

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

Report: March - 2009



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Preface

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

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

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

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

The Survey and Audit modules for various circles within the Zones, due the sheer scale of data collection, have been distributed across various Half Yearly periods. IMRB International Auditors carried out Audits across UP (W), Himachal Pradesh, Jammu and Kashmir, Orissa, North East, Assam, Andhra Pradesh and Kerala circles in the second Half Yearly period 2008. **This report details the performance of various service providers in UP (W) circle against Quality of Services benchmarks for various parameters laid down by TRAI in respective regulations for Basic (Wireline), Cellular (Mobile) and Broadband services**

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1.0 Background

The Telecom Regulatory Authority of India (TRAI) has a critical mandate to protect the interest of telecom consumers in addition to various other functions bestowed upon it. As part of the license conditions to telecom operators, it has the power and authority to measure the Quality of Service provided by various govt. (BSNL & MTNL) and private telecom operators. The parameters that need to be measured for Basic (Wireline) and Cellular Mobile (Wireless) services have been specified in the TRAI notification on Quality of Services of Basic (Wireline) and Cellular Mobile (Wireless) services dated 1st July, 2005. The parameters for Broadband Service have been specified in the TRAI notification for Quality of Services of Broadband Service Regulation, 2006

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 UP (W) circle that was covered in the Quarter 3 (July – September 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 August 2008 – November 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 UP West circle for Basic (Wireline), Cellular Mobile services, and Broadband services

2.0 Objectives and Methodology

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

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

- 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 the sample of exchanges was selected was spread across 10% of SDCA's in the entire service. Overall 40 exchanges (16 Urban and 24 Rural) exchanges were audited.
- For Bharti data was collected pertaining to all the exchanges present in the circle/service area

3.2 Sampling for Cellular Mobile (Wireless) service providers

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

- Bharti Airtel Ltd.
- Reliance communications
- BSNL
- Idea Cellular
- TATA Teleservices
- Vodafone Essar Ltd

3.3 Sampling for Broadband service providers

- Audits for various Broadband service providers were conducted at the service provider's central node. Since 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 UP (W) and data submitted by various exchanges/POPs providing Broadband service was verified and collected. This was done in such a way that atleast 5% of POPs spread across 10% of SDCA's were covered
- For BSNL, the data pertaining to network related parameters was obtained by IMRB Auditors at the central node in Bangalore.
- Following Broadband service providers were Audited in UP (W) circle: - Bharti Airtel Ltd., Sify, BSNL

4 Audit methodology

4.1 Basic (Wireline) Services

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

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

* In addition to above verification of records for PMR submitted during April to June 2008 was carried out for all network and non network related parameters.

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

4.2 Cellular Mobile Services

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

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

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

4.3 Broadband Services

In a nutshell, the audit methodology was as follows:

	Parameters	Verification of PMR	Three day live measurement	Data Verification for one month	Live calling
(i)	Service Provisioning/ Activation time	YES	YES	YES	YES
(ii)	Fault Repair/ Restoration Time	YES	YES	YES	YES
(iii)	Billing Performance				
-	Billing Complaints per 100 Bills issued	YES	YES	YES	
-	%age of billing complaints resolved in four weeks	YES	YES	YES	YES
-	Time taken for refund of deposits after closure	YES	YES	YES	YES
(iv)	Response time to the customer for assistance(Voice to Voice)				
-	<i>Within 60 seconds > 60%</i>	YES	YES	YES	YES
-	<i>Within 90 seconds > 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 Note 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. For e.g. for network related parameters for Broadband services 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. Also for some service providers who have call centralized call centers located at places away from ISP Nodes/Exchanges detailed raw data i.e. call by call detail was not available for verification. Hence verification of records was done to the extent possible in such cases.
- 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 September 2008 to November 2008 in UP (W) circle. The executive summary encapsulates the key findings of the Audit by providing: -

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

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

S.no	Parameters	B'mark	Bharti	BSNL
1	Provision of telephone after registration of demand			
1.1	Connections completed within 7 days	100%	100%	97%
2	Fault incidence/clearance statistics			
3	Fault incidences(No. of faults/100 subscribers/month)	<3	4	10.5
3.1	Faults repaired within 24 hours	>90%	98%	63%
3.2	Faults repaired within three working days	100%	100%	92%
4	Mean time to Repair (MTTR)	<8 hours	7	24
5	Call Completion Rate (CCR)	>55%	93%	48%
6	Metering and billing credibility			
6.1	Billing complaints per 100 bills issued	<0.1%	0.01%	0.05%
6.2	%age of billing complaints resolved within 4 weeks	100%	100%	93%
7	Customer care/helpline promptness			
7.1	<u>Shift requests attended</u>			
	Shift requests attended within 3 days	95%	97%	77%
7.2	<u>Closure request attended</u>			
	Closure within 24 hours	95%	100%	15%
7.3	<u>Supplementary (additional) service requests attended</u>			
	Additional facility provided within 24 hours	95%	99%	78%
8	Response time to customer for assistance			
8.1	% age call answered through IVR in 20 seconds	80%	100%	100%
	% age call answered through IVR in 40 seconds	100%	100%	100%
8.2	% age calls answered by operator in 60 seconds	80%	97%	DNA
	% age calls answered by operator in 90 seconds	95%	99%	DNA
9	Time taken for refund of deposits after closure			
9.1	%age cases where refund received within 60 days	100%	100%	100%

** 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 UP (W) circle broadly indicates that neither Bharti Airtel nor BSNL could meet all the benchmarks as specified by Telecom Regulatory Authority of India.

The live calling results were found to be different from the 1 month audit data collection in certain places. To some extent the difference can be attributed to the smaller sample size undertaken for the live calling. For live measurements conducted to assess Call Completion Rate (CCR) it was found that BSNL is falling short of the TRAI specified benchmark with a score of 46%.

For verification of raw data for the period of April to June 2008, there was variation observed when compared to the figures reported in the PMR by BSNL but the same was largely due to the fact that audit was carried out only for sample 5% exchanges in UP circle. For Bharti data provided in the PMR was in congruence with the data which was verified by IMRB auditors for most of the parameters.

The parameter wise key takeouts for the wireline service providers for the UP (W) circle are as under:-

Provision of telephone after registration of demand

- BSNL with 97% connections registered within 7 days was found to be falling short of the TRAI specified benchmark. Bharti did exceptionally well with by scoring 100% on the parameter.
- BSNL has scored low on Service provisioning/activation time. One of the reasons for the same was observed to be the fact that the service provider provides connection at all the locations and SDCA's in the circle whereas private service providers normally provide connections in areas which are technically feasible for the operator, especially for retail customers.
- As far as live calling scores are concerned the scores for BSNL and Bharti are observed to be 56% and 99% respectively.

Fault incidence / clearance statistics

- BSNL falls short of TRAI specified benchmark for fault repair within 24 hrs (at 63%). However the service provider does fairly well with a score of 92% on fault repair within 3 days.
- The reason for low score by BSNL could be the fact that service providers also has presence in rural areas where fault repair may sometimes take time due to operational difficulties.
- Bharti meets the TRAI specified benchmark on fault repair within 24 hrs and fault repair within 3 working days.
- The live calling scores (for fault repair within 24 hrs) were observed to be really poor both for BSNL and Bharti with negligible subscribers claiming that the fault was repaired in stipulated time period. As mentioned earlier, a part of it could be attributed to low sample (10% of total faults registered in month prior to Audit).
- Live calling scores for fault repair within three working days is observed to be 34% and 94% for BSNL and Bharti respectively.

Traffic statistics (CCR)

- BSNL falls short of TRAI specified benchmark of 55% CCR both during the live measurements and the month in which the audit was carried out. The live measurement and audit scores for BSNL were 46% and 48% respectively.
- Bharti meets the specified benchmark with the live measurement and audit scores of 99% and 93% respectively.

Metering and billing credibility

- Both the service providers are meeting the TRAI specified benchmark of <0.1% billing complaints.
- However, BSNL falls short (by 7%) of TRAI specified benchmark of 100% billing complaints resolved within 4 weeks.
- During verification of records of Bharti, it was found that definition of billing complaints remains to be lenient as only those cases where an internal ticket is opened i.e. cases where refund is provided by the operator are being taken as billing complaints for the consideration. Hence, there is a need felt to have some clarity on the definition of billing complaints.

Customer care/helpline promptness

- For “shift requests attended within 3 days” audit data, BSNL (at 77% score) fall short of TRAI specified benchmark of 95%.
- For closure requests within 24 hours, BSNL with 15% of the requests attended falls short of the benchmark of 95%.
- For supplementary service requests, BSNL, with 78% score, again falls short of TRAI specified benchmark (of 95% score) for the month in which audit was carried out.
- Bharti meets the specified benchmark for shift requests attended within 3 days, closure within 24 hours and supplementary service requests with 97%, 100% and 99% scores respectively.
- While looking at the live calling scores for the service request attended within 3 days, the score of 69% for Bharti is below the TRAI benchmark of 95%.

Response time to customer for assistance

- Details of calls answered and received by the operator was not available at various BSNL exchanges audited by IMRB auditors.
- BSNL and Bharti, both with cent percent scores, comfortably meet the benchmark for calls answered electronically within 20 and 40 seconds.
- Live calling results carried out to check the efficiency of calls answered by the operator reveal that both Bharti and BSNL are falling short of calls answered by IVR within 20 and 40 seconds and calls answered by the operator within 60 seconds. For Bharti, the live calling scores for calls answered by IVR within 20 and 40 seconds were 78% and 90% respectively whereas for BSNL, the live calling scores for calls answered by IVR within 20 and 40 seconds were 63% and 93%.

Time taken for refund of deposits after closure

- Both the operators meet the TRAI specified benchmark on Time taken for refund of deposits after closure.

Level 1 service

To test the efficiency of level 1 services (Trunk booking, Child helpline, Women helpline, Airline booking, Fire, Police, Railways) offered by various service providers. 270 calls were made for BSNL to different numbers and time taken to answer the call was noticed. For BSNL approximately 70% of calls made were answered in 60 seconds. It should be noted that Bharti offer level 1 service primarily for emergency services like fire, police etc

Summary of Live Measurement Results – Basic Wireline Services

Traffic statistics - Call Completion Rate	Benchmark	Bharti	BSNL
Call Completion Rate (CCR) in the local network	>55%	99%	46%

- For basic wireline services there was only one parameter (Call Completion Rate – Benchmark > 55%) for which live measurement was applicable.
- BSNL is falling short of TRAI specified benchmark of 55% for live measurements carried out during visits by IMRB auditors

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

Parameters	Benchmark	Reliance CDMA	IDEA	Bharti Airtel	TATA	BSNL-GSM	Vodafone
Accumulated downtime for community isolation	< 24 hrs.	0.00	20.23	8.17	1.28	0.00	0.00
Call Set Up Success Rate (CSSR)	> 95%	99.48%	97.66%	95.65%	97.73%	82.03%	99.80%
Service Access Delay*	9 to 20 seconds (< = 15 seconds for 100 calls)	3.80	10.91	9.20	7.80	10.50	9.00
Blocked Call Rate							
<i>SDCCH/Paging Channel Congestion</i>	<1%	0.00%	0.32%	0.98%	0.00%	0.54%	0.93%
<i>TCH Congestion</i>	< 2%	0.52%	1.10%	1.47%	0.09%	1.88%	1.51%
Call drop rate	< 3%	0.83%	1.45%	1.07%	0.99%	1.33%	1.04%
Percentage connections with good voice quality*	> 95%	94%	94%	94%	98%	72%	93%
Service coverage*							
<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%	Complied	Complied	Complied	Complied	Complied	Complied
Calls answered electronically							
Percentage calls answered within 20 seconds	80%	99%	100%	100%	100%	99%	100%
Percentage calls answered within 40 seconds	95%	99%	100%	100%	100%	100%	100%
Calls Answered by the operator							
Percentage calls answered within 60 seconds	80%	94%	73%	92%	95%	80%	95%
Percentage calls answered within 90 seconds	95%	96%	92%	93%	97%	95%	96%
Billing Complaints							
Billing complaints per 100 bills issued	<0.1%	0.09%	0.25%	0.04%	0.09%	0.00%	0.05%
Percentage billing complaints resolved within 4 weeks	100%	100%	100%	100%	100%	Not Applicable	100%
Period of refunds/payments due to customers from the date of resolution of complaints	<4 weeks	100%	100%	DNP	53%	Not Applicable	100%

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

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

Critical findings: Cellular Mobile Services

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

It should be noted that 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
Reliance CDMA	1800 – 1900	1800 – 1900
Idea Cellular	2000 – 2100	2000 – 2100
Vodafone	1900 – 2000	1900 – 2000
TATA	1900 – 2000	1900 – 2000

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

Accumulated Downtime:

In the UP West circle, there were outages that led to a community being isolated at a particular point in time for all the operators except Reliance CDMA, BSNL and Vodafone. Idea had the maximum outage in the month of audit with an outage of more than 20 hours observed.

Call Set-up Success Rate (CSSR):

All the operators except BSNL are comfortably meeting the benchmark on this parameter. During the audits the maximum CSSR was observed for Vodafone with 99.80% of their calls getting completed followed closely by RCOM at 99.48%. 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 UP West 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 Idea at 10.91 seconds. All of the operators 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 are meeting the TRAI specified on the congestion parameters. TATA teleservices leads the way in network congestion parameters with almost negligible paging as well as traffic channel congestion. The calculation methodology of these parameters was found to be in complete accordance with what has been specified by TRAI. There was almost 0 POI congestion on almost all individual POI links between a service provider vis-à-vis other service providers.

Call Drop Rate:

During the audit it was found that all the service providers were measuring this parameter as per the TRAI guidelines. The call drop rate was measured as the ratio of total calls dropped (unexpected seizure) to the total number of call attempts for all operators. Also, all of service providers were found to be meeting the TRAI specified benchmark. The lowest call drop rate was of Reliance CDMA at 0.83% while the relative highest (although it easily met the benchmark) was for Idea at 1.45%.

% 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 except TATA failed to meet the TRAI benchmark of 95%. BSNL performed the worst with only 72% score on percentage connections with good voice quality.

Service coverage:

This parameter is reported by the service provider basis the periodic drive tests in a particular circle. The service coverage for all the operators was found to be within the TRAI specified limits for 100% of the drive test route (for which the audit was conducted). However, there were places where interference and inadequate coverage was recorded (explained in greater detail along with drive test findings).

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. Also, RCOM claimed that whatever calls cannot be routed to the IVR is directly routed to the voice to voice operator. In case of calls answered by operators, all the service providers except Idea (both for percentage calls answered within 60 and 90 seconds) and Airtel for calls answered by the operator within 90 seconds meet the benchmark for the month of audit.

Billing performance

All the operators except Idea with 0.25% complaints received were found to be meeting the benchmark of < 0.1% complaints registered per 100 bills issued and the benchmark of 100% billing complaints being resolved within 4 weeks. In all cases where customers were due for refund, all the service providers except TATA meet the TRAI benchmark of 100% within 4 weeks. BSNL claimed that they did not receive any complaint in the month of audit.

Inter operator calls assessment

Inter operator call Assessment (To ↓ / From →)	Reliance CDMA	IDEA	Bharti Airtel	TATA	BSNL-UP W	Vodafone
Reliance CDMA	NA	81%	86%	99%	59%	79%
IDEA	58%	NA	74%	99%	59%	73%
Bharti Airtel	56%	83%	NA	97%	58%	81%
TATA	55%	90%	85%	NA	65%	79%
BSNL UP W	70%	84%	84%	98%	NA	52%
Vodafone	57%	93%	87%	100%	58%	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. All the operators except TATA fare very poorly in the UP West circle. The operators should look to enhance their quality of services in order to achieve better connectivity with each other.

Results of Operator assisted Drive test

The drive test was conducted simultaneously for all the operators present in the UP West circle. There was in total of three drive tests conducted in the circle. These tests were conducted in the cities of Aligarh, Dehradun and Meerut. 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 UP West telecom circle were covered.

For measuring voice quality RxQual samples for GSM operators and Frame Error Rate (FERs) for CDMA service providers were measured. RxQual greater than 5 meant that the sample was not of appropriate voice quality and for CDMA operators FERs of more than 4 were considered bad. Call drops were measured by the number of calls that were dropped to the total number of calls established during the drive test. Similarly CSSR was measured as the ratio of total calls established to the total call attempts made. Signal strength was measured in Dbm with strength > -75dbm for indoor, -85 dms for in-vehile and > -95 dbm outdoor routes.

The drive tests in the UP West circle were conducted in the cities of Aligarh, Dehradun and Meerut was conducted along the following route:

	Type of Location	Aligarh	Dehradun	Meerut
Outdoor	Periphery of the city	BSNL Exchange office, Marice road, ADA colony, Quarsi by pass, Naurangabad, Daudkhan village	Rispana, Nehrugrm, Aumwala, Surverchok	Pallav Puram, Subharti, Delhi by pass, Rishi Nagar, Krishna Nagar
	Congested Area	Jeevan Jyoti Hospital, Gaur Nagar Kabir Colony, Kela Nagar, Aligarh Medical College, Amir Nissha	Paltanbazar, Asleyhall, Tagaoremarg, Rajendranagar	Hotel Smart Place, 7/11 Hotel, Hapur Aada, Gaosala, Ghantaghar, Burana Gate
	Across the City	Kasbakol, Sasni Gate, Kala Mahal, CM Mall, Railway Road, Raghuvveer puri, Jeevan Jyoti hospital, Village Sirsoll	Ajabpur, Dallwanwala, IDBI, GM Plaza, GM Road, Vivek Vihar, Prince Chok	Metro Plaza, Begum Brize, Hapur Aada, ITO office, Satri Nagar
Indoor	Office Complex	Near Center Point Idea office	HDFC, Airtel Office	Krishna Plaza, Nokia office
	Shopping Complex	Ramghat Road Near ADA colony, Vishal Mall	Vishal Megamart	Seven Eleven

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

Drive Test – Aligarh

	Reliance CDMA		IDEA		Bharti Airtel		TATA		BSNL-GSM		Vodafone	
	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
Voice quality	99.97%	98.75%	100.00%	96.80%	94.79%	94.49%	89.71%	88.08%	97.64%	94.74%	96.57%	97.28%
CSSR	100.00%	100.00%	100.00%	100.00%	100.00%	97.80%	100.00%	98.41%	96.08%	96.77%	100.00%	100.00%
Blocked Call Rate	0.00%	0.00%	0.00%	0.00%	0.00%	2.20%	0.00%	1.59%	3.92%	3.23%	0.00%	0.00%
Call drop rate	0.00%	0.00%	0.00%	0.00%	0.00%	1.12%	0.00%	3.23%	0.00%	8.99%	0.00%	0.00%
Hands off success rate	Complied		Complied		Complied		Complied		Complied		Complied	

Drive Test – Dehradun

	Reliance CDMA		IDEA		Bharti Airtel		TATA		BSNL-GSM		Vodafone	
	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
Voice quality	99.99%	99.51%	99.94%	99.46%	99.25%	97.09%	90.52%	87.56%	97.42%	96.66%	98.51%	96.57%
CSSR	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	86.49%	55.32%	100.00%	100.00%	100.00%
Blocked Call Rate	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	13.51%	44.68%	0.00%	0.00%	0.00%
Call drop rate	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	6.52%	3.45%	0.00%	0.00%
Hands off success rate	Complied		Complied		Complied		Complied		Complied		Complied	

Drive Test – Meerut

	Reliance CDMA		IDEA		Bharti Airtel		TATA		BSNL-GSM		Vodafone	
	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
Voice quality	99.65%	99.80%	99.96%	99.82%	99.68%	95.89%	95.42%	92.74%	99.95%	96.35%	98.24%	96.34%
CSSR	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	85.71%	100.00%	100.00%	100.00%	100.00%
Blocked Call Rate	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	14.29%	0.00%	0.00%	0.00%	0.00%
Call drop rate	0.00%	0.00%	0.00%	0.00%	0.00%	2.63%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Hands off success rate	Complied		Complied		Complied		Complied		Complied		Complied	

 Not meeting the benchmark

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

ALL SERVICE PROVIDERS

Aligarh: There was interference and inadequate signal strength recorded for all operators in the outdoor areas of Quarsi By pass Daudkhan Village, Aligarh Medical College, Sarsole, Patwari Nagla, Kaila Nagar, Sasni Gate, Village Sirsoll, Railway Station area, Near Jeevan Jyoti Hospital Kabir Nagar while in the indoor areas inadequate coverage was not found in any of the areas.

Dehradun: There was interference and inadequate signal strength recorded for all the operators in the outdoor areas of Cantonment area, Clock Tower - Raipur Road, Dalanwalaas, Shashdara Road, Paltan Bazar, Chakrata Road, Mussorie Road, Dilaram Bazar Cantt Road, Crashi Carst, Rajender Marg, Madhuban Hotel, Race course, Haridwar Road, Survey Chowk, Chakroda Road - Binda pul, Saharanpur Chowk - Railway station while in the indoor areas inadequate coverage was not found in any of the areas.

Meerut: There was interference and inadequate signal strength recorded for all the operators in the outdoor areas of Cantonment area, Delhi bypass, Garh Road, Marchandi Grand, Hapur Adda, Bhagwatpura, City Center, Rachna Park, Soti Ganj, Hapur Road (Islamabad), New Mohan Puri area, Ganga Plaza area while in the indoor areas inadequate coverage was not found in any of the areas.

Conclusions:

1. Vodafone, Idea and Reliance CDMA meet the TRAI benchmark on the drive test parameters in all the three cities.
2. TATA does not meet the voice quality benchmark for out door areas in all the three cities while for indoor areas it only meets the benchmark in Aligarh
3. BSNL observes call drops in both Aligarh as well as Dehradun. Also, it performs relatively poorly in the indoor areas of Dehradun
4. Airtel does not meet the voice quality benchmark in Aligarh

Summary of Live Measurement Results – Cellular Mobile Services

Parameter	Benchmark	Reliance CDMA	IDEA	Bharti Airtel	TATA	BSNL-GSM	Vodafone
CSSR	> 95%	99.46%	87.23%	95.50%	98.31%	94.01%	99.93%
SDCCH / Paging Channel Congestion	< 1%	0.00%	0.13%	0.96%	0.00%	0.80%	0.55%
TCH Congestion	< 2%	0.54%	1.04%	1.50%	0.07%	1.91%	0.63%
Call drop rate	< 3%	0.76%	1.38%	1.49%	0.99%	3.17%	1.03%
POI congestion	< 0.5%	Complied	Complied	Complied	Complied	Complied	Complied

 Not meeting the benchmark

During the three day live measurement except for Idea and BSNL on CSSR and BSNL for call drop rate, all the operators were found to be meeting the TRAI benchmark on all the parameters.

Summary of TCH Drop for One Month

Parameter	Vodafone	TATA	Airtel	BSNL	IDEA	Reliance CDMA
Total number of cells	10423	695	Details not provided		10301	980
No. of cells exceeding 3% TCH drop	616	6			766	15
% of cells exceeding 3% TCH Drop	6%	1%			7%	1.5%

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

S.No	Parameters	B'mark	Bharti	BSNL	Sify
1	Service provisioning uptime				
1.1	Total connections registered		448	489	81
1.2	Percentage connections provided within 15 days	100%	100%	100%	100%
2	Fault repair restoration time				
2.1	Total number of faults registered/calls made		1008	1007	24
2.2	Percentage faults repaired by next working days	> 90%	98%	90%	96%
2.3	Percentage faults repaired within three working days	99%	98%	100%	100%
3	Billing performance				
3.1	Total bills generated		11921	13540	Prepaid
3.2	Billing complaints per 100 bills issued	<2%	0.01%	0.05%	
3.3	%age of billing complaints resolved within 4 weeks	100%	100%	100%	
3.4	Time taken for refund of deposits after closure	100%	100%	100%	
4	Customer care/helpline assessment				
4.1	Percentage calls answered within 60 seconds	> 60%	86%	97%	100%
4.2	Percentage calls answered within 90 seconds	>80%	92%	100%	100%
5	Bandwidth utilisation/Throughput				
5.1	Total number of intra network links tested		4 links from Agra to Delhi, 4 links from Meerut to Delhi	23 BRAS, TI 24, T2624, DSLAM 5960	412
5.2	Total number if intra network links crossing 90%		0	0	0
	<i>Upstream Bandwidth (ISP Node to NIXI/NAP/IGSP)</i>				
5.3	Total number of upstream links		3	141	27
5.4	Number of links > 90%		0	8	0
5.5	Percentage bandwidth utilised on upstream links	<80%	79%	70%	79%
6	Broadband download speed	>80%	Complied	Complied	Complied
7	Service availability/uptime	>98%	99.99%	100.00%	100.00%
8	Packet loss	<1%	1%	0%	0%
9	Network Latency				
9.1	POP/ISP Node to NIXI to IGSP	<120msec	<80	<120	<30
9.2	ISP node to NAP port	<350msec	<150	Complied	<300

** 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. Also, there were differences observed in level of reporting for e.g. Sify, and BSNL (for network related parameters) claimed to be category "A" service provider and consider all India as one circle. In fact the findings reported herewith for some of the parameters for these operators are on an all India basis.

However, we need to take a larger view of the picture and ignore some differences in measurement methodologies and level of reporting. 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 three Broadband service providers are highlighted below

Service provisioning/Activation time

- All the operators meet the TRAI benchmark of 100% connections to be provided within 15 days.
- For Live calling carried out Bharti scores the lowest with 20% subscribers claiming that connection was provided within 15 days. For rest of the service providers scores are observed to be > 90%.

Fault Repair/Restoration time

- All the operators meet the TRAI benchmark of 100% connections to be provided within 15 days.
- Live calling scores for Bharti and Sify are observed to be low when compared to scores in obtained in other circles. Of calls made to 30 subscribers each for Bharti and Sify very few claimed that the complaint was resolved in 24 hrs. Live calling scores for BSNL for fault repair within 24 hrs is observed to be relatively better at 77%

Billing performance

- Both Bharti and BSNL were found to be meeting the benchmark of 4 weeks for resolution of billing complaints for the month in which data was collected.
- Sify however claim that all its retail broadband customers are prepaid and hence there are no billing complaints for Sify.
- It should also be noted that the definition of billing complaints/disputes can be considered as lenient as Bharti include only those complaints where an internal ticket is opened and refund is made to the customer. Hence there is a need felt to have some clarity on the definition of billing complaints.

Customer Care/Helpline Assessment

- All the operators meet the benchmark of calls answered by the operator within 60 seconds and 90 seconds for the month in which audit was carried out
- For live calling carried out to assess the effectiveness of call centre Bharti falls short of TRAI specified benchmark for calls answered within 60 seconds with a score of 44%

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 utilised during the complete period to TRAI instead of Bandwidth utilised during Time Consistent Busy Hour (TCBH) as they 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. Also, it was observed that there are multiple links and busy hour may vary for each link.
- All the service providers were found to be reporting combined bandwidth utilisation for corporate and household customers as there is no mechanism available to provide it separately for different users.
- For Intra network link, data for Sify, BSNL was obtained on all India basis.
- 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 be below 80%.
- Also, Sify claims that it is not possible to measure the Bandwidth available from Cable operator to their base stations. Hence, it is believed that last mile experience may suffer as operators have relatively less control over the operations of cable operator.
- For Bandwidth utilisation on upstream links (From ISP Node to IGSP/NIXI), BSNL, and Sify meet the TRAI specified benchmark cumulatively for all the gateways present in India.
- For Bharti upstream links are physically located in Delhi and service provider is comfortably meeting the benchmark for Bandwidth utilised on upstream links during TCBH

Download speed

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

Service Availability/Uptime:

- All the service providers are meeting the benchmark on service availability/uptime for the month in which audit was carried out i.e. for none of the operators Broadband access network was in a state of failure during the period of one month in which audit was carried out

Packet Loss and Network Latency

- It was observed that almost all the service providers are measuring packet loss and latency by conducting random ping tests for their internal performance measurement, but there are no records being maintained or book keeping methodology was non existent for all the operators except BSNL. However, it should be noted that the network related data for BSNL for verification was obtained from their central node in Bangalore.
- Also, while conducting ping tests it was observed that service providers (except BSNL) were found to be not using of the standard prescribed by TRAI i.e. one ping test constitute

of 1000 pings of 64 byte packet each to be carried out daily during Time consistent Busy Hour(TCBH).

- Due to non availability of the records of old ping tests, verification process could not be conducted for most of the private operators.
- However, ping tests conducted/smoked ping results during live measurements revealed that all the service providers are meeting the benchmark prescribed by TRAI.

Summary of Live Measurement Results – Broadband Services

Parameters	Benchmark	Bharti	BSNL	Sify
Service Availability Uptime	>98%	99.9%	100.00%	100.00%
No of Intra network links found to be above 90% (Out of sample links tested)		0	0	0
Total Bandwidth utilization at all upstream links	< 80%	72%	83%	68%
Data Download Speed	> 80%	Complied	Complied	Complied
Packet Loss (Percentage)	< 1%	<1%	<1%	<1%
From user reference point at POP/ISP Node to IGSP NIXI (msec)	<120msec	99.66	Complied	<30
From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec)	<350msec	122.33	Complied	<300

** Methodology not in line with QoS

■ Figures provided on All India basis

■ Not meeting the benchmark

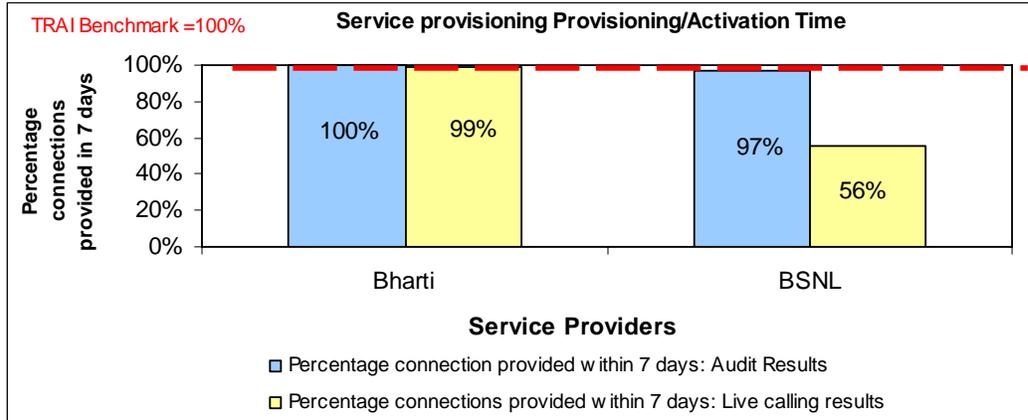
B'mark = TRAI Benchmark, **DNA** = Details not available, **NA**: Not Applicable

- All the service providers are meeting the benchmark on service availability/uptime for three day live measurements.
- The testing for Bandwidth utilization during live measurement was carried out on sample basis by IMRB auditors for intra network links. There were no intra network links that were found to have a utilization of more than 90% for all of the operators
- For Bandwidth utilization 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 for BSNL out of the total 141 gateway links present at different places in India 19 were found to be > 90 %.
- For network latency and packet loss all the service providers comfortably meet the TRAI specified benchmark for ping tests carried out during live measurements.

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

6.1 Graphical/Tabular Representations for Basic (Wireline) services

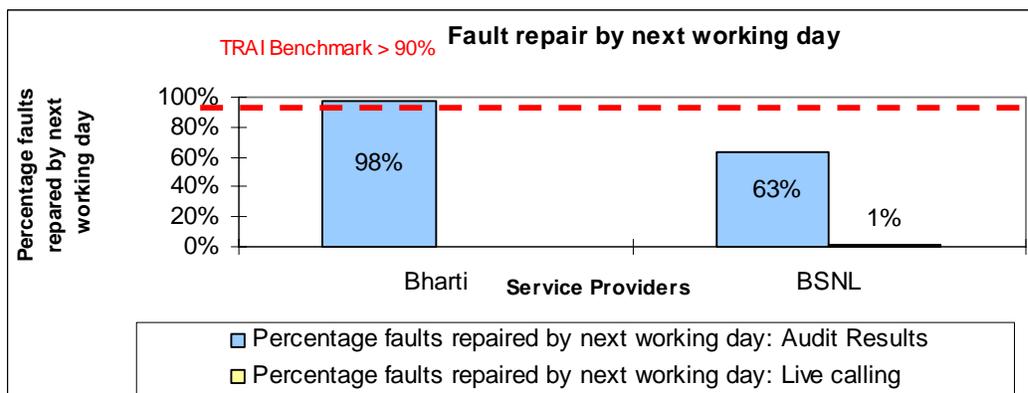
Service provisioning / Activation time (Comparison between one month audit results and live calling results)



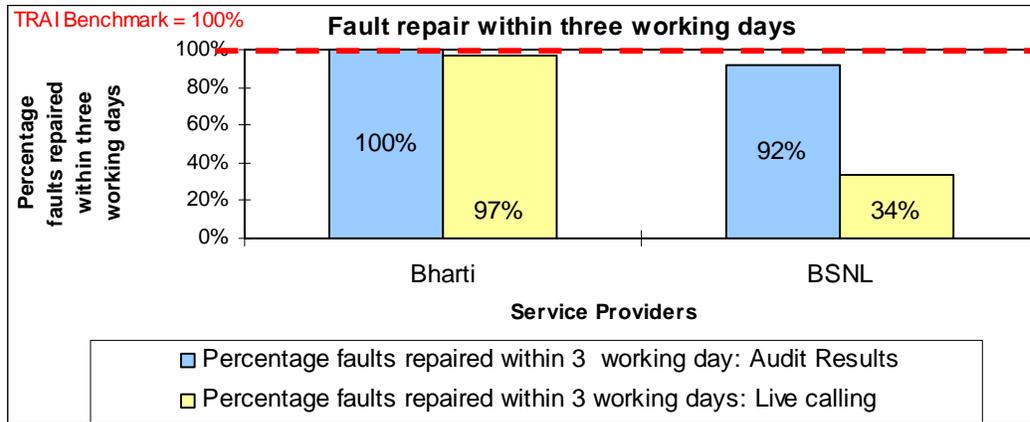
BSNL (97%) score fall short of TRAI specified benchmark for connections registered within 7 days. It should be noted that BSNL’s score is deemed to be good as BSNL was found to be providing connections in rural as well as urban areas.

Live calling scores are observed to be 99% and 56% respectively for Bharti and BSNL

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

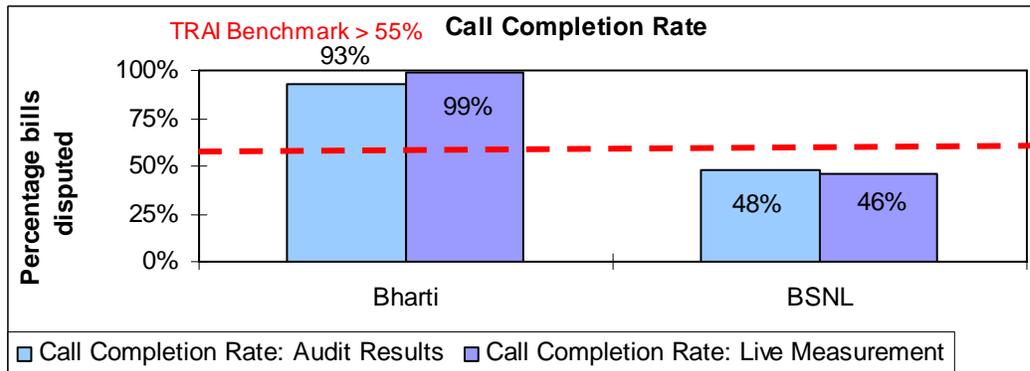


Live calling cores for fault repair within 24 hrs are found to be abysmally poor both for BSNL and Bharti



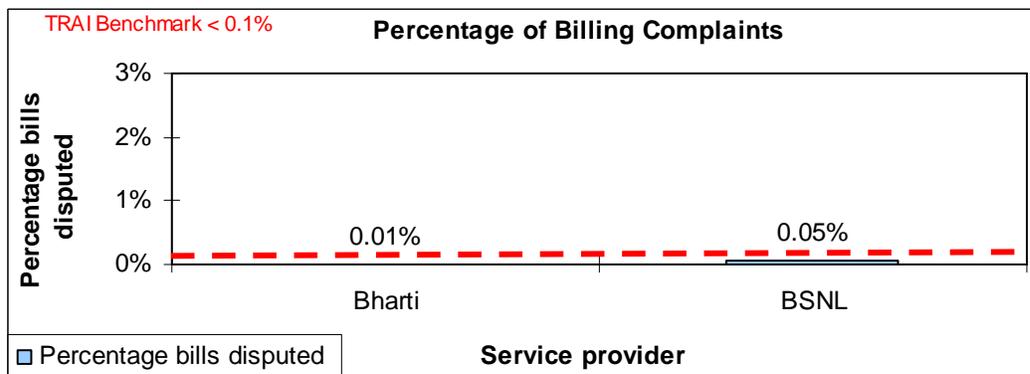
BSNL shows improvement in scores when compared to its score on fault repair within 24 hrs. For live calling scores are observed to be 97% and 34% for Bharti and BSNL respectively

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



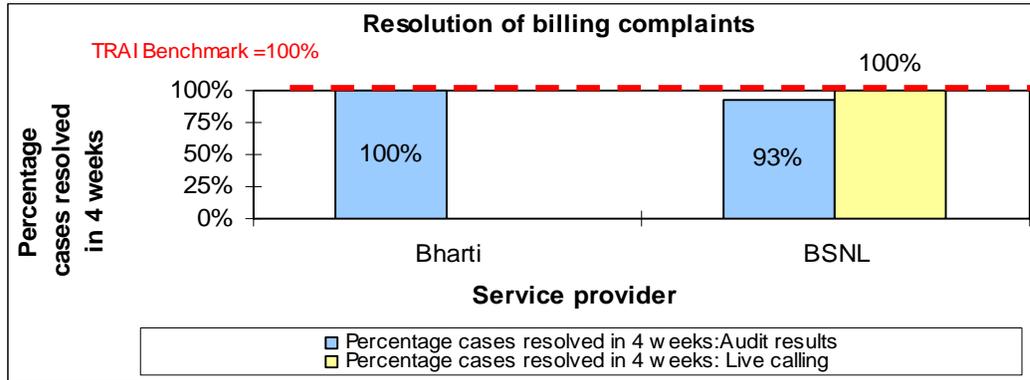
BSNL falls short of the TRAI specified benchmark both for live measurements and one month in which audit was carried out by IMRB International

Percentage bills disputed



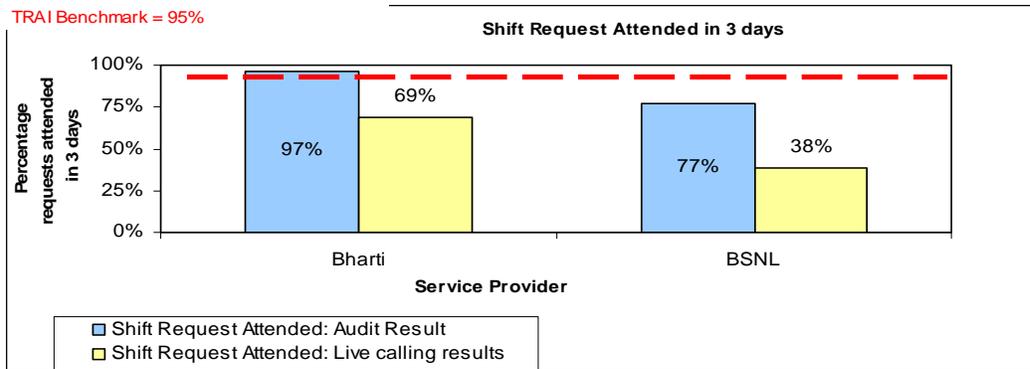
Both the operators meet the TRAI specified benchmark as percentage billing complaints remain <0.1% for all the operators

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



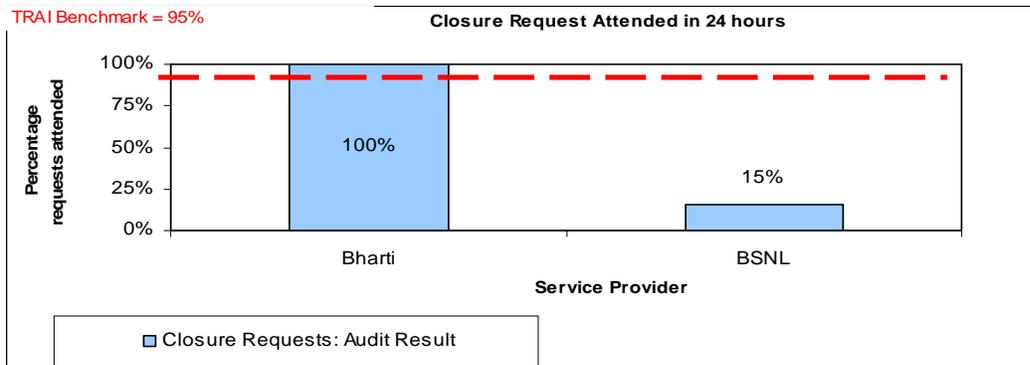
BSNL falls short of TRAI specified benchmark for resolution of billing complaints with a score of 93%. Live calling could not be carried out for Bharti owing to low billing complaints reported by subscribers prior to the month in which audit was carried out by IMRB

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



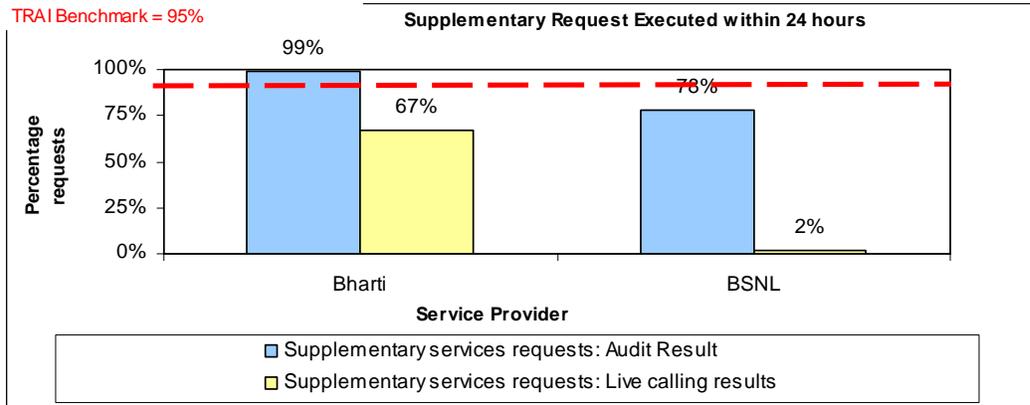
For shift requests attended within 3 days BSNL fall short of TRAI specified benchmark. For live calling Bharti leads with 69% subscribers claiming that request was attended in stipulated time. For BSNL score was observed to be 38%.

Closure requests attended within 24 hours



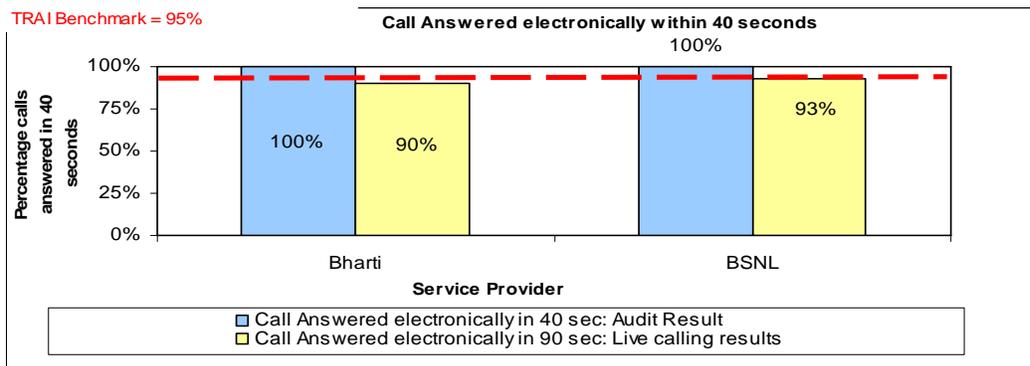
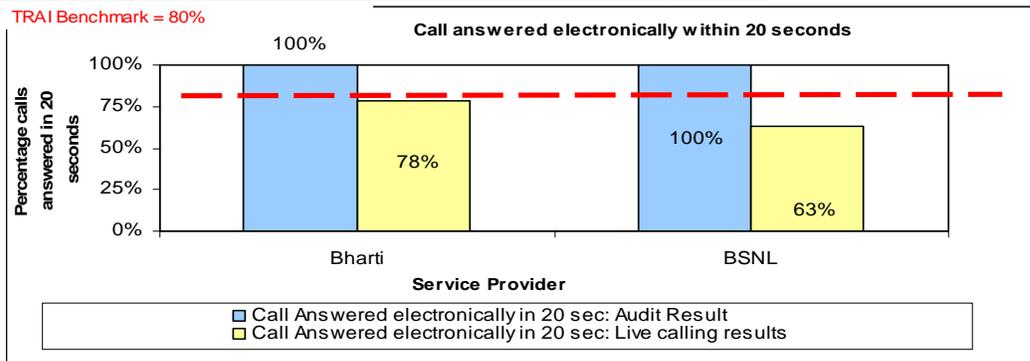
BSNL (at 15%) falls short of the benchmark of 95% closure requests attended within 24 hours for the month of Audit

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



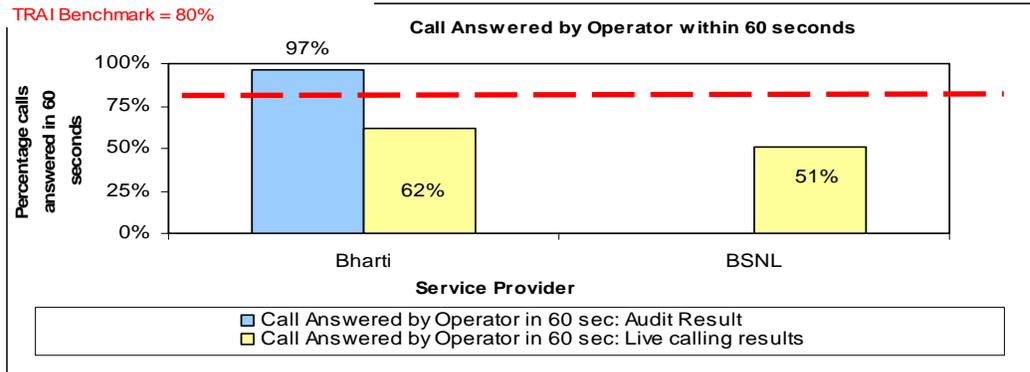
BSNL falls short of the TRAI specified benchmark of 95% "requests for additional services" to be attended within 24 hours for the month of Audit. For Live calling results for BSNL are observed to be abysmally low with 2% subscribers claiming that the request was attended within 24 hours

Response time to customer for assistance - Calls answered electronically within 20 and 40 seconds (Comparison between one month audit live calling results)



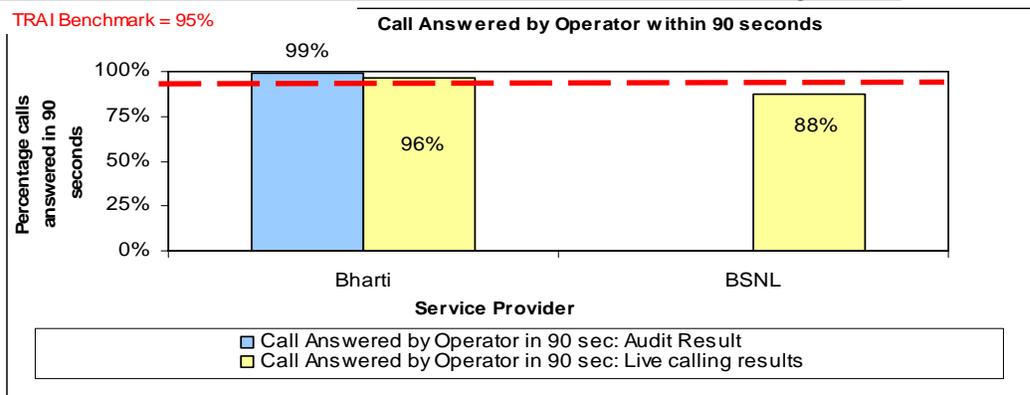
Both BSNL and Bharti fall short of TRAI specified benchmark for live calling scores for calls answered electronically by the operator

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



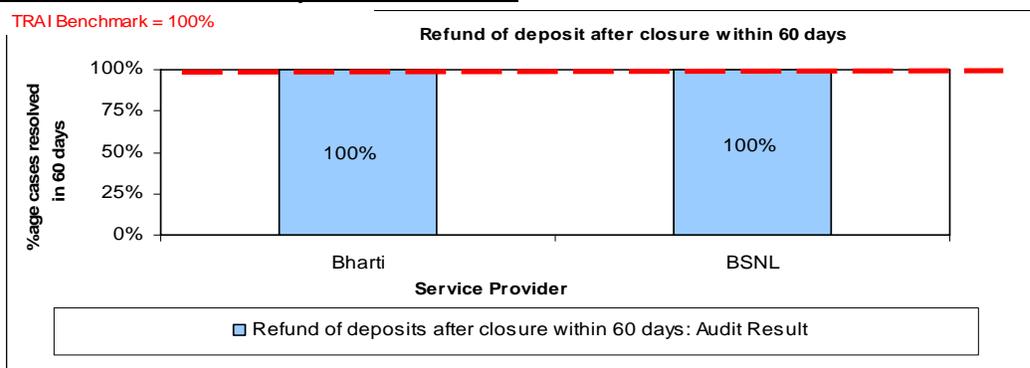
For BSNL data on calls received and answered by the operator was not available at the exchanges audited by IMRB auditors. Results for live calling are observed to be 62% and 51% for Bharti and BSNL respectively

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



Only 885 of the calls made to assess the efficiency of the call centre were answered in 90 seconds by the operator

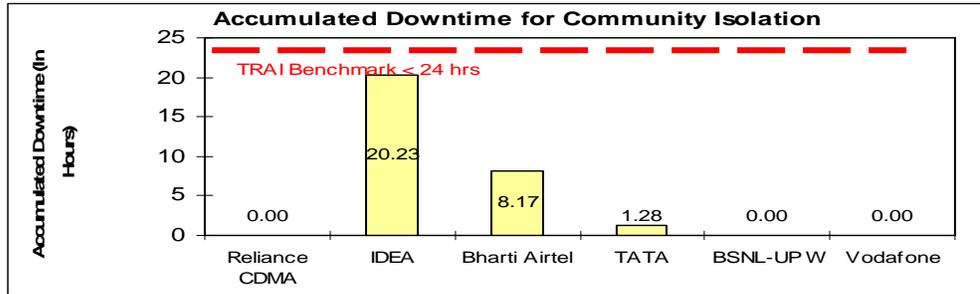
Time taken to refund of deposits after closure



Both the operators meet the TRAI specified Benchmark for time taken to refund of deposits after closure

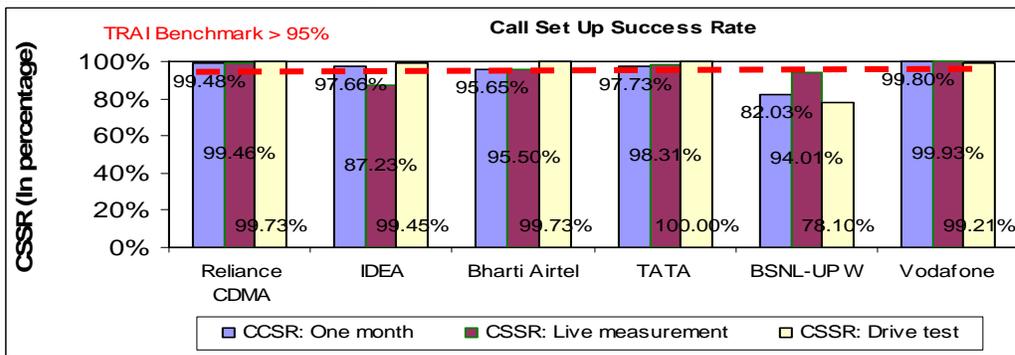
6.2 Graphical/Tabular Representations for Cellular (Mobile) services

Accumulated Downtime



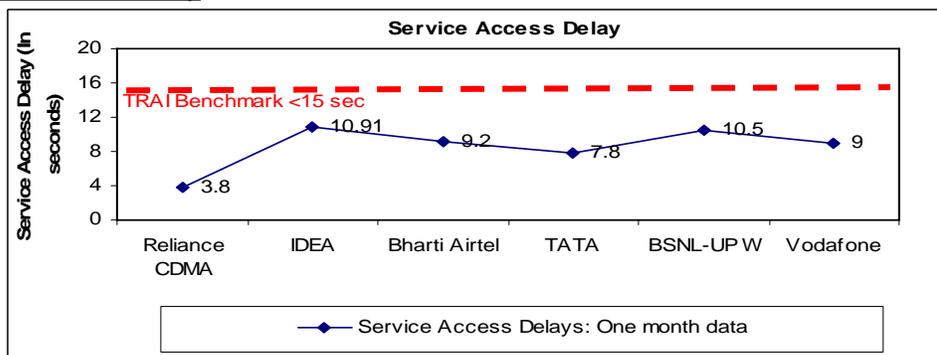
Except Reliance CDMA, BSNL and Vodafone all other operators experienced a downtime in the UP West circle in the month of audit. Idea experiences the maximum downtime in the circle at more than 20 hours.

Call Set-up Success Rate (CSSR)



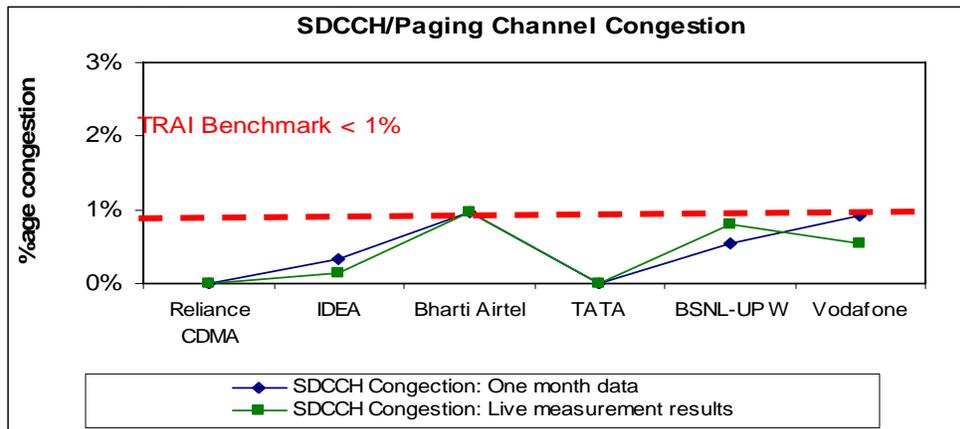
All the operators (except Idea for 3 day live measurement and BSNL for all the three) are meeting the benchmark for the audit month, live measurement as well as the drive test.

Service Access Delay



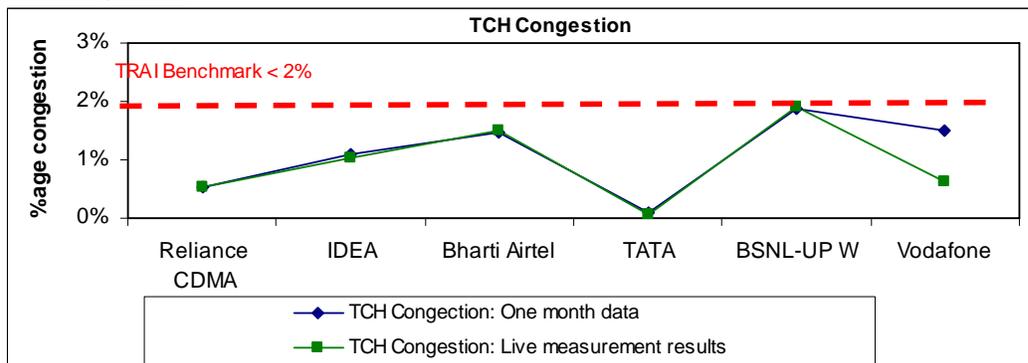
All the operators are meeting the benchmark. The auditors measured this parameter using a standard drive test tool kit. The highest service access delay was measured for Idea at 10.91 seconds and the lowest was for Reliance CDMA at 3.8 seconds.

SDCCH / Paging Channel Congestion



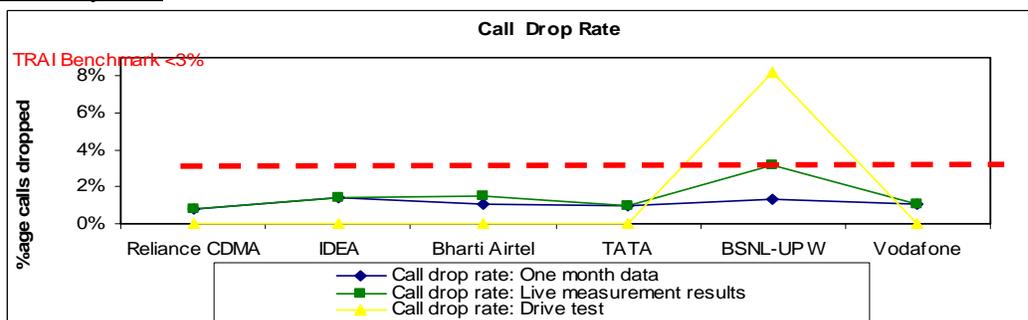
All the operators meet the benchmark for the month and the three day live measurement period. During the monthly measurements and verification TATA and Reliance CDMA do not record any paging channel congestion.

TCH Congestion



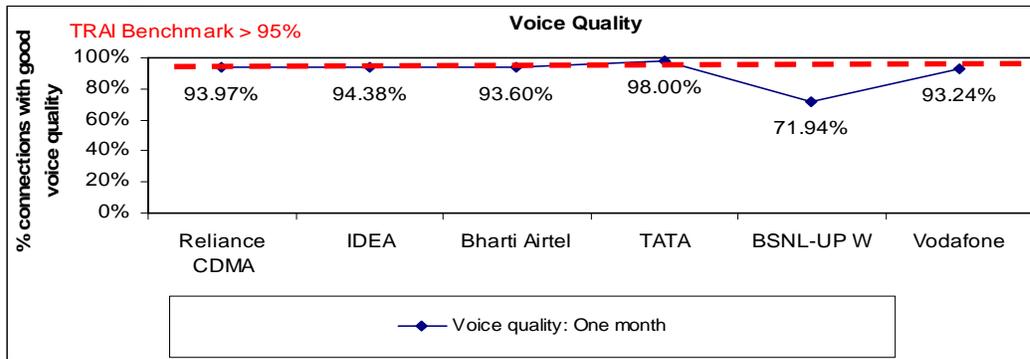
All the operators meet the TRAI benchmark for both the monthly audit as well as the three day live measurement period. On an overall basis, the relatively lower congestion is observed for TATA and Reliance CDMA.

Call Drop Rate



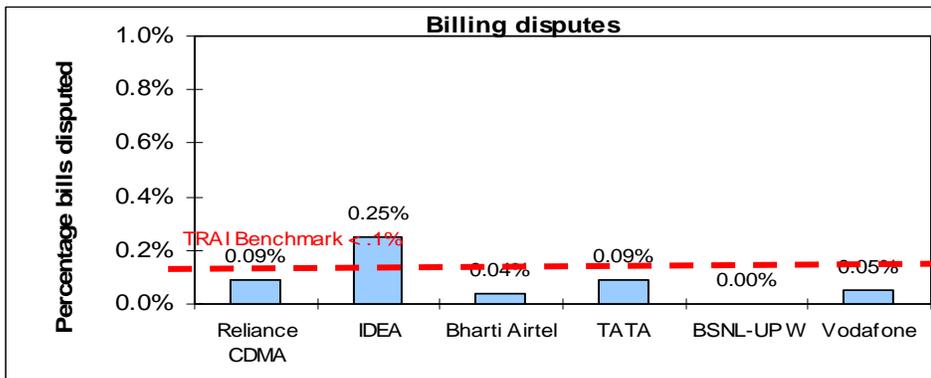
All the operators except BSNL for Drive test and three day live measurement meet the TRAI benchmark. The operators with the least call drop rates taking into consideration the figures for drive tests, live measurement and the month of audit are Reliance CDMA and TATA.

Voice quality

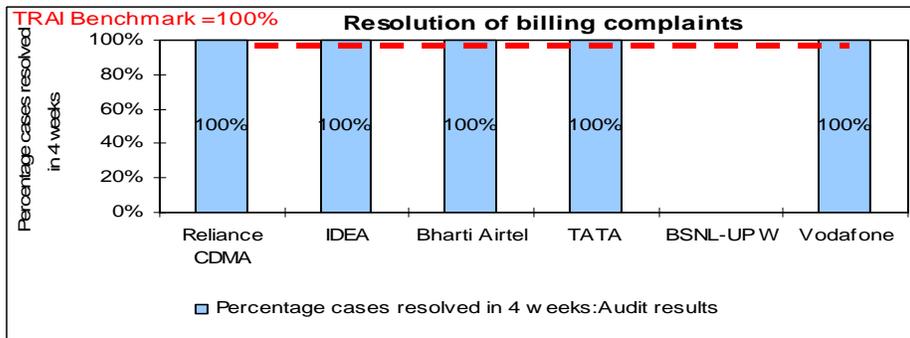


Except for TATA none of the operators meet the TRAI benchmark as found out during the drive test. The lowest percentage of connections with good voice quality was observed across BSNL at a level of 71.94% while the highest was observed for TATA at 98%.

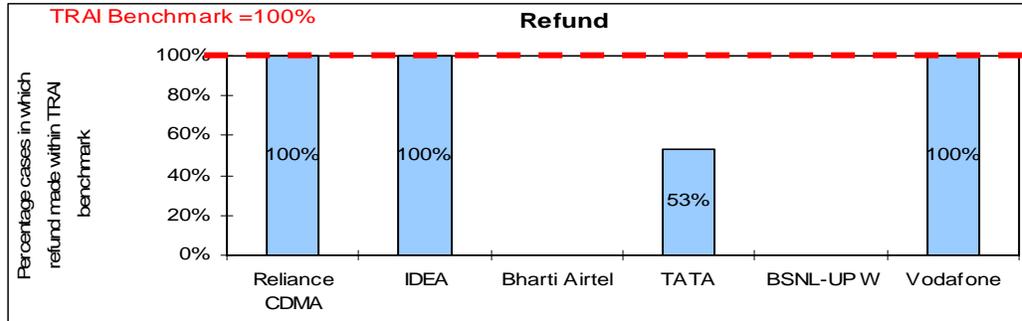
Billing Disputes



All the operators except Idea meet the TRAI benchmark on percentage billing disputes per 100 bills. BSNL did not receive any billing complaint from its postpaid subscribers during the month of audit



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



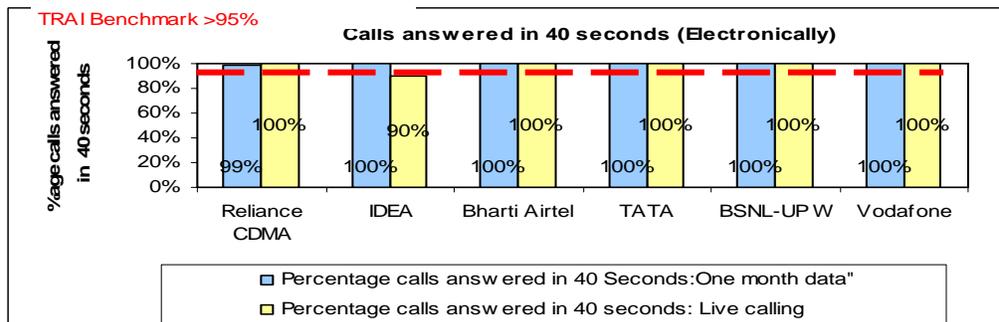
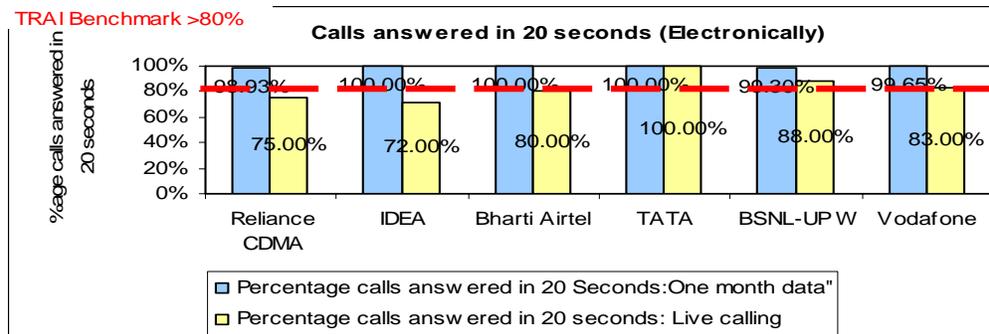
All the operators except TATA (38%) were found to giving the refunds to their subscribers within the stipulated time period.

Live calling for billing Complaints

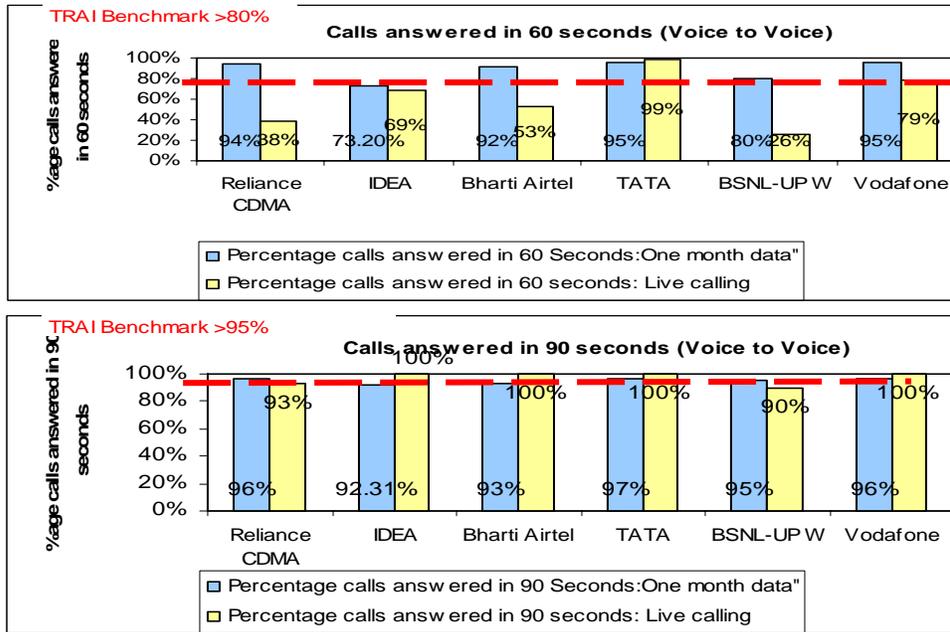
Resolution of billing complaints	Reliance CDMA	IDEA	Bharti Airtel	TATA	BSNL-UP W	Vodafone
Total Number of calls made	8	100	67	25	Not Applicable	14
Number of cases resolved in 4 weeks	4	52	18	7		2
Percentage cases resolved in four weeks	50%	52.00%	26.87%	28.00%		14%

None of the operators for live calling were able to meet the TRAI benchmark for the live calling aspect. Only 14% Vodafone subscribers say that their complaints were resolved within 4 weeks.

Customer Care / Helpline:



All the operators except Reliance CDMA (75%) and Idea (72%) for percentage calls answered electronically within 20 seconds meet the TRAI benchmark for IVR (Electronic) answering of customers' calls for the one month data as well as the live calling that was carried out during the audit.



Except for TATA for both aspects, all other operators fail to meet the TRAI benchmark of percentage calls answered by the operator within 60 seconds for live calling aspect. Idea does not meet the benchmark for the audit month also. For percentage calls answered by the operator within 90 seconds Idea and Bharti do not meet the benchmark for the month of audit while Reliance CDMA and BSNL do not meet the benchmark for live calling.

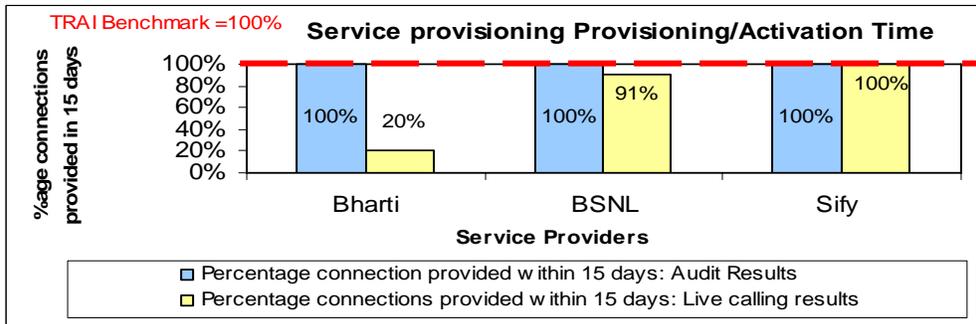
Inter operator calls assessment

Inter operator call Assessment (To ↓ / From →)	Reliance CDMA	IDEA	Bharti Airtel	TATA	BSNL-UP W	Vodafone
Reliance CDMA	NA	81%	86%	99%	59%	79%
IDEA	58%	NA	74%	99%	59%	73%
Bharti Airtel	56%	83%	NA	97%	58%	81%
TATA	55%	90%	85%	NA	65%	79%
BSNL UP W	70%	84%	84%	98%	NA	52%
Vodafone	57%	93%	87%	100%	58%	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. All the operators except TATA fare very poorly in the UP West circle. The operators should look to enhance their quality of services in order to achieve better connectivity with each other.

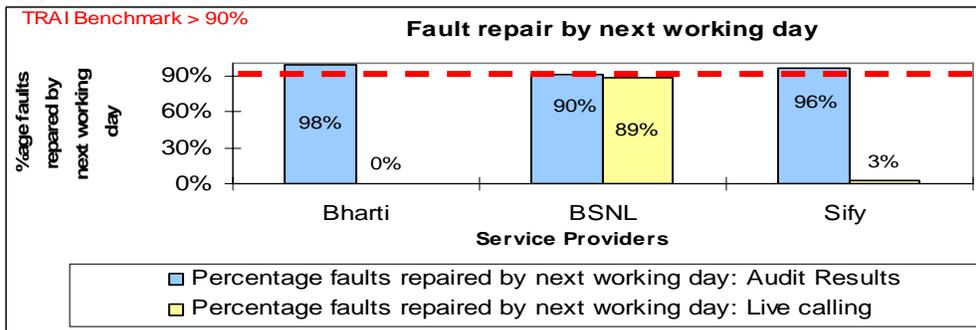
6.3 Graphical/Tabular Representations for Broadband services

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



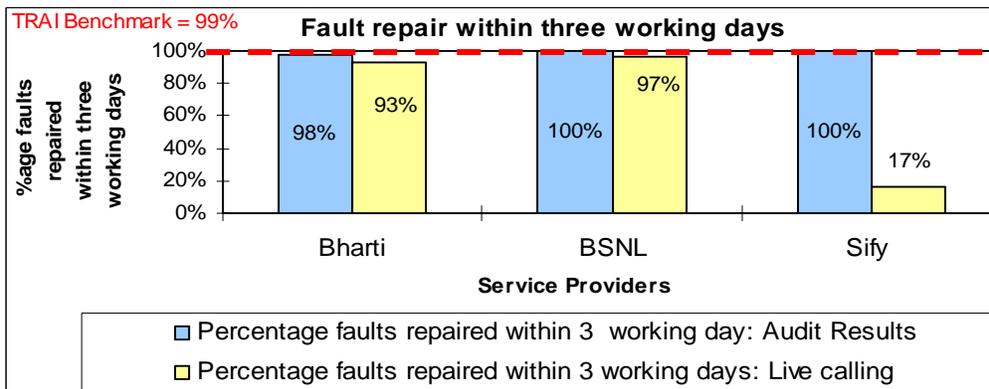
Live calling scores are observed to be low for Bharti with only 20% of subscribers claiming that connection was registered within time period stipulated by TRAI

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



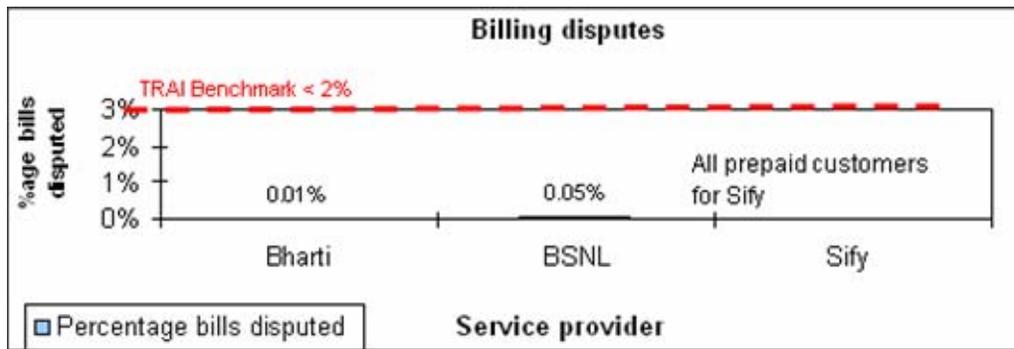
Live calling scores are found to be abysmally low for Bharti and Sify. For one month period all the subscribers are comfortably meeting the TRAI specified benchmark

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



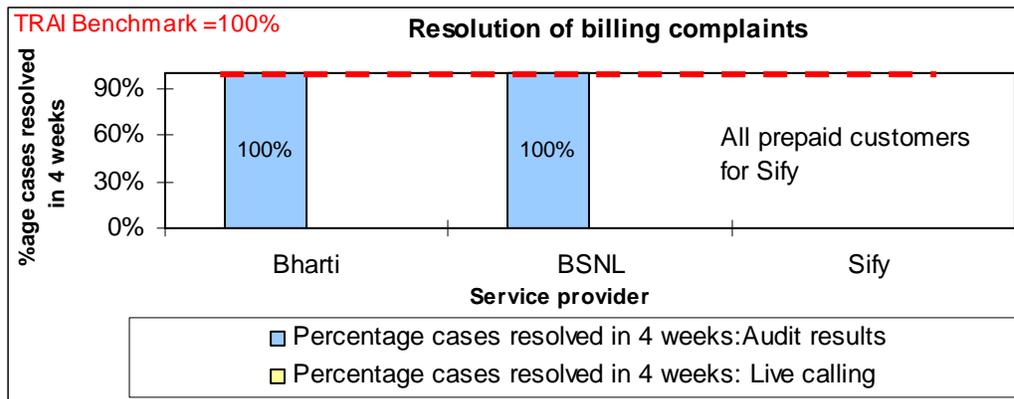
Live calling score for Sify is observed to be low again with only 17% subscribers claiming that fault reported was repaired in three working days.

Percentage bills disputed



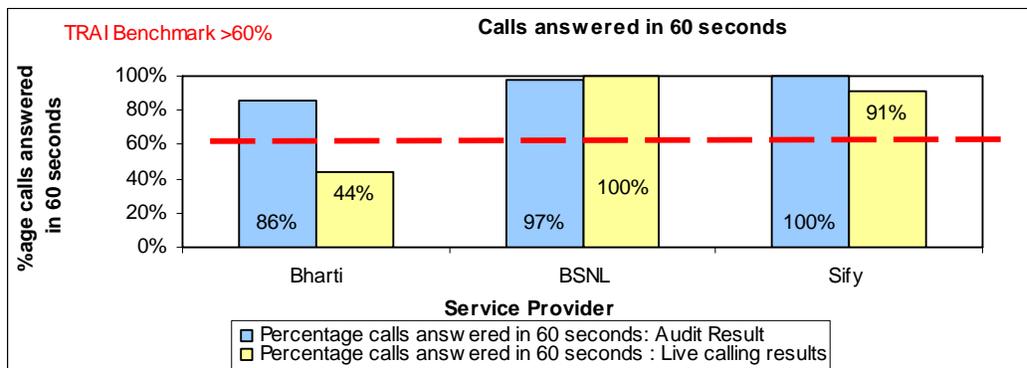
All the operators meet the benchmark on percentage bills disputed, Sify claims that all its retail customers are prepaid customers and hence there are no billing complaints.

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



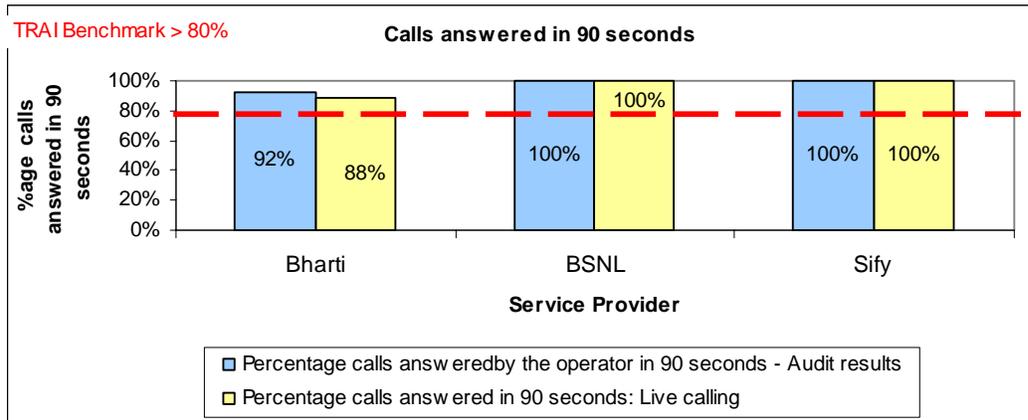
All the operators meet the TRAI specified benchmark for Percentage billing complaints resolved within four weeks during the month of Audit. Live calling could not be carried out because of low sample of billing complaints for Bharti and BSNL

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



Bharti does not meet the TRAI specified benchmark for calls answered within 60 seconds by the operator for live calling carried out by IMRB auditors

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 operators meet the TRAI specified benchmark both during live calling and for the period in which audit was carried out

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

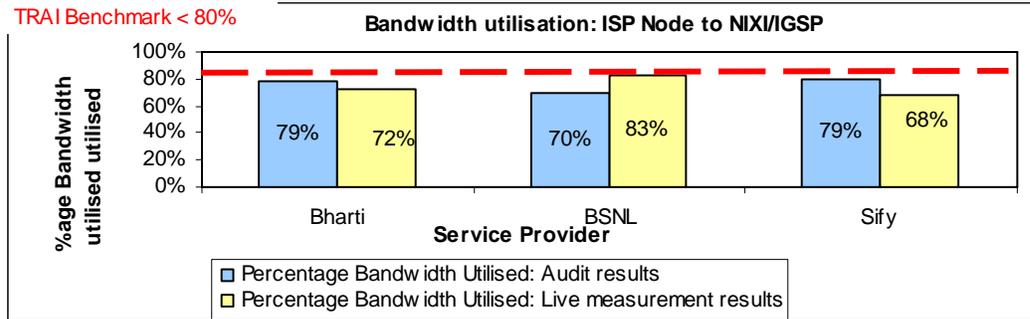
Bandwidth Utilization	B'mark	Bharti	BSNL	Sify
One month audit results				
Total number of intra network links		10	23 BRAS, TI 24, T2624, DSLAM 5960	412
No of Intra network found to be above 90%	<80%	0	0	0
Live measurement results				
No of Intra network Links tested		10	23 BRAS	412
No of Intra network found to be above 90%	<80%	0	0	0

**Reported on All India Basis, ^BRAS: Broadband Remote Access Server*

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

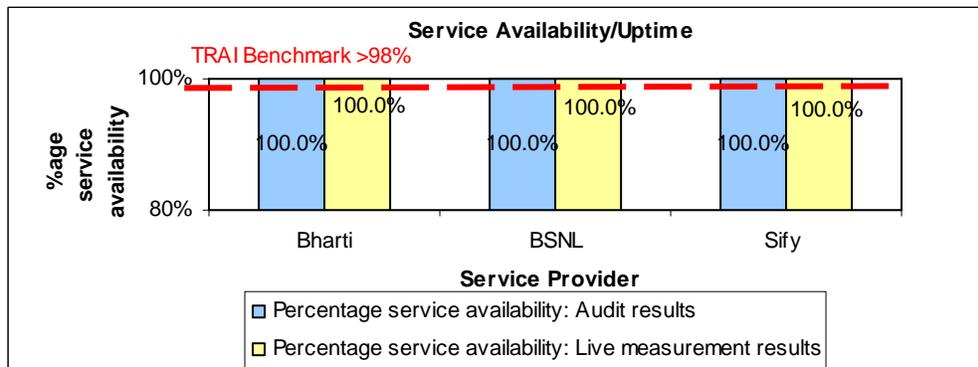
For operators distributing through cable operators, bandwidth utilisation at the end customer level (from POP to cable operator) remains unreported which may be a concern as some cable operators may be distributing more connections then their equipped capacity.

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



BSNL and Sify meet the TRAI specified benchmark cumulatively for all gateways in India. For Bharti upstream links (to IGSP/NIXI) are physically located in Delhi.

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



All the service providers meet the benchmark with uptime of more than 98% for the month of Audit.

Compliance reports: Results of Verification of Records for April to June 2008

7.1 Basic (Wireline) services

S.no	Parameters	B'mark	Bharti		BSNL	
			PMR	IMRB	PMR	IMRB*
1	Provision of telephone after registration of demand					
1.1	Percentage connections completed within 7 days	100%	100%	100%	94%	92%
2	Fault incidence/clearance statistics					
2.1	Fault incidence	<5	7.3	2.67	7.1	13.8
2.2	Faults repaired within 24 hours	>90%	95%	100%	96%	64%
2.3	Mean time to repair	<8 hrs	5.8	5.8	7.4	24
3	Call Completion Rate (CCR)	>55%	53%	53%	63%	48%
4	Metering and billing credibility					
4.1	Billing complaints per 100 bills issued	<0.1%	0.10%	0.10%	0.04%	8.90%
4.2	%age of billing complaints resolved within 4 weeks	100%	100%	100%	89%	0%
5	Customer care/helpline promptness					
5.1	<u>Shift requests (Total number received)</u>					
	Percentage shift requests attended within 3 days	95%	98%	98%	98%	72%
5.2	<u>Closure request attended (Total number received)</u>					
	Closure within 24 hours	95%	100%	100%	99%	10%
5.3	<u>Supplementary (additional) service requests attended (Total number received)</u>					
	Additional facility provided within 24 hours	95%	99%	99%	99%	22%
6	Response time to customer					
6.1	% age call answered through IVR in 20 seconds	80%	100%	100%	Data on call center not available at the exchanges	
	% age call answered through IVR in 40 seconds	100%	100%	100%		
6.2	% age calls answered by operator in 60 seconds	80%	93%	92%		
	% age calls answered by operator in 90 seconds	95%	96%	96%		
7	%age cases where refund received within 60 days	100%	100%	100%	100%	100%

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



Figures do not match with those reported in PMR



Figures verified on all India basis

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

7.2 Cellular Mobile services

S. No.	Parameter	SERVICE PROVIDER											
		Reliance CDMA		IDEA		Bharti Airtel		TATA		BSNL-GSM		Vodafone	
		PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB
A	Network Performance												
1	Accumulated Downtime	0.77	0.77	22.75	22.75	23.75	23.75	1.93	1.93	0	0	0	0
2	Call set up success rate	98.92%	98.92%	99.63%	99.95%	96.54%	96.54%	98.68%	98.68%	99%	99%	99.85%	Raw Data NA
3	Service Access delay	3.73	3.73	10.96	10.96	9	9	5.27	5.27	14 sec	14 sec	9	9
4	Blocked call rate												
	<i>SDCCH Congestion</i>	0.00%	0.00%	0.63%	0.63%	0.96%	0.96%	0%	0%	0.65%	0.65%	Raw Data NA	Raw Data NA
	<i>TCH Congestion</i>	0.00%	0.00%	1.18%	1.18%	0.93%	0.93%	0.03%	0.03%	1.63%	1.63%	Raw Data NA	Raw Data NA
5	Call drop rate	0.95%	0.95%	1.38%	1.38%	1.26%	1.21%	0.16%	0.16%	2.95%	2.95%	1.86%	Raw Data NA
6	%age connections with good voice quality	Complied		98.13%	98.13%	98.02%	98.02%	Complied		Complied		95.21%	95.21%
7	Service coverage	Complied		Complied		Complied		Complied		Complied		Complied	
8	POI congestion	Complied		Complied		Complied		Complied		Complied		Complied	
B	Customer Care												
	Calls answered electronically												
	<i>Within 20 seconds</i>	99.30%	99.30%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	91.52%	91.52%	99.92%	99.92%
	<i>Within 40 seconds</i>	99.30%	99.30%	100.00%	100.00%	100%	100%	100.00%	100.00%	96.96%	96.96%	99.92%	99.92%
	Calls answered by the operator												
	<i>Within 60 seconds</i>	96.52%	96.52%	85%	85%	92.10%	93%	92.42%	92.42%	80%	80%	94.21%	94.21%
	<i>Within 90 seconds</i>	98.20%	98.20%	87%	87%	92.80%	DNA	95.56%	95.56%	95%	95%	97.45%	97.45%
C	Billing complaints												
	Billing complaints/100 bills	0.09%	0.09%	0.01%	0.17%	0.05%	0.05%	0.06%	0.06%	0.00%	0.00%	0.07%	0.07%
	%age complaints resolved within 4 weeks	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Period of refunds due to customers	100%	100%	100%	100%	100%	100%	38%	38%	100%	100%	100%	100%

** 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

7.3 Broadband services

S.no	Parameter	B'mark	SERVICE PROVIDER					
			Bharti		BSNL		Sify	
			PMR	IMRB	PMR	IMRB	PMR	IMRB
1	Service provisioning uptime							
1.1	Percentage connections provided within 15 days	100%	100%	100%	95%	86%	100%	100%
2	Fault repair restoration time							
2.1	Percentage faults repaired by next working days	> 90%	97%	97%	94%	92%	87%	87%
2.2	Percentage faults repaired within three working days	99%	99%	99%	99%	100%	94%	94%
3	Billing performance							
3.1	Billing complaints per 100 bills issued	<2%	0.01%	0.01%	0.30%	0.00%	0.00%	0.00%
3.2	%age of billing complaints resolved in 4 weeks	100%	100%	100%	100.00%	100.00%	0.00	0.00
3.3	%age cases in which refund of deposits after closure was made in 60 days	100%	100.00%	100.00%	100%	100%	0.00	0.00
4	Customer care/helpline assessment (Voice to Voice)							
4.1	Percentage calls answered within 60 seconds	> 60%	69%	69%	80.00%	88.00%	86%	86%
4.2	Percentage calls answered within 90 seconds	> 80%	78%	78%	93.00%	94.00%	94%	94%
5	Bandwidth utilisation/Throughput							
5.1	<i>Intra network links (POP to ISP Node)</i>							
5.1.1	Total number of intra network links > 90%		0	0	NR	<80%	13	13
5.2	<i>Upstream Bandwidth (ISP Node to NIXI/NAP/IGSP)</i>							
5.2.1	Percentage bandwidth utilised on upstream links	< 80%	76%	76%	NR	<80%	85%	85%
6	Broadband download speed		Details not available for verification					
7	Service availability/uptime	> 98%	100.00%	99.00%	NR	99.00%	100%	100%
8	Packet loss	<2%	No details available for verification		Details verified at the central node in Bangalore.		No details available for verification	
9	Network Latency							
9.1	POP/ISP Node to NIXI	< 120 msec						
9.2	ISP node to NAP port (Terrestrial)	< 350 msec						

^{^^} Methodology not in Line with QoS regulation, Data verified on All India basis, NR – Not reported DNA- Details Not Available for verification, B'mark = TRAI Benchmark Figures do not match those in PMR

7.4 Conclusions

7.4.1 Basic Wireline Services

1. Variation observed in figures for BSNL is owing to the fact that only 5% of the total exchanges were audited for the operator whereas the data provided in the PMR is basis all the exchanges in the circle
2. By and large not much variation is observed in the data reported by Bharti and those verified by IMRB

7.4.2 Cellular Mobile services

1. The figures reported by all the operators on all parameters completely match the figures obtained on verification.
2. IDEA does not meet the benchmark for percentage calls by the operator within 90 seconds
3. TATA does not meet benchmark on the time taken for providing refunds to customers with only 38% score falling way below the TRAI benchmark of 100% on the same.
4. For network related parameters, raw data for Vodafone was not available for verification.

7.4.3 Broadband services

1. Complete data for Sify was verified on an all India level
2. For BSNL there is slight variation observed in for some parameters when compared to the figures reported in PMR. But the reason is largely the fact that data was obtained for sample 5% of exchanges whereas reporting is done for 100% of exchanges.
3. Historic data for Broadband download speed and Ping test conducted to check the latency and packet loss was not available for verification
4. 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 verification results for Service provisioning

Service provisioning/Activation time	Benchmark	Bharti	BSNL
Number of connections registered during the period		554	240
Total number of connections provided within 7 days		554	232
Percentage of connections provided within 7 days	100%	100%	97%

Live calling results for Service provisioning

Service Provisioning/Activation Time	Benchmark	Bharti	BSNL
Total Number of service registration calls made		100	243
Number of cases in which connection was provided in 7 Days		99	136
Percentage cases in which connection was provided in 7 days	100%	99%	56%

One month data verification results for Fault repair/Restoration time

Fault Repair/Restoration time	Benchmark	Bharti	BSNL
Total number of faults registered during the period		833	8897
Total number of faults repaired by next working day		816	5603
Percentage of faults repaired by next working day	>90%	98%	63%
Total number of fault repaired within three working days		833	8191
Percentage faults repaired within three working days	100%	100%	92%

Live calling results for Fault repair/Restoration time

Fault Repair	Benchmark	Bharti	BSNL
Total Number of calls made		30	1035
Number of cases where faults were repaired by next working day		0	7
Percentage cases where faults were repaired by next working day	>90%	0%	1%
Number of cases where faults were repaired within 3 days		29	353
Percentage cases where faults were repaired within 3 days	100%	97%	34%

One month data verification results for CCR

Traffic statistics - Call Completion Rate	Benchmark	Bharti	BSNL
Total local call attempts		13732642	24020
Total number of successful local calls		12786410	11410
Call Completion Rate (CCR) in the local network	>55%	93%	48%

Live measurement results for CCR

Traffic statistics - Call Completion Rate	Benchmark	Bharti	BSNL
Total local call attempts		57864	13672
Total number of successful local calls		57111	6330
Call Completion Rate (CCR) in the local network	>55%	99%	46%

One month data verification results for billing performance

Billing Performance	Benchmark	Bharti	BSNL
Billing disputes			
Total bills generated during the period		7876	29676
Total number of bills disputed		1	14
Percentage bills disputed	0.10%	0.01%	0.05%

Resolution of billing complaints			
Total complaints resolved in 4 weeks from date of receipt		1	13
Percentage complaints resolved within 4 weeks of date of receipt	100%	100%	93%

Live calling results for billing performance

Resolution of billing complaints	Benchmark	Bharti	BSNL
Total Number of calls made		NA	32
Number of cases resolved in 4 weeks		NA	32
Percentage cases resolved in four weeks	100%	NA	100%

One month data verification for Customer Care – Shifts

Customer Care - Shift Requests	Benchmark	Bharti	BSNL
Total Number of shift requests received		60	43
Total number requests attended in 3 days		58	33
Total number requests attended beyond 3 days		2	10
Shifts not attended		0	0
Percentage of requests attended in 3 days	95%	97%	77%
Percentage of requests attended beyond 3 days		3%	23%
Percentage of shifts not attended		0%	0%

Live calling results for Customer Care – Shifts

Customer Care - Shift Requests	Benchmark	Bharti	BSNL
Total number of call to shift requests		16	39
Total number of requests attended in 3 days	95%	11	15
Total number of requests attended beyond 3 days		4	21
Shifts not attended		1	0
Percentage of requests attended in 3 days		69%	38%
Percentage of requests attended beyond 3 days		25%	54%
Percentage of shifts not attended		6%	0%

One month data verification Audit results for Customer Care – Closures

Customer Care - Closure Requests	Benchmark	Bharti	BSNL
Total Number of closure requests received		554	269
Total closure attended within 24 hours	95%	554	41
Total number of requests attended beyond 24 hours		0	228
Closure requests not attended		0	0
Percentage of closure attended within 24 hours		100%	15%
Percentage of closure attended beyond 24 hours		0%	85%
Percentage of closures not attended		0%	0%

Live calling results for Customer Care – Supplementary requests

Customer Care - Supplementary Requests	Benchmark	Bharti	BSNL
Total Number of supplementary requests received		24	221
Total number requests attended within 24 hours	95%	16	4
Total number requests attended beyond 24 hours		8	208
Supplementary requests not attended		0	0
Percentage of requests attended within 24 hours		67%	2%
Percentage of requests attended beyond 24 hours		33%	94%
Percentage of supplementary requests not attended		0%	0%

Live calling results for calls answered electronically

Customer Care Assessment	Benchmark	Bharti	BSNL
Total Number of calls dialed on toll free number		100	800
Calls answered within 20 seconds			
Total Number of calls answered by IVR in 20 seconds	80%	78	506
Percentage calls answered in 20 seconds		78%	63%
Calls answered within 40 seconds			
Total Number of calls answered by IVR in 40 seconds	95%	90	746
Percentage calls answered in 40 seconds		90%	93%

Live calling results for calls answered by the operator

Customer Care Assessment	Benchmark	Bharti	BSNL
Total Number of calls dialed on toll free number		100	800
Calls answered within 60 seconds			
Total Number of calls answered by operator in 60 seconds	80%	62	410
Percentage calls answered in 60 seconds		62%	51.25%
Calls answered within 90 seconds			
Total Number of calls answered by operator in 90 seconds	95%	96%	700
Percentage calls answered in 90 seconds		96%	87.50%

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

Resolution of billing complaints	Benchmark	Bharti	BSNL
Total Number of cases requiring refund		16	533
Number of cases where refund was made in < 60 days		16	533
Percentage cases where refund was made in < 60 days	100%	100%	100%

Level 1 Services

Level 1 services	BSNL
TOTAL Calls Made	270
Answered in 60 seconds	187
Percentage calls answered in 60 seconds	69.7%

8.2 Parameter wise performance reports for Cellular Mobile services

Audit Results for Accumulated Downtime for community Isolation

Accumulated Downtime	Reliance CDMA	IDEA	Bharti Airtel	TATA	BSNL-UP W	Vodafone
Total Downtime (In hours)	0.00	20.23	8.17	1.28	0.00	0.00

Call set up Success rate

Audit Results for CSSR

CSSR	Reliance CDMA	IDEA	Bharti Airtel	TATA	BSNL-UP W	Vodafone
Total number of call attempts	68023376	2702564435	DNP	688403710	2512789	6536364
Total number of successful calls	67669711	2639424938	DNP	672790390	2061172	6523317
CSSR	99.48%	97.66%	95.65%	97.73%	82.03%	99.80%

Live measurement results for CSSR

CSSR	Reliance CDMA	IDEA	Bharti Airtel	TATA	BSNL-UP W	Vodafone
Total number of call attempts	82581653	345056626	DNP	6334511	1173484	7665609
Total number of successful calls	82137481	300975969	DNP	6227738	1103245	7660247
CSSR	99.46%	87.23%	95.50%	98.31%	94.01%	99.93%

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

CSSR	Reliance CDMA	IDEA	Bharti Airtel	TATA	BSNL-UP W	Vodafone
Total number of call attempts	376	365	376	370	484	378
Total number of successful calls	375	363	375	370	378	375
CSSR	99.73%	99.45%	99.73%	100.00%	78.10%	99.21%

*DNP: Details not provided

Service Access Delay

Service Access Delay	Reliance CDMA	IDEA	Bharti Airtel	TATA	BSNL-UP W	Vodafone
One month data collection	3.8	10.91	9.2	7.8	10.5	9

Audit results for SDCCH and TCH Congestion

Traffic Statistics	Reliance CDMA	IDEA	Bharti Airtel	TATA	BSNL-UP W	Vodafone
SDCCH Congestion						
Total number of SDCCH Attempts	21744331	490957544	7998744	931456	2538008	16199681
Total Number of SDCCH Congestions	0	DNP	DNP	0	DNP	DNP
Percentage SDCCH Congestion	0.00%	0.32%	0.98%	0.00%	0.54%	0.93%
TCH Congestion						
Total number of TCH Attempts	68023376	246139353	4092593	2251877	1321088	6954273
Total Number of TCH Congestions	353721	DNP	DNP	2027	DNP	DNP
Percentage TCH Congestion	0.52%	1.10%	1.47%	0.09%	1.88%	1.51%

Live measurement results for SDCCH and TCH Congestion

Traffic Statistics	Reliance CDMA	IDEA	Bharti Airtel	TATA	BSNL-UP W	Vodafone
SDCCH Congestion						
Total number of SDCCH Attempts	29660848	51343799	23468328	2701451	2373212	50344460
Total Number of SDCCH Congestions	0	DNP	DNP	0	NA	DNP
Percentage SDCCH Congestion	0.00%	0.13%	0.96%	0.00%	0.80%	0.55%
TCH Congestion						

Total number of TCH Attempts	82581653	15415708	11639875	6334511	1338499	22687585
Total Number of TCH Congestions	445940	DNP	DNP	4563	NA	DNP
Percentage TCH Congestion	0.54%	1.04%	1.50%	0.07%	1.91%	0.63%

*DNP: Details Not Provided

Call Drop Rate

Audit Results for Call drop rate

Call drop rate	Reliance CDMA	IDEA	Bharti Airtel	TATA	BSNL-UP W	Vodafone
Total number of calls established	67669711	14779687	3993544	67279039	2061172	6523317
Total number of calls dropped	563691	DNP	42788	668532	27325	68152
Call drop rate	0.83%	1.45%	1.07%	0.99%	1.33%	1.04%

Live measurement results for Call drop rate

Call drop rate	Reliance CDMA	IDEA	Bharti Airtel	TATA	BSNL-UP W	Vodafone
Total number of calls established	82137481	14558054	11400737	6227738	1103245	7660247
Total number of calls dropped	622354	DNP	170392	61876	34959	78588
Call drop rate	0.76%	1.38%	1.49%	0.99%	3.17%	1.03%

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

Call drop rate	Reliance CDMA	IDEA	Bharti Airtel	TATA	BSNL-UP W	Vodafone
Total number of calls established	248	365	248	410	378	376
Total number of calls dropped	0	0	0	0	31	0
Call drop rate	0.00%	0.00%	0.00%	0.00%	8.20%	0.00%

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

Voice quality	Reliance CDMA	IDEA	Bharti Airtel	TATA	BSNL-UP W	Vodafone
Total number of sample calls	512763	556460	131575	17233	242814	539124
Total number of calls with good voice quality	481837	525172	123155	16888	174681	502680
%age calls with good voice quality	93.97%	94.38%	93.60%	98.00%	71.94%	93.24%

Audit Results for POI Congestion

POI congestion	Reliance CDMA	IDEA	Bharti Airtel	TATA	BSNL-UP W	Vodafone
POI traffic offered on all individual POI's	DNP	DNP	DNP	DNP	36763.35	54052
Served traffic for all individual POI's	DNP	DNP	DNP	DNP	36736.35	33083
Traffic failed on all individual POI's	Complied	Complied	Complied	Complied	Complied	Complied

Live measurement results for POI congestion

POI congestion	Bharti Airtel	IDEA	TATA	BSNL-UP W	Vodafone
POI traffic offered on all individual POI's	DNP	DNP	DNP	35799.2	290028
Served traffic for all individual POI's	DNP	DNP	DNP	35799.2	180740
Traffic failed on all individual POI's	Complied	Complied	Complied	Complied	Complied

*DNP: Details Not Provided

5.8 Inter Operator Call Assessment						
Inter operator call Assessment (To/From)	Reliance CDMA	IDEA	Bharti Airtel	TATA	BSNL-UP W	Vodafone
Reliance CDMA	NA	81%	86%	99%	59%	79%
IDEA	58%	NA	74%	99%	59%	73%
Bharti Airtel	56%	83%	NA	97%	58%	81%
TATA	55%	90%	85%	NA	65%	79%
BSNL UP W	70%	84%	84%	98%	NA	52%
Vodafone	57%	93%	87%	100%	58%	NA

Audit results for customer care (Electronically)

Customer Care Assessment	Reliance CDMA	IDEA	Bharti Airtel	TATA	BSNL-UP W	Vodafone
Total Number of calls received by IVR	32484741	10668671	DNP	554783	DNP	12284055
Calls answered within 20 seconds						
Total Number of calls answered in 20 seconds	32135956	10668671	DNP	554783	DNP	12241328
Percentage calls answered in 20 seconds	98.93%	100.00%	100.00%	100.00%	99.30%	99.65%
Calls answered within 40 seconds						
Total Number of calls answered in 40 seconds	32135956	10668671	DNP	554783	DNP	12241830
Percentage calls answered in 40 seconds	98.93%	100.00%	100.00%	100.00%	99.90%	99.66%

Live calling results for customer care (Electronically)

Customer Care Assessment	Reliance CDMA	IDEA	Bharti Airtel	TATA	BSNL-UP W	Vodafone
Total Number of calls received by the operator	100	100	100	100	100	100
Calls answered within 20 seconds						
Total Number of calls answered in 20 seconds	75	72	80	100	88	83
Percentage calls answered in 20 seconds	75.00%	72.00%	80.00%	100.00%	88.00%	83.00%
Calls answered within 40 seconds						
Total Number of calls answered in 40 seconds	100	90	100	100	100	100
Percentage calls answered in 40 seconds	100%	90%	100%	100%	100%	100%

Audit results for customer care (Voice to Voice)

Customer Care Assessment	Reliance CDMA	IDEA	Bharti Airtel	TATA	BSNL-UP W	Vodafone
Total Number of calls received by the operator	398636	2610219	DNP	63147	DNP	3644124
Calls answered within 60 seconds						
Total Number of calls answered in 60 seconds	373457	1910609	DNP	60144	DNP	3465658
Percentage calls answered in 60 seconds	93.68%	73.20%	92.10%	95.24%	80.00%	95.10%
Calls answered within 90 seconds						
Total Number of calls answered in 90 seconds	383541	2409615	DNP	61134	DNP	3501587

Percentage calls answered in 90 seconds	96.21%	92.31%	92.80%	96.81%	95.00%	96.09%
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Live calling results for customer care (Voice to Voice)

Customer Care Assessment	Reliance CDMA	IDEA	Bharti Airtel	TATA	BSNL-UP W	Vodafone
Total Number of calls made	100	100	100	100	100	100
Calls answered within 60 seconds						
Number calls answered within 60 seconds	38	69	53	99	26	79
Percentage calls answered in 60 seconds	38%	69%	53%	99%	26%	79%
Calls answered within 90 seconds						
Number calls answered within 90 seconds	93	100	100	100	90	100
Percentage calls answered in 90 seconds	93%	100%	100%	100%	90%	100%

*DNP: Details Not Provided

Audit Results for Billing performance

Billing Performance	Reliance CDMA	IDEA	Bharti Airtel	TATA	BSNL-UP W	Vodafone
Billing disputes						
Total bills generated during the period	118639	164569	86213	83827	47354	62784
Total number of bills disputed	105	416	34	73	0	34
Percentage bills disputed	0.09%	0.25%	0.04%	0.09%	0.00%	0.05%
Total complaints resolved in 4 weeks from date of receipt	105	416	34	73	Not Applicable	34
Percentage complaints resolved within 4 weeks of date of receipt	100%	100%	100%	100%	Not Applicable	100%
Refund of deposits after closure						
Total number of cases requiring refund of deposits	105	74	DNP	332	Not Applicable	28
Total number of cases where refund was made within 60 days	105	74	DNP	176	Not Applicable	28
Percentage cases in which refund was receive within 60 days	100%	100%	DNP	53%	Not Applicable	100%

Live calling results for resolution of billing complaints

Resolution of billing complaints	Reliance CDMA	IDEA	Bharti Airtel	TATA	BSNL-UP W	Vodafone
Total Number of calls made	8	100	67	25	Not Applicable	14
Number of cases resolved in 4 weeks	4	52	18	7		2
Percentage cases resolved in four weeks	50%	52.00%	26.87%	28.00%		14%

8.3 Parameter wise performance reports for Broadband services

One month data verification results for Service provisioning

Service provisioning/Activation time	B'mark	Bharti	BSNL	Sify
No of connections registered during the period		448	489	81
Total number registered during 15 days		448	489	81
Percentage of connections provided within 15 days	100%	100.0%	100.0%	100.0%

Live calling results for Service provisioning

Service Provisioning/Activation Time	B'mark	Bharti	BSNL	Sify
Total Number of calls made		100	271	30
Number of cases in which connection was provided in 15 Days		20	246	30
Percentage cases in which connection was provided in 15 days	100%	20%	91%	100%

One month data verification results for Fault repair

Fault Repair/Restoration time	B'mark	Bharti	BSNL	Sify
Total number of faults registered during the period		1008	1007	24
Total number of faults repaired by next working day		988	911	23
Percentage of faults repaired by next working day	>90%	98%	90%	96%
Total number of faults repaired within three working days		988	1007	24
Percentage of faults repaired within three working days	>99%	98%	100%	100%

Live calling results for fault repair

Fault Repair	B'mark	Bharti	BSNL	Sify
Total Number of calls made		30	87	30
Number of cases in which faults were repaired by next working day		0	77	1
Percentage cases in which faults were repaired by next working day	>90%	0%	89%	3%
Number of cases in which faults were repaired within three working days		28	84	5
Percentage cases in which faults were repaired within three working days	>99%	93%	97%	17%

One month data verification results for billing performance

Billing Performance	B'mark	Bharti	BSNL	Sify
Billing disputes				
Total bills generated during the period		11921	13540	Prepaid
Total number of bills disputed		1	7	
Percentage bills disputed	<2%	0.01%	0.05%	
Resolution of billing complaints				
Total complaints resolved in 4 weeks from date of receipt		1	7	Prepaid
Percentage complaints resolved within 4 weeks of date of receipt	100%	100%	100%	
Refund of deposits after closure				
Total number of cases requiring refund of deposits		1	1	Prepaid
Total number of cases where refund was made within 60 days		1	1	
Percentage cases in which refund was receive within 60 days	100%	100%	100%	

Live calling results for call centre

Customer Care Assessment	B'mark	Bharti	BSNL	Sify
Total Number of calls made		100	332	100
Calls answered within 60 seconds				
Number calls answered within 60 seconds		44	331	91
Percentage calls answered in 60 seconds	>60%	44%	100%	91%
Calls answered within 90 seconds				
Number calls answered within 90 seconds		88	332	100

Percentage calls answered in 90 seconds	>80%	88%	100%	100%
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One month data verification results for Service Availability/Uptime

Service Availability Uptime	B'mark	Bharti	BSNL	Sify
Total Operational Hours		15328080	53568	744
Total Downtime		1656	2	0
Total time when the service was available		15326424	53566	744
Service Availability Uptime in Percentage	>98%	100.0%	100.0%	100.0%

Three day live measurement results for Service Availability/Uptime

Service Availability Uptime	B'mark	Bharti	BSNL	Sify
Total Operational Hours		798480	5184	72
Total Downtime		0	0	0
Total time when the service was available		798480	5184	72
Service Availability Uptime in Percentage	>98%	100.00%	100.00%	100.00%

One month data verification results for Bandwidth utilisation

Bandwidth Utilisation	B'mark	Bharti	BSNL	Sify
Intra-network links (POP to ISP Node)				
Total number of intra network links		10	23 BRAS, TI 24, T2624,DSLAM 5960	412
No of Intra network found to be above 90%		0	0	0
International Bandwidth				
Total number of upstream links		3	141	27
No of Intra network found to be above 90%		0	8	0
Total International Bandwidth available from ISP Node to IGSP/NIXI/NAP (In mpbs)		9633	27048	2830
Total International Bandwidth utilised during peak hours		7605	18934	2238
Percentage Bandwidth utilisation during peak hours (In mpbs)	>90%	79%	70%	79%

Live measurement results for Bandwidth utilisation

Bandwidth Utilisation	B'mark	Bharti	BSNL	Sify
Intra-network links				
Total number of intra network links		10	23 BRAS	412
No of Intra network Links tested		0	0	0
No of Intra network found to be above 90%		0	0	0
International Bandwidth				
Total number of upstream links		3	141	27
No of Intra network found to be above 90%		0	19	0
Total International Bandwidth available from ISP Node to IGSP/NIXI/NAP (In mpbs)		9633	22010	2830
Total International Bandwidth utilised during peak hours		6979	18326	1934
Percentage Bandwidth utilisation during peak hours (In mpbs)	>90%	72%	83%	68%

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

9.1 For Basic wireline services

1. Provision of telephone after registration of demand	
Computational Methodology as per QoS definition	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.
Benchmark	100% cases in <7 days, subject to technical feasibility
Audit Procedure	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 Live calling :- - 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

2. Fault incidence/clearance related statistic	
Computational Methodology	Fault incidence = (No. of faults reported by the customer per month/ Total Number of Subscribers for that particular month)*100
Benchmark	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.
Audit Procedure	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 Live calling :- -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	Percentage incidence of billing complaints = (No. of billing complaints reported by the customer per month/ Total Number of Subscribers for that particular month)*100 Percentage resolution of billing complaints = (No. of billing complaints resolved over a particular period of time/Total No. of billing complaints of that period of time)*100
Benchmark	Percentage incidence of billing complaints: Not more than 0.1% of the bills issued Percentage resolution of billing complaints: 100% within a period of 4 weeks
Audit Procedure	IMRB Auditors to verify and collect data pertaining to <ul style="list-style-type: none"> - Number of Billing complaints received at the service provider's level - Last billing cycle stated should be such that due date for payment of bills must be beyond the date when this form is filled. - Include all types of bills generated for customers. This could include online as well as other forms of bills presentation including printed bills - Billing complaint is any of written complaint/ personal visit/ telephonic complaint related to: Excess metering/ wrong tariff scheme charged, Late receipt of bills/ Not received at all, Wrong name and address, Payment made in time but charged penalty/ not reflected in next bill, Last payment not reflected in bill, Adjustment/ waiver not done, Anything else related to bills, Toll free numbers charged etc. <p>Live calling : -</p> <ul style="list-style-type: none"> - IMRB Auditors collected the list of all the subscribers who have made billing complaints in the month prior to the Audit. - 100 such subscribers per service provider were called to check the time taken to resolve the billing complaint. However, in some cases where number of billing complaints were less the sample size could not be achieved

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

6. Response time to customer (Electronically and Voice to Voice)	
Computational Methodology	Percentage of calls answered in a specified time = (Total no. of calls answered within that specified time / Total no. of calls dialed for a particular service)*100
Benchmark	(i) % age of calls answered (electronically): within 20 seconds = 80% of the calls over a period within 40 seconds = 95% of the calls over a period (ii) % age of calls answered by operator / voice to voice): within 60 seconds = 80% of the calls over a period within 90 seconds = 95% of the calls over a period
Audit Procedure	-IMRB auditors made test calls from the exchanges to the operator's customer care / helpline / toll free numbers. They will record the time taken to connect a customer's call both to the IVR as well as to a customer care executive. - All the supplementary services that have any kind of human intervention are to be covered here. It also includes the IVR assisted services. - Time to answer the call by the operator should be taken from the time auditor has pressed the requisite button for being assisted by the operator. <u>Live calling: -</u> - Overall sample size is 2*50 calls per service provider per circle at different points of time, evenly distributed across the selected exchanges – 50 calls between 1000 HRS to 1300 HRS and 50 calls between 1500 HRS to 1700 HRS - Time to answer the call by the operator was assessed from the time interviewer pressed the requisite button for being assisted by the operator. - All the supplementary services that have any kind of human intervention are to be covered here. It also includes the IVR assisted services.

7. Time taken to refund of deposits after closure	
Computational Methodology	Percentage of cases needing refund in a specified time = (Total no. of cases where refund was made within a particular time / Total no. of cases requiring refunds)*100
Benchmark	Time taken to refund = 100% within 60 days
Audit Procedure	IMRB Auditors verified and collected data pertaining to - Cases requiring refund of deposits after closure are to be included - Time taken starts from the date on which the closure is made by the service provider and ends at the date on which refund is received by the customer <u>Live calling : -</u> - Collect the details of all the cases for which the refund was provided by the operator prior to the month of Audit - Overall 100 number of live calls are to be made in a licensed service area/circle for each service provider (Distributed across number of exchanges selected)

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

9.2 For Cellular Mobile services

1. Accumulated Downtime of the Network	
Computational Methodology as per QoS definition	<p>The total time for which the network is down for a particular service provider resulting in a community isolation</p> <p>Computational Methodology: Accumulated downtime = Summation of Significant Downtime* * 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"> 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 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

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

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

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

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"> ↳ Total calls dropped = All calls ceasing unnaturally i.e. due to handover or due to radio loss ↳ Total calls established = All calls that have TCH allocation during busy hour <p>Computational Methodology: Total Calls Dropped / Total Calls Established x 100</p>
Benchmark	< 3%
Audit Procedure	<p>IMRB Auditors collected and verified records pertaining to:</p> <ul style="list-style-type: none"> ↳ Audit of traffic data of the relevant quarter kept in OMC-R at MSCs and used for arriving at CDR was conducted. ↳ The operator should only be considering those calls which are dropped during Time consistent busy hour (TCBH) for all days of the relevant quarter

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

7. Service Coverage	
Computational Methodology as per QoS definition	<p>Definition:</p> <ul style="list-style-type: none"> ↳ The level of signal available in a particular part of a city is known as signal strength. <p>Computational Methodology:</p> <ul style="list-style-type: none"> ↳ Service Coverage for route type x = $[(N1 \times CSS1) + (N2 \times CSS2) + \dots + (Nn \times CSSn)] / (N1 + N2 + \dots + Nn)$ ↳ Where:- N1 = Number of calls on type of route x made in drive test 1 ↳ CSS1 = Average coverage signal strength on type of route x in drive test 1 (in dBm) ↳ N2 = Number of calls on type of route x made in drive test 2 ↳ CSS2 = Average coverage signal strength on type of route x in drive test 2 (in dBm) ↳ Nn = Number of calls on type of route x made in drive test n ↳ CSSn = Average coverage signal strength on type of route x in drive test n (in dBm)
Benchmark	<p>Indoor >= -75 dBm In-vehicle >= -85 dBm Outdoor – in city >= -95 dBm</p>
Audit Procedure	<p>IMRB Auditors collected and verified call centre records pertaining to:</p> <ul style="list-style-type: none"> ↳ 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. ↳ Procedures were verified that were to be followed by operator for obtaining relevant details for computing this parameter:- <ul style="list-style-type: none"> ↳ Operator to conduct at least one drive test using standard drive test equipment* every week during Time consistent busy hour (TCBH). ↳ Each drive test should evenly cover the following 5 types of locations: – <ul style="list-style-type: none"> ↳ 3 Outdoor (Periphery of the city, Congested Area, Across the City), and ↳ 2 Indoor (Office Complex and Shopping Complex) ↳ <i>Measurements using Engineering handsets were not acceptable</i>

8. Response time to customer (Electronically and Voice to Voice)	
Computational Methodology	<p>To connect to IVR: The time taken to connect a person (as soon as he presses call) to the IVR of the service provider</p> <p>To connect to operator: The time taken to connect a person (as soon as he presses 9) to the customer care executive</p> <p>Computational Methodology: Percentage of calls answered in a specified time = $(\text{Total no. of calls answered within that specified time} / \text{Total no. of calls dialed for a particular service}) * 100$</p>
Benchmark	<p>(i) %age of calls answered (electronically):</p> <ul style="list-style-type: none"> ↳ within 20 seconds = 80% ↳ within 40 seconds = 95% <p>(ii) %age of calls answered by operator (voice to voice):</p> <ul style="list-style-type: none"> ↳ within 60 seconds = 80% ↳ within 90 seconds = 95%

Audit Procedure	<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>Live calling: -</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	
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"> • Local call charges billed as STD/ISD or vice-versa • Toll free numbers charged • Wrong roaming charges • Call made/received disputed • Wrongly charged extra for some service (SIM replacement charged twice, service not used but charged etc.) • 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) • Payment made but not reflected (may be wrongly adjusted to another customer etc.) <p>Billing complaints per 100 bills issued = 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>
Benchmark	< 0.1% billing complaints per 100 bills
Audit Procedure	<p>IMRB auditors collected and verified data pertaining to</p> <ul style="list-style-type: none"> - Number of bills generated - Number of billing complaints received - %age complaints per 100 bills

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

9.3 Period of refunds / payments due to customers	
Computational Methodology as per QoS definition	<p>Period of all refunds = Maximum value of 'Time taken to refund' where:-Time taken to refund = Date of refund – date of lodging complaint</p>
Benchmark	100% cases in less than 4 weeks
Audit Procedure	<p>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.</p> <p>Operator to provide details of:-</p> <ul style="list-style-type: none"> • Dates of lodging of all billing complaints resolved in favour of customer and resulting in requirement of a refund by the operator • Dates of refund pertaining to all billing complaints received during the relevant quarter <p>Also random live checks of all subscribers entitled for refund were conducted</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>Percentage connections provided within X working days = No of connections provided within X working days/ Total number of connections registered during the period * 100</p> <p>Technically Non Feasible (TNF) 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"> -Number of applications received at the service provider's level -Number of connections provided within 15 days -Number of connections provided after 15 days <p>Live calling : 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>Percentage faults repaired in X working days = (Total no of faults repaired in X working days /Total number of faults reported during the period)*100</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"> -Number of applications received at the service provider's level -Number of connections provided within 15 days -Number of connections provided after 15 days <p>Live calling : 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"> • Wrongly charged extra for some service • Cheque submitted on time but charged penalty for paying beyond due date • Payment made but not reflected (may be wrongly adjusted to another customer etc.) <p>Billing complaints per 100 bills issued = 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"> - Number of bills generated - Number of billing complaints received - %age complaints per 100 bills

3.1. Resolution of billing complaints	
Computational Methodology as per QoS definition	<p>%age of billing complaints resolved within 4 weeks=(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"> - Total number of billing complaints/bills disputed - Number of complaints resolved in 4 weeks <p>Live calling :-</p> <p>-Overall 100 number of live calls are to be made in a licensed service area/circle for each service provider. However in certain cases the sample could not be achieved as bills disputed (prior to the month of Audit) were found to be less than 100</p>

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	IMRB Auditors collected and verified data pertaining to -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	%age of calls answered by operator (voice to voice) within n seconds = (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	IMRB Auditors collected and verified call centre records pertaining to -Number of calls received by the operator -Number and %age calls answered within 60 seconds -Number and percentage calls answered within 90 seconds Live calling : - 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	IMRB Auditors collected and verified call centre records pertaining to (I)POP to ISP gateway Node [Intra – network] Links -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 (ii) ISP Gateway Node to IGSP / NIXI Node upstream Link's) for international connectivity -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>Live calling : -</p> <ul style="list-style-type: none"> -Details of live customers were obtained from the service providers -Overall 50 number 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 -Details of total committed download speed and speed available to the users were recorded for each of the subscriber - Percentage download speed available was calculated as = Sum of total speed available for 50 customers/Total committed download speed for 50 customers*100

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 = (Total operational hours – Total Downtime hrs)*100 / Total operational hours</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"> - 90% for quarter ending June 2007 - 98% with effect from quarter ending September 2007 and onwards
Audit Procedure	<p>IMRB Auditors collected and verified call centre records pertaining to</p> <ul style="list-style-type: none"> -Total operational hrs -Total downtime hrs <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 1000 pings of 64 byte packet each.</p> <p>Service provider needs to carry out such tests daily during Time Consistent Busy Hour(TCBH) and report the average results for the month in the performance monitoring report to TRAI</p> <p>Minimum sample reference points for each service area shall be three in number or multiple reference points if required</p> <p>Hence Packet loss is computed by the formula - (Total number of ping packets lost during the period/Total number of ping packets transmitted)* 100</p>
Benchmark	<1 %
Audit Procedure	<p>IMRB Auditors collected and verified call centre records pertaining to</p> <ul style="list-style-type: none"> - Records maintained for ping tests conducted during the period of July to September 2007 - Smoked ping test (wherever available) results for the period of July to September 2007 - Results of live ping tests conducted during three day live measurement and month of Audit (During peak hours) - Live ping tests were conducting by selecting a minimum of three user reference test points at POP/ISP Node in each circle

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 1000 pings of 64 bytes each (Pings are to be sent subsequent to acknowledgement received for the same for previous ping)</p> <p>Service provider needs to carry out such tests daily during Time Consistent Busy Hour(TCBH) and report the average results for the month in the performance monitoring report to TRAI</p> <p>Minimum sample reference points for each service area shall be three in number or multiple reference points if required</p> <p>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</p>
Benchmark	<p>< 120 msec from user reference point at POP/ISP Node to International Gateway < 350 msec from User reference point at ISP Gateway Node to International nearest NAP port (Terrestrial) < 800 msec from User reference point at ISP Gateway Node to International nearest Nap port (Sattelite)</p>
Audit Procedure	<p>IMRB Auditors collected and verified call centre records pertaining to</p> <ul style="list-style-type: none"> - Records maintained for ping tests conducted during the period of July to September 2007 - Smoked ping test (wherever available) results for the period of July to September 2007 - Results of live ping tests conducted during three day live measurement and month of Audit (During peak hours) - Live ping tests were conducting by selecting a minimum of three user reference test points at POP/ISP Node in each circle
