TRAI Audit Wireless Report for West Bengal Circle

EAST ZONE

QE September 2016

Prepared by:

KANTAR IMRB

Submitted to:

TRAI

Telecom Regulatory Authority of India

(IS/ISO 9001-2008 Certified Organisation)

1 TABLE OF CONTENTS

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

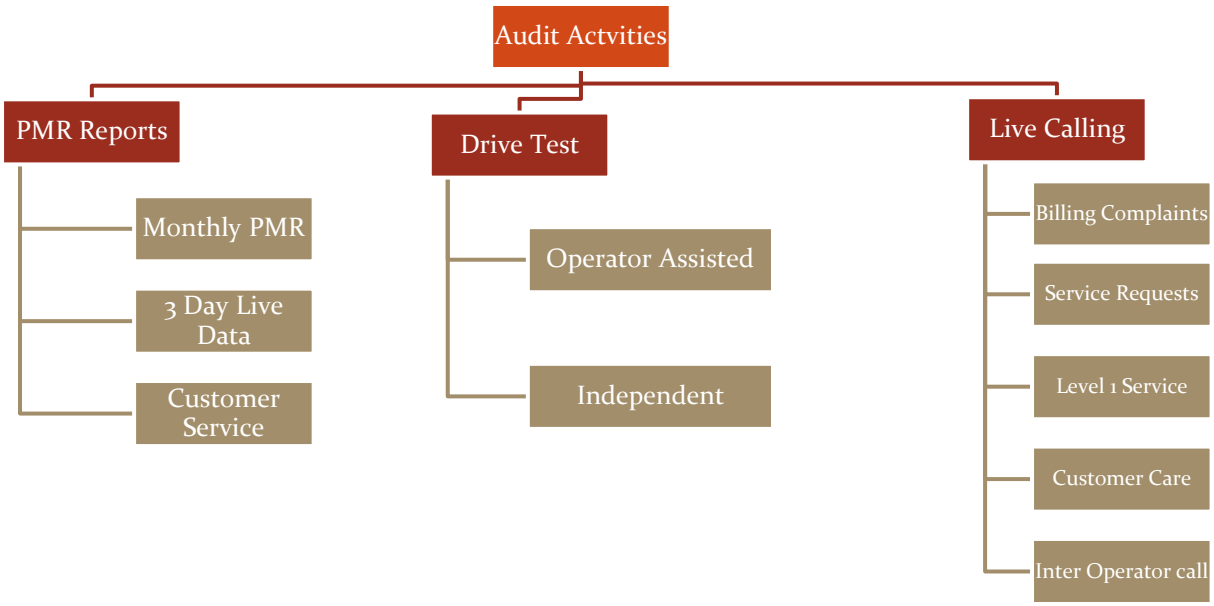
The primary objective of the Audit module is to-

- 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 West Bengal circle.

2.3 COVERAGE

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

2.4 FRAMEWORK USED

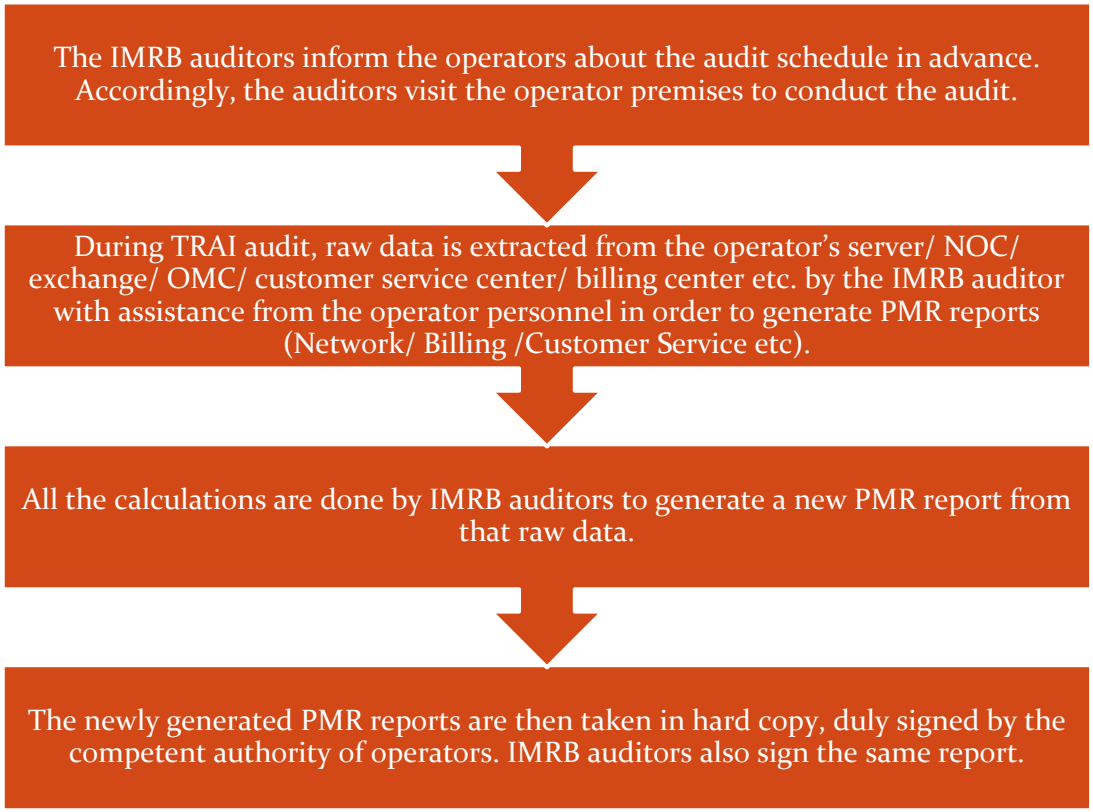


Let's discuss each of the activity in detail and the methodology adopted for each of the module.

2.4.1 PMR REPORTS

2.4.1.1 SIGNIFICANCE AND METHODOLOGY

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



The PMR report for network parameters is taken for each month of the audit quarter and is extracted and verified in the first week of the subsequent month of the audit month. For example, July 2016 audit data was collected in the month of August 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 September 2016 (JAS'16) was collected in the month of October 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 July, August and September 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 July, August and September 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% 3% Circuit switched Voice drop rate

Voice Quality

- % Connections with good Circuit Switched Voice Quality

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

2.4.1.5 AUDIT PARAMETERS – NETWORK 3G

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

Network Related

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

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

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

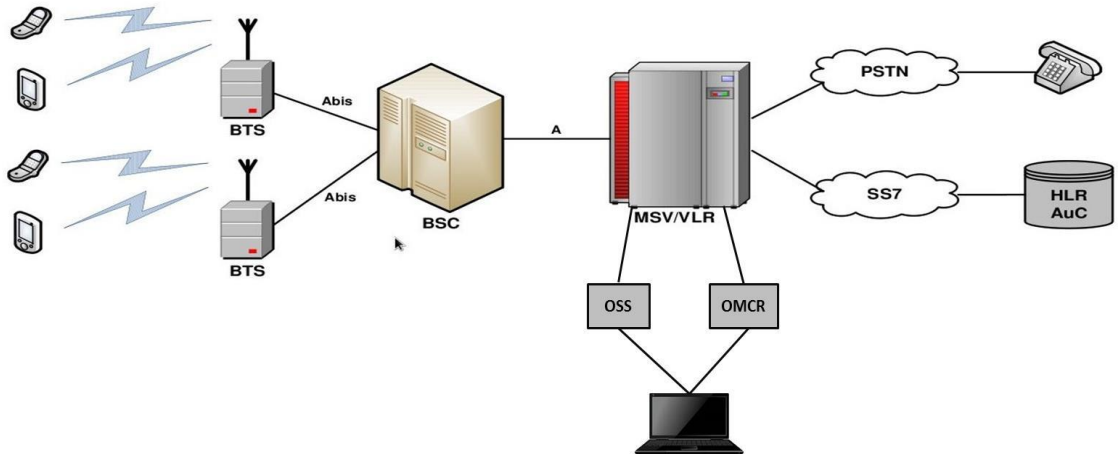
- Services Activation/ provisioning:- Activation done within 4 hours ≥ 95%
- PDP Context activation success rate:- PDP Context activation success rate ≥ 95%
- Drop Rate:- Drop Rate ≤ 5%

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

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

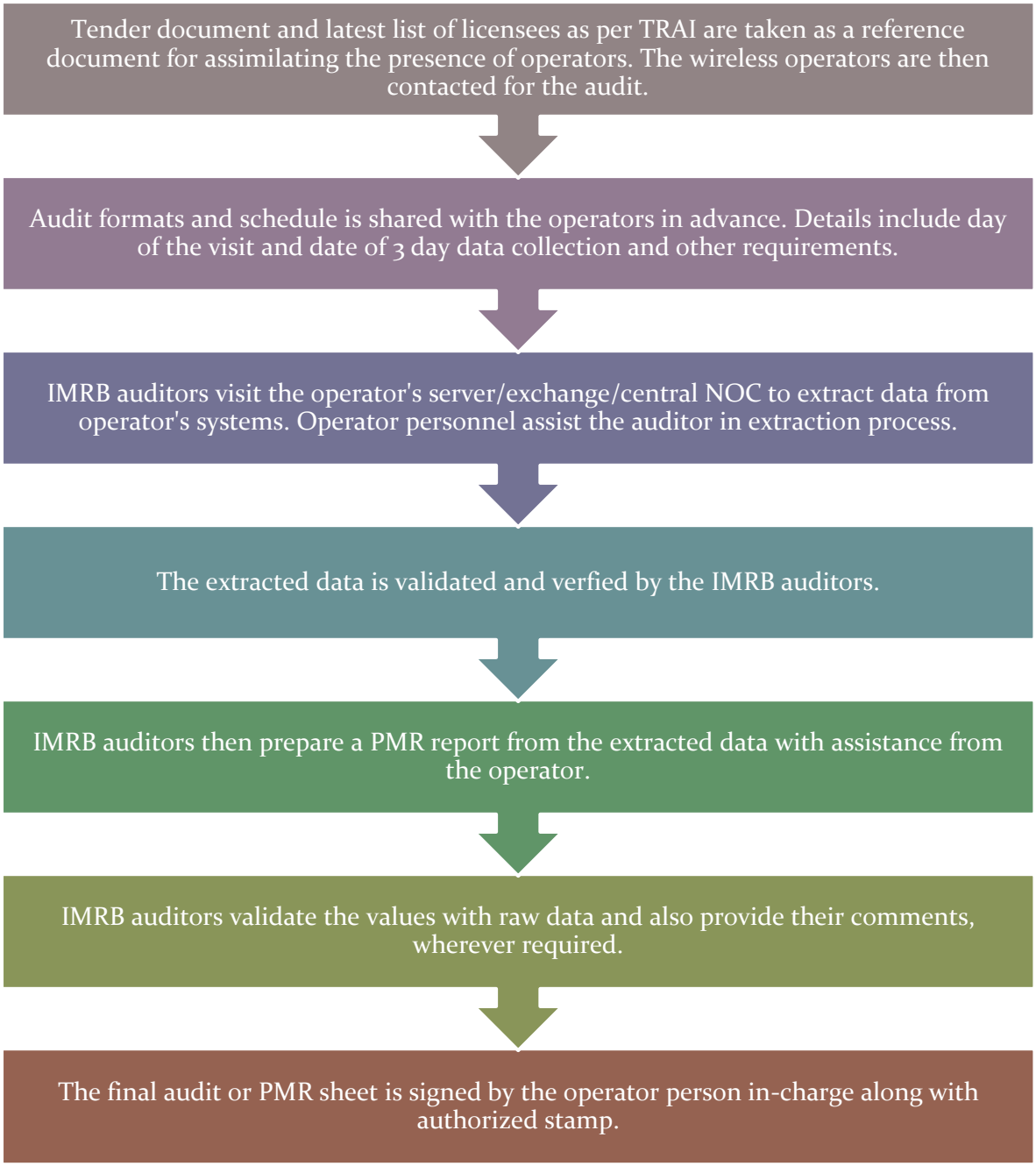
2.4.1.8 POINT OF DATA EXTRACTION

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



2.4.1.9 STEP BY STEP AUDIT PROCEDURE

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



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

2.4.1.10 CALCULATION METHODOLOGY – NETWORK PARAMETERS 2G

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

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% = [(A1 x C1) + (A2 x C2) +.....+ (An x Cn)] / (A1 + A2 +...+ An) Where: A1 = Number of attempts to establish RRC/ RAB made on day 1 C1 = Average RRC/ RAB Congestion % on day 1 A2 = Number of attempts to establish RRC/ RAB made on day 2 C2 = Average RRC/ RAB Congestion % on day 2 An = Number of attempts to establish RRC/ RAB made on day n Cn = Average RRC/ RAB Congestion % on day n
Circuit Switched RAB Congestion	
POI Congestion	POI Congestion% = [(A1 x C1) + (A2 x C2) +.....+ (An x Cn)] / (A1 + A2 +...+ An) Where: A1 = POI traffic offered on all POIs (no. of calls) on day 1 C1 = Average POI Congestion % on day 1 A2 = POI traffic offered on all POIs (no. of calls) on day 2 C2 = Average POI Congestion % on day 2 An = POI traffic offered on all POIs (no. of calls) on day n Cn = Average POI Congestion % on day n
Circuit Switched Voice Drop Rate	No. of voice RAB normally released / (No. of voice RAB normally released + RAB abnormally released) x 100
Worst Affected Cells having more than 3% Circuit Switched Voice Drop Rate	Number of cells having CSV drop rate > 3% during CBBH in a month / Total number of cells in the licensed area) x 100
Connections with good Circuit switched voice quality	1- (Number of Faulty Transport Blocks In Uplink downlink After Selection Combining Speech / Total number of Transport Blocks In Uplink downlink After Selection Combining Speech)) x 100

2.4.1.12 3 DAY LIVE DATA

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

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

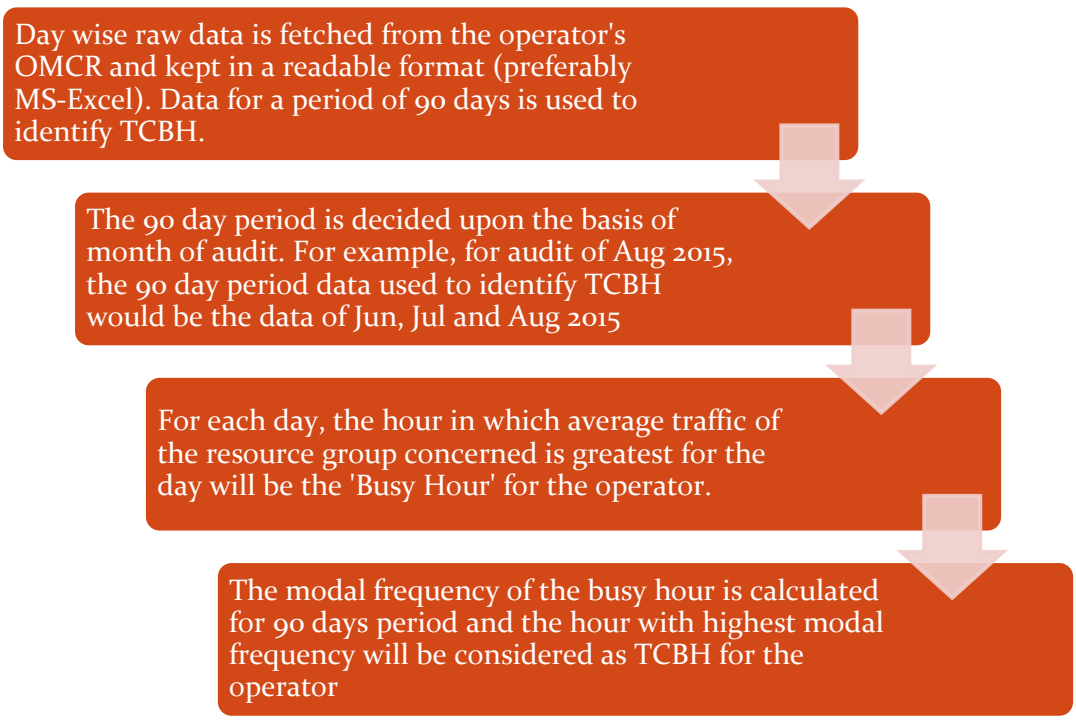
Network related parameters were evaluated for a period of 3 days in each month. 3 day live audit was conducted for 3 consecutive weekdays for each month. The data was extracted from each operator's server/ NOC etc. at the end of the 3rd day. The extracted data is then used to create a report (similar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

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

2.4.1.13 TCBH – SIGNIFICANCE AND SELECTION METHODOLOGY

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

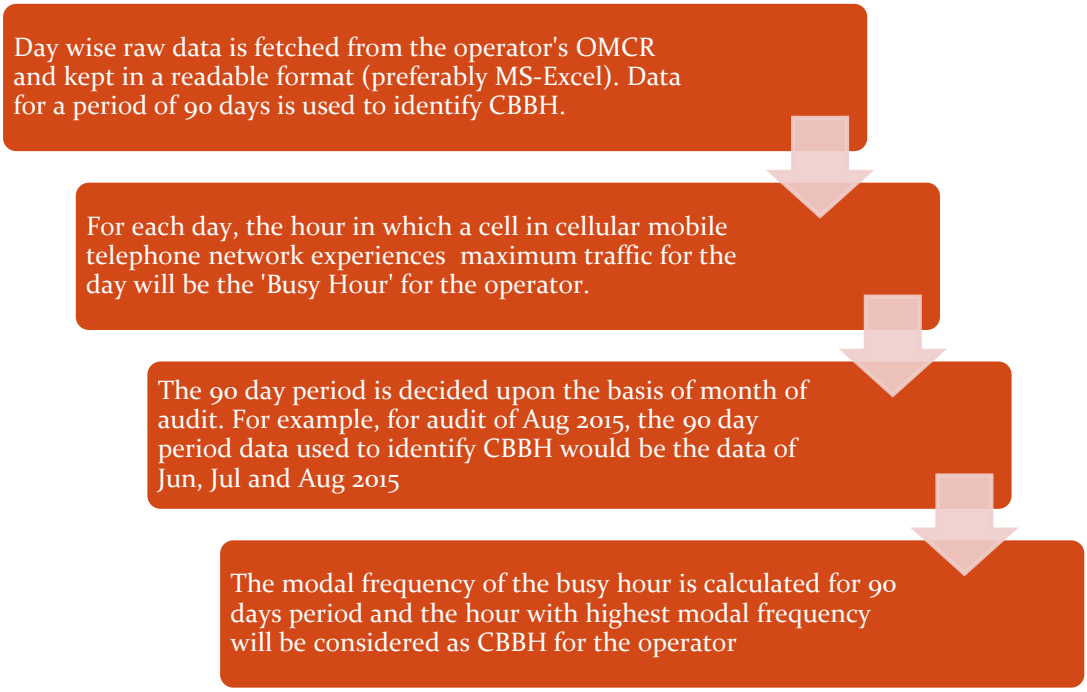
Step by step procedure to identify TCBH for an operator:



2.4.1.14 CBBH – SIGNIFICANCE AND SELECTION METHODOLOGY

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

Step by step procedure to identify CBBH for an operator:



2.4.1.15 CUSTOMER SERVICE PARAMETERS

The data to generate PMR report for customer service parameters is extracted at the operator premises and verified once every quarter in the subsequent month of the last month of the quarter. For example, data for quarter ending September 2016 (JAS'16) was collected in the month of October 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%

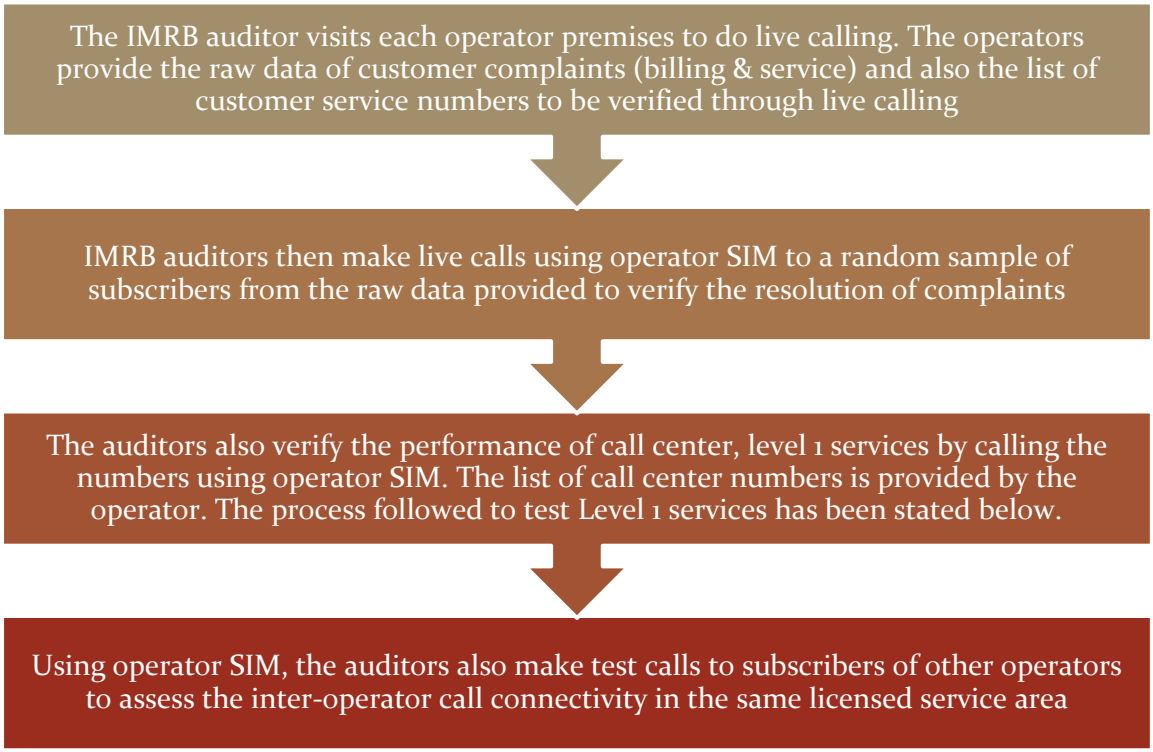
2.4.1.17 CALCULATION METHODOLOGY – CUSTOMER SERVICE PARAMETERS

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.



Live calling activity was carried out during the period of September 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 August 2016 was considered for live calling activity conducted in September 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 JAS'16, IMRB has tried contacting the list of Level 1 services provided by TRAI as per the NNP (National Numbering Plan).

2.4.2.4.1 PROCESS TO TEST LEVEL 1 SERVICES

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

- Post verifying the list, auditors do live calling by equally distributing the calls among the various numbers and update the results in the live calling sheet.

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

2.4.2.5 CUSTOMER CARE

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

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

The process for this parameter is stated below.

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

2.4.2.6 INTER OPERATOR CALL ASSESEMENT

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

2.4.3 VOICE DRIVE TEST – 2G & 3G

2.4.3.1 SIGNIFICANCE AND METHODOLOGY

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

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

IMRB conducted two types of drive tests as mentioned below.

- Operator Assisted Drive Test
- Independent Drive Test

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

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

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

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

1. Normal SSA
2. Difficult SSA

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

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

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

- Drive test was conducted for 6 consecutive days in selected SSAs; SSAs are defined as per BSNL and SSA list was finalized by regional TRAI office.
- 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 SSAs were defined as per BSNL and SSA list was finalized by regional TRAI office.
- Route map was designed in such a way that all the major roads, highways and all the important towns and villages were covered as part of audit.
- Special emphasis was given to those areas where the number of complaints received were on the higher side, if provided by TRAI.
- The route is defined in a way that we cover maximum area in the SSA and try to cover maximum villages and cities within the SSA. The route is designed such that there is no overlap of roads (if possible).
- The route was classified as-
    - With In city
    - Major Roads
    - Highways
    - Shopping complex/ Mall
    - Office Complex/ Government Building
- There were no fixed calls which we need to do for within city, major roads and highways, but a minimum of 30 calls in each route, i.e., within city, major roads and highways on each day. For indoors, 20 calls each for shopping and office complex each day preferably in relatively bigger city.
- The drive test covered selected cities and adjoining towns/rural areas where the service provider has commenced service, including congested areas and indoor sites.
- The drive test of each mobile network was conducted between 10 am and 8 pm on weekdays.
- The Vehicle used in the drive tests was equipped with the test tool that automatically generates calls on the mobile telephone networks.
- The speed of the vehicle was kept at around 30-50 km/hr.
- The holding period of each test call was 120 seconds.
- A test call was generated 10 seconds after the previous test call is completed. For 3G, the gap between two calls was 30 seconds.
- Height of the antenna was kept uniform in case of all service providers.

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

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

- Coverage-Signal strength (GSM)
  - ✓ Total calls made (A)
  - ✓ Number of calls with signal strength between 0 to -75 dBm
  - ✓ Number of calls with signal strength between 0 to -85 dBm
  - ✓ Number of calls with signal strength between 0 to -95 dBm
- Coverage-Signal strength (CDMA)
  - ✓ Total Ec/Io BINS (A)
  - ✓ Total Ec/Io BINS with less than –15 (B)
  - ✓ Low Interference = [1 - (B/A)] x 100
- Voice quality (GSM)
  - ✓ Total Rx Qual Samples– A
  - ✓ Rx Qual samples with 0-5 value – B
  - ✓ %age samples with good voice quality = B/A x 100
- Voice quality (CDMA)
  - ✓ Total FER BINs (forward FER) – A
  - ✓ FER BINs with 0-2 value (forward FER) – B
  - ✓ FER BINs with 0-4 value (forward FER) – C
  - ✓ %age samples with FER bins having 0-2 value (forward FER) = B/A x 100
  - ✓ %age samples with FER bins having 0-4 value (forward FER) = C/A x 100
  - ✓ No. of FER samples with value > 4 = [A-C]
- Call setup success rate
  - ✓ Total number of call attempts – A
  - ✓ Total Calls successfully established – B
  - ✓ Call success rate (%age) = (B/A) x 100
- Blocked calls
  - ✓ 100% - Call Set up Rate
- Call drop rate
  - ✓ Total Calls successfully established – A
  - ✓ Total calls dropped after being established – B
  - ✓ Call Drop Rate (%age) = (B/A) x 100

2.4.4 WIRELESS DATA DRIVE TEST – 2G & 3G

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

2.4.4.1 METHODOLOGY

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

The basic measurement set-up consists of a Test-Device and a Test-Server with specified software and hardware. Test calls are established between the Test-Device and Test-Server and measurements are made for the respective QoS parameters. These parameters are measured in a stationary mode. Service

Activation/Provisioning, PDP Context Activation Success Rate and Drop rate are reported from the actual network counters/database.

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

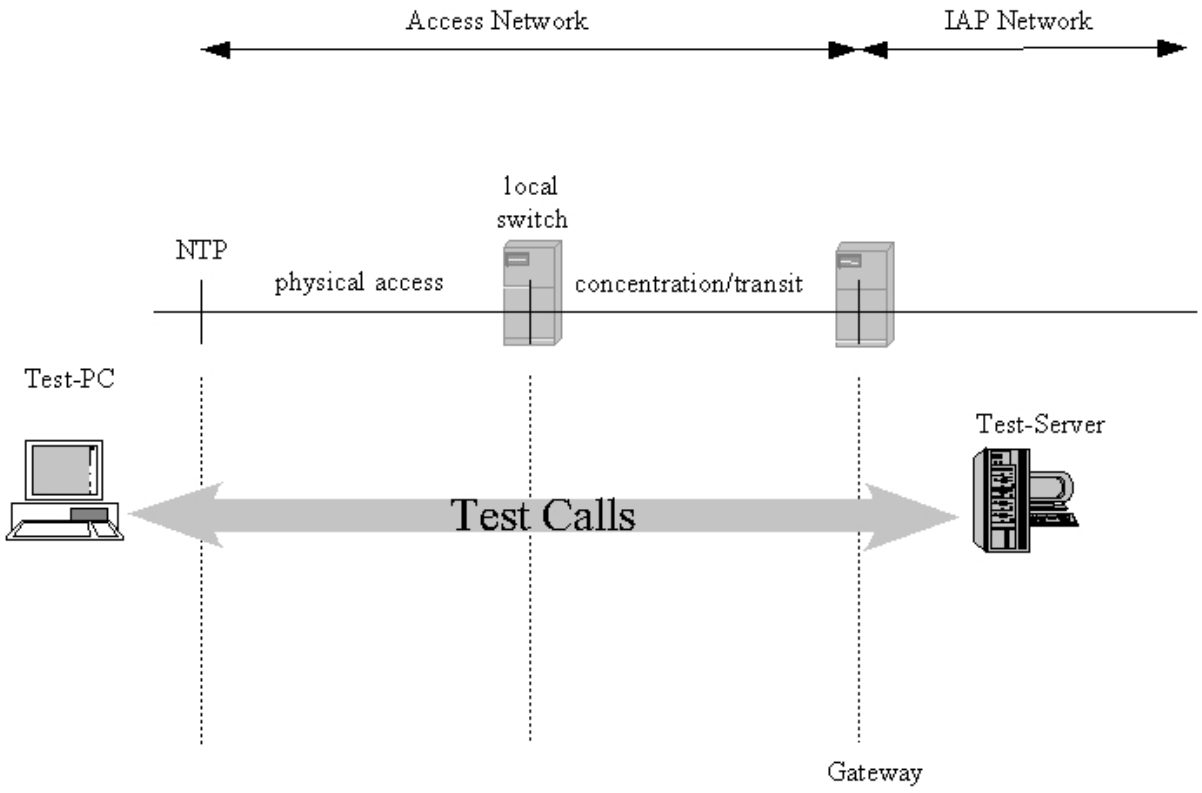


Figure for Measurement set-up

2.4.4.2 REQUIREMENTS FOR THE TEST-SERVER

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

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

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

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

2.4.4.3 TEST FILES

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

2.4.4.4 REPRESENTATIVENESS OR NUMBER OF TEST CALLS

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

2.4.4.5 PARAMETERS EVALUATED DURING DATA DRIVE TEST AT HOTSPOTS

Data Drive Test		
	Parameter	**Benchmarks**
Download Attempts		
	Successful data transmission download attempts	>80%
Upload Attempts		
	Successful data transmission upload attempts	>75%
Download Speed		
	Minimum download speed	To be measured for each plan by the service provider and reported to TRAI
Throughtput Packet		
	Average Throughput for Packet data	>75% of the Subscribed speed.
Latency		
	Latency	Data <250ms

2.4.4.5.1 SUCCESSFUL DATA TRANSMISSIONS DOWNLOAD ATTEMPTS

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

Measurement:

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

Successful data transmission download attempts =

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

2.4.4.5.2 SUCCESSFUL DATA TRANSMISSION UPLOAD ATTEMPTS

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

Measurement:

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

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

2.4.4.5.3 MINIMUM DOWNLOAD SPEED

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

Measurement:

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

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

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

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

2.4.4.5.4 AVERAGE THROUGHPUT FOR PACKET DATA

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

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

Measurement:

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

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

2.4.4.5.5 LATENCY

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

Measurement:

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

Latency (Percentage of successful pinged) =

$$\frac{\text{Total number of successful ping}}{\text{Total number of ping sent to the Test Server}} \times 100$$

2.5 OPERATORS COVERED 2G AND 3G

Name of Operator	Number of Subscriber as per VLR-2G
Aircel	3489331
Airtel	13656770
BSNL	1210647
Idea	5916207
MTS	845579
Reliance CDMA	No Service
Reliance GSM	No Service
Tata CDMA	2021
Tata GSM	220483
Vodafone	17184744
Name of Operator	**Number of Subscriber as per VLR-3G**
Aircel 3G	207260
Airtel 3G	1063614
BSNL 3G	46993
Reliance 3G	241805
Vodafone 3G	1079265

September'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 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 West Bengal circle, with a parameter wise performance evaluation as compared to TRAI benchmark.

3.1 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	0.37%	1.70%	97.48%	0.36%	0.89%	1.17%	10.65%	97.02%
Airtel	0.09%	0.08%	95.83%	0.10%	1.69%	1.46%	2.65%	95.67%
BSNL	0.42%	1.56%	97.50%	1.17%	1.74%	1.03%	28.14%	95.06%
Idea	0.17%	1.08%	99.15%	0.15%	0.14%	0.46%	0.45%	97.12%
MTS	0.13%	0.00%	99.64%	NA	0.11%	0.71%	2.63%	99.61%
Tata CDMA	0.02%	0.00%	99.01%	NA	0.01%	0.08%	0.81%	97.75%
Tata GSM	0.04%	0.00%	99.05%	0.24%	0.09%	0.57%	2.66%	97.78%
Vodafone	0.07%	0.16%	99.07%	0.42%	0.93%	0.79%	2.73%	96.65%

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

Following are the parameter wise observations for wireless operators for West Bengal circle:

BTSs Accumulated Downtime:

All operators met the benchmark. Minimum BTS Accumulated downtime was recorded for TATA CDMA and Vodafone at 0.02%.

Worst Affected BTSs Due to Downtime:

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

Call Set-up Success Rate (CSSR):

All operators met the benchmark for CSSR. The maximum CSSR was observed for MTS with 99.64%.

SDCCH/ Paging Chl. Congestion:

BSNL failed to meet the benchmark on SDCCH / Paging Channel Congestion, in which best performance was TATA CDMA with 0.10%.

TCH Congestion:

All operators met the benchmark for TCH congestion, in which best performance was TATA CDMA with 0.01%.

Call Drop Rate:

All operators met the benchmark for the parameter. Minimum call drop rate was recorded for TATA CDMA at 0.21%.

Worst Affected Cells Having More than 3% TCH Drop:

Aircel (10.65%) and BSNL (28.14%) failed to meet the benchmark. Best performance was recorded for Idea at 0.45%.

Voice Quality

All operators meet the benchmark. Best performance was recorded for MTS at 99.61%.

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

3.1.1 PMR DATA - JULY FOR 2G

Name of Service Provider Month July	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	0.34%	1.46%	97.13%	0.47%	1.39%	1.22%	11.01%	96.85%
Airtel	0.08%	0.09%	96.19%	0.12%	1.69%	1.43%	2.67%	95.67%
BSNL	0.43%	1.89%	97.94%	1.46%	1.51%	1.00%	27.66%	95.04%
Idea	0.14%	0.65%	99.35%	0.19%	0.16%	0.41%	0.34%	96.72%
MTS	0.07%	0.00%	99.68%	NA	0.07%	0.71%	2.48%	99.65%
Tata CDMA	0.02%	0.00%	99.33%	NA	0.00%	0.08%	0.95%	97.88%
Tata GSM	0.02%	0.00%	99.05%	0.53%	0.09%	0.56%	2.51%	97.75%
Vodafone	0.06%	0.29%	98.96%	0.35%	1.04%	0.78%	2.71%	96.77%

3.1.2 PMR DATA – AUGUST FOR 2G

Name of Service Provider Month August	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	0.44%	2.16%	97.51%	0.37%	0.81%	1.19%	10.93%	96.98%
Airtel	0.11%	0.09%	95.61%	0.10%	1.67%	1.54%	2.66%	95.58%
BSNL	0.42%	1.34%	97.57%	1.10%	1.81%	0.99%	28.42%	95.08%
Idea	0.24%	1.80%	98.68%	0.18%	0.14%	0.51%	0.47%	97.08%
MTS	0.15%	0.00%	99.69%	NA	0.12%	0.72%	2.54%	99.71%
Tata CDMA	0.02%	0.00%	99.38%	NA	0.00%	0.08%	0.73%	97.71%
Tata GSM	0.07%	0.00%	99.04%	0.14%	0.09%	0.58%	2.76%	97.75%
Vodafone	0.06%	0.03%	99.14%	0.43%	0.86%	0.80%	2.74%	96.58%

3.1.3 PMR DATA - SEPTEMBER FOR 2G

Name of Service Provider Month September	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	0.33%	1.48%	97.79%	0.24%	0.45%	1.09%	10.02%	97.26%
Airtel	0.08%	0.06%	95.69%	0.08%	1.72%	1.37%	2.63%	95.75%
BSNL	0.43%	1.46%	96.98%	0.97%	1.89%	1.10%	28.33%	95.04%
Idea	0.13%	0.80%	99.41%	0.08%	0.13%	0.46%	0.52%	97.56%
MTS	0.16%	0.00%	99.56%	NA	0.13%	0.70%	2.88%	99.46%
Tata CDMA	0.02%	0.00%	98.31%	NA	0.03%	0.08%	0.76%	97.63%
Tata GSM	0.02%	0.00%	99.07%	0.03%	0.09%	0.57%	2.72%	97.87%
Vodafone	0.08%	0.18%	99.12%	0.47%	0.88%	0.79%	2.72%	96.60%

3.2 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	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	0.47%	0.16%	98.22%	0.24%	0.37%	0.99%	10.73%	97.41%
Airtel	0.11%	0.00%	95.89%	0.18%	1.60%	1.40%	2.64%	95.67%
BSNL	0.40%	0.00%	97.53%	1.78%	1.59%	1.05%	21.65%	95.15%
Idea	0.36%	0.34%	99.66%	0.13%	0.04%	0.42%	0.12%	97.31%
MTS	0.15%	0.00%	99.76%	NA	0.05%	0.56%	0.12%	99.04%
Tata CDMA	0.02%	0.00%	98.62%	NA	0.01%	0.10%	1.19%	97.49%
Tata GSM	0.13%	0.00%	99.29%	0.55%	0.03%	0.51%	2.59%	97.83%
Vodafone	0.08%	0.00%	99.72%	0.33%	0.28%	0.66%	2.76%	97.23%

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

BTSs Accumulated Downtime:

All operators met the benchmark. Minimum BTS Accumulated downtime was recorded for Tata CDMA at 0.02%.

Worst Affected BTSs Due to Downtime:

All operators met the benchmark. Minimum worst affected BTSs due to downtime was recorded for most of the operators at 0.00%.

Call Set-up Success Rate (CSSR):

All operators met the benchmark for CSSR. The maximum CSSR was observed for MTS with 99.76%.

SDCCH/ Paging Chl. Congestion:

BSNL failed to meet the benchmark for SDCCH / Paging Channel Congestion, while Idea recorded the best SDCCH / Paging Channel Congestion.

TCH Congestion:

Airtel failed to meet the benchmark for TCH congestion, while Tata CDMA performed the best on TCH congestion with 0.01% congestion.

Call Drop Rate:

All operators met the benchmark for the parameter. Minimum call drop rate was recorded for Tata CDMA at 0.10%.

Worst Affected Cells Having More than 3% TCH Drop:

Aircel (10.73%) and BSNL (21.65%) failed to meet the benchmark. Best performance was recorded for Idea and MTS at 0.12%.

Voice Quality

All operators met the benchmark. Best performance was recorded for MTS at 99.04%.

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.

3.2.1 3 DAY DATA - JULY FOR 2G

Name of Service Provider 3 Day July	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	0.36%	0.16%	98.11%	0.28%	0.48%	0.99%	10.52%	97.30%
Airtel	0.10%	0.00%	96.06%	0.09%	1.73%	1.39%	2.66%	95.72%
BSNL	0.41%	0.00%	97.83%	3.57%	1.45%	1.14%	22.81%	95.04%
Idea	0.17%	0.18%	99.72%	0.11%	0.03%	0.38%	0.10%	97.26%
MTS	0.10%	0.00%	99.81%	NA	0.06%	0.55%	0.13%	99.30%
Tata CDMA	0.00%	0.00%	99.41%	NA	0.00%	0.10%	1.22%	97.73%
Tata GSM	0.01%	0.00%	99.33%	0.02%	0.01%	0.51%	2.75%	97.82%
Vodafone	0.11%	0.00%	99.74%	0.34%	0.26%	0.65%	2.71%	97.34%

3.2.2 3 DAY DATA – AUGUST FOR 2G

Name of Service Provider 3 Day August	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	0.76%	0.19%	98.20%	0.23%	0.42%	1.08%	12.38%	97.32%
Airtel	0.17%	0.00%	95.70%	0.22%	1.49%	1.48%	2.65%	95.61%
BSNL	0.50%	0.00%	97.33%	1.04%	2.00%	1.11%	22.58%	95.30%
Idea	0.74%	0.69%	99.63%	0.14%	0.04%	0.44%	0.09%	97.29%
MTS	0.19%	0.00%	99.83%	NA	0.03%	0.58%	0.11%	99.06%
Tata CDMA	0.00%	0.00%	99.39%	NA	0.00%	0.09%	1.04%	97.48%
Tata GSM	0.37%	0.00%	99.26%	1.60%	0.03%	0.52%	2.57%	97.73%
Vodafone	0.06%	0.00%	99.64%	0.27%	0.36%	0.65%	2.81%	97.13%

3.2.3 3 DAY DATA - SEPTEMBER FOR 2G

Name of Service Provider 3 Day September	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	0.28%	0.13%	98.34%	0.22%	0.20%	0.90%	9.33%	97.62%
Airtel	0.06%	0.00%	95.90%	0.24%	1.58%	1.34%	2.61%	95.67%
BSNL	0.28%	0.00%	97.43%	0.72%	1.31%	0.90%	19.57%	95.10%
Idea	0.17%	0.15%	99.64%	0.14%	0.06%	0.44%	0.17%	97.94%
MTS	0.17%	0.00%	99.65%	NA	0.07%	0.55%	0.13%	99.01%
Tata CDMA	0.06%	0.00%	97.04%	NA	0.02%	0.13%	1.31%	97.25%
Tata GSM	0.01%	0.00%	99.29%	0.03%	0.05%	0.49%	2.44%	97.94%
Vodafone	0.07%	0.00%	99.77%	0.37%	0.23%	0.68%	2.78%	97.20%

3.3 PMR DATA – 3 MONTHS- CONSOLIDATED FOR 3G

Name of Service Provider	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Call drop rate	Worst affected cells having more than 3% Circuit switched	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel 3G	0.65%	2.96%	98.68%	0.31%	0.34%	0.31%	3.81%	97.74%
Airtel 3G	0.10%	0.07%	99.69%	0.03%	0.08%	0.92%	2.60%	98.82%
BSNL 3G	0.39%	1.16%	96.79%	0.66%	1.76%	1.44%	14.86%	NA
Reliance 3G	0.21%	0.91%	97.97%	0.03%	0.05%	0.29%	0.73%	NA
Vodafone 3G	0.06%	0.15%	99.68%	0.08%	0.10%	0.33%	2.72%	99.03%

NA (No Data Received)

Following are the parameter wise observations for wireless operators for West Bengal circle:

Node Bs downtime:

All operators met the benchmark. Minimum Node Bs downtime was recorded for Airtel 3G at 0.10%.

Worst affected Node Bs due to downtime:

Aircel failed to meet the benchmark. Minimum worst affected Node Bs due to downtime was recorded for Airtel 3G at 0.07%.

Call Set-up Success Rate (CSSR):

All operators met the benchmark for CSSR. The maximum CSSR was observed for Airtel 3G with 99.69%.

RRC Congestion:

All operators met the benchmark for RRC congestion. The best RRC congestion was observed for Reliance 3G with 0.03%.

Circuit Switched RAB Congestion:

BSNL 3G failed to meet the benchmark for Circuit Switched RAB congestion. The best Circuit Switched RAB congestion was observed for Reliance 3G with 0.05%.

Circuit Switched Voice Call Drop Rate:

All operators met the benchmark for the parameter. Minimum call drop rate was recorded for Reliance 3G at 0.29%.

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

Aircel 3G and BSNL 3G (14.86%) failed to meet the benchmark. Best performance was recorded for Reliance 3G at 0.73%.

Circuit Switch Voice Quality:

All operators met the benchmark. Best performance was recorded for Vodafone at 99.03%.

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.

3.3.1 PMR DATA - JULY FOR 3G

Name of Service Provider Month July	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%
Aircel 3G	0.59%	2.76%	98.83%	0.25%	0.28%	0.29%	3.29%	97.78%
Airtel 3G	0.11%	0.07%	99.63%	0.02%	0.05%	0.47%	2.64%	99.29%
BSNL 3G	0.39%	1.27%	96.32%	0.88%	2.15%	1.51%	15.37%	NA
Reliance 3G	0.23%	0.64%	96.65%	0.03%	0.07%	0.34%	0.87%	NA
Vodafone 3G	0.07%	0.30%	99.71%	0.08%	0.07%	0.31%	2.78%	99.02%

3.3.2 PMR DATA – AUGUST FOR 3G

Name of Service Provider Month August	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%
Aircel 3G	0.84%	4.32%	98.79%	0.22%	0.27%	0.33%	3.90%	97.66%
Airtel 3G	0.11%	0.10%	99.98%	0.04%	0.13%	1.82%	2.57%	98.84%
BSNL 3G	0.42%	1.11%	96.36%	0.78%	1.66%	1.45%	16.32%	NA
Reliance 3G	0.14%	0.94%	98.12%	0.02%	0.05%	0.32%	0.92%	NA
Vodafone 3G	0.06%	0.00%	99.71%	0.05%	0.06%	0.33%	2.79%	99.04%

3.3.3 PMR DATA - SEPTEMBER FOR 3G

Name of Service Provider Month September	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%
Aircel 3G	0.55%	1.82%	98.43%	0.45%	0.46%	0.33%	4.23%	97.78%
Airtel 3G	0.09%	0.05%	99.45%	0.03%	0.06%	0.47%	2.59%	98.34%
BSNL 3G	0.36%	1.10%	97.69%	0.33%	1.46%	1.35%	12.90%	NA
Reliance 3G	0.21%	1.65%	99.15%	0.03%	0.03%	0.18%	0.40%	NA
Vodafone 3G	0.07%	0.16%	99.62%	0.12%	0.19%	0.34%	2.60%	99.02%

3.4 3 DAYS 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.

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%
Aircel 3G	0.67%	0.35%	98.91%	0.30%	0.21%	0.30%	3.85%	97.84%
Airtel 3G	0.10%	0.00%	99.31%	0.23%	0.20%	0.45%	2.64%	98.97%
BSNL 3G	0.90%	0.26%	97.14%	0.52%	1.78%	1.41%	12.76%	NA
Reliance 3G	0.05%	0.00%	98.20%	0.03%	0.05%	0.21%	0.67%	NA
Vodafone 3G	0.08%	0.00%	99.75%	0.04%	0.04%	0.30%	2.62%	99.03%

NA (No Data Received)

Node Bs downtime:

All operators met the benchmark. Minimum BTS Accumulated downtime was recorded for Reliance 3G at 0.05%.

Worst affected Node Bs due to downtime:

All operators met the benchmark. Minimum worst affected BTSs due to downtime was recorded for Airtel 3G, Reliance 3G and Vodafone 3G at 0.00%.

Call Set-up Success Rate (CSSR):

All operators met the benchmark for CSSR. The maximum CSSR was observed for Aircel 3G with 99.31%.

RRC Congestion:

All operators met the benchmark for RRC congestion. The maximum RRC congestion was observed for Airtel 3G with 0.03%.

Circuit Switched RAB Congestion:

All operators met the benchmark for Circuit Switched RAB congestion. The minimum Circuit Switched RAB congestion was observed for Reliance 3G with 0.05%.

Circuit Switched Voice Call Drop Rate:

All operators met the benchmark for the parameter. Minimum call drop rate was recorded for Aircel 3G and Reliance 3G at 0.21%.

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

Aircel 3G and BSNL 3G (12.76%) failed to meet the benchmark. Best performance was recorded for Reliance 3G at 0.67%.

Circuit Switch Voice Quality:

All operators met the benchmark. Best performance was recorded for Vodafone 3G at 99.03%.

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.

3.4.1 3 DAY DATA - JULY FOR 3G

Name of Service Provider 3 Day July	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%
Aircel 3G	0.50%	0.27%	99.15%	0.18%	0.15%	0.25%	2.97%	97.99%
Airtel 3G	0.07%	0.00%	99.59%	0.22%	0.11%	0.46%	2.65%	98.76%
BSNL 3G	1.97%	0.79%	96.94%	0.94%	2.25%	1.59%	14.73%	NA
Reliance 3G	0.04%	0.00%	97.31%	0.02%	0.06%	0.27%	0.92%	NA
Vodafone 3G	0.12%	0.00%	99.78%	0.03%	0.02%	0.30%	2.77%	99.03%

3.4.2 3 DAY DATA – AUGUST FOR 3G

Name of Service Provider 3 Day August	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%
Aircel 3G	1.14%	0.52%	98.94%	0.24%	0.20%	0.33%	4.43%	97.66%
Airtel 3G	0.17%	0.00%	99.29%	0.24%	0.19%	0.50%	2.63%	98.81%
BSNL 3G	0.46%	0.00%	96.78%	0.28%	1.49%	1.30%	12.45%	NA
Reliance 3G	0.00%	0.00%	99.28%	0.03%	0.01%	0.18%	0.39%	NA
Vodafone 3G	0.05%	0.00%	99.78%	0.03%	0.02%	0.29%	2.72%	99.04%

3.4.3 3 DAY DATA - SEPTEMBER FOR 3G

Name of Service Provider 3 Day September	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%
Aircel 3G	0.37%	0.26%	98.63%	0.48%	0.26%	0.32%	4.05%	97.88%
Airtel 3G	0.07%	0.00%	99.05%	0.23%	0.29%	0.29%	2.65%	99.35%
BSNL 3G	0.27%	0.00%	97.68%	0.34%	1.60%	1.33%	11.13%	NA
Reliance 3G	0.13%	0.00%	98.01%	0.03%	0.06%	0.16%	0.71%	NA
Vodafone 3G	0.06%	0.00%	99.70%	0.06%	0.08%	0.32%	2.38%	99.03%

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

Name of Service Provider	Wireless Data-PMR			Wireless Data-Live Data		
	Activation done within 4 hours	PDP Context activation success rate	Drop Rate	Activation done within 4 hours	PDP Context activation success rate	Drop Rate
Benchmark	≥ 95%	≥ 95%	≤ 5%	≥ 95%	≥ 95%	≤ 5%
Aircel	99.99%	98.36%	1.41%	99.99%	99.52%	1.56%
Airtel	99.55%	99.39%	2.60%	99.84%	99.60%	2.68%
BSNL	96.48%	96.16%	NA	100.00%	96.57%	NA
Idea	99.98%	98.86%	1.09%	100.00%	98.80%	1.22%
MTS	99.49%	99.71%	0.74%	100.00%	99.63%	0.79%
Tata CDMA	100.00%	96.74%	0.37%	100.00%	96.77%	0.30%
Tata GSM	100.00%	99.99%	0.99%	100.00%	100.00%	0.98%
Vodafone	99.77%	99.89%	4.47%	98.99%	99.30%	4.62%

NA (No Data Received)

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

Note: - BSNL did not submit the drop rate for PMR as well as live audit.

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

Name of Service Provider	Wireless Data-PMR			Wireless Data-Live Data		
	Activation done within 4 hours	PDP Context activation success rate	Drop Rate	Activation done within 4 hours	PDP Context activation success rate	Drop Rate
Benchmark	≥ 95%	≥ 95%	≤ 5%	≥ 95%	≥ 95%	≤ 5%
Aircel 3G	99.99%	98.36%	1.44%	99.99%	99.52%	1.17%
Airtel 3G	99.50%	99.98%	0.34%	99.84%	99.89%	0.37%
BSNL 3G	96.48%	93.00%	NA	100.00%	94.31%	NA
Reliance 3G	100.00%	99.00%	1.01%	100.00%	98.21%	0.93%
Vodafone 3G	99.89%	98.60%	0.60%	99.73%	99.77%	3.57%

NA: (No Data Received)

- BSNL 3G failed to meet the benchmark for PDP context activation success rate in PMR as well live audit.

Note: - BSNL did not submit the drop rate for PMR as well as live audit.

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

3.7 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	98.00%	98.00%	100.00%	100.00%	87.33%	97.00%
Airtel	98.00%	98.00%	100.00%	91.00%	81.33%	96.00%
BSNL	98.00%	98.00%	100.00%	94.00%	84.33%	99.00%
Idea	97.00%	97.00%	100.00%	100.00%	92.33%	97.00%
MTS	97.00%	97.00%	100.00%	90.00%	88.00%	97.00%
Reliance GSM	98.00%	98.00%	100.00%	100.00%	92.67%	99.00%
Tata CDMA	NA	NA	100.00%	100.00%	93.67%	83.33%
Tata GSM	100.00%	100.00%	100.00%	94.00%	92.67%	96.00%
Vodafone	100.00%	100.00%	100.00%	100.00%	93.33%	100.00%

NA- Not applicable, due to pre-paid services

Resolution of billing complaints

As per the consumers (live calling exercise) Idea and MTS failed to meet the benchmark of resolving 98% complaints within 4 weeks.

As per the consumers (live calling exercise) all operators failed to meet the benchmark of resolving 100% complaints within 6 weeks except Tata GSM and Vodafone.

Complaint/Request Attended to Satisfaction

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

Level 1 Service

As per the live calling results, none of the operators met the TRAI benchmark for level 1 service with calls being answered. The details of live calling done for the level 1 service have been provided in the annexure for each operator.

It was also observed that a number of Category-I (i.e. mandatory) services were not being operated by most of the operators.

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 TRAI benchmark for the parameter except Airtel, BSNL, MTS and Tata GSM.

3.8 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 voice) within 90
Benchmark	≤ 0.1%	≤ 0.1%	≥ 98%	≥ 100%	≥ 100%	≥ 95%	≥ 95%
Aircel	0.00%	0.02%	NA	NA	100.00%	96.56%	96.64%
Airtel	0.04%	0.04%	100.00%	100.00%	100.00%	92.70%	93.78%
BSNL	0.00%	0.02%	100.00%	100.00%	100.00%	95.38%	96.52%
Idea	0.28%	0.20%	100.00%	100.00%	100.00%	99.17%	99.94%
MTS	0.05%	0.04%	100.00%	100.00%	100.00%	98.95%	95.38%
Reliance GSM	0.08%	0.03%	100.00%	100.00%	100.00%	99.49%	93.08%
Tata CDMA	NA	0.00%	NA	NA	100.00%	NA	99.50%
Tata GSM	0.00%	0.00%	100.00%	100.00%	100.00%	98.57%	98.79%
Vodafone	0.09%	0.06%	100.00%	100.00%	100.00%	100.00%	96.02%

NA:-

Metering and Billing Credibility – Post-paid Subscribers

Idea failed to meet the TRAI benchmark for the parameter. Aircel, Tata GSM and BSNL have the best performance with 0.00% billing disputes.

Metering and Billing Credibility – Prepaid Subscribers

For the prepaid customers, Idea failed to meet the benchmark of charging disputes. TATA GSM and CDMA performed the best with 0.00% disputes.

Resolution of billing complaints

All operators met the TRAI benchmark of resolution of billing complaints within 4 weeks and 6 weeks. All operators had the best performance with the 100% resolution of billing complaints within 4 weeks and 6 weeks.

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

All the 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 except Airtel. Vodafone recorded the best performance for the parameter.

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

All operators met the TRAI specified benchmark of 95% except Airtel and Reliance GSM. Idea recorded the best performance for the parameter.

3.9 INTER OPERATOR CALL ASSESSMENT - CONSOLIDATED

6. Inter Operator Call Assessment										
Inter operator call Assessment To↓ From→	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Aircel	NA	100.00%	100.00%	100.00%	100.00%	NS	100.00%	100.00%	100.00%	100.00%
Airtel	100.00%	NA	100.00%	100.00%	100.00%	NS	100.00%	100.00%	100.00%	100.00%
BSNL	100.00%	100.00%	NA	100.00%	100.00%	NS	100.00%	100.00%	100.00%	100.00%
Idea	100.00%	100.00%	100.00%	NA	100.00%	NS	100.00%	100.00%	100.00%	100.00%
MTS	100.00%	100.00%	100.00%	100.00%	NA	NS	100.00%	100.00%	100.00%	100.00%
Reliance CDMA	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Reliance GSM	100.00%	100.00%	100.00%	100.00%	100.00%	NS	NA	100.00%	100.00%	100.00%
Tata CDMA	100.00%	100.00%	100.00%	100.00%	100.00%	NS	100.00%	NA	100.00%	100.00%
Tata GSM	100.00%	100.00%	100.00%	100.00%	100.00%	NS	100.00%	100.00%	NA	100.00%
Vodafone	100.00%	100.00%	100.00%	100.00%	100.00%	NS	100.00%	100.00%	100.00%	NA

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

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

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

Name of Service Provider	Network Availability				Connection Establishment (Accessibility)						Connection Maintenance (Retainability)						Point of Interconnection (POI) Congestion	
	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			
Benchmark	≤ 2%		≤ 2%		≥ 95%		≤ 1%		≤ 2%		≤ 2%		≤ 3%		≥ 95%		≤ 0.5%	
	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB
Aircel	0.37%	0.37%	1.70%	1.70%	97.48%	97.48%	0.36%	0.36%	0.89%	0.89%	1.17%	1.17%	10.65%	10.65%	97.03%	97.02%	0.00%	0.00%
Airtel	0.09%	0.09%	0.08%	0.08%	95.88%	95.83%	0.10%	0.10%	1.68%	1.69%	1.47%	1.46%	2.66%	2.65%	95.59%	95.67%	0.00%	0.00%
BSNL	0.36%	0.42%	1.11%	1.56%	97.68%	97.50%	0.99%	1.17%	1.61%	1.74%	1.35%	1.03%	14.76%	28.14%	96.36%	95.06%	0.00%	0.00%
Idea	0.17%	0.17%	1.08%	1.08%	99.15%	99.15%	0.15%	0.15%	0.14%	0.14%	0.46%	0.46%	0.44%	0.45%	97.12%	97.12%	0.00%	0.00%
MTS	0.13%	0.13%	0.00%	0.00%	99.64%	99.64%	0.00%	NA	0.11%	0.11%	0.71%	0.71%	2.63%	2.63%	99.61%	99.61%	0.00%	0.00%
TATA CDMA	0.02%	0.02%	0.00%	0.00%	99.01%	99.01%	0.00%	NA	0.01%	0.01%	0.08%	0.08%	0.81%	0.81%	97.74%	97.75%	0.00%	0.00%
TATA GSM	0.04%	0.04%	0.00%	0.00%	99.05%	99.05%	0.23%	0.24%	0.09%	0.09%	0.57%	0.57%	2.66%	2.66%	97.79%	97.78%	0.00%	0.00%
Vodafone	0.07%	0.07%	0.17%	0.16%	99.07%	99.07%	0.42%	0.42%	0.93%	0.93%	0.79%	0.79%	2.72%	2.73%	96.65%	96.65%	0.00%	0.00%

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

Name of Service Provider	Network Availability				Connection Establishment (Accessibility)						Connection Maintenance (Retainability)						Point of Interconnection (POI) Congestion	
	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%		≤ 0.5%	
	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB
Aircel	0.66%	0.65%	2.97%	2.96%	98.68%	98.68%	0.31%	0.31%	0.34%	0.34%	0.31%	0.31%	3.80%	3.81%	97.74%	97.74%	0.00%	0.00%
Airtel	0.11%	0.10%	0.08%	0.07%	99.59%	99.69%	0.03%	0.03%	0.08%	0.08%	0.47%	0.92%	2.11%	2.60%	98.86%	98.82%	0.00%	0.00%
BSNL	0.22%	0.39%	0.57%	1.16%	96.83%	96.79%	0.62%	0.66%	1.23%	1.76%	1.00%	1.44%	7.42%	14.86%	95.50%	NA	0.00%	0.00%
RTL	0.35%	0.21%	1.50%	0.91%	97.91%	97.97%	0.03%	0.03%	0.04%	0.05%	0.29%	0.29%	0.72%	0.73%	99.85%	NA	0.00%	0.00%
vodafone	0.06%	0.06%	0.15%	0.15%	99.68%	99.68%	0.08%	0.08%	0.10%	0.10%	0.33%	0.33%	2.72%	2.72%	99.03%	99.03%	0.00%	0.00%

Value calculated by Operator and IMRB match		Value calculated by Operator and IMRB do not match	

4 CRITICAL FINDINGS

PMR Consolidated (Network Parameters) for 2G

- BSNL failed to meet the benchmark on SDCCH / Paging channel congestion
- **Aircel (10.65%)** and **BSNL (28.14%)** failed to meet the benchmark for worst affected cells having more than 3% TCH drop.

3 Day Live Measurement (Network Parameters) for 2G

- BSNL did not meet the benchmark for SDCCH / Paging channel congestion.
- **Aircel (10.73%)** and BSNL **(21.65%)** failed to meet the benchmark worst affected cells having more than 3% TCH drop.

PMR Consolidated (Network Parameters) for 3G

- Aircel 3G failed to meet the benchmark worst affected Node Bs due to downtime.
- Aircel 3G and **BSNL 3G (14.86%)** failed to meet the benchmark worst affected cells having more than 3% Circuit switched voice drop rate.

3 Day Live Measurement (Network Parameters) for 3G

- Aircel and **BSNL (12.76%)** failed to meet the benchmark worst affected cells having more than 3% Circuit switched voice drop rate.

  Note: - BSNL did not submit the drop rate for PMR as well as live audit.

Wireless Data Services for 2G and 3G:

- BSNL 3G failed to meet the benchmark in monthly as well as live for PDP Context activation success rate

  Note: - BSNL did not submit the drop rate data for PMR as well as live audit.

Live Calling

- As per the consumers (live calling exercise) Idea and MTS failed to meet the benchmark of resolving 98% complaints within 4 weeks.
- As per the consumers (live calling exercise) all operators failed to meet the benchmark of resolving 100% complaints within 6 weeks except Tata GSM and Vodafone.
- As per the live calling results, none of the operators met the TRAI benchmark for level 1 service with calls being answered.
- Airtel, MTS, Tata GSM and BSNL failed to meet the TRAI specified benchmark of Customer Care Percentage of calls answered by the operators (Voice to Voice) within 90 seconds

Metering and billing credibility

- For the billing disputes of post-paid and pre-paid subscribers, it was observed that Idea failed to meet the TRAI benchmark for the parameter.
- For the IVR call aspect, Airtel failed to meet the TRAI benchmark of 95% of Customer Care Percentage of calls answered by the IVR.
- Airtel and Reliance GSM failed to meet the TRAI specified benchmark of Customer Care Percentage of calls answered by the operators (Voice to Voice) within 90 seconds

Drive Test (Operator Assisted) for 2G

- In Midnapore SSA BSNL failed to meet the benchmark for voice quality in outdoor locations.
- In Midnapore SSA BSNL failed to meet the benchmark for CSSR in outdoor locations.
- In Midnapore SSA BSNL failed to meet the benchmark for call drop rate in outdoor locations.
- In Balurghat SSA MTS failed to meet the benchmark for voice quality in outdoor locations.

Drive Test (Operator Assisted) for 3G

- In Midnapore SSA BSNL 3G failed to meet the benchmark for voice quality in indoor as well as outdoor location.
- In Midnapore SSA BSNL 3G failed to meet the benchmark for CSSR indoor as well as outdoor location.
- In Midnapore SSA BSNL 3G failed to meet the benchmark for call drop rate in outdoor location.

Note: BSNL did not participated in drive test in Balurghat SSA

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

5.1 BTS ACCUMULATED DOWNTIME

5.1.1 PARAMETER DESCRIPTION

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

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

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

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

3. **TRAI Benchmark –**

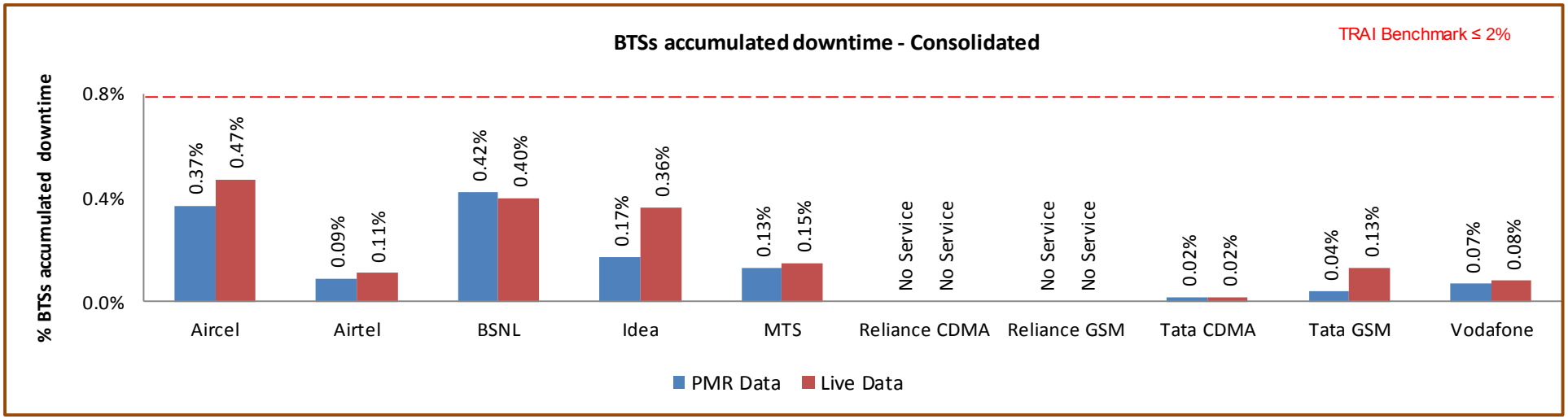
    a. BTSs Accumulated downtime (not available for service) ≤ 2%

4. **Audit Procedure –**

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

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

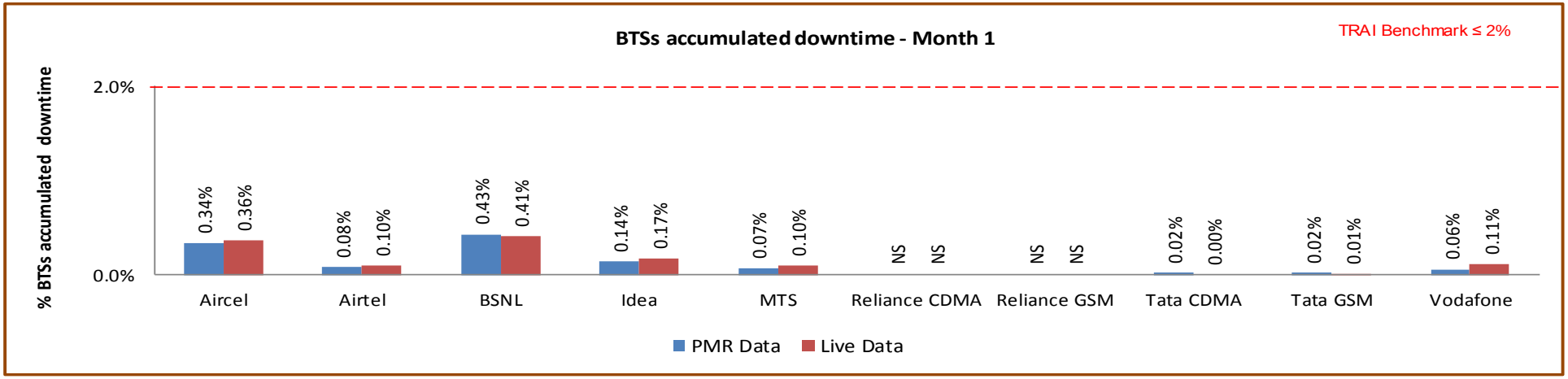
5.1.2 KEY FINDINGS - CONSOLIDATED



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

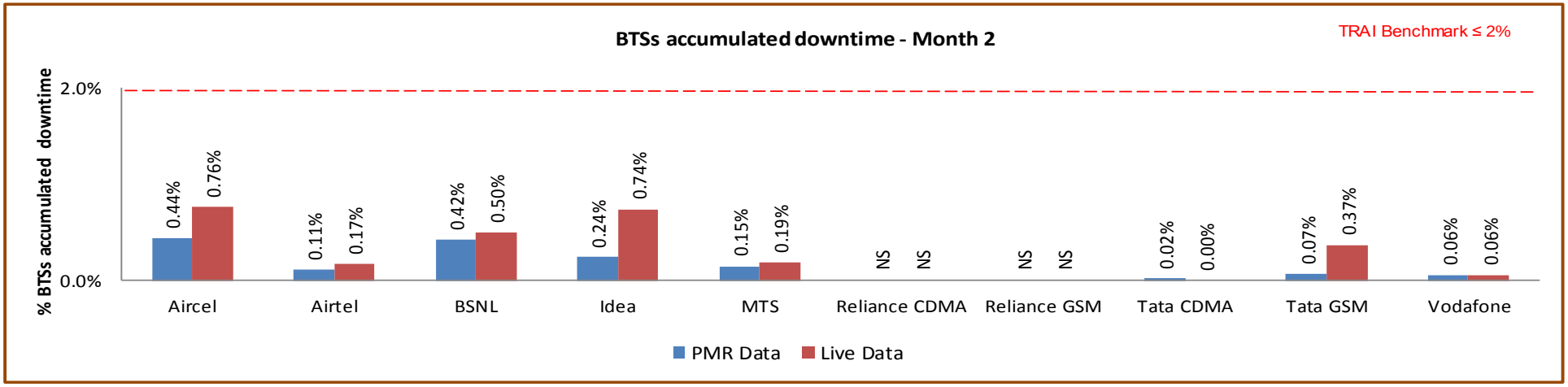
All operators met the benchmark on aspect of BTS accumulated downtime as per audit/PMR data.

5.1.2.1 KEY FINDINGS – MONTH 1



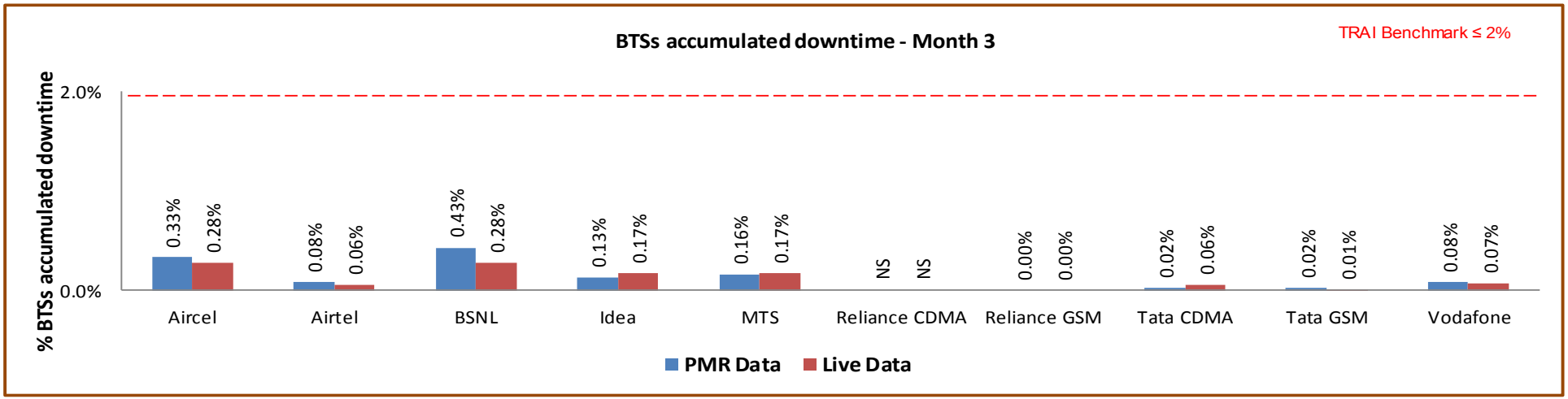
Data Source: Operations and Maintenance Center (OMC) of the operators

5.1.2.2 KEY FINDINGS – MONTH 2



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

5.1.2.3 KEY FINDINGS – MONTH 3



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

5.2 WORST AFFECTED BTS DUE TO DOWNTIME

5.2.1 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.

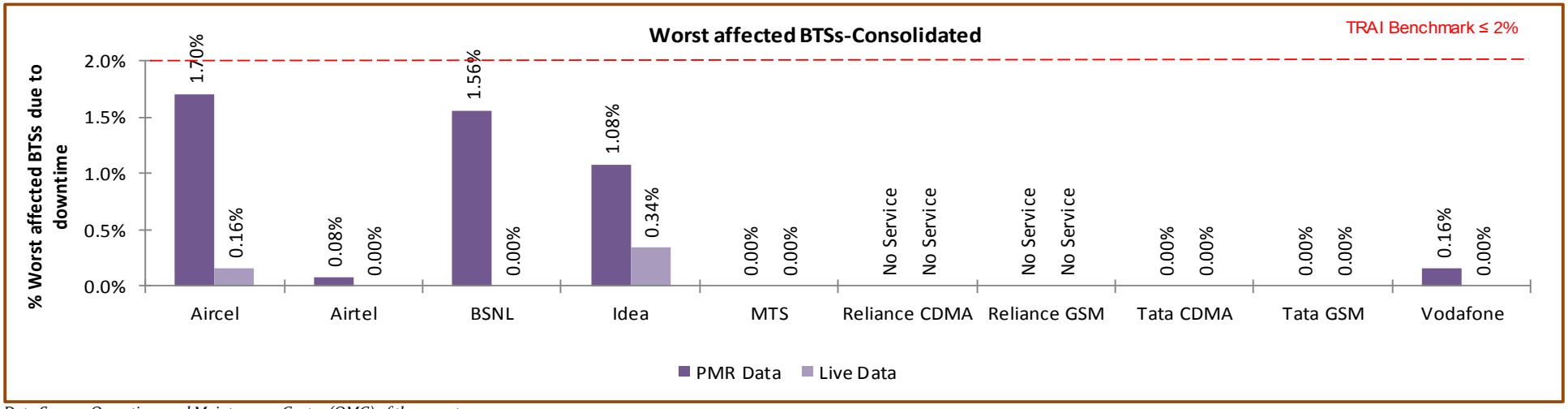
  iii. Data is extracted from system log of the server of the operator. This data is in raw format which is further processed to arrive at the cumulative values.

  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.

5.2.2 KEY FINDINGS – CONSOLIDATED

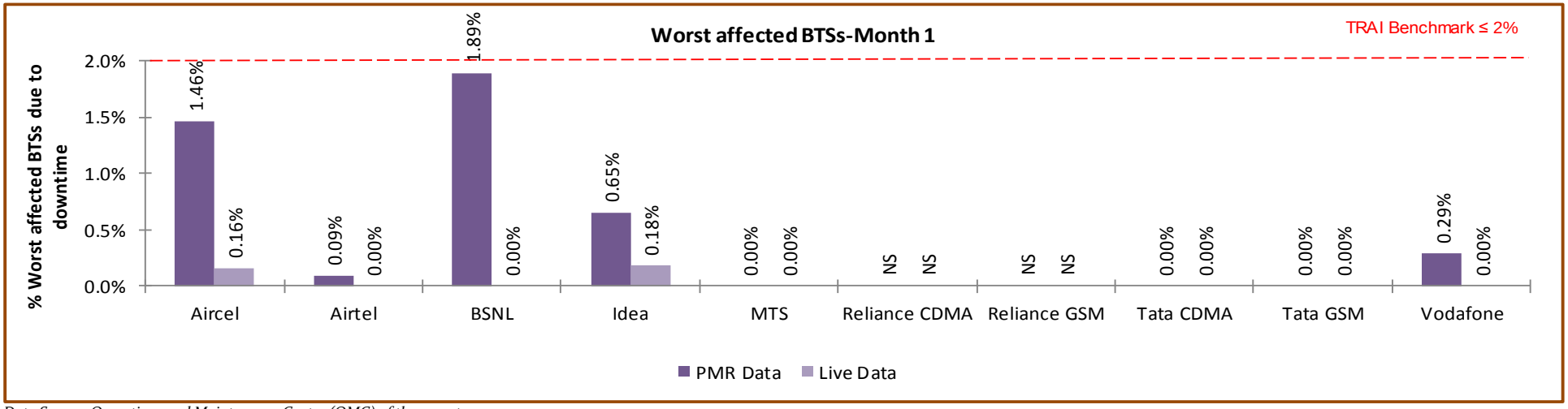


Data Source: Operations and Maintenance Center (OMC) of the operators

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

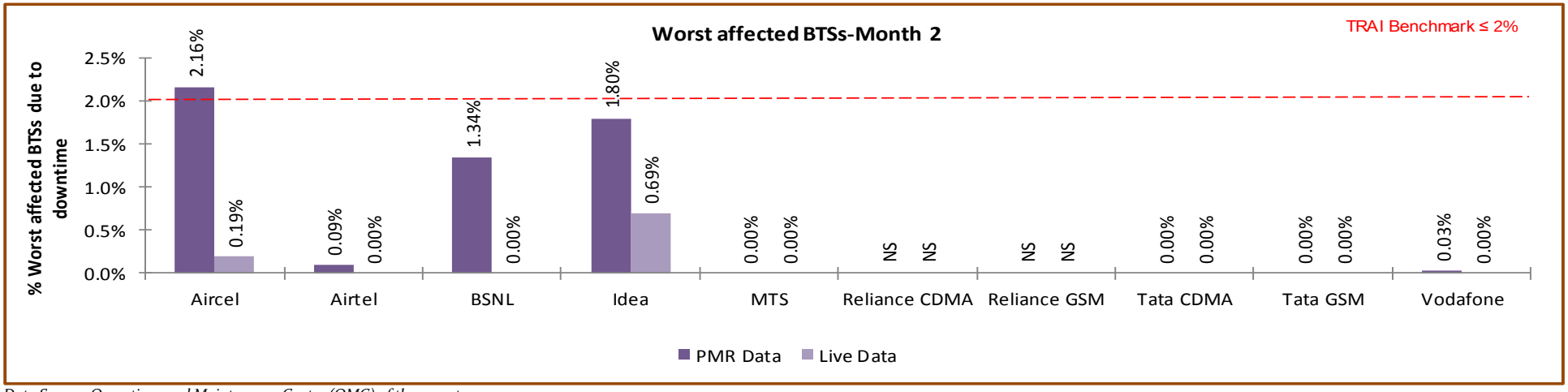
Significant difference was observed between PMR & live measurement data for Aircel, Airtel, Idea, Vodafone and BSNL. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for three days.

5.2.2.1 KEY FINDINGS – MONTH 1



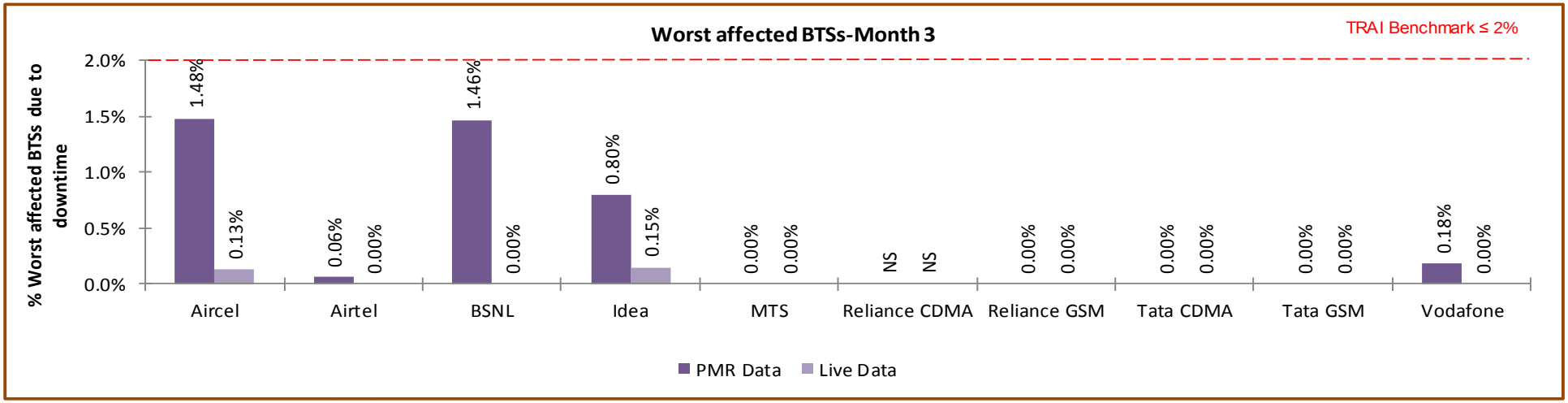
Data Source: Operations and Maintenance Center (OMC) of the operators

5.2.2.2 KEY FINDINGS – MONTH 2



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

5.2.2.3 KEY FINDINGS – MONTH 3



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

5.3 CALL SET UP SUCCESS RATE

5.3.1 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

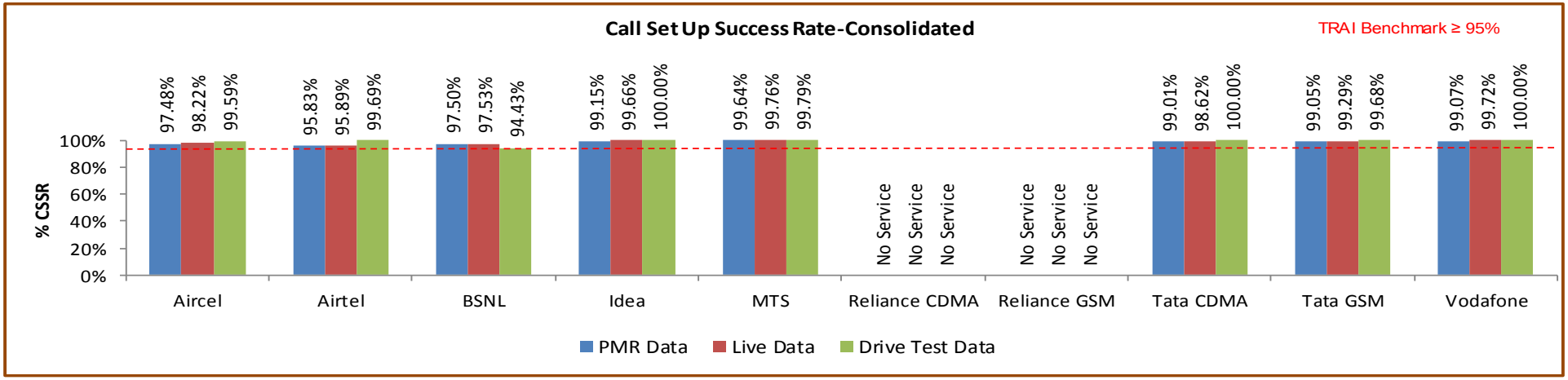
   Call Established means the following events have happened in call setup:-

   - 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.

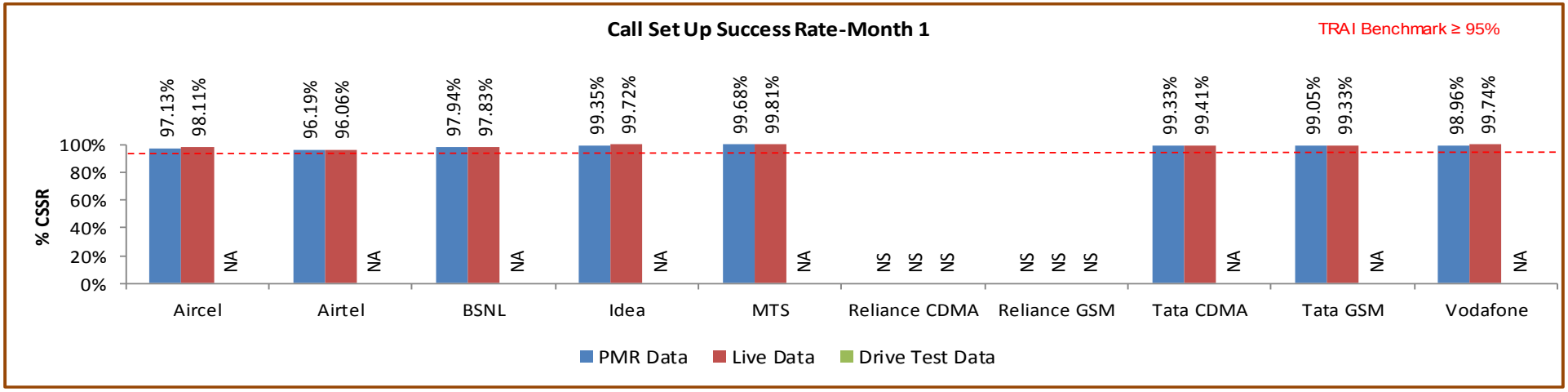
5.3.2 KEY FINDINGS - CONSOLIDATED



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

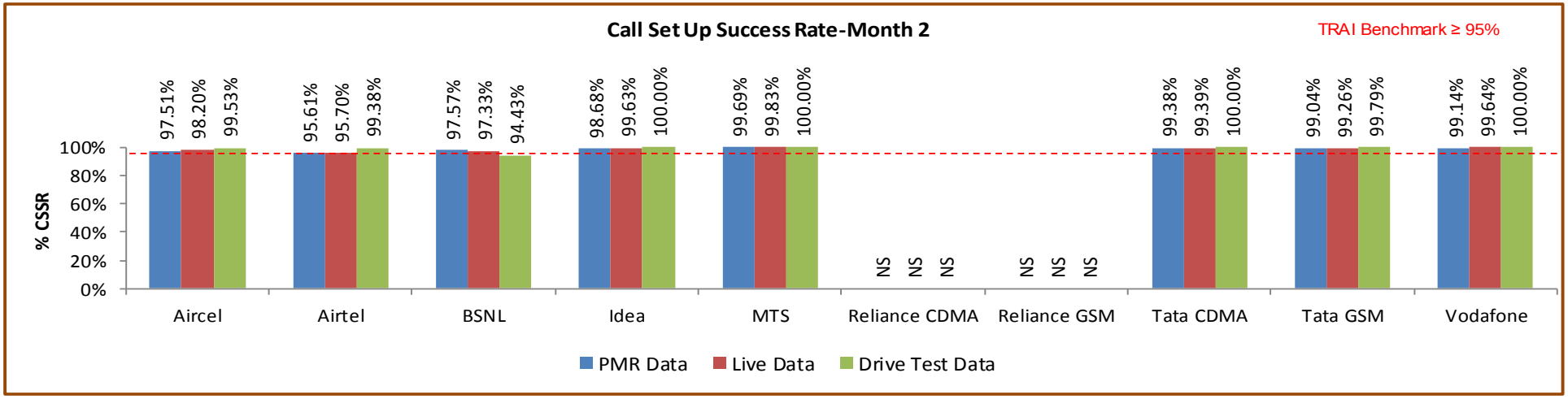
All operators met the TRAI benchmark as per audit/PMR and live data. During drive test BSNL failed to meet the TRAI benchmark.

5.3.2.1 KEY FINDINGS – MONTH 1



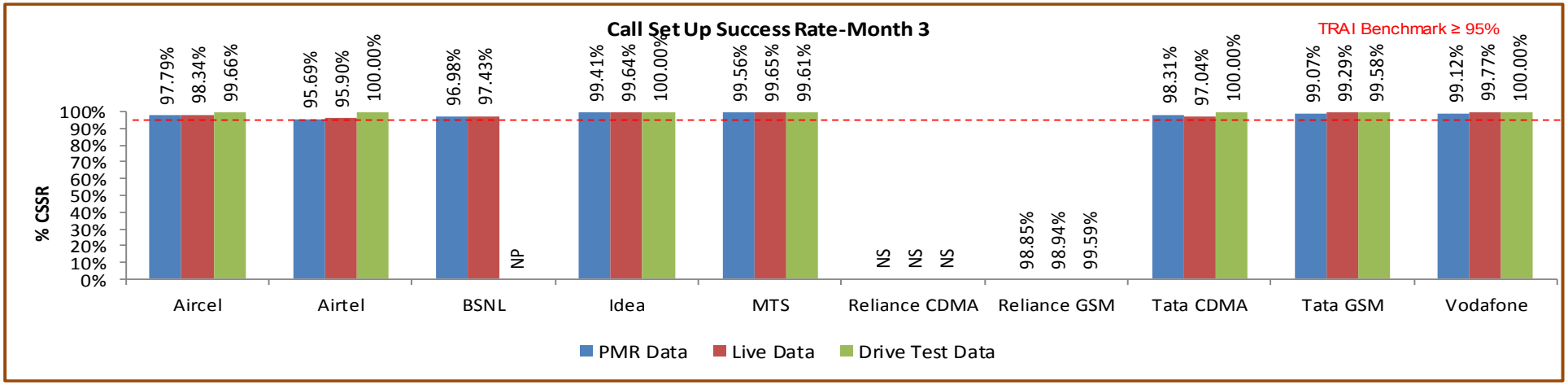
Data Source: Network Operations Center (NOC) of the operators

5.3.2.2 KEY FINDINGS – MONTH 2



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

5.3.2.3 KEY FINDINGS – MONTH 3



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

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

5.4.1 PARAMETER DESCRIPTION

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

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

2. **Computational Methodology:**

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

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

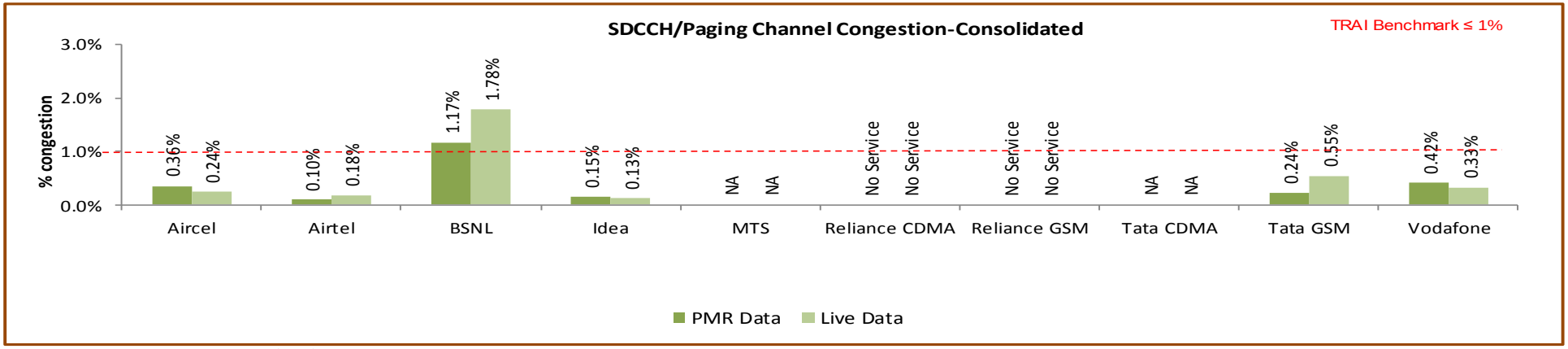
3. Benchmark:

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

4. Audit Procedure –

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

5.4.2 KEY FINDINGS - SDCCH/PAGING CHANNEL CONGESTION (CONSOLIDATED)



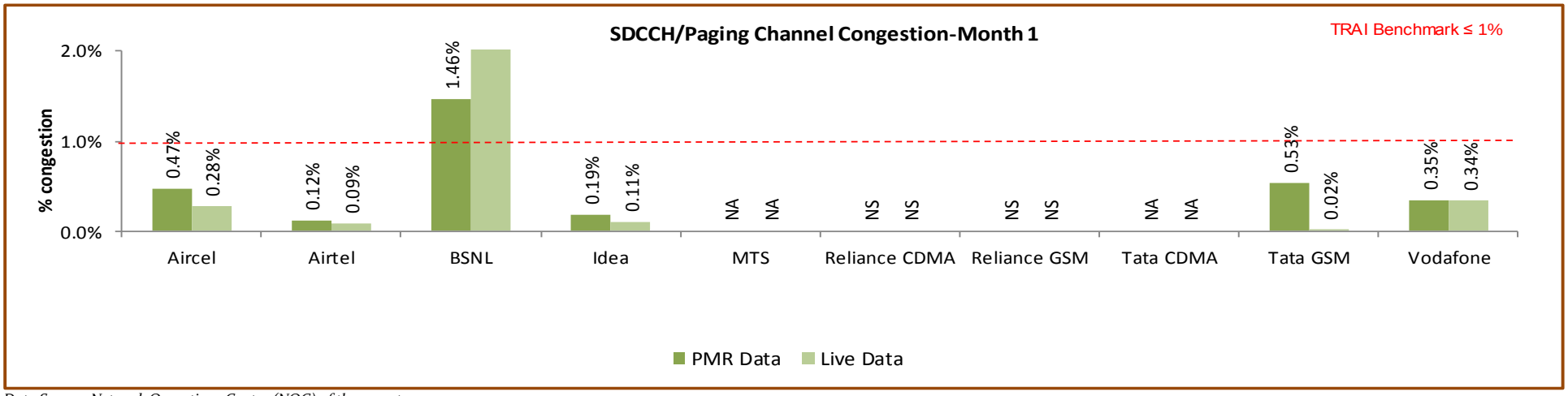
Data Source: Network Operations Center (NOC) of the operators

BSNL failed to meet the benchmark as per PMR and live audit.

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

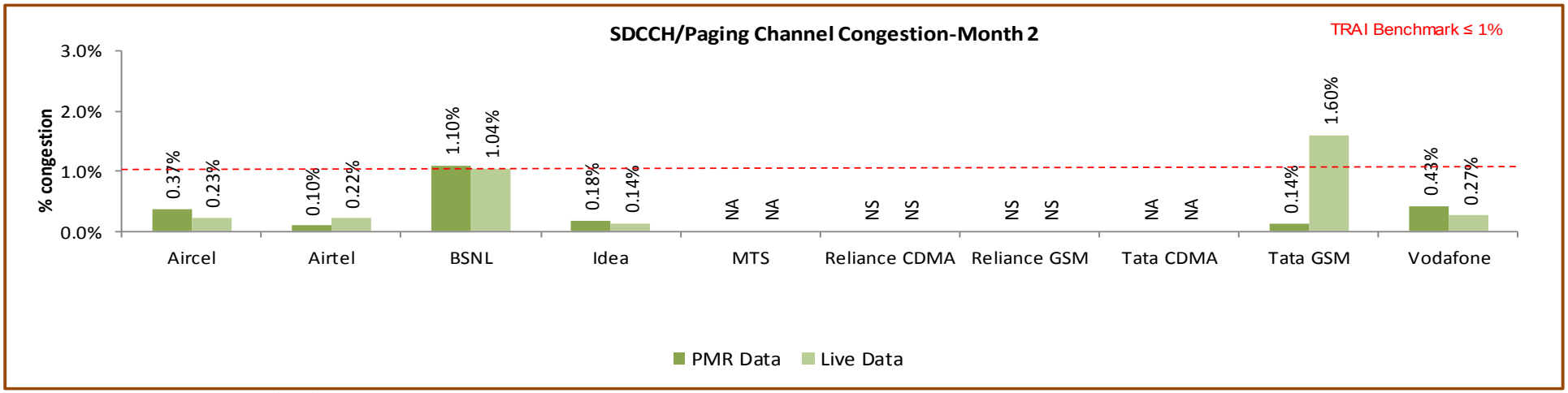
NA: SDCCH/ Paging channel congestion not applicable for CDMA operators.

5.4.2.1 KEY FINDINGS – MONTH 1



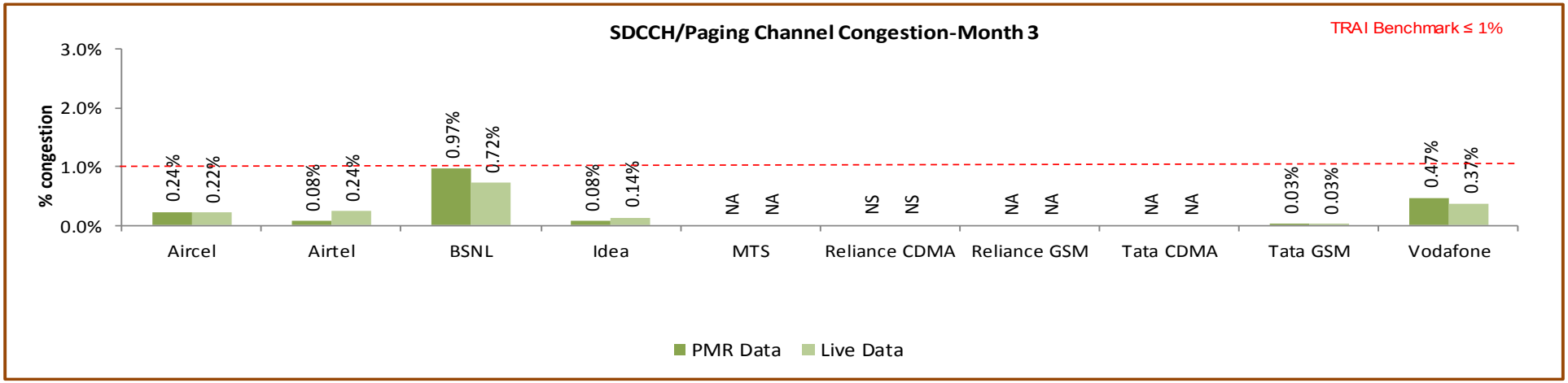
Data Source: Network Operations Center (NOC) of the operators

5.4.2.2 KEY FINDINGS – MONTH 2



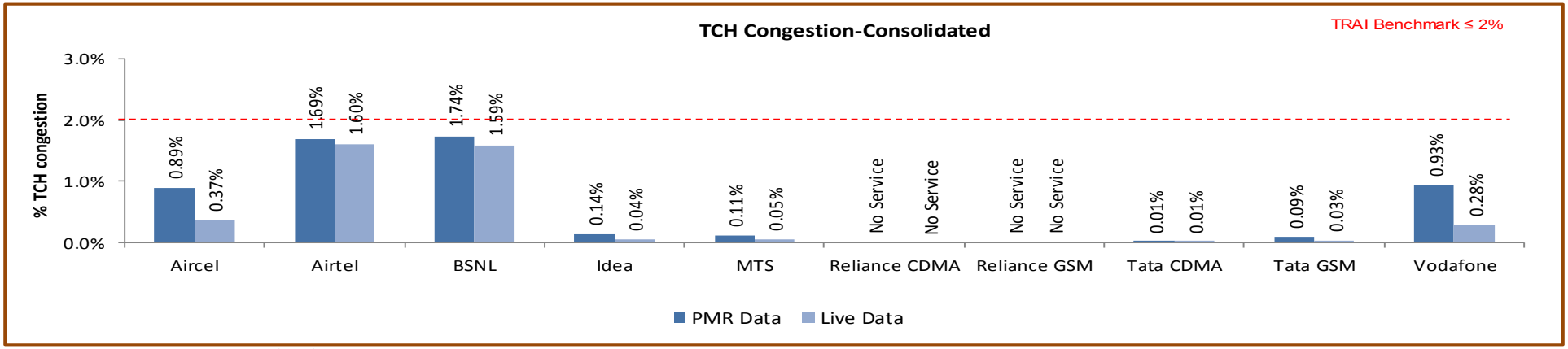
Data Source: Network Operations Center (NOC) of the operators

5.4.2.3 KEY FINDINGS – MONTH 3



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

5.4.3 KEY FINDINGS – TCH CONGESTION (CONSOLIDATED)

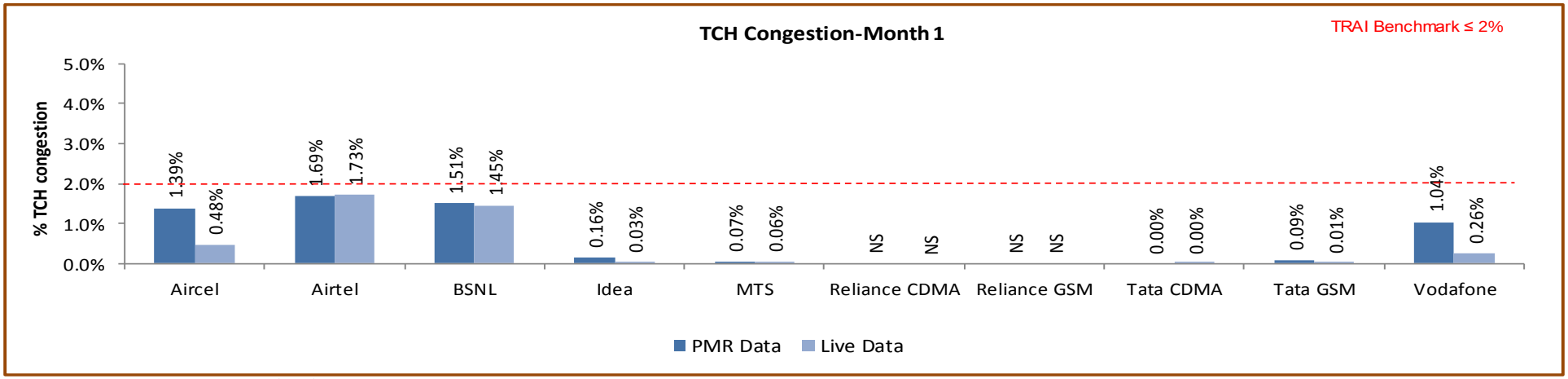


Data Source: Network Operations Center (NOC) of the operators

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

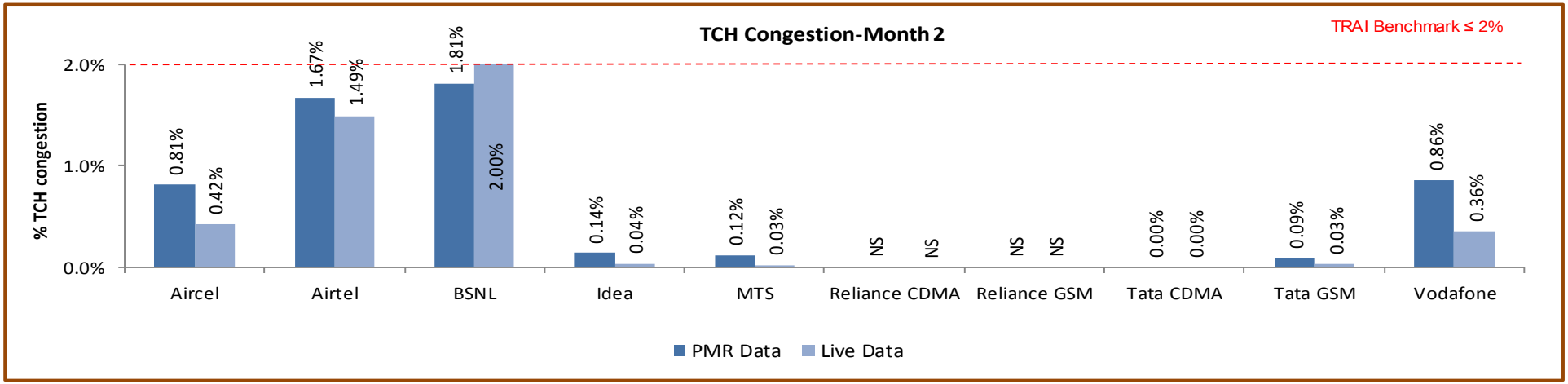
Significant difference was observed between PMR & live measurement data for Aircel, Airtel, BSNL and Vodafone. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for three days.

5.4.3.1 KEY FINDINGS – MONTH 1



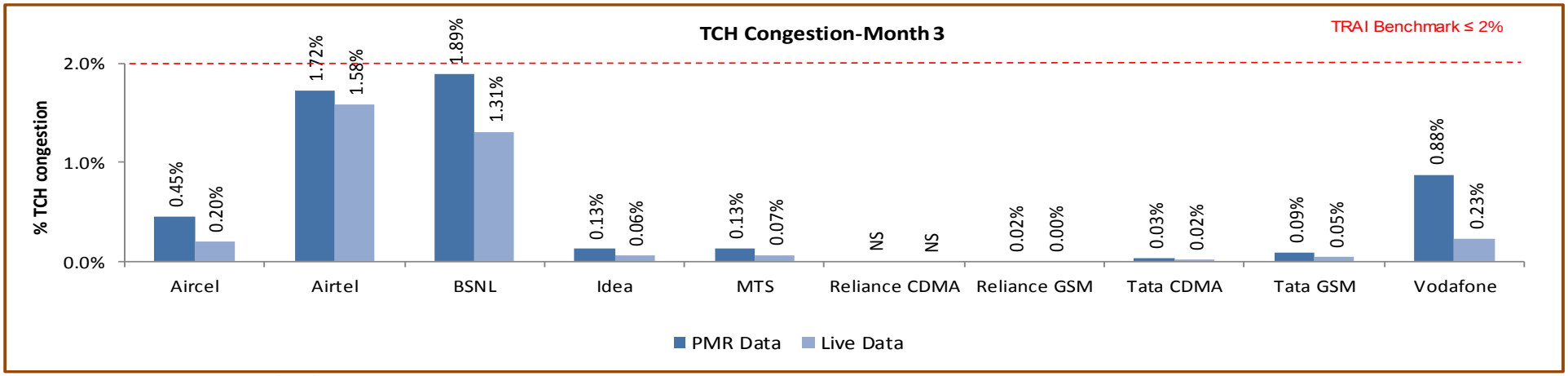
Data Source: Network Operations Center (NOC) of the operators

5.4.3.2 KEY FINDINGS – MONTH 2



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

5.4.3.3 KEY FINDINGS – MONTH 3



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

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

Audit Results for POI Congestion- PMR data											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total number of working POIs		67	40	77	149	53	No Service	No Service	45	20	48
No. of POIs not meeting benchmark		0	0	0	0	0	No Service	No Service	0	0	0
Total Capacity of all POIs (A) - in erlangs		251865	490812	412102	414728	160342	No Service	No Service	32442	19378	1123580
Traffic served for all POIs (B)- in erlangs		117514	291219	86200	243022	60427	No Service	No Service	3606	2553	629915
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	No Service	No Service	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total number of working POIs		67	40	77	149	53	No Service	No Service	45	20	48
No. of POIs not meeting benchmark		0	0	0	0	0	No Service	No Service	0	0	0
Total Capacity of all POIs (A) - in erlangs		251688	146226	412080	394183	160342	No Service	No Service	32412	19378	1122059
Traffic served for all POIs (B)- in erlangs		56335	87375	84805	241314	50819	No Service	No Service	1717	1135	268358
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	No Service	No Service	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.

5.4.4.1 KEY FINDINGS – MONTH 1

Audit Results for POI Congestion- PMR data-July											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total number of working POIs		67	40	78	150	53	NS	NS	45	20	49
No. of POIs not meeting benchmark		0	0	0	0	0	NS	NS	0	0	0
Total Capacity of all POIs (A) - in erlangs		82721	162721	137391	136715	53638	NS	NS	10769	6459	373484
Traffic served for all POIs (B)- in erlangs		40843	100805	28822	80891	20611	NS	NS	1243	915	214345
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	NS	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-July											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total number of working POIs		67	40	78	150	53	NS	NS	45	20	49
No. of POIs not meeting benchmark		0	0	0	0	0	NS	NS	0	0	0
Total Capacity of all POIs (A) - in erlangs		82703	48699	137391	135354	53638	NS	NS	10767	6459	372461
Traffic served for all POIs (B)- in erlangs		18864	29828	28707	79289	20609	NS	NS	558	382	90369
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	NS	0.00%	0.00%	0.00%

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

5.4.4.2 KEY FINDINGS – MONTH 2

Audit Results for POI Congestion- PMR data-August											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total number of working POIs		67	40	77	146	53	NS	NS	45	20	47
No. of POIs not meeting benchmark		0	0	0	0	0	NS	NS	0	0	0
Total Capacity of all POIs (A) - in erlangs		84340	164342	137391	138274	53638	NS	NS	10789	6459	374730
Traffic served for all POIs (B)- in erlangs		39258	98640	28703	80172	20055	NS	NS	1181	842	211770
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	NS	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-August											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total number of working POIs		67	40	77	146	53	NS	NS	45	20	47
No. of POIs not meeting benchmark		0	0	0	0	0	NS	NS	0	0	0
Total Capacity of all POIs (A) - in erlangs		84250	48867	137391	138202	53638	NS	NS	10794	6459	374705
Traffic served for all POIs (B)- in erlangs		18565	29222	27515	80082	20049	NS	NS	554	374	88037
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	NS	0.00%	0.00%	0.00%

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

5.4.4.3 KEY FINDINGS – MONTH 3

Audit Results for POI Congestion- PMR data-September											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total number of working POIs		67	40	77	150	53	NS	NS	45	20	49
No. of POIs not meeting benchmark		0	0	0	0	0	NS	NS	0	0	0
Total Capacity of all POIs (A) - in erlangs		84805	163748	137320	139739	53067	NS	NS	10885	6459	375365
Traffic served for all POIs (B)- in erlangs		37413	91775	28675	81959	19761	NS	NS	1182	795	203800
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	NS	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-September											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total number of working POIs		67	40	77	150	53	NS	NS	45	20	49
No. of POIs not meeting benchmark		0	0	0	0	0	NS	NS	0	0	0
Total Capacity of all POIs (A) - in erlangs		84736	48659	137298	120628	53067	NS	NS	10851	6459	374893
Traffic served for all POIs (B)- in erlangs		18906	28325	28583	81943	10161	NS	NS	606	378	89951
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	NS	0.00%	0.00%	0.00%

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

5.5 CALL DROP RATE

5.5.1 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**

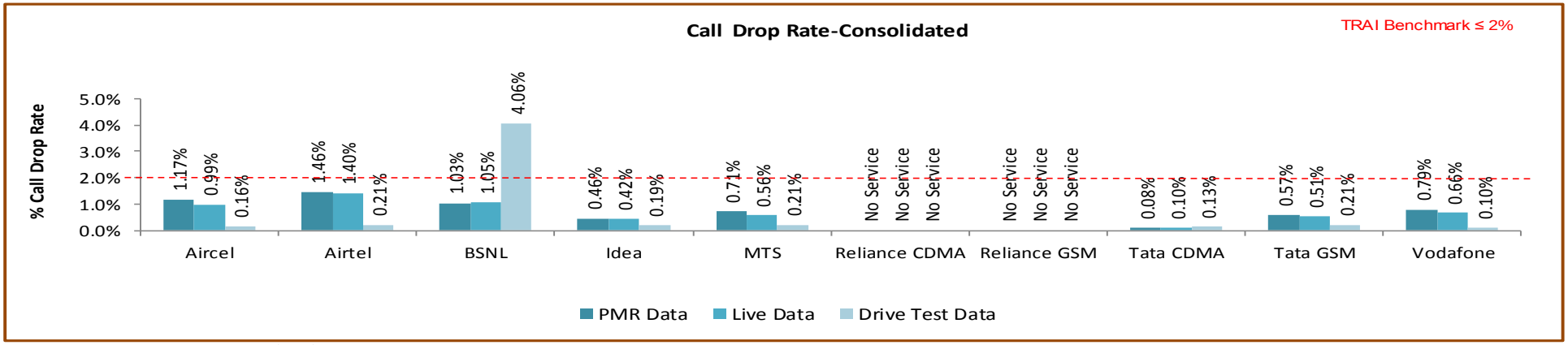
3. **TRAI Benchmark** –

   - 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.

5.5.2 KEY FINDINGS - CONSOLIDATED

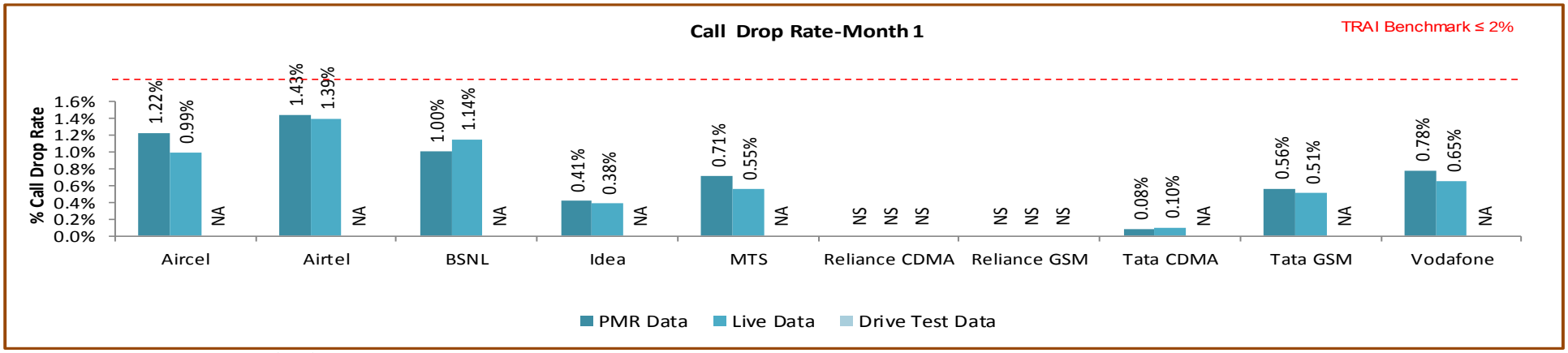


Data Source: Network Operations Center (NOC) of the operators

All operators met the benchmark for call drop rate during PMR and live audit. During drive test BSNL failed to meet the TRAI benchmark.

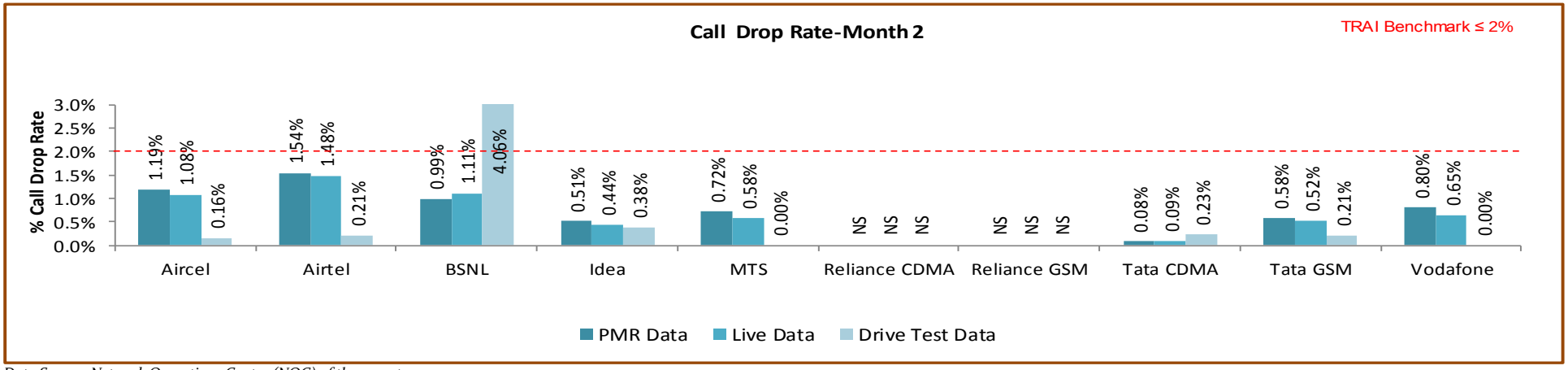
Significant difference was observed between PMR & live measurement data for Aircel, Airtel and BSNL. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for three days.

5.5.2.1 KEY FINDINGS – MONTH 1



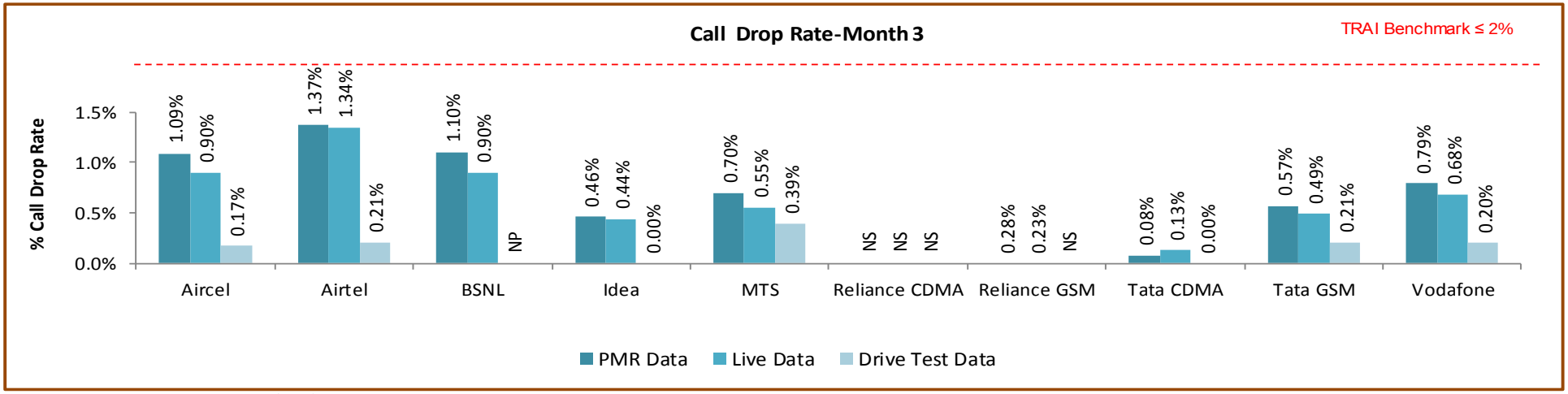
Data Source: Network Operations Center (NOC) of the operators

5.5.2.2 KEY FINDINGS – MONTH 2



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

5.5.2.3 KEY FINDINGS – MONTH 3



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

5.6 CELLS HAVING GREATER THAN 3% TCH DROP

5.6.1 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 –**

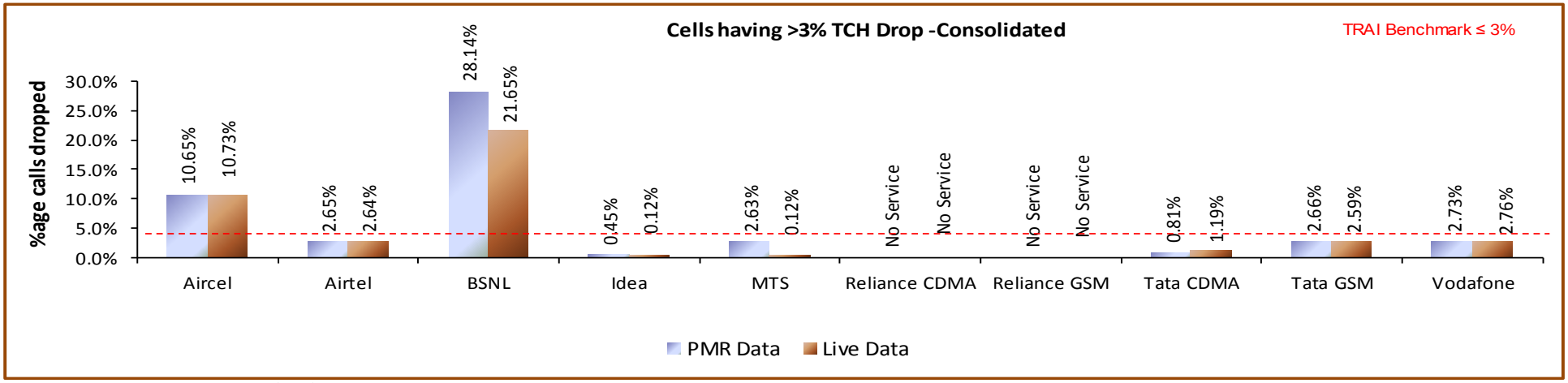
   - Worst affected cells having more than 3% TCH drop rate ≤ 3%

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.

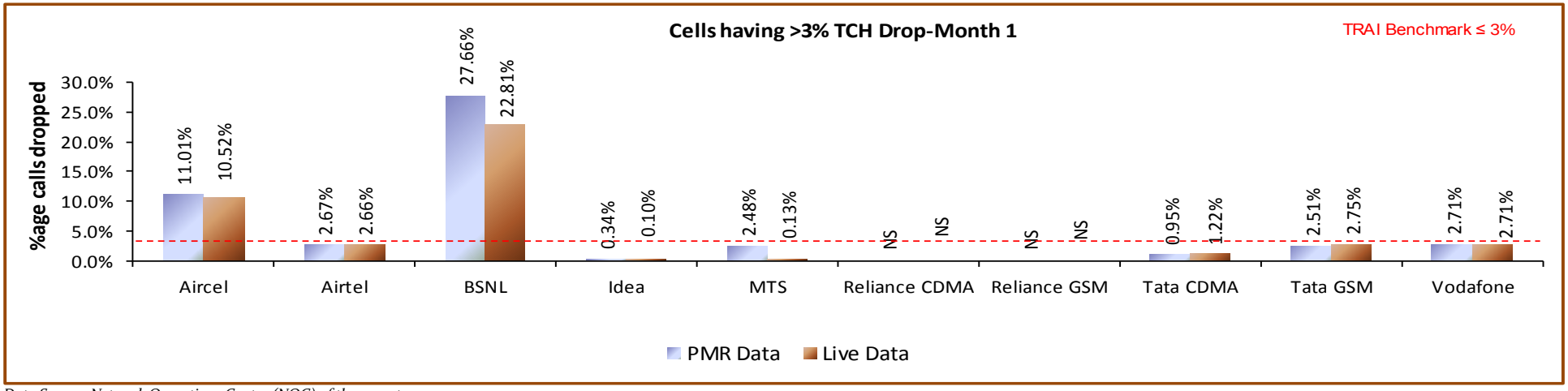
5.6.2 KEY FINDINGS - CONSOLIDATED



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

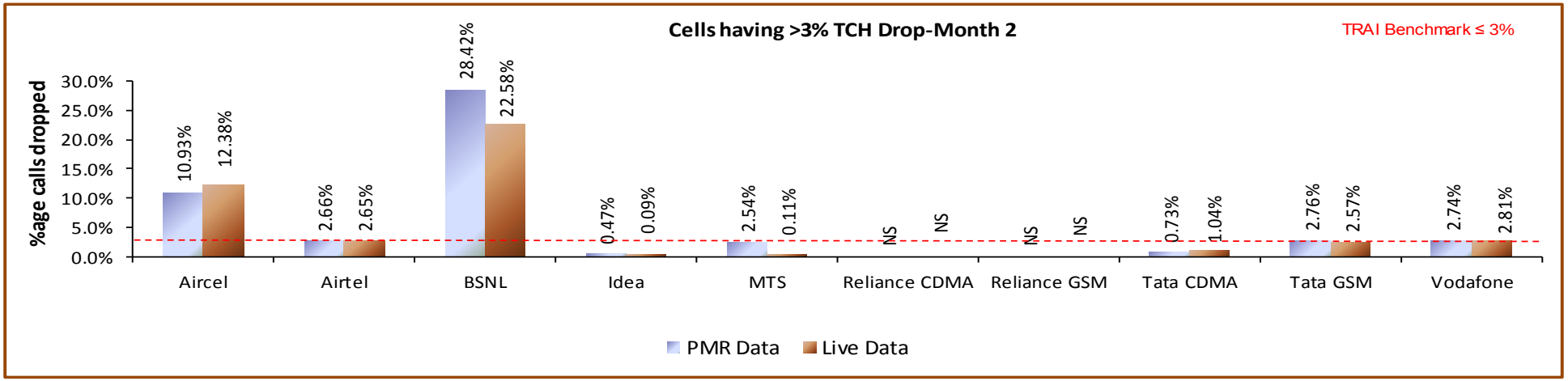
Aircel and BSNL failed to meet the benchmark for cells having >3% TCH drop rate.

5.6.2.1 KEY FINDINGS – MONTH 1



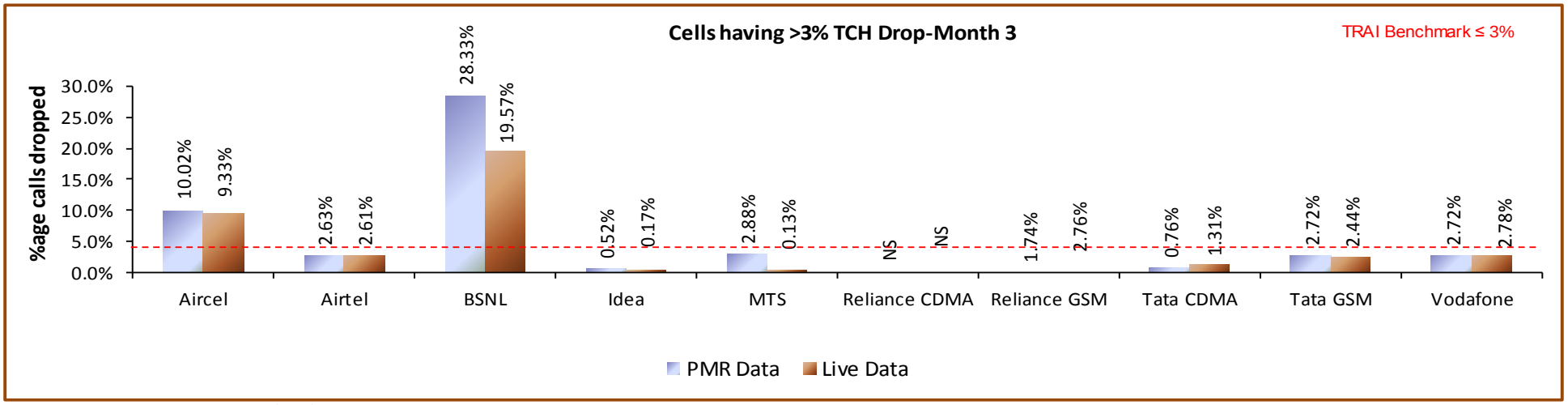
Data Source: Network Operations Center (NOC) of the operators

5.6.2.2 KEY FINDINGS – MONTH 2



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

5.6.2.3 KEY FINDINGS – MONTH 3



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

5.7 VOICE QUALITY

5.7.1 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**

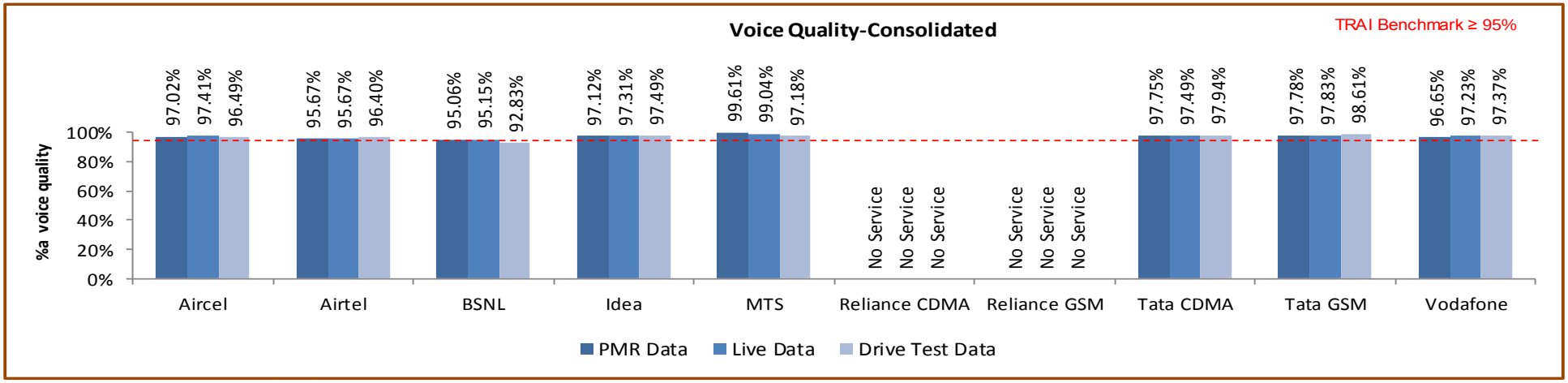
3. **TRAI Benchmark:** ≥ 95%

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.

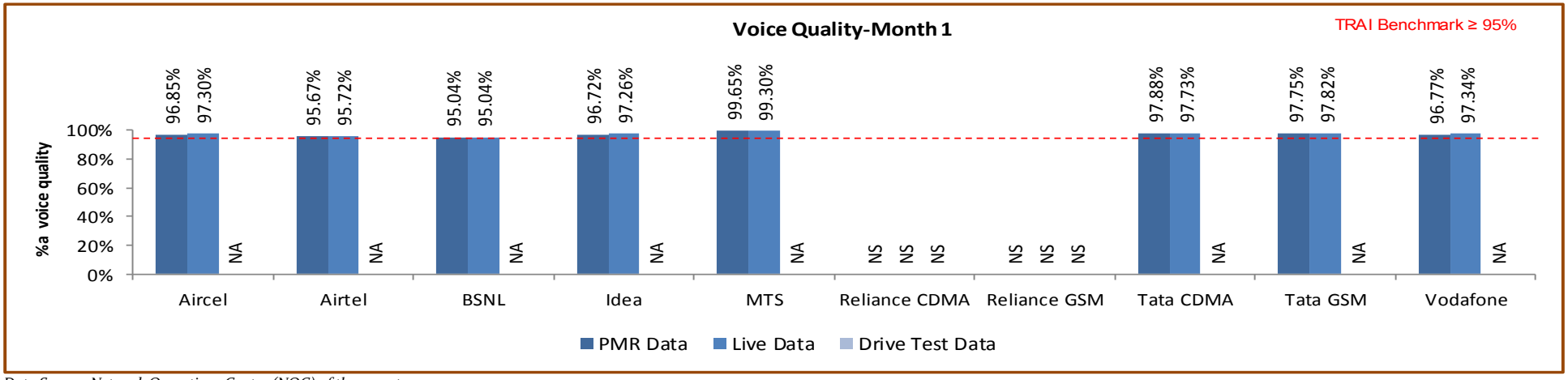
5.7.2 KEY FINDINGS



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

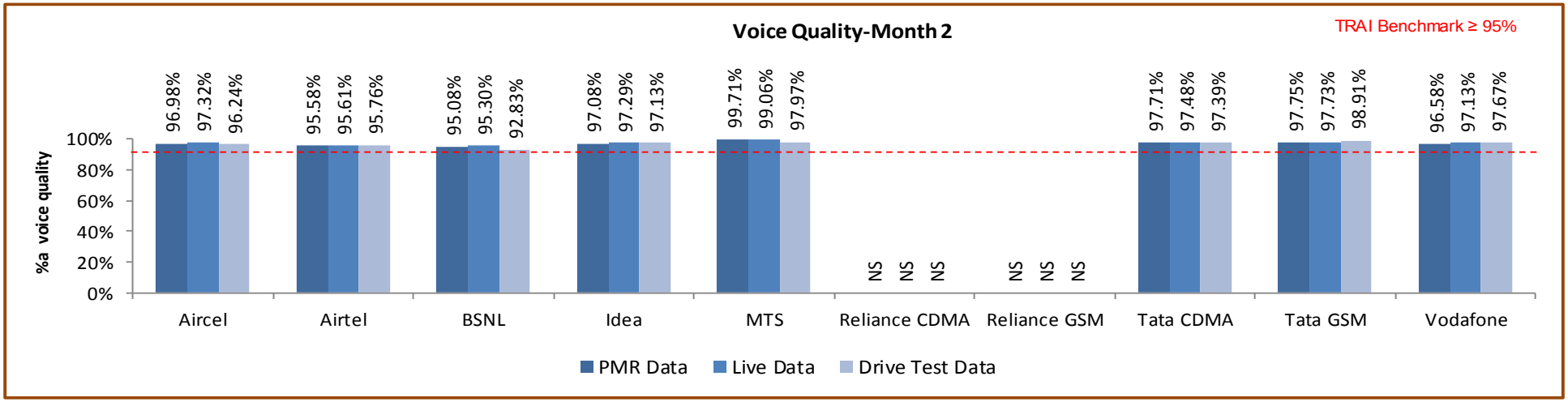
All operators met the benchmark for voice quality as per PMR and live data. During drive test BSNL failed to meet the benchmark for voice quality.

5.7.2.1 KEY FINDINGS – MONTH 1

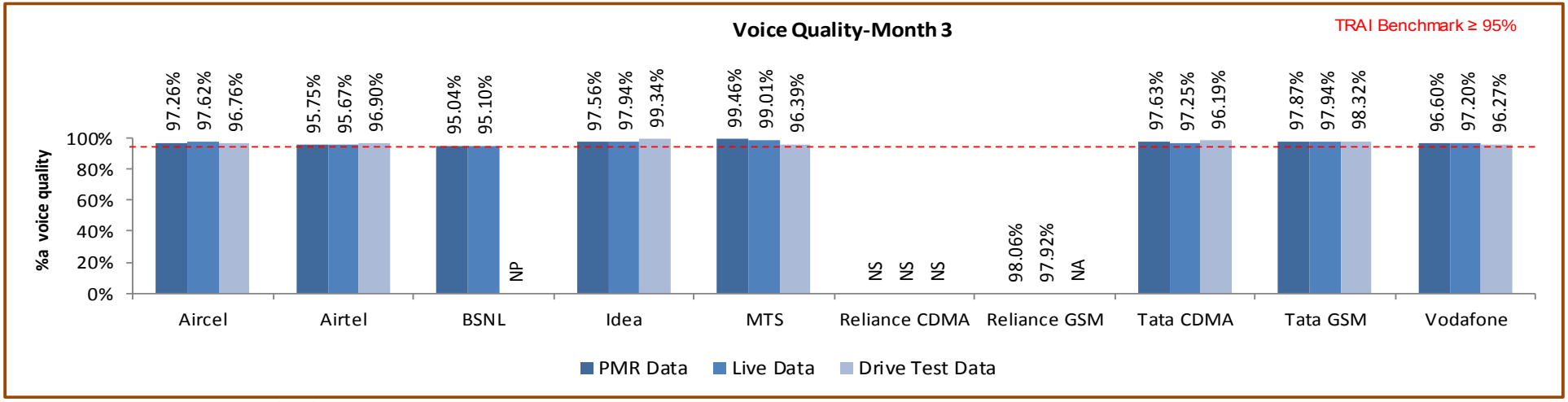


Data Source: Network Operations Center (NOC) of the operators

5.7.2.2 KEY FINDINGS – MONTH 2



5.7.2.3 KEY FINDINGS – MONTH 3



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

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

6.1 NODE BS DOWNTIME

6.1.1 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 –

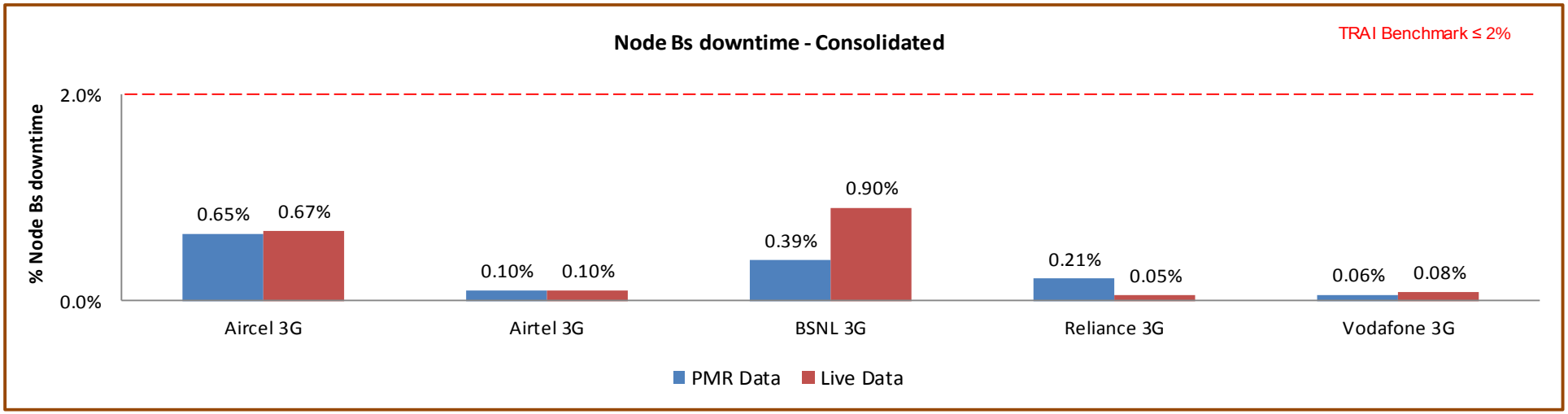
a. Node Bs downtime (not available for service) ≤ 2%

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.

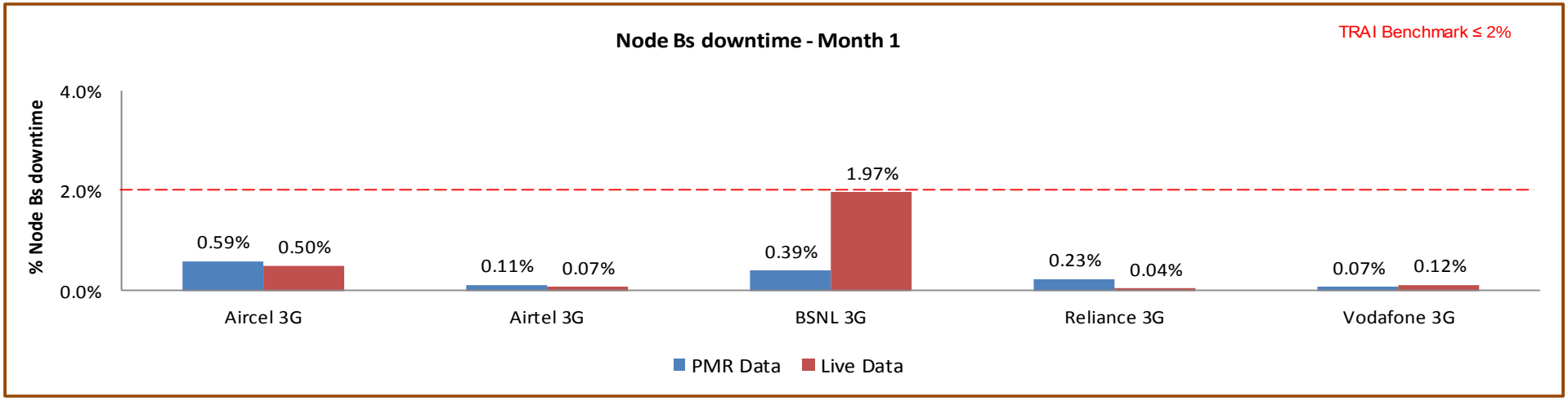
6.1.2 KEY FINDINGS - CONSOLIDATED



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

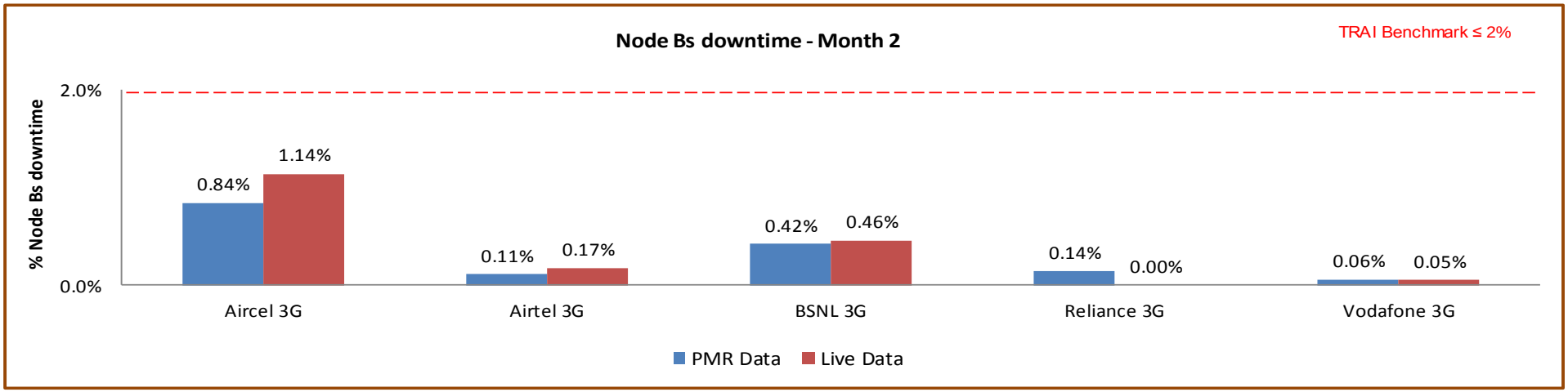
All operators met the benchmark in PMR as well as 3days live.

6.1.2.1 KEY FINDINGS – MONTH 1



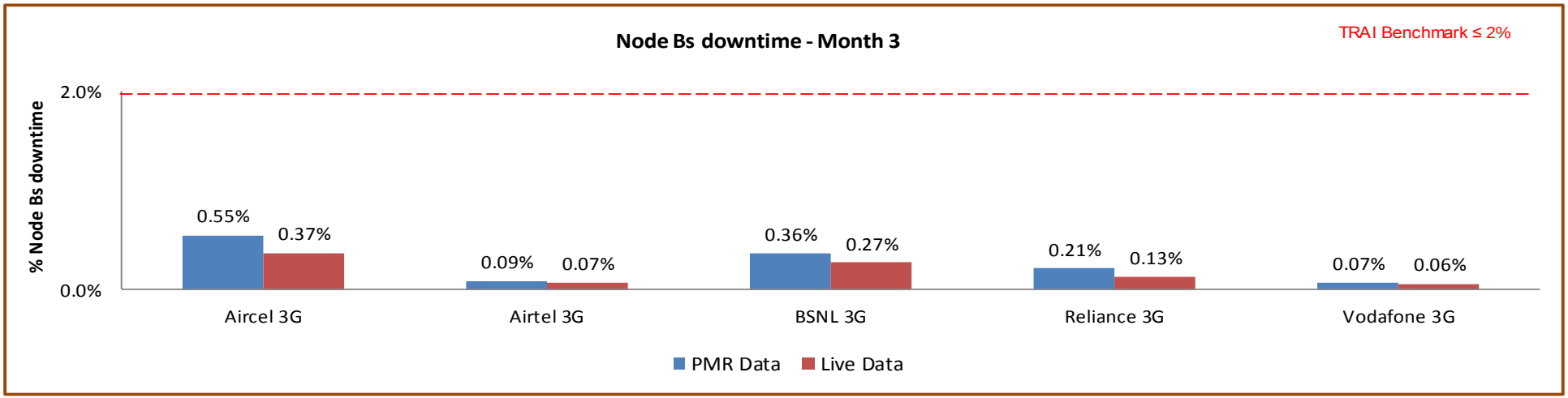
Data Source: Operations and Maintenance Center (OMC) of the operators

6.1.2.2 KEY FINDINGS – MONTH 2



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

6.1.2.3 KEY FINDINGS – MONTH 3



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

6.2 WORST AFFECTED NODE BS DUE TO DOWNTIME

6.2.1 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.

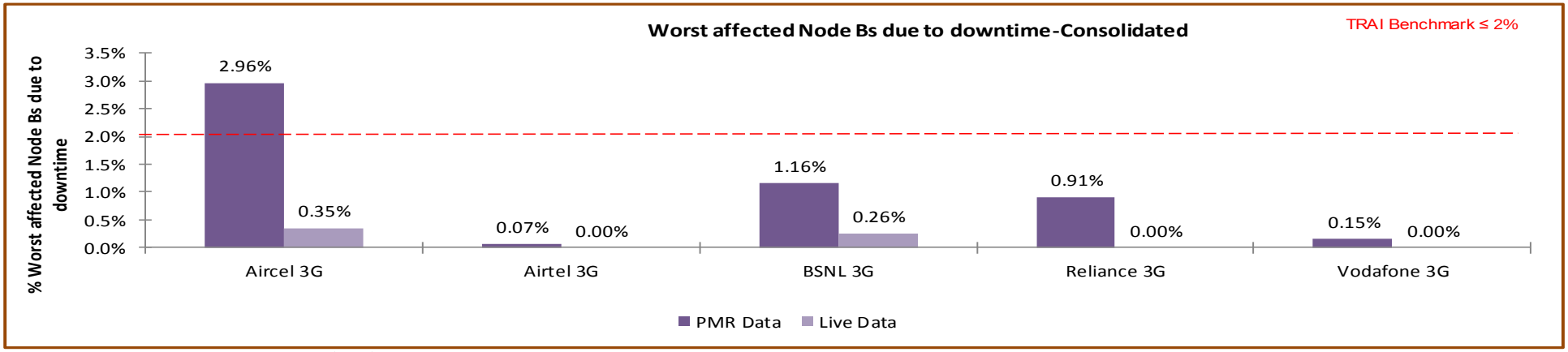
  iii. Data is extracted from system log of the server of the operator. This data is in raw format which is further processed to arrive at the cumulative values.

  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.

6.2.2 KEY FINDINGS – CONSOLIDATED

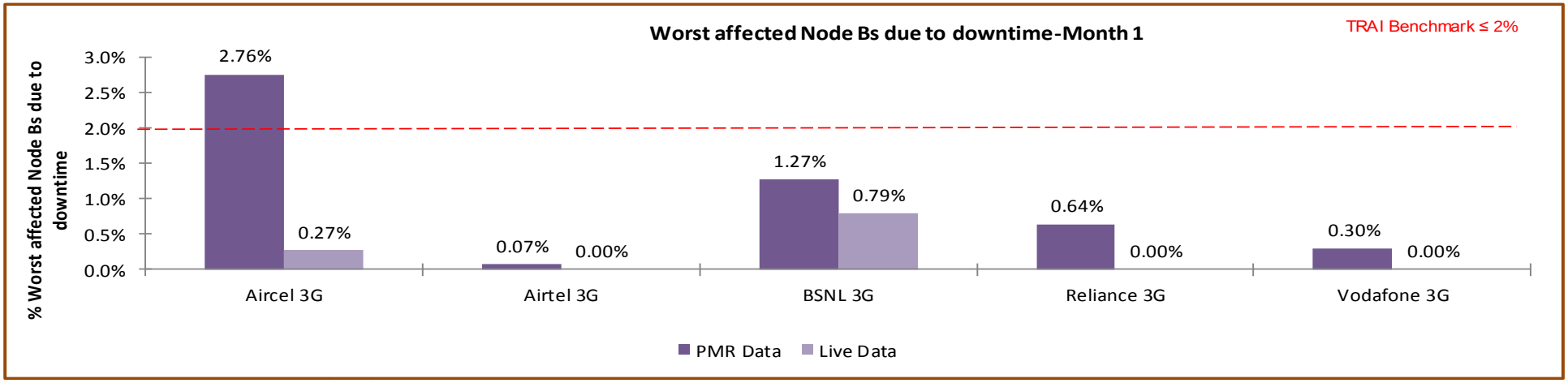


Data Source: Operations and Maintenance Center (OMC) of the operators

Aircel 3G did not meet the benchmark for worst affected Node Bs due to downtime as per PMR audit.

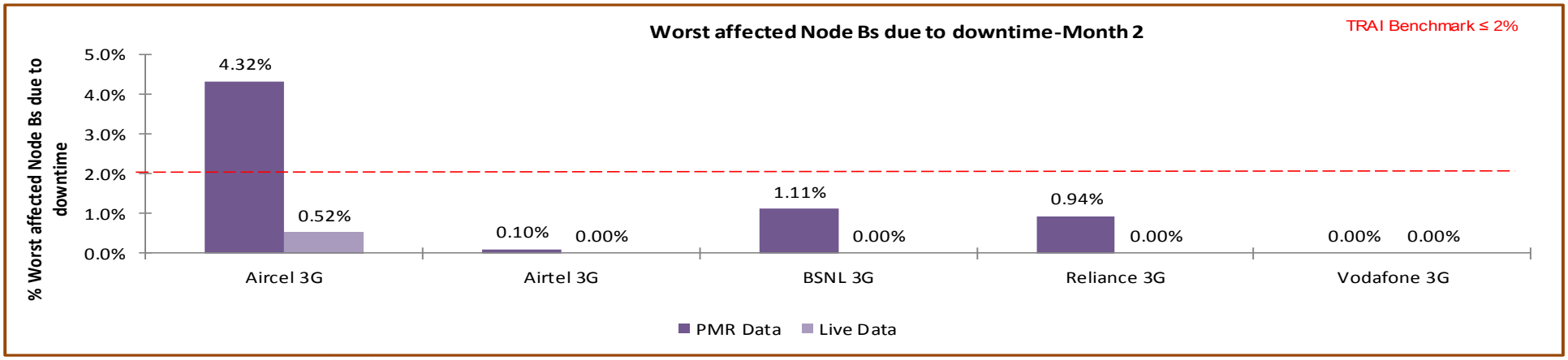
Significant difference was observed between PMR & live measurement data for Aircel 3G, Reliance 3G and BSNL 3G. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for three days.

6.2.2.1 KEY FINDINGS – MONTH 1



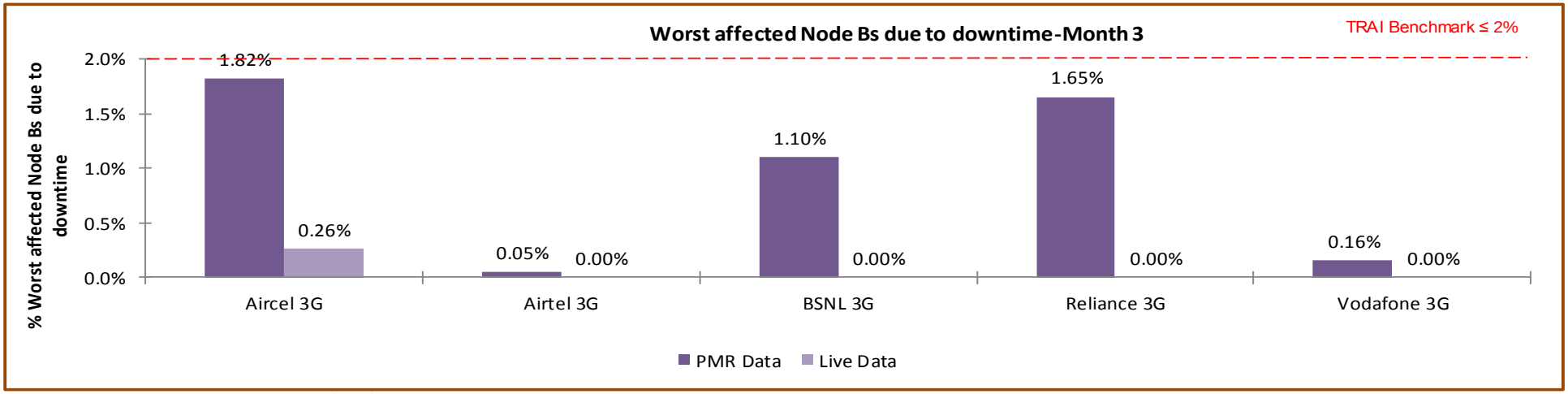
Data Source: Operations and Maintenance Center (OMC) of the operators

6.2.2.2 KEY FINDINGS – MONTH 2



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

6.2.2.3 KEY FINDINGS – MONTH 3



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

6.3 CALL SET UP SUCCESS RATE

6.3.1 PARAMETER DESCRIPTION

1. **Definition:** 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

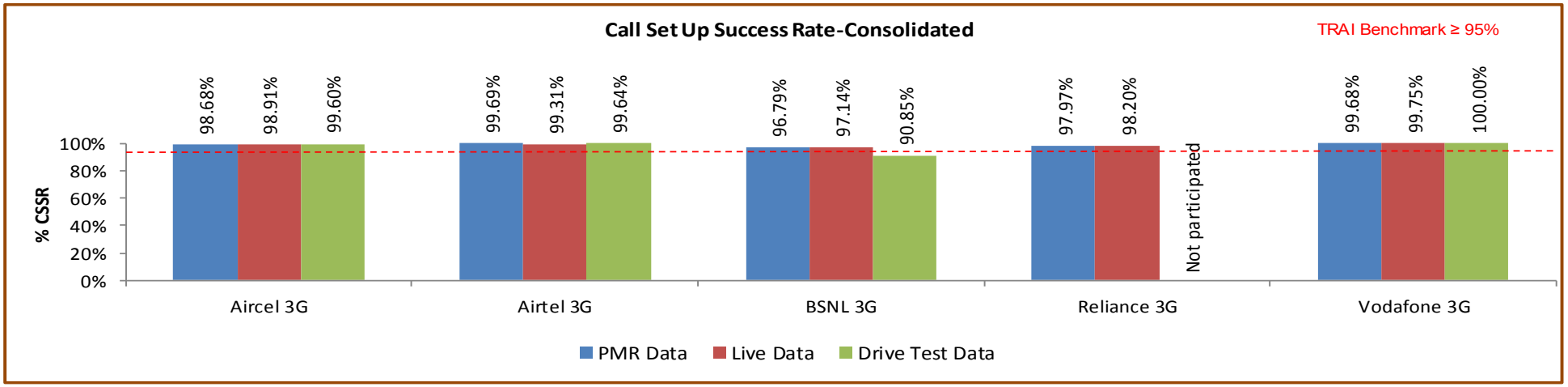
5. **TRAI Benchmark ≥** 95%

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.

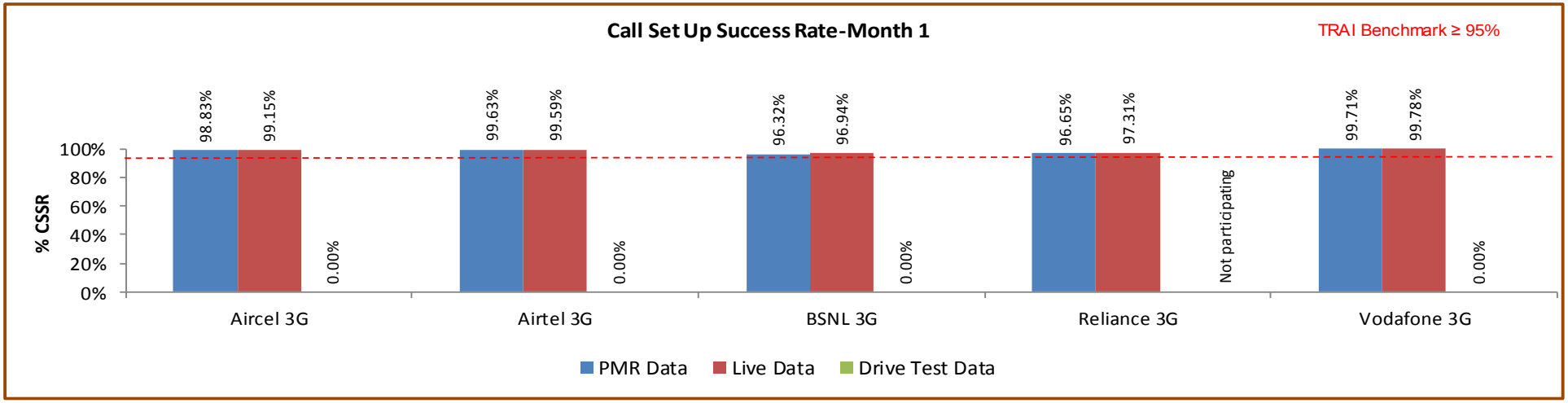
6.3.2 KEY FINDINGS - CONSOLIDATED



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

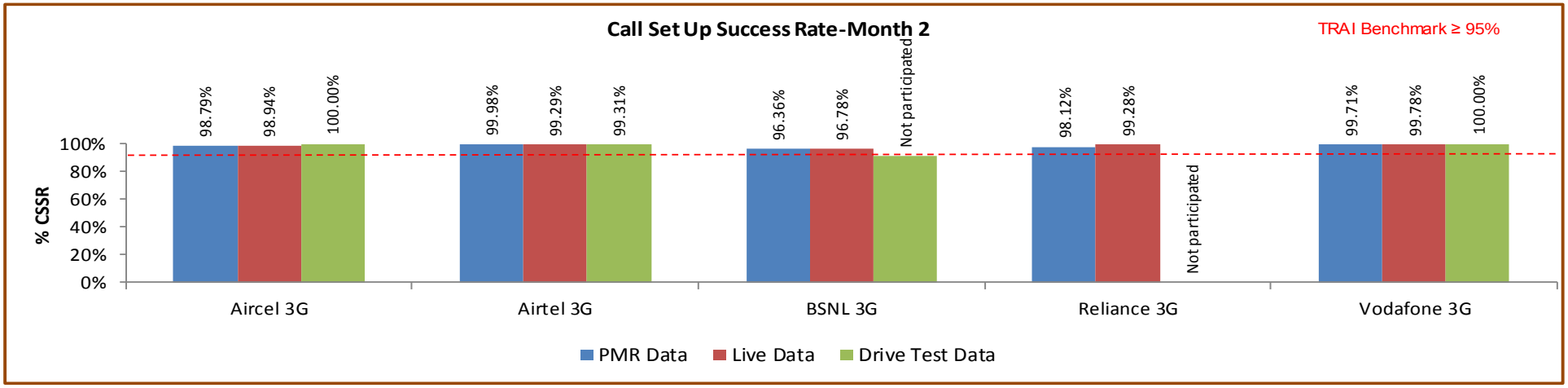
All operators met the TRAI benchmark as per audit/PMR data. During drive test BSNL 3G failed to meet the TRAI benchmark for CSSR.

6.3.2.1 KEY FINDINGS – MONTH 1



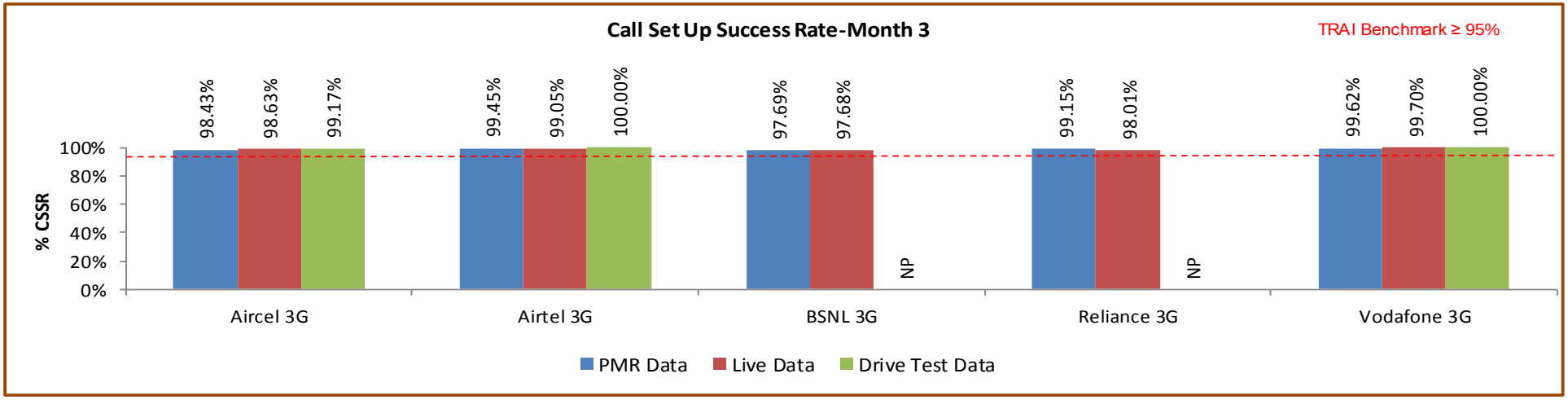
Data Source: Network Operations Center (NOC) of the operators

6.3.2.2 KEY FINDINGS – MONTH 2



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

6.3.2.3 KEY FINDINGS – MONTH 3



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

6.4 NETWORK CHANNEL CONGESTION- RRC CONGESTION/ CIRCUIT SWITCHED RAB CONGESTION

6.4.1 PARAMETER DESCRIPTION

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

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

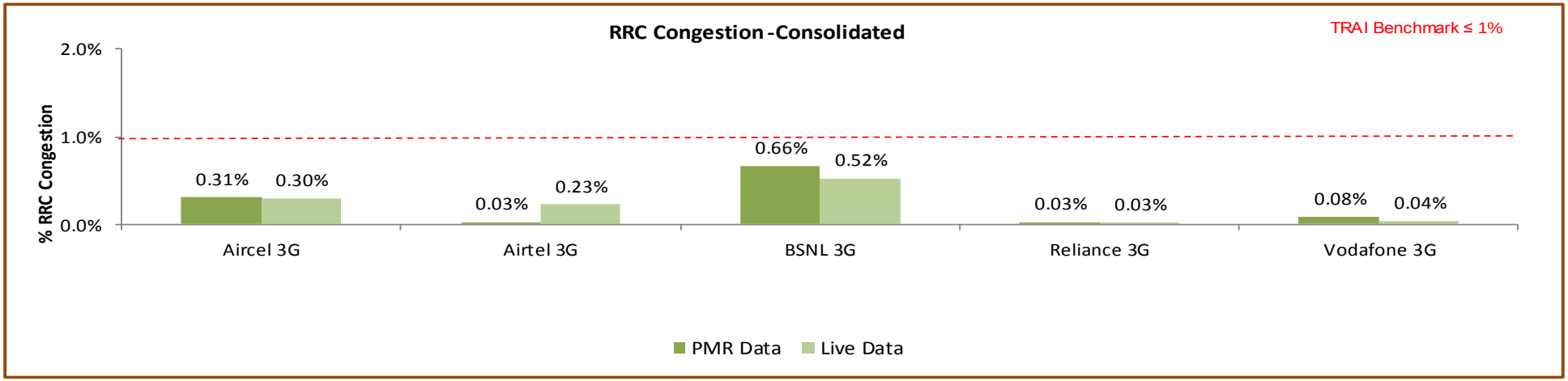
7. Benchmark:

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

8. Audit Procedure –

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

6.4.2 KEY FINDINGS - RRC CONGESTION (CONSOLIDATED)

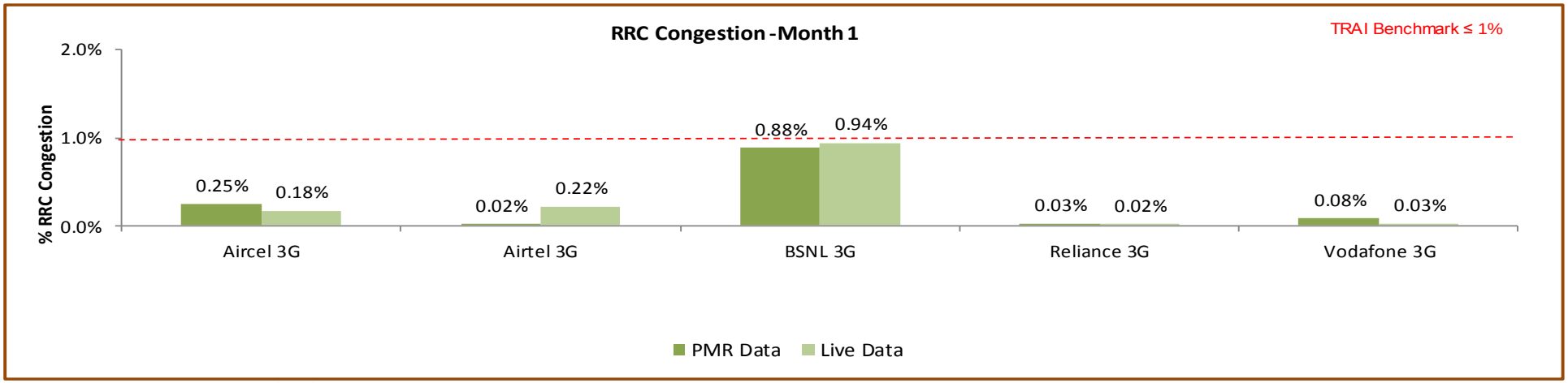


Data Source: Network Operations Center (NOC) of the operators

All operators met the benchmark for RRC congestion.

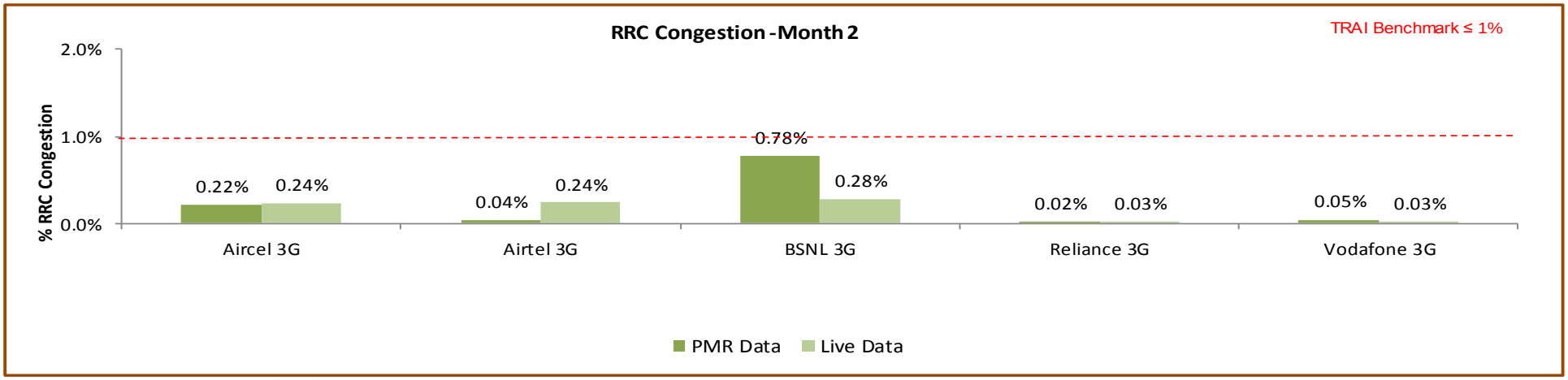
Significant difference was observed between PMR & live measurement data for Airtel 3G and BSNL 3G. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for three days.

6.4.2.1 KEY FINDINGS – MONTH 1



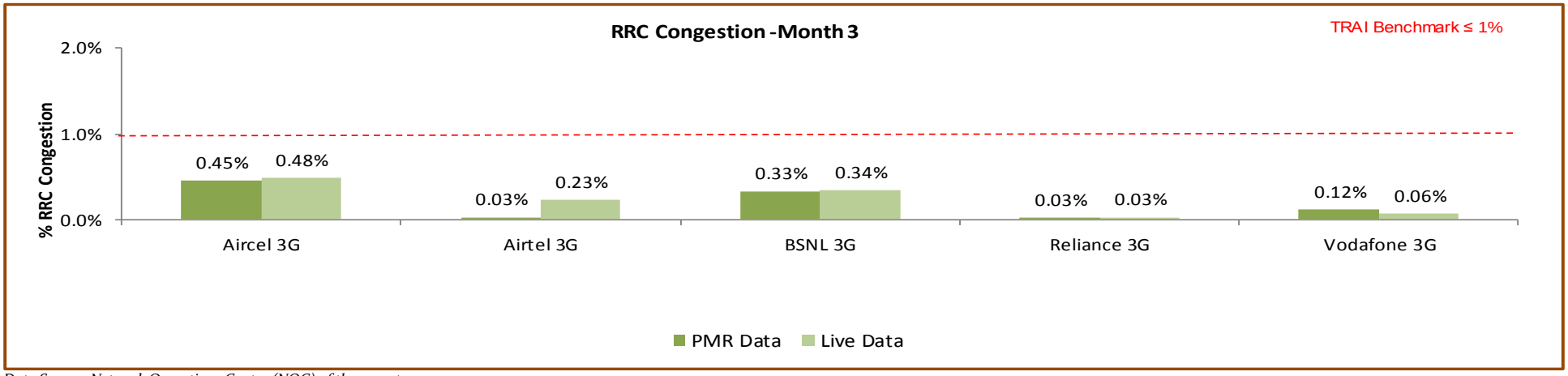
Data Source: Network Operations Center (NOC) of the operators

6.4.2.2 KEY FINDINGS – MONTH 2



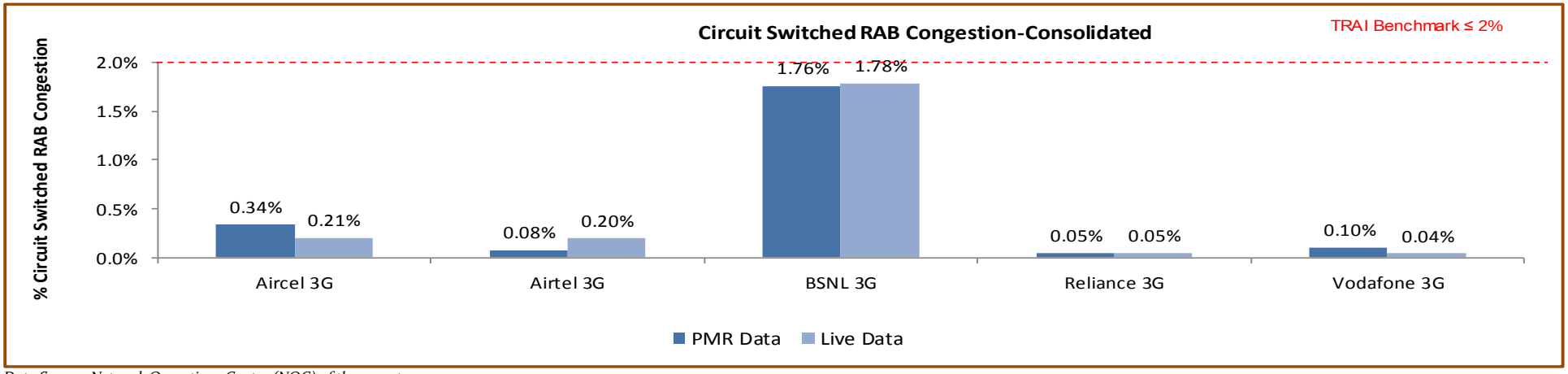
Data Source: Network Operations Center (NOC) of the operators

6.4.2.3 KEY FINDINGS – MONTH 3



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

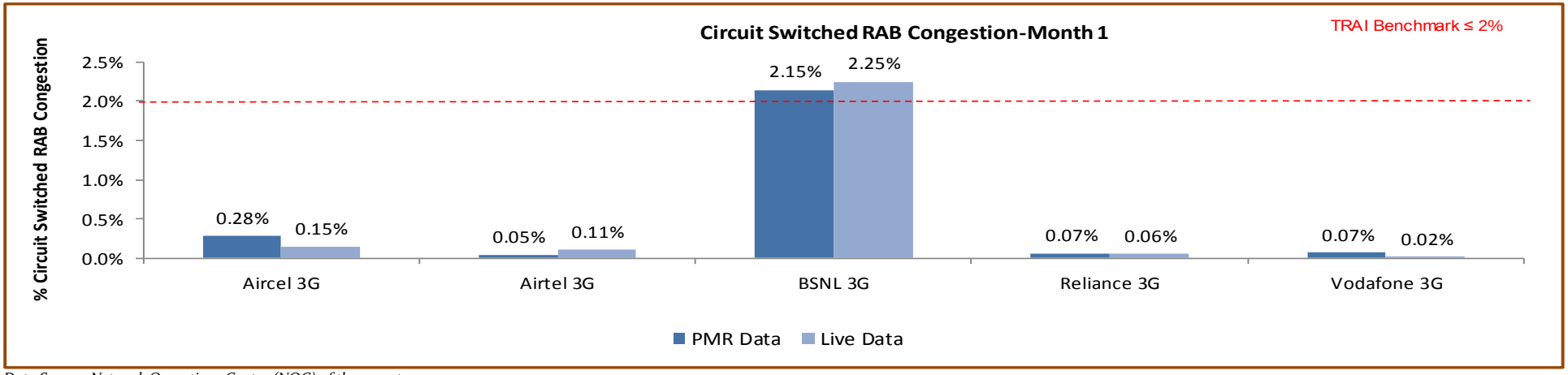
6.4.3 KEY FINDINGS – CIRCUIT SWITCHED RAB CONGESTION (CONSOLIDATED)



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

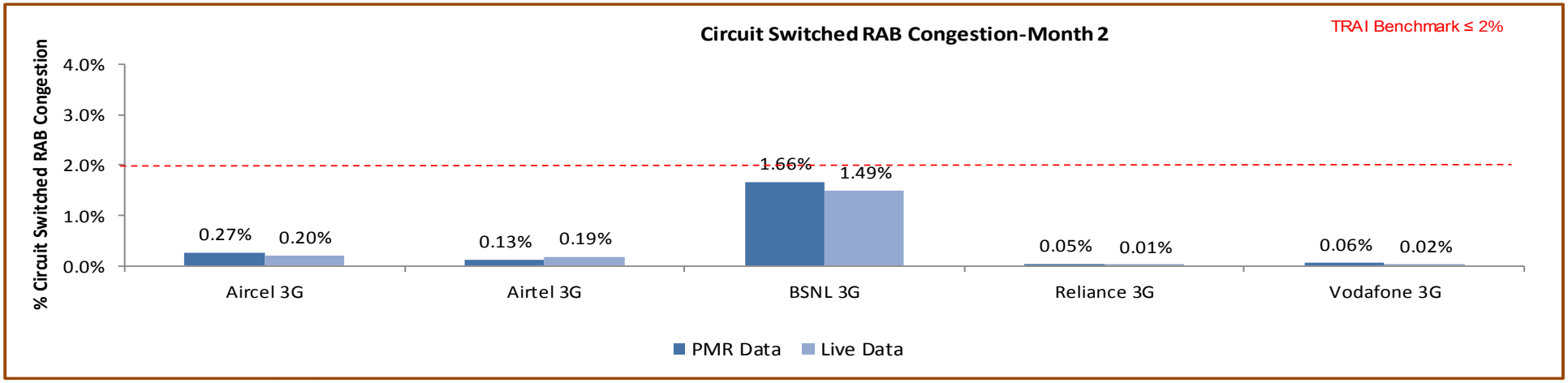
All operators met the benchmark as per audit/PMR and live report.

6.4.3.1 KEY FINDINGS – MONTH 1



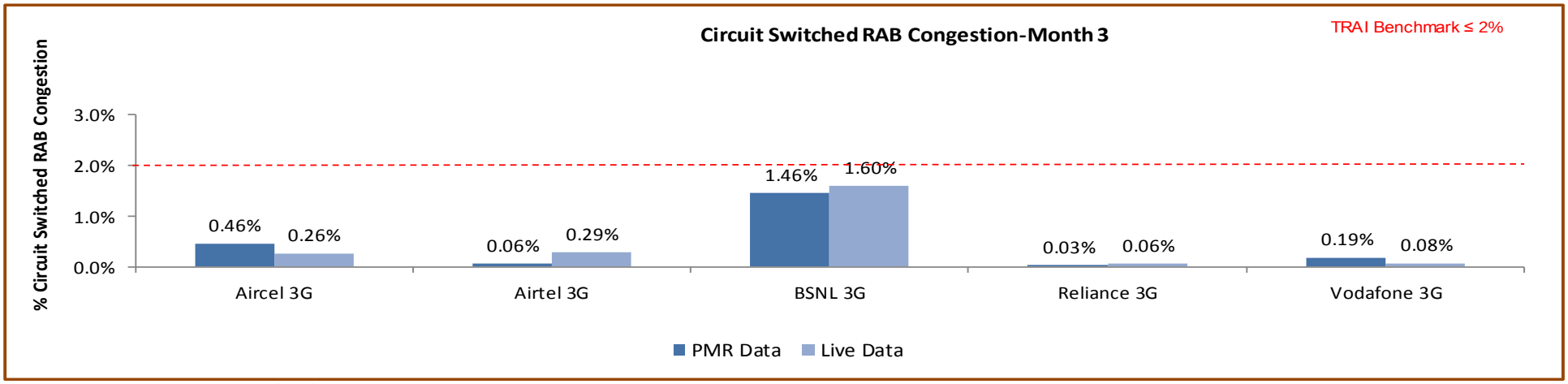
Data Source: Network Operations Center (NOC) of the operators

6.4.3.2 KEY FINDINGS – MONTH 2



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

6.4.3.3 KEY FINDINGS – MONTH 3



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

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

Audit Results for POI Congestion- PMR data						
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
Total number of working POIs		67	40	77	41	48
No. of POIs not meeting benchmark		0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		251865	490812	412102	71857	1123580
Traffic served for all POIs (B)- in erlangs		117514	291219	86200	9186	629915
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data						
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
Total number of working POIs		67	40	77	41	48
No. of POIs not meeting benchmark		0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		250888	146226	412080	71857	1121959
Traffic served for all POIs (B)- in erlangs		56335	87375	84705	8944	268358
POI congestion	≤ 0.5%	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-July						
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
Total number of working POIs		67	40	78	41	49
No. of POIs not meeting benchmark		0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		82721	162721	137391	23952	373484
Traffic served for all POIs (B)- in erlangs		40843	100805	28822	3167	214345
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-July						
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
Total number of working POIs		67	40	78	41	49
No. of POIs not meeting benchmark		0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		82703	48699	137391	23952	372461
Traffic served for all POIs (B)- in erlangs		18864	29828	28707	3123	90369
POI congestion	≤ 0.5%	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-August						
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
Total number of working POIs		67	40	77	41	47
No. of POIs not meeting benchmark		0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		84340	164342	137391	23952	374730
Traffic served for all POIs (B)- in erlangs		39258	98640	28703	3081	211770
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-August						
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
Total number of working POIs		67	40	77	41	47
No. of POIs not meeting benchmark		0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		83450	48867	137391	23952	374605
Traffic served for all POIs (B)- in erlangs		18565	29222	27515	2930	88037
POI congestion	≤ 0.5%	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-September						
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
Total number of working POIs		67	40	77	41	49
No. of POIs not meeting benchmark		0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		84805	163748	137320	23952	375365
Traffic served for all POIs (B)- in erlangs		37413	91775	28675	2938	203800
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-September						
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
Total number of working POIs		67	40	77	41	49
No. of POIs not meeting benchmark		0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		84736	48659	137298	23952	374893
Traffic served for all POIs (B)- in erlangs		18906	28325	28483	2890	89951
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%

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

6.5 CIRCUIT SWITCHED VOICE DROP RATE

6.5.1 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

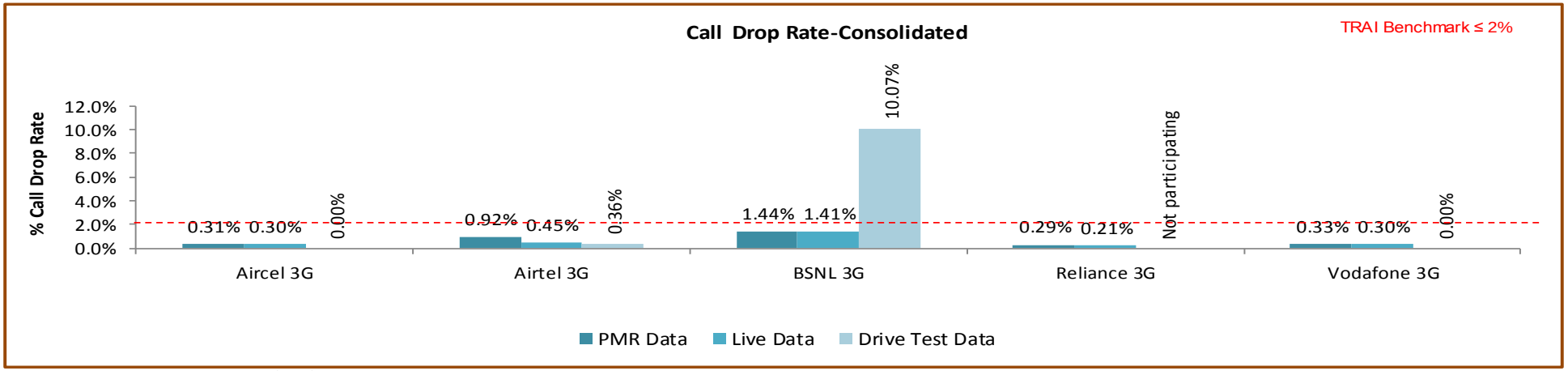
5. **TRAI Benchmark –**

   - 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.

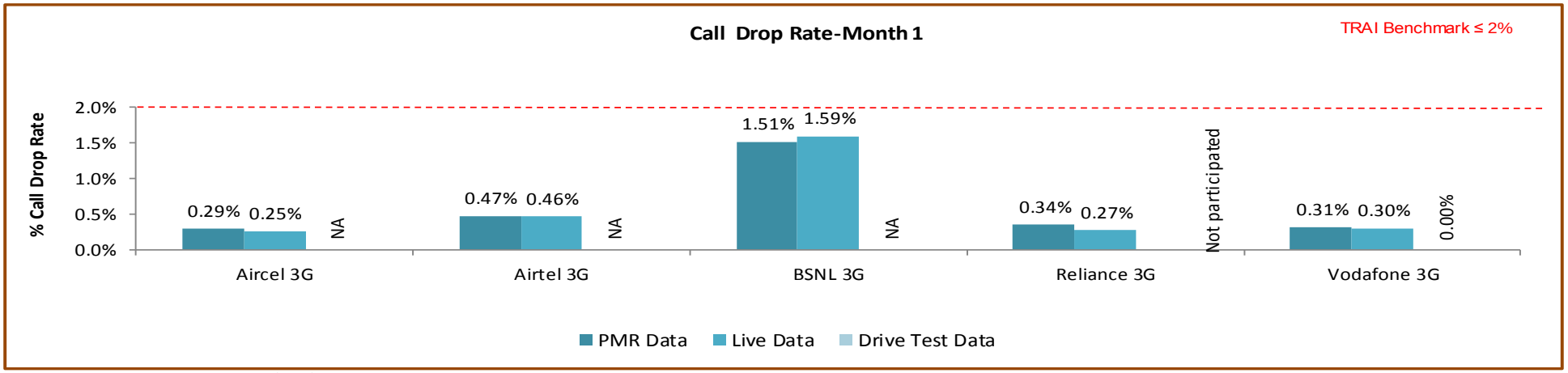
6.5.2 KEY FINDINGS - CONSOLIDATED



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

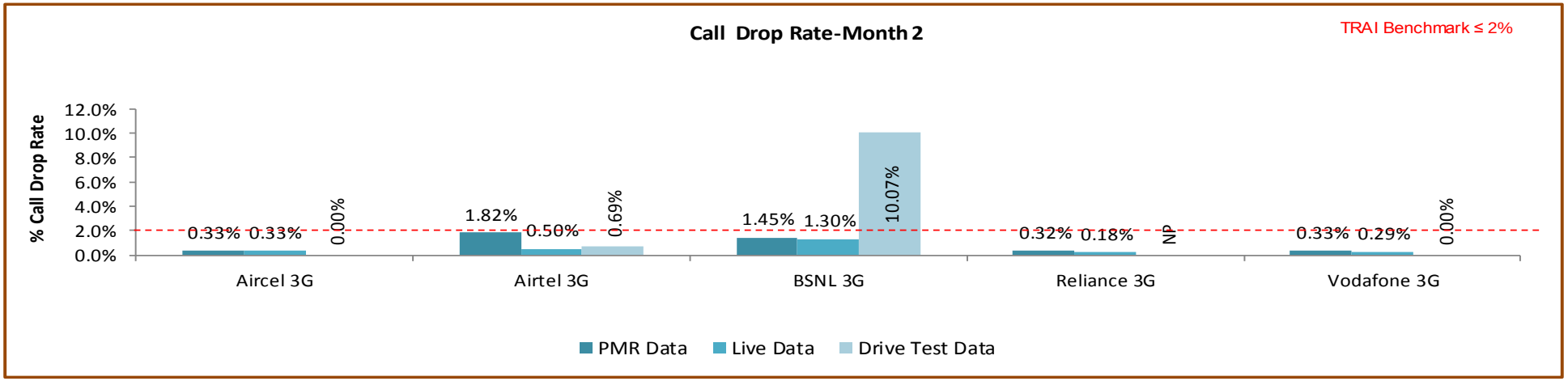
All operators met the benchmark for circuit switched voice drop rate as per audit. During drive test BSNL 3G failed to meet the benchmark.

6.5.2.1 KEY FINDINGS – MONTH 1



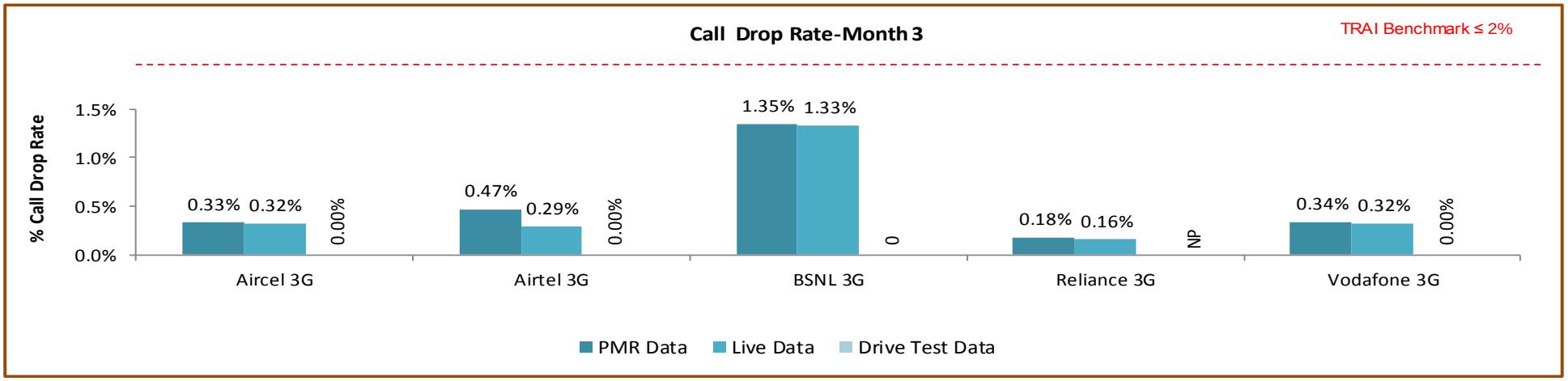
Data Source: Network Operations Center (NOC) of the operators

6.5.2.2 KEY FINDINGS – MONTH 2



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

6.5.2.3 KEY FINDINGS – MONTH 3



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

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

6.6.1 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** –

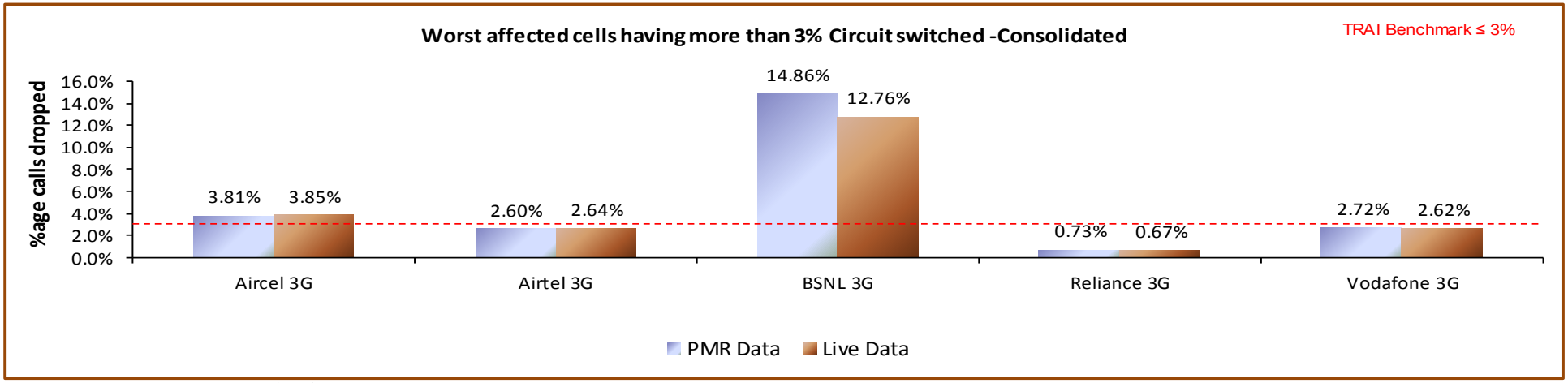
   - Worst affected cells having CSV drop rate > 3% during CBBH in a month ≤ 3%

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.

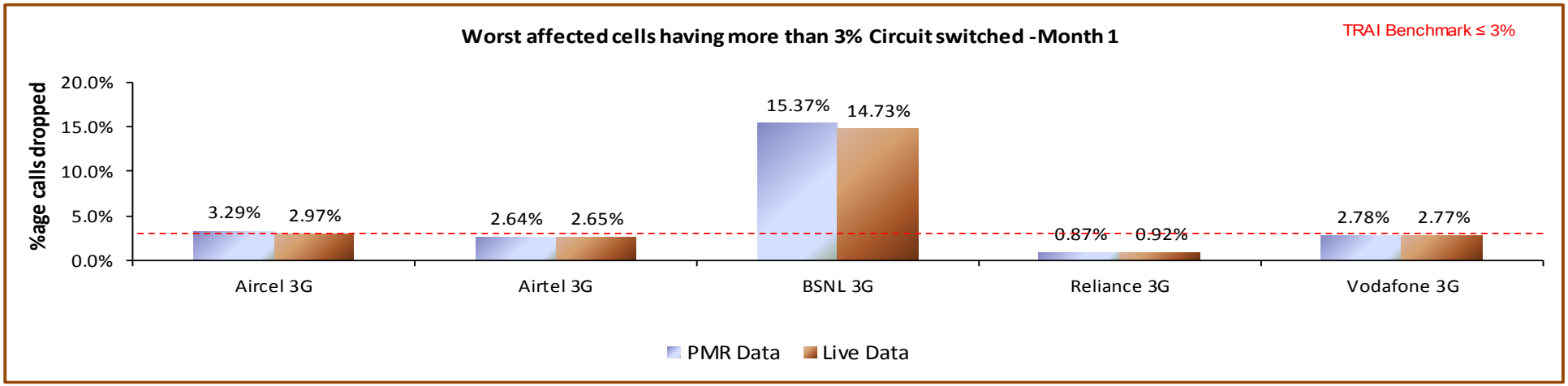
6.6.2 KEY FINDINGS - CONSOLIDATED



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

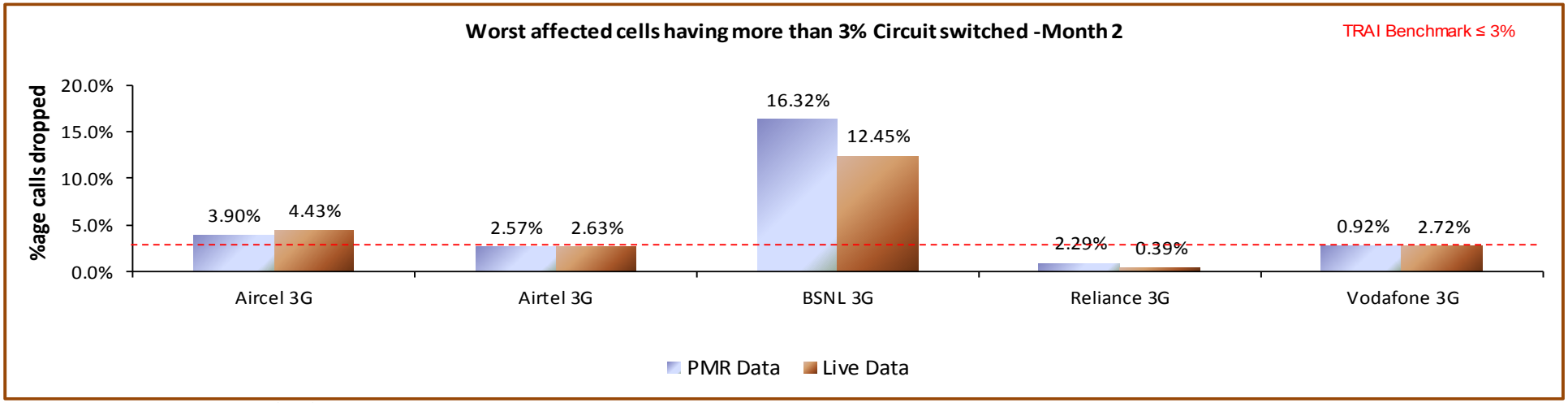
Aircel 3G and BSNL 3G did not meet the benchmark during audit.

6.6.2.1 KEY FINDINGS – MONTH 1



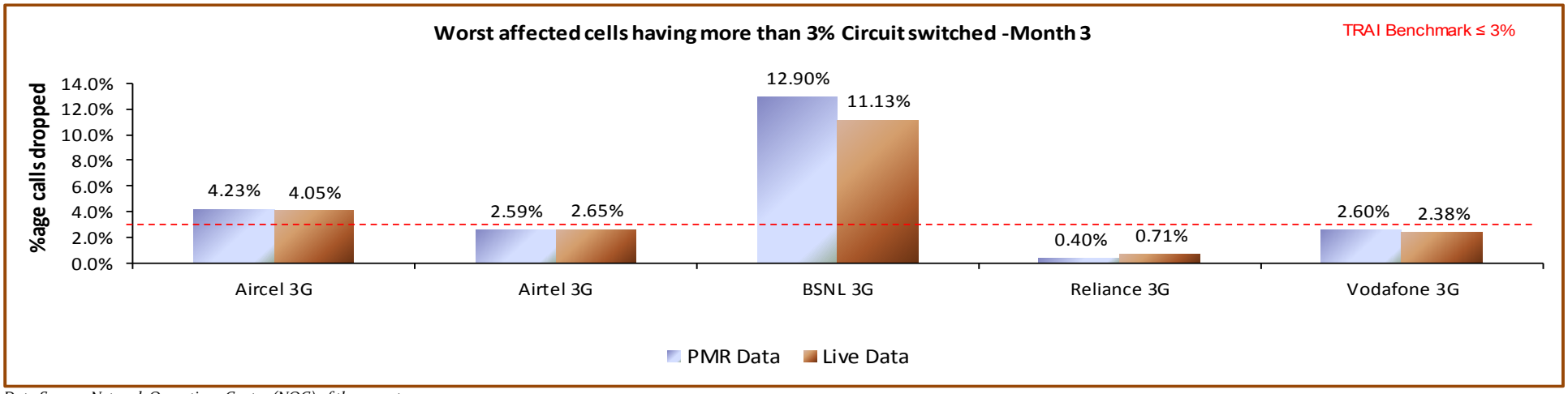
Data Source: Network Operations Center (NOC) of the operators

6.6.2.2 KEY FINDINGS – MONTH 2



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

6.6.2.3 KEY FINDINGS – MONTH 3



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

6.7 CIRCUIT SWITCH VOICE QUALITY

6.7.1 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**

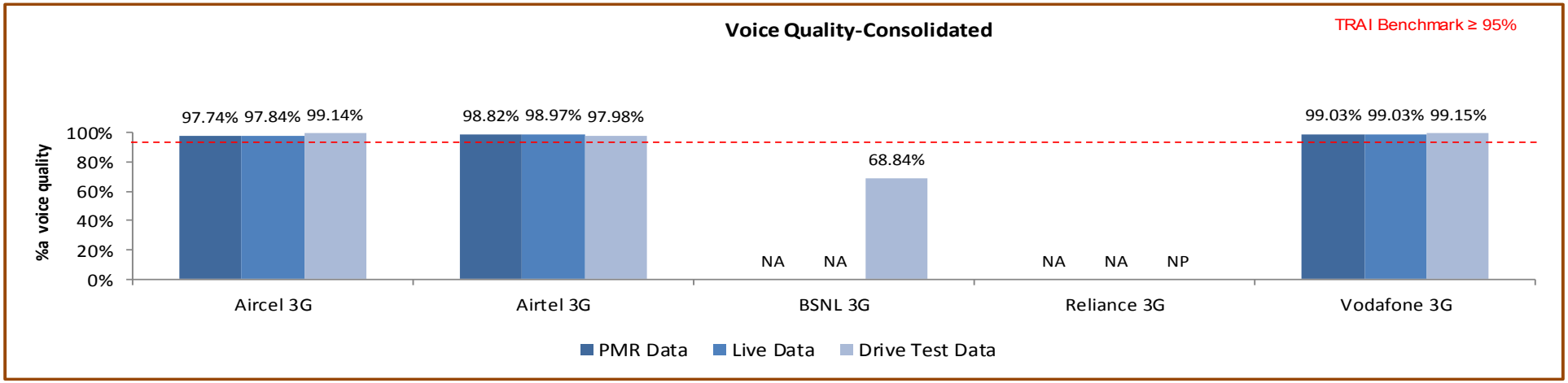
7. **TRAI Benchmark:** ≥ 95%

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.

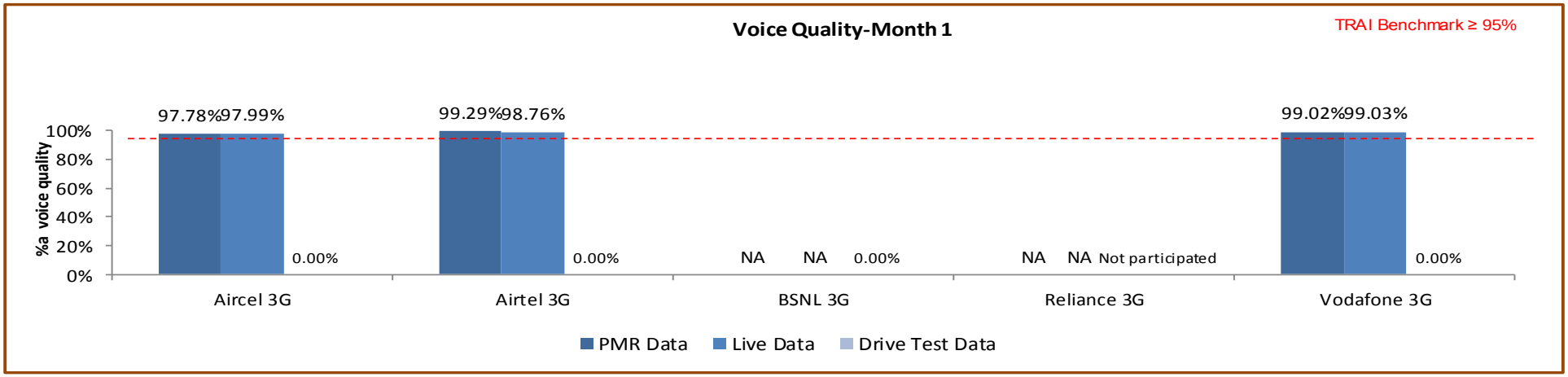
6.7.2 KEY FINDINGS



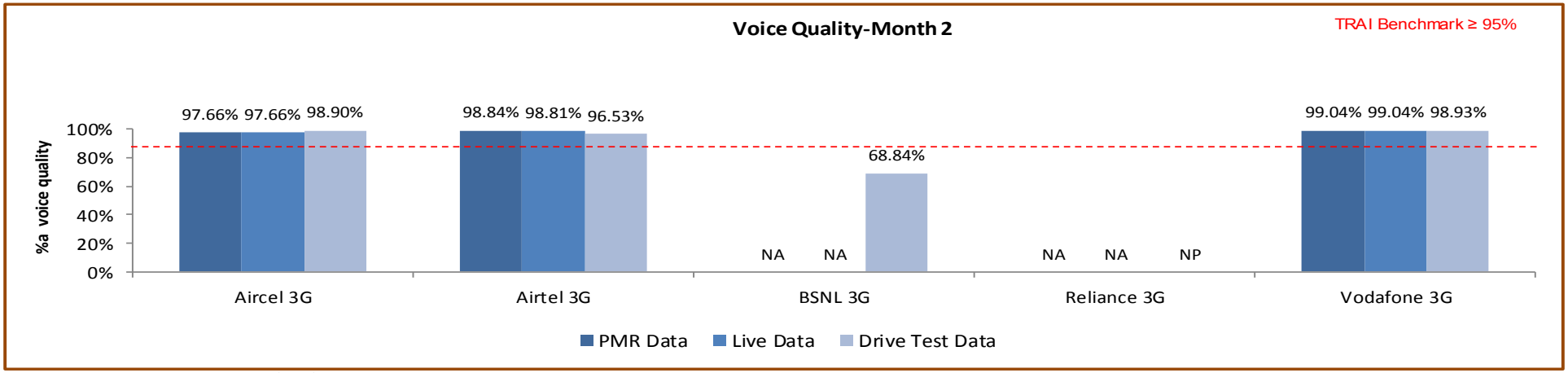
Data Source: Network Operations Center (NOC) of the operators

All operators met the bench for circuit switch voice quality. During drive test BSNL 3G failed to meet the benchmark.

6.7.2.1 KEY FINDINGS – MONTH 1

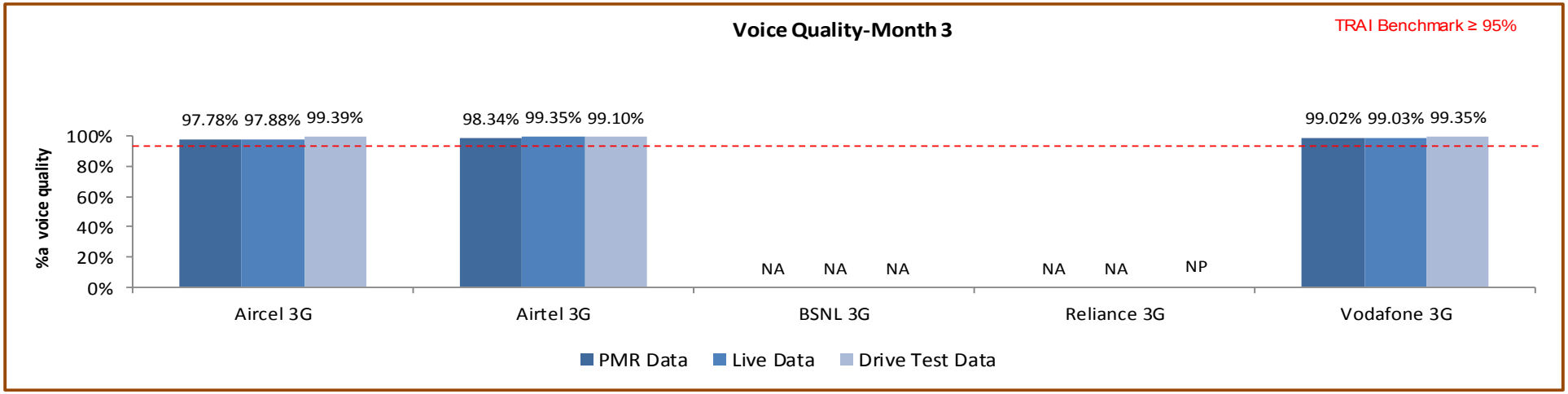


6.7.2.2 KEY FINDINGS – MONTH 2



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

6.7.2.3 KEY FINDINGS – MONTH 3



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

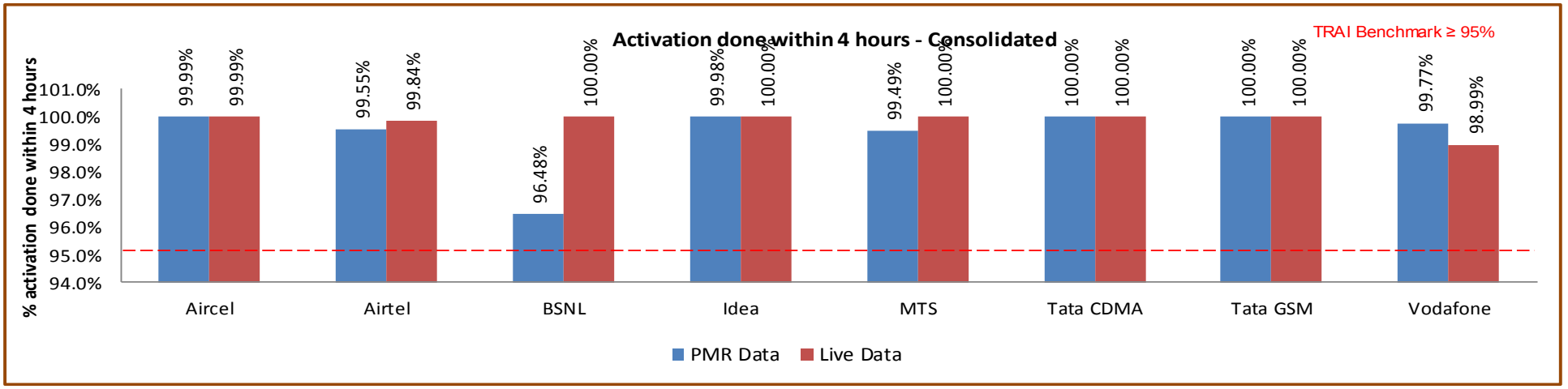
7 PARAMETER DESCRIPTION & DETAILED FINDINGS - WIRELESS DATA SERVICES (2G & 3G)

7.1 SERVICE ACTIVATION /PROVISIONING FOR 2G PMR & 3DAYS LIVE

7.1.1 PARAMETER DESCRIPTION

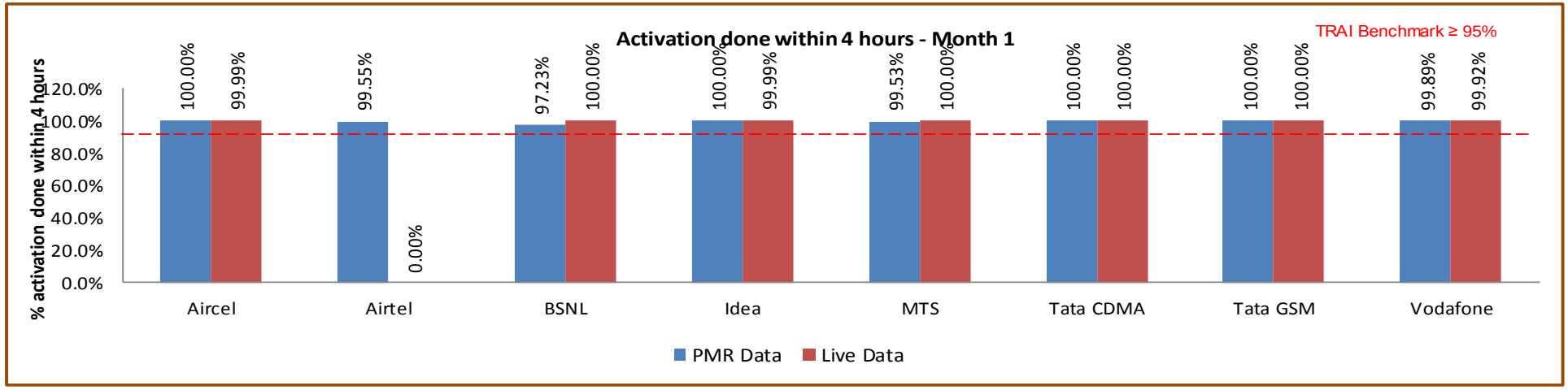
This refers to the activation of services after activation of the SIM. This involves programming the various databases with the customer's information and any gateways to standard Internet chat or mail services or any data services. The service provider typically sends these settings to the subscriber's handset using SMS or WAP.

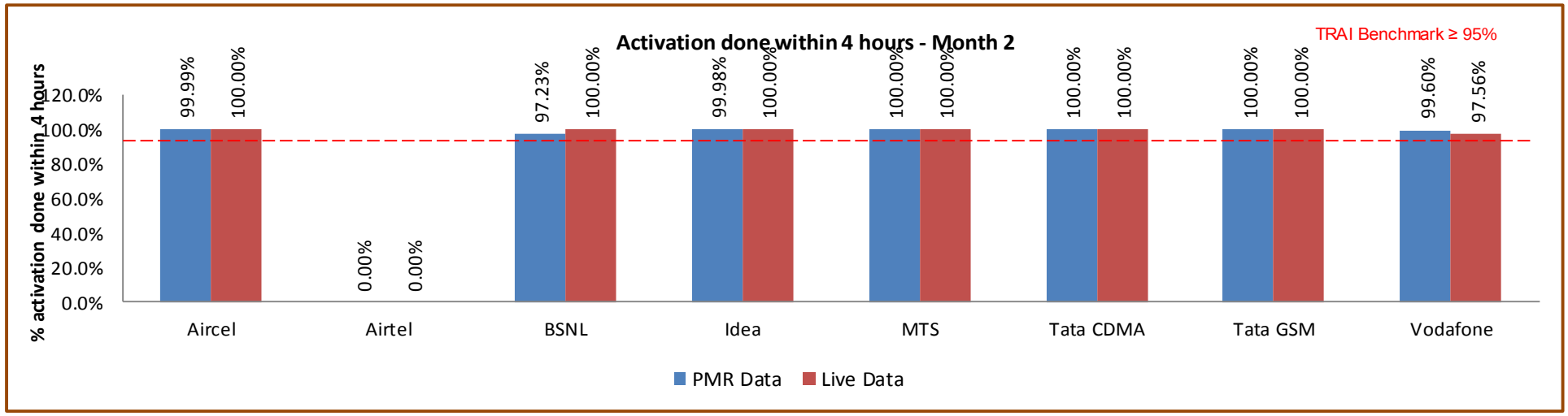
$$\text{\% activation done within 4 hours} = \frac{\text{Total Time Taken for Activation}}{\text{Total request time made}} \times 100$$

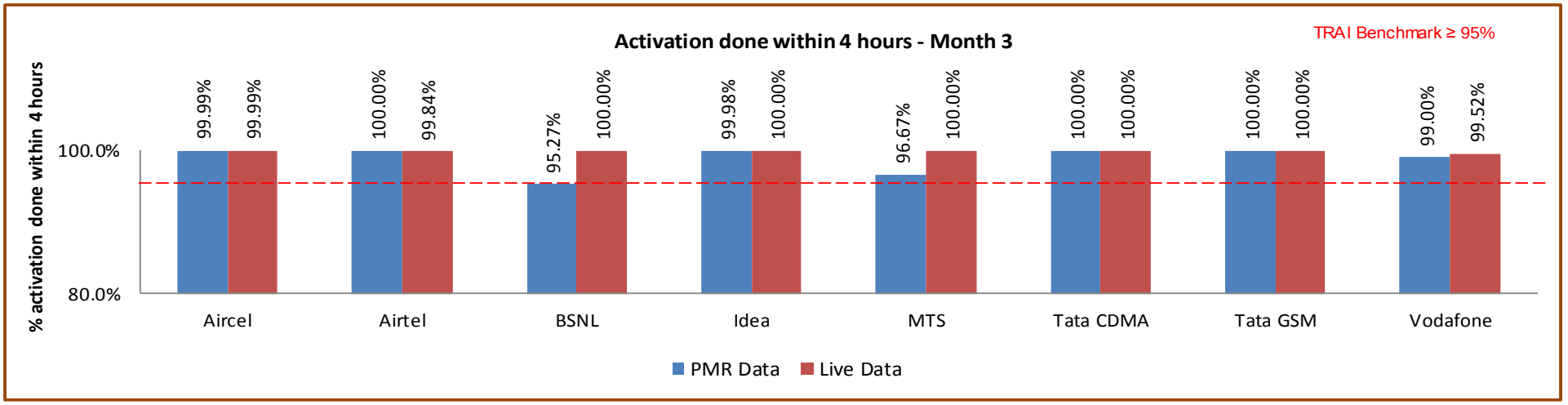


All operators met the TRAI benchmark.

7.1.2 KEY FINDINGS






Activation done within 4 hours - Month 3
TRAI Benchmark ≥ 95%
% activation done within 4 hours
100.0%
80.0%
99.99%
99.99%
100.00%
99.84%
95.27%
100.00%
99.98%
100.00%
96.67%
100.00%
100.00%
100.00%
100.00%
100.00%
99.00%
99.52%
Aircel
Airtel
BSNL
Idea
MTS
Tata CDMA
Tata GSM
Vodafone
PMR Data
Live Data

7.2 PDP CONTEXT ACTIVATION SUCCESS RATE FOR 2G PMR & 3DAYS LIVE

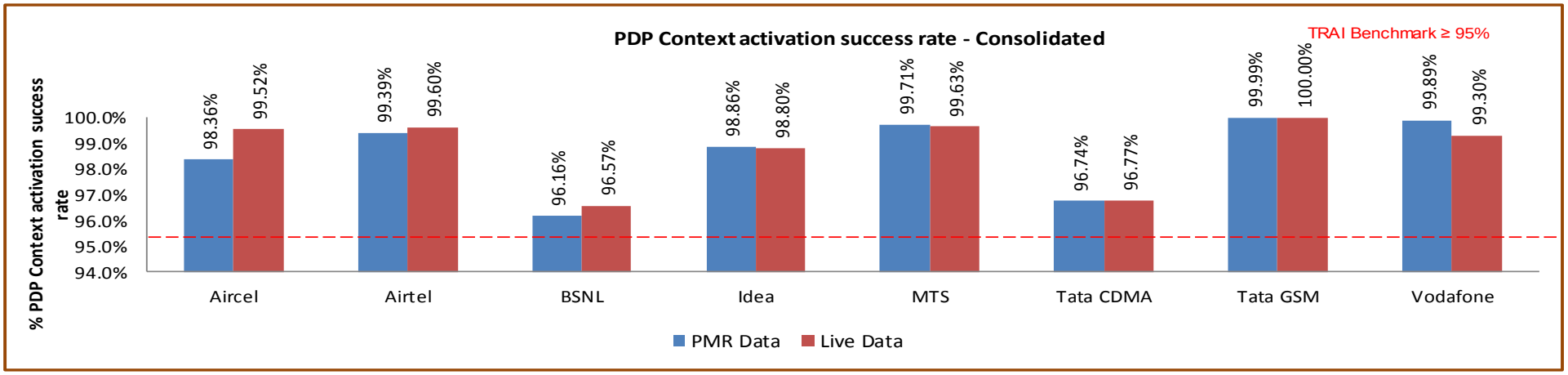
7.2.1 PARAMETER DESCRIPTION

A Packet Data Protocol (PDP) context specifies access to an external packet-switching network. The data associated with the PDP context contains information such as the type of packet-switching network, the Mobile Station PDP (MS PDP) address that is the IP address, the reference of Gateway GPRS Support Node (GGSN), and the requested QoS. A PDP context is handled by the MS, Serving GPRS Support Node (SGSN) and GGSN and is identified by a mobile's PDP address within these entities. Several PDP contexts can be activated at the same time within a given MS.

Measurement

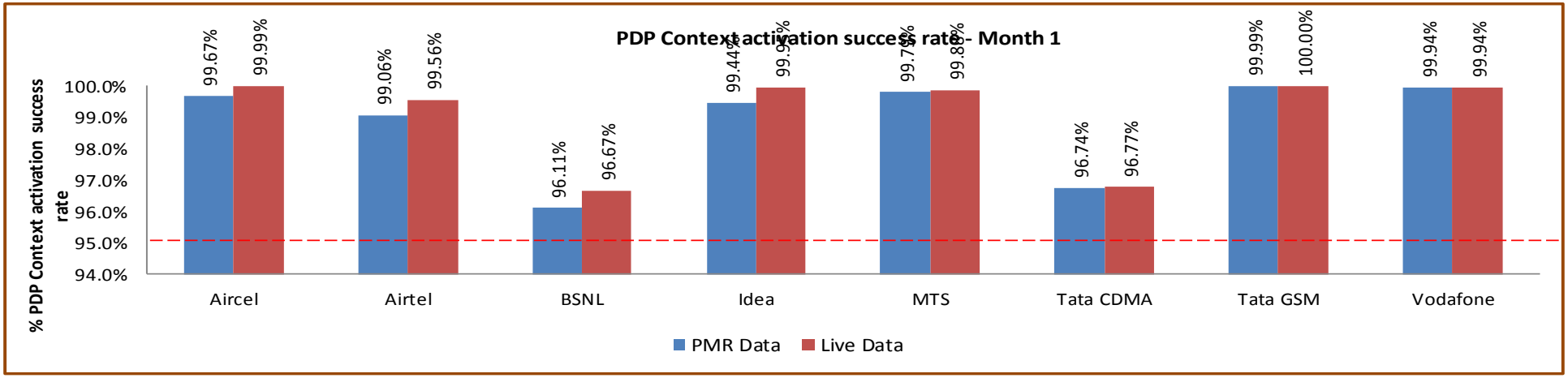
This measurement provides the number of successfully completed PDP context activations. For these context activations, the GGSN is updated successfully and a report of PDP context activation success is generated at GGSN.

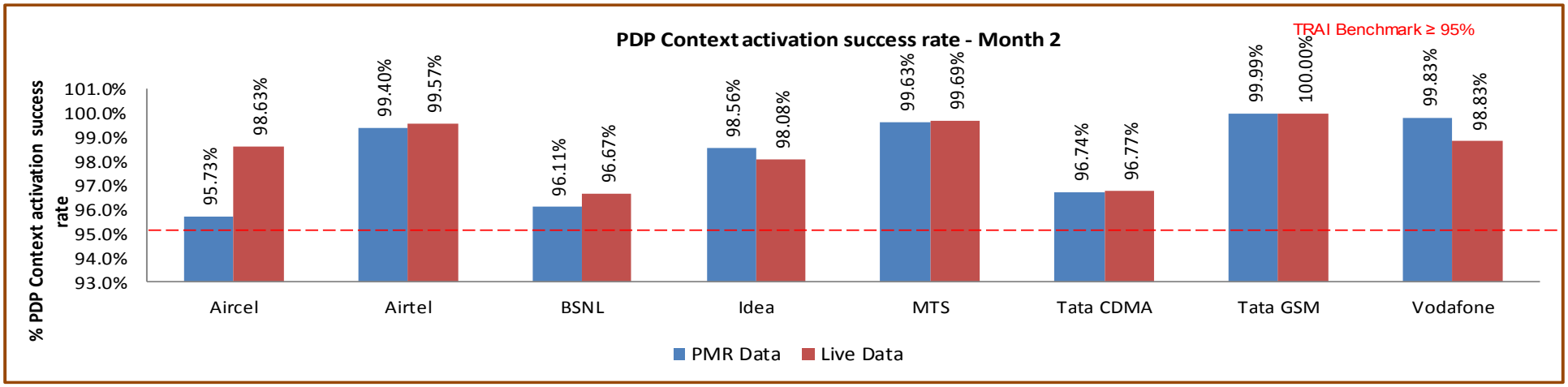
$$\textbf{PDP Context Activation Success Rate (\%)} = \frac{\text{Number of successfully completed PDP context activations}}{\text{Total attempts of context activation}} \times 100$$

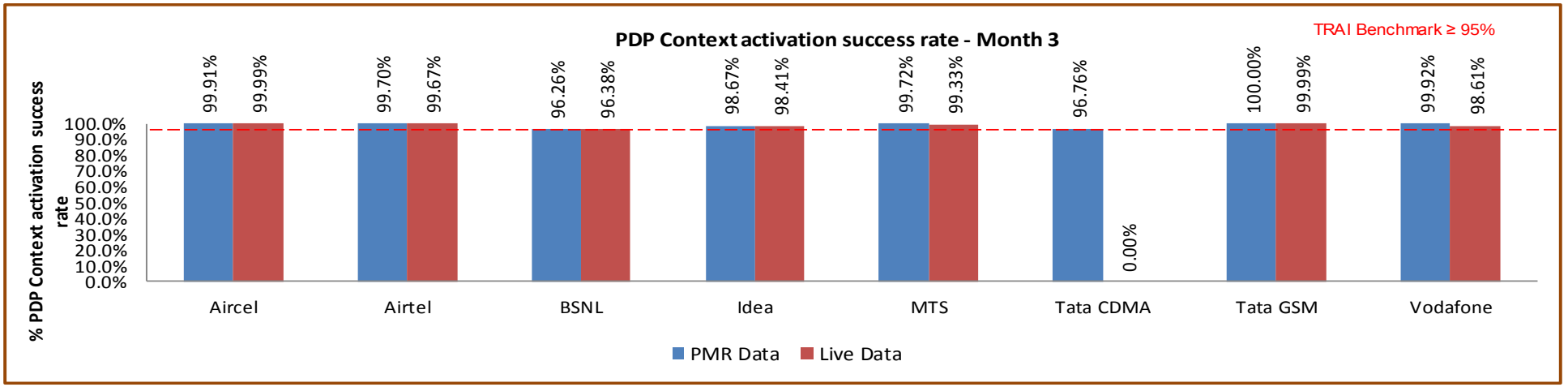


BSNL failed to meet the benchmark for PDP context activation success rate.

7.2.2 KEY FINDINGS





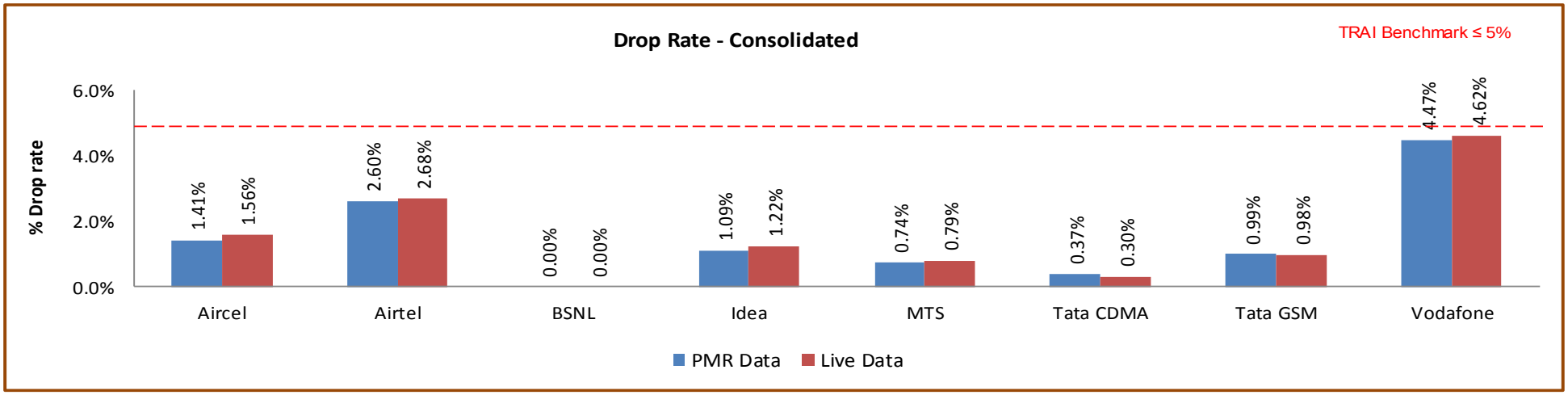

PDP Context activation success rate - Month 3
TRAI Benchmark ≥ 95%
% PDP Context activation success rate
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
99.91%
99.99%
99.70%
99.67%
96.26%
96.38%
98.67%
98.41%
99.72%
99.33%
96.76%
0.00%
100.00%
99.99%
99.92%
98.61%
Aircel
Airtel
BSNL
Idea
MTS
Tata CDMA
Tata GSM
Vodafone
PMR Data
Live Data

7.3 DROP RATE FOR 2G PMR & 3DAYS LIVE

7.3.1 PARAMETER DESCRIPTION

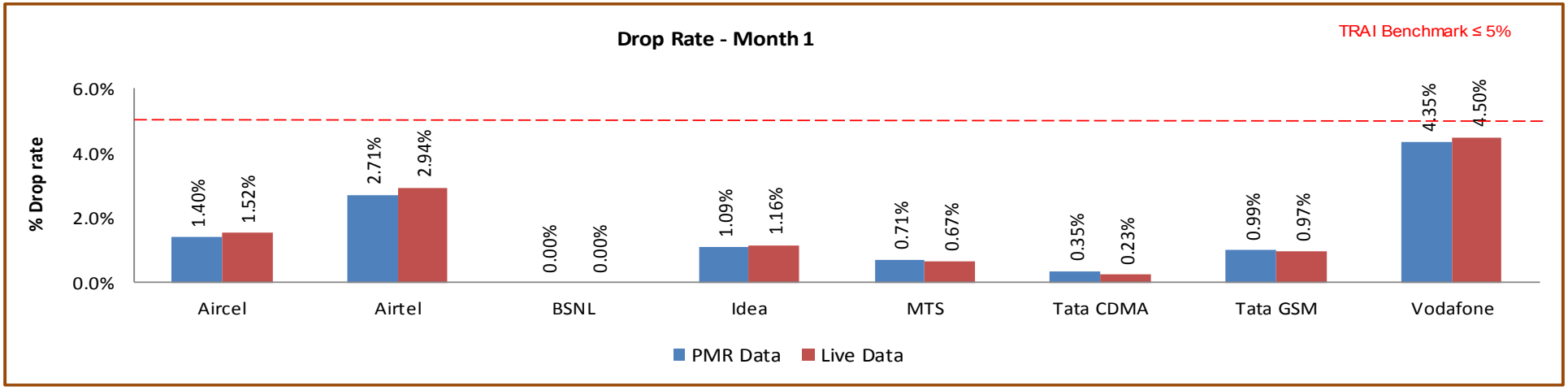
It measures the inability of Network to maintain a connection and is defined as the ratio of abnormal disconnects w.r.t. all disconnects (both normal and abnormal). An abnormal disconnect may happen because of Radio Link Failures, Uplink (UL) or Downlink (DL) interference, bad coverage, unsuccessful handovers or any other reason. The drop rate is to be measured for all generations of the technologies separately.

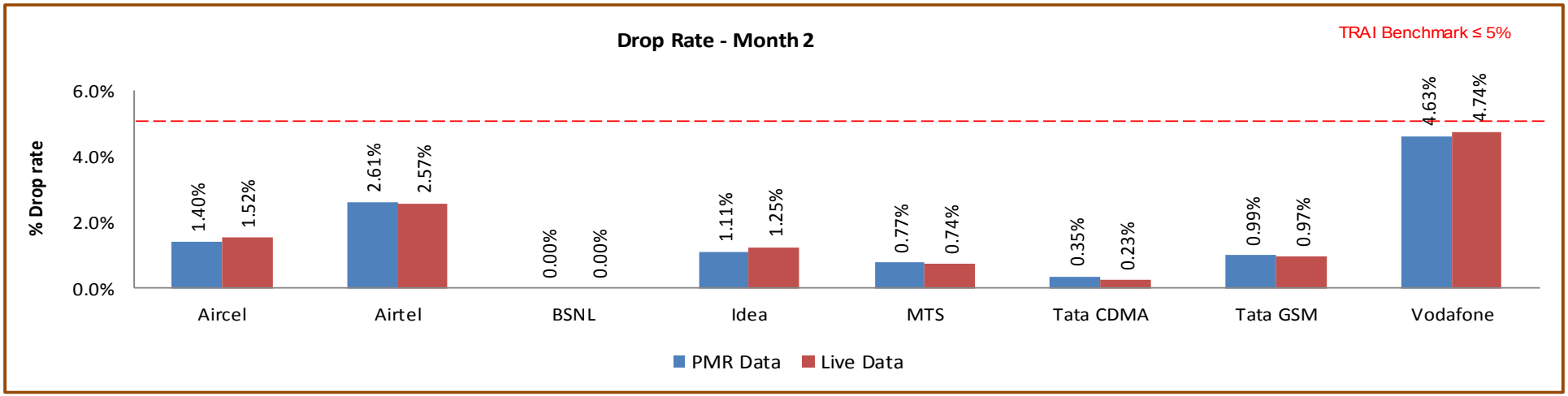
$$\textbf{Drop rate} = \frac{\text{No. of Dropped data Calls}}{\text{No. of Successful data calls}} \times 100$$

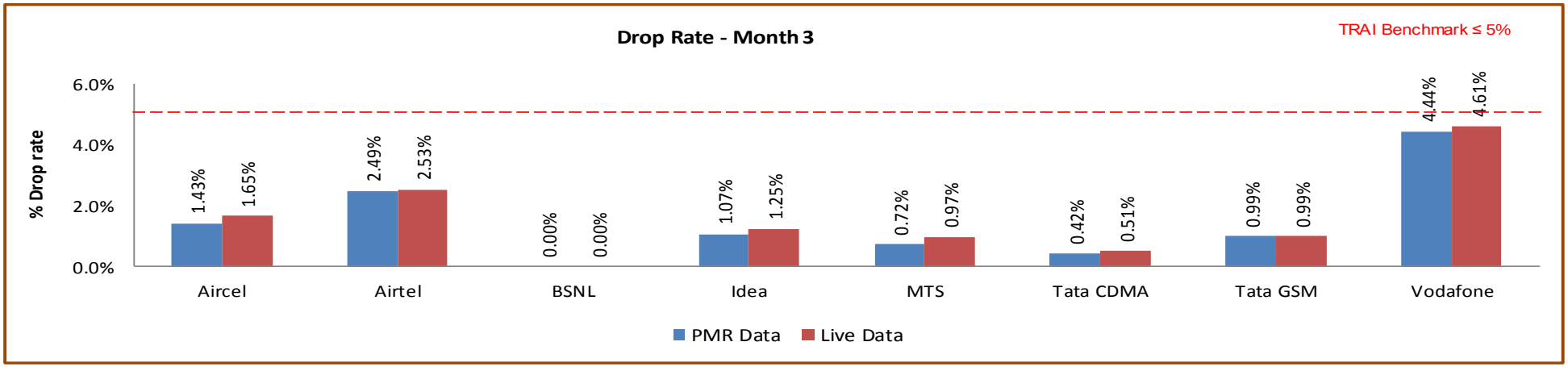


All operators met the benchmark for drop rate.

7.3.2 KEY FINDINGS





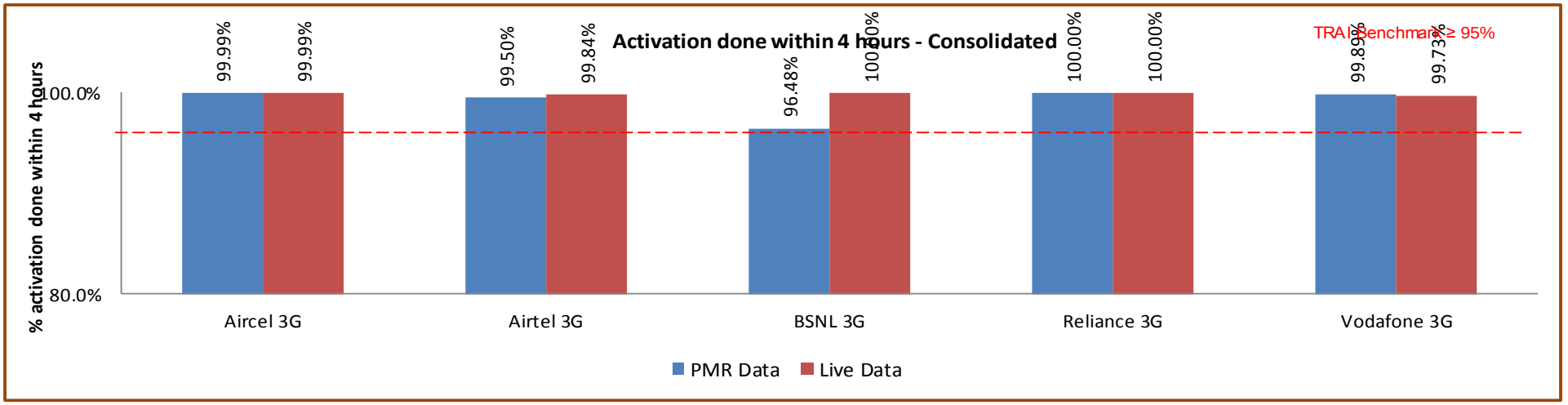

Drop Rate - Month 3
TRAI Benchmark ≤ 5%
% Drop rate
6.0%
4.0%
2.0%
0.0%
1.43%
1.65%
2.49%
2.53%
0.00%
0.00%
1.07%
1.25%
0.72%
0.97%
0.42%
0.51%
0.99%
0.99%
4.44%
4.61%
Aircel
Airtel
BSNL
Idea
MTS
Tata CDMA
Tata GSM
Vodafone
PMR Data
Live Data

7.4 SERVICE ACTIVATION /PROVISIONING FOR 3G PMR & 3DAYS LIVE

7.4.1 PARAMETER DESCRIPTION

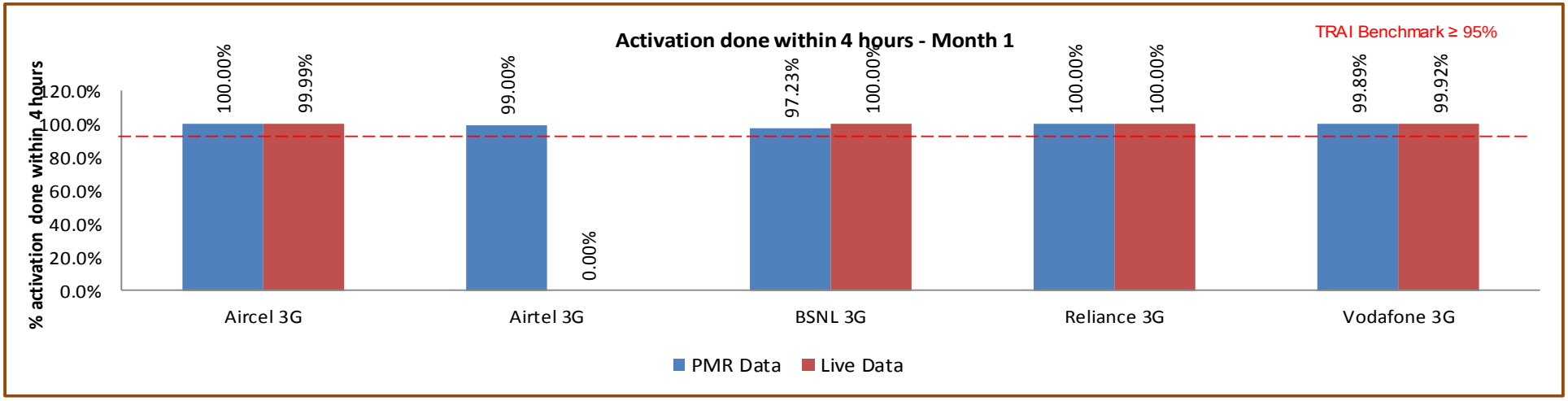
This refers to the activation of services after activation of the SIM. This involves programming the various databases with the customer's information and any gateways to standard Internet chat or mail services or any data services. The service provider typically sends these settings to the subscriber's handset using SMS or WAP.

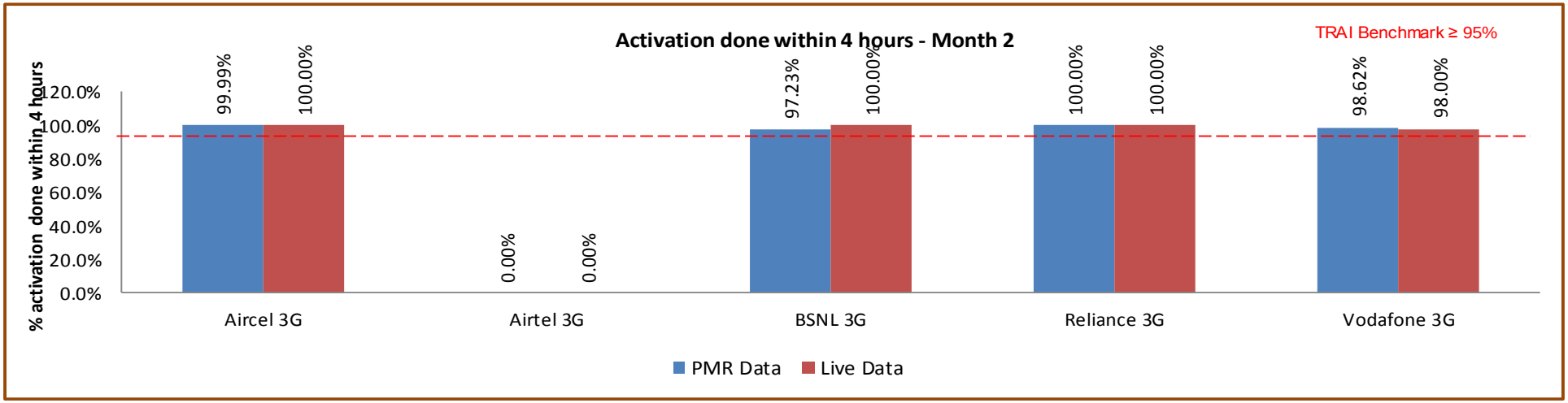
$$\text{\% activation done within 4 hours} = \frac{\text{Total Time Taken for Activation}}{\text{Total request time made}} \times 100$$

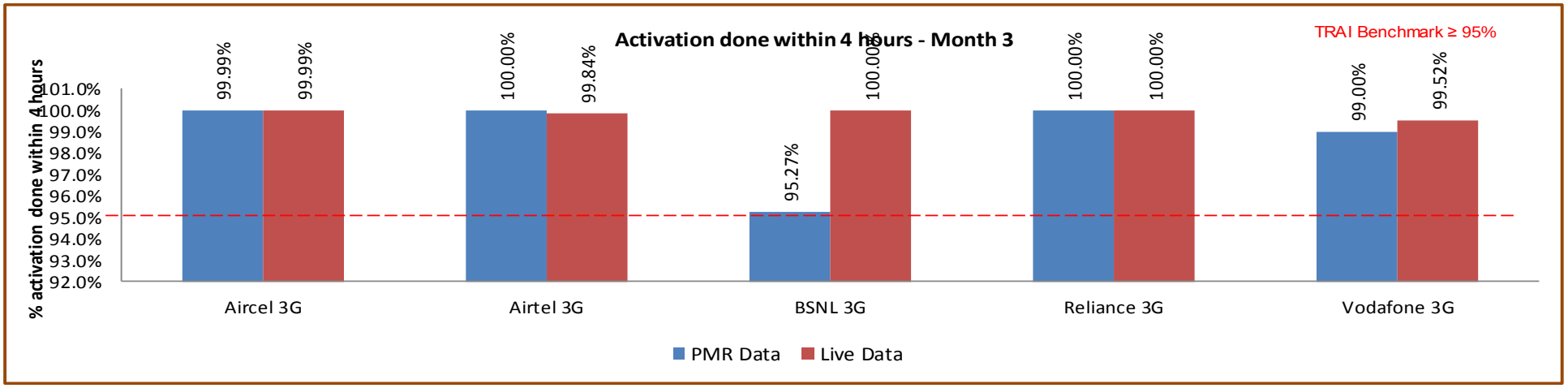


All operators met the benchmark for Activation done within 4 hours.

7.4.2 KEY FINDINGS






Activation done within 4 hours - Month 3
TRAI Benchmark ≥ 95%
% activation done within 4 hours
101.0%
100.0%
99.0%
98.0%
97.0%
96.0%
95.0%
94.0%
93.0%
92.0%
99.99%
99.99%
100.00%
99.84%
95.27%
100.00%
100.00%
100.00%
99.00%
99.52%
Aircel 3G
Airtel 3G
BSNL 3G
Reliance 3G
Vodafone 3G
PMR Data
Live Data

7.5 PDP CONTEXT ACTIVATION SUCCESS RATE FOR 3G PMR & 3DAYS LIVE

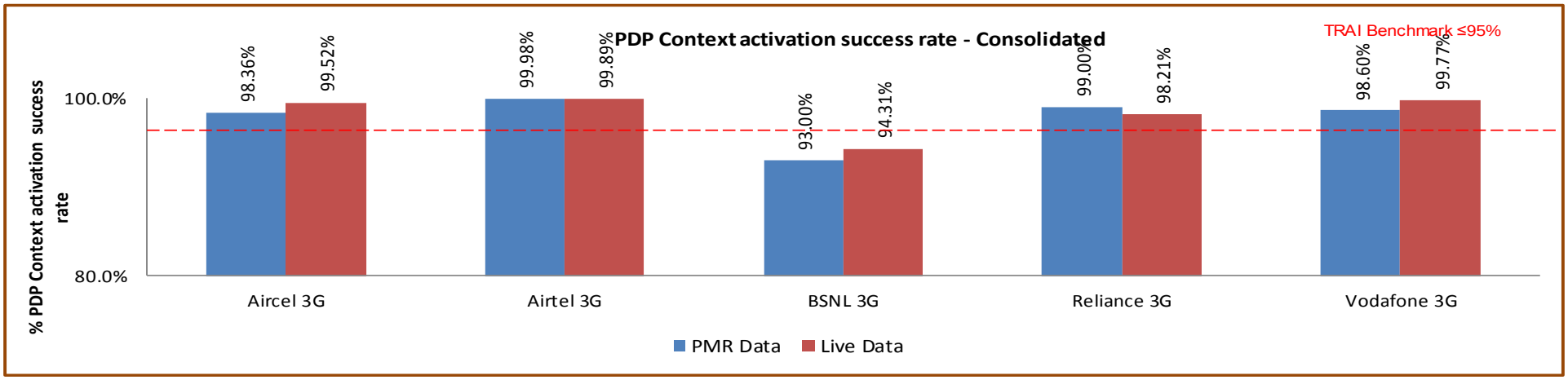
7.5.1 PARAMETER DESCRIPTION

A Packet Data Protocol (PDP) context specifies access to an external packet-switching network. The data associated with the PDP context contains information such as the type of packet-switching network, the Mobile Station PDP (MS PDP) address that is the IP address, the reference of Gateway GPRS Support Node (GGSN), and the requested QoS. A PDP context is handled by the MS, Serving GPRS Support Node (SGSN) and GGSN and is identified by a mobile's PDP address within these entities. Several PDP contexts can be activated at the same time within a given MS.

Measurement

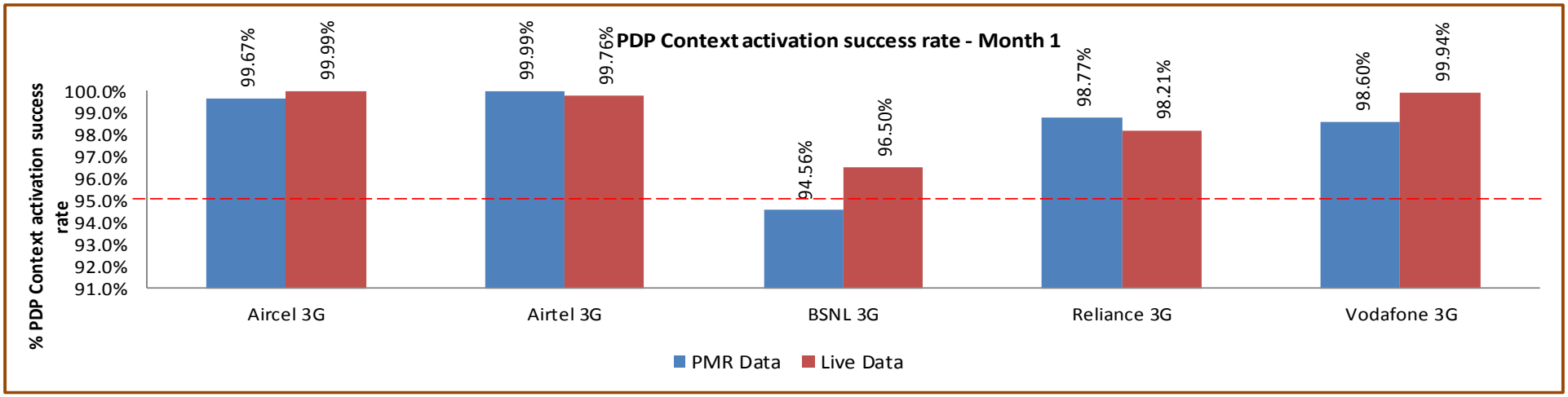
This measurement provides the number of successfully completed PDP context activations. For these context activations, the GGSN is updated successfully and a report of PDP context activation success is generated at GGSN.

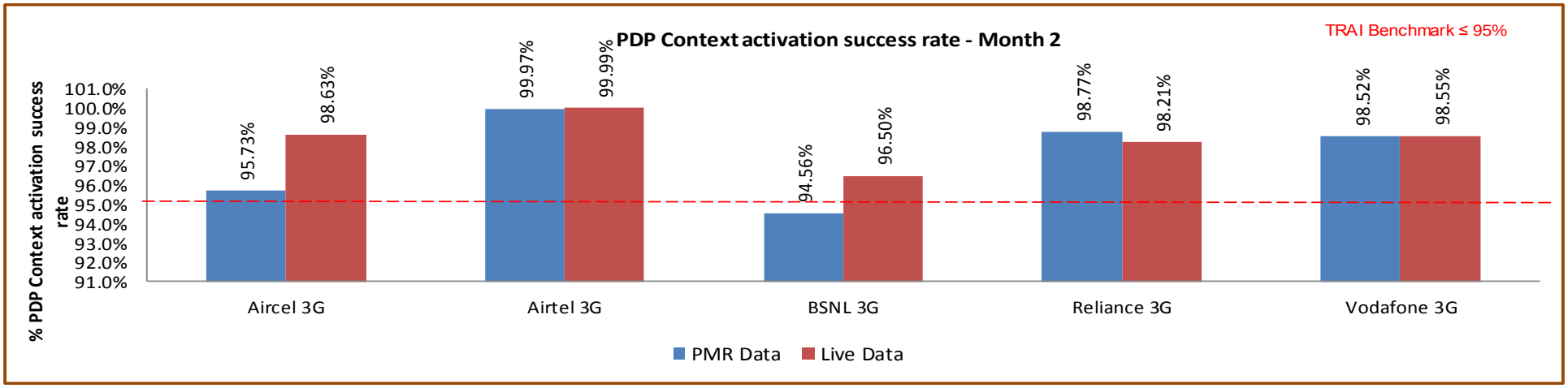
$$\textbf{PDP Context Activation Success Rate (\%)} = \frac{\text{Number of successfully completed PDP context activations}}{\text{Total attempts of context activation}} \times 100$$

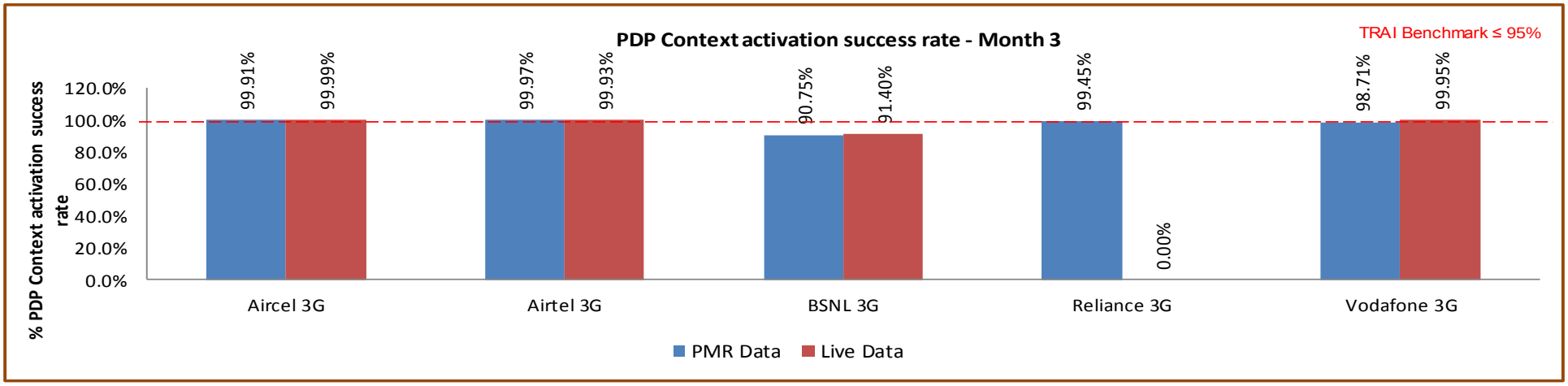


BSNL failed to meet the benchmark for PDP context activation success rate.

7.5.2 KEY FINDINGS




PDP Context activation success rate - Month 2
TRAI Benchmark ≤ 95%
% PDP Context activation success rate
101.0%
100.0%
99.0%
98.0%
97.0%
96.0%
95.0%
94.0%
93.0%
92.0%
91.0%
95.73%
98.63%
99.97%
99.99%
94.56%
96.50%
98.77%
98.21%
98.52%
98.55%
Aircel 3G
Airtel 3G
BSNL 3G
Reliance 3G
Vodafone 3G
PMR Data
Live Data

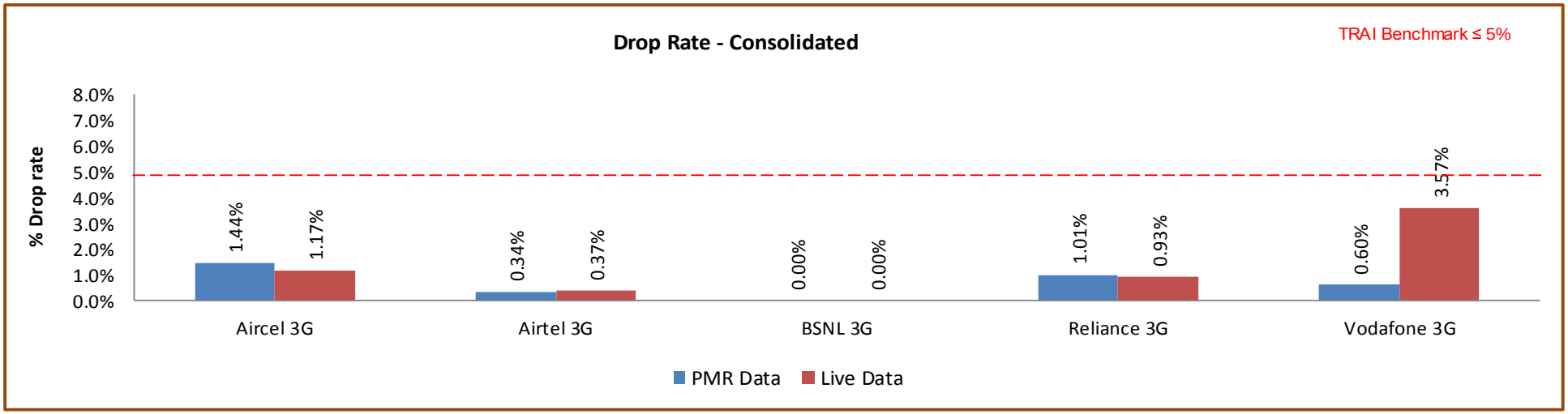

PDP Context activation success rate - Month 3
TRAI Benchmark ≤ 95%
% PDP Context activation success rate
120.0%
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
99.91%
99.99%
99.97%
99.93%
90.75%
91.40%
99.45%
0.00%
98.71%
99.95%
Aircel 3G
Airtel 3G
BSNL 3G
Reliance 3G
Vodafone 3G
PMR Data
Live Data

7.6 DROP RATE FOR 3G PMR & 3DAYS LIVE

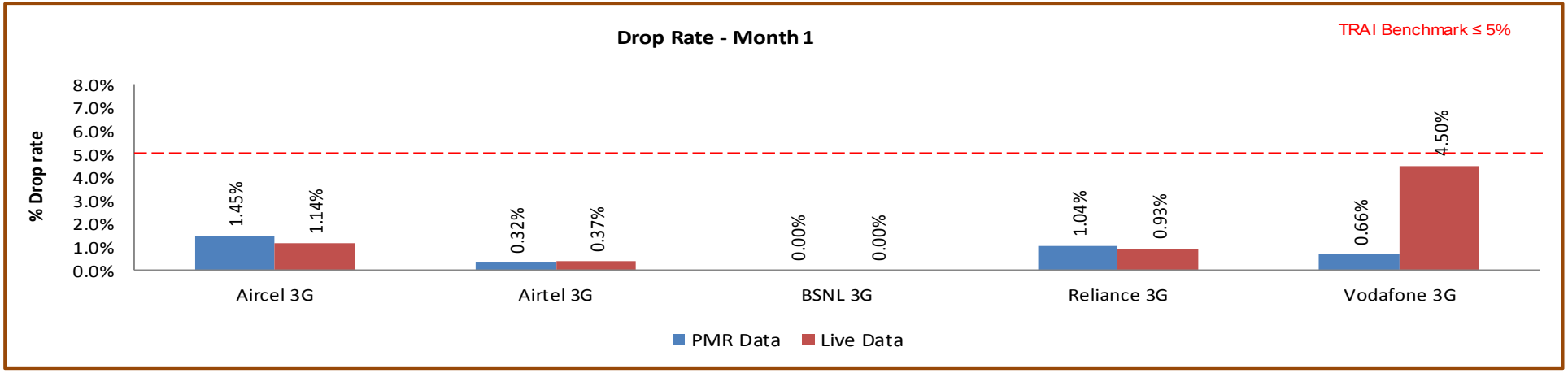
7.6.1 PARAMETER DESCRIPTION

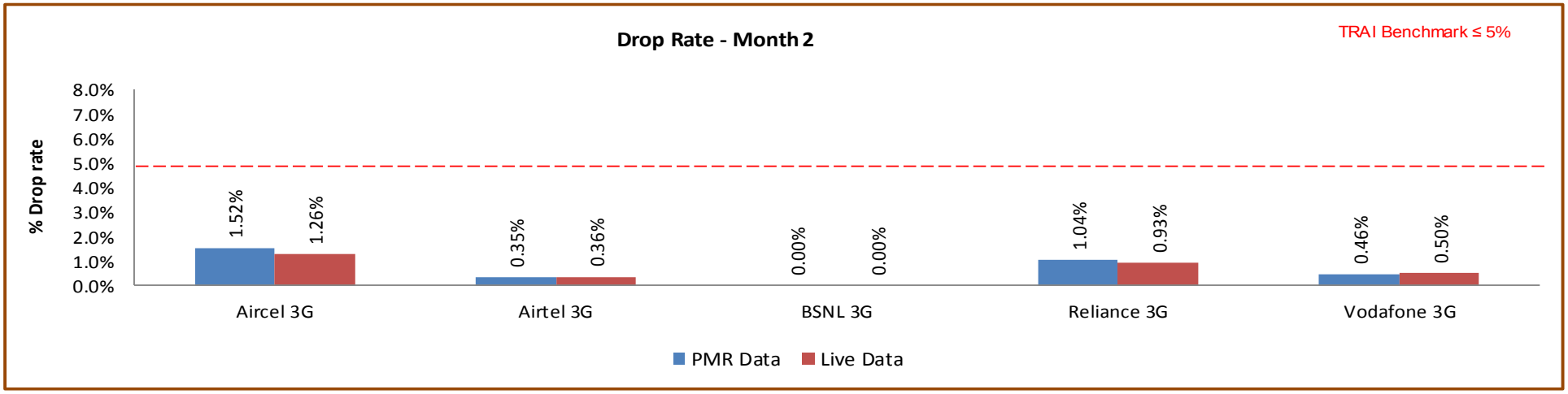
It measures the inability of Network to maintain a connection and is defined as the ratio of abnormal disconnects w.r.t. all disconnects (both normal and abnormal). An abnormal disconnect may happen because of Radio Link Failures, Uplink (UL) or Downlink (DL) interference, bad coverage, unsuccessful handovers or any other reason. The drop rate is to be measured for all generations of the technologies separately.

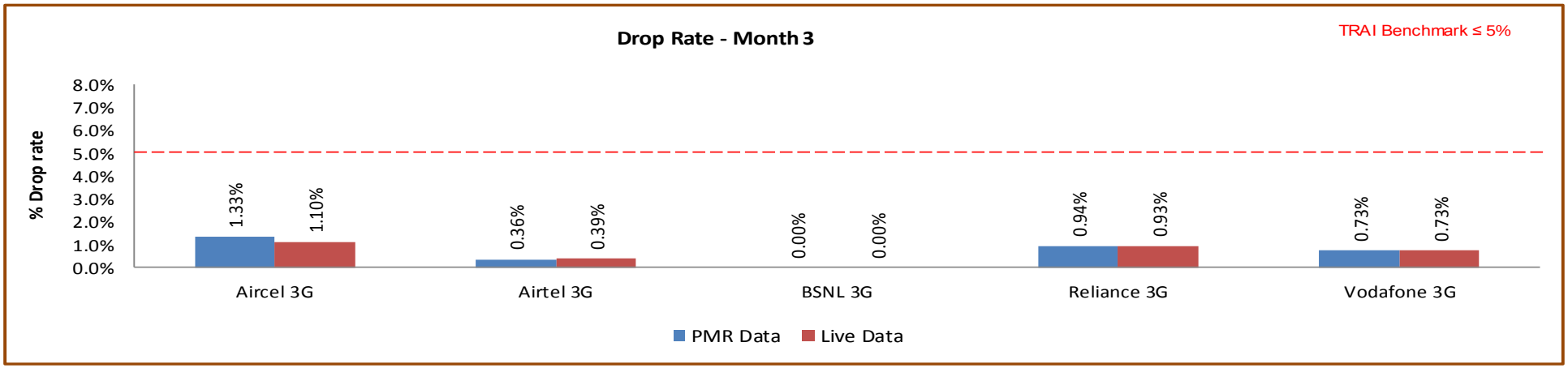
$$\textbf{Drop rate} = \frac{\text{No. of Dropped data Calls}}{\text{No. of Successful data calls}} \times 100$$



7.6.2 KEY FINDINGS







All operators met the benchmark for drop rate.

8 PARAMETER DESCRIPTION AND DETAILED FINDINGS – NON-NETWORK PARAMETERS

8.1 METERING AND BILLING CREDIBILITY

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

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

8.1.1 PARAMETER DESCRIPTION

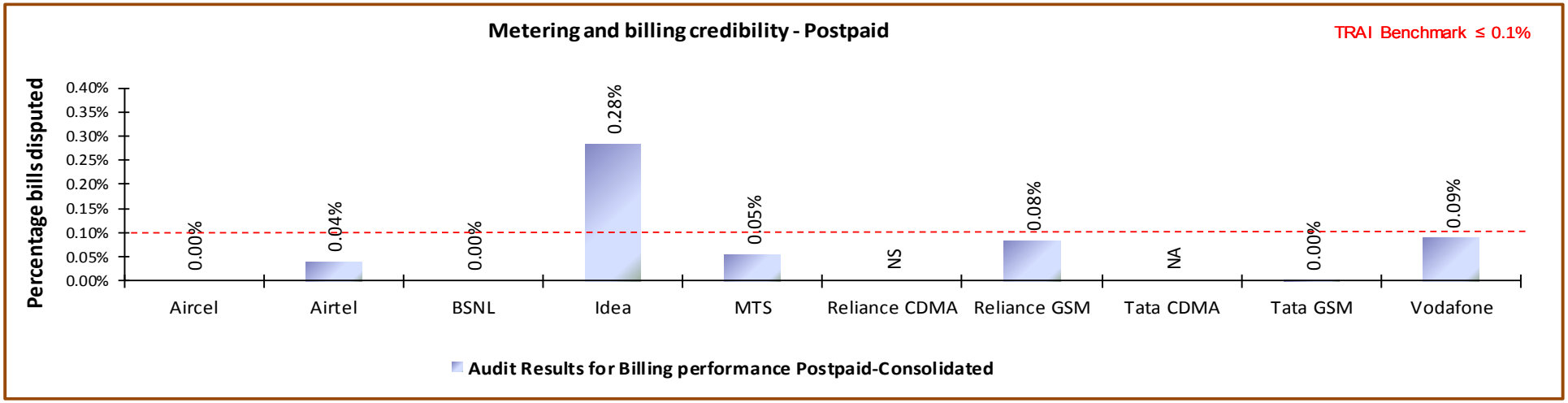
All the complaints related to billing/ charging as per clause 3.7.2 of QoS regulation of 20th December, 2009 were covered. The types of billing complaints covered are listed below.

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

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

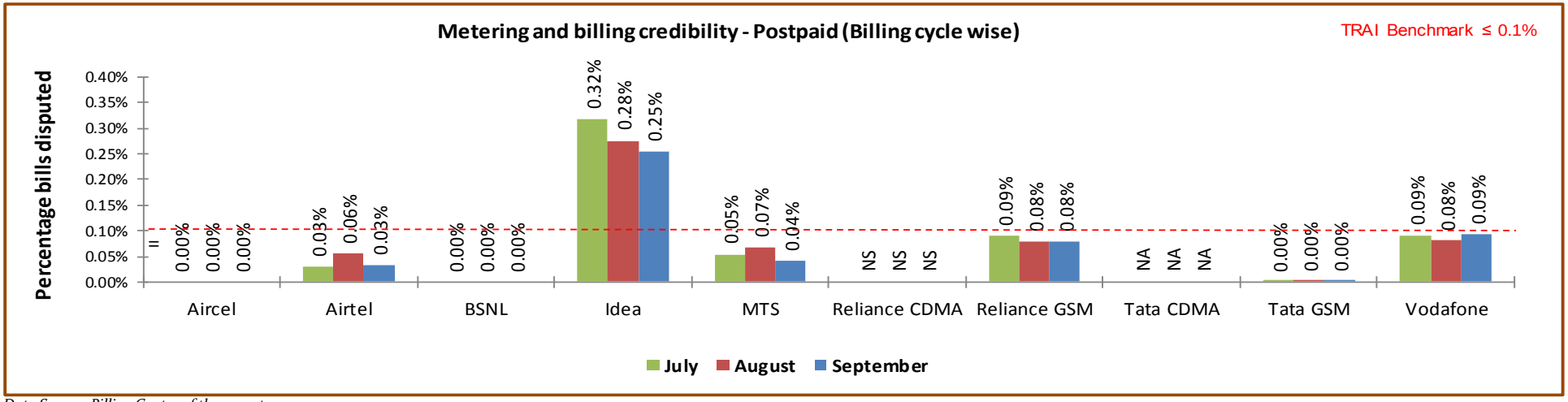
- Computational Methodology:
  - **Billing complaints per 100 bills issued (Postpaid)** = (Total billing complaints** received during the relevant billing cycle / Total bills generated* during the relevant billing cycle)*100
  - *Operator to include all types of bills generated for customers. This would 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

8.1.2 KEY FINDINGS – METERING AND BILLING CREDIBILITY (POSTPAID)



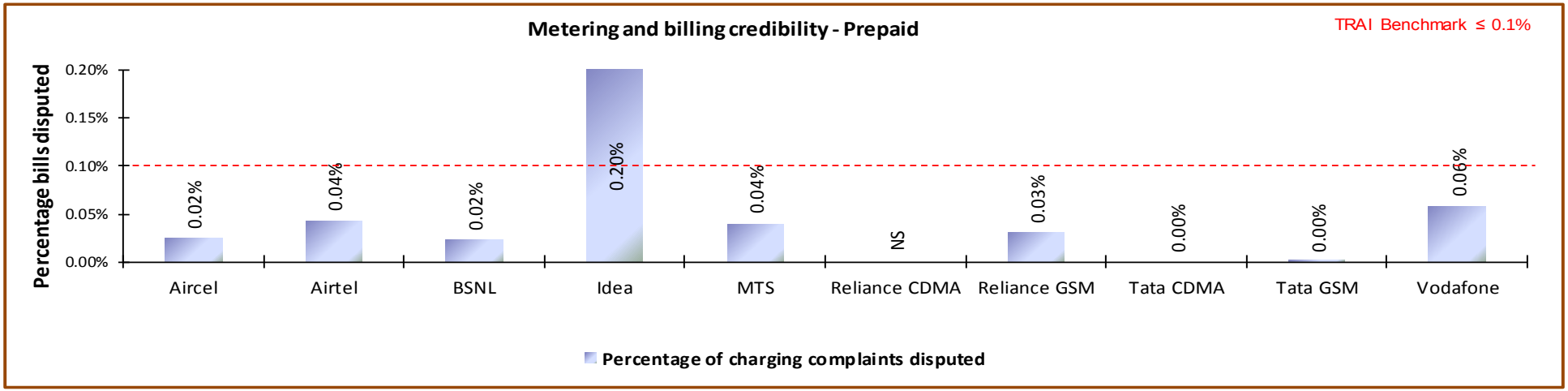
Data Source: Billing Center of the operators

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



Data Source: Billing Center of the operators

8.1.3 KEY FINDINGS - METERING AND BILLING CREDIBILITY (PREPAID)



Data Source: Billing Center of the operators

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

8.2 RESOLUTION OF BILLING/ CHARGING COMPLAINTS

8.2.1 PARAMETER DESCRIPTION

Calculation of Percentage resolution of billing complaints

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

Resolution of billing complaints within 4 weeks:

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

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

Resolution of billing complaints within 6 weeks:

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

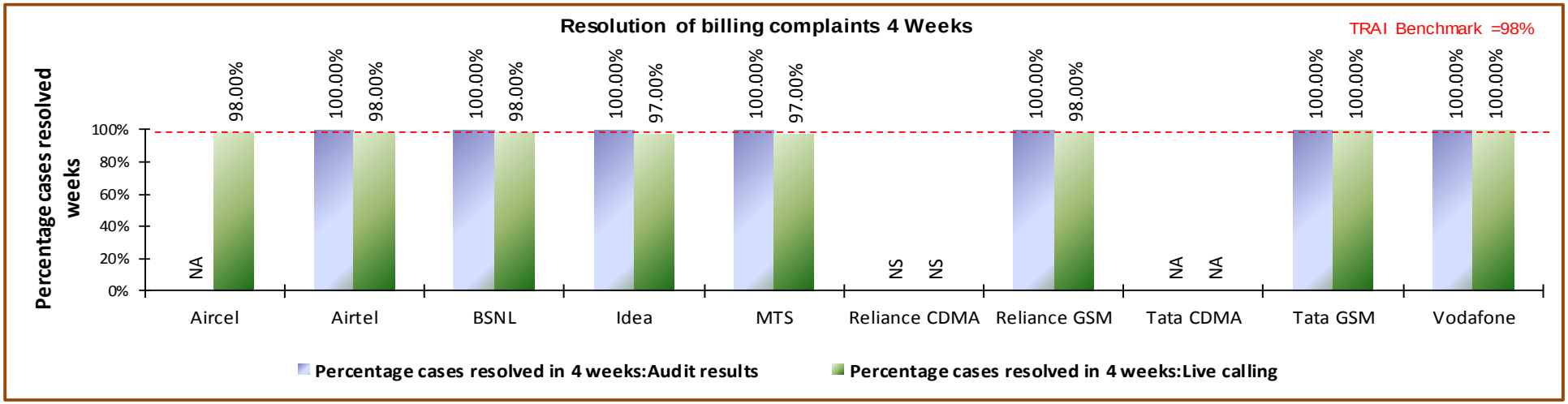
$$\frac{\text{number of billing complaints for post-paid customers/charging, credit/ validity complaints for pre-paid customers resolved within 6 weeks during the quarter}}{\text{number of billing/charging, credit / validity complaints received during the quarter}} \times 100$$

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

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

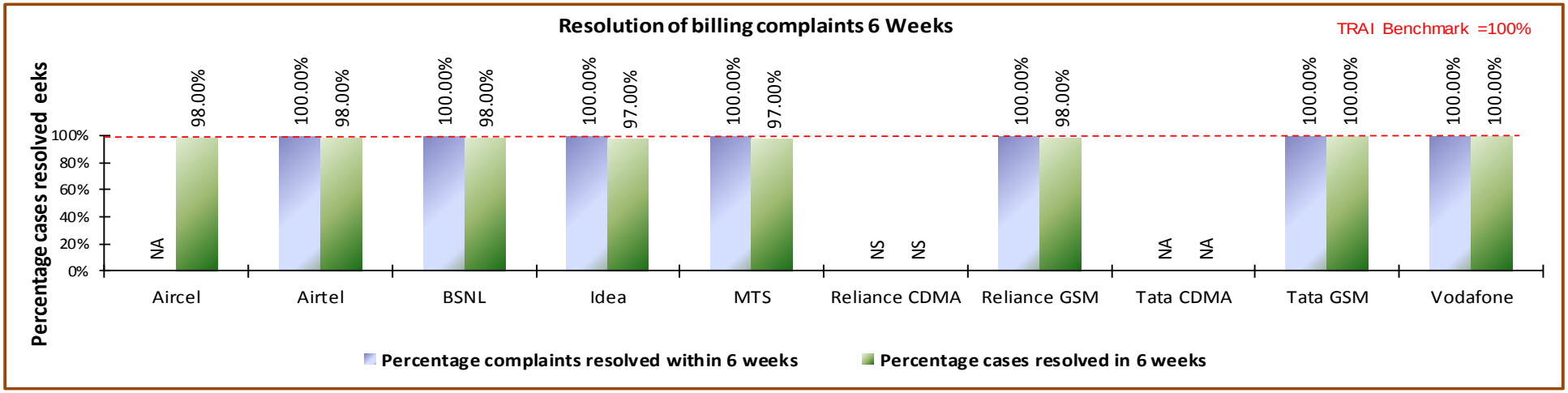
Benchmark: 98% complaints resolved within 4 weeks, 100% within 6 weeks.

8.2.2 KEY FINDINGS - WITHIN 4 WEEKS



All operators met the TRAI benchmark of resolution of billing complaints within 4 weeks as per monthly audit; however Idea and MTS failed to meet the TRAI benchmark during live calling.

8.2.3 KEY FINDINGS WITHIN 6 WEEKS



Data Source: Billing Center of the operators

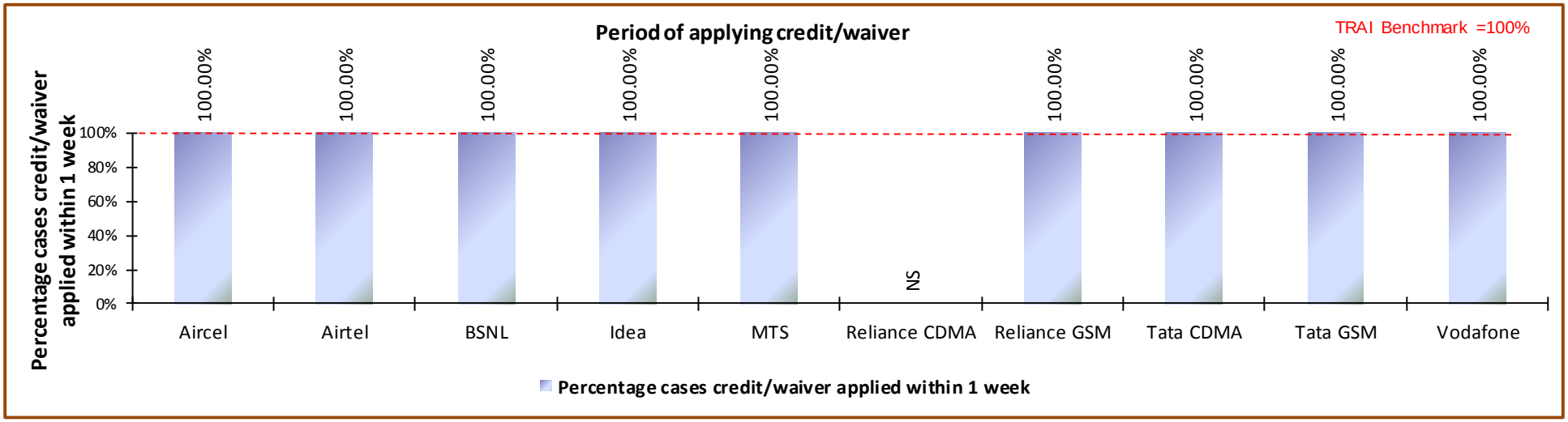
Aircel, Airtel, BSNL, Idea, MTS and Reliance GSM remained slightly behind the TRAI benchmark of resolution of billing complaints within 6 weeks live calling.

8.3 PERIOD OF APPLYING CREDIT/WAVIER

8.3.1 PARAMETER DESCRIPTION

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

8.3.2 KEY FINDINGS



Data Source: Billing Center of the operators

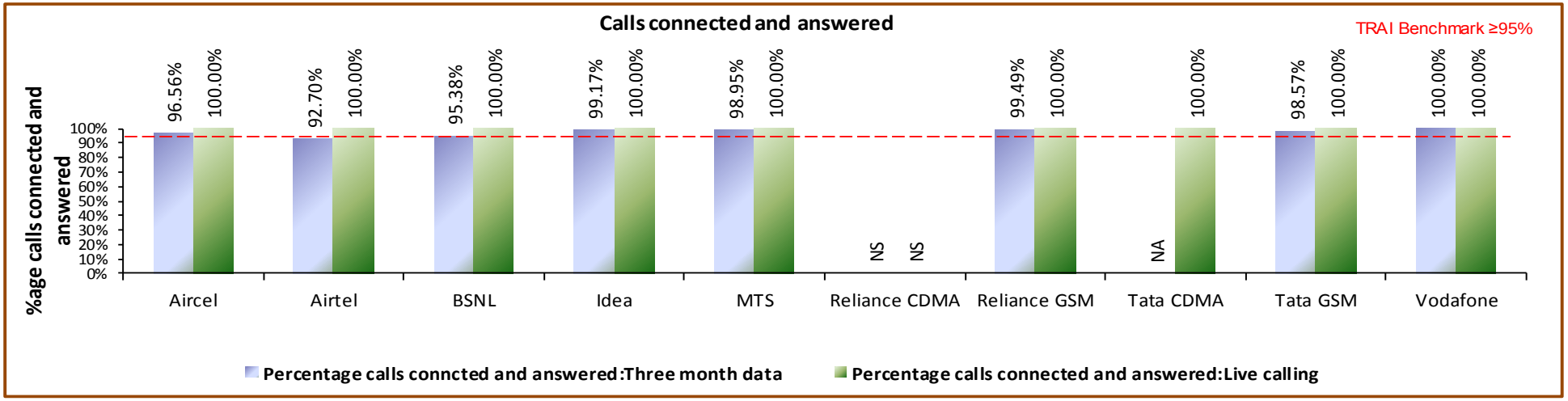
All operators met the benchmark for this parameter.

8.4 CALL CENTRE PERFORMANCE-IVR

8.4.1 PARAMETER DESCRIPTION

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

8.4.2 KEY FINDINGS



Data Source: Customer Service Center of the operators

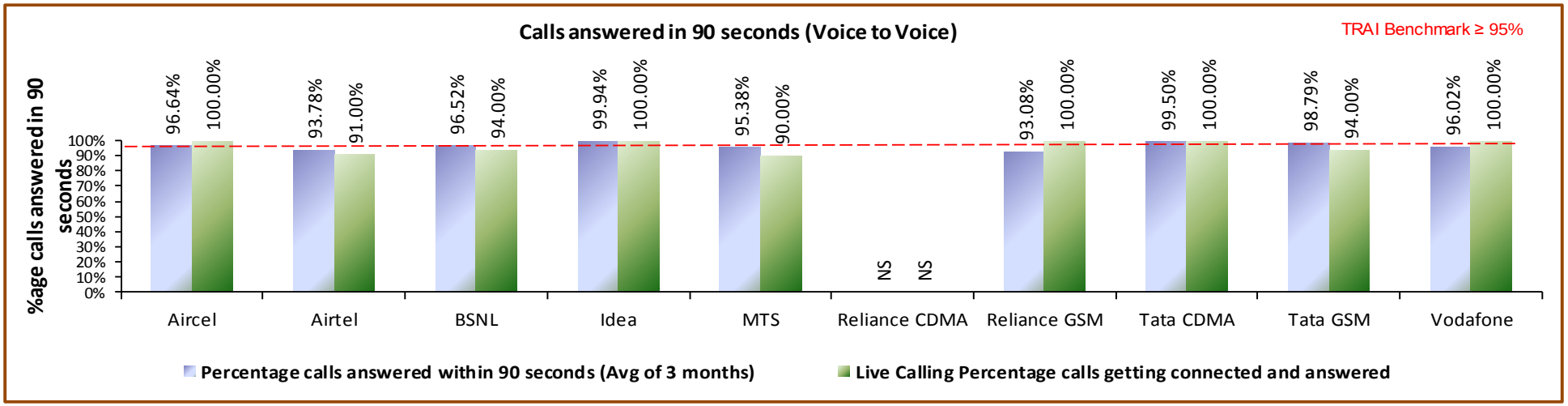
As per PMR data, Airtel failed to meet the benchmark. As per live calling, all operators met the benchmark.

8.5 CALL CENTRE PERFORMANCE-VOICE TO VOICE

8.5.1 PARAMETER DESCRIPTION

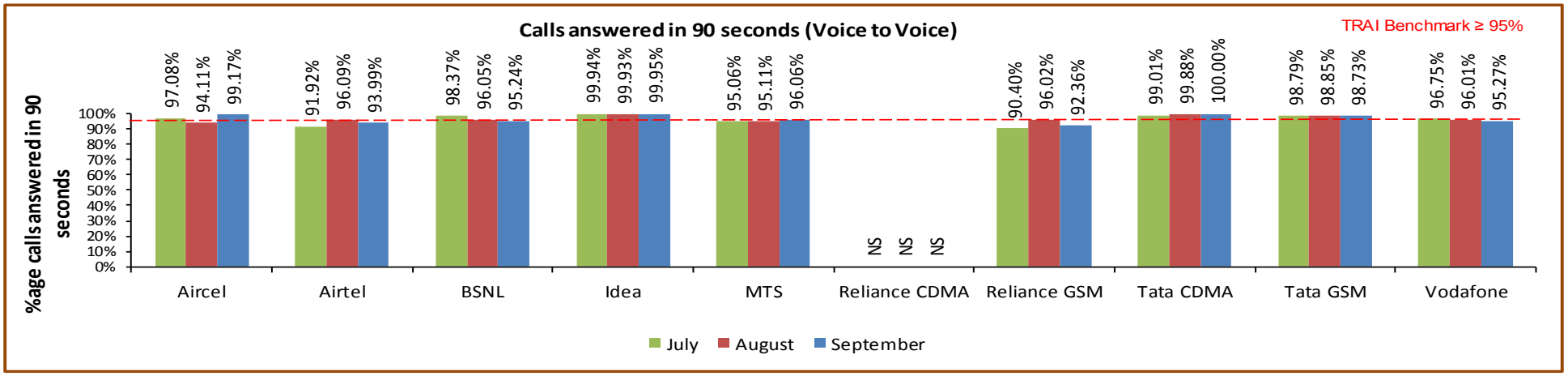
- Computational Methodology:
  - Call centre performance Voice to Voice = (Number of calls answered by operator within 90 seconds/ All calls attempted to connect to the operator) * 100
- Audit Procedure:
  - Operators provide details of the following from their central call centre/ customer service database: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

Benchmark: 95% calls to be answered within 90 seconds



As per PMR data, Airtel and Reliance GSM failed to meet the benchmark. As per live calling, Airtel, BSNL, MTS and Tata GSM failed to meet the benchmark.

8.5.2 KEY FINDINGS



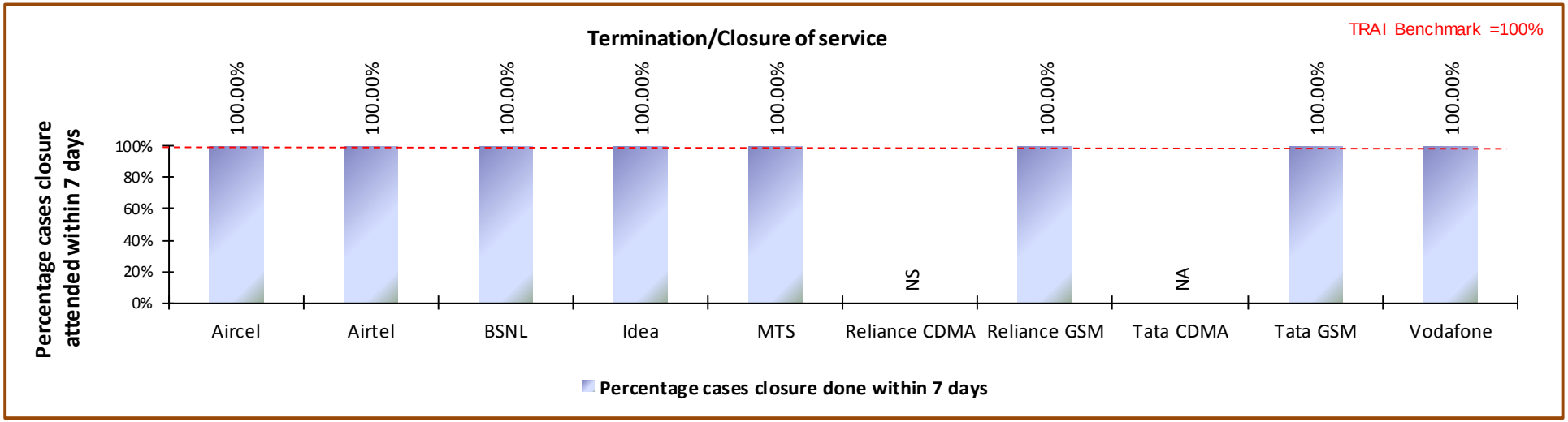
Data Source: Customer Service Center of the operators

8.6 TERMINATION/CLOSURE OF SERVICE

8.6.1 PARAMETER DESCRIPTION

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

8.6.2 KEY FINDINGS



Data Source: Customer Service Center of the operators

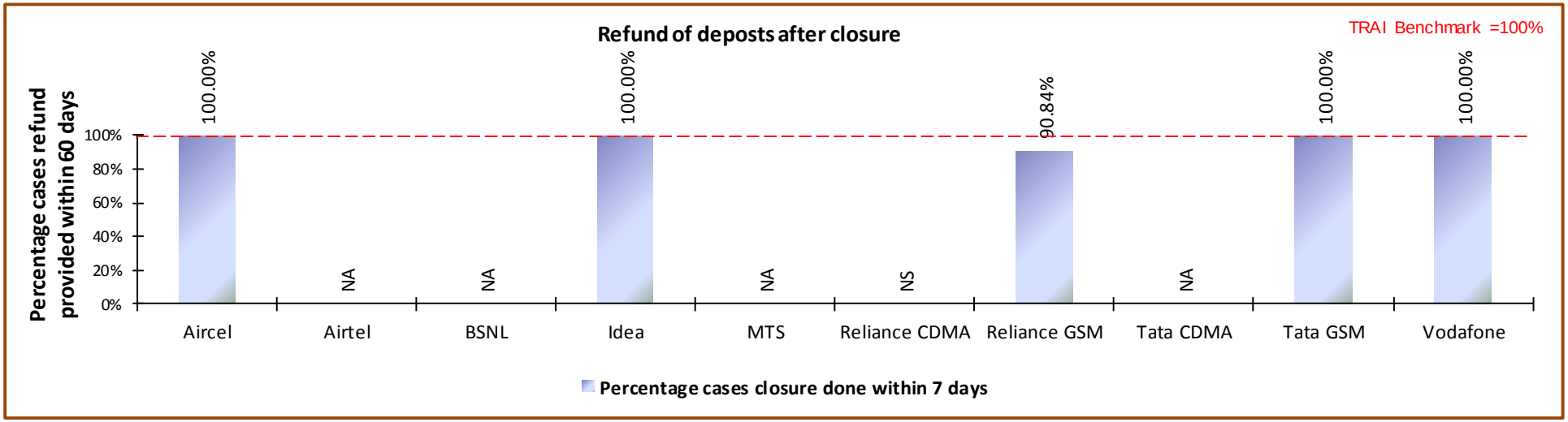
All operators met the TRAI benchmark for the parameter. Tata does not have postpaid service in WB circle.

8.7 REFUND OF DEPOSITS AFTER CLOSURE

8.7.1 PARAMETER DESCRIPTION

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

8.7.2 KEY FINDINGS



Data Source: Customer Service Center of the operators

All operators met the TRAI benchmark for the parameter except Reliance GSM. Airtel, BSNL and MTS had no cases where refund was required. Tata does not have postpaid service in WB circle.

9 DETAILED FINDINGS - DRIVE TEST DATA

9.1 OPERATOR ASSISTED DRIVE TEST - VOICE

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

Name of Operator-2G	Name of Operator-3G
Aircel	Aircel 3G
Airtel	Airtel 3G
Idea	Idea 3G
MTS	Vodafone 3G
Reliance CDMA	
Reliance GSM	
Tata CDMA	
Tata GSM	
Vodafone	

9.1.1 MIDNAPORE SSA

Month	Name of SSA Covered	Start date	End Date	Kilometer Travelled
July	MIDNAPORE	27/7/2016	29/7/2016	506

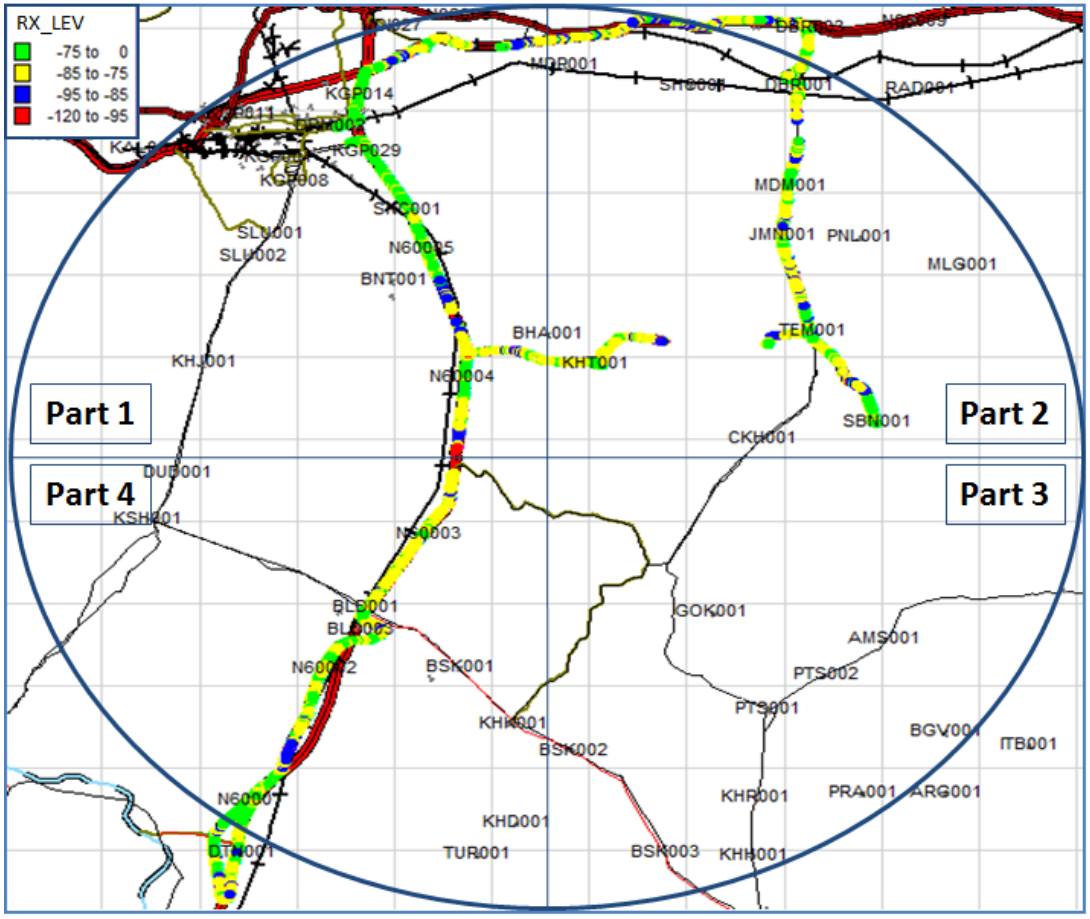
9.1.1.1 Route Details – MIDNAPORE SSA

Category	Type of location	July		
		MIDNAPORE		
		Day 1	Day 2	Day 3
Outdoor	Major Roads	KHARAGPUR-KAUSHALYA-BENAPUR-MAKRAMPUR-NARAYANGARH-BHAKRABAD-BELDA-DANTAN-DASAGRAM-CHANDKURI-TEMATHANI-SABANG-PINGLA-BALICHAWK-DEBRA-KHARAGPUR	CHOWRANGEE-SADARGHAT,MIDNAPORE-NOTUN BAZAR,MIDNAPORE-JUDGE'S COURT, MIDNAPORE-MIDNAPORE STATION-KERANICHOTI-GODAPIYASAL-SALBONI-GARBETA-CHANDRAKONA ROAD-CHANDRAKONA TOWN-KHIRPAI-BIRSINGHA GRAM-GHATAL-SONAMOYEE-DASPUR-BELTOLLA-MECHOGRAM	KHARAGPUR-NIMPURA-SADATPUR-KALAIKUNDA-KHEMASULI-LODHASULI-DHOJURI-BINPUR-JHARGRAM-DHERUA-MIDNAPORE-SAHA CHAWK-MALANCHA ROAD-KHARIDA-GOLEBAZAR-KHARAGPUR
	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 may observe three different colours (Red/Green/Yellow) of the lines, which signify signal strength; however these maps are for a single operator and have not been referred to any findings in this report. IMRB submits detailed operator wise Drive Test reports separately.

9.1.1.2 Route Map - MIDNAPORE DAY 1

RX LEV Plot – Day-1
Date of Drive Test – 27/07/2016
Name of the SDCAs covered – MIDNAPORE (ROB)



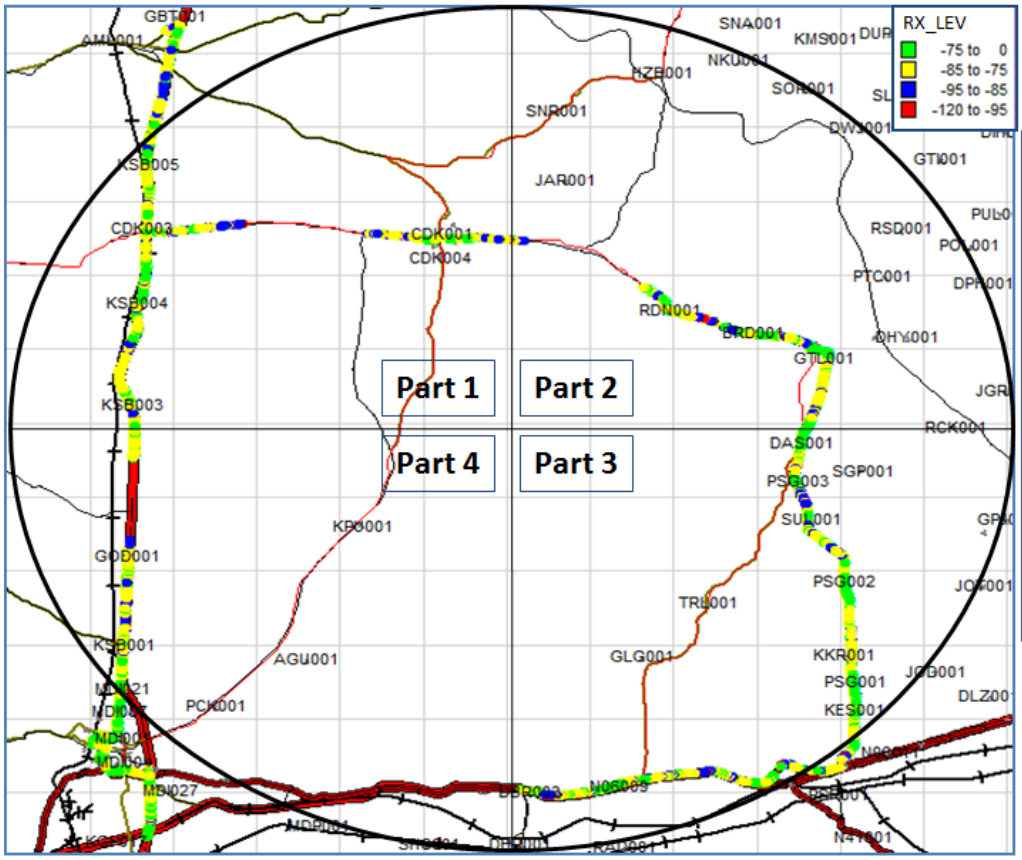
Route Covered Day-1 :

KHARAGPUR-KAUSHALYA-BENAPUR-MAKRAMPUR-NARAYANGARH-BHAKRABAD-BELDA-DANTAN-DASAGRAM-CHANDKURI-TEMATHANI-SABANG-PINGLA-BALICHAWK-DEBRA-KHARAGPUR

1 GRID = 5 KM

9.1.1.3 Route Map - MIDNAPORE DAY 2

RX LEV Plot – Day-2
Date of Drive Test – 28/07/2016
Name of the SDCAs covered – MIDNAPORE (ROB)



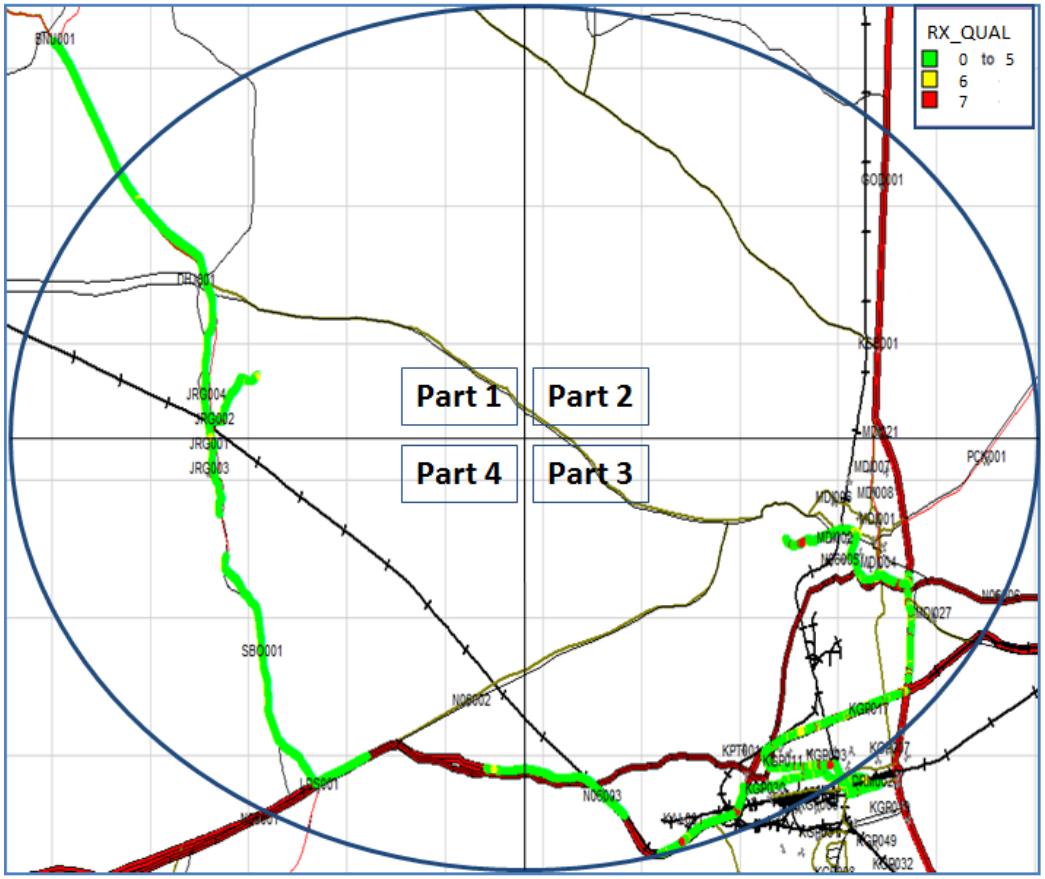
Route Covered Day-2 :

CHOWRANGEE-SADARGHAT,MIDNAPORE-NOTUN BAZAR,MIDNAPORE-JUDGE'S COURT, MIDNAPORE-MIDNAPORE STATION-KERANICHOTI-GODAPIYASAL-SALBONI-GARBETA-CHANDRAKONA ROAD-CHANDRAKONA TOWN-KHIRPAI-BIRSINGHA GRAM-GHATAL-SONAMOYEE-DASPUR-BELTOLLA-MECHOGRAM

1 GRID = 5 KM

9.1.1.4 Route Map - MIDNAPORE DAY 3

RX QUAL Plot – Day-3
Date of Drive Test – 29/07/2016
Name of the SDCAs covered – MIDNAPORE (ROB)



Route Covered Day-3 :

KHARAGPUR-NIMPURA-SADATPUR-KALAIKUNDA-KHEMASULI-LODHASULI-DHOJURI-BINPUR-JHARGRAM-DHERUA-MIDNAPORE-SAHA CHAWK-MALANCHA ROAD-KHARIDA-GOLEBAZAR-KHARAGPUR

1 GRID = 5 KM

9.1.1.5 Drive Test Results - MIDNAPORE SSA-2G

MIDNAPORE	B'mark	Aircel		Airtel		BSNL		Idea		MTS		TATA CDMA		TATA GSM		Vodafone	
Parameter's		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
0 to -75 dBm		38.63%	41.47%	94.32%	95.15%	18.36%	27.13%	46.31%	50.54%	75.98%	42.87%	44.56%	47.32%	13.79%	38.81%	100.00%	44.48%
0 to -85 dBm		83.25%	89.87%	100.00%	99.13%	58.28%	35.26%	85.92%	82.47%	88.55%	71.46%	92.52%	78.84%	88.33%	82.20%	100.00%	88.01%
0 to -95 dBm		99.72%	99.52%	100.00%	99.90%	23.12%	26.98%	99.63%	96.74%	99.99%	94.46%	100.00%	99.29%	99.49%	97.68%	100.00%	99.25%
Voice quality	≥ 95%	97.57%	95.84%	96.14%	95.71%	96.48%	91.61%	99.90%	96.98%	99.34%	96.60%	98.45%	96.34%	99.24%	98.79%	98.67%	97.43%
CSSR	≥ 95%	100.00%	99.39%	100.00%	99.28%	97.16%	93.53%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.71%	100.00%	100.00%
%age Blocked calls		0.00%	0.61%	0.00%	0.72%	2.84%	6.47%	0.00%	0.52%	0.00%	0.00%	0.00%	0.00%	0.00%	0.29%	0.00%	0.00%
Call drop rate	≤ 2%	0.00%	0.20%	0.00%	0.24%	0.73%	5.19%	0.00%	0.52%	0.00%	0.00%	0.00%	0.30%	0.00%	0.29%	0.00%	0.00%
Hands off success rate		100.00%	98.76%	100.00%	96.09%	0.00%	0.00%	100.00%	100.00%	100.00%	99.95%	100.00%	100.00%	99.62%	97.85%	100.00%	99.74%

Data Source: Drive test reports submitted by operators to auditors

Voice Quality

In Midnapore SSA BSNL failed to meet the benchmark for voice quality in outdoor locations.

Call Set Success Rate (CSSR)

In Midnapore SSA BSNL failed to meet the benchmark for CSSR in outdoor locations.

Call Drop Rate

In Midnapore SSA BSNL failed to meet the benchmark for call drop rate in outdoor locations.

9.1.1.1 Drive Test Results – MIDNAPORE SSA-3G

MIDNAPORE	B'mark	Aircel 3G		Airtel 3G		BSNL 3G		Vodafone 3G	
Parameter's		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
0 to -75 dBm		0.99%	5.86%	91.35%	78.01%	0.18%	3.83%	28.55%	36.32%
0 to -85 dBm		82.53%	47.07%	100.00%	93.16%	21.73%	15.57%	95.16%	71.21%
0 to -95 dBm		99.14%	94.13%	100.00%	98.47%	24.06%	18.72%	100.00%	93.83%
Voice quality	≥ 95%	97.82%	99.14%	97.65%	96.21%	68.43%	69.19%	99.79%	98.66%
CSSR	≥ 95%	100.00%	100.00%	100.00%	99.20%	94.12%	88.24%	100.00%	100.00%
%age Blocked calls		0.00%	0.00%	0.00%	0.80%	5.88%	11.76%	0.00%	0.00%
Call drop rate	≤ 2%	0.00%	0.00%	0.00%	0.81%	0.00%	18.67%	0.00%	0.00%
Hands off success rate		100.00%	98.83%	100.00%	97.25%	NA	NA	100.00%	100.00%

Data Source: Drive test reports submitted by operators to auditors

Voice Quality

In Midnapore SSA BSNL 3G failed to meet the benchmark for voice quality in indoor as well as outdoor location.

Call Set Success Rate (CSSR)

In Midnapore SSA BSNL 3G failed to meet the benchmark for CSSR indoor as well as outdoor location.

Call Drop Rate

In Midnapore SSA BSNL 3G failed to meet the benchmark for call drop rate in outdoor location.

9.1.1.1 Data Drive Test Results - MIDNAPORE SSA -2G

Name of the Parameter	Bench Mark	Aircel	Airtel	BSNL	Idea	MTS	TATA CDMA	TATA GSM	Vodafone
Succesful Data Transmission download speed attempts	>80%	100	100	98	100	100	100	100	100
Succesful Data Transmission upload speed attempts	>75%	100	100	97	100	100	100	100	100
Minimum download speed		66	44	51	74	557	45	74	90
Average throughput for Packet Data		108	112	489	149	1242	70	101	128
Latency	<250ms	100	100	100	100	100	100	100	100

All operators met the TRAI benchmark.

9.1.1.2 Data Drive Test Results - MIDNAPORE SSA -3G

Name of the Parameter	Bench Mark	Aircel 3G	Airtel 3G	BSNL 3G	Vodafone 3G
Succesful Data Transmission download speed attempts	>80%	100	100	98	100
Succesful Data Transmission upload speed attempts	>75%	100	100	97	100
Minimum download speed		1305	338	291	1904
Average throughput for Packet Data		2811	3003	489	2454
Latency	<250ms	100	100	100	100

All operators met the TRAI benchmark.

9.1.2 BALURGHAT SSA

Month	Name of SSA Covered	Start date	End Date	Kilometer Travelled
	BALURGHAT	01-09-2016	03-09-2016	413

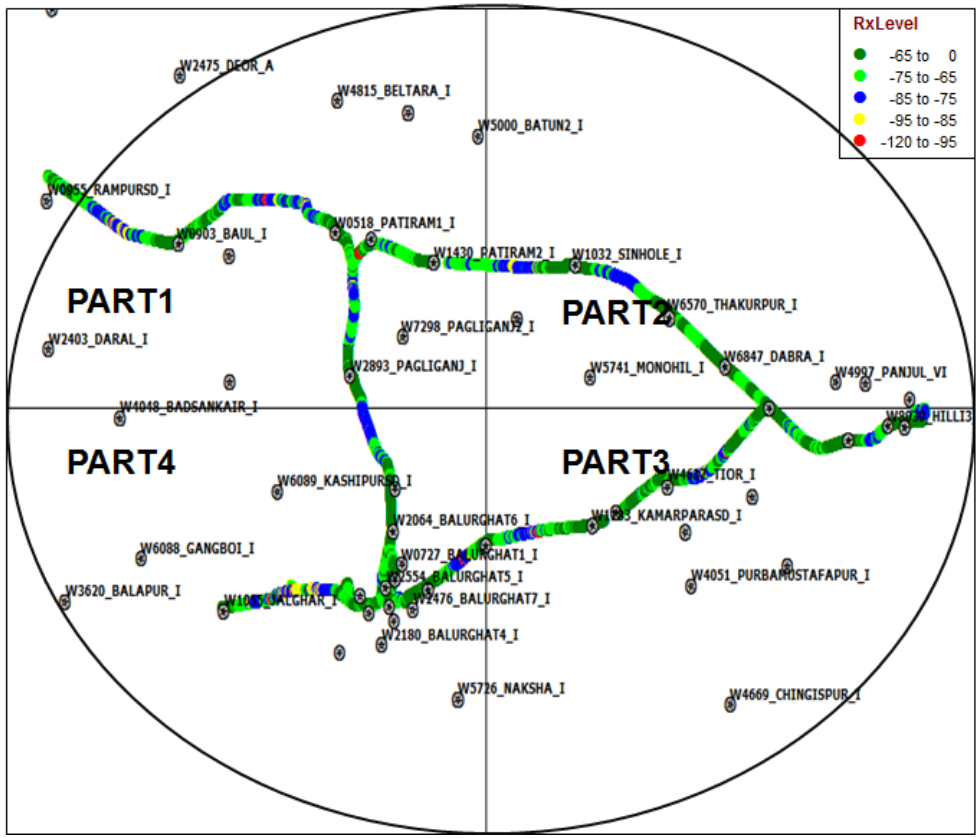
9.1.2.1 Route Details – BALURGHAT SSA

Category	Type of location	September		
		BALURGHAT		
		Day 1	Day 2	Day 3
Outdoor	Major Roads	Balurghat Station-Jalghar-Thana More-Chawk Bhabani-Raghunathpur-Tank More-Patiram-Bahicha More-Bolla-Rampur-Baul-Manipur-Pagligunj-Mahinagar-Balurghat-Mangalpur-Kamarpara-Teor-Trimohini-Hilli Border	Balurghat Bus Stand-Nelson Mandela Sarani-Chak Vrigu-Razua More-Siliguri More-Daral Hat-Tapan-Nayabazar-Gangarampur-Phulbari-Rampur-Rasulpur-Nazirpur-Paranpur-Mahinagar-Plain Ghati-Mahinagar Forest	Balurghat-Kurmile-Chingispur Border-Thakurpara-Gopalbati-Binsura- Bus Stand-Balurghat HospitalMore-Beltalla Park-Biswas Para-Jubo Sangha-Bangi Battalla-Prachho Bharati Road-Lenin Sarani-Sadhana More-Mokhtar Para-School Para-Shusila-Bhatpara-Dangi-Dipali Nagar-Saheb Kachari-Tower More
	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 may observe three different colours (Red/Green/Yellow) of the lines, which signify signal strength; however these maps are for a single operator and have not been referred to any findings in this report. IMRB submits detailed operator wise Drive Test reports separately.

9.1.2.1 Route Map - BALURGHAT DAY 1

Rx Level Plot –Day-1
Date of Drive Test-01/09/2016
Name of the SDCAs covered – **BALURGHAT**

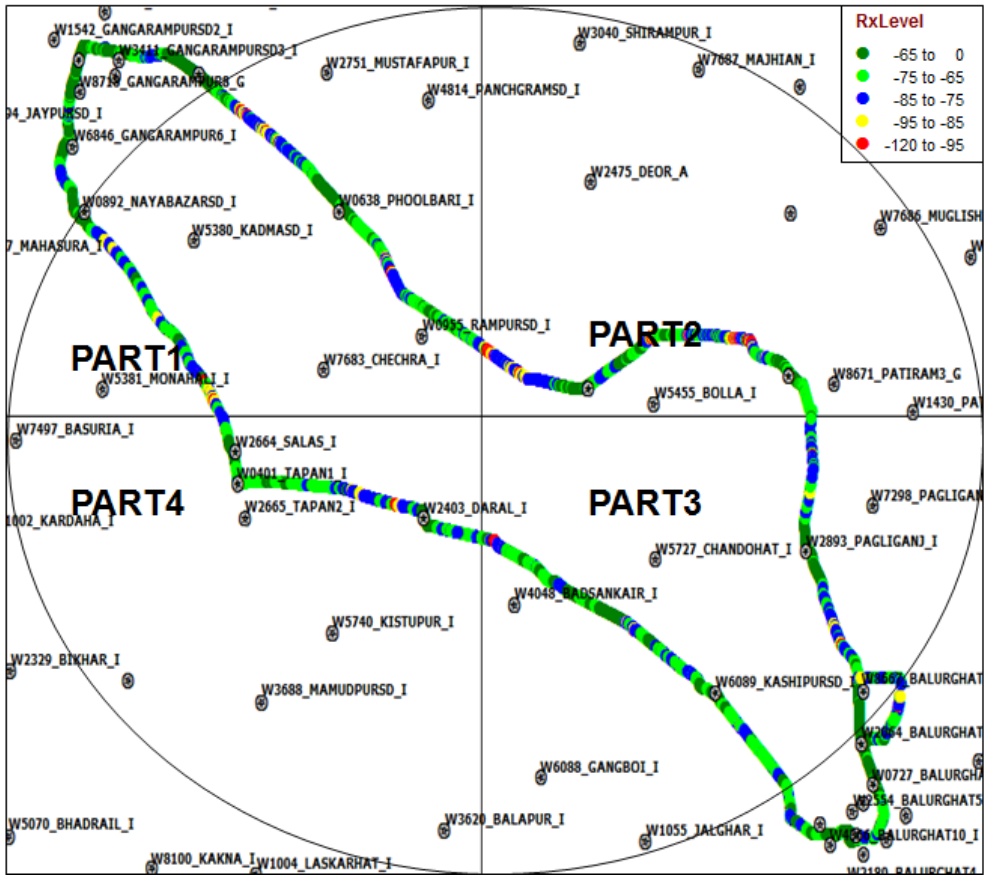


Route Covered_Day1

Balurghat Station-Jalghar-Thana More-Chawk Bhabani-Raghunathpur-Tank More-Patiram-Bahicha More-Bolla-Rampur-Baul-Manipur-Pagligunj-Mahinagar-Balurghat-Mangalpur-Kamarpara-Teor-Trimohini-Hilli Border

9.1.2.2 Route Map - BALURGHAT DAY 2

Rx Level Plot –Day-2
Date of Drive Test-02/09/2016
Name of the SDCAs covered – **BALURGHAT**

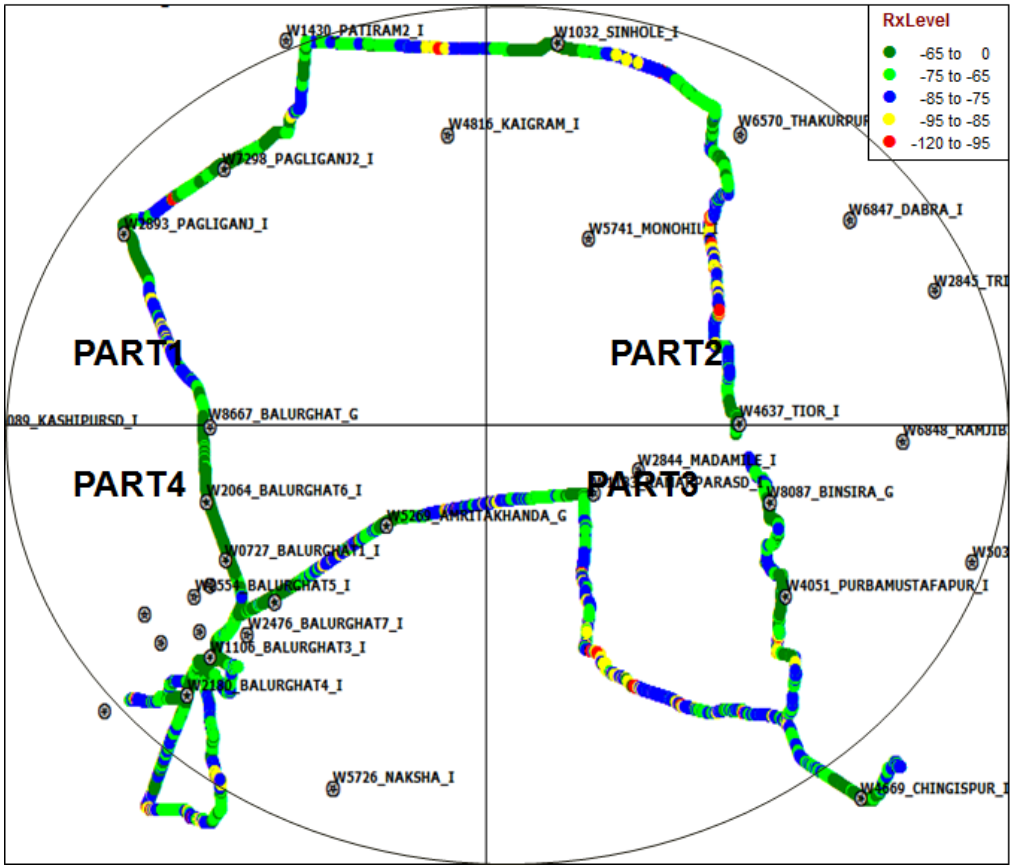


Route Covered_Day2

Balurghat Bus Stand-Nelson Mandela Sarani-Chak Vrigu-Razua More-Siliguri More-Daral Hat-Tapan-Nayabazar-Gangarampur-Phulbari-Rampur-Rasulpur-Nazirpur-Paranpur-Mahinagar-Plain Ghati-Mahinagar Forest

9.1.2.3 Route Map - BALURGHAT DAY 3

Rx Level Plot –Day-3
Date of Drive Test-03/09/2016
Name of the SDCAs covered – **BALURGHAT**



Route Covered_Day3

Balurghat-Kurmile-Chingispur Border-Thakurpara-Gopalbati-Binsura- Bus Stand-Balurghat HospitalMore-Beltalla Park-Biswas Para-Jubo Sangha-Bangi Battalla-Prachho Bharati Road-Lenin Sarani-Sadhana More-Mokhtar Para-School Para-Shusila-Bhatpara-Dangi-Dipali Nagar-Saheb Kachari-Tower More

9.1.2.1 DRIVE TEST RESULTS - BALURGHAT SSA 2G

BALURGHAT	B'mark	Aircel		Airtel		BSNL		Idea		MTS		TATA CDMA		TATA GSM		Vodafone	
Parameter's		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
0 to -75 dBm		43.48%	39.94%	86.65%	95.52%	Not participated		38.97%	37.24%	18.61%	9.18%	54.55%	24.50%	10.68%	17.85%	56.19%	66.00%
0 to -85 dBm		98.26%	88.97%	99.13%	98.99%			73.87%	70.50%	35.39%	32.00%	62.10%	62.58%	72.87%	76.16%	94.11%	93.75%
0 to -95 dBm		99.96%	99.30%	99.91%	99.87%			91.24%	91.75%	92.54%	65.08%	96.23%	95.82%	97.99%	98.04%	99.85%	98.74%
Voice quality	≥ 95%	98.24%	96.31%	99.18%	96.68%			99.94%	99.14%	98.14%	94.64%	98.79%	98.18%	99.42%	97.91%	98.94%	95.52%
CSSR	≥ 95%	100.00%	99.57%	100.00%	100.00%			100.00%	100.00%	100.00%	99.50%	100.00%	100.00%	100.00%	99.42%	100.00%	100.00%
%age Blocked calls		0.00%	0.43%	0.00%	0.00%			0.00%	0.00%	0.00%	0.50%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Call drop rate	≤ 2%	0.00%	0.22%	0.00%	0.24%			0.00%	0.00%	0.00%	0.51%	0.00%	0.00%	0.00%	0.29%	0.00%	0.27%
Hands off success rate		100.00%	99.75%	100.00%	99.76%			100.00%	99.74%	100.00%	99.86%	100.00%	100.00%	100.00%	99.32%	99.13%	99.47%

Voice Quality

In Balurghat SSA MTS failed to meet the benchmark for voice quality in outdoor locations.

Call Set Success Rate (CSSR)

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

Call Drop Rate

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

Note: BSNL did not participated

9.1.2.1 DRIVE TEST RESULTS - BALURGHAT SSA 3G

BALURGHAT	B'mark	Aircel 3G		Airtel 3G		BSNL 3G		Vodafone 3G	
Parameter's		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
0 to -75 dBm		26.89%	16.82%	96.14%	72.87%	Not participated		28.50%	17.90%
0 to -85 dBm		82.13%	79.44%	99.12%	85.01%			90.36%	59.08%
0 to -95 dBm		99.74%	98.00%	99.73%	96.52%			99.99%	90.49%
Voice quality	≥ 95%	99.88%	99.18%	97.06%	99.15%			99.85%	99.03%
CSSR	≥ 95%	100.00%	98.83%	100.00%	100.00%			100.00%	100.00%
%age Blocked calls		0.00%	1.17%	0.00%	0.00%			0.00%	0.00%
Call drop rate	≤ 2%	0.00%	0.00%	0.00%	0.00%			0.00%	0.00%
Hands off success rate		100.00%	100.00%	100.00%	100.00%			100.00%	100.00%

Voice Quality

All operators met the benchmark for voice quality in outdoor locations.

Call Set Success Rate (CSSR)

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

Call Drop Rate

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

Note: BSNL did not participated

9.1.2.2 Data Drive Test Results - BALURGHAT SSA -2G

Name of the Parameter	Bench Mark	Aircel	Airtel	BSNL	Idea	MTS	TATA CDMA	TATA GSM	Vodafone
Succesful Data Transmission download speed attempts	>80%	100	100	Not participated	100	100	100	100	100
Succesful Data Transmission upload speed attempts	>75%	100	100		100	100	100	100	100
Minimum download speed		102	47		140	126	47	72	104
Average throughput for Packet Data		128	99		186	59	68	103	143
Latency	<250ms	100	100		100	100	NA	NA	100

All operators met the TRAI benchmark.

9.1.2.3 Data Drive Test Results - BALURGHAT SSA -2G

Name of the Parameter	Bench Mark	Aircel 3G	Airtel 3G	BSNL 3G	Vodafone 3G
Succesful Data Transmission download speed attempts	>80%	100	100	Not participated	100
Succesful Data Transmission upload speed attempts	>75%	100	100		100
Minimum download speed		1231	338		2198
Average throughput for Packet Data		2004	1853		4190
Latency	<250ms	100	100		100

All operators met the TRAI benchmark.

10 ANNEXURE – CONSOLIDATED-2G

10.1 NETWORK AVAILABILITY

1. Network Availability											
Audit Results for Network Availability- PMR data											
	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Number of BTSs in the licensed service area		9410	20979	7609	15496	2732	No Service	No Service	75	765	23267
Sum of downtime of BTSs in a month (in hours)		25872	13978	23776	19384	2549	No Service	No Service	11	205	11534
BTSs accumulated downtime (not available for service)	≤ 2%	0.37%	0.09%	0.42%	0.17%	0.13%	No Service	No Service	0.02%	0.04%	0.07%
Number of BTSs having accumulated downtime >24 hours		160	16	119	168	0	No Service	No Service	0	0	38
Worst affected BTSs due to downtime	≤ 2%	1.70%	0.08%	1.56%	1.08%	0.00%	No Service	No Service	0.00%	0.00%	0.16%
Live Measurement Results for Network Availability- 3 Day live data											
	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Number of BTSs in the licensed service area		9354	20925	7609	15350	2740	No Service	No Service	75	765	23213
Sum of downtime of BTSs in a month (in hours)		3142	1643	2168	3972	295	No Service	No Service	1	71	1319
BTSs accumulated downtime (not available for service)	≤ 2%	0.47%	0.11%	0.40%	0.36%	0.15%	No Service	No Service	0.02%	0.13%	0.08%
Number of BTSs having accumulated downtime >24 hours		15	0	0	52	0	No Service	No Service	0	0	0
Worst affected BTSs due to downtime	≤ 2%	0.16%	0.00%	0.00%	0.34%	0.00%	No Service	No Service	0.00%	0.00%	0.00%

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

10.2 CONNECTION ESTABLISHMENT (ACCESSIBILITY)

Audit Results for CSSR, SDCCH and TCH congestion- PMR data											
CSSR	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
CSSR	≥ 95%	97.48%	95.83%	97.50%	99.15%	99.64%	No Service	No Service	99.01%	99.05%	99.07%
SDCCH/Paging channel congestion	≤ 1%	0.36%	0.10%	1.17%	0.15%	NA	No Service	No Service	NA	0.24%	0.42%
TCH congestion	≤ 2%	0.89%	1.69%	1.74%	0.14%	0.11%	No Service	No Service	0.01%	0.09%	0.93%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data											
CSSR	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
CSSR	≥ 95%	98.22%	95.89%	97.53%	99.66%	99.76%	No Service	No Service	98.62%	99.29%	99.72%
SDCCH/Paging channel congestion	≤ 1%	0.24%	0.18%	1.78%	0.13%	NA	No Service	No Service	NA	0.55%	0.33%
TCH congestion	≤ 2%	0.37%	1.60%	1.59%	0.04%	0.05%	No Service	No Service	0.01%	0.03%	0.28%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data											
CSSR	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total number of call attempts		1227	966	574	1076	970	No Service	No Service	742	947	1038
Total number of successful calls established		1222	963	542	1076	968	No Service	No Service	742	944	1038
CSSR	≥ 95%	99.59%	99.69%	94.43%	100.00%	99.79%	No Service	No Service	100.00%	99.68%	100.00%
%age blocked calls		0.41%	0.31%	5.57%	0.00%	0.21%	No Service	No Service	0.00%	0.32%	0.00%

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

10.3 CONNECTION MAINTENANCE (RETAINABILITY)

Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data											
Call drop rate	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total number of calls established		298584410	738089908	178816107	486880428	102698816	No Service	No Service	309846	17296599	1545912561
Total number of calls dropped		3493308	10749112	1841130	2244199	729770	No Service	No Service	246	98317	12240362
Call drop rate	≤ 2%	1.17%	1.46%	1.03%	0.46%	0.71%	No Service	No Service	0.08%	0.57%	0.79%
Total number of cells in the network		28189	66332	22254	46687	10110	No Service	No Service	225	2294	70180
Total number of cells having more than 3% TCH		3002	1760	6262	208	266	No Service	No Service	2	61	1913
Worst affected cells having more than 3% TCH	≤ 3%	10.65%	2.65%	28.14%	0.45%	2.63%	No Service	No Service	0.81%	2.66%	2.73%
Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data											
Call drop rate	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total number of calls established		381929188	119495374	18051582	579213462	126533762	No Service	No Service	433974	20840377	1754983159
Total number of calls dropped		3774402	1675606	189079	2451290	709990	No Service	No Service	448	105677	11586392
Call drop rate	≤ 2%	0.99%	1.40%	1.05%	0.42%	0.56%	No Service	No Service	0.10%	0.51%	0.66%
Total number of cells in the network		28021	198367	22254	46231	10134	No Service	No Service	225	2295	70013
Total number of cells having more than 3% TCH		3006	5238	4818	57	12	No Service	No Service	3	59	1935
Worst affected cells having more than 3% TCH	≤ 3%	10.73%	2.64%	21.65%	0.12%	0.12%	No Service	No Service	1.19%	2.59%	2.76%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data											
Call drop rate	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total number of calls established		1222	963	542	1074	968	No Service	No Service	742	944	1038
Total number of calls dropped		2	2	22	2	2	No Service	No Service	1	2	1
Call drop rate	≤ 2%	0.16%	0.21%	4.06%	0.19%	0.21%	No Service	No Service	0.13%	0.21%	0.10%

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

10.4 VOICE QUALITY

Audit Results for Voice quality -PMR Data											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total number of sample calls		57465336945	463401072339	21133	80679453681	310624	No Service	No Service	1006588818	3263652833	287390370356
Total number of calls with good voice quality		55753492541	443317288268	20088	78358777528	309415	No Service	No Service	983903953	3191348442	277765013192
%age calls with good voice quality	≥ 95%	97.02%	95.67%	95.06%	97.12%	99.61%	No Service	No Service	97.75%	97.78%	96.65%
Live measurement results for Voice quality-3 Day data											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total number of sample calls		6512404376	45096844503	2081	52753776928	290822	No Service	No Service	119140374	365105577	200049165861
Total number of calls with good voice quality		6343724279	43142464363	1980	51334933719	288019	No Service	No Service	116148651	357182555	194513282211
%age calls with good voice quality	≥ 95%	97.41%	95.67%	95.15%	97.31%	99.04%	No Service	No Service	97.49%	97.83%	97.23%
Drive test results for Voice quality (Average of three drive tests) - DT data											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total number of sample calls		297581	1875838	867251	869746	NA	No Service	No Service	NA	1505467	1145024
Total number of calls with good voice quality		287129	1808260	805080	847936	NA	No Service	No Service	NA	1484520	1114926
%age calls with good voice quality	≥ 95%	96.49%	96.40%	92.83%	97.49%	97.18%	No Service	No Service	97.94%	98.61%	97.37%

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

10.5 POI CONGESTION

Audit Results for POI Congestion- PMR data											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total number of working POIs		67	40	77	149	53	No Service	No Service	45	20	48
No. of POIs not meeting benchmark		0	0	0	0	0	No Service	No Service	0	0	0
Total Capacity of all POIs (A) - in erlangs		251865	490812	412102	414728	160342	No Service	No Service	32442	19378	1123580
Traffic served for all POIs (B)- in erlangs		117514	291219	86200	243022	60427	No Service	No Service	3606	2553	629915
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	No Service	No Service	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total number of working POIs		67	40	77	149	53	No Service	No Service	45	20	48
No. of POIs not meeting benchmark		0	0	0	0	0	No Service	No Service	0	0	0
Total Capacity of all POIs (A) - in erlangs		251688	146226	412080	394183	160342	No Service	No Service	32412	19378	1122059
Traffic served for all POIs (B)- in erlangs		56335	87375	84805	241314	50819	No Service	No Service	1717	1135	268358
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	No Service	No Service	0.00%	0.00%	0.00%

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

10.6 ADDITIONAL NETWORK RELATED PARAMETERS

Audit Results for Total Traffic Handled in Erlang											
Traffic in Erlang		Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Eqipped capacity of the network		152091	409770	204000	172434.3038	109200	No Service	No Service	5535	13873	435437
Total taffic handled in erlang during TCBH		92447	352630	62327	147772	34656	No Service	No Service	70	4536	438144
Total no. of customers served (as per VLR)		3489331	13656770	1210647	5916207	845579	No Service	No Service	2021	220483	17184744

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

11 ANNEXURE – CONSOLIDATED-3G

11.1 NETWORK AVAILABILITY

Audit Results for Network Availability- PMR data						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
(Number of Node Bs in the network in the licensed service area		2295	12520	1896	4182	11255
Sum of downtime (i.e. total outage time) of Node Bs		11137	9693	5456	6414	5298
Node Bs downtime (not available for service)	≤ 2%	0.65%	0.10%	0.39%	0.21%	0.06%
Number of Node Bs having accumulated downtime of >24 hours in a month		68	9	22	38	17
Worst affected Node Bs due to downtime	≤ 2%	2.96%	0.07%	1.16%	0.91%	0.15%
Live Measurement Results for Network Availability- 3 Day live data						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
(Number of Node Bs in the network in the licensed service area		2282	12458	1896	4184	11242
Sum of downtime (i.e. total outage time) of Node Bs		1109	921	1227	150	630
Node Bs downtime (not available for service)	≤ 2%	0.67%	0.10%	0.90%	0.05%	0.08%
Number of Node Bs having accumulated downtime of >24 hours in a month		8	0	5	0	0
Worst affected Node Bs due to downtime	≤ 2%	0.35%	0.00%	0.26%	0.00%	0.00%

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

11.2 CONNECTION ESTABLISHMENT (ACCESSIBILITY)

Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
CSSR	≥ 95%	98.68%	99.69%	96.79%	97.97%	99.68%
RRC Congestion	≤ 1%	0.31%	0.03%	0.66%	0.03%	0.08%
Circuit Switched RAB Congestion	≤ 2%	0.34%	0.08%	1.76%	0.05%	0.10%
Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
CSSR	≥ 95%	98.91%	99.31%	97.14%	98.20%	99.75%
RRC Congestion	≤ 1%	0.30%	0.23%	0.52%	0.03%	0.04%
Circuit Switched RAB Congestion	≤ 2%	0.21%	0.20%	1.78%	0.05%	0.04%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data						
CSSR	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
Total number of RRC attempts (A)		505	841	230	Not participated	767
Total number of RRC established (B)		503	838	209	Not participated	767
Call setup success rate (B/A*100)	≥ 95%	99.60%	99.64%	90.85%	Not participated	100.00%
%age blocked calls		0.40%	0.36%	9.15%	Not participated	0.00%

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

11.3 CONNECTION MAINTENANCE (RETAINABILITY)

Audit Results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate -PMR data						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		15950710	NA	4385906	8941588	102750478
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		50139	NA	63030	25864	337284
Call drop rate (B/A*100)	≤ 2%	0.31%	0.92%	1.44%	0.29%	0.33%
Total no. of cells in the licensed service area (B)		6882	39487	5688	7604	34451
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		262	1027	845	56	938
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	3.81%	2.60%	14.86%	0.73%	2.72%
Live measurement results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate - 3 Day data						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		20372194	40295947	430664	10380232	142966355
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		61173	180839	6090	21999	434939
Call drop rate (B/A*100)	≤ 2%	0.30%	0.45%	1.41%	0.21%	0.30%
Total no. of cells in the licensed service area (B)		6600	117036	5688	7568	34417
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		254	3093	726	51	902
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	3.85%	2.64%	12.76%	0.67%	2.62%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data						
Call drop rate	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		503	838	209	Not participated	767
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		0	3	21	Not participated	0
Call drop rate (B/A*100)	≤ 2%	0.00%	0.36%	10.07%	Not participated	0.00%

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

11.4 VOICE QUALITY

Voice quality	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		65634307790	NA	NA	NA	287654610664
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		64150855212	NA	NA	NA	284855979164
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	97.74%	98.82%	NA	NA	99.03%
Live measurement results for Voice quality-3 Day data						
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		9430929512	NA	NA	NA	33473518610
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		9227027342	NA	NA	NA	33150098978
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	97.84%	98.97%	NA	NA	99.03%
Drive test results for Voice quality (Average of three drive tests) - DT data						
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		832946	3049777	991025	Not participated	982841
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		825751	2988130	682176	Not participated	974534
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	99.14%	97.98%	68.84%	Not participated	99.15%

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

11.5 POI CONGESTION

Audit Results for POI Congestion- PMR data						
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
Total number of working POIs		67	40	77	41	48
No. of POIs not meeting benchmark		0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		251865	490812	412102	71857	1123580
Traffic served for all POIs (B)- in erlangs		117514	291219	86200	9186	629915
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data						
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
Total number of working POIs		67	40	77	41	48
No. of POIs not meeting benchmark		0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		250888	146226	412080	71857	1121959
Traffic served for all POIs (B)- in erlangs		56335	87375	84705	8944	268358
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%

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

11.6 ADDITIONAL NETWORK RELATED PARAMETERS

Audit Results for Total Traffic Handled in Erlang						
Traffic in Erlang		Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
Eqipped capacity of the network		NA	NA	170744	126000	NA
Total taffic handled in erlang during TCBH		1786	21166	31136	23233	22698
Total no. of customers served (as per VLR)		207260	1063614	46993	241805	1079265

12 ANNEXURE – CUSTOMER SERVICES

12.1 METERING AND BILLING CREDIBILITY

Audit Results for Billing performance Postpaid-Consolidated											
Billing Performance	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	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		564	263537	98747	22644	31024	NS	49635	0	3392918	1283523
Total number of bills disputed		0	105	0	64	17	NS	41	0	37	1135
Total number of valid billing complaints		0	44	0	12	10	NS	41	0	37	443
Total complaints considered invalid		0	61	0	52	7	NS	0	0	0	692
Percentage bills disputed (Avg of 3 billing cycles)	≤ 0.1%	0.00%	0.04%	0.00%	0.28%	0.05%	NS	0.08%	NA	0.00%	0.09%
July											
Total bills generated during the first billing cycle		191	86916	32928	7556	11003	NS	16715	0	1141701	415119
Total number of bills disputed in first billing cycle		0	26	0	24	6	NS	15	0	5	379
Total number of valid billing complaints (billing cycle 1)		0	6	0	5	4	NS	15	0	5	166
Total complaints considered invalid (billing cycle 1)		0	20	0	19	2	NS	0	0	0	213
Percentage bills disputed (first billing cycle)	≤ 0.1%	0.00%	0.03%	0.00%	0.32%	0.05%	NS	0.09%	NA	0.00%	0.09%
August											
Total bills generated during the second billing cycle		188	87545	32890	7604	10302	NS	16507	0	1115518	427939
Total number of bills disputed in second billing cycle		0	49	0	21	7	NS	13	0	15	345
Total number of valid billing complaints (billing cycle 2)		0	30	0	4	5	NS	13	0	15	134
Total complaints considered invalid (billing cycle 2)		0	19	0	17	2	NS	0	0	0	211
Percentage bills disputed (second billing cycle)	≤ 0.1%	0.00%	0.06%	0.00%	0.28%	0.07%	NS	0.08%	NA	0.00%	0.08%

Data Source: Billing Center of the operators

September											
Total bills generated during the third billing cycle		185	89076	32929	7484	9719	NS	16413	0	1135699	440465
Total number of bills disputed in third billing cycle		0	30	0	19	4	NS	13	0	17	411
Total number of valid billing complaints (billing cycle 3)		0	8	0	3	1	NS	13	0	17	143
Total complaints considered invalid (billing cycle 3)		0	22	0	16	3	NS	0	0	0	268
Percentage bills disputed (third billing cycle)	≤ 0.1%	0.00%	0.03%	0.00%	0.25%	0.04%	NS	0.08%	NA	0.00%	0.09%
Metering and billing credibility - Prepaid											
Performance prepaid	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total number of charging complaints (valid) - sum of 3 months		3588	5003	547	17357	278	NS	2850	0	71	6497
Total complaints considered invalid (sum of 3 months)		0	14623	501	16038	239	NS	0	0	0	3986
Total number of charging complaints (sum of 3 months)		3588	19626	1048	33395	517	NS	2850	0	71	10483
Total no of customers served (Sum of 3 months)		15004086	45665300	4695026	16515284	1297269	NS	9512005	48435	60471270	18209789
Percentage of charging complaints disputed	≤ 0.1%	0.02%	0.04%	0.02%	0.20%	0.04%	NS	0.03%	0.00%	0.00%	0.06%

Resolution of Billing Complaints

Resolution of billing complaints (Postpaid+Prepaid)-Consolidated											
Billing Performance	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Vodafone**
Total number of billing/charging complaints		3588	19731	547	33511	295	NS	2891	0	108	11618
Total number of complaints resolved in favour of customer		0	5047	501	16090	249	NS	2891	0	108	6940
Total complaints considered invalid		3588	14684	46	17421	46	NS	0	0	0	4678
Number of complaints resolved in 4 weeks		0	5047	501	16090	249	NS	2891	0	108	6940
Percentage complaints resolved within 4 weeks	≥ 98%	NA	100.00%	100.00%	100.00%	100.00%	NS	100.00%	NA	100.00%	100.00%
Number of complaints resolved in 6 weeks		0	5047	501	16090	249	NS	2891	0	108	6940
Percentage complaints resolved within 6 weeks	100.00%	NA	100.00%	100.00%	100.00%	100.00%	NS	100.00%	NA	100.00%	100.00%
Period of applying credit / waiver											
Total number of complaints where credit/waiver is required		0	5047	501	1331	249	NS	2891	0	0	1460
Percentage cases in which credit/waiver was received within 1 week	100%	100.00%	100.00%	100.00%	100.00%	100.00%	NS	100.00%	100.00%	100.00%	100.00%
Live calling results for resolution of billing complaints											
Resolution of billing complaints	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Vodafone**
Total Number of calls made		100	100	100	100	100	NS	100	NA	15	100
Number of cases resolved in 4 weeks		98	98	98	97	97	NS	98	NA	15	100
Percentage cases resolved in 4 weeks	≥ 98%	98.00%	98.00%	98.00%	97.00%	97.00%	NS	98.00%	NA	100.00%	100.00%
Number of cases resolved in 6 weeks		98	98	98	97	97	NS	98	NA	15	100
Percentage cases resolved in 6 weeks	100.00%	98.00%	98.00%	98.00%	97.00%	97.00%	NS	98.00%	NA	100.00%	100.00%

Data Source: Billing Center of the operator

12.2 CUSTOMER CARE

Audit results for customer care (IVR and voice-to-Voice) -Consolidated											
Customer Care Assessment	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total number of call attempts to customer care for assistance		14437547	4903051	1783546	17266467	2933251	NS	3388100		62493	30989047
Number of calls getting connected and answered (electronically)		13940665	4545318	1701073	17123053	2902547	NS	3370733	0	61599	30989034
Percentage calls getting connected and answered	≥ 95%	96.56%	92.70%	95.38%	99.17%	98.95%	NS	99.49%	NA	98.57%	100.00%
Audit results for customer care (voice-to-Voice)- (Avg of 3 months)-Consolidated											
Customer Care Assessment	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total Number of calls received (3 months)		3326349	6332489	46012	5430392	778525	NS	1055620	2998	81899	10968909
Total Number of calls answered within 90 seconds (3 months)		3214438	5938370	44409	5427230	742551	NS	982586	2983	80911	10532560
Percentage calls answered within 90 seconds (Avg of 3 months)	≥ 95%	96.64%	93.78%	96.52%	99.94%	95.38%	NS	93.08%	99.50%	98.79%	96.02%
July											
Total calls received (Month 1)		1161946	2603409	14689	1907733	295874	NS	312686	1419	29048	3753550
Total calls answered within 90 seconds (Month 1)		1128030	2392996	14449	1906577	281250	NS	282667	1405	28697	3631574
% calls answered within 90 seconds (Month 1)	≥ 95%	97.08%	91.92%	98.37%	99.94%	95.06%	NS	90.40%	99.01%	98.79%	96.75%
August											
Total calls received (Month 2)		1186683	1924399	15682	1749341	246937	NS	375450	810	27160	3601287
Total calls answered within 90 seconds (Month 2)		1116807	1849093	15063	1748146	234874	NS	360497	809	26848	3457688
% calls answered within 90 seconds (Month 2)	≥ 95%	94.11%	96.09%	96.05%	99.93%	95.11%	NS	96.02%	99.88%	98.85%	96.01%
September											
Total calls received (Month 3)		977720	1804681	15641	1773318	235714	NS	367484	769	25691	3614072
Total calls answered within 90 seconds (Month 3)		969601	1696281	14897	1772507	226427	NS	339422	769	25366	3443298
% calls answered within 90 seconds (Month 3)	≥ 95%	99.17%	93.99%	95.24%	99.95%	96.06%	NS	92.36%	100.00%	98.73%	95.27%
Live calling results for customer care (IVR)											
Customer Care Assessment	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total number of call attempts to customer care for assistance		100	100	100	100	100	NS	100	100	100	100
Number of calls getting connected and answered (electronically)		100	100	100	100	100	NS	100	100	100	100
Percentage calls getting connected and answered	≥ 95%	100.00%	100.00%	100.00%	100.00%	100.00%	NS	100.00%	100.00%	100.00%	100.00%
Live calling results for customer care (Voice to Voice)											
Customer Care Assessment	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total Number of calls received		21	100	100	100	100	NS	100	100	100	100
Total Number of calls getting connected and answered		21	91	94	100	90	NS	100	100	94	100
Live Calling Percentage calls getting connected and answered	≥ 95%	100.00%	91.00%	94.00%	100.00%	90.00%	NS	100.00%	100.00%	94.00%	100.00%

June											
Total calls received (Month 3)		1164406	2524902	13766	1837319	387760	0	309628	740	30163	3608838
Total calls answered within 90 seconds (Month 3)		1128155	1922668	13352	1835163	369167	0	184948	740	29941	3459713
% calls answered within 90 seconds (Month 3)	≥ 95%	96.89%	76.15%	96.99%	99.88%	95.21%	NA	59.73%	100.00%	99.26%	95.87%
Live calling results for customer care (IVR)											
Customer Care Assessment	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	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	100
Number of calls getting connected and answered (electronically)		100	100	90	100	98	100	100	100	100	100
Percentage calls getting connected and answered	≥ 95%	100.00%	100.00%	90.00%	100.00%	98.00%	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	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total Number of calls received		89	100	100	100	100	100	100	100	100	100
Total Number of calls getting connected and answered		73	100	90	100	100	100	100	100	100	100
Live Calling Percentage calls getting connected and answered	≥ 95%	82.02%	100.00%	90.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

12.3 TERMINATION / CLOSURE OF SERVICE

Audit results for termination / closure of service-Consolidated											
Termination	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total number of closure request		2	787	1550	377	779	NS	72	0	31550	5812
Number of requests attended within 7 days		2	787	1550	377	779	NS	72	0	31550	5812
Percentage cases in which termination done within 7 days	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	NS	100.00%	NA	100.00%	100.00%

Data Source: Customer Service Center of the operators

12.4 TIME TAKEN FOR REFUND OF DEPOSITS AFTER CLOSURE

Audit results for refund of deposits-Consolidated											
Refund	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total number of cases requiring refund of deposits		1	0	0	252	NA	NS	262	0	1767	5515
Total number of cases where refund was made within 60 days		1	0	0	252	NA	NS	238	0	1767	5515
Percentage cases in which refund was receive within 60 days	100.00%	100.00%	NA	NA	100.00%	NA	NS	90.84%	NA	100.00%	100.00%

Data Source: Billing Center of the operators

12.5 LIVE CALLING RESULTS FOR RESOLUTION OF SERVICE REQUESTS

Live calling results for resolution of service requests										
Resolution of service requests	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total Number of calls made	100	100	100	100	100	NS	100	6	100	100
Number of cases resolved to satisfaction	97	96	99	97	97	NS	99	5	96	100
Percentage cases resolved in four weeks	97.00%	96.00%	99.00%	97.00%	97.00%	NS	99.00%	83.33%	96.00%	100.00%

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

12.6 LIVE CALLING RESULTS FOR LEVEL 1 SERVICES

Live calling for level 1 services											
Level 1 services		Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total no. of calls made		300	300	300	300	300	NS	300	300	300	300
Calls answered		262	244	253	277	264	NS	278	281	278	280
% of calls connected	≥ 95%	87.33%	81.33%	84.33%	92.33%	88.00%	NS	92.67%	93.67%	92.67%	93.33%

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

12.7 LEVEL 1 SERVICE CALLS MADE

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

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

Aircel					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		38	33
101	Fire	Y		37	33
102	Ambulance	Y		38	33
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline	Y		38	32
138	All India Helpine for Passangers	Y		37	33
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline		N		
1033	Road Accident Management Service		N		
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti Corruption Helpline		N		

1070	Relief Commission for Natural Calamities		N		
1071	Air Accident Helpline		N		
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline		N		
1077	Control Room for District Collector		N		
1090	Call Alart (Crime Branch)		N		
1091	Women Helpline	Y		38	33
1097	National AIDS Helpline to NACO		N		
1099	Central Accident and Trauma Services (CATS)		N		
10580	Educationa & 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		37	33
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	Y		37	32
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		19	16
101	Fire	Y		19	15
102	Ambulance	Y		19	15
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpine for Passangers	Y		18	15
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline	Y		19	15
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		19	15
1071	Air Accident Helpline	Y		18	15
1072	Rail Accident Helpline	Y		19	15
1073	Road Accident Helpline	Y		19	15
1077	Control Room for District Collector		N		
1090	Call Alart (Crime Branch)	Y		19	15
1091	Women Helpline	Y		19	16
1097	National AIDS Helpline to NACO	Y		18	15

1099	Central Accident and Trauma Services (CATS)		N		
10580	Educationa & 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		N		
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline	Y		18	16
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
1903	Sashastra Seema Bal (SSB)	Y		19	15
1909	National Do Not Call Registry	Y		19	16
1912	Complaint of Electricity		N		
1916	Drinking Water Supply		N		
1950	Election Commission of India	Y		19	15
BSNL					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		23	20
101	Fire	Y		24	20
102	Ambulance	Y		23	19
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpine for Passangers	Y		23	19

149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline	Y		23	20
182	Indian Railway Security Helpline	Y		23	19
1033	Road Accident Management Service		N		
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services	Y		23	20
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti Corruption Helpline	Y		23	20
1070	Relief Commission for Natural Calamities	Y		23	19
1071	Air Accident Helpline		N		
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline		N		
1077	Control Room for District Collector		N		
1090	Call Alart (Crime Branch)		N		
1091	Women Helpline	Y		23	19
1097	National AIDS Helpline to NACO		N		
1099	Central Accident and Trauma Services (CATS)		N		
10580	Educationa & 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		N		
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline		N		
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
1903	Sashastra Seema Bal (SSB)	Y		23	19
1909	National Do Not Call Registry	Y		23	19
1912	Complaint of Electricity	Y		23	20
1916	Drinking Water Supply		N		
1950	Election Commission of India		N		
Idea					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		23	21
101	Fire	Y		23	22
102	Ambulance	Y		23	22
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpine for Passangers	Y		23	21
149	Public Road Transport Utility Service	Y		23	21
181	Chief Minister Helpline	Y		24	22
182	Indian Railway Security Helpline		N		
1033	Road Accident Management Service		N		
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		

1063	Public Grievance Cell DoT Hq		N		
1064	Anti Corruption Helpline		N		
1070	Relief Commission for Natural Calamities	Y		23	22
1071	Air Accident Helpline		N		
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline		N		
1077	Control Room for District Collector		N		
1090	Call Alart (Crime Branch)	Y		23	21
1091	Women Helpline	Y		23	21
1097	National AIDS Helpline to NACO	Y		23	21
1099	Central Accident and Trauma Services (CATS)		N		
10580	Educationa & 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		N		
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	Y		23	21
1912	Complaint of Electricity	Y		23	21
1916	Drinking Water Supply	Y		23	21

1950	Election Commission of India		N		
MTS					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		16	14
101	Fire	Y		16	14
102	Ambulance	Y		16	13
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpine for Passangers	Y		15	14
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline	Y		16	14
1033	Road Accident Management Service	Y		16	14
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		15	14
1071	Air Accident Helpline	Y		16	13
1072	Rail Accident Helpline	Y		16	14
1073	Road Accident Helpline	Y		16	14
1077	Control Room for District Collector		N		
1090	Call Alart (Crime Branch)	Y		16	14

1091	Women Helpline	Y		15	14
1097	National AIDS Helpline to NACO	Y		16	14
1099	Central Accident and Trauma Services (CATS)		N		
10580	Educationa & 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		16	14
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		16	14
1909	National Do Not Call Registry	Y		16	14
1912	Complaint of Electricity	Y		15	14
1916	Drinking Water Supply	Y		16	14
1950	Election Commission of India	Y		16	14
Reliance GSM					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		25	23
101	Fire	Y		25	23
102	Ambulance		N		
104	Health Information Helpline		N		

108	Emergency and Disaster Management Helpline		N		
138	All India Helpine for Passangers		N		
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline		N		
1033	Road Accident Management Service		N		
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti Corruption Helpline		N		
1070	Relief Commission for Natural Calamities	Y		25	23
1071	Air Accident Helpline	Y		25	23
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline	Y		25	23
1077	Control Room for District Collector		N		
1090	Call Alart (Crime Branch)		N		
1091	Women Helpline	Y		25	24
1097	National AIDS Helpline to NACO	Y		25	24
1099	Central Accident and Trauma Services (CATS)		N		
10580	Educationa & Vocational Guidance and Counselling		N		
10589	Mother and Child Tracking (MCTH)		N		
10740	Central Pollution Control Board		N		

10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway	Y		25	23
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline		N		
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
1903	Sashastra Seema Bal (SSB)	Y		25	23
1909	National Do Not Call Registry	Y		25	23
1912	Complaint of Electricity	Y		25	23
1916	Drinking Water Supply	Y		25	23
1950	Election Commission of India		N		
TATA CDMA					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		60	57
101	Fire		N		
102	Ambulance		N		
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpine for Passangers		N		
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline		N		
1033	Road Accident Management Service		N		

1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti Corruption Helpline		N		
1070	Relief Commission for Natural Calamities	Y		60	56
1071	Air Accident Helpline	Y		60	56
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline	Y		60	56
1077	Control Room for District Collector		N		
1090	Call Alart (Crime Branch)		N		
1091	Women Helpline	Y		60	56
1097	National AIDS Helpline to NACO		N		
1099	Central Accident and Trauma Services (CATS)		N		
10580	Educationa & 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		N		
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		N		
1916	Drinking Water Supply		N		
1950	Election Commission of India		N		
TATA GSM					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		25	24
101	Fire		N		
102	Ambulance		N		
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpine for Passangers	Y		25	24
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline		N		
1033	Road Accident Management Service		N		
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti Corruption Helpline		N		
1070	Relief Commission for Natural Calamities	Y		25	23

1071	Air Accident Helpline	Y		25	23
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline	Y		25	23
1077	Control Room for District Collector		N		
1090	Call Alart (Crime Branch)	Y		25	23
1091	Women Helpline	Y		25	23
1097	National AIDS Helpline to NACO	Y		25	23
1099	Central Accident and Trauma Services (CATS)		N		
10580	Educationa & Vocational Guidance and Counselling		N		
10589	Mother and Child Tracking (MCTH)		N		
10740	Central Pollution Control Board		N		
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway	Y		25	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	Y		25	23
1912	Complaint of Electricity	Y		25	23
1916	Drinking Water Supply		N		
1950	Election Commission of India	Y		25	23
Vodafone					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected

100	Police	Y		19	18
101	Fire	Y		19	18
102	Ambulance		N		
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpine for Passangers	Y		19	17
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline	Y		19	18
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		N		
1071	Air Accident Helpline	Y		18	18
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline	Y		19	17
1077	Control Room for District Collector		N		
1090	Call Alart (Crime Branch)	Y		19	17
1091	Women Helpline	Y		19	18
1097	National AIDS Helpline to NACO		N		
1099	Central Accident and Trauma Services (CATS)		N		

10580	Educationa & 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		19	18
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline	Y		19	18
155304	Municipal Corporations		N		
155214	Labour Helpline	Y		19	17
1903	Sashastra Seema Bal (SSB)	Y		18	18
1909	National Do Not Call Registry	Y		18	17
1912	Complaint of Electricity	Y		19	17
1916	Drinking Water Supply	Y		18	17
1950	Election Commission of India	Y		19	17

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

12.8 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 Changeable)])

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))**

12.8.1 ERICSSON

Ericsson provides network support to Vodafone, Aircel, BSNL, Reliance GSM and Reliance CDMA in the circle.

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

Ericsson Counters

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

CCALLS	Channel allocation attempt counter on SDCCH.
TNDROP	The total number of dropped TCH Connections.
QUAL00DL	Number of quality 0 reported on downlink.
QUAL10DL	Number of quality 1 reported on downlink.
QUAL20DL	Number of quality 2 reported on downlink.
QUAL30DL	Number of quality 3 reported on downlink.
QUAL40DL	Number of quality 4 reported on downlink.
QUAL50DL	Number of quality 5 reported on downlink.
QUAL60DL	Number of quality 6 reported on downlink.
QUAL70DL	Number of quality 7 reported on downlink.

12.8.2 NSN (NOKIA SIEMENS NETWORKS)

NSN provides network support to Airtel 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)

12.8.3 HUAWEI

Huawei provides network support to Idea and MTS in the circle.

HUAWEI CDMA		
SR .NO	KPI	HUAWEI FORMULA
1	CALL SETUP SUCCES (NUM)	[Successful CS IS-95 Orig Call Setups + Successful CS IS-2000 Orig Call Setups + Successful CS IS-95 Term Call Setups + Successful CS IS-2000 Term Call Setups] ([1157628567] + [1157628587] + [1157628568] + [1157628588])
2	CALL SETUP SUCCES (DEN)	[CS IS-95 Orig Attempts + CS IS-2000 Orig Attempts + CS IS-95 Term Attempts + CS IS-2000 Term Attempts] ([1157628553] + [1157628573] + [1157628554] + [1157628574])
3	CALL SETUP SUCCESS RATE (%)	CALL SETUP SUCCES (NUM) / CALL SETUP SUCCES (DEN) * 100\

4	CALL DROP RATE (NUM)	[CS IS-95 Call Drops (Too many Erasure frames) + CS IS-2000 Call Drops (Too many Erasure frames) + CS IS-95 Call Drops (No reverse frame received) + CS IS-2000 Call Drops (No reverse frame received) + CS IS-95 Call Drops (Abis interface abnormal) + CS IS-2000 Call Drops (Abis interface abnormal) + CS IS-95 Call Drops (A2 interface abnormal) + CS IS-2000 Call Drops (A2 interface abnormal) + CS IS-95 Call Drops (HHO fail) + CS IS-2000 Call Drops (HHO fail) + CS IS-95 Call Drops (Other causes) + CS IS-2000 Call Drops (Other causes)] ([1157628608] + [1157628614] + [1157628609] + [1157628615] + [1157628610] + [1157628616] + [1157628611] + [1157628617] + [1157628612] + [1157628618] + [1157628613] + [1157628619])
5	CALL DROP RATE(DEN)	[Successful CS IS-95 Orig Call Setups + Successful CS IS-2000 Orig Call Setups + Successful CS IS-95 Term Call Setups + Successful CS IS-2000 Term Call Setups + CS IS-95 Successful Incoming Hard HOs + CS IS-2000 Successful Incoming Hard HOs] [1157628619]) x 100/([1157628567] + [1157628587] + [1157628568] + [1157628588] + [1157628569] + [1157628589])]
6	Call DROP Rate	CALL DROP RATE (NUM) / CALL DROP RATE(DEN) * 100\
7	RF BLOCK RATE (NUM)	{[(TCH Assignment Requests-CS Orig-IS95[Times] + TCH Assignment Requests-CS Orig-IS2000[Times] + TCH Assignment Requests-CS Term-IS95[Times] + TCH Assignment Requests-CS Term-IS2000[Times]) - (Successful TCH Assignments-CS Orig-IS95[Times] + Successful TCH Assignments-CS Orig-IS2000[Times] + Successful TCH Assignments-CS Term-IS95[Times] + Successful TCH Assignments-CS Term-IS2000[Times])] {[(1157628621 + 1157628628 + 1157628635+ 1157628642)
8	RF BLOCK RATE (DEN)	[((TCH Assignment Requests-CS Orig-IS95[Times] + TCH Assignment Requests-CS Orig-IS2000[Times] + TCH Assignment Requests-CS Term-IS95[Times] + TCH Assignment Requests-CS Term-IS2000[Times]))]} [(1157628621 + 1157628628 + 1157628635+ 1157628642)]}
9	RF BLOCK RATE	RF BLOCK RATE (NUM) / RF BLOCK RATE (DEN) *100
10	Call Quality (RFER)	CS Reverse Link Average FER of Carrier[%]

12.8.4 ZTE

ZTE provides network support to Tata CDMA and Tata GSM in the circle.

1. Connection Establishment (Accessibility)

A. CALL SETUP SUCCESS RATE:

KPI is calculated as Average over the month at TCBH

((1-C900060053/(C900060003+C900060010+C900060038))*(1-((C900060005+C900060011+C900060039)/(C900060003+C900060010+C900060038)))*(1-(C900060020+C900060031+C900060043+C900060047)/(C900060019+C900060030+C900060042+C900060046))*(1-(C900060018+C900060029+C900060037+C900060135+C900060200+C900060211)/(C900060017+C900060028+C900060036+C900060018+C900060029+C900060037+C900060235+C900060199+C900060210+C900060135+C900060200+C900060211)))*100

Where,

C900060053	Number of SDCCH drops
C900060003	Number of SDCCH seizure attempts for assignment
C900060010	Number of signaling TCH/F seizure attempts for assignment
C900060038	Number of signaling TCH/H seizure attempts for assignment
C900060005	Number of SDCCH seizure failure for assignment
C900060011	Number of signaling TCH/F seizure failure for assignment
C900060039	Number of signaling TCH/H seizure failure for assignment
C900060020	Number of voice TCH/F seizure failure for assignment
C900060031	Number of data TCH/F seizure failure for assignment
C900060043	Number of voice TCH/H seizure failure for assignment
C900060047	Number of data TCH/H seizure failure for assignment
C900060019	Number of voice TCH/F seizure attempts for assignment
C900060030	Number of data TCH/F seizure attempts for assignment
C900060042	Number of voice TCH/H seizure attempts for assignment
C900060046	Number of data TCH/H seizure attempts for assignment
C900060018	Number of signaling TCH/F assignment failure for assignment
C900060029	Number of voice TCH/F assignment failure for assignment

C900060037	Number of data TCH/F assignment failure
C900060135	Number of signaling TCH/H assignment failure
C900060200	Number of Voice TCH/H assignment failure
C900060211	Number of data TCH/H assignment failure
C900060017	Number of signaling TCH/F assignment success for assignment
C900060028	Number of voice TCH/F assignment success
C900060036	Number of data TCH/F assignment success
C900060235	Number of signaling TCH/H assignment success
C900060199	Number of Voice TCH/H assignment success
C900060210	Number of data TCH/H assignment success

B. SDCCH BLOCKING:

KPI is calculated as Average over the month at TCBH

(C900060005+C900060011+C900060039)/(C900060003+C900060010+C900060038)

Where,

C900060005	Number of SDCCH seizure failure for assignment
C900060011	Number of signaling TCH/F seizure failure for assignment
C900060039	Number of signaling TCH/H seizure failure for assignment
C900060003	Number of SDCCH seizure attempts for assignment
C900060010	Number of signaling TCH/F seizure attempts for assignment
C900060038	Number of signaling TCH/H seizure attempts for assignment

C. TCH BLOCKING:

KPI is calculated as Average over the month at TCBH

(C900060020+C900060031+C900060043+C900060047)/(C900060019+C900060030+C900060042+C900060046)

Where,

C900060020	Number of voice TCH/F seizure failure for assignment
C900060031	Number of data TCH/F seizure failure for assignment
C900060043	Number of voice TCH/H seizure failure for assignment
C900060047	Number of data TCH/H seizure failure for assignment
C900060019	Number of voice TCH/F seizure attempts for assignment

C900060030	Number of data TCH/F seizure attempts for assignment
C900060042	Number of voice TCH/H seizure attempts for assignment
C900060046	Number of data TCH/H seizure attempts for assignment

2. Connection Maintenance (Retainability)

A. TCH drop:

KPI is calculated as Average over the month at TCBH

(C900060054+C900060055)/(C900060028+C900060036+C900060199+C900060210+C900060098+C900060102 -(C900060094+C900060095))

Where,

C900060054	Number of TCH/F drops
C900060055	Number of TCH/H drops
C900060028	Number of voice TCH/F assignment success
C900060036	Number of data TCH/F assignment success
C900060199	Number of Voice TCH/H assignment success
C900060210	Number of data TCH/H assignment success
C900060098	Number of BSC-controlled inter-cell incoming handover success
C900060102	Number of MSC-controlled incoming handover success
C900060094	Number of BSC-controlled inter-cell outgoing handover success
C900060095	Number of MSC-controlled outgoing handover

C900060030	Number of data TCH/F seizure attempts for assignment
C900060042	Number of voice TCH/H seizure attempts for assignment
C900060046	Number of data TCH/H seizure attempts for assignment

2. Connection Maintenance (Retainability)

A. TCH drop:

KPI is calculated as Average over the month at TCBH

(C900060054+C900060055)/(C900060028+C900060036+C900060199+C900060210+C900060098+C900060102 -(C900060094+C900060095))

Where,

C900060054	Number of TCH/F drops
C900060055	Number of TCH/H drops
C900060028	Number of voice TCH/F assignment success
C900060036	Number of data TCH/F assignment success
C900060199	Number of Voice TCH/H assignment success
C900060210	Number of data TCH/H assignment success
C900060098	Number of BSC-controlled inter-cell incoming handover success
C900060102	Number of MSC-controlled incoming handover success
C900060094	Number of BSC-controlled inter-cell outgoing handover success
C900060095	Number of MSC-controlled outgoing handover

B. Total No. of cells exceeding 3% TCH drop (call drop):

Total no of cells with TCH drop>3%

C. Total No. of cells in the Network:

Active cell from last day of the month.

D. Worst affected cells having more than 3% TCH drop (call drop) rate:

(Total no. of cells with TCH drop>3%/Total no. of cells of on air sites)*100

E. %age of Connection with Good Voice Quality:

KPI is calculated as Average over the month at TCBH

(C900060074+C900060075+C900060076+C900060077+C900060078+C900060079)/(C900060074+C900060075+C900060076+C900060077+C900060078+C900060079+C900060080+C900060081)*100

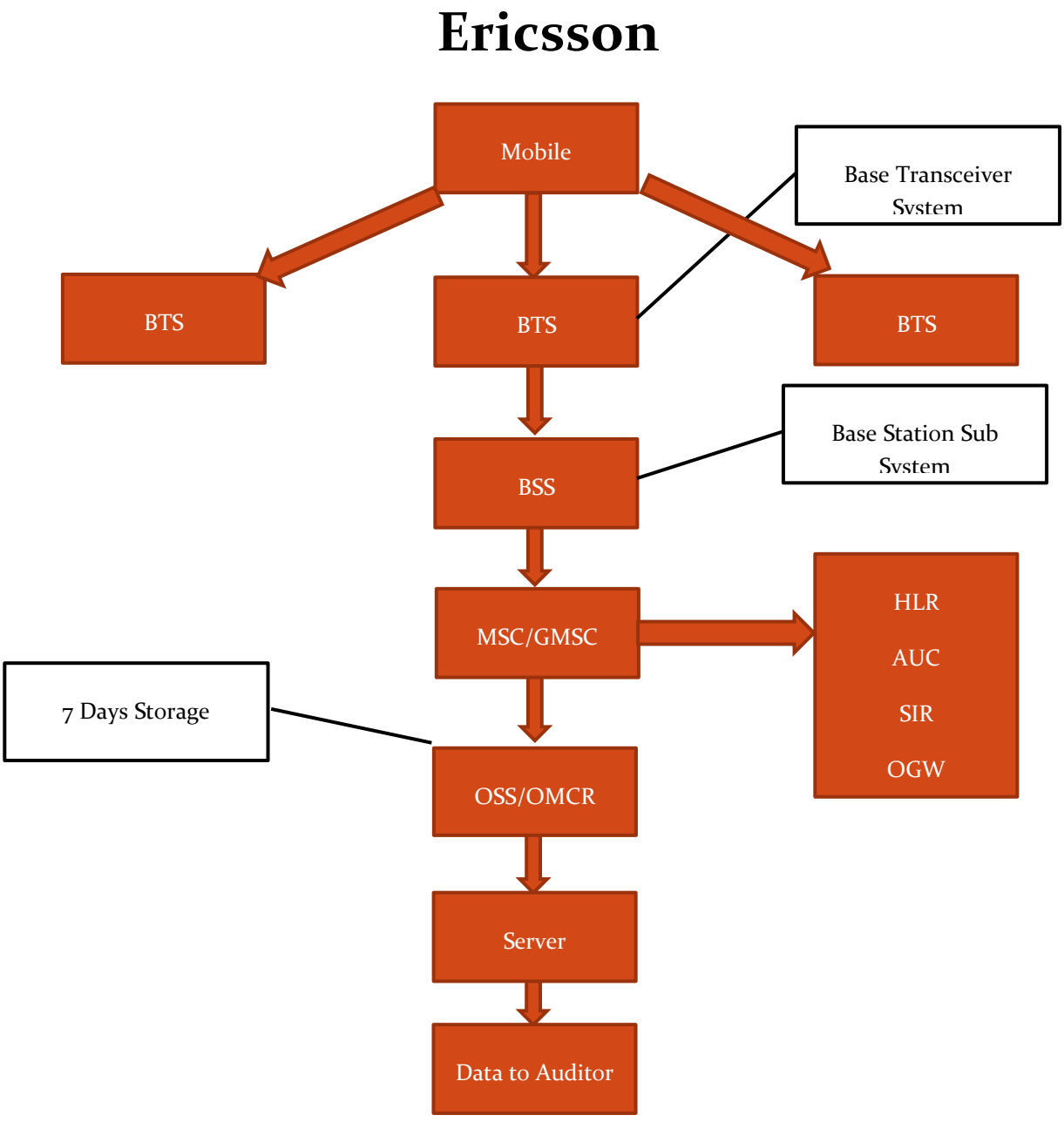
Where,

C900060074	Number of samples with DL RQ = 0
C900060075	Number of samples with DL RQ = 1
C900060076	Number of samples with DL RQ = 2
C900060077	Number of samples with DL RQ = 3
C900060078	Number of samples with DL RQ = 4
C900060079	Number of samples with DL RQ = 5
C900060079	Number of samples with DL RQ = 5
C900060080	Number of samples with DL RQ = 6
C900060081	Number of samples with DL RQ = 7

12.9 BLOCK SCHEMATIC DIAGRAMS

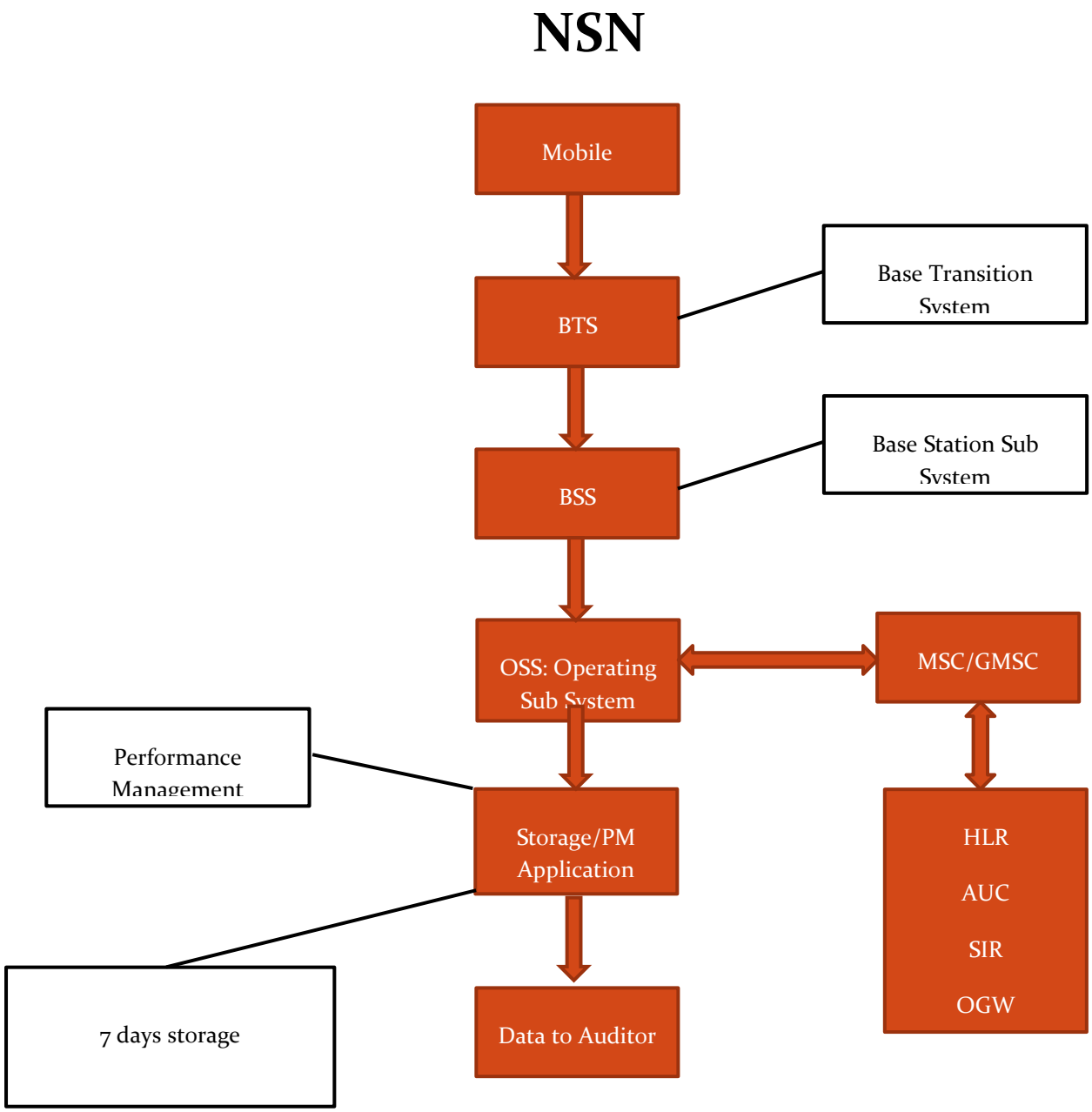
12.9.1 ERICSSON

Ericsson provides network support to Aircel, Uninor, BSNL, Reliance CDMA and Reliance GSM in the circle.



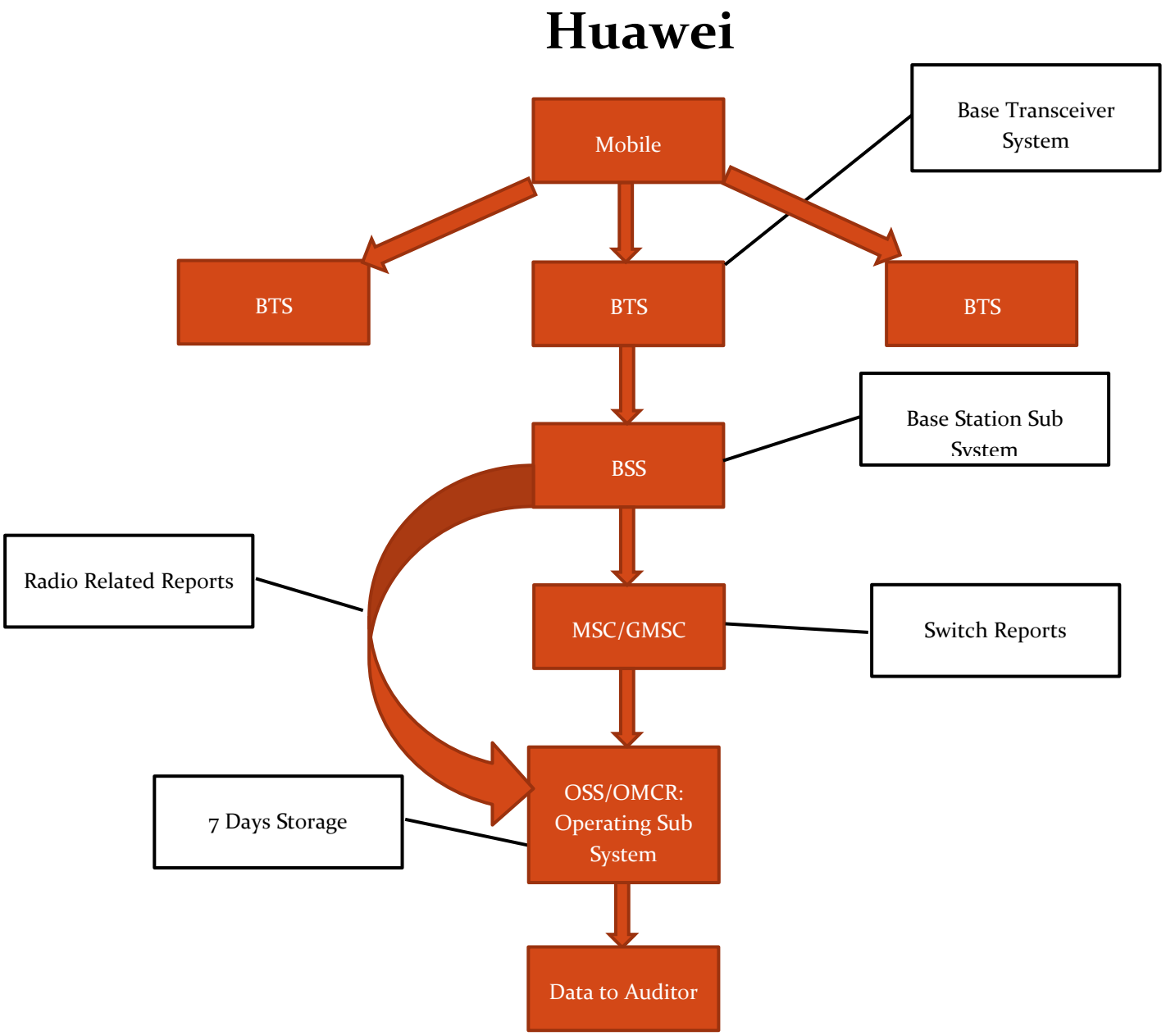
12.9.2 NSN (NOKIA SIEMENS NETWORKS)

NSN provides network support to Airtel, Vodafone and Idea in the circle.



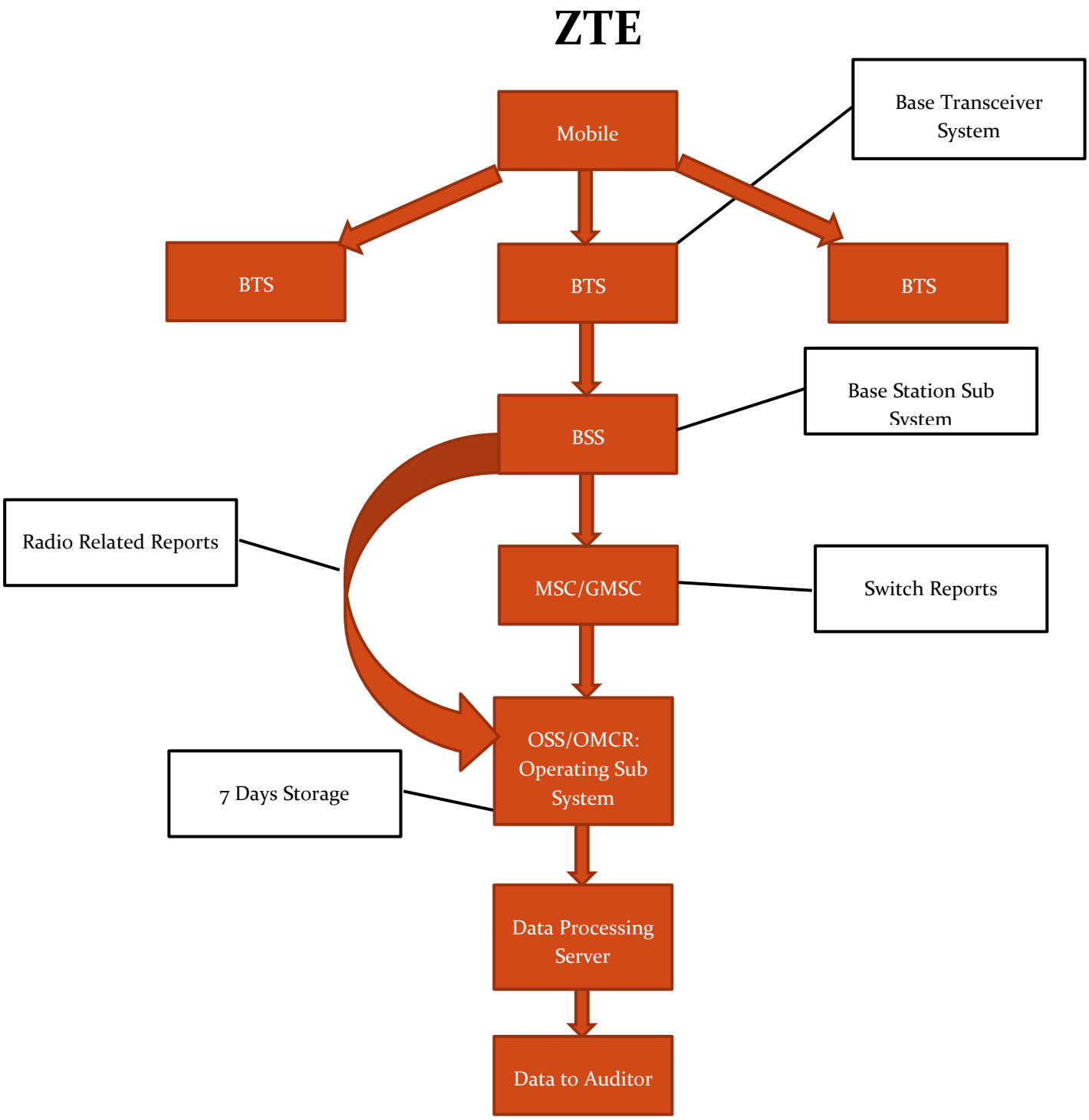
12.9.3 HUAWEI

Huawei provides network support to Telenor in the circle.



12.9.4 ZTE

ZTE provides network support to BSNL, Tata GSM and Tata CDMA in the circle.



1. Network Availability											
Audit Results for Network Availability- PMR data-July											
	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Number of BTSs in the licensed service area		3090	6937	2535	5092	916	NS	NS	25	255	7689
Sum of downtime of BTSs in a month (in hours)		7874	4185	8142	5121	504	NS	NS	4	36	3619
BTSs accumulated downtime (not available for service)	≤ 2%	0.34%	0.08%	0.43%	0.14%	0.07%	NS	NS	0.02%	0.02%	0.06%
Number of BTSs having accumulated downtime >24 hours		45	6	48	33	0	NS	NS	0	0	22
Worst affected BTSs due to downtime	≤ 2%	1.46%	0.09%	1.89%	0.65%	0.00%	NS	NS	0.00%	0.00%	0.29%
Live Measurement Results for Network Availability- 3 Day live data-July											
	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Number of BTSs in the licensed service area		3091	6929	2535	5061	916	NS	NS	25	255	7651
Sum of downtime of BTSs in a month (in hours)		802	475	740	609	63	NS	NS	0	2	612
BTSs accumulated downtime (not available for service)	≤ 2%	0.36%	0.10%	0.41%	0.17%	0.10%	NS	NS	0.00%	0.01%	0.11%
Number of BTSs having accumulated downtime >24 hours		5	0	0	9	0	NS	NS	0	0	0
Worst affected BTSs due to downtime	≤ 2%	0.16%	0.00%	0.00%	0.18%	0.00%	NS	NS	0.00%	0.00%	0.00%

2. Connection Establishment (Accessibility)											
Audit Results for CSSR, SDCCH and TCH congestion- PMR data-July											
CSSR	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Vodafone**
CSSR	≥ 95%	97.13%	96.19%	97.94%	99.35%	99.68%	NS	NS	99.33%	99.05%	98.96%
SDCCH/Paging channel congestion	≤ 1%	0.47%	0.12%	1.46%	0.19%	NA	NS	NS	NA	0.53%	0.35%
TCH congestion	≤ 2%	1.39%	1.69%	1.51%	0.16%	0.07%	NS	NS	0.00%	0.09%	1.04%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-July											
CSSR	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Vodafone**
CSSR	≥ 95%	98.11%	96.06%	97.83%	99.72%	99.81%	NS	NS	99.41%	99.33%	99.74%
SDCCH/Paging channel congestion	≤ 1%	0.28%	0.09%	3.57%	0.11%	NA	NS	NS	NA	0.02%	0.34%
TCH congestion	≤ 2%	0.48%	1.73%	1.45%	0.03%	0.06%	NS	NS	0.00%	0.01%	0.26%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-July											
CSSR	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Vodafone**
Total number of call attempts		NA	NA	NA	NA	NA	NS	NS	NA	NA	NA
Total number of successful calls established		NA	NA	NA	NA	NA	NS	NS	NA	NA	NA
CSSR	≥ 95%	NA	NA	NA	NA	NA	NS	NS	NA	NA	NA
%age blocked calls		NA	NA	NA	NA	NA	NS	NS	NA	NA	NA

3. Connection Maintenance (Retainability)											
Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data-July											
Call drop rate	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Vodafone**
Total number of calls established		108538750	414054411	60662511	164812429	36942400	NS	NS	110715	6159513	508067331
Total number of calls dropped		1319103	5926211	604629	681096	261409	NS	NS	88	34597	3986402
Call drop rate	≤ 2%	1.22%	1.43%	1.00%	0.41%	0.71%	NS	NS	0.08%	0.56%	0.78%
Total number of cells in the network		9256	21936	7414	15339	3386	NS	NS	75	764	23134
Total number of cells having more than 3% TCH		1019	586	2051	52	84	NS	NS	1	19	627
Worst affected cells having more than 3% TCH	≤ 3%	11.01%	2.67%	27.66%	0.34%	2.48%	NS	NS	0.95%	2.51%	2.71%
Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data-July											
Call drop rate	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Vodafone**
Total number of calls established		135210466	41400575	6396634	180086146	42386499	NS	NS	137113	6884940	575484864
Total number of calls dropped		1336831	574368	72636	690581	232800	NS	NS	137	35011	3740002
Call drop rate	≤ 2%	0.99%	1.39%	1.14%	0.38%	0.55%	NS	NS	0.10%	0.51%	0.65%
Total number of cells in the network		9250	65670	7414	15246	3386	NS	NS	75	765	23019
Total number of cells having more than 3% TCH		973	1748	1691	15	4	NS	NS	1	21	623
Worst affected cells having more than 3% TCH	≤ 3%	10.52%	2.66%	22.81%	0.10%	0.13%	NS	NS	1.22%	2.75%	2.71%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-July											
Call drop rate	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Vodafone**
Total number of calls established		NA	NA	NA	NA	NA	NS	NS	NA	NA	NA
Total number of calls dropped		NA	NA	NA	NA	NA	NS	NS	NA	NA	NA
Call drop rate	≤ 2%	NA	NA	NA	NA	NA	NS	NS	NA	NA	NA

4. Voice quality											
Audit Results for Voice quality -PMR Data-July											
Voice quality	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Vodafone**
Total number of sample calls		20439603461	158807518806	6937	26283249469	104918	NS	NS	358747533	1148111964	97246261012
Total number of calls with good voice quality		19796735757	151923238352	6593	25421518759	104550	NS	NS	351153270	1122257223	94105041343
%age calls with good voice quality	≥ 95%	96.85%	95.67%	95.04%	96.72%	99.65%	NS	NS	97.88%	97.75%	96.77%
Live measurement results for Voice quality-3 Day data-July											
Voice quality	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Vodafone**
Total number of sample calls		2267586700	15178599216	685	24572617168	24379	NS	NS	40909009	122818483	94560742737
Total number of calls with good voice quality		2206273287	14529053906	651	23899591430	24209	NS	NS	39979048	120139729	92046022271
%age calls with good voice quality	≥ 95%	97.30%	95.72%	95.04%	97.26%	99.30%	NS	NS	97.73%	97.82%	97.34%
Drive test results for Voice quality (Average of three drive tests) - DT data-July											
Voice quality	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Vodafone**
Total number of sample calls		NA	NA	NA	NA	NA	NS	NS	NA	NA	NA
Total number of calls with good voice quality		NA	NA	NA	NA	NA	NS	NS	NA	NA	NA
%age calls with good voice quality	≥ 95%	NA	NA	NA	NA	NA	NS	NS	NA	NA	NA

1. Network Availability											
Audit Results for Network Availability- PMR data-August											
	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Number of BTSs in the licensed service area		3141	6996	2535	5172	908	NS	NS	25	255	7771
Sum of downtime of BTSs in a month (in hours)		10364	5613	7830	9233	1016	NS	NS	5	135	3689
BTSs accumulated downtime (not available for service)	≤ 2%	0.44%	0.11%	0.42%	0.24%	0.15%	NS	NS	0.02%	0.07%	0.06%
Number of BTSs having accumulated downtime >24 hours		68	6	34	93	0	NS	NS	0	0	2
Worst affected BTSs due to downtime	≤ 2%	2.16%	0.09%	1.34%	1.80%	0.00%	NS	NS	0.00%	0.00%	0.03%
Live Measurement Results for Network Availability- 3 Day live data-August											
	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Number of BTSs in the licensed service area		3091	6979	2535	5101	916	NS	NS	25	255	7770
Sum of downtime of BTSs in a month (in hours)		1698	867	913	2723	123	NS	NS	0	68	325
BTSs accumulated downtime (not available for service)	≤ 2%	0.76%	0.17%	0.50%	0.74%	0.19%	NS	NS	0.00%	0.37%	0.06%
Number of BTSs having accumulated downtime >24 hours		6	0	0	35	0	NS	NS	0	0	0
Worst affected BTSs due to downtime	≤ 2%	0.19%	0.00%	0.00%	0.69%	0.00%	NS	NS	0.00%	0.00%	0.00%

14 ANNEXURE – AUGUST-2G

2. Connection Establishment (Accessibility)											
Audit Results for CSSR, SDCCH and TCH congestion- PMR data-August											
CSSR	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Vodafone**
CSSR	≥ 95%	97.51%	95.61%	97.57%	98.68%	99.69%	NS	NS	99.38%	99.04%	99.14%
SDCCH/Paging channel congestion	≤ 1%	0.37%	0.10%	1.10%	0.18%	NA	NS	NS	NA	0.14%	0.43%
TCH congestion	≤ 2%	0.81%	1.67%	1.81%	0.14%	0.12%	NS	NS	0.00%	0.09%	0.86%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-August											
CSSR	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Vodafone**
CSSR	≥ 95%	98.20%	95.70%	97.33%	99.63%	99.83%	NS	NS	99.39%	99.26%	99.64%
SDCCH/Paging channel congestion	≤ 1%	0.23%	0.22%	1.04%	0.14%	NA	NS	NS	NA	1.60%	0.27%
TCH congestion	≤ 2%	0.42%	1.49%	2.00%	0.04%	0.03%	NS	NS	0.00%	0.03%	0.36%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-August											
CSSR	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Vodafone**
Total number of call attempts		635	484	574	527	455	NS	NS	438	471	538
Total number of successful calls established		632	481	542	527	455	NS	NS	438	470	538
CSSR	≥ 95%	99.53%	99.38%	94.43%	100.00%	100.00%	NS	NS	100.00%	99.79%	100.00%
%age blocked calls		0.47%	0.62%	5.57%	0.00%	0.00%	NS	NS	0.00%	0.21%	0.00%

3. Connection Maintenance (Retainability)											
Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data-August											
Call drop rate	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Vodafone**
Total number of calls established		99188572	381233476	61190575	163296767	34820995	NS	NS	106101	5811031	523716789
Total number of calls dropped		1180138	5857837	608260	838384	251885	NS	NS	86	33589	4188630
Call drop rate	≤ 2%	1.19%	1.54%	0.99%	0.51%	0.72%	NS	NS	0.08%	0.58%	0.80%
Total number of cells in the network		9410	22118	7414	15579	3362	NS	NS	75	765	23554
Total number of cells having more than 3% TCH		1028	588	2107	74	85	NS	NS	1	21	646
Worst affected cells having more than 3% TCH	≤ 3%	10.93%	2.66%	28.42%	0.47%	2.54%	NS	NS	0.73%	2.76%	2.74%
Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data-August											
Call drop rate	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Vodafone**
Total number of calls established		121396546	39155407	5700528	185772057	42103876	NS	NS	163653	6930225	578136413
Total number of calls dropped		1305955	580056	63084	820628	246294	NS	NS	140	35928	3776445
Call drop rate	≤ 2%	1.08%	1.48%	1.11%	0.44%	0.58%	NS	NS	0.09%	0.52%	0.65%
Total number of cells in the network		9263	66149	7414	15366	3386	NS	NS	75	765	23548
Total number of cells having more than 3% TCH		1146	1752	1674	14	4	NS	NS	1	20	661
Worst affected cells having more than 3% TCH	≤ 3%	12.38%	2.65%	22.58%	0.09%	0.11%	NS	NS	1.04%	2.57%	2.81%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-August											
Call drop rate	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Vodafone**
Total number of calls established		632	481	542	525	455	NS	NS	438	470	538
Total number of calls dropped		1	1	22	2	0	NS	NS	1	1	0
Call drop rate	≤ 2%	0.16%	0.21%	4.06%	0.38%	0.00%	NS	NS	0.23%	0.21%	0.00%

4. Voice quality											
Audit Results for Voice quality -PMR Data-August											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total number of sample calls		19188043967	156465769262	7114	27571058657	104846	NS	NS	343530865	1102992581	96661324946
Total number of calls with good voice quality		18608478471	149555319779	6764	26765977742	104547	NS	NS	335656814	1078146983	93357553569
%age calls with good voice quality	≥ 95%	96.98%	95.58%	95.08%	97.08%	99.71%	NS	NS	97.71%	97.75%	96.58%
Live measurement results for Voice quality-3 Day data-August											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total number of sample calls		2113317167	15005560463	681	25394215427	24379	NS	NS	39574294	120640620	95456454645
Total number of calls with good voice quality		2056671259	14346201134	649	24705916762	24149	NS	NS	38575809	117900917	92715770402
%age calls with good voice quality	≥ 95%	97.32%	95.61%	95.30%	97.29%	99.06%	NS	NS	97.48%	97.73%	97.13%
Drive test results for Voice quality (Average of three drive tests) - DT data-August											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total number of sample calls		154563	833548	867251	727729	NA	NS	NS	NA	737392	900270
Total number of calls with good voice quality		148745	798231	805080	706859	NA	NS	NS	NA	729383	879293
%age calls with good voice quality	≥ 95%	96.24%	95.76%	92.83%	97.13%	97.97%	NS	NS	97.39%	98.91%	97.67%

5. POI Congestion											
Audit Results for POI Congestion- PMR data-August											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total number of working POIs		67	40	77	146	53	NS	NS	45	20	47
No. of POIs not meeting benchmark		0	0	0	0	0	NS	NS	0	0	0
Total Capacity of all POIs (A) - in erlangs		84340	164342	137391	138274	53638	NS	NS	10789	6459	374730
Traffic served for all POIs (B)- in erlangs		39258	98640	28703	80172	20055	NS	NS	1181	842	211770
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	NS	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-August											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total number of working POIs		67	40	77	146	53	NS	NS	45	20	47
No. of POIs not meeting benchmark		0	0	0	0	0	NS	NS	0	0	0
Total Capacity of all POIs (A) - in erlangs		84250	48867	137391	138202	53638	NS	NS	10794	6459	374705
Traffic served for all POIs (B)- in erlangs		18565	29222	27515	80082	20049	NS	NS	554	374	88037
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	NS	0.00%	0.00%	0.00%

15 ANNEXURE – SEPTEMBER-2G

1. Network Availability											
Audit Results for Network Availability- PMR data-September											
	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Number of BTSs in the licensed service area		3179	7046	2539	5232	908	NS	NS	25	255	7807
Sum of downtime of BTSs in a month (in hours)		7634	4180	7803	5030	1029	NS	NS	3	34	4225
BTSs accumulated downtime (not available for service)	≤ 2%	0.33%	0.08%	0.43%	0.13%	0.16%	NS	NS	0.02%	0.02%	0.08%
Number of BTSs having accumulated downtime >24 hours		47	4	37	42	0	NS	NS	0	0	14
Worst affected BTSs due to downtime	≤ 2%	1.48%	0.06%	1.46%	0.80%	0.00%	NS	NS	0.00%	0.00%	0.18%
Live Measurement Results for Network Availability- 3 Day live data-September											
	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Number of BTSs in the licensed service area		3172	7017	2539	5188	908	NS	NS	25	255	7792
Sum of downtime of BTSs in a month (in hours)		642	301	515	640	109	NS	NS	1	2	382
BTSs accumulated downtime (not available for service)	≤ 2%	0.28%	0.06%	0.28%	0.17%	0.17%	NS	NS	0.06%	0.01%	0.07%
Number of BTSs having accumulated downtime >24 hours		4	0	0	8	0	NS	NS	0	0	0
Worst affected BTSs due to downtime	≤ 2%	0.13%	0.00%	0.00%	0.15%	0.00%	NS	NS	0.00%	0.00%	0.00%

2. Connection Establishment (Accessibility)											
Audit Results for CSSR, SDCCH and TCH congestion- PMR data-September											
CSSR	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Vodafone**
CSSR	≥ 95%	97.79%	95.69%	96.98%	99.41%	99.56%	NS	NS	98.31%	99.07%	99.12%
SDCCH/Paging channel congestion	≤ 1%	0.24%	0.08%	0.97%	0.08%	NA	NS	NS	NA	0.03%	0.47%
TCH congestion	≤ 2%	0.45%	1.72%	1.89%	0.13%	0.13%	NS	NS	0.03%	0.09%	0.88%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-September											
CSSR	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Vodafone**
CSSR	≥ 95%	98.34%	95.90%	97.43%	99.64%	99.65%	NS	NS	97.04%	99.29%	99.77%
SDCCH/Paging channel congestion	≤ 1%	0.22%	0.24%	0.72%	0.14%	NA	NS	NS	NA	0.03%	0.37%
TCH congestion	≤ 2%	0.20%	1.58%	1.31%	0.06%	0.07%	NS	NS	0.02%	0.05%	0.23%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-September											
CSSR	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Vodafone**
Total number of call attempts		592	482	NP	549	515	NS	NS	304	476	500
Total number of successful calls established		590	482	NP	549	513	NS	NS	304	474	500
CSSR	≥ 95%	99.66%	100.00%	NP	100.00%	99.61%	NS	NS	100.00%	99.58%	100.00%
%age blocked calls		0.34%	0.00%	NP	0.00%	0.39%	NS	NS	0.00%	0.42%	0.00%

3. Connection Maintenance (Retainability)											
Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data-September											
Call drop rate	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Vodafone**
Total number of calls established		90857088	356856432	56963021	158771232	30935421	NS	NS	93030	5326055	514128441
Total number of calls dropped		994067	4891275	628241	724719	216476	NS	NS	72	30131	4065330
Call drop rate	≤ 2%	1.09%	1.37%	1.10%	0.46%	0.70%	NS	NS	0.08%	0.57%	0.79%
Total number of cells in the network		9523	22278	7426	15769	3362	NS	NS	75	765	23492
Total number of cells having more than 3% TCH		954	586	2104	82	97	NS	NS	1	21	640
Worst affected cells having more than 3% TCH	≤ 3%	10.02%	2.63%	28.33%	0.52%	2.88%	NS	NS	0.76%	2.72%	2.72%
Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data-September											
Call drop rate	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Vodafone**
Total number of calls established		125322176	38939392	5954420	213355259	42043387	NS	NS	133208	7025212	601361882
Total number of calls dropped		1131616	521182	53359	940081	230896	NS	NS	171	34738	4069945
Call drop rate	≤ 2%	0.90%	1.34%	0.90%	0.44%	0.55%	NS	NS	0.13%	0.49%	0.68%
Total number of cells in the network		9508	66548	7426	15619	3362	NS	NS	75	765	23446
Total number of cells having more than 3% TCH		887	1738	1453	27	4	NS	NS	1	19	651
Worst affected cells having more than 3% TCH	≤ 3%	9.33%	2.61%	19.57%	0.17%	0.13%	NS	NS	1.31%	2.44%	2.78%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-September											
Call drop rate	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Vodafone**
Total number of calls established		590	482	NP	549	513	NS	NS	304	474	500
Total number of calls dropped		1	1	NP	0	2	NS	NS	0	1	1
Call drop rate	≤ 2%	0.17%	0.21%	NP	0.00%	0.39%	NS	NS	0.00%	0.21%	0.20%

4. Voice quality											
Audit Results for Voice quality -PMR Data-September											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total number of sample calls		17837689517	148127784271	7082	26825145555	100860	NS	NS	304310420	1012548288	93482784398
Total number of calls with good voice quality		17348278313	141838730137	6731	26171281027	100318	NS	NS	297093869	990944236	90302418280
%age calls with good voice quality	≥ 95%	97.26%	95.75%	95.04%	97.56%	99.46%	NS	NS	97.63%	97.87%	96.60%
Live measurement results for Voice quality-3 Day data-September											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total number of sample calls		2131500509	14912684824	715	2786944333	242064	NS	NS	38657071	121646474	10031968479
Total number of calls with good voice quality		2080779733	14267209323	680	2729425527	239661	NS	NS	37593794	119141909	9751489538
%age calls with good voice quality	≥ 95%	97.62%	95.67%	95.10%	97.94%	99.01%	NS	NS	97.25%	97.94%	97.20%
Drive test results for Voice quality (Average of three drive tests) - DT data-September											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total number of sample calls		143018	104229000.00%	NP	142017	NA	NS	NS	NA	768075	244754
Total number of calls with good voice quality		138384	101002900.00%	NP	141077	NA	NS	NS	NA	755137	235633
%age calls with good voice quality	≥ 95%	96.76%	96.90%	NP	99.34%	96.39%	NS	NS	98.48%	98.32%	96.27%

5. POI Congestion											
Audit Results for POI Congestion- PMR data-September											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total number of working POIs		67	40	77	150	53	NS	NS	45	20	49
No. of POIs not meeting benchmark		0	0	0	0	0	NS	NS	0	0	0
Total Capacity of all POIs (A) - in erlangs		84805	163748	137320	139739	53067	NS	NS	10885	6459	375365
Traffic served for all POIs (B)- in erlangs		37413	91775	28675	81959	19761	NS	NS	1182	795	203800
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	NS	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-September											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Vodafone
Total number of working POIs		67	40	77	150	53	NS	NS	45	20	49
No. of POIs not meeting benchmark		0	0	0	0	0	NS	NS	0	0	0
Total Capacity of all POIs (A) - in erlangs		84736	48659	137298	120628	53067	NS	NS	10851	6459	374893
Traffic served for all POIs (B)- in erlangs		18906	28325	28583	81943	10161	NS	NS	606	378	89951
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	NS	0.00%	0.00%	0.00%

.

16 ANNEXURE – JULY -3G

PERFORMANCE REPORTS - PARAMETER WISE -Month 1						
1. Network Availability						
Audit Results for Network Availability- PMR data-July						
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**	**Vodafone 3G**
(Number of Node Bs in the network in the licensed service area		762	4123	629	2487	3686
Sum of downtime (i.e. total outage time) of Node Bs		3318	3503	1814	4224	1863
Node Bs downtime (not available for service)	≤ 2%	0.59%	0.11%	0.39%	0.23%	0.07%
Number of Node Bs having accumulated downtime of >24 hours in a month		21	3	8	16	11
Worst affected Node Bs due to downtime	≤ 2%	2.76%	0.07%	1.27%	0.64%	0.30%
Live Measurement Results for Network Availability- 3 Day live data-July						
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**	**Vodafone 3G**
(Number of Node Bs in the network in the licensed service area		752	4129	629	2489	3685
Sum of downtime (i.e. total outage time) of Node Bs		273	215	893	71	323
Node Bs downtime (not available for service)	≤ 2%	0.50%	0.07%	1.97%	0.04%	0.12%
Number of Node Bs having accumulated downtime of >24 hours in a month		2	0	5	0	0
Worst affected Node Bs due to downtime	≤ 2%	0.27%	0.00%	0.79%	0.00%	0.00%

2. Connection Establishment (Accessibility)						
Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data-July						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
CSSR	≥ 95%	98.83%	99.63%	96.32%	96.65%	99.71%
RRC Congestion	≤ 1%	0.25%	0.02%	0.88%	0.03%	0.08%
Circuit Switched RAB Congestion	≤ 2%	0.28%	0.05%	2.15%	0.07%	0.07%
Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data-July						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
CSSR	≥ 95%	99.15%	99.59%	96.94%	97.31%	99.78%
RRC Congestion	≤ 1%	0.18%	0.22%	0.94%	0.02%	0.03%
Circuit Switched RAB Congestion	≤ 2%	0.15%	0.11%	2.25%	0.06%	0.02%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-July						
CSSR	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
Total number of RRC attempts (A)		NA	NA	NA	NA	NA
Total number of RRC established (B)		NA	NA	NA	NA	NA
Call setup success rate (B/A*100)	≥ 95%	NA	NA	NA	NA	NA
%age blocked calls		NA	NA	NA	NA	NA

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-July						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		5342053	NA	1498052	3444120	31386556
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		15414	NA	22577	11663	98366
Call drop rate (B/A*100)	≤ 2%	0.29%	0.47%	1.51%	0.34%	0.31%
Total no. of cells in the licensed service area (B)		2285	12780	1887	2525	11264
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		75	337	290	22	313
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	3.29%	2.64%	15.37%	0.87%	2.78%
Live measurement results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate - 3 Day data-July						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		6393727	35083651	155318	4480167	39186181
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		15867	160922	2467	12294	116360
Call drop rate (B/A*100)	≤ 2%	0.25%	0.46%	1.59%	0.27%	0.30%
Total no. of cells in the licensed service area (B)		2012	38341	1887	2489	11261
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		60	1017	278	23	312
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	2.97%	2.65%	14.73%	0.92%	2.77%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-July						
Call drop rate	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		NA	NA	NA	NA	NA
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		NA	NA	NA	NA	NA
Call drop rate (B/A*100)	≤ 2%	NA	NA	NA	NA	NA

4. Voice quality						
Audit Results for Voice quality -PMR Data-July						
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		21978519887	NA	NA	NA	92639485502
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		21491429558	NA	NA	NA	91735463848
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	97.78%	99.29%	NA	NA	99.02%
Live measurement results for Voice quality-3 Day data-July						
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		3129253632	NA	NA	NA	10346718377
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		3066264558	NA	NA	NA	10246736086
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	97.99%	98.76%	NA	NA	99.03%
Drive test results for Voice quality (Average of three drive tests) - DT data-July						
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	NA	NA	NA	NA
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	NA	NA	NA	NA
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	NA	NA	NA	NA	NA

5. POI Congestion						
Audit Results for POI Congestion- PMR data-July						
POI congestion	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of working POIs		67	0	78	41	49
No. of POIs not meeting benchmark		0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		82721	0	137391	23952	373484
Traffic served for all POIs (B)- in erlangs		40843	0	28822	3167	214345
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-July						
POI congestion	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of working POIs		67	40	78	41	49
No. of POIs not meeting benchmark		0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		82703	486983	137391	23952	372461
Traffic served for all POIs (B)- in erlangs		18864	298278	28707	3123	90369
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%

17 ANNEXURE – AUGUST-3G

1. Network Availability						
Audit Results for Network Availability- PMR data-August						
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**	**Vodafone 3G**
(Number of Node Bs in the network in the licensed service area		764	4155	629	848	3779
Sum of downtime (i.e. total outage time) of Node Bs		4764	3411	1985	889	1575
Node Bs downtime (not available for service)	≤ 2%	0.84%	0.11%	0.42%	0.14%	0.06%
Number of Node Bs having accumulated downtime of >24 hours in a month		33	4	7	8	0
Worst affected Node Bs due to downtime	≤ 2%	4.32%	0.10%	1.11%	0.94%	0.00%
Live Measurement Results for Network Availability- 3 Day live data-August						
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**	**Vodafone 3G**
(Number of Node Bs in the network in the licensed service area		767	4139	629	848	3770
Sum of downtime (i.e. total outage time) of Node Bs		630	494	209	2	149
Node Bs downtime (not available for service)	≤ 2%	1.14%	0.17%	0.46%	0.00%	0.05%
Number of Node Bs having accumulated downtime of >24 hours in a month		4	0	0	0	0
Worst affected Node Bs due to downtime	≤ 2%	0.52%	0.00%	0.00%	0.00%	0.00%

2. Connection Establishment (Accessibility)						
Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data-August						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
CSSR	≥ 95%	98.79%	99.98%	96.36%	98.12%	99.71%
RRC Congestion	≤ 1%	0.22%	0.04%	0.78%	0.02%	0.05%
Circuit Switched RAB Congestion	≤ 2%	0.27%	0.13%	1.66%	0.05%	0.06%
Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data-August						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
CSSR	≥ 95%	98.94%	99.29%	96.78%	99.28%	99.78%
RRC Congestion	≤ 1%	0.24%	0.24%	0.28%	0.03%	0.03%
Circuit Switched RAB Congestion	≤ 2%	0.20%	0.19%	1.49%	0.01%	0.02%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-August						
CSSR	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
Total number of RRC attempts (A)		264	436	230	NP	456
Total number of RRC established (B)		264	433	209	NP	456
Call setup success rate (B/A*100)	≥ 95%	100.00%	99.31%	90.85%	NP	100.00%
%age blocked calls		0.00%	0.69%	9.15%	NP	0.00%

4. Voice quality						
Audit Results for Voice quality -PMR Data-August						
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		23080948789	NA	NA	NA	96421431695
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		22540447326	NA	NA	NA	95491342931
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	97.66%	98.84%	NA	NA	99.04%
Live measurement results for Voice quality-3 Day data-August						
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		3344586564	NA	NA	NA	11451615180
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		3266468225	NA	NA	NA	11341450024
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	97.66%	98.81%	NA	NA	99.04%
Drive test results for Voice quality (Average of three drive tests) - DT data-August						
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		434060	1327622	991025	NP	457139
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		429281	1281509	682176	NP	452251
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.90%	96.53%	68.84%	NP	98.93%

5. POI Congestion						
Audit Results for POI Congestion- PMR data-August						
POI congestion	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of working POIs		67	0	77	41	47
No. of POIs not meeting benchmark		0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		84340	0	137391	23952	374730
Traffic served for all POIs (B)- in erlangs		39258	0	28703	3081	211770
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-August						
POI congestion	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of working POIs		67	40	77	41	47
No. of POIs not meeting benchmark		0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		83450	488676	137391	23952	374605
Traffic served for all POIs (B)- in erlangs		18565	292213	27515	2930	88037
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%

5. POI Congestion						
Audit Results for POI Congestion- PMR data-August						
POI congestion	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of working POIs		67	40	77	41	47
No. of POIs not meeting benchmark		0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		84340	164342	137391	23952	374730
Traffic served for all POIs (B)- in erlangs		39258	98640	28703	3081	211770
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-August						
POI congestion	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of working POIs		67	40	77	41	47
No. of POIs not meeting benchmark		0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		83450	48867	137391	23952	374605
Traffic served for all POIs (B)- in erlangs		18565	29222	27515	2930	88037

POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%

18 ANNEXURE – SEPTEMBER-3G

1. Network Availability						
Audit Results for Network Availability- PMR data-September						
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**	**Vodafone 3G**
(Number of Node Bs in the network in the licensed service area		769	4242	638	847	3790
Sum of downtime (i.e. total outage time) of Node Bs		3055	2779	1657	1301	1860
Node Bs downtime (not available for service)	≤ 2%	0.55%	0.09%	0.36%	0.21%	0.07%
Number of Node Bs having accumulated downtime of >24 hours in a month		14	2	7	14	6
Worst affected Node Bs due to downtime	≤ 2%	1.82%	0.05%	1.10%	1.65%	0.16%
Live Measurement Results for Network Availability- 3 Day live data-September						
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**	**Vodafone 3G**
(Number of Node Bs in the network in the licensed service area		763	4190	638	847	3787
Sum of downtime (i.e. total outage time) of Node Bs		205	211	125	77	158
Node Bs downtime (not available for service)	≤ 2%	0.37%	0.07%	0.27%	0.13%	0.06%
Number of Node Bs having accumulated downtime of >24 hours in a month		2	0	0	0	0
Worst affected Node Bs due to downtime	≤ 2%	0.26%	0.00%	0.00%	0.00%	0.00%

2. Connection Establishment (Accessibility)						
Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data-September						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
CSSR	≥ 95%	98.43%	99.45%	97.69%	99.15%	99.62%
RRC Congestion	≤ 1%	0.45%	0.03%	0.33%	0.03%	0.12%
Circuit Switched RAB Congestion	≤ 2%	0.46%	0.06%	1.46%	0.03%	0.19%
Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data-September						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
CSSR	≥ 95%	98.63%	99.05%	97.68%	98.01%	99.70%
RRC Congestion	≤ 1%	0.48%	0.23%	0.34%	0.03%	0.06%
Circuit Switched RAB Congestion	≤ 2%	0.26%	0.29%	1.60%	0.06%	0.08%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-September						
CSSR	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
Total number of RRC attempts (A)		241	405	NP	NP	311
Total number of RRC established (B)		239	405	NP	NP	311
Call setup success rate (B/A*100)	≥ 95%	99.17%	100.00%	NP	NP	100.00%
%age blocked calls		0.83%	0.00%	NP	NP	0.00%

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-September						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		5081966	NA	1351955	2477382	35517096
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		16681	NA	18244	4516	121163
Call drop rate (B/A*100)	≤ 2%	0.33%	0.47%	1.35%	0.18%	0.34%
Total no. of cells in the licensed service area (B)		2306	13501	1914	2541	11644
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		98	350	247	10	303
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	4.23%	2.59%	12.90%	0.40%	2.60%
Live measurement results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate - 3 Day data-September						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		7031062	2938412	134192	4448101	59886622
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		22330	8559	1790	7085	193396
Call drop rate (B/A*100)	≤ 2%	0.32%	0.29%	1.33%	0.16%	0.32%
Total no. of cells in the licensed service area (B)		2288	40110	1914	2541	11637
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		93	1062	213	18	277
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	4.05%	2.65%	11.13%	0.71%	2.38%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-September						
Call drop rate	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		239	405	NP	NP	311
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		0	0	NP	NP	0
Call drop rate (B/A*100)	≤ 2%	0.00%	0.00%	NP	NP	0.00%

4. Voice quality						
Audit Results for Voice quality -PMR Data-September						
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		20574839114	NA	NA	NA	98593693467
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		20118978328	NA	NA	NA	97629172385
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	97.78%	98.34%	NA	NA	99.02%
Live measurement results for Voice quality-3 Day data-September						
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		2957089316	NA	NA	NA	11675185053
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		2894294559	NA	NA	NA	11561912868
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	97.88%	99.35%	NA	NA	99.03%
Drive test results for Voice quality (Average of three drive tests) - DT data-September						
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		398886	1722155	NP	NP	525702
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		396470	1706621	NP	NP	522283
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	99.39%	99.10%	NP	NP	99.35%

5. POI Congestion						
Audit Results for POI Congestion- PMR data-September						
POI congestion	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of working POIs		67	0	77	41	49
No. of POIs not meeting benchmark		0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		84805	0	137320	23952	375365
Traffic served for all POIs (B)- in erlangs		37413	0	28675	2938	203800
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-September						
POI congestion	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of working POIs		67	40	77	41	49
No. of POIs not meeting benchmark		0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		84736	486598	137298	23952	374893
Traffic served for all POIs (B)- in erlangs		18906	283258	28483	2890	89951
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%

19 ABBREVIATIONS

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

1. TRAI – Telecom Regulatory Authority of India
2. QoS – Quality of Service
3. JAS'16 – Refers to the quarter of July , August and September 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

KANTAR IMRB

SCO 47, 5th Floor, Old Judicial Complex, Sector 15
Part 1, Gurgaon, Haryana – 122001

✆+91 (124) 4217300

www.imrbint.com