

# Objective Assessment of Quality of Services for (QoS) for Basic Wireline, Cellular Mobile (Wireless) and Broadband Service Providers – Kolkata 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 Kolkata circle against Quality of Services benchmarks for various parameters laid down by TRAI in respective regulations for Basic (Wireline), Cellular (Mobile) and Broadband services**

## Table of contents

	<u>Page no.</u>
1.0 Background .....	4
2.0 Objectives and Methodology .....	5
3.0 Sampling methodology .....	6
4 Audit methodology .....	7
4.1 Basic (Wireline) Services .....	7
4.2 Cellular Mobile Services .....	8
4.3 Broadband Services .....	9
4.4 Audit Limitations .....	10
5 Executive Summary .....	11
5.1 Service provider performance report based on one month data collection – Basic (Wireline) Services .....	11
5.2 Service provider performance report based on one month data collection: Cellular Mobile Services .....	15
5.3 Service provider performance report based on one month data collection – Broadband Services .....	22
6. Detailed findings – Includes comparison between Live calling/Live measurements and One month data collection .....	27
6.1 Graphical/Tabular Representations for Basic (Wireline) services .....	27
6.2 Graphical/tabular Representations for Cellular Mobile Services .....	32
6.3 Graphical/Tabular Representations for Broadband services .....	37
7.0 Compliance reports: Results of Verification of Records for July to September 2007 .....	42
7.1 Basic (Wireline) services .....	42
7.2 Cellular Mobile services .....	43
7.3 Broadband services .....	44
7.4 Compliance Report – Conclusions .....	45
7.4.1 Basic Wireline Services .....	45
7.4.2 Cellular Mobile Services .....	45
7.4.3 Broadband Services .....	45
8. Annexure - I .....	46
8.1 Parameter wise performance reports for Basic Wireline services .....	46
8.2 Parameter wise performance reports for Cellular Mobile services .....	50
8.3 Parameter wise performance reports for Broadband services .....	54
9 Annexure – II Detailed Explanation of Audit methodology (Parameter wise) .....	58
9.1 For Basic wireline services .....	58
9.2 For Cellular Mobile services .....	61
9.3 For Broadband services .....	68

## **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 has been specified in the TRAI notification for Quality of Services of Broadband Service Regulation, 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 Kolkata 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 Kolkatacircle 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

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 collection 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)



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

### **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 20 exchanges were audited in Kolkata circle
- For rest of the service providers (TATA, Reliance and Bharti Airtel) 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 MSCs (GMSCs) and Mobile Switching Centers (MSCs) 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 and number of MSCs covered in Kolkata circle

- Bharti Airtel Ltd. – 2
- Tata teleservices ltd – 3
- Reliance communications – 3
- RTL – 1
- BSNL – 4
- Vodafone Essar Ltd. – 4

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

- Audits for various Broadband service providers were conducted at the service provider's central node in the Kolkata 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 Kolkata and data submitted by various exchanges/POPs providing Broadband service was verified and collected. This was done in such a way that at least 5% of POPs spread across 10% of SDCA's were covered. Also data for network related parameters i.e. Network Latency, Bandwidth utilisation and service availability was obtained from BSNL's central node in Bangalore.
- Following Broadband service providers were Audited in Kolkata circle: - Bharti Airtel Ltd., Sify, Reliance, BSNL and VSNL (TATA communications Ltd.). For VSNL one month Audit data provided herewith includes findings for UP (E) as the service provider reports it cumulatively to TRAI.

## **4 Audit methodology**

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

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

Sl. No.	Parameters	One month data collection	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 the entire 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 DATA COLLECTION FOR THE MONTH OF AUDIT	AS FOUND IN 3 DAY LIVE MEASURE MENT 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		
<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		

### 4.3 Broadband Services

In a nutshell, the audit methodology was as follows:

	Parameters	Verification of PMR	Three day live measurement	Data Collection 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, 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 Kolkata circle. The executive summary encapsulates the key findings of the Audit by providing: -

- A “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 completed within 7 days	100%	87%	43%	79%	All connections provided in technically non feasible areas
2	Fault incidences (No. of faults/100 customers/month)	< 3	5	10	1.33	6
3	Fault Repair					
3.1	Faults repaired within 24 hours	>90%	59%	60%	97%	100%
3.2	Faults repaired within three working days	100%	83%	87%	98%	100%
4	Mean time to Repair (MTTR)	<8 hours	9.45	32	5	1.2
5	Call Completion Rate (CCR)	>55%	58%	71%	DNA	69%
6	Metering and billing credibility					
6.1	Billing complaints per 100 bills issued	<0.1%	1.41%	0.01%	0.09%	0.43%
6.2	%age of billing complaints resolved within 4 weeks	100%	100%	100%	100%	100%
7	Customer care/helpline promptness					
7.1	Shift requests attended					
	Shift requests attended within 3 days	95%	100%	59%	96%	NA
7.2	Closure request attended					
	Closure within 24 hours	95%	100%	64%	100%	NA
7.3	Supplementary (additional) service requests attended					
	Additional facility provided within 24 hours	95%	100%	97%	100%	23%
8	Response time to customer for assistance					
8.1	% age call answered through IVR in 20 seconds	80%	DNA	Call centre data not available at the exchanges	100%	DNA
	% age call answered through IVR in 40 seconds	100%	DNA		100%	DNA
8.2	% age calls answered by operator in 60 seconds	80%	97%		95%	97%
	% age calls answered by operator in 90 seconds	95%	99%		98%	97%
9	Time taken for refund of deposits after closure					
7.1	%age cases where refund received within 60 days	100%	100%	71%	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 only to corporate clients in Kolkata 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 Kolkata 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 varying 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.

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 results pertain only to sample 5% of exchanges spread over 10% of Short Distance Charging Area (SDCA's) in Kolkata circle.

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

#### Provision of telephone after registration of demand

- None of the operator was found to be meeting the benchmark for the month in which the audit was carried out. For TATA teleservices out of 28 new corporate connections registered during the month of audit, in none of the cases connection was provided within 15 days. It should also be noted that according to the service provider all these connections were provided to corporate customers in Technically Non Feasible (TNF) areas.
- Variation was found in the live calling and audit data findings for all the service providers. A part of it can be attributed to low sample sizes.
- 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 resist in providing connections in technically non feasible areas to retail customers.

#### Fault incidence / clearance statistics

- Only RCOM meets the TRAI benchmark for fault incidences. For BSNL the figures reported are averaged across 5% of exchanges across 10% of the SDCAs.
- During exchange audits for BSNL, it was observed that the fault incidences were higher at some of the exchanges whereas some others were compliant to the TRAI benchmark.
- The scores for the 'Faults repaired within 24 hours' were found to be 59%, 60%, 97% and 100% for Bharti, BSNL, Reliance and Tata teleservices. However it should be noted that TATA teleservices registered very less faults owing to low subscriber base
- Live calling scores for the fault repair within 24 hours for Bharti and BSNL were found to be low for most of the service providers. As mentioned earlier a part of it could be attributed to low sample (10% of total faults registered in month prior to Audit)
- Mean Time to Repair (MTTR) for BSNL was found to be very high for some of the exchanges which has resulted in higher average score for the operator. The operator claims that the prime reason for the same is because of the breakdowns caused by external agencies for e.g. Municipal Corporation of Kolkata carrying out construction work which results in cable cuts.

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.
- 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 and MTNL. 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 and TATA tele services were found to be not meeting the benchmark during the month in which audit was carried out for %age bills disputed.
- However during verification of records of various service providers namely Bharti and Reliance it was found that definition of billing complaints remains to be lenient as only those cases where an internal ticket is opened (wherever refund is due to the subscriber) by the operator are being taken into consideration.

Customer care/helpline promptness

- For “shift and closure requests attended within 3 days” audit data BSNL does not meet the TRAI specified benchmark for data obtained from 5% of exchanges during the month in which audit was carried out. For TATA teleservices there were no shift requests received in the month in which audit was carried out.
- For supplementary service requests all the service providers except TATA teleservices meet the benchmark. Out of total 107 requests received for additional services during the month in which audit was carried out for only 23% were attended in 24 hours.

Response time to customer for assistance

- For customer care number through electronic IVR menu parameter, live calling scores for Bharti and R Com were found to be 100% for call answering through IVR in 20 seconds.
- For call answering by operator in 60 seconds also, all the operators are meeting the benchmark, as per the guidelines of TRAI. However, BSNL does not meet the benchmark for live calling for calls answered by the operator within 60 seconds with a score of 54% out of 100 calls made.
- 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 TATA teleservices claimed that its Wireline customers have direct access to the voice operator for customer care. Hence, details of calls made to IVR are not available for the service provider.

Time taken for refund of deposits after closure

- Only BSNL was found not to be meeting the benchmark as only 71% of cases eligible for refund after closure in sample exchanges audited were observed to be resolved in 60 days.

Level 1 Services

To test the efficiency of level 1 services (West Bengal Tourism, Indian Railway Enquiry, Trunk booking, Child helpline, Women helpline, Airline booking) offered by various service providers. Atleast 200 calls were made to different numbers provided by service providers and time taken to answer the call was noticed. Bharti & TATA emerged out to be the most efficient with 100% of the total calls that were made being answered in 60 seconds, followed by BSNL with 98% calls getting answered in 60 seconds. RCOM's score on the same was observed to be 97%.

Live Measurement Findings

**Call Completion Rate (Benchmark > 55%)**

Parameter	Benchmark	Bharti	BSNL	RCOM	TATA
Call Completion Rate (CCR)	>55%	58%	83%	DNA	80%

All of the service providers were found to be meeting TRAI benchmark for Call Completion Rate during the three days live measurement for which data was obtained and verified. BSNL led the way with a CCR of 83% followed closely by TATA at 80%, with both being well above the benchmark. Reliance 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 and MTNL. 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.

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

Parameters	Benchmark	Bharti	BSNL	Vodafone	TATA Teleservices	RTL	RCOM
Accumulated downtime for community isolation	< 24 hrs.	0.00	0.00	0.00	0.00	0.00	0.00
Call Set Up Success Rate (CSSR)	> 95%	99.99%	98.12%	99.99%	98.43%	99.85%	98.91%
Service Access Delay*	9 to 20 seconds (< = 15 seconds for 100 calls)	7.00	11.60	9.00	5.13	9.05	0.50
<b>Blocked Call Rate</b>							
<i>SDCCH/Paging Channel Congestion</i>	<1%	0.52%	0.39%	0.39%	0.00%	0.05%	0.00%
<i>TCH Congestion</i>	< 2%	0.26%	0.81%	0.81%	2.00%	0.09%	0.00%
Call drop rate	< 3%	1.13%	0.94%	0.87%	0.86%	1.15%	0.68%
Percentage connections with good voice quality*	> 95%	96.69%	98.76%	96.76%	97.46%	97.94%	96.12%
<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%	0.1%
<b>Calls answered electronically</b>							
Percentage calls answered within 20 seconds	80%	100%	91%	100%	100%	100%	100%
Percentage calls answered within 40 seconds	95%	100%	96%	100%	100%	100%	100%
<b>Calls Answered by the operator</b>							
Percentage calls answered within 60 seconds	80%	93%	83%	95%	89%	87%	98%
Percentage calls answered within 90 seconds	95%	94%	95%	97%	96%	Not measured by operator	99%
<b>Billing Complaints</b>							
Billing complaints per 100 bills issued	<0.1%	0.00%	0.00%	0.04%	0.01%	RTL has no postpaid subscribers	0.09%
Percentage billing complaints resolved within 4 weeks	100%	100%	100%	99%	100%		100%
Period of refunds/payments due to customers from the date of resolution of complaints	100% cases in 4 weeks	100%	100%	99%	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  
 # All the service providers complied with the TRAI benchmark on an average basis. However, details of the areas where service coverage has been found to be inadequate have been explained in critical findings for drive tests

\*\* Methodology not in line with QoS



Figures provided on All India basis



Not meeting the benchmark

DNA = Details not available (the reasons for the same have been given in critical findings)  
 NA: Not Applicable

### Critical findings: Cellular Mobile Services

The audit for cellular mobile service providers were conducted at their respective MSCs in the Kolkata 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	1900 – 2000	1900 – 2000
BSNL	1900 – 2000	1900 – 2000
RCOM	1100 – 1200	1100 – 1200
RTL	2100 – 2200	2100 – 2200
TATA	1900 – 2000	1900 – 2000
Vodafone	2100 – 2200	2100 – 2200

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

#### Accumulated Downtime:

In the Kolkata 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. 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 Bharti & Vodafone with 99.99% of their calls getting completed. All the other operators have CSSR of more than 98%. 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 Kolkata 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 BSNL with 11.60 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 TATA for TCH congestion are meeting the TRAI specified on the congestion parameters. TATA does not meet the TRAI specified benchmark with a TCH congestion of 2.00% which was found during the one month data collected for the month of audit. RCOM leads the way in network congestion parameters with almost no 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 for 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 successful call attempts for all operators. Also, all of service providers were found to be meeting the TRAI specified benchmark. The call drop rate is highest for RTL at 1.15% followed closely by Airtel 1.13%. The lowest call drop rate was of RCOM with only 0.68% call drop.

% connections with good voice quality:

Almost all of the operators are measuring these parameters via their periodic drive tests. 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 all the operators were able to meet the benchmark for the parameter.

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 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 within 90 seconds, all the service providers except Bharti at 94% meet the benchmark during the month of audit.

Billing performance

All the operators were found not to be meeting the benchmark of < 0.1% complaints registered per 100 bills issued. Vodafone just misses the benchmark for 100% complaint resolution with 4 weeks and 100% refunds within 4 weeks at 99%. However, all the operators consider only those as complaints where refund is due to the customers.

Inter operator calls assessment

Inter operator call Assessment (From / To)	Bharti	BSNL	Vodafone	TTL	RTL	RCOM
Bharti	NA	100%	100%	99%	100%	100%
BSNL	87%	NA	72%	78%	81%	81%
Vodafone	100%	92%	NA	100%	100%	98%
TATA	100%	89%	98%	NA	97%	100%
RTL	100%	75%	100%	99%	NA	100%
RCOM	100%	89%	100%	100%	96%	NA

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 all operators except TTL were connected 100% of the times. Similarly BSNL's connectivity with all the operators was found to be very low with the highest connectivity being observed with Bharti at only 87%. BSNL's connectivity with Vodafone is the poorest at 72%. However, connectivity of all other operators with Vodafone is quite good. Also, except for BSNL all calls from other service providers got connected to a Bharti number.

Results of Operator assisted Drive test

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

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

Area Type	Type of Location	Area
Outdoor	Periphery of the city	Science City, Rajarhut, birati, Madhyamgram, Barasat, Barrackpore, Kalikapore, Science City
	Congested Area	Theatre Road, Park Street, Russell Street, Mallik Bazaar Sealdah, MG Road, Posta, Giris Park
	Across the City	Barackpore, Dunlop, Shyam Bazaar, CR Avenue, Tollygunje, South City
Indoor	Office Complex	Vishwakarama Building
	Shopping Complex	South City Mall

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

Call drop rate	Bharti		BSNL		Vodafone		TATA		RTL		RCOM	
	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
Voice quality	98.40%	94.71%	98.58%	98.52%	94.48%	97.12%	97.68%	97.22%	100.00%	97.20%	96.49%	96.12%
Call set up Success Rate	99.04%	99.04%	100.00%	100.00%	100.00%	99.48%	100.00%	100.00%	100.00%	100.00%	100.00%	97.40%
Call drop rate	1.46%	1.46%	0.00%	0.00%	0.00%	0.52%	0.00%	0.51%	0.00%	0.00%	0.00%	0.03%
Hands off success rate	97.37%	97.37%	100.00%	100.00%	100.00%	100.00%	100.00%	99.86%	100.00%	100.00%	100.00%	100.00%

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

**BSNL** – There was interference and low signal strength recorded for BSNL in the outdoor areas near Science City(ITC SONAR BANGLA)-7/Chingri Hata-6/Nicco Park(Call Got Disconnected Twice)/No Service Near Bowler's Den/Link Road-6/Sect V Bridge To Newton-7/Axix Bengal Peerless/ Rajarhat / Haldiram / VIP Rd(No Hopping) / Big Bazaar /Gate No:01 /Airport Resort / New Jessore Road /Barasat College-No Service., Newton /DLF Building /Bengal Axis Peerless / Rajarhat, Russel Street / Park Street / Sealdah / M.G Road / Howrah Station

**Vodafone** - There was interference and low signal strength recorded for Vodafone in the outdoor areas near Silver Spring/ Nalbon/ Nicco Park /Wipro Crossing / /Technopolis Bridge /Bengal Peerless Housing/ Techno India Crossing/ Rajarhat/ HUDCO/ Kolkata International Convention Centre, Hiland Woods Shrachi, Rajarhat-Baguihati/ Mitsuishi Motors/ Charnock Hospital / Haldiram's Bridge/ B.P Poddar Kaikholi/ VIP Rd/ Airport More/ BP Petrol Pump/ Airport Gate No:2/ IAS / Madhyam Crossing / IOC Pump / IBP Pump/ Madhyagram/ Purbalaya/ Hridaipur/ Barbaria/ Barasat/ Malibagan / Nabopalli., Titagarh/ Ishwr Chatterjee Lane /Elias Road / Kamarhat / B.T Road /Belghoria /Dunlop, Disconnected At Shyambazaar / Mechua / Colitala /Terity Bazaar / Dharmatala / Metro Cinema/ Elgin /Harishpark /Uttam Mancha / Rashbehari / Lake Gardens Down. Emaar Management / Chingri Hata/ Nalbon/ DLF / /DPS/ ONGC/ Baguihati Crossing/ Kaikhali /Kazi Nazrul Islam Avenue/ Jessore Rd Crossing / Airport More / Uday Rajpur/ Colony More/ Gun Laboratory / Ashalara Bidyamandir/ Jaggannathpur/ Nilunj/ Sewli High School I / Mohanpur Metro Dairy., Park Circus Crossing / AJC Bose Rd / Theatre Rd / Park Street / Mullick Bazaar To Sealdah / Burra Bazaar / Howrah Court / Girish Park, Barrackpore/ Titagarh / Kamarhati / Exide/ Elgin /Jadavpur

**Bharti** – There was interference and low signal strength recorded for Bharti in the outdoor areas near Near Ganga Nagar, Between Madhyamgram & Barasat, between Barasat & Akrapore, Near Howrah Bridge, Near Agarpara, Between Science City & Chingri Ghata, Near Howrah Bridge, in Russell Street, Near Moulali, After Shyam Bazaar AV School

**RTL** – Indoor areas - low signal strength recorded 10 times and interference 6 times in South City Mall and Vishwakarma building. There was interference and low signal strength recorded for Aircel in the outdoor areas of city center II, charnock city, jessore road - airport crossing, belghoria expressway crossing, CISF Unit, Micheal Nagar, Sukanta Nagar, BT College, Rathala, Hridyapur Crossing, Dak Bungalow, Vivekanand More, Panna Jheel, Tallykhola, Anantpur, Sainik Nagar, Kajibari More, Punjabi Khola, Nilgaunj Bazar, Nonachandanpikur Bazar, Park Street, Archbishop House, College Street, CR Avenue crossing, Howrah Bridge, Ganesh Talkies Crossing, kamarhati, State Garage, Chiria more, Chunni Babyu Bazar, Paikpara, Central Metro Station, Geological Survey of India, Jatin Das shishu udayan.

**Reliance** - There was interference and low signal strength recorded for Reliance in the outdoor areas near Nicco Park /New Town Township /Near Airport /Dak Bungalow/ Barasat Metro Dairy / Airport To Madhyamgram {Call Dropped 2 times and Call Blocked 2 times). Park circus / Little Russel Street / Park Street / Mullick Bazaar / Central Garage / Entally Market / N.R.S / Sealdah / M.G Road / College Street / Burra Bazaar / Howrah Bridge /Posta / Girish Park, / Sealdah / M.G Road / Howrah Station, BT Road Crossing/ Aryan School/ Chandigarh Hotel BT Rd/ M.G Rd Metro/ Central Metro/ Metro Cinema/ Dharmatala/ Ishpat Bhawan/ Elliot Park/

**Exide/ Chowrangee/ EGARO Showroom/ Merlin Fort/ Prince Anwar Shah Rd/ South City /Dunlop/ BP Pump/ Tala Bridge.** Indoor areas - 43 Incidents where coverage dropped, 13 incidents where interference was seen. In all 10 call exceeded the given level in Vishwakarma Building and South City Mall

**TATA** - There was interference and low signal strength recorded for TATA only in the outdoor areas near **Duckbungalow more (Barasat), Peerless Nagar (Neelgaunje), Tala Bridge**

#### Conclusions:

- The congested areas in Kolkata are a problem source for all the operators
- TATA and Bharti perform relatively well than the other operators
- Areas of Madhayamgram and Barasat are a problem for most of the operators
- The signal strength for Vodafone was recorded inadequate in quite a lot of areas on the day of the drive test
- Areas near the Airport are also a problem area for some of the operators

#### Live Measurement Findings

Parameters	Benchmark	Bharti	BSNL	Vodafone	TATA	Aircel	RCOM
CSSR	> 95%	99.96%	98.00%	99.96%	98.98%	99.82%	99.16%
Percentage SDCCH Congestion	< 1%	0.46%	0.51%	0.51%	0.00%	0.00%	0.00%
Percentage TCH Congestion	< 2%	0.18%	0.80%	0.80%	1.40%	0.06%	0.00%
POI Congestion	< 0.5%	0%	0%	0%	0%	0%	0%
Call drop rate	< 3%	1.06%	0.84%	0.84%	0.66%	1.15%	0.59%

All the operators are meeting the TRAI benchmarks on the above parameters. Bharti and Vodafone lead the way with a CSSR of 99.96% observed during the three day live measurement followed closely by Aircel with 99.82% CSSR. BSNL relatively has the lowest CSSR at 98.00% but is still way above the TRAI benchmark of 95%.

For the network congestion parameters, all the operators meet the benchmark. RCOM was found to be having no network congestion. Relatively higher congestion was observed for BSNL and Vodafone for the three day live measurement. There was no POI congestion observed for all the operators.

RCOM leads the way with the lowest call drop rate of 0.59% followed closely by TATA at 0.66%. Aircel relatively has a higher call drop rate than the other operators at 1.15% but it is still comfortably meeting the benchmark.

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

S. No.	Parameters	B'mark	Bharti	BSNL	Sify	VSNL	RCOM
1	Service provisioning uptime						
1.1	Total number of connections registered during the period		658	12140	307	564	1092
1.2	Percentage connections provided within 15 days	100%	90%	96%	100%	100%**	64%**
2	Fault repair restoration time						
2.1	Total number of faults registered during the period		1631	18408	521	8306	19
2.2	Percentage faults repaired by next working days	> 90%	97%	67%	90%	88%**	100%
2.3	Percentage faults repaired within three working days	99%	99%	84%	100%	97%**	100%
3	Billing performance						
3.1	Total bills generated		18331	104483	Prepaid*	5799	3486
3.2	Billing complaints per 100 bills issued	<2%	1.41%	0.33%		0.88%	0.11%
3.3	%age of billing complaints resolved within 4 weeks	100%	100%	98%		100%	100%
3.4	Time taken for refund of deposits after closure	100%	100%	19%		100%	100%
4	Customer care/helpline assessment						
4.1	Percentage calls answered within 60 seconds	> 60%	85%	87%	100%	93%	94%
4.2	Percentage calls answered within 90 seconds	>80%	91%	100%	100%	98%	96%
5	Bandwidth utilisation/Throughput						
	<i>Intra network links (POP to ISP Node)</i>						
5.1	Total number of intra network links	< 80% for all the links	80	BRAS-23,T1-24,T2-610, DSLAM-5456	400	4 (POP's in Kolkata)	2
5.2	Total number if intra network links crossing 90%		0	Chennai BRAS > 90%	5	0	0
	<i>Upstream Bandwidth (ISP Node to IGSP/NAP/NIXI)</i>						
5.3	Total number of upstream links		4	97	28	35	NA*
5.4	Number of upstream links having >90% bandwidth utilisation		0	1	0	0	NA*
5.5	Percentage bandwidth utilized on upstream links	<80%	67%	75%	64%	74%	NA*
6	Broadband download speed	>80%	Complied	Complied	Complied	Complied	Complied
7	Service availability/uptime	>98%	99.99%	99.91%	100.00%	97.97%	99.41%
8	Packet loss	<1%	<1%	<1%	<1%	<1%	<1%**
9	Network Latency						
9.1	POP/ISP Node to NIXI (In msec)	<120	<80	<120	<45	<90	<30
9.2	ISP node to NAP port (In msec)	<350	<120	<350	<300	<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. Also, for Reliance there is no international gateway located in Kolkata, hence all the parameters related to the same show NA i.e. Not Applicable)

\*\* 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. Also, there were differences observed in level of reporting for e.g. Sify, Reliance, and BSNL (for network related parameters) claimed to be category "A" service provider and consider all India as one circle. 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

- Bharti, BSNL and Reliance do not meet the TRAI specified benchmark for service provisioning activation time in Kolkata circle.
- However, all the service providers are falling below the benchmark for the results of Live calling process undertaken by IMRB interviewers.
- 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. 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, BSNL 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. Some part of variation can also be attributed to low sample size
- 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 (VSNL), where rebate was being provided for the number of days for which the connection was inactive.

### Billing performance

- All the service providers (except BSNL) were found to be meeting the benchmark of 4 weeks for resolution of billing complaints. Sify however claims that all its retail broadband customers are prepaid and hence there are no billing complaints.

- It should also be noted that the definition of billing complaints/Disputes can be considered as lenient as service providers namely Reliance and Bharti include only those complaints where an internal ticket is opened and refund is made to the customer. There is a need felt to have more clarity regarding the definition of billing complaints.
- Also, it was discovered during verification process at Bharti, that service provider cannot segregate the complaints and billing data for Broadband and Wireline subscribers.

#### Customer Care/Helpline Assessment

- Most of the service providers, meet the benchmark for percentage calls answered within 60 and 90 seconds by the operator (Voice to Voice) for live calling as well as one month data collection
- For live calling although 98% of 100 calls made to BSNL helpline were answered by the operator in 90 seconds but the service provider score for live calling for calls answered in 60 seconds by the operator was observed to be very low at 2%

#### 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 some of the service providers are reporting average bandwidth utilized during the period to TRAI instead Bandwidth utilised during Time Consistent Busy Hour (TCBH) as service providers claim that the 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.
- 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.
- Kolkata 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%.
- For BSNL, audit for network related parameters was carried out at the central node in Bangalore. All the intra network links (In Kolkata) randomly tested on sample basis during live measurements were found to be below 90%.
- For Bandwidth utilisation on upstream links, most the service providers are meeting the benchmark and have excess capacities available on their upstream links.
- Service providers distributing services through cable operators (Sify) claim that it is not possible to measure the Bandwidth available from Cable operator to their base stations. Hence, it is believed that last mile availability will suffer as operators have relatively less control over the operations of cable operator.

### Download speed

- During live measurements carried out at Pop's/ISP Node it was observed that all the operators are meeting the TRAI prescribed benchmark of greater than 80% speed available to the customer.
- However, no data was available for verification of records for month of Audit as well as quarter ending July to September 2007 with the service providers. Service provider's claimed that they are reporting to TRAI basis live tests conducted at POPs/ISP Node and tests done at customer premises during field visits.
- Hence, IMRB Auditors also carried out live calling to understand the download speed available to the customers at the last mile, VSNL and RCOM were the only two operators found to be not meeting the TRAI benchmark (For sample calls made to subscribers across different locations).

### 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) 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. In other words book keeping methodology was found to be absent for all the operators except BSNL.
- 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.
- 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 (Bharti and Reliance). Smoked ping tool was found to be configured for sending 5 pings of 56 bytes each every 300 seconds.

- However, ping tests conducted/smoked 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	VSNL	RCOM
Service Availability Uptime	>98%	99.99%	100.00%	100.00%	98.84%	DNA
No. of Intra network links found to be above 90%		0	0	0	0	0
Total Bandwidth utilization at all upstream links	< 80%	74%	71%	64%	74%	No international gateway from Kolkata
Data Download Speed	> 80%	Complied	Complied	Complied	Complied	Complied
Packet Loss (Percentage)	< 1%	< 1%	< 1%	< 1%	< 1%	< 1%
<b>Network Latency</b>						
From user reference point at POP/ISP Node to IGSP NIXI (msec)	<120msec	75	<120	28	<90	<40
From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec)	<350msec	122	<350	270	<200	<290

 Figures provided on All India basis

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.

Out of the sample links (from POP to ISP Node) tested by IMRB auditors there were no intra network links that were found to have a utilization of more than 90% for all of the operators.

For Bandwidth utilisation on upstream links, all the service providers are meeting the benchmark during the three day live measurement and have excess capacities available on their upstream links. However, it should be noted that during live measurements carried out for BSNL minimum 10 and maximum 20 out of the 97 gateway links all across India were found to be having greater than 90% Bandwidth utilisation.

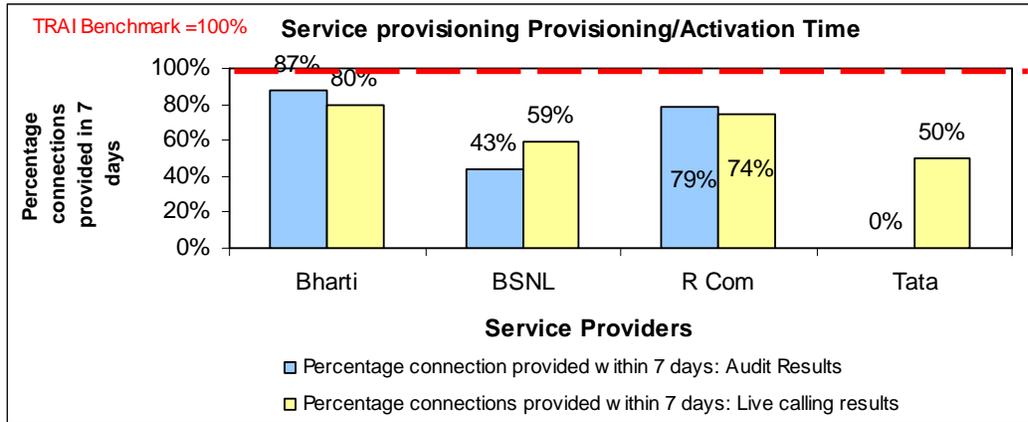
During live measurements carried out at Pop's/ISP Node it was observed that all the operators are meeting the TRAI prescribed benchmark of greater than 80% speed available to the customer.

Also, all the operators were found to be meeting the TRAI benchmark on packet loss and network latency parameters for three day live measurement. This was measured by carrying out live ping tests/checking smoke ping results.

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

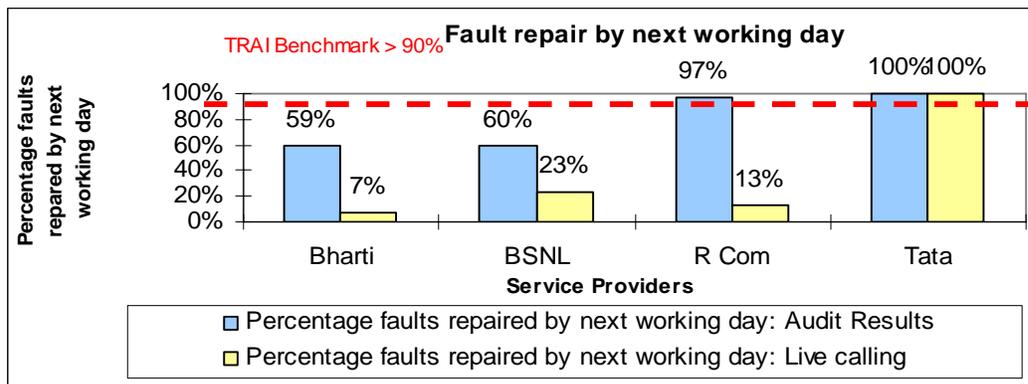
### 6.1 Graphical/Tabular Representations for Basic (Wireline) services

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

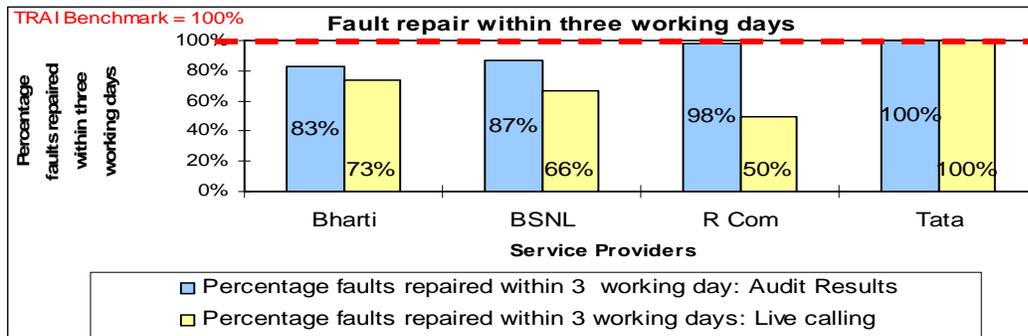


None of the service providers is meeting the TRAI benchmark. As per audit findings, Bharti and R - Com are doing better than other service provider. For Tata Teleservcies, no one was provided connection within 7 days, as per the audit data findings. However the service provider claimed that **all the 28 connections were provided to corporate customers within the time committed to the customer.** For live calling, since the sample size for Tata Teleservices was less (Since very few customers had applied for new connections), it was found that **2 out of 4 person called got the connection within 7 days.**

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

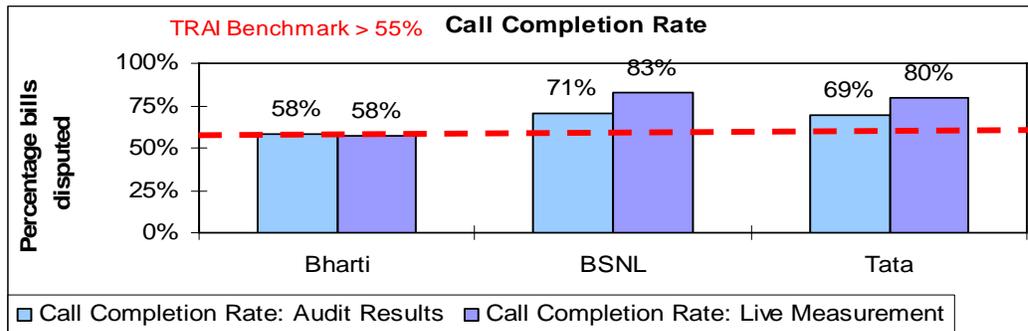


Tata and Rcom meet the benchmark of 90% fault repairing by next working day with the audit scores of 100% and 97% respectively. The scores for Bharti and BSNL on this sub-parameter are 59% and 60% respectively for the month of data collection. Also for live calling only TATA meets the benchmark but the number of calls made were very less as service provider claims that there are very few faults owing to low subscriber base.



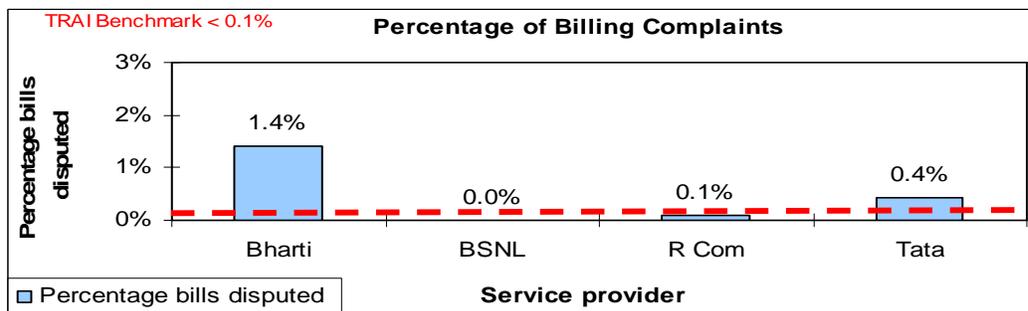
Bharti and BSNL fall short of TRAI benchmark for one month data collection. Also, for live calling scores were relatively high for Bharti (73%) followed by BSNL (66%).

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



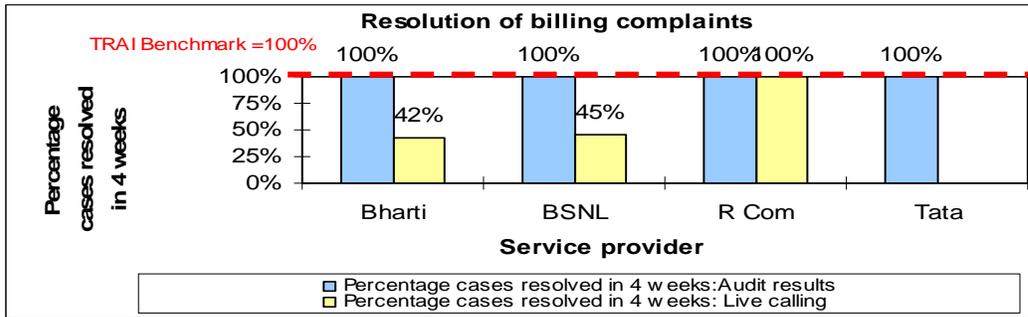
All the service providers were found to be meeting TRAI benchmark (55%) for Call Completion Rate. Within the service providers for the wireline services in the Kolkata circle the live measurement results for BSNL were found to be relatively higher at 83% than that of other service providers.

**Percentage bills disputed**



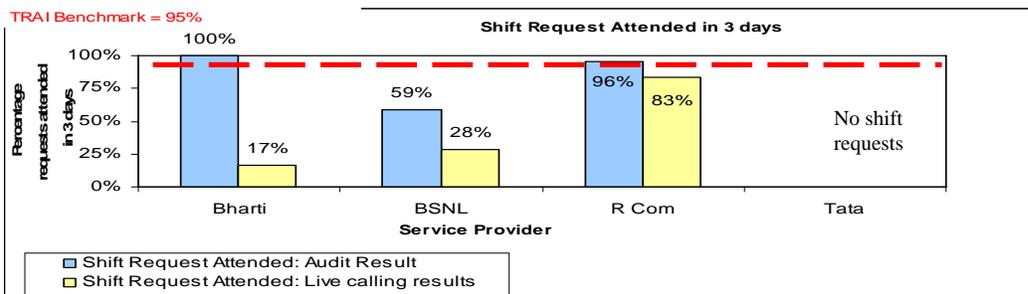
Bharti and TATA do not meet the TRAI specified benchmark for percentage bills disputed for one month in which the Audit was carried out.

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



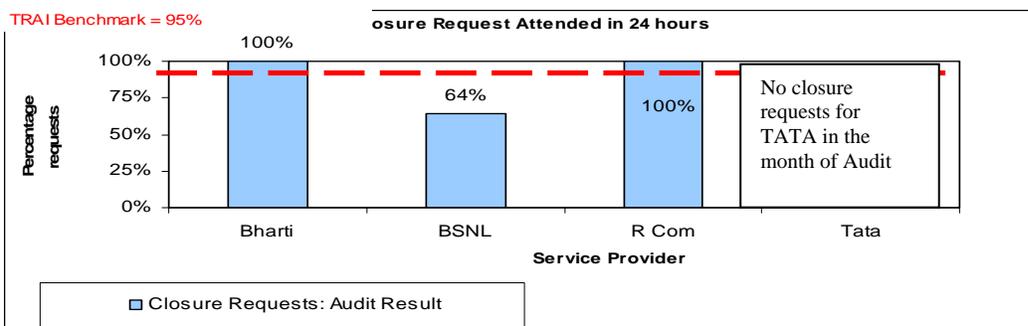
As per audit data findings, all the billing related complaints were resolved by the service providers. Live calling result show that for Bharti, only 42% of the cases were resolved within 4 weeks. However, it should be noted that sample for live calling was low for RCOM as total billing complaints were very less owing to low subscriber base. For TATA live calling was not applicable as there was no billing complaint reported prior to the month of audit.

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



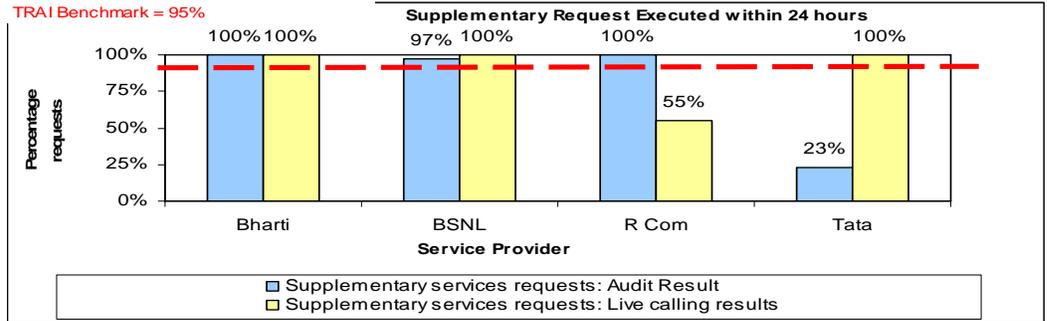
BSNL does not meet the TRAI specified benchmark for shift requests attended within 3 days for the month in which data was collected. Sample for live calling was low for Bharti (6) and RCOM (6) owing to less shift requests during the month prior to Audit.

**Closure requests attended within 24 hours**



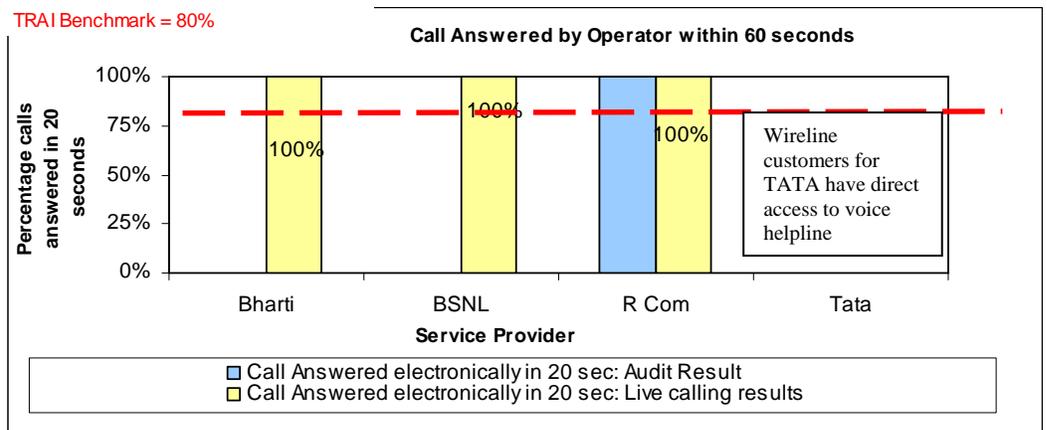
BSNL falls short of benchmark for time taken to attend closure requests for the month in which the Audit was carried out

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



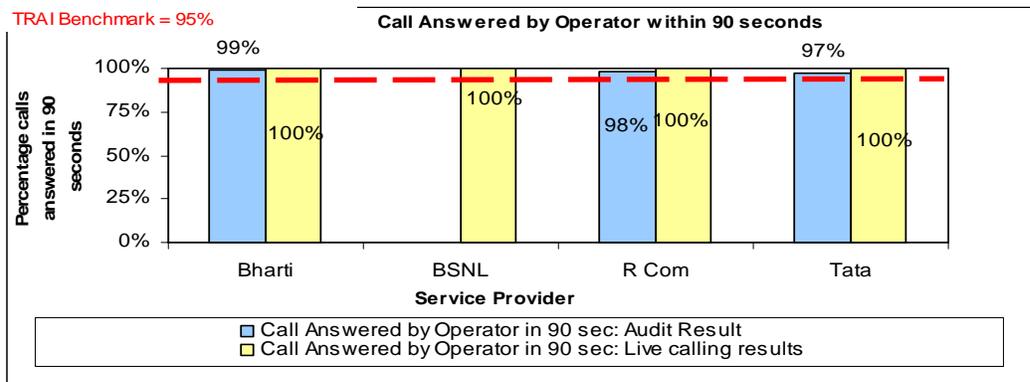
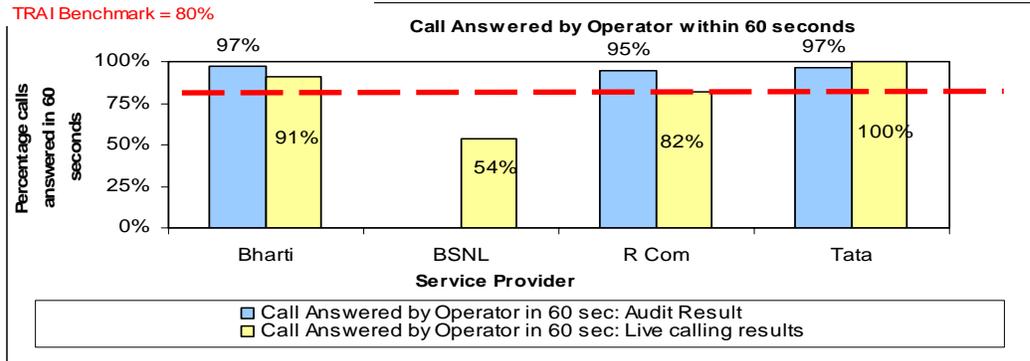
All the service providers meet the benchmark for one month data collection except TATA teleservices which scores low at 23%. Sample for live calling was very low (2) for TATA teleservices for supplementary requests as there were very few requests for supplementary service during the month prior to visit of Audit

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



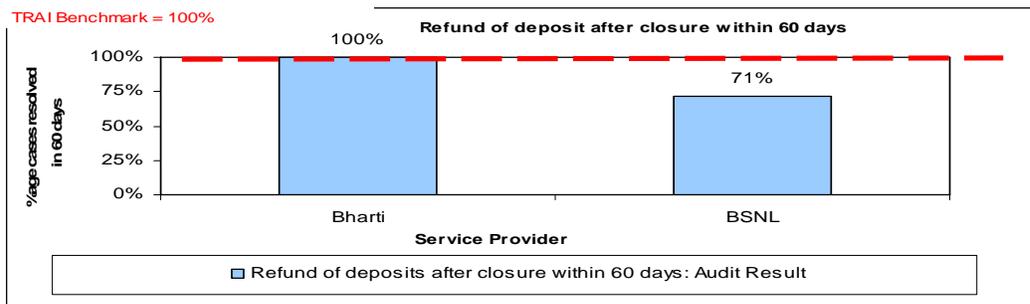
All the service providers meet the benchmark for live calling for calls answered within 20 seconds. However, for Bharti it was observed that only calls answered by the operator are recorded. The service provider does not have any mechanism to record total calls received by the IVR.

**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 operators meet the TRAI specified Benchmark for one month data collection for response time to customer for assistance. BSNL falls short of meeting the benchmark for calls answered within 60 seconds by the operator for live calling with a score of 54%.

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



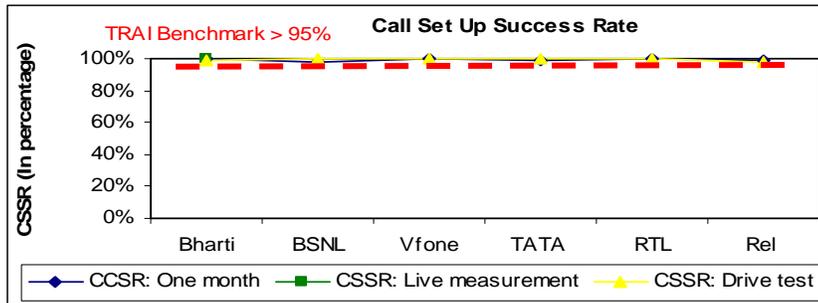
For 'Refund after closure' parameter, Bharti's scores the audit data findings is 100% whereas it is 71% for BSNL. Also, there were no such cases reported both for RCOM and TATA teleservices.

## 6.2 Graphical/tabular Representations for Cellular Mobile Services

### Accumulated Downtime

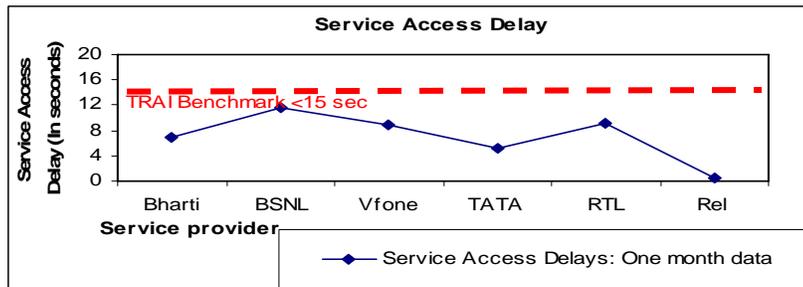
None of the operators experienced any downtime in the network in the month of audit. Although several BTSs went down but there were contiguous BTSs to take over which did not result in a community being isolated.

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



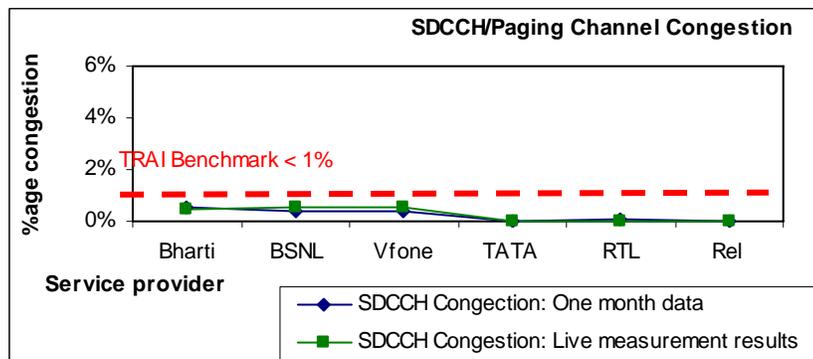
All the operators are meeting the benchmark for the audit month, live measurement as well as the drive test.

### Service Access Delay



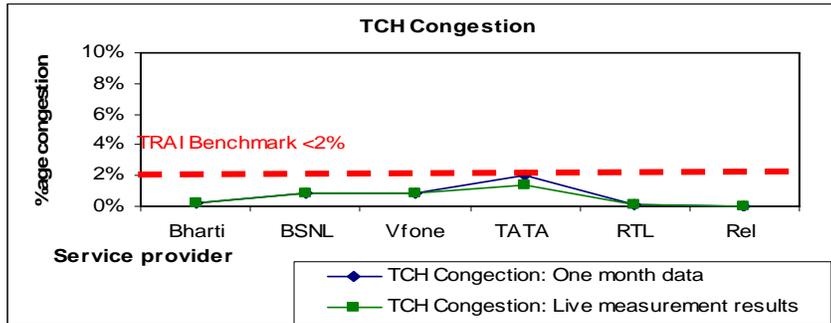
All the operators are meeting the benchmark. The auditors measured this parameter using a standard drive test tool kit.

### SDCCH / Paging Channel Congestion



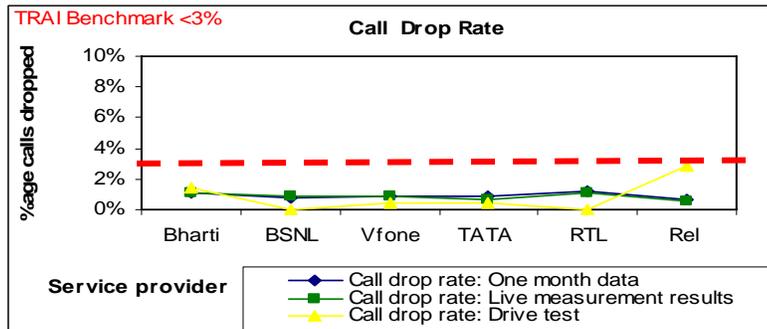
All the operators meet the TRAI benchmark for the month of audit. Also, all operators meet the benchmark for the three day live measurement.

**TCH Congestion**



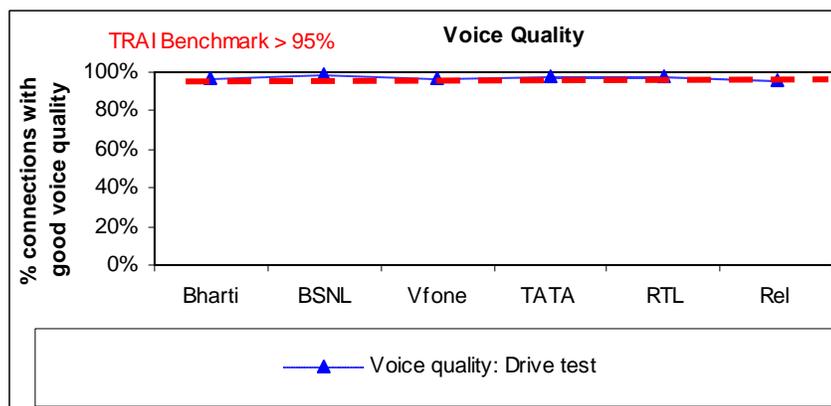
All the operators meet the TRAI specified benchmark. The maximum TCH congestion observed is for TATA.

**Call Drop Rate**



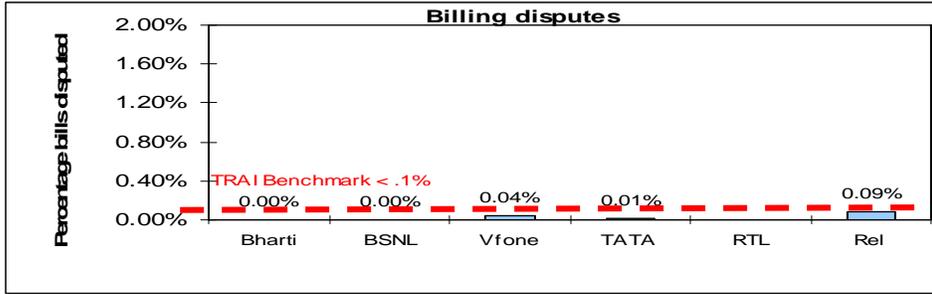
All the operators meet the TRAI benchmark. The operator with the least call drop rate taking into consideration the figures for live measurement, drive test and the month of audit is TATA.

**Voice quality**

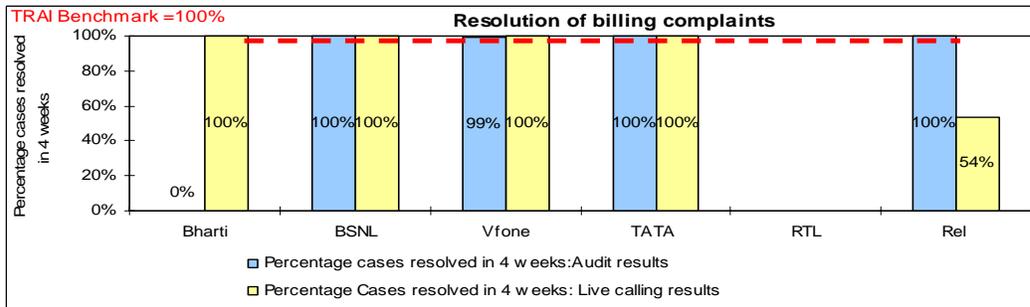


All the operators meet the TRAI benchmark as found out during the drive test. Generally, in metro circles there are some patches where the signal strength becomes inadequate (which is explained in the findings of the drive test). However, on an overall basis the operators meet the benchmark.

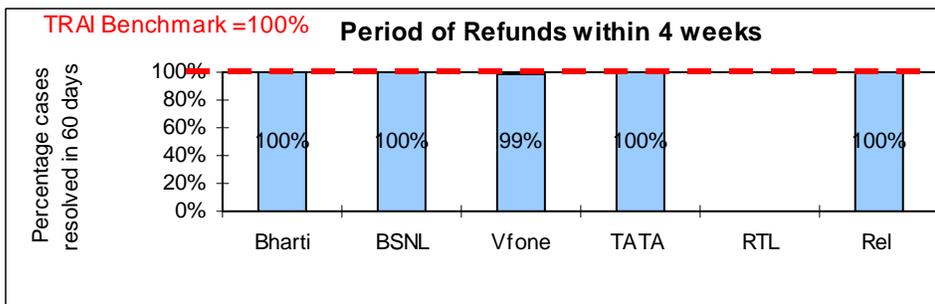
**Billing Disputes**



All the operators meet the TRAI benchmark. Interestingly, none of the Bharti subscribers have registered a billing complaint in the month for which the audit was done. RTL has only prepaid subscribers in Kolkata circle and hence no billing complaints are reported for the operator.



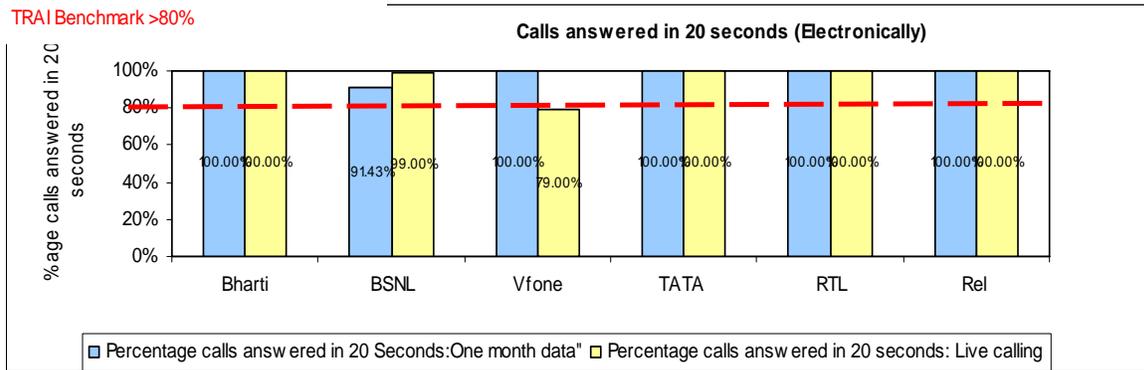
All the operators except Vodafone meet the TRAI benchmark of resolving 100% of the cases related to billing complaints. However, the operators consider only those as billing complaints where they have issued an internal ticket which essentially means that a refund is due to the customer. For RTL all the subscribers are prepaid and hence there is no billing complaint reported. Also, no billing complaint was reported for Bharti during the month of Audit



All the operators except Vodafone meet the TRAI benchmark of 100% for giving refunds within 4 weeks of the cases related to billing complaints. There was only 1 case in Vodafone where refund was not made within the stipulated time to the subscriber.

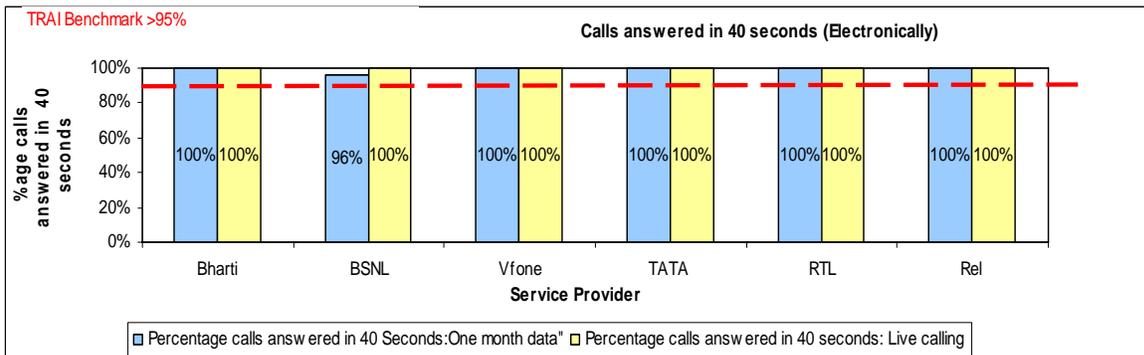
**Customer Care / Helpline:**

TRAI Benchmark >80%



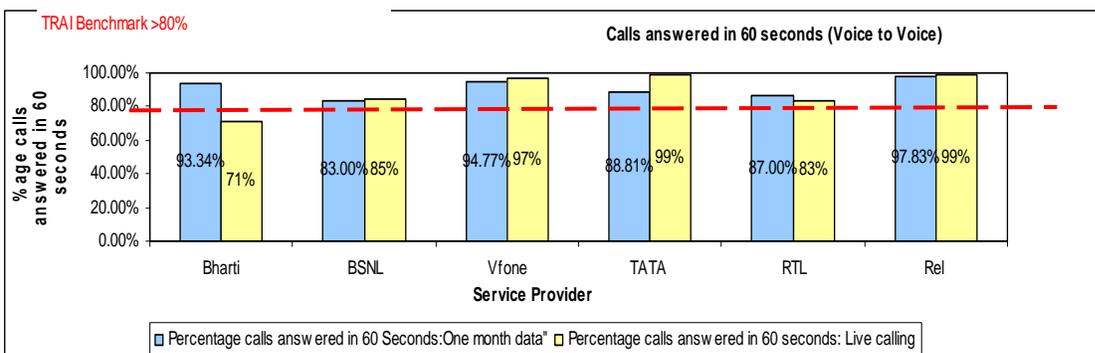
All the operators except Vodafone (live calling) meet the TRAI benchmark for IVR (Electronic) answering of customers' calls.

TRAI Benchmark >95%

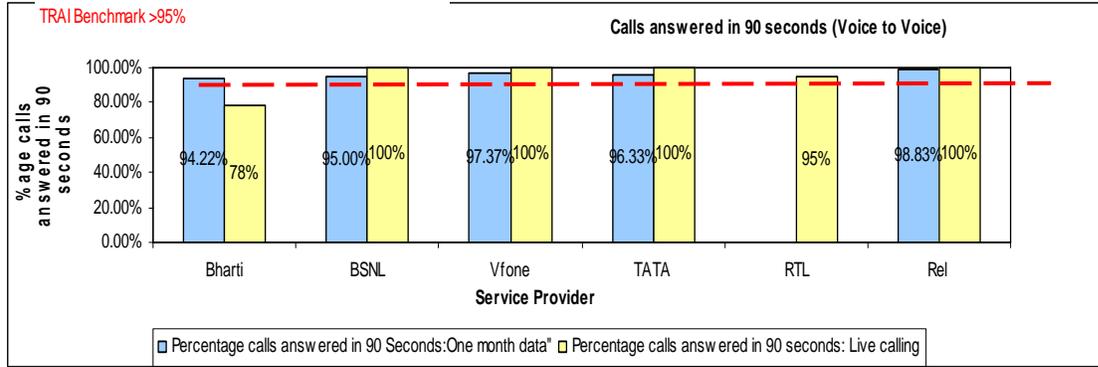


All the service providers meet the TRAI specified benchmark for calls answered by IVR within 40 seconds.

TRAI Benchmark >80%



Bharti does not meet the TRAI benchmark in live calling aspect with only 71% of the calls being answered by the operator within 60 seconds. However, all other operators meet the TRAI benchmark for both the one month and live measurements.



Bharti does not meet the TRAI benchmark in live calling aspect with only 78% of the calls being answered by the operator within 90 seconds. However, all other operators meet the TRAI benchmark for both the one month and live measurements.

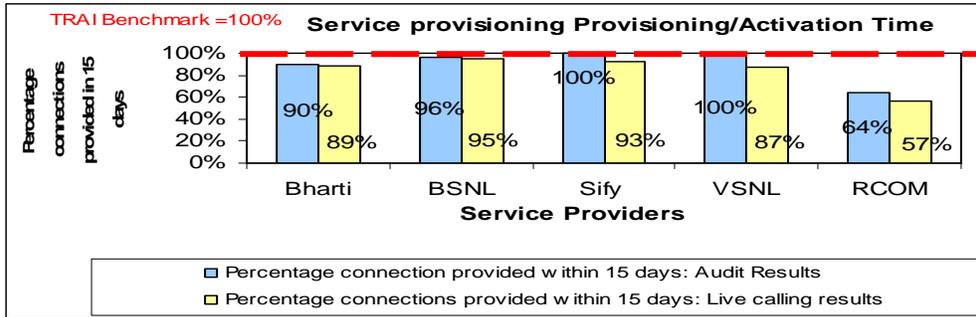
**Inter Operator Call Assessment**

Inter operator call Assessment (From / To)	Bharti	BSNL	Vodafone	TTL	RTL	RCOM
Bharti	NA	100%	100%	99%	100%	100%
BSNL	87%	NA	72%	78%	81%	81%
Vfone	100%	92%	NA	100%	100%	98%
TATA	100%	89%	98%	NA	97%	100%
RTL	100%	75%	100%	99%	NA	100%
RCOM	100%	89%	100%	100%	96%	NA

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 all operators except TTL were connected 100% of the times. Similarly BSNL's connectivity with all the operators was found to be very low with the highest connectivity being observed with Bharti at only 87%. BSNL's connectivity with Vodafone is the poorest at 72%. However, connectivity of all other operators with Vodafone is quite good. Also, except for BSNL all calls from other service providers got connected to a Bharti number.

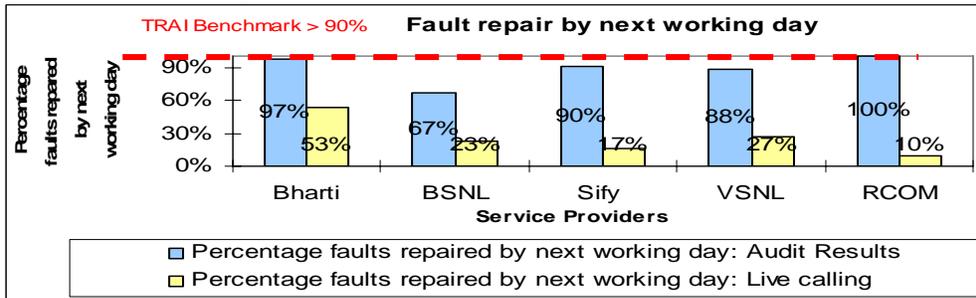
### 6.3 Graphical/Tabular Representations for Broadband services

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



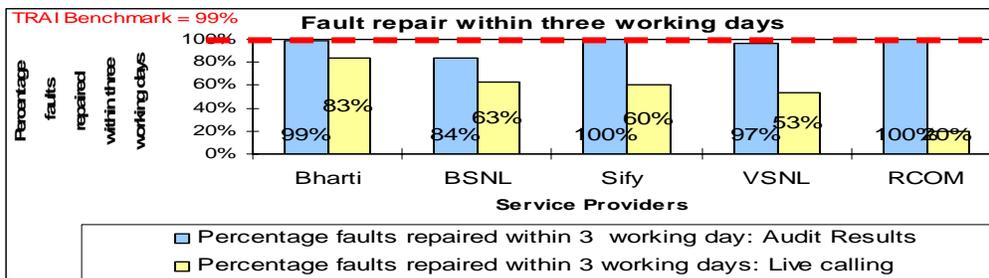
Only Sify and VSNL meet the benchmark in the month in which audit was carried out by IMRB auditors. Although, Reliance scores below the benchmark of 100% connections to be provided within 15 days one month data collection verification of records reveals that most of the delayed connections are either 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.

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



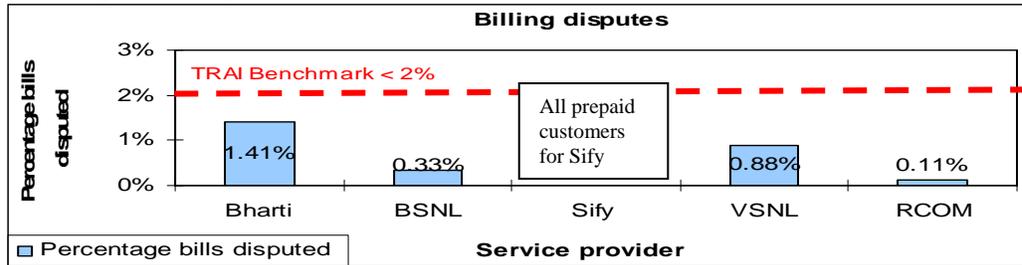
All operators fall below the benchmark for results of live calling. For one month data collection only RCOM meets the TRAI specified benchmark. One of the reasons for same could be the fact that only 19 faults were reported by the customers in Kolkata circle during the month in which audit was carried out.

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



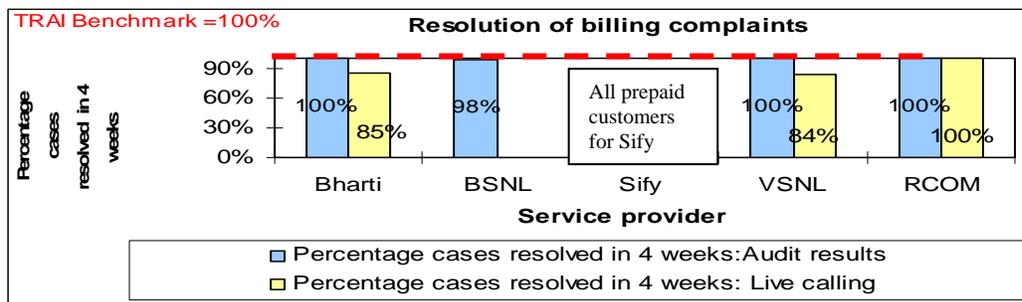
Only Sify and RCOM meets the benchmark on fault repair within three working days for the results of live calling results. It should be noted that VSNL which does not meet the benchmark for one month data collection includes billing complaints while calculating percentage faults repaired within three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

**Percentage bills disputed**



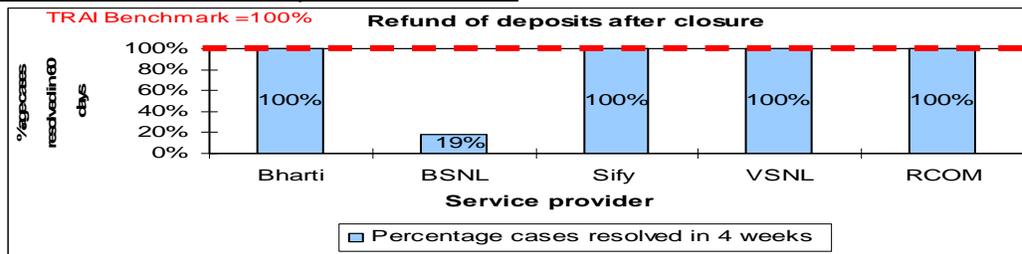
All the operators meet the benchmark on percentage bills disputed in Kolkata circle. Sify claims that all its retail customers are prepaid customers and hence there are no billing complaints

**Resolution of billing complaints**



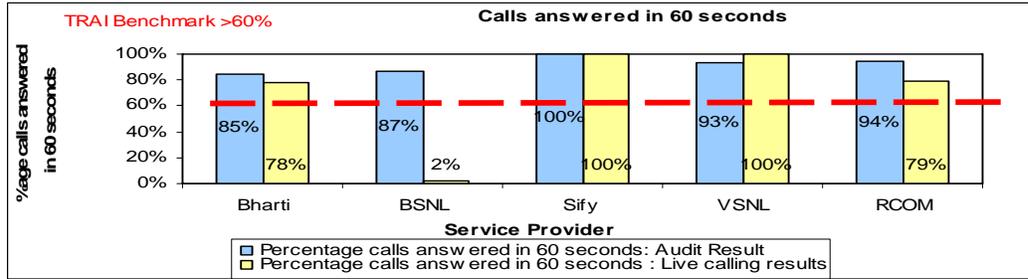
None of the operator meets the benchmark for resolution of complaints for live calling results in Kolkata circle. Bharti performs best for live calling results at 85%. However it should be noted that the sample live calls were low as service provider claimed that there are very few cases for billing complaints. Also live calling was not possible for BSNL owing to non availability of the data. 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**



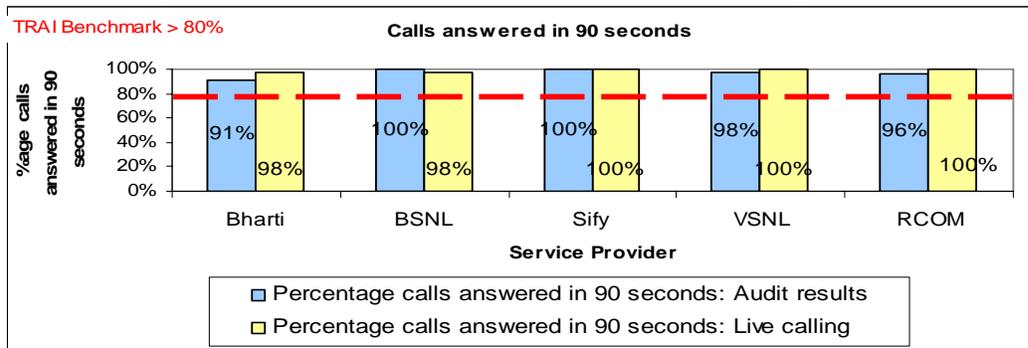
All the operators meet the benchmark as in all the cases of closures which require refund; the same was made within 4 weeks.

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



BSNL scores really low on live calling results with only two percent of 100 calls made were answered by the operator in 60 seconds.

**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 meet the benchmark for response time to customer for assistance within 90 seconds both for live calling and the month in which data was collected.

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

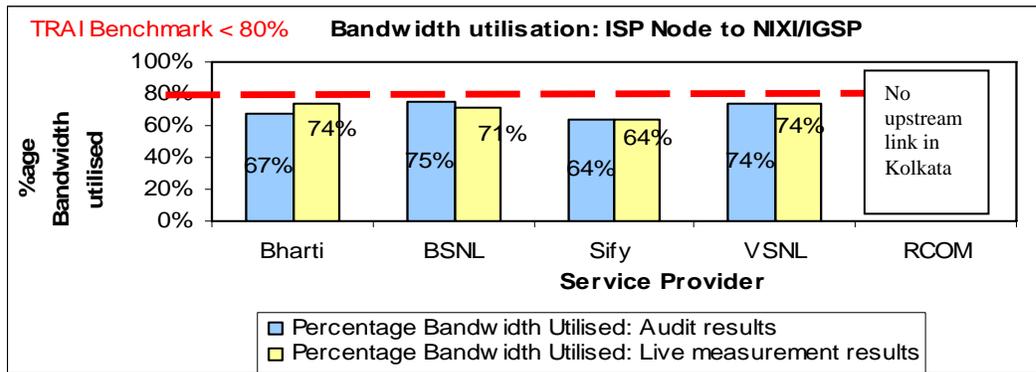
Bandwidth Utilisation	B'mark	Bharti	BSNL	Sify	VSNL	RCOM
<b>Intra-network links (One month data collection)</b>						
Total number of intra network links		80	BRAS-23,T1-24,T2-610, DSLAM-5456	400	4	2
No of Intra network found to be above 90%	<80%	0	Chennai BRAS > 90%	5	0	0

**Three day live measurement**

Bandwidth Utilisation	Benchmark	Bharti	BSNL	Sify	VSNL	RCOM
<b>Intra-network links (Live measurements)</b>						
No of Intra network Links		5	22	7 (Kolkata PoP's)	4	2
No of Intra network found to be above 90%	<80%	0	0	0	0	0

As far as bandwidth utilization on the intra network links is concerned all the operators seem to performing well as all the intra network links tested during live measurement were found to be below 90%. Kolkata 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 three day live measurement)**



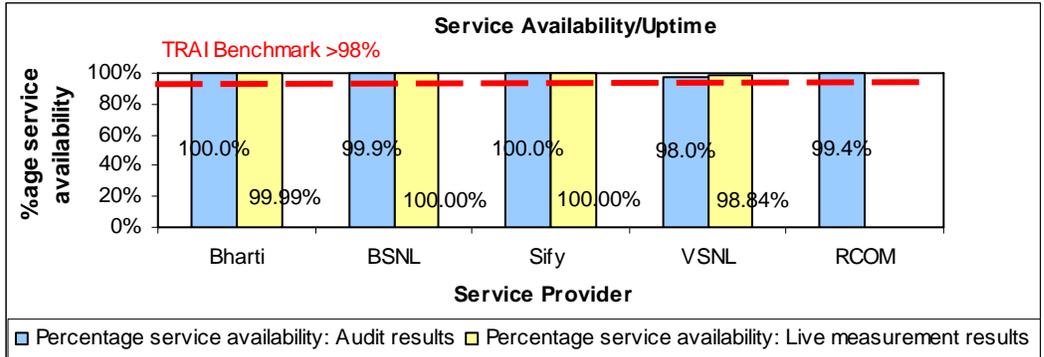
Most of the service providers audited have excess bandwidth capacities available as bandwidth utilisation on the upstream links remained below 90%.

**Broadband connection speed available to sample subscribers**

Download Speed	Benchmark	Bharti	BSNL	Sify	VSNL	RCOM
Percentage speed observed	>80%	80%	86%	82%	56%	60%

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 VSNL) 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 three day live measurement)**



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

## 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	Provision of telephone after registration of demand									
1.1	Percentage connections provided within 7 days	100%	90%	90%	97%	39%	46%	47%	98%	Mostly corporate connections and in technically non feasible areas
2	Fault incidence/clearance statistics									
2.1	Faults repaired within 24 hours	>90%	71%	71%	89%	44%	100%	100%	100%	100%
2.2	Mean time to repair	<8 hrs	11.27	11.27	9.6	45	4.4	4.4	0	1.7
3	Call Completion Rate (CCR)	>55%	55%	55%	61%	67%	0%	DNA	70%	70%
4	Metering and billing credibility									
4.1	Billing complaints per 100 bills issued	<0.1%	1.90%	1.90%	0.01%	0.01%	0.00%	0.09%	0.00%	No complaints
4.2	%age of billing complaints resolved within 4 weeks	100%	99%	99%	99%	96%	100%	100%	0%	No complaints
5	Customer care/helpline promptness									
5.1	Shift requests (Total number received)		198	198	2541	1001	79	31	0	No cases
	Percentage shift requests attended within 3 days	95%	64%	64%	96%	34%	100%	100%	0%	NA
5.2	Closure request attended (Total number received)		1612	1612	17560	2758	918	918	0	0
	Closure within 24 hours	95%	32%	32%	98%	60%	96%	96%	0%	0%
5.3	Supplementary (additional) service requests attended (Total number received)		818	818	3607	1289	8151	8151	23	22
	Additional facility provided within 24 hours	95%	94%	94%	99%	94%	98%	98%	100%	77%
6	Response time to customer									
6.1	% age call answered through IVR in 20 seconds	80%	DNA	DNA	100%		99%	100%	92%	NA
	% age call answered through IVR in 40 seconds	100%	DNA	DNA	100%		99%	100%	100%	NA
6.2	% age calls answered by operator in 60 seconds	80%	96%	96%	100%		95%	95%	89%	93%
	% age calls answered by operator in 90 seconds	95%	98%	98%	100%		100%	100%	91%	96%
7	%age cases where refund received within 60 days	100%	75%	75%	100%	80%	0%	No cases	100%	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

## 7.2 Cellular Mobile services

S.No.	Parameter	Benchmark	SERVICE PROVIDER											
			Bharti		BSNL		Vodafone		TATA		RTL		Reliance	
			PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB
<b>A</b>	<b>Network Performance</b>													
1	Accumulated Downtime	< 24 hrs.	0	0	0	0	0	0	3.6	3.6	0	0	0	0
2	Call set up success rate	> 95%	96.72%	96.72%	98.00%	98.00%	99.93%	99.93%	97.80%	97.80%	99.83%	99.83%	99.60%	99.60%
3	Service Access delay	9 to 20 seconds (< = 15 seconds for 100 calls)	8	8	10.6	10.6	14.5	14.5	9.17	9.17	8.15	8.15	3.99	3.99
4	Blocked call rate													
	<i>SDCCH Congestion</i>	<1%	0.60%	0.43%	0.00%	0.00%	0.38%	0.37%	0%	0%	0.03%	0.03%	0%	0%
	<i>TCH Congestion</i>	< 2%	0.59%	0.18%	0.00%	0.00%	1.37%	0.88%	0.41%	0.41%	0.08%	0.08%	0%	0%
5	Call drop rate	< 3%	3.00%	0.52%	0.47%	0.47%	1.21%	1.21%	0.64%	0.64%	1.29%	1.29%	0.68%	0.68%
6	%age connections with good voice quality	> 95%	97.00%	97.00%	99%	99%	97.93%	97.93%	97.00%	97.00%	95.10%	95.10%	99.52%	99.52%
7	Service coverage	>-75dbm												
		>-85dbm	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
		>-95dbm												
8	POI congestion	< 0.5%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0.1%	0.1%
<b>B</b>	<b>Customer Care</b>													
	Calls answered electronically													
1	<i>Within 20 seconds</i>	80%	99%	99%	96%	96%	100%	100%	100%	100%	100%	100%	99.50%	99.50%
2	<i>Within 40 seconds</i>	95%	99%	99%	99%	99%	100%	100%	100%	100%	100%	100%	99.50%	99.50%
	Calls answered by operator													
3	<i>Within 60 seconds</i>	80%	93.76%	93.76%	81%	81%	88.84%	87.96%	43%	43%	83%	83%	51.14%	51.14%
4	<i>Within 90 seconds</i>	95%	96.18%	96.18%	91%	91%	96.34%	96.27%	71%	71%	No system of monitoring this data point available		57.70%	57.70%
<b>C</b>	<b>Billing complaints</b>													
1	Billing complaints/100 bills	<0.1%	0.0451	0.0451	0.0035	0.00353	0.05	0.05	0.03	0.03	0	0	0.09	0.09
2	%age complaints resolved within 4 weeks	100%	100%	100%	100%	100%	100%	99.87%	100%	100%	No Postpaid subscriber of the operator in the circle		100%	100%
3	Period of refunds due to customers	<4 weeks	100%	100%	100%	100%	100%	99.06%	100%	100%			100%	100%



Figures do not match with those reported in PMR



Not meeting benchmark

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

### 7.3 Broadband services

S. No.	Parameters	B'mark	Bharti		BSNL		Sify		VSNL		RCOM	
			PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB
	<b>Service provisioning</b>											
1	Percentage connections provided within 15 days	100%	98%	92%	100%	96.88%	100%	100%	100%	100%	75%	75%
1.1	<b>Fault repair restoration time</b>											
2	Percentage faults repaired by next working days	> 90%	92%	84%	91%	64%**	87%	87%	84.70%	84.70%	95%	95%
2.1	Percentage faults repaired within three working days	99%	95%	86%	99%	80%	94%	94%	93.60%	93.60%	100%	100%
2.2	<b>Billing performance</b>											
3	Total bills generated		13674	13674	3142107	276665			12371	12371	75319	75319
3.1	Billing complaints per 100 bills issued	<2%	0.05%	0.05%	0.30%	0.85%	Prepaid	Prepaid	0.97%	0.97%	0.50%	0.50%
3.2	%age of billing complaints resolved	100%	100.00%	100.00%	100%	99.30%			99.99%	99.99%	100%	100%
3.3	Time taken for refund of deposits after closure	100%	100%	100%	99.40%	80.28%**	100%	100%	100%	100%	100%	100%
4	<b>Customer care/helpline assessment (Voice to Voice)</b>											
4.1	Percentage calls answered within 60 seconds	> 60%	84%	84%	80.91	87%**	86%	86%	77%	77%	99%	86%
4.2	Percentage calls answered within 90 seconds	> 80%	89%	89%	94.55	100%	94%	94%	82%	82%	99%	94%
5	<b>Bandwidth utilisation/Throughput</b>											
5.1	<b>Intra network links (POP to ISP Node)</b>											
5.1.1	Total number of Intra network links > 90%		2	2	0	0	34	34	0	0	0	0
5.2	<b>Upstream Bandwidth (ISP Node to NIXI/NAP/IGSP)</b>											
5.2.1	Percentage bandwidth utilised on upstream links	< 80%	72%	72%	52%	52%	79%	79%	70%	70%	50%	50%
6	<b>Broadband download speed</b>		No raw data available for verification									
7	<b>Service availability/uptime</b>	> 98%	99.56%	99.56%	99.30%	99.30%	100%	100%	99.40%	99.40%	99%	99%
8	<b>Packet loss</b>	<2%	DNA	DNA	<2%	Complied*	DNA	DNA	DNA	DNA	DNA	DNA
9	<b>Network Latency</b>						DNA	DNA	DNA	DNA	DNA	DNA
9.1	POP/ISP Node to NIXI (In msec)	< 120	DNA	DNA	<120	Complied*	DNA	DNA	DNA	DNA	DNA	DNA
9.2	ISP node to NAP port (In msec)	< 350	DNA	DNA	<350	Complied*	D NA					

(\*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.)

(\*\* Also a large part of the figures not matching with those reported in PMR for BSNL can be attributed to the fact that only sample POP's were audited in Kolkata whereas PMR provides the figures on all India basis)

Data verified on All India basis,  Figures do not match with those reported in PMR, DNA- Details Not Available for verification/Raw data not available for verification, B'mark = TRAI Benchmark

## **7.4 Compliance Report – Conclusions**

### **7.4.1 Basic Wireline Services**

- a. The verification figures for BSNL do not match with the IMRB audit figures for most of the parameter because the audits were conducted in a sample (5% spread across 10% of SDCA's) of the total number of BSNL exchanges in Kolkata
- b. For TATA teleservices there was variation observed regarding data pertaining to number of connections provided in seven days. On verification of records it was revealed that all the connections were provided at 22 customer locations in technically non feasible areas.
- c. RCOM does not meet the benchmark for provision of new connections within 7 days. However the operator claims that the subscribers where connections were not provided within 7 days were present in the "Technically non feasible" areas for them.
- d. Also, the parameter for help services for RCOM is reported at an all India level
- e. MTTR for faults for BSNL was observed to be very high for some of the exchanges which have skewed the average figure towards the higher side.
- f. In exchanges where MTTR was found to be very high, the service provider's representative claimed that the reason for not meeting the benchmark was that the fault was caused by external agencies such as digging of roads by Municipal Corporation of Kolkata, etc.
- g. Also, the service provider claimed that MTTR is high during the quarter for which the figures are verified because it is the prime monsoon period in Kolkata and the quality of cables had become poor

### **7.4.2 Cellular Mobile Services**

- a. The PMR figures for Bharti do not match with verification figures for parameters such as SDCCH congestion, TCH congestion and call drop rate.
- b. The PMR figures for Vodafone do not match with verification figures for parameters such as TCH congestion, calls answered by operators within 60 seconds, billing complaints resolution with 4 weeks and period of refunds.
- c. The service providers were found to be measuring all the parameters as per TRAI norms.

### **7.4.3 Broadband Services**

- a. Complete data for Sify and Reliance was verified on an all India level
- b. 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 and is not in line with QoS methodology.
- c. 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.
- d. 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.
- e. Historic data for Broadband 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.
- f. 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. Records of old ping tests were found to be maintained only by BSNL.

## 8. Annexure - I

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

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

Service provisioning/Activation time	Benchmark	Bharti	BSNL	R Com	Tata
Number of connections registered during the period		3482	1267	2034	28
Total number of connections provided within 7 days		3046	550	1607	0
Percentage of connections provided within 7 days	100%	87%	43%	79%	0%
Total number of connections provided after 7 days		48	655	16	28
Percentage of connections provided after 7 days		1%	52%	1%	100%

#### Live calling results for Service provisioning

Service Provisioning/Activation Time	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of service registration made		80	642	100	4
Number of cases in which connection was provided in 7 Days		64	379	74	2
Percentage cases in which connection was provided in 7 days	100%	80%	59%	74%	50%
Number of cases in which connection was provided after 7 days		16	260	22	2
Percentage cases in which connection was provided after 7 days		20%	40%	22%	50%
Percentage cases in which connection was provided after 7 days		20%	40%	22%	50%

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

Fault Repair/Restoration time	Benchmark	Bharti	BSNL	R Com	Tata
Total number of faults registered during the period		1518	32899	712	30
Total number of faults repaired by next working day		899	19764	689	30
Percentage of faults repaired by next working day	>90%	59%	60%	97%	100%
Total number of fault repaired within three working days		1264	28584	700	30
Percentage faults repaired within three working days	100%	83%	87%	98%	100%

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

Fault Repair	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of calls made		30	561	30	2
Number of cases where faults were repaired by next working day		2	127	4	2
Percentage cases where faults were repaired by next working day	>90%	7%	23%	13%	100%
Number of cases where faults were repaired within 3 days		22	372	15	2
Percentage cases where faults were repaired within 3 days	100%	73%	66%	50%	100%

**One month data collection results for CCR**

Traffic statistics - Call Completion Rate	Benchmark	Bharti	BSNL	R Com	Tata
Total local call attempts		17748799	2712950	DNA	30684
Total number of successful local calls		10364865	1923313	DNA	21324
Call Completion Rate (CCR) in the local network	>55%	58%	71%	DNA	69%

**Live measurement results for CCR**

Traffic statistics - Call Completion Rate	Benchmark	Bharti	BSNL	R Com	Tata
Total local call attempts		2421953	1649223	DNA	984
Total number of successful local calls		1396032	1369436	DNA	788
Call Completion Rate (CCR) in the local network	>55%	58%	83%	DNA	80%

**One month data collection results for billing performance**

Billing Performance	Benchmark	Bharti	BSNL	R Com	Tata
<b>Billing disputes</b>					
Total bills generated during the period		18331	2796544	29680	235
Total number of bills disputed		259	211	27	1
Percentage bills disputed	0.10%	1.4%	0.01%	0.09%	0.40%
<b>Resolution of billing complaints</b>					
Total complaints resolved in 4 weeks from date of receipt		258	211	27	1
Percentage complaints resolved within 4 weeks of date of receipt	100%	100%	100%	100%	100%

**Live calling results for Billing performance**

Resolution of billing complaints	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of calls made		50	98	3	NA
Number of cases resolved in 4 weeks		21	44	3	NA
Percentage cases resolved in four weeks	100%	42%	45%	100%	NA

**Audit results for Customer Care – Shifts**

Customer Care - Shift Requests	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of shift requests received		11	292	24	NA
Total number requests attended in 3 days	95%	11	172	23	NA
Total number requests attended beyond 3 days		0	118	1	NA
Shifts not attended		0	3	0	NA
Percentage of requests attended in 3 days		100%	59%	96%	NA
Percentage of requests attended beyond 3 days		0%	40%	4%	NA
Percentage of shifts not attended		0%	1%	0%	NA

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

Customer Care - Shift Requests	Benchmark	Bharti	BSNL	R Com	Tata
Total number of call to shift requests		6	144	6	NA
Total number of requests attended in 3 days	95%	1	41	5	NA
Total number of requests attended beyond 3 days			103	1	NA
Shifts not attended		0	0	0	NA
Percentage of requests attended in 3 days		17%	28%	83%	NA
Percentage of requests attended beyond 3 days		0%	72%	17%	NA
Percentage of shifts not attended		0%	0%	0%	NA

**Audit results for Customer Care – Closures**

Customer Care - Closure Requests	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of closure requests received		662	951	457	NA
Total closure attended within 24 hours	95%	662	612	456	NA
Total number of requests attended beyond 24 hours		0	321	1	NA
Closure requests not attended		0	18	0	NA
Percentage of closure attended within 24 hours		100%	64%	100%	NA
Percentage of closure attended beyond 24 hours		0%	34%	0%	NA
Percentage of closures not attended		0%	2%	0%	NA

**Audit results for Customer Care – Supplementary requests**

Customer Care - Supplementary Requests	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of supplementary requests received		1103	271	792	107
Total number of requests attended within 24 hours	95%	1103	264	792	25
Total number of requests attended beyond 24 hours		0	8	0	82
Supplementary requests not attended		0	0	0	0
Percentage of requests attended within 24 hours		100%	97%	100%	23%
Percentage of requests attended beyond 24 hours		0%	3%	0%	77%
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		41	213	40	2
Total number requests attended within 24 hours	95%	41	213	22	2
Total number requests attended beyond 24 hours		100	100	18	0
Supplementary requests not attended		0	0	0	0
Percentage of requests attended within 24 hours		100%	100%	55%	100%
Percentage of requests attended beyond 24 hours		27%	47%	45%	0%
Percentage of supplementary requests not attended		0%	0%	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	2200	100	NA
<b>Calls answered within 20 seconds</b>					
Total Number of calls answered by IVR in 20 seconds	80%	100	2197	100	NA
Percentage calls answered in 20 seconds		100%	100%	100%	NA
<b>Calls answered within 40 seconds</b>					
Total Number of calls answered by IVR in 40 seconds	95%	100	2200	100	NA
Percentage calls answered in 40 seconds		100%	100%	100%	NA

**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	2200	100	100
<b>Calls answered within 60 seconds</b>					
Total Number of calls answered by operator in 60 seconds	80%	91	1184	82	100
Percentage calls answered in 60 seconds		91%	54%	82%	100%
<b>Calls answered within 90 seconds</b>					
Total Number of calls answered by operator in 90 seconds	95%	100	2196	100	100
Percentage calls answered in 90 seconds		100%	100%	100%	100%

**Audit results for Refund of deposits after closure**

Resolution of billing complaints	Benchmark	Bharti	BSNL	R Com	Tata
Total Number of cases requiring refund		17	906	0	0
Number of cases where refund was made in < 60 days		17	646	0	0
Percentage cases where refund was made in < 60 days		100%	71%	NA	NA

## 8.2 Parameter wise performance reports for Cellular Mobile services

### Audit Results for Accumulated Downtime for community Isolation

Accumulated Downtime	Benchmark	Bharti	BSNL	Vodafone	TATA	RTL	RCOM
Total Downtime (In hours)		0.00	0.00	0.00	0.00	0.00	0.00

### Audit Results for CSSR

CSSR	Bharti	BSNL	Vfone	TATA	RTL	RCOM
Total number of call attempts	16869394	2167719	16869394	45113604	4013224	DNP
Total number of successful calls	16867629	2124470	16867629	44404395	4007149	DNP
CSSR	99.99%	98.00%	99.99%	98.43%	99.85%	98.91%

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	1688702	DNP	1688702	55748747	769414	DNP
Total number of successful calls	1688027	DNP	1688027	55180647	767997	DNP
CSSR	99.96%	98.00%	99.96%	98.98%	99.82%	99.16%

DNP – the figure was obtained directly from the system.

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

CSSR	Bharti	BSNL	Vfone	TATA	RTL	RCOM
Total number of call attempts	208	220	222	430	97	207
Total number of successful calls	206	220	221	430	97	202
CSSR	99.04%	100.00%	99.55%	100.00%	100.00%	97.58%

### Audit results for Service Access Delay

Service Access Delay	Bharti	BSNL	Vfone	TATA	RTL	RCOM
One month data collection	7	11.595	9	5.13	9.05	0.5

### Audit results for SDCCH and TCH Congestion

Traffic Statistics	Bharti	BSNL	Vfone	TATA	RTL	RCOM
<b>SDCCH Congestion</b>						
Total number of SDCCH Attempts	6315305	4715258	4715258	476791368317	815476	DNP
Total Number of SDCCH Congestions	32839.586	18389.506	18389.51	0	407.738	DNP
Percentage SDCCH Congestion	0.52%	0.39%	0.39%	0.00%	0.05%	0.00%
<b>TCH Congestion</b>						
Total number of TCH Attempts	2607625	DNP	6667735	44404395	146501	DNP
Total Number of TCH Congestions	6780	DNP	54009	888087	132	DNP
Percentage TCH Congestion	0.26%	0.81%	0.81%	2.00%	0.09%	0.00%

DNP – the figure was obtained directly from the system.

#### 5.4.2 Live measurement results for SDCCH and TCH Congestion

Traffic Statistics	Bharti	BSNL	Vodafone	TATA	RTL	RCOM
<b>SDCCH Congestion</b>						
Total number of SDCCH Attempts	6632735	DNP	DNP	46835751947	779374	DNP
Total Number of SDCCH Congestions	30510.581	DNP	DNP	0	0	DNP
Percentage SDCCH Congestion	0.46%	0.51%	0.51%	0.00%	0.00%	0.00%
<b>TCH Congestion</b>						
Total number of TCH Attempts	2716625	DNP	DNP	55748747	168033	0
Total Number of TCH Congestions	4889.925	DNP	DNP	780482	101	0
Percentage TCH Congestion	0.18%	0.80%	0.80%	1.40%	0.06%	0.00%

DNP – the figure was obtained directly from the system.

#### Audit Results for Call drop rate

Call drop rate	Bharti	BSNL	Vodafone	TATA	RTL	RCOM
Total number of calls established	2544972	2124470	71441134	44404395	54377251	DNP
Total number of calls dropped	28739	15463	624137	383272	627772	DNP
Call drop rate	1.13%	0.73%	0.87%	0.86%	1.15%	0.68%

DNP – the figure was obtained directly from the system.

#### Live measurement results for Call drop rate

Call drop rate	Bharti	BSNL	Vodafone	TATA	RTL	RCOM
Total number of calls established	2651763	DNP	DNP	55748747	10859935	DNP
Total number of calls dropped	28202	DNP	DNP	367015	125043	DNP
Call drop rate	1.06%	0.84%	0.84%	0.66%	1.15%	0.59%

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	RTL	RCOM
Total number of calls established	206	185	221	215	97	207
Total number of calls dropped	3	0	1	1	0	6
Call drop rate	1.46%	0.00%	0.45%	0.47%	0.00%	2.90%

#### Drive test results for Voice quality

Voice quality	Bharti	BSNL	Vodafone	TATA	RTL	RCOM
Total number of sample calls	431407	101030	60210	7314	97	23585
Total number of calls with good voice quality	14267	99780	58257	7128	95	22676
%age calls with good voice quality	96.69%	98.76%	96.76%	97.46%	97.94%	96.15%

**Audit Results for POI Congestion**

POI congestion	Bharti	BSNL	Vodafone	TATA	RTL	RCOM
POI traffic offered on individual POI's	1094051	DNP	DNP	22433	DNP	DNP
Served traffic for individual POI's	806762	DNP	DNP	11883	DNP	DNP
Traffic failed on individual 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	RTL	RCOM
POI traffic offered on individual POI's	108844.42	DNP	DNP	1622010	DNP	DNP
Served traffic for individual POI's	82413.7	DNP	DNP	454978	DNP	DNP
Traffic failed on individual POI's	0%	0%	0%	0%	0%	0%

**Audit results for customer care (Electronically)**

Customer Care Assessment	Bharti	BSNL	Vfone	TATA	RTL	RCOM
Total Number of calls received by	10105815	503801	3274653	887109	DNP	DNP
<b>Calls answered within 20 seconds</b>						
Total Number of calls answered in 20 seconds	10105815	460602	3274653	887109	DNP	DNP
Percentage calls answered in 20 seconds	100.00%	91.43%	100.00%	100.00%	100.00%	100.00%
<b>Calls answered within 40 seconds</b>						
Total Number of calls answered in 40 seconds	10105815	481620	3274653	887109	DNP	100
Percentage calls answered in 40 seconds	100%	96%	100%	100%	100%	100%

DNP – the figure was obtained directly from the system

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

Customer Care Assessment	Bharti	BSNL	Vfone	TATA	RTL	RCOM
Total Number of calls received by the operator	100	100	100	100	100	100
<b>Calls answered within 20 seconds</b>						
Total Number of calls answered in 20 seconds	100	99	79	100	100	100
Percentage calls answered in 20 seconds	100.00%	99.00%	79.00%	100.00%	100.00%	100.00%
<b>Calls answered within 40 seconds</b>						
Total Number of calls answered in 40 seconds	100	100	100	100	100	100
Percentage calls answered in 40 seconds	100%	100%	100%	100%	100%	100%

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

Customer Care Assessment	Bharti	BSNL	Vfone	TATA	RTL	RCOM
Total Number of calls received by the operator	6601993	503806	1412310	104919	370779	<b>693958</b>
<b>Calls answered within 60 seconds</b>						
Total Number of calls answered in 60 seconds	6162451	418156	1338428	93182	322578	<b>678900</b>
Percentage calls answered in 60 seconds	93.34%	83.00%	94.77%	88.81%	87.00%	97.83%
<b>Calls answered within 90 seconds</b>						
Total Number of calls answered in 90 seconds	6220317	478612	1375125	101068	na	<b>685839</b>
Percentage calls answered in 90 seconds	94.22%	95.00%	97.37%	96.33%	na	98.83%

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

Customer Care Assessment	Bharti	BSNL	Vfone	TATA	RTL	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	71	85	97	99	83	99
Percentage calls answered in 60 seconds	71%	85%	97%	99%	83%	99%
<b>Calls answered within 90 seconds</b>						
Number calls answered within 90 seconds	78	100	100	100	95	100
Percentage calls answered in 90 seconds	78%	100%	100%	100%	95%	100%

**Audit Results for Billing performance**

Billing Performance	Bharti	BSNL	Vfone	TATA	RTL	RCOM
<b>Billing disputes</b>						
Total bills generated during the period	171524	272805	240370	111224	NA	294291
Total number of bills disputed	0	2	106	15	NA	256
Percentage bills disputed	0.00%	0.00%	0.04%	0.01%	NA	0.09%
<b>Resolution of billing complaints</b>						
Total complaints resolved in 4 weeks from date of receipt	0	2	105	15	NA	256
Percentage complaints resolved within 4 weeks of date of receipt	NA	100%	99%	100%	NA	100%
<b>Refund of deposits after closure</b>						
Total number of cases requiring refund of deposits	NA	0	106	2	NA	256
Total number of cases where refund was made within 60 days	NA	NA	105	2	NA	256
Percentage cases in which refund was receive within 60 days	NA	NA	99%	100%	NA	100%
<b>Resolution of billing complaints</b>						
Total complaints resolved in 4 weeks from date of receipt	0	2	105	15	na	256
Percentage complaints resolved within 4 weeks of date of receipt	na	100%	99%	100%	na	100%

### 8.3 Parameter wise performance reports for Broadband services

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

Service provisioning/Activation time	B'mark	Bharti	BSNL	Sify	VSNL	RCOM
No of connections registered during the period		658	12140	307	564	1092
Total number registered during 15 days		593	11660	307	564	698
Percentage of connections provided within 15 days	100%	90.1%	96.0%	100.0%	100.0%	63.9%

#### Live calling results for Service provisioning

Service Provisioning/Activation Time	B'mark	Bharti	BSNL	Sify	VSNL	RCOM
Total Number of calls made		100	100	41	100	100
Number of cases in which connection was provided in 15 Days		89	95	38	87	57
Percentage cases in which connection was provided in 15 days	100%	89%	95%	93%	87%	57%
Number of cases in which connection was provided beyond 15 days		11	5	3	13	43
Percentage cases in which connection was provided after 15 days		11%	5%	7%	13%	43%

#### One month data collection results for fault repair

Fault Repair/Restoration time	B'mark	Bharti	BSNL	Sify	VSNL	RCOM
Total number of faults registered during the period		1631	18408	521	8306	19
Total number of faults repaired by next working day		1583	12393	471	7280	19
Percentage of faults repaired by next working day	>90%	97%	67%	90%	88%	100%
Total number of faults repaired within three working days		1610	15376	521	8048	19
Percentage of faults repaired within three working days	99%	99%	84%	100%	97%	100%

#### Live calling results for fault repair

Fault Repair	B'mark	Bharti	BSNL	Sify	VSNL	RCOM
Total Number of calls made		30	30	30	30	30
Number of cases in which faults were repaired by next working day		16	7	5	8	3
Percentage cases in which faults were repaired by next working day	>90%	53%	23%	17%	27%	10%
Number of cases in which faults were repaired within three working days		25	19	18	16	6
Percentage cases in which faults were repaired within three working days	99%	83%	63%	60%	53%	20%

**One month data collection results for billing performance**

Billing Performance	B'mark	Bharti	BSNL	Sify	VSNL	RCOM
<b>Billing disputes</b>						
Total bills generated during the period		18331	104483	Prepaid	5799	3486
Total number of bills disputed		259	344		51	4
Percentage bills disputed	<2%	1.41%	0.33%		0.88%	0.11%
<b>Resolution of billing complaints</b>						
Total complaints resolved in 4 weeks from date of receipt		258	337	Prepaid	51	4
Percentage complaints resolved within 4 weeks of date of receipt	100%	100%	98%		100%	100%
<b>Refund of deposits after closure</b>						
Total number of cases requiring refund of deposits		12	75	0	NP	NP
Total number of cases where refund was made within 60 days		12	14	0	NP	NP
Percentage cases in which refund was receive within 60 days	100%	100%	19%	100%	100%	100%

**Live calling results for billing complaints**

Resolution of billing complaints	B'mark	Bharti	BSNL	Sify	VSNL	RCOM
Total Number of calls made		55		Prepaid	50	2
Number of cases resolved in 4 weeks		47			42	2
Percentage cases resolved in four weeks	100%	85%			84%	100%

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

Customer Care Assessment	B'mark	Bharti	BSNL	Sify	VSNL	RCOM
Total Number of calls received by the operator		47244	45322	740	427497	232805
<b>Calls answered within 60 seconds</b>						
Total Number of calls answered in 60 seconds		39979	39430	740	398646	218836
Percentage calls answered in 60 seconds	>60%	85%	87%	100%	93%	94%
<b>Calls answered within 90 seconds</b>						
Total Number of calls answered in 90 seconds		42823	45322	740	418372	223492
Percentage calls answered in 90 seconds	>80%	91%	100%	100%	98%	96%

**Live calling results for call centre**

Customer Care Assessment	B'mark	Bharti	BSNL	Sify	VSNL	RCOM
Total Number of calls made		50	100	50	50	100
<b>Calls answered within 60 seconds</b>						
Number calls answered within 60 seconds		39	2	50	50	79
Percentage calls answered in 60 seconds	>60%	78%	2%	100%	100%	79%
<b>Calls answered within 90 seconds</b>						
Number calls answered within 90 seconds		49	98	50	50	100
Percentage calls answered in 90 seconds	>80%	98%	98%	100%	100%	100%

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

Service Availability Uptime	B'mark	Bharti	BSNL	Sify	VSNL	RCOM
Total Operational Hours		6894648	2208	744	892080	744
Total Downtime		836	2	0	18104	4.42
Total time when the service was available		6893812	2206	744	873976	739.58
Service Availability Uptime in Percentage	>98%	100.0%	99.9%	100.0%	98.0%	99.4%

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

Service Availability Uptime	B'mark	Bharti	BSNL	Sify	VSNL	RCOM
Total Operational Hours		649248	72	72	88488	DNA
Total Downtime		77	0	0	1023	DNA
Total time when the service was available		649171	72	72	87465	DNA
Service Availability Uptime in Percentage	>98%	99.99%	100.00%	100.00%	98.84%	DNA

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

Bandwidth Utilisation	B'mark	Bharti	BSNL	Sify	VSNL	RCOM
<b>Intra-network links (POP to ISP Node)</b>						
Total number of intra network links		80		400	4	2
No of Intra network found to be above 90%		0	0	5	0	0
<b>Upstream Links (ISP Node to IGSP/NIXI/NAP)</b>						
Total number of upstream links		4	97	28	35	NA
No of Intra network found to be above 90%		0	1	0	0	NA
Total International Bandwidth available from ISP Node to IGSP/NIXI/NAP (In mpbs)		220	17233	3218	21688	NA
Total International Bandwidth utilised during peak hours		148	12877	2069	16021	NA
Percentage Bandwidth utilisation during peak hours (In mpbs)	>80%	67%	75%	64%	74%	NA

**Live measurement results for Bandwidth utilisation**

Bandwidth Utilisation	Benchmark	Bharti	BSNL	Sify	VSNL	RCOM
<b>Intra-network links</b>						
No of Intra network Links tested		5	22	7	4	2
No of Intra network found to be above 90%		0	0	0	0	0
<b>International Bandwidth (ISP Node to IGSP/NIXI/NAP)</b>						
Total number of upstream links		4	97	28	35	NA
No of Intra network found to be above 90%		0	10 to 20	0	0	NA
Total International Bandwidth available from ISP Node to IGSP/NIXI/NAP (In mpbs)		220	18157	3218	21688	NA
Total International Bandwidth utilised during peak hours		162	12909	2052	16021	NA
Percentage Bandwidth utilisation during peak hours (In mpbs)	>80%	74%	71%	64%	74%	NA

**Live calling results for data download speed**

Bandwidth Utilisation	Benchmark	Bharti	BSNL	Sify	VSNL	RCOM
Data download speed	>80%	>80%	86%	82%	56%	60%

## **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 were request is still pending  <b>Live calling :-</b> - Interviewers ensured that operator should provide list of all new numbers added in one month prior to IMRB staff visit. - Live calling team called up at least 10% of the customers who applied for new connections during the month prior to Audit - Checked and Recorded whether the connection was provided within 7 days of registration on demand

<b>2. Fault incidence/clearance related statistic</b>	
<b>Computational Methodology</b>	<b>Fault incidence</b> = (No. of faults reported by the customer per month/ Total Number of Subscribers for that particular month)*100
<b>Benchmark</b>	Total number of faults registered per month: 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.

4. Metering and billing credibility – billing complaints	
Computational Methodology	<p>Percentage incidence of billing complaints = (No. of billing complaints reported by the customer per month/ Total Number of Subscribers for that particular month)*100</p> <p>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</p>
Benchmark	<p>Percentage incidence of billing complaints: Not more than 0.1% of the bills issued</p> <p>Percentage resolution of billing complaints: 100% within a period of 4 weeks</p>
Audit Procedure	<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>

5. Customer care promptness (Shifts, Closures and Additional facility)	
Computational Methodology	<p>Supplementary (Additional) services requests: A few of the supplementary services that are considered for the audit purpose:</p> <p>Clip (caller line identification presentation) facility , STD, ISD, Call forwarding, Voice Mail etc.</p>
Benchmark	<p>Shifting of telephone line : Less than 3 days</p> <p>Processing of closure request: Less than 24 hours</p> <p>Supplementary (Additional) services requests: Less than 24 hours</p>
Audit procedure	<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><b>Live calling was done in 10% of such cases to check the time taken to attend all such requests</b></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>Computational Methodology: Accumulated downtime = Summation of Significant Downtime*</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>↳ <math>SDCCH / TCH \text{ Congestion\%} = [(A1 \times C1) + (A2 \times C2) + \dots + (An \times Cn)] / (A1 + A2 + \dots + An)</math> <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>↳ <math>POI \text{ Congestion\%} = [(A1 \times C1) + (A2 \times C2) + \dots + (An \times Cn)] / (A1 + A2 + \dots + An)</math> <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></p> <p>Audit would be conducted based on the details of periodic drive tests conducted at different part of the network during Time consistent busy hour (TCBH) and used to arrive at the benchmarks reported to TRAI.</p> <p>Procedures that were to be followed by operator for obtaining relevant details for computing this parameter were audited</p> <ul style="list-style-type: none"> <li>↳ Operator to conduct <u>at least one</u> drive test using standard drive test equipment every week during TCBH</li> <li>↳ Each drive test should evenly cover the following 5 types of locations:</li> <li>↳ <b>3 Outdoor</b> (Periphery of the city, Congested Area, Across the City), and <b>2 Indoor</b> (Office Complex and Shopping Complex)</li> <li>↳ 2 minute long calls to be initiated and held throughout the drive test</li> <li>↳ The speed of the vehicle should be kept at around 50km/hr. (around 30 km/hr in case of geographically small cities) – This was ensured during the drive tests conducted by IMRB Auditors</li> <li>↳ RxQual / FER samples generated during the drive test collected by the operator were verified</li> <li>↳ <i>Measurements using Engineering handsets were not acceptable</i></li> <li>↳ All the operators were not maintaining this data at the switch level</li> </ul>

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 records pertaining to:</b></p> <ul style="list-style-type: none"> <li>↪ Audit was conducted based on the details of periodic drive tests conducted at different part of the network during Time consistent busy hour (TCBH) which were used to arrive at the benchmarks reported to TRAI.</li> <li>↪ Procedures were verified that were to be followed by operator for obtaining relevant details for computing this parameter:-                             <ul style="list-style-type: none"> <li>↪ Operator to conduct at least one drive test using standard drive test equipment* every week during Time consistent busy hour (TCBH).</li> <li>↪ Each drive test should evenly cover the following 5 types of locations: –                                     <ul style="list-style-type: none"> <li>↪ 3 Outdoor (Periphery of the city, Congested Area, Across the City), and</li> <li>↪ 2 Indoor (Office Complex and Shopping Complex)</li> </ul> </li> </ul> </li> <li>↪ <i>Measurements using Engineering handsets were not acceptable</i></li> </ul>

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}) * 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>  <b>Overall 100 number of live calls</b> made in a licensed service area/circle for each service provider. However in certain cases the sample could not be achieved as bills disputed (prior to the month of Audit) were found to be less than 100</p>

9.3 Period of refunds / payments due to customers	
Computational Methodology as per QoS definition	<p><b>Period of all refunds = Maximum value of 'Time taken to refund'</b>            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>  <b>Operator to provide details of:-</b></p> <ul style="list-style-type: none"> <li>• <b>Dates of lodging</b> of all billing complaints resolved in favour of customer and resulting in requirement of a refund by the operator</li> <li>• <b>Dates of refund</b> 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 :-</p> <ul style="list-style-type: none"> <li>-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</li> </ul>

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 60 seconds -Number and percentage calls answered within 90 seconds <b>Live calling : -</b> Overall 100 number of live calls at different points of time 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  <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  <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                      &lt; 350 msec from User reference point at ISP Gateway Node to International nearest NAP port (Terrestrial)                      &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>