



Operator Assisted Drive Test Report

Karnal City

24th Aug to 25th Aug 2023

By

TRAI Regional office Jaipur

Key Performance Indicators: All TSPs have met the Drop Call Rate (DCR) benchmark of 2%. All TSPs have met the Call Setup Success Rate (CSSR) of 95%.

The Operator Assisted Drive Test has been carried out by Regional Office, Jaipur with the help of Service Providers in Karnal City and surrounding areas from 9:00 AM to 8:00 PM during 24th Aug 2023 to 25th Aug 2023. The drive test covered drive route of 220 KMs & 6 no. hotspots over a period of 2 days. Approximately 220 calls were made for each of the TSPs networks: three 2G networks, one 3G networks and three LTE /5G networks covering four TSPs.

Overview

Voice Summary

Data Summary

Overview

Regional Office, TRAI Jaipur conducted Operator Assisted Drive Test from 24th to 26th Aug 2023 covering Karnal and surrounding areas. The performance of Airtel, BSNL, Vodafone Idea and Jio was monitored across various technologies (2G, 3G and 4G). The test results obtained from these drive tests were utilized to assess the network quality for Voice and Data services.

Voice: Coverage, Quality, Handover Success Rate, Call Setup Success Rate, Drop Call Rate and Block Call Rate.

Data: Download Throughputs, Upload Throughputs, Web Browsing Delay and Latency.

Drive Test Details :

Voice Tests: Calls were made for 90 sec duration with a wait time of 10 sec between calls in all technologies. The drive test covered a drive route of approximately 220 KMs. Approximately 200 calls were made for each of the TSPs networks: three 2G (Lock Mode) networks, One 3G (Dual mode) networks and three VoLTE networks covering 4 unique TSPs.

Data Tests:

Dynamic data test was conducted for 103 kms for download throughput in all technologies.

2G – measurement – UE Locked in 2G file size- 500KB

3G – measurement – UE in 3G File Size- 20MB

4G – measurement – UE in LTE File Size- 40MB

Static data tests on 6 hotspots

1. Hotel Jewels
2. Kalpna Chawla Main Gate
3. Old Bus Stand Karnal
4. Railway Station Karnal
5. Namastey Chowk Karnal
6. Sector 6 Market Karnal

Service	Specifications
Download	2G (Locked) - 500KB, 3G (Dual) - 20 MB, 4G (Free) - 40 MB
Upload	2G (Locked) - 100KB, 3G (Dual) - 5 MB, 4G (Free) - 10 MB
Web Browsing	3 links of e/m commerce website www.amazon.in, www.flipkart.com and PayTm
Latency	32 Bytes on www.google.com

Overview

Voice & Dynamic Data Test Drive Route



Date	Test Scenario	Area to be Covered
24.08.2023	Data Hot Spots- 2G/3G/4G/5G Static Data Tests	Starting Hotel Jewels, Kalpna Chawla Main Gate, Old Bus Stand Karnal, Railway Station Karnal, Namastey Chowk Karnal, Sector 6 Market Karnal
25.08.2023	2G/3G/4G Voice and 3G/4G/5G Dynamic	Starting Point Hotel Jewels-Old Bus Stand-Clock Tower Chk-Ghoda Chk-Meera Ghati Chk-Novelty Rd-Clock Tower Chk-Railway Stn-Shiv Colony Fly Over-Central Jail-Nehar Rd-CSSRI toward Kachwa Rd-Ram Ngr Fly over-Minar Rd-NDRI Chk-Kalpna Chawla-Sec12 to M/T Rd-ITI-Sec9-Sec8-Sec7-Anaj Mandi-Sec3-Doon Valley Rd-Chand Sarai-Gogripur Fly over-Shiv Colony Fly Over-Ram Ngr-Gogripur Chk-Brahmanand Chk-Namastey Chk-Meera Ghati Rd-Tau Devi Lal Chk-Nagla Chk-Sec6-Sec5-Namastey Chk-Sec14-Sec13-Mugal Canal-Kunjpura Rd-M/T-Hotel Jewels

Overview

Data Service Test- Static Locations



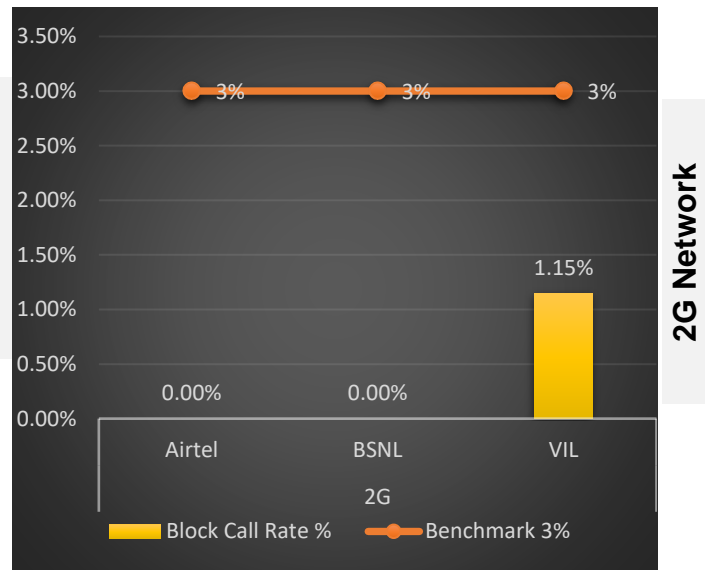
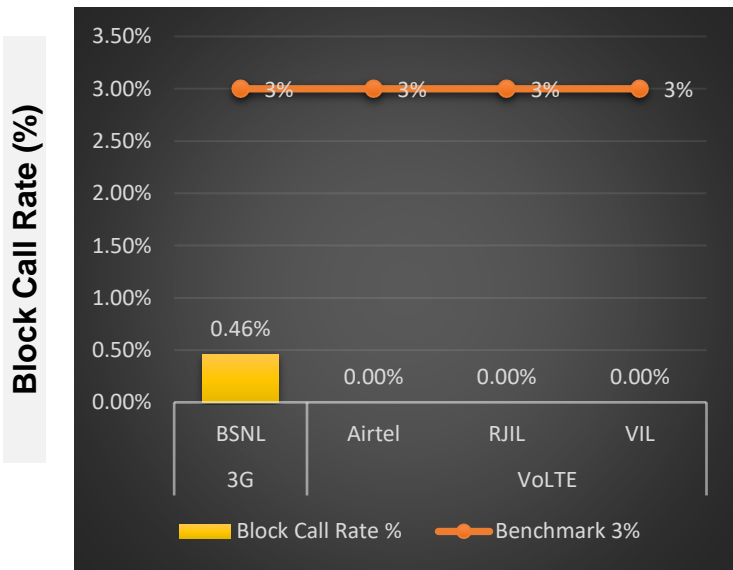
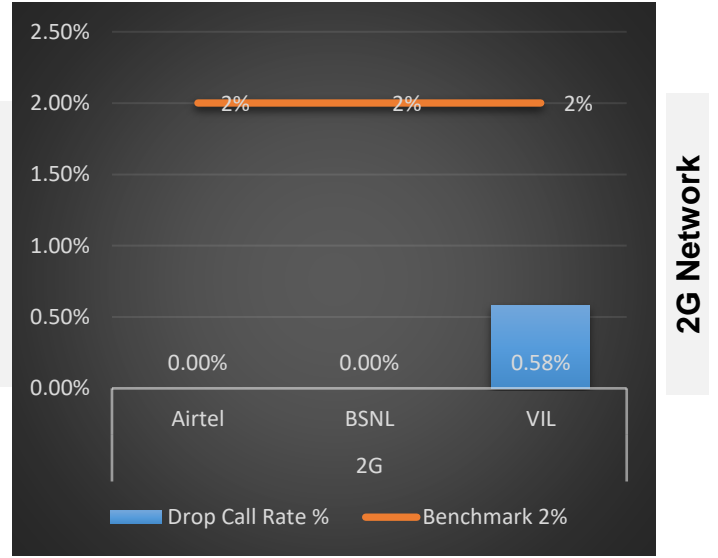
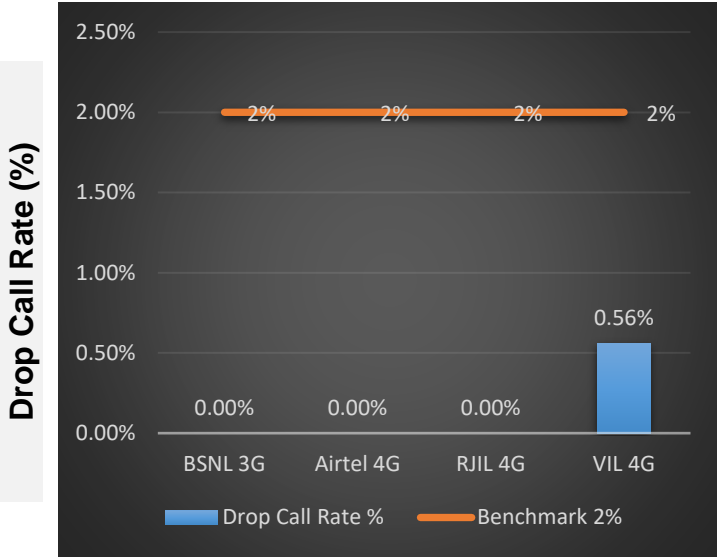
Hotspot Locations

- | | |
|----|-------------------------|
| 1) | Hotel Jewels |
| 2) | Kalpna Chawla Main Gate |
| 3) | Old Bus Stand Karnal |
| 4) | Railway Station Karnal |
| 5) | Namastey Chowk Karnal |
| 6) | Sector 6 Market Karnal |

Voice Calls

Key Observations

QoS compliance of the TSPs in karnal City for Voice across technologies 2G/3G/4G-VoLTE



KPIs	2G			3G	4G		
	Airtel	BSNL	VIL	BSNL	Airtel	RJIL	VIL
Drop Call Rate %	0.00%	0.00%	0.58%	0.00%	0.00%	0.00%	0.56%
Block Call Rate %	0.00%	0.00%	1.15%	0.46%	0.00%	0.00%	0.00%

- a) All TSPs have met the 2% QOS benchmark of Drop Call Rate (DCR%).
- b) Call Block Rate (CBR%) benchmark of 3% was achieved by all TSP's.

Voice Calls

Key Observations

Coverage

a) Percentage of coverage samples for 2G \geq -85 dBm.

TSPs	2G		
	Airtel	BSNL	VIL
Coverage %	99.88%	93.24%	90.00%

b) Percentage of coverage samples for 3G \geq -90 dBm

TSPs	3G
	BSNL
Coverage %	93.87%

c) Percentage of coverage samples for LTE \geq -110 dBm.

TSPs	VoLTE		
	Airtel	JIO	VIL
Coverage %	99.77%	99.84%	100.00%

d) Percentage of time spent on 3G/4G network

TSPs	3G	VoLTE		
	BSNL	Airtel	JIO	VIL
Time spent on 3G/4G Network %	87.71%	100.00%	100.00%	100.00%

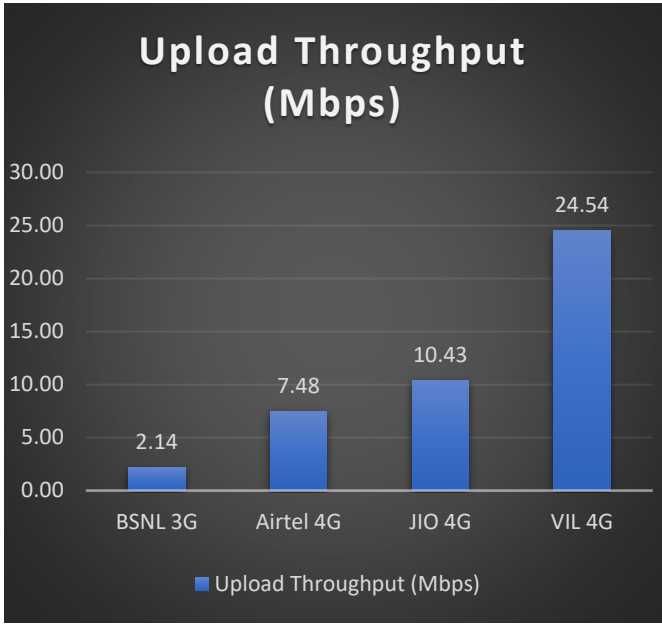
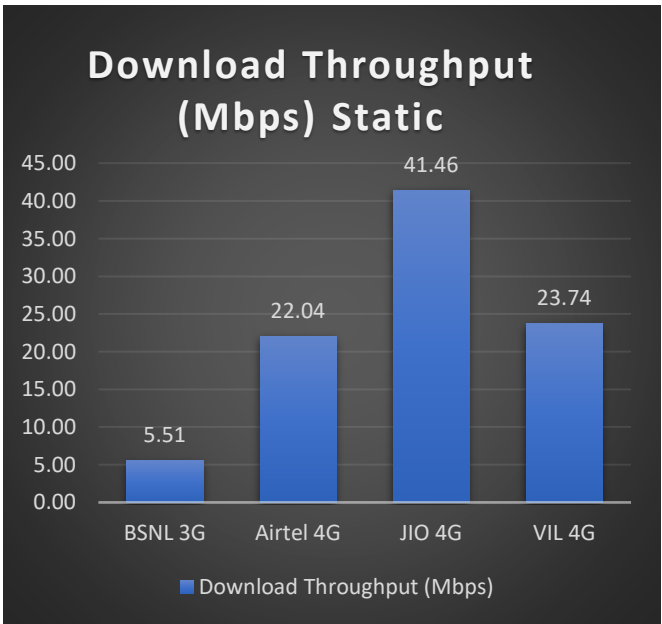
Data Services Static

Key Observations

Data was tested at 5 locations .Following services were tested: Data Download/Upload, Latency (www.google.com), and Web browsing (Flipkart, Amazon, Paytm)

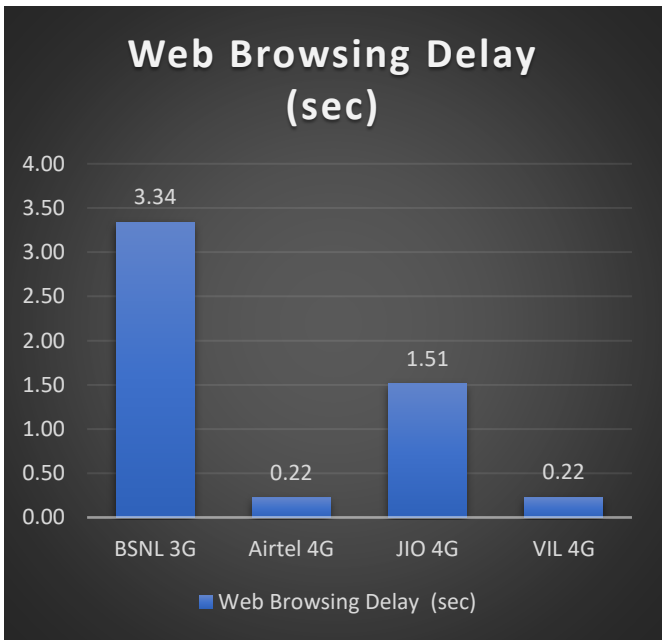
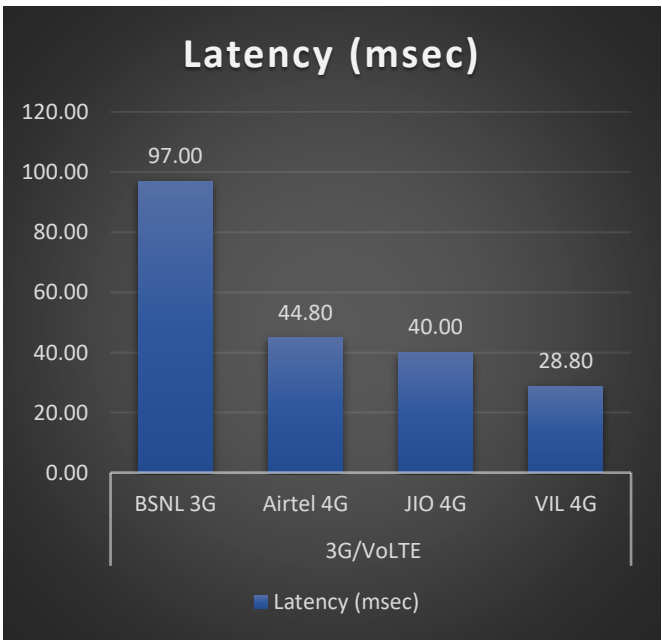
Data Download and Upload Performance Static (Mbps)

3G/4G/ Network:



Latency (ms)

Web Browsing (Sec)



Data Services Dynamic

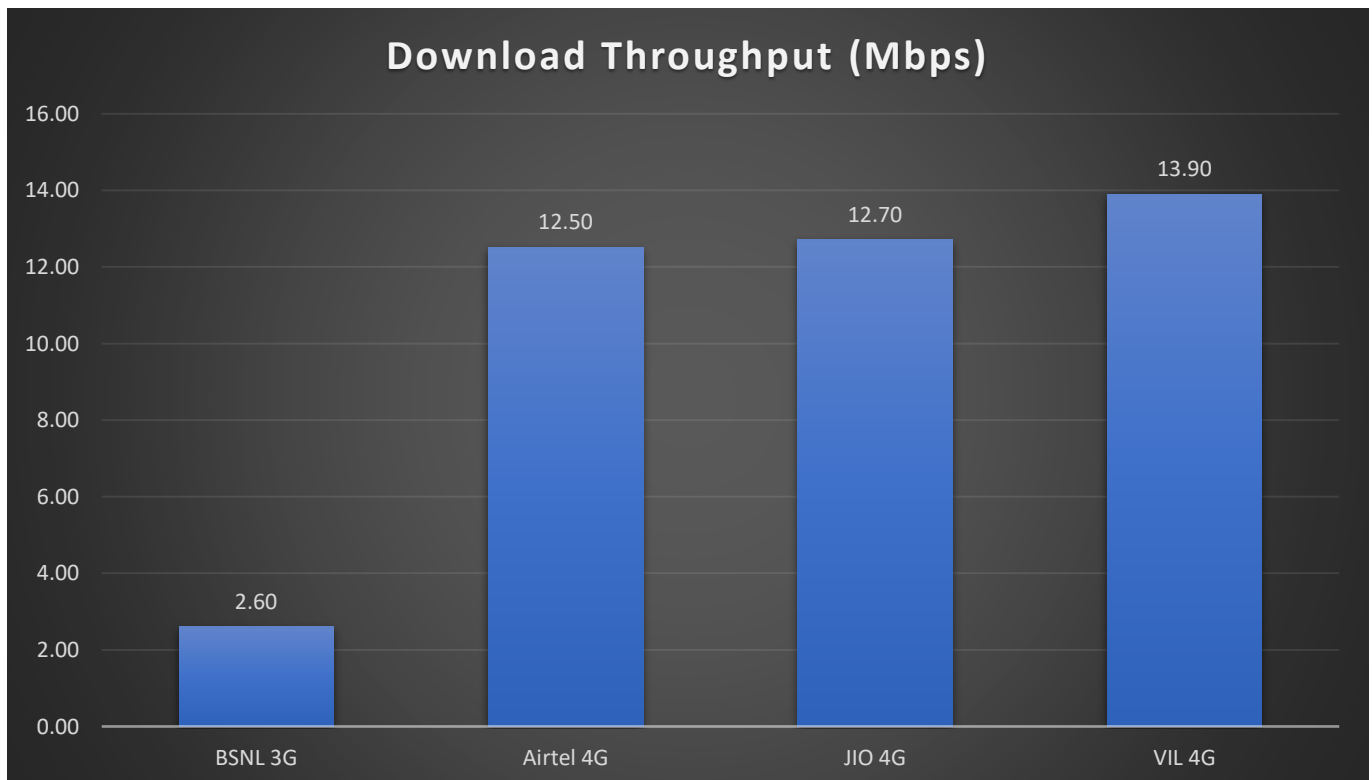
Key Observations

Dynamic Data was tested for whole voice route. Download Throughput was tested.

Data Download Performance (kbps) - Dynamic

3G/4G/ Network:

Data Services Dynamic	3G/VoLTE			
	BSNL 3G	Airtel 4G	JIO 4G	VIL 4G
Download Throughput (Mbps)	2.60	12.50	12.70	13.90



Summary

City Level Summary-Voice

Voice Call	2G		
	Airtel	BSNL	VIL
Call Attempt	222	215	174
Blocked Call Rate (%)	0.00%	0.00%	1.16%
CSSR% (Accessibility)	100.00%	100.00%	98.84%
Drop Call Rate (%)	0.00%	0.00%	0.58%
Mobility HOSR (%)	99.53%	100.00%	99.26%
Rx Quality (%)	95.06%	95.87%	95.26%
Average CST Sec	3.79	2.70	5.07

Voice Call	3G/VoLTE			
	BSNL 3G	Airtel VoLTE	JIO VoLTE	VIL VoLTE
Call Attempt	216	225	171	178
Blocked Call Rate (%)	0.46%	0.00%	0.00%	0.00%
CSSR% (Accessibility)	99.54%	100.00%	100.00%	100.00%
Drop Call Rate (%)	0.00%	0.00%	0.00%	0.56%
Mobility HOSR (%)	99.94%	99.08%	99.66%	99.31%
Rx Quality (%)	88.55%	96.00%	91.74%	85.00%
Average CST Sec	2.40	1.40	0.52	2.75

Summary

City Level Summary- Data Services

Data Services Static	2G		
	Airtel	BSNL	VIL
Download Throughput (kbps)	173.28	NA	89.22
Upload Throughput (kbps)	83.38	NA	83.34
Web Browsing Delay (sec)	0.47	NA	0.69
Latency (msec)	245.80	NA	183.40

Data Services Static	3G / 4G			
	BSNL 3G	Airtel 4G	JIO 4G	VIL 4G
Download Throughput (Mbps)	5.51	22.04	41.46	23.74
Upload Throughput(Mbps)	2.14	7.48	10.43	24.54
Video Streaming Delay (sec)	-	0.43	0.37	0.40
Web Browsing Delay (sec)	3.34	0.22	1.51	0.22
Latency (msec)	97.00	44.80	40.00	28.80

<u>Hotel Jewels</u>	2G		
	Airtel	BSNL	VIL
Download Throughput (kbps)	199.40	NA	102.00
Upload Throughput (kbps)	91.90	NA	77.30
Web Browsing Delay (sec)	0.60	NA	0.40
Latency (msec)	235.00	NA	184.00

<u>Kalpna Chawla Main Gate</u>	2G		
	Airtel	BSNL	VIL
Download Throughput (kbps)	141.00	NA	68.00
Upload Throughput (kbps)	81.00	NA	93.40
Web Browsing Delay (sec)	0.38	NA	0.82
Latency (msec)	251.00	NA	255.00

<u>Old Bus Stand Karnal</u>	2G		
	Airtel	BSNL	VIL
Download Throughput (kbps)	161.00	NA	81.40
Upload Throughput (kbps)	73.00	NA	96.10
Web Browsing Delay (sec)	0.53	NA	0.55
Latency (msec)	247.00	NA	200.00

<u>Namastey Chowk Karnal</u>	2G		
	Airtel	BSNL	VIL
Download Throughput (kbps)	178.00	0.00	63.20
Upload Throughput (kbps)	88.00	0.00	56.00
Web Browsing Delay (sec)	0.46	0.00	0.80
Latency (msec)	251.00	0.00	131.00

<u>Railway Station Karnal</u>	2G		
	Airtel	BSNL	VIL
Download Throughput (kbps)	187.00	NA	131.50
Upload Throughput (kbps)	83.00	NA	93.90
Web Browsing Delay (sec)	0.40	NA	0.86
Latency (msec)	245.00	NA	147.00

<u>Sector 6 Market Karnal</u>	2G		
	Airtel	BSNL	VIL
Download Throughput (kbps)	175.00	NA	93.70
Upload Throughput (kbps)	79.00	NA	53.30
Web Browsing Delay (sec)	0.53	NA	0.80
Latency (msec)	263.00	NA	140.00

Data Services static

<u>Hotel Jewels</u>	3G	4G		
	BSNL	Airtel	Jio	VIL
Download Throughput (mbps)	7.60	15.90	49.56	19.30
Upload Throughput (mbps)	1.74	6.50	9.42	26.30
Video Streaming Delay (Secs.)	-	0.44	0.35	0.42
Web Browsing Delay (sec)	2.74	0.89	1.55	0.20
Latency (msec)	81	49.00	36.00	21.00

<u>Kalpna Chawla Main Gate</u>	3G	4G		
	BSNL	Airtel	Jio	VIL
Download Throughput (mbps)	4.14	22.70	47.30	28.40
Upload Throughput (mbps)	2.45	8.21	9.18	29.80
Video Streaming Delay (Secs.)	-	0.35	0.38	0.22
Web Browsing Delay (sec)	2.41	0.05	1.52	0.20
Latency (msec)	35	38.00	43.00	40.00

<u>Old Bus Stand Karnal</u>	3G	4G		
	BSNL	Airtel	Jio	VIL
Download Throughput (mbps)	6.27	25.40	31.01	17.80
Upload Throughput (mbps)	1.57	8.10	15.90	16.30
Video Streaming Delay (Secs.)	-	0.45	0.43	0.57
Web Browsing Delay (sec)	1.68	0.08	1.45	0.25
Latency (msec)	48	43.00	42.00	31.00

Data Services static

<u>Railway Station Karnal</u>	3G	4G		
	BSNL	Airtel	Jio	VIL
Download Throughput (mbps)	4.12	21.60	39.97	29.50
Upload Throughput (mbps)	3.30	6.70	8.61	31.92
Video Streaming Delay (Secs.)	0.00	0.50	0.34	0.37
Web Browsing Delay (sec)	4.01	0.05	1.50	0.23
Latency (msec)	236	41.00	36.00	26.00

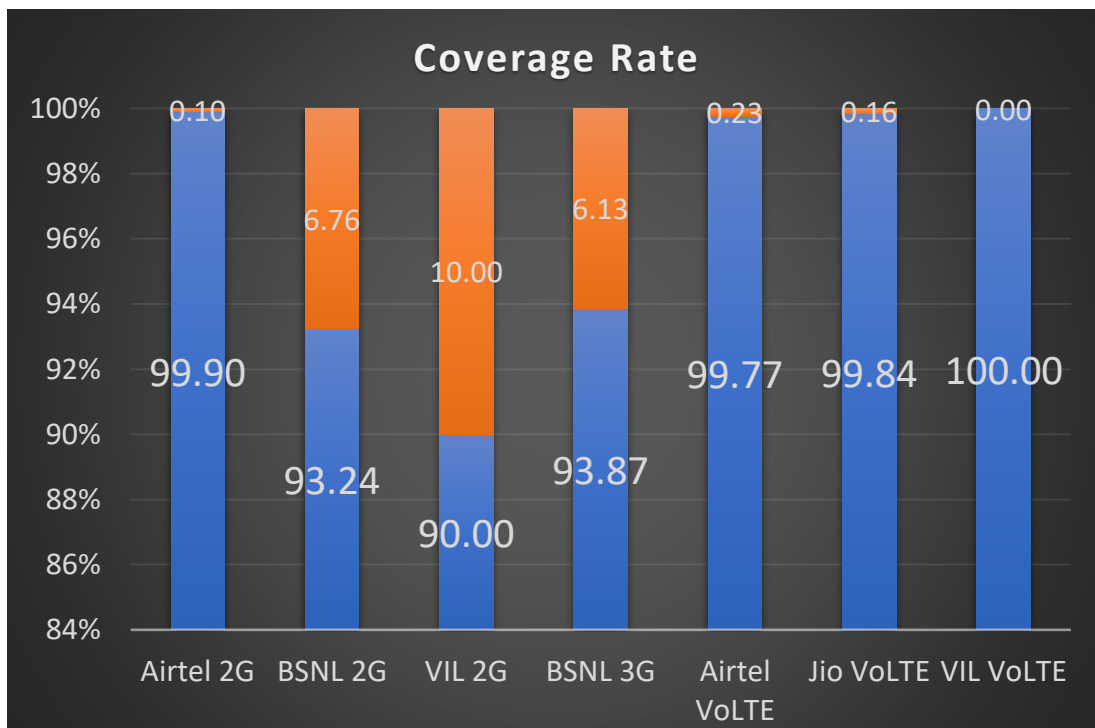
<u>Namastey Chowk Karnal</u>	3G	4G		
	BSNL	Airtel	Jio	VIL
Download Throughput (mbps)	5.42	24.60	39.47	23.70
Upload Throughput (mbps)	1.64	7.90	9.03	18.36
Video Streaming Delay (Secs.)	-	0.41	0.36	0.43
Web Browsing Delay (sec)	5.84	0.04	1.53	0.24
Latency (msec)	85	53.00	43.00	26.00

<u>Sector 6 Market Karnal</u>	3G	4G		
	BSNL	Airtel	Jio	VIL
Download Throughput (mbps)	3.31	22.10	40.39	29.90
Upload Throughput (mbps)	1.85	7.30	7.59	8.90
Video Streaming Delay (Secs.)	-	0.35	0.41	0.32
Web Browsing Delay (sec)	3.42	0.05	1.55	0.33
Latency (msec)	55	46.00	39.00	40.00

Coverage Details

RF Coverage relates to the geographical footprint within the system that has sufficient RF signal strength to provide for a call session. The Coverage rate is calculated on the basis of % of samples in which the Rx level \geq -85 dBm, RSCP is \geq -90 dBm & RSRP \geq -110dBm. The details are as follows.

TSP	Coverage Rate %
Airtel 2G	99.88%
BSNL 2G	93.24%
VIL 2G	90.00%
BSNL 3G	93.87%
Airtel VoLTE	99.77%
Jio VoLTE	99.84%
VIL VoLTE	100.00%



TSP-AIRTEL

	Technology	Coverage %
2G	2G	99.88%
	VoLTE	99.77%



2G			
Overall RxLevel	# Samples	% PDF	Legends
[Max, >=-75]	2617971	84.64	
[-75, >=-85)	468312	15.14%	
[-85, >=-95)	6959	0.22	
[-95, >=Min)	0	0%	
Total	3093242	100%	

VoLTE



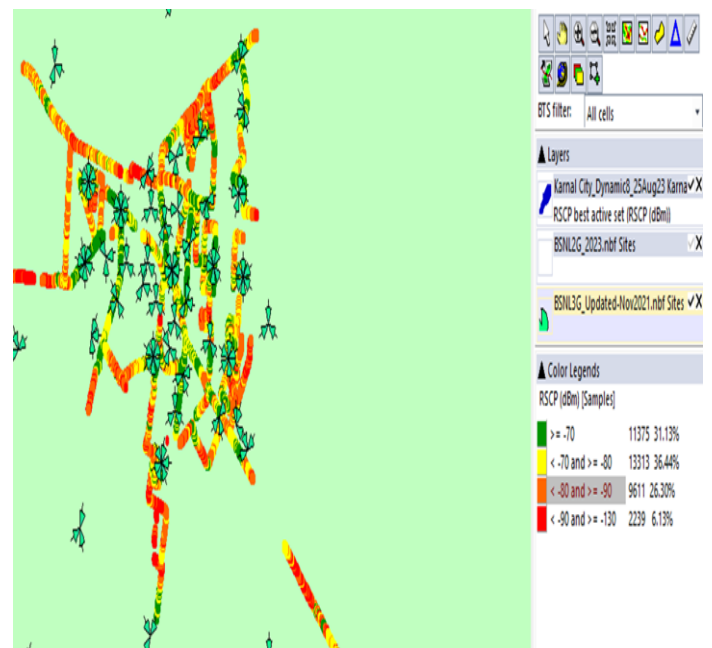
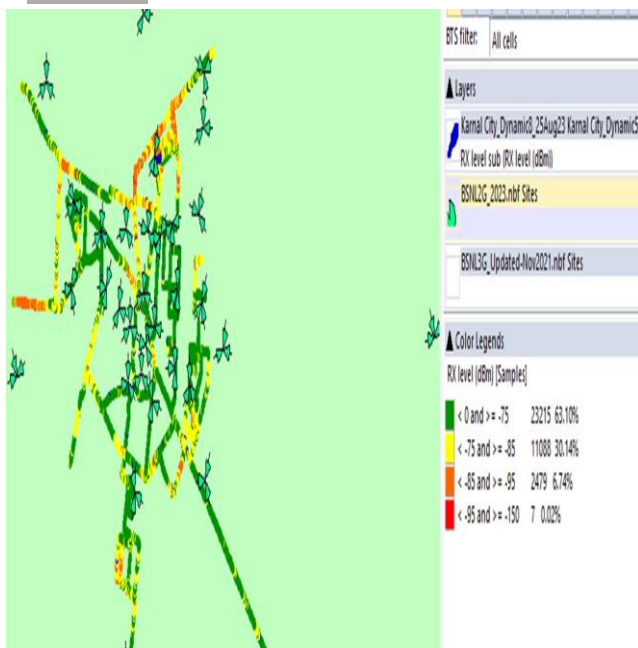
VoLTE			
Overall RSRP	# Samples	% PDF	Legends
[Max, >=-80]	1933520	46.92%	
[-80, >=-90)	1450461	35.20%	
[-90, >=-110)	735765	17.85%	
[-110, >=Min)	1364	0.33%	
Total	4121110	100%	

TSP- BSNL

Technology	Coverage %
2G	93.24%
3G	93.87%

2G

3G



Overall RxLevel	# Samples	% PDF	Legends
(Max, >=-75)	23215	63.10	
(<-75, >=-85)	11088	30.14	
(<-85, >=-95)	2479	6.74	
(<-95, >=Min)	7	0.02	
Total	36789	100%	

Overall RSCP	# Samples	% PDF	Legends
(Max, >=-70)	11375	31.13	
(<-70, >=-80)	13313	36.44	
(<-80, >=-90)	9611	26.30	
(<-90, >=Min)	2239	6.13	
Total	36538	100%	

JIO

Technology	Coverage %
VoLTE	99.84%



VoLTE /5G			
Overall RSRP	# Samples	% PDF	Legends
[Max, >=-80]	11270	57.60	
[-80, >=-90)	5032	25.72	
[-90, >=-110)	3233	16.52	
[-110, >=Min)	31	.16	
Total	19566	100%	

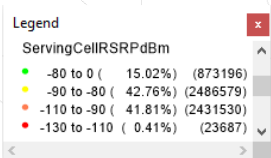
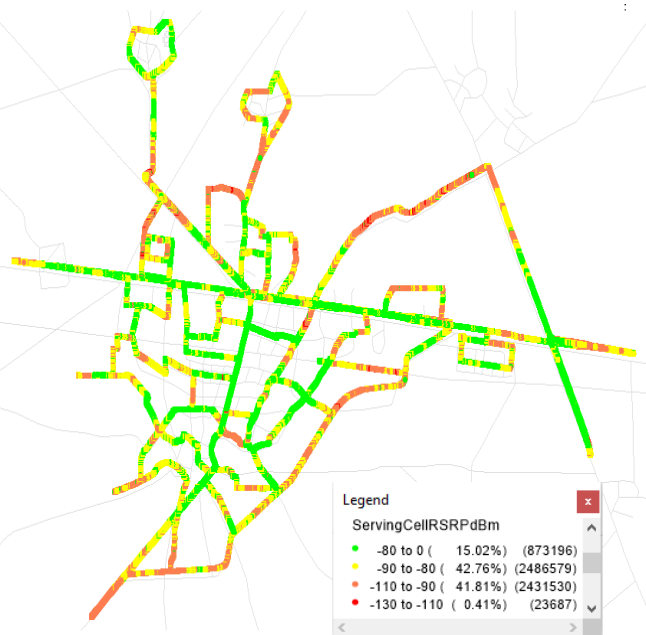
VIL

	Technology	Coverage Rate %
	2G	90.00%
2G	VoLTE	100.00%



VoLTE

2G			
Overall RxLevel	# Samples	% PDF	Legends
[Max, >=-75]	787129	53%	
[-75, >=-85)	543449	37%	
[-85, >=-95)	143713	10%	
[-95, >=Min)	2889	0%	
Total	147718	100%	

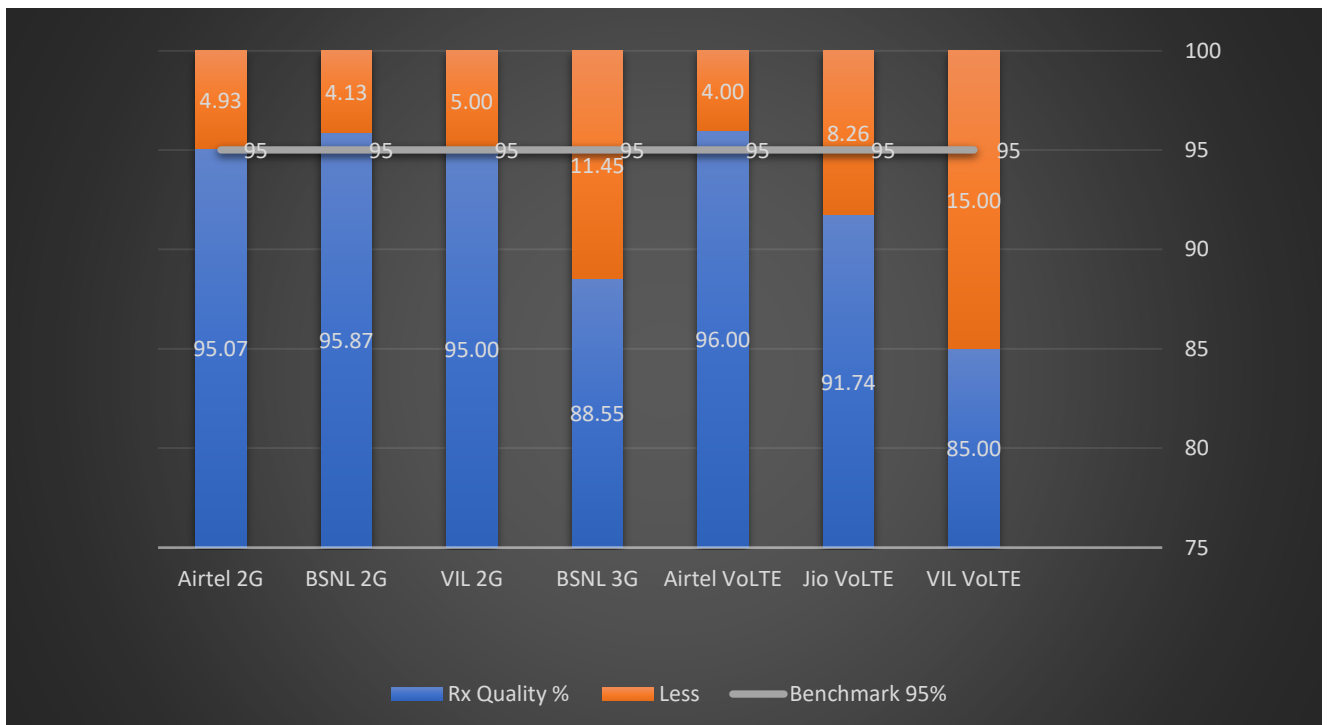


VoLTE /5G			
Overall RSRP	# Samples	% PDF	Legends
[Max, >=-80]	202016	43%	
[-80, >=-90)	166776	36%	
[-90, >=-110)	100710	21%	
[-110, >=Min)	582	0%	
Total	470084	100%	

II. Quality Details

For measuring voice quality, as per the QoS norms, RxQual ≤ 5 for GSM TSPs, EcNo ≥ -14 dBm for 3G TSP sand SINR > 0 in case of VoLTE is considered to be good, where as quality beyond this benchmark is considered to be bad. The benchmark should usually be $\geq 95\%$.

<u>TSP</u>	Rx Quality %
Airtel 2G	95.07
BSNL 2G	95.87
VIL 2G	95.00
BSNL 3G	88.55
Airtel VoLTE	96.00
Jio VoLTE	91.74
VIL VoLTE	85.00



II. Quality Details

Airtel

Technology	Rx Quality %
2G	95.06%
VoLTE	96.00%

2G



Overall Rx Quality	# Samples	% PDF	Legends
(Min, <=2)	2691230	83.97%	
(2, <=3)	140018	4.37	
(3, <=4)	129949	4.05	
(4, <=5)	85584	2.67	
(5, <=Max)	158126	4.94%	
Total	3204907	100%	

VoLTE

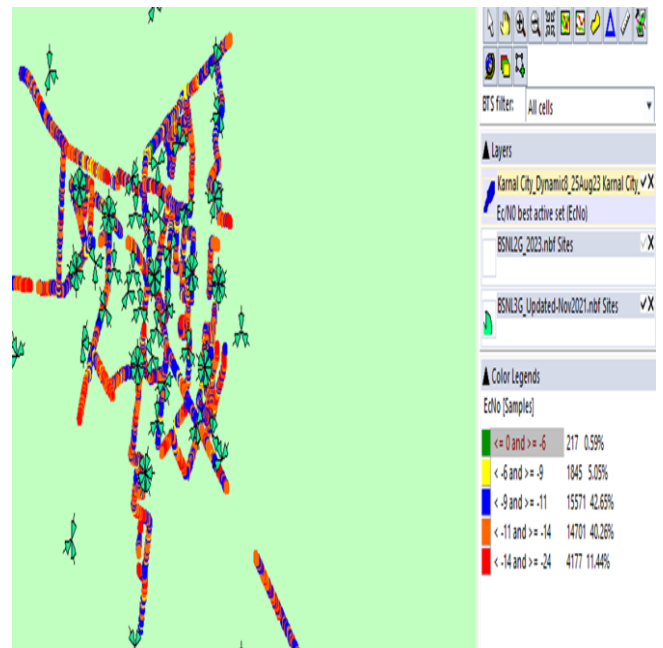
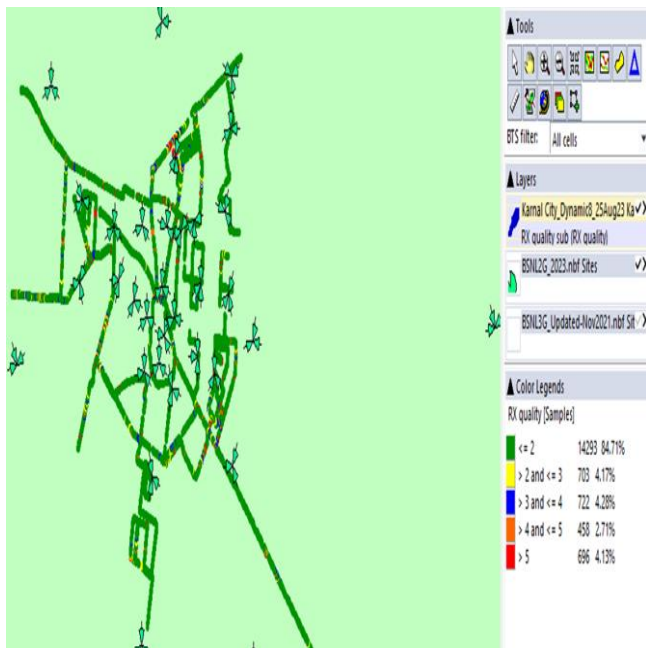


Overall SINR	# Samples	% PDF	Legends
(Min, <=0)	189938	4%	
(0, <=5)	2131576	50%	
(5, <=10)	1234104	30%	
(10, <=15)	493098	12%	
(15, <=Max)	174058	4%	
Total	4222774	100%	

II. Quality Details

BSNL

	Technology	Rx Quality %	
2G	2G	95.87%	3G
	3G	88.55%	



Overall Rx Quality	# Samples	% PDF	Legends
(Min, <=2)	14293	84.71	
(>2, <=3)	703	4.17	
(>3, <=4)	722	4.28	
(>4, <=5)	458	2.71	
(>5, <=Max)	696	4.13	
Total	16872	100%	

Overall Ec/No	# Samples	% PDF	Legends
(<=0, >=-6)	217	0.59	
(<-6, >=-9)	1845	5.05	
(<-9, >=-11)	15571	42.65	
(<-11, >=-14)	14701	40.26	
(<-14, >= 24)	4177	11.44	
Total	36511	100%	

Quality Details

For measuring voice quality, as per the QoS norms, RxQual ≤ 5 for GSM TSPs, EcNo ≥ -14 dBm for 3G TSP and SINR > 0 in case of VoLTE is considered to be good, where as quality beyond this benchmark is considered to be bad. The benchmark should usually be $\geq 95\%$.

JIO

Technology	Rx Quality %
VoLTE	91.74%



Overall SINR	# Samples	% PDF	Legends
(Min, ≤ 0)	1617	8.26	
(0, ≤ 5)	3970	20.29	
(5, ≤ 10)	5080	25.96	
(10, ≤ 15)	4791	24.49	
(15, $\leq \text{Max}$)	4108	21.00	
Total	19566	100%	

II. Quality Details

VIL

Technology	Rx Quality %
2G	95.26%
4G	85.00%

2G



VoLTE

Overall Rx Quality	# Samples	% PDF	Legends
(Min, <=2)	968131	66%	
(2, <=3)	184637	12%	
(3, <=4)	143759	10%	
(4, <=5)	106090	7%	
(5, <=Max)	74563	5%	
Total	1477180	100%	

Overall SINR	# Samples	% PDF	Legends
(Min, <=0)	717788	15%	
(0, <=5)	100531	21%	
(5, <=10)	123165	26%	
(10, <=15)	988252	21%	
(15, <=Max)	750799	17%	
Total		100%	

III. Technology Details

TSP	% of Time Spent on 3G/VoLTE
BSNL 3G	87.71%
Airtel VoLTE	100.00%
Jio VoLTE	100.00%
VIL VoLTE	100.00%

