TRAI Audit Wireless Report for Assam Circle

EAST ZONE

QE September- 2016

Prepared by:

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2   INTRODUCTION

2.1   ABOUT TRAI

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

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

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

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

2.2   OBJECTIVES

The primary objective of the Audit module is to-

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

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2.3 COVERAGE

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

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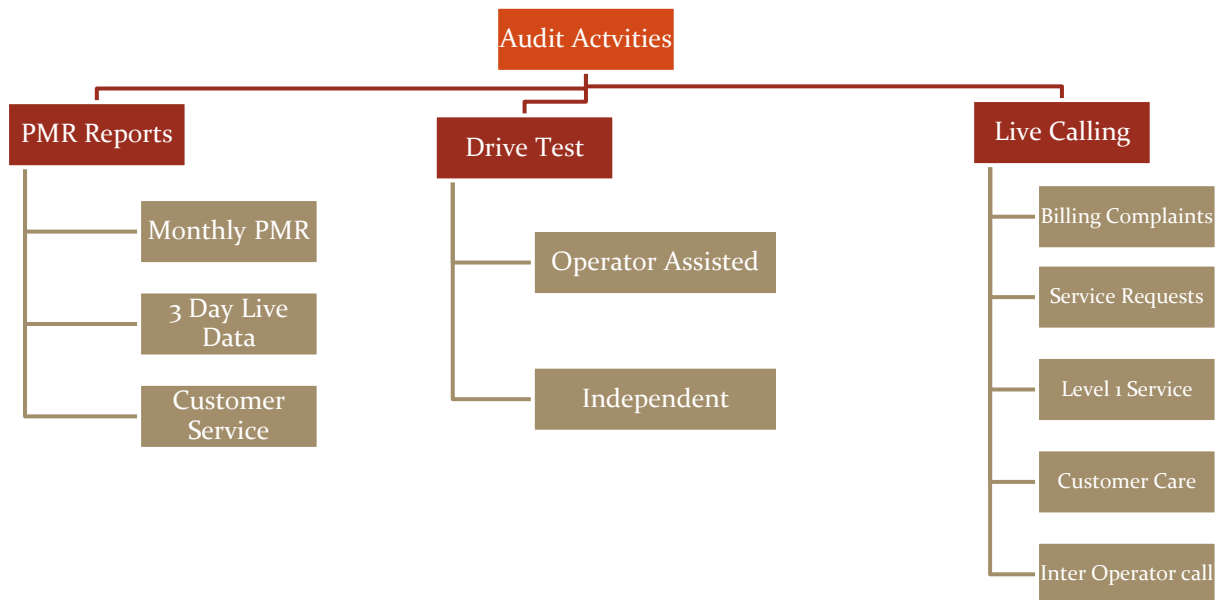
Let's discuss each of the activity in detail and the methodology adopted for each of the module.

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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.

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

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

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

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

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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.

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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.

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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%**

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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% Circuit switched Voice drop rate

Voice Quality

• % Connections with good Circuit Switched Voice Quality

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

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2.4.1.5 AUDIT PARAMETERS – NETWORK 3G

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

Network Related

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

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

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

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

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

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

2.4.1.8   POINT OF DATA EXTRACTION

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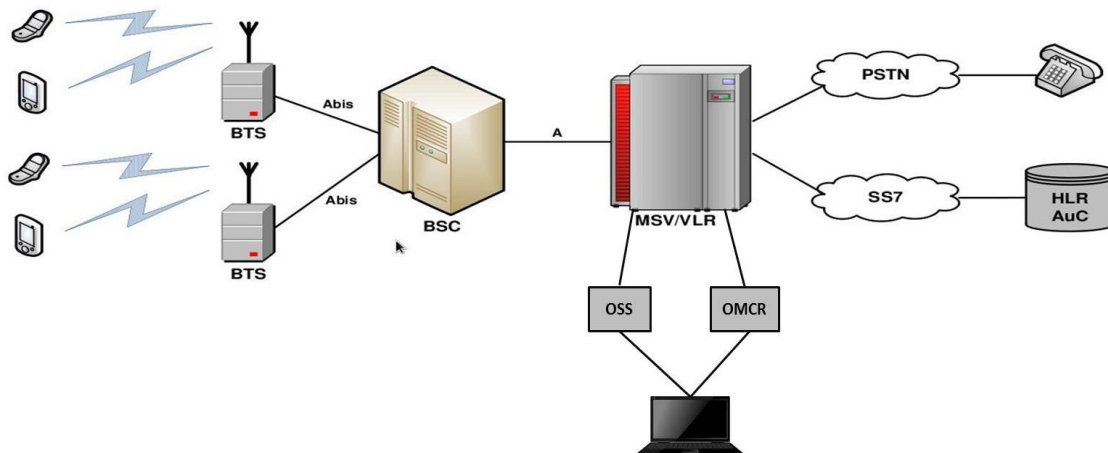
2.4.1.9 STEP BY STEP AUDIT PROCEDURE

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

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

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

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

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

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

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

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

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

2.4.1.10 CALCULATION METHODOLOGY – NETWORK PARAMETERS 2G

Parameter	Calculation Methodology
BTS Accumulated Downtime	Sum of downtime of BTSs in a month in hours i.e. total outage time of all BTSs in hours during a month / (24 x Number of days in a month x Number of BTSs in the network in licensed service area) x 100
Worst Affected BTS Due to Downtime	(Number of BTSs having accumulated downtime greater than 24 hours in a month / Number of BTS in Licensed Service Area) * 100
Call Setup Success Rate	(Calls Established / Total Call Attempts) * 100
SDCCH/ Paging Channel Congestion	SDCCH / TCH Congestion% = $[(A_1 \times C_1) + (A_2 \times C_2) +.......+ (A_n \times C_n)] / (A_1 + A_2 +...+ A_n)$ Where: A_1 = Number of attempts to establish SDCCH / TCH made on day 1
TCH Congestion	C_1 = Average SDCCH / TCH Congestion % on day 1 A_2 = Number of attempts to establish SDCCH / TCH made on day 2 C_2 = Average SDCCH / TCH Congestion % on day 2 A_n = Number of attempts to establish SDCCH / TCH made on day n C_n = Average SDCCH / TCH Congestion % on day n
POI Congestion	POI Congestion% = $[(A_1 \times C_1) + (A_2 \times C_2) +.......+ (A_n \times C_n)] / (A_1 + A_2 +...+ A_n)$ Where: A_1 = POI traffic offered on all POIs (no. of calls) on day 1 C_1 = Average POI Congestion % on day 1 A_2 = POI traffic offered on all POIs (no. of calls) on day 2 C_2 = Average POI Congestion % on day 2 A_n = POI traffic offered on all POIs (no. of calls) on day n C_n = Average POI Congestion % on day n
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
Circuit Switched RAB Congestion	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	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

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2.4.1.12 3 DAY LIVE DATA

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

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

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

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

2.4.1.13 TCBH – SIGNIFICANCE AND SELECTION METHODOLOGY

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

Step by step procedure to identify TCBH for an operator:

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

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

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

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

2.4.1.14 CBBH – SIGNIFICANCE AND SELECTION METHODOLOGY

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

Step by step procedure to identify CBBH for an operator:

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

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

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

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

2.4.1.15 CUSTOMER SERVICE PARAMETERS

The data to generate PMR report for customer service parameters is extracted at the operator premises and verified once every quarter in the subsequent month of the last month of the quarter. For example, data for quarter ending 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.

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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

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2.4.2 LIVE CALLING

2.4.2.1 SIGNIFICANCE AND METHODOLOGY

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

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

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

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

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

Live calling activity was carried out during the period of 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.

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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.

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- 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

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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).

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

In drive test for difficult SSAs, the methodology adopted for the drive test is:-
- Drive test was conducted for 6 consecutive days in selected SSAs; 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.

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

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

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

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

- ✓ Total 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.
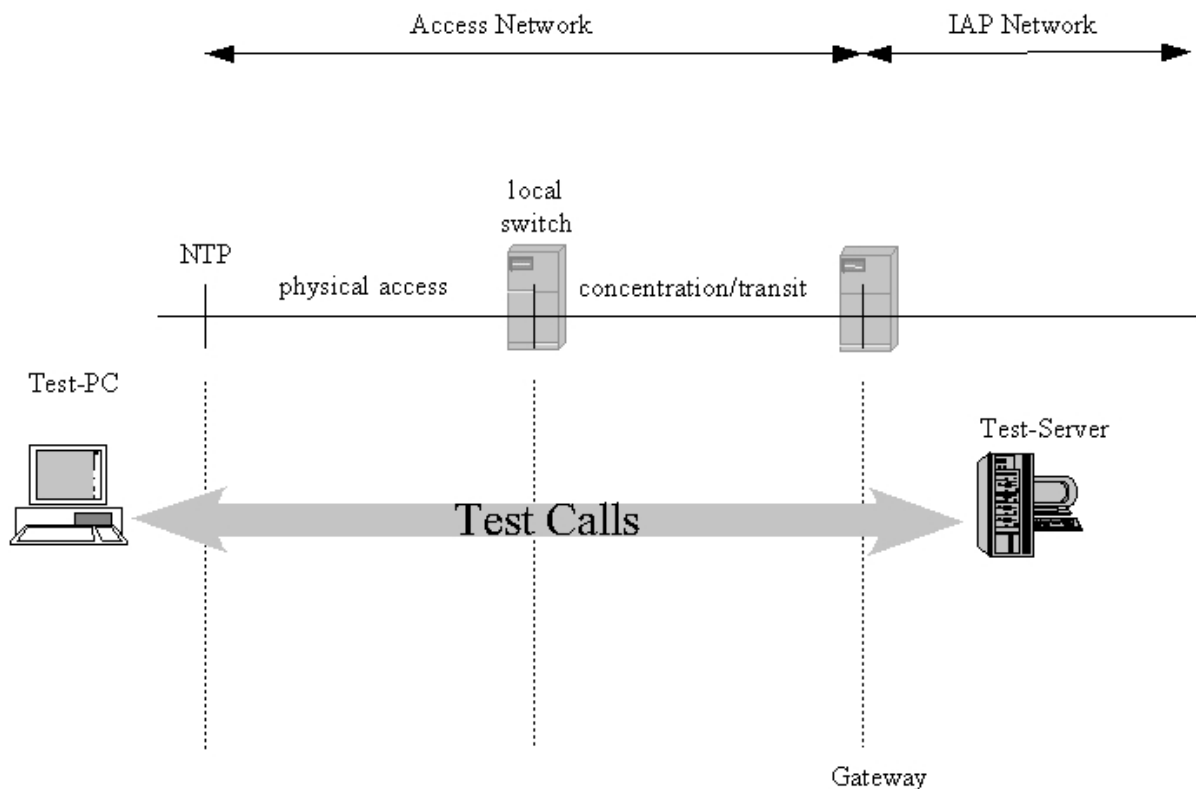
Figure for Measurement set-up

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:

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

2.4.4.3   TEST FILES

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

2.4.4.4   REPRESENTATIVENESS OR NUMBER OF TEST CALLS

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

2.4.4.5   PARAMETERS EVALUATED DURING DATA DRIVE TEST AT HOTSPOTS

2.4.4.5.1   SUCCESSFUL DATA TRANSMISSIONS DOWNLOAD ATTEMPTS

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

Measurement:

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

Successful data transmission download attempts =

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

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2.4.4.5.2   SUCCESSFUL DATA TRANSMISSION UPLOAD ATTEMPTS

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

Measurement:

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

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

2.4.4.5.3   MINIMUM DOWNLOAD SPEED

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

Measurement:

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

Minimum download speed (average of lower 10% of all test calls) =
$$\dfrac{\text{Download speed } (A1+A2+A3+A4+A5+A6) \times 100}{6}$$
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) = $\dfrac{\text{Total number of successful ping} \times 100}{\text{Total number of ping sent to the Test Server}}$

2.5   OPERATORS COVERED 2G AND 3G

Name of Operator	Number of Subscriber as per VLR-2G
Aircel	144240
Airtel	5406107
BSNL CDMA	6109
BSNL GSM	NDR
Idea	1168275
Reliance GSM	NS
Vodafone	4050131
Name of Operator	**Number of Subscriber as per VLR-3G**
Aircel 3G	204971
Airtel 3G	313006
BSNL 3G	NDR
Reliance 3G	66000
Vodafone 3G	4050131

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

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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 Assam circle, with a parameter wise performance evaluation as compared to TRAI benchmark.

3.1 PMR DATA – 3 MONTHS- CONSOLIDATED FOR 2G

Reliance GSM doesn't have service in Assam as their license has been expired.

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	0.05%	18.75%	91.55%	0.89%	5.81%	1.93%	19.06%	90.98%
Airtel	0.36%	0.67%	95.75%	0.91%	1.49%	1.12%	1.62%	99.07%
BSNL CDMA	0.26%	26.75%	98.65%	NA	NA	1.27%	5.58%	NA
BSNL GSM	1.99%	1.94%	98.10%	0.88%	1.90%	1.92%	2.97%	NA
Idea	1.30%	0.78%	98.22%	0.41%	1.33%	0.50%	2.37%	95.38%
Vodafone	0.73%	1.42%	98.93%	0.56%	1.07%	0.64%	2.16%	96.87%

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

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

BTSs Accumulated Downtime:

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

Worst Affected BTSs Due to Downtime:

Aircel (18.75%) and BSNL CDMA (26.75%) failed to meet the benchmark. Minimum worst affected BTSs due to downtime was recorded for Airtel at 0.67%.

Call Set-up Success Rate (CSSR):

Aircel failed to meet the benchmark for CSSR. The maximum CSSR was observed for Vodafone with 98.93%.

Excluding Airtel, all other operators were found to be calculating the parameter as per the norm specified by TRAI, as given in parameter description section. Airtel is using a formula that has not been specified by TRAI or the counter definitions provided by their network service provider (Ericsson).

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However, this report presents the appropriate CSSR value for Airtel, which was calculated by using the proper counter details (provided in section 8.15.1) by the IMRB auditor during audit.

SDCCH/ Paging Chl. Congestion:

All operators met the benchmark on SDCCH / Paging Channel Congestion. Idea recorded the best SDCCH / Paging Channel Congestion at 0.41%.

TCH Congestion:

Aircel failed to meet the benchmark for TCH congestion, while Vodafone performed the best on TCH congestion at 1.07%.

The calculation methodology (given in parameter description section) followed by the operators was found to be in complete accordance with what has been specified by TRAI.

Call Drop Rate:

All operators met the benchmark for the parameter. Minimum call drop rate was recorded for Idea at 0.50%.

Worst Affected Cells Having More than 3% TCH Drop:

Aircel (19.06%) and BSNL CDMA failed to meet the benchmark. Best performance was recorded for Airtel at 1.62%.

Voice Quality

Aircel failed to meet the benchmark. Best performance was recorded for Airtel at 99.07%.

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.

3.1.1 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	0.05%	21.32%	90.56%	0.98%	6.79%	1.92%	19.32%	91.03%
Airtel	0.36%	0.61%	95.89%	0.72%	1.32%	1.09%	1.48%	98.98%
BSNL CDMA	0.24%	24.69%	98.42%	NA	NA	1.35%	6.99%	NA
BSNL GSM	1.99%	1.94%	98.09%	0.87%	1.91%	1.93%	2.97%	NA
Idea	1.21%	0.78%	98.39%	0.46%	1.20%	0.47%	2.34%	95.39%
Vodafone	0.74%	1.34%	98.84%	0.83%	1.16%	0.67%	1.94%	96.65%

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	0.05%	18.83%	92.00%	0.98%	5.48%	1.90%	18.94%	90.89%
Airtel	0.38%	0.69%	95.74%	1.00%	1.63%	1.09%	1.56%	99.05%
BSNL CDMA	0.26%	26.34%	98.62%	NA	NA	1.23%	4.37%	NA
BSNL GSM	1.99%	1.94%	98.11%	0.89%	1.89%	1.91%	2.97%	NA
Idea	1.38%	0.70%	98.46%	0.30%	1.14%	0.53%	2.46%	95.38%
Vodafone	0.75%	1.63%	99.11%	0.36%	0.89%	0.60%	2.59%	97.20%

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	0.04%	16.12%	92.08%	0.70%	5.15%	1.96%	18.91%	91.02%
Airtel	0.34%	0.69%	95.62%	1.00%	1.52%	1.17%	1.82%	99.18%
BSNL CDMA	0.27%	29.22%	98.91%	NA	NA	1.22%	5.39%	NA
BSNL GSM	NA	NA	0.00%	0.00%	0.00%	NA	NA	NA
Idea	1.35%	0.85%	97.80%	0.47%	1.64%	0.50%	2.29%	95.37%
Vodafone	0.71%	1.30%	98.85%	0.48%	1.15%	0.66%	1.97%	96.70%

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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 network)	SDCCH/ Paging Chl. Congestion (%age)	TCH Congestion (%age)	Call Drop Rate (%age)	Worst affected cells having more than 3% TCH drop	%age of connection with good voice quality
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel	0.05%	2.37%	95.60%	0.56%	2.91%	1.58%	14.55%	92.49%
Airtel	0.34%	0.00%	96.21%	0.39%	0.77%	0.96%	1.51%	99.18%
BSNL CDMA	0.27%	7.13%	98.79%	NA	NA	1.31%	5.77%	NA
BSNL GSM	1.61%	0.29%	91.99%	4.21%	8.01%	5.47%	6.22%	NA
Idea	1.42%	0.66%	99.01%	0.34%	0.27%	0.45%	2.53%	96.63%
Vodafone	0.65%	0.12%	99.36%	0.44%	0.64%	0.62%	2.36%	97.14%

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

BTSs Accumulated Downtime:

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

Worst Affected BTSs Due to Downtime:

Aircel and BSNL CDMA (7.13%) failed to meet the benchmark. Minimum worst affected BTSs due to downtime was recorded for Airtel at 0.00%.

Call Set-up Success Rate (CSSR):

BSNL GSM failed to meet the benchmark for CSSR. The maximum CSSR was observed for Vodafone with 99.36%.

Excluding Airtel, all other operators were found to be calculating the parameter as per the norm specified by TRAI, as given in parameter description section. Airtel is using a formula that has not been specified by TRAI or the counter definitions provided by their network service provider (Ericsson). However, this report presents the appropriate CSSR value for Airtel, which was calculated by using the proper counter details (provided in section 8.15.1) by the IMRB auditor during audit.

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SDCCH/ Paging Chl. Congestion:

BSNL GSM failed to meet the benchmark for SDCCH / Paging Channel Congestion. Idea recorded the best SDCCH / Paging Channel Congestion at 0.34%.

TCH Congestion:

Aircel and BSNL GSM (8.01%) failed to meet the benchmark for TCH congestion, while Idea performed the best on TCH congestion at 0.27%.

The calculation methodology (given in parameter description section) followed by the operators was found to be in complete accordance with what has been specified by TRAI.

Call Drop Rate:

BSNL GSM failed to meet the benchmark for the parameter. Minimum call drop rate was recorded for Idea at 0.45%.

Worst Affected Cells Having More than 3% TCH Drop:

Aircel (14.55%), BSNL CDMA & GSM failed to meet the benchmark. Best performance was recorded for Airtel at 1.51%.

Voice Quality

Aircel failed to meet the benchmark. Best performance was recorded for Airtel at 99.18%.

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

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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	0.05%	2.75%	94.52%	0.70%	3.89%	1.63%	14.65%	91.81%
Airtel	0.28%	0.00%	96.33%	0.39%	0.68%	0.94%	1.25%	99.18%
BSNL CDMA	0.26%	10.70%	98.69%	NA	NA	1.45%	6.84%	NA
BSNL GSM	1.58%	0.29%	84.89%	4.31%	15.11%	7.44%	0.00%	NA
Idea	1.06%	0.56%	98.80%	0.33%	0.34%	0.47%	2.31%	96.32%
Vodafone	0.60%	0.00%	99.35%	0.52%	0.65%	0.64%	2.94%	97.04%

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	0.05%	2.32%	95.99%	0.56%	2.71%	1.59%	14.44%	92.44%
Airtel	0.39%	0.00%	96.21%	0.37%	0.71%	0.98%	1.51%	99.18%
BSNL CDMA	0.30%	4.12%	98.80%	NA	NA	1.25%	4.90%	NA
BSNL GSM	1.63%	0.29%	99.08%	4.10%	0.92%	4.32%	11.00%	NA
Idea	1.70%	0.67%	99.13%	0.40%	0.18%	0.46%	2.77%	96.62%
Vodafone	0.80%	0.18%	99.48%	0.28%	0.52%	0.57%	2.17%	97.57%

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	0.05%	2.05%	96.30%	0.42%	2.13%	1.53%	14.55%	92.61%
Airtel	0.35%	0.00%	96.07%	0.39%	0.91%	0.97%	1.77%	99.18%
BSNL CDMA	0.27%	6.58%	98.89%	NA	NA	1.22%	5.58%	NA
BSNL GSM	NA	NA	0.00%	0.00%	0.00%	NA	NA	NA
Idea	1.51%	0.75%	99.09%	0.29%	0.29%	0.42%	2.51%	96.68%
Vodafone	0.55%	0.17%	99.25%	0.53%	0.75%	0.65%	1.96%	97.09%

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	0.05%	22.27%	99.16%	0.20%	0.00%	0.60%	7.35%	98.94%
Airtel 3G	0.47%	1.18%	98.82%	0.20%	0.09%	0.71%	1.16%	98.78%
BSNL 3G	1.81%	1.88%	96.57%	1.00%	1.68%	1.45%	2.97%	NA
Reliance 3G	0.10%	0.69%	99.89%	0.04%	0.03%	0.09%	0.37%	99.88%
Vodafone 3G	0.84%	0.60%	99.83%	0.03%	0.03%	0.31%	2.39%	98.90%

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

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

Node Bs downtime:

All operators met the benchmark for Node Bs downtime.

Worst affected Node Bs due to downtime:

Aircel 3G (22.27%) failed to meet the benchmark for Worst affected Node Bs due to downtime.

Call Set-up Success Rate (CSSR):

All operators met the benchmark for CSSR. The maximum CSSR was observed for Reliance 3G with 99.89%.

RRC Congestion:

All operators met the benchmark for RRC Congestion.

Circuit Switched RAB Congestion:

All operators met the TRAI benchmark for Circuit Switched RAB Congestion.

Circuit Switched Voice Call Drop Rate:

All operators met the benchmark for the parameter Circuit Switched Voice Call Drop Rate.

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

Aircel 3G (7.35%) and Vodafone 3G failed to meet the benchmark for worst affected cells having more than 3% Circuit switched voice drop rate.

Circuit Switch Voice Quality:

All operators met the benchmark for the parameter Circuit Switch Voice Quality.

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	0.06%	27.68%	99.32%	0.13%	0.00%	0.66%	8.09%	98.92%
Airtel 3G	0.50%	1.16%	98.79%	0.14%	0.12%	0.70%	1.18%	98.80%
BSNL 3G	NA	NA	NA	NA	NA	NA	NA	NA
Reliance 3G	0.20%	0.86%	99.85%	0.04%	0.00%	0.08%	0.53%	99.89%
Vodafone 3G	0.69%	0.00%	99.75%	0.03%	0.03%	0.30%	2.20%	98.88%

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	0.05%	25.13%	99.38%	0.07%	0.00%	0.61%	7.86%	98.95%
Airtel 3G	0.50%	1.24%	98.50%	0.41%	0.09%	0.72%	1.14%	98.77%
BSNL 3G	1.81%	1.88%	96.57%	1.00%	1.68%	1.45%	2.97%	NA
Reliance 3G	0.09%	0.35%	99.91%	0.04%	0.00%	0.08%	0.29%	99.88%
Vodafone 3G	1.06%	1.01%	99.87%	0.02%	0.03%	0.33%	2.27%	98.91%

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	0.04%	14.06%	98.80%	0.40%	0.00%	0.53%	6.10%	98.96%
Airtel 3G	0.42%	1.14%	99.18%	0.04%	0.06%	0.69%	1.16%	98.78%
BSNL 3G	NA	NA	NA	NA	NA	NA	NA	NA
Reliance 3G	0.01%	0.87%	99.91%	0.05%	0.09%	0.11%	0.29%	99.85%
Vodafone 3G	0.81%	0.79%	99.87%	0.03%	0.03%	0.30%	2.70%	98.91%

3.4   3 DAY DATA – CONSOLIDATED FOR 3G

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

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	0.99%	1.85%	97.49%	0.34%	0.00%	0.55%	5.17%	98.96%
Airtel 3G	0.47%	1.20%	98.65%	0.44%	0.13%	0.68%	1.23%	98.79%
BSNL 3G	1.82%	2.13%	95.76%	3.86%	1.93%	1.34%	0.50%	NA
Reliance 3G	0.00%	0.00%	99.93%	0.03%	0.00%	0.06%	0.17%	99.89%
Vodafone 3G	0.70%	0.31%	99.86%	0.03%	0.01%	0.31%	2.33%	98.89%

Note: BSNL 3G did not submit the data for audit.

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

Node Bs downtime:
All operators met the benchmark for Node Bs downtime.

Worst affected Node Bs due to downtime:
BSNL 3G failed to meet the benchmark for worst affected Node Bs due to downtime.

Call Set-up Success Rate (CSSR):
All operators met the benchmark for CSSR.

RRC Congestion:
BSNL 3G failed to meet the benchmark for RRC Congestion.

Circuit Switched RAB Congestion:
All operators met the TRAI benchmark for Circuit Switched RAB Congestion.

Circuit Switched Voice Call Drop Rate:
All operators met the benchmark for the parameter Circuit Switched Voice Call Drop Rate.

Worst affected cells having more than 3% Circuit switched voice drop rate:
Aircel 3G and Vodafone 3G failed to meet the benchmark for worst affected cells having more than 3% Circuit switched voice drop rate.

Circuit Switch Voice Quality:
All operators met the benchmark for the parameter Circuit Switch Voice Quality.

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

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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	0.28%	1.79%	95.33%	0.18%	0.00%	0.59%	5.56%	98.93%
Airtel 3G	0.05%	1.17%	98.84%	0.12%	0.19%	0.75%	1.27%	98.81%
BSNL 3G	NA	NA	NA	NA	NA	NA	NA	NA
Reliance 3G	0.00%	0.00%	99.91%	0.03%	0.00%	0.05%	0.24%	99.90%
Vodafone 3G	0.69%	0.07%	99.78%	0.01%	0.01%	0.32%	2.61%	98.89%

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	0.08%	2.92%	97.87%	0.12%	0.00%	0.58%	5.67%	98.95%
Airtel 3G	0.51%	1.26%	97.96%	1.11%	0.12%	0.71%	1.23%	98.79%
BSNL 3G	1.82%	2.13%	95.76%	3.86%	1.93%	1.34%	0.50%	NA
Reliance 3G	0.00%	0.00%	99.93%	0.02%	0.00%	0.07%	0.17%	99.90%
Vodafone 3G	0.72%	0.50%	99.90%	0.01%	0.01%	0.30%	2.14%	98.88%

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	0.04%	0.83%	99.26%	0.71%	0.00%	0.48%	4.30%	98.97%
Airtel 3G	0.36%	1.16%	99.16%	0.08%	0.07%	0.60%	1.19%	98.78%
BSNL 3G	NA	NA	NA	NA	NA	NA	NA	NA
Reliance 3G	0.00%	0.00%	99.97%	0.03%	0.00%	0.06%	0.10%	99.87%
Vodafone 3G	0.70%	0.36%	99.89%	0.07%	0.01%	0.31%	2.24%	98.90%

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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	99.09%	98.39%	1.93%	98.98%	99.75%	1.61%
Airtel	99.35%	NA	NA	98.04%	NA	NA
BSNL CDMA	NA	NA	NA	NA	NA	NA
BSNL GSM	NA	NA	NA	NA	NA	NA
Idea	99.99%	99.85%	0.18%	99.96%	99.96%	0.17%
Vodafone	99.76%	99.70%	2.96%	100.00%	99.51%	2.86%

NA: Data did not received from Operators

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

Activation done within 4 hours:

All operators met the benchmark for activation done within 4 hours for monthly, however for 3days data not received from operators.

PDP Context activation success rate:

All operators met the benchmark for PDP Context activation success rate, however most of the operators not provided data for monthly as well as 3days live.

Drop Rate:

All operators met the benchmark for Drop Rate; however most of the operators not provided data for PMR as well as 3days live.

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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	99.09%	96.98%	1.90%	98.88%	99.95%	1.76%
Airtel 3G	99.35%	NA	NA	98.04%	NA	NA
BSNL 3G	NA	91.79%	3.59%	NA	NA	NA
Reliance 3G	100.00%	99.21%	0.90%	100.00%	NA	NA
Vodafone 3G	99.72%	99.49%	0.22%	99.94%	99.59%	0.17%

NA: Data were not submitted by most of operators

BSNL 3G failed to meet the benchmark for PDP context activation success rate during PMR audit.

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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	71.00%	91.00%	100.00%	98.21%	82.33%	77.00%
Airtel	79.00%	96.00%	100.00%	84.27%	82.67%	78.00%
BSNL CDMA	NA	NA	100.00%	88.89%	83.00%	NA
BSNL GSM	71.00%	92.00%	100.00%	85.00%	80.33%	73.00%
Idea	77.00%	95.00%	100.00%	95.70%	82.67%	76.00%
Reliance GSM	72.00%	89.00%	100.00%	89.47%	82.00%	77.00%
Vodafone	74.00%	98.00%	100.00%	93.33%	83.00%	85.00%

NA: - Not applicable,

Resolution of billing complaints

As per the consumers (live calling exercise), none of the operators was able to meet the benchmark of resolving 98% complaints within 4 weeks and 100% complaints within 6 weeks.

Accessibility of Call Centre/Customer Care-IVR

For the IVR aspect, all operators failed to meet the TRAI benchmark of 95%, except Idea.

Customer Care / Helpline Assessment (voice to voice)

All operators failed to meet the benchmark for the parameter except Aircel.

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.

Complaint/Request Attended to Satisfaction

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

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
Benchmark	≤ 0.1%	≤ 0.1%	≥ 98%	≥ 100%	≥ 100%	≥ 95%	≥ 95%
Aircel	0.04%	0.02%	100.00%	100.00%	100.00%	95.89%	95.59%
Airtel	0.02%	0.04%	100.00%	100.00%	100.00%	90.00%	89.86%
BSNL CDMA	0.03%	0.00%	100.00%	100.00%	100.00%	100.00%	100.00%
BSNL GSM	NA	NA	NA	NA	NA	NA	NA
Idea	0.39%	0.21%	100.00%	100.00%	100.00%	97.55%	99.87%
Reliance GSM	0.09%	0.03%	100.00%	100.00%	100.00%	97.48%	97.27%
Vodafone	0.11%	0.02%	100.00%	100.00%	100.00%	99.96%	100.00%

NA: - BSNL GSM did not submit the data.

Metering and Billing Credibility – Post-paid Subscribers

For the billing disputes of post-paid subscribers, it was observed that Idea and Vodafone failed to meet the TRAI benchmark for the parameter. Airtel had the best performance with 0.02% billing disputes.

Metering and Billing Credibility – Prepaid Subscribers

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

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

Airtel failed to meet the TRAI benchmark of 95% IVR call.

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

Airtel failed to meet the TRAI specified benchmark of 95%. BSNL CDMA and Vodafone recorded the best performance for the parameter.

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3.9   INTER OPERATOR CALL ASSESSMENT - CONSOLIDATED

6. Inter Operator Call Assessment							
Inter operator call Assessment To↓ From→	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Aircel	NA	94.00%	91.00%	94.00%	95.00%	88.00%	95.00%
Airtel	92.00%	NA	94.00%	91.00%	96.00%	84.00%	93.00%
BSNL CDMA	91.00%	96.00%	NA	93.00%	96.00%	88.00%	95.00%
BSNL GSM	88.00%	92.00%	91.00%	NA	95.00%	96.00%	93.00%
Idea	90.00%	94.00%	92.00%	90.00%	NA	88.00%	94.00%
Reliance GSM	91.00%	94.00%	92.00%	92.00%	95.00%	NA	89.00%
Vodafone	93.00%	94.00%	91.00%	92.00%	95.00%	87.00%	NA

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

In the inter-operator call assessment, most of the operators faced problems in connecting to other operators.

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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	2.84%	0.05%	18.76%	18.75%	91.54%	91.55%	0.89%	0.89%	5.81%	5.81%	1.93%	1.93%	19.05%	19.06%	90.98%	90.98%	0.00%	0.00%
Airtel	0.37%	0.36%	0.74%	0.67%	95.79%	95.75%	0.88%	0.91%	1.48%	1.49%	1.10%	1.12%	1.55%	1.62%	99.03%	99.07%	0.00%	0.00%
BSNL	1.99%	1.99%	1.94%	1.94%	98.09%	98.10%	0.89%	0.88%	1.91%	1.90%	1.93%	1.92%	2.97%	2.97%	96.83%	NA	0.00%	NA
Idea	1.32%	1.30%	0.78%	0.78%	98.22%	98.22%	0.41%	0.41%	1.33%	1.33%	0.50%	0.50%	2.37%	2.37%	95.38%	95.38%	0.00%	0.00%
Vodafone	0.76%	0.73%	1.31%	1.42%	98.86%	98.93%	0.63%	0.56%	1.14%	1.07%	0.66%	0.64%	1.93%	2.16%	96.63%	96.87%	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	3.14%	0.05%	22.29%	22.27%	99.17%	99.16%	0.20%	0.20%	0.00%	0.00%	0.43%	0.60%	7.36%	7.35%	98.94%	98.94%	0.00%	0.00%
Airtel	0.49%	0.47%	1.20%	1.18%	98.72%	98.82%	0.25%	0.20%	0.10%	0.09%	0.71%	0.71%	1.16%	1.16%	98.78%	98.78%	0.00%	0.00%
BSNL	1.90%	1.81%	1.93%	1.88%	96.67%	96.57%	0.33%	1.00%	1.07%	1.68%	1.50%	1.45%	2.90%	2.97%	96.83%	NA	0.00%	0.00%
rtl	0.20%	0.10%	0.69%	0.69%	99.89%	99.89%	0.04%	0.04%	0.03%	0.03%	0.09%	0.09%	0.37%	0.37%	99.88%	99.88%	0.00%	0.00%
vodafone	0.63%	0.84%	0.60%	0.60%	99.83%	99.83%	0.03%	0.03%	0.03%	0.03%	0.31%	0.31%	2.40%	2.39%	98.87%	98.90%	0.00%	0.00%

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

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PMR Consolidated (Network Parameters) for 2G

- Aircel did not meet the benchmark for worst affected BTSs due to downtime (**18.75%**), TCH congestion, CSSR, worst affected cells having more than 3% TCH drop (**19.06%**) and voice quality.
- BSNL CDMA failed to meet the benchmark for worst affected BTSs due to downtime (**26.75%**) and Worst Affected Cells Having More than 3% TCH Drop (**5.58%**).

3 Day Live Measurement (Network Parameters) for 2G

- Aircel did not meet the benchmark for worst affected BTSs due to downtime, TCH congestion, worst affected cells having more than 3% TCH drop (**14.55%**) and Voice quality.
- BSNL CDMA failed to meet the benchmark for worst affected BTSs due to downtime (**7.13%**) and worst affected cells having more than 3% TCH Drop (**5.77%**).
- BSNL GSM failed to meet the benchmark for CSSR, SDCCH congestion (**4.21%**), TCH congestion (**8.01%**), call drop rate (**5.47%**) and worst affected cells having more than 3% TCH drop (**6.22%**)

PMR Consolidated (Network Parameters) for 3G

- Aircel 3G failed to meet the benchmark for worst affected Node Bs due to downtime (**22.27%**) and worst affected cells having more than 3% Circuit switched voice drop rate (**7. 35%**).

3 Day Live Measurement (Network Parameters) for 3G

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

Wireless Data Services 2G & 3G

- BSNL 3G failed to meet the benchmark for PDP context activation success rate during PMR audit

Live Calling

- As per the consumers (live calling exercise), none of the operators was able to meet the benchmark of resolving 98% complaints within 4 weeks and 100% complaints within 6 weeks.
- All operators failed to meet the benchmark for the parameter except Idea and Aircel.
- 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.

Metering and billing credibility

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

Customer Care

➢ Airtel failed to meet the TRAI benchmark of 95% IVR call.
➢ Airtel 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 Voice 2G

➢ In Kamrup SSA Aircel, Airtel, BSNL CDMA, BSNL GSM and Vodafone did not meet the benchmark for voice quality in outdoor locations.
➢ In Kamrup SSA Aircel, BSNL CDMA, BSNL GSM and idea failed to meet the benchmark for CSSR in outdoor locations.
➢ In Kamrup BSNL CDMA, BSNL GSM and idea failed to meet the benchmark for call drop rate in outdoor locations.

Drive Test Voice 2G

➢ In Kamrup SSA Airtel 3G failed to meet the benchmark for voice quality in indoor as well as outdoor locations and Vodafone 3G failed to meet in indoor and BSNL 3G failed in outdoor locations.
➢ In Kamrup SSA BSNL 3G failed to meet the benchmark for CSSR in outdoor locations.
➢ In Kamrup SSA BSNL 3G failed to meet the benchmark for call drop rate in outdoor locations.

Note: Due to non-co-operation from Assam BSNL team for BSNL GSM, BSNL 3G, Wireless data services monthly audit for the month of September 2016 and CSD data for JAS'16. We have marked them as non-compliance.

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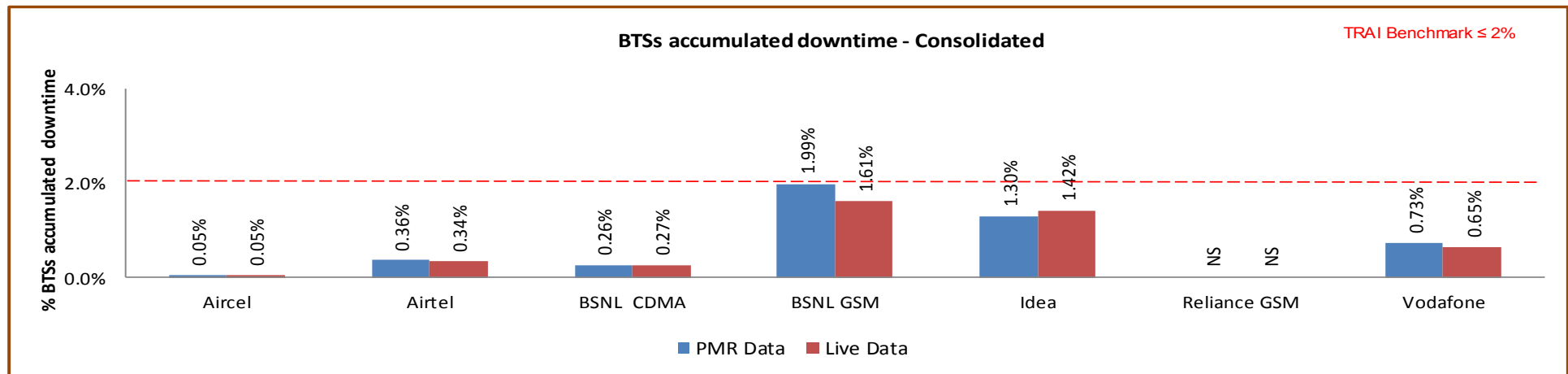
Data Source: Operations and Maintenance Center (OMC) of the operators

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

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

5.1.2.1 KEY FINDINGS – MONTH 1

BTSs accumulated downtime - Month 1

TRAI Benchmark ≤ 2%

Operator	PMR Data	Live Data
Aircel	0.05%	0.05%
Airtel	0.36%	0.28%
BSNL CDMA	0.24%	0.26%
BSNL GSM	1.99%	158%
Idea	1.21%	1.06%
Reliance GSM	NS	NS
Vodafone	0.74%	0.60%

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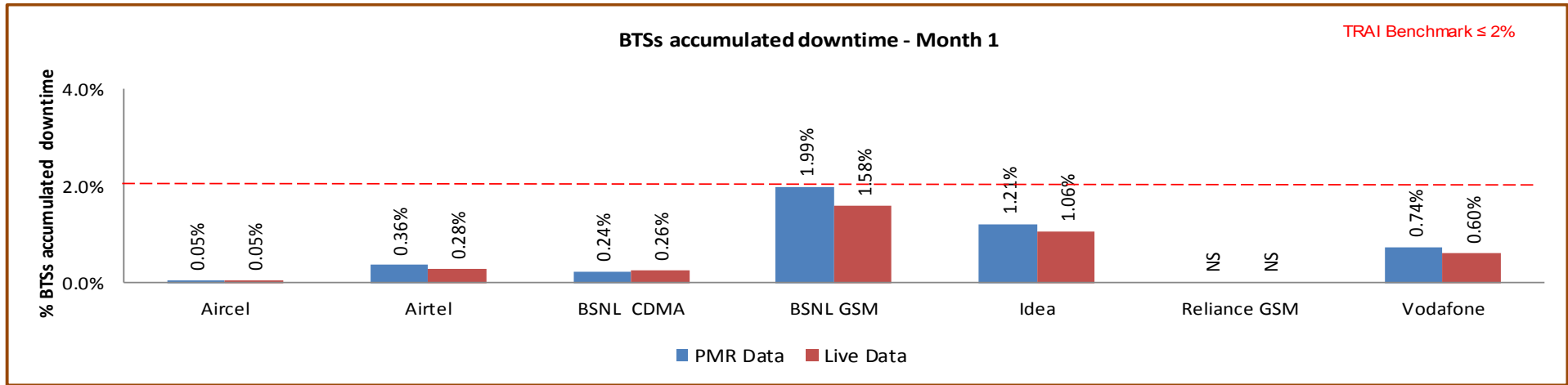
Data Source: Operations and Maintenance Center (OMC) of the operators

5.1.2.2 KEY FINDINGS – MONTH 2

BTSs accumulated downtime - Month 2

TRAI Benchmark ≤ 2%

Operator	PMR Data	Live Data
Aircel	0.05%	0.05%
Airtel	0.38%	0.39%
BSNL CDMA	0.26%	0.30%
BSNL GSM	1.99%	1.63%
Idea	1.38%	1.70%
Reliance GSM	NS	NS
Vodafone	0.75%	0.80%

■ PMR Data ■ Live Data

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

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5.1.2.3 KEY FINDINGS – MONTH 3

BTSs accumulated downtime - Month 3

TRAI Benchmark ≤ 2%

% BTSs accumulated downtime

	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
PMR Data	0.04%	0.34%	0.27%	NA	1.35%	NS	0.71%
Live Data	0.05%	0.35%	0.27%	NA	1.51%	NS	0.55%

■ **PMR Data** ■ **Live Data**

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

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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

Worst affected BTSs-Consolidated

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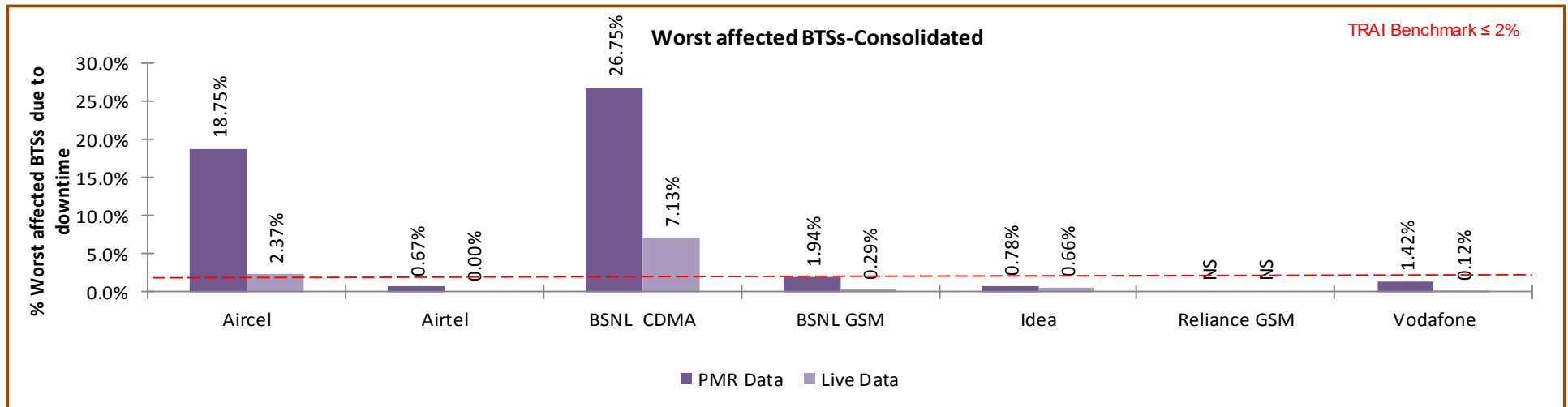
Data Source: Operations and Maintenance Center (OMC) of the operators

Aircel and BSNL CDMA did not meet 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 and BSNL CDMA &GSM. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for three days.

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5.2.2.1 KEY FINDINGS – MONTH 1

Worst affected BTSs-Month 1

TRAI Benchmark ≤ 2%

% Worst affected BTSs due to downtime

Operator	PMR Data	Live Data
Aircel	21.32%	2.75%
Airtel	0.61%	0.00%
BSNL CDMA	24.69%	10.70%
BSNL GSM	1.94%	0.29%
Idea	0.78%	0.56%
Reliance GSM	NS	NS
Vodafone	1.34%	0.00%

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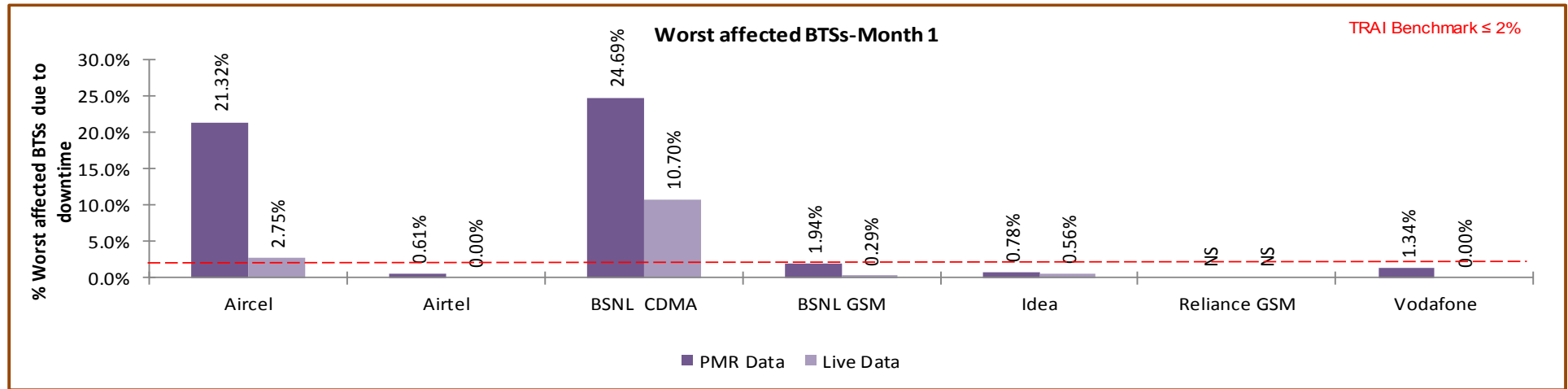
Data Source: Operations and Maintenance Center (OMC) of the operators

5.2.2.2 KEY FINDINGS – MONTH 2

Worst affected BTSs-Month 2

TRAI Benchmark ≤ 2%

% Worst affected BTSs due to downtime

Operator	PMR Data	Live Data
Aircel	18.83%	2.32%
Airtel	0.69%	0.00%
BSNL CDMA	26.34%	4.12%
BSNL GSM	1.94%	0.29%
Idea	0.70%	0.67%
Reliance GSM	NS	NS
Vodafone	1.63%	0.18%

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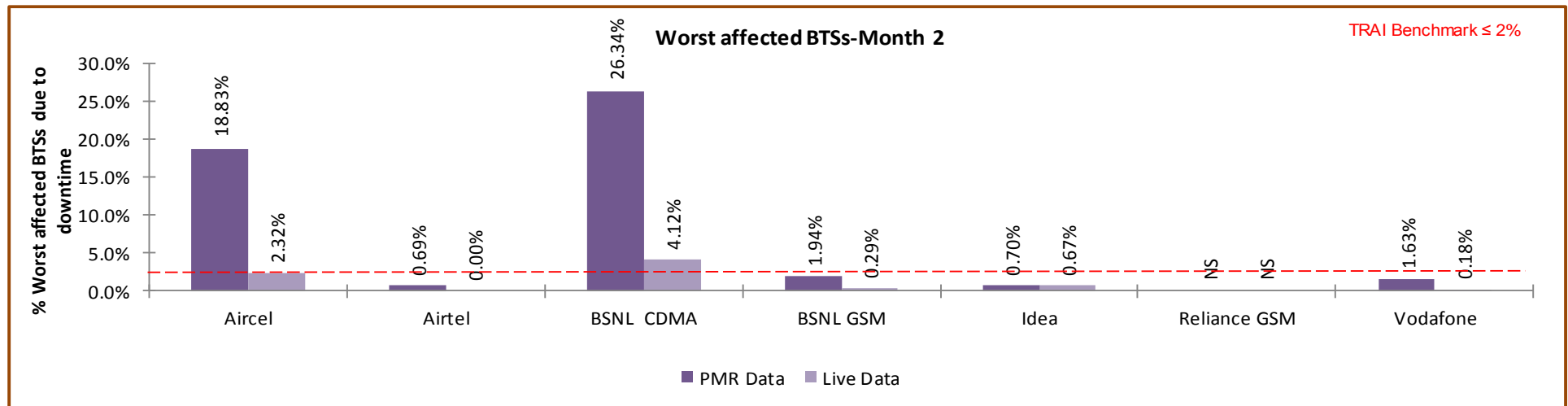
Data Source: Operations and Maintenance Center (OMC) of the operators

5.2.2.3 KEY FINDINGS – MONTH 3

Worst affected BTSs-Month 3

TRAI Benchmark ≤ 2%

% Worst affected BTSs due to downtime

Operator	PMR Data	Live Data
Aircel	16.12%	2.05%
Airtel	0.69%	0.00%
BSNL CDMA	29.22%	6.58%
BSNL GSM	NA	NA
Idea	0.85%	0.75%
Reliance GSM	NS	NS
Vodafone	1.30%	0.17%

■ PMR Data ■ Live Data

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

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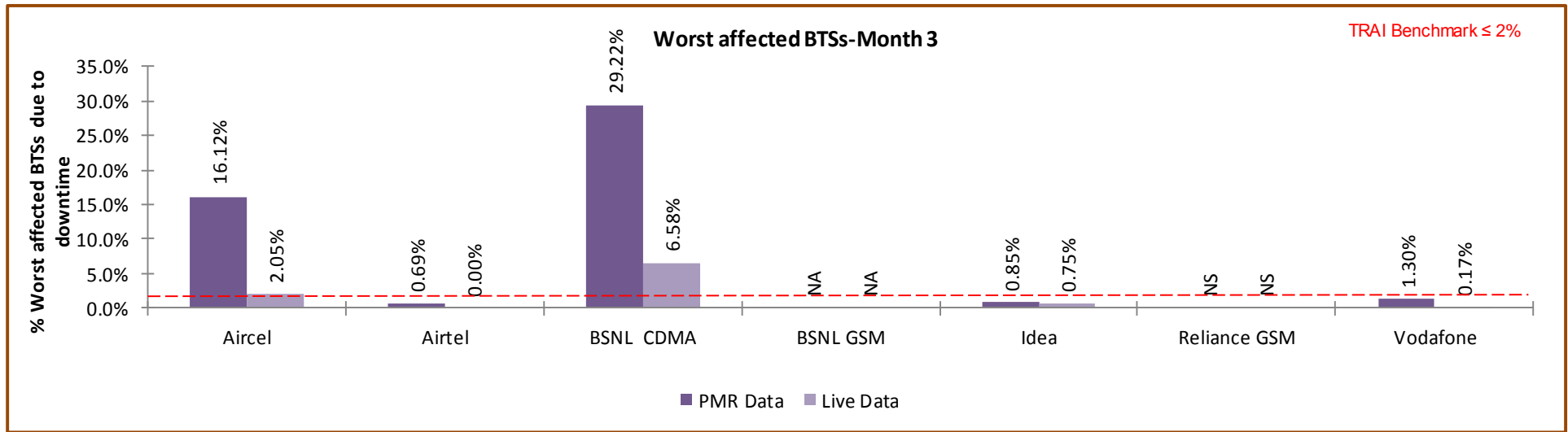
5.3 CALL SET UP SUCCESS RATE

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

Call Set Up Success Rate-Consolidated

TRAI Benchmark ≥ 95%

Operator	PMR Data	Live Data	Drive Test Data
Aircel	91.55%	95.60%	97.34%
Airtel	95.75%	96.21%	99.62%
BSNL CDMA	98.65%	98.79%	84.34%
BSNL GSM	98.10%	91.99%	91.14%
Idea	98.22%	99.01%	96.20%
Reliance GSM	NS	NS	NS
Vodafone	98.93%	99.36%	95.62%
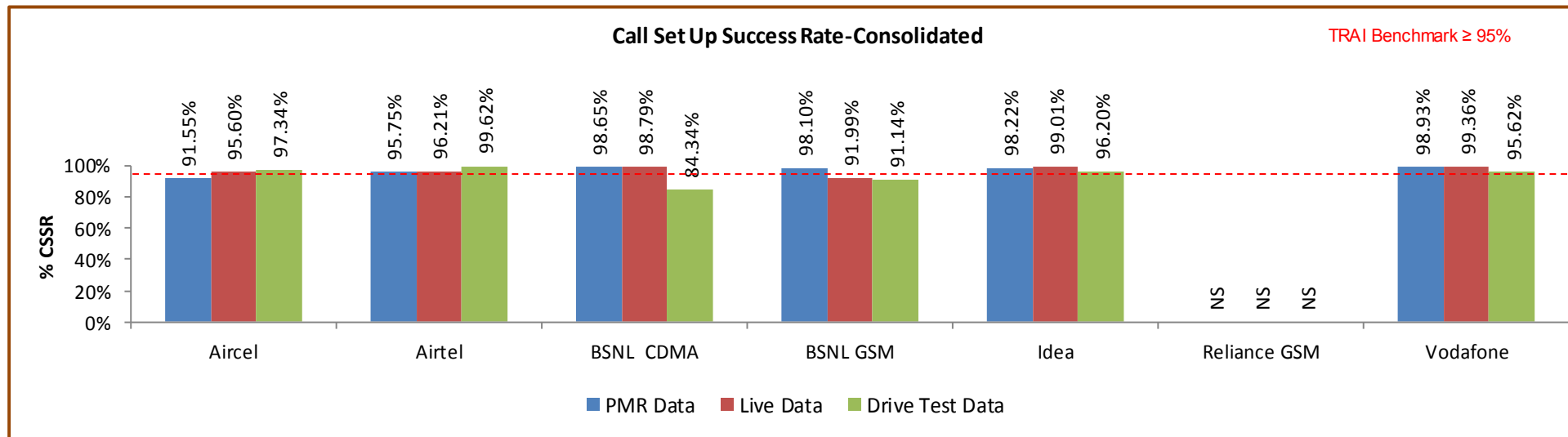
Data Source: Network Operations Center (NOC) of the operators

Aircel failed to meet the TRAI benchmark as per audit/PMR data. However, BSNL GSM failed in 3 days live audit. During drive test BSNL CDMA and BSNL GSM failed to meet the benchmark.

To calculate CSSR, Airtel is using a formula that has not been specified by TRAI or the counter definitions provided by their network service provider (Ericsson). However, this report presents the appropriate CSSR value for Airtel, which was calculated by using the proper counter details (provided in section 8.15.1) by the IMRB auditor during audit.

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5.3.2.1 KEY FINDINGS – MONTH 1

Call Set Up Success Rate-Month 1

TRAI Benchmark ≥ 95%

Operator	PMR Data	Live Data	Drive Test Data
Aircel	90.56%	94.52%	NA
Airtel	95.89%	96.33%	NA
BSNL CDMA	98.42%	98.69%	NA
BSNL GSM	98.09%	84.89%	NA
Idea	98.39%	98.80%	NA
Reliance GSM	NS	NS	NS
Vodafone	98.84%	99.35%	NA

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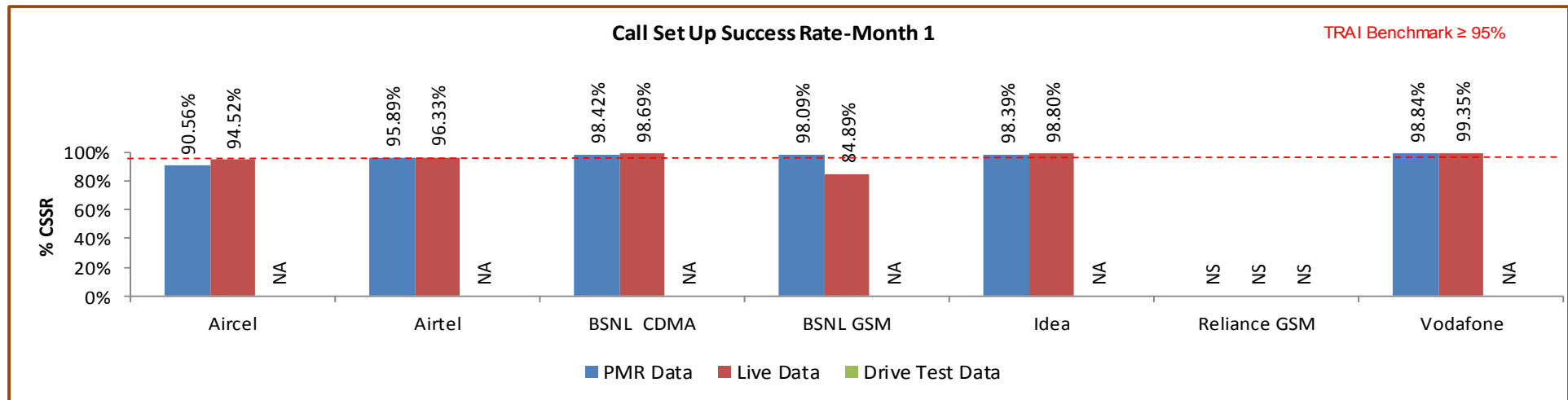
Data Source: Network Operations Center (NOC) of the operators

5.3.2.2 KEY FINDINGS – MONTH 2

Call Set Up Success Rate-Month 2

TRAI Benchmark ≥ 95%

Operator	PMR Data	Live Data	Drive Test Data
Aircel	92.00%	95.99%	97.34%
Airtel	95.74%	96.21%	99.62%
BSNL CDMA	98.62%	98.80%	84.34%
BSNL GSM	98.11%	99.08%	91.14%
Idea	98.46%	99.13%	96.20%
Reliance GSM	NS	NS	NS
Vodafone	99.11%	99.48%	95.62%

■ PMR Data ■ Live Data ■ Drive Test Data

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

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5.3.2.3 KEY FINDINGS – MONTH 3

Call Set Up Success Rate-Month 3

TRAI Benchmark ≥ 95%

Operator	PMR Data	Live Data	Drive Test Data
Aircel	92.08%	96.30%	NA
Airtel	95.62%	96.07%	NA
BSNL CDMA	98.91%	98.89%	NA
BSNL GSM			NA
Idea	97.80%	99.09%	NA
Reliance GSM	NS	NS	NS
Vodafone	98.85%	99.25%	NA

Legend: PMR Data | Live Data | Drive Test Data

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

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

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

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

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

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

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

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

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

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

     - C_1 = Average POI Congestion % on day 1

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

     - C_2 = Average POI Congestion % on day 2

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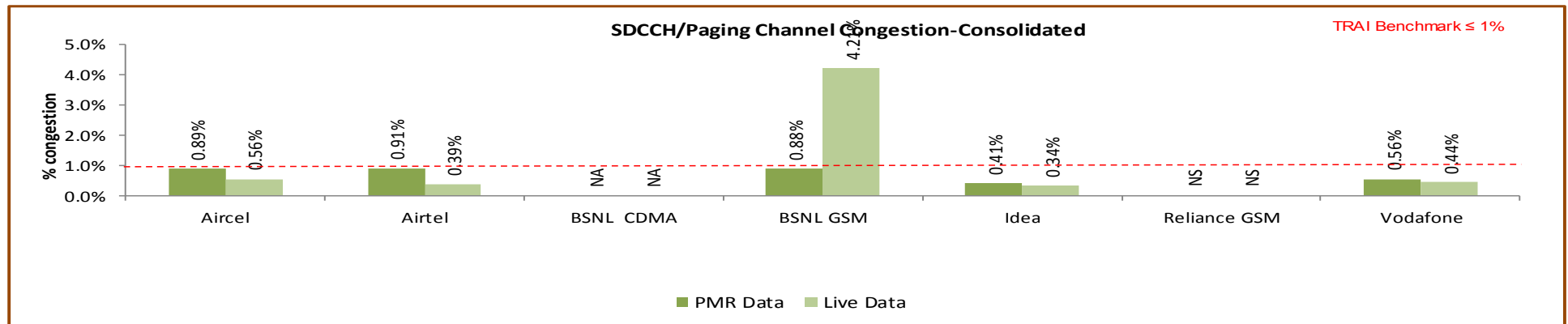
Data Source: Network Operations Center (NOC) of the operators

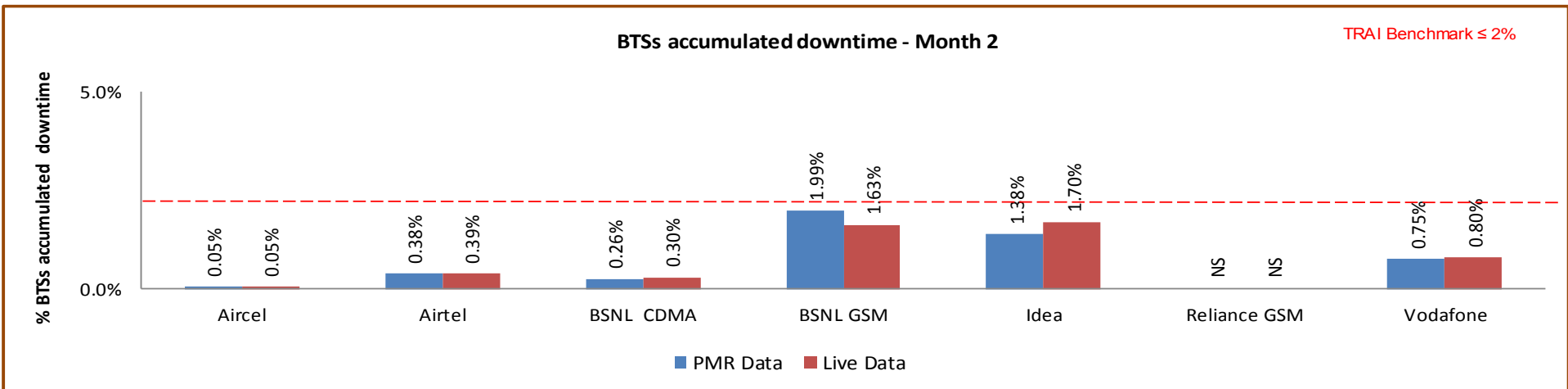All operators met the benchmark as per PMR/audit Data except BSNL GSM in live audit.

Significant difference was observed between PMR & live measurement data for BSNL GSM and Airtel. 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 3 days.
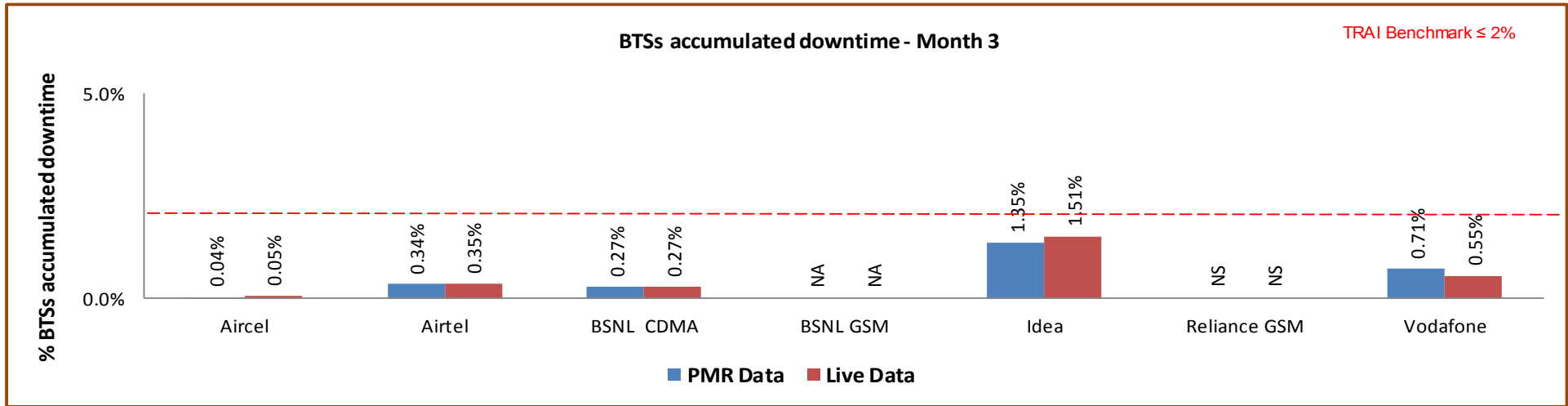
NA: SDCCH/ Paging channel congestion not applicable for CDMA operators. Hence, it has been reported as NA for BSNL CDMA.

5.4.2.1   KEY FINDINGS – MONTH 1

SDCCH/Paging Channel Congestion-Month 1

TRAI Benchmark ≤ 1%

Operator	PMR Data	Live Data
Aircel	0.98%	0.70%
Airtel	0.72%	0.39%
BSNL CDMA	NA	NA
BSNL GSM	0.87%	4.3%
Idea	0.46%	0.33%
Reliance GSM	NS	NS
Vodafone	0.83%	0.52%
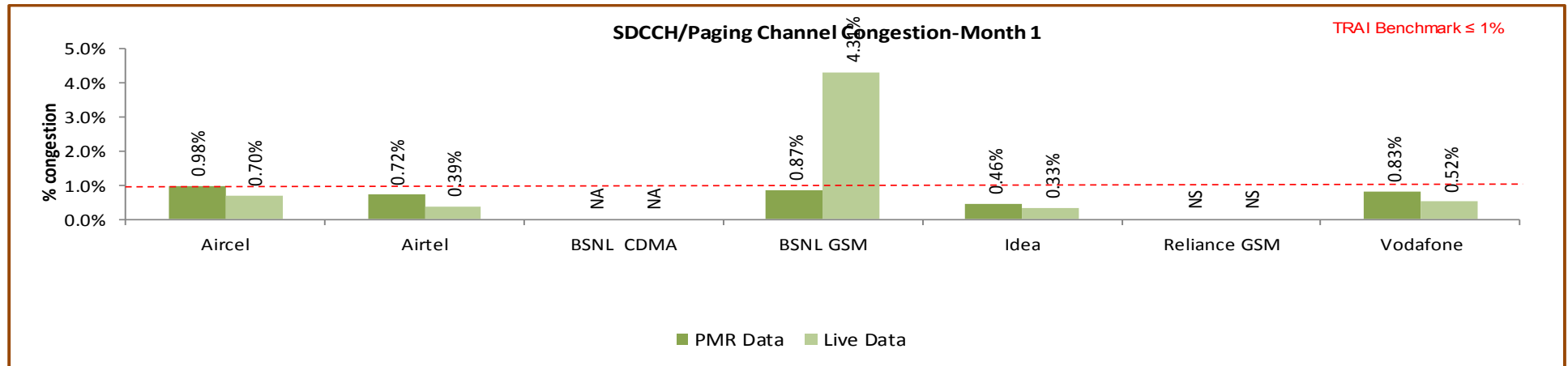
Data Source: Network Operations Center (NOC) of the operators

5.4.2.2   KEY FINDINGS – MONTH 2

SDCCH/Paging Channel Congestion-Month 2

TRAI Benchmark ≤ 1%

Operator	PMR Data	Live Data
Aircel	0.98%	0.56%
Airtel	1.00%	0.37%
BSNL CDMA	NA	NA
BSNL GSM	0.89%	4.10%
Idea	0.30%	0.40%
Reliance GSM	NS	NS
Vodafone	0.36%	0.28%

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

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5.4.2.3   KEY FINDINGS – MONTH 3

SDCCH/Paging Channel Congestion-Month 3

TRAI Benchmark ≤ 1%

Operator	PMR Data	Live Data
Aircel	0.70%	0.42%
Airtel	1.00%	0.39%
BSNL CDMA	NA	NA
BSNL GSM		
Idea	0.47%	0.29%
Reliance GSM	NS	NS
Vodafone	0.48%	0.53%

■ PMR Data   ■ Live Data

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

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5.4.3 KEY FINDINGS – TCH CONGESTION (CONSOLIDATED)
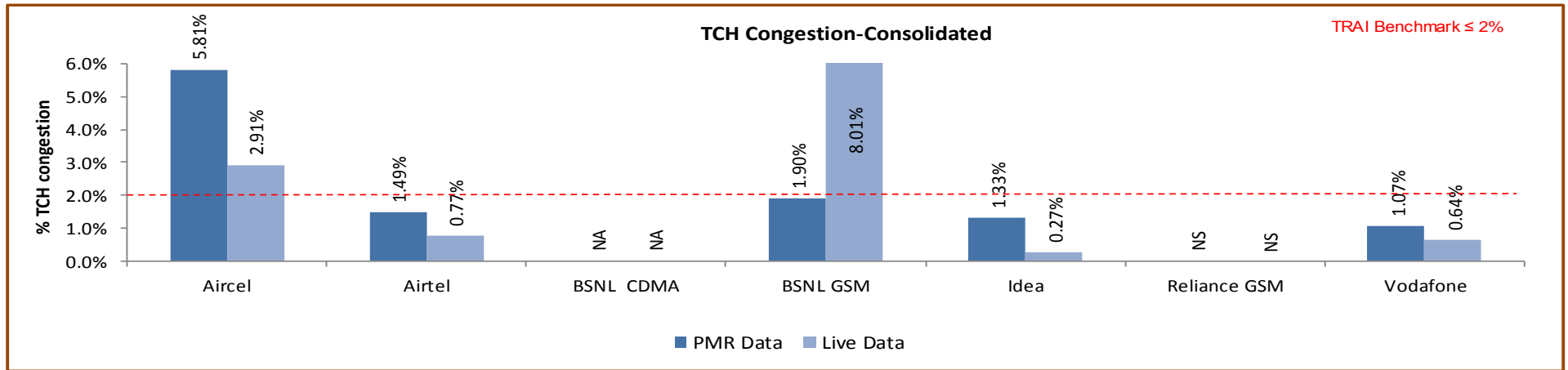
Data Source: Network Operations Center (NOC) of the operators

Aircel and BSNL GSM failed to meet the benchmark as per audit/PMR report.

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

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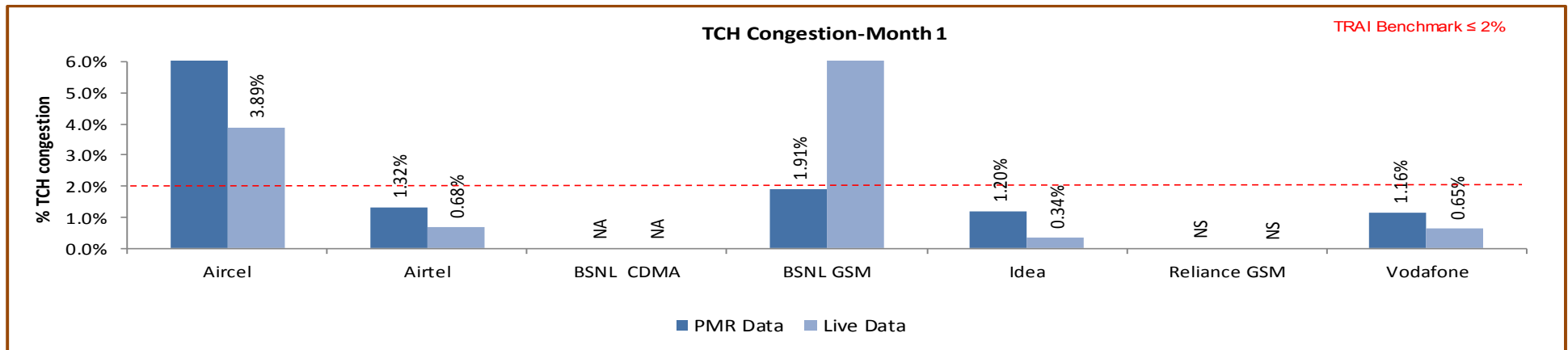
Data Source: Network Operations Center (NOC) of the operators

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5.4.3.2 KEY FINDINGS – MONTH 2

TCH Congestion-Month 2

TRAI Benchmark ≤ 2%

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

5.4.3.3 KEY FINDINGS – MONTH 3

TCH Congestion-Month 3

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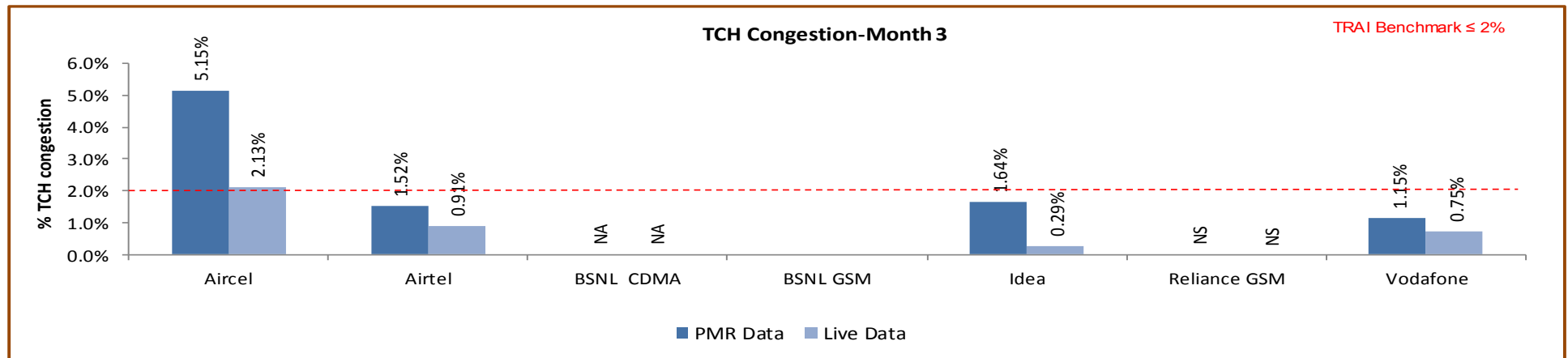
Data Source: Network Operations Center (NOC) of the operators

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

5. POI Congestion								
Audit Results for POI Congestion- PMR data								
POI congestion	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of working POIs		60	15	NA	19	32	NS	32
No. of POIs not meeting benchmark		0	0	NA	0	0	NS	0
Total Capacity of all POIs (A) - in erlangs		312971	376695	NA	50567	113493	NS	5370274
Traffic served for all POIs (B)- in erlangs		185362	123880	NA	47028	54835	NS	3593446
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	0.00%
Live Measurement Results for POI Congestion- 3 Day data								
POI congestion	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of working POIs		59	15	NA	19	32	NS	32
No. of POIs not meeting benchmark		0	0	NA	0	0	NS	0
Total Capacity of all POIs (A) - in erlangs		309191	376158	NA	50567	113133	NS	2219334
Traffic served for all POIs (B)- in erlangs		183995	114731	NA	34811	52318	NS	2483234
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	0.00%

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

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

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5.4.4.1 KEY FINDINGS – MONTH 1

5. POI Congestion								
Audit Results for POI Congestion- PMR data-July								
POI congestion	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of working POIs		60	15	NA	19	33	NS	32
No. of POIs not meeting benchmark		0	0	NA	0	0	NS	0
Total Capacity of all POIs (A) - in erlangs		103330	132694	NA	25284	36778	NS	1878694
Traffic served for all POIs (B)- in erlangs		61720	40180	NA	23869	20260	NS	1489220
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	0.00%
Live Measurement Results for POI Congestion- 3 Day data-July								
POI congestion	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of working POIs		58	15	NA	19	33	NS	32
No. of POIs not meeting benchmark		0	0	NA	0	0	NS	0
Total Capacity of all POIs (A) - in erlangs		100601	118491	NA	25284	36618	NS	457596
Traffic served for all POIs (B)- in erlangs		60668	32941	NA	17806	19866	NS	1373212
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	0.00%

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

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5.4.4.2 KEY FINDINGS – MONTH 2

5. POI Congestion							
Audit Results for POI Congestion- PMR data-August							
POI congestion	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of working POIs		60	15	NA	19	30	NS	32
No. of POIs not meeting benchmark		0	0	NA	0	0	NS	0
Total Capacity of all POIs (A) - in erlangs		104007	131362	NA	25284	36801	NS	1853168
Traffic served for all POIs (B)- in erlangs		61289	40373	NA	23158	20640	NS	1247944
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	0.00%
Live Measurement Results for POI Congestion- 3 Day data-August							
POI congestion	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of working POIs		59	15	NA	19	30	NS	32
No. of POIs not meeting benchmark		0	0	NA	0	0	NS	0
Total Capacity of all POIs (A) - in erlangs		103113	131264	NA	25284	36801	NS	493341
Traffic served for all POIs (B)- in erlangs		61126	37451	NA	17006	18781	NS	159510
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	0.00%

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

TRAI

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5.4.4.3 KEY FINDINGS – MONTH 3

5. POI Congestion								
Audit Results for POI Congestion- PMR data-September								
POI congestion	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of working POIs		60	15	NA	NA	33	NS	32
No. of POIs not meeting benchmark		0	0	NA	NA	0	NS	0
Total Capacity of all POIs (A) - in erlangs		105633	112639	NA	NA	39914	NS	1638412
Traffic served for all POIs (B)- in erlangs		62353	43327	NA	NA	13934	NS	856282
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	NA	0.00%	NS	0.00%
Live Measurement Results for POI Congestion- 3 Day data-September								
POI congestion	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of working POIs		60	15	NA	NA	33	NS	32
No. of POIs not meeting benchmark		0	0	NA	NA	0	NS	0
Total Capacity of all POIs (A) - in erlangs		105477	126403	NA	NA	39713	NS	1268397
Traffic served for all POIs (B)- in erlangs		62201	44340	NA	NA	13672	NS	950512
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	NA	0.00%	NS	0.00%

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

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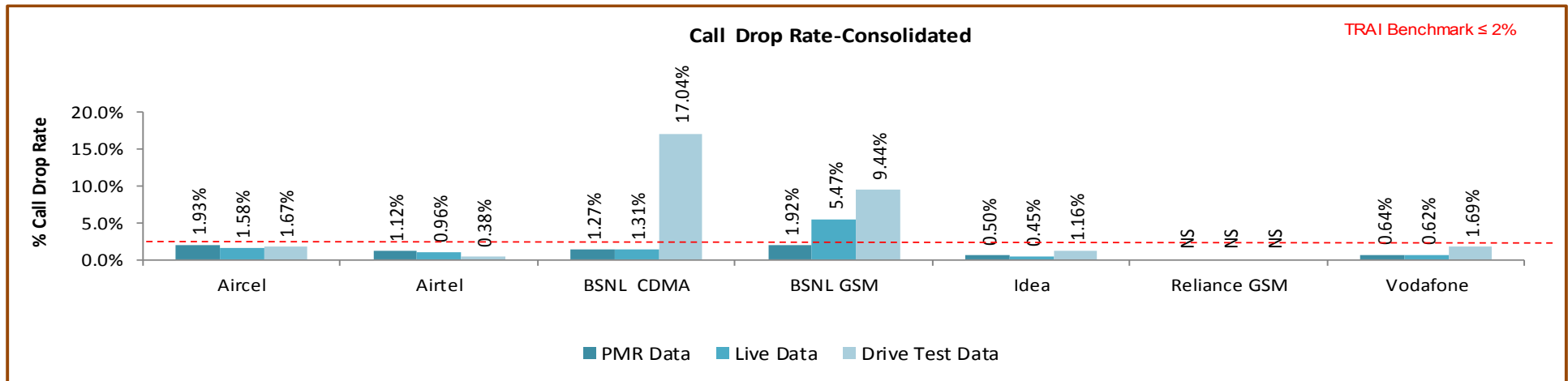
Data Source: Network Operations Center (NOC) of the operators

All operators met the benchmark for call drop rate during audit except BSNL GSM for 3 days live. During drive test BSNL CDMA and BSNL GSM failed to meet the TRAI benchmark.

Significant difference was observed between PMR & live measurement data for Aircel. 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.
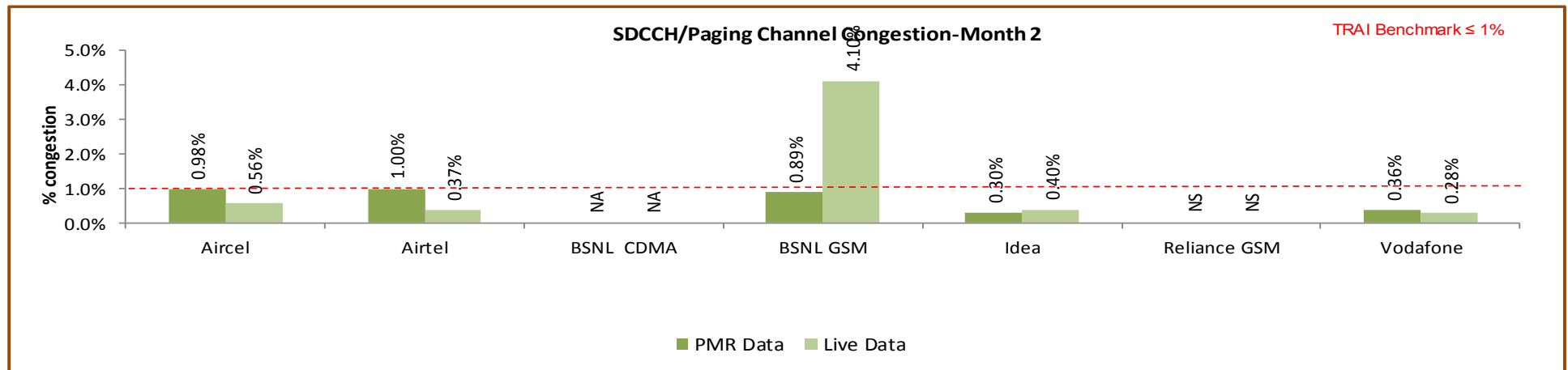
5.5.2.1   KEY FINDINGS – MONTH 1

Call Drop Rate-Month 1

TRAI Benchmark ≤ 2%

	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
PMR Data	1.92%	1.09%	1.35%	1.93%	0.47%	NS	0.67%
Live Data	1.63%	0.94%	1.45%	7.44%	0.47%	NS	0.64%
Drive Test Data	NA	NA	NA	NA	NA	NS	NA
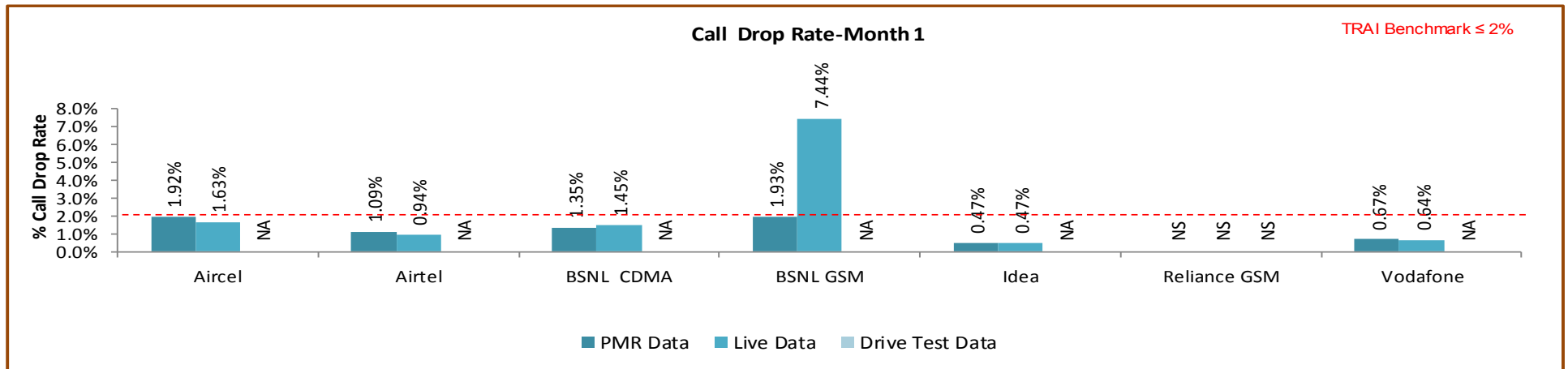
Data Source: Network Operations Center (NOC) of the operators

5.5.2.2   KEY FINDINGS – MONTH 2
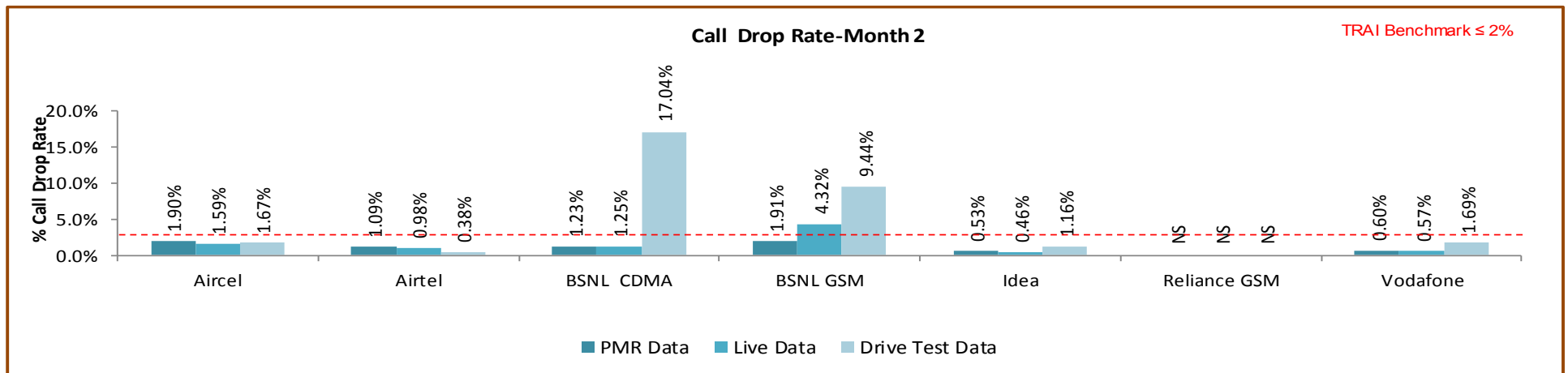
Call Drop Rate-Month 2

TRAI Benchmark ≤ 2%

	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
PMR Data	1.90%	1.09%	1.23%	1.91%	0.53%	NS	0.60%
Live Data	1.59%	0.98%	1.25%	4.32%	0.46%	NS	0.57%
Drive Test Data	1.67%	0.38%	17.04%	9.44%	1.16%	NS	1.69%

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

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5.5.2.3   KEY FINDINGS – MONTH 3

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

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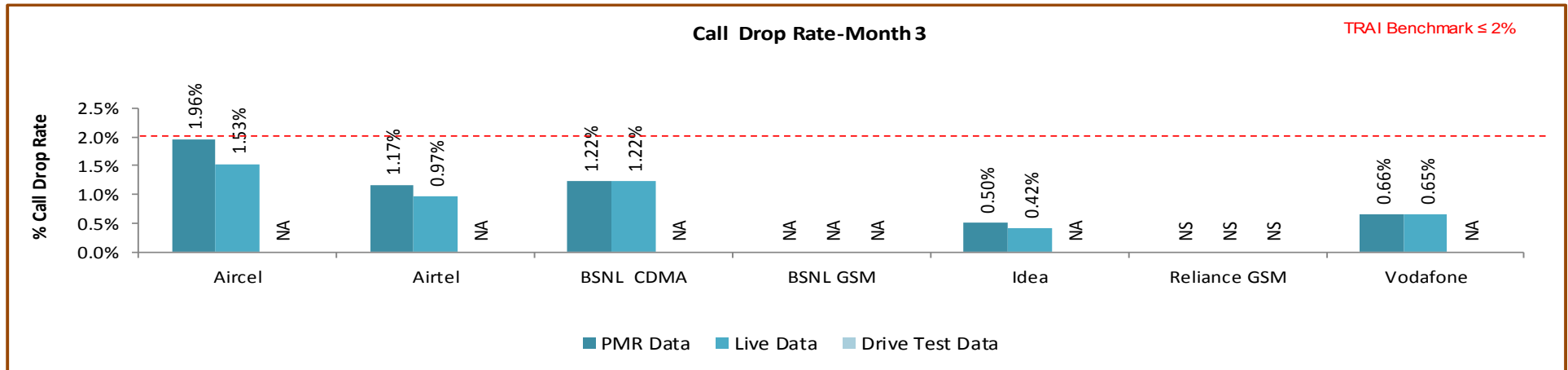
5.6   CELLS HAVING GREATER THAN 3% TCH DROP

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.

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5.6.2 KEY FINDINGS - CONSOLIDATED

Cells having >3% TCH Drop -Consolidated

TRAI Benchmark ≤ 3%

Aircel: PMR Data 19.06%, Live Data 14.55%
Airtel: PMR Data 1.62%, Live Data 1.51%
BSNL CDMA: PMR Data 5.58%, Live Data 5.77%
BSNL GSM: PMR Data 2.97%, Live Data 6.22%
Idea: PMR Data 2.37%, Live Data 2.53%
Reliance GSM: NS, NS
Vodafone: PMR Data 2.16%, Live Data 2.36%

%age calls dropped

■ PMR Data   ■ Live Data
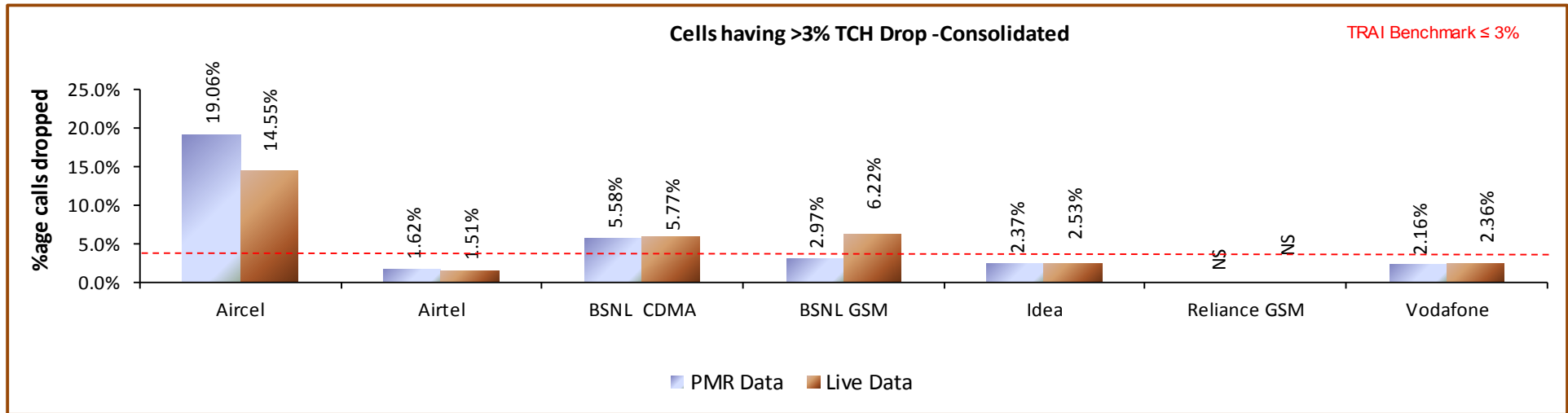
Data Source: Network Operations Center (NOC) of the operators
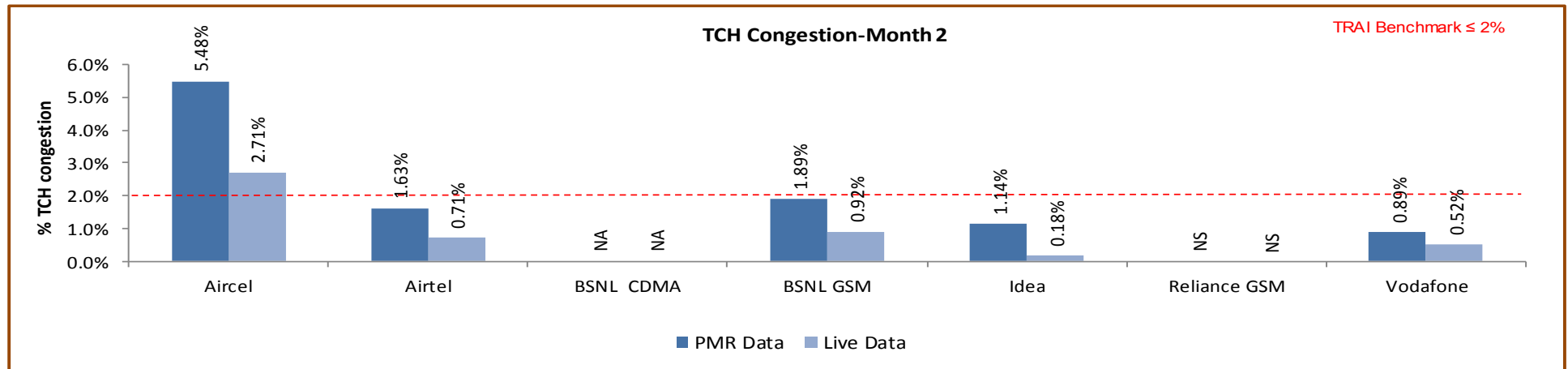
Aircel, BSNL GSM and BSNL CDMA failed to meet the TRAI benchmark.

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

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5.6.2.1 KEY FINDINGS – MONTH 1

Cells having >3% TCH Drop-Month 1

TRAI Benchmark ≤ 3%

	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
PMR Data	19.32%	1.48%	6.99%	2.97%	2.34%	NS	1.94%
Live Data	14.65%	1.25%	6.84%	0.00%	2.31%	NS	2.94%
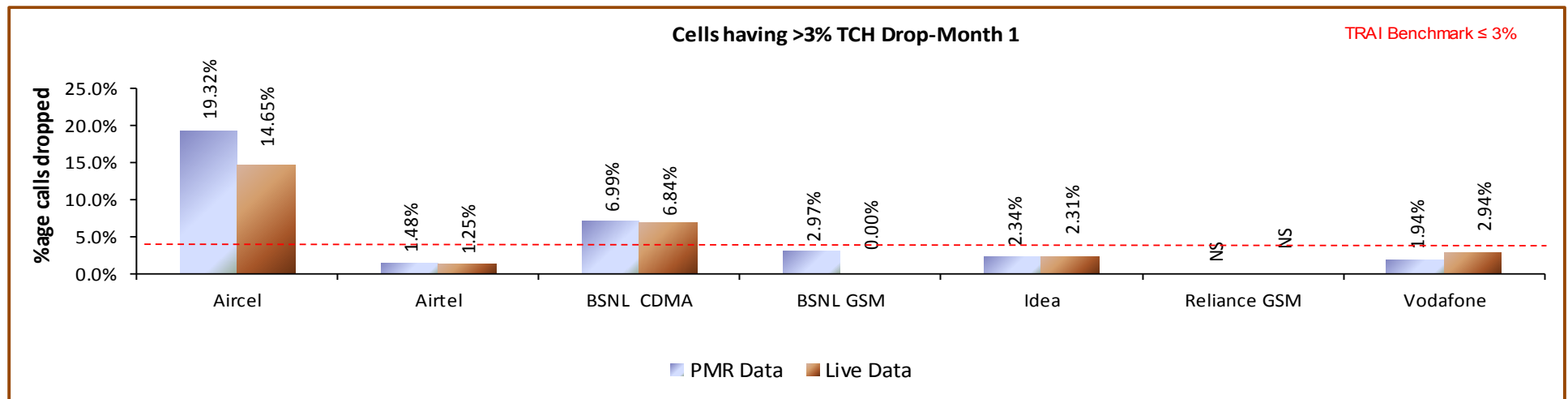
Data Source: Network Operations Center (NOC) of the operators

5.6.2.2 KEY FINDINGS – MONTH 2

Cells having >3% TCH Drop-Month 2

TRAI Benchmark ≤ 3%

	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
PMR Data	18.94%	1.56%	4.37%	2.97%	2.46%	NS	2.59%
Live Data	14.44%	1.51%	4.90%	11.00%	2.77%	NS	2.17%

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

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5.6.2.3   KEY FINDINGS – MONTH 3

Cells having >3% TCH Drop-Month 3

TRAI Benchmark ≤ 3%

Operator	PMR Data	Live Data
Aircel	18.91%	14.55%
Airtel	1.82%	1.77%
BSNL CDMA	5.39%	5.58%
BSNL GSM	NA	NA
Idea	2.29%	2.51%
Reliance GSM	NS	NS
Vodafone	1.97%	1.96%

%age calls dropped

■ PMR Data   ■ Live Data

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

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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.

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5.7.2 KEY FINDINGS

Voice Quality-Consolidated

TRAI Benchmark ≥ 95%
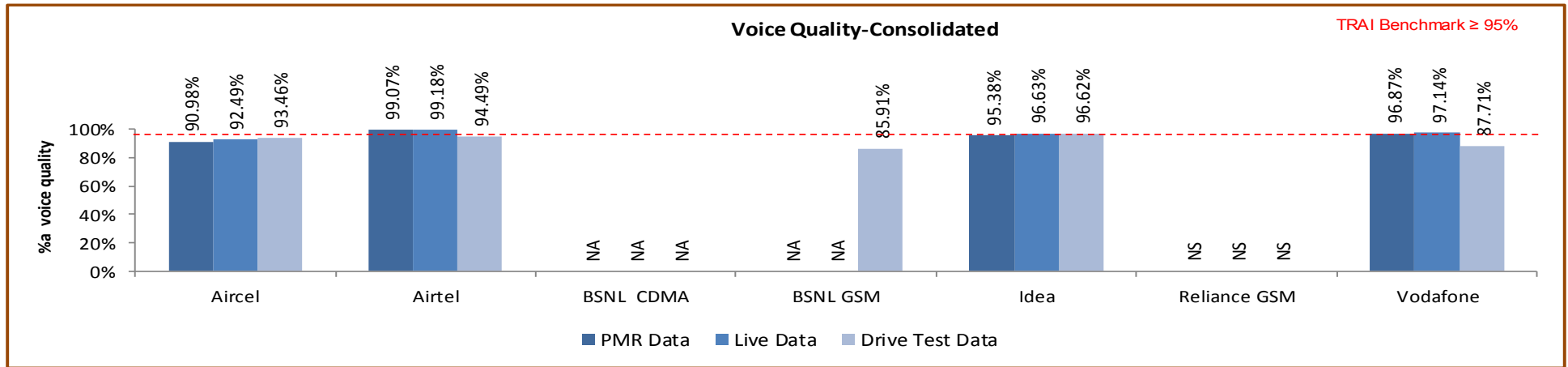
Data Source: Network Operations Center (NOC) of the operators

Aircel were not able to meet the benchmark for Voice quality as per PMR data. During drive test Aircel, Airtel, BSNL GSM and Vodafone failed to meet the benchmark.

5.7.2.1 KEY FINDINGS – MONTH 1
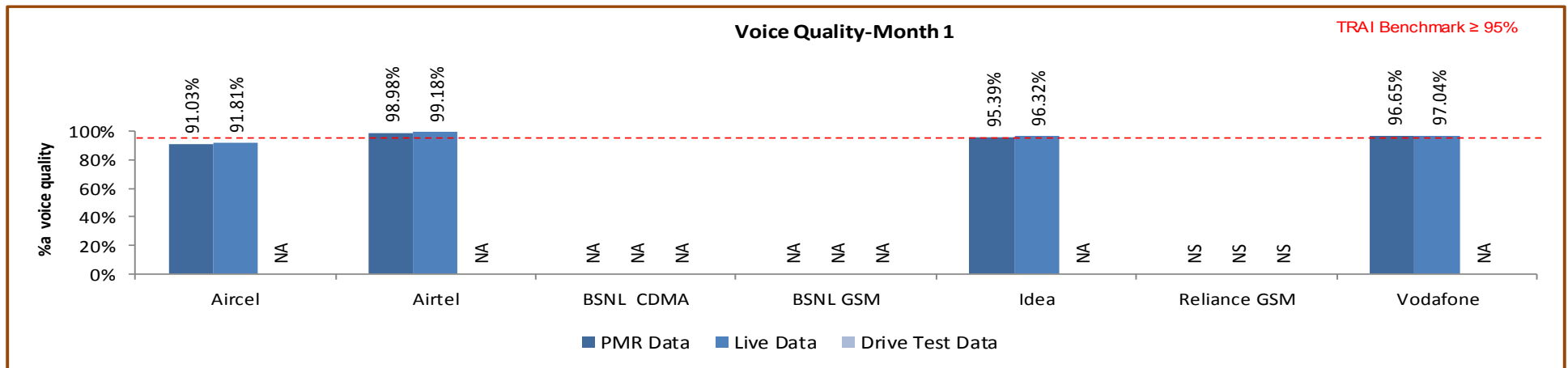
Voice Quality-Month 1

TRAI Benchmark ≥ 95%

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

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5.7.2.2 KEY FINDINGS – MONTH 2

Voice Quality-Month 2

TRAI Benchmark ≥ 95%

	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
PMR Data	90.89%	99.05%	NA	NA	95.38%	NS	97.20%
Live Data	92.44%	99.18%	NA	NA	96.62%	NS	97.57%
Drive Test Data	93.46%	94.49%	91.96%	85.91%	96.62%	NS	87.71%
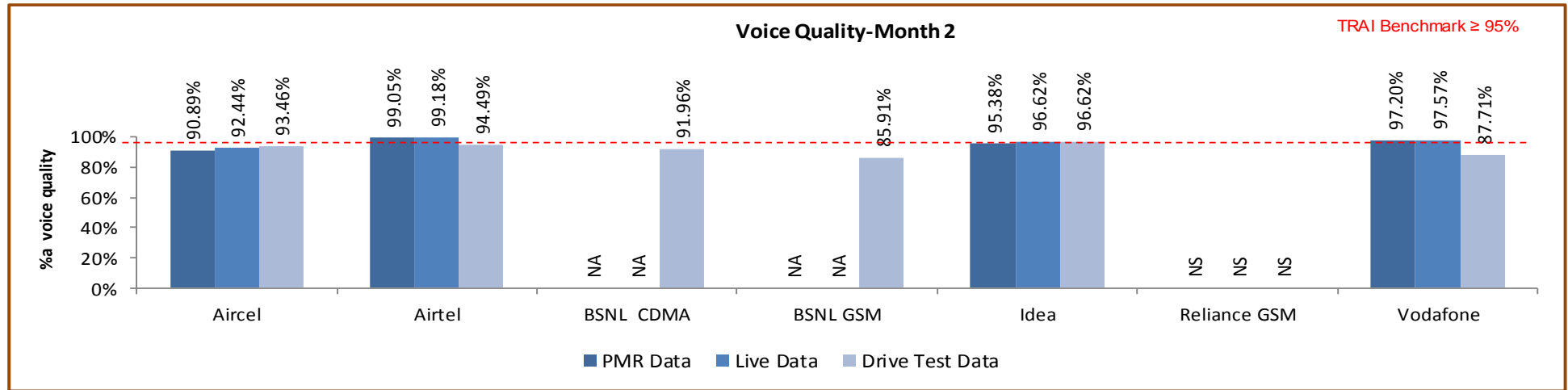
Data Source: Network Operations Center (NOC) of the operators

5.7.2.3 KEY FINDINGS – MONTH 3

Voice Quality-Month 3

TRAI Benchmark ≥ 95%

	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
PMR Data	91.02%	99.18%	NA	NA	95.37%	NS	96.70%
Live Data	92.61%	99.18%	NA	NA	96.68%	NS	97.09%
Drive Test Data	NA	NA	NA	NA	NA	NS	NA

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

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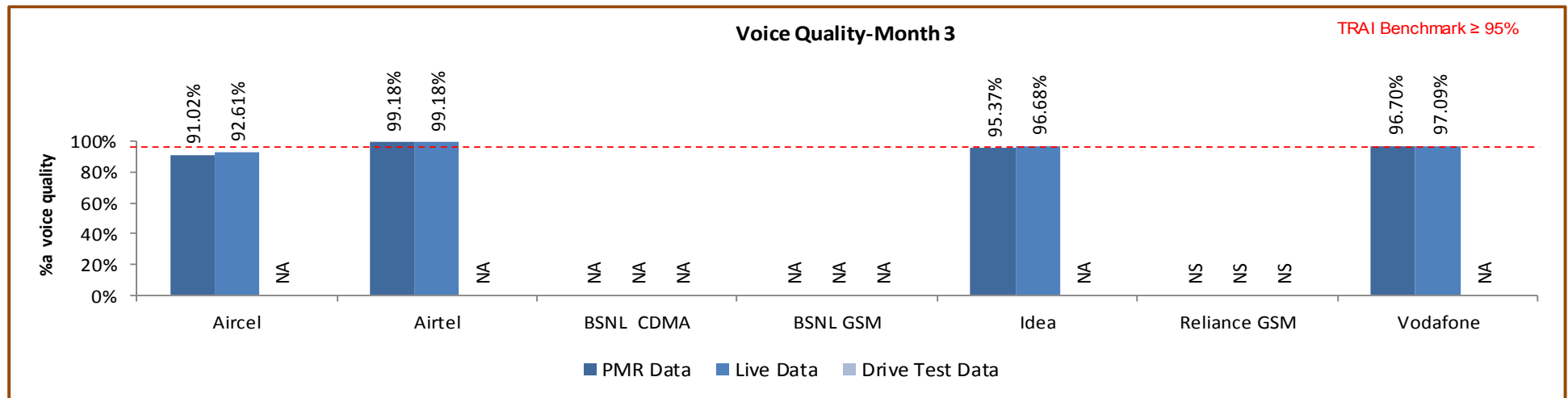
6   PARAMETER DESCRIPTION & DETAILED FINDINGS - COMPARISON BETWEEN PMR DATA, 3 DAY LIVE DATA AND LIVE CALLING DATA FOR 3G

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

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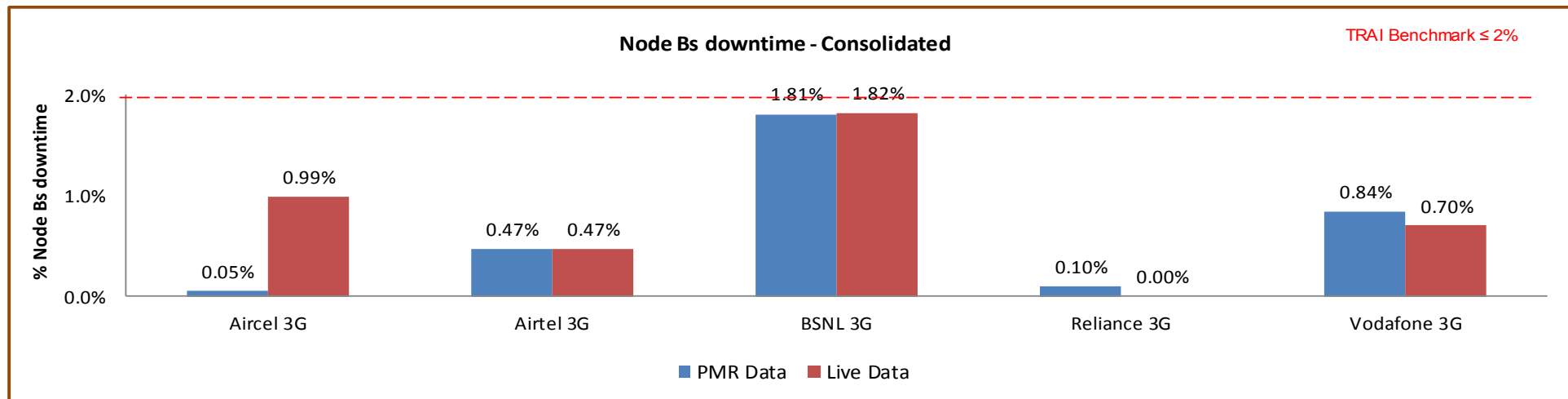
Data Source: Operations and Maintenance Center (OMC) of the operators

All operators met the benchmark.

Significant difference was observed between PMR & live measurement data for Aircel, Airtel, Vodafone and Reliance CDMA. 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.

6.1.2.1 KEY FINDINGS – MONTH 1

Node Bs downtime - Month 1

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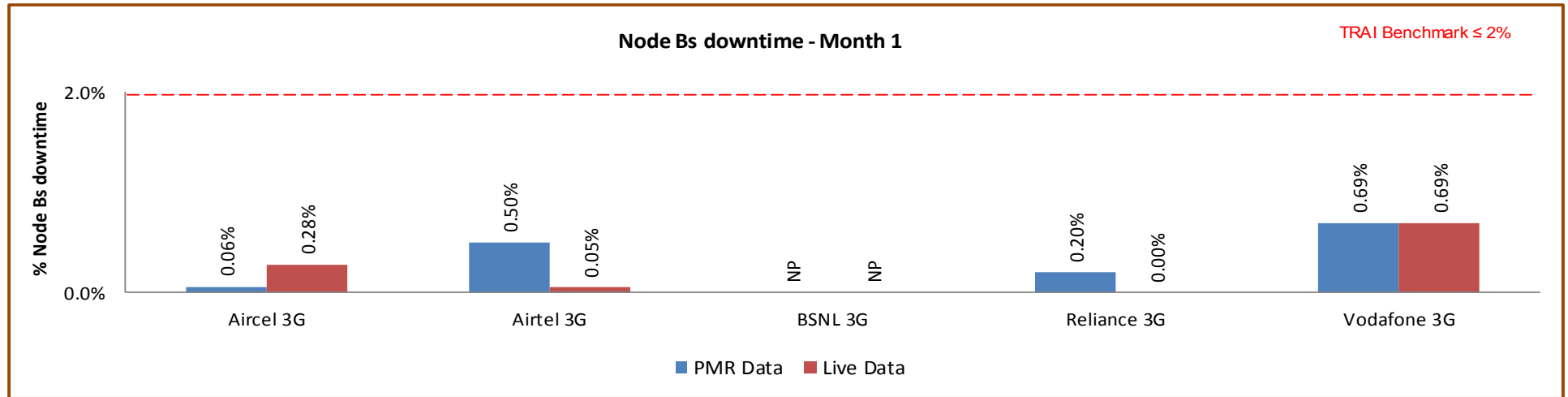
Data Source: Operations and Maintenance Center (OMC) of the operators

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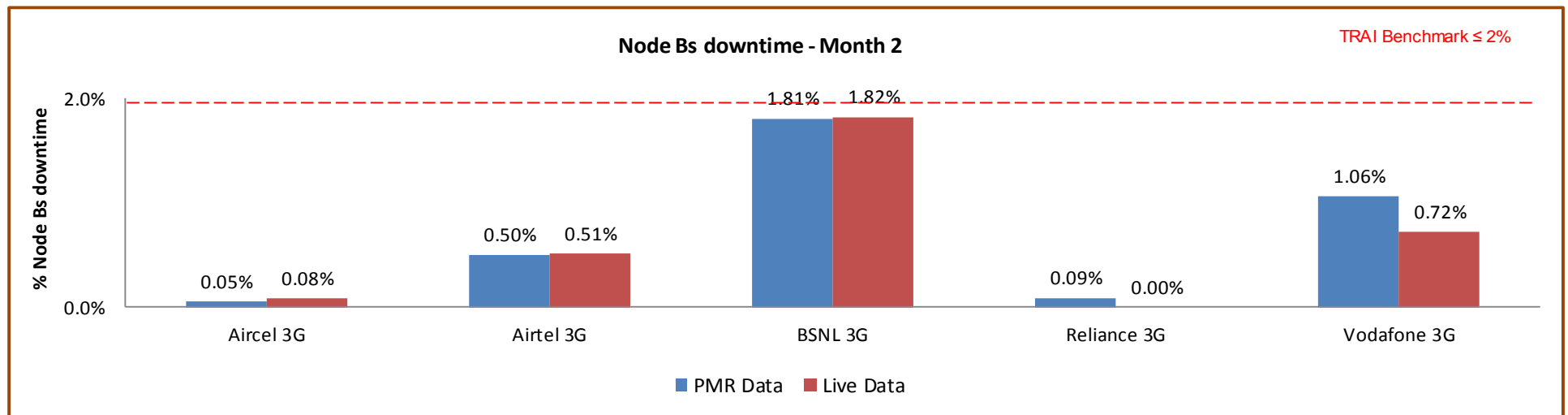
Node Bs downtime - Month 2

TRAI Benchmark ≤ 2%

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

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6.1.2.3 KEY FINDINGS – MONTH 3

Node Bs downtime - Month 3

TRAI Benchmark ≤ 2%

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

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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.

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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

Worst affected Node Bs due to downtime-Consolidated

TRAI Benchmark ≤ 2%

- Aircel 3G: PMR Data 22.27%, Live Data 1.85%
- Airtel 3G: PMR Data 1.18%, Live Data 1.20%
- BSNL 3G: PMR Data 1.88%, Live Data 2.13%
- Reliance 3G: PMR Data 0.69%, Live Data 0.00%
- Vodafone 3G: PMR Data 0.60%, Live Data 0.31%

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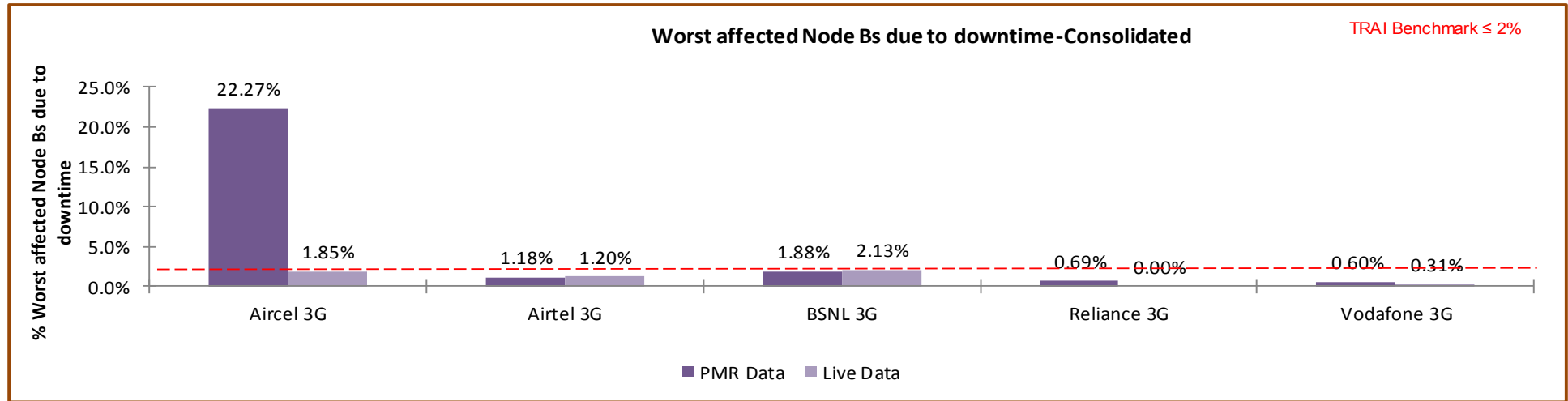
Data Source: Operations and Maintenance Center (OMC) of the operators

Aircel did not meet the benchmark as per audit/PMR data.

Significant difference was observed between PMR & live measurement data for Airce, Airtel, Vodafone and Reliance. 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.
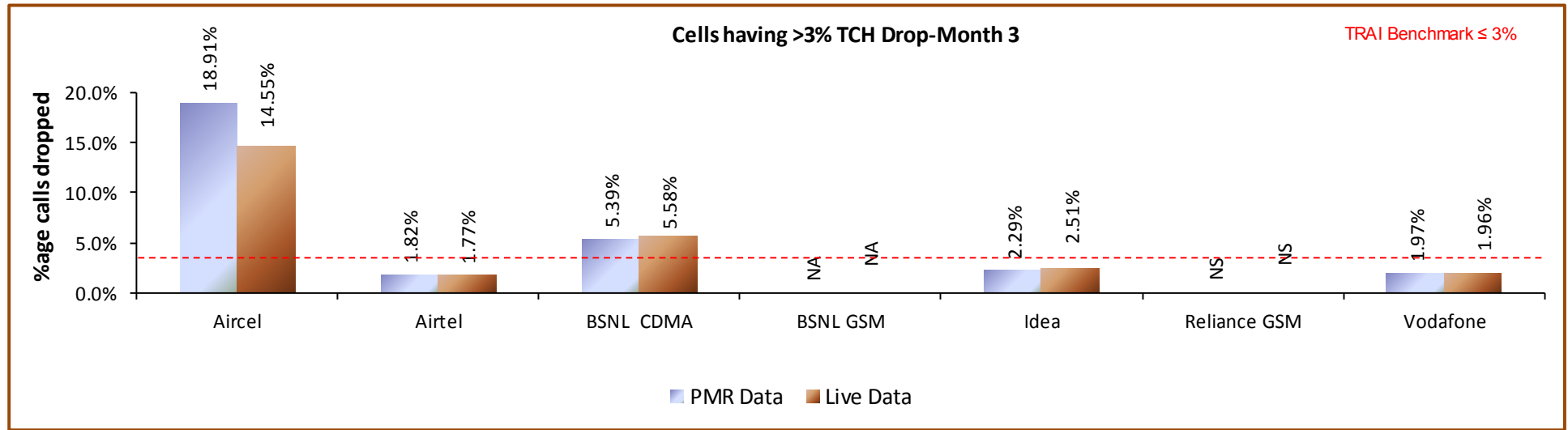
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6.2.2.1   KEY FINDINGS – MONTH 1

Worst affected Node Bs due to downtime-Month 1

TRAI Benchmark ≤ 2%

Aircel 3G: PMR Data 27.68%, Live Data 1.79%
Airtel 3G: PMR Data 1.16%, Live Data 1.17%
BSNL 3G: PMR Data NP, Live Data NP
Reliance 3G: PMR Data 0.86%, Live Data 0.00%
Vodafone 3G: PMR Data 0.00%, Live Data 0.07%

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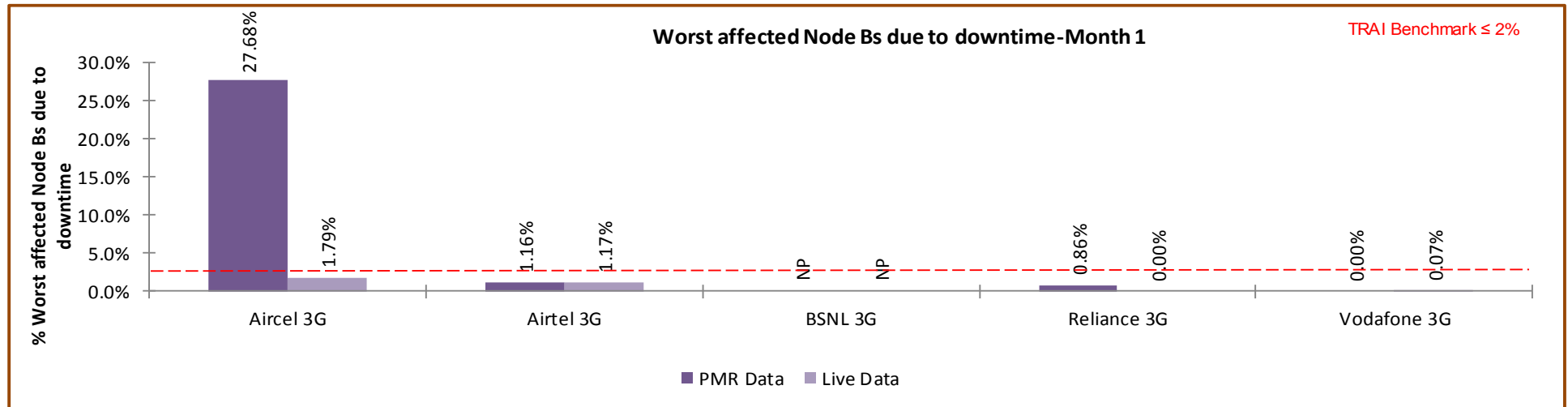
Data Source: Operations and Maintenance Center (OMC) of the operators

6.2.2.2   KEY FINDINGS – MONTH 2

Worst affected Node Bs due to downtime-Month 2

TRAI Benchmark ≤ 2%

Aircel 3G: PMR Data 25.13%, Live Data 2.92%
Airtel 3G: PMR Data 1.24%, Live Data 1.26%
BSNL 3G: PMR Data 1.88%, Live Data 2.13%
Reliance 3G: PMR Data 0.35%, Live Data 0.00%
Vodafone 3G: PMR Data 1.01%, Live Data 0.50%

■ PMR Data   ■ Live Data

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

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6.2.2.3   KEY FINDINGS – MONTH 3

Worst affected Node Bs due to downtime-Month 3

TRAI Benchmark ≤ 2%

	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
PMR Data	14.06%	1.14%	0.77%	0.87%	0.79%
Live Data	0.83%	1.16%	0.77%	0.00%	0.36%

Y-axis: % Worst affected Node Bs due to downtime

■ PMR Data   ■ Live Data

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

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6.3   CALL SET UP SUCCESS RATE

6.3.1   PARAMETER DESCRIPTION

1. **Definition:** 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

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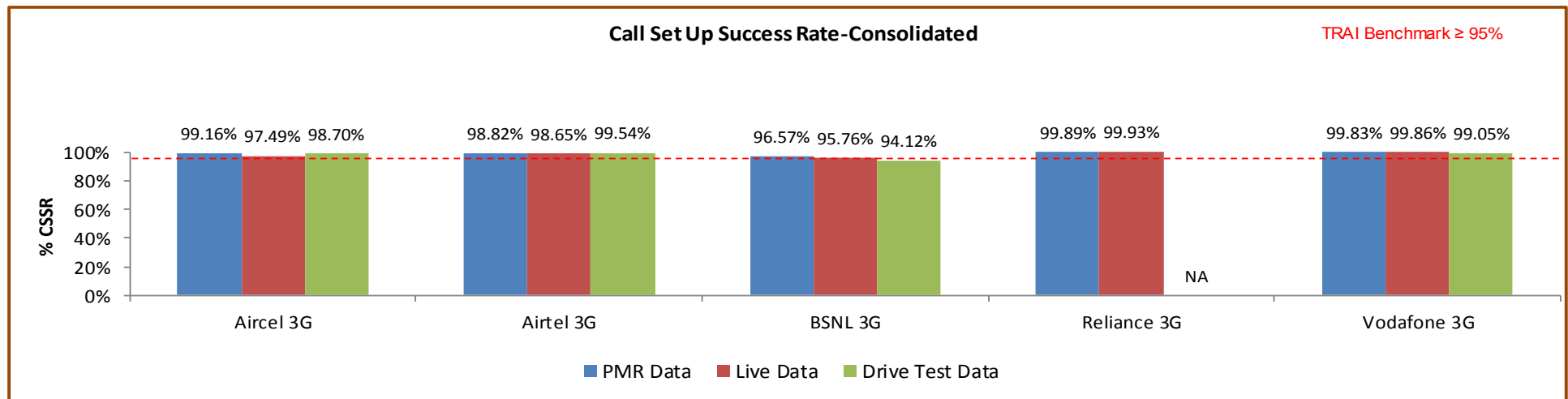
Data Source: Network Operations Center (NOC) of the operators

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

6.3.2.1 KEY FINDINGS – MONTH 1

Call Set Up Success Rate-Month 1

TRAI Benchmark ≥ 95%
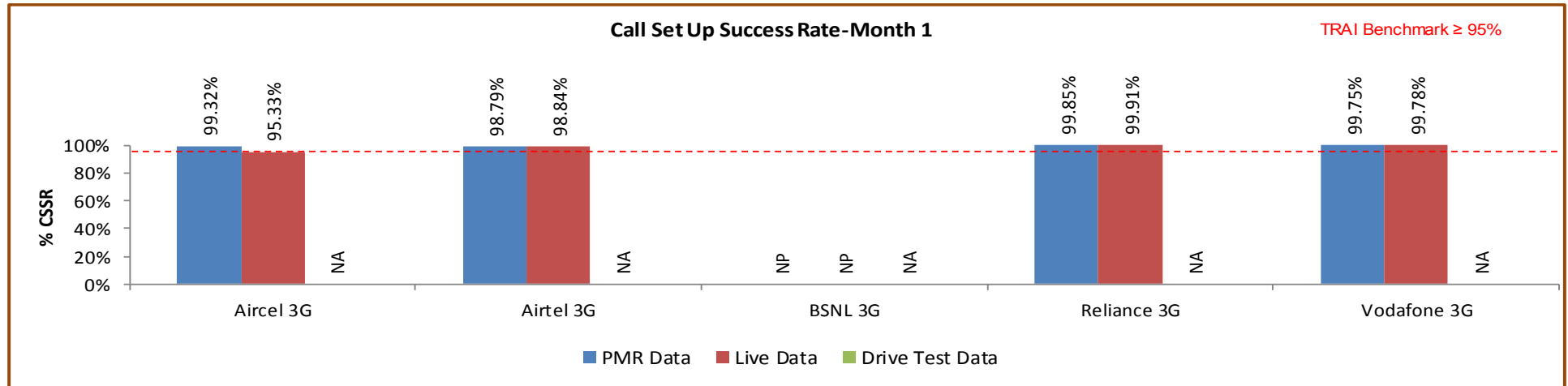
Data Source: Network Operations Center (NOC) of the operators

6.3.2.2 KEY FINDINGS – MONTH 2
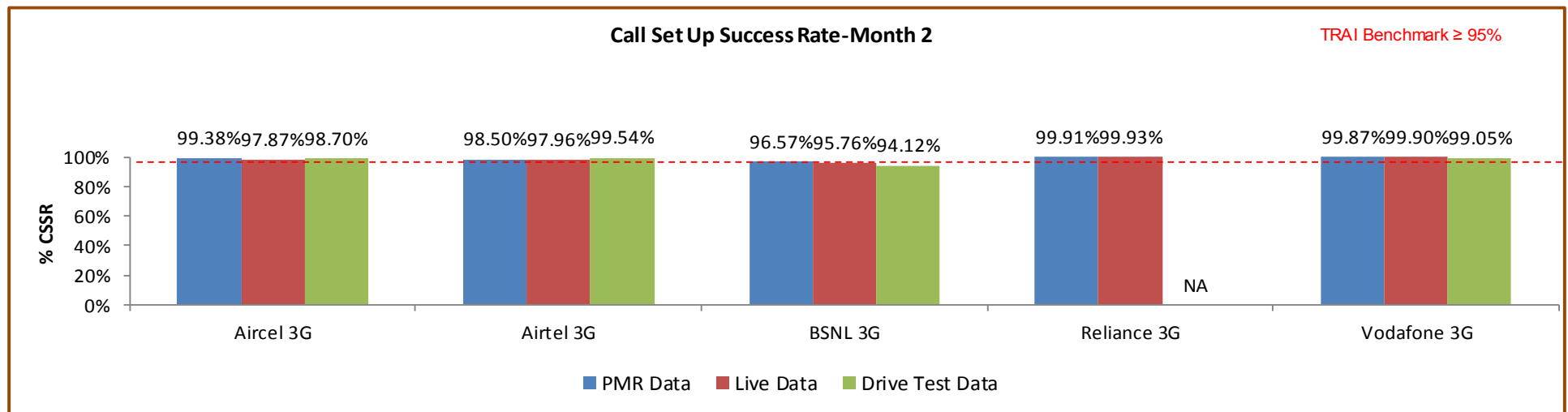
Call Set Up Success Rate-Month 2

TRAI Benchmark ≥ 95%

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

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6.3.2.3   KEY FINDINGS – MONTH 3

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

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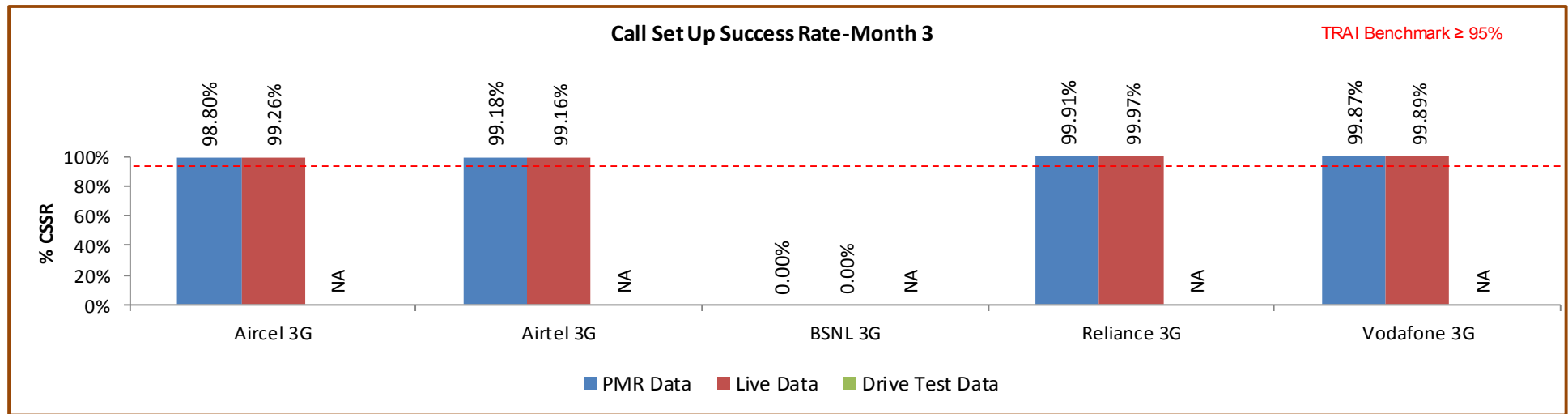
6.4 NETWORK CHANNEL CONGESTION- RRC CONGESTION/ CIRCUIT SWITCHED RAB CONGESTION

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

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

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

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

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

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

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

↳ **POI Congestion%** = **[(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

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6.4.2 KEY FINDINGS - RRC CONGESTION (CONSOLIDATED)

RRC Congestion -Consolidated

TRAI Benchmark ≤ 1%
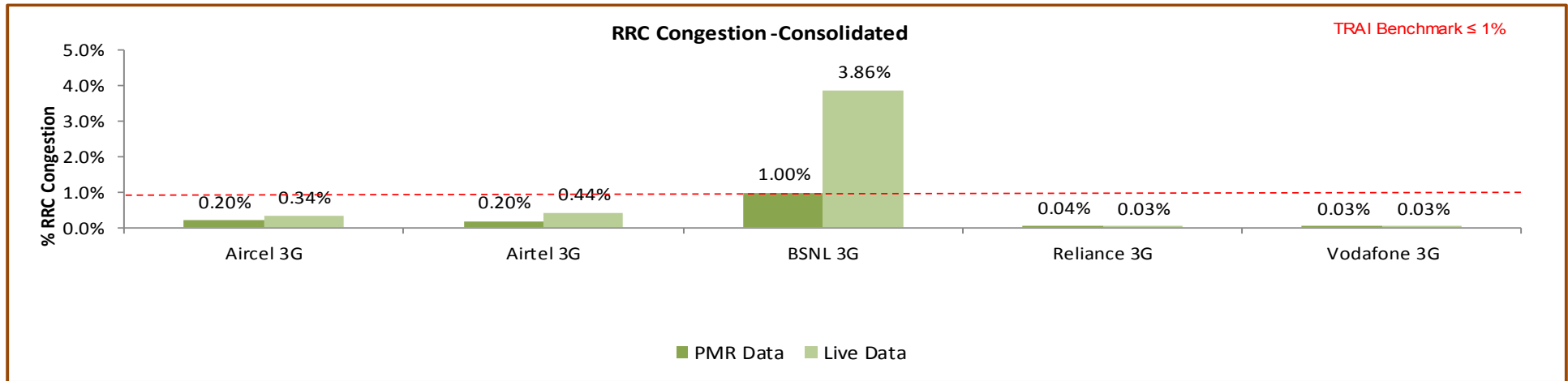
Data Source: Network Operations Center (NOC) of the operators

BSNL 3G failed to meet the benchmark during live audit.

6.4.2.1 KEY FINDINGS – MONTH 1
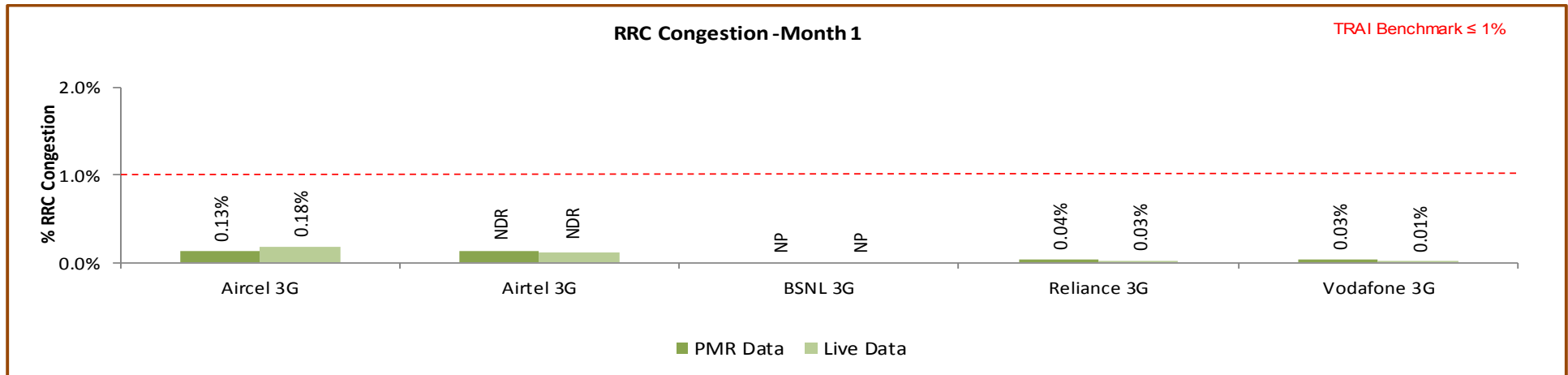
RRC Congestion -Month 1

TRAI Benchmark ≤ 1%

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

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6.4.2.2 KEY FINDINGS – MONTH 2

RRC Congestion -Month 2

TRAI Benchmark ≤ 1%

% RRC Congestion

- Aircel 3G: PMR 0.07%, Live 0.12%
- Airtel 3G: PMR 0.41%, Live 1.11%
- BSNL 3G: PMR 1.00%, Live 3.86%
- Reliance 3G: PMR 0.04%, Live 0.02%
- Vodafone 3G: PMR 0.02%, Live 0.01%

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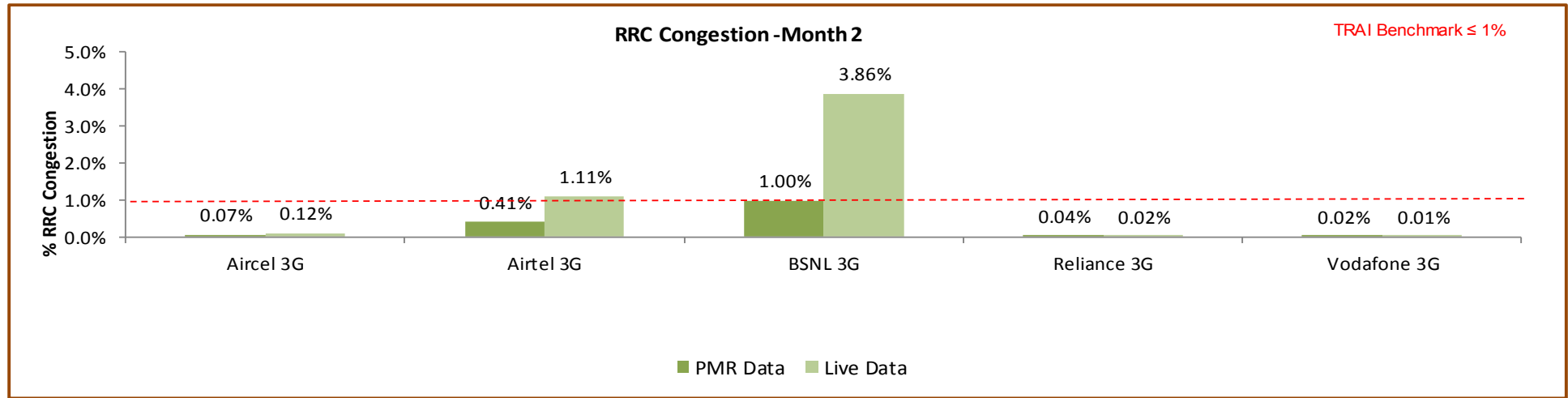
Data Source: Network Operations Center (NOC) of the operators

6.4.2.3 KEY FINDINGS – MONTH 3

RRC Congestion -Month 3

TRAI Benchmark ≤ 1%

% RRC Congestion

- Aircel 3G: PMR 0.40%, Live 0.71%
- Airtel 3G: PMR 0.04%, Live 0.08%
- BSNL 3G: PMR 0.00%, Live 0.00%
- Reliance 3G: PMR 0.05%, Live 0.03%
- Vodafone 3G: PMR 0.03%, Live 0.07%

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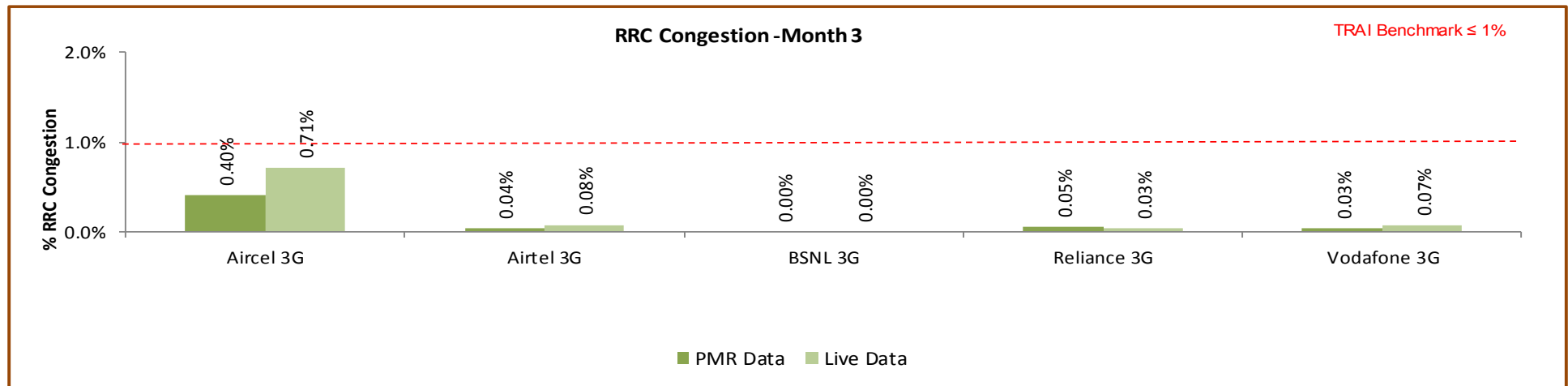
Data Source: Network Operations Center (NOC) of the operators

6.4.3 KEY FINDINGS – CIRCUIT SWITCHED RAB CONGESTION (CONSOLIDATED)
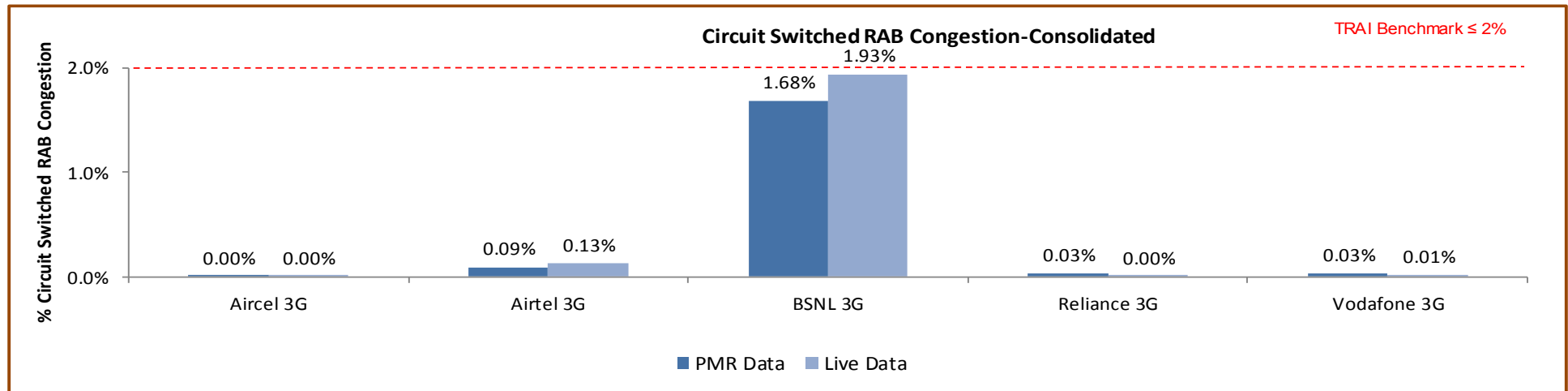
Data Source: Network Operations Center (NOC) of the operators

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

Significant difference was observed between PMR & live measurement data for Airtel 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.
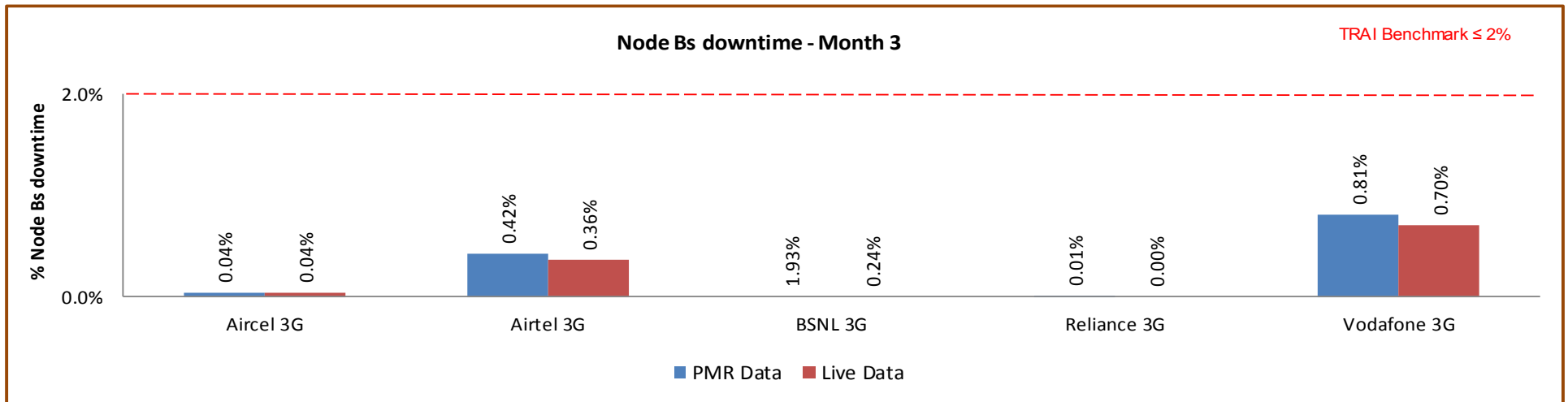
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6.4.3.1 KEY FINDINGS – MONTH 1

Circuit Switched RAB Congestion-Month 1

TRAI Benchmark ≤ 2%

% Circuit Switched RAB Congestion

	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
PMR Data	0.00%	0.12%	NP	0.00%	0.03%
Live Data	0.00%	0.19%	NP	0.00%	0.01%

■ PMR Data   ■ Live Data

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

6.4.3.2 KEY FINDINGS – MONTH 2

Circuit Switched RAB Congestion-Month 2

TRAI Benchmark ≤ 2%

% Circuit Switched RAB Congestion

	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
PMR Data	0.00%	NDR	1.68%	0.00%	0.03%
Live Data	0.00%	NDR	1.99%	0.00%	0.01%

■ PMR Data   ■ Live Data

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

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6.4.3.3   KEY FINDINGS – MONTH 3

Circuit Switched RAB Congestion-Month 3

TRAI Benchmark ≤ 2%

Operator	PMR Data	Live Data
Aircel 3G	0.00%	0.00%
Airtel 3G	0.06%	0.07%
BSNL 3G	0.00%	0.00%
Reliance 3G	0.09%	0.00%
Vodafone 3G	0.03%	0.01%

■ PMR Data   ■ Live Data

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

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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		60	15	19	14	32
No. of POIs not meeting benchmark		0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		312971	376695	25284	47029	5155548
Traffic served for all POIs (B)- in erlangs		185362	123880	23158	22290	3201723
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		59	15	19	14	32
No. of POIs not meeting benchmark		0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		309191	376158	25284	47029	2994441
Traffic served for all POIs (B)- in erlangs		183995	114731	17006	22290	2882679
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

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		60	15	NA	14	32
No. of POIs not meeting benchmark		0	0	NA	0	0
Total Capacity of all POIs (A) - in erlangs		103330	132694	NA	17145	1878724
Traffic served for all POIs (B)- in erlangs		61720	40180	NA	8028	1489159
POI congestion	≤ 0.5%	0.00%	0.00%	NA	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		58	15	NA	14	32
No. of POIs not meeting benchmark		0	0	NA	0	0
Total Capacity of all POIs (A) - in erlangs		100601	118491	NA	17145	457596
Traffic served for all POIs (B)- in erlangs		60668	32941	NA	8028	1373212
POI congestion	≤ 0.5%	0.00%	0.00%	NA	0.00%	0.00%

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

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6.4.4.2   KEY FINDINGS – MONTH 2

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		60	15	19	14	32
No. of POIs not meeting benchmark		0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		104007	131362	25284	16932	1638412
Traffic served for all POIs (B)- in erlangs		61289	40373	23158	8048	856282
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		59	15	19	14	32
No. of POIs not meeting benchmark		0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		103113	131264	25284	16932	1268448
Traffic served for all POIs (B)- in erlangs		61126	37451	17006	8048	558955
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%

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

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6.4.4.3   KEY FINDINGS – MONTH 3

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		60	15	NA	14	32
No. of POIs not meeting benchmark		0	0	NA	0	0
Total Capacity of all POIs (A) - in erlangs		105633	112639	NA	12952	1638412
Traffic served for all POIs (B)- in erlangs		62353	43327	NA	6214	856282
POI congestion	≤ 0.5%	0.00%	0.00%	NA	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		60	15	NA	14	32
No. of POIs not meeting benchmark		0	0	NA	0	0
Total Capacity of all POIs (A) - in erlangs		105477	126403	NA	12952	1268397
Traffic served for all POIs (B)- in erlangs		62201	44340	NA	6214	950512
POI congestion	≤ 0.5%	0.00%	0.00%	NA	0.00%	0.00%

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

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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
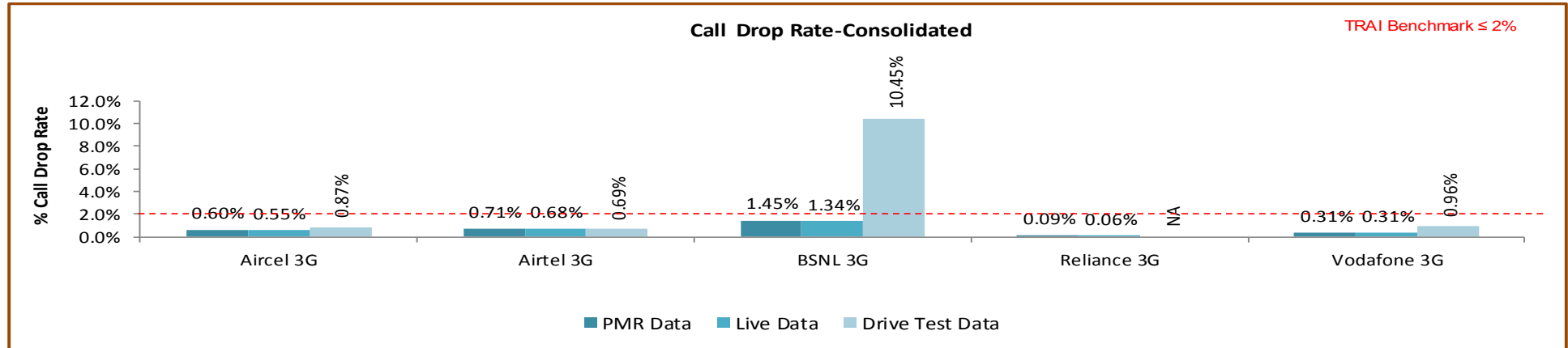
Call Drop Rate-Consolidated

TRAI Benchmark ≤ 2%

Aircel 3G: 0.60% 0.55% 0.87%
Airtel 3G: 0.71% 0.68% 0.69%
BSNL 3G: 1.45% 1.34% 10.45%
Reliance 3G: 0.09% 0.06% NA
Vodafone 3G: 0.31% 0.31% 0.96%

■ PMR Data ■ Live Data ■ Drive Test Data

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

All operators met the benchmark for call drop rate during audit. During drive test BSNL 3G failed to meet the benchmark.

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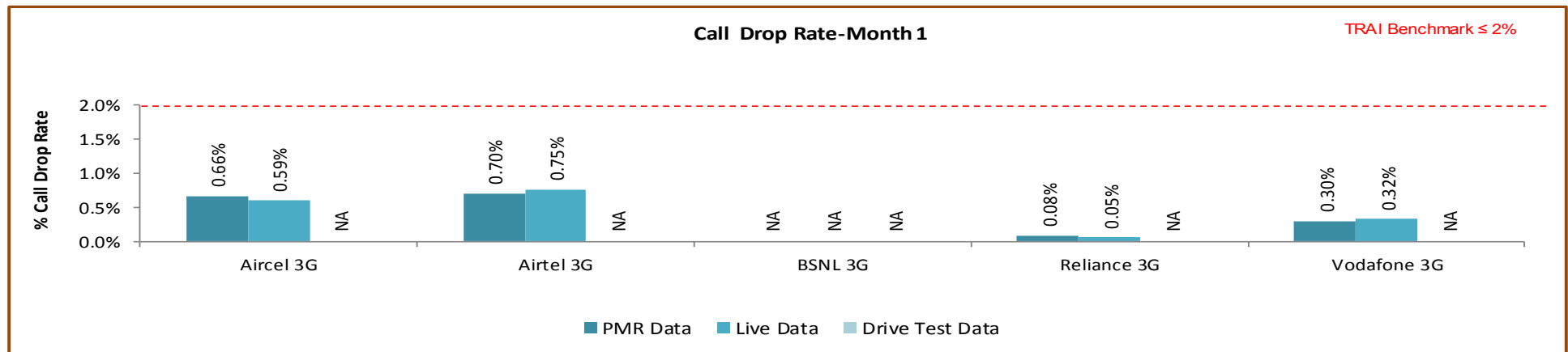
Call Drop Rate-Month 1

TRAI Benchmark ≤ 2%

Aircel 3G: 0.66% 0.59% NA
Airtel 3G: 0.70% 0.75% NA
BSNL 3G: NA NA NA
Reliance 3G: 0.08% 0.05% NA
Vodafone 3G: 0.30% 0.32% NA

■ PMR Data ■ Live Data ■ Drive Test Data

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

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6.5.2.2 KEY FINDINGS – MONTH 2

Call Drop Rate-Month 2

TRAI Benchmark ≤ 2%

Operator	PMR Data	Live Data	Drive Test Data
Aircel 3G	0.61%	0.58%	0.87%
Airtel 3G	0.72%	0.71%	0.69%
BSNL 3G	1.45%	1.34%	10.45%
Reliance 3G	0.08%	0.07%	NA
Vodafone 3G	0.33%	0.30%	0.96%

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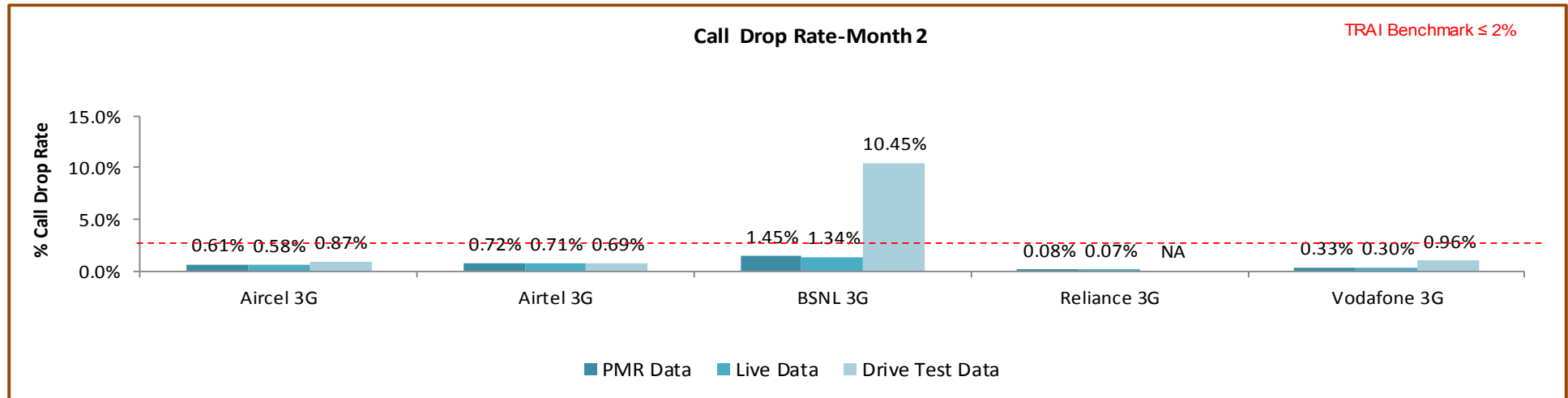
Data Source: Network Operations Center (NOC) of the operators

6.5.2.3 KEY FINDINGS – MONTH 3

Call Drop Rate-Month 3

TRAI Benchmark ≤ 2%

Operator	PMR Data	Live Data	Drive Test Data
Aircel 3G	0.53%	0.48%	NA
Airtel 3G	0.69%	0.60%	NA
BSNL 3G	0.26%	0.29%	NA
Reliance 3G	0.11%	0.06%	NA
Vodafone 3G	0.30%	0.31%	NA

■ PMR Data ■ Live Data ■ Drive Test Data

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

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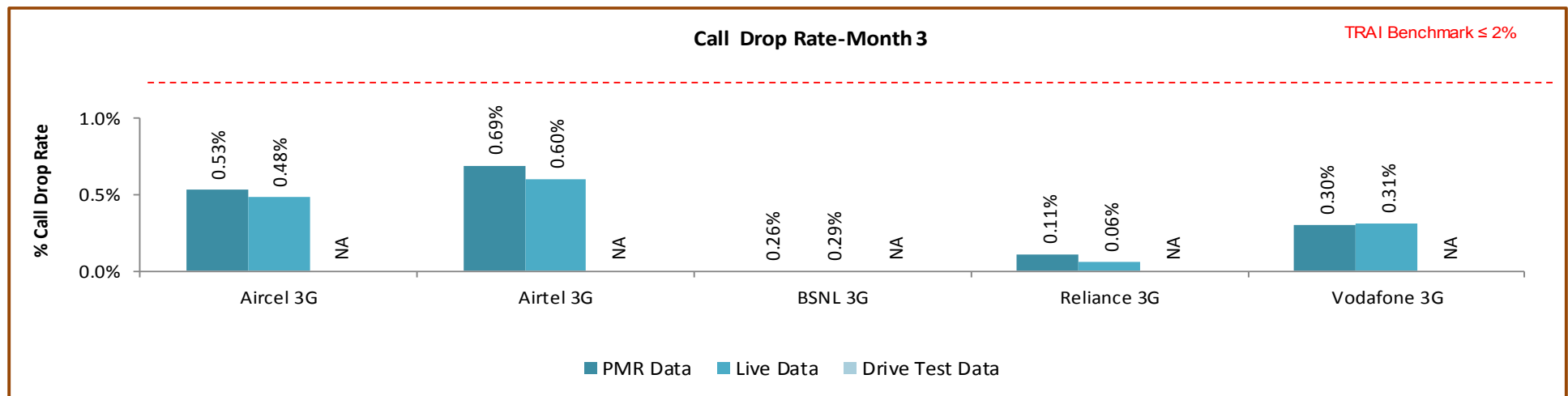
6.6 WORST AFFECTED CELLS HAVING MORE THAN 3% CIRCUIT SWITCHED VOICE DROP RATE

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

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

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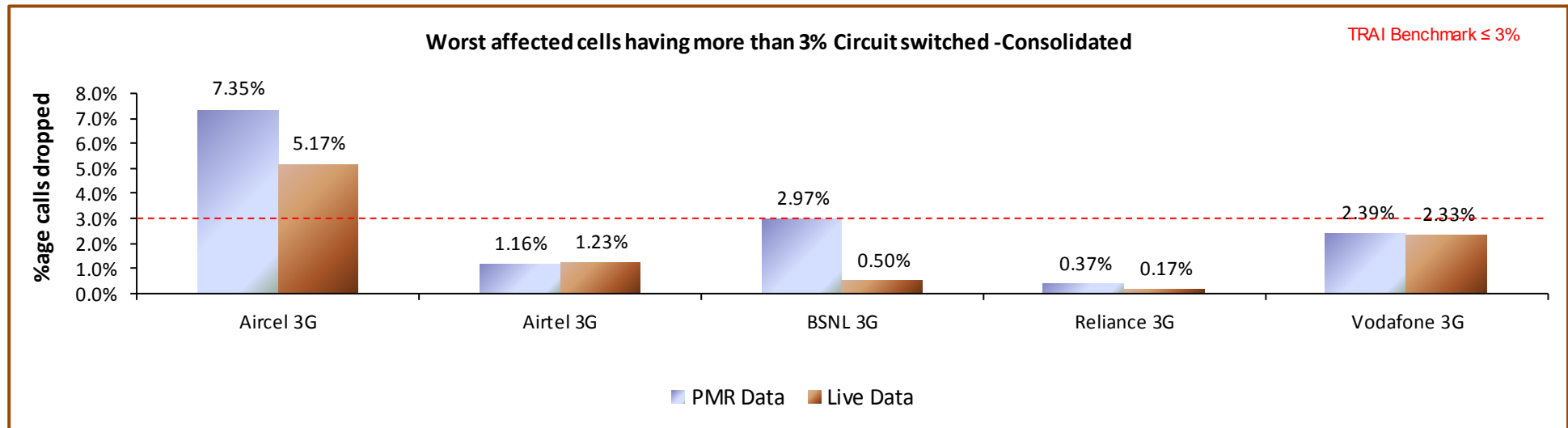
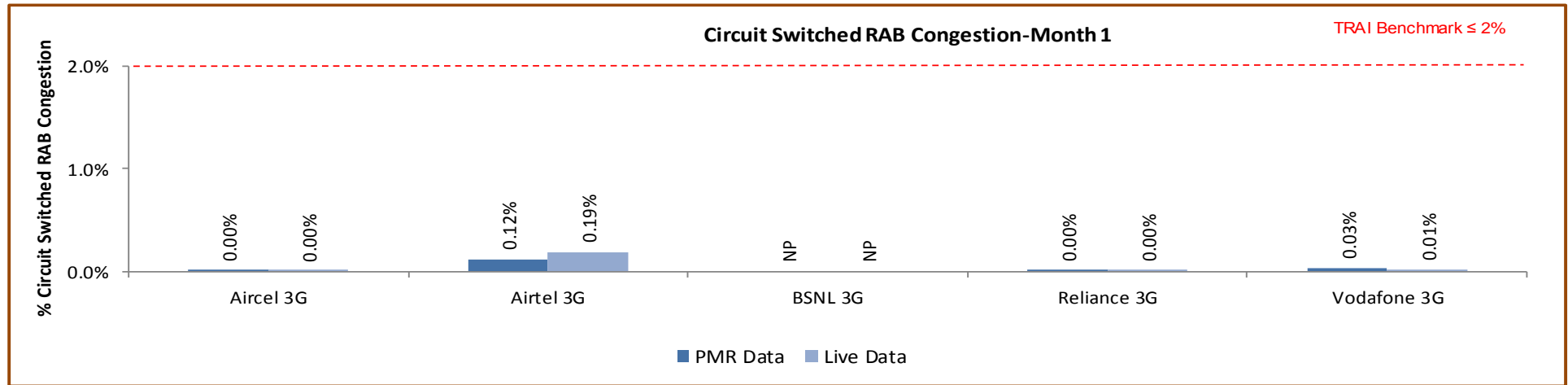*Data Source: Network Operations Center (NOC) of the operators*

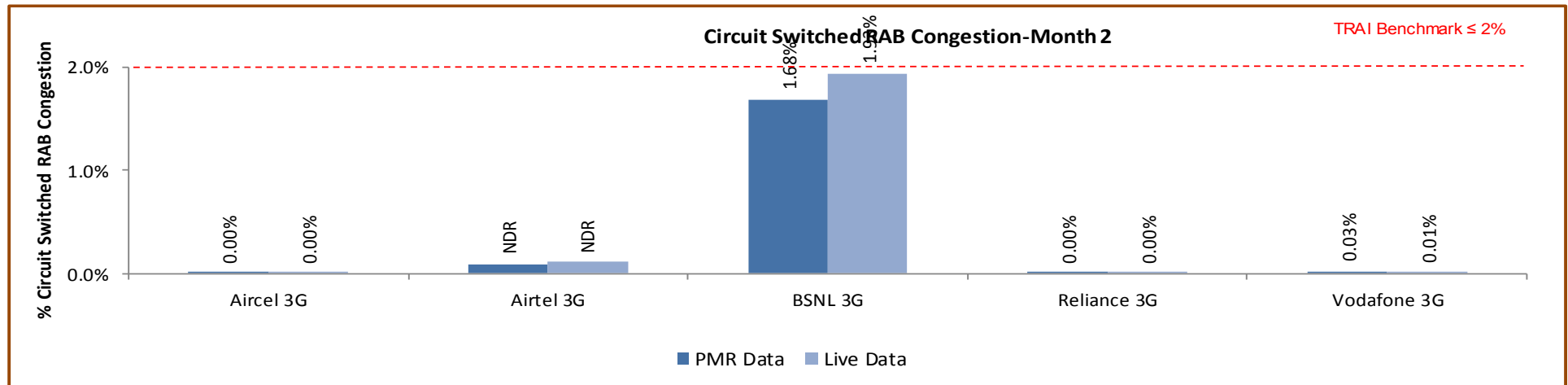Aircel 3G did not meet the benchmark during audit.

Significant difference was observed between PMR & live measurement data for Aircel, Reliance 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.
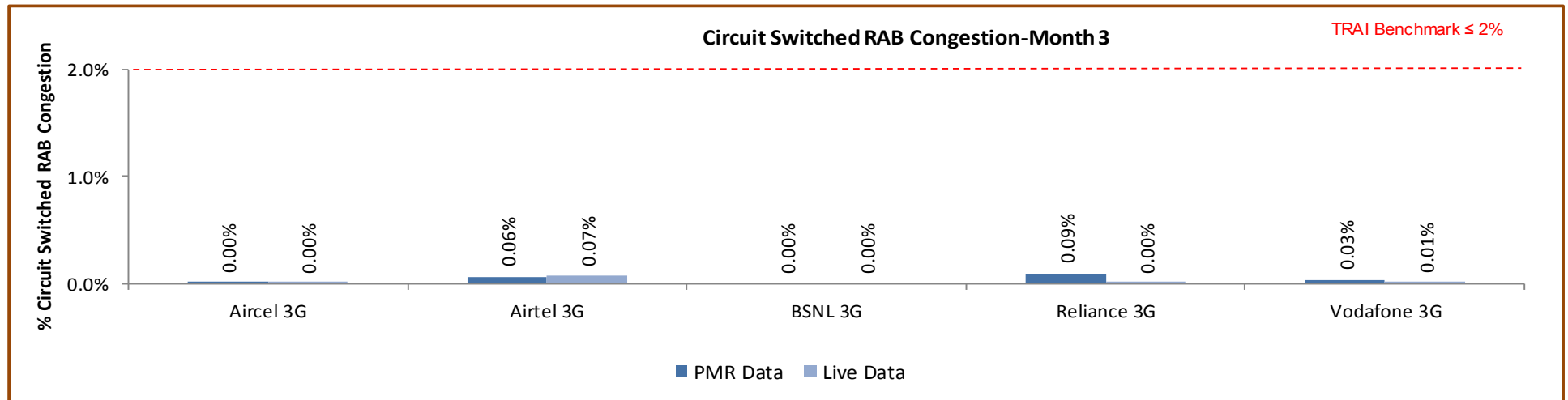
Telecom Regulatory Authority of India
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6.6.2.1 KEY FINDINGS – MONTH 1

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

TRAI Benchmark ≤ 3%

Operator	PMR Data	Live Data
Aircel 3G	8.09%	5.56%
Airtel 3G	1.18%	1.27%
BSNL 3G	NP	NP
Reliance 3G	0.53%	0.24%
Vodafone 3G	2.20%	2.61%
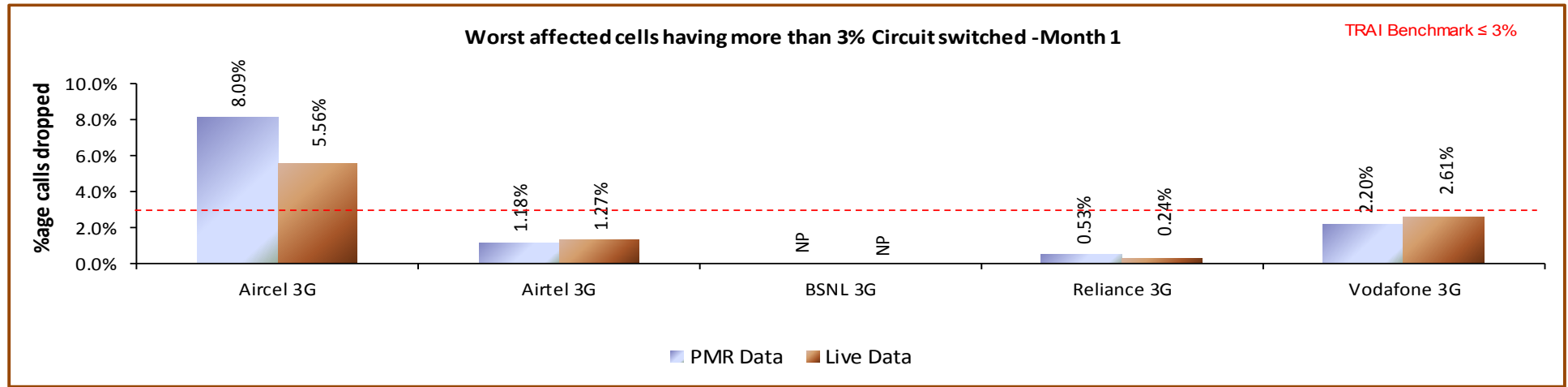
Data Source: Network Operations Center (NOC) of the operators

6.6.2.2 KEY FINDINGS – MONTH 2

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

TRAI Benchmark ≤ 3%

Operator	PMR Data	Live Data
Aircel 3G	7.86%	5.67%
Airtel 3G	1.14%	1.23%
BSNL 3G	2.97%	0.50%
Reliance 3G	0.29%	0.17%
Vodafone 3G	2.27%	2.14%

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

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6.6.2.3 KEY FINDINGS – MONTH 3

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

TRAI Benchmark ≤ 3%

%age calls dropped

Operator	PMR Data	Live Data
Aircel 3G	6.10%	4.30%
Airtel 3G	1.16%	1.19%
BSNL 3G	1.51%	2.91%
Reliance 3G	0.29%	0.10%
Vodafone 3G	2.70%	2.24%

■ PMR Data ■ Live Data

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

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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.

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6.7.2 KEY FINDINGS

Voice Quality-Consolidated
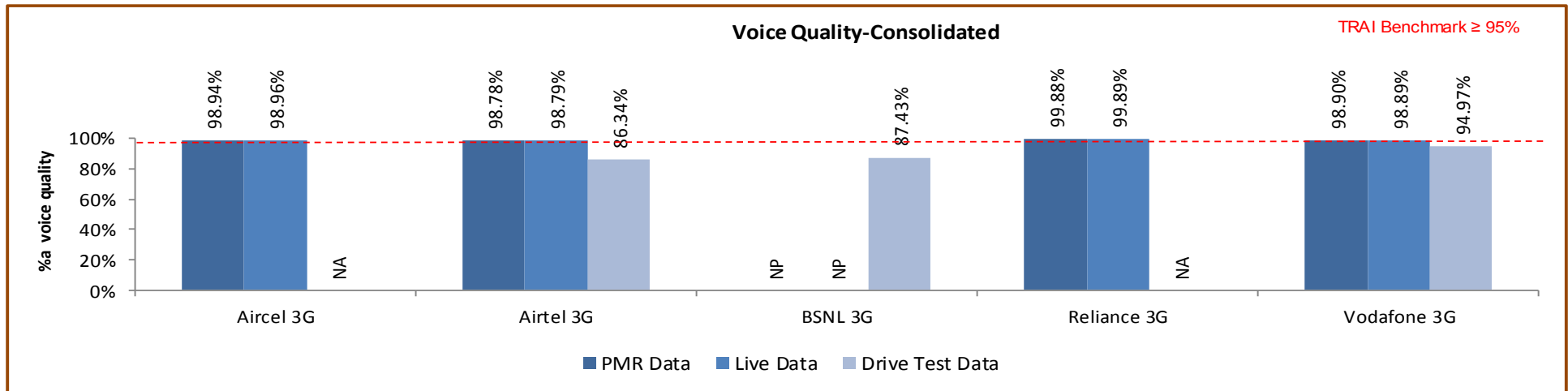
TRAI Benchmark ≥ 95%

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

All Operators met the TRAI benchmark in PMR and live audit, during drive test Airtel, BSNL and Vodafone failed to meet the benchmark.

6.7.2.1 KEY FINDINGS – MONTH 1

Voice Quality-Month 1

TRAI Benchmark ≥ 95%

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6.7.2.2   KEY FINDINGS – MONTH 2

Voice Quality-Month 2

TRAI Benchmark ≥ 95%

	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
PMR Data	98.95%	98.77%	NP	99.88%	98.91%
Live Data	98.95%	98.79%	NP	99.90%	98.88%
Drive Test Data	NA	86.34%	87.43%	NA	94.97%

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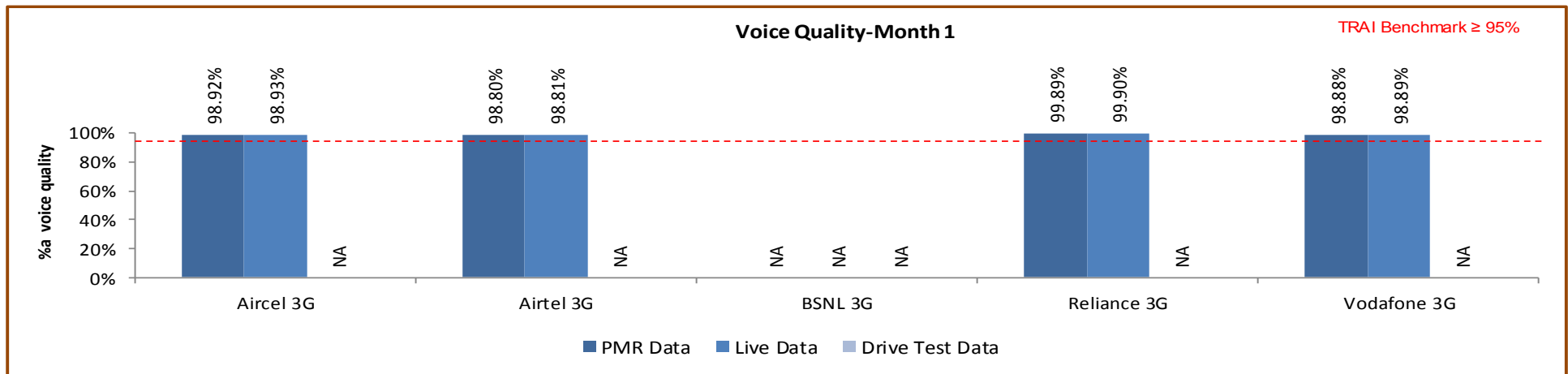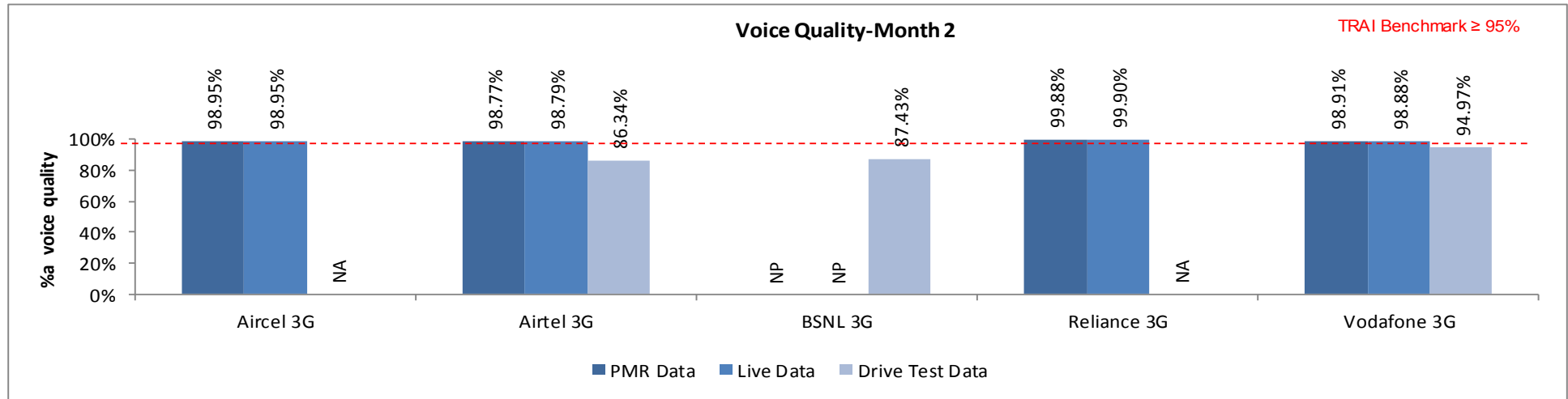
Data Source: Network Operations Center (NOC) of the operators

6.7.2.3   KEY FINDINGS – MONTH 3

Voice Quality-Month 3

TRAI Benchmark ≥ 95%

	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
PMR Data	98.96%	98.78%	NP	99.85%	98.91%
Live Data	98.97%	98.78%	NP	99.87%	98.90%
Drive Test Data	NA	NA	NA	NA	NA

■ PMR Data ■ Live Data ■ Drive Test Data

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

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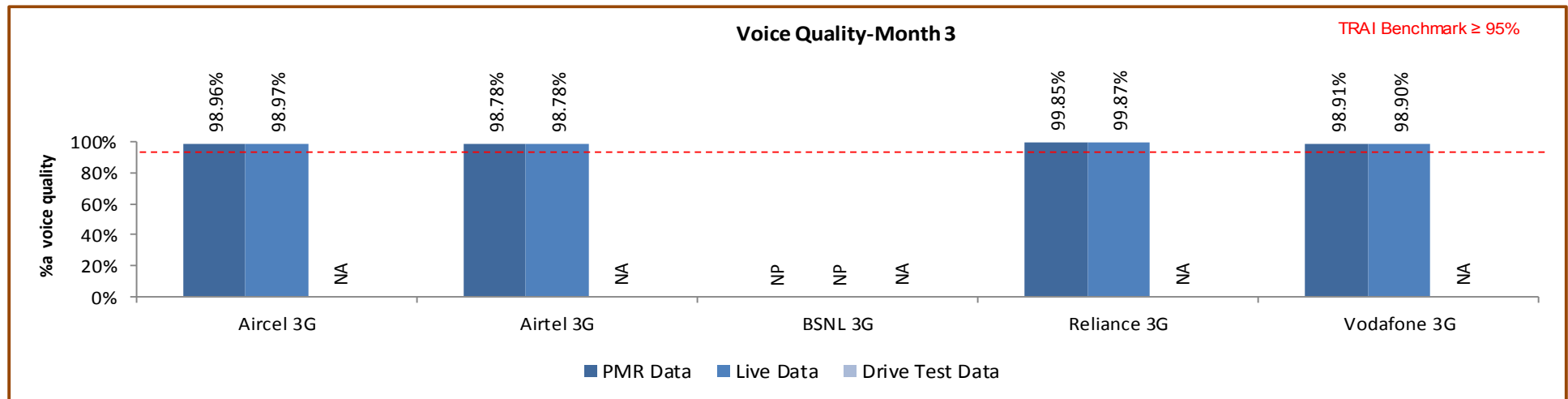
7   PARAMETER DESCRIPTION & DETAILED FINDINGS - WIRELESS DATA SERVICES (2G & 3G)

7.1   SERVICE ACTIVATION /PROVISIONING FOR 2G & 3G

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.

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

Benchmark: >=95%

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7.1.2   KEY FINDINGS

Activation done within 4 hours - Consolidated-2G

TRAI Benchmark ≥ 95%

	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
PMR Data	99.09%	99.35%	NA	NA	99.99%	NS	99.68%
Live Data	98.98%	98.04%	NA	NA	99.96%	NS	100.00%

Activation done within 4 hours - Month 1

TRAI Benchmark ≥ 95%

	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
PMR Data	99.03%	99.67%	NA	NA	100.00%	NS	99.88%
Live Data	98.96%	100.00%	NA	NA	100.00%	NS	100.00%

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Activation done within 4 hours - Month 2

TRAI Benchmark ≥ 95%

	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
PMR Data	99.09%	99.28%	NA	NA	99.98%	NS	99.60%
Live Data	98.88%	96.15%	NA	NA	99.78%	NS	100.00%

■ PMR Data ■ Live Data

Activation done within 4 hours - Month 3

TRAI Benchmark ≥ 95%

	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
PMR Data	99.17%	99.08%	NA	NA	99.99%	NS	99.57%
Live Data	99.17%	97.75%	NA	NA	99.99%	NS	100.00%

■ PMR Data ■ Live Data

TRAI

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Activation done within 4 hours - Consolidated-3G

TRAI Benchmark ≥ 95%

	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
PMR Data	99.09%	99.35%	NA	100.00%	99.72%
Live Data	98.88%	98.04%	NA	100.00%	99.94%

All operators met the TRAI benchmark.

Activation done within 4 hours - Month 1

TRAI Benchmark ≥ 95%

	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
PMR Data	99.09%	99.67%	NA	100.00%	99.89%
Live Data	98.88%	100.00%	NA	100.00%	99.85%

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Activation done within 4 hours - Month 2

TRAI Benchmark ≥ 95%

	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
PMR Data	NA	99.28%	NA	100.00%	99.73%
Live Data	NA	96.15%	NA	100.00%	100.00%

■ PMR Data ■ Live Data

Activation done within 4 hours - Month 3

TRAI Benchmark ≥ 95%

	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
PMR Data	NA	99.08%	NA	100.00%	99.51%
Live Data	NA	97.75%	NA	100.00%	100.00%

■ PMR Data ■ Live Data

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7.2 PDP CONTEXT ACTIVATION SUCCESS RATE FOR 2G & 3G

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.

PDP Context Activation Success Rate (%) =

$$\frac{\text{Number of successfully completed PDP context activations}}{\text{Total attempts of context activation}} \times 100$$

Benchmark: >=95%

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7.2.2 KEY FINDINGS

PDP Context activation success rate - Consolidated-2G

TRAI Benchmark ≥ 95%

	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
PMR Data	98.39%	NA	NA	NA	99.8%	NS	99.70%
Live Data	99.75%	NA	NA	NA	99.9%	NS	99.51%

■ PMR Data ■ Live Data

PDP Context activation success rate - Month 1

	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
PMR Data	99.99%	NA	NA	NA	99.70%	NS	99.27%
Live Data	99.89%	NA	NA	NA	99.91%	NS	99.30%

■ PMR Data ■ Live Data

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PDP Context activation success rate - Month 2

TRAI Benchmark ≥ 95%

PDP Context activation success rate - Month 3

TRAI Benchmark ≥ 95%

All operators met the TRAI benchmark.

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PDP Context activation success rate - Consolidated-3G

PDP Context activation success rate - Month 1

PDP Context activation success rate - Month 2

PDP Context activation success rate - Month 3

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7.3   DROP RATE FOR 2G & 3G

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.

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

Benchmark: <=5%

7.3.2 KEY FINDINGS

Drop Rate - Consolidated-2G

TRAI Benchmark ≤ 5%

Drop Rate - Month 1

TRAI Benchmark ≤ 5%

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Drop Rate - Month 2

TRAI Benchmark ≤ 5%

Drop Rate - Month 3

TRAI Benchmark ≤ 5%

All operators met the TRAI benchmarks.

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Drop Rate - Consolidated-3G

TRAI Benchmark ≤ 5%

Chart: % Drop rate (y-axis 0.0% to 8.0%)

- Aircel 3G: PMR Data 1.90%, Live Data 1.76%
- Airtel 3G: PMR Data NA, Live Data NA
- BSNL 3G: PMR Data 0.78%, Live Data NA
- Reliance 3G: PMR Data 0.90%, Live Data NA
- Vodafone 3G: PMR Data 0.22%, Live Data 0.17%

■ PMR Data ■ Live Data

Drop Rate - Month 1

TRAI Benchmark ≤ 5%

Chart: % Drop rate (y-axis 0.0% to 8.0%)

- Aircel 3G: PMR Data 1.90%, Live Data 1.76%
- Airtel 3G: PMR Data NA, Live Data NA
- BSNL 3G: PMR Data NA, Live Data NA
- Reliance 3G: PMR Data 0.82%, Live Data NA
- Vodafone 3G: PMR Data 0.12%, Live Data 0.11%

■ PMR Data ■ Live Data

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Drop Rate - Month 2

TRAI Benchmark ≤ 5%

Drop Rate - Month 3

TRAI Benchmark ≤ 5%

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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 June, 2009 were covered. The types of billing complaints covered are listed below.

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

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

⮕ Computational Methodology:

    ↳ **Billing complaints per 100 bills issued (Postpaid)** = (Total billing complaints** received during the relevant billing cycle / Total bills generated* during the relevant billing cycle)*100

    ↳ *Operator to include all types of bills generated for customers. This would include printed bills, online bills and any other forms of bills generated

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

    ↳ **Charging complaints per 100 subscribers (Prepaid)** = (Total charging complaints received during the quarter/ Total number of subscribers reported by the operator at the end of the quarter) * 100

⮕ TRAI Benchmark: <= 0.1%

⮕ Audit Procedure:

    ↳ Audit of billing complaint details for the complaints received during the quarter and used for arriving at the benchmark reported to TRAI would be conducted

        ⮕ For Postpaid, the total billing complaints would be audited by averaging over billing cycles in a quarter

        ⮕ For Prepaid, the data of total charging complaints in a quarter would be taken for the purpose of audit

8.1.2 KEY FINDINGS – METERING AND BILLING CREDIBILITY (POSTPAID)
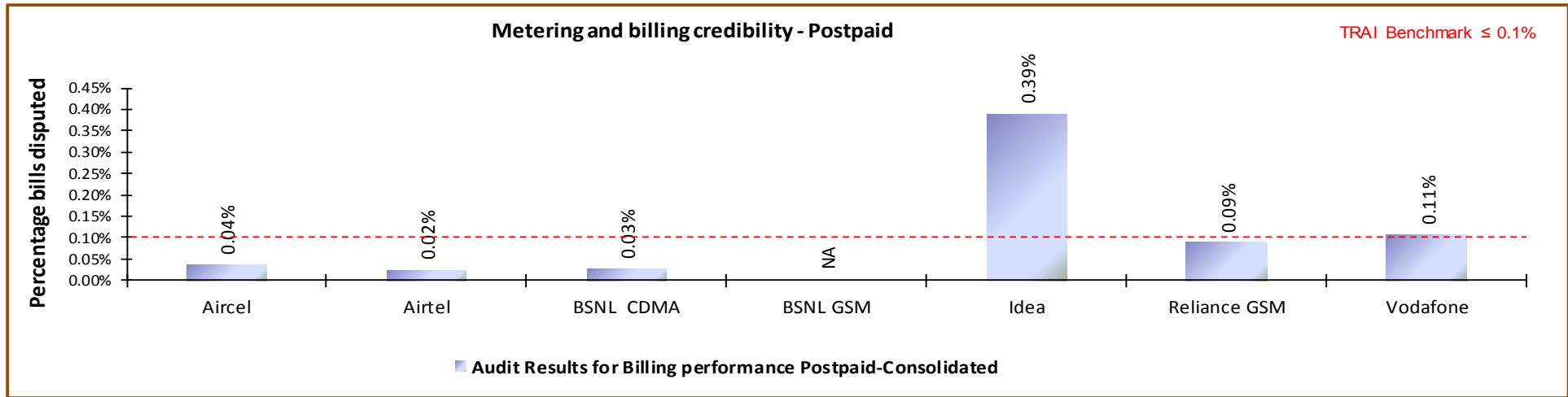
Data Source: Billing Center of the operators

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

Data Source: Billing Center of the operators

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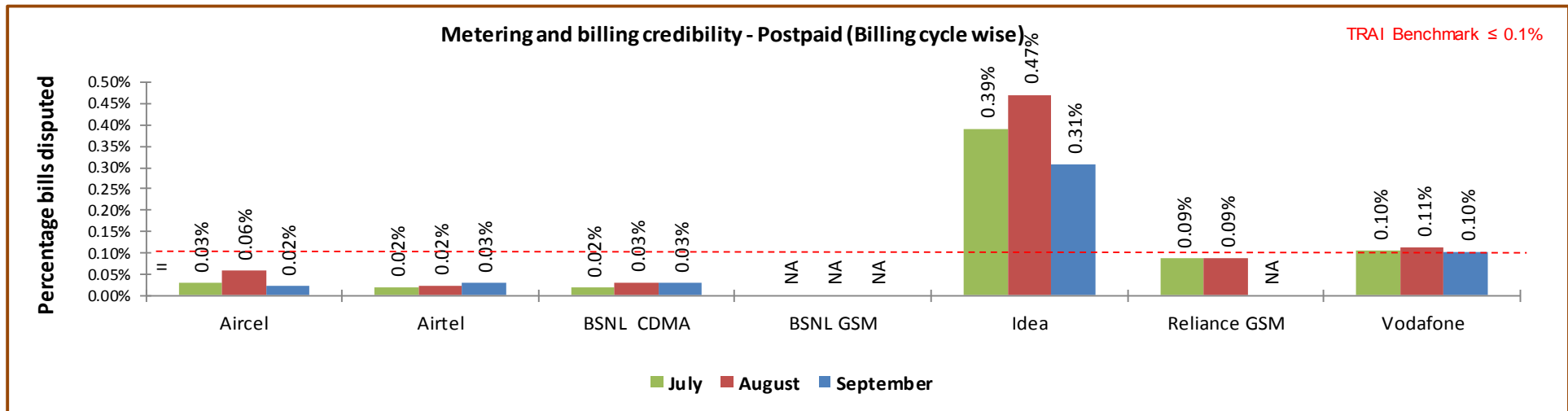
8.1.3 KEY FINDINGS - METERING AND BILLING CREDIBILITY (PREPAID)
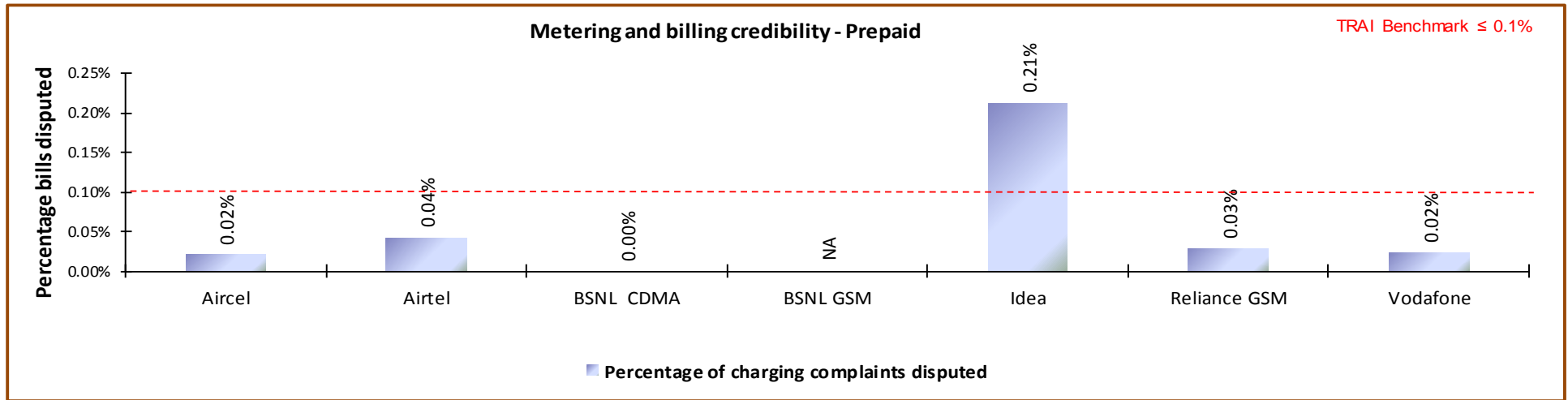
Data Source: Billing Center of the operators

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

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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 =

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

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

✤ The complaints that get marked as invalid by the operator are not considered for calculation as those complaints cannot be considered as resolved by the operator.

➲ *** Date of resolution in this case would refer to the date when a communication has taken place from the operator's end to inform the complainant about the final resolution of the issue / dispute.

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

8.2.2   KEY FINDINGS - WITHIN 4 WEEKS

Data Source: Billing Center of the operators

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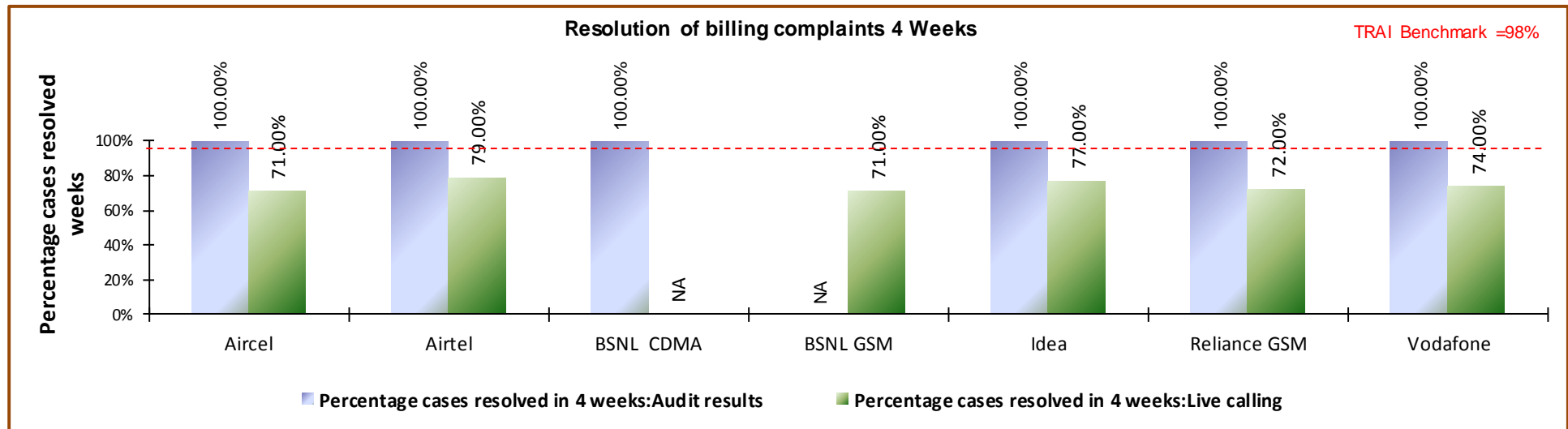
8.2.3 KEY FINDINGS WITHIN 6 WEEKS
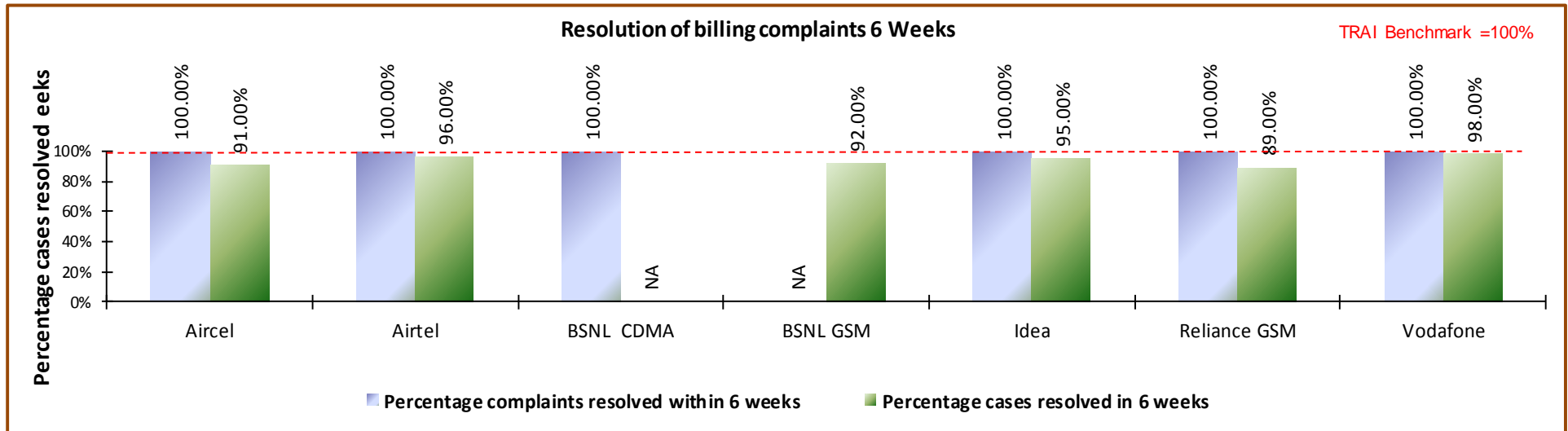
Resolution of billing complaints 6 Weeks

TRAI Benchmark =100%

Y-axis: **Percentage cases resolved eeks** (100%, 80%, 60%, 40%, 20%, 0%)

- Aircel: 100.00% / 91.00%
- Airtel: 100.00% / 96.00%
- BSNL CDMA: 100.00% / NA
- BSNL GSM: NA / 92.00%
- Idea: 100.00% / 95.00%
- Reliance GSM: 100.00% / 89.00%
- Vodafone: 100.00% / 98.00%

■ Percentage complaints resolved within 6 weeks   ■ Percentage cases resolved in 6 weeks

Data Source: Billing Center of the operators

All operators met the TRAI benchmark of resolution of billing complaints within 4 weeks and 6 weeks. However, as per live calling done to customers, the performance of all operators was observed to be much below the PMR data.

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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
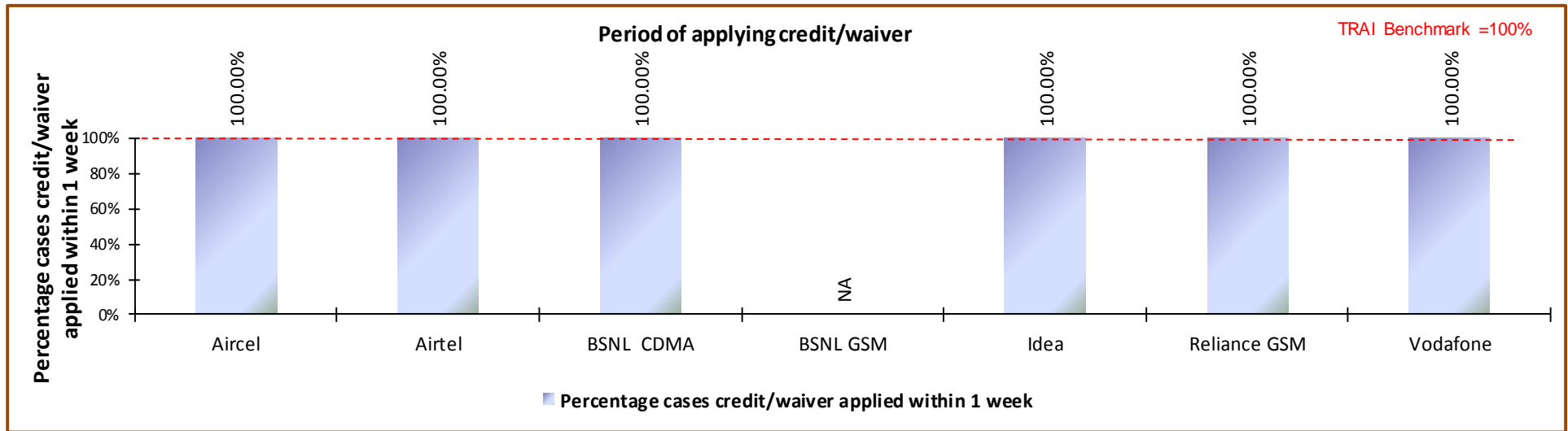
Period of applying credit/waiver

TRAI Benchmark =100%

	Percentage cases credit/waiver applied within 1 week
Aircel	100.00%
Airtel	100.00%
BSNL CDMA	100.00%
BSNL GSM	NA
Idea	100.00%
Reliance GSM	100.00%
Vodafone	100.00%

■ Percentage cases credit/waiver applied within 1 week

Data Source: Billing Center of the operators

All operators met the benchmark for this parameter.

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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

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8.4.2 KEY FINDINGS

Calls connected and answered

TRAI Benchmark ≥95%

Operator	Three month data	Live calling
Aircel	95.89%	100.00%
Airtel	90.00%	100.00%
BSNL CDMA	100.00%	100.00%
BSNL GSM		100.00%
Idea	97.55%	100.00%
Reliance GSM	97.48%	100.00%
Vodafone	99.96%	100.00%

%age calls connected and answered

■ Percentage calls conncted and answered:Three month data ■ Percentage calls connected and answered:Live calling

Data Source: Customer Service Center of the operators

As per PMR data Airtel failed to meet the benchmark, however in live calling operators are much below than PMR.

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8.5   CALL CENTRE PERFORMANCE-VOICE TO VOICE

8.5.1   PARAMETER DESCRIPTION

- ➲ Computational Methodology:

  - ↳ Call centre performance Voice to Voice = (Number of calls answered by operator within 90 seconds/ All calls attempted to connect to the operator) * 100

- ➲ Audit Procedure:

  - ↳ Operators provide details of the following from their central call centre/ customer service database:

    - ‣ Total calls connected and answered by operator within 90 seconds

    - ‣ Total calls attempted to connect to the operator

  - ↳ Also live calling was done to test the calls answered within 90 seconds by the operator

Benchmark: 95% calls to be answered within 90 seconds

8.5.2   KEY FINDINGS
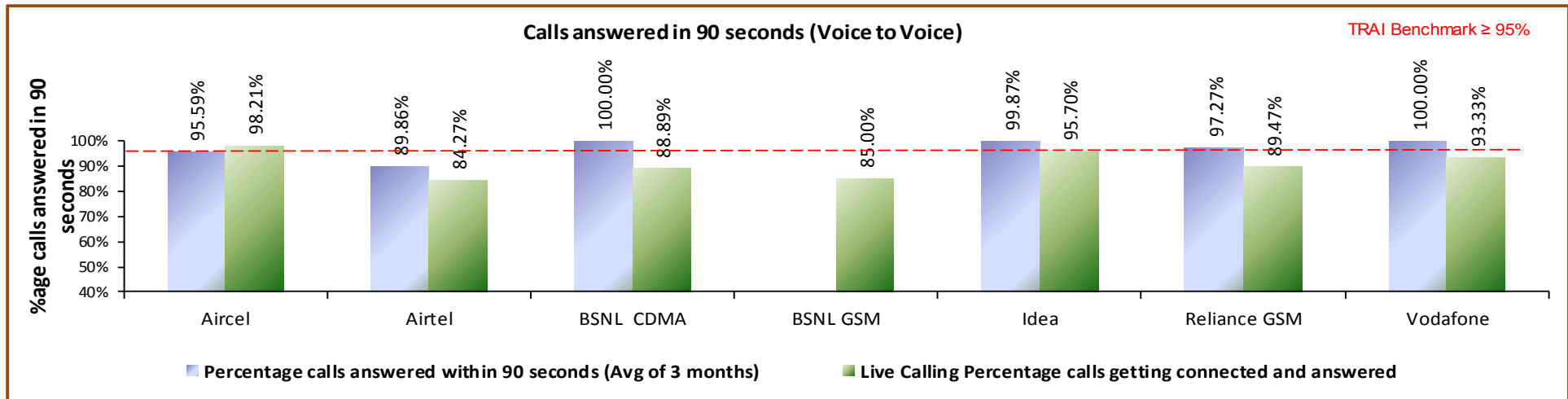
Calls answered in 90 seconds (Voice to Voice)

TRAI Benchmark ≥ 95%

	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Percentage calls answered within 90 seconds (Avg of 3 months)	95.59%	89.86%	100.00%	85.00%	99.87%	97.27%	100.00%
Live Calling Percentage calls getting connected and answered	98.21%	84.27%	88.89%		95.70%	89.47%	93.33%

Data Source: Customer Service Center of the operators

All operators met the benchmark as per Audit except Airtel. However, as per live calling done to customers, the performance of Airtel, BSNL GSM & CDMA, Reliance GSM and Vodafone was far inferior to the PMR data.

Calls answered in 90 seconds (Voice to Voice)

TRAI Benchmark ≥ 95%

	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
July	96.30%	87.04%	100.00%		99.86%	97.35%	100.00%
August	94.38%	89.22%	100.00%		99.87%	97.20%	100.00%
September	96.10%	93.44%	100.00%		99.88%		100.00%

Data Source: Customer Service Center of the operators

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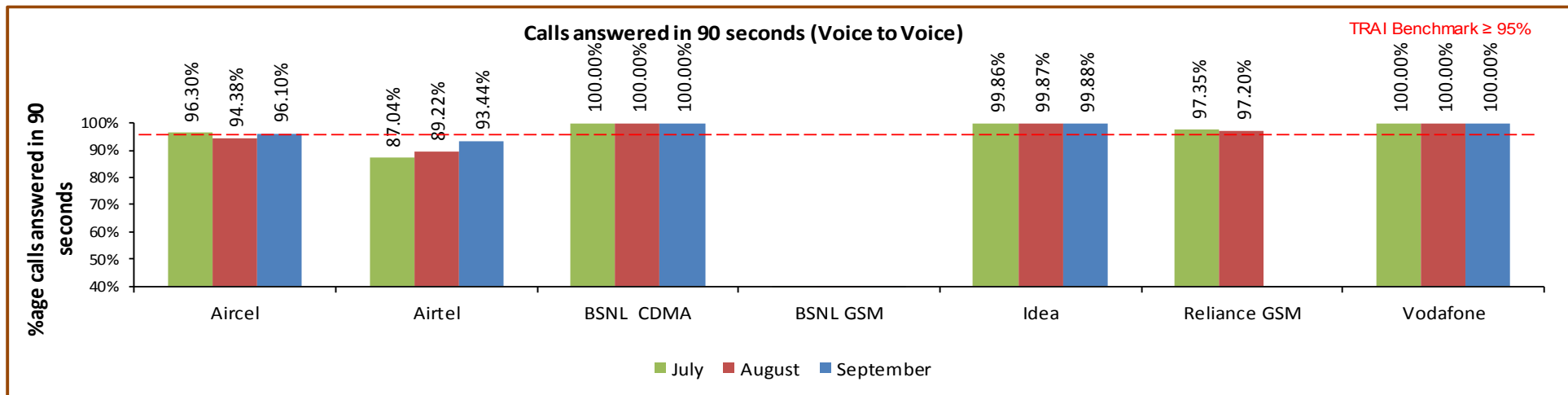
8.6 TERMINATION/CLOSURE OF SERVICE

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
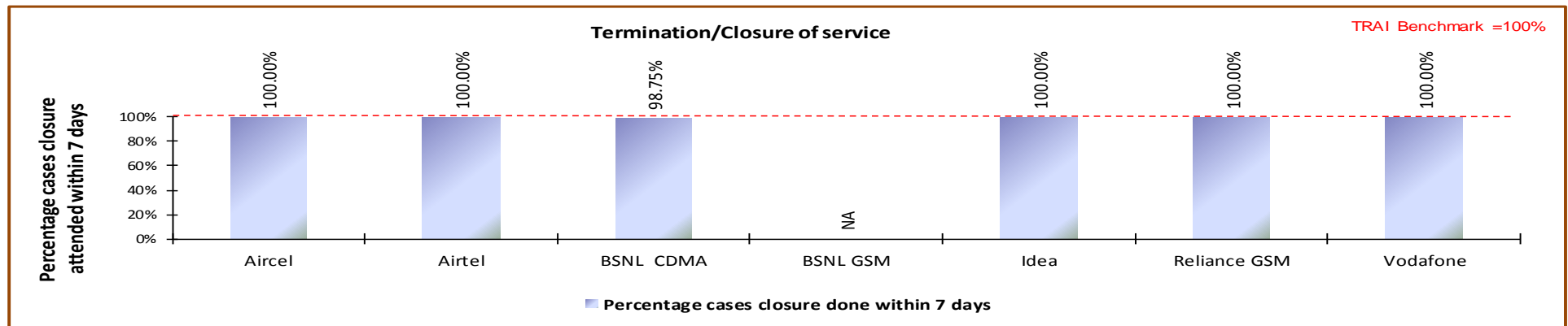
Data Source: Customer Service Center of the operators

BSNL CDMA failed to meet the TRAI benchmark for the parameter.

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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
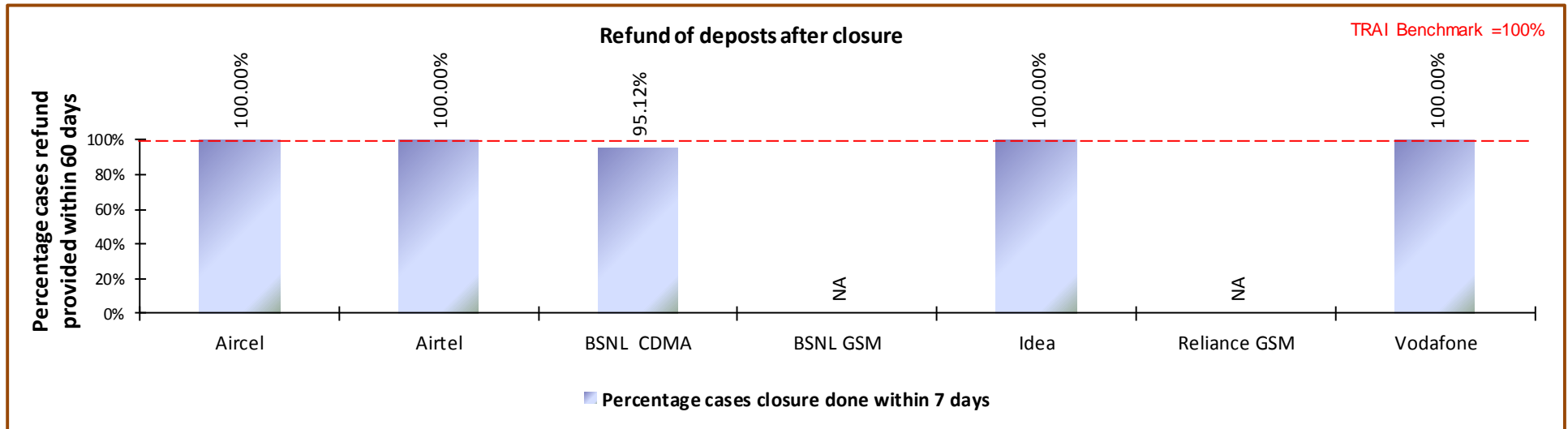
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8.7.2 KEY FINDINGS

Refund of deposts after closure

TRAI Benchmark =100%

Percentage cases refund provided within 60 days

- Aircel: 100.00%
- Airtel: 100.00%
- BSNL CDMA: 95.12%
- BSNL GSM: NA
- Idea: 100.00%
- Reliance GSM: NA
- Vodafone: 100.00%

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

Data Source: Customer Service Center of the operators

BSNL CDMA failed to meet the TRAI benchmark for the parameter.

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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 Assam 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 Assam circle are given below.

2G	3G
Aircel	Aircel 3G
Airtel	Airtel 3G
BSNL CDMA	BSNL 3G
BSNL GSM	Reliance 3G
Idea	Vodafone 3G
Reliance GSM	
Vodafone	

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9.1.1 KAMRUP SSA

Month	Name of SSA Covered	Start date	End Date	Kilometer Travelled
August	KAMRUP	23/8/2016	25/8/2016	317

9.1.1.1 Route Details - KAMRUP SSA

Category	Type of location	August KAMRUP		
		Day 1	Day 2	Day 3
Outdoor	Major Roads	Guwahati Rly Stn, Changsari, Chepti, Khudra Dimu, Balisatra, Hemdol, Rongia, Tulsibari, Tamulpur, Rampur, Niz- Barigog	Sutarkuchi, Adabari, Kalitakuchi, Hajo, Bamundi, Sualkuchi, Mirza, Vijay Nager, Chaygaon	Kulsi, Barmukam, Patgaon, Kallapara, Pamoni Rd, Jorabat, Batakuchi, Gumoria, Durang, Khetri
	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.

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9.1.1.2   Route Map - KAMRUP DAY 1

Rx Level Plot Day-1
Date of Drive Test-23/08/16
Name of the SDCAs Covered- RANGIA

Part-1

Part-2

RAN0021

RAN0041   RAN0031   RAN0011

RAN0031

RAN0051   Part-4

Part-3

ROUTE COVERED DAY-1

MAIN ROAD
BUSSTAND
MARKET
HOSPITAL

Rx Level Sub

🟩	-75 to 0
🟨	-85 to -75
🟦	-95 to -85
🟥	-120 to -95

9.1.1.3 Route Map - KAMRUP DAY 2

Rx Level Day-2
Date of Drive Test-24/08/16
Name of the SDCAs Covered- GUWAHATI

Part-1

Part-2

Part-3

Part-4

ROUTE COVERED DAY-2

HOSPITAL

BUS STAND

POLICE STATION

MAIN ROAD

Rx Level Sub

🟩	-75 to 0
🟨	-85 to -75
🟦	-95 to -85
🟥	-120 to -95

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9.1.1.4   Route Map - KAMRUP DAY 3

Rx LEVEL Day-3
Date of Drive Test-25/08/16
Name of the SDCAs Covered- GUWAHATI

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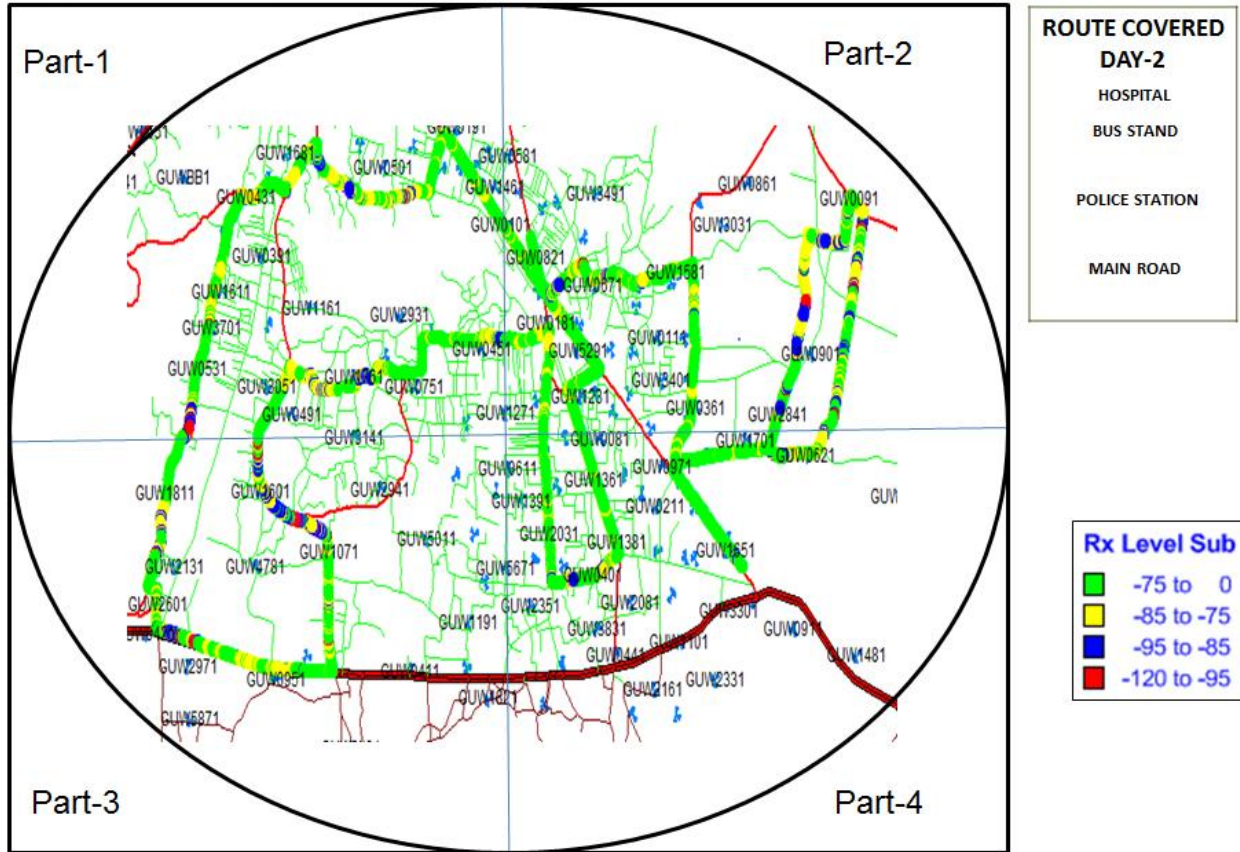
9.1.1.5 Drive Test Results - KAMRUP SSA-2G

August													
KAMRUP	B'mark	Aircel		Airtel		BSNL CDMA		BSNL GSM		Idea		Vodafone	
Parameter's		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
0 to -75 dBm		38.89%	57.91%	14.62%	48.08%	37.36%	14.48%	42.15%	34.00%	45.36%	42.64%	84.40%	51.68%
0 to -85 dBm		96.07%	84.78%	77.99%	78.81%	88.06%	35.09%	88.05%	68.36%	89.60%	76.70%	99.48%	76.70%
0 to -95 dBm		99.87%	96.95%	97.78%	94.75%	88.06%	68.19%	99.58%	91.62%	99.59%	90.31%	100.00%	92.66%
Voice quality	≥ 95%	98.16%	93.05%	98.62%	94.09%	99.76%	84.16%	97.19%	84.61%	98.80%	96.39%	98.51%	87.04%
CSSR	≥ 95%	97.87%	94.22%	100.00%	99.58%	98.04%	83.26%	100.00%	90.42%	NA	96.20%	100.00%	95.25%
%age Blocked calls		2.13%	2.71%	0.00%	0.42%	1.96%	16.74%	0.00%	15.55%	NA	3.80%	0.00%	2.64%
Call drop rate	≤ 2%	0.00%	0.72%	0.00%	0.42%	0.00%	18.62%	0.00%	10.28%	NA	1.16%	0.00%	1.85%
Hands off success rate		NA	100.00%	100.00%	98.41%	99.44%	99.29%	100.00%	90.22%	NA	98.22%	100.00%	97.54%

Data Source: Drive test reports submitted by operators to auditors

Voice Quality

Aircel, Airtel, BSNL CDMA, BSNL GSM and Vodafone did not meet the benchmark for voice quality in outdoor locations.

Call Set Success Rate (CSSR)

Aircel, BSNL CDMA, BSNL GSM and idea failed to meet the benchmark for CSSR in outdoor locations.

Call Drop Rate

BSNL CDMA, BSNL GSM and idea failed to meet the benchmark for call drop rate in outdoor locations.

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9.1.1.1 Drive Test Results - KAMRUP SSA-3G

August KAMRUP Parameter's	B'mark	Aircel 3G		Airtel 3G		BSNL 3G		Vodafone 3G	
		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
0 to -75 dBm		66.60%	50.06%	59.19%	39.78%	0.09%	21.39%	89.15%	47.11%
0 to -85 dBm		98.81%	80.91%	74.83%	71.24%	41.44%	40.53%	99.99%	68.82%
0 to -95 dBm		100.00%	97.76%	100.00%	91.65%	65.90%	66.03%	100.00%	82.38%
Voice quality	≥ 95%	NA	NA	83.92%	86.64%	99.40%	85.39%	92.80%	95.17%
CSSR	≥ 95%	100.00%	98.38%	100.00%	99.49%	100.00%	93.50%	100.00%	98.93%
%age Blocked calls		0.00%	1.08%	0.00%	0.26%	0.00%	28.07%	0.00%	3.49%
Call drop rate	≤ 2%	0.00%	1.08%	0.00%	0.77%	0.00%	12.16%	0.00%	1.08%
Hands off success rate		100.00%	100.00%	100.00%	100.00%	95.00%	93.18%	100.00%	100.00%

Data Source: Drive test reports submitted by operators to auditors

Voice Quality

Airtel 3G failed to meet the benchmark for voice quality in indoor as well as outdoor locations and Vodafone 3G failed to meet in indoor and BSNL 3G failed in outdoor locations.

Call Set Success Rate (CSSR)

BSNL 3G failed to meet the benchmark for CSSR in outdoor locations.

Call Drop Rate

BSNL 3G failed to meet the benchmark for call drop rate in outdoor locations.

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9.1.1.1   Drive Test Results KAMRUP SSA- DATA-2G

Name of the Parameter	Bench Mark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Vodafone
Succesful Data Transmission download speed attempts	>80%	100.00	100.00		100.00	100.00	100.00
Succesful Data Transmission upload speed attempts	>75%	100.00	100.00		100.00	100.00	100.00
Minimum download speed		30.11	67.41	NA	NA	23.49	NA
Average throughput for Packet Data		118.58	80.81		52.92	57.79	128.13
Latency	<250ms	100.00	100.00		NA	NA	NA

All the parameters met the TRAI benchmark.

9.1.1.2   Drive Test Results – KAMRUP SSA- DATA-3G

Name of the Parameter	Bench Mark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
Succesful Data Transmission download speed attempts	>80%	100	100	100		100
Succesful Data Transmission upload speed attempts	>75%	100	100	100		100
Minimum download speed		361	1246	NA	NA	NA
Average throughput for Packet Data		772	1351	227		3635
Latency	<250ms	100	100	NA		NA

All the parameters met the TRAI benchmark.

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10 ANNEXURE – CONSOLIDATED-2G

10.1 NETWORK AVAILABILITY

1. Network Availability								
Audit Results for Network Availability- PMR data								
	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Number of BTSs in the licensed service area		8644	10810	729	2782	5539	NS	10200
Sum of downtime of BTSs in a month (in hours)		3017	28771	1393	41209	53641	NS	55131
BTSs accumulated downtime (not available for service)	≤ 2%	0.05%	0.36%	0.26%	1.99%	1.30%	NS	0.73%
Number of BTSs having accumulated downtime >24 hours		1621	72	195	54	43	NS	145
Worst affected BTSs due to downtime	≤ 2%	18.75%	0.67%	26.75%	1.94%	0.78%	NS	1.42%
Live Measurement Results for Network Availability- 3 Day live data								
	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Number of BTSs in the licensed service area		8644	10714	729	2782	5439	NS	10200
Sum of downtime of BTSs in a month (in hours)		311	2645	144	3217	5573	NS	4764
BTSs accumulated downtime (not available for service)	≤ 2%	0.05%	0.34%	0.27%	1.61%	1.42%	NS	0.65%
Number of BTSs having accumulated downtime >24 hours		205	0	52	8	36	NS	12
Worst affected BTSs due to downtime	≤ 2%	2.37%	0.00%	7.13%	0.29%	0.66%	NS	0.12%

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

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10.2 CONNECTION ESTABLISHMENT (ACCESSIBILITY)

2. Connection Establishment (Accessibility)								
Audit Results for CSSR, SDCCH and TCH congestion- PMR data								
CSSR	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
CSSR	≥ 95%	91.55%	95.75%	98.65%	98.10%	98.22%	NS	98.93%
SDCCH/Paging channel congestion	≤ 1%	0.89%	0.91%	NA	0.88%	0.41%	NS	0.56%
TCH congestion	≤ 2%	5.81%	1.49%	NA	1.90%	1.33%	NS	1.07%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data								
CSSR	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
CSSR	≥ 95%	95.60%	96.21%	98.79%	91.99%	99.01%	NS	99.36%
SDCCH/Paging channel congestion	≤ 1%	0.56%	0.39%	NA	4.21%	0.34%	NS	0.44%
TCH congestion	≤ 2%	2.91%	0.77%	NA	8.01%	0.27%	NS	0.64%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data								
CSSR	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of call attempts		601	522	696	598	447	NS	617
Total number of successful calls established		585	520	587	545	430	NS	590
CSSR	≥ 95%	97.34%	99.62%	84.34%	91.14%	96.20%	NS	95.62%
%age blocked calls		2.66%	0.38%	15.66%	8.86%	3.80%	NS	4.38%

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

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10.3   Connection Maintenance (Retainability)

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 CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of calls established		676795551	648658159	970920	726866021	120071277	NS	431476313
Total number of calls dropped		13040444	7250197	12297	13957858	598668	NS	2780932
Call drop rate	≤ 2%	1.93%	1.12%	1.27%	1.92%	0.50%	NS	0.64%
Total number of cells in the network		25741	32464	2061	8286	16617	NS	30539
Total number of cells having more than 3% TCH		4905	525	115	246	393	NS	660
Worst affected cells having more than 3% TCH	≤ 3%	19.06%	1.62%	5.58%	2.97%	2.37%	NS	2.16%
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 CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of calls established		703257814	659616285	1202928	74893730	133335411	NS	522842944
Total number of calls dropped		11120466	6339161	15718	4096352	595282	NS	3233314
Call drop rate	≤ 2%	1.58%	0.96%	1.31%	5.47%	0.45%	NS	0.62%
Total number of cells in the network		25776	32212	2061	66590	16317	NS	30539
Total number of cells having more than 3% TCH		3750	486	119	4143	413	NS	720
Worst affected cells having more than 3% TCH	≤ 3%	14.55%	1.51%	5.77%	6.22%	2.53%	NS	2.36%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data								
Call drop rate	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of calls established		240	521	587	551	430	NS	590
Total number of calls dropped		4	2	100	52	5	NS	10
Call drop rate	≤ 2%	1.67%	0.38%	17.04%	9.44%	1.16%	NS	1.69%

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

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10.4   VOICE QUALITY

4. Voice quality								
Audit Results for Voice quality -PMR Data								
Voice quality	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of sample calls		69822257870	68824663712	NA	NA	14093097129	NS	62606615992
Total number of calls with good voice quality		63523842335	68183862776	NA	NA	13442083175	NS	60648238559
%age calls with good voice quality	≥ 95%	90.98%	99.07%	NA	NA	95.38%	NS	96.87%
Live measurement results for Voice quality-3 Day data								
Voice quality	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
NDR		49371814647	46936839932	NA	NA	9647003989	NS	27254193794
Total number of calls with good voice quality		45664107508	46550764938	NA	NA	9322379471	NS	26473945239
%age calls with good voice quality	≥ 95%	92.49%	99.18%	NA	NA	96.63%	NS	97.14%
Drive test results for Voice quality (Average of three drive tests) - DT data								
Voice quality	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of sample calls		881032	824621	NA	684263	821299	NS	962168
Total number of calls with good voice quality		823424	779195	NA	587861	793559	NS	843964
%age calls with good voice quality	≥ 95%	93.46%	94.49%	NA	85.91%	96.62%	NS	87.71%

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 CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of working POIs		60	15	NA	19	32	NS	32
No. of POIs not meeting benchmark		0	0	NA	0	0	NS	0
Total Capacity of all POIs (A) - in erlangs		312971	376695	NA	50567	113493	NS	5370274
Traffic served for all POIs (B)- in erlangs		185362	123880	NA	47028	54835	NS	3593446
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	0.00%
Live Measurement Results for POI Congestion- 3 Day data								
POI congestion	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of working POIs		59	15	NA	19	32	NS	32
No. of POIs not meeting benchmark		0	0	NA	0	0	NS	0
Total Capacity of all POIs (A) - in erlangs		309191	376158	NA	50567	113133	NS	2219334
Traffic served for all POIs (B)- in erlangs		183995	114731	NA	34811	52318	NS	2483234
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	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 CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Eqipped capacity of the network	191118.7522	187396.9802	33750	NP	44979	NS	136574
Total taffic handled in erlang during TCBH	0	150824.85	119	NP	30581.88	NS	104519.3073
Total no. of customers served (as per VLR)	144239.9132	5406107	6109	NP	1168275	NS	4050131

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

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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		2869	7033	797	1736	4163
Sum of downtime (i.e. total outage time) of Node Bs		1108	24656	10748	1231	26123
Node Bs downtime (not available for service)	≤ 2%	0.05%	0.47%	1.81%	0.10%	0.84%
Number of Node Bs having accumulated downtime of >24 hours in a month		639	83	15	12	25
Worst affected Node Bs due to downtime	≤ 2%	22.27%	1.18%	1.88%	0.69%	0.60%
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		2869	6924	797	1736	4163
Sum of downtime (i.e. total outage time) of Node Bs		2042	2321	1043	0	2098
Node Bs downtime (not available for service)	≤ 2%	0.99%	0.47%	1.82%	0.00%	0.70%
Number of Node Bs having accumulated downtime of >24 hours in a month		53	83	17	0	13
Worst affected Node Bs due to downtime	≤ 2%	1.85%	1.20%	2.13%	0.00%	0.31%

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

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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%	99.16%	98.82%	96.57%	99.89%	99.83%
RRC Congestion	≤ 1%	0.20%	0.20%	1.00%	0.04%	0.03%
Circuit Switched RAB Congestion	≤ 2%	0.00%	0.09%	1.68%	0.03%	0.03%
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%	97.49%	98.65%	95.76%	99.93%	99.86%
RRC Congestion	≤ 1%	0.34%	0.44%	3.86%	0.03%	0.03%
Circuit Switched RAB Congestion	≤ 2%	0.00%	0.13%	1.93%	0.00%	0.01%
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)		230	437	476	NA	422
Total number of RRC established (B)		227	435	448	NA	418
Call setup success rate (B/A*100)	≥ 95%	98.70%	99.54%	94.12%	NA	99.05%
%age blocked calls		1.30%	0.46%	5.88%	NA	0.95%

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

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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)		21534262	521352	45786685	5927113	39139391
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		129240	3679	661836	5287	121082
Call drop rate (B/A*100)	≤ 2%	0.60%	0.71%	1.45%	0.09%	0.31%
Total no. of cells in the licensed service area (B)		8536	27519	2391	5162	12593
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		627	320	71	19	301
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	7.35%	1.16%	2.97%	0.37%	2.39%
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)		28227375	52111	289134	8520920	52065788
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		154612	357	3879	5199	160774
Call drop rate (B/A*100)	≤ 2%	0.55%	0.68%	1.34%	0.06%	0.31%
Total no. of cells in the licensed service area (B)		8527	27519	2391	5161	12593
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		441	338	12	9	294
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	5.17%	1.23%	0.50%	0.17%	2.33%
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)		231	435	469	NA	418
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		2	3	49	NA	4
Call drop rate (B/A*100)	≤ 2%	0.87%	0.69%	10.45%	NA	0.96%

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

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11.4   VOICE QUALITY

Audit Results for Voice quality -PMR Data						
Voice quality	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		2189562002822	1182583652	NA	49186690190	74187703444
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		2166368652383	1168184405	NA	49126113369	73373129558
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.94%	98.78%	NA	99.88%	98.90%
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		1117532262101	128763545	NA	65232988675	59868612838
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		1105951747109	127210849	NA	65161097541	59205857764
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.96%	98.79%	NA	99.89%	98.89%
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		NA	1953421	1724079	NA	2181199
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	1686608	1507372	NA	2071545
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	NA	86.34%	87.43%	NA	94.97%

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

11.5 POI CONGESTION

POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
Total number of working POIs		60	15	19	14	32
No. of POIs not meeting benchmark		0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		312971	376695	25284	47029	5155548
Traffic served for all POIs (B)- in erlangs		185362	123880	23158	22290	3201723
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		59	15	19	14	32
No. of POIs not meeting benchmark		0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		309191	376158	25284	47029	2994441
Traffic served for all POIs (B)- in erlangs		183995	114731	17006	22290	2882679
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%

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

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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		6219.05	19	NP	66000	136574
Total taffic handled in erlang during TCBH		NA	17410.35694	NP	19353.05333	104519.3073
Total no. of customers served (as per VLR)		204971	334427.3333	NP	59176.66667	4050131

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12 ANNEXURE – CUSTOMER SERVICES

12.1 METERING AND BILLING CREDIBILITY

Billing performance								
Audit Results for Billing performance Postpaid-Consolidated								
Billing Performance	**Benchmark**	**Aircel**	**Airtel**	**BSNL CDMA**	**BSNL GSM**	**Idea**	**Reliance GSM**	**Vodafone**
Metering and billing credibility – Postpaid (Avg of 3 billing cycles)								
Metering and billing credibility – Postpaid								
Total bills generated during the period		236600	379972	30480		64375	196253	403972
Total number of bills disputed		86	94	8		251	173	433
Total number of valid billing complaints		4	24	8		84	87	351
Total complaints considered invalid		82	70	0		167	86	82
Percentage bills disputed (Avg of 3 billing cycles)	≤ 0.1%	0.04%	0.02%	0.03%	NA	0.39%	0.09%	0.11%
July								
Total bills generated during the first billing cycle		78607	124147	10619		21229	98186	131816
Total number of bills disputed in first billing cycle		23	24	2		83	86	138
Total number of valid billing complaints (billing cycle 1)		1	10	2		82	0	107
Total complaints considered invalid (billing cycle 1)		22	14	0		1	86	31
Percentage bills disputed (first billing cycle)	≤ 0.1%	0.03%	0.02%	0.02%	NA	0.39%	0.09%	0.10%
August								
Total bills generated during the second billing cycle		79025	126708	9445		21917	98067	134369
Total number of bills disputed in second billing cycle		46	31	3		103	87	152
Total number of valid billing complaints (billing cycle 2)		2	10	3		1	87	125
Total complaints considered invalid (billing cycle 2)		44	21	0		102	0	27
Percentage bills disputed (second billing cycle)	≤ 0.1%	0.06%	0.02%	0.03%	NA	0.47%	0.09%	0.11%
September								
Total bills generated during the third billing cycle		78968	129117	10416		21229	0	137787
Total number of bills disputed in third billing cycle		17	39	3		65	0	143
Total number of valid billing complaints (billing cycle 3)		1	4	3		1	0	119
Total complaints considered invalid (billing cycle 3)		16	35	0		64	0	24
Percentage bills disputed (third billing cycle)	≤ 0.1%	0.02%	0.03%	0.03%	NA	0.31%	NA	0.10%

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Metering and billing credibility - Prepaid								
Performance prepaid	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of charging complaints (valid) - sum of 3 months		1	1344	0		828	519	1574
Total complaints considered invalid (sum of 3 months)		3359	6370	0		1617	209	995
Total number of charging complaints (sum of 3 months)		3360	7714	0		2445	728	2569
Total no of customers served (Sum of 3 months)		16347833	18109739	166746		1153639	2578038	11148972
Percentage of charging complaints disputed	≤ 0.1%	0.02%	0.04%	0.00%	NA	0.21%	0.03%	0.02%

Data Source: Billing Center of the operators

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Resolution of Billing Complaints

Resolution of billing complaints (Postpaid+Prepaid)-Consolidated								
Billing Performance	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of billing/charging complaints		6887	1368	8		2696	901	3002
Total number of complaints resolved in favour of customer		3441	1368	8		831	692	1925
Total complaints considered invalid		3446	6440	0		1865	209	1077
Number of complaints resolved in 4 weeks		3441	1368	8		831	692	1925
Percentage complaints resolved within 4 weeks	≥ 98%	100.00%	100.00%	100.00%	NA	100.00%	100.00%	100.00%
Number of complaints resolved in 6 weeks		3441	1368	8		831	692	1925
Percentage complaints resolved within 6 weeks	100.00%	100.00%	100.00%	100.00%	NA	100.00%	100.00%	100.00%
Period of applying credit / waiver								
Total number of complaints where credit/waiver is required		5	1368	0		855	692	1781
Percentage cases in which credit/waiver was received within 1 week	100%	100.00%	100.00%	100.00%	NA	100.00%	100.00%	100.00%
Live calling results for resolution of billing complaints								
Resolution of billing complaints	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total Number of calls made		100	100	0	100	100	100	100
Number of cases resolved in 4 weeks		71	79	0	71	77	72	74
Percentage cases resolved in 4 weeks	≥ 98%	71.00%	79.00%	NA	71.00%	77.00%	72.00%	74.00%
Number of cases resolved in 6 weeks		91	96		92	95	89	98
Percentage cases resolved in 6 weeks	100.00%	91.00%	96.00%	NA	92.00%	95.00%	89.00%	98.00%

Data Source: Billing Center of the operators

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12.2 CUSTOMER CARE

Audit results for customer care (IVR and voice-to-Voice) -Consolidated								
Customer Care Assessment	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of call attempts to customer care for assistance		14100266	2287404	4129		6060654	510888	7566839
Number of calls getting connected and answered (electronically)		13521391	2058750	4129		5912068	498012	7563759
Percentage calls getting connected and answered	≥ 95%	95.89%	90.00%	100.00%	NA	97.55%	97.48%	99.96%
Audit results for customer care (voice-to-Voice)- (Avg of 3 months)-Consolidated								
Customer Care Assessment	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total Number of calls received (3 months)		2455803	1959526	1513		1346179	180322	2753983
Total Number of calls answered within 90 seconds (3 months)		2347425	1760833	1513		1344427	175392	2753983
Percentage calls answered within 90 seconds (Avg of 3 months)	≥ 95%	95.59%	89.86%	100.00%	NA	99.87%	97.27%	100.00%
July								
Total calls received (Month 1)		837977	666143	498		455013	81350	997312
Total calls answered within 90 seconds (Month 1)		806951	579826	498		454383	79192	997312
% calls answered within 90 seconds (Month 1)	≥ 95%	96.30%	87.04%	100.00%	NA	99.86%	97.35%	100.00%
August								
Total calls received (Month 2)		828972	652333	545		455646	98972	869154
Total calls answered within 90 seconds (Month 2)		782379	581993	545		455065	96200	869154
% calls answered within 90 seconds (Month 2)	≥ 95%	94.38%	89.22%	100.00%	NA	99.87%	97.20%	100.00%
September								
Total calls received (Month 3)		788854	641050	470		435520	0	887517
Total calls answered within 90 seconds (Month 3)		758095	599014	470		434979	0	887517
% calls answered within 90 seconds (Month 3)	≥ 95%	96.10%	93.44%	100.00%	NA	99.88%	NA	100.00%

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Live calling results for customer care (IVR)								
Customer Care Assessment	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of call attempts to customer care for assistance		100	100	100	100	100	100	100
Number of calls getting connected and answered (electronically)		100	100	100	100	100	100	100
Percentage calls getting connected and answered	≥ 95%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Live calling results for customer care (Voice to Voice)								
Customer Care Assessment	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total Number of calls received		56	89	45	40	93	38	90
Total Number of calls getting connected and answered		55	75	40	34	89	34	84
Live Calling Percentage calls getting connected and answered	≥ 95%	98.21%	84.27%	88.89%	85.00%	95.70%	89.47%	93.33%

12.3 TERMINATION / CLOSURE OF SERVICE

Audit results for termination / closure of service-Consolidated								
Termination	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of closure request		1509	1833	480		533	431	1103
Number of requests attended within 7 days		1509	1833	474		533	431	1103
Percentage cases in which termination done within 7 days	100.00%	100.00%	100.00%	98.75%	NA	100.00%	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 CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of cases requiring refund of deposits		1783	66	123		291	0	2369
Total number of cases where refund was made within 60 days		1783	66	117		291	0	2369
Percentage cases in which refund was receive within 60 days	100.00%	100.00%	100.00%	95.12%	NA	100.00%	NA	100.00%

Data Source: Billing Center of the operators

12.5 LIVE CALLING RESULTS FOR RESOLUTION OF SERVICE REQUESTS

Live calling results for resolution of service requests							
Resolution of service requests	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total Number of calls made	100	100	0	100	100	100	100
Number of cases resolved to satisfaction	77	78	0	73	76	77	85
Percentage cases resolved in four weeks	77.00%	78.00%	NA	73.00%	76.00%	77.00%	85.00%

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

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12.6 LIVE CALLING RESULTS FOR LEVEL 1 SERVICES

Live calling for level 1 services								
Level 1 services		Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total no. of calls made		300	300	300	300	300	300	300
Calls answered		247	248	249	241	248	246	249
% of calls connected	≥ 95%	82.33%	82.67%	83.00%	80.33%	82.67%	82.00%	83.00%

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

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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		20	17
101	Fire	Y		20	16
102	Ambulance	Y		20	17
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline	Y		20	16
138	All India Helpline for Passengers	Y		20	16
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline	Y		20	17
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		20	16

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Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
1071	Air Accident Helpline	Y		20	17
1072	Rail Accident Helpline	Y		20	17
1073	Road Accident Helpline	Y		20	17
1077	Control Room for District Collector		N		
1090	Call Alert (Crime Branch)		N		
1091	Women Helpline		N		
1097	National AIDS Helpline to NACO	Y		20	16
1099	Central Accident and Trauma Services (CATS)		N		
10580	Educational & Vocational Guidance and Counselling		N		
10589	Mother and Child Tracking (MCTH)		N		
10740	Central Pollution Control Board		N		
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway	Y		20	16
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline	Y		20	17
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
1903	Sashastra Seema Bal (SSB)		N		
1909	National Do Not Call Registry		N		
1912	Complaint of Electricity	Y		25	16
1916	Drinking Water Supply	Y		20	16
1950	Election Commission of India		N		
Airtel					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		20	17

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101	Fire	Y		20	17
102	Ambulance	Y		20	17
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpline for Passengers	Y		20	17
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline	Y		20	16
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		20	17
1071	Air Accident Helpline	Y		20	17
1072	Rail Accident Helpline	Y		20	17
1073	Road Accident Helpline	Y		20	16
1077	Control Room for District Collector		N		
1090	Call Alert (Crime Branch)	Y		20	17
1091	Women Helpline	Y		20	16
1097	National AIDS Helpline to NACO	Y		20	16
1099	Central Accident and Trauma Services (CATS)		N		
10580	Educational & Vocational Guidance and Counselling		N		

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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		20	16
1909	National Do Not Call Registry	Y		20	16
1912	Complaint of Electricity	Y		20	16
1916	Drinking Water Supply		N		
1950	Election Commission of India		N		

BSNL CDMA					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		27	23
101	Fire	Y		27	22
102	Ambulance	Y		27	23
104	Health Information Helpline	Y		28	22
108	Emergency and Disaster Management Helpline	Y		27	23
138	All India Helpline for Passengers	Y		27	22
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 Alert (Crime Branch)		N		
1091	Women Helpline		N		
1097	National AIDS Helpline to NACO	Y		28	22
1099	Central Accident and Trauma Services (CATS)		N		
10580	Educational & Vocational Guidance and Counselling		N		
10589	Mother and Child Tracking (MCTH)		N		
10740	Central Pollution Control Board		N		
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway		N		
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline		N		
155304	Municipal Corporations		N		
155214	Labour Helpline		N		

Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
1903	Sashastra Seema Bal (SSB)	Y		28	23
1909	National Do Not Call Registry	Y		27	23
1912	Complaint of Electricity	Y		27	23
1916	Drinking Water Supply		N		
1950	Election Commission of India	Y		27	23
BSNL GSM					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		17	14
101	Fire	Y		16	14
102	Ambulance	Y		17	14
104	Health Information Helpline	Y		17	14
108	Emergency and Disaster Management Helpline	Y		17	13
138	All India Helpline for Passengers		N		
149	Public Road Transport Utility Service	Y		16	13
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline	Y		17	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		17	13
1071	Air Accident Helpline		N		
1072	Rail Accident Helpline	Y		16	14

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Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
1073	Road Accident Helpline	Y		17	13
1077	Control Room for District Collector		N		
1090	Call Alert (Crime Branch)		N		
1091	Women Helpline		N		
1097	National AIDS Helpline to NACO	Y		17	13
1099	Central Accident and Trauma Services (CATS)	Y		16	13
10580	Educational & Vocational Guidance and Counselling		N		
10589	Mother and Child Tracking (MCTH)		N		
10740	Central Pollution Control Board		N		
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway	Y		17	13
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline	Y		16	13
155304	Municipal Corporations	Y		17	13
155214	Labour Helpline		N		
1903	Sashastra Seema Bal (SSB)		N		
1909	National Do Not Call Registry	Y		17	13
1912	Complaint of Electricity	Y		17	13
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		17	14
101	Fire	Y		16	14
102	Ambulance	Y		16	14

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104	Health Information Helpline	Y		17	14
108	Emergency and Disaster Management Helpline	Y		17	14
138	All India Helpline for Passengers	Y		17	13
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline	Y		17	14
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	Y		17	14
1064	Anti-Corruption Helpline	Y		17	14
1070	Relief Commission for Natural Calamities	Y		17	14
1071	Air Accident Helpline		N		
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline		N		
1077	Control Room for District Collector	Y		16	13
1090	Call Alert (Crime Branch)	Y		17	13
1091	Women Helpline		N		
1097	National AIDS Helpline to NACO	Y		17	14
1099	Central Accident and Trauma Services (CATS)		N		
10580	Educational & Vocational Guidance and Counselling		N		
10589	Mother and Child Tracking (MCTH)		N		
10740	Central Pollution Control Board		N		

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Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
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)	Y		17	14
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		16	14
1912	Complaint of Electricity	Y		16	13
1916	Drinking Water Supply		N		
1950	Election Commission of India	Y		17	14
Reliance					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		18	16
101	Fire	Y		18	15
102	Ambulance	Y		18	16
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpline for Passengers	Y		18	15
149	Public Road Transport Utility Service	Y		18	16
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline	Y		18	16
1033	Road Accident Management Service		N		
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		

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1056	Emergency Medical Services	Y		18	16
106X	State of the Art Hospitals	Y		18	15
1063	Public Grievance Cell DoT Hq		N		
1064	Anti-Corruption Helpline		N		
1070	Relief Commission for Natural Calamities	Y		18	16
1071	Air Accident Helpline	Y		18	15
1072	Rail Accident Helpline	Y		18	15
1073	Road Accident Helpline		N		
1077	Control Room for District Collector		N		
1090	Call Alert (Crime Branch)		N		
1091	Women Helpline		N		
1097	National AIDS Helpline to NACO	Y		18	15
1099	Central Accident and Trauma Services (CATS)		N		
10580	Educational & Vocational Guidance and Counselling		N		
10589	Mother and Child Tracking (MCTH)		N		
10740	Central Pollution Control Board		N		
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway	Y		18	15
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		18	15
1912	Complaint of Electricity	Y		18	15

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Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
1916	Drinking Water Supply		N		
1950	Election Commission of India	Y		18	15
Vodafone					
100	Police	Y		18	15
101	Fire	Y		17	15
102	Ambulance	Y		18	15
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpline for Passengers	Y		18	14
149	Public Road Transport Utility Service	Y		18	15
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline	Y		17	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	Y		18	14
1064	Anti-Corruption Helpline	Y		18	14
1070	Relief Commission for Natural Calamities	Y		18	15
1071	Air Accident Helpline	Y		17	15
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline		N		
1077	Control Room for District Collector	Y		17	14
1090	Call Alert (Crime Branch)		N		

1091	Women Helpline		N		
1097	National AIDS Helpline to NACO	Y		18	15
1099	Central Accident and Trauma Services (CATS)	Y		17	14
10580	Educational & Vocational Guidance and Counselling		N		
10589	Mother and Child Tracking (MCTH)		N		
10740	Central Pollution Control Board		N		
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway	Y		18	15
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline	Y		18	14
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
1903	Sashastra Seema Bal (SSB)		N		
1909	National Do Not Call Registry	Y		18	15
1912	Complaint of Electricity	Y		17	15
1916	Drinking Water Supply		N		
1950	Election Commission of India		N		

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

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13 COUNTER DETAILS

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

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

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13.1.1 ERICSSON

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

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

Ericsson Counters

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

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

13.1.2 NSN (NOKIA SIEMENS NETWORKS)

NSN provides network support to Vodafone in the circle.

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

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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_QUAL 5) / (FREQ_DL_QUAL0+FREQ_DL_QUAL1+FREQ_DL_QUAL2+FREQ_DL_QUAL3+FREQ_DL_QUAL4+FREQ_DL_QUAL 5+FREQ_DL_QUAL6+FREQ_DL_QUAL7)

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13.2 BLOCK SCHEMATIC DIAGRAMS

13.2.1 ERICSSON

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

Ericsson
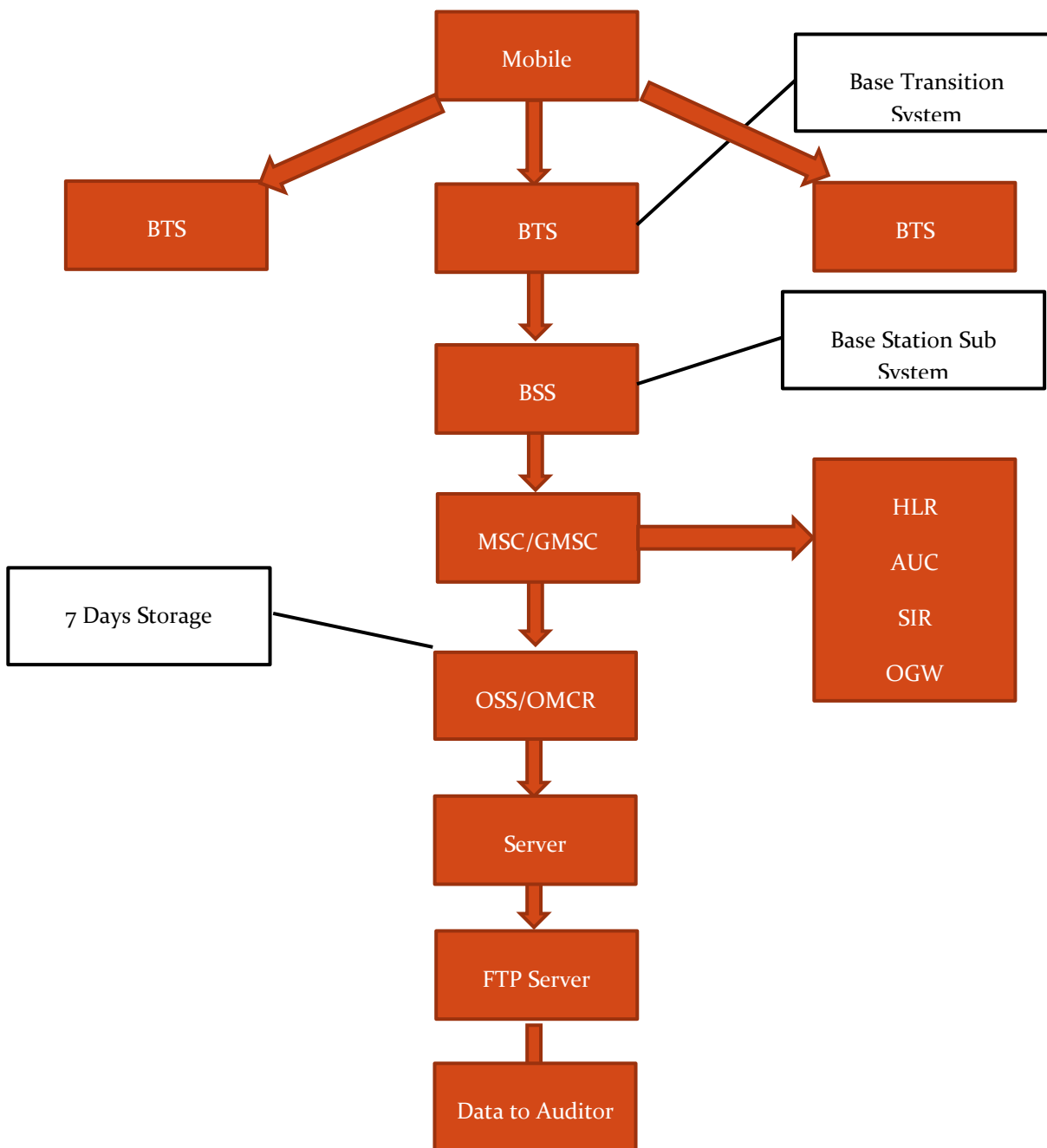
13.2.2 NSN (NOKIA SIEMENS NETWORKS)

NSN provides network support to Vodafone in the circle.

NSN
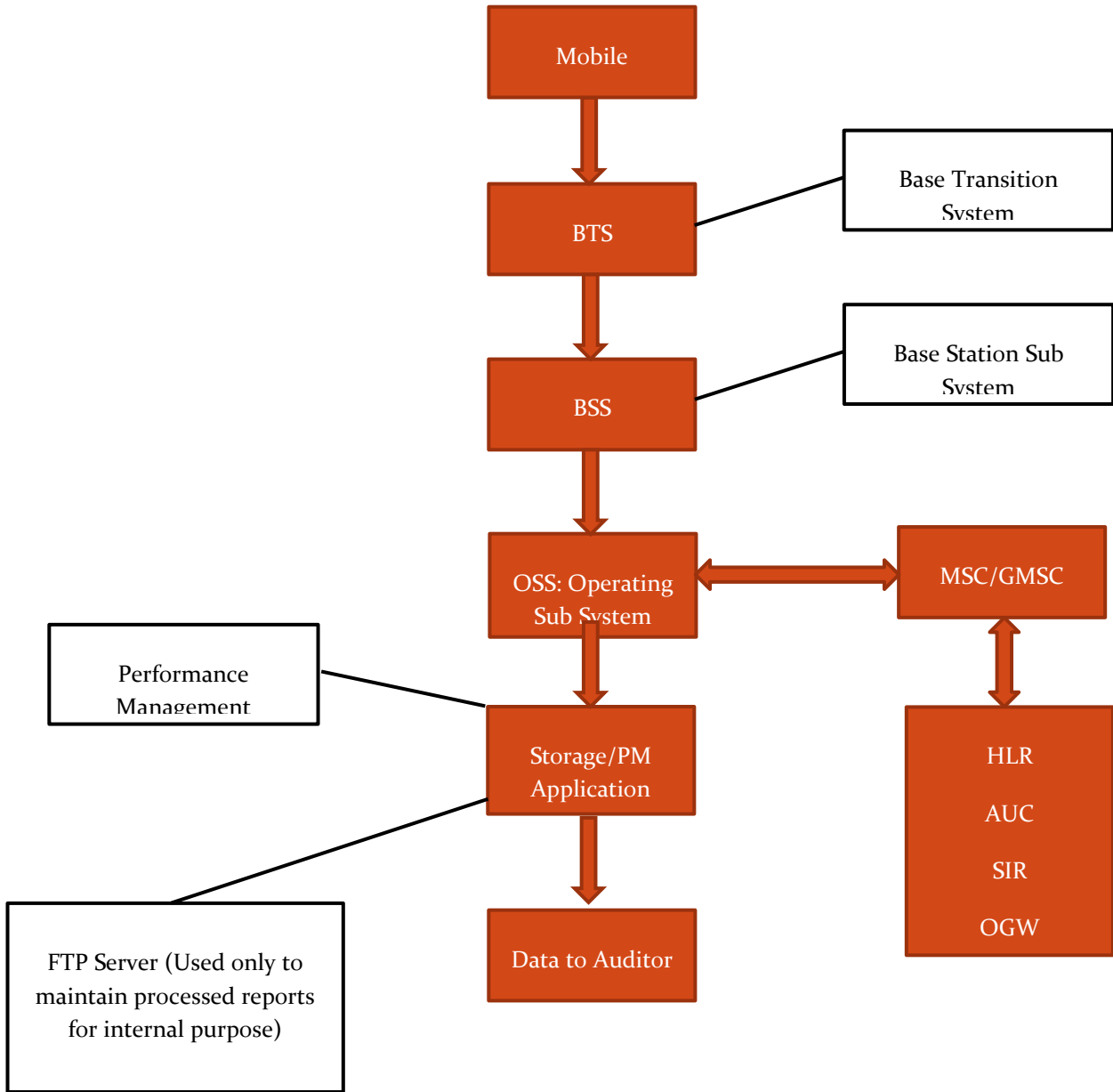
```
                    ┌──────────────────┐
                    │      Mobile      │
                    └────────┬─────────┘
                             ↓
                    ┌──────────────────┐        ┌──────────────────┐
                    │       BTS        │────────│ Base Transition  │
                    └────────┬─────────┘        │      System      │
                             ↓                  └──────────────────┘
                    ┌──────────────────┐        ┌──────────────────┐
                    │       BSS        │────────│ Base Station Sub │
                    └────────┬─────────┘        │      System      │
                             ↓                  └──────────────────┘
                    ┌──────────────────┐        ┌──────────────────┐
                    │ OSS: Operating   │←──────→│    MSC/GMSC      │
                    │   Sub System     │        └────────┬─────────┘
                    └────────┬─────────┘                 ↕
┌──────────────────┐        ↓                  ┌──────────────────┐
│   Performance    │ ┌──────────────────┐      │       HLR        │
│   Management     │─│    Storage/PM    │      │       AUC        │
└──────────────────┘ │   Application    │      │       SIR        │
                     └────────┬─────────┘      │       OGW        │
                              ↓                └──────────────────┘
┌──────────────────┐ ┌──────────────────┐
│ FTP Server (Used │ │  Data to Auditor │
│ only to maintain │ └──────────────────┘
│ processed reports│
│ for internal     │
│ purpose)         │
└──────────────────┘
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Audit Results for Network Availability- PMR data-July							
	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Number of BTSs in the licensed service area		2875	3580	243	1391	1793	NS	3424
Sum of downtime of BTSs in a month (in hours)		1139	9638	433	20619	16132	NS	18875
BTSs accumulated downtime (not available for service)	≤ 2%	0.05%	0.36%	0.24%	1.99%	1.21%	NS	0.74%
Number of BTSs having accumulated downtime >24 hours		613	22	60	27	14	NS	46
Worst affected BTSs due to downtime	≤ 2%	21.32%	0.61%	24.69%	1.94%	0.78%	NS	1.34%
Live Measurement Results for Network Availability- 3 Day live data-July							
	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Number of BTSs in the licensed service area		2875	3557	243	1391	1789	NS	3424
Sum of downtime of BTSs in a month (in hours)		108	728	45	1586	1361	NS	1489
BTSs accumulated downtime (not available for service)	≤ 2%	0.05%	0.28%	0.26%	1.58%	1.06%	NS	0.60%
Number of BTSs having accumulated downtime >24 hours		79	0	26	4	10	NS	0
Worst affected BTSs due to downtime	≤ 2%	2.75%	0.00%	10.70%	0.29%	0.56%	NS	0.00%

Audit Results for CSSR, SDCCH and TCH congestion- PMR data-July								
CSSR	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
CSSR	≥ 95%	90.56%	95.89%	98.42%	98.09%	98.39%	NS	98.84%
SDCCH/Paging channel congestion	≤ 1%	0.98%	0.72%	NA	0.87%	0.46%	NS	0.83%
TCH congestion	≤ 2%	6.79%	1.32%	NA	1.91%	1.20%	NS	1.16%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-July								
CSSR	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
CSSR	≥ 95%	94.52%	96.33%	98.69%	84.89%	98.80%	NS	99.35%
SDCCH/Paging channel congestion	≤ 1%	0.70%	0.39%	NA	4.31%	0.33%	NS	0.52%
TCH congestion	≤ 2%	3.89%	0.68%	NA	15.11%	0.34%	NS	0.65%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-July								
CSSR	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of call attempts		NA	NA	NA	NA	NA	NS	NA
Total number of successful calls established		NA	NA	NA	NA	NA	NS	NA
CSSR	≥ 95%	NA	NA	NA	NA	NA	NS	NA
%age blocked calls		NA	NA	NA	NA	NA	NS	NA

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 CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of calls established		231124386	221795689	323863	373582539	40973176	NS	139987968
Total number of calls dropped		4441201	2424654	4360	7210143	191506	NS	943444
Call drop rate	≤ 2%	1.92%	1.09%	1.35%	1.93%	0.47%	NS	0.67%
Total number of cells in the network		8575	10757	687	4143	5379	NS	10246
Total number of cells having more than 3% TCH		1657	159	48	123	126	NS	199
Worst affected cells having more than 3% TCH	≤ 3%	19.32%	1.48%	6.99%	2.97%	2.34%	NS	1.94%
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 CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of calls established		242068533	229548572	400343	27534103	46047804	NS	164899627
Total number of calls dropped		3938089	2158950	5794	2049104	214263	NS	1055598
Call drop rate	≤ 2%	1.63%	0.94%	1.45%	7.44%	0.47%	NS	0.64%
Total number of cells in the network		8580	10704	687	28930	5367	NS	10246
Total number of cells having more than 3% TCH		1257	134	47	0	124	NS	301
Worst affected cells having more than 3% TCH	≤ 3%	14.65%	1.25%	6.84%	0.00%	2.31%	NS	2.94%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-July								
Call drop rate	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of calls established		NA	NA	NA	NA	NA	NS	NA
Total number of calls dropped		NA	NA	NA	NA	NA	NS	NA
Call drop rate	≤ 2%	NA	NA	NA	NA	NA	NS	NA

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Audit Results for Voice quality -PMR Data-July								
Voice quality	**Benchmark**	**Aircel**	**Airtel**	**BSNL CDMA**	**BSNL GSM**	**Idea**	**Reliance GSM**	**Vodafone**
Total number of sample calls		23188675191	21821462058	NA	NA	4246586908	NS	19953282546
Total number of calls with good voice quality		21109721217	21598348163	NA	NA	4050923788	NS	19284987592
%age calls with good voice quality	≥ 95%	91.03%	98.98%	NA	NA	95.39%	NS	96.65%
Live measurement results for Voice quality-3 Day data-July								
Voice quality	**Benchmark**	**Aircel**	**Airtel**	**BSNL CDMA**	**BSNL GSM**	**Idea**	**Reliance GSM**	**Vodafone**
Total number of sample calls		2537209698	2235087615	NA	NA	469014463	NS	2176021373
Total number of calls with good voice quality		2329433550	2216703092	NA	NA	451777295	NS	2111597122
%age calls with good voice quality	≥ 95%	91.81%	99.18%	NA	NA	96.32%	NS	97.04%
Drive test results for Voice quality (Average of three drive tests) - DT data-July								
Voice quality	**Benchmark**	**Aircel**	**Airtel**	**BSNL CDMA**	**BSNL GSM**	**Idea**	**Reliance GSM**	**Vodafone**
Total number of sample calls		NA	NA	NA	NA	NA	NS	NA
Total number of calls with good voice quality		NA	NA	NA	NA	NA	NS	NA
%age calls with good voice quality	≥ 95%	NA	NA	NA	NA	NA	NS	NA

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Audit Results for POI Congestion- PMR data-July								
POI congestion	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of working POIs		60	15	NA	19	33	NS	32
No. of POIs not meeting benchmark		0	0	NA	0	0	NS	0
Total Capacity of all POIs (A) - in erlangs		103330	132694	NA	25284	36778	NS	1878694
Traffic served for all POIs (B)- in erlangs		61720	40180	NA	23869	20260	NS	1489220
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	0.00%
Live Measurement Results for POI Congestion- 3 Day data-July								
POI congestion	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of working POIs		58	15	NA	19	33	NS	32
No. of POIs not meeting benchmark		0	0	NA	0	0	NS	0
Total Capacity of all POIs (A) - in erlangs		100601	118491	NA	25284	36618	NS	457596
Traffic served for all POIs (B)- in erlangs		60668	32941	NA	17806	19866	NS	1373212
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	0.00%

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15 ANNEXURE – AUGUST-2G

Audit Results for Network Availability- PMR data-August								
	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Number of BTSs in the licensed service area		2884	3611	243	1391	1853	NS	3317
Sum of downtime of BTSs in a month (in hours)		994	10231	479	20590	19077	NS	18456
BTSs accumulated downtime (not available for service)	≤ 2%	0.05%	0.38%	0.26%	1.99%	1.38%	NS	0.75%
Number of BTSs having accumulated downtime >24 hours		543	25	64	27	13	NS	54
Worst affected BTSs due to downtime	≤ 2%	18.83%	0.69%	26.34%	1.94%	0.70%	NS	1.63%
Live Measurement Results for Network Availability- 3 Day live data-August								
	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Number of BTSs in the licensed service area		2884	3580	243	1391	1793	NS	3317
Sum of downtime of BTSs in a month (in hours)		109	1005	52	1631	2196	NS	1907
BTSs accumulated downtime (not available for service)	≤ 2%	0.05%	0.39%	0.30%	1.63%	1.70%	NS	0.80%
Number of BTSs having accumulated downtime >24 hours		67	0	10	4	12	NS	6
Worst affected BTSs due to downtime	≤ 2%	2.32%	0.00%	4.12%	0.29%	0.67%	NS	0.18%

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Audit Results for CSSR, SDCCH and TCH congestion- PMR data-August							
CSSR	**Benchmark**	**Aircel**	**Airtel**	**BSNL CDMA**	**BSNL GSM**	**Idea**	**Reliance GSM**	**Vodafone**
CSSR	≥ 95%	92.00%	95.74%	98.62%	98.11%	98.46%	NS	99.11%
SDCCH/Paging channel congestion	≤ 1%	0.98%	1.00%	NA	0.89%	0.30%	NS	0.36%
TCH congestion	≤ 2%	5.48%	1.63%	NA	1.89%	1.14%	NS	0.89%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-August							
CSSR	**Benchmark**	**Aircel**	**Airtel**	**BSNL CDMA**	**BSNL GSM**	**Idea**	**Reliance GSM**	**Vodafone**
CSSR	≥ 95%	95.99%	96.21%	98.80%	99.08%	99.13%	NS	99.48%
SDCCH/Paging channel congestion	≤ 1%	0.56%	0.37%	NA	4.10%	0.40%	NS	0.28%
TCH congestion	≤ 2%	2.71%	0.71%	NA	0.92%	0.18%	NS	0.52%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-August							
CSSR	**Benchmark**	**Aircel**	**Airtel**	**BSNL CDMA**	**BSNL GSM**	**Idea**	**Reliance GSM**	**Vodafone**
Total number of call attempts		601	522	696	598	447	NS	617
Total number of successful calls established		585	520	587	545	430	NS	590
CSSR	≥ 95%	97.34%	99.62%	84.34%	91.14%	96.20%	NS	95.62%
%age blocked calls		2.66%	0.38%	15.66%	8.86%	3.80%	NS	4.38%

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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 CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of calls established		231844748	217306155	328461	353283482	37476362	NS	157526090
Total number of calls dropped		4403295	2374830	4056	6747715	200161	NS	947133
Call drop rate	≤ 2%	1.90%	1.09%	1.23%	1.91%	0.53%	NS	0.60%
Total number of cells in the network		8563	10837	687	4143	5559	NS	9869
Total number of cells having more than 3% TCH		1621	169	30	123	137	NS	255
Worst affected cells having more than 3% TCH	≤ 3%	18.94%	1.56%	4.37%	2.97%	2.46%	NS	2.59%
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 CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of calls established		228198010	213423047	410768	47359626	41896290	NS	189520583
Total number of calls dropped		3625131	2083708	5151	2047248	190889	NS	1081723
Call drop rate	≤ 2%	1.59%	0.98%	1.25%	4.32%	0.46%	NS	0.57%
Total number of cells in the network		8591	10748	687	37659	5379	NS	9869
Total number of cells having more than 3% TCH		1240	162	34	4143	149	NS	214
Worst affected cells having more than 3% TCH	≤ 3%	14.44%	1.51%	4.90%	11.00%	2.77%	NS	2.17%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-August								
Call drop rate	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of calls established		240	521	587	551	430	NS	590
Total number of calls dropped		4	2	100	52	5	NS	10
Call drop rate	≤ 2%	1.67%	0.38%	17.04%	9.44%	1.16%	NS	1.69%

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Audit Results for Voice quality -PMR Data-August								
Voice quality	**Benchmark**	**Aircel**	**Airtel**	**BSNL CDMA**	**BSNL GSM**	**Idea**	**Reliance GSM**	**Vodafone**
Total number of sample calls		23509512394	24476866888	NA	NA	5027670968	NS	23243696771
Total number of calls with good voice quality		21367032554	24243355057	NA	NA	4795479323	NS	22593311319
%age calls with good voice quality	≥ 95%	90.89%	99.05%	NA	NA	95.38%	NS	97.20%
Live measurement results for Voice quality-3 Day data-August								
Voice quality	**Benchmark**	**Aircel**	**Airtel**	**BSNL CDMA**	**BSNL GSM**	**Idea**	**Reliance GSM**	**Vodafone**
Total number of sample calls		22699888325	22350876158	NA	NA	4404627538	NS	2699099732
Total number of calls with good voice quality		20984629443	22167030923	NA	NA	4255724206	NS	2633540510
%age calls with good voice quality	≥ 95%	92.44%	99.18%	NA	NA	96.62%	NS	97.57%
Drive test results for Voice quality (Average of three drive tests) - DT data-August								
Voice quality	**Benchmark**	**Aircel**	**Airtel**	**BSNL CDMA**	**BSNL GSM**	**Idea**	**Reliance GSM**	**Vodafone**
Total number of sample calls		881032	824621	NA	684263	821299	NS	962168
Total number of calls with good voice quality		823424	779195	NA	587861	793559	NS	843964
%age calls with good voice quality	≥ 95%	93.46%	94.49%	91.96%	85.91%	96.62%	NS	87.71%

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Audit Results for POI Congestion- PMR data-August								
POI congestion	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of working POIs		60	15	NA	19	30	NS	32
No. of POIs not meeting benchmark		0	0	NA	0	0	NS	0
Total Capacity of all POIs (A) - in erlangs		104007	131362	NA	25284	36801	NS	1853168
Traffic served for all POIs (B)- in erlangs		61289	40373	NA	23158	20640	NS	1247944
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	0.00%
Live Measurement Results for POI Congestion- 3 Day data-August								
POI congestion	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of working POIs		59	15	NA	19	30	NS	32
No. of POIs not meeting benchmark		0	0	NA	0	0	NS	0
Total Capacity of all POIs (A) - in erlangs		103113	131264	NA	25284	36801	NS	493341
Traffic served for all POIs (B)- in erlangs		61126	37451	NA	17006	18781	NS	159510
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	0.00%

16 ANNEXURE – SEPTEMBER-2G

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1. Network Availability								
Audit Results for Network Availability- PMR data-September								
	Benchmark	**Aircel**	**Airtel**	**BSNL CDMA**	**BSNL GSM**	**Idea**	**Reliance GSM**	**Vodafone**
Number of BTSs in the licensed service area		2885	3619	243		1893	NS	3459
Sum of downtime of BTSs in a month (in hours)		883	8902	481		18431	NS	17800
BTSs accumulated downtime (not available for service)	≤ 2%	0.04%	0.34%	0.27%	NA	1.35%	NS	0.71%
Number of BTSs having accumulated downtime >24 hours		465	25	71		16	NS	45
Worst affected BTSs due to downtime	≤ 2%	16.12%	0.69%	29.22%	NA	0.85%	NS	1.30%
Live Measurement Results for Network Availability- 3 Day live data-September								
	Benchmark	**Aircel**	**Airtel**	**BSNL CDMA**	**BSNL GSM**	**Idea**	**Reliance GSM**	**Vodafone**
Number of BTSs in the licensed service area		2885	3577	243		1857	NS	3459
Sum of downtime of BTSs in a month (in hours)		94	913	47		2016	NS	1368
BTSs accumulated downtime (not available for service)	≤ 2%	0.05%	0.35%	0.27%	NA	1.51%	NS	0.55%
Number of BTSs having accumulated downtime >24 hours		59	0	16		14	NS	6
Worst affected BTSs due to downtime	≤ 2%	2.05%	0.00%	6.58%	NA	0.75%	NS	0.17%

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2. Connection Establishment (Accessibility)								
Audit Results for CSSR, SDCCH and TCH congestion- PMR data-September								
CSSR	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
CSSR	≥ 95%	92.08%	95.62%	98.91%		97.80%	NS	98.85%
SDCCH/Paging channel congestion	≤ 1%	0.70%	1.00%	NA		0.47%	NS	0.48%
TCH congestion	≤ 2%	5.15%	1.52%	NA		1.64%	NS	1.15%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-September								
CSSR	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
CSSR	≥ 95%	96.30%	96.07%	98.89%		99.09%	NS	99.25%
SDCCH/Paging channel congestion	≤ 1%	0.42%	0.39%	NA		0.29%	NS	0.53%
TCH congestion	≤ 2%	2.13%	0.91%	NA		0.29%	NS	0.75%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-September								
CSSR	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of call attempts		NA	NA	NA	NA	NA	NS	NA
Total number of successful calls established		NA	NA	NA	NA	NA	NS	NA
CSSR	≥ 95%	NA	NA	NA	NA	NA	NS	NA
%age blocked calls		NA	NA	NA	NA	NA	NS	NA

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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 CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of calls established		213826417	209556315	318596		41621739	NS	133962255
Total number of calls dropped		4195948	2450713	3881		207001	NS	890355
Call drop rate	≤ 2%	1.96%	1.17%	1.22%	NA	0.50%	NS	0.66%
Total number of cells in the network		8604	10870	687		5679	NS	10424
Total number of cells having more than 3% TCH		1627	197	37		130	NS	205
Worst affected cells having more than 3% TCH	≤ 3%	18.91%	1.82%	5.39%	NA	2.29%	NS	1.97%
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 CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of calls established		232991271	216644666	391817		45391317	NS	168422734
Total number of calls dropped		3557246	2096503	4773		190130	NS	1095993
Call drop rate	≤ 2%	1.53%	0.97%	1.22%	NA	0.42%	NS	0.65%
Total number of cells in the network		8605	10760	687		5571	NS	10424
Total number of cells having more than 3% TCH		1252	190	38		140	NS	204
Worst affected cells having more than 3% TCH	≤ 3%	14.55%	1.77%	5.58%	NA	2.51%	NS	1.96%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-September								
Call drop rate	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of calls established		NA	NA	NA	NA	NA	NS	NA
Total number of calls dropped		NA	NA	NA	NA	NA	NS	NA
Call drop rate	≤ 2%	NA	NA	NA	NA	NA	NS	NA

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4. Voice quality								
Audit Results for Voice quality -PMR Data-September								
Voice quality	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of sample calls		23124070285	22526334766	NA		4818839253	NS	19409636675
Total number of calls with good voice quality		21047088564	22342159556	NA		4595680064	NS	18769939648
%age calls with good voice quality	≥ 95%	91.02%	99.18%	NA	NA	95.37%	NS	96.70%
Live measurement results for Voice quality-3 Day data-September								
Voice quality	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of sample calls		24134716624	22350876158	NA		4773361988	NS	22379072689
Total number of calls with good voice quality		22350044515	22167030923	NA		4614877970	NS	21728807607
%age calls with good voice quality	≥ 95%	92.61%	99.18%	NA	NA	96.68%	NS	97.09%
Drive test results for Voice quality (Average of three drive tests) - DT data-September								
Voice quality	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of sample calls		NA	NA	NA	NA	NA	NS	NA
Total number of calls with good voice quality		NA	NA	NA	NA	NA	NS	NA
%age calls with good voice quality	≥ 95%	NA	NA	NA	NA	NA	NS	NA

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5. POI Congestion							
Audit Results for POI Congestion- PMR data-September							
POI congestion	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of working POIs		60	15	NA	NA	33	NS	32
No. of POIs not meeting benchmark		0	0	NA	NA	0	NS	0
Total Capacity of all POIs (A) - in erlangs		105633	112639	NA	NA	39914	NS	1638412
Traffic served for all POIs (B)- in erlangs		62353	43327	NA	NA	13934	NS	856282
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	NA	0.00%	NS	0.00%
Live Measurement Results for POI Congestion- 3 Day data-September							
POI congestion	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of working POIs		60	15	NA	NA	33	NS	32
No. of POIs not meeting benchmark		0	0	NA	NA	0	NS	0
Total Capacity of all POIs (A) - in erlangs		105477	126403	NA	NA	39713	NS	1268397
Traffic served for all POIs (B)- in erlangs		62201	44340	NA	NA	13672	NS	950512
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	NA	0.00%	NS	0.00%

17 ANNEXURE – JULY -3G

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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		950	2333	NA	579	1386
Sum of downtime (i.e. total outage time) of Node Bs		448	8713	NA	842	7130
Node Bs downtime (not available for service)	≤ 2%	0.06%	0.50%	NA	0.20%	0.69%
Number of Node Bs having accumulated downtime of >24 hours in a month		263	27	NA	5	0
Worst affected Node Bs due to downtime	≤ 2%	27.68%	1.16%	NA	0.86%	0.00%
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		950	2298	NA	579	1386
Sum of downtime (i.e. total outage time) of Node Bs		1959	882	NA	0	684
Node Bs downtime (not available for service)	≤ 2%	0.28%	0.05%	NA	0.00%	0.69%
Number of Node Bs having accumulated downtime of >24 hours in a month		17	27	NA	0	1
Worst affected Node Bs due to downtime	≤ 2%	1.79%	1.17%	NA	0.00%	0.07%

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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%	99.32%	98.79%	NA	99.85%	99.75%
RRC Congestion	≤ 1%	0.13%	0.14%	NA	0.04%	0.03%
Circuit Switched RAB Congestion	≤ 2%	0.00%	0.12%	NA	0.00%	0.03%
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%	95.33%	98.84%	NA	99.91%	99.78%
RRC Congestion	≤ 1%	0.18%	0.12%	NA	0.03%	0.01%
Circuit Switched RAB Congestion	≤ 2%	0.00%	0.19%	NA	0.00%	0.01%
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

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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)		6438508	168428	NA	1969843	12603620
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		42680	1184	NA	1567	38163
Call drop rate (B/A*100)	≤ 2%	0.66%	0.70%	NA	0.08%	0.30%
Total no. of cells in the licensed service area (B)		2830	9054	NA	1699	4197
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		229	107	NA	9	93
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	8.09%	1.18%	NA	0.53%	2.20%
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)		8816374	15781	NA	2784552	16041778
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		52065	118	NA	1477	50742
Call drop rate (B/A*100)	≤ 2%	0.59%	0.75%	NA	0.05%	0.32%
Total no. of cells in the licensed service area (B)		2827	9054	NA	1699	4197
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		157	115	NA	4	110
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	5.56%	1.27%	NA	0.24%	2.61%
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

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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		676292045389	365107652	NA	15606570448	22938341384
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		668966790818	360720258	NA	15590096795	22682467309
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.92%	98.80%	NA	99.89%	98.88%
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		78412885654	47363938	NA	20817262976	2883294485
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		77571142171	46798051	NA	20796548331	2851204066
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.93%	98.81%	NA	99.90%	98.89%
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

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(IS/ISO 9001-2008 Certified Organisation)

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		60	15	NA	14	32
No. of POIs not meeting benchmark		0	0	NA	0	0
Total Capacity of all POIs (A) - in erlangs		103330	132694	NA	17145	1878724
Traffic served for all POIs (B)- in erlangs		61720	40180	NA	8028	1489159
POI congestion	≤ 0.5%	0.00%	0.00%	NA	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		58	15	NA	14	32
No. of POIs not meeting benchmark		0	0	NA	0	0
Total Capacity of all POIs (A) - in erlangs		100601	118491	NA	17145	457596
Traffic served for all POIs (B)- in erlangs		60668	32941	NA	8028	1373212
POI congestion	≤ 0.5%	0.00%	0.00%	NA	0.00%	0.00%

18 ANNEXURE – AUGUST-3G

Telecom Regulatory Authority of India
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1. Network Availability						
Audit Results for Network Availability- PMR data-August						
3G	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
(Number of Node Bs in the network in the licensed service area		959	2333	797	579	1387
Sum of downtime (i.e. total outage time) of Node Bs		392	8713	10748	367	10899
Node Bs downtime (not available for service)	≤ 2%	0.05%	0.50%	1.81%	0.09%	1.06%
Number of Node Bs having accumulated downtime of >24 hours in a month		241	29	15	2	14
Worst affected Node Bs due to downtime	≤ 2%	25.13%	1.24%	1.88%	0.35%	1.01%
Live Measurement Results for Network Availability- 3 Day live data-August						
3G	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
(Number of Node Bs in the network in the licensed service area		959	2299	797	579	1387
Sum of downtime (i.e. total outage time) of Node Bs		54	840	1043	0	715
Node Bs downtime (not available for service)	≤ 2%	0.08%	0.51%	1.82%	0.00%	0.72%
Number of Node Bs having accumulated downtime of >24 hours in a month		28	29	17	0	7
Worst affected Node Bs due to downtime	≤ 2%	2.92%	1.26%	2.13%	0.00%	0.50%

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

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-August						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		7884015	182274	45786685	1969301	13581694
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		48053	1310	661836	1485	44658
Call drop rate (B/A*100)	≤ 2%	0.61%	0.72%	1.45%	0.08%	0.33%
Total no. of cells in the licensed service area (B)		2846	9180	2391	1735	4203
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		224	105	71	5	96
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	7.86%	1.14%	2.97%	0.29%	2.27%
Live measurement results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate – 3 Day data-August						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		9414823	19224	289134	2752218	17685361
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		54184	136	3879	1969	53867
Call drop rate (B/A*100)	≤ 2%	0.58%	0.71%	1.34%	0.07%	0.30%
Total no. of cells in the licensed service area (B)		2841	9180	2391	1737	4203
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		161	113	12	3	90
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	5.67%	1.23%	0.50%	0.17%	2.14%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-August						
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)		231	435	469	NA	418
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		2	3	49	NA	4
Call drop rate (B/A*100)	≤ 2%	0.87%	0.69%	10.45%	NA	0.96%

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

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		760353476270	416940963	NA	16696659953	25306060216
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		752336461962	411803132	NA	16677396759	25030574868
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.95%	98.77%	NA	99.88%	98.91%
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		86548834479	41944664	NA	21016181953	23302660244
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		85637917320	41438292	NA	20994857986	23042657960
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.95%	98.79%	NA	99.90%	98.88%
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		NA	1953421	1724079	NA	2181199
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	1686608	1507372	NA	2071545
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	NA	86.34%	87.43%	NA	94.97%

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(IS/ISO 9001-2008 Certified Organisation)

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		60	15	19	14	32
No. of POIs not meeting benchmark		0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		104007	131362	25284	16932	1638412
Traffic served for all POIs (B)- in erlangs		61289	40373	23158	8048	856282
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		59	15	19	14	32
No. of POIs not meeting benchmark		0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		103113	131264	25284	16932	1268448
Traffic served for all POIs (B)- in erlangs		61126	37451	17006	8048	558955
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%

19   ANNEXURE – SEPTEMBER-3G

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

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		960	2367	NA	578	1390
Sum of downtime (i.e. total outage time) of Node Bs		268	7230	NA	22	8093
Node Bs downtime (not available for service)	≤ 2%	0.04%	0.42%	NA	0.01%	0.81%
Number of Node Bs having accumulated downtime of >24 hours in a month		135	27	NA	5	11
Worst affected Node Bs due to downtime	≤ 2%	14.06%	1.14%	NA	0.87%	0.79%
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		960	2327	NA	578	1390
Sum of downtime (i.e. total outage time) of Node Bs		29	599	NA	0	699
Node Bs downtime (not available for service)	≤ 2%	0.04%	0.36%	NA	0.00%	0.70%
Number of Node Bs having accumulated downtime of >24 hours in a month		8	27	NA	0	5
Worst affected Node Bs due to downtime	≤ 2%	0.83%	1.16%	NA	0.00%	0.36%

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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%	98.80%	99.18%	NA	99.91%	99.87%
RRC Congestion	≤ 1%	0.40%	0.04%	NA	0.05%	0.03%
Circuit Switched RAB Congestion	≤ 2%	0.00%	0.06%	NA	0.09%	0.03%
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%	99.26%	99.16%	NA	99.97%	99.89%
RRC Congestion	≤ 1%	0.71%	0.08%	NA	0.03%	0.07%
Circuit Switched RAB Congestion	≤ 2%	0.00%	0.07%	NA	0.00%	0.01%
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)		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

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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		752916481163	400535037	NA	16883459789	25943301844
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		745065399603	395661014	NA	16858619815	25660087381
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.96%	98.78%	NA	99.85%	98.91%
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		952570541968	39454943	NA	23399543746	33682658109
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		942742687618	38974506	NA	23369691224	33311995738
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.97%	98.78%	NA	99.87%	98.90%
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		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

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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		60	15	NA	14	32
No. of POIs not meeting benchmark		0	0	NA	0	0
Total Capacity of all POIs (A) - in erlangs		105633	112639	NA	12952	1638412
Traffic served for all POIs (B)- in erlangs		62353	43327	NA	6214	856282
POI congestion	≤ 0.5%	0.00%	0.00%	NA	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		60	15	NA	14	32
No. of POIs not meeting benchmark		0	0	NA	0	0
Total Capacity of all POIs (A) - in erlangs		105477	126403	NA	12952	1268397
Traffic served for all POIs (B)- in erlangs		62201	44340	NA	6214	950512
POI congestion	≤ 0.5%	0.00%	0.00%	NA	0.00%	0.00%

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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'2016 – 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