

# Objective Assessment of Quality of Services (QoS) for Cellular Mobile (Wireless), Basic Wireline and Broadband Service Providers

## Assam Circle

Report: October – November - December - 2009



Prepared for: **Telecom Regulatory Authority of India**

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## Preface

TRAI, the regulatory watch dog for the Quality of Service for the telecom services – Basic (Wireline), Cellular Mobile (Wireless) and Broadband has commissioned this study with the objective of measuring Quality of Services under the parameters as per the published notifications. The study, from the execution perspective, has been divided into two modules – Survey module and Audit module.

The Survey module has been commissioned with the objective of gauging the subscriber feedback on Quality of Services by way of primary survey and comparing them with quality of service benchmarks stipulated by TRAI. In addition, Survey module would also measure the compliance of 'Telecom Consumer Protection and Redressal of Grievances Regulations, 2007'.

The Audit module would assess the Quality of Service of telecom operators Basic (Wireline), Cellular Mobile (Wireless) and Broadband services) by auditing the service level records maintained by the operators, conducting drive tests as well as live measurements and comparing them with quality of service benchmarks stipulated by TRAI.

For the ease of execution both the modules have been commissioned as two separate exercises. However, the findings of each module would feed into the justification of the other module.

The Survey and Audit modules for various circles within the Zones, due the sheer scale of data collection, have been distributed across various Half Yearly periods. IMRB International Auditors carried out Audits across Punjab, Rajasthan, Karnataka, North East and Assam circles in the second Half Yearly period 2009. **This report details the performance of various service providers in Assam circle against Quality of Services benchmarks for various parameters laid down by TRAI in respective regulations for Cellular (Mobile), Basic Wireline and Broadband services.**

## Table of contents

	<u>Page no.</u>
1.0 Background .....	5
2.0 Objectives and Methodology .....	6
<b>Section A: WIRELINE</b> .....	<b>1</b>
3.0 Sampling Methodology .....	8
3.1 Sampling for Basic (Wireline) services.....	8
4.0 Audit methodology.....	9
4.1 Basic (Wireline) Services .....	9
5.0 Executive Summary .....	10
5.1 Service provider performance report based on one month data verification – Basic (Wireline) Services .....	10
6.0 Detailed findings – Includes comparison between Live calling/Live measurements and One month data collection for Basic Wireline Services.....	13
6.1 Graphical/Tabular Representations for Basic (Wireline) services .....	13
7.0 Compliance reports: Results of Verification of Records .....	20
7.1 Basic (Wireline) services .....	20
7.2 Conclusions .....	21
<b>Section B: WIRELESS</b> .....	<b>1</b>
8.0 Sampling methodology.....	23
9.0 Audit methodology.....	24
9.1 Cellular Mobile Services .....	24
10.0 Executive Summary .....	25
10.1 Service provider performance report based on one month data verification: Cellular Mobile Services.....	26
11.0 Detailed findings – Includes comparison between Live calling/Live measurements and One month data collection .....	33
11.1 Graphical/Tabular Representations for Cellular Mobile Services .....	33
12.0 Compliance reports: Results of Verification of PMR* .....	42
12.1 Cellular Mobile services.....	42
12.2 Conclusions .....	43
<b>Section C: BROADBAND</b> .....	<b>1</b>
13.0 Sampling Methodology .....	45

<b>14.0 Audit methodology</b> .....	<b>46</b>
<b>14.1 Broadband Services</b> .....	<b>46</b>
<b>15.0 Executive Summary</b> .....	<b>47</b>
<b>15.1 Service provider performance report based on one month data Verification – Broadband Services</b> .....	<b>47</b>
<b>16.0 Detailed findings – Includes comparison between Live calling/Live measurements and One month data collection for Broadband Services</b> .....	<b>51</b>
<b>16.1 Graphical/Tabular Representations for Broadband services</b> .....	<b>51</b>
<b>17.0 Compliance reports: Results of Verification of Records for January to March 2009</b> .....	<b>56</b>
<b>17.1 Broadband services</b> .....	<b>56</b>
<b>17.2 Conclusions</b> .....	<b>57</b>
<b>18.0 Annexure - I (WIRELINE)</b> .....	<b>58</b>
<b>18.1 Parameter wise performance reports for Basic Wireline services</b> .....	<b>58</b>
<b>19.0 Annexure - I (WIRELESS)</b> .....	<b>62</b>
<b>19.1 Service provider performance report based on one month data</b> .....	<b>62</b>
<b>19.2 Monthly Point of Interconnection (POI) Congestion Report</b> .....	<b>63</b>
<b>19.3 Parameter wise performance reports for Cellular Mobile services</b> .....	<b>63</b>
<b>20.0 Annexure - I (BROADBAND)</b> .....	<b>69</b>
<b>20.1 Parameter wise performance reports for Broadband services</b> .....	<b>69</b>
<b>21.0 Annexure – II Detailed Explanation of Audit methodology (Parameter wise)</b> .....	<b>73</b>
<b>21.1 For Basic (Wireline) services</b> .....	<b>73</b>
<b>21.2 Cellular Mobile services</b> .....	<b>76</b>
<b>21.3 For Broadband services</b> .....	<b>81</b>

## **1.0 Background**

The Telecom Regulatory Authority of India (TRAI) has a critical mandate to protect the interest of telecom consumers in addition to various other functions bestowed upon it. As part of the license conditions to telecom operators, it has the power and authority to measure the Quality of Service provided by various govt. (BSNL & MTNL) and private telecom operators. The parameters that need to be measured for Basic (Wireline) and Cellular Mobile (Wireless) services have been specified in the TRAI notification on Quality of Services of Basic (Wireline) and Cellular Mobile (Wireless) services dated 20<sup>th</sup> March, 2009. The parameters for Broadband Service have been specified in the TRAI notification for Quality of Services of Broadband Service Regulation, 2006

IMRB has been carrying out this exercise for TRAI since December 2007 to assess the quality of services being provided by Basic (Wireline), Cellular Mobile (Wireless) and Broadband service providers.

The study is being conducted broadly in two modules. They are:

**Survey module:** To obtain subscriber feedback on quality of services by way of primary survey and to check the 'Implementation and effectiveness of Telecom Consumer Protection and Redressal of Grievances Regulations, 2007'

**Audit module:** To assess the quality of service of telecom operators Basic (Wireline), Cellular Mobile (Wireless) and Broadband services by auditing the service level records maintained by the operators, conducting drive tests as well as live measurements and comparing them with quality of service benchmarks stipulated by TRAI

This report highlights the findings for the Audit module for Assam circle that was covered in the 4<sup>th</sup> Quarter (October – December 2009). The primary data collection and verification of records maintained by various operators of Cellular Mobile (Wireless), Basic wireline and Broadband services was undertaken by IMRB International during the period October – December 2009.



***The study is being conducted broadly in two modules:  
(i) Survey module and  
(ii) Audit module***



***This report highlights the Audit Module findings for Assam circle for Cellular Mobile services***

## **2.0 Objectives and Methodology**

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). Following are the key activities undertaken by Auditors during the Audit process conducted at the operator's premises

1. **Verification of the data submitted by service providers:**  
This involved verification of the quarterly Performance Monitoring Reports (PMR's) and monthly Point of Interconnect (POI) Congestion reports being submitted by various service providers. The raw data in the records maintained by service providers was audited to assess the book keeping methodology.
2. **Live measurement for three days:** Network performance of service providers was assessed for three days in the month in which the Audit was carried out. Live figures from the server/ NMS software were recorded for various network related parameters.
3. **Data verification for the month in which Audits were carried out:** Subsequent to the visits for Audit during the live measurement at various Exchanges/ISP Nodes/Exchanges, data for all the network and Non network related parameters was collected from various service providers for the complete month in which the Audit was carried out. Raw data/records pertaining to these were also verified on sample basis to check the veracity of data provided by the operators.
4. **Drive tests:** Operator assisted drive tests were conducted in three cities as per the norms stated in the tender.
5. **Live calling:** Live testing was done on a sample basis to check efficiency of the customer care, inter operator call assessment, Back check calls for service provisioning and fault repair



*All Network related and Non network related parameters notified by TRAI in various regulations were Audited*

- Any changes or discrepancies found in the methodology were reported to the service providers and changes were suggested by IMRB Auditors.
- PMR verification was done as per the new parameters being reported to TRAI by all operators.
- Live measurement and 1 month data collection was done as per the new regulations published by TRAI on 20th March, 2009.
- Separate formats were designed each for Basic (Wireline), Cellular mobile (Wireless) and Broadband services to collect the information on various parameters

**Section A:**  
**WIRELINE**

### **3.0 Sampling Methodology**

#### **3.1 Sampling for Basic (Wireline) services**

- BSNL is the only operator present in Assam circle offering Basic (Wireline) services
- For BSNL the sample of exchanges was selected was spread across 10% of SDCA's in the entire service. Overall 30 exchanges (8 Urban and 22 Rural) exchanges were audited

	Name of Operator
Operator 1	BSNL



## **4.0 Audit methodology**

### **4.1 Basic (Wireline) Services**

Following table explains the audit methodology for Basic (Wireline) services:-

<b>Sl. No.</b>	<b>Parameters</b>	<b>One month data verification</b>	<b>Live measurement</b>	<b>Live calling</b>
1	Provision of telephone after registration of demand	YES	----	YES
2	Fault incidence/clearance related statistic	YES		
2.1	- Total number of faults registered per month	YES		YES
2.2	- Fault repair by next working day	YES		YES
3	Mean Time to Repair (MTTR)	YES		
4	Call Completion Rate (CCR)	YES	YES	
5	Metering and billing credibility – billing complaints	YES		YES
6	Customer care promptness	YES		
6.1	- Shifting of telephone line	YES		YES
6.2	- Processing closure request	YES		YES
6.3	- Processing of additional supplementary services	YES		YES
7	Response time to customer	YES		
7.1	- While call is getting connected and answered	YES		YES
7.2	- While call is answered by operator (voice to voice)	YES		YES
8	Time taken to refund of deposits after closure	YES		YES

{**Note:** - A more detailed explanation of parameter wise audit methodology for Basic (wireline) services is explained in Annexure II}

## 5.0 Executive Summary

The objective assessment of Quality of Services (QoS) was carried out by IMRB International for all the Basic (Wireline) and Broadband service providers during the period starting from October to December 2009 in Assam circle. The executive summary encapsulates the key findings of the Audit by providing: -

- “Service provider performance report” for Basic (Wireline) service, which gives a glimpse of the performance of various operators against the benchmark specified by TRAI, during the month in which the Audit was carried out by IMRB Auditors
- “Parameter wise critical findings” for Basic (Wireline) service: This indicates key observations and findings from different activities carried out during the Audit process

### 5.1 Service provider performance report based on one month data verification – Basic (Wireline) Services

Parameters	Benchmarks	BSNL
Faults incidences ( No. of faults/100 Subs./month)	≤5	4.9
% of faults repaired by next working day	≥ 90%	82.69%
% of faults repaired within 3 days	100%	99.72%
Faults pending for > 3days and ≤7 days	Rent rebate of 7 days	100.00%
Faults pending for > 7 days and ≤15 days	Rent rebate of 15 days	NA
Faults pending for > 15 days	Rent rebate of 1 month	100.00%
Mean Time to Repair (MTTR)	≤ 8 Hrs	2.71
Call Completion Rate (CCR)	≥ 55%	56.94%
Answer to Seizure ratio (ASR)	≥ 75%	NA
No. of POIs with congestion > 0.5%	≤ 0.5%	0
Metering and billing credibility - Number of bills disputed during over a billing cycle	≤ 0.1%	0.12%
Resolution of billing complaints within 4 weeks	100%	94.11%
Period of applying credit / waiver	≤ 1 week	100.00%
<b>Customer care/helpline promptness</b>		
Percentage shift requests attended within 3 days	≥ 95%	72.22%
Closure within 7 days	100%	100.00%
<b>Response time to customer for assistance</b>		
% age calls getting connected and answered	≥ 95%	97.00%
% age call answered by operator in 60 seconds	≥ 90%	89.00%
Time taken for refund of deposits after closures within 60 days	100%	81.62%

(\*Note: For BSNL data pertains to the sample 5% of exchanges audited during the period of October to December 2009)

\*\* Methodology not in line with QoS ■ Figures provided on All India basis ■ Not meeting the benchmark **B'mark** = TRAI Benchmark, **DNA** = Details not available, **NA**: Not Applicable

## Summary of Live Measurement Results – Wireline Services

Parameters	Benchmarks	BSNL
Percentage connections completed within 7 days	100%	70.91%
% of faults repaired by next working day	≥ 90%	61.49%
% of faults repaired within 3 days	100%	95.65%
Call Completion Rate (CCR)	≥ 55%	54.73%
Answer to Seizure ratio (ASR)	≥ 75%	NA
Resolution of billing complaints within 4 weeks	100%	100.00%
Customer care/helpline promptness		
Percentage shift requests attended within 3 days	≥ 95%	73.68%
Response time to customer for assistance		
% age calls getting connected and answered	≥ 95%	81.71%
% age call answered by operator in 60 seconds	≥ 90%	56.31%

Not meeting the benchmark

### Critical findings and Key take outs: Basic (Wireline) services

BSNL is the only operator providing Basic (Wireline) Services in Assam circle to retail customers. During the audit process it was observed that the service provider could not meet TRAI specified benchmark on most of the parameters specified by TRAI.

The live calling results were found to be different from the 1 month audit data collection in certain places. To some extent the difference can be attributed to the smaller sample size undertaken for the live calling. For live measurements conducted to assess Call Completion Rate (CCR) it was found that the service provider meets the TRAI specified benchmark with CCR during three days observed to be 72%.

The parameter wise key takeouts for the Wireline service providers for the Assam circle are as under:-

#### Provision of telephone after registration of demand

- In Assam circle, live calling for service provisioning shows BSNL falling short of TRAI specified benchmark of 100% connections within 7 days.

#### Fault incidence / clearance statistics

- Fault repair remains pain point as only 82% of the total complaints registered in the sample exchanges were repaired within 24 hrs which is significantly short of TRAI specified benchmark of >90%.
- For live calling carried out by IMRB auditors only 61% of subscribers claimed that fault was repaired within 24 hrs.
- Even for fault repair within 3 days BSNL falls short of the TRAI specified benchmark both in month of audit and live calling.

- Part reason of service provider poor performance on this parameter can be attributed to the fact that in remote areas of Assam circle prompt action on faults becomes difficult due to accessibility issues.

Mean time to Repair (MTTR)

- BSNL (2.71) meet the TRAI benchmark on this parameter during month in which audit was carried out.

Traffic statistics (CCR)

- BSNL meets the benchmark on this parameter during month in which audit was carried out but falls marginally short of the benchmark in three days when live measurement carried out in auditor’s presence at various exchanges

Metering and billing credibility

- The service provider (BSNL) just fails to meet TRAI specified benchmark with percentage billing complaints being equal to 0.1% of the total bills generated.
- Also all the complaints registered were not resolved within the time period stipulated by TRAI

Customer care/helpline promptness

- Attention is also required on the promptness of customer care as BSNL falls short of TRAI specified benchmark for time taken to attend shift requests for the month in which audit was carried out by IMRB auditors

Response time to customer for assistance

- BSNL does not meet TRAI specified benchmark for both calls getting connected and answered by the operator in 60 seconds during month of audit and live calling

Time taken for refund of deposits after closure

- BSNL does not meet the benchmark of 100% refund of deposits within 60 days observed during month of audit

Level 1 service

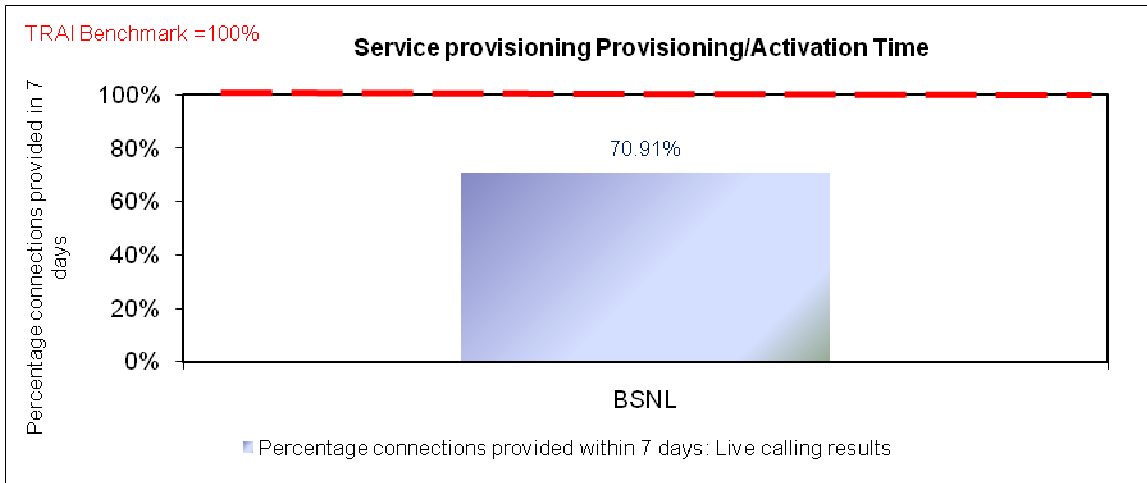
Level 1 services	Benchmark	BSNL
Total no. of calls made		970
Calls answered in 60 sec		878
Calls answered after 60 sec		92

To test the efficiency of level 1 services (Trunk booking, Child helpline, Women helpline, Airline booking, Fire, Police, Railways) offered by various service providers. 970 calls were made for BSNL to different numbers and time taken to answer the call was noticed. Out of which 878 calls made were answered in 60 seconds.

## **6.0 Detailed findings – Includes comparison between Live calling/Live measurements and One month data collection for Basic Wireline Services**

### **6.1 Graphical/Tabular Representations for Basic (Wireline) services**

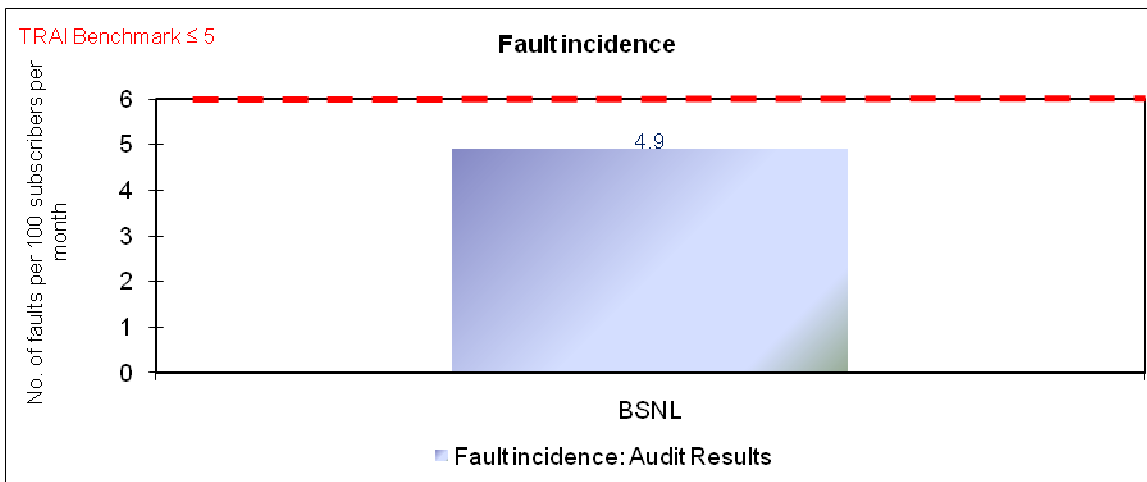
#### **Service provisioning / Activation time (Comparison between one month audit results and live calling results)**



#### **Live calling**

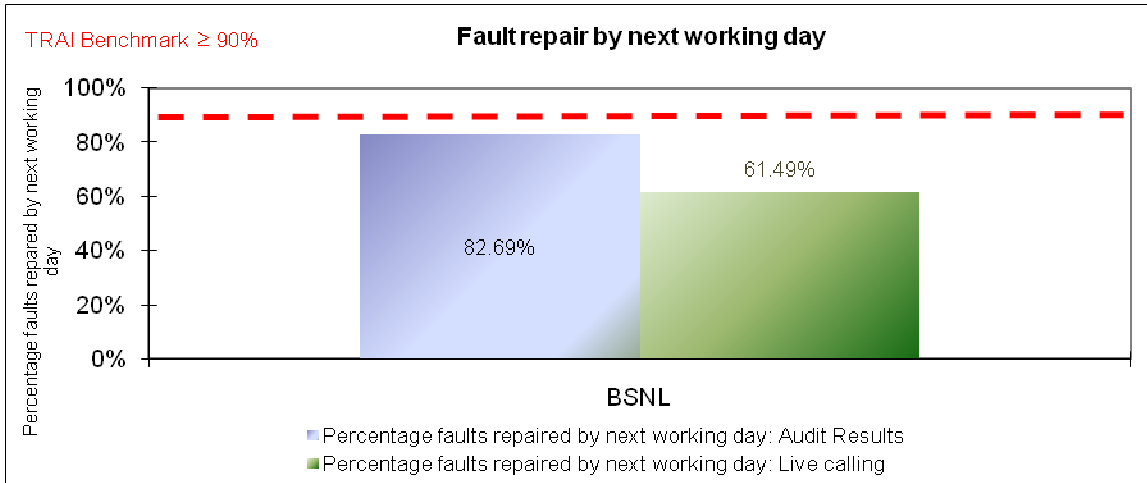
BSNL is not meeting the benchmark

#### **Fault incidence**



BSNL is meeting the benchmark

**Fault repair/Restoration time (Comparison between one month audit results and live calling results)**

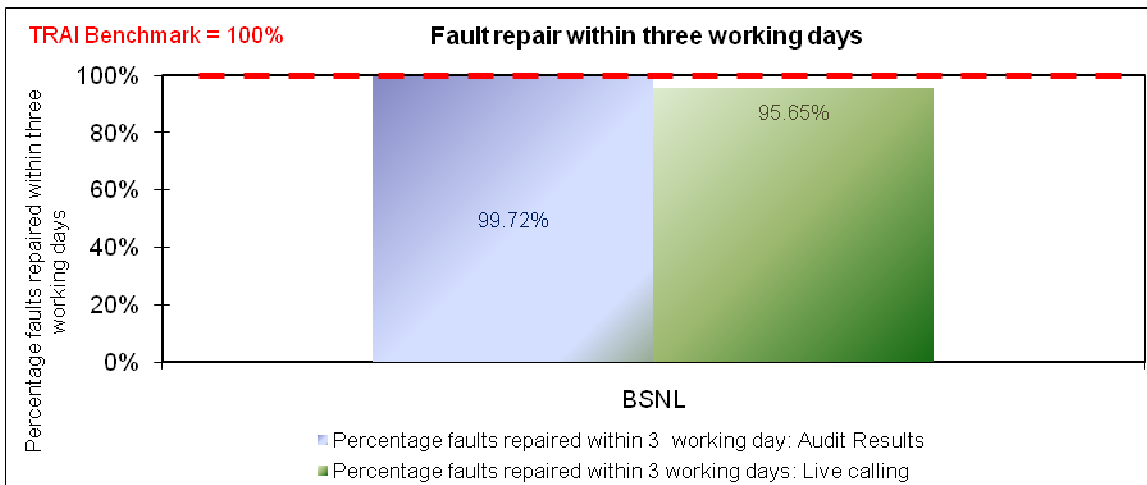


**One month**

BSNL is not meeting the benchmark

**Live calling**

BSNL is not meeting the benchmark



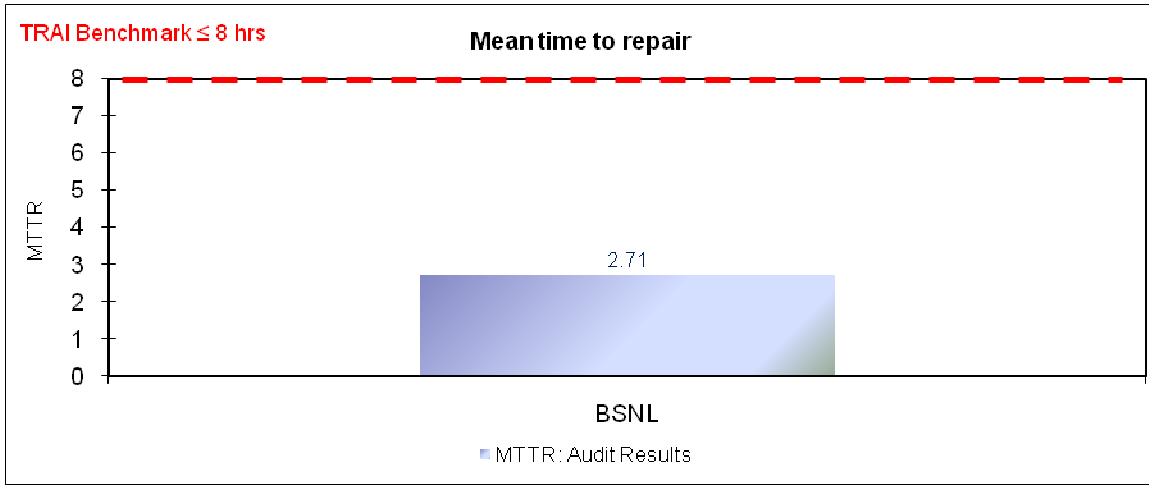
**One month**

BSNL is not meeting the benchmark

**Live calling**

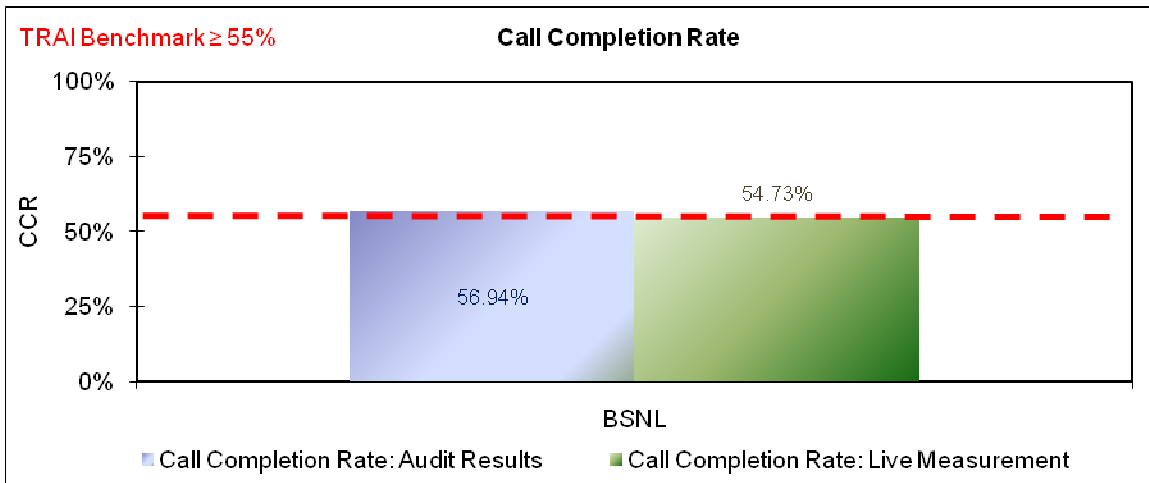
BSNL is not meeting the benchmark

**Mean time to repair**



BSNL is meeting the benchmark

**Call completion rate (Comparison between one month audit results and three day live measurement)**



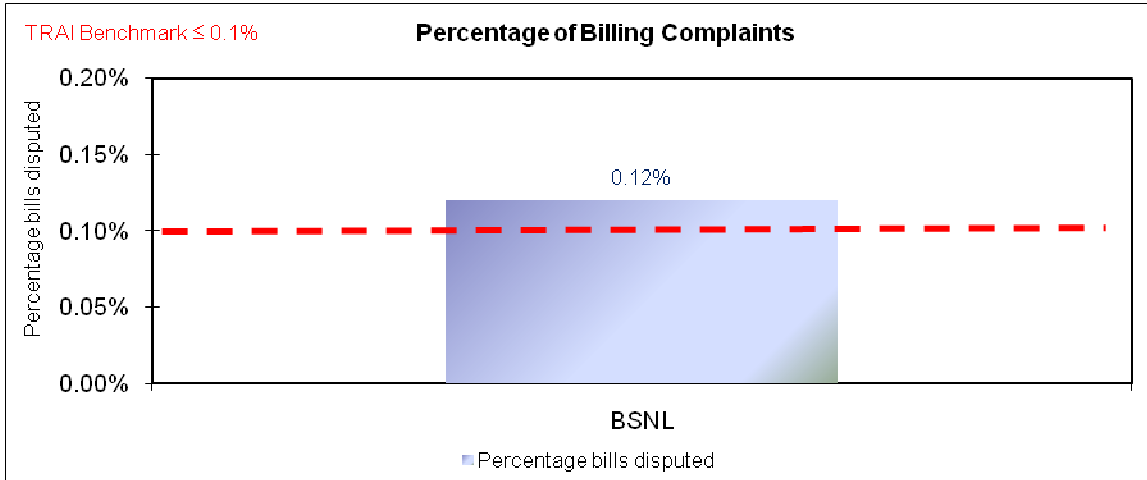
**One month**

BSNL is meeting the benchmark

**Live measurement**

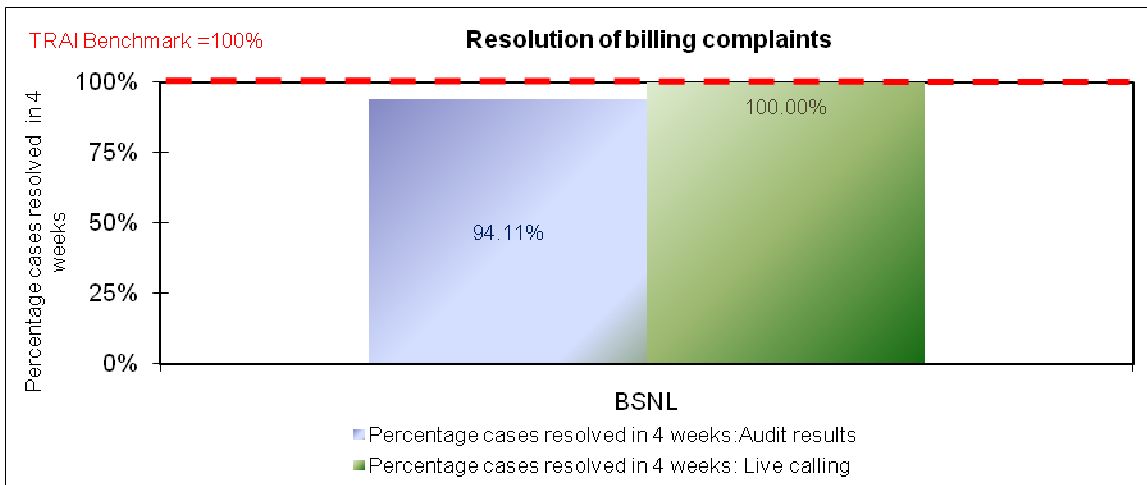
BSNL is not meeting the benchmark

**Percentage bills disputed**



BSNL is not meeting the benchmark

**Resolution of billing complaints (Comparison between one month audit results and live calling results)**



**One month**

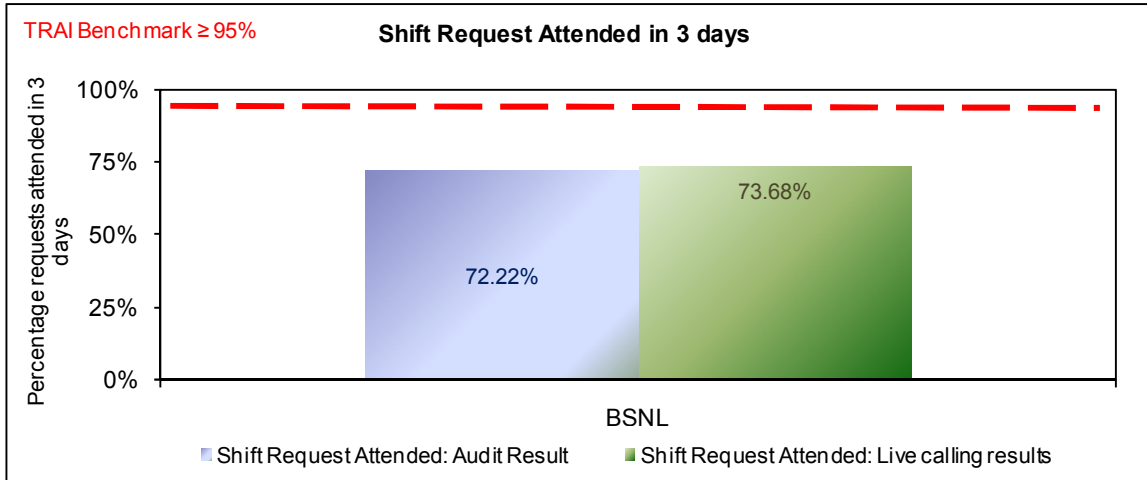
BSNL is not meeting the benchmark

**Live calling**

BSNL is meeting the benchmark



**Shift requests attended (Comparison between one month audit results and live calling results)**



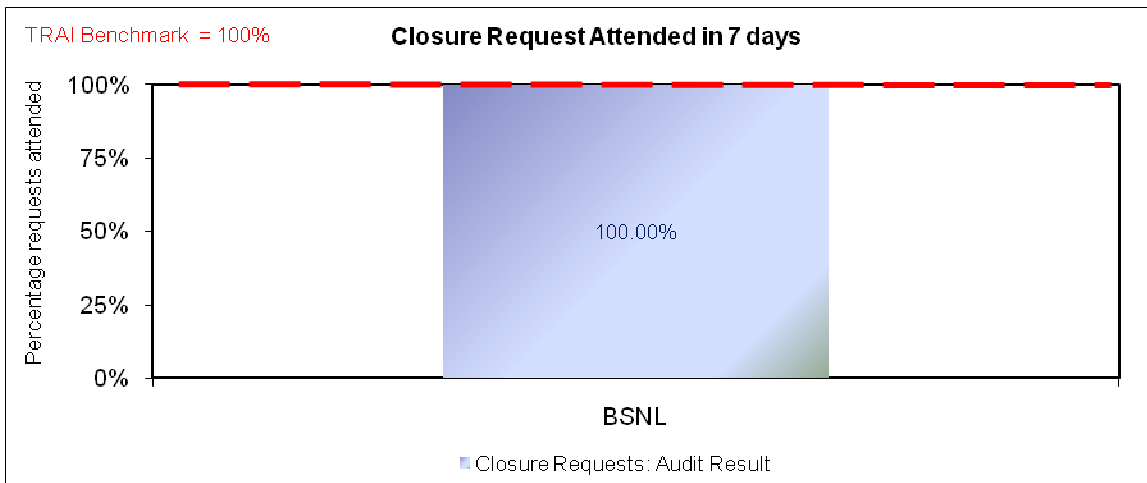
**One month**

BSNL is not meeting the benchmark

**Live calling**

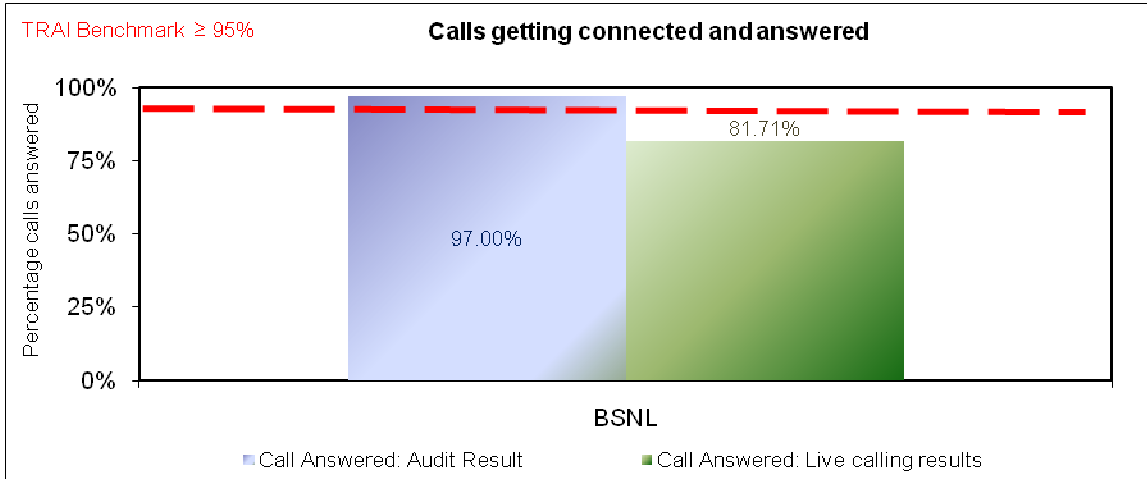
BSNL is not meeting the benchmark

**Closure requests attended within 7 days**



BSNL is meeting the benchmark

**Response time to customer for assistance - Calls answered and getting connected  
(Comparison between one month audit and live calling results)**



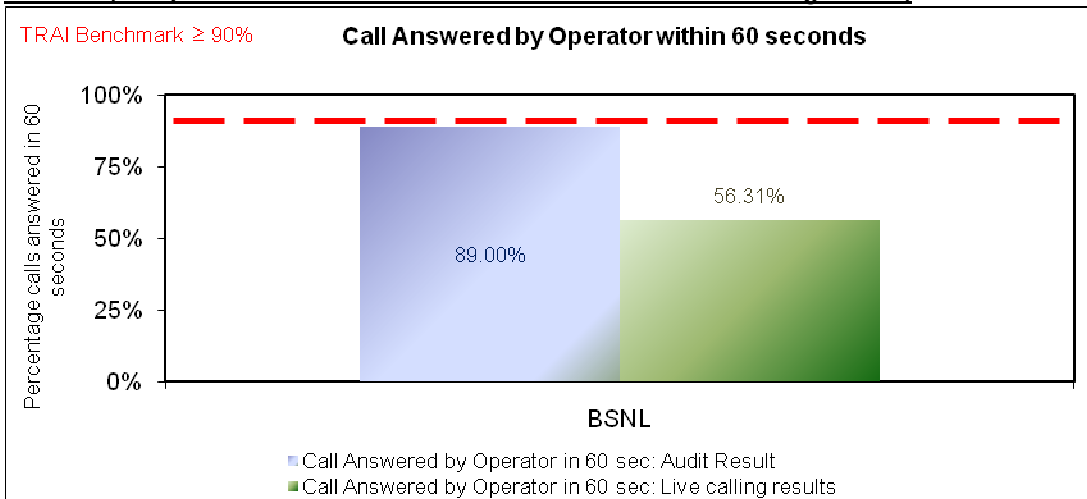
**One month**

BSNL is meeting the benchmark

**Live calling**

BSNL is not meeting the benchmark

**Response time to customer for assistance - Calls answered by the operator within 60 seconds  
(Comparison between one month audit results and live calling results)**



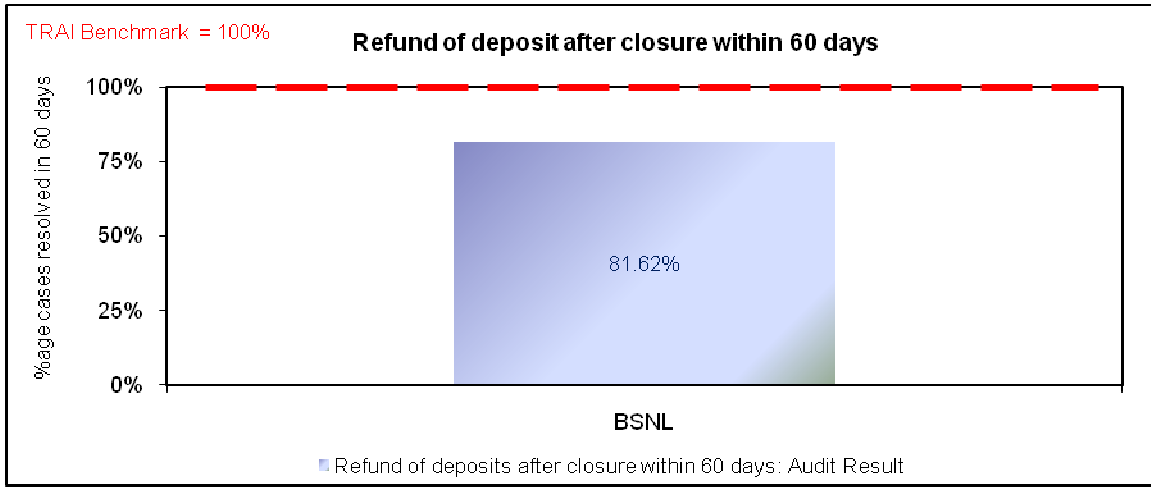
**One month**

BSNL is not meeting the benchmark

**Live calling**

BSNL is not meeting the benchmark

**Time taken to refund of deposits after closure**



BSNL is not meeting the benchmark

## 7.0 Compliance reports: Results of Verification of Records

### 7.1 Basic (Wireline) services

Parameters	Benchmarks	BSNL	
		PMR#	IMRB
Percentage connections completed within 7 days	100%	99.22%	93.00%
Faults incidences ( No. of faults/100 Subs./month)	≤5	6.20	4.60
% of faults repaired by next working day	≥ 90%	92.97%	89.00%
Faults pending for > 3days and ≤7 days	Rent rebate of 7 days	0	444
Faults pending for > 7 days and ≤15 days	Rent rebate of 15 days	0	0
Faults pending for > 15 days	Rent rebate of 1 month	0	1797
Mean Time to Repair (MTTR)	≤ 8 Hrs	8.81	4.47
Call Completion Rate (CCR)	≥ 55%	59.00%	52.00%
Metering and billing credibility - Number of bills disputed during over a billing cycle	≤ 0.1%	0.05%	0.00%
Resolution of billing complaints within 4 weeks	100%	92.54%	94.00%

#### Customer care/helpline promptness

Shift requests (Total number received)		449	2072
Percentage shift requests attended within 3 days	>95%	95.00%	94.00%
Closure request attended		6080	25780
Closure within 24 hours	>95%	99.75%	100.00%
Supplementary (additional) service requests attended		Complied	
Additional facility provided within 24 hours	>95%	Complied	

#### Response time to customer for assistance

% age call answered through IVR in 20 seconds	≥80%	Complied	
% age call answered through IVR in 40 seconds	100%	Complied	
% age call answered by operator in 60 seconds	≥80%	95.00%	95.00%
% age call answered by operator in 90 seconds	≥95%	Complied	
Time taken for refund of deposits after closures within 60 days	100%	100.00%	98.00%

\* These have been calculated cumulatively on the basis of figures reported by various exchanges

#As per the PMR submitted by the operators in the 3<sup>rd</sup> quarter of 2009

Figures do not match with those reported in PMR
  Not meeting the benchmark
  Figures verified on all India bases

**B'mark** = TRAI Benchmark, **DNA** = Details not available, **NA**: Not Applicable

## **7.2 Conclusions**

### **Basic Wireline Services**

1. Significant variation is observed in figures reported in PMR and those verified in sample exchanges for shifts, rent rebate and closures for BSNL
2. For rest of the parameters, variation observed in figures for BSNL is owing to the fact that only 5% of the total exchanges were audited for the operator whereas the data provided in the PMR is basis all the exchanges in the circle
3. Raw data on call centre details was not available at the exchanges audited and hence the same could not be verified by IMRB auditors

**Section B**  
**WIRELESS**

## **8.0 Sampling methodology**

### **8.1 Sampling for Cellular Mobile (Wireless) service providers**

Data pertaining to 100% of the Gateway MSC's (GMSC's) and Mobile Switching Centers (MSC's) of all the Cellular Mobile Service Providers or Unified Access Service Providers (UASP) was collected and verified in specified circles/service areas. Following are the various operators covered in Assam circle

	Name of Operator	Month of Audit
<b>Operator 1</b>	Airtel	November
<b>Operator 2</b>	Vodafone	December
<b>Operator 3</b>	BSNL	December
<b>Operator 4</b>	Tata	November
<b>Operator 5</b>	Dishnet	December
<b>Operator 6</b>	RTL	October

## 9.0 Audit methodology

### 9.1 Cellular Mobile Services

In a nutshell the following activities were done while auditing for various parameters for Cellular Mobile Services:

S.no	Parameter	AS REPORTED IN PMR	AS FOUND IN ACTUAL RECORDS AFTER VERIFICATION	AS FOUND IN VERIFICATION FOR THE MONTH OF AUDIT	AS FOUND IN 3 DAY LIVE MEASUREMENT DATA	LIVE CALLING	OPERATOR ASSISTED DRIVE TESTS	INDEPENDENT DRIVE TESTS
<b>A</b>	<b>Network Performance</b>							
<b>A (i)</b>	BTS accumulated down time	Yes	Yes	Yes				
<b>A (ii)</b>	Call setup success rate (within licensee own network)	Yes	Yes	Yes	Yes		Yes	Yes
<b>A (iii)</b>	Blocked Call Rate	Yes	Yes	Yes	Yes		Yes	Yes
<b>A (iv)</b>	Call Drop rate	Yes	Yes	Yes	Yes		Yes	Yes
<b>A (v)</b>	% Connections with good voice quality	Yes	Yes	Yes			Yes	Yes
<b>A (vi)</b>	Service Coverage	Yes	Yes	Yes			Yes	Yes
<b>A (vii)</b>	PoI Congestion	Yes	Yes	Yes				
<b>B</b>	<b>Customer Helpline</b>							
<b>B (i)</b>	Response time to the customer for assistance	Yes	Yes	Yes		Yes		
<b>C</b>	<b>Billing Complaints</b>							
<b>C (i)</b>	Billing complaints per 100 bills issued	Yes	Yes	Yes				
<b>C (ii)</b>	%age of billing complaints resolved within 4 weeks	Yes	Yes	Yes		Yes		
<b>C (iii)</b>	Period of all refunds/payments due to customers from date of resolution as in (ii) above	Yes	Yes	Yes		Yes		

{Note: A more detailed explanation of parameter wise audit methodology for Cellular Mobile services is explained in Annexure II}



## **10.0 Executive Summary**

The objective assessment of Quality of Services (QoS) was carried out by IMRB International for all the Cellular mobile service providers during the period starting from October 2009 to December 2009 in Assam circle. The executive summary encapsulates the key findings of the Audit by providing: -

- “Service provider performance report” for Cellular mobile service , which gives a glimpse of the performance of various operators against the benchmark specified by TRAI, during the month in which the Audit was carried out by IMRB Auditors
- “Parameter wise critical findings” for Cellular mobile services: This indicates key observations and findings from different activities carried out during the Audit process

### 10.1 Service provider performance report based on one month data verification: Cellular Mobile Services

Name of Service Provider	Time Consistent Busy Hour (TCBH)	Network Availability					Connection Establishment (Accessibility)			Connection Maintenance (Retainability)				POI		Network Traffic Capacity and Utilization			
		Total no. of BTSs in the licensed service area	Sum of downtime of BTSs in a month in hours i.e. total outage time of all BTSs in hours during a month	BTSs Accumulated downtime (not available for service) (%age)	No. of BTSs having accumulated downtime of >24 hours in a month	Worst affected BTSs due to downtime (%age)	Call Set-up Success Rate (within licensee's own network)	SDCCH/Paging Chl. Congestion (%age)	TCH Congestion (%age)	Call Drop Rate (%age)	Total No. of cells exceeding 3% TCH drop (call drop)	Total no. of cells in the network	Worst affected cells having more than 3% TCH drop (call drop) rate (%age)	Connecti on with good voice quality*	POI Congesti on (No. of POIs not meeting the benchmark)	Total number of working POI Service Area wise	Equipped Capacity of Network in respect of Traffic in erlang	Total traffic handle d in TCBH in erlang	Total no. of customers served (as per VLR) on last day of the month
B'mark			≤ 2%			≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%			≤ 5%	≥ 95%	≤ 0.5%				
Airtel	20:00 – 21:00	1921	4085	0.29%	103	5.36%	95.40%	0.75%	1.56%	1.69%	568	6085	9.33%	93.38%	0	16	100168	76902	1963334
Vodafone	20:00 – 21:00	979	2999	0.41%	19	1.94%	97.73%	0.06%	0.90%	0.19%	38	979	3.88%	96.42%	1	17	35698	23038	446905
BSNL	19:00 – 20:00	1131	13525	1.61%	186	16.45%	95.62%	1.00%	2.00%	2.00%	479	3408	14.06%	96.35%	4	99	11478	8639	790520
Tata	19:00 – 20:00	135	143	0.14%	0	0.00%	99.15%	0.00%	0.13%	0.54%	11	408	2.70%	99.37%	0	23	16523	3953	42213
Dishnet	19:00 – 20:00	1977	13905	0.95%	169	8.55%	94.95%	2.40%	2.86%	2.58%	1631	5915	27.57%	90.26%	0	42	139317	75606	1842635
RTL	19:00 – 20:00	1097	11785	1.44%	75	6.84%	96.12%	1.42%	4.40%	1.04%	138	3537	3.90%	97.52%	1	17	DNA	53679	964427

\*Details pertaining to these are obtained through operator done drive tests. Results of the operator assisted drive tests are explained in detail in critical findings

\*\* Methodology not in line with QoS

Figures provided on All India basis

Not meeting the benchmark

B'mark = TRAI Benchmark, DNA = Details not available, NA: Not Applicable

### Critical findings: Cellular Mobile Services

The audit for cellular mobile service providers were conducted at their respective MSCs in the Assam circle apart from Reliance Communication whose audit was conducted at their central NOC at Mumbai.

The audit involved a three stage verification process which consisted of auditing the records of the service providers and verifying the data submitted to TRAI. The second step involved a three day live measurement of all the network parameters. Finally basis the three day live measurement the auditors needed to find out the busy hour for the service provider and collect the hourly data for this busy hour for the month in which the audit was conducted.

#### Busy Hour of Various Service Providers

Service Provider	Reported Time Consistent Busy Hour	Network Busy Hour found in 3 day live measurement
Airtel	20:00 – 21:00	<b>20:00 – 21:00</b>
Vodafone	20:00 – 21:00	<b>20:00 – 21:00</b>
BSNL	19:00 – 20:00	<b>19:00 – 20:00</b>
Tata	19:00 – 20:00	<b>19:00 – 20:00</b>
Dishnet	19:00 – 20:00	<b>19:00 – 20:00</b>
RTL	<b>19:00 – 20:00</b>	<b>19:00 – 20:00</b>

The TCBH reported by all the service providers matched the network busy hour calculated by IMRB auditors for the Assam circle.

#### BTSS Accumulated Downtime:

In the Assam circle, all the operators were found to be meeting the TRAI benchmark for this parameter. Tata experienced the lowest outage hours (around 143 hrs) in the month of audit. Airtel, BSNL, Dishnet and RTL do not meet the TRAI benchmark for worst affected BTSS due to downtime with more than 2% of its BTSS having downtime >24 hours in a month.

#### Call Set-up Success Rate (CSSR):

All the operators except Dishnet wireless were comfortably meeting the benchmark on this parameter. During the audits the maximum CSSR was observed for Tata with 99.15% of their calls getting completed. All the operators were found to be calculating the parameter as per the norm specified by TRAI. CSSR was established as the ratio of total number of successful call attempts (establishment) to the total number of call attempts made.

#### Network Congestion parameters:

SDCCH / Paging Channel Congestion, TCH and POI are part of the network congestion parameters. All the operators except Dishnet wireless and RTL for SDCCH and Traffic channel congestion are meeting the TRAI specified benchmarks on the congestion parameters. TATA leads the way in network congestion parameters with almost negligible paging as well as traffic channel congestion. The calculation methodology of these parameters was found to be in complete accordance with what has been specified by TRAI. Both RCOM CDMA and Tata Teleservices measure paging channel utilization. When the value of this parameter is less than 100%, it is counted as 0% congestion. There were almost no POIs with congestion more than the benchmark ( $\leq 0.5\%$ ) except for 1 POI for Vodafone and 1 for RTL.

#### Call Drop Rate:

During the audit it was found that all the service providers were measuring this parameter as per the TRAI guidelines. The call drop rate was measured as the ratio of total calls dropped to the total number of call attempts for all operators. Also, all of service providers except Dishnet wireless (2.58%) were found to be meeting the TRAI specified benchmark. The lowest call drop rate was of Vodafone at 0.19%.

Connections with good voice quality:

All the operators are measuring this parameter via their periodic drive tests. However, for some operators these parameters can be obtained at their switch as well. During the audit it was found that all the service providers were measuring this parameter as per the TRAI guidelines. Airtel and Dishnet wireless are not meeting the TRAI specified benchmark for connections with good voice quality.

Customer Care / Helpline Assessment

For the accessibility of customer care aspect all the service providers except Vodafone meet the TRAI benchmark. Tata and RTL are the only 2 operators meeting TRAI benchmark for percentage calls answered by the operator within 60 seconds for the month of audit.

Billing performance

All the operators except Vodafone with 0.25% billing complaints were found to be meeting the benchmark of ≤0.1% complaints registered per 100 bills issued. Also for the benchmark of 100% billing complaints being resolved within 4 weeks and refunds within 1 week, all the service providers meet the TRAI benchmark

Inter operator calls assessment

Inter operator call Assessment To↓ From→	Airtel	Vodafone	BSNL	Tata	Dishnet	RTL
Airtel	NA	98%	79%	100%	100%	100%
Vodafone	100%	NA	100%	100%	100%	96%
BSNL	100%	100%	NA	98%	98%	97%
Tata	100%	96%	100%	NA	100%	95%
Dishnet	100%	97%	100%	100%	NA	100%
RTL	100%	89%	100%	100%	93%	NA



The maximum problem faced by the calling operator to other operators

In the inter-operator call assessment, calls were made from the test SIMs of service provider whose audit was being conducted to all the other service providers. Vodafone and Dishnet found tough connecting to a RTL number with only 89% and 93% of the calls getting connected respectively. RTL had difficulty in connecting to a Tata number with 95% of their calls getting completed. From BSNL, only 79% of calls to a Airtel number got connected.

Results of Operator assisted Drive test

The drive test was conducted simultaneously for all the operators present in the Assam circle. There was in total of three drive tests conducted in the circle. These tests were conducted in the cities of Guwahati, Tezpur and Nagaon. IMRB auditors were present in vehicles of every operator. A sample of 15 – 30 test calls were made along each of the routes. The holding period for all test calls was between 120 seconds to 180 seconds. The drive test vehicle across all routes plied at a speed of less than 20 km per hour. Taking into consideration the route that was taken for the drive test; most of the major areas Assam telecom circles were covered.

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 > -75dbm for indoor, -85 dms for in-vehicle and > -95 dbm outdoor routes.

The drive tests in the Assam circle were conducted in the cities of Guwahati, Tezpur and Nagaon was conducted along the following route:

	Type of location	Guwahati	Tezpur	Nagaon
Outdoor	Periphery of the city	Bharalu, Kamakhya, Mandir, Maligaon, Adabari, Jalukbari, Guwahati University, Airpot, Jalubari, NH 37, Khanapara, Six mile, Bagharbari, Six Mile, VIP Road, Satgaon, Naregi, Noonmati	Mission Chariali, Ketekibari, Majgaon, Baruah Chariali, Nilkamal Chariali, NH 37, Dolabari No. 1, Barika Chuburi, Ex Police Line, Tribeni, NT Road, Kamar Chuburi	Lakhinagar, no2 amolapatty, sani mandir road, sms road, dhing road, hoiborgaon railway station, tarun phukan road, I.k road, M.D road, ADP road, Chistianbasti,, Doboka road, poraj bora path, ranigaon, 2 no panigaon, masjid road, paniali kesa ali, balibhau, nortam panigaon, nagaon polytechnic, nagaon kendriya bidyalaya, difalu, poly road, chayali amolapatty
	Congested area	Panbazar, Donbosco Main gate, Panbazar Fly over, Paltan Bazar,	Head Post office, Nehru bali Stadium, ASTC, Swahid Chariali,	natun bazar, north hoiborgaon, laokhowa road, m dev road, AT

		Nepali Mandir, Vishal Megamart, H.B. Road, Fancy Bazar, LOG Hindi, H.S., Athgaon, Bharalu	New Amolapatty, Hospital road, Polo Field, Natunpara, Lachit Chowk, JB Road, Jyotish Road, SC Road	road, M.D road, masjid road, dhakapatty, GNB road, LNB road, bhuyanpatty, AJB road, khutikotia, A.R.B road, R.R.B road, RKK road, kasalukhava railway gate, motiram bora road, K Ahmed road
	Across the city	Noommati, Chanmari, R.R. Baruah, Ganeshguri, Hatigaon, Bhetapara, Beltola Tiniali, Dispur Last Gate, Super Market, Ganeshguri, Bhangagarh	Badhara Bamun Chuburi, Majgaon, Nebapur, Rubber Bagan, Darrang College Road, Mahabhairab, LDS Road, Barohaliya, GNB Road	Sensowa, khutikatiya, AT road, haiborgaon, nagaon head post office, nagaon college, panigaon, dimoruguri tiniali, pratap ch road, BM road, police reserve, lakhinagar chariali
Indoor	Office complex	GMC	District Information and Public Information Office	ASTC Nagaon office
	Shopping complex	Big Bazar	Vishal Megamart	Stadium Market complex

The tables given below gives a glimpse of the results of the operator assisted drive test:

**Drive Test – Guwahati**


	Benchmark	Airtel		Vodafone		BSNL		Tata		Dishnet		RTL	
		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
Voice quality	≥ 95%	96.67%	96.50%	94.10%	96.11%	92.87%	94.55%	99.82%	98.48%	97.08%	91.04%	91.22%	93.79%
CSSR	≥ 95%	98.31%	98.63%	100.00%	98.65%	95.88%	97.68%	100.00%	99.51%	100.00%	95.00%	100.00%	98.62%
%age Blocked calls		1.69%	1.37%	0.00%	1.35%	4.12%	2.32%	0.00%	0.49%	0.00%	5.00%	0.00%	1.38%
Call drop rate	≤ 2%	0.00%	1.46%	0.00%	1.36%	0.00%	1.36%	0.00%	0.25%	0.88%	1.05%	0.00%	0.00%
Hands off success rate		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.71%	100.00%	100.00%

**Drive Test – Tezpur**

	Benchmark	Airtel		Vodafone		BSNL		Tata		Dishnet		RTL	
		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
Voice quality	≥ 95%	96.52%	95.58%	96.12%	90.52%	94.19%	96.83%	99.79%	98.24%	94.86%	95.65%	85.84%	80.14%
CSSR	≥ 95%	100.00%	100.00%	100.00%	98.71%	100.00%	99.38%	100.00%	98.48%	98.90%	97.47%	100.00%	93.55%
%age Blocked calls		0.00%	0.00%	0.00%	1.29%	0.00%	0.62%	0.00%	1.52%	1.10%	2.53%	0.00%	6.45%
Call drop rate	≤ 2%	0.00%	0.00%	0.00%	0.65%	0.00%	0.00%	0.00%	0.76%	1.11%	0.00%	0.00%	0.88%
Hands off success rate		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.02%	100.00%	100.00%	100.00%

**Drive Test – Nagaon**

	Benchmark	Airtel		Vodafone		BSNL		Tata		Dishnet		RTL	
		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
Voice quality	≥ 95%	97.35%	97.50%	93.21%	95.44%	96.03%	93.32%	99.63%	99.38%	94.65%	100.00%	92.92%	86.62%
CSSR	≥ 95%	98.55%	99.20%	98.59%	98.46%	100.00%	95.12%	100.00%	100.00%	98.63%	97.06%	100.00%	96.95%
%age Blocked calls		1.45%	0.80%	1.41%	1.54%	0.00%	4.88%	0.00%	0.00%	1.37%	2.94%	0.00%	3.05%
Call drop rate	≤ 2%	1.47%	0.81%	0.00%	0.00%	0.00%	1.71%	0.00%	0.00%	0.00%	1.52%	0.00%	0.00%
Hands off success rate		100.00%	99.46%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	94.67%	100.00%	100.00%

 Not meeting the benchmark

Following were the areas where the signal strength was found to be inadequate for the operators:

**City - Guwahati**

There was interference and low signal strength recorded in the outdoor areas near Beltola, Jalukbari and NH 37 near ISBT, Athgaon, Hatigaon, Guwahati University, Azara, Fancy Bazar, Panbazar, Super Market and Ganeshguri, while in the indoor areas no interference and inadequate coverage was recorded

**City - Tezpur**

There was interference and low signal strength recorded in the outdoor areas of NT Road, Ex. Police Line, Hospital Road, Vishal (Shopping Complex), Barika Suburi, Dolabari, Natun Para, JB Road and Tribeni while in the indoor areas no interference and inadequate coverage was recorded

**City - Nagaon**

There was interference and low signal strength recorded in the outdoor areas of Sensoa, Dhing Road, Khutikotia, Natun Bazar, Statium Market, Dhakapatty and ADP Road while in the indoor areas no interference and inadequate coverage was recorded

**Conclusions:**

Drive test was conducted by IMRB with the help of service providers to measure their network performance.

1. Vodafone, RTL, Dishnet wireless and BSNL does not meet the TRAI benchmark on voice quality in all the 3 cities
2. RTL in Tezpur do not meet the benchmark for CSSR in outdoor areas
3. All operators were found to be meeting the TRAI specified benchmark for call drop rate in all 3 cities

**Summary of Live Measurement Results – Cellular Mobile Services**

Name of Service Provider	Connection Establishment (Accessibility)			Connection Maintenance (Retainability)			Metering and Billing	Response time to customer for assistance	
	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*	%age complaints resolved within 4 weeks	Accessibility of call centre/customer care	Percentage of calls answered by the operators (voice to voice) within 60 seconds
<b>B'mark</b>	<b>≥ 95%</b>	<b>≤ 1%</b>	<b>≤ 2%</b>	<b>≤ 2%</b>	<b>≤ 5%</b>	<b>≥ 95%</b>	<b>100%</b>	<b>≥ 95%</b>	<b>≥ 90%</b>
Airtel	98.02%	0.03%	0.29%	1.48%	10.74%	96.39%	100.00%	100.00%	94.00%
Vodafone	97.73%	0.05%	0.71%	1.49%	2.35%	94.15%	94.00%	100.00%	100.00%
BSNL	97.95%	0.22%	16.10%	2.35%	12.85%	94.54%	45.45%	98.00%	94.00%
Tata	99.11%	0.00%	0.14%	0.49%	2.23%	99.04%	87.50%	100.00%	100.00%
Dishnet	96.70%	1.20%	1.00%	1.97%	16.33%	94.04%	90.00%	100.00%	98.00%
RTL	96.02%	0.52%	2.90%	0.90%	4.68%	89.38%	100.00%	100.00%	100.00%

Not meeting the benchmark

\* Based on operator assisted drive tests conducted by IMRB

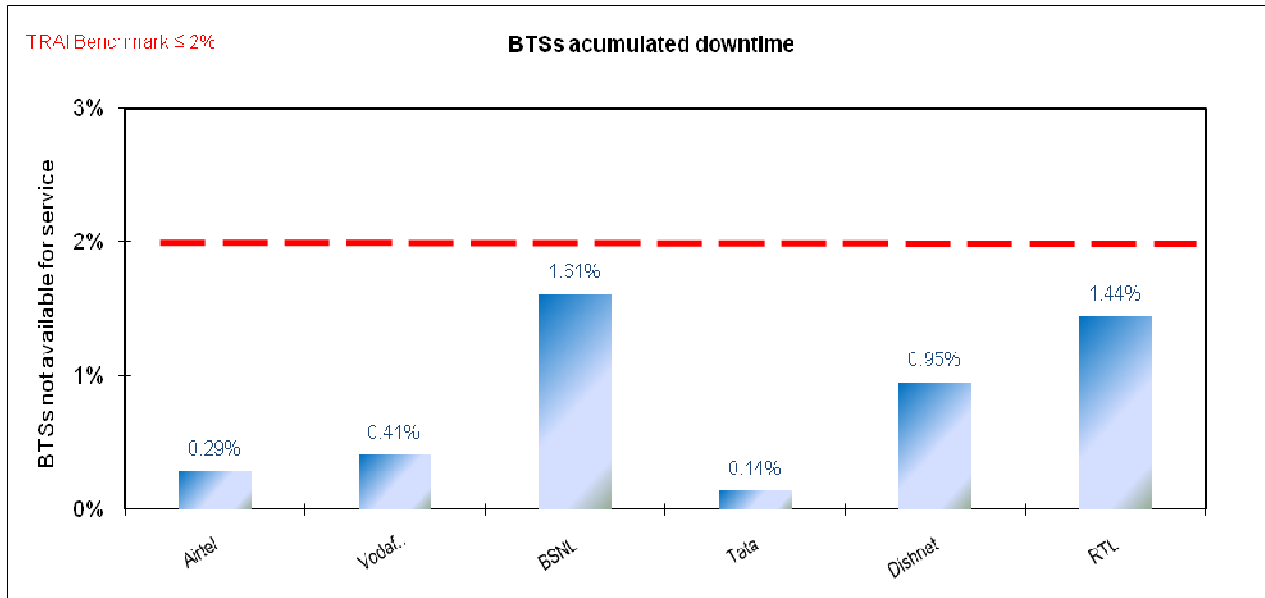
During the three day live measurement, BSNL and Dishnet wireless was found to be not meeting the TRAI benchmark on most of the parameters. Airtel is not meeting benchmark for worst affected cells and RTL for TCH congestion and voice quality.



## 11.0 Detailed findings – Includes comparison between Live calling/Live measurements and One month data collection

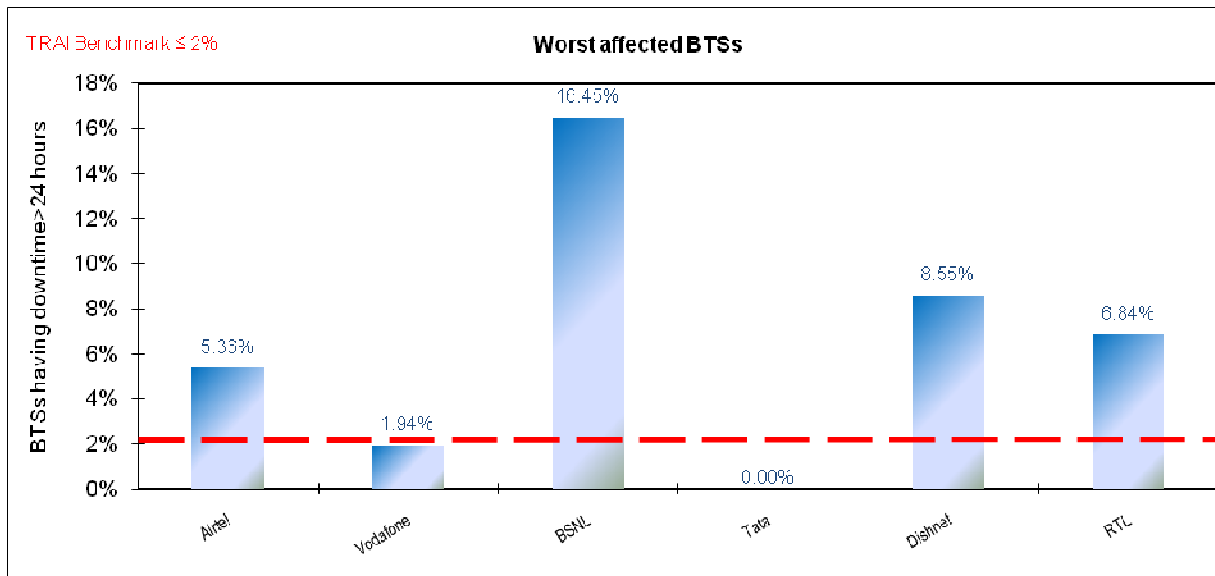
### 11.1 Graphical/Tabular Representations for Cellular Mobile Services

#### BTSS Accumulated Downtime



All the operators meet the benchmark

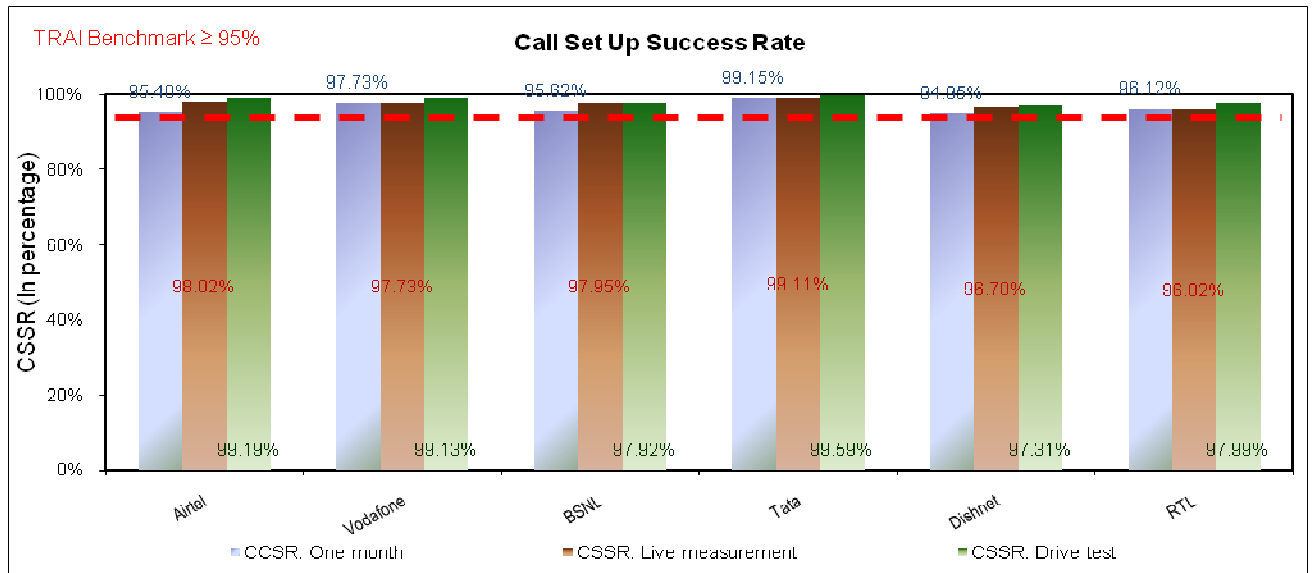
#### Worst Affected BTSS



Operator(s) meeting benchmark: Vodafone, Tata

Operator(s) not meeting the benchmark: Airtel, BSNL, Dishnet, RTL

**Call Set-up Success Rate (CSSR)**



**One month**

Operator(s) meeting benchmark: Airtel, Vodafone, BSNL, Tata, RTL

Operator(s) not meeting the benchmark: Dishnet

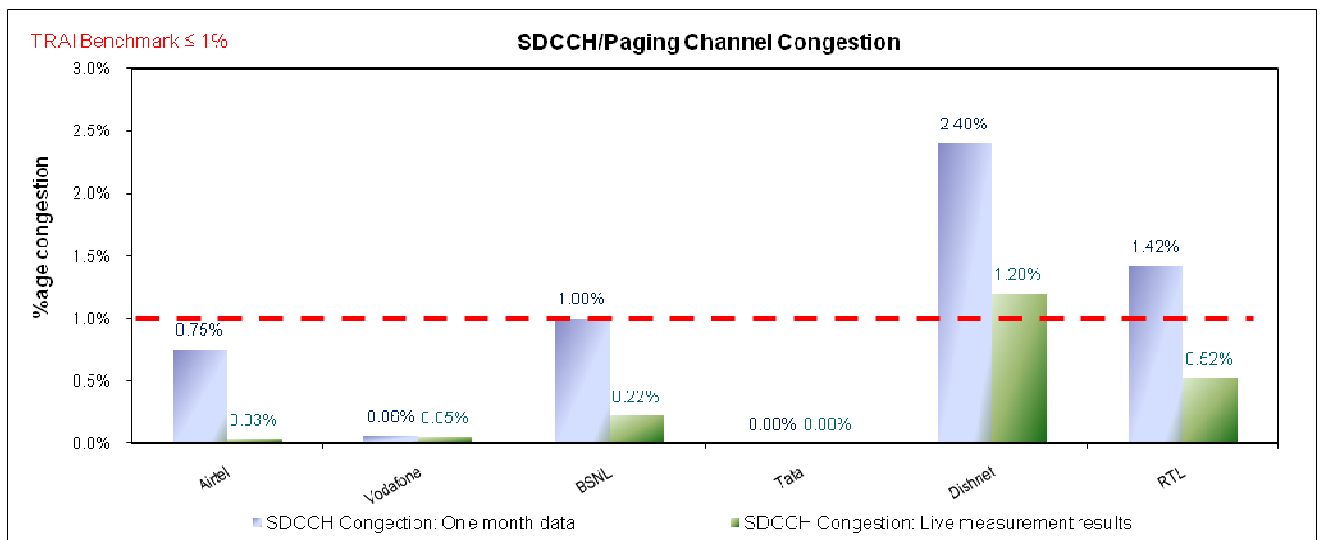
**Live measurement**

All the operators meet the benchmark

**Drive test**

All the operators meet the benchmark

**SDCCH / Paging Channel Congestion**



**One month**

Operator(s) meeting benchmark: Airtel, Vodafone, BSNL, Tata

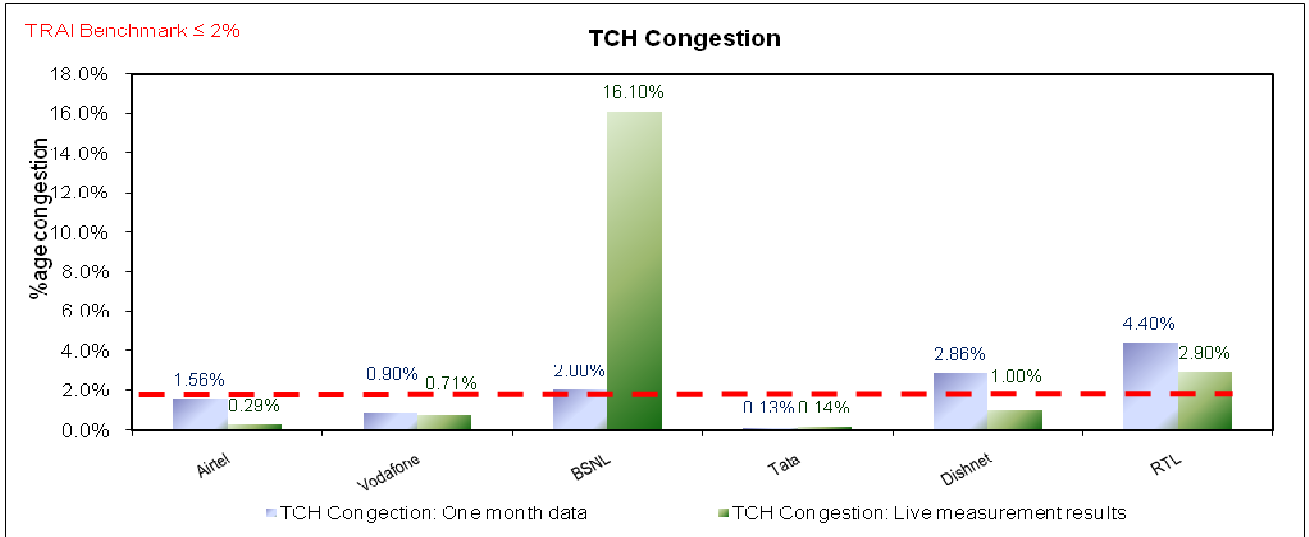
Operator(s) not meeting the benchmark: Dishnet, RTL

**Live measurement**

Operator(s) meeting benchmark: Airtel, Vodafone, BSNL, Tata, RTL

Operator(s) not meeting the benchmark: Dishnet

**TCH Congestion**



**One month**

Operator(s) meeting benchmark: Airtel, Vodafone, BSNL, Tata

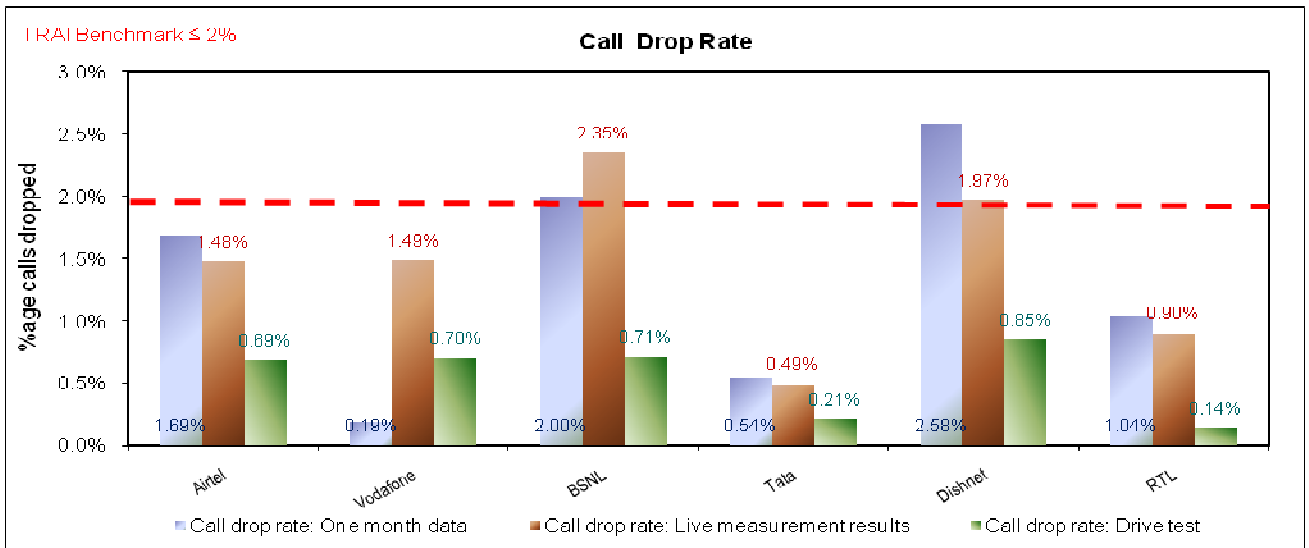
Operator(s) not meeting the benchmark: Dishnet, RTL

**Live measurement**

Operator(s) meeting benchmark: Airtel, Vodafone, Tata, Dishnet

Operator(s) not meeting the benchmark: BSNL, RTL

**Call Drop Rate**



**One month**

Operator(s) meeting benchmark: Airtel, Vodafone, BSNL, Tata, RTL  
 Operator(s) not meeting the benchmark: Dishnet

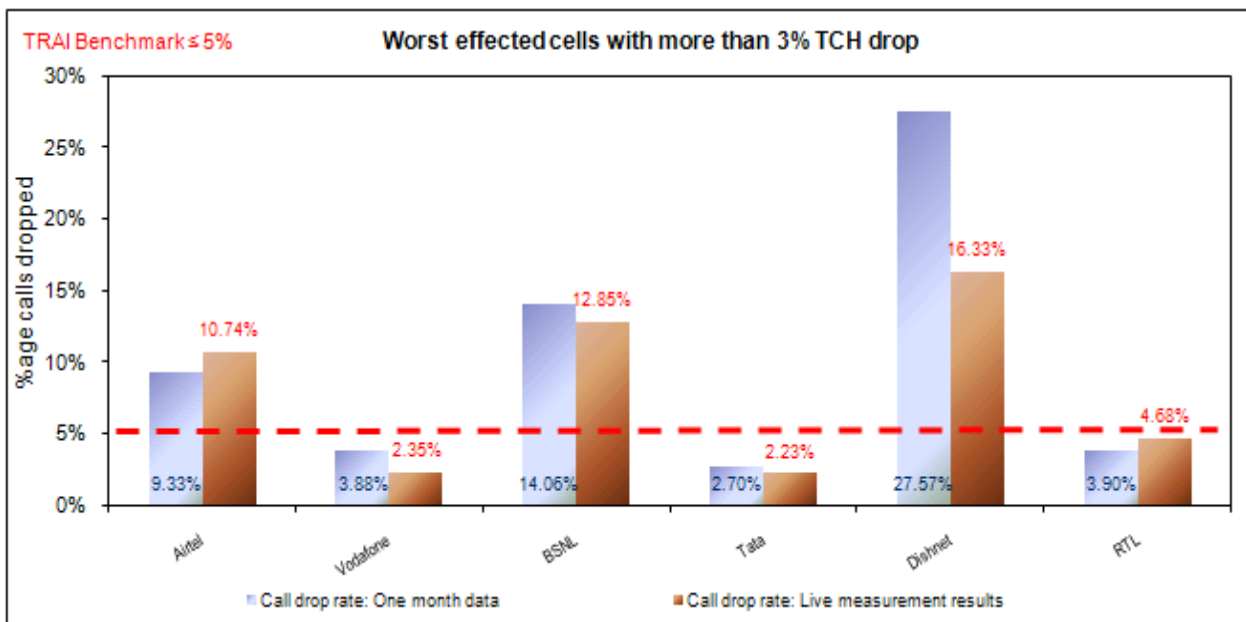
**Live measurement**

Operator(s) meeting benchmark: Airtel, Vodafone, Tata, Dishnet, RTL  
 Operator(s) not meeting the benchmark: BSNL

**Drive test**

All the operators meet the benchmark

**Cells with more than 3% Call Drop Rate**



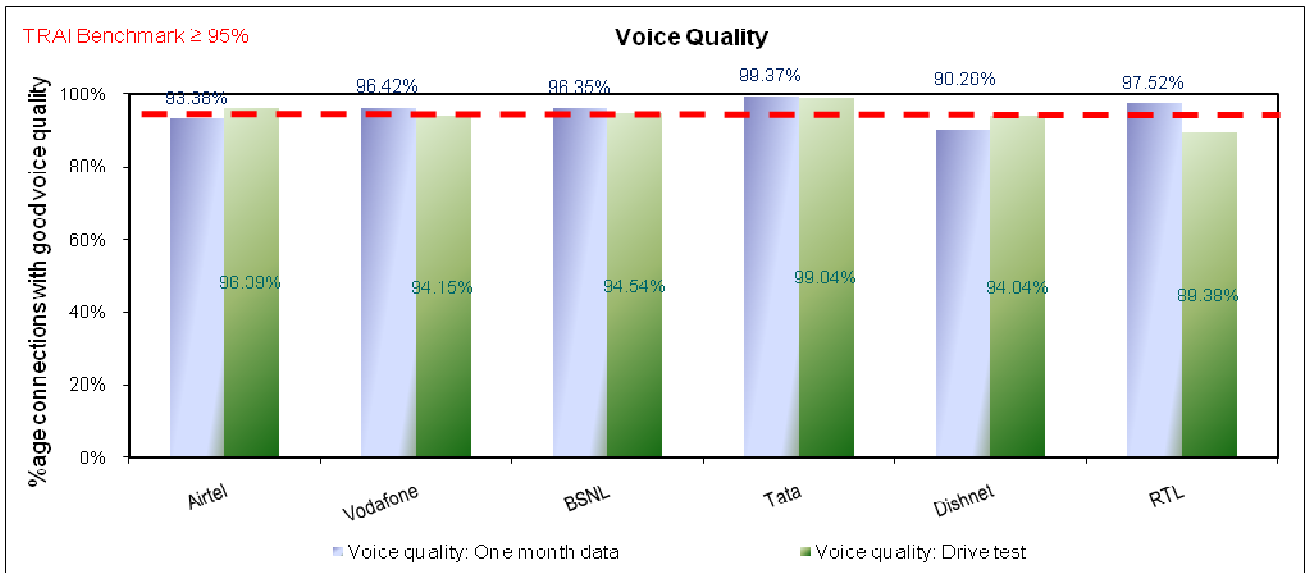
**One month**

Operator(s) meeting benchmark: Vodafone, Tata, RTL  
 Operator(s) not meeting the benchmark: Airtel, BSNL, Dishnet

**Live measurement**

Operator(s) meeting benchmark: Vodafone, Tata, RTL  
 Operator(s) not meeting the benchmark: Airtel, BSNL, Dishnet

**Voice quality**



**One month**

Operator(s) meeting benchmark: Vodafone, BSNL, Tata, RTL

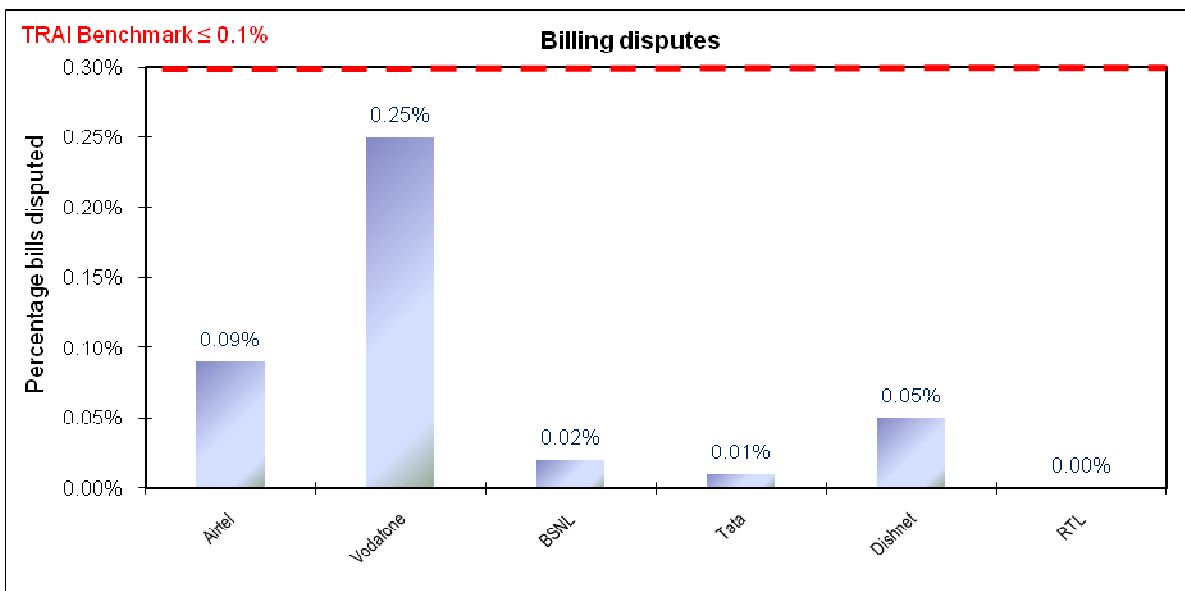
Operator(s) not meeting the benchmark: Airtel, Dishnet

**Drive test**

Operator(s) meeting benchmark: Airtel, Tata

Operator(s) not meeting the benchmark: Vodafone, BSNL, Dishnet, RTL

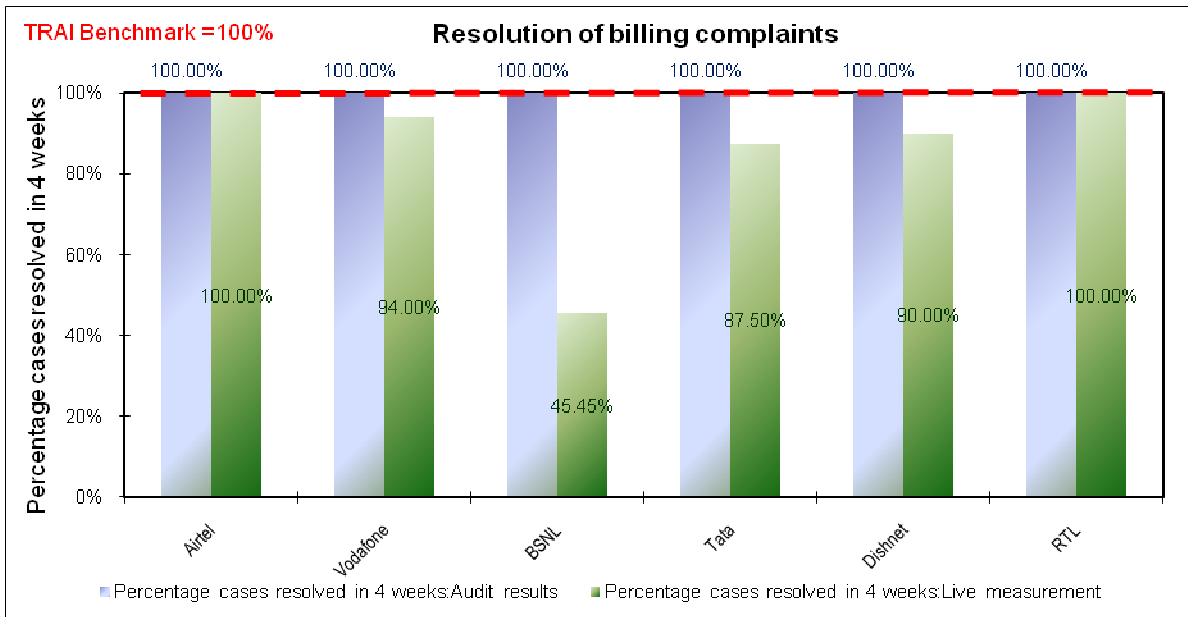
**Billing Disputes**



Operator(s) meeting benchmark: Airtel, BSNL, Tata, Dishnet, RTL

Operator(s) not meeting the benchmark: Vodafone

**Resolution of billing complaints**



**One month**

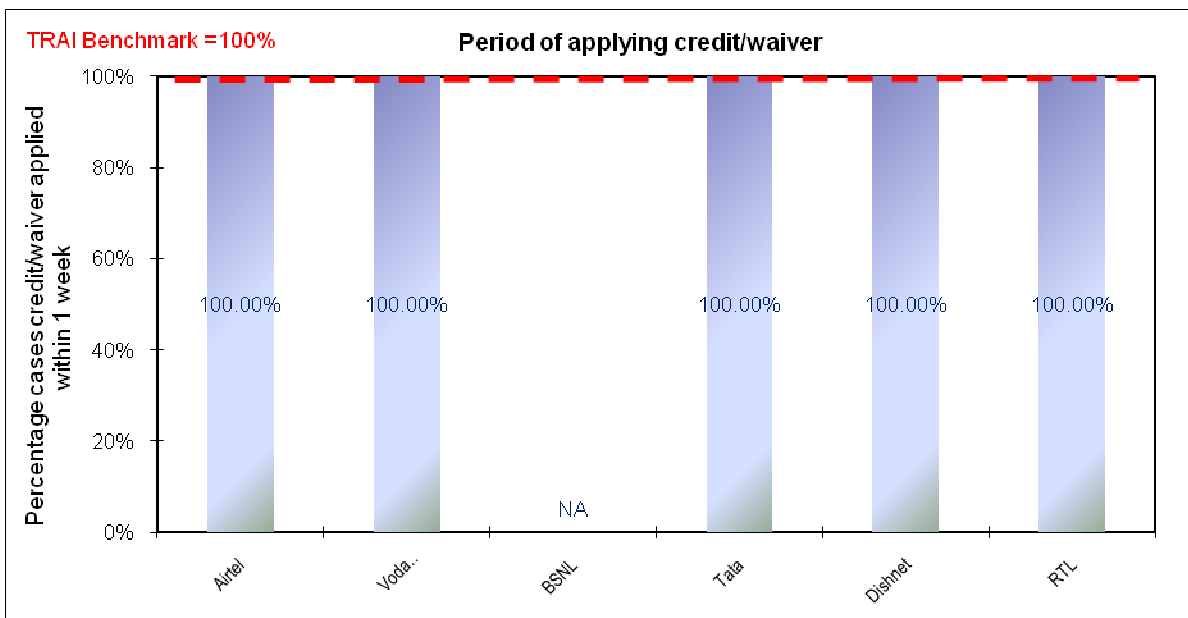
All the operators meet the benchmark

**Live measurement**

Operator(s) meeting benchmark: Airtel, RTL

Operator(s) not meeting the benchmark: Vodafone, BSNL, Tata, Dishnet

**Period of applying credit / waiver**



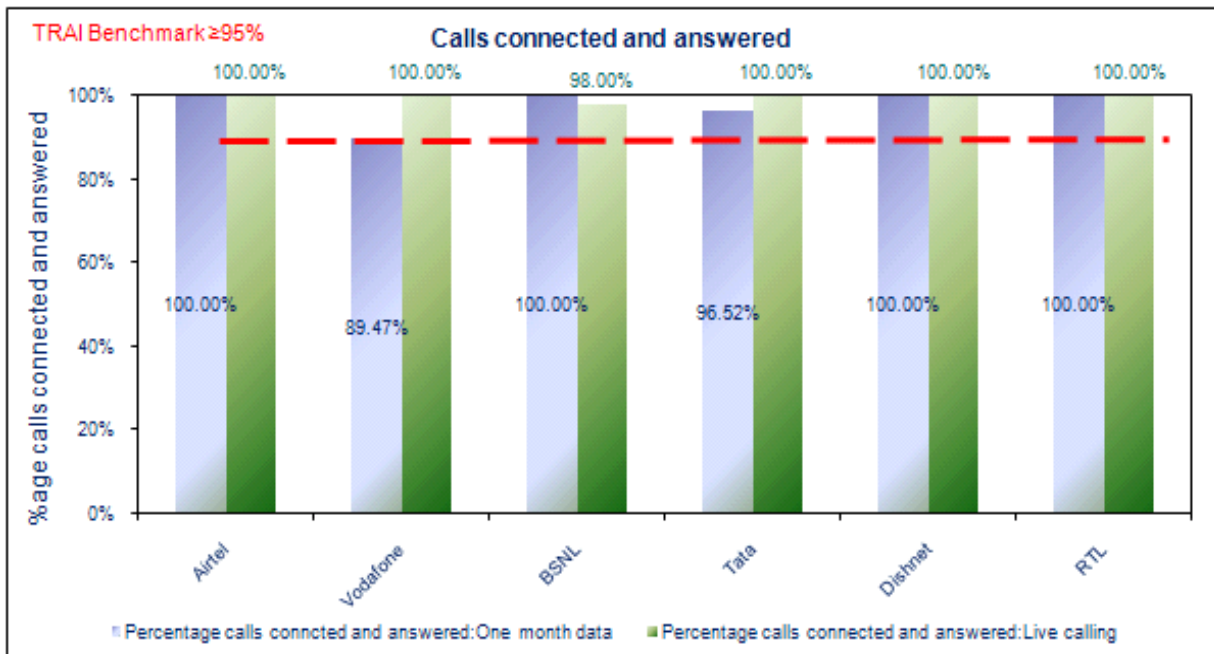
All the operators meet the benchmark

**Live calling for billing Complaints**

Resolution of billing complaints	Benchmark	Airtel	Vodafone	BSNL	Tata	Dishnet	RTL
Total Number of calls made		24	50	11	8	50	50
Number of cases resolved in 4 weeks		24	47	5	7	45	50
Percentage cases resolved in four weeks	100%	100.00%	94.00%	45.45%	87.50%	90.00%	100.00%

Operators not meeting the benchmark

**Customer Care / Helpline: Calls answered**



**One month**

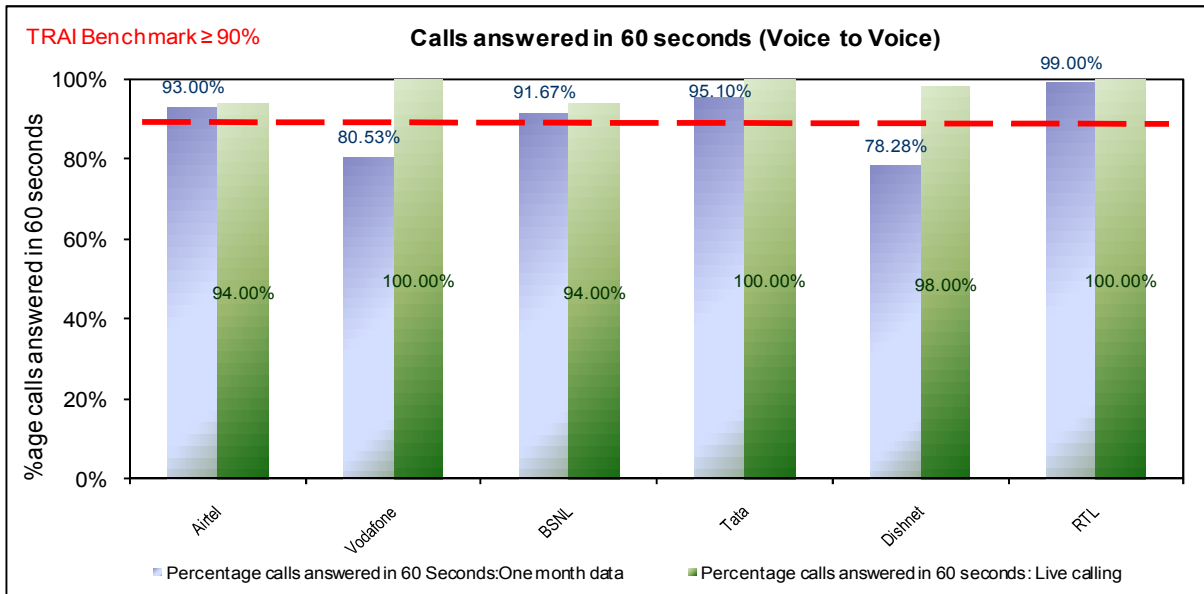
Operator(s) meeting benchmark: Airtel, BSNL, Tata, Dishnet, RTL

Operator(s) not meeting the benchmark: Vodafone

**Live measurement**

All the operators meet the benchmark

**Customer Care / Helpline: Calls answered voice to voice**



**One month**

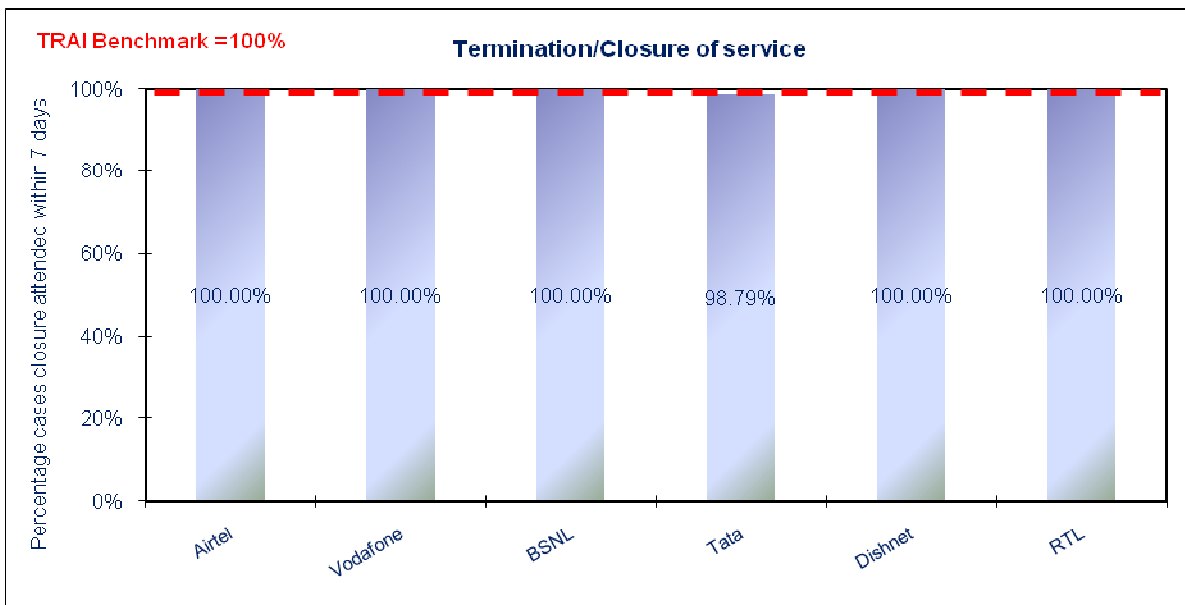
Operator(s) meeting benchmark: Airtel, BSNL, Tata, RTL

Operator(s) not meeting the benchmark: Vodafone, Dishnet

**Live measurement**

All the operators meet the benchmark

**Termination / Closure of service**

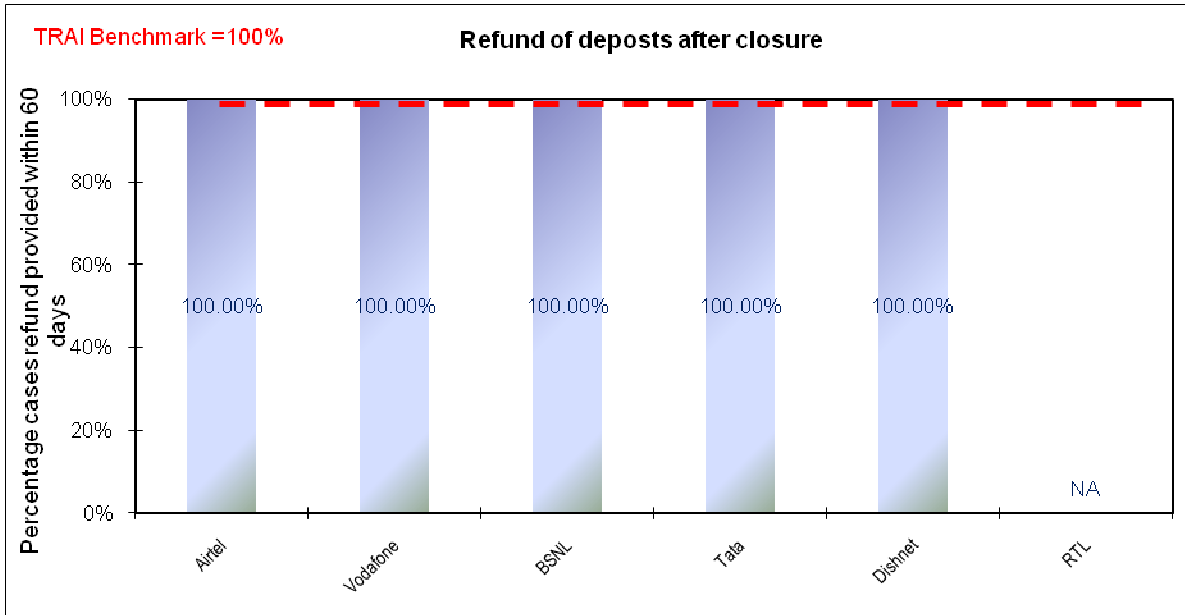


Operator(s) meeting benchmark: Airtel, Vodafone, BSNL, Dishnet, RTL

Operator(s) not meeting the benchmark: Tata



**Refund of deposits**



All the operators meet the benchmark

Inter operator calls assessment

Inter operator call Assessment To↓ From→	Airtel	Vodafone	BSNL	Tata	Dishnet	RTL
Airtel	NA	98%	79%	100%	100%	100%
Vodafone	100%	NA	100%	100%	100%	96%
BSNL	100%	100%	NA	98%	98%	97%
Tata	100%	96%	100%	NA	100%	95%
Dishnet	100%	97%	100%	100%	NA	100%
RTL	100%	89%	100%	100%	93%	NA

The maximum problem faced by the calling operator to other operators

In the inter-operator call assessment, calls were made from the test SIMs of service provider whose audit was being conducted to all the other service providers. Vodafone and Dishnet found tough connecting to a RTL number with only 89% and 93% of the calls getting connected respectively. RTL had difficulty in connecting to a Tata number with 95% of their calls getting completed. From BSNL, only 79% of calls to a Airtel number got connected.

## 12.0 Compliance reports: Results of Verification of PMR\*

### 12.1 Cellular Mobile services

Name of Service Provider	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)			POI	Metering and Billing			Response time to customer for assistance		Termination / closure of service		
	BTSS Accumulated downtime (not available for service) (%age)	Worst affected BTSS due to downtime (%age)	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 (call drop) rate (%age)	%age of connection with good voice quality	Point of Interconnection (POI) Congestion	Metering and billing credibility	%age complaints resolved within 4 weeks	Period of applying credit/waiver less than 1 week	Accessibility of call centre/ customer care	Percentage of calls answered by the operators (voice to voice) within 60 seconds	%age requests for Termination / Closure of service complied within 7 days	Refund of deposits after closure within 60 days	
<b>B.mark</b>	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 5%	≥ 95%	≤ 0.5%	< 0.1%	100%	100%	≥ 95%	≥ 90%	100%	100%	
Airtel	PMR	1.86%	12.60%	95.76%	0.69%	1.68%	2.01%	16.36%	90.76%	0	0.01%	100.00%	100.00%	97.72%	92.00%	99.00%	100.00%
	IMRB	1.91%	12.60%	95.45%	0.69%	1.68%	1.95%	16.36%	90.76%	0	0.01%	100.00%	100.00%	97.72%	92.00%	99.00%	100.00%
Vodafone	PMR	0.39%	1.26%	96.08%	0.52%	1.94%	1.88%	3.74%	97.43%	0	0.10%	100.00%	100.00%	99.00%	96.00%	94.80%	100.00%
	IMRB	0.35%	1.40%	97.96%	0.52%	1.94%	1.91%	4.91%	97.43%	0	0.10%	100.00%	100.00%	92.72%	88.56%	95.00%	100.00%
BSNL	PMR	1.34%	13.08%	97.90%	1.04%	1.98%	2.74%	13.51%	96.67%	0	0.00%	100.00%	100.00%	100.00%	75.42%	100.00%	100.00%
	IMRB	1.34%	13.08%	98.00%	1.21%	1.98%	2.82%	13.51%	97.00%	0	0.01%	100.00%	100.00%	100.00%	75.42%	100.00%	100.00%
Tata	PMR	0.70%	0.00%	99.27%	0.00%	0.40%	0.40%	1.00%	98.99%	0	0.01%	100.00%	100.00%	100.00%	98.00%	91.53%	100.00%
	IMRB	0.70%	0.00%	99.20%	0.00%	0.40%	0.54%	2.73%	98.99%	0	0.01%	100.00%	100.00%	99.51%	98.00%	91.53%	97.67%
Dishnet	PMR	2.08%	17.20%	88.72%	3.21%	2.94%	3.82%	40.67%	90.40%	0	0.10%	100.00%	100.00%	100.00%	89.00%	100.00%	100.00%
	IMRB	2.08%	17.20%	88.72%	3.21%	2.94%	3.82%	40.67%	90.40%	0	0.10%	100.00%	100.00%	100.00%	89.00%	100.00%	100.00%
RTL	PMR	0.15%	1.33%	97.06%	0.55%	1.71%	0.85%	0.27%	96.00%	0	0.02%	100.00%	100.00%	86.00%	99.00%	100.00%	100.00%
	IMRB	3.31%	11.75%	95.52%	0.55%	1.71%	1.27%	4.19%	96.00%	0	0.02%	100.00%	100.00%	86.00%	99.00%	100.00%	100.00%

\*As per the PMR submitted by the operators in the 3<sup>rd</sup> quarter of 2009



Figures do not match with those reported in PMR



Figures verified on all India basis



Not meeting benchmark

B'mark = TRAI Benchmark, DNA = Details not available

## 12.2 Conclusions

### Cellular Mobile services

1. The figures reported by almost all the operators on CSSR and call drop rate vary with the figures obtained on verification.
2. Dishnet does not meet the benchmark on network availability, accessibility and retainability
3. BSNL also fails to meet the benchmark for many of these parameters and also for response time to customer for assistance by the operator within 60 seconds
4. Dishnet and Vodafone also do not meet the TRAI benchmark for percentage calls answered within 60 seconds by the operator.

**Section C**  
**BROADBAND**

## **13.0 Sampling Methodology**

### **13.1 Sampling for Broadband service providers**

- BSNL and Sify are the two operators providing Broadband services in Assam circle
- For BSNL, Audit was conducted at the central node in Assam and data submitted by various exchanges/POPs providing Broadband service was verified and collected. This was done in such a way that at least 5% of POPs spread across 10% of SDCA's were covered
- For Sify the audit was carried out at the central node in Chennai. Live calling and download speed test were carried out at the regional office in Assam circle
- For BSNL, the data pertaining to network related parameters was obtained by IMRB Auditors at the central node in Bangalore.
- Following Broadband service providers were Audited in Assam circle:

	Name of Operator
Operator 1	BSNL
Operator 2	Sify

## 14.0 Audit methodology

### 14.1 Broadband Services

In a nutshell, the audit methodology was as follows:

	Parameters	Verification of PMR	Three day live measurement	Data Verification for one month	Live calling
(i)	Service Provisioning/ Activation time	YES	YES	YES	YES
(ii)	Fault Repair/ Restoration Time	YES	YES	YES	YES
(iii)	Billing Performance				
-	Billing Complaints per 100 Bills issued	YES	YES	YES	
-	%age of billing complaints resolved in four weeks	YES	YES	YES	YES
-	Time taken for refund of deposits after closure	YES	YES	YES	YES
(iv)	Response time to the customer for assistance(Voice to Voice)				
-	Within 60 seconds > 60%	YES	YES	YES	YES
-	Within 90 seconds > 90%	YES	YES	YES	YES
(V)	Bandwidth Utilization/ Throughput:				
▪	A)Bandwidth Utilization				
-	POP to ISP gateway Node [Intra – network] Links	YES	YES	YES	
-	ISP Gateway Node to IGSP / NIXI Node upstream Link(s) for international connectivity	YES	YES	YES	
▪	B) Broadband Connection Speed (Download)	YES	YES	YES	YES
(vi)	Service availability / Uptime	YES	YES	YES	
(vii)	Packet Loss	YES	YES	YES	
(viii)	Network Latency for wired broadband access)				
-	User reference point at POP / ISP Gateway Node to International Gateway (IGSP/NIXI)	YES	YES	YES	
-	User reference point at ISP Gateway Node to International nearest NAP port abroad ( Satellite)	YES	YES	YES	
-	User reference point at ISP Gateway Node to International nearest NAP port abroad ( Satellite)	YES	YES	YES	

{Note: A more detailed explanation of parameter wise audit methodology for Broadband services is explained in Annexure II}

## 15.0 Executive Summary

The objective assessment of Quality of Services (QoS) was carried out by IMRB International for all the Broadband service providers during the period starting from October 2009 to December 2009 in Assam circle.

### 15.1 Service provider performance report based on one month data Verification – Broadband Services

Parameters	Benchmarks	BSNL	Sify
<b>Service provisioning uptime</b>			
Percentage connections provided within 15 days	100%	81.62%	100.00%
<b>Fault repair restoration time</b>			
Percentage faults repaired by next working days	> 90%	71.15%	96.46%
Percentage faults repaired within three working days	> 99%	94.57%	99.08%
<b>Billing performance</b>			
Billing complaints per 100 bills issued	< 2%	0.24%	NA
%age of billing complaints resolved in 4 weeks	100%	98.86%	NA
%age cases in which refund of deposits after closure was made in 60 days	100%	NA	NA
<b>Customer care/helpline assessment (Voice to Voice)</b>			
Percentage calls answered within 60 seconds	> 60%	86.02%	100.00%
Percentage calls answered within 90 seconds	> 80%	94.67%	100.00%
<b>Bandwidth utilization/Throughput</b>			
Intra network links (POP to ISP Node)		166	400
Total number of intra network links > 90%		0	0
Upstream links (ISP Node to NIXI/NAP/IGSP)		280	20
Percentage bandwidth utilized on upstream links	< 80%	74.59%	83.22%
Broadband download speed	> 80%	97.66%	87.50%
Service availability/uptime	> 98%	99.98%	100.00%
Packet loss	< 1%	0.00%	0.00%
<b>Network Latency</b>			
POP/ISP Node to NIXI	< 120 msec	16	45
ISP node to NAP port (Terrestrial)	< 350 msec	219	300

{\*Note: For BSNL data pertains to the sample 5% of exchanges audited during the period October to December 2009}



Figures provided on All India basis



Not meeting the benchmark

B'mark = TRAI Benchmark, DNA = Details not available, NA: Not Applicable

### **Critical findings and Key take outs: Broadband services**

Before concluding the Audit findings for Broadband services we would like to accentuate the fact that some service providers claimed that they were submitting the PMR basis their inference of the QoS parameters. Also, there were differences observed in level of reporting for e.g. Sify, and BSNL (for network related parameters) consider all India as one circle and VSNL has been reporting PMR on the regional basis where 1 region would cover multiple circles. In fact the findings reported herewith for some of the parameters for these operators are on an all India basis.

The key conclusions (Parameter wise) emerging out from the Audit exercise of six Broadband service providers are highlighted below

#### Service provisioning/Activation time

- BSNL does not meet the TRAI benchmark of 100% connections to be provided within 15 days in Assam circle
- Live calling scores for Sify and BSNL are observed to be 87.3% and 76% respectively

#### Fault Repair/Restoration time

- BSNL (at 71%) is falling below the benchmark for fault repair within three working days.
- TRAI can consider including Mean Time to Repair (MTTR) for faults as one of the parameters for measuring Quality of Services (QoS) in future for Broadband services as well.
- Live calling scores are observed to be poor for both BSNL and Sify with both the operators falling below the benchmark level.

#### Billing performance

- Sify claims that all its retail broadband customers are prepaid and hence there are no billing complaints for Sify.
- BSNL comfortably meets the benchmark for billing complaints per 100 bills issued but falls below the benchmark for %age resolution of billing complaints

#### Customer Care/Helpline Assessment

- Both the operators meet the benchmark for calls answered by the operator in 60 and 90 seconds both for the month in which audit was carried out and for live calling carried out by IMRB auditors

#### Bandwidth Utilization:

- Both the service providers were found to be using Multiple Router Traffic Grapher (MRTG) to measure the bandwidth utilization at intra network links.
- Both the service providers were found to be reporting combined bandwidth utilization for corporate and household customers as there is no mechanism available to provide it separately for different users.
- For Intra network link, data for was obtained on all India basis. None of the links tested for these operators was found to be having above 90% bandwidth utilization for the month in which audit was carried out



- Also It was observed that all the links (tested during three day live measurement) in the access segment for both the service providers were found be below 80%.
- For Bandwidth utilization on upstream links (From ISP Node to IGSP/NIXI), Sify fails to meet the TRAI specified benchmark.

#### Download speed

- During live measurements carried out at Pop's/ISP Node it was observed that all the operators are meeting the TRAI prescribed benchmark of greater than 80% speed available to the customer. These measurements were carried out by IMRB auditors on a sample basis during visits at PoPs and ISP Node
- However, no historic data was available for verification of records for month of Audit as well as quarter ending April to June 2008 with the service providers. Most of them claimed that they are reporting to TRAI basis live tests conducted at customer premises during field visits and tests conducted at POPs/ISP Node.

#### Service Availability/Uptime:

- Both the service providers are meeting the benchmark on service availability/uptime for the month of audit and 3 day live measurement carried out

#### Packet Loss and Network Latency

- It was observed that almost all the service providers are measuring packet loss and latency by conducting random ping tests for their internal performance measurement.
- The verification of the records of old ping tests was done through latency graphs (available from smoke ping tool) for some of the operators.
- However, ping tests conducted/smoked ping results during live measurements revealed that both the service providers are meeting the benchmark prescribed by TRAI.

### Summary of Live Measurement Results – Broadband Services

Parameters	Benchmarks	BSNL	Sify
<b>Service provisioning uptime</b>			
Percentage connections provided within 15 days	100%	76.00%	87.30%
<b>Fault repair restoration time</b>			
Percentage faults repaired by next working days	> 90%	46.67%	16.67%
Percentage faults repaired within three working days	> 99%	93.33%	36.67%
<b>Billing performance</b>			
%age of billing complaints resolved in 4 weeks	100%	90.00%	NA
<b>Customer care/helpline assessment (Voice to Voice)</b>			
Percentage calls answered within 60 seconds	> 60%	80.00%	80.00%
Percentage calls answered within 90 seconds	> 80%	100.00%	100.00%
<b>Bandwidth utilization/Throughput</b>			
Intra network links (POP to ISP Node)		168	394
Total number of intra network links > 90%		0	0
Upstream links (ISP Node to NIXI/NAP/IGSP)		280	20
Percentage bandwidth utilized on upstream links	< 80%	75.34%	83.04%
Broadband download speed	> 80%	97.66%	87.50%
Service availability/uptime	> 98%	99.93%	100.00%
Packet loss	< 1%	0.00%	0.00%
<b>Network Latency</b>			
POP/ISP Node to NIXI	< 120 msec	17	56
ISP node to NAP port (Terrestrial)	< 350 msec	220	105



Figures provided on All India basis



Not meeting the benchmark

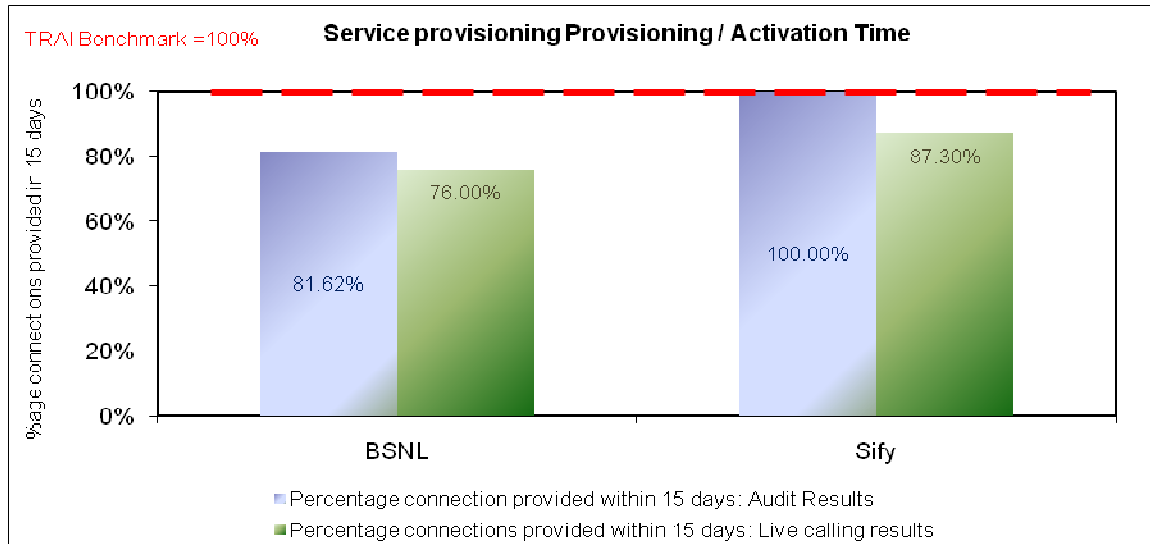
B'mark = TRAI Benchmark, DNA = Details not available, NA: Not Applicable

- Both Sify and BSNL are meeting the benchmark on service availability/uptime for three day live measurements.
- The testing for Bandwidth utilization during live measurement was carried out on sample basis by IMRB auditors for intra network links. There were no intra network links that were found to have a utilization of more than 90% for both the operators
- For Bandwidth utilization on upstream links, Sify is not meeting the benchmark during the three day live measurement.
- For network latency and packet loss both the service providers comfortably meet the TRAI specified benchmark for ping tests carried out during live measurements.

**16.0 Detailed findings – Includes comparison between Live calling/Live measurements and One month data collection for Broadband Services**

**16.1 Graphical/Tabular Representations for Broadband services**

**Service provisioning / Activation time (Comparison between one month audit results and live calling results)**



**One month**

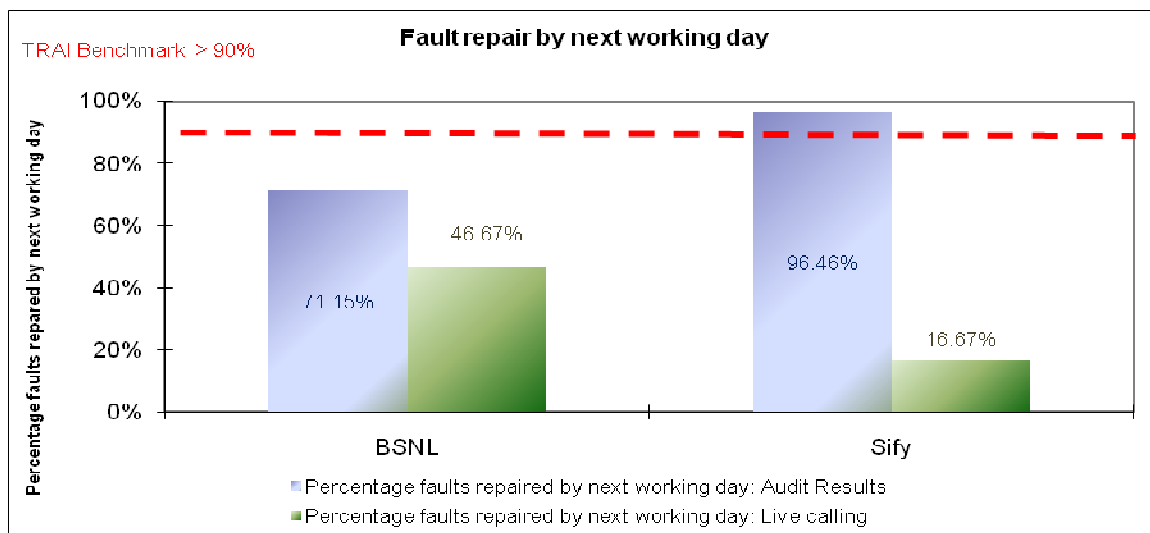
Operator meeting benchmark: Sify

Operator not meeting benchmark: BSNL

**Live calling**

No operator is meeting the benchmark

**Fault repair/Restoration time (By next working day)- Comparison between one month audit results and live calling results**



**One month**

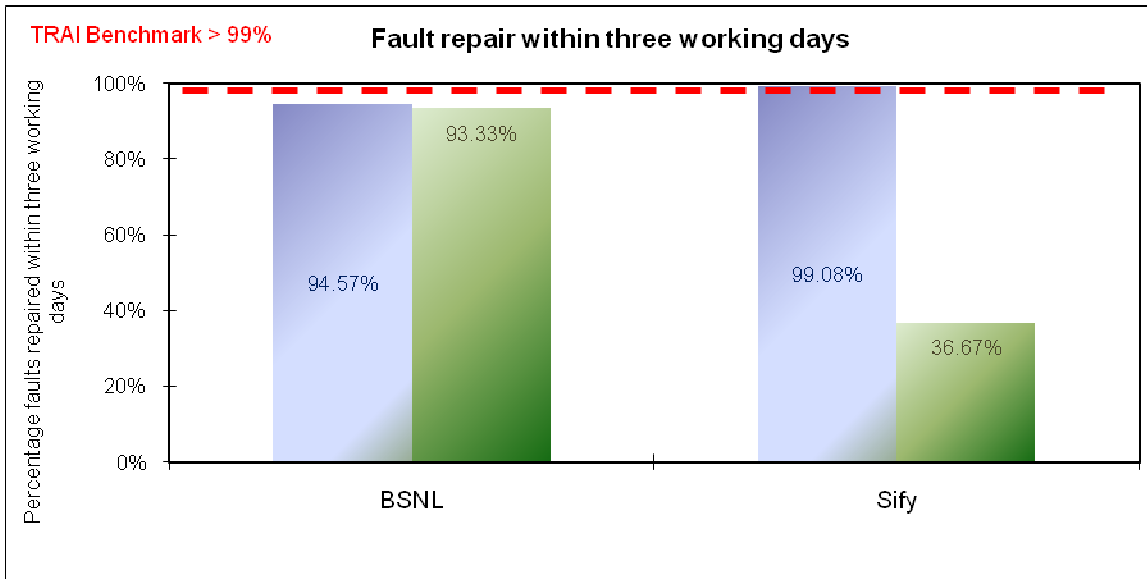
Operator meeting benchmark: Sify

Operator not meeting benchmark: BSNL

**Live calling**

No operator is meeting the benchmark

**Fault repair/Restoration time within three working days (Comparison between one month audit results and live calling results)**



**One month**

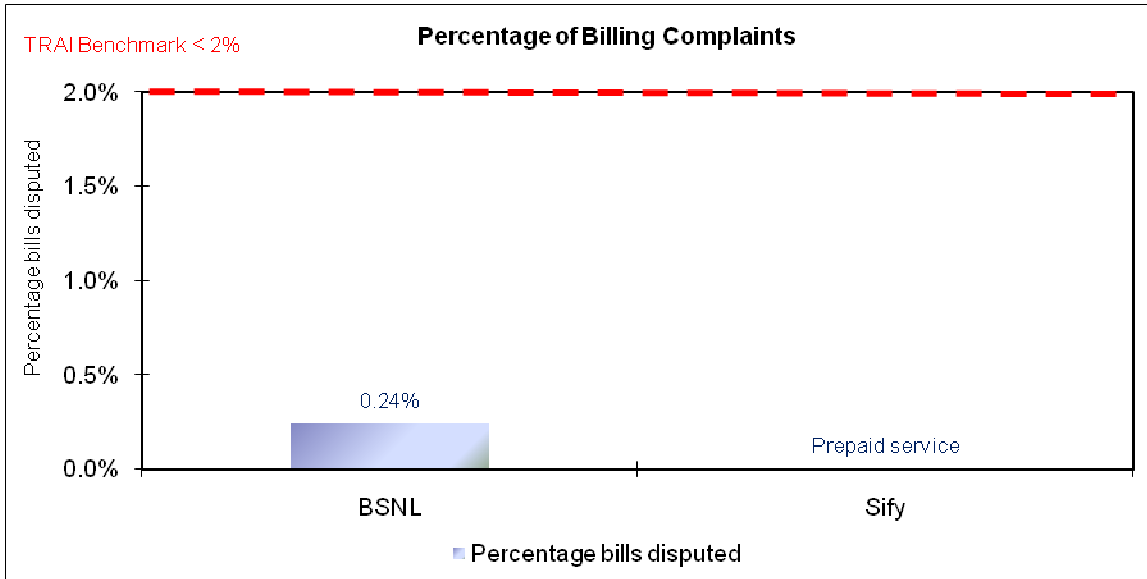
Operator meeting benchmark: Sify

Operator not meeting benchmark: BSNL

**Live calling**

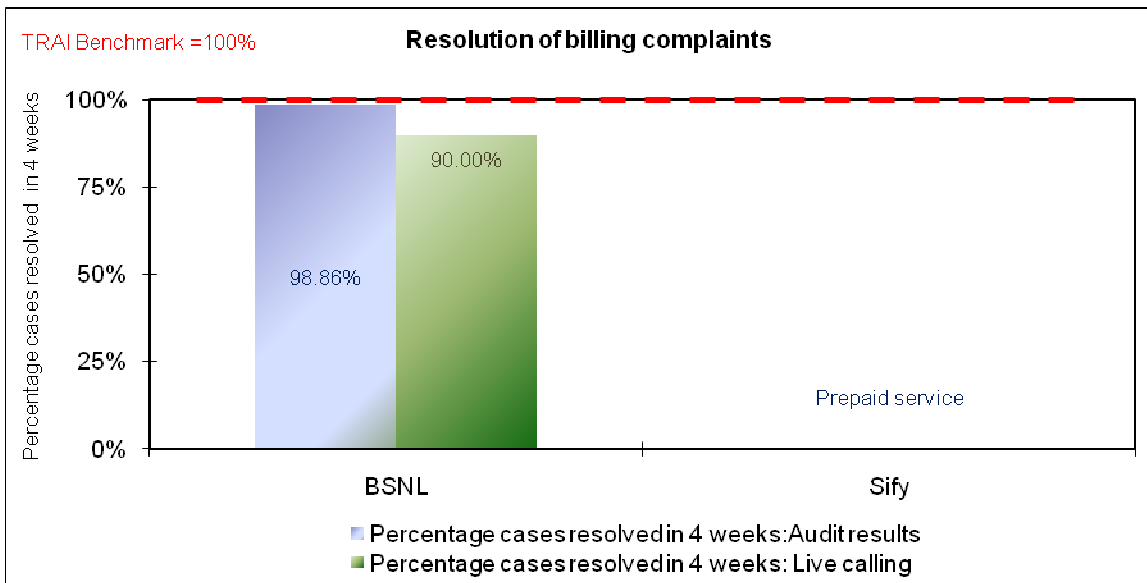
No operator is meeting the benchmark

**Percentage bills disputed**



BSNL is meeting the benchmark

**Resolution of billing complaints (Comparison between one month audit results and live calling results)**



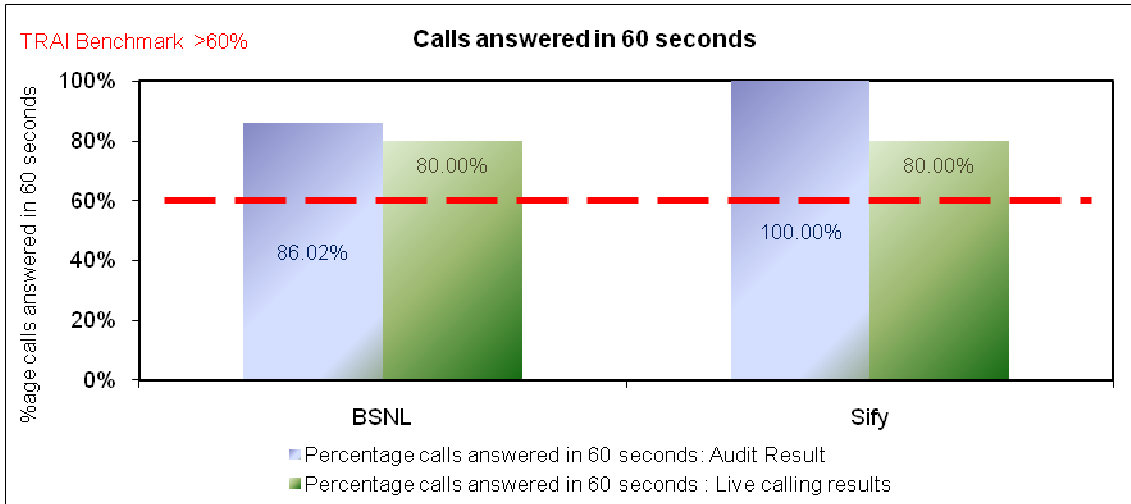
**One month**

BSNL is not meeting the benchmark

**Live calling**

BSNL is not meeting the benchmark

**Response time to customer for assistance - Calls answered by the operator within 60 seconds (Comparison between one month audit results and live calling results)**



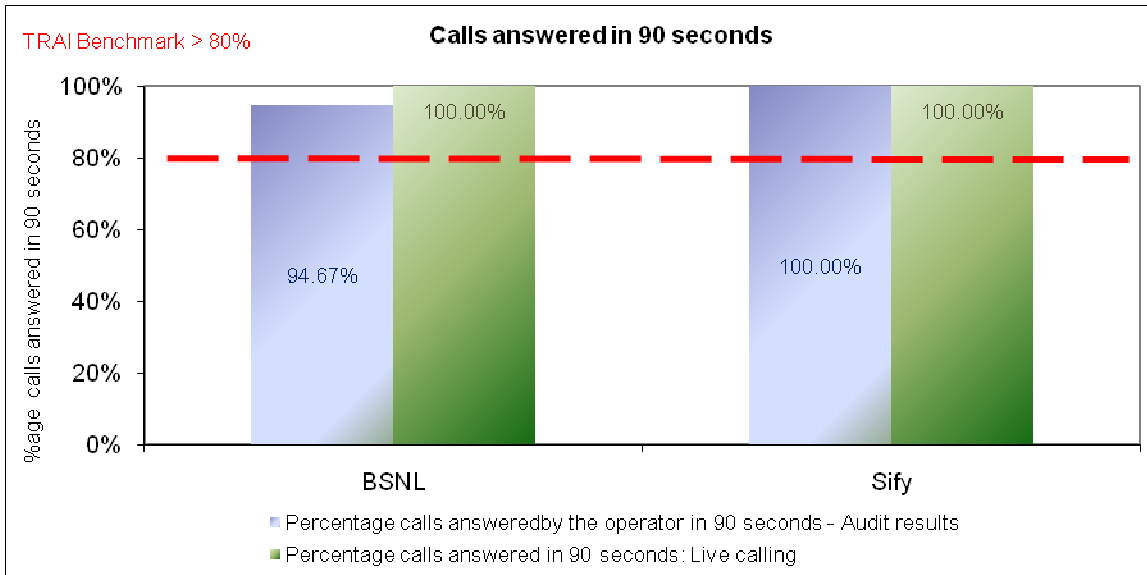
**One month**

All operators are meeting the benchmark

**Live calling**

All operators are meeting the benchmark

**Response time to customer for assistance - Calls answered by the operator within 90 seconds (Comparison between one month audit results and live calling results)**



**One month**

All operators are meeting the benchmark

**Live calling**

All operators are meeting the benchmark

**Bandwidth utilization at Intra network links (Comparison between one month audit results and live measurement results)**

Bandwidth Utilization (One month)	B'mark	BSNL	Sify
Total number of intra network links		166	400
No of Intra network found to be above 90%		0	0

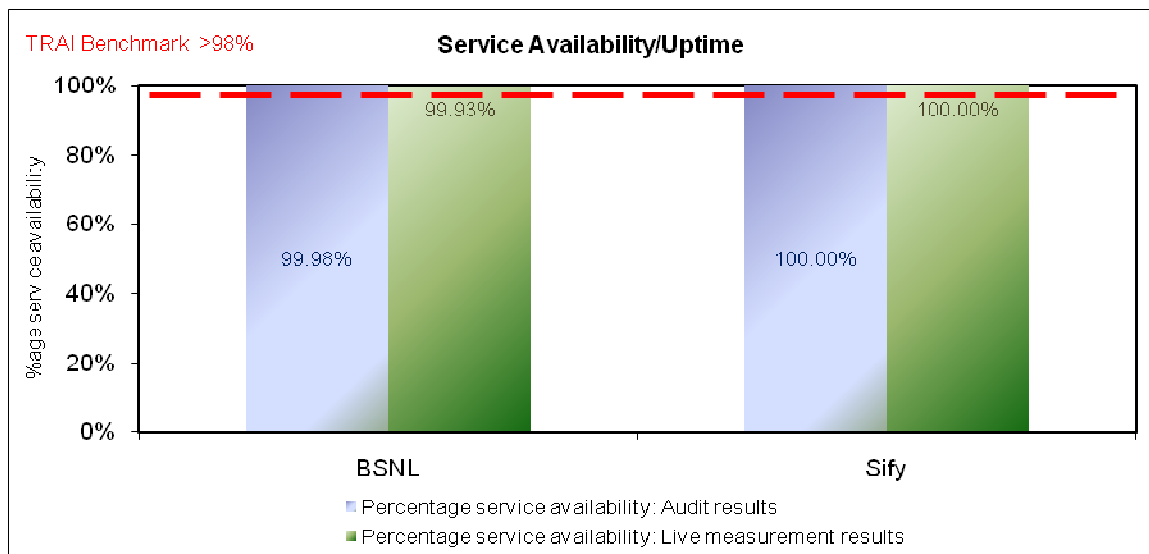
Bandwidth Utilization (Live measurement)	B'mark	BSNL	Sify
Total number of intra network links		168	394
No of Intra network found to be above 90%		0	0

Broadband download speed	Benchmark	BSNL	Sify
%age subscribed speed available to the subscriber during TCBH (B/A)*100	>80%	97.66%	87.50%

As far as bandwidth utilization on the intra network links is concerned both the operators seem to performing well as all the sample intra network links (Access segment) tested during live measurement were found to be below 90%.

For Sify bandwidth utilization at the end customer level (from POP to cable operator) remains unreported which may be a concern as some cable operators may be distributing more connections than their equipped capacity.

**Service availability/Uptime (Comparison between one month audit results and live measurement results)**



**One month**

All operators are meeting the benchmark

**Live calling**

All operators are meeting the benchmark

## 17.0 Compliance reports: Results of Verification of Records for January to March 2009

### 17.1 Broadband services

Parameters	Benchmarks	BSNL*		Sify	
		PMR#	IMRB	PMR	IMRB
<b>Service provisioning uptime</b>					
Percentage connections provided within 15 days	100%	100.00%	97.00%	100.00%	100.00%
<b>Fault repair restoration time</b>					
Percentage faults repaired by next working days	> 90%	92.00%	94.00%	90.00%	91.00%
Percentage faults repaired within three working days	> 99%	100.00%	95.00%	99.00%	100.00%
<b>Billing performance</b>					
Billing complaints per 100 bills issued	< 2%	0.00%	0.37%	0.00%	0.00%
%age of billing complaints resolved in 4 weeks	100%	100.00%	99.18%	NA	NA
%age cases in which refund of deposits after closure was made in 60 days	100%	100.00%	100.00%	NA	NA
<b>Customer care/helpline assessment (Voice to Voice)</b>					
Percentage calls answered within 60 seconds	> 60%	85.40%	85.40%	90.00%	100.00%
Percentage calls answered within 90 seconds	> 80%	86.90%	86.90%	100.00%	100.00%
<b>Bandwidth utilization/Throughput</b>					
Intra network links (POP to ISP Node)		NA	187	382	382
Total number of intra network links > 90%		NA	0	0	0
Upstream Bandwidth (ISP Node to NIXI/NAP/IGSP)		NA	650	24	24
Percentage bandwidth utilized on upstream links	< 80%	NA	73.00%	79.00%	79.00%
Broadband download speed	> 80%	92.00%	92.00%	95.00%	85.00%
Service availability/uptime	> 98%	99.00%	100.00%	100.00%	100.00%
Packet loss	< 1%	NA	4.00%	<1%	0.00%
<b>Network Latency</b>					
POP/ISP Node to NIXI ( in msec)	< 120 msec	NA	22.6	<45	45
ISP node to NAP port (Terrestrial) ( in msec)	< 350 msec	NA	243	<300	300

\* These have been calculated cumulatively on the basis of figures reported by various exchanges

#As per the PMR submitted by the operators in the 3<sup>rd</sup> quarter of 2009



Figures do not match with those reported in PMR



Not meeting the benchmark

B'mark = TRAI Benchmark, DNA = Details not available, NA: Not Applicable



## 17.2 Conclusions

### Broadband services

1. Complete data for Sify was verified on an all India level
2. For BSNL there is slight variation observed in for some parameters when compared to the figures reported in PMR. But the reason is largely the fact that data was obtained for sample 5% of exchanges whereas reporting is done for 100% of exchanges.
3. Historic data for Broadband download speed and Ping test conducted to check the latency and packet loss was available only for BSNL

**18.0 Annexure - I (WIRELINE)**

Name of the Service Provider	Name of POI not meeting the benchmark	Total No. of circuits on POI	Total No. of call attempts on POI	Total traffic served on POI (Erlang)	% of Congestion POI	Action already taken/ action plan for meeting the benchmark
BSNL	All POIs meeting TRAI specified benchmark of congestion $\leq 0.5\%$					

**18.1 Parameter wise performance reports for Basic Wireline services****1.1 Live calling for Service provisioning**

	Benchmark	BSNL
Total registrations / OB note issued in General category		55
Number of connections provided within 7 days		39
Percentage of connections provided within 7 days	100%	70.91%
Connections completed after 7 days including pending connections		16

**2.1 Audit Results for Fault repair**

Fault incidences	Benchmark	BSNL
Faults incidences ( No. of faults/100 Subs./month)	$\leq 5$	4.9

Fault repair (Urban areas)	Benchmark	BSNL
Total No. of faults registered during the month		2108
No. of faults repaired by next working day during the month		1743
Percentage of faults repaired by next working day during the month	$\geq 90\%$	82.69%
No. of faults repaired within 3 days during the month		2102
Percentage of faults repaired within 3 days during the month	100%	99.72%

Fault repair (Rural & Hilly areas)	Benchmark	BSNL
Total No. of faults registered during the month		1613
No. of faults repaired by next working day during the month		1444
Percentage of faults repaired by next working day during the month	$\geq 90\%$	89.52%
No. of faults repaired within 5 days during the month		1593
Percentage of faults repaired within 5 days during the month	100%	98.76%

Rent rebate	Benchmark	BSNL
No. of cases with faults pending for >3 days and $\leq 7$ days		3
Out of these number of cases where rent rebate for 7 days was given		3
Percentage of cases where rent rebate for 7 days was given	100%	100.00%
No. of cases with faults pending for >7 days and $\leq 15$ days		0
Out of these number of cases where rent rebate for 15 days was given		0
Percentage of cases where rent rebate for 15 days was given	100%	NA
No. of cases with faults pending for $\geq 15$ days		360

Not meeting the benchmark

Out of these number of cases where rent rebate for 30 days was given		360
Percentage of cases where rent rebate for 30 days was given	100%	100.00%

MTTR	Benchmark	BSNL
Mean time taken to repair the fault in hours	≤ 8	2.71

### 2.2 Live calling for fault repair

Urban area	Benchmark	BSNL
Total Number of calls made		161
Number of cases where faults were repaired by next working day		99
Percentage cases where faults were repaired by next working day	≥ 90%	61.49%
Number of cases where faults were repaired within 3 days		154
Percentage cases where faults were repaired within 3 days	100%	95.65%

Rural & Hilly area	Benchmark	BSNL
Total Number of calls made		164
Number of cases where faults were repaired by next working day		59
Percentage cases where faults were repaired by next working day	≥ 90%	35.98%
Number of cases where faults were repaired within 5 days		154
Percentage cases where faults were repaired within 5 days	100%	93.90%

### 3.1 Audit Results for Call Completion Rate (CCR)

Traffic statistics - Call Completion Rate	Benchmark	BSNL
Total local call attempts		278644
Total number of successful local calls		158654
Call Completion Rate (CCR) in the local network	≥ 55%	56.94%

Traffic statistics - Answer to Seizure Ratio	Benchmark	BSNL
Total number of calls processed by the switch		NA
Total number of calls answered		NA
Answer to Seizure Ratio (ASR)	≥ 75%	NA

### 3.2 Live measurement results for Call Completion Rate (CCR)

Traffic statistics - Call Completion Rate	Benchmark	BSNL
Total local call attempts		234859
Total number of successful local calls		128549
Call Completion Rate (CCR) in the local network	≥ 55%	54.73%

Traffic statistics - Answer to Seizure Ratio	Benchmark	BSNL
Total number of calls processed by the switch		NA
Total number of calls answered		NA
Answer to Seizure Ratio (ASR)	≥ 75%	NA

Not meeting the benchmark

## 4.1 Audit Results for POI Congestion

POI congestion	Benchmark	BSNL
POI traffic offered on all individual POI's		990
Served traffic for all POI's		733
Traffic failed on all POI's	≤ 0.5%	0.00%

## 4.2 Live measurement results for POI congestion

POI congestion	Benchmark	BSNL
POI traffic offered on all individual POI's		165
Served traffic for all POI's		122
Traffic failed on all POI's	≤ 0.5%	0.00%

POI congestion	Benchmark	BSNL
No. of POIs not meeting benchmark		0
Total number of working POIs		DNA

## 5.1 Audit Results for Billing performance

Billing Performance	Benchmark	BSNL
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## Billing disputes - Postpaid

Total bills generated during the period		554858
Total number of bills disputed		662
Percentage bills disputed	≤ 0.1%	0.12%

## Resolution of billing complaints

Total complaints resolved in 4 weeks from date of receipt		623
Percentage complaints resolved within 4 weeks of date of receipt	100%	94.11%

## Period of applying credit / waiver

Total number of cases requiring credit/waiver		2
Total number of cases where credit/waiver was made within 1 week		2
Percentage cases in which credit/waiver was received within 1 week	100%	100.00%

## 5.2 Live calling results for resolution of billing complaints

Resolution of billing complaints	Benchmark	BSNL
Total Number of calls made		7
Number of cases resolved in 4 weeks		7
Percentage cases resolved in 4 weeks	100%	100.00%

## 6.1 Audit Results for Requests

Shift Requests	Benchmark	BSNL
Total no. of requests received for Shifts		18
Total no. of requests for shifts attended within 3 days		13
Percentage of requests for shifts attended within 3 days	≥ 95%	72.22%
Total no. of requests for shifts not attended or attended beyond 3 days		5

Not meeting the benchmark

Closure Requests	Benchmark	BSNL
Total no. of requests received for Closures		302
Total no. of requests for closures attended within 7 days		302
Percentage of requests for closures attended within 7 days	100%	100.00%
Total no. of requests for closures not attended or attended beyond 7 days		0

#### 6.2 Live calling for Requests

Shift Requests	Benchmark	BSNL
Total no. of requests received for Shifts		19
Total no. of requests for shifts attended within 3 days		14
Percentage of requests for shifts attended within 3 days	≥ 95%	73.68%
Total no. of requests for shifts not attended or attended beyond 3 days		5

#### 7.1 Audit results for customer care

Customer Care Assessment	Benchmark	BSNL
Percentage calls getting connected and answered	≥ 95%	97.00%
Percentage calls answered within 60 seconds (voice to voice)	≥ 90%	89.00%

#### 7.2 Live calling results for customer care

Customer Care Assessment	Benchmark	BSNL
Total Number of calls received		1750
Total Number of calls getting connected and answered		1430
Percentage calls getting connected and answered	≥ 95%	81.71%

#### 7.4 Live calling results for customer care (Voice to Voice)

Customer Care Assessment	Benchmark	BSNL
Total Number of calls received		650
Total Number of calls answered within 60 seconds		366
Percentage calls answered within 60 seconds	≥ 90%	56.31%

#### 8.1 Audit results for refund of deposits

Refund	Benchmark	BSNL
Total number of cases requiring refund of deposits		2236
Total number of cases where refund was made within 60 days		1825
Percentage cases in which refund was receive within 60 days	100%	81.62%

#### 9.1 Live calling for level 1 services

Level 1 services	Benchmark	BSNL
Total no. of calls made		970
Calls answered in 60 sec		878
Calls answered after 60 sec		92

Not meeting the benchmark

## 19.0 Annexure - I (WIRELESS)

### 19.1 Service provider performance report based on one month data

Name of Service Provider	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)			Metering and Billing			Response time to customer for assistance		Termination / closure of service	
	BTSs Accumulated downtime (not available for service) (%age)	Worst affected BTSs due to downtime (%age)	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	Metering and billing credibility	%age complaints resolved within 4 weeks	Period of applying credit/waiver less than 1 week	Accessibility of call centre/ customer care	Percentage of calls answered by operators (voice to voice) within 60 sec	%age requests for Termination complied within 7 days	Refund of deposits after closure within 60 days
B' mark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 5%	≥ 95%	≤ 0.1%	100%	100%	≥ 95%	≥ 90%	100%	100%
Airtel	0.29%	5.36%	95.40%	0.75%	1.56%	1.69%	9.33%	93.38%	0.09%	100.00%	100.00%	100.00%	93.00%	100.00%	100.00%
Vodafone	0.41%	1.94%	97.73%	0.06%	0.90%	0.19%	3.88%	96.42%	0.25%	100.00%	100.00%	89.47%	80.53%	100.00%	100.00%
BSNL	1.61%	16.45%	95.62%	1.00%	2.00%	2.00%	14.06%	96.35%	0.02%	100.00%	NA	100.00%	91.67%	100.00%	100.00%
Tata	0.14%	0.00%	99.15%	0.00%	0.13%	0.54%	2.70%	99.37%	0.01%	100.00%	100.00%	96.52%	95.10%	98.79%	100.00%
Dishnet	0.95%	8.55%	94.95%	2.40%	2.86%	2.58%	27.57%	90.26%	0.05%	100.00%	100.00%	100.00%	78.28%	100.00%	100.00%
RTL	1.44%	6.84%	96.12%	1.42%	4.40%	1.04%	3.90%	97.52%	0.00%	100.00%	100.00%	100.00%	99.00%	100.00%	NA



Operators not meeting the benchmark

NA: Not Applicable

## 19.2 Monthly Point of Interconnection (POI) Congestion Report

Name of the Service Provider	Name of POI not meeting the benchmark	Total No. of circuits on POI	Total No. of call attempts on POI	Total traffic served on POI (Erlang)	% of Congestion POI	Action already taken/ action plan for meeting the benchmark
1	2	3	4	5	6	7
<b>Airtel</b>	All POIs are meeting TRAI specified benchmark of ≤0.5% congestion					
<b>Vodafone</b>	VSNL NLD	245	8288	236.7	1.00	
<b>BSNL</b>	AXEDIS		14,111.00	1,791.80	3.31	
<b>BSNL</b>	AXEDISO		14,111.00	1,791.80	3.31	
<b>BSNL</b>	MSCSLC		3,679.00	203.21	8.02	
<b>BSNL</b>	MSCSLCO		2,297.00	154.10	11.38	
<b>Tata</b>	All POIs are meeting TRAI specified benchmark of ≤0.5% congestion					
<b>Dishnet</b>	All POIs are meeting TRAI specified benchmark of ≤0.5% congestion					
<b>RTL</b>	RT-G-GWHT-MSC-02-HU		4565	91.31	>0.5%	

## 19.3 Parameter wise performance reports for Cellular Mobile services

### 1. Network Availability

#### Audit Results for Network Availability

	Benchmark	Airtel	Vodafone	BSNL	Tata	Dishnet	RTL
Number of BTSs in the licensed service area		1921	979	1131	135	1977	1097
Sum of downtime of BTSs in a month (in hours)		4085	2999	13525	143	13905	11785
BTSs accumulated downtime (not available for service)	≤ 2%	0.29%	0.41%	1.61%	0.14%	0.95%	1.44%
Number of BTSs having accumulated downtime >24 hours		103	19	186	0	169	75
Worst affected BTSs due to downtime	≤ 2%	5.36%	1.94%	16.45%	0.00%	8.55%	6.84%

### 2. Connection Establishment (Accessibility)

#### Audit Results for CSSR, SDCCH and TCH congestion

CSSR	Benchmark	Airtel	Vodafone	BSNL	Tata	Dishnet	RTL
Total number of call attempts		238268935	50405621	2270241	2196985	174882697	801240
Total number of successful calls established		227296928	49261413	2170804	2178367	166053102	770178
CSSR	≥ 95%	95.40%	97.73%	95.62%	99.15%	94.95%	96.12%

SDCCH congestion	Benchmark	Airtel	Vodafone	BSNL	Tata	Dishnet	RTL
SDCCH/Paging channel congestion	≤ 1%	0.75%	0.06%	1.00%	0.00%	2.40%	1.42%

DNA: Detailed breakup was not available with the operator. IMRB auditors have taken data the data directly from the counters.

TCH congestion	Benchmark	Airtel	Vodafone	BSNL	Tata	Dishnet	RTL
TCH congestion	≤ 2%	1.56%	0.90%	2.00%	0.15%	2.00%	4.40%

**Live measurement results for CSSR, SDCCCH and TCH congestion**

CSSR	Benchmark	Airtel	Vodafone	BSNL	Tata	Dishnet	RTL
Total number of call attempts		DNA	5261039	260511	2869672	167106126	437687
Total number of successful calls established		DNA	5141613	255170	2844079	161594244	420256
CSSR	≥ 95%	98.02%	97.73%	97.95%	99.11%	96.70%	96.02%

SDCCCH congestion	Benchmark	Airtel	Vodafone	BSNL	Tata	Dishnet	RTL
SDCCCH/Paging channel congestion	≤ 1%	0.03%	0.05%	0.22%	0.00%	1.20%	0.52%

TCH congestion	Benchmark	Airtel	Vodafone	BSNL	Tata	Dishnet	RTL
TCH congestion	≤ 2%	0.29%	0.71%	16.10%	0.14%	1.00%	2.90%

**Drive test results for CSSR (Average of three drive tests) and blocked calls**

CSSR	Benchmark	Airtel	Vodafone	BSNL	Tata	Dishnet	RTL
Total number of call attempts		741	573	864	1450	483	745
Total number of successful calls established		735	568	846	1444	470	730
CSSR	≥ 95%	99.19%	99.13%	97.92%	99.59%	97.31%	97.99%


Blocked calls	Benchmark	Airtel	Vodafone	BSNL	Tata	Dishnet	RTL
%age blocked calls		0.81%	0.87%	2.08%	0.41%	2.69%	2.01%

**3. Connection Maintenance (Retainability)**

**Audit Results for Call drop rate and for number of cells having more than 3% TCH**

Call drop rate	Benchmark	Airtel	Vodafone	BSNL	Tata	Dishnet	RTL
Total number of calls established		120362180	25439200	2170804	1988934	157104675	2431637
Total number of calls dropped		2038299	49351	43416	10802	4053084	25300
Call drop rate	≤ 2%	1.69%	0.19%	2.00%	0.54%	2.58%	1.04%

Cells having more than 3% TCH	Benchmark	Airtel	Vodafone	BSNL	Tata	Dishnet	RTL
Total number of cells in the network		6085	979	3408	408	5915	3537
Total number of cells having more than 3% TCH		568	38	479	11	1631	138
Worst affected cells having more than 3% TCH	≤ 5%	9.33%	3.88%	14.06%	2.70%	27.57%	3.90%

 Operators not meeting the benchmark

DNA: Detailed breakup was not available with the operator. IMRB auditors have taken data the data directly from the counters.



**Live measurement results for Call drop rate and for number of cells having more than 3% TCH**

Call drop rate	Benchmark	Airtel	Vodafone	BSNL	Tata	Dishnet	RTL
Total number of calls established		DNA	247094	257010	2507687	155651393	2784704
Total number of calls dropped		DNA	3681	6027	12402	3066256	25060
Call drop rate	≤ 2%	1.48%	1.49%	2.35%	0.49%	1.97%	0.90%

Cells having more than 3% TCH	Benchmark	Airtel	Vodafone	BSNL	Tata	Dishnet	RTL
Total number of cells in the network		6106	979	3408	403	17270	3546
Total number of cells having more than 3% TCH		656	23	438	9	2820	166
Worst affected cells having more than 3% TCH	≤ 5%	10.74%	2.35%	12.85%	2.23%	16.33%	4.68%

**Drive test results for Call drop rate (Average of three drive tests)**

Call drop rate	Benchmark	Airtel	Vodafone	BSNL	Tata	Dishnet	RTL
Total number of calls established		722	568	846	1450	470	727
Total number of calls dropped		5	4	6	3	4	1
Call drop rate	≤ 2%	0.69%	0.70%	0.71%	0.21%	0.85%	0.14%


**4. Voice quality**

**Audit Results for Voice quality**

Voice quality	Benchmark	Airtel	Vodafone	BSNL	Tata	Dishnet	RTL
Total number of sample calls		DNA	1002979	137	DNA	10397295799	5750721129
Total number of calls with good voice quality		DNA	967072	132	DNA	9384713882	5607956673
%age calls with good voice quality	≥ 95%	93.38%	96.42%	96.35%	99.37%	90.26%	97.52%

**Drive test results for Voice quality (Average of three drive tests)**

Voice quality	Benchmark	Airtel	Vodafone	BSNL	Tata	Dishnet	RTL
Total number of sample calls		360382	581296	818305	33924	424670	775961
Total number of calls with good voice quality		347367	547286	773656	33600	399354	693530
%age calls with good voice quality	≥ 95%	96.39%	94.15%	94.54%	99.04%	94.04%	89.38%

 Operators not meeting the benchmark

DNA: Detailed breakup was not available with the operator. IMRB auditors have taken data the data directly from the counters.


## 5. POI Congestion

### Audit Results for POI Congestion

POI congestion	Benchmark	Airtel	Vodafone	BSNL	Tata	Dishnet	RTL
No. of POIs not meeting benchmark		0	1	4	0	0	1
Total number of working POIs		16	17	99	23	42	17

## 6. Inter Operator Call Assessment


Inter operator call Assessment To↓ From→	Airtel	Vodafone	BSNL	Tata	Dishnet	RTL
Airtel	NA	98%	79%	100%	100%	100%
Vodafone	100%	NA	100%	100%	100%	96%
BSNL	100%	100%	NA	98%	98%	97%
Tata	100%	96%	100%	NA	100%	95%
Dishnet	100%	97%	100%	100%	NA	100%
RTL	100%	89%	100%	100%	93%	NA

 The maximum problem faced by the calling operator to other operators

## 7. Metering and Billing credibility

### Audit Results for Billing performance

Billing Performance	Benchmark	Airtel	Vodafone	BSNL	Tata	Dishnet	RTL
Billing disputes - Postpaid							
Total bills generated during the period		42886	46046	793682	18831	48064	118193
Total number of bills disputed		38	115	121	1	25	0
Percentage bills disputed	<= 0.1%	0.09%	0.25%	0.02%	0.01%	0.05%	0.00%
Billing disputes - Prepaid							
Number of complaints related to charging, credit & validity		214	4466	5245	12	2047	494
Total number of prepaid customers in that period		33886157	576508	734537	50283	2226171	1364104
Percentage of complaints	<= 0.1%	0.00%	0.77%	0.71%	0.02%	0.09%	0.04%
Resolution of billing complaints							
Total complaints resolved in 4 weeks from date of receipt		38	4581	121	35	2072	2808
Percentage complaints resolved within 4 weeks of date of receipt	100%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Period of applying credit / waiver							
Total number of cases requiring credit/waiver		8	1324	0	13	223	494
Total number of cases where credit/waiver was made within 1 week		8	1324	0	13	223	494
Percentage cases in which credit/waiver was received within 1 week	100%	100.00%	100.00%	NA	100.00%	100.00%	100.00%

 Operators not meeting the benchmark

DNA: Detailed breakup was not available with the operator. IMRB auditors have taken data the data directly from the counters.

**Live calling results for resolution of billing complaints**

Resolution of billing complaints	Benchmark	Airtel	Vodafone	BSNL	Tata	Dishnet	RTL
Total Number of calls made		24	50	11	8	50	50
Number of cases resolved in 4 weeks		24	47	5	7	45	50
Percentage cases resolved in four weeks	100%	100.00%	94.00%	45.45%	87.50%	90.00%	100.00%

**8. Customer Care**

**Audit results for customer care**

Customer Care Assessment	Benchmark	Airtel	Vodafone	BSNL	Tata	Dishnet	RTL
Total Number of calls received		12981	1108392	1356	10846	145305	1912854
Total Number of calls getting connected and answered (Elec.)		12981	991703	1356	10469	145305	1912854
Percentage calls getting connected and answered (Elec.)	≥ 95%	100.00%	89.47%	100.00%	96.52%	100.00%	100.00%
Percentage calls answered within 60 seconds (V2V)	≥ 90%	93.00%	80.53%	91.67%	95.10%	78.28%	99.00%

**Live calling results for customer care**

Customer Care Assessment	Benchmark	Airtel	Vodafone	BSNL	Tata	Dishnet	RTL
Total Number of calls received		50	50	50	50	50	50
Total Number of calls getting connected and answered		50	50	49	50	50	50
Percentage calls getting connected and answered	≥ 95%	100.00%	100.00%	98.00%	100.00%	100.00%	100.00%

**Live calling results for customer care (Voice to Voice)**

Customer Care Assessment	Benchmark	Airtel	Vodafone	BSNL	Tata	Dishnet	RTL
Total Number of calls received		50	50	50	50	50	50
Total Number of calls answered within 60 seconds		47	50	47	50	49	50
Percentage calls answered within 60 seconds	≥ 90%	94.00%	100.00%	94.00%	100.00%	98.00%	100.00%

**9. Termination / closure of service**

**Audit results for termination / closure of service**

Termination	Benchmark	Airtel	Vodafone	BSNL	Tata	Dishnet	RTL
Total number of closure request		333	524	275	165	95	331
Number of requests attended within 7 days		333	524	275	163	95	331
Percentage cases in which termination done within 7 days	100%	100.00%	100.00%	100.00%	98.79%	100.00%	100.00%



Operators not meeting the benchmark

DNA: Detailed breakup was not available with the operator. IMRB auditors have taken data the data directly from the counters.

**Audit results for refund of deposits**

Refund	Benchmark	Airtel	Vodafone	BSNL	Tata	Dishnet	RTL
Total number of cases requiring refund of deposits		3	115	109	206	95	0
Total number of cases where refund was made within 60 days		3	115	109	206	95	0
Percentage cases in which refund was receive within 60 days	100%	100.00%	100.00%	100.00%	100.00%	100.00%	NA

**11. Additional Network Related parameters**

**Audit Results for Total Traffic Handled in Erlang**

Traffic in Erlang		Airtel	Vodafone	BSNL	Tata	Dishnet	RTL
Equipped capacity of the network		100168	35698	11478	16523	139317	DNA
Total traffic handled in erlang during TCBH		76902	23038	8639	3953	75606	53679

**Total number of customers**

As per VLR		Airtel	Vodafone	BSNL	Tata	Dishnet	RTL
Total no. of customers served (as per VLR) on last day of the month		1963334	446905	790520	42213	1842635	964427



Operators not meeting the benchmark

DNA: Detailed breakup was not available with the operator. IMRB auditors have taken data the data directly from the counters.

## 20.0 Annexure - I (BROADBAND)

### 20.1 Parameter wise performance reports for Broadband services

#### 1. Service Provisioning

##### 1.1 Audit Results for Service provisioning

	Benchmark	BSNL	Sify
Total connections registered during the period		1447	154
Number of connections provided within 15 days		1181	154
Percentage of connections provided within 15 days	100%	81.62%	100.00%
Number of connections provided after 15 days of registration of demand		266	0
Number of customers to whom credit is given for delayed connections		0	0
Percentage of customers to whom credit is given for delayed connections	100%	0.00%	NA

##### 1.2 Live calling for Service provisioning

	Benchmark	BSNL	Sify
Total connections registered during the period		100	63
Number of connections provided within 15 days		76	55
Percentage of connections provided within 15 days	100%	76.00%	87.30%

#### 2. Fault Incidence / Clearance Statistics

##### 2.1 Audit Results for Fault repair

Fault repair	Benchmark	BSNL	Sify
Total No. of faults registered during the month		1456	14679
No. of faults repaired by next working day during the month		1036	14160
Percentage of faults repaired by next working day during the month	> 90%	71.15%	96.46%
No. of faults repaired within 3 days during the month		1377	14544
Percentage of faults repaired within 3 days during the month	>99%	94.57%	99.08%

Rent rebate	Benchmark	BSNL	Sify
No. of cases with faults pending for >3 days and ≤7 days		0	1
Out of these number of cases where rent rebate for 7 days was given		0	1
Percentage of cases where rent rebate for 7 days was given	100%	NA	100.00%
No. of cases with faults pending for >7 days and ≤15 days		0	0
Out of these number of cases where rent rebate for 15 days was given		0	0
Percentage of cases where rent rebate for 15 days was given	100%	NA	NA
No. of cases with faults pending for ≥15 days		0	0
Out of these number of cases where rent rebate for 30 days was given		0	0
Percentage of cases where rent rebate for 30 days was given	100%	NA	NA

Not meeting the benchmark

## 2.2 Live calling for fault repair

Fault repair	Benchmark	BSNL	Sify
Total Number of calls made		30	30
Number of cases where faults were repaired by next working day		14	5
Percentage cases where faults were repaired by next working day	> 90%	46.67%	16.67%
Number of cases where faults were repaired within 3 days		28	11
Percentage cases where faults were repaired within 3 days	>99%	93.33%	36.67%

## 3. Billing performance

### 3.1 Audit Results for Billing performance

Billing Performance	Benchmark	BSNL	Sify
<b>Billing disputes</b>			
Total bills generated during the period		37067	NA
Total number of bills disputed		88	NA
Percentage bills disputed	< 2%	0.24%	NA
<b>Resolution of billing complaints</b>			
Total complaints resolved in 4 weeks from date of receipt		87	NA
Percentage complaints resolved within 4 weeks of date of receipt	100%	98.86%	NA
<b>Period of refund</b>			
Total number of cases requiring refund		0	NA
Total number of cases where credit/waiver was made within 60 days		0	NA
Percentage cases in which credit/waiver was received within 60 days	100%	NA	NA

### 3.2 Live calling results for resolution of billing complaints

Resolution of billing complaints	Benchmark	BSNL	Sify
Total Number of calls made		20	NA
Number of cases resolved in 4 weeks		18	NA
Percentage cases resolved in 4 weeks	100%	90.00%	NA

## 4. Response time to the customer for assistance

### 4.1 Audit results for customer care (Voice to Voice)

Customer Care Assessment	Benchmark	BSNL	Sify
Total Number of calls received		1538	200
Total Number of calls answered within 60 seconds		1323	200
Percentage calls answered within 60 seconds	> 60%	86.02%	100.00%

### 4.2 Live calling results for customer care (Voice to Voice)

Customer Care Assessment	Benchmark	BSNL	Sify
Total Number of calls received		50	25
Total Number of calls answered within 60 seconds		40	20
Percentage calls answered within 60 seconds	> 60%	80.00%	80.00%

Not meeting the benchmark

**4.3 Audit results for customer care (Voice to Voice)**

Customer Care Assessment	Benchmark	BSNL	Sify
Total Number of calls received		1538	200
Total Number of calls answered within 90 seconds		1456	200
Percentage calls answered within 90 seconds	> 80%	94.67%	100.00%

**4.4 Live calling results for customer care (Voice to Voice)**

Customer Care Assessment	Benchmark	BSNL	Sify
Total Number of calls received		50	25
Total Number of calls answered within 90 seconds		50	25
Percentage calls answered within 90 seconds	> 80%	100.00%	100.00%

**5. Bandwidth utilization**

**5.1 Audit results for Bandwidth Utilization**

Bandwidth utilization	Benchmark	BSNL	Sify
Intra-network links (POP to ISP Node)			
Total number of intra network links		166	400
Total Bandwidth Available at the links (in Mbps)		166000	14614
Total Bandwidth utilized at all the links during TCBH (In Mbps)		32447	4620
Percentage Bandwidth utilized	<80%	19.55%	31.61%
No of Intra network found to be above 90%		0	0
International Bandwidth			
Total number of upstream links		280	20
Total International Bandwidth available from ISP Node to IGSP/NIXI/NAP (In mpbs)		43400	2830
Total International Bandwidth utilized during peak hours		32370	2355
Percentage Bandwidth utilization during peak hours (In mpbs)	<80%	74.59%	83.22%
No of Intra network found to be above 90%		0	0

**5.2 Live measurement results for Bandwidth Utilization**

Bandwidth utilization	Benchmark	BSNL	Sify
Intra-network links (POP to ISP Node)			
Total number of intra network links		168	394
Total Bandwidth Available at the links (in Mbps)		168000	15813
Total Bandwidth utilized at all the links during TCBH (In Mbps)		30706	4550
Percentage Bandwidth utilized	<80%	18.28%	28.77%
No of Intra network found to be above 90%		0	0
International Bandwidth			
Total number of upstream links		280	20
Total International Bandwidth available from ISP Node to IGSP/NIXI/NAP (In mpbs)		43400	2730
Total International Bandwidth utilized during peak hours		32698	2267
Percentage Bandwidth utilization during peak hours (In mpbs)	<80%	75.34%	83.04%
No of Intra network found to be above 90%		0	0

Not meeting the benchmark

## 6. Broadband download speed

### 6.2 Live calling results for broadband download speed

Broadband download speed	Benchmark	BSNL	Sify
%age subscribed speed available to the subscriber during TCBH (B/A)*100	>80%	97.66%	87.50%

## 7. Service availability/uptime

### 7.1 Audit results for service availability

Service Availability	Benchmark	BSNL	Sify
Total Operational Hours		126000	744
Total Downtime		30	0
Total time when the service was available		125970	744
Service Availability Uptime in Percentage	>98%	99.98%	100.00%

### 7.2 Live measurement results for service availability

Service Availability	Benchmark	BSNL	Sify
Total Operational Hours		12600	72
Total Downtime		9	0
Total time when the service was available		12591	72
Service Availability Uptime in Percentage	>98%	99.93%	100.00%

## 8. Network latency / Packet loss

### 8.1 Audit results for Latency and packet loss

Network Latency and Packet Loss	Benchmark	BSNL	Sify
Packet Loss (Percentage)	< 1%	0.00%	0.00%

#### Network Latency


From user reference point at POP/ISP Node to IGSP/ NIXI (msec)	<120msec	16	45
From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec)	<350msec	219	300

### 8.2 Live measurement results for Latency and packet loss

Network Latency and Packet Loss	Benchmark	BSNL	Sify
Packet Loss (Percentage)	< 1%	0.00%	0.00%

#### Network Latency

From user reference point at POP/ISP Node to IGSP/ NIXI (msec)	<120msec	17	56
From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec)	<350msec	220	105

 Not meeting the benchmark



## **21.0 Annexure – II Detailed Explanation of Audit methodology (Parameter wise)**

### **21.1 For Basic (Wireline) services**

<b>1. Provision of telephone after registration of demand</b>	
<b>Computational Methodology as per QoS definition</b>	Percentage connections provided within 7 working days = (No. of connections provided within seven working days/ Total number of connections registered during the period of 3 months) * 100 Technically Non Feasible (TNF) cases such as unavailability of telephone infrastructure/ equipment in the Area or Spare Capacity for activating telephone connection shall be excluded from the calculation of this parameter.
<b>Benchmark</b>	100% cases in <7 days, subject to technical feasibility
<b>Audit Procedure</b>	IMRB Auditors verified and collected data pertaining to number of applications received at the service provider's level in the following time frames:- - Number of connections provided within 7 days - Number of connections provided after 7 days - Number of connections were request is still pending  <b>Live calling :-</b> - Interviewers ensured that operator should provide list of all new numbers added in one month prior to IMRB staff visit. - Live calling team called up at least 10% of the customers who applied for new connections during the month prior to Audit - Checked and Recorded whether the connection was provided within 7 days of registration on demand

<b>2. Fault incidence/clearance related statistic</b>	
<b>Computational Methodology</b>	<b>Fault incidence</b> = (No. of faults reported by the customer per month/ Total Number of Subscribers for that particular month)*100
<b>Benchmark</b>	Total number of faults registered per month: <=5 complaints per 100 subscribers Fault repair by next working day: >=90% and within 3 days: 100%, averaged over a quarter.
<b>Audit Procedure</b>	IMRB Auditors to verify and collect data pertaining to number of fault received at the service provider's level in the following time frames:- Number of faults cleared within 24 hours Number of cleared in more than 1 day but less than 3 days Number of cleared in more than 3 days but less than 7 days Number of cleared in more than 7 days but less than 15 days Number of cleared in more than 15 days <b>Live calling :-</b> -Live calling to be done to verify 'Fault repair by next working day' parameter -Interviewers ensured that operator provided a list of all the subscribers who reported faults in one month prior to IMRB staff visit. -Calls were made to up to 10% or 30 complainants for the concerned exchange, whichever is less - Auditors checked and recorded whether the fault was corrected within the timeframes as mentioned in the benchmark.

<b>3. Metering and billing credibility – billing complaints</b>	
<b>Computational Methodology</b>	Percentage incidence of billing complaints = (No. of billing complaints reported by the customer per month/ Total Number of Subscribers for that particular month)*100 Percentage resolution of billing complaints = (No. of billing complaints resolved over a particular period of time/Total No. of billing complaints of that period of time)*100
<b>Benchmark</b>	Percentage incidence of billing complaints: Not more than 0.1% of the bills issued Percentage resolution of billing complaints: 100% within a period of 4 weeks Period of applying credit/waiver/adjustment : In 100% of the cases within 1 week of resolution of complaint
<b>Audit Procedure</b>	IMRB Auditors to verify and collect data pertaining to - Number of Billing complaints received at the service provider's level - Last billing cycle stated should be such that due date for payment of bills must be beyond the date when this form is filled. - Include all types of bills generated for customers. This could include online as well as other forms of bills presentation including printed bills - Billing complaint is any of written complaint/ personal visit/ telephonic complaint related to: Excess metering/ wrong tariff scheme charged, Late receipt of bills/ Not received at all, Wrong name and address, Payment made in time but charged penalty/ not reflected in next bill, Last payment not reflected in bill, Adjustment/ waiver not done, Anything else related to bills, Toll free numbers charged etc. <b>Live calling : -</b> - IMRB Auditors collected the list of all the subscribers who have made billing complaints in the month prior to the Audit. -100 such subscribers per service provider were called to check the time taken to resolve the billing complaint. However, in some cases where number of billing complaints were less the sample size could not be achieved

<b>4. Customer care promptness (Shifts and Closures)</b>	
<b>Computational Methodology</b>	Shifts and closure requests
<b>Benchmark</b>	Shifting of telephone line : Less than 3 days Processing of closure request: Less than 7 days
<b>Audit procedure</b>	<b>IMRB Auditors collected and verified data pertaining to</b> <b>Shifting Request: (Following key points were taken care of while verifying the data)</b> - Date of filing form should be at least 3 working days after the date of month appraised. - All the holidays are excluded and only working days are considered - The number of shift requests per month does not include the pending connections of the previous months. <b>Processing of closure request (Following key points were taken care of while verifying the data)</b> - The operator includes all Requests for volunteer Permanent Closure and External (shifts to other exchanges) Shift requests received at their exchange. - DNP (due to Non – payment) cases are excluded - All holidays are excluded for calculating 7 days. - Closure requests attended in the previous months are excluded - The period for closure starts from the time of submission of application by the subscriber.

<b>5. Response time to customer</b>	
<b>Computational Methodology</b>	Percentage of calls answered in a specified time = (Total no. of calls answered within that specified time / Total no. of calls dialed for a particular service)*100
<b>Benchmark</b>	(i) % age of calls getting connected and answered: In 95% of the cases or more  (ii) % age of calls answered by operator / voice to voice) within 60 seconds: In 90% of the cases or more

<b>Audit Procedure</b>	<p>-IMRB auditors made test calls from the exchanges to the operator's customer care / helpline / toll free numbers. They will record the time taken to connect a customer's call both to the IVR as well as to a customer care executive.</p> <p>- All the supplementary services that have any kind of human intervention are to be covered here. It also includes the IVR assisted services.</p> <p>- Time to answer the call by the operator should be taken from the time auditor has pressed the requisite button for being assisted by the operator.</p> <p><b>Live calling: -</b></p> <p>- Overall sample size is 2*50 calls per service provider per circle at different points of time, evenly distributed across the selected exchanges – 50 calls between 1000 HRS to 1300 HRS and 50 calls between 1500 HRS to 1700 HRS</p> <p>- Time to answer the call by the operator was assessed from the time interviewer pressed the requisite button for being assisted by the operator.</p> <p>- All the supplementary services that have any kind of human intervention are to be covered here. It also includes the IVR assisted services.</p>
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<b>6. Time taken to refund of deposits after closure</b>	
<b>Computational Methodology</b>	Percentage of cases needing refund in a specified time = (Total no. of cases where refund was made within a particular time / Total no. of cases requiring refunds)*100
<b>Benchmark</b>	Time taken to refund = 100% within 60 days
<b>Audit Procedure</b>	<p>IMRB Auditors verified and collected data pertaining to</p> <p>- Cases requiring refund of deposits after closure are to be included</p> <p>- Time taken starts from the date on which the closure is made by the service provider and ends at the date on which refund is received by the customer</p> <p><b>Live calling : -</b></p> <p>- Collect the details of all the cases for which the refund was provided by the operator prior to the month of Audit</p> <p>- Overall 100 number of live calls are to be made in a licensed service area/circle for each service provider (Distributed across number of exchanges selected)</p>

<b>7. Call completion rate</b>	
<b>Computational Methodology</b>	<p>Call Completion Rate: Call Completion Rate (CCR) is defined as the percentage of total calls that are connected out of the total calls presented to exchange. This could be due to:- Other exchange not working / lines blocked</p> <p>Calling exchange is blocked</p> $CCR = [(Call\ attempts - Calls\ blocked) / Call\ attempts] \times 100$
<b>Benchmark</b>	Call Completion Rate (CCR) within local network: More than 55%
<b>Audit Procedure</b>	<p>IMRB Auditors verified and collected data pertaining to Sample Traffic Data during Time Consistent Busy Hour (TCBH). These details were collected separately for</p> <p>- Three days in which live measurement was carried out</p> <p>- For the complete month in which audit was carried out</p>

## 21.2 Cellular Mobile services

1. Accumulated Downtime of the Network	
<b>Computational Methodology as per QoS definition</b>	<p>BTSs 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 upgradation.</p> <p><b>Computational Methodology:</b></p> <ul style="list-style-type: none"> <li>BTSs Accumulated downtime = <math>\frac{\text{Sum of downtime of BTSs in a month in hours}}{24 \times \text{No. of days in the month} \times \text{No. of BTSs in the network in the licensed service area}} \times 100</math></li> <li>Worst affected BTSs due to downtime = <math>\frac{\text{No. of BTSs having accumulated downtime &gt;24 hours in a month}}{\text{Total No. of BTSs in the network in the licensed service area}} \times 100</math></li> </ul>
<b>Benchmark</b>	<ul style="list-style-type: none"> <li>BTSs Accumulated downtime (not available for service) <math>\leq 2\%</math></li> <li>Worst affected BTSs due to downtime <math>\leq 2\%</math></li> </ul>
<b>Audit Procedure</b>	<p>IMRB auditors collected and verified data pertaining to:</p> <p>The fault alarm details at the OMC (MSC) for the network outages (due to own network elements and infrastructure service provider end outages) used for arriving at the benchmark reported to TRAI were audit</p>

2. Call Set-Up Success Rate (CSSR)	
<b>Computational Methodology as per QoS definition</b>	<p>The ratio of calls established to total calls is known CSSR.</p> <p>Call Established means the following events have happened in call setup:-</p> <ul style="list-style-type: none"> <li>↪ call attempt is made</li> <li>↪ the TCH is allocated</li> <li>↪ the call is routed to the outward path of the concerned MSC</li> </ul> <p>Computational Methodology: <math>\text{Calls Established} / \text{Total Call Attempts} \times 100</math></p>
<b>Benchmark</b>	> 95%
<b>Audit Procedure</b>	<p>IMRB auditors collected and verified data pertaining to</p> <ul style="list-style-type: none"> <li>↪ The cell-wise data generated through counters/ MMC available in the switch for traffic measurements was verified by the auditors</li> <li>↪ CSSR calculation was measured using OMC generated data only</li> <li>↪ Measurement was done only in Time Consistent Busy Hour (TCBH) period for all days of the week</li> </ul>

3. Network Congestion Parameters	
Computational Methodology as per QoS definition	<p>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:</p> <ul style="list-style-type: none"> <li>↳ SDCCH Level: Stand-alone dedicated control channel</li> <li>↳ TCH Level: Traffic Channel</li> <li>↳ POI Level: Point of Interconnect</li> </ul> <p><b>Computational Methodology:</b></p> <ul style="list-style-type: none"> <li>↳ <b>SDCCH / TCH Congestion% = <math>[(A1 \times C1) + (A2 \times C2) + \dots + (An \times Cn)] / (A1 + A2 + \dots + An)</math></b> <ul style="list-style-type: none"> <li>● Where:-A1 = Number of attempts to establish SDCCH / TCH made on day 1</li> <li>● C1 = Average SDCCH / TCH Congestion % on day 1</li> <li>● A2 = Number of attempts to establish SDCCH / TCH made on day 2</li> <li>● C2 = Average SDCCH / TCH Congestion % on day 2</li> <li>● An = Number of attempts to establish SDCCH / TCH made on day n</li> <li>● Cn = Average SDCCH / TCH Congestion % on day n</li> </ul> </li> <li>↳ <b>POI Congestion% = <math>[(A1 \times C1) + (A2 \times C2) + \dots + (An \times Cn)] / (A1 + A2 + \dots + An)</math></b> <ul style="list-style-type: none"> <li>● Where:-A1 = POI traffic offered on all POIs (no. of calls) on day 1</li> <li>● C1 = Average POI Congestion % on day 1</li> <li>● A2 = POI traffic offered on all POIs (no. of calls) on day 2</li> <li>● C2 = Average POI Congestion % on day 2</li> <li>● An = POI traffic offered on all POIs (no. of calls) on day n</li> <li>● Cn = Average POI Congestion % on day n</li> </ul> </li> </ul>
Benchmark	<p><b>SDCCH Congestion: ≤ 1%</b>  <b>TCH Congestion: ≤ 2%</b>  <b>POI Congestion: ≤ 0.5%</b></p>
Audit Procedure	<p><b>IMRB Auditors collected and verified records pertaining to:</b></p> <ul style="list-style-type: none"> <li>↳ Audit of the details of SDCCH and TCH congestion percentages computed by the operator (using OMC–Switch data only) was conducted</li> <li>↳ The operator should be measuring this parameter during Time consistent busy hour (TCBH) only SDCCH</li> <li>↳ The POI details were verified from the switch for all the links of the operators</li> </ul>

4. Call Drop Rate	
Computational Methodology as per QoS definition	<p>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</p> <ul style="list-style-type: none"> <li>↳ <b>Total calls dropped</b> = All calls ceasing unnaturally i.e. due to handover or due to radio loss</li> <li>↳ <b>Total calls established</b> = All calls that have TCH allocation during busy hour</li> </ul> <p><b>Computational Methodology:</b>  <math>\text{Total Calls Dropped} / \text{Total Calls Established} \times 100</math></p>
Benchmark	<p>≤ 2%</p>
Audit Procedure	<p><b>IMRB Auditors collected and verified records pertaining to:</b></p> <ul style="list-style-type: none"> <li>↳ Audit of traffic data of the relevant quarter kept in OMC-R at MSCs and used for arriving at CDR was conducted.</li> <li>↳ The operator should only be considering those calls which are dropped during Time consistent busy hour (TCBH) for all days of the relevant quarter</li> </ul>

5. Connections with Good Voice Quality	
Computational Methodology as per QoS definition	<p>Definition:</p> <ul style="list-style-type: none"> <li>↪ for GSM service providers the calls having a value of 0 – 4 are considered to be of good quality (on a seven point scale)</li> <li>↪ 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 %</li> </ul> <p><b>Computational Methodology:</b></p> <ul style="list-style-type: none"> <li>↪ <b>% Connections with good voice quality</b> = (No. of voice samples with good voice quality / Total number of samples) x 100</li> </ul>
Benchmark	≥ 95%
Audit Procedure	<p><b>IMRB Auditors collected and verified records pertaining to:</b></p> <p>Audit would be conducted based on the details of periodic drive tests conducted at different part of the network during Time consistent busy hour (TCBH) and used to arrive at the benchmarks reported to TRAI.</p> <p>Procedures that were to be followed by operator for obtaining relevant details for computing this parameter were audited</p> <ul style="list-style-type: none"> <li>↪ Operator to conduct <u>at least one</u> drive test using standard drive test equipment every week during TCBH</li> <li>↪ Each drive test should evenly cover the following 5 types of locations:</li> <li>↪ <b>3 Outdoor</b> (Periphery of the city, Congested Area, Across the City), and <b>2 Indoor</b> (Office Complex and Shopping Complex)</li> <li>↪ 2 minute long calls to be initiated and held throughout the drive test</li> <li>↪ The speed of the vehicle should be kept at around 50km/hr. (around 30 km/hr in case of geographically small cities) – This was ensured during the drive tests conducted by IMRB Auditors</li> <li>↪ RxQual / FER samples generated during the drive test collected by the operator were verified</li> <li>↪ <i>Measurements using Engineering handsets were not acceptable</i></li> <li>↪ All the operators were not maintaining this data at the switch level</li> </ul>

6. Service Coverage	
Computational Methodology as per QoS definition	<p>Definition:</p> <ul style="list-style-type: none"> <li>↪ The level of signal available in a particular part of a city is known as signal strength.</li> </ul> <p><b>Computational Methodology:</b></p> <ul style="list-style-type: none"> <li>↪ Service Coverage for route type x = <math>[(N1 \times CSS1) + (N2 \times CSS2) + \dots + (Nn \times CSSn)] / (N1 + N2 + \dots + Nn)</math></li> <li>↪ Where:-N1 = Number of calls on type of route x made in drive test 1</li> <li>↪ CSS1 = Average coverage signal strength on type of route x in drive test 1 (in dBm)</li> <li>↪ N2 = Number of calls on type of route x made in drive test 2</li> <li>↪ CSS2 = Average coverage signal strength on type of route x in drive test 2 (in dBm)</li> <li>↪ Nn = Number of calls on type of route x made in drive test n</li> <li>↪ CSSn = Average coverage signal strength on type of route x in drive test n (in dBm)</li> </ul>
Benchmark	<p><b>Indoor &gt;= -75 dBm</b></p> <p><b>In-vehicle &gt;= -85 dBm</b></p> <p><b>Outdoor – in city &gt;= -95 dBm</b></p>
Audit Procedure	<p><b>IMRB Auditors collected and verified call centre records pertaining to:</b></p> <ul style="list-style-type: none"> <li>↪ Audit was conducted based on the details of periodic drive tests conducted at different part of the network during Time consistent busy hour (TCBH) which were used to arrive at the benchmarks reported to TRAI.</li> <li>↪ Procedures were verified that were to be followed by operator for obtaining relevant details for computing this parameter:-</li> </ul>

	<ul style="list-style-type: none"> <li>↳ Operator to conduct at least one drive test using standard drive test equipment* every week during Time consistent busy hour (TCBH).</li> <li>↳ Each drive test should evenly cover the following 5 types of locations: –             <ul style="list-style-type: none"> <li>↳ 3 Outdoor (Periphery of the city, Congested Area, Across the City), and</li> <li>↳ 2 Indoor (Office Complex and Shopping Complex)</li> </ul> </li> </ul> <p>↳ <i>Measurements using Engineering handsets were not acceptable</i></p>
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7. Response time to customer	
<b>Computational Methodology</b>	<p><b>To connect to Customer care:</b> The time taken to connect a person (as soon as he presses call) to the IVR of the service provider</p> <p><b>To connect to operator:</b> The time taken to connect a person (as soon as he presses 9) to the customer care executive</p> <p><b>Computational Methodology:</b></p> <ul style="list-style-type: none"> <li>• % age of calls getting connected = <math display="block">\frac{\text{Total number of calls getting connected} \times 100}{\text{Total number of calls made}}</math></li> <li>• % age of calls answered within 60 sec (voice to voice) = <math display="block">\frac{\text{Total number of calls answered within 60 seconds} \times 100}{\text{Total number of calls made}}</math></li> </ul>
<b>Benchmark</b>	<ul style="list-style-type: none"> <li>↳ % age of calls getting connected and answered <math>\geq 95\%</math></li> <li>↳ % age of calls answered by operator (voice to voice) within 60 seconds <math>\geq 90\%</math></li> </ul>
<b>Audit Procedure</b>	<p>-IMRB auditors made test calls from the exchanges to the operator's customer care / helpline / toll free numbers. They will record the time taken to connect a customer's call both to the IVR as well as to a customer care executive.</p> <p>- All the supplementary services that have any kind of human intervention are to be covered here. It also includes the IVR assisted services.</p> <p>- Time to answer the call by the operator should be taken from the time auditor has pressed the requisite button for being assisted by the operator.</p> <p><b>Live calling: -</b></p> <p>- Overall sample size is 2*50 calls per service provider per circle at different points of time, evenly distributed across the selected exchanges – 50 calls between 1000 HRS to 1300 HRS and 50 calls between 1500 HRS to 1700 HRS</p> <p>- Time to answer the call by the operator was assessed from the time interviewer pressed the requisite button for being assisted by the operator.</p> <p>- All the supplementary services that have any kind of human intervention are to be covered here. It also includes the IVR assisted services.</p>

**8.1 Billing complaints per 100 bills issued**

<p><b>Computational Methodology as per QoS definition</b></p>	<p>Billing complaints includes any of the following complaints related to billing from the point of view of customer:</p> <ul style="list-style-type: none"> <li>• Local call charges billed as STD/ISD or vice-versa</li> <li>• Toll free numbers charged</li> <li>• Wrong roaming charges</li> <li>• Call made/received disputed</li> <li>• Wrongly charged extra for some service (SIM replacement charged twice, service not used but charged etc.)</li> <li>• Cheque submitted on time but charged penalty for paying beyond due date (in case customer is not at fault i.e. all those that operator cannot prove that he/she is not lying)</li> <li>• Payment made but not reflected (may be wrongly adjusted to another customer etc.)</li> </ul> <p><b>Billing complaints per 100 bills issued</b> = Total billing complaints** received during the relevant quarter / Total bills generated* during the relevant quarter</p> <p>* All types of bills generated for customers i.e. printed bills, online bills and any other forms of bills generated are to be included</p> <p>** <u>Only</u> dispute related issues (including those that may arise because of a lack of awareness at the subscribers' end) are to be included. It does not include any provisional issues (such as delayed dispatch of billing statements, etc.) in which the operator has opened a ticket internally.</p>
<p><b>Benchmark</b></p>	<p>&lt; 0.1% billing complaints per 100 bills</p>
<p><b>Audit Procedure</b></p>	<p>IMRB auditors collected and verified data pertaining to</p> <ul style="list-style-type: none"> <li>- Number of bills generated</li> <li>- Number of billing complaints received</li> <li>- %age complaints per 100 bills</li> </ul>

**8.2 Resolution of billing complaints**

<p><b>Computational Methodology as per QoS definition</b></p>	<p><b>%age of billing complaints resolved within 4 weeks</b>=(Complaints resolved in 4 weeks from date of receipt / Total billing complaints received during the relevant period) x 100</p> <p><i>Only dispute related issues (including those that may arise because of a lack of awareness at the subscribers' end) are to be included. It does not include any provisional issues (such as delayed dispatch of billing statements, etc.) in which the operator has opened a ticket internally.</i></p> <p><i>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.</i></p>
<p><b>Benchmark</b></p>	<p>100% cases to be resolved within 4 weeks</p>
<p><b>Audit Procedure</b></p>	<p>IMRB Auditors collected and verified data pertaining to</p> <ul style="list-style-type: none"> <li>- Total number of billing complaints/bills disputed</li> <li>- Number of complaints resolved in 4 weeks</li> </ul> <p><b>Live calling :-</b>  <b>Overall 100 number of live calls</b> made in a licensed service area/circle for each service provider. However in certain cases the sample could not be achieved as bills disputed (prior to the month of Audit) were found to be less than 100</p>
<p><b>Benchmark</b></p>	<p>100% cases in less than 1 week</p>
<p><b>Audit Procedure</b></p>	<p><b>Audit of refund details and complaints (only those resulting in refunds) resolution details used for arriving at the figures reported to TRAI to be conducted.</b>  <b>Operator to provide details of:-</b></p> <ul style="list-style-type: none"> <li>• <b><u>Dates of resolution</u></b> of all billing complaints resolved in favour of customer</li> </ul>



<p style="text-align: center;"><b>and resulting in requirement of a refund by the operator</b></p> <ul style="list-style-type: none"> <li>• <b><u>Dates of refund</u> pertaining to all billing complaints received during the relevant quarter</b></li> </ul> <p style="text-align: center;"><b>Also random live checks of all subscribers entitled for refund were conducted</b></p>
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### 21.3 For Broadband services

<b>1. Service provisioning/Activation time</b>	
<b>Computational Methodology as per QoS definition</b>	<p>Service provisioning time refers to the time taken from the date of receipt of an application to the date when the service is activated</p> <p><b>Percentage connections provided within X working days =</b>                      No of connections provided within X working days/ Total number of connections registered during the period * 100</p> <p><b>Technically Non Feasible (TNF)</b> cases such as unavailability of Broadband infrastructure/ equipment in the Area or Spare Capacity i.e. Broadband Ports including equipment to be installed at the customer premises for activating Broadband connection shall be excluded from the calculation of this parameter.</p> <p>Also, problems relating to customer owned equipment such as PC, LAN Card/ USB Port and internal wiring or non-availability of such equipment shall be excluded from the calculation of this parameter.</p>
<b>Benchmark</b>	100 % cases in =<15 working days.
<b>Audit Procedure</b>	<p><b>IMRB</b> auditors collected and verified data pertaining to</p> <ul style="list-style-type: none"> <li>-Number of applications received at the service provider's level</li> <li>-Number of connections provided within 15 days</li> <li>-Number of connections provided after 15 days</li> </ul> <p><b>Live calling</b> : At least 10% of the subscribers who had requested for new connections in month prior to Audit were called to check whether connection was provided in 15 days</p>

<b>2. Fault repair/Restoration time</b>	
<b>Computational Methodology as per QoS definition</b>	<p>This refers to the time taken to restore the existing customer service to operational level from the time that a problem or fault is reported</p> <p><b>Percentage faults repaired in X working days = (Total no of faults repaired in X working days /Total number of faults reported during the period)*100</b></p> <p>The time period for fault repair starts from the time when the fault is reported to the service provider either through customer care help line or in person by the subscriber</p> <p>Only the complaints registered till the close of the business hours of the day are to be taken into account. All the complaints registered after the business hours are to be considered as being registered in the next day business hours</p>
<b>Benchmark</b>	By next working day: > 90% and within 3 working days: 99%
<b>Audit Procedure</b>	<p><b>IMRB</b> auditors collected and verified data pertaining to</p> <ul style="list-style-type: none"> <li>-Number of applications received at the service provider's level</li> <li>-Number of connections provided within 15 days</li> <li>-Number of connections provided after 15 days</li> </ul> <p><b>Live calling</b> : At least 10% of the subscribers who had requested for new connections in month prior to Audit were called to check whether connection was provided in 15 days</p>

<b>3. Billing complaints per 100 bills issued</b>	
<b>Computational Methodology as per QoS definition</b>	<p>Billing complaints includes any of the following complaints related to billing from the point of view of customer:</p> <ul style="list-style-type: none"> <li>• Wrongly charged extra for some service</li> <li>• Cheque submitted on time but charged penalty for paying beyond due date</li> <li>• Payment made but not reflected (may be wrongly adjusted to another customer etc.)</li> </ul> <p><b>Billing complaints per 100 bills issued</b> = Total billing complaints** received during the relevant quarter / Total bills generated* during the relevant quarter</p> <p>* All types of bills generated for customers i.e. printed bills, online bills and any other forms of bills generated are to be included</p> <p>** <u>Only</u> dispute related issues (including those that may arise because of a lack of awareness at the subscribers' end) are to be included. It does not include any provisional issues (such as delayed dispatch of billing statements, etc.) in which the operator has opened a ticket internally.</p>
<b>Benchmark</b>	< 2% billing complaints per 100 bills
<b>Audit Procedure</b>	<p>IMRB auditors collected and verified data pertaining to</p> <ul style="list-style-type: none"> <li>- Number of bills generated</li> <li>- Number of billing complaints received</li> <li>- %age complaints per 100 bills</li> </ul>

<b>3.1. Resolution of billing complaints</b>	
<b>Computational Methodology as per QoS definition</b>	<p><b>%age of billing complaints resolved within 4 weeks</b>=(Complaints resolved*** in 4 weeks from date of receipt / Total billing complaints** received during the period 2008 ) x 100</p> <p><u>Only</u> dispute related issues (including those that may arise because of a lack of awareness at the subscribers' end) are to be included. It does not include any provisional issues (such as delayed dispatch of billing statements, etc.) in which the operator has opened a ticket internally.</p> <p>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.</p>
<b>Benchmark</b>	100% cases to be resolved within 4 weeks
<b>Audit Procedure</b>	<p>IMRB Auditors collected and verified data pertaining to</p> <ul style="list-style-type: none"> <li>- Total number of billing complaints/bills disputed</li> <li>- Number of complaints resolved in 4 weeks</li> </ul> <p><b>Live calling :-</b></p> <p>-Overall 100 number of live calls are to be made in a licensed service area/circle for each service provider. However in certain cases the sample could not be achieved as bills disputed (prior to the month of Audit) were found to be less than 100</p>

<b>3.2 Time taken to refund after closure</b>
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<b>Computational Methodology as per QoS definition</b>	Time taken to refund = Date of refund – Date of closure  Date of closure is considered to be the date on which the connection is discontinued in the service provider database of active customers
<b>Benchmark</b>	100% cases in less than 60 days
<b>Audit Procedure</b>	<b>IMRB Auditors collected and verified data pertaining to</b> -Number of cases requiring refund of deposits -Number of cases where refund was made within 60 days -%age cases where refund was made within 60 days

<b>4. Response time to customer for assistance</b>	
<b>Computational Methodology as per QoS definition</b>	<b>%age of calls answered by operator (voice to voice) within n seconds</b> = (Number of calls where <b>time taken for operator to respond</b> * >= n sec / Total number of calls where an attempt to route to the operator was made) x 100  <b>Time taken for operator to respond</b> = Time when an operator responds to a call – Time when the relevant code to reach the operator is dialled
<b>Benchmark</b>	Calls answered within 60 seconds > 60 % Calls answered within > 80%
<b>Audit Procedure</b>	<b>IMRB Auditors collected and verified call centre records pertaining to</b> -Number of calls received by the operator -Number and %age calls answered within <b>60 seconds</b> -Number and percentage calls answered within <b>90 seconds</b> <b>Live calling :-</b> Overall <b>100 number</b> of live calls at <b>different points of time</b> were made in a licensed service area/circle for each service provider to assess the efficiency of the call centre

<b>5. Bandwidth Utilization</b>	
<b>Computational Methodology as per QoS definition</b>	Percentage Bandwidth available on the link = Total Bandwidth* utilised in TCBH for the period/ Total Bandwidth Available during the period*100  Multi Router Traffic Grapher (MRTG) is to be used to measure the details of Bandwidth utilisation by service providers
<b>Benchmark</b>	-- < 80% link(s)/route bandwidth utilization during peak hours (TCBH). -- If on any link(s)/route bandwidth utilization exceeds 90%, then network is considered to have congestion. For this additional provisioning of bandwidth on immediate basis, but not later than one month is mandated.
<b>Audit Procedure</b>	<b>IMRB Auditors collected and verified call centre records pertaining to</b> <b>( I ) POP to ISP gateway Node [Intra – network] Links</b> -Auditors to verify and collect data pertaining to Total Bandwidth available and Total Bandwidth utilised during TCBH at some of the sample intra network links (POP to ISP Node) on each of the three days of live measurement separately - Total Bandwidth available and Total bandwidth utilised during at the sample links TCBH for the complete month of audit - Total number of intra network links having >90% bandwidth utilisation during the month of Audit <b>(ii) ISP Gateway Node to IGSP / NIXI Node upstream Link's) for international connectivity</b> -Total number of upstream links for International connectivity -Total number of links having Bandwidth > 90% Total Bandwidth available and Total Bandwidth utilised on all the upstream links during TCBH (POP to ISP Node) on each of the three days of live measurement separately -Total Bandwidth available and Total bandwidth utilised at all the international links during TCBH for the complete month of audit (Also obtain details separately for the days)

Broadband download speed	
<b>Computational Methodology as per QoS definition</b>	This refers to the ratio of size of the file to be downloaded and total time required for error free transmission of the file
<b>Benchmark</b>	Subscribed broadband connection speed to be met >80% from ISP Node to user
<b>Audit Procedure</b>	<p><b>Live calling :-</b></p> <ul style="list-style-type: none"> <li>-Details of live customers were obtained from the service providers</li> <li>-Overall <b>50 number</b> of live calls at were made during peak hours in a licensed service area/circle for each service provider to assess the download speed available to subscribers. Tool provided by the on the service providers website was used for the same</li> <li>-Details of total committed download speed and speed available to the users were recorded for each of the subscriber</li> <li>- Percentage download speed available was calculated as = Sum of total speed available for 50 customers/Total committed download speed for 50 customers*100</li> </ul>

Service availability/Uptime	
<b>Computational Methodology as per QoS definition</b>	<p>Service availability/uptime is the measure of the degree to which the broadband access network including ISP Node is operable and not in a state of failure or outage at any point of time for all users</p> <p>Service availability/Uptime = <math>(\text{Total operational hours} - \text{Total Downtime hrs}) * 100 / \text{Total operational hours}</math></p> <p>Total downtime for all users, including the LAN switches, Routers, Servers, Etc at ISP Node and connectivity to upstream service provider are to be included</p> <p>Planned outages for routine maintenance of the system are excluded from the calculation of service availability/uptime</p>
<b>Benchmark</b>	- 98%
<b>Audit Procedure</b>	<p><b>IMRB Auditors collected and verified call centre records pertaining to</b></p> <ul style="list-style-type: none"> <li>-Total operational hrs</li> <li>-Total downtime hrs</li> </ul> <p>The above mentioned data was obtained and verified separately for three days in which the live measurement was carried out, Month in which audit was carried out Also, verification of old records was carried out</p>

<b>Packet loss Benchmark</b>	<1 %
<b>Computational Methodology as per QoS definition</b>	<p>Packet loss is the percentage of packets lost to total packets transmitted between two designated customer premises equipments/ router ports. If the measurement of packet lost from the broadband customer premises equipments/ router ports is conducted at reference point at POP/ISP Node to IGSP/NIXI Gateway and to the nearest NXP/POP/Node</p> <p><b>IMRB Auditors collected and verified call centre records pertaining to</b></p> <ul style="list-style-type: none"> <li>- Results of live ping tests conducted during three day live measurement and month of Audit (During peak hours)</li> </ul> <p>The packet loss is measured by computing the percent packet loss of <b>1000 pings of 64 byte packet each</b> live ping tests were conducting by selecting a minimum of three user reference test points at POP/ISP Node in each circle</p> <p>Service provider needs to carry out such tests daily during Time Consistent Busy Hour(TCBH) and report the average results for the month in the performance monitoring report to TRAI</p> <p>Minimum sample reference points for each service area shall be three in number or multiple reference points if required</p> <p><b>Hence Packet loss is computed by the formula - <math>(\text{Total number of ping packets lost during the period} / \text{Total number of ping packets transmitted}) * 100</math></b></p>

<b>Network Latency</b>	
<b>Computational Methodology as per QoS definition</b>	<p>Latency is the measure of duration of a round trip for a data packet between specific source and destination Router Port/Customer Premises Equipment (CPE). The round trip delay for the ping packets from ISP premises to the IGSP premises to the IGSP/NIXI gateway and to the nearest NAP port abroad are measured by computing delay for <b>1000 pings of 64 bytes each</b> (Pings are to be sent subsequent to acknowledgement received for the same for previous ping)</p> <p>Service provider needs to carry out such tests daily during Time Consistent Busy Hour(TCBH) and report the average results for the month in the performance monitoring report to TRAI</p> <p>Minimum sample reference points for each service area shall be three in number or multiple reference points if required</p> <p><b>Hence the formula for network latency would be Network latency for X days= Total round trip time for all the ping packets transmitted in X days /No of days during the period</b></p>
<b>Benchmark</b>	<p>&lt; 120 msec from user reference point at POP/ISP Node to International Gateway</p> <p>&lt; 350 msec from User reference point at ISP Gateway Node to International nearest NAP port (Terrestrial)</p> <p>&lt; 800 msec from User reference point at ISP Gateway Node to International nearest Nap port (Satellite)</p>
<b>Audit Procedure</b>	<p><b>IMRB Auditors collected and verified call centre records pertaining to</b></p> <ul style="list-style-type: none"> <li>- Records maintained for ping tests conducted</li> <li>- Smoked ping test (wherever available) results</li> <li>- Results of live ping tests conducted during three day live measurement and month of Audit (During peak hours)</li> <li>- Live ping tests were conducting by selecting a minimum of three user reference test points at POP/ISP Node in each circle</li> </ul>

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