TRAI Audit Wireless Report for Assam Circle

EAST ZONE

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Submitted to:

TRAI
Telecom Regulatory Authority of India

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2 INTRODUCTION

2.1 ABOUT TRAI

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

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

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

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

2.2 OBJECTIVES

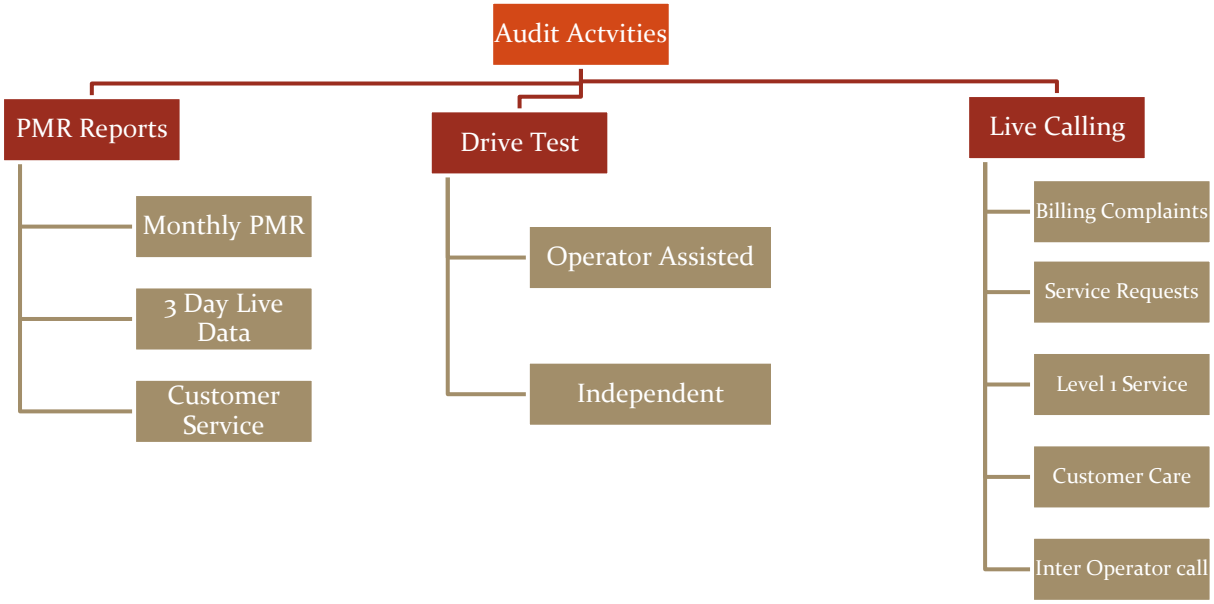
The primary objective of the Audit module is to-

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

2.3 COVERAGE

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

2.4 FRAMEWORK USED

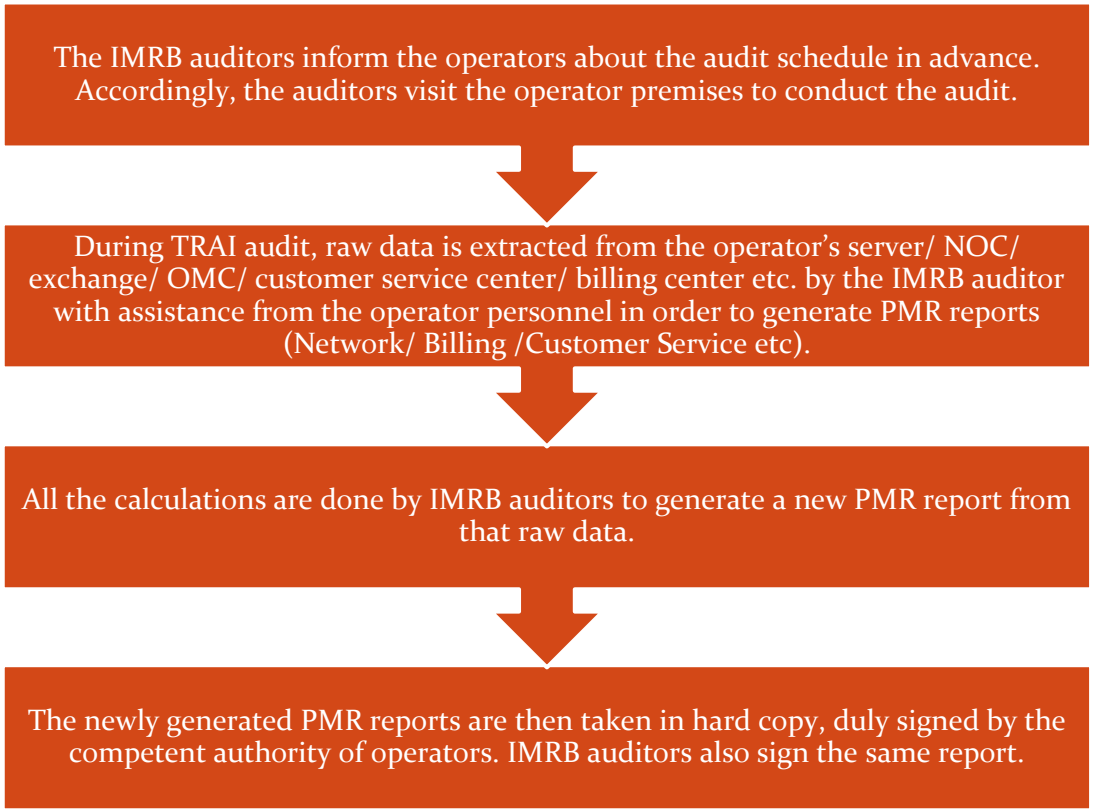


Let's discuss each of the activity in detail and the methodology adopted for each of the module.

2.4.1 PMR REPORTS

2.4.1.1 SIGNIFICANCE AND METHODOLOGY

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



The PMR report for network parameters is taken for each month of the audit quarter and is extracted and verified in the first week of the subsequent month of the audit month. For example, October 2015 audit data was collected in the month of November 2015.

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 December 2015 (OND'15) was collected in the month of January 2016.

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

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

Let us understand these formats in detail.

2.4.1.2 MONTHLY PMR 2G

This involved calculation of the various 2G Quality of Service network parameters through monthly Performance Monitoring Reports (PMR). The PMR reports were generated from the data extracted from operator's systems by the IMRB representative with the assistance of the operator at the operator's premises for the month of October, November and December 2015. The performance of operators on various parameters was assessed against the benchmarks. Parameters include-

Network Availability

- BTS accumulated downtime
- Worst affected BTS due to downtime

Connection Establishment (Accessibility)

- Call Set Up success Rate (CSSR)

Network Congestion Parameters

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

Connection Maintenance

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

Voice Quality

- % Connections with good voice quality

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

2.4.1.3 AUDIT PARAMETERS – NETWORK 2G

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

Network Related

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

2.4.1.4 MONTHLY PMR 3G

This involved calculation of the various 3G Quality of Service network parameters through monthly Performance Monitoring Reports (PMR). The PMR reports were generated from the data extracted from operator's systems by the IMRB representative with the assistance of the operator at the operator's premises for the month of October, November and December 2015. The performance of operators on various parameters was assessed against the benchmarks. Parameters include-

Network Availability

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

Connection Establishment (Accessibility)

- Call Set Up success Rate (CSSR)

Network Congestion Parameters

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

Connection Maintenance

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

Voice Quality

- % Connections with good Circuit Switched Voice Quality

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

2.4.1.5 AUDIT PARAMETERS – NETWORK 3G

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

Network Related

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

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

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

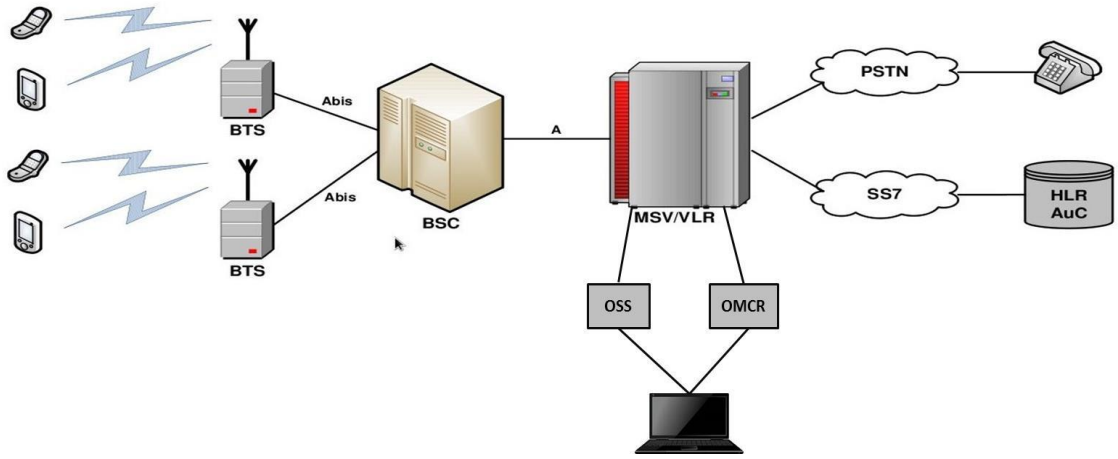
- Services Activation/ provisioning:- Activation done within 4 hours ≥ 95%
- PDP Context activation success rate:- PDP Context activation success rate ≥ 95%
- Drop Rate:- Drop Rate ≤ 5%

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

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

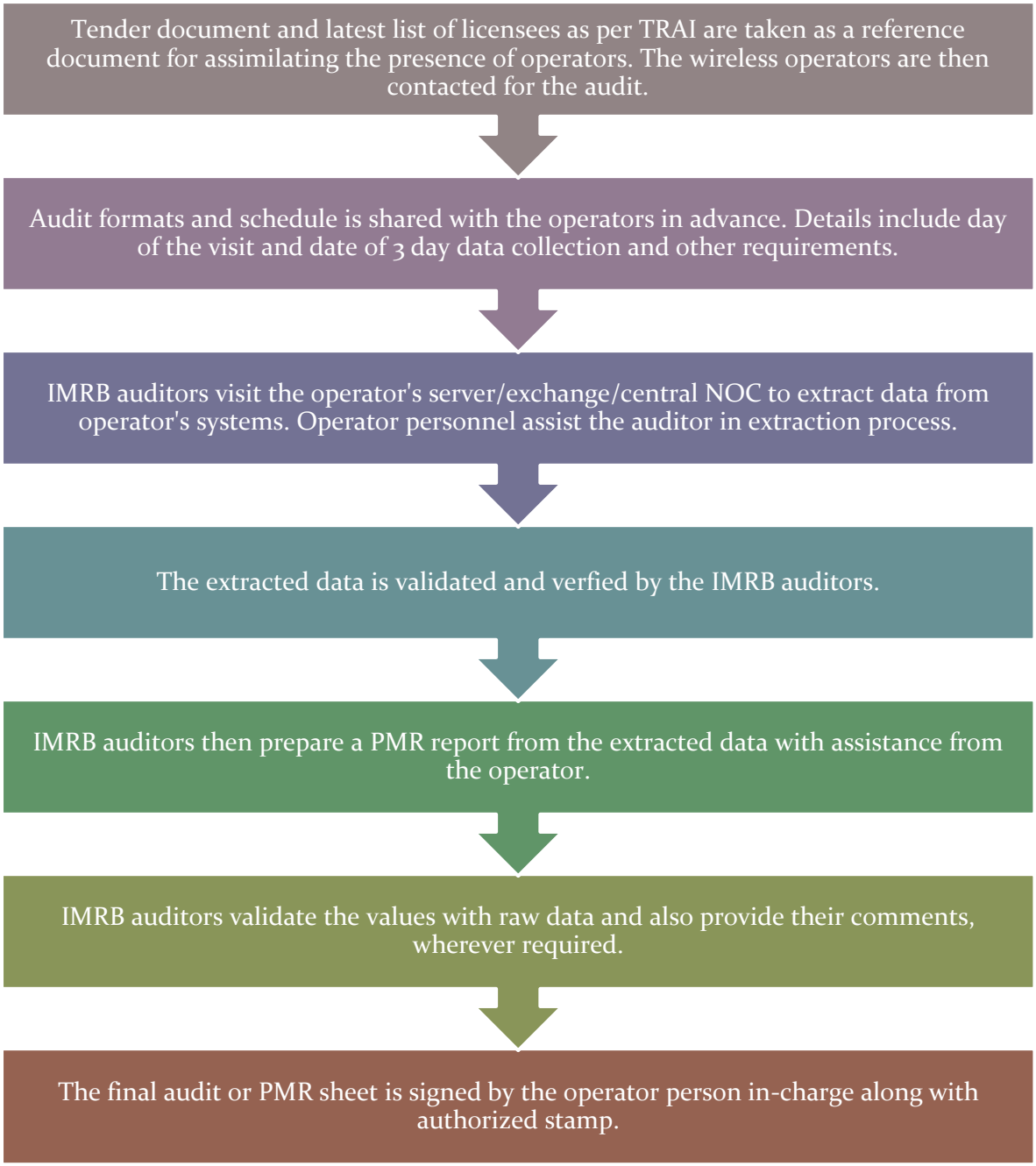
2.4.1.8 POINT OF DATA EXTRACTION

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



2.4.1.9 STEP BY STEP AUDIT PROCEDURE

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



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

2.4.1.10 CALCULATION METHODOLOGY – NETWORK PARAMETERS 2G

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

2.4.1.11 CALCULATION METHODOLOGY – NETWORK PARAMETERS 3G

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

2.4.1.12 3 DAY LIVE DATA

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

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

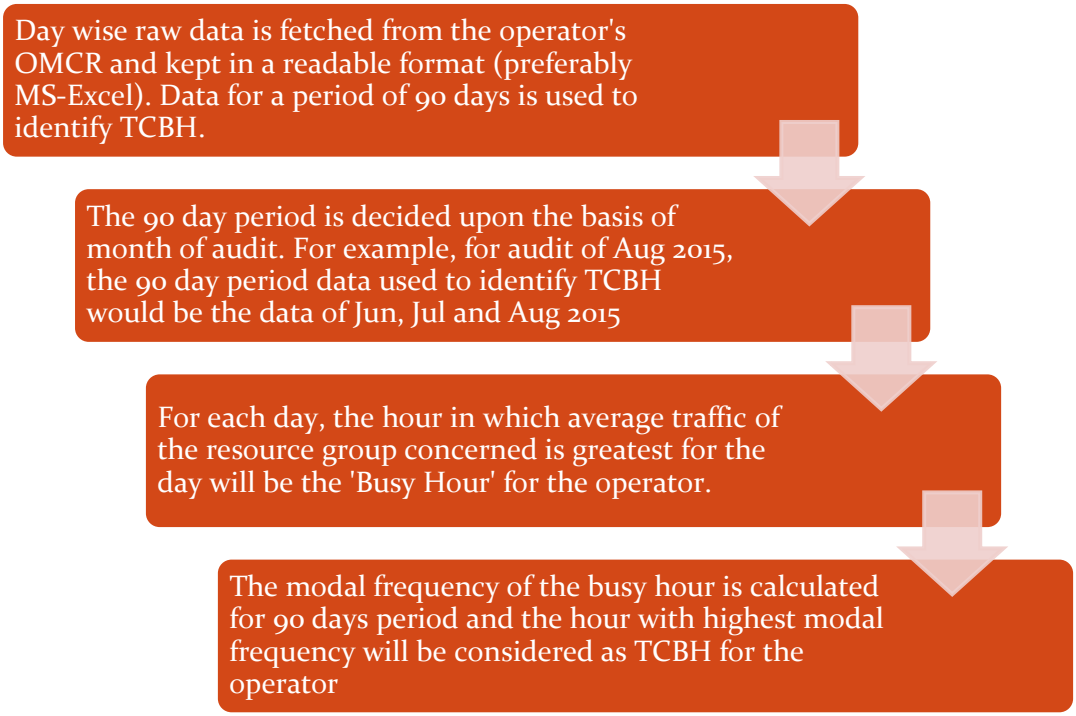
Network related parameters were evaluated for a period of 3 days in each month. 3 day live audit was conducted for 3 consecutive weekdays for each month. The data was extracted from each operator's server/ NOC etc. at the end of the 3rd day. The extracted data is then used to create a report (similar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

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

2.4.1.13 TCBH – SIGNIFICANCE AND SELECTION METHODOLOGY

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

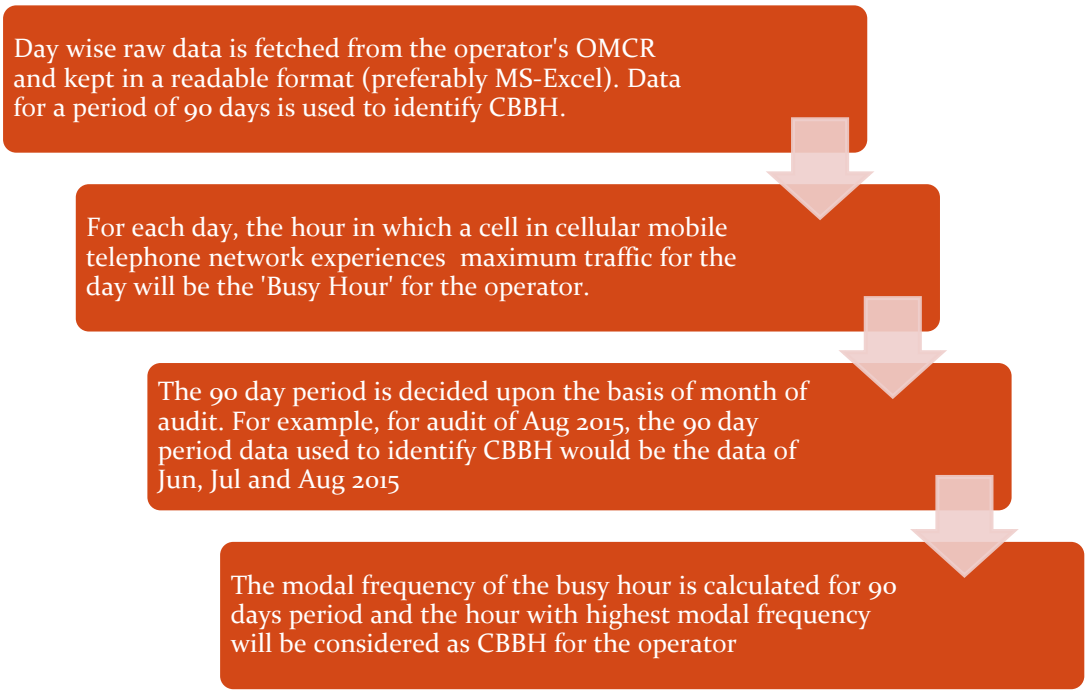
Step by step procedure to identify TCBH for an operator:



2.4.1.14 CBBH – SIGNIFICANCE AND SELECTION METHODOLOGY

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

Step by step procedure to identify CBBH for an operator:



2.4.1.15 CUSTOMER SERVICE PARAMETERS

The data to generate PMR report for customer service parameters is extracted at the operator premises and verified once every quarter in the subsequent month of the last month of the quarter. For example, data for quarter ending December 2015 (OND'15) was collected in the month of January 2016. To extract the data for customer service parameters for the purpose of audit, IMRB auditors primarily visit the following locations/ departments/ offices at the operator's end.

- Central Billing Center
- Central Customer Service Center

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

The Customer Service Quality Parameters include the following:

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

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

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

2.4.1.16 AUDIT PARAMETERS – CUSTOMER SERVICE

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

2.4.1.17 CALCULATION METHODOLOGY – CUSTOMER SERVICE PARAMETERS

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

2.4.2 LIVE CALLING

2.4.2.1 SIGNIFICANCE AND METHODOLOGY

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

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

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

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

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

Live calling activity was carried out during the period of December 2015. 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 November 2015 was considered for live calling activity conducted in December 2015.

A detailed explanation of each parameter is explained below.

2.4.2.2 BILLING COMPLAINTS

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

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

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

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

TRAI benchmark-

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

2.4.2.3 SERVICE COMPLAINTS REQUESTS

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

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

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

2.4.2.4 LEVEL 1 SERVICE

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

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

In OND'15, IMRB has tried contacting the list of Level 1 services provided by TRAI as per the NNP (National Numbering Plan).

2.4.2.4.1 PROCESS TO TEST LEVEL 1 SERVICES

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

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

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

2.4.2.5 CUSTOMER CARE

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

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

The process for this parameter is stated below.

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

2.4.2.6 INTER OPERATOR CALL ASSESEMENT

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

2.4.3 VOICE DRIVE TEST – 2G & 3G

2.4.3.1 SIGNIFICANCE AND METHODOLOGY

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

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

IMRB conducted two types of drive tests as mentioned below.

- Operator Assisted Drive Test
- Independent Drive Test

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

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

SSAs are selected according to the total no. of SSAs on that region and audited in each quarter, at least 1 SSA in each month it may be more depends on the total no. of drive on that circle. The drive tests were conducted for all operators in the circle, for both 2G and 3G voice services. As per TRAI instructions, the 2G drive was done in 2G only mode, while 3G drive test was conducted in dual mode (3G on priority).

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

1. Normal SSA
2. Difficult SSA

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

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

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

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

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

2.4.3.3 INDEPENDENT DRIVE TEST – 2G & 3G

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

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

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

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

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

- ✓ Total RxQual Samples– A
- ✓ RxQual samples with 0-5 value – B
- ✓ %age samples with good voice quality = B/A x 100

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

2.4.4 WIRELESS DATA DRIVE TEST – 2G & 3G

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

2.4.4.1 METHODOLOGY

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

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

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

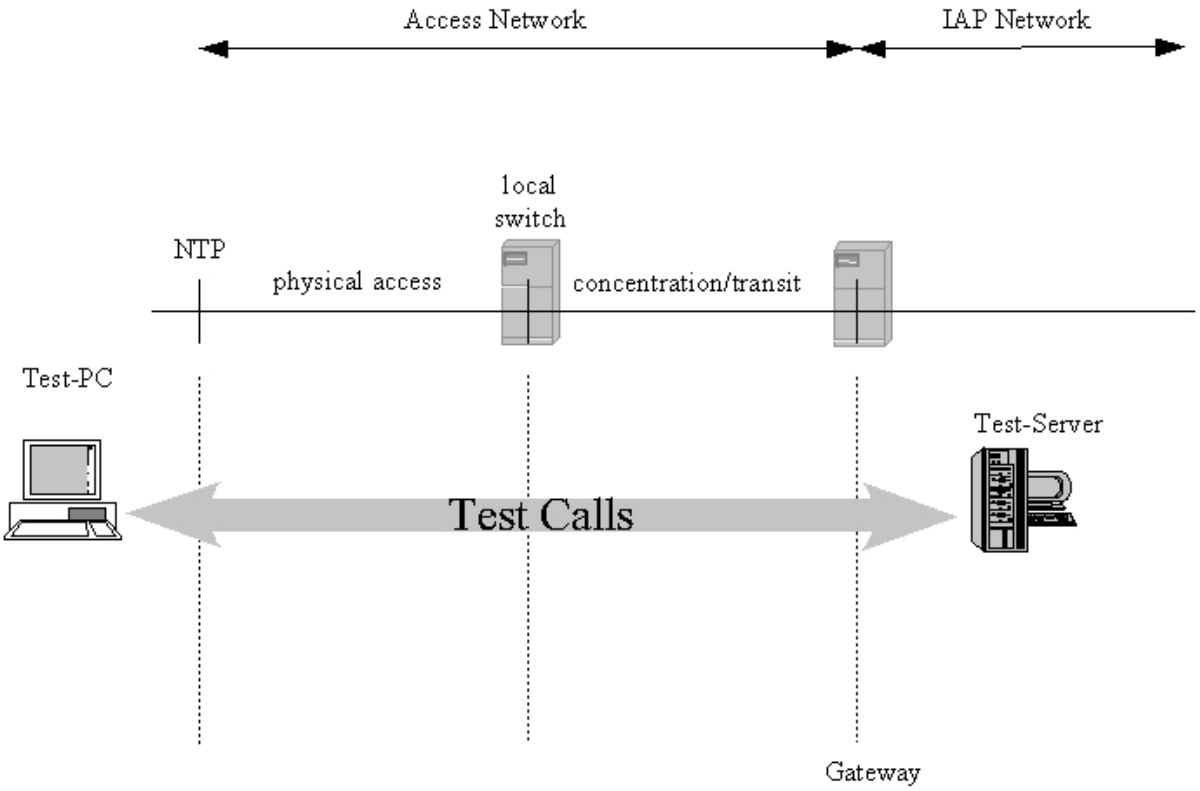


Figure for Measurement set-up

2.4.4.2 REQUIREMENTS FOR THE TEST-SERVER

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

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

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

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

2.4.4.3 TEST FILES

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

2.4.4.4 REPRESENTATIVENESS OR NUMBER OF TEST CALLS

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

2.4.4.5 PARAMETERS EVALUATED DURING DATA DRIVE TEST AT HOTSPOTS

2.4.4.5.1 SUCCESSFUL DATA TRANSMISSIONS DOWNLOAD ATTEMPTS

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

Measurement:

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

Successful data transmission download attempts =

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

2.4.4.5.2 SUCCESSFUL DATA TRANSMISSION UPLOAD ATTEMPTS

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

Measurement:

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

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

2.4.4.5.3 MINIMUM DOWNLOAD SPEED

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

Measurement:

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

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

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

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

2.4.4.5.4 AVERAGE THROUGHPUT FOR PACKET DATA

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

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

Measurement:

The average throughput for packet data should be calculated from all the test calls made according to the measurement setup.

Test calls are made to weigh the results according to the patterns of real traffic. Average throughput is calculated as the average of all such test calls.

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

2.4.4.5.5 LATENCY

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

Measurement:

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

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

2.5 OPERATORS COVERED 2G AND 3G

Name of Operator	Number of Subscriber as per VLR-2G
Aircel	3603794
Airtel	NDR
BSNL CDMA	8141
BSNL GSM	NDR
Idea	1061315
Reliance GSM	NDR
Vodafone	4108971
Name of Operator	**Number of Subscriber as per VLR-3G**
Aircel	NDR
Airtel	NDR
BSNL WCDMA	NDR
Reliance WCDMA	NDR

Dec'15 VLR data was considered for the number of subscribers.

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

Airtel and Vodafone did not submit the data for 3G services

2.6 COLOUR CODES TO READ THE REPORT

Not Meeting the benchmark **Best Performing Operator**

3 EXECUTIVE SUMMARY-2G

The objective assessment of Quality of Service (QoS) carried out by IMRB gives an insight into the overall performance of various operators in the 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 due to 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	11.44%	12.98%	92.63%	0.75%	5.17%	1.73%	12.61%	91.43%
Airtel	0.24%	0.77%	96.10%	0.33%	0.88%	1.27%	1.29%	99.04%
BSNL CDMA	13.00%	24.55%	98.77%	NA	2.90%	1.63%	8.01%	93.01%
BSNL GSM	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR
Idea	0.97%	0.79%	96.00%	0.71%	1.47%	0.48%	1.78%	95.80%
Reliance GSM	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR
Vodafone	22.32%	1.65%	99.14%	0.36%	0.86%	0.66%	2.49%	97.31%

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

NDR: data not received

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

BTSs Accumulated Downtime:

Aircel, Vodafone and BSNL CDMA did not meet the benchmark. Minimum BTS Accumulated downtime was recorded for Airtel at 0.24%.

Worst Affected BTSs Due to Downtime:

Aircel and BSNL CDMA failed to meet the benchmark. Minimum worst affected BTSs due to downtime was recorded for Airtel at 0.77%.

Call Set-up Success Rate (CSSR):

Airtel failed to meet the benchmark for CSSR. The maximum CSSR was observed for Vodafone with 99.14%.

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

SDCCH/ Paging Chl. Congestion:

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

TCH Congestion:

Aircel and BSNL CDMA failed to meet the benchmark for TCH congestion, while Vodafone performed the best on TCH congestion.

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 0.48%.

Worst Affected Cells Having More than 3% TCH Drop:

Aircel and BSNL CDMA failed to meet the benchmark. Best performance was recorded for Airtel at 1.29%.

Voice Quality

Aircel and BSNL CDMA failed to meet the benchmark. Best performance was recorded for Airtel at 99.04%.

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

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

3.1.1 PMR DATA - OCTOBER FOR 2G

Month								
Name of Service Provider Month October	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	3.31%	19.09%	92.48%	0.85%	5.43%	1.84%	12.85%	91.10%
Airtel	NDR	NDR	NDR	NDR	NDR	NA	NA	NA
BSNL CDMA	14.54%	28.40%	98.68%	NA	3.21%	1.67%	8.88%	NA
BSNL GSM	NDR	NDR	NDR	NDR	NDR	NA	NA	NA
Idea	1.09%	0.73%	97.29%	0.45%	1.07%	0.62%	2.31%	95.70%
Reliance GSM	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR
Vodafone	0.53%	1.79%	99.41%	0.21%	0.59%	0.53%	2.23%	97.82%

3.1.2 PMR DATA – NOVEMBER FOR 2G

Month								
Name of Service Provider Month November	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	15.44%	4.18%	92.93%	0.49%	4.77%	1.71%	12.19%	91.49%
Airtel	0.21%	0.55%	96.10%	0.33%	0.88%	1.24%	1.34%	99.02%
BSNL CDMA	11.78%	23.87%	98.77%	NA	2.69%	1.72%	8.15%	NA
BSNL GSM	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR
Idea	0.89%	0.73%	95.58%	0.81%	1.81%	0.49%	1.70%	95.71%
Reliance GSM	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR
Vodafone	26.70%	1.66%	99.64%	0.25%	0.36%	0.50%	2.31%	97.82%

3.1.3 PMR DATA - DECEMBER FOR 2G

Month								
Name of Service Provider Month December	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	15.57%	15.68%	92.49%	0.91%	5.31%	1.56%	12.79%	91.71%
Airtel	0.28%	0.98%	NDR	NDR	NDR	1.29%	1.25%	99.05%
BSNL CDMA	12.67%	21.40%	98.87%	NA	2.82%	1.51%	6.99%	93.01%
BSNL GSM	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR
Idea	0.94%	0.90%	95.12%	0.88%	1.53%	0.35%	1.35%	95.97%
Reliance GSM	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR
Vodafone	39.71%	1.50%	98.38%	0.63%	1.62%	0.79%	2.94%	96.85%

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	1.79%	0.71%	96.37%	0.53%	2.40%	1.36%	13.35%	92.56%
Airtel	0.21%	0.00%	96.70%	0.14%	0.48%	0.93%	1.33%	99.22%
BSNL CDMA	11.22%	1.23%	98.60%	NA	3.26%	1.52%	7.33%	NDR
BSNL GSM	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR
Idea	0.97%	0.67%	98.38%	0.33%	0.74%	0.34%	2.03%	96.38%
Reliance GSM	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR
Vodafone	0.45%	0.09%	99.31%	0.43%	0.69%	0.68%	2.74%	97.44%

For Reliance GSM, Data for, October, November'15 and December'15 could not be audited due to a server issue at operator's end. The same was pre-informed to TRAI by the operator.

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

BTSs Accumulated Downtime:

BSNL CDMA did not meet the benchmark. Minimum BTS Accumulated downtime was recorded for Airtel at 0.21%.

Worst Affected BTSs Due to Downtime:

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

Call Set-up Success Rate (CSSR):

All operators met the benchmark for CSSR. The maximum CSSR was observed for Vodafone with 99.31%.

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

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

SDCCH/ Paging Chl. Congestion:

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

TCH Congestion:

Aircel and BSNL CDMA failed to meet the benchmark for TCH congestion, while Airtel performed the best on TCH congestion.

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 0.34%.

Worst Affected Cells Having More than 3% TCH Drop:

Aircel and BSNL CDMA failed to meet the benchmark. Best performance was recorded for Airtel at 1.33%.

Voice Quality

Aircel failed to meet the benchmark. Best performance was recorded for Airtel at 99.22%.

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

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

3.2.1 3 DAY DATA - OCTOBER FOR 2G

3 Day								
Name of Service Provider 3 Day October	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	2.58%	2.14%	96.56%	0.50%	2.26%	1.32%	13.91%	92.47%
Airtel	NDR	NDR	NDR	NDR	NDR	NA	NA	NA
BSNL CDMA	11.44%	1.65%	98.29%	NA	3.98%	1.78%	6.84%	NA
BSNL GSM	NDR	NDR	NDR	NDR	NDR	NA	NA	NA
Idea	0.88%	0.61%	98.12%	0.48%	0.75%	0.43%	2.76%	96.27%
Reliance GSM	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR
Vodafone	0.42%	0.13%	99.66%	0.31%	0.34%	0.48%	2.48%	98.22%

3.2.2 3 DAY DATA – NOVEMBER FOR 2G

3 Day								
Name of Service Provider 3 Day November	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	BTSs Accumulated downtime (not available for service)	Worst affected BTSs due to downtime	Call Set-up Success Rate (within licensee's own network)	SDCCH/ Paging Chl. Congestion	TCH Congestion	Call Drop Rate (%age)	Worst affected cells having more than 3% TCH drop	%age of connection with good voice quality
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel	0.13%	0.00%	96.17%	0.41%	2.66%	1.38%	12.09%	92.31%
Airtel	0.19%	0.00%	96.76%	0.14%	0.53%	0.95%	1.64%	99.23%
BSNL CDMA	11.03%	2.06%	98.78%	NA	2.45%	1.54%	7.86%	NA
BSNL GSM	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NA
Idea	0.85%	0.73%	97.97%	0.16%	0.83%	0.30%	1.97%	96.20%
Reliance GSM	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR
Vodafone	0.32%	0.01%	99.54%	0.23%	0.46%	0.58%	2.73%	97.92%

3.2.3 3 DAY DATA - DECEMBER FOR 2G

3 Day								
Name of Service Provider 3 Day December	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	2.67%	0.00%	96.37%	0.68%	2.28%	1.39%	13.99%	92.86%
Airtel	0.24%	0.00%	96.63%	0.14%	0.42%	0.91%	1.02%	99.22%
BSNL CDMA	11.20%	0.00%	98.74%	NA	3.33%	1.47%	7.28%	NA
BSNL GSM	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR
Idea	1.19%	0.67%	99.05%	0.35%	0.65%	0.30%	1.38%	96.67%
Reliance GSM	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR
Vodafone	0.61%	0.13%	98.73%	0.75%	1.27%	0.75%	3.00%	97.03%

3.3 PMR DATA – 3 MONTHS- CONSOLIDATED FOR 3G

For Reliance GSM, data for October, November'15 and December'15 could not be audited due to a server issue at operator's end. The same was pre-informed to TRAI by the operator.

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

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	51.61%	12.38%	96.92%	0.71%	0.00%	0.64%	8.15%	98.18%
BSNL WCDMA	14.54%	28.40%	98.68%	3.21%	NDR	1.67%	9.02%	NDR

Note: Airtel & Reliance did not submit data

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

Node Bs downtime:

Aircel and BSNL did not meet the benchmark for Node Bs downtime.

Worst affected Node Bs due to downtime:

Aircel and BSNL CDMA 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 Vodafone with 99.68%.

RRC Congestion:

BSNL failed to meet the TRAI 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 and BSNL 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 - OCTOBER FOR 3G

Month								
Name of Service Provider Month October	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Call drop rate	Worst affected cells having more than 3% Circuit switched voice drop	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel	13.07%	14.35%	96.05%	1.99%	0.00%	0.73%	NA	95.94%
BSNL WCDMA	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR

3.3.2 PMR DATA – NOVEMBER FOR 3G

Month								
Name of Service Provider Month November	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	1.85%	12.99%	97.03%	0.04%	0.00%	0.62%	7.76%	99.05%
BSNL WCDMA	14.54%	28.40%	98.68%	3.21%	0.00%	1.67%	9.02%	NDR

3.3.3 PMR DATA - DECEMBER FOR 3G

Month								
Name of Service Provider Month December	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	15.60%	10.64%	97.68%	0.08%	0.00%	0.61%	8.49%	99.03%
BSNL WCDMA	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR

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	34.65%	8.48%	99.84%	0.90%	0.34%	0.64%	7.74%	97.39%
BSNL WCDMA	15.03%	28.40%	98.24%	2.75%	NDR	1.68%	9.16%	NDR

Note: Airtel & Reliance did not submit data

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

Node Bs downtime:

Aircel and BSNL did not meet the benchmark for Node Bs downtime.

Worst affected Node Bs due to downtime:

Aircel and BSNL CDMA 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 Aircel with 99.84%.

RRC Congestion:

BSNL failed to meet the TRAI 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 and BSNL 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 3 day live data.

3.4.1 3 DAY DATA - OCTOBER FOR 3G

3 Day								
Name of Service Provider 3 Day October	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	10.99%	14.35%	99.73%	1.36%	1.01%	0.65%	NA	95.94%
BSNL WCDMA	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR

3.4.2 3 DAY DATA – NOVEMBER FOR 3G

3 Day								
Name of Service Provider 3 Day November	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	19.11%	12.99%	101.47%	1.30%	0.00%	0.54%	7.74%	99.06%
BSNL CDMA	15.03%	28.40%	98.24%	2.75%	0.00%	1.68%	9.16%	NDR

3.4.3 3 DAY DATA - DECEMBER FOR 3G

3 Day								
Name of Service Provider 3 Day December	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Call drop rate	Worst affected cells having more than 3% Circuit switched voice drop	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel	2.38%	1.31%	98.31%	0.05%	0.00%	0.64%	NA	98.09%
BSNL WCDMA	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR

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	72.11%	99.02%	1.63%	NDR	99.81%	1.38%
Airtel	NDR	NDR	NDR	NDR	NDR	NDR
BSNL CDMA	NDR	NDR	NDR	NDR	NDR	NDR
BSNL GSM	NDR	NDR	NDR	NDR	NDR	NDR
Idea	99.99%	98.70%	0.16%	NDR	99.29%	0.17%
Reliance GSM	NDR	100.00%	NDR	NDR	NDR	NDR
Vodafone	99.76%	NDR	NDR	NDR	NDR	NDR

NDR: Data did not received from Operators

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

Activation done within 4 hours:

Aircel did not meet 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 monthly as well as 3days live.

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	NDR	NDR	NDR	NDR	NDR	NDR
Airtel	NDR	NDR	NDR	NDR	NDR	NDR
BSNL WCDMA	NDR	NDR	NDR	NDR	NDR	NDR
Reliance WCDMA	NDR	NDR	NDR	NDR	NDR	NDR

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

NDR: Data were not submitted by any operators for 3G.

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

3.7 LIVE CALLING DATA - CONSOLIDATED

Name of Service Provider	Metering and Billing		Response time to customer for assistance		Level 1 Service	Service Requests
	%age complaints resolved within 4 weeks	%age complaints resolved within 6 weeks	Accessibility of call centre/ customer care	Percentage of calls answered by the operators (voice to	Call answered	Complaint /Request attended to Satisfaction
Benchmark	98%	100%	≥ 95%	≥ 95%	≥ 95%	
Aircel	67.00%	70.00%	97.00%	100.00%	69.67%	74.00%
Airtel	53.33%	63.33%	22.00%	59.09%	80.00%	77.00%
BSNL CDMA	0.00%	100.00%	91.00%	95.60%	94.00%	NA
BSNL GSM	69.00%	73.00%	10.00%	90.00%	94.67%	67.00%
Idea	65.00%	79.00%	46.00%	100.00%	79.33%	67.00%
Reliance GSM	72.00%	79.00%	13.00%	84.62%	83.67%	71.00%
Vodafone	65.00%	77.00%	74.00%	91.89%	74.67%	71.00%

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 except BSNL CDMA for within 6 week.

Complaint/Request Attended to Satisfaction

All operators performed satisfactorily in terms of satisfaction of the customers for service requests. Airtel recorded the best performance at 77%.

Level 1 Service

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

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

Accessibility of Call Centre/Customer Care-IVR

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

Customer Care / Helpline Assessment (voice to voice)

All operators failed to meet the benchmark for the parameter except Aircel, Idea and BSNL CDMA.

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	0.08%	0.17%	100.00%	100.00%	100.00%	92.09%	79.31%
Airtel	0.05%	0.00%	100.00%	100.00%	100.00%	100.00%	96.06%
BSNL CDMA	0.05%	0.00%	100.00%	100.00%	100.00%	100.00%	97.92%
BSNL GSM	0.01%	0.00%	100.00%	100.00%	100.00%	96.74%	95.83%
Idea	0.29%	0.05%	100.00%	100.00%	100.00%	97.48%	99.86%
Reliance GSM	0.09%	0.02%	99.73%	100.00%	100.00%	98.72%	93.43%
Vodafone	0.17%	0.08%	100.00%	100.00%	100.00%	99.61%	100.00%

Metering and Billing Credibility – Postpaid 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. BSNL GSM had the best performance with 0.01% billing disputes.

Metering and Billing Credibility – Prepaid Subscribers

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

Resolution of billing complaints

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

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

All the operators met the TRAI benchmark of providing credit or waiver within one week in case of complaints received.

Customer Care Percentage of calls answered by the IVR

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

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

Aircel and Reliance GSM failed to meet the TRAI specified benchmark of 95%. Vodafone recorded the best performance for the parameter.

3.9 INTER OPERATOR CALL ASSESSMENT - CONSOLIDATED

6. Inter Operator Call Assessment							
Inter operator call Assessment To↓ From→	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Aircel	NA	95.00%	94.00%	94.00%	93.00%	95.00%	97.00%
Airtel	93.00%	NA	96.00%	96.00%	95.00%	93.00%	97.00%
BSNL CDMA	92.00%	95.00%	NA	95.00%	94.00%	93.00%	93.00%
BSNL GSM	95.00%	94.00%	93.00%	NA	95.00%	94.00%	95.00%
Idea	88.00%	89.00%	91.00%	93.00%	NA	94.00%	96.00%
Reliance GSM	85.00%	95.00%	93.00%	92.00%	95.00%	NA	93.00%
Vodafone	90.00%	93.00%	92.00%	94.00%	94.00%	93.00%	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 any problems in connecting to other operators.

4 CRITICAL FINDINGS

PMR Consolidated (Network Parameters) for 2G

- Aircel, Vodafone and BSNL CDMA did not meet the benchmark for BTS Accumulated downtime.
- Aircel and BSNL CDMA failed to meet the benchmark for worst affected BTSs due to downtime.
- Airtel failed to meet the benchmark for CSSR
- Aircel and BSNL CDMA failed to meet the benchmark for TCH congestion.
- Aircel and BSNL CDMA failed to meet the benchmark for Worst Affected Cells Having More than 3% TCH Drop.
- Aircel and BSNL CDMA failed to meet the benchmark for Voice Quality.

3 Day Live Measurement (Network Parameters) for 2G

- BSNL CDMA did not meet the benchmark for BTS Accumulated downtime.
- Aircel and BSNL CDMA failed to meet the benchmark for TCH congestion.
- Aircel and BSNL CDMA failed to meet the benchmark for Worst Affected Cells Having More than 3% TCH Drop.
- Aircel failed to meet the benchmark for Voice Quality

PMR Consolidated (Network Parameters) for 3G

- Aircel and BSNL did not meet the benchmark for Node Bs downtime.
- Aircel and BSNL CDMA failed to meet the benchmark for Worst affected Node Bs due to downtime.
- BSNL failed to meet the TRAI benchmark for RRC Congestion.
- Aircel and BSNL failed to meet the benchmark for worst affected cells having more than 3% Circuit switched voice drop rate.

3 Day Live Measurement (Network Parameters) for 3G

- Aircel and BSNL did not meet the benchmark for Node Bs downtime.
- Aircel and BSNL CDMA failed to meet the benchmark for Worst affected Node Bs due to downtime.
- BSNL failed to meet the TRAI benchmark for RRC Congestion.
- Aircel and BSNL failed to meet the benchmark for worst affected cells having more than 3% Circuit switched voice drop rate

Wireless data Services for 2G & 3G

- Aircel 2G did not meet the benchmark for activation done within 4 hours for monthly, however for 3G data not received from operators.

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 except BSNL CDMA for within 6 week.
- 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.
- For the IVR aspect, all operators failed to meet the TRAI benchmark of Accessibility of Call Centre/Customer Care-IVR, except Aircel.
- All operators failed to meet the benchmark for the parameter Customer Care / Helpline Assessment (voice to voice) except Aircel, Idea and BSNL CDMA.

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, Aircel failed to meet the benchmark of charging disputes.

Customer Care

- All operators met the benchmark of Customer Care Percentage of calls answered by the IVR except Aircel.
- Aircel and Reliance GSM failed to meet the TRAI specified benchmark of Customer Care Percentage of calls answered by the operators (Voice to Voice) within 90 seconds.

Drive Test for 2G

- In Jorhat SSA Aircel, Airtel and BSNL CDMA did not meet the benchmark for Voice Quality in outdoor locations and Vodafone did not meet the benchmark in indoor as well as outdoor locations.
- In Jorhat SSA Aircel BSNL CDMA and BSNL GSM failed to meet the benchmark for call drop rate in outdoor locations and Vodafone did not meet the benchmark in indoor location.
- In Nagaon SSA Aircel, Airtel, BSNL CDMA and Idea failed to meet the benchmark for Voice Quality in outdoor locations; however Vodafone failed to meet the benchmark in indoor location. BSNL GSM failed to meet the benchmark in outdoor as well as indoor locations.
- In Nagaon SSA Aircel and BSNL CDMA failed to meet the benchmark for CSSR in outdoor locations and BSNL GSM did not meet in outdoor as well as indoor locations.
- In Nagaon SSA BSNL CDMA and BSNL GSM failed to meet the benchmark for call drop rate in outdoor locations.

Drive Test for 3G

- In Jorhat SSA all the operators failed to meet the benchmark for Voice Quality in indoor as well as outdoor locations.
- In Jorhat SSA Vodafone WCDMA failed to meet the benchmark for CSSR in outdoor locations.

- In Jorhat SSA BSNL WCDMA failed to meet the benchmark for call drop rate in outdoor locations.
- In Nagaon SSA Airtel and BSNL WCDMA failed to meet the benchmark for Voice Quality in outdoor locations. And Vodafone did not meet the benchmark in both the locations.
- In Nagaon SSA BSNL WCDMA failed to meet the benchmark for CSSR in indoor as well as outdoor locations & Vodafone in outdoor locations.
- In Nagaon SSA BSNL WCDMA failed to meet the benchmark for call drop rate in outdoor locations.

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 –**

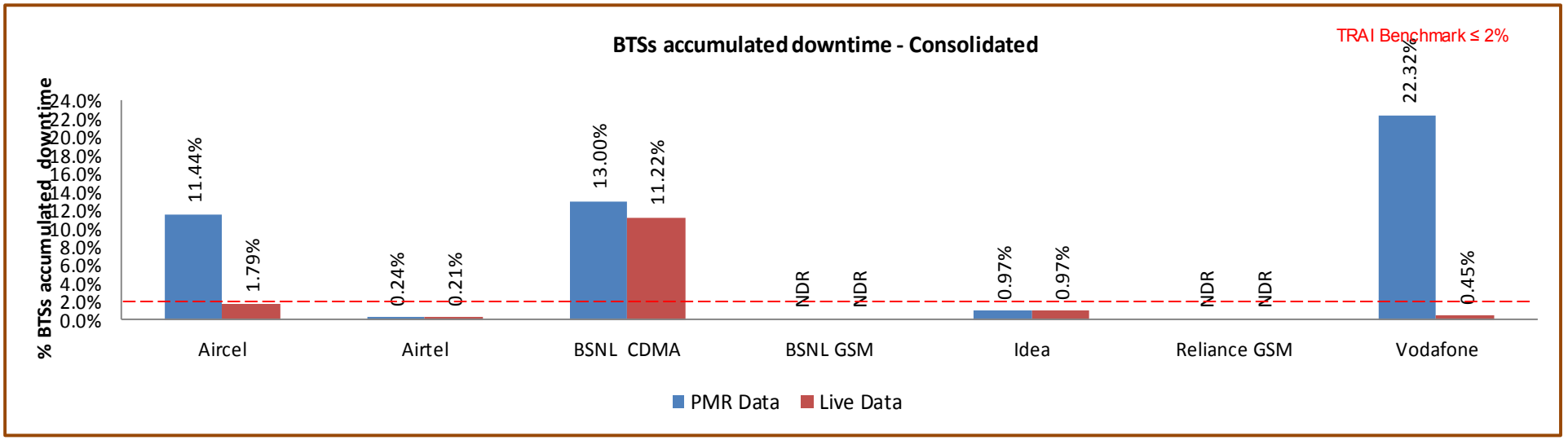
    a. BTSs Accumulated downtime (not available for service) ≤ 2%

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.

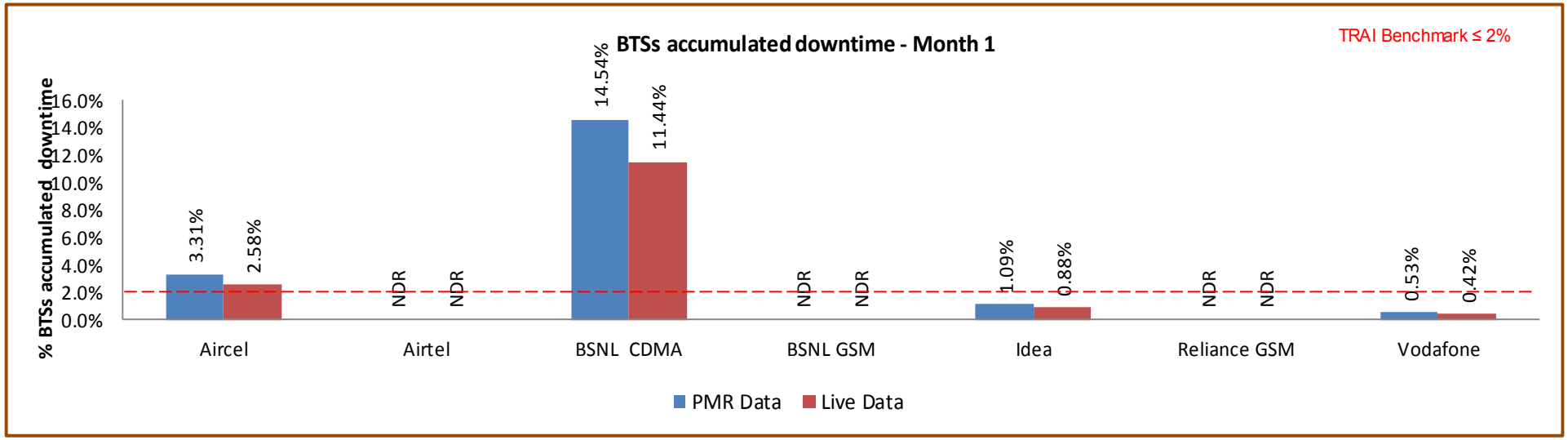
5.1.2 KEY FINDINGS - CONSOLIDATED



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

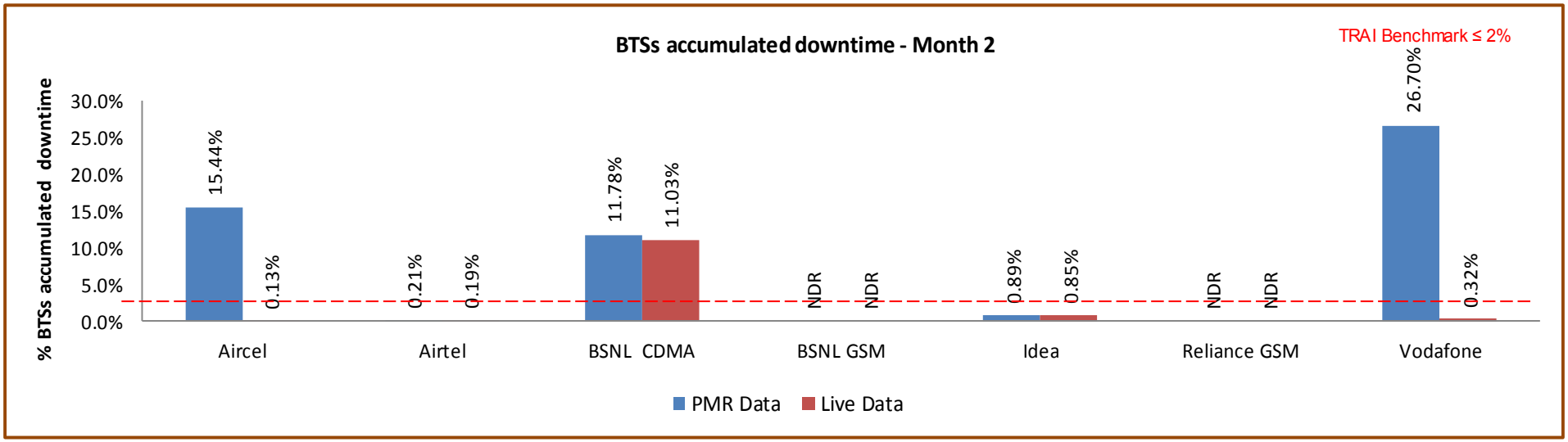
Aircel, Vodafone and BSNL CDMA did not meet the benchmark on aspect of BTS accumulated downtime as per audit/PMR data.

5.1.2.1 KEY FINDINGS – MONTH 1



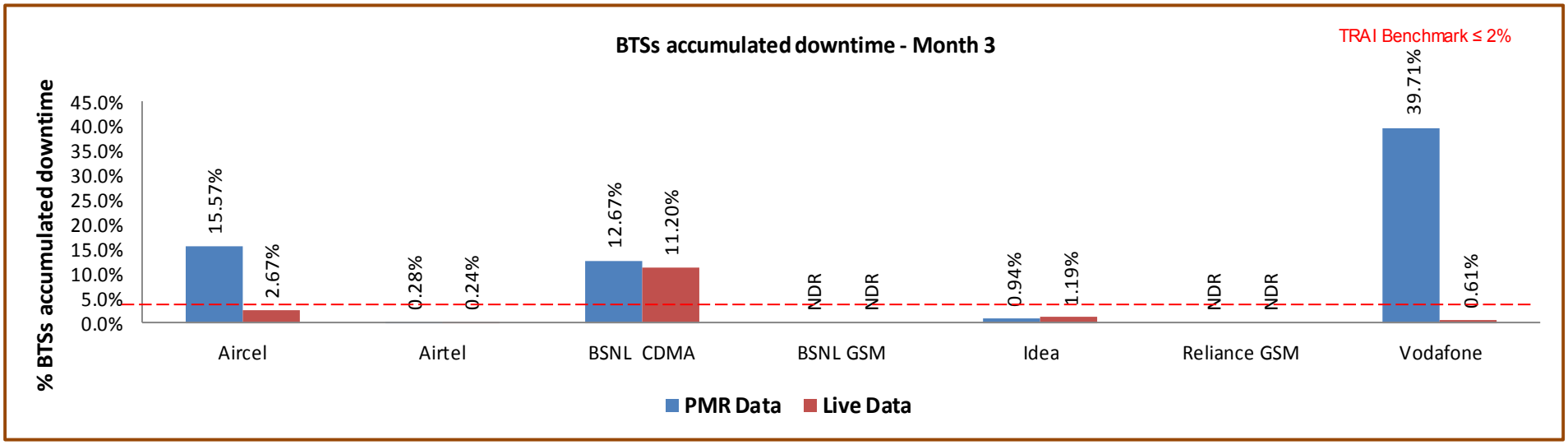
Data Source: Operations and Maintenance Center (OMC) of the operators

5.1.2.2 KEY FINDINGS – MONTH 2



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

5.1.2.3 KEY FINDINGS – MONTH 3



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

5.2 WORST AFFECTED BTS DUE TO DOWNTIME

5.2.1 PARAMETER DESCRIPTION

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

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

- **Computation Methodology –**

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

- **TRAI Benchmark –**

  a. Worst affected BTSs due to downtime ≤ 2%

- **Audit Procedure –**

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

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

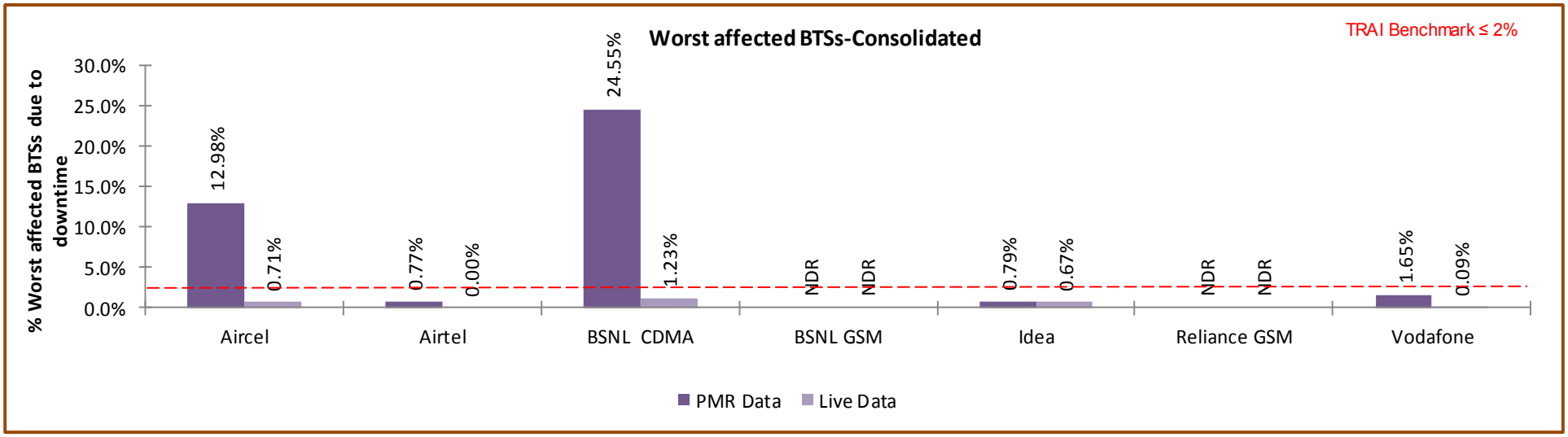
  iii. Data is extracted from system log of the server of the operator. This data is in raw format which is further processed to arrive at the cumulative values.

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

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

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

5.2.2 KEY FINDINGS – CONSOLIDATED

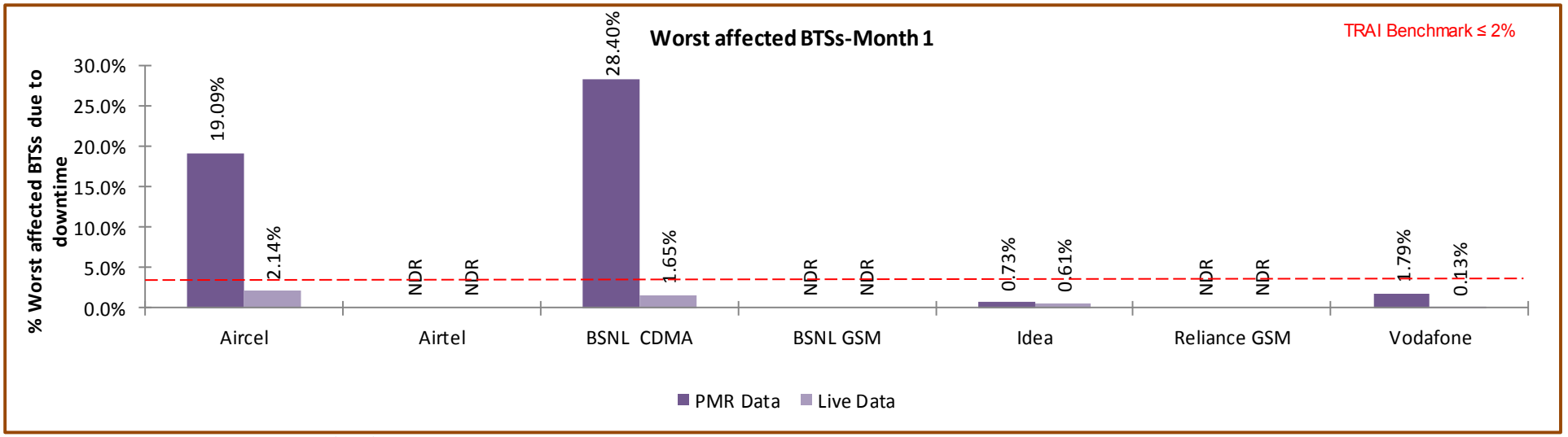


Data Source: Operations and Maintenance Center (OMC) of the operators

Aircel and BSNL CDMA did not meet the benchmark for worst affected BTSs due to downtime as per audit/PMR data.

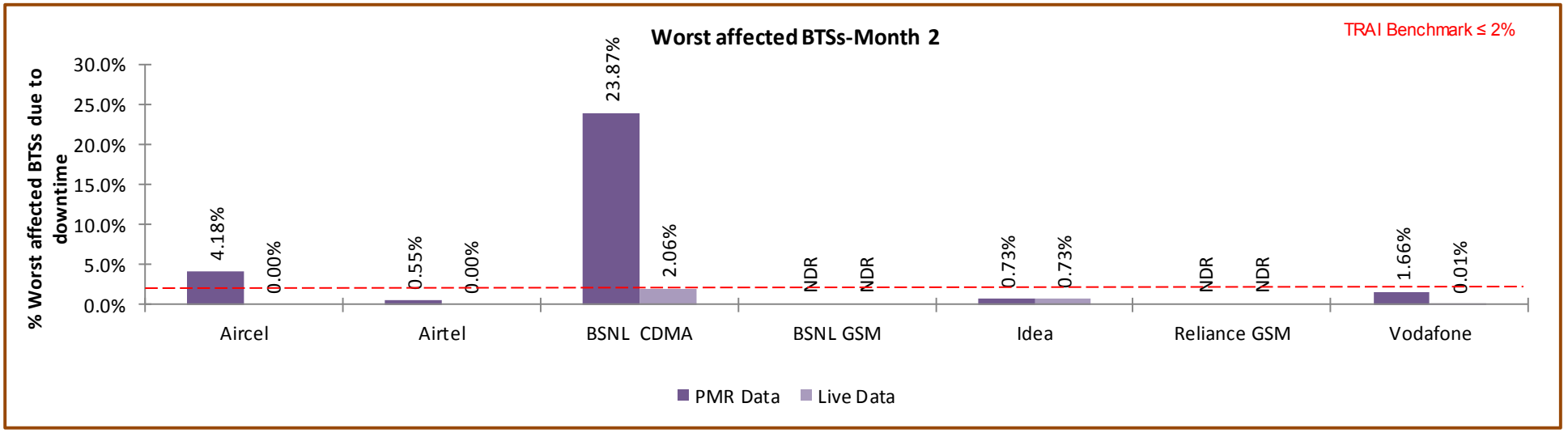
Significant difference was observed between PMR & live measurement data for Aircel and BSNL CDMA. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for three days.

5.2.2.1 KEY FINDINGS – MONTH 1



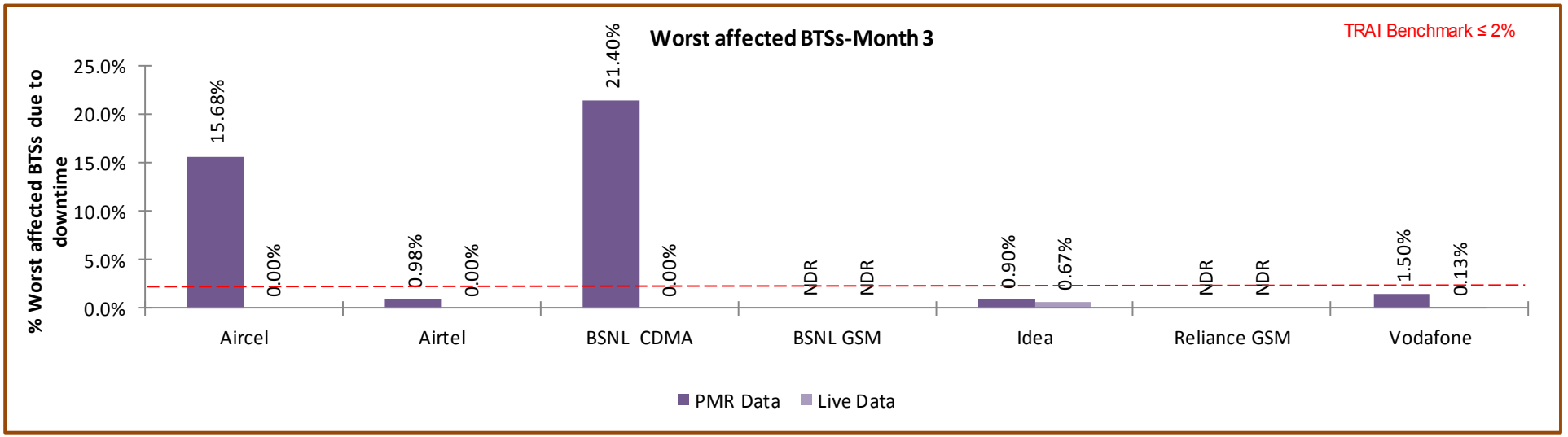
Data Source: Operations and Maintenance Center (OMC) of the operators

5.2.2.2 KEY FINDINGS – MONTH 2



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

5.2.2.3 KEY FINDINGS – MONTH 3



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

5.3 CALL SET UP SUCCESS RATE

5.3.1 PARAMETER DESCRIPTION

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

   (Calls Established / Total Call Attempts) * 100

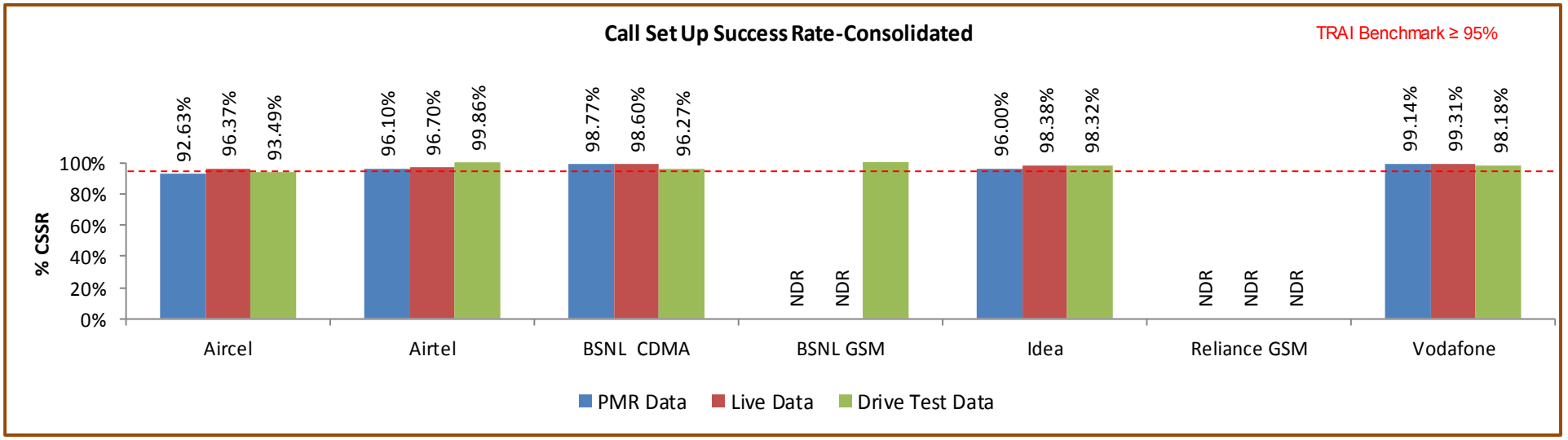
   Call Established means the following events have happened in call setup:-

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

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

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

5.3.2 KEY FINDINGS - CONSOLIDATED

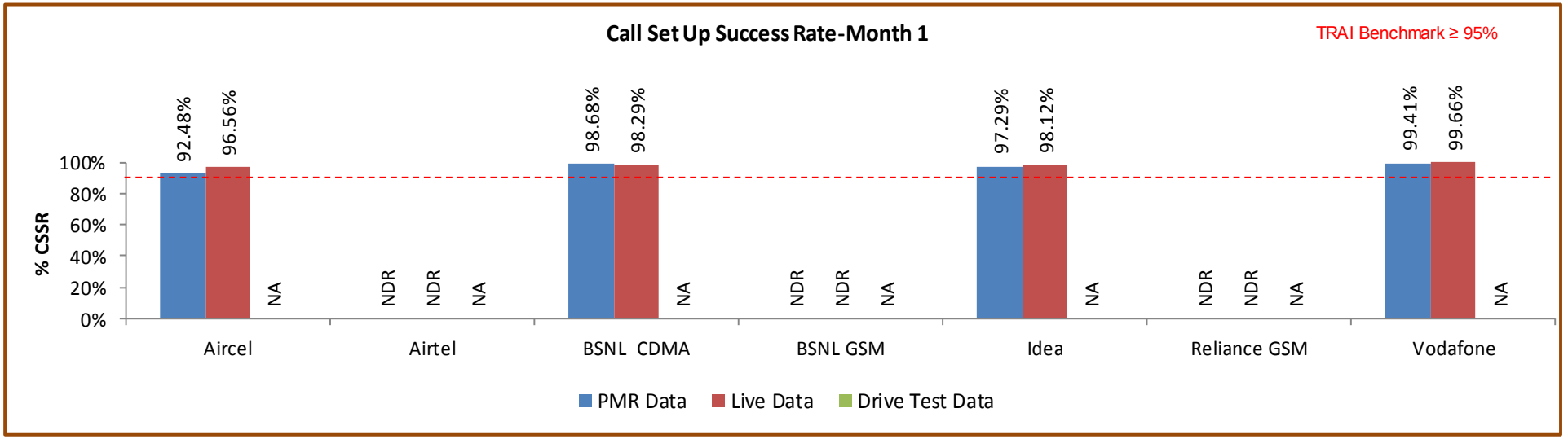


Data Source: Network Operations Center (NOC) of the operators

Aircel and Airtel failed to meet the TRAI benchmark as per audit/PMR data.

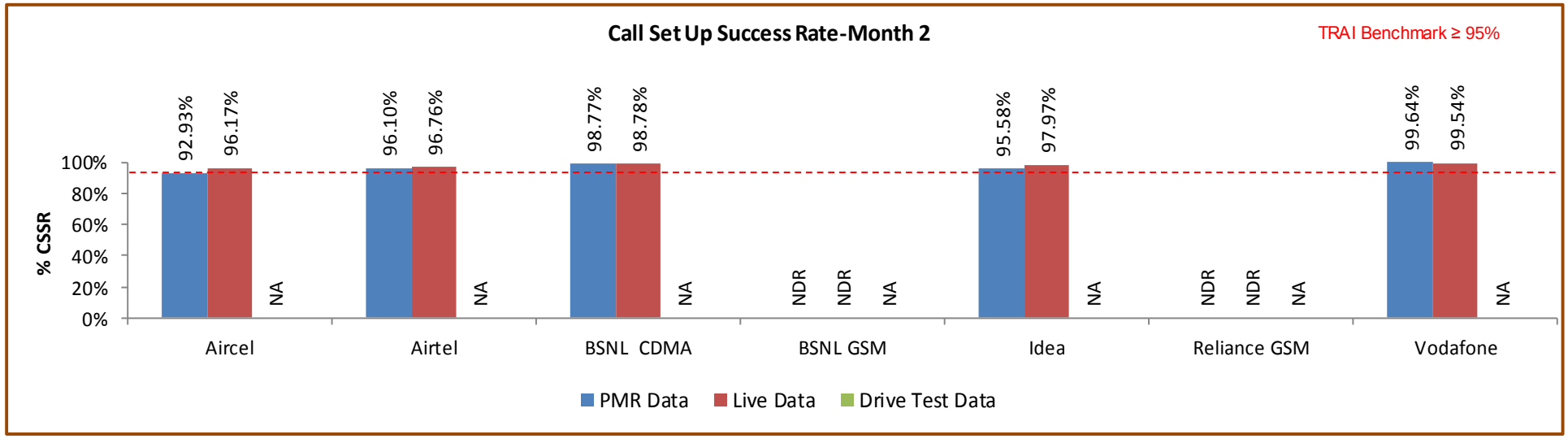
To calculate CSSR, Airtel is using a formula that has not been specified by TRAI or the counter definitions provided by their network service provider (Ericsson). However, this report presents the appropriate CSSR value for Airtel, which was calculated by using the proper counter details (provided in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

5.3.2.1 KEY FINDINGS – MONTH 1



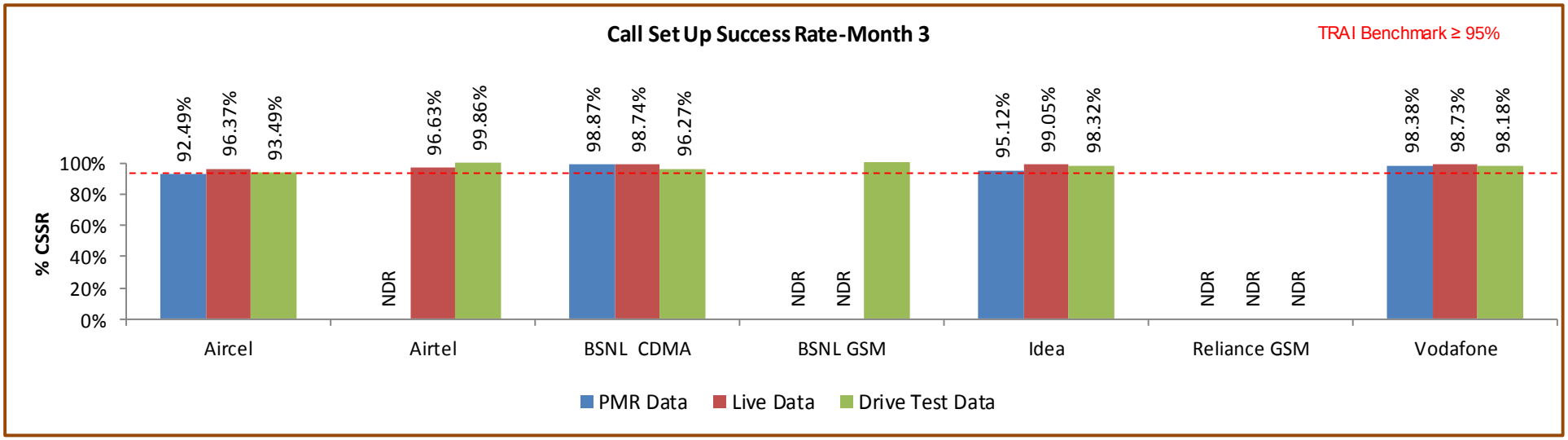
Data Source: Network Operations Center (NOC) of the operators

5.3.2.2 KEY FINDINGS – MONTH 2



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

5.3.2.3 KEY FINDINGS – MONTH 3



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

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

5.4.1 PARAMETER DESCRIPTION

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

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

2. **Computational Methodology:**

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

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

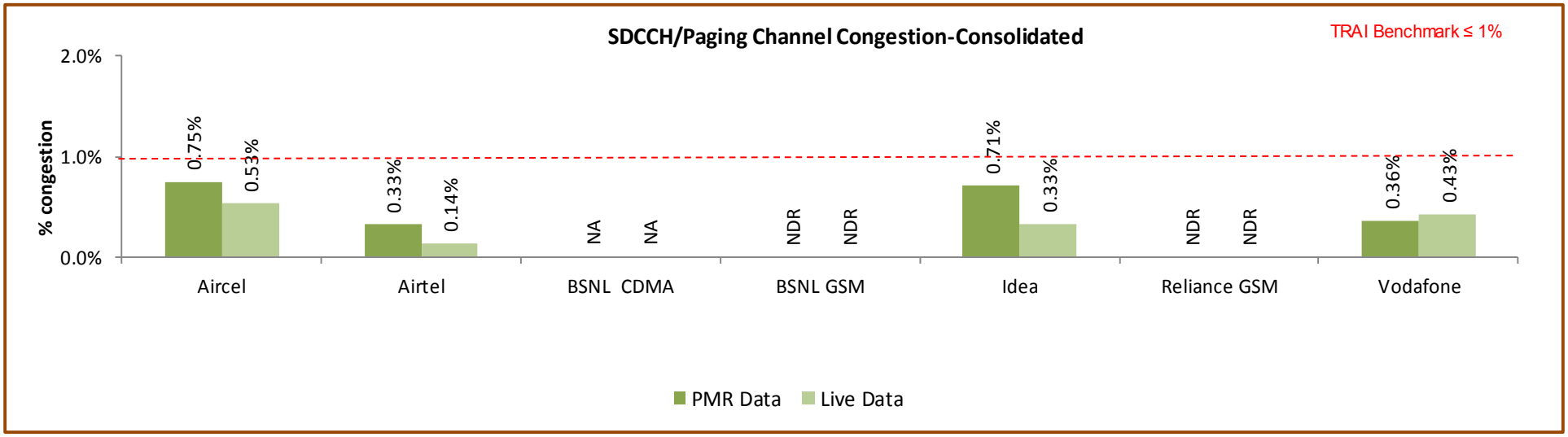
3. **Benchmark:**

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

4. **Audit Procedure –**

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

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



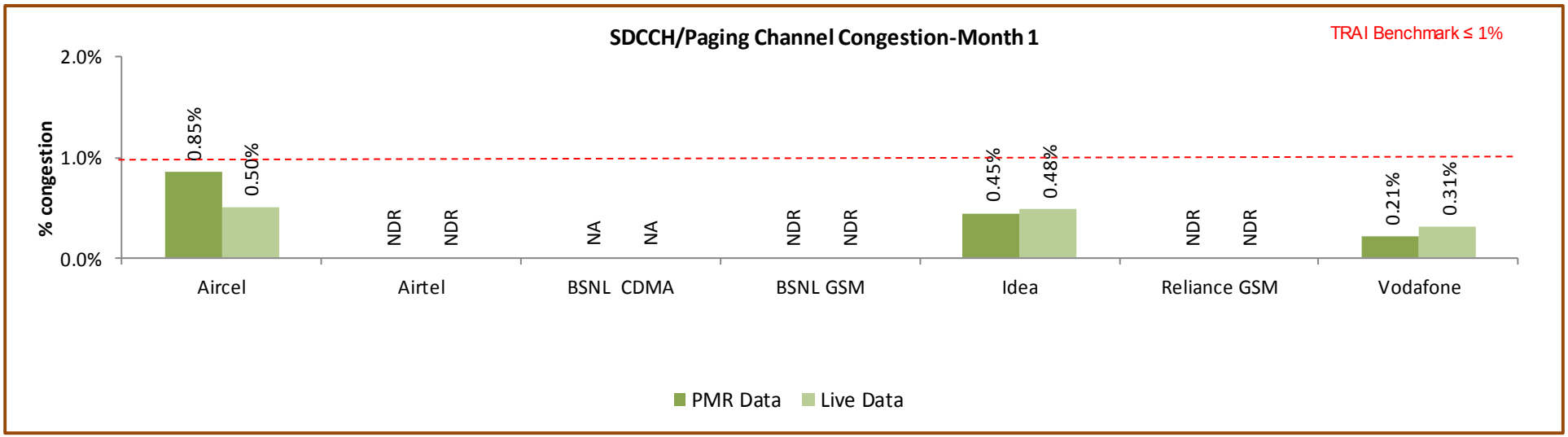
Data Source: Network Operations Center (NOC) of the operators

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

Significant difference was observed between PMR & live measurement data for Aircel, 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 3 days.

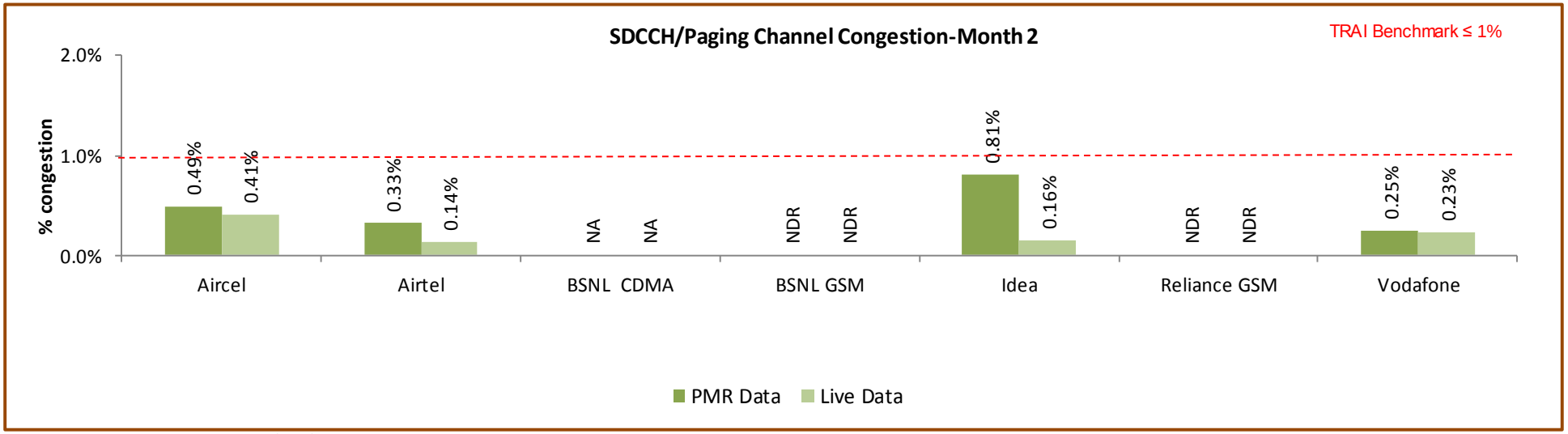
NA: SDCCH/ Paging channel congestion not applicable for CDMA operators. Hence, it has been reported as NA for BSNL CDMA.

5.4.2.1 KEY FINDINGS – MONTH 1



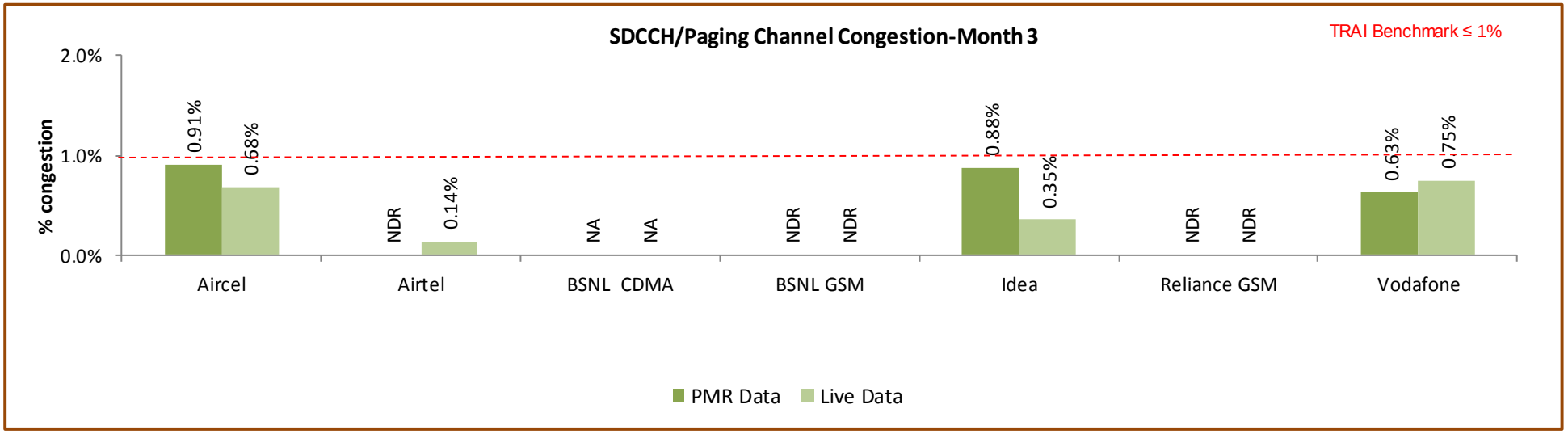
Data Source: Network Operations Center (NOC) of the operators

5.4.2.2 KEY FINDINGS – MONTH 2



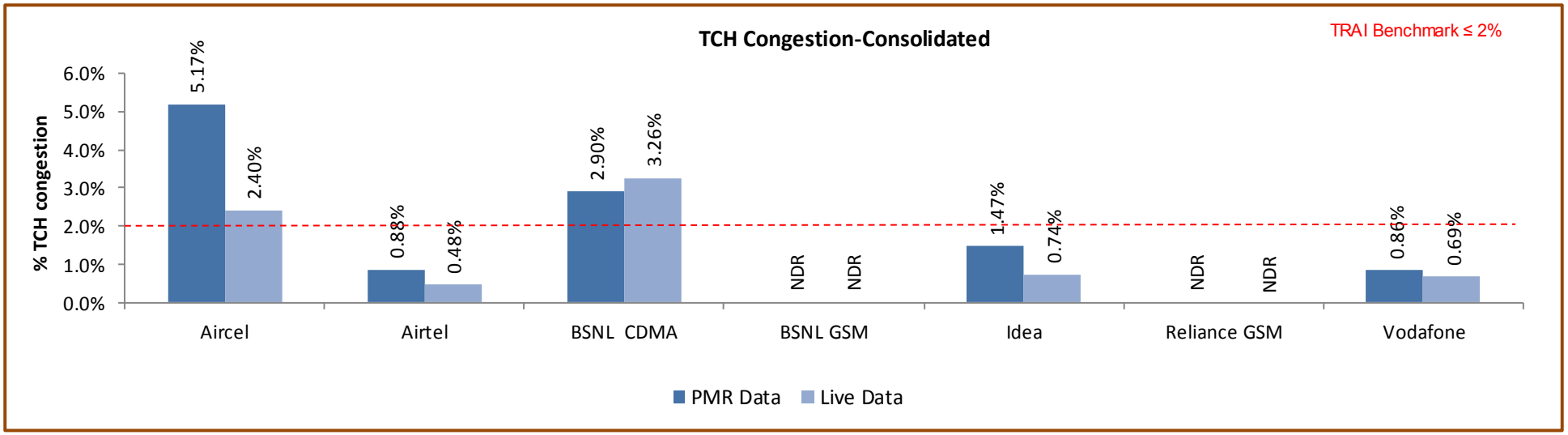
Data Source: Network Operations Center (NOC) of the operators

5.4.2.3 KEY FINDINGS – MONTH 3



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

5.4.3 KEY FINDINGS – TCH CONGESTION (CONSOLIDATED)

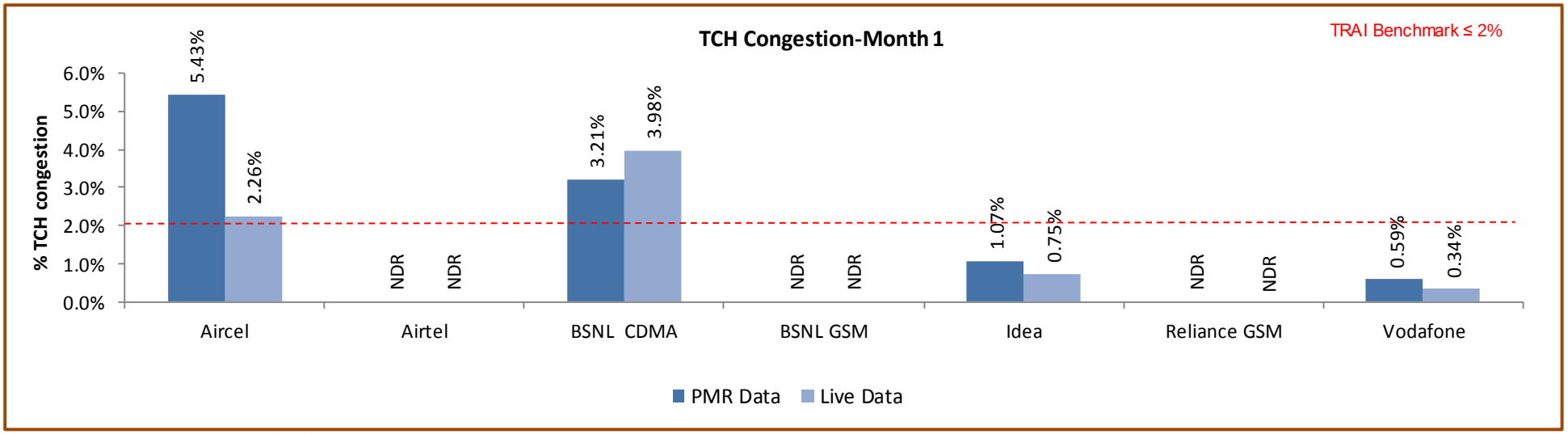


Data Source: Network Operations Center (NOC) of the operators

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

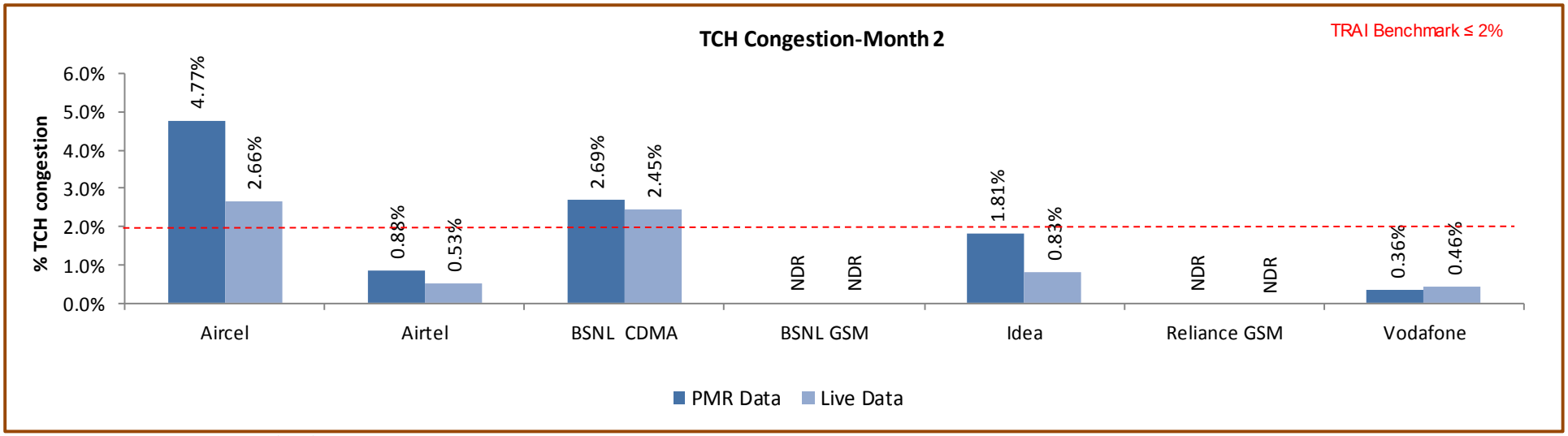
Significant difference was observed between PMR & live measurement data for Aircel, BSNL GSM and Idea. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for three days.

5.4.3.1 KEY FINDINGS – MONTH 1



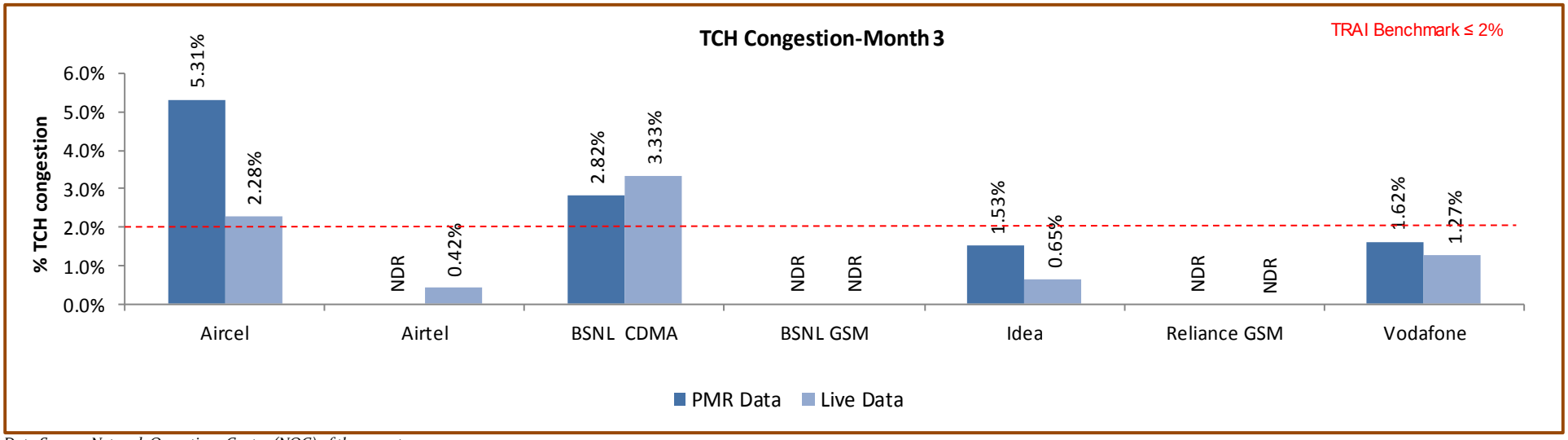
Data Source: Network Operations Center (NOC) of the operators

5.4.3.2 KEY FINDINGS – MONTH 2



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

5.4.3.3 KEY FINDINGS – MONTH 3



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

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

Audit Results for POI Congestion- PMR data								
POI congestion	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of working POIs		156	30	0	NDR	92	NDR	96
No. of POIs not meeting benchmark		0	30	0	NDR	0	NDR	0
Total Capacity of all POIs (A) - in erlangs		368158	229444	0	NDR	90245	NDR	48032193
Traffic served for all POIs (B)- in erlangs		224629	65654	0	NDR	58649	NDR	43242878
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	NDR	0.00%	NDR	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		156	30	0	NDR	92	NDR	96
No. of POIs not meeting benchmark		0	30	0	NDR	0	NDR	0
Total Capacity of all POIs (A) - in erlangs		281977	229432	0	NDR	90223	NDR	4916565
Traffic served for all POIs (B)- in erlangs		169620	67669	0	NDR	52224	NDR	4328117
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	NDR	0.00%	NDR	0.00%

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

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

5.4.4.1 KEY FINDINGS – MONTH 1

Audit Results for POI Congestion- PMR data-October								
POI congestion	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of working POIs		52	NDR	0	NDR	30	NDR	32
No. of POIs not meeting benchmark		0	NDR	0	NDR	0	NDR	0
Total Capacity of all POIs (A) - in erlangs		180746	NDR	0	NDR	29869	NDR	16010282
Traffic served for all POIs (B)- in erlangs		119495	NDR	0	NDR	18653	NDR	15208637
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-October								
POI congestion	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of working POIs		52	NDR	0	NDR	30	NDR	32
No. of POIs not meeting benchmark		0	NDR	0	NDR	0	NDR	0
Total Capacity of all POIs (A) - in erlangs		90826	NDR	0	NDR	30055	NDR	1638203
Traffic served for all POIs (B)- in erlangs		56276	NDR	0	NDR	11851	NDR	1459725
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

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

5.4.4.2 KEY FINDINGS – MONTH 2

Audit Results for POI Congestion- PMR data-November								
POI congestion	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of working POIs		52	15	0	NDR	31	NDR	32
No. of POIs not meeting benchmark		0	15	0	NDR	0	NDR	0
Total Capacity of all POIs (A) - in erlangs		93708	113777	0	NDR	30081	NDR	16010282
Traffic served for all POIs (B)- in erlangs		56298	30194	0	NDR	19367	NDR	14011345
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-November								
POI congestion	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of working POIs		52	15	0	NDR	31	NDR	32
No. of POIs not meeting benchmark		0	15	0	NDR	0	NDR	0
Total Capacity of all POIs (A) - in erlangs		97451	113777	0	NDR	30084	NDR	1638500
Traffic served for all POIs (B)- in erlangs		55115	32971	0	NDR	19408	NDR	1402258
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

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

5.4.4.3 KEY FINDINGS – MONTH 3

Audit Results for POI Congestion- PMR data-December								
POI congestion	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of working POIs		52	15	0	NDR	31	NDR	32
No. of POIs not meeting benchmark		0	15	0	NDR	0	NDR	0
Total Capacity of all POIs (A) - in erlangs		93704	115668	0	NDR	30295	NDR	16011629
Traffic served for all POIs (B)- in erlangs		48836	35460	0	NDR	20630	NDR	14022896
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	NDR	0.00%	NDR	0.00%
Live Measurement Results for POI Congestion- 3 Day data-December								
POI congestion	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of working POIs		52	15	0	NDR	31	NDR	32
No. of POIs not meeting benchmark		0	15	0	NDR	0	NDR	0
Total Capacity of all POIs (A) - in erlangs		93700	115655	0	NDR	30084	NDR	1639862
Traffic served for all POIs (B)- in erlangs		58229	34698	0	NDR	20964	NDR	1466134
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	NDR	0.00%	NDR	0.00%

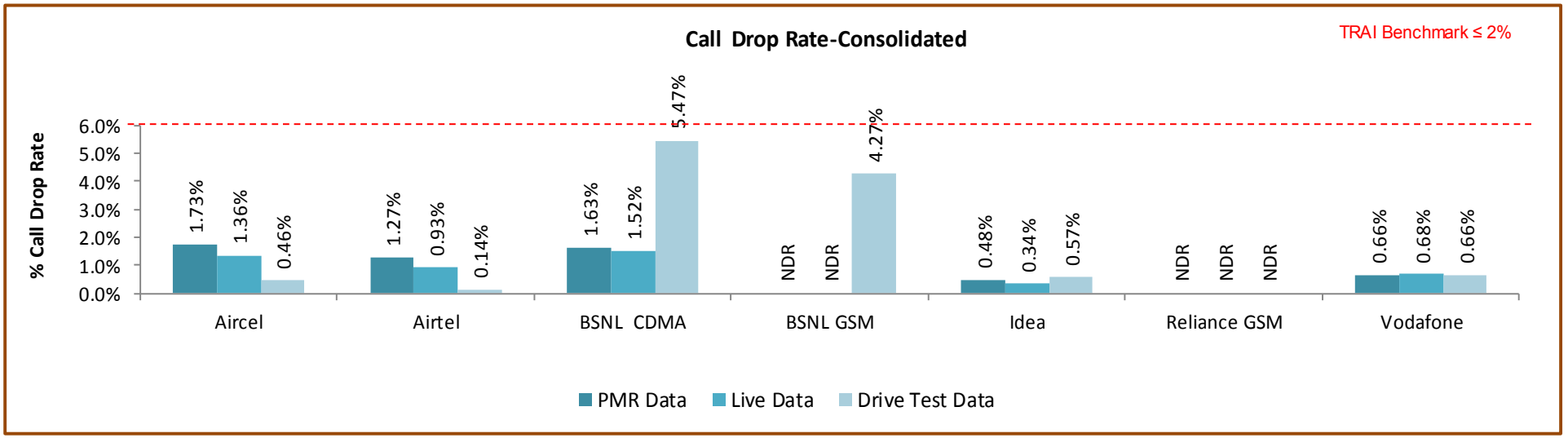
Data Source: Network Operations Center (NOC) of the operators

5.5 CALL DROP RATE

5.5.1 PARAMETER DESCRIPTION

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

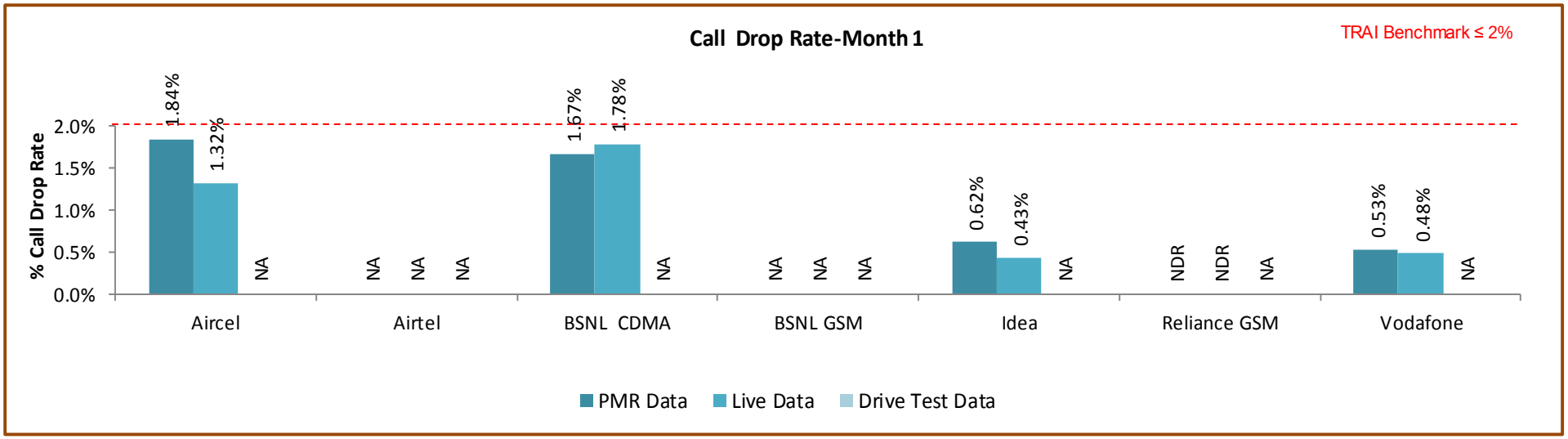
5.5.2 KEY FINDINGS - CONSOLIDATED



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

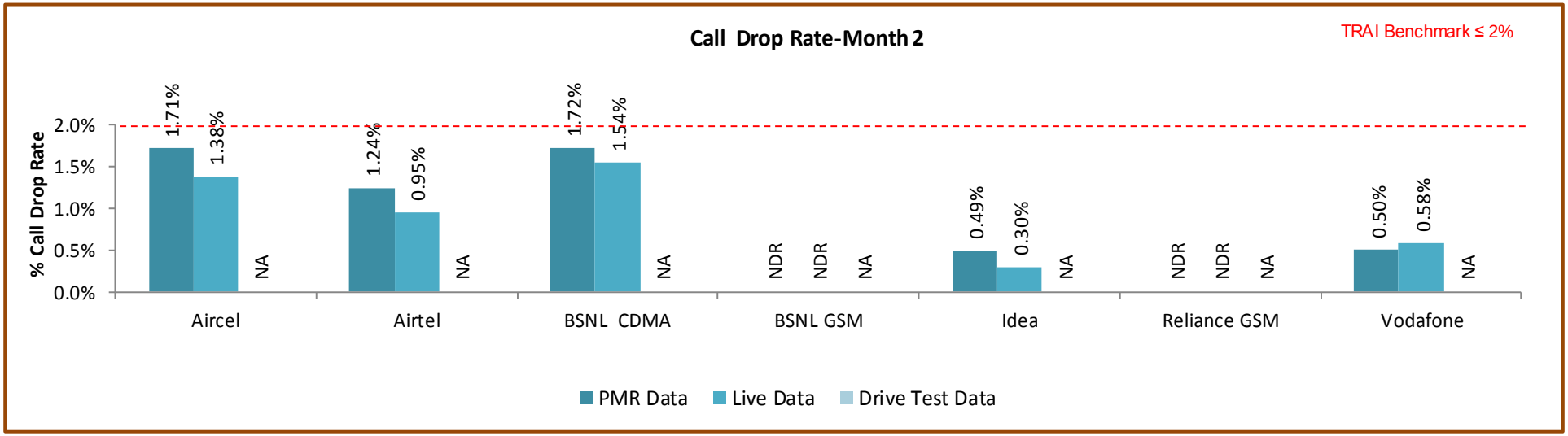
All operators met the benchmark for call drop rate during audit.

5.5.2.1 KEY FINDINGS – MONTH 1



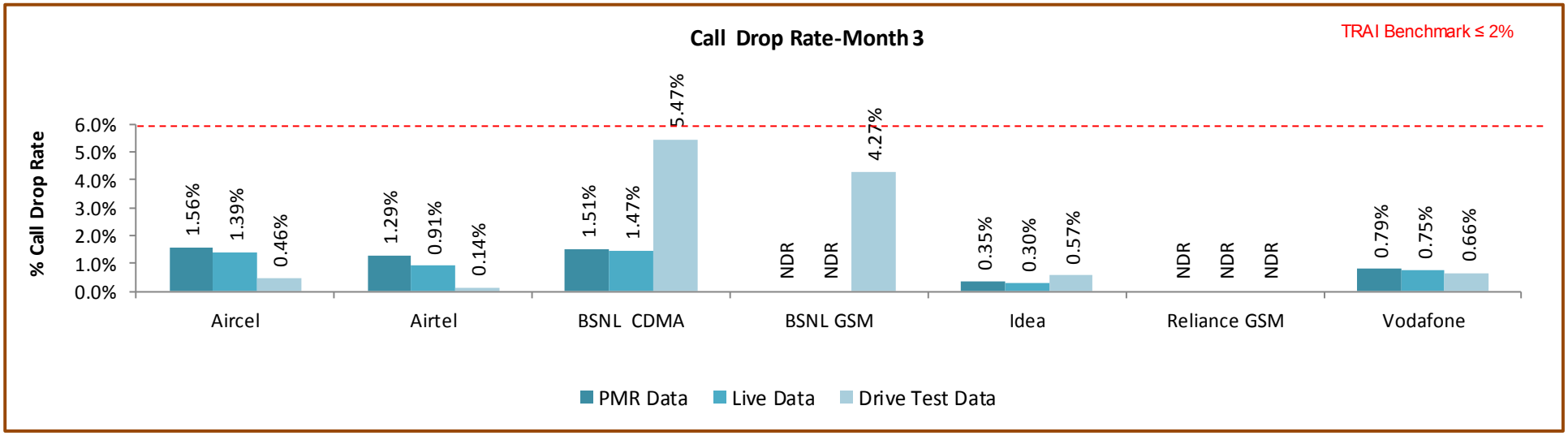
Data Source: Network Operations Center (NOC) of the operators

5.5.2.2 KEY FINDINGS – MONTH 2



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

5.5.2.3 KEY FINDINGS – MONTH 3



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

5.6 CELLS HAVING GREATER THAN 3% TCH DROP

5.6.1 PARAMETER DESCRIPTION

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

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

3. **TRAI Benchmark –**

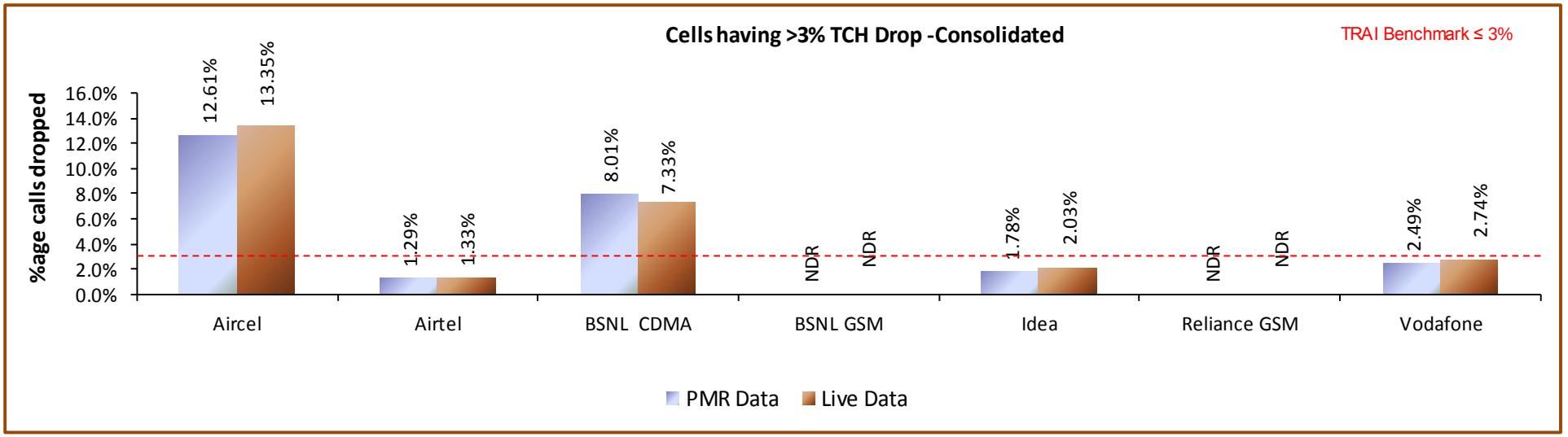
   - Worst affected cells having more than 3% TCH drop rate ≤ 3%

4. **Audit Procedure –**

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

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

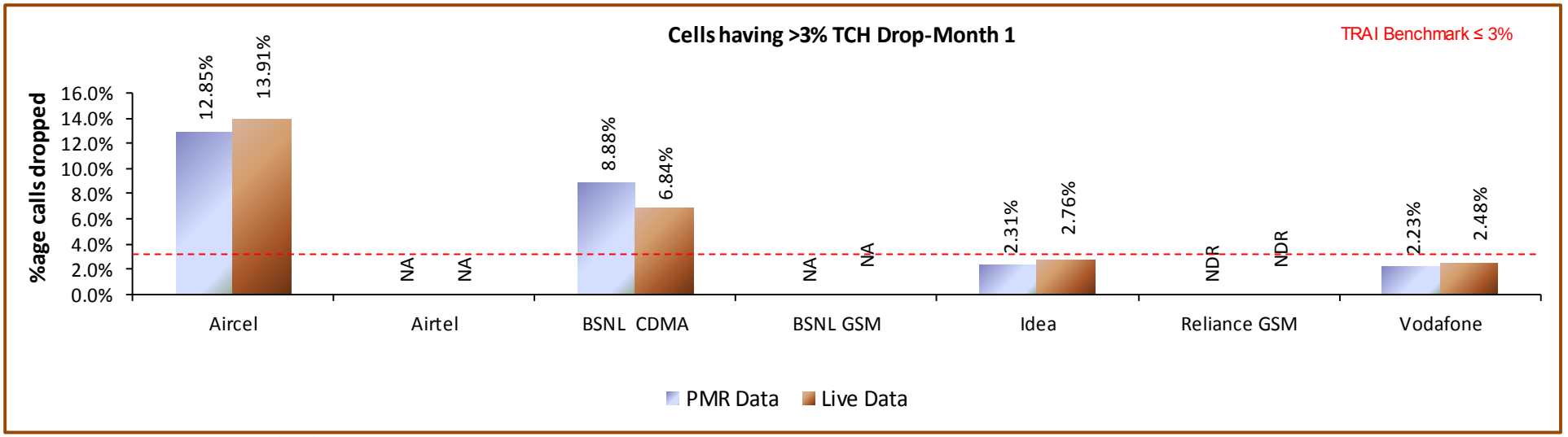
5.6.2 KEY FINDINGS - CONSOLIDATED



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

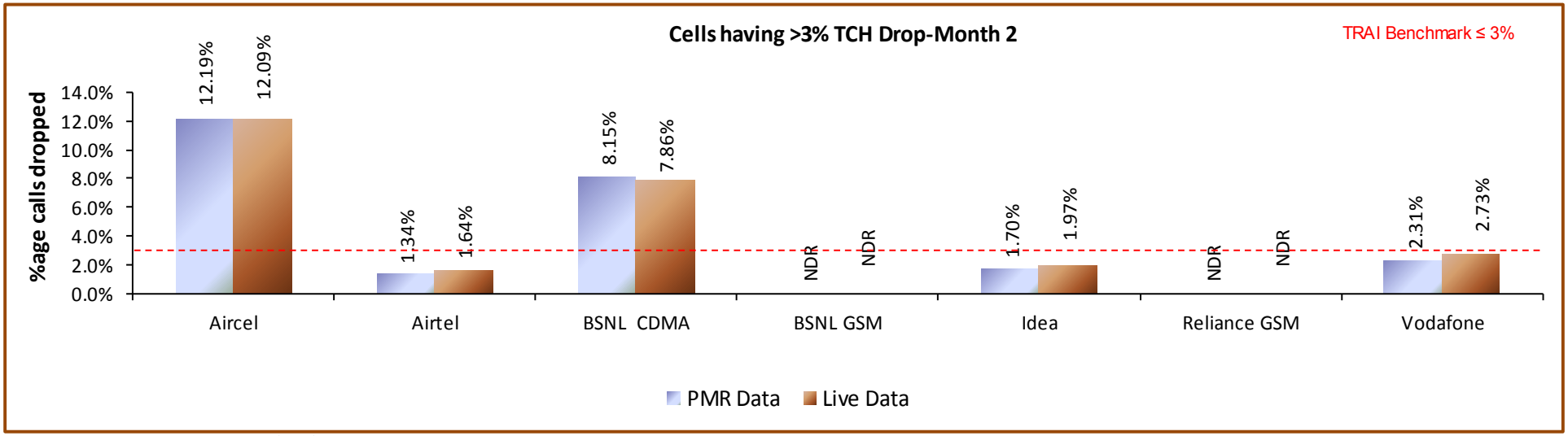
Aircel BSNL CDMA failed to meet the TRAI benchmark.

5.6.2.1 KEY FINDINGS – MONTH 1



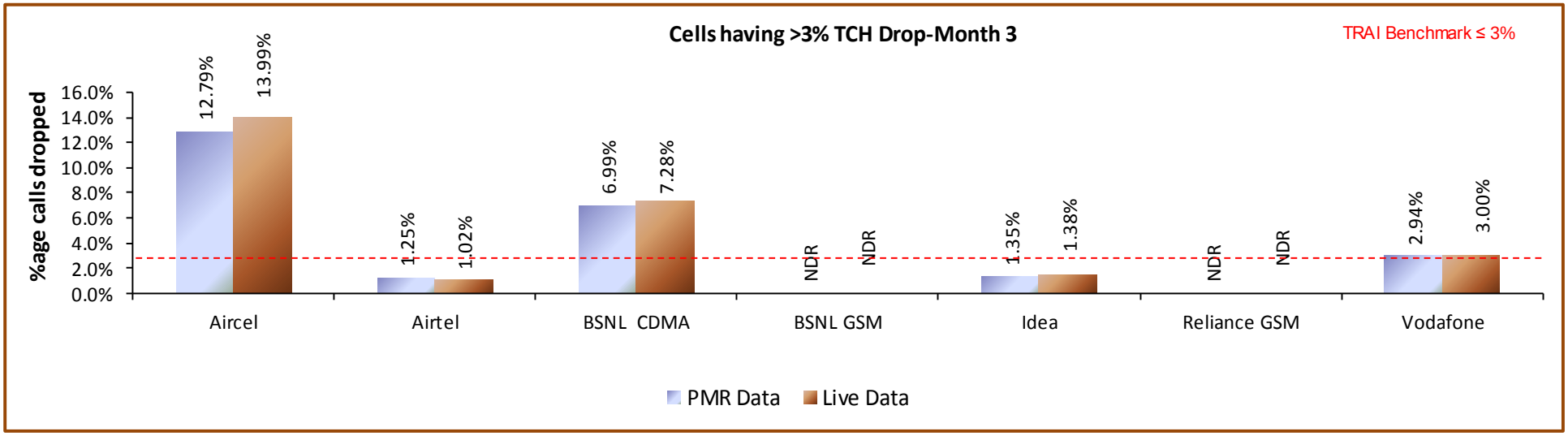
Data Source: Network Operations Center (NOC) of the operators

5.6.2.2 KEY FINDINGS – MONTH 2



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

5.6.2.3 KEY FINDINGS – MONTH 3



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

5.7 VOICE QUALITY

5.7.1 PARAMETER DESCRIPTION

1. **Definition:**

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

2. **Computational Methodology:**

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

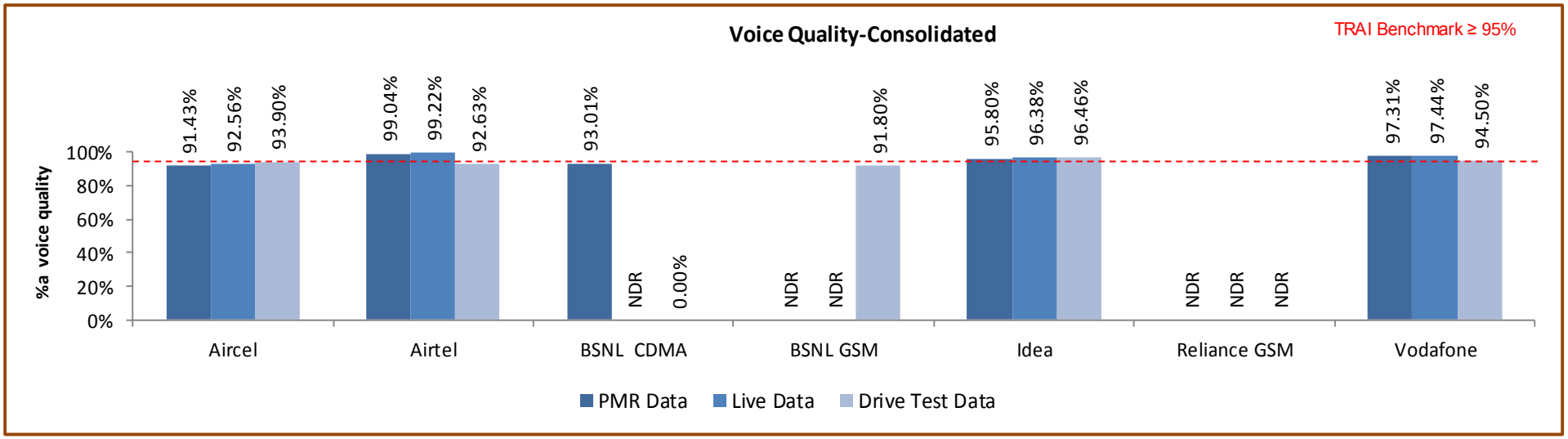
3. **TRAI Benchmark:** ≥ 95%

4. **Audit Procedure –**

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

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

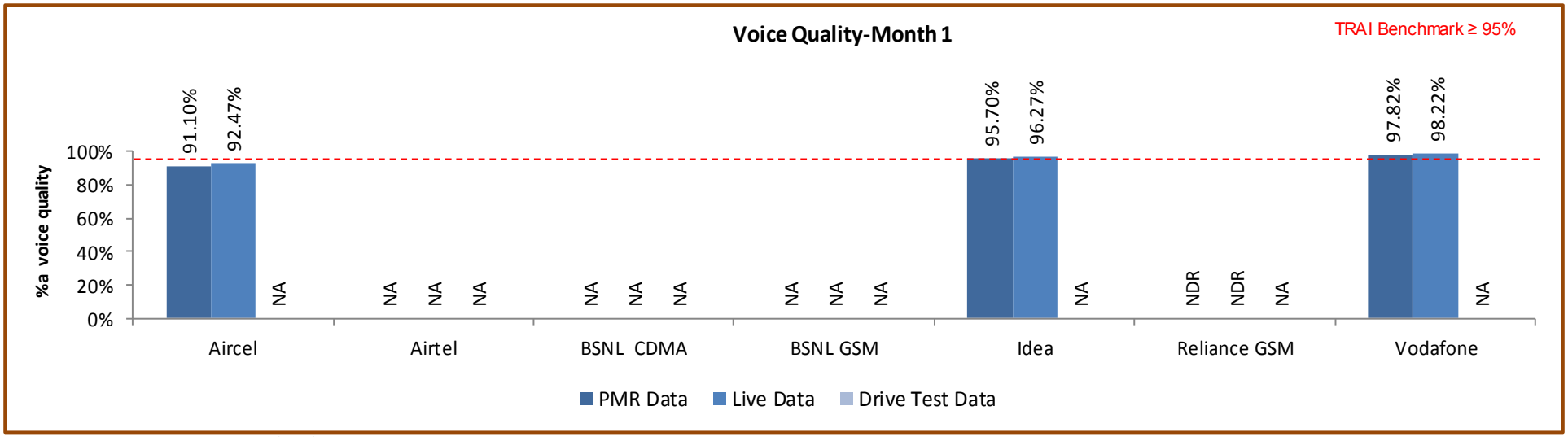
5.7.2 KEY FINDINGS



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

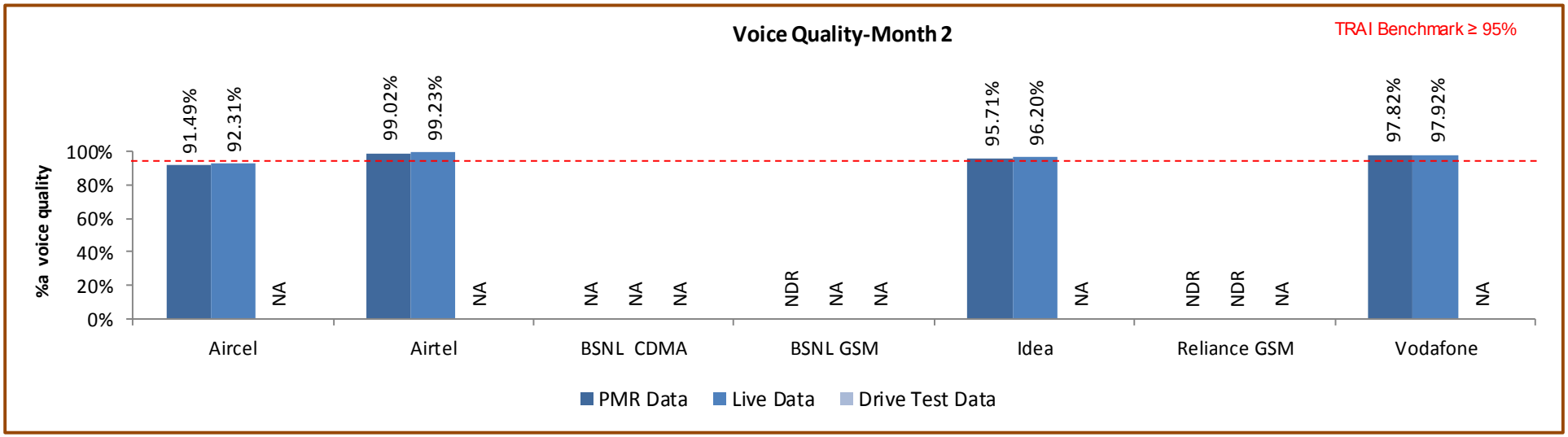
Aircel and BSNL CDMA were not able to meet the benchmark for Voice quality as per PMR data.

5.7.2.1 KEY FINDINGS – MONTH 1



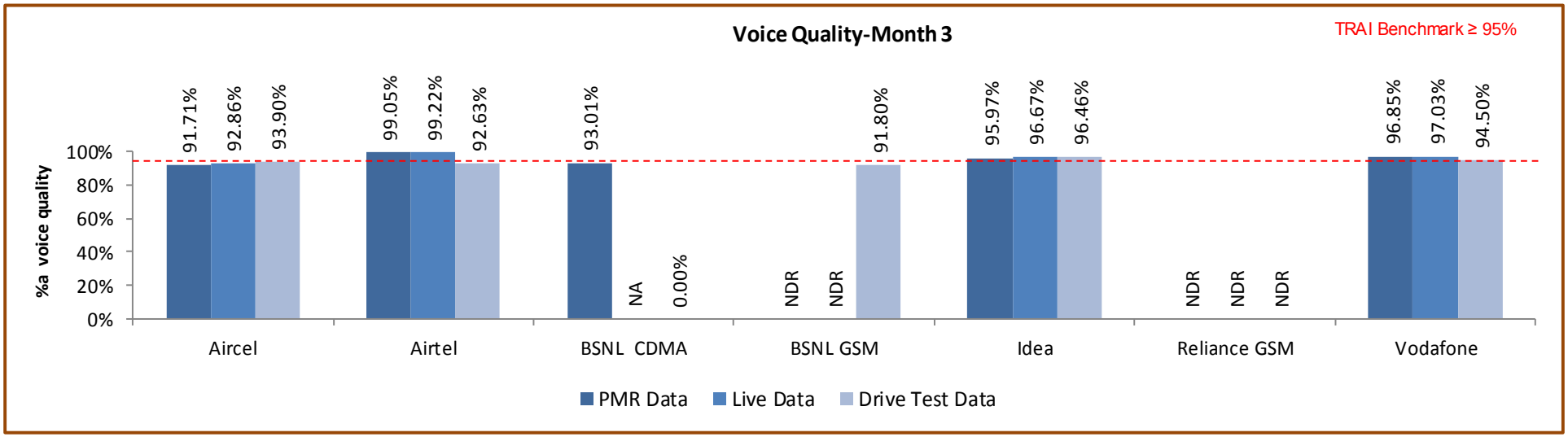
Data Source: Network Operations Center (NOC) of the operators

5.7.2.2 KEY FINDINGS – MONTH 2



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

5.7.2.3 KEY FINDINGS – MONTH 3



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

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

6.1 NODE BS DOWNTIME

6.1.1 PARAMETER DESCRIPTION

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

  1. Node Bs downtime (not available for service)

  2. Worst affected Node Bs due to downtime

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

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

3. TRAI Benchmark –

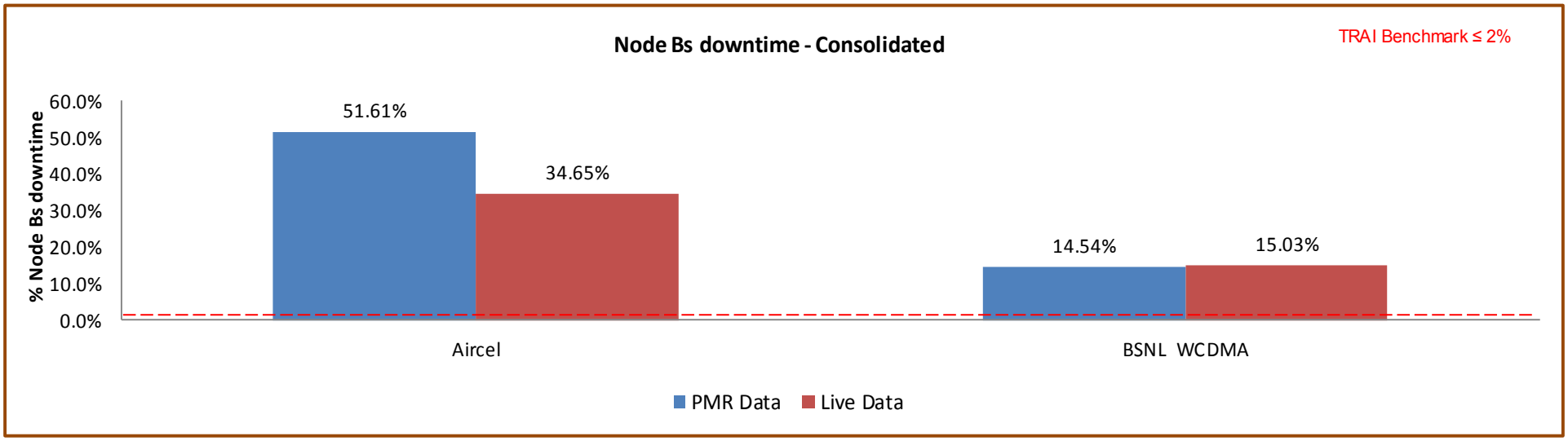
a. Node Bs downtime (not available for service) ≤ 2%

4. Audit Procedure –

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

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

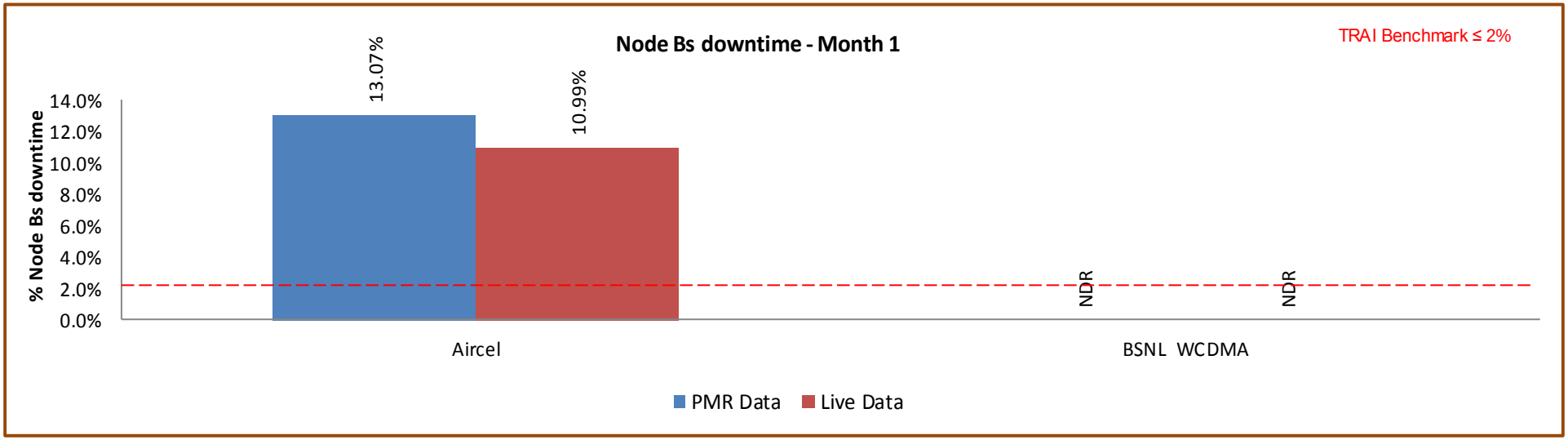
6.1.2 KEY FINDINGS - CONSOLIDATED



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

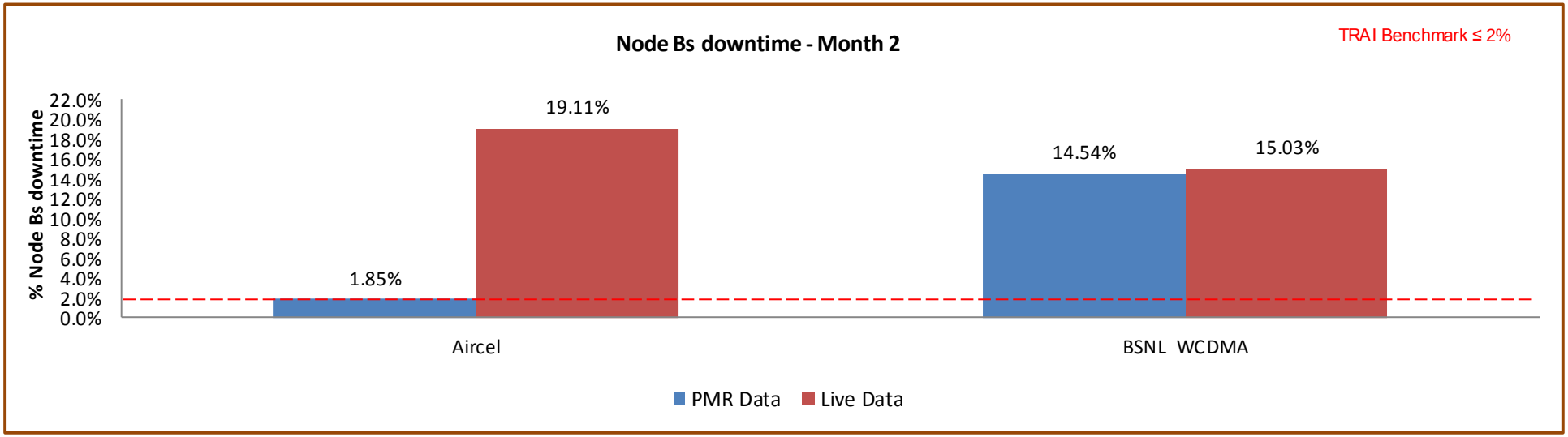
Aircel and BSNL failed to meet the benchmark.

6.1.2.1 KEY FINDINGS – MONTH 1



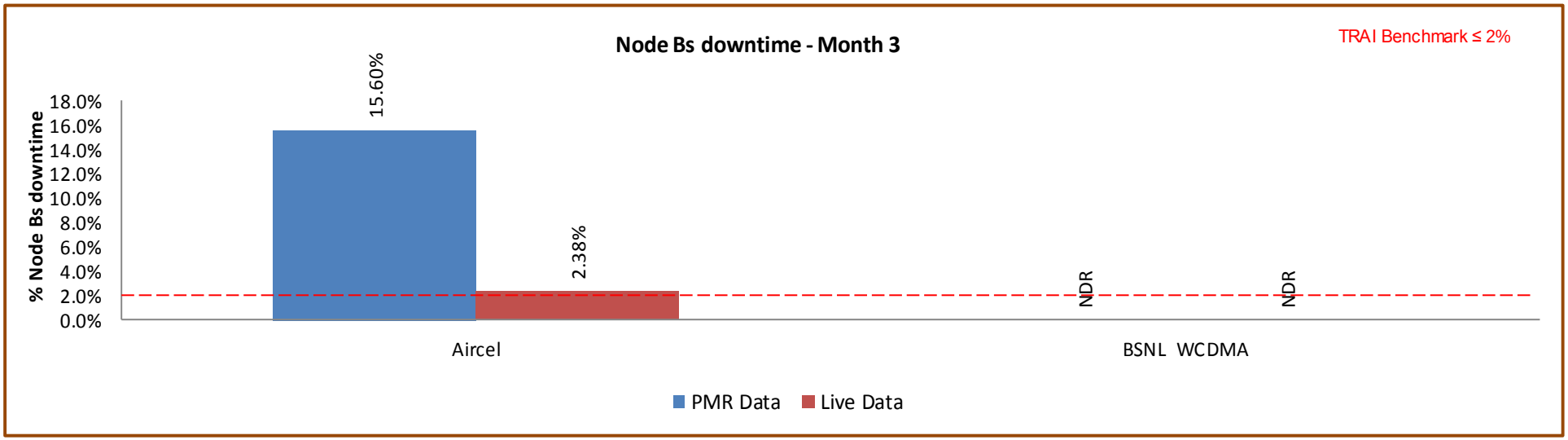
Data Source: Operations and Maintenance Center (OMC) of the operators

6.1.2.2 KEY FINDINGS – MONTH 2



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

6.1.2.3 KEY FINDINGS – MONTH 3



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

6.2 WORST AFFECTED NODE BS DUE TO DOWNTIME

6.2.1 PARAMETER DESCRIPTION

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

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

- **Computation Methodology –**

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

- **TRAI Benchmark –**

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

- **Audit Procedure –**

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

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

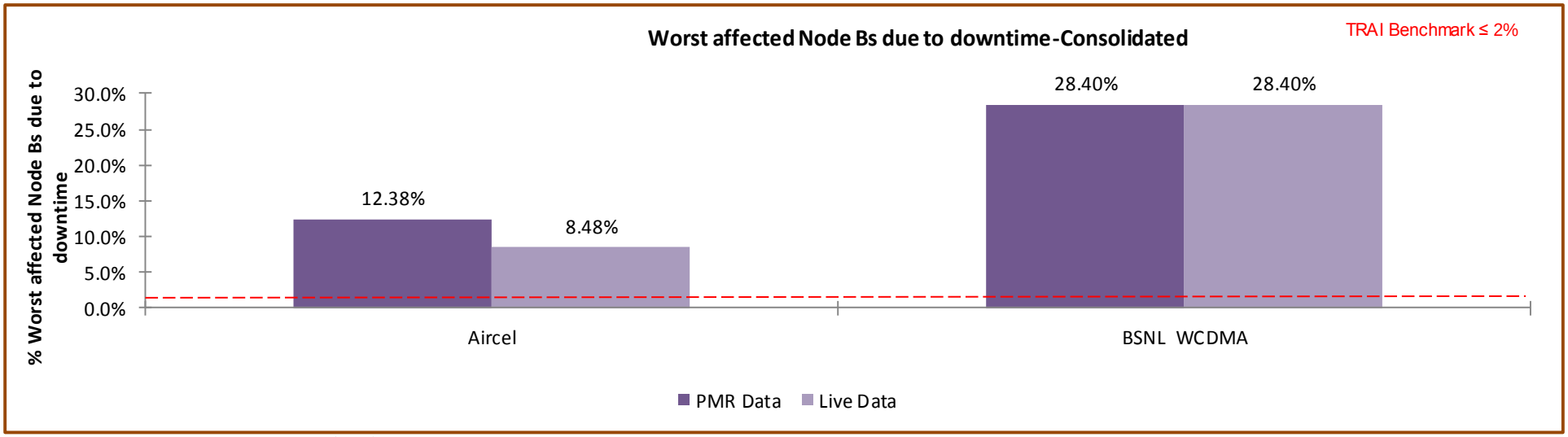
  iii. Data is extracted from system log of the server of the operator. This data is in raw format which is further processed to arrive at the cumulative values.

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

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

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

6.2.2 KEY FINDINGS – CONSOLIDATED

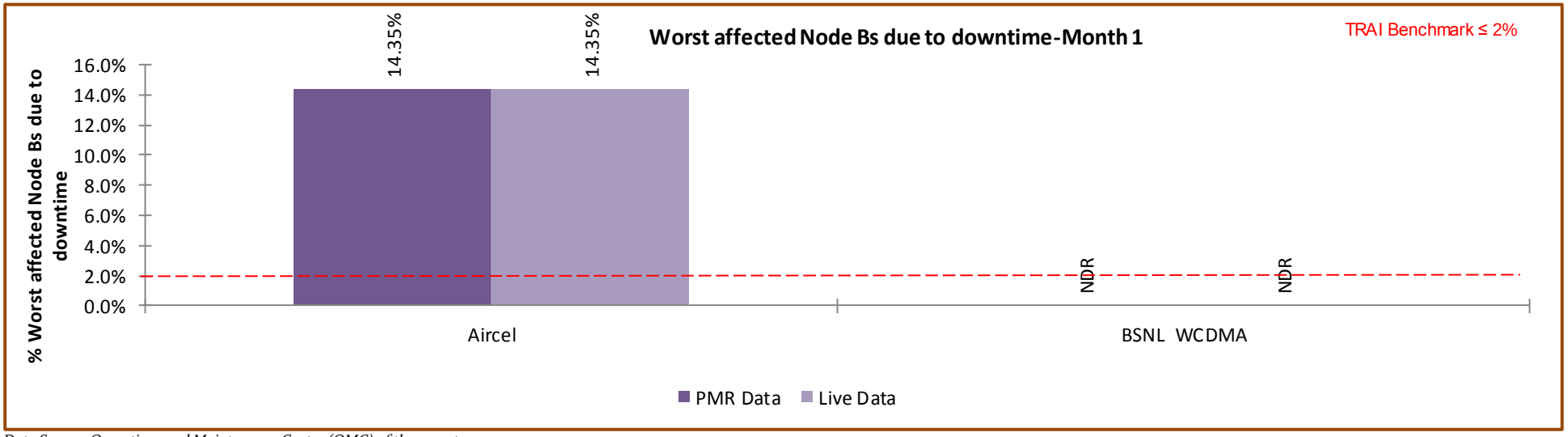


Data Source: Operations and Maintenance Center (OMC) of the operators

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

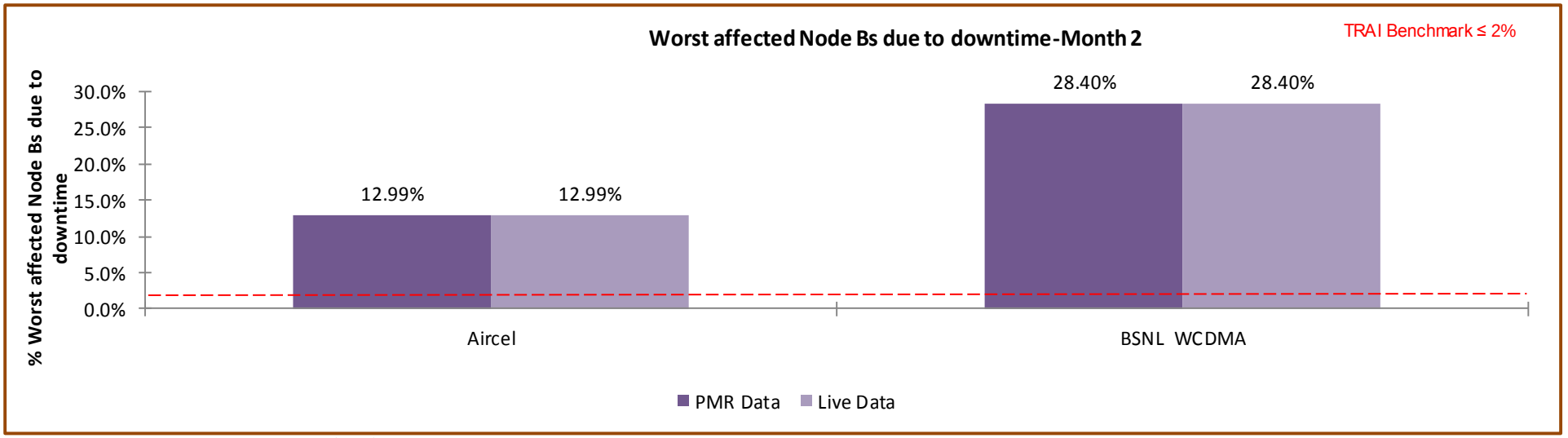
Significant difference was observed between PMR & live measurement data for Aircel and BSNL. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for three days.

6.2.2.1 KEY FINDINGS – MONTH 1



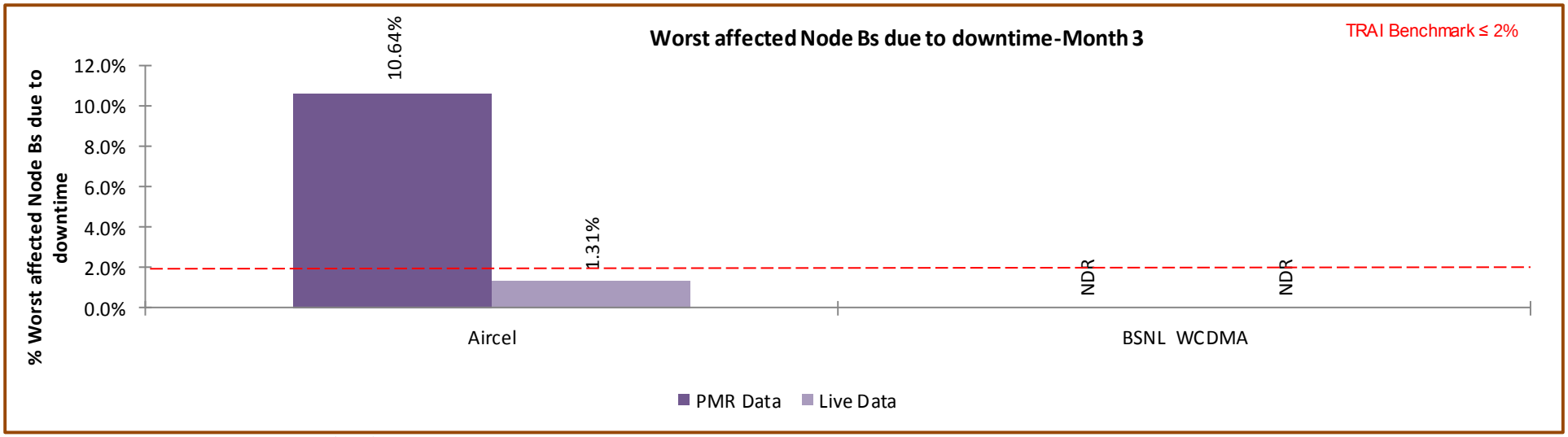
Data Source: Operations and Maintenance Center (OMC) of the operators

6.2.2.2 KEY FINDINGS – MONTH 2



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

6.2.2.3 KEY FINDINGS – MONTH 3



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

6.3 CALL SET UP SUCCESS RATE

6.3.1 PARAMETER DESCRIPTION

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

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

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

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

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

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

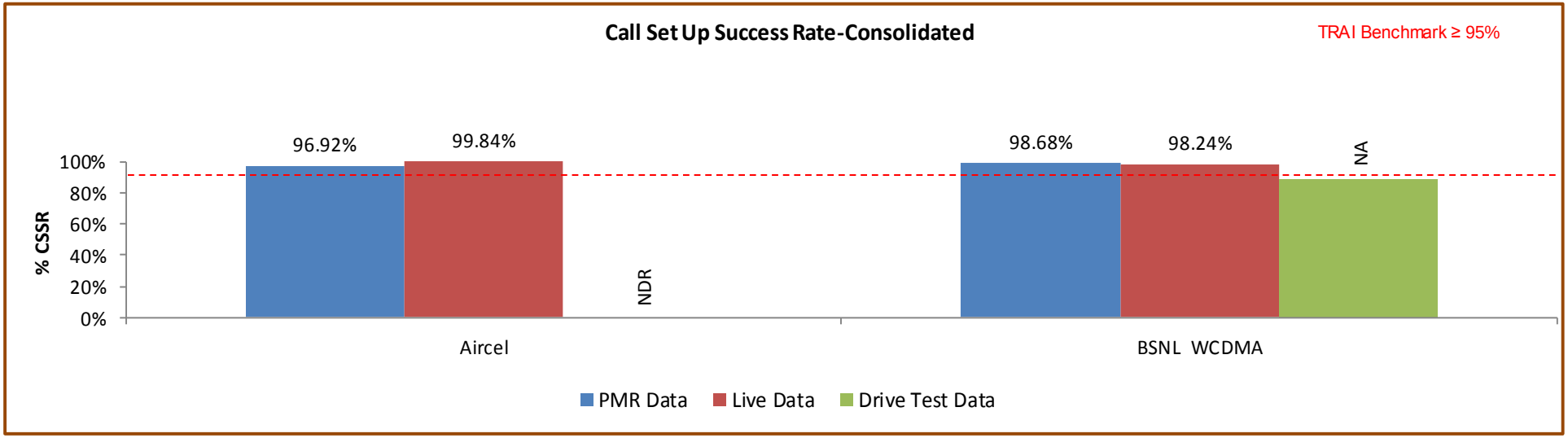
5. **TRAI Benchmark ≥** 95%

6. **Audit Procedure –**

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

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

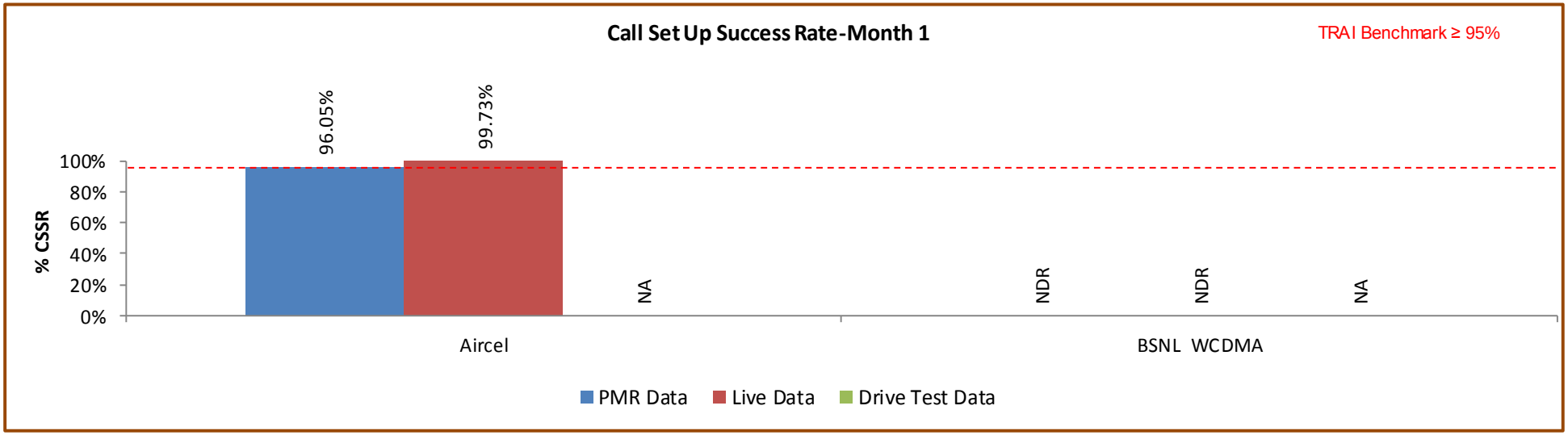
6.3.2 KEY FINDINGS - CONSOLIDATED



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

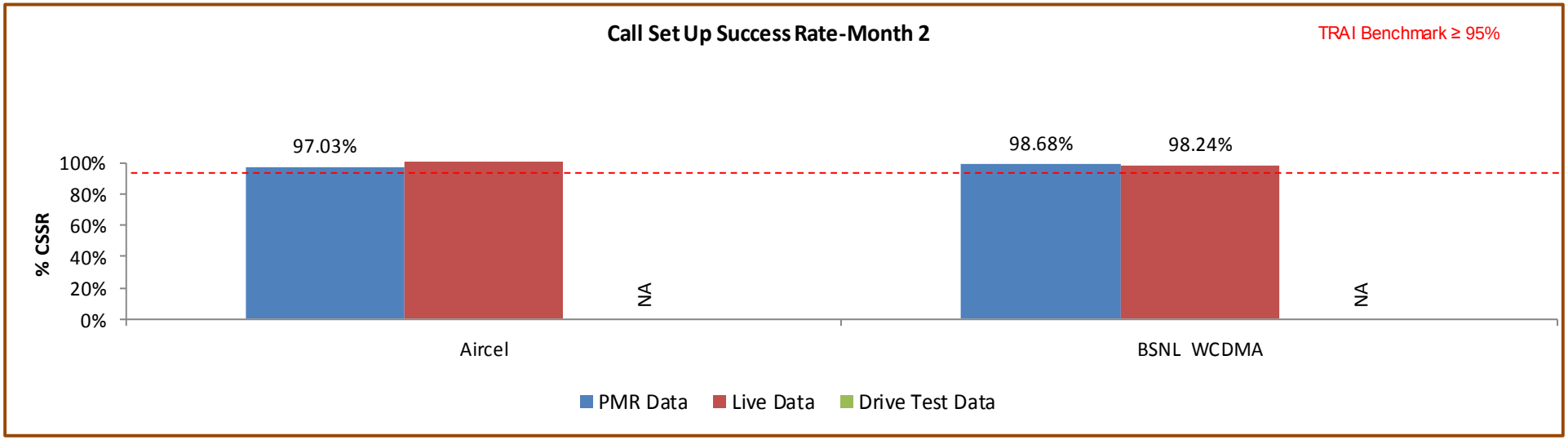
All operators met the TRAI benchmark as per audit/PMR data.

6.3.2.1 KEY FINDINGS – MONTH 1



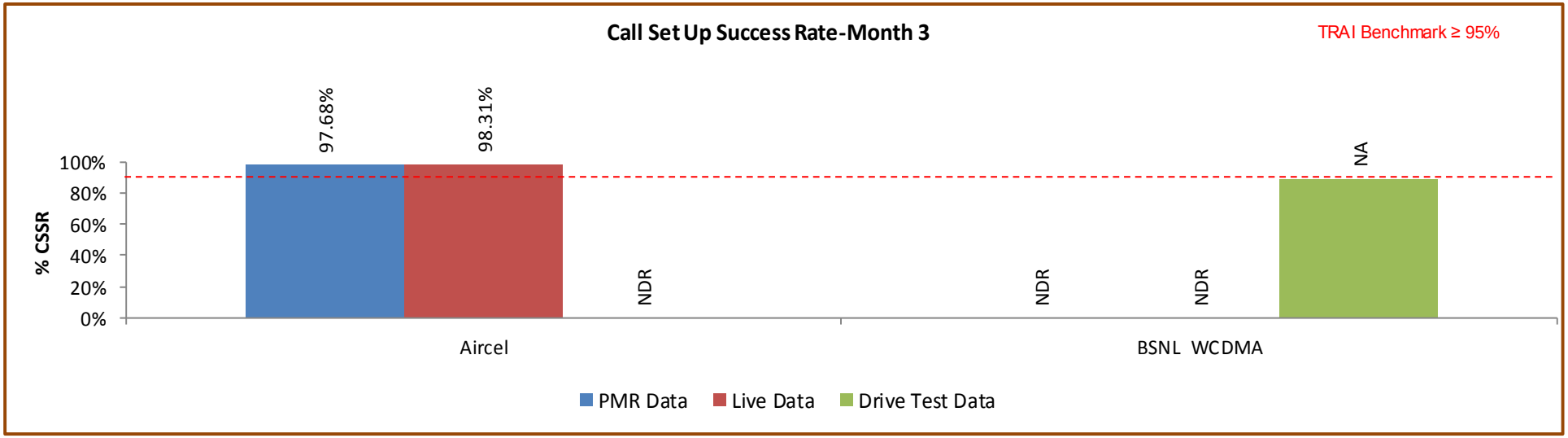
Data Source: Network Operations Center (NOC) of the operators

6.3.2.2 KEY FINDINGS – MONTH 2



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

6.3.2.3 KEY FINDINGS – MONTH 3



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

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

6.4.1 PARAMETER DESCRIPTION

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

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

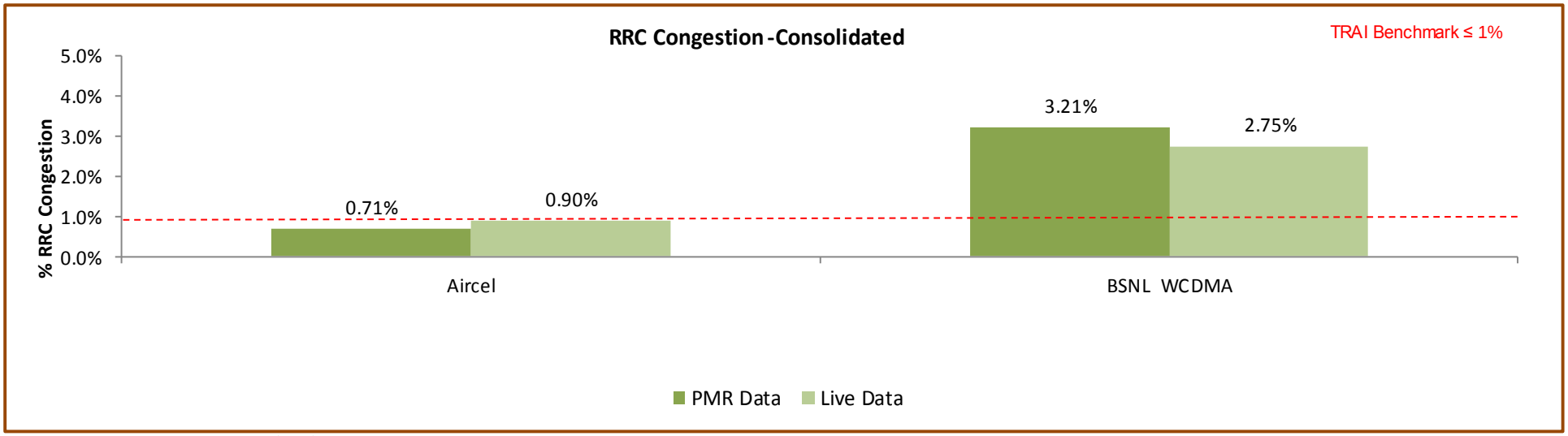
7. Benchmark:

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

8. Audit Procedure –

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

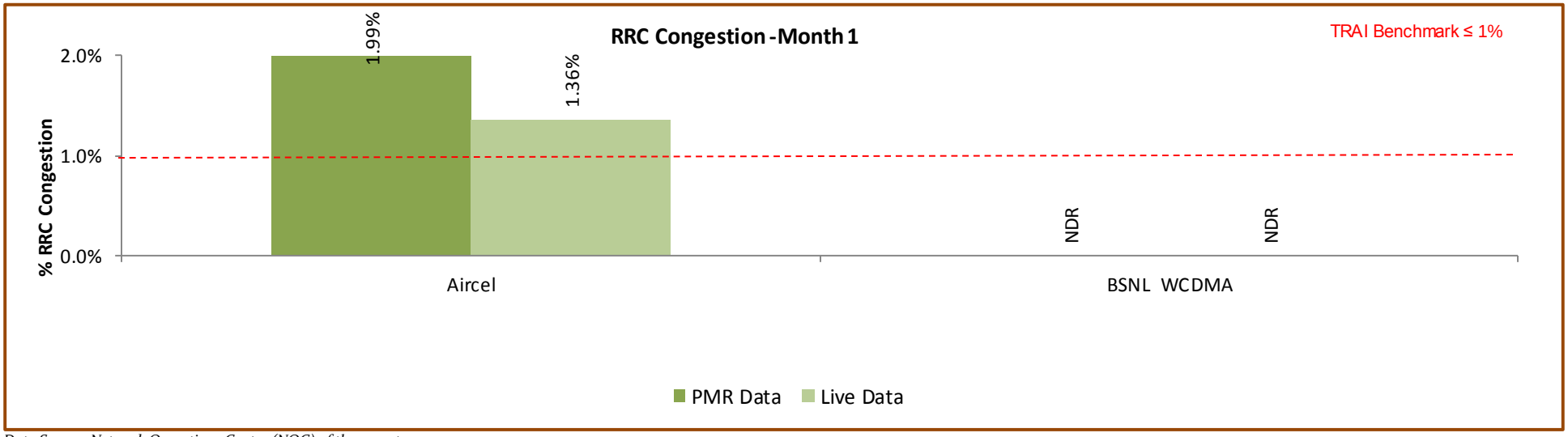
6.4.2 KEY FINDINGS - RRC CONGESTION (CONSOLIDATED)



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

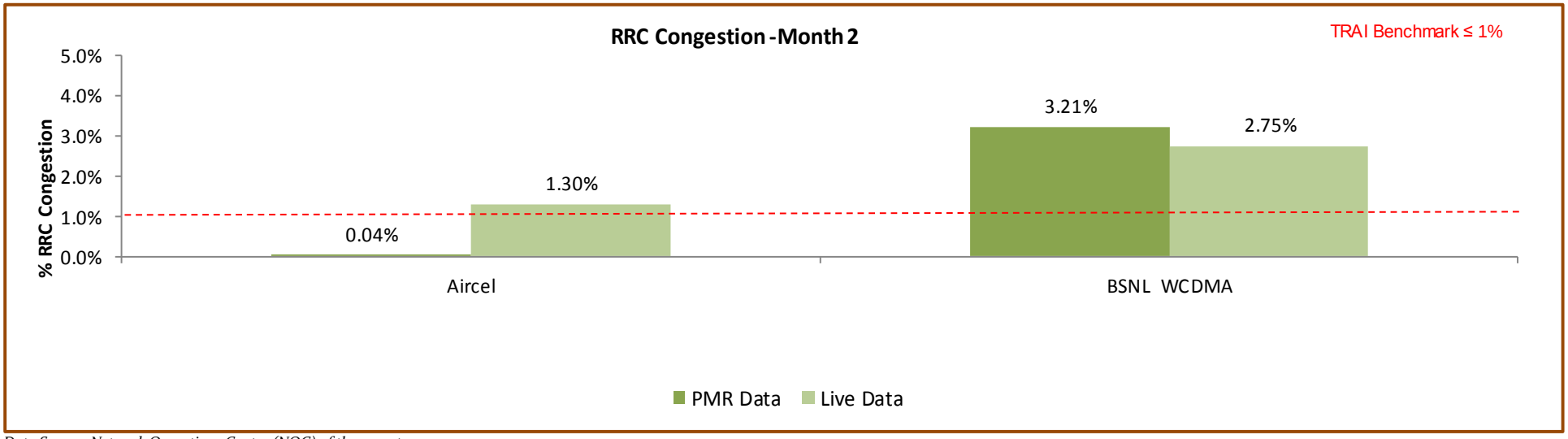
BSNL failed to meet the benchmark.

6.4.2.1 KEY FINDINGS – MONTH 1



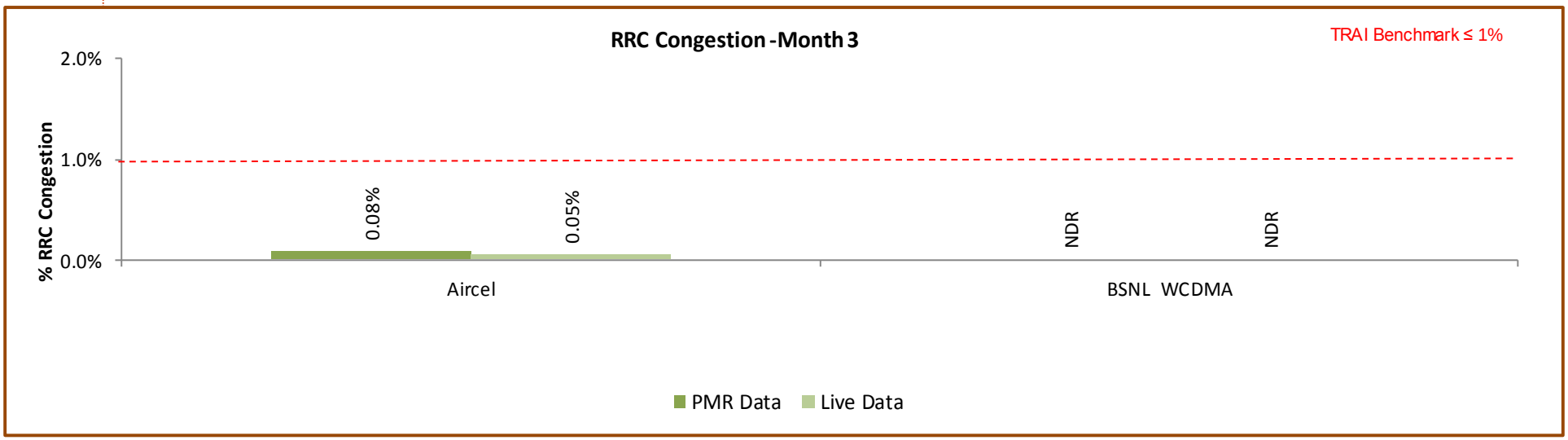
Data Source: Network Operations Center (NOC) of the operators

6.4.2.2 KEY FINDINGS – MONTH 2



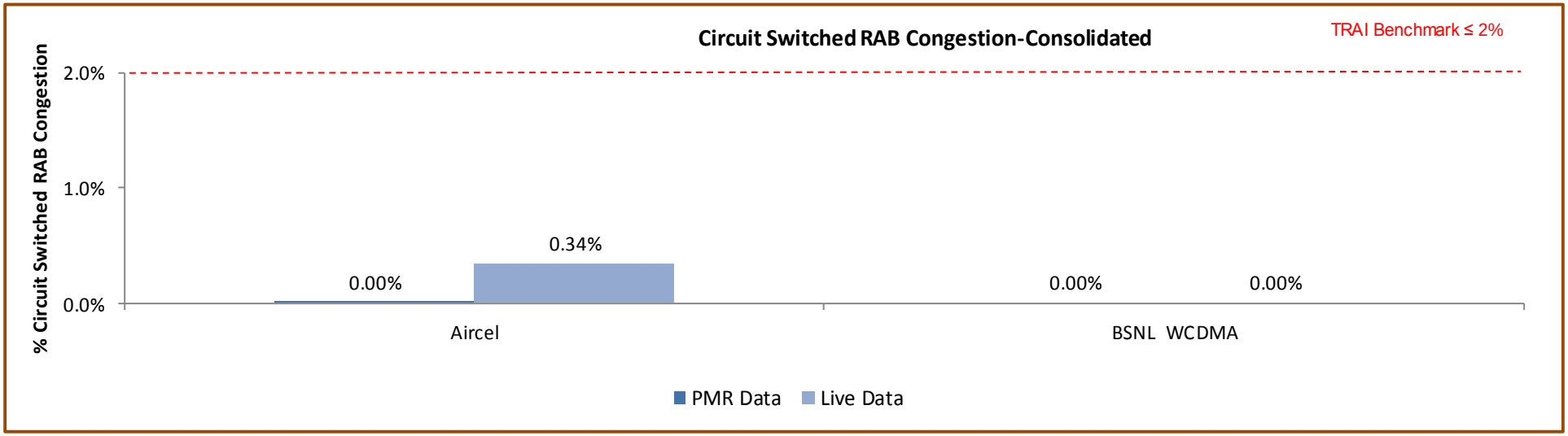
Data Source: Network Operations Center (NOC) of the operators

6.4.2.3 KEY FINDINGS – MONTH 3



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

6.4.3 KEY FINDINGS – CIRCUIT SWITCHED RAB CONGESTION (CONSOLIDATED)

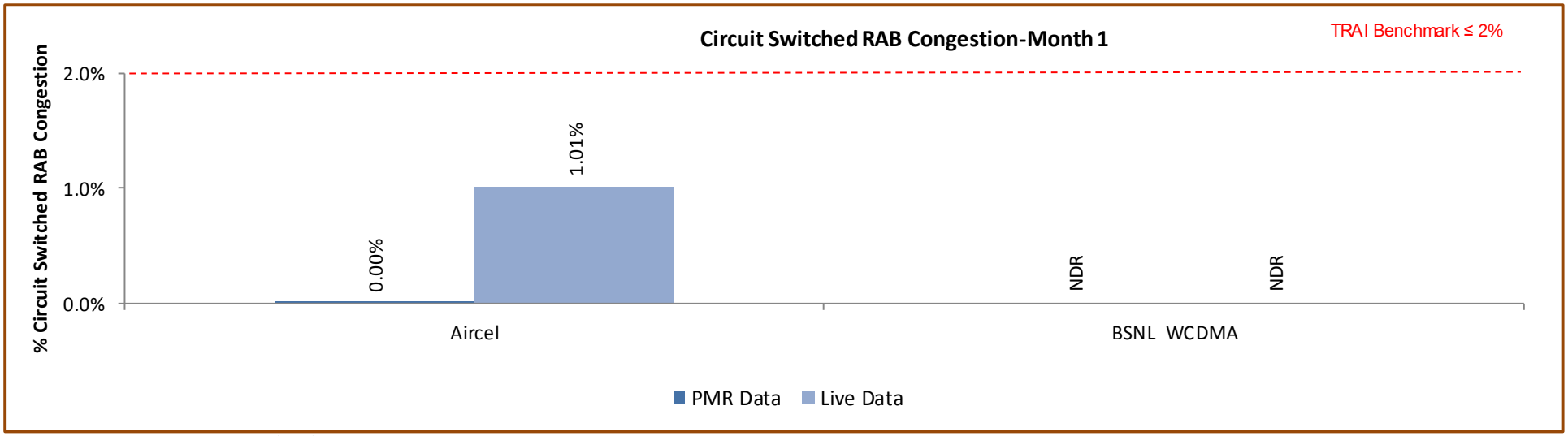


Data Source: Network Operations Center (NOC) of the operators

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

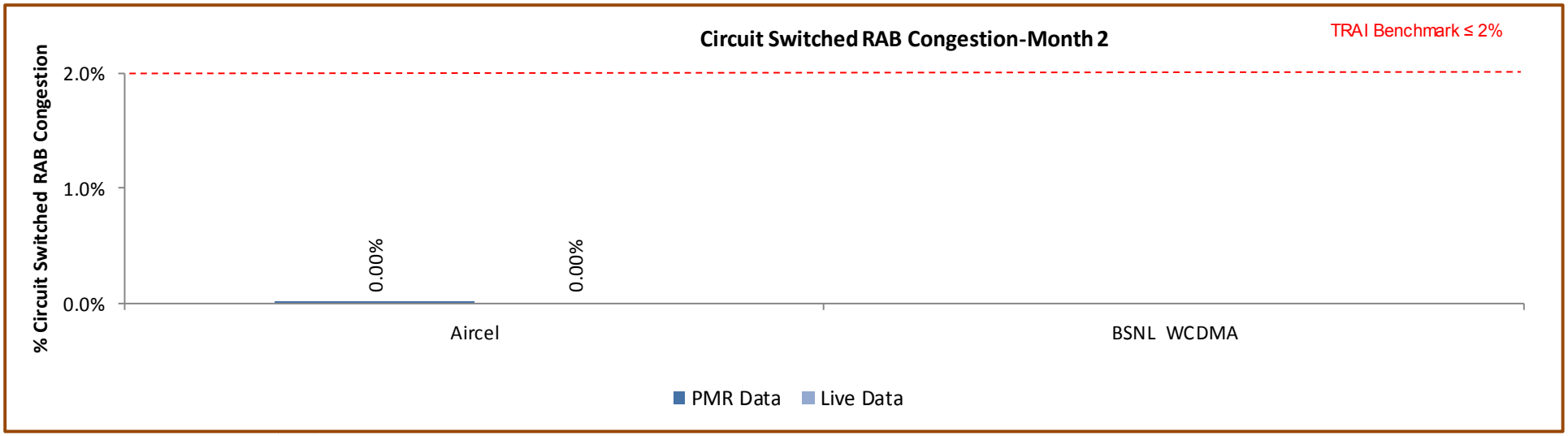
Significant difference was observed between PMR & live measurement data for Aircel. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for three days.

6.4.3.1 KEY FINDINGS – MONTH 1



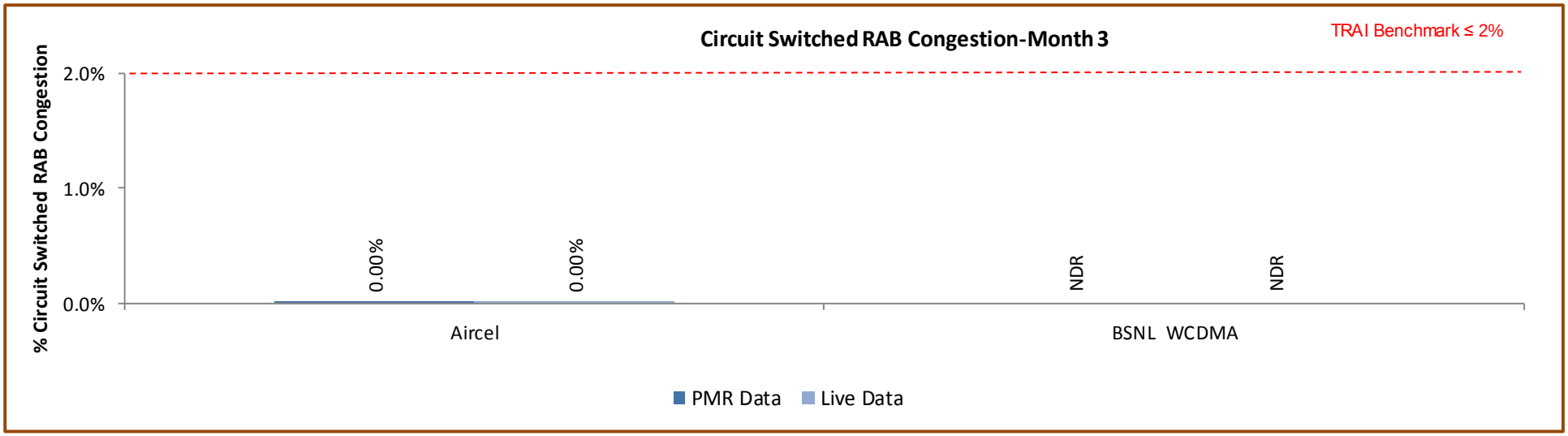
Data Source: Network Operations Center (NOC) of the operators

6.4.3.2 KEY FINDINGS – MONTH 2



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

6.4.3.3 KEY FINDINGS – MONTH 3



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

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

Audit Results for POI Congestion- PMR data			
POI congestion	Benchmark	Aircel	BSNL WCDMA
Total number of working POIs		0	0
No. of POIs not meeting benchmark		0	0
Total Capacity of all POIs (A) - in erlangs		0	0
Traffic served for all POIs (B)- in erlangs		0	0
POI congestion	≤ 0.5%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data			
POI congestion	Benchmark	Aircel	BSNL WCDMA
Total number of working POIs		0	0
No. of POIs not meeting benchmark		0	0
Total Capacity of all POIs (A) - in erlangs		0	0
Traffic served for all POIs (B)- in erlangs		0	0
POI congestion	≤ 0.5%	0.00%	0.00%

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

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

6.4.4.1 KEY FINDINGS – MONTH 1

Audit Results for POI Congestion- PMR data-October			
POI congestion	Benchmark	Aircel	BSNL WCDMA
Total number of working POIs		0	NDR
No. of POIs not meeting benchmark		0	NDR
Total Capacity of all POIs (A) - in erlangs		0	NDR
Traffic served for all POIs (B)- in erlangs		0	NDR
POI congestion	≤ 0.5%	0.00%	NDR
Live Measurement Results for POI Congestion- 3 Day data-October			
POI congestion	Benchmark	Aircel	BSNL WCDMA
Total number of working POIs		0	NDR
No. of POIs not meeting benchmark		0	NDR
Total Capacity of all POIs (A) - in erlangs		0	NDR
Traffic served for all POIs (B)- in erlangs		0	NDR
POI congestion	≤ 0.5%	0.00%	NDR

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

6.4.4.2 KEY FINDINGS – MONTH 2

Audit Results for POI Congestion- PMR data-November			
POI congestion	Benchmark	Aircel	BSNL WCDMA
Total number of working POIs		0	0
No. of POIs not meeting benchmark		0	0
Total Capacity of all POIs (A) - in erlangs		0	0
Traffic served for all POIs (B)- in erlangs		0	0
POI congestion	≤ 0.5%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-November			
POI congestion	Benchmark	Aircel	BSNL WCDMA
Total number of working POIs		0	0
No. of POIs not meeting benchmark		0	0
Total Capacity of all POIs (A) - in erlangs		0	0
Traffic served for all POIs (B)- in erlangs		0	0
POI congestion	≤ 0.5%	0.00%	0.00%

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

6.4.4.3 KEY FINDINGS – MONTH 3

Audit Results for POI Congestion- PMR data-December			
POI congestion	Benchmark	Aircel	BSNL WCDMA
Total number of working POIs		0	NDR
No. of POIs not meeting benchmark		0	NDR
Total Capacity of all POIs (A) - in erlangs		0	NDR
Traffic served for all POIs (B)- in erlangs		0	NDR
POI congestion	≤ 0.5%	0.00%	NDR
Live Measurement Results for POI Congestion- 3 Day data-December			
POI congestion	Benchmark	Aircel	BSNL WCDMA
Total number of working POIs		0	NDR
No. of POIs not meeting benchmark		0	NDR
Total Capacity of all POIs (A) - in erlangs		0	NDR
Traffic served for all POIs (B)- in erlangs		0	NDR
POI congestion	≤ 0.5%	0.00%	NDR

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

6.5 CIRCUIT SWITCHED VOICE DROP RATE

6.5.1 PARAMETER DESCRIPTION

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

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

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

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

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

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

5. **TRAI Benchmark –**

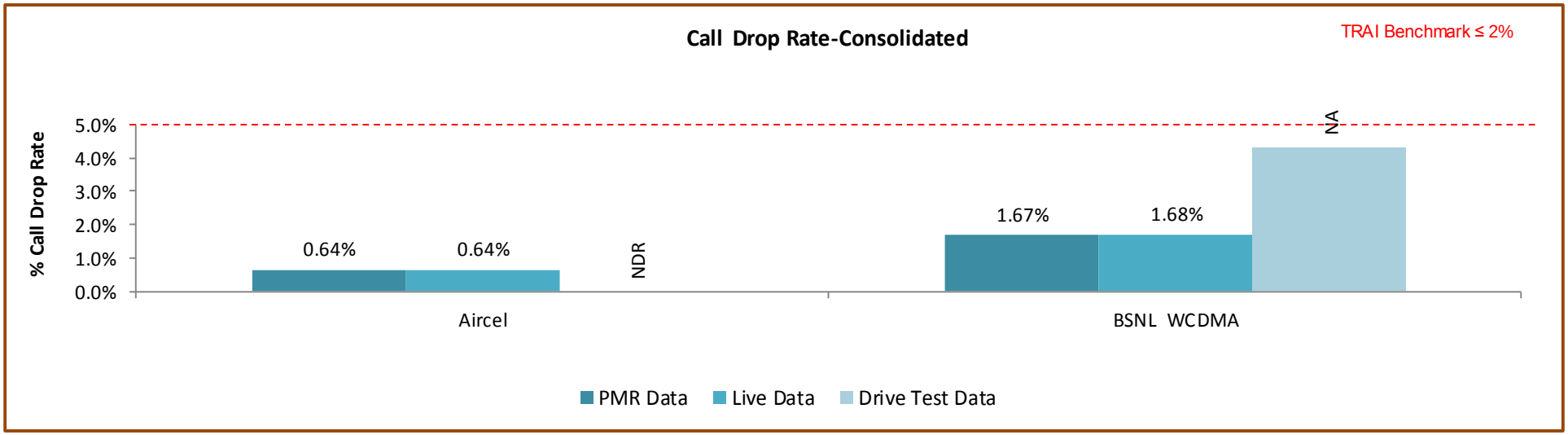
   - Circuit switched voice drop rate ≤ 2%

6. **Audit Procedure –**

   - Audit of traffic data of the relevant quarter kept in OMC-R at MSCs and used for arriving at CDR was used

- The operator should only be considering those calls which are dropped during Time consistent busy hour (TCBH) for all days of the relevant quarter.

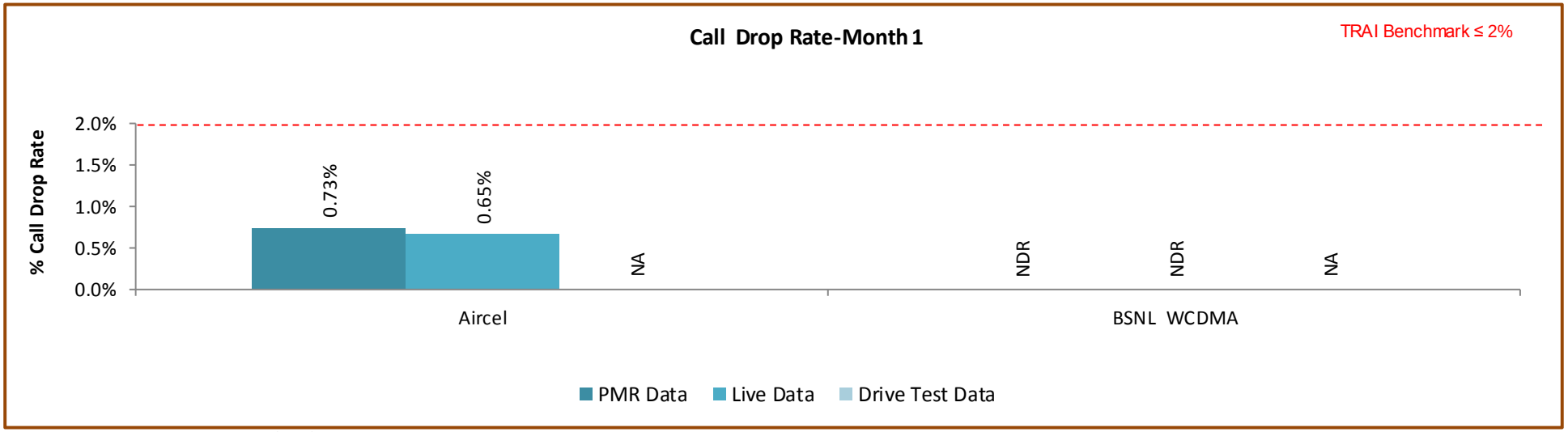
6.5.2 KEY FINDINGS - CONSOLIDATED



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

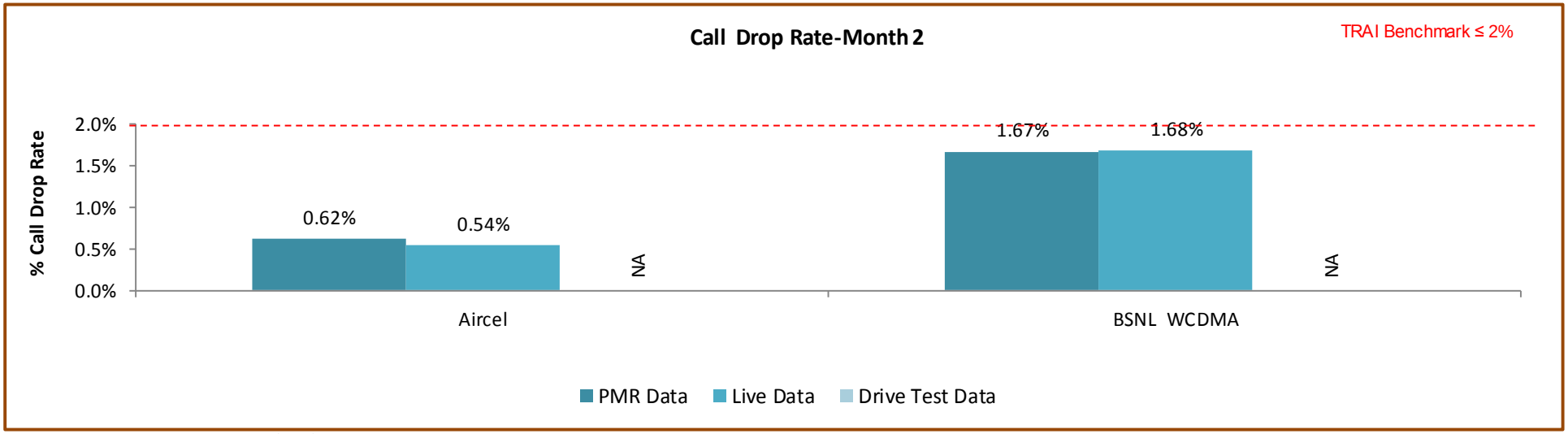
All operators met the benchmark for call drop rate during audit.

6.5.2.1 KEY FINDINGS – MONTH 1



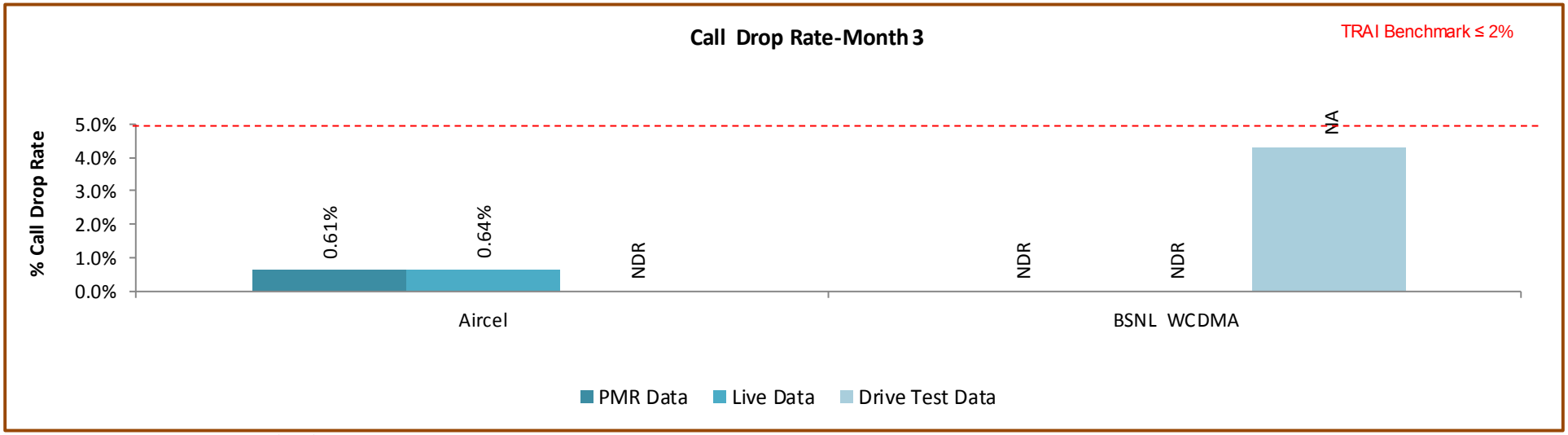
Data Source: Network Operations Center (NOC) of the operators

6.5.2.2 KEY FINDINGS – MONTH 2



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

6.5.2.3 KEY FINDINGS – MONTH 3



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

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

6.6.1 PARAMETER DESCRIPTION

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

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

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

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

5. **TRAI Benchmark** –

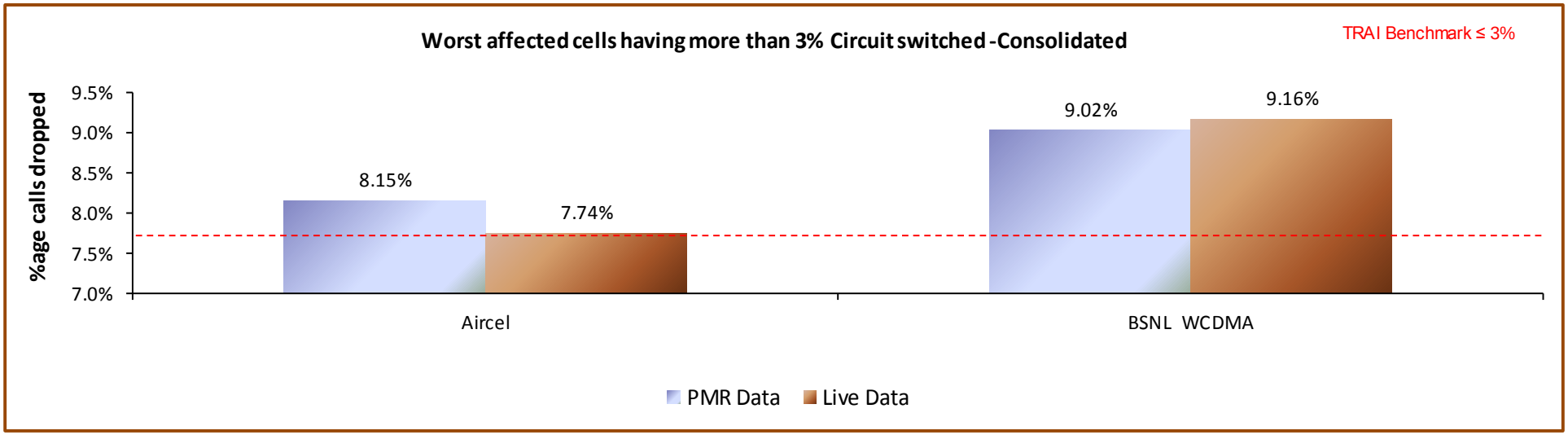
   - Worst affected cells having CSV drop rate > 3% during CBBH in a month ≤ 3%

6. **Audit Procedure** –

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

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

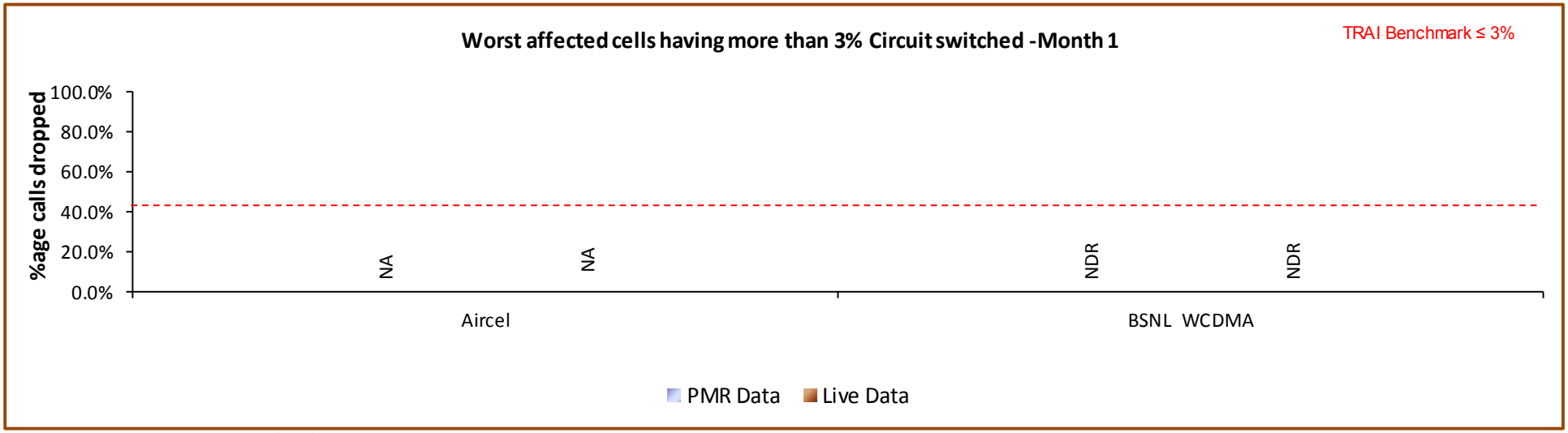
6.6.2 KEY FINDINGS - CONSOLIDATED



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

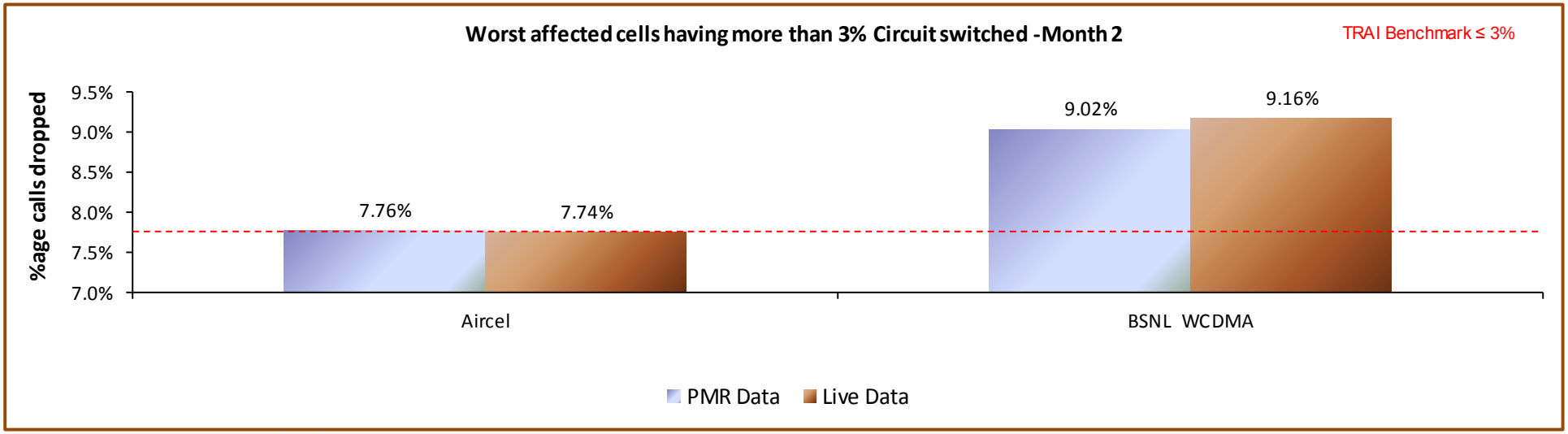
Aircel and BSNL did not meet the benchmark during audit.

6.6.2.1 KEY FINDINGS – MONTH 1



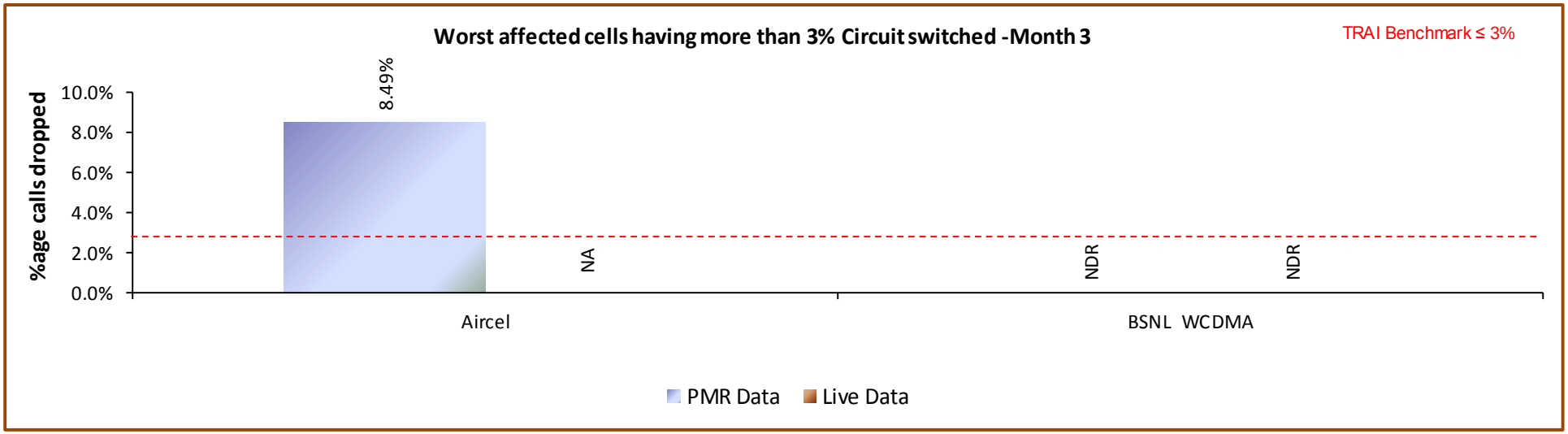
Data Source: Network Operations Center (NOC) of the operators

6.6.2.2 KEY FINDINGS – MONTH 2



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

6.6.2.3 KEY FINDINGS – MONTH 3



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

6.7 CIRCUIT SWITCH VOICE QUALITY

6.7.1 PARAMETER DESCRIPTION

5. **Definition:**

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

6. **Computational Methodology:**

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

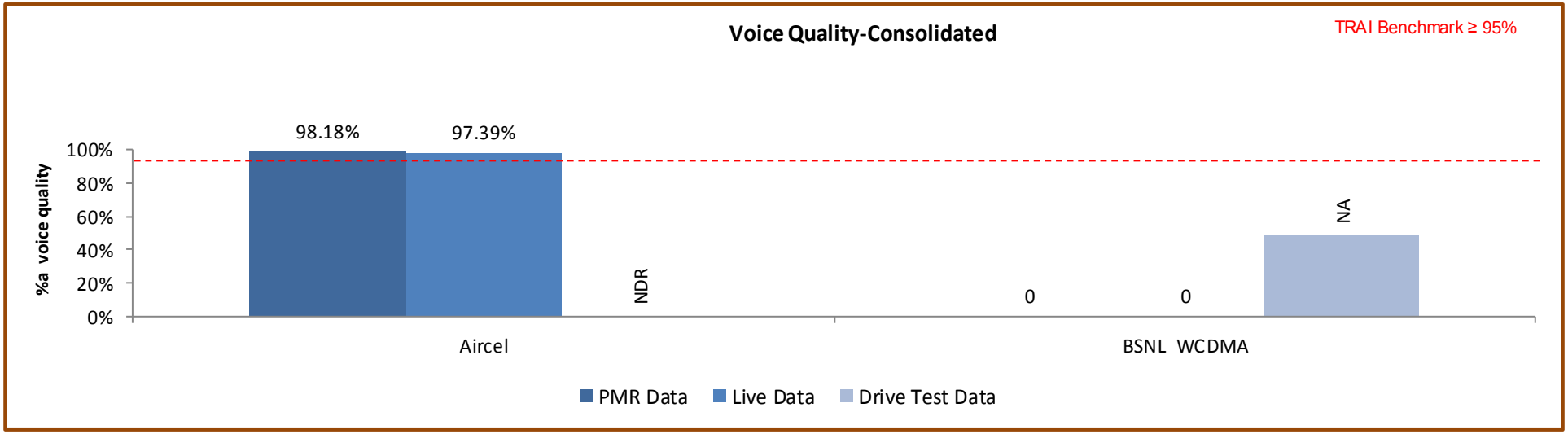
7. **TRAI Benchmark:** ≥ 95%

8. **Audit Procedure –**

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

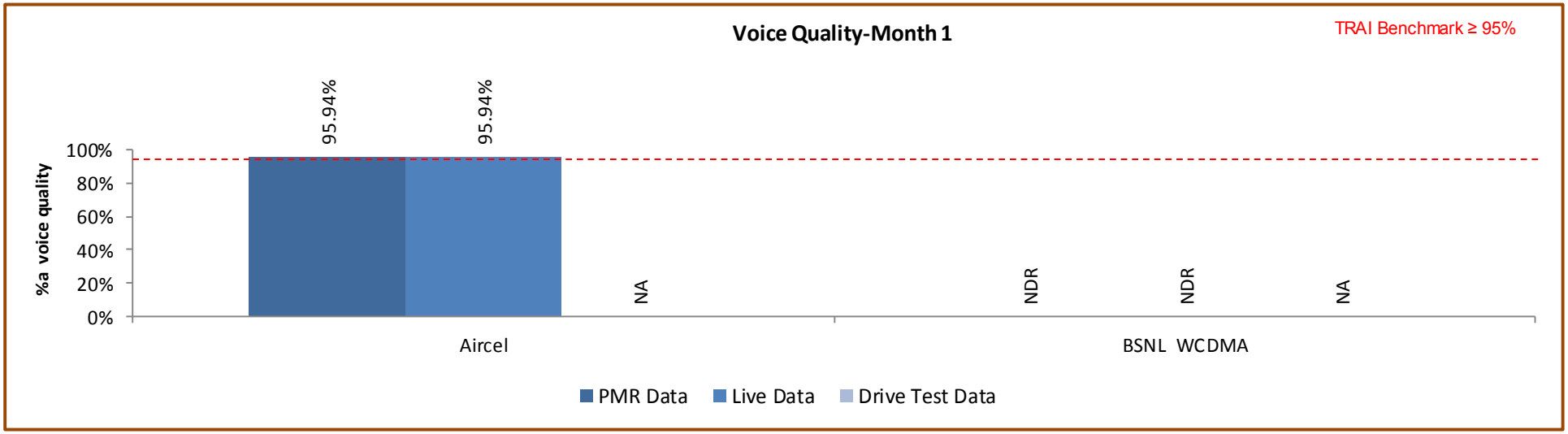
   b. The operator should only be considering those calls which are meeting the desired benchmark of good voice quality.

6.7.2 KEY FINDINGS

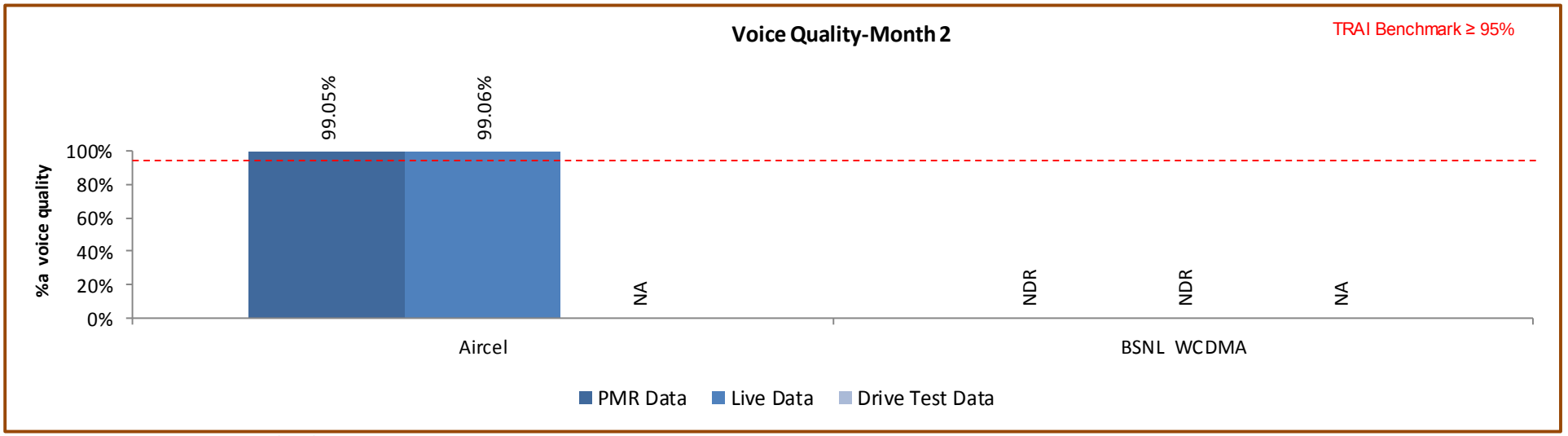


Data Source: Network Operations Center (NOC) of the operators

6.7.2.1 KEY FINDINGS – MONTH 1

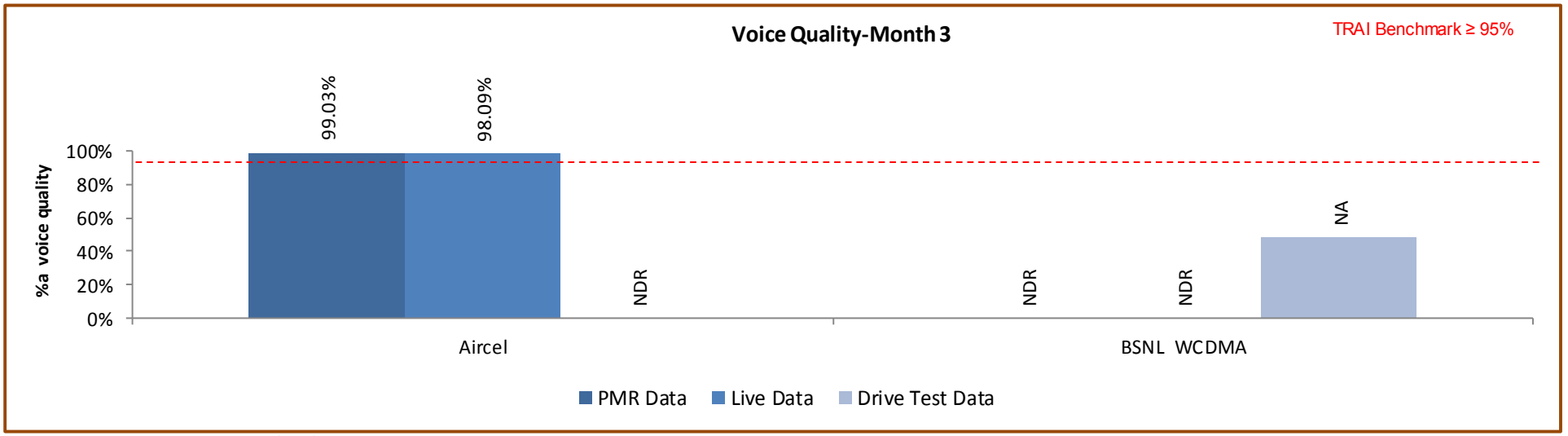


6.7.2.2 KEY FINDINGS – MONTH 2



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

6.7.2.3 KEY FINDINGS – MONTH 3



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

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

7.1 SERVICE ACTIVATION /PROVISIONING FOR 2G & 3G

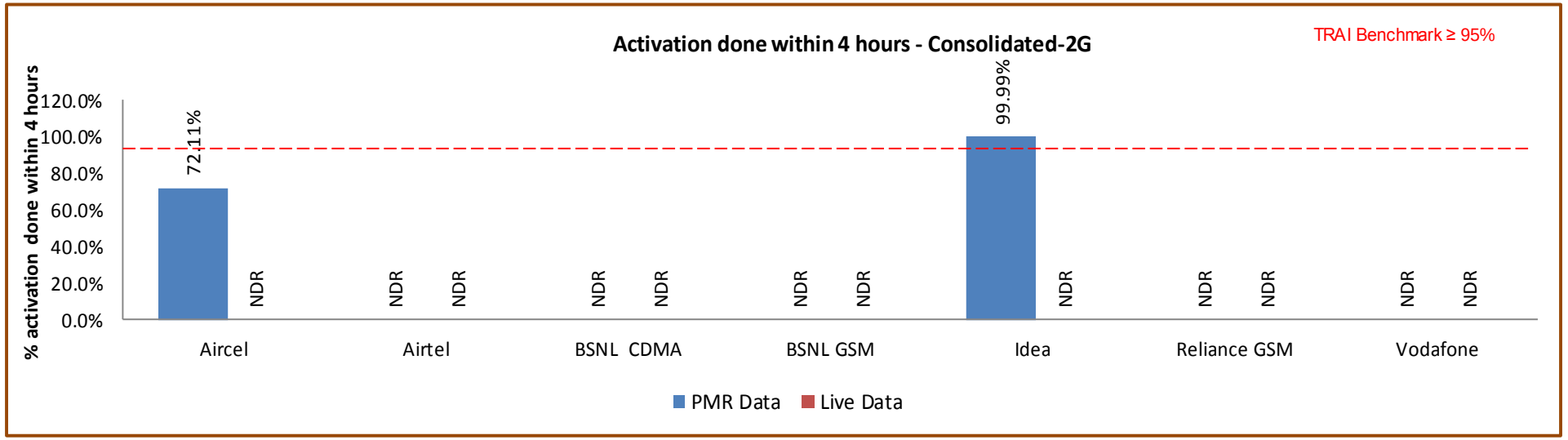
7.1.1 PARAMETER DESCRIPTION

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.

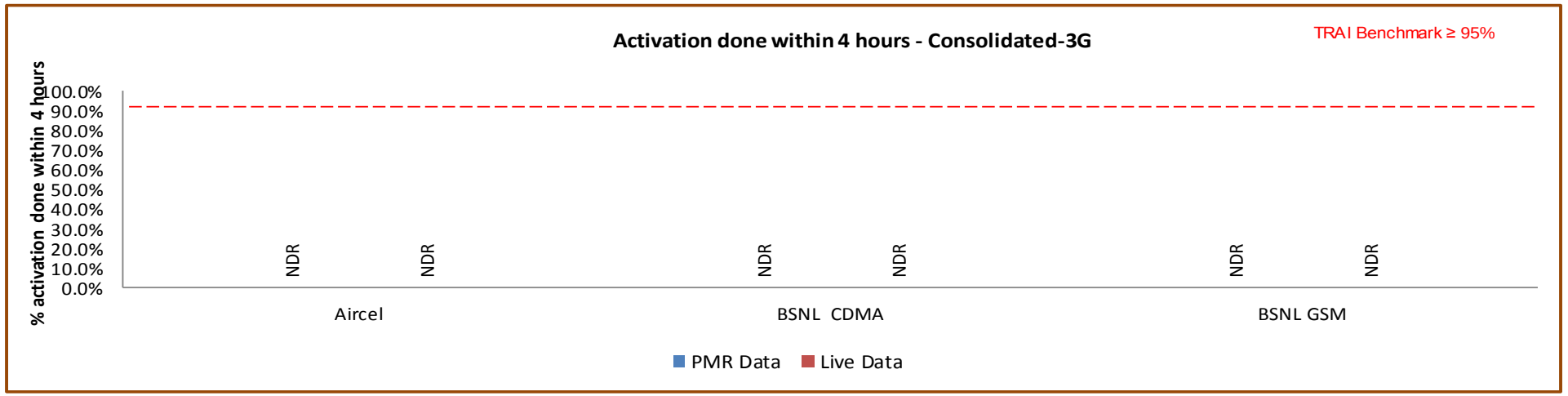
$$\textbf{\% activation done within 4 hours} = \frac{\text{Total Time Taken for Activation}}{\text{Total request time made}} \times 100$$

Benchmark: >=95%

7.1.2 KEY FINDINGS



Aircel and Idea met the TRAI benchmark.



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

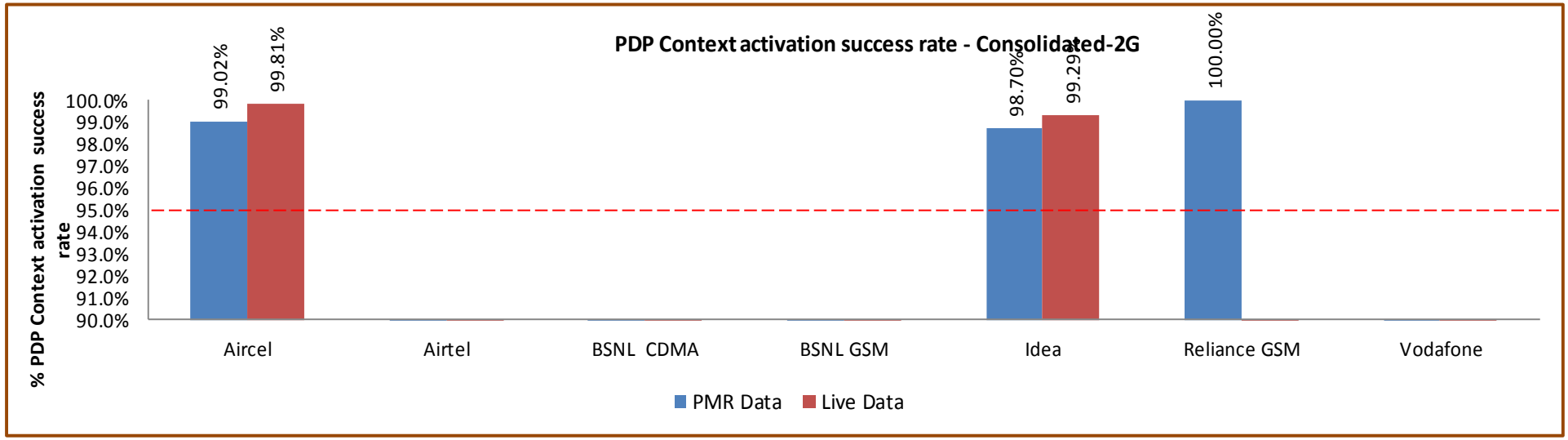
This measurement provides the number of successfully completed PDP context activations. For these context activations, the GGSN is updated successfully and a report of PDP context activation success is generated at GGSN.

PDP Context Activation Success Rate (%) =

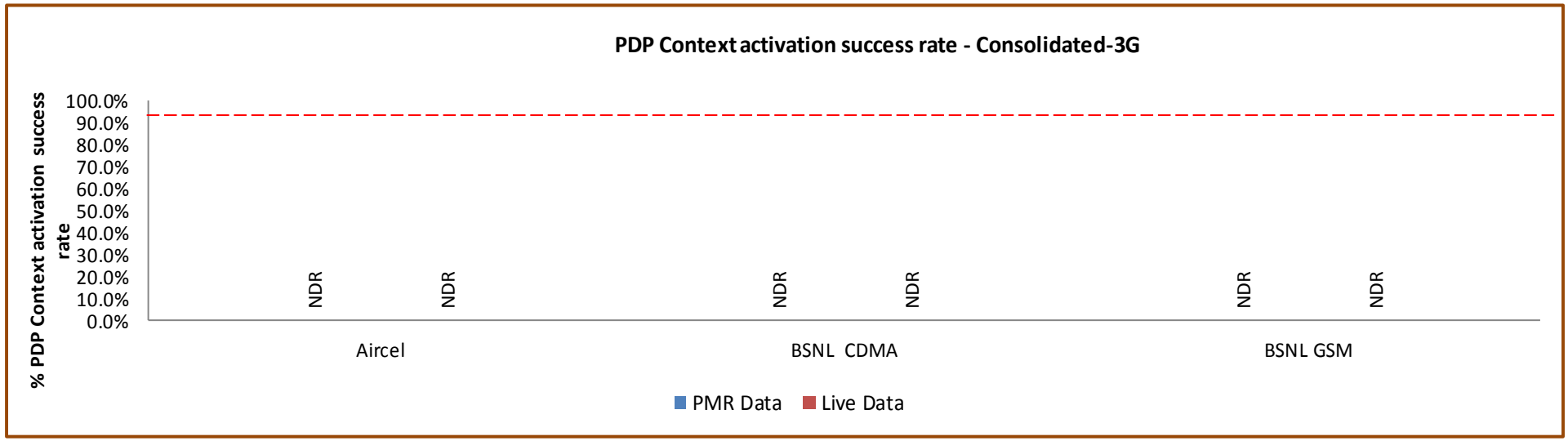
$$\frac{\text{Number of successfully completed PDP context activations}}{\text{Total attempts of context activation}} \times 100$$

Benchmark: >=95%

7.2.2 KEY FINDINGS



All operators met the TRAI benchmark.



7.3 DROP RATE FOR 2G & 3G

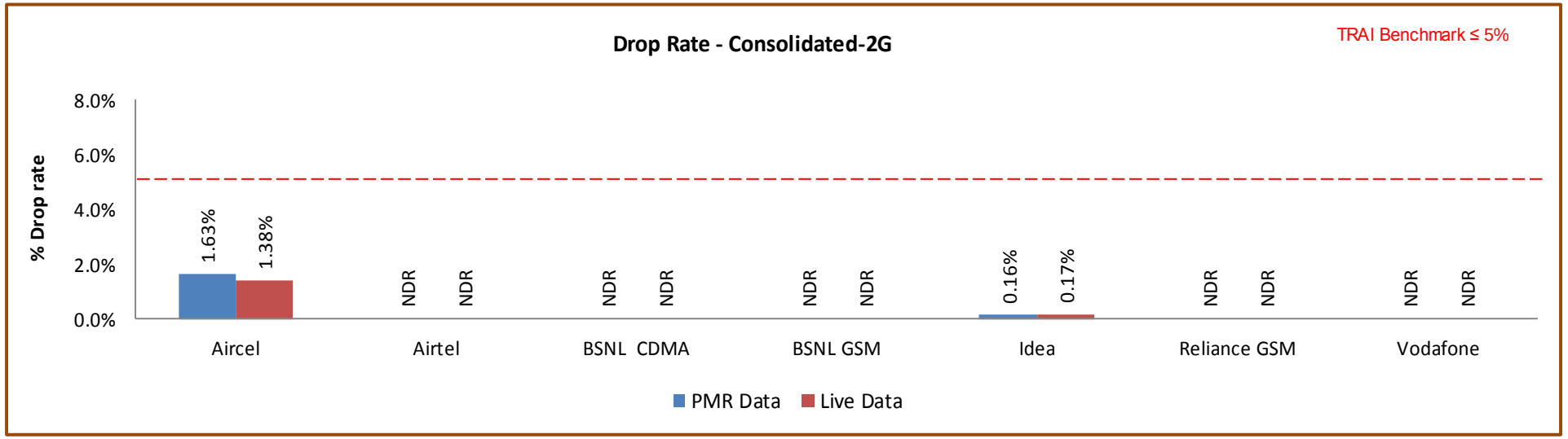
7.3.1 PARAMETER DESCRIPTION

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.

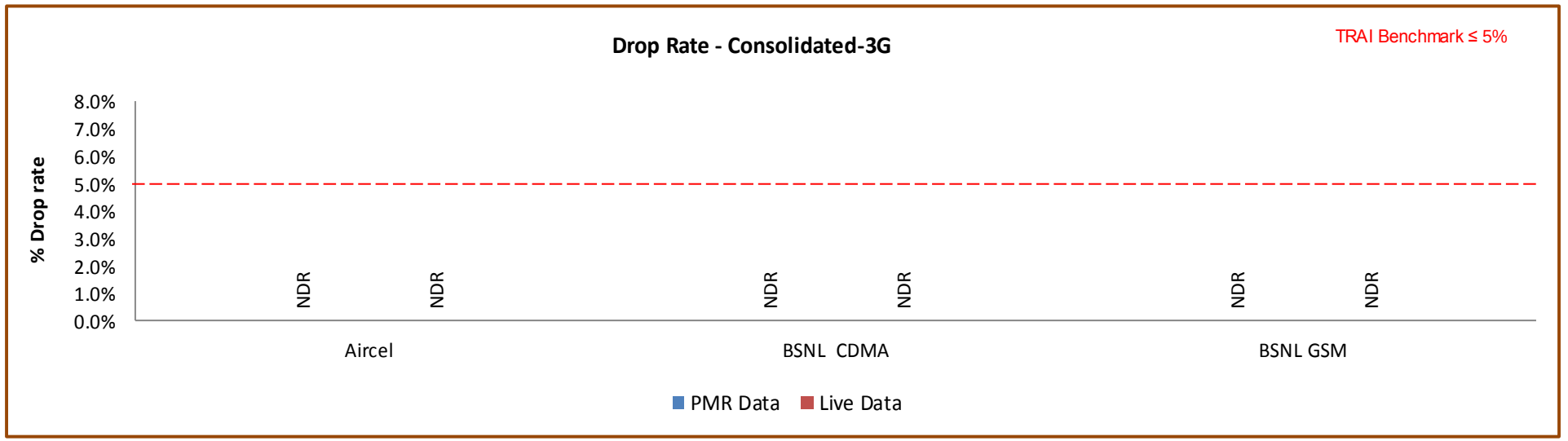
$$\textbf{Drop rate} = \frac{\text{No. of Dropped data Calls}}{\text{No. of Successful data calls}} \times 100$$

Benchmark: <=5%

7.3.2 KEY FINDINGS



All operators met the TRAI benchmarks.



8 PARAMETER DESCRIPTION AND DETAILED FINDINGS – NON-NETWORK PARAMETERS

8.1 METERING AND BILLING CREDIBILITY

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

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

8.1.1 PARAMETER DESCRIPTION

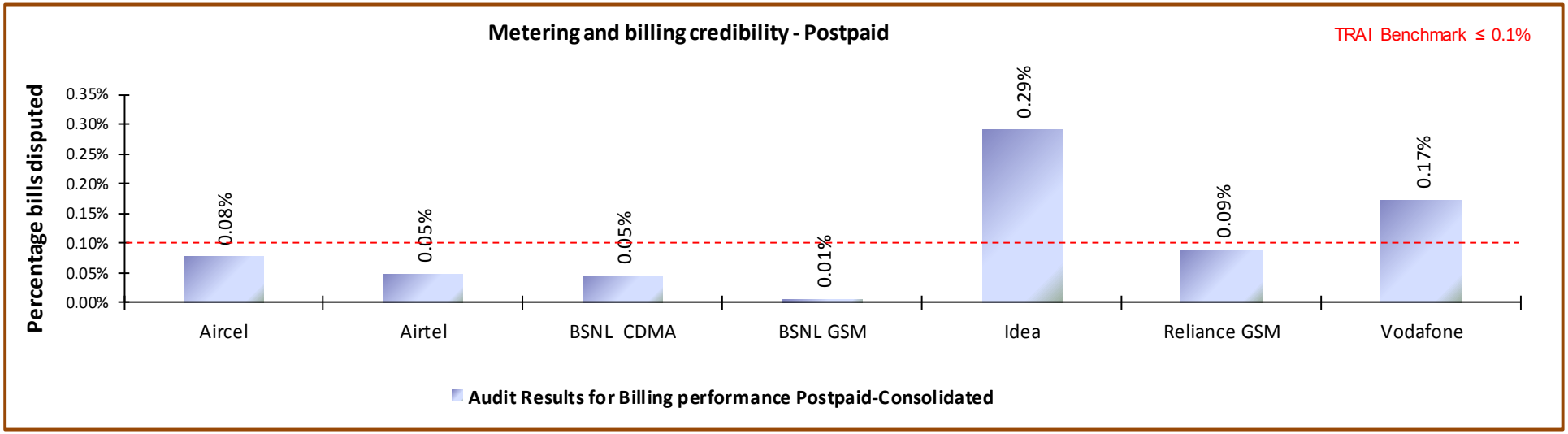
All the complaints related to billing/ charging as per clause 3.7.2 of QoS regulation of 20th December, 2009 were covered. The types of billing complaints covered are listed below.

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

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

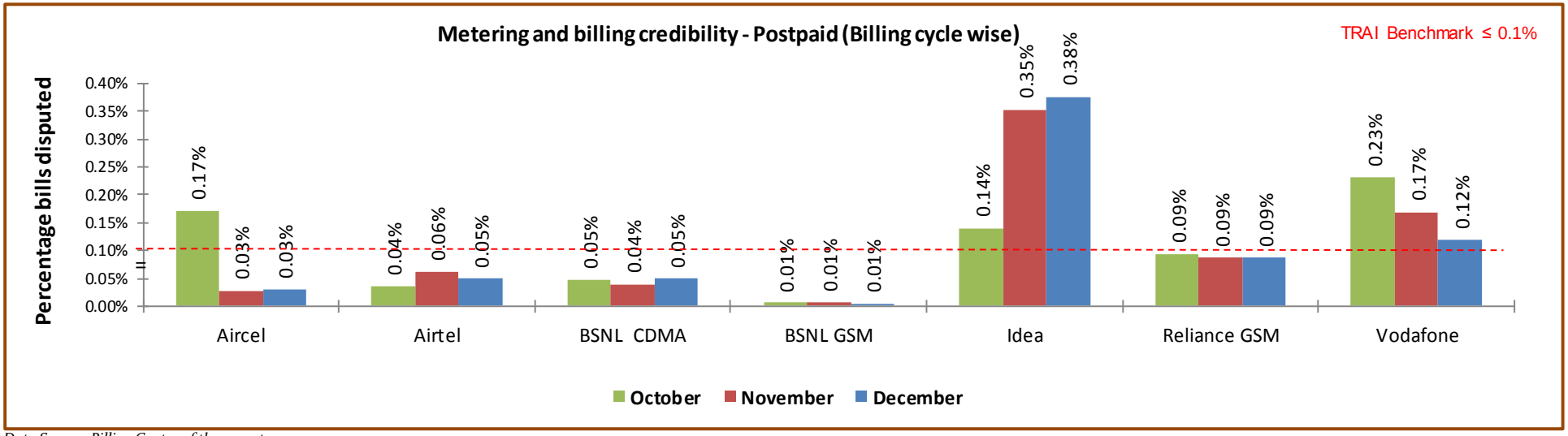
- Computational Methodology:
  - **Billing complaints per 100 bills issued (Postpaid)** = (Total billing complaints** received during the relevant billing cycle / Total bills generated* during the relevant billing cycle)*100
  - *Operator to include all types of bills generated for customers. This would include printed bills, online bills and any other forms of bills generated
  - **Billing complaints here shall include only dispute related issues (including those that November 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)



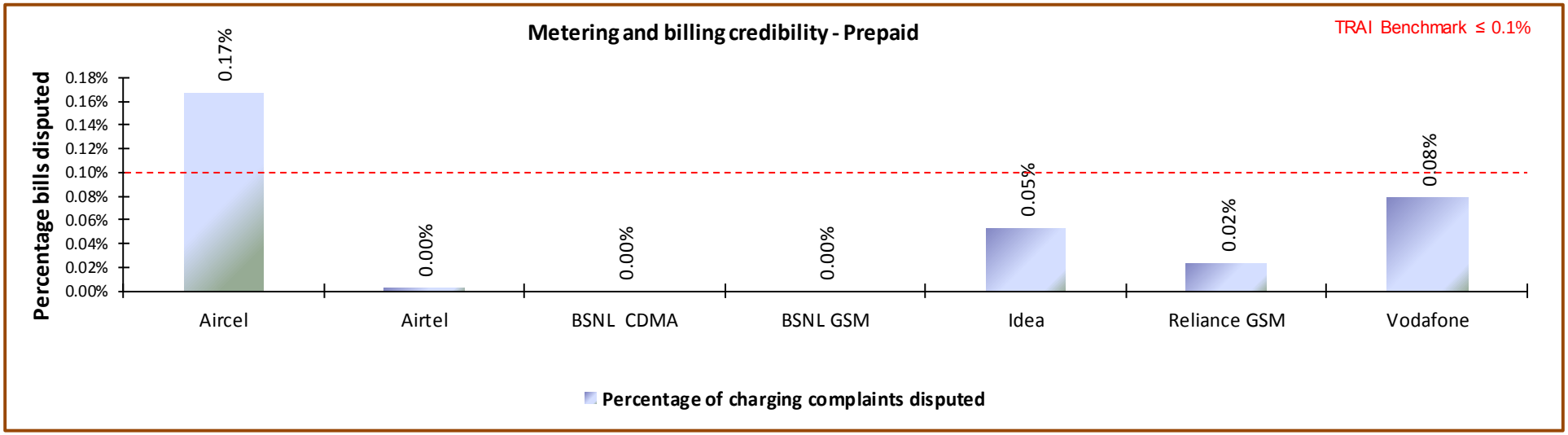
Data Source: Billing Center of the operators

Idea and Vodafone failed to meet the benchmark of 0.1% postpaid metering and billing credibility.



Data Source: Billing Center of the operators

8.1.3 KEY FINDINGS - METERING AND BILLING CREDIBILITY (PREPAID)



Data Source: Billing Center of the operators

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

8.2 RESOLUTION OF BILLING/ CHARGING COMPLAINTS

8.2.1 PARAMETER DESCRIPTION

Calculation of Percentage resolution of billing complaints

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

Resolution of billing complaints within 4 weeks:

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

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

Resolution of billing complaints within 6 weeks:

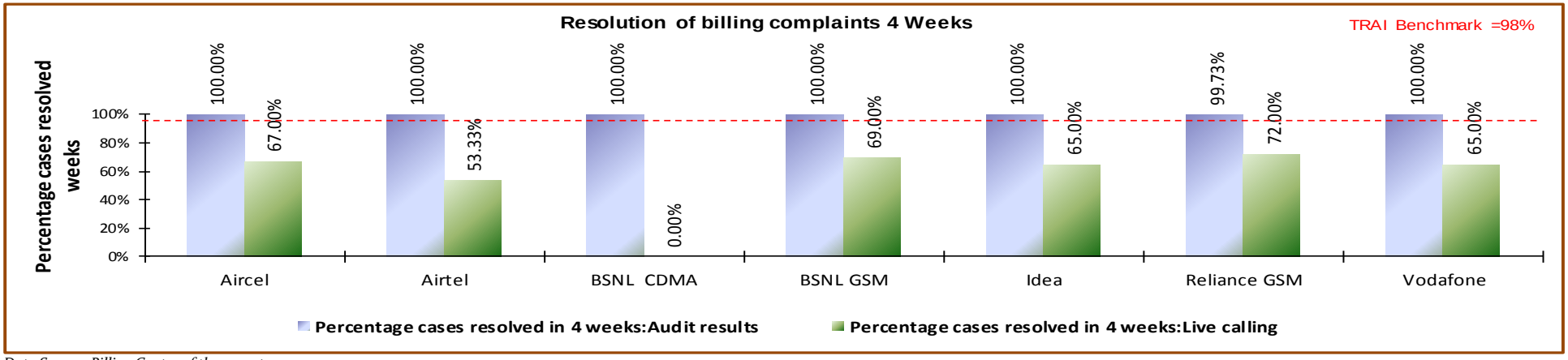
%age of billing complaints (for post-paid customers)/ charging, credit & validity (for pre-paid customers) resolved within 6 weeks =

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

- **Billing complaints here shall include only dispute related issues (including those that November 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.

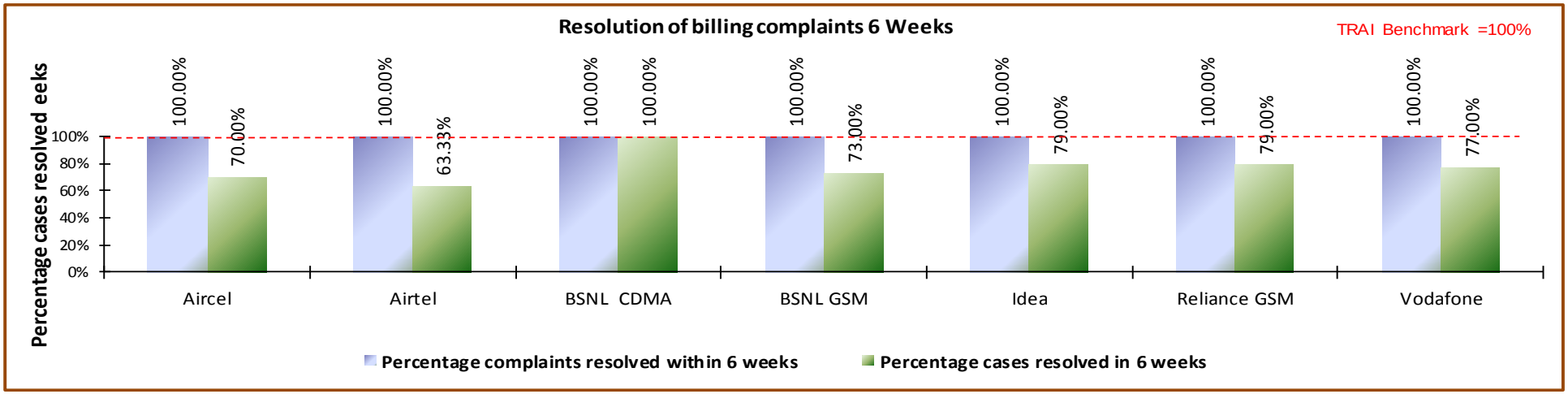
Benchmark: 98% complaints resolved within 4 weeks, 100% within 6 weeks.

8.2.2 KEY FINDINGS - WITHIN 4 WEEKS



Data Source: Billing Center of the operators

8.2.3 KEY FINDINGS WITHIN 6 WEEKS



Data Source: Billing Center of the operators

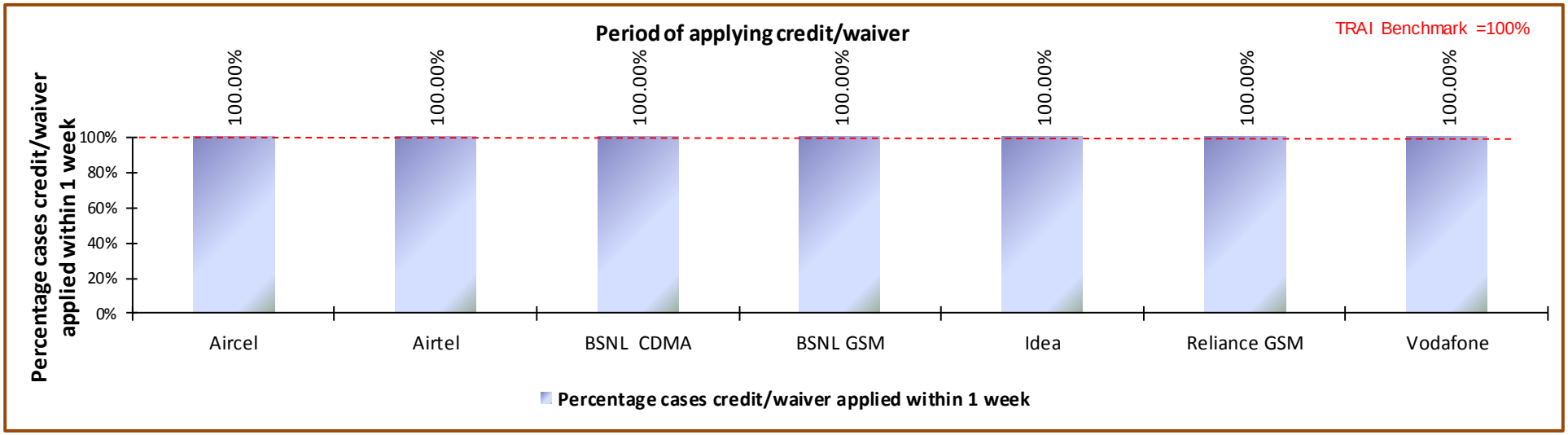
All operators met the TRAI benchmark of resolution of billing complaints within 4 weeks and 6 weeks. However, as per live calling done to customers, the performance of all operators was observed to be much below the PMR data.

8.3 PERIOD OF APPLYING CREDIT/WAVIER

8.3.1 PARAMETER DESCRIPTION

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

8.3.2 KEY FINDINGS



Data Source: Billing Center of the operators

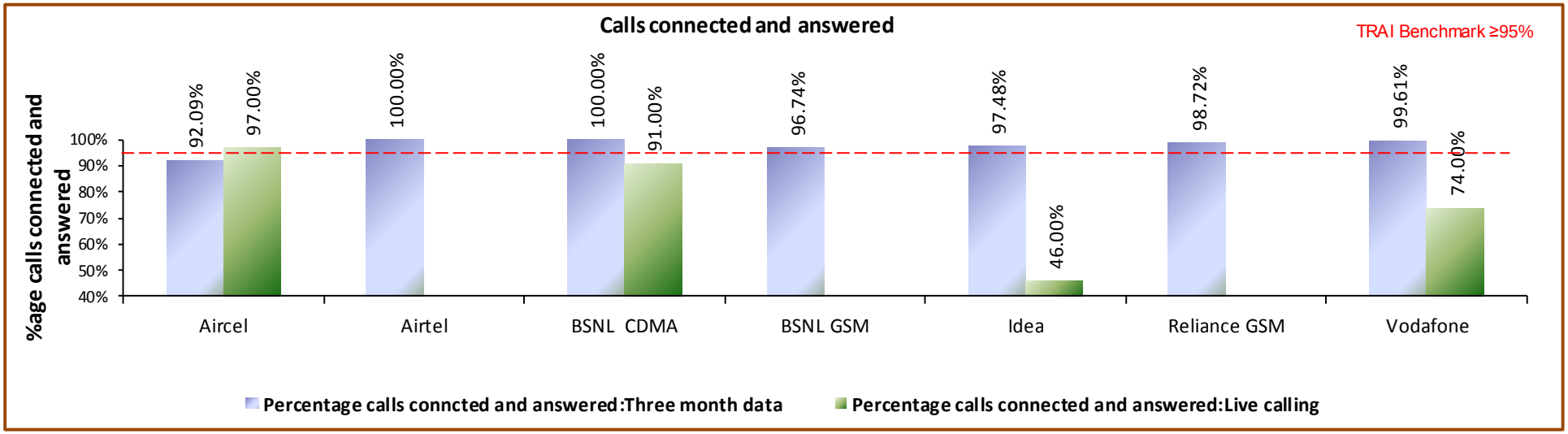
All operators met the benchmark for this parameter.

8.4 CALL CENTRE PERFORMANCE-IVR

8.4.1 PARAMETER DESCRIPTION

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

8.4.2 KEY FINDINGS



Data Source: Customer Service Center of the operators

As per PMR data, all operators met the benchmark except Aircel for PMR, however in live calling operators are much below than PMR.

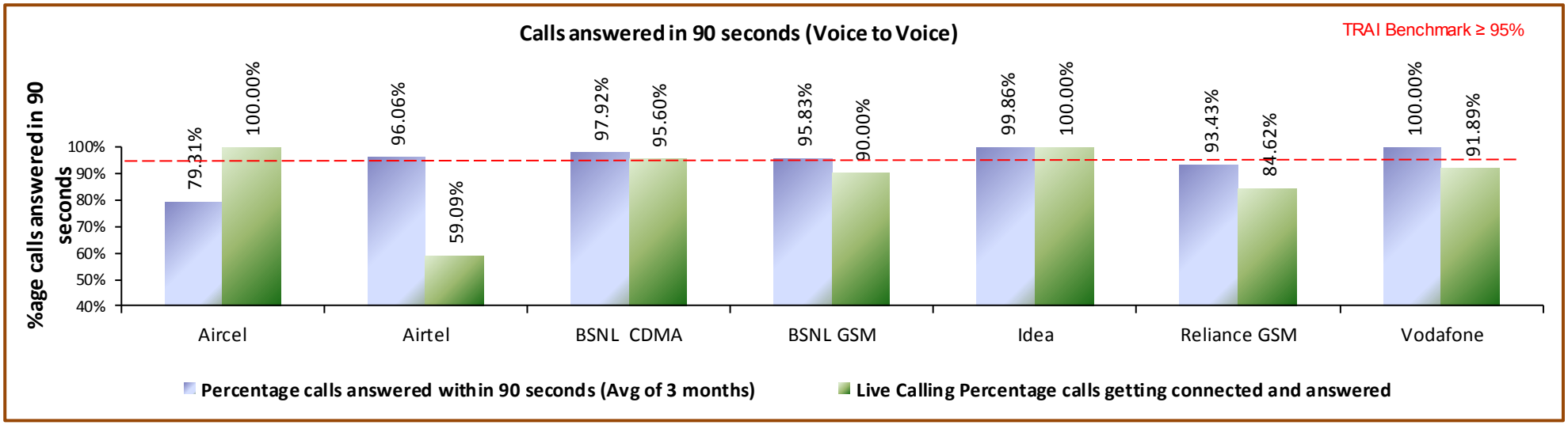
8.5 CALL CENTRE PERFORMANCE-VOICE TO VOICE

8.5.1 PARAMETER DESCRIPTION

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

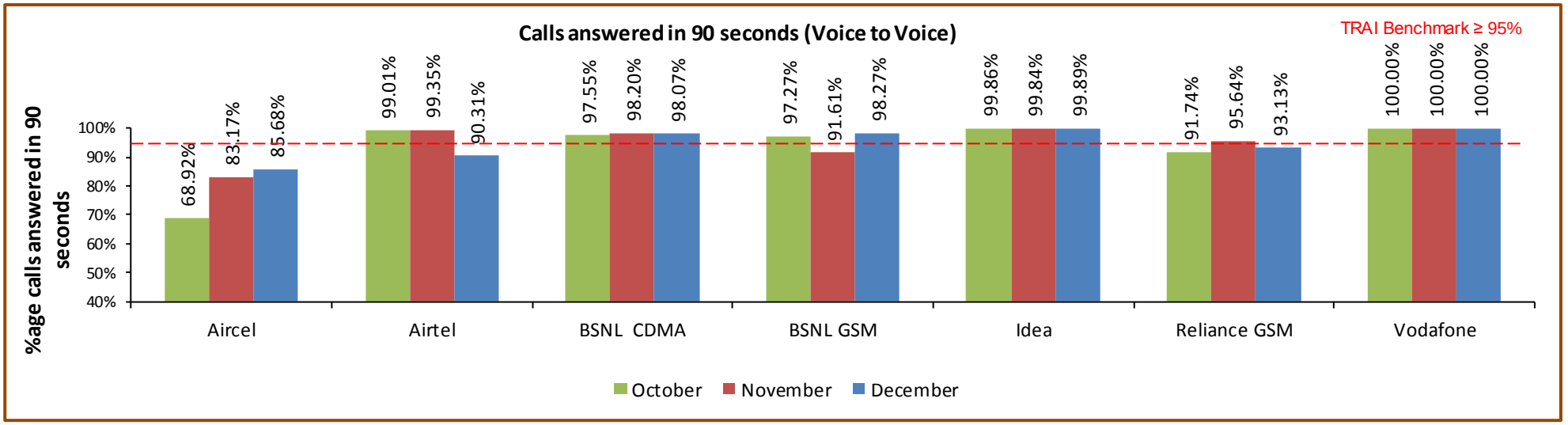
Benchmark: 95% calls to be answered within 90 seconds

8.5.2 KEY FINDINGS



Data Source: Customer Service Center of the operators

Aircel and Reliance GSM were not able to meet the benchmark as per audit. However, as per live calling done to customers, the performance of Airtel, BSNL GSM, Reliance GSM and Vodafone was far inferior to the PMR data.



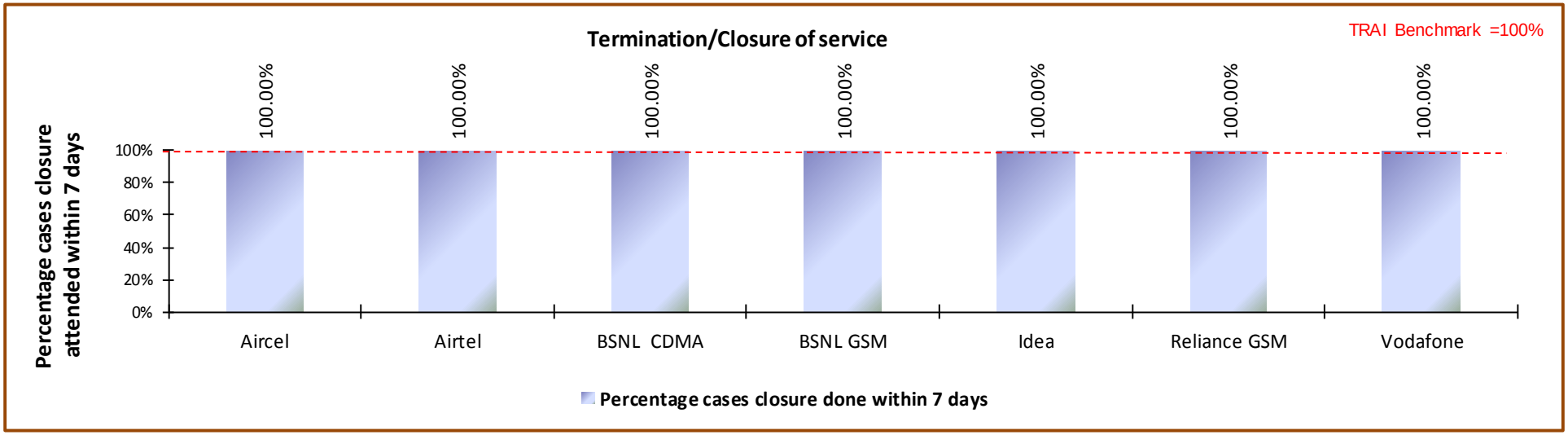
Data Source: Customer Service Center of the operators

8.6 TERMINATION/CLOSURE OF SERVICE

8.6.1 PARAMETER DESCRIPTION

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

8.6.2 KEY FINDINGS



Data Source: Customer Service Center of the operators

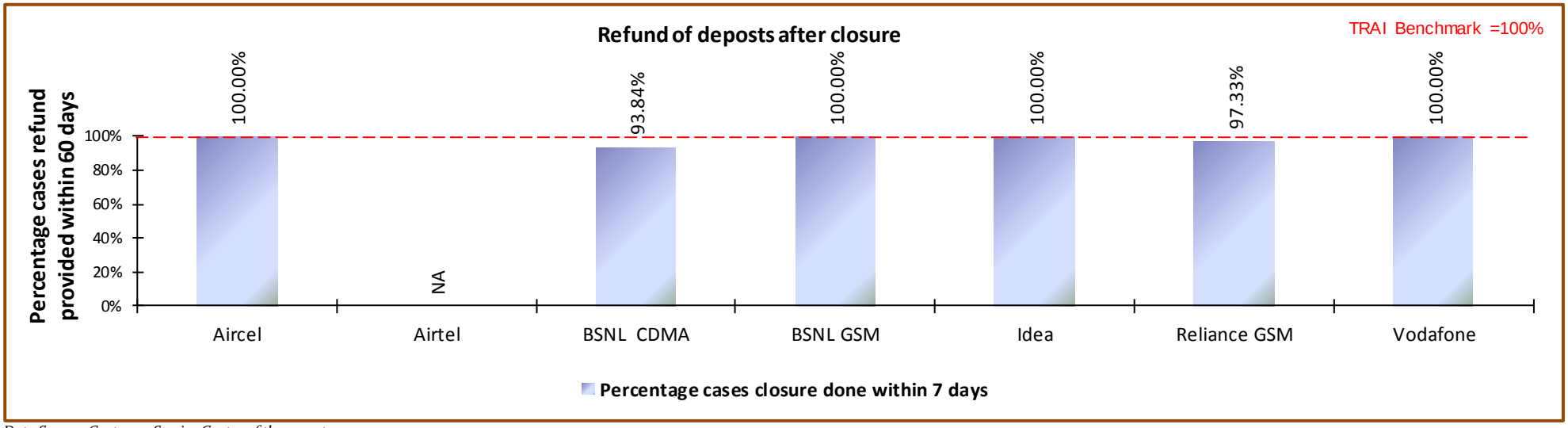
All operators met the TRAI benchmark for the parameter.

8.7 REFUND OF DEPOSITS AFTER CLOSURE

8.7.1 PARAMETER DESCRIPTION

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

8.7.2 KEY FINDINGS



Data Source: Customer Service Center of the operators

All operators met the TRAI benchmark for the parameter.

9 DETAILED FINDINGS - DRIVE TEST DATA

9.1 OPERATOR ASSISTED DRIVE TEST - VOICE

The drive test was conducted simultaneously for all the operators present in the 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
Airtel	Airtel
BSNL CDMA	BSNL WCDMA
BSNL GSM	Reliance WCDMA
Idea	
Reliance GSM	
Vodafone	

9.1.1 Jorhat SSA

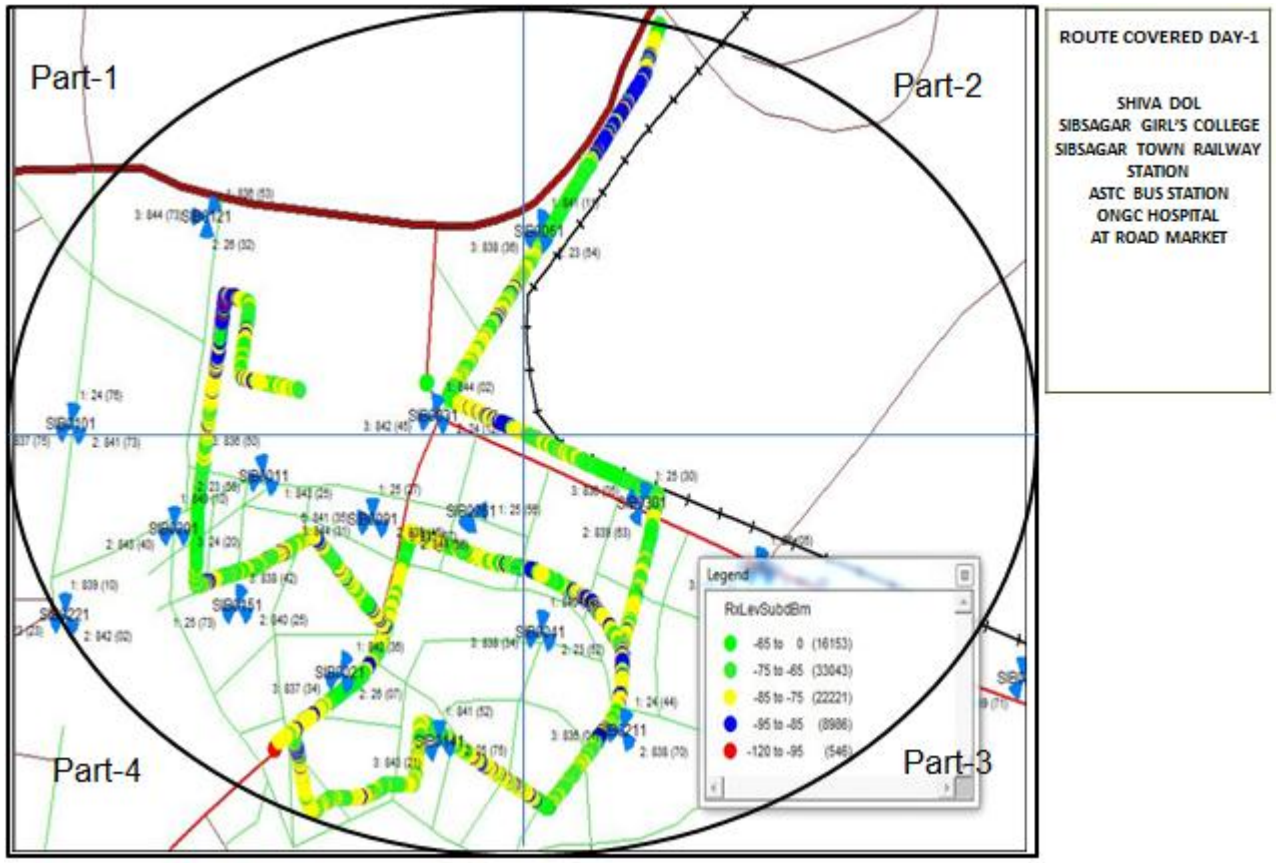
Month	Name of SSA Covered	Start date	End Date	Kilometer Travelled
December	JORHAT	21-12-2015	23-12-1015	323

9.1.1.1 Route Details - Jorhat SSA

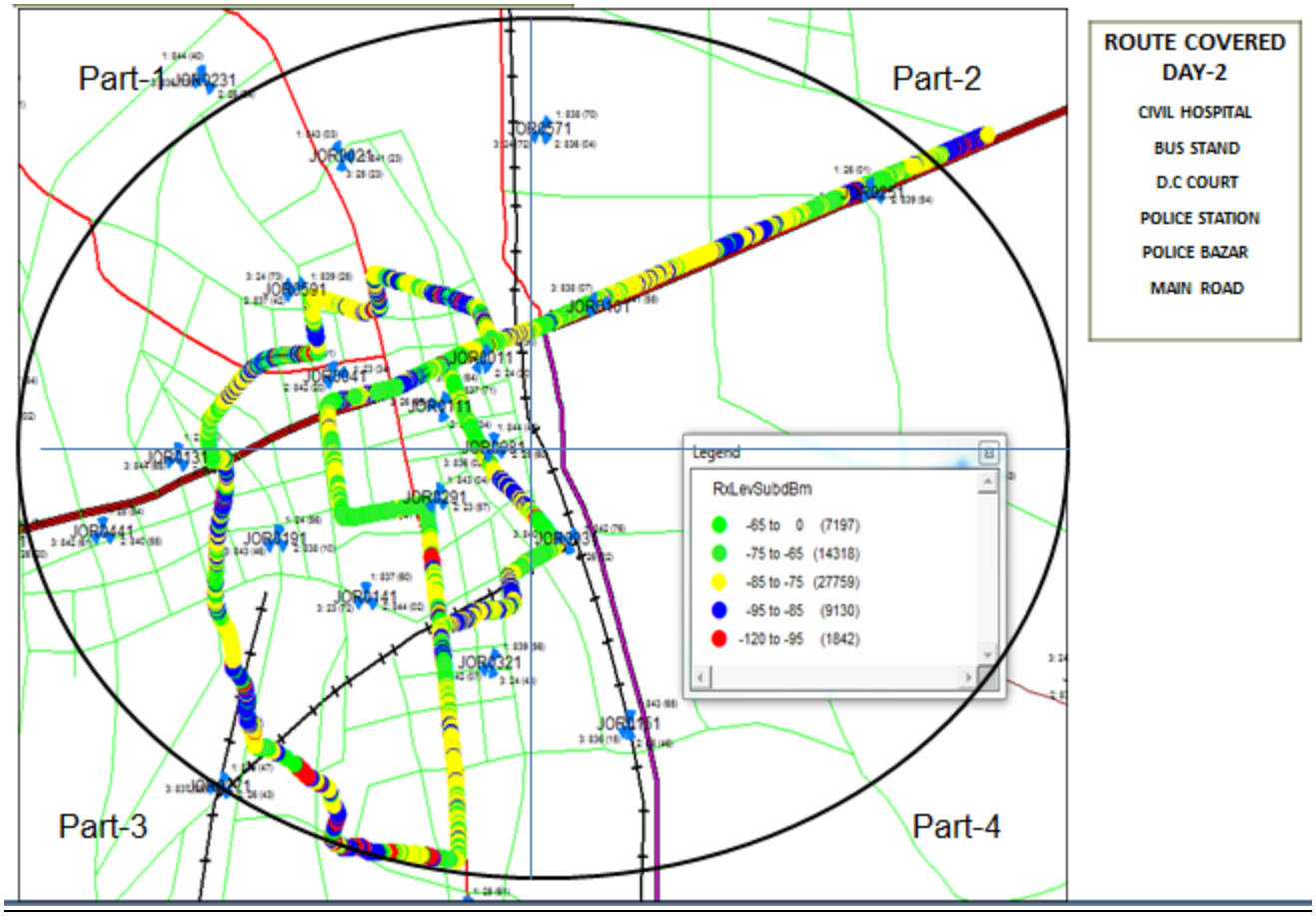
Category	Type of location	December		
		JORHAT		
		Day 1	Day 2	Day 3
Outdoor	Major Roads	NOWJAN NAMTIYAL PATHAR GOHAINCHOK PUKHAN NAGAR WORD NO. 4 YAMUNA KINARA DOLMUKH CHARIALI	KENDUGURI KACHARIPARIA BABUPATTY JB COLLEGE ROAD CHOWK BAZAR NEW COLONY AT ROAD DCB ROAD	CHANDAN NAGAR GORANGA KUMARPATTY BHOGA GAON JYOTI NAGAR JUNAKI NAGAR
	Highways			
	With in the City			
Indoor	Shopping complex			
	Office complex			

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

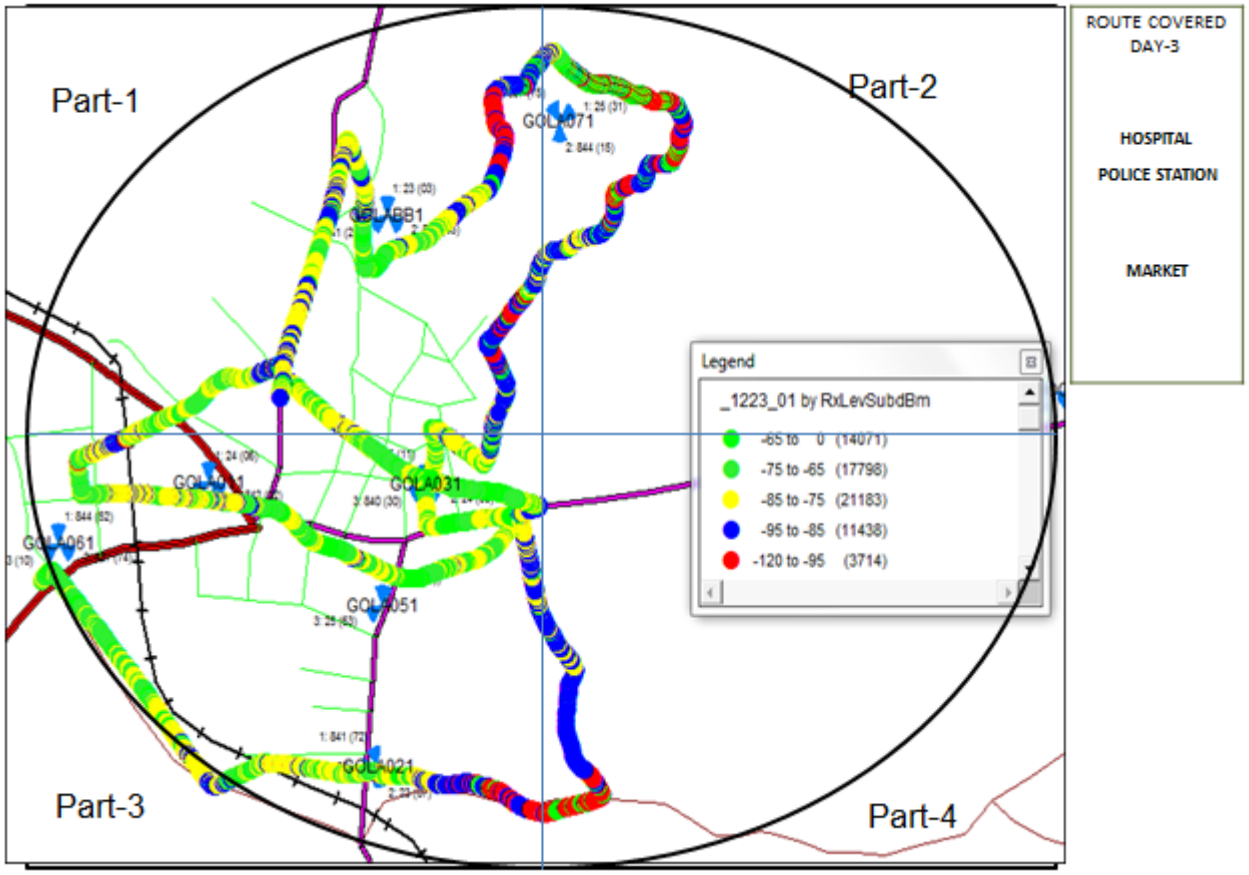
9.1.1.2 Route Map - Jorhat DAY 1



9.1.1.3 Route Map - Jorhat DAY 2



9.1.1.4 Route Map - Jorhat DAY 3



9.1.1.5 Drive Test Results - Jorhat SSA-2G

December-JORHAT															
	B'mark	Aircel		Airtel		BSNL CDMA		BSNL GSM		Idea		Reliance GSM		Vodafone	
Parameter's		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
0 to -75 dBm		61.20%	37.59%	25.68%	34.93%	100.00%	100.00%	82.64%	66.62%	61.71%	43.37%	NDR		27.44%	27.16%
0 to -85 dBm		99.67%	63.50%	89.60%	65.24%	100.00%	100.00%	99.07%	78.25%	93.43%	70.16%			95.15%	61.46%
0 to -95 dBm		100.00%	92.31%	99.86%	90.75%	100.00%	100.00%	99.71%	91.97%	100.00%	89.03%			99.50%	88.33%
Voice quality	≥ 95%	98.34%	92.62%	96.72%	89.48%	98.33%	93.27%	99.00%	95.04%	96.48%	97.68%			90.23%	94.21%
CSSR	≥ 95%	100.00%	95.71%	100.00%	99.71%	100.00%	97.17%	98.89%	95.81%	NDR	98.85%			100.00%	98.10%
%age Blocked calls		0.00%	2.04%	0.00%	0.29%	0.00%	4.78%	1.11%	4.19%	NDR	1.15%			0.00%	1.90%
Call drop rate	≤ 2%	0.00%	0.43%	0.00%	0.00%	0.00%	6.71%	0.00%	2.73%	NDR	0.39%			2.22%	0.83%
Hands off success rate		100.00%	99.41%	100.00%	100.00%	100.00%	100.00%	100.00%	94.81%	NDR	100.00%			97.87%	96.04%

Data Source: Drive test reports submitted by operators to auditors

Note: - Reliance did not meet the benchmark

Voice Quality

Aircel, Airtel and BSNL CDMA did not meet the benchmark in outdoor locations and Vodafone did not meet the benchmark in indoor as well as outdoor locations.

Call Set Success Rate (CSSR)

All the parameters meet the benchmark.

Call Drop Rate

BSNL CDMA and BSNL GSM failed to meet the benchmark for call drop rate in outdoor locations and Vodafone did not meet the benchmark in indoor location.

9.1.1.1 Drive Test Results - Jorhat SSA-3G

December-JORHAT									
	B'mark	Aircel		Airtel		BSNL WCDMA		Vodafone	
Parameter's		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
0 to -75 dBm		NDR		16.72%	17.87%	19.93%	35.19%	0.56%	28.82%
0 to -85 dBm				51.25%	36.28%	63.08%	49.48%	99.64%	57.21%
0 to -95 dBm				99.07%	61.41%	84.65%	65.59%	100.00%	76.01%
Voice quality	≥ 95%			73.22%	85.11%	17.88%	28.45%	58.51%	61.17%
CSSR	≥ 95%			100.00%	99.04%	100.00%	95.04%	100.00%	76.80%
%age Blocked calls				0.00%	0.96%	0.00%	4.96%	0.00%	0.35%
Call drop rate	≤ 2%			0.00%	0.00%	0.00%	4.93%	0.00%	1.41%
Hands off success rate				100.00%	100.00%	100.00%	99.93%	100.00%	100.00%

Data Source: Drive test reports submitted by operators to auditors

Note: - Aircel did not share the data

Voice Quality

All the operators failed to meet the benchmark in indoor as well as outdoor locations.

Call Set Success Rate (CSSR)

Vodafone failed to meet the benchmark for CSSR in outdoor locations.

Call Drop Rate

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

9.1.1.1 Drive Test Results - Jorhat SSA- DATA-2G

Name of the Parameter	Bench Mark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	RCOM CDMA	Vodafone
Succesful Data Transmission download speed attempts	>80%	100%	100%	NA	100%	100%	NA	100%
Succesful Data Transmission upload speed attempts	>75%	100%	100%		100%	100%	NA	100%
Minimum download speed		55	100%		NDR	52	NA	NDR
Average throughput for Packet Data		63	200		66	70	NA	124
Latency	<250ms	NDR	100		100	NDR	NA	NDR

9.1.1.2 Drive Test Results - Jorhat SSA- DATA-3G

Name of the Parameter	Bench Mark	Aircel	Airtel	BSNL CDMA	Reliance WCDMA
Succesful Data Transmission download speed attempts	>80%	NDR	NDR	100%	NDR
Succesful Data Transmission upload speed attempts	>75%	NDR	NDR	100%	
Minimum download speed		NDR	NDR	NDR	
Average throughput for Packet Data		NDR	NDR	189	
Latency	<250ms	NDR	NDR	100	

9.1.2 NAGAON SSA

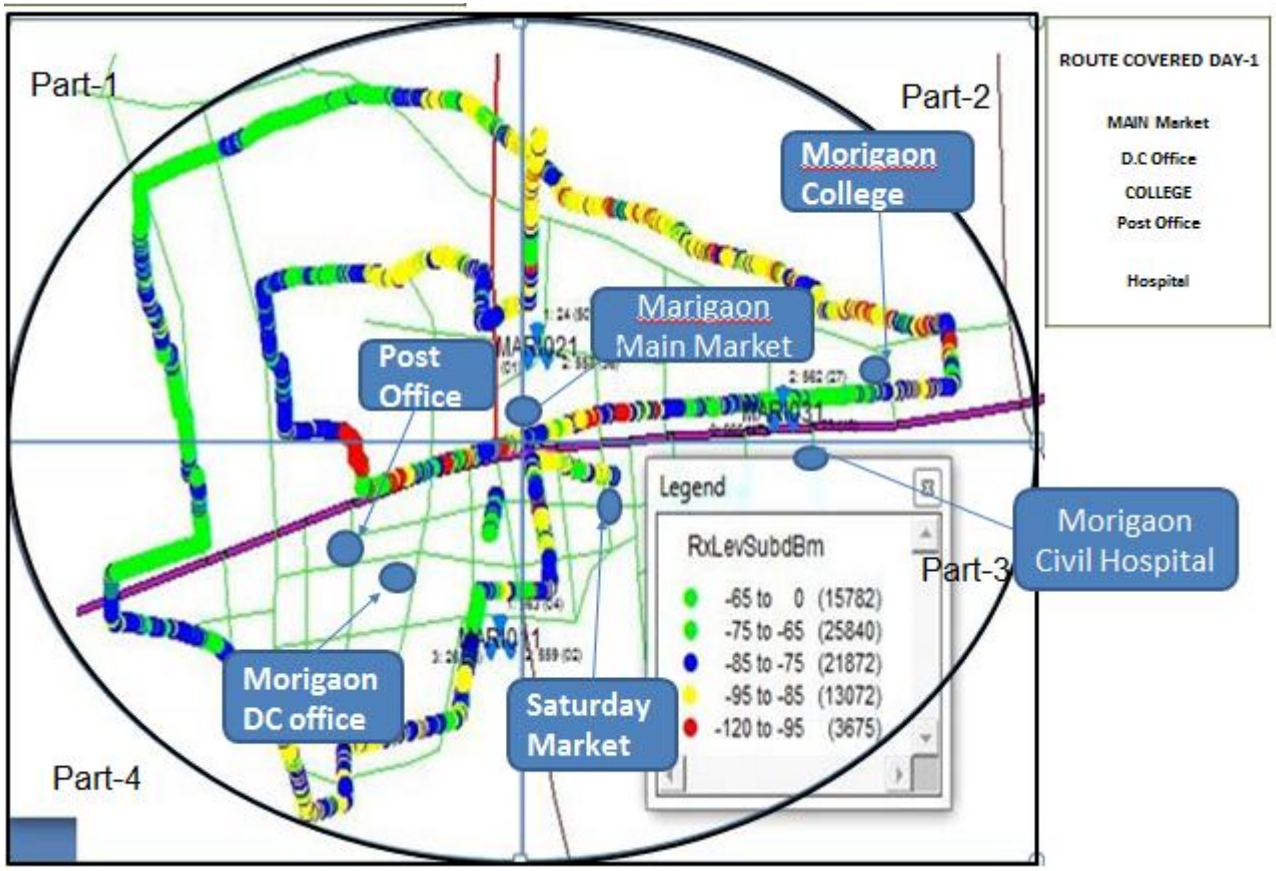
Month	Name of SSA Covered	Start date	End Date	Kilometer Travelled
December	NAGAON	28-12-1015	30-12-1015	340

9.1.2.1 Route Details - Jorhat SSA

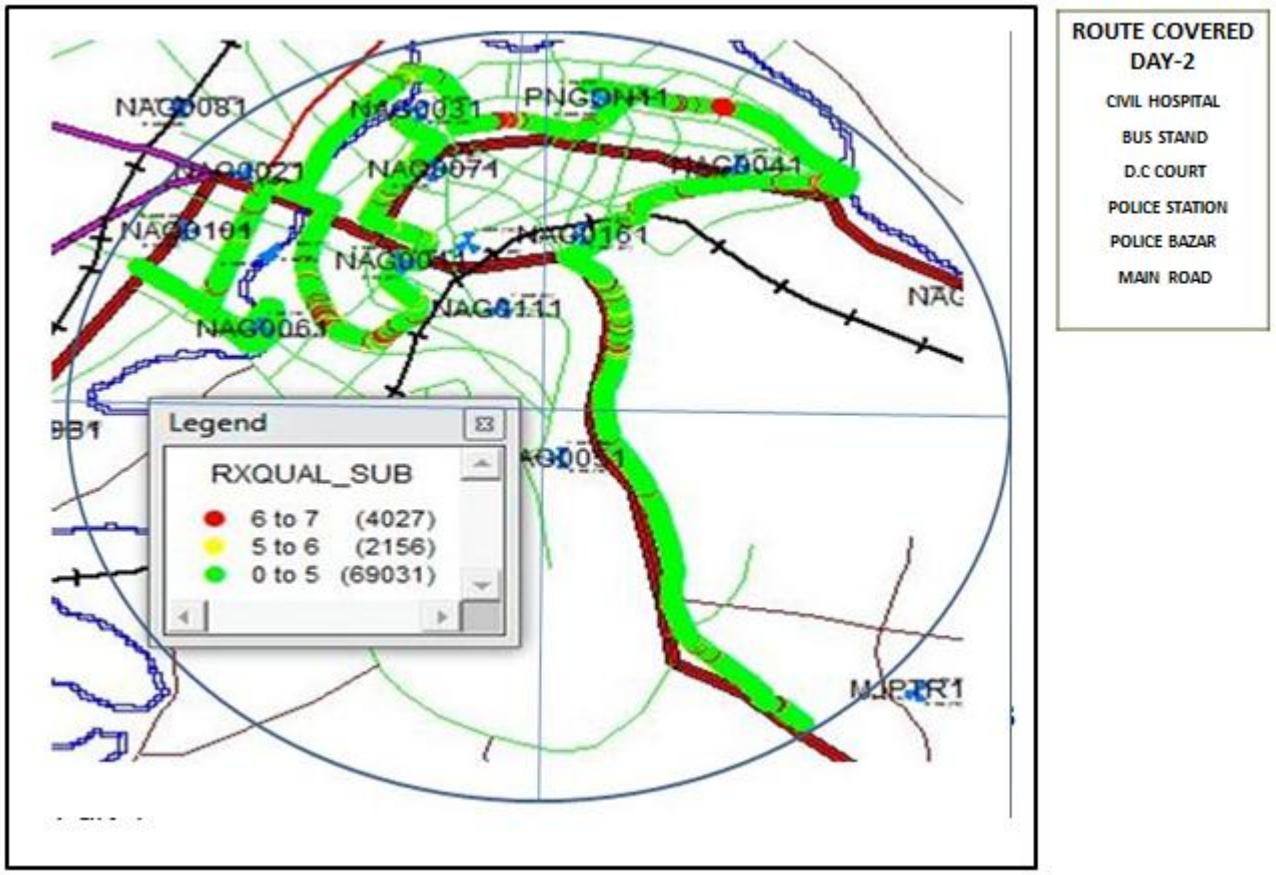
Category	Type of location	December NAGAON		
		Day 1	Day 2	Day 3
Outdoor	Major Roads	SHANTIPUR KRISHNANAGAR SARATHI PALZA CROSSING GATE RD SHASITRI GAON RAILWAY STAION RD COLLEGE RD	M.DROAD, HAIBERGAON, PANIGAON, AMLAPATTY, AT ROAD OLD TENAZIRAAN, MOHKHULI, MAJORATI, HAIBORGAON, ADP ROAD, MADHUPUR	LATHABORI, DOLOI CHUBA BUS STOP, MARIGAON COLLEGE, RAJAGAON, BAKARIGAON, NOWAGAON
	Highways			
	With in the City			
Indoor	Shopping complex			
	Office complex			

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

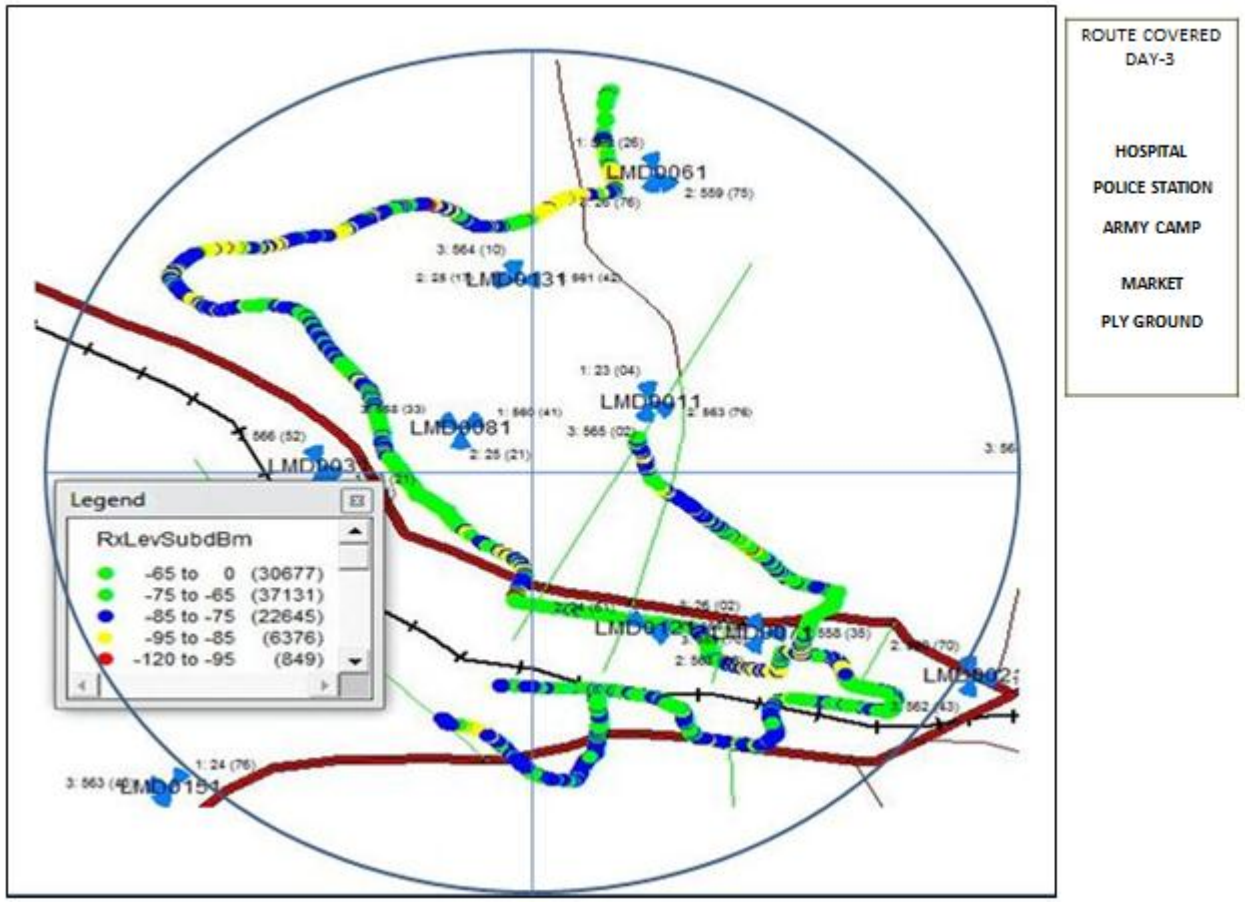
9.1.2.2 Route Map - NAGAON DAY 1



9.1.2.3 Route Map - NAGAON DAY 2



9.1.2.4 Route Map - NAGAON DAY 3



9.1.2.5 Drive Test Results - NAGAON SSA-2G

December-NAGAON															
	B'mark	Aircel		Airtel		BSNL CDMA		BSNL GSM		Idea		Reliance GSM		Vodafone	
Parameter's		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
0 to -75 dBm		97.07%	60.40%	56.78%	31.51%	100.00%	100.00%	67.78%	16.49%	90.17%	36.74%	NDR		78.47%	47.91%
0 to -85 dBm		99.89%	88.02%	80.45%	53.10%	100.00%	100.00%	94.99%	51.64%	99.69%	71.68%			98.34%	82.09%
0 to -95 dBm		99.99%	97.76%	99.66%	80.25%	100.00%	100.00%	99.90%	81.83%	100.00%	93.50%			100.00%	96.82%
Voice quality	≥ 95%	97.58%	94.34%	98.93%	94.08%	95.35%	91.04%	88.93%	75.37%	99.41%	94.68%			94.21%	95.66%
CSSR	≥ 95%	100.00%	88.60%	100.00%	100.00%	100.00%	94.41%	60.87%	69.90%	NDR	97.83%			100.00%	97.65%
%age Blocked calls		0.00%	7.02%	0.00%	0.00%	0.00%	7.10%	14.79%	21.07%	NDR	1.45%			0.00%	1.01%
Call drop rate	≤ 2%	0.00%	0.66%	0.00%	0.40%	0.00%	5.69%	0.00%	10.53%	NDR	0.74%			0.00%	0.34%
Hands off success rate		100.00%	99.92%	100.00%	98.28%	100.00%	100.00%	95.35%	96.73%	NDR	99.10%			100.00%	99.60%

Data Source: Drive test reports submitted by operators to auditors

Note: - Reliance did not meet the benchmark

Voice Quality

Aircel, Airtel, BSNL CDMA and Idea failed to meet the benchmark in outdoor locations; however Vodafone failed to meet the benchmark in indoor location. BSNL GSM failed to meet the benchmark in outdoor as well as indoor locations.

Call Set Success Rate (CSSR)

Aircel and BSNL CDMA failed to meet the benchmark for CSSR in outdoor locations and BSNL GSM did not meet in outdoor as well as indoor locations.

Call Drop Rate

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

9.1.2.1 Drive Test Results - NAGAON SSA-3G

December-NAGAON									
	B'mark	Aircel		Airtel		BSNL WCDMA		Vodafone	
Parameter's		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
0 to -75 dBm		NDR		29.37%	19.23%	44.05%	2.93%	61.15%	31.58%
0 to -85 dBm				95.90%	50.06%	82.37%	10.19%	90.56%	60.44%
0 to -95 dBm				99.88%	78.66%	90.10%	27.76%	100.00%	79.16%
Voice quality	≥ 95%			96.18%	92.60%	96.54%	76.94%	57.79%	70.16%
CSSR	≥ 95%			100.00%	100.00%	69.49%	76.52%	100.00%	82.79%
%age Blocked calls				0.00%	0.00%	8.47%	17.42%	0.00%	1.49%
Call drop rate	≤ 2%			0.00%	0.00%	0.00%	5.94%	0.00%	1.02%
Hands off success rate				100.00%	100.00%	94.59%	97.06%	100.00%	100.00%

Data Source: Drive test reports submitted by operators to auditors

Note: - Aircel did not share the data

Voice Quality

Airtel and BSNL WCDMA failed to meet the benchmark in outdoor locations. And Vodafone did not meet the benchmark in both the locations.

Call Set Success Rate (CSSR)

BSNL WCDMA failed to meet the benchmark for CSSR in indoor as well as outdoor locations & Vodafone in outdoor locations.

Call Drop Rate

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

9.1.2.1 Drive Test Results - NAGAON SSA-DATA-2G

Name of the Parameter	Bench Mark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	RCOM CDMA	Vodafone
Succesful Data Transmission download speed attempts	>80%	100%	100%	NA	100%	100%	NA	100%
Succesful Data Transmission upload speed attempts	>75%	100%	100%		100%	100%	NA	100%
Minimum download speed		55	100		NDR	56	NA	100
Average throughput for Packet Data		63	100		31	65	NA	100
Latency	<250ms	NDR	100		100	NDR	NA	100

9.1.2.2 Drive Test Results - NAGAON SSA-DATA-3G

Name of the Parameter	Bench Mark	Aircel	Airtel	BSNL CDMA	Reliance WCDMA	Vodafone
Succesful Data Transmission download speed attempts	>80%	NDR	NDR	NDR	NDR	100%
Succesful Data Transmission upload speed attempts	>75%	NDR	NDR	NDR		100%
Minimum download speed		NDR	NDR	NDR		NDR
Average throughput for Packet Data		NDR	NDR	NDR		2500
Latency	<250ms	NDR	NDR	NDR		100

10 ANNEXURE – CONSOLIDATED-2G

10.1 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		8169	6924	729	NDR	4949	NDR	9568
Sum of downtime of BTSs in a month (in hours)		4636484	12510	70501	NDR	35882	NDR	1588778
BTSs accumulated downtime (not available for service)	≤ 2%	11.44%	0.24%	13.00%	NDR	0.97%	NDR	22.32%
Number of BTSs having accumulated downtime >24 hours		1060	53	179	NDR	39	NDR	158
Worst affected BTSs due to downtime	≤ 2%	12.98%	0.77%	24.55%	NDR	0.79%	NDR	1.65%
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		8169	6904	729	NDR	4913	NDR	9568
Sum of downtime of BTSs in a month (in hours)		10553	1060	5891	NDR	3446	NDR	3103
BTSs accumulated downtime (not available for service)	≤ 2%	1.79%	0.21%	11.22%	NDR	0.97%	NDR	0.45%
Number of BTSs having accumulated downtime >24 hours		58	0	9	NDR	33	NDR	8
Worst affected BTSs due to downtime	≤ 2%	0.71%	0.00%	1.23%	NDR	0.67%	NDR	0.09%

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

10.2 CONNECTION ESTABLISHMENT (ACCESSIBILITY)

Audit Results for CSSR, SDCCH and TCH congestion- PMR data								
CSSR	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
CSSR	≥ 95%	92.63%	96.10%	98.77%	NDR	96.00%	NDR	99.14%
SDCCH/Paging channel congestion	≤ 1%	0.75%	0.33%	NA	NDR	0.71%	NDR	0.36%
TCH congestion	≤ 2%	5.17%	0.88%	2.90%	NDR	1.47%	NDR	0.86%
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%	96.37%	96.70%	98.60%	NDR	98.38%	NDR	99.31%
SDCCH/Paging channel congestion	≤ 1%	0.53%	0.14%	NA	NDR	0.33%	NDR	0.43%
TCH congestion	≤ 2%	2.40%	0.48%	3.26%	NDR	0.74%	NDR	0.69%
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		461	352	523	410	269	NDR	385
Total number of successful calls established		431	352	503	446	264	NDR	378
CSSR	≥ 95%	93.49%	99.86%	96.27%	108.78%	98.32%	NDR	98.18%
%age blocked calls		6.51%	0.14%	3.73%	-8.78%	1.68%	NDR	1.82%

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

10.3 CONNECTION MAINTENANCE (RETAINABILITY)

Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data								
Call drop rate	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of calls established		666560336	384311391	1181178	NDR	107109934	NDR	270174311
Total number of calls dropped		11533456	4874570	19288	NDR	516584	NDR	1772523
Call drop rate	≤ 2%	1.73%	1.27%	1.63%	NDR	0.48%	NDR	0.66%
Total number of cells in the network		24285	20820	2061	NDR	14847	NDR	28811
Total number of cells having more than 3% TCH		3062	269	165	NDR	265	NDR	718
Worst affected cells having more than 3% TCH	≤ 3%	12.61%	1.29%	8.01%	NDR	1.78%	NDR	2.49%
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		64602123	39863987	477133	NDR	38993956	NDR	29858682
Total number of calls dropped		1175447	477560	7903	NDR	198895	NDR	192479
Call drop rate	≤ 2%	1.36%	0.93%	1.52%	NDR	0.34%	NDR	0.68%
Total number of cells in the network		22775	20796	2061	NDR	14739	NDR	28812
Total number of cells having more than 3% TCH		3040	277	151	NDR	300	NDR	789
Worst affected cells having more than 3% TCH	≤ 3%	13.35%	1.33%	7.33%	NDR	2.03%	NDR	2.74%
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		431	352	503	234	264	NDR	378
Total number of calls dropped		2	1	28	10	2	NDR	3
Call drop rate	≤ 2%	0.46%	0.14%	5.47%	4.27%	0.57%	NDR	0.66%

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

10.4 VOICE QUALITY

Audit Results for Voice quality -PMR Data								
Voice quality	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of sample calls		60500106928	41615932897	125125	NDR	14281456230	NDR	42766176481
Total number of calls with good voice quality		55318088160	41214788377	116373	NDR	13681395706	NDR	41616846220
%age calls with good voice quality	≥ 95%	91.43%	99.04%	93.01%	NDR	95.80%	NDR	97.31%
Live measurement results for Voice quality-3 Day data								
Voice quality	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
NDR		40412084351	4123208261	NDR	NDR	6012665755	NDR	4442742982
Total number of calls with good voice quality		37326313944	4083486024	NDR	NDR	5409089742	NDR	4320457611
%age calls with good voice quality	≥ 95%	92.56%	99.22%	NDR	NDR	96.38%	NDR	97.44%
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		799032	703624	62581	969707	573142	NDR	690645
Total number of calls with good voice quality		750268	651751	0	890211	552865	NDR	652639
%age calls with good voice quality	≥ 95%	93.90%	92.63%	0.00%	91.80%	96.46%	NDR	94.50%

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		156	30	0	NDR	92	NDR	96
No. of POIs not meeting benchmark		0	30	0	NDR	0	NDR	0
Total Capacity of all POIs (A) - in erlangs		368158	229444	0	NDR	90245	NDR	48032193
Traffic served for all POIs (B)- in erlangs		224629	65654	0	NDR	58649	NDR	43242878
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	NDR	0.00%	NDR	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		156	30	0	NDR	92	NDR	96
No. of POIs not meeting benchmark		0	30	0	NDR	0	NDR	0
Total Capacity of all POIs (A) - in erlangs		281977	229432	0	NDR	90223	NDR	4916565
Traffic served for all POIs (B)- in erlangs		169620	67669	0	NDR	52224	NDR	4328117
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	NDR	0.00%	NDR	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	185449.5511	NDR	33750	NDR	38761	NDR	136093.8477
Total taffic handled in erlang during TCBH	127590.3776	NDR	149.9439	NDR	30577.97	NDR	107494.7517
Total no. of customers served (as per VLR)	3603794	NDR	8141	NDR	1061315	NDR	4108971

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

11 ANNEXURE – CONSOLIDATED-3G

11.1 NETWORK AVAILABILITY

Audit Results for Network Availability- PMR data			
	Benchmark	Aircel	BSNL WCDMA
(Number of Node Bs in the network in the licensed service area		1640	243
Sum of downtime (i.e. total outage time) of Node Bs		629699	26294
Node Bs downtime (not available for service)	≤ 2%	51.61%	14.54%
Number of Node Bs having accumulated downtime of >24 hours in a month		203	69
Worst affected Node Bs due to downtime	≤ 2%	12.38%	28.40%
Live Measurement Results for Network Availability- 3 Day live data			
	Benchmark	Aircel	BSNL WCDMA
(Number of Node Bs in the network in the licensed service area		1640	243
Sum of downtime (i.e. total outage time) of Node Bs		40917	2629
Node Bs downtime (not available for service)	≤ 2%	34.65%	15.03%
Number of Node Bs having accumulated downtime of >24 hours in a month		139	69
Worst affected Node Bs due to downtime	≤ 2%	8.48%	28.40%

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

11.2 CONNECTION ESTABLISHMENT (ACCESSIBILITY)

Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data			
	Benchmark	Aircel	BSNL WCDMA
CSSR	≥ 95%	96.92%	98.68%
RRC Congestion	≤ 1%	0.71%	3.21%
Circuit Switched RAB Congestion	≤ 2%	0.00%	NDR
Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data			
	Benchmark	Aircel	BSNL WCDMA
CSSR	≥ 95%	99.84%	98.24%
RRC Congestion	≤ 1%	0.90%	2.75%
Circuit Switched RAB Congestion	≤ 2%	0.34%	NDR
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data			
CSSR	Benchmark	Aircel	BSNL WCDMA
Total number of RRC attempts (A)		NDR	302
Total number of RRC established (B)		NDR	268
Call setup success rate (B/A*100)	≥ 95%	NDR	88.89%
%age blocked calls		NDR	11.11%

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

11.3 CONNECTION MAINTENANCE (RETAINABILITY)

Audit Results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate -PMR data			
	Benchmark	Aircel	BSNL WCDMA
Total calls successfully established (A) (Number of voice RAB normally released)		8473230	407552
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		54054	6824
Call drop rate (B/A*100)	≤ 2%	0.64%	1.67%
Total no. of cells in the licensed service area (B)		3474	687
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		283	62
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	8.15%	9.02%
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	BSNL WCDMA
Total calls successfully established (A) (Number of voice RAB normally released)		5344894	401568
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		33987	6736
Call drop rate (B/A*100)	≤ 2%	0.64%	1.68%
Total no. of cells in the licensed service area (B)		4959	677
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		384	62
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	7.74%	9.16%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data			
Call drop rate	Benchmark	Aircel	BSNL WCDMA
Total calls successfully established (A) (Number of voice RAB normally released)		NDR	268
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		NDR	12
Call drop rate (B/A*100)	≤ 2%	NDR	4.30%

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

11.4 VOICE QUALITY

Audit Results for Voice quality -PMR Data			
Voice quality	**Benchmark**	**Aircel**	**BSNL WCDMA**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		939850003876	NDR
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		922780929792	NDR
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.18%	NDR
Live measurement results for Voice quality-3 Day data			
Voice quality	**Benchmark**	**Aircel**	**BSNL WCDMA**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		752701765205	NDR
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		733082692860	NDR
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	97.39%	NDR
Drive test results for Voice quality (Average of three drive tests) - DT data			
Voice quality	**Benchmark**	**Aircel**	**BSNL WCDMA**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NDR	876746
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NDR	422448
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	NDR	48.18%

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

11.5 POI CONGESTION

Audit Results for POI Congestion- PMR data			
POI congestion	Benchmark	Aircel	BSNL WCDMA
Total number of working POIs		0	0
No. of POIs not meeting benchmark		0	0
Total Capacity of all POIs (A) - in erlangs		0	0
Traffic served for all POIs (B)- in erlangs		0	0
POI congestion	≤ 0.5%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data			
POI congestion	Benchmark	Aircel	BSNL WCDMA
Total number of working POIs		0	0
No. of POIs not meeting benchmark		0	0
Total Capacity of all POIs (A) - in erlangs		0	0
Traffic served for all POIs (B)- in erlangs		0	0
POI congestion	≤ 0.5%	0.00%	0.00%

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

11.6 ADDITIONAL NETWORK RELATED PARAMETERS

Audit Results for Total Traffic Handled in Erlang			
Traffic in Erlang	Aircel	Airtel	Reliance WCDMA
Eqipped capacity of the network	NDR	NDR	NDR
Total taffic handled in erlang during TCBH	NDR	NDR	NDR
Total no. of customers served (as per VLR)	NDR	NDR	NDR

12 ANNEXURE – CUSTOMER SERVICES

12.1 METERING AND BILLING CREDIBILITY

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		223133	225822	30652	620057	47468	359972	304698
Total number of bills disputed		172	111	14	37	138	323	520
Total number of valid billing complaints		11	20	14	37	7	323	203
Total complaints considered invalid		161	91	0	0	131	0	317
Percentage bills disputed (Avg of 3 billing cycles)	≤ 0.1%	0.08%	0.05%	0.05%	0.01%	0.29%	0.09%	0.17%
October								
Total bills generated during the first billing cycle		74669	75602	10512	206946	15632	120865	96367
Total number of bills disputed in first billing cycle		128	27	5	12	22	114	222
Total number of valid billing complaints (billing cycle 1)		7	4	5	12	1	114	67
Total complaints considered invalid (billing cycle 1)		121	23		0	21	0	155
Percentage bills disputed (first billing cycle)	≤ 0.1%	0.17%	0.04%	0.05%	0.01%	0.14%	0.09%	0.23%

November								
Total bills generated during the second billing cycle		73989	74733	10040	206893	15867	120261	99980
Total number of bills disputed in second billing cycle		21	47	4	14	56	105	169
Total number of valid billing complaints (billing cycle 2)		3	8	4	14	3	105	71
Total complaints considered invalid (billing cycle 2)		18	39		0	53	0	98
Percentage bills disputed (second billing cycle)	≤ 0.1%	0.03%	0.06%	0.04%	0.01%	0.35%	0.09%	0.17%
December								
Total bills generated during the third billing cycle		74475	75487	10100	206218	15969	118846	108351
Total number of bills disputed in third billing cycle		23	37	5	11	60	104	129
Total number of valid billing complaints (billing cycle 3)		1	8	5	11	3	104	65
Total complaints considered invalid (billing cycle 3)		22	29		0	57	0	64
Percentage bills disputed (third billing cycle)	≤ 0.1%	0.03%	0.05%	0.05%	0.01%	0.38%	0.09%	0.12%

Data Source: Billing Center of the operators

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		2262	42	0	0	412	1181	1366
Total complaints considered invalid (sum of 3 months)		21335	380	0	0	1184	112	1271
Total number of charging complaints (sum of 3 months)		23597	422	0	0	1596	1293	2637
Total no of customers served (Sum of 3 months)		14138096	16264112	165845	2908973	2979959	5430914	3359243
Percentage of charging complaints disputed	≤ 0.1%	0.17%	0.00%	0.00%	0.00%	0.05%	0.02%	0.08%

Data Source: Billing Center of the operators

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		23769	533	14	37	1734	1616	3157
Total number of complaints resolved in favour of customer		2273	62	14	37	419	1504	1569
Total complaints considered invalid		21496	471	0	0	1315	112	1588
Number of complaints resolved in 4 weeks		2273	62	14	37	419	1500	1569
Percentage complaints resolved within 4 weeks	≥ 98%	100.00%	100.00%	100.00%	100.00%	100.00%	99.73%	100.00%
Number of complaints resolved in 6 weeks		2273	62	14	37	419	1504	1569
Percentage complaints resolved within 6 weeks	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Period of applying credit / waiver								
Total number of complaints where credit/waiver is required		2273	62	0	37	448	1504	0
Percentage cases in which credit/waiver was received within 1 week	100%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
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	30	1	100	100	100	100
Number of cases resolved in 4 weeks		67	16	0	69	65	72	65
Percentage cases resolved in 4 weeks	≥ 98%	67.00%	53.33%	0.00%	69.00%	65.00%	72.00%	65.00%
Number of cases resolved in 6 weeks		70	19	1	73	79	79	77
Percentage cases resolved in 6 weeks	100.00%	70.00%	63.33%	100.00%	73.00%	79.00%	79.00%	77.00%

Data Source: Billing Center of the operators

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		16248020	1653784	10349	1255821	4084896	4473650	7493624
Number of calls getting connected and answered (electronically)		14962496	1653784	10349	1214940	3982025	4416243	7464140
Percentage calls getting connected and answered	≥ 95%	92.09%	100.00%	100.00%	96.74%	97.48%	98.72%	99.61%
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)		2264933	1766319	5780	429505	964283	1099618	3237440
Total Number of calls answered within 90 seconds (3 months)		1796272	1696677	5660	411577	962972	1027336	3237440
Percentage calls answered within 90 seconds (Avg of 3 months)	≥ 95%	79.31%	96.06%	97.92%	95.83%	99.86%	93.43%	100.00%
October								
Total calls received (Month 1)		755196	576770	1915	153726	314420	471396	990669
Total calls answered within 90 seconds (Month 1)		520463	571045	1868	149527	313976	432457	990669
% calls answered within 90 seconds (Month 1)	≥ 95%	68.92%	99.01%	97.55%	97.27%	99.86%	91.74%	100.00%
November								
Total calls received (Month 2)		706577	568402	1330	134476	305098	391115	1035304
Total calls answered within 90 seconds (Month 2)		587632	564692	1306	123194	304623	374065	1035304
% calls answered within 90 seconds (Month 2)	≥ 95%	83.17%	99.35%	98.20%	91.61%	99.84%	95.64%	100.00%
December								
Total calls received (Month 3)		803160	621147	2535	141303	344765	237107	1211467
Total calls answered within 90 seconds (Month 3)		688177	560940	2486	138856	344373	220814	1211467
% calls answered within 90 seconds (Month 3)	≥ 95%	85.68%	90.31%	98.07%	98.27%	99.89%	93.13%	100.00%

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)		97	22	91	10	46	13	74
Percentage calls getting connected and answered	≥ 95%	97.00%	22.00%	91.00%	10.00%	46.00%	13.00%	74.00%
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		97	22	91	10	46	13	74
Total Number of calls getting connected and answered		97	13	87	9	46	11	68
Live Calling Percentage calls getting connected and answered	≥ 95%	100.00%	59.09%	95.60%	90.00%	100.00%	84.62%	91.89%

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		1442	1333	278	858	426	748	784
Number of requests attended within 7 days		1442	1333	278	858	426	748	784
Percentage cases in which termination done within 7 days	100.00%	100.00%	100.00%	100.00%	100.00%	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		1152	0	146	339	265	2734	2298
Total number of cases where refund was made within 60 days		1152	0	137	339	265	2661	2298
Percentage cases in which refund was receive within 60 days	100.00%	100.00%	NA	93.84%	100.00%	100.00%	97.33%	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	74	77	0	67	67	71	71
Percentage cases resolved in four weeks	74.00%	77.00%	NA	67.00%	67.00%	71.00%	71.00%

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

12.6 LIVE CALLING RESULTS FOR LEVEL 1 SERVICES

Live calling for level 1 services								
Level 1 services		Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total no. of calls made		300	300	300	300	300	300	300
Calls answered		209	240	282	284	238	251	224
% of calls connected	≥ 95%	69.67%	80.00%	94.00%	94.67%	79.33%	83.67%	74.67%

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

12.7 LEVEL 1 SERVICE CALLS MADE

Aircel					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	✓		18	12
101	Fire	✓		17	13
102	Ambulance	✓		18	12
104	Health Information Helpline	✓		18	13
108	Emergency and Disaster Management Helpline	✓		17	13
138	All India Helpine for Passangers	✓		18	12
1412	Public Road Transport Utility Service		×		
181	Chief Minister Helpline		×		
182	Indian Railway Security Helpline	✓		18	12
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	✓		18	12
1071	Air Accident Helpline		×		
1072	Rail Accident Helpline		×		
1073	Road Accident Helpline	✓		18	12
1077	Control Room for District Collector		×		
10120	Call Alart (Crime Branch)		×		

10121	Women Helpline	☐	×		
10127	National AIDS Helpline to NACO	✓	☐	18	12
101212	Central Accident and Trauma Services (CATS)	☐	×		
10580	Educationa & Vocational Guidance and Counselling	☐	×		
105812	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	✓	☐	18	13
1514	National Career Service(NCS)	✓	☐	17	12
15100	Free Legal Service Helpline	✓	☐	17	13
155304	Municipal Corporations	☐	×		
155214	Labour Helpline	✓	☐	18	12
11203	Sashastra Seema Bal (SSB)	✓	☐	17	12
112012	National Do Not Call Registry	✓	☐	18	12
11212	Complaint of Electricity	✓	☐	17	12
11216	Drinking Water Supply	☐	×		
11250	Election Commission of India	☐	×		

Airtel

Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	✓	☐	19	15
101	Fire	✓	☐	19	15
102	Ambulance	✓	☐	18	15
104	Health Information Helpline	✓	☐	18	15
108	Emergency and Disaster Management Helpline	✓	☐	19	15

138	All India Helpine for Passangers	✓	☐	19	15
1412	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	✓	☐	18	15
1071	Air Accident Helpline	☐	×		
1072	Rail Accident Helpline	✓	☐	19	15
1073	Road Accident Helpline	☐	×		
1077	Control Room for District Collector	✓	☐	18	15
10120	Call Alart (Crime Branch)	☐	×		
10121	Women Helpline	☐	×		
10127	National AIDS Helpline to NACO	✓	☐	19	15
101212	Central Accident and Trauma Services (CATS)	☐	×		
10580	Educationa & Vocational Guidance and Counselling	☐	×		
105812	Mother and Child Tracking (MCTH)	✓	☐	19	15
10740	Central Pollution Control Board	☐	×		
10741	Pollution Control Board	✓	☐	19	15
1511	Police Related Service for all Metro Railway Project	☐	×		

1512	Prevention of Crime in Railway	✓	☐	19	15
1514	National Career Service(NCS)	☐	×		
15100	Free Legal Service Helpline	☐	×		
155304	Municipal Corporations	☐	×		
155214	Labour Helpline	✓	☐	19	15
11203	Sashastra Seema Bal (SSB)	✓	☐	19	15
112012	National Do Not Call Registry	✓	☐	19	15
11212	Complaint of Electricity	☐	×		
11216	Drinking Water Supply	☐	×		
11250	Election Commission of India	☐	×		
BSNL CDMA					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		16	15
101	Fire	Y		16	15
102	Ambulance	Y		16	15
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline	Y		15	14
138	All India Helpine for Passangers	Y		16	15
1412	Public Road Transport Utility Service		N		
181	Chief Minister Helpline	Y		16	15
182	Indian Railway Security Helpline		N		
1033	Road Accident Management Service	Y		16	14
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		

1064	Anti Corruption Helpline		N		
1070	Relief Commission for Natural Calamities	Y		15	15
1071	Air Accident Helpline		N		
1072	Rail Accident Helpline	Y		16	15
1073	Road Accident Helpline	Y		16	14
1077	Control Room for District Collector		N		
10120	Call Alart (Crime Branch)	Y		16	15
10121	Women Helpline		N		
10127	National AIDS Helpline to NACO	Y		16	15
101212	Central Accident and Trauma Services (CATS)		N		
10580	Educationa & Vocational Guidance and Counselling		N		
105812	Mother and Child Tracking (MCTH)		N		
10740	Central Pollution Control Board	Y		16	15
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway	Y		16	15
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline	Y		16	15
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
11203	Sashastra Seema Bal (SSB)	Y		16	15
112012	National Do Not Call Registry	Y		16	15
11212	Complaint of Electricity	Y		15	15
11216	Drinking Water Supply		N		
11250	Election Commission of India	Y		15	15
BSNL GSM					

Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		16	16
101	Fire	Y		16	16
102	Ambulance		N		
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline	Y		17	16
138	All India Helpine for Passangers	Y		16	16
1412	Public Road Transport Utility Service		N		
181	Chief Minister Helpline	Y		17	15
182	Indian Railway Security Helpline	Y		17	16
1033	Road Accident Management Service	Y		16	15
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	Y		16	16
1073	Road Accident Helpline	Y		17	16
1077	Control Room for District Collector		N		
10120	Call Alart (Crime Branch)	Y		16	15
10121	Women Helpline		N		
10127	National AIDS Helpline to NACO	Y		17	16

101212	Central Accident and Trauma Services (CATS)	Y		17	16
10580	Educationa & Vocational Guidance and Counselling		N		
105812	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	15
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline	Y		17	16
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
11203	Sashastra Seema Bal (SSB)	Y		17	16
112012	National Do Not Call Registry	Y		17	16
11212	Complaint of Electricity	Y		17	16
11216	Drinking Water Supply		N		
11250	Election Commission of India	Y		17	16
Idea					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	✓	☐	22	17
101	Fire	✓	☐	22	17
102	Ambulance	✓	☐	21	17
104	Health Information Helpline	✓	☐	22	17
108	Emergency and Disaster Management Helpline	✓	☐	21	17
138	All India Helpine for Passangers	✓	☐	21	17
1412	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	✓	☐	22	17
1071	Air Accident Helpline	☐	×		
1072	Rail Accident Helpline	☐	×		
1073	Road Accident Helpline	☐	×		
1077	Control Room for District Collector	✓	☐	22	17
10120	Call Alart (Crime Branch)	☐	×		
10121	Women Helpline	☐	×		
10127	National AIDS Helpline to NACO	✓	☐	21	17
101212	Central Accident and Trauma Services (CATS)	☐	×		
10580	Educationa & Vocational Guidance and Counselling	☐	×		
105812	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	✓	☐	22	17
1514	National Career Service(NCS)	☐	×		

15100	Free Legal Service Helpline	☐	×		
155304	Municipal Corporations	☐	×		
155214	Labour Helpline	☐	×		
11203	Sashastra Seema Bal (SSB)	✓	☐	21	17
112012	National Do Not Call Registry	✓	☐	21	17
11212	Complaint of Electricity	✓	☐	21	17
11216	Drinking Water Supply	✓	☐	21	17
11250	Election Commission of India	☐	×		

Reliance

Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		19	16
101	Fire	Y		18	16
102	Ambulance		N		
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline				
138	All India Helpine for Passangers	Y		18	16
1412	Public Road Transport Utility Service		N		
181	Chief Minister Helpline				
182	Indian Railway Security Helpline	Y		19	15
1033	Road Accident Management Service		N		
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti Corruption Helpline		N		

1070	Relief Commission for Natural Calamities	Y		18	16
1071	Air Accident Helpline	Y		19	16
1072	Rail Accident Helpline				
1073	Road Accident Helpline	Y		19	16
1077	Control Room for District Collector				
10120	Call Alart (Crime Branch)	Y		19	16
10121	Women Helpline	Y		19	16
10127	National AIDS Helpline to NACO	Y		19	15
101212	Central Accident and Trauma Services (CATS)				
10580	Educationa & Vocational Guidance and Counselling		N		
105812	Mother and Child Tracking (MCTH)		N		
10740	Central Pollution Control Board	Y		19	16
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway	Y		19	15
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline	Y	N	18	16
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
11203	Sashastra Seema Bal (SSB)		N		
112012	National Do Not Call Registry	Y		19	16
11212	Complaint of Electricity	Y		19	15
11216	Drinking Water Supply		N		
11250	Election Commission of India	Y		19	15
Vodafone					

Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	✓		21	16
101	Fire	✓		21	16
102	Ambulance	✓		22	16
104	Health Information Helpline	✓		21	16
108	Emergency and Disaster Management Helpline	✓		22	16
138	All India Helpine for Passangers	✓		21	16
1412	Public Road Transport Utility Service		×		
181	Chief Minister Helpline		×		
182	Indian Railway Security Helpline	✓		22	16
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	✓		22	16
1071	Air Accident Helpline		×		
1072	Rail Accident Helpline		×		
1073	Road Accident Helpline		×		
1077	Control Room for District Collector	✓		22	16
10120	Call Alart (Crime Branch)		×		
10121	Women Helpline		×		
10127	National AIDS Helpline to NACO	✓		22	16

101212	Central Accident and Trauma Services (CATS)	☐	✗		
10580	Educationa & Vocational Guidance and Counselling	☐	✗		
105812	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	✓	☐	21	16
11203	Sashastra Seema Bal (SSB)	✓	☐	21	16
112012	National Do Not Call Registry	✓	☐	21	16
11212	Complaint of Electricity	✓	☐	21	16
11216	Drinking Water Supply	☐	✗		
11250	Election Commission of India	☐	✗		

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.

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

13 COUNTER DETAILS

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

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

13.1.1 ERICSSON

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

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

Ericsson Counters

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

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

13.1.2 NSN (NOKIA SIEMENS NETWORKS)

NSN provides network support to Vodafone in the circle.

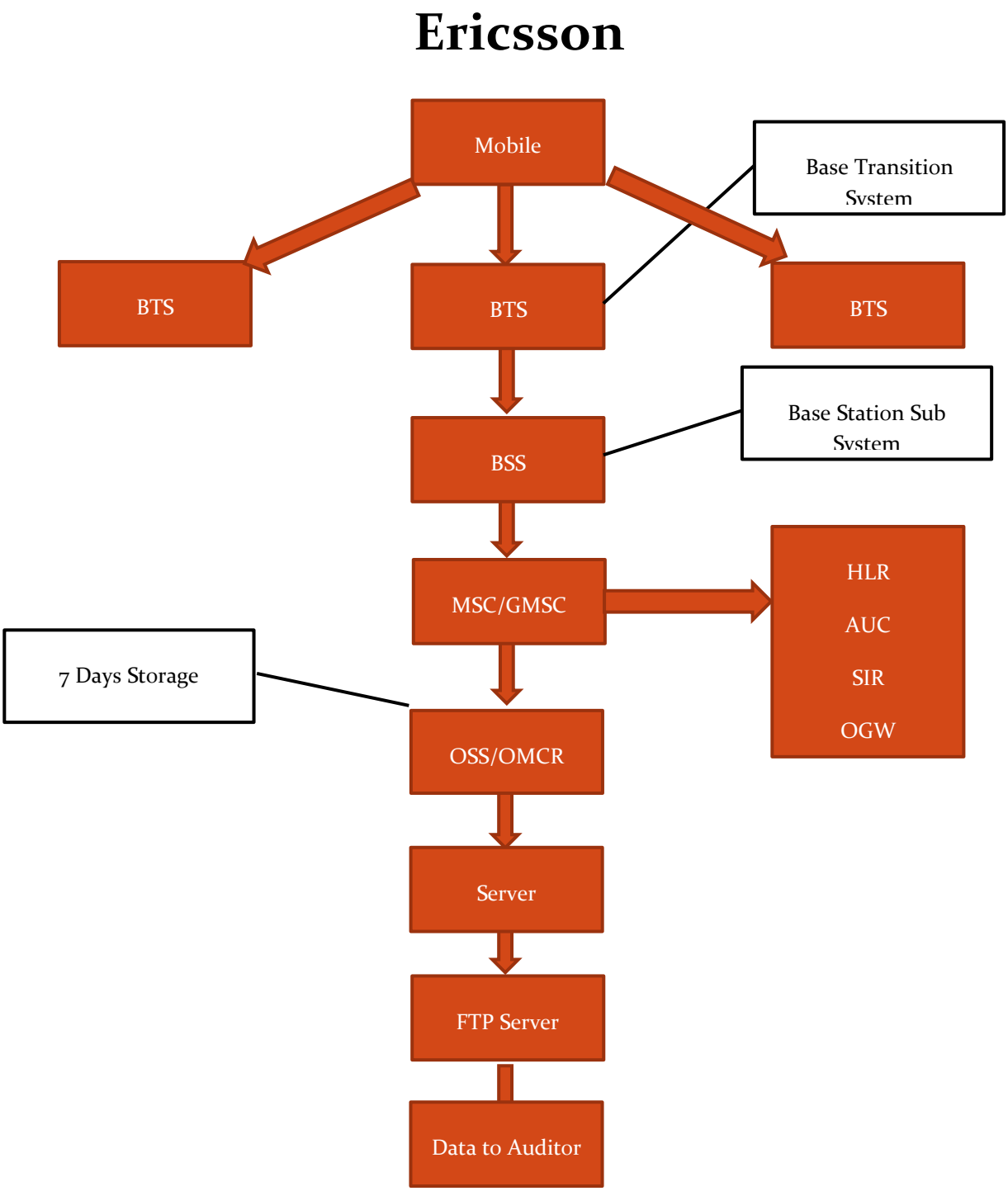
Sl No.	KPI	NSN
1	CSSR= (No of established Calls / No of Attempted Calls)%	CSSR= 100-100*((SDCCH_BUSY_ATT)-(TCH_SEIZ_DUE_SDCCH_CON) + (SDCCH_RADIO_FAIL)+(SDCCH_RF_OLD_HO)+(SDCCH_USER_ACT)+(SDCCH_BCSU_RESET)+(SDCCH_NETW_ACT)+(SDCCH_BTS_FAIL)+(SDCCH_LAPD_FAIL)+ (BLCK_8I_NOM)/ {(CH_REQ_MSG_REC)+(PACKET_CH_REQ)}-{(GHOST_CCCH_RES)-(REJ_SEIZ_ATT_DUE_DIST)}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

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

13.2 BLOCK SCHEMATIC DIAGRAMS

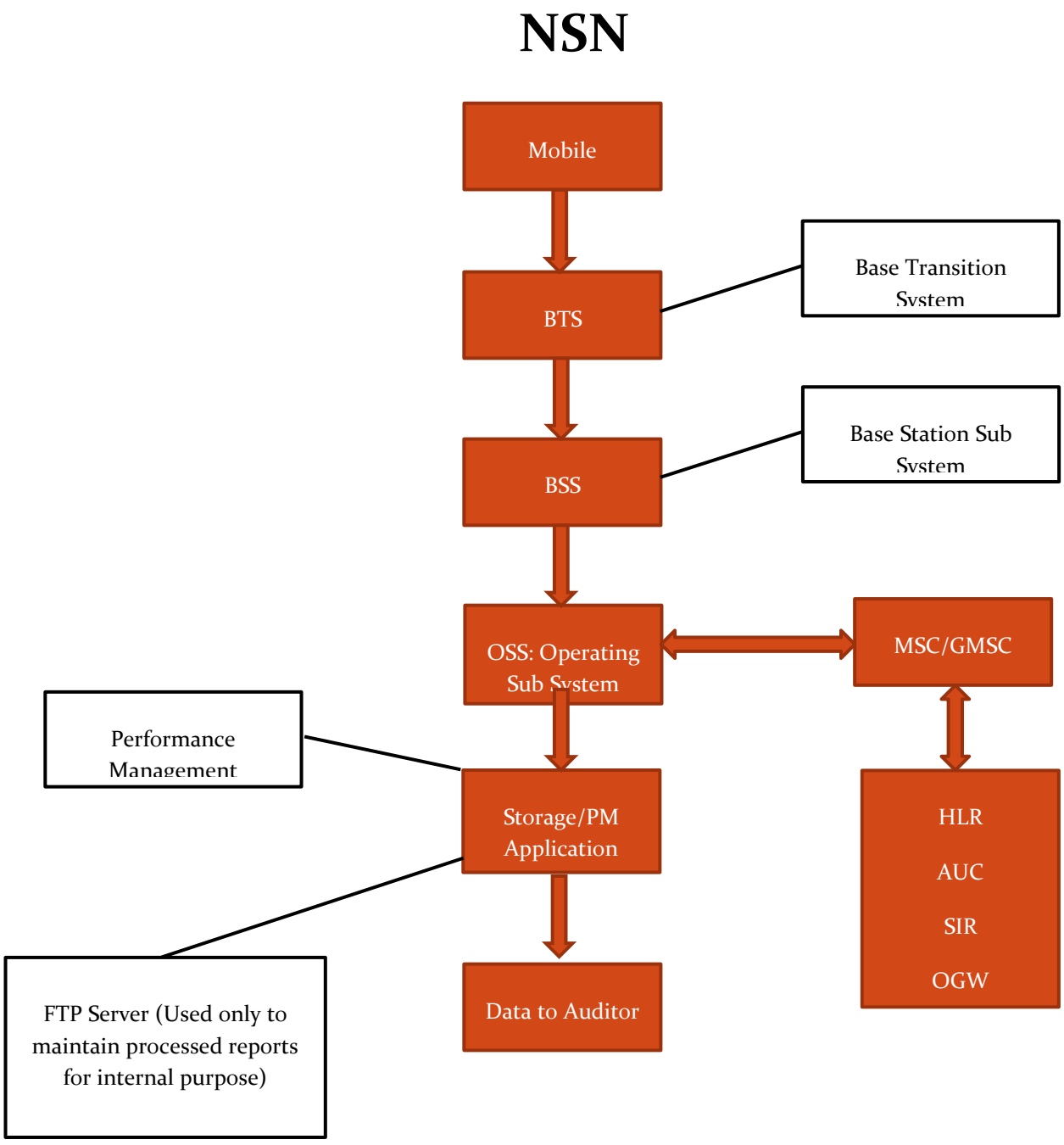
13.2.1 ERICSSON

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



13.2.2 NSN (NOKIA SIEMENS NETWORKS)

NSN provides network support to Vodafone in the circle.



14 ANNEXURE – OCTOBER -2G

Audit Results for Network Availability- PMR data-October								
	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Number of BTSs in the licensed service area		2713	NDR	243	NDR	1633	NDR	3188
Sum of downtime of BTSs in a month (in hours)		4007202	NDR	26294	NDR	13280	NDR	12592
BTSs accumulated downtime (not available for service)	≤ 2%	3.31%	NDR	14.54%	NDR	1.09%	NDR	0.53%
Number of BTSs having accumulated downtime >24 hours		518	NDR	69	NDR	12	NDR	57
Worst affected BTSs due to downtime	≤ 2%	19.09%	NDR	28.40%	NDR	0.73%	NDR	1.79%
Live Measurement Results for Network Availability- 3 Day live data-October								
	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Number of BTSs in the licensed service area		2713	NDR	243	NDR	1630	NDR	3188
Sum of downtime of BTSs in a month (in hours)		5047	NDR	2001	NDR	1031	NDR	958
BTSs accumulated downtime (not available for service)	≤ 2%	2.58%	NDR	11.44%	NDR	0.88%	NDR	0.42%
Number of BTSs having accumulated downtime >24 hours		58	NDR	4	NDR	10	NDR	4
Worst affected BTSs due to downtime	≤ 2%	2.14%	NDR	1.65%	NDR	0.61%	NDR	0.13%

Audit Results for CSSR, SDCCH and TCH congestion- PMR data-October								
CSSR	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
CSSR	≥ 95%	92.48%	NDR	98.68%	NDR	97.29%	NDR	99.41%
SDCCH/Paging channel congestion	≤ 1%	0.85%	NDR	NA	NDR	0.45%	NDR	0.21%
TCH congestion	≤ 2%	5.43%	NDR	3.21%	NDR	1.07%	NDR	0.59%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-October								
CSSR	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
CSSR	≥ 95%	96.56%	NDR	98.29%	NDR	98.12%	NDR	99.66%
SDCCH/Paging channel congestion	≤ 1%	0.50%	NDR	NA	NDR	0.48%	NDR	0.31%
TCH congestion	≤ 2%	2.26%	NDR	3.98%	NDR	0.75%	NDR	0.34%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-October								
CSSR	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of call attempts		NA	NA	NA	NA	NA	NA	NA
Total number of successful calls established		NA	NA	NA	NA	NA	NA	NA
CSSR	≥ 95%	NA	NA	NA	NA	NA	NA	NA
%age blocked calls		NA	NA	NA	NA	NA	NA	NA

Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data-October								
Call drop rate	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of calls established		316447456	NDR	407552	NDR	34920556	NDR	3845641
Total number of calls dropped		5827424	NDR	6824	NDR	216580	NDR	20262
Call drop rate	≤ 2%	1.84%	NA	1.67%	NA	0.62%	NDR	0.53%
Total number of cells in the network		8044	NDR	687	NDR	4899	NDR	9590
Total number of cells having more than 3% TCH		1033	NDR	61	NDR	113	NDR	214
Worst affected cells having more than 3% TCH	≤ 3%	12.85%	NA	8.88%	NA	2.31%	NDR	2.23%
Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data-October								
Call drop rate	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of calls established		29751168	NDR	40035	NDR	31682287	NDR	1971765
Total number of calls dropped		581294	NDR	713	NDR	170695	NDR	9555
Call drop rate	≤ 2%	1.32%	NA	1.78%	NA	0.43%	NDR	0.48%
Total number of cells in the network		8058	NDR	687	NDR	4890	NDR	9591
Total number of cells having more than 3% TCH		1121	NDR	47	NDR	135	NDR	238
Worst affected cells having more than 3% TCH	≤ 3%	13.91%	NA	6.84%	NA	2.76%	NDR	2.48%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-October								
Call drop rate	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of calls established		NA	NA	NA	NA	NA	NA	NA
Total number of calls dropped		NA	NA	NA	NA	NA	NA	NA
Call drop rate	≤ 2%	NA	NA	NA	NA	NA	NA	NA

Audit Results for Voice quality -PMR Data-October								
Voice quality	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of sample calls		20033629448	NDR	0	NDR	4483421737	NDR	636666059
Total number of calls with good voice quality		18250423014	NDR	0	NDR	4290437768	NDR	622806865
%age calls with good voice quality	≥ 95%	91.10%	NA	NA	NA	95.70%	NDR	97.82%
Live measurement results for Voice quality-3 Day data-October								
Voice quality	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of sample calls		19903358193	NDR	0	NDR	456940742	NDR	321921896
Total number of calls with good voice quality		18404229889	NDR	0	NDR	43908280	NDR	316188946
%age calls with good voice quality	≥ 95%	92.47%	NA	NA	NA	96.27%	NDR	98.22%
Drive test results for Voice quality (Average of three drive tests) - DT data-October								
Voice quality	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of sample calls		NA	NA	NA	NA	NA	NA	NA
Total number of calls with good voice quality		NA	NA	NA	NA	NA	NA	NA
%age calls with good voice quality	≥ 95%	NA	NA	NA	NA	NA	NA	NA

Audit Results for POI Congestion- PMR data-October								
POI congestion	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of working POIs		52	NDR	0	NDR	30	NDR	32
No. of POIs not meeting benchmark		0	NDR	0	NDR	0	NDR	0
Total Capacity of all POIs (A) - in erlangs		180746	NDR	0	NDR	29869	NDR	16010282
Traffic served for all POIs (B)- in erlangs		119495	NDR	0	NDR	18653	NDR	15208637
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-October								
POI congestion	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of working POIs		52	NDR	0	NDR	30	NDR	32
No. of POIs not meeting benchmark		0	NDR	0	NDR	0	NDR	0
Total Capacity of all POIs (A) - in erlangs		90826	NDR	0	NDR	30055	NDR	1638203
Traffic served for all POIs (B)- in erlangs		56276	NDR	0	NDR	11851	NDR	1459725
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

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Audit Results for Network Availability- PMR data-November								
	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Number of BTSs in the licensed service area		2726	3461	243	NDR	1643	NDR	3190
Sum of downtime of BTSs in a month (in hours)		313121	5316	21293	NDR	10890	NDR	633626
BTSs accumulated downtime (not available for service)	≤ 2%	15.44%	0.21%	11.78%	NDR	0.89%	NDR	26.70%
Number of BTSs having accumulated downtime >24 hours		114	19	58	NDR	12	NDR	53
Worst affected BTSs due to downtime	≤ 2%	4.18%	0.55%	23.87%	NDR	0.73%	NDR	1.66%
Live Measurement Results for Network Availability- 3 Day live data-November								
	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Number of BTSs in the licensed service area		2726	3458	243	NDR	1636	NDR	3190
Sum of downtime of BTSs in a month (in hours)		265	462	1930	NDR	1005	NDR	744
BTSs accumulated downtime (not available for service)	≤ 2%	0.13%	0.19%	11.03%	NDR	0.85%	NDR	0.32%
Number of BTSs having accumulated downtime >24 hours		0	0	5	NDR	12	NDR	0
Worst affected BTSs due to downtime	≤ 2%	0.00%	0.00%	2.06%	NDR	0.73%	NDR	0.01%

Audit Results for CSSR, SDCCH and TCH congestion- PMR data-November								
CSSR	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
CSSR	≥ 95%	92.93%	96.10%	98.77%	NDR	95.58%	NDR	99.64%
SDCCH/Paging channel congestion	≤ 1%	0.49%	0.33%	NA	NDR	0.81%	NDR	0.25%
TCH congestion	≤ 2%	4.77%	0.88%	2.69%	NDR	1.81%	NDR	0.36%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-November								
CSSR	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
CSSR	≥ 95%	96.17%	96.76%	98.78%	NDR	97.97%	NDR	99.54%
SDCCH/Paging channel congestion	≤ 1%	0.41%	0.14%	NA	NDR	0.16%	NDR	0.23%
TCH congestion	≤ 2%	2.66%	0.53%	2.45%	NDR	0.83%	NDR	0.46%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-November								
CSSR	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of call attempts		NA	NA	NA	NA	NA	NA	NA
Total number of successful calls established		NA	NA	NA	NA	NA	NA	NA
CSSR	≥ 95%	NA	NA	NA	NA	NA	NA	NA
%age blocked calls		NA	NA	NA	NA	NA	NA	NA

Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data-November								
Call drop rate	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of calls established		159431585	172659453	363545	NDR	33690300	NDR	119743363
Total number of calls dropped		2725026	2141539	6258	NDR	164248	NDR	599359
Call drop rate	≤ 2%	1.71%	1.24%	1.72%	NDR	0.49%	NDR	0.50%
Total number of cells in the network		8117	10407	687	NDR	4929	NDR	9608
Total number of cells having more than 3% TCH		989	139	56	NDR	84	NDR	222
Worst affected cells having more than 3% TCH	≤ 3%	12.19%	1.34%	8.15%	NDR	1.70%	NDR	2.31%
Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data-November								
Call drop rate	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of calls established		15768283	17320626	35724	NDR	3392315	NDR	11593795
Total number of calls dropped		296339	215942	542	NDR	16517	NDR	71323
Call drop rate	≤ 2%	1.38%	0.95%	1.54%	NDR	0.30%	NDR	0.58%
Total number of cells in the network		7360	10400	687	NDR	4908	NDR	9608
Total number of cells having more than 3% TCH		890	171	54	NDR	97	NDR	262
Worst affected cells having more than 3% TCH	≤ 3%	12.09%	1.64%	7.86%	NDR	1.97%	NDR	2.73%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-November								
Call drop rate	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of calls established		NA	NA	NA	NA	NA	NA	NA
Total number of calls dropped		NA	NA	NA	NA	NA	NA	NA
Call drop rate	≤ 2%	NA	NA	NA	NA	NA	NA	NA

Audit Results for Voice quality -PMR Data-November								
Voice quality	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of sample calls		19768228151	20248019311	0	NDR	4665119859	NDR	19765288717
Total number of calls with good voice quality		18086229319	20049677358	0	NDR	4464823188	NDR	19334103232
%age calls with good voice quality	≥ 95%	91.49%	99.02%	NA	NDR	95.71%	NDR	97.82%
Live measurement results for Voice quality-3 Day data-November								
Voice quality	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of sample calls		18509308209	2048829772	0	NDR	474859667	NDR	1967618095
Total number of calls with good voice quality		17086449119	2028981427	0	NDR	453688292	NDR	1919925145
%age calls with good voice quality	≥ 95%	92.31%	99.23%	NA	NA	96.20%	NDR	97.92%
Drive test results for Voice quality (Average of three drive tests) - DT data-November								
Voice quality	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of sample calls		NA	NA	NA	NA	NA	NA	NA
Total number of calls with good voice quality		NA	NA	NA	NA	NA	NA	NA
%age calls with good voice quality	≥ 95%	NA	NA	NA	NA	NA	NA	NA

Audit Results for POI Congestion- PMR data-November								
POI congestion	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of working POIs		52	15	0	NDR	31	NDR	32
No. of POIs not meeting benchmark		0	15	0	NDR	0	NDR	0
Total Capacity of all POIs (A) - in erlangs		93708	113777	0	NDR	30081	NDR	16010282
Traffic served for all POIs (B)- in erlangs		56298	30194	0	NDR	19367	NDR	14011345
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-November								
POI congestion	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of working POIs		52	15	0	NDR	31	NDR	32
No. of POIs not meeting benchmark		0	15	0	NDR	0	NDR	0
Total Capacity of all POIs (A) - in erlangs		97451	113777	0	NDR	30084	NDR	1638500
Traffic served for all POIs (B)- in erlangs		55115	32971	0	NDR	19408	NDR	1402258
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

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Audit Results for Network Availability- PMR data-December								
	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Number of BTSs in the licensed service area		2730	3463	243	NDR	1673	NDR	3190
Sum of downtime of BTSs in a month (in hours)		316161	7194	22914	NDR	11712	NDR	942561
BTSs accumulated downtime (not available for service)	≤ 2%	15.57%	0.28%	12.67%	NDR	0.94%	NDR	39.71%
Number of BTSs having accumulated downtime >24 hours		428	34	52	NDR	15	NDR	48
Worst affected BTSs due to downtime	≤ 2%	15.68%	0.98%	21.40%	NDR	0.90%	NDR	1.50%
Live Measurement Results for Network Availability- 3 Day live data-December								
	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Number of BTSs in the licensed service area		2730	3446	243	NDR	1647	NDR	3190
Sum of downtime of BTSs in a month (in hours)		5242	598	1960	NDR	1410	NDR	1401
BTSs accumulated downtime (not available for service)	≤ 2%	2.67%	0.24%	11.20%	NDR	1.19%	NDR	0.61%
Number of BTSs having accumulated downtime >24 hours		0	0	0	NDR	11	NDR	4
Worst affected BTSs due to downtime	≤ 2%	0.00%	0.00%	0.00%	NDR	0.67%	NDR	0.13%

Audit Results for CSSR, SDCCH and TCH congestion- PMR data-December								
CSSR	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
CSSR	≥ 95%	92.49%	NDR	98.87%	NDR	95.12%	NDR	98.38%
SDCCH/Paging channel congestion	≤ 1%	0.91%	NDR	NA	NDR	0.88%	NDR	0.63%
TCH congestion	≤ 2%	5.31%	NDR	2.82%	NDR	1.53%	NDR	1.62%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-December								
CSSR	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
CSSR	≥ 95%	96.37%	96.63%	98.74%	NDR	99.05%	NDR	98.73%
SDCCH/Paging channel congestion	≤ 1%	0.68%	0.14%	NA	NDR	0.35%	NDR	0.75%
TCH congestion	≤ 2%	2.28%	0.42%	3.33%	NDR	0.65%	NDR	1.27%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-December								
CSSR	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of call attempts		461	352	523	410	269	NDR	385
Total number of successful calls established		431	352	503	446	264	NDR	378
CSSR	≥ 95%	93.49%	99.86%	96.27%	108.78%	98.32%	NDR	98.18%
%age blocked calls		6.51%	0.14%	3.73%	-8.78%	1.68%	NDR	1.82%

Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data-December								
Call drop rate	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of calls established		190681295	211651938	410081	NDR	38499078	NDR	146585307
Total number of calls dropped		2981006	2733031	6206	NDR	135756	NDR	1152902
Call drop rate	≤ 2%	1.56%	1.29%	1.51%	NDR	0.35%	NDR	0.79%
Total number of cells in the network		8125	10413	687	NDR	5019	NDR	9613
Total number of cells having more than 3% TCH		1039	130	48	NDR	68	NDR	283
Worst affected cells having more than 3% TCH	≤ 3%	12.79%	1.25%	6.99%	NDR	1.35%	NDR	2.94%
Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data-December								
Call drop rate	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of calls established		19082672	22543361	401374	NDR	3919354	NDR	16293122
Total number of calls dropped		297814	261618	6648	NDR	11683	NDR	111601
Call drop rate	≤ 2%	1.39%	0.91%	1.47%	NDR	0.30%	NDR	0.75%
Total number of cells in the network		7357	10396	687	NDR	4941	NDR	9613
Total number of cells having more than 3% TCH		1029	106	50	NDR	68	NDR	289
Worst affected cells having more than 3% TCH	≤ 3%	13.99%	1.02%	7.28%	NDR	1.38%	NDR	3.00%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-December								
Call drop rate	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of calls established		431	352	503	234	264	NDR	378
Total number of calls dropped		2	1	28	10	2	NDR	3
Call drop rate	≤ 2%	0.46%	0.14%	5.47%	4.27%	0.57%	NDR	0.66%

Audit Results for Voice quality -PMR Data-December								
Voice quality	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of sample calls		20698249329	21367913586	125125	NDR	5132914634	NDR	22364221705
Total number of calls with good voice quality		18981435827	21165111019	116373	NDR	4926134750	NDR	21659936123
%age calls with good voice quality	≥ 95%	91.71%	99.05%	93.01%	NDR	95.97%	NDR	96.85%
Live measurement results for Voice quality-3 Day data-December								
Voice quality	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of sample calls		1999417949	2074378489	0	NDR	5080865346	NDR	2153202991
Total number of calls with good voice quality		1835634936	2054504597	0	NDR	4911493170	NDR	2084343520
%age calls with good voice quality	≥ 95%	92.86%	99.22%	NA	NDR	96.67%	NDR	97.03%
Drive test results for Voice quality (Average of three drive tests) - DT data-December								
Voice quality	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of sample calls		799032	703624	62581	969707	573142	NDR	690645
Total number of calls with good voice quality		750268	651751	0	890211	552865	NDR	652639
%age calls with good voice quality	≥ 95%	93.90%	92.63%	0.00%	91.80%	96.46%	NDR	94.50%

Audit Results for POI Congestion- PMR data-December								
POI congestion	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of working POIs		52	15	0	NDR	31	NDR	32
No. of POIs not meeting benchmark		0	15	0	NDR	0	NDR	0
Total Capacity of all POIs (A) - in erlangs		93704	115668	0	NDR	30295	NDR	16011629
Traffic served for all POIs (B)- in erlangs		48836	35460	0	NDR	20630	NDR	14022896
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	NDR	0.00%	NDR	0.00%
Live Measurement Results for POI Congestion- 3 Day data-December								
POI congestion	Benchmark	Aircel	Airtel	BSNL CDMA	BSNL GSM	Idea	Reliance GSM	Vodafone
Total number of working POIs		52	15	0	NDR	31	NDR	32
No. of POIs not meeting benchmark		0	15	0	NDR	0	NDR	0
Total Capacity of all POIs (A) - in erlangs		93700	115655	0	NDR	30084	NDR	1639862
Traffic served for all POIs (B)- in erlangs		58229	34698	0	NDR	20964	NDR	1466134
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	NDR	0.00%	NDR	0.00%

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Audit Results for Network Availability- PMR data-October			
	Benchmark	Aircel	BSNL WCDMA
(Number of Node Bs in the network in the licensed service area		446	NDR
Sum of downtime (i.e. total outage time) of Node Bs		43372	NDR
Node Bs downtime (not available for service)	≤ 2%	13.07%	NDR
Number of Node Bs having accumulated downtime of >24 hours in a month		64	NDR
Worst affected Node Bs due to downtime	≤ 2%	14.35%	NDR
Live Measurement Results for Network Availability- 3 Day live data-October			
	Benchmark	Aircel	BSNL WCDMA
(Number of Node Bs in the network in the licensed service area		446	NDR
Sum of downtime (i.e. total outage time) of Node Bs		32752	NDR
Node Bs downtime (not available for service)	≤ 2%	10.99%	NDR
Number of Node Bs having accumulated downtime of >24 hours in a month		64	NDR
Worst affected Node Bs due to downtime	≤ 2%	14.35%	NDR

Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data-October			
	Benchmark	Aircel	BSNL WCDMA
CSSR	≥ 95%	96.05%	NDR
RRC Congestion	≤ 1%	1.99%	NDR
Circuit Switched RAB Congestion	≤ 2%	0.00%	NDR

Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data-October			
	Benchmark	Aircel	BSNL WCDMA
CSSR	≥ 95%	99.73%	NDR
RRC Congestion	≤ 1%	1.36%	NDR
Circuit Switched RAB Congestion	≤ 2%	1.01%	NDR

Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-October			
CSSR	Benchmark	Aircel	BSNL WCDMA
Total number of RRC attempts (A)		NA	NA
Total number of RRC established (B)		NA	NA
Call setup success rate (B/A*100)	≥ 95%	NA	NA
%age blocked calls		NA	NA

Audit Results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate - PMR data-October			
	Benchmark	Aircel	BSNL WCDMA
Total calls successfully established (A) (Number of voice RAB normally released)		1951281	NDR
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		14250	NDR
Call drop rate (B/A*100)	≤ 2%	0.73%	NDR
Total no. of cells in the licensed service area (B)		0	NDR
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		0	NDR
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	NA	NDR
Live measurement results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate - 3 Day data-October			
	Benchmark	Aircel	BSNL WCDMA
Total calls successfully established (A) (Number of voice RAB normally released)		217232	NDR
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		1404	NDR
Call drop rate (B/A*100)	≤ 2%	0.65%	NDR
Total no. of cells in the licensed service area (B)		0	NDR
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		0	NDR
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	NA	NDR
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-October			
Call drop rate	Benchmark	Aircel	BSNL WCDMA
Total calls successfully established (A) (Number of voice RAB normally released)		NA	NA
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		NA	NA
Call drop rate (B/A*100)	≤ 2%	NA	NA

Audit Results for Voice quality -PMR Data-October			
Voice quality	Benchmark	Aircel	BSNL WCDMA
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		258749998040	NDR
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		248245270024	NDR
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	95.94%	NDR
Live measurement results for Voice quality-3 Day data-October			
Voice quality	Benchmark	Aircel	BSNL WCDMA
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		258749998040	NDR
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		248245270024	NDR
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	95.94%	NDR
Drive test results for Voice quality (Average of three drive tests) - DT data-October			
Voice quality	Benchmark	Aircel	BSNL WCDMA
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	NA
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	NA
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	NA	NA

Audit Results for POI Congestion- PMR data-October			
POI congestion	Benchmark	Aircel	BSNL WCDMA
Total number of working POIs		0	NDR
No. of POIs not meeting benchmark		0	NDR
Total Capacity of all POIs (A) - in erlangs		0	NDR
Traffic served for all POIs (B)- in erlangs		0	NDR
POI congestion	≤ 0.5%	0.00%	NDR
Live Measurement Results for POI Congestion- 3 Day data-October			
POI congestion	Benchmark	Aircel	BSNL WCDMA
Total number of working POIs		0	NDR
No. of POIs not meeting benchmark		0	NDR
Total Capacity of all POIs (A) - in erlangs		0	NDR
Traffic served for all POIs (B)- in erlangs		0	NDR
POI congestion	≤ 0.5%	0.00%	NDR

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Audit Results for Network Availability- PMR data-November			
	Benchmark	Aircel	BSNL WCDMA
(Number of Node Bs in the network in the licensed service area		508	243
Sum of downtime (i.e. total outage time) of Node Bs		6988	26294
Node Bs downtime (not available for service)	≤ 2%	1.85%	14.54%
Number of Node Bs having accumulated downtime of >24 hours in a month		66	69
Worst affected Node Bs due to downtime	≤ 2%	12.99%	28.40%
Live Measurement Results for Network Availability- 3 Day live data-November			
	Benchmark	Aircel	BSNL WCDMA
(Number of Node Bs in the network in the licensed service area		508	243
Sum of downtime (i.e. total outage time) of Node Bs		6988	2629
Node Bs downtime (not available for service)	≤ 2%	19.11%	15.03%
Number of Node Bs having accumulated downtime of >24 hours in a month		66	69
Worst affected Node Bs due to downtime	≤ 2%	12.99%	28.40%

Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data-November			
	Benchmark	Aircel	BSNL WCDMA
CSSR	≥ 95%	97.03%	98.68%
RRC Congestion	≤ 1%	0.04%	3.21%
Circuit Switched RAB Congestion	≤ 2%	0.00%	

Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data-November			
	Benchmark	Aircel	BSNL WCDMA
CSSR	≥ 95%	101.47%	98.24%
RRC Congestion	≤ 1%	1.30%	2.75%
Circuit Switched RAB Congestion	≤ 2%	0.00%	

Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-November			
CSSR	Benchmark	Aircel	BSNL WCDMA
Total number of RRC attempts (A)		NA	NA
Total number of RRC established (B)		NA	NA
Call setup success rate (B/A*100)	≥ 95%	NA	NA
%age blocked calls		NA	NA

Audit Results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate -RMR data-November			
	Benchmark	Aircel	BSNL WCDMA
Total calls successfully established (A) (Number of voice RAB normally released)		2853910	407552
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		17554	6824
Call drop rate (B/A*100)	≤ 2%	0.62%	1.67%
Total no. of cells in the licensed service area (B)		1577	687
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		122	62
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	7.76%	9.02%
Live measurement results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate - 3 Day data-November			
	Benchmark	Aircel	BSNL WCDMA
Total calls successfully established (A) (Number of voice RAB normally released)		288712	401568
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		1545	6736
Call drop rate (B/A*100)	≤ 2%	0.54%	1.68%
Total no. of cells in the licensed service area (B)		4959	677
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		384	62
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	7.74%	9.16%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-November			
Call drop rate	Benchmark	Aircel	BSNL WCDMA
Total calls successfully established (A) (Number of voice RAB normally released)		NA	NA
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		NA	NA
Call drop rate (B/A*100)	≤ 2%	NA	NA

Audit Results for Voice quality -PMR Data-November			
Voice quality	Benchmark	Aircel	BSNL WCDMA
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		320931170475	NDR
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		317868145968	NDR
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	99.05%	NDR
Live measurement results for Voice quality-3 Day data-November			
Voice quality	Benchmark	Aircel	BSNL WCDMA
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		33154652638	NDR
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		32841533196	NDR
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	99.06%	NDR
Drive test results for Voice quality (Average of three drive tests) - DT data-November			
Voice quality	Benchmark	Aircel	BSNL WCDMA
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	NA
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	NA
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	NA	NA

Audit Results for POI Congestion- PMR data-November			
POI congestion	Benchmark	Aircel	BSNL WCDMA
Total number of working POIs		0	0
No. of POIs not meeting benchmark		0	0
Total Capacity of all POIs (A) - in erlangs		0	0
Traffic served for all POIs (B)- in erlangs		0	0
POI congestion	≤ 0.5%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-November			
POI congestion	Benchmark	Aircel	BSNL WCDMA
Total number of working POIs		0	0
No. of POIs not meeting benchmark		0	0
Total Capacity of all POIs (A) - in erlangs		0	0
Traffic served for all POIs (B)- in erlangs		0	0
POI congestion	≤ 0.5%	0.00%	0.00%

19 ANNEXURE – DECEMBER-3G

Audit Results for Network Availability- PMR data-December			
	Benchmark	Aircel	BSNL WCDMA
(Number of Node Bs in the network in the licensed service area		686	NDR
Sum of downtime (i.e. total outage time) of Node Bs		579339	NDR
Node Bs downtime (not available for service)	≤ 2%	15.60%	NDR
Number of Node Bs having accumulated downtime of >24 hours in a month		73	NDR
Worst affected Node Bs due to downtime	≤ 2%	10.64%	NDR
Live Measurement Results for Network Availability- 3 Day live data-December			
	Benchmark	Aircel	BSNL WCDMA
(Number of Node Bs in the network in the licensed service area		686	NDR
Sum of downtime (i.e. total outage time) of Node Bs		1177	NDR
Node Bs downtime (not available for service)	≤ 2%	2.38%	NDR
Number of Node Bs having accumulated downtime of >24 hours in a month		9	NDR
Worst affected Node Bs due to downtime	≤ 2%	1.31%	NDR

Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data- December			
	Benchmark	Aircel	BSNL WCDMA
CSSR	≥ 95%	97.68%	NDR
RRC Congestion	≤ 1%	0.08%	NDR
Circuit Switched RAB Congestion	≤ 2%	0.00%	NDR

Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data-December			
	Benchmark	Aircel	BSNL WCDMA
CSSR	≥ 95%	98.31%	NDR
RRC Congestion	≤ 1%	0.05%	NDR
Circuit Switched RAB Congestion	≤ 2%	0.00%	NDR

Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data- December			
CSSR	Benchmark	Aircel	BSNL WCDMA
Total number of RRC attempts (A)		NDR	302
Total number of RRC established (B)		NDR	268
Call setup success rate (B/A*100)	≥ 95%	NDR	88.89%
%age blocked calls		NDR	11.11%

Audit Results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate -PMR data-December			
	Benchmark	Aircel	BSNL WCDMA
Total calls successfully established (A) (Number of voice RAB normally released)		3668039	NDR
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		22250	NDR
Call drop rate (B/A*100)	≤ 2%	0.61%	NDR
Total no. of cells in the licensed service area (B)		1896	NDR
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		161	NDR
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	8.49%	NDR

Live measurement results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate - 3 Day data-December			
	Benchmark	Aircel	BSNL WCDMA
Total calls successfully established (A) (Number of voice RAB normally released)		4838950	NDR
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		31038	NDR
Call drop rate (B/A*100)	≤ 2%	0.64%	NDR
Total no. of cells in the licensed service area (B)		0	NDR
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		0	NDR
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	NA	NDR

Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-December			
Call drop rate	Benchmark	Aircel	BSNL WCDMA
Total calls successfully established (A) (Number of voice RAB normally released)		NDR	268
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		NDR	12
Call drop rate (B/A*100)	≤ 2%	NDR	4.30%

Audit Results for Voice quality -PMR Data-December			
Voice quality	Benchmark	Aircel	BSNL WCDMA
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		360168835361	NDR
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		356667513800	NDR
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	99.03%	NDR
Live measurement results for Voice quality-3 Day data-December			
Voice quality	Benchmark	Aircel	BSNL WCDMA
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		460797114527	NDR
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		451995889640	NDR
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.09%	NDR
Drive test results for Voice quality (Average of three drive tests) - DT data-December			
Voice quality	Benchmark	Aircel	BSNL WCDMA
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NDR	876746
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NDR	422448
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	NDR	48.18%

Audit Results for POI Congestion- PMR data-December			
POI congestion	Benchmark	Aircel	BSNL WCDMA
Total number of working POIs		0	NDR
No. of POIs not meeting benchmark		0	NDR
Total Capacity of all POIs (A) - in erlangs		0	NDR
Traffic served for all POIs (B)- in erlangs		0	NDR
POI congestion	≤ 0.5%	0.00%	NDR
Live Measurement Results for POI Congestion- 3 Day data-December			
POI congestion	Benchmark	Aircel	BSNL WCDMA
Total number of working POIs		0	NDR
No. of POIs not meeting benchmark		0	NDR
Total Capacity of all POIs (A) - in erlangs		0	NDR
Traffic served for all POIs (B)- in erlangs		0	NDR
POI congestion	≤ 0.5%	0.00%	NDR

20 ABBREVIATIONS

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

1. TRAI – Telecom Regulatory Authority of India
2. QoS – Quality of Service
3. OND'15 – Refers to the quarter of October , November and December 2015
4. IMRB – Refers to IMRB International, the audit agency for this report
5. SSA – Secondary Switching Area
6. NOC – Network Operation Center
7. OMC – Operations and Maintenance Center
8. MSC – Mobile Switching Center
9. PMR – Performance Monitoring Reports
10. TCBH – Time Consistent Busy Hour
11. CBBH - Cell Bouncing Busy Hour
12. BTS – Base Transceiver Station
13. CSSR – Call Setup Success Rate
14. TCH – Traffic Channel
15. SDCCH – Standalone Dedicated Control Channel
16. CDR – Call Drop Rate
17. FER – Frame Error Rate
18. SIM – Subscriber Identity Module
19. GSM – Global System for Mobile
20. CDMA – Code Division Multiple Access
21. NA – Not Applicable
22. NC – Non Compliance
23. POI – Point of Interconnection
24. IVR – Interactive Voice Response
25. STD – Standard Trunk Dialing
26. ISD – International Subscriber Dialing

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