

DELHI LSA OADT Report

1. Introduction

The Operator Assisted Drive Test (OADT) of Delhi LSA was conducted from 15th to 19th March 2021 from 0900hrs to 1900hrs covering Central, North, South, East and West part of Delhi. This OADT activity was carried out with the assistance of Service Providers Airtel, MTNL, Vodafone Idea and Reliance JIO under supervision of officials from QOS Division of TRAI. The purpose of this OADT activity is to assess the Quality of Service by conducting field measurement over specified area, at street levels as well as in the congested markets, shopping malls, multi-level parking etc through walk tests which are normally not covered during the regular drive tests done by service providers. Conducting drive test in a specified area also rules out the averaging effect of the KPIs which is generally observed in the performance monitoring reports submitted by TSPs to TRAI quarterly. The OADT for adjoining NCR region could not be done in view of Delhi border sealing due to on-going Kisan agitation at border areas of Delhi state.

2. Activities planned

Following activities were planned for Delhi LSA OADT.

- i) Voice performance Testing
- ii) Data Testing [Stationary (hotspots) & Dynamic]
- iii) MOS testing.
- iv) Walk test for congested markets/ commercial complexes.
- v) Wireless data testing.
- vi) Static (hotspots) and dynamic Data testing, done for ftp/ site browsing/ video streaming & Latency tests.

- vii) TSP's used their internal server for FTP and site browsing Amazon/fliptkart/myntra and streaming was tested on Youtube (<https://www.youtube.com/watch?v=VeoHhkjV6qo>).
- viii) CSFB testing.
- ix) One Mobile handset was used for 2G (dedicated), one for 3G/4G in dual mode, one for dynamic data testing and two for MOS test.

In Delhi LSA OADT, around 500 KMs route, was drive tested for Voice and Data services in addition to the Walk tests. Stationary Data testing at 10 Hotspot locations and Walk test [approx. 15KMs] at 06 locations are also done, covering congested non-motorable locations. A total of 08 networks were drive tested [2G - Airtel, Vodafone-Idea, MTNL, 3G - Airtel, Vodafone-Idea, MTNL; 4G - Airtel, Vodafone-Idea, Reliance Jio].

Service Provider	2G	3G	4G
Airtel	Yes	No	Yes
MTNL	Yes	Yes	No
Reliance Jio	No	No	Yes
Vodafone-Idea	Yes	Yes	Yes

For Voice testing short call of 90 seconds durations were made with a wait time of 10 seconds. Dynamic Data testing was also carried out by putting the drive test tool to download a big size video file. Web streaming and browsing delays is also measured at specified web addresses.

3. Stationary Data Tests

The **Hotspots for Stationary Data testing** is conducted at following locations;

- 1) Union Public service Commission (UPSC)
- 2) Bengali Market
- 3) Lal Quilla Metro Station Gate no. 5
- 4) Sarojni Nagar Market
- 5) Heliport Rohini
- 6) MCD Parking Model Town
- 7) V3S Mall Nirman Vihar.
- 8) TRAI Office parking
- 9) Gaffar Market, Karol Bagh
- 10) Mall in Dwarka

4. Walk Test Locations

In addition to the drive tests, non-motorable congested markets, commercial complexes are also covered through walk **tests** at following locations.

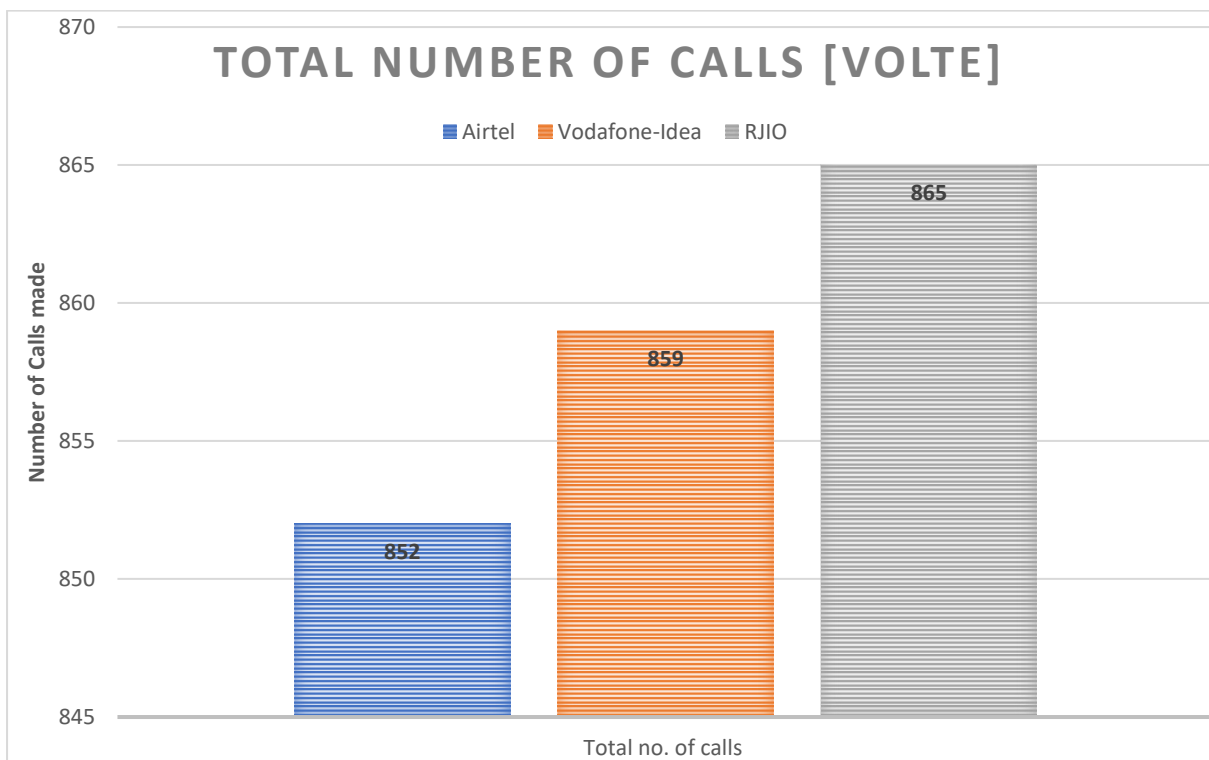
- 1) Lal Quilla Parking to Chandni Chowk market – Fatehpuri Masjid –
Lal Quilla Metro Station Gate.
- 2) Ashok Vihar Central Market
- 3) V3S Mall Nirman Vihar
- 4) Gandhi Nagar.
- 5) Gaffar Market, Karol Bagh.
- 6) City Centre Mall Dwarka

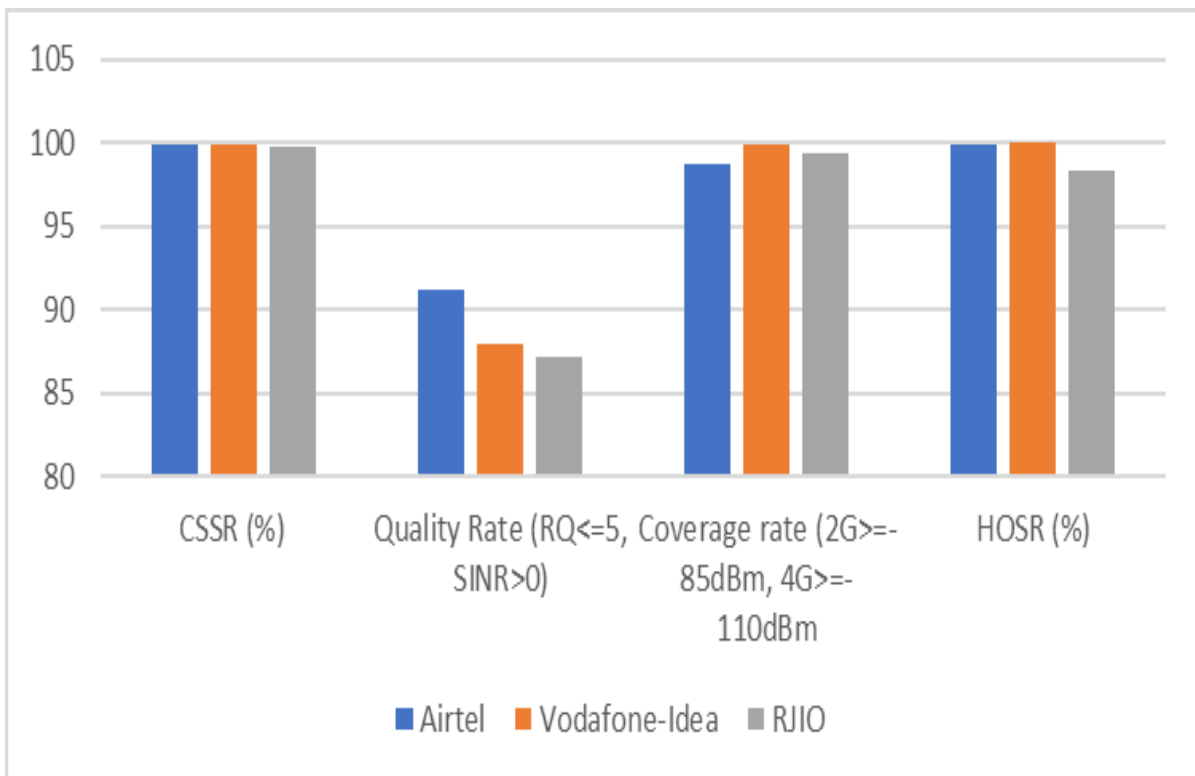
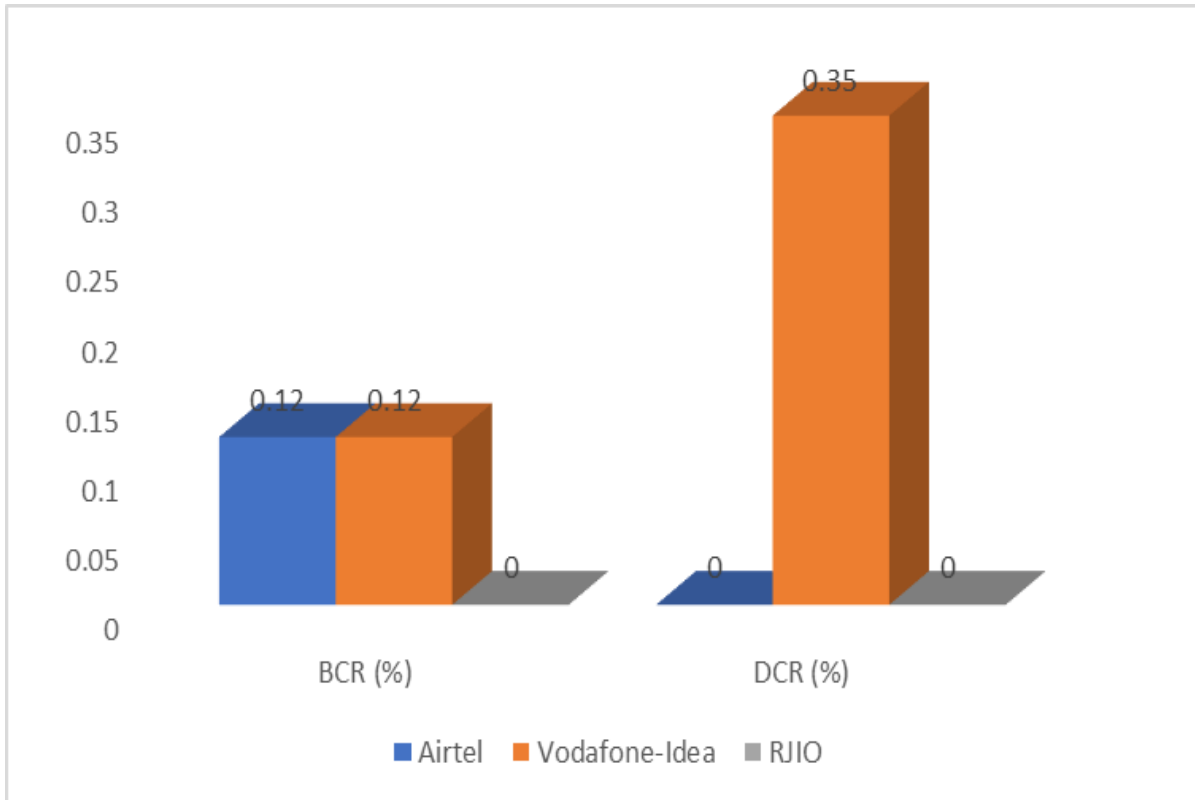
5. Observations

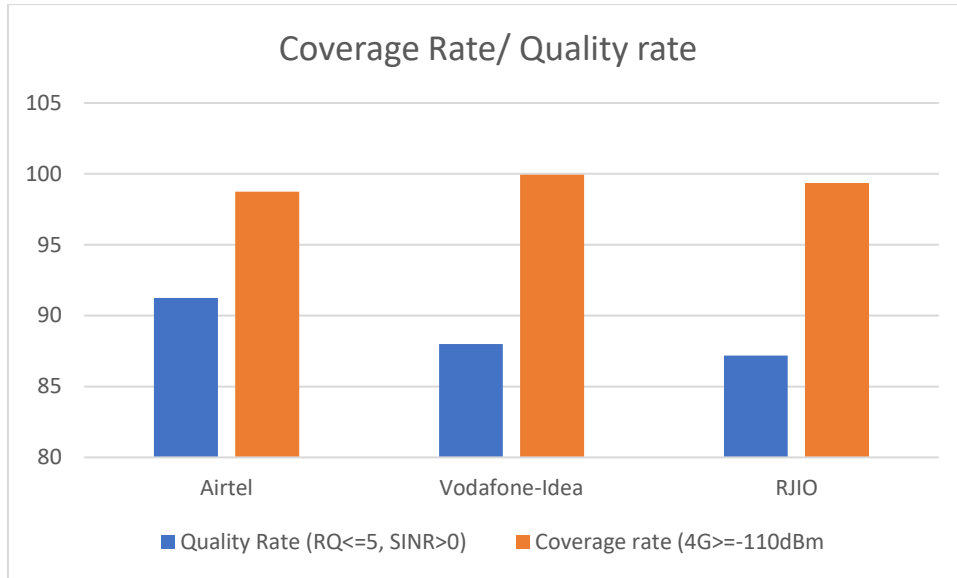
5.1 VOLTE Drive Call Statistics [4G]

Parameter	Airtel	Vodafone-Idea	RJIO
Total no. of calls	852	859	865
CSSR (%)	99.88	99.88	99.8
BCR (%)	0.12	0.12	0
DCR (%)	0	0.35	0
Quality Rate (RQ<=5, SINR>0)	91.24	87.99	87.19
Coverage rate (4G>=-110dBm)	98.75	99.95	99.35
HOSR (%)	99.84	100	98.40

Quality Benchmarks: CSSR>95%, DCR<2%, BCR<3%

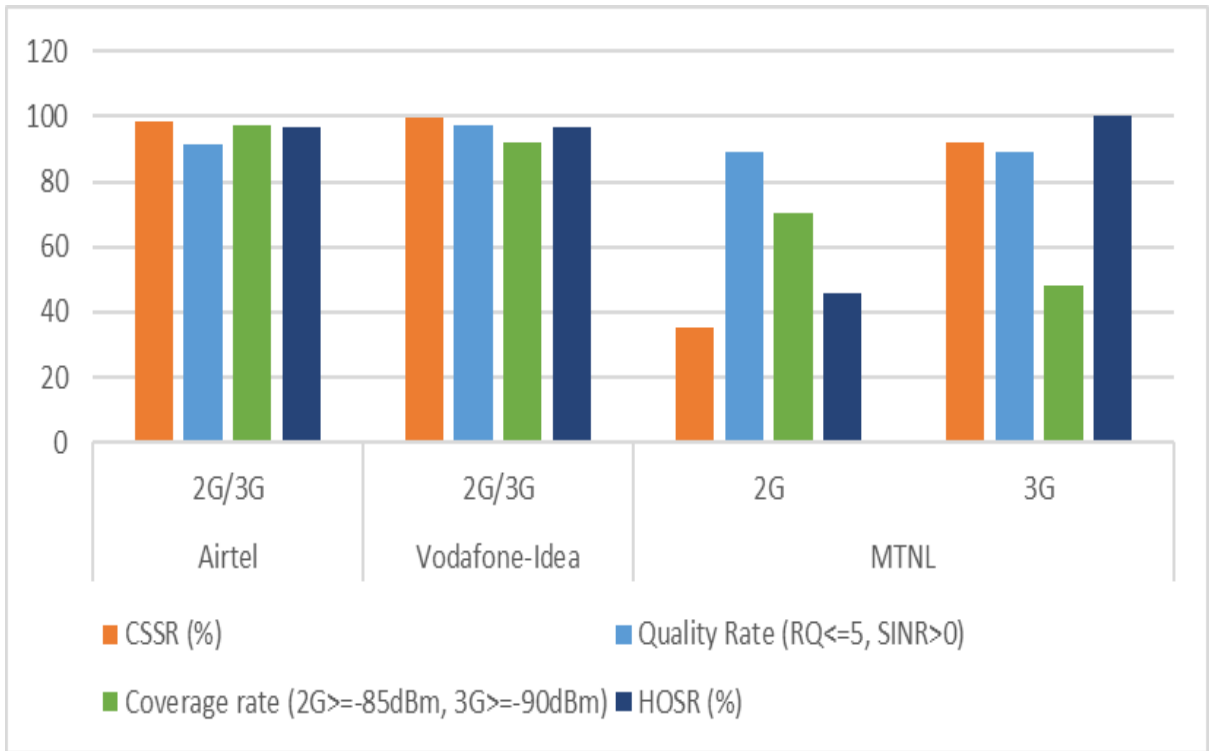
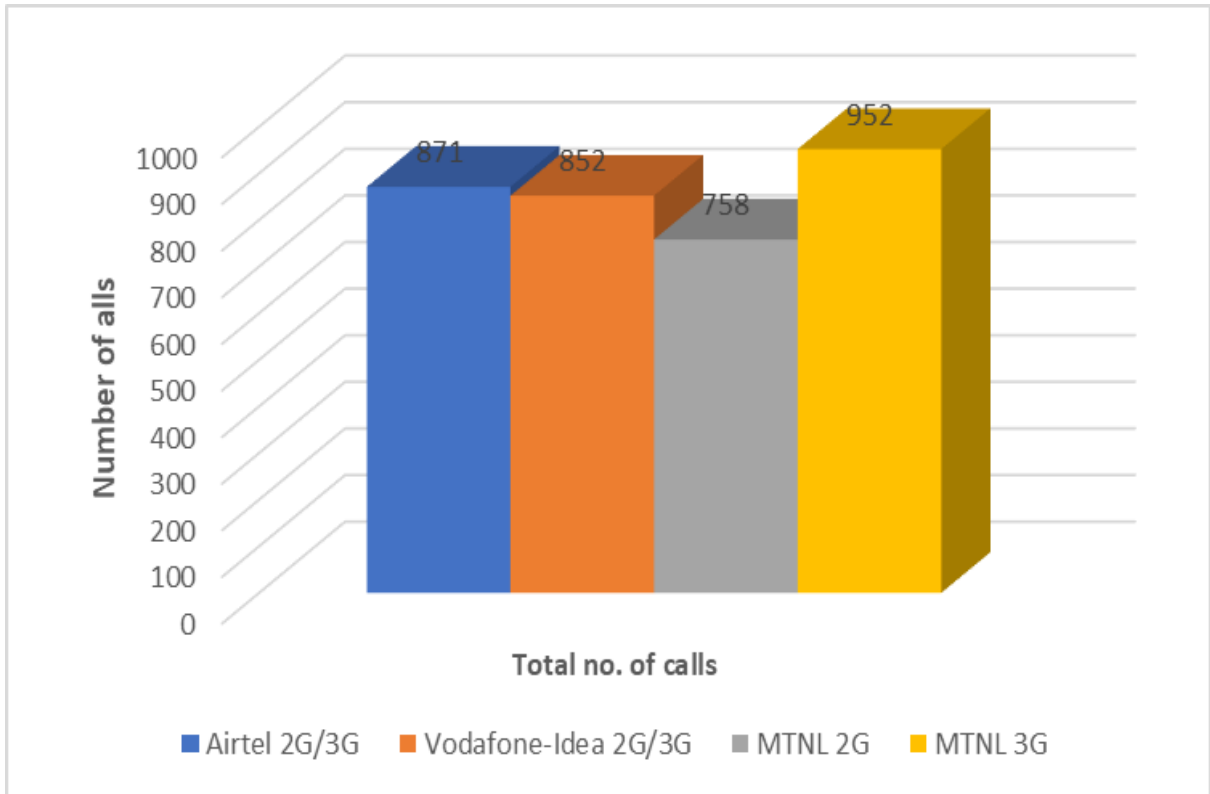


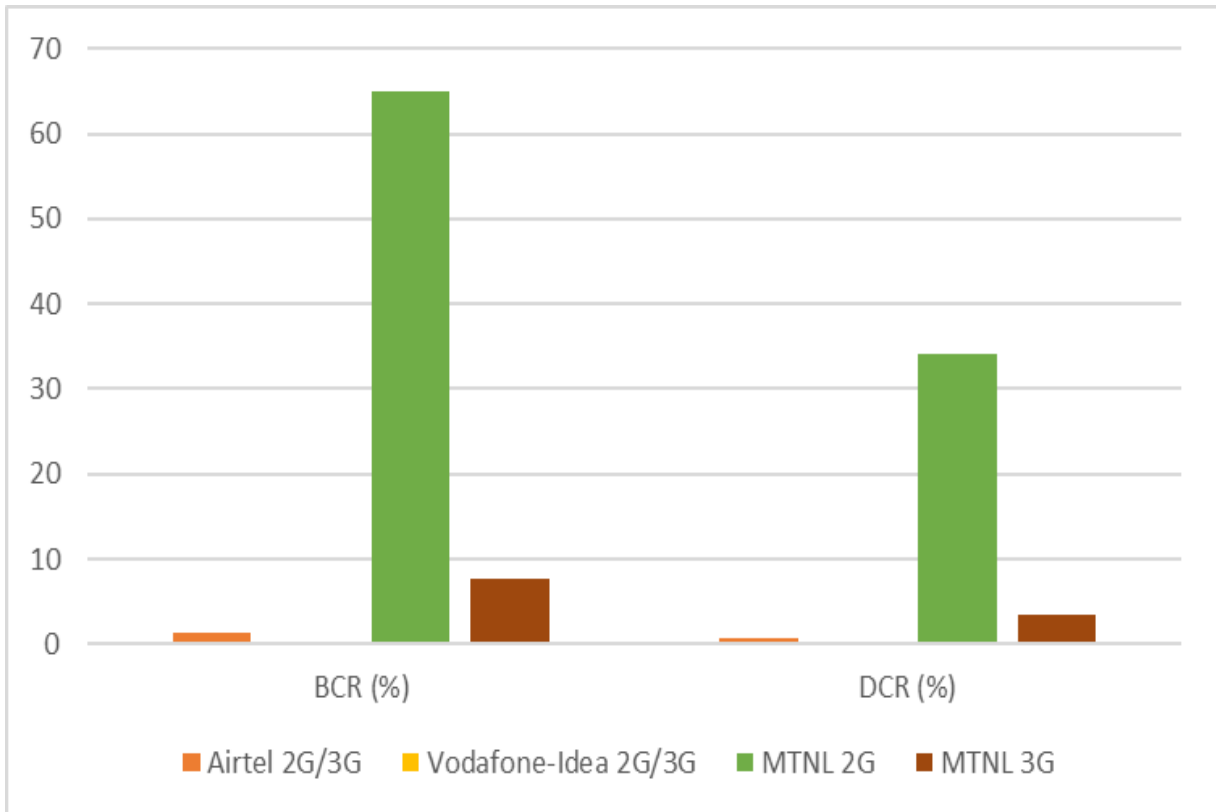




5.2 2G/3G Voice Call Performance

Parameter	Airtel	Vodafone-Idea	MTNL	
	2G/3G	2G/3G	2G	3G
Total no. of calls	871	852	758	952
CSSR (%)	98.62	99.77	35.09	92.23
BCR (%)	1.38	0.23	64.90	7.71
DCR (%)	0.8	0.35	34.21	3.41
Quality Rate (RQ<=5, ECNO>-14)	91.24	97.47	89.35	88.85
Coverage rate (2G>=-85dBm, 3G>=-90dBm)	97.12	91.89	70.42	47.94
HOSR (%)	96.85	96.70	45.65	100



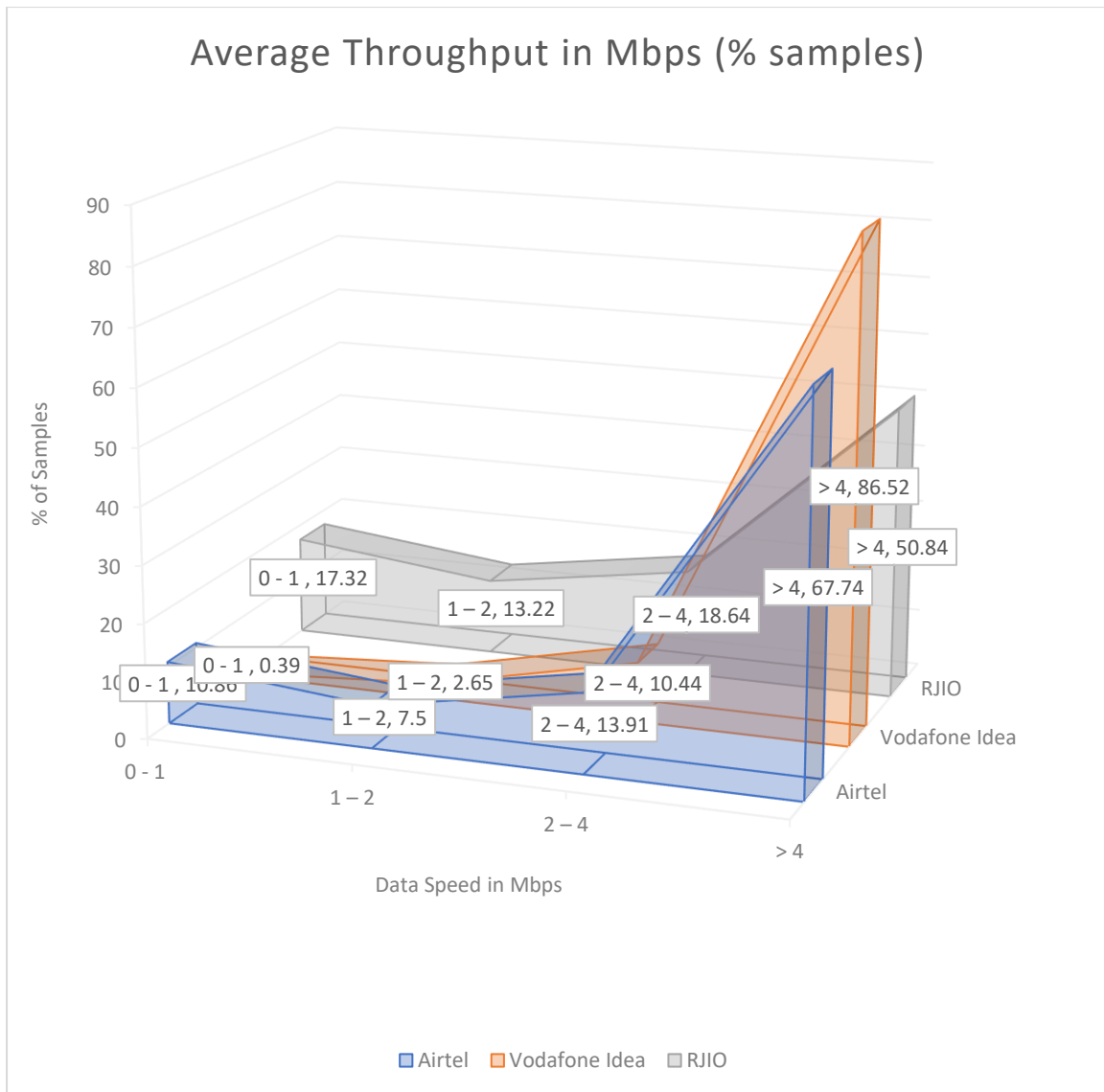


Benchmarks: DCR<2%, BCR<3%

5.3 Data Statistics [Dynamic]

Data Performance [VOLTE] Average Throughput in Mbps (% samples)

Average Throughput in Mbps	Airtel	Vodafone Idea	RJIO
0 - 1	10.86	0.39	17.32
1 - 2	7.50	2.65	13.22
2 - 4	13.91	10.44	18.64
> 4	67.74	86.52	50.84



MTNL Dynamic data performance [3G]:

Parameter	Throughput in Kbps
DL throughput(kbps)	1966.16
UL Throughput (kbps)	322.06
Web browsing Delay (Sec)	8.65
Web Streaming Delay (Sec)	0.44
Latency (msec)	134.26

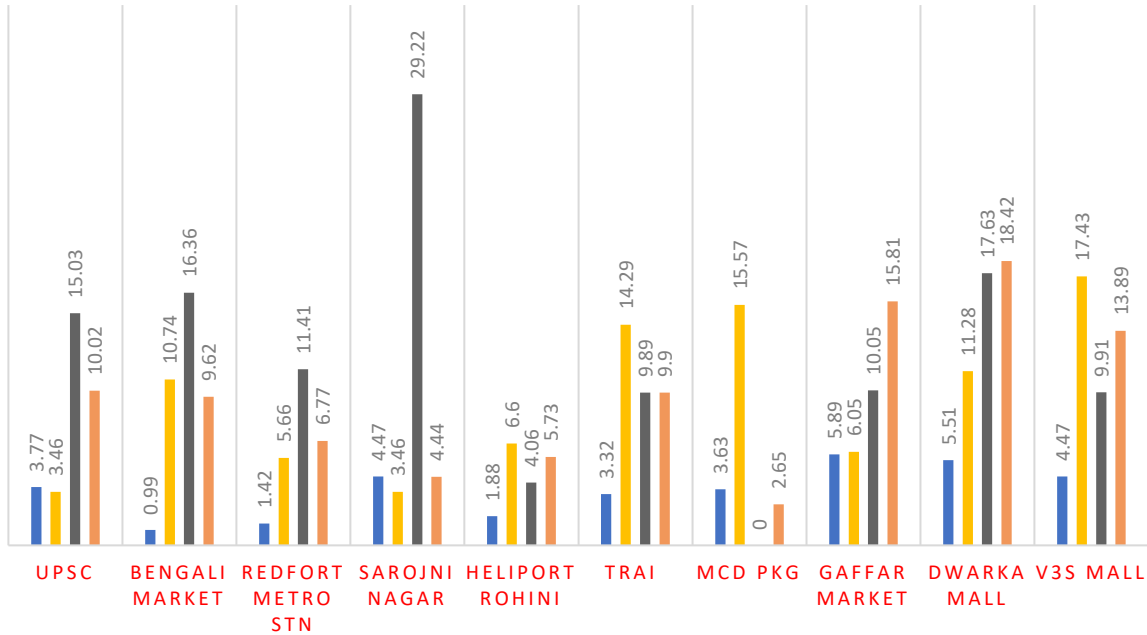
Stationary Data Statistics [Hotspots]

Operator	Parameter	UPSC	Bengali market	Red fort Metro Stn	Sarojni Nagar	Heliport Rohini
		1	2	3	4	5
MTNL	DL throughput	3.77	0.99	1.42	4.47	1.88
	UL throughput	0.99	0.14	0	1.75	1.91
	Latency	860	23	109	451	37
Airtel	DL throughput	3.46	10.74	5.66	3.46	6.60
	UL throughput	2.61	1.44	1.15	2.61	1.86
	Web Browsing Delay	2.79	8.99	2.49	2.3	2.28
	Web Streaming Delay	0.37	1.17	1.1	0.88	0.99
	Latency	20	19	20	20	26
VI	DL throughput	15.03	16.36	11.41	29.22	4.060
	UL throughput	6.67	1.73	6.002	17.71	7.090
	Web Browsing Delay	10.34	6.42	5.79	8.581	11.34
	Web Streaming Delay	1.56	0.72	1.51	0.78	0.80
	Latency	24	43	19	42	49
RJIO	DL throughput	10.02	9.62	6.77	4.44	5.73
	UL throughput	6.64	2.12	4.56	6.03	0.7
	Web Browsing Delay	3.48	3.14	3.52	4.28	3.8
	Web Streaming Delay	3.17	2.7	2.66	3.058	2.26
	Latency	42	31	39	49	33
Operator	Parameter	TRAI	MCD Pkg	Gaffar Market	Dwarka Mall	V3S Mall
		6	7	8	9	10
MTNL	DL throughput	3.32	3.63	5.89	5.51	4.47
	UL throughput	0.44	0.49	0.23	1.43	0.42
	Latency	24	24			298

Airtel	DL throughput	14.29	15.57	6.05	11.28	17.43
	UL throughput	3.99	0.419	3.47	10.05	8.59
	Web Browsing Delay	3.65	2.73	7.92	2.73	3.14
	Web Streaming Delay	0.69	1.1	2.86	1.1	1.3
	Latency	19	76	16	16	18
VI	DL throughput	9.890	12,20	10.05	17.63	9.91
	UL throughput	7.345	2.76	8.034	12.90	3.02
	Web Browsing Delay	8.75	8.25	5.54	7.22	6.57
	Web Streaming Delay	0.7	0.53	0.63	0,75	0.51
	Latency	19	40	19	25	19
RJIO	DL throughput	9.90	2.65	15.81	18.42	13.89
	UL throughput	3.31	4.4	1.59	6.25	4.93
	Web Browsing Delay	2.53	6.66	3.3	2.42	2.58
	Web Streaming Delay	1.6	2.3	3.22	2.48	1.4
	Latency	36	25	33	27	26

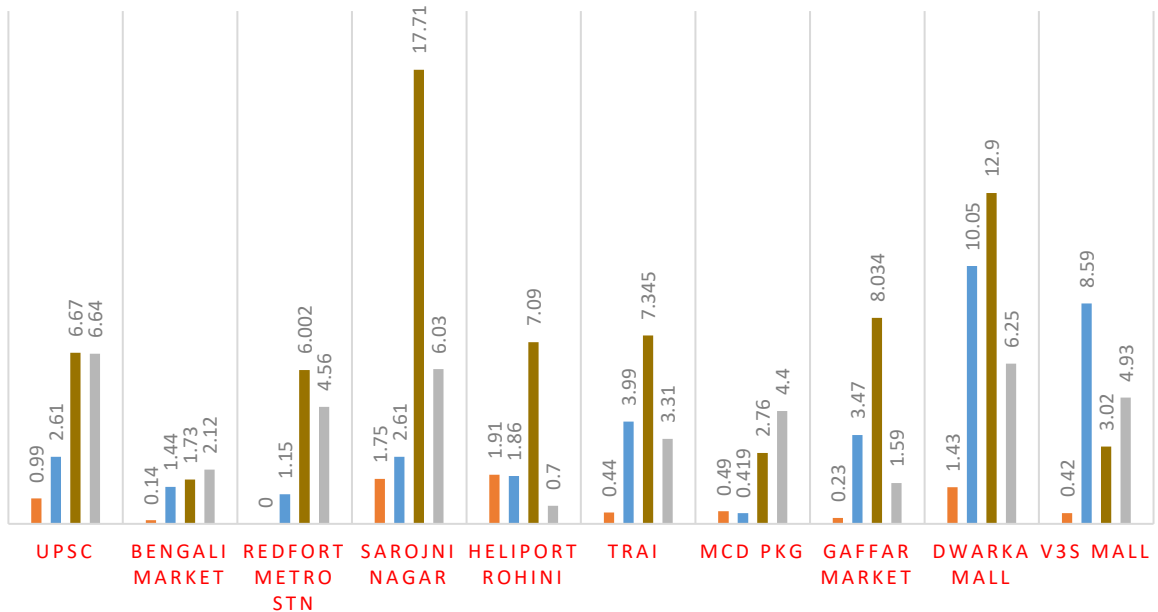
DOWNLOAD THROUGHPUT (MBPS)

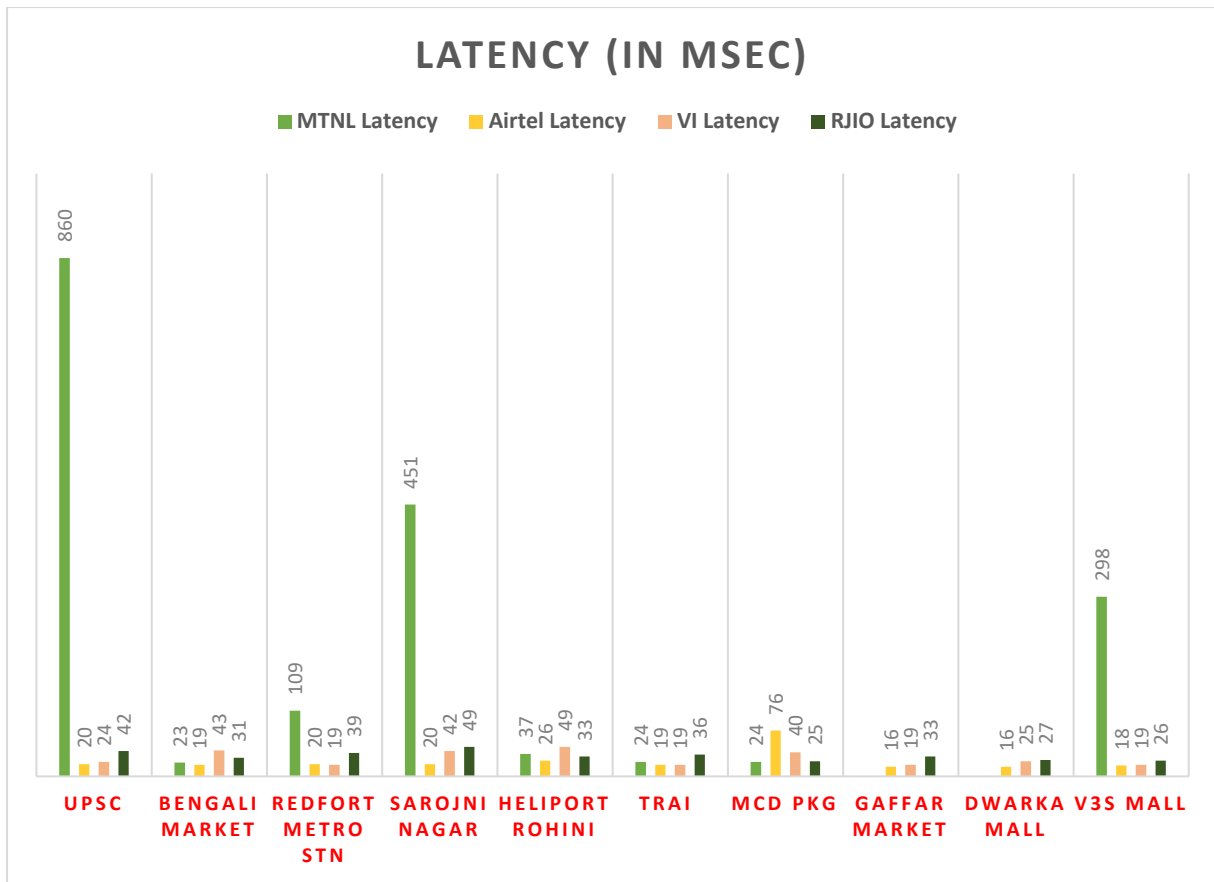
■ MTNL DL throughput ■ Airtel DL throughput ■ VI DL throughput ■ RJO DL throughput



UPLOAD THROUGHPUT (MBPS)

■ MTNL UL throughput ■ Airtel UL throughput ■ VI UL throughput ■ RJO UL throughput





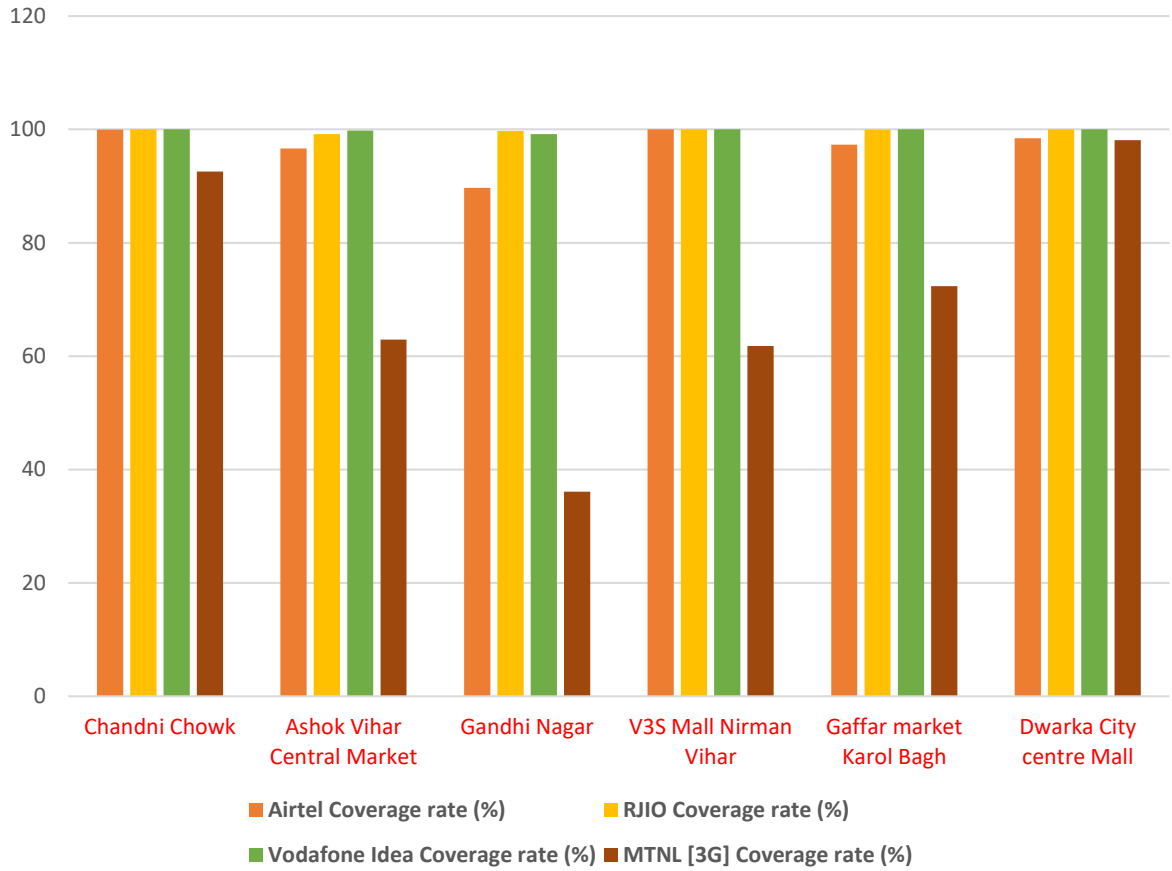
6. Walk Test Statistics

Voice Call Performance VOLTE/3G

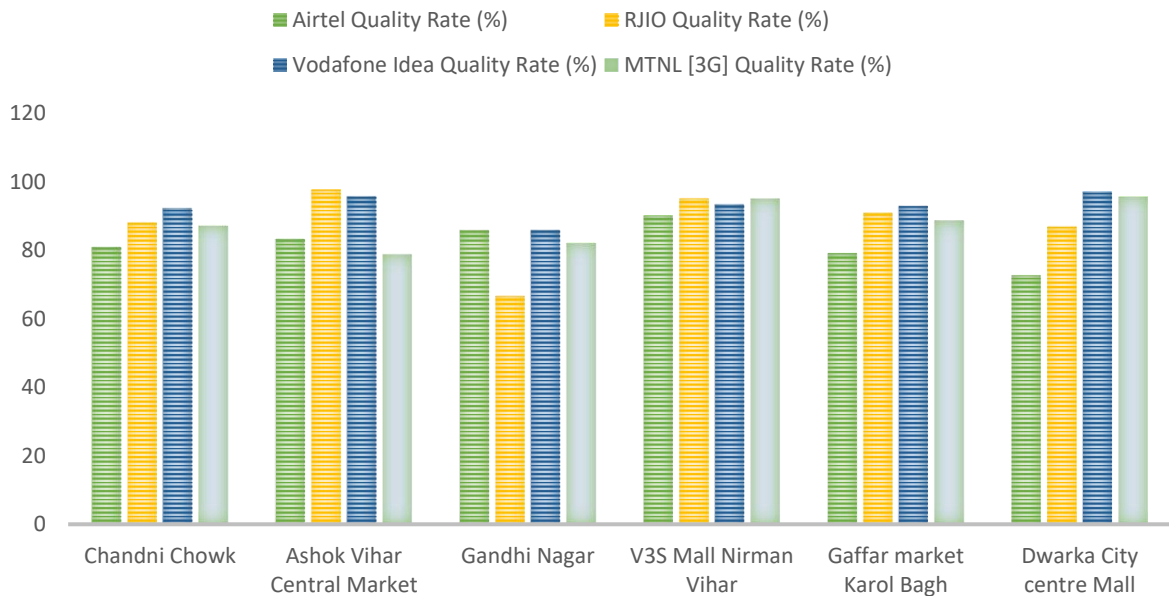
Service Provider	Parameter	Chandni Chowk	Ashok Vihar Central Market	Gandhi Nagar	V3S Mall Nirman Vihar	Gaffar market Karol Bagh	Dwarka City centre Mall
Airtel (VOLTE)	Quality Rate (%)	81.01	83.30	85.83	90.16	79.13	72.63
	Coverage rate (%)	99.95	96.61	89.69	100	97.30	98.45
RJO (VOLTE)	Quality Rate (%)	88.08	97.73	66.69	95.09	90.95	87
	Coverage rate (%)	100	99.17	99.74	100	99.96	100
Vodafone Idea (VOLTE)	Quality Rate (%)	92.17	95.63	85.81	93.35	92.88	97.08
	Coverage rate (%)	100	99.78	99.19	100	100	100
MTNL [3G]	Quality Rate (%)	87.06	78.72	82.05	95.03	88.69	95.58
	Coverage rate (%)	92.58	62.93	36.11	61.8	72.35	98.12

*Quality Rate : 4G SINR>0 Coverage rate : 4G RSRP>-110dbm
3G ECNO>-14 3G RSCP>-90 dBm

Coverage Rate [RSRP>-110dBm, RSCP>-90dBm]



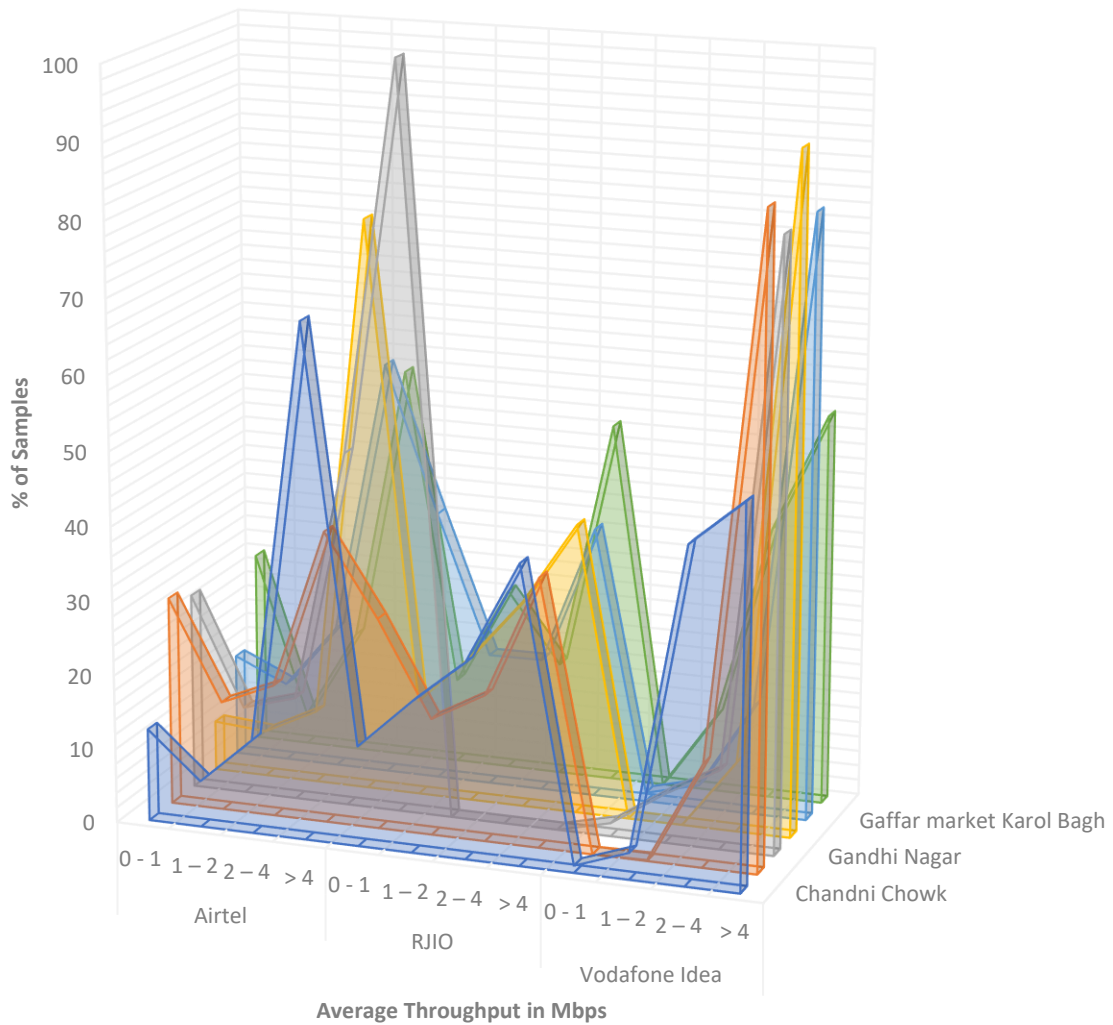
QUALITY RATE (%) [4G: SINR>0, 3G ECNO>-14]



Data Performance [VOLTE] Average Throughput in Mbps (% samples)

Service Provider	Average Throughput in Mbps	Chandni Chowk	Ashok Vihar Central Market	Gandhi Nagar	V3S Mall Nirman Vihar	Gaffar market Karol Bagh	Dwarka City centre Mall
Data Performance [VOLTE] Average Throughput in Mbps (% samples)							
Airtel	0 - 1	12.47	28.14	26.47	6.73	13.80	25.95
	1 - 2	6.21	14.73	11.76	6.19	10.63	4.12
	2 - 4	12.65	17.81	13.87	9.77	19.31	16.32
	> 4	68.67	39.32	47.90	77.31	56.27	53.61
RJIO	0 - 1	13.47	28.41	100	12.88	36.61	11.39
	1 - 2	20.21	15.72	0	19.79	17.87	24.68
	2 - 4	26.21	19.72	0	28.17	17.97	15.19
	> 4	40.04	36.15	0	39.16	36.61	48.73
Vodafone Idea	0 - 1	0.97	0	1.79	0	1.16	0
	1 - 2	3.59	0.13	6.64	0	3.08	10.44
	2 - 4	44.64	13.9	10.68	9.46	14.74	36.89
	> 4	50.79	85.96	81.09	90.54	81.02	52.67

Average Throughput in Mbps



	Airtel				RJIO				Vodafone Idea			
	0 - 1	1 - 2	2 - 4	> 4	0 - 1	1 - 2	2 - 4	> 4	0 - 1	1 - 2	2 - 4	> 4
Chandni Chowk	12.47	6.21	12.65	68.67	13.47	20.21	26.21	40.04	0.97	3.59	44.64	50.79
Ashok Vihar Central Market	28.14	14.73	17.81	39.32	28.41	15.72	19.72	36.15	0	0.13	13.9	85.96
Gandhi Nagar	26.47	11.76	13.87	47.9	100	0	0	0	1.79	6.64	10.68	81.09
V3S Mall Nirman Vihar	6.73	6.19	9.77	77.31	12.88	19.79	28.17	39.16	0	0	9.46	90.54
Gaffar market Karol Bagh	13.8	10.63	19.31	56.27	36.61	17.87	17.97	36.61	1.16	3.08	14.74	81.02
Dwarka City centre Mall	25.95	4.12	16.32	53.61	11.39	24.68	15.19	48.73	0	10.44	36.89	52.67

7. CSFB Testing

Circuit Switched Fall Back is a technology wherein the Voice and SMS services are delivered over the LTE network. This is done utilizing GSM, or any other circuit switched network. It is one of the much-needed services in an LTE network because LTE cannot handle the circuit switched calls. Circuit Switched Fall Back (CSFB) testing is done to measure and report call set up delays. As per the regulation, the measurements are to be taken by the access providers in every quarter of the year and report to Trai and these measurements to be made in various locations of the identified cities or districts in the service area.

In this OADT activity also CSFB testing is done by M/s Airtel and M/s Vodafone Idea and same are as below;

Service Provider	No. of Locations tested	MO Call setup time	MT Call Setup time
Airtel	30	3.14 sec	1.96 sec
Vodafone-Idea	15	3.86 sec	2.99 sec

8. Wireless Data Testing

Wireless data testing activity is also carried out as per QOS regulations during this OADT activity at 200 locations and following are the service provider's performance during the tests;

TSP	Successful Data Transmission download attempts (%)			Successful Data Transmission upload attempts (%)			Minimum download speed (Kbps)			Avg Throughput (Mbps)		
	2G	3G	4G	2G	3G	4G	2G	3G	4G	2G	3G	4G
Airtel	98.04	-	100	99.05	-	99.50	114.39	-	12166.37	0.117		16.86
VI	97.5	100	100	100	100	100	127	2896	6378	0.201	6.488	18.64
RJIO	-	-		-	-		-	-		-		24.46

9. Comparison with PMR:

The quality KPIs measured during drive tests were compared with the previous quarter Performance Monitoring Reports (PMRs) submitted by service providers and it is found that the KPI's viz. CSSR, DCR, SDCCH/ RRC congestion are well within the specified benchmarks except for MTNL 2G & 3G service KPI's CSSR, BCR & DCR are flouting the quality benchmarks.

It is worth to note that the PMRs submitted by the service provider reflects the performance of a service providers for a technology over complete Licensed Service Area (LSA) whereas in drive tests the outside street level KPIs are captured over a smaller area and their comparison may not yield same results/ true picture of the QoS perceived by the service consumers.

10. Observations w.r.t. illegal Radio equipment:

Service Providers have reported the use of repeaters/ coverage boosters in several locations especially in congested markets, basements etc and this is badly affecting the network performance. They often issue notices to the premise's owner for its removal and sometimes the owners do accept to their requests, but its rampant use is affecting the performance of mobile networks adversely.

11. TSPs Comments on the deficiencies observed during drive test and Action taken/ proposed to rectify

TSPs were asked to comment upon the shortcomings observed and the action taken/ proposed to rectify the deficiencies, the responses are as below;

Airtel: Airtel has observed six patches of poor coverage during the OADT activity and did the optimization activity on the serving/ neighbouring sites. The issue was resolved at one location and at three locations new site is planned and for remaining one location further solution is being explored. Airtel also observed call drop at seven locations and it improved after the optimization activity.

Vodafone-idea: VI in response submitted the following as action taken for the OADT done in March 2021;

S.No	Major problematic area	Action taken/planned
1	Ridge Road	High intersite distance, site acquisition is issue in the Ridge Road area
2	Gandhi Nagar	There are 2 sites where height of the antennae to be increased, also there is interference in the area near site R3793
3	Model Town	High external interference causing accessibility and retainability issues
4	Adhchini Market	Sector Swap found, optimized and improved
5	Bikaner House	Post sites relocation, optimization done, and No call drop, or blocking observed after the shifting of the sites R2072
6	West Punjabi Bagh	Coverage patch, high inter site distance, new site already planned

RJIO: In order to ensure highest level of customer satisfaction, following measures have been taken to further improve the network connectivity.

- i) To Improve the Coverage, Capacity and Quality of JIO Network, we have upgraded spectrum of 2300/1800/850 Band during the period April to Sept 2021.
- ii) Additionally, Network is being continuously monitored and Network Optimization is done on continuous basis to improve network performance.
- iii) More than 2000 solutions have been added in the drive cities and from Apr'21 till date, and more than 1000 are pipelined in upcoming months.

MTNL:

i) The call drops noticed during drive tests were primarily due to large inter-site distance (550M to 1400M) and MTNL has noted them and shall plan additional sites in next phase of expansion.

ii) Due to extremely low volume of 2G traffic & better customer experience for data services in 3G service, further expansion activity in 2G is not being carried out at present, however efforts are being made to optimize the 2G coverage with existing infra & HW equipment.

iii) MTNL is making sincere efforts to observe healthy status of existing BTS/Node-Bs despite of severe financial crunch. Also drive tests are being conducted time to time and on need basis for the optimization of sites to clear coverage deficiency.