TRAI Audit Wireless Report for Kolkata Circle

QE March 2016

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).

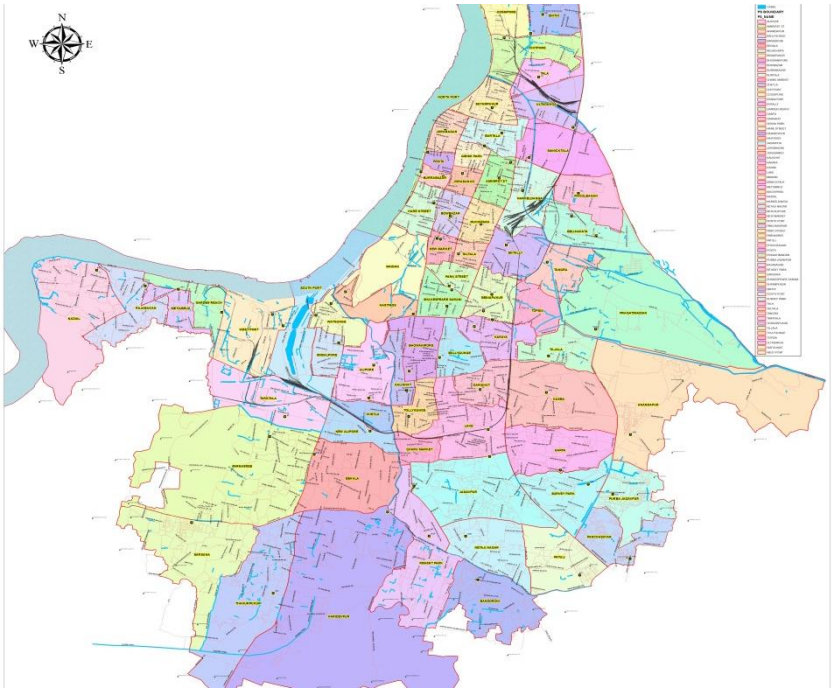
2.2 OBJECTIVES

The primary objective of the Audit module is to-

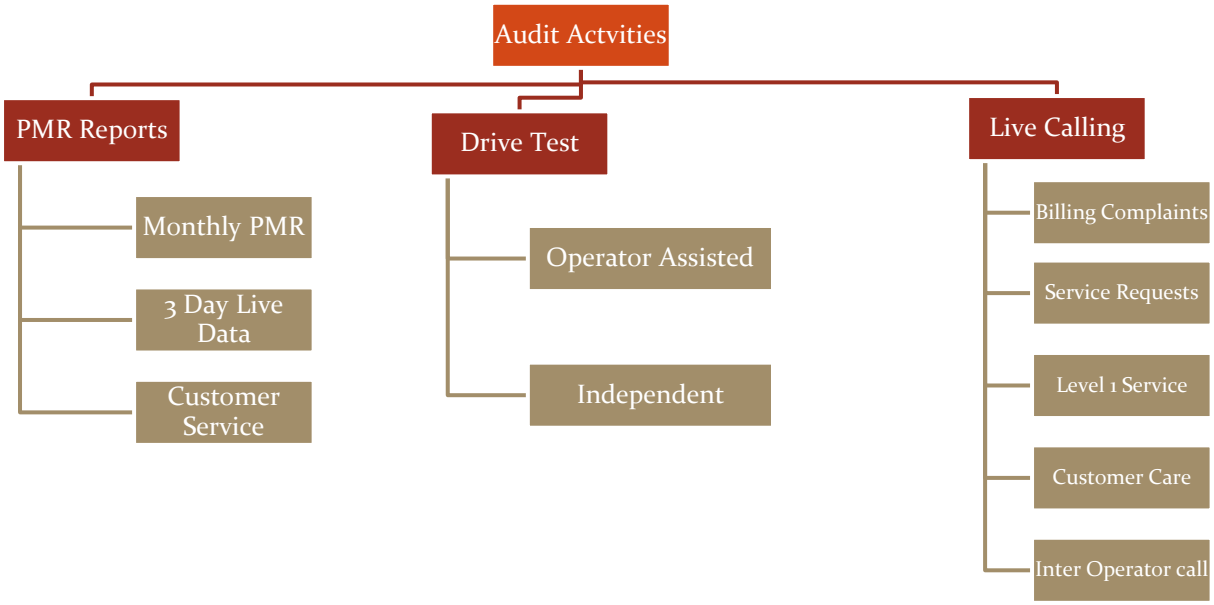
- Audit and Assess the Quality of Services being rendered by Basic (Wireline), Cellular Mobile (Wireless), and Broadband service against the parameters notified by TRAI. (The parameters of Quality of Services (QoS) have been specified by in the respective regulations published by TRAI).
- This report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

2.3 COVERAGE

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



2.4 FRAMEWORK USED

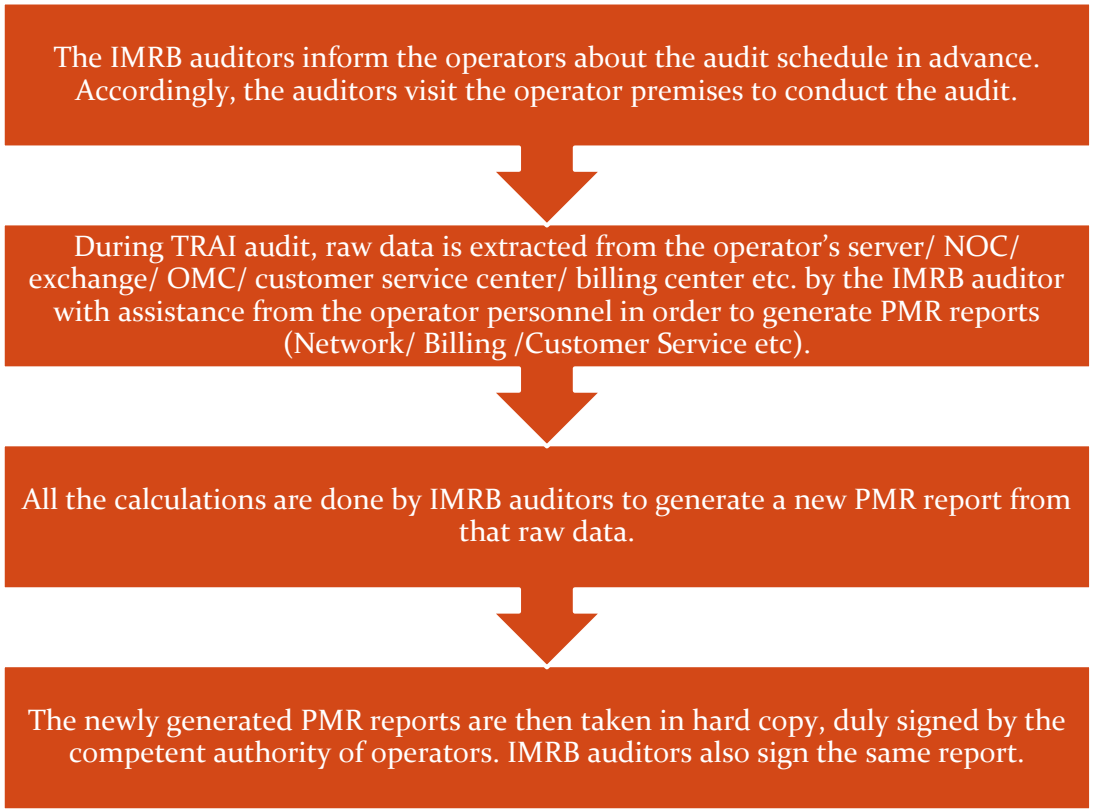


Let's discuss each of the activity in detail and the methodology adopted for each of the module.

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, January 2016 audit data was collected in the month of February 2016.

The PMR report for customer service parameters is extracted from Customer Service Center and verified once every quarter in the subsequent month of the last month of the quarter. For example, data for quarter ending March 2016 (JFM'16) 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 January, February and March 2016. The performance of operators on various parameters was assessed against the benchmarks. Parameters include-

Network Availability

- BTS accumulated downtime
- Worst affected BTS due to downtime

Connection Establishment (Accessibility)

- Call Set Up success Rate (CSSR)

Network Congestion Parameters

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

Connection Maintenance

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

Voice Quality

- % Connections with good voice quality

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

2.4.1.3 AUDIT PARAMETERS – NETWORK 2G

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

Network Related

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

2.4.1.4 MONTHLY PMR 3G

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

Network Availability

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

Connection Establishment (Accessibility)

- Call Set Up success Rate (CSSR)

Network Congestion Parameters

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

Connection Maintenance

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

Voice Quality

- % Connections with good Circuit Switched Voice Quality

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

2.4.1.5 AUDIT PARAMETERS – NETWORK 3G

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

Network Related

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

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

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

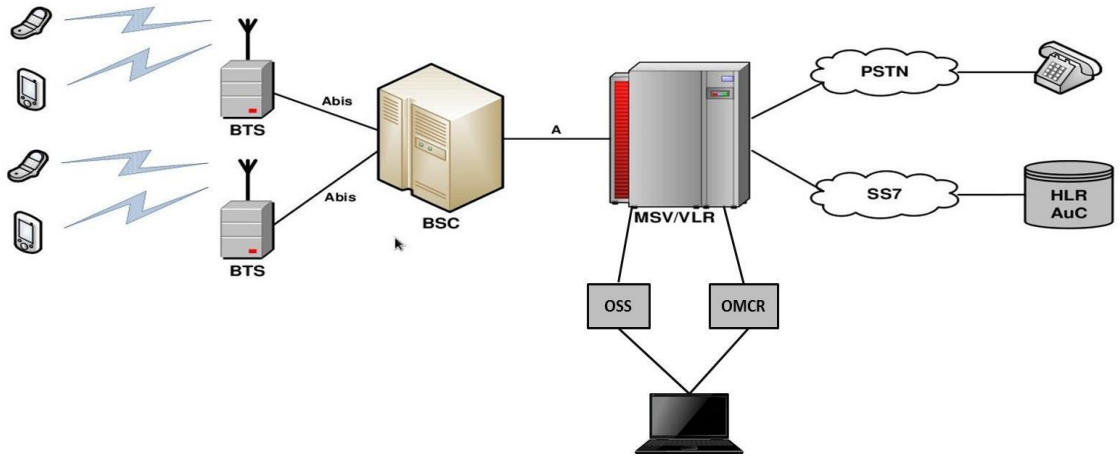
- Services Activation/ provisioning:- Activation done within 4 hours ≥ 95%
- PDP Context activation success rate:- PDP Context activation success rate ≥ 95%
- Drop Rate:- Drop Rate ≤ 5%

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

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

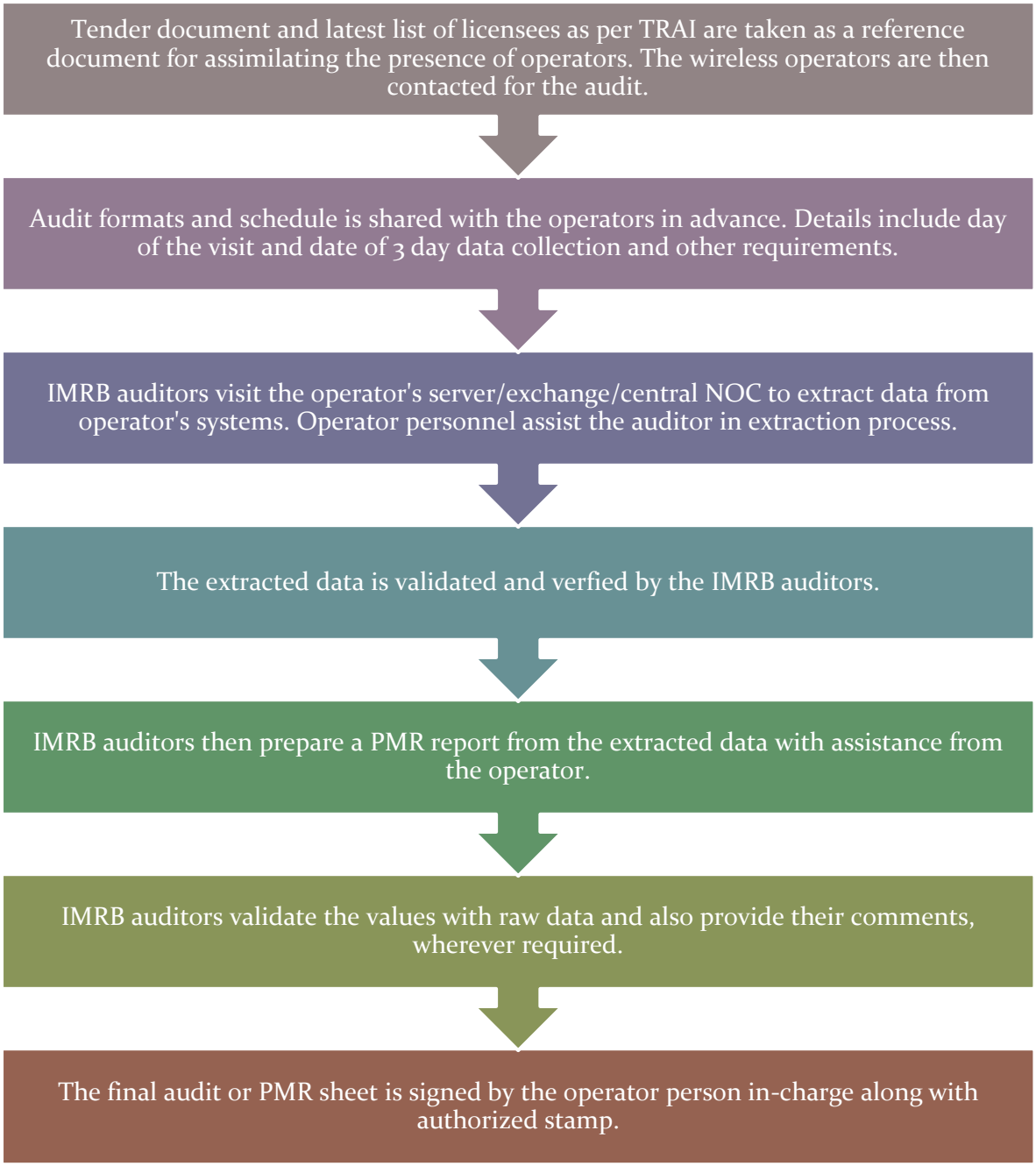
2.4.1.8 POINT OF DATA EXTRACTION

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



2.4.1.9 STEP BY STEP AUDIT PROCEDURE

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



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

2.4.1.10 GENERIC 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.

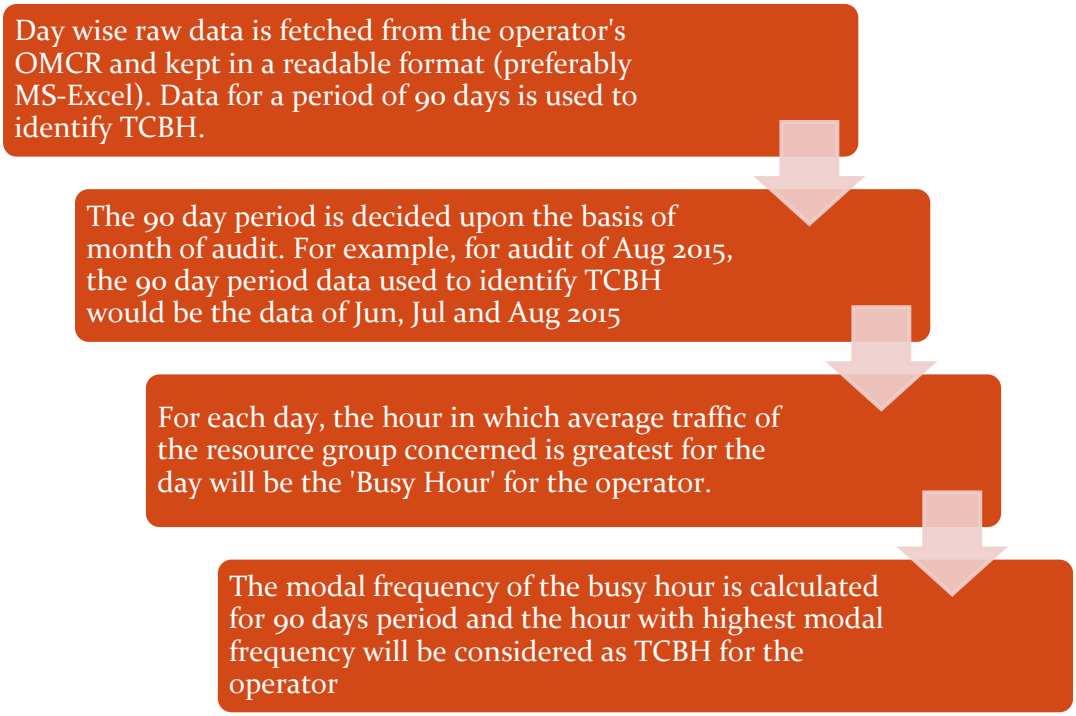
Network related parameters were evaluated for a period of 3 days in each month. 3 day live audit was conducted for 3 consecutive weekdays for each month. The data was extracted from each operator's server/ NOC etc. at the end of the 3rd day. The extracted data is then used to create a report (similar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

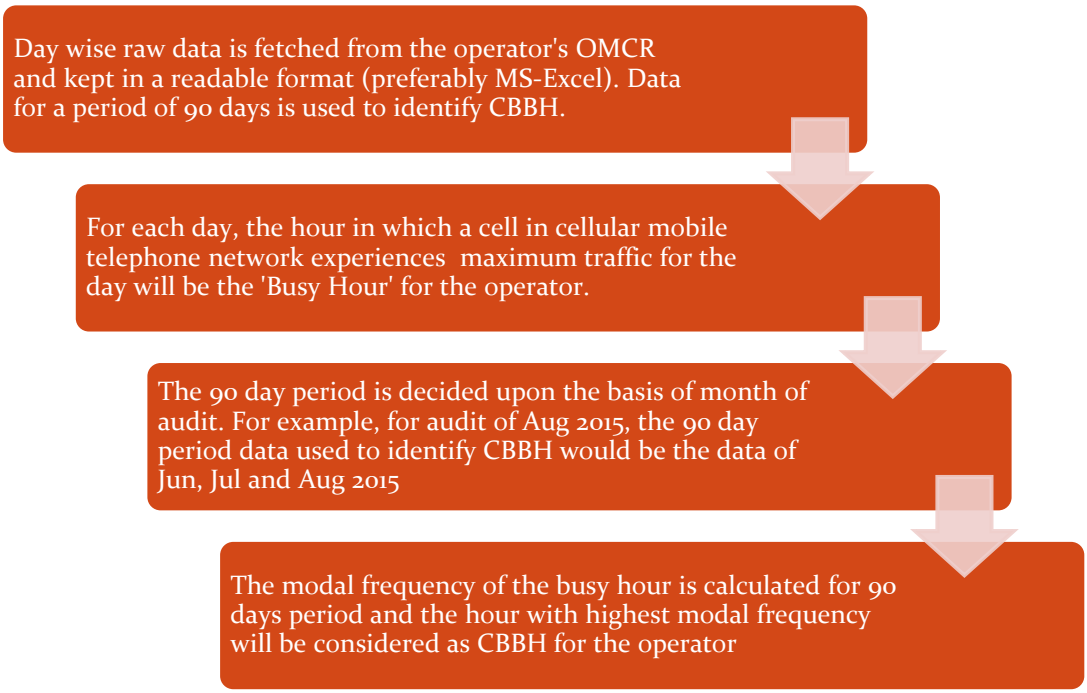
Step by step procedure to identify TCBH for an operator:



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 March 2016 (JFM'16) 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 March 2016. The data considered for live calling was for the month prior to the month in which the live calling activity was being conducted. In this case, data of February 2016 was considered for live calling activity conducted in March 2016.

A detailed explanation of each parameter is explained below.

2.4.2.2 BILLING COMPLAINTS

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

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

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

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

TRAI benchmark-

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

2.4.2.3 SERVICE COMPLAINTS REQUESTS

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

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

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

2.4.2.4 LEVEL 1 SERVICE

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

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

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

2.4.2.4.1 PROCESS TO TEST LEVEL 1 SERVICES

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

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

2.4.2.5 CUSTOMER CARE

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

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

The process for this parameter is stated below.

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

2.4.2.6 INTER OPERATOR CALL ASSESEMENT

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

2.4.3 VOICE DRIVE TEST – 2G & 3G

2.4.3.1 SIGNIFICANCE AND METHODOLOGY

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

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

IMRB conducted two types of drive tests as mentioned below.

- Operator Assisted Drive Test
- Independent Drive Test (No IDT conducted in this quarter)

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

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

1. Normal SSA
2. Difficult SSA

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

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

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

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

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

2.4.3.3 INDEPENDENT DRIVE TEST – 2G & 3G

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

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

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

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

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

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

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

2.4.4 WIRELESS DATA DRIVE TEST – 2G & 3G

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

2.4.4.1 METHODOLOGY

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

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

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

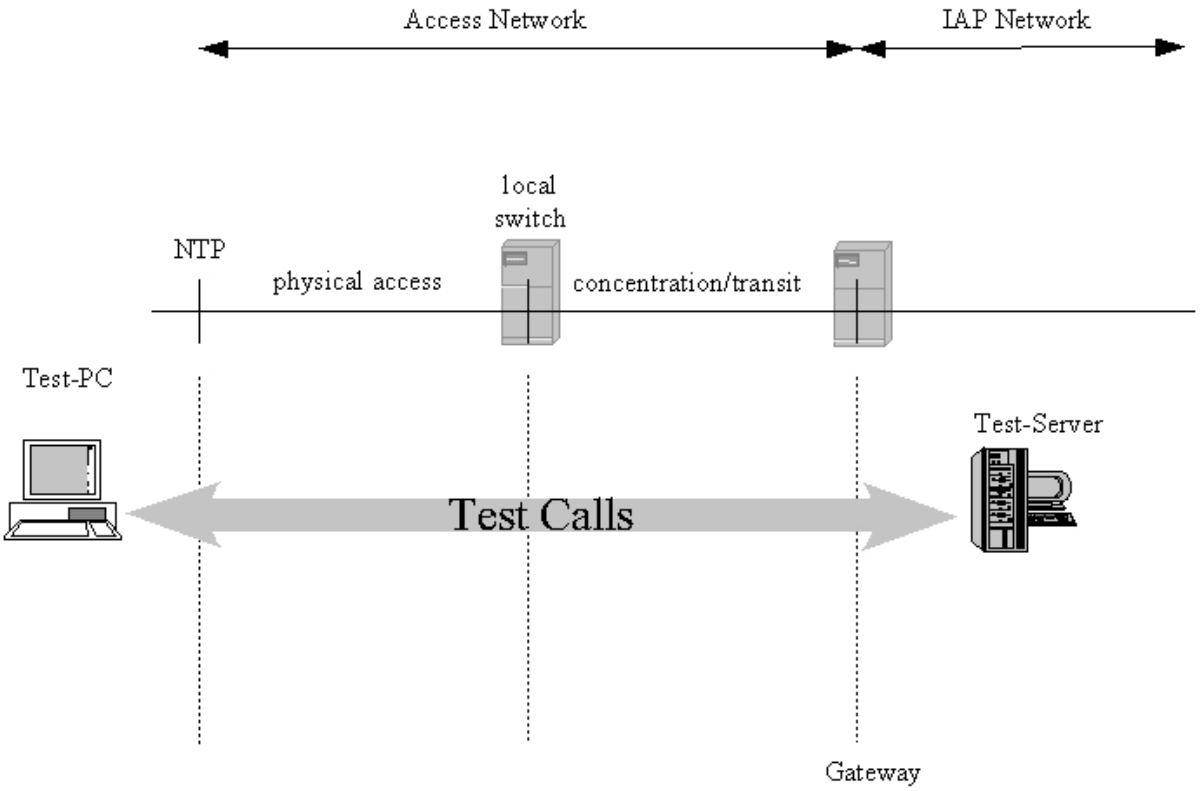


Figure for Measurement set-up

2.4.4.2 REQUIREMENTS FOR THE TEST-SERVER

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

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

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

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

2.4.4.3 TEST FILES

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

2.4.4.4 REPRESENTATIVENESS OR NUMBER OF TEST CALLS

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

2.4.4.5 PARAMETERS EVALUATED DURING DATA DRIVE TEST AT HOTSPOTS

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	2337315
Airtel	3865189
BSNL	686413
Idea	1798619
MTS	472170
Reliance CDMA	899925
Reliance GSM	3484961
TATA CDMA	87266
TATA GSM	2147048
Vodafone	4154142
Name of Operator	**Number of Subscriber as per VLR-3G**
Aircel 3G	567618
Airtel 3G	618619
BSNL 3G	66805
Idea 3G	114714
Vodafone 3G	930741

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

2.6 COLOUR CODES TO READ THE REPORT

Not Meeting the benchmark

Best Performing Operator

3 EXECUTIVE SUMMARY-2G

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

3.1 PMR DATA – 3 MONTHS- CONSOLIDATED FOR 2G

Name of Service Provider	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	BTSs Accumulated downtime (not available for service)	Worst affected BTSs due to downtime	Call Set-up Success Rate (within licensee's own network)	SDCCH/ Paging Chl. Congestion	TCH Congestion	Call Drop Rate (%age)	Worst affected cells having more than 3% TCH drop	%age of connection with good voice quality
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel	0.20%	0.60%	97.40%	0.83%	0.61%	0.67%	2.36%	96.94%
Airtel	0.01%	0.00%	99.50%	0.03%	0.03%	0.86%	2.44%	97.45%
BSNL	1.85%	3.86%	99.20%	0.72%	0.57%	0.93%	2.41%	99.79%
Idea	0.13%	0.76%	99.56%	0.09%	0.13%	0.28%	0.30%	97.52%
MTS	0.05%	0.00%	99.85%	NA	0.00%	0.50%	2.01%	99.96%
Reliance CDMA	0.39%	0.00%	97.17%	NA	1.18%	0.29%	0.71%	99.01%
Reliance GSM	1.05%	0.24%	98.65%	0.06%	0.09%	0.00%	0.30%	99.11%
TATA CDMA	0.02%	0.00%	99.06%	NA	0.08%	0.46%	2.50%	99.27%
TATA GSM	0.09%	0.26%	99.04%	0.07%	0.10%	0.63%	2.37%	98.37%
Vodafone	0.09%	0.42%	99.59%	0.06%	0.41%	0.78%	2.63%	97.25%

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

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

BTSs Accumulated Downtime:

All operators met the benchmark. Minimum BTS Accumulated downtime was recorded for Airtel at 0.01%.

Worst Affected BTSs Due to Downtime:

BSNL failed to meet the benchmark. Minimum worst affected BTSs due to downtime was recorded for Airtel, Reliance CDMA, TATA CDMA and MTS at 0.00%.

Call Set-up Success Rate (CSSR):

All operators met the benchmark for CSSR. The maximum CSSR was observed for MTS with 99.85%.

SDCCH/ Paging Chl. Congestion:

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

Airtel recorded the best SDCCH / Paging Channel Congestion.

TCH Congestion:

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

Call Drop Rate:

All operators met the benchmark for the parameter. Minimum call drop rate was recorded for Reliance GSM at 0.00%.

Worst Affected Cells Having More than 3% TCH Drop:

All operators met the benchmark for the parameter. Best performance was recorded for Reliance GSM & Idea at 0.30%.

Voice Quality

All operators met the benchmark for the parameter. Best performance was recorded for MTS at 99.96%.

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 - JANUARY FOR 2G

Name of Service Provider Month January	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	0.19%	0.86%	97.72%	0.64%	0.71%	0.67%	2.27%	97.09%
Airtel	0.01%	0.00%	99.84%	0.02%	0.03%	1.30%	2.45%	97.56%
BSNL	1.97%	4.15%	99.22%	0.89%	0.52%	0.98%	2.16%	99.77%
Idea	0.09%	0.51%	99.48%	0.07%	0.08%	0.29%	0.39%	97.37%
MTS	0.04%	0.00%	99.87%	NA	0.00%	0.50%	1.87%	99.96%
Reliance CDMA	0.26%	0.00%	97.30%	NA	1.18%	0.27%	0.81%	99.26%
Reliance GSM	0.25%	0.73%	99.24%	0.03%	0.06%	0.09%	0.31%	99.10%
TATA CDMA	0.03%	0.00%	99.12%	NA	0.01%	0.51%	2.57%	99.29%
TATA GSM	0.08%	0.33%	98.46%	0.05%	0.07%	0.63%	2.37%	98.47%
Vodafone	0.07%	0.30%	99.57%	0.05%	0.43%	0.82%	2.78%	96.98%

3.1.2 PMR DATA – FEBRUARY FOR 2G

Name of Service Provider Month February	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	0.23%	0.67%	97.38%	0.88%	0.61%	0.69%	2.42%	96.84%
Airtel	0.01%	0.00%	99.38%	0.03%	0.02%	0.68%	2.44%	97.36%
BSNL	1.62%	3.67%	99.20%	0.37%	0.54%	1.03%	2.66%	99.78%
Idea	0.16%	0.73%	99.67%	0.10%	0.09%	0.27%	0.23%	97.60%
MTS	0.06%	0.00%	99.86%	NA	0.00%	0.50%	2.06%	99.98%
Reliance CDMA	0.40%	0.00%	97.01%	NA	1.18%	0.30%	0.74%	98.99%
Reliance GSM	1.45%	0.00%	98.72%	0.06%	0.09%	0.00%	0.33%	99.07%
TATA CDMA	0.01%	0.00%	98.99%	NA	0.16%	0.44%	2.41%	99.27%
TATA GSM	0.11%	0.17%	99.32%	0.07%	0.12%	0.64%	2.35%	98.31%
Vodafone	0.09%	0.52%	99.58%	0.06%	0.42%	0.77%	2.65%	97.26%

3.1.3 PMR DATA - MARCH FOR 2G

Name of Service Provider Month March	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	0.17%	0.27%	97.11%	0.98%	0.50%	0.65%	2.40%	96.89%
Airtel	0.02%	0.00%	99.29%	0.03%	0.05%	0.62%	2.43%	97.42%
BSNL	1.95%	3.75%	99.18%	0.89%	0.64%	0.77%	2.43%	99.82%
Idea	0.15%	1.00%	99.53%	0.10%	0.21%	0.27%	0.29%	97.59%
MTS	0.06%	0.00%	99.83%	NA	0.00%	0.49%	2.10%	99.95%
Reliance CDMA	0.50%	0.00%	97.20%	NA	1.18%	0.31%	0.58%	98.78%
Reliance GSM	1.44%	0.00%	98.00%	0.10%	0.11%	0.09%	0.26%	99.15%
TATA CDMA	0.02%	0.00%	99.07%	NA	0.06%	0.45%	2.51%	99.26%
TATA GSM	0.08%	0.28%	99.34%	0.08%	0.10%	0.62%	2.40%	98.36%
Vodafone	0.11%	0.44%	99.62%	0.08%	0.38%	0.74%	2.46%	97.52%

3.2 3 DAYS LIVE DATA – CONSOLIDATED FOR 2G

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

Name of Service Provider	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	BTSs Accumulated downtime (not available for service)	Worst affected BTSs due to downtime	Call Set-up Success Rate (within licensee's own network)	SDCCH/ Paging Chl. Congestion (%age)	TCH Congestion (%age)	Call Drop Rate (%age)	Worst affected cells having more than 3% TCH drop	%age of connection with good voice quality
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel	0.24%	0.07%	97.95%	0.90%	0.26%	0.59%	2.38%	96.94%
Airtel	0.01%	0.00%	99.52%	0.02%	0.02%	0.65%	2.53%	97.76%
BSNL	0.97%	0.64%	99.19%	0.47%	1.33%	0.83%	2.37%	99.00%
Idea	0.19%	0.25%	99.75%	0.07%	0.05%	0.24%	0.03%	97.52%
MTS	0.05%	0.00%	99.90%	NA	0.00%	0.36%	0.06%	99.96%
Reliance CDMA	0.49%	0.00%	97.90%	NA	0.80%	0.26%	0.84%	99.17%
Reliance GSM	0.57%	0.00%	88.25%	0.03%	0.02%	0.11%	0.38%	99.11%
TATA CDMA	0.02%	0.00%	99.30%	NA	0.03%	0.42%	3.56%	99.27%
TATA GSM	0.10%	0.00%	98.76%	0.08%	0.06%	0.58%	2.41%	98.37%
Vodafone	0.11%	0.05%	99.74%	0.06%	0.26%	0.65%	2.63%	97.25%

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

BTSs Accumulated Downtime:

All operators met the benchmark. Minimum BTS Accumulated downtime was recorded for Airtel at 0.01%.

Worst Affected BTSs Due to Downtime:

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

Call Set-up Success Rate (CSSR):

Reliance GSM failed to meet the benchmark for CSSR. The maximum CSSR was observed for MTS with 99.90%.

SDCCH/ Paging Chl. Congestion:

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

TCH Congestion:

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

Call Drop Rate:

All operators met the benchmark for the parameter. Minimum call drop rate was recorded for Reliance GSM.

Worst Affected Cells Having More than 3% TCH Drop:

TATA CDMA failed to meet the benchmark. Best performance was recorded for Idea at 0.03%.

Voice Quality

All operators met the benchmark for the parameter. Best performance was recorded for MTS at 99.89%.

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

3.2.1 3 DAY DATA - JANUARY FOR 2G

Name of Service Provider 3 Day January	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	0.19%	0.00%	98.16%	1.07%	0.27%	0.57%	2.08%	97.47%
Airtel	0.01%	0.00%	99.87%	0.03%	0.02%	0.66%	2.67%	97.52%
BSNL	1.22%	0.73%	99.13%	0.25%	1.06%	0.93%	2.11%	99.00%
Idea	0.14%	0.14%	99.74%	0.05%	0.03%	0.24%	0.03%	97.59%
MTS	0.04%	0.00%	99.90%	NA	0.00%	0.33%	0.05%	99.87%
Reliance CDMA	0.36%	0.00%	99.20%	NA	1.17%	0.23%	0.79%	99.28%
Reliance GSM	0.16%	0.00%	99.45%	0.04%	0.01%	0.96%	0.33%	99.25%
TATA CDMA	0.04%	0.00%	99.40%	NA	0.01%	0.39%	3.30%	99.33%
TATA GSM	0.12%	0.00%	98.49%	0.09%	0.05%	0.56%	2.37%	98.79%
Vodafone	0.14%	0.04%	99.73%	0.05%	0.27%	0.68%	2.72%	97.48%

3.2.2 3 DAY DATA – FEBRUARY FOR 2G

Name of Service Provider 3 Day February	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	0.38%	0.22%	97.98%	0.88%	0.24%	0.60%	2.32%	97.13%
Airtel	0.01%	0.00%	99.36%	0.02%	0.02%	0.68%	2.49%	97.35%
BSNL	0.94%	0.72%	99.22%	0.75%	1.51%	0.83%	2.32%	99.00%
Idea	0.27%	0.42%	99.78%	0.09%	0.04%	0.24%	0.03%	97.76%
MTS	0.07%	0.00%	99.89%	NA	0.00%	0.36%	0.07%	99.90%
Reliance CDMA	0.35%	0.00%	97.04%	NA	1.17%	0.28%	0.95%	99.29%
Reliance GSM	0.21%	0.00%	66.32%	0.05%	0.02%	0.09%	0.43%	99.16%
TATA CDMA	0.01%	0.00%	99.29%	NA	0.01%	0.42%	3.43%	99.32%
TATA GSM	0.10%	0.00%	98.36%	0.09%	0.06%	0.59%	2.41%	98.63%
Vodafone	0.12%	0.04%	99.72%	0.07%	0.28%	0.63%	2.50%	97.71%

3.2.3 3 DAY DATA - MARCH FOR 2G

Name of Service Provider 3 Day March	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	0.15%	0.00%	97.69%	0.75%	0.25%	0.59%	2.74%	97.41%
Airtel	0.00%	0.00%	99.34%	0.02%	0.02%	0.61%	2.44%	97.90%
BSNL	0.75%	0.48%	99.22%	0.41%	1.41%	0.73%	2.68%	99.00%
Idea	0.15%	0.18%	99.71%	0.07%	0.09%	0.24%	0.03%	97.73%
MTS	0.03%	0.00%	99.90%	NA	0.00%	0.38%	0.06%	99.89%
Reliance CDMA	0.75%	0.00%	97.45%	NA	0.07%	0.27%	0.78%	98.94%
Reliance GSM	1.34%	0.00%	99.00%	0.01%	0.02%	0.08%	0.38%	99.24%
TATA CDMA	0.02%	0.00%	99.21%	NA	0.08%	0.45%	3.94%	99.28%
TATA GSM	0.08%	0.00%	99.44%	0.07%	0.06%	0.59%	2.44%	98.62%
Vodafone	0.08%	0.07%	99.76%	0.05%	0.24%	0.63%	2.66%	97.84%

3.3 PMR DATA – 3 MONTHS- CONSOLIDATED FOR 3G

Name of Service Provider	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Call drop rate	Worst affected cells having more than 3% Circuit switched	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel 3G	0.22%	0.63%	97.31%	0.88%	0.52%	0.44%	2.91%	98.29%
Airtel 3G	0.00%	0.00%	99.50%	0.00%	0.01%	0.34%	2.74%	99.36%
BSNL 3G	0.04%	5.02%	98.05%	1.12%	2.60%	2.30%	2.61%	99.79%
Idea 3G	0.25%	0.96%	99.87%	0.00%	0.01%	0.28%	0.45%	99.83%
Vodafone 3G	0.10%	0.43%	99.97%	0.03%	0.01%	0.33%	1.97%	98.84%

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

Node Bs downtime:

All operators met the benchmark. Minimum Node Bs Accumulated downtime was recorded for Airtel 3G at 0.00%.

Worst affected Node Bs due to downtime:

BSNL 3G failed to meet the benchmark. Minimum worst affected Node Bs due to downtime was recorded for Airtel 3G at 0.00%.

Call Set-up Success Rate (CSSR):

All operators met the benchmark for CSSR. The maximum CSSR was observed for Vodafone with 99.97%.

RRC Congestion:

BSNL 3G failed to meet the benchmark. Minimum RRC congestion was recorded for Airtel 3G at 0.00%.

Circuit Switched RAB Congestion:

BSNL 3G did not meet the benchmark. Minimum Circuit Switched RAB congestion was recorded for Airtel 3G at 0.01%.

Call Drop Rate:

BSNL 3G failed to meet the benchmark for the parameter. Minimum call drop rate was recorded for Idea 3G at 0.28%.

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

All operators met he benchmark for the parameter. Best performance was recorded for Idea 3G at 0.45%.

Circuit Switch Voice Quality:

All operators met the benchmark for the parameter. Best performance was recorded for Idea 3G at 99.83%.

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

3.3.1 PMR DATA - JANUARY FOR 3G

Name of Service Provider Month January	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Call drop rate	Worst affected cells having more than 3% Circuit switched voice drop rate	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel 3G	0.23%	0.78%	96.46%	0.92%	0.49%	0.42%	2.95%	98.32%
Airtel 3G	0.00%	0.00%	99.46%	0.00%	0.01%	0.41%	2.84%	99.35%
BSNL 3G	0.04%	5.45%	95.50%	1.14%	5.50%	4.50%	2.68%	99.77%
Idea 3G	0.17%	0.09%	99.87%	0.00%	0.00%	0.31%	0.47%	99.80%
Vodafone 3G	0.09%	0.31%	99.98%	0.02%	0.01%	0.33%	2.09%	98.84%

3.3.2 PMR DATA – FEBRUARY FOR 3G

Name of Service Provider Month February	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Call drop rate	Worst affected cells having more than 3% Circuit switched voice drop rate	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel 3G	0.28%	0.84%	98.09%	0.77%	0.65%	0.45%	2.96%	98.27%
Airtel 3G	0.00%	0.00%	99.51%	0.00%	0.00%	0.30%	2.62%	99.35%
BSNL 3G	0.04%	5.02%	98.77%	1.46%	1.28%	1.27%	2.56%	99.78%
Idea 3G	0.28%	0.78%	99.86%	0.00%	0.01%	0.30%	0.52%	99.84%
Vodafone 3G	0.10%	0.57%	99.97%	0.03%	0.00%	0.33%	1.98%	98.84%

3.3.3 PMR DATA - MARCH FOR 3G

Name of Service Provider Month March	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Call drop rate	Worst affected cells having more than 3% Circuit switched	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel 3G	0.15%	0.28%	97.39%	0.95%	0.41%	0.45%	2.82%	98.27%
Airtel 3G	0.01%	0.00%	99.52%	0.00%	0.01%	0.32%	2.76%	99.37%
BSNL 3G	0.04%	4.59%	99.88%	0.76%	1.03%	1.04%	2.61%	99.82%
Idea 3G	0.28%	1.85%	99.88%	0.00%	0.03%	0.26%	0.36%	99.85%
Vodafone 3G	0.12%	0.42%	99.94%	0.06%	0.01%	0.32%	1.85%	98.84%

3.4 3 DAY LIVE DATA – CONSOLIDATED FOR 3G

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

Name of Service Provider	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Call drop rate	Worst affected cells having more than 3% Circuit switched	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel 3G	0.26%	0.12%	95.80%	6.80%	0.32%	0.39%	3.23%	98.29%
Airtel 3G	0.04%	0.00%	98.67%	0.00%	0.00%	0.30%	2.51%	98.87%
BSNL 3G	0.79%	0.73%	96.14%	0.95%	1.29%	0.34%	0.41%	99.00%
Idea 3G	0.15%	0.12%	99.87%	0.00%	0.02%	0.33%	0.20%	99.83%
Vodafone 3G	0.11%	0.06%	99.96%	0.04%	0.01%	0.37%	2.04%	98.84%

Node Bs downtime:

All operators met the benchmark for the parameter. Minimum Node Bs Accumulated downtime was recorded for Airtel 3G at 0.04%.

Worst affected Node Bs due to downtime:

All operators met the benchmark for the parameter. Minimum worst affected Node Bs due to downtime was recorded for Airtel 3G at .00%.

Call Set-up Success Rate (CSSR):

All operators met the benchmark for the parameter. The maximum CSSR was observed for Vodafone 3G with 99.96%.

RRC Congestion:

Aircel 3G failed to meet the benchmark for the parameter. Minimum RRC congestion was for Airtel 3G with 0.00%.

Circuit Switched RAB Congestion:

All operators met the benchmark for the parameter. Minimum Circuit Switched RAB congestion was for Airtel 3G with 0.06%

Call Drop Rate:

All operators met the benchmark for the parameter. Minimum call drop rate was recorded for Airtel 3G at 0.30%.

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

Aircel failed to meet the benchmark for the parameter. Minimum Worst affected cells having more than 3% Circuit switched voice drop rate was recorded for Idea 3G at 0.20%.

Circuit Switch Voice Quality:

All operators met the benchmark. Best performance was recorded for Idea 3G at 99.78%.

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

3.4.1 3 DAY DATA - JANUARY FOR 3G

Name of Service Provider 3 Day January	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Call drop rate	Worst affected cells having more than 3% Circuit switched voice drop rate	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel 3G	0.22%	0.12%	94.84%	8.15%	0.31%	0.41%	3.36%	98.33%
Airtel 3G	0.03%	0.00%	98.22%	0.00%	0.00%	0.11%	2.61%	98.05%
BSNL 3G	0.97%	0.75%	94.97%	0.99%	1.92%	0.35%	0.45%	99.00%
Idea 3G	0.21%	0.12%	99.79%	0.00%	0.06%	0.48%	0.23%	99.61%
Vodafone 3G	0.15%	0.04%	99.92%	0.08%	0.02%	0.44%	2.34%	98.78%

3.4.2 3 DAY DATA – FEBRUARY FOR 3G

Name of Service Provider 3 Day February	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Call drop rate	Worst affected cells having more than 3% Circuit switched	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel 3G	0.39%	0.24%	94.26%	11.00%	0.39%	0.41%	3.52%	98.18%
Airtel 3G	0.03%	0.00%	98.66%	0.00%	0.00%	0.70%	2.15%	99.22%
BSNL 3G	0.75%	0.86%	97.35%	0.96%	0.93%	0.33%	0.45%	99.00%
Idea 3G	0.17%	0.17%	99.88%	0.00%	0.00%	0.28%	0.26%	99.84%
Vodafone 3G	0.11%	0.08%	99.96%	0.04%	0.01%	0.36%	2.17%	98.80%

3.4.3 3 DAY DATA - MARCH FOR 3G

Name of Service Provider 3 Day March	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 3G	0.18%	0.00%	98.31%	1.24%	0.25%	0.35%	2.85%	98.20%
Airtel 3G	0.05%	0.00%	99.12%	0.00%	0.00%	0.11%	2.78%	99.33%
BSNL 3G	0.66%	0.57%	96.09%	0.89%	1.03%	0.36%	0.33%	99.00%
Idea 3G	0.10%	0.08%	99.94%	0.00%	0.00%	0.27%	0.12%	99.86%
Vodafone 3G	0.08%	0.07%	99.99%	0.01%	0.00%	0.32%	1.62%	98.80%

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

Name of Service Provider	Wireless Data-PMR			Wireless Data-Live Data		
	Activation done within 4 hours	PDP Context activation success rate	Drop Rate	Activation done within 4 hours	PDP Context activation success rate	Drop Rate
Benchmark	≥ 95%	≥ 95%	≤ 5%	≥ 95%	≥ 95%	≤ 5%
Aircel	99.95%	99.56%	1.28%	99.95%	99.98%	1.57%
Airtel	NDR	NDR	NDR	NDR	NDR	NDR
BSNL	NDR	99.93%	4.82%	NDR	80.46%	4.83%
Idea	99.83%	99.35%	1.06%	99.92%	98.36%	1.21%
MTS	98.84%	99.79%	1.47%	99.93%	99.80%	1.57%
Reliance CDMA	99.95%	NDR	NDR	99.99%	NDR	NDR
Reliance GSM	99.99%	NDR	NDR	99.99%	NDR	NDR
TATA CDMA	98.37%	NDR	1.38%	100.00%	NDR	1.40%
TATA GSM	100.00%	99.73%	1.56%	100.00%	99.89%	1.56%
Vodafone	99.05%	99.90%	1.84%	99.73%	99.88%	1.81%

NDR: - No data received from operators

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

Activation done within 4 hours:

In PMR as well as 3Days live all operators met the benchmark. Maximum Activation done within 4 hours was recorded for TATA GSM at 100.00%. However in 3day live maximum Activation done within 4 hours was recorded for TATA GSM & CDMA at 100.00%.

Note: - Airtel and BSNL not submitted Activation data

PDP Context activation success rate:

In PMR all operators met the benchmark. Maximum PDP Context activation success rate was recorded for BSNL at 99.93%. However in 3day live BSNL failed to meet the benchmark. Maximum PDP Context activation success rate was recorded for Aircel at 99.95%.

Note: - Airtel, Reliance GSM & CDMA and TATA CDMA did not submit PDP Context Activation data.

Drop Rate:

All operators met the benchmark in PMR as well as 3day live. The minimum drop rate was observed in PMR as well as 3day live for Idea.

Note: - Airtel and Reliance GSM & CDMA did not submit Drop rate data.

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

Name of Service Provider	Wireless Data-PMR			Wireless Data-Live Data		
	Activation done within 4 hours	PDP Context activation success rate	Drop Rate	Activation done within 4 hours	PDP Context activation success rate	Drop Rate
Benchmark	≥ 95%	≥ 95%	≤ 5%	≥ 95%	≥ 95%	≤ 5%
Aircel 3G	99.95%	99.56%	2.17%	99.95%	99.98%	1.55%
Airtel 3G	NDR	NDR	NDR	NDR	NDR	NDR
BSNL 3G	NDR	99.93%	4.15%	NDR	81.47%	4.96%
Idea 3G	NDR	97.31%	0.70%	NDR	96.69%	0.92%
Vodafone 3G	99.95%	98.94%	0.37%	98.96%	98.90%	0.35%

NDR: - No data received from operators

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

Activation done within 4 hours:

In PMR as well as 3days live all operators met the benchmark. Maximum Activation done within 4 hours was recorded for Aircel and Vodafone at 99.95%. However in 3day live maximum Activation done within 4 hours was recorded for Aircel 3G at 99.95%.

Note: - Airtel 3G, Idea 3G and BSNL 3G did not submit Activation data

PDP Context activation success rate:

In PMR all operators met the benchmark. Maximum PDP Context activation success rate was recorded for BSNL 3G at 99.93%. However in 3day live BSNL 3G failed to meet the benchmark, maximum PDP Context activation success rate was recorded for Aircel 3G at 99.98%.

Note: - Airtel 3G did not submit PDP Context Activation data

Drop Rate:

All operators met the benchmark in PMR as well as 3day live. The minimum drop rate was observed for PMR as well 3days live Vodafone 3G.

Note: - Airtel 3G did not submit Drop rate data.

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

3.7 LIVE CALLING DATA - CONSOLIDATED

Name of Service Provider	Metering and Billing		Response time to customer for assistance		Level 1 Service	Service Requests
	%age complaints resolved within 4 weeks	%age complaints resolved within 6 weeks	Accessibility of call centre/ customer care	Percentage of calls answered by the operators (voice to	Call answered	Complaint /Request attended to Satisfaction
Benchmark	98%	100%	≥ 95%	≥ 95%	≥ 95%	
Aircel	98.00%	100.00%	100.00%	100.00%	97.67%	98.00%
Airtel	97.00%	100.00%	100.00%	100.00%	38.67%	97.00%
BSNL	99.00%	100.00%	95.00%	100.00%	77.67%	95.00%
Idea	99.00%	99.00%	100.00%	100.00%	94.00%	97.00%
MTS	97.00%	97.00%	100.00%	100.00%	49.00%	95.00%
Reliance CDMA	96.00%	96.00%	100.00%	100.00%	92.67%	97.00%
Reliance GSM	99.00%	99.00%	100.00%	100.00%	78.00%	98.00%
TATA CDMA	100.00%	100.00%	100.00%	100.00%	83.33%	97.75%
TATA GSM	99.00%	99.00%	100.00%	100.00%	84.33%	100.00%
Vodafone	100.00%	100.00%	100.00%	100.00%	60.00%	100.00%

Resolution of billing complaints

As per the consumers (live calling exercise) Airtel, MTS and Reliance CDMA failed to meet the benchmark of resolving 98% complaints within 4 weeks and Idea, MTS, Reliance GSM & CDMA and TATA CDMA failed to meet the benchmark of 100% complaints within 6 weeks.

Accessibility of Call Centre/Customer Care-IVR

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

Customer Care / Helpline Assessment (voice to voice)

All the operators met the TRAI benchmark of 95% with most of the operators recording 100% for the parameter

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 except Aircel. The details of live calling done for the level 1 service have been provided in the annexure for each operator.

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

Complaint/Request Attended to Satisfaction

All operators performed satisfactorily in terms of satisfaction of the customers for service requests. TATA GSM and Vodafone recorded the best performance at 100.00%.

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	0.07%	0.06%	100.00%	100.00%	100.00%	97.74%	89.70%
Airtel	0.08%	0.01%	100.00%	100.00%	100.00%	96.28%	66.65%
BSNL	0.01%	0.04%	99.89%	100.00%	100.00%	96.52%	95.05%
Idea	0.61%	0.10%	100.00%	100.00%	100.00%	98.29%	98.99%
MTS	0.07%	0.03%	100.00%	100.00%	100.00%	99.15%	95.39%
Reliance CDMA	0.07%	0.01%	100.00%	100.00%	100.00%	99.19%	93.66%
Reliance GSM	0.09%	0.03%	100.00%	100.00%	100.00%	99.76%	94.53%
TATA CDMA	0.00%	0.00%	100.00%	100.00%	100.00%	99.35%	98.57%
TATA GSM	0.00%	0.00%	100.00%	100.00%	100.00%	99.29%	93.27%
Vodafone	0.05%	0.04%	100.00%	100.00%	100.00%	100.00%	98.17%

Metering and Billing Credibility – Post-paid Subscribers

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

Metering and Billing Credibility – Prepaid Subscribers

For the prepaid customers, all operators met the benchmark of charging disputes. TATA GSM & 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 with 100.00%.

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. Vodafone recorded the best performance for the parameter.

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

Airtel, Airtel, TATA GSM, and Reliance (GSM & CDMA) failed to meet the TRAI specified benchmark of 95%. Idea recorded the best performance for the parameter with 98.99%.

3.9 INTER OPERATOR CALL ASSESSMENT - CONSOLIDATED

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

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

In the inter-operator call assessment, most of the operators connected well to other operators

.

3.10 PMR COMPARISON WITH IMRB AND OPERATORS DATA 2G

Name of Service Provider	Network Availability				Connection Establishment (Accessibility)						Connection Maintenance (Retainability)						Point of Interconnection (POI) Congestion	
	BTSs Accumulated downtime (not available for service)		Worst affected BTSs due to downtime		Call Set-up Success Rate		SDCCH/ Paging Chl. Congestion		TCH Congestion		Call drop rate		Worst affected cells having more than 3%		Connection with good voice quality			
Benchmark	≤ 2%		≤ 2%		≥ 95%		≤ 1%		≤ 2%		≤ 2%		≤ 3%		≥ 95%		≤ 0.5%	
	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB
Aircel	0.20%	0.20%	0.60%	0.60%	97.40%	97.40%	0.83%	0.83%	0.61%	0.61%	0.67%	0.67%	2.36%	2.36%	96.94%	96.94%	0.00%	0.00%
Airtel	0.01%	0.01%	0.00%	0.00%	99.58%	99.50%	0.02%	0.03%	0.02%	0.03%	0.95%	0.86%	2.44%	2.44%	97.45%	97.45%	0.00%	0.00%
BSNL	1.88%	1.85%	3.86%	3.86%	99.20%	99.20%	0.72%	0.72%	0.57%	0.57%	0.93%	0.93%	2.42%	2.41%	99.79%	99.79%	0.00%	0.00%
Idea	0.14%	0.13%	0.75%	0.76%	99.56%	99.56%	0.09%	0.09%	0.13%	0.13%	0.28%	0.28%	0.30%	0.30%	97.52%	97.52%	0.00%	0.00%
MTS	0.06%	0.05%	0.00%	0.00%	99.85%	99.85%	NA	NA	0.00%	0.00%	0.50%	0.50%	2.00%	2.01%	99.96%	99.96%	0.00%	0.00%
RCOM CDMA	0.26%	0.39%	1.54%	0.00%	97.17%	97.17%	NA	NA	1.18%	1.18%	0.29%	0.29%	0.67%	0.71%	99.21%	99.01%	0.00%	0.00%
RTL	0.43%	1.05%	1.20%	0.24%	98.73%	98.65%	0.06%	0.06%	0.07%	0.09%	0.09%	0.00%	0.30%	0.30%	99.09%	99.11%	0.00%	0.00%
TATA CDMA	0.02%	0.02%	0.00%	0.00%	99.06%	99.06%	NA	NA	0.08%	0.08%	0.47%	0.46%	2.51%	2.50%	99.27%	99.27%	0.00%	0.00%
TATA GSM	0.09%	0.09%	0.26%	0.26%	99.04%	99.04%	0.07%	0.07%	0.10%	0.10%	0.63%	0.63%	2.37%	2.37%	98.38%	98.37%	0.00%	0.00%
Vodafone	0.09%	0.09%	0.42%	0.42%	99.59%	99.59%	0.06%	0.06%	0.41%	0.41%	0.78%	0.78%	2.63%	2.63%	97.25%	97.25%	0.00%	0.00%

3.11 PMR COMPARISON WITH IMRB AND OPERATORS DATA 3G

Name of Service Provider	Network Availability				Connection Establishment (Accessibility)						Connection Maintenance (Retainability)						Point of Interconnection (POI) Congestion	
	Node Bs downtime (not available for service)		Worst affected Node Bs due to downtime		CSSR		RRC Congestion		Circuit Switched RAB Congestion		Call drop rate		Worst affected cells having more than 3% Circuit switched		%Circuit Switch Voice Quality (CSV quality)			
Benchmark	≤ 2%		≤ 2%		≥ 95%		≤ 1%		≤ 2%		≤ 2%		≤ 3%		≥ 95%		≤ 0.5%	
	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB
Aircel	0.23%	0.22%	0.64%	0.63%	97.31%	97.31%	0.88%	0.88%	0.52%	0.52%	0.44%	0.44%	2.91%	2.91%	99.41%	98.29%	0.00%	0.00%
Airtel	0.00%	0.00%	0.00%	0.00%	99.49%	99.50%	0.00%	0.00%	0.00%	0.01%	0.35%	0.34%	2.73%	2.74%	99.35%	99.36%	0.00%	0.00%
BSNL	2.37%	0.04%	4.97%	5.02%	96.67%	98.05%	1.07%	1.12%	2.57%	2.60%	2.23%	2.30%	2.57%	2.61%	99.73%	99.79%	0.00%	0.00%
IDEA	0.25%	0.25%	0.91%	0.96%	99.87%	99.87%	0.00%	0.00%	0.01%	0.01%	0.29%	0.28%	0.45%	0.45%	99.83%	99.83%	0.00%	0.00%
Vodafone	0.58%	0.10%	0.27%	0.43%	99.85%	99.97%	0.03%	0.03%	0.01%	0.01%	0.33%	0.33%	1.97%	1.97%	99.02%	98.84%	0.00%	0.00%

4 CRITICAL FINDINGS

PMR Consolidated (Network Parameters) for 2G

- BSNL failed to meet the benchmark worst affected BTSs due to downtime

3 Day Live Measurement (Network Parameters) for 2G

- Reliance GSM failed to meet the benchmark for CSSR.
- TATA CDMA failed to meet the benchmark Worst Affected Cells Having More than 3% TCH Drop.

PMR Consolidated (Network Parameters) for 3G

- BSNL 3G failed to meet the benchmark for worst affected Node Bs due to downtime
- BSNL 3G did not meet the benchmark Circuit Switched RAB congestion.
- BSNL 3G failed to meet the benchmark for RRC congestion.
- BSNL 3G failed to meet the benchmark for the parameter Worst affected cells having more than 3% Circuit switched voice drop rate.

3 Day Live Measurement (Network Parameters) for 3G

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

Wireless data services for 2G

- In PMR as well as 3Days live all operators met the benchmark. Maximum Activation done within 4 hours was recorded for TATA GSM at 100.00%. However in 3day live maximum Activation done within 4 hours was recorded for TATA GSM & CDMA at 100.00%.

  Note: - Airtel and BSNL did not submit Activation done within 4hrs data.

- In PMR all operators met the benchmark. Maximum PDP Context activation success rate was recorded for BSNL at 99.93%. However in 3day live BSNL failed to meet the benchmark. Maximum PDP Context activation success rate was recorded for Aircel at 99.95%.

  Note: - Airtel, Reliance GSM & CDMA and TATA CDMA did not submit PDP Context Activation data.

- All operators met the benchmark in PMR as well as 3day live for drop rate. The minimum drop rate was observed in PMR as well as 3day live for Idea.

  Note: - Airtel and Reliance GSM & CDMA did not submit Drop rate data.

Wireless data services for 3G

- In PMR as well as 3days live all operators met the benchmark. Maximum Activation done within 4 hours was recorded for Aircel and Vodafone at 99.95%. However in 3day live maximum Activation done within 4 hours was recorded for Aircel 3G at 99.95%.

  Note: - Airtel 3G, Idea 3G and BSNL 3G did not submit Activation data.
- In PMR all operators met the benchmark. Maximum PDP Context activation success rate was recorded for BSNL 3G at 99.93%. However in 3day live BSNL 3G failed to meet the benchmark, maximum PDP Context activation success rate was recorded for Aircel 3G at 99.98%.

  Note: - Airtel 3G did not submit PDP Context Activation data.

- All operators met the benchmark in PMR as well as 3day live for Drop rate. The minimum drop rate was observed for PMR as well 3days live Vodafone 3G.

  Note: - Airtel 3G did not submit Drop rate data

Live Calling

- As per the consumers (live calling exercise) Airtel, MTS and Reliance CDMA failed to meet the benchmark of resolving 98% complaints within 4 weeks and Idea, MTS, Reliance GSM & CDMA and TATA CDMA failed to meet the benchmark of 100% complaints within 6 weeks.
- As per the live calling results, none of the operators met the TRAI benchmark for level 1 service with calls being answered except Aircel. The details of live calling done for the level 1 service have been provided in the annexure for each operator.

Metering and billing credibility

- For the billing disputes of post-paid subscribers, it was observed that Idea failed to meet the TRAI benchmark for the parameter. TATA GSM & CDMA had the best performance with 0.00% billing disputes.
- Airtel, Airtel, TATA GSM, and Reliance (GSM & CDMA) failed to meet the TRAI specified benchmark for Customer Care Percentage of calls answered by the operators (Voice to Voice) within 90 seconds

Drive Test (Operator Assisted)

- Aircel 2G and TATA GSM failed to meet the benchmark in outdoor locations for Voice quality.
- Reliance CDMA failed to meet the benchmark for CSSR in outdoor as well as indoor locations.
- BSNL 2G 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

3 Day Live Data: - Data representing for Reliance CDMA and Reliance GSM is for March 2016, since they had server issue in the month of January 2016 and February 2016 we could not able to conduct the audit same has been intimated to TRAI by the operator.

5.1 BTS ACCUMULATED DOWNTIME

5.1.1 PARAMETER DESCRIPTION

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

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

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

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

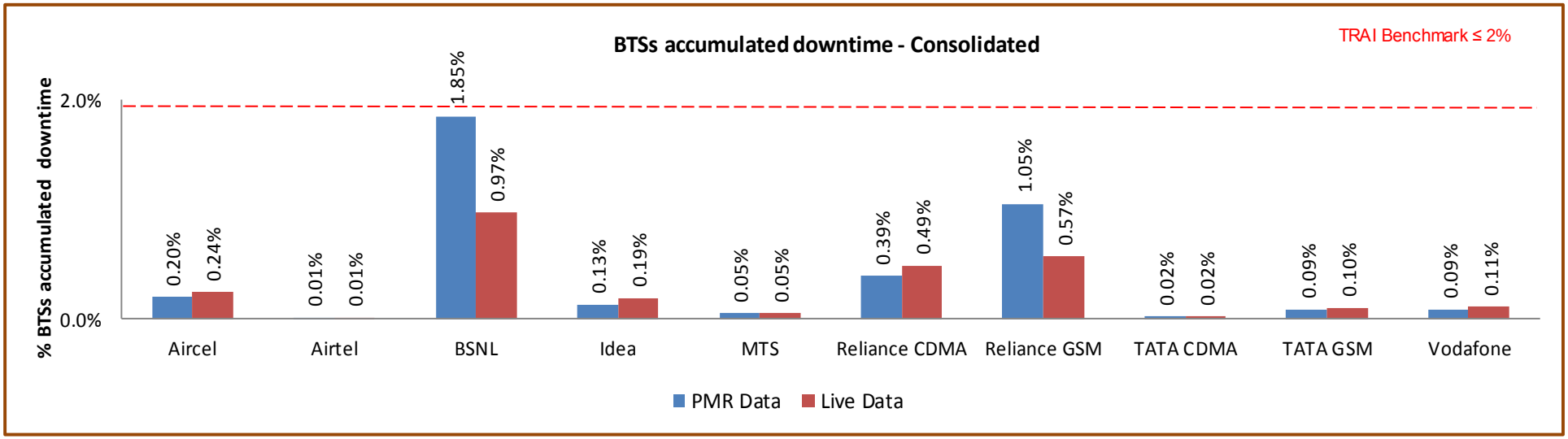
3. **TRAI Benchmark –**

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

4. **Audit Procedure –**

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

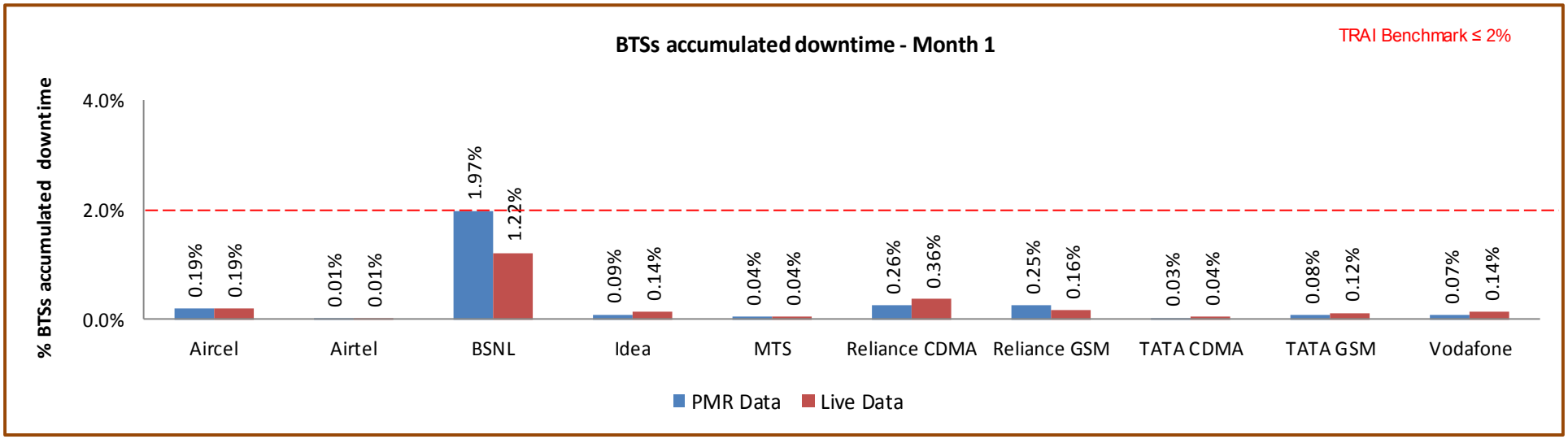
5.1.2 KEY FINDINGS - CONSOLIDATED



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

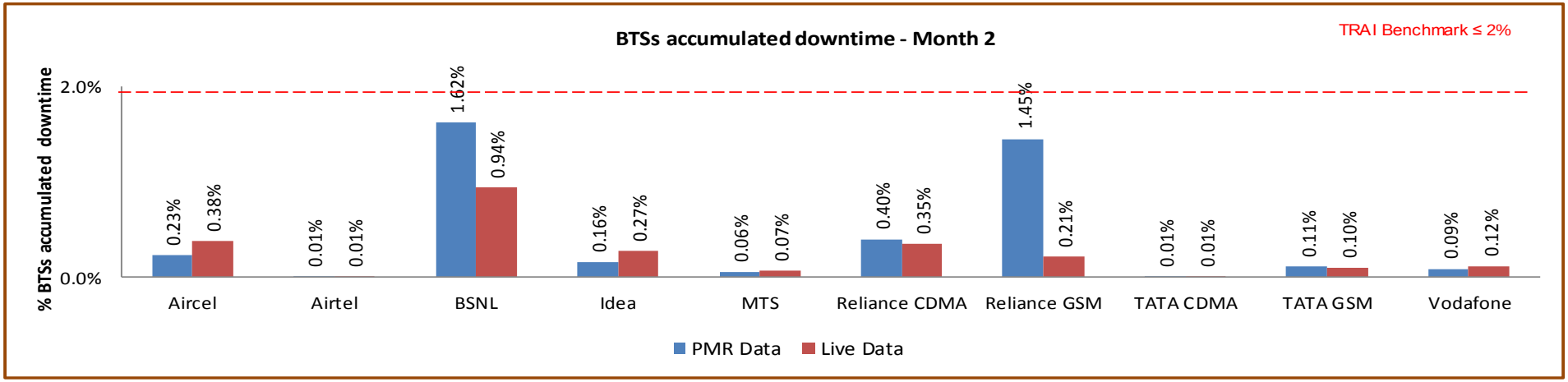
All operators met the benchmark on aspect of BTS accumulated downtime as per audit/PMR data.

5.1.2.1 KEY FINDINGS – MONTH 1



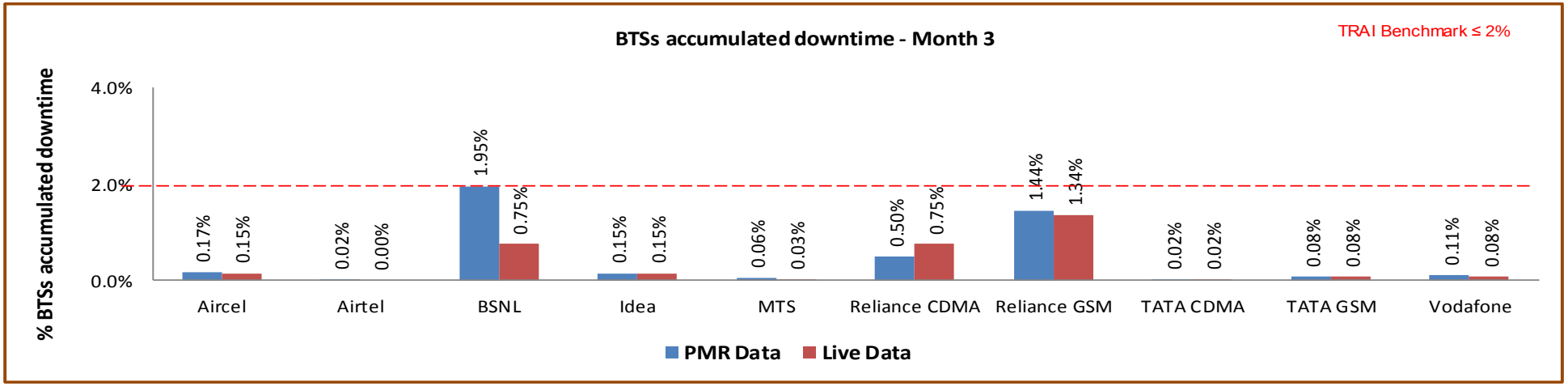
Data Source: Operations and Maintenance Center (OMC) of the operators

5.1.2.2 KEY FINDINGS – MONTH 2



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

5.1.2.3 KEY FINDINGS – MONTH 3



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

5.2 WORST AFFECTED BTS DUE TO DOWNTIME

5.2.1 PARAMETER DESCRIPTION

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

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

- **Computation Methodology –**

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

- **TRAI Benchmark –**

  a. Worst affected BTSs due to downtime ≤ 2%

- **Audit Procedure –**

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

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

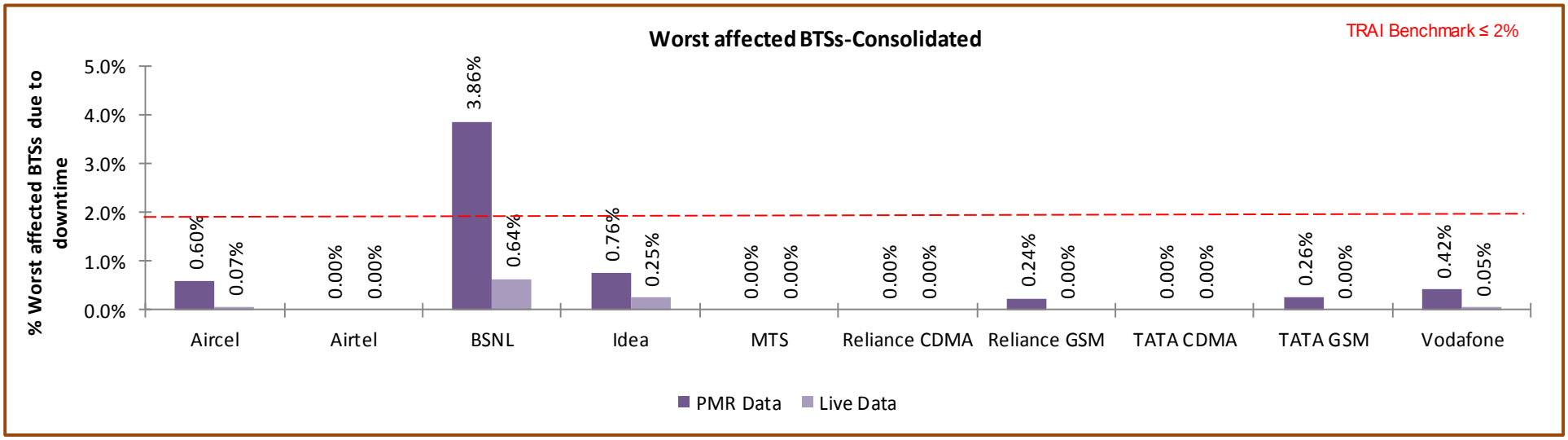
  iii. Data is extracted from system log of the server of the operator. This data is in raw format which is further processed to arrive at the cumulative values.

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

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

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

5.2.2 KEY FINDINGS – CONSOLIDATED

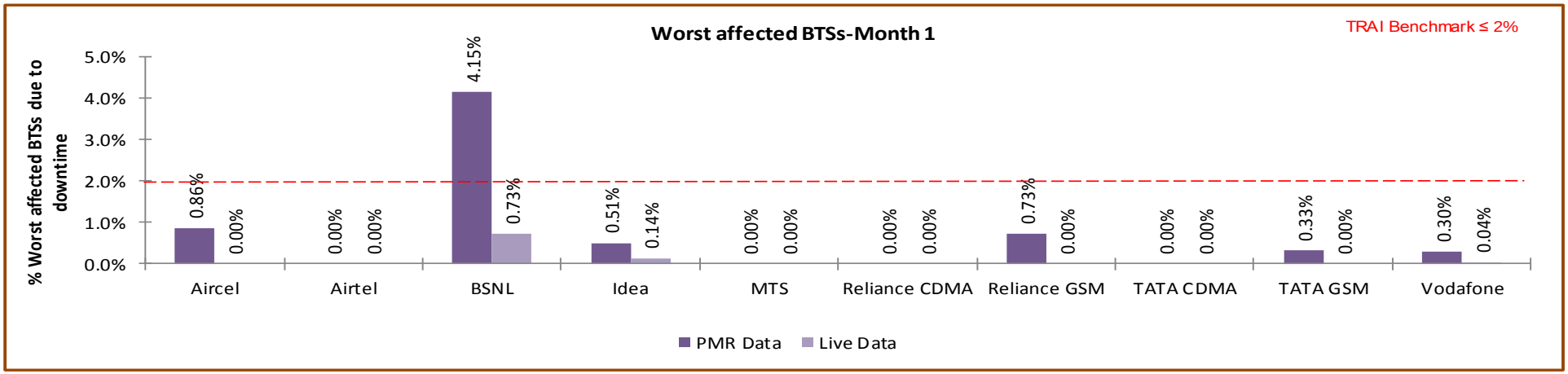


Data Source: Operations and Maintenance Center (OMC) of the operators

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

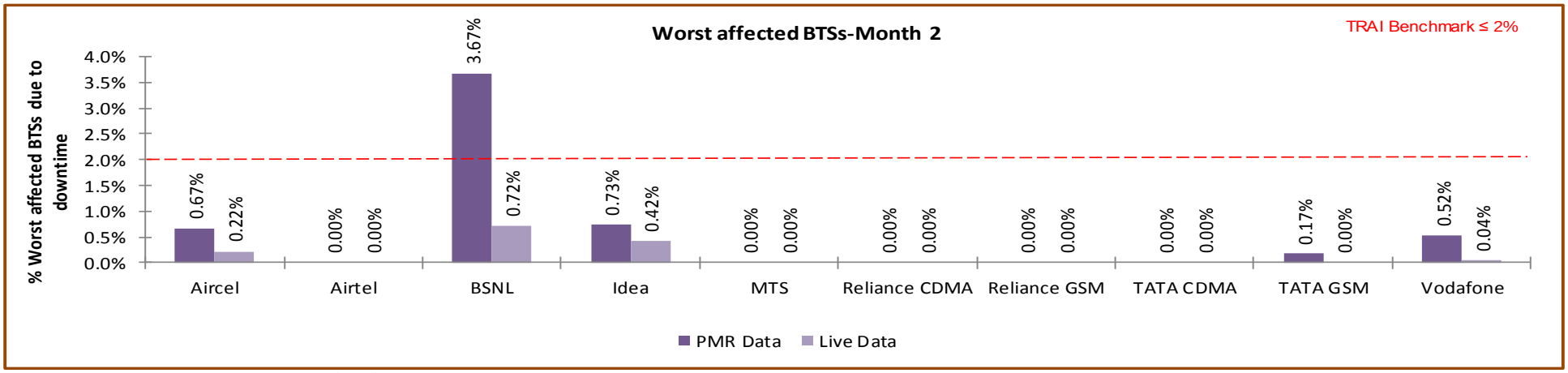
Significant difference was observed between PMR & live measurement data for Aircel, Idea, Reliance GSM, TATA (CDMA & GSM) and BSNL. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for three days.

5.2.2.1 KEY FINDINGS – MONTH 1



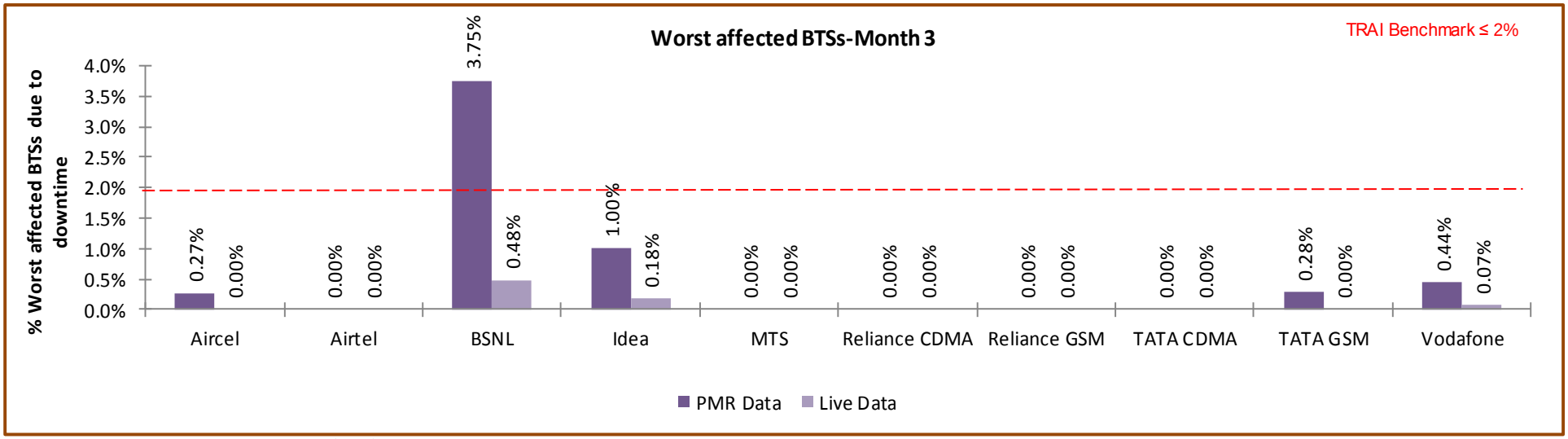
Data Source: Operations and Maintenance Center (OMC) of the operators

5.2.2.2 KEY FINDINGS – MONTH 2



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

5.2.2.3 KEY FINDINGS – MONTH 3



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

5.3 CALL SET UP SUCCESS RATE

5.3.1 PARAMETER DESCRIPTION

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

   (Calls Established / Total Call Attempts) * 100

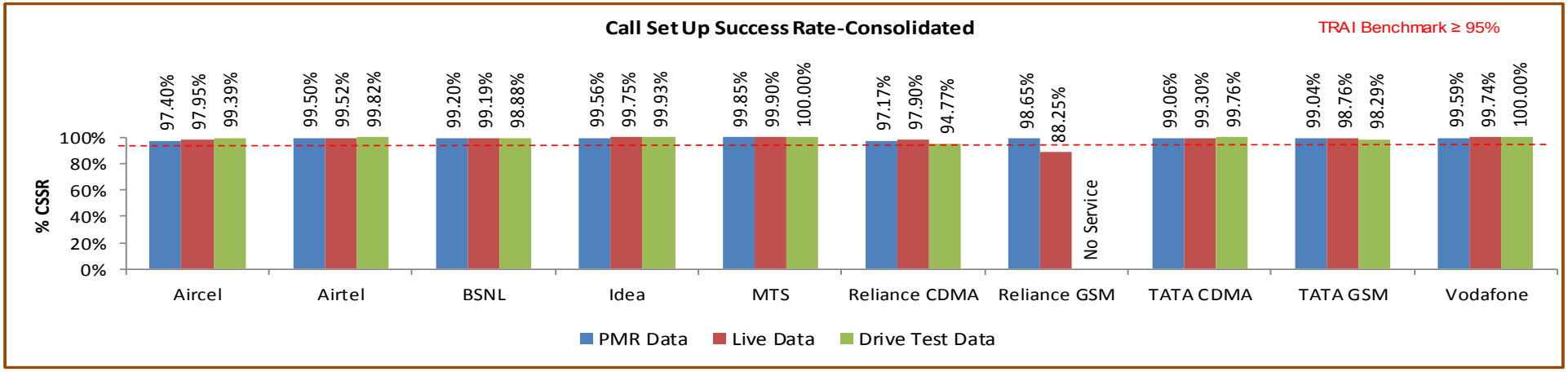
   Call Established means the following events have happened in call setup:-

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

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

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

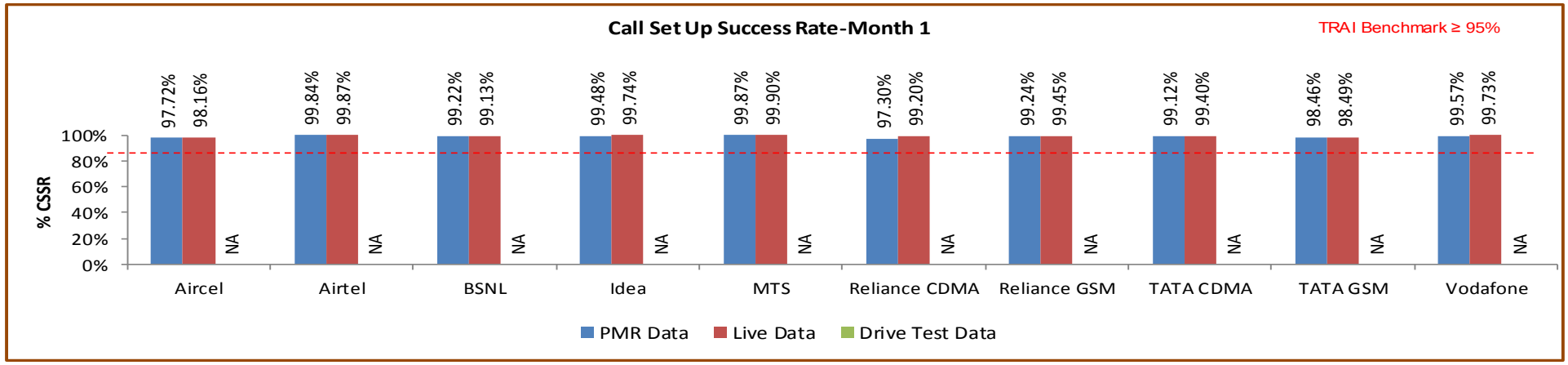
5.3.2 KEY FINDINGS - CONSOLIDATED



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

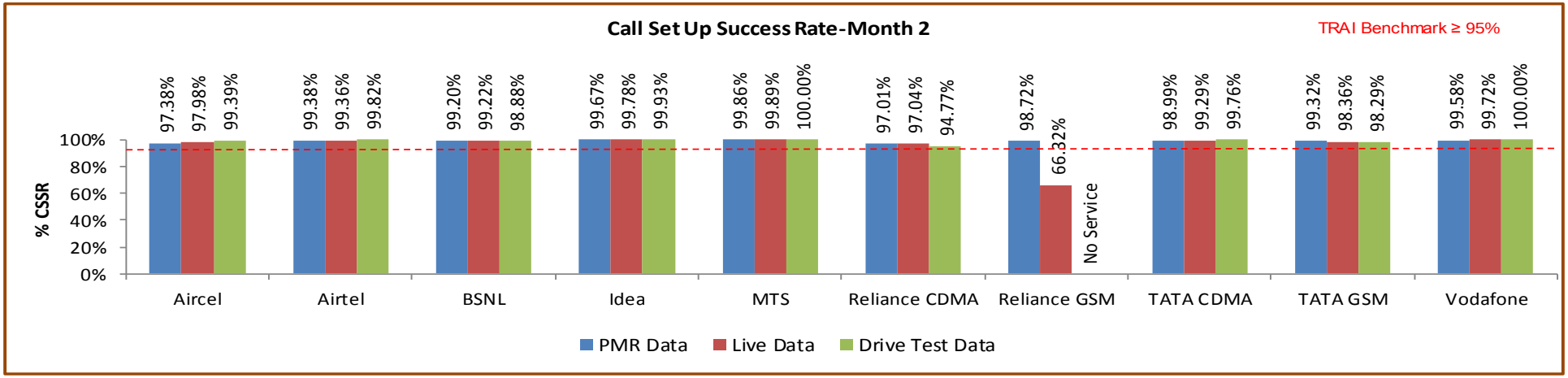
All operators met the TRAI benchmark as per audit/PMR data except Reliance GSM for 3days live.

5.3.2.1 KEY FINDINGS – MONTH 1



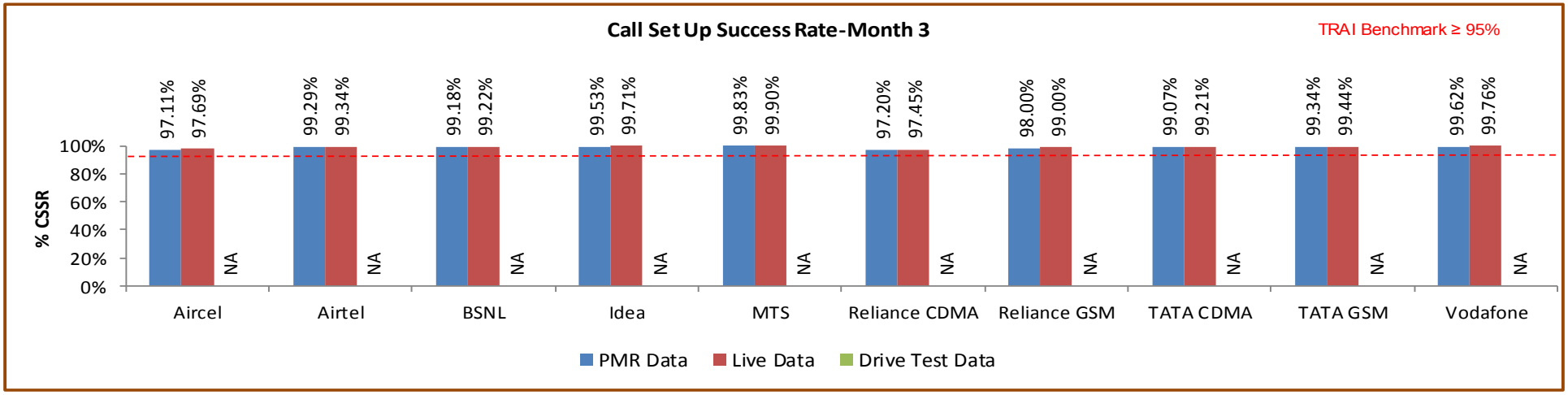
Data Source: Network Operations Center (NOC) of the operators

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:**

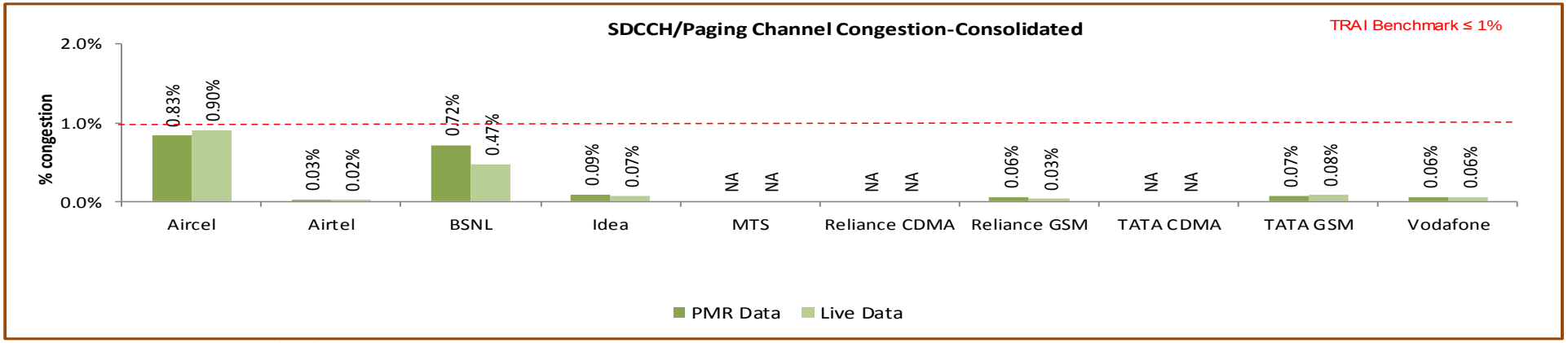
   ↳ SDCCH Congestion: ≤ 1%, TCH Congestion: ≤ 2%, POI Congestion: ≤ 0.5%

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)



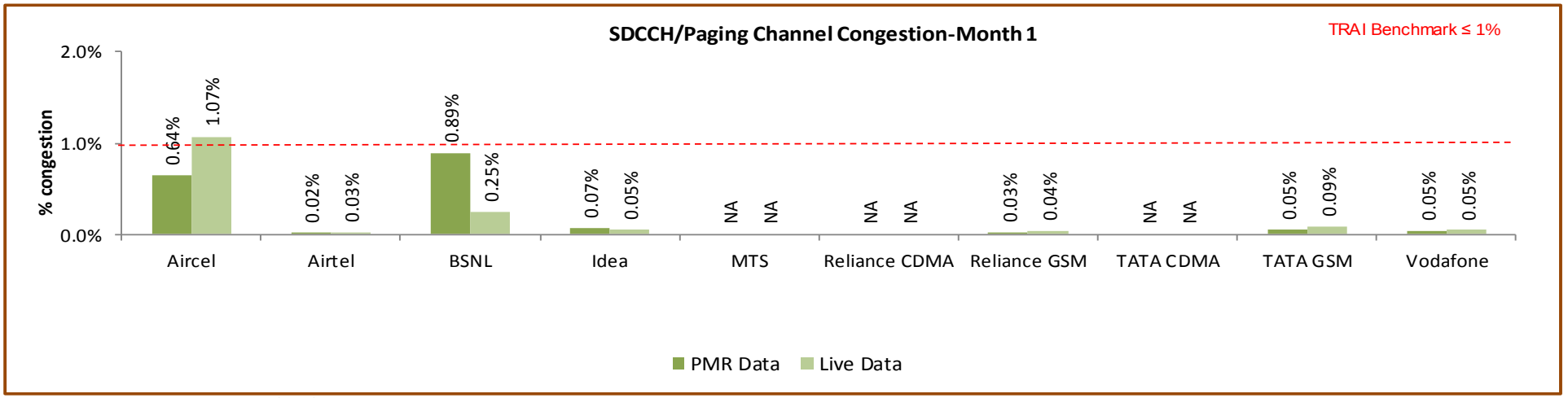
Data Source: Network Operations Center (NOC) of the operators

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

All operators met the benchmark as per PMR/audit Data except BSNL for 3days live.

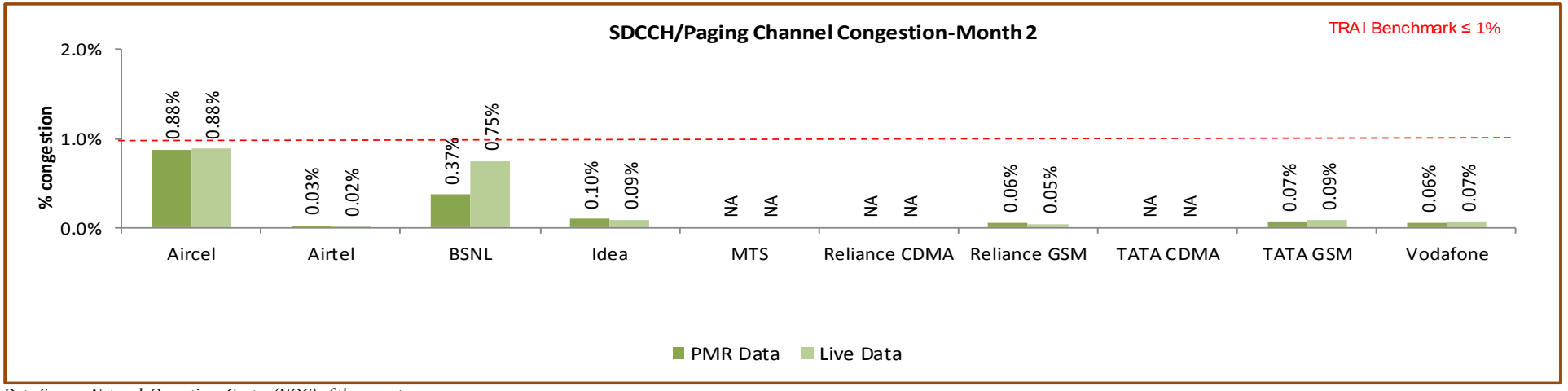
Significant difference was observed between PMR & live measurement data for BSNL and Aircel. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for 3 days.

5.4.2.1 KEY FINDINGS – MONTH 1



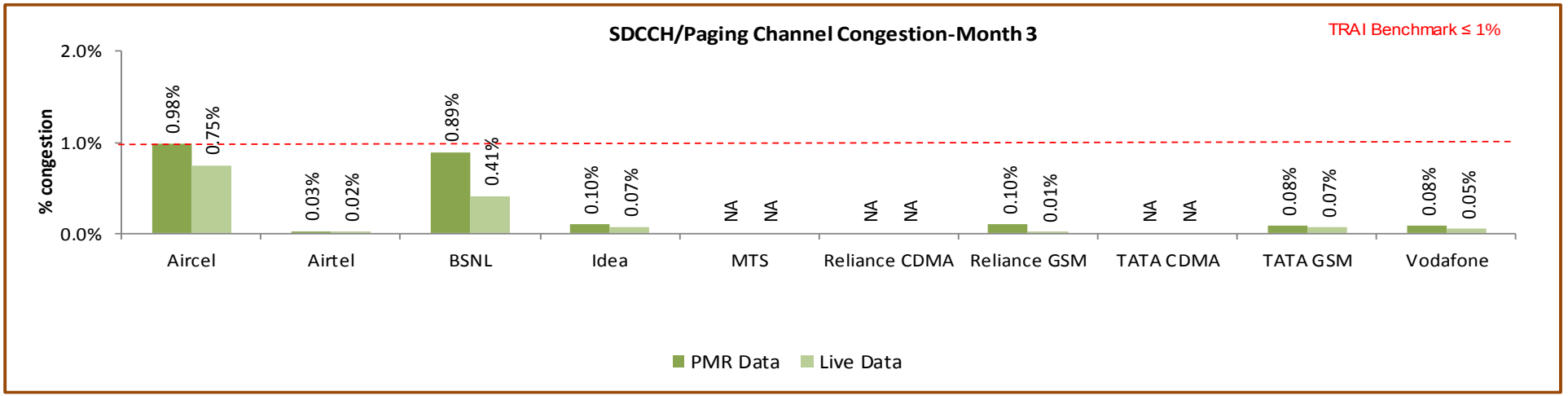
Data Source: Network Operations Center (NOC) of the operators

5.4.2.2 KEY FINDINGS – MONTH 2



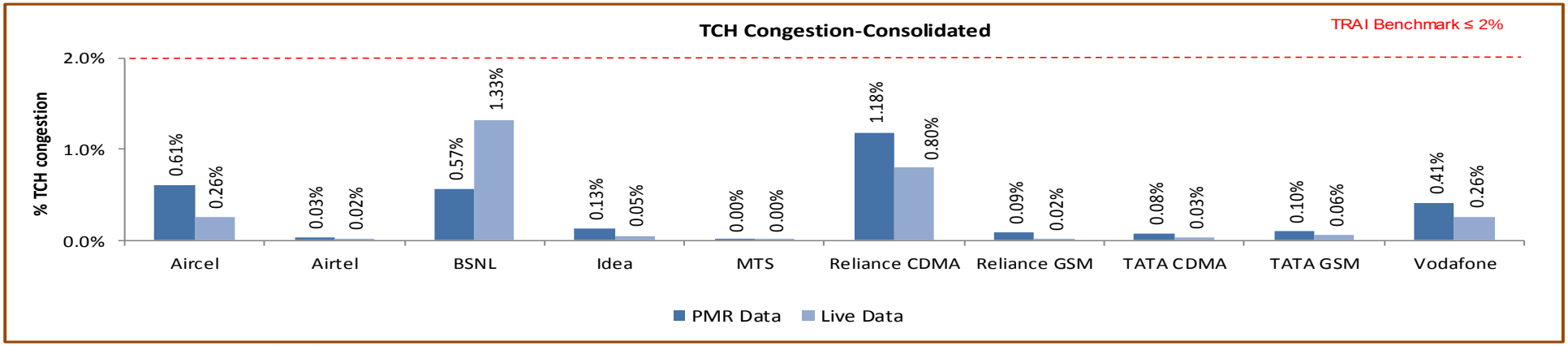
Data Source: Network Operations Center (NOC) of the operators

5.4.2.3 KEY FINDINGS – MONTH 3



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

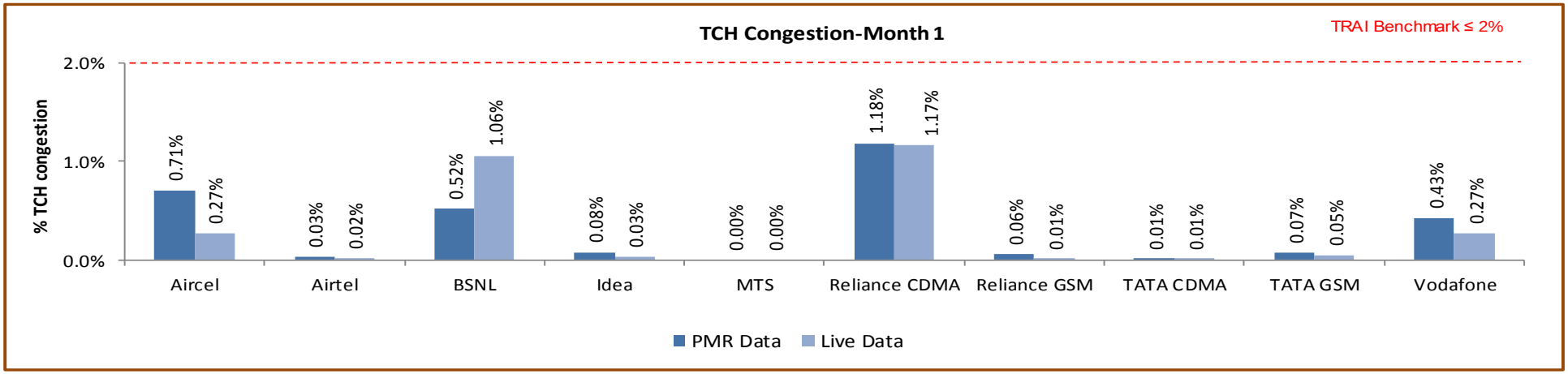
5.4.3 KEY FINDINGS – TCH CONGESTION (CONSOLIDATED)



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

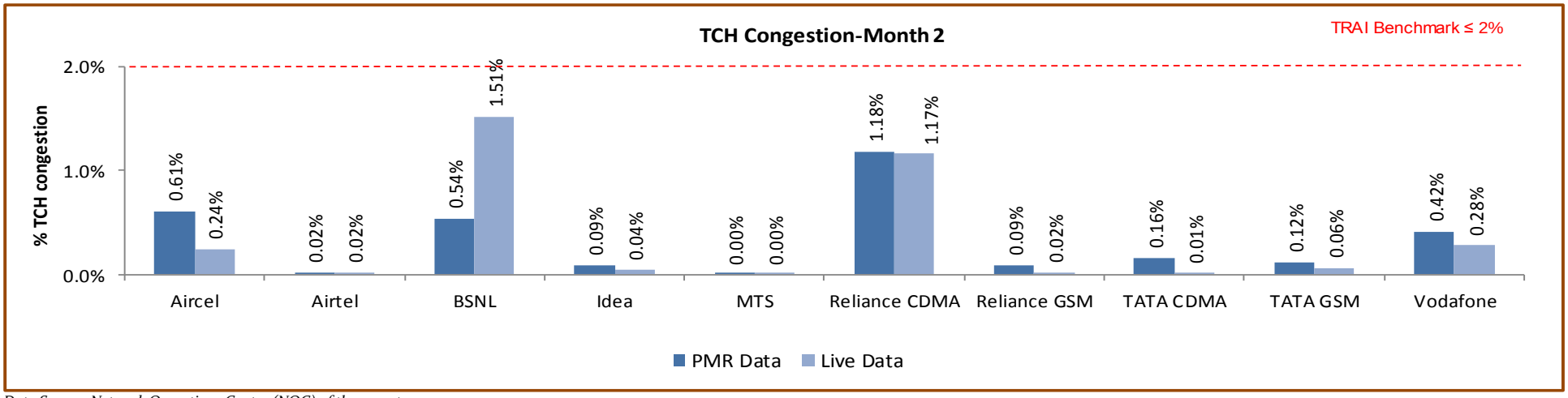
All operators met the benchmark as per audit/PMR report.

5.4.3.1 KEY FINDINGS – MONTH 1



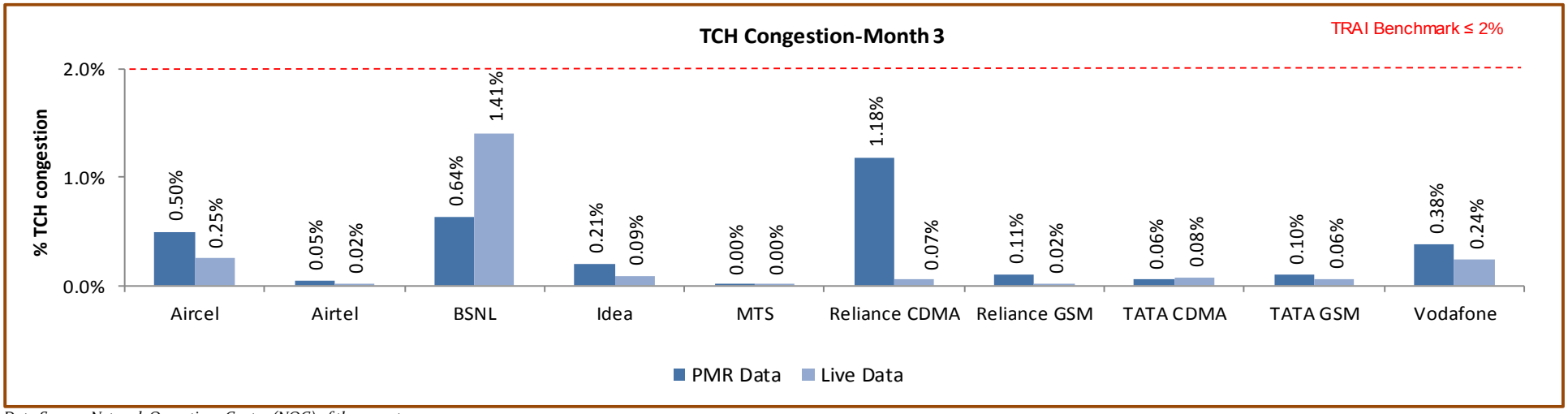
Data Source: Network Operations Center (NOC) of the operators

5.4.3.2 KEY FINDINGS – MONTH 2



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

5.4.3.3 KEY FINDINGS – MONTH 3



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

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

Audit Results for POI Congestion- PMR data											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		49	32	79	93	40	12	29	41	30	45
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		203436	238053	1374939	176578	110238	24459	35631	66432	38799	572309
Traffic served for all POIs (B)- in erlangs		85328	118953	35234	101676	33936	7820	21603	28770	23785	304155
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		49	32	79	94	40	12	29	41	30	45
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		169566	109045	1327328	175208	109822	24459	33223	65409	38225	572155
Traffic served for all POIs (B)- in erlangs		56410	68289	33501	100150	33099	4724	18710	16826	11951	163281
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Data

Source: Network Operations Center (NOC) of the operators

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

5.4.4.1 KEY FINDINGS – MONTH 1

Audit Results for POI Congestion- PMR data-January											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		49	32	79	94	40	12	29	41	30	45
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		68064	81497	436020	55971	37071	8153	11877	22348	12747	190638
Traffic served for all POIs (B)- in erlangs		27781	39642	11425	32122	11080	2639	6934	9492	7473	97794
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-January											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		49	32	79	94	40	12	29	41	30	45
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		35182	24449	427866	55046	37039	8153	11877	22282	12677	190558
Traffic served for all POIs (B)- in erlangs		27668	18669	11321	31519	10965	1431	6649	5586	3850	52755
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

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

5.4.4.2 KEY FINDINGS – MONTH 2

Audit Results for POI Congestion- PMR data-February											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		49	32	79	93	40	12	29	41	30	45
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		67783	81497	466336	56060	36483	8153	11877	22117	12645	191039
Traffic served for all POIs (B)- in erlangs		28930	39642	12113	34226	11672	2443	7442	9876	8283	104379
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-February											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		49	32	79	94	40	12	29	41	30	45
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		67045	27988	447866	56029	36479	8153	10673	22095	12423	191032
Traffic served for all POIs (B)- in erlangs		13318	24810	11621	34204	11527	973	7056	5668	4047	54955
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

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

5.4.4.3 KEY FINDINGS – MONTH 3

Audit Results for POI Congestion- PMR data-March											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		49	31	79	93	40	12	29	40	30	45
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		67590	75060	472583	64548	36684	8153	11877	21967	13406	190631
Traffic served for all POIs (B)- in erlangs		28618	39669	11696	35329	11184	2738	7227	9403	8029	101982
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-March											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		49	31	79	93	40	12	29	40	30	45
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		67339	56608	451596	64133	36304	8153	10673	21033	13125	190564
Traffic served for all POIs (B)- in erlangs		15423	24809	10559	34426	10608	2319	5006	5572	4053	55571
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

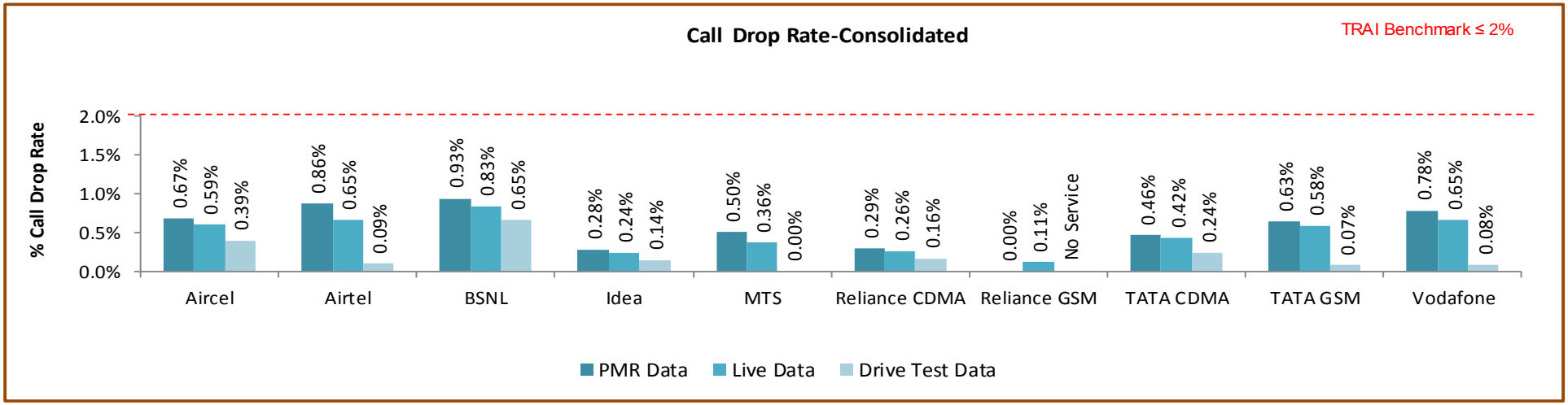
Data Source: Network Operations Center (NOC) of the operators

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.

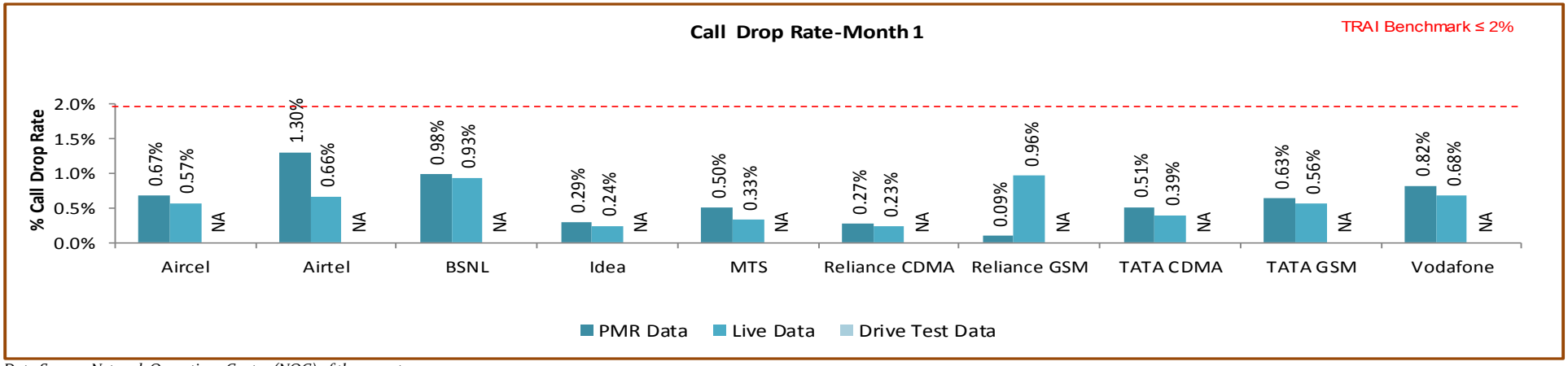
5.5.2 KEY FINDINGS - CONSOLIDATED



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

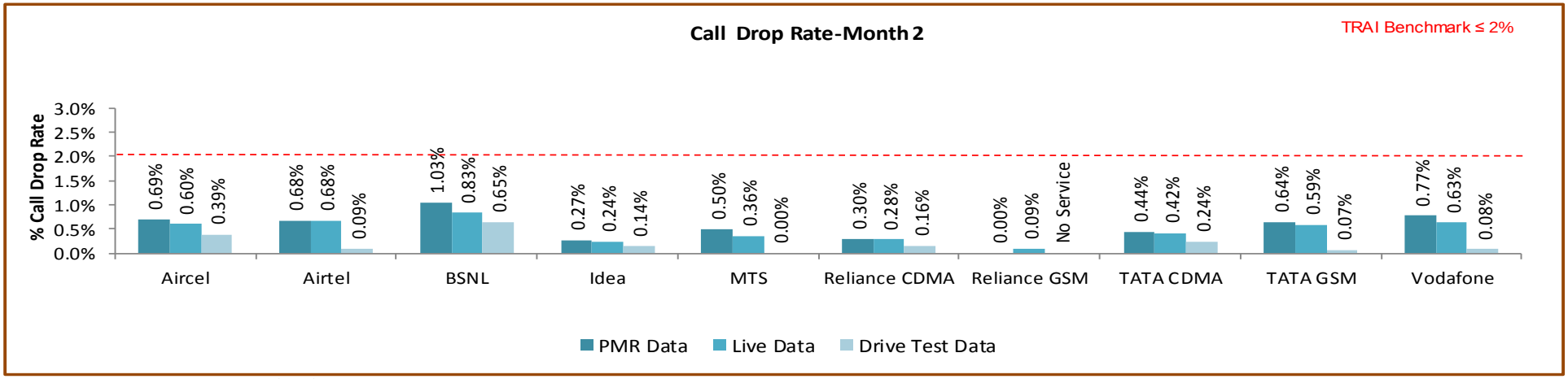
All operators met the benchmark for call drop rate during audit.

5.5.2.1 KEY FINDINGS – MONTH 1



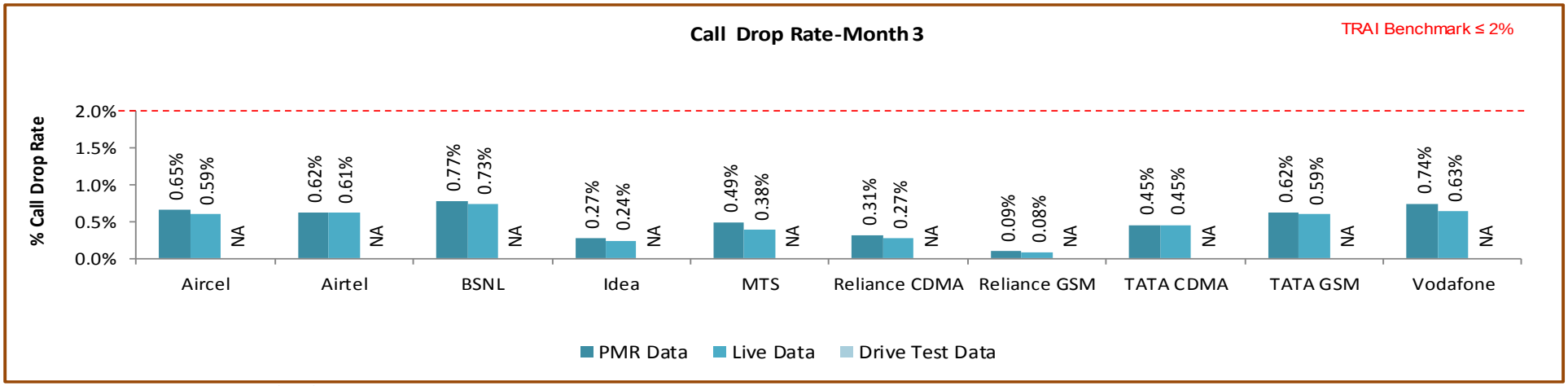
Data Source: Network Operations Center (NOC) of the operators

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 –**

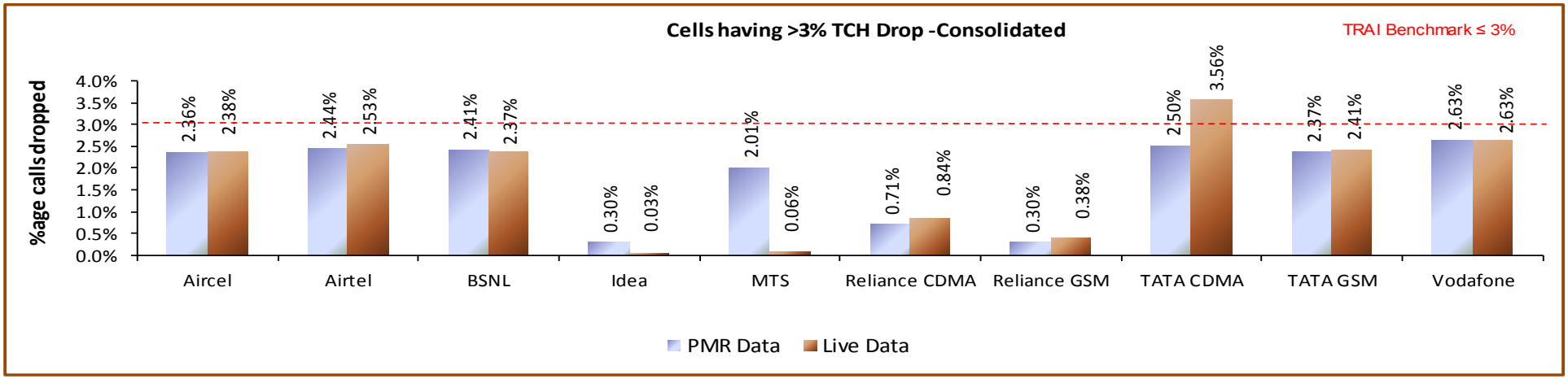
   - Worst affected cells having more than 3% TCH drop rate ≤ 3%

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

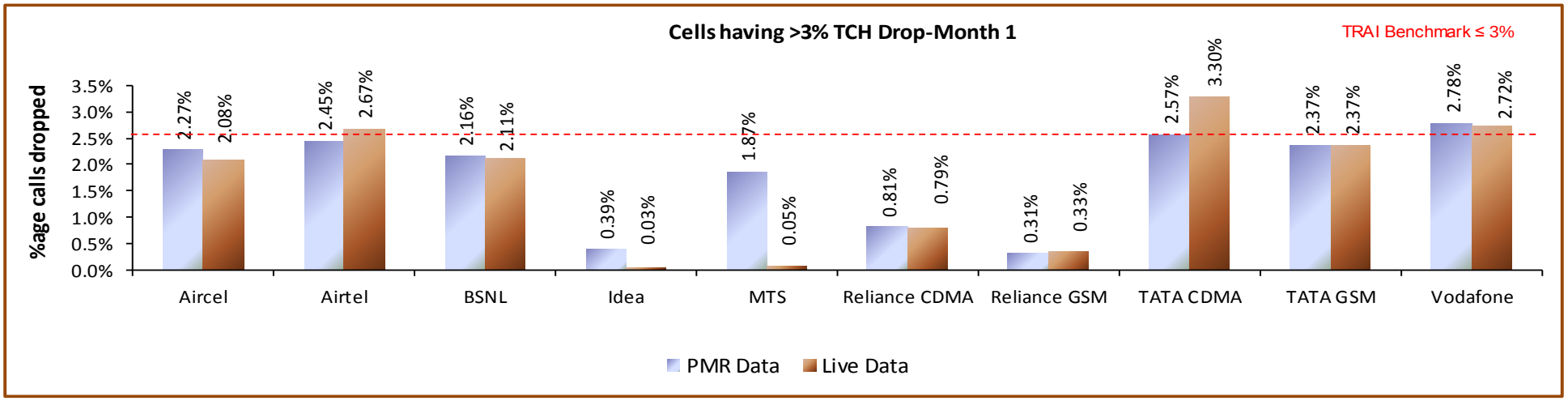


Data Source: Network Operations Center (NOC) of the operators

TATA CDMA failed to meet the benchmark for cell having >3% TCH Drop rate in 3day live.

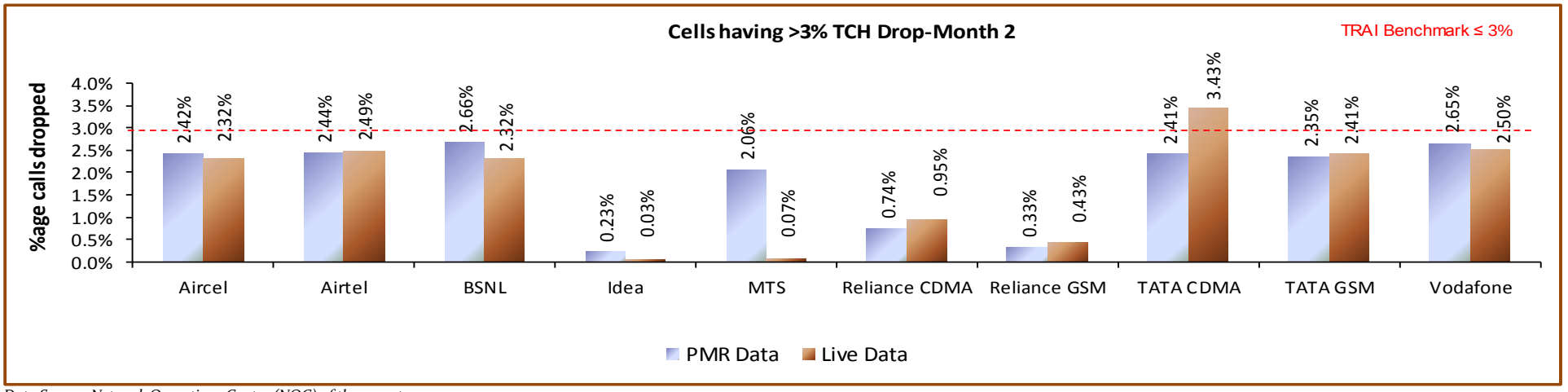
May Significant difference was observed between PMR & live measurement data for MTS, Reliance GSM & CDMA and TATA CDMA. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for 3 days

5.6.2.1 KEY FINDINGS – MONTH 1



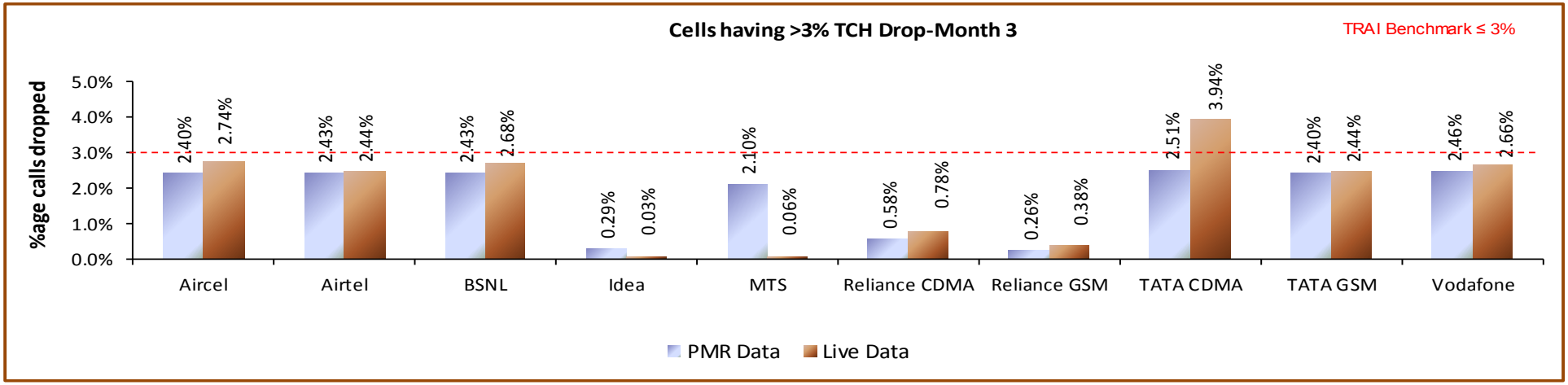
Data Source: Network Operations Center (NOC) of the operators

5.6.2.2 KEY FINDINGS – MONTH 2



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

5.6.2.3 KEY FINDINGS – MONTH 3



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

5.7 VOICE QUALITY

5.7.1 PARAMETER DESCRIPTION

1. **Definition:**

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

2. **Computational Methodology:**

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

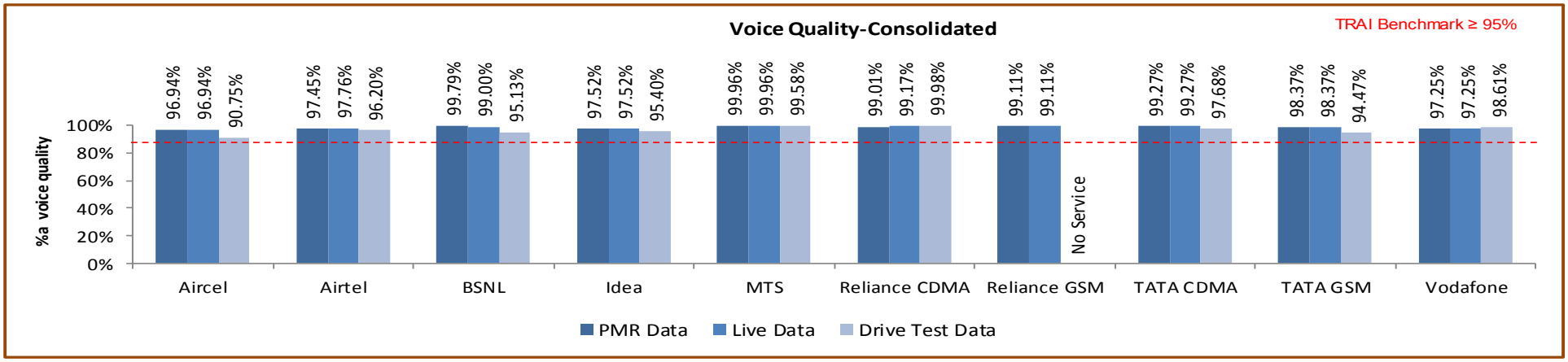
3. **TRAI Benchmark:** ≥ 95%

4. **Audit Procedure –**

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

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

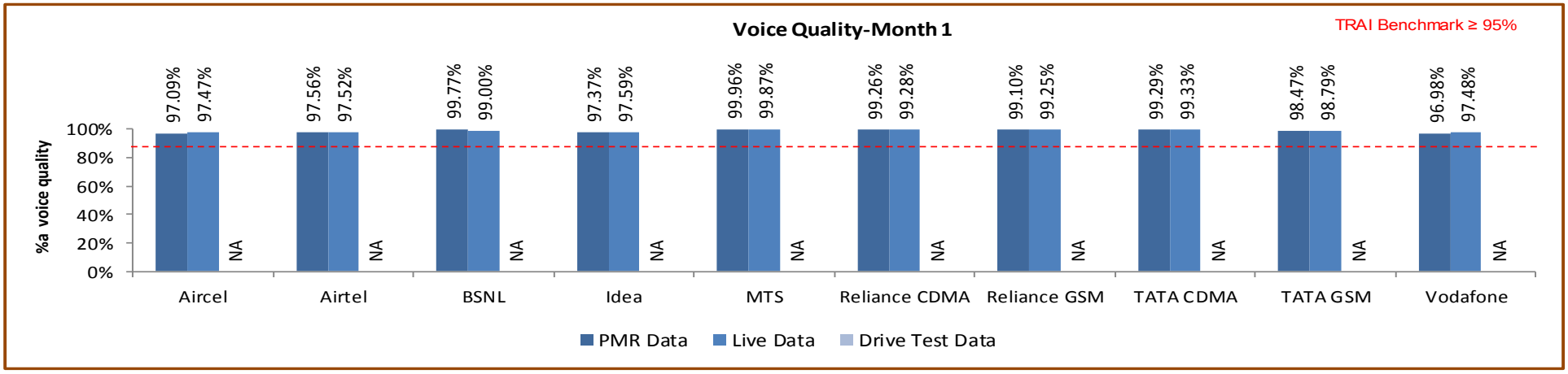
5.7.2 KEY FINDINGS



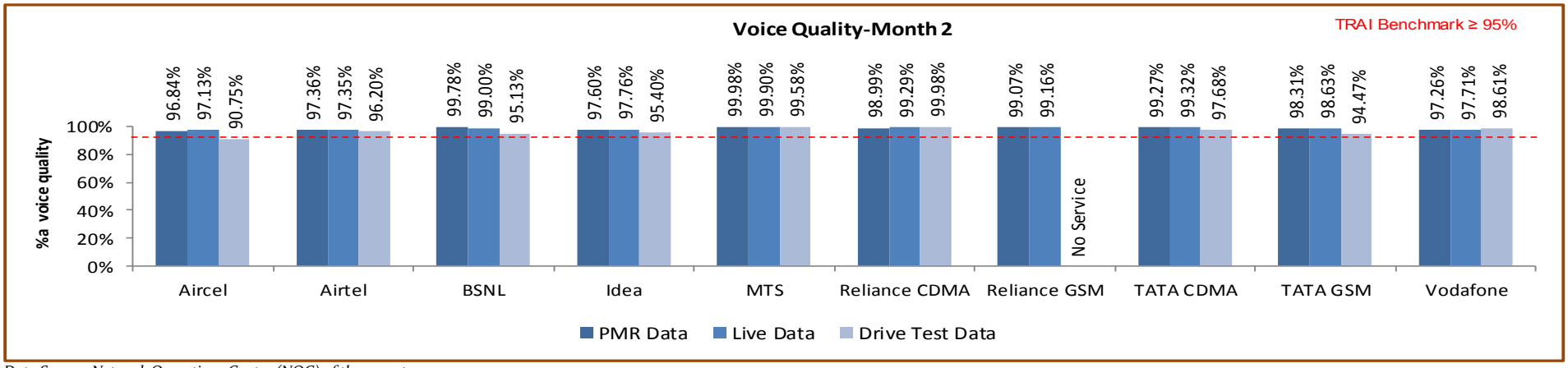
Data Source: Network Operations Center (NOC) of the operators

All operators met the benchmark for Voice quality as per PMR data except Reliance GSM for drive test.

5.7.2.1 KEY FINDINGS – MONTH 1

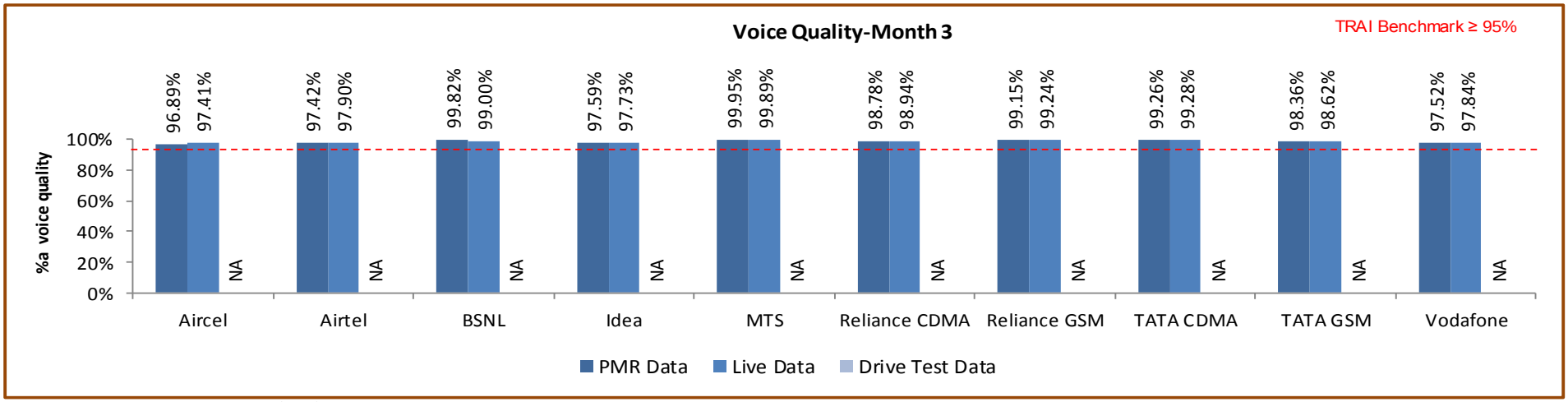


5.7.2.2 KEY FINDINGS – MONTH 2



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 –

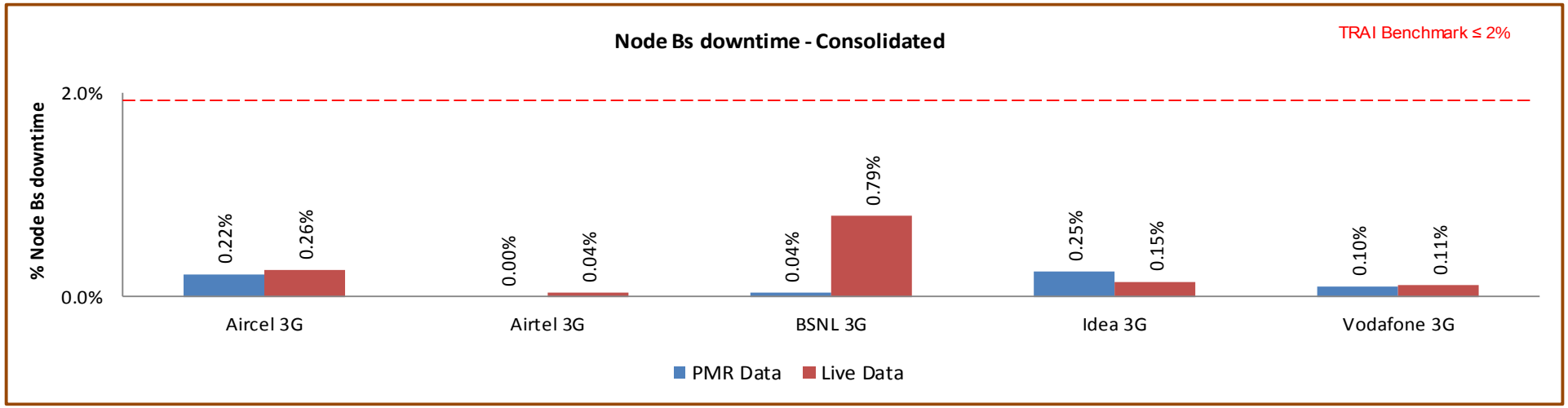
a. Node Bs downtime (not available for service) ≤ 2%

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.

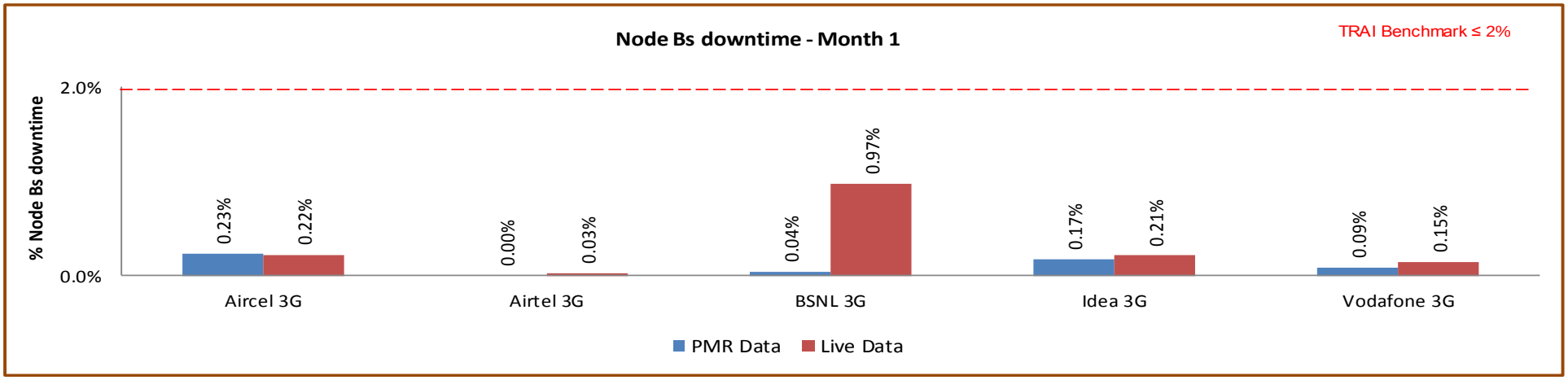
6.1.2 KEY FINDINGS - CONSOLIDATED



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

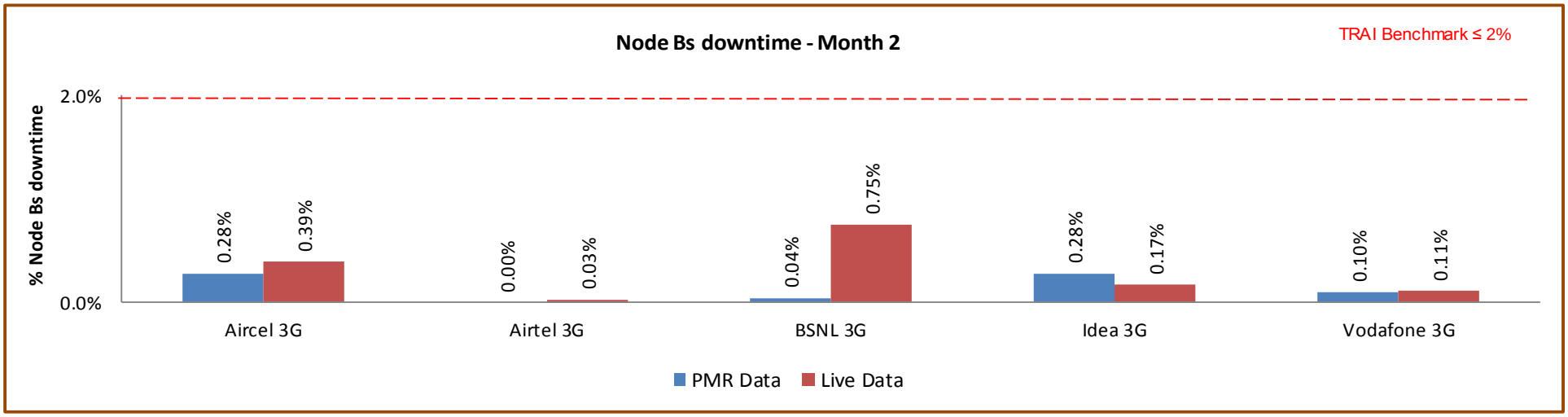
All operators met the benchmark for Node Bs down time in PMR audit data, rest of the operators are meeting the benchmark.

6.1.2.1 KEY FINDINGS – MONTH 1



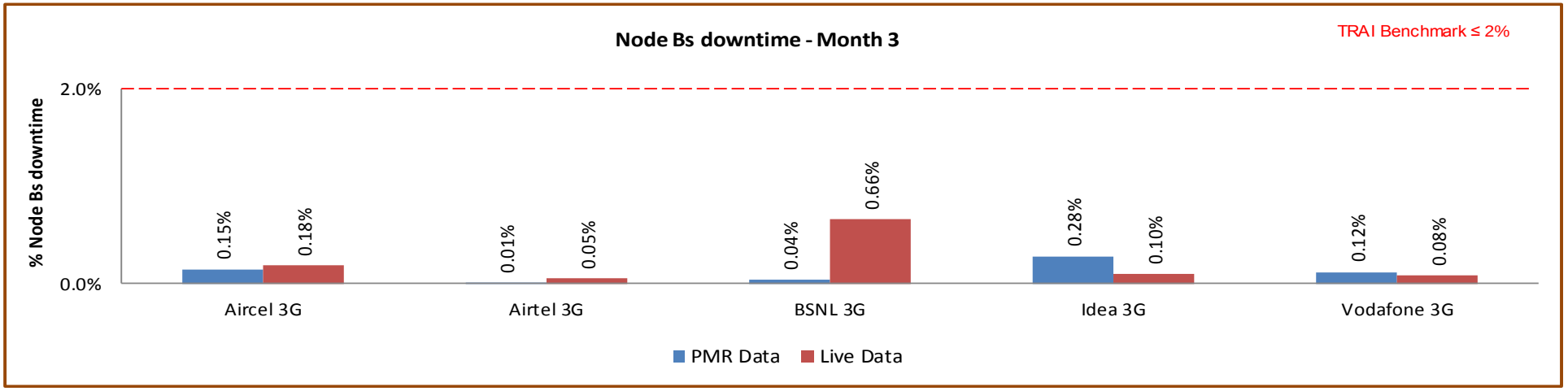
Data Source: Operations and Maintenance Center (OMC) of the operators

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.

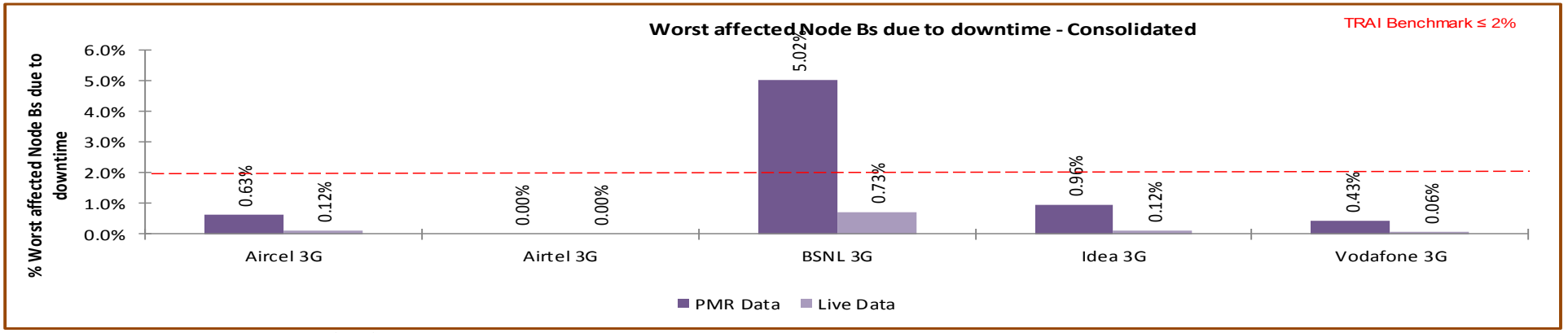
  iii. Data is extracted from system log of the server of the operator. This data is in raw format which is further processed to arrive at the cumulative values.

  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

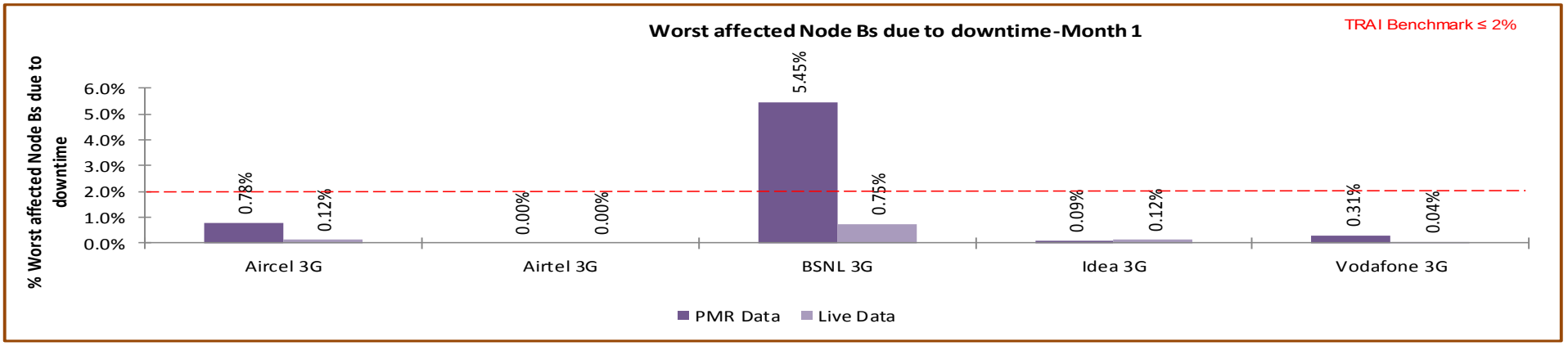


Data Source: Operations and Maintenance Center (OMC) of the operators

All operators met the benchmark for worst affected BTSs due to downtime as per audit/PMR data except BSNL 3G.

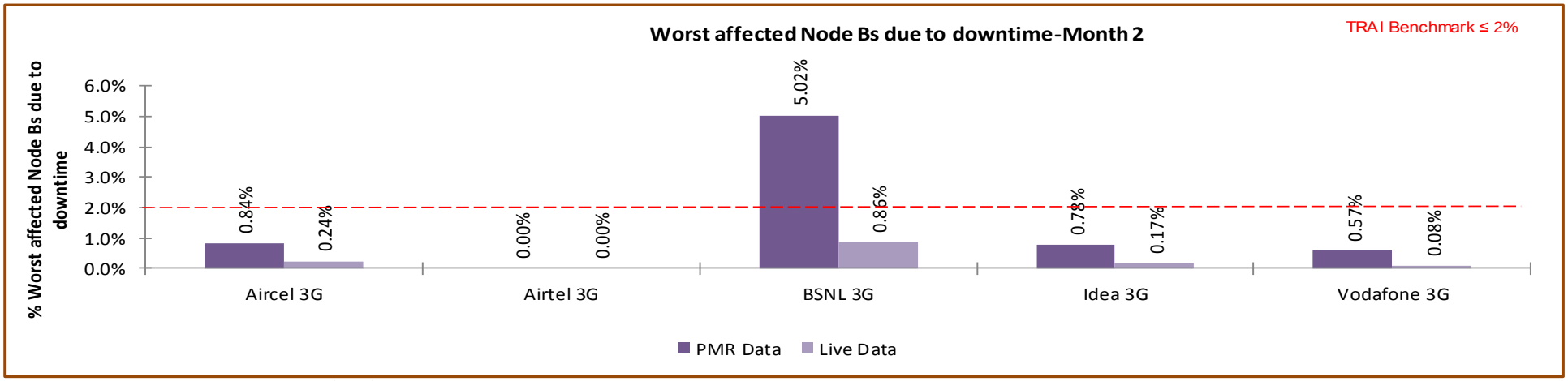
Significant difference was observed between PMR & live measurement data for Aircel, Vodafone, Idea and BSNL. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for three days.

6.2.2.1 KEY FINDINGS – MONTH 1



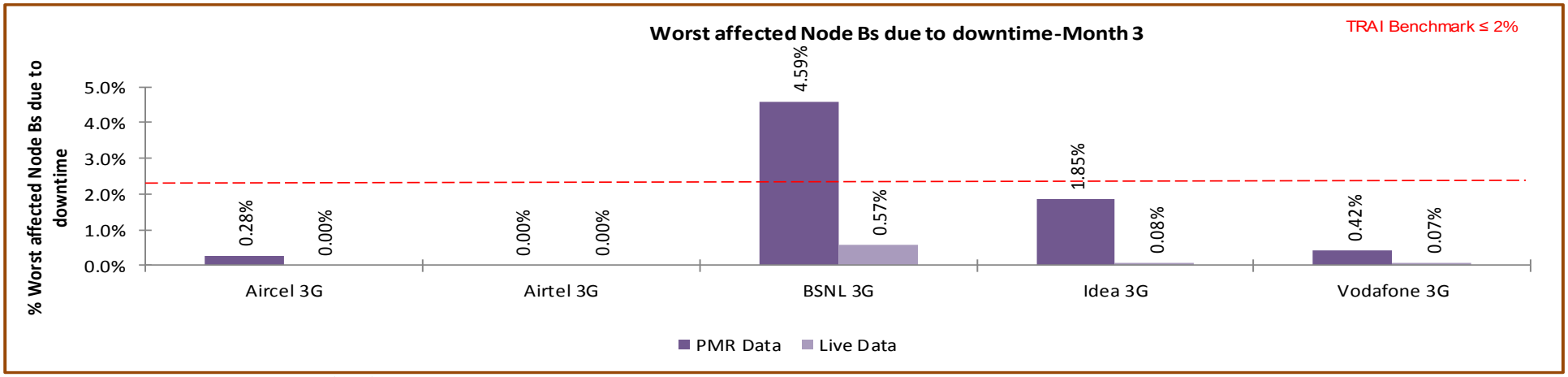
Data Source: Operations and Maintenance Center (OMC) of the operators

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

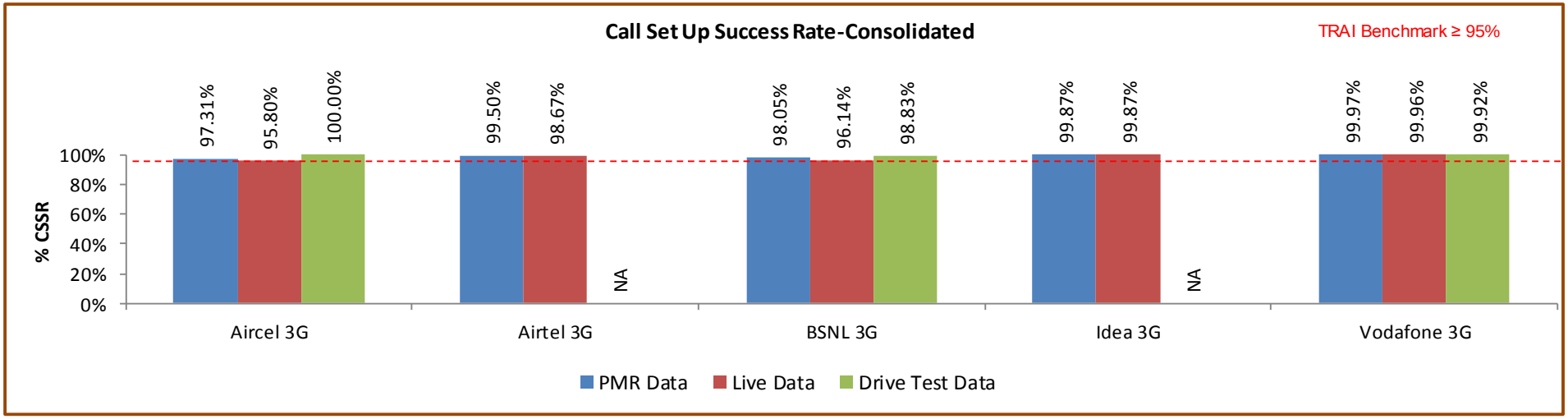
5. **TRAI Benchmark ≥** 95%

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.

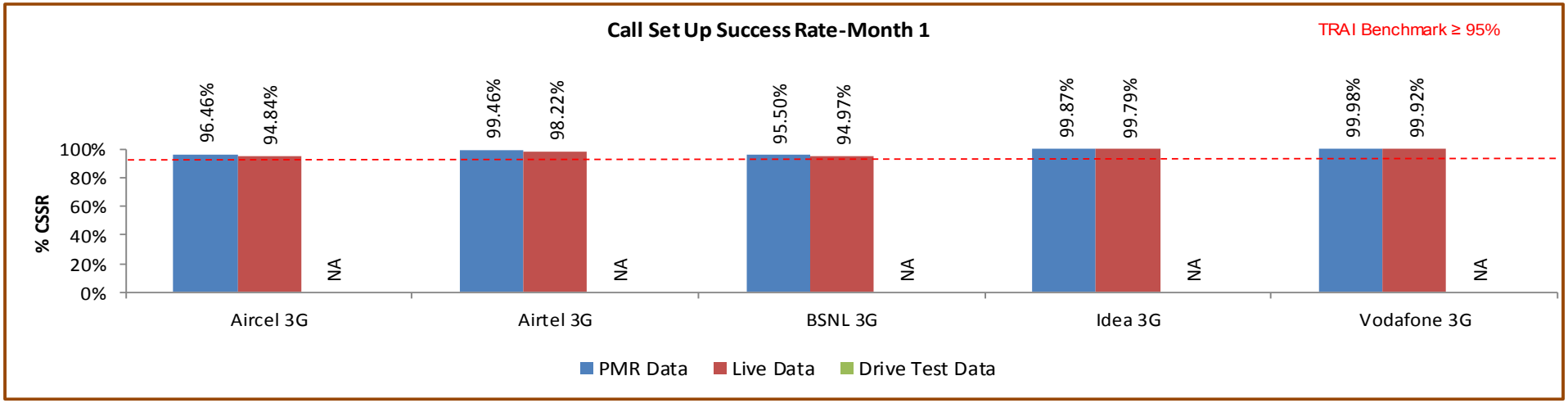
6.3.2 KEY FINDINGS - CONSOLIDATED



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

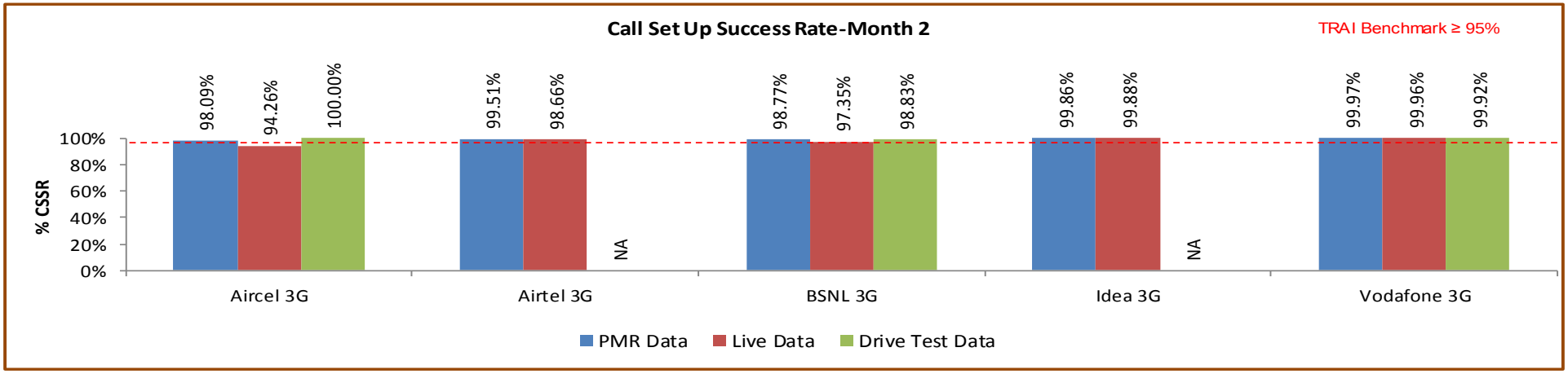
All operators met the TRAI benchmark as per audit/PMR data.

6.3.2.1 KEY FINDINGS – MONTH 1



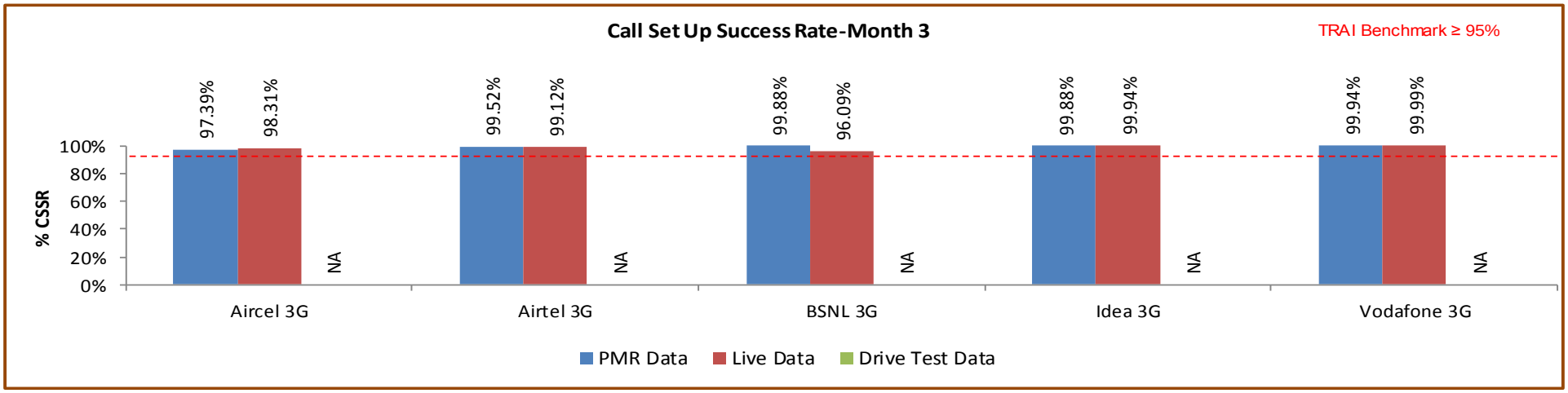
Data Source: Network Operations Center (NOC) of the operators

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

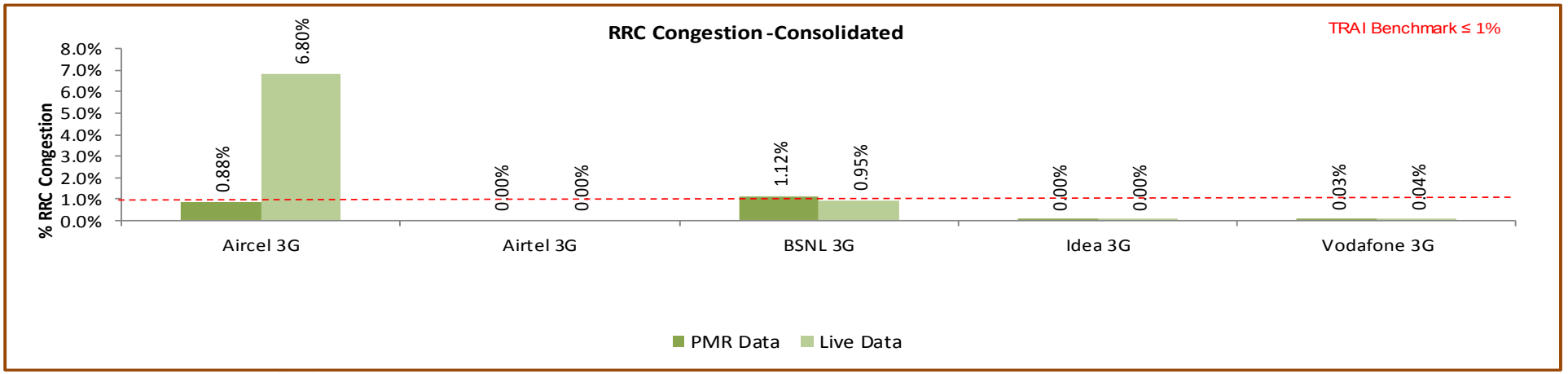
7. Benchmark:

- 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

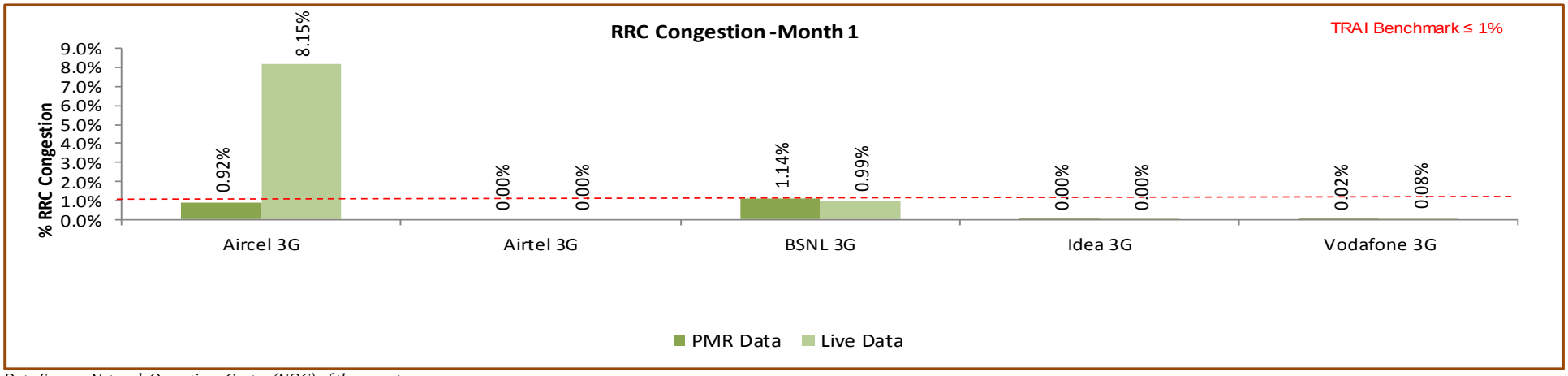
6.4.2 KEY FINDINGS - RRC CONGESTION (CONSOLIDATED)



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

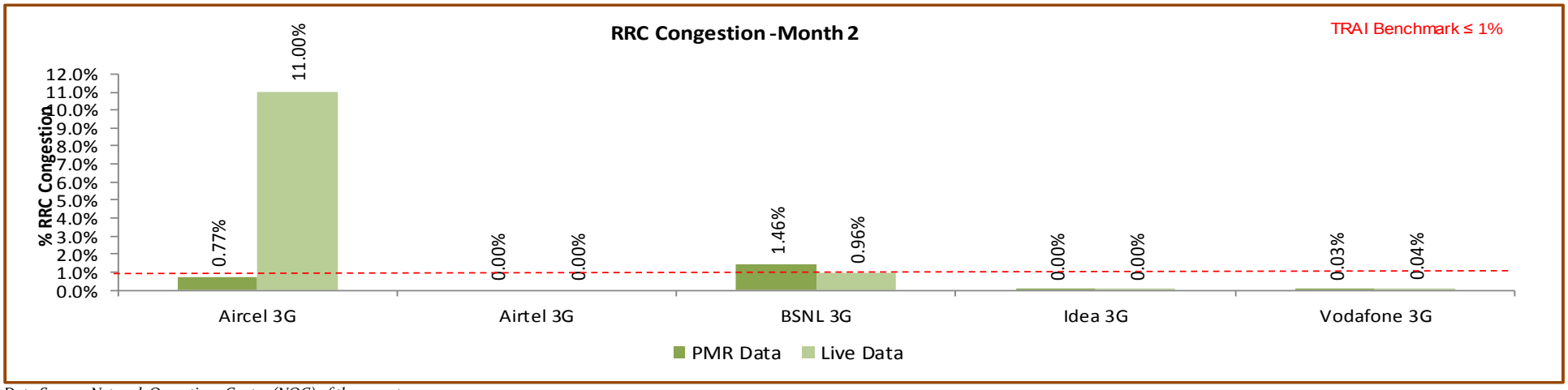
Airtel 3G for 3days live and BSNL 3G for PMR failed to meet the benchmark for RRC Congestion.

6.4.2.1 KEY FINDINGS – MONTH 1



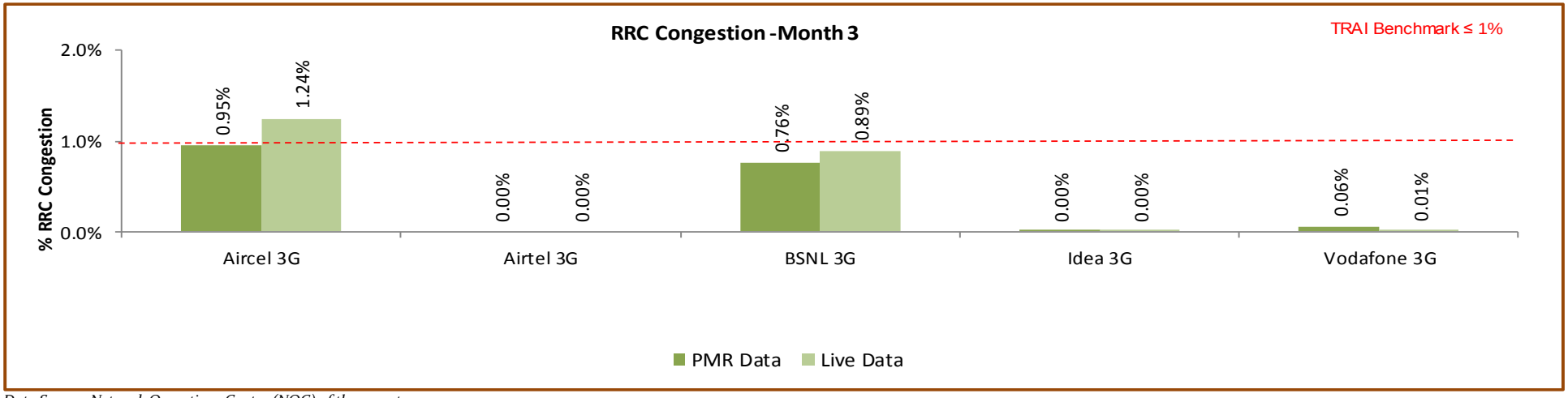
Data Source: Network Operations Center (NOC) of the operators

6.4.2.2 KEY FINDINGS – MONTH 2



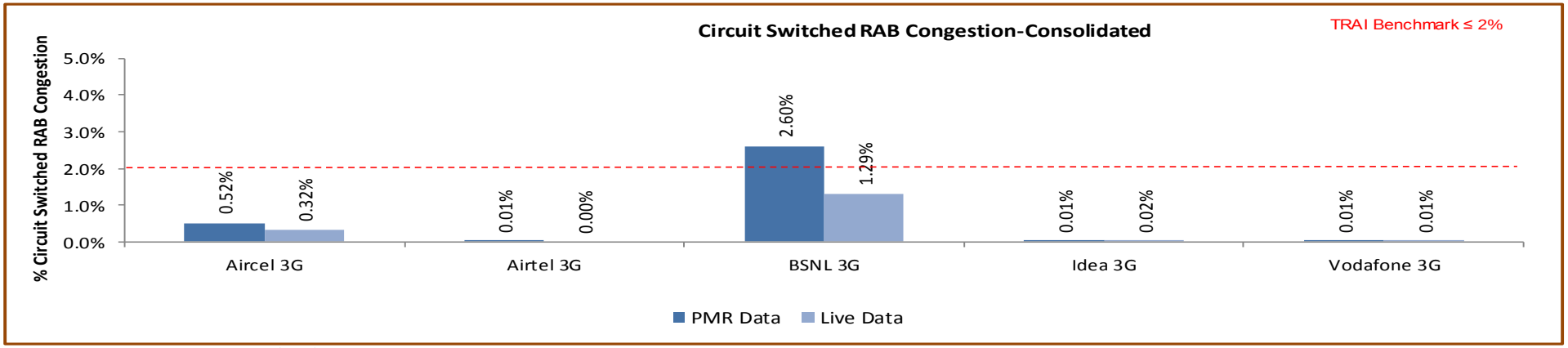
Data Source: Network Operations Center (NOC) of the operators

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)

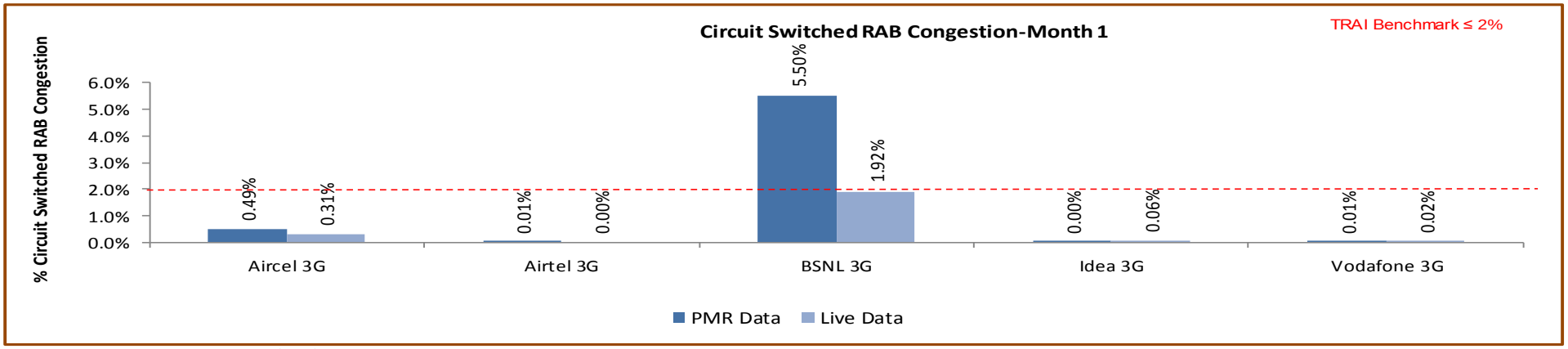


Data Source: Network Operations Center (NOC) of the operators

BSNL failed to meet the benchmark as per audit/PMR & 3days live report.

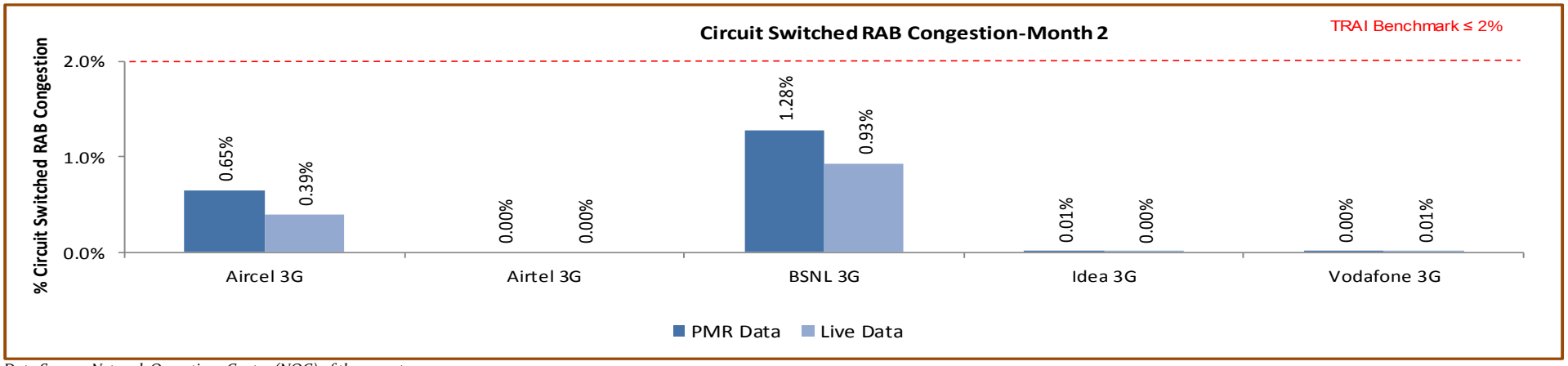
Significant difference was observed between PMR & live measurement data for BSNL. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for three days.

6.4.3.1 KEY FINDINGS – MONTH 1



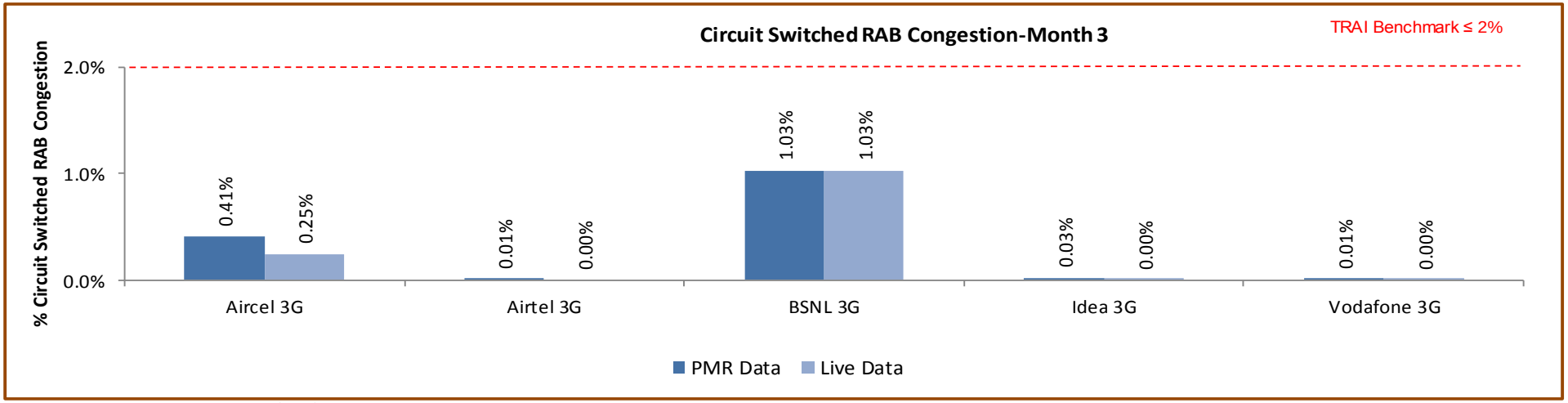
Data Source: Network Operations Center (NOC) of the operators

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

6.5 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

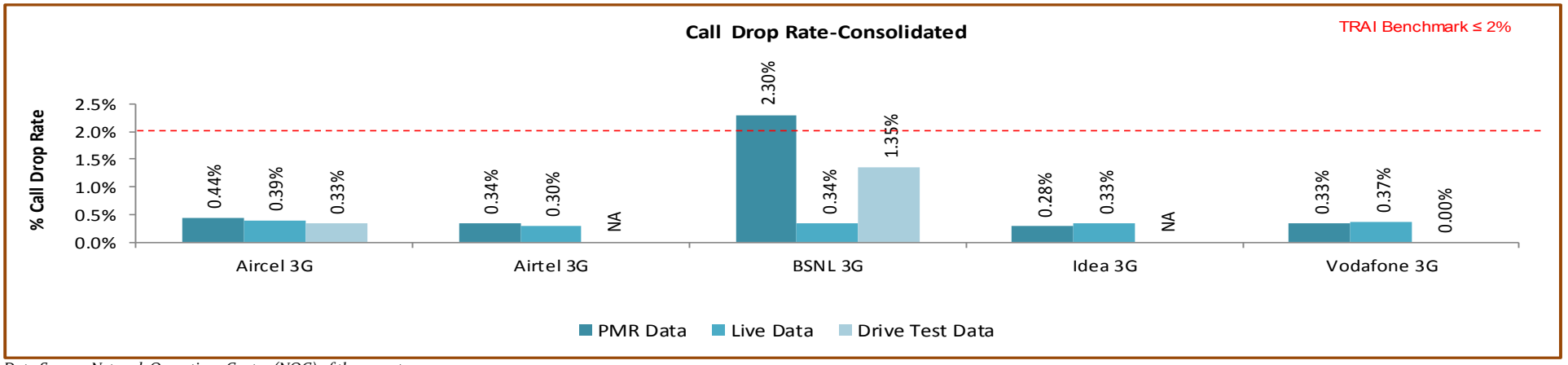
5. **TRAI Benchmark** –

   - 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.

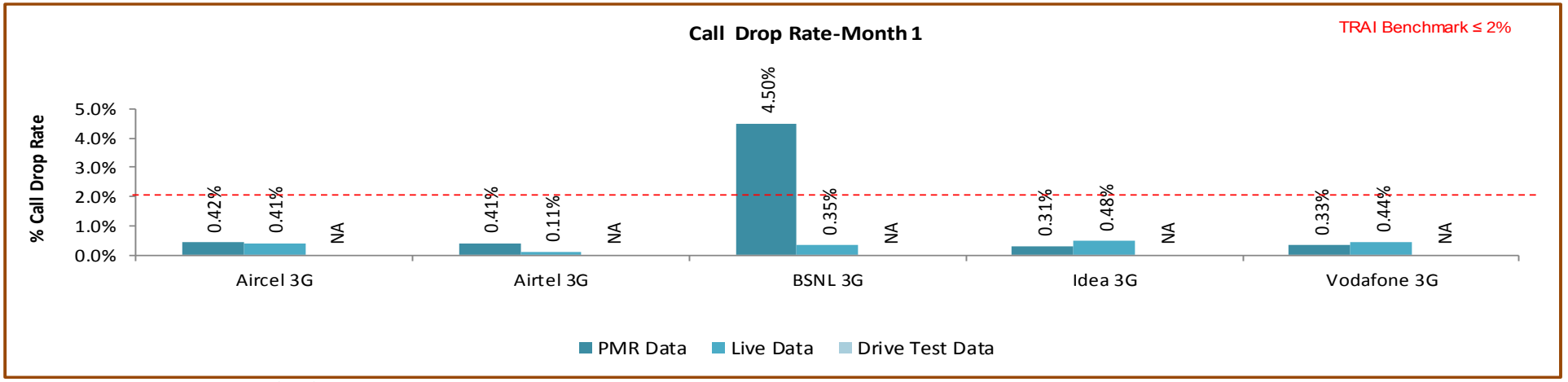
6.5.2 KEY FINDINGS - CONSOLIDATED



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

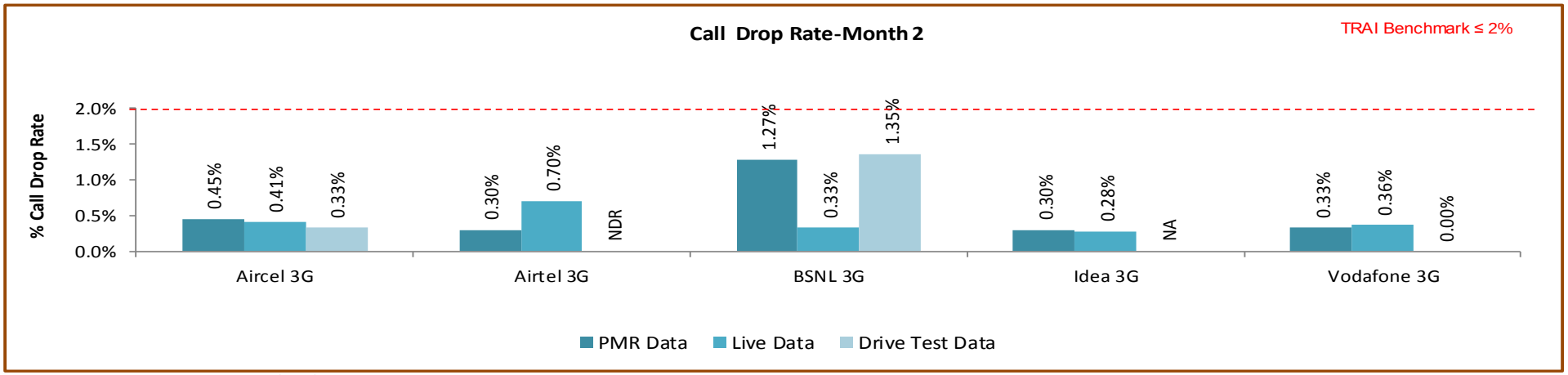
All operators met the benchmark for call drop rate during audit except BSNL.

6.5.2.1 KEY FINDINGS – MONTH 1



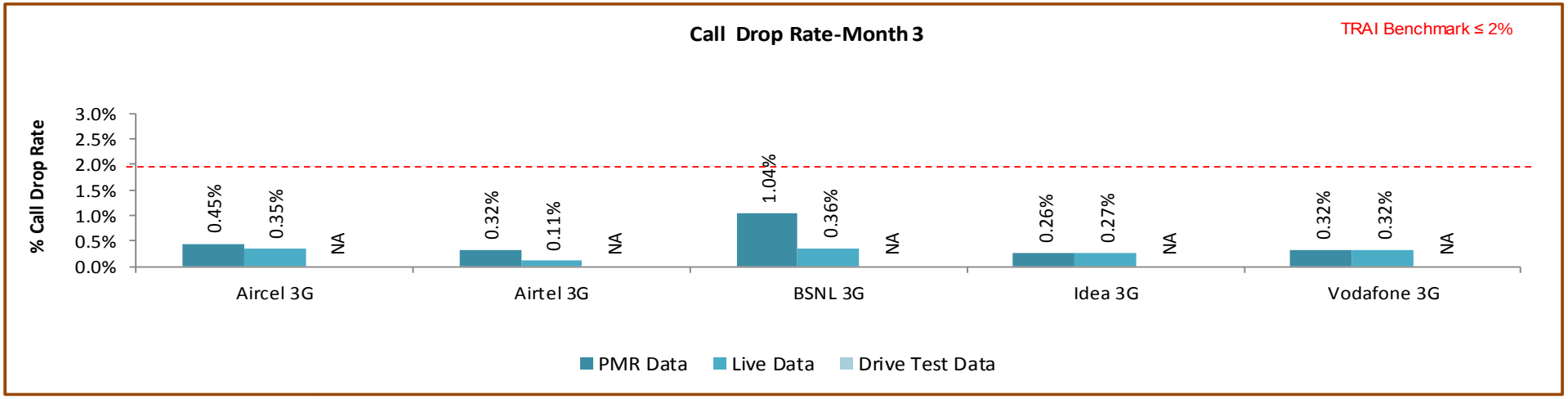
Data Source: Network Operations Center (NOC) of the operators

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** –

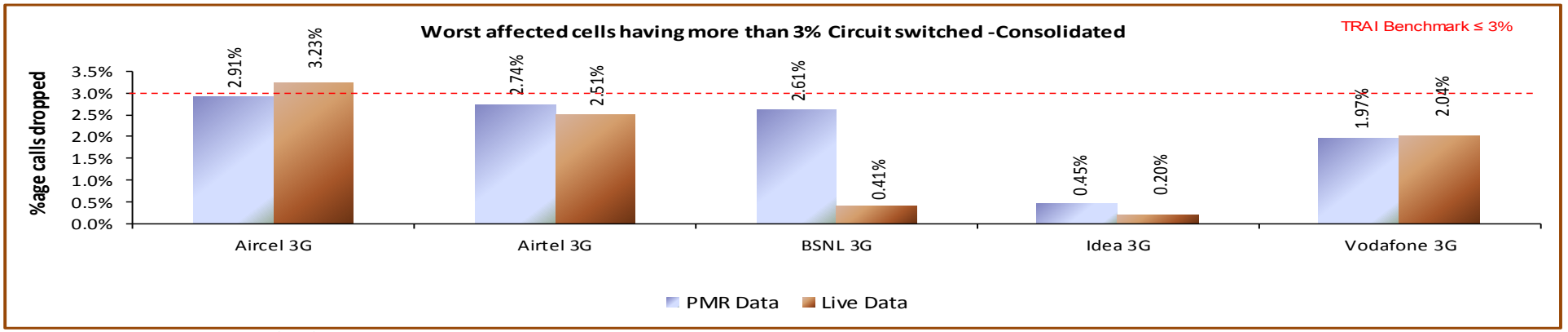
   - Worst affected cells having CSV drop rate > 3% during CBBH in a month ≤ 3%

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

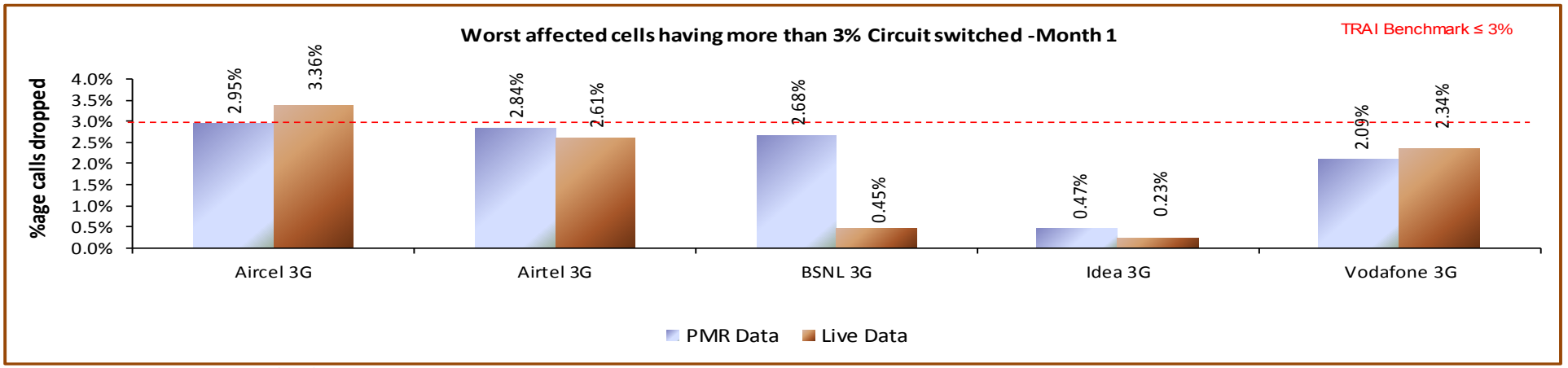


Data Source: Network Operations Center (NOC) of the operators

All operators met the benchmark during audit except Aircel 3G for live calling.

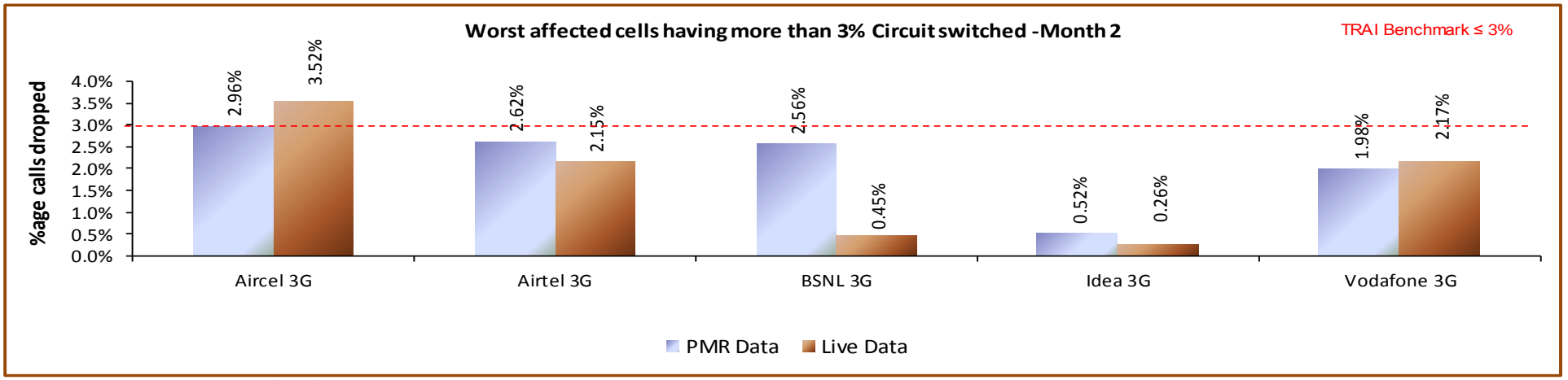
Significant difference was observed between PMR & live measurement data for Aircel, Airtel, Idea and BSNL. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for three days.

6.6.2.1 KEY FINDINGS – MONTH 1



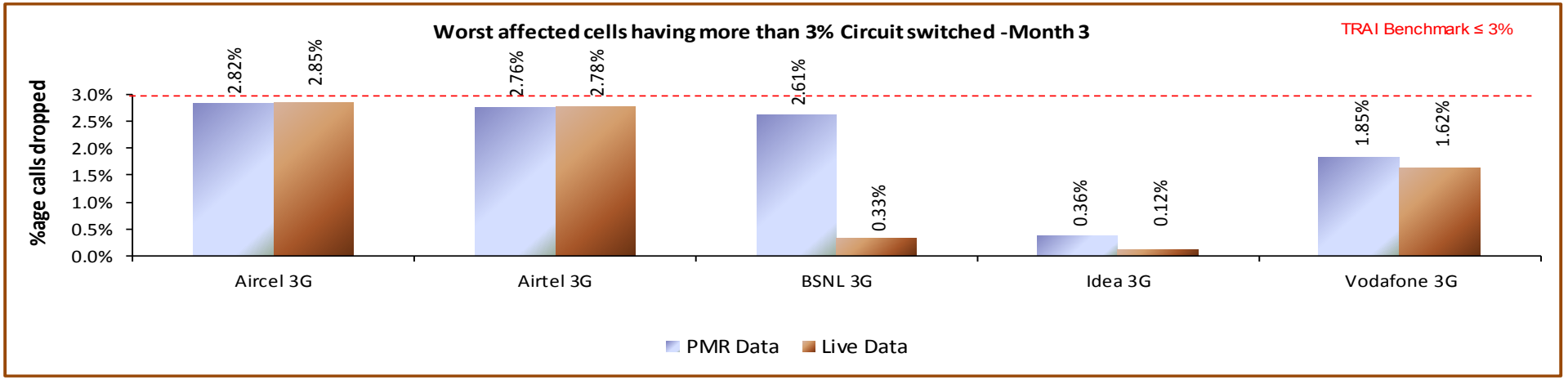
Data Source: Network Operations Center (NOC) of the operators

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**

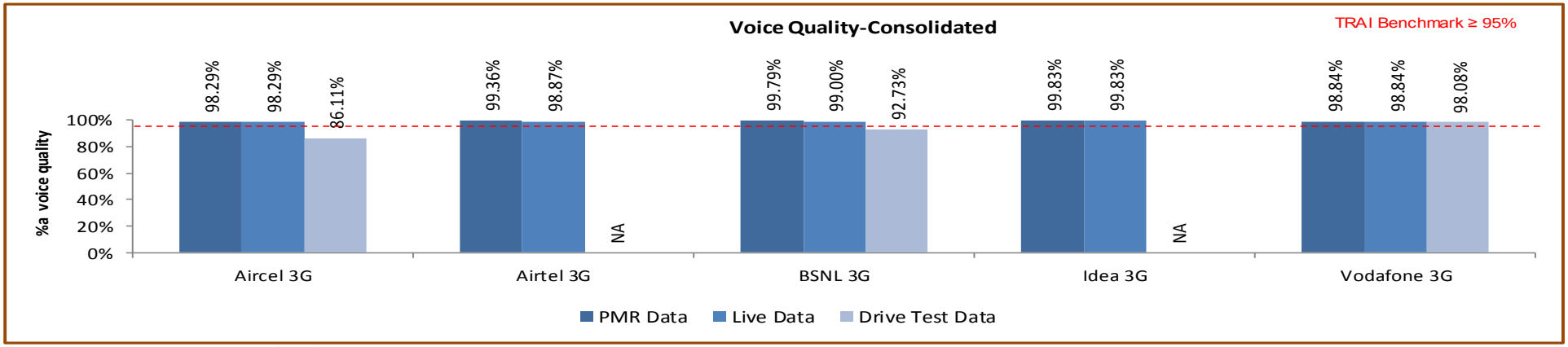
7. **TRAI Benchmark:** ≥ 95%

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

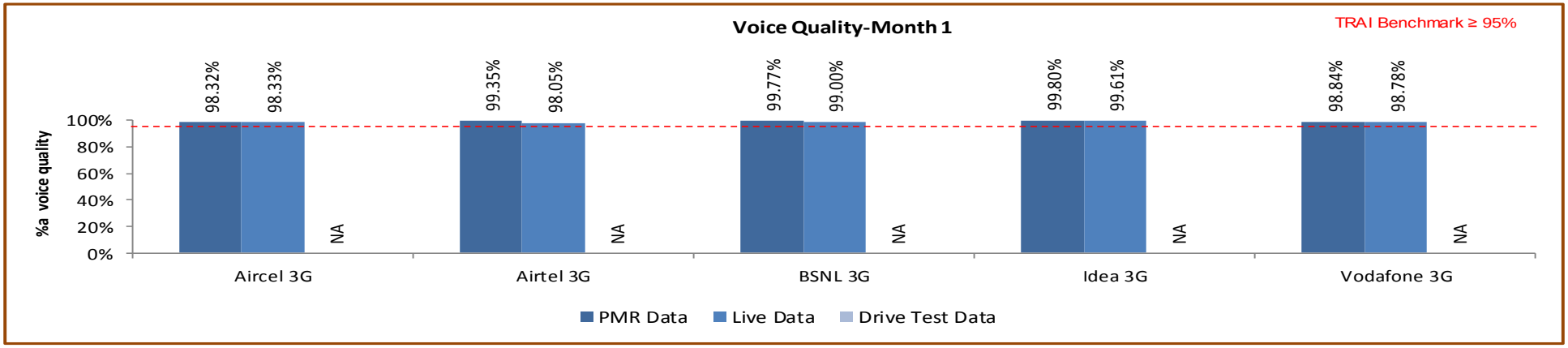


Data Source: Network Operations Center (NOC) of the operators

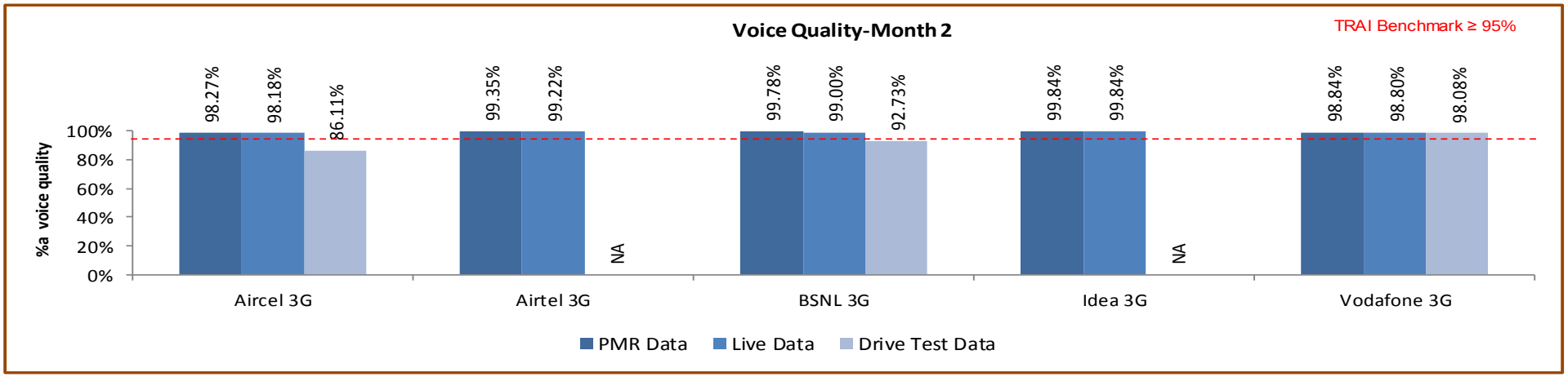
Aircel 3G and BSNL 3G failed to meet the benchmark in drive test.

Significant difference was observed between PMR & drive test 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.

6.7.2.1 KEY FINDINGS – MONTH 1

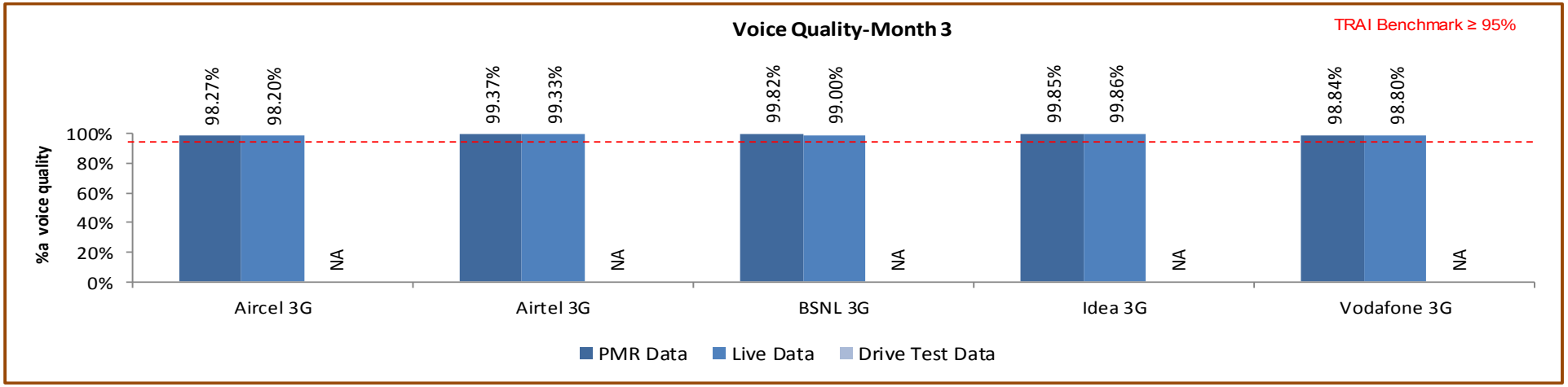


6.7.2.2 KEY FINDINGS – MONTH 2



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

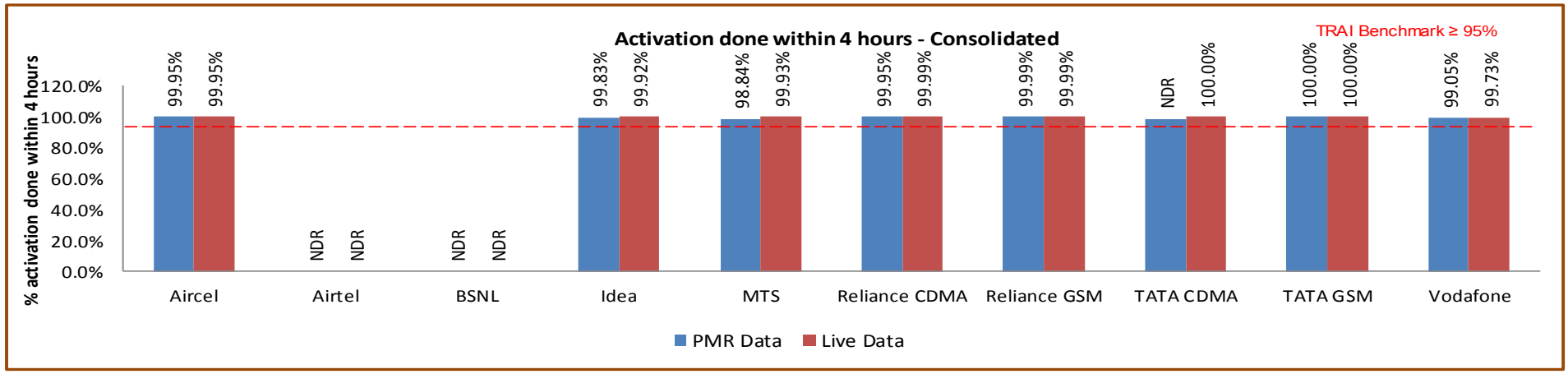
7 PARAMETER DESCRIPTION & DETAILED FINDINGS - WIRELESS DATA SERVICES 2G

7.1 SERVICE ACTIVATION /PROVISIONING FOR 2G

7.1.1 PARAMETER DESCRIPTION

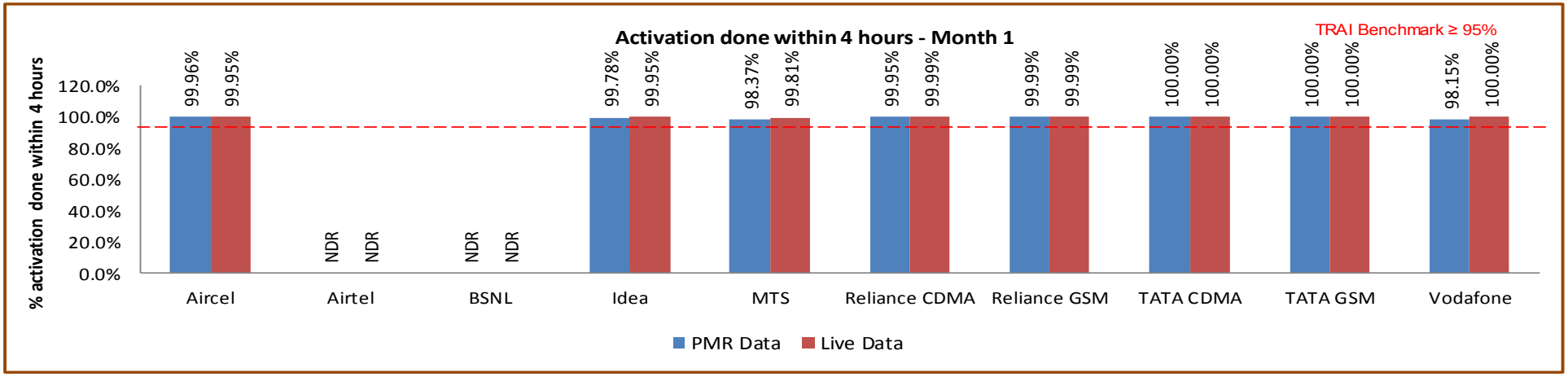
This refers to the activation of services after activation of the SIM. This involves programming the various databases with the customer's information and any gateways to standard Internet chat or mail services or any data services. The service provider typically sends these settings to the subscriber's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

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

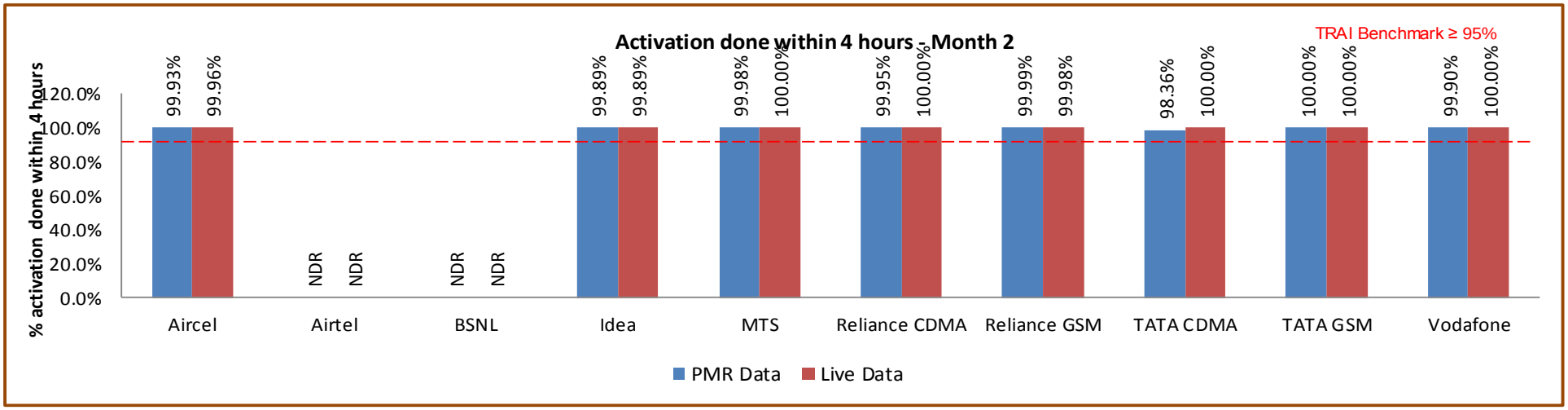


All operators met the benchmark for PMR as well as live audit.

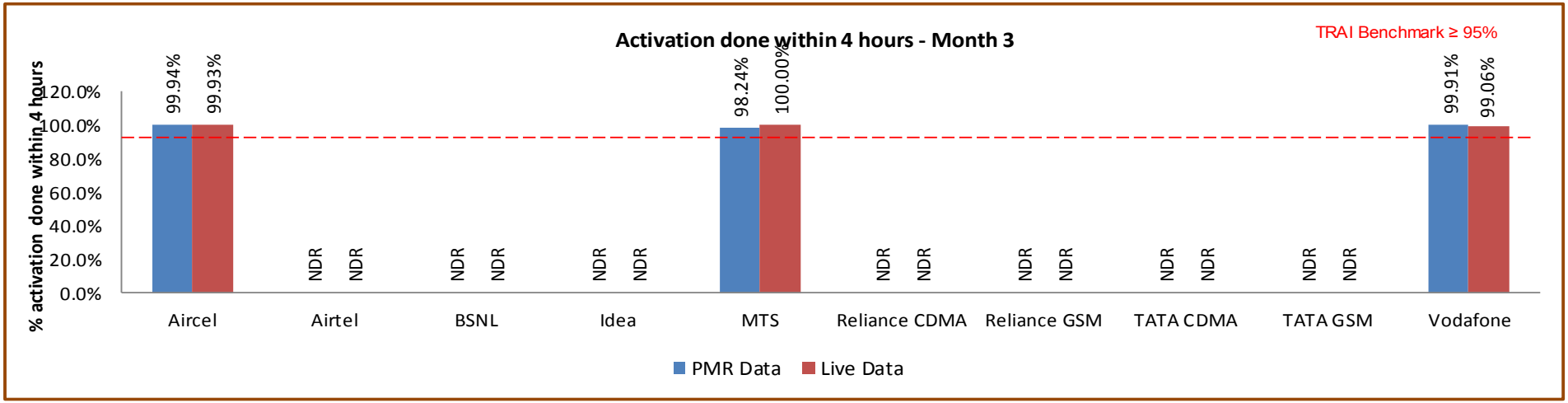
7.1.1.1 KEY FINDINGS – MONTH 1



7.1.1.2 KEY FINDINGS – MONTH 2



7.1.1.3 KEY FINDINGS – MONTH 3



7.2 PDP CONTEXT ACTIVATION SUCCESS RATE FOR 2G

7.2.1 PARAMETER DESCRIPTION

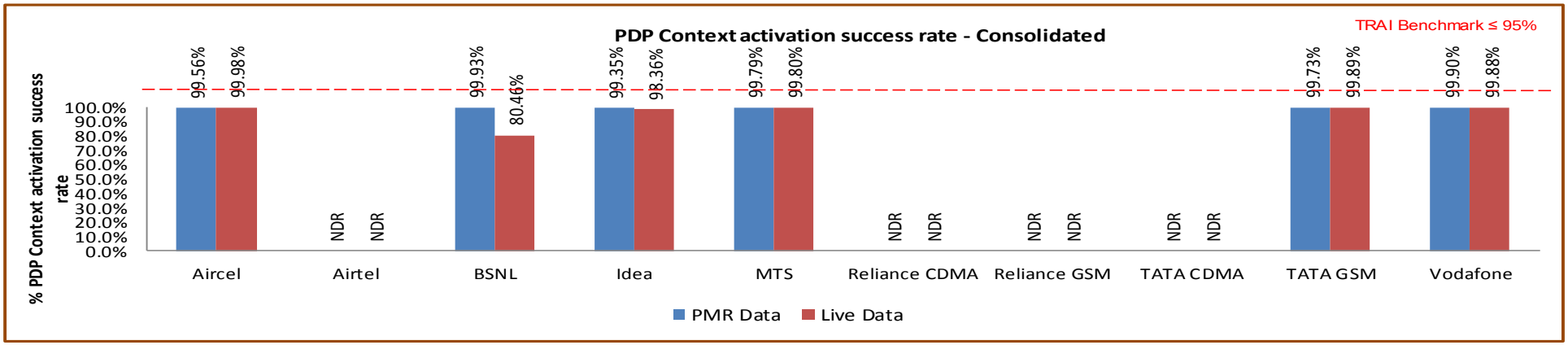
A Packet Data Protocol (PDP) context specifies access to an external packet-switching network. The data associated with the PDP context contains information such as the type of packet-switching network, the Mobile Station PDP (MS PDP) address that is the IP address, the reference of Gateway GPRS Support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

Measurement

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

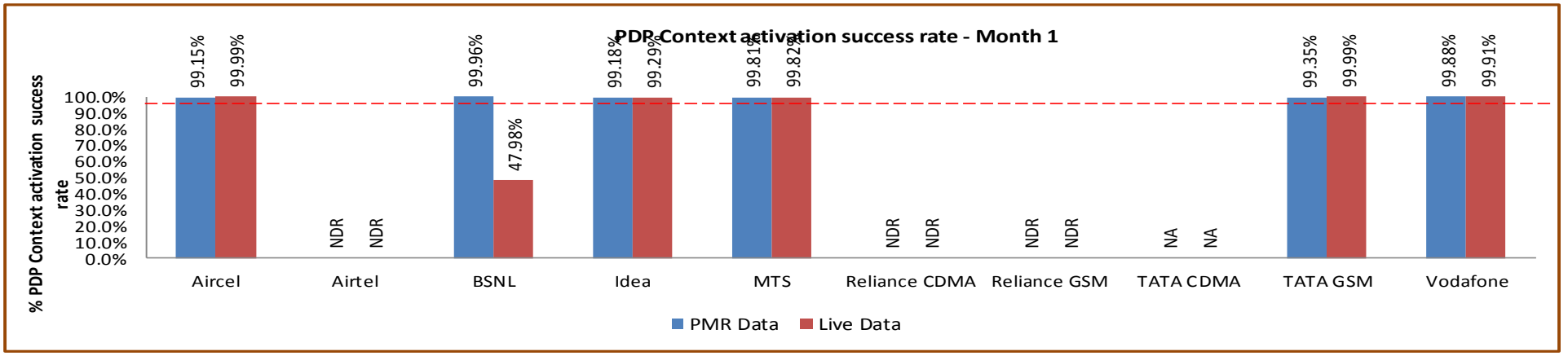
$$\textbf{PDP Context Activation Success Rate (\%)} = \frac{\text{Number of successfully completed PDP context activations}}{\text{Total attempts of context activation}} \times 100$$

7.2.2 KEY FINDINGS

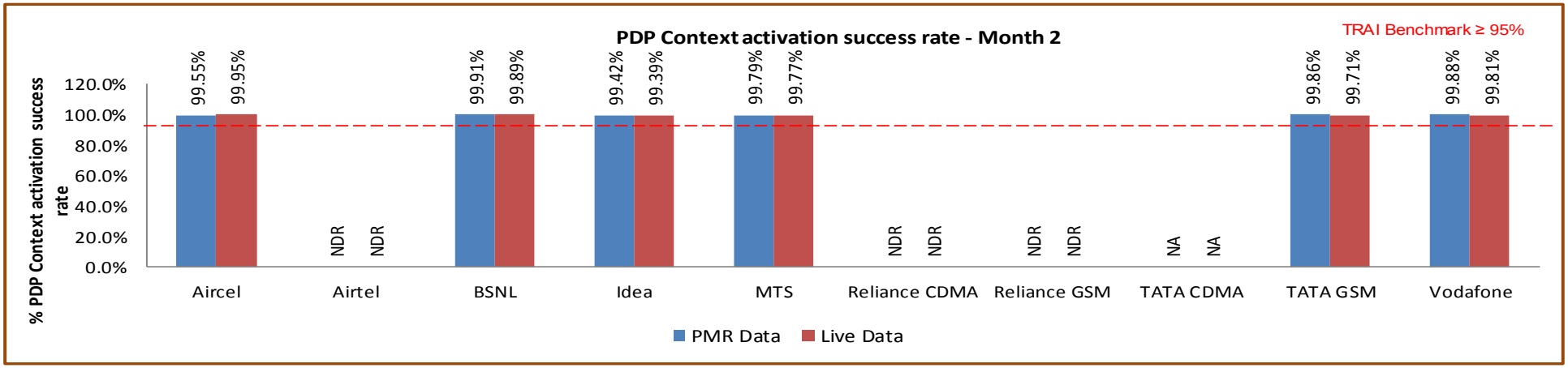


All operators met the benchmark for PMR as well as live audit

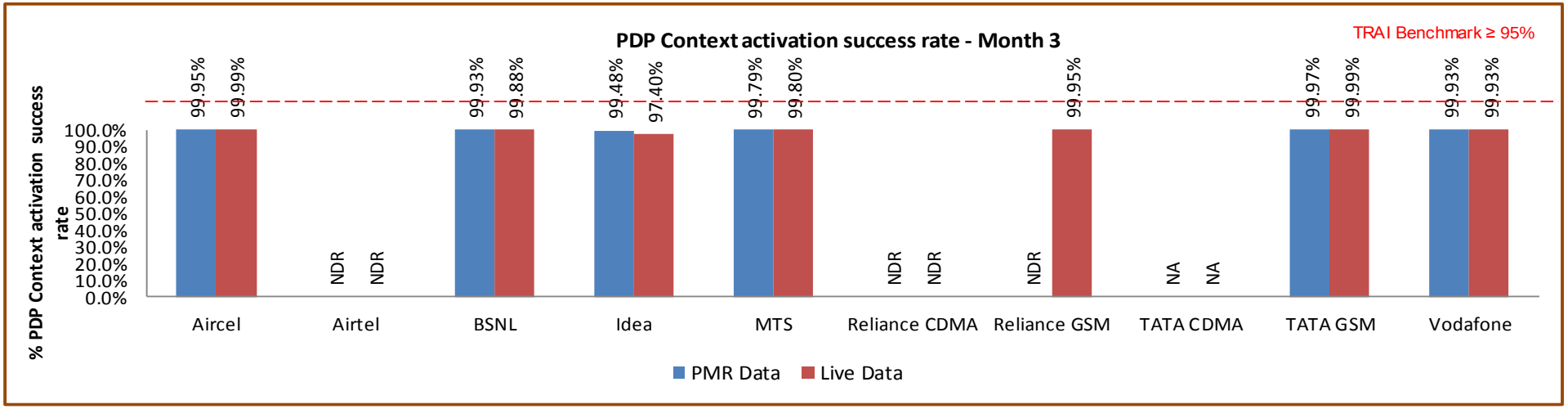
7.2.2.1 KEY FINDINGS – MONTH 1



7.2.2.2 KEY FINDINGS – MONTH 2



7.2.2.3 KEY FINDINGS – MONTH 3



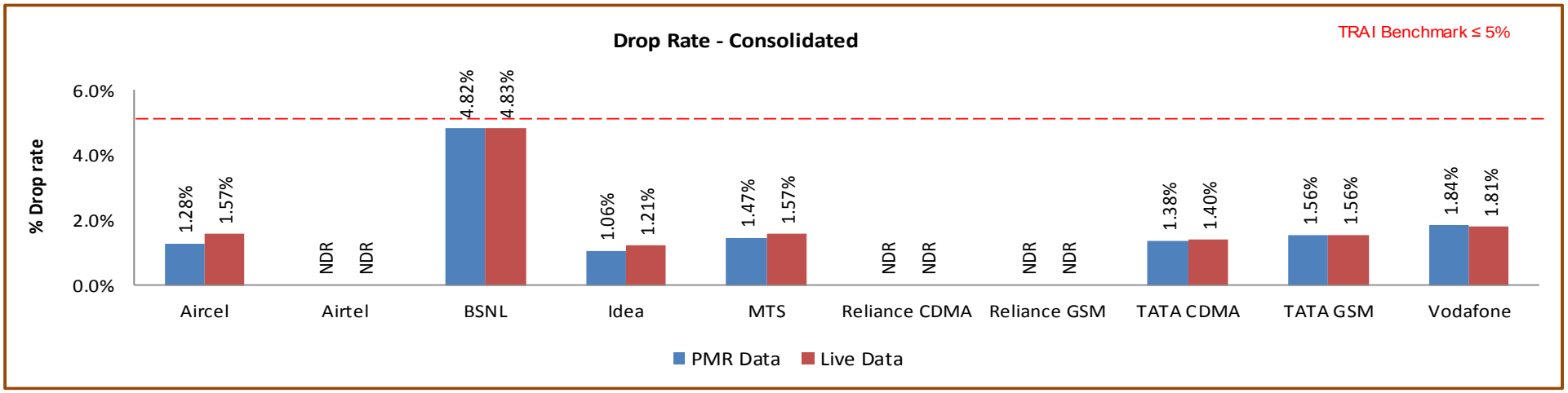
7.3 DROP RATE FOR 2G

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.

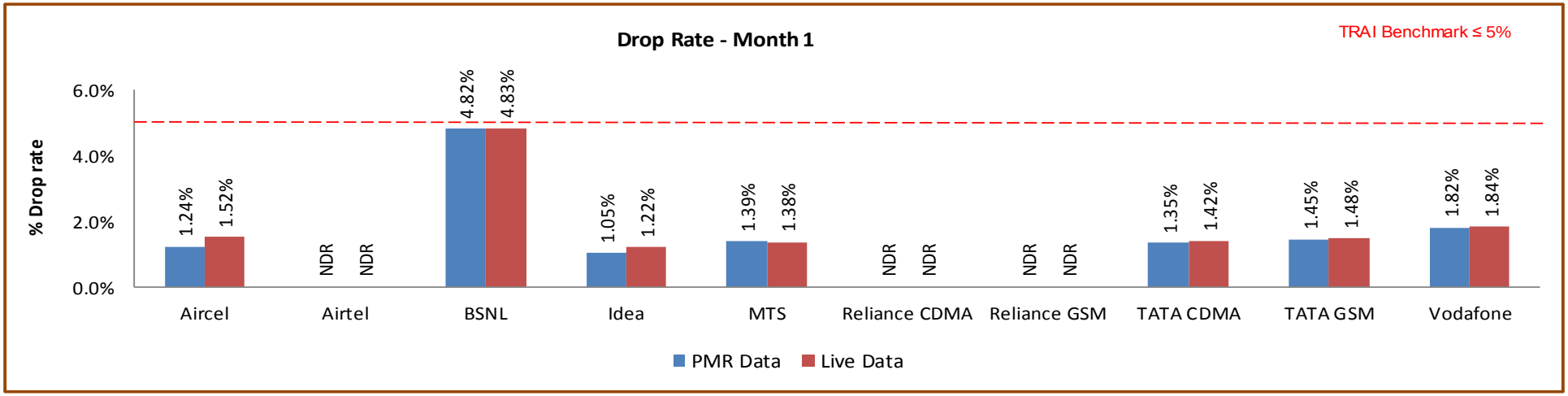
$$\textbf{Drop rate} = \frac{\text{No. of Dropped data Calls}}{\text{No. of Successful data calls}} \times 100$$

7.3.2 KEY FINDINGS

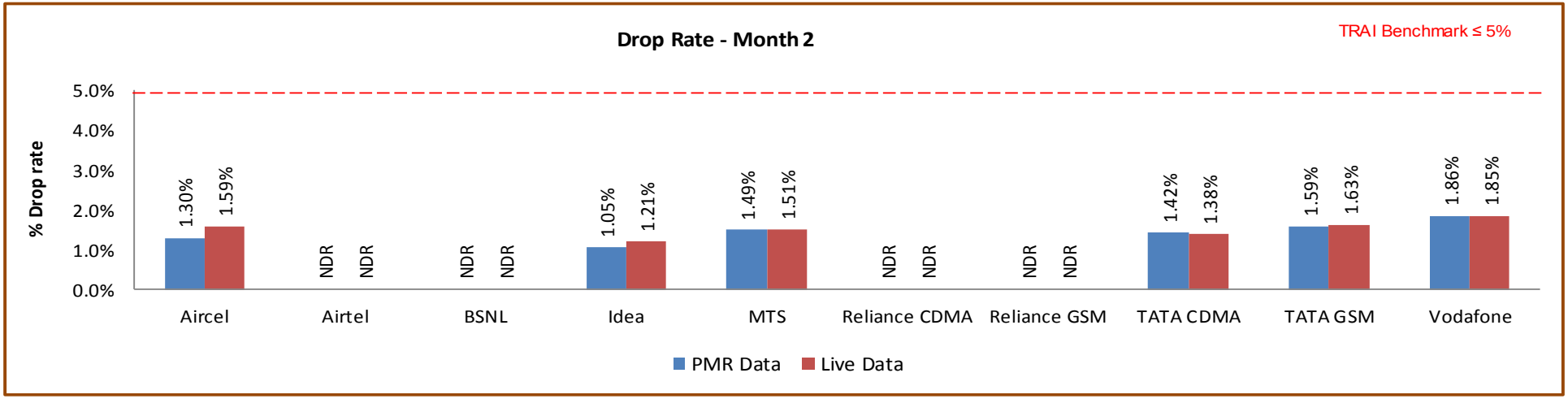


All operators met the benchmark for PMR as well as live audit.

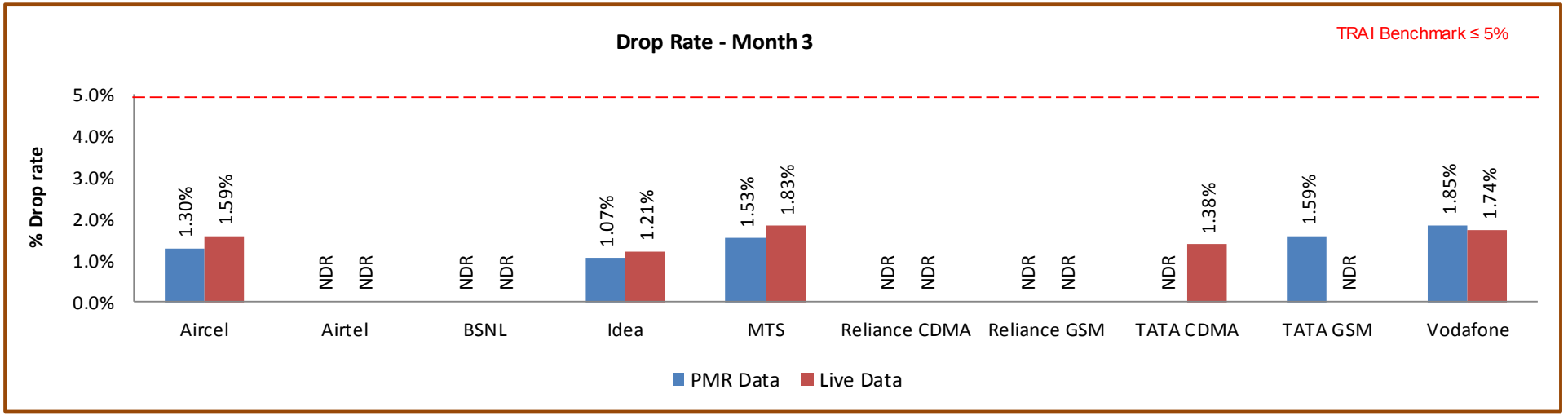
7.3.2.1 KEY FINDINGS – MONTH 1



7.3.2.2 KEY FINDINGS – MONTH 2



7.3.2.3 KEY FINDINGS – MONTH 3



8 PARAMETER DESCRIPTION & DETAILED FINDINGS - WIRELESS DATA SERVICES 3G

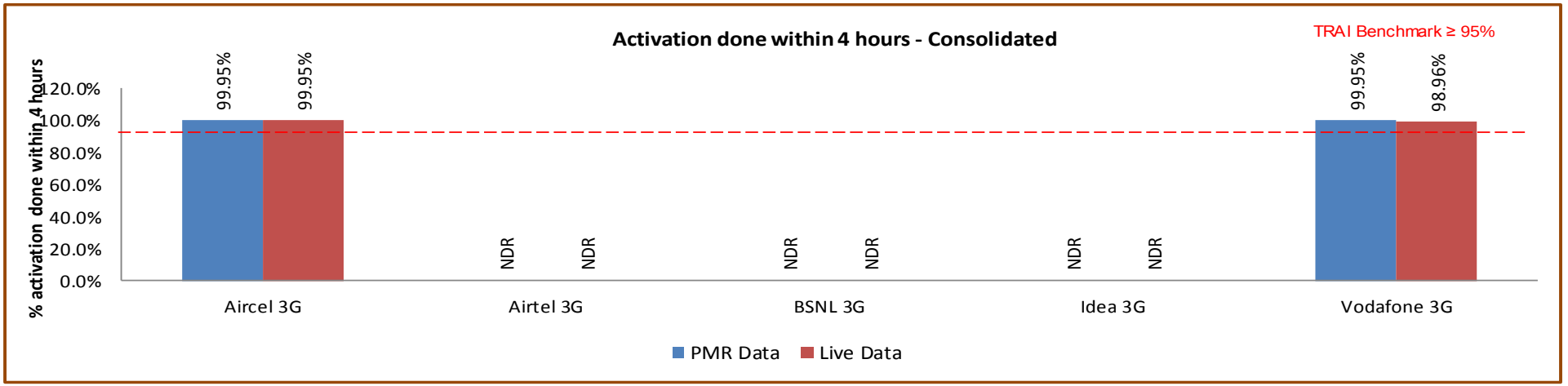
8.1 SERVICE ACTIVATION /PROVISIONING FOR 3G

8.1.1 PARAMETER DESCRIPTION

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

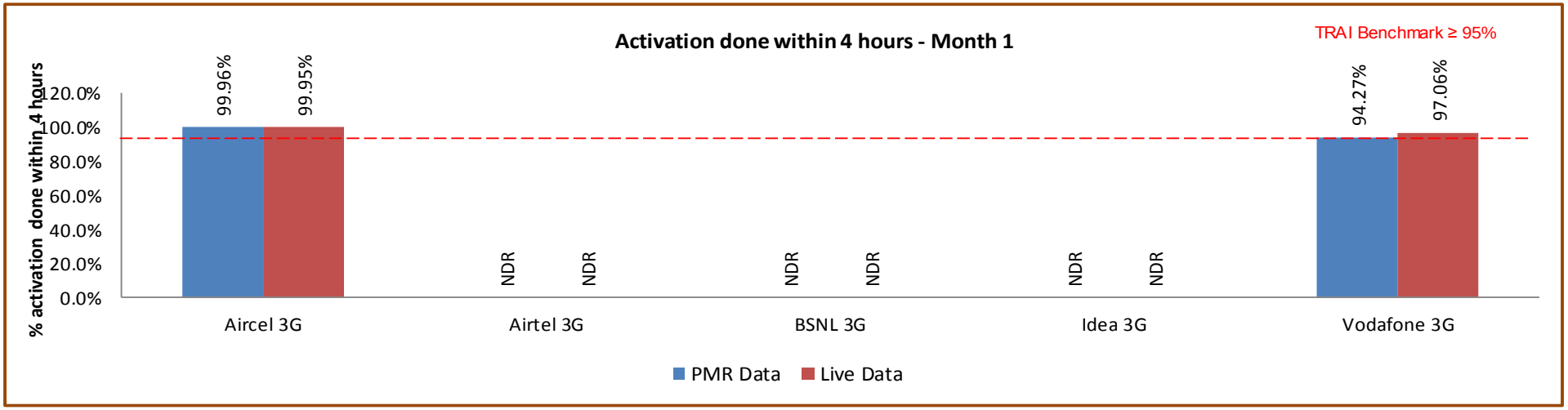
$$\text{\% activation done within 4 hours} = \frac{\text{Total Time Taken for Activation}}{\text{Total request time made}} \times 100$$

8.1.2 KEY FINDINGS

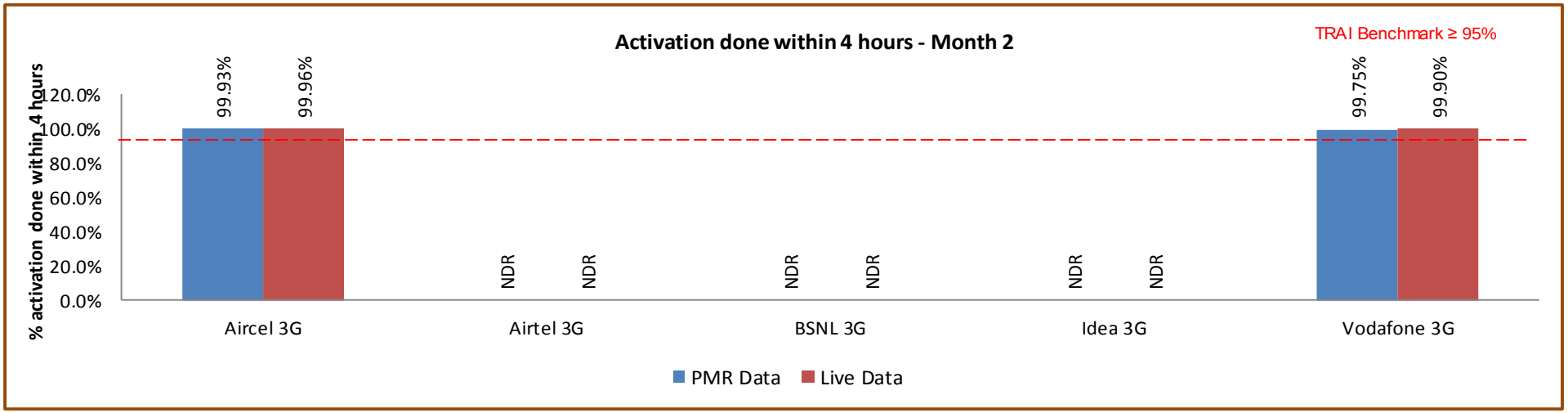


All operators met the benchmark for PMR as well as live audit.

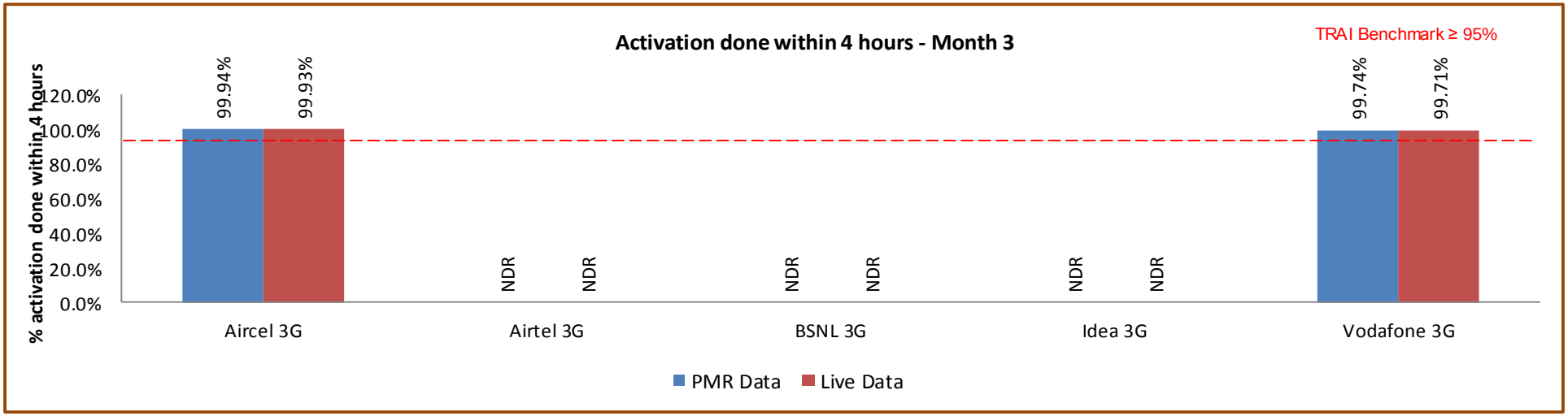
8.1.2.1 KEY FINDINGS – MONTH 1



8.1.2.2 KEY FINDINGS – MONTH 2



8.1.2.3 KEY FINDINGS – MONTH 3



8.2 PDP CONTEXT ACTIVATION SUCCESS RATE FOR 3G

8.2.1 PARAMETER DESCRIPTION

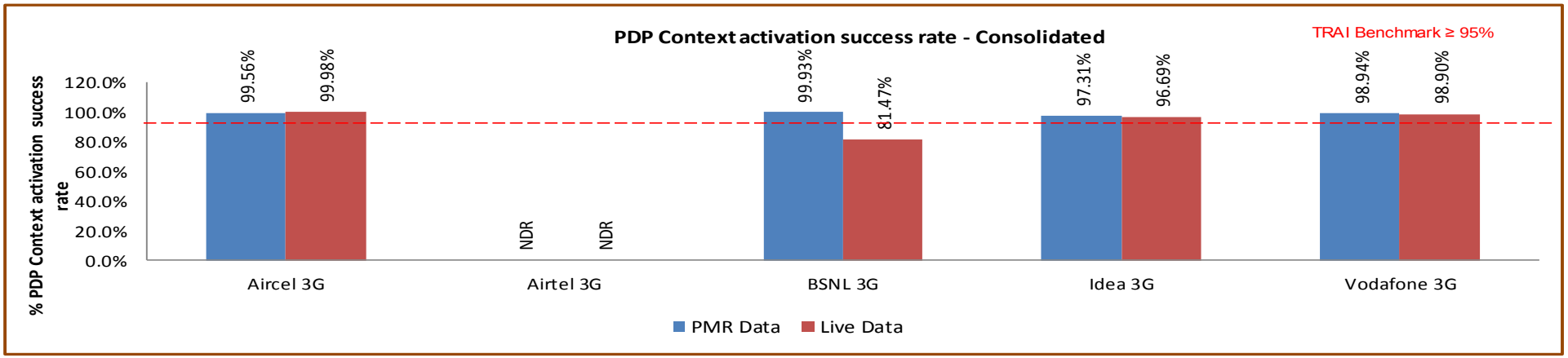
A Packet Data Protocol (PDP) context specifies access to an external packet-switching network. The data associated with the PDP context contains information such as the type of packet-switching network, the Mobile Station PDP (MS PDP) address that is the IP address, the reference of Gateway GPRS Support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

Measurement

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

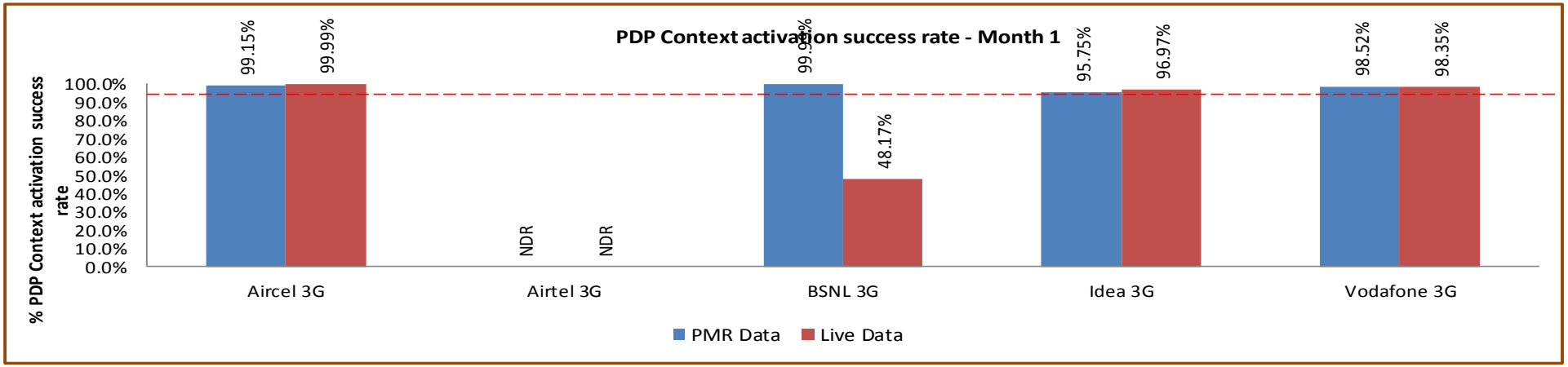
$$\textbf{PDP Context Activation Success Rate (\%)} = \frac{\text{Number of successfully completed PDP context activations}}{\text{Total attempts of context activation}} \times 100$$

8.2.2 KEY FINDINGS

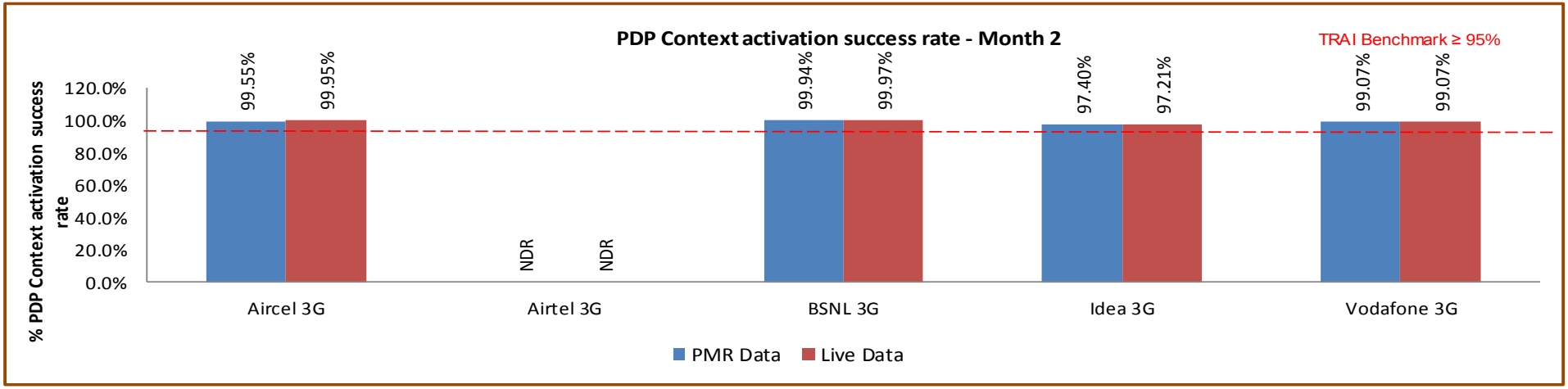


All operators met the benchmark for PMR as well as live audit, except BSNL 3G for live audit.

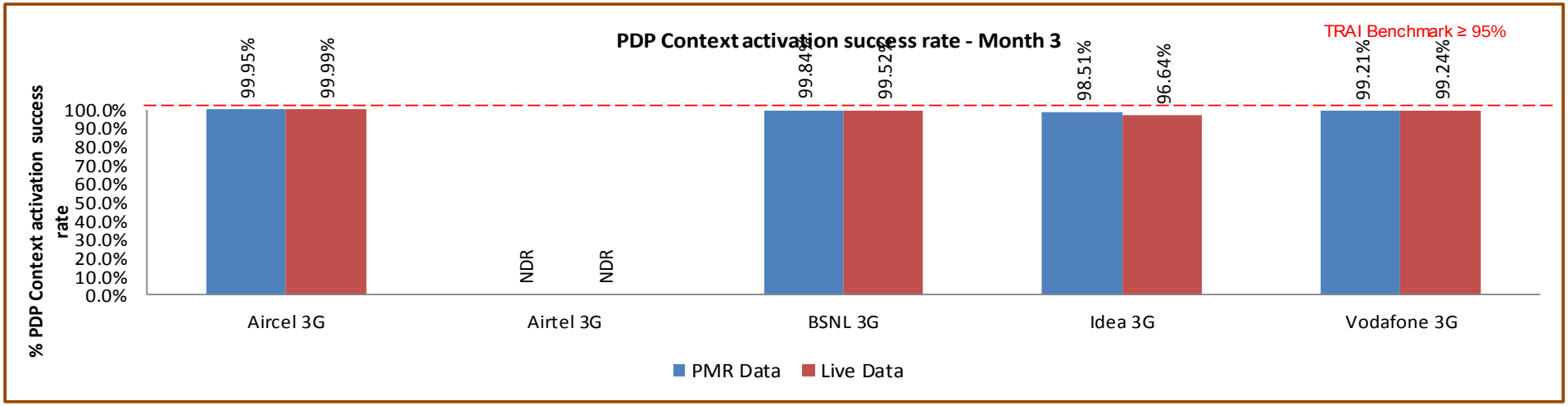
8.2.2.1 KEY FINDINGS – MONTH 1



8.2.2.2 KEY FINDINGS – MONTH 2



8.2.2.3 KEY FINDINGS – MONTH 3



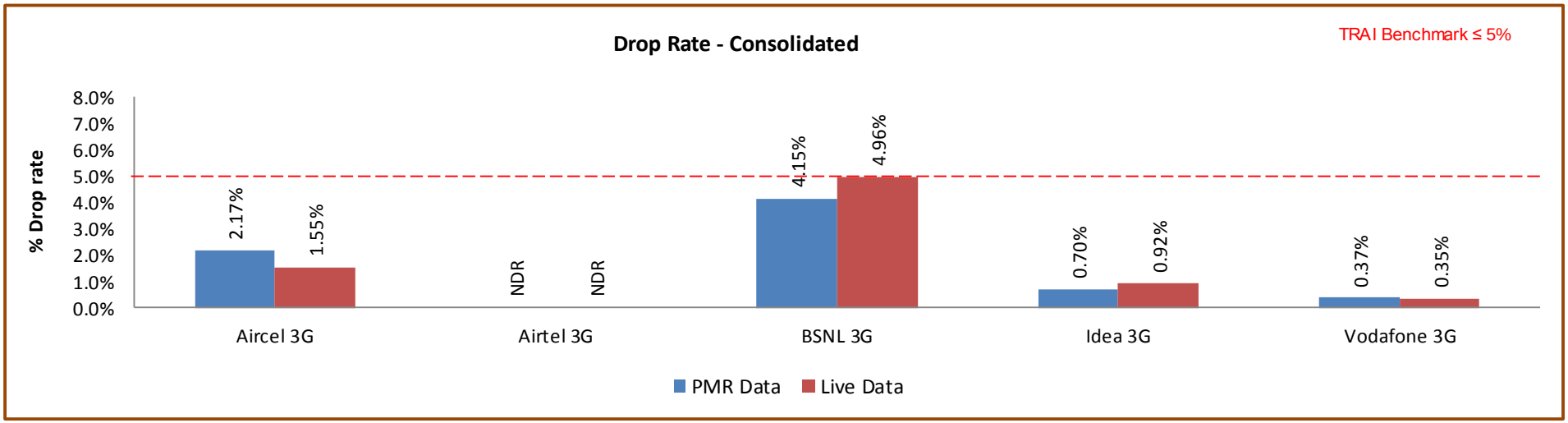
8.3 DROP RATE FOR 3G

8.3.1 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.

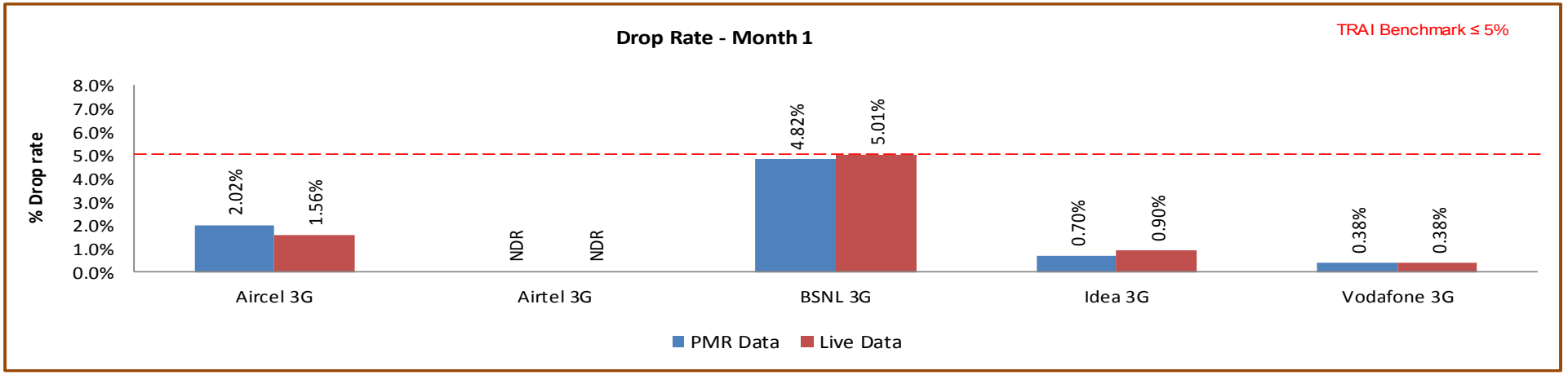
$$\textbf{Drop rate} = \frac{\text{No. of Dropped data Calls}}{\text{No. of Successful data calls}} \times 100$$

8.3.2 KEY FINDINGS

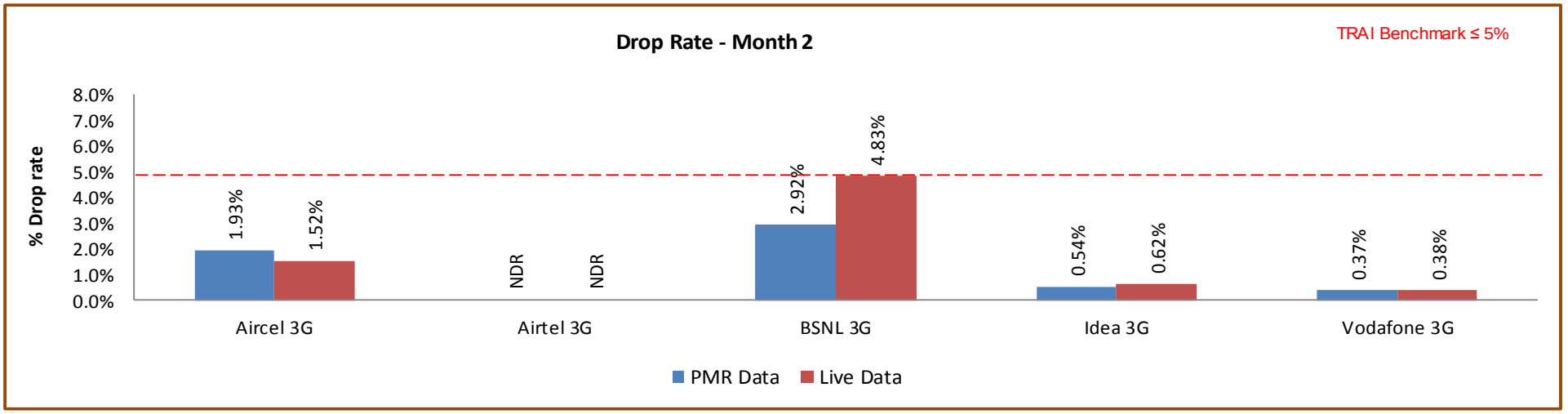


All operators met the benchmark for PMR as well as live audit.

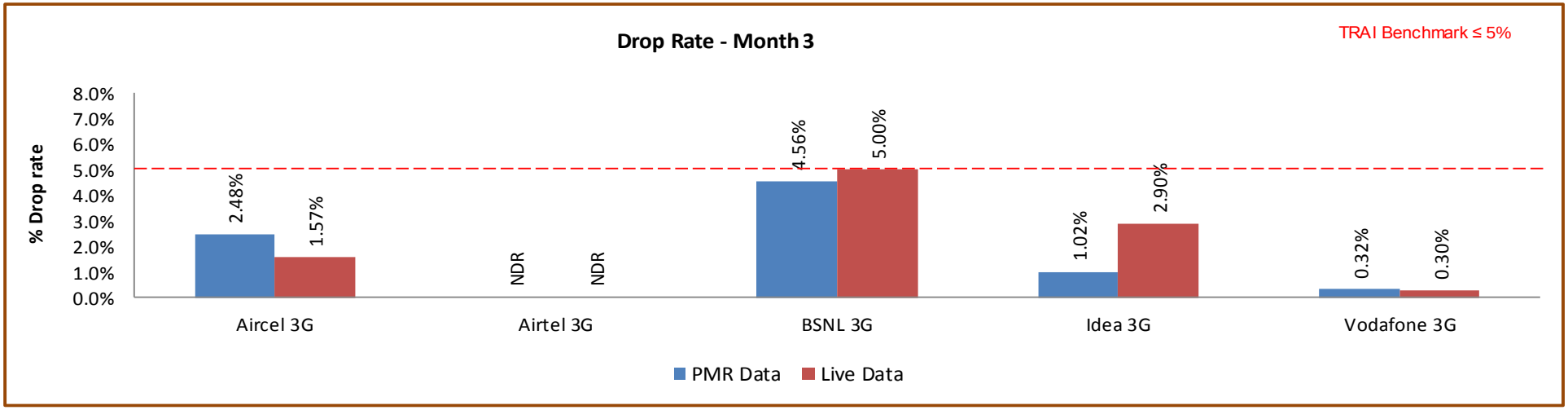
8.3.2.1 KEY FINDINGS – MONTH 1



8.3.2.2 KEY FINDINGS – MONTH 2



8.3.2.3 KEY FINDINGS – MONTH 3



9 PARAMETER DESCRIPTION AND DETAILED FINDINGS – NON-NETWORK PARAMETERS

9.1 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.

9.1.1 PARAMETER DESCRIPTION

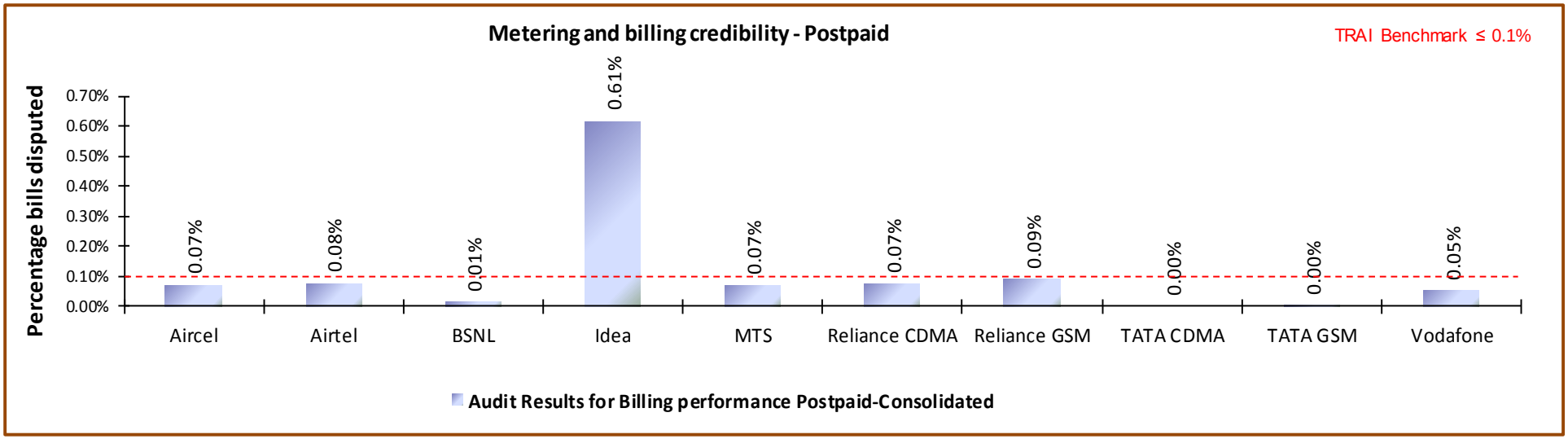
All the complaints related to billing/ charging as per clause 3.7.2 of QoS regulation of 20th December, 2009 were covered. The types of billing complaints covered are listed below.

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

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

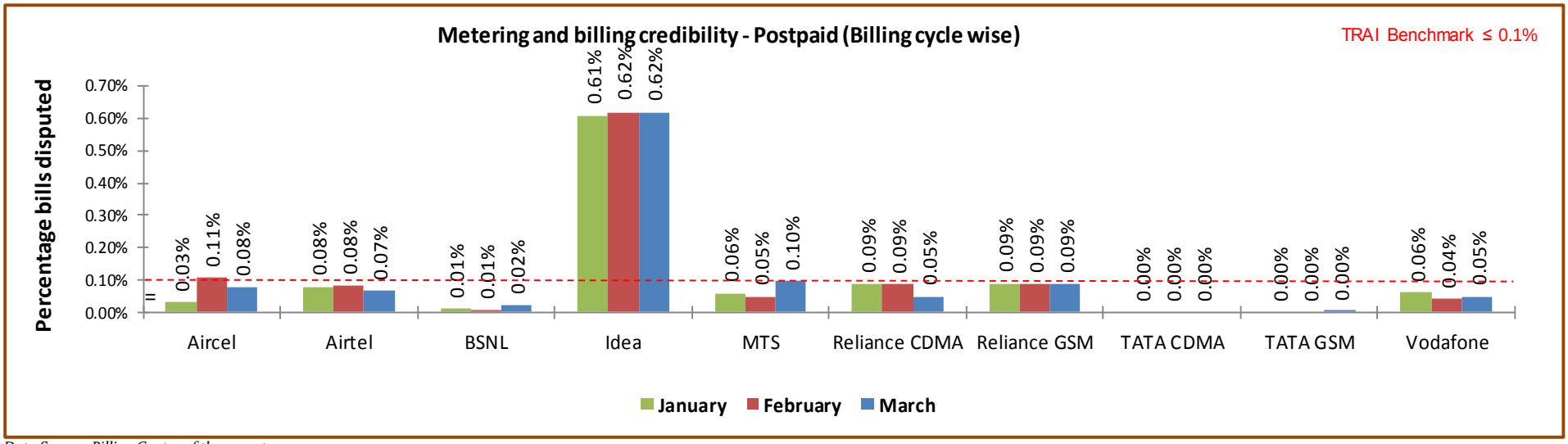
- Computational Methodology:
  - **Billing complaints per 100 bills issued (Post-paid)** = (Total billing complaints** received during the relevant billing cycle / Total bills generated* during the relevant billing cycle)*100
  - *Operator to include all types of bills generated for customers. This would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

9.1.2 KEY FINDINGS – METERING AND BILLING CREDIBILITY (POSTPAID)



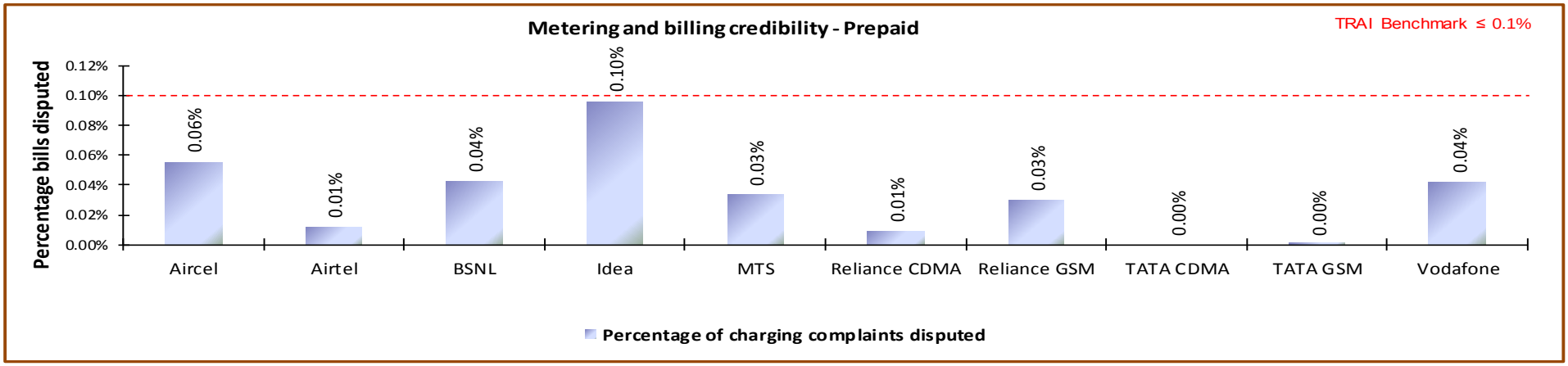
Data Source: Billing Center of the operators

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



Data Source: Billing Center of the operators

9.1.3 KEY FINDINGS - METERING AND BILLING CREDIBILITY (PREPAID)



Data Source: Billing Center of the operators

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

9.2 RESOLUTION OF BILLING/ CHARGING COMPLAINTS

9.2.1 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:

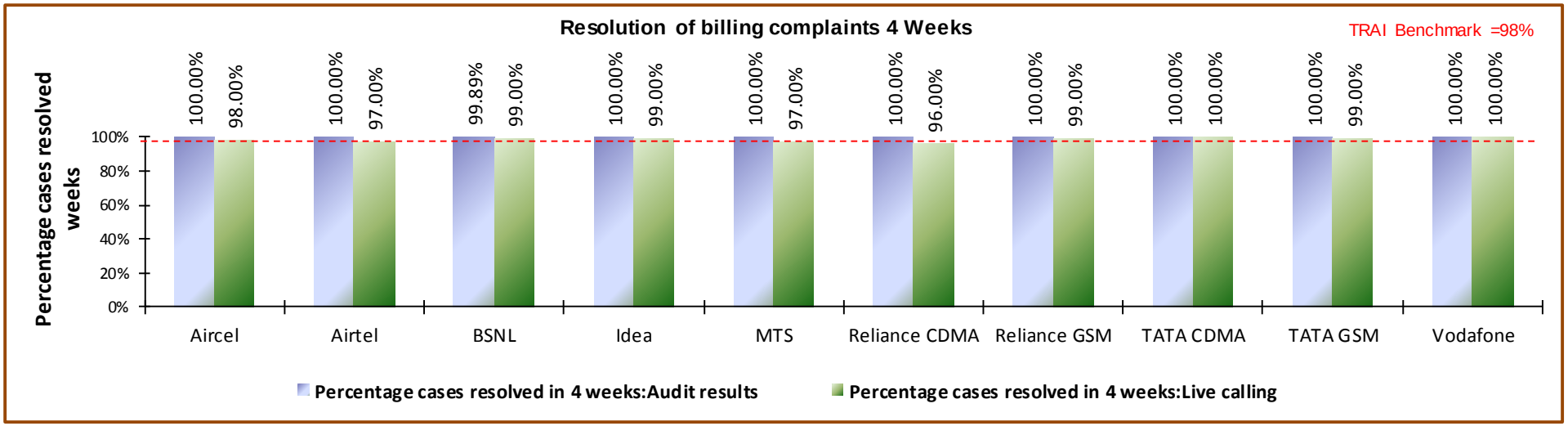
%age of billing complaints (for post-paid customers)/ charging, credit & validity (for pre-paid customers) resolved within 6 weeks =

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

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

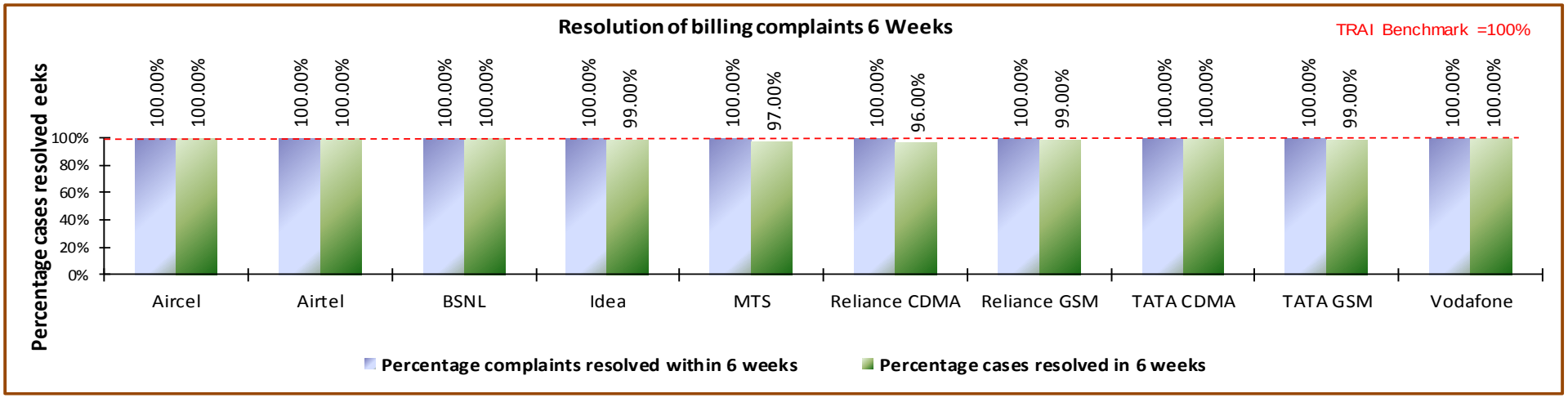
Benchmark: 98% complaints resolved within 4 weeks, 100% within 6 weeks.

9.2.2 KEY FINDINGS - WITHIN 4 WEEKS



Data Source: Billing Center of the operators

9.2.3 KEY FINDINGS WITHIN 6 WEEKS



Data Source: Billing Center of the operators

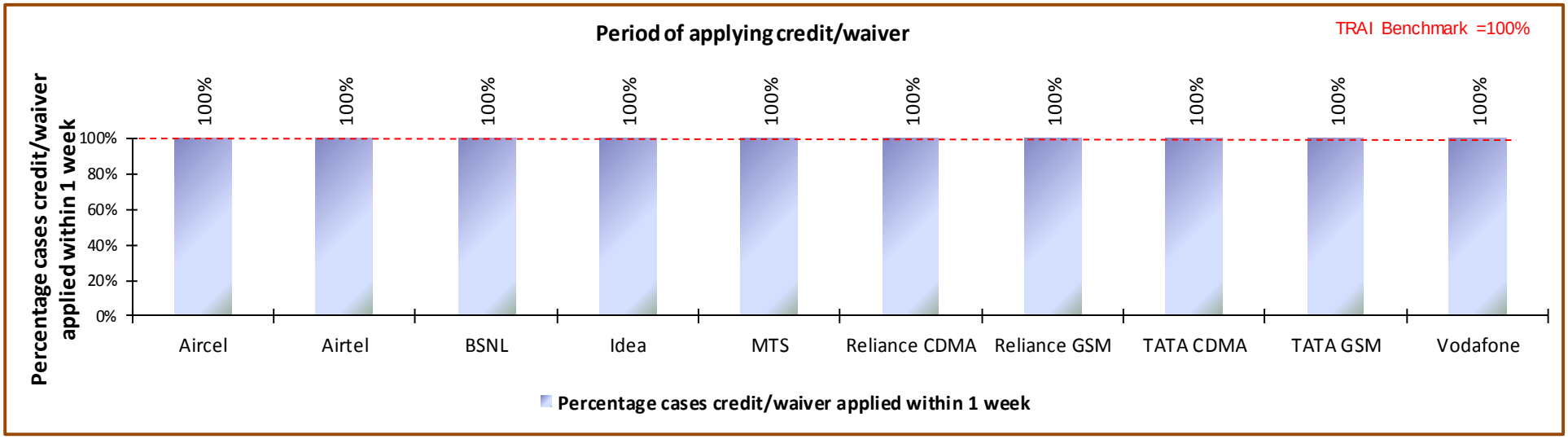
All operators met the TRAI benchmark of resolution of billing complaints within 4 weeks, however in 3days live Airtel, MTS and Reliance CDMA fell slightly short of the benchmark of resolution of billing complaints within 4 weeks. However, as per live calling done to customers, the performance of Idea, MTS, Reliance GSM & CDMA and TATA GSM were observed to be much below the PMR data.

9.3 PERIOD OF APPLYING CREDIT/WAVIER

9.3.1 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

9.3.2 KEY FINDINGS



Data Source: Billing Center of the operators

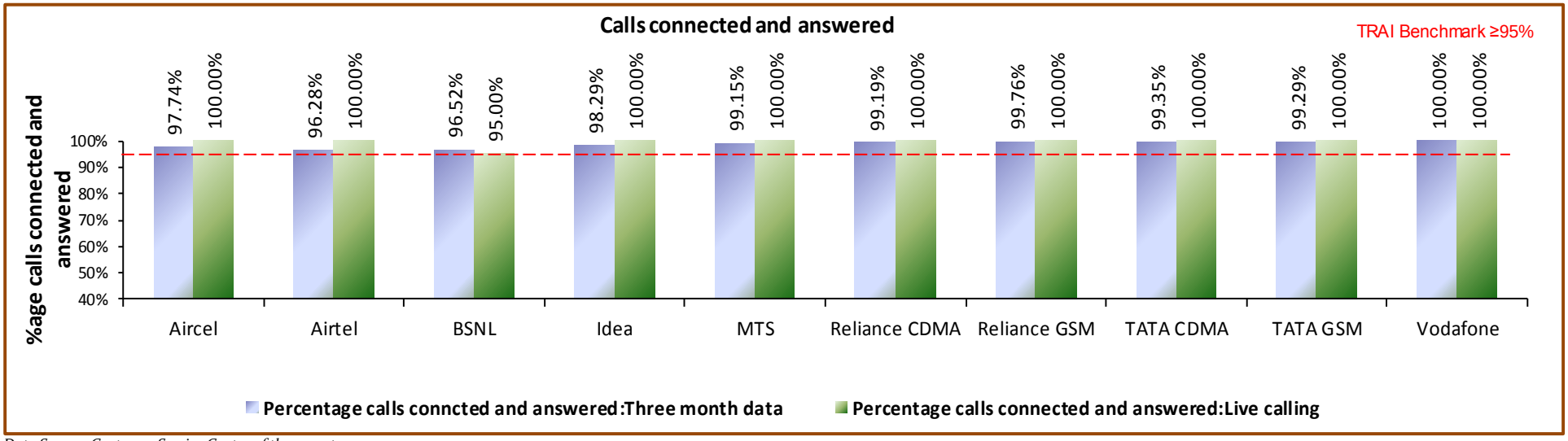
All operators met the benchmark for this parameter.

9.4 CALL CENTRE PERFORMANCE-IVR

9.4.1 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

9.4.2 KEY FINDINGS



Data Source: Customer Service Center of the operators

As per PMR data, all operators met the benchmark.

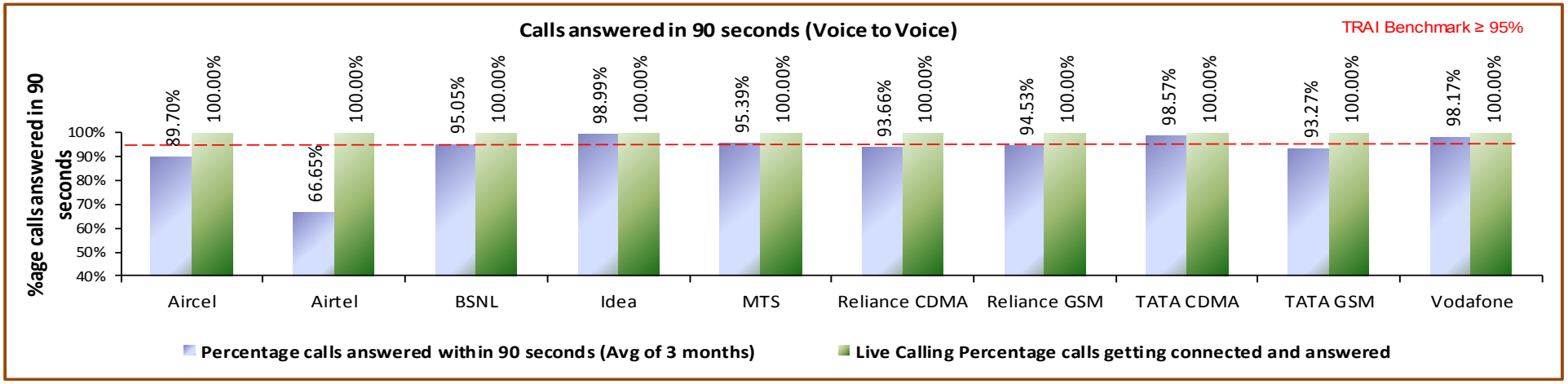
9.5 CALL CENTRE PERFORMANCE-VOICE TO VOICE

9.5.1 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

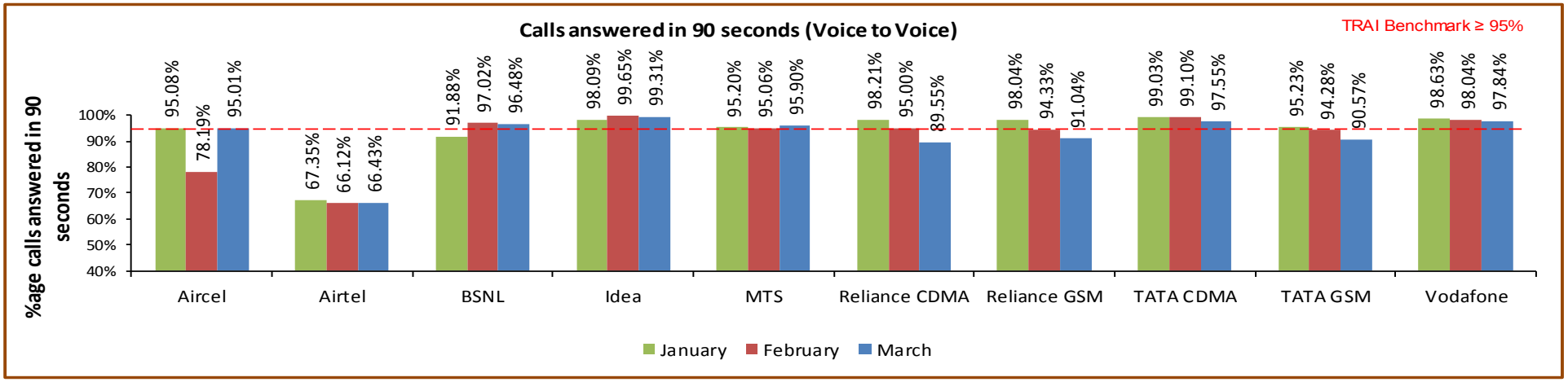
Benchmark: 95% calls to be answered within 90 seconds

9.5.2 KEY FINDINGS



Data Source: Customer Service Center of the operators

Aircel, Airtel, TATA GSM and Reliance GSM & CDMA were not able to meet the benchmark as per audit PMR data. However, as per live calling done to customers, the performance of all operators met the benchmark.



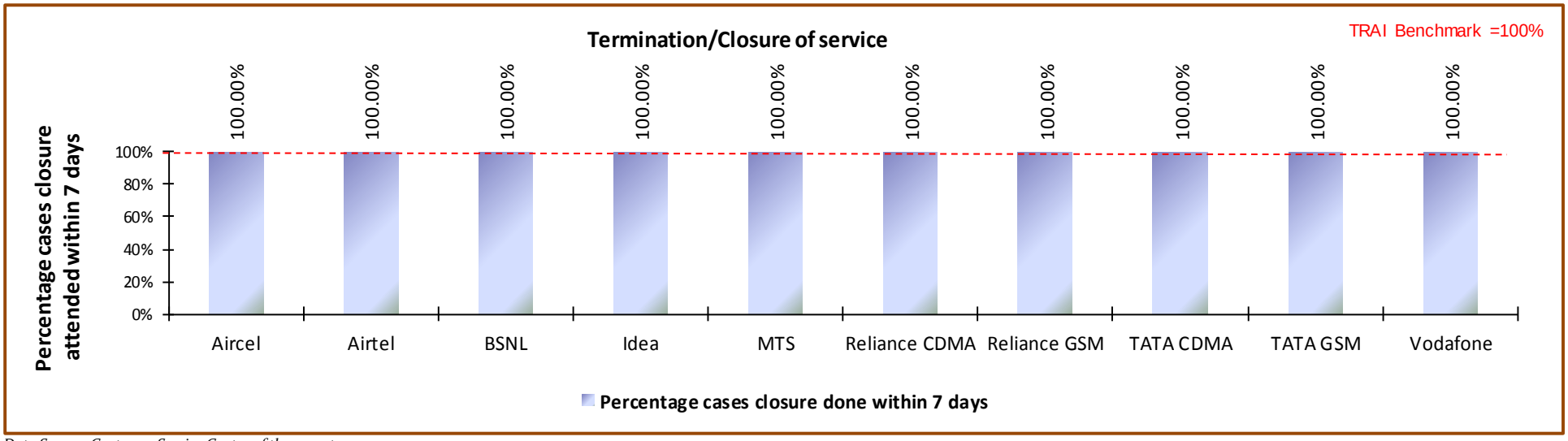
Data Source: Customer Service Center of the operators

9.6 TERMINATION/CLOSURE OF SERVICE

9.6.1 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

9.6.2 KEY FINDINGS



Data Source: Customer Service Center of the operators

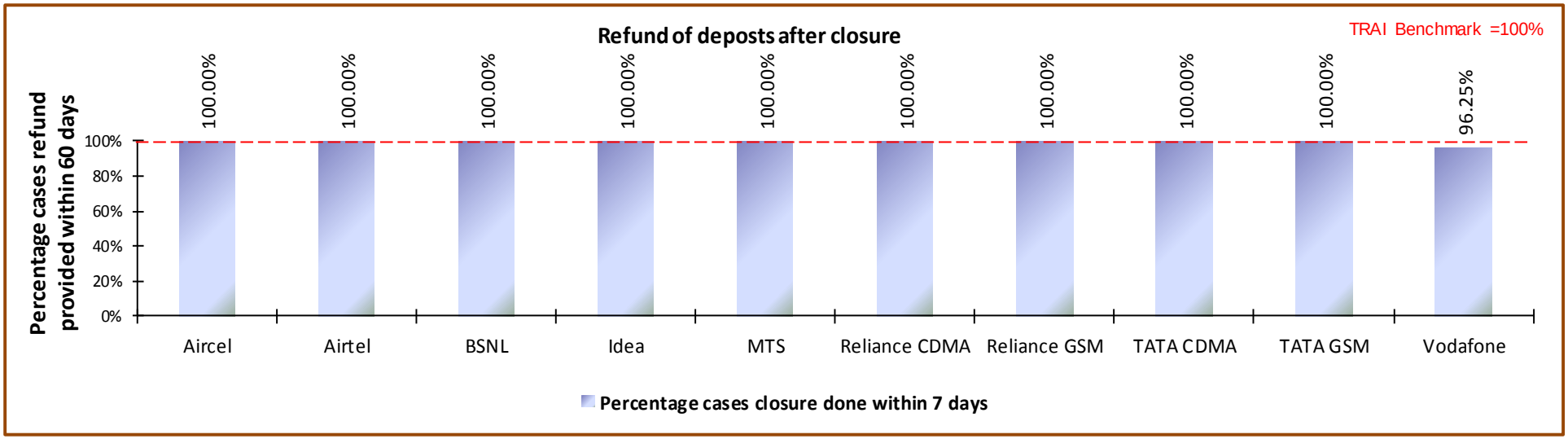
All operators met the TRAI benchmark for the parameter.

9.7 REFUND OF DEPOSITS AFTER CLOSURE

9.7.1 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

9.7.2 KEY FINDINGS



Data Source: Customer Service Center of the operators

All operators met the TRAI benchmark for the parameter except Vodafone.

10 DETAILED FINDINGS - DRIVE TEST DATA

10.1 OPERATOR ASSISTED DRIVE TEST - VOICE

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

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

10.1.1 Kolkata SSA

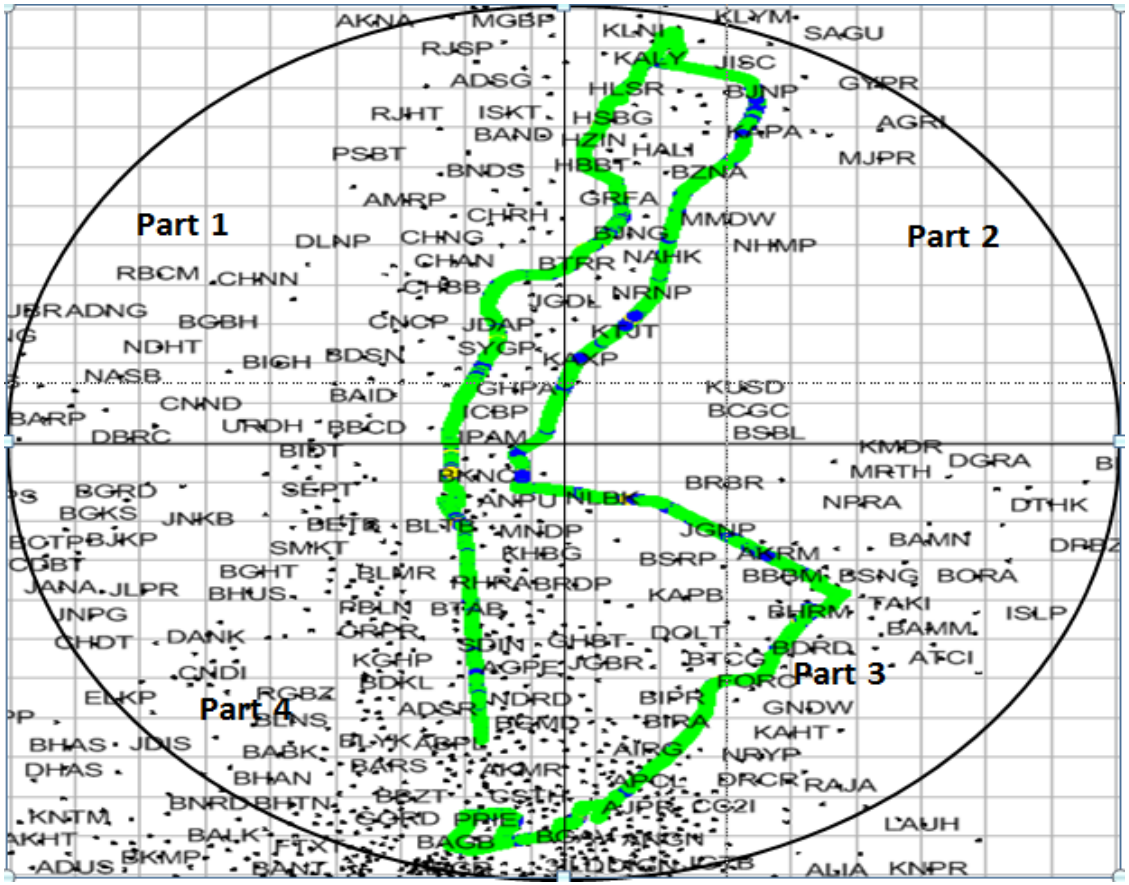
Month	Name of SSA Covered	Start date	End Date	Kilometer Travelled
February	Kolkata	22/02/16	27/02/16	500

10.1.1.1 Route Details - Kolkata SSA

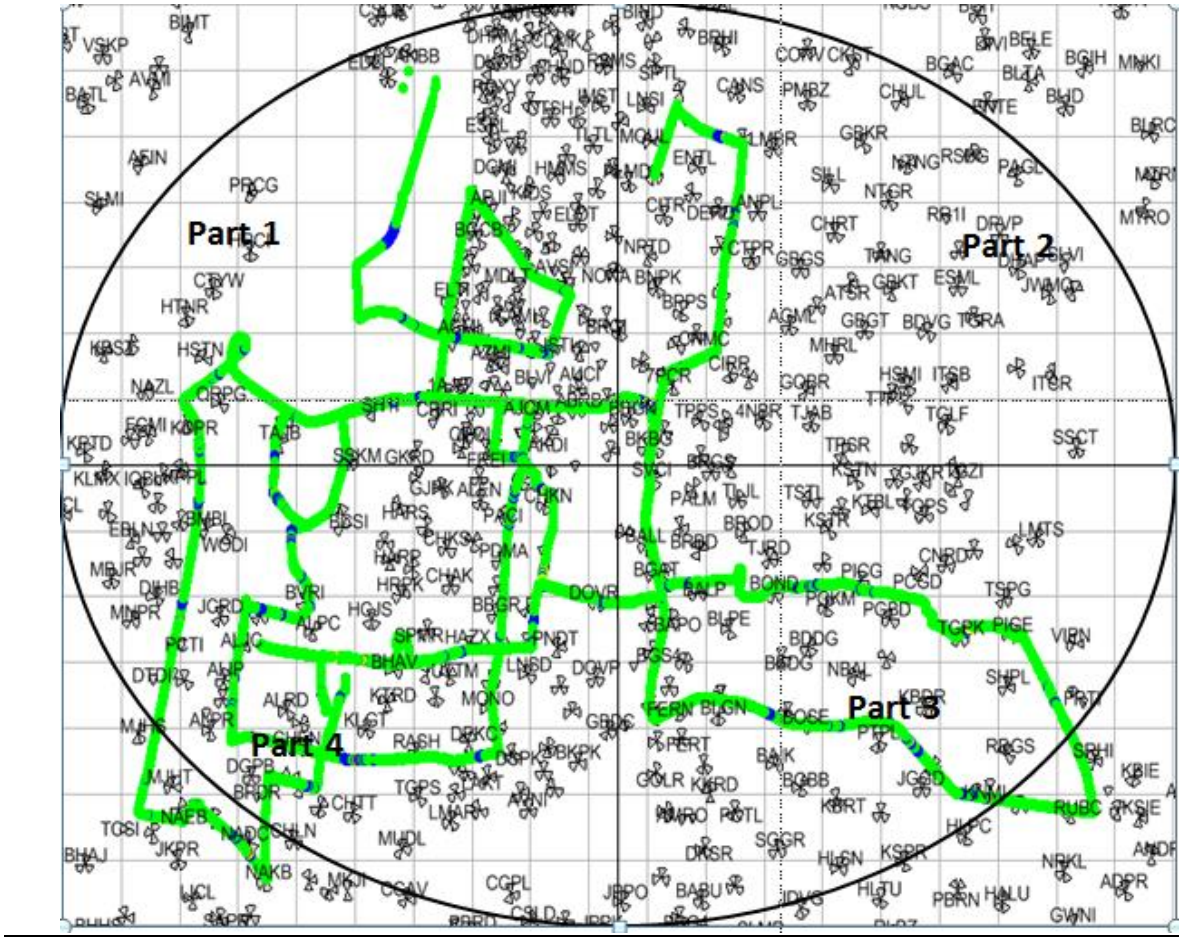
Category	Type of location	February					
		Kolkata					
		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Outdoor	Major Roads	Baghbazar-Shyambazar5Point-R.G.Kar-Paikpara-Raja Manindra Rd-NorthernAvenue-Dumdum Rd-7Tanks-Chiriamore-Cossipur-Belgachia-Patipukur-Kalindi-Nagerbazar-Dumdum1No.Gate-Dumdum2No.Gate Via Jessore Road-Michael Nagar-Madhyamgram-Barasat-Dukbunglow More-Colony More-Hatkhola More-Champadali More-Nilgunj Rd-Barrackpur Wireless More-Kalyani Express Way-Kalyani-Ghosh Para Road-Kanchrapara-Hazinagar-Bhatpara-Naihati-Kankinara-Shyamnagar-Ichapur-Barrackpur via B.T.Road-Titagarh-Khardah-Sodepur-Agarpara-Belgharia-Dunlop	Ladies Park-Park Circus 7 Point-Syed Amir Ali Avenue-BeckBagan-AJC Bose Road-Moulali-CIT Road-Syed Amir Ali Avenue-Ballygunge Phari-Bondel Road-Picnic Garden-EM Bye Pass-Ruby-Kasba-Gariahat-Dover Lane-Garcha Road-Ballygunge Circular Road-Hazra More-Chetla-Kalighat Road-Patuapara-Ramesh Mitra Road-Harish Mukherjee Road-Gopalnagar-Alipur Road-Taratalla-D.H.Road-Ekbalpur-Mominpur-Khidderpore-National Library-DL Khan Road-Alipur Zoo-Baker Road-Bhabani Bhawan-Belvedere Road-Burdwan Road-RashBehari Avenue-Dshopriyo Park-Sarat Bose Road-Lee Road-Elgin Road-Sambhunath Pandit Road-Hazra Road-Monohar Pukur Road-Panditia Road-Ruby-Gariahat-Rashbehari-Chetla-Burdwan Road-Diamond Harbour Road-Taratalla Road	Taratalla-James Long Sarani-Biren Roy Road (East)-Parnashree-Behala Chowrastha- Behala Shakher Bazar-Thakurpukur-Banamali Naskar Road-Behala Thana-Rai Bahadur Road-Joka-Amtalla-Jalilpur-Sethpur-Baruipur-Harihartolla-Malancha-Subhas Gram-Rajpur-Sonarpur-Kamalgazi-Dhalai Bridge-Narendrapur-E.M.Bye Pass-Kalibazar-Jagriti Sangha-Jagaddal EM Bye Pass Connector-Chowhati More-Rakshit More-Boral Main Road-Garia More-Sitala Mandir-Naktalla-Bansdroni-N.S.Road-Tollygunge-B.L.Saha Road-Biren Roy Road (West)-Bakultalla-Sakuntalla Park-Sarsuna-MG Road-NetajiNagar Kali Bari-MaheshtallaHPCL-BataNagar-BudgeBudge	Beadon Street/Bidhan Sarani Crossing-Bidhan Sarani-Shyambazar 5 Point-J.M.Avenue-C.R.Avenue-Girish Park-M.G.Road-Central Metro-Esplanade-EdenGardens-Babughat-Strand Road-Dalhousie-Writers'Building-B.B.Ganguli Street-LalBazar-Podder Court-Chandni Metro-Moti Sil Street-Chowringhee Place-New Market Complex-Bertram Street-Lindsay Street-Park Street-Maidan-J.L.Nehru Road-Theatre Road-Birla Planetarium-Rabindra Sadan-Ashutosh Mukherjee Road-Bhowanipore-S.P.Mukherjee Road-Jatin Das Park-Kalighat Metro Station-Southern Avenue-Sarat Bose Road-Minto Park-AJC Bose Road-S.N.Banerjee Road-Lenin Sarani-Moulali-Sealdah-APC Road-Shyambazar-R.G.Kar-Canal East Road-Maniktalla Main Road-Kankurgachi-CIT Road-Ultadanga-Ultadanga Main Road-Aurobindo Sarani-Grey Street-B.K.Paul Avenue-Ahiritola-Nimtalla Ghat Road-Posta-Burrabazar-M.G.Road-Natunbazar-Vivekananda Road-Ahmerst Street-B.B.Ganguli Street-College Street-Bidhan Sarani	Park Circus7 Point-Convent Road-Tangra-Beliaghata Main Road-E.M.Bye Pass-Chingrighata-Science City-Ruby General Hospital-Prince Anwar Shah /Avishikta Crossing-Dhakuria-Jadavpur-Baghajatin-Patuli-Chawk Garia-Garia Station Road-E.M.Bye Pass-Beliaghata CIT More-CIT Road-Phoolbagan-Kankurgachi-Purbasha-Saltlake Purbachal-Labani-CA Island-PNB-Tank No.3-Baisakhi-CityCentre1-Vidya Sagar-Karunamoyee-Tank No.8-Sector 5-College More-DLF-Technopolis-New Town-City Centre2-Chinar Park-Rajarhat-211Bus Route-Dashadrone-KaliPark-Gopalpur-93 Bus Route-Narayanpur-Kaikhali More-Baguiati-Rajarhat Road-Tegharia	Belur-Ballyghat-Dankuni-Dankuni Station Road-T.N.Mukherjee Road-Jagadishpur-Chamrail-Bombay Road-Salap More-Makardah-Kantalia-Domjur Bus Stand-Jhapardah South-Bakultalla-Ankurhati-NH6-NH117-Grand Trunk Road-Mullick Fatak-BelePole-Santragachi-Ichapur Notun Rasta-Nabin Sangha Childern's Park-M.B.Road-N.S.Road-Kalibabur Bazar-N.S.Dutta Road-D.P.Sasmal Road-Kadamtalla-Panchanantolla Road- Howrah Maidan-Foreshore Road-G.T.Road-Belilious Road-Avani Mall-Tikia Para-Sanpur-Baltikuri-Bankra-NH6-Benaras Road-Tantipara Road-Dasnagar-Tikiapara-Belgachia-Bamangachi-Salkia-Salkia Chowrastha-Ghusuri-Liluah-Bally .
	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 February 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.

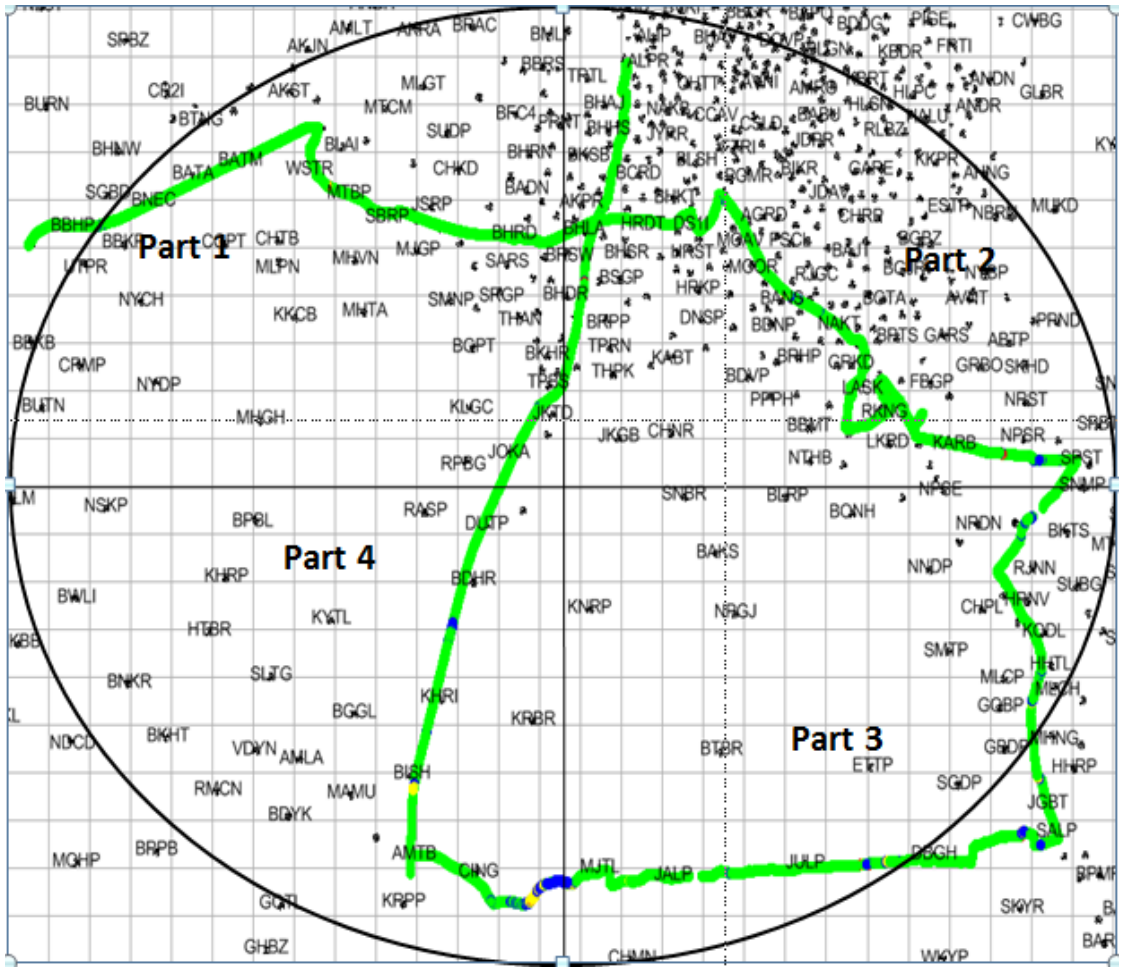
10.1.1.2 Route Map - Kolkata DAY 1



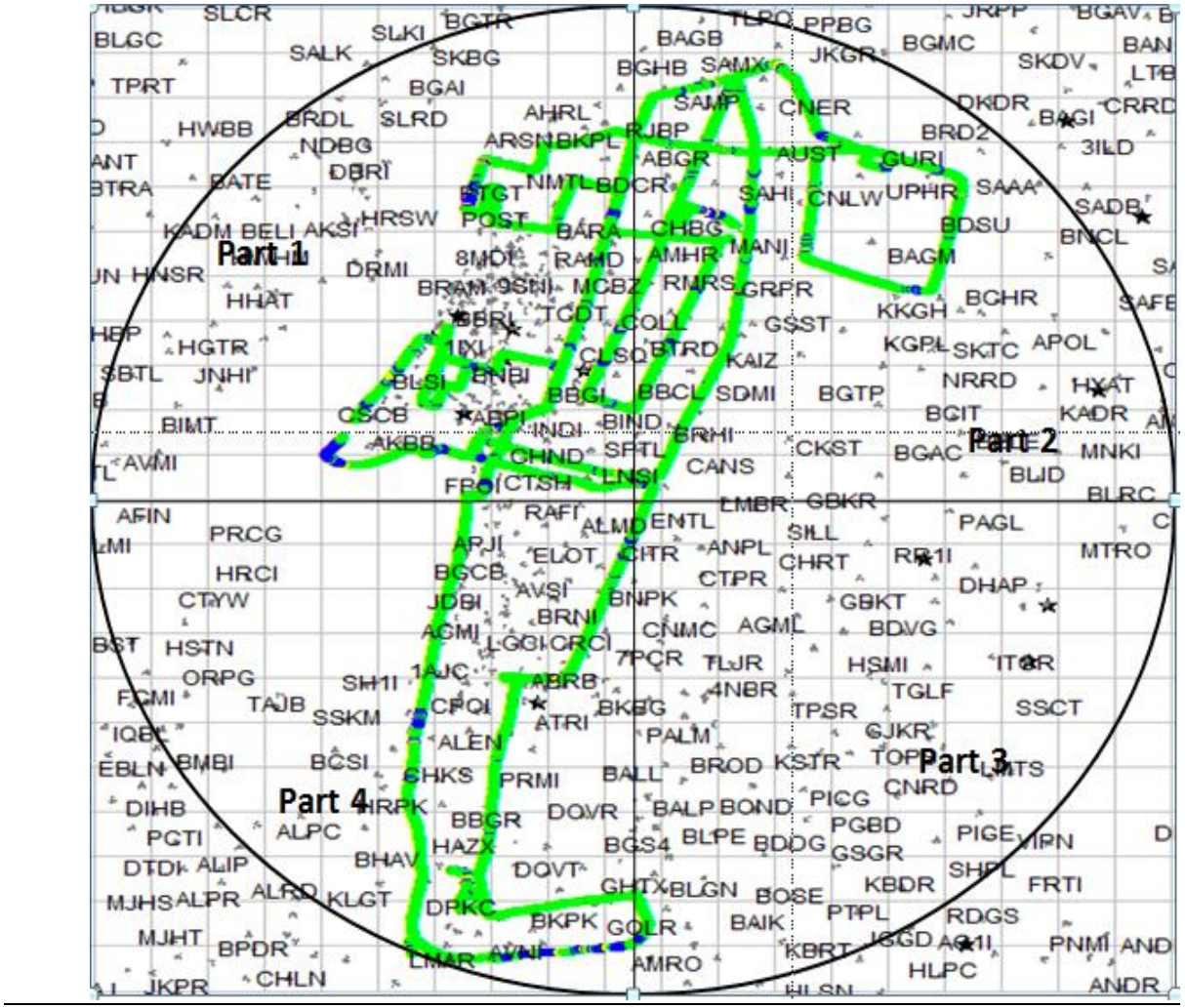
10.1.1.3 Route Map - Kolkata DAY 2



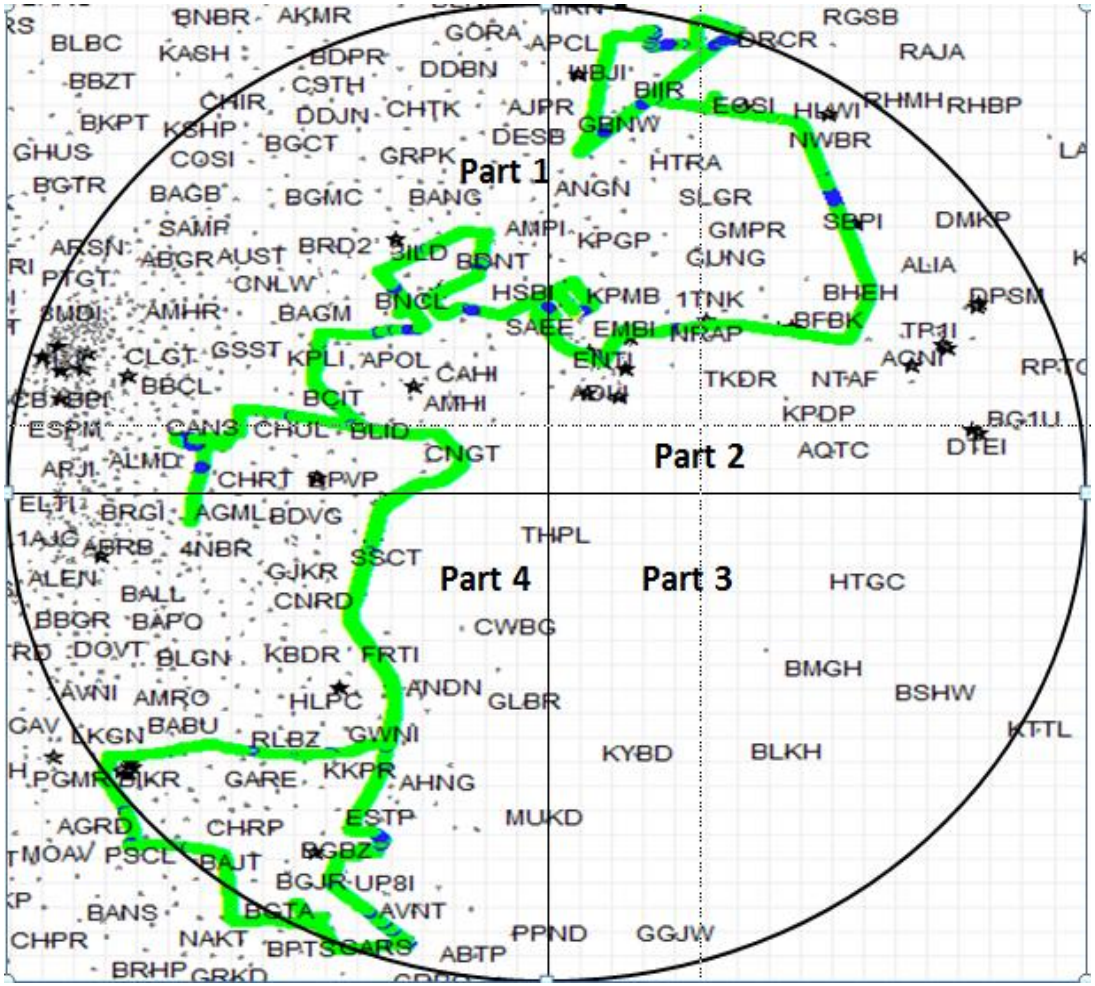
10.1.1.4 ROUTE MAP - KOLKATA DAY 3



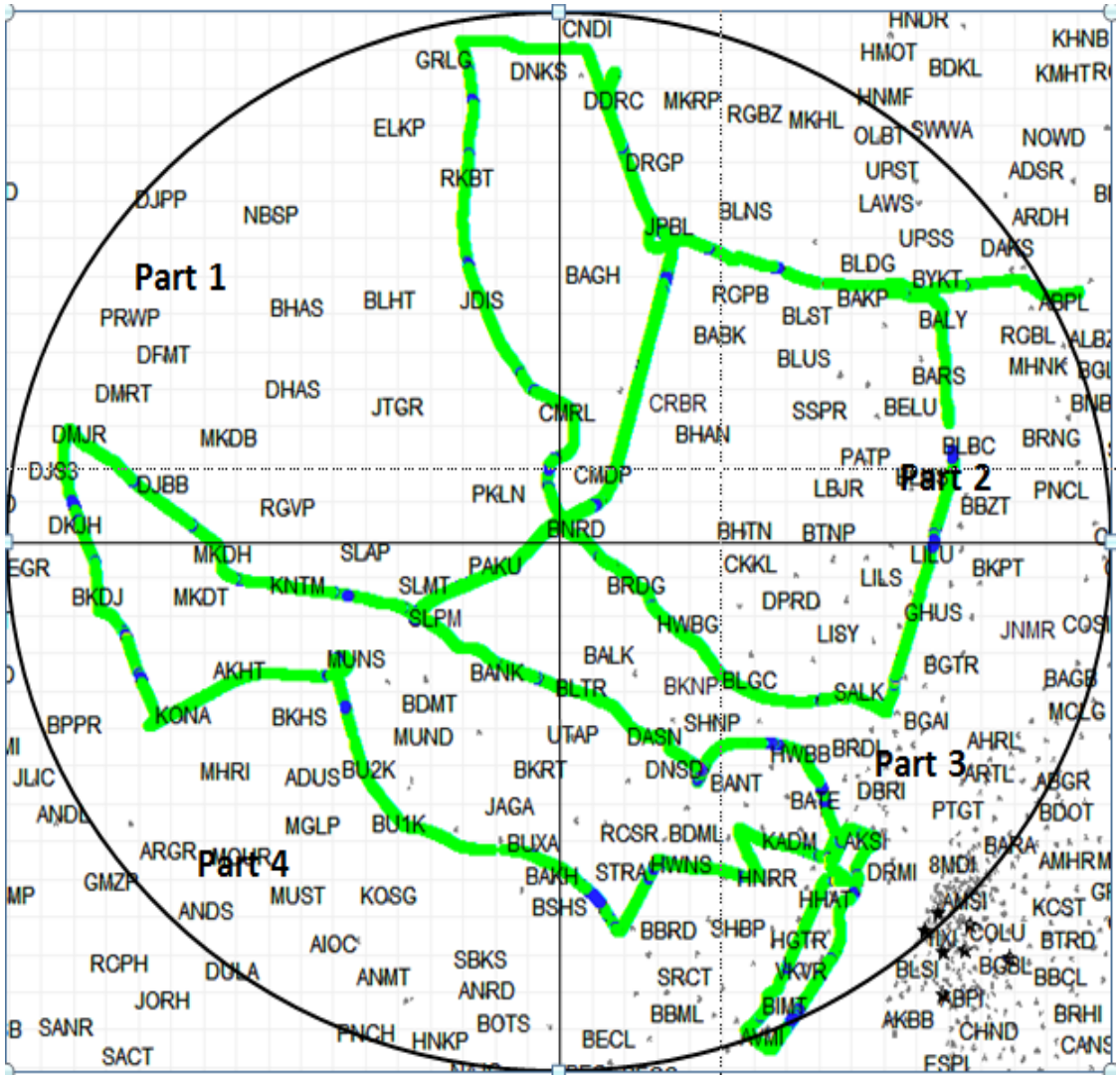
10.1.1.1 Route Map - Kolkata DAY 4



10.1.1.2 Route Map - Kolkata DAY 5



10.1.1.3 Route Map - Kolkata DAY 6



10.1.1.4 Drive Test Results - Kolkata SSA-2G

Kolkata	B'mark	Aircel		Airtel		BSNL		Idea		MTS		Reliance CDMA		Reliance GSM		TATA CDMA		TATA GSM		Vodafone	
Parameter's		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
0 to -75 dBm		76.16%	96.78%	97.73%	97.22%	82.53%	83.95%	38.06%	76.83%	41.56%	76.65%	30.93%	47.26%	No Service		59.87%	90.12%	12.78%	89.25%	80.69%	91.05%
0 to -85 dBm		98.78%	99.54%	100.00%	100.00%	97.12%	97.30%	77.46%	94.48%	94.17%	96.05%	63.72%	77.76%			83.70%	99.46%	73.78%	98.59%	99.65%	99.21%
0 to -95 dBm		99.92%	99.87%	100.00%	100.00%	100.00%	99.90%	98.28%	99.96%	100.00%	99.56%	87.61%	97.33%			99.99%	99.99%	99.33%	99.79%	100.00%	100.00%
Voice quality	≥ 95%	96.46%	89.53%	98.11%	95.97%	95.58%	95.00%	99.01%	95.28%	97.86%	95.89%	99.37%	99.78%			98.43%	95.85%	98.88%	93.78%	99.13%	98.44%
CSSR	≥ 95%	100.00%	99.25%	100.00%	99.80%	99.62%	98.68%	100.00%	99.91%	100.00%	100.00%	93.46%	94.77%			100.00%	99.70%	100.00%	97.93%	100.00%	100.00%
%age Blocked calls		0.00%	0.75%	0.00%	0.00%	0.00%	1.12%	0.00%	0.09%	0.00%	0.00%	0.00%	0.02%			0.00%	0.00%	0.00%	0.91%	0.00%	0.00%
Call drop rate	≤ 2%	0.00%	0.47%	0.00%	0.10%	0.00%	0.82%	0.00%	0.17%	0.00%	0.00%	1.22%	2.17%			0.00%	0.30%	0.00%	0.08%	0.00%	0.11%
Hands off success rate		100.00%	98.29%	100.00%	98.01%	97.68%	98.59%	100.00%	98.57%	100.00%	99.99%	100.00%	100.00%			0.00%	0.00%	100.00%	97.69%	100.00%	100.00%

Data Source: Drive test reports submitted by operators to auditors

Voice Quality

Aircel 2G and TATA GSM failed to meet the benchmark in outdoor locations.

Call Set Success Rate (CSSR)

Reliance CDMA failed to meet the benchmark for CSSR in outdoor as well as indoor locations.

Call Drop Rate

BSNL 2G failed to meet the benchmark for call drop rate in outdoor locations.

10.1.1.1 Drive Test Results - Kolkata SSA-3G

Kolkata	B'mark	Aircel 3G		Airtel 3G		BSNL 3G		Vodafone 3G	
Parameter's		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
0 to -75 dBm		38.30%	53.85%	Not Participated		76.91%	78.43%	80.13%	92.67%
0 to -85 dBm		80.04%	86.94%			95.52%	92.14%	99.80%	99.45%
0 to -95 dBm		95.29%	98.48%			99.51%	99.35%	100.00%	100.00%
Voice quality	≥ 95%	99.45%	83.40%			93.65%	92.47%	98.63%	97.76%
CSSR	≥ 95%	100.00%	100.00%			100.00%	98.51%	100.00%	99.89%
%age Blocked calls		0.40%	1.13%			0.00%	1.46%	0.00%	0.11%
Call drop rate	≤ 2%	0.00%	0.42%			0.41%	1.59%	0.00%	0.00%
Hands off success rate		98.85%	98.74%			95.74%	97.74%	100.00%	100.00%

Voice Quality

BSNL 3G failed to meet the benchmark in outdoor as well as indoor locations. Aircel 3G did not meet the benchmark in outdoor locations.

Call Set Success Rate (CSSR)

All the operators met the TRAI benchmark.

Call Drop Rate

All the operators met the TRAI benchmark.

10.1.1.1 Data Drive Test Results -Kolkata SSA -2G

Name of the Parameter	Bench Mark	Aircel	Airtel	BSNL	Idea	MTS	RCOM CDMA	RCOM GSM	TATA CDMA	TATA GSM	Vodafone
Succesful Data Transmission download speed attempts	>80%	100%	100%	96	100%	100%	100	100%	100%	100%	100%
Succesful Data Transmission upload speed attempts	>75%	100%	100%	96	100%	100%	100	100%	100%	100%	100%
Minimum download speed		98	116	32	121	121	59	70	705	85	89
Average throughput for Packet Data		137	175	62	114	702	109	106	1239	147	129
Latency	<250ms	100	100	98	96	100	100	100	100	100	100

All operators met the TRAI benchmark.

10.1.1.2 Data Drive Test Results -Kolkata SSA -3G

Name of the Parameter	Bench Mark	Aircel	Airtel	BSNL	Vodafone
Succesful Data Transmission download speed attempts	>80%	100%	100%	96	100%
Succesful Data Transmission upload speed attempts	>75%	100%	100%	96	100%
Minimum download speed		1563	945	240	2172
Average throughput for Packet Data		2602	1769	483	4111
Latency	<250ms	100	100	98	100

All operators met the TRAI benchmark.

11 ANNEXURE – CONSOLIDATED-2G

11.1 NETWORK AVAILABILITY

1. Network Availability											
Audit Results for Network Availability- PMR data											
	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		6700	8387	3759	6620	1714	1368	4902	420	5428	8070
Sum of downtime of BTSs in a month (in hours)		9819	811	51633	6531	695	3959	38278	66	3565	5416
BTSs accumulated downtime (not available for service)	≤ 2%	0.20%	0.01%	1.85%	0.13%	0.05%	0.39%	1.05%	0.02%	0.09%	0.09%
Number of BTSs having accumulated downtime >24 hours		40	0	145	50	0	0	12	0	14	34
Worst affected BTSs due to downtime	≤ 2%	0.60%	0.00%	3.86%	0.76%	0.00%	0.00%	0.24%	0.00%	0.26%	0.42%
Live Measurement Results for Network Availability- 3 Day live data											
	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		6690	8349	3744	6481	1712	1368	4902	420	5429	8028
Sum of downtime of BTSs in a month (in hours)		1145	34	2619	875	58	478	2008	7	396	643
BTSs accumulated downtime (not available for service)	≤ 2%	0.24%	0.01%	0.97%	0.19%	0.05%	0.49%	0.57%	0.02%	0.10%	0.11%
Number of BTSs having accumulated downtime >24 hours		5	0	24	16	0	0	0	0	0	4
Worst affected BTSs due to downtime	≤ 2%	0.07%	0.00%	0.64%	0.25%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%

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

11.2 CONNECTION ESTABLISHMENT (ACCESSIBILITY)

Audit Results for CSSR, SDCCH and TCH congestion- PMR data											
CSSR	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
CSSR	≥ 95%	97.40%	99.50%	99.20%	99.56%	99.85%	97.17%	98.65%	99.06%	99.04%	99.59%
SDCCH/Paging channel congestion	≤ 1%	0.83%	0.03%	0.72%	0.09%	NA	NA	0.06%	NA	0.07%	0.06%
TCH congestion	≤ 2%	0.61%	0.03%	0.57%	0.13%	0.00%	1.18%	0.09%	0.08%	0.10%	0.41%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data											
CSSR	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
CSSR	≥ 95%	97.95%	99.52%	99.19%	99.75%	99.90%	97.90%	88.25%	99.30%	98.76%	99.74%
SDCCH/Paging channel congestion	≤ 1%	0.90%	0.02%	0.47%	0.07%	NA	NA	0.03%	NA	0.08%	0.06%
TCH congestion	≤ 2%	0.26%	0.02%	1.33%	0.05%	0.00%	0.80%	0.02%	0.03%	0.06%	0.26%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data											
CSSR	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of call attempts		1304	1115	1245	1402	1258	1263	No Service	1268	1466	1248
Total number of successful calls established		1296	1113	1231	1401	1258	1197	No Service	1265	1441	1248
CSSR	≥ 95%	99.39%	99.82%	98.88%	99.93%	100.00%	94.77%	No Service	99.76%	98.29%	100.00%
%age blocked calls		0.61%	0.18%	1.12%	0.07%	0.00%	5.23%	No Service	0.24%	1.71%	0.00%

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

11.3 CONNECTION MAINTENANCE (RETAINABILITY)

Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data											
Call drop rate	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		221698123	279206505	104532552	164556595	38140701	53049524	##############	4336406	166203609	342131007
Total number of calls dropped		1484564	2407427	969246	458187	189334	156210	93342	20156	1040760	2653128
Call drop rate	≤ 2%	0.67%	0.86%	0.93%	0.28%	0.50%	0.29%	0.00%	0.46%	0.63%	0.78%
Total number of cells in the network		20066	24703	10506	19787	6587	4104	14703	1371	15923	20791
Total number of cells having more than 3% TCH		474	603	253	60	132	29	44	34	378	547
Worst affected cells having more than 3% TCH	≤ 3%	2.36%	2.44%	2.41%	0.30%	2.01%	0.71%	0.30%	2.50%	2.37%	2.63%
Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data											
Call drop rate	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		286530105	29075599	51570996	209474282	54697412	66271488	87982238	5372052	237721847	492057733
Total number of calls dropped		1687097	188419	429006	500925	196811	172297	100727	22527	1382450	3183217
Call drop rate	≤ 2%	0.59%	0.65%	0.83%	0.24%	0.36%	0.26%	0.11%	0.42%	0.58%	0.65%
Total number of cells in the network		20039	73720	10655	19367	6584	4104	14703	1371	15934	20685
Total number of cells having more than 3% TCH		477	1867	253	6	4	34	56	49	384	543
Worst affected cells having more than 3% TCH	≤ 3%	2.38%	2.53%	2.37%	0.03%	0.06%	0.84%	0.38%	3.56%	2.41%	2.63%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data											
Call drop rate	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		1296	1113	1231	1402	1258	1263	No Service	1268	1441	1248
Total number of calls dropped		5	1	8	2	0	2	No Service	3	1	1
Call drop rate	≤ 2%	0.39%	0.09%	0.65%	0.14%	0.00%	0.16%	No Service	0.24%	0.07%	0.08%

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	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		43808054066	48821488298	18000	23615726651	199723	NA	18623970926	294041960	23950053203	52428329277
Total number of calls with good voice quality		42467196193	47575236872	17962	23030210313	199652	NA	18457574032	291905788	23560409121	50987064787
%age calls with good voice quality	≥ 95%	96.94%	97.45%	99.79%	97.52%	99.96%	99.01%	99.11%	99.27%	98.37%	97.25%
Live measurement results for Voice quality-3 Day data											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		1825335586	11422085214	1800	983988610	8322	NA	775998789	12251748	997918883	2184513720
Total number of calls with good voice quality		1769466508	11166620194	1782	959592096	8319	NA	769065585	12162741	981683713	2124461033
%age calls with good voice quality	≥ 95%	96.94%	97.76%	99.00%	97.52%	99.96%	99.17%	99.11%	99.27%	98.37%	97.25%
Drive test results for Voice quality (Average of three drive tests) - DT data											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		349382	257717	1841922	2051118	NA	1682568	No Service	NA	2838385	331755
Total number of calls with good voice quality		317063	247922	1752129	1956755	NA	1682302	No Service	NA	2681501	327132
%age calls with good voice quality	≥ 95%	90.75%	96.20%	95.13%	95.40%	99.58%	99.98%	No Service	97.68%	94.47%	98.61%

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	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		49	32	79	93	40	12	29	41	30	45
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		203436	238053	1374939	176578	110238	24459	35631	66432	38799	572309
Traffic served for all POIs (B)- in erlangs		85328	118953	35234	101676	33936	7820	21603	28770	23785	304155
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		49	32	79	94	40	12	29	41	30	45
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		169566	109045	1327328	175208	109822	24459	33223	65409	38225	572155
Traffic served for all POIs (B)- in erlangs		56410	68289	33501	100150	33099	4724	18710	16826	11951	163281
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

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

11.6 ADDITIONAL NETWORK RELATED PARAMETERS

Audit Results for Total Traffic Handled in Erlang										
Traffic in Erlang	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Eqipped capacity of the network	86557	113525	136000	68372	50400	56000	88000	18737	98423	147210
Total taffic handled in erlang during TCBH	70117	69275	49656	42489	11776	21530	43362	2011	45183	102388
Total no. of customers served (as per VLR)	2337315	3865189	686413	1798619	472170	899925	3484961	87266	2147048	4154142

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

12 ANNEXURE – CONSOLIDATED-3G

12.1 NETWORK AVAILABILITY

Audit Results for Network Availability- PMR data						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
(Number of Node Bs in the network in the licensed service area		5092	6819	2091	3642	7854
Sum of downtime (i.e. total outage time) of Node Bs		8326	208	615	6675	6011
Node Bs downtime (not available for service)	≤ 2%	0.22%	0.00%	0.04%	0.25%	0.10%
Number of Node Bs having accumulated downtime of >24 hours in a month		32	0	105	35	34
Worst affected Node Bs due to downtime	≤ 2%	0.63%	0.00%	5.02%	0.96%	0.43%
Live Measurement Results for Network Availability- 3 Day live data						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
(Number of Node Bs in the network in the licensed service area		5069	6601	2062	3287	7920
Sum of downtime (i.e. total outage time) of Node Bs		951	179	1175	361	648
Node Bs downtime (not available for service)	≤ 2%	0.26%	0.04%	0.79%	0.15%	0.11%
Number of Node Bs having accumulated downtime of >24 hours in a month		6	0	15	4	5
Worst affected Node Bs due to downtime	≤ 2%	0.12%	0.00%	0.73%	0.12%	0.06%

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

12.2 CONNECTION ESTABLISHMENT (ACCESSIBILITY)

Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
CSSR	≥ 95%	97.31%	99.50%	98.05%	99.87%	99.97%
RRC Congestion	≤ 1%	0.88%	0.00%	1.12%	0.00%	0.03%
Circuit Switched RAB Congestion	≤ 2%	0.52%	0.01%	2.60%	0.01%	0.01%
Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
CSSR	≥ 95%	95.80%	98.67%	96.14%	99.87%	99.96%
RRC Congestion	≤ 1%	6.80%	0.00%	0.95%	0.00%	0.04%
Circuit Switched RAB Congestion	≤ 2%	0.32%	0.00%	1.29%	0.02%	0.01%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data						
CSSR	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
Total number of RRC attempts (A)		796	NA	1200	NA	1246
Total number of RRC established (B)		796	NA	1186	NA	1245
Call setup success rate (B/A*100)	≥ 95%	100.00%	NA	98.83%	NA	99.92%
%age blocked calls		0.00%	NA	1.17%	NA	0.08%

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

12.3 CONNECTION MAINTENANCE (RETAINABILITY)

Audit Results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate -PMR data						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		44715289	NDR	646610029	6978039	116287539
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		197048	NDR	14903301	19876	380886
Call drop rate (B/A*100)	≤ 2%	0.44%	0.34%	2.30%	0.28%	0.33%
Total no. of cells in the licensed service area (B)		15241	20532	6280	10991	23198
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		443	562	164	49	457
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	2.91%	2.74%	2.61%	0.45%	1.97%
Live measurement results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate - 3 Day data						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		57074026	NDR	9294312	9469866	157887433
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		221905	NDR	32020	30817	586422
Call drop rate (B/A*100)	≤ 2%	0.39%	0.30%	0.34%	0.33%	0.37%
Total no. of cells in the licensed service area (B)		15109	20001	6663	9920	23141
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		489	502	27	20	473
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	3.23%	2.51%	0.41%	0.20%	2.04%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data						
Call drop rate	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		1210	NA	1186	NA	1245
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		4	NA	16	NA	0
Call drop rate (B/A*100)	≤ 2%	0.33%	NA	1.35%	NA	0.00%

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

12.4 VOICE QUALITY

Audit Results for Voice quality -PMR Data						
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Vodafone 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		231111544769	NDR	18000	22202458500	263114263045
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		227160628657	NDR	17962	22165473395	260055820916
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.29%	99.36%	99.79%	99.83%	98.84%
Live measurement results for Voice quality-3 Day data						
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Vodafone 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		9629647699	NDR	1800	925102438	10963094294
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		9465026194	NDR	1782	923561391	10835659205
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.29%	98.87%	99.00%	99.83%	98.84%
Drive test results for Voice quality (Average of three drive tests) - DT data						
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Vodafone 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		339083	NA	1694990	NA	410941
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		292000	NA	1571711	NA	403039
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	86.11%	NA	92.73%	NA	98.08%

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

12.5 POI CONGESTION

Audit Results for POI Congestion- PMR data						
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
Total number of working POIs		147	0	237	280	135
No. of POIs not meeting benchmark		0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		203436	0	1374939	176578	572309
Traffic served for all POIs (B)- in erlangs		85328	0	35234	101676	304155
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data						
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
Total number of working POIs		147	0	237	280	135
No. of POIs not meeting benchmark		0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		202356	0	1321682	173208	572126
Traffic served for all POIs (B)- in erlangs		56004	0	33951	99120	161056
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%

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

12.6 ADDITIONAL NETWORK RELATED PARAMETERS

Audit Results for Total Traffic Handled in Erlang						
Traffic in Erlang		Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
Eqipped capacity of the network		0	0	22120	0	0
Total taffic handled in erlang during TCBH		5141	25856	10607	2182	343499
Total no. of customers served (as per VLR)		567618	618619	66805	114714	930741

13 ANNEXURE – CUSTOMER SERVICES

13.1 METERING AND BILLING CREDIBILITY

Audit Results for Billing performance Postpaid-Consolidated											
Billing Performance	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Metering and billing credibility - Postpaid (Avg of 3 billing cycles)											
Metering and billing credibility - Postpaid											
Total bills generated during the period		19576	1396404	258260	183007	140630	172251	237718	30565	138501	2837416
Total number of bills disputed		14	1057	34	1125	95	130	210	0	1	1423
Total number of valid billing complaints		0	291	30	160	51	122	210	0	1	812
Total complaints considered invalid		14	766	4	965	44	8	0	0	0	611
Percentage bills disputed (Avg of 3 billing cycles)	≤ 0.1%	0.07%	0.08%	0.01%	0.61%	0.07%	0.07%	0.09%	0.00%	0.00%	0.05%
January											
Total bills generated during the first billing cycle		6583	456841	86715	59642	48294	59811	76305	10344	47863	919913
Total number of bills disputed in first billing cycle		2	362	9	363	29	53	69	0	0	558
Total number of valid billing complaints (billing cycle 1)		0	109	8	58	12	53	69	0	0	306
Total complaints considered invalid (billing cycle 1)		2	253	1	305	17	0	0	0	0	252
Percentage bills disputed (first billing cycle)	≤ 0.1%	0.03%	0.08%	0.01%	0.61%	0.06%	0.09%	0.09%	0.00%	0.00%	0.06%
February											
Total bills generated during the second billing cycle		6556	460881	86292	60903	48980	57659	79695	10167	45606	945801
Total number of bills disputed in second billing cycle		7	382	6	377	24	50	70	0	0	384
Total number of valid billing complaints (billing cycle 2)		0	92	3	50	16	50	70	0	0	214
Total complaints considered invalid (billing cycle 2)		7	290	3	327	8	0	0	0	0	170
Percentage bills disputed (second billing cycle)	≤ 0.1%	0.11%	0.08%	0.01%	0.62%	0.05%	0.09%	0.09%	0.00%	0.00%	0.04%

March											
Total bills generated during the third billing cycle		6437	478682	85253	62462	43356	54781	81718	10054	45032	971702
Total number of bills disputed in third billing cycle		5	313	19	385	42	27	71	0	1	481
Total number of valid billing complaints (billing cycle 3)		0	90	19	52	23	19	71	0	1	292
Total complaints considered invalid (billing cycle 3)		5	223	0	333	19	8	0	0	0	189
Percentage bills disputed (third billing cycle)	≤ 0.1%	0.08%	0.07%	0.02%	0.62%	0.10%	0.05%	0.09%	0.00%	0.00%	0.05%

Data Source: Billing Center of the operators

Metering and billing credibility - Prepaid											
Performance prepaid	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of charging complaints (valid) - sum of 3 months		6788	81	854	667	90	135	3154	0	1	684
Total complaints considered invalid (sum of 3 months)		2	1398	19	5399	74	114	0	0	0	1246
Total number of charging complaints (sum of 3 months)		6790	1479	873	6066	164	249	3154	0	1	1930
Total no of customers served (Sum of 3 months)		12256467	12353231	2048189	6292012	492059	2815494	10529063	599547	2834686	4585521
Percentage of charging complaints disputed	≤ 0.1%	0.06%	0.01%	0.04%	0.10%	0.03%	0.01%	0.03%	0.00%	0.00%	0.04%

Data Source: Billing Center of the operators

Resolution of billing complaints (Postpaid+Prepaid)-Consolidated											
Billing Performance	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of billing/charging complaints		6804	2536	907	13555	377	636	3364	NA	2	3353
Total number of complaints resolved in favour of customer		2	372	884	7191	259	379	3364	NA	2	1496
Total complaints considered invalid		6802	2164	23	6364	118	257	0	NA	0	1857
Number of complaints resolved in 4 weeks		2	372	883	7191	259	379	3364	NA	2	1496
Percentage complaints resolved within 4 weeks	≥ 98%	100.00%	100.00%	99.89%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Number of complaints resolved in 6 weeks		2	372	884	7191	259	379	3364	0	2	1496
Percentage complaints resolved within 6 weeks	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Period of applying credit / waiver											
Total number of complaints where credit/waiver is required		2	372	225	827	141	257	3364	0	2	332
Percentage cases in which credit/waiver was received within 1 week	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Live calling results for resolution of billing complaints											
Resolution of billing complaints	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total Number of calls made		100	100	100	100	100	100	100	25	100	100
Number of cases resolved in 4 weeks		98	97	99	99	97	96	99	25	99	100
Percentage cases resolved in 4 weeks	≥ 98%	98.00%	97.00%	99.00%	99.00%	97.00%	96.00%	99.00%	100.00%	99.00%	100.00%
Number of cases resolved in 6 weeks		100	100	100	99	97	96	99	25	99	100
Percentage cases resolved in 6 weeks	100.00%	100.00%	100.00%	100.00%	99.00%	97.00%	96.00%	99.00%	100.00%	99.00%	100.00%

Data Source: Billing Center of the operators

13.2 CUSTOMER CARE

Audit results for customer care (IVR and voice-to-Voice) -Consolidated											
Customer Care Assessment	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of call attempts to customer care for assistance		9856732	866574	1985728	5057237	799471	886905	4417111	31238	459292	6354646
Number of calls getting connected and answered (electronically)		9634245	834344	1916548	4970788	792641	879721	4406474	31036	456022	6354646
Percentage calls getting connected and answered	≥ 95%	97.74%	96.28%	96.52%	98.29%	99.15%	99.19%	99.76%	99.35%	99.29%	100.00%
Audit results for customer care (voice-to-Voice)- (Avg of 3 months)-Consolidated											
Customer Care Assessment	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total Number of calls received (3 months)		2574731	1733940	34910	1622635	274099	364922	992991	32950	701548	2430598
Total Number of calls answered within 90 seconds (3 months)		2309615	1155626	33182	1606236	261450	341770	938724	32479	654343	2386014
Percentage calls answered within 90 seconds (Avg of 3 months)	≥ 95%	89.70%	66.65%	95.05%	98.99%	95.39%	93.66%	94.53%	98.57%	93.27%	98.17%
January											
Total calls received (Month 1)		852214	590556	12197	570827	93874	108436	337477	12381	236615	798500
Total calls answered within 90 seconds (Month 1)		810298	397748	11206	559921	89366	106495	330866	12261	225317	787524
% calls answered within 90 seconds (Month 1)	≥ 95%	95.08%	67.35%	91.88%	98.09%	95.20%	98.21%	98.04%	99.03%	95.23%	98.63%
February											
Total calls received (Month 2)		816117	553585	11478	524955	89492	102376	336732	9881	213985	800640
Total calls answered within 90 seconds (Month 2)		638133	366057	11136	523113	85075	97262	317640	9792	201738	784986
% calls answered within 90 seconds (Month 2)	≥ 95%	78.19%	66.12%	97.02%	99.65%	95.06%	95.00%	94.33%	99.10%	94.28%	98.04%
March											
Total calls received (Month 3)		906400	589799	11235	526853	90733	154110	318782	10688	250948	831458
Total calls answered within 90 seconds (Month 3)		861184	391821	10840	523202	87009	138013	290218	10426	227288	813504
% calls answered within 90 seconds (Month 3)	≥ 95%	95.01%	66.43%	96.48%	99.31%	95.90%	89.55%	91.04%	97.55%	90.57%	97.84%

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

13.3 TERMINATION / CLOSURE OF SERVICE

Audit results for termination / closure of service-Consolidated											
Termination	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of closure request		141	8677	11144	3262	2548	1266	1707	652	2267	18610
Number of requests attended within 7 days		141	8677	11144	3262	2548	1266	1707	652	2267	18610
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%	100.00%	100.00%	100.00%

Data Source: Customer Service Center of the operators

13.4 TIME TAKEN FOR REFUND OF DEPOSITS AFTER CLOSURE

Audit results for refund of deposits-Consolidated											
Refund	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of cases requiring refund of deposits		342	NA	130	1481	NA	1167	1465	82	100	17177
Total number of cases where refund was made within 60 days		342	NA	130	1481	NA	1167	1465	82	100	16533
Percentage cases in which refund was receive within 60 days	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	96.25%

Data Source: Billing Center of the operators

13.5 LIVE CALLING RESULTS FOR RESOLUTION OF SERVICE REQUESTS

Live calling results for resolution of service requests										
Resolution of service requests	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total Number of calls made	100	100	100	100	100	100	100	89	100	100
Number of cases resolved to satisfaction	98	97	95	97	95	97	98	87	100	100
Percentage cases resolved in four weeks	98.00%	97.00%	95.00%	97.00%	95.00%	97.00%	98.00%	97.75%	100.00%	100.00%

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

13.6 LIVE CALLING RESULTS FOR LEVEL 1 SERVICES

Live calling for level 1 services											
Level 1 services		Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total no. of calls made		300	300	300	300	300	300	300	300	300	300
Calls answered		293	116	233	282	147	278	234	250	253	180
% of calls connected	≥ 95%	97.67%	38.67%	77.67%	94.00%	49.00%	92.67%	78.00%	83.33%	84.33%	60.00%

13.7 LEVEL 1 SERVICE CALLS MADE

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

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

Aircel					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		18	18
101	Fire		N		
102	Ambulance	Y		18	17
104	Health Information Helpline	Y		18	17
108	Emergency and Disaster Management Helpline		N		
138	All India Helpine for Passangers	Y		18	17
1412	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline	Y		17	17
1033	Road Accident Management Service	Y		18	18
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		

1064	Anti Corruption Helpline		N		
1070	Relief Commission for Natural Calamities	Y		18	18
1071	Air Accident Helpline	Y		18	17
1072	Rail Accident Helpline	Y		17	17
1073	Road Accident Helpline		N		
1077	Control Room for District Collector		N		
10120	Call Alart (Crime Branch)	Y		17	17
10121	Women Helpline	Y		17	17
10127	National AIDS Helpline to NACO	Y		18	17
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		18	18
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway	Y		17	17
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline	Y		18	17
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
11203	Sashastra Seema Bal (SSB)		N		
112012	National Do Not Call Registry	Y		17	17
11212	Complaint of Electricity		N		

11216	Drinking Water Supply		N		
11250	Election Commission of India	Y		18	17
Airtel					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		19	8
101	Fire		N		
102	Ambulance		N		
104	Health Information Helpline	Y		19	7
108	Emergency and Disaster Management Helpline	Y		19	7
138	All India Helpine for Passangers		N		
1412	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline	Y		19	8
1033	Road Accident Management Service	Y		19	7
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq	Y		19	8
1064	Anti Corruption Helpline		N		
1070	Relief Commission for Natural Calamities		N		
1071	Air Accident Helpline		N		
1072	Rail Accident Helpline	Y		19	7

1073	Road Accident Helpline	Y		19	7
1077	Control Room for District Collector		N		
10120	Call Alart (Crime Branch)	Y		19	8
10121	Women Helpline		N		
10127	National AIDS Helpline to NACO	Y		19	7
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		18	7
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project	Y		19	7
1512	Prevention of Crime in Railway	Y		19	7
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline	Y		18	7
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
11203	Sashastra Seema Bal (SSB)		N		
112012	National Do Not Call Registry		N		
11212	Complaint of Electricity	Y		18	7
11216	Drinking Water Supply		N		
11250	Election Commission of India	Y		18	7

BSNL

Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected

100	Police	Y		20	16
101	Fire	Y		20	15
102	Ambulance		N		
104	Health Information Helpline	Y		20	16
108	Emergency and Disaster Management Helpline		N		
138	All India Helpine for Passangers	Y		20	16
1412	Public Road Transport Utility Service	Y		20	15
181	Chief Minister Helpline	Y		20	16
182	Indian Railway Security Helpline		N		
1033	Road Accident Management Service		N		
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services	Y		20	15
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti Corruption Helpline	Y		20	15
1070	Relief Commission for Natural Calamities		N		
1071	Air Accident Helpline		N		
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline	Y		20	16
1077	Control Room for District Collector		N		
10120	Call Alart (Crime Branch)	Y		20	16
10121	Women Helpline	Y		20	15
10127	National AIDS Helpline to NACO		N		

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		N		
10741	Pollution Control Board	Y		20	15
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway		N		
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline	Y		20	16
155304	Municipal Corporations		N		
155214	Labour Helpline	Y		20	16
11203	Sashastra Seema Bal (SSB)		N		
112012	National Do Not Call Registry		N		
11212	Complaint of Electricity	Y		20	15
11216	Drinking Water Supply		N		
11250	Election Commission of India		N		

Idea

Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		20	19
101	Fire	Y		20	18
102	Ambulance		N		
104	Health Information Helpline		N		

108	Emergency and Disaster Management Helpline		N		
138	All India Helpine for Passangers	Y		20	19
1412	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline	Y		20	19
1033	Road Accident Management Service		N		
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti Corruption Helpline		N		
1070	Relief Commission for Natural Calamities	Y		20	19
1071	Air Accident Helpline	Y		20	18
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline	Y		20	19
1077	Control Room for District Collector		N		
10120	Call Alart (Crime Branch)	Y		20	19
10121	Women Helpline	Y		20	19
10127	National AIDS Helpline to NACO		N		
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		20	18
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway	Y		20	19
1514	National Career Service(NCS)	Y		20	19
15100	Free Legal Service Helpline		N		
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
11203	Sashastra Seema Bal (SSB)		N		
112012	National Do Not Call Registry	Y		20	19
11212	Complaint of Electricity	Y		20	19
11216	Drinking Water Supply		N		
11250	Election Commission of India	Y		20	19
MTS					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		22	11
101	Fire		N		
102	Ambulance	Y		21	10
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline	Y		22	11
138	All India Helpine for Passangers	Y		22	11
1412	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		

182	Indian Railway Security Helpline		N		
1033	Road Accident Management Service	Y		22	10
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		21	10
1073	Road Accident Helpline	Y		22	11
1077	Control Room for District Collector		N		
10120	Call Alart (Crime Branch)	Y		21	11
10121	Women Helpline		N		
10127	National AIDS Helpline to NACO	Y		21	10
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		N		
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		

1512	Prevention of Crime in Railway	Y		22	10
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline	Y		21	11
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
11203	Sashastra Seema Bal (SSB)		N		
112012	National Do Not Call Registry	Y		21	10
11212	Complaint of Electricity	Y		21	10
11216	Drinking Water Supply		N		
11250	Election Commission of India	Y		21	11
Reliance CDMA					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		19	18
101	Fire		N		
102	Ambulance	Y		19	17
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline	Y		19	18
138	All India Helpine for Passangers	Y		19	17
1412	Public Road Transport Utility Service		N		
181	Chief Minister Helpline	Y		18	18
182	Indian Railway Security Helpline	Y		19	17
1033	Road Accident Management Service		N		
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		

1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti Corruption Helpline		N		
1070	Relief Commission for Natural Calamities	Y		18	18
1071	Air Accident Helpline		N		
1072	Rail Accident Helpline	Y		19	17
1073	Road Accident Helpline		N		
1077	Control Room for District Collector	Y		18	17
10120	Call Alart (Crime Branch)		N		
10121	Women Helpline		N		
10127	National AIDS Helpline to NACO		N		
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		N		
10741	Pollution Control Board	Y		19	17
1511	Police Related Service for all Metro Railway Project	Y		19	17
1512	Prevention of Crime in Railway	Y		18	17
1514	National Career Service(NCS)	Y		19	18
15100	Free Legal Service Helpline		N		
155304	Municipal Corporations	Y		19	17
155214	Labour Helpline		N		

11203	Sashastra Seema Bal (SSB)		N		
112012	National Do Not Call Registry		N		
11212	Complaint of Electricity	Y		19	18
11216	Drinking Water Supply	Y		19	17
11250	Election Commission of India		N		
Reliance GSM					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		20	15
101	Fire		N		
102	Ambulance	Y		20	15
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpine for Passangers				
1412	Public Road Transport Utility Service		N		
181	Chief Minister Helpline	Y		20	16
182	Indian Railway Security Helpline	Y		20	16
1033	Road Accident Management Service		N		
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti Corruption Helpline		N		

1070	Relief Commission for Natural Calamities	Y		20	16
1071	Air Accident Helpline		N		
1072	Rail Accident Helpline	Y		20	16
1073	Road Accident Helpline	Y		20	15
1077	Control Room for District Collector		N		
10120	Call Alart (Crime Branch)		N		
10121	Women Helpline	Y		20	16
10127	National AIDS Helpline to NACO		N		
101212	Central Accident and Trauma Services (CATS)	Y		20	16
10580	Educationa & Vocational Guidance and Counselling		N		
105812	Mother and Child Tracking (MCTH)		N		
10740	Central Pollution Control Board	Y		20	15
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project	Y		20	15
1512	Prevention of Crime in Railway	Y		20	15
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline	Y		20	16
155304	Municipal Corporations	Y		20	16
155214	Labour Helpline		N		
11203	Sashastra Seema Bal (SSB)		N		
112012	National Do Not Call Registry		N		
11212	Complaint of Electricity	Y		20	16
11216	Drinking Water Supply		N		

11250	Election Commission of India		N		
TATA CDMA					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		20	17
101	Fire	Y		20	17
102	Ambulance	Y		20	16
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpine for Passangers	Y		20	17
1412	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline	Y		20	17
1033	Road Accident Management Service		N		
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services	Y		20	16
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti Corruption Helpline		N		
1070	Relief Commission for Natural Calamities	Y		20	17
1071	Air Accident Helpline	Y		20	16
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline	Y		20	17

1077	Control Room for District Collector		N		
10120	Call Alart (Crime Branch)	Y		20	17
10121	Women Helpline	Y		20	17
10127	National AIDS Helpline to NACO	Y		20	16
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		N		
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway	Y		20	17
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline		N		
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
11203	Sashastra Seema Bal (SSB)		N		
112012	National Do Not Call Registry	Y		20	17
11212	Complaint of Electricity		N		
11216	Drinking Water Supply		N		
11250	Election Commission of India	Y		20	16
TATA GSM					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		23	20

101	Fire	Y		23	19
102	Ambulance		N		
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpine for Passangers	Y		23	20
1412	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline	Y		24	19
1033	Road Accident Management Service		N		
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti Corruption Helpline		N		
1070	Relief Commission for Natural Calamities	Y		23	20
1071	Air Accident Helpline		N		
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline				
1077	Control Room for District Collector		N		
10120	Call Alart (Crime Branch)	Y		23	19
10121	Women Helpline	Y		23	20
10127	National AIDS Helpline to NACO		N		

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		N		
10741	Pollution Control Board	Y		23	19
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway		N		
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline	Y		23	20
155304	Municipal Corporations	Y		23	20
155214	Labour Helpline		N		
11203	Sashastra Seema Bal (SSB)	Y		23	19
112012	National Do Not Call Registry	Y		23	19
11212	Complaint of Electricity		N		
11216	Drinking Water Supply		N		
11250	Election Commission of India	Y		23	19
Vodafone					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		19	11
101	Fire	Y		18	11
102	Ambulance		N		
104	Health Information Helpline	Y		19	11

108	Emergency and Disaster Management Helpline		N		
138	All India Helpine for Passangers	Y		18	11
1412	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline	Y		19	11
1033	Road Accident Management Service		N		
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services	Y		18	11
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti Corruption Helpline		N		
1070	Relief Commission for Natural Calamities		N		
1071	Air Accident Helpline		N		
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline	Y		19	11
1077	Control Room for District Collector		N		
10120	Call Alart (Crime Branch)	Y		19	12
10121	Women Helpline	Y		19	11
10127	National AIDS Helpline to NACO		N		
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		19	11
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway	Y		19	12
1514	National Career Service(NCS)	Y		19	11
15100	Free Legal Service Helpline	Y		18	12
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
11203	Sashastra Seema Bal (SSB)	Y		19	11
112012	National Do Not Call Registry	Y		19	12
11212	Complaint of Electricity		N		
11216	Drinking Water Supply		N		
11250	Election Commission of India	Y		19	11

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

13.8 COUNTER DETAILS

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

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

13.8.1 ERICSSON

Ericsson provides network support to Vodafone, Aircel, BSNL, Reliance CDMA 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.

13.8.2 NSN (NOKIA SIEMENS NETWORKS)

NSN provides network support to Airtel in the circle.

Sl No.	KPI	NSN
1	CSSR= (No of established Calls / No of Attempted Calls)%	CSSR= 100-100*((SDCCH_BUSY_ATT)-(TCH_SEIZ_DUE_SDCCH_CON) + (SDCCH_RADIO_FAIL)+(SDCCH_RF_OLD_HO)+(SDCCH_USER_ACT)+(SDCCH_BCSU_RESET)+(SDCCH_NETW_ACT)+(SDCCH_BTS_FAIL)+(SDCCH_LAPD_FAIL)+ (BLCK_8I_NOM)/ {(CH_REQ_MSG_REC)+(PACKET_CH_REQ)}-{(GHOST_CCCH_RES)-(REJ_SEIZ_ATT_DUE_DIST)}
2	SDCCH congestion= (SDCCH Failure/SDCCH attempts)%	SDCCH congestion = (sdcch_busy_att - .tch_seiz_due_sdcch_con)/{(CH_REQ_MSG_REC)+(PACKET_CH_REQ)}-{(GHOST_CCCH_RES)-(REJ_SEIZ_ATT_DUE_DIST)}
3	TCH congestion= (TCH Failures /TCH Attempts)%	TCH congestion = BLCK_8I_NOM / {(TCH_NORM_SEIZ)+(MSC_I_SDCCH_TCH_AT)+(BSC_I_SDCCH_TCH_AT)}

4	Call Drop Rate= (The total no of dropped calls*100)/Total no of calls successfully established (where traffic channel is allotted)	TCH Drop = (drop_after_tch_assign)-(tch_re_est_release) / {(TCH_NORM_SEIZ)+(MSC_I_SDCCH_TCH_AT)+(BSC_I_SDCCH_TCH_AT)}
5	Call Drop Rate= (No of cells having call drop rate >3% during CBBH in a month*100)/Total no of cells in the licensed service area	Above formula with counters being used in CBBH.
6	Connection with good quality voice= (Connection with good quality voice/Total voice samples)%	Connection with good quality voice= (FREQ_DL_QUAL0+FREQ_DL_QUAL1+FREQ_DL_QUAL2+FREQ_DL_QUAL3+FREQ_DL_QUAL4+FREQ_DL_QUAL5) / (FREQ_DL_QUAL0+FREQ_DL_QUAL1+FREQ_DL_QUAL2+FREQ_DL_QUAL3+FREQ_DL_QUAL4+FREQ_DL_QUAL5+FREQ_DL_QUAL6+FREQ_DL_QUAL7)

13.8.3 HUAWEI

Huawei provides network support to Idea, Tata GSM, Tata CDMA and MTS in the circle.

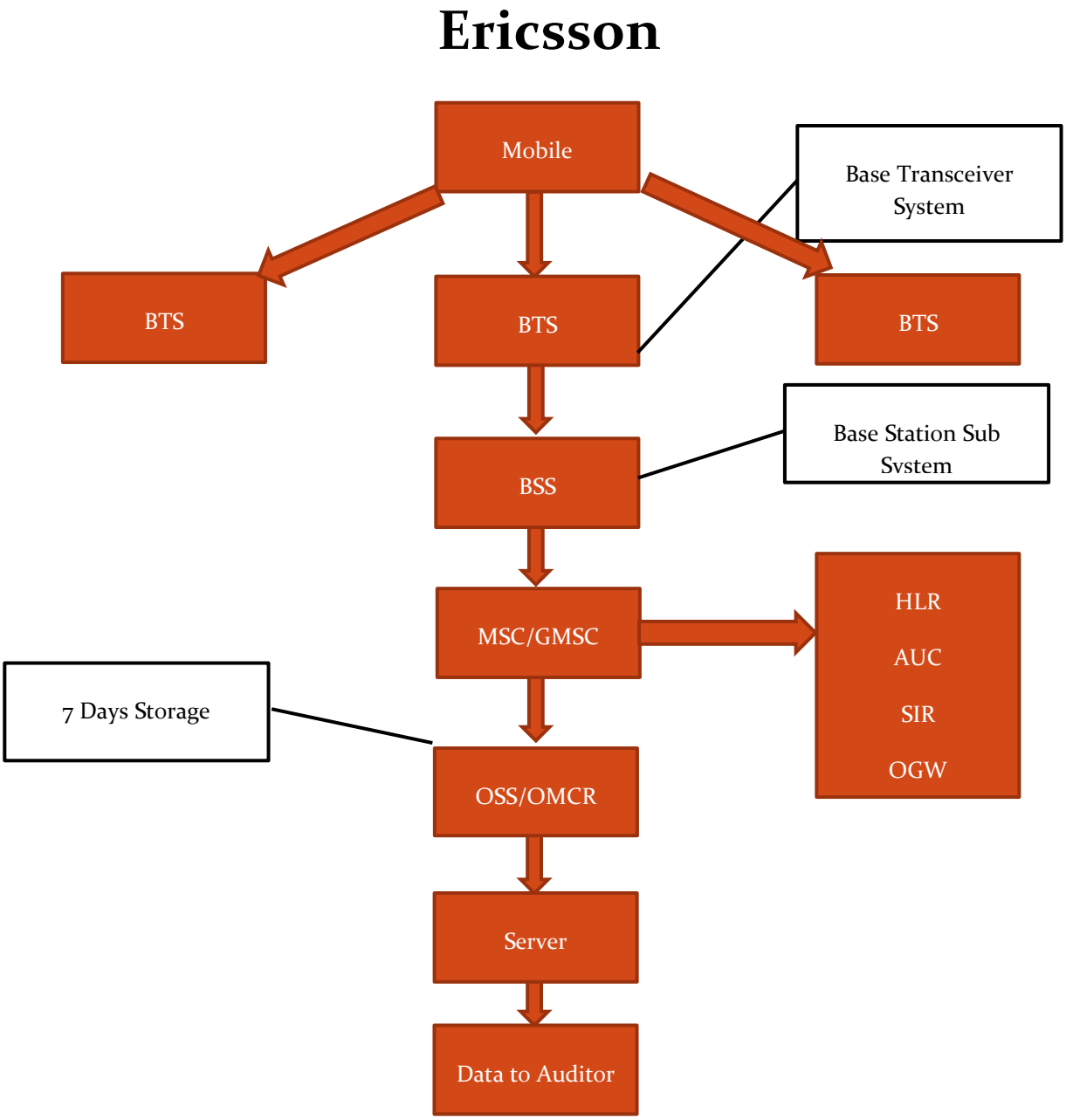
HUAWEI		
SR .NO	KPI	HUAWEI FORMULA
1	CALL SETUP SUCCES (NUM)	[Successful CS IS-95 Orig Call Setups + Successful CS IS-2000 Orig Call Setups + Successful CS IS-95 Term Call Setups + Successful CS IS-2000 Term Call Setups] ([1157628567] + [1157628587] + [1157628568] + [1157628588])
2	CALL SETUP SUCCES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

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

13.9 BLOCK SCHEMATIC DIAGRAMS

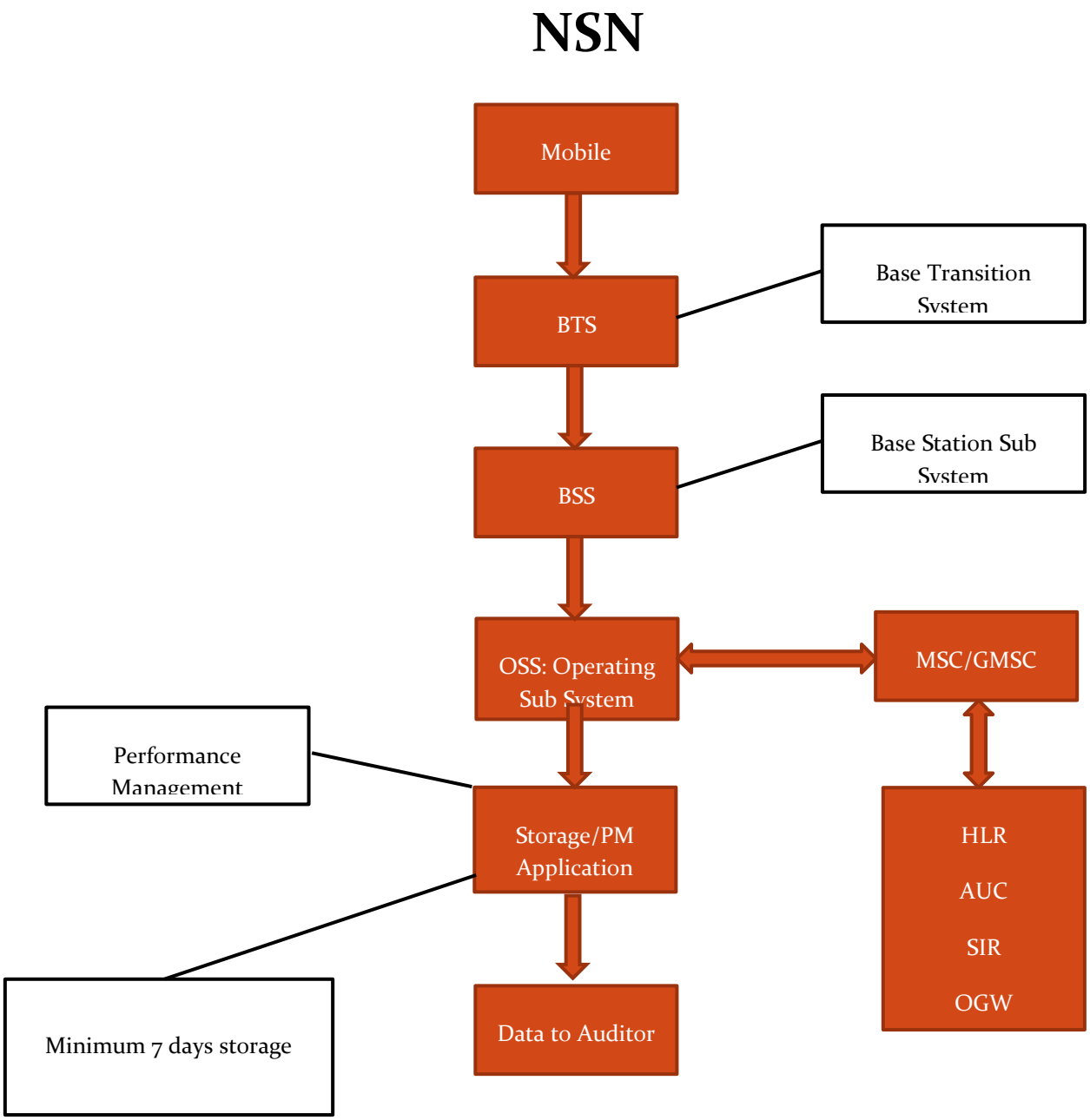
13.9.1 ERICSSON

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



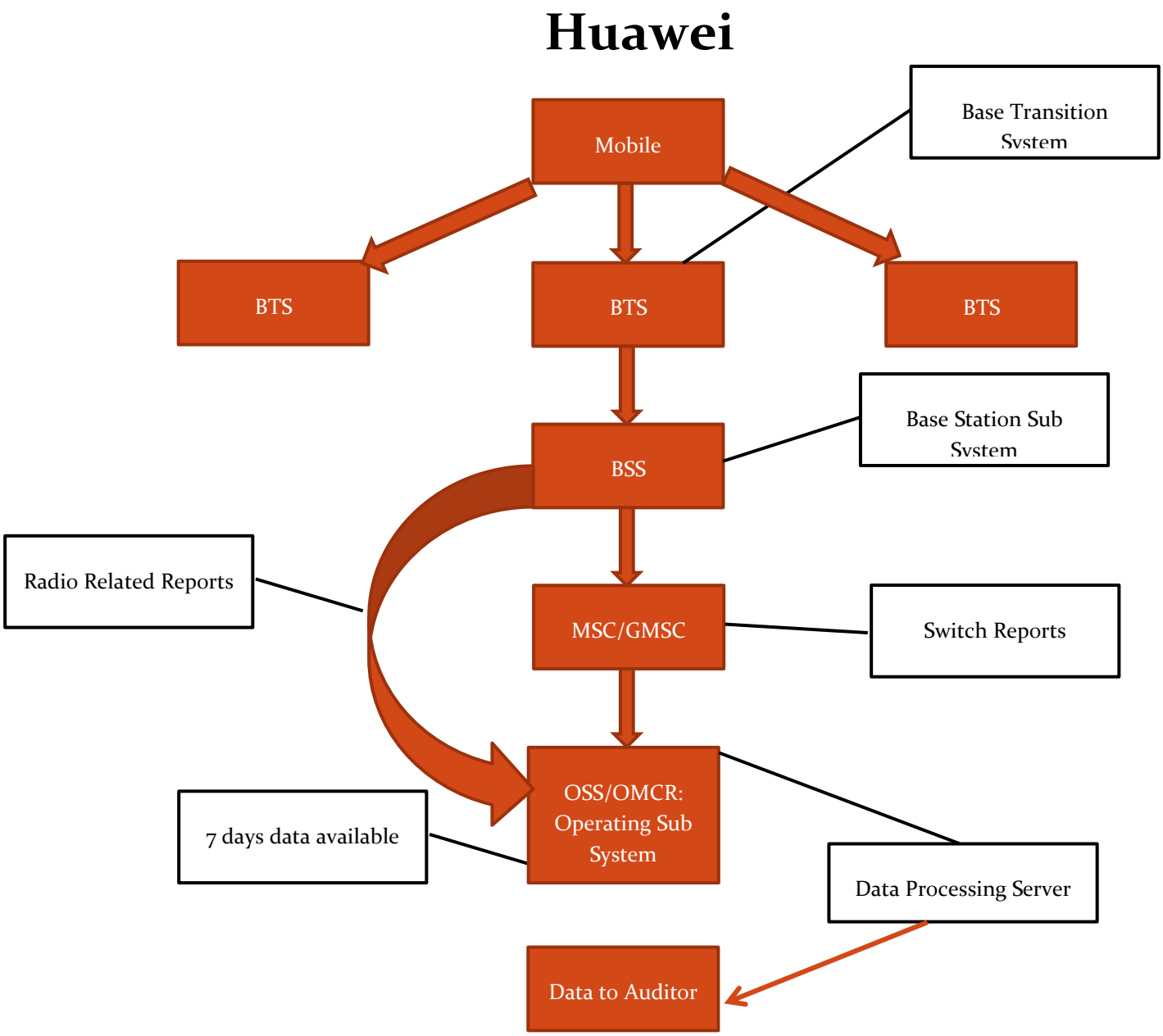
13.9.2 NSN (NOKIA SIEMENS NETWORKS)

NSN provides network support to Airtel in the circle.



13.9.3 HUAWEI

Huawei provides network support to Idea, Tata GSM, Tata CDMA and MTS in the circle.



14 ANNEXURE – JANUARY -2G

Audit Results for Network Availability- PMR data-January											
	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		2222	2773	1253	2145	572	456	1634	140	1810	2681
Sum of downtime of BTSs in a month (in hours)		3213	185	18350	1431	188	885	3054	35	1085	1446
BTSs accumulated downtime (not available for service)	≤ 2%	0.19%	0.01%	1.97%	0.09%	0.04%	0.26%	0.25%	0.03%	0.08%	0.07%
Number of BTSs having accumulated downtime >24 hours		19	0	52	11	0	0	12	0	6	8
Worst affected BTSs due to downtime	≤ 2%	0.86%	0.00%	4.15%	0.51%	0.00%	0.00%	0.73%	0.00%	0.33%	0.30%
Live Measurement Results for Network Availability- 3 Day live data-January											
	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		2216	2759	1235	2145	570	456	1634	140	1810	2663
Sum of downtime of BTSs in a month (in hours)		296	13	1084	220	15	117	184	4	154	261
BTSs accumulated downtime (not available for service)	≤ 2%	0.19%	0.01%	1.22%	0.14%	0.04%	0.36%	0.16%	0.04%	0.12%	0.14%
Number of BTSs having accumulated downtime >24 hours		0	0	9	3	0	0	0	0	0	1
Worst affected BTSs due to downtime	≤ 2%	0.00%	0.00%	0.73%	0.14%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%

Audit Results for CSSR, SDCCH and TCH congestion- PMR data-January											
CSSR	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
CSSR	≥ 95%	97.72%	99.84%	99.22%	99.48%	99.87%	97.30%	99.24%	99.12%	98.46%	99.57%
SDCCH/Paging channel congestion	≤ 1%	0.64%	0.02%	0.89%	0.07%	NA	NA	0.03%	NA	0.05%	0.05%
TCH congestion	≤ 2%	0.71%	0.03%	0.52%	0.08%	0.00%	1.18%	0.06%	0.01%	0.07%	0.43%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-January											
CSSR	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
CSSR	≥ 95%	98.16%	99.87%	99.13%	99.74%	99.90%	99.20%	99.45%	99.40%	98.49%	99.73%
SDCCH/Paging channel congestion	≤ 1%	1.07%	0.03%	0.25%	0.05%	NA	NA	0.04%	NA	0.09%	0.05%
TCH congestion	≤ 2%	0.27%	0.02%	1.06%	0.03%	0.00%	1.17%	0.01%	0.01%	0.05%	0.27%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-January											
CSSR	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of call attempts		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total number of successful calls established		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CSSR	≥ 95%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
%age blocked calls		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data-January											
Call drop rate	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		71959092	91076240	35295285	57166141	12586730	16269525	34887141	1325949	44185670	112815224
Total number of calls dropped		481399	1185584	345424	167324	62669	43838	31962	6704	276423	929552
Call drop rate	≤ 2%	0.67%	1.30%	0.98%	0.29%	0.50%	0.27%	0.09%	0.51%	0.63%	0.82%
Total number of cells in the network		6655	8166	3553	6408	2197	1368	4901	457	5316	6899
Total number of cells having more than 3% TCH		151	200	77	25	41	11	15	12	126	192
Worst affected cells having more than 3% TCH	≤ 3%	2.27%	2.45%	2.16%	0.39%	1.87%	0.81%	0.31%	2.57%	2.37%	2.78%
Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data-January											
Call drop rate	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		92794806	9008697	17362145	67342032	17917910	21172028	3287819	1742459	76841224	162516058
Total number of calls dropped		528921	59081	160856	159276	59780	48873	31484	6831	429632	1100568
Call drop rate	≤ 2%	0.57%	0.66%	0.93%	0.24%	0.33%	0.23%	0.96%	0.39%	0.56%	0.68%
Total number of cells in the network		6640	24381	3549	6409	2194	1368	4901	457	5315	6861
Total number of cells having more than 3% TCH		138	650	75	2	1	11	16	15	126	187
Worst affected cells having more than 3% TCH	≤ 3%	2.08%	2.67%	2.11%	0.03%	0.05%	0.79%	0.33%	3.30%	2.37%	2.72%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-January											
Call drop rate	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total number of calls dropped		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Call drop rate	≤ 2%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Audit Results for Voice quality -PMR Data-January											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		14365101620	17106002546	6000	7754137302	68023	NA	6179529452	97108602	6734551142	17743008296
Total number of calls with good voice quality		13946840842	16687939167	5986	7550112459	67995	NA	6123829250	96415681	6631838753	17207998472
%age calls with good voice quality	≥ 95%	97.09%	97.56%	99.77%	97.37%	99.96%	99.26%	99.10%	99.29%	98.47%	96.98%
Live measurement results for Voice quality-3 Day data-January											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		598545901	1591084218	600	323089054	2834	NA	257480394	4046192	280606298	739292012
Total number of calls with good voice quality		581118368	1551583040	594	314588019	2833	NA	255159552	4017320	276326615	716999936
%age calls with good voice quality	≥ 95%	97.47%	97.52%	99.00%	97.59%	99.87%	99.28%	99.25%	99.33%	98.79%	97.48%
Drive test results for Voice quality (Average of three drive tests) - DT data-January											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total number of calls with good voice quality		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
%age calls with good voice quality	≥ 95%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Audit Results for POI Congestion- PMR data-January											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		49	32	79	94	40	12	29	41	30	45
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		68064	81497	436020	55971	37071	8153	11877	22348	12747	190638
Traffic served for all POIs (B)- in erlangs		27781	39642	11425	32122	11080	2639	6934	9492	7473	97794
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-January											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		49	32	79	94	40	12	29	41	30	45
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		35182	24449	427866	55046	37039	8153	11877	22282	12677	190558
Traffic served for all POIs (B)- in erlangs		27668	18669	11321	31519	10965	1431	6649	5586	3850	52755
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

15 ANNEXURE – FEBRUARY-2G

Audit Results for Network Availability- PMR data-February											
	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		2233	2799	1253	2177	571	456	1634	140	1809	2684
Sum of downtime of BTSs in a month (in hours)		3824	286	15127	2525	240	1372	17686	15	1430	1738
BTSs accumulated downtime (not available for service)	≤ 2%	0.23%	0.01%	1.62%	0.16%	0.06%	0.40%	1.45%	0.01%	0.11%	0.09%
Number of BTSs having accumulated downtime >24 hours		15	0	46	16	0	0	0	0	3	14
Worst affected BTSs due to downtime	≤ 2%	0.67%	0.00%	3.67%	0.73%	0.00%	0.00%	0.00%	0.00%	0.17%	0.52%
Live Measurement Results for Network Availability- 3 Day live data-February											
	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		2233	2784	1256	2146	571	456	1634	140	1810	2681
Sum of downtime of BTSs in a month (in hours)		615	21	854	423	31	114	253	1	134	223
BTSs accumulated downtime (not available for service)	≤ 2%	0.38%	0.01%	0.94%	0.27%	0.07%	0.35%	0.21%	0.01%	0.10%	0.12%
Number of BTSs having accumulated downtime >24 hours		5	0	9	9	0	0	0	0	0	1
Worst affected BTSs due to downtime	≤ 2%	0.22%	0.00%	0.72%	0.42%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%

Audit Results for CSSR, SDCCH and TCH congestion- PMR data-February											
CSSR	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
CSSR	≥ 95%	97.38%	99.38%	99.20%	99.67%	99.86%	97.01%	98.72%	98.99%	99.32%	99.58%
SDCCH/Paging channel congestion	≤ 1%	0.88%	0.03%	0.37%	0.10%	NA	NA	0.06%	NA	0.07%	0.06%
TCH congestion	≤ 2%	0.61%	0.02%	0.54%	0.09%	0.00%	1.18%	0.09%	0.16%	0.12%	0.42%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-February											
CSSR	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
CSSR	≥ 95%	97.98%	99.36%	99.22%	99.78%	99.89%	97.04%	66.32%	99.29%	98.36%	99.72%
SDCCH/Paging channel congestion	≤ 1%	0.88%	0.02%	0.75%	0.09%	NA	NA	0.05%	NA	0.09%	0.07%
TCH congestion	≤ 2%	0.24%	0.02%	1.51%	0.04%	0.00%	1.17%	0.02%	0.01%	0.06%	0.28%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-February											
CSSR	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of call attempts		1304	1115	1245	1402	1258	1263	No Service	1268	1466	1248
Total number of successful calls established		1296	1113	1231	1401	1258	1197	No Service	1265	1441	1248
CSSR	≥ 95%	99.39%	99.82%	98.88%	99.93%	100.00%	94.77%	No Service	99.76%	98.29%	100.00%
%age blocked calls		0.61%	0.18%	1.12%	0.07%	0.00%	5.23%	No Service	0.24%	1.71%	0.00%

Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data-February											
Call drop rate	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		72931912	92202918	33591901	52218253	12434776	18656063	##############	1448043	59016699	111685617
Total number of calls dropped		503811	623946	347576	141501	62646	56634	31405	6370	375815	854737
Call drop rate	≤ 2%	0.69%	0.68%	1.03%	0.27%	0.50%	0.30%	0.00%	0.44%	0.64%	0.77%
Total number of cells in the network		6688	8241	3364	6507	2195	1368	4901	457	5302	6920
Total number of cells having more than 3% TCH		162	201	90	15	45	10	16	11	125	183
Worst affected cells having more than 3% TCH	≤ 3%	2.42%	2.44%	2.66%	0.23%	2.06%	0.74%	0.33%	2.41%	2.35%	2.65%
Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data-February											
Call drop rate	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		98434957	9770411	17074680	71801870	18613087	23734119	43022185	1838186	80767207	166922967
Total number of calls dropped		591565	66605	142508	175815	67717	66066	37238	7650	476356	1056998
Call drop rate	≤ 2%	0.60%	0.68%	0.83%	0.24%	0.36%	0.28%	0.09%	0.42%	0.59%	0.63%
Total number of cells in the network		6688	24550	3549	6412	2195	1368	4901	457	5313	6905
Total number of cells having more than 3% TCH		155	611	82	2	2	13	21	16	128	172
Worst affected cells having more than 3% TCH	≤ 3%	2.32%	2.49%	2.32%	0.03%	0.07%	0.95%	0.43%	3.43%	2.41%	2.50%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-February											
Call drop rate	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		1296	1113	1231	1402	1258	1263	No Service	1268	1441	1248
Total number of calls dropped		5	1	8	2	0	2	No Service	3	1	1
Call drop rate	≤ 2%	0.39%	0.09%	0.65%	0.14%	0.00%	0.16%	No Service	0.24%	0.07%	0.08%

Audit Results for Voice quality -PMR Data-February											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		14204605656	16165606925	6000	7802715045	63655	NA	5807826336	96853478	8581019915	17211932907
Total number of calls with good voice quality		13755201092	15738171022	5987	7615755151	63643	NA	5753548143	96150522	8435989889	16739637154
%age calls with good voice quality	≥ 95%	96.84%	97.36%	99.78%	97.60%	99.98%	98.99%	99.07%	99.27%	98.31%	97.26%
Live measurement results for Voice quality-3 Day data-February											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		591858569	1709841086	600	325113127	2652	NA	241992764	4035562	357542496	717163871
Total number of calls with good voice quality		573133379	1664501714	594	317323131	2652	NA	239731173	4006272	351499579	697484881
%age calls with good voice quality	≥ 95%	97.13%	97.35%	99.00%	97.76%	99.90%	99.29%	99.16%	99.32%	98.63%	97.71%
Drive test results for Voice quality (Average of three drive tests) - DT data-February											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		349382	257717	1841922	2051118	NA	1682568	No Service	NA	2838385	331755
Total number of calls with good voice quality		317063	247922	1752129	1956755	NA	1682302	No Service	NA	2681501	327132
%age calls with good voice quality	≥ 95%	90.75%	96.20%	95.13%	95.40%	99.58%	99.98%	No Service	97.68%	94.47%	98.61%

Audit Results for POI Congestion- PMR data-February											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		49	32	79	93	40	12	29	41	30	45
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		67783	81497	466336	56060	36483	8153	11877	22117	12645	191039
Traffic served for all POIs (B)- in erlangs		28930	39642	12113	34226	11672	2443	7442	9876	8283	104379
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-February											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		49	32	79	94	40	12	29	41	30	45
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		67045	27988	447866	56029	36479	8153	10673	22095	12423	191032
Traffic served for all POIs (B)- in erlangs		13318	24810	11621	34204	11527	973	7056	5668	4047	54955
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

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Audit Results for Network Availability- PMR data-March											
	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		2245	2815	1253	2298	571	456	1634	140	1809	2705
Sum of downtime of BTSs in a month (in hours)		2782	340	18156	2575	267	1702	17538	16	1050	2232
BTSs accumulated downtime (not available for service)	≤ 2%	0.17%	0.02%	1.95%	0.15%	0.06%	0.50%	1.44%	0.02%	0.08%	0.11%
Number of BTSs having accumulated downtime >24 hours		6	0	47	23	0	0	0	0	5	12
Worst affected BTSs due to downtime	≤ 2%	0.27%	0.00%	3.75%	1.00%	0.00%	0.00%	0.00%	0.00%	0.28%	0.44%
Live Measurement Results for Network Availability- 3 Day live data-March											
	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		2241	2806	1253	2190	571	456	1634	140	1809	2684
Sum of downtime of BTSs in a month (in hours)		234	0	681	232	12	247	1572	2	108	159
BTSs accumulated downtime (not available for service)	≤ 2%	0.15%	0.00%	0.75%	0.15%	0.03%	0.75%	1.34%	0.02%	0.08%	0.08%
Number of BTSs having accumulated downtime >24 hours		0	0	6	4	0	0	0	0	0	2
Worst affected BTSs due to downtime	≤ 2%	0.00%	0.00%	0.48%	0.18%	0.00%	0.00%	0.00%	0.00%	0.00%	0.07%

Audit Results for CSSR, SDCCH and TCH congestion- PMR data-March											
CSSR	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
CSSR	≥ 95%	97.11%	99.29%	99.18%	99.53%	99.83%	97.20%	98.00%	99.07%	99.34%	99.62%
SDCCH/Paging channel congestion	≤ 1%	0.98%	0.03%	0.89%	0.10%	NA	NA	0.10%	NA	0.08%	0.08%
TCH congestion	≤ 2%	0.50%	0.05%	0.64%	0.21%	0.00%	1.18%	0.11%	0.06%	0.10%	0.38%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-March											
CSSR	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
CSSR	≥ 95%	97.69%	99.34%	99.22%	99.71%	99.90%	97.45%	99.00%	99.21%	99.44%	99.76%
SDCCH/Paging channel congestion	≤ 1%	0.75%	0.02%	0.41%	0.07%	NA	NA	0.01%	NA	0.07%	0.05%
TCH congestion	≤ 2%	0.25%	0.02%	1.41%	0.09%	0.00%	0.07%	0.02%	0.08%	0.06%	0.24%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-March											
CSSR	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of call attempts		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total number of successful calls established		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CSSR	≥ 95%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
%age blocked calls		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data-March											
Call drop rate	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		76807119	95927347	35645366	55172201	13119195	18123936	35060321	1562414	63001240	117630166
Total number of calls dropped		499354	597897	276245	149362	64019	55738	29975	7082	388522	868839
Call drop rate	≤ 2%	0.65%	0.62%	0.77%	0.27%	0.49%	0.31%	0.09%	0.45%	0.62%	0.74%
Total number of cells in the network		6723	8296	3589	6872	2195	1368	4901	457	5305	6972
Total number of cells having more than 3% TCH		161	202	87	20	46	8	13	11	127	171
Worst affected cells having more than 3% TCH	≤ 3%	2.40%	2.43%	2.43%	0.29%	2.10%	0.58%	0.26%	2.51%	2.40%	2.46%
Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data-March											
Call drop rate	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		95300342	10296491	17134171	70330380	18166415	21365341	41672234	1791407	80113416	162618708
Total number of calls dropped		566611	62733	125641	165834	69314	57358	32005	8046	476462	1025651
Call drop rate	≤ 2%	0.59%	0.61%	0.73%	0.24%	0.38%	0.27%	0.08%	0.45%	0.59%	0.63%
Total number of cells in the network		6711	24789	3557	6546	2195	1368	4901	457	5306	6919
Total number of cells having more than 3% TCH		184	606	95	2	1	11	19	18	130	184
Worst affected cells having more than 3% TCH	≤ 3%	2.74%	2.44%	2.68%	0.03%	0.06%	0.78%	0.38%	3.94%	2.44%	2.66%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-March											
Call drop rate	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total number of calls dropped		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Call drop rate	≤ 2%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Audit Results for Voice quality -PMR Data-March											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		15238346790	15549878827	6000	8058874304	68045	NA	6636615138	100079880	8634482146	17473388074
Total number of calls with good voice quality		14765154259	15149126683	5989	7864342703	68014	NA	6580196639	99339584	8492580479	17039429161
%age calls with good voice quality	≥ 95%	96.89%	97.42%	99.82%	97.59%	99.95%	98.78%	99.15%	99.26%	98.36%	97.52%
Live measurement results for Voice quality-3 Day data-March											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		634931116	8121159910	600	335786429	2835	NA	276525631	4169995	359770089	728057836
Total number of calls with good voice quality		615214761	7950535440	594	327680946	2834	NA	274174860	4139149	353857520	709976215
%age calls with good voice quality	≥ 95%	97.41%	97.90%	99.00%	97.73%	99.89%	98.94%	99.24%	99.28%	98.62%	97.84%
Drive test results for Voice quality (Average of three drive tests) - DT data-March											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total number of calls with good voice quality		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
%age calls with good voice quality	≥ 95%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Audit Results for POI Congestion- PMR data-March											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		49	31	79	93	40	12	29	40	30	45
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		67590	75060	472583	64548	36684	8153	11877	21967	13406	190631
Traffic served for all POIs (B)- in erlangs		28618	39669	11696	35329	11184	2738	7227	9403	8029	101982
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-March											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		49	31	79	93	40	12	29	40	30	45
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		67339	56608	451596	64133	36304	8153	10673	21033	13125	190564
Traffic served for all POIs (B)- in erlangs		15423	24809	10559	34426	10608	2319	5006	5572	4053	55571
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

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Audit Results for Network Availability- PMR data-January						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
(Number of Node Bs in the network in the licensed service area		1658	2197	697	1066	2618
Sum of downtime (i.e. total outage time) of Node Bs		2883	51	218	1386	1721
Node Bs downtime (not available for service)	≤ 2%	0.23%	0.00%	0.04%	0.17%	0.09%
Number of Node Bs having accumulated downtime of >24 hours in a month		13	0	38	1	8
Worst affected Node Bs due to downtime	≤ 2%	0.78%	0.00%	5.45%	0.09%	0.31%
Live Measurement Results for Network Availability- 3 Day live data-January						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
(Number of Node Bs in the network in the licensed service area		1658	2186	668	844	2618
Sum of downtime (i.e. total outage time) of Node Bs		257	47	465	128	278
Node Bs downtime (not available for service)	≤ 2%	0.22%	0.03%	0.97%	0.21%	0.15%
Number of Node Bs having accumulated downtime of >24 hours in a month		2	0	5	1	1
Worst affected Node Bs due to downtime	≤ 2%	0.12%	0.00%	0.75%	0.12%	0.04%

Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data-January						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
CSSR	≥ 95%	96.46%	99.46%	95.50%	99.87%	99.98%
RRC Congestion	≤ 1%	0.92%	0.00%	1.14%	0.00%	0.02%
Circuit Switched RAB Congestion	≤ 2%	0.49%	0.01%	5.50%	0.00%	0.01%
Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data-January						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
CSSR	≥ 95%	94.84%	98.22%	94.97%	99.79%	99.92%
RRC Congestion	≤ 1%	8.15%	0.00%	0.99%	0.00%	0.08%
Circuit Switched RAB Congestion	≤ 2%	0.31%	0.00%	1.92%	0.06%	0.02%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-January						
CSSR	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
Total number of RRC attempts (A)		NA	NA	NA	NA	NA
Total number of RRC established (B)		NA	NA	NA	NA	NA
Call setup success rate (B/A*100)	≥ 95%	NA	NA	NA	NA	NA
%age blocked calls		NA	NA	NA	NA	NA

Audit Results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate -PMR data-January						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		14264327	NDR	222516738	1647862	37815118
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		59534	NDR	10022980	5072	124673
Call drop rate (B/A*100)	≤ 2%	0.42%	0.41%	4.50%	0.31%	0.33%
Total no. of cells in the licensed service area (B)		4947	6582	1820	3216	7709
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		146	187	49	15	161
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	2.95%	2.84%	2.68%	0.47%	2.09%
Live measurement results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate - 3 Day data-January						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		18163773	NDR	2405660	2385752	51831361
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		74994	NDR	8384	11440	226161
Call drop rate (B/A*100)	≤ 2%	0.41%	0.11%	0.35%	0.48%	0.44%
Total no. of cells in the licensed service area (B)		4956	6128	2212	2544	7688
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		166	160	10	6	180
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	3.36%	2.61%	0.45%	0.23%	2.34%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-January						
Call drop rate	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		NA	NA	NA	NA	NA
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		NA	NA	NA	NA	NA
Call drop rate (B/A*100)	≤ 2%	NA	NA	NA	NA	NA

Audit Results for Voice quality -PMR Data-January						
Voice quality	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		85423037479	NA	6000	5547212500	85710508698
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		83991252230	NA	5986	5536391668	84714796685
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.32%	99.35%	99.77%	99.80%	98.84%
Live measurement results for Voice quality-3 Day data-January						
Voice quality	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		3559293228	NA	600	231133854	3571271196
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		3499635510	NA	594	230682986	3529783195
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.33%	98.05%	99.00%	99.61%	98.78%
Drive test results for Voice quality (Average of three drive tests) - DT data-January						
Voice quality	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	NA	NA	NA	NA
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	NA	NA	NA	NA
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	NA	NA	NA	NA	NA

Audit Results for POI Congestion- PMR data-January						
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
Total number of working POIs		49	0	79	94	45
No. of POIs not meeting benchmark		0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		68064	0	436020	55971	190638
Traffic served for all POIs (B)- in erlangs		27781	0	11425	32122	97794
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-January						
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
Total number of working POIs		49	0	79	94	45
No. of POIs not meeting benchmark		0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		67890	0	427866	53046	190558
Traffic served for all POIs (B)- in erlangs		26149	0	11321	31519	52252
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%

18 ANNEXURE – FEBRUARY-3G

Audit Results for Network Availability- PMR data-February						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
(Number of Node Bs in the network in the licensed service area		1658	2283	697	1276	2618
Sum of downtime (i.e. total outage time) of Node Bs		3447	59	209	2611	2019
Node Bs downtime (not available for service)	≤ 2%	0.28%	0.00%	0.04%	0.28%	0.10%
Number of Node Bs having accumulated downtime of >24 hours in a month		14	0	35	10	15
Worst affected Node Bs due to downtime	≤ 2%	0.84%	0.00%	5.02%	0.78%	0.57%
Live Measurement Results for Network Availability- 3 Day live data-February						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
(Number of Node Bs in the network in the licensed service area		1658	2076	697	1151	2618
Sum of downtime (i.e. total outage time) of Node Bs		464	48	378	138	210
Node Bs downtime (not available for service)	≤ 2%	0.39%	0.03%	0.75%	0.17%	0.11%
Number of Node Bs having accumulated downtime of >24 hours in a month		4	0	6	2	2
Worst affected Node Bs due to downtime	≤ 2%	0.24%	0.00%	0.86%	0.17%	0.08%

Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data-February						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
CSSR	≥ 95%	98.09%	99.51%	98.77%	99.86%	99.97%
RRC Congestion	≤ 1%	0.77%	0.00%	1.46%	0.00%	0.03%
Circuit Switched RAB Congestion	≤ 2%	0.65%	0.00%	1.28%	0.01%	0.00%
Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data-February						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
CSSR	≥ 95%	94.26%	98.66%	97.35%	99.88%	99.96%
RRC Congestion	≤ 1%	11.00%	0.00%	0.96%	0.00%	0.04%
Circuit Switched RAB Congestion	≤ 2%	0.39%	0.00%	0.93%	0.00%	0.01%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-February						
CSSR	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
Total number of RRC attempts (A)		796	NA	1200	NA	1246
Total number of RRC established (B)		796	NA	1186	NA	1245
Call setup success rate (B/A*100)	≥ 95%	100.00%	NA	98.83%	NA	99.92%
%age blocked calls		0.00%	NA	1.17%	NA	0.08%

Audit Results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate -PMR data-February						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		13746534	NDR	208175166	2421654	37557865
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		61948	NDR	2636894	7175	123625
Call drop rate (B/A*100)	≤ 2%	0.45%	0.30%	1.27%	0.30%	0.33%
Total no. of cells in the licensed service area (B)		4976	6836	2212	3853	7735
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		147	179	57	20	153
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	2.96%	2.62%	2.56%	0.52%	1.98%
Live measurement results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate - 3 Day data-February						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		19240978	NDR	4395238	3319076	52241845
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		78533	NDR	14669	9382	187248
Call drop rate (B/A*100)	≤ 2%	0.41%	0.70%	0.33%	0.28%	0.36%
Total no. of cells in the licensed service area (B)		4931	6851	2212	3476	7710
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		173	147	10	9	168
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	3.52%	2.15%	0.45%	0.26%	2.17%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-February						
Call drop rate	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		1210	NA	1186	NA	1245
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		4	NA	16	NA	0
Call drop rate (B/A*100)	≤ 2%	0.33%	NDR	1.35%	NA	0.00%

Audit Results for Voice quality -PMR Data-February						
Voice quality	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		75812346348	NA	6000	7756407500	85400165972
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		74502754909	NA	5987	7743990875	84407960603
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.27%	99.35%	99.78%	99.84%	98.84%
Live measurement results for Voice quality-3 Day data-February						
Voice quality	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		3158847765	NA	600	323183646	3558340249
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		3104281455	NA	594	322666286	3516998358
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.18%	99.22%	99.00%	99.84%	98.80%
Drive test results for Voice quality (Average of three drive tests) - DT data-February						
Voice quality	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		339083	NA	1694990	NA	410941
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		292000	NA	1571711	NA	403039
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	86.11%	NA	92.73%	NA	98.08%

Audit Results for POI Congestion- PMR data-February						
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
Total number of working POIs		49	0	79	93	45
No. of POIs not meeting benchmark		0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		67783	0	466336	56060	191039
Traffic served for all POIs (B)- in erlangs		28930	0	12113	34226	104379
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-February						
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
Total number of working POIs		49	0	79	93	45
No. of POIs not meeting benchmark		0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		67590	0	442220	56029	191009
Traffic served for all POIs (B)- in erlangs		14924	0	12071	34174	54139
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%

19 ANNEXURE – MARCH-3G

Audit Results for Network Availability- PMR data-February						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
(Number of Node Bs in the network in the licensed service area		1658	2283	697	1276	2618
Sum of downtime (i.e. total outage time) of Node Bs		3447	59	209	2611	2019
Node Bs downtime (not available for service)	≤ 2%	0.28%	0.00%	0.04%	0.28%	0.10%
Number of Node Bs having accumulated downtime of >24 hours in a month		14	0	35	10	15
Worst affected Node Bs due to downtime	≤ 2%	0.84%	0.00%	5.02%	0.78%	0.57%
Live Measurement Results for Network Availability- 3 Day live data-February						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
(Number of Node Bs in the network in the licensed service area		1658	2076	697	1151	2618
Sum of downtime (i.e. total outage time) of Node Bs		464	48	378	138	210
Node Bs downtime (not available for service)	≤ 2%	0.39%	0.03%	0.75%	0.17%	0.11%
Number of Node Bs having accumulated downtime of >24 hours in a month		4	0	6	2	2
Worst affected Node Bs due to downtime	≤ 2%	0.24%	0.00%	0.86%	0.17%	0.08%

Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data-February						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
CSSR	≥ 95%	98.09%	99.51%	98.77%	99.86%	99.97%
RRC Congestion	≤ 1%	0.77%	0.00%	1.46%	0.00%	0.03%
Circuit Switched RAB Congestion	≤ 2%	0.65%	0.00%	1.28%	0.01%	0.00%
Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data-February						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
CSSR	≥ 95%	94.26%	98.66%	97.35%	99.88%	99.96%
RRC Congestion	≤ 1%	11.00%	0.00%	0.96%	0.00%	0.04%
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Total number of RRC attempts (A)		796	NA	1200	NA	1246
Total number of RRC established (B)		796	NA	1186	NA	1245
Call setup success rate (B/A*100)	≥ 95%	100.00%	NA	98.83%	NA	99.92%
%age blocked calls		0.00%	NA	1.17%	NA	0.08%

Audit Results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate -PMR data-February						
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
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Call drop rate (B/A*100)	≤ 2%	0.45%	0.30%	1.27%	0.30%	0.33%
Total no. of cells in the licensed service area (B)		4976	6836	2212	3853	7735
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		147	179	57	20	153
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	2.96%	2.62%	2.56%	0.52%	1.98%
Live measurement results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate - 3 Day data-February						
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Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		4	NA	16	NA	0
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Drive test results for Voice quality (Average of three drive tests) - DT data-February						
Voice quality	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		339083	NA	1694990	NA	410941
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		292000	NA	1571711	NA	403039
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	86.11%	NA	92.73%	NA	98.08%

Audit Results for POI Congestion- PMR data-February						
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Traffic served for all POIs (B)- in erlangs		28930	0	12113	34226	104379
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-February						
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
Total number of working POIs		49	0	79	93	45
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Total Capacity of all POIs (A) - in erlangs		67590	0	442220	56029	191009
Traffic served for all POIs (B)- in erlangs		14924	0	12071	34174	54139
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%

20 ABBREVIATIONS

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

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

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