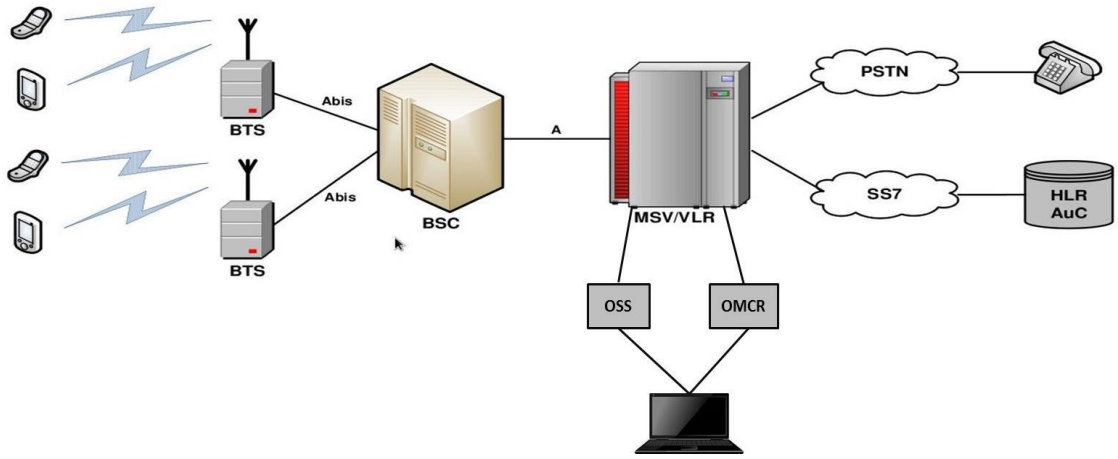
- Services Activation/ provisioning:- Activation done within 4 hours ≥ 95%
- PDP Context activation success rate:- PDP Context activation success rate ≥ 95%
- Drop Rate:- Drop Rate ≤ 5%

### 2.4.1.7 AUDIT PARAMETERS – WIRELESS DATA SERVICES (2G & 3G)

| Wireless Data Service | | |
|---|---|---|
| **Service Activation** | **Activation done within 4 hours** | **≥ 95%** |
| **PDP Context activation success rate** | **PDP Context activation success rate** | **≥ 95%** |
| **Drop Rate** | **Drop Rate** | **≤ 5%** |

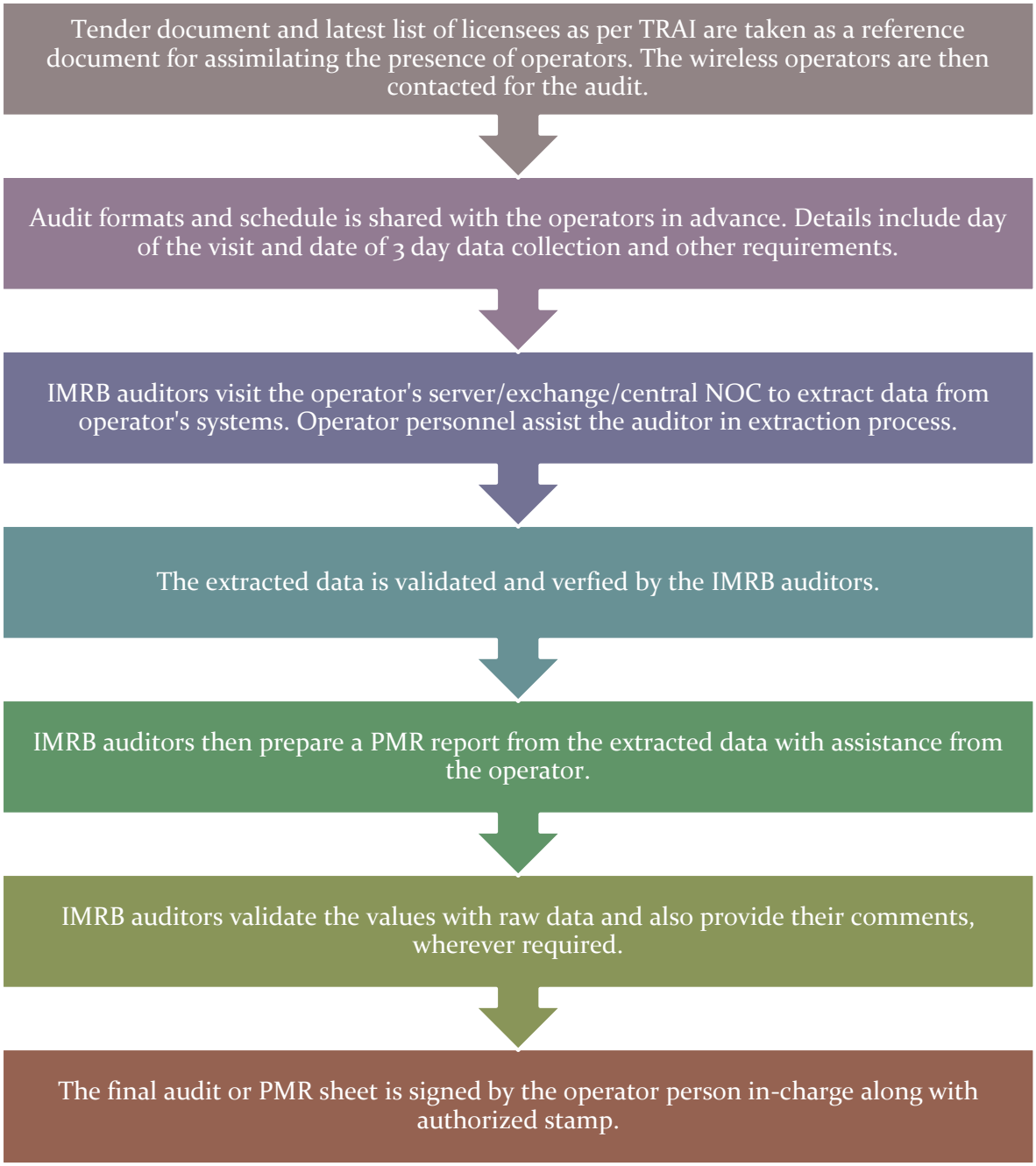
### 2.4.1.8 POINT OF DATA EXTRACTION

The data is extracted from a terminal/computer connected to OMCR & OSS on the operator network.



### 2.4.1.9 STEP BY STEP AUDIT PROCEDURE

The key steps followed for extraction of reports at the operator premises are given below.




Data has been extracted and calculated as per the counter details provided by the operators. The details of counters have been provided in section 8.15 of the report. The calculation methodology for each parameter has been stated in the table given below.

## 2.4.1.10 CALCULATION METHODOLOGY – NETWORK PARAMETERS 2G

| Parameter | Calculation Methodology |
|---|---|
| **BTS Accumulated Downtime** | Sum of downtime of BTSs in a month in hours i.e. total outage time of all BTSs in hours during a month / (24 x Number of days in a month x Number of BTSs in the network in licensed service area) x 100 |
| **Worst Affected BTS Due to Downtime** | (Number of BTSs having accumulated downtime greater than 24 hours in a month / Number of BTS in Licensed Service Area) * 100 |
| **Call Setup Success Rate** | (Calls Established / Total Call Attempts) * 100 |
| **SDCCH/ Paging Channel Congestion** | SDCCH / TCH Congestion% = [(A1 x C1) + (A2 x C2) +.....+ (An x Cn)] / (A1 + A2 +...+ An)<br><br>Where:<br>A1 = Number of attempts to establish SDCCH / TCH made on day 1<br>C1 = Average SDCCH / TCH Congestion % on day 1<br>A2 = Number of attempts to establish SDCCH / TCH made on day 2<br>C2 = Average SDCCH / TCH Congestion % on day 2<br>An = Number of attempts to establish SDCCH / TCH made on day n<br>Cn = Average SDCCH / TCH Congestion % on day n |
| **TCH Congestion** | |
| **POI Congestion** | POI Congestion% = [(A1 x C1) + (A2 x C2) +.....+ (An x Cn)] / (A1 + A2 +...+ An)<br>Where:<br>A1 = POI traffic offered on all POIs (no. of calls) on day 1<br>C1 = Average POI Congestion % on day 1<br>A2 = POI traffic offered on all POIs (no. of calls) on day 2<br>C2 = Average POI Congestion % on day 2<br>An = POI traffic offered on all POIs (no. of calls) on day n<br>Cn = Average POI Congestion % on day n |
| **Call Drop Rate** | Total Calls Dropped / Total Calls Established x 100 |
| **Worst Affected Cells having more than 3% TCH drop** | Total number of cells having more than 3% TCH drop during CBBH/ Total number of cells in the LSA x 100 |
| **Connections with good voice quality** | No. of voice samples with good voice quality / Total number of samples x 100 |

| Parameter | Calculation Methodology |
|---|---|
| **Node Bs Accumulated Downtime** | Sum of downtime of Node Bs in a month in hours i.e. total outage time of all Node Bs in hours during a month / (24 x Number of days in a month x Number of Node Bs in the network in licensed service area) x 100 |
| **Worst Affected Node Bs Due to Downtime** | (Number of Node Bs having accumulated downtime greater than 24 hours in a month / Number of Node B in Licensed Service Area) * 100 |
| **Call Setup Success Rate** | (RRC Established / Total RRC Attempts) * 100 |
| **RRC Congestion** | RRC / RAB Congestion% = [(A1 x C1) + (A2 x C2) +.....+ (An x Cn)] / (A1 + A2 +...+ An)<br><br>Where:<br>A1 = Number of attempts to establish RRC/ RAB made on day 1<br>C1 = Average RRC/ RAB Congestion % on day 1<br>A2 = Number of attempts to establish RRC/ RAB made on day 2<br>C2 = Average RRC/ RAB Congestion % on day 2<br>An = Number of attempts to establish RRC/ RAB made on day n<br>Cn = Average RRC/ RAB Congestion % on day n |
| **Circuit Switched RAB Congestion** | |
| **POI Congestion** | POI Congestion% = [(A1 x C1) + (A2 x C2) +.....+ (An x Cn)] / (A1 + A2 +...+ An)<br>Where:<br>A1 = POI traffic offered on all POIs (no. of calls) on day 1<br>C1 = Average POI Congestion % on day 1<br>A2 = POI traffic offered on all POIs (no. of calls) on day 2<br>C2 = Average POI Congestion % on day 2<br>An = POI traffic offered on all POIs (no. of calls) on day n<br>Cn = Average POI Congestion % on day n |
| **Circuit Switched Voice Drop Rate** | No. of voice RAB normally released / (No. of voice RAB normally released + RAB abnormally released) x 100 |
| **Worst Affected Cells having more than 3% Circuit Switched Voice Drop Rate** | Number of cells having CSV drop rate > 3% during CBBH in a month / Total number of cells in the licensed area) x 100 |
| **Connections with good Circuit switched voice quality** | 1- ( Number of Faulty Transport Blocks In Uplink downlink After Selection Combining Speech / Total number of Transport Blocks In Uplink downlink After Selection Combining Speech)) x 100 |

### 2.4.1.12 3 DAY LIVE DATA

The main purpose of 3 day live measurement is to evaluate the network parameters on intraday basis. While the monthly PMR report provides an overall view of the performance of QoS parameters, the 3 day live data helps looking at intraday performance on the network parameters discussed earlier. All the calculations are done on the basis of that raw data of 3 days.

The 3 day live data provides a sample of 9 days in a quarter (3 days each month of a quarter) with hourly performance, which enables the auditor to identify and validate intraday issues for an operator on the QoS network parameters. For example, network congestion being faced by an operator during busy/peak hours.

Network related parameters were evaluated for a period of 3 days in each month. 3 day live audit was conducted for 3 consecutive weekdays for each month. The data was extracted from each operator's server/ NOC etc. at the end of the 3rd day. The extracted data is then used to create a report (similar to PMR report) to assess the various QoS parameters.

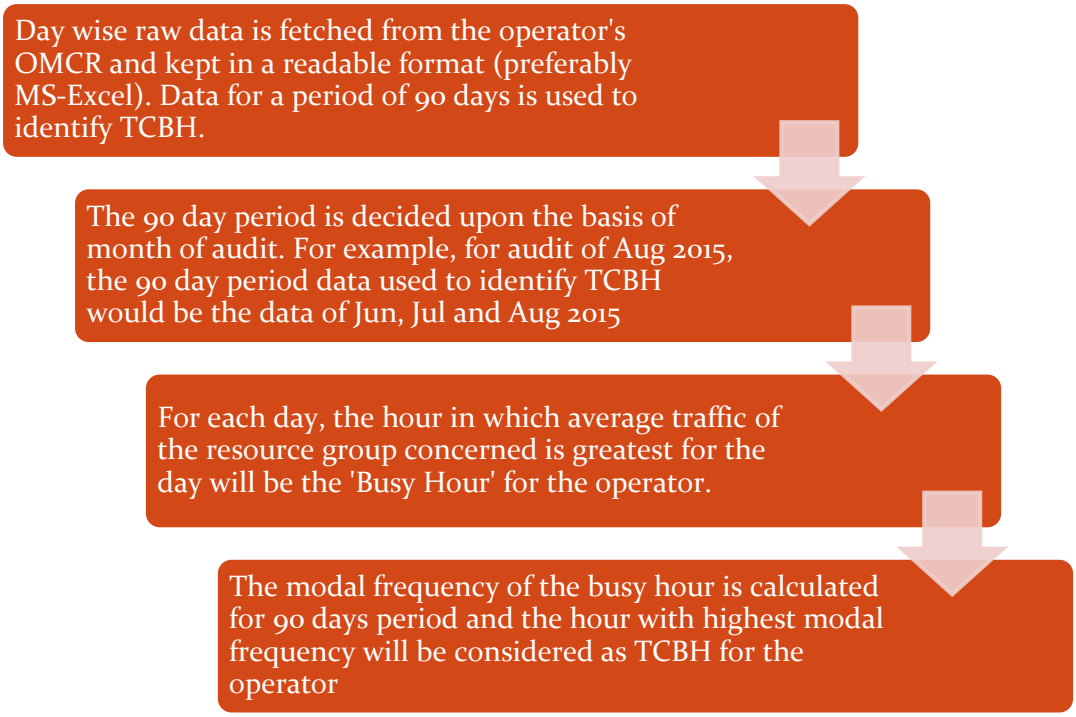
The 3 day live measurement was conducted for network parameters (2G & 3G) and wireless data services (2G & 3G).

| S. No. | Name of Service Provider | Date of Live Measurement Audit | | |
|---|---|---|---|---|
| GSM | | Apr-16 | May-16 | Jun-16 |
| 1 | Aircel | April 07, 08, 09 | May 07, 08, 09 | June 07, 08, 09 |
| 2 | Airtel | April 02, 03, 04 | May 04, 05, 06 | June 01, 02, 03 |
| 3 | BSNL | April 01, 02, 03 | May 01, 02, 04 | June 01, 02, 03 |
| 4 | IDEA | April 04, 05, 06 | May 03, 04, 05 | June 06, 07, 08 |
| 5 | MTS | April 07, 08,09 | May 07, 08, 09 | June 07, 08, 09 |
| 6 | RCOM GSM | April 01, 02, 03 | May 04, 05, 06 | June 01, 02, 03 |
| 7 | Tata GSM | April 04, 05, 06 | May 04, 05, 06 | June 04, 05, 06 |
| 8 | Telenor | April 04, 05, 06 | May 03, 04, 05 | June 06, 07, 08 |
| 9 | Vodafone | April 03, 04, 05 | May 01, 02, 03 | June 06, 07, 08 |
| CDMA Operators | | | | |
| 10 | Reliance | April 01, 02, 03 | May 04, 05, 06 | June 01, 02, 03 |
| 11 | TATA | April 04, 05, 06 | May 04, 05, 07 | June 04, 05, 06 |
| 3G Operators | | | | |
| 12 | Airtel | April 02, 03, 04 | May 04, 05, 06 | June 01, 02, 03 |
| 13 | BSNL | April 01, 02, 03 | May 01, 02, 04 | June 01, 02, 03 |
| 14 | IDEA | April 04, 05, 06 | May 03, 04, 05 | June 06, 07, 08 |
| 15 | Tata | April 04, 05, 06 | May 04, 05, 07 | June 04, 05, 06 |
| 16 | Vodafone | April 03, 04, 05 | May 01, 02, 04 | June 06, 07, 08 |

### 2.4.1.13 TCBH – SIGNIFICANCE AND SELECTION METHODOLOGY

As per QoS regulations 2009 (7 of 2009), Time Consistent Busy Hour" or "TCBH" means the one hour period starting at the same time each day for which the average traffic of the resource group concerned is greatest over the days under consideration and such Time Consistent Busy Hour shall be established on the basis of analysis of traffic data for a period of ninety days.

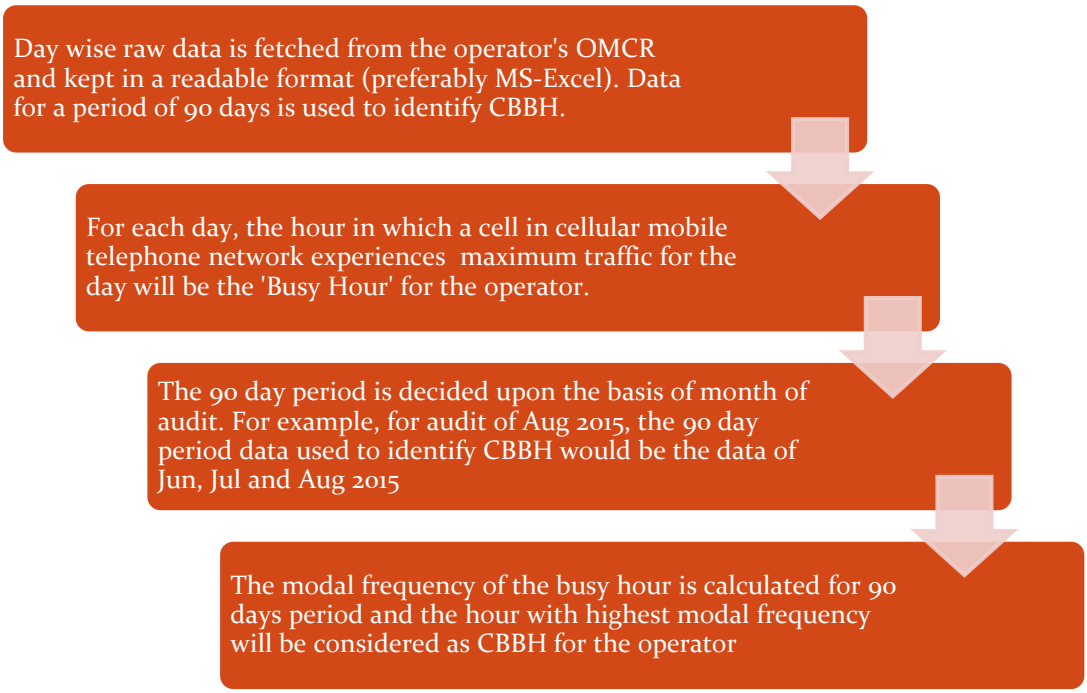
Step by step procedure to identify TCBH for an operator:



### 2.4.1.14 CBBH – SIGNIFICANCE AND SELECTION METHODOLOGY

As per QoS regulations 2009 (7 of 2009), Cell Bouncing Busy Hour (CBBH) means the one hour period in a day during which a cell in cellular mobile telephone network experiences the maximum traffic.

Step by step procedure to identify CBBH for an operator:




### 2.4.1.15 CUSTOMER SERVICE PARAMETERS

The data to generate PMR report for customer service parameters is extracted at the operator premises and verified once every quarter in the subsequent month of the last month of the quarter. For example, data for quarter ending June 2016 (AMJ'16) was collected in the month of July 2016. To extract the data for customer service parameters for the purpose of audit, IMRB auditors primarily visit the following locations/ departments/ offices at the operator's end.

- Central Billing Center
- Central Customer Service Center

The operators are duly informed in advance about the audit schedule.

The Customer Service Quality Parameters include the following:

- Metering and billing credibility (postpaid and prepaid)
- Resolution of billing/charging complaints
- Period of applying credit/waiver/adjustment to customer's account
- Response time to the customer for assistance
- Termination/closure of service
- Time taken for refund of security deposit after closures.

Most of the customer service parameters were calculated by averaging over the quarter; however billing parameters were calculated by averaging over one billing cycle for a quarter.

All the parameters have been described in detail along with key findings of the parameter in section 6 of the report. The benchmark values for each parameter have been given in the table below.

### 2.4.1.16 AUDIT PARAMETERS – CUSTOMER SERVICE

| Metering and Billing Credibility | Benchmark |
|---|---|
| No of billing complaints received - Post paid | ≤ 0.1% |
| No. of billing complaints received- Prepaid | ≤ 0.1% |
| Resolution of billing/ charging complaints within 4 weeks | 98% |
| Resolution of billing/ charging complaints within 6 weeks | 100% |
| Period of applying credit/ waiver within 1 week of resolution of complaint | 100% |
| **Response Time to the Customer form Assistance** | |
| Accessibility of call centre/customer care | ≥ 95% |
| Percentage of calls answered by the operators (voice to voice) within 90 seconds | ≥ 95% |
| Termination/ closure of service | ≤ 7 days |
| Time taken for refund of deposits after closures within 60 days | 100% |

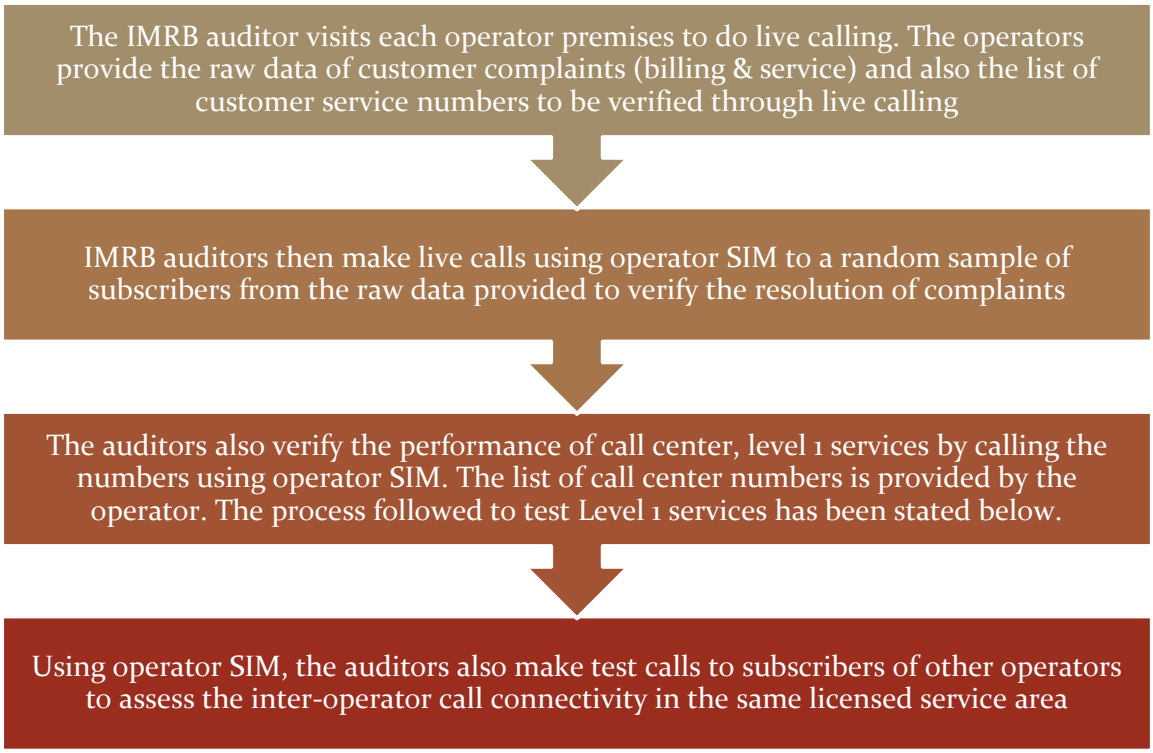
## 2.4.1.17 CALCULATION METHODOLOGY – CUSTOMER SERVICE PARAMETERS

| Parameter | Calculation Methodology |
|---|---|
| **Metering and billing credibility - Postpaid** | Total billing complaints received during the relevant billing cycle / Total bills generated during the relevant billing cycle *100 |
| **Metering and billing credibility – Prepaid** | Total charging complaints received during the quarter/ Total number of subscribers reported by the operator at the end of the quarter * 100 |
| **Resolution of billing/ charging complaints (Postpaid + Prepaid)** | There are two benchmarks involved here:<br><br>Billing or Charging Complaints resolved in 4 weeks from date of receipt / Total billing or charging complaints received during the quarter) x 100<br><br>Billing or Charging Complaints resolved in 6 weeks from date of receipt / Total billing or charging complaints received during the quarter) x 100 |
| **Period of applying credit waiver** | Number of cases where credit waiver is applied within 7 days/ total number of cases eligible for credit waiver * 100 |
| **Call centre performance IVR (Calling getting connected and answered by IVR)** | Number of calls connected and answered by IVR/ All calls attempted to IVR * 100 |
| **Call centre performance (Voice to Voice)** | Call centre performance Voice to Voice = (Number of calls answered by operator within 90 seconds/ All calls attempted to connect to the operator) * 100<br><br>The calculation excludes the calls dropped before 90 seconds |
| **Time taken for termination/ closure of service** | Number of closures done within 7 days/ total number of closure requests * 100 |
| **Time taken for refund for deposit after closures** | Number of cases of refund after closure done within 60 days/ total number of cases of refund after closure * 100 |

## 2.4.2 LIVE CALLING

### 2.4.2.1 SIGNIFICANCE AND METHODOLOGY

The main purpose of live calling is to verify the performance of various customer service parameters by doing test calls to the subscribers/ specific numbers. Below is a step wise procedure of live calling.




Live calling activity was carried out during the period of June 2016. The data considered for live calling was for the month prior to the month in which the live calling activity was being conducted. In this case, data of May 2016 was considered for live calling activity conducted in June 2016.

A detailed explanation of each parameter is explained below.

### 2.4.2.2 BILLING COMPLAINTS

Live calling is done to verify Resolution of billing complaints within stipulated time. The process for this parameter is stated below.

- Auditors request the operator provided the database of all the subscribers who reported billing complaints in one month prior to IMRB auditor visit. In case of BSNL, data for the complaints from the subscribers belonging to the sample exchanges is requested specifically
- A sample of 10% or 100 complainants, whichever is less, is selected randomly from the list provided by operator

Calls are made by auditors to the sample of subscribers to check and record whether the complaint was resolved within the timeframes as mentioned in the benchmark.

All the complaints related to billing as per clause 3.7.2 of QoS regulation of 20th December, 2009 were considered as population for selection of samples. A complete list of the same has been provided in Section 6.1.1.

**TRAI benchmark-**

**Resolution of billing/ charging complaints** - 98% within 4 weeks, 100% within 6 weeks

#### 2.4.2.3 SERVICE COMPLAINTS REQUESTS

"Service request" means a request made to a service provider by its consumer pertaining to his account, and includes.

- A request for change of tariff plan
- A request for activation or deactivation of a value added service or a supplementary service or a special pack
- A request for activation of any service available on the service provider's network
- A request for shift or closure or termination of service or for billing details

All the complaints other than billing were covered. A total of 100 calls per service provider for each service in licensed service area were done by the IMRB auditors.

#### 2.4.2.4 LEVEL 1 SERVICE

Level 1 is used for accessing special services like emergency services, supplementary services, inquiry and operator-assisted services.

Level 1 Services include services such as police, fire, ambulance (Emergency services). Test calls were made from operator SIMs. A total of 300 test calls were made per service provider in the quarter.

In AMJ'16, IMRB has tried contacting the list of Level 1 services provided by TRAI as per the NNP (National Numbering Plan).

##### 2.4.2.4.1 PROCESS TO TEST LEVEL 1 SERVICES

- On visiting the operator's premises (Exchange/Central Server etc.), auditors ask the operator authorized personnel to provide a list of Level 1 services being active in their service. The list should contain a description of the numbers along with dialing code.
- Operators might provide a long list of L1 services. To identify emergency L1 service numbers, auditors check if there is any number that starts with code '10' in that list. If auditors find any emergency number in addition to the below list, that number is also tested during live calling.
- On receiving the list, auditors verify it if the below given list of numbers are active in the service provider's network.
- If there are any other additional numbers provided by the operator, auditors also do live calling on those numbers along with below list.
- If any of these numbers is not active, then we would write the same in our report, auditors write in the report.
- Post verifying the list, auditors do live calling by equally distributing the calls among the various numbers and update the results in the live calling sheet.

| L1 Code | Description |
|---|---|
| 100 | Police |
| 101 | Fire |
| 102 | Ambulance |
| 104 | Health Information Helpline |
| 108 | Emergency and Disaster Management Helpline |
| 138 | All India Helpine for Passangers |
| 149 | Public Road Transport Utility Service |
| 181 | Chief Minister Helpline |
| 182 | Indian Railway Security Helpline |
| 1033 | Road Accident Management Service |
| 1037 | Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline' |
| 1056 | Emergency Medical Services |
| 106X | State of the Art Hospitals |
| 1063 | Public Grievance Cell DoT Hq |
| 1064 | Anti Corruption Helpline |
| 1070 | Relief Commission for Natural Calamities |
| 1071 | Air Accident Helpline |
| 1072 | Rail Accident Helpline |
| 1073 | Road Accident Helpline |
| 1077 | Control Room for District Collector |
| 1090 | Call Alart ( Crime Branch) |
| 1091 | Women Helpline |
| 1097 | National AIDS Helpline to NACO |
| 1099 | Central Accident and Trauma Services (CATS) |
| 10580 | Educationa & Vocational Guidance and Counselling |
| 10589 | Mother and Child Tracking ( MCTH) |
| 10740 | Central Pollution Control Board |
| 10741 | Pollution Control Board |
| 1511 | Police Related Service for all Metro Railway Project |
| 1512 | Prevention of Crime in Railway |
| 1514 | National Career Service(NCS) |
| 15100 | Free Legal Service Helpline |
| 155304 | Municipal Corporations |
| 155214 | Labour Helpline |
| 1903 | Sashastra Seema Bal (SSB) |
| 1909 | National Do Not Call Registry |
| 1912 | Complaint of Electricity |
| 1916 | Drinking Water Supply |
| 1950 | Election Commission of India |

### 2.4.2.5 CUSTOMER CARE

Live calling is done to verify response time for customer assistance is done to verify the performance of call center in terms of

- Calls getting connected and answered by operator's IVR.
- % age of calls answered by operator / voice to voice) within 90 seconds: In 95% of the cases or more

The process for this parameter is stated below.

- Overall sample size is 100 calls per service provider per circle at different points of time, evenly distributed across the selected exchanges – 50 calls between 1100 HRS to 1400 HRS and 50 calls between 1600 HRS to 1900 HRS.
- Time to answer the call by the operator was assessed from the time interviewer pressed the requisite button for being assisted by the operator.
- All the supplementary services that have any kind of human intervention are to be covered here. It also includes the IVR assisted services.

#### 2.4.2.6 INTER OPERATOR CALL ASSESEMENT

A total of 100 calls per service provider to all the other service providers in a licensed service area were done for the purpose of audit.

### 2.4.3 VOICE DRIVE TEST – 2G & 3G

#### 2.4.3.1 SIGNIFICANCE AND METHODOLOGY

Drive test, as the name suggests, is conducted to measure the performance of an operator in a moving vehicle in a specified network coverage area.
The main purpose of the drive test is to check the health of the mobile network of various operators in the area in terms of coverage (signal strength), voice quality, call drop rate, call set up success rate etc.

To assess the indoor coverage, the test is also conducted at two static indoor locations in each SSA, such as Malls, office buildings, shopping complexes, government buildings etc.

IMRB conducted two types of drive tests as mentioned below.

- Operator Assisted Drive Test
- Independent Drive Test

The main difference between the two is that in the operator assisted, operators participate in the drive test along with their hardware, software, phones etc. while in the independent drive test IMRB conducts the drive test on solitary basis and uses its own hardware. Operators generally do not have any knowledge of the drive test being conducted.
A detailed explanation of the two methodologies has been provided below.

#### 2.4.3.2 OPERATOR ASSISTED DRIVE TEST – VOICE 2G & 3G

SSAs are selected according to the total no. of SSAs on that region and audited as per TRAI instructions, it depends on the total no. of drive on that circle. The drive tests were conducted for all operators in the circle, for both 2G and 3G voice services. As per TRAI instructions, the 2G drive was done in 2G only mode, while 3G drive test was conducted in dual mode (3G on priority).

As per the new directive given by TRAI headquarters, drive test in the quarter were conducted at a SSA level. SSAs have been defined in two categories by TRAI as per the criticality of the SSA.

1. Normal SSA
2. Difficult SSA

**During the drive test in normal SSA, the methodology adopted for the drive test is:**

- 3 consecutive days were selected for drive test in selected SSA and SSA list was finalized by TRAI office New Delhi.
- On an average, a minimum of 80 kilometers was covered each day, covering a minimum distance of 250kms in 3 days.
- Route map was designed in such a way that all the major roads, highways and all the important towns and villages were covered as part of audit.
- Special emphasis was given to those areas where the number of complaints received were on the higher side, if provided by TRAI office New Delhi.
- The route is defined in a way that we cover maximum area in the SSA and try to cover maximum villages and cities within the SSA. The route is designed such that there is no overlap of roads (if possible).
- The route was classified as-
    - With In city
    - Major Roads
    - Highways
    - Shopping complex/ Mall
    - Office Complex/ Government Building
- There were no fixed calls which we need to do for within city, major roads and highways, but a minimum of 30 calls in each route, i.e., within city, major roads and highways on each day. For indoors, 20 calls each for shopping and office complex each day preferably in relatively bigger city.
- The drive test covered selected cities and adjoining towns/rural areas where the service provider has commenced service, including congested areas and indoor sites.
- The drive test of each mobile network was conducted between 10 am and 8 pm on weekdays.
- The Vehicle used in the drive tests was equipped with the test tool that automatically generates calls on the mobile telephone networks.
- The speed of the vehicle was kept at around 30-50 km/hr.
- The holding period of each test call was 120 seconds.
- A test call was generated 10 seconds after the previous test call is completed. For 3G, the gap between two calls was 30 seconds.
- Height of the antenna was kept uniform in case of all service providers.

**In drive test for difficult SSAs, the methodology adopted for the drive test is:-**

- Drive test was conducted for 6 consecutive days in selected SSAs and SSA list was finalized by TRAI office New Delhi.
- On an average, a minimum of 80 kilometers was covered each day, covering a minimum distance of 500kms in 6 days.

Rest of the activities for drive test in difficult SSAs are same as drive test for normal SSAs.

### 2.4.3.3 INDEPENDENT DRIVE TEST – 2G & 3G

The number of independent drive tests to be conducted and their locations are decided basis TRAI recommendation.

- A minimum of 80 kilometers was traversed during the independent drive test in a SSA on each day and SSA list was finalized by TRAI office New Delhi.
- Route map was designed in such a way that all the major roads, highways and all the important towns and villages were covered as part of audit.
- Special emphasis was given to those areas where the number of complaints received were on the higher side, if provided by TRAI.
- The route is defined in a way that we cover maximum area in the SSA and try to cover maximum villages and cities within the SSA. The route is designed such that there is no overlap of roads (if possible).
- The route was classified as-
    - With In city
    - Major Roads
    - Highways
    - Shopping complex/ Mall
    - Office Complex/ Government Building
- There were no fixed calls which we need to do for within city, major roads and highways, but a minimum of 30 calls in each route, i.e., within city, major roads and highways on each day. For indoors, 20 calls each for shopping and office complex each day preferably in relatively bigger city.
- The drive test covered selected cities and adjoining towns/rural areas where the service provider has commenced service, including congested areas and indoor sites.
- The drive test of each mobile network was conducted between 10 am and 8 pm on weekdays.
- The Vehicle used in the drive tests was equipped with the test tool that automatically generates calls on the mobile telephone networks.
- The speed of the vehicle was kept at around 30-50 km/hr.
- The holding period of each test call was 120 seconds.
- A test call was generated 10 seconds after the previous test call is completed. For 3G, the gap between two calls was 30 seconds.
- Height of the antenna was kept uniform in case of all service providers.

#### 2.4.3.4 PARAMETERS EVALUATED DURING VOICE DRIVE TEST – 2G & 3G

The parameters which were captured during the drive test include. Below are the parameters which are captured for the GSM and CDMA operators.

- Coverage-Signal strength (GSM)
    - ✓ Total calls made (A)
    - ✓ Number of calls with signal strength between 0 to -75 dBm
    - ✓ Number of calls with signal strength between 0 to -85 dBm
    - ✓ Number of calls with signal strength between 0 to -95 dBm
- Coverage-Signal strength (CDMA)
    - ✓ Total Ec/Io BINS (A)
    - ✓ Total Ec/Io BINS with less than –15 (B)
    - ✓ Low Interference = [1 - (B/A)] x 100
- Voice quality (GSM)
    - ✓ Total RxQual Samples– A
    - ✓ RxQual samples with 0-5 value – B

- ✓ %age samples with good voice quality = B/A x 100

- Voice quality (CDMA)
  - ✓ Total FER BINs (forward FER) – A
  - ✓ FER BINs with 0-2 value (forward FER) – B
  - ✓ FER BINs with 0-4 value (forward FER) – C
  - ✓ %age samples with FER bins having 0-2 value (forward FER) = B/A x 100
  - ✓ %age samples with FER bins having 0-4 value (forward FER) = C/A x 100
  - ✓ No. of FER samples with value > 4 = [A-C]
- Call setup success rate
  - ✓ Total number of call attempts – A
  - ✓ Total Calls successfully established – B
  - ✓ Call success rate (%age) = (B/A) x 100
- Blocked calls
  - ✓ 100% - Call Set up Rate
- Call drop rate
  - ✓ Total Calls successfully established – A
  - ✓ Total calls dropped after being established – B
  - ✓ Call Drop Rate (%age) = (B/A) x 100

### 2.4.4 WIRELESS DATA DRIVE TEST – 2G & 3G

The data drive test is conducted at stationary places called hotspots in a SSA for all the days the voice drive test is conducted in the same SSA.

#### 2.4.4.1 METHODOLOGY

The measurement setup is used to conduct test calls for measuring successful data transmission download and upload attempts, minimum download speed, average throughput and latency is given in figure given below.

The basic measurement set-up consists of a Test-Device and a Test-Server with specified software and hardware. Test calls are established between the Test-Device and Test-Server and measurements are made for the respective QoS parameters. These parameters are measured in a stationary mode. Service Activation/Provisioning, PDP Context Activation Success Rate and Drop rate are reported from the actual network counters/database.

- To assess the quality of the connection between an end user and an Internet Service Provider (ISP), ideally the Test-Server is placed as near as possible to the gateway providing the interconnection between access network and ISP network. The location of the test-server is as near as possible to the gateway providing the interconnection between access network and ISP network implies that the measurements will not reflect the influence in the QoS of the ISP network, between that gateway and the gateway interconnecting with the Internet.

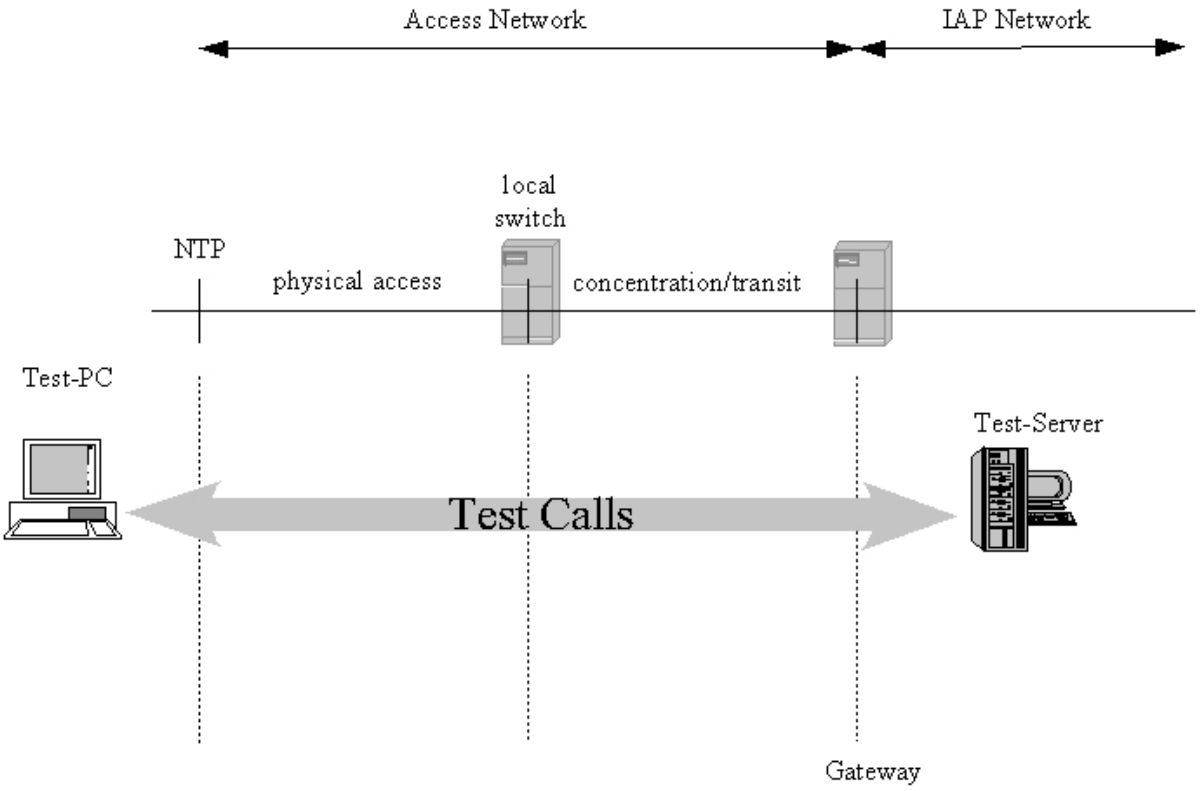



Figure for Measurement set-up

### 2.4.4.2 REQUIREMENTS FOR THE TEST-SERVER

For all tests, a dedicated test server is used as a well-defined reference. The test server may be located centrally for all the licensed service areas (LSA) or for a number of LSAs or in each LSA (not more than one in each LSA). Under no circumstances a commercial server (e.g. www.yahoo.com) is used, since the test conditions for such a server may change over time making later reproduction of the results impossible. The test server is identified by an IP address and not by its fully qualified Domain Name (FQDN) in order to avoid issues with Domain Name Server (DNS) lookup and including the DNS caching strategies of the used operating system into the measurement.

- The Transmission Control Protocol (TCP) settings of the server tested against, is also recorded. Since the number of host operating systems for internet servers is larger than on the client side, no detailed recommendation concerning the TCP settings of the server is given.

However, the TCP stack of the reference server should at least be capable of the following:

- Maximum Segment Size between 1380 Bytes and 1460 Bytes.
- TCP RX Window Size > 4096 Bytes
- SACK (Selective Acknowledgement) enabled.
- TCP Fast Retransmit.
- TCP Fast Recovery enabled.
- Delayed ACK enabled (200ms).

#### 2.4.4.3 TEST FILES

The test file consist of incompressible data i.e. a data file that is already compressed, e.g. like a zip or jpg file. The test file has at least twice the size (in Kbit) of the theoretically maximum data transmission rate per second (in Kbit/s) of the Internet access under consideration.

#### 2.4.4.4 REPRESENTATIVENESS OR NUMBER OF TEST CALLS

- The choice of adequate test calls, i.e. geographical locations of origin and destination of calls as well as traffic variations, is a crucial point with respect to the comparability and validation of the statistics are calculated for the measured parameters. For each parameter, it is ensured that the samples are aggregated over all classes of customers for fairness in reflecting the QoS actually perceived by the user and the statistics are preserved to substantiate the same.
- The necessary number of samples (test calls) are 1067 for each of the category "A" and "Metro" licensed service area (LSA), 600 for each of the category "B" LSA and 384 for each of the category "C" LSA for all the parameters.

#### 2.4.4.5 PARAMETERS EVALUATED DURING DATA DRIVE TEST AT HOTSPOTS

##### 2.4.4.5.1 SUCCESSFUL DATA TRANSMISSIONS DOWNLOAD ATTEMPTS

The successful data download attempts is defined as the ratio of successful data downloads to the total number of data download attempts in a specified time period. A data transmission is successful if a test file is downloaded completely and with no errors.

**Measurement:**

The percentage that is the sum total of successful data downloads, divided by the sum total of all attempts to download a test file is provided. The statistics are calculated from test calls made according to the measurement set-up and taking into account the representativeness requirements. The successful data download is measured by downloading a test file. An attempt to transmit the test file is considered unsuccessful if it takes longer than 60 seconds.

**Successful data transmission download attempts** =

$$\frac{\text{Total Successful download attempts}}{\text{Total download attempts}} \times 100$$

### 2.4.4.5.2 SUCCESSFUL DATA TRANSMISSION UPLOAD ATTEMPTS

The successful data upload attempts is defined as the ratio of successful data uploads to the total number of data upload attempts in a specified time period. A data upload is successful if a test file is uploaded completely and with no errors.

**Measurement:**

The percentage that is the sum total of successful data uploads, divided by the sum total of all attempts to upload a test file should be provided. The statistics are calculated from test calls made according to the measurement set-up and taking into account the representativeness requirements. The successful data upload is measured by uploading a test file. An attempt to transmit the test file is considered unsuccessful if it takes longer than 60 seconds.

**Successful data transmission upload attempts** = $\frac{\text{Total Successful upload attempts}}{\text{Total upload attempts}} \times 100$

### 2.4.4.5.3 MINIMUM DOWNLOAD SPEED

The download speed is defined as the data transmission rate that is achieved for downloading a test file from a test server to a test device.

**Measurement:**

The minimum download speed is calculated from test calls made according to the measurement set-up. Test calls are to be made to weigh the results according to the patterns of real traffic. Minimum download speed is the average of the lower 10% of all such test calls.

**Minimum download speed (average of lower 10% of all test calls)** =

$$\frac{\text{Download speed } (A1+A2+A3+A4+A5+A6)}{6} \times 100$$

**Note**- A1, A2, A3, A4 A5 & A6 are download speeds at 6 hotspots

### 2.4.4.5.4 AVERAGE THROUGHPUT FOR PACKET DATA

It is defined as the rate at which packets are transmitted in a network. In a mobile network the download speed varies depending on the number of users in a particular location. Even though a service provider may be advertising certain speed, the actual speed may vary as per the number of users in the network and there could be customer dissatisfaction on account of relatively slow speed. Hence, there is a need to prescribe an average throughput to protect the interest of consumers. The service providers need to constantly upgrade their network to meet average throughput benchmark.

- The throughput is defined as the data transmission rate that is achieved for downloading a test file from a test server to a test device.
- The service provider will advertise the throughput being offered to its customers as per their category or plan and it should be meted out as per their commitment.

**Measurement:**

The average throughput for packet data should be calculated from all the test calls made according to the measurement setup.
Test calls are made to weigh the results according to the patterns of real traffic. Average throughput is calculated as the average of all such test calls.

**Average Throughput for Packet data** = Average of download attempts in Kbit/ average download time in secs

#### 2.4.4.5.5 LATENCY

Latency is the amount of time taken by a packet to reach the receiving endpoint after being transmitted from the sending point. This time period is termed the "end-to-end delay" occurring along the transmission path. Latency generally refers to network conditions, such as congestion, that may affect the overall time required for transit.

**Measurement:**

Latency is measured with the test server for ping connected directly to the server on the same Intranet domain.

**Latency (Percentage of successful pinged)** = $\frac{\text{Total number of successful ping}}{\text{Total number of ping sent to the Test Server}} \times 100$

## 2.5 OPERATORS COVERED 2G AND 3G

| Name of Operator | Number of Subscriber as per VLR-2G |
|---|---|
| Aircel | 9221 |
| Airtel | 7191127 |
| BSNL | 2805815 |
| Idea | 12838548 |
| MTS | 131870 |
| RCOM CDMA | 144000 |
| RCOM GSM | 144000 |
| TATA CDMA | 252740 |
| TATA GSM | 1314873 |
| Telenor | 5344824 |
| Vodafone | 18250165 |
| **Name of Operator** | **Number of Subscriber as per VLR-3G** |
| Airtel 3G | 1031236 |
| BSNL 3G | 566987 |
| Idea 3G | 2411452 |
| TATA 3G | 583111 |
| Vodafone 3G | 2113637 |

June'16 VLR data was considered for the number of subscribers.

## 2.6 COLOUR CODES TO READ THE REPORT

**Not Meeting the benchmark**

**Best Performing Operator**

# 3 CRITICAL FINDINGS

### PMR Consolidated 2G (Network Parameters)

- TATA GSM failed to meet the benchmark for BTSs Accumulated Downtime.
- TATA CDMA failed to meet the benchmark for voice quality.

### 3 Day Live Measurement 2G (Network Parameters)

- Reliance CDMA failed to meet the benchmark on TCH congestion.
- TATA CDMA failed to meet the benchmark for voice quality.

### 3 Day Live Measurement 3G (Network Parameters)

- BSNL 3G failed meet the benchmark for the parameter Circuit switched voice quality

### Wireless Data Services for 2G

- Telenor failed to meet the benchmark for Activation done within 4 hours in PMR as well as live audit.
- Aircel failed to meet the benchmark for PDP Context activation success rate in PMR audit.

### Live Calling

- As per the consumers (live calling exercise) all of the operators met the benchmark of resolving 100% complaints within 6 weeks. However, all operator failed to meet the benchmark of resolving 98% complaints within 4 weeks

### Customer Service Quality Parameters

- For the billing disputes of post-paid subscribers, it was observed that Idea failed to meet the TRAI benchmark for the parameter.
- TATA GSM failed to meet the TRAI benchmark of providing credit or waiver within one week in case of complaints received.
- Aircel failed to meet the benchmark for Customer Care Percentage of calls answered by the IVR.
- Airtel, Reliance GSM and Reliance CDMA failed to meet the TRAI benchmark of customer care percentage of calls answered by the operators (Voice to Voice) within 90 seconds

### Operators Assisted Drive Test (Voice) for 2G & 3G

- In Surat SSA Reliance GSM fail to meet the benchmark for voice quality in outdoor locations.
- In Surat SSA Tata 3G failed to meet the benchmark for voice quality in outdoor locations.

# 4 EXECUTIVE SUMMARY-2G

The objective assessment of Quality of Service (QoS) carried out by IMRB gives an insight into the overall performance of various operators in the Gujarat circle, with a parameter wise performance evaluation as compared to TRAI benchmark.

## 4.1 PMR DATA – 3 MONTHS- CONSOLIDATED FOR 2G

| Name of Service Provider | Network Availability | | Connection Establishment (Accessibility) | | | Connection Maintenance (Retainability) | | |
|---|---|---|---|---|---|---|---|---|
| | BTSs Accumulated downtime (not available for service) | Worst affected BTSs due to downtime | Call Set-up Success Rate (within licensee's own network) | SDCCH/ Paging Chl. Congestion | TCH Congestion | Call Drop Rate (%age) | Worst affected cells having more than 3% TCH drop | %age of connection with good voice quality |
| Benchmark | ≤ 2% | ≤ 2% | ≥ 95% | ≤ 1% | ≤ 2% | ≤ 2% | ≤ 3% | ≥ 95% |
| Aircel | 0.03% | 0.00% | 98.86% | 0.05% | 0.09% | 0.32% | 1.74% | 96.88% |
| Airtel | 0.12% | 0.19% | 99.03% | 0.05% | 0.51% | 0.63% | 1.31% | 97.54% |
| BSNL | 1.66% | 1.08% | 97.59% | 0.07% | 0.35% | 0.42% | 1.30% | 98.80% |
| Idea | 0.05% | 0.09% | 99.34% | 0.40% | 0.25% | 0.76% | 2.29% | 96.67% |
| MTS | 0.03% | 0.00% | 99.77% | NA | 0.00% | 0.13% | 0.00% | 99.27% |
| RCOM CDMA | 0.11% | 0.78% | 98.44% | NA | 0.18% | 0.22% | 0.59% | NA |
| RCOM GSM | 0.08% | 0.43% | 96.85% | 0.04% | 1.77% | 0.13% | 0.25% | 98.97% |
| TATA CDMA | 1.14% | 0.00% | 98.86% | NA | 0.05% | 0.28% | 1.73% | 87.05% |
| TATA GSM | 2.66% | 0.00% | 99.08% | 0.07% | 0.21% | 0.55% | 2.21% | 98.42% |
| Telenor | 0.09% | 0.27% | 98.15% | 0.26% | 1.00% | 0.84% | 2.74% | 97.96% |
| Vodafone | 0.04% | 0.16% | 99.68% | 0.17% | 0.32% | 0.61% | 1.52% | 97.68% |

NA: SDCCH/ Paging channel congestion not applicable for CDMA operators.

Following are the parameter wise observations for wireless operators for Gujarat circle:

### BTSs Accumulated Downtime:

TATA GSM did not meet the benchmark. Minimum BTS Accumulated downtime was recorded for MTS and Aircel at 0.03%.

### Worst Affected BTSs Due to Downtime:

All met the benchmark. Minimum worst affected BTSs due to downtime was recorded for Aircel, MTS, TATA CDMA and TATA GSM at 0.00%.

### Call Set-up Success Rate (CSSR):

All operators met the benchmark for CSSR. The maximum CSSR was observed for MTS with 99.77%.

### SDCCH/ Paging Chl. Congestion:

All operators met the benchmark on SDCCH / Paging Channel Congestion. Rcom GSM recorded the best SDCCH / Paging Channel Congestion.

## TCH Congestion:

All operators met the benchmark on TCH congestion; MTS performed the best on TCH congestion.

## Call Drop Rate:

All operators met the benchmark for the parameter. Minimum call drop rate was recorded for MTS and Rcom GSM at 0.13%.

## Worst Affected Cells Having More than 3% TCH Drop:

All operators met the benchmark for the parameter. Best performance was recorded for MTS at 0.00%.

## Voice Quality

TATA CDMA failed to meet the benchmark for the parameter. Best performance was recorded for MTS at 99.27%.

All the service providers were measuring this parameter as per the TRAI guidelines that have been stated in parameter description section.

Below are the month wise summary tables for each network parameter basis PMR data.

### 4.1.1 PMR DATA - APRIL FOR 2G

| Month | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Name of Service Provider Month April | Network Availability | | Connection Establishment (Accessibility) | | | Connection Maintenance (Retainability) | | |
| | BTSs Accumulated downtime (not available for service) | Worst affected BTSs due to downtime | Call Set-up Success Rate (within licensee's own network) | SDCCH/ Paging Chl. Congestion | TCH Congestion | Call Drop Rate (%age) | Worst affected cells having more than 3% TCH drop | %age of connection with good voice quality |
| Benchmark | ≤ 2% | ≤ 2% | ≥ 95% | ≤ 1% | ≤ 2% | ≤ 2% | ≤ 3% | ≥ 95% |
| Aircel | 0.01% | 0.00% | 99.00% | 0.02% | 0.04% | 0.29% | 1.66% | 97.19% |
| Airtel | 0.07% | 0.07% | 99.05% | 0.05% | 0.35% | 0.63% | 1.18% | 97.57% |
| BSNL | 1.60% | 1.06% | 97.79% | 0.07% | 0.33% | 99.58% | 1.35% | 98.83% |
| Idea | 0.03% | 0.05% | 99.28% | 0.50% | 0.29% | 0.74% | 2.15% | 96.46% |
| MTS | 0.05% | 0.00% | 99.69% | NA | 0.00% | 0.02% | 0.00% | 99.24% |
| RCOM CDMA | 0.05% | 0.36% | 97.52% | NA | 0.41% | 0.32% | 0.47% | NA |
| RCOM GSM | 0.07% | 0.43% | 96.02% | 0.03% | 1.15% | 0.12% | 0.27% | 99.04% |
| TATA CDMA | 0.26% | 0.00% | 98.95% | NA | 0.05% | 0.27% | 1.68% | 64.90% |
| TATA GSM | 2.03% | 0.00% | 99.10% | 0.06% | 0.21% | 0.54% | 2.35% | 98.42% |
| Telenor | 0.06% | 0.13% | 98.15% | 0.30% | 1.10% | 0.87% | 3.24% | 98.04% |
| Vodafone | 0.02% | 0.08% | 99.64% | 0.22% | 0.36% | 0.63% | 1.57% | 97.58% |

### 4.1.2 PMR DATA – MAY FOR 2G

| Month | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Name of Service Provider Month May | Network Availability | | Connection Establishment (Accessibility) | | | Connection Maintenance (Retainability) | | |
| | BTSs Accumulated downtime (not available for service) | Worst affected BTSs due to downtime | Call Set-up Success Rate (within licensee's own network) | SDCCH/ Paging Chl. Congestion | TCH Congestion | Call Drop Rate (%age) | Worst affected cells having more than 3% TCH drop | %age of connection with good voice quality |
| Benchmark | ≤ 2% | ≤ 2% | ≥ 95% | ≤ 1% | ≤ 2% | ≤ 2% | ≤ 3% | ≥ 95% |
| Aircel | 0.03% | 0.00% | 98.93% | 0.03% | 0.08% | 0.30% | 1.62% | 97.02% |
| Airtel | 0.11% | 0.05% | 99.07% | 0.05% | 0.42% | 0.61% | 1.16% | 97.38% |
| BSNL | 1.78% | 1.05% | 97.47% | 0.07% | 0.36% | 0.42% | 1.28% | 98.80% |
| Idea | 0.06% | 0.13% | 99.35% | 0.47% | 0.24% | 0.70% | 2.33% | 96.70% |
| MTS | 0.03% | 0.00% | 99.80% | NA | 0.00% | 0.08% | 0.00% | 99.22% |
| RCOM CDMA | 0.03% | 0.36% | 98.70% | NA | 0.09% | 0.13% | 0.00% | NA |
| RCOM GSM | 0.08% | 0.43% | 96.87% | 0.05% | 1.39% | 0.12% | 0.24% | 98.99% |
| TATA CDMA | 1.08% | 0.00% | 98.68% | NA | 0.05% | 0.30% | 1.74% | 63.97% |
| TATA GSM | 3.02% | 0.00% | 99.14% | 0.07% | 0.19% | 0.50% | 2.09% | 98.45% |
| Telenor | 0.10% | 0.10% | 98.22% | 0.32% | 0.94% | 0.78% | 2.35% | 97.93% |
| Vodafone | 0.04% | 0.13% | 99.71% | 0.17% | 0.29% | 0.59% | 1.41% | 97.70% |

### 4.1.3 PMR DATA - JUNE FOR 2G

| Month | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Name of Service Provider Month June | Network Availability | | Connection Establishment (Accessibility) | | | Connection Maintenance (Retainability) | | |
| | BTSs Accumulated downtime (not available for service) | Worst affected BTSs due to downtime | Call Set-up Success Rate (within licensee's own network) | SDCCH/ Paging Chl. Congestion | TCH Congestion | Call Drop Rate (%age) | Worst affected cells having more than 3% TCH drop | %age of connection with good voice quality |
| Benchmark | ≤ 2% | ≤ 2% | ≥ 95% | ≤ 1% | ≤ 2% | ≤ 2% | ≤ 3% | ≥ 95% |
| Aircel | 0.04% | 0.00% | 98.66% | 0.09% | 0.15% | 0.37% | 1.93% | 96.49% |
| Airtel | 0.17% | 0.44% | 98.98% | 0.07% | 0.76% | 0.66% | 1.60% | 97.27% |
| BSNL | 1.67% | 1.12% | 97.51% | 0.07% | 0.35% | 0.42% | 1.28% | 98.78% |
| Idea | 0.06% | 0.09% | 99.41% | 0.23% | 0.21% | 0.83% | 2.37% | 96.87% |
| MTS | 0.02% | 0.00% | 99.82% | NA | 0.01% | 0.14% | 0.00% | 99.27% |
| RCOM CDMA | 0.24% | 1.62% | 99.09% | NA | 0.05% | 0.11% | 0.72% | NA |
| RCOM GSM | 0.08% | 0.43% | 97.67% | 0.05% | 2.77% | 0.14% | 0.25% | 98.90% |
| TATA CDMA | 2.11% | 0.00% | 98.95% | NA | 0.04% | 0.27% | 1.78% | 157.84% |
| TATA GSM | 3.03% | 0.00% | 98.98% | 0.06% | 0.23% | 0.63% | 2.20% | 98.40% |
| Telenor | 0.12% | 0.58% | 98.07% | 0.17% | 0.95% | 0.88% | 2.63% | 97.93% |
| Vodafone | 0.05% | 0.26% | 99.70% | 0.14% | 0.30% | 0.62% | 1.58% | 97.77% |

## 4.2 3 DAY DATA – CONSOLIDATED FOR 2G

A three day live measurement was conducted to measure the QoS provided by the operators. The table provided below gives a snapshot of the performance of all operators during live measurement.

| Name of Service Provider | Network Availability | | Connection Establishment (Accessibility) | | | Connection Maintenance (Retainability) | | |
|---|---|---|---|---|---|---|---|---|
| | BTSs Accumulated downtime (not available for service) | Worst affected BTSs due to downtime | Call Set-up Success Rate (within licensee's own network) | SDCCH/ Paging Chl. Congestion (%age) | TCH Congestion (%age) | Call Drop Rate (%age) | Worst affected cells having more than 3% TCH drop | %age of connection with good voice quality |
| Benchmark | ≤ 2% | ≤ 2% | ≥ 95% | ≤ 1% | ≤ 2% | ≤ 2% | ≤ 3% | ≥ 95% |
| Aircel | 0.02% | 0.00% | 98.88% | 0.03% | 0.10% | 0.32% | 1.69% | 96.98% |
| Airtel | 0.09% | 0.05% | 99.05% | 0.03% | 0.22% | 0.62% | 1.28% | 97.46% |
| BSNL | 1.39% | 0.73% | 97.59% | 0.07% | 0.34% | 0.41% | 1.28% | 98.70% |
| Idea | 0.04% | 0.00% | 99.27% | 0.36% | 0.33% | 0.79% | 2.21% | 96.69% |
| MTS | 0.00% | 0.00% | 99.59% | NA | 0.00% | 0.18% | 0.00% | 99.20% |
| RCOM CDMA | 0.08% | 0.00% | 98.45% | NA | 2.65% | 0.17% | 0.50% | NA |
| RCOM GSM | 0.10% | 0.00% | 97.71% | 0.05% | 1.73% | 0.13% | 0.31% | 98.96% |
| TATA CDMA | 0.58% | 0.00% | 98.96% | NA | 0.05% | 0.30% | 0.15% | 65.32% |
| TATA GSM | 1.37% | 0.00% | 99.16% | 0.08% | 0.15% | 0.54% | 2.25% | 98.45% |
| Telenor | 0.11% | 0.00% | 98.13% | 0.21% | 1.09% | 0.73% | 2.79% | 98.02% |
| Vodafone | 0.01% | 0.00% | 99.83% | 0.10% | 0.17% | 0.47% | 0.44% | 97.85% |

NA: SDCCH/ Paging channel congestion not applicable for CDMA operators.

Following are the parameter wise observations for wireless operators for Gujarat circle:

### BTSs Accumulated Downtime:

All operators met the benchmark. Minimum BTS Accumulated downtime was recorded for MTS at 0.00%.

### Worst Affected BTSs Due to Downtime:

All operators met the benchmark for worst affected BTSs due to downtime.

### Call Set-up Success Rate (CSSR):

All operators met the benchmark for CSSR. The maximum CSSR was observed for Vodafone with 99.83%.

### SDCCH/ Paging Chl. Congestion:

All operators met the benchmark on SDCCH / Paging Channel Congestion. Airtel recorded the best SDCCH / Paging Channel Congestion.

### TCH Congestion:

Reliance CDMA failed to meet the benchmark on TCH congestion, while MTS performed the best on TCH congestion.

## Call Drop Rate:

All operators met the benchmark for the parameter. Minimum call drop rate was recorded for Rcom GSM at 0.13%.

## Worst Affected Cells Having More than 3% TCH Drop:

All operators met the benchmark for the parameter. Best performance was recorded for MTS at 0.00%.

## Voice Quality

TATA CDMA failed to meet the benchmark for the parameter. Best performance was recorded for MTS at 99.20%.

All the service providers were measuring this parameter as per the TRAI guidelines that have been stated in parameter description section.

Below are the month wise summary tables for each network parameter basis 3 day live data.

### 4.2.1 3 DAY DATA - APRIL FOR 2G

| Name of Service Provider 3 Day April | Network Availability | | Connection Establishment (Accessibility) | | | Connection Maintenance (Retainability) | | |
|---|---|---|---|---|---|---|---|---|
| | BTSs Accumulated downtime (not available for service) | Worst affected BTSs due to downtime | Call Set-up Success Rate (within licensee's own network) | SDCCH/ Paging Chl. Congestion | TCH Congestion | Call Drop Rate (%age) | Worst affected cells having more than 3% TCH drop | %age of connection with good voice quality |
| Benchmark | ≤ 2% | ≤ 2% | ≥ 95% | ≤ 1% | ≤ 2% | ≤ 2% | ≤ 3% | ≥ 95% |
| Aircel | 0.01% | 0.00% | 98.95% | 0.02% | 0.04% | 0.30% | 1.51% | 97.18% |
| Airtel | 0.06% | 0.00% | 99.03% | 0.02% | 0.19% | 0.60% | 1.10% | 97.55% |
| BSNL | 1.74% | 0.02% | 97.75% | 0.07% | 0.34% | 0.43% | 1.44% | 98.57% |
| Idea | 0.02% | 0.00% | 99.29% | 0.21% | 0.30% | 0.73% | 2.14% | 96.56% |
| MTS | 0.00% | 0.00% | 99.78% | NA | 0.00% | 0.01% | 0.00% | 98.65% |
| RCOM CDMA | 0.03% | 0.00% | 97.62% | NA | 0.27% | 0.31% | 0.35% | NA |
| RCOM GSM | 0.03% | 0.00% | 96.38% | 0.03% | 1.11% | 0.12% | 0.26% | 99.01% |
| TATA CDMA | 0.15% | 0.00% | 99.02% | NA | 0.04% | 0.26% | 0.15% | 66.20% |
| TATA GSM | 0.00% | 0.00% | 99.04% | 0.05% | 0.24% | 0.57% | 2.61% | 98.39% |
| Telenor | 0.10% | 0.00% | 97.96% | 0.24% | 1.41% | 0.94% | 3.60% | 98.09% |
| Vodafone | 0.00% | 0.00% | 99.88% | 0.12% | 0.12% | 0.48% | 0.07% | 97.83% |

### 4.2.2 3 DAY DATA – MAY FOR 2G

| Name of Service Provider 3 Day May | Network Availability | | Connection Establishment (Accessibility) | | | Connection Maintenance (Retainability) | | |
|---|---|---|---|---|---|---|---|---|
| | BTSs Accumulated downtime (not available for service) | Worst affected BTSs due to downtime | Call Set-up Success Rate (within licensee's own network) | SDCCH/ Paging Chl. Congestion | TCH Congestion | Call Drop Rate (%age) | Worst affected cells having more than 3% TCH drop | %age of connection with good voice quality |
| Benchmark | ≤ 2% | ≤ 2% | ≥ 95% | ≤ 1% | ≤ 2% | ≤ 2% | ≤ 3% | ≥ 95% |
| Aircel | 0.03% | 0.00% | 98.92% | 0.03% | 0.05% | 0.29% | 1.52% | 97.11% |
| Airtel | 0.08% | 0.00% | 99.08% | 0.04% | 0.16% | 0.61% | 1.21% | 97.47% |
| BSNL | 1.16% | 1.06% | 97.43% | 0.07% | 0.33% | 0.40% | 1.22% | 98.83% |
| Idea | 0.04% | 0.00% | 99.38% | 0.28% | 0.20% | 0.71% | 2.13% | 96.72% |
| MTS | 0.00% | 0.00% | 99.19% | NA | 0.00% | 0.00% | 0.00% | 99.13% |
| RCOM CDMA | 0.03% | 0.00% | 98.67% | NA | 7.61% | 0.14% | 0.37% | NA |
| RCOM GSM | 0.12% | 0.00% | 97.82% | 0.03% | 1.85% | 0.11% | 0.28% | 99.02% |
| TATA CDMA | 1.59% | 0.00% | 98.87% | NA | 0.06% | 0.31% | 0.15% | 65.25% |
| TATA GSM | 4.09% | 0.00% | 99.24% | 0.14% | 0.10% | 0.56% | 2.14% | 98.51% |
| Telenor | 0.12% | 0.00% | 98.31% | 0.17% | 0.81% | 0.72% | 2.57% | 98.00% |
| Vodafone | 0.00% | 0.00% | 99.89% | 0.10% | 0.11% | 0.46% | 0.05% | 98.17% |

### 4.2.3 3 DAY DATA - JUNE FOR 2G

| Name of Service Provider 3 Day June | Network Availability | | Connection Establishment (Accessibility) | | | Connection Maintenance (Retainability) | | |
|---|---|---|---|---|---|---|---|---|
| | BTSs Accumulated downtime (not available for service) | Worst affected BTSs due to downtime | Call Set-up Success Rate (within licensee's own network) | SDCCH/ Paging Chl. Congestion | TCH Congestion | Call Drop Rate (%age) | Worst affected cells having more than 3% TCH drop | %age of connection with good voice quality |
| Benchmark | ≤ 2% | ≤ 2% | ≥ 95% | ≤ 1% | ≤ 2% | ≤ 2% | ≤ 3% | ≥ 95% |
| Aircel | 0.02% | 0.00% | 98.76% | 0.05% | 0.21% | 0.37% | 2.04% | 96.69% |
| Airtel | 0.12% | 0.16% | 99.02% | 0.03% | 0.29% | 0.65% | 1.51% | 97.39% |
| BSNL | 1.27% | 1.12% | 97.60% | 0.07% | 0.34% | 0.41% | 1.17% | 98.64% |
| Idea | 0.06% | 0.00% | 99.13% | 0.59% | 0.48% | 0.93% | 2.35% | 96.82% |
| MTS | 0.00% | 0.00% | 99.81% | NA | 0.00% | 0.19% | 0.00% | 99.25% |
| RCOM CDMA | 0.18% | 0.00% | 99.07% | NA | 0.06% | 0.10% | 0.78% | NA |
| RCOM GSM | 0.14% | 0.00% | 98.94% | 0.09% | 2.24% | 0.16% | 0.39% | 98.85% |
| TATA CDMA | 0.00% | 0.00% | 98.98% | NA | 0.04% | 0.34% | 0.15% | 99.36% |
| TATA GSM | 0.01% | 0.00% | 99.18% | 0.04% | 0.12% | 0.50% | 2.00% | 98.44% |
| Telenor | 0.10% | 0.00% | 98.11% | 0.23% | 1.06% | 0.53% | 2.19% | 97.98% |
| Vodafone | 0.02% | 0.00% | 99.71% | 0.09% | 0.29% | 0.57% | 1.18% | 97.77% |

## 4.3 PMR DATA – 3 MONTHS- CONSOLIDATED FOR 3G

| Name of Service Provider | Network Availability | | Connection Establishment (Accessibility) | | | Connection Maintenance (Retainability) | | |
|---|---|---|---|---|---|---|---|---|
| | Node Bs downtime (not available for service) | Worst affected Node Bs due to downtime | CSSR | RRC Congestion | Circuit Switched RAB Congestion | Call drop rate | Worst affected cells having more than 3% Circuit switched | %Circuit Switch Voice Quality (CSV quality) |
| Benchmark | ≤ 2% | ≤ 2% | ≥ 95% | ≤ 1% | ≤ 2% | ≤ 2% | ≤ 3% | ≥ 95% |
| Airtel 3G | 0.14% | 0.39% | 99.09% | 0.03% | 0.05% | 0.17% | 1.80% | 99.48% |
| BSNL 3G | 1.24% | 1.63% | 96.04% | 0.86% | 0.57% | 1.22% | 1.57% | 95.60% |
| Idea 3G | 0.06% | 0.10% | 99.72% | 0.16% | 0.06% | 0.40% | 2.21% | 98.75% |
| TATA 3G | 0.38% | 0.00% | 99.18% | 0.05% | 0.21% | 0.45% | 2.07% | 99.72% |

Following are the parameter wise observations for wireless operators for Gujarat circle:

### Node Bs downtime:

All operators met the benchmark. Minimum Node Bs downtime was recorded for Idea at 0.06%.

### Worst affected Node Bs due to downtime:

All operators met the benchmark. Minimum worst affected Node Bs due to downtime was recorded for TATA 3G at 0.00%.

### Call Set-up Success Rate (CSSR):

All operators met the benchmark for CSSR. The maximum CSSR was observed for Idea with 99.72%.

### RRC Congestion:

All operators met the benchmark. Minimum RRC congestion was recorded for Airtel 3G at 0.03%.

### Circuit Switched RAB Congestion:

All operators met the benchmark. Minimum Circuit Switched RAB congestion was recorded for Airtel at 0.05%.

### Call Drop Rate:

All operators met the benchmark for the parameter. Minimum call drop rate was recorded for Airtel 3G at 0.17%.

### Worst affected cells having more than 3% Circuit switched voice drop rate:

All operators met the benchmark for the parameter. Best performance was recorded for BSNL 3G at 1.57%.

### Circuit Switch Voice Quality:

All operators met the benchmark for the parameter. Best performance was recorded for TATA 3G at 99.72%.

Below are the month wise summary tables for each network parameter basis PMR data.

### 4.3.1 PMR DATA - APRIL FOR 3G

| Month | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Name of Service Provider Month April | Network Availability | | Connection Establishment (Accessibility) | | | Connection Maintenance (Retainability) | | |
| | Node Bs downtime (not available for service) | Worst affected Node Bs due to downtime | CSSR | RRC Congestion | Circuit Switched RAB Congestion | Call drop rate | Worst affected cells having more than 3% Circuit switched voice drop rate | %Circuit Switch Voice Quality (CSV quality) |
| Benchmark | ≤ 2% | ≤ 2% | ≥ 95% | ≤ 1% | ≤ 2% | ≤ 2% | ≤ 3% | ≥ 95% |
| Airtel 3G | 0.10% | 0.46% | 99.49% | 0.01% | 0.04% | 0.17% | 1.91% | 99.50% |
| BSNL 3G | 1.19% | 1.53% | 96.04% | 0.86% | 0.57% | 1.22% | 1.61% | 95.60% |
| Idea 3G | 0.03% | 0.07% | 99.70% | 0.26% | 0.09% | 0.40% | 2.39% | 98.75% |
| TATA 3G | 0.00% | 0.00% | 99.11% | 0.07% | 0.29% | 0.44% | 2.16% | 99.72% |
| Vodafone 3G | NA | NA | 0.00% | 0.00% | 0.00% | NA | NA | NA |

### 4.3.2 PMR DATA – MAY FOR 3G

| Month | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Name of Service Provider Month May | Network Availability | | Connection Establishment (Accessibility) | | | Connection Maintenance (Retainability) | | |
| | Node Bs downtime (not available for service) | Worst affected Node Bs due to downtime | CSSR | RRC Congestion | Circuit Switched RAB Congestion | Call drop rate | Worst affected cells having more than 3% Circuit switched voice drop rate | %Circuit Switch Voice Quality (CSV quality) |
| Benchmark | ≤ 2% | ≤ 2% | ≥ 95% | ≤ 1% | ≤ 2% | ≤ 2% | ≤ 3% | ≥ 95% |
| Airtel 3G | 0.13% | 0.27% | 99.63% | 0.04% | 0.05% | 0.17% | 1.84% | 99.50% |
| BSNL 3G | 1.10% | 1.68% | 96.04% | 0.87% | 0.57% | 1.23% | 1.56% | 95.59% |
| Idea 3G | 0.07% | 0.16% | 99.72% | 0.17% | 0.07% | 0.42% | 2.30% | 98.73% |
| TATA 3G | 1.79% | 0.00% | 99.30% | 0.04% | 0.13% | 0.44% | 1.99% | 99.73% |
| Vodafone 3G | 0.03% | 0.02% | 99.78% | 0.02% | 0.02% | 0.16% | 0.96% | 99.03% |

### 4.3.3 PMR DATA - JUNE FOR 3G

| Month | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Name of Service Provider Month June | Network Availability | | Connection Establishment (Accessibility) | | | Connection Maintenance (Retainability) | | |
| | Node Bs downtime (not available for service) | Worst affected Node Bs due to downtime | CSSR | RRC Congestion | Circuit Switched RAB Congestion | Call drop rate | Worst affected cells having more than 3% Circuit switched voice drop rate | %Circuit Switch Voice Quality (CSV quality) |
| Benchmark | ≤ 2% | ≤ 2% | ≥ 95% | ≤ 1% | ≤ 2% | ≤ 2% | ≤ 3% | ≥ 95% |
| Airtel 3G | 0.17% | 0.45% | 98.15% | 0.03% | 0.07% | 0.16% | 1.66% | 99.45% |
| BSNL 3G | 1.44% | 1.67% | 96.04% | 0.86% | 0.57% | 1.22% | 1.54% | 95.60% |
| Idea 3G | 0.06% | 0.07% | 99.74% | 0.06% | 0.03% | 0.38% | 1.95% | 98.77% |
| TATA 3G | 2.18% | 0.00% | 99.14% | 0.05% | 0.22% | 0.47% | 2.06% | 99.71% |
| Vodafone 3G | 0.04% | 0.10% | 99.80% | 0.15% | 0.17% | 0.17% | 0.98% | 99.03% |

## 4.4 3 DAY DATA – CONSOLIDATED FOR 3G

A three day live measurement was conducted to measure the QoS provided by the operators. The table provided below gives a snapshot of the performance of all operators during live measurement.

**Live Data - 3G**

| Name of Service Provider | Network Availability | | Connection Establishment (Accessibility) | | | Connection Maintenance (Retainability) | | |
|---|---|---|---|---|---|---|---|---|
| | Node Bs downtime (not available for service) | Worst affected Node Bs due to downtime | CSSR | RRC Congestion | Circuit Switched RAB Congestion | Call drop rate | Worst affected cells having more than 3% Circuit switched | %Circuit Switch Voice Quality (CSV quality) |
| Benchmark | ≤ 2% | ≤ 2% | ≥ 95% | ≤ 1% | ≤ 2% | ≤ 2% | ≤ 3% | ≥ 95% |
| Airtel 3G | 0.11% | 0.04% | 99.77% | 0.02% | 0.03% | 0.17% | 1.83% | 99.50% |
| BSNL 3G | 1.36% | 0.86% | 96.90% | 0.68% | 0.46% | 1.24% | 1.46% | 94.75% |
| Idea 3G | 0.05% | 0.00% | 99.73% | 0.17% | 0.07% | 0.38% | 2.23% | 98.75% |
| TATA 3G | 0.54% | 0.00% | 99.22% | 0.04% | 0.17% | 0.45% | 2.19% | 99.71% |

Following are the parameter wise observations for wireless operators for Gujarat circle:

### Node Bs downtime:

All operators met the benchmark. Minimum Node Bs downtime was recorded for Idea at 0.05%.

### Worst affected Node Bs due to downtime:

All operators met the benchmark. Minimum worst affected Node Bs due to downtime was recorded for Idea and TATA 3G at 0.00%.

### Call Set-up Success Rate (CSSR):

All operators met the benchmark for CSSR. The maximum CSSR was observed for Airtel 3G with 99.77%.

### RRC Congestion:

All operators met the benchmark. Minimum RRC congestion was recorded for Airtel 3G at 0.02%.

### Circuit Switched RAB Congestion:

All operators met the benchmark. Minimum Circuit Switched RAB congestion was recorded for Airtel 3G at 0.03%.

### Call Drop Rate:

All operators met the benchmark for the parameter. Minimum call drop rate was recorded for Airtel 3G at 0.17%.

### Worst affected cells having more than 3% Circuit switched voice drop rate:

All operators met the benchmark for the parameter. Best performance was recorded for BSNL 3G at 1.46%.

### Circuit Switch Voice Quality:

BSNL failed to meet the benchmark for the parameter. Best performance was recorded for TATA 3G at 99.71%.

Below are the month wise summary tables for each network parameter basis 3 day live data.

### 4.4.1 3 DAY DATA - APRIL FOR 3G

| 3 Day | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Name of Service Provider 3 Day April | Network Availability | | Connection Establishment (Accessibility) | | | Connection Maintenance (Retainability) | | |
| | Node Bs downtime (not available for service) | Worst affected Node Bs due to downtime | CSSR | RRC Congestion | Circuit Switched RAB Congestion | Call drop rate | Worst affected cells having more than 3% Circuit switched voice drop rate | %Circuit Switch Voice Quality (CSV quality) |
| Benchmark | ≤ 2% | ≤ 2% | ≥ 95% | ≤ 1% | ≤ 2% | ≤ 2% | ≤ 3% | ≥ 95% |
| Airtel 3G | 0.12% | 0.02% | 99.89% | 0.00% | 0.01% | 0.18% | 1.92% | 99.50% |
| BSNL 3G | 1.51% | 0.38% | 97.18% | 0.29% | 0.40% | 1.43% | 1.43% | 97.16% |
| Idea 3G | 0.02% | 0.00% | 99.72% | 0.11% | 0.07% | 0.38% | 2.33% | 98.77% |
| TATA 3G | 0.00% | 0.00% | 98.95% | 0.10% | 0.39% | 0.47% | 2.30% | 99.71% |
| Vodafone 3G | NA | NA | 0.00% | 0.00% | 0.00% | NA | NA | NA |

### 4.4.2 3 DAY DATA – MAY FOR 3G

| 3 Day | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Name of Service Provider 3 Day May | Network Availability | | Connection Establishment (Accessibility) | | | Connection Maintenance (Retainability) | | |
| | Node Bs downtime (not available for service) | Worst affected Node Bs due to downtime | CSSR | RRC Congestion | Circuit Switched RAB Congestion | Call drop rate | Worst affected cells having more than 3% Circuit switched voice drop rate | %Circuit Switch Voice Quality (CSV quality) |
| Benchmark | ≤ 2% | ≤ 2% | ≥ 95% | ≤ 1% | ≤ 2% | ≤ 2% | ≤ 3% | ≥ 95% |
| Airtel 3G | 0.15% | 0.00% | 99.61% | 0.06% | 0.06% | 0.18% | 1.93% | 99.50% |
| BSNL 3G | 1.08% | 1.72% | 96.76% | 0.87% | 0.49% | 1.15% | 1.48% | 93.66% |
| Idea 3G | 0.06% | 0.00% | 99.74% | 0.12% | 0.06% | 0.42% | 2.56% | 98.69% |
| TATA 3G | 1.60% | 0.00% | 99.38% | 0.02% | 0.06% | 0.42% | 1.95% | 99.73% |
| Vodafone 3G | 0.00% | 0.00% | 99.81% | 0.14% | 0.17% | 0.17% | 0.06% | 99.03% |

### 4.4.3 3 DAY DATA - JUNE FOR 3G

| 3 Day | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Name of Service Provider 3 Day June | Network Availability | | Connection Establishment (Accessibility) | | | Connection Maintenance (Retainability) | | |
| | Node Bs downtime (not available for service) | Worst affected Node Bs due to downtime | CSSR | RRC Congestion | Circuit Switched RAB Congestion | Call drop rate | Worst affected cells having more than 3% Circuit switched voice drop rate | %Circuit Switch Voice Quality (CSV quality) |
| Benchmark | ≤ 2% | ≤ 2% | ≥ 95% | ≤ 1% | ≤ 2% | ≤ 2% | ≤ 3% | ≥ 95% |
| Airtel 3G | 0.07% | 0.10% | 99.81% | 0.00% | 0.02% | 0.16% | 1.67% | 99.50% |
| BSNL 3G | 1.48% | 0.48% | 96.76% | 0.87% | 0.49% | 1.15% | 1.46% | 93.66% |
| Idea 3G | 0.07% | 0.00% | 99.74% | 0.27% | 0.08% | 0.35% | 1.79% | 98.77% |
| TATA 3G | 0.00% | 0.00% | 99.32% | 0.02% | 0.07% | 0.46% | 2.31% | 99.71% |
| Vodafone 3G | 0.02% | 0.00% | 99.81% | 0.14% | 0.17% | 0.17% | 0.85% | 99.03% |

## 4.5 WIRELESS DATA PMR & 3 DAY LIVE – CONSOLIDATED FOR 2G

| Wireless Data 2G | | | | | | |
|---|---|---|---|---|---|---|
| Name of Service Provider | Wireless Data-PMR | | | Wireless Data-Live Data | | |
| | Activation done within 4 hours | PDP Context activation success rate | Drop Rate | Activation done within 4 hours | PDP Context activation success rate | Drop Rate |
| Benchmark | ≥ 95% | ≥ 95% | ≤ 5% | ≥ 95% | ≥ 95% | ≤ 5% |
| Aircel | 98.45% | 94.60% | 0.66% | 100.00% | 96.51% | 0.65% |
| Airtel | 100.00% | 98.40% | 3.03% | 100.00% | 99.52% | 2.99% |
| BSNL | 100.00% | 98.16% | 2.76% | 100.00% | 98.16% | 2.76% |
| Idea | NDR | 100.00% | 0.17% | NDR | 100.00% | 0.17% |
| MTS | NDR | NDR | 0.00% | NDR | NDR | 0.00% |
| RCOM CDMA | 100.00% | 98.31% | 0.33% | 100.00% | 98.31% | 0.33% |
| RCOM GSM | 100.00% | 100.00% | 0.36% | 100.00% | 100.00% | 0.42% |
| TATA CDMA | 100.00% | 97.98% | 2.98% | 100.00% | 98.99% | 1.26% |
| TATA GSM | 100.00% | 99.71% | 2.01% | 100.00% | 99.77% | 1.99% |
| Telenor | 94.99% | 98.56% | 0.75% | 94.64% | 97.35% | 0.74% |
| Vodafone | NDR | NDR | NDR | NDR | NDR | NDR |

NDR: - No data received

Note: MTS and Vodafone did not submit the data

Following are the parameter wise observations for wireless operators for Gujarat circle:

### Activation done within 4 hours:

Telenor failed to meet the benchmark for Activation done within 4 hours in PMR as well as live audit.

Note: Vodafone did not submit data for the audit

### PDP Context activation success rate:

Aircel failed to meet the benchmark for PDP Context activation success rate in PMR. Maximum PDP Context activation success rate was recorded for Reliance GSM at 100.00%.

Note: Vodafone did not submit data for the audit.

### Drop Rate:

All operators met the benchmark in PMR as well as 3day live. The minimum drop rate was observed for in PMR as well as 3days live MTS with 0.00%.

Note: Vodafone did not submit data for the audit

## 4.6 WIRELESS DATA PMR & 3 DAY LIVE – CONSOLIDATED FOR 3G

| Wireless Data 3G | | | | | | |
|---|---|---|---|---|---|---|
| Name of Service Provider | Wireless Data-PMR | | | Wireless Data-Live Data | | |
| | Activation done within 4 hours | PDP Context activation success rate | Drop Rate | Activation done within 4 hours | PDP Context activation success rate | Drop Rate |
| Benchmark | ≥ 95% | ≥ 95% | ≤ 5% | ≥ 95% | ≥ 95% | ≤ 5% |
| Airtel 3G | NDR | 99.62% | 0.06% | NDR | NDR | NDR |
| BSNL 3G | NDR | 95.66% | 2.32% | NDR | 95.66% | 2.23% |
| Idea 3G | NDR | 100.00% | 0.64% | NDR | 100.00% | 0.64% |
| TATA 3G | NDR | NDR | NDR | NDR | NDR | NDR |
| Vodafone 3G | NDR | 99.35% | 0.44% | NDR | 99.76% | NDR |

**NDR**: No Data Received

### Activation done within 4 hours:

None of the operators submitted data for Activation done within 4 hours for PMR as well as live audit.

### PDP Context activation success rate:

In PMR as well as 3days live all operators met the benchmark. Maximum PDP Context activation success rate was recorded for Idea 3G at 100.00%.
Note: TATA 3G did not submit data for the audit and Airtel did not submit data for the 3 days live.

### Drop Rate:

All operators met the benchmark in PMR as well as 3day live. The minimum drop rate was observed for PMR Airtel 3G with 0.06% and Idea 3G at 0.64% for live.

Note: TATA 3G did not submit data for the audit and Airtel and Vodafone did not submit data for the 3 days live.

Below are the month wise summary tables for each network parameter basis PMR and Live data.

## 4.7 LIVE CALLING DATA - CONSOLIDATED

| Name of Service Provider | Metering and Billing | | Response time to customer for assistance | | Level 1 Service | Service Requests |
|---|---|---|---|---|---|---|
| | %age complaints resolved within 4 weeks | %age complaints resolved within 6 weeks | Accessibility of call centre/ customer care | Percentage of calls answered by the operators (voice to | Call answered | Complaint /Request attended to Satisfaction |
| Benchmark | 98% | 100% | ≥ 95% | ≥ 95% | ≥ 95% | |
| Aircel | NA | NA | 100.00% | 100.00% | 100.00% | 98.00% |
| Airtel | 87.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| BSNL | 70.00% | 100.00% | 100.00% | 100.00% | 100.00% | 98.00% |
| Idea | 85.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| MTS | 80.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| RCOM CDMA | 80.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| RCOM GSM | 79.00% | 100.00% | 100.00% | 100.00% | 100.00% | 99.00% |
| TATA CDMA | 83.33% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| TATA GSM | 83.33% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| Telenor | 77.50% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| Vodafone | 89.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |

### Resolution of billing complaints

As per the consumers (live calling exercise) all of the operators met the benchmark of resolving 100% complaints within 6 weeks. However, all operator failed to meet the benchmark of resolving 98% complaints within 4 weeks.

### Accessibility of Call Centre/Customer Care-IVR

For the IVR aspect, all operators met the TRAI benchmark of 95% with Telenor recorded 100% for the parameter.

### Customer Care / Helpline Assessment (voice to voice)

All operators met the benchmark for Customer Care / Helpline assessment (voice to voice).

### Level 1 Service

As per the live calling results, all of the operators met the TRAI benchmark for level 1 service with calls being answered.

### Complaint/Request Attended to Satisfaction

All operators performed satisfactorily in terms of satisfaction of the customers for service requests.

## 4.8 BILLING AND CUSTOMER CARE - CONSOLIDATED

| Name of Service Provider | Metering and billing credibility | | Billing Complaints | | Response time to customer for assistance | Customer care | |
|---|---|---|---|---|---|---|---|
| | Postpaid Subscribers | Prepaid Subscribers | % of complaints resolved in 4 weeks | % of complaints resolved in 6 weeks | % of cases where credit/wavier is received within one week | Percentage of calls answered by the IVR | Percentage of calls answered by the operators (voice to |
| Benchmark | ≤ 0.1% | ≤ 0.1% | ≥ 98% | ≥ 100% | ≥ 100% | ≥ 95% | ≥ 95% |
| Aircel | 0.00% | 0.00% | NA | NA | 100.00% | 93.82% | 99.13% |
| Airtel | 0.06% | 0.01% | 100.00% | 100.00% | 100.00% | 100.00% | 78.98% |
| BSNL | 0.08% | 0.06% | 100.00% | 100.00% | 100.00% | 98.47% | 97.62% |
| Idea | 0.40% | 0.04% | 100.00% | 100.00% | 100.00% | 98.86% | 99.75% |
| MTS | 0.08% | 0.01% | 100.00% | 100.00% | 100.00% | 96.26% | 95.75% |
| RCOM CDMA | 0.09% | 0.01% | 100.00% | 100.00% | 100.00% | 98.26% | 91.46% |
| RCOM GSM | 0.09% | 0.03% | 100.00% | 100.00% | 100.00% | 98.20% | 91.35% |
| TATA CDMA | 0.01% | 0.00% | 100.00% | 100.00% | 100.00% | NA | 99.63% |
| TATA GSM | 0.00% | 0.00% | 100.00% | 100.00% | 66.67% | 98.31% | 97.05% |
| Telenor | NA | 0.00% | 100.00% | 100.00% | 100.00% | 99.53% | 98.52% |
| Vodafone | 0.10% | 0.01% | 100.00% | 100.00% | 100.00% | 100.00% | 97.87% |

### Metering and Billing Credibility – Post-paid Subscribers

For the billing disputes of post-paid subscribers, it was observed that Idea failed to meet the TRAI benchmark for the parameter. Aircel had the best performance with 0.00% billing disputes.

### Metering and Billing Credibility – Prepaid Subscribers

For the prepaid customers, all operators met the benchmark of charging disputes. Aircel, TATA CDMA and TATA GSM performed the best with 0.00% disputes.

### Resolution of billing complaints

All operators met the TRAI benchmark of resolution of billing complaints within 4 weeks and resolving 100% complaints within 6 weeks.

### Response Time to customer for assistance - % of cases in which advance waiver is received within one week

TATA GSM failed to meet the TRAI benchmark of providing credit or waiver within one week in case of complaints received.

### Customer Care Percentage of calls answered by the IVR

All operators met the benchmark of 95% IVR call being attended except Aircel. Airtel & Vodafone recorded the best performance for the parameter.

### Customer Care Percentage of calls answered by the operators (Voice to Voice) within 90 seconds

Airtel, Reliance GSM and Reliance CDMA failed to meet the TRAI benchmark of 95%. Idea recorded the best performance for the parameter.

## 4.9 INTER OPERATOR CALL ASSESSMENT - CONSOLIDATED

| 6. Inter Operator Call Assessment | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Inter operator call Assessment To↓ From→ | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Aircel | NA | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| Airtel | 100.00% | NA | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| BSNL | 100.00% | 100.00% | NA | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| Idea | 100.00% | 100.00% | 100.00% | NA | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| MTS | 100.00% | 100.00% | 100.00% | 100.00% | NA | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| RCOM CDMA | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | NA | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| RCOM GSM | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | NA | 100.00% | 100.00% | 100.00% | 100.00% |
| TATA CDMA | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | NA | 100.00% | 100.00% | 100.00% |
| TATA GSM | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | NA | 100.00% | 100.00% |
| Telenor | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | NA | 100.00% |
| Vodafone | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | NA |

**Maximum Problem faced by the calling operator to other operator. The orange colour denotes performance below circle average.**

In the inter-operator call assessment, all operators performed satisfactory.

## 4.10 COMPARISON BETWEEN IMRB AND OPERATOR'S PMR DATA FOR 2G

| Circle | Operator | Network Availability | | | | Connection Establishment (Accessibility) | | | | | | Connection Maintenance (Retainability) | | | | | | POI | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BTSs Accumulated downtime (not available for service) | | Worst affected BTSs due to downtime | | Call Set-up Success Rate | | SDCCH/ Paging Chl. Congestion | | TCH Congestion | | Call Drop Rate | | Worst affected cells having more than 3% ) | | Connection with good voice quality | | Point of Interconnection (POI) | |
| | | ≤ 2% | ≤ 2% | ≤ 2% | ≤ 2% | ≥ 95% | ≥ 95% | ≤ 1% | ≤ 1% | ≤ 2% | ≤ 2% | ≤ 2% | ≤ 2% | ≤ 3% | ≤ 3% | ≥ 95% | ≥ 95% | ≤ 0.5% | ≤ 0.5% |
| | | Operator | IMRB | Operator | IMRB | Operator | IMRB | Operator | IMRB | Operator | IMRB | Operator | IMRB | Operator | IMRB | Operator | IMRB | Operator | IMRB |
| Gujarat | Aircel | 0.03 | 0.03 | 0.00 | 0.00 | 98.86 | 98.86 | 0.05 | 0.05 | 0.09 | 0.09 | 0.32 | 0.32 | 1.74 | 1.74 | 96.90 | 96.88 | 0.00 | 0.00 |
| | Airtel | 0.10 | 0.12 | 0.10 | 0.19 | 99.05 | 99.03 | 0.05 | 0.05 | 0.43 | 0.51 | 0.62 | 0.63 | 1.22 | 1.31 | 97.45 | 97.54 | 0.00 | 0.00 |
| | BSNL | 1.70 | 1.66 | 1.08 | 1.08 | 97.59 | 97.59 | 0.07 | 0.07 | 0.35 | 0.35 | 0.41 | 0.42 | 1.31 | 1.30 | 100.00 | 98.80 | 0.00 | 0.00 |
| | Idea | 0.05 | 0.05 | 0.09 | 0.09 | 99.34 | 99.34 | 0.40 | 0.40 | 0.25 | 0.25 | 0.76 | 0.76 | 2.29 | 2.29 | 96.68 | 96.67 | 0.00 | 0.00 |
| | MTS | 0.03 | 0.03 | 0.00 | 0.00 | 99.77 | 99.77 | 0.00 | NA | 0.00 | 0.00 | 0.08 | 0.13 | 0.65 | 0.00 | 99.24 | 99.27 | 0.00 | 0.00 |
| | RCOM CDMA | 0.12 | 0.11 | 0.78 | 0.78 | 98.86 | 98.44 | 0.00 | NA | 0.10 | 0.18 | 0.11 | 0.22 | 0.65 | 0.59 | 99.63 | NA | 0.00 | 0.00 |
| | RCOM GSM | 0.07 | 0.08 | 0.61 | 0.43 | 96.85 | 96.85 | 0.04 | 0.04 | 1.77 | 1.77 | 0.13 | 0.13 | 0.26 | 0.25 | 98.97 | 98.97 | 0.00 | 0.00 |
| | TTL CDMA | 0.02 | 1.14 | 0.00 | 0.00 | 98.87 | 98.86 | 0.00 | NA | 0.05 | 0.05 | 0.28 | 0.28 | 1.71 | 1.73 | 99.36 | 87.05 | 0.00 | 0.00 |
| | TTL GSM | 0.04 | 2.66 | 0.00 | 0.00 | 99.08 | 99.08 | 0.06 | 0.07 | 0.20 | 0.21 | 0.56 | 0.55 | 2.21 | 2.21 | 98.44 | 98.42 | 0.00 | 0.00 |
| | Telenor | 0.09 | 0.09 | 0.27 | 0.27 | 98.15 | 98.15 | 0.26 | 0.26 | 1.00 | 1.00 | 0.84 | 0.84 | 2.74 | 2.74 | 97.97 | 97.96 | 0.00 | 0.00 |
| | Videocon | 0.07 | NS | 0.16 | NS | 98.22 | NS | 0.14 | NS | 1.70 | NS | 0.16 | NS | 0.00 | NS | 98.87 | NS | 0.00 | NS |
| | Vodafone | 0.04 | 0.04 | 0.16 | 0.16 | 99.68 | 99.68 | 0.17 | 0.17 | 0.32 | 0.32 | 0.61 | 0.61 | 1.52 | 1.52 | 97.68 | 97.68 | 0.00 | 0.00 |

## 4.11 COMPARISON BETWEEN IMRB AND OPERATOR'S PMR DATA FOR 3G

| Circle | Operator | Network Availability | | | | Connection Establishment (Accessibility) | | | | | | Connection Maintenance (Retainability) | | | | | | POI | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Node Bs downtime (not available for service) | | Worst affected Node Bs due to downtime | | Call Set-up Success Rate | | RRC Congestion | | Circuit Switched RAB Congestion | | Call drop rate | | Worst affected cells having more than 3% Circuit switched voice drop rate | | %Circuit Switch Voice Quality | | Point of Interconnection (POI) | |
| | | ≤ 2% | ≤ 2% | ≤ 2% | ≤ 2% | ≥ 95% | ≥ 95% | ≤ 1% | ≤ 1% | ≤ 2% | ≤ 2% | ≤ 2% | ≤ 2% | ≤ 3% | ≤ 3% | ≥ 95% | ≥ 95% | ≤ 0.5% | ≤ 0.5% |
| | | Operator | IMRB | Operator | IMRB | Operator | IMRB | Operator | IMRB | Operator | IMRB | Operator | IMRB | Operator | IMRB | Operator | IMRB | Operator | IMRB |
| Gujarat | Airtel | 0.13 | 0.14 | 0.37 | 0.39 | 99.40 | 99.09 | 0.03 | 0.03 | 0.05 | 0.05 | 0.17 | 0.17 | 1.85 | 1.80 | 99.50 | 99.48 | 0.00 | 0.00 |
| | BSNL | 1.23 | 1.24 | 1.63 | 1.63 | 98.00 | 96.04 | 0.43 | 0.86 | 0.90 | 0.57 | 1.23 | 1.22 | 2.33 | 1.57 | 100.00 | 95.60 | 0.00 | 0.00 |
| | IDEA | 0.06 | 0.06 | 0.10 | 0.10 | 99.72 | 99.72 | 0.16 | 0.16 | 0.06 | 0.06 | 0.40 | 0.40 | 2.21 | 2.21 | 98.75 | 98.75 | 0.00 | 0.00 |
| | Tata | 0.03 | 0.38 | 0.00 | 0.00 | 99.03 | 99.18 | 0.07 | 0.05 | 0.28 | 0.21 | 0.46 | 0.45 | 2.05 | 2.07 | 99.72 | 99.72 | 0.00 | 0.00 |
| | Vodafone | 0.04 | 0.03 | 0.05 | 0.06 | 99.81 | 99.80 | 0.08 | 0.07 | 0.02 | 0.07 | 0.16 | 0.17 | 1.05 | 0.99 | 99.02 | 99.03 | 0.00 | 0.00 |

# 5 CRITICAL FINDINGS

### PMR Consolidated 2G (Network Parameters)

- TATA GSM failed to meet the benchmark for BTSs Accumulated Downtime.
- TATA CDMA failed to meet the benchmark for voice quality.

### 3 Day Live Measurement 2G (Network Parameters)

- Reliance CDMA failed to meet the benchmark on TCH congestion.
- TATA CDMA failed to meet the benchmark for voice quality.

### 3 Day Live Measurement 3G (Network Parameters)

- BSNL 3G failed meet the benchmark for the parameter Circuit switched voice quality

### Wireless Data Services for 2G

- Telenor failed to meet the benchmark for Activation done within 4 hours in PMR as well as live audit.
- Aircel failed to meet the benchmark for PDP Context activation success rate in PMR audit.

### Live Calling

- As per the consumers (live calling exercise) all of the operators met the benchmark of resolving 100% complaints within 6 weeks. However, all operator failed to meet the benchmark of resolving 98% complaints within 4 weeks

### Customer Service Quality Parameters

- For the billing disputes of post-paid subscribers, it was observed that Idea failed to meet the TRAI benchmark for the parameter.
- TATA GSM failed to meet the TRAI benchmark of providing credit or waiver within one week in case of complaints received.
- Aircel failed to meet the benchmark for Customer Care Percentage of calls answered by the IVR.
- Airtel, Reliance GSM and Reliance CDMA failed to meet the TRAI benchmark of customer care percentage of calls answered by the operators (Voice to Voice) within 90 seconds

### Operators Assisted Drive Test (Voice) for 2G & 3G

- In Surat SSA Reliance GSM fail to meet the benchmark for voice quality in outdoor locations.
- In Surat SSA Tata 3G failed to meet the benchmark for voice quality in outdoor locations.

# 6 PARAMETER DESCRIPTION & DETAILED FINDINGS - COMPARISON BETWEEN PMR DATA, 3 DAY LIVE DATA AND LIVE CALLING DATA FOR 2G

## 6.1 BTS ACCUMULATED DOWNTIME

### 6.1.1 PARAMETER DESCRIPTION

- The parameter of network availability would be measured from following sub-parameters

    1. BTSs Accumulated downtime (not available for service)
    2. Worst affected BTSs due to downtime

1. **Definition - BTSs (Base Transceiver Station) accumulated downtime** (not available for service) shall basically measure the downtime of the BTSs, including its transmission links/circuits during the period of a month, but excludes all planned service downtime for any maintenance or software up gradation. For measuring the performance against the benchmark for this parameter the downtime of each BTS lasting more than 1 hour at a time in a day during the period of a month were considered.

2. **Computation Methodology –**
   **BTS accumulated downtime (not available for service) = Sum of downtime of BTSs in a month in hours i.e. total outage time of all BTSs in hours during a month / (24 x Number of days in a month x Number of BTSs in the network in licensed service area) x 100**

3. **TRAI Benchmark –**

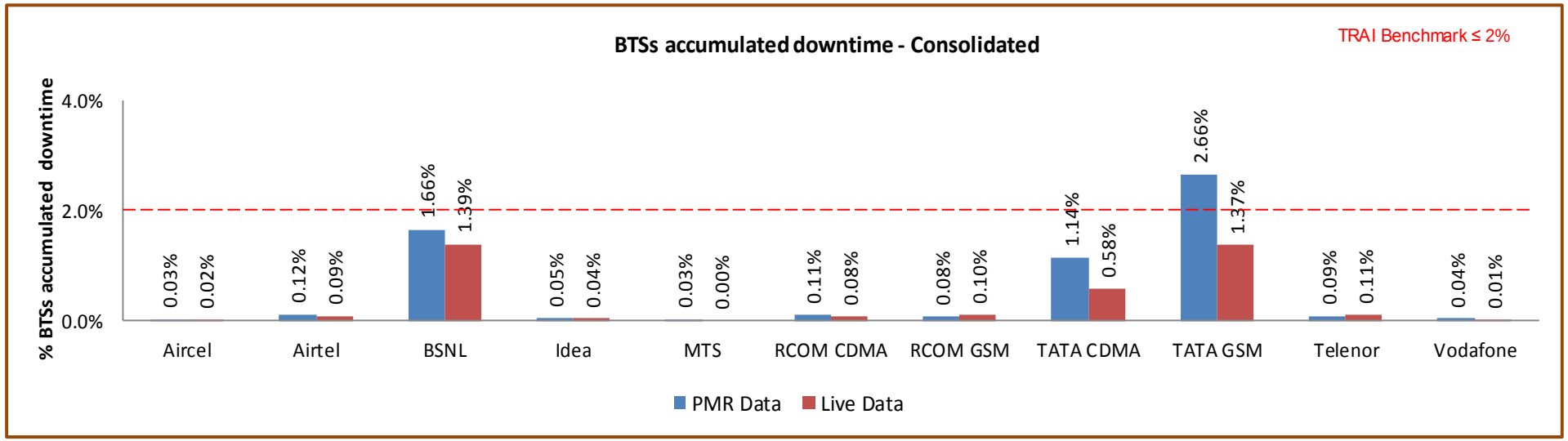
    a. BTSs Accumulated downtime (not available for service) ≤ 2%

4. **Audit Procedure –**

    - The fault alarm details at the OMC (MSC) for the network outages (due to own network elements and infrastructure service provider end outages) was audited
    - All the BTS in service area were considered. Planned outages due to network up gradation, routine maintenance were not considered.

- Any outage as a result of force majeure were not considered at the time of calculation
- Data is extracted from system log of the server of the operator. This data is in raw format which is further processed to arrive at the cumulative values.
- List of operating sites with cell details and ids are taken from the operator.
- When there is any outage a performance report gets generated in line with that cell resulting and master base of the Accumulated downtime and worst affected BTS due to downtime.

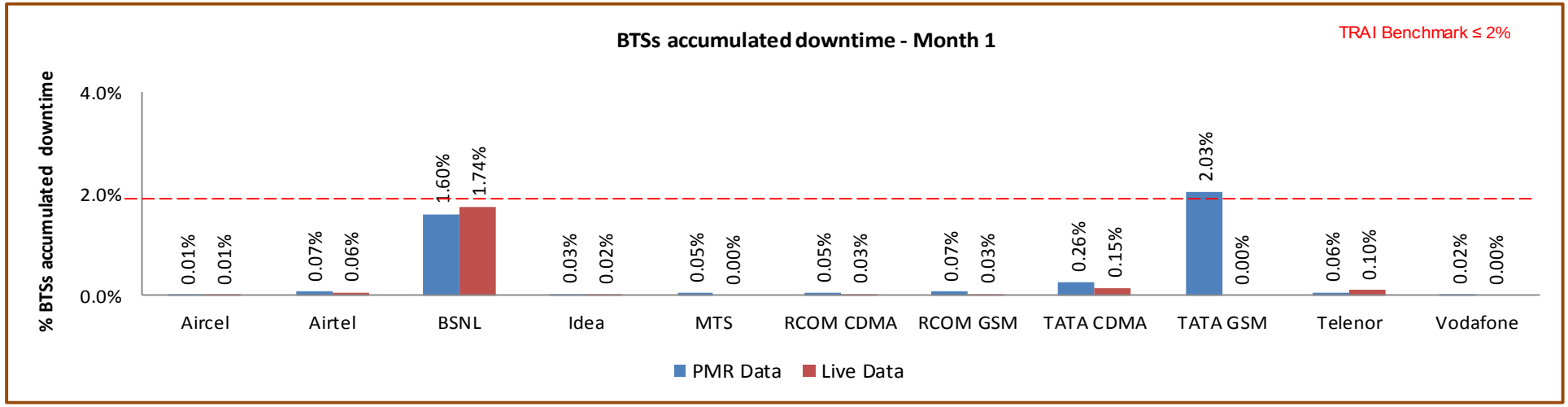
### 6.1.2 KEY FINDINGS - CONSOLIDATED




*Data Source: Operations and Maintenance Center (OMC) of the operators*

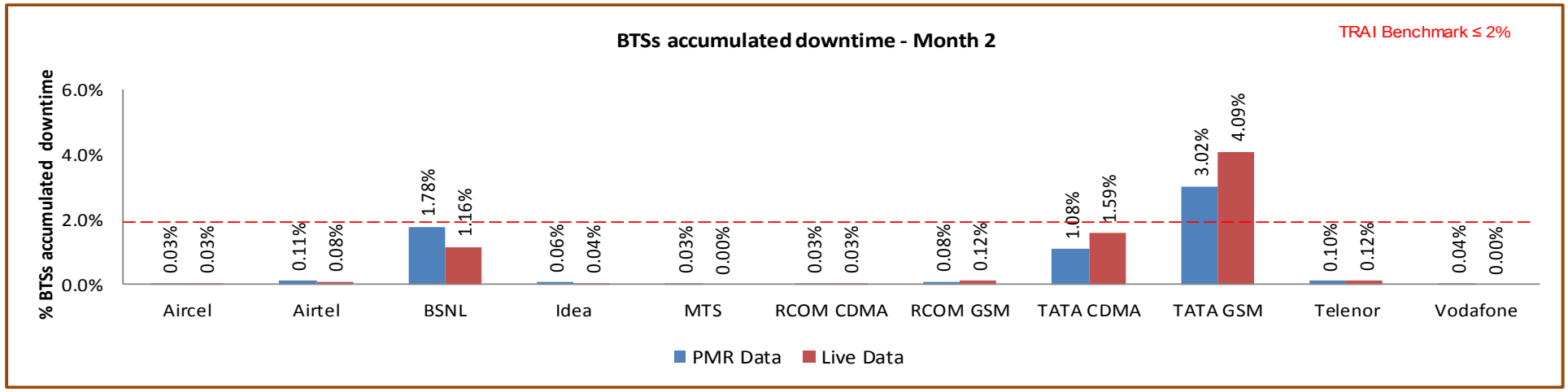
TATA GSM failed to meet the benchmark for BTS accumulated downtime as per audit/PMR data.

### 6.1.2.1 KEY FINDINGS – MONTH 1



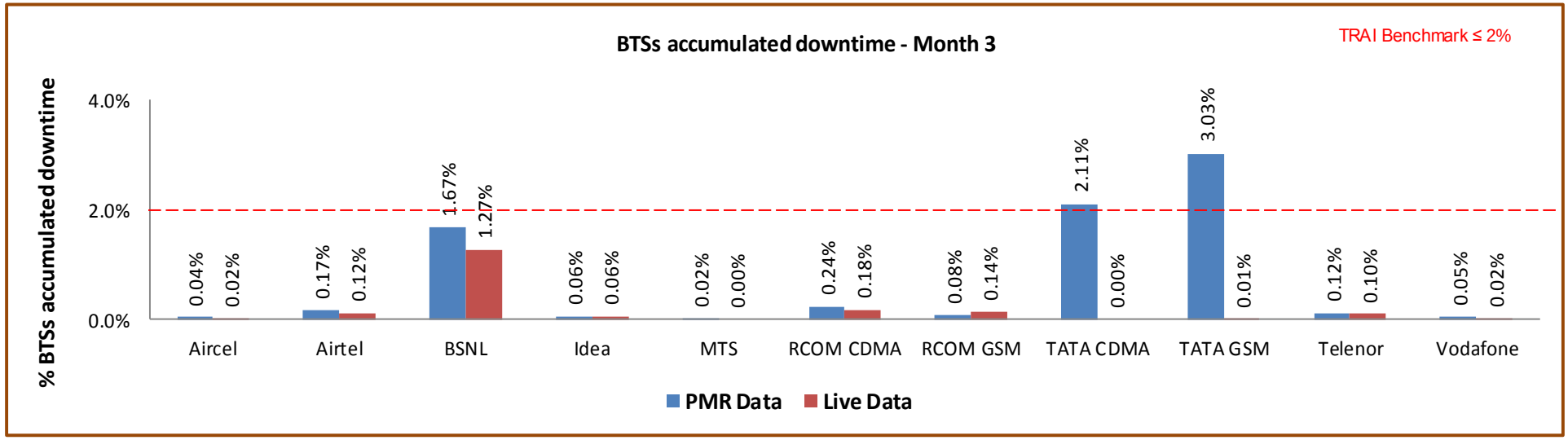

*Data Source: Operations and Maintenance Center (OMC) of the operators*

### 6.1.2.2 KEY FINDINGS – MONTH 2




*Data Source: Operations and Maintenance Center (OMC) of the operator*

### 6.1.2.3 KEY FINDINGS – MONTH 3




*Data Source: Operations and Maintenance Center (OMC) of the operators*

## 6.2 WORST AFFECTED BTS DUE TO DOWNTIME

### 6.2.1 PARAMETER DESCRIPTION

- **Definition – Worst Affected BTS due to downtime** shall basically measure percentage of BTS having downtime greater than 24 hours in a month. Planned outages were not considered as part while computing.

  For measuring the parameter "Percentage of worst affected BTSs due to downtime" the downtime of each BTS lasting for more than 1 hour at a time in a day during the period of a month was considered.

- **Computation Methodology –**

  **Worst affected BTSs due to downtime = (Number of BTSs having accumulated downtime greater than 24 hours in a month / Number of BTS in Licensed Service Area) * 100**

- **TRAI Benchmark –**

  **a.** Worst affected BTSs due to downtime ≤ 2%

- **Audit Procedure –**

  i. The fault alarm details at the OMC (MSC) for the network outages (due to own network elements and infrastructure service provider end outages) was audited

  ii. All the BTS in service area were considered. Planned outages due to network up gradation, routine maintenance were not considered.

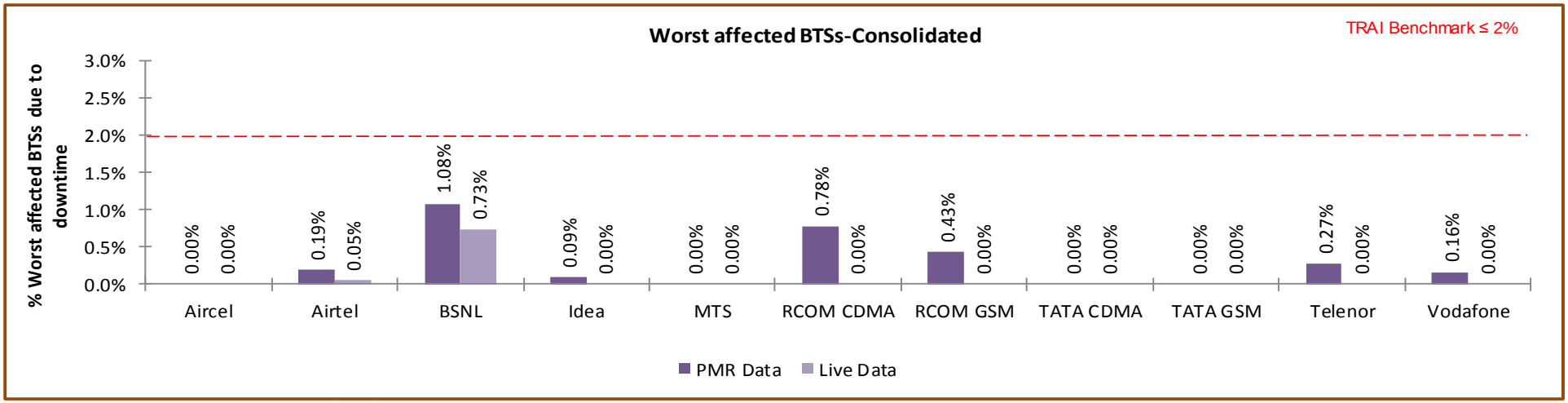
  iii. Data is extracted from system log of the server of the operator. This data is in raw format which is further processed to arrive at the cumulative values.

  iv. Any outage as a result of force majeure was not considered at the time of calculation.

  v. List of operating sites with cell details and ids are taken from the operator.

  vi. All the BTS having down time greater than 24 hours is assessed and values of BTS accumulated downtime is computed in accordance.

### 6.2.2 KEY FINDINGS – CONSOLIDATED

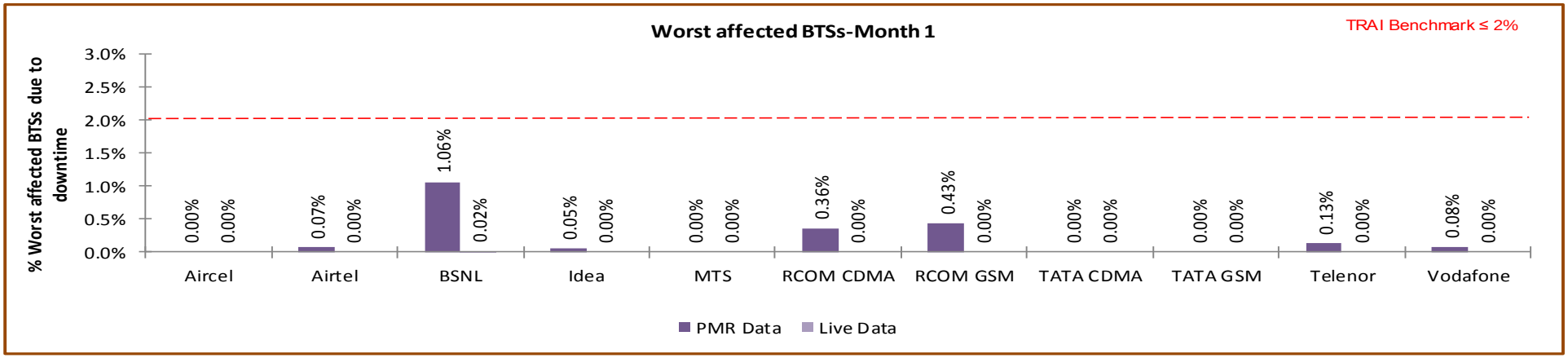



*Data Source: Operations and Maintenance Center (OMC) of the operators*

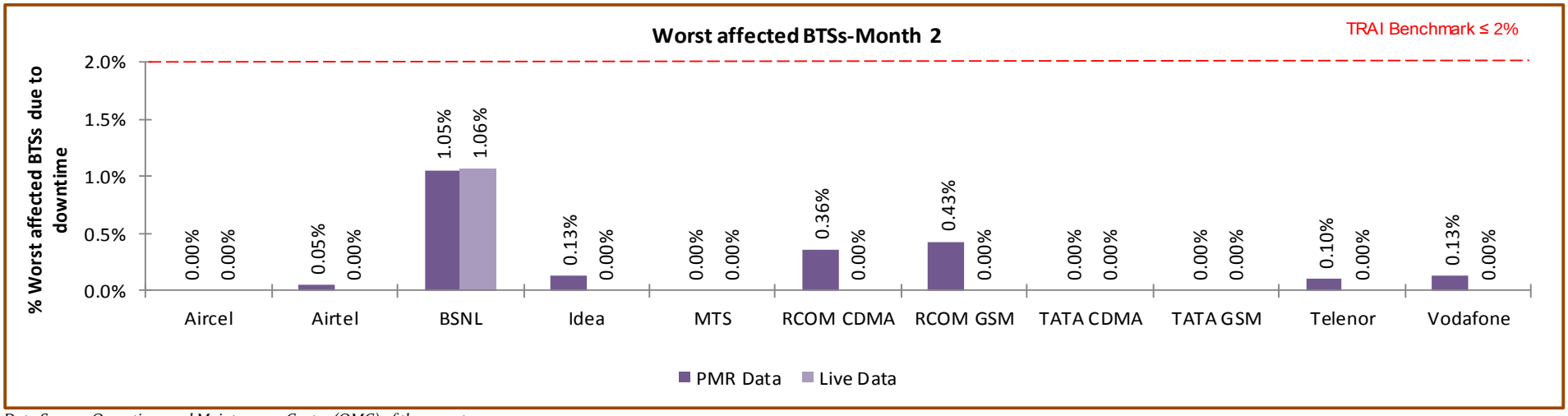
All operators met the benchmark for worst affected BTSs due to downtime as per audit/PMR data.

Significant difference was observed between PMR & live measurement data for Telenor, Reliance GSM & CDMA and BSNL. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for three days.

### 6.2.2.1 KEY FINDINGS – MONTH 1

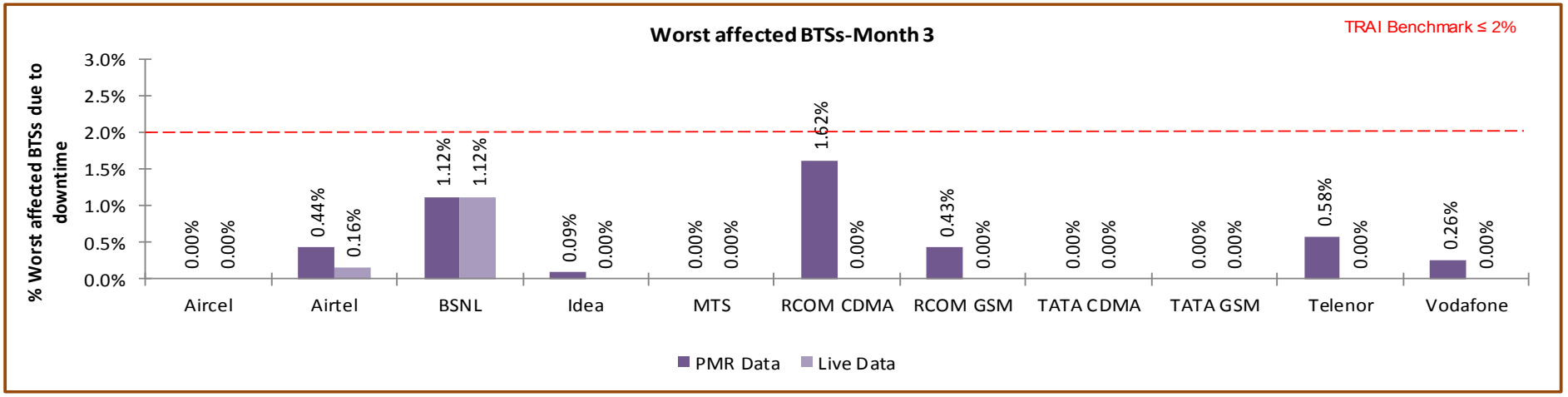



### 6.2.2.2 KEY FINDINGS – MONTH 2




*Data Source: Operations and Maintenance Center (OMC) of the operators*

### 6.2.2.3 KEY FINDINGS – MONTH 3




*Data Source: Operations and Maintenance Center (OMC) of the operators*

## 6.3 CALL SET UP SUCCESS RATE

### 6.3.1 PARAMETER DESCRIPTION

1. **Definition:** The ratio of successful calls established to total calls is known as Call Set-Up Success Rate (CSSR).
2. **Computation Methodology-**

   **(Calls Established / Total Call Attempts) * 100**

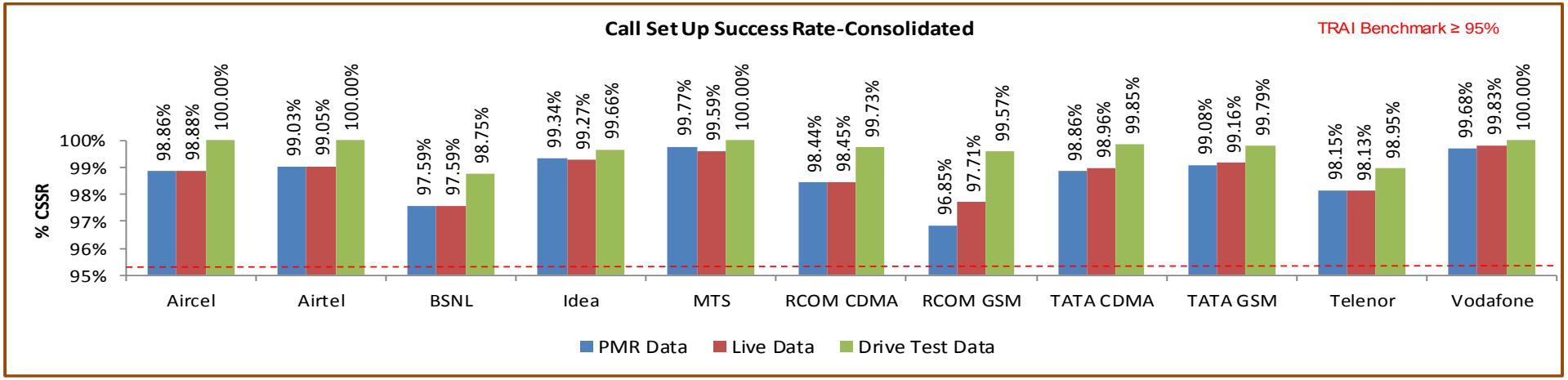
   Call Established means the following events have happened in call setup:-

   - call attempt is made
   - the TCH is allocated
   - the call is routed to the outward path of the concerned MSC

3. **TRAI Benchmark ≥** 95%
4. **Audit Procedure –**

   - The cell-wise data generated through counters/ MMC available in the switch for traffic measurements
   - CSSR calculation should be measured using OMC generated data only
   - Measurement should be only in Time Consistent Busy Hour (CBBH) period for all days of the week
   - Counter data is extracted from the NOC of the operators.
   - Total calls established include all calls established excluding Signaling blocking, TCH Drop and TCH blocking.
   - The numerator and denominator values are derived from adding the counter values from the MSC.

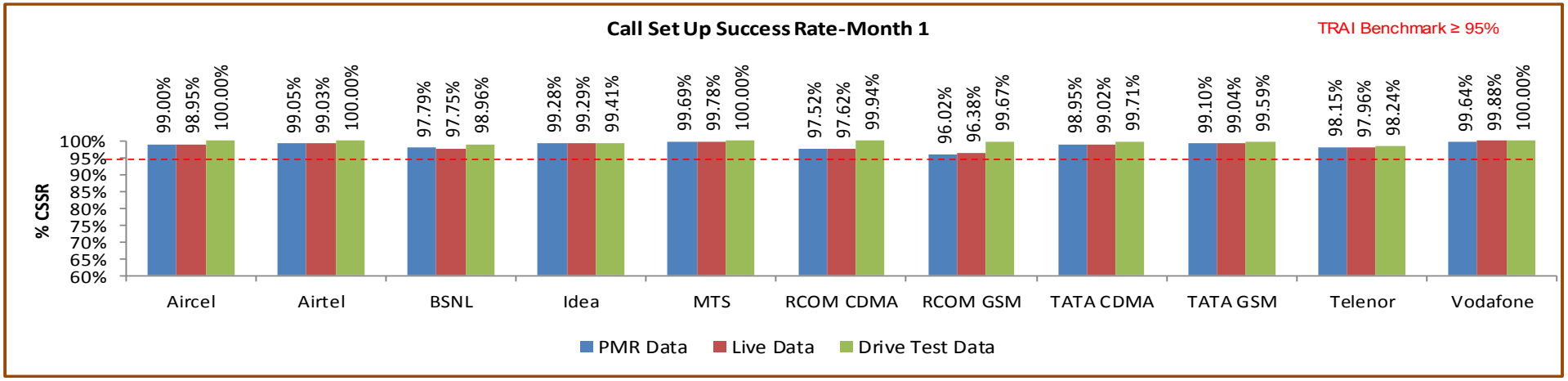
### 6.3.2 KEY FINDINGS - CONSOLIDATED




*Data Source: Network Operations Center (NOC) of the operators*

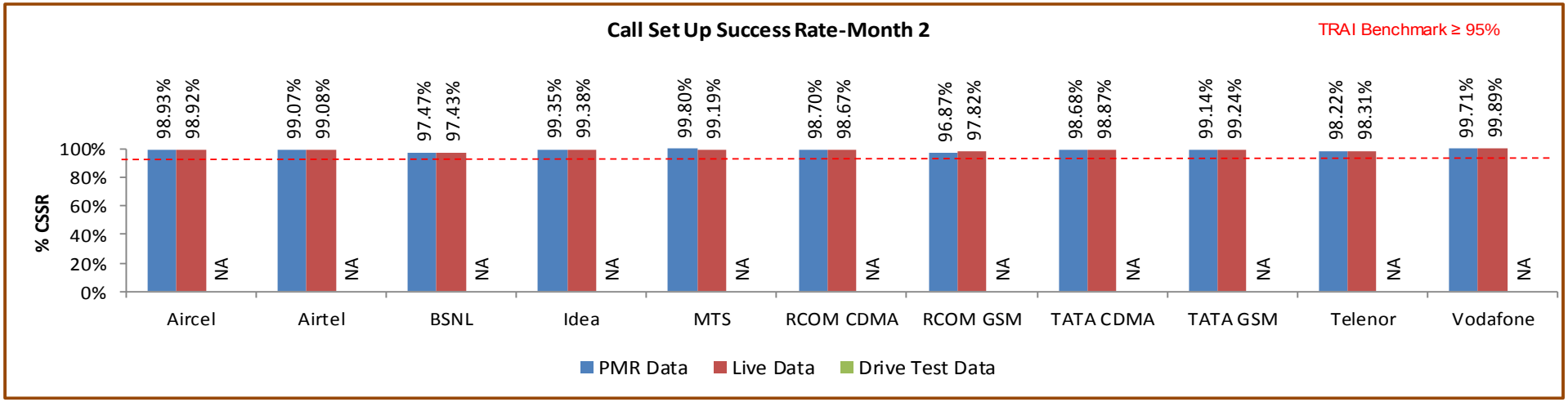
All operators met the TRAI benchmark as per audit/PMR data.

#### 6.3.2.1 KEY FINDINGS – MONTH 1



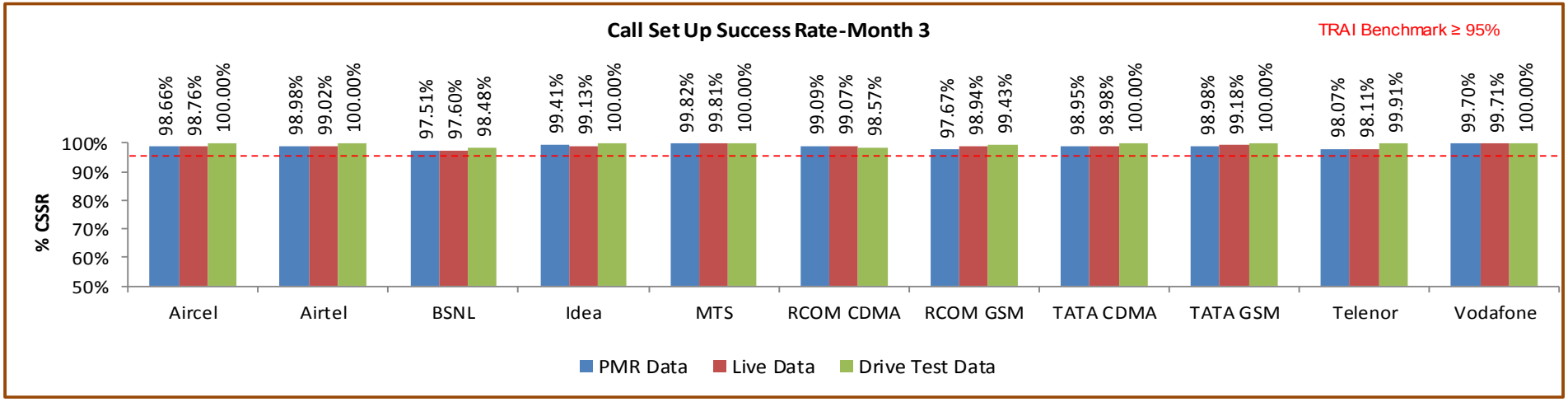

*Data Source: Network Operations Center (NOC) of the operators*

### 6.3.2.2 KEY FINDINGS – MONTH 2




*Data Source: Network Operations Center (NOC) of the operators*

### 6.3.2.3 KEY FINDINGS – MONTH 3




*Data Source: Network Operations Center (NOC) of the operators*

## 6.4 NETWORK CHANNEL CONGESTION- PAGING CHANNEL /TCH CONGESTION/POI

### 6.4.1 PARAMETER DESCRIPTION

1. **Definition:** It means a call is not connected because there is no free channel to serve the call attempt. This parameter represents congestion in the network. It happens at three levels:

   - SDCCH Level: Stand-alone dedicated control channel
   - TCH Level: Traffic Channel
   - POI Level: Point of Interconnect

2. **Computational Methodology:**

   - **SDCCH / TCH Congestion% = [(A1 x C1) + (A2 x C2) +.....+ (An x Cn)] / (A1 + A2 +...+ An)**
     - Where:-A1 = Number of attempts to establish SDCCH / TCH made on day 1
     - C1 = Average SDCCH / TCH Congestion % on day 1
     - A2 = Number of attempts to establish SDCCH / TCH made on day 2
     - C2 = Average SDCCH / TCH Congestion % on day 2
     - An = Number of attempts to establish SDCCH / TCH made on day n
     - Cn = Average SDCCH / TCH Congestion % on day n
   - **POI Congestion% = [(A1 x C1) + (A2 x C2) +.....+ (An x Cn)] / (A1 + A2 +...+ An)**
     - Where:-A1 = POI traffic offered on all POIs (no. of calls) on day 1
     - C1 = Average POI Congestion % on day 1
     - A2 = POI traffic offered on all POIs (no. of calls) on day 2
     - C2 = Average POI Congestion % on day 2

- An = POI traffic offered on all POIs (no. of calls) on day n
- Cn = Average POI Congestion % on day n

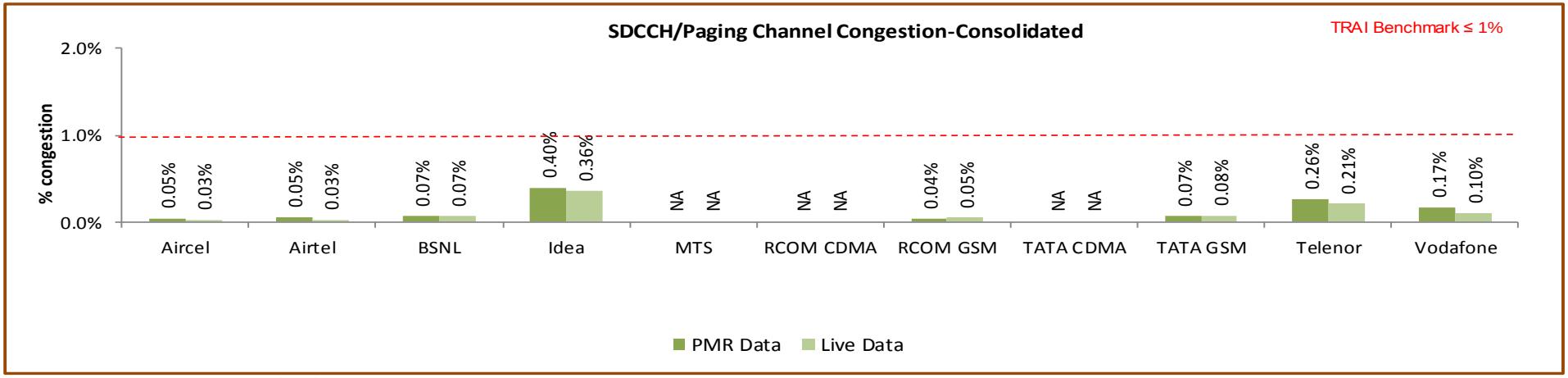
3. **Benchmark:**

   - SDCCH Congestion: ≤ 1%, TCH Congestion: ≤ 2%, POI Congestion: ≤ 0.5%

4. **Audit Procedure –**

   - Audit of the details of SDCCH and TCH congestion percentages computed by the operator (using OMC–Switch data only) would be conducted
   - The operator should be measuring this parameter during Time consistent busy hour (TCBH) only SDCCH

### 6.4.2 KEY FINDINGS - SDCCH/PAGING CHANNEL CONGESTION (CONSOLIDATED)

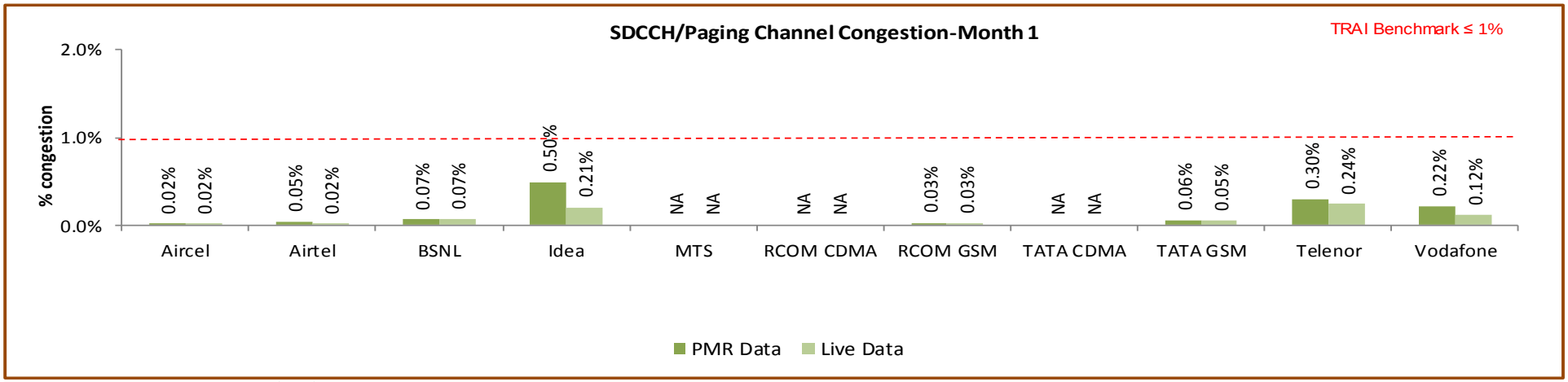



*Data Source: Network Operations Center (NOC) of the operators*

All operators met the benchmark as per PMR/audit Data.

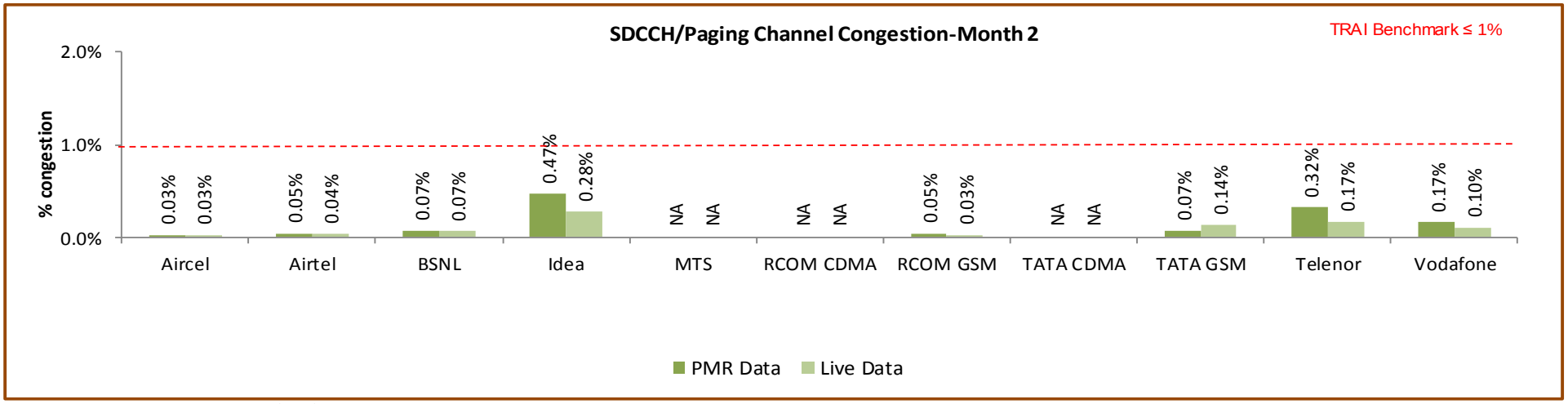
NA: SDCCH/ Paging channel congestion not applicable for CDMA operators.

### 6.4.2.1 KEY FINDINGS – MONTH 1



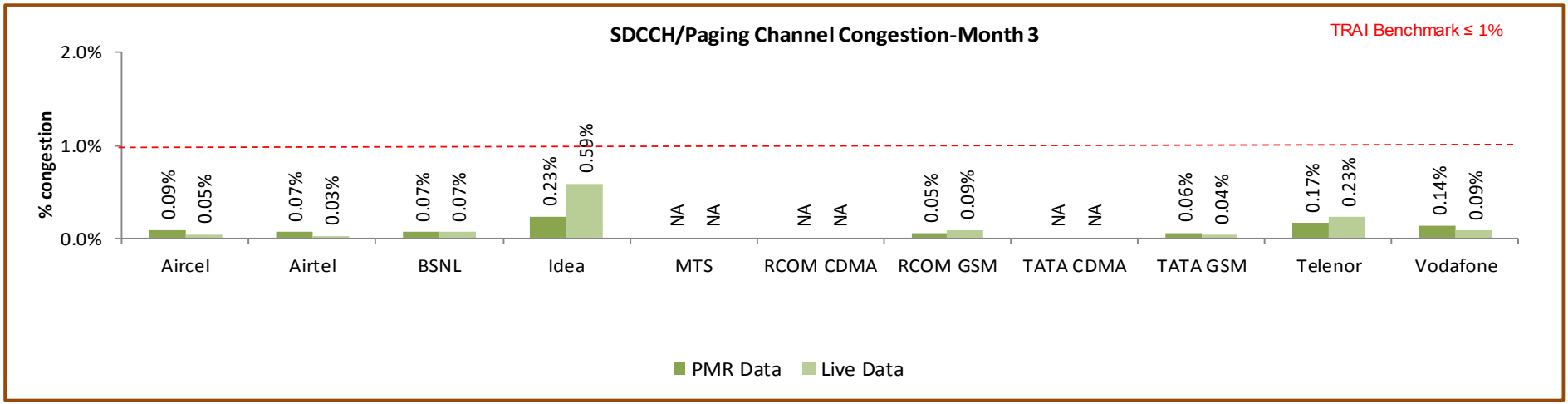

*Data Source: Network Operations Center (NOC) of the operators*

### 6.4.2.1 KEY FINDINGS – MONTH 2



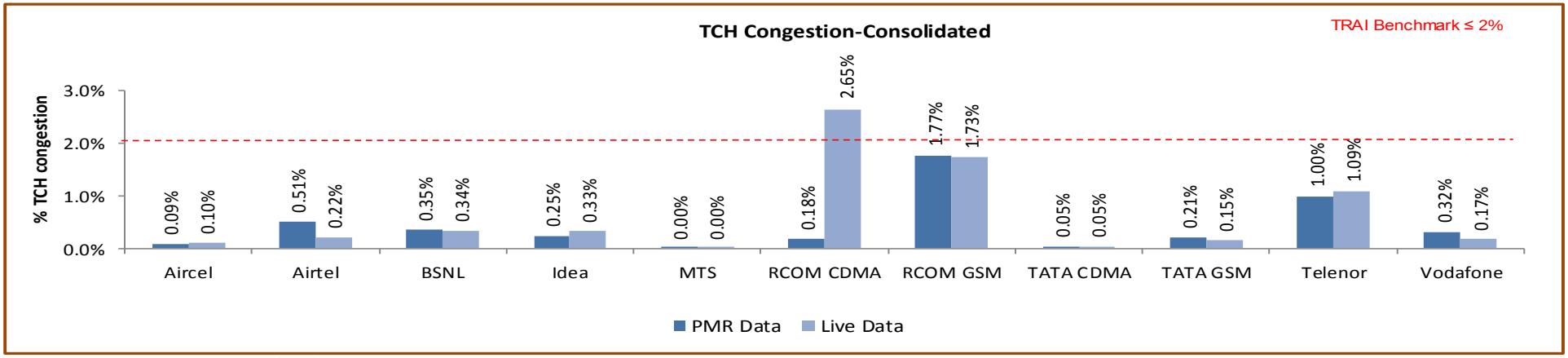

*Data Source: Network Operations Center (NOC) of the operators*

### 6.4.2.2 KEY FINDINGS – MONTH 3




*Data Source: Network Operations Center (NOC) of the operators*

### 6.4.3 KEY FINDINGS – TCH CONGESTION (CONSOLIDATED)

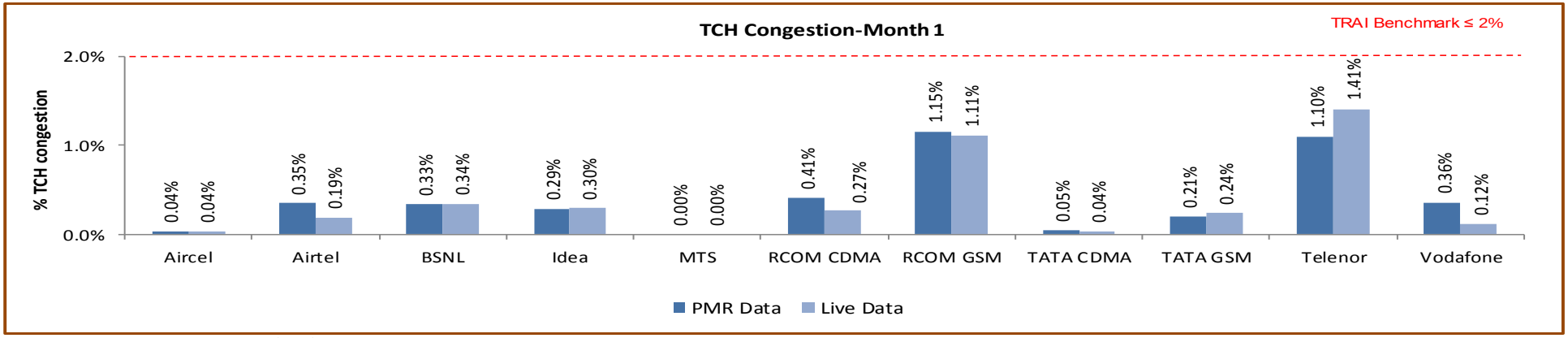



*Data Source: Network Operations Center (NOC) of the operators*

All operators met the benchmark as per audit/PMR report. However Rcom CDMA failed during live audit.

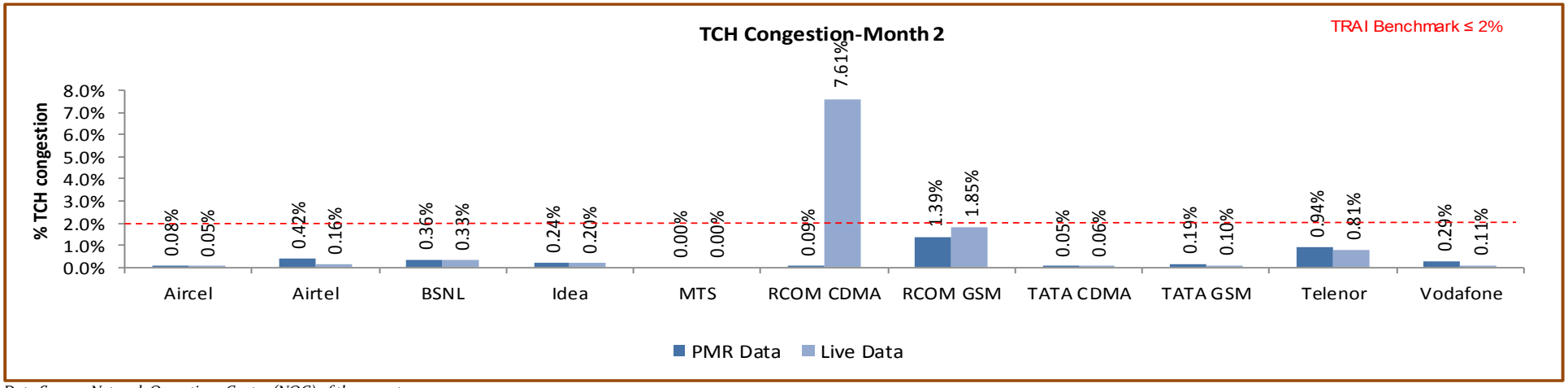
Significant difference was observed between PMR & live measurement data for Airtel, Reliance CDMA, Vodafone, Telenor and Idea. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for three days.

#### 6.4.3.1 KEY FINDINGS – MONTH 1



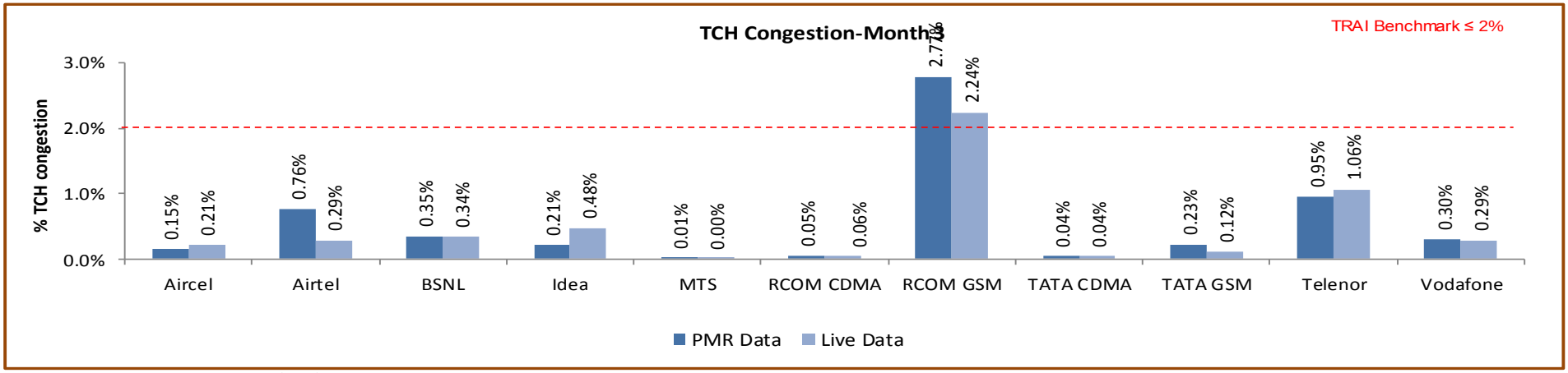

*Data Source: Network Operations Center (NOC) of the operators*

### 6.4.3.2 KEY FINDINGS – MONTH 2




*Data Source: Network Operations Center (NOC) of the operators*

### 6.4.3.3 KEY FINDINGS – MONTH 3




*Data Source: Network Operations Center (NOC) of the operators*

### 6.4.4 KEY FINDINGS – POI CONGESTION (CONSOLIDATED) – AVERAGE OF 3 MONTHS

| Audit Results for POI Congestion- PMR data | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| POI congestion | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of working POIs | | 118 | 58 | 174 | 452 | 196 | 120 | 38 | 477 | 75 | 79 | 449 |
| No. of POIs not meeting benchmark | | 0 | 0 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Capacity of all POIs (A) - in erlangs | | 5566 | 137497 | 142596 | 482403 | 28243 | 304097 | 651376 | 104231 | 110741 | 363937 | 446228 |
| Traffic served for all POIs (B)- in erlangs | | 120 | 4888 | 88826 | 239732 | 2935 | 108132 | 389741 | 40279 | 65621 | 239738 | 255632 |
| POI congestion | ≤ 0.5% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| **Live Measurement Results for POI Congestion- 3 Day data** | | | | | | | | | | | | |
| POI congestion | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of working POIs | | 118 | 58 | 174 | 455 | 196 | 180 | 98 | 477 | 75 | 85 | 447 |
| No. of POIs not meeting benchmark | | 0 | 0 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Capacity of all POIs (A) - in erlangs | | 5566 | 137497 | 142596 | 338026 | 28243 | 509974 | 467778 | 104231 | 110741 | 363000 | 436624 |
| Traffic served for all POIs (B)- in erlangs | | 113 | 4888 | 79623 | 229787 | 1690 | 177017 | 305379 | 25491 | 44701 | 229774 | 113478 |
| POI congestion | ≤ 0.5% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |

*Data Source: Network Operations Center (NOC) of the operators*

All operators met the benchmark of POI Congestion as per PMR/audit Data.

### 6.4.4.1 KEY FINDINGS – MONTH 1

| Audit Results for POI Congestion- PMR data-April | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| POI congestion | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of working POIs | | 40 | NA | 58 | 154 | 64 | 0 | 0 | 159 | 25 | 27 | 151 |
| No. of POIs not meeting benchmark | | 0 | NA | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Capacity of all POIs (A) - in erlangs | | 1869 | NA | 47350 | 161243 | 7998 | 0 | 0 | 34744 | 36914 | 121431 | 149964 |
| Traffic served for all POIs (B)- in erlangs | | 36 | NA | 29871 | 79887 | 867 | 0 | 0 | 13440 | 24347 | 78091 | 60288 |
| POI congestion | ≤ 0.5% | 0.00% | NA | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Live Measurement Results for POI Congestion- 3 Day data-April | | | | | | | | | | | | |
| POI congestion | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of working POIs | | 40 | NA | 58 | 154 | 64 | 60 | 19 | 159 | 25 | 26 | 151 |
| No. of POIs not meeting benchmark | | 0 | NA | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Capacity of all POIs (A) - in erlangs | | 1869 | NA | 47350 | 161121 | 7998 | 343107 | 218322 | 34744 | 36914 | 120941 | 140986 |
| Traffic served for all POIs (B)- in erlangs | | 33 | NA | 29102 | 71684 | 534 | 127586 | 149598 | 8668 | 22821 | 70797 | 30325 |
| POI congestion | ≤ 0.5% | 0.00% | NA | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |

*Data Source: Network Operations Center (NOC) of the operators*

### 6.4.4.2 KEY FINDINGS – MONTH 2

| Audit Results for POI Congestion- PMR data-May | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| POI congestion | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of working POIs | | 40 | 58 | 58 | 150 | 64 | 60 | 19 | 159 | 25 | 27 | 150 |
| No. of POIs not meeting benchmark | | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Capacity of all POIs (A) - in erlangs | | 1863 | 137497 | 47350 | 160814 | 8354 | 256159 | 316525 | 34744 | 36914 | 121066 | 148273 |
| Traffic served for all POIs (B)- in erlangs | | 42 | 4888 | 29791 | 80513 | 794 | 100802 | 187419 | 13317 | 15353 | 79156 | 136795 |
| POI congestion | ≤ 0.5% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| **Live Measurement Results for POI Congestion- 3 Day data-May** | | | | | | | | | | | | |
| POI congestion | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of working POIs | | 40 | 58 | 58 | 153 | 64 | 60 | 19 | 159 | 25 | 25 | 148 |
| No. of POIs not meeting benchmark | | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Capacity of all POIs (A) - in erlangs | | 1863 | 137497 | 47350 | 160761 | 8354 | 126823 | 218322 | 34744 | 36914 | 120650 | 147819 |
| Traffic served for all POIs (B)- in erlangs | | 39 | 4888 | 29711 | 80478 | 466 | 48323 | 149598 | 8362 | 10755 | 78229 | 32640 |
| POI congestion | ≤ 0.5% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |

*Data Source: Network Operations Center (NOC) of the operators*

### 6.4.4.3 KEY FINDINGS – MONTH 3

| Audit Results for POI Congestion- PMR data-June | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| POI congestion | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of working POIs | | 38 | NA | 58 | 148 | 68 | 60 | 19 | 159 | 25 | 25 | 148 |
| No. of POIs not meeting benchmark | | 0 | NA | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Capacity of all POIs (A) - in erlangs | | 1834 | NA | 47896 | 160346 | 11891 | 47938 | 334851 | 34744 | 36914 | 121441 | 147991 |
| Traffic served for all POIs (B)- in erlangs | | 41 | NA | 29164 | 79333 | 1275 | 7330 | 202322 | 13522 | 25921 | 82491 | 58549 |
| POI congestion | ≤ 0.5% | 0.00% | NA | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| **Live Measurement Results for POI Congestion- 3 Day data-June** | | | | | | | | | | | | |
| POI congestion | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of working POIs | | 38 | NA | 58 | 148 | 68 | 60 | 60 | 159 | 25 | 35 | 148 |
| No. of POIs not meeting benchmark | | 0 | NA | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Capacity of all POIs (A) - in erlangs | | 1834 | NA | 47896 | 16144 | 11891 | 40044 | 31134 | 34744 | 36914 | 121409 | 147819 |
| Traffic served for all POIs (B)- in erlangs | | 40 | NA | 20810 | 77625 | 689 | 1107 | 6183 | 8461 | 11125 | 80748 | 50513 |
| POI congestion | ≤ 0.5% | 0.00% | NA | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |

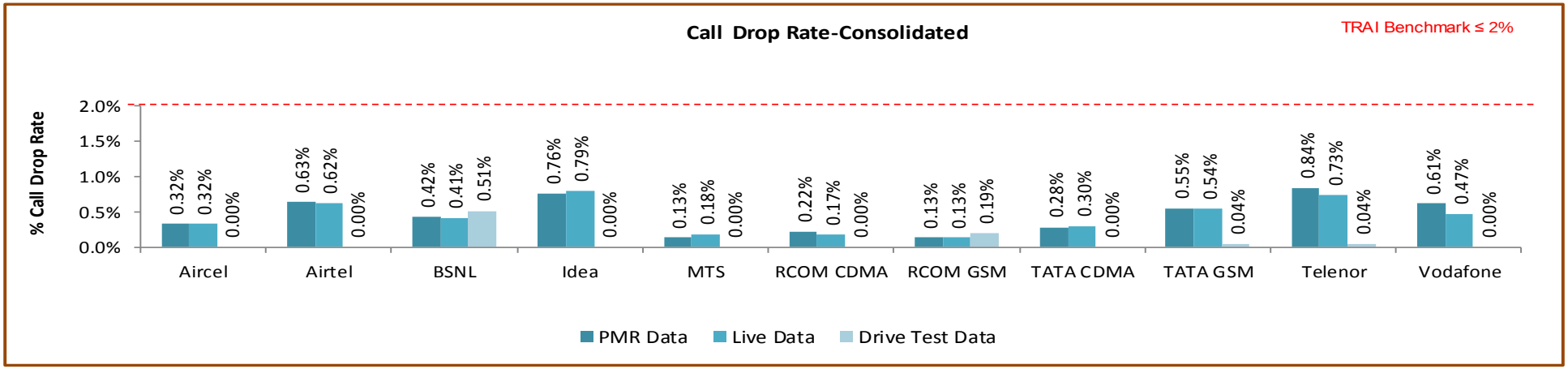
*Data Source: Network Operations Center (NOC) of the operators*

## 6.5 CALL DROP RATE

### 6.5.1 PARAMETER DESCRIPTION

1. **Definition -** The dropped call rate is the ratio of successfully originated calls that were found to drop to the total number of successfully originated calls that were correctly released.
    - **Total calls dropped** = All calls ceasing unnaturally i.e. due to handover or due to radio loss
    - **Total calls established** = All calls that have TCH allocation during busy hour
2. **Computational Methodology:** (**Total Calls Dropped** / **Total Calls Established) x 100**
3. **TRAI Benchmark –**
    - Call drop rate ≤ 2%
4. **Audit Procedure –**
    - Audit of traffic data of the relevant quarter kept in OMC-R at MSCs and used for arriving at CDR was used
    - The operator should only be considering those calls which are dropped during Time consistent busy hour (TCBH) for all days of the relevant quarter.

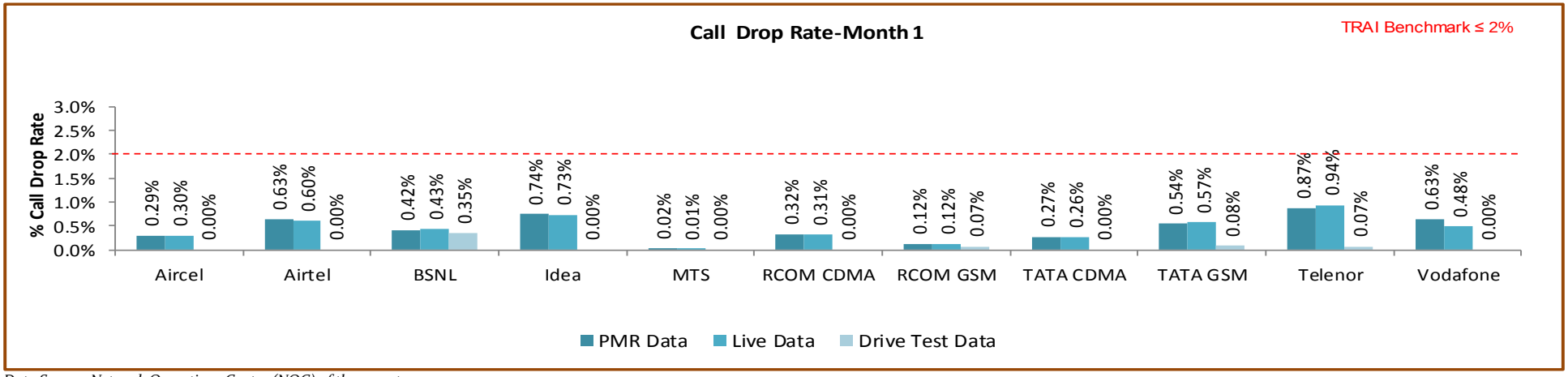
### 6.5.2 KEY FINDINGS - CONSOLIDATED




*Data Source: Network Operations Center (NOC) of the operators*

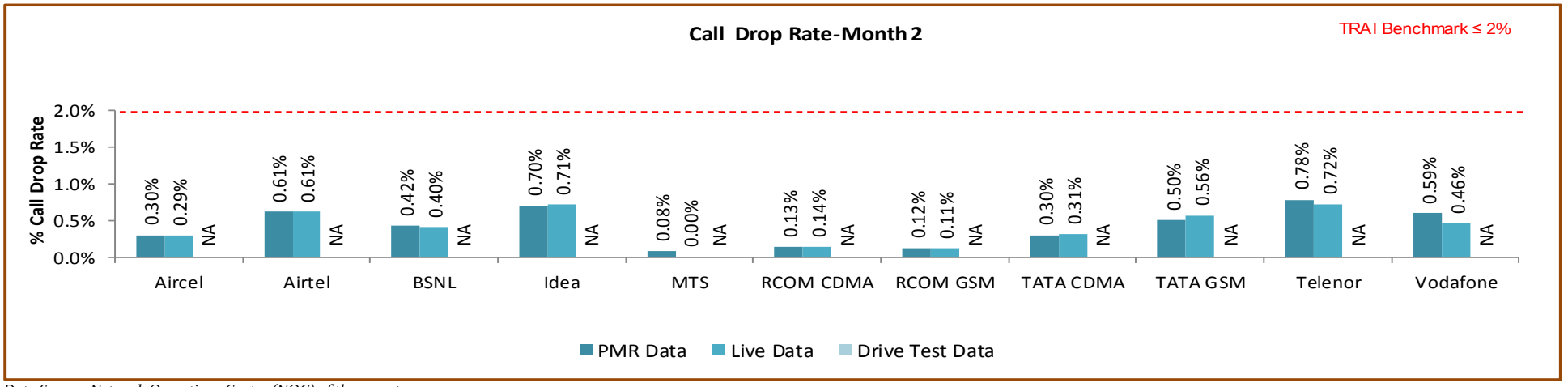
All operators met the benchmark for call drop rate during audit.

#### 6.5.2.1 KEY FINDINGS – MONTH 1



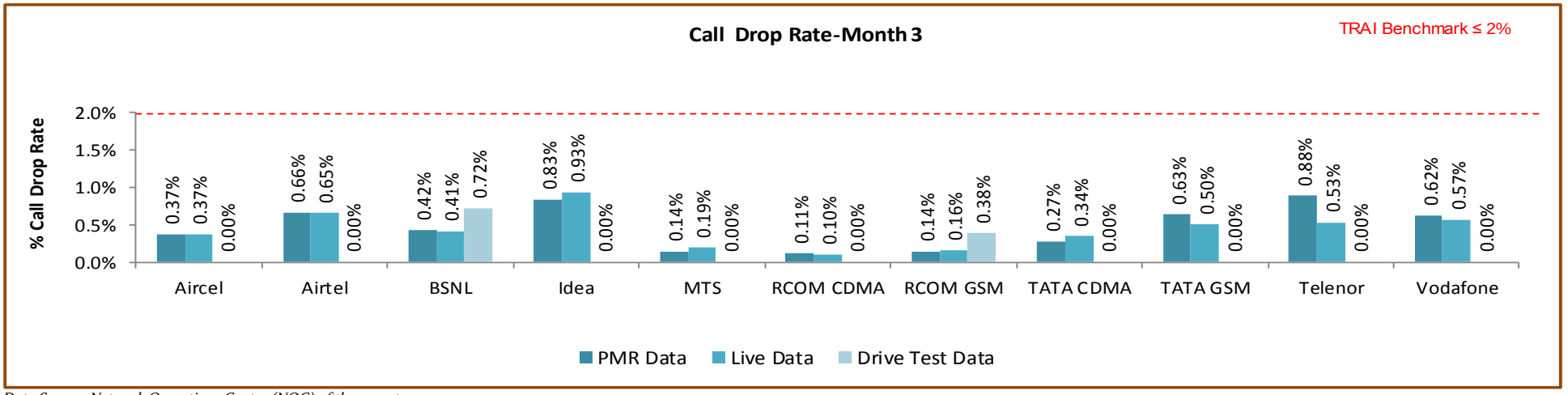

*Data Source: Network Operations Center (NOC) of the operators*

### 6.5.2.2 KEY FINDINGS – MONTH 2




*Data Source: Network Operations Center (NOC) of the operator*

### 6.5.2.3 KEY FINDINGS – MONTH 3




*Data Source: Network Operations Center (NOC) of the operators*

## 6.6 CELLS HAVING GREATER THAN 3% TCH DROP

### 6.6.1 PARAMETER DESCRIPTION

1. **Definition- Worst Affected Cells having more than 3% TCH drop** shall measure the ratio of total number of cells in the network to the ratio of cells having more than 3% TCH drop.

2. **Computational Methodology: (Total number of cells having more than 3% TCH drop during CBBH/ Total number of cells in the network) x 100**

3. **TRAI Benchmark –**

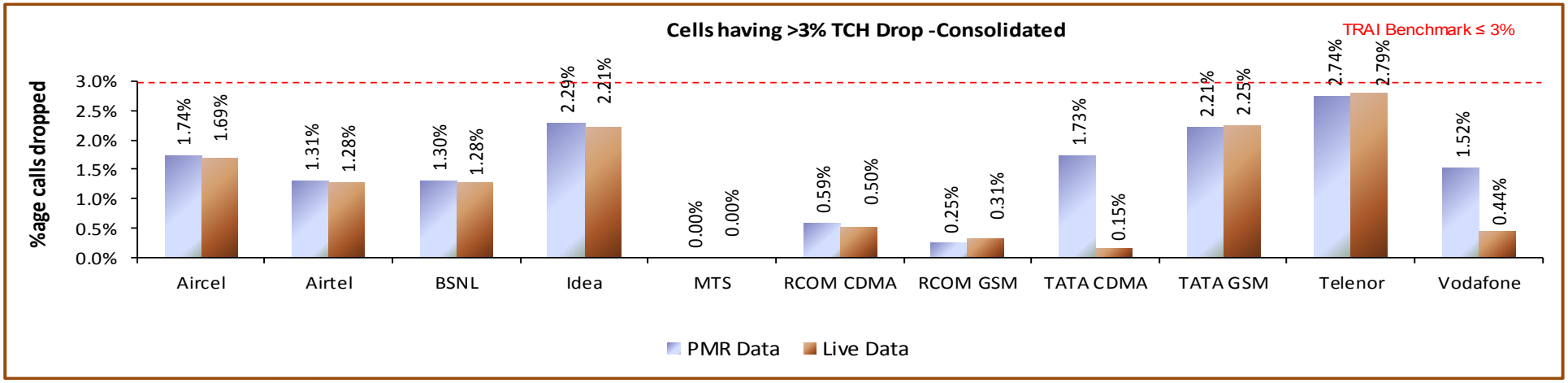
   - Worst affected cells having more than 3% TCH drop rate ≤ 3%

4. **Audit Procedure –**

   - Audit of traffic data of the relevant quarter kept in OMC-R at MSCs and used for arriving at CDR would be conducted.

The operator should only be considering those calls which are dropped during Cell Bouncing Busy hour (CBBH) for all days of the relevant quarter.

### 6.6.2 KEY FINDINGS - CONSOLIDATED

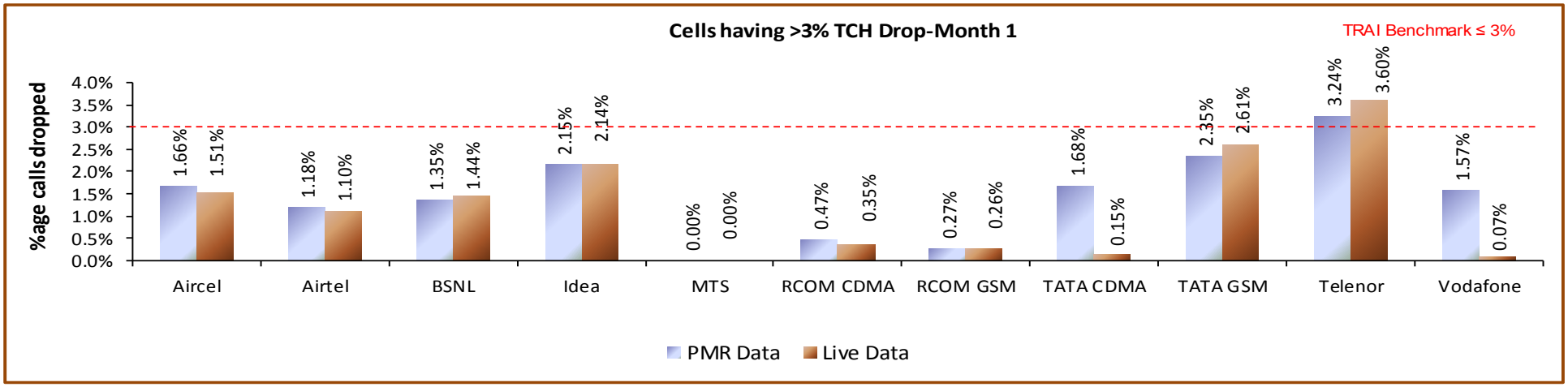



*Data Source: Network Operations Center (NOC) of the operators*

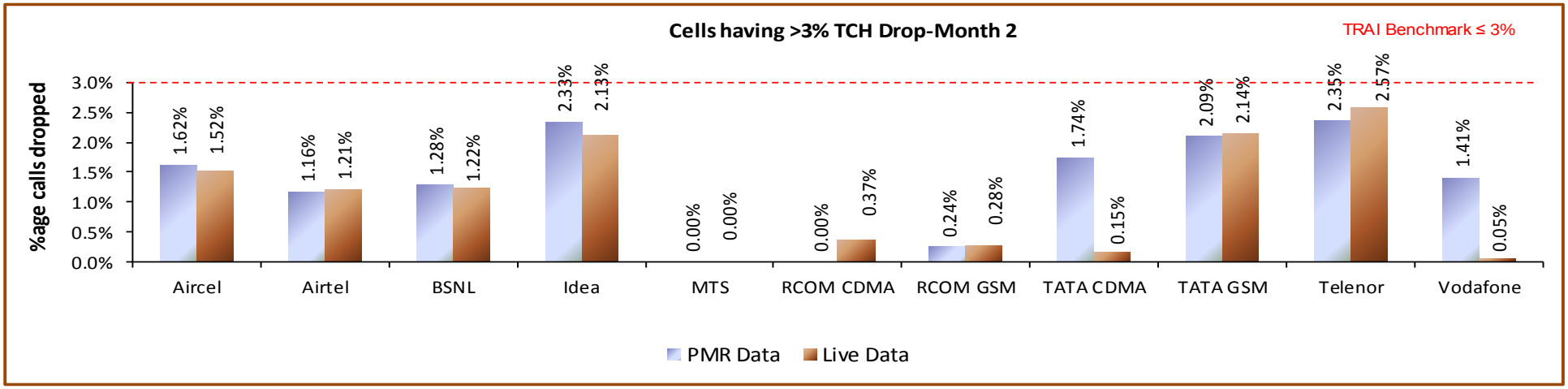
All operators met the TRAI benchmark.

Significant difference was observed between PMR & live measurement data for TATA CDMA and Vodafone. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for three days.

### 6.6.2.1 KEY FINDINGS – MONTH 1

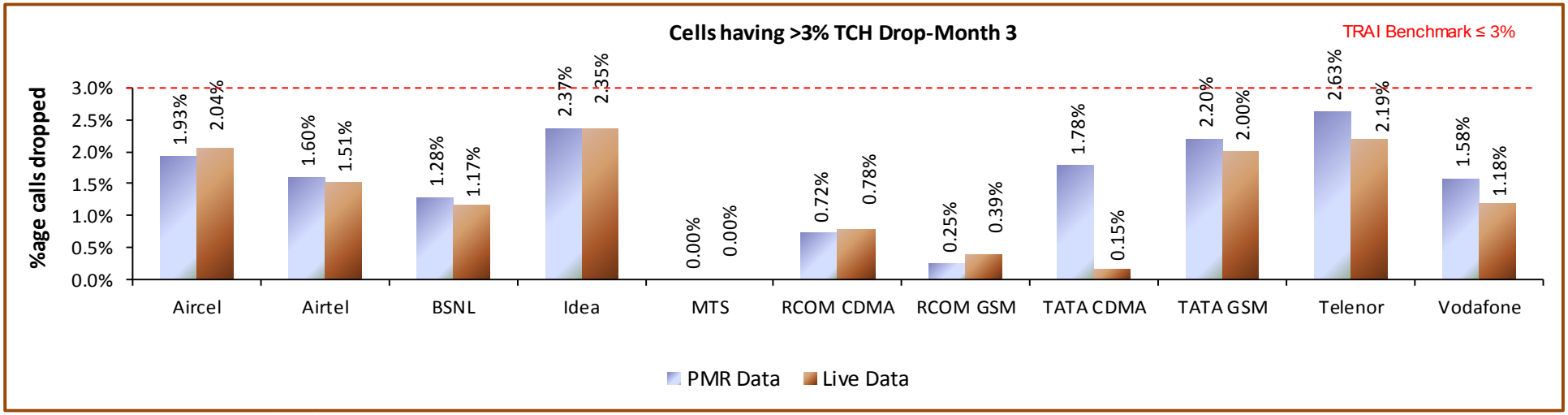



### 6.6.2.2 KEY FINDINGS – MONTH 2




*Data Source: Network Operations Center (NOC) of the operators*

### 6.6.2.3 KEY FINDINGS – MONTH 3



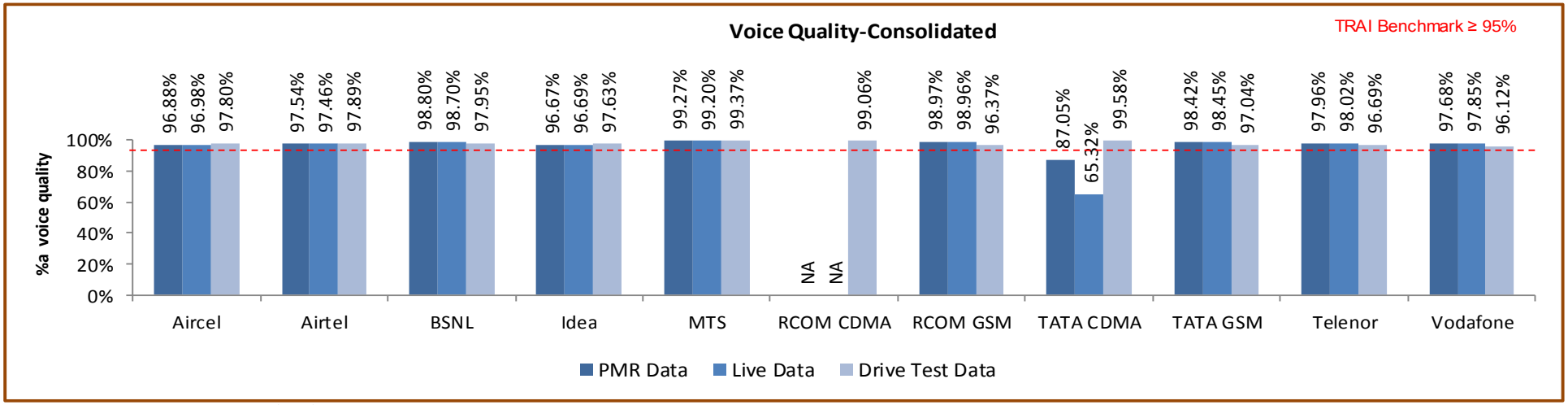

*Data Source: Network Operations Center (NOC) of the operators*

## 6.7 VOICE QUALITY

### 6.7.1 PARAMETER DESCRIPTION

1. **Definition:**
   - for GSM service providers the calls having a value of 0 –5 are considered to be of good quality (on a seven point scale)
   - For CDMA the measure of voice quality is Frame Error Rate (FER). FER is the probability that a transmitted frame will be received incorrectly. Good voice quality of a call is considered when it FER value lies between 0 – 4 %
2. **Computational Methodology:**
   - **% Connections with good voice quality = (No. of voice samples with good voice quality / Total number of samples) x 100**
3. **TRAI Benchmark:** ≥ 95%
4. **Audit Procedure –**
   a. A sample of calls would be taken randomly from the total calls established.
   b. The operator should only be considering those calls which are meeting the desired benchmark of good voice quality.

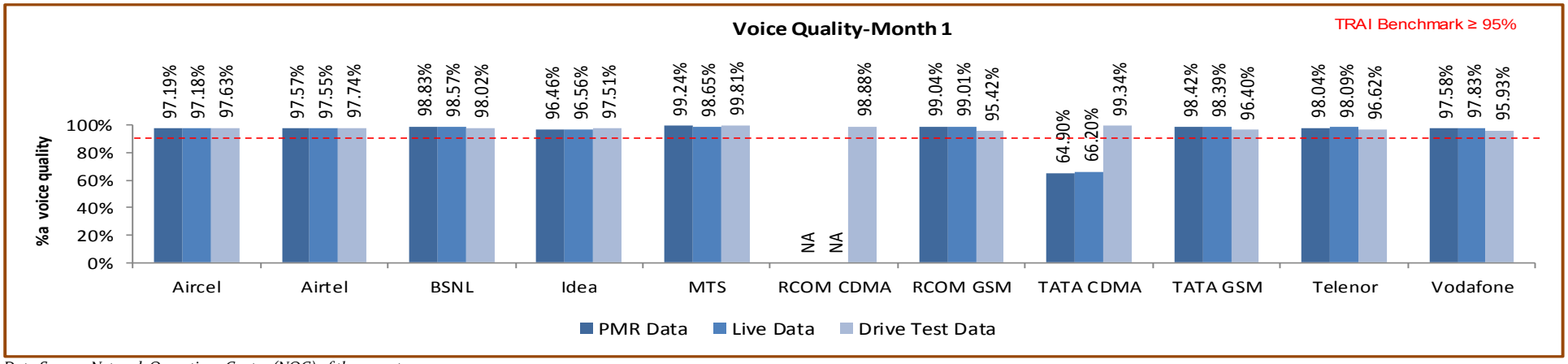
## 6.7.2 KEY FINDINGS




*Data Source: Network Operations Center (NOC) of the operators*

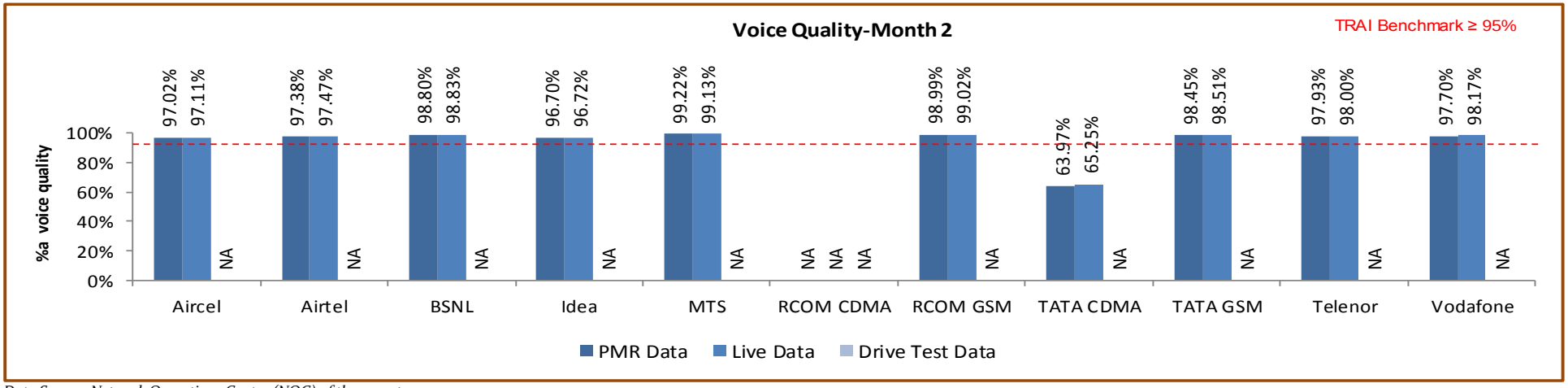
TATA CDMA failed to meet the benchmark for Voice quality as per PMR and live data.

## 6.7.3 KEY FINDINGS- MONTH 1



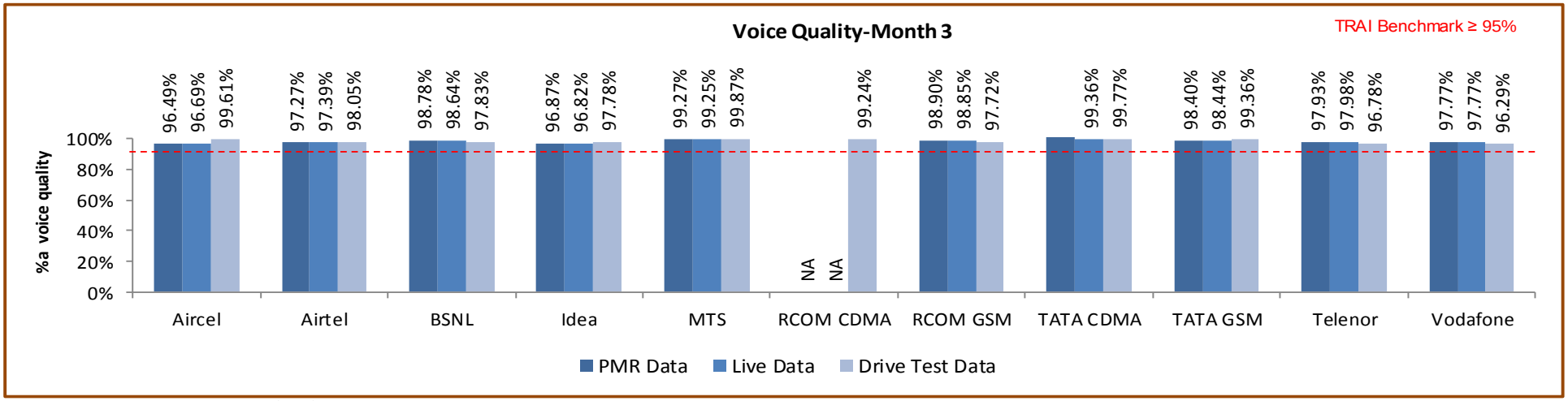

*Data Source: Network Operations Center (NOC) of the operators*

### 6.7.3.1 KEY FINDINGS – MONTH 2




*Data Source: Network Operations Center (NOC) of the operators*

### 6.7.3.2 KEY FINDINGS – MONTH 3




*Data Source: Network Operations Center (NOC) of the operators*

# 7 PARAMETER DESCRIPTION & DETAILED FINDINGS - COMPARISON BETWEEN PMR DATA, 3 DAY LIVE DATA AND LIVE CALLING DATA FOR 3G

## 7.1 NODE BS DOWNTIME

### 7.1.1 PARAMETER DESCRIPTION

- The parameter of network availability would be measured from following sub-parameters

  **1. Node Bs downtime (not available for service)**

  **2. Worst affected Node Bs due to downtime**

- **Definition - Node Bs downtime (not available for service):** In the case of 3G networks, instead of BTS the nomenclature is Node B. The measurement methodology for the parameter Node B Accumulated downtime (not available for service) will be similar to the existing parameter for BTSs Accumulated downtime (not available for service).

- **Data Extraction/collection methodology** - Data extraction to be done from appropriate counters. Auditors should be aware of counter details and definitions for each operator.
- **Source of Data:** Network Operation Center (NOC) or a Central Server
- **Computation Methodology –**
  **Node Bs downtime (not available for service) = Sum of downtime of Node Bs in a month in hours i.e. total outage time of all Node Bs in hours during a month / (24 x Number of days in a month x Number of Node Bs in the network in licensed service area) x 100**

**3. TRAI Benchmark –**

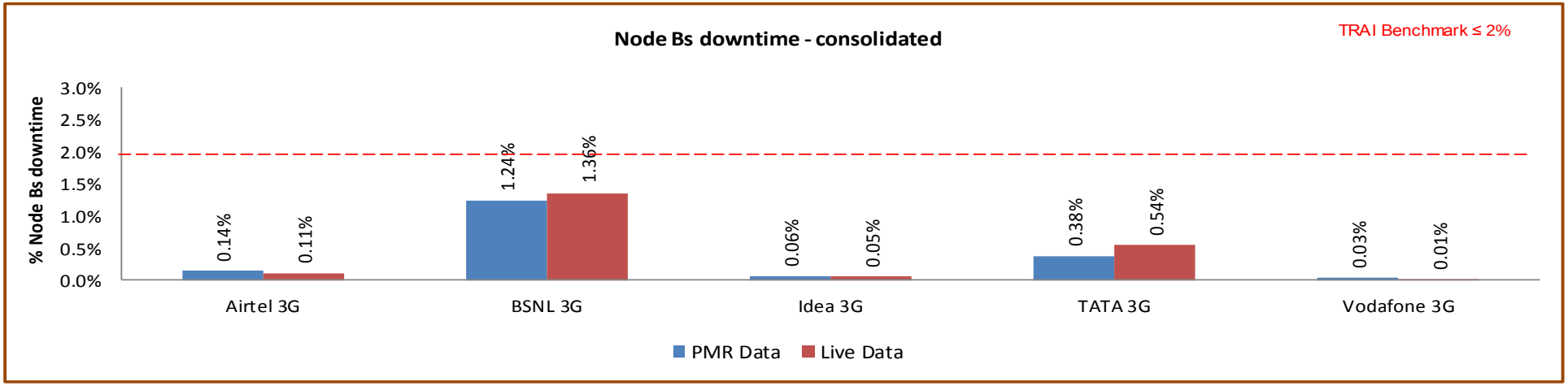
**a.** Node Bs downtime (not available for service) ≤ 2%

**4. Audit Procedure –**

- The fault alarm details at the OMC (MSC) for the network outages (due to own network elements and infrastructure service provider end outages) was audited

- All the Node Bs in service area was considered. Planned outages due to network up gradation, routine maintenance were not considered.
- Any outage as a result of force majeure were not considered at the time of calculation
- Data is extracted from system log of the server of the operator. This data is in raw format which is further processed to arrive at the cumulative values.
- List of operating sites with cell details and ids are taken from the operator.
    - When there is any outage a performance report gets generated in line with that cell resulting and master base of the Node Bs downtime and worst affected Node Bs due to downtime.

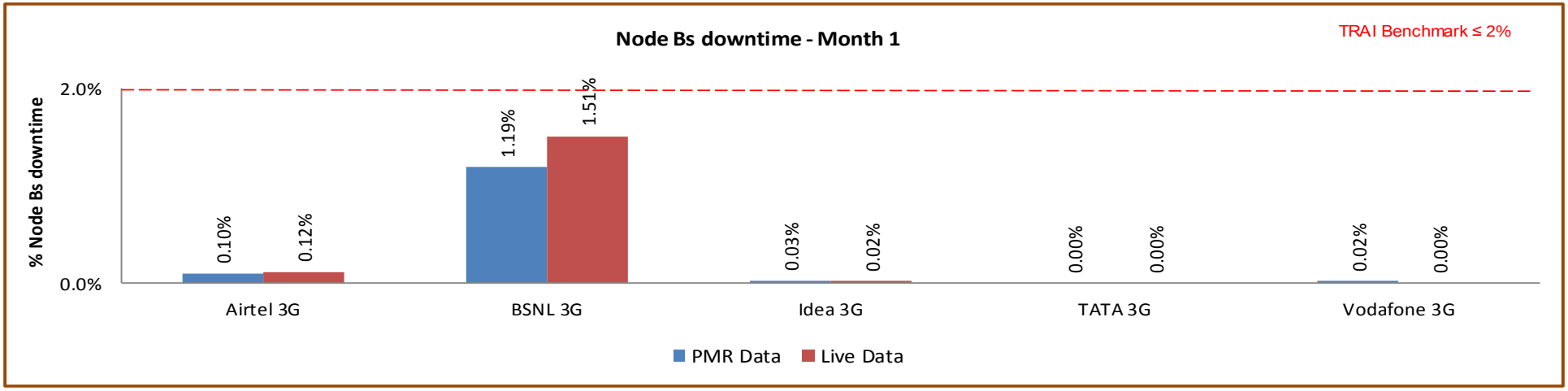
### 7.1.2 KEY FINDINGS - CONSOLIDATED




*Data Source: Operations and Maintenance Center (OMC) of the operators*

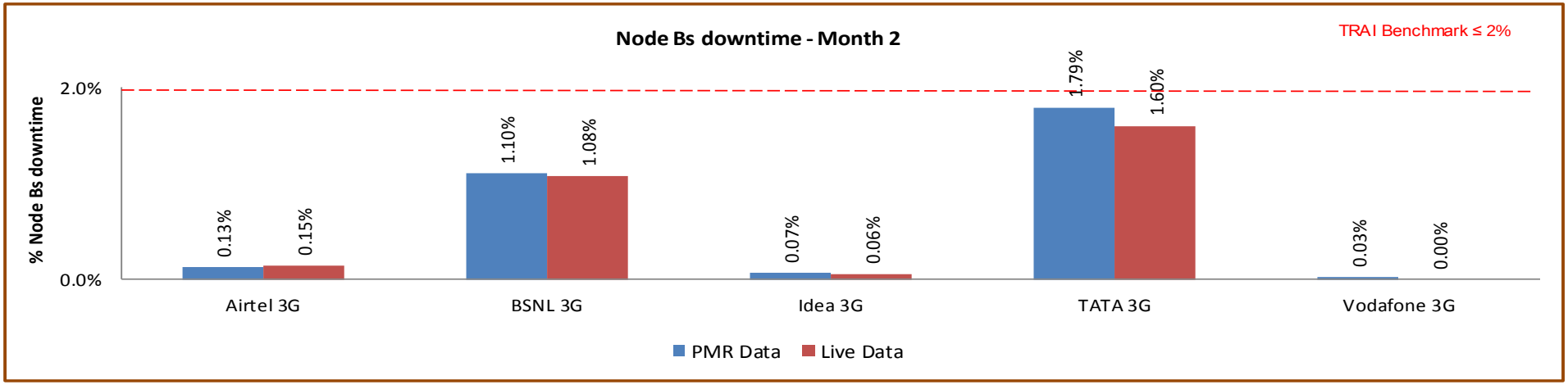
All operators met the benchmark for Node Bs downtime.

### 7.1.2.1 KEY FINDINGS – MONTH 1



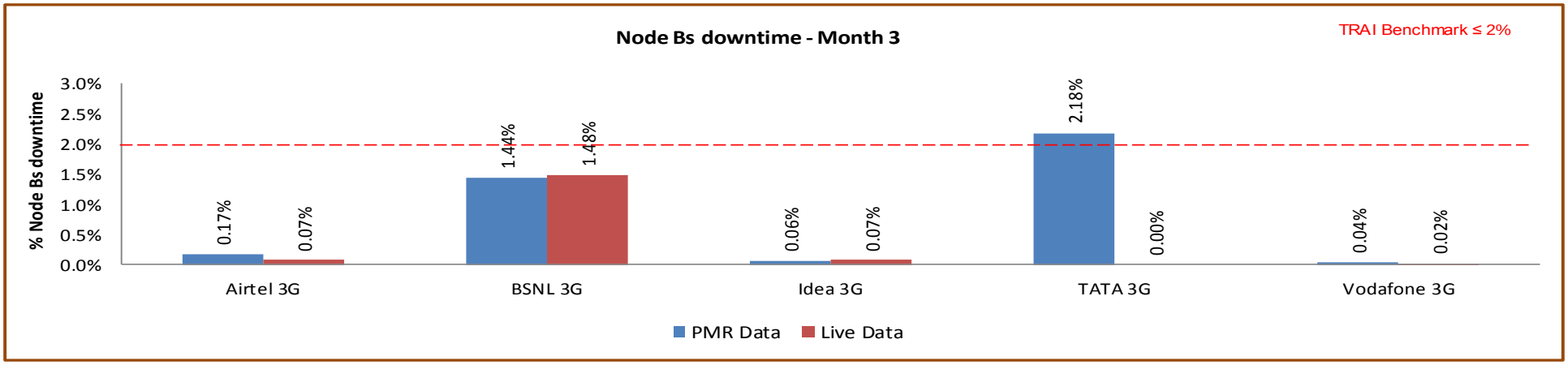

*Data Source: Operations and Maintenance Center (OMC) of the operators*

### 7.1.2.2 KEY FINDINGS – MONTH 2




*Data Source: Operations and Maintenance Center (OMC) of the operator*

### 7.1.2.3 KEY FINDINGS – MONTH 3




*Data Source: Operations and Maintenance Center (OMC) of the operators*

## 7.2 WORST AFFECTED NODE BS DUE TO DOWNTIME

### 7.2.1 PARAMETER DESCRIPTION

- **Definition – Worst Affected Node Bs due to downtime** shall basically measure percentage of Node Bs having downtime greater than 24 hours in a month. Planned outages were not considered as part while computing.

  For measuring the parameter "Percentage of worst affected Node Bs due to downtime" the downtime of each Node B lasting for more than 1 hour at a time in a day during the period of a month was considered.

- **Computation Methodology –**

  **Worst affected Node Bs due to downtime = (Number of Node Bs having accumulated downtime greater than 24 hours in a month / Number of Node Bs in Licensed Service Area) * 100**

- **TRAI Benchmark –**

  **b.** Worst affected Node Bss due to downtime ≤ 2%

- **Audit Procedure –**

  i. The fault alarm details at the OMC (MSC) for the network outages (due to own network elements and infrastructure service provider end outages) was audited

  ii. All the Node Bs in service area were considered. Planned outages due to network up gradation, routine maintenance were not considered.

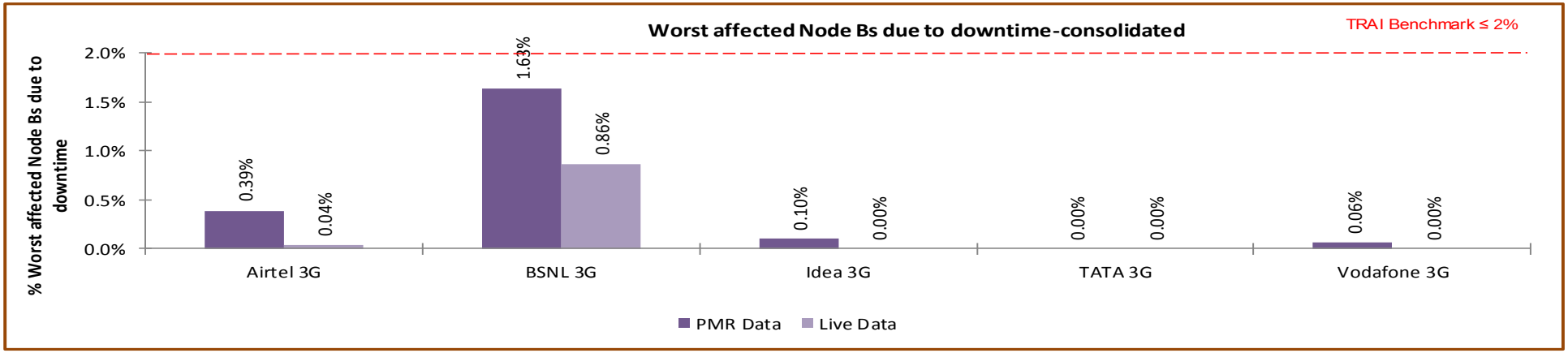
  iii. Data is extracted from system log of the server of the operator. This data is in raw format which is further processed to arrive at the cumulative values.

  iv. Any outage as a result of force majeure was not considered at the time of calculation.

  v. List of operating sites with cell details and ids are taken from the operator.

vi. All the Node Bs having down time greater than 24 hours is assessed and values of Node Bs accumulated downtime is computed in accordance.

### 7.2.2 KEY FINDINGS – CONSOLIDATED

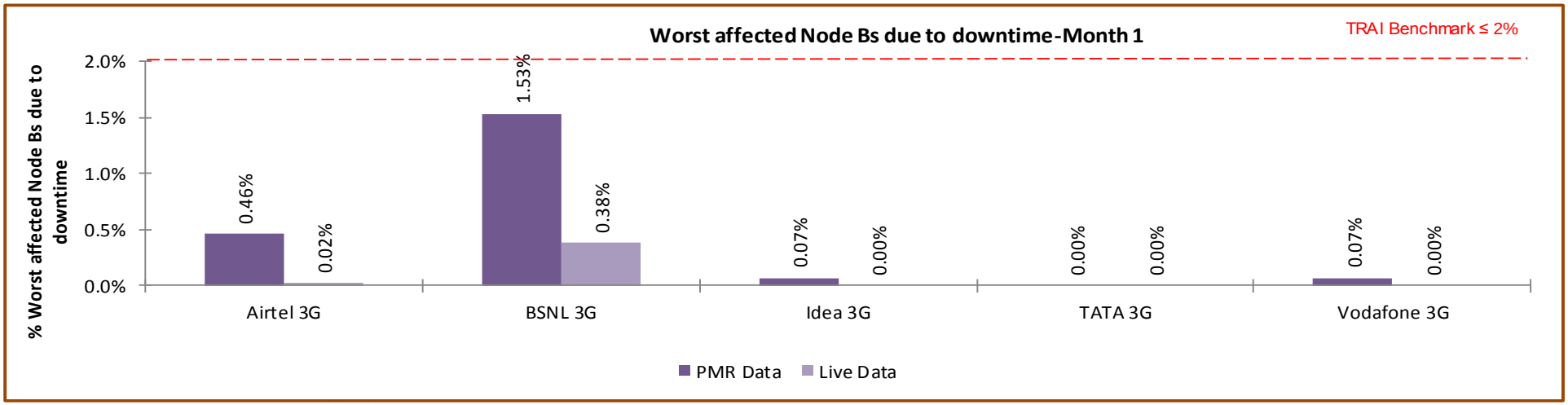



*Data Source: Operations and Maintenance Center (OMC) of the operators*

All operators met the benchmark for worst affected BTSs due to downtime as per audit/PMR data.

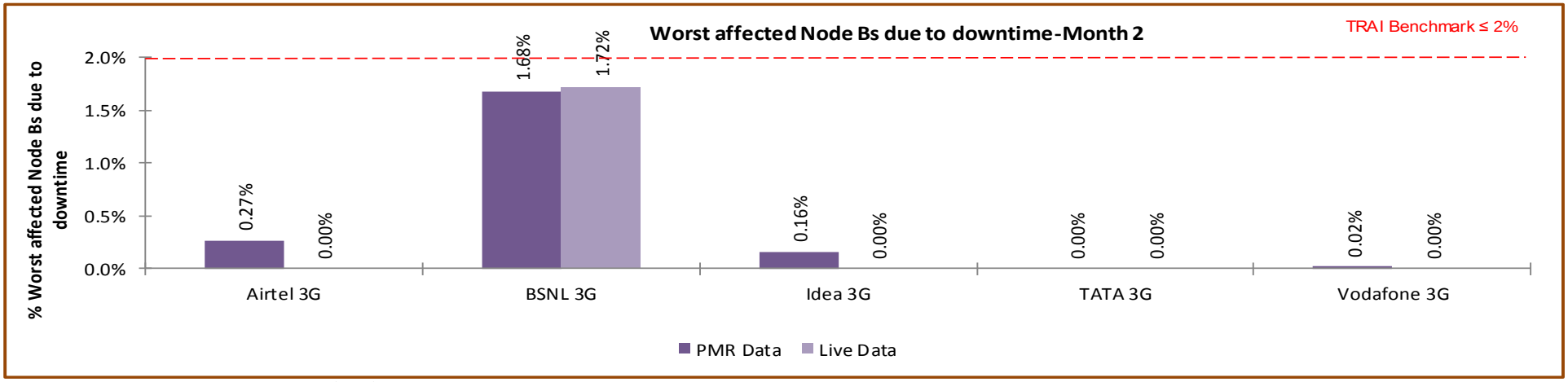
Significant difference was observed between PMR & live measurement data for Airtel and BSNL. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for three days.

### 7.2.2.1 KEY FINDINGS – MONTH 1



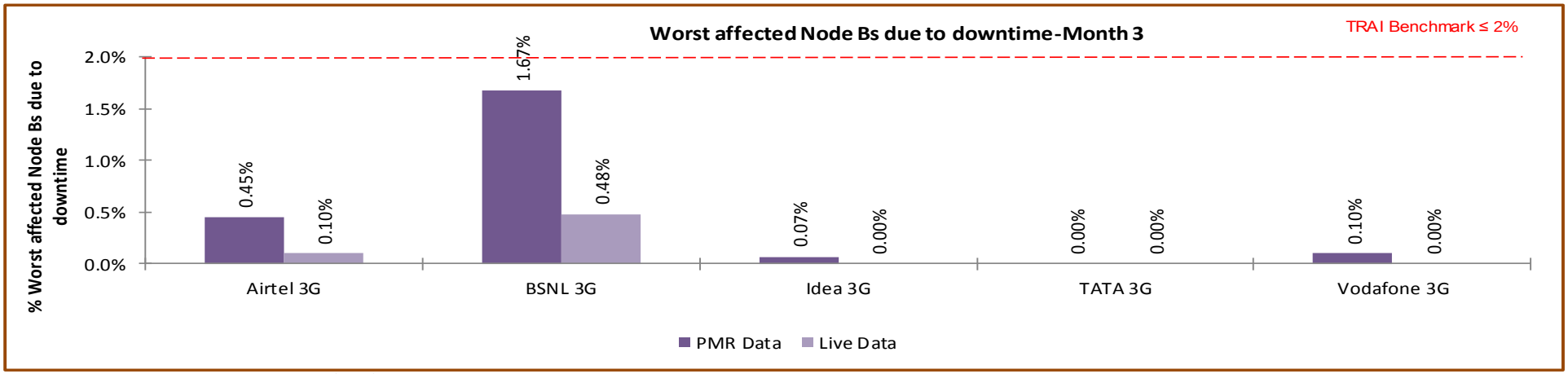

*Data Source: Operations and Maintenance Center (OMC) of the operators*

### 7.2.2.2 KEY FINDINGS – MONTH 2




*Data Source: Operations and Maintenance Center (OMC) of the operators*

### 7.2.2.3 KEY FINDINGS – MONTH 3




*Data Source: Operations and Maintenance Center (OMC) of the operators*

## 7.3 CALL SET UP SUCCESS RATE

### 7.3.1 PARAMETER DESCRIPTION

1. **Definition:** This parameter is same for 2G Networks as well as 3G Networks. However, the network elements involved in both the networks are different. Call Set-up Success Rate is defined as the ratio of Established Calls to Call Attempts. For establishing a call in 3G Networks, User Equipment (UE) accesses the Universal Terrestrial Radio Access Network (UTRAN) and establishes an RRC connection. Once RRC connection is established the Non Access Stratum (NAS) messages are exchanged between the UE and the Core Network (CN). The last step of the call setup is the establishment of a Radio Access Bearer (RAB) between the CN and the UE. However, any RAB abnormal release after RAB Assignment Response or Alerting/Connect message is to be considered as a dropped call.

2. **Data Extraction/collection methodology** - Data extraction to be done from appropriate counters. Auditors should be aware of counter details and definitions for each operator.

3. **Source of Data:** Network Operation Center (NOC) or a Central Server

4. **Computation Methodology-**
   **(RRC Established / Total RRC Attempts) * 100**

   RRC Established means the following events have happened in RRC setup:-

   - RRC attempt is made
   - The RRC established
   - The RRC is routed to the outward path of the concerned MSC

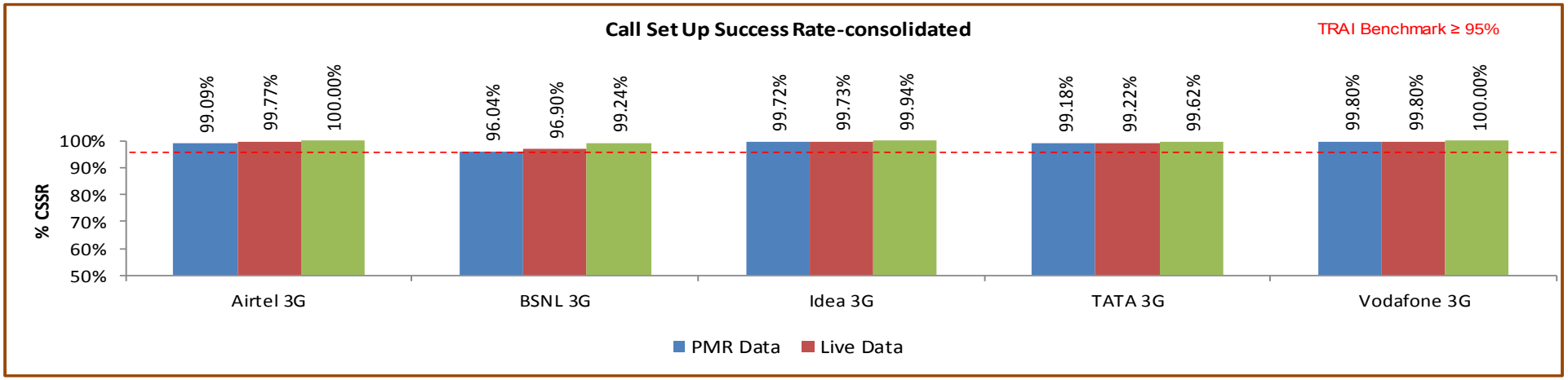
5. **TRAI Benchmark ≥** 95%

6. **Audit Procedure –**

   - The cell-wise data generated through counters/ MMC available in the switch for traffic measurements

- CSSR calculation should be measured using OMC generated data only
- Measurement should be only in Time Consistent Busy Hour (CBBH) period for all days of the week
- Counter data is extracted from the NOC of the operators.
- Total calls established include all calls established excluding RAB congestion.
  - The numerator and denominator values are derived from adding the counter values from the MSC.

### 7.3.2 KEY FINDINGS - CONSOLIDATED

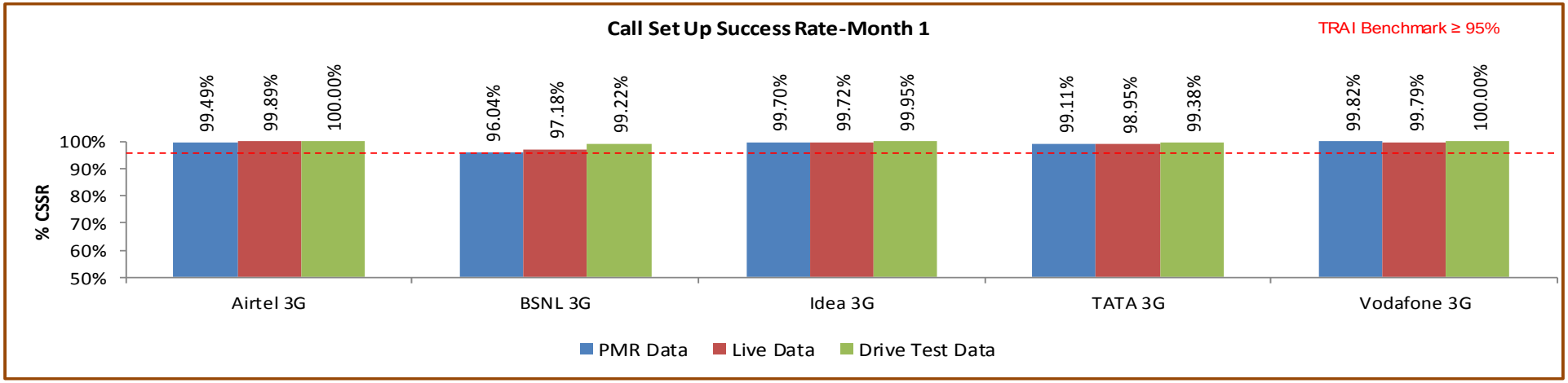



*Data Source: Network Operations Center (NOC) of the operators*

All operators met the TRAI benchmark as per audit/PMR data.

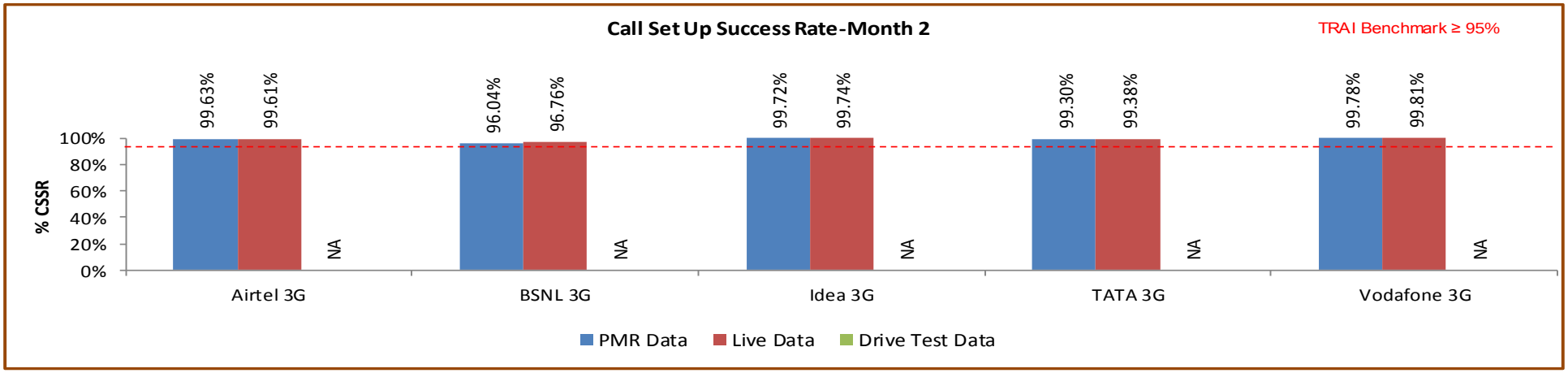
To calculate CSSR, Airtel is using a formula that has not been specified by TRAI or the counter definitions provided by their network service provider (Ericsson). However, this report presents the appropriate CSSR value for BSNL and TATA, which was calculated by using the proper counter details by the IMRB auditor during audit.

### 7.3.2.1 KEY FINDINGS – MONTH 1



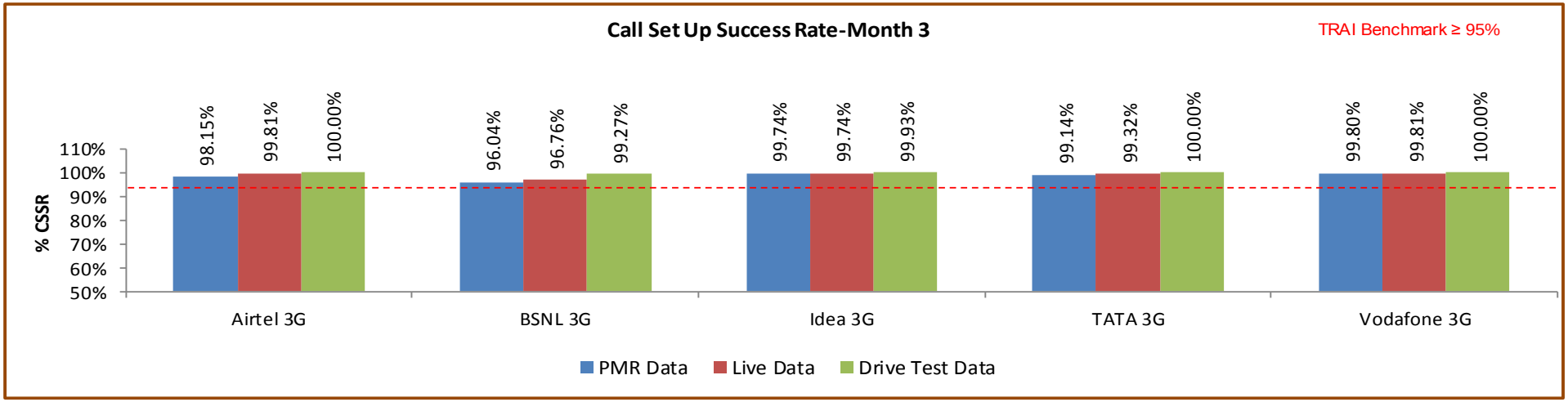

*Data Source: Network Operations Center (NOC) of the operators*

### 7.3.2.2 KEY FINDINGS – MONTH 2




*Data Source: Network Operations Center (NOC) of the operators*

### 7.3.2.3 KEY FINDINGS – MONTH 3




*Data Source: Network Operations Center (NOC) of the operators*

## 7.4 NETWORK CHANNEL CONGESTION- RRC CONGESTION/ CIRCUIT SWITCHED RAB CONGESTION

### 7.4.1 PARAMETER DESCRIPTION

1. **Definition (RRC Congestion):** This parameter has been amended to include RRC Congestion in 3G Networks.
2. **Definition (Circuit Switched RAB congestion):** Circuit Switched RAB congestion is similar to Traffic Channel Congestion. Therefore, the existing parameter has been amended to include RAB congestion in 3G Networks.
3. **Point of Interconnection (POI) Congestion:** This parameter denotes congestion at the outgoing traffic between two networks and is equally applicable for 2G networks and 3G networks.
    - RRC Level: Stand-alone dedicated control channel
    - RAB Level: Traffic Channel
    - POI Level: Point of Interconnect
4. **Data Extraction/collection methodology** - Data extraction to be done from appropriate counters. Auditors should be aware of counter details and definitions for each operator.
5. **Source of Data:** Network Operation Center (NOC) or a Central Server
6. **Computational Methodology:**
    - **RRC / RAB Congestion% = [(A1 x C1) + (A2 x C2) +.....+ (An x Cn)] / (A1 + A2 +...+ An)**
        - Where:-A1 = Number of attempts to establish RRC/ RAB made on day 1
        - C1 = Average RRC / RAB Congestion % on day 1
        - A2 = Number of attempts to establish RRC / RAB made on day 2
        - C2 = Average RRC / RAB Congestion % on day 2
        - An = Number of attempts to establish RRC / RAB made on day n
        - Cn = Average RRC / RAB Congestion % on day n

- **POI Congestion% = [(A1 x C1) + (A2 x C2) +.....+ (An x Cn)] / (A1 + A2 +...+ An)**
  - Where:-A1 = POI traffic offered on all POIs (no. of calls) on day 1
  - C1 = Average POI Congestion % on day 1
  - A2 = POI traffic offered on all POIs (no. of calls) on day 2
  - C2 = Average POI Congestion % on day 2
  - An = POI traffic offered on all POIs (no. of calls) on day n
  - Cn = Average POI Congestion % on day n

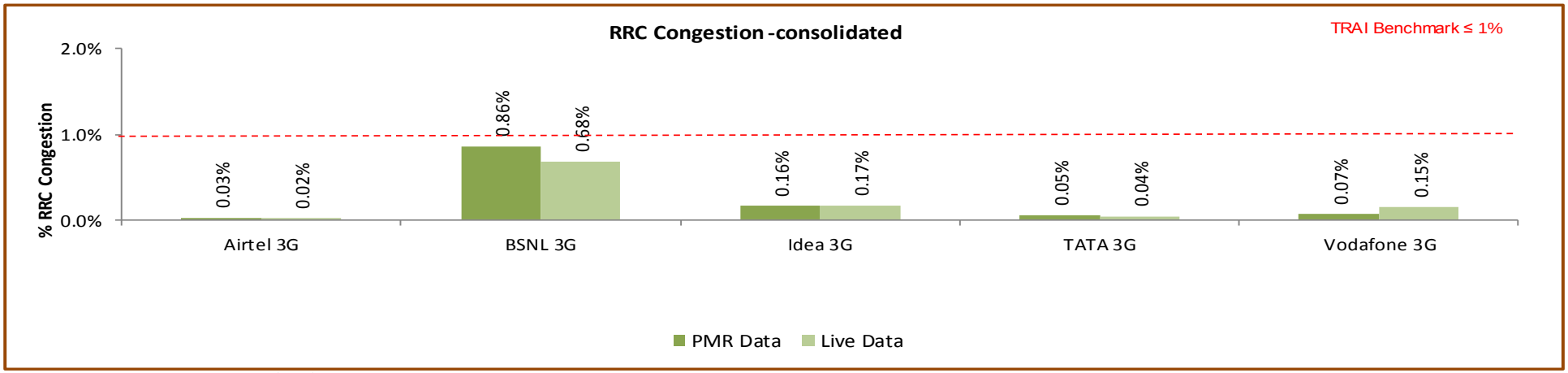
## 7. Benchmark:

- RRC Congestion: ≤ 1%, RAB Congestion: ≤ 2%, POI Congestion: ≤ 0.5%

## 8. Audit Procedure –

- Audit of the details of RRC and RAB congestion percentages computed by the operator (using OMC–Switch data only) would be conducted
  - The operator should be measuring this parameter during Time consistent busy hour (TCBH) only RRC

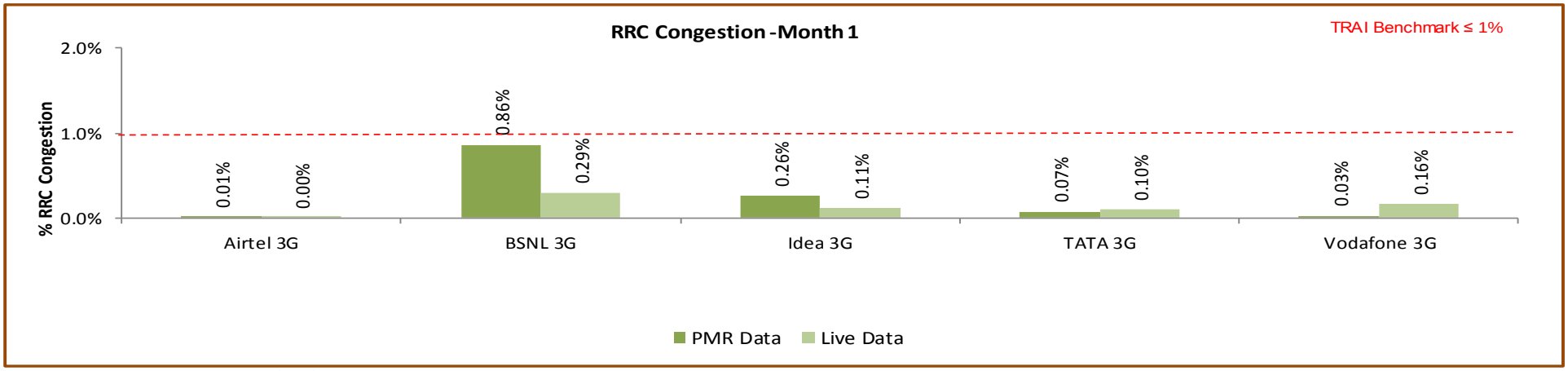
### 7.4.2 KEY FINDINGS - RRC CONGESTION (CONSOLIDATED)




*Data Source: Network Operations Center (NOC) of the operators*

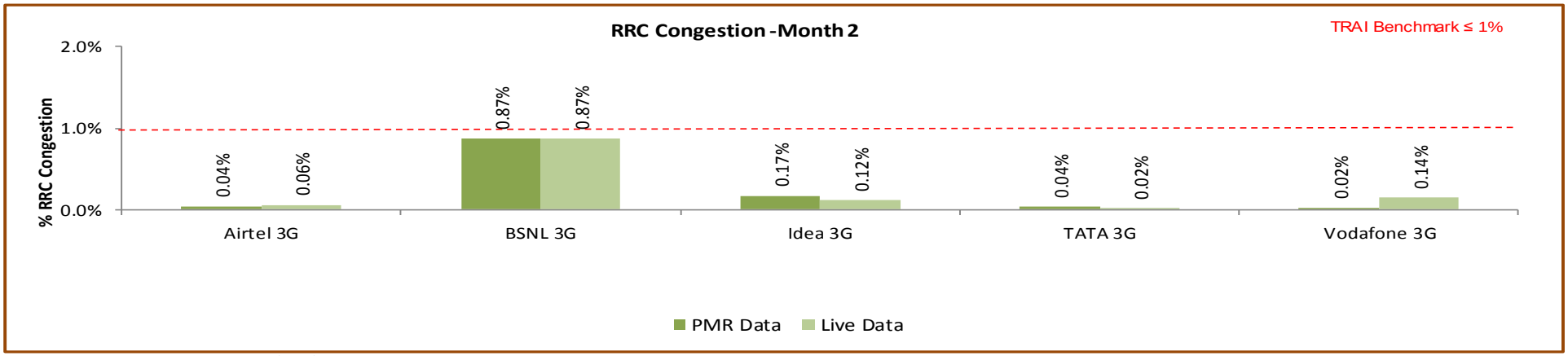
All operators met the benchmark for RRC congestion.

#### 7.4.2.1 KEY FINDINGS – MONTH 1



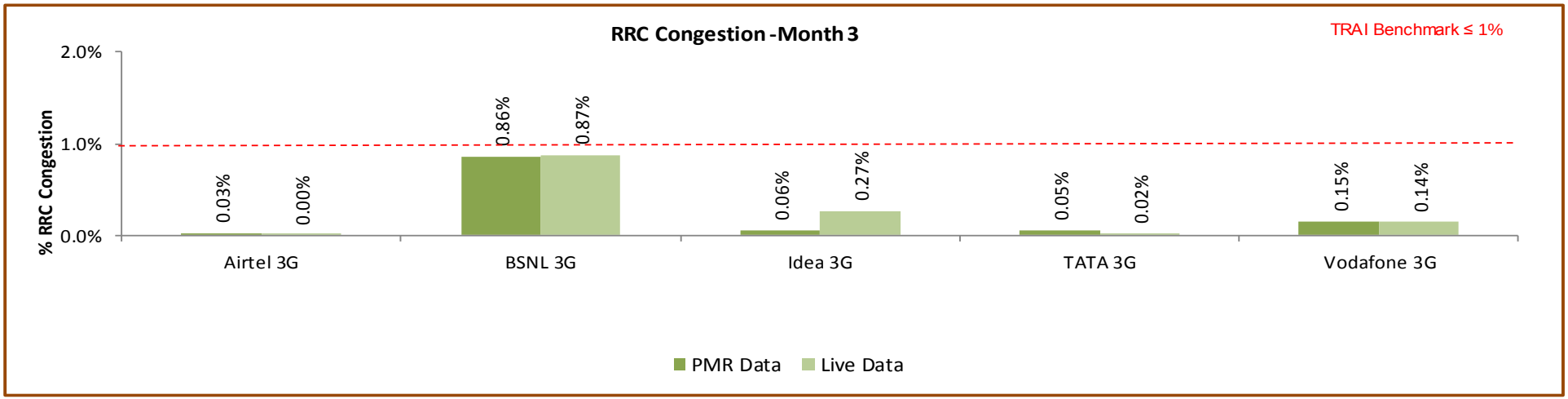

*Data Source: Network Operations Center (NOC) of the operators*

### 7.4.2.2 KEY FINDINGS – MONTH 2



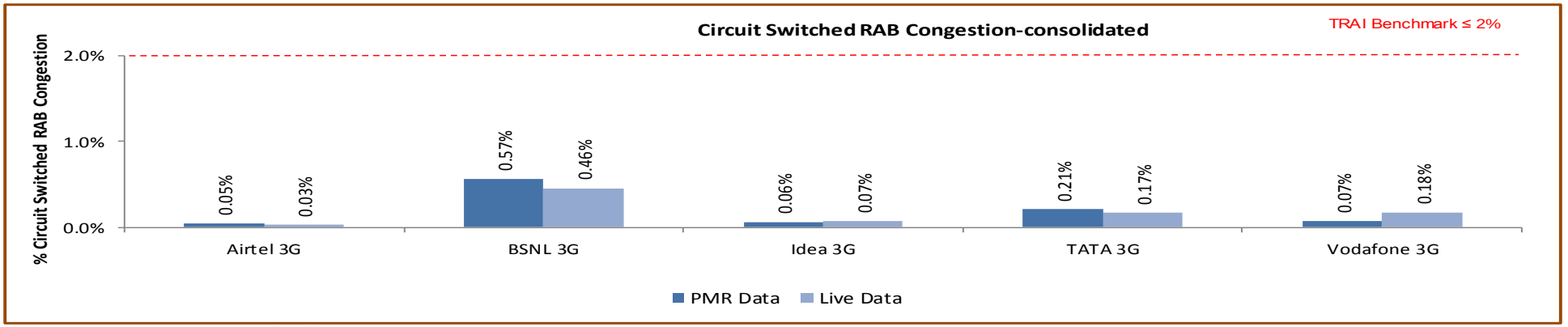

*Data Source: Network Operations Center (NOC) of the operators*

### 7.4.2.3 KEY FINDINGS – MONTH 3




*Data Source: Network Operations Center (NOC) of the operators*

### 7.4.3 KEY FINDINGS – CIRCUIT SWITCHED RAB CONGESTION (CONSOLIDATED)

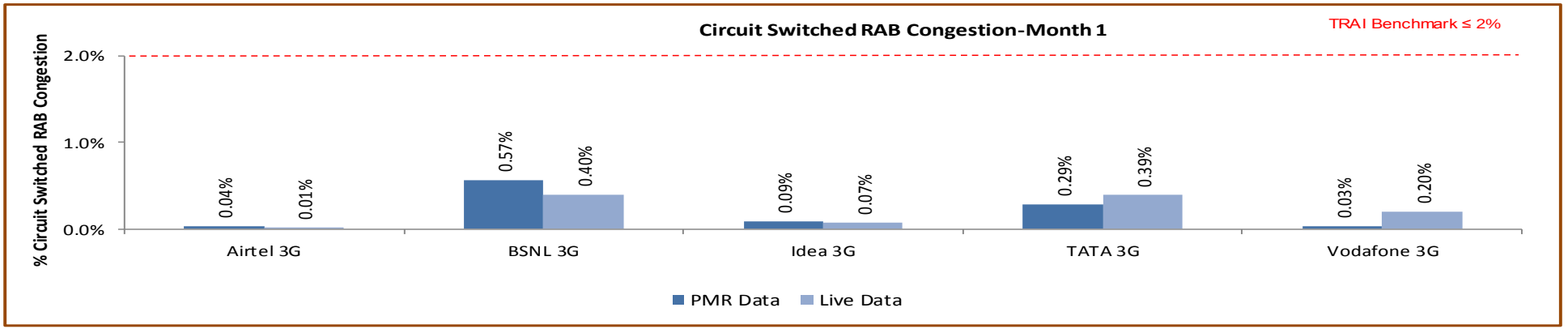



*Data Source: Network Operations Center (NOC) of the operators*

All operators met the benchmark as per audit/PMR report.

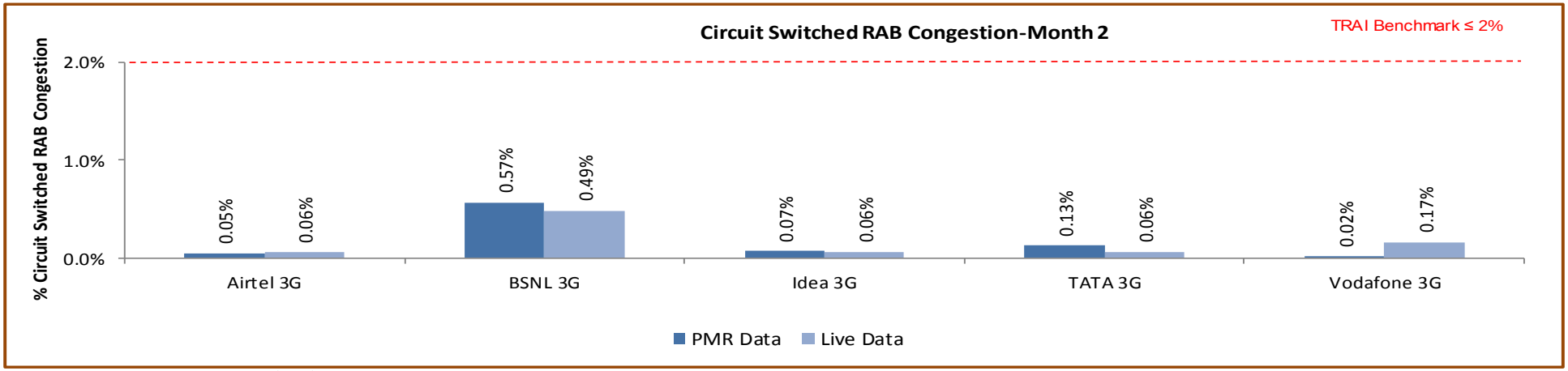
Significant difference was observed between PMR & live measurement data for BSNL, TATA and Vodafone. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for three days.

#### 7.4.3.1 KEY FINDINGS – MONTH 1



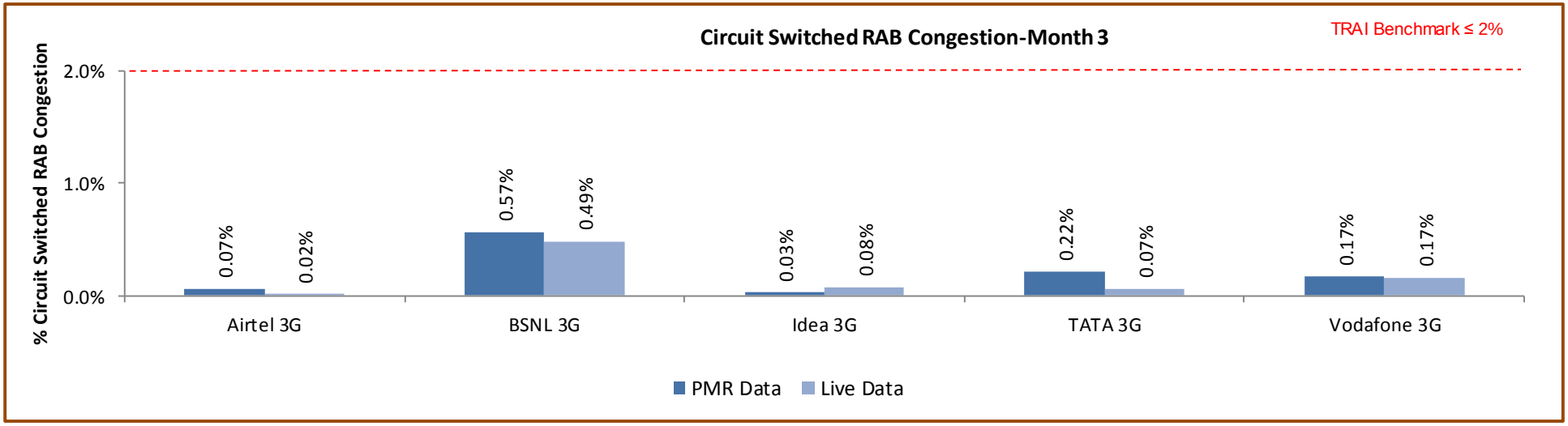

*Data Source: Network Operations Center (NOC) of the operators*

### 7.4.3.2 KEY FINDINGS – MONTH 2




*Data Source: Network Operations Center (NOC) of the operators*

### 7.4.3.3 KEY FINDINGS – MONTH 3




*Data Source: Network Operations Center (NOC) of the operators*

### 7.4.4 KEY FINDINGS – POI CONGESTION (CONSOLIDATED) – AVERAGE OF 3 MONTHS

| Audit Results for POI Congestion- PMR data | | | | | | |
|---|---|---|---|---|---|---|
| **POI congestion** | **Benchmark** | **Airtel 3G** | **BSNL 3G** | **Idea 3G** | **TATA 3G** | **Vodafone 3G** |
| Total number of working POIs | | 0 | 174 | 452 | 25 | 449 |
| No. of POIs not meeting benchmark | | 0 | 1 | 3 | 0 | 0 |
| Total Capacity of all POIs (A) - in erlangs | | 0 | 142596 | 482403 | 36914 | 446056 |
| Traffic served for all POIs (B)- in erlangs | | 0 | 88869 | 239732 | 25921 | 257597 |
| POI congestion | ≤ 0.5% | NA | 0.00% | 0.00% | 0.00% | 0.00% |
| **Live Measurement Results for POI Congestion- 3 Day data** | | | | | | |
| **POI congestion** | **Benchmark** | **Airtel 3G** | **BSNL 3G** | **Idea 3G** | **TATA 3G** | **Vodafone 3G** |
| Total number of working POIs | | 0 | 174 | 455 | 25 | 447 |
| No. of POIs not meeting benchmark | | 0 | 1 | 3 | 0 | 0 |
| Total Capacity of all POIs (A) - in erlangs | | 0 | 142596 | 473430 | 36914 | 436696 |
| Traffic served for all POIs (B)- in erlangs | | 0 | 61894 | 229787 | 11125 | 68818 |
| POI congestion | ≤ 0.5% | NA | 0.00% | 0.00% | 0.00% | 0.00% |

*Data Source: Network Operations Center (NOC) of the operators*

All operators met the benchmark of POI Congestion as per PMR/audit Data.

### 7.4.4.1 KEY FINDINGS – MONTH 1

| Audit Results for POI Congestion- PMR data-April | | | | | | |
|---|---|---|---|---|---|---|
| POI congestion | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total number of working POIs | | NA | 58 | 154 | 0 | 151 |
| No. of POIs not meeting benchmark | | NA | 0 | 1 | 0 | 0 |
| Total Capacity of all POIs (A) - in erlangs | | NA | 47350 | 161243 | 0 | 149964 |
| Traffic served for all POIs (B)- in erlangs | | NA | 29871 | 79887 | 0 | 60288 |
| POI congestion | ≤ 0.5% | NA | 0.00% | 0.00% | 0.00% | 0.00% |
| **Live Measurement Results for POI Congestion- 3 Day data-April** | | | | | | |
| POI congestion | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total number of working POIs | | NA | 58 | 154 | 0 | 151 |
| No. of POIs not meeting benchmark | | NA | 0 | 1 | 0 | 0 |
| Total Capacity of all POIs (A) - in erlangs | | NA | 47350 | 161221 | 0 | 140986 |
| Traffic served for all POIs (B)- in erlangs | | NA | 29102 | 71684 | 0 | 30325 |
| POI congestion | ≤ 0.5% | NA | 0.00% | 0.00% | 0.00% | 0.00% |

*Data Source: Network Operations Center (NOC) of the operators*

### 7.4.4.2 KEY FINDINGS – MONTH 2

| Audit Results for POI Congestion- PMR data-May | | | | | | |
|---|---|---|---|---|---|---|
| POI congestion | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total number of working POIs | | NA | 58 | 150 | 0 | 150 |
| No. of POIs not meeting benchmark | | NA | 0 | 1 | #DIOV/0! | 0 |
| Total Capacity of all POIs (A) - in erlangs | | NA | 47350 | 160814 | 0 | 148273 |
| Traffic served for all POIs (B)- in erlangs | | NA | 29834 | 80513 | 0 | 136795 |
| POI congestion | ≤ 0.5% | NA | 0.00% | 0.00% | 0.00% | 0.00% |
| **Live Measurement Results for POI Congestion- 3 Day data-May** | | | | | | |
| POI congestion | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total number of working POIs | | NA | 58 | 153 | 0 | 148 |
| No. of POIs not meeting benchmark | | NA | 0 | 1 | 0 | 0 |
| Total Capacity of all POIs (A) - in erlangs | | NA | 47350 | 160761 | 0 | 147819 |
| Traffic served for all POIs (B)- in erlangs | | NA | 29711 | 80478 | 0 | 32640 |
| POI congestion | ≤ 0.5% | NA | 0.00% | 0.00% | 0.00% | 0.00% |

*Data Source: Network Operations Center (NOC) of the operators*

### 7.4.4.3 KEY FINDINGS – MONTH 3

| Audit Results for POI Congestion- PMR data-June | | | | | | |
|---|---|---|---|---|---|---|
| POI congestion | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total number of working POIs | | NA | 58 | 148 | 25 | 148 |
| No. of POIs not meeting benchmark | | NA | 1 | 1 | 0 | 0 |
| Total Capacity of all POIs (A) - in erlangs | | NA | 47896 | 160346 | 36914 | 147819 |
| Traffic served for all POIs (B)- in erlangs | | NA | 29164 | 79333 | 25921 | 60513 |
| POI congestion | ≤ 0.5% | NA | 0.00% | 0.00% | 0.00% | 0.00% |
| **Live Measurement Results for POI Congestion- 3 Day data-June** | | | | | | |
| POI congestion | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total number of working POIs | | NA | 58 | 148 | 25 | 148 |
| No. of POIs not meeting benchmark | | NA | 1 | 1 | 0 | 0 |
| Total Capacity of all POIs (A) - in erlangs | | NA | 47896 | 151448 | 36914 | 147891 |
| Traffic served for all POIs (B)- in erlangs | | NA | 3081 | 77625 | 11125 | 5854 |
| POI congestion | ≤ 0.5% | NA | 0.00% | 0.00% | 0.00% | 0.00% |

*Data Source: Network Operations Center (NOC) of the operators*

## 7.5 CIRCUIT SWITCHED VOICE DROP RATE

### 7.5.1 PARAMETER DESCRIPTION

1. **Definition** - The Call Drop Rate measures the inability of Network to maintain a call and is defined as the ratio of abnormal speech disconnects with respect to all speech disconnects (both normal and abnormal). In 3G Networks, a normal disconnect is initiated from the Mobile Switching Centre (MSC) at completion of the call by a RAB Disconnect message. An abnormal RAB disconnect can be initiated by either UTRAN or CN and includes Radio Link Failures, Uplink (UL) or Downlink (DL) interference or any other reason.

   - **Total No. of voice RAB abnormally released** = All calls ceasing unnaturally i.e. due to handover or due to radio loss
   - **No. of voice RAB normally released** = All calls that have RAB allocation during busy hour

2. **Data Extraction/collection methodology** - Data extraction to be done from appropriate counters. Auditors should be aware of counter details and definitions for each operator.

3. **Source of Data:** Network Operation Center (NOC) or a Central Server

4. **Computational Methodology:** **(No. of voice RAB normally released / (No. of voice RAB normally released + RAB abnormally released )x 100**

| Key Performance Indicator Term | Definition |
|---|---|
| #RAB Normal Release(CSV) | Number of voice RAB normally Released |
| #RAB Abnormal Release(CSV) | Number of voice RAB abnormally Released |

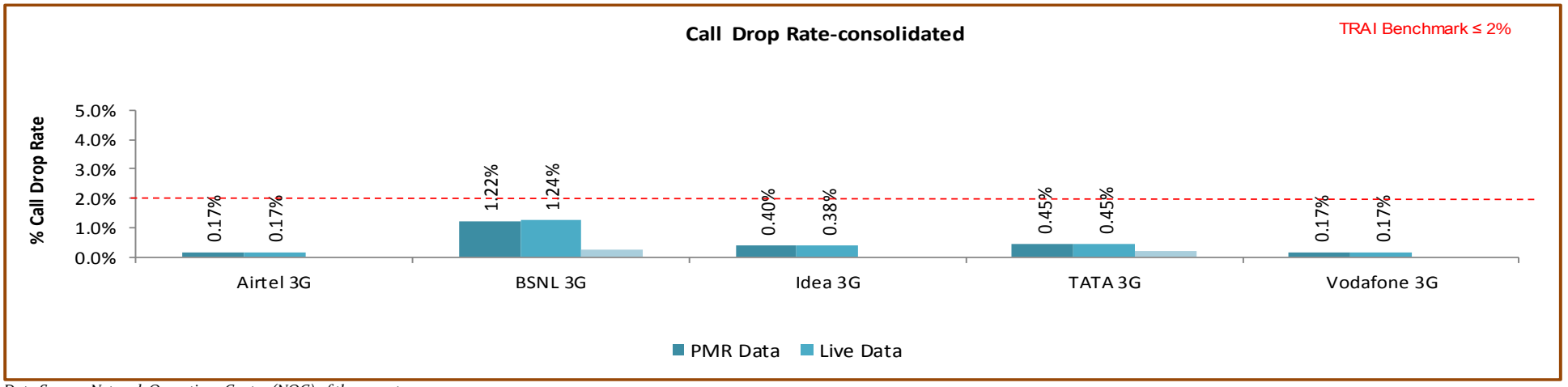
5. **TRAI Benchmark –**

   - Circuit switched voice drop rate ≤ 2%

6. **Audit Procedure –**

   - Audit of traffic data of the relevant quarter kept in OMC-R at MSCs and used for arriving at CDR was used
   - The operator should only be considering those calls which are dropped during Time consistent busy hour (TCBH) for all days of the relevant quarter.

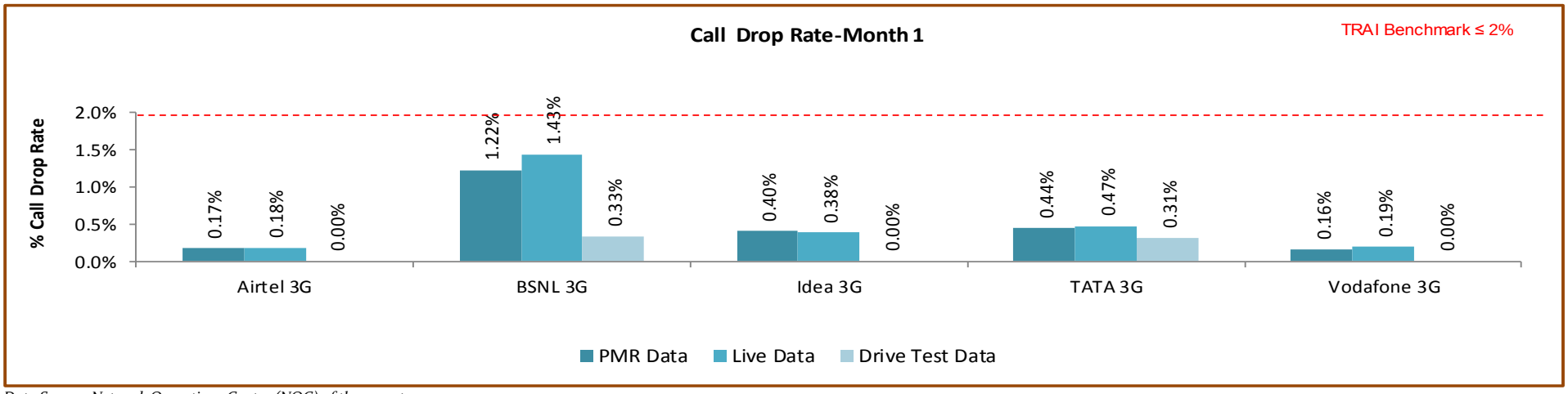
### 7.5.2 KEY FINDINGS - CONSOLIDATED




*Data Source: Network Operations Center (NOC) of the operators*

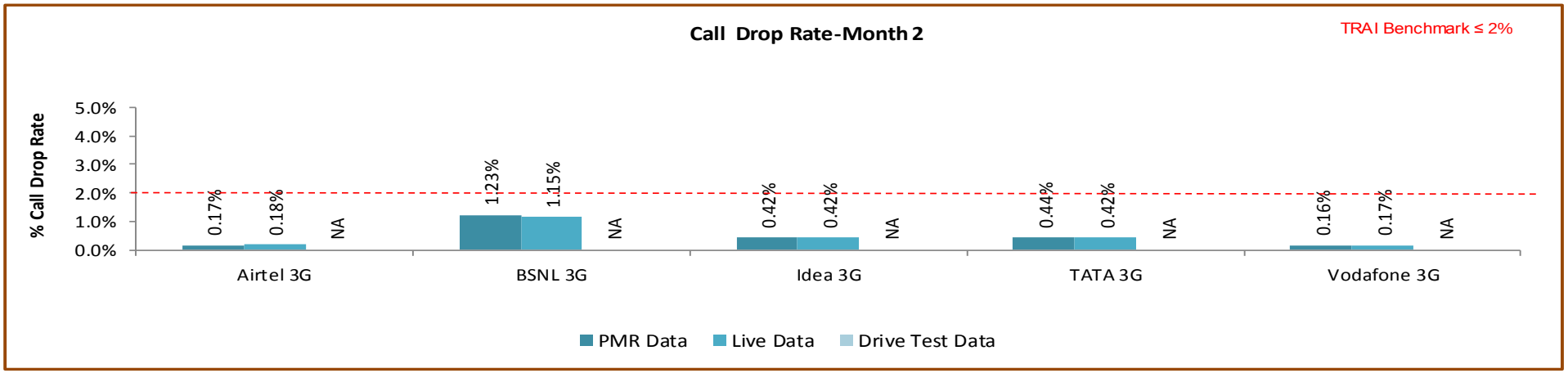
All operators met the benchmark for call drop rate during audit.

#### 7.5.2.1 KEY FINDINGS – MONTH 1



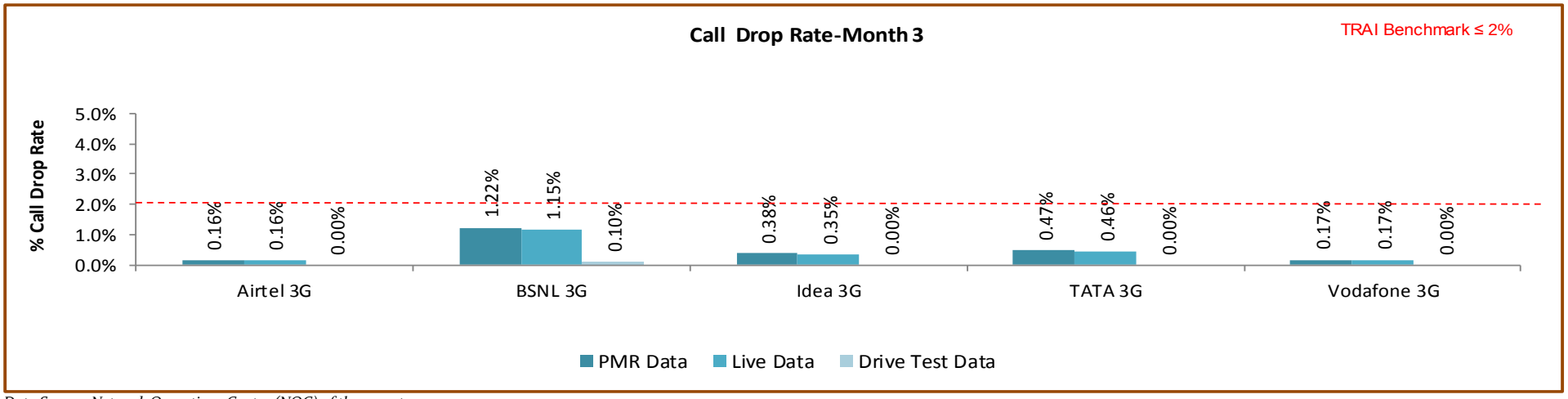

*Data Source: Network Operations Center (NOC) of the operators*

### 7.5.2.2 KEY FINDINGS – MONTH 2




*Data Source: Network Operations Center (NOC) of the operators*

### 7.5.2.3 KEY FINDINGS – MONTH 3




*Data Source: Network Operations Center (NOC) of the operators*

## 7.6 WORST AFFECTED CELLS HAVING MORE THAN 3% CIRCUIT SWITCHED VOICE DROP RATE

### 7.6.1 PARAMETER DESCRIPTION

1. **Definition- Cells having more than 3% circuit switch voice quality:** The existing parameter has been amended to cover 3G Networks to assess worst affected cells having more than 3% CSV Drop Rate.

2. **Data Extraction/collection methodology** - Data extraction to be done from appropriate counters. Auditors should be aware of counter details and definitions for each operator.

3. **Source of Data:** Network Operation Center (NOC) or a Central Server

4. **Computational Methodology:** (**Number of cells having CSV drop rate > 3% during CBBH in a month** / **Total number of cells in the licensed area) x 100**

5. **TRAI Benchmark** –

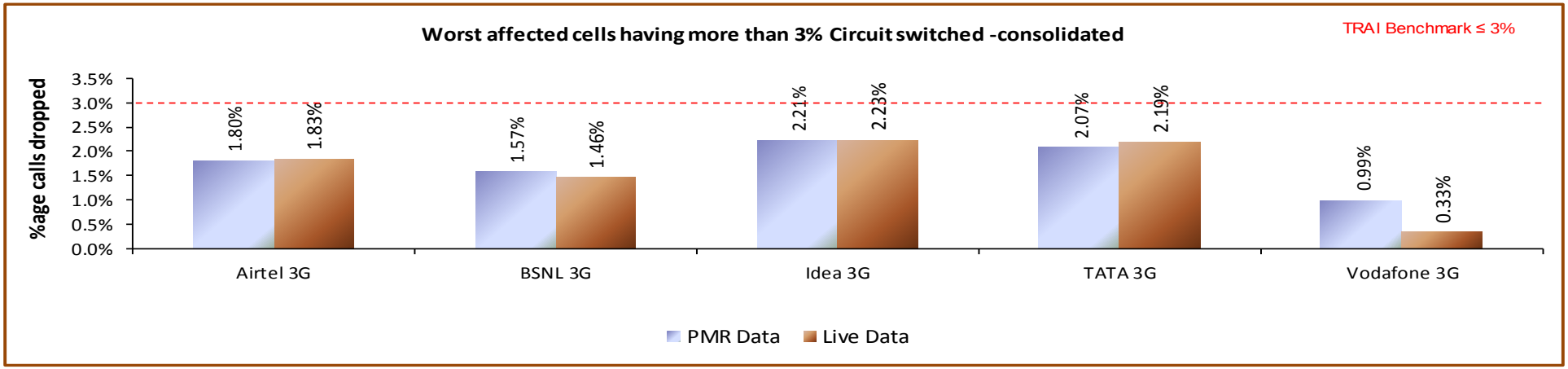
   - Worst affected cells having CSV drop rate > 3% during CBBH in a month ≤ 3%

6. **Audit Procedure** –

   - Audit of traffic data of the relevant quarter kept in OMC-R at MSCs and used for arriving at CDR would be conducted.

The operator should only be considering those calls which are dropped during Cell Bouncing Busy hour (CBBH) for all days of the relevant quarter.

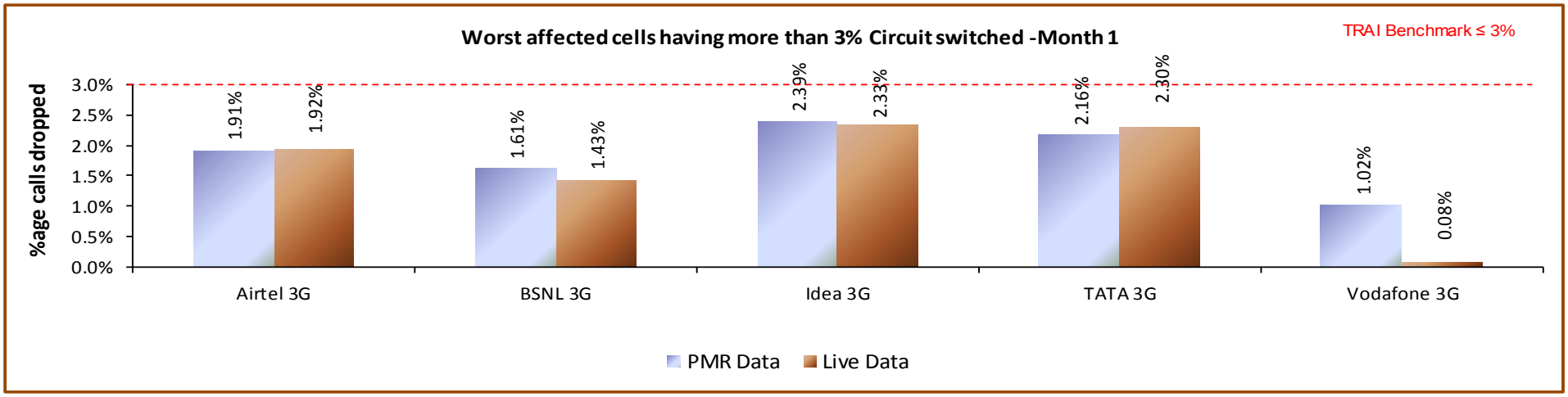
### 7.6.2 KEY FINDINGS - CONSOLIDATED




*Data Source: Network Operations Center (NOC) of the operators*

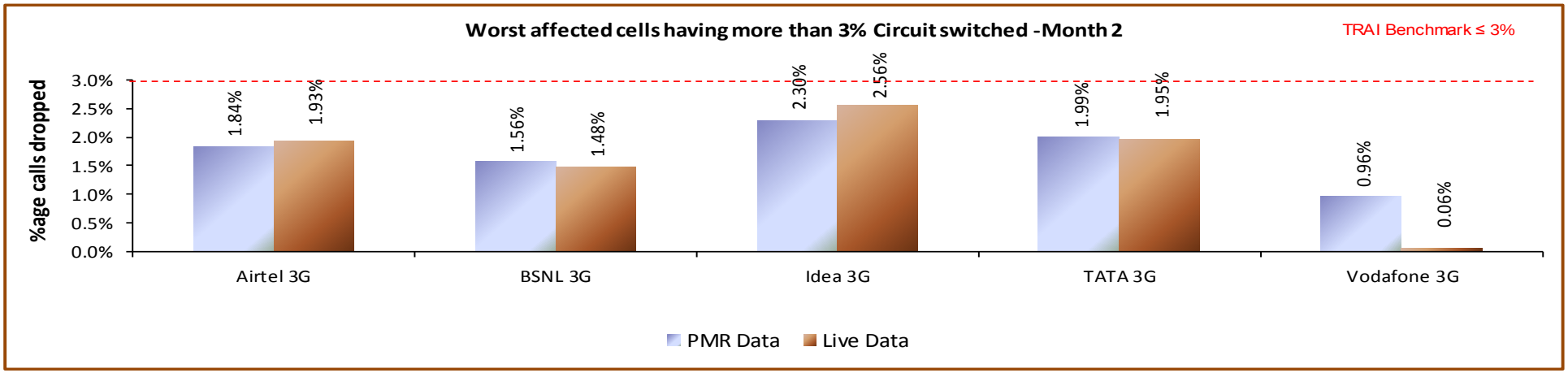
All operators met the benchmark during audit.

#### 7.6.2.1 KEY FINDINGS – MONTH 1



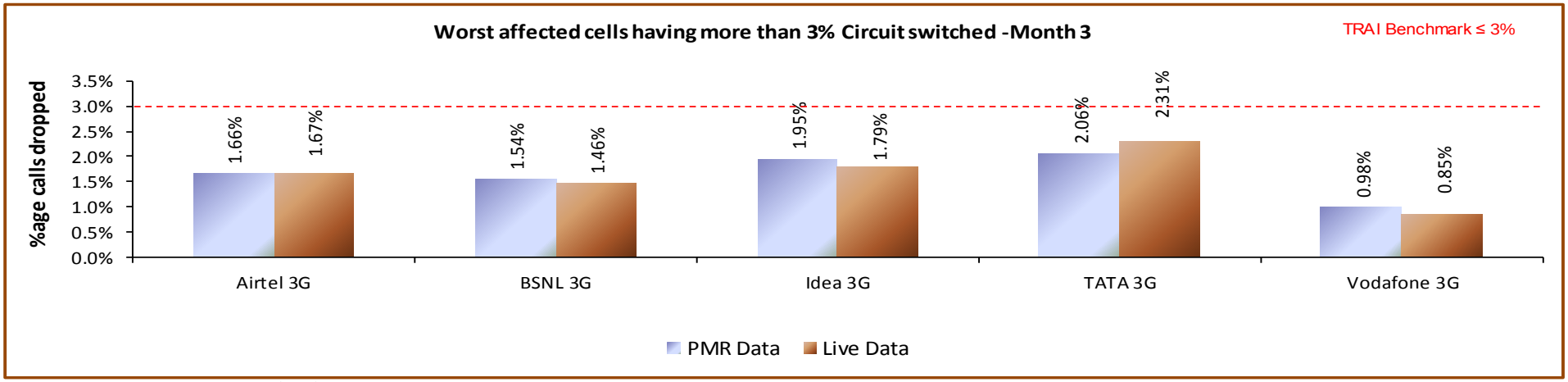

*Data Source: Network Operations Center (NOC) of the operator*

### 7.6.2.2 KEY FINDINGS – MONTH 2




*Data Source: Network Operations Center (NOC) of the operators*

### 7.6.2.3 KEY FINDINGS – MONTH 3




*Data Source: Network Operations Center (NOC) of the operators*

## 7.7 CIRCUIT SWITCH VOICE QUALITY

### 7.7.1 PARAMETER DESCRIPTION

5. **Definition:**

   - for GSM service providers the calls having a value of 0 –5 are considered to be of good quality (on a seven point scale)
   - For CDMA the measure of voice quality is Frame Error Rate (FER). FER is the probability that a transmitted frame will be received incorrectly. Good voice quality of a call is considered when it FER value lies between 0 – 4 %

6. **Computational Methodology:**

   - **% Connections with good voice quality = (No. of voice samples with good voice quality / Total number of samples) x 100**

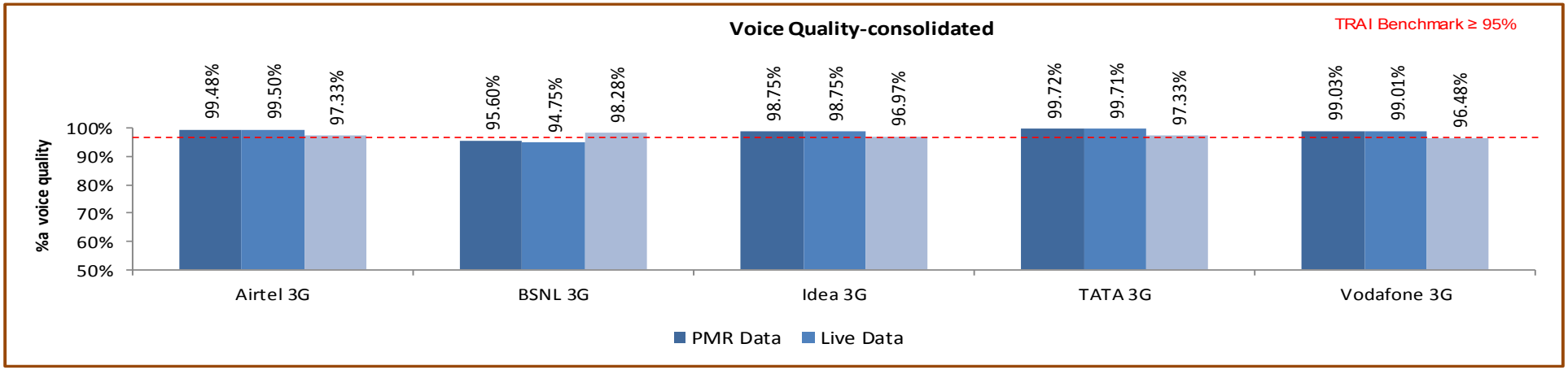
7. **TRAI Benchmark:** ≥ 95%

8. **Audit Procedure –**

   a. A sample of calls would be taken randomly from the total calls established.

   b. The operator should only be considering those calls which are meeting the desired benchmark of good voice quality.

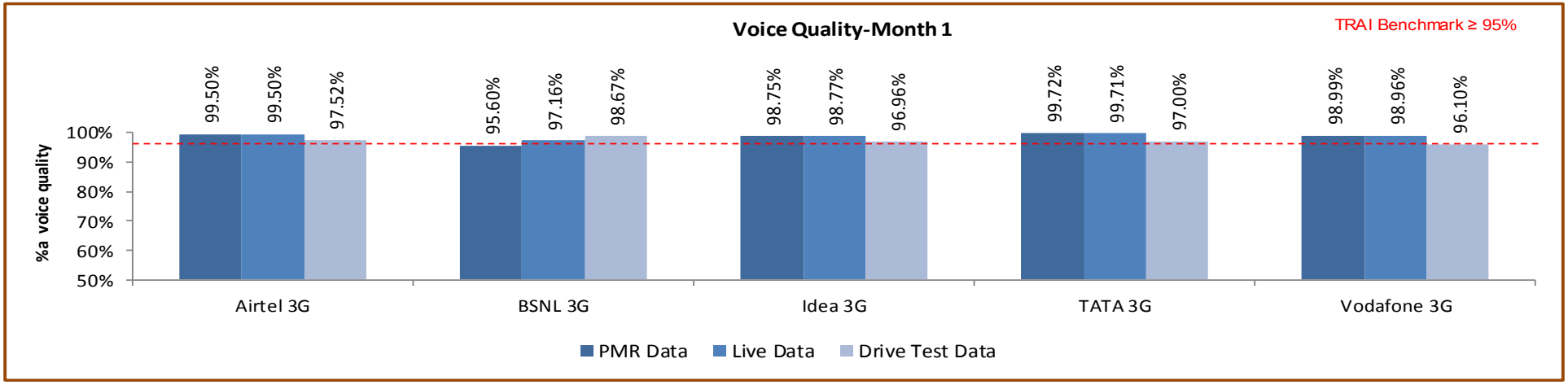
### 7.7.2 KEY FINDINGS



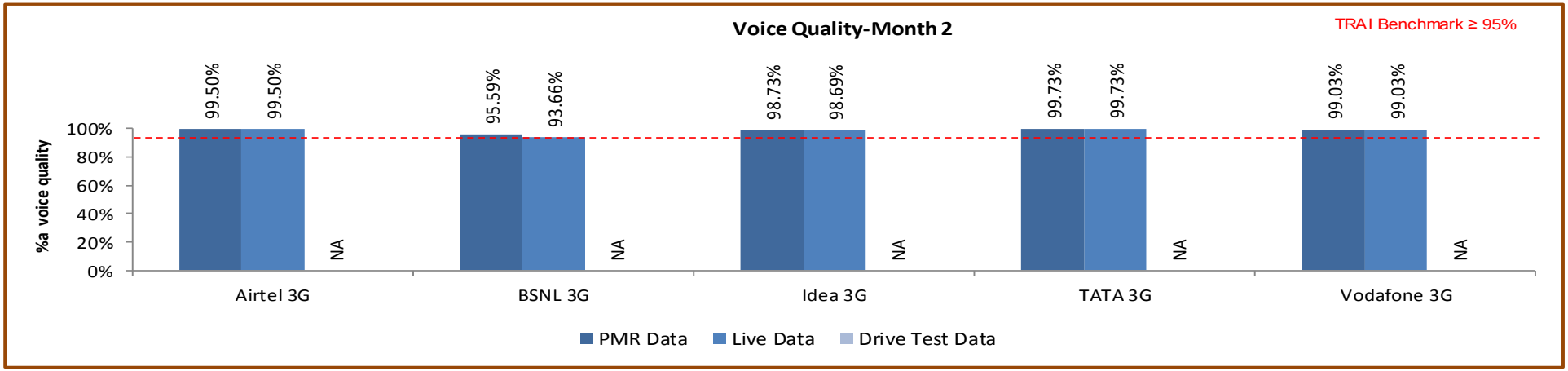

*Data Source: Network Operations Center (NOC) of the operators*

All operators met the benchmark for circuit switch Voice quality in live audit.

#### 7.7.2.1 KEY FINDINGS – MONTH 1

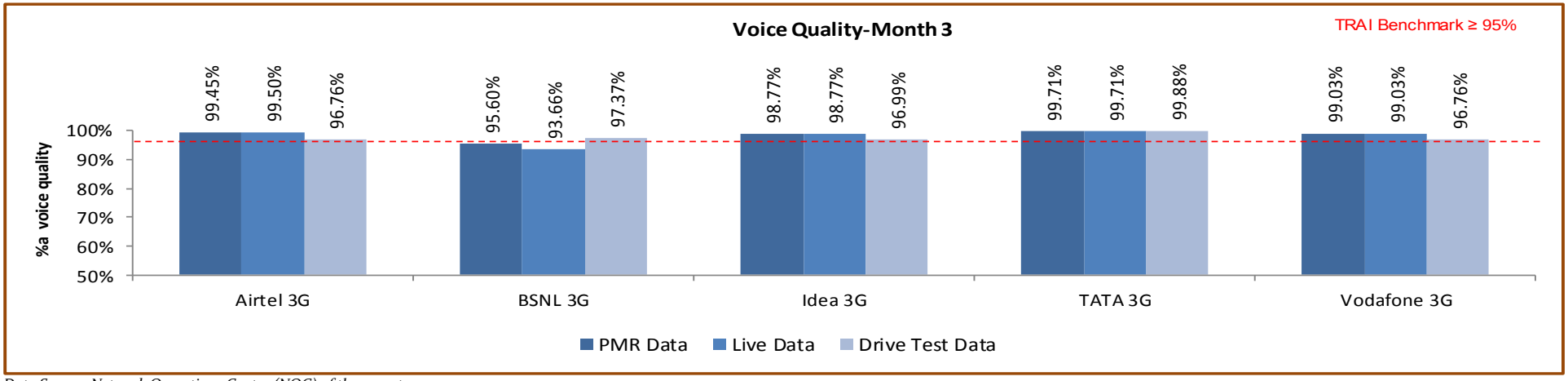


### 7.7.2.2 KEY FINDINGS – MONTH 2




*Data Source: Network Operations Center (NOC) of the operators*

### 7.7.2.3 KEY FINDINGS – MONTH 3




*Data Source: Network Operations Center (NOC) of the operators*

# 8 PARAMETER DESCRIPTION AND DETAILED FINDINGS – NON-NETWORK PARAMETERS

## 8.1 METERING AND BILLING CREDIBILITY

The billing complaints for postpaid are calculated by averaging over one billing cycle in a quarter. For example, there are three billing cycles in a quarter, the data for each billing cycle is calculated separately and then averaged over.

The charging complaints for prepaid are calculated by taking all complaints in a quarter.

### 8.1.1 PARAMETER DESCRIPTION

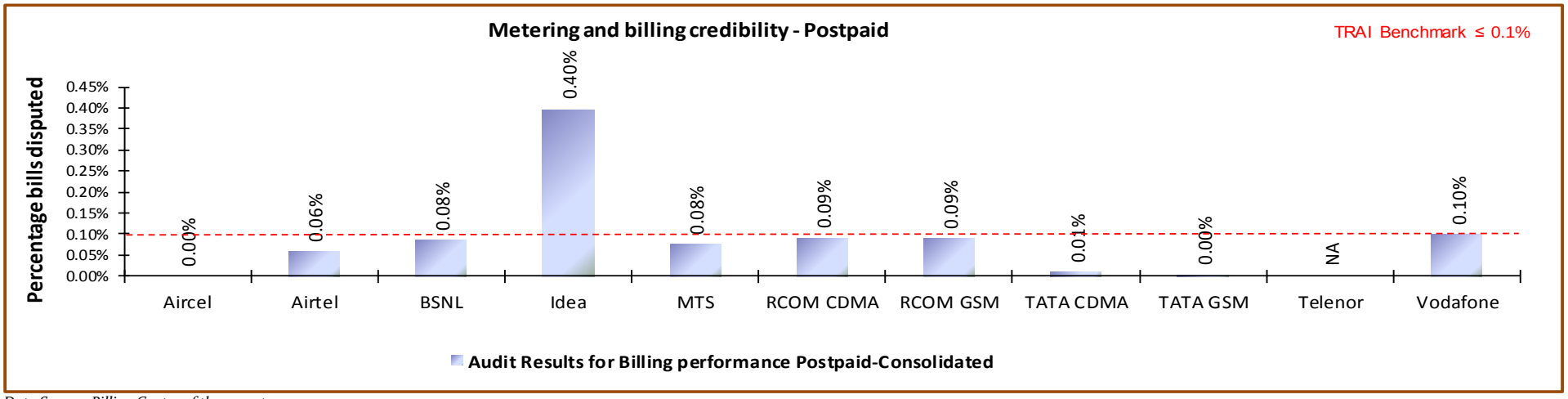
All the complaints related to billing/ charging as per clause 3.7.2 of QoS regulation of 20th December, 2009 were covered. The types of billing complaints covered are listed below.

- Payments made and not credited to the subscriber account
- Payment made on time but late payment charge levied wrongly
- Wrong roaming charges
- Double charges
- Charging for toll free services
- Local calls charged/billed as STD/ISD or vice versa
- Calls or messages made disputed
- Validity related complaints
- Credit agreed to be given in resolution of complaint, but not accounted in the bill
- Charging for services provided without consent
- Charging not as per tariff plans or top up vouchers/ special packs etc.
- Overcharging or undercharging

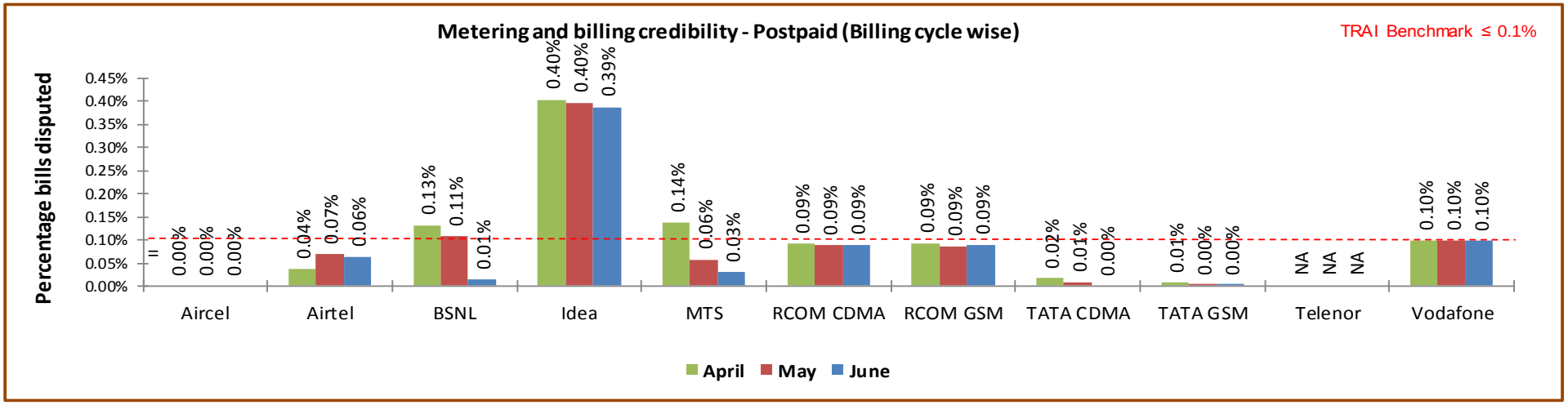
In addition to the above, any billing complaint which leads to billing error, waiver, refund, credit, or any adjustment is also considered as valid billing complaint for calculating the number of disputed bills.

- Computational Methodology:
  - **Billing complaints per 100 bills issued (Post-paid)** = (Total billing complaints** received during the relevant billing cycle / Total bills generated* during the relevant billing cycle)*100
  - *Operator to include all types of bills generated for customers. This would include printed bills, online bills and any other forms of bills generated
  - **Billing complaints here shall include only dispute related issues (including those that may arise because of a lack of awareness at the subscribers' end). It does not include any provisional issues (such as delayed dispatch of billing statements, etc.) in which the operator has opened a ticket internally.
  - **Charging complaints per 100 subscribers (Prepaid)** = (Total charging complaints received during the quarter/ Total number of subscribers reported by the operator at the end of the quarter) * 100
- TRAI Benchmark: <= 0.1%
- Audit Procedure:
  - Audit of billing complaint details for the complaints received during the quarter and used for arriving at the benchmark reported to TRAI would be conducted
    - For Postpaid, the total billing complaints would be audited by averaging over billing cycles in a quarter
    - For Prepaid, the data of total charging complaints in a quarter would be taken for the purpose of audit

## 8.1.2 KEY FINDINGS – METERING AND BILLING CREDIBILITY (POSTPAID)

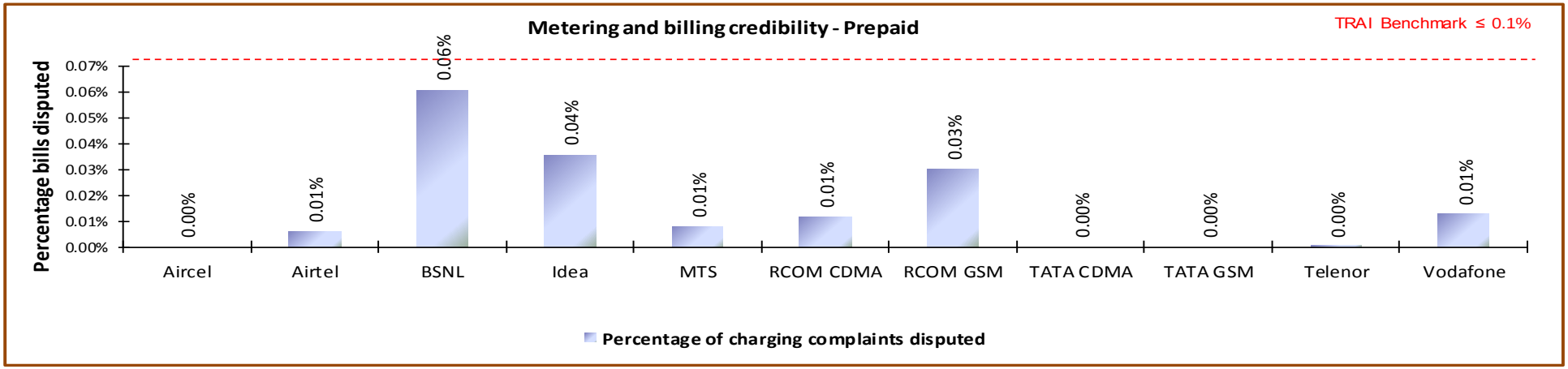



*Data Source: Billing Center of the operators*




Idea failed to meet the benchmark for metering and billing credibility of postpaid subscribers.

### 8.1.3 KEY FINDINGS - METERING AND BILLING CREDIBILITY (PREPAID)




*Data Source: Billing Center of the operators*

All operators met the benchmark for metering and billing credibility of prepaid subscribers.

## 8.2 RESOLUTION OF BILLING/ CHARGING COMPLAINTS

### 8.2.1 PARAMETER DESCRIPTION

**Calculation of Percentage resolution of billing complaints**

The calculation methodology (given below) as per QoS regulations 2009 (7 of 2009) was followed to -calculate resolution of billing complaints.

**Resolution of billing complaints within 4 weeks:**

%age of billing complaints (for post-paid customers)/ charging, credit & validity (for pre-paid customers) resolved within 4 weeks =

$$\frac{\text{number of billing complaints for post-paid customers/charging, credit/ validity complaints for pre-paid customers resolved within 4 weeks during the quarter}}{\text{number of billing/charging, credit / validity complaints received during the quarter}} \times 100$$

**Resolution of billing complaints within 6 weeks:**

%age of billing complaints (for post-paid customers)/ charging, credit & validity (for pre-paid customers) resolved within 6 weeks =

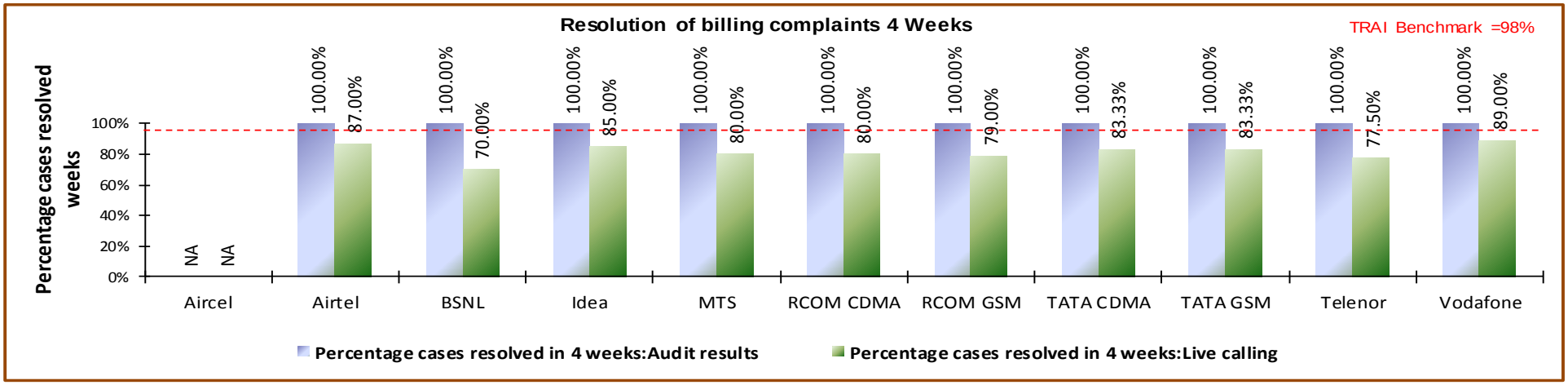
$$\frac{\text{number of billing complaints for post-paid customers/charging, credit/ validity complaints for pre-paid customers resolved within 6 weeks during the quarter}}{\text{number of billing/charging, credit / validity complaints received during the quarter}} \times 100$$

- **Billing complaints here shall include only dispute related issues (including those that may arise because of a lack of awareness at the subscribers' end). It does not include any provisional issues (such as delayed dispatch of billing statements, etc.) in which the operator has opened a ticket internally. Complaints raised by the consumers to operator are only considered as part of the calculation.

- The complaints that get marked as invalid by the operator are not considered for calculation as those complaints cannot be considered as resolved by the operator.
- *** Date of resolution in this case would refer to the date when a communication has taken place from the operator's end to inform the complainant about the final resolution of the issue / dispute.

Benchmark: 98% complaints resolved within 4 weeks, 100% within 6 weeks.

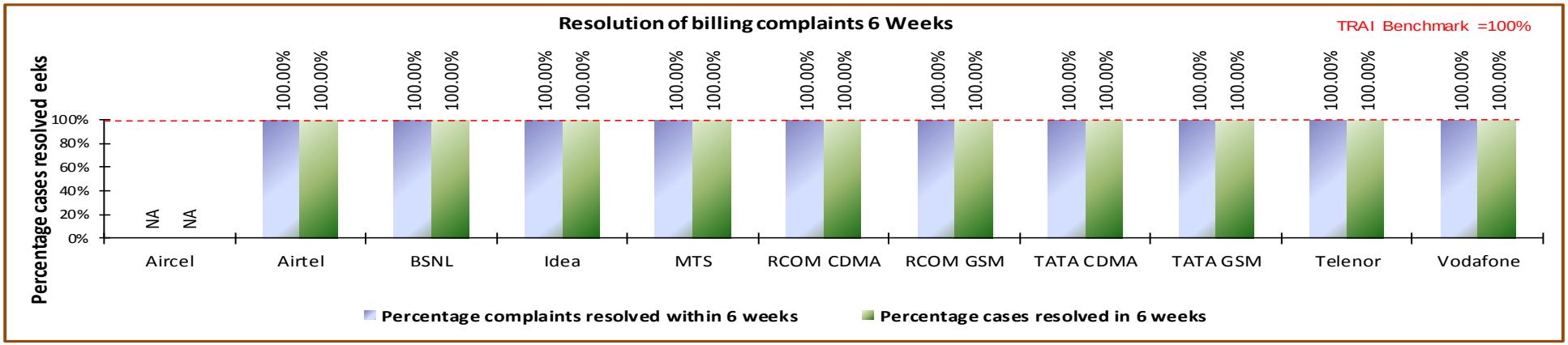
### 8.2.2 KEY FINDINGS - WITHIN 4 WEEKS




*Data Source: Billing Center of the operators*

All failed to meet the benchmark for resolution of billing complaints within 4 weeks in 3 days live calling. However, all operators met the benchmark for resolution of billing complaints within 4 weeks in PMR data.

### 8.2.3 KEY FINDINGS WITHIN 6 WEEKS




*Data Source: Billing Center of the operators*

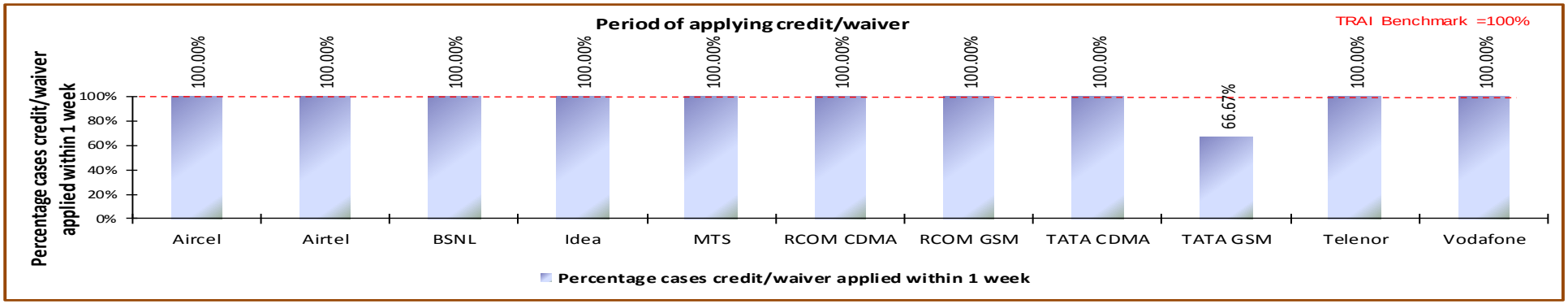
All operators met the TRAI benchmark of resolution of billing complaints within 4 weeks as well as within 6 weeks.

## 8.3 PERIOD OF APPLYING CREDIT/WAVIER

### 8.3.1 PARAMETER DESCRIPTION

- Computational Methodology:
  - **Period of applying credit waiver = (number of cases where credit waiver is applied within 7 days/ total number of cases eligible for credit waiver) * 100**
- TRAI Benchmark:
  - Period of applying credit waiver within 7 days: 100%
- Audit Procedure:
  - Operator to provide details of:-
    - List of all eligible cases along with
      - Date of applying credit waiver to all the eligible cases.
      - Date of resolution of complaint for all eligible cases

### 8.3.2 KEY FINDINGS




*Data Source: Billing Center of the operators*

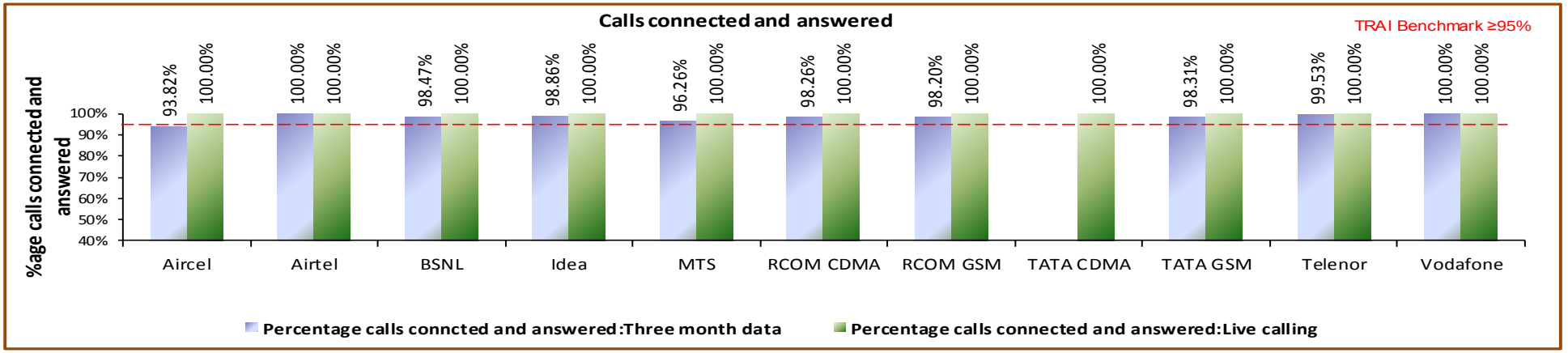
TATA GSM failed to meet the benchmark for this parameter.

## 8.4 CALL CENTRE PERFORMANCE-IVR

### 8.4.1 PARAMETER DESCRIPTION

- Computational Methodology:
  - **Call centre performance IVR = (Number of calls connected and answered by IVR/ All calls attempted to IVR) * 100**
- TRAI Benchmark: >= 95%
- Audit Procedure:
  - Operators provide details of the following from their central call centre/ customer service database:
    - Total calls connected and answered by IVR
    - Total calls attempted to IVR
  - Also live calling is done to test the calls connected and answered by IVR

### 8.4.2 KEY FINDINGS




*Data Source: Customer Service Center of the operators*

As per 3 days live, all operators met the benchmark. However, Aircel failed to meet benchmark in PMR audit.

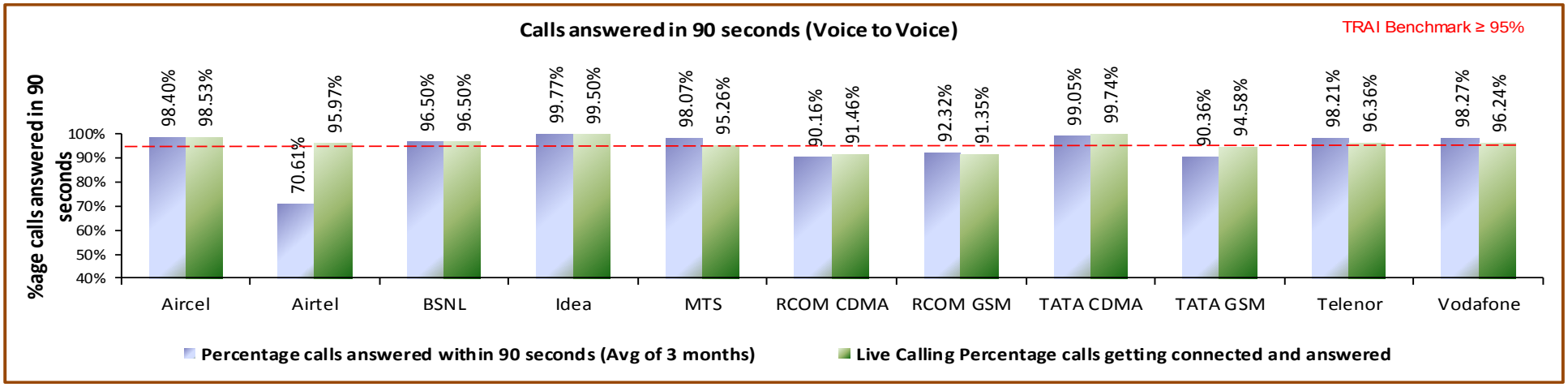
## 8.5 CALL CENTRE PERFORMANCE-VOICE TO VOICE

### 8.5.1 PARAMETER DESCRIPTION

- Computational Methodology:
  - Call centre performance Voice to Voice = (Number of calls answered by operator within 90 seconds/ All calls attempted to connect to the operator) * 100
- Audit Procedure:
  - Operators provide details of the following from their central call centre/ customer service database:
    - Total calls connected and answered by operator within 90 seconds
    - Total calls attempted to connect to the operator
  - Also live calling was done to test the calls answered within 90 seconds by the operator

**Benchmark:** 95% calls to be answered within 90 seconds

### 8.5.2 KEY FINDINGS




*Data Source: Customer Service Center of the operators*

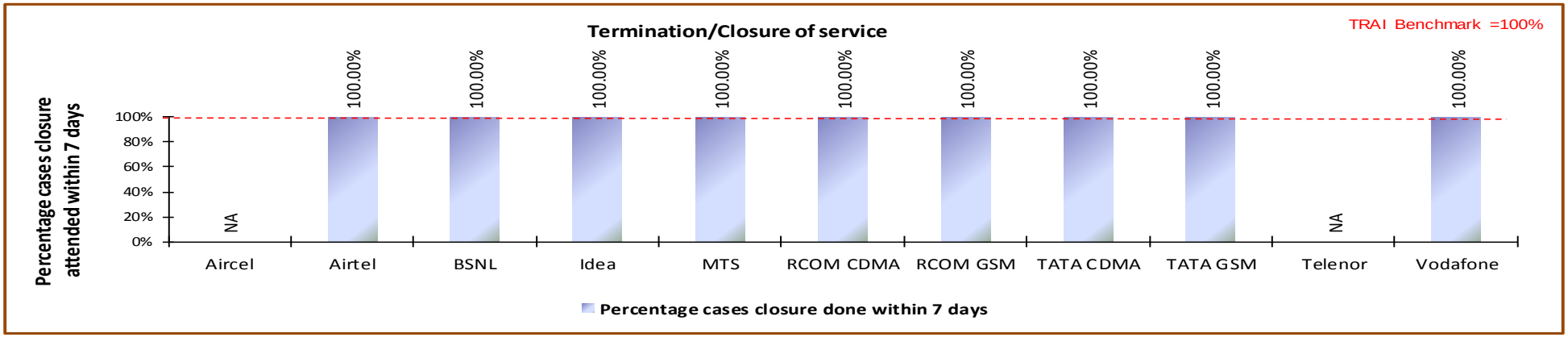
Reliance GSM & CDMA, Airtel and Tata GSM failed to meet the benchmark as per audit. However, as per live calling done to customers, the performance of TATA GSM and Reliance GSM & CDMA was far inferior to the PMR data.

## 8.6 TERMINATION/CLOSURE OF SERVICE

### 8.6.1 PARAMETER DESCRIPTION

- Computational Methodology:
  - **Time taken for closure of service = (number of closures done within 7 days/ total number of closure requests) * 100**
- TRAI Benchmark:
  - Termination/Closure of Service: <=7 days
- Audit Procedure:
  - Operator provide details of the following from their central billing/CS database:
    - Date of lodging the closure request (all requests in given period)
    - Date of closure of service

### 8.6.2 KEY FINDINGS




*Data Source: Customer Service Center of the operators*

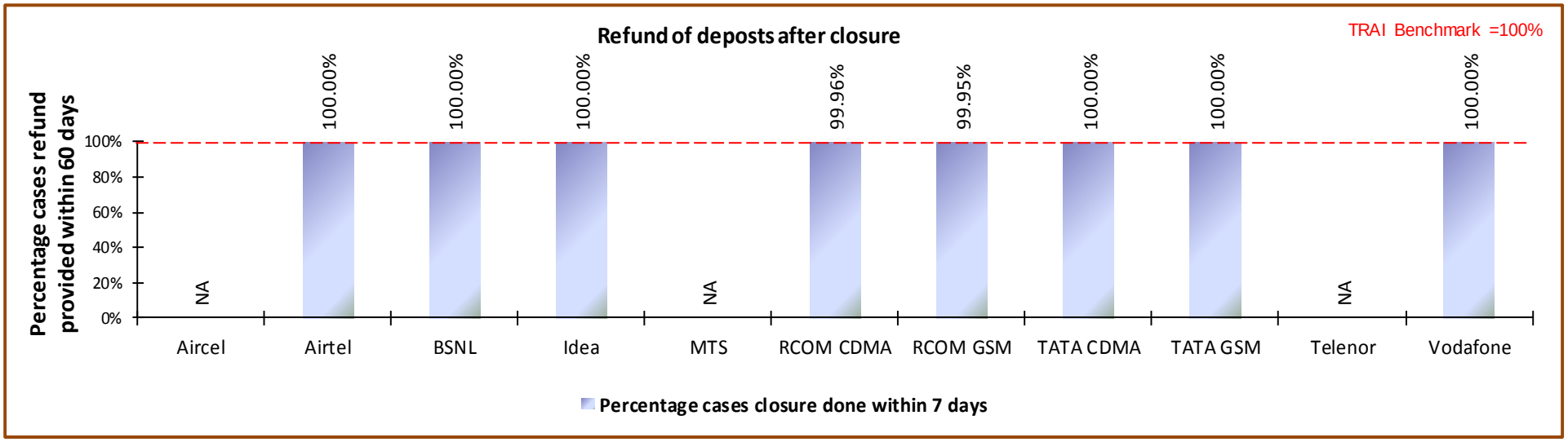
All operators met the TRAI benchmark for the parameter.

## 8.7 REFUND OF DEPOSITS AFTER CLOSURE

### 8.7.1 PARAMETER DESCRIPTION

- Computational Methodology:
  - **Time taken for refund for deposit after closures = (number of cases of refund after closure done within 60 days/ total number of cases of refund after closure) * 100**
  - Any case where the operators need to return the amount back to consumers post closure of service in form of cheque/cash is considered to be refund.
- TRAI Benchmark:
  - Time taken for refund for deposit after closures: 100% within 60 days
- Audit Procedure:
  - Operator provide details of the following from their central billing/refund database:
    - Dates of completion of all 'closure requests' resulting in requirement of a refund by the operator.
    - Dates of refund pertaining to all closure request received during the relevant quarter

### 8.7.2 KEY FINDINGS




*Data Source: Customer Service Center of the operators*

All operators met the TRAI benchmark for the parameter.

## 9 DETAILED FINDINGS - DRIVE TEST DATA

## 9.1 OPERATOR ASSISTED DRIVE TEST - VOICE

The drive test was conducted simultaneously for all the operators present in the Gujarat circle. As per the new directive given by TRAI headquarters, drive test in the quarter were conducted at a SSA level. SSAs have been defined in two categories by TRAI as per the criticality of the SSA.

3. Normal SSA
4. Difficult SSA

The drive test in Normal SSA was conducted for three days with minimum distance of 250 kilometers over three days. The drive test in difficult SSAs was conducted for six days with minimum distance of 500 kilometers over six days. The selection of routes ensured that the maximum towns, villages, highways are covered as part of drive test. The routes were selected post discussion with TRAI regional teams. The holding period for all test calls was 120 seconds and gap between calls was 10 seconds.

For measuring voice quality RxQual samples for GSM operators and Frame Error Rate (FERs) for CDMA service providers were measured. RxQual greater than 5 meant that the sample was not of appropriate voice quality and for CDMA operators FERs of more than 4 were considered bad. Call drops were measured by the number of calls that were dropped to the total number of calls established during the drive test. Similarly CSSR was measured as the ratio of total calls established to the total call attempts made. Signal strength was measured in Dbm with strength > -75 dbm for indoor, -85 dbm for in-vehicle and > -95 dbm outdoor routes.

The schedule and operators involved in the operator assisted drive test for Gujarat circle are given below.

| Name of Operator | Name of Operator |
|---|---|
| Aircel | BSNL 3G |
| Airtel | Idea 3G |
| BSNL | TATA 3G |
| Idea | Vodafone 3G |
| MTS | |
| RCOM CDMA | |
| RCOM GSM | |
| TATA CDMA | |
| TATA GSM | |
| Telenor | |
| Videocon | |
| Vodafone | |

### 9.1.1 Ahmedabad SSA

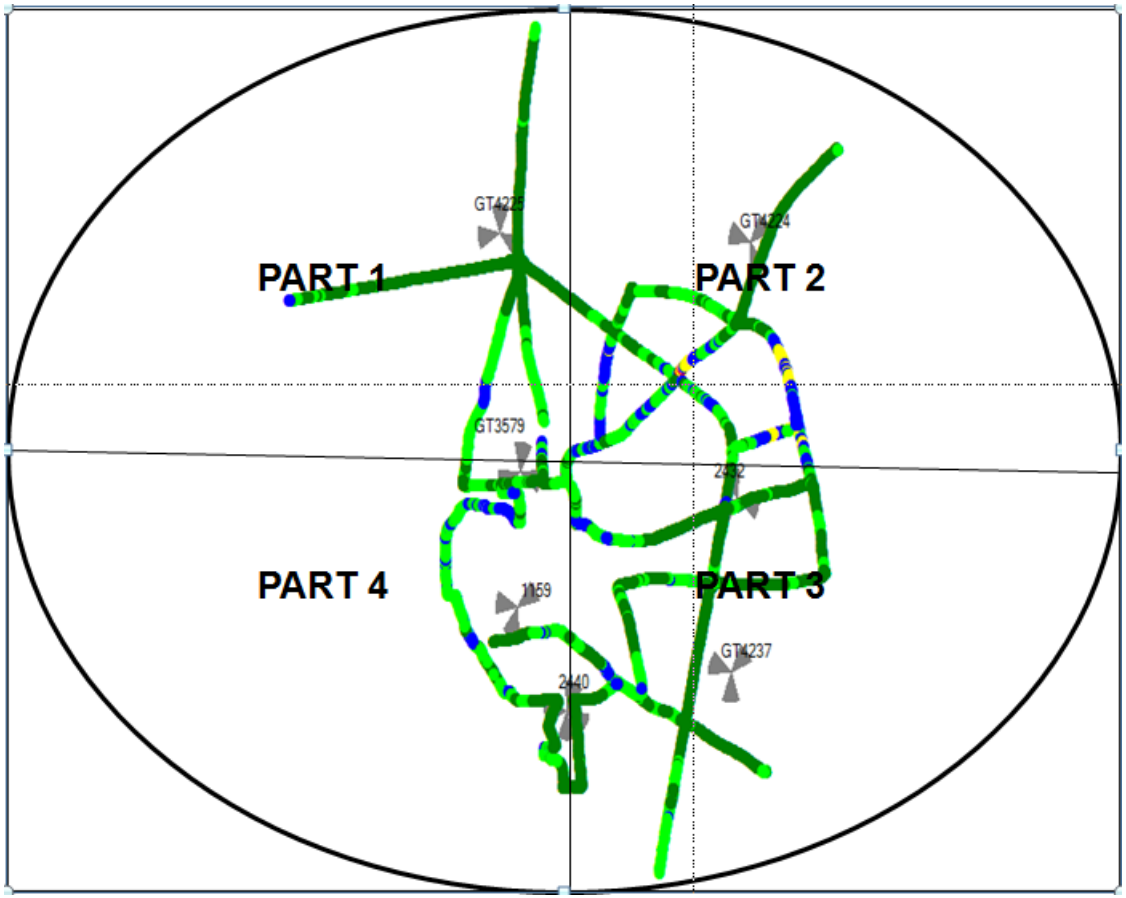
| Month | Name of SSA Covered | Start date | End Date | Kilometer Travelled |
|---|---|---|---|---|
| April | Ahmedabad | 27-04-16 | 29-04-16 | 410 |

### 9.1.1.1 Route Details - Ahmedabad a SSA

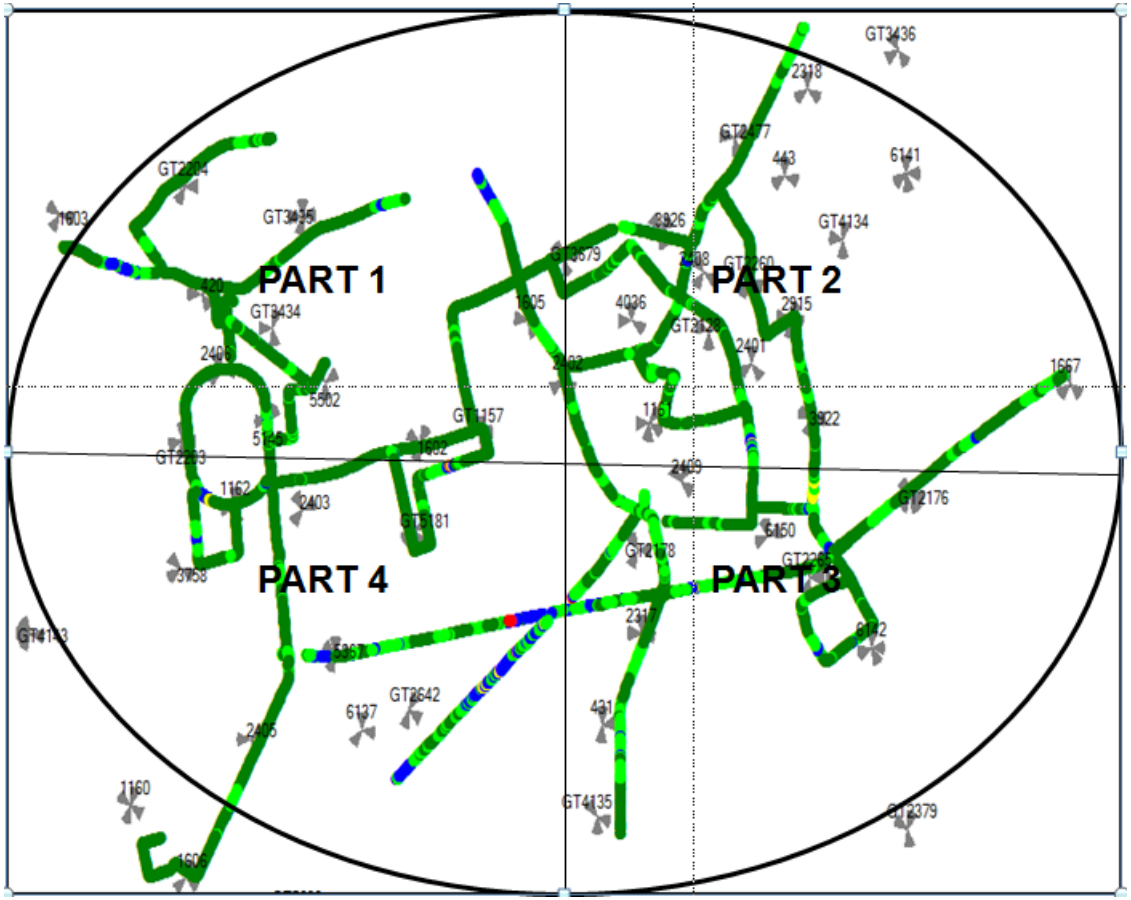
| Category | Type of location | Ahmedabad | | |
|---|---|---|---|---|
| | | Day 1 | Day 2 | Day 3 |
| Outdoor | Major Roads | Thaltej, Hebatpura, Science city, Iscon, Vadaj, Chandlodiya, Ghatloadiya,New Ranip,Pragatinagar. Airport, Shahibaug,naroda patiya, soninichali,kalupur, krishnanagar, NH-8 highway. Maningar, Khokhra, Geeta mandir, narol, Kankaria. Ashram Road, paldi,Juhapura,Sarkhej chokdi, Ring road, Bopal chokdi, Vastrapur, Mansi circle. | Vavol, Sports authority of India,Mahatma mandir, Sector 26,27 Sarita Udhyan,Sarvodaynagar society,CH rd,Sector 21, 22, 4,5 Sector 8, Indroda,Sector 10A Infocity, Gandhinagar bypass rd,Sankalp Rd,Sector 2,3. Railway station, GIDC,Siyavda, Barotvada. Bayad Rd,Paliya,Pankaj society. Aminwada,Nehru society. Vadodara Patia Rd,Darshan society,Chiloda Rd,Vinayak Park, Labdhi. | Kalikund, Sarthinagar, New shiv Shakti society, Bavla Rd,Maghiya Bekatekri. Ahmedabad highway. Bhavani society, Rampur,kheda highway. Buraj Rd,malav Telav Rd,Radhanpuri, Alka Rd, Bagodara Rd. Bawla Bagodara Highway. Badrinath Society, yogeshwar park,Umiya Park, Railway station, BAPS Mandir. Shir Nand park society, Panchshil society, Dholka Rd. Shantinagar society. Kadiya St, Bhadar,Amreli Rd,Kothadiya Rd,Bus stand. Jain Nagar,Punit nagar,kailas nagar,Kikani colony. Amreli Rd, karimabad society |
| | Highways | | | |
| | With in the City | | | |
| Indoor | Shopping complex | | | |
| | Office complex | | | |

The route maps given in the report are provided for the purpose of identifying the routes traversed during the drive tests. We November observe three different colours (Red/Green/Yellow) of the lines, which signify signal strength; however these maps are for a single operator and have not been referred to any findings in this report. IMRB submits detailed operator wise Drive Test reports separately.

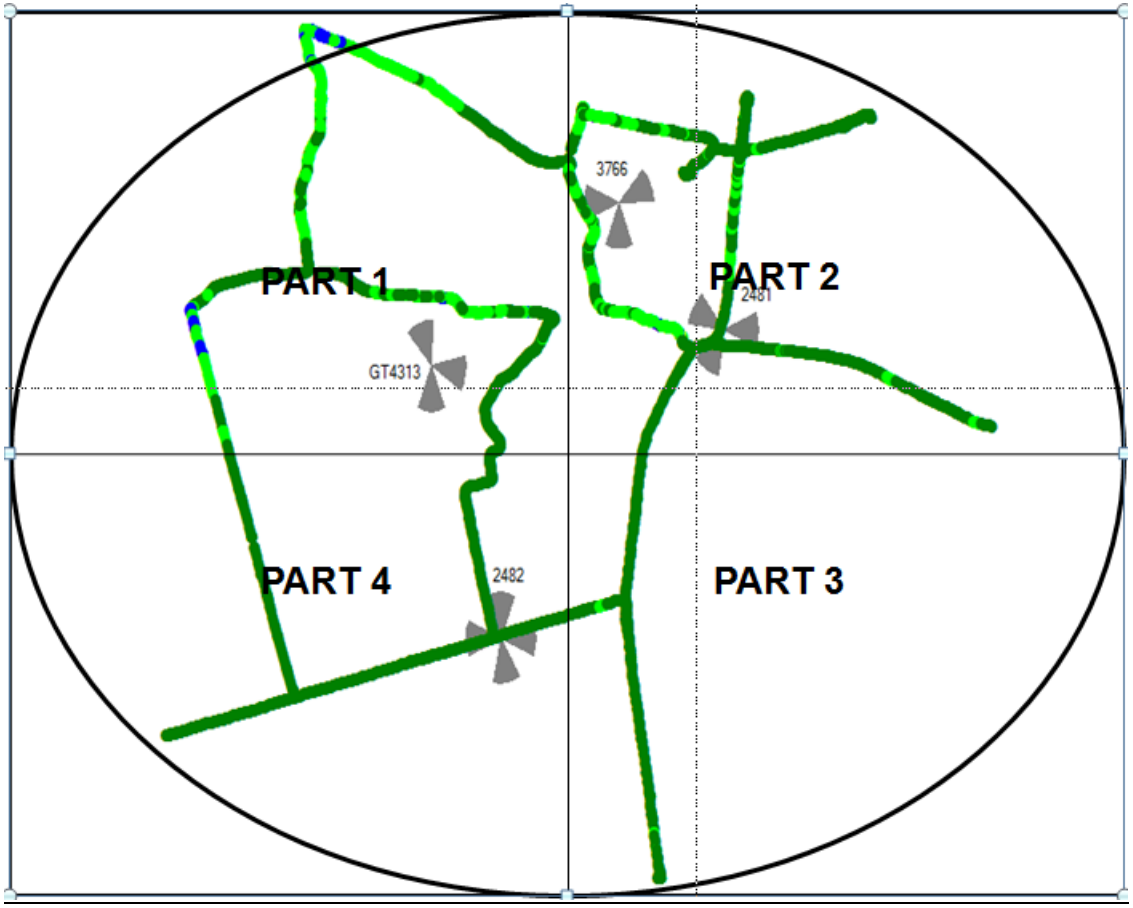
### 9.1.1.1 Route Map - Ahmedabad DAY 1




### 9.1.1.2 Route Map - Ahmedabad DAY 2




### 9.1.1.3 Route Map - Ahmedabad DAY 3


3766
PART 1
PART 2
2481
GT4313
PART 4
2482
PART 3

### 9.1.1.4 Drive Test Results - Ahmedabad SSA 2G

| Ahmedabad | B'mark | Aircel | | Airtel | | BSNL | | Idea | | MTS | | RCOM CDMA | | RCOM GSM | | TATA CDMA | | TATA GSM | | Telenor | | Vodafone | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter's | | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor |
| 0 to -75 dBm | | 77.30% | 72.59% | 98.22% | 93.51% | 59.92% | 87.14% | 98.92% | 94.75% | 66.90% | 59.34% | 92.70% | 60.78% | 89.26% | 72.58% | 63.92% | 69.06% | 39.08% | 71.06% | 80.73% | 88.00% | 93.53% | 90.26% |
| 0 to -85 dBm | | 99.61% | 93.37% | 99.96% | 99.24% | 97.23% | 98.30% | 100.00% | 99.82% | 99.33% | 93.15% | 99.91% | 88.37% | 99.91% | 94.56% | 93.36% | 95.02% | 96.90% | 92.11% | 18.23% | 11.34% | 99.66% | 97.43% |
| 0 to -95 dBm | | 100.00% | 99.26% | 100.00% | 99.88% | 100.00% | 99.95% | 100.00% | 99.99% | 99.71% | 99.72% | 100.00% | 99.40% | 100.00% | 99.56% | 99.56% | 99.60% | 99.96% | 98.91% | 1.04% | 0.66% | 100.00% | 99.42% |
| Voice quality | ≥ 95% | 98.59% | 97.18% | 97.28% | 97.41% | 96.89% | 96.50% | 98.32% | 96.58% | 99.96% | 99.80% | 99.33% | 98.01% | 96.27% | 95.31% | 99.46% | 99.44% | 98.42% | 95.84% | 98.44% | 95.81% | 98.32% | 95.21% |
| CSSR | ≥ 95% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 99.61% | 100.00% | 98.48% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 99.78% | 100.00% | 99.71% | 100.00% | 99.54% | 98.36% | 97.21% | 100.00% | 100.00% |
| %age Blocked calls | | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.29% | 0.00% | 0.46% | 0.00% | 0.60% | 0.00% | 0.00% |
| Call drop rate | ≤ 2% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.20% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.22% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Hands off success rate | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 99.08% | 100.00% | 98.54% | 100.00% | 100.00% | 100.00% | 100.00% | 99.71% | 99.89% | 100.00% | 100.00% | 100.00% | 94.58% | 100.00% | 97.92% | 100.00% | 100.00% |

*Data Source: Drive test reports submitted by operators to auditors*

## Voice Quality

All operators met the benchmark in outdoor as well as indoor locations.

## Call Set Success Rate (CSSR)

All operators met the benchmark for CSSR in outdoor as well as indoor locations.

## Call Drop Rate

All operators met the benchmark for call drop rate in outdoor as well as indoor locations.

### 9.1.1.5 Drive Test Results - Ahmedabad SSA 3G

| Ahmedabad | B'mark | Airtel 3G | | BSNL 3G | | Idea 3G | | Tata 3G | | Vodafone 3G | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter's | | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor |
| 0 to -75 dBm | | 52.43% | 63.30% | 42.90% | 39.71% | 99.01% | 88.39% | 18.61% | 43.76% | 54.08% | 72.15% |
| 0 to -85 dBm | | 97.70% | 87.55% | 80.44% | 68.49% | 100.00% | 98.67% | 93.89% | 76.63% | 66.74% | 93.44% |
| 0 to -95 dBm | | 100.00% | 97.91% | 99.94% | 91.61% | 100.00% | 99.96% | 100.00% | 94.66% | 87.57% | 99.29% |
| Voice quality | ≥ 95% | 95.21% | 97.32% | 100.00% | 100.00% | 99.22% | 96.46% | 99.95% | 97.77% | 97.92% | 95.17% |
| CSSR | ≥ 95% | 100.00% | 100.00% | 100.00% | 99.26% | 100.00% | 99.38% | 100.00% | 99.16% | 100.00% | 100.00% |
| %age Blocked calls | | 0.00% | 0.00% | 0.00% | 0.39% | 0.00% | 0.15% | 0.00% | 0.84% | 0.00% | 0.00% |
| Call drop rate | ≤ 2% | 0.00% | 0.00% | 0.00% | 0.20% | 0.00% | 0.00% | 0.00% | 0.42% | 0.00% | 0.00% |
| Hands off success rate | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |

*Data Source: Drive test reports submitted by operators to auditors*

## Voice Quality

All operators met the benchmark in outdoor as well as indoor locations.

## Call Set Success Rate (CSSR)

All operators met the benchmark for CSSR in outdoor locations.

## Call Drop Rate

All operators met the benchmark for call drop rate in outdoor locations.

### 9.1.1.1 Data Drive Test Results - Ahmedabad SSA-2G

| Name of the Parameter | Bench Mark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Videocon | Vodafone |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Succesful Data Transmission download speed attempts | >80% | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | Service Closed | 100 |
| Succesful Data Transmission upload speed attempts | >75% | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | | 100 |
| Minimum download speed | | 147 | 137 | 5 | 124 | 868 | 86 | 34 | 44 | 48 | 125 | | 134 |
| Average throughput for Packet Data | | 170 | 166 | 102 | 174 | 1438 | 107 | 67 | 80 | 96 | 142 | | 190 |
| Latency | <250ms | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | | 100 |

All operators met the TRAI benchmark for data drive test.

### 9.1.1.2 Data Drive Test Results - Ahmedabad SSA-3G

| Name of the Parameter | Bench Mark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
|---|---|---|---|---|---|---|
| Succesful Data Transmission download speed attempts | >80% | 100 | 100 | 100 | 100 | 100 |
| Succesful Data Transmission upload speed attempts | >75% | 100 | 100 | 100 | 100 | 100 |
| Minimum download speed | | 2203 | 162 | 2531 | 928 | 1945 |
| Average throughput for Packet Data | | 3130 | 2954 | 4915 | 1969 | 3113 |
| Latency | <250ms | 100 | 100 | 100 | 100 | 100 |

All operators met the TRAI benchmark for data drive test.

### 9.1.2 Surat SSA

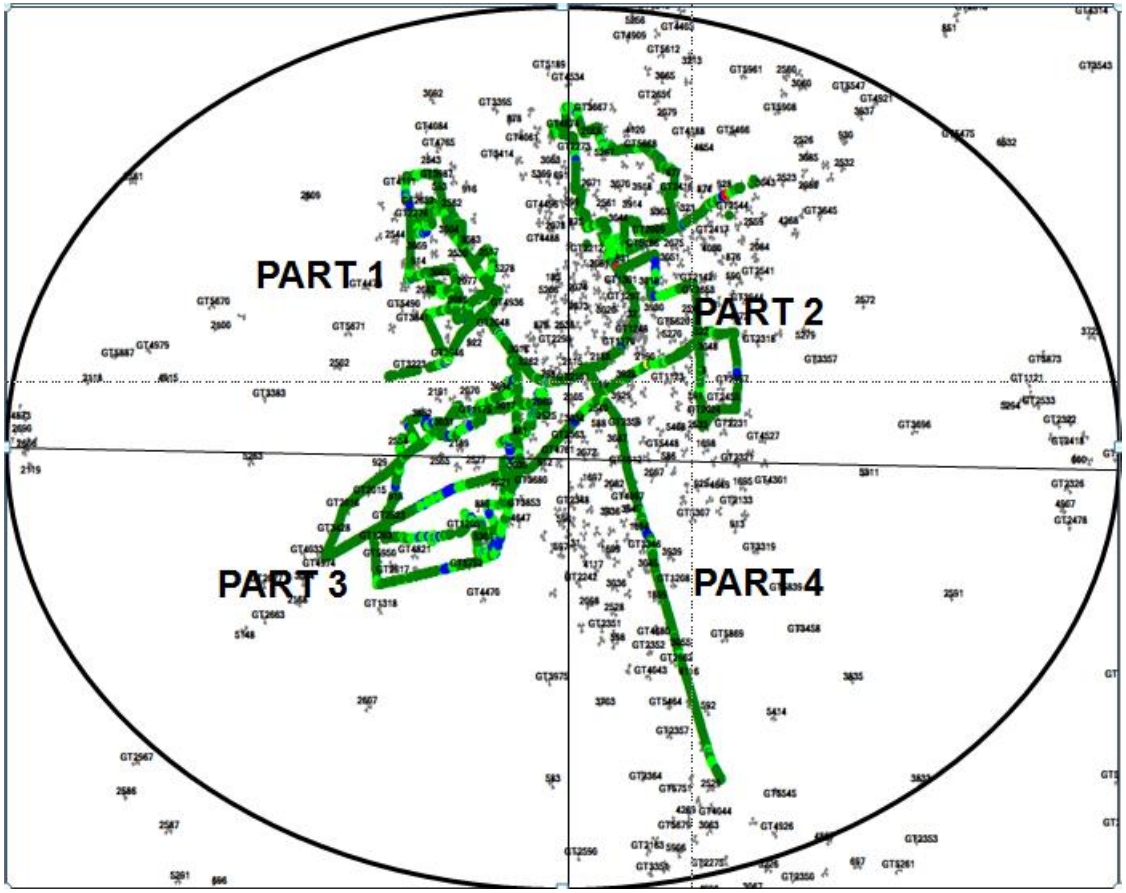
| Month | Name of SSA Covered | Start date | End Date | Kilometer Travelled |
|---|---|---|---|---|
| April | Surat | 04-07-2016 | 04-09-2016 | 305 |

#### 9.1.2.1 ROUTE DETAILS - SURAT SSA

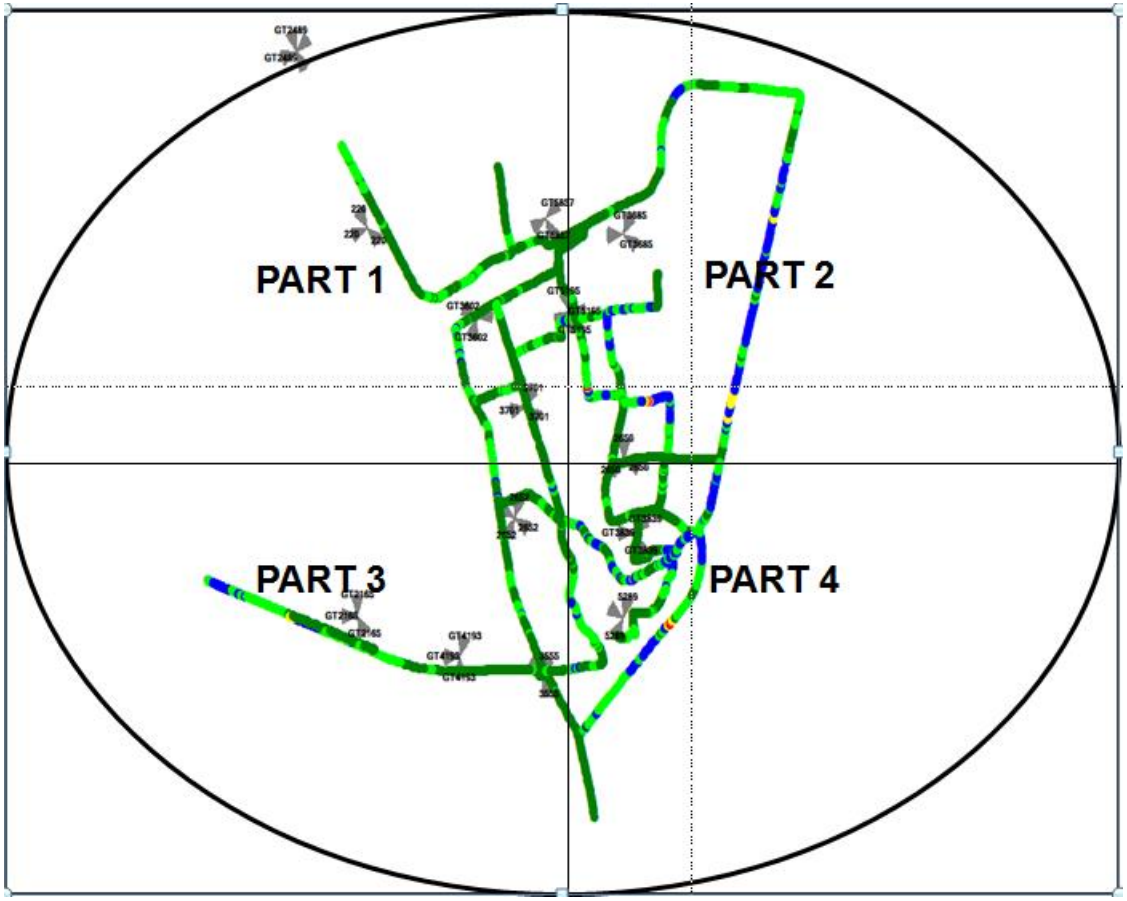
| Type of location | April Surat Day 1 | Day 2 | Day 3 |
|---|---|---|---|
| Major Roads | 1. RTO pal, Star bazar, Anandmahal road, LP savni circle, Morabhagal char rasta, sardar bridge, athwalines, Ghoddod road, Parlepoint, Umra 2. Kapodara, Spinning mill, hira baug, minibazar, bhatni wadi, AK road, Dharam nagar, Katargam GIDC, gajera Circle, Dabholi, Bapasitaram chowk, Sahajnanad soc, Pipals char rasta, Sumul dairy road, Railway/Bus station, Ring road, Sahara darwaja, Bombay market, Aai mata road, Paravt gam, bhathena 3. Udhana, Pandesara, Udhana Navsari road, Sachin flyover, unn jakatnaka 4. Vesu, UM road, Udhana, Bhatar road, University road, Piplod, VR mall, Althan | 1. Baben, Bardoli railway station, Gandhi Hospital, Vatsalya Trust 2. Bardoli Sugar staff colony , Astan road, Moti Nagar, Radhebaug Society 3. JM Patel schhol, Shrinagar society, Navdurga Road, Upli Bazzar 4. Ten GIDC, Mahatma Gandhi Road, Asiyana Nagar, Station Masjid 1. Zankhvav road , Bus station, Shivkrupa Hospital 2. DC shah college, Tejas Eye Hospital, Ghanchiwad 3. Kabrastan road, Soni Faliya, Bajar Raod 4. BB Avichal College, Mandvi education society, 1. No route 2. Sayan Sugar factory, Sayan GIDC 3. Sayan-kim road, GIDC area, Railway station, bus stop, Sayan-sekhpur road, Thakur dwar 4. Sithan town, Hazira road, Anjani ind estate, pushpak society | 1. Vyara railway station, Vyara Bus station 2. Old Bus stand, Jumma Masjid, Ratnamani Nagar 3. Agricultural university, Jakhari, Main Bazzar 4. Vyara Church, New Dhodiyawad, Vipul Park 1. Hathi faliya road, Ramji Mandir road 2. Bapa sitaram Nagar, Maslim Faliya, Vania 3. Ukai Songadh railway station road 4. Pokhran to Songadh road 1. Government science college, Valod ITI 2. Bapunagar Valod 3. Ambaji street, Skynet computer, Zaveri street 4. Taluka Panchayat office |
| Highways | | | |
| With in the City | | | |
| Shopping complex | | | |
| Office complex | | | |

The route maps given in the report are provided for the purpose of identifying the routes traversed during the drive tests. We November observe three different colours (Red/Green/Yellow) of the lines, which signify signal strength; however these maps are for a single operator and have not been referred to any findings in this report. IMRB submits detailed operator wise Drive Test reports separately.

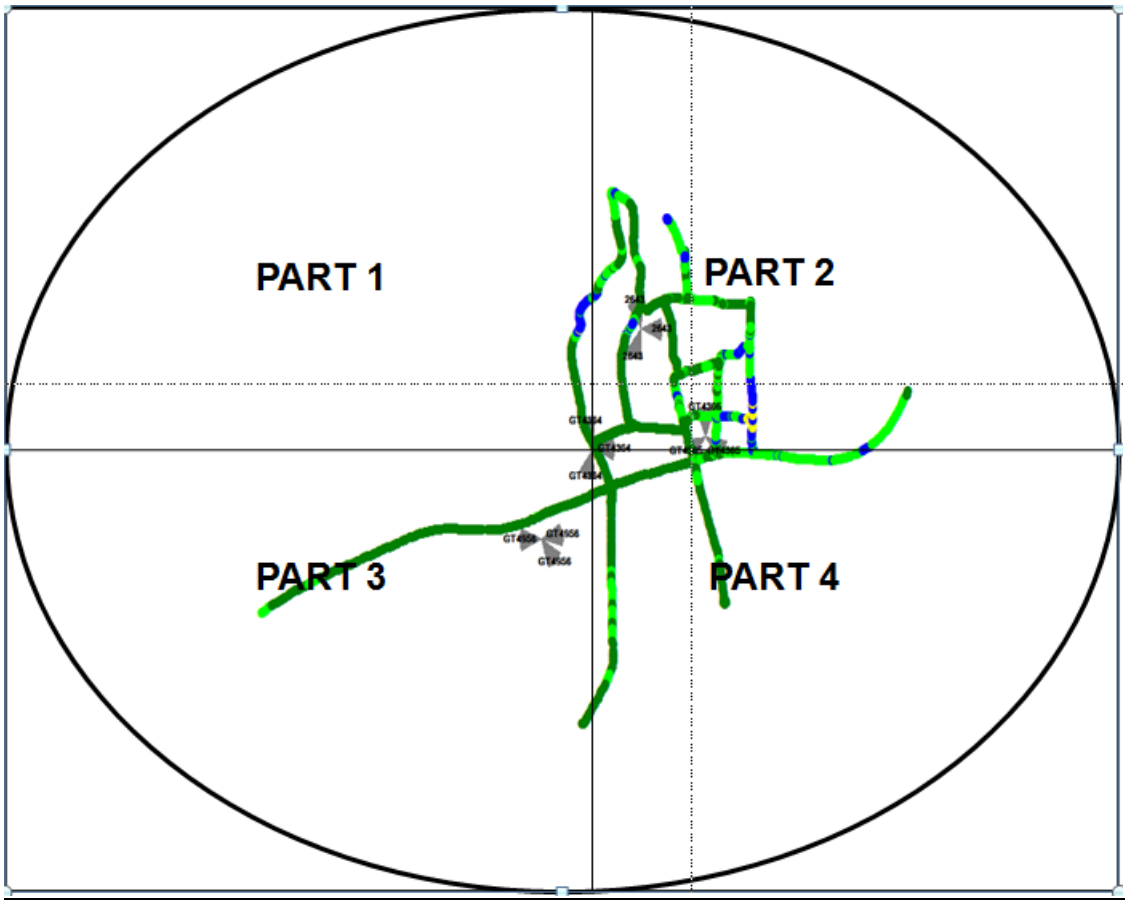
### 9.1.2.2 Route Map - Surat DAY 1



### 9.1.2.3 Route Map - Surat DAY 2



### 9.1.2.4 Route Map - Surat DAY 3



### 9.1.2.1 Drive Test Results -Surat SSA 2G

| Surat | B'mark | Aircel | | Airtel | | BSNL | | Idea | | MTS | | RCOM CDMA | | RCOM GSM | | TATA CDMA | | TATA GSM | | Telenor | | Vodafone | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter's | | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor |
| 0 to -75 dBm | | 84.26% | 73.90% | 84.75% | 94.59% | 97.50% | 80.59% | 97.62% | 95.80% | 99.88% | 73.12% | 100.00% | 82.91% | 100.00% | 85.05% | 97.60% | 64.44% | 95.12% | 66.48% | 59.16% | 67.10% | 100.00% | 93.17% |
| 0 to -85 dBm | | 99.86% | 97.01% | 99.53% | 99.33% | 99.90% | 97.55% | 99.97% | 99.83% | 99.97% | 96.78% | 100.00% | 97.34% | 100.00% | 97.76% | 100.00% | 90.61% | 100.00% | 91.06% | 26.19% | 22.04% | 100.00% | 98.30% |
| 0 to -95 dBm | | 100.00% | 100.00% | 100.00% | 99.92% | 100.00% | 99.95% | 100.00% | 100.00% | 99.99% | 99.77% | 100.00% | 99.99% | 100.00% | 99.98% | 100.00% | 98.55% | 100.00% | 98.90% | 13.65% | 10.25% | 100.00% | 99.65% |
| Voice quality | ≥ 95% | 98.87% | 99.22% | 98.74% | 95.33% | 96.48% | 97.86% | 98.90% | 97.15% | 99.89% | 99.51% | 100.00% | 97.78% | 99.53% | 94.46% | 100.00% | 98.20% | 99.96% | 95.16% | 98.58% | 96.38% | 98.36% | 96.07% |
| CSSR | ≥ 95% | 100.00% | 100.00% | 100.00% | 100.00% | 98.46% | 98.85% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 99.60% | 100.00% | 99.66% | 100.00% | 98.69% | 100.00% | 100.00% |
| %age Blocked calls | | 0.00% | 0.00% | 0.00% | 0.00% | 1.54% | 1.15% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.22% | 0.00% | 0.00% | 0.00% | 0.40% | 0.00% | 0.34% | 0.00% | 1.13% | 0.00% | 0.00% |
| Call drop rate | ≤ 2% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.58% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.34% | 0.00% | 0.19% | 0.00% | 0.00% |
| Hands off success rate | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 98.03% | 100.00% | 98.93% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 99.39% | 100.00% | 100.00% | 100.00% | 99.03% | 100.00% | 98.19% | 100.00% | 100.00% |

## Voice Quality

Reliance GSM fail to meet the benchmark in outdoor locations.

## Call Set Success Rate (CSSR)

All operators met the benchmark for CSSR in outdoor as well as indoor locations.

## Call Drop Rate

All operators met the benchmark for call drop rate in outdoor as well as indoor locations.

### 9.1.2.2 Drive Test Results - Surat SSA 3G

| Surat | B'mark | Airtel 3G | | BSNL 3G | | Idea 3G | | Tata 3G | | Vodafone 3G | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter's | | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor |
| 0 to -75 dBm | | 83.28% | 71.74% | 39.00% | 37.88% | 99.92% | 96.51% | 99.96% | 55.93% | 100.00% | 79.44% |
| 0 to -85 dBm | | 99.98% | 92.77% | 91.30% | 69.98% | 100.00% | 99.74% | 100.00% | 81.24% | 100.00% | 95.93% |
| 0 to -95 dBm | | 100.00% | 99.47% | 100.00% | 89.73% | 100.00% | 100.00% | 100.00% | 96.19% | 100.00% | 99.52% |
| Voice quality | ≥ 95% | 99.84% | 97.58% | 99.34% | 96.70% | 98.03% | 97.01% | 100.00% | 94.69% | 99.83% | 96.51% |
| CSSR | ≥ 95% | 100.00% | 100.00% | 100.00% | 98.75% | 100.00% | 100.00% | 100.00% | 98.88% | 100.00% | 100.00% |
| %age Blocked calls | | 0.00% | 0.00% | 0.00% | 1.25% | 0.00% | 0.00% | 0.00% | 1.12% | 0.00% | 0.00% |
| Call drop rate | ≤ 2% | 0.00% | 0.00% | 0.00% | 1.02% | 0.00% | 0.00% | 0.00% | 0.57% | 0.00% | 0.00% |
| Hands off success rate | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |

## Voice Quality

Tata 3G failed to meet the benchmark for voice quality in outdoor locations.

## Call Set Success Rate (CSSR)

All operators met the benchmark for CSSR in outdoor as well as indoor locations.

## Call Drop Rate

All operators met the benchmark for call drop rate in outdoor as well as indoor locations.

### 9.1.2.1 Data Drive Test Results - Surat SSA-2G

| Name of the Parameter | Bench Mark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Videocon | Vodafone |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Succesful Data Transmission download speed attempts | >80% | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | Service Closed | 100 |
| Succesful Data Transmission upload speed attempts | >75% | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | | 100 |
| Minimum download speed | | 150 | 130 | 17.5 | 119 | 260 | 73 | 63 | 78 | 103 | 129 | | 131 |
| Average throughput for Packet Data | | 187 | 169 | 39 | 179 | 390 | 107 | 76 | 85 | 122 | 144 | | 181 |
| Latency | <250ms | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | | 100 |

All operators met the TRAI benchmark for data drive test.

### 9.1.2.2 Data Drive Test Results - Surat SSA-3G

| Name of the Parameter | Bench Mark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
|---|---|---|---|---|---|---|
| Succesful Data Transmission download speed attempts | >80% | 100 | 100 | 100 | 100 | 100 |
| Succesful Data Transmission upload speed attempts | >75% | 100 | 100 | 100 | 100 | 100 |
| Minimum download speed | | 2571 | 276 | 2853 | 1841 | 2089 |
| Average throughput for Packet Data | | 3448 | 1406 | 4605 | 2492 | 2961 |
| Latency | <250ms | 100 | 100 | 100 | 100 | 100 |

All operators met the TRAI benchmark for data drive test.

### 9.1.3 Vadodara SSA

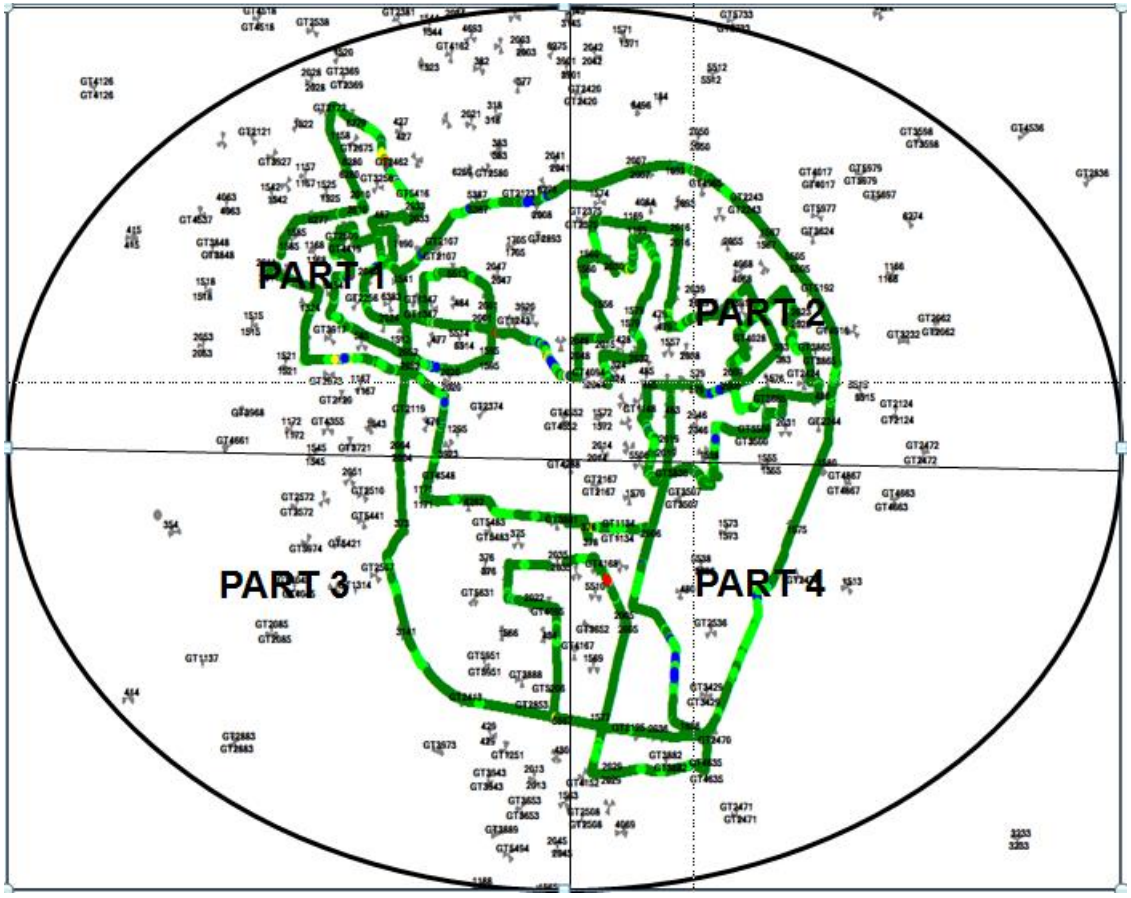
| Month | Name of SSA Covered | Start date | End Date | Kilometer Travelled |
|---|---|---|---|---|
| April | Vadodara | 04-04-2016 | 04-06-2016 | 295 |

#### 9.1.3.1 Route Details - Vadodara SSA

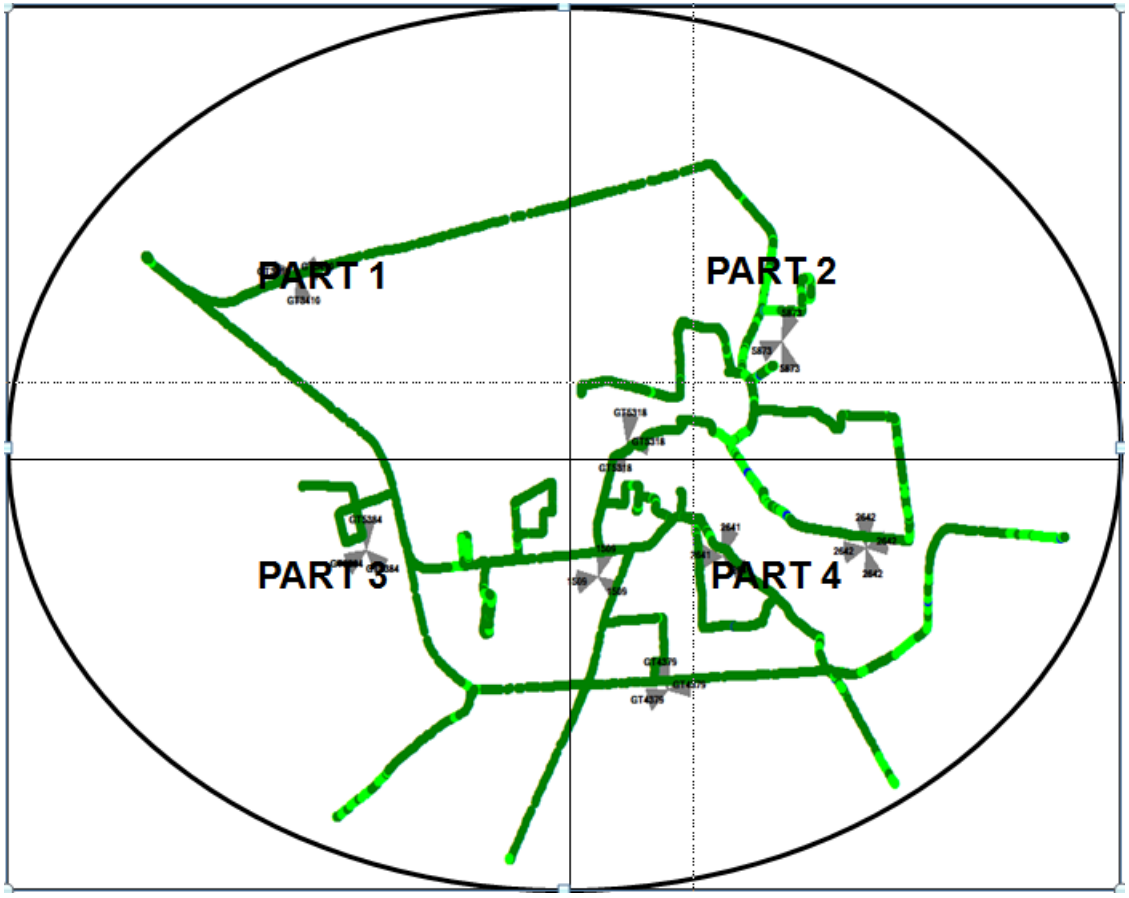
| Category | Type of location | April Vadodara Day 1 | Day 2 | Day 3 |
|---|---|---|---|---|
| Outdoor | Major Roads | Op Road, Akota, Raopura, Manjalpur, Makarpura, Subhanpura, Karelibug, Amit agar Alkapuri,New VIP Road GIDC , Main Market, Waghodiya gam Jumma Masjid road | Vadodara –Padra Road, Main Market , M.K Amin College Area Near Padra Talav, Karjan Highway, Karjan main market,Area Near Anaj Mandi, Karjan Railway Station area, Area Near Busstand. Dabhoi –karjan Road, Dabhoi – Vadodara Road,Sinor Chwkadi Road, Area Near sardar Garden, Bus Stand College road | Bodeli Railway Station Road Alipura Char Rasta Bus stand area, General hospital road, Bodeli Halol Road Highway. Pavijetpur-Chhotaudaipur Road, Pavijetpur Bodeli Road, Main Market, Pavijetpur Village, Railway station. Highway, Railway station , Bus stand, Area Near Chhotaudaipur talav, Near Rajmahal, Comm. College road , |
| | Highways | | | |
| | With in the City | | | |
| Indoor | Shopping complex | | | |
| | Office complex | | | |

The route maps given in the report are provided for the purpose of identifying the routes traversed during the drive tests. We November observe three different colours (Red/Green/Yellow) of the lines, which signify signal strength; however these maps are for a single operator and have not been referred to any findings in this report. IMRB submits detailed operator wise Drive Test reports separately.

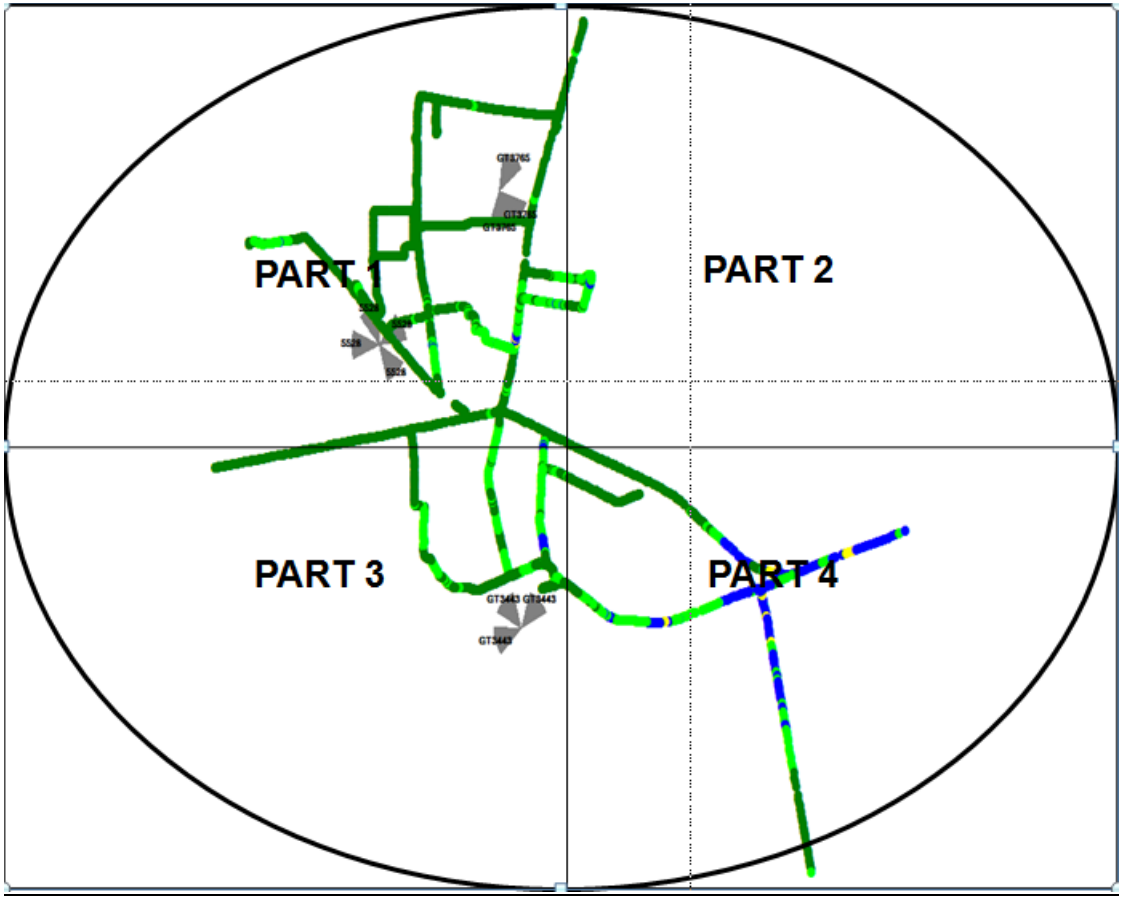
### 9.1.3.2 Route Map - Vadodara DAY 1



### 9.1.3.3 Route Map - Vadodara DAY 2



### 9.1.3.4 Route Map - Vadodara DAY 3



### 9.1.3.5 Drive Test Results - Vadodara SSA 2G

| Vadodara | B'mark | Aircel | | Airtel | | BSNL | | Idea | | MTS | | RCOM CDMA | | RCOM GSM | | TATA CDMA | | TATA GSM | | Telenor | | Vodafone | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter's | | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor |
| 0 to -75 dBm | | 99.93% | 62.84% | 99.80% | 95.97% | 65.94% | 79.72% | 89.52% | 90.80% | 98.22% | 89.09% | 96.64% | 81.10% | 99.75% | 71.57% | 100.00% | 67.24% | 51.90% | 73.74% | 68.31% | 68.33% | 100.00% | 89.54% |
| 0 to -85 dBm | | 100.00% | 91.76% | 99.99% | 99.48% | 92.14% | 97.65% | 99.92% | 99.43% | 98.88% | 99.08% | 100.00% | 98.02% | 93.80% | 95.14% | 100.00% | 92.97% | 97.95% | 95.24% | 20.02% | 21.48% | 100.00% | 98.25% |
| 0 to -95 dBm | | 100.00% | 98.83% | 100.00% | 99.95% | 99.98% | 99.93% | 100.00% | 99.98% | 99.34% | 99.71% | 100.00% | 99.99% | 100.00% | 99.87% | 100.00% | 99.11% | 99.97% | 99.25% | 11.28% | 9.73% | 100.00% | 99.77% |
| Voice quality | ≥ 95% | 99.61% | 97.33% | 99.01% | 97.67% | 99.85% | 98.68% | 99.59% | 98.13% | 100.00% | 99.71% | 99.77% | 98.42% | 99.74% | 96.66% | 99.81% | 99.93% | 99.75% | 97.37% | 99.28% | 97.59% | 98.91% | 95.91% |
| CSSR | ≥ 95% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 97.90% | 100.00% | 99.66% | 100.00% | 100.00% | 100.00% | 99.78% | 100.00% | 99.05% | 100.00% | 99.62% | 100.00% | 99.34% | 100.00% | 98.87% | 100.00% | 100.00% |
| %age Blocked calls | | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 2.10% | 0.00% | 0.17% | 0.00% | 0.00% | 0.00% | 0.22% | 0.00% | 0.95% | 0.00% | 0.38% | 0.00% | 0.67% | 0.00% | 0.00% | 0.00% | 0.00% |
| Call drop rate | ≤ 2% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.54% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.24% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Hands off success rate | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 99.69% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 99.82% | 100.00% | 100.00% | 100.00% | 99.25% | 100.00% | 100.00% | 100.00% | 100.00% |

## Voice Quality

All operators met the benchmark in outdoor as well as indoor locations.

## Call Set Success Rate (CSSR)

All operators met the benchmark for CSSR in outdoor as well as indoor locations.

## Call Drop Rate

All operators met the benchmark for call drop rate in outdoor as well as indoor locations.

### 9.1.3.6 Drive Test Results - Vadodara SSA 3G

| Vadodara | B'mark | Airtel 3G | | BSNL 3G | | Idea 3G | | TATA 3G | | Vodafone 3G | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter's | | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor |
| 0 to -75 dBm | | 99.57% | 57.94% | 69.72% | 45.93% | 99.42% | 94.60% | 36.30% | 29.81% | 100.00% | 63.54% |
| 0 to -85 dBm | | 100.00% | 90.71% | 98.86% | 84.28% | 100.00% | 99.73% | 99.93% | 65.73% | 100.00% | 93.04% |
| 0 to -95 dBm | | 100.00% | 99.42% | 100.00% | 98.18% | 100.00% | 100.00% | 100.00% | 92.64% | 100.00% | 99.78% |
| Voice quality | ≥ 95% | 99.83% | 97.65% | 100.00% | 98.67% | 99.16% | 96.82% | 99.91% | 97.25% | 98.42% | 95.89% |
| CSSR | ≥ 95% | 100.00% | 100.00% | 100.00% | 99.26% | 100.00% | 99.49% | 100.00% | 100.00% | 100.00% | 100.00% |
| %age Blocked calls | | 0.00% | 0.00% | 0.00% | 0.74% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Call drop rate | ≤ 2% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Hands off success rate | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |

## Voice Quality

All operators met the benchmark in outdoor as well as indoor locations.

## Call Set Success Rate (CSSR)

All operators met the benchmark for CSSR in outdoor as well as indoor locations.

## Call Drop Rate

All operators met the benchmark for call drop rate in outdoor as well as indoor locations.

### 9.1.3.7 Data Drive Test Results - Vadodara SSA-2G

| Name of the Parameter | Bench Mark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Videocon | Vodafone |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Succesful Data Transmission download speed attempts | >80% | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | NDR | 100 | Service Closed | 100 |
| Succesful Data Transmission upload speed attempts | >75% | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | NDR | 100 | | 100 |
| Minimum download speed | | 154 | 144 | 60 | 99 | 257 | 83 | 58 | 80 | NDR | 124 | | 127 |
| Average throughput for Packet Data | | 187 | 176 | 131 | 156 | 389 | 106 | 87 | 83 | NDR | 139 | | 169 |
| Latency | <250ms | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | NDR | 100 | | 100 |

All operators met the TRAI benchmark for data drive test.

### 9.1.3.8 Data Drive Test Results - Vadodara SSA-3G

| Name of the Parameter | Bench Mark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
|---|---|---|---|---|---|---|
| Succesful Data Transmission download speed attempts | >80% | 100 | 100 | 100 | 100 | 100 |
| Succesful Data Transmission upload speed attempts | >75% | 100 | 100 | 100 | 100 | 100 |
| Minimum download speed | | 2812 | 630 | 2111 | 1442 | 2331 |
| Average throughput for Packet Data | | 3981 | 1389 | 4616 | 1852 | 3177 |
| Latency | <250ms | 100 | 100 | 100 | 100 | 100 |

All operators met the TRAI benchmark for data drive test.

### 9.1.4 Palanpur SSA

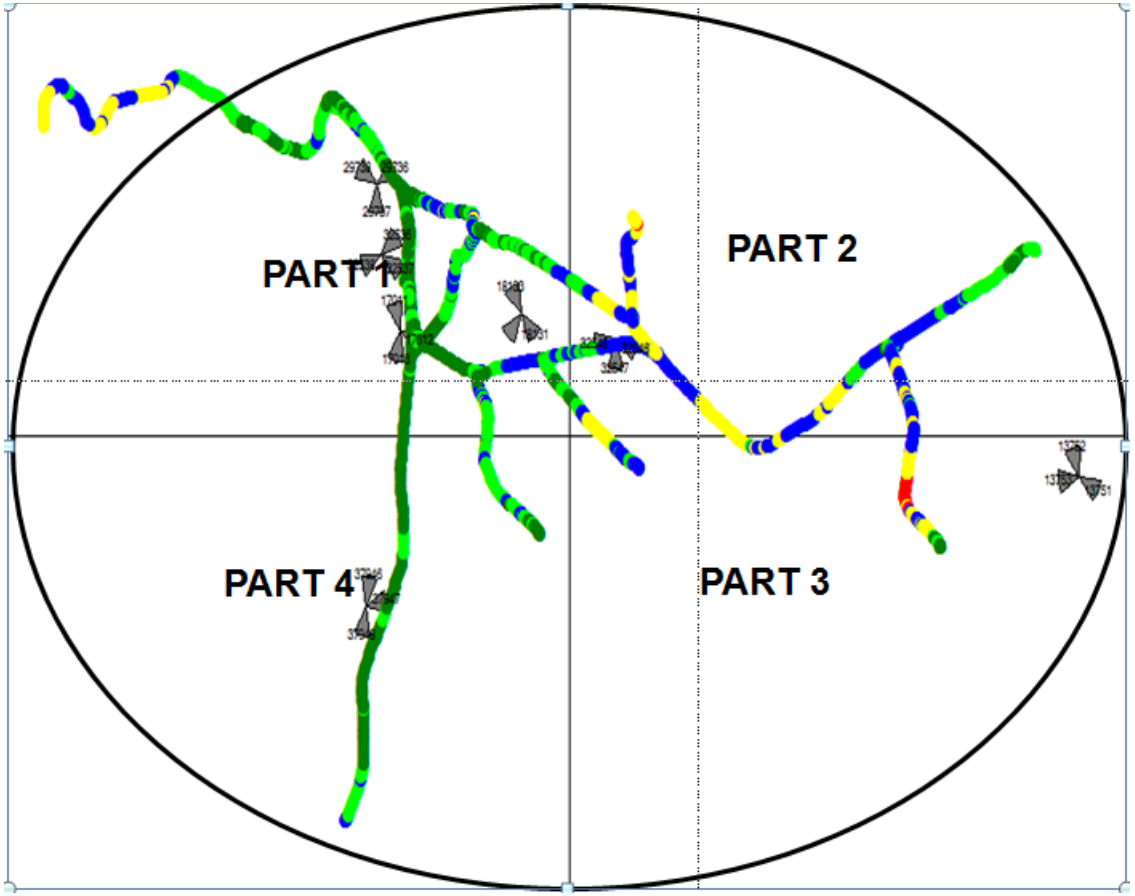
| Month | Name of SSA Covered | Start date | End Date | Kilometer Travelled |
|---|---|---|---|---|
| June | Palanpur | 06-01-2016 | 06-03-2016 | 250 |

#### 9.1.4.1 Route Details - Palanpur SSA

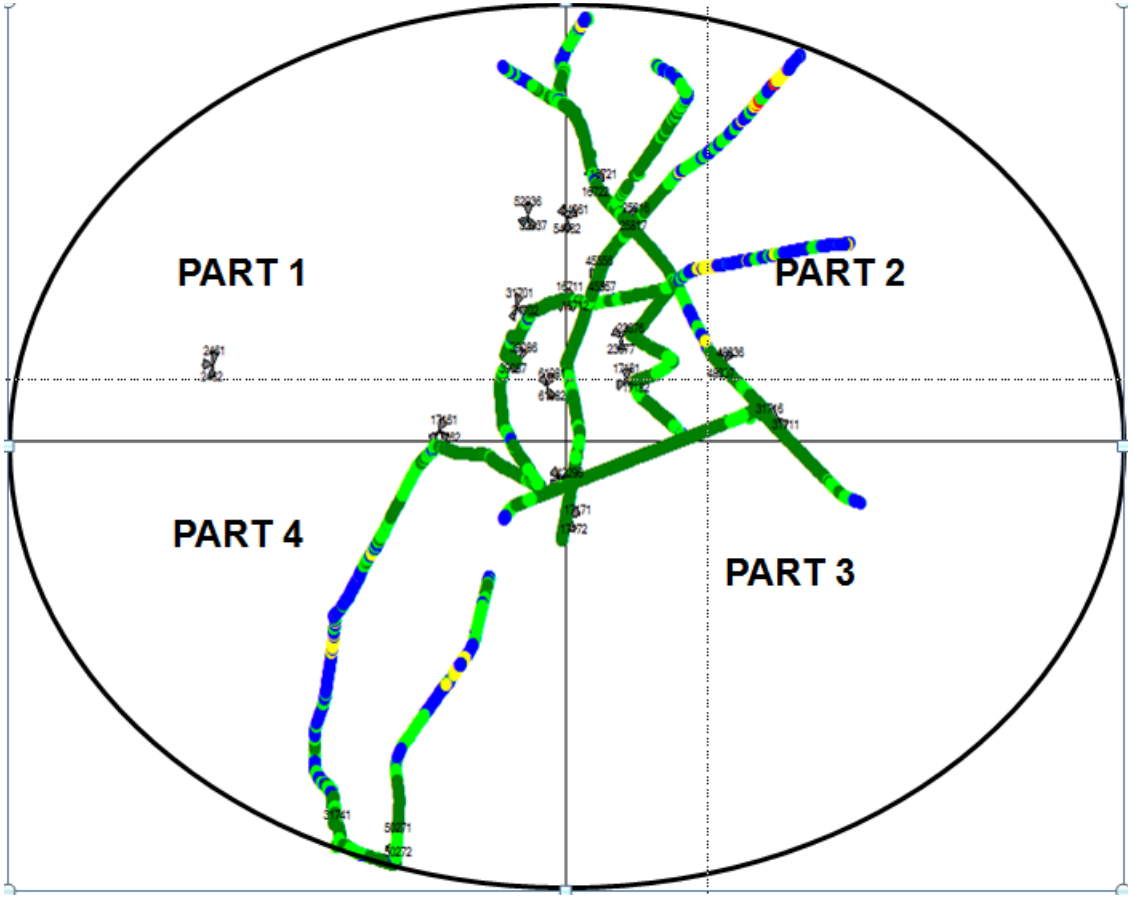
| Category | Type of location | June Palanpur Day 1 | Day 2 | Day 3 |
|---|---|---|---|---|
| Outdoor | Major Roads | Sidhraj Nagar, Sardar Patel Nagar. Bihari Bag, Jantanagar,Parshvanathnagar, Dhalvas,Badarpura Lalwada, Gujarat Highschool,Delhigate,City Light road,Jampura. Becharpura, Krushannagar, Laxmipura,Saraswati Nagar. | Tharad Road,Tekara. Rijment road, VN Park, Indira nagar, Diamond society. Gulbani nagar,Suriyanagar. Sonibazar, Mira mohalla,Risala Bazar. | Sedlai Rd, Shivnagar, Police station, Main market. Main Bazar rd, Tooda ni Paal, APMC market. Deesa Tharad chodki,Ramanuj nagar, GEB Tharad. Abheypura, Anandnagar, R&B Subdivision. |
| | Highways | Pataliya, Mahavir Hospital road. Ambaji road, Post office, Bank of Baroda. Main market , bus stand. Danta Polo Farm house. | Shanti Bazar, Maniben Hospital. Fatehpura,Mewada Dhanera rd, APMC Market. Kunz bazar, Teen cross rd,Jalaram Nagar. Hinglaj nagar,Umiyanagar. | Muktidham, KMP house, Trikamji Mandir. Hinglaj mataji vav rd, sports ground. Police station rd. Vinamandir play ground, BRC Bhavan. |
| | With in the City | Gabbar Temple Main market, Ambaji temple Mangalya Van,Shakti Ashram. Yogeshwar Nagar, Palanpur highway. | Railway Station rd, Bus stand, Main market. Pragati nagar, GIDC, Narmada Colony. Depdar Patan highway, Pluspoint Institute. Darbar Gadh. | Jalaram Gaushala. Bhabar Vav rd. Mochibazar, Bhabhar Nava. Mamlatadar office, Khatri kuwa bor. |
| Indoor | Shopping complex | | | |
| | Office complex | | | |

The route maps given in the report are provided for the purpose of identifying the routes traversed during the drive tests. We November observe three different colours (Red/Green/Yellow) of the lines, which signify signal strength; however these maps are for a single operator and have not been referred to any findings in this report. IMRB submits detailed operator wise Drive Test reports separately.

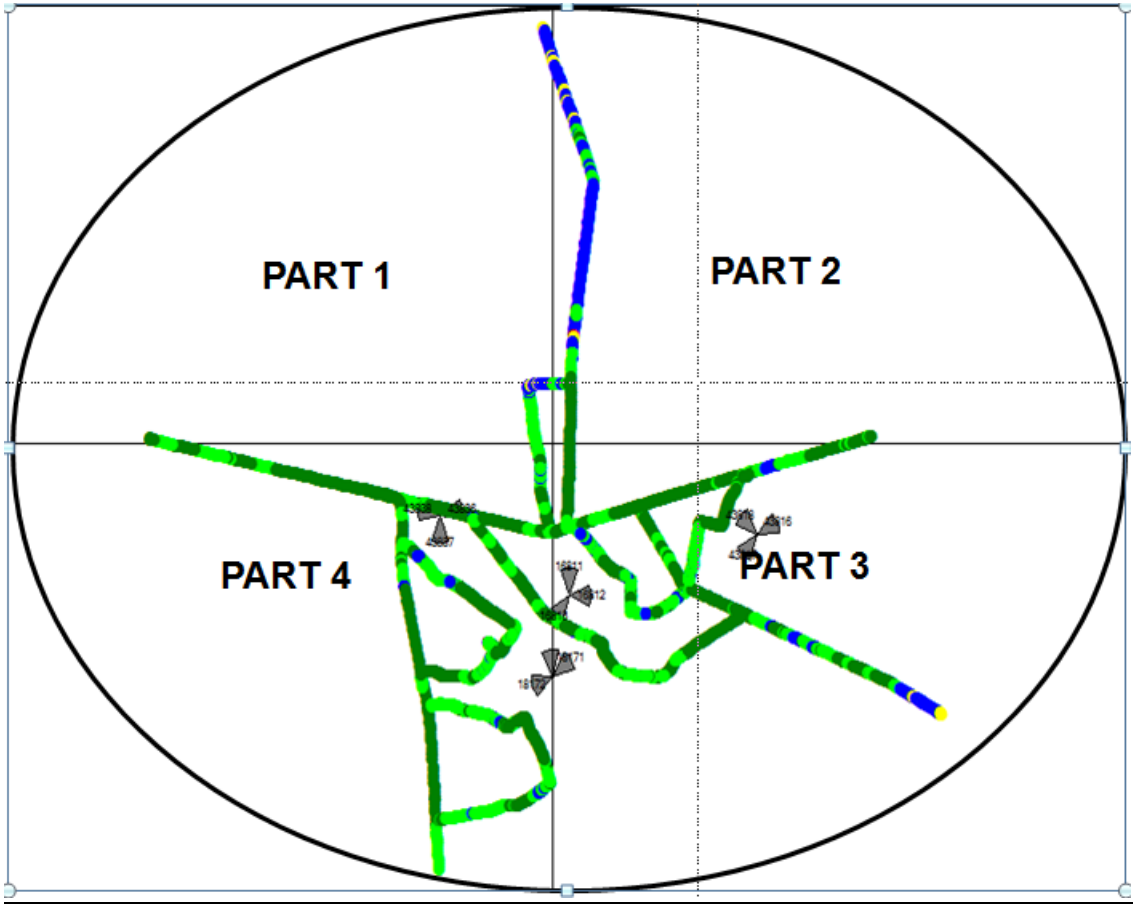
### 9.1.4.2 Route Map - Palanpur DAY 1



### 9.1.4.3 Route Map - Palanpur DAY 2



### 9.1.4.4 Route Map - Palanpur DAY 3



### 9.1.4.5 Drive Test Results - Palanpur SSA 2G

| Palanpur | B'mark | Aircel | | Airtel | | BSNL | | Idea | | MTS | | RCOM CDMA | | RCOM GSM | | TATA CDMA | | TATA GSM | | Telenor | | Vodafone | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter's | | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor |
| 0 to -75 dBm | | 100.00% | 59.46% | 94.72% | 83.71% | 72.76% | 59.51% | 99.31% | 83.56% | 98.52% | 69.47% | 75.30% | 63.54% | 74.72% | 67.20% | 98.51% | 52.04% | 60.39% | 64.71% | 68.74% | 69.30% | 98.25% | 93.39% |
| 0 to -85 dBm | | 100.00% | 92.86% | 99.93% | 97.94% | 99.57% | 93.15% | 99.92% | 97.69% | 99.57% | 93.26% | 99.62% | 84.21% | 12.41% | 25.74% | 100.00% | 83.95% | 95.91% | 83.98% | 25.35% | 24.82% | 99.78% | 99.02% |
| 0 to -95 dBm | | 100.00% | 99.81% | 100.00% | 99.89% | 99.99% | 99.62% | 99.99% | 99.93% | 99.83% | 99.12% | 100.00% | 96.99% | 6.44% | 6.00% | 100.00% | 96.70% | 99.04% | 96.07% | 5.89% | 5.58% | 99.97% | 99.64% |
| Voice quality | ≥ 95% | 99.66% | 99.58% | 98.22% | 97.88% | 99.62% | 98.82% | 98.89% | 97.28% | 100.00% | 99.48% | 100.00% | 98.47% | 99.01% | 98.14% | 99.23% | 99.07% | 99.96% | 98.46% | 99.15% | 97.05% | 95.41% | 95.94% |
| CSSR | ≥ 95% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 98.34% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 98.17% | 100.00% | 97.54% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 99.70% | 100.00% | 100.00% |
| %age Blocked calls | | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 1.66% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 1.83% | 0.00% | 2.46% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.30% | 0.00% | 0.00% |
| Call drop rate | ≤ 2% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 1.41% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 1.68% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Hands off success rate | | #DIV/0! | 100.00% | #DIV/0! | 100.00% | 100.00% | 98.64% | 100.00% | 99.35% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 99.57% | 100.00% | 100.00% | 100.00% | 99.24% | 100.00% | 100.00% | 100.00% | 100.00% |

## Voice Quality

All operators met the benchmark in outdoor as well as indoor locations.

## Call Set Success Rate (CSSR)

All operators met the benchmark for CSSR in outdoor as well as indoor locations.

## Call Drop Rate

All operators met the benchmark for call drop rate in outdoor as well as indoor locations.

### 9.1.4.6 Drive Test Results - Palanpur SSA 3G

| Palanpur | B'mark | Airtel 3G | | BSNL 3G | | Idea 3G | | TATA 3G | | Vodafone 3G | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter's | | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor |
| 0 to -75 dBm | | 90.71% | 65.40% | 67.66% | 66.21% | 99.83% | 86.54% | NA | | 67.16% | 55.78% |
| 0 to -85 dBm | | 99.64% | 91.57% | 99.97% | 87.06% | 100.00% | 98.38% | | | 81.61% | 85.11% |
| 0 to -95 dBm | | 100.00% | 98.83% | 100.00% | 100.00% | 100.00% | 99.83% | | | 99.95% | 97.13% |
| Voice quality | ≥ 95% | 99.60% | 99.16% | 99.74% | 96.07% | 99.86% | 96.82% | | | 95.88% | 97.19% |
| CSSR | ≥ 95% | 100.00% | 100.00% | 100.00% | 98.26% | 100.00% | 100.00% | | | 100.00% | 100.00% |
| %age Blocked calls | | 0.00% | 0.00% | 0.00% | 2.09% | 0.00% | 0.00% | | | 0.00% | 0.00% |
| Call drop rate | ≤ 2% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | | | 0.00% | 0.00% |
| Hands off success rate | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | | | 100.00% | 100.00% |

## Voice Quality

All operators met the benchmark in outdoor as well as indoor locations.

## Call Set Success Rate (CSSR)

All operators met the benchmark for CSSR in outdoor as well as indoor locations.

## Call Drop Rate

All operators met the benchmark for call drop rate in outdoor as well as indoor locations.

### 9.1.4.7 Data Drive Test Results - Palanpur SSA-2G

| Name of the Parameter | Bench Mark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Videocon | Vodafone |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Succesful Data Transmission download speed attempts | >80% | 100 | 100 | NDR | 100 | 100 | 100 | 100 | 100 | 100 | 100 | Service Closed | 100 |
| Succesful Data Transmission upload speed attempts | >75% | 100 | 100 | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | | 100 |
| Minimum download speed | | 172.7 | 145 | | 98 | 70 | 68 | 61 | 44 | 59 | 112 | | 141 |
| Average throughput for Packet Data | >75% | 185 | 170 | | 167 | 80 | 108 | 99 | 78 | 105 | 142 | | 175 |
| Latency | <250ms | 100 | 100 | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | | 100 |

All operators met the TRAI benchmark for data drive test.

### 9.1.4.8 Data Drive Test Results - Palanpur SSA-3G

| Name of the Parameter | Bench Mark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
|---|---|---|---|---|---|---|
| Succesful Data Transmission download speed attempts | >80% | 100 | NDR | 100 | NDR | 100 |
| Succesful Data Transmission upload speed attempts | >75% | 100 | NDR | 100 | NDR | 100 |
| Minimum download speed | | 2434 | NDR | 2204 | NDR | 2227 |
| Average throughput for Packet Data | | 2887 | NDR | 4927 | NDR | 3172 |
| Latency | <250ms | 100 | NDR | 100 | NDR | 100 |

All operators met the TRAI benchmark for data drive test.

### 9.1.5 Bhuj SSA

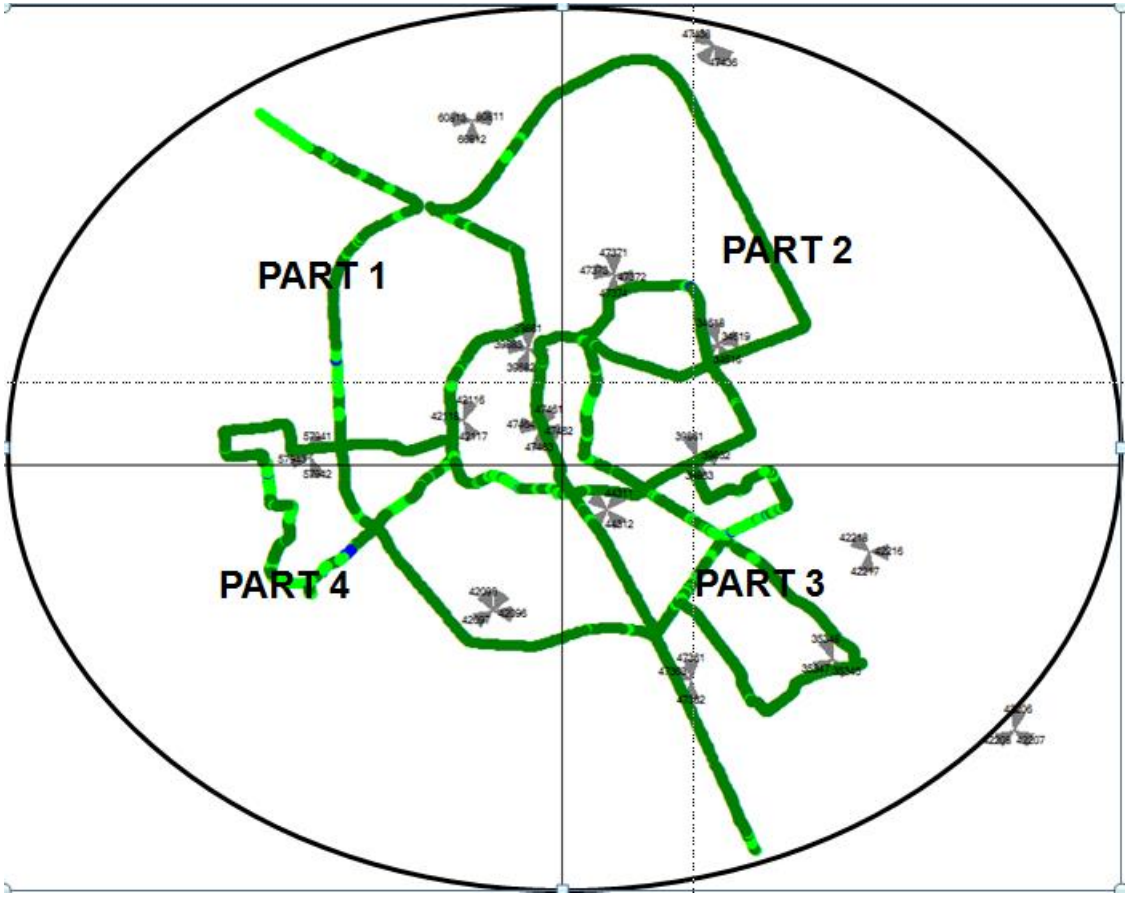
| Month | Name of SSA Covered | Start date | End Date | Kilometer Travelled |
|---|---|---|---|---|
| June | Bhuj | 28/06/2016 | 30/06/2016 | 260 |

#### 9.1.5.1 Route Details - Bhuj SSA

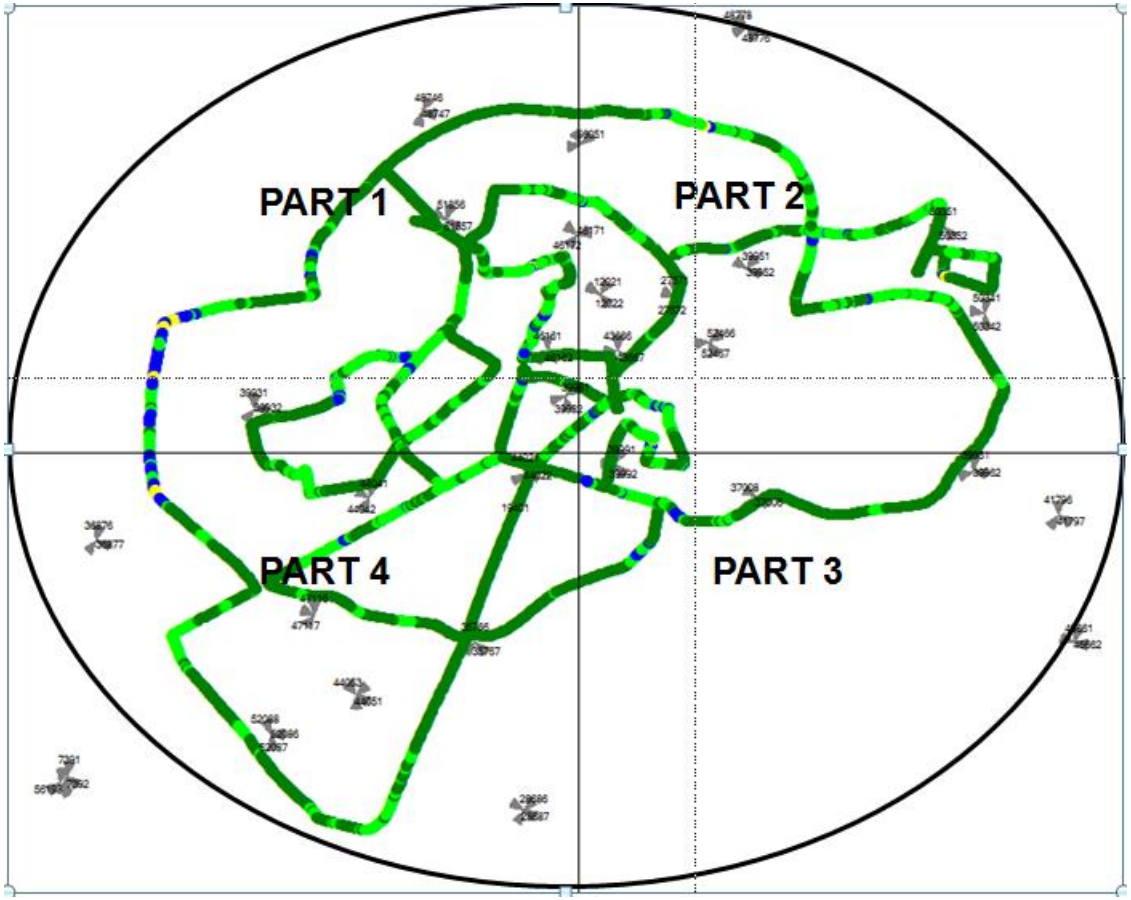
| Category | Type of location | Bhuj | | |
|---|---|---|---|---|
| | | Day 1 | Day 2 | Day 3 |
| Outdoor | Major Roads | JALRAM NGAR,VIJAY NAGAR 2,BHAKTI NAGAR,PUNCHAVTI,NAVHGHAM,RAM KRISHAM NAGAR,GIDC ESTATE ANJAR,GUJRAT HOSING BOARD,RAMESWER NAGAR,MISTRI COLONY,YOGESHWAR NAGAR,MHADEVNAGAR,VRUNDAVAN,BHAVA NIPUR,RAMDEV NAGAR,ANAND PUR,BHATPALIYA ,ASP SENNA TRADERS,SHREE TIRUPATICOURIER,MEGHPAR,ADIPUR,RADIDS ON HOTEL KANDLA,RAMBAGH ROAD,GURUKUL ROAD,MITHI ROHAR,ADMINISTRARTIVE OFFICE,KANDLA PORT ROAD,SERVICE P,COMMUNITY HELATH CENTER,SITARAM PURA,HANUMANVAS | DHARA NAGAR,NEW RAVAL WADI,MUSTAFA NAGAR,GAURAV PATH,STATION ROAD,CAMP ROAD,HOSPITAL ROAD,GEETA MARKET ROAD,SOMIYA NAGAR,NRI NAGAR,MIRJAPUR BYPASS ROAD,SHIVKRUPA NAGAR,JAYNAGAR,B.E.D CLG ROAD,BSF BN HQ,JP RESORT,UMIYA NAGAR,COLLEGE ROAD,ANGIYA,PGVCL ELCTRICITY OFFICE,HOTEL RUDRAKSHA,HOTEL RELISH | SHRI HARI NGAR,MANDVI SHERDI ROAD,POONAM NAGR,NILKANTH NAGAR,MUKHDANI,ASHPURA,RAMESHW ER COLON,MOTA SALYA,NANAKAPYA,SHANTIVN COLONY,UMIYA NAGAR,BAROI ROAD,MHAVIR NAGAR,VRDHMANA NAGAR,SUKHPAR,WAY TO ADANI WILMAR,PETROL PUMP |
| | Highways | | | |
| | With in the City | | | |
| Indoor | Shopping complex | | | |
| | Office complex | | | |

The route maps given in the report are provided for the purpose of identifying the routes traversed during the drive tests. We November observe three different colours (Red/Green/Yellow) of the lines, which signify signal strength; however these maps are for a single operator and have not been referred to any findings in this report. IMRB submits detailed operator wise Drive Test reports separately.

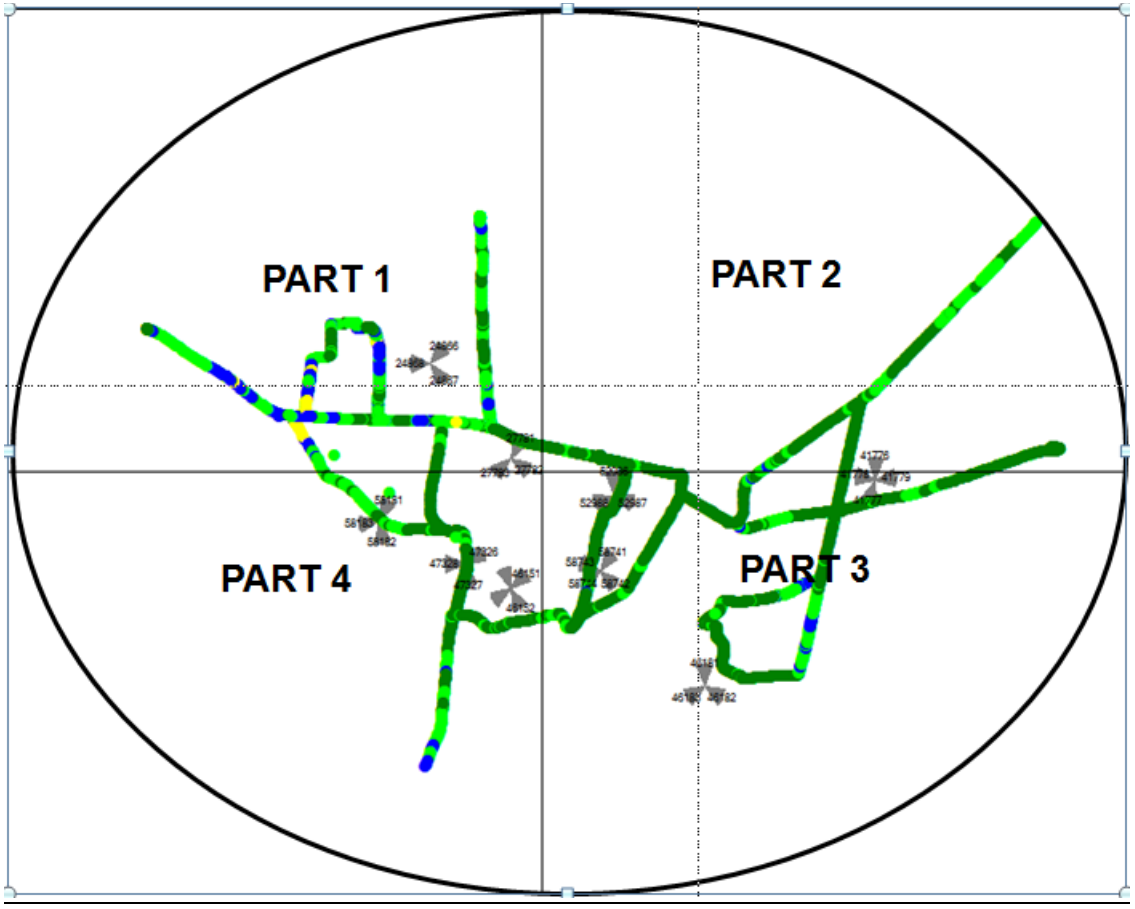
### 9.1.5.2 Route Map - Bhuj DAY 1



### 9.1.5.3 Route Map - Bhuj DAY 2



### 9.1.5.4 Route Map - Bhuj DAY 3



### 9.1.5.5 Drive Test Results - Bhuj SSA 2G

| BHUJ | B'mark | Aircel | | Airtel | | BSNL | | Idea | | MTS | | RCOM CDMA | | RCOM GSM | | TATA CDMA | | TATA GSM | | Telenor | | Vodafone | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter's | | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor |
| 0 to -75 dBm | | No Services | | 93.25% | 96.08% | 79.25% | 64.90% | 99.88% | 92.73% | 66.41% | 61.90% | No Services | | 76.18% | 60.47% | 91.65% | 79.69% | 91.99% | 69.38% | 96.51% | 78.74% | 99.81% | 98.26% |
| 0 to -85 dBm | | | | 99.89% | 99.53% | 95.09% | 92.39% | 100.00% | 99.74% | 99.24% | 95.05% | | | 99.57% | 87.91% | 99.99% | 98.54% | 99.70% | 93.95% | 3.28% | 17.02% | 99.85% | 99.63% |
| 0 to -95 dBm | | | | 100.00% | 99.93% | 99.74% | 99.18% | 100.00% | 99.98% | 99.86% | 99.80% | | | 100.00% | 98.14% | 100.00% | 99.97% | 99.95% | 99.68% | 0.21% | 3.87% | 99.92% | 99.85% |
| Voice quality | ≥ 95% | | | 99.60% | 98.54% | 99.34% | 97.65% | 99.11% | 97.71% | 100.00% | 99.86% | | | 100.00% | 97.82% | 100.00% | 99.80% | 99.84% | 97.95% | 96.22% | 96.67% | 97.36% | 97.43% |
| CSSR | ≥ 95% | | | 100.00% | 100.00% | 100.00% | 97.67% | 100.00% | 100.00% | 100.00% | 100.00% | | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| %age Blocked calls | | | | 0.00% | 0.00% | 0.00% | 3.50% | 0.00% | 0.00% | 0.00% | 0.00% | | | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Call drop rate | ≤ 2% | | | 0.00% | 0.00% | 0.00% | 0.80% | 0.00% | 0.00% | 0.00% | 0.00% | | | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Hands off success rate | | | | 100.00% | 100.00% | 100.00% | 99.03% | 100.00% | 100.00% | 100.00% | 100.00% | | | NA | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 98.75% | 100.00% | 100.00% |

## Voice Quality

All operators met the benchmark in outdoor as well as indoor locations.

## Call Set Success Rate (CSSR)

All operators met the benchmark for CSSR in outdoor as well as indoor locations.

## Call Drop Rate

All operators met the benchmark for call drop rate in outdoor as well as indoor locations.

### 9.1.5.6 Drive Test Results - Bhuj SSA 3G

| BHUJ | B'mark | Airtel 3G | | BSNL 3G | | Idea 3G | | TATA 3G | | Vodafone 3G | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter's | | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor |
| 0 to -75 dBm | | 51.73% | 47.13% | 41.05% | 19.75% | 100.00% | 96.78% | 51.67% | 40.82% | 64.31% | 73.72% |
| 0 to -85 dBm | | 99.23% | 82.94% | 99.81% | 52.33% | 100.00% | 99.85% | 98.95% | 76.20% | 98.65% | 95.62% |
| 0 to -95 dBm | | 100.00% | 97.73% | 100.00% | 82.20% | 100.00% | 100.00% | 99.96% | 97.12% | 99.99% | 99.80% |
| Voice quality | ≥ 95% | 99.78% | 98.79% | 99.88% | 96.61% | 99.94% | 96.84% | 100.00% | 97.61% | 96.33% | 95.22% |
| CSSR | ≥ 95% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| %age Blocked calls | | 0.00% | 0.00% | 0.00% | 0.45% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Call drop rate | ≤ 2% | 0.00% | 0.00% | 0.00% | 0.45% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Hands off success rate | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |

#### Voice Quality

All operators met the benchmark in outdoor as well as indoor locations.

#### Call Set Success Rate (CSSR)

All operators met the benchmark for CSSR in outdoor as well as indoor locations.

#### Call Drop Rate

All operators met the benchmark for call drop rate in outdoor as well as indoor locations.

### 9.1.5.7 Data Drive Test Results - Bhuj SSA-2G

| Name of the Parameter | Bench Mark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Videocon | Vodafone |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Succesful Data Transmission download speed attempts | >80% | Not present | 100 | NDR | 100 | 100 | Service Closed | 100 | 100 | 100 | 100 | Service Closed | 100 |
| Succesful Data Transmission upload speed attempts | >75% | | 100 | | 100 | 100 | | 100 | 100 | 100 | 100 | | 100 |
| Minimum download speed | | | 115 | | 114 | 449 | | 45 | 39 | 46 | 110 | | 145 |
| Average throughput for Packet Data | >75% | | 184 | | 177 | 747 | | 93 | 72 | 103 | 125 | | 170 |
| Latency | <250ms | | 100 | | 100 | 100 | | 100 | 100 | 100 | 100 | | 100 |

All operators met the TRAI benchmark for data drive test.

### 9.1.5.8 Data Drive Test Results - Bhuj SSA-3G

| Name of the Parameter | Bench Mark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
|---|---|---|---|---|---|---|
| Succesful Data Transmission download speed attempts | >80% | 100 | NDR | 100 | 100 | 100 |
| Succesful Data Transmission upload speed attempts | >75% | 100 | NDR | 100 | 100 | 100 |
| Minimum download speed | | 5573 | NDR | 2583 | 367 | 2494 |
| Average throughput for Packet Data | | 7611 | NDR | 4788 | 1914 | 4719 |
| Latency | <250ms | 100 | NDR | 100 | 100 | 100 |

All operators met the TRAI benchmark for data drive test.

### 9.1.6 Rajkot SSA

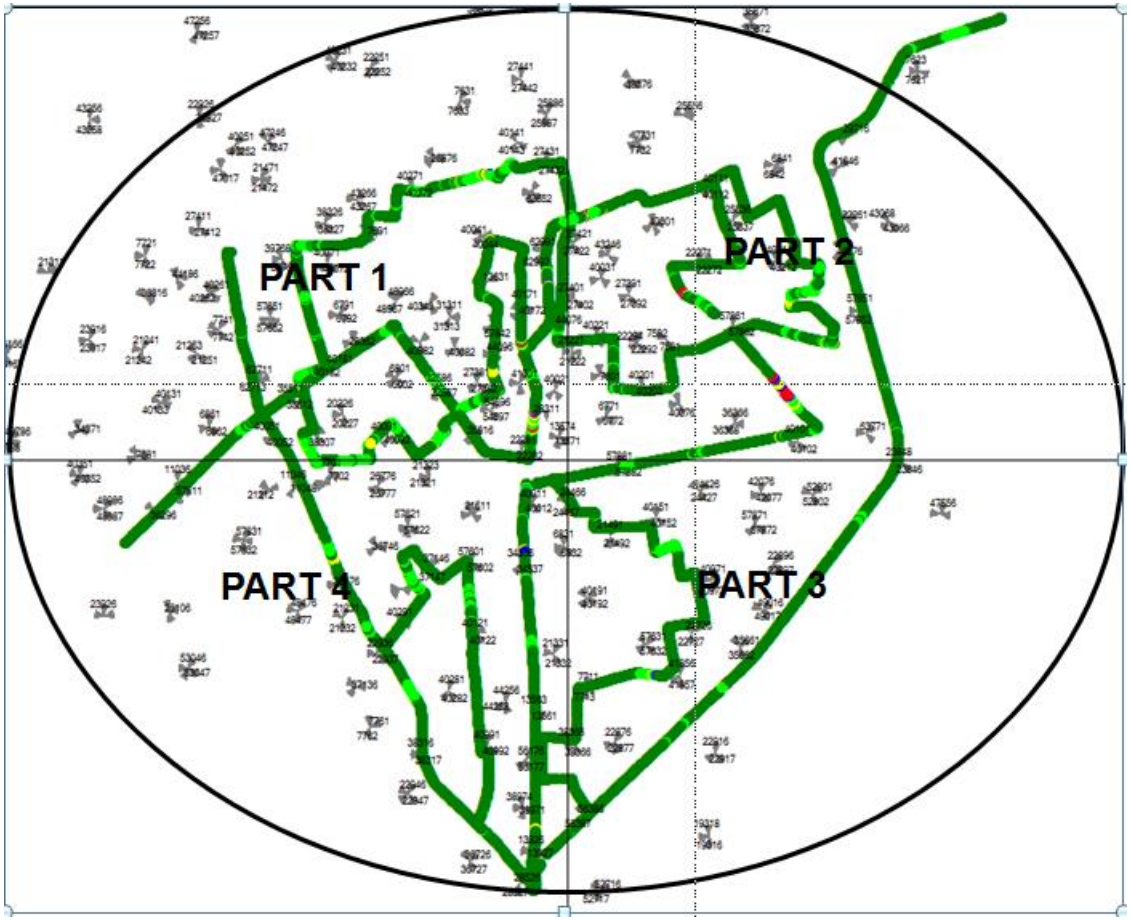
| Month | Name of SSA Covered | Start date | End Date | Kilometer Travelled |
|---|---|---|---|---|
| June | RAJKOT | 21-06-16 | 23-06-16 | 230 |

#### 9.1.6.1 Route Details - Rajkot SSA

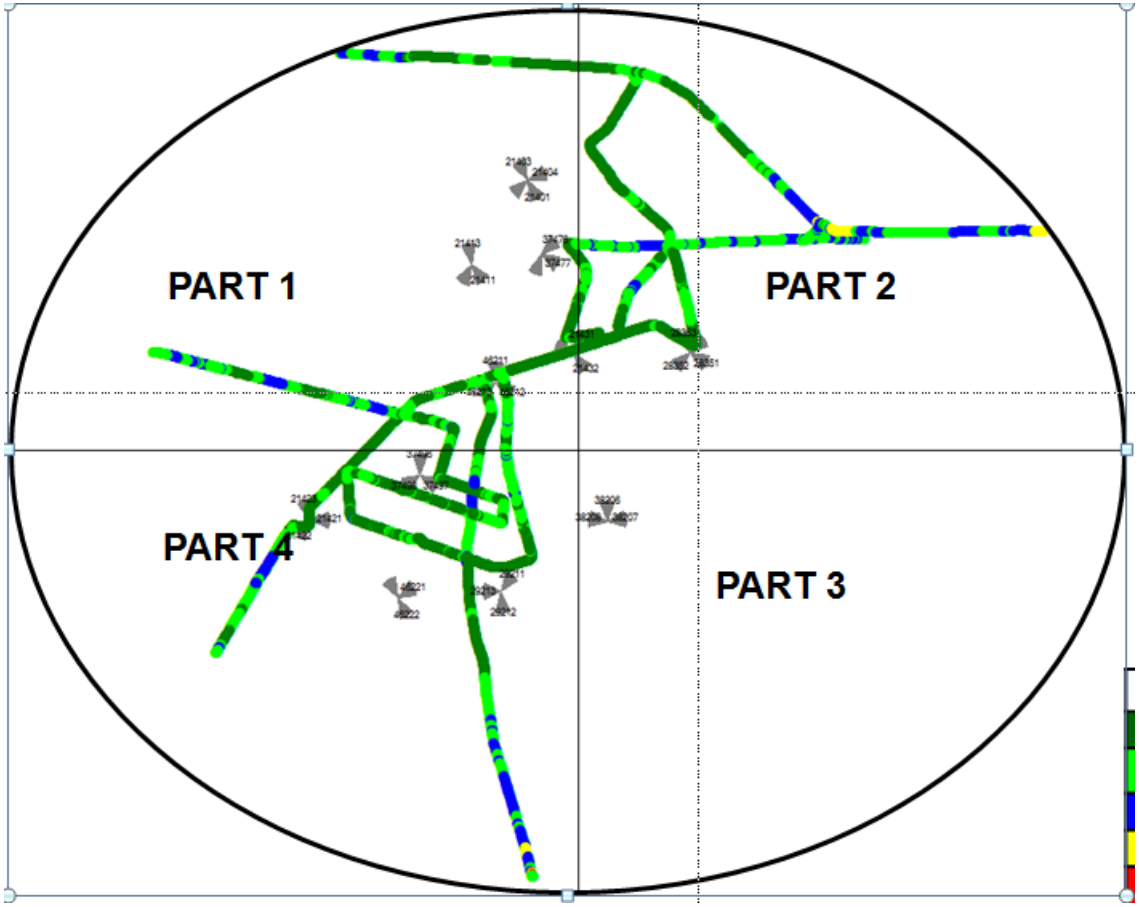
| Category | Type of location | RAJKOT | | |
|---|---|---|---|---|
| | | Day 1 | Day 2 | Day 3 |
| Outdoor | Major Roads | Airport road,Raiya road,University road,Pedak road,Juno morboi road,Bhavnagr road,Canal road,Bhakti nagar,80 feet road,Mavdi,Tagore road,Gujrat housing boardSoliya road,Mhadev mandir,Sagun school,Police station,Guru datt mandir,Shri laxmi temple,Kotda sangani road | Vijaynagar,Rampura,Radha nagar,Happy home colony,Jam nagar,Utpan nagar,Jetpur road,Bhadar colony,New Dhorji,Kailash nagar,Satodiya society,Bargati pura,Yogi nagar,Devmata,Old city,Yudh nagar,Vijay nagar,Udhog nagarShiv nagarHari om nagar,amwani GIDC,Darji society,Nawa garh,Nagbai society,Jeevan bagh,Old highway,Saran pull,Laxmi nagar,Khodpara,Patel nagar,Balaji societyJunagadhDobariya wadi | Patel nagar,Balaji society,Jeevan bagh,Neelkanth area,Krishna nagar,Patel nagar,Canal road,Vishal nagar,Moviya,Shiv battery service,Barkhadevi Pavbhaji,PGVCL,Areon INDIA,Station road,Padadhari railway,Jamnagr Rajkot highway,Digvijay nagar,Ram Krishna nagr,Arunody society,Dhamalpar,Hasanpar,Chandrapur, Rajavadla,Aroyga nagar Vivekanand society |
| | Highways | | | |
| | With in the City | | | |
| Indoor | Shopping complex | | | |
| | Office complex | | | |

The route maps given in the report are provided for the purpose of identifying the routes traversed during the drive tests. We November observe three different colours (Red/Green/Yellow) of the lines, which signify signal strength; however these maps are for a single operator and have not been referred to any findings in this report. IMRB submits detailed operator wise Drive Test reports separately.

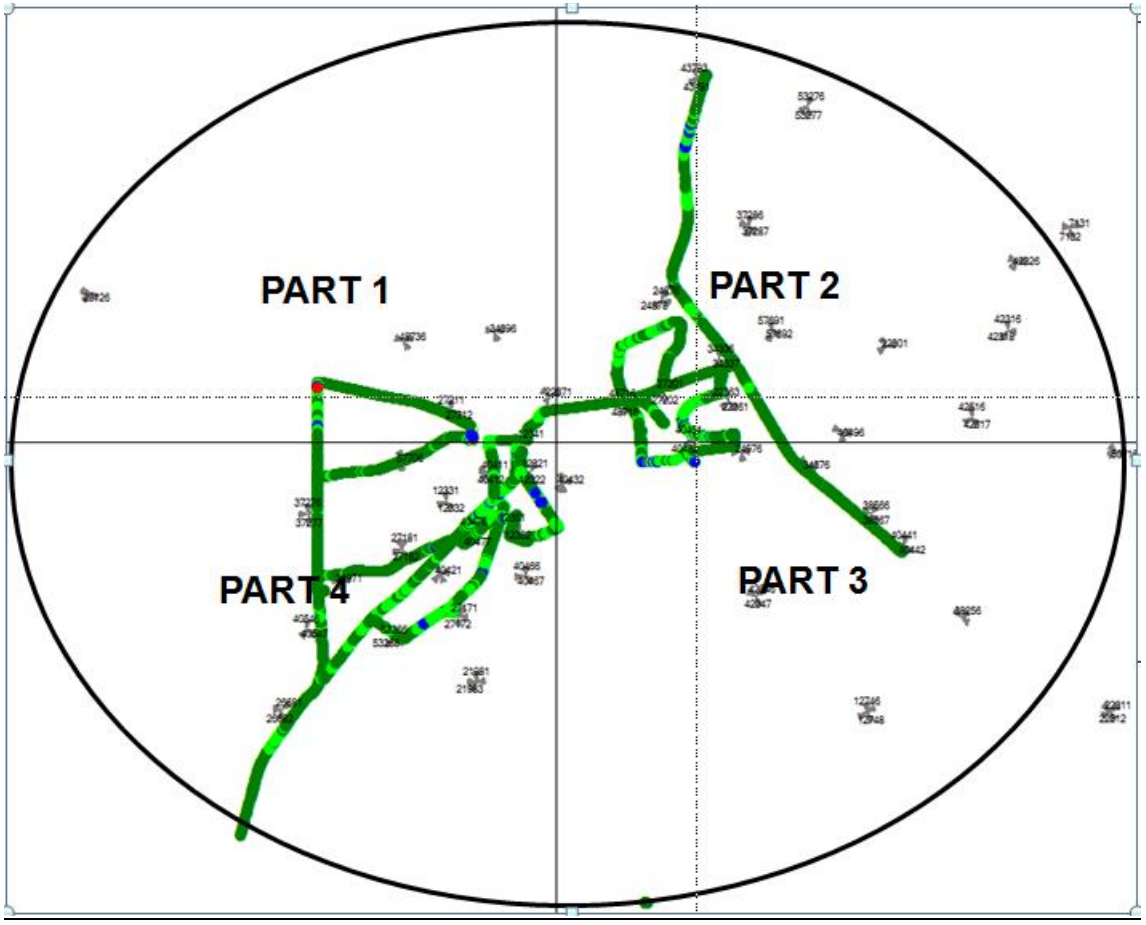
### 9.1.6.2 Route Map - Rajkot DAY 1



### 9.1.6.3 Route Map - Rajkot DAY 2



### 9.1.6.4 Route Map - Rajkot DAY 3



### 9.1.6.5 Drive Test Results - Rajkot SSA 2G

| Rajkot | B'mark | Aircel | | Airtel | | BSNL | | Idea | | MTS | | RCOM CDMA | | RCOM GSM | | TATA CDMA | | TATA GSM | | Telenor | | Vodafone | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter's | | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor |
| 0 to -75 dBm | | Not present | | 99.94% | 97.37% | 96.20% | 76.78% | 92.00% | 93.07% | 97.88% | 84.51% | Not present | | 100.00% | 89.15% | 66.84% | 85.39% | 96.57% | 80.98% | 99.92% | 78.74% | 43.40% | 88.85% |
| 0 to -85 dBm | | | | 100.00% | 99.70% | 99.97% | 88.38% | 99.89% | 99.49% | 99.50% | 97.51% | | | 100.00% | 99.16% | 99.97% | 98.60% | 99.79% | 97.68% | 0.08% | 17.02% | 96.08% | 98.35% |
| 0 to -95 dBm | | | | 100.00% | 99.91% | 100.00% | 99.98% | 99.99% | 99.99% | 99.91% | 99.71% | | | 100.00% | 100.00% | 100.00% | 100.00% | 99.99% | 99.84% | 0.00% | 3.87% | 99.96% | 99.77% |
| Voice quality | ≥ 95% | | | 99.36% | 97.91% | 99.84% | 95.80% | 98.67% | 97.74% | 100.00% | 99.89% | | | 99.87% | 97.19% | 99.94% | 99.88% | 99.90% | 96.76% | 99.10% | 96.18% | 98.96% | 95.77% |
| CSSR | ≥ 95% | | | 100.00% | 100.00% | 100.00% | 98.59% | 100.00% | 100.00% | 100.00% | 100.00% | | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| %age Blocked calls | | | | 0.00% | 0.00% | 0.00% | 0.85% | 0.00% | 0.00% | 0.00% | 0.00% | | | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Call drop rate | ≤ 2% | | | 0.00% | 0.00% | 0.00% | 0.28% | 0.00% | 0.00% | 0.00% | 0.00% | | | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Hands off success rate | | | | 100.00% | 100.00% | 100.00% | 98.95% | 100.00% | 99.77% | 100.00% | 100.00% | | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 98.54% | 100.00% | 100.00% |

## Voice Quality

All operators met the benchmark in outdoor as well as indoor locations.

## Call Set Success Rate (CSSR)

All operators met the benchmark for CSSR in outdoor as well as indoor locations.

## Call Drop Rate

All operators met the benchmark for call drop rate in outdoor as well as indoor locations.

### 9.1.6.6 Drive Test Results - Rajkot SSA 3G

| Rajkot | B'mark | Airtel 3G | | BSNL 3G | | Idea 3G | | TATA 3G | | Vodafone 3G | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter's | | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor | In door | Outdoor |
| 0 to -75 dBm | | 13.53% | 62.06% | 99.85% | 17.61% | 99.74% | 95.60% | 99.54% | 66.76% | 67.64% | 74.97% |
| 0 to -85 dBm | | 97.41% | 92.93% | 100.00% | 52.93% | 100.00% | 99.60% | 100.00% | 92.43% | 95.68% | 95.79% |
| 0 to -95 dBm | | 100.00% | 99.73% | 100.00% | 79.90% | 100.00% | 100.00% | 100.00% | 99.28% | 99.99% | 99.57% |
| Voice quality | ≥ 95% | 99.41% | 98.36% | 100.00% | 97.54% | 98.03% | 96.34% | 99.96% | 96.15% | 99.12% | 96.09% |
| CSSR | ≥ 95% | 100.00% | 100.00% | 100.00% | 99.34% | 100.00% | 99.78% | 100.00% | 100.00% | 100.00% | 100.00% |
| %age Blocked calls | | 0.00% | 0.00% | 0.00% | 0.66% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Call drop rate | ≤ 2% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Hands off success rate | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |

## Voice Quality

All operators met the benchmark in outdoor as well as indoor locations.

## Call Set Success Rate (CSSR)

All operators met the benchmark for CSSR in outdoor as well as indoor locations.

## Call Drop Rate

All operators met the benchmark for call drop rate in outdoor as well as indoor locations.

### 9.1.6.7 Data Drive Test Results - Rajkot SSA-2G

| Name of the Parameter | Bench Mark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Videocon | Vodafone |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Succesful Data Transmission download speed attempts | >80% | Not present | 100 | 99 | 100 | 100 | Service Closed | 100 | 100 | 100 | 100 | Service Closed | 100 |
| Succesful Data Transmission upload speed attempts | >75% | | 100 | 100 | 100 | 100 | | 100 | 100 | 100 | 100 | | 100 |
| Minimum download speed | | | 151 | 41 | 125 | 1130 | | 40 | 66 | 82 | 101 | | 160 |
| Average throughput for Packet Data | >75% | | 186 | 93 | 182 | 1752 | | 81 | 97 | 104 | 125 | | 189 |
| Latency | <250ms | | 100 | 99 | 100 | 100 | | 100 | 100 | 100 | 100 | | 100 |

All operators met the TRAI benchmark for data drive test.

### 9.1.6.8 Data Drive Test Results - Rajkot SSA-3G

| Name of the Parameter | Bench Mark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
|---|---|---|---|---|---|---|
| Succesful Data Transmission download speed attempts | >80% | 100 | 100 | 100 | 100 | 100 |
| Succesful Data Transmission upload speed attempts | >75% | 100 | 100 | 100 | 100 | 100 |
| Minimum download speed | | 2703 | 477 | 2437 | 430 | 2691 |
| Average throughput for Packet Data | | 3692 | 1246 | 5216 | 1914 | 3707 |
| Latency | <250ms | 100 | 100 | 100 | 100 | 100 |

All operators met the TRAI benchmark for data drive test.

# 10 ANNEXURE – CONSOLIDATED-2G

## 10.1 NETWORK AVAILABILITY

| Audit Results for Network Availability- PMR data | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Number of BTSs in the licensed service area | | 2473 | 23073 | 13650 | 22509 | 564 | 3337 | 7604 | 1725 | 5698 | 11544 | 25667 |
| Sum of downtime of BTSs in a month (in hours) | | 482 | 19913 | 168961 | 8331 | 114 | 2629 | 4257 | 14612 | 112697 | 7875 | 7584 |
| BTSs accumulated downtime (not available for service) | ≤ 2% | 0.03% | 0.12% | 1.66% | 0.05% | 0.03% | 0.11% | 0.08% | 1.14% | 2.66% | 0.09% | 0.04% |
| Number of BTSs having accumulated downtime >24 hours | | 0 | 43 | 147 | 21 | 0 | 26 | 33 | 0 | 0 | 31 | 40 |
| Worst affected BTSs due to downtime | ≤ 2% | 0.00% | 0.19% | 1.08% | 0.09% | 0.00% | 0.78% | 0.43% | 0.00% | 0.00% | 0.27% | 0.16% |
| Live Measurement Results for Network Availability- 3 Day live data | | | | | | | | | | | | |
| | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Number of BTSs in the licensed service area | | 2473 | 23017 | 13616 | 22435 | 357 | 3335 | 7601 | 1725 | 5721 | 11513 | 25657 |
| Sum of downtime of BTSs in a month (in hours) | | 40 | 1511 | 13619 | 666 | 0 | 192 | 537 | 721 | 5650 | 883 | 108 |
| BTSs accumulated downtime (not available for service) | ≤ 2% | 0.02% | 0.09% | 1.39% | 0.04% | 0.00% | 0.08% | 0.10% | 0.58% | 1.37% | 0.11% | 0.01% |
| Number of BTSs having accumulated downtime >24 hours | | 0 | 12 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Worst affected BTSs due to downtime | ≤ 2% | 0.00% | 0.05% | 0.73% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |

*Data Source: Operations and Maintenance Center (OMC) of the operators*

## 10.2 CONNECTION ESTABLISHMENT (ACCESSIBILITY)

| Audit Results for CSSR, SDCCH and TCH congestion- PMR data | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CSSR | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| CSSR | ≥ 95% | 98.86% | 99.03% | 97.59% | 99.34% | 99.77% | 98.44% | 96.85% | 98.86% | 99.08% | 98.15% | 99.68% |
| SDCCH/Paging channel congestion | ≤ 1% | 0.05% | 0.05% | 0.07% | 0.40% | NA | NA | 0.04% | NA | 0.07% | 0.26% | 0.17% |
| TCH congestion | ≤ 2% | 0.09% | 0.51% | 0.35% | 0.25% | 0.00% | 0.18% | 1.77% | 0.05% | 0.21% | 1.00% | 0.32% |
| **Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data** | | | | | | | | | | | | |
| CSSR | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| CSSR | ≥ 95% | 98.88% | 99.05% | 97.59% | 99.27% | 99.59% | 98.45% | 97.71% | 98.96% | 99.16% | 98.13% | 99.83% |
| SDCCH/Paging channel congestion | ≤ 1% | 0.03% | 0.03% | 0.07% | 0.36% | NA | NA | 0.05% | NA | 0.08% | 0.21% | 0.10% |
| TCH congestion | ≤ 2% | 0.10% | 0.22% | 0.34% | 0.33% | 0.00% | 2.65% | 1.73% | 0.05% | 0.15% | 1.09% | 0.17% |
| **Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data** | | | | | | | | | | | | |
| CSSR | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of call attempts | | 1022 | 2889 | 2561 | 2975 | 2370 | 1854 | 2573 | 1976 | 2360 | 2568 | 2341 |
| Total number of successful calls established | | 1022 | 2889 | 2529 | 2965 | 2370 | 1849 | 2562 | 1973 | 2355 | 2541 | 2341 |
| CSSR | ≥ 95% | 100.00% | 100.00% | 98.75% | 99.66% | 100.00% | 99.73% | 99.57% | 99.85% | 99.79% | 98.95% | 100.00% |
| %age blocked calls | | 0.00% | 0.00% | 1.25% | 0.34% | 0.00% | 0.27% | 0.43% | 0.15% | 0.21% | 1.05% | 0.00% |

*Data Source: Network Operations Center (NOC) of the operators and Data Source: Drive test reports submitted by operators to auditors*

## 10.3 Connection Maintenance (Retainability)

| Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Call drop rate | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of calls established | | 39982185 | 641790611 | 200231789 | 959194197 | 1249740 | 42630525 | 205254666 | 21900767 | 117320186 | 577414125 | 1479366166 |
| Total number of calls dropped | | 129507 | 4046908 | 834189 | 7252219 | 1664 | 94697 | 259896 | 61307 | 651042 | 4848450 | 9064500 |
| Call drop rate | ≤ 2% | 0.32% | 0.63% | 0.42% | 0.76% | 0.13% | 0.22% | 0.13% | 0.28% | 0.55% | 0.84% | 0.61% |
| Total number of cells in the network | | 7419 | 71997 | 40474 | 67364 | 1894 | 6711 | 22549 | 5238 | 17153 | 35625 | 78047 |
| Total number of cells having more than 3% TCH | | 129 | 946 | 527 | 1540 | 0 | 40 | 57 | 91 | 380 | 975 | 1184 |
| Worst affected cells having more than 3% TCH | ≤ 3% | 1.74% | 1.31% | 1.30% | 2.29% | 0.00% | 0.59% | 0.25% | 1.73% | 2.21% | 2.74% | 1.52% |
| Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data | | | | | | | | | | | | |
| Call drop rate | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of calls established | | 3916396 | 70428875 | 19773735 | 93898726 | 1404310 | 12124625 | 19801641 | 32025277 | 11779156 | 56913253 | 1309118175 |
| Total number of calls dropped | | 12631 | 437997 | 81270 | 739154 | 2551 | 20130 | 26259 | 96776 | 63880 | 413418 | 6209463 |
| Call drop rate | ≤ 2% | 0.32% | 0.62% | 0.41% | 0.79% | 0.18% | 0.17% | 0.13% | 0.30% | 0.54% | 0.73% | 0.47% |
| Total number of cells in the network | | 7419 | 71902 | 40323 | 67518 | 1175 | 10031 | 22693 | 4818 | 17173 | 35941 | 78008 |
| Total number of cells having more than 3% TCH | | 125 | 918 | 516 | 1490 | 0 | 50 | 71 | 7 | 386 | 1002 | 340 |
| Worst affected cells having more than 3% TCH | ≤ 3% | 1.69% | 1.28% | 1.28% | 2.21% | 0.00% | 0.50% | 0.31% | 0.15% | 2.25% | 2.79% | 0.44% |
| Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data | | | | | | | | | | | | |
| Call drop rate | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of calls established | | 1022 | 2889 | 2536 | 2965 | 2370 | 1850 | 2565 | 1976 | 2355 | 2563 | 2341 |
| Total number of calls dropped | | 0 | 0 | 13 | 0 | 0 | 0 | 5 | 0 | 1 | 1 | 0 |
| Call drop rate | ≤ 2% | 0.00% | 0.00% | 0.51% | 0.00% | 0.00% | 0.00% | 0.19% | 0.00% | 0.04% | 0.04% | 0.00% |

*Data Source: Network Operations Center (NOC) of the operators and Drive test reports submitted by operators to auditors*

## 10.4 VOICE QUALITY

| Audit Results for Voice quality -PMR Data | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Voice quality | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of sample calls | | 7349370112 | 959013719592 | 7721582638 | 221797843424 | 5671128071 | NA | 33473806790 | 479974752 | 17570505079 | 145525311745 | 227320859932 |
| Total number of calls with good voice quality | | 7120371988 | 935389775847 | 7629302305 | 214418307746 | 5629651597 | NA | 33130017042 | 417832308 | 17293710951 | 142557164859 | 222052337245 |
| %age calls with good voice quality | ≥ 95% | 96.88% | 97.54% | 98.80% | 96.67% | 99.27% | NA | 98.97% | 87.05% | 98.42% | 97.96% | 97.68% |
| **Live measurement results for Voice quality-3 Day data** | | | | | | | | | | | | |
| Voice quality | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of sample calls | | 727422375 | 23512857326 | 642137794 | 22304314409 | 690513971 | NA | 3276189412 | 66794605 | 1730822025 | 12190388858 | 92505908149 |
| Total number of calls with good voice quality | | 705434975 | 22915805227 | 633803694 | 21567084142 | 685004426 | NA | 3242047597 | 43631467 | 1703960595 | 11949507629 | 90520998334 |
| %age calls with good voice quality | ≥ 95% | 96.98% | 97.46% | 98.70% | 96.69% | 99.20% | NA | 98.96% | 65.32% | 98.45% | 98.02% | 97.85% |
| **Drive test results for Voice quality (Average of three drive tests) - DT data** | | | | | | | | | | | | |
| Voice quality | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of sample calls | | 1503807 | 699682 | 352841 | 718731 | NA | NA | 417159 | 537924 | 2446406 | 381805 | 715407 |
| Total number of calls with good voice quality | | 1470736 | 684951 | 345611 | 701663 | NA | NA | 402021 | 535685 | 2373874 | 369153 | 687629 |
| %age calls with good voice quality | ≥ 95% | 97.80% | 97.89% | 97.95% | 97.63% | 99.37% | 99.06% | 96.37% | 99.58% | 97.04% | 96.69% | 96.12% |

*Data Source: Network Operations Center (NOC) of the operators and Drive test reports submitted by operators to auditors*

## 10.5 POI CONGESTION

| Audit Results for POI Congestion- PMR data | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| POI congestion | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of working POIs | | 118 | 58 | 174 | 452 | 196 | 120 | 38 | 477 | 75 | 79 | 449 |
| No. of POIs not meeting benchmark | | 0 | 0 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Capacity of all POIs (A) - in erlangs | | 5566 | 137497 | 142596 | 482403 | 28243 | 304097 | 651376 | 104231 | 110741 | 363937 | 446228 |
| Traffic served for all POIs (B)- in erlangs | | 120 | 4888 | 88826 | 239732 | 2935 | 108132 | 389741 | 40279 | 65621 | 239738 | 255632 |
| POI congestion | ≤ 0.5% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| **Live Measurement Results for POI Congestion- 3 Day data** | | | | | | | | | | | | |
| POI congestion | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of working POIs | | 118 | 58 | 174 | 455 | 196 | 180 | 98 | 477 | 75 | 85 | 447 |
| No. of POIs not meeting benchmark | | 0 | 0 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Capacity of all POIs (A) - in erlangs | | 5566 | 137497 | 142596 | 338026 | 28243 | 509974 | 467778 | 104231 | 110741 | 363000 | 436624 |
| Traffic served for all POIs (B)- in erlangs | | 113 | 4888 | 79623 | 229787 | 1690 | 177017 | 305379 | 25491 | 44701 | 229774 | 113478 |
| POI congestion | ≤ 0.5% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |

*Data Source: Network Operations Center (NOC) of the operators*

# 11 ANNEXURE – CONSOLIDATED-3G

## 11.1 NETWORK AVAILABILITY

| Audit Results for Network Availability- PMR data | | | | | | |
|---|---|---|---|---|---|---|
| | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| (Number of Node Bs in the network in the licensed service area | | 15461 | 6336 | 16425 | 14114 | 18529 |
| Sum of downtime (i.e. total outage time) of Node Bs | | 15614 | 58542 | 7054 | 39539 | 3980 |
| Node Bs downtime (not available for service) | ≤ 2% | 0.14% | 1.24% | 0.06% | 0.38% | 0.03% |
| Number of Node Bs having accumulated downtime of >24 hours in a month | | 61 | 103 | 17 | 0 | 11 |
| Worst affected Node Bs due to downtime | ≤ 2% | 0.39% | 1.63% | 0.10% | 0.00% | 0.06% |
| Live Measurement Results for Network Availability- 3 Day live data | | | | | | |
| | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| (Number of Node Bs in the network in the licensed service area | | 14934 | 6259 | 16418 | 4010 | 18478 |
| Sum of downtime (i.e. total outage time) of Node Bs | | 1209 | 6112 | 561 | 1545 | 82 |
| Node Bs downtime (not available for service) | ≤ 2% | 0.11% | 1.36% | 0.05% | 0.54% | 0.01% |
| Number of Node Bs having accumulated downtime of >24 hours in a month | | 6 | 54 | 0 | 0 | 0 |
| Worst affected Node Bs due to downtime | ≤ 2% | 0.04% | 0.86% | 0.00% | 0.00% | 0.00% |

*Data Source: Operations and Maintenance Center (OMC) of the operators*

## 11.2 CONNECTION ESTABLISHMENT (ACCESSIBILITY)

| Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data | | | | | | |
|---|---|---|---|---|---|---|
| | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| CSSR | ≥ 95% | 99.09% | 96.04% | 99.72% | 99.18% | 99.80% |
| RRC Congestion | ≤ 1% | 0.03% | 0.86% | 0.16% | 0.05% | 0.07% |
| Circuit Switched RAB Congestion | ≤ 2% | 0.05% | 0.57% | 0.06% | 0.21% | 0.07% |
| **Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data** | | | | | | |
| | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| CSSR | ≥ 95% | 99.77% | 96.90% | 99.73% | 99.22% | 99.80% |
| RRC Congestion | ≤ 1% | 0.02% | 0.68% | 0.17% | 0.04% | 0.15% |
| Circuit Switched RAB Congestion | ≤ 2% | 0.03% | 0.46% | 0.07% | 0.17% | 0.18% |
| **Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data** | | | | | | |
| CSSR | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total number of RRC attempts (A) | | 2375 | 2496 | 3243 | 1057 | 2284 |
| Total number of RRC established (B) | | 2375 | 2477 | 3241 | 1053 | 2284 |
| Call setup success rate (B/A*100) | ≥ 95% | 100.00% | 99.24% | 99.94% | 99.62% | 100.00% |
| %age blocked calls | | 0.00% | 0.76% | 0.06% | 0.38% | 0.00% |

*Data Source: Network Operations Center (NOC) of the operators and Data Source: Drive test reports submitted by operators to auditors*

## 11.3 CONNECTION MAINTENANCE (RETAINABILITY)

| Audit Results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate -PMR data | | | | | | |
|---|---|---|---|---|---|---|
| | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total calls successfully established (A) (Number of voice RAB normally released) | | 101797035 | 427427291 | 257847699 | 45610683 | 1865748016 |
| Total calls dropped after establishment (B) (Number of voice RAB abnormally released) | | 173043 | 5222291 | 1022237 | 204714 | 3152367 |
| Call drop rate (B/A*100) | ≤ 2% | 0.17% | 1.22% | 0.40% | 0.45% | 0.17% |
| Total no. of cells in the licensed service area (B) | | 49123 | 19251 | 51088 | 11993 | 59791 |
| No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A) | | 884 | 302 | 1130 | 248 | 591 |
| Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100) | ≤ 3% | 1.80% | 1.57% | 2.21% | 2.07% | 0.99% |
| **Live measurement results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate - 3 Day data** | | | | | | |
| | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total calls successfully established (A) (Number of voice RAB normally released) | | 10739864 | 39645530 | 27822856 | 4950153 | 497928601 |
| Total calls dropped after establishment (B) (Number of voice RAB abnormally released) | | 18705 | 491332 | 106070 | 22281 | 865308 |
| Call drop rate (B/A*100) | ≤ 2% | 0.17% | 1.24% | 0.38% | 0.45% | 0.17% |
| Total no. of cells in the licensed service area (B) | | 47232 | 19236 | 51210 | 11998 | 59968 |
| No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A) | | 866 | 280 | 1141 | 262 | 198 |
| Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100) | ≤ 3% | 1.83% | 1.46% | 2.23% | 2.19% | 0.33% |
| **Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data** | | | | | | |
| Call drop rate | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total calls successfully established (A) (Number of voice RAB normally released) | | 2379 | 2452 | 3238 | 1053 | 2284 |
| Total calls dropped after establishment (B) (Number of voice RAB abnormally released) | | 0 | 6 | 0 | 2 | 0 |
| Call drop rate (B/A*100) | ≤ 2% | 0.00% | 0.24% | 0.00% | 0.19% | 0.00% |

*Data Source: Network Operations Center (NOC) of the operators and Drive test reports submitted by operators to auditors*

## 11.4 VOICE QUALITY

| Audit Results for Voice quality -PMR Data | | | | | | |
|---|---|---|---|---|---|---|
| Voice quality | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec | | NA | 446103400 | 199421788397 | 95849854000 | 4643242836289 |
| Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec | | NA | 426469209 | 196934522781 | 95580279861 | 4598053125837 |
| %Circuit Switch Voice Quality (CSV quality) (B/A*100) | ≥ 95% | 99.48% | 95.60% | 98.75% | 99.72% | 99.03% |
| **Live measurement results for Voice quality-3 Day data** | | | | | | |
| Voice quality | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec | | NA | 44641121 | 20288578389 | 10629630000 | 124149568583 |
| Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec | | NA | 42296861 | 20034141285 | 10599277649 | 122920128651 |
| %Circuit Switch Voice Quality (CSV quality) (B/A*100) | ≥ 95% | 99.50% | 94.75% | 98.75% | 99.71% | 99.01% |
| **Drive test results for Voice quality (Average of three drive tests) - DT data** | | | | | | |
| Voice quality | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec | | 1547486 | 455997 | 5489030 | 3322971 | 655618 |
| Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec | | 1506170 | 448154 | 5322678 | 3234148 | 632571 |
| %Circuit Switch Voice Quality (CSV quality) (B/A*100) | ≥ 95% | 97.33% | 98.28% | 96.97% | 97.33% | 96.48% |

*Data Source: Network Operations Center (NOC) of the operators and Drive test reports submitted by operators to auditors*

## 11.5 POI CONGESTION

| Audit Results for POI Congestion- PMR data | | | | | | |
|---|---|---|---|---|---|---|
| POI congestion | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total number of working POIs | | 0 | 174 | 452 | 25 | 449 |
| No. of POIs not meeting benchmark | | 0 | 1 | 3 | 0 | 0 |
| Total Capacity of all POIs (A) - in erlangs | | 0 | 142596 | 482403 | 36914 | 446056 |
| Traffic served for all POIs (B)- in erlangs | | 0 | 88869 | 239732 | 25921 | 257597 |
| POI congestion | ≤ 0.5% | NA | 0.00% | 0.00% | 0.00% | 0.00% |
| **Live Measurement Results for POI Congestion- 3 Day data** | | | | | | |
| POI congestion | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total number of working POIs | | 0 | 174 | 455 | 25 | 447 |
| No. of POIs not meeting benchmark | | 0 | 1 | 3 | 0 | 0 |
| Total Capacity of all POIs (A) - in erlangs | | 0 | 142596 | 473430 | 36914 | 436696 |
| Traffic served for all POIs (B)- in erlangs | | 0 | 61894 | 229787 | 11125 | 68818 |
| POI congestion | ≤ 0.5% | NA | 0.00% | 0.00% | 0.00% | 0.00% |

*Data Source: Network Operations Center (NOC) of the operators*

# 12 ANNEXURE – CUSTOMER SERVICES

## 12.1 METERING AND BILLING CREDIBILITY

| Audit Results for Billing performance Postpaid-Consolidated | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Billing Performance | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Metering and billing credibility - Postpaid (Avg of 3 billing cycles) | | | | | | | | | | | | |
| Metering and billing credibility - Postpaid | | | | | | | | | | | | |
| Total bills generated during the period | | 96 | 1539372 | 145668 | 1891372 | 81519 | 415029 | 272905 | 36574 | 176166 | NA | 6115300 |
| Total number of bills disputed | | 0 | 868 | 122 | 7485 | 62 | 373 | 244 | 3 | 6 | NA | 6007 |
| Total number of valid billing complaints | | 0 | 162 | 15 | 583 | 46 | 373 | 244 | 3 | 6 | NA | 6007 |
| Total complaints considered invalid | | 0 | 706 | 107 | 6902 | 16 | 0 | 0 | 0 | 0 | NA | 0 |
| Percentage bills disputed (Avg of 3 billing cycles) | ≤ 0.1% | 0.00% | 0.06% | 0.08% | 0.40% | 0.08% | 0.09% | 0.09% | 0.01% | 0.00% | NA | 0.10% |
| April | | | | | | | | | | | | |
| Total bills generated during the first billing cycle | | 33 | 532378 | 47900 | 620836 | 27561 | 140481 | 81634 | 12291 | 59147 | NA | 2022302 |
| Total number of bills disputed in first billing cycle | | 0 | 197 | 63 | 2505 | 38 | 128 | 76 | 2 | 4 | NA | 2006 |
| Total number of valid billing complaints (billing cycle 1) | | 0 | 23 | 4 | 209 | 34 | 128 | 76 | 2 | 4 | NA | 2006 |
| Total complaints considered invalid (billing cycle 1) | | 0 | 174 | 59 | 2296 | 4 | 0 | 0 | 0 | 0 | NA | 0 |
| Percentage bills disputed (first billing cycle) | ≤ 0.1% | 0.00% | 0.04% | 0.13% | 0.40% | 0.14% | 0.09% | 0.09% | 0.02% | 0.01% | NA | 0.10% |
| May | | | | | | | | | | | | |
| Total bills generated during the second billing cycle | | 32 | 499542 | 48148 | 628942 | 27803 | 138630 | 91967 | 12000 | 58258 | NA | 2046499 |
| Total number of bills disputed in second billing cycle | | 0 | 346 | 52 | 2496 | 16 | 123 | 79 | 1 | 1 | NA | 2013 |
| Total number of valid billing complaints (billing cycle 2) | | 0 | 62 | 4 | 163 | 9 | 123 | 79 | 1 | 1 | NA | 2013 |
| Total complaints considered invalid (billing cycle 2) | | 0 | 284 | 48 | 2333 | 7 | 0 | 0 | 0 | 0 | NA | 0 |
| Percentage bills disputed (second billing cycle) | ≤ 0.1% | 0.00% | 0.07% | 0.11% | 0.40% | 0.06% | 0.09% | 0.09% | 0.01% | 0.00% | NA | 0.10% |

*Data Source: Billing Center of the operators*

| June | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total bills generated during the third billing cycle | | 31 | 507452 | 49620 | 641594 | 26155 | 135918 | 99304 | 12283 | 58761 | NA | 2046499 |
| Total number of bills disputed in third billing cycle | | 0 | 325 | 7 | 2484 | 8 | 122 | 89 | 0 | 1 | NA | 1988 |
| Total number of valid billing complaints (billing cycle 3) | | 0 | 77 | 7 | 211 | 3 | 122 | 89 | 0 | 1 | NA | 1988 |
| Total complaints considered invalid (billing cycle 3) | | 0 | 248 | 0 | 2273 | 5 | 0 | 0 | 0 | 0 | NA | 0 |
| Percentage bills disputed (third billing cycle) | ≤ 0.1% | 0.00% | 0.06% | 0.01% | 0.39% | 0.03% | 0.09% | 0.09% | 0.00% | 0.00% | NA | 0.10% |
| **Metering and billing credibility - Prepaid** | | | | | | | | | | | | |
| Performance prepaid | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of charging complaints (valid) - sum of 3 months | | 0 | 112 | 874 | 3838 | 11 | 115 | 3461 | 0 | 0 | 40 | 2194 |
| Total complaints considered invalid (sum of 3 months) | | 0 | 1167 | 5736 | 8387 | 27 | 231 | 0 | 0 | 0 | 0 | 0 |
| Total number of charging complaints (sum of 3 months) | | 0 | 1279 | 6610 | 12225 | 38 | 346 | 3461 | 0 | 0 | 40 | 2194 |
| Total no of customers served (Sum of 3 months) | | 50805 | 21837797 | 10874551 | 34303621 | 482794 | 2945112 | 11553951 | 213530 | 3398295 | 25393916 | 17393680 |
| Percentage of charging complaints disputed | ≤ 0.1% | 0.00% | 0.01% | 0.06% | 0.04% | 0.01% | 0.01% | 0.03% | 0.00% | 0.00% | 0.00% | 0.01% |

*Data Source: Billing Center of the operators*

## Resolution of Billing Complaints

| Resolution of billing complaints (Postpaid+Prepaid)-Consolidated | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Billing Performance | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of billing/charging complaints | | 0 | 274 | 6734 | 4421 | 102 | 950 | 3705 | 3 | 6 | 40 | 8201 |
| Total number of complaints resolved in favour of customer | | 0 | 274 | 889 | 4421 | 57 | 719 | 3705 | 3 | 6 | 40 | 8201 |
| Total complaints considered invalid | | 0 | 1873 | 5845 | 15289 | 43 | 231 | 0 | 0 | 0 | 0 | 7496 |
| Number of complaints resolved in 4 weeks | | 0 | 274 | 889 | 4421 | 57 | 719 | 3705 | 3 | 6 | 40 | 8201 |
| Percentage complaints resolved within 4 weeks | ≥ 98% | NA | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| Number of complaints resolved in 6 weeks | | 0 | 274 | 889 | 4421 | 57 | 719 | 3705 | 3 | 6 | 40 | 8201 |
| Percentage complaints resolved within 6 weeks | 100.00% | NA | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| Period of applying credit / waiver | | | | | | | | | | | | |
| Total number of complaints where credit/waiver is required | | 0 | 112 | 889 | 4541 | 57 | 488 | 3705 | 3 | 6 | 40 | 8201 |
| Percentage cases in which credit/waiver was received within 1 week | 100% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 66.67% | 100.00% | 100.00% |
| Live calling results for resolution of billing complaints | | | | | | | | | | | | |
| Resolution of billing complaints | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total Number of calls made | | NA | 100 | 100 | 100 | 5 | 100 | 100 | 6 | 6 | 40 | 100 |
| Number of cases resolved in 4 weeks | | NA | 87 | 70 | 85 | 4 | 80 | 79 | 5 | 5 | 31 | 89 |
| Percentage cases resolved in 4 weeks | ≥ 98% | NA | 87.00% | 70.00% | 85.00% | 80.00% | 80.00% | 79.00% | 83.33% | 83.33% | 77.50% | 89.00% |
| Number of cases resolved in 6 weeks | | NA | 100 | 100 | 100 | 5 | 100 | 100 | 6 | 6 | 40 | 100 |
| Percentage cases resolved in 6 weeks | 100.00% | NA | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |

*Data Source: Billing Center of the operators*

## 12.2 CUSTOMER CARE

| Customer Care | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Audit results for customer care (IVR and voice-to-Voice) -Consolidated** | | | | | | | | | | | | |
| **Customer Care Assessment** | **Benchmark** | **Aircel** | **Airtel** | **BSNL** | **Idea** | **MTS** | **RCOM CDMA** | **RCOM GSM** | **TATA CDMA** | **TATA GSM** | **Telenor** | **Vodafone** |
| Total number of call attempts to customer care for assistance | | 7488 | 1624008 | 335291 | 26084807 | 40735 | 631867 | 6453040 | 0 | 577228 | 14953055 | 23024491 |
| Number of calls getting connected and answered (electronically) | | 7025 | 1624008 | 330159 | 25788571 | 39211 | 620882 | 6336836 | 0 | 567496 | 14882941 | 23024491 |
| Percentage calls getting connected and answered | ≥ 95% | 93.82% | 100.00% | 98.47% | 98.86% | 96.26% | 98.26% | 98.20% | NA | 98.31% | 99.53% | 100.00% |
| **Audit results for customer care (voice-to-Voice)- (Avg of 3 months)-Consolidated** | | | | | | | | | | | | |
| **Customer Care Assessment** | **Benchmark** | **Aircel** | **Airtel** | **BSNL** | **Idea** | **MTS** | **RCOM CDMA** | **RCOM GSM** | **TATA CDMA** | **TATA GSM** | **Telenor** | **Vodafone** |
| Total Number of calls received (3 months) | | 1258 | 3437392 | 2129800 | 7917068 | 4235 | 194194 | 1393822 | 44807 | 1051019 | 4085492 | 9628818 |
| Total Number of calls answered within 90 seconds (3 months) | | 1247 | 2714921 | 2079165 | 7897134 | 4055 | 177618 | 1273193 | 44639 | 1019993 | 4024955 | 9423322 |
| Percentage calls answered within 90 seconds (Avg of 3 months) | ≥ 95% | 99.13% | 78.98% | 97.62% | 99.75% | 95.75% | 91.46% | 91.35% | 99.63% | 97.05% | 98.52% | 97.87% |
| **April** | | | | | | | | | | | | |
| Total calls received (Month 1) | | 381 | 1171965 | 725793 | 2588530 | 1347 | 53378 | 458964 | 14582 | 360554 | 1369404 | 3217278 |
| Total calls answered within 90 seconds (Month 1) | | 380 | 782614 | 712280 | 2581365 | 1289 | 46561 | 390338 | 14539 | 346228 | 1352736 | 3175922 |
| % calls answered within 90 seconds (Month 1) | ≥ 95% | 99.74% | 66.78% | 98.14% | 99.72% | 95.69% | 87.23% | 85.05% | 99.71% | 96.03% | 98.78% | 98.71% |
| **May** | | | | | | | | | | | | |
| Total calls received (Month 2) | | 419 | 1182659 | 719673 | 2684814 | 1536 | 59735 | 439191 | 14744 | 339384 | 1351151 | 3218553 |
| Total calls answered within 90 seconds (Month 2) | | 414 | 913436 | 694696 | 2676899 | 1470 | 56081 | 406970 | 14707 | 330682 | 1330424 | 3139084 |
| % calls answered within 90 seconds (Month 2) | ≥ 95% | 98.81% | 77.24% | 96.53% | 99.71% | 95.70% | 93.88% | 92.66% | 99.75% | 97.44% | 98.47% | 97.53% |
| **June** | | | | | | | | | | | | |
| Total calls received (Month 3) | | 458 | 1082768 | 684334 | 2643724 | 1352 | 81081 | 495667 | 15481 | 351081 | 1364937 | 3192987 |
| Total calls answered within 90 seconds (Month 3) | | 453 | 1018871 | 672189 | 2638870 | 1296 | 74976 | 475885 | 15393 | 343083 | 1341795 | 3108316 |
| % calls answered within 90 seconds (Month 3) | ≥ 95% | 98.91% | 94.10% | 98.23% | 99.82% | 95.86% | 92.47% | 96.01% | 99.43% | 97.72% | 98.30% | 97.35% |

## 12.3 TERMINATION / CLOSURE OF SERVICE

| Termination / closure of service | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Audit results for termination / closure of service-Consolidated | | | | | | | | | | | | |
| Termination | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of closure request | | 0 | 7599 | 17595 | 14430 | 7430 | 2800 | 810 | 845 | 1710 | 0 | 26801 |
| Number of requests attended within 7 days | | 0 | 7599 | 17595 | 14430 | 7430 | 2800 | 810 | 845 | 1710 | 0 | 26801 |
| Percentage cases in which termination done within 7 days | 100.00% | NA | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | NA | 100.00% |

*Data Source: Customer Service Center of the operators*

## 12.4 TIME TAKEN FOR REFUND OF DEPOSITS AFTER CLOSURE

| Time taken for refund of deposits after closure | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Audit results for refund of deposits-Consolidated | | | | | | | | | | | | |
| Refund | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of cases requiring refund of deposits | | 0 | 904 | 970 | 3751 | 0 | 2535 | 2170 | 219 | 111 | 0 | 7329 |
| Total number of cases where refund was made within 60 days | | 0 | 904 | 970 | 3751 | 0 | 2534 | 2169 | 219 | 111 | 0 | 7329 |
| Percentage cases in which refund was receive within 60 days | 100.00% | NA | 100.00% | 100.00% | 100.00% | NA | 99.96% | 99.95% | 100.00% | 100.00% | NA | 100.00% |

*Data Source: Billing Center of the operators*

## 12.5 LIVE CALLING RESULTS FOR RESOLUTION OF SERVICE REQUESTS

| Live calling results for resolution of service requests | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Resolution of service requests | 0.00% | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total Number of calls made | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Number of cases resolved to satisfaction | | 100 | 98 | 100 | 100 | 100 | 99 | 100 | 100 | 100 | 100 | 100 |
| Percentage cases resolved in four weeks | 98.00% | 100.00% | 98.00% | 100.00% | 100.00% | 100.00% | 99.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |

*Data Source: Live calls made by auditors from operator's network*

## 12.6 LIVE CALLING RESULTS FOR LEVEL 1 SERVICES

| Live calling for level 1 services | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Level 1 services | | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total no. of calls made | | 300 | 300 | 300 | 300 | 300 | 300 | 300 | 300 | 300 | 300 | 300 |
| Calls answered | | 300 | 300 | 300 | 300 | 300 | 300 | 300 | 300 | 300 | 300 | 300 |
| % of calls connected | ≥ 95% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |

*Data Source: Live calls made by auditors from operator's network*

## 12.7 LEVEL 1 SERVICE CALLS MADE

All the numbers given in mandatory list in Section 2.4.2.4.1 were tested. The following table provides the numbers that are activated for each operator. A tick ( ✔ ) for an operator signifies that the number was active for the operator.

Live calls were made to the active numbers to test the calls answered. The details of the same have been given below for each operator.

| Aircel | | | | | |
|---|---|---|---|---|---|
| Level 1 Number | Type of Service | Working | Not Working | Calls Made | Calls Connected |
| 100 | Police | Y | | 25 | 25 |
| 101 | Fire | Y | | 25 | 25 |
| 102 | Ambulance | | N | | |
| 104 | Health Information Helpline | Y | | 25 | 25 |
| 108 | Emergency and Disaster Management Helpline | | N | | |
| 138 | All India Helpline for Passengers | | N | | |
| 149 | Public Road Transport Utility Service | | N | | |
| 181 | Chief Minister Helpline | | N | | |
| 182 | Indian Railway Security Helpline | Y | | 25 | 25 |
| 1033 | Road Accident Management Service | | N | | |
| 1037 | Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline' | | N | | |
| 1056 | Emergency Medical Services | | N | | |
| 106X | State of the Art Hospitals | | N | | |
| 1063 | Public Grievance Cell DoT Hq | | N | | |
| 1064 | Anti-Corruption Helpline | | N | | |
| 1070 | Relief Commission for Natural Calamities | Y | | 25 | 25 |
| 1071 | Air Accident Helpline | Y | | 25 | 25 |
| 1072 | Rail Accident Helpline | | N | | |

| | | | | | |
|---|---|---|---|---|---|
| 1073 | Road Accident Helpline | | N | | |
| 1077 | Control Room for District Collector | Y | | 25 | 25 |
| 1090 | Call Alert ( Crime Branch) | | N | | |
| 1091 | Women Helpline | Y | | 25 | 25 |
| 1097 | National AIDS Helpline to NACO | | N | | |
| 1099 | Central Accident and Trauma Services (CATS) | | N | | |
| 10580 | Educational & Vocational Guidance and Counselling | | N | | |
| 10589 | Mother and Child Tracking ( MCTH) | | N | | |
| 10740 | Central Pollution Control Board | | | | |
| 10741 | Pollution Control Board | | N | | |
| 1511 | Police Related Service for all Metro Railway Project | | N | | |
| 1512 | Prevention of Crime in Railway | Y | | 25 | 25 |
| 1514 | National Career Service(NCS) | Y | | 25 | 25 |
| 15100 | Free Legal Service Helpline | | N | | |
| 155304 | Municipal Corporations | | N | | |
| 155214 | Labour Helpline | | N | | |
| 1903 | Sashastra Seema Bal (SSB) | | N | | |
| 1909 | National Do Not Call Registry | | N | | |
| 1912 | Complaint of Electricity | Y | | 25 | 25 |
| 1916 | Drinking Water Supply | Y | | 25 | 25 |
| 1950 | Election Commission of India | | N | | |

Airtel

| Level 1 Number | Type of Service | Working | Not Working | Calls Made | Calls Connected |
|---|---|---|---|---|---|
| 100 | Police | Y | | 25 | 25 |
| 101 | Fire | Y | | 25 | 25 |
| 102 | Ambulance | | N | | |
| 104 | Health Information Helpline | | N | | |

| | | | | | |
|---|---|---|---|---|---|
| 108 | Emergency and Disaster Management Helpline | | N | | |
| 138 | All India Helpline for Passengers | Y | | 25 | 25 |
| 149 | Public Road Transport Utility Service | | N | | |
| 181 | Chief Minister Helpline | | N | | |
| 182 | Indian Railway Security Helpline | Y | | 25 | 25 |
| 1033 | Road Accident Management Service | | N | | |
| 1037 | Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline' | | N | | |
| 1056 | Emergency Medical Services | | N | | |
| 106X | State of the Art Hospitals | | N | | |
| 1063 | Public Grievance Cell DoT Hq | | N | | |
| 1064 | Anti-Corruption Helpline | | N | | |
| 1070 | Relief Commission for Natural Calamities | Y | | 25 | 25 |
| 1071 | Air Accident Helpline | Y | | 25 | 25 |
| 1072 | Rail Accident Helpline | | N | | |
| 1073 | Road Accident Helpline | | N | | |
| 1077 | Control Room for District Collector | | N | | |
| 1090 | Call Alert ( Crime Branch) | | N | | |
| 1091 | Women Helpline | Y | | 25 | 25 |
| 1097 | National AIDS Helpline to NACO | Y | | 25 | 25 |
| 1099 | Central Accident and Trauma Services (CATS) | | N | | |
| 10580 | Educational & Vocational Guidance and Counselling | | N | | |
| 10589 | Mother and Child Tracking ( MCTH) | | N | | |
| 10740 | Central Pollution Control Board | | N | | |
| 10741 | Pollution Control Board | | N | | |
| 1511 | Police Related Service for all Metro Railway Project | | N | | |
| 1512 | Prevention of Crime in Railway | Y | | 25 | 25 |

| | | | | | |
|---|---|---|---|---|---|
| 1514 | National Career Service(NCS) | | N | | |
| 15100 | Free Legal Service Helpline | Y | | 25 | 25 |
| 155304 | Municipal Corporations | | N | | |
| 155214 | Labour Helpline | | N | | |
| 1903 | Sashastra Seema Bal (SSB) | | N | | |
| 1909 | National Do Not Call Registry | | N | | |
| 1912 | Complaint of Electricity | Y | | 25 | 25 |
| 1916 | Drinking Water Supply | Y | | 25 | 25 |
| 1950 | Election Commission of India | | N | | |
| BSNL | | | | | |
| Level 1 Number | Type of Service | Working | Not Working | Calls Made | Calls Connected |
| 100 | Police | Y | | 20 | 20 |
| 101 | Fire | Y | | 20 | 20 |
| 102 | Ambulance | | N | | |
| 104 | Health Information Helpline | Y | | 20 | 20 |
| 108 | Emergency and Disaster Management Helpline | | N | | |
| 138 | All India Helpline for Passengers | | N | | |
| 149 | Public Road Transport Utility Service | | N | | |
| 181 | Chief Minister Helpline | | N | | |
| 182 | Indian Railway Security Helpline | Y | | 20 | 20 |
| 1033 | Road Accident Management Service | Y | | 20 | 20 |
| 1037 | Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline' | | N | | |
| 1056 | Emergency Medical Services | Y | | 20 | 20 |
| 106X | State of the Art Hospitals | Y | | 20 | 20 |
| 1063 | Public Grievance Cell DoT Hq | | N | | |
| 1064 | Anti-Corruption Helpline | | N | | |
| 1070 | Relief Commission for Natural Calamities | Y | | 20 | 20 |
| 1071 | Air Accident Helpline | | N | | |

| | | | | | |
|---|---|---|---|---|---|
| 1072 | Rail Accident Helpline | | N | | |
| 1073 | Road Accident Helpline | | N | | |
| 1077 | Control Room for District Collector | | N | | |
| 1090 | Call Alert ( Crime Branch) | Y | | 20 | 20 |
| 1091 | Women Helpline | Y | | 20 | 20 |
| 1097 | National AIDS Helpline to NACO | Y | | 20 | 20 |
| 1099 | Central Accident and Trauma Services (CATS) | | N | | |
| 10580 | Educational & Vocational Guidance and Counselling | | N | | |
| 10589 | Mother and Child Tracking ( MCTH) | | N | | |
| 10740 | Central Pollution Control Board | | | | |
| 10741 | Pollution Control Board | | N | | |
| 1511 | Police Related Service for all Metro Railway Project | | N | | |
| 1512 | Prevention of Crime in Railway | Y | | 20 | 20 |
| 1514 | National Career Service(NCS) | | N | | |
| 15100 | Free Legal Service Helpline | | N | | |
| 155304 | Municipal Corporations | | N | | |
| 155214 | Labour Helpline | | N | | |
| 1903 | Sashastra Seema Bal (SSB) | Y | | 20 | 20 |
| 1909 | National Do Not Call Registry | Y | | 20 | 20 |
| 1912 | Complaint of Electricity | | N | | |
| 1916 | Drinking Water Supply | | N | | |
| 1950 | Election Commission of India | Y | | 20 | 20 |
| Idea | | | | | |
| Level 1 Number | Type of Service | Working | Not Working | Calls Made | Calls Connected |
| 100 | Police | Y | | 23 | 23 |
| 101 | Fire | Y | | 24 | 24 |
| 102 | Ambulance | Y | | 23 | 23 |
| 104 | Health Information Helpline | | N | | |

| | | | | | |
|---|---|---|---|---|---|
| 108 | Emergency and Disaster Management Helpline | | N | | |
| 138 | All India Helpline for Passengers | Y | | 23 | 23 |
| 149 | Public Road Transport Utility Service | | N | | |
| 181 | Chief Minister Helpline | | N | | |
| 182 | Indian Railway Security Helpline | | N | | |
| 1033 | Road Accident Management Service | | N | | |
| 1037 | Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline' | | N | | |
| 1056 | Emergency Medical Services | | N | | |
| 106X | State of the Art Hospitals | | N | | |
| 1063 | Public Grievance Cell DoT Hq | | N | | |
| 1064 | Anti-Corruption Helpline | | N | | |
| 1070 | Relief Commission for Natural Calamities | Y | | 23 | 23 |
| 1071 | Air Accident Helpline | Y | | 23 | 23 |
| 1072 | Rail Accident Helpline | | N | | |
| 1073 | Road Accident Helpline | | N | | |
| 1077 | Control Room for District Collector | | N | | |
| 1090 | Call Alert ( Crime Branch) | | N | | |
| 1091 | Women Helpline | Y | | 23 | 23 |
| 1097 | National AIDS Helpline to NACO | Y | | 23 | 23 |
| 1099 | Central Accident and Trauma Services (CATS) | | N | | |
| 10580 | Educational & Vocational Guidance and Counselling | | N | | |
| 10589 | Mother and Child Tracking ( MCTH) | | N | | |
| 10740 | Central Pollution Control Board | | N | | |
| 10741 | Pollution Control Board | | N | | |
| 1511 | Police Related Service for all Metro Railway Project | | N | | |
| 1512 | Prevention of Crime in Railway | Y | | 23 | 23 |

| | | | | | |
|---|---|---|---|---|---|
| 1514 | National Career Service(NCS) | | N | | |
| 15100 | Free Legal Service Helpline | | N | | |
| 155304 | Municipal Corporations | | N | | |
| 155214 | Labour Helpline | Y | | 23 | 23 |
| 1903 | Sashastra Seema Bal (SSB) | Y | | 23 | 23 |
| 1909 | National Do Not Call Registry | Y | | 23 | 23 |
| 1912 | Complaint of Electricity | Y | | 23 | 23 |
| 1916 | Drinking Water Supply | | N | | |
| 1950 | Election Commission of India | | N | | |
| MTS | | | | | |
| Level 1 Number | Type of Service | Working | Not Working | Calls Made | Calls Connected |
| 100 | Police | Y | | 21 | 21 |
| 101 | Fire | Y | | 22 | 22 |
| 102 | Ambulance | Y | | 22 | 22 |
| 104 | Health Information Helpline | Y | | 21 | 21 |
| 108 | Emergency and Disaster Management Helpline | | N | | |
| 138 | All India Helpline for Passengers | | N | | |
| 149 | Public Road Transport Utility Service | | N | | |
| 181 | Chief Minister Helpline | | N | | |
| 182 | Indian Railway Security Helpline | Y | | 21 | 21 |
| 1033 | Road Accident Management Service | | N | | |
| 1037 | Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline' | | N | | |
| 1056 | Emergency Medical Services | | N | | |
| 106X | State of the Art Hospitals | | N | | |
| 1063 | Public Grievance Cell DoT Hq | | N | | |
| 1064 | Anti-Corruption Helpline | | N | | |
| 1070 | Relief Commission for Natural Calamities | Y | | 22 | 22 |
| 1071 | Air Accident Helpline | | N | | |

| | | | | | |
|---|---|---|---|---|---|
| 1072 | Rail Accident Helpline | | N | | |
| 1073 | Road Accident Helpline | Y | | 21 | 21 |
| 1077 | Control Room for District Collector | | N | | |
| 1090 | Call Alert ( Crime Branch) | | N | | |
| 1091 | Women Helpline | Y | | 21 | 21 |
| 1097 | National AIDS Helpline to NACO | | N | | |
| 1099 | Central Accident and Trauma Services (CATS) | | N | | |
| 10580 | Educational & Vocational Guidance and Counselling | | N | | |
| 10589 | Mother and Child Tracking ( MCTH) | | N | | |
| 10740 | Central Pollution Control Board | Y | | 22 | 22 |
| 10741 | Pollution Control Board | Y | | 22 | 22 |
| 1511 | Police Related Service for all Metro Railway Project | | N | | |
| 1512 | Prevention of Crime in Railway | Y | | 22 | 22 |
| 1514 | National Career Service(NCS) | | N | | |
| 15100 | Free Legal Service Helpline | Y | | 21 | 21 |
| 155304 | Municipal Corporations | | N | | |
| 155214 | Labour Helpline | | N | | |
| 1903 | Sashastra Seema Bal (SSB) | | N | | |
| 1909 | National Do Not Call Registry | | N | | |
| 1912 | Complaint of Electricity | Y | | 21 | 21 |
| 1916 | Drinking Water Supply | Y | | 21 | 21 |
| 1950 | Election Commission of India | | N | | |

Reliance CDMA

| Level 1 Number | Type of Service | Working | Not Working | Calls Made | Calls Connected |
|---|---|---|---|---|---|
| 100 | Police | Y | | 20 | 20 |
| 101 | Fire | Y | | 20 | 20 |
| 102 | Ambulance | | N | | |
| 104 | Health Information Helpline | Y | | 20 | 20 |

| | | | | | |
|---|---|---|---|---|---|
| 108 | Emergency and Disaster Management Helpline | | N | | |
| 138 | All India Helpline for Passengers | Y | | 20 | 20 |
| 149 | Public Road Transport Utility Service | | N | | |
| 181 | Chief Minister Helpline | | N | | |
| 182 | Indian Railway Security Helpline | Y | | 20 | 20 |
| 1033 | Road Accident Management Service | Y | | 20 | 20 |
| 1037 | Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline' | | N | | |
| 1056 | Emergency Medical Services | | N | | |
| 106X | State of the Art Hospitals | | N | | |
| 1063 | Public Grievance Cell DoT Hq | | N | | |
| 1064 | Anti-Corruption Helpline | | N | | |
| 1070 | Relief Commission for Natural Calamities | Y | | 20 | 20 |
| 1071 | Air Accident Helpline | | N | | |
| 1072 | Rail Accident Helpline | | N | | |
| 1073 | Road Accident Helpline | | N | | |
| 1077 | Control Room for District Collector | Y | | 20 | 20 |
| 1090 | Call Alert ( Crime Branch) | Y | | 20 | 20 |
| 1091 | Women Helpline | | N | | |
| 1097 | National AIDS Helpline to NACO | Y | | 20 | 20 |
| 1099 | Central Accident and Trauma Services (CATS) | | N | | |
| 10580 | Educational & Vocational Guidance and Counselling | | N | | |
| 10589 | Mother and Child Tracking ( MCTH) | | N | | |
| 10740 | Central Pollution Control Board | | N | | |
| 10741 | Pollution Control Board | | N | | |
| 1511 | Police Related Service for all Metro Railway Project | | N | | |
| 1512 | Prevention of Crime in Railway | Y | | 20 | 20 |

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|---|---|---|---|---|---|
| 1514 | National Career Service(NCS) | | N | | |
| 15100 | Free Legal Service Helpline | | | | |
| 155304 | Municipal Corporations | | N | | |
| 155214 | Labour Helpline | | N | | |
| 1903 | Sashastra Seema Bal (SSB) | Y | | 20 | 20 |
| 1909 | National Do Not Call Registry | Y | | 20 | 20 |
| 1912 | Complaint of Electricity | Y | | 20 | 20 |
| 1916 | Drinking Water Supply | Y | | 20 | 20 |
| 1950 | Election Commission of India | | N | | |
| Reliance GSM | | | | | |
| Level 1 Number | Type of Service | Working | Not Working | Calls Made | Calls Connected |
| 100 | Police | Y | | 27 | 27 |
| 101 | Fire | Y | | 28 | 28 |
| 102 | Ambulance | | N | | |
| 104 | Health Information Helpline | | N | | |
| 108 | Emergency and Disaster Management Helpline | | N | | |
| 138 | All India Helpline for Passengers | Y | | 28 | 28 |
| 149 | Public Road Transport Utility Service | | N | | |
| 181 | Chief Minister Helpline | | N | | |
| 182 | Indian Railway Security Helpline | Y | | 27 | 27 |
| 1033 | Road Accident Management Service | | N | | |
| 1037 | Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline' | | N | | |
| 1056 | Emergency Medical Services | | N | | |
| 106X | State of the Art Hospitals | | N | | |
| 1063 | Public Grievance Cell DoT Hq | | N | | |
| 1064 | Anti-Corruption Helpline | | N | | |
| 1070 | Relief Commission for Natural Calamities | Y | | 27 | 27 |
| 1071 | Air Accident Helpline | Y | | 28 | 28 |

| | | | | | |
|---|---|---|---|---|---|
| 1072 | Rail Accident Helpline | | N | | |
| 1073 | Road Accident Helpline | | N | | |
| 1077 | Control Room for District Collector | | N | | |
| 1090 | Call Alert ( Crime Branch) | | N | | |
| 1091 | Women Helpline | Y | | 27 | 27 |
| 1097 | National AIDS Helpline to NACO | | N | | |
| 1099 | Central Accident and Trauma Services (CATS) | | N | | |
| 10580 | Educational & Vocational Guidance and Counselling | | N | | |
| 10589 | Mother and Child Tracking ( MCTH) | | N | | |
| 10740 | Central Pollution Control Board | Y | | 27 | 27 |
| 10741 | Pollution Control Board | | N | | |
| 1511 | Police Related Service for all Metro Railway Project | | N | | |
| 1512 | Prevention of Crime in Railway | Y | | 27 | 27 |
| 1514 | National Career Service(NCS) | | N | | |
| 15100 | Free Legal Service Helpline | Y | | 27 | 27 |
| 155304 | Municipal Corporations | | N | | |
| 155214 | Labour Helpline | | N | | |
| 1903 | Sashastra Seema Bal (SSB) | | N | | |
| 1909 | National Do Not Call Registry | | N | | |
| 1912 | Complaint of Electricity | Y | | 27 | 27 |
| 1916 | Drinking Water Supply | | N | | |
| 1950 | Election Commission of India | | N | | |
| TATA CDMA | | | | | |
| Level 1 Number | Type of Service | Working | Not Working | Calls Made | Calls Connected |
| 100 | Police | Y | | 23 | 23 |
| 101 | Fire | Y | | 23 | 23 |
| 102 | Ambulance | | N | | |
| 104 | Health Information Helpline | | N | | |

| | | | | | |
|---|---|---|---|---|---|
| 108 | Emergency and Disaster Management Helpline | Y | | 23 | 23 |
| 138 | All India Helpline for Passengers | Y | | 23 | 23 |
| 149 | Public Road Transport Utility Service | | N | | |
| 181 | Chief Minister Helpline | Y | | 23 | 23 |
| 182 | Indian Railway Security Helpline | | N | | |
| 1033 | Road Accident Management Service | | N | | |
| 1037 | Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline' | | N | | |
| 1056 | Emergency Medical Services | | N | | |
| 106X | State of the Art Hospitals | | N | | |
| 1063 | Public Grievance Cell DoT Hq | | N | | |
| 1064 | Anti-Corruption Helpline | | N | | |
| 1070 | Relief Commission for Natural Calamities | Y | | 24 | 24 |
| 1071 | Air Accident Helpline | | N | | |
| 1072 | Rail Accident Helpline | Y | | 23 | 23 |
| 1073 | Road Accident Helpline | | N | | |
| 1077 | Control Room for District Collector | | N | | |
| 1090 | Call Alert ( Crime Branch) | Y | | 23 | 23 |
| 1091 | Women Helpline | Y | | 23 | 23 |
| 1097 | National AIDS Helpline to NACO | | N | | |
| 1099 | Central Accident and Trauma Services (CATS) | | N | | |
| 10580 | Educational & Vocational Guidance and Counselling | | N | | |
| 10589 | Mother and Child Tracking ( MCTH) | | N | | |
| 10740 | Central Pollution Control Board | | | | |
| 10741 | Pollution Control Board | | N | | |
| 1511 | Police Related Service for all Metro Railway Project | | N | | |
| 1512 | Prevention of Crime in Railway | Y | | 23 | 23 |

| | | | | | |
|---|---|---|---|---|---|
| 1514 | National Career Service(NCS) | | N | | |
| 15100 | Free Legal Service Helpline | | N | | |
| 155304 | Municipal Corporations | | N | | |
| 155214 | Labour Helpline | | N | | |
| 1903 | Sashastra Seema Bal (SSB) | Y | | 23 | 23 |
| 1909 | National Do Not Call Registry | Y | | 23 | 23 |
| 1912 | Complaint of Electricity | | N | | |
| 1916 | Drinking Water Supply | | N | | |
| 1950 | Election Commission of India | Y | | 23 | 23 |
| TATA GSM | | | | | |
| Level 1 Number | Type of Service | Working | Not Working | Calls Made | Calls Connected |
| 100 | Police | Y | | 25 | 25 |
| 101 | Fire | Y | | 25 | 25 |
| 102 | Ambulance | Y | | 25 | 25 |
| 104 | Health Information Helpline | | N | | |
| 108 | Emergency and Disaster Management Helpline | | N | | |
| 138 | All India Helpline for Passengers | | N | | |
| 149 | Public Road Transport Utility Service | | N | | |
| 181 | Chief Minister Helpline | Y | | 25 | 25 |
| 182 | Indian Railway Security Helpline | Y | | 25 | 25 |
| 1033 | Road Accident Management Service | | N | | |
| 1037 | Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline' | | N | | |
| 1056 | Emergency Medical Services | | N | | |
| 106X | State of the Art Hospitals | | N | | |
| 1063 | Public Grievance Cell DoT Hq | | N | | |
| 1064 | Anti-Corruption Helpline | | N | | |
| 1070 | Relief Commission for Natural Calamities | Y | | 25 | 25 |
| 1071 | Air Accident Helpline | | N | | |

| | | | | | |
|---|---|---|---|---|---|
| 1072 | Rail Accident Helpline | | N | | |
| 1073 | Road Accident Helpline | Y | | 25 | 25 |
| 1077 | Control Room for District Collector | | N | | |
| 1090 | Call Alert ( Crime Branch) | | N | | |
| 1091 | Women Helpline | Y | | 25 | 25 |
| 1097 | National AIDS Helpline to NACO | | N | | |
| 1099 | Central Accident and Trauma Services (CATS) | | N | | |
| 10580 | Educational & Vocational Guidance and Counselling | | N | | |
| 10589 | Mother and Child Tracking ( MCTH) | | N | | |
| 10740 | Central Pollution Control Board | Y | | 25 | 25 |
| 10741 | Pollution Control Board | | N | | |
| 1511 | Police Related Service for all Metro Railway Project | | N | | |
| 1512 | Prevention of Crime in Railway | Y | | 25 | 25 |
| 1514 | National Career Service(NCS) | | N | | |
| 15100 | Free Legal Service Helpline | | N | | |
| 155304 | Municipal Corporations | | N | | |
| 155214 | Labour Helpline | | N | | |
| 1903 | Sashastra Seema Bal (SSB) | | N | | |
| 1909 | National Do Not Call Registry | | N | | |
| 1912 | Complaint of Electricity | Y | | 25 | 25 |
| 1916 | Drinking Water Supply | Y | | 25 | 25 |
| 1950 | Election Commission of India | | N | | |
| Telenor | | | | | |
| Level 1 Number | Type of Service | Working | Not Working | Calls Made | Calls Connected |
| 100 | Police | Y | | 23 | 23 |
| 101 | Fire | Y | | 23 | 23 |
| 102 | Ambulance | | N | | |
| 104 | Health Information Helpline | | N | | |

| | | | | | |
|---|---|---|---|---|---|
| 108 | Emergency and Disaster Management Helpline | Y | | 23 | 23 |
| 138 | All India Helpline for Passengers | | N | | |
| 149 | Public Road Transport Utility Service | | N | | |
| 181 | Chief Minister Helpline | Y | | 23 | 23 |
| 182 | Indian Railway Security Helpline | Y | | 23 | 23 |
| 1033 | Road Accident Management Service | | N | | |
| 1037 | Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline' | | N | | |
| 1056 | Emergency Medical Services | | N | | |
| 106X | State of the Art Hospitals | Y | | 23 | 23 |
| 1063 | Public Grievance Cell DoT Hq | | N | | |
| 1064 | Anti-Corruption Helpline | | N | | |
| 1070 | Relief Commission for Natural Calamities | Y | | 23 | 23 |
| 1071 | Air Accident Helpline | | N | | |
| 1072 | Rail Accident Helpline | | N | | |
| 1073 | Road Accident Helpline | | N | | |
| 1077 | Control Room for District Collector | | N | | |
| 1090 | Call Alert ( Crime Branch) | | N | | |
| 1091 | Women Helpline | | N | | |
| 1097 | National AIDS Helpline to NACO | | N | | |
| 1099 | Central Accident and Trauma Services (CATS) | Y | | 23 | 23 |
| 10580 | Educational & Vocational Guidance and Counselling | | N | | |
| 10589 | Mother and Child Tracking ( MCTH) | | N | | |
| 10740 | Central Pollution Control Board | Y | | 23 | 23 |
| 10741 | Pollution Control Board | | N | | |
| 1511 | Police Related Service for all Metro Railway Project | | | | |
| 1512 | Prevention of Crime in Railway | Y | | 23 | 23 |

| | | | | | |
|---|---|---|---|---|---|
| 1514 | National Career Service(NCS) | | N | | |
| 15100 | Free Legal Service Helpline | Y | | 23 | 23 |
| 155304 | Municipal Corporations | | N | | |
| 155214 | Labour Helpline | | N | | |
| 1903 | Sashastra Seema Bal (SSB) | | N | | |
| 1909 | National Do Not Call Registry | | N | | |
| 1912 | Complaint of Electricity | Y | | 23 | 23 |
| 1916 | Drinking Water Supply | Y | | 23 | 23 |
| 1950 | Election Commission of India | | N | | |
| Vodafone | | | | | |
| Level 1 Number | Type of Service | Working | Not Working | Calls Made | Calls Connected |
| 100 | Police | Y | | 18 | 18 |
| 101 | Fire | Y | | 17 | 17 |
| 102 | Ambulance | Y | | 18 | 18 |
| 104 | Health Information Helpline | | N | | |
| 108 | Emergency and Disaster Management Helpline | Y | | 18 | 18 |
| 138 | All India Helpline for Passengers | Y | | 17 | 17 |
| 149 | Public Road Transport Utility Service | | N | | |
| 181 | Chief Minister Helpline | | N | | |
| 182 | Indian Railway Security Helpline | | N | | |
| 1033 | Road Accident Management Service | Y | | 18 | 18 |
| 1037 | Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline' | | N | | |
| 1056 | Emergency Medical Services | | N | | |
| 106X | State of the Art Hospitals | | N | | |
| 1063 | Public Grievance Cell DoT Hq | | N | | |
| 1064 | Anti-Corruption Helpline | | N | | |
| 1070 | Relief Commission for Natural Calamities | Y | | 18 | 18 |
| 1071 | Air Accident Helpline | Y | | 17 | 17 |

| | | | | | |
|---|---|---|---|---|---|
| 1072 | Rail Accident Helpline | | N | | |
| 1073 | Road Accident Helpline | Y | | 17 | 17 |
| 1077 | Control Room for District Collector | Y | | 18 | 18 |
| 1090 | Call Alert ( Crime Branch) | Y | | 17 | 17 |
| 1091 | Women Helpline | | N | | |
| 1097 | National AIDS Helpline to NACO | Y | | 18 | 18 |
| 1099 | Central Accident and Trauma Services (CATS) | | N | | |
| 10580 | Educational & Vocational Guidance and Counselling | | N | | |
| 10589 | Mother and Child Tracking ( MCTH) | | N | | |
| 10740 | Central Pollution Control Board | Y | | 17 | 17 |
| 10741 | Pollution Control Board | | N | | |
| 1511 | Police Related Service for all Metro Railway Project | | N | | |
| 1512 | Prevention of Crime in Railway | Y | | 18 | 18 |
| 1514 | National Career Service(NCS) | | N | | |
| 15100 | Free Legal Service Helpline | Y | | 18 | 18 |
| 155304 | Municipal Corporations | | N | | |
| 155214 | Labour Helpline | | N | | |
| 1903 | Sashastra Seema Bal (SSB) | | N | | |
| 1909 | National Do Not Call Registry | Y | | 18 | 18 |
| 1912 | Complaint of Electricity | | N | | |
| 1916 | Drinking Water Supply | | N | | |
| 1950 | Election Commission of India | Y | | 18 | 18 |

*Data Source: Live calls made by auditors from operator's network*

# 13 COUNTER DETAILS

| Sl No. | KPI | Formula with Counter Description |
|---|---|---|
| 1 | CSSR= (No of established Calls / No of Attempted Calls)% | ***No of established Calls =*** ([Assignment Requests]-([Failed Assignments (Signaling Channel)]+[Failed Assignments during MOC on the A Interface (Including Directed Retry)]+[Failed Assignments during MTC on the A Interface (Including Directed Retry)]+[Failed Assignments during Emergency Call on the A Interface (Including Directed Retry)] +[Failed Assignments during Call Re-establishment on the A Interface (Including Directed Retry)]+[Failed Mode Modify Attempts (MOC) (TCHF)]+[Failed Mode Modify Attempts (MTC) (TCHF)]+[Failed Mode Modify Attempts (Emergency Call) (TCHF)]+[Failed Mode Modify Attempts (Call Re-establishment) (TCHF)]+[Failed Mode Modify Attempts (MOC) (TCHH)]+[Failed Mode Modify Attempts (MTC) (TCHH)]+[Failed Mode Modify Attempts (Call Re-establishment) (TCHH)]))/***No of Attempted Calls =*** ([Assignment Requests (Signaling Channel) (TCH)] + [Assignment Requests (Signaling Channel) (SDCCH)] + [Assignment Requests (TCHF Only)] + [Assignment Requests (TCHH Only)] + [Assignment Requests (TCHF Preferred, Channel Type Unchangeable)] + [Assignment Requests (TCHH Preferred, Channel Type Unchangeable)] + [Assignment Requests (TCHF or TCHH, Channel Type Unchangeable)] + [Assignment Requests (TCHF Preferred, Channel Type Changeable)] + [Assignment Requests (TCHH Preferred, Channel Type Changeable)] + [Assignment Requests (TCHF or TCHH, Channel Type Changeable)]) |
| 2 | SDCCH congestion= (SDCCH Failure/SDCCH attempts)% | ***SDCCH Failure=*** ([Channel Assignment Failures (All Channels Busy or Channels Unconfigured) in Immediate Assignment Procedure (SDCCH)] + [Failed Internal Intra-Cell Handovers (No Channel Available) (SDCCH)] + [Number of Unsuccessful Incoming Internal Inter-Cell Handovers (No Channel Available) (SDCCH)] + [Failed Incoming External Inter-Cell Handovers (No Channel Available) (SDCCH)])/***SDCCH attempts =*** ([Channel Assignment Requests in Immediate Assignment Procedure (SDCCH)] + [Internal Intra-Cell Handover Requests (SDCCH)] + [Number of Incoming Internal Inter-Cell Handover Requests (SDCCH) (900/850/810-900/850/810)] + [Number of Incoming Internal Inter-Cell Handover Requests (SDCCH) (1800/1900-1800/1900)] + [Number of Incoming Internal Inter-Cell Handover Requests (SDCCH) (900/850/810-1800/1900)] + [Number of Incoming Internal Inter-Cell Handover Requests (SDCCH) (1800/1900-900/850/810)] + [Incoming External Inter-Cell Handover Requests (SDCCH) (900/850/810-900/850/810)] + [Incoming External Inter-Cell Handover Requests (SDCCH) (1800/1900-1800/1900)] + [Incoming External Inter-Cell Handover Requests (SDCCH) (900/850/810-1800/1900)] + [Incoming External Inter-Cell Handover Requests (SDCCH) (1800/1900-900/850/810)]) |
| 3 | TCH congestion= (TCH Failures /TCH Attempts)% | ***TCH Failures=*** ((Failed TCH Seizures due to Busy TCH (Signaling Channel)+([Failed Assignments (First Assignment, No Channel Available in Assignment Procedure)]+[Failed Assignments (First Assignment, No Channel Available in Directed Retry Procedure)]+[Failed Assignments (Reconnection to Old Channels, No Channel Available in Assignment)]+[Failed Assignments (Reconnection to Old Channels, No Channel Available in Directed Retry)])/***TCH Attempts =*** ([Assignment Requests (Signaling Channel) (TCH)] + [Assignment Requests (Signaling Channel) (SDCCH)] + [Assignment Requests (TCHF Only)] + [Assignment Requests (TCHH Only)] + [Assignment Requests (TCHF Preferred, Channel Type Unchangeable)] + [Assignment Requests (TCHH Preferred, Channel Type Unchangeable)] + [Assignment Requests (TCHF or TCHH, Channel Type Unchangeable)] + [Assignment Requests (TCHF Preferred, Channel Type Changeable)] + [Assignment Requests (TCHH Preferred, Channel Type Changeable)] + [Assignment Requests (TCHF or TCHH, Channel Type |

| | | |
|---|---|---|
| 4 | **Call Drop Rate= (The total no of dropped calls*100)/Total no of calls successfully established (where traffic channel is allotted)** | ***The total no of dropped calls=*** **([Call Drops on Radio Interface in Stable State (Traffic Channel)] + [Call Drops on Radio Interface in Handover State (Traffic Channel)] + [Call Drops Due to No MR from MS for a Long Time (Traffic Channel)] + [Call Drops due to Abis Terrestrial Link Failure (Traffic Channel)] + [Call Drops due to Equipment Failure (Traffic Channel)] + [Call Drops due to Forced Handover (Traffic Channel)] + [Call Drops due to local switching Start Failure] + [Call Drops due to Failures to Return to Normal Call from local switching])/*Total no of calls successfully established (where traffic channel is allotted) =* ([Assignment Requests]-([Failed Assignments (Signaling Channel)]+[Failed Assignments during MOC on the A Interface (Including Directed Retry)]+[Failed Assignments during MTC on the A Interface (Including Directed Retry)]+[Failed Assignments during Emergency Call on the A Interface (Including Directed Retry)] +[Failed Assignments during Call Re-establishment on the A Interface (Including Directed Retry)]+[Failed Mode Modify Attempts (MOC) (TCHF)]+[Failed Mode Modify Attempts (MTC) (TCHF)]+[Failed Mode Modify Attempts (Emergency Call) (TCHF)]+[Failed Mode Modify Attempts (Call Re-establishment) (TCHF)]+[Failed Mode Modify Attempts (MOC) (TCHH)]+[Failed Mode Modify Attempts (MTC) (TCHH)]+[Failed Mode Modify Attempts (Call Re-establishment) (TCHH)])** |
| 5 | **Call Drop Rate= (No of cells having call drop rate >3% during CBBH in a month*100)/Total no of cells in the licensed service area** | **Above formula with counters being used in CBBH.** |
| 6 | **Connection with good quality voice= (Connection with good quality voice/Total voice samples)%** | ***Connection with good quality voice =*** **((Number of MRs on Downlink TCHF (Receive Quality Rank 0)+Number of MRs on Downlink TCHF (Receive Quality Rank 1)+Number of MRs on Downlink TCHF (Receive Quality Rank 2)+Number of MRs on Downlink TCHF (Receive Quality Rank 3)+Number of MRs on Downlink TCHF (Receive Quality Rank 4)+Number of MRs on Downlink TCHF (Receive Quality Rank 5)+Number of MRs on Downlink TCHH (Receive Quality Rank 0)+Number of MRs on Downlink TCHH (Receive Quality Rank 1)+Number of MRs on Downlink TCHH (Receive Quality Rank 2)+Number of MRs on Downlink TCHH (Receive Quality Rank 3)+Number of MRs on Downlink TCHH (Receive Quality Rank 4)+Number of MRs on Downlink TCHH (Receive Quality Rank 5)) /*Total voice samples=* ((Number of MRs on Downlink TCHF (Receive Quality Rank 0)+Number of MRs on Downlink TCHF (Receive Quality Rank 1)+Number of MRs on Downlink TCHF (Receive Quality Rank 2)+Number of MRs on Downlink TCHF (Receive Quality Rank 3)+Number of MRs on Downlink TCHF (Receive Quality Rank 4)+Number of MRs on Downlink TCHF (Receive Quality Rank 5)+Number of MRs on Downlink TCHF (Receive Quality Rank 6)+Number of MRs on Downlink TCHF (Receive Quality Rank 7)+Number of MRs on Downlink TCHH (Receive Quality Rank 0)+:Number of MRs on Downlink TCHH (Receive Quality Rank 1)+Number of MRs on Downlink TCHH (Receive Quality Rank 2)+Number of MRs on Downlink TCHH (Receive Quality Rank 3)+Number of MRs on Downlink TCHH (Receive Quality Rank 4)+Number of MRs on Downlink TCHH (Receive Quality Rank 5)+Number of MRs on Downlink TCHH (Receive Quality Rank 6)+Number of MRs on Downlink TCHH (Receive Quality Rank 7))** |

### 13.1.1 ERICSSON

Ericsson provides network support to Aircel, Airtel, Idea, BSNL and Reliance GSM in the circle.

| Sl No. | KPI | Ericsson |
|---|---|---|
| 1 | **CSSR= (No of established Calls / No of Attempted Calls)%** | CSSR (No of established Calls / No of Attempted Calls)=(TCASSALL/TASSALL)*100 |
| 2 | **SDCCH congestion= (SDCCH Failure/SDCCH attempts)%** | SDCCH congestion (SDCCH Failure/SDCCH attempts)% = (CCONGS/CCALLS)*100 |
| 3 | **TCH congestion= (TCH Failures /TCH Attempts)%** | TCH congestion (TCH Failures /TCH Attempts)%= (CNRELCONG+TNRELCONG)/TASSALL)*100 |
| 4 | **Call Drop Rate= (The total no of dropped calls*100)/Total no of calls successfully established (where traffic channel is allotted)** | Call Drop Rate (Total no dropped calls/No of established calls)%= (TNDROP)/TCASSALL*100 |
| 5 | **Call Drop Rate= (No of cells having call drop rate >3% during CBBH in a month*100)/Total no of cells in the licensed service area** | Above formula with counters being used in CBBH. |
| 6 | **Connection with good quality voice= (Connection with good quality voice/Total voice samples)%** | Connection with good quality voice (Connection with good quality voice samples 0-5 /Total voice samples)= 100 * (QUAL50DL + QUAL40DL + QUAL30DL + QUAL20DL + QUAL10DL + QUAL00DL) / (QUAL70DL + QUAL60DL + QUAL50DL + QUAL40DL + QUAL30DL + QUAL20DL + QUAL10DL + QUAL00DL) |

***Ericsson Counters***

| Counter | Counter Description |
|---|---|
| TCASSALL | Number of assignment complete messages on TCH for all MS classes |
| TASSALL | Number of first assignment attempts on TCH for all MS classes. |
| CNRELCONG | Number of released connections on SDCCH due to TCH or Transcoder (TRA) congestion. |
| TNRELCONG | Number of released TCH signalling connections due to transcoder resource congestion during immediate assignment on TCH |
| CCONGS | Congestion counter for SDCCH. Stepped per congested allocation attempt. |
| CCALLS | Channel allocation attempt counter on SDCCH. |

| | |
|---|---|
| TNDROP | The total number of dropped TCH Connections. |
| QUAL00DL | Number of quality 0 reported on downlink. |
| QUAL10DL | Number of quality 1 reported on downlink. |
| QUAL20DL | Number of quality 2 reported on downlink. |
| QUAL30DL | Number of quality 3 reported on downlink. |
| QUAL40DL | Number of quality 4 reported on downlink. |
| QUAL50DL | Number of quality 5 reported on downlink. |
| QUAL60DL | Number of quality 6 reported on downlink. |
| QUAL70DL | Number of quality 7 reported on downlink. |

### 13.1.2 NSN (NOKIA SIEMENS NETWORKS)

NSN provides network support to Vodafone in the circle.

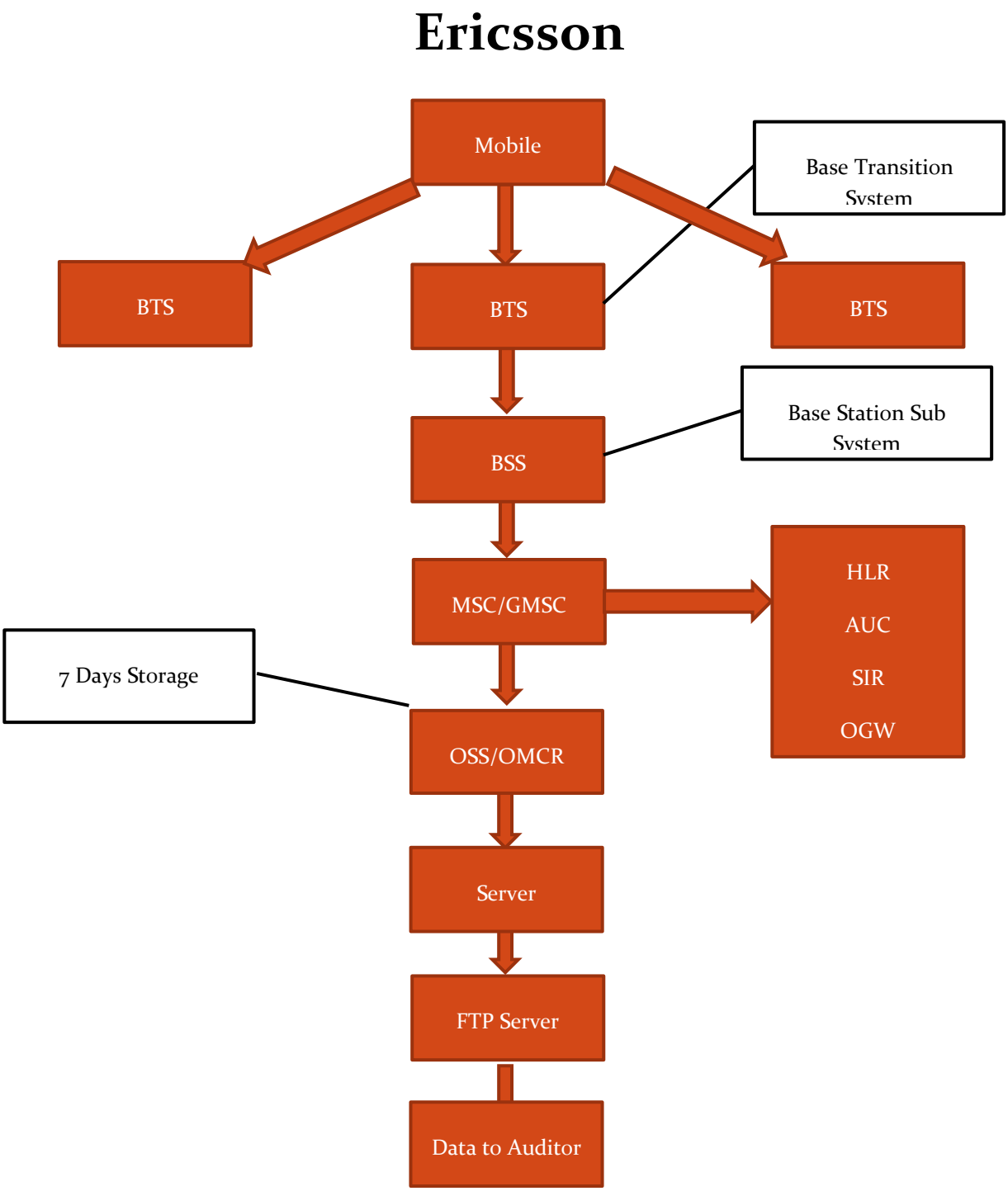
| Sl No. | KPI | NSN |
|---|---|---|
| 1 | CSSR= (No of established Calls / No of Attempted Calls)% | CSSR= 100-100*((SDCCH_BUSY_ATT)-(TCH_SEIZ_DUE_SDCCH_CON) + (SDCCH_RADIO_FAIL)+(SDCCH_RF_OLD_HO)+(SDCCH_USER_ACT)+(SDCCH_BCSU_RESET)+(SDCCH_NETW_ACT)+(SDCCH_BTS_FAIL)+(SDCCH_LAPD_FAIL)+ (BLCK_8I_NOM)/ {(CH_REQ_MSG_REC)+(PACKET_CH_REQ)}-{(GHOST_CCCH_RES)-(REJ_SEIZ_ATT_DUE_DIST)} |
| 2 | SDCCH congestion= (SDCCH Failure/SDCCH attempts)% | SDCCH congestion = (sdcch_busy_att - .tch_seiz_due_sdcch_con)/{(CH_REQ_MSG_REC)+(PACKET_CH_REQ)}-{(GHOST_CCCH_RES)-(REJ_SEIZ_ATT_DUE_DIST)} |
| 3 | TCH congestion= (TCH Failures /TCH Attempts)% | TCH congestion = BLCK_8I_NOM / {(TCH_NORM_SEIZ)+(MSC_I_SDCCH_TCH_AT)+(BSC_I_SDCCH_TCH_AT)} |
| 4 | Call Drop Rate= (The total no of dropped calls*100)/Total no of calls successfully established (where traffic channel is allotted) | TCH Drop = ( drop_after_tch_assign)-(tch_re_est_release) / {(TCH_NORM_SEIZ)+(MSC_I_SDCCH_TCH_AT)+(BSC_I_SDCCH_TCH_AT)} |

| | | |
|---|---|---|
| 5 | Call Drop Rate= (No of cells having call drop rate >3% during CBBH in a month*100)/Total no of cells in the licensed service area | Above formula with counters being used in CBBH. |
| 6 | Connection with good quality voice= (Connection with good quality voice/Total voice samples)% | Connection with good quality voice= (FREQ_DL_QUAL0+FREQ_DL_QUAL1+FREQ_DL_QUAL2+FREQ_DL_QUAL3+FREQ_DL_QUAL4+FREQ_DL_QUAL5) / (FREQ_DL_QUAL0+FREQ_DL_QUAL1+FREQ_DL_QUAL2+FREQ_DL_QUAL3+FREQ_DL_QUAL4+FREQ_DL_QUAL5+FREQ_DL_QUAL6+FREQ_DL_QUAL7) |

## 13.2 BLOCK SCHEMATIC DIAGRAMS

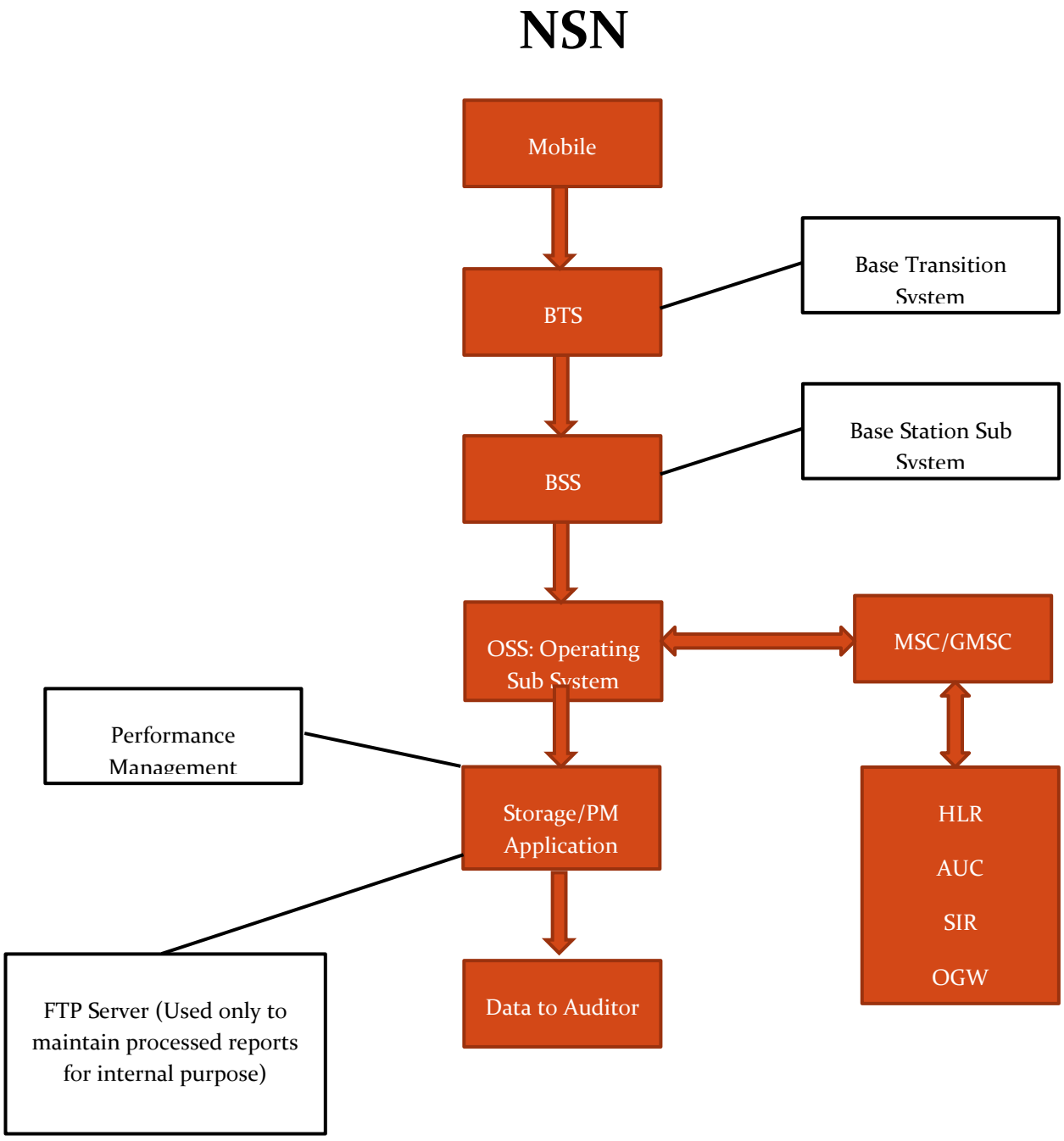
### 13.2.1 ERICSSON

Ericsson provides network support to Aircel, Airtel, Idea, BSNL and Reliance GSM in the circle.



### 13.2.2 NSN (NOKIA SIEMENS NETWORKS)

NSN provides network support to Vodafone in the circle.



# 14 ANNEXURE – APRIL -2G

| Audit Results for Network Availability- PMR data-April | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Number of BTSs in the licensed service area | | 824 | 7665 | 4544 | 7478 | 59 | 1113 | 2534 | 575 | 1914 | 3886 | 8521 |
| Sum of downtime of BTSs in a month (in hours) | | 84 | 4136 | 54146 | 1813 | 20 | 415 | 1299 | 1115 | 28896 | 1803 | 1570 |
| BTSs accumulated downtime (not available for service) | ≤ 2% | 0.01% | 0.07% | 1.60% | 0.03% | 0.05% | 0.05% | 0.07% | 0.26% | 2.03% | 0.06% | 0.02% |
| Number of BTSs having accumulated downtime >24 hours | | 0 | 5 | 48 | 4 | 0 | 4 | 11 | 0 | 0 | 5 | 7 |
| Worst affected BTSs due to downtime | ≤ 2% | 0.00% | 0.07% | 1.06% | 0.05% | 0.00% | 0.36% | 0.43% | 0.00% | 0.00% | 0.13% | 0.08% |
| Live Measurement Results for Network Availability- 3 Day live data-April | | | | | | | | | | | | |
| | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Number of BTSs in the licensed service area | | 825 | 7647 | 4521 | 7438 | 44 | 1113 | 2534 | 575 | 1915 | 3854 | 8511 |
| Sum of downtime of BTSs in a month (in hours) | | 9 | 357 | 5678 | 122 | 0 | 21 | 56 | 62 | 0 | 282 | 0 |
| BTSs accumulated downtime (not available for service) | ≤ 2% | 0.01% | 0.06% | 1.74% | 0.02% | 0.00% | 0.03% | 0.03% | 0.15% | 0.00% | 0.10% | 0.00% |
| Number of BTSs having accumulated downtime >24 hours | | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Worst affected BTSs due to downtime | ≤ 2% | 0.00% | 0.00% | 0.02% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |

| Audit Results for CSSR, SDCCH and TCH congestion- PMR data-April | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CSSR | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| CSSR | ≥ 95% | 99.00% | 99.05% | 97.79% | 99.28% | 99.69% | 97.52% | 96.02% | 98.95% | 99.10% | 98.15% | 99.64% |
| SDCCH/Paging channel congestion | ≤ 1% | 0.02% | 0.05% | 0.07% | 0.50% | NA | NA | 0.03% | NA | 0.06% | 0.30% | 0.22% |
| TCH congestion | ≤ 2% | 0.04% | 0.35% | 0.33% | 0.29% | 0.00% | 0.41% | 1.15% | 0.05% | 0.21% | 1.10% | 0.36% |
| Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-April | | | | | | | | | | | | |
| CSSR | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| CSSR | ≥ 95% | 98.95% | 99.03% | 97.75% | 99.29% | 99.78% | 97.62% | 96.38% | 99.02% | 99.04% | 97.96% | 99.88% |
| SDCCH/Paging channel congestion | ≤ 1% | 0.02% | 0.02% | 0.07% | 0.21% | NA | NA | 0.03% | NA | 0.05% | 0.24% | 0.12% |
| TCH congestion | ≤ 2% | 0.04% | 0.19% | 0.34% | 0.30% | 0.00% | 0.27% | 1.11% | 0.04% | 0.24% | 1.41% | 0.12% |
| Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-April | | | | | | | | | | | | |
| CSSR | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of call attempts | | 936 | 1719 | 1440 | 1709 | 1390 | 1575 | 1521 | 1018 | 1209 | 1477 | 1308 |
| Total number of successful calls established | | 936 | 1719 | 1425 | 1699 | 1390 | 1574 | 1516 | 1015 | 1204 | 1451 | 1308 |
| CSSR | ≥ 95% | 100.00% | 100.00% | 98.96% | 99.41% | 100.00% | 99.94% | 99.67% | 99.71% | 99.59% | 98.24% | 100.00% |
| %age blocked calls | | 0.00% | 0.00% | 1.04% | 0.59% | 0.00% | 0.06% | 0.33% | 0.29% | 0.41% | 1.76% | 0.00% |

| Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data-April | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Call drop rate | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of calls established | | 11966924 | 209177908 | 64618725 | 321513121 | 13305 | 20584273 | 65290224 | 7871262 | 38059187 | 187014678 | 489202912 |
| Total number of calls dropped | | 34906 | 1307566 | 271309 | 2393113 | 3 | 66594 | 76469 | 21235 | 206033 | 1618972 | 3065248 |
| Call drop rate | ≤ 2% | 0.29% | 0.63% | 0.42% | 0.74% | 0.02% | 0.32% | 0.12% | 0.27% | 0.54% | 0.87% | 0.63% |
| Total number of cells in the network | | 2472 | 23904 | 13543 | 22391 | 179 | 3351 | 7615 | 1738 | 5745 | 11784 | 25912 |
| Total number of cells having more than 3% TCH | | 41 | 283 | 183 | 482 | 0 | 16 | 21 | 29 | 135 | 382 | 406 |
| Worst affected cells having more than 3% TCH | ≤ 3% | 1.66% | 1.18% | 1.35% | 2.15% | 0.00% | 0.47% | 0.27% | 1.68% | 2.35% | 3.24% | 1.57% |
| Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data-April | | | | | | | | | | | | |
| Call drop rate | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of calls established | | 1203345 | 20867945 | 6306875 | 31277331 | 25650 | 2164574 | 6719629 | 10451315 | 3804615 | 18786453 | 613539521 |
| Total number of calls dropped | | 3591 | 125536 | 26936 | 228374 | 3 | 6730 | 7975 | 27278 | 21856 | 176097 | 2935854 |
| Call drop rate | ≤ 2% | 0.30% | 0.60% | 0.43% | 0.73% | 0.01% | 0.31% | 0.12% | 0.26% | 0.57% | 0.94% | 0.48% |
| Total number of cells in the network | | 2475 | 23894 | 13537 | 22386 | 134 | 3345 | 7612 | 1611 | 5748 | 12053 | 25873 |
| Total number of cells having more than 3% TCH | | 37 | 264 | 195 | 478 | 0 | 12 | 20 | 2 | 150 | 433 | 18 |
| Worst affected cells having more than 3% TCH | ≤ 3% | 1.51% | 1.10% | 1.44% | 2.14% | 0.00% | 0.35% | 0.26% | 0.15% | 2.61% | 3.60% | 0.07% |
| Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-April | | | | | | | | | | | | |
| Call drop rate | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of calls established | | 936 | 1719 | 1424 | 1699 | 1390 | 1573 | 1519 | 1018 | 1204 | 1472 | 1308 |
| Total number of calls dropped | | 0 | 0 | 5 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 |
| Call drop rate | ≤ 2% | 0.00% | 0.00% | 0.35% | 0.00% | 0.00% | 0.00% | 0.07% | 0.00% | 0.08% | 0.07% | 0.00% |

| Audit Results for Voice quality -PMR Data-April | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Voice quality | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of sample calls | | 2262510698 | 817192709943 | 2556947824 | 75640055941 | 56224873 | NA | 10917959447 | 184669307 | 6159282987 | 39970607636 | 76330571347 |
| Total number of calls with good voice quality | | 2198961481 | 797360667705 | 2527115811 | 72963993821 | 55795489 | NA | 10812704481 | 119849693 | 6062246647 | 39187154335 | 74482468038 |
| %age calls with good voice quality | ≥ 95% | 97.19% | 97.57% | 98.83% | 96.46% | 99.24% | NA | 99.04% | 64.90% | 98.42% | 98.04% | 97.58% |

| Live measurement results for Voice quality-3 Day data-April | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Voice quality | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of sample calls | | 229773122 | 7206799679 | 125386744 | 7812463261 | 48113858 | NA | 1107109362 | 23144637 | 643755261 | 4308818948 | 76248194706 |
| Total number of calls with good voice quality | | 223291565 | 7030206969 | 123591805 | 7543408604 | 47463011 | NA | 1096146036 | 15322011 | 633382472 | 4226478499 | 74590510350 |
| %age calls with good voice quality | ≥ 95% | 97.18% | 97.55% | 98.57% | 96.56% | 98.65% | NA | 99.01% | 66.20% | 98.39% | 98.09% | 97.83% |

| Drive test results for Voice quality (Average of three drive tests) - DT data-April | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Voice quality | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of sample calls | | 1376441 | 355457 | 227706 | 401275 | NA | NA | 244133 | 231372 | 1920368 | 225067 | 347749 |
| Total number of calls with good voice quality | | 1343872 | 347426 | 223189 | 391265 | NA | NA | 232947 | 229848 | 1851197 | 217457 | 333607 |
| %age calls with good voice quality | ≥ 95% | 97.63% | 97.74% | 98.02% | 97.51% | 99.81% | 98.88% | 95.42% | 99.34% | 96.40% | 96.62% | 95.93% |

| Audit Results for POI Congestion- PMR data-April | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| POI congestion | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of working POIs | | 40 | NA | 58 | 154 | 64 | 0 | 0 | 159 | 25 | 27 | 151 |
| No. of POIs not meeting benchmark | | 0 | NA | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Capacity of all POIs (A) - in erlangs | | 1869 | NA | 47350 | 161243 | 7998 | 0 | 0 | 34744 | 36914 | 121431 | 149964 |
| Traffic served for all POIs (B)- in erlangs | | 36 | NA | 29871 | 79887 | 867 | 0 | 0 | 13440 | 24347 | 78091 | 60288 |
| POI congestion | ≤ 0.5% | 0.00% | NA | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| **Live Measurement Results for POI Congestion- 3 Day data-April** | | | | | | | | | | | | |
| POI congestion | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of working POIs | | 40 | NA | 58 | 154 | 64 | 60 | 19 | 159 | 25 | 26 | 151 |
| No. of POIs not meeting benchmark | | 0 | NA | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Capacity of all POIs (A) - in erlangs | | 1869 | NA | 47350 | 161121 | 7998 | 343107 | 218322 | 34744 | 36914 | 120941 | 140986 |
| Traffic served for all POIs (B)- in erlangs | | 33 | NA | 29102 | 71684 | 534 | 127586 | 149598 | 8668 | 22821 | 70797 | 30325 |
| POI congestion | ≤ 0.5% | 0.00% | NA | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| **Month Summary-April** | | | | | | | | | | | | |
| | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| BTSs accumulated downtime (not available for service) | ≤ 2% | 0.01% | 0.07% | 1.60% | 0.03% | 0.05% | 0.05% | 0.07% | 0.26% | 2.03% | 0.06% | 0.02% |
| Worst affected BTSs due to downtime | ≤ 2% | 0.00% | 0.07% | 1.06% | 0.05% | 0.00% | 0.36% | 0.43% | 0.00% | 0.00% | 0.13% | 0.08% |
| CSSR | ≥ 95% | 99.00% | 99.05% | 97.79% | 99.28% | 99.69% | 97.52% | 96.02% | #VALUE! | 99.10% | 98.15% | 99.64% |
| SDCCH/Paging channel congestion | ≤ 1% | 0.02% | 0.05% | 0.07% | 0.50% | NA | NA | 0.03% | NA | 0.06% | 0.30% | 0.22% |
| TCH congestion | ≤ 2% | 0.04% | 0.35% | 0.33% | 0.29% | 0.00% | 0.41% | 1.15% | 0.05% | 0.21% | 1.10% | 0.36% |
| Call drop rate | ≤ 2% | 0.29% | 0.63% | 99.58% | 0.74% | 0.02% | 0.32% | 0.12% | 0.27% | 0.54% | 0.87% | 0.63% |
| Worst affected cells having more than 3% TCH | ≤ 3% | 1.66% | 1.18% | 1.35% | 2.15% | 0.00% | 0.47% | 0.27% | 1.68% | 2.35% | 3.24% | 1.57% |
| %age calls with good voice quality | ≥ 95% | 97.19% | 97.57% | 98.83% | 96.46% | 99.24% | NA | 99.04% | 64.90% | 98.42% | 98.04% | 97.58% |
| POI congestion | ≤ 0.5% | 0.00% | NA | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |

# 15 ANNEXURE – MAY-2G

| Audit Results for Network Availability- PMR data-May | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Number of BTSs in the licensed service area | | 824 | 7687 | 4550 | 7512 | 241 | 1113 | 2535 | 575 | 1892 | 3840 | 8551 |
| Sum of downtime of BTSs in a month (in hours) | | 172 | 6000 | 58250 | 3167 | 53 | 222 | 1479 | 4487 | 41184 | 2649 | 2527 |
| BTSs accumulated downtime (not available for service) | ≤ 2% | 0.03% | 0.11% | 1.78% | 0.06% | 0.03% | 0.03% | 0.08% | 1.08% | 3.02% | 0.10% | 0.04% |
| Number of BTSs having accumulated downtime >24 hours | | 0 | 4 | 48 | 10 | 0 | 4 | 11 | 0 | 0 | 4 | 11 |
| Worst affected BTSs due to downtime | ≤ 2% | 0.00% | 0.05% | 1.05% | 0.13% | 0.00% | 0.36% | 0.43% | 0.00% | 0.00% | 0.10% | 0.13% |
| **Live Measurement Results for Network Availability- 3 Day live data-May** | | | | | | | | | | | | |
| | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Number of BTSs in the licensed service area | | 824 | 7649 | 4544 | 7478 | 61 | 1111 | 2535 | 575 | 1914 | 3846 | 8551 |
| Sum of downtime of BTSs in a month (in hours) | | 20 | 461 | 3789 | 203 | 0 | 27 | 221 | 659 | 5637 | 339 | 0 |
| BTSs accumulated downtime (not available for service) | ≤ 2% | 0.03% | 0.08% | 1.16% | 0.04% | 0.00% | 0.03% | 0.12% | 1.59% | 4.09% | 0.12% | 0.00% |
| Number of BTSs having accumulated downtime >24 hours | | 0 | 0 | 48 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Worst affected BTSs due to downtime | ≤ 2% | 0.00% | 0.00% | 1.06% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |

| Audit Results for CSSR, SDCCH and TCH congestion- PMR data-May | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CSSR | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| CSSR | ≥ 95% | 98.93% | 99.07% | 97.47% | 99.35% | 99.80% | 98.70% | 96.87% | 98.68% | 99.14% | 98.22% | 99.71% |
| SDCCH/Paging channel congestion | ≤ 1% | 0.03% | 0.05% | 0.07% | 0.47% | NA | NA | 0.05% | NA | 0.07% | 0.32% | 0.17% |
| TCH congestion | ≤ 2% | 0.08% | 0.42% | 0.36% | 0.24% | 0.00% | 0.09% | 1.39% | 0.05% | 0.19% | 0.94% | 0.29% |
| Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-May | | | | | | | | | | | | |
| CSSR | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| CSSR | ≥ 95% | 98.92% | 99.08% | 97.43% | 99.38% | 99.19% | 98.67% | 97.82% | 98.87% | 99.24% | 98.31% | 99.89% |
| SDCCH/Paging channel congestion | ≤ 1% | 0.03% | 0.04% | 0.07% | 0.28% | NA | NA | 0.03% | NA | 0.14% | 0.17% | 0.10% |
| TCH congestion | ≤ 2% | 0.05% | 0.16% | 0.33% | 0.20% | 0.00% | 7.61% | 1.85% | 0.06% | 0.10% | 0.81% | 0.11% |
| Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-May | | | | | | | | | | | | |
| CSSR | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of call attempts | | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Total number of successful calls established | | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| CSSR | ≥ 95% | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| %age blocked calls | | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

| Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data-May | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Call drop rate | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of calls established | | 13409173 | 221867313 | 70099101 | 330189330 | 118037 | 18228914 | 68931879 | 7217887 | 41450433 | 199995201 | 514542368 |
| Total number of calls dropped | | 40258 | 1352729 | 290959 | 2312474 | 93 | 24036 | 84649 | 21611 | 208314 | 1553993 | 3048361 |
| Call drop rate | ≤ 2% | 0.30% | 0.61% | 0.42% | 0.70% | 0.08% | 0.13% | 0.12% | 0.30% | 0.50% | 0.78% | 0.59% |
| Total number of cells in the network | | 2472 | 23978 | 13473 | 22413 | 823 | 25 | 7465 | 1750 | 5728 | 11965 | 25999 |
| Total number of cells having more than 3% TCH | | 40 | 278 | 172 | 522 | 0 | 0 | 18 | 30 | 120 | 281 | 365 |
| Worst affected cells having more than 3% TCH | ≤ 3% | 1.62% | 1.16% | 1.28% | 2.33% | 0.00% | 0.00% | 0.24% | 1.74% | 2.09% | 2.35% | 1.41% |
| Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data-May | | | | | | | | | | | | |
| Call drop rate | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of calls established | | 1256366 | 21157486 | 6609595 | 32597248 | 27009 | 9346576 | 6364117 | 12204769 | 3826204 | 18681584 | 645543933 |
| Total number of calls dropped | | 3666 | 128684 | 26474 | 231339 | 1 | 12777 | 7306 | 37325 | 21425 | 134712 | 2990861 |
| Call drop rate | ≤ 2% | 0.29% | 0.61% | 0.40% | 0.71% | 0.00% | 0.14% | 0.11% | 0.31% | 0.56% | 0.72% | 0.46% |
| Total number of cells in the network | | 2472 | 23929 | 13491 | 22504 | 185 | 3345 | 7612 | 1596 | 5745 | 11972 | 25999 |
| Total number of cells having more than 3% TCH | | 38 | 291 | 165 | 480 | 0 | 12 | 22 | 2 | 123 | 308 | 13 |
| Worst affected cells having more than 3% TCH | ≤ 3% | 1.52% | 1.21% | 1.22% | 2.13% | 0.00% | 0.37% | 0.28% | 0.15% | 2.14% | 2.57% | 0.05% |
| Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-May | | | | | | | | | | | | |
| Call drop rate | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of calls established | | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Total number of calls dropped | | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Call drop rate | ≤ 2% | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

| Audit Results for Voice quality -PMR Data-May | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Voice quality | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of sample calls | | 2441229775 | 71891916561 | 2575349028 | 75255632966 | 604882590 | NA | 11191026040 | 179114998 | 5489708168 | 57548831385 | 77653297823 |
| Total number of calls with good voice quality | | 2368532422 | 70006249379 | 2544565965 | 72774714198 | 600164287 | NA | 11077711269 | 114587961 | 5404447357 | 56358543582 | 75865048546 |
| %age calls with good voice quality | ≥ 95% | 97.02% | 97.38% | 98.80% | 96.70% | 99.22% | NA | 98.99% | 63.97% | 98.45% | 97.93% | 97.70% |
| Live measurement results for Voice quality-3 Day data-May | | | | | | | | | | | | |
| Voice quality | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of sample calls | | 229107178 | 7080779722 | 249368102 | 7516024813 | 52151588 | NA | 1068501553 | 22068422 | 612237395 | 3890543770 | 8877875218 |
| Total number of calls with good voice quality | | 222478138 | 6901547353 | 246456869 | 7269513126 | 51695559 | NA | 1058004536 | 14399942 | 603136688 | 3812692801 | 8715360936 |
| %age calls with good voice quality | ≥ 95% | 97.11% | 97.47% | 98.83% | 96.72% | 99.13% | NA | 99.02% | 65.25% | 98.51% | 98.00% | 98.17% |
| Drive test results for Voice quality (Average of three drive tests) - DT data-May | | | | | | | | | | | | |
| Voice quality | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of sample calls | | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Total number of calls with good voice quality | | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| %age calls with good voice quality | ≥ 95% | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

| Audit Results for POI Congestion- PMR data-May | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| POI congestion | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of working POIs | | 40 | 58 | 58 | 150 | 64 | 60 | 19 | 159 | 25 | 27 | 150 |
| No. of POIs not meeting benchmark | | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Capacity of all POIs (A) - in erlangs | | 1863 | 137497 | 47350 | 160814 | 8354 | 256159 | 316525 | 34744 | 36914 | 121066 | 148273 |
| Traffic served for all POIs (B)- in erlangs | | 42 | 4888 | 29791 | 80513 | 794 | 100802 | 187419 | 13317 | 15353 | 79156 | 136795 |
| POI congestion | ≤ 0.5% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| **Live Measurement Results for POI Congestion- 3 Day data-May** | | | | | | | | | | | | |
| POI congestion | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of working POIs | | 40 | 58 | 58 | 153 | 64 | 60 | 19 | 159 | 25 | 25 | 148 |
| No. of POIs not meeting benchmark | | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Capacity of all POIs (A) - in erlangs | | 1863 | 137497 | 47350 | 160761 | 8354 | 126823 | 218322 | 34744 | 36914 | 120650 | 147819 |
| Traffic served for all POIs (B)- in erlangs | | 39 | 4888 | 29711 | 80478 | 466 | 48323 | 149598 | 8362 | 10755 | 78229 | 32640 |
| POI congestion | ≤ 0.5% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| **Month Summary-May** | | | | | | | | | | | | |
| | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| BTSs accumulated downtime (not available for service) | ≤ 2% | 0.03% | 0.11% | 1.78% | 0.06% | 0.03% | 0.03% | 0.08% | 1.08% | 3.02% | 0.10% | 0.04% |
| Worst affected BTSs due to downtime | ≤ 2% | 0.00% | 0.05% | 1.05% | 0.13% | 0.00% | 0.36% | 0.43% | 0.00% | 0.00% | 0.10% | 0.13% |
| CSSR | ≥ 95% | 98.93% | 99.07% | 97.47% | 99.35% | 99.80% | 98.70% | 96.87% | 98.68% | 99.14% | 98.22% | 99.71% |
| SDCCH/Paging channel congestion | ≤ 1% | 0.03% | 0.05% | 0.07% | 0.47% | NA | NA | 0.05% | NA | 0.07% | 0.32% | 0.17% |
| TCH congestion | ≤ 2% | 0.08% | 0.42% | 0.36% | 0.24% | 0.00% | 0.09% | 1.39% | 0.05% | 0.19% | 0.94% | 0.29% |
| Call drop rate | ≤ 2% | 0.30% | 0.61% | 0.42% | 0.70% | 0.08% | 0.13% | 0.12% | 0.30% | 0.50% | 0.78% | 0.59% |
| Worst affected cells having more than 3% TCH | ≤ 3% | 1.62% | 1.16% | 1.28% | 2.33% | 0.00% | 0.00% | 0.24% | 1.74% | 2.09% | 2.35% | 1.41% |
| %age calls with good voice quality | ≥ 95% | 97.02% | 97.38% | 98.80% | 96.70% | 99.22% | NA | 98.99% | 63.97% | 98.45% | 97.93% | 97.70% |
| POI congestion | ≤ 0.5% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |

# 16 ANNEXURE – JUNE-2G

| Audit Results for Network Availability- PMR data-June | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Number of BTSs in the licensed service area | | 825 | 7721 | 4556 | 7519 | 264 | 1111 | 2535 | 575 | 1892 | 3818 | 8595 |
| Sum of downtime of BTSs in a month (in hours) | | 226 | 9777 | 56566 | 3351 | 41 | 1992 | 1478 | 9010 | 42617 | 3424 | 3486 |
| BTSs accumulated downtime (not available for service) | ≤ 2% | 0.04% | 0.17% | 1.67% | 0.06% | 0.02% | 0.24% | 0.08% | 2.11% | 3.03% | 0.12% | 0.05% |
| Number of BTSs having accumulated downtime >24 hours | | 0 | 34 | 51 | 7 | 0 | 18 | 11 | 0 | 0 | 22 | 22 |
| Worst affected BTSs due to downtime | ≤ 2% | 0.00% | 0.44% | 1.12% | 0.09% | 0.00% | 1.62% | 0.43% | 0.00% | 0.00% | 0.58% | 0.26% |
| Live Measurement Results for Network Availability- 3 Day live data-June | | | | | | | | | | | | |
| | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Number of BTSs in the licensed service area | | 824 | 7721 | 4551 | 7519 | 252 | 1111 | 2532 | 575 | 1892 | 3813 | 8595 |
| Sum of downtime of BTSs in a month (in hours) | | 12 | 693 | 4153 | 341 | 0 | 145 | 261 | 0 | 13 | 262 | 108 |
| BTSs accumulated downtime (not available for service) | ≤ 2% | 0.02% | 0.12% | 1.27% | 0.06% | 0.00% | 0.18% | 0.14% | 0.00% | 0.01% | 0.10% | 0.02% |
| Number of BTSs having accumulated downtime >24 hours | | 0 | 12 | 51 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Worst affected BTSs due to downtime | ≤ 2% | 0.00% | 0.16% | 1.12% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |

| Audit Results for CSSR, SDCCH and TCH congestion- PMR data-June | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CSSR | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| CSSR | ≥ 95% | 98.66% | 98.98% | 97.51% | 99.41% | 99.82% | 99.09% | 97.67% | 98.95% | 98.98% | 98.07% | 99.70% |
| SDCCH/Paging channel congestion | ≤ 1% | 0.09% | 0.07% | 0.07% | 0.23% | NA | NA | 0.05% | NA | 0.06% | 0.17% | 0.14% |
| TCH congestion | ≤ 2% | 0.15% | 0.76% | 0.35% | 0.21% | 0.01% | 0.05% | 2.77% | 0.04% | 0.23% | 0.95% | 0.30% |
| Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-June | | | | | | | | | | | | |
| CSSR | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| CSSR | ≥ 95% | 98.76% | 99.02% | 97.60% | 99.13% | 99.81% | 99.07% | 98.94% | 98.98% | 99.18% | 98.11% | 99.71% |
| SDCCH/Paging channel congestion | ≤ 1% | 0.05% | 0.03% | 0.07% | 0.59% | NA | NA | 0.09% | NA | 0.04% | 0.23% | 0.09% |
| TCH congestion | ≤ 2% | 0.21% | 0.29% | 0.34% | 0.48% | 0.00% | 0.06% | 2.24% | 0.04% | 0.12% | 1.06% | 0.29% |
| Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-June | | | | | | | | | | | | |
| CSSR | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of call attempts | | 86 | 1170 | 1121 | 1266 | 980 | 279 | 1052 | 958 | 1151 | 1091 | 1033 |
| Total number of successful calls established | | 86 | 1170 | 1104 | 1266 | 980 | 275 | 1046 | 958 | 1151 | 1090 | 1033 |
| CSSR | ≥ 95% | 100.00% | 100.00% | 98.48% | 100.00% | 100.00% | 98.57% | 99.43% | 100.00% | 100.00% | 99.91% | 100.00% |
| %age blocked calls | | 0.00% | 0.00% | 1.52% | 0.00% | 0.00% | 1.43% | 0.57% | 0.00% | 0.00% | 0.09% | 0.00% |

| Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data-June | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Call drop rate | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of calls established | | 14606088 | 210745390 | 65513963 | 307491746 | 1118398 | 3817338 | 71032563 | 6811618 | 37810566 | 190404246 | 475620886 |
| Total number of calls dropped | | 54343 | 1386613 | 271921 | 2546632 | 1568 | 4067 | 98778 | 18461 | 236695 | 1675485 | 2950891 |
| Call drop rate | ≤ 2% | 0.37% | 0.66% | 0.42% | 0.83% | 0.14% | 0.11% | 0.14% | 0.27% | 0.63% | 0.88% | 0.62% |
| Total number of cells in the network | | 2475 | 24115 | 13458 | 22559 | 892 | 3335 | 7469 | 1750 | 5680 | 11876 | 26136 |
| Total number of cells having more than 3% TCH | | 48 | 386 | 172 | 535 | 0 | 24 | 19 | 31 | 125 | 312 | 413 |
| Worst affected cells having more than 3% TCH | ≤ 3% | 1.93% | 1.60% | 1.28% | 2.37% | 0.00% | 0.72% | 0.25% | 1.78% | 2.20% | 2.63% | 1.58% |
| Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data-June | | | | | | | | | | | | |
| Call drop rate | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of calls established | | 1456685 | 28403444 | 6857265 | 30024147 | 1351651 | 613475 | 6717895 | 9369193 | 4148337 | 19445216 | 50034721 |
| Total number of calls dropped | | 5374 | 183777 | 27860 | 279441 | 2547 | 623 | 10978 | 32173 | 20599 | 102609 | 282748 |
| Call drop rate | ≤ 2% | 0.37% | 0.65% | 0.41% | 0.93% | 0.19% | 0.10% | 0.16% | 0.34% | 0.50% | 0.53% | 0.57% |
| Total number of cells in the network | | 2472 | 24080 | 13295 | 22628 | 856 | 3341 | 7469 | 1612 | 5680 | 11916 | 26136 |
| Total number of cells having more than 3% TCH | | 50 | 364 | 156 | 532 | 0 | 26 | 29 | 2 | 113 | 261 | 309 |
| Worst affected cells having more than 3% TCH | ≤ 3% | 2.04% | 1.51% | 1.17% | 2.35% | 0.00% | 0.78% | 0.39% | 0.15% | 2.00% | 2.19% | 1.18% |
| Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-June | | | | | | | | | | | | |
| Call drop rate | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of calls established | | 86 | 1170 | 1112 | 1266 | 980 | 277 | 1046 | 958 | 1151 | 1091 | 1033 |
| Total number of calls dropped | | 0 | 0 | 8 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 |
| Call drop rate | ≤ 2% | 0.00% | 0.00% | 0.72% | 0.00% | 0.00% | 0.00% | 0.38% | 0.00% | 0.00% | 0.00% | 0.00% |

| Audit Results for Voice quality -PMR Data-June | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Voice quality | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of sample calls | | 2645629639 | 69929093088 | 2589285786 | 70902154517 | 5010020608 | NA | 11364821303 | 116190447 | 5921513924 | 48005872724 | 73336990762 |
| Total number of calls with good voice quality | | 2552878085 | 68022858763 | 2557620529 | 68679599727 | 4973691821 | NA | 11239601292 | 183394654 | 5827016947 | 47011466942 | 71704820661 |
| %age calls with good voice quality | ≥ 95% | 96.49% | 97.27% | 98.78% | 96.87% | 99.27% | NA | 98.90% | 157.84% | 98.40% | 97.93% | 97.77% |
| Live measurement results for Voice quality-3 Day data-June | | | | | | | | | | | | |
| Voice quality | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of sample calls | | 268542075 | 9225277925 | 267382948 | 6975826335 | 590248525 | NA | 1100578497 | 21581546 | 474829369 | 3991026140 | 7379838225 |
| Total number of calls with good voice quality | | 259665272 | 8984050905 | 263755020 | 6754162412 | 585845856 | NA | 1087897025 | 13909514 | 467441435 | 3910336329 | 7215127048 |
| %age calls with good voice quality | ≥ 95% | 96.69% | 97.39% | 98.64% | 96.82% | 99.25% | NA | 98.85% | 99.36% | 98.44% | 97.98% | 97.77% |
| Drive test results for Voice quality (Average of three drive tests) - DT data-June | | | | | | | | | | | | |
| Voice quality | Benchmark | Aircel | Airtel | BSNL | Idea | MTS | RCOM CDMA | RCOM GSM | TATA CDMA | TATA GSM | Telenor | Vodafone |
| Total number of sample calls | | 127366 | 344225 | 125135 | 317456 | NA | NA | 173026 | 306552 | 526038 | 156738 | 367658 |
| Total number of calls with good voice quality | | 126864 | 337525 | 122422 | 310398 | NA | NA | 169074 | 305837 | 522677 | 151696 | 354022 |
| %age calls with good voice quality | ≥ 95% | 99.61% | 98.05% | 97.83% | 97.78% | 99.87% | 99.24% | 97.72% | 99.77% | 99.36% | 96.78% | 96.29% |

# 17 ANNEXURE – APRIL -3G

| Audit Results for Network Availability- PMR data-April | | | | | | |
|---|---|---|---|---|---|---|
| | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| (Number of Node Bs in the network in the licensed service area | | 5025 | 2088 | 5458 | 11442 | 6043 |
| Sum of downtime (i.e. total outage time) of Node Bs | | 3821 | 18484 | 1393 | 0 | 926 |
| Node Bs downtime (not available for service) | ≤ 2% | 0.10% | 1.19% | 0.03% | 0.00% | 0.02% |
| Number of Node Bs having accumulated downtime of >24 hours in a month | | 23 | 32 | 4 | 0 | 4 |
| Worst affected Node Bs due to downtime | ≤ 2% | 0.46% | 1.53% | 0.07% | 0.00% | 0.07% |
| **Live Measurement Results for Network Availability- 3 Day live data-April** | | | | | | |
| | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| (Number of Node Bs in the network in the licensed service area | | 4762 | 2083 | 5454 | 1337 | 5992 |
| Sum of downtime (i.e. total outage time) of Node Bs | | 409 | 2267 | 73 | 0 | 0 |
| Node Bs downtime (not available for service) | ≤ 2% | 0.12% | 1.51% | 0.02% | 0.00% | 0.00% |
| Number of Node Bs having accumulated downtime of >24 hours in a month | | 1 | 8 | 0 | 0 | 0 |
| Worst affected Node Bs due to downtime | ≤ 2% | 0.02% | 0.38% | 0.00% | 0.00% | 0.00% |

| Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data-April | | | | | | |
|---|---|---|---|---|---|---|
| | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| CSSR | ≥ 95% | 99.49% | 96.04% | 99.70% | 99.11% | 99.82% |
| RRC Congestion | ≤ 1% | 0.01% | 0.86% | 0.26% | 0.07% | 0.03% |
| Circuit Switched RAB Congestion | ≤ 2% | 0.04% | 0.57% | 0.09% | 0.29% | 0.03% |
| **Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data-April** | | | | | | |
| | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| CSSR | ≥ 95% | 99.89% | 97.18% | 99.72% | 98.95% | 99.79% |
| RRC Congestion | ≤ 1% | 0.00% | 0.29% | 0.11% | 0.10% | 0.16% |
| Circuit Switched RAB Congestion | ≤ 2% | 0.01% | 0.40% | 0.07% | 0.39% | 0.20% |
| **Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-April** | | | | | | |
| CSSR | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total number of RRC attempts (A) | | 1065 | 1536 | 1835 | 645 | 1212 |
| Total number of RRC established (B) | | 1065 | 1524 | 1834 | 641 | 1212 |
| Call setup success rate (B/A*100) | ≥ 95% | 100.00% | 99.22% | 99.95% | 99.38% | 100.00% |
| %age blocked calls | | 0.00% | 0.78% | 0.05% | 0.62% | 0.00% |

| Audit Results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate -PMR data-April | | | | | | |
|---|---|---|---|---|---|---|
| | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total calls successfully established (A) (Number of voice RAB normally released) | | 32290866 | 140651903 | 83364022 | 13304082 | 131095310 |
| Total calls dropped after establishment (B) (Number of voice RAB abnormally released) | | 56335 | 1712587 | 333345 | 59051 | 206355 |
| Call drop rate (B/A*100) | ≤ 2% | 0.17% | 1.22% | 0.40% | 0.44% | 0.16% |
| Total no. of cells in the licensed service area (B) | | 15909 | 6264 | 17020 | 3999 | 19526 |
| No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A) | | 303 | 101 | 407 | 86 | 200 |
| Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100) | ≤ 3% | 1.91% | 1.61% | 2.39% | 2.16% | 1.02% |
| **Live measurement results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate - 3 Day data-April** | | | | | | |
| | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total calls successfully established (A) (Number of voice RAB normally released) | | 3809935 | 12314406 | 9186521 | 1657715 | 162690847 |
| Total calls dropped after establishment (B) (Number of voice RAB abnormally released) | | 6730 | 176058 | 34514 | 7786 | 300994 |
| Call drop rate (B/A*100) | ≤ 2% | 0.18% | 1.43% | 0.38% | 0.47% | 0.19% |
| Total no. of cells in the licensed service area (B) | | 14935 | 6249 | 17043 | 4002 | 19703 |
| No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A) | | 286 | 90 | 397 | 92 | 15 |
| Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100) | ≤ 3% | 1.92% | 1.43% | 2.33% | 2.30% | 0.08% |
| **Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-April** | | | | | | |
| Call drop rate | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total calls successfully established (A) (Number of voice RAB normally released) | | 1069 | 1497 | 1831 | 641 | 1212 |
| Total calls dropped after establishment (B) (Number of voice RAB abnormally released) | | 0 | 5 | 0 | 2 | 0 |
| Call drop rate (B/A*100) | ≤ 2% | 0.00% | 0.33% | 0.00% | 0.31% | 0.00% |

| Audit Results for Voice quality -PMR Data-April | | | | | | |
|---|---|---|---|---|---|---|
| Voice quality | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec | | NA | 147002626 | 65530728350 | 28647034000 | 311947369335 |
| Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec | | NA | 140539596 | 64714639806 | 28566584823 | 308781460760 |
| %Circuit Switch Voice Quality (CSV quality) (B/A*100) | ≥ 95% | 99.50% | 95.60% | 98.75% | 99.72% | 98.99% |
| **Live measurement results for Voice quality-3 Day data-April** | | | | | | |
| Voice quality | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec | | NA | 13860503 | 7115780756 | 3688637500 | 40293574723 |
| Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec | | NA | 13466849 | 7028226295 | 3677846296 | 39875681111 |
| %Circuit Switch Voice Quality (CSV quality) (B/A*100) | ≥ 95% | 99.50% | 97.16% | 98.77% | 99.71% | 98.96% |
| **Drive test results for Voice quality (Average of three drive tests) - DT data-April** | | | | | | |
| Voice quality | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec | | 1161911 | 319039 | 3049188 | 2943197 | 270043 |
| Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec | | 1133099 | 314792 | 2956372 | 2854818 | 259500 |
| %Circuit Switch Voice Quality (CSV quality) (B/A*100) | ≥ 95% | 97.52% | 98.67% | 96.96% | 97.00% | 96.10% |

| Audit Results for POI Congestion- PMR data-April | | | | | | |
|---|---|---|---|---|---|---|
| POI congestion | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total number of working POIs | | NA | 58 | 154 | 0 | 151 |
| No. of POIs not meeting benchmark | | NA | 0 | 1 | 0 | 0 |
| Total Capacity of all POIs (A) - in erlangs | | NA | 47350 | 161243 | 0 | 149964 |
| Traffic served for all POIs (B)- in erlangs | | NA | 29871 | 79887 | 0 | 60288 |
| POI congestion | ≤ 0.5% | NA | 0.00% | 0.00% | 0.00% | 0.00% |
| **Live Measurement Results for POI Congestion- 3 Day data-April** | | | | | | |
| POI congestion | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total number of working POIs | | NA | 58 | 154 | 0 | 151 |
| No. of POIs not meeting benchmark | | NA | 0 | 1 | 0 | 0 |
| Total Capacity of all POIs (A) - in erlangs | | NA | 47350 | 161221 | 0 | 140986 |
| Traffic served for all POIs (B)- in erlangs | | NA | 29102 | 71684 | 0 | 30325 |
| POI congestion | ≤ 0.5% | NA | 0.00% | 0.00% | 0.00% | 0.00% |

# 18 ANNEXURE – MAY-3G

| Audit Results for Network Availability- PMR data-May | | | | | | |
|---|---|---|---|---|---|---|
| | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| (Number of Node Bs in the network in the licensed service area | | 5121 | 2149 | 5461 | 1336 | 6196 |
| Sum of downtime (i.e. total outage time) of Node Bs | | 5042 | 17525 | 3034 | 17831 | 1241 |
| Node Bs downtime (not available for service) | ≤ 2% | 0.13% | 1.10% | 0.07% | 1.79% | 0.03% |
| Number of Node Bs having accumulated downtime of >24 hours in a month | | 14 | 36 | 9 | 0 | 1 |
| Worst affected Node Bs due to downtime | ≤ 2% | 0.27% | 1.68% | 0.16% | 0.00% | 0.02% |
| **Live Measurement Results for Network Availability- 3 Day live data-May** | | | | | | |
| | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| (Number of Node Bs in the network in the licensed service area | | 5008 | 2088 | 5458 | 1337 | 6196 |
| Sum of downtime (i.e. total outage time) of Node Bs | | 537 | 1618 | 223 | 1545 | 0 |
| Node Bs downtime (not available for service) | ≤ 2% | 0.15% | 1.08% | 0.06% | 1.60% | 0.00% |
| Number of Node Bs having accumulated downtime of >24 hours in a month | | 0 | 36 | 0 | 0 | 0 |
| Worst affected Node Bs due to downtime | ≤ 2% | 0.00% | 1.72% | 0.00% | 0.00% | 0.00% |

| Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data-May | | | | | | |
|---|---|---|---|---|---|---|
| | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| CSSR | ≥ 95% | 99.63% | 96.04% | 99.72% | 99.30% | 99.78% |
| RRC Congestion | ≤ 1% | 0.04% | 0.87% | 0.17% | 0.04% | 0.02% |
| Circuit Switched RAB Congestion | ≤ 2% | 0.05% | 0.57% | 0.07% | 0.13% | 0.02% |
| **Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data-May** | | | | | | |
| | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| CSSR | ≥ 95% | 99.61% | 96.76% | 99.74% | 99.38% | 99.81% |
| RRC Congestion | ≤ 1% | 0.06% | 0.87% | 0.12% | 0.02% | 0.14% |
| Circuit Switched RAB Congestion | ≤ 2% | 0.06% | 0.49% | 0.06% | 0.06% | 0.17% |
| **Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-May** | | | | | | |
| CSSR | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total number of RRC attempts (A) | | NA | NA | NA | NA | NA |
| Total number of RRC established (B) | | NA | NA | NA | NA | NA |
| Call setup success rate (B/A*100) | ≥ 95% | NA | NA | NA | NA | NA |
| %age blocked calls | | NA | NA | NA | NA | NA |

| Audit Results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate -PMR data-May | | | | | | |
|---|---|---|---|---|---|---|
| | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total calls successfully established (A) (Number of voice RAB normally released) | | 35342962 | 146123485 | 85284426 | 16045091 | 138054517 |
| Total calls dropped after establishment (B) (Number of voice RAB abnormally released) | | 61816 | 1797117 | 354236 | 69897 | 220706 |
| Call drop rate (B/A*100) | ≤ 2% | 0.17% | 1.23% | 0.42% | 0.44% | 0.16% |
| Total no. of cells in the licensed service area (B) | | 16309 | 6447 | 17024 | 3997 | 20033 |
| No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A) | | 300 | 101 | 391 | 80 | 193 |
| Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100) | ≤ 3% | 1.84% | 1.56% | 2.30% | 1.99% | 0.96% |
| Live measurement results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate - 3 Day data-May | | | | | | |
| | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total calls successfully established (A) (Number of voice RAB normally released) | | 3339367 | 13665562 | 9246824 | 1568402 | 167618877 |
| Total calls dropped after establishment (B) (Number of voice RAB abnormally released) | | 6113 | 157637 | 38992 | 6608 | 282157 |
| Call drop rate (B/A*100) | ≤ 2% | 0.18% | 1.15% | 0.42% | 0.42% | 0.17% |
| Total no. of cells in the licensed service area (B) | | 15857 | 6447 | 17003 | 3999 | 20033 |
| No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A) | | 306 | 95 | 436 | 78 | 11 |
| Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100) | ≤ 3% | 1.93% | 1.48% | 2.56% | 1.95% | 0.06% |
| Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-May | | | | | | |
| Call drop rate | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total calls successfully established (A) (Number of voice RAB normally released) | | NA | NA | NA | NA | NA |
| Total calls dropped after establishment (B) (Number of voice RAB abnormally released) | | NA | NA | NA | NA | NA |
| Call drop rate (B/A*100) | ≤ 2% | NA | NA | NA | NA | NA |

| Audit Results for Voice quality -PMR Data-May | | | | | | |
|---|---|---|---|---|---|---|
| **Voice quality** | **Benchmark** | **Airtel 3G** | **BSNL 3G** | **Idea 3G** | **TATA 3G** | **Vodafone 3G** |
| Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec | | NA | 152098148 | 62396941789 | 33209930500 | 327964010029 |
| Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec | | NA | 145390017 | 61603678405 | 33119485965 | 324771156399 |
| %Circuit Switch Voice Quality (CSV quality) (B/A*100) | ≥ 95% | 99.50% | 95.59% | 98.73% | 99.73% | 99.03% |
| **Live measurement results for Voice quality-3 Day data-May** | | | | | | |
| **Voice quality** | **Benchmark** | **Airtel 3G** | **BSNL 3G** | **Idea 3G** | **TATA 3G** | **Vodafone 3G** |
| Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec | | NA | 15390309 | 5961104033 | 3355135000 | 41927996930 |
| Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec | | NA | 14415006 | 5882870173 | 3346007179 | 41522223770 |
| %Circuit Switch Voice Quality (CSV quality) (B/A*100) | ≥ 95% | 99.50% | 93.66% | 98.69% | 99.73% | 99.03% |
| **Drive test results for Voice quality (Average of three drive tests) - DT data-May** | | | | | | |
| **Voice quality** | **Benchmark** | **Airtel 3G** | **BSNL 3G** | **Idea 3G** | **TATA 3G** | **Vodafone 3G** |
| Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec | | NA | NA | NA | NA | NA |
| Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec | | NA | NA | NA | NA | NA |
| %Circuit Switch Voice Quality (CSV quality) (B/A*100) | ≥ 95% | NA | NA | NA | NA | NA |

| Audit Results for POI Congestion- PMR data-May | | | | | | |
|---|---|---|---|---|---|---|
| POI congestion | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total number of working POIs | | NA | 58 | 150 | 0 | 150 |
| No. of POIs not meeting benchmark | | NA | 0 | 1 | #DI0V/0! | 0 |
| Total Capacity of all POIs (A) - in erlangs | | NA | 47350 | 160814 | 0 | 148273 |
| Traffic served for all POIs (B)- in erlangs | | NA | 29834 | 80513 | 0 | 136795 |
| POI congestion | ≤ 0.5% | NA | 0.00% | 0.00% | 0.00% | 0.00% |

| Live Measurement Results for POI Congestion- 3 Day data-May | | | | | | |
|---|---|---|---|---|---|---|
| POI congestion | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total number of working POIs | | NA | 58 | 153 | 0 | 148 |
| No. of POIs not meeting benchmark | | NA | 0 | 1 | 0 | 0 |
| Total Capacity of all POIs (A) - in erlangs | | NA | 47350 | 160761 | 0 | 147819 |
| Traffic served for all POIs (B)- in erlangs | | NA | 29711 | 80478 | 0 | 32640 |
| POI congestion | ≤ 0.5% | NA | 0.00% | 0.00% | 0.00% | 0.00% |

# 19 ANNEXURE – JUNE-3G

| Audit Results for Network Availability- PMR data-June | | | | | | |
|---|---|---|---|---|---|---|
| | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| (Number of Node Bs in the network in the licensed service area | | 5315 | 2099 | 5506 | 1336 | 6290 |
| Sum of downtime (i.e. total outage time) of Node Bs | | 6751 | 22533 | 2627 | 21708 | 1813 |
| Node Bs downtime (not available for service) | ≤ 2% | 0.17% | 1.44% | 0.06% | 2.18% | 0.04% |
| Number of Node Bs having accumulated downtime of >24 hours in a month | | 24 | 35 | 4 | 0 | 6 |
| Worst affected Node Bs due to downtime | ≤ 2% | 0.45% | 1.67% | 0.07% | 0.00% | 0.10% |
| **Live Measurement Results for Network Availability- 3 Day live data-June** | | | | | | |
| | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| (Number of Node Bs in the network in the licensed service area | | 5164 | 2088 | 5506 | 1336 | 6290 |
| Sum of downtime (i.e. total outage time) of Node Bs | | 263 | 2228 | 265 | 0 | 82 |
| Node Bs downtime (not available for service) | ≤ 2% | 0.07% | 1.48% | 0.07% | 0.00% | 0.02% |
| Number of Node Bs having accumulated downtime of >24 hours in a month | | 5 | 10 | 0 | 0 | 0 |
| Worst affected Node Bs due to downtime | ≤ 2% | 0.10% | 0.48% | 0.00% | 0.00% | 0.00% |

| Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data-June | | | | | | |
|---|---|---|---|---|---|---|
| | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| CSSR | ≥ 95% | 98.15% | 96.04% | 99.74% | 99.14% | 99.80% |
| RRC Congestion | ≤ 1% | 0.03% | 0.86% | 0.06% | 0.05% | 0.15% |
| Circuit Switched RAB Congestion | ≤ 2% | 0.07% | 0.57% | 0.03% | 0.22% | 0.17% |
| **Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data-June** | | | | | | |
| | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| CSSR | ≥ 95% | 99.81% | 96.76% | 99.74% | 99.32% | 99.81% |
| RRC Congestion | ≤ 1% | 0.00% | 0.87% | 0.27% | 0.02% | 0.14% |
| Circuit Switched RAB Congestion | ≤ 2% | 0.02% | 0.49% | 0.08% | 0.07% | 0.17% |
| **Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-June** | | | | | | |
| CSSR | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total number of RRC attempts (A) | | 1310 | 960 | 1408 | 412 | 1072 |
| Total number of RRC established (B) | | 1310 | 953 | 1407 | 412 | 1072 |
| Call setup success rate (B/A*100) | ≥ 95% | 100.00% | 99.27% | 99.93% | 100.00% | 100.00% |
| %age blocked calls | | 0.00% | 0.73% | 0.07% | 0.00% | 0.00% |

| Audit Results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate -PMR data-June | | | | | | |
|---|---|---|---|---|---|---|
| | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total calls successfully established (A) (Number of voice RAB normally released) | | 34163207 | 140651903 | 89199251 | 16261510 | 1596598189 |
| Total calls dropped after establishment (B) (Number of voice RAB abnormally released) | | 54892 | 1712587 | 334656 | 75766 | 2725306 |
| Call drop rate (B/A*100) | ≤ 2% | 0.16% | 1.22% | 0.38% | 0.47% | 0.17% |
| Total no. of cells in the licensed service area (B) | | 16905 | 6540 | 17045 | 3996 | 20232 |
| No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A) | | 281 | 101 | 332 | 82 | 198 |
| Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100) | ≤ 3% | 1.66% | 1.54% | 1.95% | 2.06% | 0.98% |
| Live measurement results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate - 3 Day data-June | | | | | | |
| | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total calls successfully established (A) (Number of voice RAB normally released) | | 3590562 | 13665562 | 9389511 | 1724036 | 167618877 |
| Total calls dropped after establishment (B) (Number of voice RAB abnormally released) | | 5862 | 157637 | 32564 | 7887 | 282157 |
| Call drop rate (B/A*100) | ≤ 2% | 0.16% | 1.15% | 0.35% | 0.46% | 0.17% |
| Total no. of cells in the licensed service area (B) | | 16440 | 6540 | 17164 | 3997 | 20232 |
| No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A) | | 274 | 95 | 308 | 92 | 172 |
| Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100) | ≤ 3% | 1.67% | 1.46% | 1.79% | 2.31% | 0.85% |
| Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-June | | | | | | |
| Call drop rate | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total calls successfully established (A) (Number of voice RAB normally released) | | 1310 | 955 | 1407 | 412 | 1072 |
| Total calls dropped after establishment (B) (Number of voice RAB abnormally released) | | 0 | 1 | 0 | 0 | 0 |
| Call drop rate (B/A*100) | ≤ 2% | 0.00% | 0.10% | 0.00% | 0.00% | 0.00% |

| Audit Results for Voice quality -PMR Data-June | | | | | | |
|---|---|---|---|---|---|---|
| **Voice quality** | **Benchmark** | **Airtel 3G** | **BSNL 3G** | **Idea 3G** | **TATA 3G** | **Vodafone 3G** |
| Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec | | NA | 147002626 | 71494118258 | 33992889500 | 4003331456925 |
| Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec | | NA | 140539596 | 70616204570 | 33894209073 | 3964500508678 |
| %Circuit Switch Voice Quality (CSV quality) (B/A*100) | ≥ 95% | 99.45% | 95.60% | 98.77% | 99.71% | 99.03% |
| **Live measurement results for Voice quality-3 Day data-June** | | | | | | |
| **Voice quality** | **Benchmark** | **Airtel 3G** | **BSNL 3G** | **Idea 3G** | **TATA 3G** | **Vodafone 3G** |
| Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec | | NA | 15390309 | 7211693600 | 3585857500 | 41927996930 |
| Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec | | NA | 14415006 | 7123044817 | 3575424174 | 41522223770 |
| %Circuit Switch Voice Quality (CSV quality) (B/A*100) | ≥ 95% | 99.50% | 93.66% | 98.77% | 99.71% | 99.03% |
| **Drive test results for Voice quality (Average of three drive tests) - DT data-June** | | | | | | |
| **Voice quality** | **Benchmark** | **Airtel 3G** | **BSNL 3G** | **Idea 3G** | **TATA 3G** | **Vodafone 3G** |
| Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec | | 385575 | 136958 | 2439842 | 379774 | 385575 |
| Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec | | 373071 | 133362 | 2366306 | 379330 | 373071 |
| %Circuit Switch Voice Quality (CSV quality) (B/A*100) | ≥ 95% | 96.76% | 97.37% | 96.99% | 99.88% | 96.76% |

| Audit Results for POI Congestion- PMR data-June | | | | | | |
|---|---|---|---|---|---|---|
| POI congestion | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total number of working POIs | | NA | 58 | 148 | 25 | 148 |
| No. of POIs not meeting benchmark | | NA | 1 | 1 | 0 | 0 |
| Total Capacity of all POIs (A) - in erlangs | | NA | 47896 | 160346 | 36914 | 147819 |
| Traffic served for all POIs (B)- in erlangs | | NA | 29164 | 79333 | 25921 | 60513 |
| POI congestion | ≤ 0.5% | NA | 0.00% | 0.00% | 0.00% | 0.00% |

| Live Measurement Results for POI Congestion- 3 Day data-June | | | | | | |
|---|---|---|---|---|---|---|
| POI congestion | Benchmark | Airtel 3G | BSNL 3G | Idea 3G | TATA 3G | Vodafone 3G |
| Total number of working POIs | | NA | 58 | 148 | 25 | 148 |
| No. of POIs not meeting benchmark | | NA | 1 | 1 | 0 | 0 |
| Total Capacity of all POIs (A) - in erlangs | | NA | 47896 | 151448 | 36914 | 147891 |
| Traffic served for all POIs (B)- in erlangs | | NA | 3081 | 77625 | 11125 | 5854 |
| POI congestion | ≤ 0.5% | NA | 0.00% | 0.00% | 0.00% | 0.00% |

# 20 ABBREVIATIONS

Following terms/abbreviations have been used in this report. This section provides meaning of the abbreviations used in the report.

1. TRAI – Telecom Regulatory Authority of India
2. QoS – Quality of Service
3. AMJ'16 – Refers to the quarter of April , May and June 2016
4. IMRB – Refers to IMRB International, the audit agency for this report
5. SSA – Secondary Switching Area
6. NOC – Network Operation Center
7. OMC – Operations and Maintenance Center
8. MSC – Mobile Switching Center
9. PMR – Performance Monitoring Reports
10. TCBH – Time Consistent Busy Hour
11. CBBH - Cell Bouncing Busy Hour
12. BTS – Base Transceiver Station
13. CSSR – Call Setup Success Rate
14. TCH – Traffic Channel
15. SDCCH – Standalone Dedicated Control Channel
16. CDR – Call Drop Rate
17. FER – Frame Error Rate
18. SIM – Subscriber Identity Module
19. GSM – Global System for Mobile
20. CDMA – Code Division Multiple Access
21. NA – Not Applicable
22. NC – Non Compliance
23. POI – Point of Interconnection
24. IVR – Interactive Voice Response
25. STD – Standard Trunk Dialing
26. ISD – International Subscriber Dialing

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# WEST ZONE

# TRAI AUDIT BROADBAND REPORT – GUJARAT - AUDIT OF AMJ QUARTER, 2016

Prepared By -

IMRB International | eTech

Prepared For-

TRAI

सत्यमेव जयते

Telecom Regulatory Authority of India

(IS/ISO 9001-2008 Certified Organisation)

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# 1. INTRODUCTION

## 1.1 About TRAI

TRAI's mission is to create and nurture conditions for growth of telecommunications in the country in a manner and at a pace that will enable India to play a leading role in the emerging global information society. One of the main objectives of TRAI is to provide a fair and transparent policy environment which promotes a level playing field and facilitates fair competition.

In pursuance of above objective, TRAI has been issuing regulations, order and directives to deal with the issues or complaints raised by the operators as well as the consumers. These regulations, order and directives have helped to nurture the growth of multi operator multi service - an open competitive market from a government owned monopoly. Also, the directions, orders and regulations issued cover a wide range of subjects including tariff, interconnection and quality of service as well as governance of the Authority.

TRAI initiated a regulation - The Standards of Quality of Service of Basic Telephone Service (Wire line) and Cellular Mobile Telephone Service Regulations, 2009 (7 of 2009) dated 20th March, 2009, the "Standards of Quality of Service for Wireless Data Services Regulations, 2012 dated 4th December 2012, and the "Quality of Service of Broadband Service Regulations", 2006 (11 of 2006) dated 6th October, 2006 that provide the benchmarks for the parameters on customer perception of service to be achieved by service provider.

In order to assess the above regulations, TRAI has commissioned a third party agency to conduct the audit of the service providers and check the performance of the operators on the various benchmarks set by Telecom Regulatory Authority of India (TRAI).

## 1.2 OBJECTIVES

The primary objective of the Audit module is to:

- Audit and Assess the Quality of Services being rendered by Basic (Wireline), Cellular Mobile (Wireless), and Broadband service against the parameters notified by TRAI. (The parameters of Quality of Services (QoS) have been specified by in the respective regulations published by TRAI).

## 1.3 COVERAGE

The broadband audit was conducted in GUJARAT circle. For BSNL, a geographical spread among the SDCAs and POPs was maintained. For other operators, the audit was conducted for all SDCAs at overall level.


*Image Source: Internet*

## 1.4 AUDIT PROCESS AND OPERATOR SELECTION

As per TRAI guidelines, the Broadband Audit for a circle is conducted once every year.

- The operators have been assimilated as per TRAI guidelines given in QoS tender document 2015 and latest list of licensees (with more than 10,000 subscriber in their LSAs) provided by TRAI.

- To conduct the audit, IMRB auditors contacted the broadband operators given in the list below to conduct the audit in GUJARAT circle for the AMJ 2016 quarter.

| |
|---|
| Airtel |
| BSNL |
| GTPL |
| Hathway |
| IndusInd Media |
| Pacenet |
| Reliance |

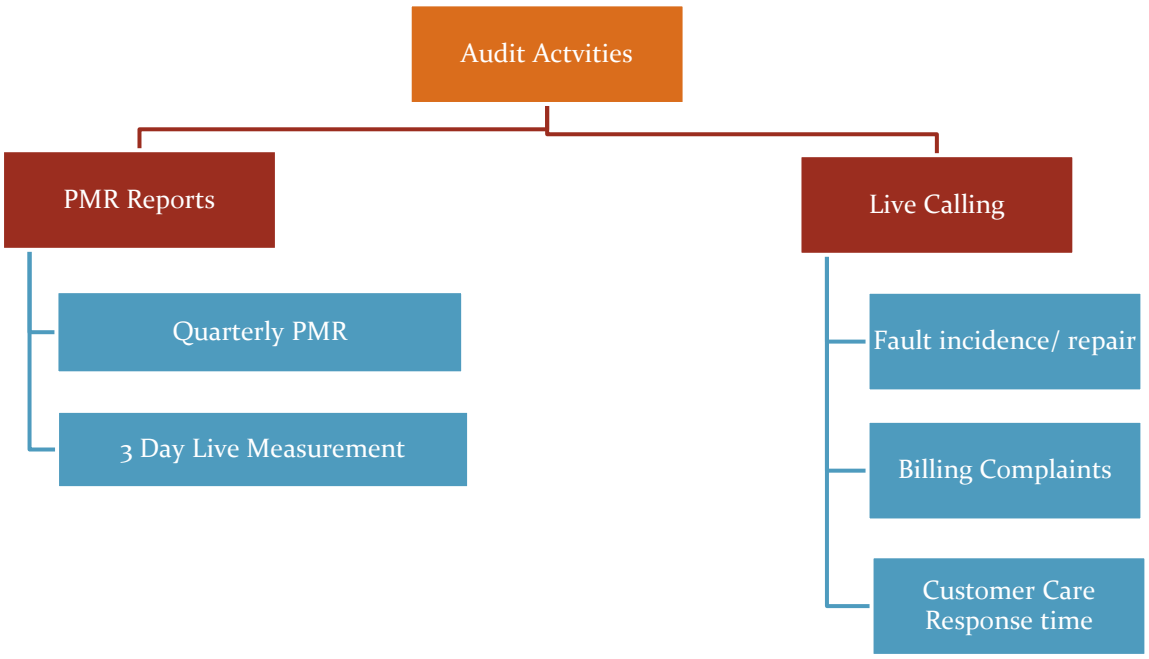
| |
|---|
| Spidigo |
| TATA |
| Tikona |
| You Broadband |

- The PMR was generated from the raw data pertaining to April, May and June 2016 (AMJ'16), which was extracted by auditor from the operator's systems during the audit conducted in the month of July 2016.

- Live calling activity was carried out during the period of June 2016. The data considered for live calling was for the month prior to the live calling month. In this round of audit, May 2016 data was considered for live calling for all operators.

- 3 day live measurement activity was carried out on working days during the month of June 2016. The data for the last three working days from the date of live measurement was extracted from operator's systems and audited by the auditors.

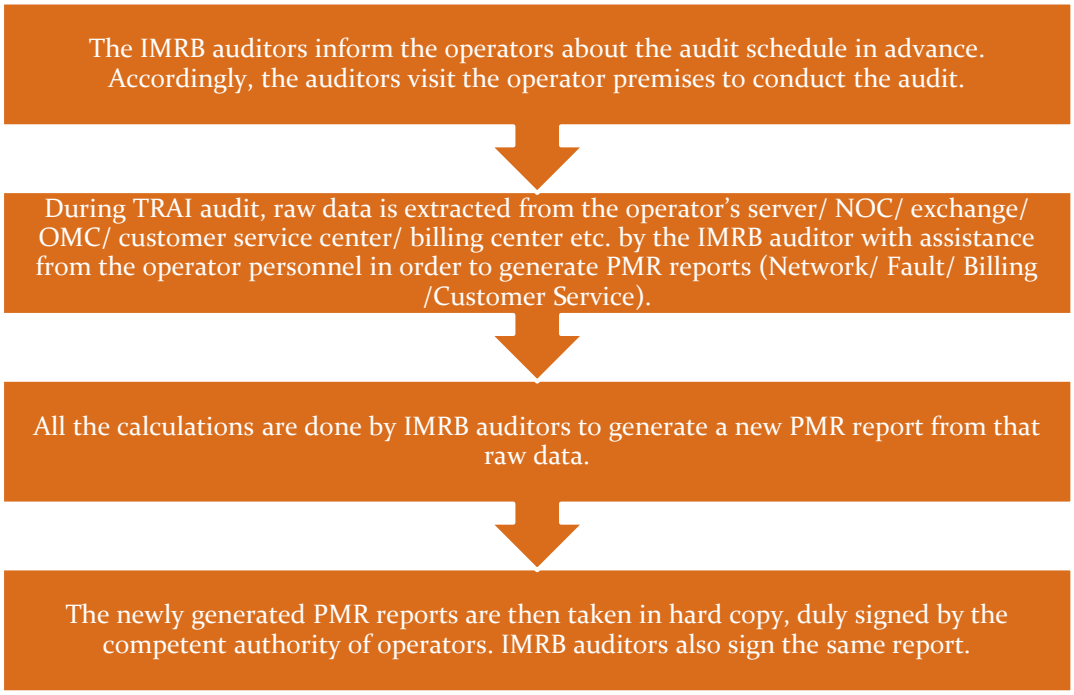
## 1.5 FRAMEWORK USED



### 1.5.1 PMR REPORTS - SIGNIFICANCE AND METHODOLOGY

The significance of PMR or Performance Monitoring Reports is to assess the various Quality of Service (QoS) parameters involved in the Broadband services, which indicate the overall health of service for an operator.

To verify the QoS performance of the operators, TRAI has appointed IMRB as their auditor in West Zone to conduct QoS audit of operators. The steps involved in the audit have been given below.




The raw data extracted is then used to generate PMR reports in the following formats.

- Quarterly PMR
- 3 Day Live Measurement Data

Let us understand these formats in detail.

This report has been prepared from the raw data extracted for the period of AMJ'16 during June 2016.

#### 1.5.1.1 QUARTERLY PMR REPORT – PARAMETERS REVIEWED

The main purpose of quarterly PMR report is to verify the following key QoS parameters on quarterly basis as per the methodology stated above in section 1.4.

- Service Provisioning
- Fault incidence/clearance related statistic
- Billing Performance (Metering and billing credibility)
- Resolution of billing complaints
- Response time to customer for assistance
- Bandwidth Utilization
- Broadband download speed
- Service Availability/ Uptime
- Network Latency/ Packet Loss

### 1.5.1.2 3 DAY LIVE MEASUREMENT - SIGNIFICANCE AND METHODOLOGY

The main purpose of 3 day live measurement is to evaluate the following parameters on intraday basis. The auditors visit the sample exchanges (in case of BSNL) and main exchanges (in case of other operators) to collect the 3 day live data for the following parameters.

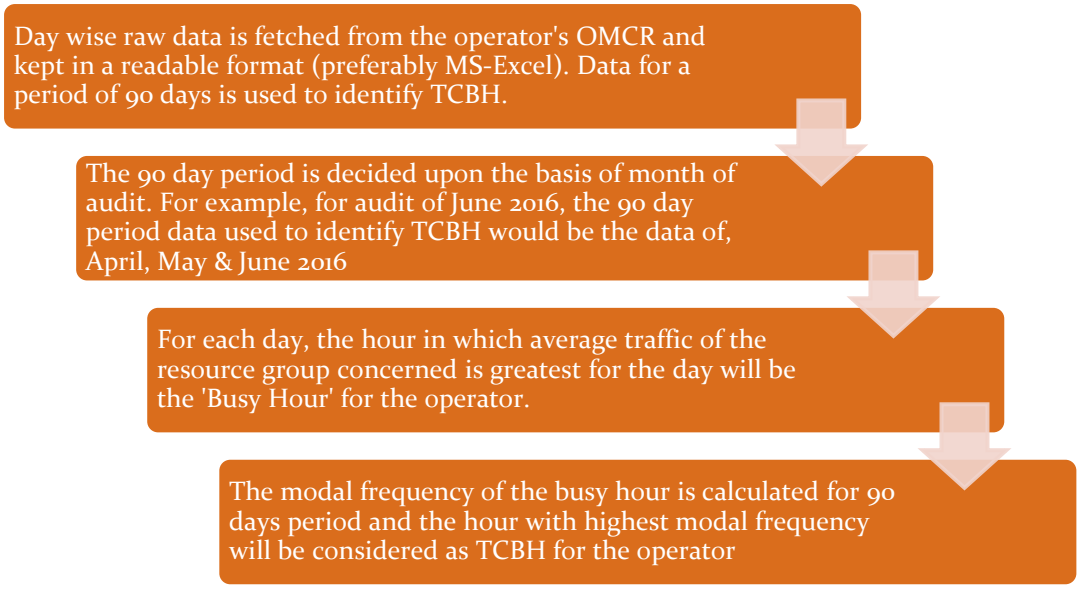
- Bandwidth Utilization
- Broadband download speed
- Service Availability/ Uptime
- Network Latency/ Packet Loss

While the quarterly PMR report provides an overall view of the performance of QoS parameters, the 3 day live data helps looking at intraday performance on the above given parameters. All the calculations are then done on the basis of that raw data of 3 days.

### 1.5.1.3 TCBH – SIGNIFICANCE AND SELECTION METHODOLOGY

As per Quality of Service of Broadband Service Regulations", 2006 (11 of 2006), Time Consistent Busy Hour" or "TCBH" means the one hour period starting at the same time each day for which the average traffic of the resource group concerned is greatest over the days under consideration and such Time Consistent Busy Hour shall be established on the basis of analysis of traffic data for a period of ninety days.

Step by step procedure to identify TCBH for an operator:




During audit, the auditors identified following TCBHs from the raw data collected from the operators for the quarter of AMJ'16.

| Airtel | BSNL | GTPL | Hathway | Indusind Media | pacenet | Reliance | spidigo | TATA | Tikona | You Broadband |
|---|---|---|---|---|---|---|---|---|---|---|
| 11:00 - 12:00 | 18:00 - 19:00 | 15:00 - 16:00 | 18:00 - 19:00 | 19:00-20:00 | 18:00 - 19:00 | 19:00-20:00 | 19:00-20:00 | 18:00 - 19:00 | 18:00 - 19:00 | 18:00 - 19:00 |

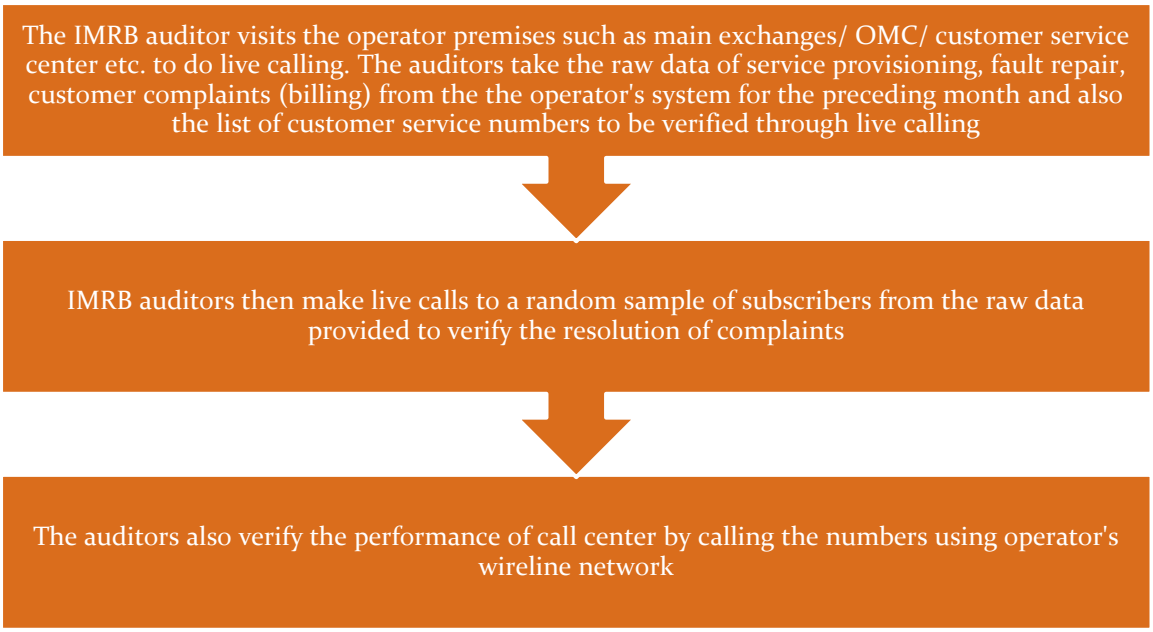
The data for network parameters has been taken as per the TCBH identified by the auditor for the operators.

### 1.5.2 LIVE CALLING - SIGNIFICANCE AND METHODOLOGY

The main purpose of live calling is to verify the performance of following parameters by doing test calls to the subscribers/ specific numbers.

- Service Provisioning
- Fault incidence/clearance related statistic
- Resolution of billing complaints
- Response time to customer for assistance

The process of conducting live calling has been stated below.




Let us now discuss the methodology of live calling for each parameter in detail.

#### 1.5.2.1 SERVICE PROVISIONING

Live calling for service provisioning is done to verify the following.

- Number of connections provided in 15 days from customer request

**Live Calling Process:**

- Auditors request the operator to provide the database of all the subscribers who requested for a new connection in one month prior to IMRB auditor visit
- 100 Calls per service provider are made to customers or in case of BSNL, 10% or 30 per SDCA by randomly selecting from the database provided by operator
- Auditors check and record whether the connection was provided to customers within the timeframes as mentioned in the benchmark

**Benchmark:**

- New connections provided within 15 days: 100%

### 1.5.2.2 FAULT CLEARANCE

Live calling for fault clearance is done to verify the following.

- Fault repair by next working day
- Fault repair within 3 working days

**Live Calling Process:**

- Auditors request the operator to provide the database of all the subscribers who reported Faults in one month prior to IMRB auditor visit
- Calls are made to up to 10% or 100 complainants, whichever is less, per service provider or in case of BSNL, if there are more than 1 SDCAs selected for the sample, 10% or 30 complainants per sample SDCA by randomly selecting from the list provided by operator.
- Auditors check and record whether the fault was corrected within the timeframes as mentioned in the benchmark

**Benchmarks:**

- Fault repair by next working day: =>90%
- Fault repair within 3 working days: =>99%

### 1.5.2.3 RESOLUTION OF BILLING COMPLAINTS

Live calling is done to verify Resolution of billing complaints within stipulated time. The process for this parameter is stated below.

- Auditors request the operator provided the database of all the subscribers who reported billing complaints in one month prior to IMRB auditor visit. In case of BSNL, data for the complaints from the subscribers belonging to the sample exchanges is requested specifically
- A sample of 10% or 100 complainants, whichever is less, is selected randomly from the list provided by operator
- Calls are made by auditors to the sample of subscribers to check and record whether the complaint was resolved within the timeframes as mentioned in the benchmark.

**Benchmarks**:

98% complaints resolved within 4 weeks

### 1.5.2.4 RESPONSE TIME TO CUSTOMER FOR ASSISTANCE

Live calling is done to verify response time for customer assistance is done to verify the performance of call center in terms of

- % age of calls answered by operator ( voice to voice) within 60 seconds: In 60% of the cases or more
- % age of calls answered by operator (voice to voice) within 90 seconds: In 80% of the cases or more

The process for this parameter is stated below.

- Overall sample size was 100 calls per service provider per circle at different points of time, evenly distributed across the selected exchanges – 50 calls between 1000 HRS to 1300 HRS and 50 calls between 1500 HRS to 1700 HRS.
- Time to answer the call by the operator was assessed from the time interviewer pressed the requisite button for being assisted by the operator.
- All the supplementary services that have any kind of human intervention are to be covered here. It also includes the IVR assisted services.

## 1.6 COLOUR CODE TO READ THE REPORT

**Not Meeting the benchmark**

## 1.7 AUDIT METHODOLOGY

As per audit tender, following table explains the audit methodology for Broadband services. Here, a YES signifies that the mentioned parameter gets audited by the given audit method (PMR/ Live Measurement/ Live Calling).

| | Parameters | Quarterly PMR Data | 3 day live measurement | Live calling |
|---|---|---|---|---|
| 1 | **Service Provisioning/ Activation time** | YES | | YES |
| **2** | **Fault Repair/ Restoration Time** | YES | | YES |
| **3** | **Billing Performance** | | | |
| (i) | Billing Complaints per 100 Bills issued | YES | | |
| (ii) | %age of billing complaints resolved in four weeks | YES | | Yes |
| (iii) | Refund of deposits after closure within 60 days | YES | | |
| **4** | **Response time to the customer for assistance(Voice to Voice)** | | | |
| (i) | *Within 60 seconds > 60%* | YES | | YES |
| (ii) | *Within 90 seconds > 80%* | YES | | YES |
| **5** | **Bandwidth Utilization/ Throughput:** | | | |
| | *A) Bandwidth Utilization* | | | |
| - | POP to ISP gateway Node [Intra – network] Links | YES | YES | |
| - | ISP Gateway Node to IGSP / NIXI Node upstream Link(s) for international connectivity | YES | YES | |
| | *B) Broadband Connection Speed (Download)* | YES | YES | |
| **6** | **Service Availability/Uptime** | YES | YES | |
| **7** | **Packet Loss** | YES | YES | |
| **8** | **Network Latency for wired broadband access)** | | | |
| (i) | *User reference point at POP / ISP Gateway Note to International Gateway (IGSP/NIXI)* | YES | YES | |
| (ii) | *User reference point at ISP Gateway Node to International nearest NAP port abroad ( Satellite)* | YES | YES | |
| (iii) | *User reference point at ISP Gateway Node to International nearest NAP port abroad ( Satellite)* | YES | YES | |

## 1.8 SAMPLING METHODOLOGY

- As per the sampling methodology prescribed by TRAI, all exchanges over 10% of SDCA or 10 SDCAs whichever is more in a licensed service area should be selected for the purpose of audit, live calling and live measurement. However apart from BSNL, all exchanges covered for other operators.

Below list of SDCAs covered during the audit for BSNL in Gujarat Circle:-

| SSA | SDCA | SSA | SDCA |
|---|---|---|---|
| Ahmedabad | AMD | Palanpur | PNP |
| Bhuj | BUJ | Surat | SRT |
| Jamnagar | JMN | Bharuch | BCH |
| Nadiad | NAD | Godhra | GDR |
| Surendranagar | SEN | Mehsana | MEH |
| Valsad | VAL | Rajkot | RAJ |
| Amreli | AMR | Vadodara | VAD |
| Bhavnagar | BVN | Himatnagar | HMT |
| Junagadh | JND | | |

## 1.9 EXECUTIVE SUMMARY

### 1.9.1 PMR QUARTERLY DATA – AMJ'16

| Parameters | Benchmarks | Airtel | BSNL | GTPL | Hathway | Indusind Media | pacenet | Reliance | spidigo | TATA | Tikona | You Broadband |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Service provsioning uptime | | | | | | | | | | | | |
| Percentage connections provided within 15 days | 100% | 100.00% | 100.00% | 92.59% | 98.63% | 92.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 99.60% |
| Fault repair restoration time | | | | | | | | | | | | |
| Percentage faults repaired by next working days | ≥ 90% | 97.92% | 92.83% | 94.67% | 87.51% | 100.00% | 77.11% | 100.00% | 92.22% | 92.55% | 91.47% | 90.26% |
| Percentage faults repaired within three working days | ≥ 99% | 99.91% | 100.00% | 99.00% | NP | 100.00% | 97.63% | 100.00% | 99.41% | 98.96% | 99.47% | 99.04% |
| Billing performance | | | | | | | | | | | | |
| Billing complaints per 100 bills issued | < 2% | 0.04% | NP | NA | NA | NA | NA | 0.12% | NA | NP | 0.55% | NA |
| %age of billing complaints resolved in 4 weeks | 100% | 100.00% | NP | NA | NA | NA | NA | 100.00% | NA | NP | NP | NA |
| %age cases in which refund of deposits after closure was made in 60 days | 100% | 100.00% | 100.00% | NA | NA | NA | NA | NA | NA | NP | NP | NA |
| Customer care/helpline assessment (Voice to Voice) | | | | | | | | | | | | |
| Percentage calls answered within 60 seconds | ≥ 60% | 41.36% | 68.50% | 92.37% | 95.29% | 100.00% | NA | 94.75% | 59.69% | 98.22% | 62.07% | 88.78% |
| Percentage calls answered within 90 seconds | ≥ 80% | 46.80% | 77.69% | 99.93% | 99.94% | 99.90% | NA | 95.51% | 72.24% | 98.22% | 81.54% | 95.55% |
| Bandwidth utilisation/Throughput | | | | | | | | | | | | |
| Percentage bandwidth utilised on upstream links | < 80% | NP | 77.00% | 85.23% | 47.60% | 49.20% | 75.00% | 41.00% | 73.00% | 75.00% | 66.70% | 77.20% |
| Broadband download speed | ≥ 80% | NP | 100.00% | 99.35% | 88.30% | 87.00% | 96.00% | 93.26% | NDR | 92.30% | 94.60% | 90.10% |
| Service availability/uptime | ≥ 98% | 100.00% | 99.36% | 100.00% | 99.90% | 100.00% | 98.90% | 99.81% | 100.00% | 100.00% | 100.00% | 100.00% |
| Packet loss | < 1% | 0.32% | 0.00% | 0.00% | 0.00% | 0.00% | 0.40% | 0.54% | 0.00% | 0.00% | 0.00% | 0.00% |
| Network Latency | | | | | | | | | | | | |
| POP/ISP Node to NIXI | < 120 msec | 42 | NP | NA | 66 | NA | NA | 1 | NA | 100 | NA | 10 |
| ISP node to NAP port (Terrestrial) | < 350 msec | 62 | NP | NA | 145 | NA | NA | 7 | NA | 65 | NA | 273 |

**NA:** Parameters not applicable for the operators.

The objective assessment of Quality of Service (QoS) carried out by IMRB gives an insight into the overall broadband performance of various operators with a parameter wise performance evaluation as compared to TRAI benchmark.

Following are the parameter wise observations for the operators in GUJARAT circle.

### 1.9.1 SERVICE PROVISIONING/ ACTIVATION TIME

- As per audit, all operators met the benchmark for providing new connections within 15 days, except GTPL, Hathway, IndusInd and You Broadband.

### 1.9.2 FAULT REPAIR/ RESTORATION

- The benchmark of repairing 90% faults within the next day was not met by Hathway and Pacenet.
- The benchmark of repairing 99% faults within next three days of receiving complaints was not met by GTPL, Pacenet and TATA.

### 1.9.3 BILLING PERFORMANCE

- As per audit, Reliance and Tikona met the benchmark for metering and billing credibility.
- Reliance met the benchmark for resolution of billing complaints within 4 weeks.

**NP: BSNL and TATA did not participate in the audit for the billing performance.**

**NA: Subscribers of GTPL, Hathway, Indus, Spidigo, Pacenet and You are not applicable because they are under pre-paid service.**

### 1.9.4 RESPONSE TIME TO CUSTOMER FOR ASSISTANCE

- All operators met the benchmark for answering 60% calls within 60 seconds and 80% calls within 90 seconds as per audit, except Spidigo. Whereas BSNL did not meet for 90 seconds.

### 1.9.5 BANDWIDTH UTILIZATION AND THROUGHPUT

**NP: Not Participated, Airtel did not submit the data.**

- All operators met the benchmark for bandwidth utilized on upstream links during audit except GTPL.
- All operators met the benchmark for download speed.
- All operators met the benchmark for service availability time as per audit.
- All operators met the benchmark for packet loss.

### 1.9.6 NETWORK LATENCY

- All operators met the benchmark for Network Latency parameters.

## 1.10 LIVE MEASUREMENT

| Parameters | Benchmarks | Airtel | BSNL | GTPL | Hathway | Indusind Media | pacenet | Reliance | spidigo | TATA | Tikona | You Broadband |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bandwidth utilisation/Throughput | | | | | | | | | | | | |
| Percentage bandwidth utilised on upstream links | < 80% | NP | 72.00% | 86.60% | 58.00% | 50.00% | 75.00% | 50.83% | 91.00% | 78.00% | 70.00% | 72.00% |
| Broadband download speed | ≥ 80% | NP | 100.00% | 99.20% | 85.60% | 90.20% | 96.20% | 95.25% | NDR | 93.10% | 95.30% | 91.20% |
| Service availability/uptime | ≥ 98% | 100.00% | 99.00% | 100.00% | 100.00% | 99.99% | 99.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| Packet loss | < 1% | 0.30% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.55% | 0.00% | 0.00% | 0.00% | 0.00% |
| Network Latency | | | | | | | | | | | | |
| POP/ISP Node to NIXI | < 120 msec | 42 | NP | NA | 66 | NA | NA | 1 | NA | 100 | NA | 10 |
| ISP node to NAP port (Terrestrial) | < 350 msec | 62 | NP | NA | 145 | NA | NA | 7 | NA | 65 | NA | 273 |

### 1.10.1 BANDWIDTH UTILIZATION AND THROUGHPUT

**NP: Not Participated, Airtel did not submit the data.**

- GTPL and Spidigo failed to meet the benchmark for bandwidth utilized on upstream links during live measurement.
- All operators met the benchmark of providing committed broadband download speed as per live measurement except You Broadband.
- All operators met the benchmark for service availability time as per live measurement.
- All operators met the benchmark for packet loss.

### 1.10.2 NETWORK LATENCY

During live measurement, all operators met the benchmark for network latency parameters.

**NA: Parameters not applicable for the operators.**

## 1.11 LIVE CALLING

| Parameters | Benchmarks | Airtel | BSNL | GTPL | Hathway | Indusind Media | pacenet | Reliance | spidigo | TATA | Tikona | You Broadband |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Service provsioning uptime | | | | | | | | | | | | |
| Percentage connections provided within 15 days | 100% | 100.00% | 100.00% | 98.00% | 99.00% | 80.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 98.00% |
| Fault repair restoration time | | | | | | | | | | | | |
| Percentage faults repaired by next working days | ≥ 90% | 100.00% | 98.00% | 100.00% | 67.00% | 100.00% | 76.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| Percentage faults repaired within three working days | ≥ 99% | 100.00% | 99.00% | 100.00% | 76.00% | 100.00% | 86.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| Billing performance | | | | | | | | | | | | |
| %age of billing complaints resolved in 4 weeks | 100% | 100.00% | 80.00% | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Customer care/helpline assessment (Voice to Voice) | | | | | | | | | | | | |
| Percentage calls answered within 60 seconds | ≥ 60% | 96.99% | 89.42% | 98.13% | 100.00% | 98.66% | 96.00% | 100.00% | 85.07% | 100.00% | 100.00% | 69.86% |
| Percentage calls answered within 90 seconds | ≥ 80% | 98.90% | 92.57% | 100.00% | 100.00% | 99.35% | 100.00% | 100.00% | 87.12% | 100.00% | 100.00% | 87.70% |

**NA: Parameters not applicable for the operators.**

### 1.11.1 SERVICE PROVISIONING/ ACTIVATION TIMES

- As per live calling, all operators met the benchmark of providing 100% new connections within the TRAI stipulated timeline of 15 days, except GTPL, Hathway, IndusInd and You Broadband.

### 1.11.2 FAULT REPAIR/ RESTORATION

- All operators the benchmark of repairing 90% faults within next working day and benchmark for repairing 99% faults within 3 days, except Hathway and Pacenet

### 1.11.3 BILLING PERFORMANCE

- BSNL failed to meet the benchmark for resolution of billing complaints within 4 weeks

**NA: operator's live calling for 'resolution of billing complaints' has not been conducted due to very low/ zero base of billing complaints for the operators.**

**NA: Subscribers of GTPL, Hathway, Indus, Spidigo, Pacenet and You are not applicable because they are under pre-paid service.**

### 1.11.4 RESPONSE TIME TO CUSTOMER FOR ASSISTANCE

- As per live calling, BSNL, You Broadband and Spidigo failed to meet the benchmarks for call answered within 60 seconds.
- As per live calling, You Broadband failed to meet the benchmarks for call answered within 60 seconds and 90 Seconds.

# 2. CRITICAL FINDINGS

### Service Provisioning/ Activation Time

- As per audit, all operators met the benchmark for providing new connections within 15 days, except GTPL, Hathway, IndusInd and You Broadband.

### Fault Repair/ Restoration

- The benchmark of repairing 90% faults within the next day was not met by Hathway and Pacenet.
- The benchmark of repairing 99% faults within next three days of receiving complaints was not met by GTPL, Pacenet and TATA.

### Billing Performance

- As per audit, Reliance, Airtel and Tikona met the benchmark for metering and billing credibility.
- Reliance met the benchmark for resolution of billing complaints within 4 weeks.

**NP: BSNL, Tikona and TATA did not participate in the audit for the billing performance.**

**NA: Subscribers of GTPL, Hathaway, IndusInd, Spidigo, Pacenet and You Broadband are not applicable because they are under pre-paid service.**

### Response time to customer for assistance

- All operators met the benchmark for answering 60% calls within 60 seconds and 80% calls within 90 seconds as per audit, except Spidigo. Whereas BSNL did not meet for 90 seconds.

### Bandwidth Utilization and Throughput

**NP: Not Participated, Airtel did not submit the data.**

- All operators met the benchmark for bandwidth utilized on upstream links during audit except GTPL.
- All operators met the benchmark for download speed.
- All operators met the benchmark for service availability time as per audit.
- All operators met the benchmark for packet loss.

### Network Latency

**NP: Not Participated, BSNL did not submit the data.**

- All operators met the benchmark for Network Latency parameters.

## Live calling

### Service Provisioning/ Activation Times

- As per live calling, all operators met the benchmark of providing 100% new connections within the TRAI stipulated timeline of 15 days, except GTPL, Hathway, IndusInd and You Broadband.

### Fault Repair/ Restoration

- All operators  the benchmark of repairing 90% faults within next working day and benchmark for repairing 99% faults within 3 days, except Hathway and Pacenet

### Billing Performance

- BSNL failed to meet the benchmark for resolution of billing complaints within 4 weeks

**NA: operator's live calling for 'resolution of billing complaints' has not been conducted due to very low/ zero base of billing complaints for the operators.**

**NA: Subscribers of GTPL, Hathway, IndusInd, Spidigo, Pacenet and You Broadband are not applicable because they are under pre-paid service.**

### Response time to customer for assistance

- As per live calling, BSNL, You Broadband and Spidigo failed to meet the benchmarks for call answered within 60 seconds.
- As per live calling, You Broadband failed to meet the benchmarks for call answered within 60 seconds and 90 Seconds.

# 3. DETAILED FINDINGS - COMPARISON BETWEEN PMR DATA AND LIVE MEASUREMENT/ CALLING DATA

## 3.1 SERVICE PROVISIONING/ ACTIVATION TIME

### 3.1.1 PARAMETER EXPLANATION

#### 3.1.1.1 AUDIT PROCEDURE

IMRB Auditors verified and collected data pertaining to number of applications received at the service provider's level in the following time frames:-

- Number of applications received at the service provider's level
- Number of connections provided within 15 days
- Number of connections provided after 15 days

**Live Calling: -**

- At least 10% of the subscribers who had requested for new connections in month prior to Audit were called to check whether connection was provided in 15 days

Data for the parameter was extracted from OMC (Operations and Maintenance Center) of the operators.

#### 3.1.1.2 COMPUTATIONAL METHODOLOGY

- Technically Non Feasible (TNF) cases such as unavailability of Broadband infrastructure/ equipment in the Area or Spare Capacity i.e. Broadband Ports including equipment to be installed at the customer premises for activating Broadband connection were excluded from the calculation of this parameter.

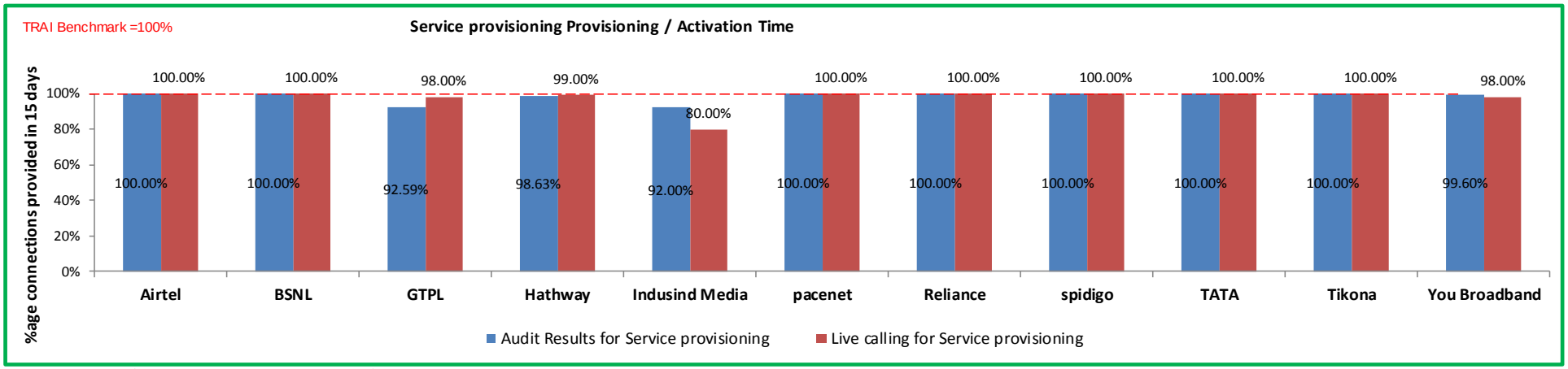
- Also, problems relating to customer owned equipment such as PC, LAN Card/ USB Port and internal wiring or non-availability of such equipment were excluded from the calculation of this parameter.

**Percentage connections provided within X working days = *No of connections provided within X working days/ Total number of connections registered during the period * 100***

### 3.1.1.3 BENCHMARK

100 % cases in =<15 working days.

## 3.1.2 DETAILED FINDINGS - SERVICE PROVISONING




*Data Source: OMC (Operations and Maintenance Center) of the operators*

As per audit, all operators met the benchmark for providing new connections within 15 days. However, during live calling it was observed that GTPL, Hathway, Indus Media and You Broadband failed to meet the benchmark of providing 100% new connections within the TRAI stipulated timeline of 15 days.

## 3.2 FAULT REPAIR/ RESTORATION TIME

### 3.2.1 PARAMETER EXPLANATION

#### 3.2.1.1 AUDIT PROCEDURE

IMRB Auditors to verify and collect data pertaining to number of fault received and also number of faults cleared at the service provider's level in the following time frames:-

- Number of faults cleared within 24 hours
- Number of cleared in more than 1 day but less than 3 days
- Number of cleared in more than 3 days

**Live calling: -**

- Live calling is done to verify 'Fault repair by next working day', 'Fault repair within 3 working days' and 'Fault repair in more than 3 working days'
- Interviewers ensure that operator provided a list of all the subscribers who reported Faults in one month prior to IMRB staff visit
- Calls are made to up to 10% or 100 complainants, whichever is less, per service provider or in case of BSNL, if there are more than 1 SDCAs selected for the sample, 10% or 30 complainants per sample SDCA by randomly selecting from the list provided by operator.
- Auditors check and record whether the fault was corrected within the timeframes as mentioned in the benchmark

Data for the parameter was extracted from OMC (Operations and Maintenance Center) of the operators.

#### 3.2.1.2 COMPUTATIONAL METHODOLOGY

- The time period for fault repair starts from the time when the fault is reported to the service provider either through customer care help line or in person by the subscriber

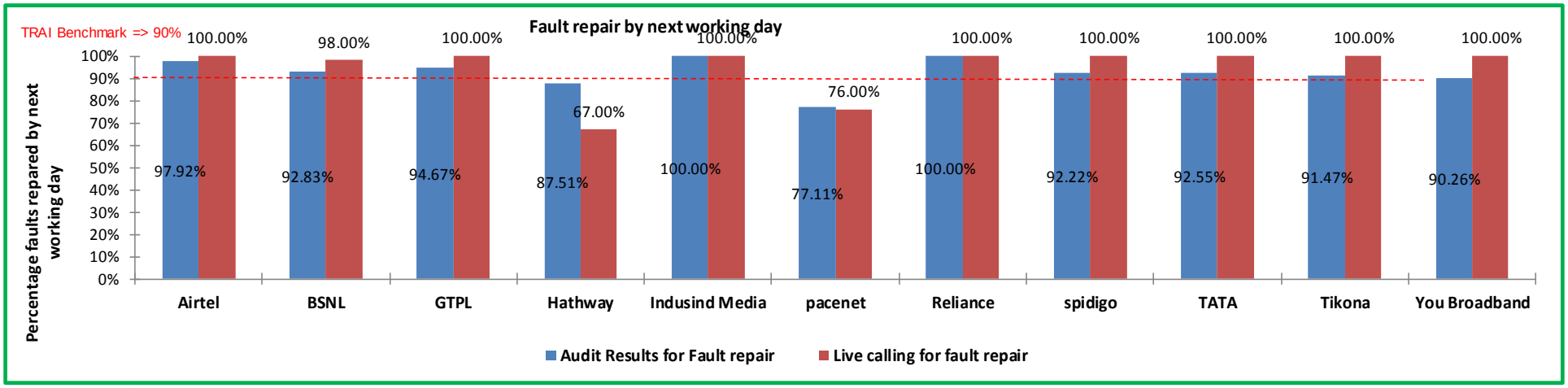
- Only the complaints registered till the close of the business hours of the day are to be taken into account. All the complaints registered after the business hours are to be considered as being registered in the next day business hours

**Fault incidence = *(Total no of faults repaired in X working days /Total number of faults reported during the period)*100***

### 3.2.1.3 BENCHMARK

- By next working day: => 90% and within 3 working days: => 99%.

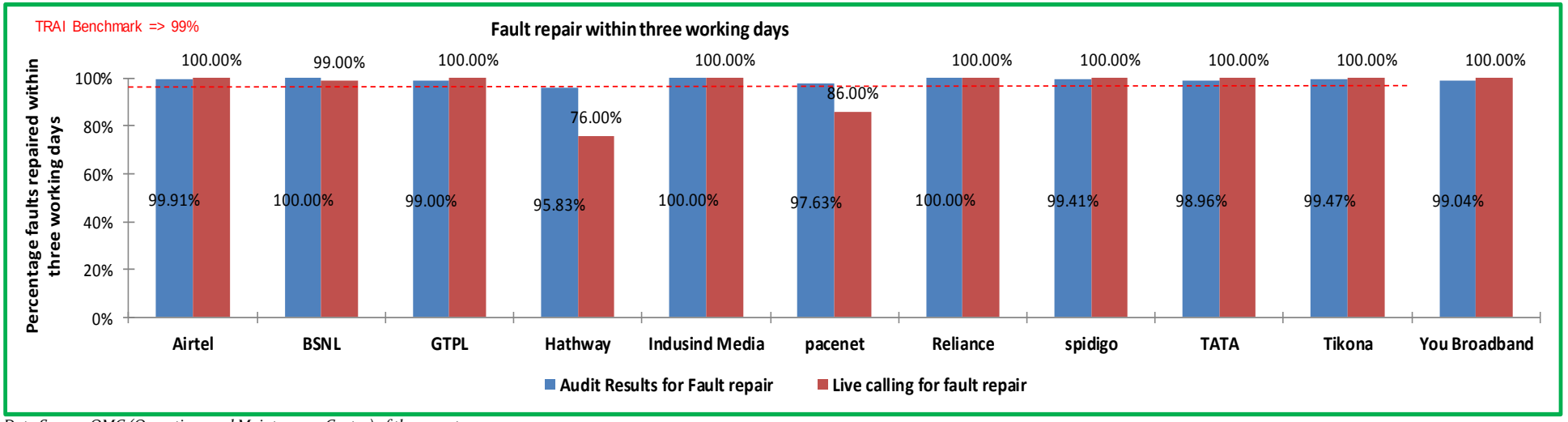
## 3.2.2 DETAILED FINDINGS - FAULT REPAIR WITHIN NEXT WORKING DAY




*Data Source: OMC (Operations and Maintenance Center) of the operators*

Hathway and Pacenet failed to meet the benchmark for the parameter as per audit as well as during live calling.

### 3.2.3 DETAILED FINDINGS - FAULT REPAIR WITHIN 3 WORKING DAYS




*Data Source: OMC (Operations and Maintenance Center) of the operators*

All operators met the benchmark for the parameter as per audit and live calling except Hathway and Pacenet.

TATA did not meet during the Quarterly Audit

## 3.3 METERING AND BILLING CREDIBILITY

### 3.3.1 PARAMETER EXPLANATION – BILLING COMPLAINTS

All the complaints related to billing as per clause 3.7.2 of QoS regulation of 20th March, 2009 were covered. The types of billing complaints covered are listed below.

- Payments made and not credited to the subscriber account
- Payment made on time but late payment charge levied wrongly
- Double charges
- Credit agreed to be given in resolution of complaint, but not accounted in the bill
- Charging for services provided without consent
- Charging not as per tariff plans
- Overcharging or undercharging

In addition to the above, any billing complaint which leads to billing error, waiver, refund, credit, or any adjustment is also considered as a billing complaint for calculating the number of disputed bills.

#### 3.3.1.1 AUDIT PROCEDURE

IMRB Auditors to verify and collect data pertaining to –

- Number of Billing complaints received at the service provider's level
- Last billing cycle stated should be such that due date for payment of bills must be beyond the date when this form is filled.
- Include all types of bills generated for customers. This could include online as well as other forms of bills presentation including printed bills

- Billing complaint is any of written complaint/ personal visit/ telephonic complaint related to: Excess metering/ wrong tariff scheme charged, Payment made in time but charged penalty/ not reflected in next bill, Last payment not reflected in bill, Adjustment/ waiver not done, Anything else related to bills, Toll free numbers charged etc.
- Billing complaints resolution database, with opening and closing date of complaint to identify the time taken to resolve a complaint

**Live calling:**

- Auditors request the operator provided the database of all the subscribers who reported billing complaints in one month prior to IMRB auditor visit. In case of BSNL, data for the complaints from the subscribers belonging to the sample exchanges is requested specifically. In case the sample data is too low to fulfill the target calls, auditors may call subscribers whose complaints got resolved in other months of the same audit period.
- A sample of 10% or 100 complainants, whichever is less, is selected randomly from the list provided by operator
- Calls are made by auditors to the sample of subscribers to check and record whether the complaint was resolved within the timeframes as mentioned in the benchmark.

Raw data for the parameter was extracted from central billing center of the operators.

### 3.3.1.2 COMPUTATIONAL METHODOLOGY – METERING AND BILLING CREDIBILITY

The calculation methodology (given below) as per QoS Regulations 2006 (11 of 2006), was followed to calculate incidence of billing complaints.

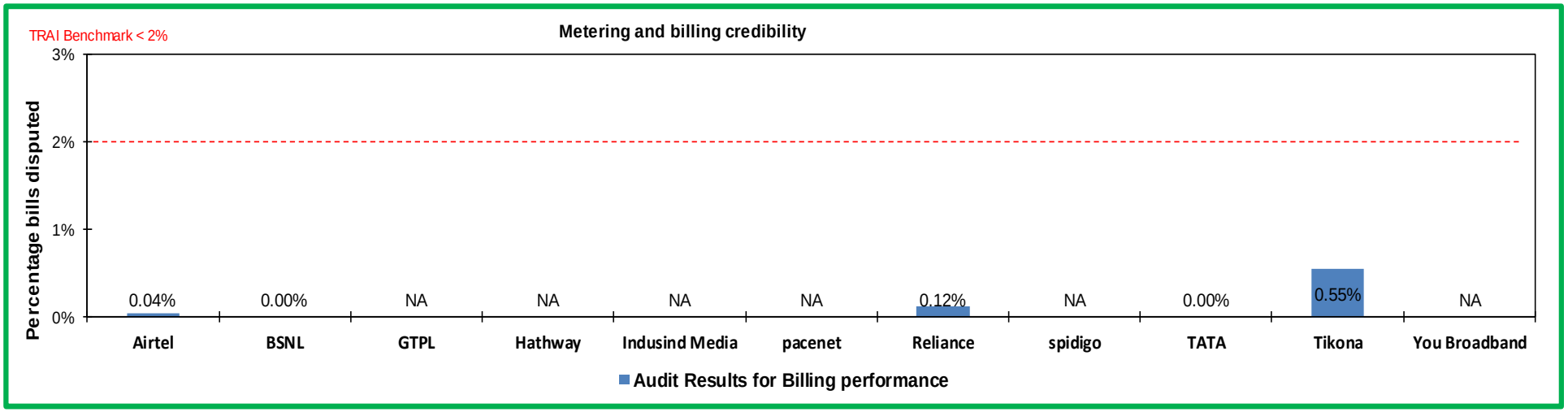
$$\text{Billing complaints (\%)} = \frac{\text{total number of disputed bills X 100}}{\text{total number of bills issued during one billing cycle.}}$$

- *Operator to include all types of bills generated for customers. This would include printed bills, online bills and any other forms of bills generated

- **Billing complaints here shall include only dispute related issues (including those that may arise because of a lack of awareness at the subscribers' end). It does not include any provisional issues (such as delayed dispatch of billing statements, etc.) in which the operator has opened a ticket internally.

**TRAI Benchmark:** < 2%

### 3.3.1.3 METERING AND BILLING CREDIBILITY – AUDIT FINDINGS




*Data Source: Billing Center of the operators*

All operators met the benchmark for the parameter.

**NA: operator's live calling for 'resolution of billing complaints' has not been conducted due to very low/ zero base of billing complaints for the operators.**

**NA: Subscribers of GTPL, Hathway, IndusInd, Spidigo, Pacenet and You Broadband are not applicable because they are under pre-paid service.**

### 3.3.1.4 COMPUTATIONAL METHODOLOGY – RESOLUTION OF BILLING COMPLAINTS

#### Calculation of Percentage resolution of billing complaints

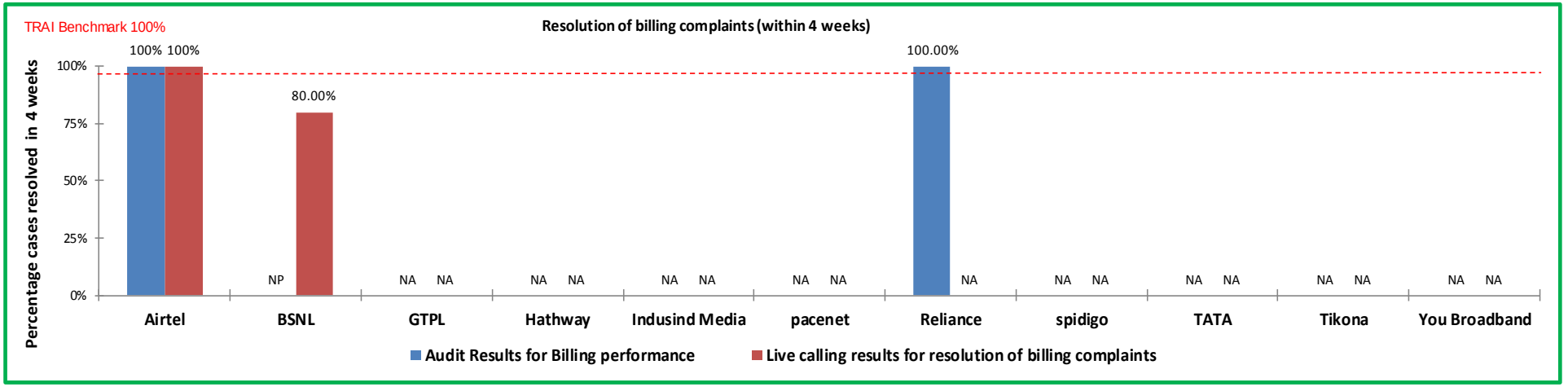
The calculation methodology (given below) as per QoS Regulations 2006 (11 of 2006), and TRAI guidelines (Received on Sep 08, 2014) was followed to calculate resolution of billing complaints.

**Resolution of billing complaints within 4 weeks:**

%age of billing complaints (for post-paid customers)/ charging, credit & validity (for pre-paid customers) resolved within 4 weeks =

$$\frac{\text{number of billing complaints for post-paid customers/charging, credit/ validity complaints for pre-paid customers resolved within 4 weeks during the quarter}}{\text{number of billing/charging, credit / validity complaints received during the quarter}} \times 100$$

### 3.3.1.5 RESOLUTION OF BILLING COMPLAINTS – AUDIT FINDINGS




As per audit all operators met the benchmark for resolution of billing complaints within 4 weeks except BSNL.

**NP: Not Participated, BSNL did not participate in the Audit for AMJ, 2016.**

**NA: operator's live calling for 'resolution of billing complaints' has not been conducted due to very low/ zero base of billing complaints for the operators.**

**NA: Subscribers of GTPL, Hathway, Indus, Spidigo, Pacenet and You Broadband are not applicable because they are under pre-paid service.**

## 3.4 TIME TAKEN TO REFUND AFTER CLOSURE

### 3.4.1 PARAMETER EXPLANATION

#### 3.4.1.1 AUDIT PROCEDURE

IMRB Auditors collected and verified data pertaining to -

- Number of cases requiring refund of deposits
- Number of cases where refund was made within 60 days
- %age cases where refund was made within 60 days.

Data for the parameter was extracted from central billing center of the operators.

#### 3.4.1.2 COMPUTATIONAL METHODOLOGY

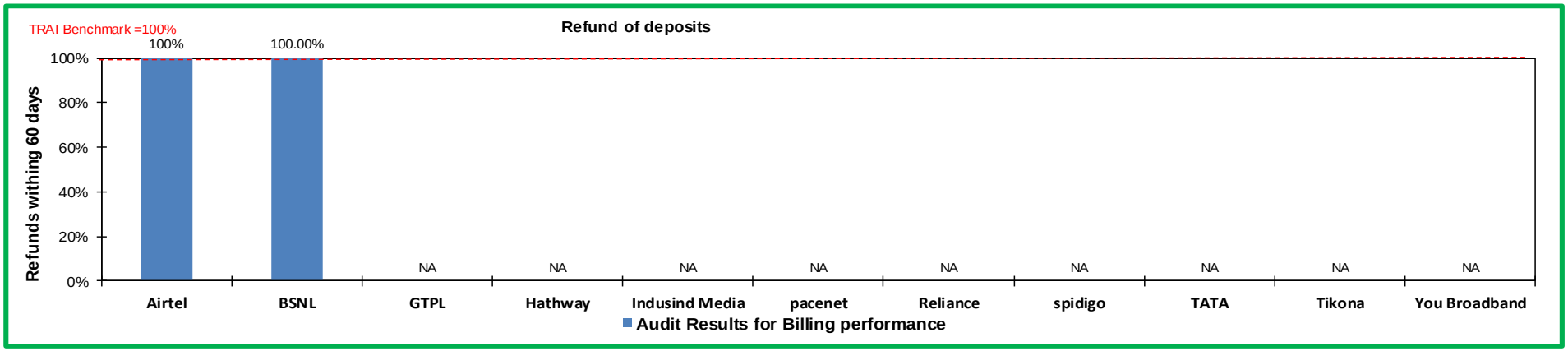
- Date of closure is considered to be the date on which the connection is discontinued in the service provider database of active customers

**Time taken to refund = Date of refund – Date of closure**

#### 3.4.1.3 BENCHMARK

- 100% cases in less than 60 days

### 3.4.2 DETAILED FINDINGS - REFUND OF DEPOSITS




All operators met the benchmark for the parameter.

NA: -Operators had no cases where a refund was applicable.

## 3.5 RESPONSE TIME TO CUSTOMER FOR ASSISTANCE

### 3.5.1 PARAMETER EXPLANATION

#### 3.5.1.1 AUDIT PROCEDURE

IMRB Auditors collected and verified data pertaining to

- Number of calls received by the operator
- Number and percentage calls answered within 60 seconds
- Number and percentage calls answered within 80 seconds

**Live calling:**

- Overall 100 number of live calls at different points of time were made in a licensed service area/circle for each service provider to assess the efficiency of the call center

Data for the parameter was extracted from central customer service center of the operators.

### 3.5.1.2 COMPUTATIONAL METHODOLOGY

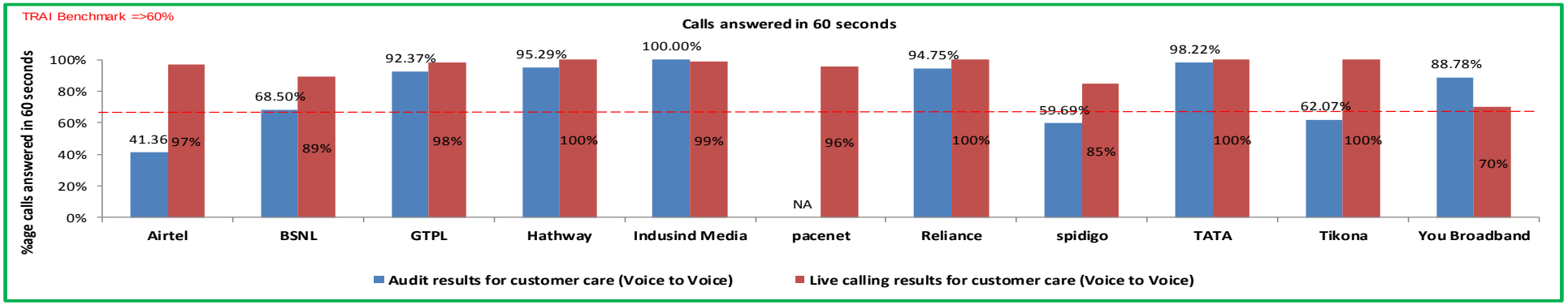
**%age of calls answered by operator (voice to voice) within n seconds = *(Number of calls where time taken for operator to respond* >= n sec / Total number of calls where an attempt to route to the operator was made) x 100)*.***

**Time taken for operator to respond = Time when an operator responds to a call – Time when the relevant code to reach the operator is dialled**

### 3.5.1.3 BENCHMARK

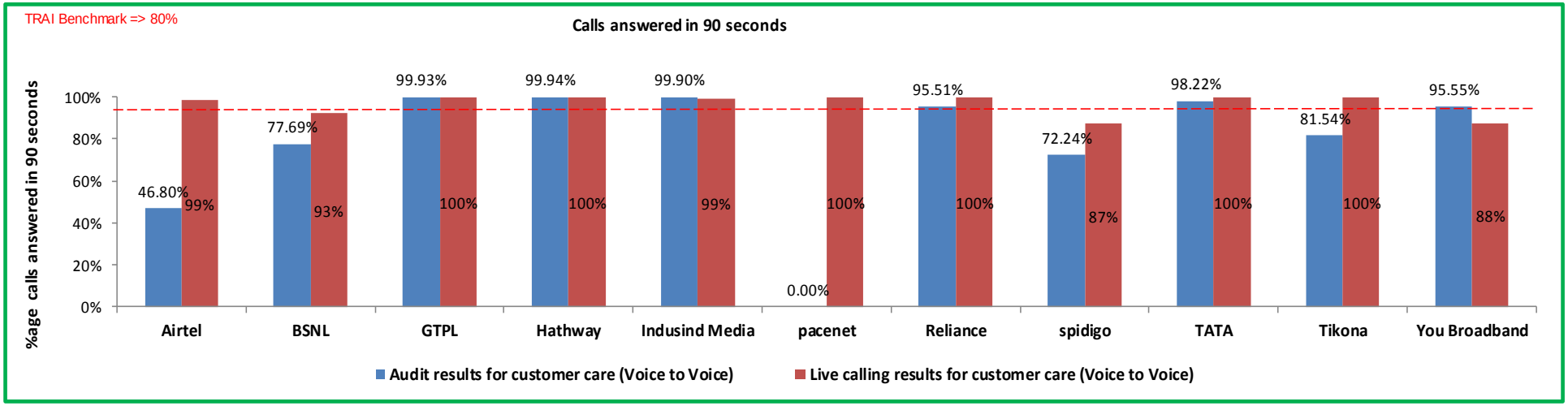
- Calls answered within 60 seconds => 60 %
- Calls answered within 90 seconds => 80%

## 3.5.2 DETAILED FINDINGS - CALL ANSWERED WITHIN 60 SECONDS




*Data Source: Customer Service Center of the operators*

### 3.5.3 DETAILED FINDINGS - CALL ANSWERED WITHIN 90 SECONDS




*Data Source: Customer Service Center of the operators*

All operators met the benchmark for answering 60% calls within 60 seconds and 80% calls within 90 seconds as per audit.

## 3.6 BANDWIDTH UTILIZATION & DOWNLOAD SPEED

### 3.6.1 PARAMETER EXPLANATION – BANDWIDTH UTILIZATION

#### 3.6.1.1 AUDIT PROCEDURE

IMRB Auditors verified and collected data pertaining to –

**POP to ISP gateway Node [Intra – network] Links**

- Auditors to verify and collect data pertaining to Total Bandwidth available and Total Bandwidth utilized during TCBH at some of the sample intra network links (POP to ISP Node) on each of the three days of live measurement separately

- Total Bandwidth available and Total bandwidth utilized during at the sample links TCBH for the complete month of audit
- Total number of intra network links having >90% bandwidth utilization during the month of Audit

**ISP Gateway Node to IGSP / NIXI Node upstream Link's) for international connectivity**

- Total number of upstream links for International connectivity
- Total number of links having Bandwidth > 90%Total Bandwidth available and Total Bandwidth utilized on all the upstream links during TCBH (POP to ISP Node) on each of the three days of live measurement separately
- Total Bandwidth available and Total bandwidth utilized at all the international links during TCBH for the complete month of audit (Also obtain details separately for the days)

Data for the parameter was extracted from NOC (Network Operations Center) of the operators.

### 3.6.1.2 COMPUTATIONAL METHODOLOGY

**Percentage Bandwidth available on the link = *Total Bandwidth* utilised in TCBH for the period/ Total Bandwidth Available during the period*100**

### 3.6.1.3 BENCHMARK

- < 80% link(s)/route bandwidth utilization during peak hours (TCBH).
- If on any link(s)/route bandwidth utilization exceeds 90%, then network is considered to have congestion. For this additional provisioning of bandwidth on immediate basis, but not later than one month is mandated.

## 3.6.2 DETAILED FINDINGS – BANDWIDTH UTILIZATION

| Audit results for Bandwidth Utilization | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Bandwidth utilization** | **Benchmark** | **Airtel** | **BSNL** | **GTPL** | **Hathway** | **Indusind Media** | **pacenet** | **Reliance** | **spidigo** | **TATA** | **Tikona** | **You Broadband** |
| Percentage Bandwidth utilisation during peak hours (In Mbps) | <80% | NP | 77.00% | 85.23% | 47.60% | 49.20% | 75.00% | 41.00% | 73.00% | 75.00% | 66.70% | 77.20% |
| **Live measurment results for Bandwidth Utilization** | | | | | | | | | | | | |
| **Bandwidth utilization** | **Benchmark** | **Airtel** | **BSNL** | **GTPL** | **Hathway** | **Indusind Media** | **pacenet** | **Reliance** | **spidigo** | **TATA** | **Tikona** | **You Broadband** |
| Percentage Bandwidth utilisation during peak hours (In Mbps) | <80% | NP | 72.00% | 86.60% | 58.00% | 50.00% | 75.00% | 50.83% | 91.00% | 78.00% | 70.00% | 72.00% |

*Data Source: Network Operations Center (NOC) of the operators*

**NP: Not Participated, Airtel did not participate in the Audit for AMJ, 2016.**

All the operators met the benchmark for bandwidth utilization during audit. However during live Audit Spidigo failed to meet the benchmark.

GTPL did not meet benchmark during both PMR and Live.

## 3.6.3 PARAMETER EXPLANATION - BROADBAND DOWNLOAD SPEED

### 3.6.3.1 AUDIT PROCEDURE

Auditors collected and verified the following information from the operator's system.

- Total committed download speed to the all subscribers (In Mbps) (A)
- Total average download speed observed during TCBH (In Mbps)

**Live Calling/ Measurement:**

- Details of live customers were obtained from the service providers
- Overall 50 numbers of live calls at were made during peak hours (TCBH) in a licensed service area/circle for each service provider to assess the download speed available to subscribers. A download measurement software tool provided by the service providers was used for the same
- Details of total committed download speed and speed available to the users were recorded for each of the subscriber

### 3.6.3.2 COMPUTATIONAL METHODOLOGY

- The download speed for one customer is calculated by the download speed measurement software using the formula provided below:

**Data Download Speed = Size of test file (data) in ISP server/ Transmission time required for error free transfer of the entire data**

Percentage download speed available was calculated as = Sum of total speed available for 50 customers/Total committed download speed for 50 customers*100

### 3.6.3.3 BENCHMARK

Subscribed broadband connection speed to be met >= 80% from ISP Node to user

Data for the parameter was taken from "Download measurement software" installed in the server at ISP Node of the operators.

## 3.6.4 DETAILED FINDINGS – BROADBAND DOWNLOAD SPEED

| Audit results for broadband download speed | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Broadband download speed | Benchmark | Airtel | BSNL | GTPL | Hathway | Indusind Media | pacenet | Reliance | spidigo | TATA | Tikona | You Broadband |
| %age subscribed speed available to the subscriber during TCBH (B/A)*100 | ≥ 80% | NP | 100.00% | 99.35% | 88.30% | 87.00% | 96.00% | 93.26% | NDR | 92.30% | 94.60% | 90.10% |
| **Live measurement results for broadband download speed** | | | | | | | | | | | | |
| Broadband download speed | Benchmark | Airtel | BSNL | GTPL | Hathway | Indusind Media | pacenet | Reliance | spidigo | TATA | Tikona | You Broadband |
| %age subscribed speed available to the subscriber during TCBH (B/A)*100 | ≥ 80% | NP | 100.00% | 99.20% | 85.60% | 90.20% | 96.20% | 95.25% | NDR | 93.10% | 95.30% | 91.20% |

*Data Source: Download measurement software installed in the server at ISP Node of the operators*

**NP: Not Participated, Airtel did not participate in the Audit for AMJ, 2016.**

All operators met the benchmark of providing committed broadband download speed as per PMR audit and Live Audit.

## 3.7 SERVICE AVAILABILITY/UPTIME

### 3.7.1.1 AUDIT PROCEDURE

IMRB Auditors verified and collected data pertaining to –

- Total operational hrs.
- Total downtime hrs.
- The above mentioned data was obtained and verified separately for three days in which the live measurement was carried out, Month in which audit was carried out/

Data for the parameter was extracted from OMC (Operations and Maintenance Center) of the operators.

### 3.7.1.2 COMPUTATIONAL METHODOLOGY

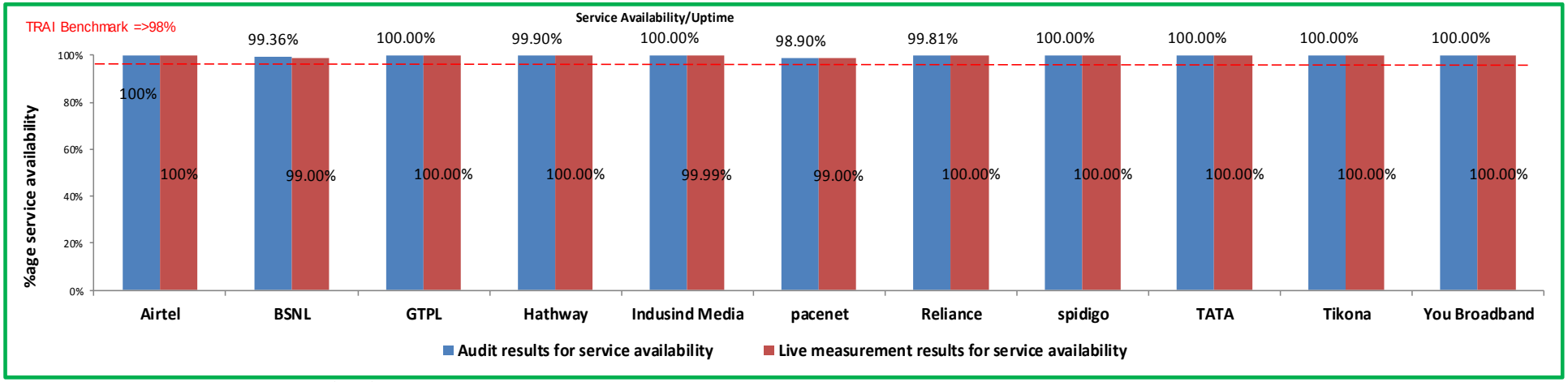
- Total downtime for all users, including the LAN switches, Routers, Servers, etc. at ISP Node and connectivity to upstream service provider are to be included
- Planned outages for routine maintenance of the system are excluded from the calculation of service availability/uptime

**Service availability/Uptime = *(Total operational hours – Total Downtime hrs)*100 / Total operational hours***

### 3.7.1.3 BENCHMARK

- =>98% with effect from quarter ending September 2007 and onwards

## 3.7.2 DETAILED FINDINGS - SERVICE AVAILABILITY




*Data Source: Operations and Maintenance Center (OMC) of the operators*

All operators met the benchmark for service availability time as per Quarterly audit and Live Audit.

## 3.8 NETWORK LATENCY & PACKET LOSS

### 3.8.1 PARAMETER EXPLANATION - NETWORK LATENCY

Network Latency: Network Latency is the measure of duration of a round trip for a data packet between specific source and destination Router Port/ Customer Premises Equipment (CPE).

#### 3.8.1.1 AUDIT PROCEDURE

IMRB Auditors verified and collected data pertaining to:

- Records maintained for ping tests conducted during the period
- Smoked ping test (wherever available) results for the period
- Results of live ping tests conducted during three day live measurement and month of Audit (During peak hours)
- Live ping tests were conducting by selecting a minimum of three user reference test points at POP/ISP Node in each circle

Data for the parameter was extracted from NOC (Network Operations Center) of the operators.

#### 3.8.1.2 COMPUTATIONAL METHODOLOGY

- Latency is the measure of duration of a round trip for a data packet between specific source and destination Router Port/Customer Premises Equipment (CPE). The round trip delay for the ping packets from ISP premises to the IGSP premises to the IGSP/NIXI gateway and to the nearest NAP port abroad are measured by computing delay for 1000 pings of 64 bytes each (Pings are to be sent subsequent to acknowledgement received for the same for previous ping)
- Service provider needs to carry out such tests daily during Time Consistent Busy Hour(TCBH) and report the average results for the month in the performance monitoring report to TRAI
- Minimum sample reference points for each service area shall be three in number or multiple reference points if required

**Hence the formula for network latency would be Network latency for X days= *Total round trip time for all the ping packets transmitted in X days /No of days during the period***

#### 3.8.1.3 BENCHMARK

- < 120 msec from user reference point at POP/ISP Node to International Gateway
- < 350 msec from User reference point at ISP Gateway Node to International nearest NAP port (Terrestrial)
- < 800 msec from User reference point at ISP Gateway Node to International nearest Nap port (Satellite)

### 3.8.2 PARAMETER EXPLANATION – PACKET LOSS

Packet Loss: Packet loss is the percentage of packets lost to the total packets transmitted between two designated CPE/ Router Ports.

#### 3.8.2.1 AUDIT PROCEDURE

IMRB Auditors verified and collected data pertaining to –

- Records maintained for ping tests conducted during the period
- Smoked ping test (wherever available) results for the period
- Results of live ping tests conducted during three day live measurement and month of Audit (During TCBH)
- Live ping tests were conducting by selecting a minimum of three user reference test points at POP/ISP Node in each circle

Data for the parameter was extracted from NOC (Network Operations Center) of the operators.

#### 3.8.2.2 COMPUTATIONAL METHODOLOGY

- Packet loss is the percentage of packets lost to total packets transmitted between two designated Customer Premises Equipment's/Router ports. It is the measurement of packet lost from the broadband customer (User) configuration/User reference point at POP/ISP Node to IGSP/NIXI Gateway and to the nearest NAP port abroad
- The packet loss is measured by computing the percent packet loss of 1000 pings of 64 byte packet each.
- Service provider needs to carry out such tests daily during Time Consistent Busy Hour(TCBH) and report the average results for the month in the performance monitoring report to TRAI
- Minimum sample reference points for each service area were three in number or multiple reference points if required

**Hence Packet loss is computed by the formula:** ***(Total number of ping packets lost during the period/Total number of ping packets transmitted)* 100***

### 3.8.2.3 BENCHMARK

- Packets Loss <1 %

## 3.8.3 DETAILED FINDINGS - NETWORK LATENCY / PACKET LOSS

| Audit results for Latency and packet loss | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Network Latency and Packet Loss** | **Benchmark** | **Airtel** | **BSNL** | **GTPL** | **Hathway** | **Indusind Media** | **pacenet** | **Reliance** | **spidigo** | **TATA** | **Tikona** | **You Broadband** |
| Packet Loss (Percentage) | < 1% | 0.32% | 0.00% | 0.00% | 0.00% | 0.00% | 0.40% | 0.54% | 0.00% | 0.00% | 0.00% | 0.00% |
| **Network Latency** | | | | | | | | | | | | |
| From user reference point at POP/ISP Node to IGSP/ NIXI (msec) | <120msec | 42 | NP | NA | 66 | NA | NA | 1 | NA | 100 | NA | 10 |
| From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec) | <350msec | 62 | NP | NA | 145 | NA | NA | 7 | NA | 65 | NA | 273 |
| From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec) | <800msec | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Live measurement results for Latency and packet loss** | | | | | | | | | | | | |
| **Network Latency and Packet Loss** | **Benchmark** | **Airtel** | **BSNL** | **GTPL** | **Hathway** | **Indusind Media** | **pacenet** | **Reliance** | **spidigo** | **TATA** | **Tikona** | **You Broadband** |
| Packet Loss (Percentage) | < 1% | 0.30% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.55% | 0.00% | 0.00% | 0.00% | 0.00% |
| **Network Latency** | | | | | | | | | | | | |
| From user reference point at POP/ISP Node to IGSP/ NIXI (msec) | <120msec | 42 | NP | NA | 66 | NA | NA | 1 | NA | 100 | NA | 10 |
| From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec) | <350msec | 62 | NP | NA | 145 | NA | NA | 7 | NA | 65 | NA | 273 |
| From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec) | <800msec | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

*Data Source: Network Operations Center (NOC) of the operators*

All operators met the benchmark for network latency related parameters.

# 4. ANNEXURE – AMJ'16

## 4.1 SERVICE PROVISIONING

| Audit Results for Service provisioning | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Benchmark | Airtel | BSNL | GTPL | Hathway | Indusind Media | pacenet | Reliance | spidigo | TATA | Tikona | You Broadband |
| Total connections registered during the period | | 4317 | 405 | 18852 | 4514 | 125 | 253 | 1304 | 2484 | 1023 | 2388 | 7835 |
| Number of connections provided within 15 days | | 4317 | 405 | 17456 | 4452 | 115 | 253 | 1304 | 2484 | 1023 | 2388 | 7804 |
| Percentage of connections provided within 15 days | 100% | 100.00% | 100.00% | 92.59% | 98.63% | 92.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 99.60% |
| Number of connections provided after 15 days of registration of demand | | NA | NA | NA | 4504 | 14 | NA | NA | NA | NA | NP | 7834 |
| percentage of connections provided after 15 days of registration of demand | 100% | NA | NA | NA | 99.78% | NA | NA | NA | NA | NA | NP | 99.99% |
| Number of customers to whom credit is given for delayed connections | | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Percentage of customers to whom credit is given for delayed connections | 100% | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Live calling for Service provisioning** | | | | | | | | | | | | |
| | Benchmark | Airtel | BSNL | GTPL | Hathway | Indusind Media | pacenet | Reliance | spidigo | TATA | Tikona | You Broadband |
| Total connections registered during the period | | 100 | 100 | 100 | 100 | 10 | 100 | 100 | 100 | 100 | 100 | 100 |
| Number of connections provided within 15 days | | 100 | 100 | 98 | 99 | 8 | 100 | 100 | 100 | 100 | 100 | 98 |
| Percentage of connections provided within 15 days | 100% | 100.00% | 100.00% | 98.00% | 99.00% | 80.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 98.00% |

*Data Source: Operations and Maintenance Center (OMC) of the operators*

## 4.2 FAULT REPAIR/ RESTORATION

| Audit Results for Fault repair | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Fault repair** | **Benchmark** | **Airtel** | **BSNL** | **GTPL** | **Hathway** | **Indusind Media** | **pacenet** | **Reliance** | **spidigo** | **TATA** | **Tikona** | **You Broadband** |
| Total No. of faults registered during the period | | 6357 | 837 | 121577 | 44285 | 620 | 6242 | 2447 | 19950 | 2122 | 5672 | 57583 |
| No. of faults repaired by next working day during the period | | 6225 | 777 | 115103 | 38754 | 620 | 4813 | 2447 | 18398 | 1964 | 5188 | 51973 |
| Percentage of faults repaired by next working day during the period | ≥ 90% | 97.92% | 92.83% | 94.67% | 87.51% | 100.00% | 77.11% | 100.00% | 92.22% | 92.55% | 91.47% | 90.26% |
| No. of faults repaired within 3 days during the period | | 6351 | 837 | 120361 | 42437 | 620 | 6094 | 2447 | 19832 | 2100 | 5642 | 57029 |
| Percentage of faults repaired within 3 days during the period | ≥ 99% | 99.91% | 100.00% | 99.00% | 95.83% | 100.00% | 97.63% | 100.00% | 99.41% | 98.96% | 99.47% | 99.04% |
| 2>> | | | | | | | | | | | | |
| **Rent rebate** | **Benchmark** | **Airtel** | **BSNL** | **GTPL** | **Hathway** | **Indusind Media** | **pacenet** | **Reliance** | **spidigo** | **TATA** | **Tikona** | **You Broadband** |
| Percentage of cases where rent rebate for >3 days was given | 100% | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Percentage of cases where rent rebate for 15 days was given | 100% | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Percentage of cases where rent rebate for 30 days was given | 100% | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

*Data Source: Operations and Maintenance Center (OMC) of the operators and live calls conducted by the auditors from operator's network*

| Live calling for fault repair | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fault repair | Benchmark | Airtel | BSNL | GTPL | Hathway | Indusind Media | pacenet | Reliance | spidigo | TATA | Tikona | You Broadband |
| Total Number of calls made to subscribers | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Number of cases where faults were repaired by next working day | | 95 | 98 | 100 | 67 | 100 | 76 | 100 | 100 | 100 | 100 | 100 |
| Percentage cases where faults were repaired by next working day | ≥ 90% | 100.00% | 98.00% | 100.00% | 67.00% | 100.00% | 76.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| Number of cases where faults were repaired within 3 days | | 100 | 99 | 100 | 76 | 100 | 86 | 100 | 100 | 100 | 100 | 100 |
| Percentage cases where faults were repaired within 3 days | ≥ 99% | 100.00% | 99.00% | 100.00% | 76.00% | 100.00% | 86.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |

## 4.3 BILLING PERFORMANCE – METERING AND BILLING CREDIBILITY

| Audit Results for Billing performance | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Billing Performance** | **Benchmark** | **Airtel** | **BSNL** | **GTPL** | **Hathway** | **Indusind Media** | **pacenet** | **Reliance** | **spidigo** | **TATA** | **Tikona** | **You Broadband** |
| **Billing diputes** | | | | | | | | | | | | |
| Total bills generated during the period | | 1,16,357 | NP | NA | NA | NA | NA | 68247 | NA | NP | 21454 | NA |
| Total number of bills disputed | | 47 | NP | NA | NA | NA | NA | 83 | NA | NP | 119 | NA |
| Percentage bills disputed (Avg of 3 billing cycles) | ≤ 2% | 0.04% | NP | NA | NA | NA | NA | 0.12% | NA | NP | 0.55% | NA |
| **Resolution of billing complaints** | | | | | | | | | | | | |
| Total number of complaints | | 16 | NP | NA | NA | NA | NA | 68247 | NA | NP | NP | NA |
| Total complaints resolved in 4 weeks from date of receipt | | 16 | NP | NA | NA | NA | NA | 68247 | NA | NP | NP | NA |
| Percentage complaints resolved within 4 weeks of date of receipt | 100% | 100.00% | NP | NA | NA | NA | NA | 100.00% | NA | NP | NP | NA |
| **Refund of deposits** | | | | | | | | | | | | |
| Total number of cases requiring refund | | NA | 5 | NA | NA | NA | NA | NA | NA | NP | NP | NA |
| Total number of cases where refund was made within 60 days | | NA | 5 | NA | NA | NA | NA | NA | NA | NP | NP | NA |
| Percentage cases in which refund was received within 60 days | 100% | 100.00% | 100.00% | NA | NA | NA | NA | NA | NA | NP | NP | NA |

*Data Source: Billing Center of the operators*

| Live calling results for resolution of billing complaints | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Resolution of billing complaints | Benchmark | Airtel | BSNL | GTPL | Hathway | Indusind Media | pacenet | Reliance | spidigo | TATA | Tikona | You Broadband |
| Total Number of calls made | | 10 | 15 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Number of cases resolved in 4 weeks | | 10 | 12 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Percentage cases resolved in 4 weeks | ≥ 98% | 100.00% | 80.00% | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Number of cases resolved in 6 weeks | | 10 | 15 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Percentage cases resolved in 6 weeks | 100% | 100.00% | 100.00% | NA | NA | NA | NA | NA | NA | NA | NA | NA |

*Data Source: Live calls conducted by the auditors from operator's network*

## 4.4 RESPONSE TIME TO THE CUSTOMER FOR ASSISTANCE

| Audit results for customer care (Voice to Voice) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Calls Answered within 60 seconds | | | | | | | | | | | | |
| Customer Care Assessment | Benchmark | Airtel | BSNL | GTPL | Hathway | Indusind Media | pacenet | Reliance | spidigo | TATA | Tikona | You Broadband |
| Total Number of calls received | | 71929 | 109073 | 145678 | 178234 | 1023 | NA | 98281 | 20123 | 47634 | 48952 | 442871 |
| Total Number of calls answered within 60 seconds | | 29753 | 74720 | 134567 | 169845 | 1023 | NA | 93118 | 12011 | 46784 | 30386 | 393173 |
| Percentage calls answered within 60 seconds | ≥ 60% | 41.36% | 68.50% | 92.37% | 95.29% | 100.00% | NA | 94.75% | 59.69% | 98.22% | 62.07% | 88.78% |

| Calls Answered within 90 seconds | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Number of calls received | | 71929 | 109073 | 145678 | 178234 | 1023 | NA | 98281 | 20123 | 47634 | 48952 | 442871 |
| Total Number of calls answered within 90 seconds | | 33666 | 84735 | 145578 | 178134 | 1022 | NA | 93864 | 14537 | 46784 | 39914 | 423173 |
| Percentage calls answered within 90 seconds | ≥ 80% | 46.80% | 77.69% | 99.93% | 99.94% | 99.90% | NA | 95.51% | 72.24% | 98.22% | 81.54% | 95.55% |

*Data Source: Customer Service Center of the operators*

| Live calling results for customer care (Voice to Voice) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Customer Care Assessment | Benchmark | Airtel | BSNL | GTPL | Hathway | Indusind Media | pacenet | Reliance | spidigo | TATA | Tikona | You Broadband |
| Total Number of calls received | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Total Number of calls answered within 60 seconds | | 97 | 89 | 98 | 100 | 99 | 96 | 100 | 85 | 100 | 100 | 70 |
| Percentage calls answered within 60 seconds | ≥ 60% | 97% | 89% | 98% | 100% | 99% | 96% | 100% | 85% | 100% | 100% | 70% |
| Total Number of calls answered within 90 seconds | | 99 | 93 | 100 | 100 | 99 | 100 | 100 | 87 | 100 | 100 | 88 |
| Percentage calls answered within 90 seconds | ≥ 80% | 99% | 93% | 100% | 100% | 99% | 100% | 100% | 87% | 100% | 100% | 88% |

*Data Source: Live calls conducted by the auditors from operator's network*

## 4.5 BANDWIDTH UTILIZATION

| Audit results for Bandwidth Utilization | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bandwidth utilization | Benchmark | Airtel | BSNL | GTPL | Hathway | Indusind Media | pacenet | Reliance | spidigo | TATA | Tikona | You Broadband |
| Percentage Bandwidth utilisation during peak hours (In Mbps) | <80% | NP | 77.00% | 85.23% | 47.60% | 49.20% | 75.00% | 41.00% | 73.00% | 75.00% | 66.70% | 77.20% |
| **Live measurment results for Bandwidth Utilization** | | | | | | | | | | | | |
| Bandwidth utilization | Benchmark | Airtel | BSNL | GTPL | Hathway | Indusind Media | pacenet | Reliance | spidigo | TATA | Tikona | You Broadband |
| Percentage Bandwidth utilisation during peak hours (In Mbps) | <80% | NP | 72.00% | 86.60% | 58.00% | 50.00% | 75.00% | 50.83% | 91.00% | 78.00% | 70.00% | 72.00% |

*Data Source: Network Operations Center (NOC) of the operators*

## 4.6 BROADBAND DOWNLOAD SPEED

| Audit results for broadband download speed | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Broadband download speed | Benchmark | Airtel | BSNL | GTPL | Hathway | Indusind Media | pacenet | Reliance | spidigo | TATA | Tikona | You Broadband |
| %age subscribed speed available to the subscriber during TCBH (B/A)*100 | ≥ 80% | NP | 100.00% | 99.35% | 88.30% | 87.00% | 96.00% | 93.26% | NDR | 92.30% | 94.60% | 90.10% |
| **Live measurement results for broadband download speed** | | | | | | | | | | | | |
| Broadband download speed | Benchmark | Airtel | BSNL | GTPL | Hathway | Indusind Media | pacenet | Reliance | spidigo | TATA | Tikona | You Broadband |
| %age subscribed speed available to the subscriber during TCBH (B/A)*100 | ≥ 80% | NP | 100.00% | 99.20% | 85.60% | 90.20% | 96.20% | 95.25% | NDR | 93.10% | 95.30% | 91.20% |

*Data Source: Download measurement software installed in the server at ISP Node of the operators*

## 4.7 SERVICE AVAILABILITY/ UPTIME

| Audit results for service availability | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Service Availability | Benchmark | Airtel | BSNL | GTPL | Hathway | Indusind Media | pacenet | Reliance | spidigo | TATA | Tikona | You Broadband |
| Service Availability Uptime in Percentage | ≥ 98% | 100.00% | 99.36% | 100.00% | 99.90% | 100.00% | 98.90% | 99.81% | 100.00% | 100.00% | 100.00% | 100.00% |
| **Live measurement results for service availability** | | | | | | | | | | | | |
| Service Availability | Benchmark | Airtel | BSNL | GTPL | Hathway | Indusind Media | pacenet | Reliance | spidigo | TATA | Tikona | You Broadband |
| Service Availability Uptime in Percentage | ≥ 98% | 100.00% | 99.00% | 100.00% | 100.00% | 99.99% | 99.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |

*Data Source: Operations and Maintenance Center (OMC) of the operators*

## 4.8 NETWORK LATENCY / PACKET LOSS

| Audit results for Latency and packet loss | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Network Latency and Packet Loss** | **Benchmark** | **Airtel** | **BSNL** | **GTPL** | **Hathway** | **Indusind Media** | **pacenet** | **Reliance** | **spidigo** | **TATA** | **Tikona** | **You Broadband** |
| Packet Loss (Percentage) | < 1% | 0.32% | 0.00% | 0.00% | 0.00% | 0.00% | 0.40% | 0.54% | 0.00% | 0.00% | 0.00% | 0.00% |
| **Network Latency** | | | | | | | | | | | | |
| From user reference point at POP/ISP Node to IGSP/ NIXI (msec) | <120msec | 42 | NP | NA | 66 | NA | NA | 1 | NA | 100 | NA | 10 |
| From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec) | <350msec | 62 | NP | NA | 145 | NA | NA | 7 | NA | 65 | NA | 273 |
| From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec) | <800msec | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Live measurement results for Latency and packet loss** | | | | | | | | | | | | |
| **Network Latency and Packet Loss** | **Benchmark** | **Airtel** | **BSNL** | **GTPL** | **Hathway** | **Indusind Media** | **pacenet** | **Reliance** | **spidigo** | **TATA** | **Tikona** | **You Broadband** |
| Packet Loss (Percentage) | < 1% | 0.30% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.55% | 0.00% | 0.00% | 0.00% | 0.00% |
| **Network Latency** | | | | | | | | | | | | |
| From user reference point at POP/ISP Node to IGSP/ NIXI (msec) | <120msec | 42 | NP | NA | 66 | NA | NA | 1 | NA | 100 | NA | 10 |
| From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec) | <350msec | 62 | NP | NA | 145 | NA | NA | 7 | NA | 65 | NA | 273 |
| From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec) | <800msec | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

*Data Source: Network Operations Center (NOC) of the operators*

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