

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

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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 quarterly periods. IMRB International Auditors carried out Audits across Chennai, Delhi and Kolkata circles in the period of January – May 2008. **This report details the performance of various service providers in Chennai circle against Quality of Services benchmarks for various parameters laid down by TRAI in respective regulations for Basic (Wireline), Cellular (Mobile) 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 1st July, 2005. The parameters for Broadband Service have been specified in the TRAI notification for Quality of Services of Broadband Service Regulation, 2006 dated 6th Oct. 2006.

IMRB has been engaged by TRAI for a period of 12 months starting January 2008 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

The present report highlights the findings for the Audit module for Chennai circle that was covered in the Quarter 1 (Jan – March 2008). 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 of February 2008 – May 2008.



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



***This report highlights the Audit Module findings for Chennai circle for Basic (Wireline), Cellular Mobile services, and Broadband services***

## **2.0 Objectives and Methodology**

The primary objective of the Audit module is to Audit and Assess the Quality of Services being rendered by Basic (Wireline), Cellular Mobile (Wireless), and Broadband service against the parameters notified by TRAI. (The parameters of Quality of Services (QoS) have been specified by in the respective regulations published by TRAI). Following are the key activities undertaken by Auditors during the Audit process conducted at the operator's premises



***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. **Drive tests:** Operator assisted and Independent drive test were conducted in the city as per the norms stated in the tender.
5. **Live calling:** Live testing was done on a sample basis to check efficiency of the customer care, inter operator call assessment, Back check calls for service provisioning and fault repair

- Any changes or discrepancies found in the methodology were reported to the service providers and changes were suggested by IMRB Auditors.
- Separate formats were designed each for Basic (Wireline), Cellular mobile (Wireless) and Broadband services to collect the information on various parameters (Please refer to Annexure)

### **3.0 Sampling methodology**

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

- For BSNL and MTNL the sample of exchanges was selected was spread across 10% of SDCA's in the entire service. Overall 16 (12 Urban and 4 Rural) exchanges were audited.
- For rest of the service providers (TATA, Reliance and Bharti Bharti) data was collected pertaining to all the exchanges present in the circle/service area

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

Data pertaining to 100% of the Gateway MSC's (GMSC's) and Mobile Switching Centres (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 Chennai circle

- Bharti Airtel Ltd. – 7 MSCs
- Aircel – 2 MSCs
- Tata teleservices ltd – 2 MSCs
- Reliance communications – 5 MSCs
- BSNL – 4 MSCs
- Vodafone Essar Ltd. – 1 MSC

#### **3.3 Sampling for Broadband service providers**

- Audits for various Broadband service providers were conducted at the service provider's central node in the Chennai circle. Since most of the private operators have a centralized system of monitoring their network data was obtained for all the Point of Presence (POPs) present in the circle.
- For BSNL, Audit was conducted at the central node in Chennai and data submitted by various exchanges/POPs providing Broadband service was verified and collected. This was done in such a way that atleast 5% of POPs spread across 10% of SDCA's were covered
- Following Broadband service providers were Audited in Chennai circle: - Bharti Audit Ltd., Hathaway, Sify, Reliance, BSNL and VSNL (TATA communications Ltd.)

## **4 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 electronically 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 July to September 2007 was carried out for all the 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}

## 4.2 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>	Accumulated down time of community isolation	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>	Service Access Delay	Yes	Yes	Yes				
<b>A (iv)</b>	Blocked Call Rate	Yes	Yes	Yes	Yes		Yes	Yes
<b>A (v)</b>	Call Drop rate	Yes	Yes	Yes	Yes		Yes	Yes
<b>A (vi)</b>	% Connections with good voice quality	Yes	Yes	Yes			Yes	Yes
<b>A (vii)</b>	Service Coverage	Yes	Yes	Yes			Yes	Yes
<b>A (viii)</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	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 Broadband services is explained in Annexure II}



### 4.3 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)				
-	<i>Within 60 seconds &gt; 60%</i>	YES	YES	YES	YES
-	<i>Within 90 seconds &gt; 90%</i>	YES	YES	YES	YES
(V)	Bandwidth Utilization/ Throughput:				
▪	<i>A)Bandwidth Utilization</i>				
-	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	
▪	<i>B) Broadband Connection Speed (Download)</i>	YES	YES	YES	YES
(vi)	Service availability / Uptime	YES	YES	YES	
(vii)	Packet Loss	YES	YES	YES	
(viii)	Network Latency for wired broadband access)				
-	<i>User reference point at POP / ISP Gateway Node to International Gateway (IGSP/NIXI)</i>	YES	YES	YES	
-	<i>User reference point at ISP Gateway Node to International nearest NAP port abroad ( Satellite)</i>	YES	YES	YES	
-	<i>User reference point at ISP Gateway Node to International nearest NAP port abroad ( Satellite)</i>	YES	YES	YES	

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

## 4.4 Audit Limitations

Despite having a wide scope of work, we have found following problems that may impair the comparison across operators. As mentioned earlier we have suggested changes to operators, which will allow comparison in future. TRAI has already suggested a book keeping methodology and practical ways to the operators (within the spirit of QoS definition), also there has been previous rounds of Audit being conducted by different independent audit agencies (including IMRB) which had enabled comparison of the findings but still some variations were observed in methodologies and understanding of parameters among service providers (especially for Broadband services where Audit was carried out for the first time). Hence, the data reported in here has to be used carefully in the light of variation in testing.

1. **Complete data not being maintained:** In certain cases lack of availability of the data with the service providers rendered verification of raw data unfeasible and verification was done to the extent possible. This was especially observed for network related parameters for Broadband services where service providers could not produce old raw data files for ping tests, download speed etc
2. **Difference in measurement methodology:** For some cases, calculation methodology for some of the parameters was found to be different across various service providers.
3. **Technical unfeasibility:** There were cases observed where service providers expressed technical unfeasibility to provide the data required as according them their current system does not support the data being maintained/ recorded in the desired form. For e.g. Service providers were unable to provide data on service access delay and signal coverage from OMC for cellular mobile services. Hence, data was collected from the results of recent drive tests being conducted by various service providers
4. **Decentralized system for book keeping:** In certain cases, book keeping of records was found to be decentralized. This was largely observed for call centre performance for BSNL, where required data was not available with the exchanges and hence data could not be collected for the same.
5. **Difference in level of reporting to TRAI:** Some of the large Broadband service providers were observed to be reporting their performance on various parameters to TRAI at an all India level. They claimed that since they are providing gateway service to other small service providers entire, they are "Category A service providers and consider entire India as one circle. Data for some of the parameters was provided by these operators on All India basis.

## 5 Executive Summary

The objective assessment of Quality of Services(QoS) was carried out by IMRB International for all the Basic(Wireline), Cellular mobile and Broadband service providers during the period starting from February 2008 to May 2008 in Chennai circle. The executive summary encapsulates the key findings of the Audit by providing: -

- “Service provider performance report” for Basic (Wireline), Cellular mobile and Broadband 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), Cellular mobile and Broadband services: 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

S.no	Parameters	B'mark	Bharti	BSNL*	RCOM	TATA teleservices*
1	Provision of telephone after registration of demand					
1.1	Connections provided within 7 days	100%	99%	77%	100%	100%
2	Fault incidence (Number of faults/100 subscribers/month)	<3	2	4.14	<3	<3
3	Fault repair					
3.1	Faults repaired within 24 hours	>90%	94%	77%	92%	100%
3.2	Fault repaired in three working days	100%	100%	95%	100%	100%
4	Mean time to repair faults (MTTR) In hours	< 8 hrs	11	18	4.19	4.9
5	Call Completion Rate (CCR)	>55%	67%	84%	DNA	88%
6	Metering and billing credibility					
6.1	Billing complaints per 100 bills issued	<0.1%	0.25%	0.16%	0.02%	0.00%
6.2	%age of billing complaints resolved within 4 weeks	100%	100%	99%	100%	NA
7	Customer care/helpline promptness					
7.1	<u>Shift requests attended</u>					
	Shift requests attended within 3 days	95%	73%	42%	96%	100%
7.2	<u>Closure request attended</u>					
	Closure within 24 hours	95%	55%	76%	100%	100%
7.3	<u>Supplementary (additional) service requests attended</u>					
	Additional facility provided within 24 hours	95%	99%	82%	100%	100%
8	Response time to customer					
8.1	% age call answered through IVR in 20 seconds	80%		DNA	100%	100%
	% age call answered through IVR in 40 seconds	95%		DNA	100%	100%
8.2	% age calls answered by operator in 60 seconds	80%	94%	DNA	95%	77%
	% age calls answered by operator in 90 seconds	95%	97%	DNA	98%	81%
9	Time taken for refund of deposits after closure					
9.1	%age cases where refund received within 60 days	100%	91%	11%	NA	NA

(\*Note: For BSNL data pertains to the sample 5% of exchanges audited during the period of February to May 2008, whereas for rest of the operators figures pertain to all the exchanges present in the circle, TATA teleservices has limited presence and offers Basic (Wireline) services primarily to corporate clients in Chennai 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: Basic (Wireline) services**

The Basic (Wireline) services audit for Chennai circle broadly indicates that almost all the service providers are not meeting some of the benchmarks, as mandated by TRAI (Telecom Regulatory Authority of India).

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 all the operators who are reporting the same to TRAI were meeting the benchmark.

It should also be noted that Tata teleservices has limited presence in Chennai circle for Basic (Wireline services) and caters primarily to corporate customers.

Also, results of verification of the records for the period of July to September show that there was slight variation in the figures reported in the PMR and those found in actual records for BSNL. The reason can largely be attributed to the fact that BSNL has a decentralized system for Book keeping, and data was verified only for sample 5% of exchanges spread over 10% of Short Distance Charging Area (SDCA's) in Chennai circle.

To test the efficiency of level 1 services (Trunk booking, Child helpline, Women helpline, Airline booking) offered by various service providers. Atleast 250 calls were made to different numbers provided by service providers and time taken to answer the call was noticed. Bharti emerged out to be the most efficient with 99.6% of the total calls that were made being answered in 60 seconds followed by Reliance with 96% calls answered in 60 seconds. BSNL and TATA's score on the same was observed to be 82% and 60% respectively.

The parameter wise key takeouts for the wireline service providers for the Chennai circle are as under:-

#### *Provision of telephone after registration of demand*

- Tata, R Com were found to be meeting the TRAI benchmark of 100% for provisioning of telephone within 7 working days.
- Variation was found in the live calling and audit data findings for all the service providers. The difference was relatively less for BSNL (70% for live calling against 77% for audit data). As mentioned earlier the reason for same can be attributed to low sample sizes for live calling.
- BSNL has scored low on Service provisioning/activation time, one of the reasons for the same was observed to be the fact that the service provider provides connection at all the locations and SDCA's in the circle whereas private service providers normally provide connections in areas which are technically feasible for the operator, especially for retail customers.

#### *Fault incidence / clearance statistics*

- As per the 1-month audit data findings, Tata, Bharti and R Com scores were 100%, 94%, and 92% respectively for the 'Faults repaired within 24 hours'.
- As per the 1-month audit data findings, BSNL was found to be not meeting 90% benchmark score for fault repair within 24 hours. The service provider's score for sample 5% of exchanges was found to be 77% on the parameter.

- The live calling scores for the fault repair within 24 hours for Bharti, BSNL, RCOM and TATA were found to be 57%, 21%, 20% and 67% respectively. As mentioned earlier a part of it could be attributed to low sample (10% of total faults registered in month prior to Audit).
- For BSNL, It was observed that data on fault repair and maintenance registers are not being maintained properly or maintained in conventional ways at some of the exchanges in Chennai circle.
- Interestingly, it was observed that for BSNL rebate activities are being taken care by some of the main exchanges.
- While verification of records of service providers it was found that all the service providers are providing rebates as per TRAI norms. However, it was observed during exchange Audit for BSNL that rent rebates are being provided to the customers only when it is claimed by the customer.

#### Traffic statistics (CCR)

- Most of the service providers were found to be meeting TRAI benchmark for Call Completion Rate during the three days live measurement and for one month in which data was obtained.
- For all the service providers, the difference between live measurement data and audit data for this parameter was found to be less as compared to other parameters for live calling results.
- During Audit process at Reliance, it was observed that service provider does not have the technical capability to measure Call Completion Rate (CCR) as per TRAI norms. The reason primarily is the difference between its network as compared to BSNL. The service provider measures and reports to TRAI Answer Seizure Ratio (ASR) which is claimed to be a better indicator of network congestion for the kind network owned by the operator.

#### Metering and billing credibility

- Among the service providers, Bharti with 0.25% billing complaint and BSNL with 0.16% billing complaint were not found to be meeting the benchmark of less than 0.1% billing complaints of the total number of bills issued.
- It should be noted that TATA teleservices claimed to have no billing complaints. The reason for the same was found to be low subscriber base for the service provider with prime focus on corporate customers.
- However during verification of records of service providers namely Reliance and Bharti it was found that definition of billing complaints remains to be lenient as only those cases where an internal ticket is opened i.e. cases where refund is provided by the operator are being taken into consideration. Hence, there is a need felt to have some clarity on the definition of billing complaints.
- As per audit data findings for one month, all the operators were found to be complying (or close to complying) the sub-parameter 'age of billing complaints resolved within 4 weeks'.

#### Customer care/helpline promptness

- For "shift requests attended within 3 days" audit data, Tata Teleservices has scored 100% score, however it should be noted that **there was only one request for shifting telephone connection** during the month in which data was collected, whereas BSNL' score is 42%. For R Com and Bharti, the score on this sub-parameter is 96% and 73%.

- For closure requests within 24 hours TATA and R Com are meeting the benchmark with 100% closure requests attended in the stipulated time period. For BSNL and Bharti, the percentage score is low at 76% and 55% respectively.
- For supplementary service requests, R Com and Tata's audit data score is 100% whereas Bharti's and BSNL's audit score is 99% and 82% respectively.

Response time to customer for assistance

- For customer care number through electronic IVR menu parameter, live calling scores for Bharti, TATA and R Com were found to be 100% for call answering through IVR in 20 seconds.
- For BSNL, response time data was not available for most of the exchanges as service provider claimed that data is managed centrally at Bangalore.
- During verification of records for Bharti, it was observed that the service provider does not have a mechanism of recording number of calls which are answered by IVR; only the calls answered by the operator are recorded. The service provider does not report the figure in the PMR submitted to TRAI.
- Also, live calling results reveal that most of the operators are meeting TRAI benchmark for call centre effectiveness. BSNL scored the lowest with 72% calls answered by the operator in 60 seconds and 92% calls answered by the operator in 90 seconds.

Time taken for refund of deposits after closure

- The audit data score on 'time taken for refund of deposit after closure' parameter for BSNL was 11% whereas for Bharti, it was 91% (quite close to the benchmark level of 100%). The auditor's comments for BSNL on this parameter are "Most of the closed customers don't ask for refund of deposit since in some cases outstanding will be more and in some cases they would have left the station." In some places the representatives said that refund is handled by the accounts department which operates from some other exchange.

**Summary of Live Measurement Results – Basic Wireline Services**

Parameters	Benchmark	Bharti	BSNL	R Com	Tata
Call Completion Rate	> 55%	67%	84%	DNA	88%

For basic wireline services there was only one parameter (Call Completion Rate – Benchmark > 55%) for which live measurement was applicable. All the operators met the TRAI benchmark with TATA leading the way with a call completion rate of 88% which was observed during the day live measurement. BSNL also was not far behind with a CCR of 84% while Bharti was the lowest amongst all the operators with a CCR of 67%. However, it comfortably met the TRAI benchmark. As explained above, RCOM does not have the technical capability to measure CCR.

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

Parameters	Benchmark	Bharti	BSNL	Vodafone	TATA Teleservices	Aircel	RCOM
Accumulated downtime for community isolation	< 24 hrs.	0.00	0.00	0.00	0.98	0.00	0.00
Call Set Up Success Rate (CSSR)	> 95%	98.44%	98.12%	98.43%	99.92%	95.25%	99.15%
Service Access Delay*	9 to 20 seconds (< = 15 seconds for 100 calls)	12.13	7.64	8.68	12.84	10.85	1.37
<b>Blocked Call Rate</b>							
<i>SDCCH/Paging Channel Congestion</i>	<1%	0.24%	0.21%	0.22%	0.00%	0.09%	1.63%
<i>TCH Congestion</i>	< 2%	0.17%	1.54%	0.47%	0.01%	1.48%	0.43%
Call drop rate	< 3%	0.13%	0.94%	0.82%	0.35%	0.50%	0.53%
Percentage connections with good voice quality*	> 95%	84%	95%	97%	99%	90%	99%
<b>Service coverage*</b>							
<i>In door</i>	>-75dbm	Complied	Complied	Complied	Complied	Complied	Complied
<i>In vehicle</i>	>-85dbm						
<i>Out door - in city</i>	>-95dbm						
POI congestion	< 0.5%	0%	0%	0%	0%	0%	0%
<b>Calls answered electronically</b>							
Percentage calls answered within 20 seconds	80%	99%	99%	100%	100%	100%	90%
Percentage calls answered within 40 seconds	95%	99%	100%	100%	100%	100%	99%
<b>Calls Answered by the operator</b>							
Percentage calls answered within 60 seconds	80%	98%	91%	93%	77%	100%	71%
Percentage calls answered within 90 seconds	95%	98%	99%	95%	81%	100%	77%
<b>Billing Complaints</b>							
Billing complaints per 100 bills issued	<0.1%	0.00%	0.22%	0.11%	0.04%	0.09%	0.09%
Percentage billing complaints resolved within 4 weeks	100%	100%	100%	100%	100%	100%	100%
Period of refunds/payments due to customers from the date of resolution of complaints	<4 weeks	100%	100%	100%	100%	100%	100%

\*Details pertaining to these are obtained through operator assisted drive tests. Results of the drive tests are explained in greater 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 Chennai circle apart from Reliance Communication whose audit was conducted at their central NOC at Mumbai. For almost all network parameters, all the service providers meet the TRAI specified benchmark. Most of the service providers claimed that they were submitting the PMR basis their inference of the QoS parameters. However, we need to take a larger view of the picture and ignore some differences in measurement methodologies. We believe that book keeping is bound to get better as more such Audits will be carried out in subsequent quarters as mandated by TRAI.

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	2000 – 2100	2000 – 2100
BSNL	1900 – 2000	1900 – 2000
RCOM	1100 – 1200	1100 – 1200
Aircel	2000 – 2100	2000 – 2100
TATA	1900 – 2000	1900 – 2000
Vodafone	1900 – 2000	1900 – 2000

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

#### Accumulated Downtime:

In the Chennai circle, although there were outages in various BTS across all the service providers, none of them actually led to a community being isolated at a particular point in time except for TATA where there was a fiber cut which resulted in an outage of 59 minutes. There were several other contiguous BTS of all service providers which maintained the service availability.

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

All the operators are comfortably meeting the benchmark on this parameter. During the audits the maximum CSSR was observed for TATA with 99.92% of their calls getting completed. Aircel relatively had 95.25% CSSR which was the lowest among all services providers but still it met the benchmark. 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.



Service Access Delay:

This parameter is reported to TRAI basis the period drive tests that are conducted by the service providers during that quarter. It is measured using a drive test tool kit and a protocol analyzer. All the operators in the Chennai comfortably meet the TRAI specified benchmark. Also, all the operators follow the TRAI specified mechanism for measuring the parameter. During the drive test, none of the operators were found to be using engineering hand sets. The highest service access delay was observed for TATA with 12.84 seconds which comfortably met the TRAI benchmark of < = 15 seconds for a sample of 100 calls.

Network Congestion parameters:

SDCCH / Paging Channel Congestion, TCH and POI are part of the network congestion parameters. All the operators except RCOM are meeting the TRAI specified on the congestion parameters. RCOM does not meet the TRAI specified benchmark with a Paging Channel congestion of 1.63% which was found during the one month data collected for the month of audit. TATA leads the way in network congestion parameters with almost negligible paging and traffic channel congestion. The calculation methodology of these parameters was found to be in complete accordance with what has been specified by TRAI. There was almost 0 POI congestion on almost all individual POI links between a service provider vis-à-vis other service providers.

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 (unexpected seizure) to the total number of call attempts for all operators. Also, all of service providers were found to be meeting the TRAI specified benchmark. However, for Bharti and RCOM (although both of them met the TRAI benchmark) there was a significant difference in the figures for three day live measurement and monthly data collection. The lowest call drop rate was of Bharti with only 0.13% call drop and the relative highest (although it easily met the benchmark) was for BSNL with 0.94%.

% connections with good voice quality:

Almost all of the operators are measuring these parameters via their periodic drive tests. However, for Vodafone these parameters can be obtained at their switch also. During the audit it was found that all the service providers were measuring this parameter as per the TRAI guidelines. Drive test was conducted by IMRB with the help of service providers to measure this parameter. In the drive test it was found that Bharti with 84% and Aircel with 90% did not meet the TRAI benchmark. However, all the operators were able to meet the benchmark for the quarter for which the PMR verification was being conducted.

Service coverage:

This parameter is reported by the service provider basis the periodic drive tests in a particular circle. The service coverage for all the operators was found to be within the TRAI specified limits for 100% of the drive test route (for which the audit was conducted). This can be due to the fact that a metro circle is one of the major areas in which a licensed service provider wants to capture the maximum share.

Customer Care / Helpline Assessment

For the IVR aspect all the service providers meet the TRAI benchmark. However, in case of Reliance no breakup of IVR calls by circle is present. The figure reported is for all India level. In case of calls answered by operators, all the service providers except Reliance & TATA meet the benchmark for the month of audit. However, Reliance & BSNL did not meet the benchmark when the live calling was carried out.

Billing performance

Vodafone & BSNL were found not to be meeting the benchmark of < 0.1% complaints registered per 100 bills issued. Vodafone just misses the benchmark at 0.11%. However, all the operators except TATA, whose customers were contacted for live calling, fail to meet the TRAI benchmark of billing complaint resolution in 4 weeks. One reason could be the low number of postpaid subscribers of TATA as compared to other operators. In all cases where customers were due for refund, all the service providers meet the TRAI benchmark of 100% with 4 weeks.

Inter operator calls assessment

Inter operator call Assessment (From / To)	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Bharti		98%	99%	97%	98%	100%
BSNL	99%		100%	100%	95%	100%
Vodafone	100%	98%		97%	98%	100%
TATA	98%	93%	93%		96%	99%
Aircel	94%	100%	99%	93%		91%
RCOM	98%	95%	98%	99%	98%	

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. The calls from Bharti to RCOM were established 100% of the times. Similarly BSNL's connectivity with all the operators was found to be good except Aircel where it has score 95%. However, all 100 calls from Aircel got connected to BSNL. TATA had problems connecting to both BSNL & Vodafone with 93 calls out of 100 getting established. Also, Aircel's connectivity to Reliance was not good with only 91 out of 100 calls getting connected.

Results of Operator assisted Drive test

The drive test was conducted simultaneously for all the operators present in the Chennai circle. 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 of Chennai 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-vehile and > -95 dbm outdoor routes.

The drive test in the city of Chennai was conducted along the following route:

Area Type	Type of Location	Area
Outdoor	Periphery of the city	Koyembedu to Savitha Dental College
	Congested Area	Anna statue to Madhakailash
	Across the City	Guindy to Koyembedu
Indoor	Office Complex	Pangal Maligai
	Shopping Complex	Spencer Shopping Complex

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

Drive Test Results	Bharti		BSNL		Vodafone		TATA		Aircel		Reliance	
	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
Voice quality	91.22%	81.73%	96.07%	92.80%	98.57%	97.20%	99.23%	99.08%	92.83%	89.63%	100.00%	98.51%
Call set up Success Rate	100.00%	100.00%	100.00%	100.00%	100.00%	99.12%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Call drop rate	0.00%	1.36%	0.00%	0.00%	0.00%	0.00%	0.00%	0.82%	0.00%	0.00%	0.00%	0.00%
Hands off success rate	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.86%	99.07%	99.52%	100.00%	100.00%

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

**BSNL** – For BSNL there was none of areas which recorded inadequate coverage. However, interference was recorded in outdoor areas near **Savitha dental college, Mandevali bus depot, malar hospital road Pachappas College road, Triplicane high road, Adyar bridge, Kathipara (100 feet road), Chetpet, Koyambedu ,Madura voyil ,Arcot road**. In the indoor interference was recorded in **Spencer Plaza and Panagal Maligai**.

**Vodafone** - There was interference and low signal strength recorded in the outdoor areas of **Koyambedu, Mandaveli Bus Depot and Chetpat, Spencer Plaza** and in the indoor area of **Panagal Maligai**.

**Bharti** – There was interference and low signal strength recorded for Bharti in the outdoor areas near **Savetha Dental College, near Mandevali bus depot, Pachappas College, Triplicane high road, near Adyar malar hospital, PH road and Kodambakkam** and in the indoor areas of **Spencer Plaza and Panagal Maligai**.

**Aircel** – There was interference and low signal strength recorded for Aircel in the outdoor areas near **Savetha Dental College, near Mandevali bus depot, Pachappas College, Malar hospital, Triplicane high road, 100 feet road, Arcot road and Maduravoyil** and in the indoor areas of **Spencer Plaza and Panagal Maligai**.

**Reliance** - There was interference and low signal strength recorded for Reliance only in the outdoor areas near **Savetha Dental College, near Mandevali bus depot, Pachappas College 100 Feet road (Ekaduthangal), Triplicane high road and maduravoyil**. In the indoor areas there was neither interference nor low signal recorded.

**TATA** - There was interference and low signal strength recorded for TATA only in the outdoor areas near **Savetha Dental College, Triplicane high road, and PH road (from Koyembedu towards Maduravoyil)**.

#### Conclusions:

1. The area where inadequate signal strength was observed for all operators except Vodafone was near the Savetha Dental College
2. Also area the Mandevali bus depot had inadequate signal strength for all the operators except TATA
3. Except for Reliance & TATA , inadequate coverage was observed for all the operators in the indoor areas of Spencer plaza and Panagal Maligai
4. Percentage connections with good Voice quality for Bharti, BSNL(for outdoor areas) and Aircel were not meeting the benchmark during the drive test.
5. CSSR was 100% for all the operators except Vodafone in outdoor areas

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

Parameters	Benchmark	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
CSSR	> 95%	98.38%	98.12%	98.47%	99.95%	98.03%	98.13%
SDCCH / Paging Channel Congestion	< 1%	0.22%	0.08%	0.11%	0.00%	0.09%	0.00%
TCH Congestion	< 2%	0.10%	1.32%	0.15%	0.01%	1.10%	0.00%
POI congestion	< 0.5%	0%	0%	0%	0%	0%	0%
Call drop rate	< 3%	1.33%	1.02%	0.78%	0.30%	0.49%	1.87%

During the three day live measurement, all the operators were found to be meeting the TRAI benchmark for all the parameters that were to be measured during the three days. TATA led the way on CSSR with a call success rate of 99.95%. Also, CSSR for other operators was found to be more than 98% during the live measurement.

Also, all the operators met the TRAI benchmark on the network congestion parameters. During the live measurements the maximum SDCCH congestion was observed for Bharti at 0.22%. RCOM and TATA experienced no Paging Channel Congestion. BSNL and Aircel had the maximum traffic channel congestion with 1.32% and 1.10% respectively. Also, there was no POI congestion observed for all individual POI links for any of the operators.

Also, during the three days live measurement, all the operators met the benchmark on call drop rates. The maximum call drop rate was observed for RCOM with 1.87% calls getting dropped after establishment. It was followed by Bharti with 1.33% and BSNL with 1.02% call drop rate. The lowest call drop rate was observed for TATA with only 0.30% of total calls getting dropped after establishment.

### 5.3 Service provider performance report based on one month data collection – Broadband Services

S.no	Parameters	B'mark	Bharti	BSNL	Sify	Hathaway	VSNL	RCOM
1	<b>Service provisioning</b>							
1.1	Total connections registered during the period		7525	14282	272	1485	1861	413
1.2	Percentage connections provided within 15 days	100%	99%	100%	100%	93%	100%**	85%**
2	<b>Fault repair / Restoration time</b>							
2.1	Total number of faults registered		8080	15506	685	6449	19942	1188
2.2	Percentage faults repaired by next working days	> 90%	93%	91%	81%	83%	76%**	94%
2.3	Percentage faults repaired within three working days	99%	96%	100%	100%	95%	92%**	99%
3	<b>Billing performance</b>							
3.1	Total number of bills generated		584541	151426	Prepaid*	2069	21201	2019
3.2	Billing complaints per 100 bills issued	<2%	0.25%	0.02%	Prepaid*	3.43%	0.55%	0.10%
3.3	%age of billing complaints resolved within 4 weeks	100%	100%	100%	Prepaid*	100%	100%	100%
3.4	Time taken for refund of deposits after closure	100%	100%	100%	100%	82%	100%	100%
4	<b>Customer care/helpline assessment</b>							
4.2	Percentage calls answered within 60 seconds by the operator	> 60%	45%	98%	100%	80 - 90%	93%	94%
4.3	Percentage calls answered within 90 seconds by the operator	>80%	56.4%	100%	100%	100%	98%	96%
5	<b>Bandwidth utilization/Throughput time</b>							
5.1	Total number of intra network links/links tested (From POP to ISP Node)	<80% on every link	406	21	400	3	4	4
5.2	Total number if intra network links crossing 90%		0	0	5	3	0	0
	<i>Upstream Bandwidth</i>							
5.3	Total number of upstream links (From ISP Gateway Node to IGSP/NIXI Node for international connectivity)		1	36 + 1 (NIXI)	28	6	35	7
5.4	Total number of upstream links > 90%		0	1	0	1	0	0
5.5	Percentage bandwidth utilised on upstream links	<80%	81%	59%	64%	92%	74%	40%
6	Broadband download speed	>80%	Complied	Complied	Complied	Complied	Complied	Complied
7	<b>Service availability/uptime</b>	>98%	100.00%	100.00%	100.00%	98.92%	98.48%	99.24%**
8	<b>Packet loss</b>	<1%	0%	0%	0%	0%	0%	< 1%**
9	<b>Network Latency</b>							
9.1	POP/ISP Node to NIXI (In msec)	<120	<50	<120	<45	<120	<90	<30
9.2	ISP node to NAP port (In msec)	<350	<230	<350	<300	<350	<200	<290

{\*Note: -For Sify all the connections provided to retail broadband customers are prepaid, hence the service provider claims that there are no billing related complaints.}

\*\* 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 the Broadband audit process was being carried out for the first time by an independent audit agency. Most of the service providers claimed that they were submitting the PMR basis their inference of the QoS parameters. However, we need to take a larger view of the picture and ignore some differences in measurement methodologies. We believe that book keeping is bound to get better as more such Audits will be carried out in subsequent quarters as mandated by TRAI.

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

### Service provisioning/Activation time

- All the service providers are performing reasonably well on time taken to activate a new connection. Bharti, Hathaway and Reliance do not meet the benchmark with scores of 99%, 93% and 85%.
- However, all the service providers are falling below the benchmark for the results of Live calling process undertaken by IMRB interviewers. Bharti is the lowest scorer with only 82% of subscribers claiming that they were provided connections within 15 days.
- As far as the book keeping methodology is concerned it was observed that Reliance is including the cases where it is technically not feasible to provide the connections to the subscriber within 15 days while reporting to TRAI. This is one of the reasons for service provider's low performance on the parameter. Ideally such cases should be excluded as per TRAI guidelines.
- Also, VSNL considers all types of connections as Broadband which includes connections subscribed with download speed of less than 256Kpbs, which is not in line with the QoS regulation for Broadband.

### Fault Repair/Restoration time

- Sify, Hathaway and TATA communications (VSNL) are falling below the benchmark for fault repair within next working day. There is a scope for improvement as far as the current benchmark is concerned. 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.
- None of the service providers were found to be meeting the benchmark for Fault repair/Restoration for Live calling results. Scores are as low as only 13% (for VSNL) subscribers claiming that their fault was repaired within next working day. Some part of variation can also be attributed to low sample size (10% of total faults reported in the month prior to visit of Audit)
- As far as book keeping methodology is concerned, TATA Communications (VSNL) was found to be considering even billing complaints as fault complaints while reporting to TRAI. This may be one of the reasons for service provider's ordinary performance for the parameter.
- All the service providers were found to be providing Rebate as per the norms stipulated by TRAI except TATA communications, where rebate was being provided for the number of days for which the connection was inactive and not as per TRAI guidelines for the same.

### Billing performance

- All the service providers (except Hathaway) were found to be meeting the benchmark of 4 weeks for resolution of billing complaints for the month in which data was collected. Sify however claims that all its retail broadband customers are prepaid and hence there are no billing complaints for Sify.
- It should also be noted that the definition of billing complaints/Disputes can be considered as lenient as service providers namely Bharti and Reliance include only those complaints where an internal ticket is opened and refund is made to the customer. Hence there is a need felt to have some clarity on the definition of billing complaints.
- Also, it was discovered during verification of commercial records at Bharti that service provider cannot segregate the complaints and billing data for Broadband and Wireline subscribers.

### Customer Care/Helpline Assessment

- All the service providers, except Bharti meet the benchmark (Both for live calling as well as One month data collection results) for percentage calls answered within 60 and 90 seconds by the operator (Voice to Voice). Bharti scores low for one month data collection results with only 45% calls answered by the operator within 60 seconds.

### Bandwidth Utilisation:

- All the service providers were found to be using Multiple Router Traffic Grapher (MRTG) to measure the bandwidth utilisation at intra network links. However, it was noticed that most of the service providers are reporting Average bandwidth utilised during the period to TRAI instead Bandwidth utilised during Time Consistent Busy Hour (TCBH) as service providers claim that their peak hours generally range from 11.00AM in the morning to 4.00 PM in the evening owing to high corporate usage during the period. Also, it was observed that there are multiple links and busy hour may vary for each link.
- All the service providers were found to be reporting combined bandwidth utilisation for corporate and household customers as there is no mechanism available to provide it separately for different users.
- Chennai being a metro city, it was observed that all the links (tested during three day live measurement) in the Access segment for most of the service providers were found to be below 80%. Infact for large service providers having Metro E network, bandwidth utilisation during peak hours was found to be less than 50% during peak hours.
- Hathaway was the only exception where all the 3 intra network links from POP to ISP Node were found to be > 90%, but the service provider claimed that the Bandwidth can be increased, whenever required.
- For Bandwidth utilisation on upstream links, most the service providers are meeting the benchmark and have excess capacities available on their upstream links. Hathaway, which had greater than 90% utilisation is currently buying upstream bandwidth from VSNL and Reliance and claims that it can be increased whenever required.
- Service providers distributing services through cable operators (Sify and Hathaway) claim that it is not possible to measure the Bandwidth available from Cable operator to their base stations as wireless technology is being used for the same. Hence, it is believed that last mile experience may suffer as operators have relatively less control over the operations of cable operator.



### Download speed

- All the service providers in the circle have made available the tool for measuring download speed on the respective websites. Also, during live measurements carried out at Pop's/ISP Node it was observed that all the operators are meeting the TRAI prescribed benchmark of greater than 80% speed available to the customer.
- However, no historic data was available for verification of records for month of Audit as well as quarter ending July to September 2007 with all the service providers claimed that they are reporting to TRAI basis live tests conducted at customer premises during field visits and tests conducted at POPs/ISP Node.
- Hence, IMRB Auditors also carried out live calling to understand the download speed available to the customer, Hathaway was the only operator found to be not meeting the TRAI benchmark (For sample 50 calls made to subscribers across different locations in Chennai).

### Service Availability/Uptime:

- All the service providers are meeting the benchmark on service availability/uptime.
- However, it was observed that type of sites being taken into consideration for calculating network uptime varies from operator to operator.
  - For e.g. TATA communications (VSNL) and Bharti consider all the sites in the access network (including DSLAM, Building Nodes etc) for calculating network uptime whereas BSNL does not consider downtime for DSLAM's while reporting to TRAI. Again for service providers distributing through cable operators (Sify, Hathaway), it was observed that downtime for equipment at the cable operator's premises is not being taken into consideration for calculating service availability.
  - The same is in line with the guideline provided by TRAI as service availability aims at measuring time for which Broadband access network (Including ISP Node) was not in a state of failure for all users.
  - However, it should be noted that parameter ignores cases in which Broadband access network may be in state of failure for some/part users. Hence it is recommended that TRAI can take into consideration including "Customer uptime" as a parameter for measuring Quality of Services (QoS) for various service providers.
- Also, it was observed that Reliance is calculating total downtime hour's basis Mean Time to Repair (MTTR) for various faults reported by customers, which is not in line with QoS methodology. Ideally, MTTR for repairing various sites or equipments which went down during the period should be considered.

### Packet Loss and Network Latency

- It was observed that although all the service providers are measuring packet loss and latency by conducting random ping tests for their internal performance measurement, but there are no records being maintained or book keeping methodology was non existent for all the operators except BSNL. However it should be noted that the network related data for BSNL for verification was obtained from their central node in Bangalore.
- Also, while conducting ping tests it was observed that service providers (except BSNL) were found to be unaware of the standard prescribed by TRAI i.e. one ping test constitute of 1000 pings of 64 byte packet each to be carried out daily during Time consistent Busy Hour(TCBH).

- Due to non availability of the records of old ping tests, verification process could not be conducted for the private operators. Only latency graphs (smoke ping tool) could be verified for some of the operators. Smoke ping tool was found to be configured for sending 5 pings of 56 bytes each every 300 seconds.
- However, ping tests conducted/smoke ping results during live measurements revealed (from three user reference points) that all the service providers are meeting the benchmark prescribed by TRAI.
- Also, it was observed that Reliance is calculating packet loss basis number of faults reported by customers which was not in line with methodology prescribed by TRAI.

### Summary of Live Measurement Results – Broadband Services

Parameters	Benchmark	Bharti	BSNL	Sify	Hathway	VSNL	RCOM
Service Availability Uptime	>98%	100.00%	100.00%	100.00%	99.40%	99.12%	No live measurements possible
No of Intra network links found to be above 90%		0	0	0	3	0	0
Total Bandwidth utilization at all upstream links	< 80%	77%	70%	64%	90%	74%	43%
Data Download Speed	> 80%	Complied	Complied	Complied	Complied	Complied	Complied
Packet Loss (Percentage)	< 1%	0.00%	0.33%	< 1.00%	0.00%	0.00%	0.00%
<b>Network Latency</b>							
From user reference point at POP/ISP Node to IGSP NIXI (msec)	<120msec	15	132	28	98	<90	30
From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec)	<350msec	220	350	270	120	<200	288

All the service providers are meeting the benchmark on service availability/uptime for three day live measurement. As explained in the executive summary, it was observed that type of sites being taken into consideration for calculating network uptime varies from operator to operator. RCOM is calculating total downtime hour's basis Mean Time to Repair (MTTR) for various faults reported by customers, which is not in line with QoS methodology. The auditors have suggested RCOM to bring its methodology in tune with the one which is specified in the TRAI gazette.

There were no intra network links that were found to have a utilization of more than 90% for almost all of the operators. Hathway was the only exception where all the 3 intra network links from POP to ISP Node were found to be > 90%, but the service provider claimed that the Bandwidth can be increased, whenever required.

For Bandwidth utilisation on upstream links, most the service providers are meeting the benchmark during the three day live measurement and have excess capacities available on their upstream links. Hathway, which had greater than 90% utilisation is currently buying upstream bandwidth from VSNL and Reliance and claims that it can be increased whenever required.

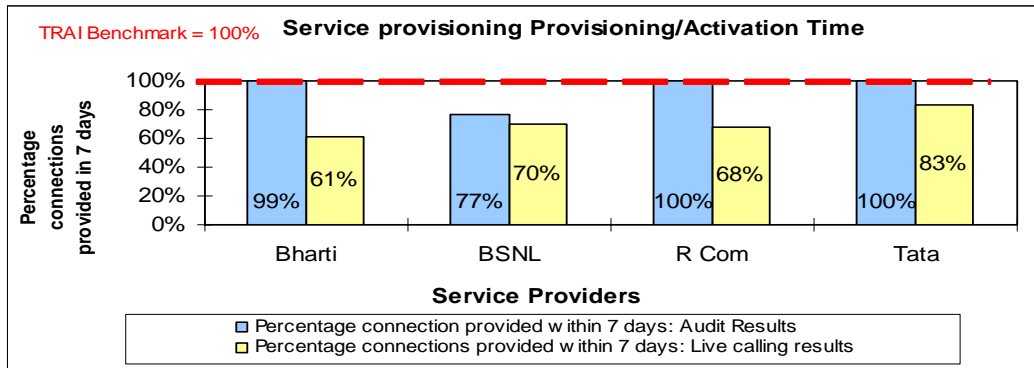
During live measurements carried out at Pop's/ISP Node it was observed that all the operators are meeting the TRAI prescribed benchmark of greater than 80% speed available to the customer.

Also, all the operators were found to be meeting the TRAI benchmark on packet loss and network latency parameters for three day live measurement.

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

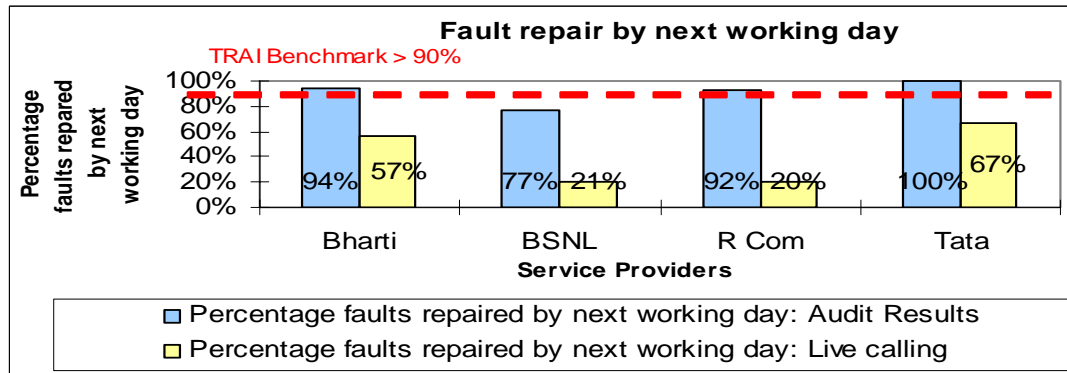
### 6.1 Graphical/Tabular Representations for Basic (Wireline) services

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

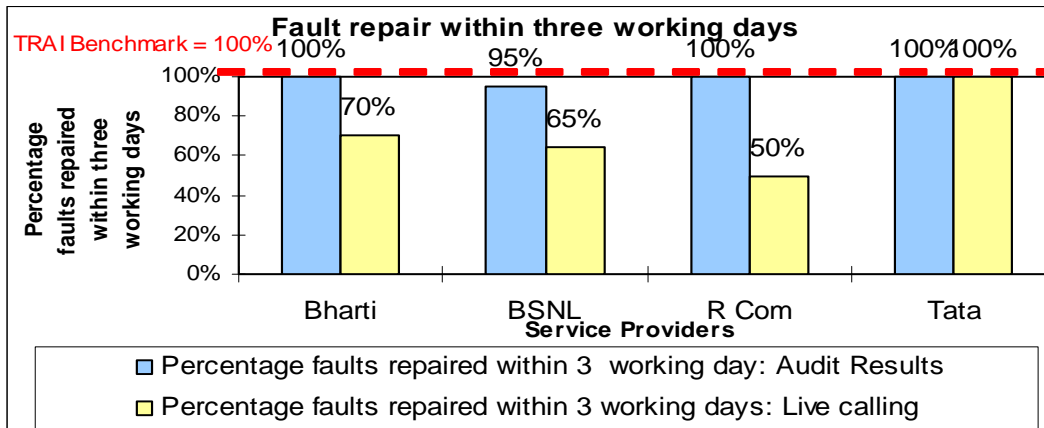


All the service providers except BSNL are meeting the TRAI benchmark, as per audit findings. During the month of Audit, Bharti and R - Com are doing better than with cent percent score for audit results. For live calling, the difference was less for BSNL (70% for live calling against 77% for audit data).

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

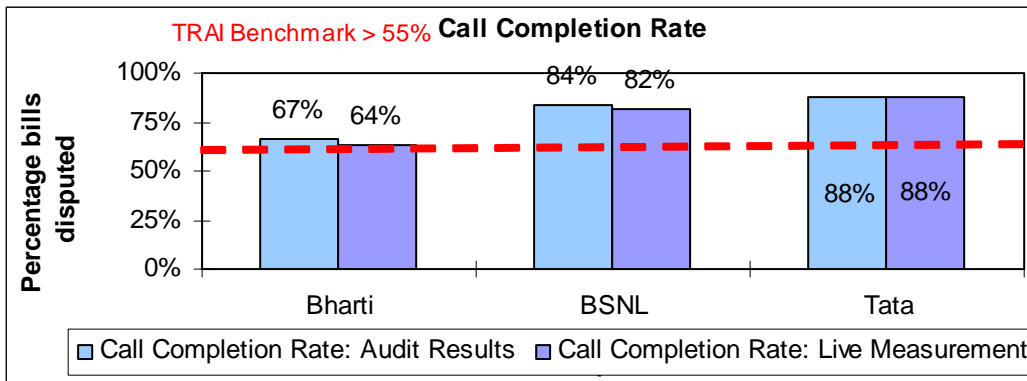


Tata, Rcom and Bharti meet the benchmark of 90% fault repairing by next working day with the audit scores of 100%, 92% and 94% respectively. For live calling none of the operator was found be meeting the benchmark.



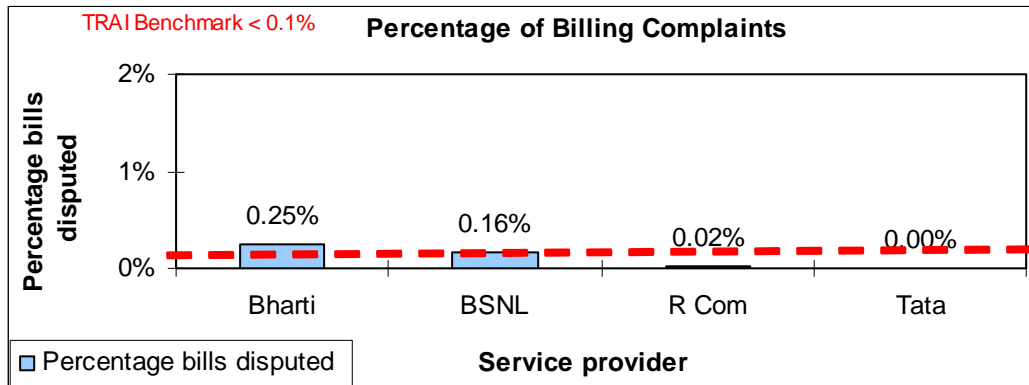
For fault repair within three days, all the operators scored almost 100% except BSNL which has scored 95%. Again for live calling results none of the operators meet the benchmark.

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



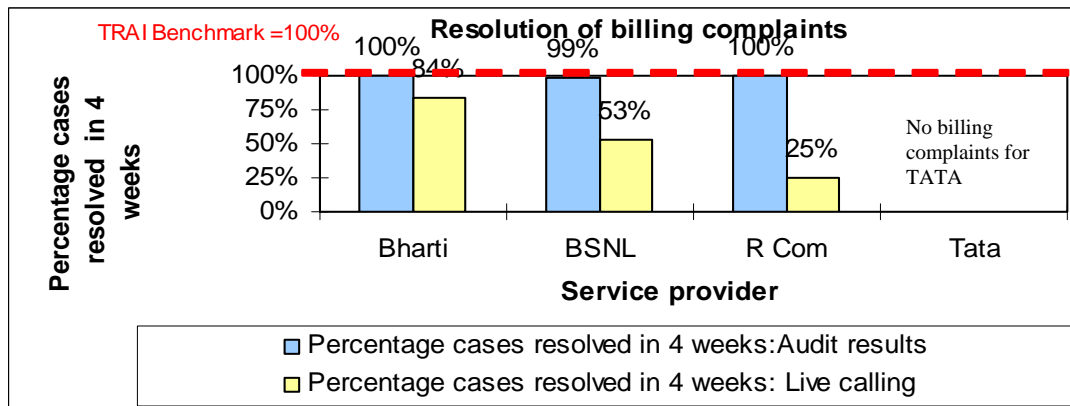
All the service providers were found to be meeting TRAI benchmark (55%) for Call Completion Rate. Within the service providers for the wireline services in the Chennai circle, the live measurement results for Tata and BSNL were found to be much higher at 88% and 82% respectively than that of other service providers. Also, as mentioned earlier Reliance does not have the technical capability to measure CCR.

**Percentage bills disputed**



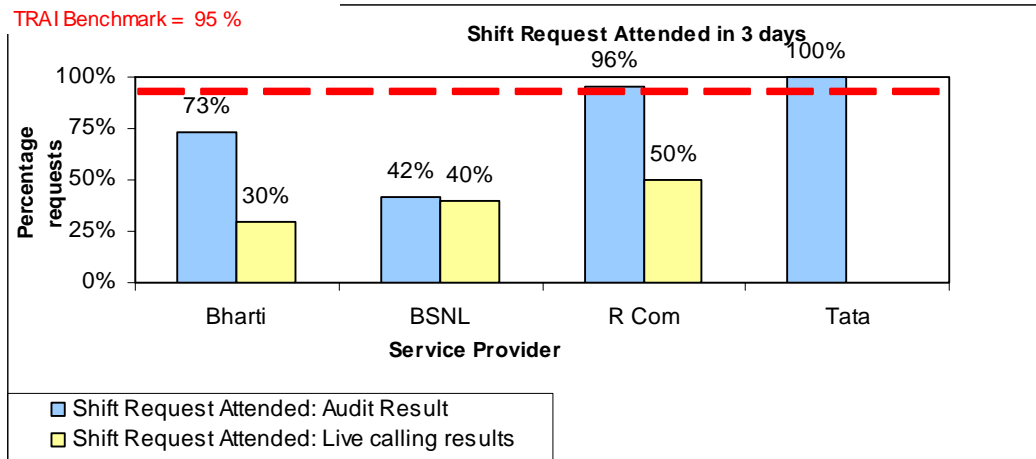
For percentage of billing disputes out of the total bills generated for the audit month, Bharti (at 0.25%) and BSNL (at 0.16%) was found to be exceeding the TRAI benchmark of 0.1%. The percentage bills disputed for R Com and Tata were 0.02% and 0% respectively. Interestingly there were no cases of bills disputed for TATA teleservices, the reason can be attributed to low subscriber base and corporate clientele.

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



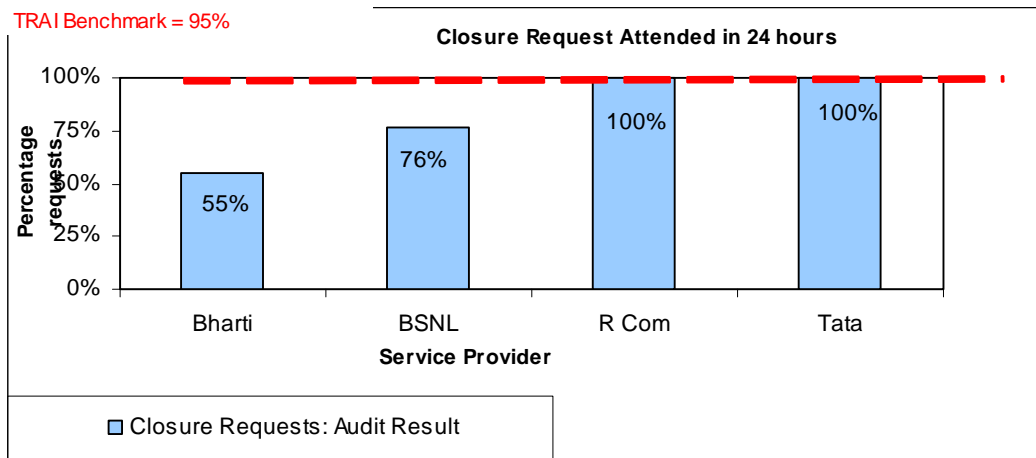
As per audit data findings, all the billing related complaints were resolved by all the service providers except BSNL where score was 99%. **For Tata, no billing complaints were observed during the audit month.** Live calling result show that for R Com and BSNL only 25% and 53% cases respectively were resolved within 4 weeks. However, the sample calls made for billing complaints were low owing to the fact that there were not many cases of billing complaints for all the operators.

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



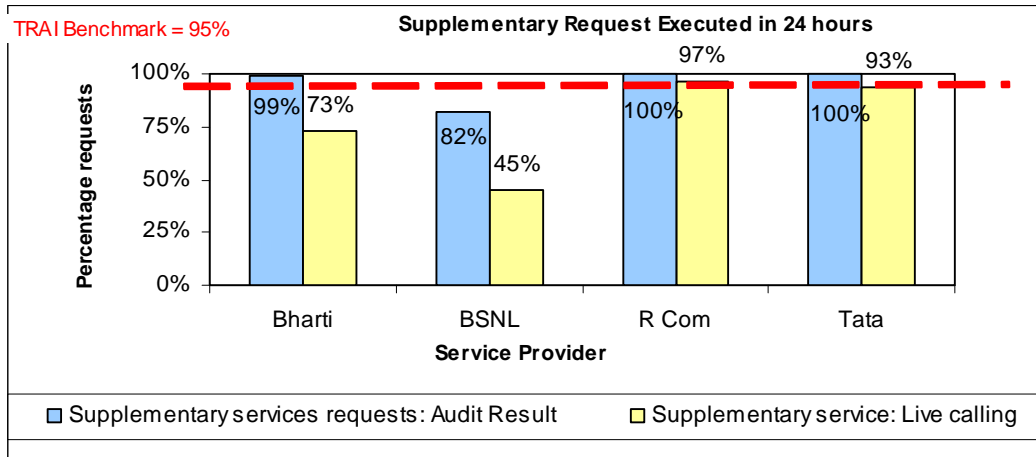
As far as shift request for BSNL and Bharti customers is concerned, 40% and 30% respondents respectively opting for shift request were attended in 3 days against TRAI benchmark of 100% for live calling results. For Reliance very few subscribers opted for shift requests and live calling was only done for 6 such customers. **Interestingly, there was only one shift request for TATA teleservices during the month of Audit primarily because of low subscriber base and high number of corporate customers**

**Closure requests attended within 24 hours**



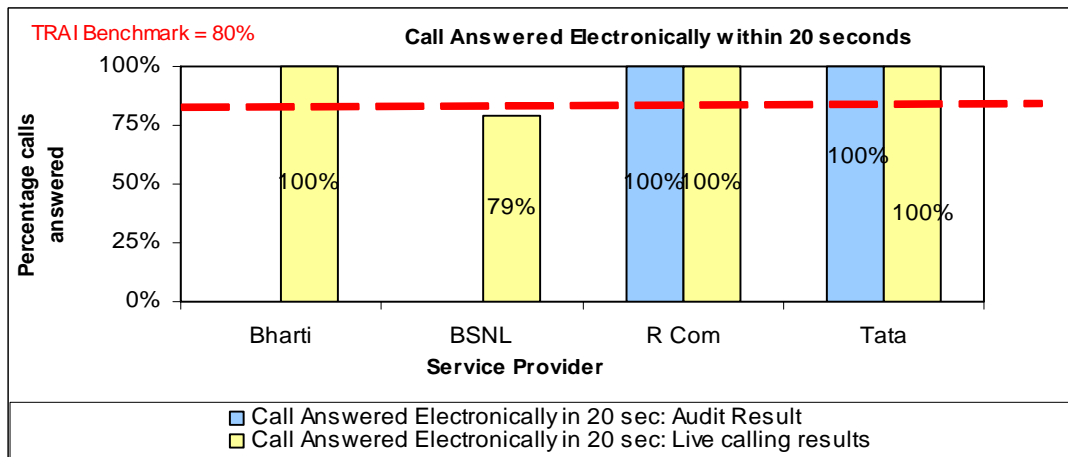
100% closure requests were found to be attended for Tata and R Com customers, as per audit data. For BSNL, 76% cases of closure requests were attended within 24 hours.

**Supplementary requests (Additional services) attended within 24 hours (Comparison between one month audit results and live calling results)**



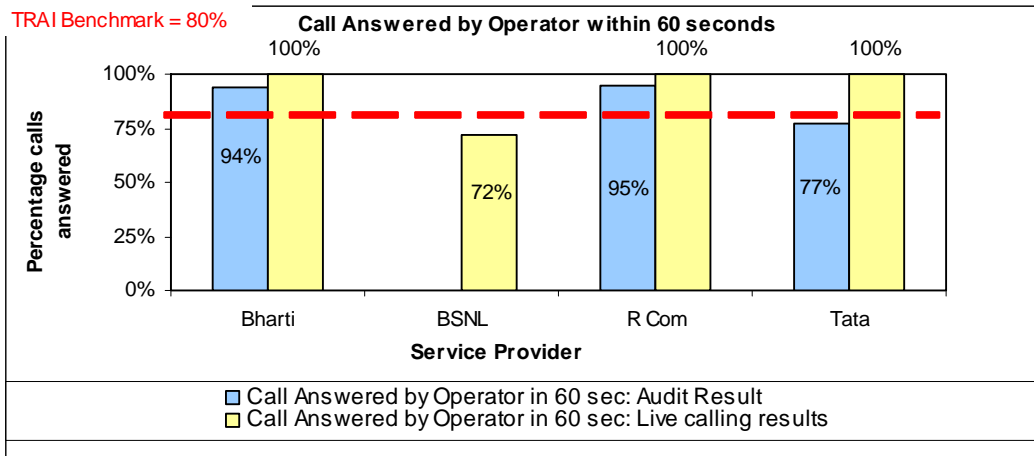
BSNL (at 82%) scores the lowest for one month data collection results. However it should be noted that supplementary services requests were relatively less for TATA and RCOM owing to low subscriber base.

**Response time to customer for assistance - Calls answered electronically within 20 seconds (Comparison between one month audit live calling results)**



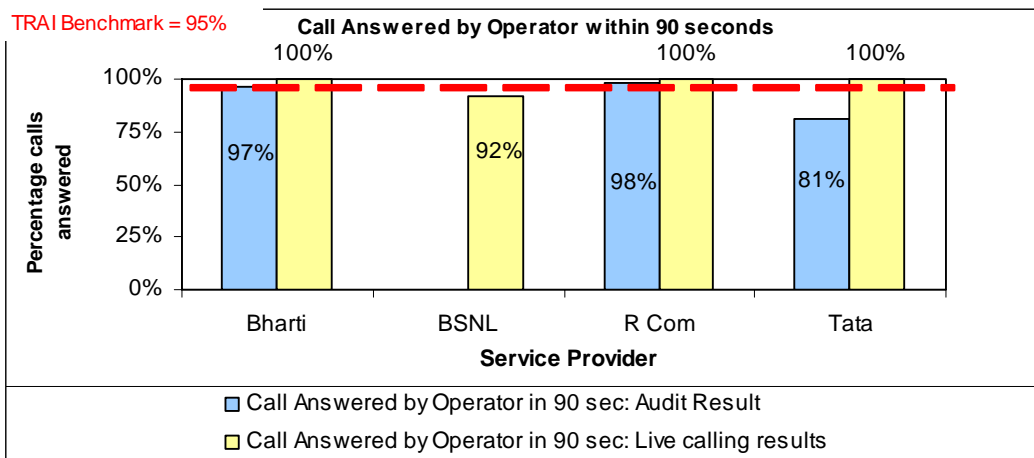
As per live calling results, Bharti and R Com with cent percent scores were found to be abiding by TRAI benchmark for call answered electronically within 20 seconds. The scores for BSNL was slightly below the benchmark at 79%. Details of number of calls made to IVR were not available from Bharti as subscriber claimed that only the calls which are answered by the operator are recorded in the system. For BSNL, data on call centre details is not being maintained by exchanges in Chennai.

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



As per live calling results, the score on the parameter call answered by operator within 60 seconds for all the operators except BSNL was 100%. For BSNL, data on call centre details is not being maintained by exchanges in Chennai as there is a centralized call centre hence one month data could not be obtained

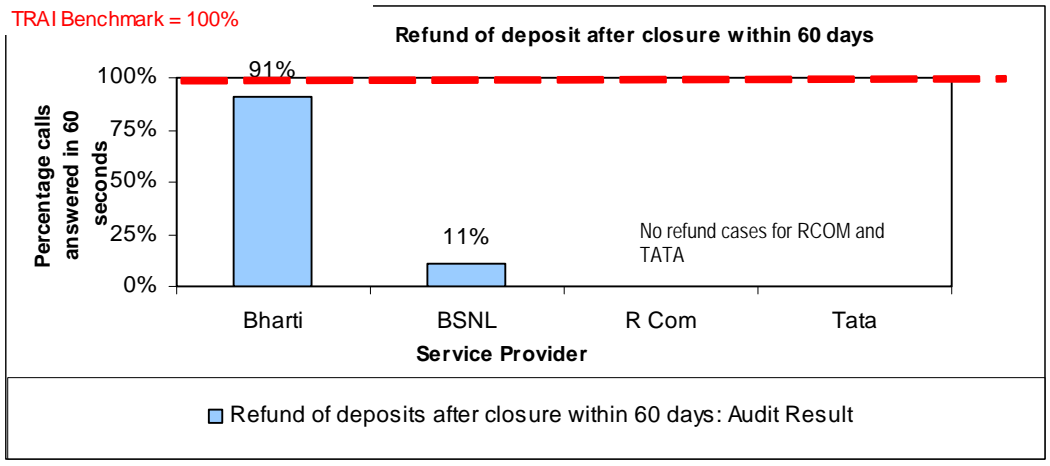
**Response time to customer for assistance - Calls answered by the operator within 90 seconds (Comparison between one month audit results and live calling results)**



As per live calling results, the score on the parameter call answered by operator within 60 seconds for all the operators except BSNL was 100%.



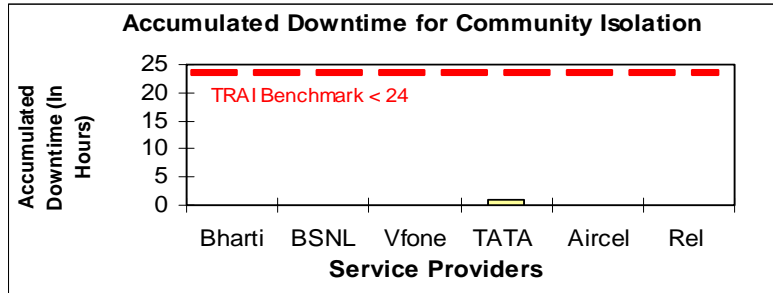
**Time taken to refund of deposits after closure**



For 'Refund after closure' parameter, Bharti's scores are 91% whereas it is just 11% for BSNL. Some of the reasons for *the slow process of refund as mentioned to the auditors are mis-match of billing cycle, customers not following up for refunds and handling of refund from different offices.* Total number of cases for refunds of deposits were nil for both Rcom and TATA teleservices.

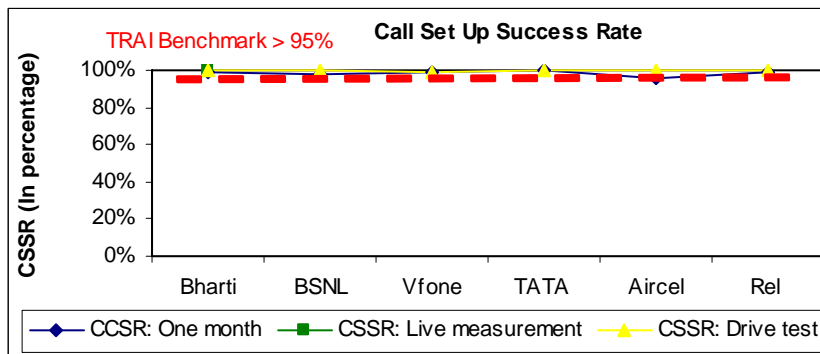
## 6.2 Graphical/Tabular Representations for Cellular Mobile Services

### Accumulated Downtime



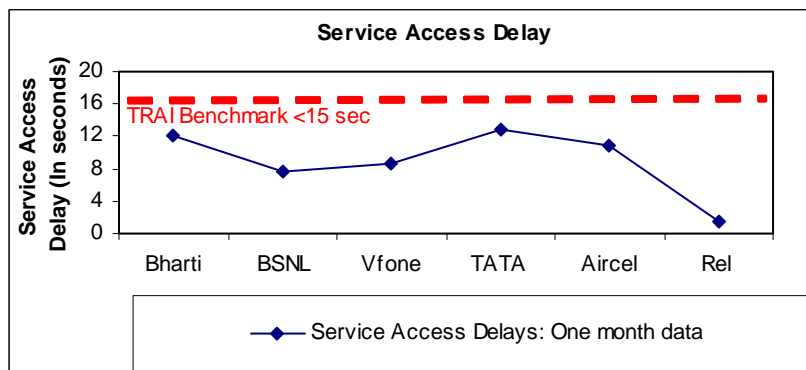
Only TATA experienced a downtime of 59 minutes in the Chennai circle in the quarter ending September 07. All other operators did not experience any downtime in the network.

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



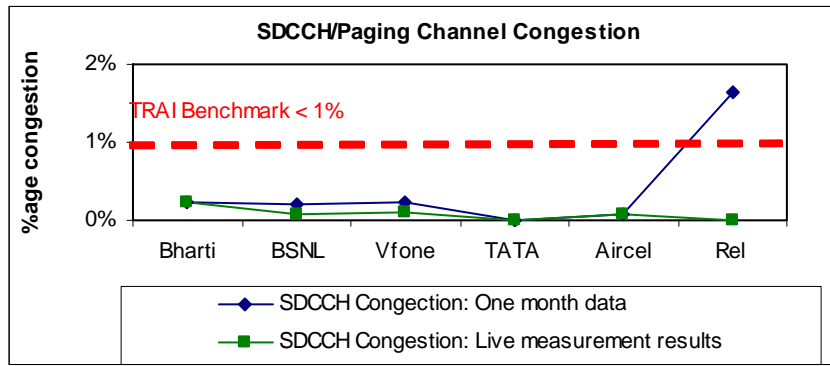
All the operators are meeting the benchmark for the audit month, live measurement as well as the drive test.

### Service Access Delay



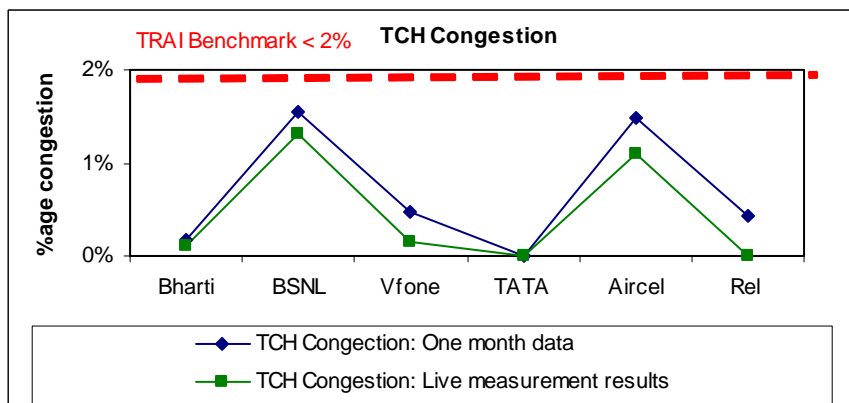
All the operators are meeting the benchmark. The auditors measured this parameter using a standard drive test tool kit.

**SDCCH / Paging Channel Congestion**



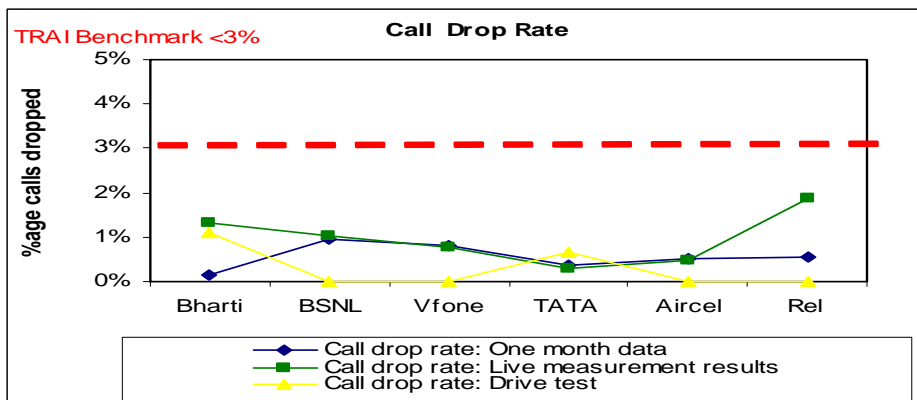
Except for RCOM which does not meet the TRAI benchmark for the month of audit, all other operators meet the benchmark both for the month of audit as well as the three day live measurement.

**TCH Congestion**



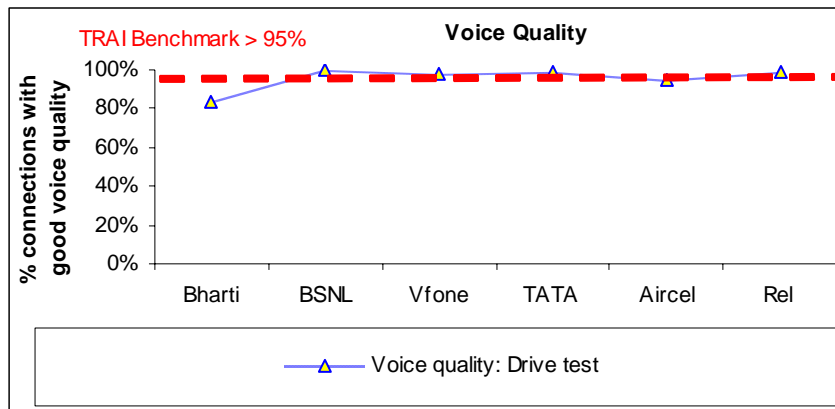
All the operators meet the TRAI specified benchmark. The maximum TCH congestion observed is for BSNL.

**Call Drop Rate**



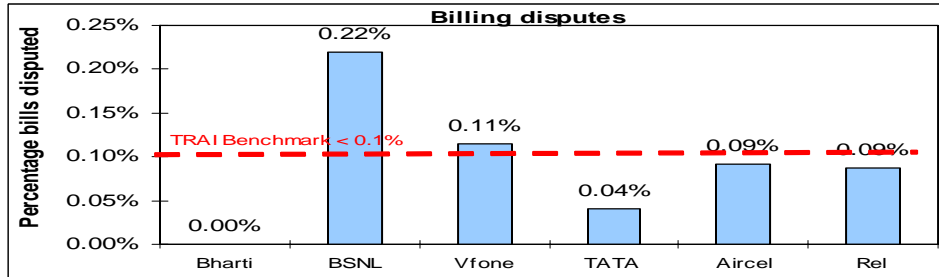
All the operators meet the TRAI benchmark. The operator with the least call drop rate taking into consideration the figures for live measurement and the month of audit is TATA.

**Voice quality**

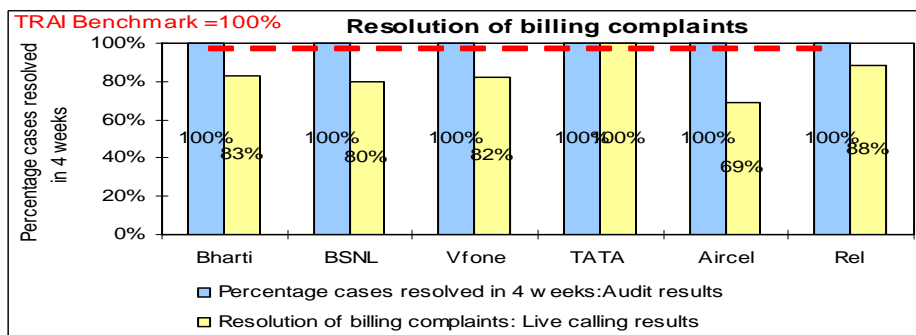


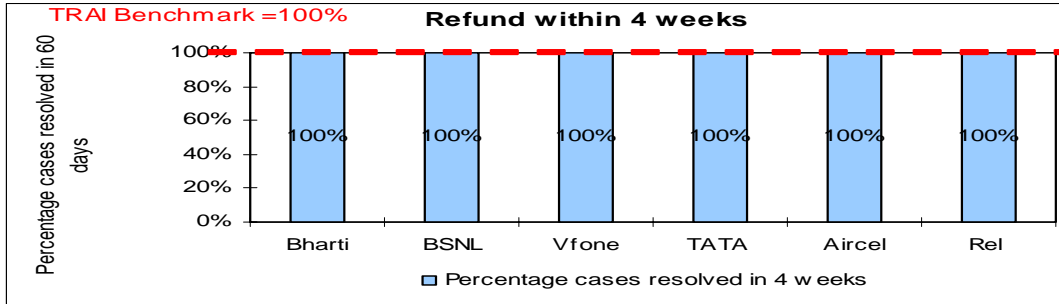
Bharti & Aircel do not meet the TRAI benchmark as found out during the drive test. However, all the operators meet the benchmark over a quarterly period when the results of all the drive tests conducted during that quarter are averaged.

**Billing Disputes**



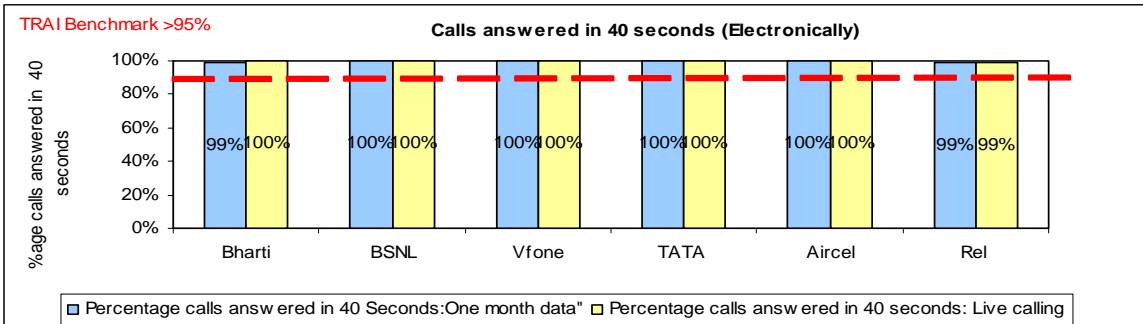
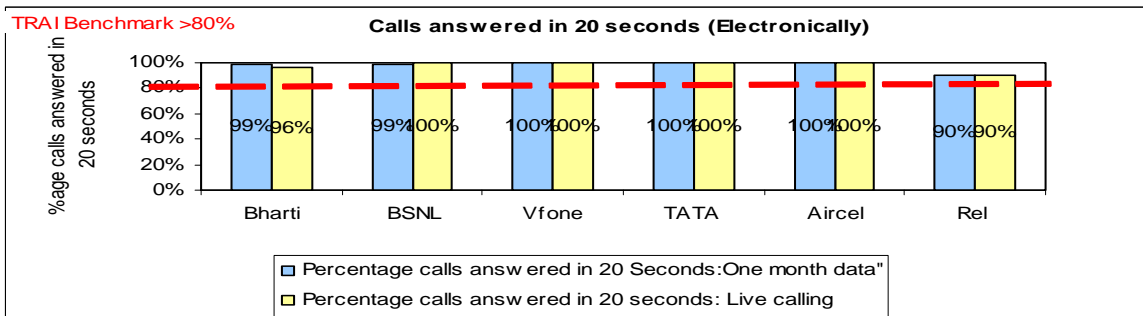
BSNL & Vodafone do not meet the TRAI benchmark. Interestingly, none of the Bharti subscribers have registered a billing complaint in the period for which the PMR verification was done.



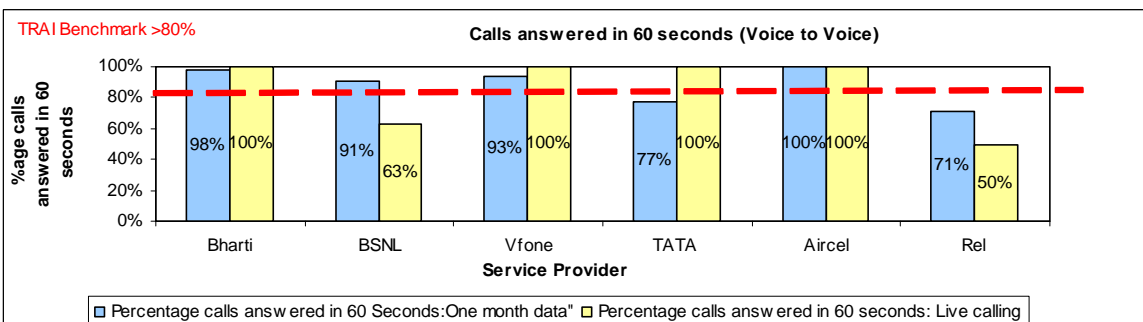


All the operators meet the TRAI benchmark of resolving 100% of the cases related to resolution of billing complaints for the month in which data was collected. However, the operators consider only those as billing complaints where they have issued an internal ticket which essentially means that a refund is due to the customer.

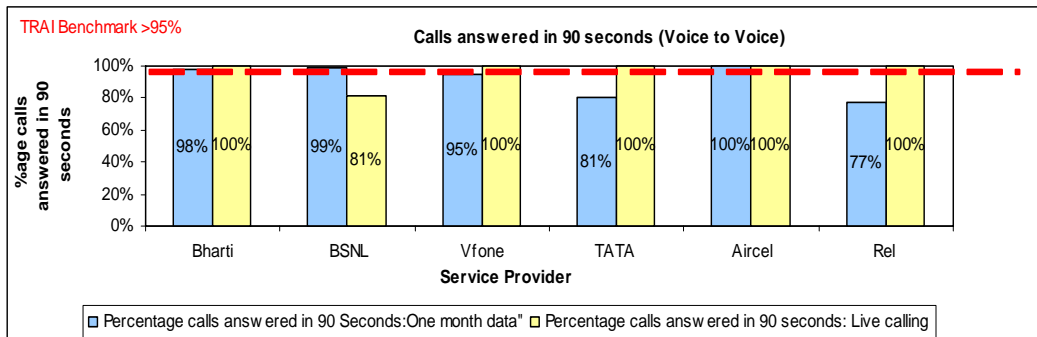
**Customer Care / Helpline:**



All the operators meet the TRAI benchmark for IVR (Electronic) answering of customers' calls.



All the service providers except BSNL (live calling) and RCOM (both live calling & one month data) meet the TRAI specified benchmark.



However, except for TATA & RCOM all other operators meet the TRAI benchmark for the one month data. BSNL does not meet the TRAI benchmark in the live calling aspect.

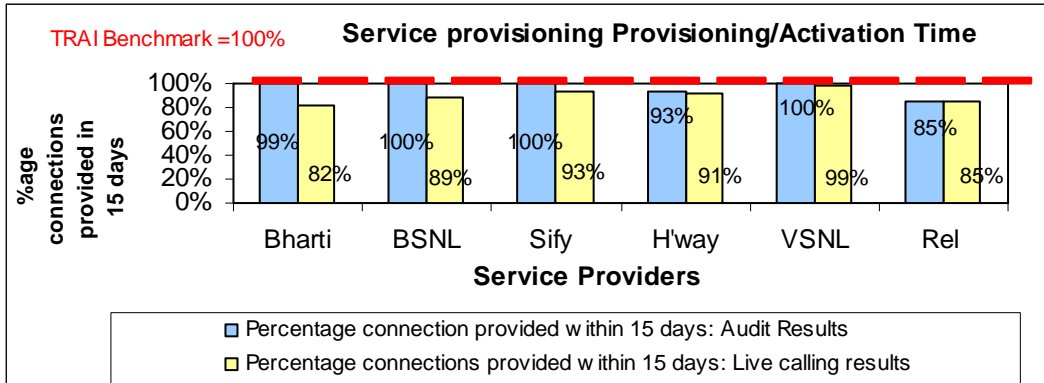
**Inter Operator Call Assessment**

Inter operator call Assessment (From / To)	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Bharti		98%	99%	97%	98%	100%
BSNL	99%		100%	100%	95%	100%
Vodafone	100%	98%		97%	98%	100%
TATA	98%	93%	93%		96%	99%
Aircel	94%	100%	99%	93%		91%
RCOM	98%	95%	98%	99%	98%	

Relatively, most of operators find connecting to BSNL & TATA a little difficult as compared to other operators. Bharti has maximum problems connecting to a TATA number. BSNL has problems connecting to Aircel, Vodafone faces difficulty in connecting to a TATA number whereas TATA faces difficulty in connecting to BSNL & Vodafone numbers. Aircel has problems in connecting to a RCOM number whereas RCOM has problems connecting to a BSNL number.

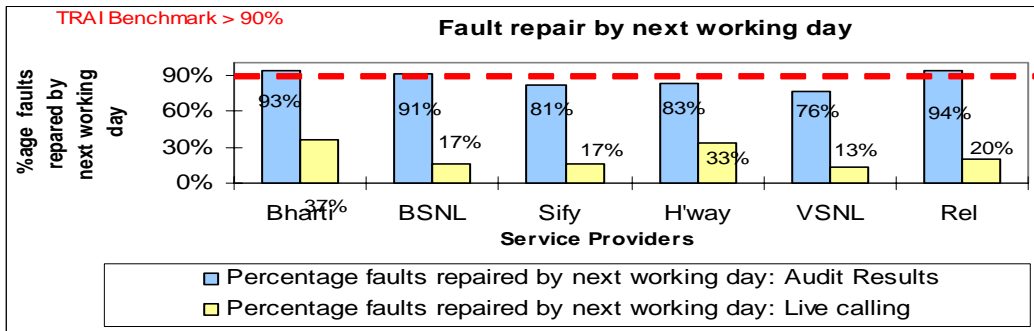
### 6.3 Graphical/Tabular Representations for Broadband services

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



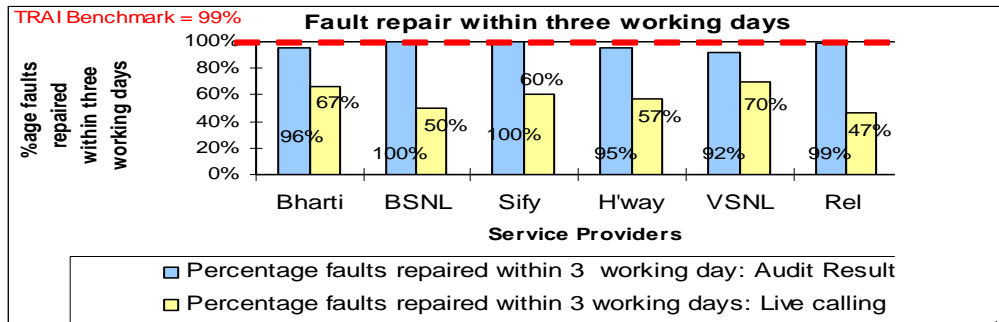
Although, Reliance scores below the benchmark of 100% connections to be provided within 15 days one month data collection verification of records reveals that most of the delayed connections are either for the internal customers or due to the non availability of equipment at the customers end. Also, there is slight variation observed in the results of live calling as none of the operator was observed to be meeting the benchmark for the calls which were made to customers who had applied for new connection in the month prior to visit of Audit

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



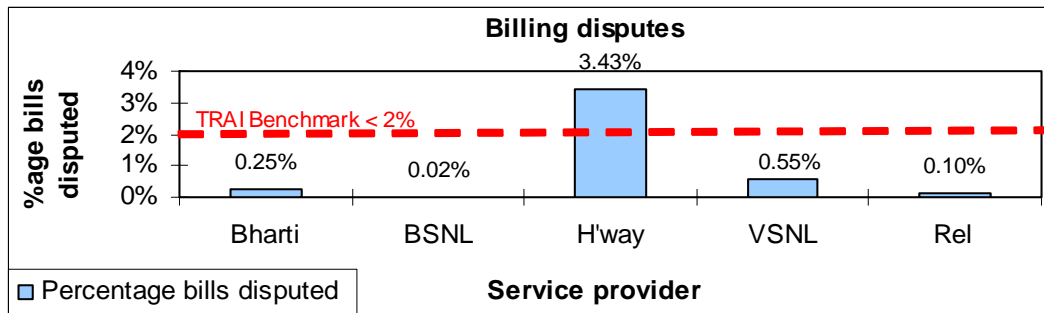
All operators fall below the benchmark for results of live calling. For one month data collection VSNL, Hathaway and Sify do not meet the benchmark.

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



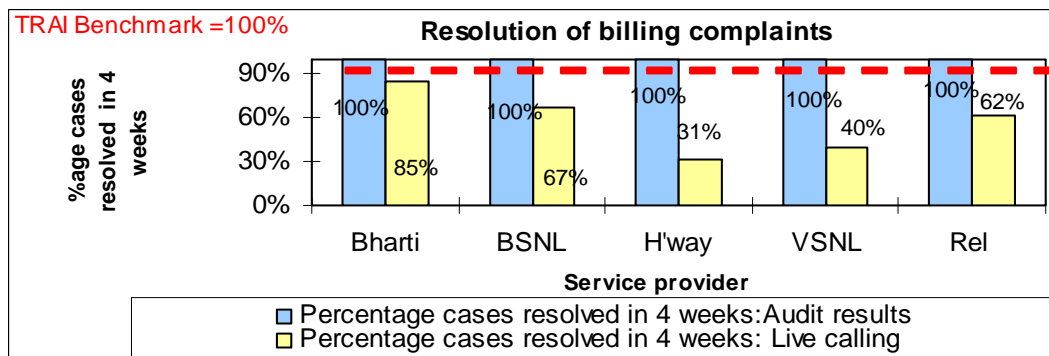
Only Bharti meets the benchmark on fault repair within three working days for the results of live calling results. It should be noted that VSNL which does not meet the benchmark for one month data collection includes billing complaints while calculating percentage faults repaired within three working days.

**Percentage bills disputed**



All the operators except Hathaway meet the benchmark on percentage bills disputed in Chennai circle. Sify claims that all its retail customers are prepaid customers and hence there are no billing complaints

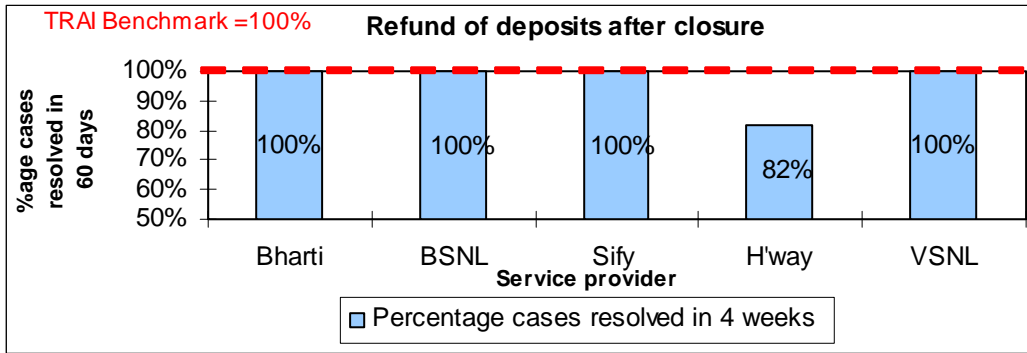
**Resolution of billing complaints (Comparison between one month audit results and live calling results)**





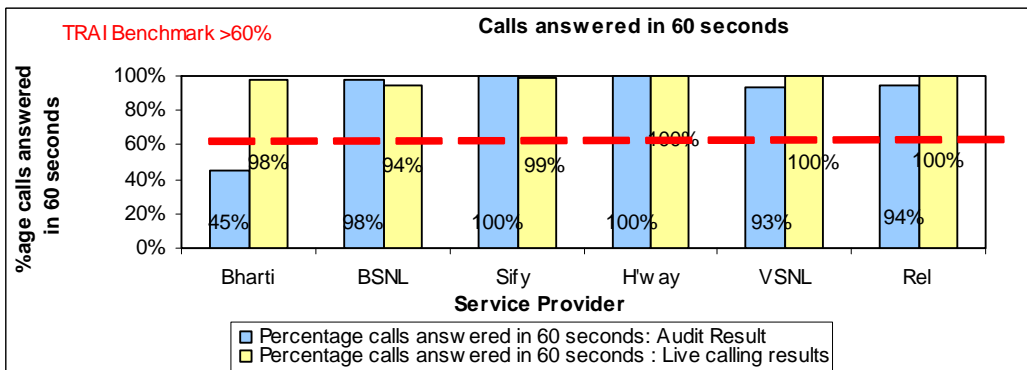
None of the operator meets the benchmark for resolution of complaints for live calling results in Chennai circle. Bharti performs best for live calling results at 85%. However it should be noted that the sample live calls were low as service provider claimed that there are very few cases for billing complaints. Sify claims that all its retail customers are prepaid customers and hence there are no billing complaints

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



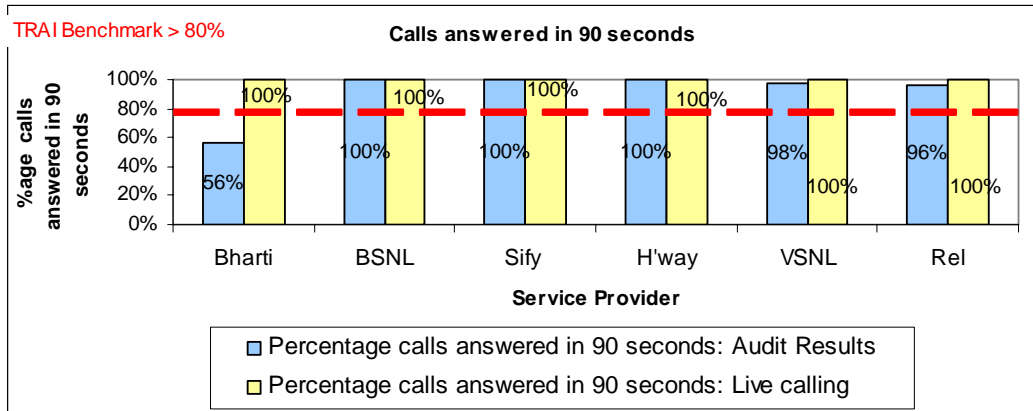
All the operators except Hathaway (82%) meet the benchmark as in all the cases of closures which require refund, the same was made within 4 weeks. Also, verification of records maintained by RCOM claims reveals that there were no cases of refunds of deposits after closure.

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



All the service providers, except Bharti (which does not meet the benchmark for month in which Audit was carried out) meet the benchmark as more that 80% of the calls made to customer care were answered by the operator in 60 seconds. Importantly Bharti claimed that it is not possible to segregate the calls made from wireline or broadband customers as they are offering both the services and have one call centre to address the complaints. Also, as Reliance and VSNL have a centralized call centre, the results shown are combined for all the circles in which they are operating.

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



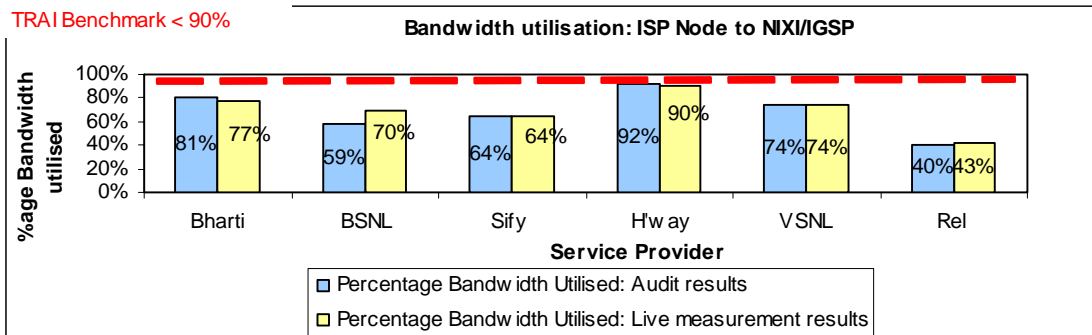
All the operators (except Bharti) meet the benchmark for percentage calls answered by the operator within 90 seconds. Interestingly, most of them have scored 100% on the call centre performance for the given parameter.

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

Bandwidth Utilization	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM
<b>Data collected in the month of Audit</b>							
Total number of intra network links		406	21	400	3	4	4
No of Intra network found to be above 90%	<80%	0	0	5	3	0	0
<b>Results of three day live measurements</b>							
Total number of intra network links		30	21	18	3	4	4
No of Intra network found to be above 90%	<80%	0	0	0	3	0	0

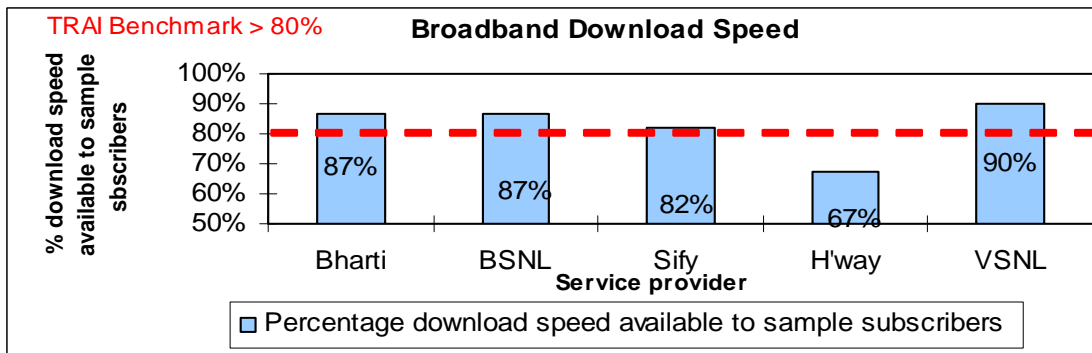
As far as bandwidth utilization on the intra network links is concerned all the operators seem to be performing well as all the intra network links tested during live measurement were found to be below 90%. Chennai being metro city operators seem to be wary about the bandwidth utilisation. However, the level from which the bandwidth utilization at Intra network links is being reported varied because of the difference in networks. For operators distributing through cable operators, bandwidth utilisation at the end customer level (from POP to cable operator) remains unreported which may be a concern as some cable operators may be distributing more connections than their equipped capacity.

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



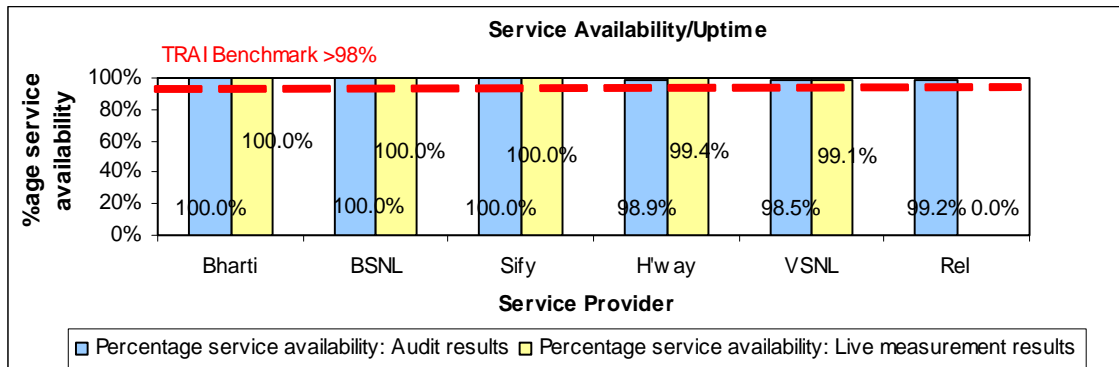
Most of the service providers (Except Hathaway) audited have excess bandwidth capacities available as bandwidth utilisation on the upstream links remained below 90%. Hathaway claimed that it buys upstream bandwidth from Reliance and VSNL and can increase the same as and when need arises

**Broadband connection speed available to sample subscribers – Live calling results**



All the service providers are meeting the benchmark for one month data collection and live measurements conducted at POPs/ISP Node. **Since verification of records was not possible because of unavailability of historic data with the operators**, IMRB auditors also conducted live calling to check speed available at the last mile. Live calling results reveal that most (except Sify and Hathaway) of the service providers are meeting the benchmark on download speed available to the customer. However, all the service providers have made available the tool for measuring download speed on their websites. Live calling could not be carried out for Reliance as the details of online customers could not be provided by the service provider.

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



All the service providers meet the benchmark with uptime of more than 98%. Also, live measurement details could not be obtained for RCOM has different methodology (based on faults reported by the customer and not network or site downtime) for calculating the above parameter and hence three day live measurement was not possible for the service provider.

**Network Latency and Packet loss - One month data collection**

Network Latency and Packet Loss	B'mark	Bharti	BSNL	Sify	H'way	VSNL	Reliance
Packet Loss (Percentage)	<1%	0.00%	0.20%	0.00%	0.00%	0.00%	1.00%
<b>Network Latency</b>							
From user reference point at POP/ISP Node to IGSP/ NIXI (msec)	<120msec	<50	<120	<45	<120	<90	<30
From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec)	<350msec	< 230	<350	<300	<350	<200	<287

**Three day live measurement**

Network Latency and Packet Loss	B'mark	Bharti	BSNL	Sify	H'way	VSNL	Reliance
Packet Loss (Percentage)		0.00%	0.33%	< 1.00%	0.00%	0.00%	0.00%
<b>Network Latency</b>							
From user reference point at POP/ISP Node to IGSP NIXI (msec)	<120msec	15	132	28	98	<90	30
From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec)	<350msec	220	350	270	120	<200	288

All the service providers audited during the period performed well on results of live measurement for packet loss and network latency. Reliance is using smoke ping tool to measure the latency at various links. However the some ping tool is configured to send 5 ping packets of 56 bytes each every 300 seconds. Also, packet loss is calculated by Reliance basis the faults reported by the customers and not by carrying out ping tests as specified by TRAI. However, smoked ping results for various links tested during live measurement revealed that there was 0% packet loss.

## 7.0 Compliance reports: Results of Verification of Records for July to September 2007

### 7.1 Basic (Wireline) services

S. N.	Parameter	Service provider								
		B'mark	Bharti		BSNL		Rcom		TATA	
			PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB
1	Percentage connections completed within 7 days	100%	98%	98%	99.53	71%	100%	100%	100%	100%
2	Fault incidence/clearance statistics									
2.1	Fault incidence	<5	2	2	3.4	3.5	3	3	6	6
2.2	Faults repaired within 24 hours	>90%	99%	99%	93%	42%	100%	100%	83%	83%
2.3	Mean time to repair	<8 hrs	7.2	7.2	9.3	13.9	4.36	4.36	20.4	20.4
3	Call Completion Rate (CCR)	>55%	68%	68%	81%	67%	DNA	DNA	70%	70%
4	Metering and billing credibility									
4.1	Billing complaints per 100 bills issued	<0.1%	0.88%	0.88%	0.01%	0.11%	0.00%	0.00%	No cases	No cases
4.2	%age of billing complaints resolved within 4 weeks	100%	99%	99%	95%	96%	100%	100%	No cases	No cases
5	Customer care/helpline promptness									
5.1	<u>Shift requests (Total number received)</u>		2469	2469	6961	2517	31	31	2	2
	Percentage shift requests attended within 3 days	>95%	98%	98%	81%	50%	100%	100%	100%	100%
5.2	<u>Closure request attended</u>		11438	11438	10697	1303	3433	3433	39	39
	Closure within 24 hours	>95%	98%	98%	100%	71%	100%	100%	100%	100%
5.3	<u>Supplementary (additional) service requests attended</u>		4330	4330	9932	2938	15260	15260	801	801
	Additional facility provided within 24 hours	>95%	99%	99%	100%	79%	100%	100%	85%	85%
6	Response time to customer for assistance									
6.1	% age call answered through IVR in 20 seconds	80%	DNA	DNA	100%	DNA	100%	100%	100%	100%
	% age call answered through IVR in 40 seconds	100%	DNA	DNA	100%	DNA	100%	100%	100%	100%
6.2	% age calls answered by operator in 60 seconds	80%	96%	96%	98.58%	DNA	95%	95%	94%	94%
	% age calls answered by operator in 90 seconds	95%	98%	98%	99.27%	DNA	100%	100%	100%	100%
7	%age cases where refund after closure was provided within 60 days	100%	100%	100%	100%	52%	No cases	No cases	No cases	No cases

(Note: - For BSNL, verification process was carried out at 5% of the total exchanges spread across 10% of SDCA's. This may be one of the reasons for variation in figures reported in PMR as figures reported are basis sample and not complete universe. Also key takeouts from verification of records has already been explained in Critical findings)



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


## 7.2 Cellular Mobile services

S. No.	Parameter	SERVICE PROVIDER											
		Bharti		BSNL		Vodafone		TATA		Aircel		Reliance	
		PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB
<b>A</b>	<b>Network Performance</b>												
1	Accumulated Downtime	0	0	0	0	0	0	0	0	0	0	0	0
2	Call set up success rate	98.32%	98.32%	98.50%	98.50%	99.61%	99.61%	99.74%	99.77%	98%	98%	99.59%	99.15%
3	Service Access delay	14.67	14.67	10.6	10.6	8.675	8.675	12.84	12.84	10.85	10.85	3.86	3.86
4	Blocked call rate												
	<i>SDCCH Congestion</i>	0.15%	0.15%	0.65%	0.50%	0.73%	0.73%	0%	0%	0.13%	0.13%	0%	0%
	<i>TCH Congestion</i>	0.19%	0.19%	1.50%	1.42%	0.96%	0.96%	0.01%	0.02%	1.90%	1.90%	0%	0%
5	Call drop rate	0.60%	0.60%	0.30%	0.76%	1.21%	1.21%	0.77%	0.77%	0.59%	0.59%	0.51%	0.51%
6	%age connections with good voice quality	98.37%	98.37%	82%	82%	98.68%	98.68%	98.26%	96.23%	95.10%	95.10%	99.45%	99.45%
7	Service coverage	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
8	POI congestion	0	0	0	0	0	0	0	0	0	0	0.1	0.1
<b>B</b>	<b>Customer Care</b>												
	Calls answered electronically												
	<i>Within 20 seconds</i>	99.00%	99.00%	100.00%	100.00%	80.00%	80.00%	100.00%	100.00%	95.00%	95.00%	99.50%	99.50%
	<i>Within 40 seconds</i>	99.00%	99.00%	100.00%	100.00%	95.00%	95.00%	100.00%	100.00%	100.00%	100.00%	99.50%	99.50%
	Calls answered by the operator												
	<i>Within 60 seconds</i>	93.76%	93.76%	88%	88%	88.82%	88.82%	77%	77%	85%	85%	80%	83.50%
	<i>Within 90 seconds</i>	96.18%	96.18%	100%	100%	96.69%	96.69%	81%	81%	100%	100%	83.50%	83.50%
<b>C</b>	<b>Billing complaints</b>												
	Billing complaints/100 bills	0.06	0.06	0.14	0.14	0.00	0.00	0.00	0.00	0.10	0.10	0.09	0.09
	%age complaints resolved within 4 weeks	100%	100%	100%	98%	100%	100%	100%	100%	100%	100%	100%	100%
	Period of refunds due to customers	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

 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

### 7.3 Broadband services

S.No	Parameters	B'mark	Bharti		BSNL		Sify		Hathaway		VSNL		RCOM	
			PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB
1	<b>Service provisioning uptime</b>													
1.2	% connections provided within 15 days	100%	90%	90%	100%	DNA	100%	100%	97.20%	97.20%	99%^^	99%^^	75%^^	76%^^
2	<b>Fault repair restoration time</b>													
2.2	Percentage faults repaired by next working day	> 90%	96%	96%	91%	90.50%	87%	87%	90.45%	90.45%	80.40%	80.40%	95%	98%
2.3	Percentage faults repaired within 3 days	>99%	97%	97%	99%	99%	94%	94%	97%	97%	92%^^	92%^^	100%	100%
3	<b>Billing performance</b>													
3.1	Total bills generated				3142107				7194	7194	51065	51065	75319	2866
3.2	Billing complaints per 100 bills issued	<2%	0.88%	0.88%	.3%	DNA			1.3	1.3	1.52%	1.52%	0.50%	0.20%
3.3	% of billing complaints resolved in 4 weeks	100%	99%	99%	100%				100%	100%	100%	100%	100%	100%
3.4	% cases in which refund of deposits after closure was made in 60 days	100%	99%	99%	99.4%	No cases			15.90%	15.90%	100%	100%	100%	No cases
4	<b>Customer care/helpline assessment (Voice)</b>													
4.1	Total calls received at the call centre		119583	119583	1000199		95172	95172	75746	75746	123637	123637	3402	3402
4.2	Percentage calls answered within 60 seconds	> 60%	97%	97%	80.91%	DNA	86%	86%	85%	85%	77%	77%	98.80	98.80%
4.3	Percentage calls answered within 90 seconds	> 80%	98.69%	98.69%	94.55%		94%	94%	100%	100%	83%	83%	99.00	99.00%
5	<b>Bandwidth utilization/Throughput</b>													
5.1	<b>Intra network links (POP to ISP Node)</b>													
	Total number of intra network links > 90%		4	4	0	0	34	34	Bustable	Bustable	0	0	0	0
	<b>International Bandwidth</b>													
5.2	Percentage bandwidth utilized on upstream links upstream links during the period	< 80%	79.63%	79.63%	52%(Details pertain to all upstream links)	83% (Details pertain to upstream links from Chennai)	79%	79%	90%	90%	70%	70%	50%	50%
6	Data download speed	> 80%	No raw data available for verification											
7	<b>Service availability/uptime</b>	> 98%	99.90%	99.90%	99.3%	99.93%	100%	100%	98.60%	98.60%	99.40%	99.40%	99.4%	99.4%
8	Packet loss	<2%											0.14%	0.14%^^
9	<b>Network Latency</b>													
9.1	POP/ISP Node to NIXI	< 120	No raw data available		<120	Complied*	No raw data available for verification. Only results of smoked ping tool could be verified for Reliance which provide average latency over a period of one year							
9.2	ISP noce to NAP port (Terrestrial)	< 350			<350	Complied*								

^^ Methodology not in Line with QoS regulation, Data verified on All India basis, DNA- Details Not Available for verification, B'mark = TRAI Benchmark

Figures do not match with those reported in PMR

(\*For BSNL records pertaining to network latency and packet loss were verified for the period of Oct – Dec 2008 at the central node in Bangalore, Also key take outs from verification of records of various service providers has already been explained in Critical findings)

## 7.4 Conclusions

### 7.4.1 Basic Wireline Services

1. The figures for BSNL vary because the audit was conducted only in sample exchanges (5% spread across 10% of SDCA's) and the PMR figure is reported by the operator on the overall circle level.
2. For RCOM parameters related to customer care are reported on an all India level
3. During verification process carried out at exchanges it was observed that customer care data is not maintained at the exchanges as service provider has a centralized call centre
4. Also it was observed that the cases related to refund of deposits are being taken care by some of the bigger exchanges in Chennai circle

### 7.4.2 Cellular Mobile services

1. The figures for BSNL do not match for network congestion parameters and call drop rate
2. CSSR figures for RCOM also did not match during the verification process.
3. It was observed that all the service providers Audited in Chennai circle were using drive tests to measure Service coverage, Signal strength and Voice quality. They still do not have the facility to measure the same form raw counters at OMC

### 7.4.3 Broadband services

1. Complete data for Sify was verified on an all India level
2. Slight variation is observed in results for BSNL as details in PMR were reported on an all India basis whereas details were verified for sample POPs in Chennai circle
3. As mentioned earlier, it was observed that Reliance follows a different methodology for calculating packet loss which is based on faults reported by the customers which is not in line with QoS methodology.
4. VSNL was found to be including even billing complaints while reporting fault repair which has resulted in average performance by the service provider on this parameter. Also it was observed that the service provider considers all the connections less than 256kpbs as Broadband connections which is not in line with QoS methodology.
5. Most of the service providers were also found to be unaware of TRAI specified guideline for carrying out ping tests of 1000 packets of 64 bytes each.
6. Historic data for BB download speed and Ping test conducted to check the latency and packet loss was not available for verification for all the service providers except BSNL.
7. Although all the service providers claimed that they conduct random ping tests and latency to check the packet loss but there is no book keeping which is maintained at their end.



## 8. Annexure - I

### 8.1 Parameter wise performance reports for Basic Wireline services

#### One month data verification results for Service provisioning

Service provisioning/Activation time	Benchmark	Bharti	BSNL	R Com	Tata
Number of connections registered during the period		9934	1004	467	50
Total number of connections provided within 7 days		9882	774	467	50
Percentage of connections provided within 7 days	100%	99%	77%	100%	100%
Total number of connections provided after 7 days		52	219	0	0
Percentage of connections provided after 7 days		1%	22%	0%	0%

#### Live calling results for Service provisioning

Service Provisioning/Activation Time	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of service registration made		100	304	100	12
Number of cases in which connection was provided in 7 Days		61	212	68	10
Percentage cases in which connection was provided in 7 days	100%	61%	70%	68%	83%
Number of cases in which connection was provided after 7 days		39	79	32	2
Percentage cases in which connection was provided after 7 days		39%	26%	32%	17%
Percentage cases in which connection was provided after 7 days		39%	26%	32%	17%

#### One month data verification results for Fault repair/Restoration time

Fault Repair/Restoration time	Benchmark	Bharti	BSNL	R Com	Tata
Total number of faults registered during the period		17798	10462	2252	13
Total number of faults repaired by next working day		16757	8076	2077	13
Percentage of faults repaired by next working day	> 90%	94%	77%	92%	100%
Total number of fault repaired within 3 days		17798	9924	2248	13
Percentage of fault repaired within 3 days		100%	95%	100%	100%

**Live calling results for Fault repair/Restoration time**

Fault Repair	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of calls made		30	457	30	15
Number of cases where faults were repaired by next working day		17	95	6	10
Percentage cases where faults were repaired by next working day	> 90%	57%	21%	20%	67%
Number of cases where faults were repaired within 3 days		21	295	15	15
Percentage cases where faults were repaired within 3 days		70%	65%	50%	100%

**One month data verification results for CCR**

Traffic statistics - Call Completion Rate	Benchmark	Bharti	BSNL	R Com	Tata
Total local call attempts		16939771	265109	DNA	1196135
Total number of successful local calls		11312346	222884	DNA	1053111
Call Completion Rate (CCR) in the local network	> 55%	67%	84%	DNA	88%

**Live measurement results for CCR**

Traffic statistics - Call Completion Rate	Benchmark	Bharti	BSNL	R Com	Tata
Total local call attempts		1814358	70365	DNA	134743
Total number of successful local calls		1154083	57413	DNA	118109
Call Completion Rate (CCR) in the local network	> 55%	64%	82%	DNA	88%

**One month data verification results for Billing performance**

Billing Performance	Benchmark	Bharti	BSNL	R Com	Tata
<b>Billing disputes</b>					
Total bills generated during the period		584541	43840	24560	480
Total number of bills disputed		1471	69	6	0
Percentage bills disputed	<0.1%	0.25%	0.16%	0.02%	0.00%
<b>Resolution of billing complaints</b>					
Total complaints resolved in 4 weeks from date of receipt		1471	68	6	0
Percentage complaints resolved within 4 weeks of date of receipt		100%	99%	100%	NA

**Live calling results for Billing performance**

Resolution of billing complaints	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of calls made		50	19	4	0
Number of cases resolved in 4 weeks		42	10	1	0
Percentage cases resolved in four weeks		84%	53%	25%	NA

**One month data verification for Customer Care – Shifts**

Customer Care - Shift Requests	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of shift requests received		1207	373	23	1
Total number requests attended in 3 days	95%	883	156	22	1
Total number requests attended beyond 3 days		0	217	1	0
Shifts not attended		0	0	0	0
Percentage of requests attended in 3 days		73%	42%	96%	100%
Percentage of requests attended beyond 3 days		0%	58%	4%	0%
Percentage of shifts not attended		0%	0%	0%	0%

**Live calling results for Customer Care – Shifts**

Customer Care - Shift Requests	Benchmark	Bharti	BSNL	R Com	Tata
Total number of call to shift requests		50	286	6	NA
Total number of requests attended in 3 days	95%	15	115	3	NA
Total number of requests attended beyond 3 days		35	164	3	NA
Shifts not attended		0	2	0	NA
Percentage of requests attended in 3 days		30%	40%	50%	NA
Percentage of requests attended beyond 3 days		70%	57%	50%	NA
Percentage of shifts not attended		0%	1%	0%	NA

**One month data verification Audit results for Customer Care – Closures**

Customer Care - Closure Requests	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of closure requests received		3986	297	845	481
Total closure attended within 24 hours	95%	2185	227	845	481
Total number of requests attended beyond 24 hours		385	70	0	0
Closure requests not attended		15	0	0	0
Percentage of closure attended within 24 hours		55%	76%	100%	100%
Percentage of closure attended beyond 24 hours		10%	24%	0%	0%
Percentage of closures not attended		0%	0%	0%	0%

**One month data verification Audit results for Customer Care – Supplementary requests**

Customer Care - Supplementary Requests	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of supplementary requests received		2622	1098	749	334
Total number of requests attended within 24 hours	95%	2588	905	749	334
Total number of requests attended beyond 24 hours		34	193	0	0
Supplementary requests not attended		0	0	0	0
Percentage of requests attended within 24 hours		99%	82%	100%	100%
Percentage of requests attended beyond 24 hours		0%	18%	0%	0%
Percentage of supplementary requests not attended		0%	0%	0%	0%

**Live calling results for Customer Care – Supplementary requests**

Customer Care - Supplementary Requests	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of supplementary requests received		30	136	30	15
Total number requests attended within 24 hours	95%	22	61	29	14
Total number requests attended beyond 24 hours		8	71	0	15
Supplementary requests not attended		0	14	0	0
Percentage of requests attended within 24 hours		73%	45%	97%	93%
Percentage of requests attended beyond 24 hours		27%	52%	0%	100%
Percentage of supplementary requests not attended		0%	10%	0%	0%

**Live calling results for calls answered electronically**

Customer Care Assessment	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of calls dialed on toll free number		100	370	100	106
<b>Calls answered within 20 seconds</b>					
Total Number of calls answered by IVR in 20 seconds	80%	100	291	100	106
Percentage calls answered in 20 seconds		100%	79%	100%	100%
<b>Calls answered within 40 seconds</b>					
Total Number of calls answered by IVR in 40 seconds	95%	100	370	100	106
Percentage calls answered in 40 seconds		100%	100%	100%	100%

**Live calling results for calls answered by the operator**

Customer Care Assessment	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of calls dialed on toll free number		100	100	100	100
<b>Calls answered within 60 seconds</b>					
Total Number of calls answered by operator in 60 seconds	80%	100	72	100	100
Percentage calls answered in 60 seconds		100%	72%	100%	100%
<b>Calls answered within 90 seconds</b>					
Total Number of calls answered by operator in 90 seconds	95%	100	92	100	100
Percentage calls answered in 90 seconds		100%	92%	100%	100%

**One month data verification Audit results for Refund of deposits after closure**

Refund of deposits after closure	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of cases requiring refund		1008	217	0	0
Number of cases where refund was made in < 60 days	100% within 60 days	913	23	0	0
Percentage cases where refund was made in < 60 days		91%	11%	NA	NA

**Level 1 Services**

LEVEL 1 SERVICES	Bharti	BSNL	RCOM	TATA
<b>TOTAL Calls Made</b>	250	300	260	278
<b>Answered in 60 seconds</b>	249	246	250	166
<b>Percentage calls answered in 60 seconds</b>	99.6%	82.0%	96.2%	59.7%

## 8.2 Parameter wise performance reports for Cellular Mobile services

### One month data verification Audit Results for Accumulated Downtime for community Isolation

Accumulated Downtime	Benchmark	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Total Downtime (In hours)	< 24 hours	0.00	0.00	0.00	0.98	0.00	0.00

### One month data verification Audit Results for CSSR

CSSR	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Total number of call attempts	DNP	DNP	DNP	172073450	DNP	987971355
Total number of successful calls	DNP	DNP	DNP	171930054	DNP	979610861
CSSR	98.44%	98.24%	98.43%	99.92%	95.25%	99.15%

DNP – the figure was obtained directly from the system.

### Live measurement results for CSSR

CSSR	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Total number of call attempts	DNP	DNP	DNP	17119420	DNP	DNP
Total number of successful calls	DNP	DNP	DNP	17110187	DNP	DNP
CSSR	98.38%	98.12%	98.47%	99.95%	98.03%	98.13%

DNP – the figure was obtained directly from the system.

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

CSSR	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Total number of call attempts	182	137	144	151	120	145
Total number of successful calls	182	137	143	151	120	145
CSSR	100%	100%	99%	100%	100%	100%

### One month data verification Audit results for Service Access Delay

Service Access Delay	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
One month data collection	12.13	7.64	8.675	12.84	10.85	1.37

### One month data verification Audit results for SDCCH and TCH Congestion

Traffic Statistics	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
<b>SDCCH Congestion</b>						
Total number of SDCCH Attempts	156818536	DNP	DNP	476791368317	2322	469132777
Total Number of SDCCH Congestions	376364	DNP	DNP	0	2	461480831
Percentage SDCCH Congestion	0.24%	0.21%	0.22%	0.00%	0.09%	1.63%
<b>TCH Congestion</b>						
Total number of TCH Attempts	DNP	DNP	DNP	21542583	5139	1273976930
Total Number of TCH Congestions	DNP	DNP	DNP	1767	76	5414800

Percentage TCH Congestion	0.17%	1.54%	0.47%	0.01%	1.48%	0.43%
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DNP – the figure was obtained directly from the system.

**Live measurement results for SDCCH and TCH Congestion**

Traffic Statistics	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
<b>SDCCH Congestion</b>						
Total number of SDCCH Attempts	DNP	DNP	DNP	46835751947	6892	DNP
Total Number of SDCCH Congestions	DNP	DNP	DNP	0	6	DNP
Percentage SDCCH Congestion	0.22%	0.08%	0.11%	0.00%	0.09%	0.00%
<b>TCH Congestion</b>						
Total number of TCH Attempts	DNP	DNP	DNP	2198694	17869	DNP
Total Number of TCH Congestions	DNP	DNP	DNP	212	196	DNP
Percentage TCH Congestion	0.10%	1.32%	0.15%	0.01%	1.10%	0.00%

DNP – the figure was obtained directly from the system.

**One month data verification Audit Results for Call drop rate**

Call drop rate	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Total number of calls established	26764016	DNP	DNP	21298806	217436961	979610861
Total number of calls dropped	36097	DNP	DNP	74592	1097835	5235586
Call drop rate	0.13%	0.94%	0.82%	0.35%	0.50%	0.53%

DNP – the figure was obtained directly from the system.

**Live measurement results for Call drop rate**

Call drop rate	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Total number of calls established	DNP	DNP	DNP	2171175	26448054	DNP
Total number of calls dropped	DNP	DNP	DNP	6509	129064	DNP
Call drop rate	1.33%	1.02%	0.78%	0.30%	0.49%	1.87%

DNP – the figure was obtained directly from the system.

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

Call drop rate	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Total number of calls established	182	137	143	151	120	145
Total number of calls dropped	2	0	0	1	0	0
Call drop rate	1.10%	0.00%	0.00%	0.66%	0.00%	0.00%

**Drive test results for Voice quality**

Voice quality	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Total number of sample calls	182074	97130	193134	3724	136422	3691

Total number of calls with good voice quality	152659	81011	188278	3691	123392	3645
%age calls with good voice quality	83.84%	83.40%	97.49%	99.11%	90.45%	98.75%

**One month data verification Audit Results for POI Congestion**

POI congestion	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
POI traffic offered on al POI's	DNP	DNP	DNP	264506.1	DNP	DNP
Served traffic for all POI's	DNP	DNP	DNP	264468.76	DNP	DNP
Traffic failed on all POI's	0%	0%	0%	0%	0%	0%

DNP – the figure was obtained directly from the system.

**Live measurement results for POI congestion**

POI congestion	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
POI traffic offered on al POI's	DNP	DNP	DNP	26733.5	DNP	DNP
Served traffic for all POI's	DNP	DNP	DNP	26733.5	DNP	DNP
Traffic failed on all POI's	0%	0%	0%	0%	0%	0%

DNP – the figure was obtained directly from the system.

**One month data verification Audit results for customer care (Electronically)**

Customer Care Assessment	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Total Number of calls received by	DNP	228492	2078036	DNP	DNP	DNP
<b>Calls answered within 20 seconds</b>						
Total Number of calls answered in 20 seconds	DNP	226207	2078036	DNP	DNP	DNP
Percentage calls answered in 20 seconds	99%	99.00%	100.00%	100%	100.00%	90.00%
<b>Calls answered within 40 seconds</b>						
Total Number of calls answered in 40 seconds	DNP	228469	2078036	DNP	DNP	DNP
Percentage calls answered in 40 seconds	99%	100%	100%	100%	100%	99%

DNP – the figure was obtained directly from the system.

**Live calling results for customer care (Electronically)**

Customer Care Assessment	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Total Number of calls received by the operator	100	40	50	190	100	100
<b>Calls answered within 20 seconds</b>						
Total Number of calls answered in 20 seconds	100	40	50	190	100	90
Percentage calls answered in 20 seconds	96.00%	100.00%	100.00%	100.00%	100.00%	90.00%
<b>Calls answered within 40 seconds</b>						
Total Number of calls answered in 40 seconds	100	40	50	190	100	99



Percentage calls answered in 40 seconds	100%	100%	100%	100%	100%	99%
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**One month data verification Audit results for customer care (Voice to Voice)**

Customer Care Assessment	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Total Number of calls received by the operator	DNP	227877	712799	DNP	DNP	<b>559659</b>
<b>Calls answered within 60 seconds</b>						
Total Number of calls answered in 60 seconds	DNP	207368	665287	DNP	DNP	<b>395569</b>
Percentage calls answered in 60 seconds	97.50%	91.00%	93.33%	77.00%	100.00%	70.68%
<b>Calls answered within 90 seconds</b>						
Total Number of calls answered in 90 seconds		226646	674026	na	100	<b>433580</b>
Percentage calls answered in 90 seconds	98.00%	99.46%	94.56%	80.70%	100.00%	77.47%

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

Customer Care Assessment	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Total Number of calls made	100	100	100	100	100	80
Number calls answered within 60 seconds	100	63	100	100	100	40
Percentage calls answered in 60 seconds	100%	63%	100%	100%	100%	50%
<b>Calls answered within 90 seconds</b>						
Number calls answered within 90 seconds	100	81	100	100	100	80
Percentage calls answered in 90 seconds	100%	81%	100%	100%	100%	100%

DNP – the figure was obtained directly from the system.

**One month data verification Audit Results for Billing performance**

Billing Performance	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
<b>Billing disputes</b>						
Total bills generated during the period	453349	96904	176070	104812	200716	294291
Total number of bills disputed	0	213	201	43	183	256
Percentage bills disputed	0.00%	0.22%	0.11%	0.04%	0.09%	0.09%
<b>Resolution of billing complaints</b>						
Total complaints resolved in 4 weeks from date of receipt	0	213	201	43	183	256
Percentage complaints resolved within 4 weeks of date of receipt	100%	100%	100%	100%	100%	100%
<b>Refund of deposits after closure</b>						
Total number of cases requiring refund of deposits	31	1034	61	36	183	256

Total number of cases where refund was made within 60 days	31	1034	61	36	183	256
Percentage cases in which refund was receive within 60 days	100%	100%	100%	100%	100%	100%

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

Resolution of billing complaints	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
Total Number of calls made	60	100	39	12	100	68
Number of cases resolved in 4 weeks	50	80	32	12	69	60
Percentage cases resolved in four weeks	83%	80%	82%	100%	69%	88%

### 8.3 Parameter wise performance reports for Broadband services

#### One month data verification results for Service provisioning

Service provisioning/Activation time	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM
No of connections registered during the period		7525	14282	272	1485	1861	413
Total number registered during 15 days		7486	14282	272	1385	1860	351
Percentage of connections provided within 15 days	100%	99.5%	100.0%	100.0%	93%	99.9%	85.0%

#### Live calling results for Service provisioning

Service Provisioning/Activation Time	B'mark	Bharti	BSNL	Sify	H'Way	VSNL	RCOM
Total Number of calls made		76	100	41	100	100	78
Number of cases in which connection was provided in 15 Days		62	89	38	91	99	66
Percentage cases in which connection was provided in 15 days	100%	82%	89%	93%	91%	99%	85%
Number of cases in which connection was provided beyond 15 days		14	11	3	9	1	12
Percentage cases in which connection was provided after 15 days		18%	11%	7%	9%	1%	15%

#### One month data verification results for Fault repair

Fault Repair/Restoration time	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM
Total number of faults registered during the period		8080	15506	685	6449	19942	1188
Total number of faults repaired by next working day		7509	14110	554	5327	15069	1116
Percentage of faults repaired by next working day	>90%	93%	91%	81%	83%	76%	94%
Total number of faults repaired within three working days		7718	15506	685	6135	18336	1176
Percentage of faults repaired within three working days	>99%	96%	100%	100%	95%	92%	99%

#### Live calling results for fault repair

Fault Repair	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM
Total Number of calls made		30	30	30	30	30	30
Number of cases in which faults were repaired by next working day		11	5	5	10	4	6
Percentage cases in which faults were repaired by next working day	>90%	37%	17%	17%	33%	13%	20%
Number of cases in which faults were repaired within three working days		20	15	18	17	21	14

Percentage cases in which faults were repaired within three working days	>99%	67%	50%	60%	57%	70%	47%
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**One month data verification results for billing performance**

Billing Performance	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM
<b>Billing disputes</b>							
Total bills generated during the period		584541	151426	Prepaid	2069	21201	2019
Total number of bills disputed		1471	35		71	116	2
Percentage bills disputed	<2%	0.25%	0.02%		3.43%	0.55%	0.10%
<b>Resolution of billing complaints</b>							
Total complaints resolved in 4 weeks from date of receipt		1471	35	Prepaid	71	116	2
Percentage complaints resolved within 4 weeks of date of receipt	100%	100%	100%		100%	100%	100%
<b>Refund of deposits after closure</b>							
Total number of cases requiring refund of deposits		762	0	0	49	NP	NA
Total number of cases where refund was made within 60 days		762	0	0	40	NP	NA
Percentage cases in which refund was receive within 60 days	100%	100%	100%	100%	82%	100%	NA

**Live calling results for billing complaints**

Resolution of billing complaints	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM
Total Number of calls made		55	100	Prepaid	35	100	13
Number of cases resolved in 4 weeks		47	67		11	40	8
Percentage cases resolved in four weeks	100%	85%	67%		31%	40%	62%

**One month data verification results for customer care**

Customer Care Assessment	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM
Total Number of calls received by the operator		65382	81432	984	14986	427497	232805
<b>Calls answered within 60 seconds</b>							
Total Number of calls answered in 60 seconds		29486	79722	984	14986	398646	218836
Percentage calls answered in 60 seconds	>60%	45%	98%	100%	100%	93%	94%
<b>Calls answered within 90 seconds</b>							
Total Number of calls answered in 90 seconds		36873	81432	984	14986	418372	223492
Percentage calls answered in 90 seconds	>80%	56%	100%	100%	100%	98%	96%

**Live calling results for call centre**

Customer Care Assessment	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM
Total Number of calls made		100	100	100	100	100	100
<b>Calls answered within 60 seconds</b>							
Number calls answered within 60 seconds		98	94	99	100	100	100
Percentage calls answered in 60 seconds	>60%	98%	94%	99%	100%	100%	100%
<b>Calls answered within 90 seconds</b>							
Number calls answered within 90 seconds		100	100	100	100	100	100
Percentage calls answered in 90 seconds	>80%	100%	100%	100%	100%	100%	100%

**One month data verification results for Service Availability/Uptime**

Service Availability Uptime	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM
Total Operational Hours		85913400	744	744	744	1490400	744
Total Downtime		3300	0	0	8	22640	5.62
Total time when the service was available		85910100	744	744	736	1467760	738.38
Service Availability Uptime in Percentage	>98%	100.0%	100.0%	100.0%	98.9%	98.5%	99.2%

**Three day live measurement results for Service Availability/Uptime**

Service Availability Uptime	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM
Total Operational Hours		8271120	72	72	72	139608	DNA
Total Downtime		0	0	0	0.4	1225	DNA
Total time when the service was available		8271120	72	72	71.6	138383	DNA
Service Availability Uptime in Percentage	>98%	100.00%	100.00%	100.00%	99.4%	99.12%	DNA

**One month data verification results for Bandwidth utilisation**

Bandwidth Utilisation	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM
<b>Intra-network links (POP to ISP Node)</b>							
Total number of intra network links		406	21	400	3	4	4
No of Intra network found to be above 90%		0	0	5	0	0	0
<b>Upstream Links (ISP Node to IGSP/NIXI/NAP)</b>							
Total number of upstream links		1	37	28	6	35	7
No of Intra network found to be above 90%		0	1	0	1	0	0
Total International Bandwidth available from ISP Node to IGSP/NIXI/NAP (In mpbs)		2488	6680	3218	75	21688	895
Total International Bandwidth utilised during peak hours		2004	3923	2069	69	16021	360
Percentage Bandwidth utilisation during peak hours (In mpbs)	<80%	81%	59%	64%	92%	74%	40%

**Live measurement results for Bandwidth utilisation**

Bandwidth Utilisation	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM
<b>Intra-network links</b>							
Total number of intra network links		406	21	400	3	4	4
No of Intra network Links tested		20	21	18	3	4	4
No of Intra network found to be above 90%		0	0	0	0	0	0
<b>International Bandwidth (ISP Node to IGSP/NIXI/NAP)</b>							
Total number of upstream links		2	37	28	6	35	7
No of Intra network found to be above 90%		0	0	0	1	0	0
Total International Bandwidth available from ISP Node to IGSP/NIXI/NAP (In mpbs)		2488	6680	3218	75	21688	895
Total International Bandwidth utilised during peak hours		1928	4685	2052	67.6	16021	381
Percentage Bandwidth utilisation during peak hours (In mpbs)	>80%	77%	70%	64%	90%	74%	43%

**Live calling results for data download speed**

Bandwidth Utilisation	B'mark	Bharti	BSNL	Sify	H'way	VSNL	RCOM
Data download speed	>80%	87%	87%	82%	67%	90%	NP

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

### **9.1 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 where 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: By 31st March 2007: <5 and By 31st March 2008: <3, averaged over the quarter Fault repair by next working day: By next working day: >90% and within 3 days: 100%, averaged over a month.
<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>4. 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
<b>Audit Procedure</b>	<p>IMRB Auditors to verify and collect data pertaining to</p> <ul style="list-style-type: none"> <li>- Number of Billing complaints received at the service provider's level</li> <li>- Last billing cycle stated should be such that due date for payment of bills must be beyond the date when this form is filled.</li> <li>- Include all types of bills generated for customers. This could include online as well as other forms of bills presentation including printed bills</li> <li>- 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.</li> </ul> <p><b>Live calling :</b> -</p> <ul style="list-style-type: none"> <li>- IMRB Auditors collected the list of all the subscribers who have made billing complaints in the month prior to the Audit.</li> <li>- 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</li> </ul>

<b>5. Customer care promptness (Shifts, Closures and Additional facility)</b>	
<b>Computational Methodology</b>	Supplementary (Additional) services requests: A few of the supplementary services that are considered for the audit purpose: Clip (caller line identification presentation) facility , STD, ISD, Call forwarding, Voice Mail etc.
<b>Benchmark</b>	Shifting of telephone line : Less than 3 days Processing of closure request: Less than 24 hours Supplementary (Additional) services requests: Less than 24 hours
<b>Audit procedure</b>	<p><b>IMRB Auditors collected and verified data pertaining to</b></p> <p><b>Shifting Request: (Following key points were taken care of while verifying the data)</b></p> <ul style="list-style-type: none"> <li>- Date of filing form should be at least 3 working days after the date of month appraised.</li> <li>- All the holidays are excluded and only working days are considered</li> <li>- The number of shift requests per month does not include the pending connections of the previous months.</li> </ul> <p><b>Processing of closure request (Following key points were taken care of while verifying the data)</b></p> <ul style="list-style-type: none"> <li>- The operator includes all Requests for volunteer Permanent Closure and External (shifts to other exchanges) Shift requests received at their exchange.</li> <li>- DNP (due to Non – payment) cases are excluded</li> <li>- All holidays are excluded for calculating 24 hours.</li> <li>- Closure requests attended in the previous months are excluded</li> <li>- The period for closure starts from the time of submission of application by the subscriber.</li> </ul> <p><b>Supplementary (Additional) services requests</b></p> <ul style="list-style-type: none"> <li>- All the supplementary services that have any kind of human intervention are to be covered here. It also includes the IVR assisted services.</li> <li>- Do not include holidays.</li> <li>- Collect the list of all cases of all subscribers requested for additional facility in past 48 hours prior to IMRB staff visit.</li> <li>- The period starts from the time of submission of application by the subscriber.</li> </ul> <p>Live calling was done in 10% of such cases to check the time taken to attend all such requests</p>



6. Response time to customer (Electronically and Voice to Voice)	
Computational Methodology	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
Benchmark	(i) % age of calls answered (electronically): within 20 seconds = 80% of the calls over a period within 40 seconds = 95% of the calls over a period (ii) % age of calls answered by operator / voice to voice): within 60 seconds = 80% of the calls over a period within 90 seconds = 95% of the calls over a period
Audit Procedure	-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. - All the supplementary services that have any kind of human intervention are to be covered here. It also includes the IVR assisted services. - 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. <u>Live calling:</u> - - 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 - Time to answer the call by the operator was assessed from the time interviewer pressed the requisite button for being assisted by the operator. - All the supplementary services that have any kind of human intervention are to be covered here. It also includes the IVR assisted services.

7. Time taken to refund of deposits after closure	
Computational Methodology	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
Benchmark	Time taken to refund = 100% within 60 days
Audit Procedure	IMRB Auditors verified and collected data pertaining to - Cases requiring refund of deposits after closure are to be included - 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 <u>Live calling :</u> - - Collect the details of all the cases for which the refund was provided by the operator prior to the month of Audit - 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)

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

## 9.2 For Cellular Mobile services

1. Accumulated Downtime of the Network	
Computational Methodology as per QoS definition	<p>The total time for which the network is down for a particular service provider resulting in a community isolation</p> <p><b>Computational Methodology: Accumulated downtime = Summation of Significant Downtime*</b></p> <p>* Significant Downtime to be defined as duration of network outages that result in groups of customers in PLMN being isolated for more than an hour at a stretch. Planned outages during low/ no traffic hours for maintenance/ modernisation/ network enhancement work etc. should be ignored</p>
Benchmark	< 24 hrs
Audit Procedure	<p>IMRB auditors collected and verified data pertaining to:</p> <ul style="list-style-type: none"> <li>• 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 audited</li> <li>• Outages could be in MSC, BSC, BTS or in trunk. In case of BTS failure we have included only those that resulted in community isolation</li> </ul>

2. Call Set-Up Success Rate (CSSR)	
Computational Methodology as per QoS definition	<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} * 100</math></p>
Benchmark	> 95%
Audit Procedure	<p>IMRB auditors collected and verified data pertaining to</p> <ul style="list-style-type: none"> <li>↳ The cell-wise data generated through counters/ MMC available in the switch for traffic measurements was verified by the auditors</li> <li>↳ CSSR calculation was measured using OMC generated data only</li> <li>↳ Measurement was done only in Time Consistent Busy Hour (TCBH) period for all days of the week</li> </ul>

3. Service Access Delay	
<p>Computational Methodology as per QoS definition</p>	<p>Service Access delay is a summation of following parts in the call flow:</p> <ul style="list-style-type: none"> <li>↳ Time to connect calls</li> <li>↳ Time to confirm instruction to connect</li> <li>↳ Time to release calls</li> <li>↳ Time to alert mobile set</li> </ul> <p><b>Computational Methodology:</b>  <u>Time to connect calls</u> = Time between "<u>Origination</u>" and "<u>Service Connect</u>" message from BTS to Mobile  <u>Time to confirm instruction to connect</u>* = Time between "<u>Origination</u>" and "Base Station Acknowledgment"                      Note: Time measured here is a sub-part of first measurement  <u>Time to release call</u> = Time between "<u>Release on Reverse Link</u>" and "<u>Release on Forward Link</u>"  <u>Time to alert a mobile</u> = This is measured as a mean of two measurements (i+ii/2):</p> <ul style="list-style-type: none"> <li>● First paging attempt = Time between receiving a call request at PLMN and alerting the mobile</li> <li>● Final paging attempt = Time between receiving a call request at PLMN and hearing start of "Not reachable" announcement</li> </ul>
<p>Benchmark</p>	<p>Between 9 to 20 seconds depending on number of paging attempts (Average of 100 calls &lt; = 15 sec.)</p>
<p>Audit Procedure</p>	<p><b>IMRB Auditors collected and verified records pertaining to:</b></p> <ul style="list-style-type: none"> <li>↳ Audit of the details of Layer 3 Message diagnostics generated from periodic Drive tests conducted at different parts of the network used to arrive at the benchmarks reported to TRAI was conducted</li> <li>↳ Validating that at least <b>100 sample</b> calls should have been by the service provider made during <b>Time consistent busy hour (TCBH)</b> for the quarter using standard drive test equipment. (Note: measurement using engineering handsets was not deemed acceptable)</li> <li>↳ The component 'first paging attempt' was checked whether it was measured by the operator using a protocol analyser.</li> </ul>

4. Network Congestion Parameters	
Computational Methodology as per QoS definition	<p>It means a call is not connected because there is no free channel to serve the call attempt. This parameter represents congestion in the network. It happens at three levels:</p> <ul style="list-style-type: none"> <li>↳ SDCCH Level: Stand-alone dedicated control channel</li> <li>↳ TCH Level: Traffic Channel</li> <li>↳ POI Level: Point of Interconnect</li> </ul> <p><b>Computational Methodology:</b></p> <ul style="list-style-type: none"> <li>↳ <b>SDCCH / TCH Congestion% = <math>[(A1 \times C1) + (A2 \times C2) + \dots + (An \times Cn)] / (A1 + A2 + \dots + An)</math></b> <ul style="list-style-type: none"> <li>● Where:-A1 = Number of attempts to establish SDCCH / TCH made on day 1</li> <li>● C1 = Average SDCCH / TCH Congestion % on day 1</li> <li>● A2 = Number of attempts to establish SDCCH / TCH made on day 2</li> <li>● C2 = Average SDCCH / TCH Congestion % on day 2</li> <li>● An = Number of attempts to establish SDCCH / TCH made on day n</li> <li>● Cn = Average SDCCH / TCH Congestion % on day n</li> </ul> </li> <li>↳ <b>POI Congestion% = <math>[(A1 \times C1) + (A2 \times C2) + \dots + (An \times Cn)] / (A1 + A2 + \dots + An)</math></b> <ul style="list-style-type: none"> <li>● Where:-A1 = POI traffic offered on all POIs (no. of calls) on day 1</li> <li>● C1 = Average POI Congestion % on day 1</li> <li>● A2 = POI traffic offered on all POIs (no. of calls) on day 2</li> <li>● C2 = Average POI Congestion % on day 2</li> <li>● An = POI traffic offered on all POIs (no. of calls) on day n</li> <li>● Cn = Average POI Congestion % on day n</li> </ul> </li> </ul>
Benchmark	<p>SDCCH Congestion: &lt; 1%                      TCH Congestion: &lt; 2%                      POI Congestion: &lt; 0.5%</p>
Audit Procedure	<p><b>IMRB Auditors collected and verified records pertaining to:</b></p> <ul style="list-style-type: none"> <li>↳ Audit of the details of SDCCH and TCH congestion percentages computed by the operator (using OMC–Switch data only) was conducted</li> <li>↳ The operator should be measuring this parameter during Time consistent busy hour (TCBH) only SDCCH</li> <li>↳ The POI details were verified from the switch for all the links of the operators</li> </ul>

5. Call Drop Rate	
Computational Methodology as per QoS definition	<p>The dropped call rate is the ratio of successfully originated calls that were found to drop to the total number of successfully originated calls that were correctly released</p> <ul style="list-style-type: none"> <li>↳ <b>Total calls dropped</b> = All calls ceasing unnaturally i.e. due to handover or due to radio loss</li> <li>↳ <b>Total calls established</b> = All calls that have TCH allocation during busy hour</li> </ul> <p><b>Computational Methodology:</b>                      Total Calls Dropped / Total Calls Established x 100</p>
Benchmark	< 3%
Audit Procedure	<p><b>IMRB Auditors collected and verified records pertaining to:</b></p> <ul style="list-style-type: none"> <li>↳ Audit of traffic data of the relevant quarter kept in OMC-R at MSCs and used for arriving at CDR was conducted.</li> <li>↳ The operator should only be considering those calls which are dropped during Time consistent busy hour (TCBH) for all days of the relevant quarter</li> </ul>

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

7. Service Coverage	
Computational Methodology as per QoS definition	<p>Definition:</p> <ul style="list-style-type: none"> <li>↳ The level of signal available in a particular part of a city is known as signal strength.</li> </ul> <p><b>Computational Methodology:</b></p> <ul style="list-style-type: none"> <li>↳ Service Coverage for route type x = <math>[(N1 \times CSS1) + (N2 \times CSS2) + \dots + (Nn \times CSSn)] / (N1 + N2 + \dots + Nn)</math></li> <li>↳ Where:- N1 = Number of calls on type of route x made in drive test 1</li> <li>↳ CSS1 = Average coverage signal strength on type of route x in drive test 1 (in dBm)</li> <li>↳ N2 = Number of calls on type of route x made in drive test 2</li> <li>↳ CSS2 = Average coverage signal strength on type of route x in drive test 2 (in dBm)</li> <li>↳ Nn = Number of calls on type of route x made in drive test n</li> <li>↳ CSSn = Average coverage signal strength on type of route x in drive test n (in dBm)</li> </ul>
Benchmark	<p>Indoor &gt;= -75 dBm                      In-vehicle &gt;= -85 dBm                      Outdoor – in city &gt;= -95 dBm</p>
Audit Procedure	<p><b>IMRB Auditors collected and verified call centre records pertaining to:</b></p> <ul style="list-style-type: none"> <li>↳ Audit was conducted based on the details of periodic drive tests conducted at different part of the network during Time consistent busy hour (TCBH) which were used to arrive at the benchmarks reported to TRAI.</li> <li>↳ Procedures were verified that were to be followed by operator for obtaining relevant details for computing this parameter:-                             <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> </ul> <p>↳ <i>Measurements using Engineering handsets were not acceptable</i></p>

8. Response time to customer (Electronically and Voice to Voice)	
Computational Methodology	<p><b>To connect to IVR:</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>                      Percentage of calls answered in a specified time = <math>(\text{Total no. of calls answered within that specified time} / \text{Total no. of calls dialed for a particular service}) \times 100</math></p>
Benchmark	<p>(i) %age of calls answered (electronically):</p> <ul style="list-style-type: none"> <li>↳ within 20 seconds = 80%</li> <li>↳ within 40 seconds = 95%</li> </ul> <p>(ii) %age of calls answered by operator (voice to voice):</p> <ul style="list-style-type: none"> <li>↳ within 60 seconds = 80%</li> <li>↳ within 90 seconds = 95%</li> </ul>

<p><b>Audit Procedure</b></p>	<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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9.1 Billing complaints per 100 bills issued	
<p><b>Computational Methodology as per QoS definition</b></p>	<p>Billing complaints includes any of the following complaints related to billing from the point of view of customer:</p> <ul style="list-style-type: none"> <li>• Local call charges billed as STD/ISD or vice-versa</li> <li>• Toll free numbers charged</li> <li>• Wrong roaming charges</li> <li>• Call made/received disputed</li> <li>• Wrongly charged extra for some service (SIM replacement charged twice, service not used but charged etc.)</li> <li>• Cheque submitted on time but charged penalty for paying beyond due date (in case customer is not at fault i.e. all those that operator cannot prove that he/she is not lying)</li> <li>• Payment made but not reflected (may be wrongly adjusted to another customer etc.)</li> </ul> <p><b>Billing complaints per 100 bills issued</b> = Total billing complaints** received during the relevant quarter / Total bills generated* during the relevant quarter</p> <p><i>* All types of bills generated for customers i.e. printed bills, online bills and any other forms of bills generated are to be included</i></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><b>Benchmark</b></p>	<p>&lt; 0.1% billing complaints per 100 bills</p>
<p><b>Audit Procedure</b></p>	<p>IMRB auditors collected and verified data pertaining to</p> <ul style="list-style-type: none"> <li>- Number of bills generated</li> <li>- Number of billing complaints received</li> <li>- %age complaints per 100 bills</li> </ul>

9.2 Resolution of billing complaints	
Computational Methodology as per QoS definition	<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>
Benchmark	100% cases to be resolved within 4 weeks
Audit Procedure	<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> Overall 100 number of live calls 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>

9.3 Period of refunds / payments due to customers	
Computational Methodology as per QoS definition	<p>Period of all refunds = Maximum value of 'Time taken to refund'</p> <p>where:-Time taken to refund = Date of refund – date of lodging complaint</p>
Benchmark	100% cases in less than 4 weeks
Audit Procedure	<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></p> <p><b>Operator to provide details of:-</b></p> <ul style="list-style-type: none"> <li>• <u>Dates of lodging</u> of all billing complaints resolved in favour of customer and resulting in requirement of a refund by the operator</li> <li>• <u>Dates of refund</u> pertaining to all billing complaints received during the relevant quarter</li> </ul> <p><b>Also random live checks of all subscribers entitled for refund were conducted</b></p>



### 9.3 For Broadband services

1. Service provisioning/Activation time	
Computational Methodology as per QoS definition	<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>
Benchmark	100 % cases in =<15 working days.
Audit Procedure	<p>IMRB 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> : Atleast 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	
Computational Methodology as per QoS definition	<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>
Benchmark	By next working day: > 90% and within 3 working days: 99%
Audit Procedure	<p>IMRB 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> : Atleast 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	
Computational Methodology as per QoS definition	<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>
Benchmark	< 2% billing complaints per 100 bills
Audit Procedure	<p>IMRB auditors collected and verified data pertaining to</p> <ul style="list-style-type: none"> <li>- Number of bills generated</li> <li>- Number of billing complaints received</li> <li>- %age complaints per 100 bills</li> </ul>

3.1. Resolution of billing complaints	
Computational Methodology as per QoS definition	<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>
Benchmark	100% cases to be resolved within 4 weeks
Audit Procedure	<p>IMRB Auditors collected and verified data pertaining to</p> <ul style="list-style-type: none"> <li>- Total number of billing complaints/bills disputed</li> <li>- Number of complaints resolved in 4 weeks</li> </ul> <p>Live calling :-                      -Overall 100 number of live calls are to be made in a licensed service area/circle for each service provider. However in certain cases the sample could not be achieved as bills disputed (prior to the month of Audit) were found to be less than 100</p>

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

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

5. Bandwidth Utilization	
Computational Methodology as per QoS definition	Percentage Bandwidth available on the link = Total Bandwidth* utilised in TCBH for the period/ Total Bandwidth Available during the period*100  Multi Router Traffic Grapher (MRTG) is to be used to measure the details of Bandwidth utilisation by service providers
Benchmark	-- < 80% link(s)/route bandwidth utilization during peak hours (TCBH). -- If on any link(s)/route bandwidth utilization exceeds 90%, then network is considered to have congestion. For this additional provisioning of bandwidth on immediate basis, but not later than one month is mandated.
Audit Procedure	<b>IMRB Auditors collected and verified call centre records pertaining to</b> <b>(1)POP to ISP gateway Node [Intra – network] Links</b> -Auditors to verify and collect data pertaining to Total Bandwidth available and Total Bandwidth utilised during TCBH at some of the sample intra network links (POP to ISP Node) on each of the three days of live measurement separately - Total Bandwidth available and Total bandwidth utilised during at the sample links TCBH for the complete month of audit - Total number of intra network links having >90% bandwidth utilisation during the month of Audit <b>(ii) ISP Gateway Node to IGSP / NIXI Node upstream Link's) for international connectivity</b> -Total number of upstream links for International connectivity -Total number of links having Bandwidth > 90%Total Bandwidth available and Total Bandwidth utilised on all the upstream links during TCBH (POP to ISP Node) on each of the three days of live measurement separately -Total Bandwidth available and Total bandwidth utilised at all the international links during TCBH for the complete month of audit (Also obtain details separately for the days)

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

Service availability/Uptime	
Computational Methodology as per QoS definition	<p>Service availability/uptime is the measure of the degree to which the broadband access network including ISP Node is operable and not in a state of failure or outage at any point of time for all users</p> <p>Service availability/Uptime = <math>(\text{Total operational hours} - \text{Total Downtime hrs}) * 100 / \text{Total operational hours}</math></p> <p>Total downtime for all users, including the LAN switches, Routers, Servers, Etc at ISP Node and connectivity to upstream service provider are to be included</p> <p>Planned outages for routine maintenance of the system are excluded from the calculation of service availability/uptime</p>
Benchmark	<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>
Audit Procedure	<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>

Packet loss	
Computational Methodology as per QoS definition	<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>
Benchmark	<1 %
Audit Procedure	<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>

Network Latency	
Computational Methodology as per QoS definition	<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>
Benchmark	<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 (Sattelite)</p>
Audit Procedure	<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>