

# **Objective Assessment of Quality of Services for (QoS) for Basic Wireline, Cellular and Broadband Service Providers - Jammu & Kashmir Circle**

Report: April – May – June, 2010



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. The auditor - IMRB International carried out the audits across Jammu & Kashmir, Himachal Pradesh, Bihar & Jharkhand and Kerala circles in the April – May – June period 2010. **This report details the performance of various service providers in Jammu & Kashmir circle against Quality of Services benchmarks for various parameters laid down by TRAI in respective regulations for Basic (Wireline), Cellular mobile (Wireless) and broadband services.**

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## **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 Jammu & Kashmir circle that was covered in the period of April – June 2010. The primary data collection and verification of records maintained by various operators of Basic (Wireline), Cellular Mobile (Wireless) and broadband services was undertaken by IMRB International during the period April – June 2010.



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

## **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



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

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. **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

- 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:**  
**WIRELIN**

### **3.0 Sampling Methodology**

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

- For BSNL the sample of exchanges was selected was spread across 5% of exchanges and 10% of SDCA's in the entire service.
- BSNL is the only service provider providing Basic (Wireline) service in Jammu & Kashmir circle.

	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:-

Sl. No.	Parameters	One month data verification	Live measurement	Live calling
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

\* In addition to above verification of records for PMR submitted during October to December 2009 was carried out for all network and non network related parameters.

{**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 April to June 2010 in Jammu & Kashmir 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	6.74
% of faults repaired by next working day	≥ 90%	62.15%
% of faults repaired within 3 days	100%	89.33%
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	NA
Mean Time to Repair (MTTR)	≤ 8 Hrs	8.29
Call Completion Rate (CCR)	≥ 55%	60.30%
Answer to Seizure ratio (ASR)	≥ 75%	71.04%
No. of POIs with congestion > 0.5%	≤ 0.5%	0.00
Metering and billing credibility - Number of bills disputed during over a billing cycle	≤ 0.1%	0.03%
Resolution of billing complaints within 4 weeks	100%	75.00%
Period of applying credit / waiver	≤ 1 week	100.00%
Closure within 7 days	100%	100.00%
Response time to customer for assistance		
% age calls getting connected and answered	≥ 95%	94.35%
% age call answered by operator in 60 seconds	≥ 90%	96.44%
Time taken for refund of deposits after closures within 60 days	100%	80.56%

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

\*\* 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
% of faults repaired by next working day	≥ 90%	30.00%
% of faults repaired within 3 days	100%	73.33%
Call Completion Rate (CCR)	≥ 55%	60.74%
Answer to Seizure ratio (ASR)	≥ 75%	49.86%
Resolution of billing complaints within 4 weeks	100%	90.91%
Response time to customer for assistance		
% age calls getting connected and answered	≥ 95%	95.00%
% age call answered by operator in 60 seconds	≥ 90%	97.50%

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

BSNL is the only operator providing Basic (Wireline) Services in Jammu & Kashmir 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 operators who are reporting the same to TRAI were meeting the benchmark.

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

#### Fault incidence / clearance statistics

- Fault repair remains pain point as only 61.74% 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 30% 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 with a score of 89.33%.

#### Traffic statistics (CCR)

- BSNL meets the benchmark on this parameter both during month in which audit was carried out and three days when live measurement was carried out in auditor's presence at various exchanges

#### Metering and billing credibility

- BSNL comfortably meets TRAI specified benchmark of percentage billing complaints being less equal to 0.1% of the total bills generated.
- For complaint resolution within the time period stipulated by TRAI (4 weeks) BSNL fail to meet the benchmark with 75% of the complaints being resolved in 4 weeks

#### Response time to customer for assistance

- BSNL in Jammu & Kashmir falls marginally short of TRAI specified benchmark for calls getting connected answered.
- However for the live calling carried out by IMRB auditors BSNL comfortably meets the TRAI specified benchmark for response time to customer for assistance

Time taken for refund of deposits after closure

- BSNL (80.56%) fail to meet benchmark for 100% refund of deposits for closures within 60 days

Level 1 service

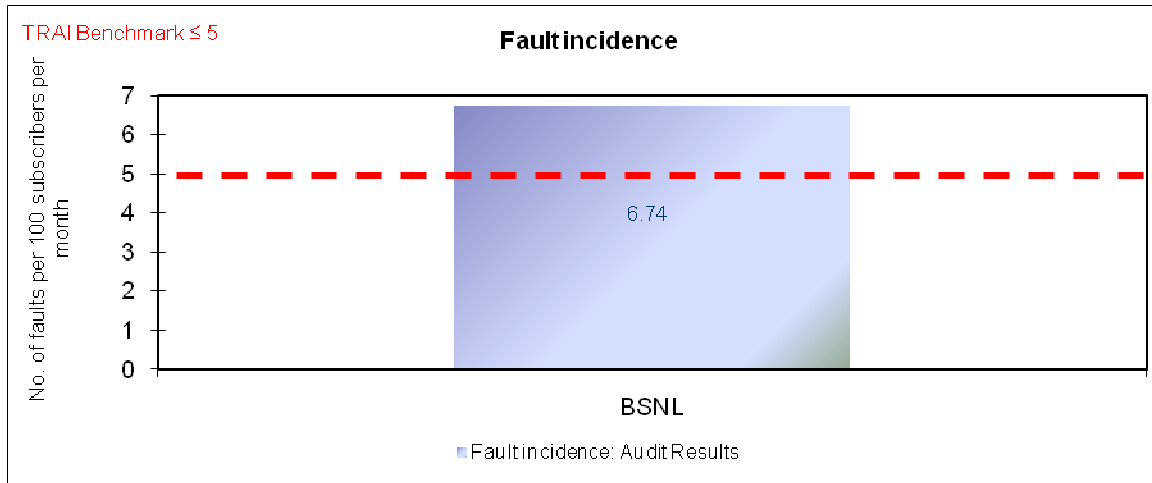
Level 1 services	Benchmark	BSNL
Total no. of calls made		360
Calls answered in 60 sec		357
Calls answered after 60 sec		3

To test the efficiency of level 1 services (Trunk booking, Child helpline, Women helpline, Airline booking, Fire, Police, Railways) offered by various service providers. 360 calls were made for BSNL to different numbers and time taken to answer the call was noticed. Out of which, 357 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**

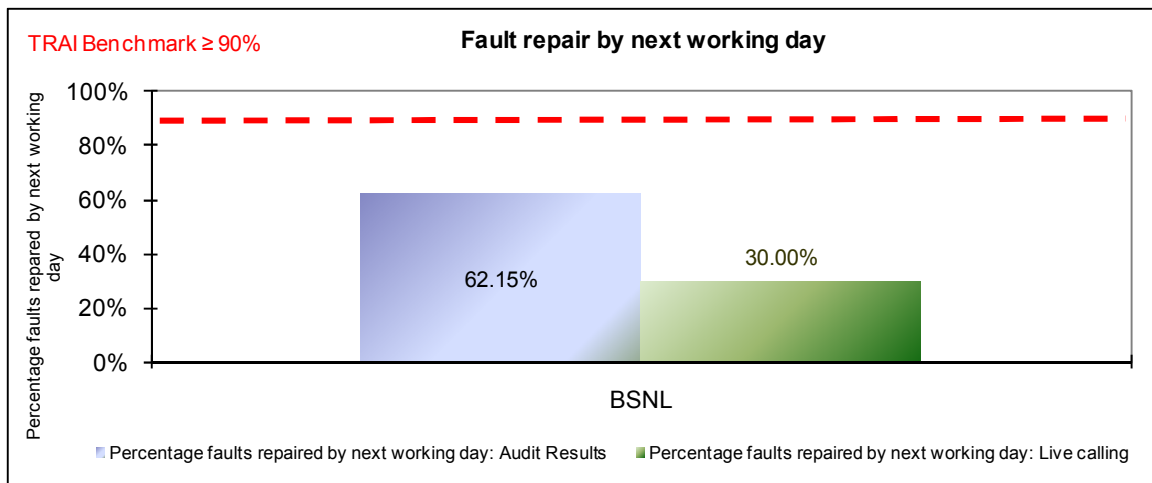
### **6.1 Graphical/Tabular Representations for Basic (Wireline) services**

#### **Fault incidence**



BSNL is not meeting benchmark

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

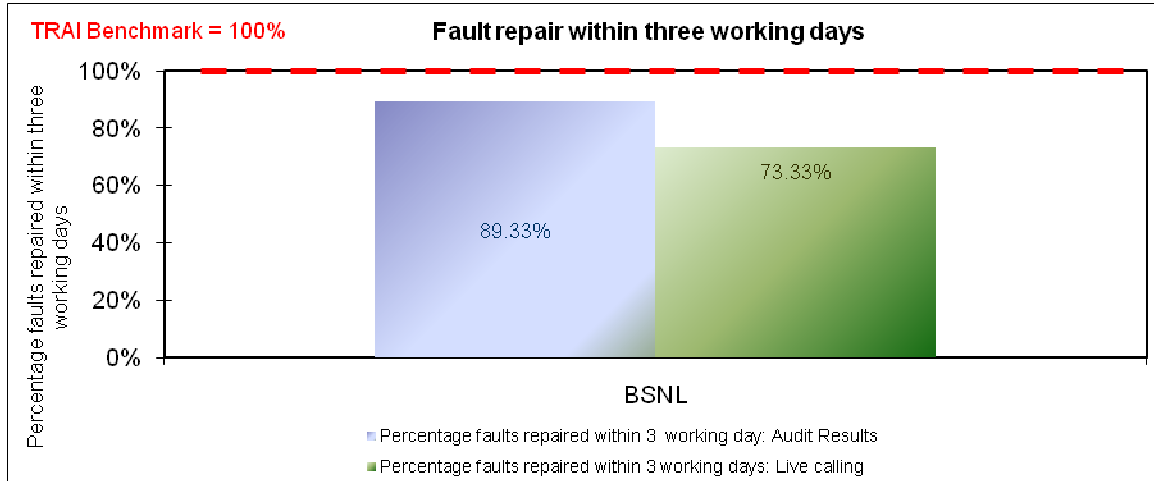


#### **One month**

BSNL is not meeting benchmark

#### **Live calling**

BSNL is not meeting benchmark



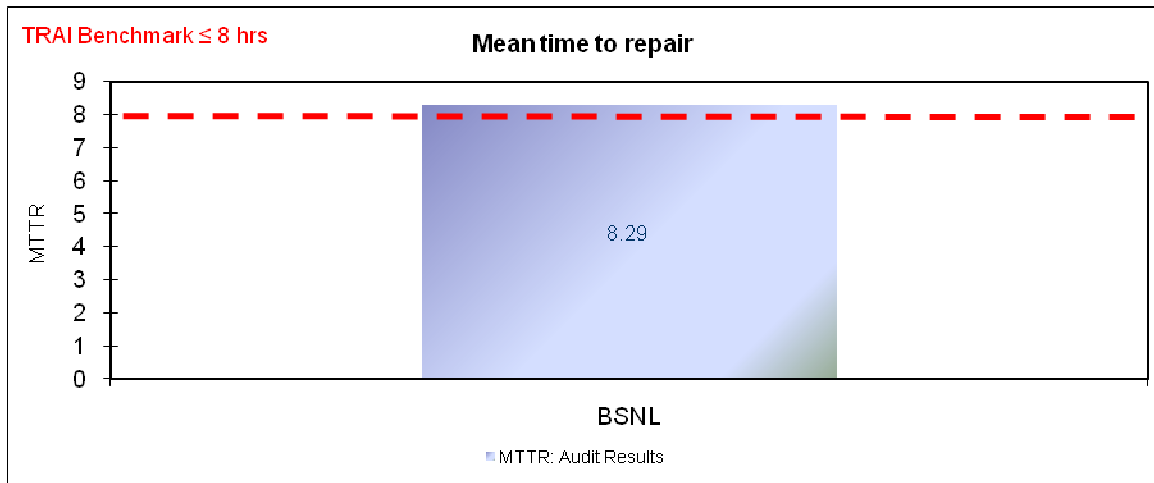
**One month**

BSNL is not meeting benchmark

**Live calling**

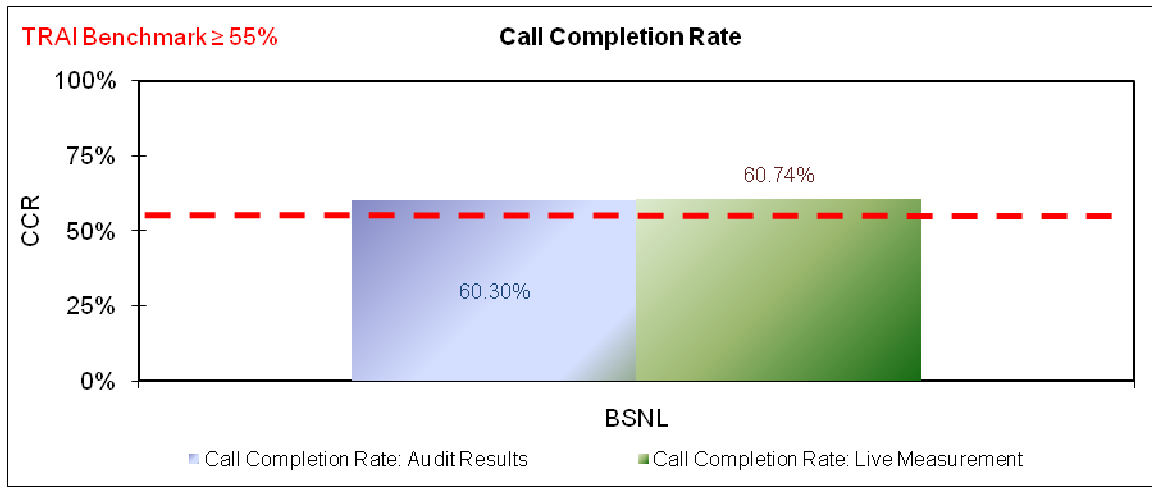
BSNL is not meeting benchmark

**Mean time to repair**



BSNL is not meeting benchmark

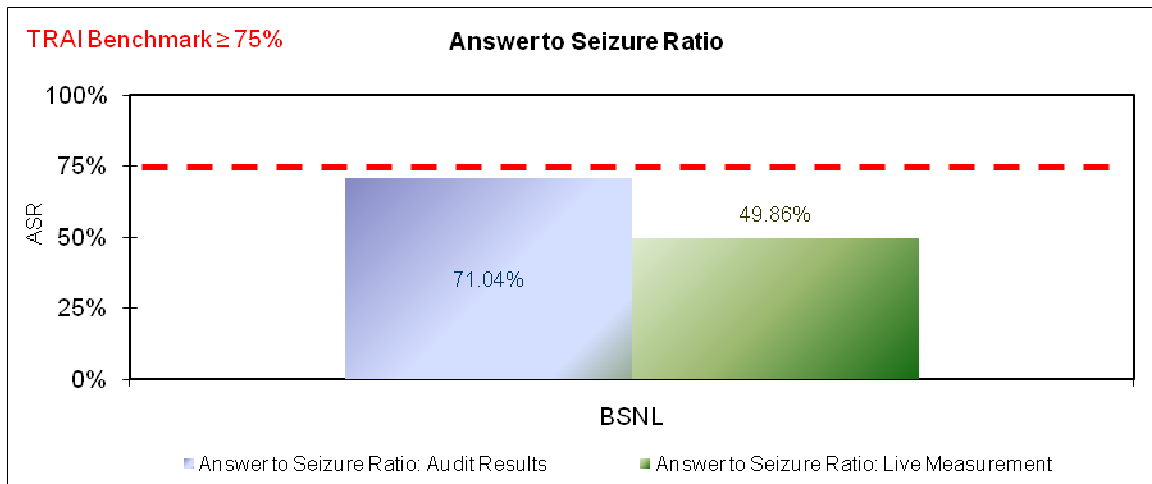
**Call completion rate (Comparison between one month audit results and three day live measurement)**



**One month**  
BSNL is meeting benchmark

**Live measurement**  
BSNL is meeting benchmark

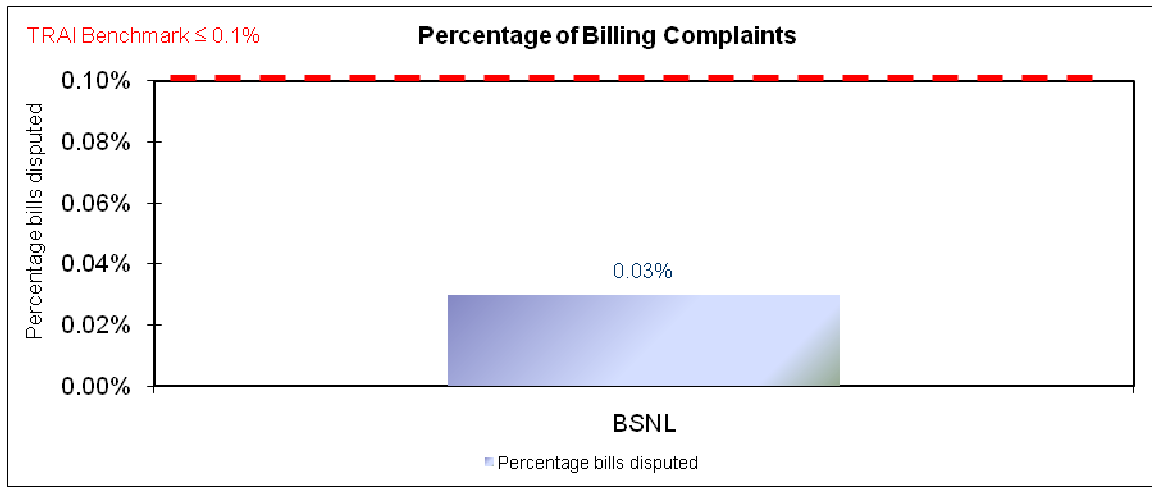
**Answer to Seizure Ratio (Comparison between one month audit results and three day live measurement)**



**One month**  
BSNL is not meeting benchmark

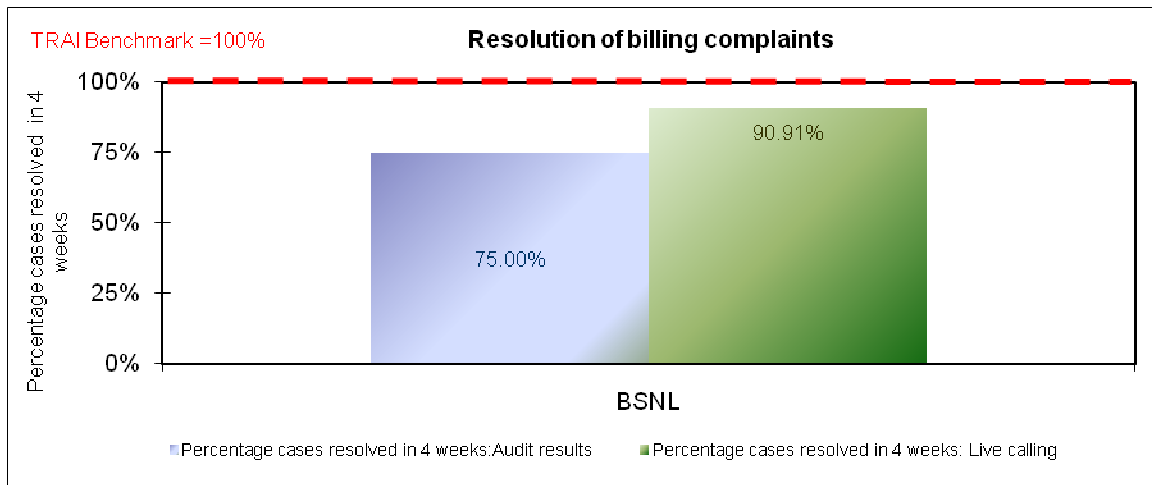
**Live measurement**  
BSNL is not meeting benchmark

**Percentage bills disputed**



BSNL is meeting benchmark

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

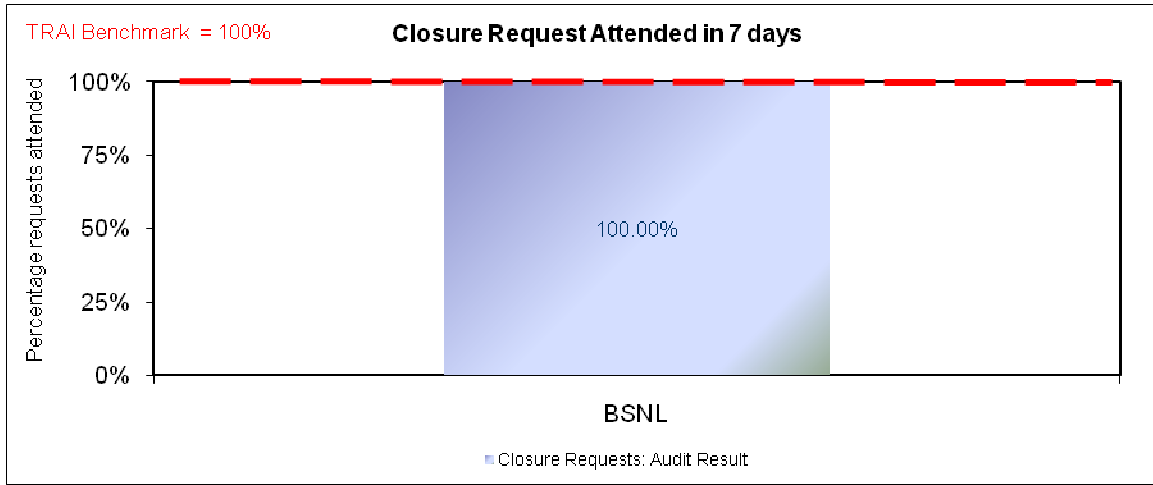


**One month**  
BSNL is not meeting benchmark

**Live calling**  
BSNL is not meeting benchmark

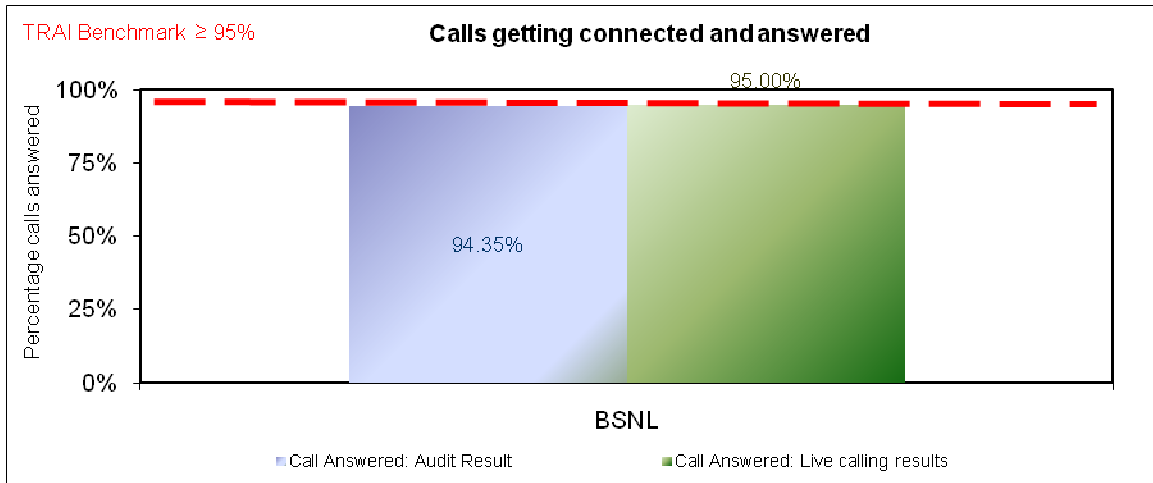


**Closure requests attended within 7 days**



BSNL is meeting benchmark

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



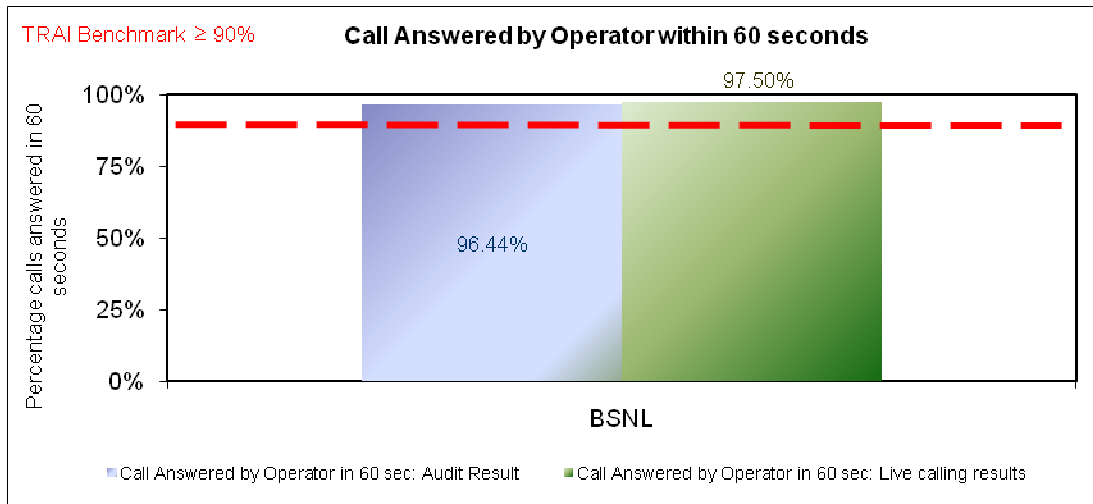
**One month**

BSNL is not meeting benchmark

**Live calling**

BSNL is meeting benchmark

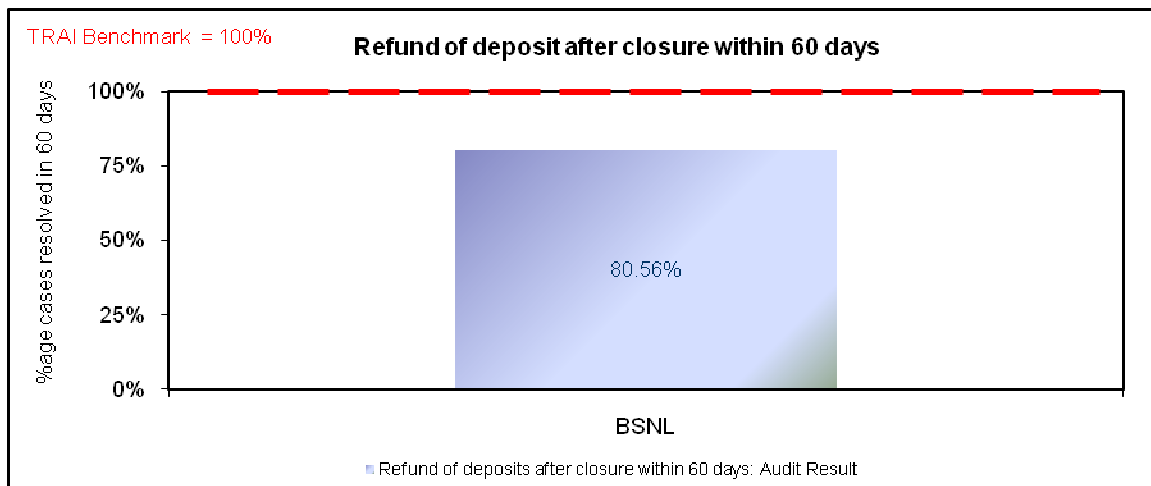
**Response time to customer for assistance - Calls answered by the operator within 60 seconds (Comparison between one month audit results and live calling results)**



**One month**  
BSNL is meeting benchmark

**Live calling**  
BSNL is meeting benchmark

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



BSNL is not meeting benchmark

## 7.0 Compliance reports: Results of Verification of Records

### 7.1 Basic (Wireline) services

Parameters	Benchmarks	BSNL*	
		PMR	IMRB
Faults incidences ( No. of faults/100 Subs./month)	≤5	7.74	7.79
% of faults repaired by next working day	By next working day: ≥ 90%	69.36%	67.75%
Total No. of faults registered during the quarter		53708	22952
No. of faults repaired by next working day during the quarter		36880	15551
No. of faults repaired within 3 days during the quarter	For urban areas	37561	22394
% of faults repaired within 3 days	For urban areas: = 100%	78.58%	99.03%
No. of faults repaired within 5 days during the quarter	For rural and hilly areas	5405	338
% of faults repaired within 5 days	For rural and hilly areas:	64.54%	100.00%
Rent Rebate :	≥ 100%		
Faults pending for> 3days and ≤7 days	Rent Rebate for 7 days	0	2
Faults pending for > 7 days and ≤15 days	Rent Rebate for 15 days	0	0
Faults pending for > 15 days	Rent Rebate for 30 days	0	5
Mean Time to Repair (MTTR)	≤ 8 Hrs	8.67	11.56
Call Completion Rate (CCR)	≥ 55%	53.40%	55.58%
Total Number of successful local calls		DNA	20508960
Total local call attempts		DNA	11399814
Answer to Seizure Ratio (ASR)	≥ 75 %	NA	70.12%
Total I/C seizures		DNA	8405282
No. of answered calls		DNA	5893655
Point of Interconnection (POI) Congestion (No. of Pols not meeting benchmark)	≤ 0.5%	2	0
Total number of working POI Service Area wise		DNA	DNA
Metering and billing credibility - post paid	Not more than 0.1%	0.02%	0.00%
No. of bills issued during the period		556553	109478
No. of bills disputed including billing complaints during the period		111	43
Metering and billing credibility - pre paid	Not more than 0.1%	NA	NA
No. of charging / credit / validity complaints during the quarter		DNA	NA
Total no. of pre-paid customers at the end of the quarter		DNA	NA

Resolution of billing/ charging/ validity complaints	100% within 4 weeks	DNA	100.00%
No. of billing/(post paid) and charging, credit / validity (pre paid) complaints resolved within 4 weeks during the quarter		DNA	43
Total no. of billing (post paid) and charging, credit / validity (pre paid) complaints received during the quarter		127	43
No. of billing complaints (post paid) and charging, credit/validity complaints (pre paid) resolved in favor of the customer during the quarter		DNA	43
No. of complaints disposed on account of not considered as valid complaints during the quarter		DNA	0
Period of applying credit/ waiver/ adjustment to customer's account from the date of resolution of complaints	within 1 week of resolution of complaint	DNA	100%
Response time to the customer for assistance	≥ 95%	DNA	DNA
Accessibility of call centre/ customer care		DNA	DNA
Total no. of call attempts to call centre / customer care nos. during TCBH		DNA	DNA
Percentage of calls answered by the operators (voice to voice) within 60 seconds	≥ 90%	DNA	100.00%
Termination / closure of service	≤ 7 days		
%age requests for Termination / Closure of service complied within 7 days	100.00%	92.53%	98.66%
Total No. of requests for Termination / Closure of service received during the quarter		1567	372
No. of requests for Termination / Closure of service complied within 7 days during the quarter		1450	367
Time taken for refund of deposits after closures	100% within 60 days.	100.00%	100.00%

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

 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

For verification of raw data for the period of October to December 2009, there was significant variation observed when compared to the figures reported in the PMR for BSNL

1. For 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
2. Details for most of the parameters was not available in PMR and hence could not be verified
3. The service provider was found not to meeting benchmark for fault incidence, fault repair by next working day and within 3 working days, MTTR and closure request within 7 days

**Section B**  
**WIRELESS**

## 8.0 Sampling methodology

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### 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 Jammu and Kashmir circle

	Name of Operator	Month of audit
Operator 1	Airtel	April
Operator 2	Vodafone	April
Operator 3	Idea	April
Operator 4	Tata	April
Operator 5	BSNL	May
Operator 6	Reliance	April
Operator 7	Aircel	May

## 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 April 2010 to June 2010 in Jammu and Kashmir 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)	%age of connection with good voice quality	POI Congestion (No. of POIs not meeting the benchmark) Note :2)	Total number of working POI Service Area wise	Equipped Capacity of Network in respect of Traffic in erlang	Total traffic handled in TCBH in erlang	Total no. of customers served (as per VLR) on last day of the month
Benchmark				≤ 2%		≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%			≤ 5%	≥ 95%	≤ 0.5%				
Airtel	20.00 to 21.00 hrs	2275	2782.75	0.16%	14	0.62%	99.01%	0.07%	0.08%	0.84%	94	6620	1.42%	98.34%	0	6	123971	73944	1610995
Vodafone	20.00 to 21.00 hrs	793	16.24	0.00%	0	0.00%	98.13%	0.84%	0.85%	1.85%	92	2364	3.89%	98.15%	0	29	19239	11217	179937
Idea	20.00 to 21.00 hrs	325	834	0.34%	0	0.00%	98.42%	0.17%	0.53%	1.82%	95	967	9.82%	97.18%	0	14	5029	2493	69637
Tata	20.00 to 21.00 hrs	235	25	0.01%	0	0.00%	99.32%	0.00%	0.04%	0.66%	5	720	0.69%	98.83%	0	34	29520	9464	55192
BSNL	19.00 to 20.00 hrs	265	584	0.30%	5	1.89%	98.00%	0.90%	1.90%	20.00%	39	806	4.84%	98.00%	0	24	12000	10740	163530
Reliance	19.00 to 20.00 hrs	764	973	0.17%	3	0.39%	98.66%	0.03%	0.31%	0.80%	35	4465	0.78%	98.02%	0	9	DNA	DNA	DNA
Aircel	20.00 to 21.00 hrs	1469	1014	0.09%	11	0.75%	95.72%	0.68%	1.80%	2.01%	672	4199	16.00%	89.53%	3	43	90875	46385	1276732

\*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 Jammu and Kashmir 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
Bharti Airtel	20.00 to 21.00 hrs	20.00 to 21.00 hrs
Aircel	20:00 to 21:00 hrs	20:00 to 21:00 hrs
BSNL	19.00 to 20.00 hrs	19.00 to 20.00 hrs
RCOM	19.00 to 20.00 hrs	19.00 to 20.00 hrs
Idea Cellular	20.00 to 21.00 hrs	20.00 to 21.00 hrs
TATA	20.00 to 21.00 hrs	20.00 to 21.00 hrs
Vodafone	20.00 to 21.00 hrs	20.00 to 21.00 hrs

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

#### BTSs Accumulated Downtime:

In the Jammu and Kashmir circle, Airtel and Aircel had the highest number of BTSs having accumulated downtime of >24 hours in a month.

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

All the operators were comfortably meeting the benchmark on this parameter. During the audits the maximum CSSR was observed for Tata with 99.32% 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 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 3 POIs of Aircel.

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 BSNL and Aircel were found to be meeting the TRAI specified benchmark. The lowest call drop rate was of TATA Indicom at 0.66% while the highest was for BSNL at 20%.

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. Except for Aircel, all the operators were meeting the TRAI benchmark for this parameter.

Customer Care / Helpline Assessment

For the accessibility of customer care aspect all the service providers meet the TRAI benchmark except Tata (93.31%) for call answered electronically and Reliance (89.00%) for calls answered by the operator within 60 seconds.

Billing performance

For billing complaints registered per 100 bills issued, Tata and Aircel failed to meet the TRAI benchmark for postpaid billing whereas for prepaid billing/charging, Idea and Aircel failed to meet the benchmark. For resolution of billing and charging related complaints and grant of waiver, all the operators were found to be meeting the TRAI benchmark.

Inter operator calls assessment

Inter operator call Assessment To ↓ From →	Airtel	Vodafone	Idea	Tata	BSNL	Reliance	Aircel
Airtel	NA	100%	98%	99%	92%	90%	100%
Vodafone	95%	NA	99%	98%	97%	96%	99%
Idea	99%	92%	NA	98%	97%	95%	98%
Tata	100%	100%	99%	NA	99%	99%	99%
BSNL	100%	97%	100%	100%	NA	98%	100%
Reliance	99%	100%	100%	99%	98%	NA	99%
Aircel	100%	100%	100%	100%	97%	99%	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. Idea, BSNL and Reliance found it difficult to connect to an Airtel number whereas Vodafone, Tata and Aircel found it difficult to connect to an Idea number. Also Tata and Airtel found it difficult connecting to a Vodafone number.

Results of Operator assisted Drive test

The drive test was conducted simultaneously for all the operators present in the Jammu and Kashmir circle. There was in total of three drive tests conducted in the circle. These tests were conducted in the cities of Jammu, Katra and Udhampur. 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 Jammu and Kashmir 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 Jammu and Kashmir circle were conducted in the cities of Jammu, Katra and Udhampur was conducted along the following route:

	Type of location	Jammu	Katra	Udhampur
<b>Outdoor</b>	Periphery of the city	BAHU PLAZA, GREEN BELT PARK, HOTEL ASIA, BIKRAM CHOWK, JEWEL, BUS STAND, SHAKUNTLA, REHARI, AMPHALLA	JOLY PLAZA, SHRINE BORAD, MAIN ROAD, MAIN CHOWK KATRA, BUS STAND, SDPO OFFICE	SUBASH NAGAR, NEW BUS STAND, MH MORE, SHIV NAGAR, OMARRA MORHE, SALIAN TALAB, VENUS CHOWK, SLATHIA CHOWK, SUBASH NAGAR.
	Congested area	CITY SQUARE MALL, JEWEL, CANAL ROAD, TALAB TILLO, BHORI, PATTA BOHRI CHOWK, BSF CAMP PLOURRA	MAIN CHOWK, BAN GANGA ROAD, CHINTA MANI.	MH MORHE, GOLE MARKET, MAIN BAZAAR, CHABUTRA BAZAAR, SALIAN TALAB.
	Across the city	AMPHALLA, NEW PLOT, JANIPUR, MUTHI, CANAL ROAD, JEWEL, CITY SQUARE MALL	MAIN CHOWK, PANTHAL ROAD, TOWARDS HELLI PAD, NEW ROAD UPTO HOTEL AMBALIKA.	SALIAN TALAB, JAMA MASJID, COURT ROAD, SLATHIA CHOWK.
<b>Indoor</b>	Office complex	Jammu Cooperative Bank Bahu Plaza	NIHARAIIKA COMPLEX	ICICI BANK
	Shopping complex	City Square Mall	INTERNATIONAL SUBASH SHOPPING COMPLEX.	VISHAL MEGA MART

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

**Drive Test – Jammu**


	Benchmark	Airtel		Vodafone		Idea		Tata		BSNL		Reliance		Aircel	
		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
Voice quality	≥ 95%	97.84%	96.14%	95.53%	96.27%	98.98%	95.49%	96.57%	97.04%	74.89%	66.82%	97.37%	89.50%	99.23%	94.84%
CSSR	≥ 95%	100.00%	100.00%	100.00%	98.88%	100.00%	100.00%	100.00%	100.00%	100.00%	97.92%	97.22%	97.87%	100.00%	100.00%
%age Blocked calls		0.00%	0.00%	0.00%	1.12%	0.00%	0.00%	0.00%	0.00%	0.00%	2.08%	2.78%	2.13%	0.00%	0.00%
Call drop rate	≤ 2%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.09%	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%	100.00%	100.00%	95.45%	100.00%	100.00%

**Drive Test – Katra**

	Benchmark	Airtel		Vodafone		Idea		Tata		BSNL		Reliance		Aircel	
		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
Voice quality	≥ 95%	97.23%	98.74%	99.33%	97.72%	99.79%	99.34%	98.82%	97.74%	79.80%	78.16%	94.85%	90.11%	98.05%	97.67%
CSSR	≥ 95%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	94.83%	100.00%	96.55%
%age Blocked calls		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	5.17%	0.00%	3.45%
Call drop rate	≤ 2%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.82%	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%	100.00%	100.00%	95.77%	100.00%	100.00%

**Drive Test – Udhampur**

	Benchmark	Airtel		Vodafone		Idea		Tata		BSNL		Reliance		Aircel	
		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
Voice quality	≥ 95%	96.41%	96.16%	99.28%	98.69%	99.80%	98.63%	98.87%	98.56%	74.45%	68.50%	93.36%	96.54%	98.27%	98.75%
CSSR	≥ 95%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	98.18%	96.77%	93.94%	100.00%	100.00%
%age Blocked calls		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.82%	3.23%	6.06%	0.00%	0.00%
Call drop rate	≤ 2%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	3.33%	0.00%	0.00%	1.67%
Hands off success rate		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	97.62%	100.00%	98.33%

 Not meeting the benchmark

Following were the areas where the signal strength was found to be inadequate for the operators:  
**ALL SERVICE PROVIDERS**

**Jammu:** There was low signal strength recorded for Idea and Reliance in the outdoor areas near Amphalla, Bohri, Near High court, Naagbani and Hari Niwas.while in the indoor areas inadequate coverage was not found in any of the areas.

**Katra:** There was low signal strength recorded for Idea in the outdoor areas of Shrine Board, Panthel Road, Banganga Road while in the indoor areas there was no inadequate coverage or interference recorded.


**Udhampur:** There was low signal strength recorded for Idea and Reliance in the outdoor areas of Omarra Morhe, Chabutra Bazar, Court Road, Near Venus Chowk, Main Bazaar and Jama Masjid 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 this parameter. In the drive test it was found that BSNL and Reliance does not meet the TRAI benchmark on voice quality in all three cities whereas Aircel failed to meet the benchmark for same in Jammu. For CSSR, Reliance managed to meet the benchmark only in Jammu whereas for Call drop rate, reliance failed to meet the benchmark in Udhampur.

**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>Benchmark</b>	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 5%	≥ 95%	100%	≥ 95%	≥ 90%
Airtel	99.02%	0.05%	0.07%	0.80%	1.37%	96.88%	43.75%	100.00%	92.00%
Vodafone	97.78%	0.93%	0.80%	1.70%	4.27%	97.72%	48.00%	98.00%	96.00%
Idea	97.68%	0.12%	1.46%	1.70%	8.51%	97.71%	60.00%	100.00%	100.00%
Tata	99.30%	0.00%	0.06%	0.71%	0.50%	98.01%	60.00%	100.00%	NA
BSNL	98.00%	0.90%	1.90%	20.00%	4.59%	72.25%	55.56%	100.00%	99.00%
Reliance	99.28%	0.02%	0.00%	0.29%	0.23%	92.24%	66.67%	100.00%	82.00%
Aircel	97.17%	0.19%	0.38%	1.91%	13.04%	97.54%	80.00%	100.00%	84.00%

 Not meeting the benchmark

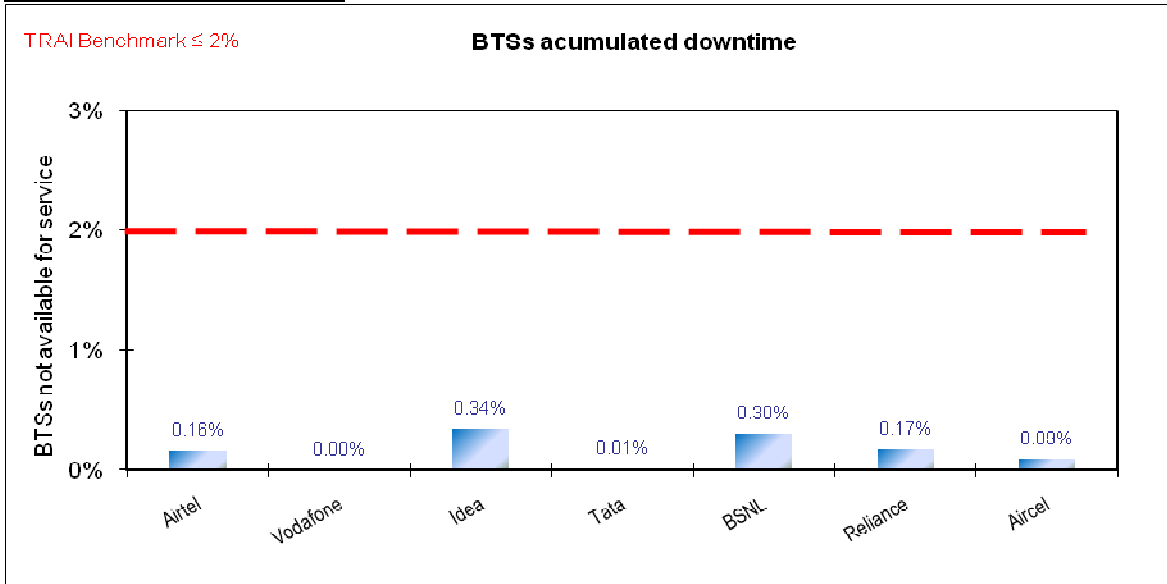
\* Based on operator assisted drive tests conducted by IMRB

During the three day live measurement, no operator was found to meet the benchmark for the parameter % complaints resolved in 4 weeks. BSNL & Reliance also did not meet the benchmark or voice quality whereas Idea and Aircel did not meet the benchmark for worst affected cells having more than 3% TCH drop. Lastly, BSNL did not meet the benchmark for call drop rate.

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

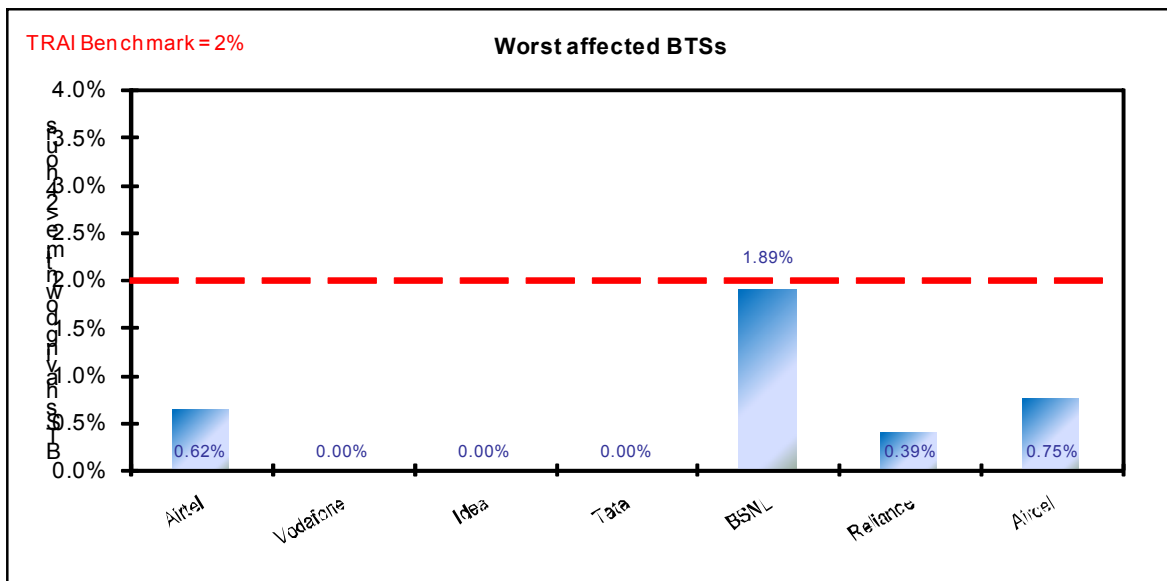
### 11.1 Graphical/Tabular Representations for Cellular Mobile Services

#### BTs Accumulated Downtime



All the operators meet the benchmark

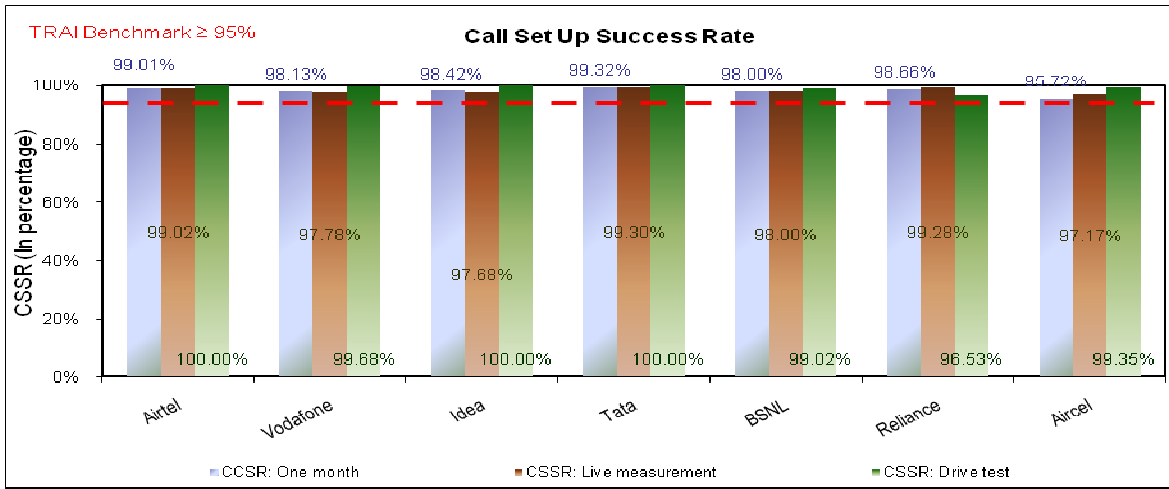
#### Worst Affected BTs



All the operators meet the benchmark



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



**One month**

All the operators meet the benchmark

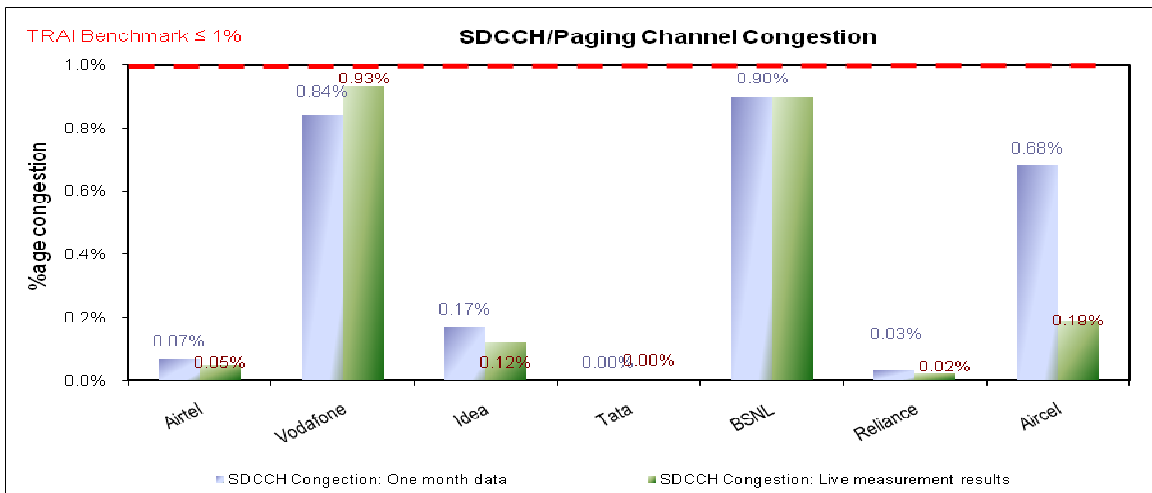
**Live measurement**

All the operators meet the benchmark

**Drive test**

All the operators meet the benchmark

**SDCCH / Paging Channel Congestion**



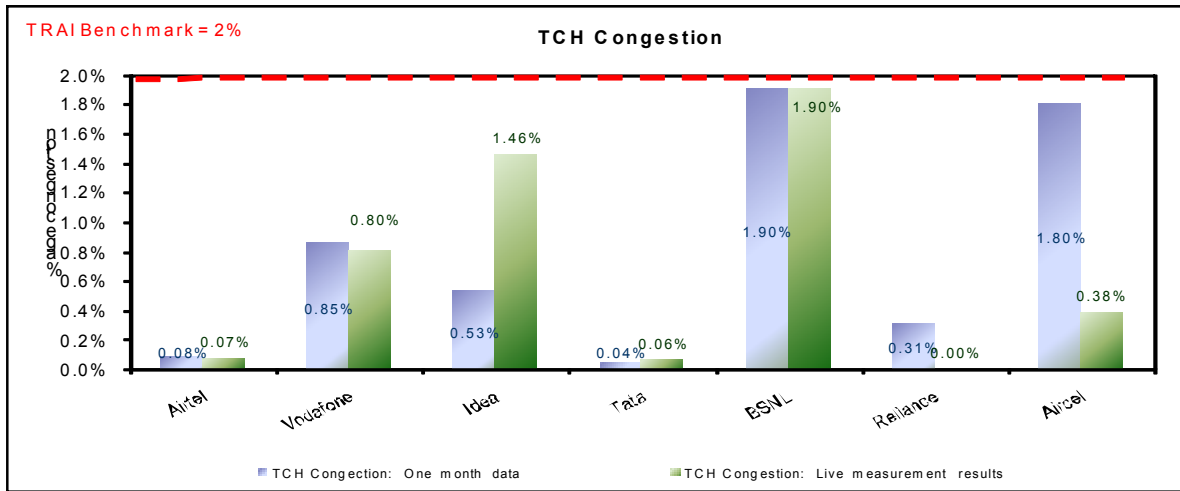
**One month**

All the operators meet the benchmark

**Live measurement**

All the operators meet the benchmark

**TCH Congestion**



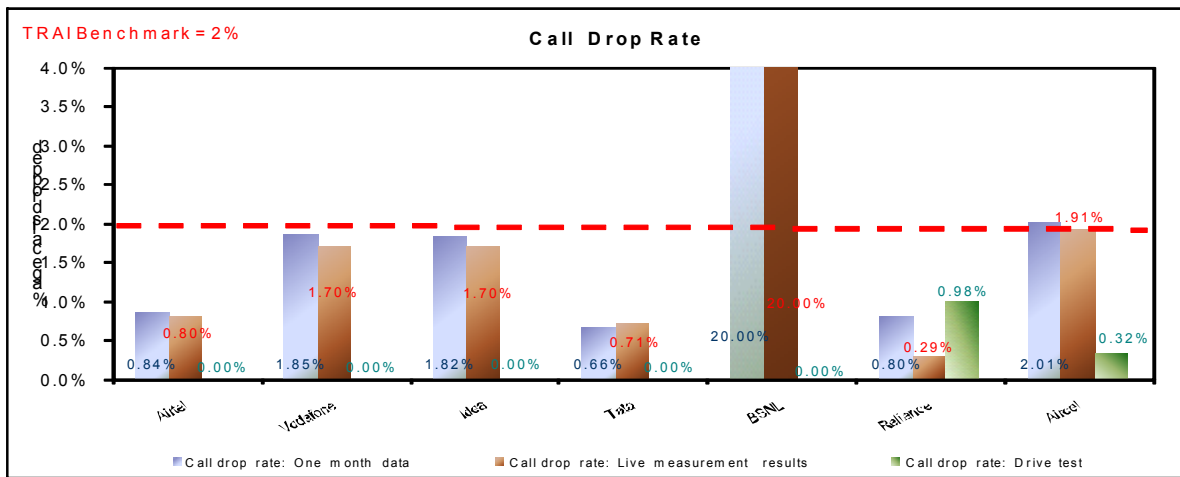
**One month**

All the operators meet the benchmark

**Live measurement**

All the operators meet the benchmark

**Call Drop Rate**



**One month**

Operator(s) meeting benchmark: Airtel, Vodafone, Idea, Tata, Reliance

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

**Live measurement**

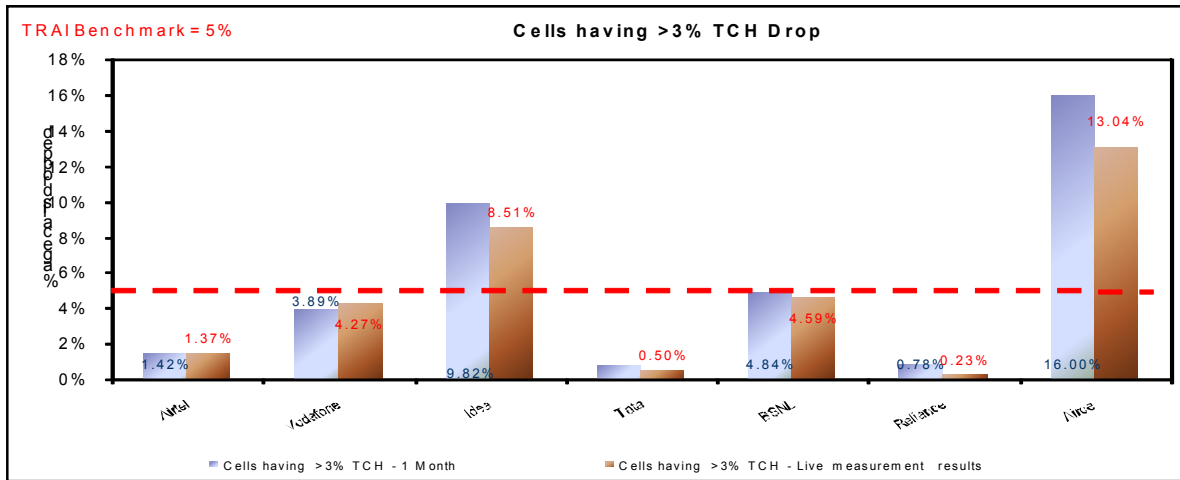
Operator(s) meeting benchmark: Airtel, Vodafone, Idea, Tata, Reliance, Aircel

Operator(s) not meeting the benchmark: BSNL

**Drive test**

All the operators meet the benchmark

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



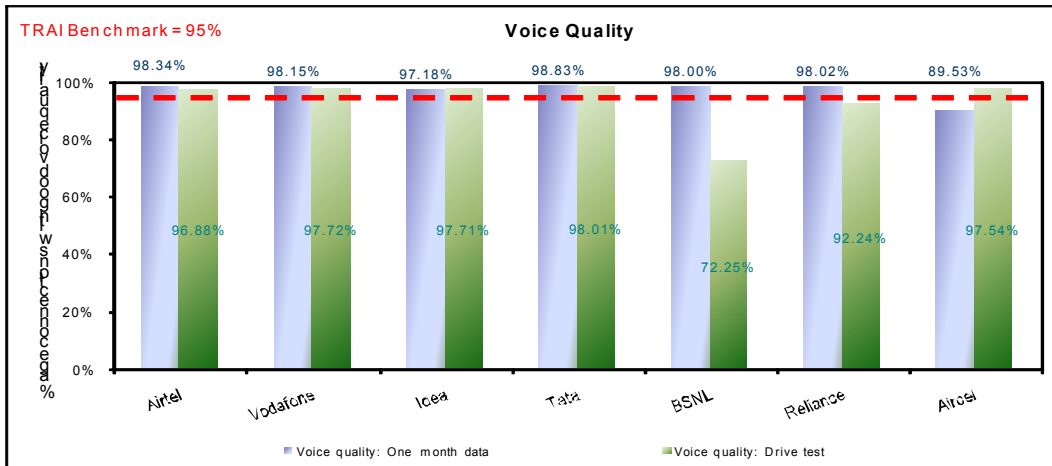
**One month**

Operator(s) meeting benchmark: Airtel, Vodafone, Tata, BSNL, Reliance  
 Operator(s) not meeting the benchmark: Idea, Airtel

**Live measurement**

Operator(s) meeting benchmark: Airtel, Vodafone, Tata, BSNL, Reliance  
 Operator(s) not meeting the benchmark: Idea, Airtel

**Voice quality**



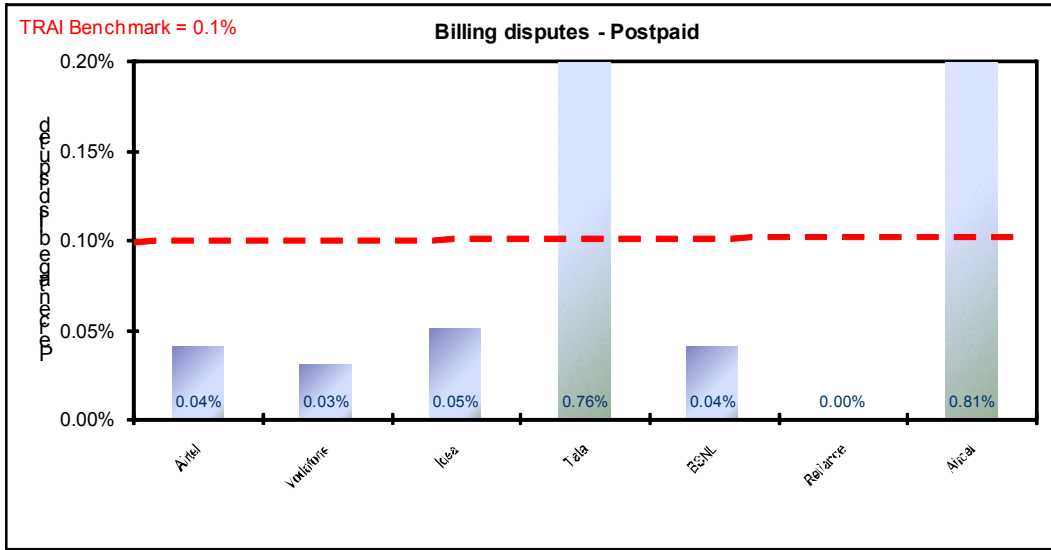
**One month**

All the operators meet the benchmark

**Live measurement (Drive test)**

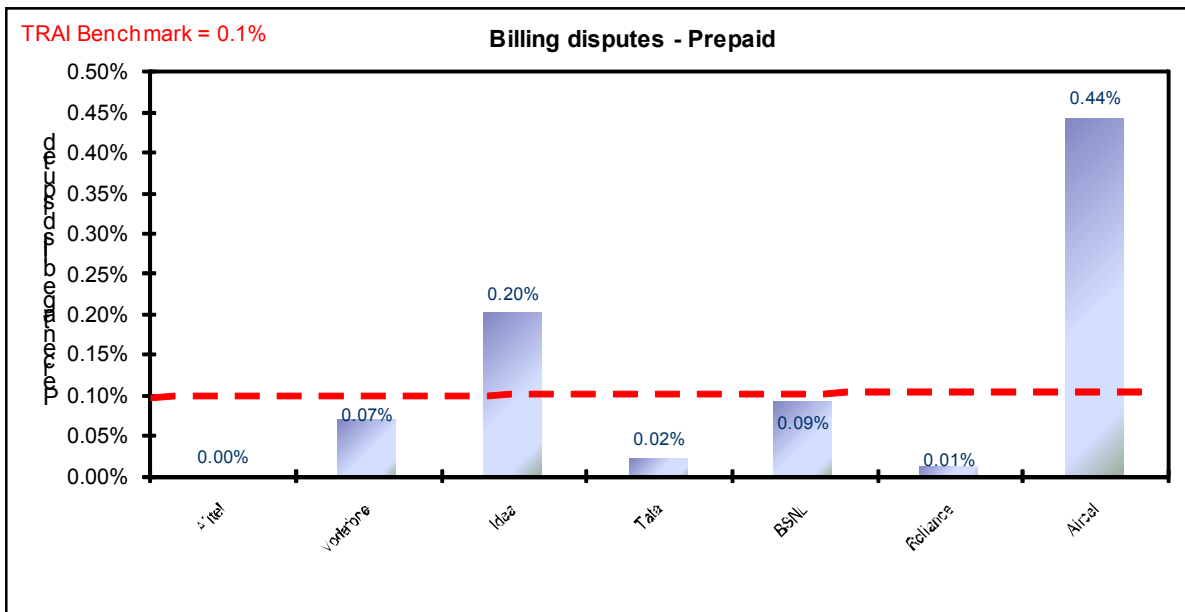
Operator(s) meeting benchmark: Airtel, Vodafone, Idea, Tata, Aircel  
 Operator(s) not meeting the benchmark: BSNL, Reliance

**Billing Disputes - Postpaid**



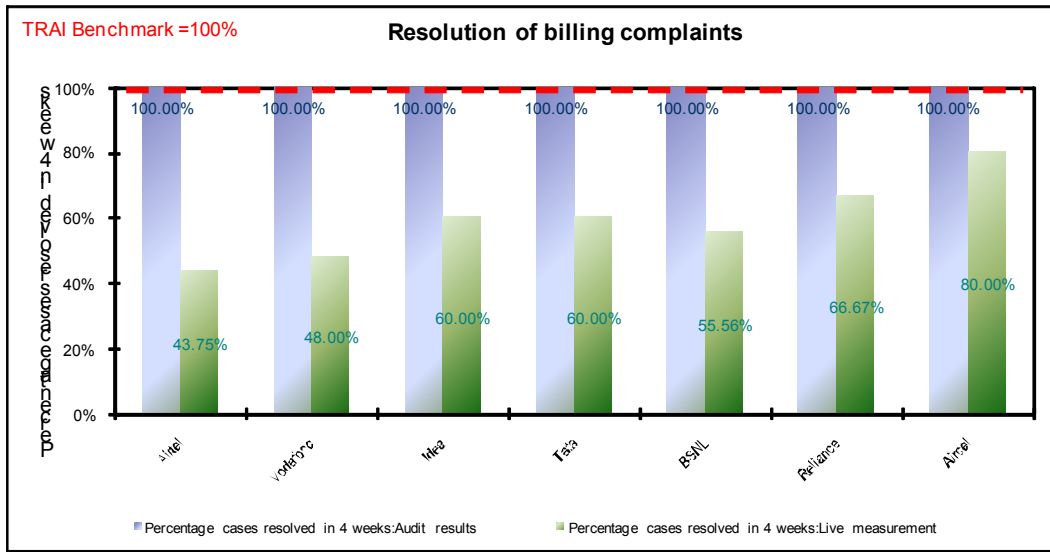
Operator(s) meeting benchmark: Airtel, Vodafone, Idea, BSNL, Reliance  
 Operator(s) not meeting the benchmark: Tata, Aircel

**Complaints - Prepaid**



Operator(s) meeting benchmark: Airtel, Vodafone, Tata, BSNL, Reliance  
 Operator(s) not meeting the benchmark: Idea, Aircel

**Resolution of billing complaints**



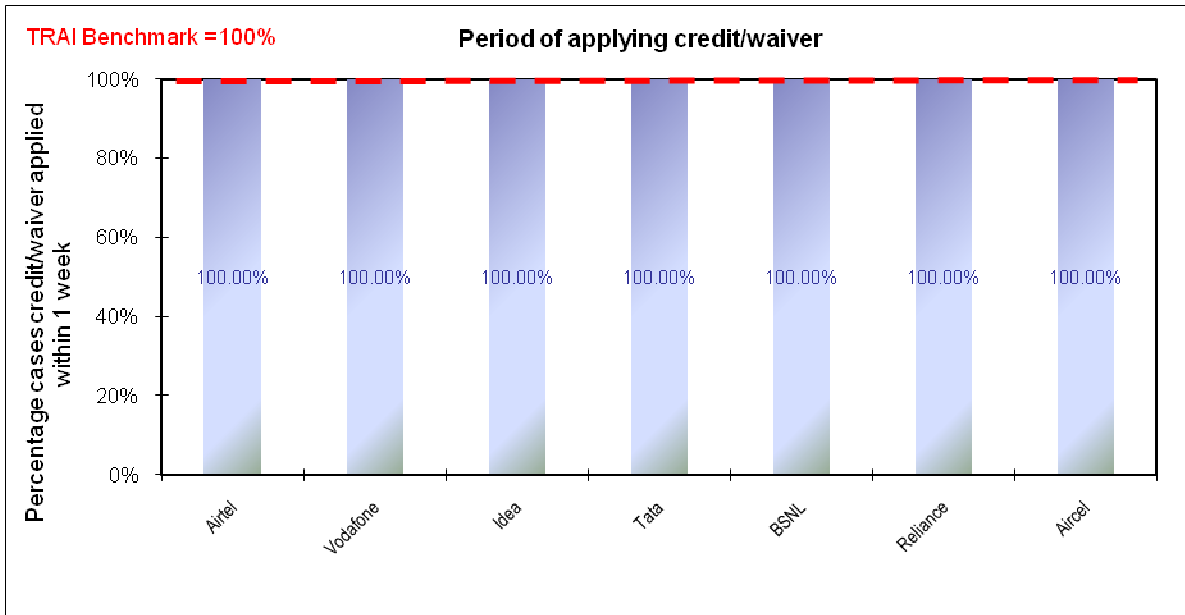
**One month**

All the operators meet the benchmark

**Live measurement**

None of the operator meets the benchmark

**Period of applying credit / waiver**

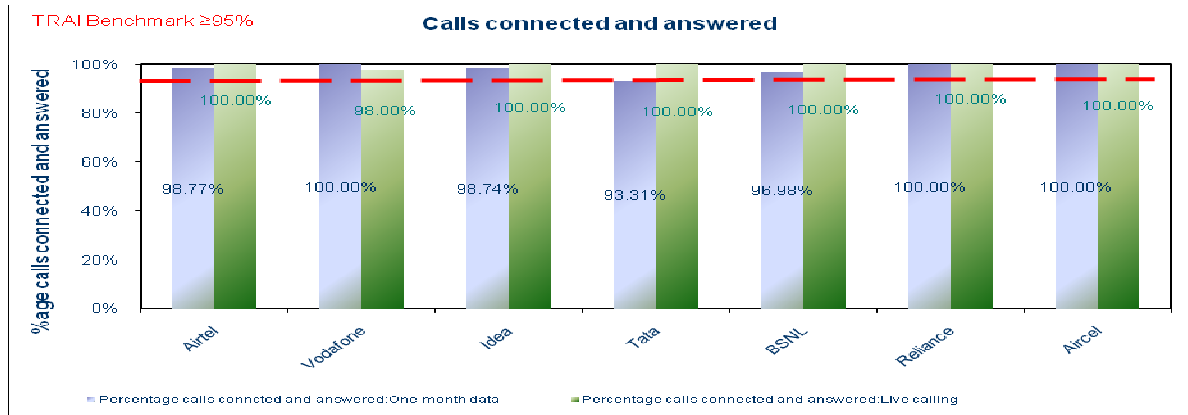


All the operators meet the benchmark

**Live calling for billing Complaints**

Resolution of billing complaints	Benchmark	Airtel	Vodafone	Idea	Tata	BSNL	Reliance	Aircel
Total Number of calls made		16	25	20	25	9	6	25
Number of cases resolved in 4 weeks		7	12	12	15	5	4	20
Percentage cases resolved in four weeks	100%	43.75%	48.00%	60.00%	60.00%	55.56%	66.67%	80.00%

**Customer Care / Helpline: Calls answered**



**One month**

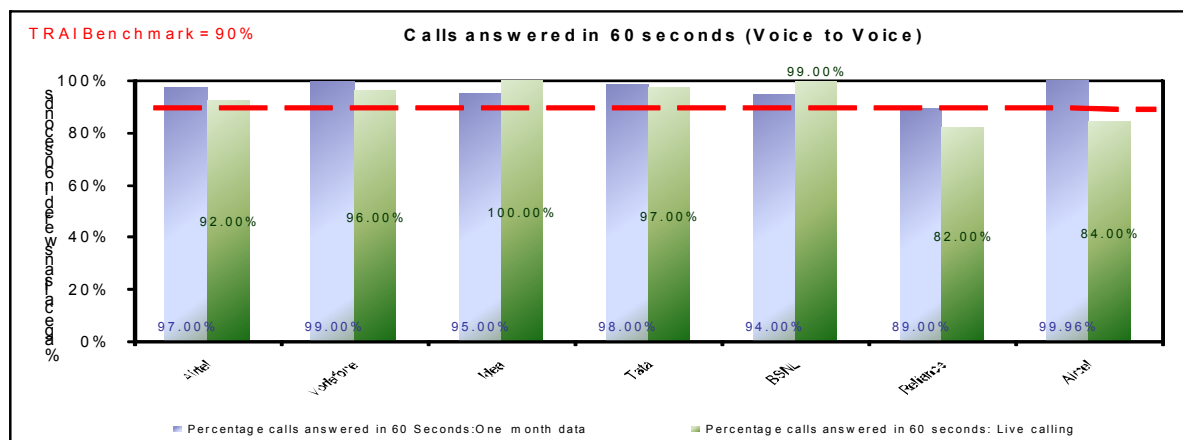
Operator(s) meeting benchmark: Airtel, Vodafone, Idea, BSNL, Reliance, Aircel

Operator(s) not meeting the benchmark: Tata

**Live measurement**

All the operators meet the benchmark

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



**One month**

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

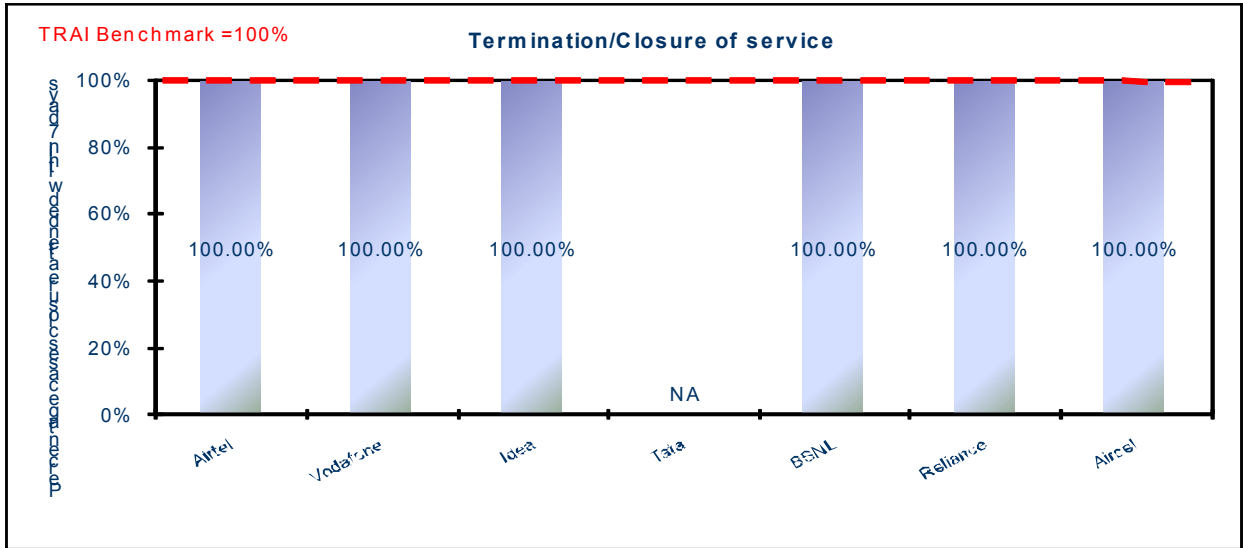
Operator(s) not meeting the benchmark: Reliance

**Live measurement**

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

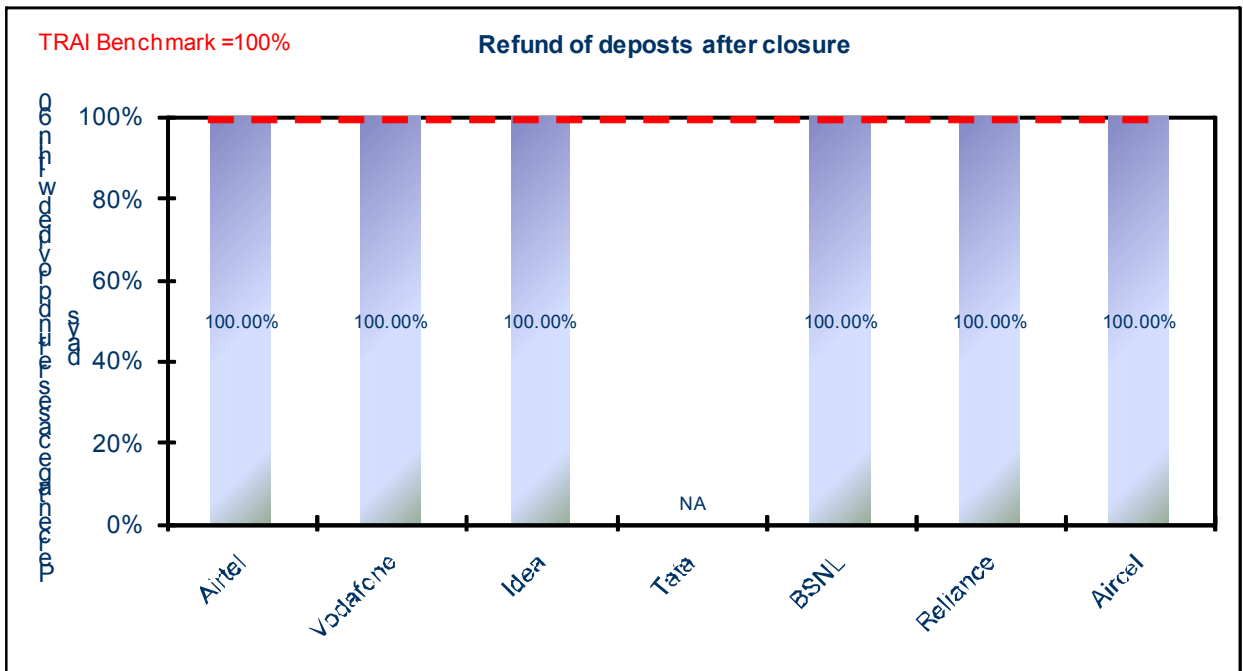
Operator(s) not meeting the benchmark: Reliance, Aircel

**Termination / Closure of service**



All the operators meet the benchmark

**Refund of deposits**



All the operators meet the benchmark

Inter operator calls assessment

Inter operator call Assessment To ↓ From →	Airtel	Vodafone	Idea	Tata	BSNL	Reliance	Aircel
Airtel	NA	100%	98%	99%	92%	90%	100%
Vodafone	95%	NA	99%	98%	97%	96%	99%
Idea	99%	92%	NA	98%	97%	95%	98%
Tata	100%	100%	99%	NA	99%	99%	99%
BSNL	100%	97%	100%	100%	NA	98%	100%
Reliance	99%	100%	100%	99%	98%	NA	99%
Aircel	100%	100%	100%	100%	97%	99%	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. Idea, BSNL and Reliance found it difficult to connect to an Airtel number. Whereas, Vodafone, Tata and Aircel found it difficult connecting to Idea number. Also Tata and Airtel found it difficult connecting to a Vodafone number.




## 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 of service		
	BTSs Accumulated downtime	Worst affected BTSs due to downtime	Call Set-up Success Rate	SDCCH/Paging Chl. Congestion	TCH Congestion	Call Drop Rate	Worst affected cells having more than 3% TCH drop	%age of connection with good voice quality	Point of Interconnection (POI) Congestion	Metering and billing credibility - Postpaid	Metering and billing credibility - Prepaid	%age complaints resolved within 4 weeks	Period of applying credit/waiver less than 1 week	Accessibility of call centre/customer care	%age of calls answered by the operators within 60 sec	%age requests for Termination within 7 days	Refund of deposits after closure within 60 days	
<b>Benchmark</b>	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 5%	≥ 95%	≤ 0.5%	≤ 0.1%	≤ 0.1%	100%	100%	≥ 95%	≥ 90%	100%	100%	
Airtel	PMR	0.22%	1.01%	98.20%	0.22%	0.32%	1.13%	4.12%	98.87%	0.00%	0.00%	0.00%	100.00%	100.00%	99.61%	67.00%	100.00%	100.00%
	IMRB	0.22%	1.01%	98.20%	0.22%	0.32%	1.13%	4.12%	98.87%	0.00%	0.00%	0.00%	100.00%	100.00%	99.60%	83.00%	100.00%	100.00%
Vodafone	PMR	0.01%	0.00%	98.98%	0.00%	0.04%	1.89%	2.59%	97.61%	0.00%	0.01%	0.04%	100.00%	100.00%	99.00%	90.00%	100.00%	100.00%
	IMRB	0.00%	0.00%	99.56%	0.02%	0.12%	0.13%	4.45%	98.08%	0.00%	0.01%	0.10%	100.00%	100.00%	99.54%	90.00%	100.00%	100.00%
Tata	PMR	0.03%	0.00%	99.27%	0.00%	0.07%	0.85%	0.79%	99.04%	0.00%	0.05%	0.04%	98.47%	100.00%	84.00%	74.00%	100.00%	100.00%
	IMRB	0.03%	0.00%	99.25%	0.00%	0.07%	0.83%	0.75%	99.03%	0.00%	0.03%	0.04%	100.00%	100.00%	95.00%	57.00%	NA	NA
BSNL	PMR	1.73%	1.95%	97.33%	0.90%	1.90%	2.00%	4.87%	98.73%	0.00%	0.04%	0.02%	100.00%	100.00%	98.00%	89.00%	100.00%	100.00%
	IMRB	1.73%	1.95%	97.00%	0.90%	1.90%	2.00%	4.87%	97.67%	0.00%	0.00%	0.05%	100.00%	100.00%	98.00%	94.00%	100.00%	100.00%
Aircel	PMR	0.38%	2.11%	96.60%	0.90%	1.56%	2.25%	25.15%	93.45%	3.00%	0.17%	0.70%	100.00%	100.00%	100.00%	60.00%	100.00%	100.00%
	IMRB	0.38%	2.11%	97.58%	0.90%	1.56%	2.25%	25.15%	93.38%	0.53%	0.20%	0.90%	100.00%	100.00%	100.00%	74.26%	100.00%	100.00%

 Figures do not match with those reported in PMR

 Figures verified on all India basis

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

 Not meeting benchmark

## **13.0 Conclusions**

### **13.1 Cellular Mobile services**

1. Except for Airtel, none of the figures reported by all the operators for the parameter CSSR completely match the figures obtained on verification. There is mismatch between the reported figures and verification figures for 9 parameters for Vodafone and for 7 parameters for TATA Indicom.
2. Airtel does not meet the TRAI benchmark for 8 parameters.
3. All the operators except Vodafone failed to meet the benchmark for %age of calls answered by the operators within 60 sec.

**Section C**  
**BROADBAND**

## **14.0 Sampling Methodology**

### **14.1 Sampling for Broadband service providers**

- For BSNL, Audit was conducted at the 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 BSNL, the data pertaining to network related parameters was obtained by IMRB Auditors at the central NOC in Bangalore.
- BSNL is the only broadband service provider operating in Jammu & Kashmir circle:

	<b>Name of Operator</b>
<b>Operator 1</b>	BSNL

## 15.0 Audit methodology

### 15.1 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}

## 16.0 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 April 2010 to June 2010 in Jammu & Kashmir circle.

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

Parameters	Benchmarks	BSNL
<b>Service provisioning uptime</b>		
Percentage connections provided within 15 days	100%	100.00%
<b>Fault repair restoration time</b>		
Percentage faults repaired by next working days	> 90%	94.84%
Percentage faults repaired within three working days	> 99%	100.00%
<b>Billing performance</b>		
Billing complaints per 100 bills issued	< 2%	0.08%
%age of billing complaints resolved in 4 weeks	100%	100.00%
%age cases in which refund of deposits after closure was made in 60 days	100%	NA
<b>Customer care/helpline assessment (Voice to Voice)</b>		
Percentage calls answered within 60 seconds	> 60%	81.98%
Percentage calls answered within 90 seconds	> 80%	98.97%
<b>Bandwidth utilization/Throughput</b>		
Intra network links (POP to ISP Node)		297
Total number of intra network links > 90%		4
Upstream Bandwidth (ISP Node to NIXI/NAP/IGSP)		345
Percentage bandwidth utilized on upstream links	< 80%	72.20%
Broadband download speed	> 80%	84.50%
Service availability/uptime	> 98%	99.06%
Packet loss	< 1%	0.00%
<b>Network Latency</b>		
POP/ISP Node to NIXI	< 120 msec	15
ISP node to NAP port (Terrestrial)	< 350 msec	219

(\*Note: For BSNL data pertains to the sample 5% of exchanges audited during the period of to April to June 2010, whereas for rest of the operators figures pertain to all the exchanges present in the circle)

\*\* 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 and Key take outs: Broadband services**

Before concluding the Audit findings for Broadband services we would like to accentuate the fact that BSNL (for network related parameters) considers all India as one circle

Since BSNL is the only broadband service provider operating in Jammu and Kashmir circle, the key conclusions (Parameter wise) emerging out from the Audit exercise for BSNL in Jammu & Kashmir circle are highlighted below

#### Service provisioning/Activation time

- BSNL meets TRAI benchmark of 100% connections to be provided within 15 days in the audit month however during live calling only 74.71% of subscribers claimed that connection was provided within 15 days

#### Fault Repair/Restoration time

- BSNL is meeting the TRAI benchmark for fault repair within next working day and three days in Jammu and Kashmir.
- 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.

#### Billing performance

- The service provider (BSNL) was found to be meeting the benchmark of percentage billings complaints received and time taken for resolution of billing complaints for the month in which data was collected.

#### Customer Care/Helpline Assessment

- BSNL meets the TRAI specified benchmark for calls answered by the operator in 60 and 90 seconds for the month in which audit was carried out
- For live calling BSNL again comfortably meets TRAI specified benchmark for calls answered by the operator in 60 seconds and 90 seconds.

#### Bandwidth Utilization:

- The service provider (BSNL) was found to be using Multiple Router Traffic Grapher (MRTG) to measure the bandwidth utilization at intra network links.
- For Intra network link, data for BSNL was obtained on all India bases. 4 of the 297 links tested for BSNL was found to be having above 90% bandwidth utilization for the month in which audit was carried out.
- 5 of the intra-network links tested during three day live measurement in the access segment for BSNL was found above 80%.
- For Bandwidth utilization on upstream links (From ISP Node to IGSP/NIXI), BSNL meets the TRAI specified benchmark during audit month

#### Download speed

- During live measurements carried out at Pop's/ISP Node it was observed that BSNL is 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

#### Service Availability/Uptime:

- BSNL meets the benchmark on service availability/uptime for the month of audit and 3 day live measurement carried out.

Packet Loss and Network Latency

- The verification of the records of old ping tests was done through latency graphs (available from smoke ping tool)
- However, ping tests conducted/smoked ping results during live measurements revealed BSNL meeting the benchmark prescribed by TRAI.

**Summary of Live Measurement Results – Broadband Services**

Parameters	Benchmarks	BSNL
<b>Service provisioning uptime</b>		
Percentage connections provided within 15 days	100%	74.71%
<b>Fault repair restoration time</b>		
Percentage faults repaired by next working days	> 90%	25.51%
Percentage faults repaired within three working days	> 99%	67.35%
<b>Billing performance</b>		
%age of billing complaints resolved in 4 weeks	100%	85.71%
<b>Customer care/helpline assessment (Voice to Voice)</b>		
Percentage calls answered within 60 seconds	> 60%	91.50%
Percentage calls answered within 90 seconds	> 80%	100.00%
<b>Bandwidth utilization/Throughput</b>		
Intra network links (POP to ISP Node)		297
Total number of intra network links > 90%		5
Upstream Bandwidth (ISP Node to NIXI/NAP/IGSP)		377
Percentage bandwidth utilized on upstream links	< 80%	84.11%
Broadband download speed	> 80%	84.50%
Service availability/uptime	> 98%	99.15%
Packet loss	< 1%	0.05%
<b>Network Latency</b>		
POP/ISP Node to NIXI	< 120 msec	73
ISP node to NAP port (Terrestrial)	< 350 msec	279

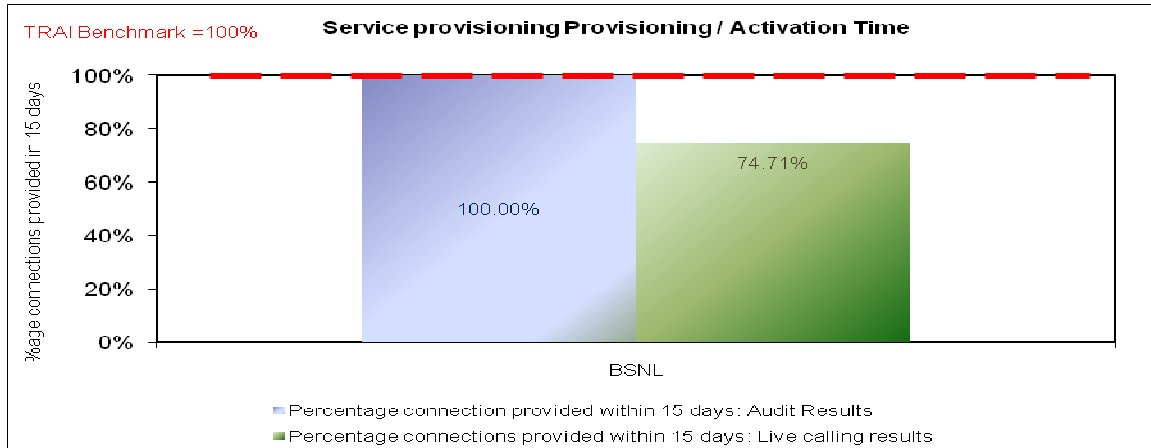
- BSNL meets the benchmark on service availability/uptime for three day live measurements
- The testing for Bandwidth utilization during live measurement was carried out on sample basis by IMRB auditors for intra network links. 5 of the links tested for these operators was found to be having above 90% bandwidth utilization for the month in which audit was carried out
- For Bandwidth utilization on upstream links, BSNL was found to be not meeting the benchmark during the three day live measurement.
- For network latency all the service providers comfortably meet the TRAI specified benchmark for ping tests carried out during live measurements.



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

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

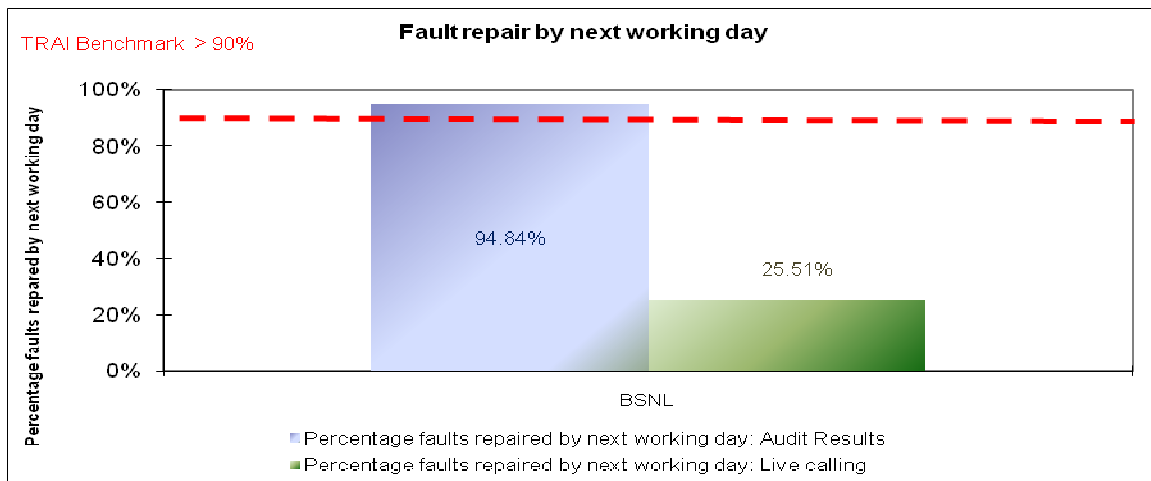
**Service provisioning / Activation time (Comparison between one month audit results and live calling results)**



**One month**  
 BSNL is meeting the benchmark

**Live calling**  
 BSNL is not meeting the benchmark

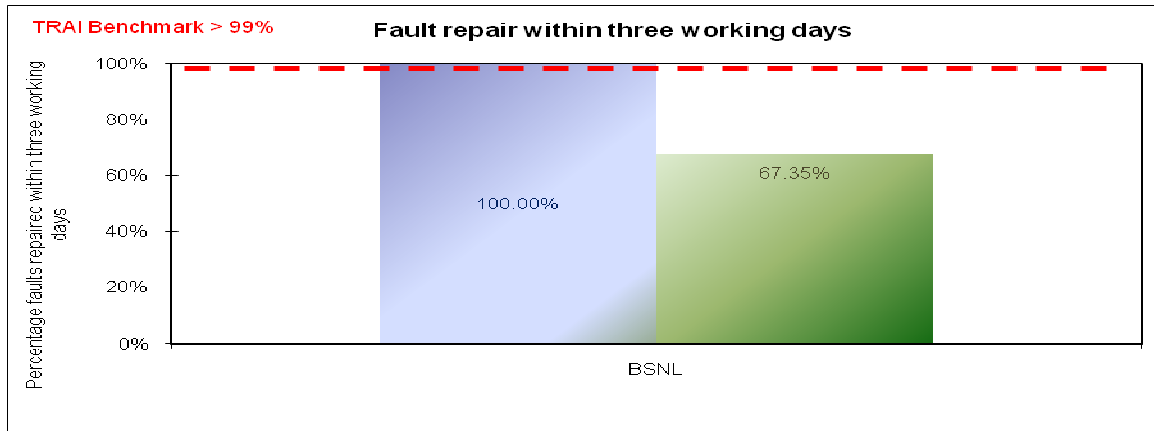
**Fault repair/Restoration time (By next working day) - Comparison between one month audit results and live calling results**



**One month**  
 BSNL is meeting the benchmark

**Live calling**  
 BSNL is not meeting the benchmark

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



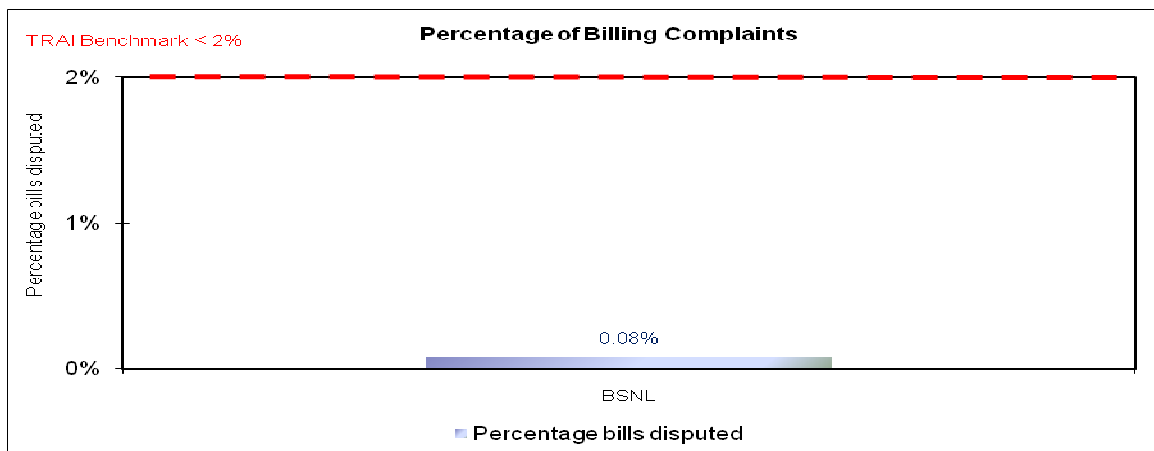
**One month**

BSNL is meeting the benchmark

**Live calling**

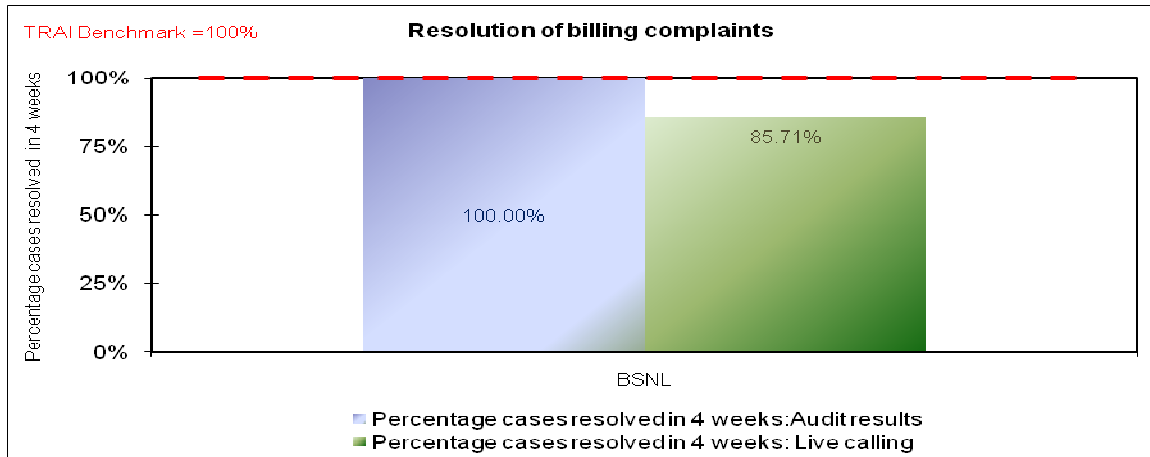
BSNL is not meeting the benchmark

**Percentage bills disputed**



BSNL is meeting the benchmark

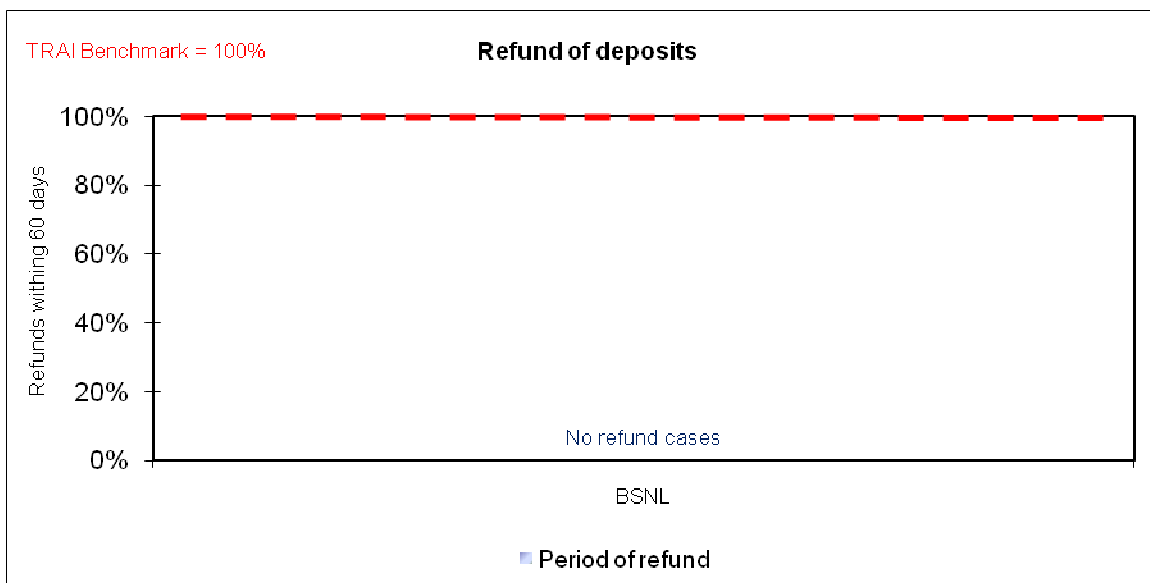
**Resolution of billing complaints (Comparison between one month audit results and live calling results)**



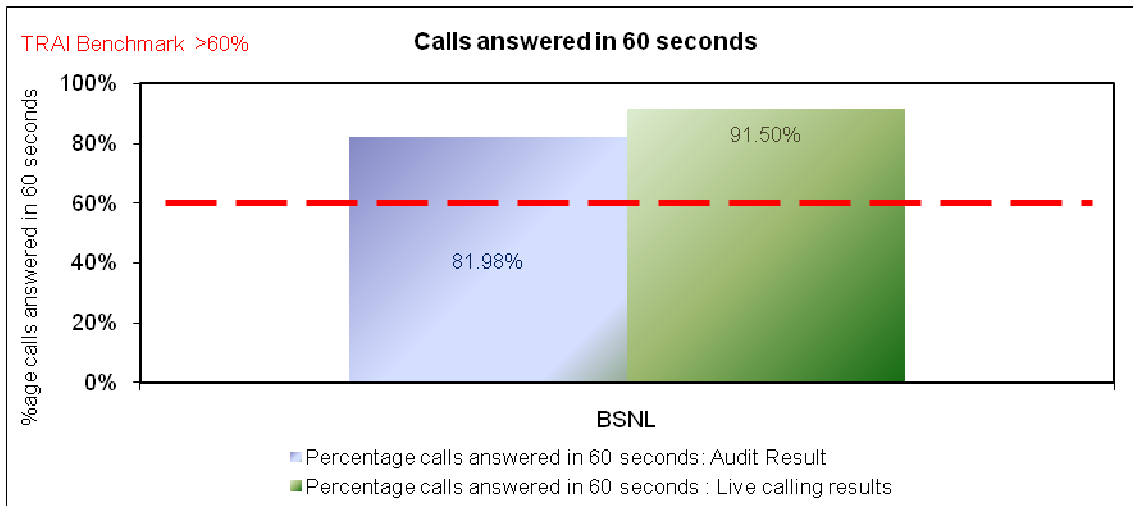
**One month**  
BSNL is meeting the benchmark

**Live calling**  
BSNL is not meeting the benchmark

**Refund of deposits after closure**



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



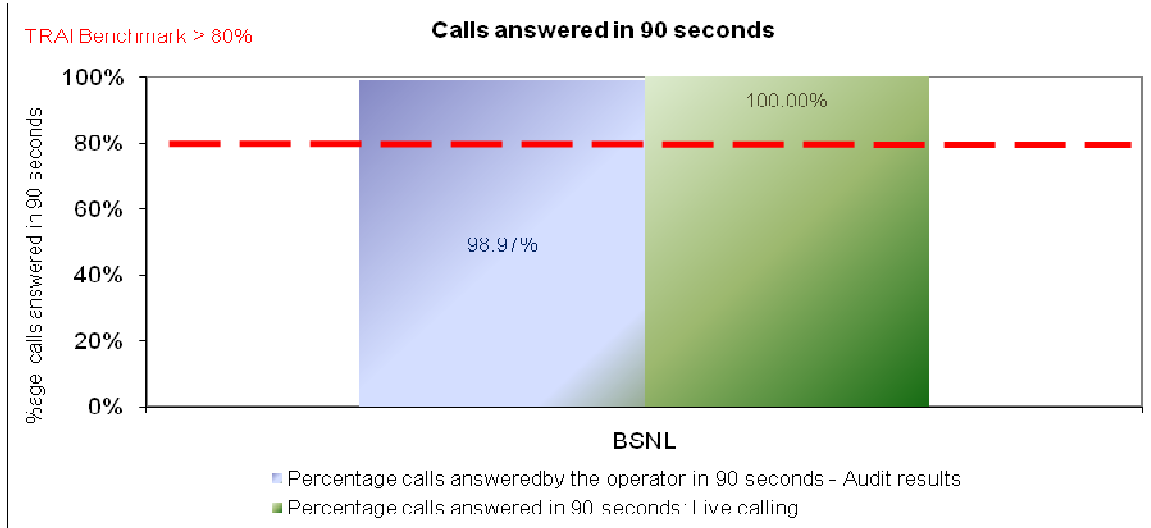
**One month**

BSNL is meeting the benchmark

**Live calling**

BSNL is 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**

BSNL is meeting the benchmark

**Live calling**

BSNL is meeting the benchmark

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

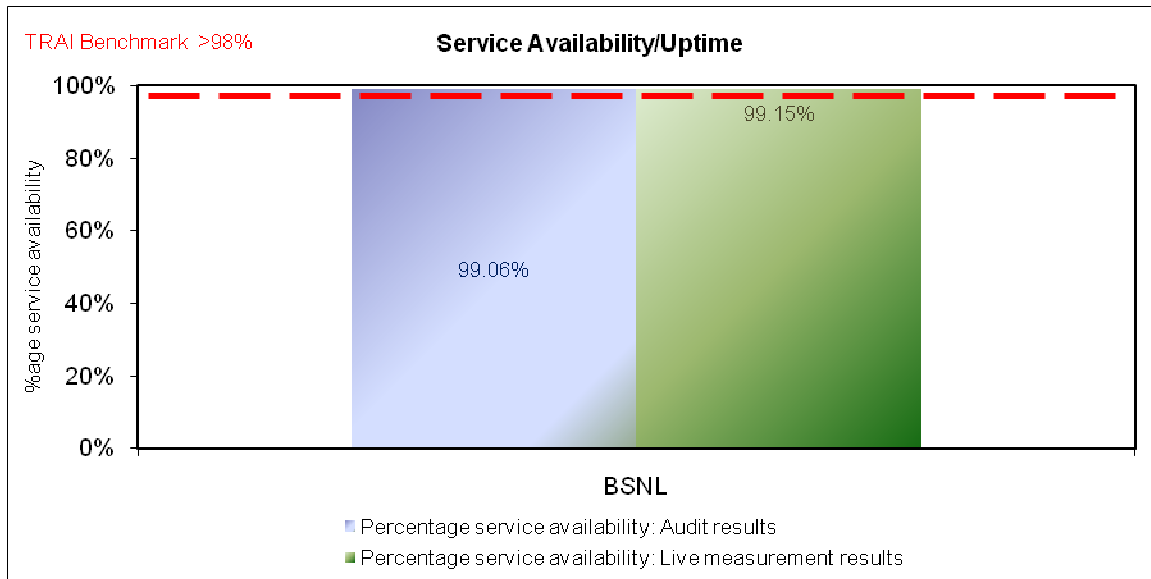
Bandwidth Utilization (One month)	B'mark	BSNL
Total number of intra network links		297
No of Intra network found to be above 90%		4

Bandwidth Utilization (Live measurement)	B'mark	BSNL
Total number of intra network links		297
No of Intra network found to be above 90%		5

Broadband download speed	Benchmark	BSNL
Total committed download speed to the sample subscribers (In mpbs) (A)		2
Total average download speed observed during TCBH (In Mpbs) (B)		1.69
%age subscribed speed available to the subscriber during TCBH (B/A)*100	>80%	84.50%

As far as bandwidth utilization on the intra network links is concerned for BSNL, 5 out of the sample intra network links tested during live measurement were found to be above 90%.

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



**One month**  
BSNL is meeting the benchmark

**Live calling**  
BSNL is meeting the benchmark

## 18.0 Compliance reports: Results of Verification of Records

### 18.1 Broadband services

Parameters	Benchmarks	BSNL *	
		PMR	IMRB
<b>Service provisioning uptime</b>			
Percentage connections provided within 15 days	100%	99.90%	99.83%
<b>Fault repair restoration time</b>			
Percentage faults repaired by next working days	> 90%	95.00%	96.50%
Percentage faults repaired within three working days	> 99%	100.00%	100.00%
<b>Billing performance</b>			
Billing complaints per 100 bills issued	< 2%	0.10%	0.06%
%age of billing complaints resolved in 4 weeks	100%	100.00%	100.00%
%age cases in which refund of deposits after closure was made in 60 days	100%	100.00%	100.00%
<b>Customer care/helpline assessment (Voice to Voice)</b>			
Percentage calls answered within 60 seconds	> 60%	79.60%	81.71%
Percentage calls answered within 90 seconds	> 80%	91.70%	98.55%
<b>Bandwidth utilization/Throughput</b>			
Intra network links (POP to ISP Node)		Project 2.2:- BRAS-23, T1-24, T2-624, DSLAM-5960, Multiplay Phase 1&2:- BNG-18, RPR-1181, OCLAN-2906, DSLAM-37036	173
Total number of intra network links > 90%		0	5
Upstream Bandwidth (ISP Node to NIXI/NAP/IGSP)		32316.4	32316.4
Percentage bandwidth utilized on upstream links	< 80%	73.10%	73.07%
Broadband download speed	> 80%	87.10%	83.75%
Service availability/uptime	> 98%	98.70%	99.27%
Packet loss	< 1%	0.00%	0.00%
<b>Network Latency</b>			
POP/ISP Node to NIXI ( in msec)	< 120 msec	13.7	13.7
ISP node to NAP port (Terrestrial) ( in msec)	< 350 msec	229	229

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



Figures do not match with those reported in PMR



Not meeting the benchmark

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

### 18.2 Conclusions

#### Broadband services

1. Network data for BSNL 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.

Historic data for Broadband download speed and Ping test conducted to check the latency and packet loss was not available for verification.

**19.0 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 in audited exchange were meeting benchmark					

**19.1 Parameter wise performance reports for Basic Wireline services****2.1 Audit Results for Fault repair**

Fault incidences	Benchmark	BSNL
Faults incidences ( No. of faults/100 Subs./month)	≤ 5	6.74

Fault repair (Urban areas)	Benchmark	BSNL
Total No. of faults registered during the month		7166
No. of faults repaired by next working day during the month		4454
Percentage of faults repaired by next working day during the month	≥ 90%	62.15%
No. of faults repaired within 3 days during the month		6330
Percentage of faults repaired within 3 days during the month	100%	89.33%

Fault repair (Rural & Hilly areas)	Benchmark	BSNL
Total No. of faults registered during the month		7166
No. of faults repaired by next working day during the month		4454
Percentage of faults repaired by next working day during the month	≥ 90%	62.15%
No. of faults repaired within 5 days during the month		80
Percentage of faults repaired within 5 days during the month	100%	100.00%

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

MTRR	Benchmark	BSNL
Mean time taken to repair the fault in hours	≤ 8	8.29

**2.2 Live calling for fault repair**

Rural & Hilly area	Benchmark	BSNL
Total Number of calls made		51
Number of cases where faults were repaired by next working day		14
Percentage cases where faults were repaired by next working day	≥ 90%	27.45%
Number of cases where faults were repaired within 5 days		33
Percentage cases where faults were repaired within 5 days	100%	64.71%

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

Traffic statistics - Call Completion Rate	Benchmark	BSNL
Total local call attempts		1769866
Total number of successful local calls		1067279
Call Completion Rate (CCR) in the local network	≥ 55%	60.30%

Traffic statistics - Answer to Seizure Ratio	Benchmark	BSNL
Total number of calls processed by the switch		2575188
Total number of calls answered		1829289
Answer to Seizure Ratio (ASR)	≥ 75%	71.04%

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

Traffic statistics - Call Completion Rate	Benchmark	BSNL
Total local call attempts		58655
Total number of successful local calls		35626
Call Completion Rate (CCR) in the local network	≥ 55%	60.74%

Traffic statistics - Answer to Seizure Ratio	Benchmark	BSNL
Total number of calls processed by the switch		180200
Total number of calls answered		89854
Answer to Seizure Ratio (ASR)	≥ 75%	49.86%

**4.1 Audit Results for POI Congestion**

POI congestion	Benchmark	BSNL
POI traffic offered on all individual POI's		168480
Served traffic for all POI's		168480
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		493
Served traffic for all POI's		493
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		12319
Total number of bills disputed		4
Percentage bills disputed	≤ 0.1%	0.03%

##### Billing disputes – Prepaid

No. of charging / credit / validity complaints during the month		NA
Total no. of pre-paid customers at the end of the month		NA
Number of complaints per 100 customers	≤ 0.1%	NA

##### Resolution of billing complaints

Total number of billing/charging complaints		4
Total complaints resolved in 4 weeks from date of receipt		3
Percentage complaints resolved within 4 weeks of date of receipt	100%	75.00%

##### Period of applying credit / waiver

No. of complaints resolved in favor of the customer during the month		4
No. of complaints disposed on account of not considered as valid complaints		0
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		11
Number of cases resolved in 4 weeks		10
Percentage cases resolved in 4 weeks	100%	90.91%

#### 6.1 Audit Results for Requests

Closure Requests	Benchmark	BSNL
Total no. of requests received for Closures		234
Total no. of requests for closures attended within 7 days		234
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

#### 7.1 Audit results for customer care

Customer Care Assessment	Benchmark	BSNL
Total no. of call attempts to call centre / customer care nos. during TCBH		3523
No. of calls connected and answered successfully to call centre / customer care nos. during TCBH		3324
Percentage of calls getting connected and answered electronically	≥ 95%	94.35%
Percentage of calls answered by the operators (voice to voice) within 60 seconds	≥ 90%	96.44%

**7.2 Live calling results for customer care**

Customer Care Assessment	Benchmark	BSNL
Total Number of calls received		100
Total Number of calls getting connected and answered		95
Percentage calls getting connected and answered	≥ 95%	95.00%

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

Customer Care Assessment	Benchmark	BSNL
Total Number of calls received		400
Total Number of calls answered within 60 seconds		390
Percentage calls answered within 60 seconds	≥ 90%	97.50%

**8.1 Audit results for refund of deposits**

Refund	Benchmark	BSNL
Total number of cases requiring refund of deposits		36
Total number of cases where refund was made within 60 days		29
Percentage cases in which refund was receive within 60 days	100%	80.56%

**9.1 Live calling for level 1 services**

Level 1 services	Benchmark	BSNL
Total no. of calls made		360
Calls answered in 60 sec		357
Calls answered after 60 sec		3

**10.1 Exchange capacity and Subscribers**

	Benchmark	BSNL
Equipped Capacity of the exchange (number of subscribers)		92500
Total number of customers served		64767

## 20.0 Annexure – I (Wireless)

### 20.1 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)	Worst affected BTSs due to downtime	Call Set-up Success Rate (within licensee's own network)	SDCCH/Paging Chl. Congestion	TCH Congestion	Call Drop Rate (%age)	Worst affected cells having more than 3% TCH drop	%age of connection with good voice quality	Metering and billing credibility (Postpaid)	Metering and billing credibility (Prepaid)	%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 within 60 sec	%age requests for Termination complied within 7 days	Refund of deposits after closure within 60 days
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 5%	≥ 95%	≤ 0.1%	≤ 0.1%	100%	100%	≥ 95%	≥ 90%	100%	100%
Airtel	0.16%	0.62%	99.01%	0.07%	0.08%	0.84%	1.42%	98.34%	0.04%	0.00%	100.00%	100.00%	98.77%	97.00%	100.00%	100.00%
Vodafone	0.00%	0.00%	98.13%	0.84%	0.85%	1.85%	3.89%	98.15%	0.03%	0.07%	100.00%	100.00%	100.00%	99.00%	100.00%	100.00%
Idea	0.34%	0.00%	98.42%	0.17%	0.53%	1.82%	9.82%	97.18%	0.05%	0.20%	100.00%	100.00%	98.74%	95.00%	100.00%	100.00%
Tata	0.01%	0.00%	99.32%	0.00%	0.04%	0.66%	0.69%	98.83%	0.76%	0.02%	100.00%	100.00%	93.31%	98.00%	NA	NA
BSNL	0.30%	1.89%	98.00%	0.90%	1.90%	20.00%	4.84%	98.00%	0.04%	0.09%	100.00%	100.00%	96.98%	94.00%	100.00%	100.00%
Reliance	0.17%	0.39%	98.66%	0.03%	0.31%	0.80%	0.78%	98.02%	0.00%	0.01%	100.00%	100.00%	100.00%	89.00%	100.00%	100.00%
Aircel	0.09%	0.75%	95.72%	0.68%	1.80%	2.01%	16.00%	89.53%	0.81%	0.44%	100.00%	100.00%	100.00%	99.96%	100.00%	100.00%

### 20.2 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
Airtel	All POI meet benchmark					
Vodafone	All POI meet benchmark					
Idea	All POI meet benchmark					
Tata	All POI meet benchmark					
BSNL	All POI meet benchmark					
Reliance	All POI meet benchmark					
Aircel	L2 TAX SRINAGAR LOCAL	308	22822.19	290.1563	11.12963	10 E1 AT in process
	L1 TAX NLD TG	608	45808.31	603.9548	1782.03%	50 E1 feasibility awaited
	L1 TAX NLD TG	928	79801.83	864.3579	16.59276	50 E1 feasibility awaited

## 20.3 Parameter wise performance reports for Cellular Mobile services

### 1. Network Availability

#### Audit Results for Network Availability

	Benchmark	Airtel	Vodafone	Idea	Tata	BSNL	Reliance	Aircel
Number of BTSs in the licensed service area		2275	793	325	235	265	764	1469
Sum of downtime of BTSs in a month (in hours)		2782.75	16.24	834	25	584	973	1014
BTSs accumulated downtime (not available for service)	≤ 2%	0.16%	0.00%	0.34%	0.01%	0.30%	0.17%	0.09%
Number of BTSs having accumulated downtime >24 hours		14	0	0	0	5	3	11
Worst affected BTSs due to downtime	≤ 2%	0.62%	0.00%	0.00%	0.00%	1.89%	0.39%	0.75%

### 2. Connection Establishment (Accessibility)

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

CSSR	Benchmark	Airtel	Vodafone	Idea	Tata	BSNL	Reliance	Aircel
CSSR	≥ 95%	99.01%	98.13%	98.42%	99.32%	98.00%	98.66%	95.72%

SDCCH congestion	Benchmark	Airtel	Vodafone	Idea	Tata	BSNL	Reliance	Aircel
SDCCH/Paging channel congestion	≤ 1%	0.07%	0.84%	0.17%	0.00%	0.90%	0.03%	0.68%

TCH congestion	Benchmark	Airtel	Vodafone	Idea	Tata	BSNL	Reliance	Aircel
TCH congestion	≤ 2%	0.08%	0.85%	0.53%	0.04%	1.90%	0.31%	1.80%

#### Live measurement results for CSSR, SDCCH and TCH congestion

CSSR	Benchmark	Airtel	Vodafone	Idea	Tata	BSNL	Reliance	Aircel
CSSR	≥ 95%	99.02%	97.78%	97.68%	99.30%	98.00%	99.28%	97.17%

SDCCH congestion	Benchmark	Airtel	Vodafone	Idea	Tata	BSNL	Reliance	Aircel
SDCCH/Paging channel congestion	≤ 1%	0.05%	0.93%	0.12%	0.00%	0.90%	0.02%	0.19%

TCH congestion	Benchmark	Airtel	Vodafone	Idea	Tata	BSNL	Reliance	Aircel
TCH congestion	≤ 2%	0.07%	0.80%	1.46%	0.06%	1.90%	0.00%	0.38%

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

CSSR	Benchmark	Airtel	Vodafone	Idea	Tata	BSNL	Reliance	Aircel
Total number of call attempts		296	317	294	328	306	317	310
Total number of successful calls established		296	316	294	328	303	306	308
CSSR	≥ 95%	100.00%	99.68%	100.00%	100.00%	99.02%	96.53%	99.35%

Blocked calls	Benchmark	Airtel	Vodafone	Idea	Tata	BSNL	Reliance	Aircel
%age blocked calls		0.00%	0.32%	0.00%	0.00%	0.98%	3.47%	0.65%

**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	Idea	Tata	BSNL	Reliance	Aircel
Total number of calls established		4635320	NA	3199522	3292610	29623930	NA	NA
Total number of calls dropped		39037	NA	58283	21836	5924786	NA	NA
Call drop rate	≤ 2%	0.84%	1.85%	1.82%	0.66%	20.00%	0.80%	2.01%

Cells having more than 3% TCH	Benchmark	Airtel	Vodafone	Idea	Tata	BSNL	Reliance	Aircel
Total number of cells in the network		6620	2364	967	720	806	4465	4199
Total number of cells having more than 3% TCH		94	92	95	5	39	35	672
Worst affected cells having more than 3% TCH	≤ 5%	1.42%	3.89%	9.82%	0.69%	4.84%	0.78%	16.00%

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

Call drop rate	Benchmark	Airtel	Vodafone	Idea	Tata	BSNL	Reliance	Aircel
Total number of calls established		4685618	NA	345631	332052	28003930	NA	NA
Total number of calls dropped		37682	NA	5886	2371	5600786	NA	NA
Call drop rate	≤ 2%	0.80%	1.70%	1.70%	0.71%	20.00%	0.29%	1.91%

Cells having more than 3% TCH	Benchmark	Airtel	Vodafone	Idea	Tata	BSNL	Reliance	Aircel
Total number of cells in the network		6620	2364	2901	720	806	11514	5170
Total number of cells having more than 3% TCH		91	101	247	3.6	37	27	674
Worst affected cells having more than 3% TCH	≤ 5%	1.37%	4.27%	8.51%	0.50%	4.59%	0.23%	13.04%

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

Call drop rate	Benchmark	Airtel	Vodafone	Idea	Tata	BSNL	Reliance	Aircel
Total number of calls established		296	316	294	328	301	306	310
Total number of calls dropped		0	0	0	0	0	3	1
Call drop rate	≤ 2%	0.00%	0.00%	0.00%	0.00%	0.00%	0.98%	0.32%

**4. Voice quality****Audit Results for Voice quality**

Voice quality	Benchmark	Airtel	Vodafone	Idea	Tata	BSNL	Reliance	Aircel
Total number of sample calls		370280414	NA	1201694092	NA	100	NA	NA
Total number of calls with good voice quality		364133759	NA	1167844132	NA	98	NA	NA
%age calls with good voice quality	≥ 95%	98.34%	98.15%	97.18%	98.83%	98.00%	98.02%	89.53%

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

Voice quality	Benchmark	Airtel	Vodafone	Idea	Tata	BSNL	Reliance	Aircel
Total number of sample calls		733461	651000	388783	11426	245131	110607	587089

Total number of calls with good voice quality		710568	636140	379896	11199	177115	102024	572640
%age calls with good voice quality	≥ 95%	96.88%	97.72%	97.71%	98.01%	72.25%	92.24%	97.54%

## 5. POI Congestion

### Audit Results for POI Congestion

POI congestion	Benchmark	Airtel	Vodafone	Idea	Tata	BSNL	Reliance	Aircel
No. of POIs not meeting benchmark		0	0	0	0	0	0	3
Total number of working POIs		6	29	14	34	24	9	43

## Live measurement results for POI congestion

### 6. Inter Operator Call Assessment

Inter operator call Assessment								
To ↓	From →	Airtel	Vodafone	Idea	Tata	BSNL	Reliance	Aircel
Airtel		NA	100%	98%	99%	92%	90%	100%
Vodafone		95%	NA	99%	98%	97%	96%	99%
Idea		99%	92%	NA	98%	97%	95%	98%
Tata		100%	100%	99%	NA	99%	99%	99%
BSNL		100%	97%	100%	100%	NA	98%	100%
Reliance		99%	100%	100%	99%	98%	NA	99%
Aircel		100%	100%	100%	100%	97%	99%	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	Idea	Tata	BSNL	Reliance	Aircel
<b>Billing disputes – Postpaid</b>								
Total bills generated during the period		76899	45958	25276	42108	1030227	110476	409338
Total number of bills disputed		32	15	13	319	396	2	3318
Percentage bills disputed	≤ 0.1%	0.04%	0.03%	0.05%	0.76%	0.04%	0.00%	0.81%
<b>Billing disputes – Prepaid</b>								
Number of complaints related to charging, credit & validity		11	123	137	11	505	48	6051
Total number of prepaid customers in that period		1597724	173672	69497	50416	546049	381759	1361352
Percentage of complaints	≤ 0.1%	0.00%	0.07%	0.20%	0.02%	0.09%	0.01%	0.44%
<b>Resolution of billing complaints</b>								
Total number of billing/charging complaints		116	138	150	330	505	794	10321
Total complaints resolved in 4 weeks from date of receipt		73	62	46	300	149	744	10311
Percentage complaints resolved within 4 weeks of date of receipt	100%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Period of applying credit / waiver								
No. of complaints resolved in favor of the customer during the month		43	76	2082	30	112	50	10
No. of complaints disposed on account of not considered as valid complaints		NA	NA	NA	NA	NA	NA	NA
Percentage cases in which credit/waiver was received within 1 week	100%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

### Live calling results for resolution of billing complaints

Resolution of billing complaints	Benchmark	Airtel	Vodafone	Idea	Tata	BSNL	Reliance	Aircel
Total Number of calls made		16	25	20	25	9	6	25
Number of cases resolved in 4 weeks		7	12	12	15	5	4	20
Percentage cases resolved in four weeks	100%	43.75%	48.00%	60.00%	60.00%	55.56%	66.67%	80.00%

## 8. Customer Care

### Audit results for customer care

Customer Care Assessment	Benchmark	Airtel	Vodafone	Idea	Tata	BSNL	Reliance	Aircel
Total number of call attempts to customer care for assistance		6585625	639567	187669	219563	1324	NA	6394384
Number of calls getting connected and answered (electronically)		6504309	639567	185307	204883	1284	453494	6394384
Percentage calls getting connected and answered	≥ 95%	98.77%	100.00%	98.74%	93.31%	96.98%	100.00%	100.00%
Percentage calls answered within 60 seconds (V2V)	≥ 90%	97.00%	99.00%	95.00%	98.00%	94.00%	89.00%	99.96%

### Live calling results for customer care

Customer Care Assessment	Benchmark	Airtel	Vodafone	Idea	Tata	BSNL	Reliance	Aircel
Total Number of calls received		100	100	100	100	100	100	100
Total Number of calls getting connected and answered		100	98	100	100	100	100	100
Percentage calls getting connected and answered	≥ 95%	100.00%	98.00%	100.00%	100.00%	100.00%	100.00%	100.00%

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

Customer Care Assessment	Benchmark	Airtel	Vodafone	Idea	Tata	BSNL	Reliance	Aircel
Total Number of calls received		100	100	100	100	100	100	100
Total Number of calls answered within 60 seconds		92	96	100	97	99	82	84
Percentage calls answered within 60 seconds	≥ 90%	92.00%	96.00%	100.00%	97.00%	99.00%	82.00%	84.00%

## 9. Termination / closure of service

### Audit results for termination / closure of service

Termination	Benchmark	Airtel	Vodafone	Idea	Tata	BSNL	Reliance	Aircel
Total number of closure request		629	565	483	0	18222	228	887

Number of requests attended within 7 days		629	565	483	0	18222	228	887
Percentage cases in which termination done within 7 days	100%	100.00%	100.00%	100.00%	NA	100.00%	100.00%	100.00%

### Audit results for refund of deposits

Refund	Benchmark	Airtel	Vodafone	Idea	Tata	BSNL	Reliance	Aircel
Total number of cases requiring refund of deposits		2	18	1	0	1145	112	273
Total number of cases where refund was made within 60 days		2	18	1	0	1145	112	273
Percentage cases in which refund was receive within 60 days	100%	100.00%	100.00%	100.00%	NA	100.00%	100.00%	100.00%

### 11. Additional Network Related parameters

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

Traffic in Erlang		Airtel	Vodafone	Idea	Tata	BSNL	Reliance	Aircel
Equipped capacity of the network		123970.747	19239.28	5029	29520	12000	NA	90875.462
Total traffic handled in erlang during TCBH		73944	11216.68	2493	9464.36	10740	NA	46385.41

#### Total number of customers as per VLR

		Airtel	Vodafone	Idea	Tata	BSNL	Reliance	Aircel
Total no. of customers served (as per VLR)		1610995	179937	69637	55192	163530	NA	1276732



## 21.0 Annexure – I (Broadband)

### 21.1 Parameter wise performance reports for Broadband services

#### 1. Service Provisioning

1.1 Audit Results for Service provisioning		
	Benchmark	BSNL
Total connections registered during the period		367
Number of connections provided within 15 days		367
Percentage of connections provided within 15 days	100%	100.00%
Number of connections provided after 15 days of registration of demand		0
Number of customers to whom credit is given for delayed connections		0
Percentage of customers to whom credit is given for delayed connections	100%	NA

1.2 Live calling for Service provisioning		
	Benchmark	BSNL
Total connections registered during the period		87
Number of connections provided within 15 days		65
Percentage of connections provided within 15 days	100%	74.71%

#### 2. Fault Incidence / Clearance Statistics

2.1 Audit Results for Fault repair		
Fault repair	Benchmark	BSNL
Total No. of faults registered during the month		1842
No. of faults repaired by next working day during the month		1747
Percentage of faults repaired by next working day during the month	> 90%	94.84%
No. of faults repaired within 3 days during the month		1842
Percentage of faults repaired within 3 days during the month	>99%	100.00%

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

2.2 Live calling for fault repair		
Fault repair	Benchmark	BSNL
Total Number of calls made		98
Number of cases where faults were repaired by next working day		25
Percentage cases where faults were repaired by next working day	> 90%	25.51%
Number of cases where faults were repaired within 3 days		66
Percentage cases where faults were repaired within 3 days	>99%	67.35%

### 3. Billing performance

3.1 Audit Results for Billing performance		
Billing Performance	Benchmark	BSNL
<b>Billing disputes</b>		
Total bills generated during the period		25574
Total number of bills disputed		20
Percentage bills disputed	< 2%	0.08%
<b>Resolution of billing complaints</b>		
Total number of complaints resolved in four weeks from date of receipt		20
Total complaints resolved in 4 weeks from date of receipt		20
Percentage complaints resolved within 4 weeks of date of receipt	100%	100.00%
<b>Period of refund</b>		
Total number of cases requiring refund		0
Total number of cases where credit/waiver was made within 60 days		0
Percentage cases in which credit/waiver was received within 60 days	100%	NA

3.2 Live calling results for resolution of billing complaints		
Resolution of billing complaints	Benchmark	BSNL
Total Number of calls made		14
Number of cases resolved in 4 weeks		12
Percentage cases resolved in 4 weeks	100%	85.71%

### 4. Response time to the customer for assistance

4.1 Audit results for customer care (Voice to Voice)		
Customer Care Assessment	Benchmark	BSNL
Total Number of calls received		7214
Total Number of calls answered within 60 seconds		5914
Percentage calls answered within 60 seconds	> 60%	81.98%

4.2 Live calling results for customer care (Voice to Voice)		
Customer Care Assessment	Benchmark	BSNL
Total Number of calls received		200
Total Number of calls answered within 60 seconds		183
Percentage calls answered within 60 seconds	> 60%	91.50%

4.3 Audit results for customer care (Voice to Voice)		
Customer Care Assessment	Benchmark	BSNL
Total Number of calls received		7214
Total Number of calls answered within 90 seconds		7140
Percentage calls answered within 90 seconds	> 80%	98.97%

4.4 Live calling results for customer care (Voice to Voice)		
Customer Care Assessment	Benchmark	BSNL
Total Number of calls received		200
Total Number of calls answered within 90 seconds		200
Percentage calls answered within 90 seconds	> 80%	100.00%

## 5. Bandwidth utilization

5.1 Audit results for Bandwidth Utilization		
Bandwidth utilization	Benchmark	BSNL
Intra-network links (POP to ISP Node)		
Total number of intra network links		297
No of Intra network found to be above 90%		4
International Bandwidth		
Total number of upstream links		345
Total International Bandwidth available from ISP Node to IGSP/NIXI/NAP (In mpbs)		53475
Total International Bandwidth utilised during peak hours		38611
Percentage Bandwidth utilization during peak hours (In mpbs)	<80%	72.20%
No of Intra network found to be above 90%		1

5.2 Live measurement results for Bandwidth Utilization		
Bandwidth utilization	Benchmark	BSNL
Intra-network links (POP to ISP Node)		
Total number of intra network links		297
No of Intra network found to be above 90%		5
International Bandwidth		
Total number of upstream links		377
Total International Bandwidth available from ISP Node to IGSP/NIXI/NAP (In mpbs)		58435
Total International Bandwidth utilised during peak hours		49152
Percentage Bandwidth utilization during peak hours (In mpbs)	<80%	84.11%
No of Intra network found to be above 90%		0

## 6. Broadband download speed

6.2 Live calling results for broadband download speed		
Broadband download speed	Benchmark	BSNL
Total committed download speed to the sample subscribers (In mpbs) (A)		2
Total average download speed observed during TCBH (In Mpbs) (B)		1.69

%age subscribed speed available to the subscriber during TCBH (B/A)*100	>80%	84.50%
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## 7. Service availability/uptime

### 7.1 Audit results for service availability

Service Availability	Benchmark	BSNL
Total Operational Hours		2880
Total Downtime		27
Total time when the service was available		2853
Service Availability Uptime in Percentage	>98%	99.06%

### 7.2 Live measurement results for service availability

Service Availability	Benchmark	BSNL
Total Operational Hours		943
Total Downtime		8
Total time when the service was available		935
Service Availability Uptime in Percentage	>98%	99.15%

## 8. Network latency / Packet loss

### 8.1 Audit results for Latency and packet loss

Network Latency and Packet Loss	Benchmark	BSNL
Packet Loss (Percentage)	< 1%	0.00%
Network Latency		
From user reference point at POP/ISP Node to IGSP/ NIXI (msec)	<120msec	15
From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec)	<350msec	219

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

Network Latency and Packet Loss	Benchmark	BSNL
Packet Loss (Percentage)	< 1%	0.05%
Network Latency		
From user reference point at POP/ISP Node to IGSP/ NIXI (msec)	<120msec	73
From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec)	<350msec	279

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

### **22.1 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:-</p> <p>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>

## 22.2 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 up gradation.</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><b>IMRB</b> 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><b>IMRB</b> 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	
<b>Computational Methodology as per QoS definition</b>	<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>
<b>Benchmark</b>	<p><b>SDCCH Congestion: <math>\leq 1\%</math></b>  <b>TCH Congestion: <math>\leq 2\%</math></b>  <b>POI Congestion: <math>\leq 0.5\%</math></b></p>
<b>Audit Procedure</b>	<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	
<b>Computational Methodology as per QoS definition</b>	<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>                      Total Calls Dropped / Total Calls Established x 100</p>
<b>Benchmark</b>	<b><math>\leq 2\%</math></b>
<b>Audit Procedure</b>	<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>

<b>5. Connections with Good Voice Quality</b>	
<b>Computational Methodology as per QoS definition</b>	<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>
<b>Benchmark</b>	<b>≥ 95%</b>
<b>Audit Procedure</b>	<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>↪ <i>All the operators were not maintaining this data at the switch level</i></li> </ul>

6. Service Coverage	
<p><b>Computational Methodology as per QoS definition</b></p>	<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>
<p><b>Benchmark</b></p>	<p><b>Indoor &gt;= -75 dBm</b>  <b>In-vehicle &gt;= -85 dBm</b>  <b>Outdoor – in city &gt;= -95 dBm</b></p>
<p><b>Audit Procedure</b></p>	<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:-             <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> </li> <li>↪ <i>Measurements using Engineering handsets were not acceptable</i></li> </ul>

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>• <math>\frac{\% \text{ age of calls getting connected}}{\text{Total number of calls getting connected}} \times 100</math></li> </ul> <p style="text-align: center;">-----</p> <p style="text-align: center;">Total number of calls made</p> <ul style="list-style-type: none"> <li>• <math>\frac{\% \text{ age of calls answered within 60 sec (voice to voice)}}{\text{Total number of calls answered within 60 seconds}} \times 100</math></li> </ul> <p style="text-align: center;">-----</p> <p style="text-align: center;">Total number of calls made</p>
<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	
<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>• 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>
<b>Benchmark</b>	< 0.1% billing complaints per 100 bills
<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 bills generated</li> <li>- Number of billing complaints received</li> <li>- %age complaints per 100 bills</li> </ul>

8.2 Resolution of billing complaints	
<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 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>
<b>Benchmark</b>	100% cases to be resolved within 4 weeks
<b>Audit Procedure</b>	<p><b>IMRB Auditors collected and verified data pertaining to</b></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>

<b>8.3 Period of refunds / payments due to customers</b>	
<b>Computational Methodology as per QoS definition</b>	<b>Period of all refunds = Maximum value of 'Time taken to refund'</b> where:-Time taken to refund = Date of refund – date of complaint resolution
<b>Benchmark</b>	100% cases in less than 1 week
<b>Audit Procedure</b>	<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> of all billing complaints resolved in favour of customer and resulting in requirement of a refund by the operator</b></li> <li>• <b><u>Dates of refund</u> pertaining to all billing complaints received during the relevant quarter</b></li> </ul> <p><b>Also random live checks of all subscribers entitled for refund were conducted</b></p>

## 22.3 For Broadband services

1. Service provisioning/Activation time	
<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>

2. Fault repair/Restoration time	
<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 =</b> (Total no of faults repaired in X working days /Total number of faults reported during the period)*100</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>

### 3. 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>• 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>
<p><b>Benchmark</b></p>	<p>&lt; 2% billing complaints per 100 bills</p>
<p><b>Audit Procedure</b></p>	<p><b>IMRB</b> 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>

<p><b>3.1. Resolution of billing complaints</b></p>	
<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 period 2008 ) 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><b>IMRB Auditors collected and verified data pertaining to</b></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><b>-Overall 100 number of live calls</b> is 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>

<p><b>3.2 Time taken to refund after closure</b></p>	
<p><b>Computational Methodology as per QoS definition</b></p>	<p>Time taken to refund = Date of refund – Date of closure</p> <p>Date of closure is considered to be the date on which the connection is discontinued in the service provider database of active customers</p>
<p><b>Benchmark</b></p>	<p>100% cases in less than 60 days</p>



<b>Audit Procedure</b>	<p><b>IMRB Auditors collected and verified data pertaining to</b></p> <ul style="list-style-type: none"> <li>-Number of cases requiring refund of deposits</li> <li>-Number of cases where refund was made within 60 days</li> <li>-%age cases where refund was made within 60 days</li> </ul>
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<b>4. Response time to customer for assistance</b>	
<b>Computational Methodology as per QoS definition</b>	<p><b>%age of calls answered by operator (voice to voice) within n seconds</b> = (Number of calls where <u>time taken for operator to respond</u>* &gt;= n sec / Total number of calls where an attempt to route to the operator was made) x 100</p> <p><u>Time taken for operator to respond</u> = Time when an operator responds to a call – Time when the relevant code to reach the operator is dialled</p>
<b>Benchmark</b>	<p>Calls answered within 60 seconds &gt; 60 %</p> <p>Calls answered within &gt; 80%</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>-Number of calls received by the operator</li> <li>-Number and %age calls answered within <b>60 seconds</b></li> <li>-Number and percentage calls answered within <b>90 seconds</b></li> </ul> <p><b>Live calling : -</b></p> <p>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</p>

<b>5. Bandwidth Utilization</b>	
<b>Computational Methodology as per QoS definition</b>	<p>Percentage Bandwidth available on the link = Total Bandwidth* utilised in TCBH for the period/ Total Bandwidth Available during the period*100</p> <p>Multi Router Traffic Grapher (MRTG) is to be used to measure the details of Bandwidth utilisation by service providers</p>
<b>Benchmark</b>	<p>-- &lt; 80% link(s)/route bandwidth utilization during peak hours (TCBH).</p> <p>-- 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.</p>
<b>Audit Procedure</b>	<p><b>IMRB Auditors collected and verified call centre records pertaining to</b></p> <p><b>( I )POP to ISP gateway Node [Intra – network] Links</b></p> <ul style="list-style-type: none"> <li>-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</li> <li>- Total Bandwidth available and Total bandwidth utilised during at the sample links TCBH for the complete month of audit</li> <li>- Total number of intra network links having &gt;90% bandwidth utilisation during the month of Audit</li> </ul> <p><b>(ii) ISP Gateway Node to IGSP / NIXI Node upstream Link's) for international connectivity</b></p> <ul style="list-style-type: none"> <li>-Total number of upstream links for International connectivity</li> <li>-Total number of links having Bandwidth &gt; 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</li> <li>-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)</li> </ul>

<b>Broadband download speed</b>	
<b>Computational Methodology as per QoS definition</b>	<p>This refers to the ratio of size of the file to be downloaded and total time required for error free transmission of the file</p>
<b>Benchmark</b>	<p>Subscribed broadband connection speed to be met &gt;80% from ISP Node to user</p>

<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>
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<b>Service availability/Uptime</b>	
<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 = <b>(Total operational hours – Total Downtime hrs)*100 / Total operational hours</b></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>	<ul style="list-style-type: none"> <li>- 90% for quarter ending June 2007</li> <li>- 98% with effect from quarter ending September 2007 and onwards</li> </ul>
<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(July to September 2007) was verified</p>

<b>Packet loss</b>	
<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. It is the measurement of packet lost from the broadband customer (User) configuration/User reference point at POP/ISP Node to IGSP/NIXI Gateway and to the nearest NAP port abroad</p> <p>The packet loss is measured by computing the percent packet loss of <b>1000 pings of 64 byte packet each.</b></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 - (Total number of ping packets lost during the period/Total number of ping packets transmitted)* 100</b></p>
<b>Benchmark</b>	<1 %

<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 during the period of July to September 2007</li> <li>- Smoked ping test (wherever available) results for the period of July to September 2007</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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<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 during the period of July to September 2007</li> <li>- Smoked ping test (wherever available) results for the period of July to September 2007</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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