TRAI Audit Wireless Report for Mumbai Circle

WEST ZONE

QE June 2016

Prepared by:

IMRB | eTech

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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 Mumbai circle.

2.3   COVERAGE

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

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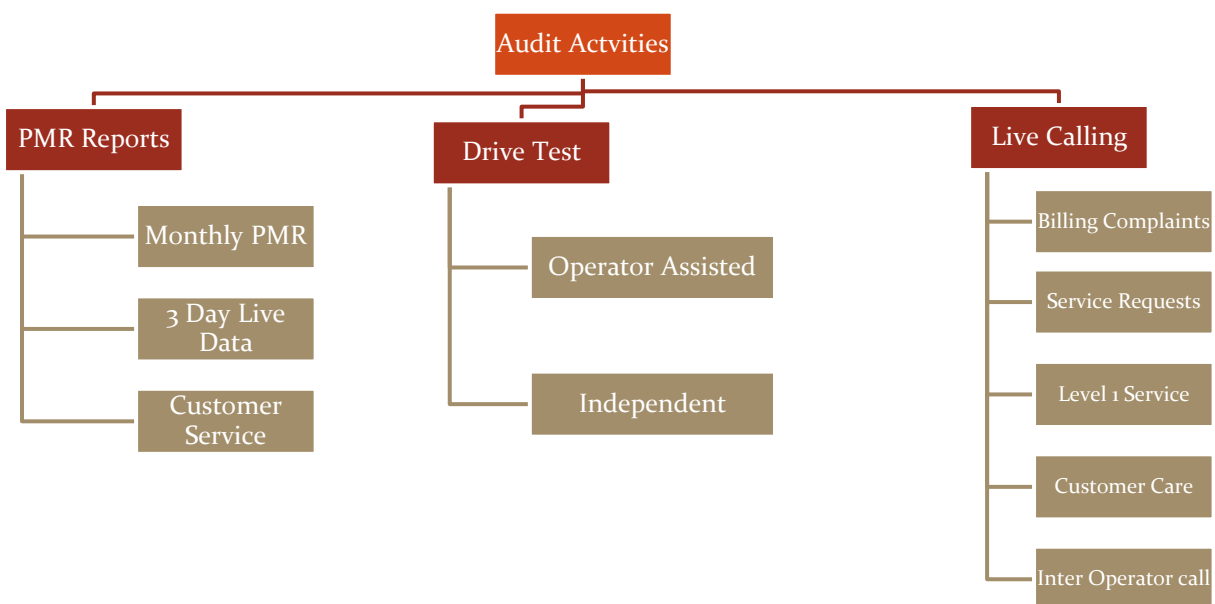
Let's discuss each of the activity in detail and the methodology adopted for each of the module.

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 IMRB auditors inform the operators about the audit schedule in advance. Accordingly, the auditors visit the operator premises to conduct the audit.

During TRAI audit, raw data is extracted from the operator's server/ NOC/ exchange/ OMC/ customer service center/ billing center etc. by the IMRB auditor with assistance from the operator personnel in order to generate PMR reports (Network/ Billing /Customer Service etc).

All the calculations are done by IMRB auditors to generate a new PMR report from that raw data.

The newly generated PMR reports are then taken in hard copy, duly signed by the competent authority of operators. IMRB auditors also sign the same report.

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.

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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%**

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2.4.1.8   POINT OF DATA EXTRACTION

The data is extracted from a terminal/computer connected to OMCR & OSS on the operator network.
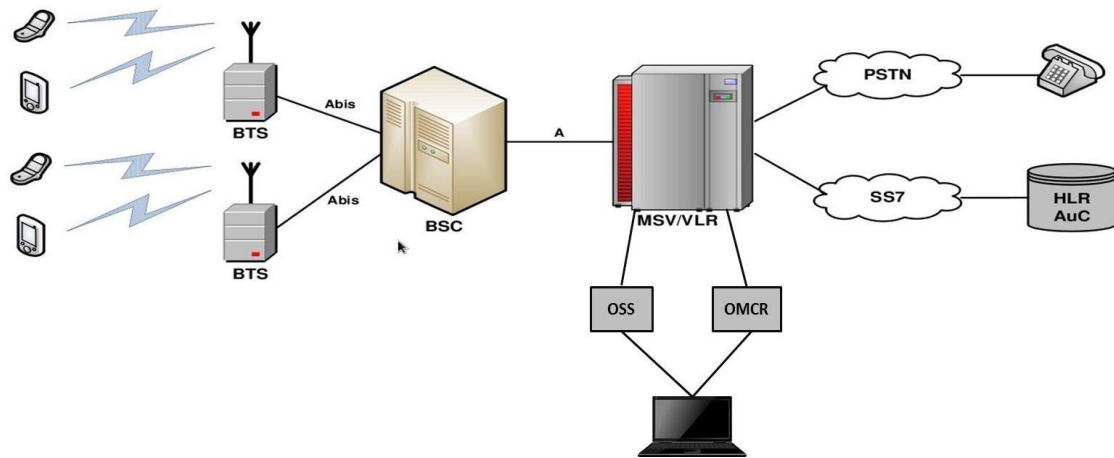
2.4.1.9 STEP BY STEP AUDIT PROCEDURE

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

Tender document and latest list of licensees as per TRAI are taken as a reference document for assimilating the presence of operators. The wireless operators are then contacted for the audit.

Audit formats and schedule is shared with the operators in advance. Details include day of the visit and date of 3 day data collection and other requirements.

IMRB auditors visit the operator's server/exchange/central NOC to extract data from operator's systems. Operator personnel assist the auditor in extraction process.

The extracted data is validated and verfied by the IMRB auditors.

IMRB auditors then prepare a PMR report from the extracted data with assistance from the operator.

IMRB auditors validate the values with raw data and also provide their comments, wherever required.

The final audit or PMR sheet is signed by the operator person in-charge along with authorized stamp.

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% = $[(A_1 \times C_1) + (A_2 \times C_2) + \ldots\ldots + (A_n \times C_n)] / (A_1 + A_2 + \ldots + A_n)$ Where: A_1 = Number of attempts to establish SDCCH / TCH made on day 1
TCH Congestion	C_1 = Average SDCCH / TCH Congestion % on day 1 A_2 = Number of attempts to establish SDCCH / TCH made on day 2 C_2 = Average SDCCH / TCH Congestion % on day 2 A_n = Number of attempts to establish SDCCH / TCH made on day n C_n = Average SDCCH / TCH Congestion % on day n
POI Congestion	POI Congestion% = $[(A_1 \times C_1) + (A_2 \times C_2) + \ldots\ldots + (A_n \times C_n)] / (A_1 + A_2 + \ldots + A_n)$ Where: A_1 = POI traffic offered on all POIs (no. of calls) on day 1 C_1 = Average POI Congestion % on day 1 A_2 = POI traffic offered on all POIs (no. of calls) on day 2 C_2 = Average POI Congestion % on day 2 A_n = POI traffic offered on all POIs (no. of calls) on day n C_n = 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

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2.4.1.11 CALCULATION METHODOLOGY – NETWORK PARAMETERS 3G

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% = $[(A_1 \times C_1) + (A_2 \times C_2) + \ldots + (A_n \times C_n)] / (A_1 + A_2 + \ldots + A_n)$ Where: A_1 = Number of attempts to establish RRC/ RAB made on day 1
Circuit Switched RAB Congestion	C_1 = Average RRC/ RAB Congestion % on day 1 A_2 = Number of attempts to establish RRC/ RAB made on day 2 C_2 = Average RRC/ RAB Congestion % on day 2 A_n = Number of attempts to establish RRC/ RAB made on day n C_n = Average RRC/ RAB Congestion % on day n
POI Congestion	POI Congestion% = $[(A_1 \times C_1) + (A_2 \times C_2) + \ldots + (A_n \times C_n)] / (A_1 + A_2 + \ldots + A_n)$ Where: A_1 = POI traffic offered on all POIs (no. of calls) on day 1 C_1 = Average POI Congestion % on day 1 A_2 = POI traffic offered on all POIs (no. of calls) on day 2 C_2 = Average POI Congestion % on day 2 A_n = POI traffic offered on all POIs (no. of calls) on day n C_n = 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

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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 05, 06, 07	May 02, 03, 04	June 04, 06, 07
2	Airtel	April 05, 06, 07	May 05, 06, 07	June 01, 02, 03
3	Idea	April 01, 02, 04	May 02, 03, 04	June 01, 02, 03
4	MTNL	April 01, 02, 04	May 02, 03, 04	June 01, 02, 03
5	Reliance	April 01, 05, 06	May 05, 06, 07	June 01, 02, 03
6	TATA	April 05, 06, 07	May 05, 06, 07	June 04, 06, 07
7	Vodafone	April 05, 06, 07	May 02, 03, 04	June 04, 06, 07
CDMA Operators				
8	Reliance	April 01, 05, 06	May 05, 06, 07	June 01, 02, 03
9	TATA	April 05, 06, 07	May 05, 06, 07	June 04, 06, 07
3G Operators				
10	Airtel	April 05, 06, 07	May 05, 06, 07	June 01, 02, 03
11	MTNL	April 01, 02, 04	May 02, 03, 04	June 01, 02, 03
12	Reliance	April 01, 05, 06	May 05, 06, 07	June 01, 02, 03
13	Vodafone	April 05, 06, 07	May 02, 03, 04	June 04, 06, 07

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:

Day wise raw data is fetched from the operator's OMCR and kept in a readable format (preferably MS-Excel). Data for a period of 90 days is used to identify TCBH.

The 90 day period is decided upon the basis of month of audit. For example, for audit of Aug 2015, the 90 day period data used to identify TCBH would be the data of Jun, Jul and Aug 2015

For each day, the hour in which average traffic of the resource group concerned is greatest for the day will be the 'Busy Hour' for the operator.

The modal frequency of the busy hour is calculated for 90 days period and the hour with highest modal frequency will be considered as TCBH for the 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:

Day wise raw data is fetched from the operator's OMCR and kept in a readable format (preferably MS-Excel). Data for a period of 90 days is used to identify CBBH.

For each day, the hour in which a cell in cellular mobile telephone network experiences maximum traffic for the day will be the 'Busy Hour' for the operator.

The 90 day period is decided upon the basis of month of audit. For example, for audit of Aug 2015, the 90 day period data used to identify CBBH would be the data of Jun, Jul and Aug 2015

The modal frequency of the busy hour is calculated for 90 days period and the hour with highest modal frequency will be considered as CBBH for the 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: Billing or Charging Complaints resolved in 4 weeks from date of receipt / Total billing or charging complaints received during the quarter) x 100 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 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.

The IMRB auditor visits each operator premises to do live calling. The operators provide the raw data of customer complaints (billing & service) and also the list of customer service numbers to be verified through live calling

IMRB auditors then make live calls using operator SIM to a random sample of subscribers from the raw data provided to verify the resolution of complaints

The auditors also verify the performance of call center, level 1 services by calling the numbers using operator SIM. The list of call center numbers is provided by the operator. The process followed to test Level 1 services has been stated below.

Using operator SIM, the auditors also make test calls to subscribers of other operators to assess the inter-operator call connectivity in the same licensed service area

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 Office New Delhi, 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-
    o With In city
    o Major Roads
    o Highways
    o Shopping complex/ Mall
    o 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. The 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-
    - o With In city
    - o Major Roads
    - o Highways
    - o Shopping complex/ Mall
    - o 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.
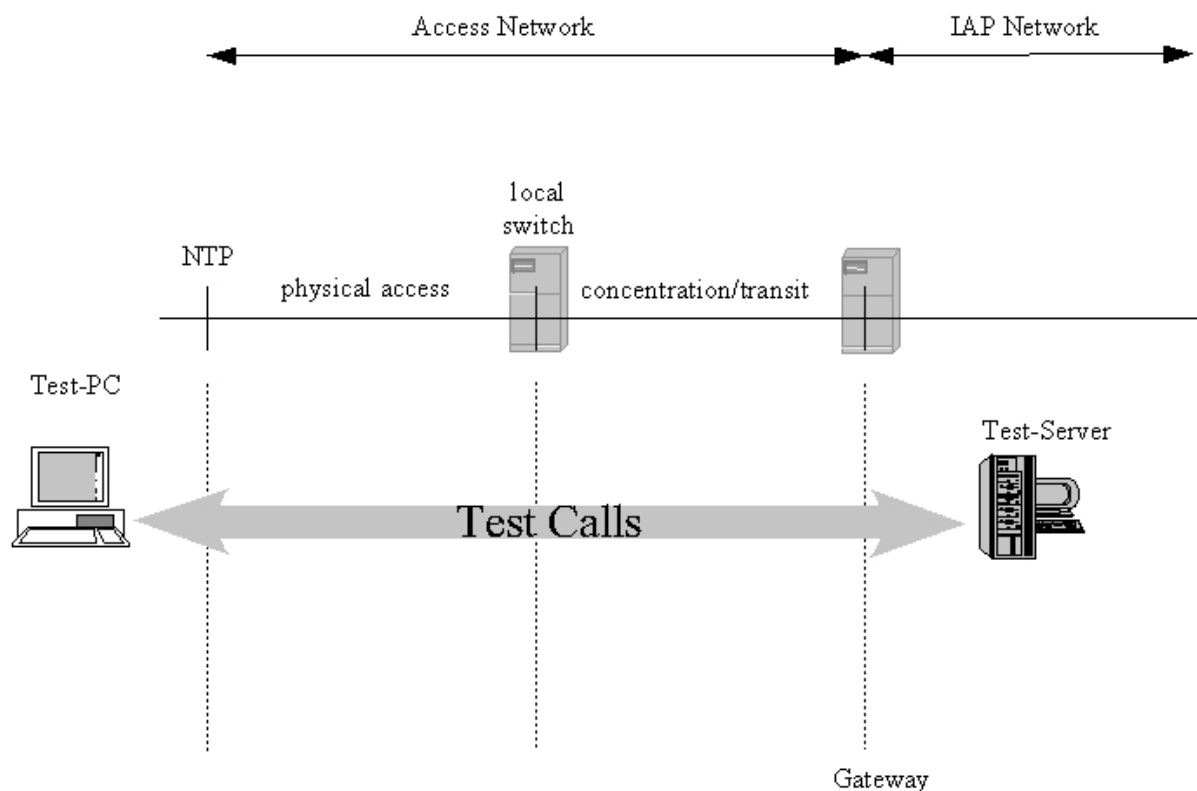
Figure for Measurement set-up

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:
- o   Maximum Segment Size between 1380 Bytes and 1460 Bytes.
- o   TCP RX Window Size > 4096 Bytes
- o   SACK (Selective Acknowledgement) enabled.
- o   TCP Fast Retransmit.
- o   TCP Fast Recovery enabled.
- o   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 =

Total Successful download attempts ×100

Total download attempts

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 = $\dfrac{\text{Total Successful upload attempts} \times 100}{\text{Total upload attempts}}$

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) =
$$\dfrac{\text{Download speed } (A_1+A_2+A_3+A_4+A_5+A_6) \times 100}{6}$$
Note- A_1, A_2, A_3, A_4 A_5 & A_6 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) = $\dfrac{\text{Total number of successful ping} \times 100}{\text{Total number of ping sent to the Test Server}}$

2.5 OPERATORS COVERED 2G AND 3G

Name of Operator	Number of Subscriber as per VLR-2G
Aircel	1634247
Airtel	3658189
Idea	3847918
MTNL	761755
Reliance CDMA	No Service
Reliance GSM	NDR
TATA CDMA	26092
TATA GSM	58526
Vodafone	7536862
Name of Operator	**Number of Subscriber as per VLR-3G**
Airtel 3G	1990674
MTNL 3G	165916
Reliance 3G	NDR
Vodafone 3G	2600395

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 (Network Parameters) for 2G

➢ Aircel failed to meet the benchmark for worst affected cells having more than 3% TCH drop rate.

3 Day Live Measurement (Network Parameters) for 2G

➢ Aircel and Vodafone failed to meet the benchmark for worst affected cells having more than 3% TCH drop rate.

PMR & 3Day live Consolidated (Network Parameters) for 3G

➢ MTNL 3G failed to meet the TRAI benchmark for Node Bs downtime during 3days live audit.

Live Calling

➢ As per the consumers (live calling exercise) all operators met the benchmark of resolving 98% complaints within 4 weeks except MTNL, Reliance CDMA and Vodafone; however MTNL failed to meet the benchmark for 100% complaints within 6 weeks.
➢ All the operators failed to meet the TRAI benchmark for level 1 service.

Metering and billing credibility

➢ For the billing disputes of post-paid subscribers, it was observed that Idea and Vodafone failed to meet the TRAI benchmark for the parameter.
➢ For the prepaid customers, Idea failed to meet the benchmark of charging disputes Metering and Billing Credibility – Prepaid Subscribers.
➢ All operators met the TRAI benchmark of resolution of billing complaints within 4 weeks. However Vodafone remained slightly below the benchmark for resolving 100% complaints within 6 weeks.
➢ Airtel, Reliance CDMA and Reliance GSM failed to meet the TRAI specified benchmark for Customer Care Percentage of calls answered by the operators (Voice to Voice) within 90 seconds.

Operator Assisted Drive test 2G

➢ Aircel, Idea, MTNL and Reliance GSM failed to meet the benchmark for voice quality in outdoor locations. While MTNL failed to meet the benchmark for voice quality in indoor locations.
➢ MTNL failed to meet the benchmark of call drop rate.

Operator Assisted Drive test 3G

➢ MTNL 3G failed to meet the benchmark for Voice quality.
➢ MTNL 3G met the benchmark for call drop rate in outdoor locations.

Independent Drive test 2G & 3G

➢ Aircel 2G, Idea 2G, MTNL 2G, Reliance GSM, Reliance CDMA and TATA CDMA failed to meet the benchmark for voice quality.

- MTNL 2G & 3G and Reliance GSM failed to meet the benchmark for CSSR.
- Aircel 2G, Idea 2G, Vodafone 2G, Reliance GSM & CDMA, MTNL 2G & 3G and Tata GSM & CDMA failed to meet the benchmark for call drop rate.

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 Mumbai 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	0.09%	0.08%	97.90%	0.29%	0.62%	0.90%	4.44%	97.07%
Airtel	0.07%	0.00%	99.89%	0.05%	0.10%	0.78%	1.59%	100.00%
Idea	0.07%	0.06%	99.26%	0.27%	0.48%	0.91%	1.48%	96.48%
MTNL	0.73%	1.12%	98.16%	0.29%	0.12%	1.49%	2.01%	96.67%
Reliance CDMA	0.08%	0.52%	98.12%	NA	0.47%	0.20%	0.35%	NA
Reliance GSM	0.04%	0.15%	99.20%	0.44%	0.54%	0.14%	0.27%	99.32%
TATA CDMA	0.09%	0.00%	99.19%	NA	0.03%	NA	1.10%	NA
TATA GSM	0.30%	0.00%	99.35%	0.05%	0.04%	0.49%	2.07%	97.96%
Vodafone	0.15%	0.00%	99.38%	0.06%	0.62%	1.01%	2.51%	97.70%

NA: SDCCH/ Paging channel congestion not applicable for CDMA operators. Hence, it has been reported as NA for Reliance CDMA and TATA CDMA.

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

BTSs Accumulated Downtime:

All the operators met the TRAI benchmark, Reliance GSM performed better than other operators with 0.04%.

Worst Affected BTSs Due to Downtime:

All the operators met the TRAI benchmark, operators like Airtel, TATA CDMA & GSM and Vodafone performed better than other operators at 0.00%

Call Set-up Success Rate (CSSR):

All the operators met the TRAI benchmark, Airtel performed better than other operators at 99.89%

SDCCH/ Paging Chl. Congestion:

All the operators met the TRAI benchmark, Airtel and TATA GSM performed better than other operators at 0.05%

TCH Congestion:

All the operators met the TRAI benchmark. TATA CDMA performed better than other operators at 0.03%

Call Drop Rate:

All the operators met the TRAI benchmark, Reliance GSM performed better than other operators at 0.14%.

Worst Affected Cells Having More than 3% TCH Drop:

Aircel failed to meet the TRAI Benchmark, Reliance GSM was best among other operators with 0.27%.

Voice Quality

All the operators met the TRAI Benchmark, Airtel was best among other operators with 100.00%.

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

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	0.06%	0.10%	98.21%	0.15%	0.44%	0.80%	3.97%	97.17%
Airtel	0.07%	0.00%	99.90%	0.04%	0.09%	0.76%	1.57%	97.66%
Idea	0.07%	0.08%	99.26%	0.32%	0.49%	0.96%	1.55%	96.60%
MTNL	0.64%	1.12%	98.13%	0.26%	0.13%	1.47%	1.99%	96.64%
Reliance CDMA	0.06%	0.35%	98.07%	NA	0.49%	0.19%	0.28%	NA
Reliance GSM	0.04%	0.14%	99.20%	0.18%	0.56%	0.12%	0.18%	99.30%
TATA CDMA	0.01%	0.00%	99.19%	NA	0.03%	0.33%	0.81%	99.19%
TATA GSM	0.00%	0.00%	99.44%	0.04%	0.04%	0.67%	2.07%	99.19%
Vodafone	0.08%	0.00%	99.43%	0.06%	0.57%	0.94%	1.66%	97.58%

4.1.2 PMR DATA – MAY FOR 2G

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	0.08%	0.00%	98.11%	0.20%	0.42%	0.76%	3.42%	97.29%
Airtel	0.07%	0.00%	99.91%	0.04%	0.08%	0.77%	1.58%	97.53%
Idea	0.07%	0.03%	99.45%	0.17%	0.32%	0.92%	1.52%	96.54%
MTNL	0.74%	1.01%	98.37%	0.22%	0.10%	1.41%	2.00%	96.83%
Reliance CDMA	0.10%	0.70%	98.16%	NA	0.45%	0.20%	0.41%	NA
Reliance GSM	0.04%	0.14%	99.23%	0.90%	0.59%	0.13%	0.18%	99.36%
TATA CDMA	0.15%	0.00%	99.19%	NA	0.03%	0.39%	1.05%	99.03%
TATA GSM	0.36%	0.00%	99.36%	0.04%	0.03%	0.49%	1.97%	97.93%
Vodafone	0.13%	0.00%	99.48%	0.06%	0.52%	0.83%	2.03%	97.79%

IMRB International | eTech

TRAI
Telecom Regulatory Authority of India
(IS/ISO 9001-2008 Certified Organisation)

4.1.3 PMR DATA - JUNE FOR 2G

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	0.13%	0.15%	97.37%	0.53%	1.01%	1.13%	5.93%	96.76%
Airtel	0.07%	0.00%	99.87%	0.07%	0.12%	0.82%	1.62%	97.46%
Idea	0.08%	0.08%	99.07%	0.31%	0.63%	0.90%	1.39%	96.31%
MTNL	0.82%	1.22%	97.98%	0.40%	0.12%	1.59%	2.04%	96.53%
Reliance CDMA	No Service	No Service	No Service	No Service	No Service	No Service	No Service	No Service
Reliance GSM	0.05%	0.18%	99.16%	23.35%	46.45%	0.18%	0.46%	99.30%
TATA CDMA	0.12%	0.00%	99.20%	NA	0.02%	0.46%	1.43%	99.12%
TATA GSM	0.55%	0.00%	99.26%	0.06%	0.06%	0.51%	2.18%	97.60%
Vodafone	0.23%	0.00%	99.24%	0.06%	0.76%	1.27%	3.82%	97.75%

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	0.06%	0.00%	97.89%	0.38%	0.61%	0.96%	4.79%	97.03%
Airtel	0.06%	0.00%	99.89%	0.05%	0.09%	0.83%	1.57%	99.23%
Idea	0.08%	0.00%	99.28%	0.27%	0.47%	0.96%	1.44%	96.48%
MTNL	0.57%	0.00%	98.19%	0.41%	0.07%	1.47%	2.01%	96.58%
Reliance CDMA	0.12%	0.00%	98.12%	NA	0.48%	0.20%	0.39%	NA
Reliance GSM	0.04%	0.00%	98.25%	0.42%	0.37%	0.15%	0.29%	99.35%
TATA CDMA	0.16%	0.00%	99.26%	NA	0.02%	0.37%	0.69%	NA
TATA GSM	0.31%	0.00%	99.43%	0.11%	0.07%	0.52%	0.81%	97.73%
Vodafone	0.13%	0.00%	99.30%	0.06%	0.69%	1.12%	3.33%	97.65%

NA: SDCCH/ Paging channel congestion not applicable for CDMA operators. Hence, it has been reported as NA for Reliance CDMA and TATA CDMA.

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

BTSs Accumulated Downtime:

All the operators met the TRAI benchmark, Reliance GSM performed better than other operators with 0.04%.

Worst Affected BTSs Due to Downtime:

All the operators met the TRAI benchmark, most of the operators performed 0.00%.

Call Set-up Success Rate (CSSR):

All the operators met the TRAI benchmark, Airtel performed better than other operators at 99.89%.

Excluding Airtel, all other operators were found to be calculating the parameter as per the norm specified by TRAI, as given in parameter description section. 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 Airtel, which was calculated by using the proper counter details (provided in section 8.15.1) by the IMRB auditor during audit.

SDCCH/ Paging Chl. Congestion:

All the operators met the TRAI benchmark, Airtel performed better than other operators at 0.05%.

TCH Congestion:

All the operators met the TRAI benchmark, TATA CDMA performed better than other operators at 0.02%.

Call Drop Rate:

All the operators met the TRAI benchmark, Reliance GSM performed better than other operators at 0.15%.

Worst Affected Cells Having More than 3% TCH Drop:

Aircel and Vodafone failed to meet the TRAI Benchmark, Reliance GSM was best among other operators with 0.29%.

Voice Quality

All the operators met the TRAI Benchmark, Reliance GSM was best among other operators with 99.35%.

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

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	0.04%	0.00%	98.18%	0.30%	0.43%	0.85%	4.35%	97.14%
Airtel	0.08%	0.00%	99.91%	0.04%	0.08%	0.79%	1.66%	97.57%
Idea	0.07%	0.00%	98.99%	0.39%	0.74%	0.99%	1.56%	96.61%
MTNL	0.49%	0.00%	98.35%	0.47%	0.07%	1.50%	2.03%	96.49%
Reliance CDMA	0.14%	0.00%	98.02%	NA	0.59%	0.20%	0.37%	NA
Reliance GSM	0.04%	0.00%	99.33%	0.19%	0.40%	0.13%	0.22%	99.38%
TATA CDMA	0.04%	0.00%	99.19%	NA	0.05%	0.37%	0.89%	97.79%
TATA GSM	0.00%	0.00%	99.51%	0.09%	0.03%	0.50%	0.34%	98.00%
Vodafone	0.11%	0.00%	99.36%	0.09%	0.64%	1.02%	1.61%	97.51%

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	0.07%	0.00%	97.74%	0.42%	0.70%	1.01%	5.01%	96.97%
Airtel	0.05%	0.00%	99.88%	0.05%	0.10%	0.84%	1.52%	97.46%
Idea	0.09%	0.00%	99.43%	0.21%	0.33%	0.95%	1.38%	96.41%
MTNL	0.61%	0.00%	98.11%	0.38%	0.08%	1.46%	2.00%	96.62%
Reliance CDMA	0.09%	0.00%	98.22%	NA	0.37%	0.20%	0.40%	NA
Reliance GSM	0.04%	0.00%	97.71%	0.54%	0.65%	0.15%	0.33%	99.34%
TATA CDMA	0.02%	0.00%	99.40%	NA	0.01%	0.42%	0.39%	99.20%
TATA GSM	0.03%	0.00%	99.32%	0.16%	0.11%	0.53%	0.42%	97.48%
Vodafone	0.10%	0.00%	99.38%	0.05%	0.60%	1.15%	4.32%	97.81%
Vodafone	NA	NA	0.00%	0.00%	0.00%	NA	NA	NA

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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	0.07%	0.00%	97.74%	0.42%	0.70%	1.01%	5.01%	96.97%
Airtel	0.05%	0.00%	99.88%	0.05%	0.10%	0.84%	1.52%	102.60%
Idea	0.09%	0.00%	99.43%	0.21%	0.33%	0.95%	1.38%	96.41%
MTNL	0.61%	0.00%	98.11%	0.38%	0.08%	1.46%	2.00%	96.62%
Reliance CDMA	No Service	No Service	No Service	No Service	No Service	No Service	No Service	No Service
Reliance GSM	0.04%	0.00%	97.71%	0.54%	0.07%	0.15%	0.33%	99.34%
TATA CDMA	0.03%	0.00%	99.18%	NA	0.00%	0.56%	0.77%	99.45%
TATA GSM	0.06%	0.00%	99.45%	0.07%	0.09%	0.55%	1.69%	97.23%
Vodafone	0.18%	0.00%	99.16%	0.05%	0.84%	1.19%	4.04%	97.65%

4.3 PMR DATA – 3 MONTHS- CONSOLIDATED FOR 3G

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

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	0.18%	0.00%	98.85%	0.06%	0.08%	0.38%	1.88%	NA
MTNL 3G	0.78%	1.35%	98.13%	0.69%	0.37%	1.59%	2.50%	98.90%
Reliance 3G	0.13%	0.98%	99.87%	0.07%	0.03%	0.10%	0.35%	NA
Vodafone 3G	0.18%	0.00%	99.83%	0.00%	0.00%	0.36%	1.89%	98.88%

Following are the parameter wise observations for wireless operators for circle: Mumbai.

Node Bs downtime:

All operators met the TRAI benchmark for 3G services, Reliance 3G performed was best with 0.13%.

Worst affected Node Bs due to downtime:

All operators met the TRAI benchmark, Airtel 3G and Vodafone 3G performed best among other operators with 0.00%.

Call Set-up Success Rate (CSSR):

All operators met the TRAI benchmark for 3G services, Reliance 3G performed best among other operators with 99.87%.

RRC Congestion:

All operators met the TRAI benchmark for 3G services, Vodafone 3G performed best among other operators with 0.00%.

Circuit Switched RAB Congestion:

All operators met the TRAI benchmark for 3G services, Vodafone 3G performed best among other operators with 0.00%.

Circuit Switched Voice Call Drop Rate:

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All operators met the TRAI benchmark for 3G services, Reliance 3G performed best among other operators with 0.10%.

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

All operators met the TRAI benchmark for 3G services, Reliance 3G performed best among other operators with 0.35%.

Circuit Switch Voice Quality:

All operators met the TRAI benchmark for 3G services, MTNL 3G performed best among other operators with 98.90%.

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

4.3.1 PMR DATA - APRIL FOR 3G

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	0.05%	0.00%	99.13%	0.07%	0.11%	0.38%	1.83%	99.50%
MTNL 3G	0.68%	1.30%	98.10%	0.67%	0.39%	1.66%	2.62%	98.91%
Reliance 3G	0.09%	0.59%	99.86%	0.06%	0.02%	0.09%	0.37%	99.72%
Vodafone 3G	0.14%	0.00%	99.84%	0.00%	0.00%	0.34%	1.85%	98.90%

4.3.2 PMR DATA – MAY FOR 3G

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	0.06%	0.00%	98.70%	0.05%	0.06%	0.36%	1.80%	99.50%
MTNL 3G	0.84%	1.30%	98.29%	0.64%	0.29%	1.52%	2.41%	98.91%
Reliance 3G	0.08%	0.79%	99.88%	0.04%	0.02%	0.09%	0.30%	99.71%
Vodafone 3G	0.19%	0.00%	99.84%	0.00%	0.00%	0.35%	1.91%	98.91%

4.3.3 PMR DATA - JUNE FOR 3G

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	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Airtel 3G	0.07%	0.00%	98.71%	0.04%	0.06%	0.40%	2.01%	99.50%
MTNL 3G	0.82%	1.45%	98.00%	0.75%	0.42%	1.58%	2.47%	98.87%
Reliance 3G	0.21%	1.57%	99.86%	0.11%	0.05%	0.11%	0.37%	99.71%
Vodafone 3G	0.21%	0.00%	99.81%	0.00%	0.00%	0.39%	1.91%	98.85%

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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.

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

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	0.20%	0.00%	98.74%	0.05%	0.08%	0.40%	1.87%	NA
MTNL 3G	2.11%	0.00%	97.70%	0.75%	0.50%	1.71%	2.71%	98.89%
Reliance 3G	0.11%	0.00%	99.99%	0.04%	0.02%	0.09%	0.31%	NA
Vodafone 3G	0.19%	0.00%	99.47%	0.00%	0.00%	0.35%	1.89%	98.35%

Following are the parameter wise observations for wireless operators for circle: Mumbai.

Node Bs downtime:

All operators met the TRAI benchmark for 3G services except MTNL 3G. Reliance 3G performed best among the other operators.

Worst affected Node Bs due to downtime:

All operators met the TRAI benchmark, Airtel 3G, Vodafone 3G and Reliance 3G performed best among the other operators with 0.00%.

Call Set-up Success Rate (CSSR):

All operators met the TRAI benchmark for 3G services, Reliance 3G performed best among the other operators with 99.99%.

RRC Congestion:

All operators met the TRAI benchmark for 3G services, Vodafone 3G performed best among the other operators with 0.00%.

Circuit Switched RAB Congestion:

All operators met the TRAI benchmark for 3G services, Vodafone 3G performed best among the other operators with 0.00%.

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Circuit Switched Voice Call Drop Rate:

All operators met the TRAI benchmark for 3G services, Reliance 3G performed best among the other operators with 0.09%.

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

All operators met the TRAI benchmark for 3G services, Reliance 3G performed best among the other operators with 0.31%.

Circuit Switch Voice Quality:

All operators met the TRAI benchmark for 3G services, MTNL 3G performed best among the other operators with 98.89%.

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.

4.4.1 3 DAY DATA - APRIL FOR 3G

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	0.07%	0.00%	98.79%	0.04%	0.07%	0.38%	1.82%	99.50%
MTNL 3G	0.65%	0.00%	97.87%	0.75%	0.53%	1.74%	2.68%	98.89%
Reliance 3G	0.10%	0.00%	99.99%	0.02%	0.02%	0.08%	0.31%	99.73%
Vodafone 3G	0.19%	0.00%	99.79%	0.00%	0.00%	0.35%	1.93%	97.86%

4.4.2 3 DAY DATA – MAY FOR 3G

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	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Airtel 3G	0.07%	0.00%	98.79%	0.04%	0.07%	0.38%	1.82%	99.50%
MTNL 3G	0.81%	0.00%	97.19%	0.81%	0.54%	1.73%	2.71%	98.90%
Reliance 3G	0.10%	0.00%	99.99%	0.02%	0.02%	0.08%	0.31%	99.73%
Vodafone 3G	0.20%	0.00%	99.82%	0.00%	0.00%	0.34%	1.91%	98.90%

4.4.3 3 DAY DATA - JUNE FOR 3G

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	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Airtel 3G	0.06%	0.00%	98.63%	0.06%	0.10%	0.43%	1.98%	99.50%
MTNL 3G	0.66%	0.00%	98.03%	0.69%	0.44%	1.67%	2.75%	98.88%
Reliance 3G	0.14%	0.00%	99.98%	0.08%	0.04%	0.09%	0.29%	99.71%
Vodafone 3G	0.17%	0.00%	98.80%	0.00%	0.00%	0.35%	1.82%	98.84%

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

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

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	99.84%	95.66%	1.57%	NDR	95.28%	1.60%
Airtel	NDR	NDR	4.42%	NDR	NDR	NDR
Idea	100.00%	99.37%	0.21%	NDR	99.43%	0.20%
MTNL	NDR	98.42%	1.61%	NDR	99.94%	0.06%
Reliance CDMA	NDR	98.81%	NDR	NDR	99.10%	3.81%
Reliance GSM	NDR	NDR	NDR	NDR	NDR	NDR
TATA CDMA	99.89%	NDR	2.67%	NDR	NDR	2.63%
TATA GSM	98.96%	NDR	2.52%	NDR	NDR	2.35%
Vodafone	99.19%	99.94%	3.02%	NDR	99.94%	2.99%

NDR: - No Data Received

All operators met the TRAI benchmark for Activation done within 4hrs in PMR as well as live audit.

All operators met the TRAI benchmark for PDP context activation success rate in PMR Audit.

All operators met the TRAI benchmark for Drop rate in PMR audit as well as 3days live.

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

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

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	NDR	0.27%	NA	NA	NA
MTNL 3G	NDR	98.42%	1.61%	NDR	99.94%	0.06%
Reliance 3G	NDR	NDR	NDR	NDR	NDR	NDR
Vodafone 3G	98.97%	99.36%	0.40%	NDR	99.39%	0.40%

NDR: - No Data Received

All operators met the TRAI benchmark for Activation done within 4hrs in PMR as well as live audit.

All operators met the TRAI benchmark for PDP context activation success rate in PMR as well as live Audit.

All operators met the TRAI benchmark for Drop rate in PMR as well as 3days live Audit.

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	100.00%	100.00%	100.00%	95.00%	85.00%	NA
Airtel	99.00%	100.00%	100.00%	100.00%	94.67%	86.00%
Idea	98.00%	100.00%	100.00%	95.00%	89.33%	76.00%
MTNL	85.71%	98.41%	100.00%	98.00%	88.33%	87.30%
Reliance CDMA	97.65%	100.00%	100.00%	96.00%	NA	76.00%
Reliance GSM	98.00%	100.00%	100.00%	95.00%	85.33%	81.00%
TATA CDMA	NA	NA	100.00%	100.00%	79.67%	NA
TATA GSM	100.00%	100.00%	100.00%	98.00%	89.00%	NA
Vodafone	96.00%	100.00%	100.00%	100.00%	86.67%	89.00%

Resolution of billing complaints

As per the consumers (live calling exercise) all operators met the benchmark of resolving 98% complaints within 4 weeks except MTNL, Reliance CDMA and Vodafone; however MTNL failed to meet the benchmark for 100% complaints within 6 weeks.

Complaint/Request Attended to Satisfaction

All operators performed satisfactorily in terms of satisfaction of the customers for service requests. Vodafone recorded the best performance.

Level 1 Service

All the operators failed to meet the TRAI benchmark.

Accessibility of Call Centre/Customer Care-IVR

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

Customer Care / Helpline Assessment (voice to voice)

All operators met the benchmark for the parameter.

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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	0.01%	0.00%	100.00%	100.00%	100.00%	98.59%	95.45%
Airtel	0.06%	0.03%	100.00%	100.00%	100.00%	100.00%	89.71%
Idea	0.38%	0.10%	100.00%	100.00%	100.00%	96.42%	98.98%
MTNL	0.05%	0.00%	100.00%	100.00%	100.00%	95.26%	100.00%
Reliance CDMA	0.08%	0.01%	100.00%	100.00%	100.00%	97.54%	78.73%
Reliance GSM	0.09%	0.03%	100.00%	100.00%	100.00%	99.30%	78.42%
TATA CDMA	0.00%	0.00%	NA	NA	NA	100.00%	99.70%
TATA GSM	0.00%	0.00%	100.00%	100.00%	100.00%	98.15%	97.93%
Vodafone	0.79%	0.07%	99.83%	99.87%	100.00%	99.71%	96.04%

Metering and Billing Credibility – Post-paid Subscribers

For the billing disputes of post-paid subscribers, it was observed that Idea and Vodafone failed to meet the TRAI benchmark for the parameter.

Metering and Billing Credibility – Prepaid Subscribers

For the prepaid customers, Idea failed to meet the benchmark of charging disputes.

Resolution of billing complaints

All operators met the TRAI benchmark of resolution of billing complaints within 4 weeks. However Vodafone failed to meet the benchmark for resolving billing complaints within 6 weeks.

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

All operators met 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. Airtel and TATA CDMA recorded the best performance for the parameter.

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

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

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4.9   INTER OPERATOR CALL ASSESSMENT - CONSOLIDATED

6. Inter Operator Call Assessment									
Inter operator call Assessment To↓ From→	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Aircel	NA	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%
Idea	100.00%	100.00%	NA	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
MTNL	100.00%	100.00%	100.00%	NA	100.00%	100.00%	100.00%	100.00%	100.00%
Reliance CDMA	100.00%	100.00%	100.00%	100.00%	NA	100.00%	100.00%	100.00%	100.00%
Reliance GSM	100.00%	100.00%	100.00%	100.00%	100.00%	NA	100.00%	100.00%	100.00%
TATA CDMA	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	NA	100.00%	100.00%
TATA GSM	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%	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, none of the operators faced any problems in connecting to other operators.

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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
Mumbai	Aircel	0.09	0.09	0.08	0.08	97.90	97.90	0.29	0.29	0.62	0.62	0.90	0.90	4.44	4.44	97.07	97.07	0	0.00
	Airtel	0.07	0.07	0.00	0.00	99.90	99.89	0.04	0.05	0.09	0.10	0.77	0.78	1.58	1.59	97.58	100.00	0	0.00
	Idea	0.07	0.07	0.06	0.06	99.26	99.26	0.27	0.27	0.48	0.48	0.93	0.91	1.48	1.48	96.48	96.48	0	0.00
	MTNL	0.75	0.73	1.12	1.12	98.16	98.16	0.29	0.29	0.12	0.12	1.49	1.49	2.01	2.01	96.67	96.67	0	0.00
	RCOM CDMA	0.13	0.08	0.62	0.52	98.04	98.12	0.00	NA	0.49	0.47	0.22	0.20	0.26	0.35	99.89	NA	0	0.00
	RCOM GSM	0.04	0.04	0.15	0.15	99.20	99.20	0.21	0.44	0.47	0.54	0.14	0.14	0.30	0.27	99.32	99.32	0	0.00
	TTML CDMA	0.09	0.09	0.00	0.00	99.19	99.19	0.00	NA	0.00	0.03	0.44	NA	1.10	1.10	99.09	NA	0	0.00
	TTML GSM	0.31	0.30	0.00	0.00	99.35	99.35	0.05	0.05	0.05	0.04	0.51	0.49	2.07	2.07	97.79	97.96	0	0.00
	Vodafone	0.15	0.15	0.00	0.00	99.39	99.38	0.06	0.06	0.62	0.62	1.01	1.01	2.77	2.51	97.71	97.70	0	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
Mumbai	Airtel	0.06	0.18	0.00	0.00	98.89	98.85	0.06	0.06	0.08	0.08	0.38	0.38	1.84	1.88	99.50	NA	0.00	0.00
	MTNL	0.80	0.78	1.37	1.35	96.63	98.13	0.70	0.69	0.37	0.37	1.60	1.59	2.70	2.50	98.90	98.90	0.00	0.00
	RCOM	0.16	0.13	1.18	0.98	99.87	99.87	0.06	0.07	0.04	0.03	0.09	0.10	0.43	0.35	98.60	NA	0.00	0.00
	Vodafone	0.18	0.18	0.00	0.00	99.83	99.83	0.00	0.00	0.00	0.00	0.35	0.36	1.91	1.89	98.89	98.88	0.00	0.00

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5   CRITICAL FINDINGS

PMR Consolidated (Network Parameters) for 2G

➢ Aircel failed to meet the benchmark for worst affected cells having more than 3% TCH drop rate.

3 Day Live Measurement (Network Parameters)

➢ Aircel and Vodafone failed to meet the benchmark for worst affected cells having more than 3% TCH drop rate.

PMR Consolidated (Network Parameters) for 3G

➢ MTNL 3G failed to meet the TRAI benchmark for Node Bs downtime, Reliance 3G performed best among other operators with 0.00% in 3days live audit.

Live Calling

➢ As per the consumers (live calling exercise) all operators met the benchmark of resolving 98% complaints within 4 weeks except MTNL, Reliance CDMA and Vodafone; however MTNL failed to meet the benchmark for 100% complaints within 6 weeks.
➢ All the operators failed to meet the TRAI benchmark for level 1 service.

Metering and billing credibility

➢ For the billing disputes of post-paid subscribers, it was observed that Idea and Vodafone failed to meet the TRAI benchmark for the parameter.
➢ For the prepaid customers, Idea failed to meet the benchmark of charging disputes Metering and Billing Credibility – Prepaid Subscribers.
➢ All operators met the TRAI benchmark of resolution of billing complaints within 4 weeks. However Vodafone remained slightly below the benchmark for resolving 100% complaints within 6 weeks.
➢ Airtel, Reliance CDMA and Reliance GSM failed to meet the TRAI specified benchmark for Customer Care Percentage of calls answered by the operators (Voice to Voice) within 90 seconds.

Operator Assisted Drive test 2G

➢ Aircel, Idea, MTNL and Reliance GSM failed to meet the benchmark for voice quality in outdoor locations. While MTNL failed to meet the benchmark for voice quality in indoor locations.
➢ MTNL failed to meet the benchmark of call drop rate.

Operator Assisted Drive test 3G

➢ MTNL 3G failed to meet the benchmark for Voice quality.
➢ MTNL 3G met the benchmark for call drop rate in outdoor locations.

Independent Drive test 2G & 3G

➢ Aircel 2G, Idea 2G, MTNL 2G, Reliance GSM, Reliance CDMA and TATA CDMA failed to meet the benchmark for voice quality.
➢ MTNL 2G & 3G and Reliance GSM failed to meet the benchmark for CSSR.
➢ Aircel 2G, Idea 2G, Vodafone 2G, Reliance GSM & CDMA, MTNL 2G & 3G and Tata GSM & CDMA failed to meet the benchmark for call drop rate

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.

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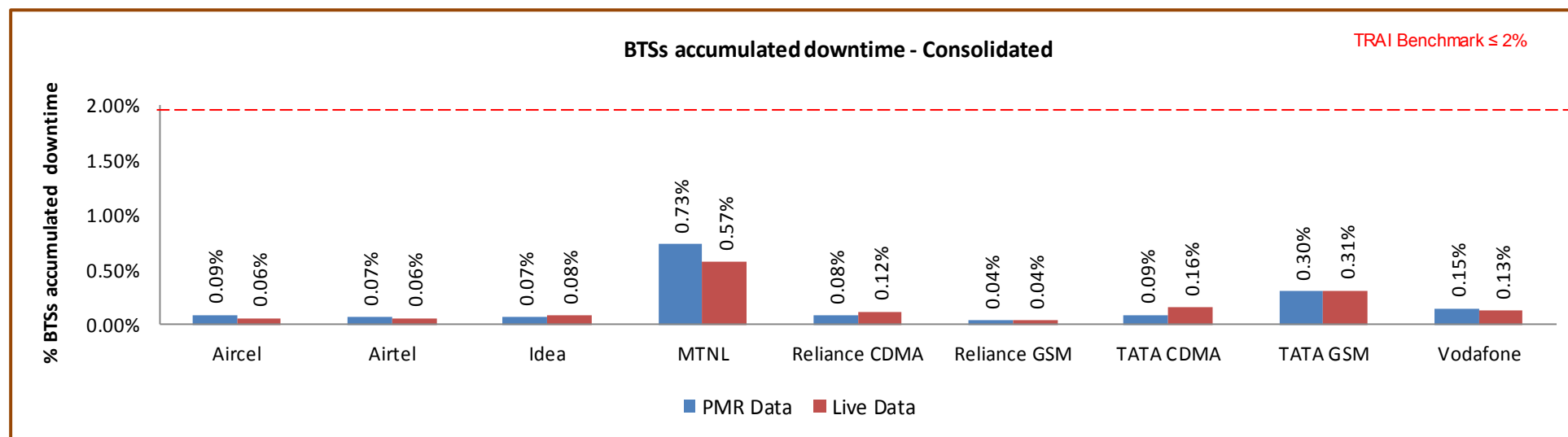
Data Source: Operations and Maintenance Center (OMC) of the operators

All the Operators met the TRAI benchmark.

6.1.2.1 KEY FINDINGS – MONTH 1

BTSs accumulated downtime - Month 1

TRAI Benchmark ≤ 2%
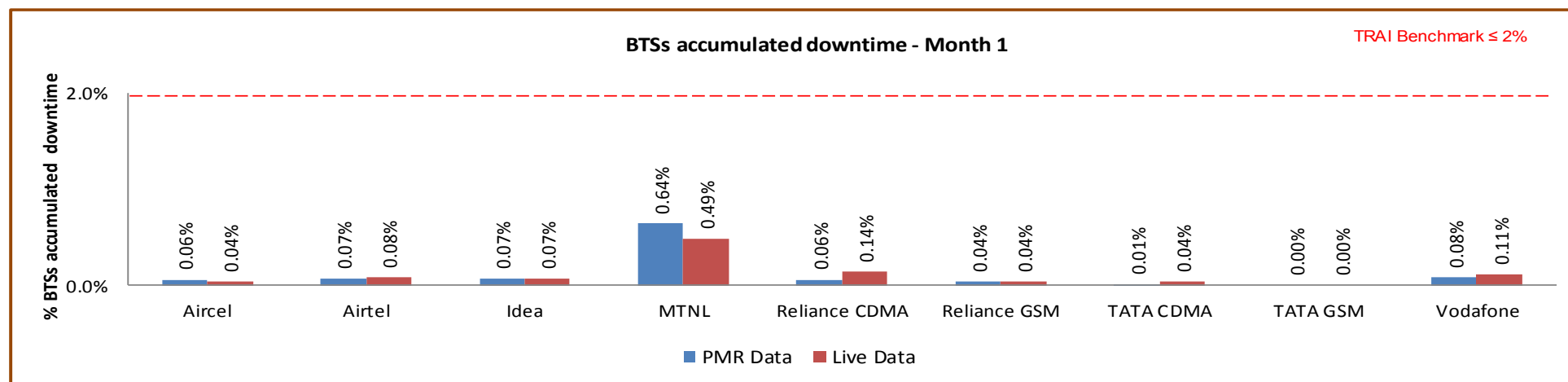
Data Source: Operations and Maintenance Center (OMC) of the operators

6.1.2.2 KEY FINDINGS – MONTH 2

BTSs accumulated downtime - Month 2

TRAI Benchmark ≤ 2%

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

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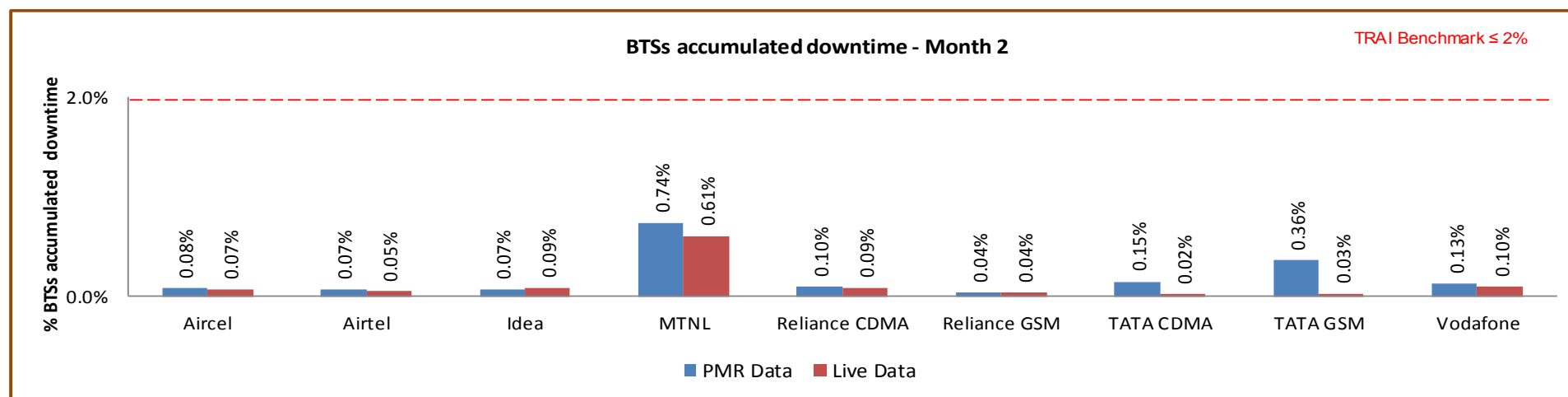
6.1.2.3 KEY FINDINGS – MONTH 3
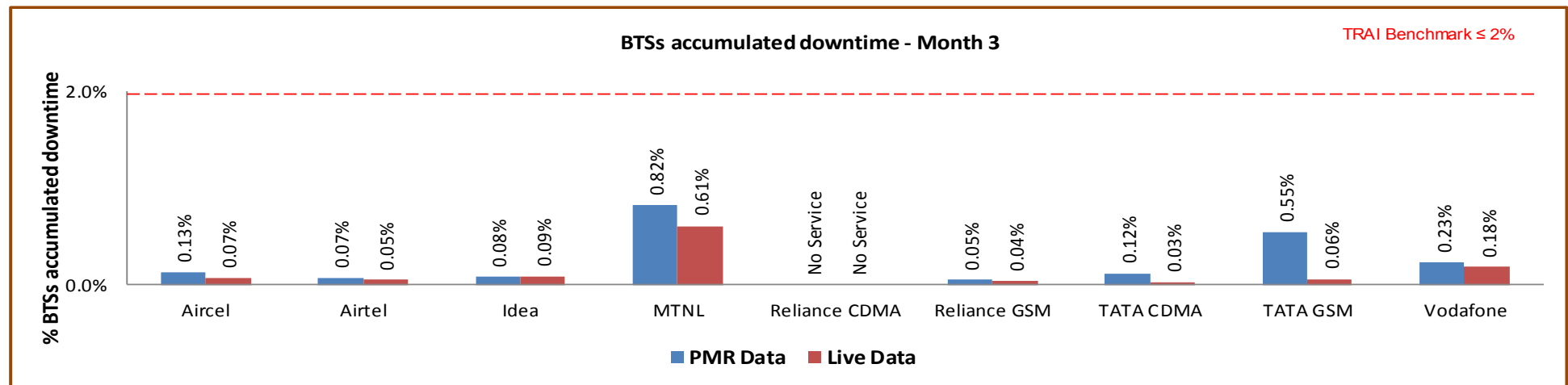
Data Source: Operations and Maintenance Center (OMC) of the operators

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
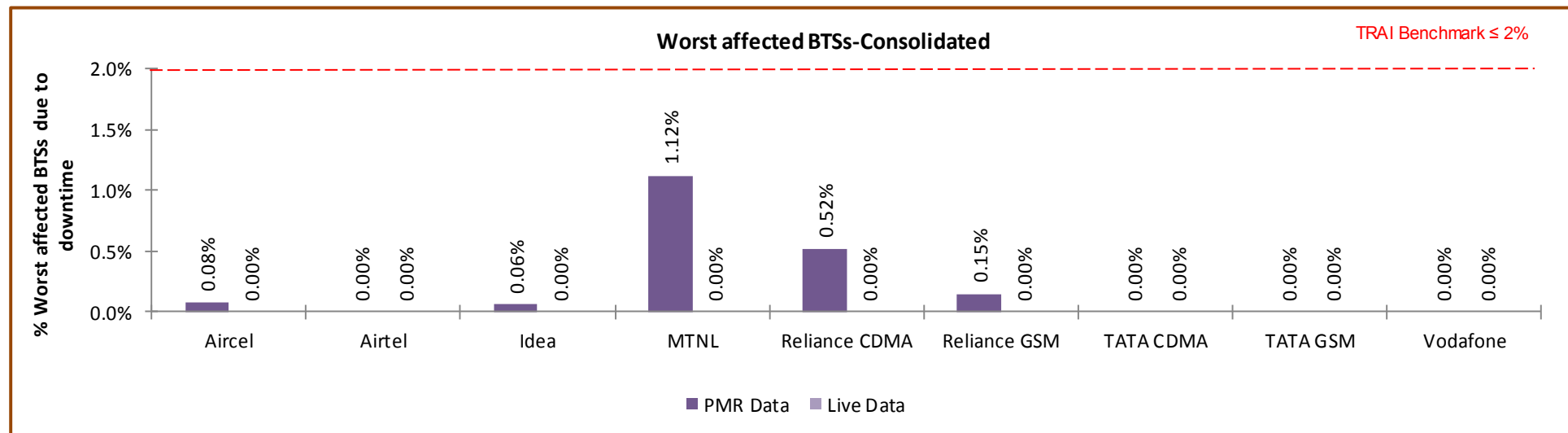
Worst affected BTSs-Consolidated

TRAI Benchmark ≤ 2%

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

All the Operators met the TRAI benchmark.

Significant difference was observed between PMR & live measurement data for MTNL, Reliance CDMA and Reliance GSM. 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

Worst affected BTSs-Month 1

TRAI Benchmark ≤ 2%

% Worst affected BTSs due to downtime

	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
PMR Data	0.10%	0.00%	0.08%	1.12%	0.35%	0.14%	0.00%	0.00%	0.00%
Live Data	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

■ PMR Data ■ Live Data
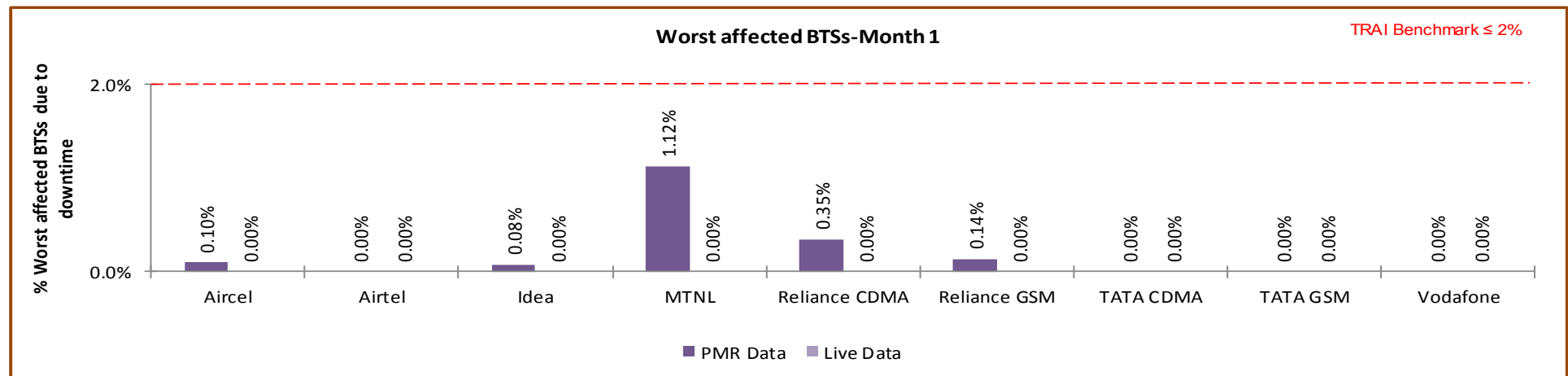
Data Source: Operations and Maintenance Center (OMC) of the operators

6.2.2.2   KEY FINDINGS – MONTH 2

Worst affected BTSs-Month 2

TRAI Benchmark ≤ 2%

% Worst affected BTSs due to downtime

	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
PMR Data	0.00%	0.00%	0.03%	1.01%	0.70%	0.14%	0.00%	0.00%	0.00%
Live Data	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

■ PMR Data ■ Live Data

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

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6.2.2.3   KEY FINDINGS – MONTH 3

Worst affected BTSs-Month 3

TRAI Benchmark ≤ 2%

% Worst affected BTSs due to downtime

Operator	PMR Data	Live Data
Aircel	0.15%	0.00%
Airtel	0.00%	0.00%
Idea	0.08%	0.00%
MTNL	1.22%	0.00%
Reliance CDMA	No Service	No Service
Reliance GSM	0.18%	0.00%
TATA CDMA	0.00%	0.00%
TATA GSM	0.00%	0.00%
Vodafone	0.00%	0.00%

■ PMR Data ■ Live Data

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

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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
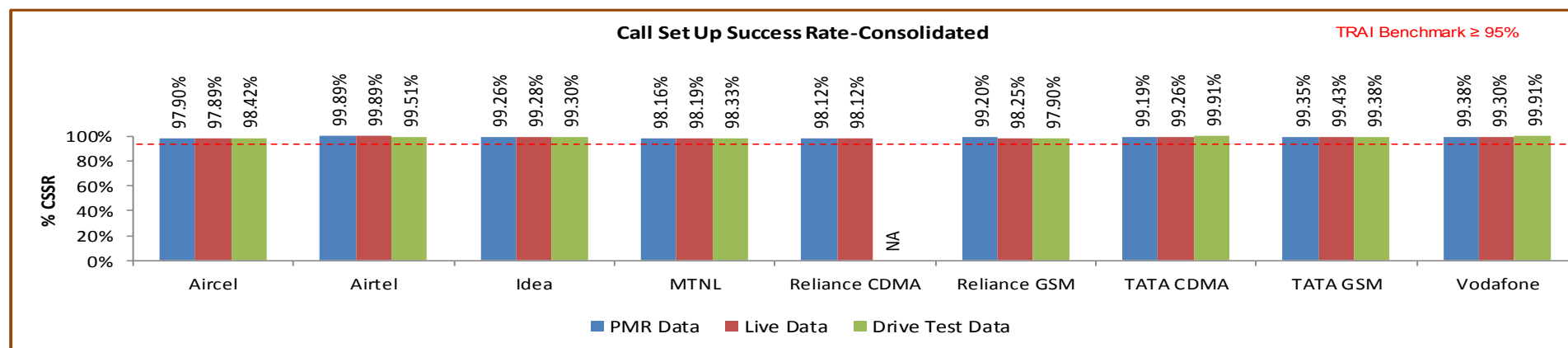
Call Set Up Success Rate-Consolidated

TRAI Benchmark ≥ 95%

Operator	PMR Data	Live Data	Drive Test Data
Aircel	97.90%	97.89%	98.42%
Airtel	99.89%	99.89%	99.51%
Idea	99.26%	99.28%	99.30%
MTNL	98.16%	98.19%	98.33%
Reliance CDMA	98.12%	98.12%	NA
Reliance GSM	99.20%	98.25%	97.90%
TATA CDMA	99.19%	99.26%	99.91%
TATA GSM	99.35%	99.43%	99.38%
Vodafone	99.38%	99.30%	99.91%

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

All the Operators met the TRAI benchmark.

6.3.2.1   KEY FINDINGS – MONTH 1

Call Set Up Success Rate-Month 1

TRAI Benchmark ≥ 95%

Operator	PMR Data	Live Data	Drive Test Data
Aircel	98.21%	98.18%	NA
Airtel	99.90%	99.91%	NA
Idea	99.26%	98.99%	NA
MTNL	98.13%	98.35%	NA
Reliance CDMA	98.07%	98.02%	NA
Reliance GSM	99.20%	99.33%	NA
TATA CDMA	99.19%	99.19%	NA
TATA GSM	99.44%	99.51%	NA
Vodafone	99.43%	99.36%	NA
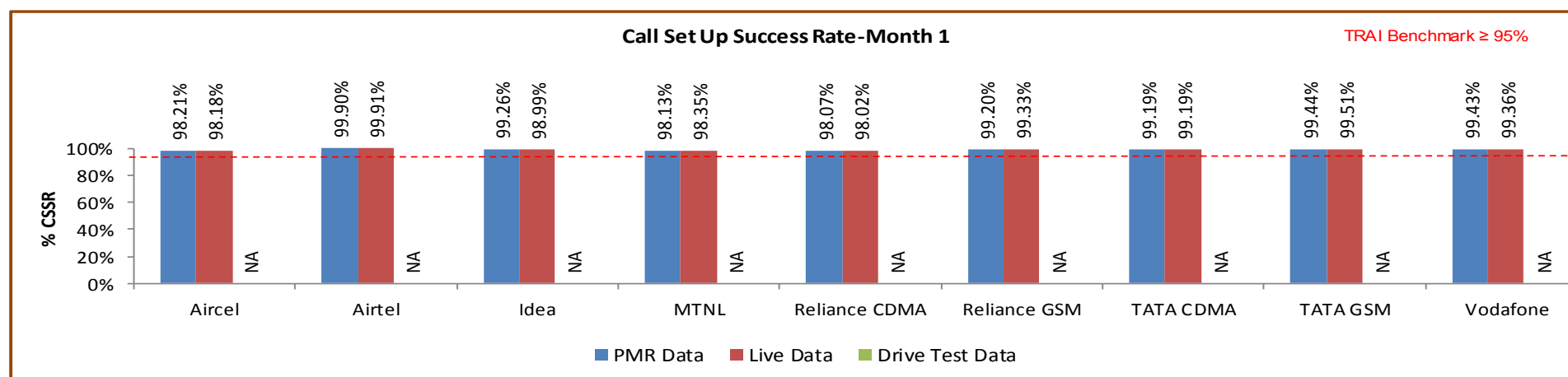
Data Source: Network Operations Center (NOC) of the operators

6.3.2.2 KEY FINDINGS – MONTH 2

Call Set Up Success Rate-Month 2

TRAI Benchmark ≥ 95%

	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
PMR Data	98.11%	99.91%	99.45%	98.37%	98.16%	99.23%	99.19%	99.36%	99.48%
Live Data	97.74%	99.88%	99.43%	98.11%	98.22%	97.71%	99.40%	99.32%	99.38%
Drive Test Data	98.42%	99.51%	99.30%	98.33%	NA	97.90%	99.91%	99.38%	99.91%
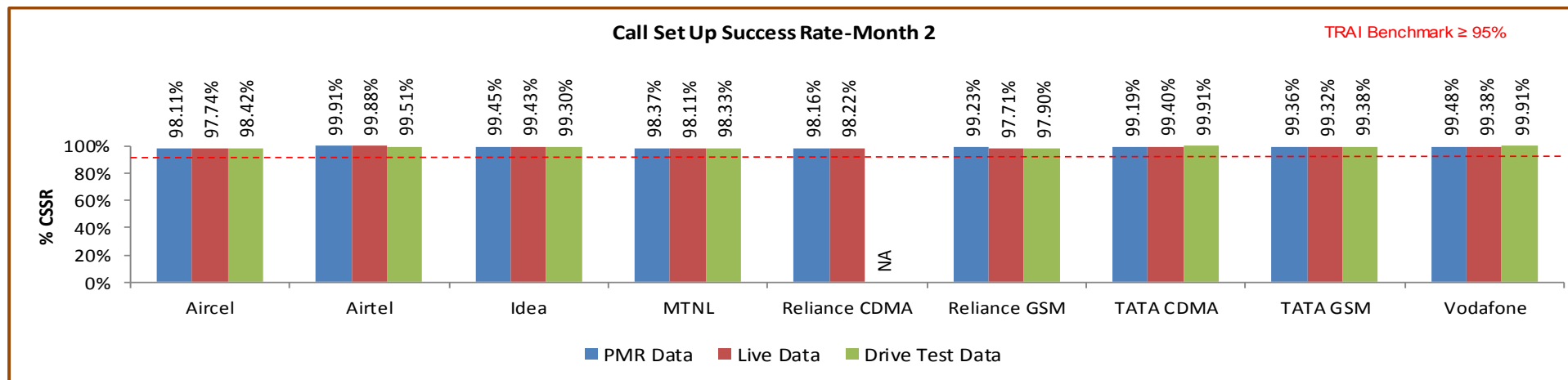
Data Source: Network Operations Center (NOC) of the operators

6.3.2.3 KEY FINDINGS – MONTH 3

Call Set Up Success Rate-Month 3

TRAI Benchmark ≥ 95%

	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
PMR Data	97.37%	99.87%	99.07%	97.98%	No Service	99.16%	99.20%	99.26%	99.24%
Live Data	97.74%	99.88%	99.43%	98.11%	No Service	97.71%	99.18%	99.45%	99.16%
Drive Test Data	NA	NA	NA	NA	NA	NA	NA	NA	NA

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

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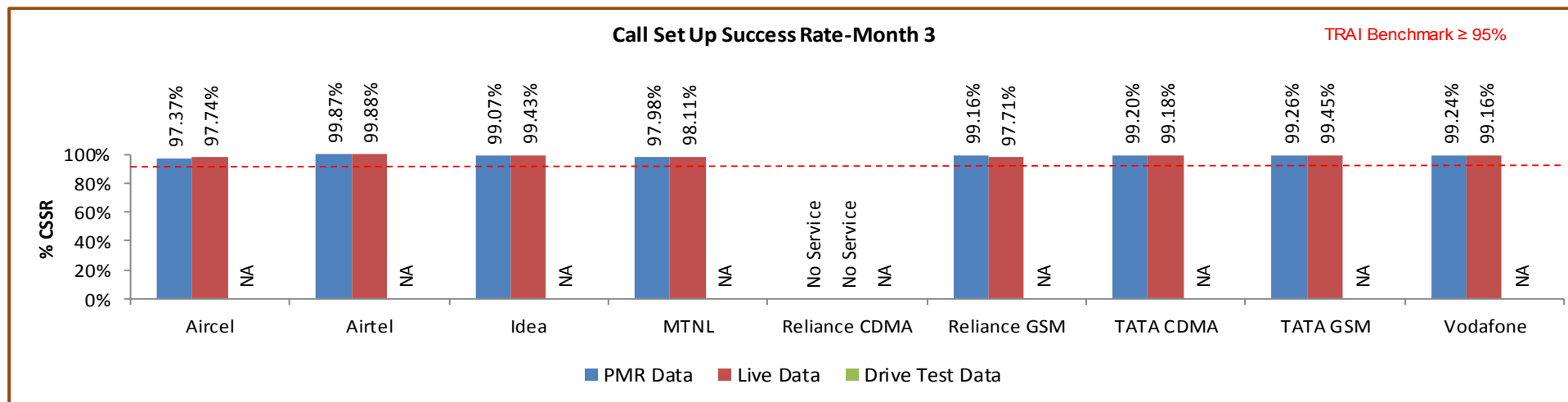
6.4 NETWORK CHANNEL CONGESTION- PAGING CHANNEL /TCH CONGESTION/POI

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% = $[(A_1 \times C_1) + (A_2 \times C_2) + ... + (A_n \times C_n)] / (A_1 + A_2 + ... + A_n)$**

   - Where:-A_1 = Number of attempts to establish SDCCH / TCH made on day 1

   - C_1 = Average SDCCH / TCH Congestion % on day 1

   - A_2 = Number of attempts to establish SDCCH / TCH made on day 2

   - C_2 = Average SDCCH / TCH Congestion % on day 2

   - A_n = Number of attempts to establish SDCCH / TCH made on day n

   - C_n = Average SDCCH / TCH Congestion % on day n

   ↳ **POI Congestion% = $[(A_1 \times C_1) + (A_2 \times C_2) + ... + (A_n \times C_n)] / (A_1 + A_2 + ... + A_n)$**

   - Where:-A_1 = POI traffic offered on all POIs (no. of calls) on day 1

   - C_1 = Average POI Congestion % on day 1

   - A_2 = POI traffic offered on all POIs (no. of calls) on day 2

   - C_2 = 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)
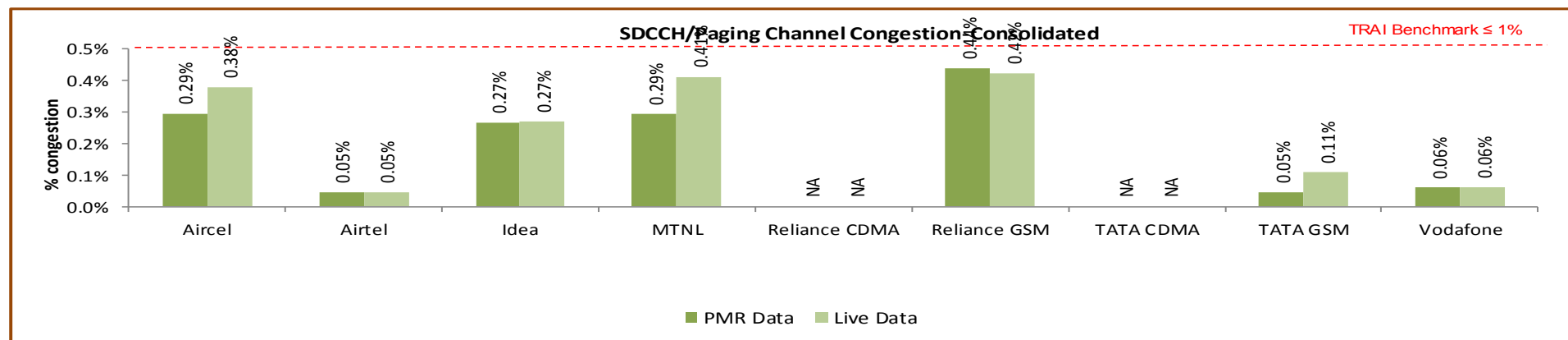
Data Source: Network Operations Center (NOC) of the operators

All operators met the benchmark as per PMR/audit.

NA: SDCCH/ Paging channel congestion not applicable for CDMA operators. Hence, it has been reported as NA for Reliance CDMA and TATA CDMA.

6.4.2.1 KEY FINDINGS – MONTH 1

SDCCH/Paging Channel Congestion-Month 1

TRAI Benchmark ≤ 1%

Operator	PMR Data	Live Data
Aircel	0.15%	0.30%
Airtel	0.04%	0.04%
Idea	0.32%	0.39%
MTNL	0.26%	0.47%
Reliance CDMA	NA	NA
Reliance GSM	0.18%	0.19%
TATA CDMA	NA	NA
TATA GSM	0.04%	0.09%
Vodafone	0.06%	0.09%
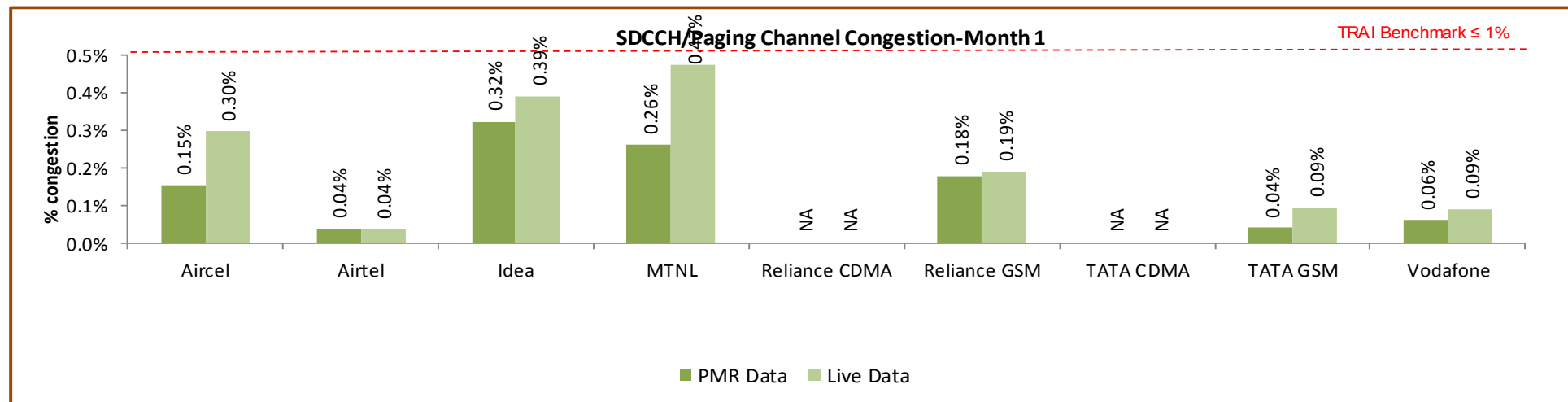
Data Source: Network Operations Center (NOC) of the operators

6.4.2.2 KEY FINDINGS – MONTH 2

SDCCH/Paging Channel Congestion-Month 2

TRAI Benchmark ≤ 1%

Operator	PMR Data	Live Data
Aircel	0.20%	0.42%
Airtel	0.04%	0.05%
Idea	0.17%	0.21%
MTNL	0.22%	0.38%
Reliance CDMA	NA	NA
Reliance GSM	0.90%	0.54%
TATA CDMA	NA	NA
TATA GSM	0.04%	0.16%
Vodafone	0.06%	0.05%

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

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6.4.2.3 KEY FINDINGS – MONTH 3

SDCCH/Paging Channel Congestion-Month 3

TRAI Benchmark ≤ 1%

Operator	PMR Data	Live Data
Aircel	0.53%	0.42%
Airtel	0.07%	0.05%
Idea	0.31%	0.21%
MTNL	0.40%	0.38%
Reliance CDMA	No Service	No Service
Reliance GSM	0.23%	0.54%
TATA CDMA	NA	NA
TATA GSM	0.06%	0.07%
Vodafone	0.06%	0.05%

■ PMR Data ■ Live Data

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

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6.4.3   KEY FINDINGS – TCH CONGESTION (CONSOLIDATED)
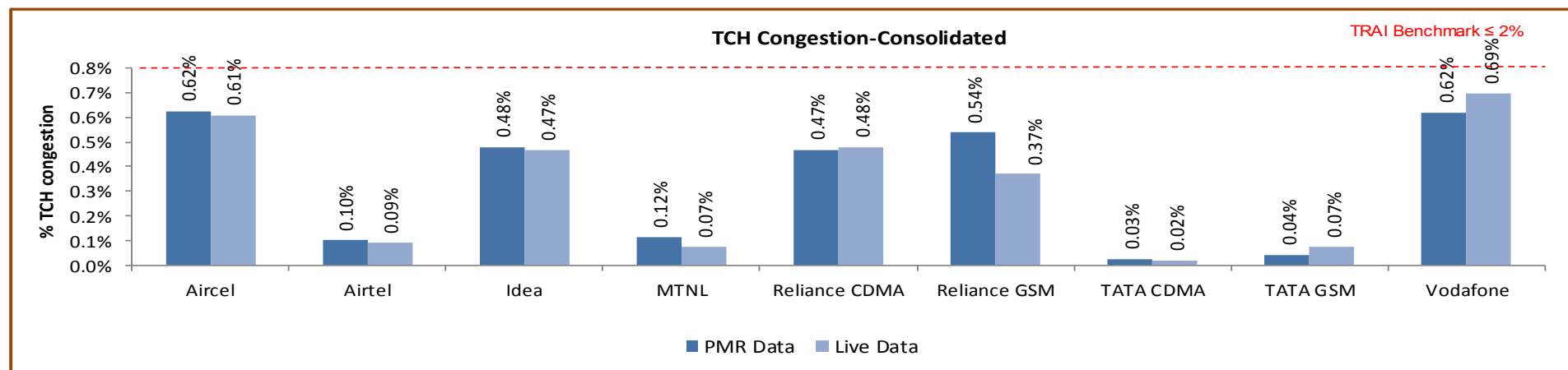
TCH Congestion-Consolidated

TRAI Benchmark ≤ 2%

Operator	PMR Data	Live Data
Aircel	0.62%	0.61%
Airtel	0.10%	0.09%
Idea	0.48%	0.47%
MTNL	0.12%	0.07%
Reliance CDMA	0.47%	0.48%
Reliance GSM	0.54%	0.37%
TATA CDMA	0.03%	0.02%
TATA GSM	0.04%	0.07%
Vodafone	0.62%	0.69%

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

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

6.4.3.1   KEY FINDINGS – MONTH 1

TCH Congestion-Month 1

TRAI Benchmark ≤ 2%

Operator	PMR Data	Live Data
Aircel	0.44%	0.43%
Airtel	0.09%	0.08%
Idea	0.49%	0.74%
MTNL	0.13%	0.07%
Reliance CDMA	0.49%	0.59%
Reliance GSM	0.56%	0.40%
TATA CDMA	0.03%	0.05%
TATA GSM	0.04%	0.03%
Vodafone	0.57%	0.64%
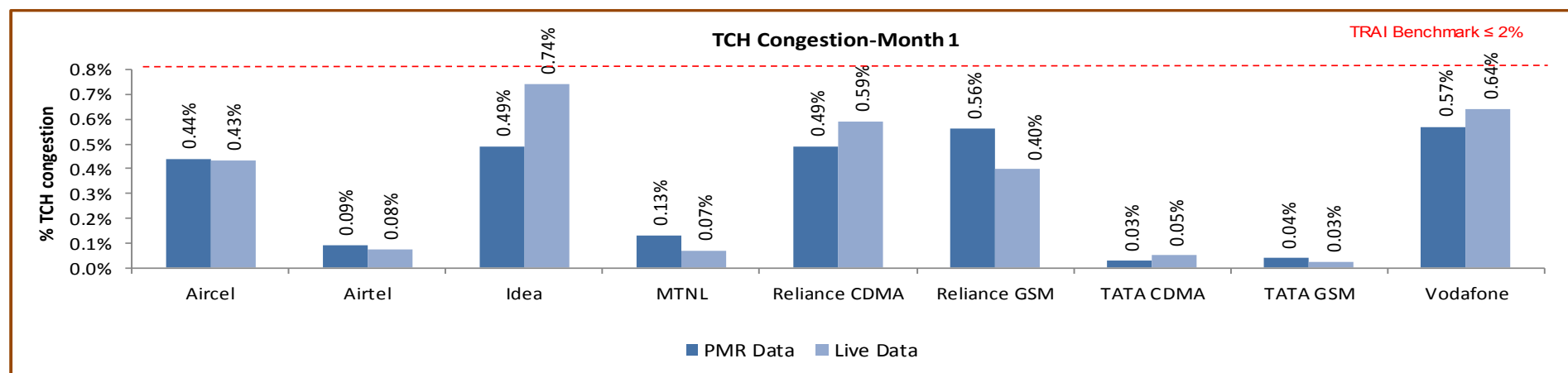
Data Source: Network Operations Center (NOC) of the operators

6.4.3.2 KEY FINDINGS – MONTH 2

TCH Congestion-Month 2

TRAI Benchmark ≤ 2%

% TCH congestion

	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
PMR Data	0.42%	0.08%	0.32%	0.10%	0.45%	0.59%	0.03%	0.03%	0.52%
Live Data	0.70%	0.10%	0.33%	0.08%	0.37%	0.65%	0.01%	0.11%	0.60%

■ PMR Data ■ Live Data
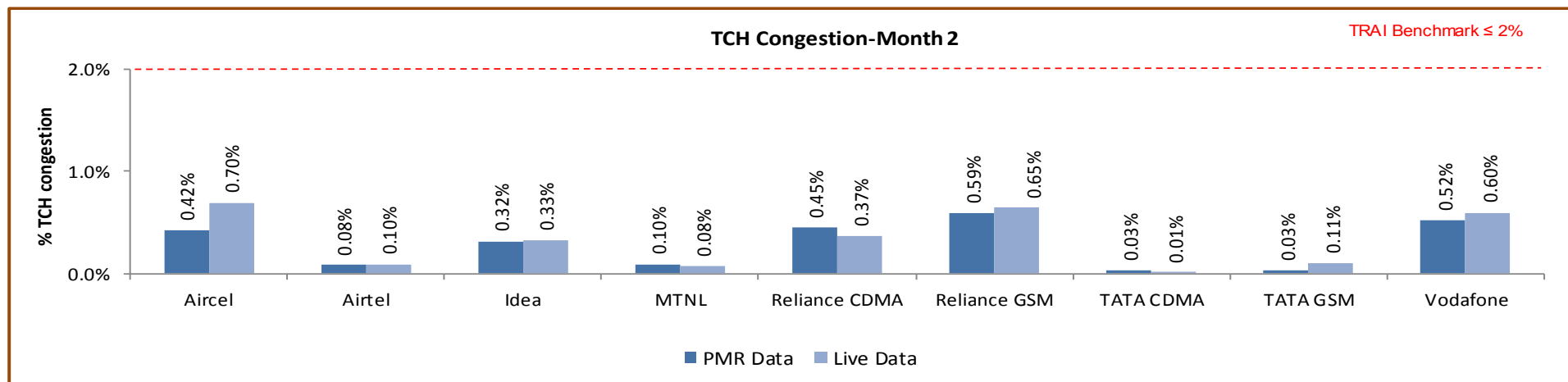
Data Source: Network Operations Center (NOC) of the operators

6.4.3.3 KEY FINDINGS – MONTH 3

TCH Congestion-Month 3

TRAI Benchmark ≤ 2%

% TCH congestion

	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
PMR Data	1.01%	0.12%	0.63%	0.12%	No Service	0.46%	0.02%	0.06%	0.76%
Live Data	0.70%	0.10%	0.33%	0.08%	No Service	0.07%	0.00%	0.09%	0.84%

■ PMR Data ■ Live Data
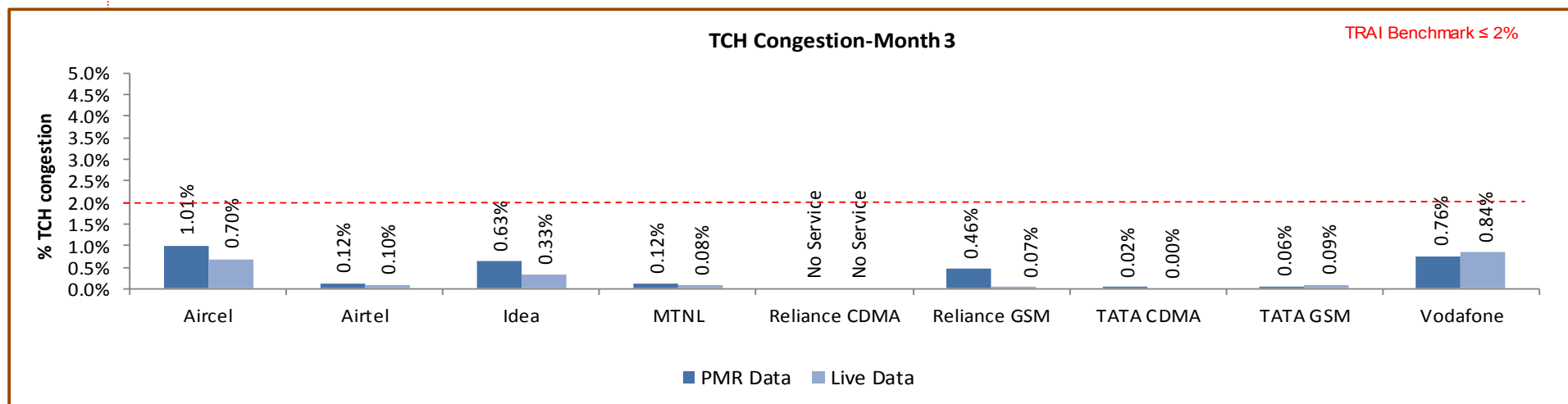
Data Source: Network Operations Center (NOC) of the operators

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

Audit Results for POI Congestion- PMR data										
POI congestion	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		302	881	284	93	256	258	0	0	0
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		236717	415815	0	45539	74480	129791	0	0	0
Traffic served for all POIs (B)- in erlangs		100807	286861	0	20620	41970	85310	0	0	0
POI congestion	≤ 0.5%	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	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		302	874	0	93	259	267	0	0	0
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		236344	412846	0	45558	74040	132736	0	0	0
Traffic served for all POIs (B)- in erlangs		102491	290649	0	11740	41597	89024	0	0	0
POI congestion	≤ 0.5%	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	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		100	300	284	31	128	81	NA	NA	NA
No. of POIs not meeting benchmark		0	0	0	0	0	0	NA	NA	NA
Total Capacity of all POIs (A) - in erlangs		78649	139403	NA	15182	37176	40961	NA	NA	NA
Traffic served for all POIs (B)- in erlangs		32711	93233	NA	7132	21960	27455	NA	NA	NA
POI congestion	≤ 0.5%	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	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		100	286	NA	31	131	85	NA	NA	NA
No. of POIs not meeting benchmark		0	0	NA	0	0	0	NA	NA	NA
Total Capacity of all POIs (A) - in erlangs		78649	134620	NA	15202	37510	43125	NA	NA	NA
Traffic served for all POIs (B)- in erlangs		33663	90572	NA	3994	21757	27914	NA	NA	NA
POI congestion	≤ 0.5%	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	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		100	294	NA	31	128	87	NA	NA	NA
No. of POIs not meeting benchmark		0	0	NA	0	0	0	NA	NA	NA
Total Capacity of all POIs (A) - in erlangs		78707	139166	NA	15179	37304	43569	NA	NA	NA
Traffic served for all POIs (B)- in erlangs		32984	94916	NA	6686	20010	27739	NA	NA	NA
POI congestion	≤ 0.5%	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	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		101	294	NA	31	128	91	NA	NA	NA
No. of POIs not meeting benchmark		0	0	NA	0	0	0	NA	NA	NA
Total Capacity of all POIs (A) - in erlangs		78848	139113	NA	15178	36530	44805	NA	NA	NA
Traffic served for all POIs (B)- in erlangs		34414	100039	NA	3873	19840	30555	NA	NA	NA
POI congestion	≤ 0.5%	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	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		102	287	NA	31	No Service	90	NA	NA	NA
No. of POIs not meeting benchmark		0	0	NA	0	No Service	0	NA	NA	NA
Total Capacity of all POIs (A) - in erlangs		79361	137246	NA	15178	No Service	45261	NA	NA	NA
Traffic served for all POIs (B)- in erlangs		35112	98712	NA	6802	No Service	30116	NA	NA	NA
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	No Service	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-June										
POI congestion	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		101	294	NA	31	No Service	91	NA	NA	NA
No. of POIs not meeting benchmark		0	0	NA	0	No Service	0	NA	NA	NA
Total Capacity of all POIs (A) - in erlangs		78848	139113	NA	15178	No Service	44805	NA	NA	NA
Traffic served for all POIs (B)- in erlangs		34414	100039	NA	3873	No Service	30555	NA	NA	NA
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	No Service	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
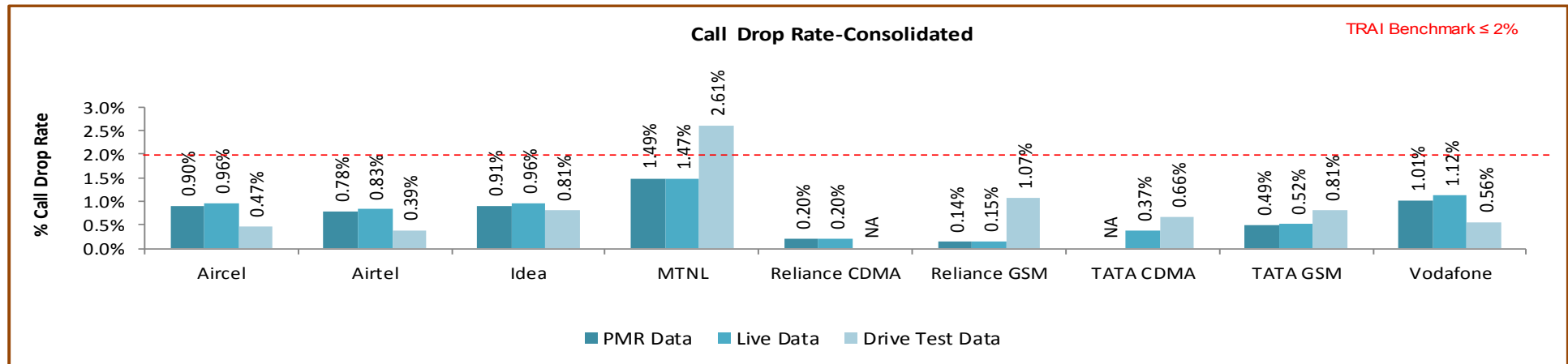
Call Drop Rate-Consolidated

TRAI Benchmark ≤ 2%

Data presented (% Call Drop Rate):

Operator	PMR Data	Live Data	Drive Test Data
Aircel	0.90%	0.96%	0.47%
Airtel	0.78%	0.83%	0.39%
Idea	0.91%	0.96%	0.81%
MTNL	1.49%	1.47%	2.61%
Reliance CDMA	0.20%	0.20%	NA
Reliance GSM	0.14%	0.15%	1.07%
TATA CDMA	NA	0.37%	0.66%
TATA GSM	0.49%	0.52%	0.81%
Vodafone	1.01%	1.12%	0.56%

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

MTNL failed to meet the benchmark for call drop rate during drive test.

6.5.2.1 KEY FINDINGS – MONTH 1
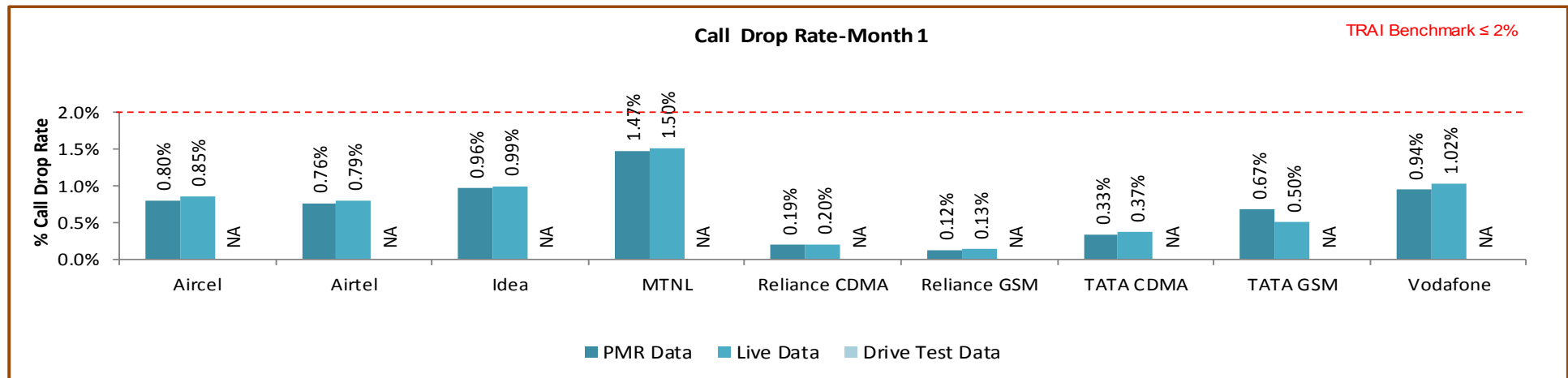
Call Drop Rate-Month 1

TRAI Benchmark ≤ 2%

Data presented (% Call Drop Rate):

Operator	PMR Data	Live Data	Drive Test Data
Aircel	0.80%	0.85%	NA
Airtel	0.76%	0.79%	NA
Idea	0.96%	0.99%	NA
MTNL	1.47%	1.50%	NA
Reliance CDMA	0.19%	0.20%	NA
Reliance GSM	0.12%	0.13%	NA
TATA CDMA	0.33%	0.37%	NA
TATA GSM	0.67%	0.50%	NA
Vodafone	0.94%	1.02%	NA

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

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6.5.2.2 KEY FINDINGS – MONTH 2

Call Drop Rate-Month 2

TRAI Benchmark ≤ 2%
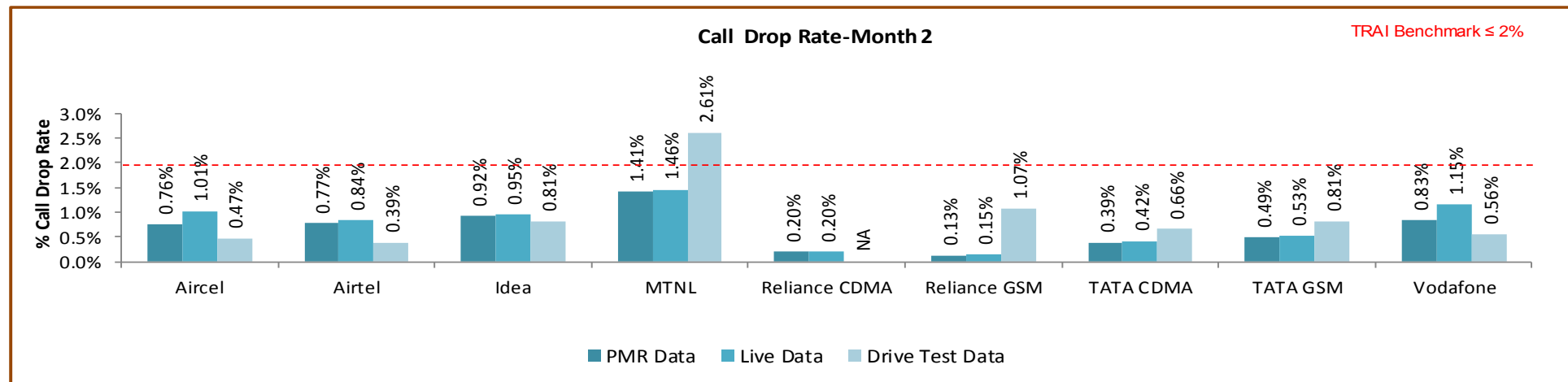
Data Source: Network Operations Center (NOC) of the operators

6.5.2.3 KEY FINDINGS – MONTH 3

Call Drop Rate-Month 3

TRAI Benchmark ≤ 2%
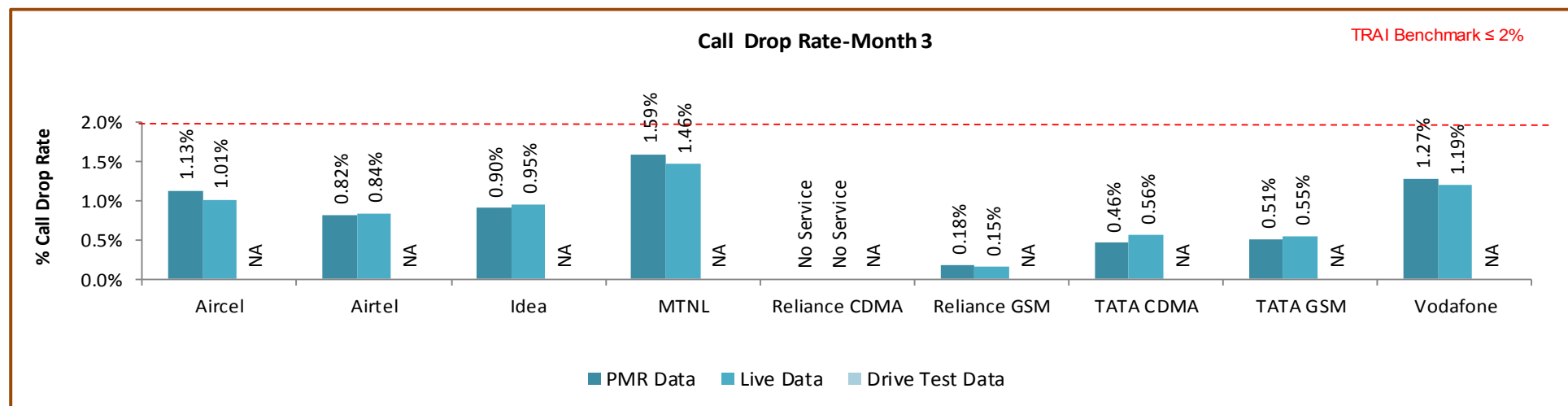
Data Source: Network Operations Center (NOC) of the operators

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

Cells having >3% TCH Drop -Consolidated

TRAI Benchmark ≤ 3%
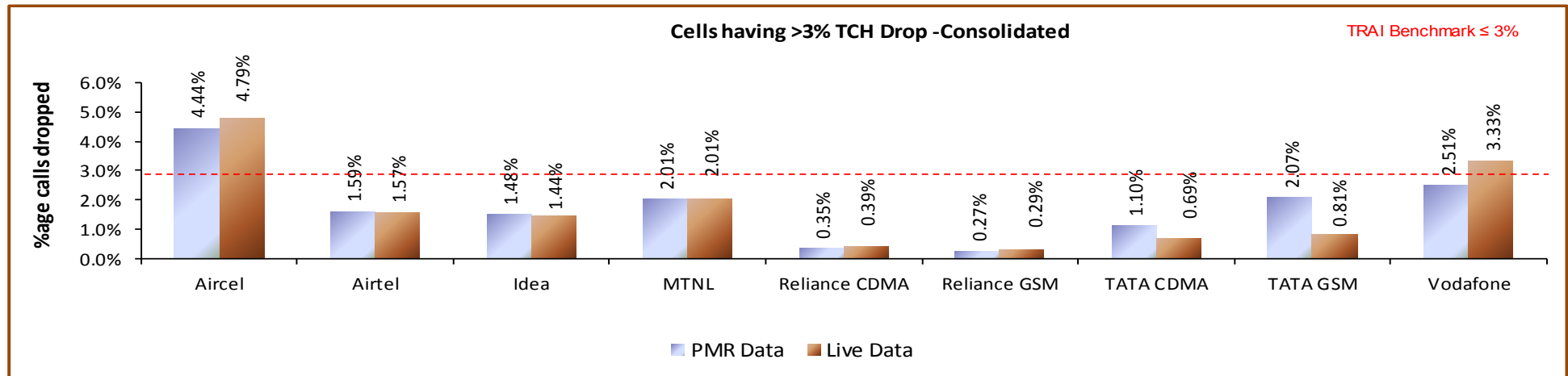
Data Source: Network Operations Center (NOC) of the operators

Aircel failed to meet the benchmark as per PMR/audit Data.

6.6.2.1   KEY FINDINGS – MONTH 1

Cells having >3% TCH Drop-Month 1

TRAI Benchmark ≤ 3%
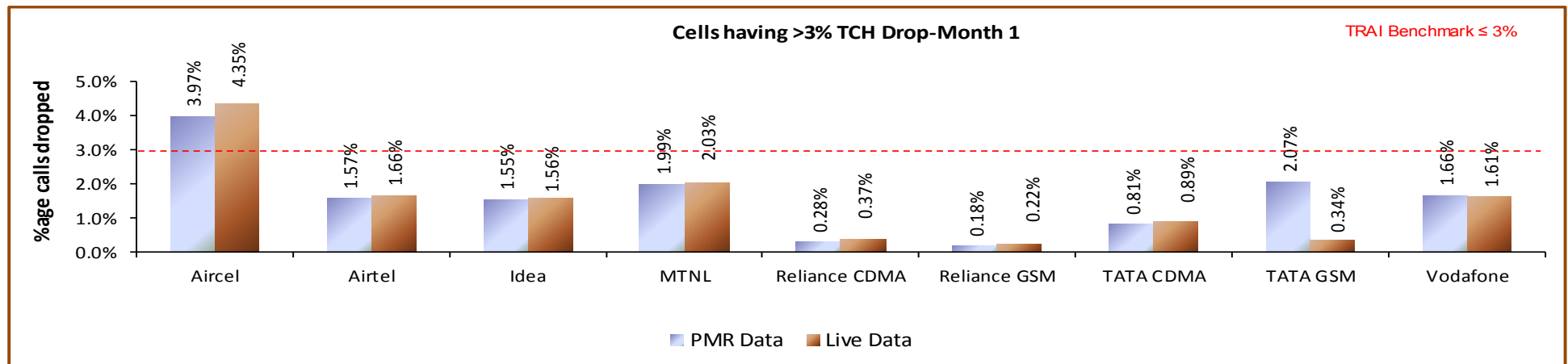
Data Source: Network Operations Center (NOC) of the operators

6.6.2.2   KEY FINDINGS – MONTH 2

Cells having >3% TCH Drop-Month 2

TRAI Benchmark ≤ 3%

%age calls dropped

Operator	PMR Data	Live Data
Aircel	3.42%	5.01%
Airtel	1.58%	1.52%
Idea	1.52%	1.38%
MTNL	2.00%	2.00%
Reliance CDMA	0.41%	0.40%
Reliance GSM	0.18%	0.33%
TATA CDMA	1.05%	0.39%
TATA GSM	1.97%	0.42%
Vodafone	2.03%	4.32%

■ PMR Data   ■ Live Data

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

6.6.2.3   KEY FINDINGS – MONTH 3

Cells having >3% TCH Drop-Month 3

TRAI Benchmark ≤ 3%

%age calls dropped

Operator	PMR Data	Live Data
Aircel	5.93%	5.01%
Airtel	1.62%	1.52%
Idea	1.39%	1.38%
MTNL	2.04%	2.00%
Reliance CDMA	No Service	No Service
Reliance GSM	0.46%	0.33%
TATA CDMA	1.43%	0.77%
TATA GSM	2.18%	1.69%
Vodafone	3.82%	4.04%

■ PMR Data   ■ Live Data

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

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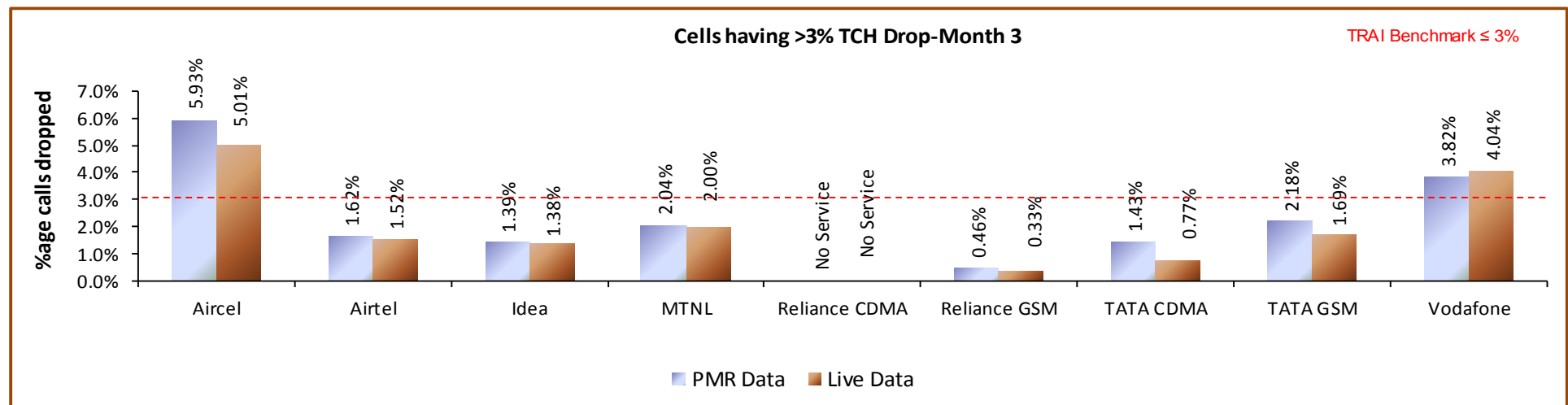
6.7   VOICE QUALITY

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.
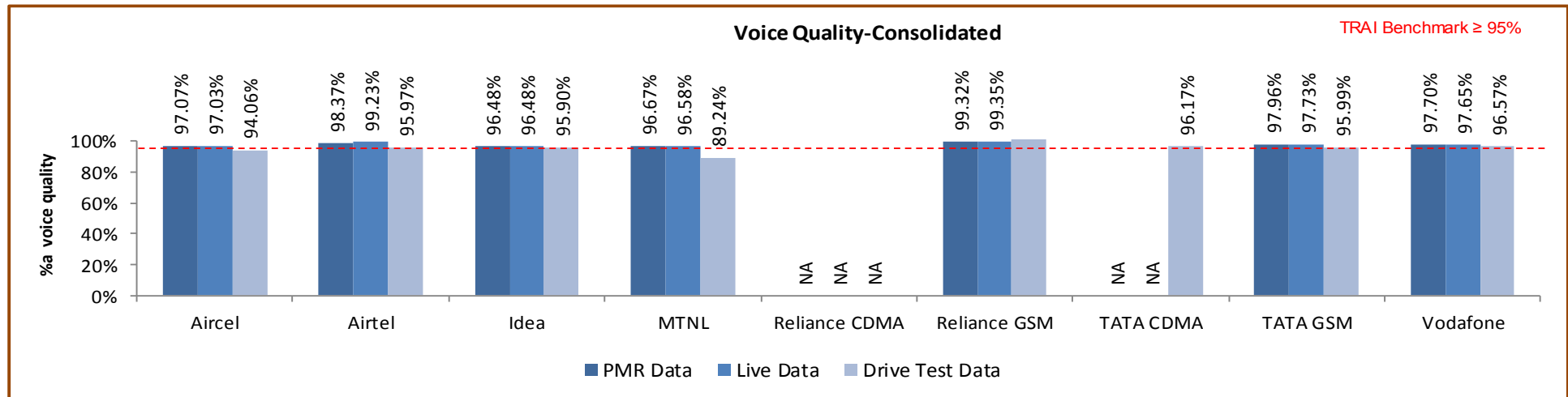
KEY FINDINGS

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

All operators met the benchmark as per PMR audit, however during drive test Aircel failed to meet the TRAI benchmark.

6.7.2.1 KEY FINDINGS – MONTH 1
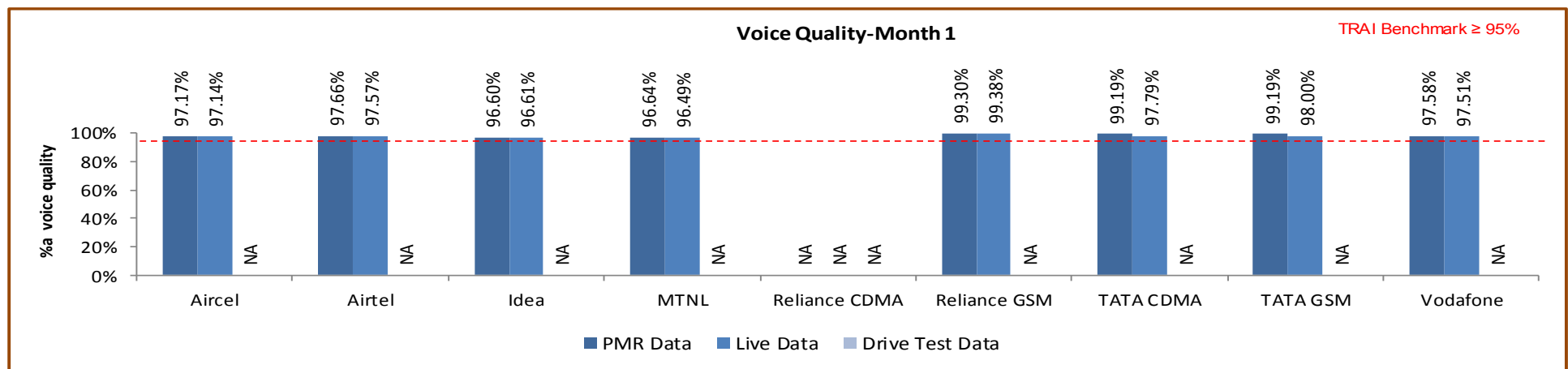
Data Source: Network Operations Center (NOC) of the operators

6.7.2.2   KEY FINDINGS – MONTH 2
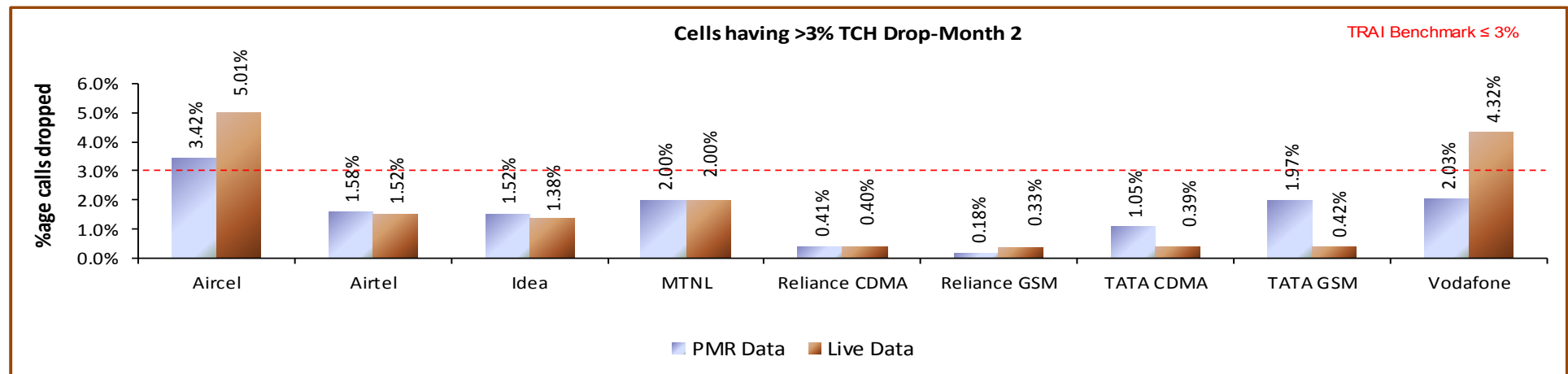
Voice Quality-Month 2

TRAI Benchmark ≥ 95%

Operator	PMR Data	Live Data	Drive Test Data
Aircel	97.29%	96.97%	94.06%
Airtel	97.53%	97.46%	95.97%
Idea	96.54%	96.41%	95.90%
MTNL	96.83%	96.62%	89.24%
Reliance CDMA	NA	NA	NA
Reliance GSM	99.36%	99.34%	
TATA CDMA	99.03%	99.20%	96.17%
TATA GSM	97.93%	97.48%	95.99%
Vodafone	97.79%	97.81%	96.57%

■ PMR Data ■ Live Data ■ Drive Test Data
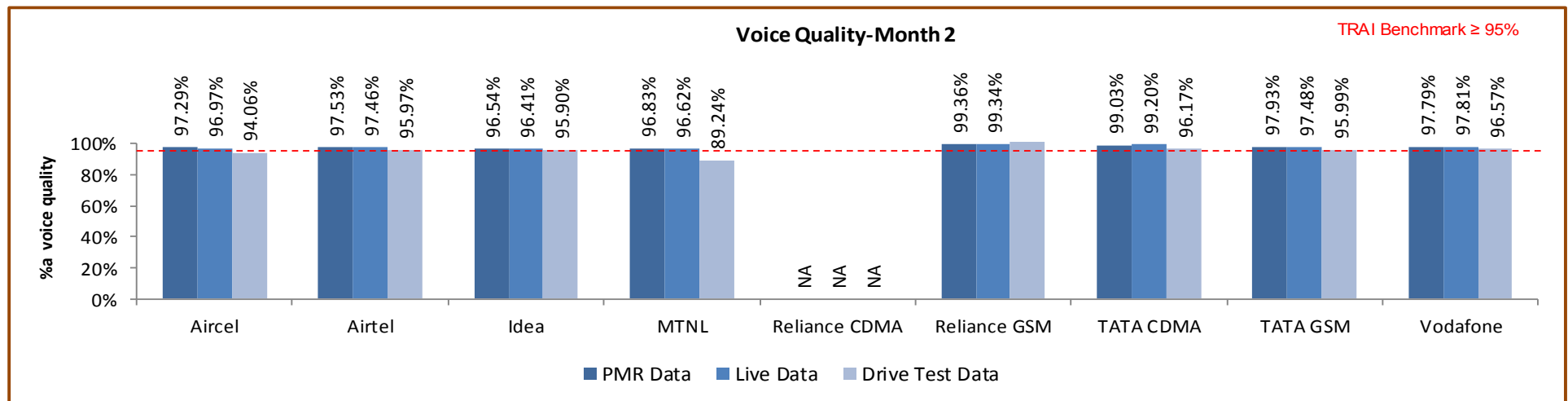
Data Source: Network Operations Center (NOC) of the operators

6.7.2.3   KEY FINDINGS – MONTH 3

Voice Quality-Month 3

TRAI Benchmark ≥ 95%

Operator	PMR Data	Live Data	Drive Test Data
Aircel	96.76%	96.97%	NA
Airtel	97.46%		NA
Idea	96.31%	96.41%	NA
MTNL	96.53%	96.62%	NA
Reliance CDMA	No Service	No Service	NA
Reliance GSM	99.30%	99.34%	NA
TATA CDMA	99.12%	99.45%	NA
TATA GSM	97.60%	97.23%	NA
Vodafone	97.75%	97.65%	NA

■ PMR Data ■ Live Data ■ Drive Test Data

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

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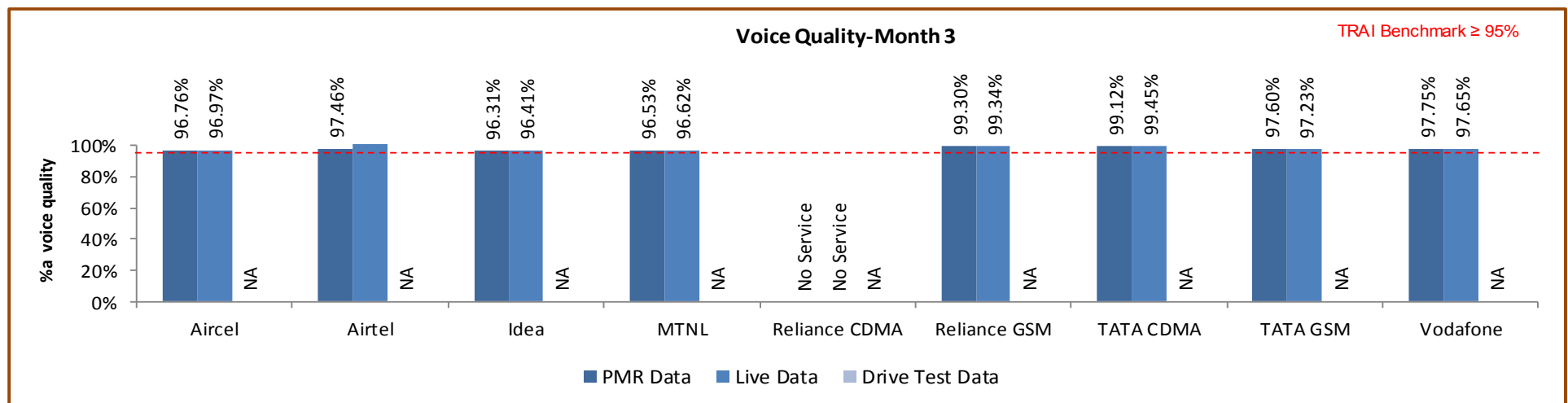
7 PARAMETER DESCRIPTION & DETAILED FINDINGS - COMPARISON BETWEEN PMR DATA, 3 DAY LIVE DATA AND LIVE CALLING DATA FOR 3G

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.

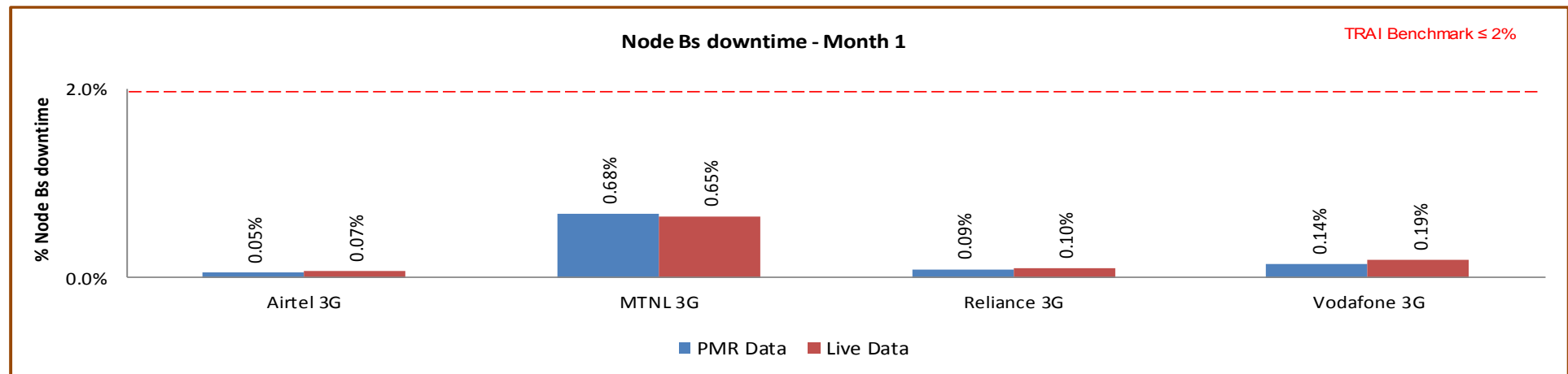## 7.1.2   KEY FINDINGS - CONSOLIDATED
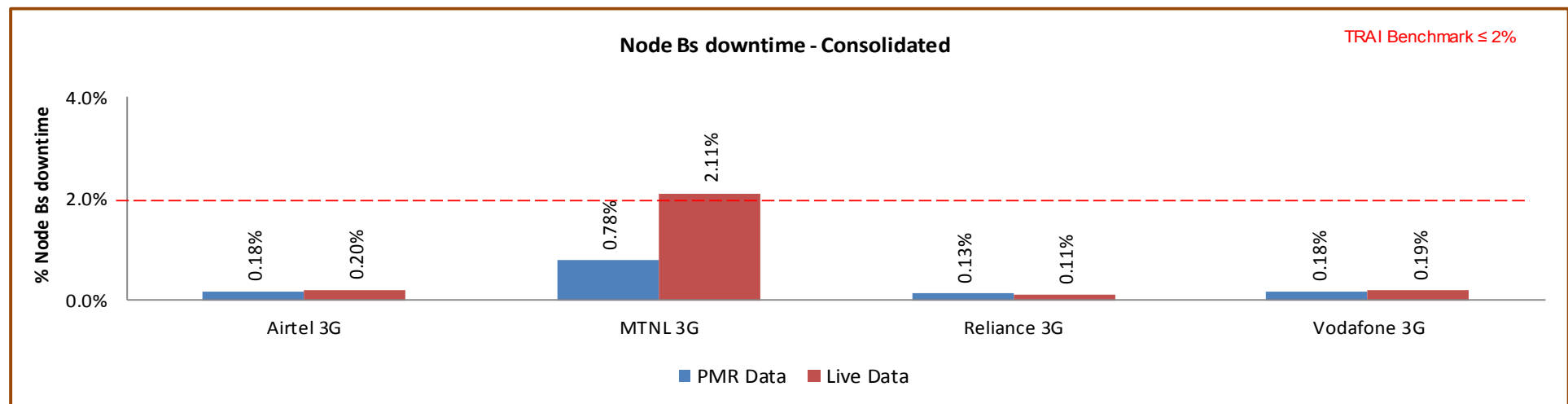
Data Source: Operations and Maintenance Center (OMC) of the operators

MTNL 3G failed to meet the benchmark as per PMR/audit Data.

7.1.2.1   KEY FINDINGS – MONTH 1

Node Bs downtime - Month 1

TRAI Benchmark ≤ 2%

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

7.1.2.2   KEY FINDINGS – MONTH 2
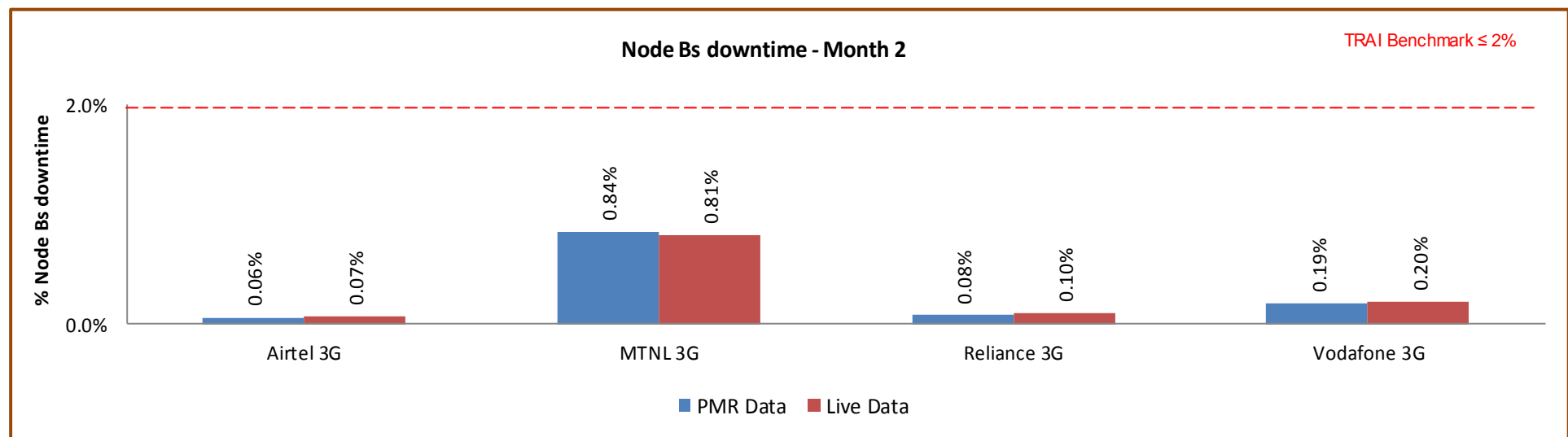
Node Bs downtime - Month 2

TRAI Benchmark ≤ 2%

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

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7.1.2.3   KEY FINDINGS – MONTH 3

Node Bs downtime - Month 3

TRAI Benchmark ≤ 2%

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.

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7.2.2 KEY FINDINGS – CONSOLIDATED

Worst affected Node Bs due to downtime-Consolidated

TRAI Benchmark ≤ 2%

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

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

7.2.2.1 KEY FINDINGS – MONTH 1
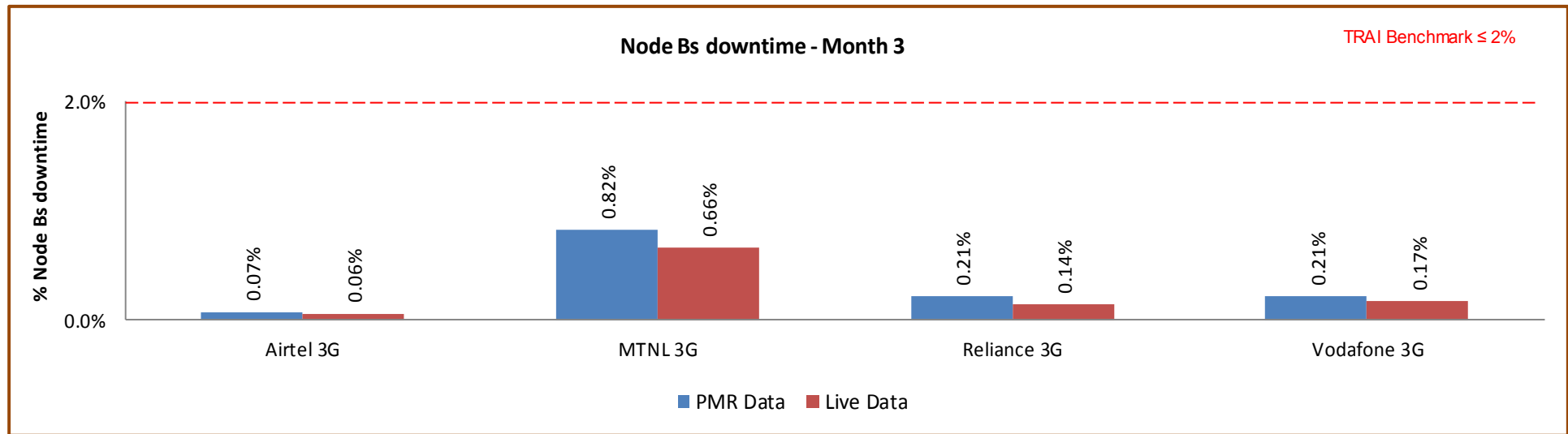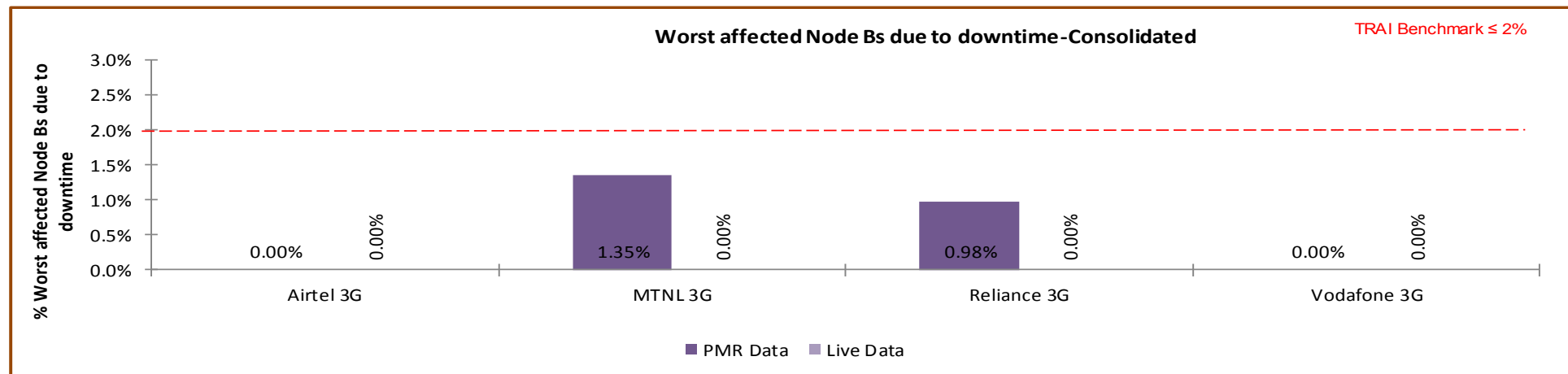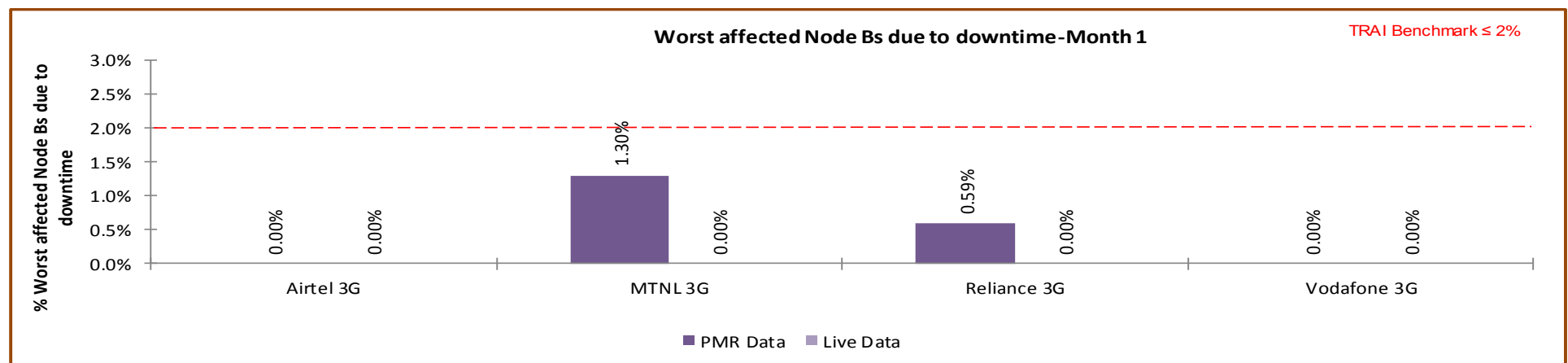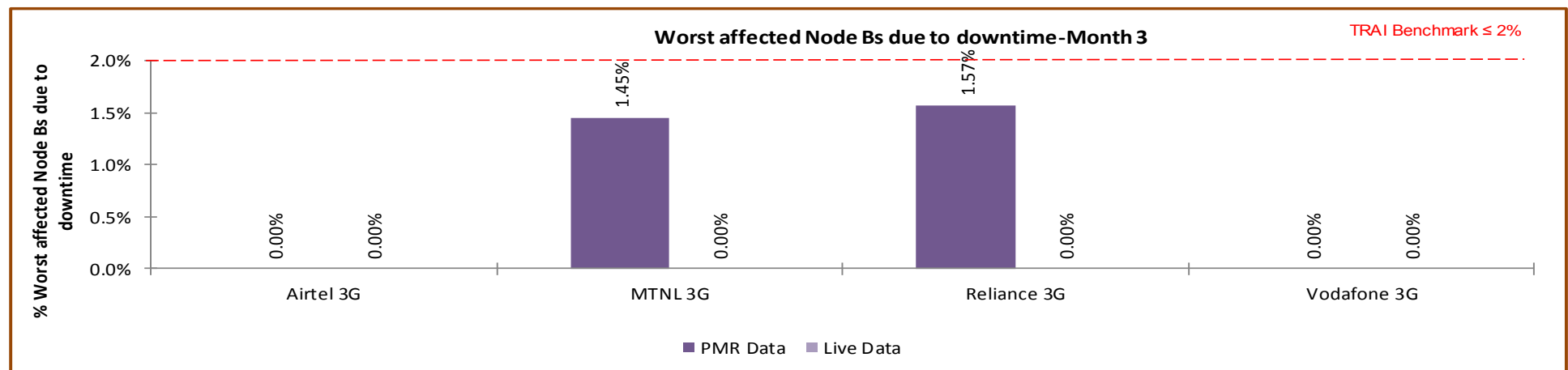
Worst affected Node Bs due to downtime-Month 1

TRAI Benchmark ≤ 2%

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

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7.2.2.2 KEY FINDINGS – MONTH 2

Worst affected Node Bs due to downtime-Month 2

TRAI Benchmark ≤ 2%

% Worst affected Node Bs due to downtime

	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
PMR Data	0.00%	1.30%	0.79%	0.00%
Live Data	0.00%	0.00%	0.00%	0.00%

■ PMR Data ■ Live Data
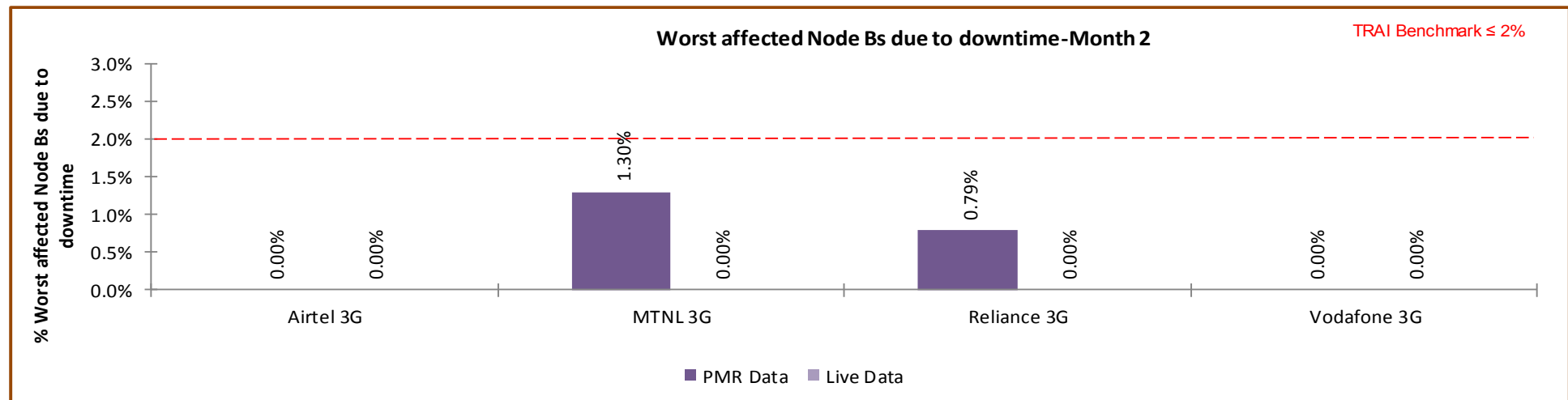
Data Source: Operations and Maintenance Center (OMC) of the operators

7.2.2.3 KEY FINDINGS – MONTH 3

Worst affected Node Bs due to downtime-Month 3

TRAI Benchmark ≤ 2%

% Worst affected Node Bs due to downtime

	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
PMR Data	0.00%	1.45%	1.57%	0.00%
Live Data	0.00%	0.00%	0.00%	0.00%

■ PMR Data ■ Live Data

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

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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
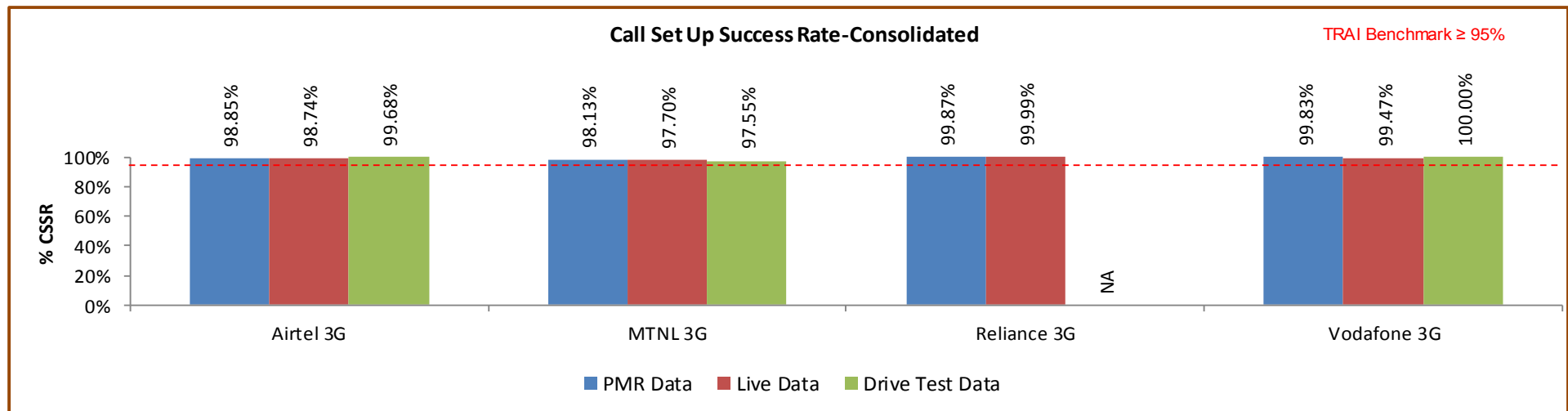
5. **TRAI Benchmark ≥ 95%**

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.

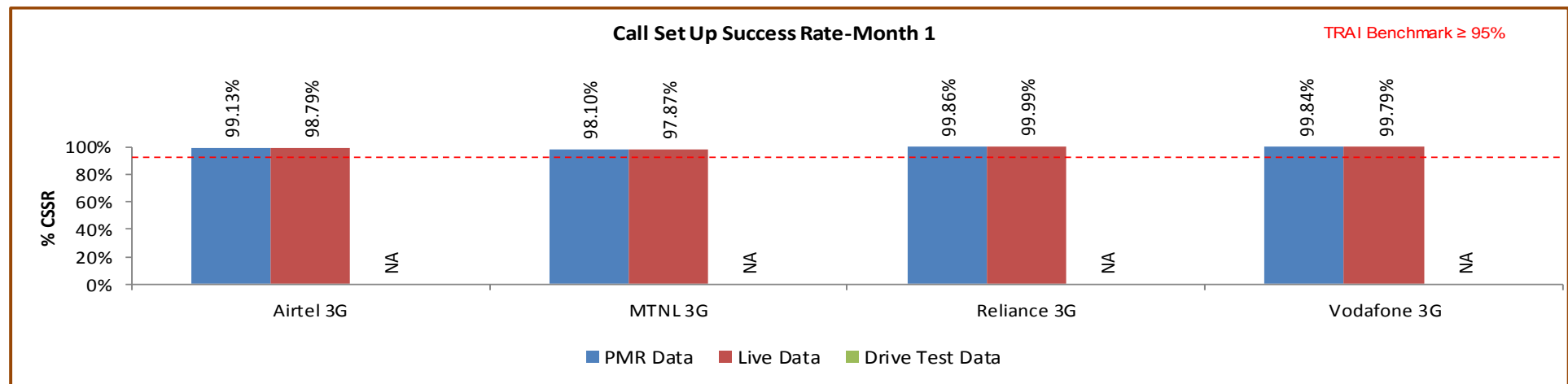 - ⮫ The numerator and denominator values are derived from adding the counter values from the MSC.

7.3.2   KEY FINDINGS - CONSOLIDATED

Call Set Up Success Rate-Consolidated

TRAI Benchmark ≥ 95%

	PMR Data	Live Data	Drive Test Data
Airtel 3G	98.85%	98.74%	99.68%
MTNL 3G	98.13%	97.70%	97.55%
Reliance 3G	99.87%	99.99%	NA
Vodafone 3G	99.83%	99.47%	100.00%

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

All operators met the benchmark as per PMR/audit and drive test

7.3.2.1 KEY FINDINGS – MONTH 1

Call Set Up Success Rate-Month 1

TRAI Benchmark ≥ 95%

Operator	PMR Data	Live Data	Drive Test Data
Airtel 3G	99.13%	98.79%	NA
MTNL 3G	98.10%	97.87%	NA
Reliance 3G	99.86%	99.99%	NA
Vodafone 3G	99.84%	99.79%	NA

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

7.3.2.2 KEY FINDINGS – MONTH 2

Call Set Up Success Rate-Month 2

TRAI Benchmark ≥ 95%

Operator	PMR Data	Live Data	Drive Test Data
Airtel 3G	98.70%	98.79%	99.68%
MTNL 3G	98.29%	97.19%	97.55%
Reliance 3G	99.88%	99.99%	NA
Vodafone 3G	99.84%	99.82%	100.00%

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

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7.3.2.3 KEY FINDINGS – MONTH 3

Call Set Up Success Rate-Month 3

TRAI Benchmark ≥ 95%

Operator	PMR Data	Live Data	Drive Test Data
Airtel 3G	98.71%	98.63%	NA
MTNL 3G	98.00%	98.03%	NA
Reliance 3G	99.86%	99.98%	NA
Vodafone 3G	99.81%	98.80%	NA

■ PMR Data ■ Live Data ■ Drive Test Data

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:-A_1 = Number of attempts to establish RRC/ RAB made on day 1

     - C_1 = Average RRC / RAB Congestion % on day 1

     - A_2 = Number of attempts to establish RRC / RAB made on day 2

     - C_2 = Average RRC / RAB Congestion % on day 2

     - A_n = Number of attempts to establish RRC / RAB made on day n

     - C_n = Average RRC / RAB Congestion % on day n

- POI Congestion% = $[(A_1 \times C_1) + (A_2 \times C_2) + ... + (A_n \times C_n)] / (A_1 + A_2 + ... + A_n)$

  - Where:-A_1 = POI traffic offered on all POIs (no. of calls) on day 1

  - C_1 = Average POI Congestion % on day 1

  - A_2 = POI traffic offered on all POIs (no. of calls) on day 2

  - C_2 = Average POI Congestion % on day 2

  - A_n = POI traffic offered on all POIs (no. of calls) on day n

  - C_n = 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

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7.4.2   KEY FINDINGS - RRC CONGESTION (CONSOLIDATED)
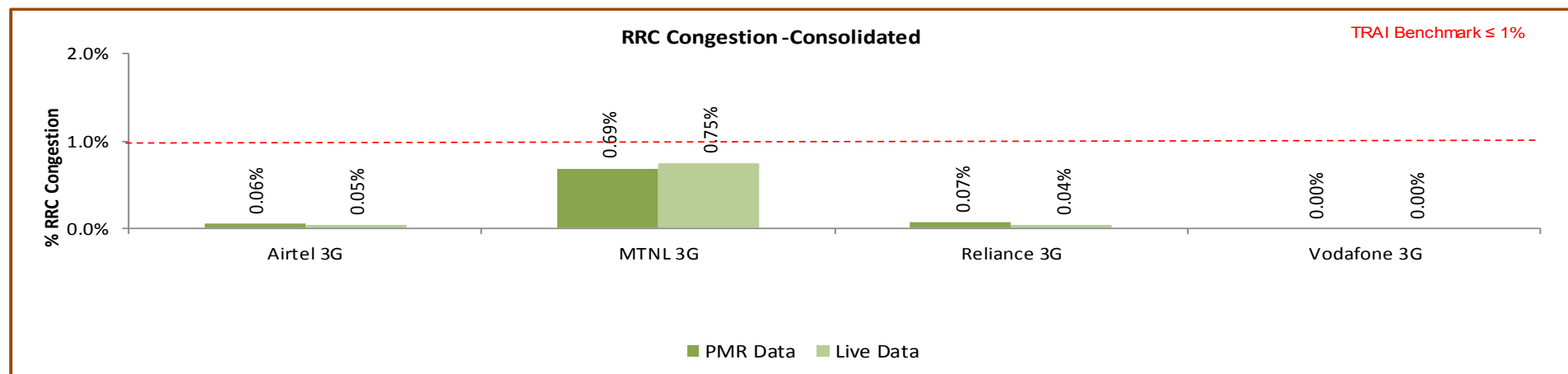
RRC Congestion -Consolidated

TRAI Benchmark ≤ 1%

% RRC Congestion

Operator	PMR Data	Live Data
Airtel 3G	0.06%	0.05%
MTNL 3G	0.69%	0.75%
Reliance 3G	0.07%	0.04%
Vodafone 3G	0.00%	0.00%

■ PMR Data ■ Live Data

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

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

7.4.2.1   KEY FINDINGS – MONTH 1
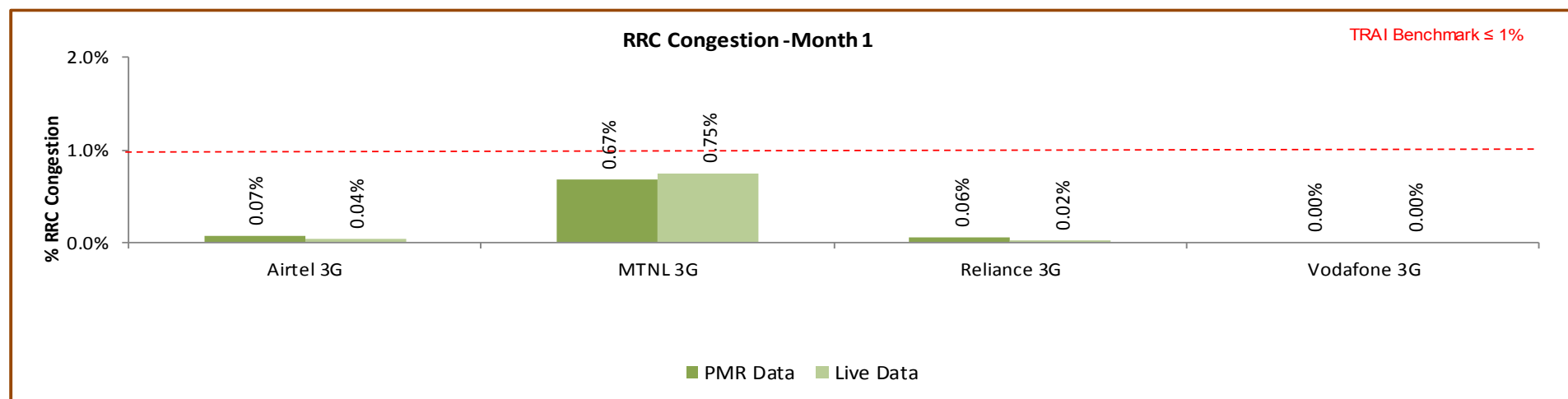
RRC Congestion -Month 1

TRAI Benchmark ≤ 1%

% RRC Congestion

Operator	PMR Data	Live Data
Airtel 3G	0.07%	0.04%
MTNL 3G	0.67%	0.75%
Reliance 3G	0.06%	0.02%
Vodafone 3G	0.00%	0.00%

■ PMR Data ■ Live Data

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

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7.4.2.2 KEY FINDINGS – MONTH 2

RRC Congestion -Month 2

TRAI Benchmark ≤ 1%

Airtel 3G: PMR Data 0.05%, Live Data 0.04%
MTNL 3G: PMR Data 0.64%, Live Data 0.81%
Reliance 3G: PMR Data 0.04%, Live Data 0.02%
Vodafone 3G: PMR Data 0.00%, Live Data 0.00%

■ PMR Data ■ Live Data
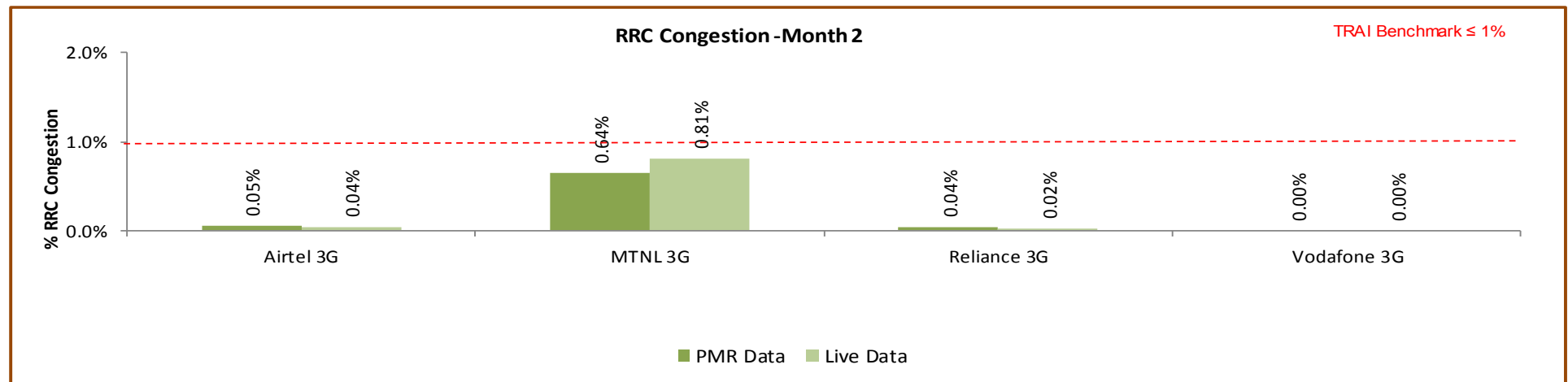
Data Source: Network Operations Center (NOC) of the operators

7.4.2.3 KEY FINDINGS – MONTH 3

RRC Congestion -Month 3

TRAI Benchmark ≤ 1%

Airtel 3G: PMR Data 0.04%, Live Data 0.06%
MTNL 3G: PMR Data 0.75%, Live Data 0.69%
Reliance 3G: PMR Data 0.11%, Live Data 0.08%
Vodafone 3G: PMR Data 0.00%, Live Data 0.00%

■ PMR Data ■ Live Data

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

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7.4.3 KEY FINDINGS – CIRCUIT SWITCHED RAB CONGESTION (CONSOLIDATED)

Circuit Switched RAB Congestion-Consolidated

TRAI Benchmark ≤ 2%

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

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

7.4.3.1 KEY FINDINGS – MONTH 1

Circuit Switched RAB Congestion-Month 1

TRAI Benchmark ≤ 2%

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

7.4.3.2   KEY FINDINGS – MONTH 2

Circuit Switched RAB Congestion-Month 2

TRAI Benchmark ≤ 2%

Operator	PMR Data	Live Data
Airtel 3G	0.06%	0.07%
MTNL 3G	0.29%	0.54%
Reliance 3G	0.02%	0.02%
Vodafone 3G	0.00%	0.00%

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

7.4.3.3   KEY FINDINGS – MONTH 3

Circuit Switched RAB Congestion-Month 3

TRAI Benchmark ≤ 2%

Operator	PMR Data	Live Data
Airtel 3G	0.06%	0.10%
MTNL 3G	0.42%	0.44%
Reliance 3G	0.05%	0.04%
Vodafone 3G	0.00%	0.00%

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

Audit Results for POI Congestion- PMR data					
POI congestion	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total number of working POIs		0	93	258	0
No. of POIs not meeting benchmark		0	0	0	0
Total Capacity of all POIs (A) - in erlangs		0	45559	130183	0
Traffic served for all POIs (B)- in erlangs		0	17482	85652	0
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data					
POI congestion	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total number of working POIs		0	93	261	0
No. of POIs not meeting benchmark		0	0	0	0
Total Capacity of all POIs (A) - in erlangs		0	45560	131056	0
Traffic served for all POIs (B)- in erlangs		0	11947	86382	0
POI congestion	≤ 0.5%	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	MTNL 3G	Reliance 3G	Vodafone 3G
Total number of working POIs		NA	31	81	NA
No. of POIs not meeting benchmark		NA	0	0	NA
Total Capacity of all POIs (A) - in erlangs		NA	15202	41353	NA
Traffic served for all POIs (B)- in erlangs		NA	3994	27796	NA
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-April					
POI congestion	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total number of working POIs		NA	31	85	NA
No. of POIs not meeting benchmark		NA	0	0	NA
Total Capacity of all POIs (A) - in erlangs		NA	15202	43125	NA
Traffic served for all POIs (B)- in erlangs		NA	3994	27914	NA
POI congestion	≤ 0.5%	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	MTNL 3G	Reliance 3G	Vodafone 3G
Total number of working POIs		NA	31	87	NA
No. of POIs not meeting benchmark		NA	0	0	NA
Total Capacity of all POIs (A) - in erlangs		NA	15179	43569	NA
Traffic served for all POIs (B)- in erlangs		NA	6686	27739	NA
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-May					
POI congestion	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total number of working POIs		NA	31	85	NA
No. of POIs not meeting benchmark		NA	0	0	NA
Total Capacity of all POIs (A) - in erlangs		NA	15180	43125	NA
Traffic served for all POIs (B)- in erlangs		NA	4080	27914	NA
POI congestion	≤ 0.5%	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	MTNL 3G	Reliance 3G	Vodafone 3G
Total number of working POIs		NA	31	90	NA
No. of POIs not meeting benchmark		NA	0	0	NA
Total Capacity of all POIs (A) - in erlangs		NA	15178	45261	NA
Traffic served for all POIs (B)- in erlangs		NA	6802	30116	NA
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-June					
POI congestion	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total number of working POIs		NA	31	91	NA
No. of POIs not meeting benchmark		NA	0	0	NA
Total Capacity of all POIs (A) - in erlangs		NA	15178	44805	NA
Traffic served for all POIs (B)- in erlangs		NA	3873	30555	NA
POI congestion	≤ 0.5%	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.

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7.5.2   KEY FINDINGS - CONSOLIDATED

Call Drop Rate-Consolidated
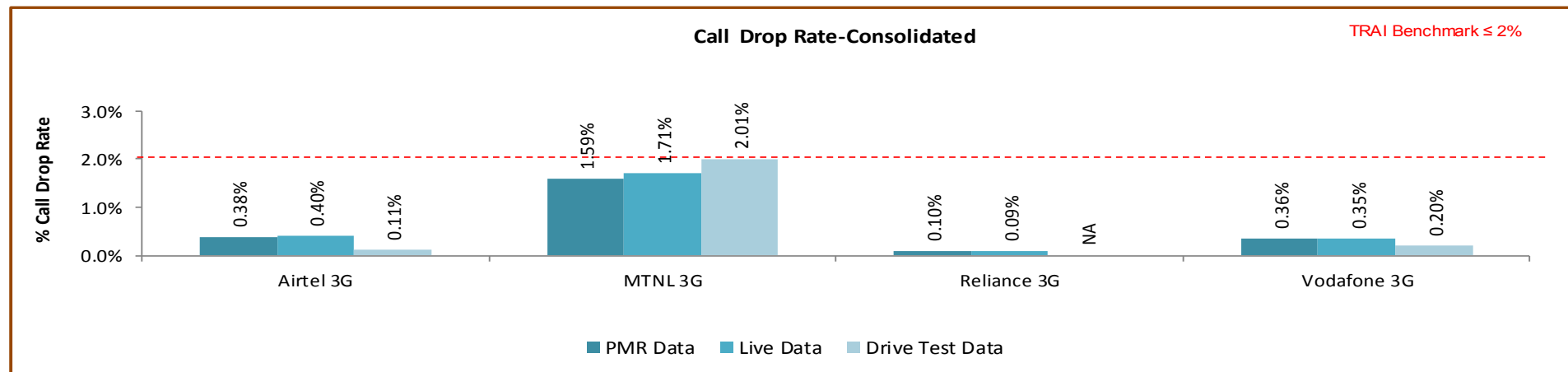
TRAI Benchmark ≤ 2%

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

All operators met the benchmark as per PMR audit data. During drive test MTNL 3G failed to meet the TRAI benchmark.
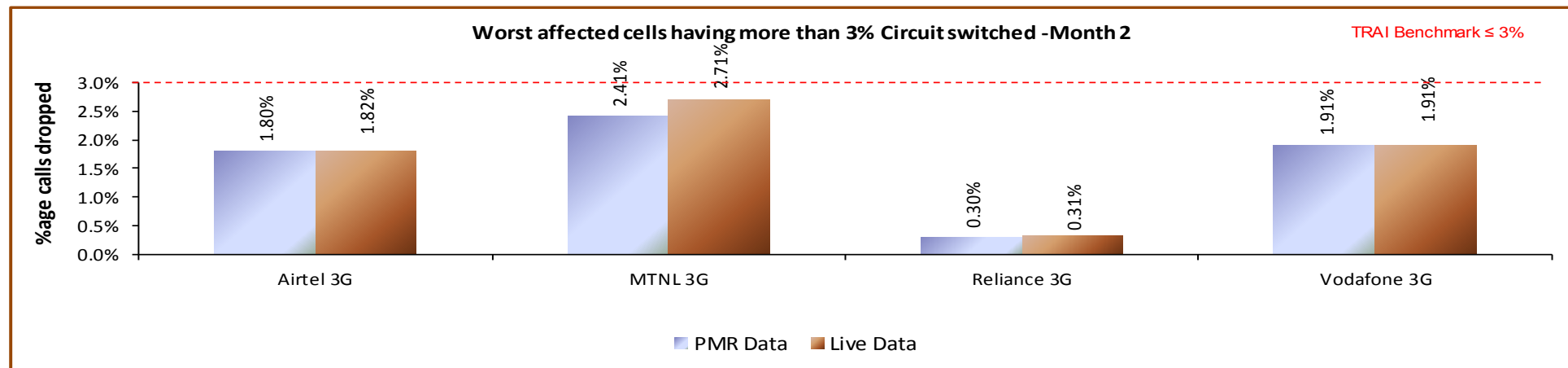
7.5.2.1   KEY FINDINGS – MONTH 1
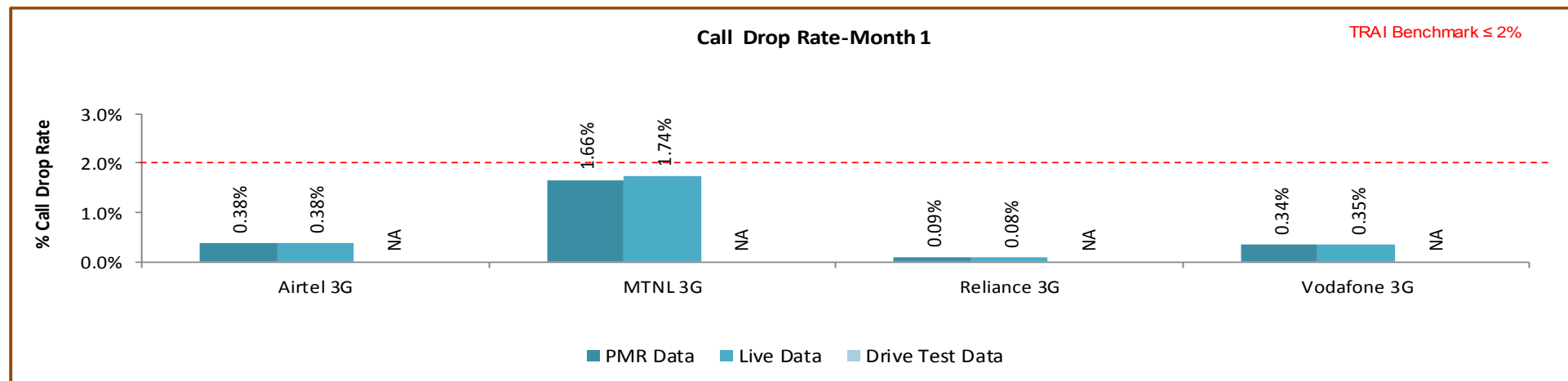
Call Drop Rate-Month 1

TRAI Benchmark ≤ 2%

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

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7.5.2.2 KEY FINDINGS – MONTH 2

Call Drop Rate-Month 2

TRAI Benchmark ≤ 2%

Airtel 3G: PMR Data 0.36%, Live Data 0.38%, Drive Test Data 0.11%
MTNL 3G: PMR Data 1.52%, Live Data 1.73%, Drive Test Data 2.01%
Reliance 3G: PMR Data 0.09%, Live Data 0.08%, Drive Test Data NA
Vodafone 3G: PMR Data 0.35%, Live Data 0.34%, Drive Test Data 0.20%

■ PMR Data ■ Live Data ■ Drive Test Data
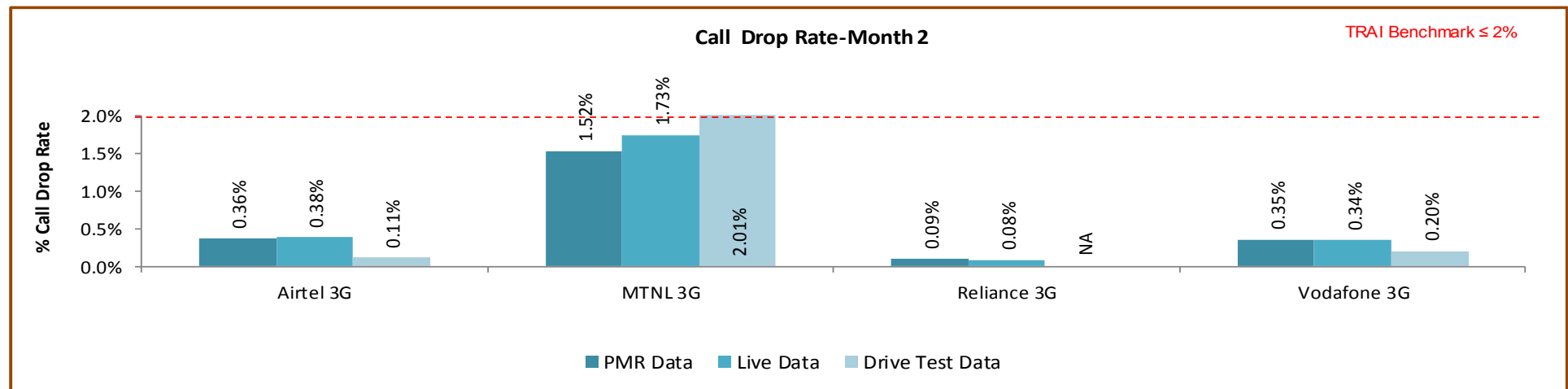
Data Source: Network Operations Center (NOC) of the operators

7.5.2.3 KEY FINDINGS – MONTH 3

Call Drop Rate-Month 3

TRAI Benchmark ≤ 2%

Airtel 3G: PMR Data 0.40%, Live Data 0.43%, Drive Test Data NA
MTNL 3G: PMR Data 1.58%, Live Data 1.67%, Drive Test Data NA
Reliance 3G: PMR Data 0.11%, Live Data 0.09%, Drive Test Data NA
Vodafone 3G: PMR Data 0.39%, Live Data 0.35%, Drive Test Data NA

■ PMR Data ■ Live Data ■ Drive Test Data

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

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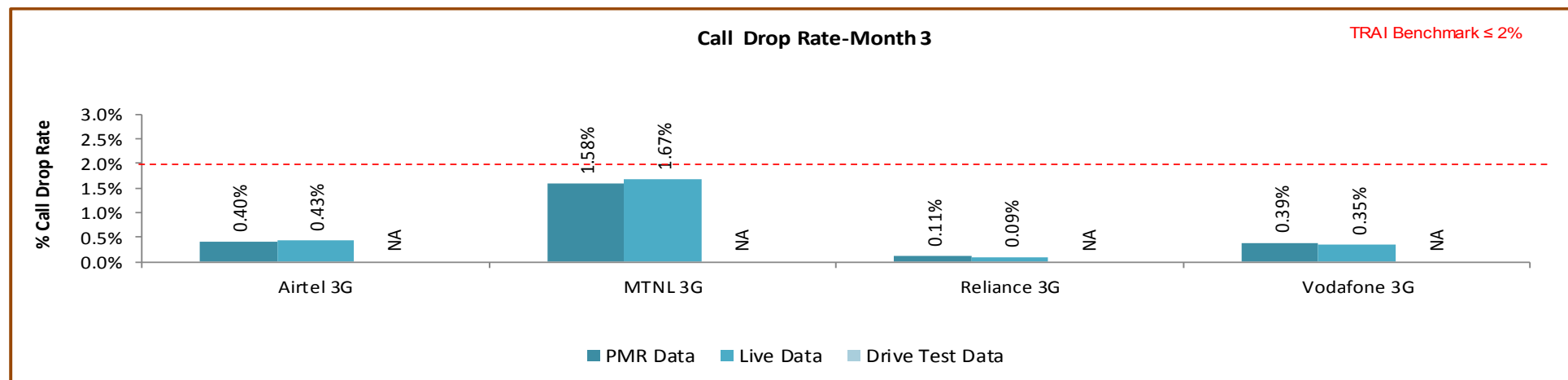
7.6 WORST AFFECTED CELLS HAVING MORE THAN 3% CIRCUIT SWITCHED VOICE DROP RATE

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
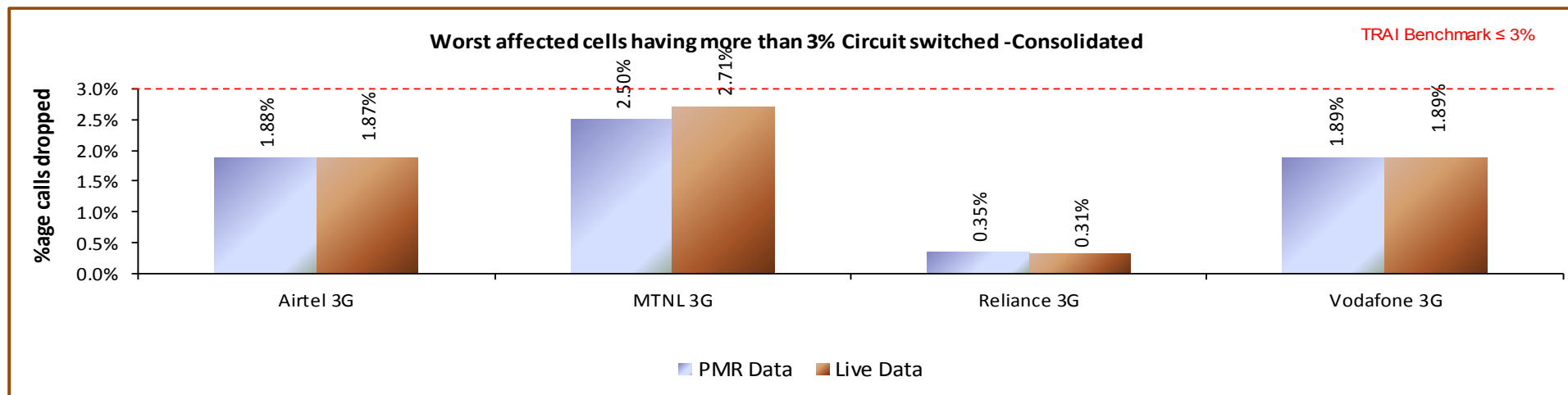
Worst affected cells having more than 3% Circuit switched -Consolidated

TRAI Benchmark ≤ 3%

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

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

7.6.2.1 KEY FINDINGS – MONTH 1

Worst affected cells having more than 3% Circuit switched -Month 1

TRAI Benchmark ≤ 3%
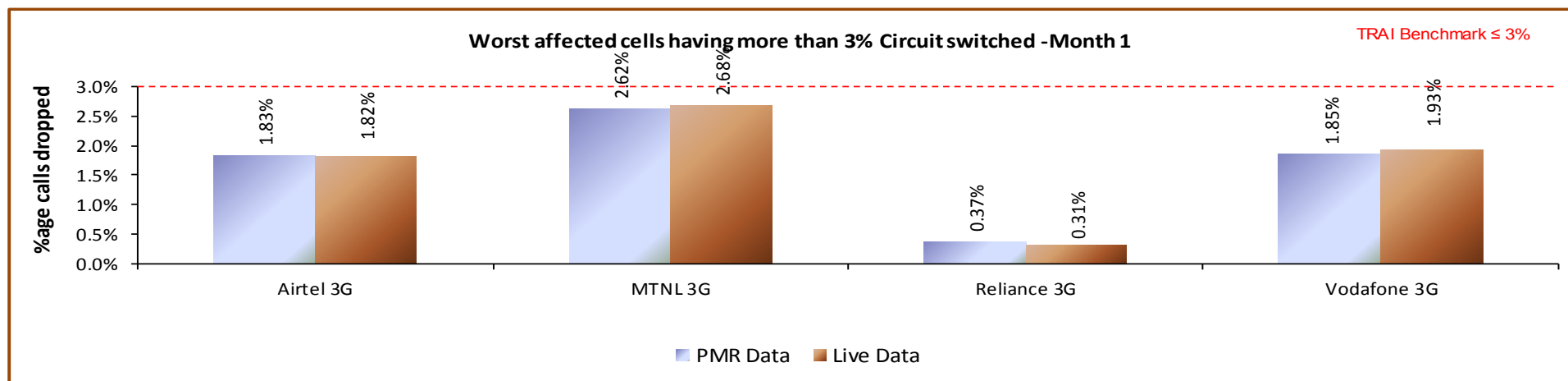
Data Source: Network Operations Center (NOC) of the operators

7.6.2.2 KEY FINDINGS – MONTH 2

Worst affected cells having more than 3% Circuit switched -Month 2

TRAI Benchmark ≤ 3%

	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
PMR Data	1.80%	2.41%	0.30%	1.91%
Live Data	1.82%	2.71%	0.31%	1.91%

%age calls dropped

■ PMR Data   ■ Live Data

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

7.6.2.3 KEY FINDINGS – MONTH 3

Worst affected cells having more than 3% Circuit switched -Month 3

TRAI Benchmark ≤ 3%

	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
PMR Data	2.01%	2.47%	0.37%	1.91%
Live Data	1.98%	2.75%	0.29%	1.82%

%age calls dropped

■ PMR Data   ■ Live Data

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

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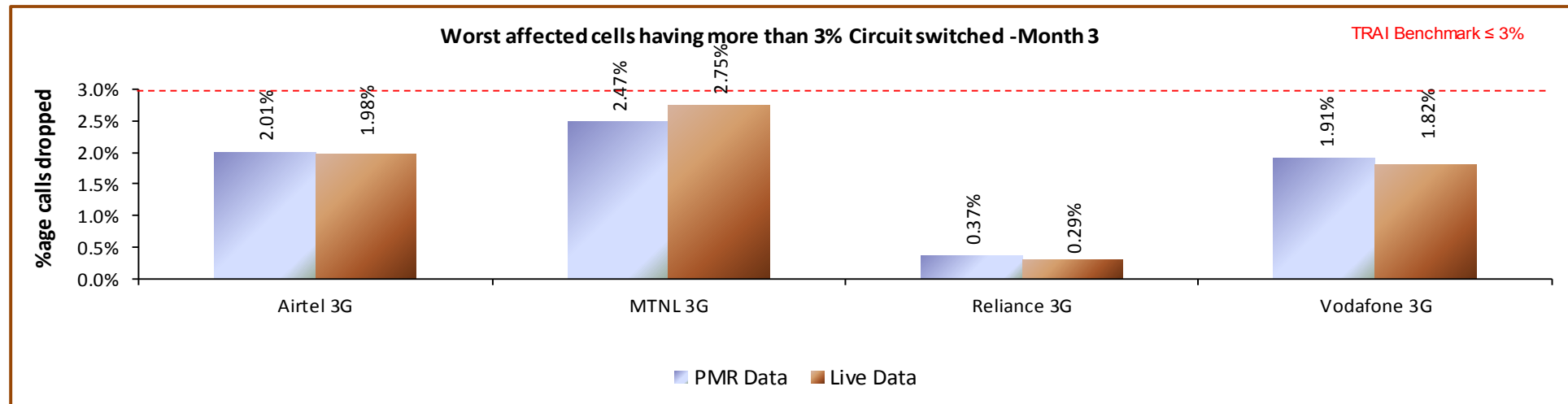
7.7 CIRCUIT SWITCH VOICE QUALITY

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
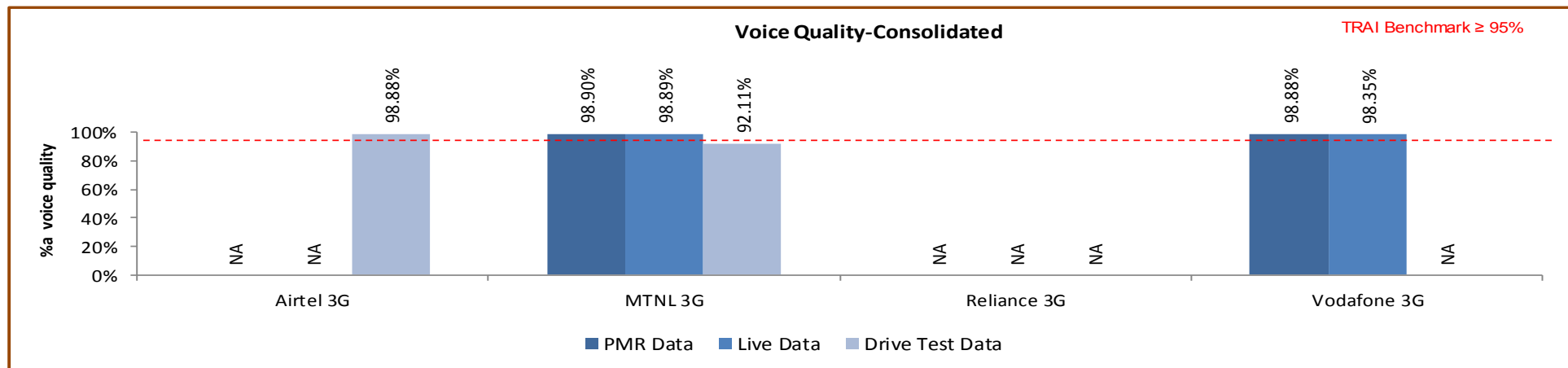
Voice Quality-Consolidated

TRAI Benchmark ≥ 95%

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

MTNL failed to meet the benchmark for voice quality during drive test data.

7.7.2.1 KEY FINDINGS – MONTH 1

Voice Quality-Month 1

TRAI Benchmark ≥ 95%

7.7.2.2 KEY FINDINGS – MONTH 2

Voice Quality-Month 2

TRAI Benchmark ≥ 95%

Operator	PMR Data	Live Data	Drive Test Data
Airtel 3G	99.50%	99.50%	98.88%
MTNL 3G	98.91%	98.90%	92.11%
Reliance 3G	99.71%	99.73%	NA
Vodafone 3G	98.91%	98.90%	NA

■ PMR Data ■ Live Data ■ Drive Test Data
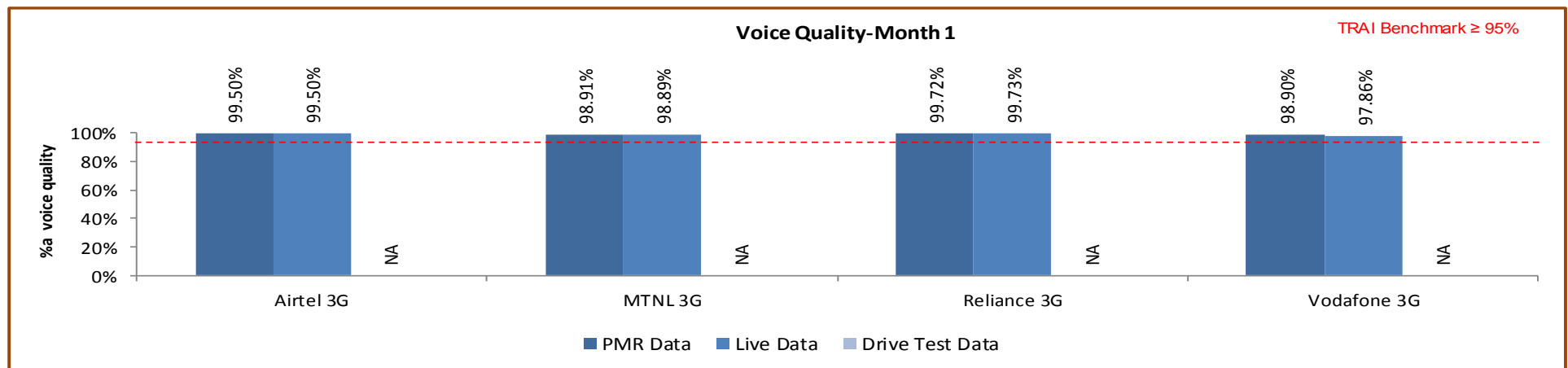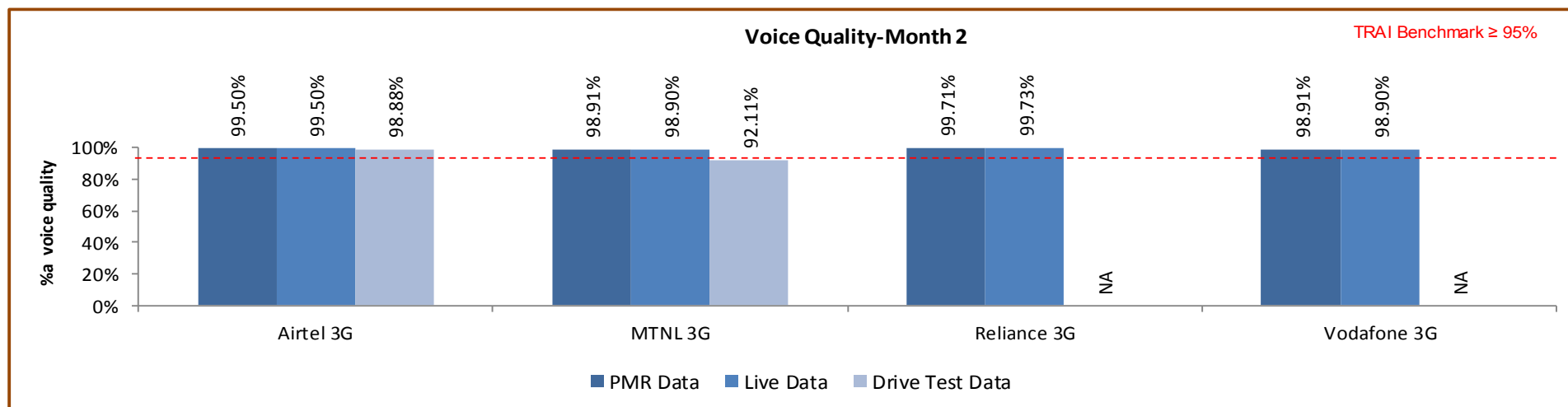
Data Source: Network Operations Center (NOC) of the operators

7.7.2.3 KEY FINDINGS – MONTH 3

Voice Quality-Month 3

TRAI Benchmark ≥ 95%

Operator	PMR Data	Live Data	Drive Test Data
Airtel 3G	99.50%	99.50%	NA
MTNL 3G	98.87%	98.88%	NA
Reliance 3G	99.71%	99.71%	NA
Vodafone 3G	98.85%	98.84%	NA

■ PMR Data ■ Live Data ■ Drive Test Data
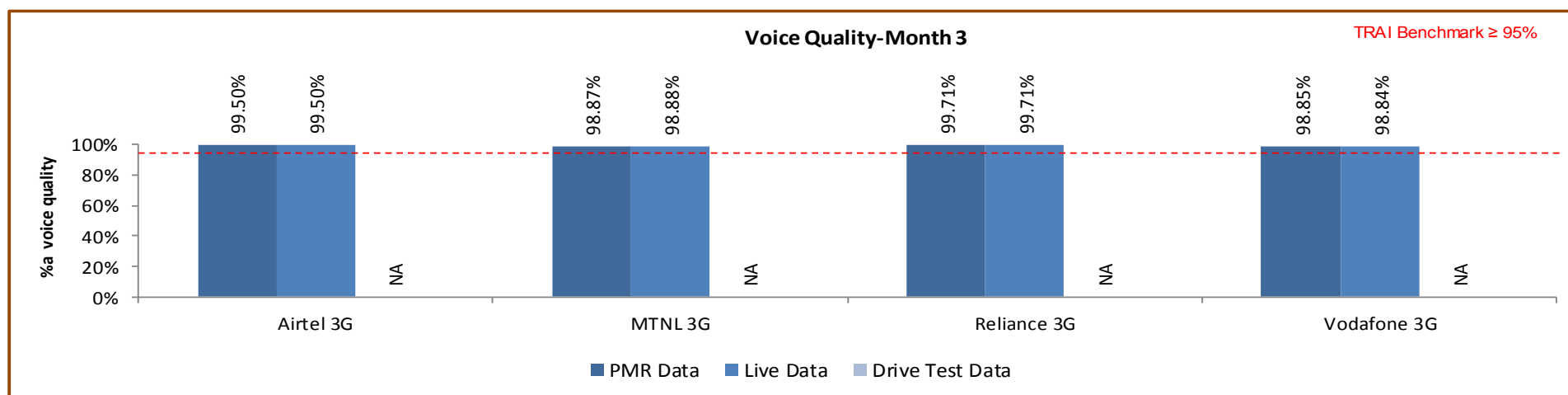
Data Source: Network Operations Center (NOC) of the operators

8 PARAMETER DESCRIPTION & DETAILED FINDINGS - WIRELESS DATA SERVICES PMR AND LIVE (2G)

8.1 APRIL

Wireless Data-PMR										
	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Activation done within 4 hours										
Total request time made		380927	NA	86032	NDR	NA	NDR	215	23	24517
Total Time Taken for Activation		380433	NA	86031	NDR	NA	NDR	214	23	24149
% activation done within 4 hours	≥ 95%	99.87%	NA	100.00%	NDR	NA	NDR	99.53%	100.00%	98.50%
PDP Context activation success rate										
No. of data Session requested		1202160001	NA	9679386	55532005	NA	NDR	NDR	NDR	664608
No. of data Session Successful		1138650415	NA	9572066	55528767	NA	NDR	NDR	NDR	664336
PDP Context activation success rate	≥ 95%	94.72%	98.35%	98.89%	99.99%	98.31%	NDR	NDR	NDR	99.96%
Drop Rate										
No. of Successful data calls		NDR	1233896427	545406253	55528767	NA	NDR	NDR	NDR	67837635
No. of Dropped data Calls		NDR	51162038	1060222	3238	NA	NDR	NDR	NDR	1973845
% Drop rate	≤ 5%	NDR	4.15%	0.19%	0.01%	NA	NDR	NDR	NDR	2.91%
Wireless Data-Live Data										
	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Activation done within 4 hours										
Total request time made		NA	NDR	NDR	NDR	NA	NDR	NDR	NDR	NDR
Total Time Taken for Activation		NA	NDR	NDR	NDR	NA	NDR	NDR	NDR	NDR
% activation done within 4 hours	≥ 95%	NA	NDR	NDR	NDR	NA	NDR	NDR	NDR	NDR
PDP Context activation success rate										
No. of data Session requested		119894214	NDR	10106811	6745087	NA	NDR	NDR	NDR	675337
No. of data Session Successful		113815704	NDR	9989169	6744753	NA	NDR	NDR	NDR	675175
PDP Context activation success rate	≥ 95%	94.93%	NDR	98.84%	100.00%	99.10%	NDR	NDR	NDR	99.98%
Drop Rate										
No. of Successful data calls		NDR	NDR	535571548	6744753	NA	NDR	NDR	NDR	71909815
No. of Dropped data Calls		NDR	NDR	891931	334	NA	NDR	NDR	NDR	1986702
Drop rate	≤ 5%	NDR	NDR	0.17%	0.00%	3.81%	NDR	NDR	NDR	2.76%

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8.2 MAY

Wireless Data-PMR										
	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Activation done within 4 hours										
Total request time made		490440	NDR	120543	NDR	NDR	NDR	156	81	49876
Total Time Taken for Activation		489143	NDR	120543	NDR	NDR	NDR	156	81	49068
% activation done within 4 hours	≥ 95%	99.74%	NDR	100.00%	NDR	NDR	NDR	100.00%	100.00%	98.38%
PDP Context activation success rate										
No. of data Session requested		1223546972	NA	8758532	61866736	NA	NA	NDR	NDR	758217
No. of data Session Successful		1169708871	NA	8724416	59217864	NA	NA	NDR	NDR	757874
PDP Context activation success rate	≥ 95%	95.60%	99.44%	99.61%	95.72%	99.03%	99.84%	NDR	NDR	99.95%
Drop Rate										
No. of Successful data calls		4656318677	2268535591	542788579	59217864	NDR	NA	NDR	1110840158	63728331
No. of Dropped data Calls		70619588	101503657	1134715	2648872	NDR	NA	NDR	27989759	1877939
Drop rate	≤ 5%	1.52%	4.47%	0.21%	4.47%	NDR	3.72%	NDR	2.52%	2.95%
Wireless Data-Live Data										
	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Activation done within 4 hours										
Total request time made		NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR
Total Time Taken for Activation		NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR
% activation done within 4 hours	≥ 95%	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR
PDP Context activation success rate										
No. of data Session requested		110472400	NDR	9030168	10534742	NDR	NDR	NDR	NDR	629578
No. of data Session Successful		105687465	NDR	9006715	10523877	NDR	NDR	NDR	NDR	629263
PDP Context activation success rate	≥ 95%	95.67%	NDR	99.74%	99.90%	NDR	NDR	NDR	NDR	99.95%
Drop Rate										
No. of Successful data calls		478360046	NDR	520699527	10523877	NDR	NDR	NDR	104630510	64976764
No. of Dropped data Calls		7640031	NDR	1017343	10865	NDR	NDR	NDR	2460885	1929286
Drop rate	≤ 5%	1.60%	NDR	0.20%	0.10%	NDR	NDR	NDR	2.35%	2.97%

8.3   JUNE

Wireless Data-PMR										
	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Activation done within 4 hours										
Total request time made		435025	NDR	NDR	NDR	NDR	NDR	539	282	70348
Total Time Taken for Activation		434663	NDR	NDR	NDR	NDR	NDR	539	278	70348
% activation done within 4 hours	≥ 95%	99.92%	NDR	NDR	NDR	NDR	NDR	100.00%	98.58%	100.00%
PDP Context activation success rate										
No. of data Session requested		1067252101	NA	9857896	51389923	NDR	NA	NDR	NDR	658015
No. of data Session Successful		1032901467	NA	9821795	51373924	NDR	NA	NDR	NDR	657367
PDP Context activation success rate	≥ 95%	96.78%	99.68%	99.63%	99.97%	NDR	99.90%	NDR	NDR	99.90%
Drop Rate										
No. of Successful data calls		4816148852	1981548030	584250900	51373924	NDR	NA	1143911858	NDR	67026331
No. of Dropped data Calls		78565410	89594961	1289696	15999	NDR	NA	30514273	NDR	2154912
Drop rate	≤ 5%	1.63%	4.52%	0.22%	0.03%	NDR	3.81%	2.67%	NDR	3.22%
Wireless Data-Live Data										
	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Activation done within 4 hours										
Total request time made		NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR
Total Time Taken for Activation		NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR
% activation done within 4 hours	≥ 95%	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR
PDP Context activation success rate										
No. of data Session requested		NDR	NDR	10644283	NDR	NDR	NDR	NDR	NDR	663118
No. of data Session Successful		NDR	NDR	10614566	NDR	NDR	NDR	NDR	NDR	662384
PDP Context activation success rate	≥ 95%	NDR	NDR	99.72%	NDR	NDR	NDR	NDR	NDR	99.89%
Drop Rate										
No. of Successful data calls		NDR	NDR	582991077	NDR	NDR	NDR	113947999	NDR	68760516
No. of Dropped data Calls		NDR	NDR	1333133	NDR	NDR	NDR	2998046	NDR	2242009
Drop rate	≤ 5%	NDR	NDR	0.23%	NDR	NDR	NDR	2.63%	NDR	3.26%

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9 PARAMETER DESCRIPTION & DETAILED FINDINGS - WIRELESS DATA SERVICES PMR AND LIVE (3G)

9.1 APRIL

Wireless Data-PMR					
	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Activation done within 4 hours					
Total request time made		NA	NDR	NA	183739
Total Time Taken for Activation		NA	NDR	NA	181627
% activation done within 4 hours	≥ 95%	NA	NDR	NA	98.85%
PDP Context activation success rate					
No. of data Session requested		NA	55532005	NA	802252
No. of data Session Successful		NA	55528767	NA	797714
PDP Context activation success rate	≥ 95%	96.13%	99.99%	99.91%	99.43%
Drop Rate					
No. of Successful data calls		44087739976	55528767	NA	39265159
No. of Dropped data Calls		103795691	3238	NA	146787
% Drop rate	≤ 5%	0.24%	0.01%	NA	0.37%
Wireless Data-Live Data					
	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Activation done within 4 hours					
Total request time made		NA	NDR	NDR	NDR
Total Time Taken for Activation		NA	NDR	NDR	NDR
% activation done within 4 hours	≥ 95%	NA	NDR	NDR	NDR
PDP Context activation success rate					
No. of data Session requested		NA	6745087	NDR	811255
No. of data Session Successful		NA	6744753	NDR	806870
PDP Context activation success rate	≥ 95%	NA	100.00%	NDR	99.46%
Drop Rate					
No. of Successful data calls		NA	6744753	NDR	40765521
No. of Dropped data Calls		NA	334	NDR	152169
Drop rate	≤ 5%	NA	0.00%	NDR	0.37%

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9.2 MAY

Wireless Data-PMR					
	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Activation done within 4 hours					
Total request time made		NDR	NDR	NDR	186681
Total Time Taken for Activation		NDR	NDR	NDR	183095
% activation done within 4 hours	≥ 95%	NDR	NDR	NDR	98.08%
PDP Context activation success rate					
No. of data Session requested		NA	61866736	NDR	765138
No. of data Session Successful		NA	59217864	NDR	760641
PDP Context activation success rate	≥ 95%	97.26%	95.72%	NDR	99.41%
Drop Rate					
No. of Successful data calls		31426139676	59217864	NDR	34685373
No. of Dropped data Calls		83805974	2648872	NDR	132613
Drop rate	≤ 5%	0.27%	4.47%	NDR	0.38%
Wireless Data-Live Data					
	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Activation done within 4 hours					
Total request time made		NDR	NDR	NDR	NDR
Total Time Taken for Activation		NDR	NDR	NDR	NDR
% activation done within 4 hours	≥ 95%	NDR	NDR	NDR	NDR
PDP Context activation success rate					
No. of data Session requested		NDR	10534742	NDR	687357
No. of data Session Successful		NDR	10523877	NDR	683427
PDP Context activation success rate	≥ 95%	NDR	99.90%	NDR	99.43%
Drop Rate					
No. of Successful data calls		NDR	10523877	NDR	29286359
No. of Dropped data Calls		NDR	10865	NDR	113113
Drop rate	≤ 5%	NDR	0.10%	NDR	0.39%

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9.3 JUNE

Wireless Data-PMR					
	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Activation done within 4 hours					
Total request time made		NDR	NDR	NDR	184318
Total Time Taken for Activation		NDR	NDR	NDR	184318
% activation done within 4 hours	≥ 95%	NDR	NDR	NDR	100.00%
PDP Context activation success rate					
No. of data Session requested		NA	51389923	NA	689793
No. of data Session Successful		NA	51373924	NA	684458
PDP Context activation success rate	≥ 95%	95.48%	99.97%	98.74%	99.23%
Drop Rate					
No. of Successful data calls		35302669932	51373924	NDR	37268074
No. of Dropped data Calls		113498793	15999	NDR	161480
Drop rate	≤ 5%	0.32%	0.03%	NDR	0.43%
Wireless Data-Live Data					
	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Activation done within 4 hours					
Total request time made		NDR	NDR	NDR	NDR
Total Time Taken for Activation		NDR	NDR	NDR	NDR
% activation done within 4 hours	≥ 95%	NDR	NDR	NDR	NDR
PDP Context activation success rate					
No. of data Session requested		NDR	NDR	NDR	680394
No. of data Session Successful		NDR	NDR	NDR	675435
PDP Context activation success rate	≥ 95%	NDR	NDR	NDR	99.27%
Drop Rate					
No. of Successful data calls		NDR	NDR	NDR	37401304
No. of Dropped data Calls		NDR	NDR	NDR	166311
Drop rate	≤ 5%	NDR	NDR	NDR	0.44%

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10   PARAMETER DESCRIPTION AND DETAILED FINDINGS – NON-NETWORK PARAMETERS

10.1 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.

10.1.1 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

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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 (Postpaid)** = (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

10.1.2 KEY FINDINGS – METERING AND BILLING CREDIBILITY (POSTPAID)

Metering and billing credibility - Postpaid

TRAI Benchmark ≤ 0.1%

Percentage bills disputed

- Aircel: 0.01%
- Airtel: 0.06%
- Idea: 0.38%
- MTNL: 0.05%
- Reliance CDMA: 0.08%
- Reliance GSM: 0.09%
- TATA CDMA: 0.00%
- TATA GSM: 0.00%
- Vodafone: 0.79%

Audit Results for Billing performance Postpaid-Consolidated
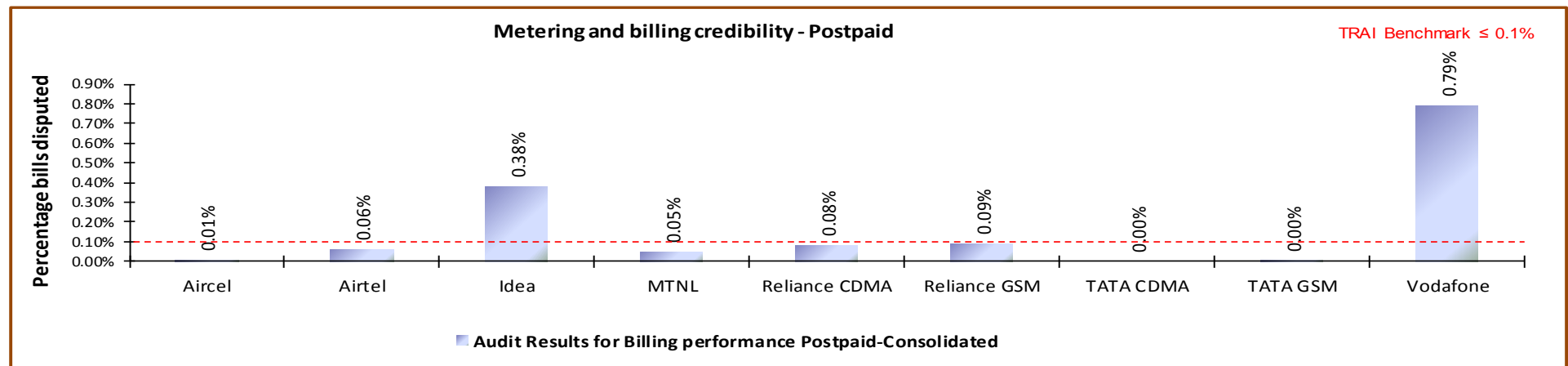
Data Source: Billing Center of the operators

Idea and Vodafone failed to meet the benchmark of 0.1% post-paid metering and billing credibility.

Metering and billing credibility - Postpaid (Billing cycle wise)

TRAI Benchmark ≤ 0.1%

Percentage bills disputed

- Aircel: 0.00%, 0.00%, 0.01%
- Airtel: 0.06%, 0.06%, 0.05%
- Idea: 0.42%, 0.38%, 0.32%
- MTNL: 0.05%, 0.05%, 0.04%
- Reliance CDMA: 0.09%, 0.09%, 0.06%
- Reliance GSM: 0.09%, 0.09%, 0.09%
- TATA CDMA: 0.00%, 0.00%, 0.00%
- TATA GSM: 0.00%, 0.00%, 0.00%
- Vodafone: 0.85%, 0.90%, 0.62%

■ April ■ May ■ June

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10.1.3 KEY FINDINGS - METERING AND BILLING CREDIBILITY (PREPAID)

Metering and billing credibility - Prepaid

TRAI Benchmark ≤ 0.1%

Percentage bills disputed

Operator	Value
Aircel	0.00%
Airtel	0.03%
Idea	0.10%
MTNL	0.00%
Reliance CDMA	0.01%
Reliance GSM	0.03%
TATA CDMA	0.00%
TATA GSM	0.00%
Vodafone	0.07%

■ **Percentage of charging complaints disputed**

Data Source: Billing Center of the operators

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

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10.2 RESOLUTION OF BILLING/ CHARGING COMPLAINTS

10.2.1 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.

10.2.2 KEY FINDINGS - WITHIN 4 WEEKS
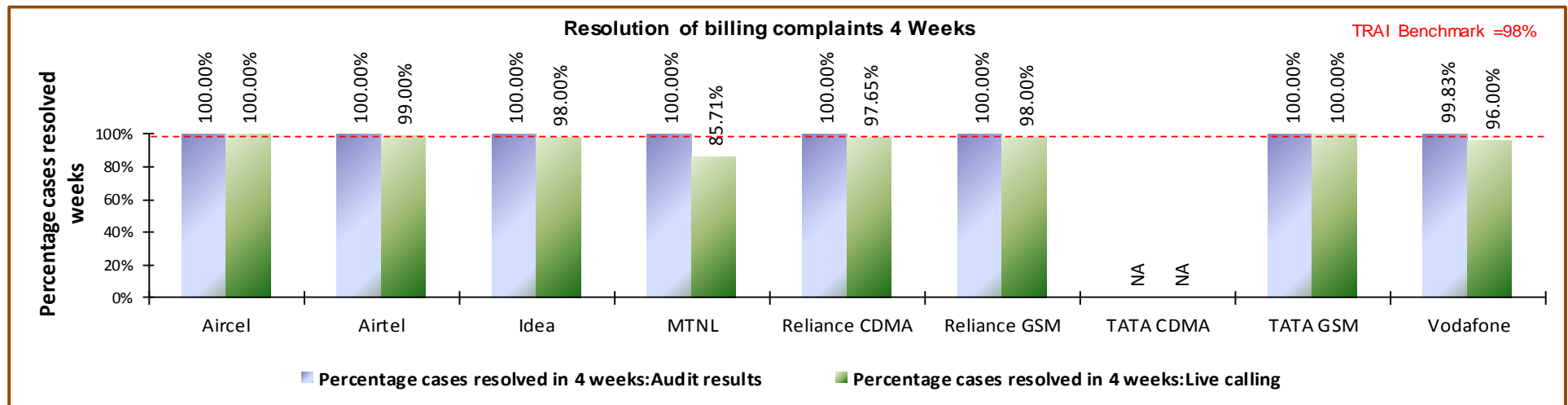
Data Source: Billing Center of the operators

10.2.3 KEY FINDINGS WITHIN 6 WEEKS
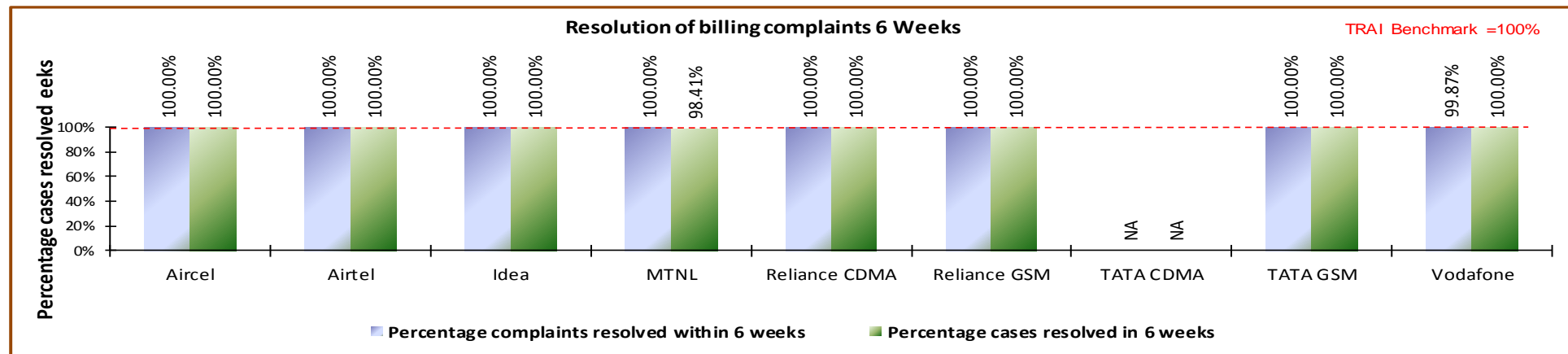
Resolution of billing complaints 6 Weeks

TRAI Benchmark =100%

Data Source: Billing Center of the operators

All operators met the TRAI benchmark of resolution of billing complaints within 4 weeks except MTNL as per 3 days live calling, while as per PMR, Vodafone failed to meet the benchmark of resolution of billing complaints within 6 Weeks. However, as per live calling done to customers, the performance of all operators was observed to be much below the PMR data.

All operators met the TRAI benchmark for Live calling with 6 Weeks.

10.3   PERIOD OF APPLYING CREDIT/WAVIER

10.3.1 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

10.3.2 KEY FINDINGS
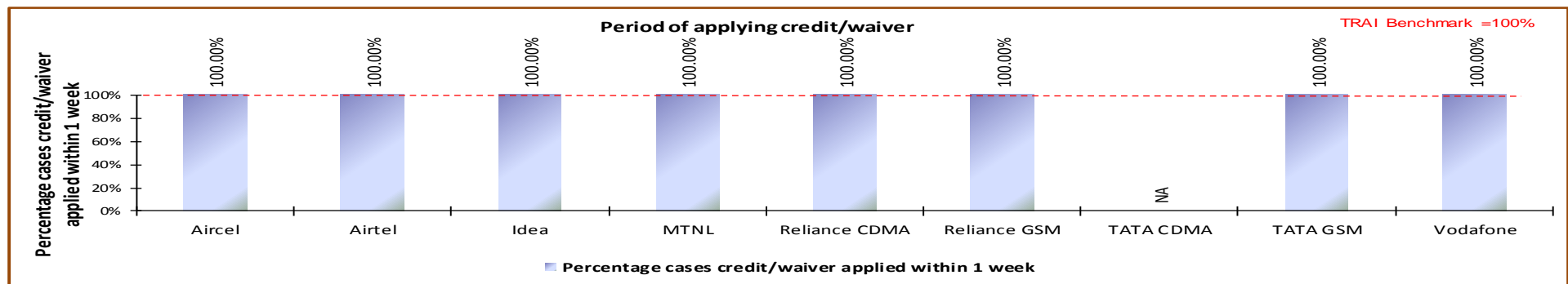
Data Source: Billing Center of the operators

All operators met the benchmark for this parameter.

10.4 CALL CENTRE PERFORMANCE-IVR

10.4.1 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

10.4.2 KEY FINDINGS
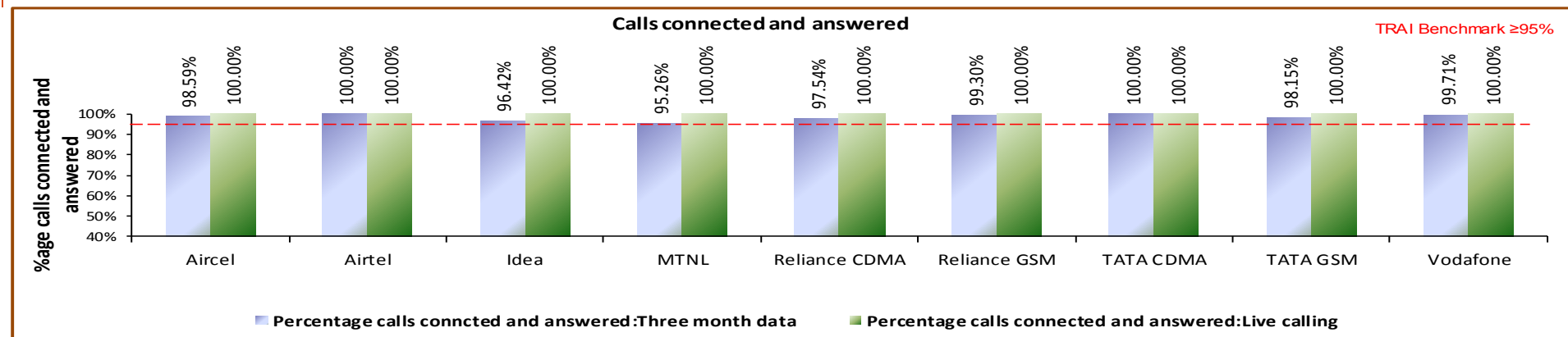
Data Source: Customer Service Center of the operators

As per PMR data, all operators met the benchmark

10.5   CALL CENTRE PERFORMANCE-VOICE TO VOICE

10.5.1 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

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10.5.2 KEY FINDINGS

Calls answered in 90 seconds (Voice to Voice)

TRAI Benchmark ≥ 95%

	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Percentage calls answered within 90 seconds (Avg of 3 months)	95.45%	89.71%	98.98%	100.00%	78.73%	78.42%	99.70%	97.93%	96.04%
Live Calling Percentage calls getting connected and answered	95.00%	100.00%	95.00%	98.00%	96.00%	95.00%	100.00%	98.00%	100.00%

■ Percentage calls answered within 90 seconds (Avg of 3 months)　■ Live Calling Percentage calls getting connected and answered

Data Source: Customer Service Center of the operators

Airtel, Reliance CDMA and Reliance GSM failed to meet the benchmark as per PMR audit.

Calls answered in 90 seconds (Voice to Voice)

TRAI Benchmark ≥ 95%

	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
April	95.64%	94.04%	99.14%	100.00%	88.94%	91.80%	99.79%	98.37%	96.94%
May	94.37%	80.96%	99.02%	100.00%	72.54%	76.86%	99.76%	97.88%	93.85%
June	96.23%	94.68%	98.80%	100.00%	75.10%	69.16%	99.58%	97.56%	97.38%

■ April　■ May　■ June

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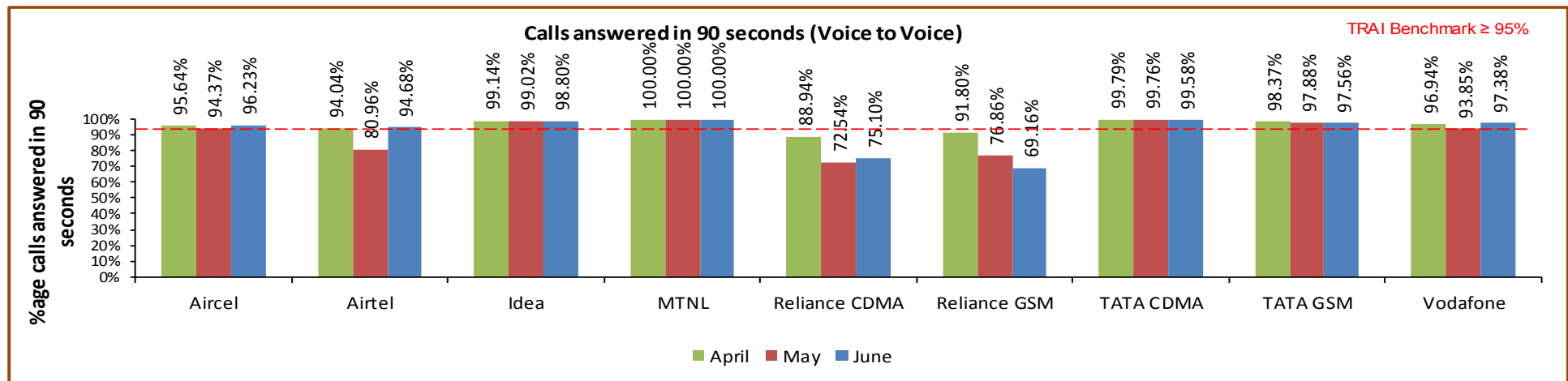
10.6 TERMINATION/CLOSURE OF SERVICE

10.6.1 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

10.6.2 KEY FINDINGS
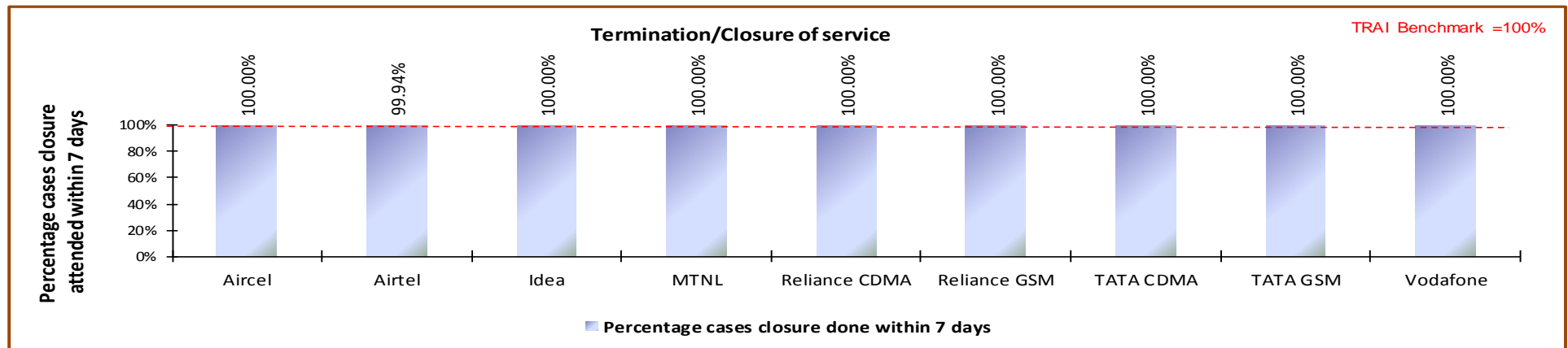
Data Source: Customer Service Center of the operators

All operators met the TRAI benchmark for the parameter.

10.7   REFUND OF DEPOSITS AFTER CLOSURE

10.7.1 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

10.7.2 KEY FINDINGS
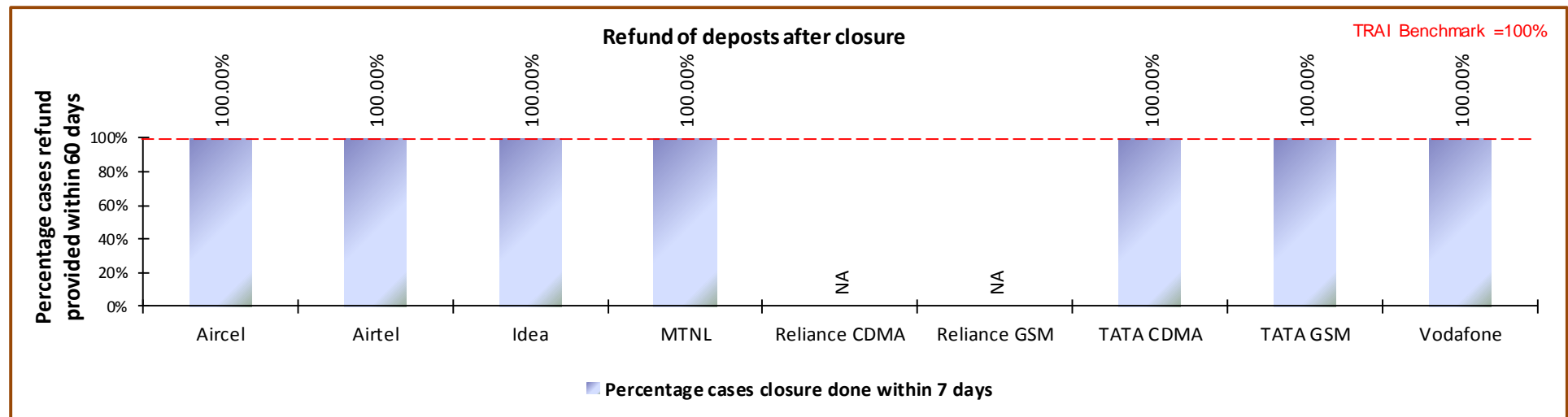
Refund of deposts after closure

TRAI Benchmark =100%

Percentage cases refund provided within 60 days

- Aircel: 100.00%
- Airtel: 100.00%
- Idea: 100.00%
- MTNL: 100.00%
- Reliance CDMA: NA
- Reliance GSM: NA
- TATA CDMA: 100.00%
- TATA GSM: 100.00%
- Vodafone: 100.00%

■ **Percentage cases closure done within 7 days**

Data Source: Customer Service Center of the operators

All operators met the TRAI benchmark for the parameter.

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11 DETAILED FINDINGS - DRIVE TEST DATA

11.1 OPERATOR ASSISTED DRIVE TEST - VOICE

The drive test was conducted simultaneously for all the operators present in the Mumbai 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 Mumbai circle are given below.

11.1.1 Mumbai SSA

Month	Name of SSA Covered	Start date	End Date	Kilometer Travelled
May	Mumbai	23-05-2016	28-05-2016	590

11.1.1.1 Route Details - Mumbai SSA

Category	Type of location	May					
		Mumbai					
		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Outdoor	Major Roads	Poor Coverage Navy Nagar. Poor Coverage & Quality Dr.Gopalrao Deshmukh Road, Navy Nagar, S VALLABHDAS MARG. Poor Quality on J.J Flyover & N.M Joshi Road	Poor Coverage & Quality L JAGMOHAN DAS MARG. Poor Coverage Carter Road & Bandstand	Poor Quality EEH Near Chunnabhati ,Kurla,Sahar Elevated Flyover,Sakivihar Road , Bail Bazzar & Near Bandra FOB	Poor Covergae & Quality Mulund West Station,Vikroli East & Bhandup West	Poor Coverage Kharghar. Poor Coverage & Quality Near Nahur Railway Station,Thane Belapur Road,Mulund Airoli Road	Poor Coverage & Quality on Godhbunder Road. Poor Coverage on Thane Godhbunder Road. Poor Quality on Link Road- Malad,Navghar Road & Jogeshwari East-West Flyover
	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 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.

11.1.1.1 Route Map - Mumbai DAY 1

Route Covered- day 1

1. Swatantrya veer savarkar marg
2. Annie Besant Road
3. Haji Ali
4. Peddar Road
5. Napansea Road
6. Marine Drive
7. Sasson Dock
8. J.J Flyover
9. Ambedkar Road
10. Priyadarshini, Chembur
11. Vashi Naka, Chembur
12. Eastern Express Freeway
13. Mahalaxmi
14. Tulsi pipe Road

RXLEV_SUB

- -65 to 0
- -75 to -65
- -85 to -75
- -95 to -85
- -120 to -95
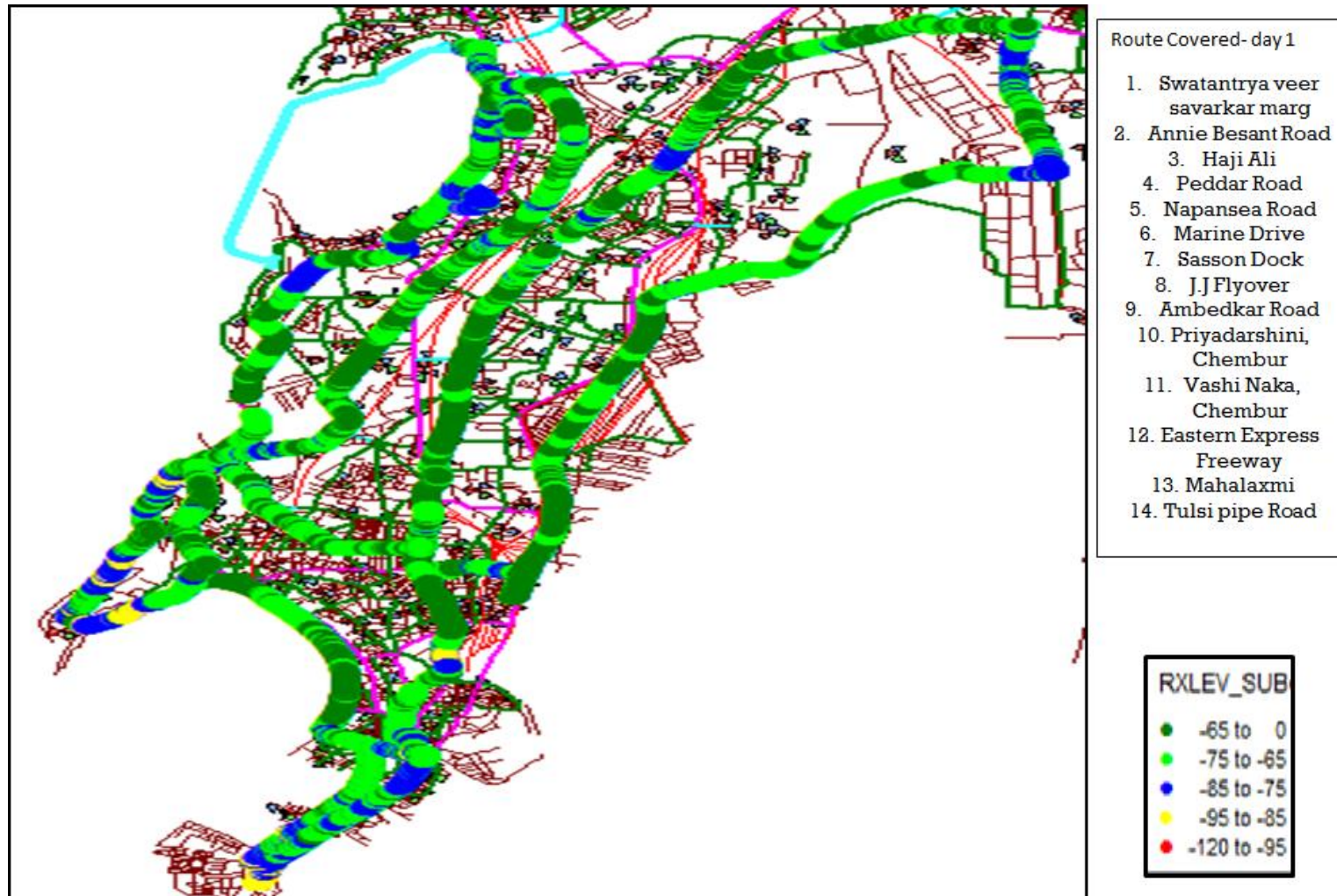
11.1.1.2 Route Map - Mumbai DAY 2
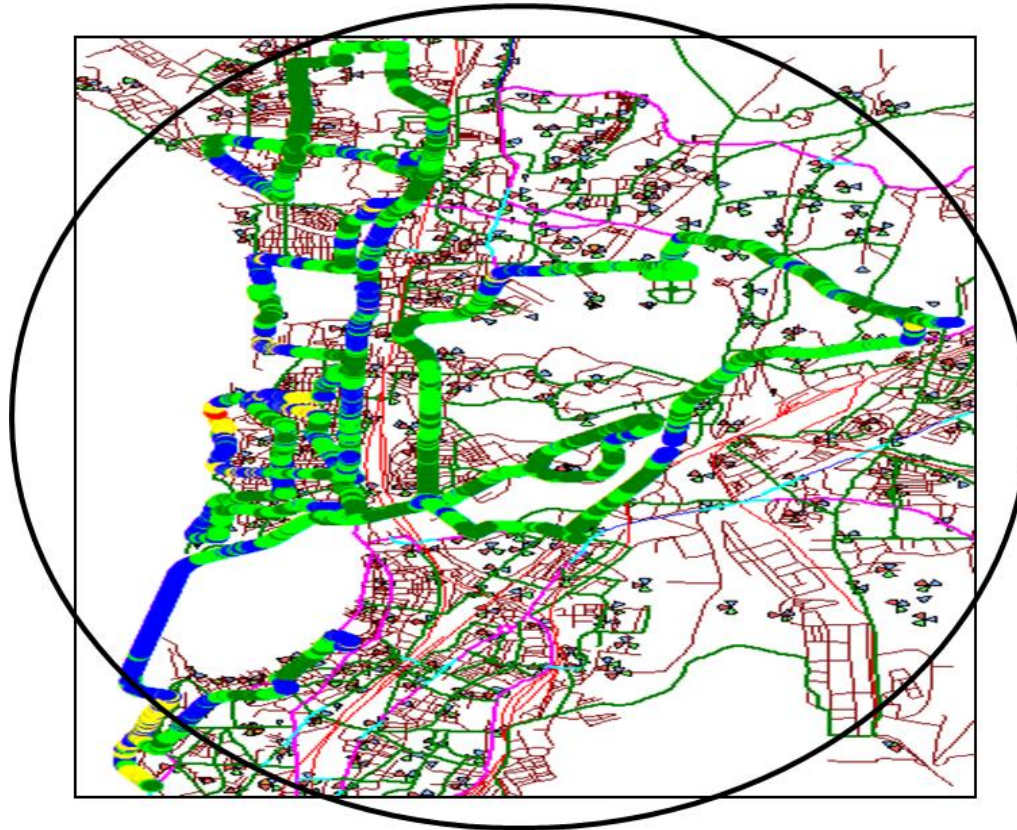
Route Covered- day 2

1. Swatantrya veer savarkar marg
2. Bandra Worli Sea link
3. Western Express Highway
4. Chatrapati Shivaji International Airport
5. Andheri Ghatkopar Link Road
6. Lal Bahadur Shastri Marg
7. Sion Dharavi
8. BKC
9. Swami Vivekananda Road
10. Andheri Link Road
11. Versova
12. Juhu Road
13. Linking Road
14. Pali Hill
15. Carter Road
16. Bandra Bandstand

11.1.1.3 Route Map - Mumbai DAY 3
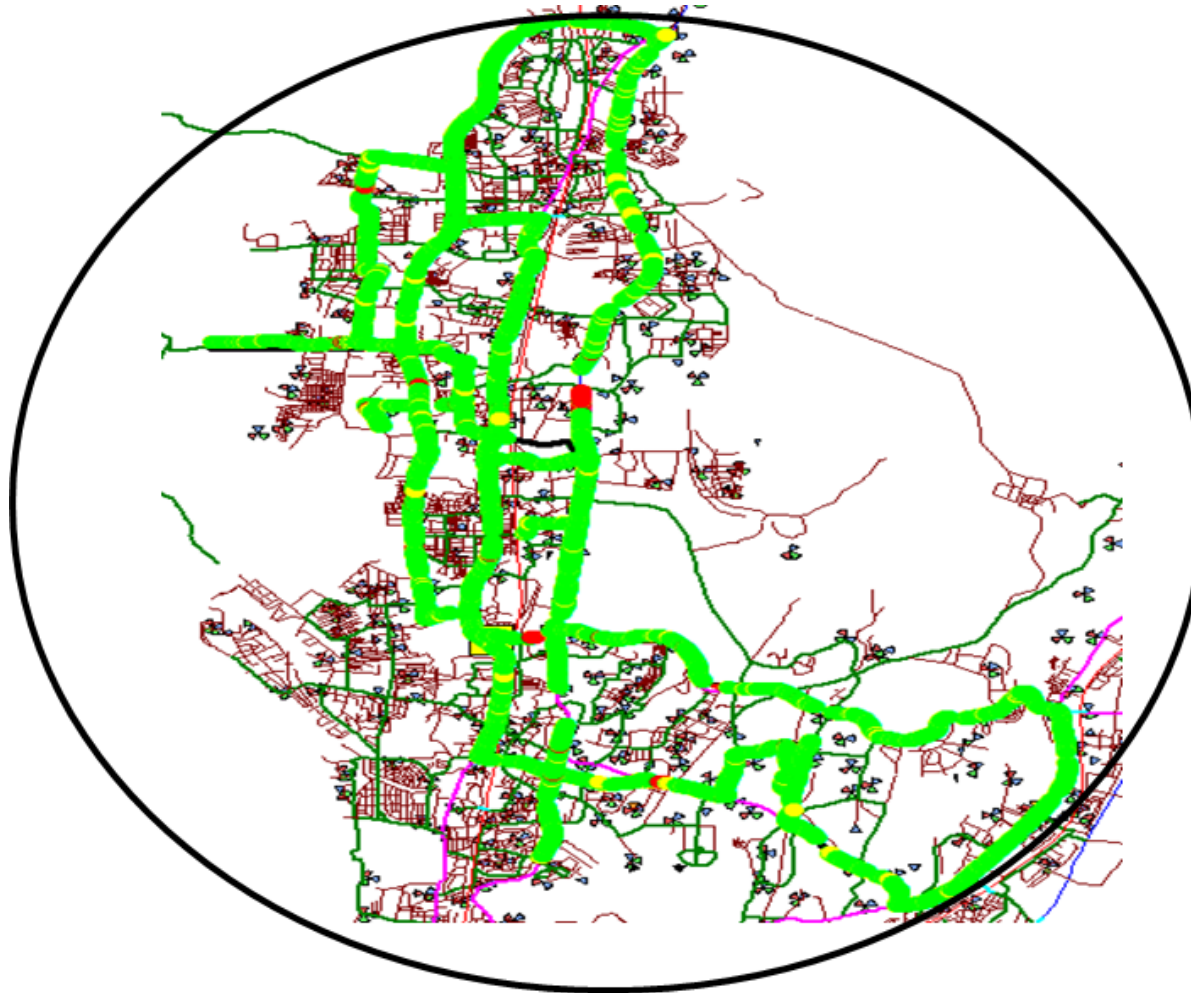
Route Covered- day 3

1. Western Express Highway
2. Kanderpada Road
3. IC Colony
4. Gorai
5. Malad Marve Road
6. New Link Road
7. Swami Vivekananda Road
8. JVLR
9. LBS Marg
10. Andheri Ghatkopar Link road
11. Saki Vihar Road
12. Marol Naka

11.1.1.4 Route Map - Mumbai DAY 4
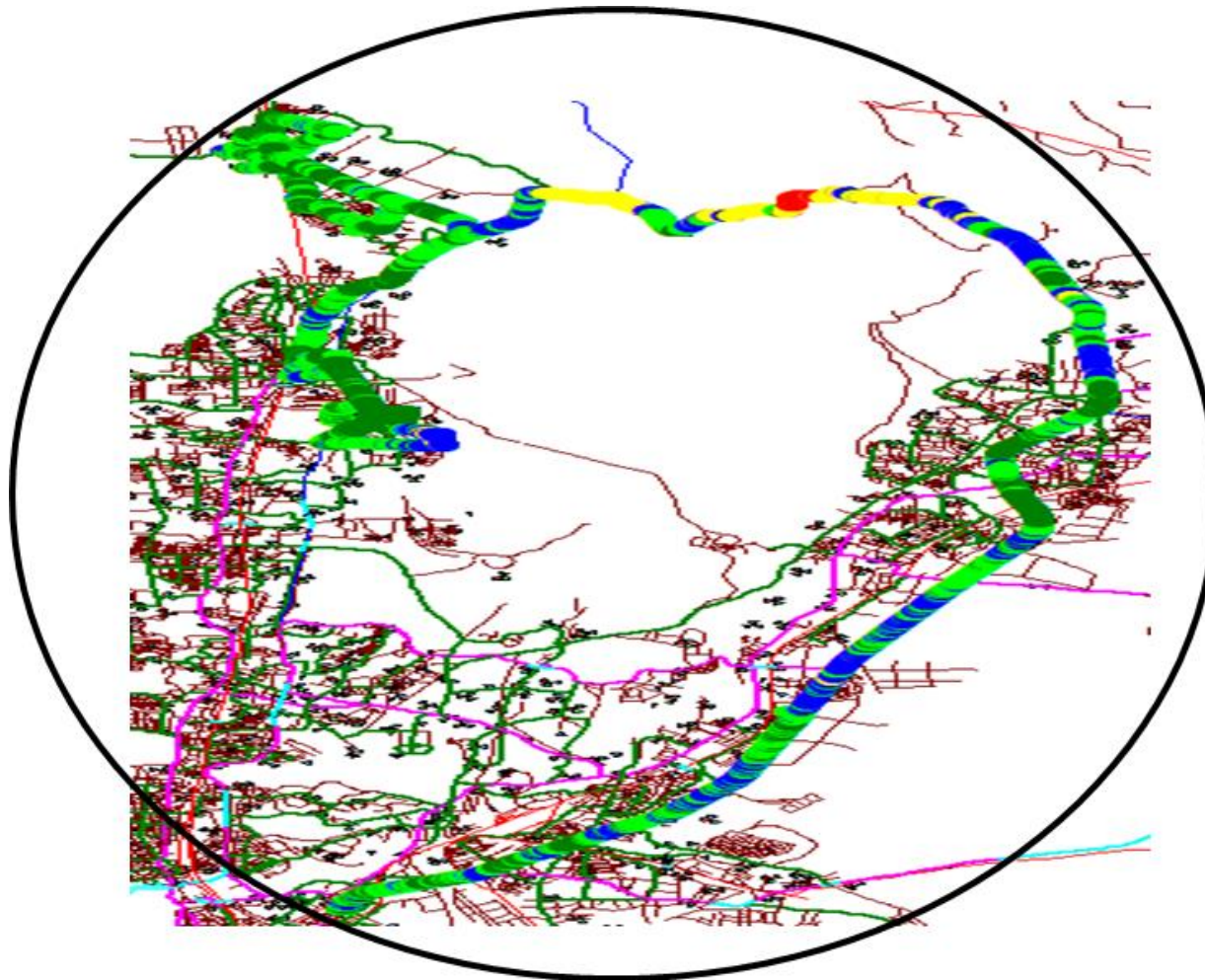
Route Covered- day 4

1. Eastern Express Highway
2. Ambedkar Road
3. Ghodbunder Road
4. Mira Bhayander Road
5. Mira Road East
6. Bhayander East
7. Bhayander West
8. Western Express Highway
9. Thakur Village
10. Borivali station east
11. Akurli Road
12. Thakur Complex

11.1.1.5 Route Map - Mumbai DAY 5
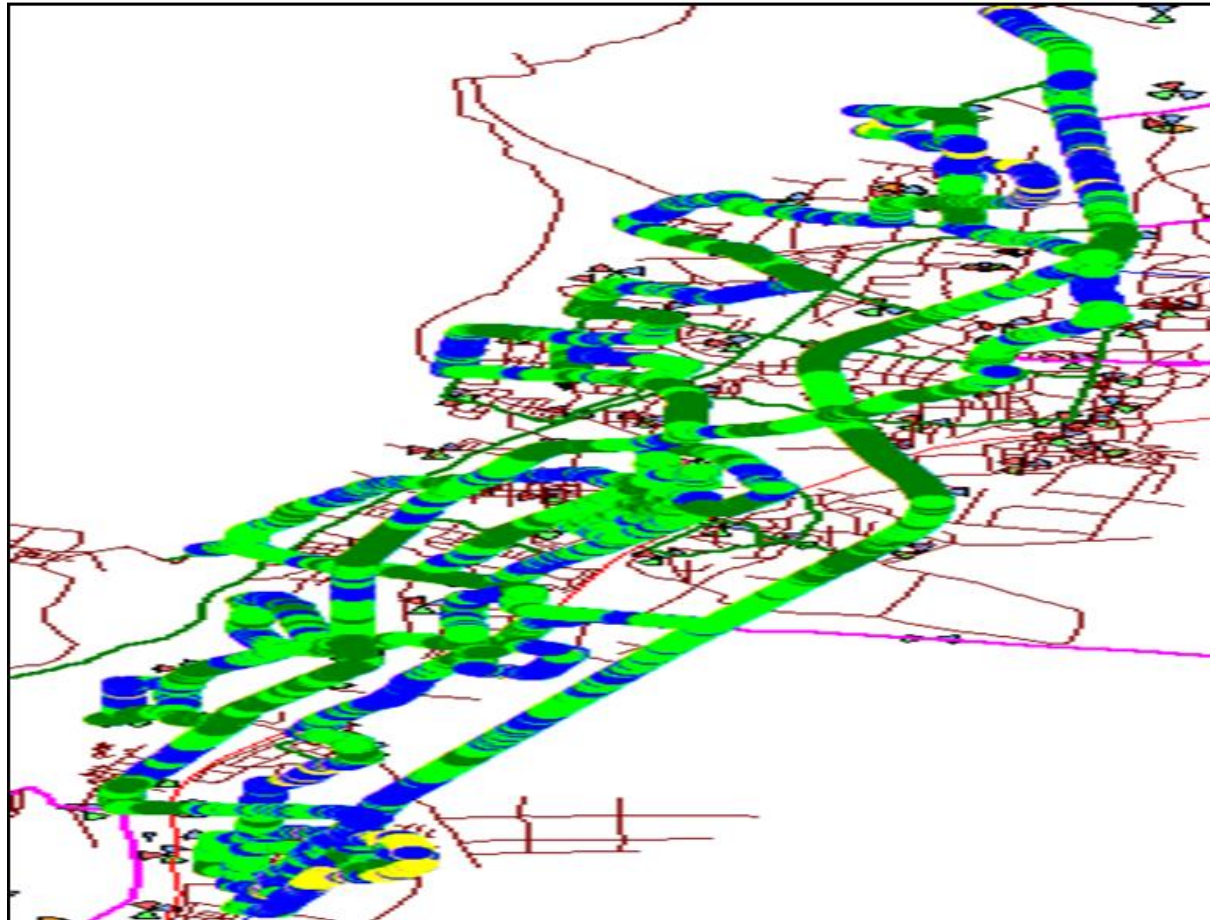
Route Covered-
day 5

1. Eastern
   Express
   Highway
2. Ghodbunder
   Road
3. Lal Bahadur
   Shastri Marg
4. Kannamwar
   Nagar,
   Vikhroli
5. Tagore
   Nagar,
   Vikhroli
6. Bhandup East
7. Nahur East
8. Tembhipada,
   Bhandup
   West
9. Sarvodaya
   Nagar,
   Bhandup
   West
10. Wagle
    Estate, Thane
11. Pokharan
    Road 1,
    Thane West
12. Pokharan
    Road 2,
    Thane West
13. Glady
    Alwares
    Road, Thane

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11.1.1.6 ROUTE MAP - MUMBAI DAY 6
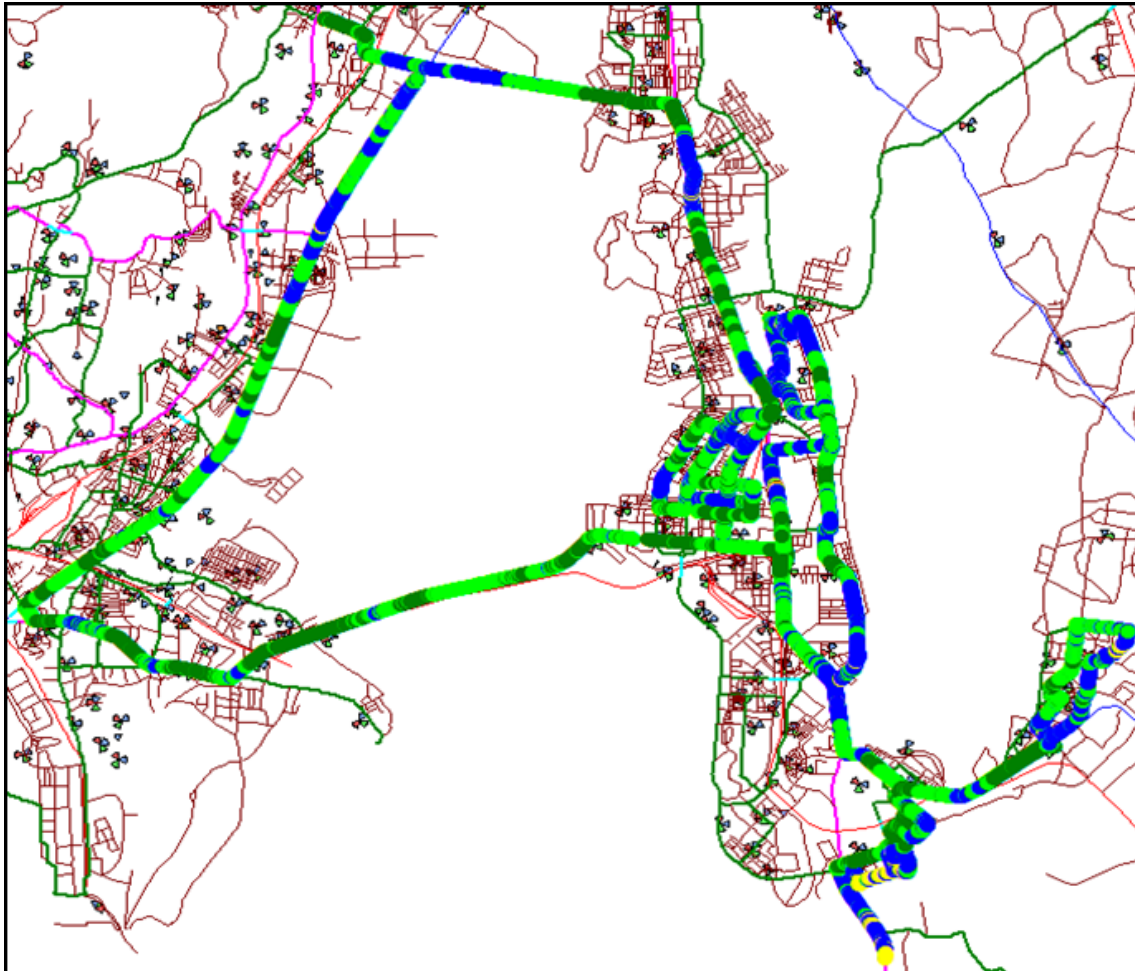
Route Covered- day 6

1. Eastern Express Highway
2. Sion Trombay Road
3. Sion Panvel Highway
4. Kharghar
5. Belapur
6. Turbhe MIDC
7. Turbhe Mahape Road
8. Mahape Gaon
9. APMC Market, Vashi
10. Palm Beach Road
11. Thane Belapur Road
12. Mulund Airoli Road
13. Airoli Flyover
14. Mulund Goregaon Link Road

11.1.1.7 Drive Test Results - Mumbai SSA-2G

Parameter's	B'mark	Aircel		Airtel		Idea		MTNL		RCOM CDMA		RCOM GSM		TATA CDMA		TATA GSM		Vodafone	
		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		63.36%	60.32%	50.22%	57.96%	98.76%	81.70%	37.60%	32.71%			99.45%	69.01%	52.90%	70.94%	100.00%	97.26%	94.38%	72.28%
0 to -85 dBm		98.36%	90.62%	98.12%	92.69%	99.99%	97.85%	83.04%	75.93%			100.00%	92.77%	95.26%	96.12%	100.00%	99.87%	99.93%	94.44%
0 to -95 dBm		99.99%	98.76%	100.00%	100.00%	100.00%	99.86%	99.77%	97.75%			100.00%	98.72%	99.99%	99.80%	100.00%	100.00%	100.00%	98.85%
Voice quality	≥ 95%	98.38%	93.17%	95.70%	95.67%	99.48%	94.98%	92.97%	88.29%	NA		100.00%	90.72%	96.66%	96.06%	98.45%	97.54%	98.67%	96.05%
CSSR	≥ 95%	100.00%	97.96%	100.00%	99.41%	100.00%	99.07%	100.00%	97.81%			100.00%	97.75%	100.00%	99.35%	100.00%	99.27%	100.00%	99.88%
%age Blocked calls		0.00%	1.68%	0.00%	0.59%	0.00%	0.93%	0.00%	1.67%			0.00%	2.25%	0.00%	0.12%	0.00%	0.70%	0.00%	0.12%
Call drop rate	≤ 2%	0.00%	0.61%	0.00%	0.48%	0.00%	1.07%	0.00%	2.61%			0.00%	1.15%	0.00%	0.66%	0.00%	1.04%	0.00%	0.71%
Hands off success rate		100.00%	97.92%	100.00%	96.03%	100.00%	98.40%	100.00%	95.83%			100.00%	97.90%	100.00%	99.28%	100.00%	98.64%	100.00%	99.14%

Data Source: Drive test reports submitted by operators to auditors

Voice Quality

Aircel, Idea, MTNL and Reliance GSM failed to meet the benchmark for voice quality in outdoor locations. While MTNL failed to meet the benchmark for voice quality in indoor locations.

Call Set Success Rate (CSSR)

All operators met the benchmarks of CSSR.

Call Drop Rate

All operators met the benchmark of call drop rate except MTNL

11.1.1.1 Drive Test Results - Mumbai SSA-3G

Parameter's	B'mark	Airtel 3G		MTNL 3G		Reliance 3G		Vodafone 3G	
		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
0 to -75 dBm		99.80%	90.23%	37.61%	39.92%			93.36%	70.72%
0 to -85 dBm		99.99%	98.74%	99.86%	72.23%			99.56%	90.43%
0 to -95 dBm		100.00%	100.00%	100.00%	96.62%			99.99%	98.24%
Voice quality	≥ 95%	98.75%	98.76%	95.88%	91.14%	NA		NA	NA
CSSR	≥ 95%	100.00%	99.60%	100.00%	96.80%			100.00%	100.00%
%age Blocked calls		0.00%	0.40%	0.00%	2.47%			0.00%	0.51%
Call drop rate	≤ 2%	0.00%	0.13%	0.00%	2.01%			0.00%	0.26%
Hands off success rate		100.00%	99.32%	100.00%	95.05%			NA	NA

Voice Quality

MTNL 3G failed to meet the benchmark for Voice quality in outdoor locations.

Call Set Success Rate (CSSR)

All operators met the benchmark for CSSR.

Call Drop Rate

MTNL 3G met the benchmark for call drop rate in outdoor locations.

11.1.1.1 Data Drive Test Results - Mumbai SSA-2G

Name of the Parameter	Bench Mark	Aircel	Airtel	Idea	MTNL	RCOM CDMA	RCOM GSM	TATA CDMA	TATA GSM	Vodafone
Succesful Data Transmission download speed attempts	>80%	100	100	100	100	100	100	100	100	99
Succesful Data Transmission upload speed attempts	>75%	100	100	100	100	100	100	100	100	100
Minimum download speed		91	125	123	23	256	256	84	85	168
Average throughput for Packet Data		139	165	164	70	451	451	99	121	190
Latency	<250ms	100	100	100	100	100	100	100	100	100

All operators met the TRAI benchmark for data drive test.

11.1.1.2 Data Drive Test Results - Mumbai SSA-3G

Name of the Parameter	Bench Mark	Airtel 3G	MTNL 3G	Vodafone 3G
Succesful Data Transmission download speed attempts	>80%	100	100	100
Succesful Data Transmission upload speed attempts	>75%	100	100	100
Minimum download speed		2782	96	4802
Average throughput for Packet Data		5904	493	7057
Latency	<250ms	NDR	100	100

All operators met the TRAI benchmark for data drive test.

11.2   INDEPENDENT DRIVE TEST – VOICE

Month	Name of SSA Covered	Start Date	End Date	KM Covered
April	Mumbai	10-05-2016	13-05-2016	580

Route Details:-

- COLABA
- NARIMAN POINT
- MARINE DRIVE
- WANKHEDE STADIUM
- WALKESHWAR RD
- BOMBOY HC CIRCLE
- LOTUS COLONY
- SENAPATI BAPAT MARG
- RC MARG MONORAIL
- BANDRA HILL RD
- PALI VILLAGE
- VASANT VIHAR
- BANCH STAND
- SION FLYOVER
- PD HINDUJA HOSPITAL
- MATUNGA ROAD RLY
- BANDRA WARLI SEA LINK
- SHRI SIDHIVINAYAK TEMPLE
- WORLI SEAFACE RD
- LALBAUG FLYOVER

- Bandra East
- Bandra west
- Khar west
- Pali Hill '
- Juhu
- Juhu Tara
- RPF Colony
- Vidya nagar
- Naik Nagar
- Shastr Nagar
- Kurla west
- Govind dham
- Jarimari
- Govind nagar
- Ghatkopar west
- Nityanand nagar
- Andheri east
- Jogeshwari East
- Jogeshwari West
- Behram Baug
- Lokhandwala

- JOGESHWARI WEST
- MALAD WEST
- MALAD EAST
- KANDIWALI WEST
- KANDIWALI EAST
- MARVE BEACH
- BORIWALI EAST
- BORIWALI WEST
- SANT JALARAM NAGAR
- MIRA BHAYANDAR
- MULUND WEST
- Vikhroli East
- Govandi East
- Mulund east
- Palm Beach
- sec 17 Vashi
- Sec 20 Khargar
- Sec 13 Khargar
- TTC industrial area
- Kannamwar nagar

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11.2.1.1 Route Map - Mumbai DAY 1, DAY2, DAY3 AND DAY4
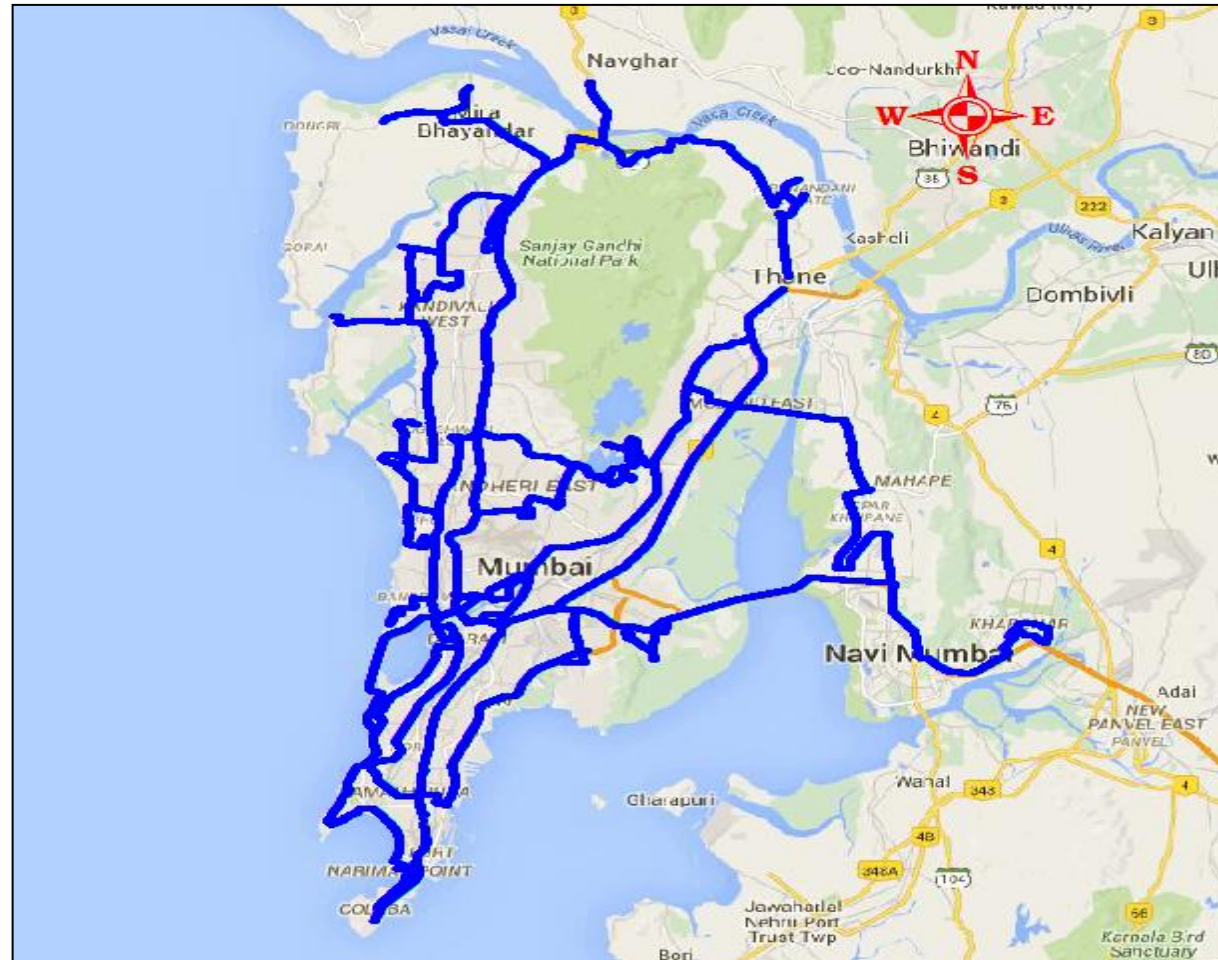
11.2.1.2 Drive Test Results - Mumbai SSA-2G & 3G

Call Events	Operators (Summary)											
	AIRTEL		AIRCEL	IDEA	VODAFONE		RCOM		MTNL		TATA	
	2G	3G	2G	2G	2G	3G	2G	CDMA	2G	3G	2G	CDMA
Call Attempt (May-16)	844	728	913	835	848	747	827	881	776	504	831	916
Blocked Call Rate (May-16)	4.27%	0.82%	1.75%	1.80%	1.53%	0.67%	6.53%	3.86%	6.57%	15.87%	1.81%	1.97%
CSSR (Accessibility) (May-16)	95.73%	99.18%	98.25%	98.20%	98.47%	99.33%	93.47%	96.14%	93.43%	84.13%	98.19%	98.03%
Dropped Call Rate (May-16)	1.49%	1.94%	2.23%	5.00%	1.68%	2.29%	2.85%	4.84%	17.93%	42.92%	2.08%	8.80%
Mobility HOSR (May-16)	97.66%	99.86%	96.01%	98.17%	96.69%	99.90%	97.23%	100.00%	92.82%	97.70%	97.38%	100.00%
Rx Quality (May-16)	97.10%	96.55%	93.50%	94.59%	96.97%	95.93%	94.50%	92.97%	80.89%	96.50%	96.23%	90.80%

Voice Quality

Aircel 2G, Idea 2G, MTNL 2G, Reliance GSM, Reliance CDMA and TATA CDMA failed to meet the benchmark for voice quality.

Call Set Success Rate (CSSR)

MTNL 2G & 3G and Reliance GSM failed to meet the benchmark for CSSR.

Call Drop Rate

Aircel 2G, Idea 2G, Vodafone 2G, Reliance GSM & CDMA, MTNL 2G & 3G and Tata GSM & CDMA failed to meet the benchmark for call drop rate.

12 ANNEXURE – CONSOLIDATED-2G

12.1 NETWORK AVAILABILITY

Audit Results for Network Availability- PMR data										
	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		5931	12779	11175	2953	1727	6509	2798	8800	14921
Sum of downtime of BTSs in a month (in hours)		3924	6710	6045	16073	1012	2080	1954	19926	16332
BTSs accumulated downtime (not available for service)	≤ 2%	0.09%	0.07%	0.07%	0.73%	0.08%	0.04%	0.09%	0.30%	0.15%
Number of BTSs having accumulated downtime >24 hours		5	0	7	33	9	10	0	0	0
Worst affected BTSs due to downtime	≤ 2%	0.08%	0.00%	0.06%	1.12%	0.52%	0.15%	0.00%	0.00%	0.00%
Live Measurement Results for Network Availability- 3 Day live data										
	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		5919	12781	11175	2959	1727	6496	2798	8800	14868
Sum of downtime of BTSs in a month (in hours)		264	547	673	1207	144	193	329	1949	1364
BTSs accumulated downtime (not available for service)	≤ 2%	0.06%	0.06%	0.08%	0.57%	0.12%	0.04%	0.16%	0.31%	0.13%
Number of BTSs having accumulated downtime >24 hours		0	0	0	0	0	0	0	0	0
Worst affected BTSs due to downtime	≤ 2%	0.00%	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

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12.2 CONNECTION ESTABLISHMENT (ACCESSIBILITY)

Audit Results for CSSR, SDCCH and TCH congestion- PMR data										
CSSR	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
CSSR	≥ 95%	97.90%	99.89%	99.26%	98.16%	98.12%	99.20%	99.19%	99.35%	99.38%
SDCCH/Paging channel congestion	≤ 1%	0.29%	0.05%	0.27%	0.29%	NA	0.44%	NA	0.05%	0.06%
TCH congestion	≤ 2%	0.62%	0.10%	0.48%	0.12%	0.47%	0.54%	0.03%	0.04%	0.62%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data										
CSSR	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
CSSR	≥ 95%	97.89%	99.89%	99.28%	98.19%	98.12%	98.25%	99.26%	99.43%	99.30%
SDCCH/Paging channel congestion	≤ 1%	0.38%	0.05%	0.27%	0.41%	NA	0.42%	NA	0.11%	0.06%
TCH congestion	≤ 2%	0.61%	0.09%	0.47%	0.07%	0.48%	0.37%	0.02%	0.07%	0.69%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data										
CSSR	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of call attempts		1074	1023	993	1015	NA	859	1061	1122	1076
Total number of successful calls established		1057	1018	986	998	NA	841	1060	1115	1075
CSSR	≥ 95%	98.42%	99.51%	99.30%	98.33%	NA	97.90%	99.91%	99.38%	99.91%
%age blocked calls		1.58%	0.49%	0.70%	1.67%	NA	2.10%	0.09%	0.62%	0.09%

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

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12.3 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	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		164989043	326509016	255138865	109320729	50292576	135075987	NA	77500238	477809947
Total number of calls dropped		1492819	2561596	2330012	1626970	99437	192960	NA	377783	4844745
Call drop rate	≤ 2%	0.90%	0.78%	0.91%	1.49%	0.20%	0.14%	NA	0.49%	1.01%
Total number of cells in the network		17616	35632	32429	7932	5172	18054	7737	24947	38223
Total number of cells having more than 3% TCH		782	566	481	160	18	50	85	517	961
Worst affected cells having more than 3% TCH	≤ 3%	4.44%	1.59%	1.48%	2.01%	0.35%	0.27%	1.10%	2.07%	2.51%
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	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		17441672	34219476	39690746	11467357	6494362	13599663	1478988	14241975	52200688
Total number of calls dropped		166759	283080	382321	168895	13222	20099	5513	73719	586611
Call drop rate	≤ 2%	0.96%	0.83%	0.96%	1.47%	0.20%	0.15%	0.37%	0.52%	1.12%
Total number of cells in the network		17576	35583	32424	7947	5172	18054	7737	24961	38185
Total number of cells having more than 3% TCH		842	558	466	160	20	52	53	203	1271
Worst affected cells having more than 3% TCH	≤ 3%	4.79%	1.57%	1.44%	2.01%	0.39%	0.29%	0.69%	0.81%	3.33%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data										
Call drop rate	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		1056	1018	986	998	NA	841	1060	1115	1075
Total number of calls dropped		5	4	8	26	NA	9	7	9	6
Call drop rate	≤ 2%	0.47%	0.39%	0.81%	2.61%	NA	1.07%	0.66%	0.81%	0.56%

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

12.4 VOICE QUALITY

Audit Results for Voice quality -PMR Data										
Voice quality	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of sample calls		30946848036	58024107325	48053397587	15739061861	NA	20343338895	NA	18106181240	60049165385
Total number of calls with good voice quality		30038942774	57077732009	46362766160	15214516169	NA	20205548699	NA	17736603675	58670652944
%age calls with good voice quality	≥ 95%	97.07%	98.37%	96.48%	96.67%	NA	99.32%	NA	97.96%	97.70%
Live measurement results for Voice quality-3 Day data										
Voice quality	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of sample calls		3256627227	5934903229	4978393701	1650397458	NA	2015996629	NA	1976571226	6249741101
Total number of calls with good voice quality		3159832027	5889085613	4803281448	1593938838	NA	2002929566	NA	1931617166	6103034310
%age calls with good voice quality	≥ 95%	97.03%	99.23%	96.48%	96.58%	NA	99.35%	NA	97.73%	97.65%
Drive test results for Voice quality (Average of three drive tests) - DT data										
Voice quality	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of sample calls		1732183	1991577	251833	1167013	NA	67480	115487	2030575	472526
Total number of calls with good voice quality		1629297	1911309	241513	1041430	NA	74273	111068	1949066	456316
%age calls with good voice quality	≥ 95%	94.06%	95.97%	95.90%	89.24%	NA	110.07%	96.17%	95.99%	96.57%

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

12.5   POI CONGESTION

Audit Results for POI Congestion- PMR data										
POI congestion	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		302	881	284	93	256	258	0	0	0
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		236717	415815	0	45539	74480	129791	0	0	0
Traffic served for all POIs (B)- in erlangs		100807	286861	0	20620	41970	85310	0	0	0
POI congestion	≤ 0.5%	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	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		302	874	0	93	259	267	0	0	0
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		236344	412846	0	45558	74040	132736	0	0	0
Traffic served for all POIs (B)- in erlangs		102491	290649	0	11740	41597	89024	0	0	0
POI congestion	≤ 0.5%	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

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13 ANNEXURE – CONSOLIDATED-3G

13.1 NETWORK AVAILABILITY

Audit Results for Network Availability- PMR data					
	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
(Number of Node Bs in the network in the licensed service area		4009	2078	6105	15710
Sum of downtime (i.e. total outage time) of Node Bs		5233	12109	5755	20918
Node Bs downtime (not available for service)	≤ 2%	0.18%	0.78%	0.13%	0.18%
Number of Node Bs having accumulated downtime of >24 hours in a month		0	28	60	0
Worst affected Node Bs due to downtime	≤ 2%	0.00%	1.35%	0.98%	0.00%
Live Measurement Results for Network Availability- 3 Day live data					
	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
(Number of Node Bs in the network in the licensed service area		4033	694	6116	15612
Sum of downtime (i.e. total outage time) of Node Bs		587	1056	505	2100
Node Bs downtime (not available for service)	≤ 2%	0.20%	2.11%	0.11%	0.19%
Number of Node Bs having accumulated downtime of >24 hours in a month		0	0	0	0
Worst affected Node Bs due to downtime	≤ 2%	0.00%	0.00%	0.00%	0.00%

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

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13.2   CONNECTION ESTABLISHMENT (ACCESSIBILITY)

Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data					
	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
CSSR	≥ 95%	98.85%	98.13%	99.87%	99.83%
RRC Congestion	≤ 1%	0.06%	0.69%	0.07%	0.00%
Circuit Switched RAB Congestion	≤ 2%	0.08%	0.37%	0.03%	0.00%
Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data					
	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
CSSR	≥ 95%	98.74%	97.70%	99.99%	99.47%
RRC Congestion	≤ 1%	0.05%	0.75%	0.04%	0.00%
Circuit Switched RAB Congestion	≤ 2%	0.08%	0.50%	0.02%	0.00%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data					
CSSR	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total number of RRC attempts (A)		933	1022	NA	1157
Total number of RRC established (B)		930	997	NA	1157
Call setup success rate (B/A*100)	≥ 95%	99.68%	97.55%	NA	100.00%
%age blocked calls		0.32%	2.45%	NA	0.00%

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

13.3 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	MTNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		228048805	12855616	67430559	407816063
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		873719	203825	64123	1467398
Call drop rate (B/A*100)	≤ 2%	0.38%	1.59%	0.10%	0.36%
Total no. of cells in the licensed service area (B)		53439	6000	17925	60786
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		1004	150	62	1149
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	1.88%	2.50%	0.35%	1.89%
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	MTNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		23211251	1309884	6650617	44351187
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		92238	22397	5830	154439
Call drop rate (B/A*100)	≤ 2%	0.40%	1.71%	0.09%	0.35%
Total no. of cells in the licensed service area (B)		53686	6006	17916	61656
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		1006	163	55	1165
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	1.87%	2.71%	0.31%	1.89%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data					
Call drop rate	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		930	997	0	1011
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		1	20	0	2
Call drop rate (B/A*100)	≤ 2%	0.11%	2.01%	NA	0.20%

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

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13.4 VOICE QUALITY

Audit Results for Voice quality -PMR Data					
Voice quality	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	24312423001	NA	543107021140
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	24044188961	NA	537039823820
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	NA	98.90%	NA	98.88%
Live measurement results for Voice quality-3 Day data					
Voice quality	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	2475441732	NA	80213735301
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	2447979700	NA	78889667420
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	NA	98.89%	NA	98.35%
Drive test results for Voice quality (Average of three drive tests) - DT data					
Voice quality	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		2734938	208396	NA	NA
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		2704179	191963	NA	NA
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.88%	92.11%	NA	NA

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

13.5   POI CONGESTION

Audit Results for POI Congestion- PMR data					
POI congestion	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total number of working POIs		0	93	258	0
No. of POIs not meeting benchmark		0	0	0	0
Total Capacity of all POIs (A) - in erlangs		0	45559	130183	0
Traffic served for all POIs (B)- in erlangs		0	17482	85652	0
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data					
POI congestion	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total number of working POIs		0	93	261	0
No. of POIs not meeting benchmark		0	0	0	0
Total Capacity of all POIs (A) - in erlangs		0	45560	131056	0
Traffic served for all POIs (B)- in erlangs		0	11947	86382	0
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%

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

14 ANNEXURE – CUSTOMER SERVICES

14.1 METERING AND BILLING CREDIBILITY

Audit Results for Billing performance Postpaid-Consolidated										
Billing Performance	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Metering and billing credibility - Postpaid (Avg of 3 billing cycles)										
Metering and billing credibility - Postpaid										
Total bills generated during the period		91282	2917698	2128536	389835	1014644	1114288	73844	293460	8232923
Total number of bills disputed		5	1712	8038	180	827	998	0	2	64744
Total number of valid billing complaints		5	272	834	143	713	998	0	2	41330
Total complaints considered invalid		0	1440	7204	37	114	0	0	0	23414
Percentage bills disputed (Avg of 3 billing cycles)	≤ 0.1%	0.01%	0.06%	0.38%	0.05%	0.08%	0.09%	0.00%	0.00%	0.79%

Data Source: Billing Center of the operators

Metering and billing credibility - Prepaid										
Performance prepaid	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of charging complaints (valid) - sum of 3 months		1	278	3134	75	94	3525	0	0	11134
Total complaints considered invalid (sum of 3 months)		0	3995	7728	83	169	0	0	0	2678
Total number of charging complaints (sum of 3 months)		1	4273	10862	158	263	3525	0	0	13812
Total no of customers served (Sum of 3 months)		2833052	13611295	10441131	3397961	2873920	11763373	615001	2637783	18557641
Percentage of charging complaints disputed	≤ 0.1%	0.00%	0.03%	0.10%	0.00%	0.01%	0.03%	0.00%	0.00%	0.07%

Data Source: Billing Center of the operators

Resolution of billing complaints (Postpaid+Prepaid)-Consolidated										
Billing Performance	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of billing/charging complaints		6	550	18900	218	1090	4523	NA	2	52464
Total number of complaints resolved in favour of customer		6	550	3968	178	807	4523	NA	2	52464
Total complaints considered invalid		0	5435	14932	120	283	0	NA	0	26092
Number of complaints resolved in 4 weeks		6	550	3968	178	807	4523	NA	2	52377
Percentage complaints resolved within 4 weeks	≥ 98%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	NA	100.00%	99.83%
Number of complaints resolved in 6 weeks		6	550	3968	178	807	4523	NA	2	52398
Percentage complaints resolved within 6 weeks	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	NA	100.00%	99.87%
Period of applying credit / waiver										
Total number of complaints where credit/waiver is required		6	550	3968	178	807	4523	NA	2	10596
Percentage cases in which credit/waiver was received within 1 week	100%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	NA	100.00%	100.00%
Live calling results for resolution of billing complaints										
Resolution of billing complaints	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total Number of calls made		4	100	100	63	85	100	NA	1	100
Number of cases resolved in 4 weeks		4	99	98	54	83	98	NA	1	96
Percentage cases resolved in 4 weeks	≥ 98%	1	1	1	1	1	1	NA	1	1
Number of cases resolved in 6 weeks		4	100	100	62	85	100	NA	1	100
Percentage cases resolved in 6 weeks	100.00%	100.00%	100.00%	100.00%	98.41%	100.00%	100.00%	NA	100.00%	100.00%

Data Source: Billing Center of the operators

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14.2   CUSTOMER CARE

Audit results for customer care (IVR and voice-to-Voice) -Consolidated										
Customer Care Assessment	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of call attempts to customer care for assistance		10184712	889026	11979055	582730	1030406	6608802	NA	441952	10121465
Number of calls getting connected and answered (electronically)		10040895	889026	11549893	555094	1005062	6562510	NA	433760	10092205
Percentage calls getting connected and answered	≥ 95%	98.59%	100.00%	96.42%	95.26%	97.54%	99.30%	100.00%	98.15%	99.71%
Audit results for customer care (voice-to-Voice)- (Avg of 3 months)-Consolidated										
Customer Care Assessment	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total Number of calls received (3 months)		2069166	2617275	2584523	530664	184129	1260663	59314	647573	4387649
Total Number of calls answered within 90 seconds (3 months)		1975100	2347850	2558241	530664	144959	988632	59139	634140	4214024
Percentage calls answered within 90 seconds (Avg of 3 months)	≥ 95%	95.45%	89.71%	98.98%	100.00%	78.73%	78.42%	99.70%	97.93%	96.04%

Live calling results for customer care (IVR)										
Customer Care Assessment	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of call attempts to customer care for assistance		100	100	100	100	100	100	100	100	100
Number of calls getting connected and answered (electronically)		100	100	100	100	100	100	100	100	100
Percentage calls getting connected and answered	≥ 95%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Live calling results for customer care (Voice to Voice)										
Customer Care Assessment	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total Number of calls received		100	100	100	100	100	100	100	100	100
Total Number of calls getting connected and answered		95	100	95	98	96	95	100	98	100
Live Calling Percentage calls getting connected and answered	≥ 95%	95.00%	100.00%	95.00%	98.00%	96.00%	95.00%	100.00%	98.00%	100.00%

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14.3 TERMINATION / CLOSURE OF SERVICE

Audit results for termination / closure of service-Consolidated										
Termination	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of closure request		472	14374	15144	12520	4828	2120	1573	1729	23187
Number of requests attended within 7 days		472	14365	15144	12520	4828	2120	1573	1729	23187
Percentage cases in which termination done within 7 days	100.00%	100.00%	99.94%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Data Source: Customer Service Center of the operators

14.4 TIME TAKEN FOR REFUND OF DEPOSITS AFTER CLOSURE

Audit results for refund of deposits-Consolidated										
Refund	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of cases requiring refund of deposits		1035	2772	2830	1106	NA	NA	327	74	11687
Total number of cases where refund was made within 60 days		1035	2772	2830	1106	NA	NA	327	74	11687
Percentage cases in which refund was receive within 60 days	100.00%	100.00%	100.00%	100.00%	100.00%	NA	NA	100.00%	100.00%	100.00%

Data Source: Billing Center of the operators

14.5 LIVE CALLING RESULTS FOR RESOLUTION OF SERVICE REQUESTS

Live calling results for resolution of service requests									
Resolution of service requests	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total Number of calls made	NA	100	100	63	100	100	NA	NA	100
Number of cases resolved to satisfaction	NA	86	76	55	76	81	NA	NA	89
Percentage cases resolved in four weeks	NA	86.00%	76.00%	87.30%	76.00%	81.00%	NA	NA	89.00%

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

NA: Data to conduct live calling for customer care was not available at the customer service center. Hence, live calling for the parameter has not been conducted for the operator.

14.6 LIVE CALLING RESULTS FOR LEVEL 1 SERVICES

Live calling for level 1 services										
Level 1 services		Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total no. of calls made		300	300	300	300	NA	300	300	300	300
Calls answered		255	284	268	265	NA	256	239	267	260
% of calls connected	≥ 95%	85.00%	94.67%	89.33%	88.33%	NA	85.33%	79.67%	89.00%	86.67%

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

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14.7 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

Aircel					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	y		20	17
101	Fire	y		20	17
102	Ambulance				
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline				
138	All India Helpline for Passengers	y		20	17
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline	y		20	17
182	Indian Railway Security Helpline		N		
1033	Road Accident Management Service	y		20	17
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'	y		20	17
1056	Emergency Medical Services				
106X	State of the Art Hospitals				
1063	Public Grievance Cell DoT Hq				
1064	Anti-Corruption Helpline	y		20	17
1070	Relief Commission for Natural Calamities	y		20	17
1071	Air Accident Helpline				
1072	Rail Accident Helpline				
1073	Road Accident Helpline	y		20	17
1077	Control Room for District Collector		N		

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Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
1090	Call Alert (Crime Branch)		N		
1091	Women Helpline				
1097	National AIDS Helpline to NACO		N		
1099	Central Accident and Trauma Services (CATS)	y		20	17
10580	Educational& Vocational Guidance and Counselling	y		20	17
10589	Mother and Child Tracking (MCTH)		N		
10740	Central Pollution Control Board	y		20	17
10741	Pollution Control Board				
1511	Police Related Service for all Metro Railway Project				
1512	Prevention of Crime in Railway	y		20	17
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline		N		
155304	Municipal Corporations	y		20	17
155214	Labour Helpline		N		
1903	Sashastra Seema Bal (SSB)		N		
1909	National Do Not Call Registry	y		20	17
1912	Complaint of Electricity		N		
1916	Drinking Water Supply		N		
1950	Election Commission of India		N		
Airtel					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		22	21
101	Fire	Y		21	20
102	Ambulance		N		
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		

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138	All India Helpline for Passengers	Y		22	21
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline	Y		22	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		21	20
1071	Air Accident Helpline	Y		22	20
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline		N		
1077	Control Room for District Collector	Y		21	21
1090	Call Alert (Crime Branch)	Y		21	20
1091	Women Helpline	Y		21	20
1097	National AIDS Helpline to NACO	Y		22	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		21	20
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline				

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155304	Municipal Corporations		N		
155214	Labour Helpline		N		
1903	Sashastra Seema Bal (SSB)		N		
1909	National Do Not Call Registry	Y		21	20
1912	Complaint of Electricity	Y		21	20
1916	Drinking Water Supply	Y		22	20
1950	Election Commission of India		N		
Idea					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		22	20
101	Fire	Y		21	19
102	Ambulance		N		
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpline for Passengers	Y		22	19
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline	Y		22	20
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		21	19
1071	Air Accident Helpline	Y		22	19
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline		N		

Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
1077	Control Room for District Collector	Y		21	19
1090	Call Alert (Crime Branch)	Y		21	19
1091	Women Helpline	Y		21	19
1097	National AIDS Helpline to NACO	Y		22	19
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		21	19
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline				
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
1903	Sashastra Seema Bal (SSB)		N		
1909	National Do Not Call Registry	Y		21	19
1912	Complaint of Electricity	Y		21	19
1916	Drinking Water Supply	Y		22	19
1950	Election Commission of India		N		
MTNL					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		27	24
101	Fire	Y		28	24
102	Ambulance		N		
104	Health Information Helpline		N		

108	Emergency and Disaster Management Helpline		N		
138	All India Helpline for Passengers	Y		28	25
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline	Y		27	24
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	24
1071	Air Accident Helpline	Y		28	24
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline	Y		27	24
1077	Control Room for District Collector		N		
1090	Call Alert (Crime Branch)		N		
1091	Women Helpline	Y		27	24
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	24
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway	Y		27	24

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Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
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		27	24
1916	Drinking Water Supply		N		
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	24
101	Fire	Y		28	23
102	Ambulance		N		
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpline for Passengers	Y		28	23
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline	Y		27	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		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti-Corruption Helpline		N		
1070	Relief Commission for Natural Calamities	Y		27	24
1071	Air Accident Helpline	Y		28	24

Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline	Y		27	23
1077	Control Room for District Collector		N		
1090	Call Alert (Crime Branch)		N		
1091	Women Helpline	Y		27	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	Y		27	23
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway	Y		27	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)		N		
1909	National Do Not Call Registry		N		
1912	Complaint of Electricity	Y		27	23
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		17	14
101	Fire	Y		17	13
102	Ambulance		N		

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104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline	Y		17	14
138	All India Helpline for Passengers	Y		17	14
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline	Y		17	14
182	Indian Railway Security Helpline	Y		17	14
1033	Road Accident Management Service	Y		17	13
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		17	13
1071	Air Accident Helpline		N		
1072	Rail Accident Helpline	Y		16	13
1073	Road Accident Helpline	Y		16	13
1077	Control Room for District Collector		N		
1090	Call Alert (Crime Branch)	Y		17	13
1091	Women Helpline	Y		16	13
1097	National AIDS Helpline to NACO	Y		16	13
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	13
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		

1512	Prevention of Crime in Railway	Y		16	13
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		17	13
1909	National Do Not Call Registry	Y		16	13
1912	Complaint of Electricity		N		
1916	Drinking Water Supply		N		
1950	Election Commission of India	Y		17	13
TATA GSM					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		27	24
101	Fire	Y		28	24
102	Ambulance		N		
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline	Y		28	25
138	All India Helpline for Passengers		N		
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline	Y		27	24
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		27	25

Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
1071	Air Accident Helpline	Y		28	25
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline	Y		27	24
1077	Control Room for District Collector		N		
1090	Call Alert (Crime Branch)		N		
1091	Women Helpline	Y		27	24
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	24
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway	Y		27	24
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		27	24
1916	Drinking Water Supply		N		
1950	Election Commission of India		N		
Vodafone					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		14	12
101	Fire	Y		14	12

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102	Ambulance				
104	Health Information Helpline				
108	Emergency and Disaster Management Helpline	Y		14	12
138	All India Helpline for Passengers		N		
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline	Y		14	12
182	Indian Railway Security Helpline	Y		13	12
1033	Road Accident Management Service		N		
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services				
106X	State of the Art Hospitals	Y		14	12
1063	Public Grievance Cell DoT Hq		N		
1064	Anti-Corruption Helpline	Y		13	13
1070	Relief Commission for Natural Calamities	Y		14	13
1071	Air Accident Helpline	Y		14	12
1072	Rail Accident Helpline	Y		13	12
1073	Road Accident Helpline	Y		14	12
1077	Control Room for District Collector	Y		13	12
1090	Call Alert (Crime Branch)	Y		14	13
1091	Women Helpline	Y		14	12
1097	National AIDS Helpline to NACO		N		
1099	Central Accident and Trauma Services (CATS)	Y		14	13
10580	Educational& Vocational Guidance and Counselling		N		
10589	Mother and Child Tracking (MCTH)		N		
10740	Central Pollution Control Board	Y		13	13
10741	Pollution Control Board	Y		14	13

1511	Police Related Service for all Metro Railway Project	Y	N	13	
1512	Prevention of Crime in Railway	Y		13	12
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline	Y		13	12
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
1903	Sashastra Seema Bal (SSB)				
1909	National Do Not Call Registry	Y		14	13
1912	Complaint of Electricity	Y		14	13
1916	Drinking Water Supply		N		
1950	Election Commission of India		N		

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

15 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

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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))

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15.1.1 ERICSSON

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

SI 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.

15.1.2 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) |

15.2 BLOCK SCHEMATIC DIAGRAMS

15.2.1 ERICSSON

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

Ericsson

15.2.2 NSN (NOKIA SIEMENS NETWORKS)

NSN provides network support to Vodafone in the circle.

NSN
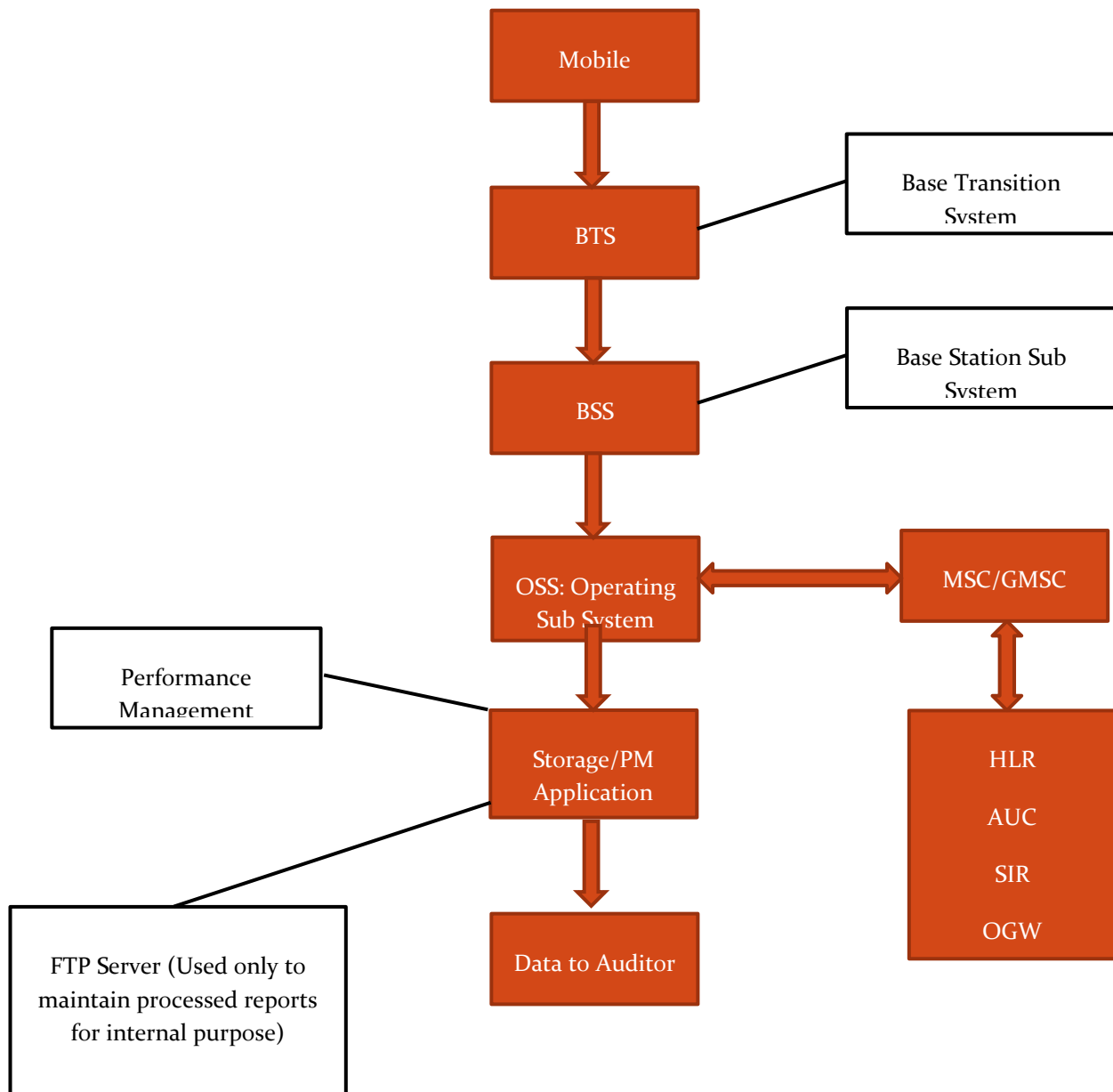
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                        ┌──────────────┐
                        │   Mobile     │
                        └──────┬───────┘
                               ↓
                        ┌──────────────┐      ┌──────────────────┐
                        │    BTS       │──────│ Base Transition  │
                        └──────┬───────┘      │ System           │
                               ↓              └──────────────────┘
                        ┌──────────────┐      ┌──────────────────┐
                        │    BSS       │──────│ Base Station Sub │
                        └──────┬───────┘      │ System           │
                               ↓              └──────────────────┘
                 ┌──────────────────┐        ┌──────────────┐
                 │ OSS: Operating   │←───────→│   MSC/GMSC   │
                 │ Sub System       │        └──────┬───────┘
┌──────────────┐ └────────┬─────────┘               ↕
│ Performance  │          ↓                  ┌──────────────┐
│ Management   │  ┌──────────────────┐       │    HLR       │
└──────────────┘  │ Storage/PM       │       │    AUC       │
                  │ Application      │       │    SIR       │
                  └────────┬─────────┘       │    OGW       │
┌──────────────┐          ↓                  └──────────────┘
│ FTP Server   │  ┌──────────────────┐
│ (Used only to│  │ Data to Auditor  │
│ maintain     │  └──────────────────┘
│ processed    │
│ reports for  │
│ internal     │
│ purpose)     │
└──────────────┘
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Audit Results for Network Availability- PMR data-April										
	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		1980	4251	3725	986	867	2158	934	2932	4955
Sum of downtime of BTSs in a month (in hours)		916	2097	1995	4680	378	694	82	67	3016
BTSs accumulated downtime (not available for service)	≤ 2%	0.06%	0.07%	0.07%	0.64%	0.06%	0.04%	0.01%	0.00%	0.08%
Number of BTSs having accumulated downtime >24 hours		2	0	3	11	3	3	0	0	0
Worst affected BTSs due to downtime	≤ 2%	0.10%	0.00%	0.08%	1.12%	0.35%	0.14%	0.00%	0.00%	0.00%
Live Measurement Results for Network Availability- 3 Day live data-April										
	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		1969	4261	3725	987	867	2158	934	2932	4924
Sum of downtime of BTSs in a month (in hours)		61	256	200	347	90	59	24	1	380
BTSs accumulated downtime (not available for service)	≤ 2%	0.04%	0.08%	0.07%	0.49%	0.14%	0.04%	0.04%	0.00%	0.11%
Number of BTSs having accumulated downtime >24 hours		0	0	0	0	0	0	0	0	0
Worst affected BTSs due to downtime	≤ 2%	0.00%	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	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
CSSR	≥ 95%	98.21%	99.90%	99.26%	98.13%	98.07%	99.20%	99.19%	99.44%	99.43%
SDCCH/Paging channel congestion	≤ 1%	0.15%	0.04%	0.32%	0.26%	NA	0.18%	NA	0.04%	0.06%
TCH congestion	≤ 2%	0.44%	0.09%	0.49%	0.13%	0.49%	0.56%	0.03%	0.04%	0.57%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-April										
CSSR	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
CSSR	≥ 95%	98.18%	99.91%	98.99%	98.35%	98.02%	99.33%	99.19%	99.51%	99.36%
SDCCH/Paging channel congestion	≤ 1%	0.30%	0.04%	0.39%	0.47%	NA	0.19%	NA	0.09%	0.09%
TCH congestion	≤ 2%	0.43%	0.08%	0.74%	0.07%	0.59%	0.40%	0.05%	0.03%	0.64%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-April										
CSSR	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of call attempts		NA	NA	NA	NA	NA	NA	NA	NA	NA
Total number of successful calls established		NA	NA	NA	NA	NA	NA	NA	NA	NA
CSSR	≥ 95%	NA	NA	NA	NA	NA	NA	NA	NA	NA
%age blocked calls		NA	NA	NA	NA	NA	NA	NA	NA	NA

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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	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		53170191	103047635	4225025	37111653	23154961	40998820	NA	NA	157868106
Total number of calls dropped		427412	783057	40768	547276	44182	47812	NA	NA	1476158
Call drop rate	≤ 2%	0.80%	0.76%	0.96%	1.47%	0.19%	0.12%	0.33%	0.67%	0.94%
Total number of cells in the network		5883	11825	10827	2649	2579	6018	2578	8311	12616
Total number of cells having more than 3% TCH		233	186	167	53	7	11	21	172	210
Worst affected cells having more than 3% TCH	≤ 3%	3.97%	1.57%	1.55%	1.99%	0.28%	0.18%	0.81%	2.07%	1.66%
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	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		5576192	10749296	13453260	3876741	2345896	3852059	1478988	6707666	16733041
Total number of calls dropped		47405	84864	133191	58189	4770	4991	5513	33428	171043
Call drop rate	≤ 2%	0.85%	0.79%	0.99%	1.50%	0.20%	0.13%	0.37%	0.50%	1.02%
Total number of cells in the network		5846	11857	10829	2649	2579	6018	2578	8333	12629
Total number of cells having more than 3% TCH		254	197	169	54	10	13	23	28	203
Worst affected cells having more than 3% TCH	≤ 3%	4.35%	1.66%	1.56%	2.03%	0.37%	0.22%	0.89%	0.34%	1.61%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-April									
Call drop rate	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		NA	NA	NA	NA	NA	NA	NA	NA	NA
Total number of calls dropped		NA	NA	NA	NA	NA	NA	NA	NA	NA
Call drop rate	≤ 2%	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Audit Results for Voice quality -PMR Data-April										
Voice quality	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		10075007142	18449543342	16099083995	5314893329	NA	6448108764	NA	9640273693	20042222672
Total number of calls with good voice quality		9789388796	18018279943	15552205928	5136198169	NA	6403100597	NA	9445832934	19556354773
%age calls with good voice quality	≥ 95%	97.17%	97.66%	96.60%	96.64%	NA	99.30%	99.19%	99.19%	97.58%
Live measurement results for Voice quality-3 Day data-April										
Voice quality	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		1081089723	1882368134	1734734901	562155254	NA	615933591	NA	941672760	2173206235
Total number of calls with good voice quality		1050221823	1836550518	1675964600	542445552	NA	612085828	NA	922794608	2119012306
%age calls with good voice quality	≥ 95%	97.14%	97.57%	96.61%	96.49%	NA	99.38%	97.79%	98.00%	97.51%
Drive test results for Voice quality (Average of three drive tests) - DT data-April										
Voice quality	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		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
%age calls with good voice quality	≥ 95%	NA	NA	NA	NA	NA	NA	NA	NA	NA

Audit Results for POI Congestion- PMR data-April									
POI congestion	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		100	300	284	31	128	81	NA	NA	NA
No. of POIs not meeting benchmark		0	0	0	0	0	0	NA	NA	NA
Total Capacity of all POIs (A) - in erlangs		78649	139403	NA	15182	37176	40961	NA	NA	NA
Traffic served for all POIs (B)- in erlangs		32711	93233	NA	7132	21960	27455	NA	NA	NA
POI congestion	≤ 0.5%	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	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		100	286	NA	31	131	85	NA	NA	NA
No. of POIs not meeting benchmark		0	0	NA	0	0	0	NA	NA	NA
Total Capacity of all POIs (A) - in erlangs		78649	134620	NA	15202	37510	43125	NA	NA	NA
Traffic served for all POIs (B)- in erlangs		33663	90572	NA	3994	21757	27914	NA	NA	NA
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

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Audit Results for Network Availability- PMR data-May										
	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		1974	4277	3725	986	860	2169	934	2940	4981
Sum of downtime of BTSs in a month (in hours)		1125	2281	1874	5437	634	579	1057	7839	4730
BTSs accumulated downtime (not available for service)	≤ 2%	0.08%	0.07%	0.07%	0.74%	0.10%	0.04%	0.15%	0.36%	0.13%
Number of BTSs having accumulated downtime >24 hours		0	0	1	10	6	3	0	0	0
Worst affected BTSs due to downtime	≤ 2%	0.00%	0.00%	0.03%	1.01%	0.70%	0.14%	0.00%	0.00%	0.00%
Live Measurement Results for Network Availability- 3 Day live data-May										
	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		1975	4260	3725	986	860	2169	934	2940	4959
Sum of downtime of BTSs in a month (in hours)		102	146	237	430	54	67	105	624	355
BTSs accumulated downtime (not available for service)	≤ 2%	0.07%	0.05%	0.09%	0.61%	0.09%	0.04%	0.02%	0.03%	0.10%
Number of BTSs having accumulated downtime >24 hours		0	0	0	0	0	0	0	0	0
Worst affected BTSs due to downtime	≤ 2%	0.00%	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	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
CSSR	≥ 95%	98.11%	99.91%	99.45%	98.37%	98.16%	99.23%	99.19%	99.36%	99.48%
SDCCH/Paging channel congestion	≤ 1%	0.20%	0.04%	0.17%	0.22%	NA	0.90%	NA	0.04%	0.06%
TCH congestion	≤ 2%	0.42%	0.08%	0.32%	0.10%	0.45%	0.59%	0.03%	0.03%	0.52%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-May									
CSSR	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
CSSR	≥ 95%	97.74%	99.88%	99.43%	98.11%	98.22%	97.71%	99.40%	99.32%	99.38%
SDCCH/Paging channel congestion	≤ 1%	0.42%	0.05%	0.21%	0.38%	NA	0.54%	NA	0.16%	0.05%
TCH congestion	≤ 2%	0.70%	0.10%	0.33%	0.08%	0.37%	0.65%	0.01%	0.11%	0.60%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-May									
CSSR	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of call attempts		1074	1023	993	1015	NA	859	1061	1122	1076
Total number of successful calls established		1057	1018	986	998	NA	841	1060	1115	1075
CSSR	≥ 95%	98.42%	99.51%	99.30%	98.33%	NA	97.90%	99.91%	99.38%	99.91%
%age blocked calls		1.58%	0.49%	0.70%	1.67%	NA	2.10%	0.09%	0.62%	0.09%

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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	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		54135939	111605234	121410504	36130368	27137615	45034850	NA	77500238	158203767
Total number of calls dropped		412972	858911	1117446	507822	55255	56820	NA	377783	1320523
Call drop rate	≤ 2%	0.76%	0.77%	0.92%	1.41%	0.20%	0.13%	0.39%	0.49%	0.83%
Total number of cells in the network		5862	11909	10814	2649	2593	6018	2578	8328	12714
Total number of cells having more than 3% TCH		200	188	164	53	11	11	27	164	258
Worst affected cells having more than 3% TCH	≤ 3%	3.42%	1.58%	1.52%	2.00%	0.41%	0.18%	1.05%	1.97%	2.03%
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	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		5932740	11735090	13118743	3795308	4148466	4873802	NA	7534309	18551275
Total number of calls dropped		59677	99108	124565	55353	8452	7554	NA	40291	213479
Call drop rate	≤ 2%	1.01%	0.84%	0.95%	1.46%	0.20%	0.15%	0.42%	0.53%	1.15%
Total number of cells in the network		5865	11863	10798	2649	2593	6018	2578	8320	12790
Total number of cells having more than 3% TCH		294	180	149	53	10	20	10	35	552
Worst affected cells having more than 3% TCH	≤ 3%	5.01%	1.52%	1.38%	2.00%	0.40%	0.33%	0.39%	0.42%	4.32%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-May										
Call drop rate	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		1056	1018	986	998	NA	841	1060	1115	1075
Total number of calls dropped		5	4	8	26	NA	9	7	9	6
Call drop rate	≤ 2%	0.47%	0.39%	0.81%	2.61%	NA	1.07%	0.66%	0.81%	0.56%

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Audit Results for Voice quality -PMR Data-May

Voice quality	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		10058485476	19762311203	15329067898	5184938526	NA	6688631863	NA	8465907547	19820121881
Total number of calls with good voice quality		9786234800	19273741861	14799432366	5020705973	NA	6645986811	NA	8290770741	19381426898
%age calls with good voice quality	≥ 95%	97.29%	97.53%	96.54%	96.83%	NA	99.36%	99.03%	97.93%	97.79%

Live measurement results for Voice quality-3 Day data-May

Voice quality	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		1087768752	2052303648	1621829400	544121102	NA	700031519	NA	1034898466	2040068807
Total number of calls with good voice quality		1054805102	2000231447	1563658424	525746643	NA	695421869	NA	1008822558	1995437941
%age calls with good voice quality	≥ 95%	96.97%	97.46%	96.41%	96.62%	NA	99.34%	99.20%	97.48%	97.81%

Drive test results for Voice quality (Average of three drive tests) - DT data-May

Voice quality	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		1732183	1991577	251833	1167013	NA	67480	115487	2030575	472526
Total number of calls with good voice quality		1629297	1911309	241513	1041430	NA	74273	111068	1949066	456316
%age calls with good voice quality	≥ 95%	94.06%	95.97%	95.90%	89.24%	NA	110.07%	96.17%	95.99%	96.57%

Audit Results for POI Congestion- PMR data-May									
POI congestion	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		100	294	NA	31	128	87	NA	NA	NA
No. of POIs not meeting benchmark		0	0	NA	0	0	0	NA	NA	NA
Total Capacity of all POIs (A) - in erlangs		78707	139166	NA	15179	37304	43569	NA	NA	NA
Traffic served for all POIs (B)- in erlangs		32984	94916	NA	6686	20010	27739	NA	NA	NA
POI congestion	≤ 0.5%	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	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		101	294	NA	31	128	91	NA	NA	NA
No. of POIs not meeting benchmark		0	0	NA	0	0	0	NA	NA	NA
Total Capacity of all POIs (A) - in erlangs		78848	139113	NA	15178	36530	44805	NA	NA	NA
Traffic served for all POIs (B)- in erlangs		34414	100039	NA	3873	19840	30555	NA	NA	NA
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

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Audit Results for Network Availability- PMR data-June										
	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		1977	4251	3725	981	No Service	2182	930	2928	4985
Sum of downtime of BTSs in a month (in hours)		1884	2331	2176	5956	No Service	807	815	12020	8586
BTSs accumulated downtime (not available for service)	≤ 2%	0.13%	0.07%	0.08%	0.82%	No Service	0.05%	0.12%	0.55%	0.23%
Number of BTSs having accumulated downtime >24 hours		3	0	3	12	No Service	4	0	0	0
Worst affected BTSs due to downtime	≤ 2%	0.15%	0.00%	0.08%	1.22%	No Service	0.18%	0.00%	0.00%	0.00%
Live Measurement Results for Network Availability- 3 Day live data-June										
	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		1975	4260	3725	986	No Service	2169	930	2928	4985
Sum of downtime of BTSs in a month (in hours)		102	146	237	430	No Service	67	200	1324	630
BTSs accumulated downtime (not available for service)	≤ 2%	0.07%	0.05%	0.09%	0.61%	No Service	0.04%	0.03%	0.06%	0.18%
Number of BTSs having accumulated downtime >24 hours		0	0	0	0	No Service	0	0	0	0
Worst affected BTSs due to downtime	≤ 2%	0.00%	0.00%	0.00%	0.00%	No Service	0.00%	0.00%	0.00%	0.00%

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Audit Results for CSSR, SDCCH and TCH congestion- PMR data-June									
CSSR	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
CSSR	≥ 95%	97.37%	99.87%	99.07%	97.98%	No Service	99.16%	99.20%	99.26%	99.24%
SDCCH/Paging channel congestion	≤ 1%	0.53%	0.07%	0.31%	0.40%	No Service	0.23%	NA	0.06%	0.06%
TCH congestion	≤ 2%	1.01%	0.12%	0.63%	0.12%	No Service	0.46%	0.02%	0.06%	0.76%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-June									
CSSR	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
CSSR	≥ 95%	97.74%	99.88%	99.43%	98.11%	No Service	97.71%	99.18%	99.45%	99.16%
SDCCH/Paging channel congestion	≤ 1%	0.42%	0.05%	0.21%	0.38%	No Service	0.54%	NA	0.07%	0.05%
TCH congestion	≤ 2%	0.70%	0.10%	0.33%	0.08%	No Service	0.07%	0.00%	0.09%	0.84%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-June									
CSSR	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of call attempts		NA	NA	NA	NA	NA	NA	NA	NA	NA
Total number of successful calls established		NA	NA	NA	NA	NA	NA	NA	NA	NA
CSSR	≥ 95%	NA	NA	NA	NA	NA	NA	NA	NA	NA
%age blocked calls		NA	NA	NA	NA	NA	NA	NA	NA	NA

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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	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		57682913	111856147	129503336	36078708	No Service	49042317	NA	NA	161738074
Total number of calls dropped		652435	919628	1171798	571872	No Service	88328	NA	NA	2048064
Call drop rate	≤ 2%	1.13%	0.82%	0.90%	1.59%	No Service	0.18%	0.46%	0.51%	1.27%
Total number of cells in the network		5871	11898	10788	2634	No Service	6018	2581	8308	12893
Total number of cells having more than 3% TCH		348	193	149	54	No Service	28	37	181	493
Worst affected cells having more than 3% TCH	≤ 3%	5.93%	1.62%	1.39%	2.04%	No Service	0.46%	1.43%	2.18%	3.82%
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	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		5932740	11735090	13118743	3795308	No Service	4873802	NA	NA	16916372
Total number of calls dropped		59677	99108	124565	55353	No Service	7554	NA	NA	202089
Call drop rate	≤ 2%	1.01%	0.84%	0.95%	1.46%	No Service	0.15%	0.56%	0.55%	1.19%
Total number of cells in the network		5865	11863	10798	2649	No Service	6018	2581	8308	12767
Total number of cells having more than 3% TCH		294	180	149	53	No Service	20	20	140	515
Worst affected cells having more than 3% TCH	≤ 3%	5.01%	1.52%	1.38%	2.00%	No Service	0.33%	0.77%	1.69%	4.04%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-June									
Call drop rate	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		NA	NA	NA	NA	NA	NA	NA	NA	NA
Total number of calls dropped		NA	NA	NA	NA	NA	NA	NA	NA	NA
Call drop rate	≤ 2%	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Audit Results for Voice quality -PMR Data-June									
Voice quality	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of sample calls		10813355418	20300822122	16625245694	5239230006	No Service	7206598268	NA	NA	20186820832
Total number of calls with good voice quality		10463319178	19785710205	16011127866	5057612027	No Service	7156461291	NA	NA	19732871273
%age calls with good voice quality	≥ 95%	96.76%	97.46%	96.31%	96.53%	No Service	99.30%	99.12%	97.60%	97.75%
Live measurement results for Voice quality-3 Day data-June										
Voice quality	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of sample calls		1087768752	2000231447	1621829400	544121102	No Service	700031519	NA	NA	2036466059
Total number of calls with good voice quality		1054805102	2052303648	1563658424	525746643	No Service	695421869	NA	NA	1988584063
%age calls with good voice quality	≥ 95%	96.97%	102.60%	96.41%	96.62%	No Service	99.34%	99.45%	97.23%	97.65%
Drive test results for Voice quality (Average of three drive tests) - DT data-June										
Voice quality	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of sample calls		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
%age calls with good voice quality	≥ 95%	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Audit Results for POI Congestion- PMR data-June										
POI congestion	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of working POIs		102	287	NA	31	No Service	90	NA	NA	NA
No. of POIs not meeting benchmark		0	0	NA	0	No Service	0	NA	NA	NA
Total Capacity of all POIs (A) - in erlangs		79361	137246	NA	15178	No Service	45261	NA	NA	NA
Traffic served for all POIs (B)- in erlangs		35112	98712	NA	6802	No Service	30116	NA	NA	NA
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	No Service	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-June										
POI congestion	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of working POIs		101	294	NA	31	No Service	91	NA	NA	NA
No. of POIs not meeting benchmark		0	0	NA	0	No Service	0	NA	NA	NA
Total Capacity of all POIs (A) - in erlangs		78848	139113	NA	15178	No Service	44805	NA	NA	NA
Traffic served for all POIs (B)- in erlangs		34414	100039	NA	3873	No Service	30555	NA	NA	NA
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	No Service	0.00%	0.00%	0.00%	0.00%

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Audit Results for Network Availability- PMR data-April					
	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
(Number of Node Bs in the network in the licensed service area		4030	694	2027	5236
Sum of downtime (i.e. total outage time) of Node Bs		1528	3529	1310	5378
Node Bs downtime (not available for service)	≤ 2%	0.05%	0.68%	0.09%	0.14%
Number of Node Bs having accumulated downtime of >24 hours in a month		0	9	12	0
Worst affected Node Bs due to downtime	≤ 2%	0.00%	1.30%	0.59%	0.00%
Live Measurement Results for Network Availability- 3 Day live data-April					
	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
(Number of Node Bs in the network in the licensed service area		4030	694	2040	5201
Sum of downtime (i.e. total outage time) of Node Bs		207	323	148	705
Node Bs downtime (not available for service)	≤ 2%	0.07%	0.65%	0.10%	0.19%
Number of Node Bs having accumulated downtime of >24 hours in a month		0	0	0	0
Worst affected Node Bs due to downtime	≤ 2%	0.00%	0.00%	0.00%	0.00%

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Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data-April					
	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
CSSR	≥ 95%	99.13%	98.10%	99.86%	99.84%
RRC Congestion	≤ 1%	0.07%	0.67%	0.06%	0.00%
Circuit Switched RAB Congestion	≤ 2%	0.11%	0.39%	0.02%	0.00%
Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data-April					
	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
CSSR	≥ 95%	98.79%	97.87%	99.99%	99.79%
RRC Congestion	≤ 1%	0.04%	0.75%	0.02%	0.00%
Circuit Switched RAB Congestion	≤ 2%	0.07%	0.53%	0.02%	0.00%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-April					
CSSR	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total number of RRC attempts (A)		NA	NA	NA	NA
Total number of RRC established (B)		NA	NA	NA	NA
Call setup success rate (B/A*100)	≥ 95%	NA	NA	NA	NA
%age blocked calls		NA	NA	NA	NA

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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	MTNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		81900456	4406365	20120925	135345270
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		313232	73010	17535	460228
Call drop rate (B/A*100)	≤ 2%	0.38%	1.66%	0.09%	0.34%
Total no. of cells in the licensed service area (B)		17714	2002	5926	20514
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		325	52	22	380
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	1.83%	2.62%	0.37%	1.85%

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	MTNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		7663288	414271	2129443	14476909
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		29099	7191	1799	51134
Call drop rate (B/A*100)	≤ 2%	0.38%	1.74%	0.08%	0.35%
Total no. of cells in the licensed service area (B)		17828	2002	5962	20576
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		324	54	19	398
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	1.82%	2.68%	0.31%	1.93%

Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-April

Call drop rate	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		NA	NA	NA	NA
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		NA	NA	NA	NA
Call drop rate (B/A*100)	≤ 2%	NA	NA	NA	NA

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Audit Results for Voice quality -PMR Data-April					
Voice quality	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	8396705882	NA	168662169652
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	8304974882	NA	166801266579
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	99.50%	98.91%	99.72%	98.90%
Live measurement results for Voice quality-3 Day data-April					
Voice quality	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	789592899	NA	41304295749
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	780826862	NA	40421061119
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	99.50%	98.89%	99.73%	97.86%
Drive test results for Voice quality (Average of three drive tests) - DT data-April					
Voice quality	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	NA	NA	NA
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	NA	NA	NA
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	NA	NA	NA	NA

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Audit Results for POI Congestion- PMR data-April					
POI congestion	**Benchmark**	**Airtel 3G**	**MTNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of working POIs		NA	31	81	NA
No. of POIs not meeting benchmark		NA	0	0	NA
Total Capacity of all POIs (A) - in erlangs		NA	15202	41353	NA
Traffic served for all POIs (B)- in erlangs		NA	3994	27796	NA
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-April					
POI congestion	**Benchmark**	**Airtel 3G**	**MTNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of working POIs		NA	31	85	NA
No. of POIs not meeting benchmark		NA	0	0	NA
Total Capacity of all POIs (A) - in erlangs		NA	15202	43125	NA
Traffic served for all POIs (B)- in erlangs		NA	3994	27914	NA
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%

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Audit Results for Network Availability- PMR data-May					
	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
(Number of Node Bs in the network in the licensed service area		4043	693	2038	5233
Sum of downtime (i.e. total outage time) of Node Bs		1670	4342	1272	7431
Node Bs downtime (not available for service)	≤ 2%	0.06%	0.84%	0.08%	0.19%
Number of Node Bs having accumulated downtime of >24 hours in a month		0	9	16	0
Worst affected Node Bs due to downtime	≤ 2%	0.00%	1.30%	0.79%	0.00%
Live Measurement Results for Network Availability- 3 Day live data-May					
	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
(Number of Node Bs in the network in the licensed service area		4030	694	2040	5201
Sum of downtime (i.e. total outage time) of Node Bs		207	405	148	757
Node Bs downtime (not available for service)	≤ 2%	0.07%	0.81%	0.10%	0.20%
Number of Node Bs having accumulated downtime of >24 hours in a month		0	0	0	0
Worst affected Node Bs due to downtime	≤ 2%	0.00%	0.00%	0.00%	0.00%

Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data-May

	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
CSSR	≥ 95%	98.70%	98.29%	99.88%	99.84%
RRC Congestion	≤ 1%	0.05%	0.64%	0.04%	0.00%
Circuit Switched RAB Congestion	≤ 2%	0.06%	0.29%	0.02%	0.00%

Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data-May

	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
CSSR	≥ 95%	98.79%	97.19%	99.99%	99.82%
RRC Congestion	≤ 1%	0.04%	0.81%	0.02%	0.00%
Circuit Switched RAB Congestion	≤ 2%	0.07%	0.54%	0.02%	0.00%

Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-May

CSSR	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total number of RRC attempts (A)		933	1022	NA	1157
Total number of RRC established (B)		930	997	NA	1157
Call setup success rate (B/A*100)	≥ 95%	99.68%	97.55%	NA	100.00%
%age blocked calls		0.32%	2.45%	NA	0.00%

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	MTNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		73066640	4284575	23945310	129419061
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		264868	65135	21911	455631
Call drop rate (B/A*100)	≤ 2%	0.36%	1.52%	0.09%	0.35%
Total no. of cells in the licensed service area (B)		18045	1999	5992	20136
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		325	48	18	385
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	1.80%	2.41%	0.30%	1.91%

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	MTNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		7663288	438087	2129443	14147404
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		29099	7573	1799	48210
Call drop rate (B/A*100)	≤ 2%	0.38%	1.73%	0.08%	0.34%
Total no. of cells in the licensed service area (B)		17828	2002	5962	20519
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		324	54	19	392
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	1.82%	2.71%	0.31%	1.91%

Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-May					
Call drop rate	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		930	997	NA	1011
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		1	20	NA	2
Call drop rate (B/A*100)	≤ 2%	0.11%	2.01%	NA	0.20%

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Audit Results for Voice quality -PMR Data-May					
Voice quality	**Benchmark**	**Airtel 3G**	**MTNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	8092935524	NA	175319915996
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	8004898109	NA	173402427484
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	99.50%	98.91%	99.71%	98.91%
Live measurement results for Voice quality-3 Day data-May					
Voice quality	**Benchmark**	**Airtel 3G**	**MTNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	836030393	NA	18188965416
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	826837572	NA	17988801779
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	99.50%	98.90%	99.73%	98.90%
Drive test results for Voice quality (Average of three drive tests) - DT data-May					
Voice quality	**Benchmark**	**Airtel 3G**	**MTNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		2734938	208396	NA	NA
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		2704179	191963	NA	NA
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.88%	92.11%	NA	NA

Audit Results for POI Congestion- PMR data-May					
POI congestion	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total number of working POIs		NA	31	87	NA
No. of POIs not meeting benchmark		NA	0	0	NA
Total Capacity of all POIs (A) - in erlangs		NA	15179	43569	NA
Traffic served for all POIs (B)- in erlangs		NA	6686	27739	NA
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-May					
POI congestion	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total number of working POIs		NA	31	85	NA
No. of POIs not meeting benchmark		NA	0	0	NA
Total Capacity of all POIs (A) - in erlangs		NA	15180	43125	NA
Traffic served for all POIs (B)- in erlangs		NA	4080	27914	NA
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%

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Audit Results for Network Availability- PMR data-June					
	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
(Number of Node Bs in the network in the licensed service area		3954	691	2040	5241
Sum of downtime (i.e. total outage time) of Node Bs		2036	4237	3173	8108
Node Bs downtime (not available for service)	≤ 2%	0.07%	0.82%	0.21%	0.21%
Number of Node Bs having accumulated downtime of >24 hours in a month		0	10	32	0
Worst affected Node Bs due to downtime	≤ 2%	0.00%	1.45%	1.57%	0.00%
Live Measurement Results for Network Availability- 3 Day live data-June					
	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
(Number of Node Bs in the network in the licensed service area		4040	694	2036	5210
Sum of downtime (i.e. total outage time) of Node Bs		173	327	209	637
Node Bs downtime (not available for service)	≤ 2%	0.06%	0.66%	0.14%	0.17%
Number of Node Bs having accumulated downtime of >24 hours in a month		0	0	0	0
Worst affected Node Bs due to downtime	≤ 2%	0.00%	0.00%	0.00%	0.00%

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Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data-June					
	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
CSSR	≥ 95%	98.71%	98.00%	99.86%	99.81%
RRC Congestion	≤ 1%	0.04%	0.75%	0.11%	0.00%
Circuit Switched RAB Congestion	≤ 2%	0.06%	0.42%	0.05%	0.00%
Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data-June					
	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
CSSR	≥ 95%	98.63%	98.03%	99.98%	98.80%
RRC Congestion	≤ 1%	0.06%	0.69%	0.08%	0.00%
Circuit Switched RAB Congestion	≤ 2%	0.10%	0.44%	0.04%	0.00%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-June					
CSSR	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total number of RRC attempts (A)		NA	NA	NA	NA
Total number of RRC established (B)		NA	NA	NA	NA
Call setup success rate (B/A*100)	≥ 95%	NA	NA	NA	NA
%age blocked calls		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-June					
	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		73081709	4164676	23364324	143051732
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		295619	65680	24677	551539
Call drop rate (B/A*100)	≤ 2%	0.40%	1.58%	0.11%	0.39%
Total no. of cells in the licensed service area (B)		17680	1999	6007	20136
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		355	49	22	385
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	2.01%	2.47%	0.37%	1.91%

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	MTNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		7884675	457526	2391731	15726874
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		34040	7633	2232	55095
Call drop rate (B/A*100)	≤ 2%	0.43%	1.67%	0.09%	0.35%
Total no. of cells in the licensed service area (B)		18030	2002	5992	20561
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		358	55	18	375
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	1.98%	2.75%	0.29%	1.82%

Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-June					
Call drop rate	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		NA	NA	NA	NA
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		NA	NA	NA	NA
Call drop rate (B/A*100)	≤ 2%	NA	NA	NA	NA

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Audit Results for Voice quality -PMR Data-June					
Voice quality	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	7822781595	NA	199124935492
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	7734315970	NA	196836129757
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	99.50%	98.87%	99.71%	98.85%
Live measurement results for Voice quality-3 Day data-June					
Voice quality	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	849818440	NA	20720474136
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	840315266	NA	20479804522
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	99.50%	98.88%	99.71%	98.84%
Drive test results for Voice quality (Average of three drive tests) - DT data-June					
Voice quality	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	NA	NA	NA
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	NA	NA	NA
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	NA	NA	NA	NA

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Audit Results for POI Congestion- PMR data-June					
POI congestion	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total number of working POIs		NA	31	90	NA
No. of POIs not meeting benchmark		NA	0	0	NA
Total Capacity of all POIs (A) - in erlangs		NA	15178	45261	NA
Traffic served for all POIs (B)- in erlangs		NA	6802	30116	NA
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-June					
POI congestion	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total number of working POIs		NA	31	91	NA
No. of POIs not meeting benchmark		NA	0	0	NA
Total Capacity of all POIs (A) - in erlangs		NA	15178	44805	NA
Traffic served for all POIs (B)- in erlangs		NA	3873	30555	NA
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%

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