Ka8 Balaji Estate, Guru Ravidass Marg, Kalkaji, New Delhi - 110019
Phone: (91)-11-4269-7800, Fax: (91)-11-42697802
Website: www.imrbint.com

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

Karnataka Circle

Report: October-November-December - 2009

-

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

By: **eTech Group@IMRB**

A specialist unit of IMRB International

Preface

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

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

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

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

The Survey and Audit modules for various circles within the Zones, due the sheer scale of data collection, have been distributed across various Half Yearly periods. The auditor - IMRB International carried out the audits across Punjab, Rajasthan, North East, Assam and Karnataka circles in the October-November-December 2009 period. **This report details the performance of various service providers in Karnataka circle against Quality of Services benchmarks for various parameters laid down by TRAI in respective regulations for Cellular (Mobile), Basic Wireline 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 20th March, 2009. The parameters for Broadband Service have been specified in the TRAI notification for Quality of Services of Broadband Service Regulation, 2006

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

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

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

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

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

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

2.0 Objectives And Methodology

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

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

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

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

Section A: WIRELINE

3.0 Sampling Methodology

3.1 Sampling for Basic (Wireline) services

- For BSNL the sample of exchanges was selected was spread across 10% of SDCA's in the entire service.
- For rest of the service providers data was collected pertaining to all the exchanges present in the circle/service area
- Following are the various Basic Wireline operators covered in Karnataka circle:

	Name of Operator
Operator 1	BSNL
Operator 2	Airtel
Operator 3	TTSL
Operator 4	RCOM

4.0 Audit methodology

4.1 Basic (Wireline) Services

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

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

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

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

5.0 Executive Summary

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

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

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

Parameters	Benchmarks	BSNL	Airtel	TTSL	RCOM
Faults incidences (No. of faults/100 Subs./month)	≤5	4.48	4	0.06	0.61
% of faults repaired by next working day	≥ 90%	73.71%	97.57%	95.68%	100.00%
% of faults repaired within 3 days	100%	92.69%	98.62%	97.48%	100.00%
Faults pending for> 3days and ≤7 days	Rent rebate of 7 days	3.75%	100.00%	NA	NA
Faults pending for > 7 days and ≤15 days	Rent rebate of 15 days	100.00%	100.00%	NA	NA
Faults pending for > 15 days	Rent rebate of 1 month	100.00%	NA	NA	NA
Mean Time to Repair (MTTR)	≤ 8 Hrs	13.49	3.39	18.95	4.55
Call Completion Rate (CCR)	≥ 55%	68.90%	66.13%	84.05%	NA
Answer to Seizure ratio (ASR)	≥ 75%	71.82%	90.67%	73.87%	88.17%
No. of POIs with congestion > 0.5%	≤ 0.5%	3	1	0	0
Metering and billing credibility - Number of bills disputed during over a billing cycle	≤ 0.1%	0.01%	0.01%	0.06%	0.06%
Resolution of billing complaints within 4 weeks	100%	57.89%	100.00%	100.00%	100.00%
Period of applying credit / waiver	≤ 1 week	57.89%	100.00%	NA	100.00%
Customer care/helpline promptness					
Percentage shift requests attended within 3 days	≥ 95%	64.27%	96.20%	100.00%	100.00%
Closure within 7 days	100%	94.34%	100.00%	100.00%	100.00%
Response time to customer for assistance					
% age calls getting connected and answered	≥ 95%	96.40%	100.00%	100.00%	100.00%
% age call answered by operator in 60 seconds	≥ 90%	99.88%	98.24%	92.00%	92.00%
Time taken for refund of deposits after closures within 60 days	100%	93.10%	100.00%	98.78%	100.00%

{*Note: For BSNL data pertains to the sample 5% of exchanges audited during the period of to October to December 2009, whereas for rest of the operators figures pertain to all the exchanges present in the circle}

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

Summary of Live Measurement Results – Wireline Services

Parameters	Benchmarks	BSNL	Airtel	TTSL	RCOM
Percentage connections completed within 7 days	100%	77.02%	77.00%	44.44%	NA
% of faults repaired by next working day	≥ 90%	62.11%	73.33%	93.33%	80.00%
% of faults repaired within 3 days	100%	92.28%	96.67%	93.33%	86.67%
Call Completion Rate (CCR)	≥ 55%	57.23%	65.59%	83.69%	NA
Answer to Seizure ratio (ASR)	≥ 75%	65.02%	88.22%	73.58%	87.01%
Resolution of billing complaints within 4 weeks	100%	100.00%	86.00%	94.44%	100.00%
Customer care/helpline promptness					
Percentage shift requests attended within 3 days	≥ 95%	62.68%	30.00%	100.00%	0.00%
Response time to customer for assistance					
% age calls getting connected and answered	≥ 95%	100.00%	100.00%	100.00%	100.00%
% age call answered by operator in 60 seconds	≥ 90%	96.42%	100.00%	81.00%	100.00%

Not meeting the benchmark

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

BSNL, Airtel, TTSL and RCOM are the 4 operators providing Basic (Wireline) Services in Karnataka circle to retail customers. During the audit process it was observed that the BSNL could not meet TRAI specified benchmark on most of the parameters specified by TRAI.

The live calling results were found to be different from the 1 month audit data collection in certain places. To some extent the difference can be attributed to the smaller sample size undertaken for the live calling.

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

Provision of telephone after registration of demand

- In Karnataka circle, live calling for service provisioning shows all service provider falling short of TRAI specified benchmark of 100% connections within 7 days. RCOM did not have any new connections in the month of audit.

Fault incidence / clearance statistics

- All service providers are meeting the TRAI benchmark for fault incidence ≤ 5 in the month of audit
- Fault repair remains pain point for BSNL as only 73% of the total complaints registered in the sample exchanges were repaired within 24 hrs which is significantly short of TRAI specified benchmark of >90%.
- For live calling carried out by IMRB auditors less than 90% of subscribers of all operators except TTSL claimed that fault were not repaired within 24 hrs.
- Even for fault repair within 3 days BSNL falls short of the TRAI specified benchmark with a score of 92.69%.

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

Mean time to Repair (MTTR)

- BSNL (13.49) and TTSL (18.95) are way above the TRAI benchmark on this parameter during month in which audit was carried out

Traffic statistics (CCR & ASR)

- All service providers comfortably meet the benchmark on CCR parameter both during month in which audit was carried out and the three days live measurement -carried out in auditor's presence at various exchanges
- BSNL and TTSL fall short of TRAI benchmark for ASR both during month in which audit was carried out and three days live measurement

Metering and billing credibility

- All the service providers comfortable meet TRAI specified benchmark with percentage billing complaints being less than equal to 0.1% of the total bills generated.
- For all the complaints registered and resolved within 4 weeks BSNL does not meet the benchmark during month of audit whereas Airtel and TTSL do not meet the benchmark during live calling done by IMRB auditors

Customer care/helpline promptness

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

Response time to customer for assistance

- All service providers comfortably meet TRAI specified benchmark for calls answered by the operator in 60 seconds.
- However for the live calling carried out by IMRB auditors TTSL (81%) fail to meet the TRAI specified benchmark of ≥ 90%

Time taken for refund of deposits after closure

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

Level 1 service

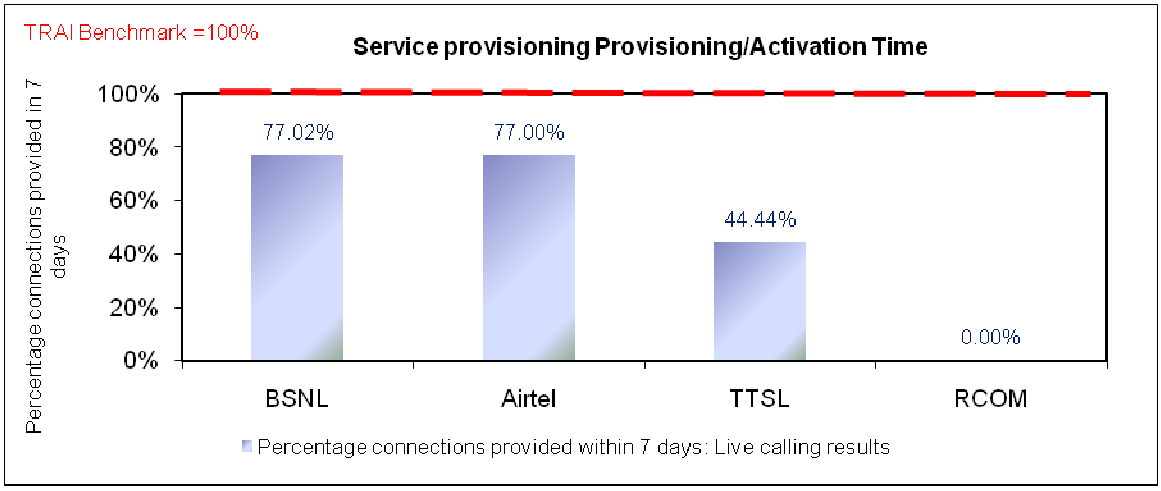
Level 1 services	Benchmark	BSNL	Airtel	TTSL	RCOM
Total no. of calls made		640	30	30	30
Calls answered in 60 sec		626	30	10	22
Calls answered after 60 sec		14	0	0	0

To test the efficiency of level 1 services (Trunk booking, Child helpline, Women helpline, Airline booking, Fire, Police, Railways) offered by various service providers. 640 calls were made for BSNL to different numbers and time taken to answer the call was noticed. Out of which 626 calls were answered in 60 seconds.

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

6.1 Graphical/Tabular Representations for Basic (Wireline) services

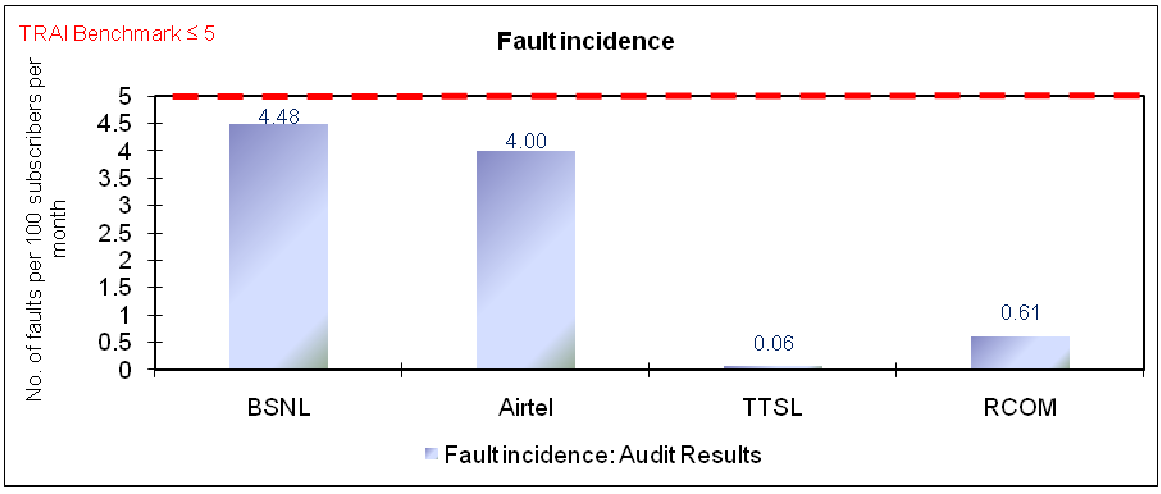
Service provisioning / Activation time (Comparison between one month audit results and live calling results)



Live calling

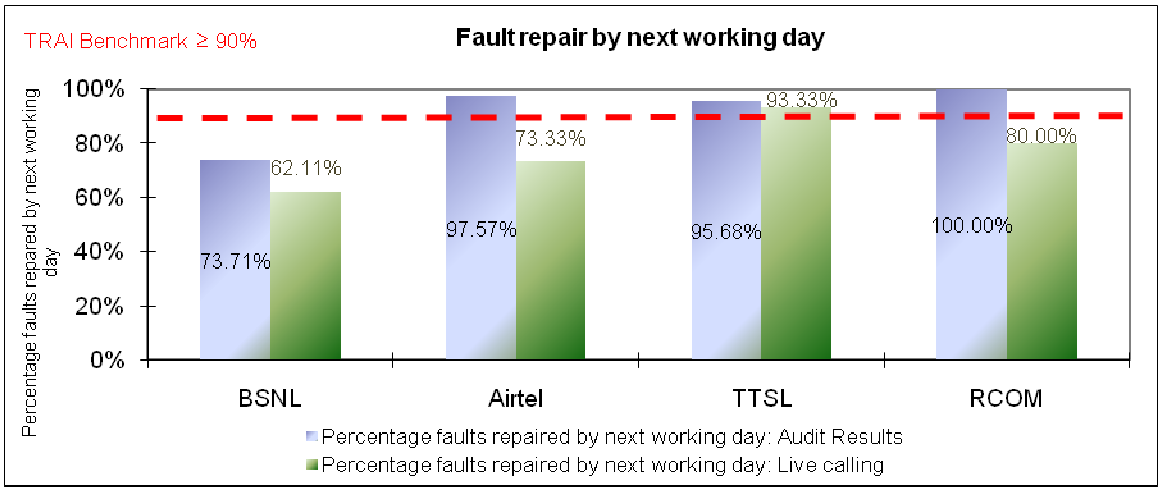
No operator is meeting the benchmark

Fault incidence



All operators are meeting the benchmark

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



One month

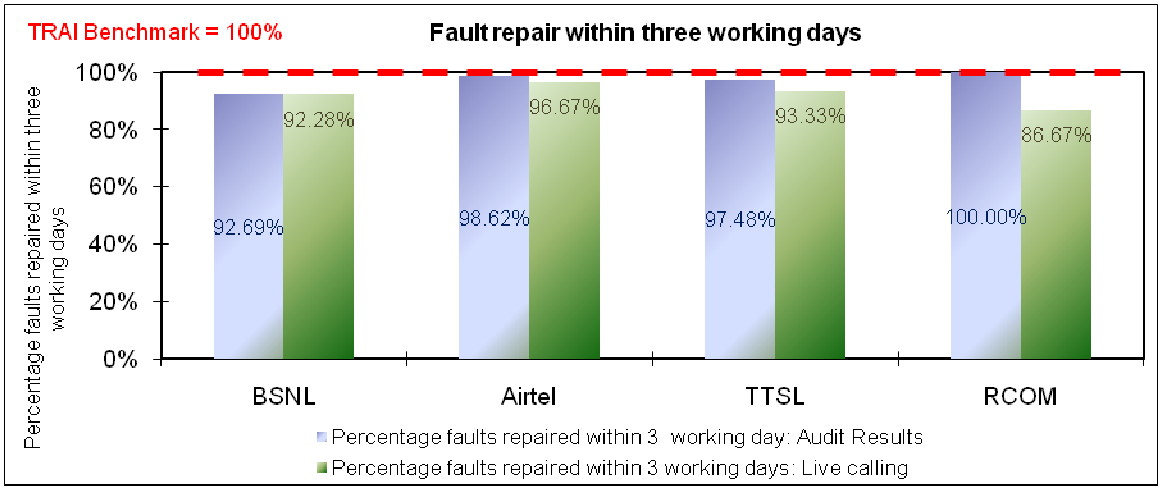
Operator meeting benchmark: Airtel, TTSL, RCOM

Operator not meeting benchmark: BSNL

Live calling

Operator meeting benchmark: TTSL

Operator not meeting benchmark: BSNL, Airtel, RCOM



One month

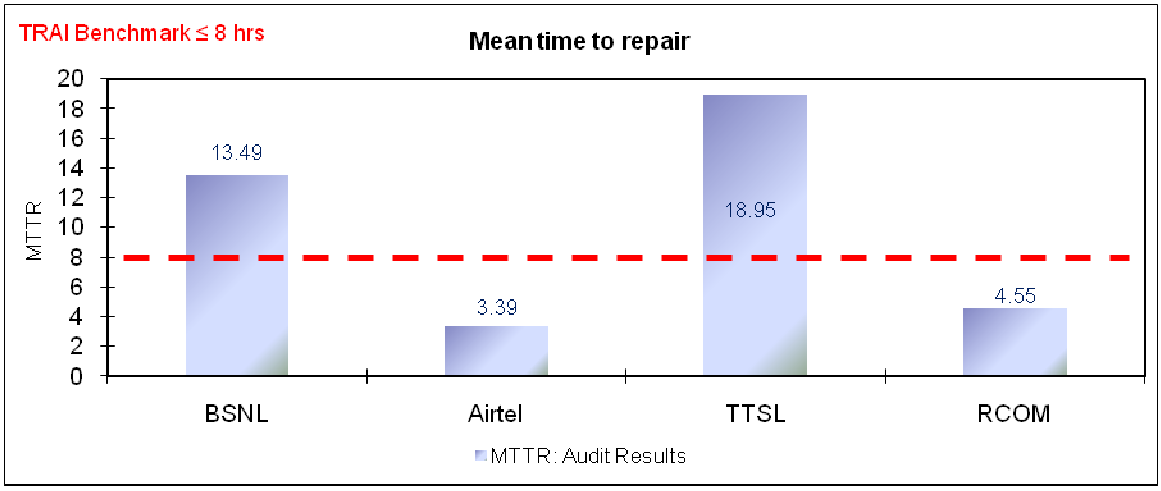
Operator meeting benchmark: RCOM

Operator not meeting benchmark: BSNL, Airtel, TTSL

Live calling

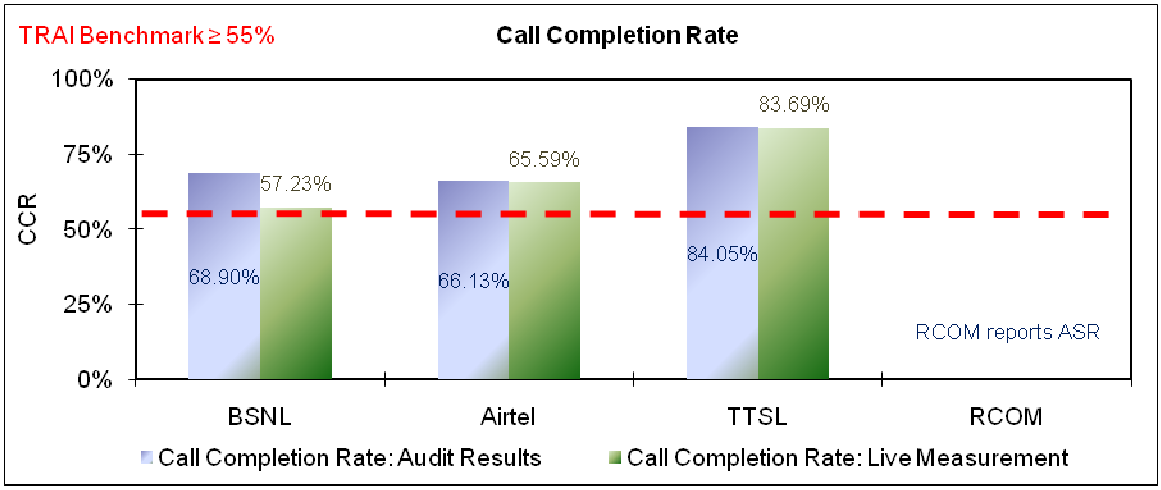
No operator is meeting the benchmark

Mean time to repair



Operator meeting benchmark: Airtel, RCOM
Operator not meeting benchmark: BSNL, TTSL

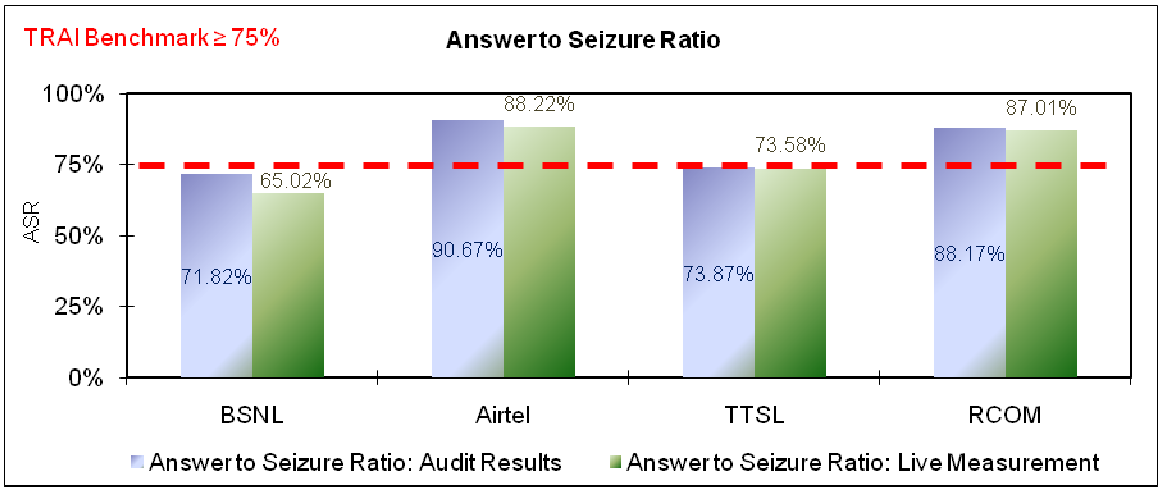
Call completion rate (Comparison between one month audit results and three day live measurement)



One month
All operators are meeting the benchmark

Live measurement
All operators are meeting the benchmark

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



One month

Operator meeting benchmark: Airtel, RCOM

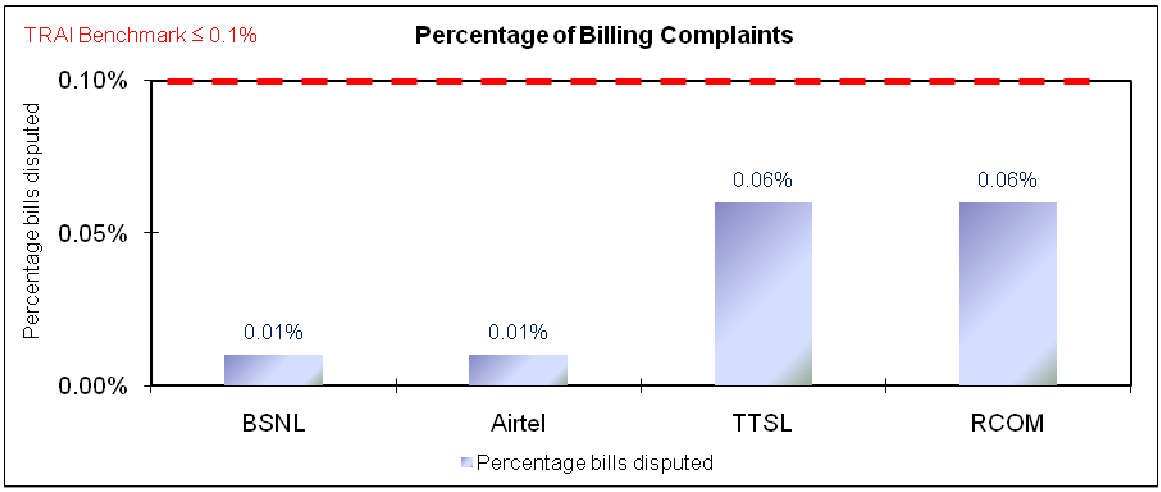
Operator not meeting benchmark: BSNL, TTSL

Live measurement

Operator meeting benchmark: Airtel, RCOM

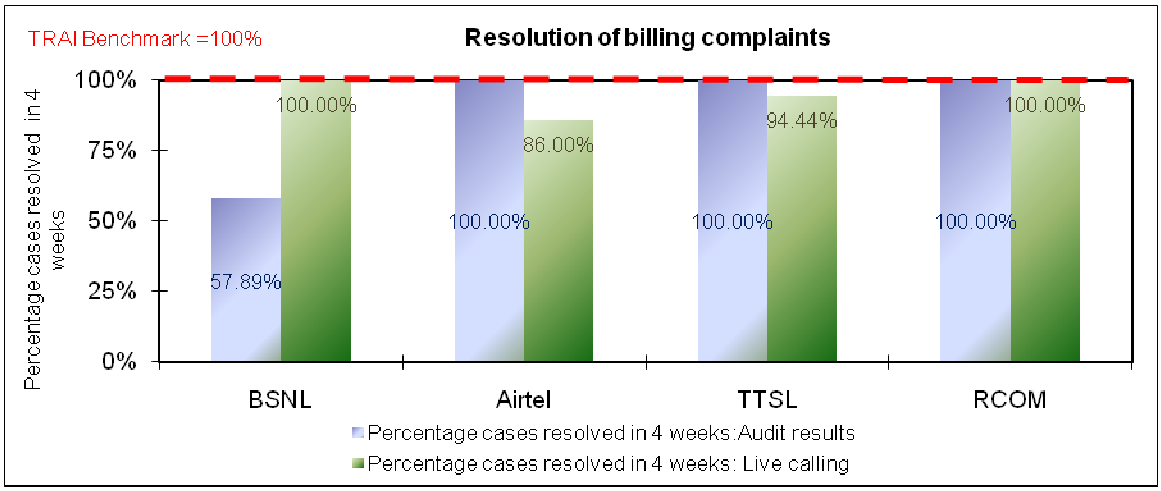
Operator not meeting benchmark: BSNL, TTSL

Percentage bills disputed



All operators are meeting the benchmark

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



One month

Operator meeting benchmark: Airtel, TTSL, RCOM

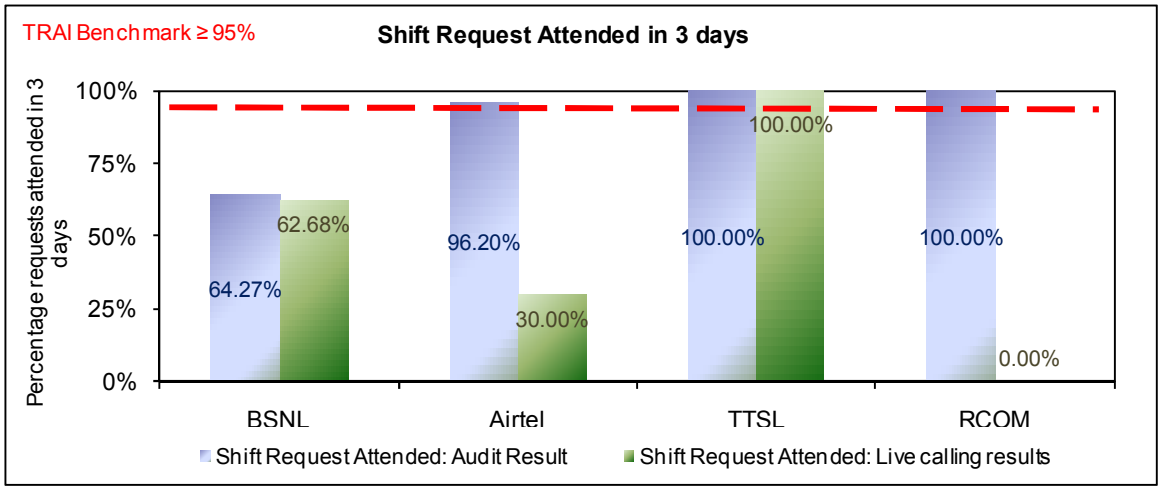
Operator not meeting benchmark: BSNL

Live calling

Operator meeting benchmark: BSNL, RCOM

Operator not meeting benchmark: Airtel, TTSL

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



One month

Operator meeting benchmark: Airtel, TTSL, RCOM

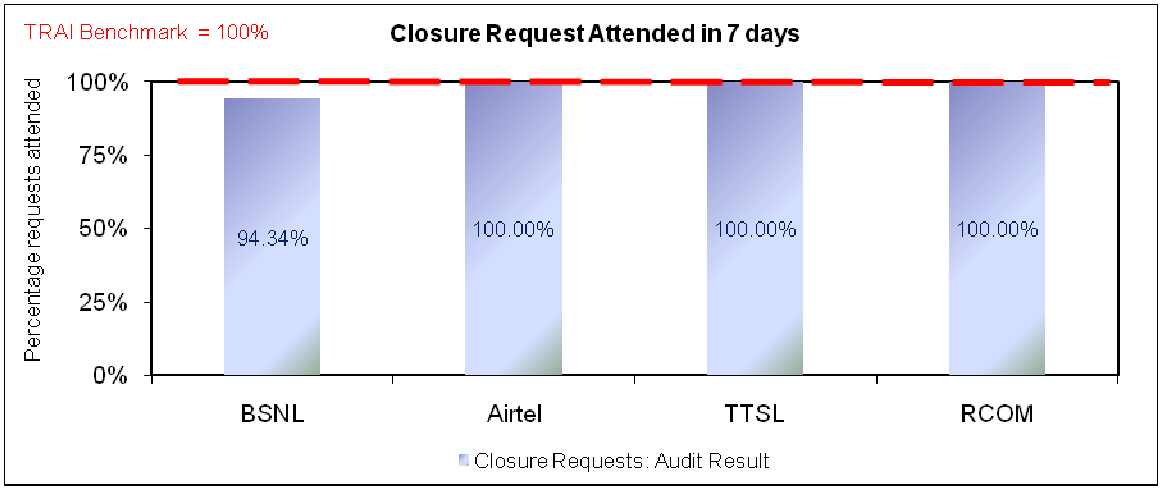
Operator not meeting benchmark: BSNL

Live calling

Operator meeting benchmark: TTSL

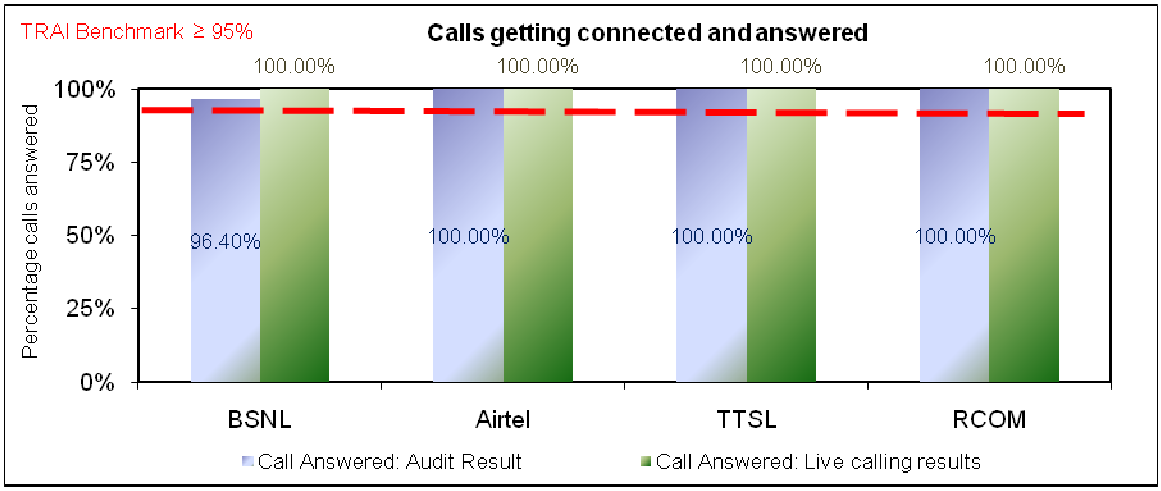
Operator not meeting benchmark: BSNL, Airtel, RCOM

Closure requests attended within 7 days



Operator meeting benchmark: Airtel, TTSL, RCOM
Operator not meeting benchmark: BSNL

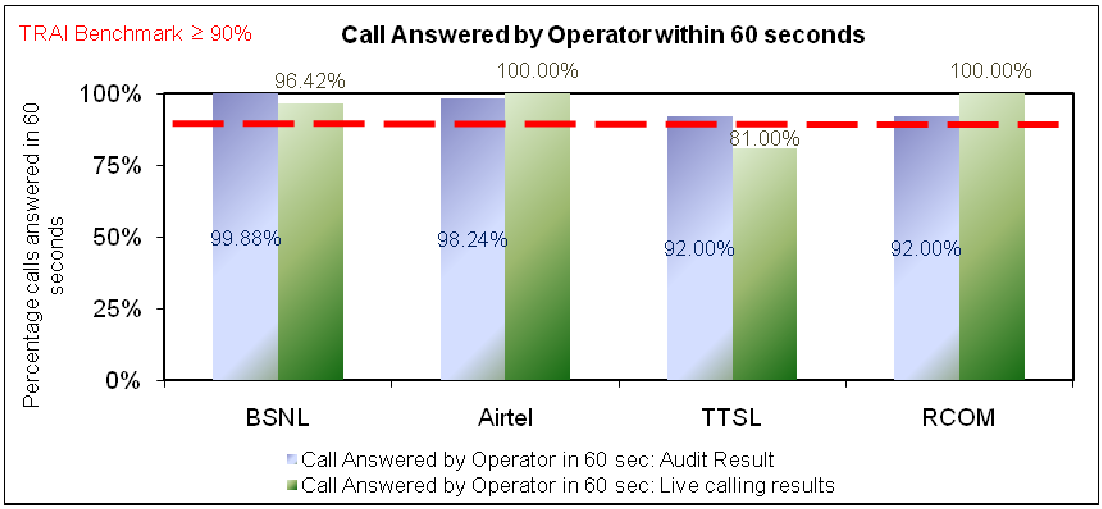
Response time to customer for assistance - Calls answered and getting connected (Comparison between one month audit and live calling results)



One month
All operators are meeting the benchmark

Live calling
All operators are meeting the benchmark

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



One month

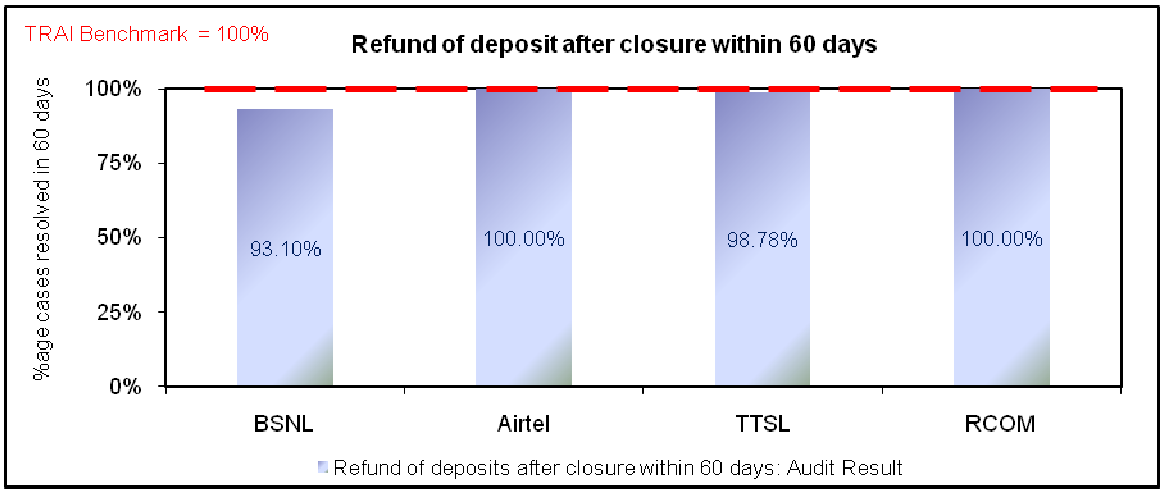
All operators are meeting the benchmark

Live calling

Operator meeting benchmark: BSNL, Airtel, RCOM

Operator not meeting benchmark: TTSL

Time taken to refund of deposits after closure



Operator meeting benchmark: Airtel, RCOM

Operator not meeting benchmark: BSNL, TTSL

7.0 Compliance reports: Results of Verification of Records

7.1 Basic (Wireline) services

Parameters	Benchmarks	BSNL*		Airtel		TTSL		RCOM	
		PMR#	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB
Percentage connections completed within 7 days	100%	100.00%	80.00%	100.00%	100.00%	100.00%	78.49%	100.00%	100.00%
Faults incidences (No. of faults/100 Subs./month)	≤5	4.60	5.60	4.00	4.00	0.03	0.15	0.40	0.40
% of faults repaired by next working day	≥ 90%	96.27%	80.00%	96.00%	95.39%	93.33%	95.68%	99.67%	99.67%
Faults pending for >3 days and ≤7 days	Rent rebate of 7 days	Nil	541	1851	1851	1	1	3	3
Faults pending for >7 days and ≤15 days	Rent rebate of 15 days	Nil	70	255	255	0	0	0	0
Faults pending for >15 days	Rent rebate of 1 month	Nil	228	91	91	0	0	0	0
Mean Time to Repair (MTTR)	≤ 8 Hrs	6.96	11.23	5.00	5.00	6.00	6.00	2.08	2.08
Call Completion Rate (CCR)	≥ 55%	66.00%	66.00%	65.36%	65.36%	98.30%	98.30%	NA	NA
Metering and billing credibility - Number of bills disputed during over a billing cycle	< 0.1%	0.03%	1.91%	0.00%	0.00%	0.01%	0.02%	0.04%	0.04%
Resolution of billing complaints within 4 weeks	100%	100.00%	80.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Customer care/helpline promptness									
Shift requests (Total number received)		5488	1504	4374	4374	111	111	28	28
Percentage shift requests attended within 3 days	>95%	100.00%	62.00%	96.00%	96.00%	100.00%	100.00%	96.43%	96.43%
Closure request attended		44944	3541	35445	35445	1979	1979	2489	2489
Closure within 24 hours	>95%	100.00%	99.00%	100.00%	100.00%	100.00%	100.00%	98.59%	98.59%
Supplementary (additional) service requests attended)		Complied		Complied		Complied		Complied	
Additional facility provided within 24 hours	>95%	Complied		Complied		Complied		Complied	
Response time to customer for assistance									
% age call answered through IVR in 20 seconds	>80%	Complied		Complied		Complied		Complied	
% age call answered through IVR in 40 seconds	100%	Complied		Complied		Complied		Complied	
% age call answered by operator in 60 seconds	>80%	99.81%	99.81%	86.00%	81.00%	91.00%	90.00%	86.00%	86.00%
% age call answered by operator in 90 seconds	>95%	Complied		Complied		Complied		Complied	
Time taken for refund of deposits after closures within 60 days	100%	100.00%	91.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

* These have been calculated cumulatively on the basis of figures reported by various exchanges #As per the PMR submitted by the operators in the 2nd quarter of 2009

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

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

7.2 Conclusions

Basic Wireline Services

For verification of raw data for the period of April to June 2009, there was significant variation observed when compared to the figures reported in the PMR for service provisioning and Time taken to attend shift requests

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

Section B
WIRELESS

8.0 Sampling methodology

8.1 Sampling for Cellular Mobile (Wireless) service providers

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

	Name of Operator	Month of Audit
Operator 1	Airtel	October
Operator 2	Vodafone	October
Operator 3	BSNL GSM	October
Operator 4	BSNL CDMA	October
Operator 5	Tata CDMA	October
Operator 6	Tata DoCoMo	October
Operator 7	Idea	October
Operator 8	Aircel	October
Operator 9	RCOM CDMA	October
Operator 10	RCOM GSM	October

9.0 Audit methodology

9.1 Cellular Mobile Services

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

S.no	Parameter	AS REPORTED IN PMR	AS FOUND IN ACTUAL RECORDS AFTER VERIFICATION	AS FOUND IN VERIFICATION FOR THE MONTH OF AUDIT	AS FOUND IN 3 DAY LIVE MEASUREMENT DATA	LIVE CALLING	OPERATOR ASSISSTED DRIVE TESTS	INDEPENDENT DRIVE TESTS
A	**Network Performance**							
A (i)	BTS accumulated down time	Yes	Yes	Yes				
A (ii)	Call setup success rate (within licensee own network)	Yes	Yes	Yes	Yes		Yes	Yes
A (iii)	Blocked Call Rate	Yes	Yes	Yes	Yes		Yes	Yes
A (iv)	Call Drop rate	Yes	Yes	Yes	Yes		Yes	Yes
A (v)	% Connections with good voice quality	Yes	Yes	Yes			Yes	Yes
A (vi)	Service Coverage	Yes	Yes	Yes			Yes	Yes
A (vii)	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}

10.0 Executive Summary

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

- *"Service provider performance report"* for Cellular mobile service , which gives a glimpse of the performance of various operators against the benchmark specified by TRAI, during the month in which the Audit was carried out by IMRB Auditors

- *"Parameter wise critical findings"* for Cellular mobile services: This indicates key observations and findings from different activities carried out during the Audit process

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

Name of Service Provider	Time Consistent Busy Hour (TCBH)	Network Availability					Connection Establishment (Accessibility)			Connection Maintenance (Retainability)					POI		Network Traffic Capacity and Utilization		
		Total no. of BTSs in the licensed service area	Sum of downtime of BTSs in a month in hours i.e. total outage time of all BTSs in hours during a month	BTSs Accumulated downtime (not available for service) (%age)	No. of BTSs having accumulated downtime of >24 hours in a month	Worst affected BTSs due to downtime (%age)	Call Set-up Success Rate (within licensee's own network)	SDCCH/ Paging Chl. Congestion (%age)	TCH Congestion (%age)	Call Drop Rate (%age)	Total No. of cells exceeding 3% TCH drop (call drop)	Total no. of cells in the network	Worst affected cells having more than 3% TCH drop (call drop) rate (%age)	Connections with good voice quality*	POI Congestion (No. of POIs not meeting the benchmark)	Total number of working POI Service Area wise	Equipped Capacity of Network in respect of Traffic in erlang	Total traffic handled in TCBH in erlang	Total no. of customers served (as per VLR) on last day of the month
Benchmark				**≤ 2%**		**≤ 2%**	**≥ 95%**	**≤ 1%**	**≤ 2%**	**≤ 2%**			**≤ 5%**	**≥ 95%**	**≤ 0.5%**				
Airtel	1900-2000	6657	45135	0.91%	340	5.11%	96.21%	0.97%	1.32%	1.77%	2217	18345	12.09%	97.60%	0	22	587999	348320	10292079
Vodafone	1900-2000	6249	20655	0.44%	43	0.69%	99.22%	0.13%	0.34%	0.65%	847	18253	4.64%	98.73%	0	48	144735	97391	2768228
BSNL GSM	1900-2000	2946	32731	1.49%	58	1.97%	98.42%	0.51%	1.74%	1.70%	170	8657	1.96%	97.44%	2	304	185600	80704	2461398
BSNL CDMA	1900-2000	446	2603	0.78%	25	5.61%	97.82%	0.55%	0.47%	0.50%	266	11429	2.33%	95.25%	NA	NA	27417	9123	394168
Tata CDMA	1900-2000	828	262	0.04%	0	0.00%	95.52%	0.00%	0.05%	0.43%	98	2158	4.54%	99.23%	0	145	103500	30447	919384
Tata DoCoMo	1900-2000	1984	5787	0.39%	1	0.05%	98.71%	0.65%	0.86%	1.00%	490	5695	8.60%	95.06%	0	1	62632	37911	1630745
Idea	1900-2000	3437	2616	0.10%	21	0.61%	99.55%	0.11%	0.45%	1.45%	486	10311	4.71%	97.14%	0	48	102323	49458	1837162
Aircel	1900-2000	1735	3827	0.30%	37	2.13%	98.39%	0.04%	0.41%	0.56%	250	4983	5.02%	98.34%	1	714	40206	6062	365437
RCOM CDMA	1900-2000	1958	2497	0.17%	5	0.26%	99.45%	0.00%	0.08%	0.63%	3	1958	0.15%	99.21%	11	108	230000	68956	4692544
RCOM GSM	1900-2000	3003	4107	0.18%	7	0.23%	98.94%	0.02%	0.09%	0.47%	56	9009	0.62%	99.12%					

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

** Methodology not in line with QoS

Figures provided on All India basis

Not meeting the benchmark

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

Critical findings: Cellular Mobile Services

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

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

Busy Hour of Various Service Providers

Service Provider	Reported Time Consistent Busy Hour	Network Busy Hour found in 3 day live measurement
Airtel	2000-2100	**1900-2000**
Vodafone	1900-2000	**1900-2000**
BSNL GSM	1900-2000	**1900-2000**
BSNL CDMA	1900-2000	**1900-2000**
Tata CDMA	1900-2000	**1900-2000**
Tata DoCoMo	1900-2000	**1900-2000**
Idea	1900-2000	**1900-2000**
Aircel	1900-2000	**1900-2000**
RCOM CDMA	1900-2000	**1900-2000**
RCOM GSM	1900-2000	**1900-2000**

The TCBH reported by all the service providers except Airtel, matched the network busy hour calculated by IMRB auditors for the Karnataka circle.

Accumulated Downtime:

In the Karnataka circle, all the operators comfortably meet the TRAI specified benchmark score of ≤2% for BTS accumulated downtime.

Call Set-up Success Rate (CSSR):

All the operators were found to be meeting the benchmark on this parameter. During the audits the maximum CSSR was observed for Spice (IDEA) with 99.55% of their calls getting completed. All the operators were found to be calculating the parameter as per the norm specified by TRAI. CSSR was established as the ratio of total number of successful call attempts (establishment) to the total number of call attempts made.

Network Congestion parameters:

SDCCH / Paging Channel Congestion, TCH and POI are part of the network congestion parameters. All the operators are meeting the TRAI specified benchmarks on the congestion parameters. Tata CDMA leads the way in network congestion parameters with almost negligible paging as well as traffic channel congestion. The calculation methodology of these parameters was found to be in complete accordance with what has been specified by TRAI. Both RCOM CDMA and Tata Teleservices measure paging channel utilization. When the value of this parameter is less

than 100%, it is counted as 0% congestion. There were almost no POIs with congestion more than the benchmark (<=0.5%) except for 2 POIs for BSNL GSM and 1 for Aircel.

Call Drop Rate:

During the audit it was found that all the service providers were measuring this parameter as per the TRAI guidelines. The call drop rate was measured as the ratio of total calls dropped to the total number of call attempts. Also, all of service providers were found to be meeting the TRAI specified benchmark. The lowest call drop rate was for Tata CDMA at 0.43%.

Connections with good voice quality:

Most of the operators are measuring this parameter via their periodic drive tests and meet the TRAI specified benchmark score. However, for some operators value for this parameter can be obtained at their switch as well. During the audit it was found that all the service providers were measuring this parameter as per the TRAI guidelines.

Customer Care / Helpline Assessment:

For the accessibility of customer care aspect all the service providers meet the TRAI benchmark. In case of calls answered by the operator, all the operators except Airtel, Aircel and RCOM GSM were found to be meeting the benchmark for the month of audit.

Billing performance:

All the operators except Aircel (both prepaid and postpaid), Vodafone (Prepaid) and BSNL GSM (prepaid) were found to be meeting the benchmark of 1 complaint registered per 1000 bills issued. For resolution of billing complaints, all the operators were found to be meeting 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 DoCoMo meet the TRAI benchmark of 100% within 1 week.

Inter operator calls assessment

Inter operator call Assessment To↓ From→	Airtel	Vodafone	BSNL GSM	BSNL CDMA	Tata CDMA	Tata DoCoMo	Idea	Aircel	RCOM CDMA	RCOM GSM
Airtel	NA	62%	98%	98%	84%	70%	95%	80%	100%	100%
Vodafone	86%	NA	85%	97%	98%	72%	95%	98%	100%	100%
BSNL GSM	86%	78%	NA	100%	90%	76%	91%	93%	100%	99%
BSNL CDMA	100%	87%	100%	NA	100%	100%	100%	100%	96%	100%
Tata CDMA	100%	98%	98%	100%	NA	100%	85%	91%	98%	98%
Tata DoCoMo	83%	82%	88%	100%	100%	NA	100%	100%	100%	98%
Idea	98%	87%	100%	100%	94%	98%	NA	90%	99%	96%
Aircel	15%	86%	82%	98%	80%	93%	54%	NA	100%	100%
RCOM CDMA	100%	87%	100%	98%	100%	100%	100%	100%	NA	100%
RCOM GSM	100%	92%	99%	98%	100%	100%	100%	100%	100%	NA

The maximum problem faced by the calling operator to other operators

In the inter-operator call assessment, calls were made from the test SIMs of service provider whose audit was being conducted to all the other service providers. Out of the 9 operators 4 found it difficult connecting to an Aircel number. For calls made from Airtel, only 15% of the calls made got connected. Vodafone, Tata DoCoMo and Aircel found it difficult connecting to Airtel number.

Results of Operator assisted Drive test

The drive test was conducted simultaneously for all the operators present in the Karnataka circle. There was in total of three drive tests conducted in the circle. These tests were conducted in the cities of Bangalore, Mysore and Hubli. 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 Karnataka telecom circles were covered.

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

The drive tests in the Karnataka circle were conducted in the cities of Bangalore, Mysore and Hubli was conducted along the following route:

	Type of location	Bangalore	Mysore	Hubli
Outdoor	Periphery of the city	Rajaji Nagar to Indira Nagar (Via inner ring road, Yeshwanthpur, Hebbal Flyover, Tin Factory)	Nasarbad Ringh Road To Nanjangud Ring Road	BSNL office - Madhura appartments - Gadag Road (Via court road) - Railway quarters - Back to KRC circle - Pune - Blr road to old Hubli - Back to KRC circle - Hosur road - Till Airport - Back to Hosur road - Deshpande circle - KRC circle - Bhumreddy college
	Congested area	Indira Nagar to MG Road (Via Canara Bank, Forum, Richmond Road, Corporation, Residency Road, Near Garuda Mall)	Palace Road, URS Road, Railway Station Road, Sayaji Rao Road, Bamboo Bazzar Road, Bannimantap, Ashok Road, Irwin Road	DWD Old Bus stand, Ghandi Chowk, Murga Mutt, CBT, University Gate, DWD Railway Gate, Old Hubli Bus Stand, Railway Station,Akshaya Park, Indi Pump, Karwar Road, Durd Bail, KR Circle.
	Across the city	SR Nagar to Rajaji Nagar (via Lalbagh, Southend circle, Nagasandra Circle, Gandhi Bazar, Uma Theatre, TR Mill, Mysore circle, BHEL circle, Vijaynagar)	Kuvempu Nagar, Saraswathi Puram, VV Mohalla, Jayalaxmipuram, Gokulam, Vijaynagar	Pinto Road, Bagalkot Road, Gadag Road, Court Road, Railway Qtrs, Bangalore Road, KRC Circle, PB Road, Old Hubli Road, Hosur Road, Airport Road, Deshpande Circle, Bhom Reddy Circle
Indoor	Office complex	Jelita Tower (Mission Road)	Sub Register Office Complex	Joint Commission Office Complex
	Shopping complex	Garuda Mall	More, Devraj URS Complex	Vishal Mart

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

Drive Test – Bangalore

	B'mark	Airtel		Vodafone		BSNL GSM		BSNL CDMA		Tata CDMA		Tata DoCoMo		Idea		Aircel		RCOM CDMA		RCOM GSM	
		In door (in%)	Outdoor (in %)	In door (in%)	Outdoor (in %)	In door (in%)	Outdoor (in %)	In door (in%)	Outdoor (in %)	In door (in%)	Outdoor (in %)	In door (in%)	Outdoor (in %)	In door (in%)	Outdoor (in %)	In door (in%)	Outdoor (in %)	In door (in%)	Outdoor (in %)	In door (in%)	Outdoor (in %)
Voice quality	≥ 95%	96.04	96.65	98.99	95.98	98.13	96.05	47.51	96.72	65.31	99.40	97.77	92.37	99.60	94.31	97.57	93.77	99.96	99.40	90.61	92.12
CSSR	≥ 95%	100	100	100	98.74	100	85.29	100	100	100	100	100	95.50	100	98.94	100	98.52	100	100	100	99.47
age Blocked calls		0.00	0.00	0.00	1.26	0.00	14.71	0.00	0.00	0.00	0.00	0.00	4.50	0.00	1.06	0.00	1.48	0.00	0.00	0.00	0.53
Call drop rate	≤ 2%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.89	0.00	0.00	0.00	0.50	0.00	1.18	0.00	4.89
Hands off success rate		100	100	100	99.65	0.00	0.00	100	100	100	100	100	99.50	0.00	100	100	99.78	100	100	100	99.11

Drive Test – Mysore

	B'mark	Airtel		Vodafone		BSNL GSM		BSNL CDMA		Tata CDMA		Tata DoCoMo		Idea		Aircel		RCOM CDMA		RCOM GSM	
		In door (in%)	Outdoor (in %)	In door (in%)	Outdoor (in %)	In door (in%)	Outdoor (in %)	In door (in%)	Outdoor (in %)	In door (in%)	Outdoor (in %)	In door (in%)	Outdoor (in %)	In door (in%)	Outdoor (in %)	In door (in%)	Outdoor (in %)	In door (in%)	Outdoor (in %)	In door (in%)	Outdoor (in %)
Voice quality	≥ 95%	90.49	94.57	99.02	97.10	89.23	89.75	99.65	95.46	99.18	99.45	97.44	94.20	98.08	94.27	98.72	95.34	99.34	99.12	92.94	92.75
CSSR	≥ 95%	100	97.50	100	100	67.74	92.41	85.71	90.39	100	100	100	98.43	100	100	100	98.11	100	100	100	97.52
%age Blocked calls		0.00	2.50	0.00	0.00	32.26	7.59	14.29	9.61	0.00	0.00	0.00	1.57	0.00	0.00	0.00	1.89	0.00	0.00	0.00	2.48
Call drop rate	≤ 2%	0.00	0.00	0.00	0.00	28.57	13.70	0.00	3.49	0.00	0.00	0.00	1.06	0.00	0.59	2.70	0.96	0.00	0.00	0.00	3.05
Hands off success rate		100	100	100	100	0.00	0.00	100	99.46	100	100	100	99.53	100	100	100	99.48	100	100	100	99.12

Drive Test – Hubli

	B'mark	Airtel		Vodafone		BSNL GSM		BSNL CDMA		Tata CDMA		Tata DoCoMo		Idea		Aircel		RCOM CDMA		RCOM GSM	
		In door (in%)	Outdoor (in %)	In door (in%)	Outdoor (in %)	In door (in%)	Outdoor (in %)	In door (in%)	Outdoor (in %)	In door (in%)	Outdoor (in %)	In door (in%)	Outdoor (in %)	In door (in%)	Outdoor (in %)	In door (in%)	Outdoor (in %)	In door (in%)	Outdoor (in %)	In door (in%)	Outdoor (in %)
Voice quality	≥ 95%	95.82	91.13	98.81	96.99	86.46	95.15	91.69	98.00	99.41	99.10	98.67	97.03	98.95	93.32	90.70	92.51	97.46	97.04	98.76	95.01
CSSR	≥ 95%	100	97.45	100	98.98	100	99.46	96.43	96.55	100	100	100	99.44	100	94.58	100	100	100	100	100	99.49
%age Blocked calls		0.00	2.55	0.00	1.02	0.00	0.54	3.57	3.45	0.00	0.00	0.00	0.56	0.00	5.42	0.00	0.00	0.00	0.00	0.00	0.51
Call drop rate	≤ 2%	0.00	0.00	0.00	0.00	0.00	0.54	3.57	8.62	0.00	0.00	0.00	1.13	0.00	0.00	0.00	0.53	0.00	0.92	0.00	1.03
Hands off success rate		100	100	100	100	0.00	0.00	99.35	96.03	100	100	92.86	98.61	100	100	100	99.78	100	100	100	99.01

Not meeting the benchmark

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

Bangalore: There was interference and low signal strength recorded in the outdoor areas of Tumkur Road, Near outer ring road, BHEL circle, Outer Ring Road, In between Audugodi Residency road, Kormangala inner ring road, Near the Richmond town Burial Ground, Koramangala IRR, Mani gowda Road, Near Lal Bagh, Bull temple Road, Near Elgin, Corporation circle, Near Lal Bagh and Vijay Nagar Bus Depot.

Mysore: There was interference and low signal strength recorded for some of the operators in the outdoor areas of Belwata near GRS fantasy park, at Nanjangud Road near Ashram, Datiagalli, KMP, V.V. College 1 KM Before Bhogadhi signal, Near Arc Circle, Near Railway station, Towards APMS, Near CFTRI, Near DC office, between Gokulam & Vijaynaga, Near Saraswathi Nagar, Near JK Tyres Trunk, Radial factory, Near Infosys, near Hootagalli Industrial Area, Bannimantapa, Jagan Mohan Palace and Jayalaxmipuram.

Hubli: In Hubli, interference and low signal strength recorded in the outdoor areas of Gadag Road near circle, Navanagar, SDM Dental college, DWD Railway gate, Ghandi nagar Dharwad, Next to mangalwarpet, Next to Murugemutt, Towards Siriguppa Mannrd Tarihal Indl Area, Karwan road and lamington road.

Conclusions:

Drive test was conducted by IMRB with the help of service providers to measure this parameter. In the drive test it was found that few of the operators are not meeting the TRAI benchmark for Voice quality whereas almost all the operators meet the TRAI benchmark on CSSR. For % blocked calls and call drop rate, all the operators were found to be meeting the benchmark in all the three cities.

Summary of Live Measurement Results – Cellular Mobile Services

Name of Service Provider	Connection Establishment (Accessibility)			Connection Maintenance (Retainability)			Metering and Billing	Response time to customer for assistance	
	Call Set-up Success Rate (within licensee's own network)	SDCCH/ Paging Chl. Congestion (%age)	TCH Congestion (%age)	Call Drop Rate (%age)	Worst affected cells having more than 3% TCH drop	Connections with good voice quality*	%age complaints resolved within 4 weeks	Accessibility of call centre/ customer care	Percentage of calls answered by the operators (voice to voice) within 60 seconds
Benchmark	**≥ 95%**	**≤ 1%**	**≤ 2%**	**≤ 2%**	**≤ 5%**	**≥ 95%**	**100%**	**≥ 95%**	**≥ 90%**
Airtel	96.37%	0.90%	1.32%	1.78%	16.03%	94.13%	82.00%	100.00%	83.00%
Vodafone	99.06%	0.07%	0.55%	0.62%	4.13%	96.90%	72.00%	100.00%	52.00%
BSNL GSM	99.19%	0.19%	1.83%	1.45%	4.99%	92.96%	100.00%	100.00%	100.00%
BSNL CDMA	94.86%	0.25%	0.50%	0.92%	4.55%	95.85%	NA	100.00%	98.06%
Tata CDMA	96.63%	0.00%	0.04%	0.44%	1.76%	98.40%	86.00%	100.00%	100.00%
Tata DoCoMo	99.43%	0.70%	0.75%	0.96%	9.53%	94.62%	70.37%	100.00%	100.00%
Idea	98.77%	0.11%	0.42%	1.21%	4.52%	94.70%	88.00%	100.00%	90.00%
Aircel	99.14%	0.02%	0.05%	0.79%	6.90%	94.30%	100.00%	100.00%	93.00%
RCOM CDMA	99.45%	0.00%	0.08%	0.61%	0.31%	98.56%	98.00%	100.00%	98.00%
RCOM GSM	98.82%	0.02%	0.14%	0.47%	0.69%	93.41%	98.00%	100.00%	100.00%

* Based on operator assisted drive tests conducted by IMRB

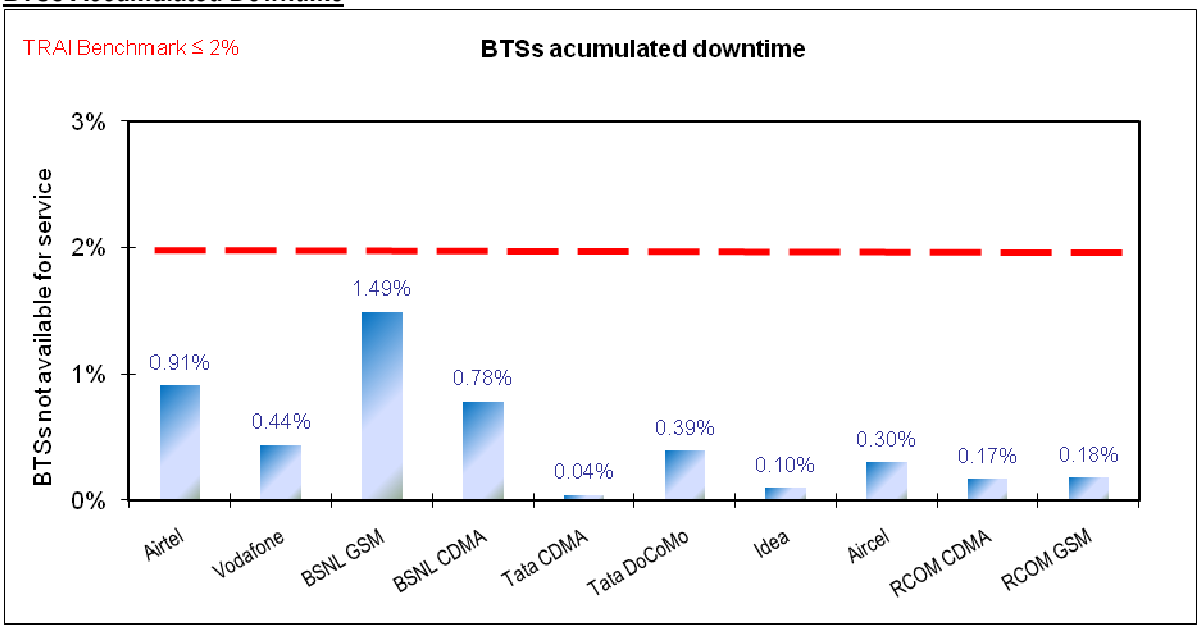
Not meeting the benchmark

During the three day live measurement, majority of the operators were found to be falling short of the TRAI benchmark for connections with good voice quality and resolution of complaint within 4 weeks.

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

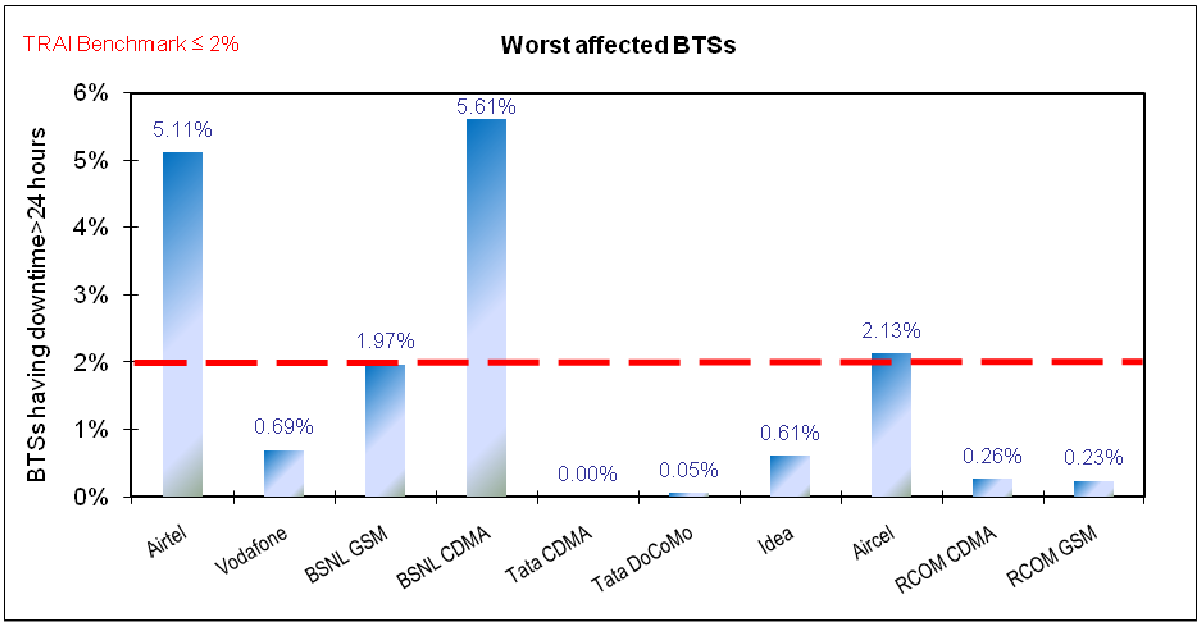
11.1 Graphical/Tabular Representations for Cellular Mobile Services

BTSs Accumulated Downtime



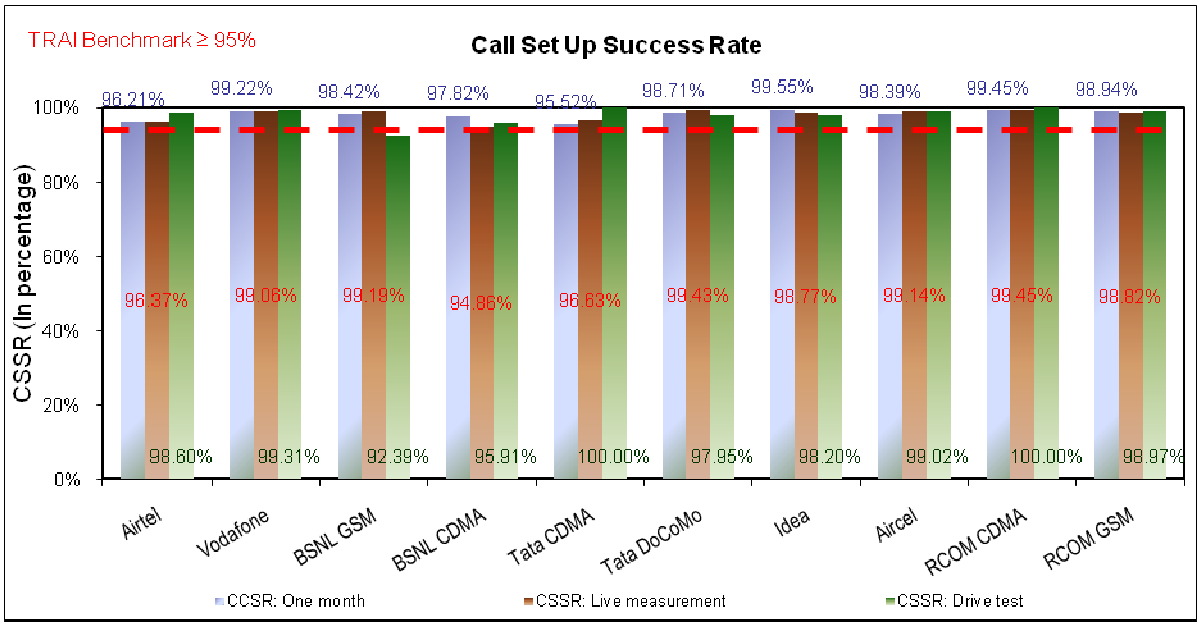
All the operators meet the benchmark

Worst Affected BTSs



Operator(s) meeting benchmark: Vodafone, BSNL GSM, Tata CDMA, Tata DoCoMo, Idea, RCOM CDMA, RCOM GSM
Operator(s) not meeting the benchmark: Airtel, BSNL CDMA, Aircel

Call Set-up Success Rate (CSSR)

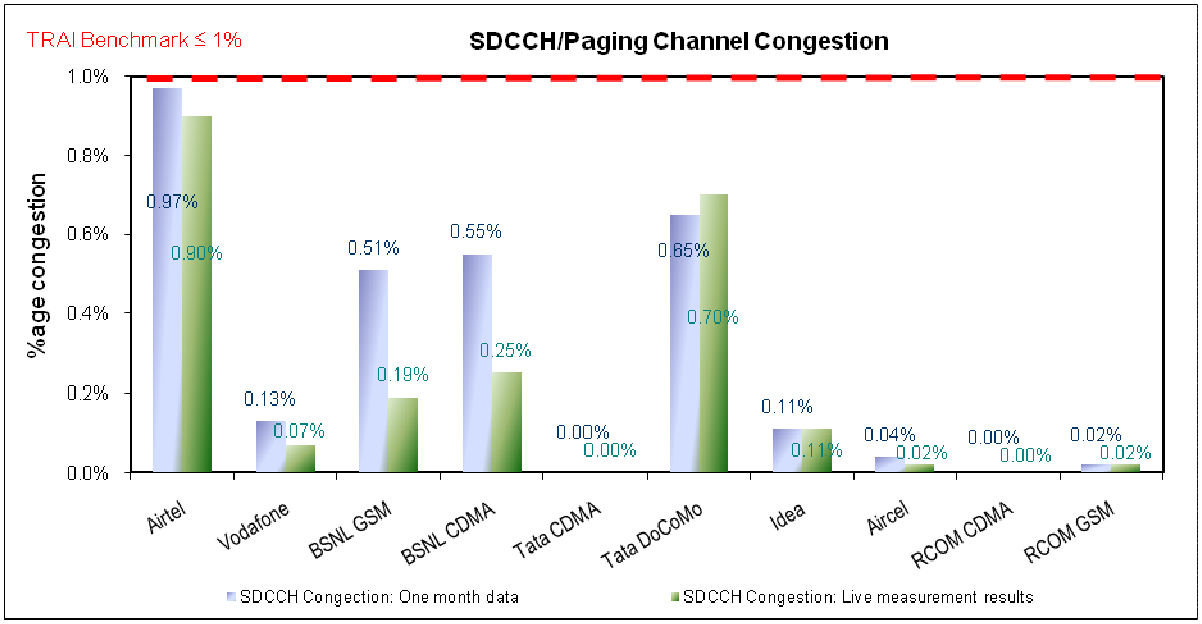


One month
All the operators meet the benchmark

Live measurement
Operator(s) meeting benchmark: Airtel, Vodafone, BSNL GSM, Tata CDMA, Tata DoCoMo, Idea, Aircel, RCOM CDMA, RCOM GSM
Operator(s) not meeting the benchmark: BSNL CDMA

Drive test
Operator(s) meeting benchmark: Airtel, Vodafone, BSNL CDMA, Tata CDMA, Tata DoCoMo, Idea, Aircel, RCOM CDMA, RCOM GSM
Operator(s) not meeting the benchmark: BSNL GSM

SDCCH / Paging Channel Congestion



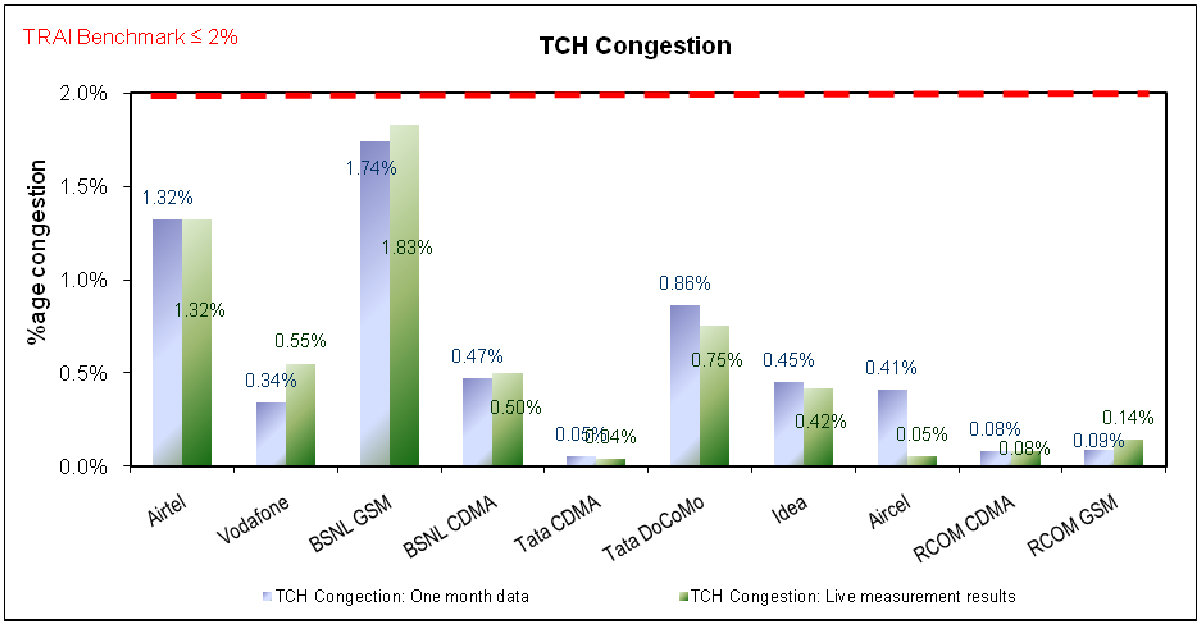
One month

All the operators meet the benchmark

Live measurement

All the operators meet the benchmark

TCH Congestion



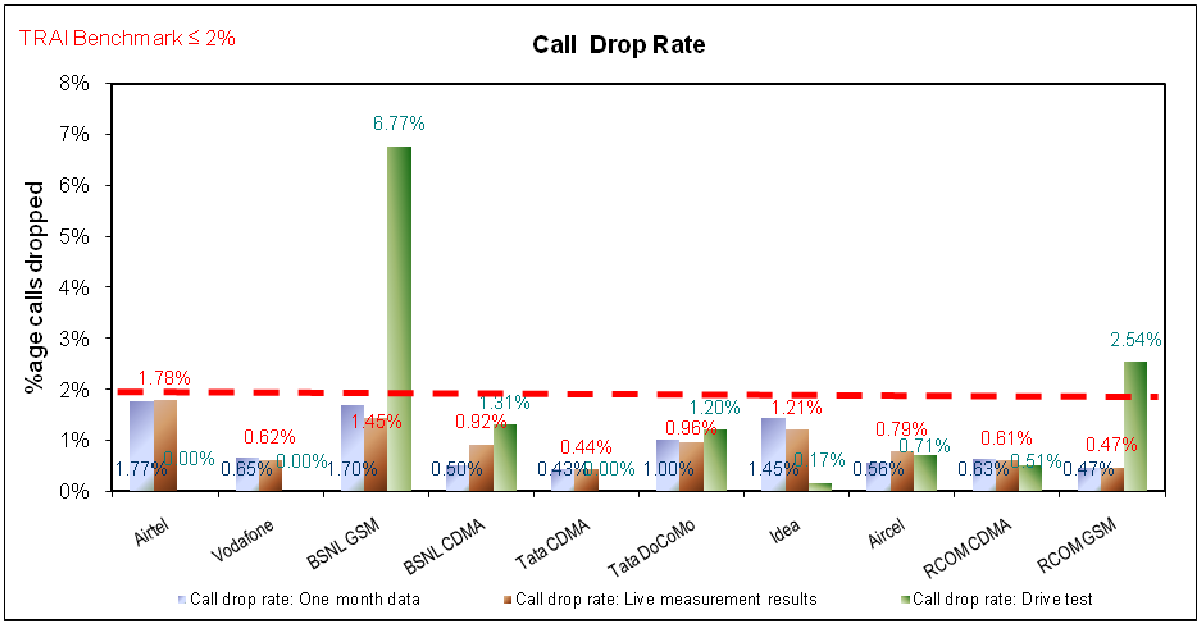
One month

All the operators meet the benchmark

Live measurement

All the operators meet the benchmark

Call Drop Rate



One month

All the operators meet the benchmark

Live measurement

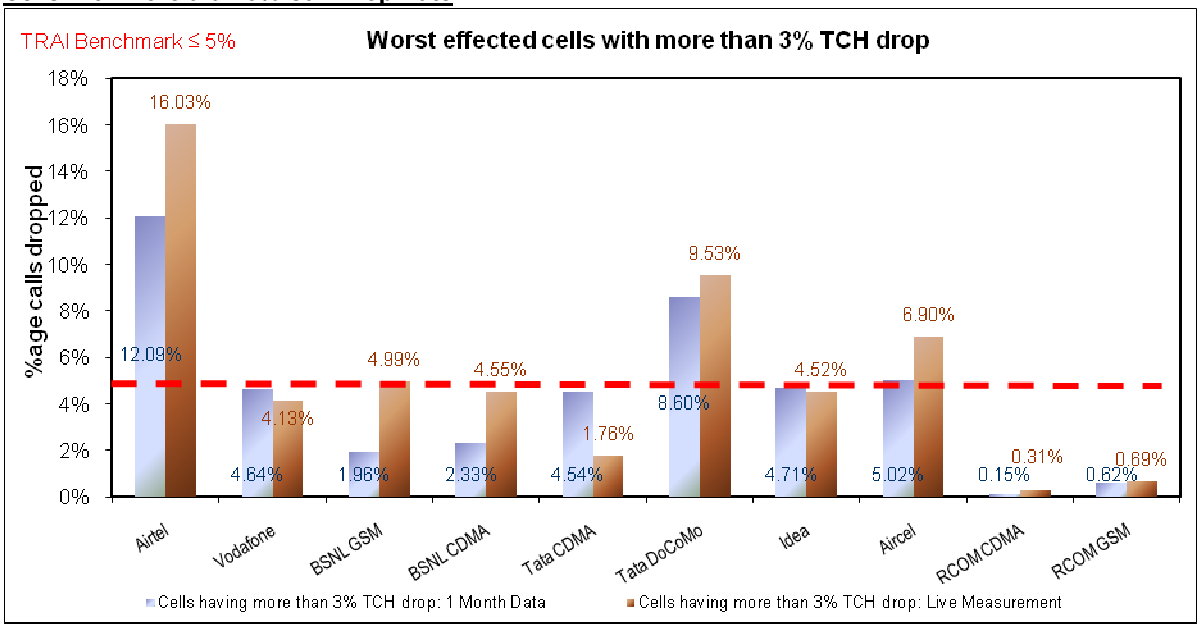
All the operators meet the benchmark

Drive test

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

Operator(s) not meeting the benchmark: BSNL GSM, RCOM GSM

Cells with more than 3% Call Drop Rate



One month

Operator(s) meeting benchmark: Vodafone, BSNL GSM, BSNL CDMA, Tata CDMA, Idea, RCOM CDMA, RCOM GSM

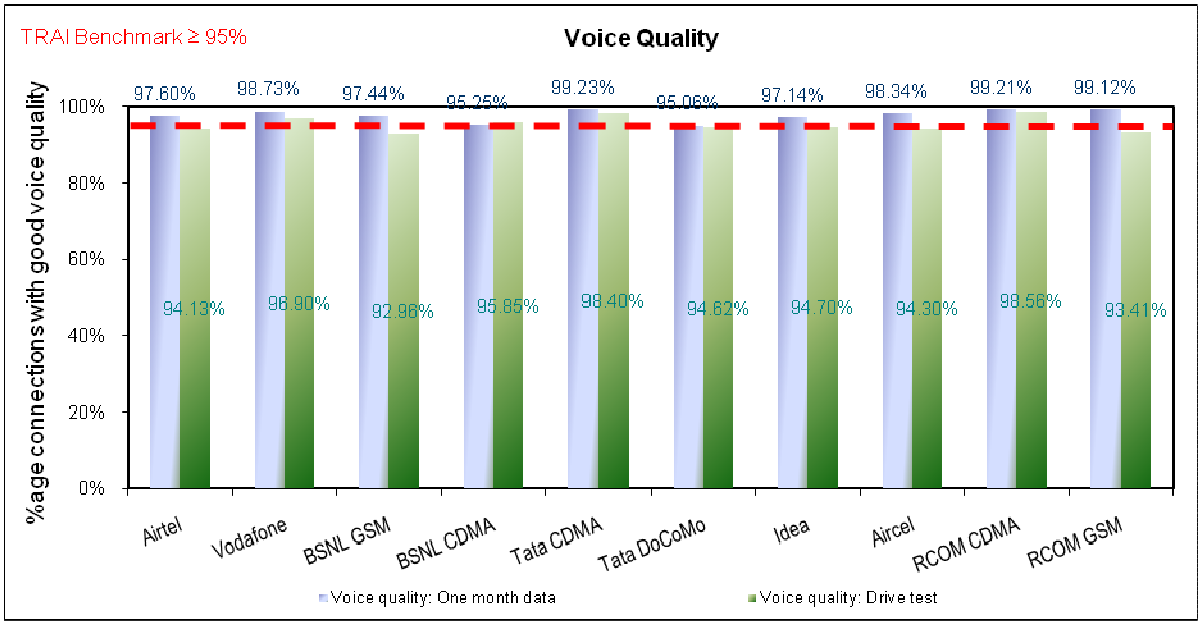
Operator(s) not meeting the benchmark: Airtel, Tata DoCoMo, Aircel

Live measurement

Operator(s) meeting benchmark: Vodafone, BSNL GSM, BSNL CDMA, Tata CDMA, Idea, RCOM CDMA, RCOM GSM

Operator(s) not meeting the benchmark: Airtel, Tata DoCoMo, Aircel

Voice quality



One month

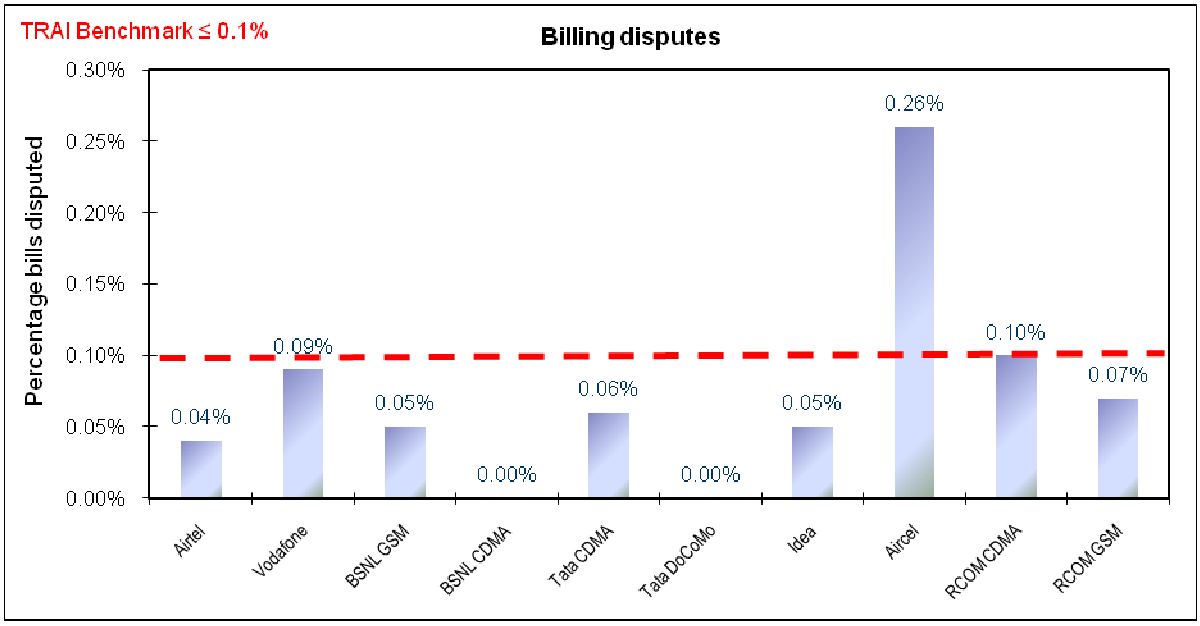
All the operators meet the benchmark

Drive test

Operator(s) meeting benchmark: Vodafone, BSNL CDMA, Tata CDMA, RCOM CDMA

Operator(s) not meeting the benchmark: Airtel, BSNL GSM, Tata DoCoMo, Idea, Aircel, RCOM GSM

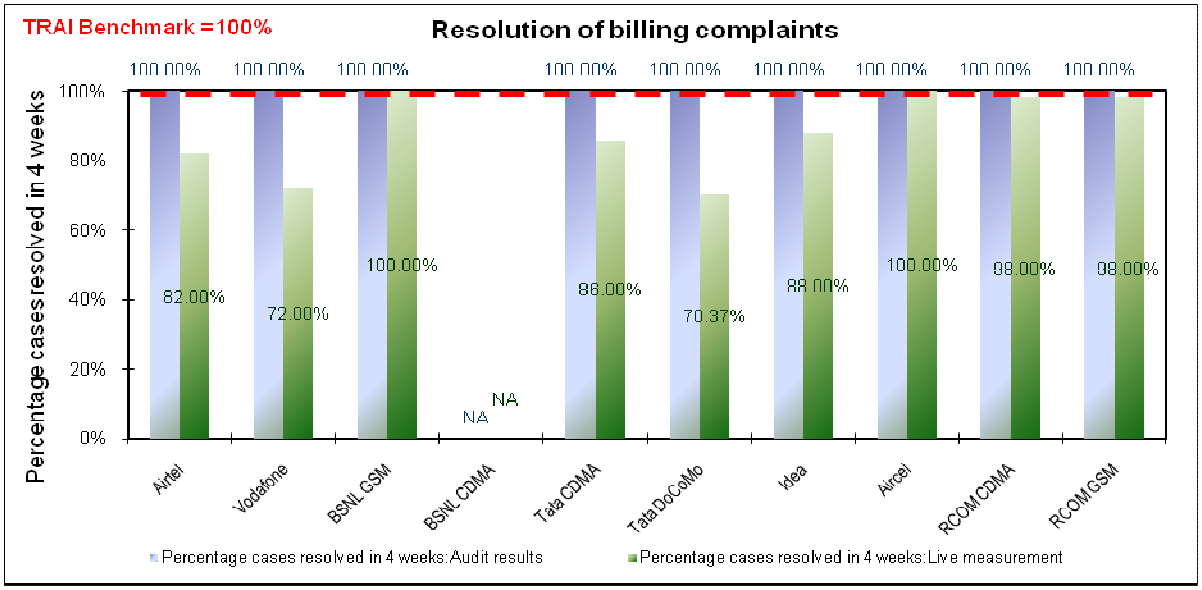
Billing Disputes



Operator(s) meeting benchmark: Airtel, Vodafone, BSNL GSM, BSNL CDMA, Tata CDMA, Tata DoCoMo, Idea, RCOM CDMA, RCOM GSM

Operator(s) not meeting the benchmark: Aircel

Resolution of billing complaints



One month

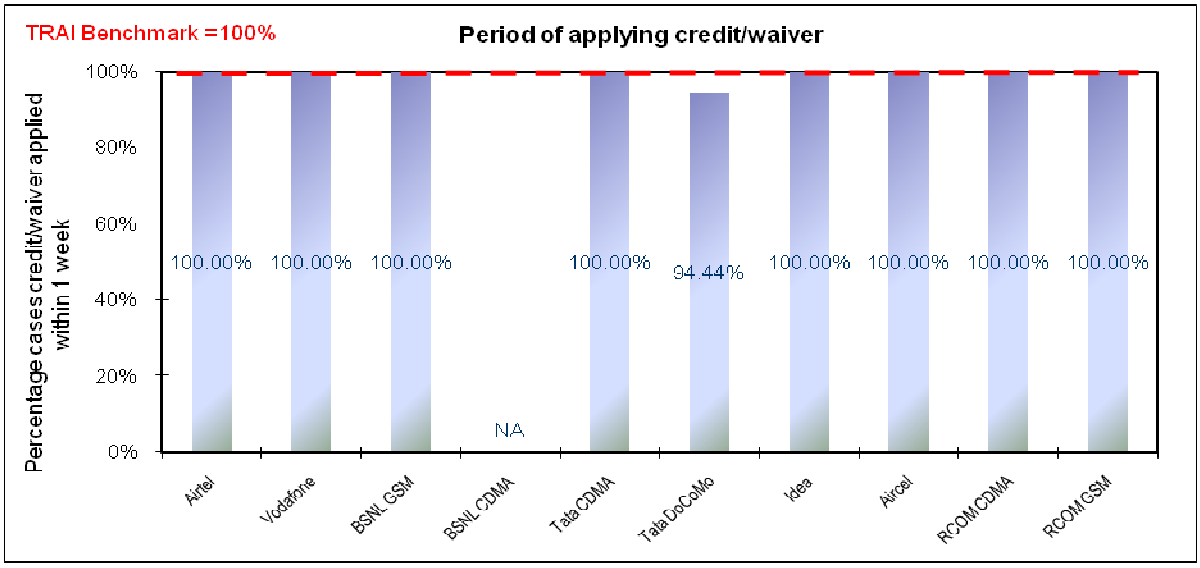
All the operators meet the benchmark

Live measurement

Operator(s) meeting benchmark: BSNL GSM, Aircel

Operator(s) not meeting the benchmark: Airtel, Vodafone, Tata CDMA, Tata DoCoMo, Idea, RCOM CDMA, RCOM GSM

Period of applying credit / waiver



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

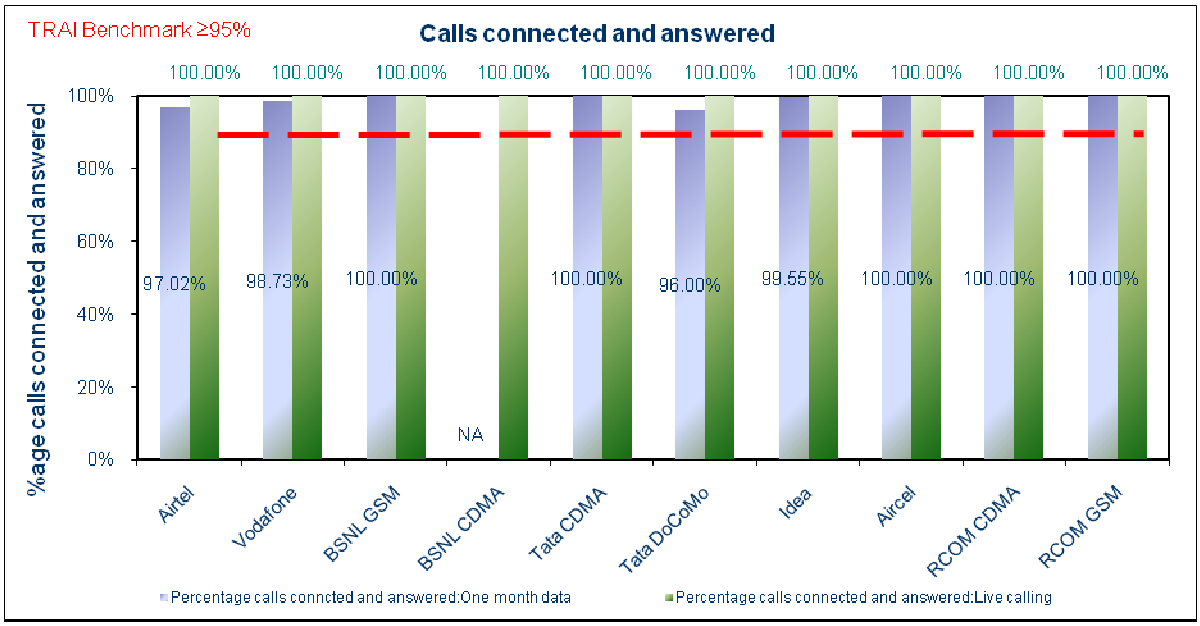
Operator(s) not meeting the benchmark: Tata DoCoMo

Live calling for billing Complaints

Resolution of billing complaints	B'mark	Airtel	Vodafone	BSNL GSM	BSNL CDMA	Tata CDMA	Tata DoCoMo	Idea	Aircel	RCOM CDMA	RCOM GSM
Total Number of calls made		50	50	23	NA	50	27	50	50	50	50
Number of cases resolved in 4 weeks		41	36	23	NA	43	19	44	50	49	49
Percentage cases resolved in four weeks	100%	82.00%	72.00%	100.00%	NA	86.00%	70.37%	88.00%	100.00%	98.00%	98.00%

Operators not meeting the benchmark

Customer Care / Helpline: Calls answered



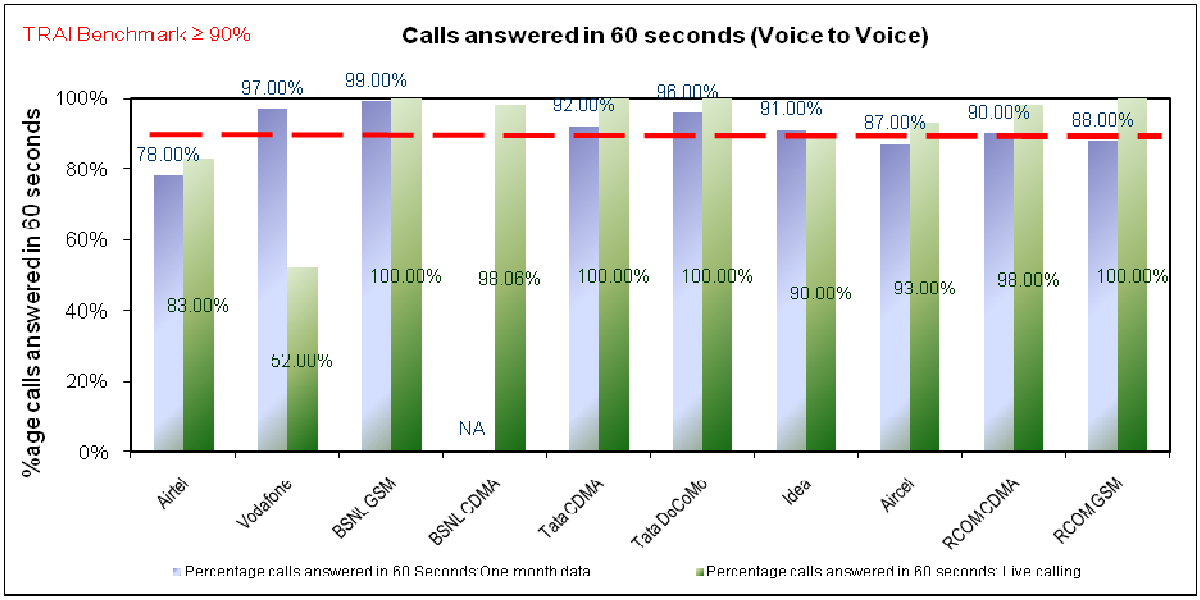
One month

All the operators meet the benchmark

Live measurement

All the operators meet the benchmark

Customer Care / Helpline: Calls answered voice to voice



One month

Operator(s) meeting benchmark: Vodafone, BSNL GSM, Tata CDMA, Tata DoCoMo, Idea, RCOM CDMA

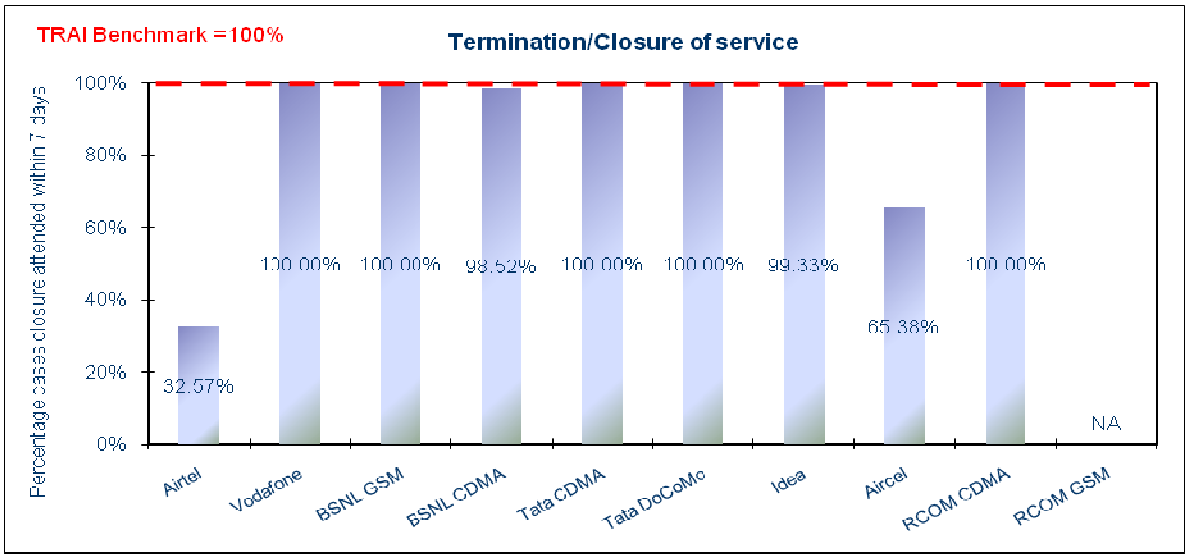
Operator(s) not meeting the benchmark: Airtel, Aircel, RCOM GSM

Live measurement

Operator(s) meeting benchmark: BSNL GSM, BSNL CDMA, Tata CDMA, Tata DoCoMo, Idea, Aircel, RCOM CDMA, RCOM GSM

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

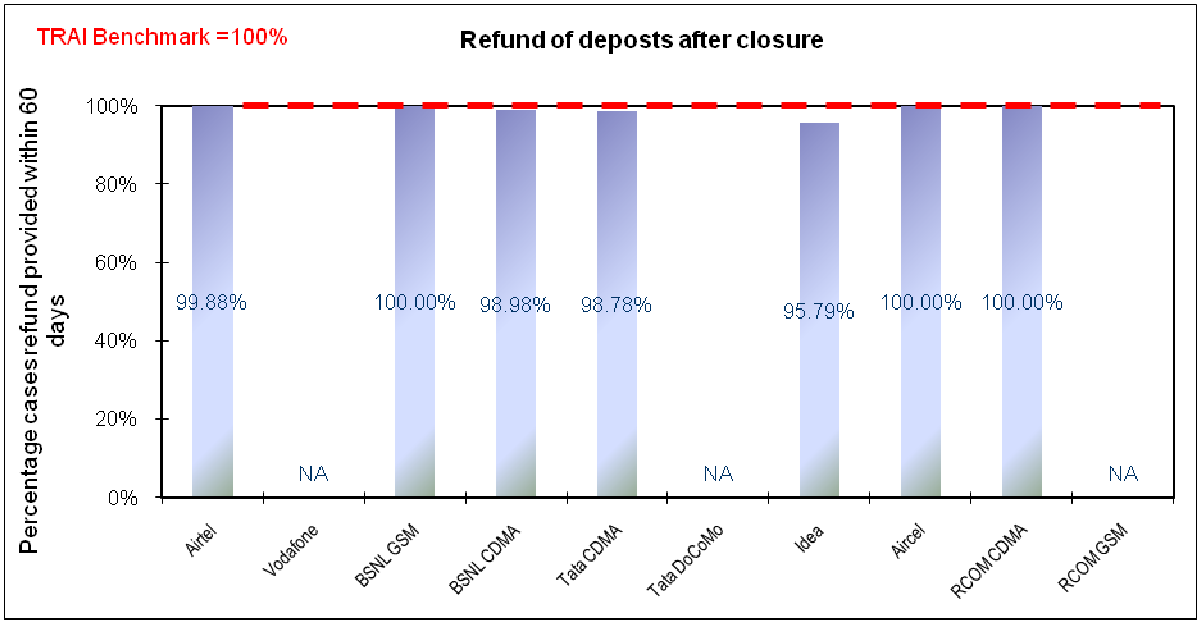
Termination / Closure of service



Operator(s) meeting benchmark: Vodafone, BSNL GSM, Tata CDMA, Tata DoCoMo, RCOM CDMA

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

Refund of deposits



Operator(s) meeting benchmark: BSNL GSM, Aircel, RCOM CDMA
Operator(s) not meeting the benchmark: Airtel, BSNL CDMA, Tata CDMA, Idea

Inter operator calls assessment

Inter operator call Assessment To↓ From→	Airtel	Vodafone	BSNL GSM	BSNL CDMA	Tata CDMA	Tata DoCoMo	Idea	Aircel	RCOM CDMA	RCOM GSM
Airtel	NA	62%	98%	98%	84%	70%	95%	80%	100%	100%
Vodafone	86%	NA	85%	97%	98%	72%	95%	98%	100%	100%
BSNL GSM	86%	78%	NA	100%	90%	76%	91%	93%	100%	99%
BSNL CDMA	100%	87%	100%	NA	100%	100%	100%	100%	96%	100%
Tata CDMA	100%	98%	98%	100%	NA	100%	85%	91%	98%	98%
Tata DoCoMo	83%	82%	88%	100%	100%	NA	100%	100%	100%	98%
Idea	98%	87%	100%	100%	94%	98%	NA	90%	99%	96%
Aircel	15%	86%	82%	98%	80%	93%	54%	NA	100%	100%
RCOM CDMA	100%	87%	100%	98%	100%	100%	100%	100%	NA	100%
RCOM GSM	100%	92%	99%	98%	100%	100%	100%	100%	100%	NA

The maximum problem faced by the calling operator to other operators

In the inter-operator call assessment, calls were made from the test SIMs of service provider whose audit was being conducted to all the other service providers. Out of the 9 operators 4 found it difficult connecting to an Aircel number. For calls made from Airtel, only 15 out of the 10 calls made got connected. Vodafone, Tata DoCoMo and Aircel found it difficult connecting to Airtel number.

12.0 Compliance reports: Results of Verification of PMR

12.1 Cellular Mobile services

Name of Service Provider		Network Performance							Billing complaints			Customer's Helpline			
		Accumulated downtime of Community isolation (in hours)	Call Set-up Success Rate (within licensee's own network)	SDCCH/ Paging Chl. Congestion (%age)	TCH Congestion (%age)	Call Drop Rate (%age)	Connection with good voice quality	Point of Interconnection (POI) Congestion	Billing complaints per 100 bills issued	%age complaints resolved within 4 weeks	Period of all refunds/payments due to customers from date of resolution	Percentage of calls answered electronically within 20 seconds	Percentage of calls answered electronically within 40 seconds	Percentage of calls answered by operators within 60 seconds	Percentage of calls answered by operators within 90 seconds
Benchmark		**≤ 24 hours**	**≥ 95%**	**≤ 1%**	**≤ 2%**	**≤ 3%**	**≥ 95%**	**≤ 0.5%**	**≤ 0.1%**	**100%**	**≤4 weeks**	**≥ 80%**	**≥ 95%**	**≥ 80%**	**≥ 95%**
Airtel	**PMR**	Complied	92.64%	2.47%	3.55%	2.12%	93.19%	NA	0.08%	100.00%	< 4 weeks	Complied	Complied	90.98%	Complied
	IMRB		92.61%	2.48%	3.57%	2.12%	93.19%	Complied	0.07%	100.00%	< 4 weeks			89.28%	
Vodafone	**PMR**	Complied	99.84%	0.16%	0.54%	0.73%	98.34%	NA	0.08%	100.00%	< 4 weeks	Complied	Complied	92.00%	Complied
	IMRB		99.84%	0.16%	0.54%	0.73%	98.34%	Complied	0.08%	100.00%	< 4 weeks			87.12%	
BSNL	**PMR**	Complied	97.00%	0.51%	1.43%	1.17%	98.00%	0.02%	0.07%	100.00%	< 4 weeks	Complied	Complied	93.00%	Complied
	IMRB		97.76%	0.44%	1.40%	1.59%	DNP	Complied	0.03%	100.00%	< 4 weeks			87.16%	
Tata CDMA	**PMR**	Complied	98.83%	0.00%	0.04%	0.25%	99.83%	0.00%	0.02%	100.00%	< 1 week	Complied	Complied	88.00%	Complied
	IMRB		98.83%	0.00%	0.04%	0.25%	99.83%	Complied	0.02%	100.00%	< 1 week			88.00%	
Idea	**PMR**	Complied	98.14%	0.09%	0.66%	1.20%	97.40%	NA	0.08%	100.00%	< 4 weeks	Complied	Complied	89.00%	Complied
	IMRB		DNP	0.09%	0.61%	1.31%	97.05%	Complied	0.08%	100.00%	< 4 weeks			90.00%	
Reliance CDMA	**PMR**	Complied	98.87%	0.00%	0.13%	0.40%	99.84%	NA	0.09%	100.00%	< 4 weeks	Complied	Complied	76.86%	Complied
	IMRB		98.87%	0.00%	0.13%	0.40%	99.84%	Complied	0.09%	100.00%	< 4 weeks			76.86%	

*As per the PMR submitted by the operators in the 2nd quarter of 2009

Figures do not match with those reported in PMR

Figures verified on all India basis

Not meeting benchmark

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

12.2 Conclusions - Cellular Mobile services

1. For BSNL and Idea, figures reported to TRAI do not match with the figures obtained on verification on most parameters.
2. Airtel falls short of the TRAI benchmark for most network performance related parameters.
3. On percentage of calls answered by operators within 60 seconds, figures reported to TRAI do not match with the figures obtained on verification for all operators except Tata and Reliance CDMA.

Section C
BROADBAND

13.0 Sampling Methodology

13.1 Sampling for Broadband service providers

- Audits for various Broadband service providers were conducted at the service provider's central node. Since most of the private operators have a centralized system of monitoring their network data was obtained for all the Point of Presence (POPs) present in the circle.
- For Reliance, the data pertaining to all parameters was obtained by IMRB Auditors at the central node in Mumbai.
- For BSNL, Audit was conducted at the various exchanges/POPs providing Broadband service was verified and collected. This was done in such a way that at least 5% of POPs spread across 10% of SDCA's were covered
- For BSNL, the data pertaining to network related parameters was obtained by IMRB Auditors at the central node in Bangalore.
- Following Broadband service providers were Audited in Karnataka circle:

	Name of Operator
Operator 1	BSNL
Operator 2	Airtel
Operator 3	Sify
Operator 4	VSNL
Operator 5	RCOM
Operator 6	Hathway
Operator 7	You Telecom
Operator 8	Spectranet

14.0 Audit methodology

14.1 Broadband Services

In a nutshell, the audit methodology was as follows:

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

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

15.0 Executive Summary

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

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

Parameters	Benchmarks	BSNL	Airtel	Sify	VSNL	RCOM	Hathway	You Telecom	Spectranet
Service provisioning uptime									
Percentage connections provided within 15 days	100%	100.00%	100.00%	100.00%	98.48%	100.00%	95.86%	100.00%	52.94%
Fault repair restoration time									
Percentage faults repaired by next working days	> 90%	94.30%	97.73%	89.98%	96.70%	100.00%	95.98%	98.96%	0.00%
Percentage faults repaired within three working days	> 99%	99.90%	98.67%	100.00%	99.19%	100.00%	99.43%	100.00%	0.00%
Billing performance									
Billing complaints per 100 bills issued	< 2%	0.18%	0.01%	NA	0.64%	0.40%	0.37%	0.31%	0.00%
%age of billing complaints resolved in 4 weeks	100%	100.00%	100.00%	NA	100.00%	100.00%	100.00%	100.00%	NA
%age cases in which refund of deposits after closure was made in 60 days	100%	NA	100.00%	NA	100.00%	100.00%	NA	70.83%	NA
Customer care/helpline assessment (Voice to Voice)									
Percentage calls answered within 60 seconds	> 60%	96.40%	95.50%	100.00%	91.51%	78.92%	100.00%	94.52%	100.00%
Percentage calls answered within 90 seconds	> 80%	99.88%	97.76%	100.00%	93.38%	81.80%	100.00%	96.66%	100.00%
Bandwidth utilization/Throughput									
Intra network links (POP to ISP Node)		166	952	400	16	64	7	NA	3
Total number of intra network links > 90%		0	0	0	0	0	0	NA	0
Upstream links (ISP Node to NIXI/NAP/IGSP)		280	1	20	5	19	4	2	1
Percentage bandwidth utilized on upstream links	< 80%	74.59%	83.49%	83.22%	44.59%	35.33%	86.82%	78.57%	25.00%
Broadband download speed	> 80%	100.00%	100.00%	87.50%	88.24%	90.08%	89.49%	85.00%	89.92%
Service availability/uptime	> 98%	99.98%	99.99%	100.00%	99.88%	99.84%	99.60%	99.64%	100.00%
Packet loss	< 1%	0.40%	0.00%	0.00%	0.00%	0.42%	1.00%	0.20%	0.00%
Network Latency									
POP/ISP Node to NIXI	< 120 msec	16	51	45	54	39	80	26.4	4
ISP node to NAP port (Terrestrial)	< 350 msec	219	268	300	213	222	320	268	NA

{*Note: For BSNL data pertains to the sample 5% of exchanges audited during the period of to October to December 2009, whereas for rest of the operators figures pertain to all the exchanges present in the circle}

Figures provided on All India basis

Not meeting the benchmark

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

Critical findings and Key take outs: Broadband services

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

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 six Broadband service providers are highlighted below

Service provisioning/Activation time

- Spectranet (52.94%), VSNL (98.48%) and Hathway (95.86%) fall short of TRAI benchmark of 100% connections to be provided within 15 days.
- For Live calling carried out, all operators except Hathway (100%) are not meeting the TRAI benchmark. Sify scores the lowest with 70% subscribers claiming that connection was provided within 15 days. For rest of the service providers scores are observed to be >85%.

Fault Repair/Restoration time

- Spectranet with no faults repaired is scoring lowest and not meeting the benchmark for fault repair. Also Sify (89.98%) is falling marginally below the benchmark for fault repair within next working day.
- For fault repair within three working days all operators except Airtel (98.67%) are meeting the TRAI specified benchmark of 99%
- TRAI can consider including Mean Time to Repair (MTTR) for faults as one of the parameters for measuring Quality of Services (QoS) in future for Broadband services as well.
- During live calling conducted by IMRB auditors, no operator except You Telecom and Airtel was found to be meeting benchmark for fault repair

Billing performance

- All the service providers were found to be meeting the benchmark of percentage billings complaints received and time taken for resolution of billing complaints for the month in which data was collected. 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 service providers include only those complaints where an internal ticket is opened and refund is made to the customer. Hence there is a need to have some clarity on the definition of billing complaints.

Customer Care/Helpline Assessment

- All the operators meet the TRAI specified benchmark for calls answered by the operator in 60 and 90 seconds for the month in which audit was carried out
- For live calling Sify and Spectranet falls short of TRAI specified benchmark for calls answered by the operator in 60 seconds and 90 seconds.

Bandwidth Utilization:

- All the service providers were found to be using Multiple Router Traffic Grapher (MRTG) to measure the bandwidth utilization at intra network links.
- All the service providers were found to be reporting combined bandwidth utilization for corporate and household customers as there is no mechanism available to provide it separately for different users.
- For Intra network link, data for Sify, RCOM, BSNL and VSNL (TATA Communications) was obtained on all India bases. None of the links tested for these operators was found to be having above 90% bandwidth utilization for the month in which audit was carried out
- Also It was observed that all the links (tested during three day live measurement) in the access segment for most of the service providers were found be below 80%.
- For Bandwidth utilization on upstream links (From ISP Node to IGSP/NIXI), operators Airtel, Sify and Hathway do not meet the TRAI specified benchmark.

Download speed

- During live measurements carried out at Pop's/ISP Node it was observed that all the operators are meeting the TRAI prescribed benchmark of greater than 80% speed available to the customer. These measurements were carried out by IMRB auditors on a sample basis during visits at PoPs and ISP Node
- However, no historic data was available for verification of records for month of Audit as well as quarter ending January to March 2009 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 of audit and 3 day live measurement carried out

Packet Loss and Network Latency

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

Summary of Live Measurement Results – Broadband Services

Parameters	Benchmarks	BSNL	Airtel	Sify	VSNL	RCOM	Hathway	You Telecom	Spectranet
Service provisioning uptime									
Percentage connections provided within 15 days	100%	91.00%	87.00%	70.00%	95.00%	98.08%	100.00%	99.00%	95.00%
Fault repair restoration time									
Percentage faults repaired by next working days	> 90%	23.33%	93.33%	73.33%	83.33%	90.00%	0.00%	96.67%	70.00%
Percentage faults repaired within three working days	> 99%	73.33%	100.00%	86.67%	96.67%	96.67%	96.67%	100.00%	80.00%
Billing performance									
%age of billing complaints resolved in 4 weeks	100%	96.00%	88.00%	NA	94.00%	100.00%	76.00%	100.00%	100.00%
Customer care/helpline assessment (Voice to Voice)									
Percentage calls answered within 60 seconds	> 60%	94.00%	100.00%	59.00%	100.00%	100.00%	100.00%	100.00%	35.00%
Percentage calls answered within 90 seconds	> 80%	100.00%	100.00%	74.00%	100.00%	100.00%	100.00%	100.00%	59.00%
Bandwidth utilization/Throughput									
Intra network links (POP to ISP Node)		168	952	394	16	21	7	NA	3
Total number of intra network links > 90%		0	0	0	0	0	0	NA	0
Upstream links (ISP Node to NIXI/NAP/IGSP)		280	1	20	5	17	4	2	1
Percentage bandwidth utilized on upstream links	< 80%	75.34%	87.17%	83.04%	54.97%	36.57%	86.82%	78.57%	25.00%
Broadband download speed	> 80%	100.00%	100.00%	87.50%	88.24%	90.08%	89.49%	85.00%	89.92%
Service availability/uptime	> 98%	99.93%	100.00%	100.00%	99.66%	99.31%	99.43%	100.00%	100.00%
Packet loss	< 1%	0.17%	0.00%	0.00%	0.00%	0.47%	0.10%	0.20%	0.00%
Network Latency									
POP/ISP Node to NIXI	< 120 msec	17	55.3	56	84	46	80	39.67	4
ISP node to NAP port (Terrestrial)	< 350 msec	220	220	105	165	129.5	280	73.67	NA

Figures provided on All India basis

Not meeting the benchmark

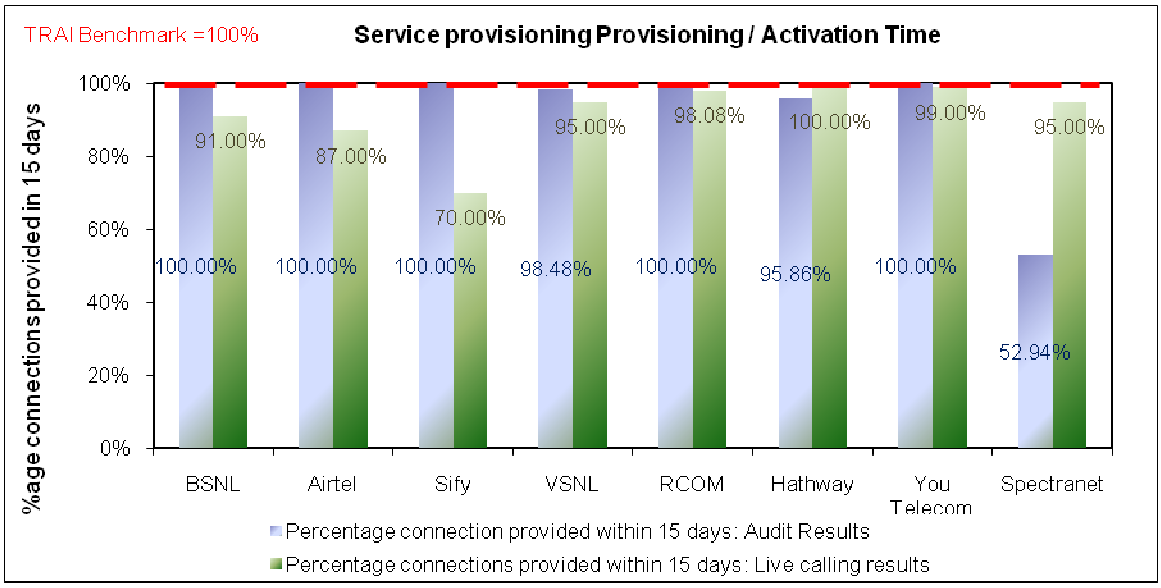
B'mark = TRAI Benchmark, **DNA** = Details not available, **NA:** Not Applicable

- 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. None of the links tested for these operators was found to be having above 90% bandwidth utilization for the month in which audit was carried out
- For Bandwidth utilization on upstream links, all the service providers except Airtel, Sify and Hathway are meeting the benchmark during the three day live measurement and have excess capacities available on their upstream links.
- For network latency all the service providers comfortably meet the TRAI specified benchmark for ping tests carried out during live measurements.

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

16.1 Graphical/Tabular Representations for Broadband services

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



One month

Operator meeting benchmark: BSNL, Airtel, Sify, RCOM, You Telecom

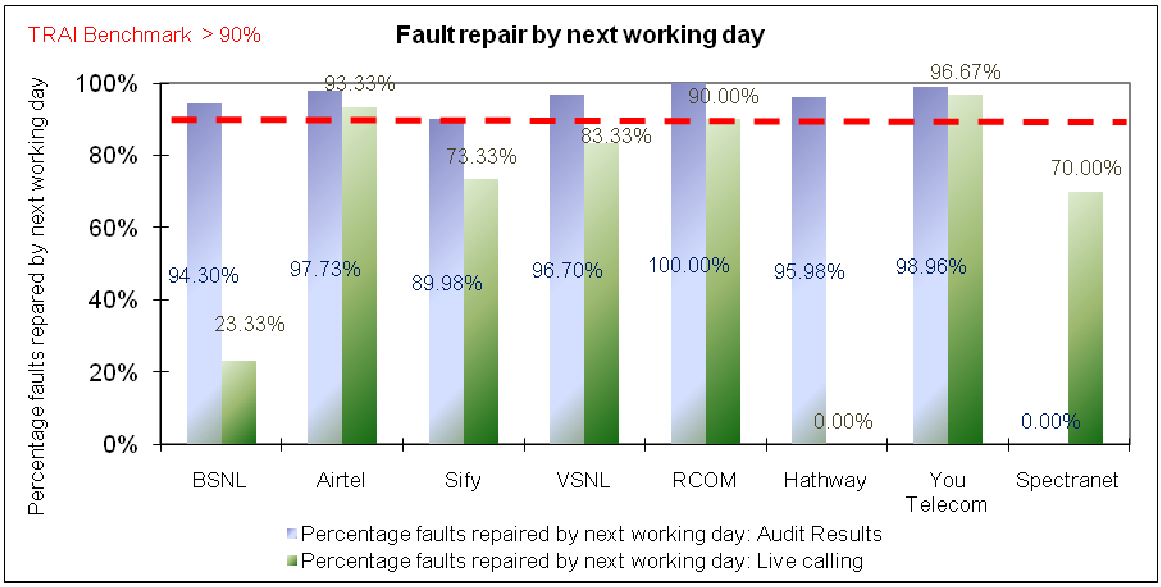
Operator not meeting benchmark: VSNL, Hathway, Spectranet

Live calling

Operator meeting benchmark: Hathway

Operator not meeting benchmark: BSNL, Airtel, Sify, VSNL, RCOM, You Telecom, Spectranet

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



One month

Operator meeting benchmark: BSNL, Airtel, VSNL, RCOM, Hathway, You Telecom

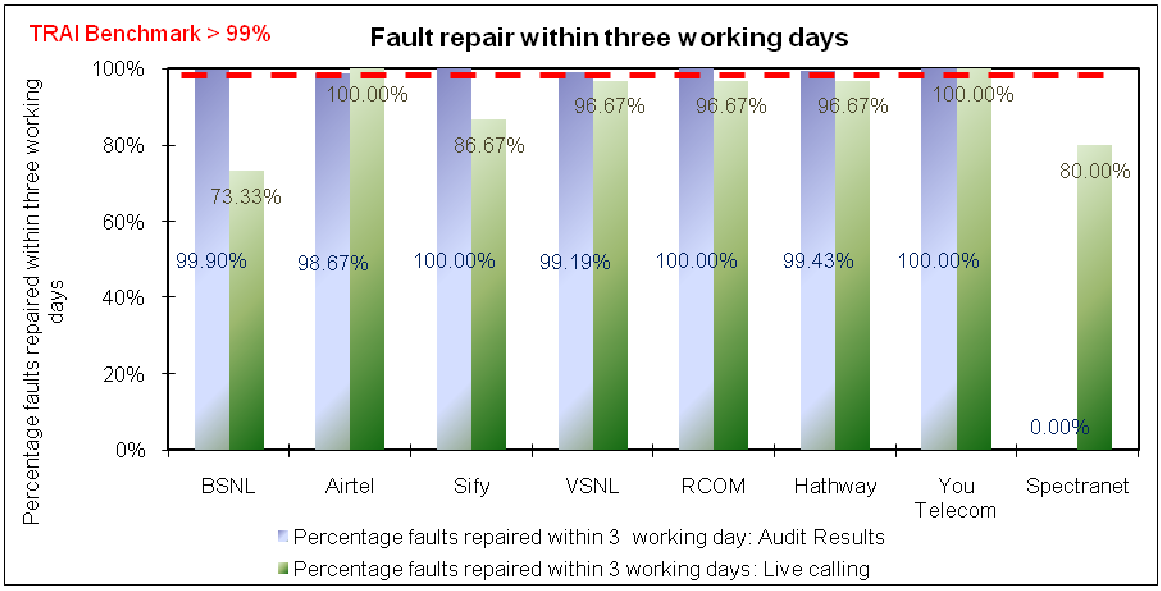
Operator not meeting benchmark: Sify, Spectranet

Live calling

Operator meeting benchmark: Airtel, You Telecom

Operator not meeting benchmark: BSNL, Sify, VSNL, RCOM, Hathway, Spectranet

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



One month

Operator meeting benchmark: BSNL, Sify, VSNL, RCOM, Hathway, You Telecom

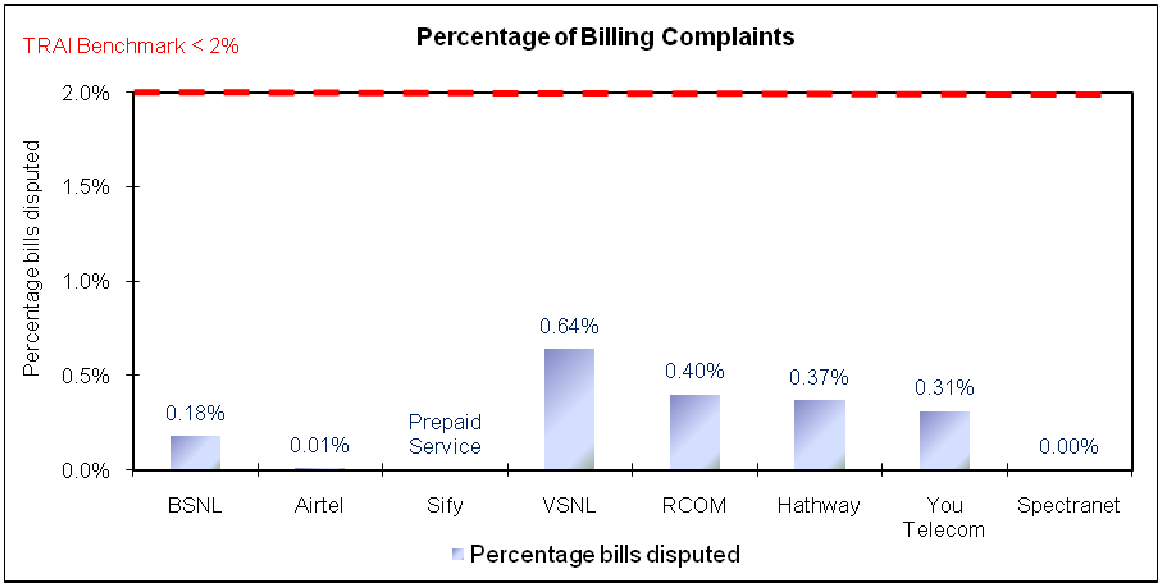
Operator not meeting benchmark: Airtel, Spectranet

Live calling

Operator meeting benchmark: Airtel, You Telecom

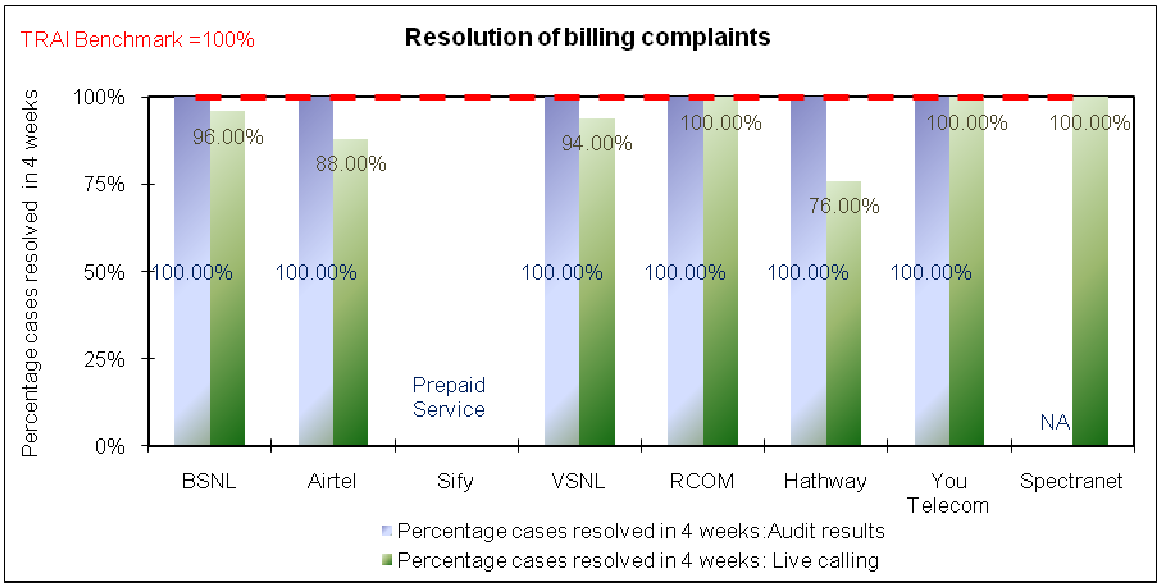
Operator not meeting benchmark: BSNL, Sify, VSNL, RCOM, Hathway, Spectranet

Percentage bills disputed



All operators are meeting the benchmark

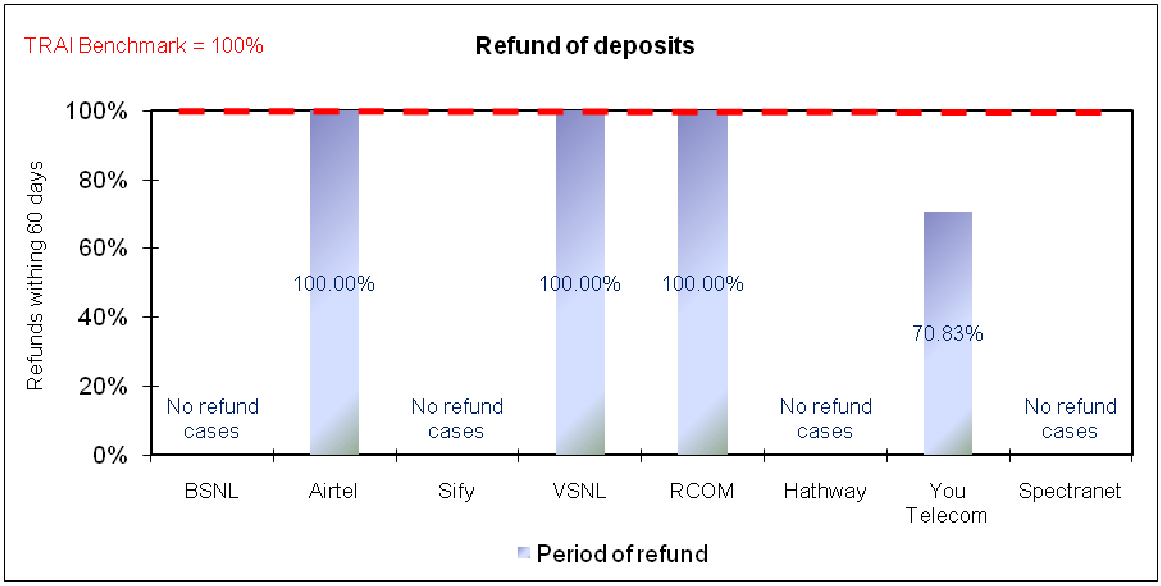
Resolution of billing complaints (Comparison between one month audit results and live calling results)



One month
All operators are meeting the benchmark

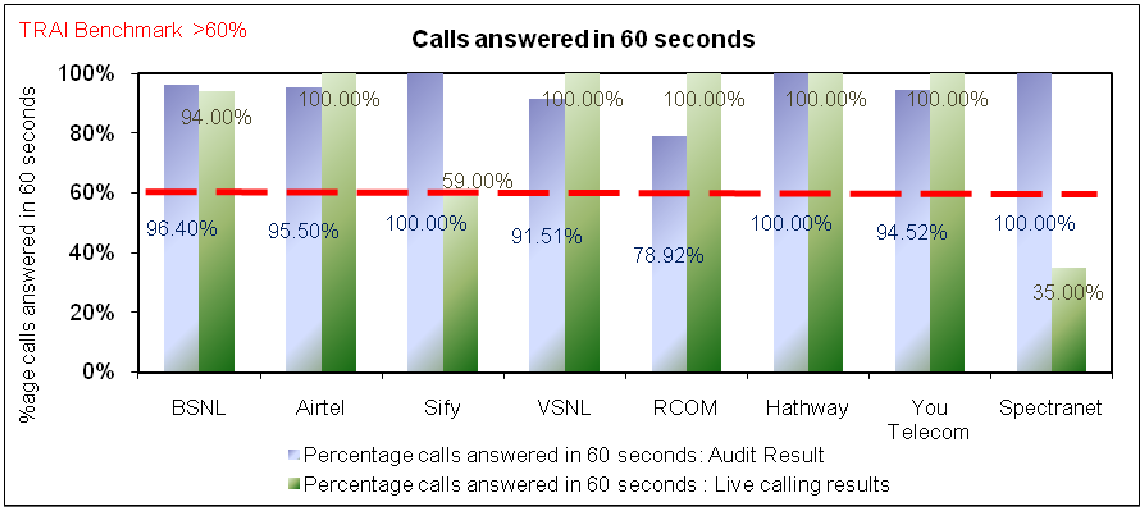
Live calling
Operator meeting benchmark: RCOM, You Telecom, Spectranet
Operator not meeting benchmark: BSNL, Airtel, VSNL, Hathway

Refund of deposits after closure



Operator meeting benchmark: Airtel, VSNL, RCOM
Operator not meeting benchmark: You Telecom

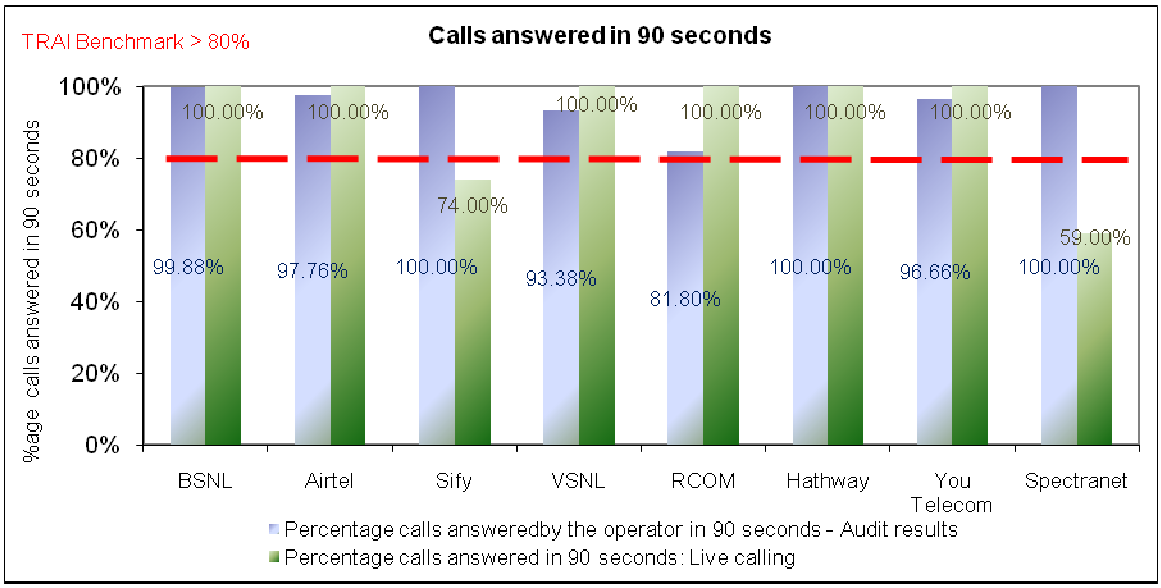
Response time to customer for assistance - Calls answered by the operator within 60 seconds (Comparison between one month audit results and live calling results)



One month
All operators are meeting the benchmark

Live calling
Operator meeting benchmark: BSNL, Airtel, VSNL, RCOM, Hathway, You Telecom
Operator not meeting benchmark: Sify, Spectranet

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



One month
All operators are meeting the benchmark

Live calling
Operator meeting benchmark: BSNL, Airtel, VSNL, RCOM, Hathway, You Telecom
Operator not meeting benchmark: Sify, Spectranet

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

Bandwidth Utilization (One month)	B'mark	BSNL	Airtel	Sify	VSNL	RCOM	Hathway	You Telecom	Spectranet
Total number of intra network links		166	952	400	16	64	7	NA	3
No of Intra network found to be above 90%		0	0	0	0	0	0	NA	0

Bandwidth Utilization (Live measurement)	B'mark	BSNL	Airtel	Sify	VSNL	RCOM	Hathway	You Telecom	Spectranet
Total number of intra network links		168	952	394	16	21	7	NA	3
No of Intra network found to be above 90%		0	0	0	0	0	0	NA	0

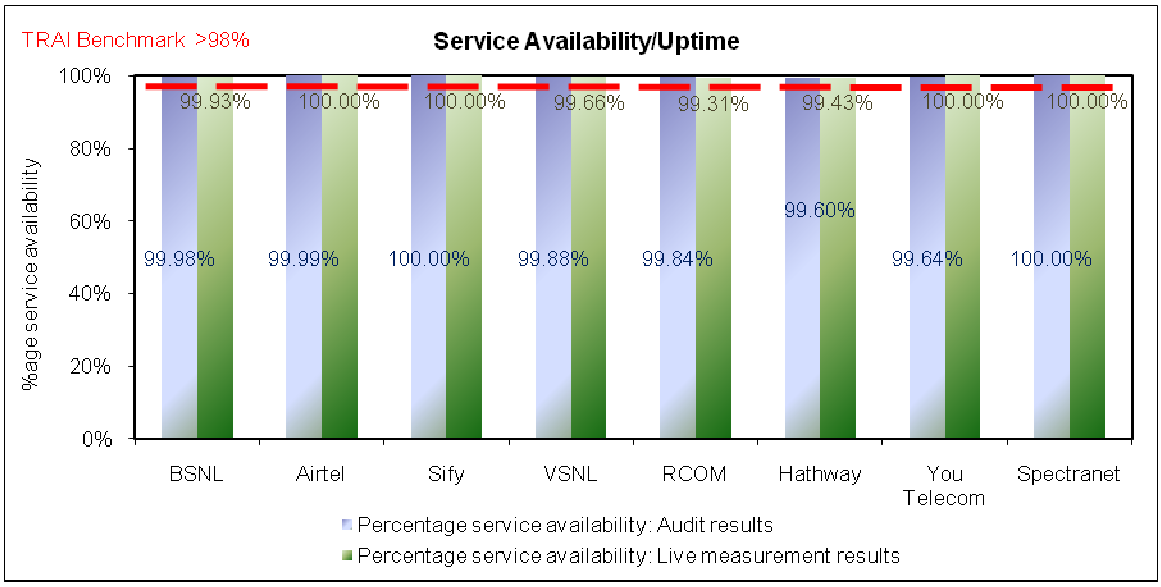
Broadband download speed	Benchmark	BSNL	Airtel	Sify	VSNL	RCOM	Hathway	You Telecom	Spectranet
%age subscribed speed available to the subscriber during TCBH (B/A)*100	>80%	100.00%	100.00%	87.50%	88.24%	90.08%	89.49%	85.00%	89.92%

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 tested during live measurement were found to be below 90%.

However, the level from which the bandwidth utilization at Intra network links is being reported varied because of the difference in networks. For e.g. Airtel was found to be reporting Bandwidth from links running from each RSU (Collection of DSLAM's) to the main node in a circle. Whereas VSNL (TATA Communications) considers the links between core distribution routers (located at 8 locations in India) and Routers being used for National long distance connectivity (Located at Chennai, Ernakkulam and Mumbai)

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

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



One month

All operators are meeting the benchmark

Live calling

All operators are meeting the benchmark

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

17.1 Broadband services

Parameters	Benchmarks	BSNL		Airtel		Sify		VSNL		RCOM		Hathway		You Telecom		Spectranet	
		PMR#	IMRB*	PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB	PMR	IMRB
Service provisioning uptime																	
Percentage connections provided within 15 days	100%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.00%	99.00%	100.00%	99.00%	98.00%	98.00%	100.00%	100.00%	100.00%	68.00%
Fault repair restoration time																	
Percentage faults repaired by next working days	> 90%	92.00%	92.00%	94.00%	94.00%	90.00%	89.00%	93.00%	93.00%	100.00%	100.00%	93.00%	93.00%	96.00%	96.00%	99.00%	99.00%
Percentage faults repaired within three working days	> 99%	100.00%	100.00%	98.00%	98.00%	99.00%	100.00%	98.00%	98.00%	100.00%	100.00%	99.00%	99.00%	100.00%	100.00%	100.00%	100.00%
Billing performance																	
Billing complaints per 100 bills issued	< 2%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.54%	0.54%	0.45%	0.45%	1.12%	1.12%	0.25%	0.25%	0.00%	0.00%
%age of billing complaints resolved in 4 weeks	100%	100.00%	100.00%	100.00%	100.00%	NA	NA	100.00%	100.00%	NA	100.00%	100.00%	100.00%	100.00%	100.00%	NA	NA
%age cases in which refund of deposits after closure was made in 60 days	100%	100.00%	100.00%	100.00%	100.00%	NA	NA	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	42.00%	60.00%	NA	NA
Customer care/helpline assessment (Voice to Voice)																	
Percentage calls answered within 60 seconds	> 60%	97.00%	97.00%	78.00%	77.60%	90.00%	100.00%	70.45%	70.45%	84.00%	84.00%	100.00%	100.00%	79.00%	79.00%	100.00%	100.00%
Percentage calls answered within 90 seconds	> 80%	100.00%	100.00%	82.00%	82.50%	100.00%	100.00%	74.75%	74.75%	88.00%	88.00%	100.00%	100.00%	58.00%	84.40%	100.00%	100.00%
Bandwidth utilization/Throughput																	
Intra network links (POP to ISP Node)		NA	187	2703	2703	382	382	16	16	132	129	1	1	NA	NA	10	10
Total number of intra network links > 90%		NA	0	0	0	0	0	0	0	0	0	1	0	NA	NA	0	0
Upstream Bandwidth (ISP Node to NIXI/NAP/IGSP)		NA	650	3	3	24	24	4	4	52	52	4	4	2	2	3	3
Percentage bandwidth utilized on upstream links	< 80%	NA	73.00%	83.07%	83.07%	79.00%	79.00%	48.47%	48.47%	45.00%	45.00%	85.00%	85.00%	70.00%	75.00%	89.00%	89.00%
Broadband download speed	> 80%	92.00%	92.00%	104.33%	100.00%	95.00%	85.00%	>80%	90.00%	88.00%	88.00%	85.00%	85.00%	85.00%	85.00%	NA	90.00%
Service availability/uptime	> 98%	99.00%	100.00%	100.00%	100.00%	100.00%	100.00%	98.97%	98.97%	99.77%	99.77%	99.00%	99.00%	98.93%	99.00%	99.00%	100.00%
Packet loss	< 1%	NA	4.00%	0.00%	0.00%	<1%	0.00%	0.00%	0.00%	<1%	0.50%	1.00%	1.00%	<1%	0.08%	<1%	0.00%
Network Latency																	
POP/ISP Node to NIXI (in msec)	< 120 msec	NA	22.6	53	53	<45	45	<80	64	22.31	37.13	80	80	< 40	26.6	<120	40
ISP node to NAP port (Terrestrial) (in msec)	< 350 msec	NA	243	273	273	<300	300	<250	184	102.11	225.7	320	320	< 300	261	NA	NA

* These have been calculated cumulatively on the basis of figures reported by various exchanges #As per the PMR submitted by the operators in the 2nd quarter of 2009

Figures do not match with those reported in PMR Not meeting the benchmark **B'mark** = TRAI Benchmark, **DNA** = Details not available, **NA:** Not Applicable

17.2 Conclusions

Broadband services

1. Network data for Sify, BSNL and RCOM 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. However the reason is largely the fact that data was obtained for a sample of 5% of exchanges whereas PMR 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 for all the service providers.

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 at their end. Records of old ping tests were found to be nonexistent.

18.0 Annexure I – Basic Wireline Service

Name of the Service Provider	Name of POI not meeting the benchmark	Total No. of circuits on POI	Total No. of call attempts on POI	Total traffic served on POI (Erlang)	% of Congestion POI	Action already taken/ action plan for meeting the benchmark
BSNL	DAVANGERE TAX	27	236	3.7	18.67	M/s Reliance has been intimated to take necessary action
BSNL	GULBARGA TAX	27	121	2.8	6.03	
BSNL	TUMKUR TAX	50	111	2.11	2.33	M/s Bharti has been intimated to take necessary action
Airtel	Vodafone NGS-ISD		431	57	>0.5%	
TTSL	All POIs meeting TRAI benchmark of congestion ≤ 0.5%					
RCOM	All POIs meeting TRAI benchmark of congestion ≤ 0.5%					

18.1 Parameter wise performance reports for Basic Wireline services

1.1 Live calling for Service provisioning

	Benchmark	BSNL	Airtel	TTSL	RCOM
Total registrations / OB note issued in General category		531	100	18	0
Number of connections provided within 7 days		409	77	8	0
Percentage of connections provided within 7 days	100%	77.02%	77.00%	44.44%	NA
Connections completed after 7 days including pending connections		122	23	10	0

2.1 Audit Results for Fault repair

Fault incidences	Benchmark	BSNL	Airtel	TTSL	RCOM
Faults incidences (No. of faults/100 Subs./month)	≤ 5	4.48	4.00	0.06	0.61

Fault repair (Urban areas)	Benchmark	BSNL	Airtel	TTSL	RCOM
Total No. of faults registered during the month		13411	18453	278	618
No. of faults repaired by next working day during the month		9885	18004	266	618
Percentage of faults repaired by next working day during the month	≥ 90%	73.71%	97.57%	95.68%	100.00%
No. of faults repaired within 3 days during the month		12431	18199	271	618
Percentage of faults repaired within 3 days during the month	100%	92.69%	98.62%	97.48%	100.00%

Fault repair (Rural & Hilly areas)	Benchmark	BSNL	Airtel	TTSL	RCOM
Total No. of faults registered during the month		823	NA	NA	NA
No. of faults repaired by next working day during the month		687	NA	NA	NA
Percentage of faults repaired by next working day during the month	≥ 90%	83.48%	NA	NA	NA
No. of faults repaired within 5 days during the month		760	NA	NA	NA
Percentage of faults repaired within 5 days during the month	100%	92.35%	NA	NA	NA

Not meeting the benchmark

Rent rebate	Benchmark	BSNL	Airtel	TTSL	RCOM
No. of cases with faults pending for >3 days and ≤7 days		160	325	0	0
Out of these number of cases where rent rebate for 7 days was given		6	325	0	0
Percentage of cases where rent rebate for 7 days was given	100%	3.75%	100.00%	NA	NA
No. of cases with faults pending for >7 days and ≤15 days		8	19	0	0
Out of these number of cases where rent rebate for 15 days was given		8	19	0	0
Percentage of cases where rent rebate for 15 days was given	100%	100.00%	100.00%	NA	NA
No. of cases with faults pending for ≥15 days		41	0	0	0
Out of these number of cases where rent rebate for 30 days was given		41	0	0	0
Percentage of cases where rent rebate for 30 days was given	100%	100.00%	NA	NA	NA

MTTR	Benchmark	BSNL	Airtel	TTSL	RCOM
Mean time taken to repair the fault in hours	≤ 8	13.49	3.39	18.95	4.55

2.2 Live calling for fault repair

Urban area	Benchmark	BSNL	Airtel	TTSL	RCOM
Total Number of calls made		570	30	30	30
Number of cases where faults were repaired by next working day		354	22	28	24
Percentage cases where faults were repaired by next working day	≥ 90%	62.11%	73.33%	93.33%	80.00%
Number of cases where faults were repaired within 3 days		526	29	28	26
Percentage cases where faults were repaired within 3 days	100%	92.28%	96.67%	93.33%	86.67%

Rural & Hilly area	Benchmark	BSNL	Airtel	TTSL	RCOM
Total Number of calls made		379	NA	NA	NA
Number of cases where faults were repaired by next working day		228	NA	NA	NA
Percentage cases where faults were repaired by next working day	≥ 90%	60.16%	NA	NA	NA
Number of cases where faults were repaired within 5 days		352	NA	NA	NA
Percentage cases where faults were repaired within 5 days	100%	92.88%	NA	NA	NA

3.1 Audit Results for Call Completion Rate (CCR)

Traffic statistics - Call Completion Rate	Benchmark	BSNL	Airtel	TTSL	RCOM
Total local call attempts		1123563	24893340	279570	NA
Total number of successful local calls		774152	16462356	234976	NA
Call Completion Rate (CCR) in the local network	≥ 55%	68.90%	66.13%	84.05%	NA

Not meeting the benchmark

Traffic statistics - Answer to Seizure Ratio	Benchmark	BSNL	Airtel	TTSL	RCOM
Total number of calls processed by the switch		1827838	72253618	234976	495194
Total number of calls answered		1312838	65510846	173586	436637
Answer to Seizure Ratio (ASR)	≥ 75%	71.82%	90.67%	73.87%	88.17%

3.2 Live measurement results for Call Completion Rate (CCR)

Traffic statistics - Call Completion Rate	Benchmark	BSNL	Airtel	TTSL	RCOM
Total local call attempts		402966	2748996	36581	NA
Total number of successful local calls		230635	1803025	30614	NA
Call Completion Rate (CCR) in the local network	≥ 55%	57.23%	65.59%	83.69%	NA

Traffic statistics - Answer to Seizure Ratio	Benchmark	BSNL	Airtel	TTSL	RCOM
Total number of calls processed by the switch		457143	32904694	30614	93561
Total number of calls answered		297253	29028752	22525	81404
Answer to Seizure Ratio (ASR)	≥ 75%	65.02%	88.22%	73.58%	87.01%

4. POI Congestion

4.1 Audit Results for POI Congestion

POI congestion	Benchmark	BSNL	Airtel	TTSL	RCOM
POI traffic offered on all individual POI's		106968	23510	774	2753.2
Served traffic for all POI's		105907	11814	242	2750
Traffic failed on all POI's	≤ 0.5%	0.00%	0.00%	0.00%	0.00%

4.2 Live measurement results for POI congestion

POI congestion	Benchmark	BSNL	Airtel	TTSL	RCOM
POI traffic offered on all individual POI's		167962	24156	773	3184
Served traffic for all POI's		167042	12546	134	3155
Traffic failed on all POI's	≤ 0.5%	0.00%	0.00%	0.00%	0.00%

POI congestion	Benchmark	BSNL	Airtel	TTSL	RCOM
No. of POIs not meeting benchmark		3	1	0	0
Total number of working POIs		DNA	19	4	188

5.1 Audit Results for Billing performance

Billing Performance	Benchmark	BSNL	Airtel	TTSL	RCOM
Billing disputes - Postpaid					
Total bills generated during the period		244358	136518	145550	18617
Total number of bills disputed		17	15	89	11
Percentage bills disputed	≤ 0.1%	0.01%	0.01%	0.06%	0.06%

Not meeting the benchmark

Resolution of billing complaints

Total complaints resolved in 4 weeks from date of receipt		19	15	89	11
Percentage complaints resolved within 4 weeks of date of receipt	100%	57.89%	100.00%	100.00%	100.00%

Period of applying credit / waiver

Total number of cases requiring credit/waiver		19	13	0	11
Total number of cases where credit/waiver was made within 1 week		11	13	0	11
Percentage cases in which credit/waiver was received within 1 week	100%	57.89%	100.00%	NA	100.00%

5.2 Live calling results for resolution of billing complaints

Resolution of billing complaints	Benchmark	BSNL	Airtel	TTSL	RCOM
Total Number of calls made		30	50	18	5
Number of cases resolved in 4 weeks		30	43	17	5
Percentage cases resolved in 4 weeks	100%	100.00%	86.00%	94.44%	100.00%

6.1 Audit Results for Requests

Shift Requests	Benchmark	BSNL	Airtel	TTSL	RCOM
Total no. of requests received for Shifts		445	4374	1	9
Total no. of requests for shifts attended within 3 days		286	4208	1	9
Percentage of requests for shifts attended within 3 days	≥ 95%	64.27%	96.20%	100.00%	100.00%
Total no. of requests for shifts not attended or attended beyond 3 days		159	166	0	0

Closure Requests	Benchmark	BSNL	Airtel	TTSL	RCOM
Total no. of requests received for Closures		831	35445	5374	491
Total no. of requests for closures attended within 7 days		784	35445	5374	491
Percentage of requests for closures attended within 7 days	100%	94.34%	100.00%	100.00%	100.00%
Total no. of requests for closures not attended or attended beyond 7 days		1	0	0	0

6.2 Live calling for Requests

Shift Requests	Benchmark	BSNL	Airtel	TTSL	RCOM
Total no. of requests received for Shifts		284	50	1	1
Total no. of requests for shifts attended within 3 days		178	15	1	0
Percentage of requests for shifts attended within 3 days	≥ 95%	62.68%	30.00%	100.00%	0.00%
Total no. of requests for shifts not attended or attended beyond 3 days		97	34	0	1

7.1 Audit results for customer care

Customer Care Assessment	Benchmark	BSNL	Airtel	TTSL	RCOM
Percentage calls getting connected and answered	≥ 95%	96.40%	100.00%	100.00%	100.00%
Percentage calls answered within 60 seconds (voice to voice)	≥ 90%	99.88%	98.24%	92.00%	92.00%

Not meeting the benchmark

7.2 Live calling results for customer care

Customer Care Assessment	Benchmark	BSNL	Airtel	TTSL	RCOM
Total Number of calls received		1900	100	100	100
Total Number of calls getting connected and answered		1900	100	100	100
Percentage calls getting connected and answered	≥ 95%	100.00%	100.00%	100.00%	100.00%

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

Customer Care Assessment	Benchmark	BSNL	Airtel	TTSL	RCOM
Total Number of calls received		1900	100	100	100
Total Number of calls answered within 60 seconds		1832	100	81	100
Percentage calls answered within 60 seconds	≥ 90%	96.42%	100.00%	81.00%	100.00%

8.1 Audit results for refund of deposits

Refund	Benchmark	BSNL	Airtel	TTSL	RCOM
Total number of cases requiring refund of deposits		609	714	328	13
Total number of cases where refund was made within 60 days		567	714	324	13
Percentage cases in which refund was receive within 60 days	100%	93.10%	100.00%	98.78%	100.00%

9.1 Live calling for level 1 services

Level 1 services	Benchmark	BSNL	Airtel	TTSL	RCOM
Total no. of calls made		640	30	30	30
Calls answered in 60 sec		626	30	10	22
Calls answered after 60 sec		14	0	0	0

Not meeting the benchmark

19.0 Annexure II - Cellular Mobile services

19.1 Service provider performance report based on one month data

Name of Service Provider	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)			Metering and Billing			Response time to customer for assistance		Termination / closure of service	
	BTSs Accumulated downtime (not available for service) (%age)	Worst affected BTSs due to downtime (%age)	Call Set-up Success Rate (within licensee's own network)	SDCCH/ Paging Chl. Congestion (%age)	TCH Congestion (%age)	Call Drop Rate (%age)	Worst affected cells having more than 3% TCH drop	Connections with good voice quality	Metering and billing credibility	%age complaints resolved within 4 weeks	Period of applying credit/waiver less than 1 week	Accessibility of call centre/ customer care	Percentage of calls answered by operators (voice to voice) within 60 sec	%age requests for Termination complied within 7 days	Refund of deposits after closure within 60 days
B'mark	**≤ 2%**	**≤ 2%**	**≥ 95%**	**≤ 1%**	**≤ 2%**	**≤ 2%**	**≤ 5%**	**≥ 95%**	**≤ 0.1%**	**100%**	**100%**	**≥ 95%**	**≥ 90%**	**100%**	**100%**
Airtel	0.91%	5.11%	96.21%	0.97%	1.32%	1.77%	12.09%	97.60%	0.04%	100.00%	100.00%	97.02%	78.00%	32.57%	99.88%
Vodafone	0.44%	0.69%	99.22%	0.13%	0.34%	0.65%	4.64%	98.73%	0.09%	100.00%	100.00%	98.73%	97.00%	100.00%	NA
BSNL GSM	1.49%	1.97%	98.42%	0.51%	1.74%	1.70%	1.96%	97.44%	0.05%	100.00%	100.00%	100.00%	99.00%	100.00%	100.00%
BSNL CDMA	0.78%	5.61%	97.82%	0.55%	0.47%	0.50%	2.33%	95.25%	0.00%	NA	NA	NA	NA	98.52%	98.98%
Tata CDMA	0.04%	0.00%	95.52%	0.00%	0.05%	0.43%	4.54%	99.23%	0.06%	100.00%	100.00%	100.00%	92.00%	100.00%	98.78%
Tata DoCoMo	0.39%	0.05%	98.71%	0.65%	0.86%	1.00%	8.60%	95.06%	0.00%	100.00%	94.44%	96.00%	96.00%	100.00%	NA
Idea	0.10%	0.61%	99.55%	0.11%	0.45%	1.45%	4.71%	97.14%	0.05%	100.00%	100.00%	99.55%	91.00%	99.33%	95.79%
Aircel	0.30%	0.00%	98.39%	0.04%	0.41%	0.56%	5.02%	98.34%	0.26%	100.00%	100.00%	100.00%	87.00%	65.38%	100.00%
RCOM CDMA	0.17%	0.26%	99.45%	0.00%	0.08%	0.63%	0.15%	99.21%	0.10%	100.00%	100.00%	100.00%	90.00%	100.00%	100.00%
RCOM GSM	0.18%	0.23%	98.94%	0.02%	0.09%	0.47%	0.62%	99.12%	0.07%	100.00%	100.00%	100.00%	88.00%	NA	NA

Operators not meeting the benchmark

NA: Not Applicable

19.2 Monthly Point of Interconnection (POI) Congestion Report

Name of the Service Provider	Name of POI not meeting the benchmark	Total No. of circuits on POI	Total No. of call attempts on POI	Total traffic served on POI (Erlang)	% of Congestion POI	Action already taken/ action plan for meeting the benchmark
BSNL	Ericsson L1TAX Bg.	1112	1854	1059	11.33	No ports available at Ericsson. Overflow traffic routed through another POI
BSNL	Ericsson TAX Bg.	618	37013	542	0.73	No ports available at Ericsson. Overflow traffic routed through another POI
Aircel	KAN7BSNLBAG1	627	28236	0	0.69	-
Reliance	TATA Bangalore GMSC	DNP	78826	1078.69	>0.5	-
Reliance	UK KARWAR L2 TAX		971	19.94	>0.5	-
Reliance	Cell One GMSC-1 at CMX		5557	74.97	>0.5	-
Reliance	Bangalore-Tata		11944	151.47	>0.5	-
Reliance	Bangalore Tata GMSCe		56706	769.78	>0.5	-
Reliance	Bangalore TATA TANDEM		63168	1161.75	>0.5	-
Reliance	VSNL-MSCe-7156		11731	274.26	>0.5	-
Reliance	Bangalore Tata NLD		3306	91.28	>0.5	-
Reliance	Aircel BLR NGN(NLD)_7499		3508	57.4	>0.5	-
Reliance	Vodafone BANG(ILD)-7482		798	51.03	>0.5	-
Reliance	BNG AIRTEL-9335		45397	618	>0.5	-

19.3 Parameter wise performance reports for Cellular Mobile services

1. Network Availability

Audit Results for Network Availability

	B'mark	Airtel	Vodafone	BSNL GSM	BSNL CDMA	Tata CDMA	Tata DoCoMo	Idea	Aircel	RCOM CDMA	RCOM GSM
Number of BTSs in the licensed service area		6657	6249	2946	446	828	1984	3437	1735	1958	3003
Sum of downtime of BTSs in a month (in hours)		45135	20655	32731.00	2603.37	262	5787	2616	3827	2497	4107
BTSs accumulated downtime (not available for service)	≤ 2%	0.91%	0.44%	1.49%	0.78%	0.04%	0.39%	0.10 %	0.30%	0.17%	0.18%
Number of BTSs having accumulated downtime >24 hours		340	43	58	25	0	1	21	37	5	7
Worst affected BTSs due to downtime	≤ 2%	5.11%	0.69%	1.97%	5.61%	0.00%	0.05%	0.61 %	2.13%	0.26%	0.23%

2. Connection Establishment (Accessibility)

Audit Results for CSSR, SDCCH and TCH congestion

CSSR	B'mark	Airtel	Vodafone	BSNL GSM	BSNL CDMA	Tata CDMA	Tata DoCoMo	Idea	Aircel	RCOM CDMA	RCOM GSM
Total number of call attempts		601808651	DNA	879364819	14734577	409751108	9300546	100683474	10157152	85228077	31250887
Total number of successful calls established		579003476	DNA	865470855	14414044	391385969	9180998	100226255	9993622	84756646	30920499
CSSR	≥ 95%	96.21%	99.22%	98.42%	97.82%	95.52%	98.71%	99.55%	98.39%	99.45%	98.94%

SDCCH congestion	B'mark	Airtel	Vodafone	BSNL GSM	BSNL CDMA	Tata CDMA	Tata DoCoMo	Idea	Aircel	RCOM CDMA	RCOM GSM
SDCCH/Paging channel congestion	≤ 1%	0.97%	0.13%	0.51%	0.55%	0.00%	0.65%	0.11%	0.04%	0.00%	0.02%

TCH congestion	B'mark	Airtel	Vodafone	BSNL GSM	BSNL CDMA	Tata CDMA	Tata DoCoMo	Idea	Aircel	RCOM CDMA	RCOM GSM
TCH congestion	≤ 2%	1.32%	0.34%	1.74%	0.47%	0.05%	0.86%	0.45%	0.41%	0.08%	0.09%

Live measurement results for CSSR, SDCCH and TCH congestion

CSSR	B'mark	Airtel	Vodafone	BSNL GSM	BSNL CDMA	Tata CDMA	Tata DoCoMo	Idea	Aircel	RCOM CDMA	RCOM GSM
Total number of call attempts		61733794	DNA	81254580	1459783	40948338	8941478	17202131	4341376	8375370	2843269
Total number of successful calls established		59495759	DNA	80598165.48	1384732	39566686	8890837	16989808	4303940	8328981	2809622
CSSR	≥ 95%	96.37%	99.06%	99.19%	94.86%	96.63%	99.43%	98.77%	99.14%	99.45%	98.82%

Operators not meeting the benchmark

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

SDCCH congestion	B'mark	Airtel	Vodafone	BSNL GSM	BSNL CDMA	Tata CDMA	Tata DoCoMo	Idea	Aircel	RCOM CDMA	RCOM GSM
SDCCH/Paging channel congestion	≤ 1%	0.90%	0.07%	0.19%	0.25%	0.00%	0.70%	0.11%	0.02%	0.00%	0.02%

TCH congestion	B'mark	Airtel	Vodafone	BSNL GSM	BSNL CDMA	Tata CDMA	Tata DoCoMo	Idea	Aircel	RCOM CDMA	RCOM GSM
TCH congestion	≤ 2%	1.32%	0.55%	1.83%	0.50%	0.04%	0.75%	0.42%	0.05%	0.08%	0.14%

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

CSSR	B'mark	Airtel	Vodafone	BSNL GSM	BSNL CDMA	Tata CDMA	Tata DoCoMo	Idea	Aircel	RCOM CDMA	RCOM GSM
Total number of call attempts		573	722	578	685	703	684	610	713	695	679
Total number of successful calls established		565	717	534	657	703	670	599	706	695	672
CSSR	≥ 95%	98.60%	99.31%	92.39%	95.91%	100.00%	97.95%	98.20%	99.02%	100.00%	98.97%

Blocked calls	Benchmark	Airtel	Vodafone	BSNL GSM	BSNL CDMA	Tata CDMA	Tata DoCoMo	Idea	Aircel	RCOM CDMA	RCOM GSM
%age blocked calls		0.84%	0.38%	9.18%	5.15%	0.00%	1.11%	1.08%	0.56%	0.00%	0.59%

3. Connection Maintenance (Retainability)

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

Call drop rate	B'mark	Airtel	Vodafone	BSNL GSM	BSNL CDMA	Tata CDMA	Tata DoCoMo	Idea	Aircel	RCOM CDMA	RCOM GSM
Total number of calls established		601808651	5096012	865470855	17086556	70116175	3019075	98585239	17401136	DNA	DNA
Total number of calls dropped		10647941	32930	14713005	86055	301092	30084	1432634	96865	DNA	DNA
Call drop rate	≤ 2%	1.77%	0.65%	1.70%	0.50%	0.43%	1.00%	1.45%	0.56%	0.63%	0.47%

Cells having more than 3% TCH	B'mark	Airtel	Vodafone	BSNL GSM	BSNL CDMA	Tata CDMA	Tata DoCoMo	Idea	Aircel	RCOM CDMA	RCOM GSM
Total number of cells in the network		18345	18253	8657	11429	2158	5695	10311	4983	1958	9009
Total number of cells having more than 3% TCH		2217	847	170	265.86	98	490	486	250	3	56
Worst affected cells having more than 3% TCH	≤ 5%	12.09%	4.64%	1.96%	2.33%	4.54%	8.60%	4.71%	5.02%	0.15%	0.62%

Operators not meeting the benchmark

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

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

Call drop rate	B'mark	Airtel	Vodafone	BSNL GSM	BSNL CDMA	Tata CDMA	Tata DoCoMo	Idea	Aircel	RCOM CDMA	RCOM GSM
Total number of calls established		61733794	5270599	80598165	1610131	5588457	2828883	10462644	4302220	DNA	DNA
Total number of calls dropped		1098419	32455	1168371	14788	24667	27082	127107	33984	DNA	DNA
Call drop rate	≤ 2%	1.78%	0.62%	1.45%	0.92%	0.44%	0.96%	1.21%	0.79%	0.61%	0.47%

Cells having more than 3% TCH	B'mark	Airtel	Vodafone	BSNL GSM	BSNL CDMA	Tata CDMA	Tata DoCoMo	Idea	Aircel	RCOM CDMA	RCOM GSM
Total number of cells in the network		18423	18170	13012	1741	2500	5900	10340	5374	1958	9009
Total number of cells having more than 3% TCH		2953	751	649	79	44	562	468	371	6	62
Worst affected cells having more than 3% TCH	≤ 5%	16.03%	4.13%	4.99%	4.55%	1.76%	9.53%	4.52%	6.90%	0.31%	0.69%

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

Call drop rate	B'mark	Airtel	Vodafone	BSNL GSM	BSNL CDMA	Tata CDMA	Tata DoCoMo	Idea	Aircel	RCOM CDMA	RCOM GSM
Total number of calls established		565	718	679	685	703	669	602	706	590	669
Total number of calls dropped		0	0	46	9	0	8	1	5	3	17
Call drop rate	≤ 2%	0.00%	0.00%	6.77%	1.31%	0.00%	1.20%	0.17%	0.71%	0.51%	2.54%

4. Voice quality

Audit Results for Voice quality

Voice quality	Benchmark	Airtel	Vodafone	BSNL GSM	BSNL CDMA	Tata CDMA	Tata DoCoMo	Idea	Aircel	RCOM CDMA	RCOM GSM
Total number of sample calls		86973	660037960	900	24664	81978	247344730	6260086649	10157152	DNA	DNA
Total number of calls with good voice quality		84888	651679300	877	23493	81350	235123982	6080773721	9988543	DNA	DNA
%age calls with good voice quality	≥ 95%	97.60%	98.73%	97.44%	95.25%	99.23%	95.06%	97.14%	98.34%	99.21%	99.12%

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

Voice quality	Benchmark	Airtel	Vodafone	BSNL GSM	BSNL CDMA	Tata CDMA	Tata DoCoMo	Idea	Aircel	RCOM CDMA	RCOM GSM
Total number of sample calls		1070356	1068172	588740	38881	81978	725550	854321	169592	40077	81073
Total number of calls with good voice quality		1007575	1035066	547282	37268	80670	686505	809018	159923	39500	75733
%age calls with good voice quality	≥ 95%	94.13%	96.90%	92.96%	95.85%	98.40%	94.62%	94.70%	94.30%	98.56%	93.41%

Operators not meeting the benchmark

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

5. POI Congestion
Audit Results for POI Congestion

POI congestion	Benchmark	Airtel	Vodafone	BSNL GSM	BSNL CDMA	Tata CDMA	Tata DoCoMo	Idea	Aircel	RCOM CDMA	RCOM GSM
No. of POIs not meeting benchmark		0	0	2	NA	0	0	0	1	11	
Total number of working POIs		22	48	304	NA	145	1	48	29	108	

6. Inter Operator Call Assessment

Inter operator call Assessment To↓ From→	Airtel	Vodafone	BSNL GSM	BSNL CDMA	Tata CDMA	Tata DoCoMo	Idea	Aircel	RCOM CDMA	RCOM GSM
Airtel	NA	62%	98%	98%	84%	70%	95%	80%	100%	100%
Vodafone	86%	NA	85%	97%	98%	72%	95%	98%	100%	100%
BSNL GSM	86%	78%	NA	100%	90%	76%	91%	93%	100%	99%
BSNL CDMA	100%	87%	100%	NA	100%	100%	100%	100%	96%	100%
Tata CDMA	100%	98%	98%	100%	NA	100%	85%	91%	98%	98%
Tata DoCoMo	83%	82%	88%	100%	100%	NA	100%	100%	100%	98%
Idea	98%	87%	100%	100%	94%	98%	NA	90%	99%	96%
Aircel	15%	86%	82%	98%	80%	93%	54%	NA	100%	100%
RCOM CDMA	100%	87%	100%	98%	100%	100%	100%	100%	NA	100%
RCOM GSM	100%	92%	99%	98%	100%	100%	100%	100%	100%	NA

The maximum problem faced by the calling operator to other operators

7. Metering and Billing credibility
Audit Results for Billing performance

Billing Performance	B'mark	Airtel	Vodafone	BSNL GSM	BSNL CDMA	Tata CDMA	Tata DoCoMo	Idea	Aircel	RCOM CDMA	RCOM GSM
Billing disputes - Postpaid											
Total bills generated during the period		804115	354694	140549	154751	145550	1775	63365	6040	192173	10929
Total number of bills disputed		355	322	68	0	89	0	30	16	201	8
Percentage bills disputed	<= 0.1%	0.04%	0.09%	0.05%	0.00%	0.06%	0.00%	0.05%	0.26%	0.10%	0.07%
Billing disputes - Prepaid											
Number of complaints related to charging, credit & validity		17	12972	4124	0	443	62	217	23418	229	94
Total number of prepaid customers in that period		10644258	4056992	2687038	6920	858858	2391897	2117819	630649	3273115	1237835
Percentage of complaints	<= 0.1%	0.00%	0.32%	0.15%	0.00%	0.05%	0.00%	0.01%	3.71%	0.01%	0.01%
Resolution of billing complaints											

Total complaints resolved in 4 weeks from date of receipt		355	13294	68	NA	532	62	841	23434	1930	505
Percentage complaints resolved within 4 weeks of date of receipt	100%	100.00%	100.00%	100.00%	NA	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Period of applying credit / waiver											
Total number of cases requiring credit/waiver		355	11026	68	NA	17	36	247	4845	430	102
Total number of cases where credit/waiver was made within 1 week		355	11026	68	NA	17	34	247	4845	430	102
Percentage cases in which credit/waiver was received within 1 week	100%	100.00%	100.00%	100.00%	NA	100.00%	94.44%	100.00%	100.00%	100.00%	100.00%

Live calling results for resolution of billing complaints

Resolution of billing complaints	B'mark	Airtel	Vodafone	BSNL GSM	BSNL CDMA	Tata CDMA	Tata DoCoMo	Idea	Aircel	RCOM CDMA	RCOM GSM
Total Number of calls made		50	50	23	NA	50	27	50	50	50	50
Number of cases resolved in 4 weeks		41	36	23	NA	43	19	44	50	49	49
Percentage cases resolved in four weeks	100%	82.00 %	72.00%	100.00 %	NA	86.00%	70.37%	88.00 %	100.00 %	98.00%	98.00%

8. Customer Care

Audit results for customer care

Customer Care Assessment	Bench mark	Airtel	Vodafone	BSNL GSM	BSNL CDMA	Tata CDMA	Tata DoCoMo	Idea	Aircel	RCOM CDMA	RCOM GSM
Total Number of calls received		36557463	5933611	2461637	NA	52333	1778348	4055533	523407	1552743	896976
Total Number of calls getting connected and answered (Elec.)		35466473	5858246	2461637	NA	52333	1707214	4037311	523407	1552743	896976
Percentage calls getting connected and answered (Elec.)	≥ 95%	97.02%	98.73%	100.00%	NA	100.00%	96.00%	99.55%	100.00%	100.00%	100.00%
Percentage calls answered within 60 seconds (V2V)	≥ 90%	78.00%	97.00%	99.00%	NA	92.00%	96.00%	91.00%	87.00%	90.00%	88.00%

Operators not meeting the benchmark

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

Live calling results for customer care

Customer Care Assessment	B'mark	Airtel	Vodafone	BSNL GSM	BSNL CDMA	Tata CDMA	Tata DoCoMo	Idea	Aircel	RCOM CDMA	RCOM GSM
Total Number of calls received		100	100	100	600	300	300	100	100	50	50
Total Number of calls getting connected and answered		100	100	100	600	300	300	100	100	50	50
Percentage calls getting connected and answered	≥ 95%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Live calling results for customer care (Voice to Voice)

Customer Care Assessment	Bench mark	Airtel	Vodafone	BSNL GSM	BSNL CDMA	Tata CDMA	Tata DoCoMo	Idea	Aircel	RCOM CDMA	RCOM GSM
Total Number of calls received		100	100	100	567	300	300	100	100	50	50
Total Number of calls answered within 60 seconds		83	52	100	556	300	300	90	93	49	50
Percentage calls answered within 60 seconds	≥ 90%	83.00%	52.00%	100.00%	98.06%	100.00%	100.00%	90.00%	93.00%	98.00%	100.00%

9. Termination / closure of service

Audit results for termination / closure of service

Termination	B'mark	Airtel	Vodafone	BSNL GSM	BSNL CDMA	Tata CDMA	Tata DoCoMo	Idea	Aircel	RCOM CDMA	RCOM GSM
Total number of closure request		9858	5236	607	539	5374	600	446	26	3623	0
Number of requests attended within 7 days		3211	5236	607	531	5374	600	443	17	3623	0
Percentage cases in which termination done within 7 days	100%	32.57%	100.00%	100.00%	98.52%	100.00%	100.00%	99.33%	65.38%	100.00%	NA

Operators not meeting the benchmark

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

Audit results for refund of deposits

Refund	B'mark	Airtel	Vodafone	BSNL GSM	BSNL CDMA	Tata CDMA	Tata DoCoMo	Idea	Aircel	RCOM CDMA	RCOM GSM
Total number of cases requiring refund of deposits		869	0	607	489	328	0	261	23	1232	0
Total number of cases where refund was made within 60 days		868	0	607	484	324	0	250	23	1232	0
Percentage cases in which refund was receive within 60 days	100%	99.88%	NA	100%	98.98%	98.78%	NA	95.79 %	100%	100%	NA

11. Additional Network Related parameters

Audit Results for Total Traffic Handled in Erlang

Traffic in Erlang	Airtel	Vodafone	BSNL GSM	BSNL CDMA	Tata CDMA	Tata DoCoMo	Idea	Aircel	RCOM CDMA	RCOM GSM
Equipped capacity of the network	587999	144735	185600	27417	103500	62632	102323	40206	230000	
Total traffic handled in erlang during TCBH	348320	97391	80704	9123	30447	37911	49458	6061	68956	

Total number of customers

As per VLR	Airtel	Vodafone	BSNL GSM	BSNL CDMA	Tata CDMA	Tata DoCoMo	Idea	Aircel	Reliance CDMA	Reliance GSM
Total no. of customers served (as per VLR) on last day of the month	10292079	2768228	2461398	394168	919384	1630745	1837162	365437	4692544	

Operators not meeting the benchmark

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

20.0 Annexure - I – Broadband services

20.1 Parameter wise performance reports for Broadband services

1. Service Provisioning

1.1 Audit Results for Service provisioning

	Benchmark	BSNL	Airtel	Sify	VSNL	RCOM	Hathway	You Telecom	Spectranet
Total connections registered during the period		11255	7150	271	1908	232	1135	136	17
Number of connections provided within 15 days		11255	7150	271	1879	232	1088	136	9
Percentage of connections provided within 15 days	100%	100.00%	100.00%	100.00%	98.48%	100.00%	95.86%	100.00%	52.94%
Number of connections provided after 15 days of registration of demand		0	0	0	29	0	47	0	8
Number of customers to whom credit is given for delayed connections		0	0	0	0	0	0	0	0
Percentage of customers to whom credit is given for delayed connections	100%	NA	NA	NA	0.00%	NA	0.00%	NA	0.00%

1.2 Live calling for Service provisioning

	Benchmark	BSNL	Airtel	Sify	VSNL	RCOM	Hathway	You Telecom	Spectranet
Total connections registered during the period		100	100	100	100	52	100	100	100
Number of connections provided within 15 days		91	87	70	95	51	100	99	95
Percentage of connections provided within 15 days	100%	91.00%	87.00%	70.00%	95.00%	98.08%	100.00%	99.00%	95.00%

2. Fault Incidence / Clearance Statistics

2.1 Audit Results for Fault repair

Fault repair	Benchmark	BSNL	Airtel	Sify	VSNL	RCOM	Hathway	You Telecom	Spectranet
Total No. of faults registered during the month		23879	6247	1267	15,734	374	6848	288	75
No. of faults repaired by next working day during the month		22518	6105	1140	15,215	374	6573	285	0
Percentage of faults repaired by next working day during the month	> 90%	94.30%	97.73%	89.98%	96.70%	100.00%	95.98%	98.96%	0.00%
No. of faults repaired within 3 days during the month		23855	6164	1267	15607	374	6809	288	0
Percentage of faults repaired within 3 days during the month	>99%	99.90%	98.67%	100.00%	99.19%	100.00%	99.43%	100.00%	0.00%

Not meeting the benchmark

Rent rebate	Benchmark	BSNL	Airtel	Sify	VSNL	RCOM	Hathway	You Telecom	Spectranet
No. of cases with faults pending for >3 days and ≤7 days		22	93	4	1103	1	31	0	0
Out of these number of cases where rent rebate for 7 days was given		0	93	4	1103	1	31	0	0
Percentage of cases where rent rebate for 7 days was given	100%	0.00%	100.00%	100.00%	100.00%	100.00%	100.00%	NA	NA
No. of cases with faults pending for >7 days and ≤15 days		74	5	0	145	1	0	0	0
Out of these number of cases where rent rebate for 15 days was given		0	5	0	145	1	0	0	0
Percentage of cases where rent rebate for 15 days was given	100%	0.00%	100.00%	NA	100.00%	100.00%	NA	NA	NA
No. of cases with faults pending for ≥15 days		152	0	0	37	0	0	0	0
Out of these number of cases where rent rebate for 30 days was given		0	0	0	37	0	0	0	0
Percentage of cases where rent rebate for 30 days was given	100%	0.00%	NA	NA	100.00%	NA	NA	NA	NA

2.2 Live calling for fault repair

Fault repair	Benchmark	BSNL	Airtel	Sify	VSNL	RCOM	Hathway	You Telecom	Spectranet
Total Number of calls made		30	30	30	30	30	30	30	30
Number of cases where faults were repaired by next working day		7	28	22	25	27	0	29	21
Percentage cases where faults were repaired by next working day	> 90%	23.33%	93.33%	73.33%	83.33%	90.00%	0.00%	96.67%	70.00%
Number of cases where faults were repaired within 3 days		22	30	26	29	29	29	30	24
Percentage cases where faults were repaired within 3 days	>99%	73.33%	100.00%	86.67%	96.67%	96.67%	96.67%	100.00%	80.00%

Not meeting the benchmark

3. Billing performance

3.1 Audit Results for Billing performance

Billing Performance	Benchmark	BSNL	Airtel	Sify	VSNL	RCOM	Hathway	You Telecom	Spectranet
Billing disputes									
Total bills generated during the period		398408	188138	NA	23048	9294	14350	2270	177
Total number of bills disputed		721	13	NA	148	37	53	7	0
Percentage bills disputed	< 2%	0.18%	0.01%	NA	0.64%	0.40%	0.37%	0.31%	0.00%
Resolution of billing complaints									
Total complaints resolved in 4 weeks from date of receipt		721	13	NA	148	37	53	7	NA
Percentage complaints resolved within 4 weeks of date of receipt	100%	100.00%	100.00%	NA	100.00%	100.00%	100.00%	100.00%	NA
Period of refund									
Total number of cases requiring refund		0	12	NA	220	28	0	24	NA
Total number of cases where credit/waiver was made within 60 days		0	12	NA	220	28	0	17	NA
Percentage cases in which credit/waiver was received within 60 days	100%	NA	100.00%	NA	100.00%	100.00%	NA	70.83%	NA

3.2 Live calling results for resolution of billing complaints

Resolution of billing complaints	Benchmark	BSNL	Airtel	Sify	VSNL	RCOM	Hathway	You Telecom	Spectranet
Total Number of calls made		50	50	NA	50	4	50	1	50
Number of cases resolved in 4 weeks		48	44	NA	47	4	38	1	50
Percentage cases resolved in 4 weeks	100%	96.00%	88.00%	NA	94.00%	100.00%	76.00%	100.00%	100.00%

4. Response time to the customer for assistance

4.1 Audit results for customer care (Voice to Voice)

Customer Care Assessment	Benchmark	BSNL	Airtel	Sify	VSNL	RCOM	Hathway	You Telecom	Spectranet
Total Number of calls received		105442	101784	1901	412935	320369	30921	3083	4719
Total Number of calls answered within 60 seconds		101646	97208	1901	377872	252825	30921	2914	4719
Percentage calls answered within 60 seconds	> 60%	96.40%	95.50%	100.00%	91.51%	78.92%	100.00%	94.52%	100.00%

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

Customer Care Assessment	Benchmark	BSNL	Airtel	Sify	VSNL	RCOM	Hathway	You Telecom	Spectranet
Total Number of calls received		100	100	100	100	100	100	100	100
Total Number of calls answered within 60 seconds		94	100	59	100	100	100	100	35
Percentage calls answered within 60 seconds	> 60%	94.00%	100.00%	59.00%	100.00%	100.00%	100.00%	100.00%	35.00%

Not meeting the benchmark

4.3 Audit results for customer care (Voice to Voice)

Customer Care Assessment	Benchmark	BSNL	Airtel	Sify	VSNL	RCOM	Hathway	You Telecom	Spectranet
Total Number of calls received		105442	101784	1901	412935	320369	30921	3083	4719
Total Number of calls answered within 90 seconds		105315	99503	1901	385586	262075	30921	2980	4719
Percentage calls answered within 90 seconds	> 80%	99.88%	97.76%	100.00%	93.38%	81.80%	100.00%	96.66%	100.00%

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

Customer Care Assessment	Benchmark	BSNL	Airtel	Sify	VSNL	RCOM	Hathway	You Telecom	Spectranet
Total Number of calls received		100	100	100	100	100	100	100	100
Total Number of calls answered within 90 seconds		100	100	74	100	100	100	100	59
Percentage calls answered within 90 seconds	> 80%	100.00%	100.00%	74.00%	100.00%	100.00%	100.00%	100.00%	59.00%

5. Bandwidth utilization

5.1 Audit results for Bandwidth Utilization

Bandwidth utilization	Benchmark	BSNL	Airtel	Sify	VSNL	RCOM	Hathway	You Telecom	Spectranet
No of Intra network found to be above 90%									
Total number of intra network links		166	952	400	16	64	7	NA	3
Total Bandwidth Available at the links (in Mbps)		166000	529823	14614	51392	81928	3400	NA	145
Total Bandwidth utilized at all the links during TCBH (In Mbps)		32447	8764	4620	28717.8	16152	213.82	NA	86
Percentage Bandwidth utilized	<80%	19.55%	1.65%	31.61%	55.88%	19.71%	6.29%	NA	59.31%
No of Intra network found to be above 90%		0	0	0	0	0	0	NA	0
International Bandwidth									
Total number of upstream links		280	1	20	5	19	4	2	1
Total International Bandwidth available from ISP Node to IGSP/NIXI/NAP (In mpbs)		43400	6444	2830	59726	39994	246.5	14	2
Total International Bandwidth utilized during peak hours		32370	5380	2355	26634	14129	214	11	0.5
Percentage Bandwidth utilization during peak hours (In mpbs)	<80%	74.59%	83.49%	83.22%	44.59%	35.33%	86.82%	78.57%	25.00%
No of Intra network found to be above 90%		0	0	0	0	0	0	0	0

Not meeting the benchmark

5.2 Live measurement results for Bandwidth Utilization

Bandwidth utilization	Benchmark	BSNL	Airtel	Sify	VSNL	RCOM	Hathway	You Telecom	Spectranet
Intra-network links (POP to ISP Node)									
Total number of intra network links		168	952	394	16	21	7	NA	3
Total Bandwidth Available at the links (in Mbps)		168000	530261	15813	51392	29928	3400	NA	145
Total Bandwidth utilized at all the links during TCBH (In Mbps)		30706	8739	4550	29451	11018	213.82	NA	85
Percentage Bandwidth utilized	<80%	18.28%	1.65%	28.77%	57.31%	36.82%	6.29%	NA	58.62%
No of Intra network found to be above 90%		0	0	0	0	0	0	NA	0
International Bandwidth									
Total number of upstream links		280	1	20	5	17	4	2	1
Total International Bandwidth available from ISP Node to IGSP/NIXI/NAP (In mpbs)		43400	6444	2730	10240	18049	246.5	14	2
Total International Bandwidth utilized during peak hours		32698	5617	2267	5629.13	6601	214	11	0.5
Percentage Bandwidth utilization during peak hours (In mpbs)	<80%	75.34%	87.17%	83.04%	54.97%	36.57%	86.82%	78.57%	25.00%
No of Intra network found to be above 90%		0	0	0	0	0	0	0	0

6. Broadband download speed

6.2 Live calling results for broadband download speed

Broadband download speed	Benchmark	BSNL	Airtel	Sify	VSNL	RCOM	Hathway	You Telecom	Spectranet
%age subscribed speed available to the subscriber during TCBH (B/A)*100	>80%	100.00%	100.00%	87.50%	88.24%	90.08%	89.49%	85.00%	89.92%

Not meeting the benchmark

7. Service availability/uptime

7.1 Audit results for service availability

Service Availability	Benchmark	BSNL	Airtel	Sify	VSNL	RCOM	Hathway	You Telecom	Spectranet
Total Operational Hours		126000	144870192	744	61008	744	744	2382660	692664
Total Downtime		30	12739	0	76	1.17	3	8494	5
Total time when the service was available		125970	144857453	744	60934	742.83	741	2374166	692659
Service Availability Uptime in Percentage	>98%	99.98%	99.99%	100.00%	99.88%	99.84%	99.60%	99.64%	100.00%

7.2 Live measurement results for service availability

Service Availability	Benchmark	BSNL	Airtel	Sify	VSNL	RCOM	Hathway	You Telecom	Spectranet
Total Operational Hours		12600	13964904	72	4704	72	72	232896	89064
Total Downtime		9	546	0	16	0.5	0.41	0	0
Total time when the service was available		12591	13964359	72	4688	71.5	71.59	232896	89064
Service Availability Uptime in Percentage	>98%	99.93%	100.00%	100.00%	99.66%	99.31%	99.43%	100.00%	100.00%

8. Network latency / Packet loss

8.1 Audit results for Latency and packet loss

Network Latency and Packet Loss	Benchmark	BSNL	Airtel	Sify	VSNL	RCOM	Hathway	You Telecom	Spectranet
Packet Loss (Percentage)	< 1%	0.40%	0.00%	0.00%	0.00%	0.42%	1.00%	0.20%	0.00%
Network Latency									
From user reference point at POP/ISP Node to IGSP/ NIXI (msec)	<120msec	16	51	45	54	39	80	26.4	4
From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec)	<350msec	219	268	300	213	222	320	268	NA

8.2 Live measurement results for Latency and packet loss

Network Latency and Packet Loss	Benchmark	BSNL	Airtel	Sify	VSNL	RCOM	Hathway	You Telecom	Spectranet
Packet Loss (Percentage)	< 1%	0.17%	0.00%	0.00%	0.00%	0.47%	0.10%	0.20%	0.00%
Network Latency									
From user reference point at POP/ISP Node to IGSP/ NIXI (msec)	<120msec	17	55.3	56	84	46	80	40	4
From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec)	<350msec	220	220	105	165	130	280	74	NA

Not meeting the benchmark

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

21.1 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: <=5 complaints per 100 subscribers Fault repair by next working day: >=90% and within 3 days: 100%, averaged over a quarter.
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.

3. 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 Period of applying credit/waiver/adjustment : In 100% of the cases within 1 week of resolution of complaint
Audit Procedure	IMRB Auditors to verify and collect data pertaining to - Number of Billing complaints received at the service provider's level - Last billing cycle stated should be such that due date for payment of bills must be beyond the date when this form is filled. - Include all types of bills generated for customers. This could include online as well as other forms of bills presentation including printed bills - Billing complaint is any of written complaint/ personal visit/ telephonic complaint related to: Excess metering/ wrong tariff scheme charged, Late receipt of bills/ Not received at all, Wrong name and address, Payment made in time but charged penalty/ not reflected in next bill, Last payment not reflected in bill, Adjustment/ waiver not done, Anything else related to bills, Toll free numbers charged etc. **Live calling : -** - 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 t he billing complaint. However, in some cases where number of billing complaints were less the sample size could not be achieved

4. Customer care promptness (Shifts and Closures)	
Computational Methodology	Shifts and closure requests
Benchmark	Shifting of telephone line : Less than 3 days Processing of closure request: Less than 7 days
Audit procedure	**IMRB Auditors collected and verified data pertaining to** **Shifting Request: (Following key points were taken care of while verifying the data)** - 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. **Processing of closure request (Following key points were taken care of while verifying the data)** - The operator includes all Requests for volunteer Permanent Closure and External (shifts to other exchanges) Shift requests received at their exchange. - DNP (due to Non – payment) cases are excluded - All holidays are excluded for calculating 7 days. - Closure requests attended in the previous months are excluded - The period for closure starts from the time of submission of application by the subscriber.

5. Response time to customer	
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 getting connected and answered: In 95% of the cases or more (ii) % age of calls answered by operator / voice to voice) within 60 seconds: In 90% of the cases or more

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. **Live calling: -** - 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.

6. 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 **Live calling : -** - 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)

7. 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] X 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

21.2 Cellular Mobile services

1. Accumulated Downtime of the Network	
Computational Methodology as per QoS definition	BTSs accumulated downtime (not available for service) shall basically measure the downtime of the BTSs, including its transmission links/circuits during the period of a month, but excludes all planned service downtime for any maintenance or software upgradation. **Computational Methodology:** • BTSs Accumulated downtime = Sum of downtime of BTSs in a month in hours i.e. total outage time of all BTSs in hours during a month X 100 --- 24 X No. of days in the month X No. of BTSs in the network in the licensed service area • Worst affected BTSs due to downtime = No. of BTSs having accumulated downtime >24 hours in a month X 100 --- Total No. of BTSs in the network in the licensed service area
Benchmark	• BTSs Accumulated downtime (not available for service) ≤ 2% • Worst affected BTSs due to downtime ≤ 2%
Audit Procedure	**IMRB** auditors collected and verified data pertaining to: The fault alarm details at the OMC (MSC) for the network outages (due to own network elements and infrastructure service provider end outages) used for arriving at the benchmark reported to TRAI were audit

2. Call Set-Up Success Rate (CSSR)	
Computational Methodology as per QoS definition	The ratio of calls established to total calls is known CSSR. Call Established means the following events have happened in call setup:- ↳ call attempt is made ↳ the TCH is allocated ↳ the call is routed to the outward path of the concerned MSC Computational Methodology: Calls Established / Total Call Attempts * 100
Benchmark	> 95%
Audit Procedure	**IMRB** auditors collected and verified data pertaining to ↳ 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. Network Congestion Parameters	
Computational Methodology as per QoS definition	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: ↳ SDCCH Level: Stand-alone dedicated control channel ↳ TCH Level: Traffic Channel ↳ POI Level: Point of Interconnect **Computational Methodology:** ↳ **SDCCH / TCH Congestion% = [(A1 x C1) + (A2 x C2) +…….+ (An x Cn)] / (A1 + A2 +…+ An)** ● 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 x C1) + (A2 x C2) +…….+ (An x Cn)] / (A1 + A2 +…+ An)** ● 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	**SDCCH Congestion: ≤ 1%** **TCH Congestion: ≤ 2%** **POI Congestion: ≤ 0.5%**
Audit Procedure	**IMRB Auditors collected and verified records pertaining to**: ↳ 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

4. Call Drop Rate	
Computational Methodology as per QoS definition	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 ↳ **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 **Computational Methodology:** Total Calls Dropped / Total Calls Established x 100
Benchmark	**≤ 2%**
Audit Procedure	**IMRB Auditors collected and verified records pertaining to**: ↳ 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

5. Connections with Good Voice Quality	
Computational Methodology as per QoS definition	Definition: ↳ 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 % **Computational Methodology:** ↳ **% Connections with good voice quality =** (No. of voice samples with good voice quality / Total number of samples) x 100
Benchmark	**≥ 95%**
Audit Procedure	**IMRB Auditors collected and verified records pertaining to**: Audit would be conducted based on the details of periodic drive tests conducted at different part of the network during Time consistent busy hour (TCBH) and used to arrive at the benchmarks reported to TRAI. Procedures that were to be followed by operator for obtaining relevant details for computing this parameter were audited ↳ Operator to conduct at least one 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 ↳ *Measurements using Engineering handsets were not acceptable* ↳ All the operators were not maintaining this data at the switch level

6. Service Coverage	
Computational Methodology as per QoS definition	Definition: ↳ The level of signal available in a particular part of a city is known as signal strength. **Computational Methodology:** ↳ Service Coverage for route type x = [(N1 x CSS1) + (N2 x CSS2) + …..+ (Nn x CSSn)] / (N1 + N2 +……..+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	**Indoor >= -75 dBm** **In-vehicle >= -85 dBm** **Outdoor – in city >= -95 dBm**
Audit Procedure	**IMRB Auditors collected and verified call centre records pertaining to**: ↳ 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:-

	➢ 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: – ➢ 3 Outdoor (Periphery of the city, Congested Area, Across the City), and ➢ 2 Indoor (Office Complex and Shopping Complex) ➢ *Measurements using Engineering handsets were not acceptable*

7. Response time to customer	
Computational Methodology	**To connect to Customer care:** The time taken to connect a person (as soon as he presses call) to the IVR of the service provider **To connect to operator:** The time taken to connect a person (as soon as he presses 9) to the customer care executive **Computational Methodology:** • % age of calls getting connected = Total number of calls getting connected X 100 / Total number of calls made • % age of calls answered within 60 sec (voice to voice) = Total number of calls answered within 60 seconds X 100 / Total number of calls made
Benchmark	➢ % age of calls getting connected and answered ≥ 95% ➢ % age of calls answered by operator (voice to voice) within 60 seconds ≥ 90%
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. **Live calling: -** - 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.

8.1 Billing complaints per 100 bills issued

Computational Methodology as per QoS definition	Billing complaints includes any of the following complaints related to billing from the point of view of customer: • 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.) **Billing complaints per 100 bills issued =** Total billing complaints** received during the relevant quarter / Total bills generated* during the relevant quarter * *All types of bills generated for customers i.e. printed bills, online bills and any other forms of bills generated are to be included* ** *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.*
Benchmark	< 0.1% billing complaints per 100 bills
Audit Procedure	**IMRB** auditors collected and verified data pertaining to - Number of bills generated - Number of billing complaints received - %age complaints per 100 bills

8.2 Resolution of billing complaints	
Computational Methodology as per QoS definition	**%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 *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.* *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.*
Benchmark	100% cases to be resolved within 4 weeks
Audit Procedure	**IMRB Auditors collected and verified data pertaining to** - Total number of billing complaints/bills disputed - Number of complaints resolved in 4 weeks **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 than100

Benchmark	100% cases in less than 1 week
Audit Procedure	**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.** **Operator to provide details of:-** • **Dates of resolution 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** **Also random live checks of all subscribers entitled for refund were conducted**

21.3 For Broadband services

1. Service provisioning/Activation time	
Computational Methodology as per QoS definition	Service provisioning time refers to the time taken from the date of receipt of an application to the date when the service is activated **Percentage connections provided within X working days** = No of connections provided within X working days/ Total number of connections registered during the period * 100 **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. 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.
Benchmark	100 % cases in =<15 working days.
Audit Procedure	**IMRB** auditors collected and verified data pertaining to -Number of applications received at the service provider's level -Number of connections provided within 15 days -Number of connections provided after 15 days **Live calling :** At least 10% of the subscribers who had requested for new connections in month prior to Audit were called to check whether connection was provided in 15 days

2. Fault repair/Restoration time	
Computational Methodology as per QoS definition	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 **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 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 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
Benchmark	By next working day: > 90% and within 3 working days: 99%
Audit Procedure	**IMRB** auditors collected and verified data pertaining to -Number of applications received at the service provider's level -Number of connections provided within 15 days -Number of connections provided after 15 days **Live calling :** At least 10% of the subscribers who had requested for new connections in month prior to Audit were called to check whether connection was provided in 15 days

3. Billing complaints per 100 bills issued	
Computational Methodology as per QoS definition	Billing complaints includes any of the following complaints related to billing from the point of view of customer: • 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.) **Billing complaints per 100 bills issued =** Total billing complaints** received during the relevant quarter / Total bills generated* during the relevant quarter * *All types of bills generated for customers i.e. printed bills, online bills and any other forms of bills generated are to be included* ** *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.*
Benchmark	< 2% billing complaints per 100 bills
Audit Procedure	**IMRB** auditors collected and verified data pertaining to - 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	**%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 *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.* *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.*
Benchmark	100% cases to be resolved within 4 weeks
Audit Procedure	**IMRB Auditors collected and verified data pertaining to** - Total number of billing complaints/bills disputed - Number of complaints resolved in 4 weeks **Live calling : -** **-Overall 100 number of live calls** are to be made in a licensed service area/circle for each service provider. However in certain cases the sample could not be achieved as bills disputed (prior to the month of Audit) were found to be less than100

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 time taken for operator to respond* >= n sec / Total number of calls where an attempt to route to the operator was made) x 100 Time taken for operator to respond = 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	**Live calling : -** -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	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 Service availability/Uptime = (**Total operational hours – Total Downtime hrs)*100 / Total operational hours** 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 Planned outages for routine maintenance of the system are excluded from the calculation of service availability/uptime
Benchmark	- 98%
Audit Procedure	**IMRB Auditors collected and verified call centre records pertaining to** -Total operational hrs -Total downtime hrs The above mentioned data was obtained and verified separately for three days in which the live measurement was carried out, Month in which audit was carried out Also, verification of old records was carried out

Packet loss	
Benchmark	<1 %
Audit Procedure **Computational Methodology as per QoS definition**	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 **IMRB Auditors collected and verified call centre records pertaining to** - Records maintained for ping tests conducted - Smoked ping test (wherever available) results - Results of live ping tests conducted during three day live measurement and month of Audit (During peak hours) The packet loss is measured by computing the percent packet loss of **1000 pings of 64 byte packet each** Live ping tests were conducting by selecting a minimum of three user reference test points at POP/ISP Node in each circle 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 Minimum sample reference points for each service area shall be three in number or multiple reference points if required **Hence Packet loss is computed by the formula - (Total number of ping packets lost during the period/Total number of ping packets transmitted)* 100**

Network Latency	
Computational Methodology as per QoS definition	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) 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 Minimum sample reference points for each service area shall be three in number or multiple reference points if required **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**
Benchmark	< 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 (Satellite)
Audit Procedure	**IMRB Auditors collected and verified call centre records pertaining to** - Records maintained for ping tests conducted - Smoked ping test (wherever available) results - 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

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