



Operator Assisted Drive Test Report

For

SANGLI

Feb. 2022

RO, Bengaluru

Key Performance Indicators: All TSPs have met the 2% QOS benchmark of Drop Call Rate except BSNL 3G. All TSPs have met the 3% QOS benchmark of Call Block Rate except BSNL 3G

The Operator Assisted Drive Test has been carried out by Regional Office, Bangalore with the help of Service Providers from 15-02-2022 to 18-02-2022. The drive test covered a drive route of 300 KMs & 6 hotspots. Approximately 500 calls were made for each of the 7 networks: three 2G networks, one 3G network and three LTE network covering four TSPs.

Overview

Voice
Summary

Data
Summary

Overview

Regional Office, TRAI Bengaluru conducted Operator Assisted Drive Test from 15-02-2022 to 18-02-2022 covering various locations in Sangli City & surrounding region. The performance of Airtel, BSNL, Vodafone Idea and Jio were monitored across various technologies (2G, 3G and 4G/VoLTE). The test results obtained from these drive tests were utilized to assess the network quality for Voice and Data services in terms of

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

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

Drive Test Details:

Voice Tests: Calls were made for 90 sec duration with wait time of 10 sec between calls in all technologies. The drive test covered a drive route of approximately 350 KMs over a period of 3 days from 15-02-2022 to 18-02-2022. Approximately 480+ calls were made for each of the 7 networks: three 2G (Lock Mode) networks, one 3G (Dual mode) networks and three VoLTE network covering 4 unique TSPs.

Data Tests: Dynamic data test (Data Test on Move) was conducted for 350 kms over a period of 3 days for download throughput for 3G & 4G technology. Data Tests were performed at 6 static locations; three 2G (Lock mode) networks, one 3G (Dual mode) networks and three 4G (Free mode) networks covering 4 unique TSPs were tested. **All the data through put figure mentioned in the report are based on the average value.**

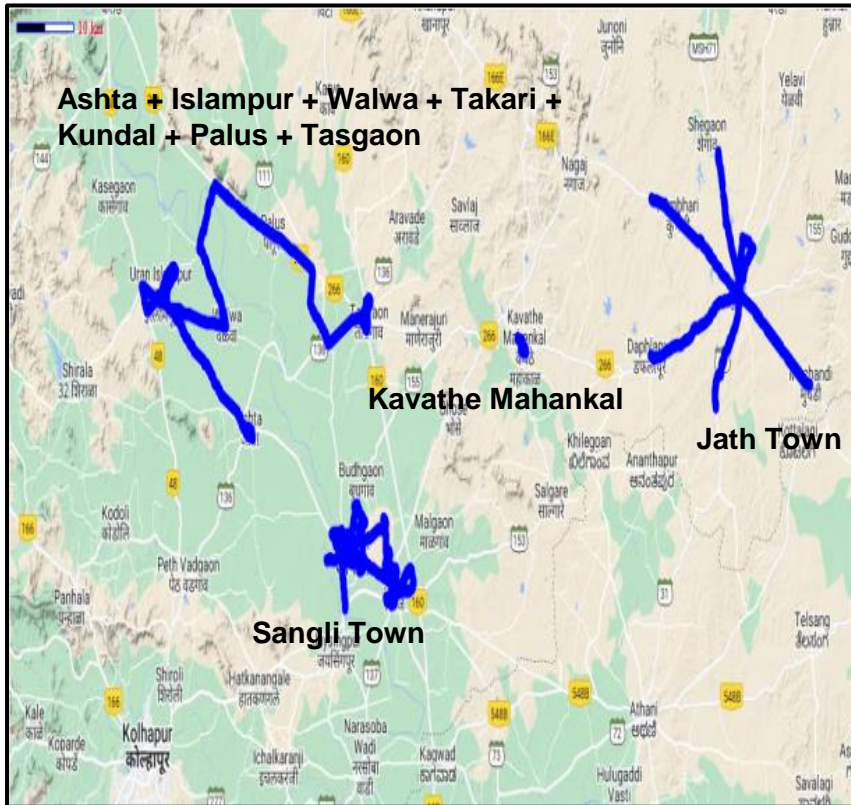
* For Voice and Data KPI's, 2G measurement is done with UE locked on 2G, 3G measurement is done with UE in Dual mode (2G & 3G) and 4G measurement is done with UE in Free Mode.

* 3G KPI's which are calculated from UE in Dual Mode (2G & 3G) includes samples and events of 2G.

* 4G KPI's which are calculated from the UE in Free Mode included samples and events of 2G & 3G.

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
Video Streaming	130 secs clip

Voice & Dynamic Data Test (Data Test on Move) Drive Route



Areas Covered

Sangli city

Sangli

Miraj

Daphlapur

Jath

Muchandi

Mangalwedha

Ashta

Islampur

Kundal

Palus

Tasgaon

Data Service Test- Static Locations

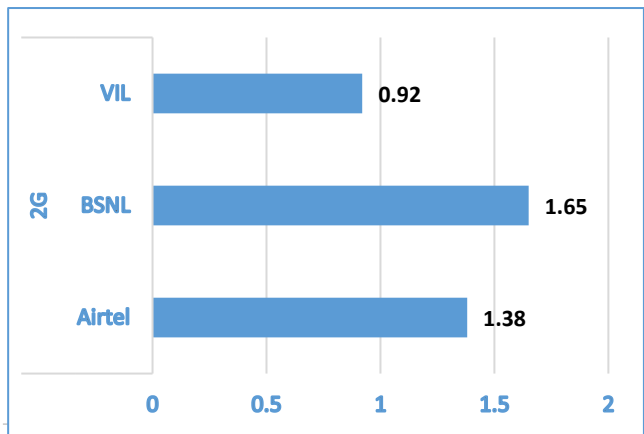
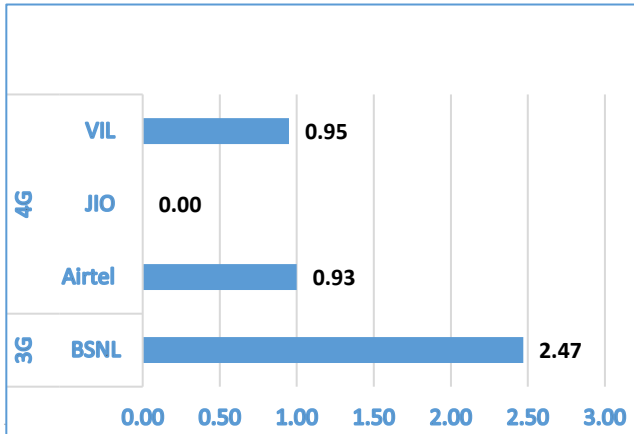
Jath Bus Stand
Tasgaon Bus Stand
Miraj Railway Station
Govt. Medical College, Miraj
Sangli district Collector office
Sangli head post office

Voice Calls

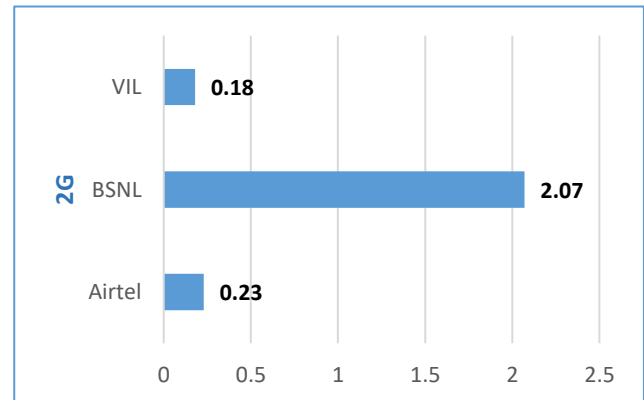
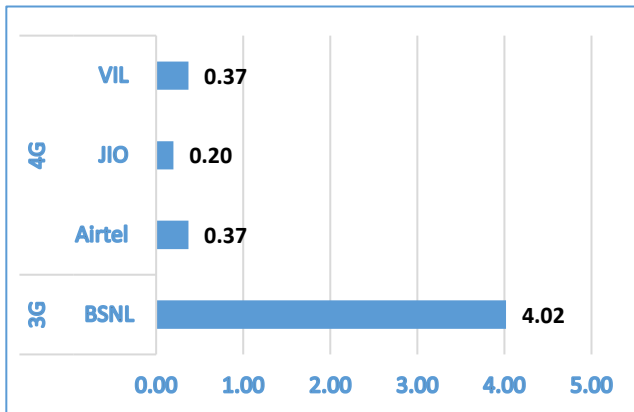
Key Observations

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

Drop Call Rate (%)



Block Call Rate (%)



KPIs	2G			3G	VoLTE		
	Airtel	BSNL	VIL	BSNL	Airtel	RJIL	VIL
Drop Call Rate %	1.38	1.65	0.92	2.47	0.93	0.00	0.95
Block Call Rate %	0.23	2.07	0.18	4.02	0.37	0.20	0.37

- a) All TSPs have met the 2% QOS benchmark of Drop Call Rate except BSNL 3G
- b) All TSPs have met the 3% QOS benchmark of Call Block Rate except BSNL 3G

Voice Calls

Key Observations

Coverage

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

TSPs	2G		
	Airtel	BSNL	VIL
Coverage%	77.7%	77.62%	74.41%

b) Percentage of coverage samples for 3G \geq -90 dBm & LTE \geq -110 dBm.

TSPs	3G	VoLTE		
	BSNL	Airtel	JIO	VIL
Coverage %	86.68%	89.04%	95.07%	93.35%

c) Percentage of time spent on 3G/VoLTE network

TSPs	3G	VoLTE		
	BSNL	Airtel	VIL	JIO
Time Spent on 3G%	51.5%	97.79%	98%	100%

Summary

City Level Summary

Voice Call	2G		
	Airtel	BSNL	VIL
Call Attempt	435	627	545
Blocked Call Rate (%)	0.23	2.07	0.18
CSSR% (Accessibility)	99.77	97.93	99.82
Drop Call Rate (%)	1.38	1.65	0.92
Mobility HOSR (%)	100	90.26	96.7
Rx Quality (%)	95.12	95.16	97.43

Voice Call	3G/VoLTE			
	BSNL 3G	Airtel VoLTE	JIO VoLTE	VIL 4G
Call Attempt	671	540	458	527
Blocked Call Rate (%)	4.02	0.37	0.20	0.37
CSSR% (Accessibility)	95.98	99.63	99	99.63
Drop Call Rate (%)	2.47	0.93	0.00	0.95
Mobility HOSR (%)	100	100	98.40	97.66
Rx Quality (%)	94.68	87.38	85.16	75.44

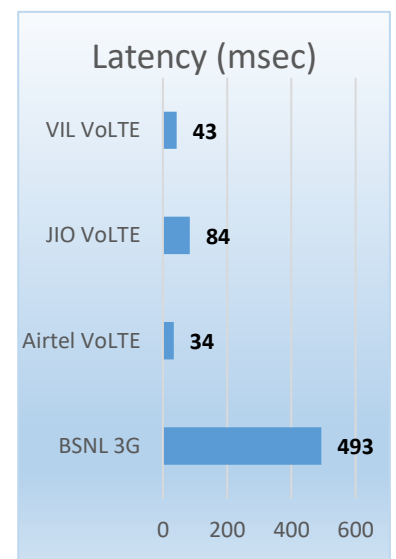
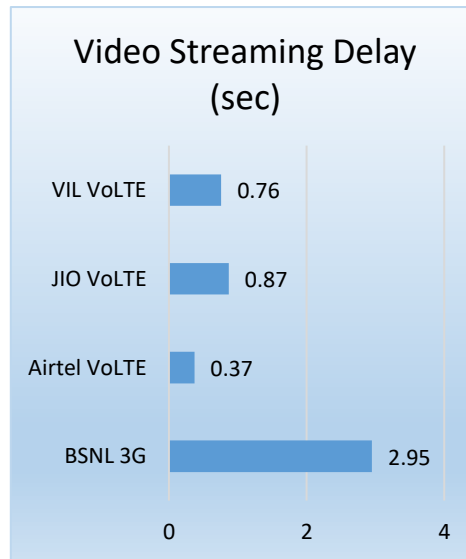
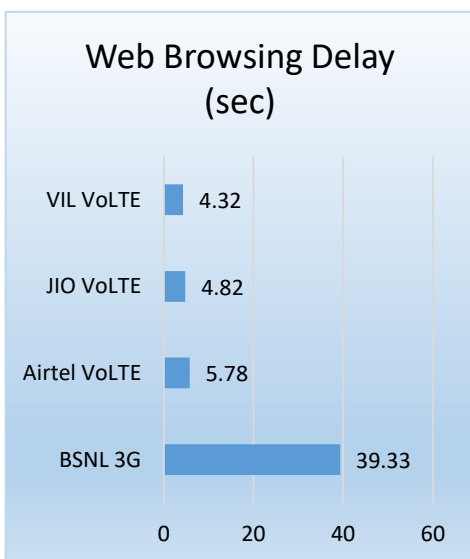
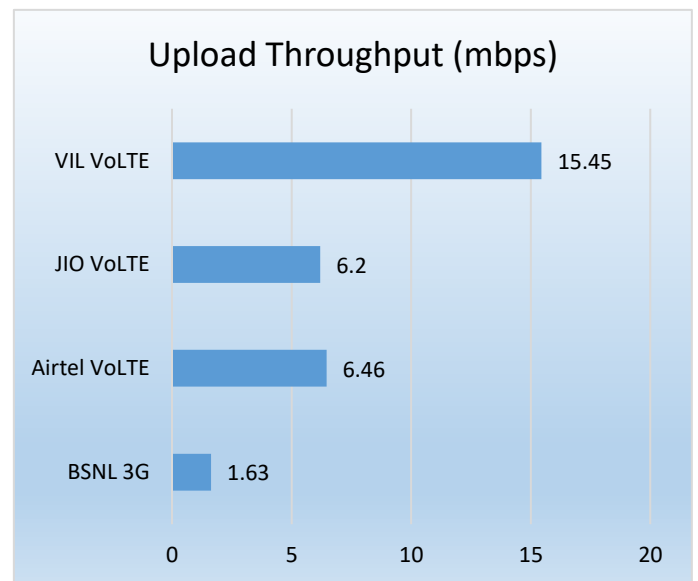
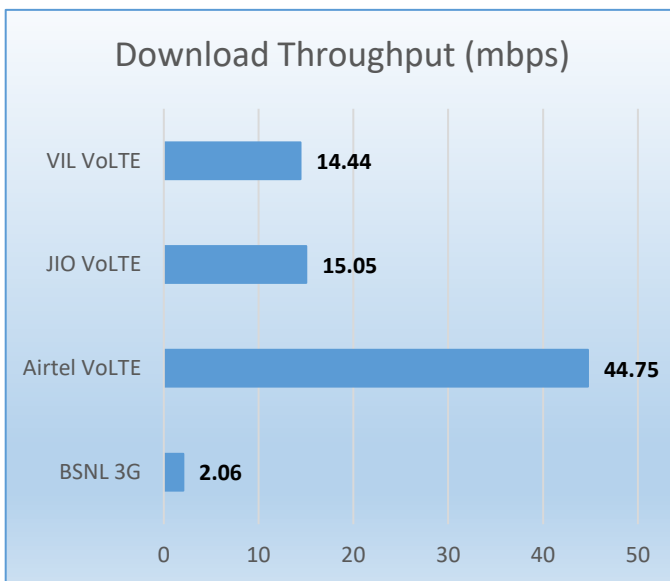
Data Services Static

Key Observations

Data was tested at 6 locations .Following services were tested: Data Download/Upload, Latency (www.google.com), and Web browsing (Flipkart, Amazon, PayTm)

Data Download, Upload Performance (Mbps), Web Browsing delay, Video Streaming and Latency

3G/4G/ Network:



Summary

City Level Summary(contd.)

Data Services Static	2G		
	Airtel	BSNL	VIL
Download Throughput (kbps)	37.14	0.15	152.75
Upload Throughput (kbps)	21.68	0.08	106.14
Web Browsing Delay (sec)	34.54	-	22.95
Latency (msec)	244	486	191

Data Services Static	3G/VoLTE			
	BSNL 3G	Airtel VoLTE	JIO VoLTE	VIL VoLTE
Download Throughput (mbps)	2.06	44.75	15.05	14.44
Upload Throughput (mbps)	1.63	6.46	6.2	15.45
Web Browsing Delay (sec)	39.33	5.78	4.82	4.32
Video Streaming Delay (sec)	2.95	0.37	0.87	0.76
Latency (msec)	493	5.78	4.82	4.32

Data Services Dynamic (Data Test on Move)	3G/VoLTE			
	BSNL 3G	Airtel VoLTE	JIO VoLTE	VIL VoLTE
Download Throughput (mbps)	2.46	8.01	4.50	5.43
Upload Throughput (mbps)	-	4.18	1.95	4.96
Video Streaming Delay (sec)				
Latency (msec)				

Summary

City Level Summary(contd.)

Data Services Static – Jath Bus Stand	2G		
	Airtel	BSNL	VIL
Download Throughput (kbps)	43.614	0.166	235.18
Upload Throughput (kbps)	25.542	0.09	134.92
Web Browsing Delay (sec)	29.26	-	19.948
Latency (ms)	247.4	232.4	162.4

Data Services Static – Jath Bus Stand	3G	VoLTE		
	BSNL 3G	Airtel	JIO	VIL
Download Throughput (Mbps)	1.166	44.7314	14.882	11.836
Upload Throughput (Mbps)	1.522	6.694	3.983	15.686
Web Browsing Delay (sec)	71.704	5.64	5.34	3.592
Video Streaming Delay (sec)	5.116	0.3514	0.9026	0.797
Latency (ms)	229.8	33.8	65.8	62.8

Data Services Static –Tasgoan Bus Stand	2G		
	Airtel	BSNL	VIL
Download Throughput (kbps)	33.836	0.174	201.76
Upload Throughput (kbps)	2.526	0.066	148.08
Web Browsing Delay (sec)	36.52	0	22.478
Latency (msec)	245.2	785.6	180.6

Data Services Static - Tasgoan Bus Stand	3G	VoLTE		
	BSNL 3G	Airtel	JIO	VIL
Download Throughput (Mbps)	3.704	44.046	14.9484	10.218
Upload Throughput (Mbps)	1.934	6.6	7.4162	15.724
Web Browsing Delay (sec)	27.814	6.1	4.84	4.522
Video Streaming Delay (sec)	1.47	0.4202	0.7298	1.14
Latency (ms)	1237.6	36	70.8	53.2

Summary

City Level Summary(contd.)

Data Services Static – Miraj Railway Station	2G		
	Airtel	BSNL	VIL
Download Throughput (kbps)	37.586	0.114	107.56
Upload Throughput (kbps)	24.312	0.0698	65.94
Web Browsing Delay (sec)	34.66	0	27.448
Latency (ms)	245.8	494	242.8

Data Services Static – Miraj Railway Station	3G	VoLTE		
	BSNL 3G	Airtel	JIO	VIL
Download Throughput (Mbps)	1.498	47.5424	14.8846	20.634
Upload Throughput (Mbps)	1.78	6.46	7.8484	15.24
Web Browsing Delay (sec)	41.866	5.68	5.22	3.95
Video Streaming Delay (sec)	6.558	0.3332	0.9176	0.3898
Latency (ms)	471.8	33	70	47.2

Data Services Static – Govt Medical College Miraj	2G		
	Airtel	BSNL	VIL
Download Throughput (kbps)	36.576	0.09	158.68
Upload Throughput (kbps)	26.456	0.084	141.08
Web Browsing Delay (sec)	34.84	0	20.49
Latency (msec)	243.4	867.2	164.6

Data Services Static - Govt Medical College Miraj	3G	VoLTE		
	BSNL 3G	Airtel	JIO	VIL
Download Throughput (Mbps)	2.324	46.732	16.0584	12.548
Upload Throughput (Mbps)	1.832	6.562	7.0744	14.446
Web Browsing Delay (sec)	31.908	5.6	3.96	5.262
Video Streaming Delay (sec)	1.972	0.3514	0.8814	0.7178
Latency (ms)	219.6	32.8	67.2	35.4

Summary

City Level Summary(contd.)

Data Services Static – Collector Office Sangli	2G		
	Airtel	BSNL	VIL
Download Throughput (kbps)	35.832	0.188	93.18
Upload Throughput (kbps)	24.894	0.094	38.54
Web Browsing Delay (sec)	36.16	0	20.978
Latency (ms)	238.4	238.6	236.2

Data Services Static – Collector Office Sangli	3G	VoLTE		
	BSNL 3G	Airtel	JIO	VIL
Download Throughput (Mbps)	1.32	40.146	15.2798	12.068
Upload Throughput (Mbps)	1.176	6.08	5.6798	14.766
Web Browsing Delay (sec)	31.306	6.04	5.02	4.298
Video Streaming Delay (sec)	1.768	0.3674	0.8356	0.9626
Latency (ms)	491	35.6	70.8	34.2

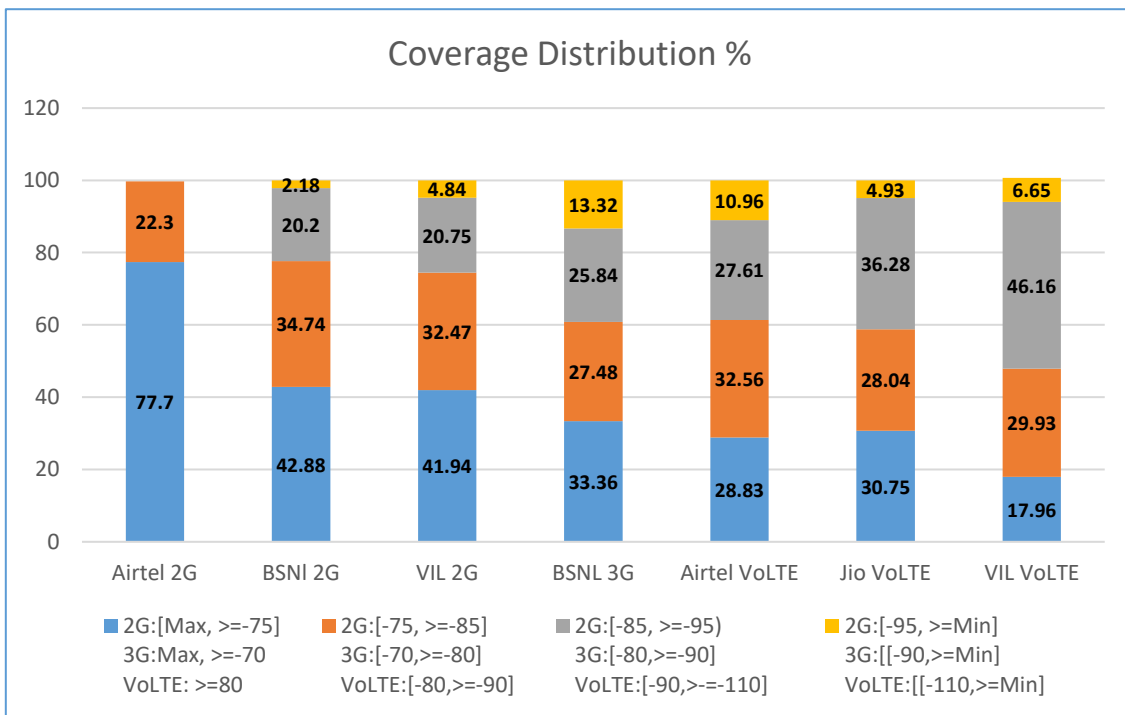
Data Services Static – Head Post office	2G		
	Airtel	BSNL	VIL
Download Throughput (kbps)	35.384	0.152	120.16
Upload Throughput (kbps)	26.324	0.086	108.26
Web Browsing Delay (sec)	35.782	0	26.362
Latency (msec)	242.4	295	158.8

Data Services Static – Head Post office	3G	VoLTE		
	BSNL 3G	Airtel	JIO	VIL
Download Throughput (Mbps)	2.376	45.314	14.2464	19.316
Upload Throughput (Mbps)	1.546	6.334	5.2158	16.852
Web Browsing Delay (sec)	31.37	5.64	4.54	4.282
Video Streaming Delay (sec)	2.284	0.3712	0.9452	0.5766
Latency (ms)	306.2	32.4	70.6	28.6

I. 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 ≥ -85 dBm, RSCP is ≥ -90 dBm & RSRP ≥ -110 dBm. The details are as follows.

TSP	Coverage Rate %
Airtel 2G	77.7
BSNI 2G	77.62
VIL 2G	74.41
BSNL 3 G	86.68
Airtel VoLTE	89.04
Jio VoLTE	95.07
VIL VoLTE	93.35

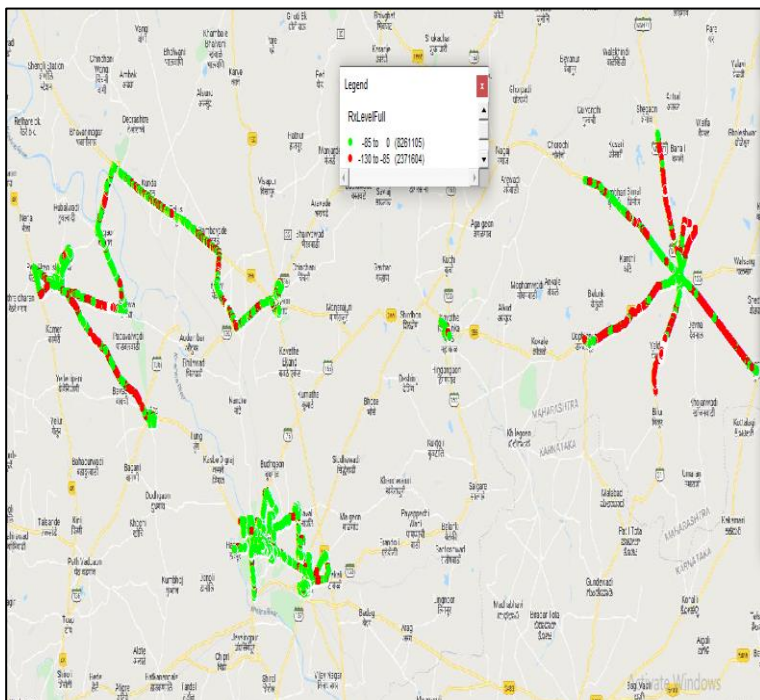


I. Coverage Details

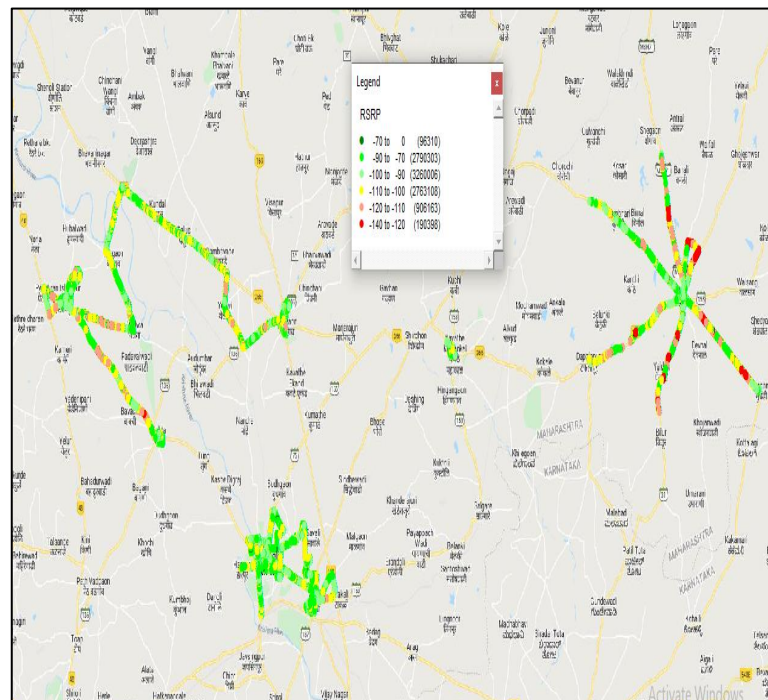
AIRTEL

Technology	Coverage Rate %
2G	77.7
VoLTE	89.04

2G



VoLTE



2G		
Overall RxLevel	# Samples	% PDF
[Max, >=-75]	8261105	77.7%
[-85, >=-130)	2371604	22.3%
Total	10632709	

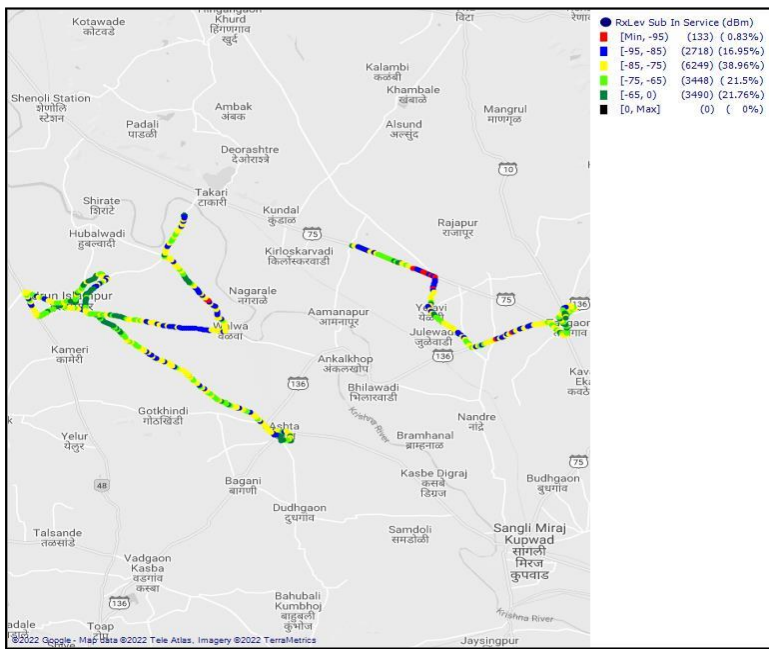
VoLTE		
Overall RSRP	# Samples	% PDF
[Max, >=-70]	96310	0.96%
[-70, >=-90)	2790303	27.87%
[-90, >=-100)	3260006	32.58%
[-100, >=-110)	2763108	27.61%
[-110, >=Min)	1096561	10.96%
Total	10006288	

I. Coverage Details

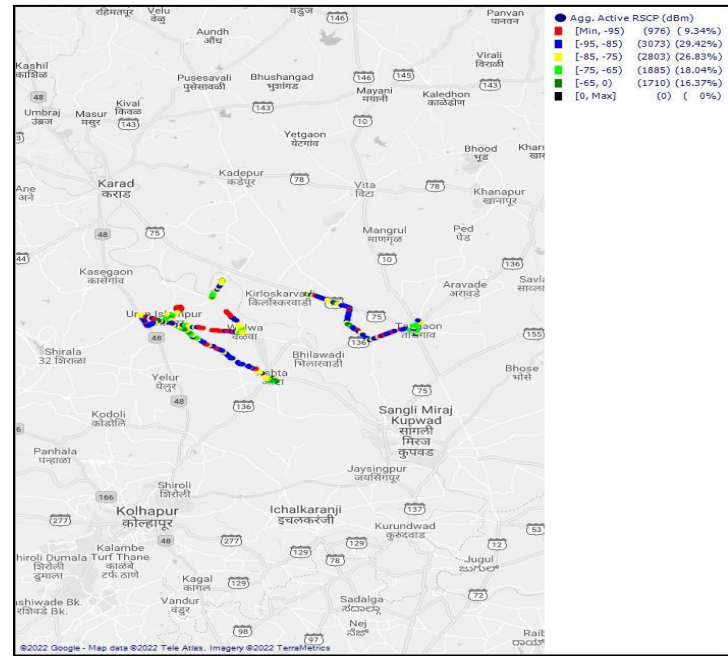
BSNL

Technology	Coverage Rate %
2G	77.62
3G	86.68

2G



3G



2G

Overall RxLevel	# Samples	% PDF
[Max, >=-75]	10649	42.88
[-75, >=-85)	8627	34.74
[-85, >=-95)	5015	20.20
[-95, >=Min)	541	2.18
Total	24832	100

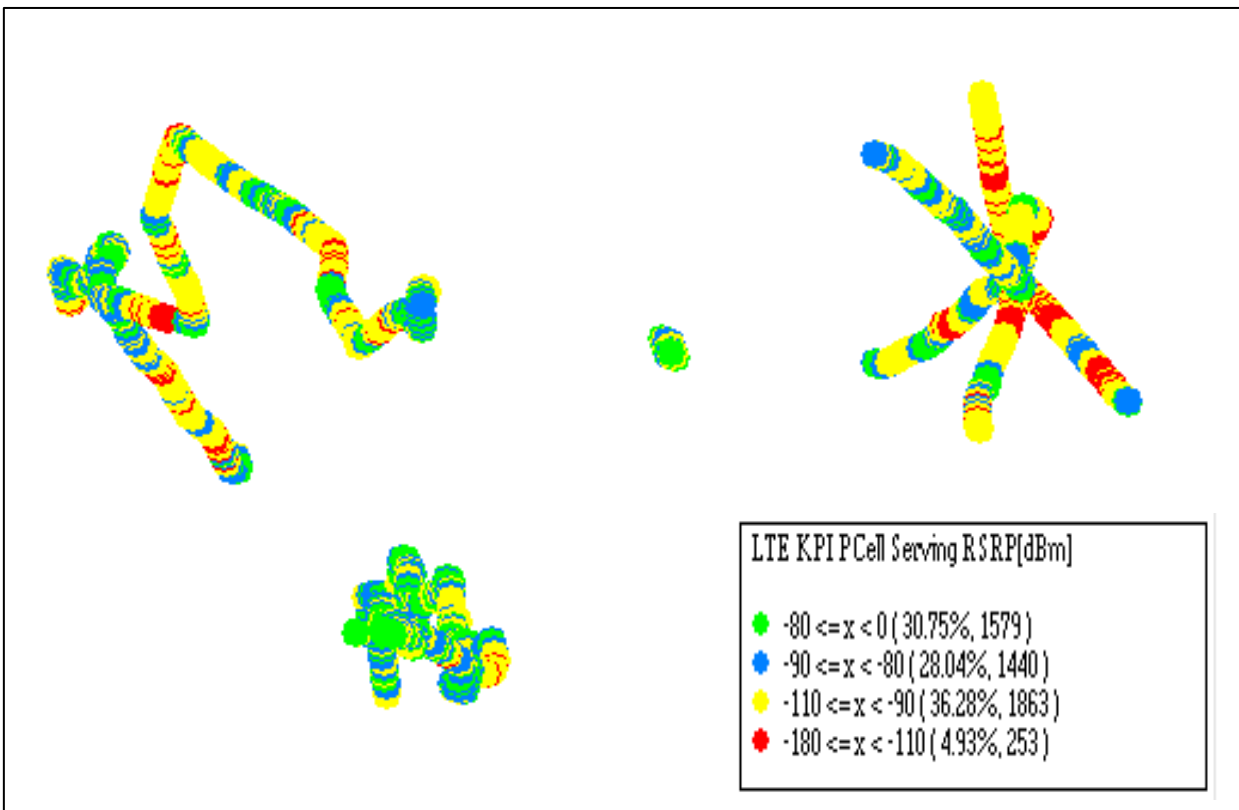
3G

Overall RSCP	# Samples	% PDF
[Max, >=-70]	5814	33.36
[-70, >=-80)	4789	27.48
[-80, >=-90)	4504	25.84
[-90, >=Min)	2323	13.32
Total	17430	100

I. Coverage Details

JIO

Technology	Coverage Rate %
VoLTE	95.07



VoLTE		
Overall RSRP	# Samples	% PDF
[Max, >=-80]	1579	30.75%
[-80, >=-90)	1440	28.04%
[-90, >=-110)	1863	36.28%
[-110, >=Min)	253	4.93
Total	5135	100%

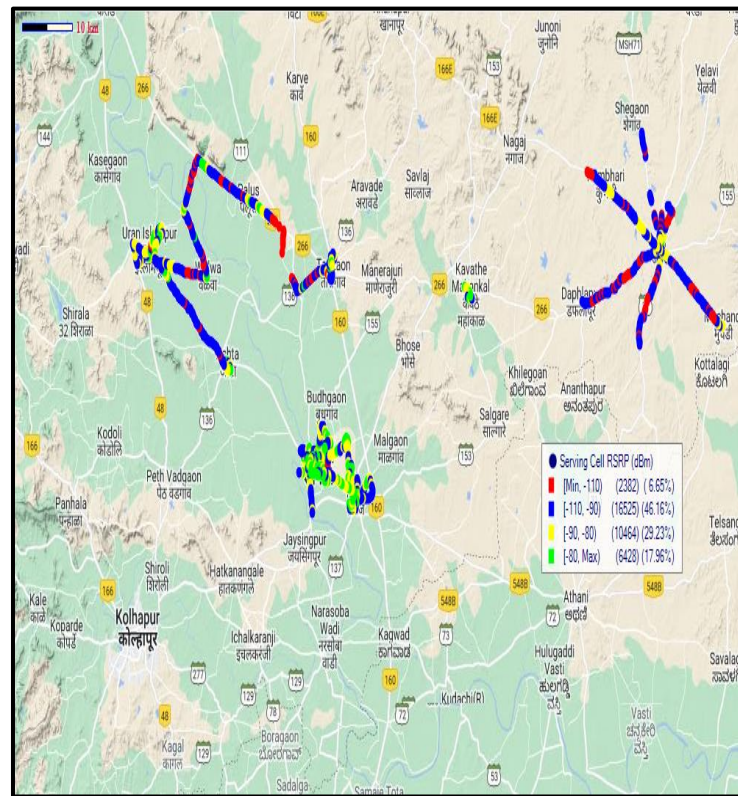
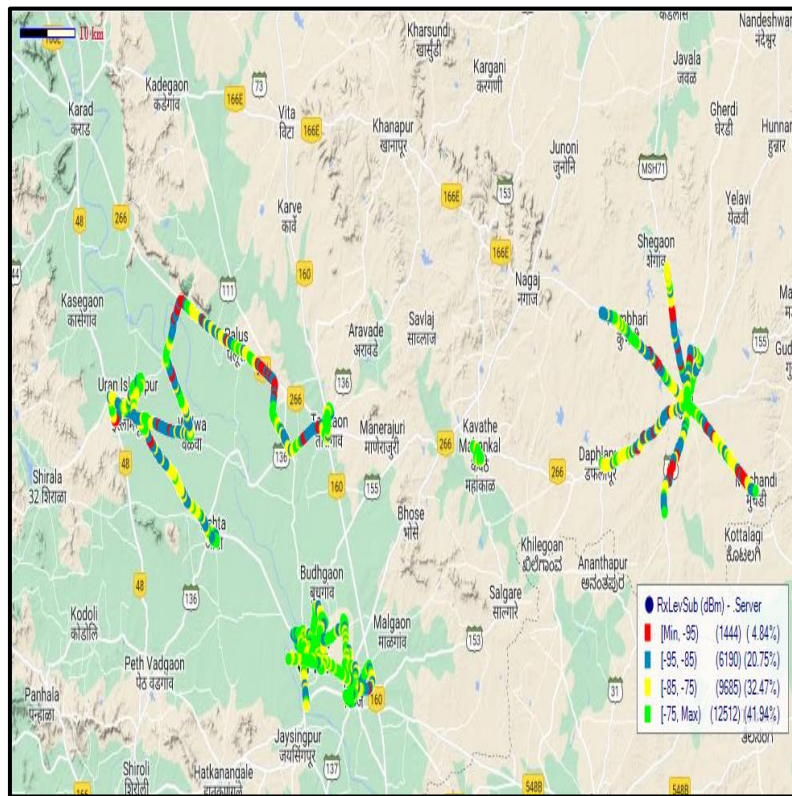
I. Coverage Details

VIL

Technology	Coverage Rate %
2G	74.41
VoLTE	93.35

2G

VoLTE

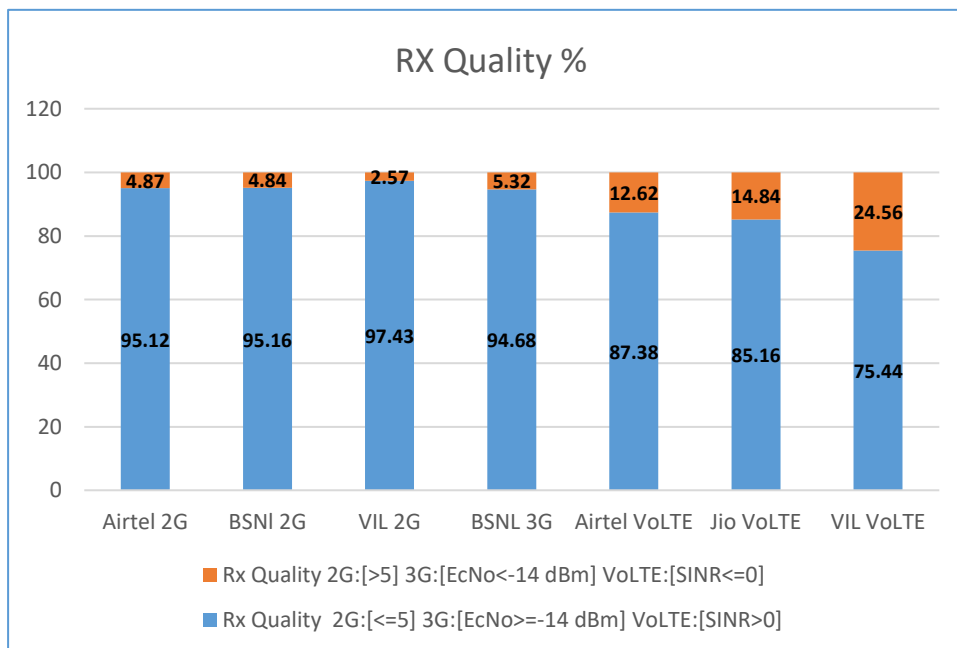


2G			VoLTE		
Overall RxLevel	# Samples	% PDF	Overall RSRP	# Samples	% PDF
[Max, >=-75]	12512	41.94	[Max, >=-80]	6428	17.96
[-75, >=-85)	9685	32.47	[-80, >=-90)	10464	29.23
[-85, >=-95)	6190	20.75	[-90, >=-110)	16525	46.16
[-95, >=Min)	1444	4.84	[-110, >=Min)	2382	6.65
Total	29831	100	Total	35799	100

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 $\geq 95\%$.

TSP	Rx Quality %
Airtel 2G	95.12
BSNI 2G	95.16
VIL 2G	97.43
BSNL 3G	94.68
Airtel VoLTE	87.38
Jio VoLTE	85.16
VIL VoLTE	75.44

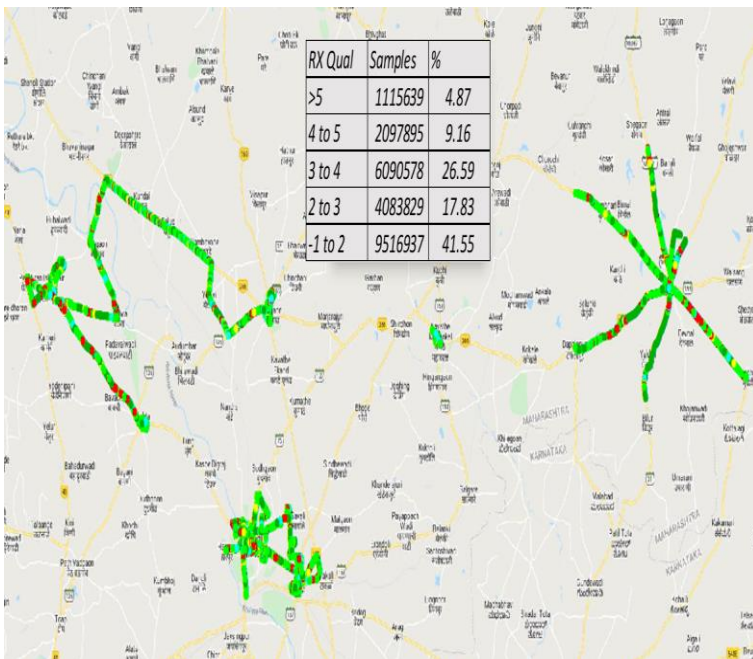


II. Quality Details

Airtel

Technology	Rx Quality %
2G	95.12
VoLTE	87.38

2G



VoLTE



Overall Rx Quality	# Samples	% PDF
(Min, <=2)	9516937	41.55
(2, <=3)	4083829	17.83
(3, <=4)	6090578	26.59
(4, <=5)	2097895	9.16
(5, <=Max)	11156639	4.87
Total	22904878	100

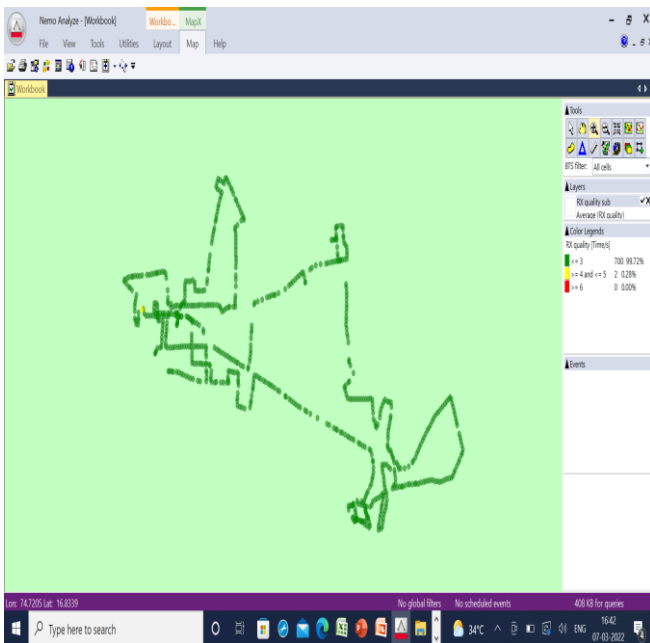
Range	# Samples	% PDF
(30-40)	2561	0.024
(25-30)	24403	0.23
(20-25)	111568	1.08
(15-20)	783818	7.61
(10-15)	1424494	13.84
(5-10)	4739267	46.04
(0-5)	1905911	18.51
(<0)	1300167	12.63
Total	15031456	100

II. Quality Details

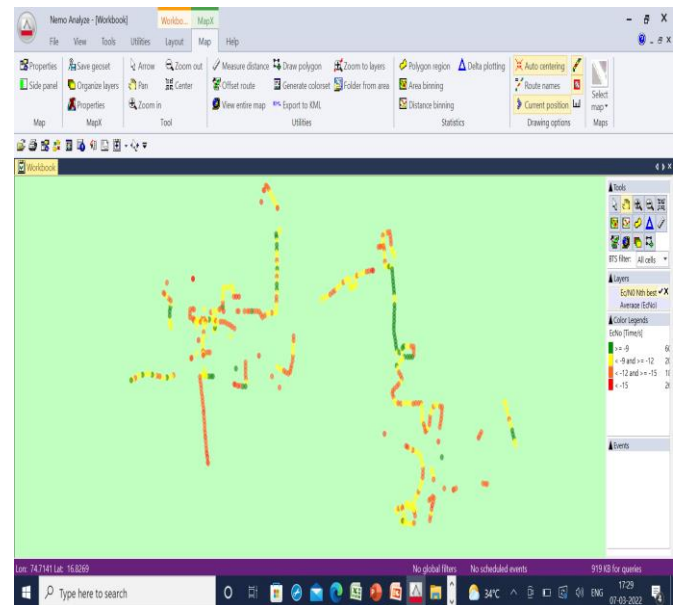
BSNL

Technology	Rx Quality %
2G	95.12
3G	94.68

2G



3G



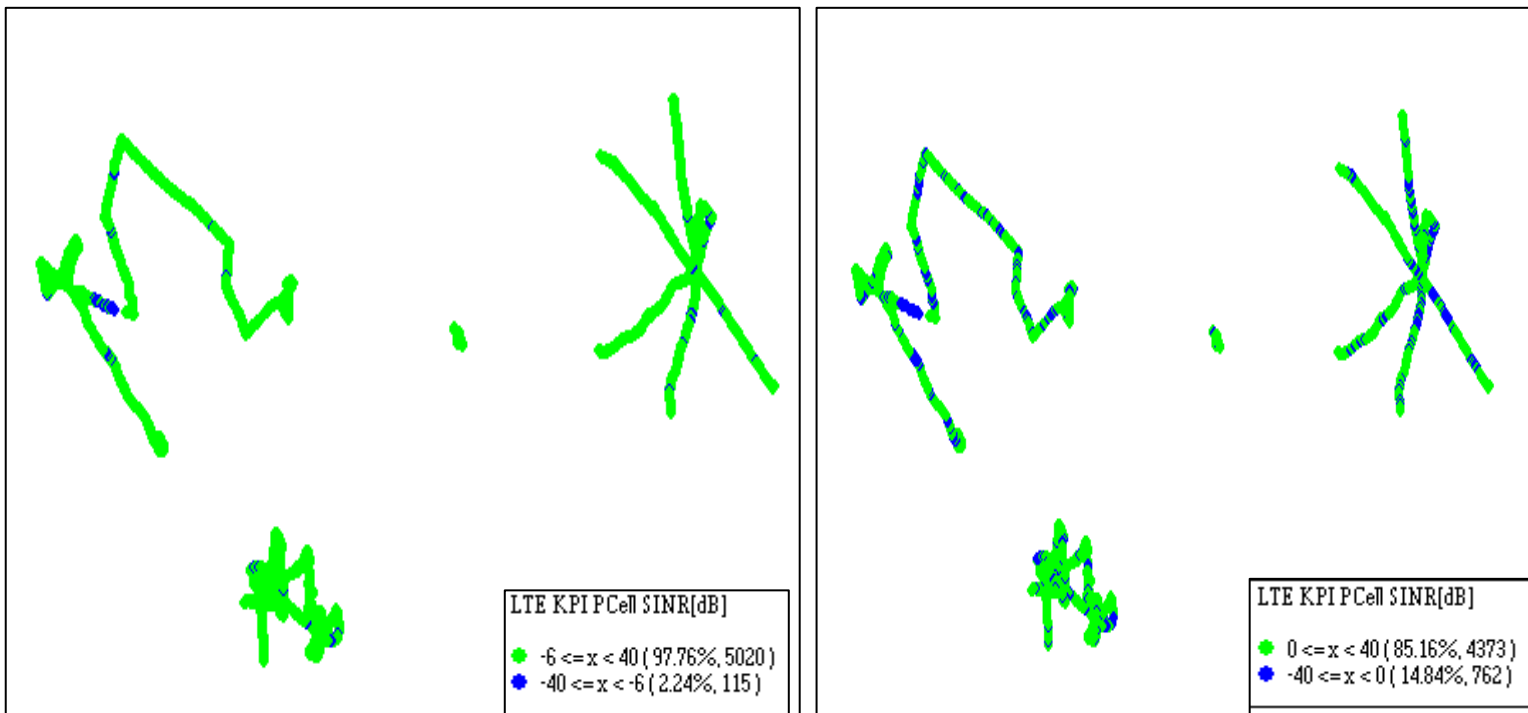
Overall Rx Quality	# Samples	% PDF
(Min, <=2)	18272	77.97
(2, <=3)	2445	10.43
(3, <=4)	917	3.91
(4, <=5)	1791	7.64
(5, <=Max)	11	0.05
Total	23436	100

Overall EcNo	# Samples	% PDF
(Max, <=-6)	3898	22.37
(-6, <=-9)	5857	33.6
(-9, <=-11)	4639	26.62
(-11, <=-14)	2488	14.27
(-14, <= Min)	548	3.14
Total	28836	100

II. Quality Details

JIO

Technology	Rx Quality %
VoLTE	85.16



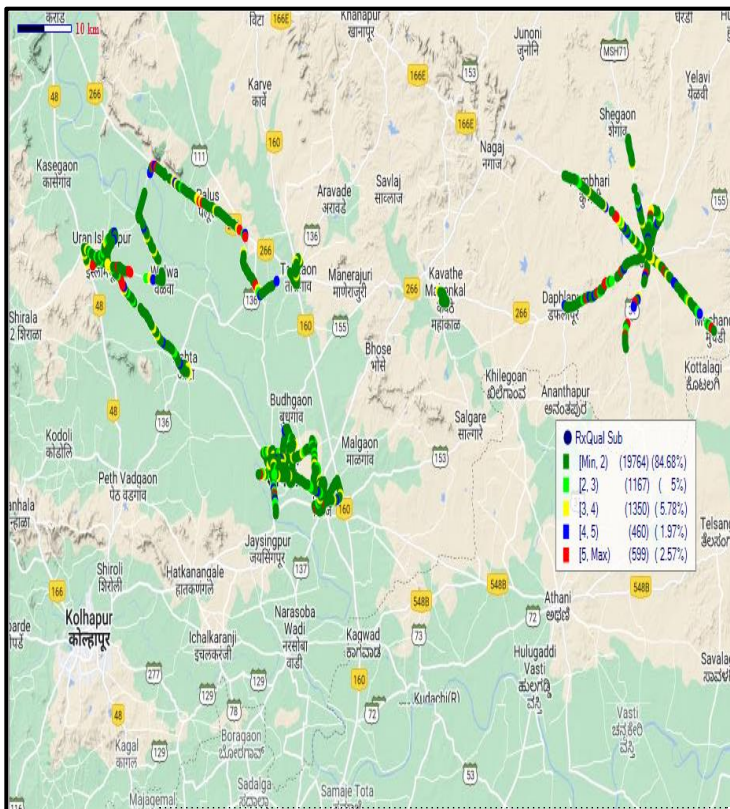
SINR	# Samples	% PDF
(Max, >0)	4373	85.16%
(<= 0)	762	14.84%
Total	5135	100%

II. Quality Details

VIL

Technology	Rx Quality %
2G	97.43
VoLTE	75.44

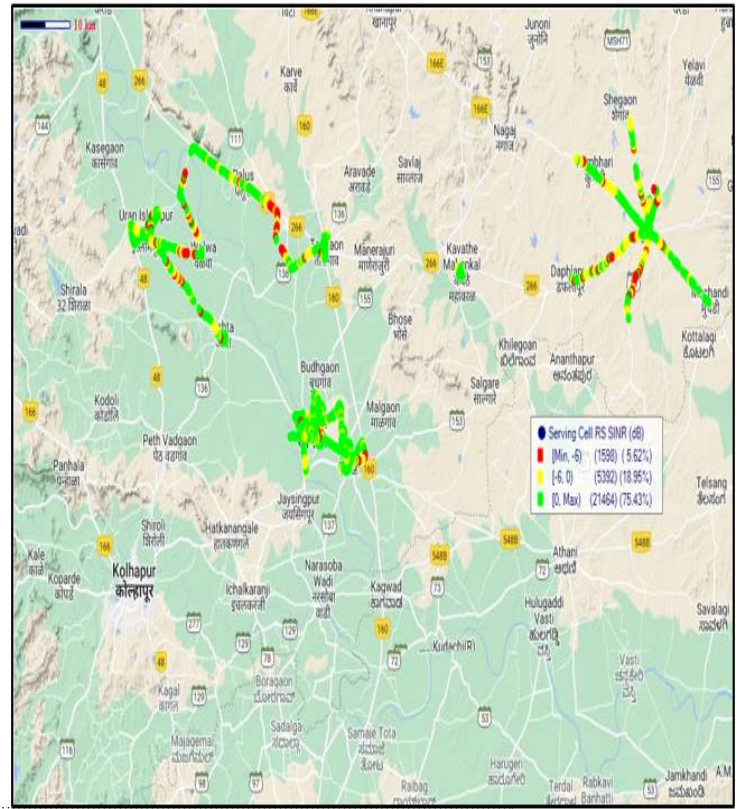
2G



2G

Overall RxQuality	# Samples	% PDF
[Min, <=2]	19764	84.68
[2, <=3]	1167	5.0
[3, <=4]	1350	5.78
[4, <=5]	460	1.97
[5, <=Max]	599	2.57
Total	23340	100

VoLTE

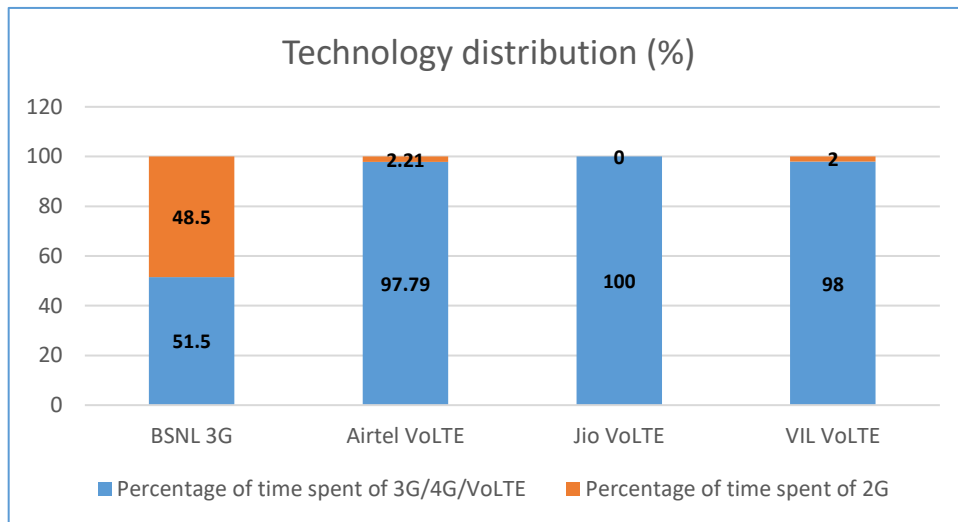


VoLTE

Overall SINR	# Samples	% PDF
[Min, <=0]	6990	24.57
[0, <=5]	7696	27.05
[5, <=10]	6017	21.15
[10, <=15]	3958	13.91
[15, <=Max]	3793	13.33
Total	28454	100

III. Technology Details

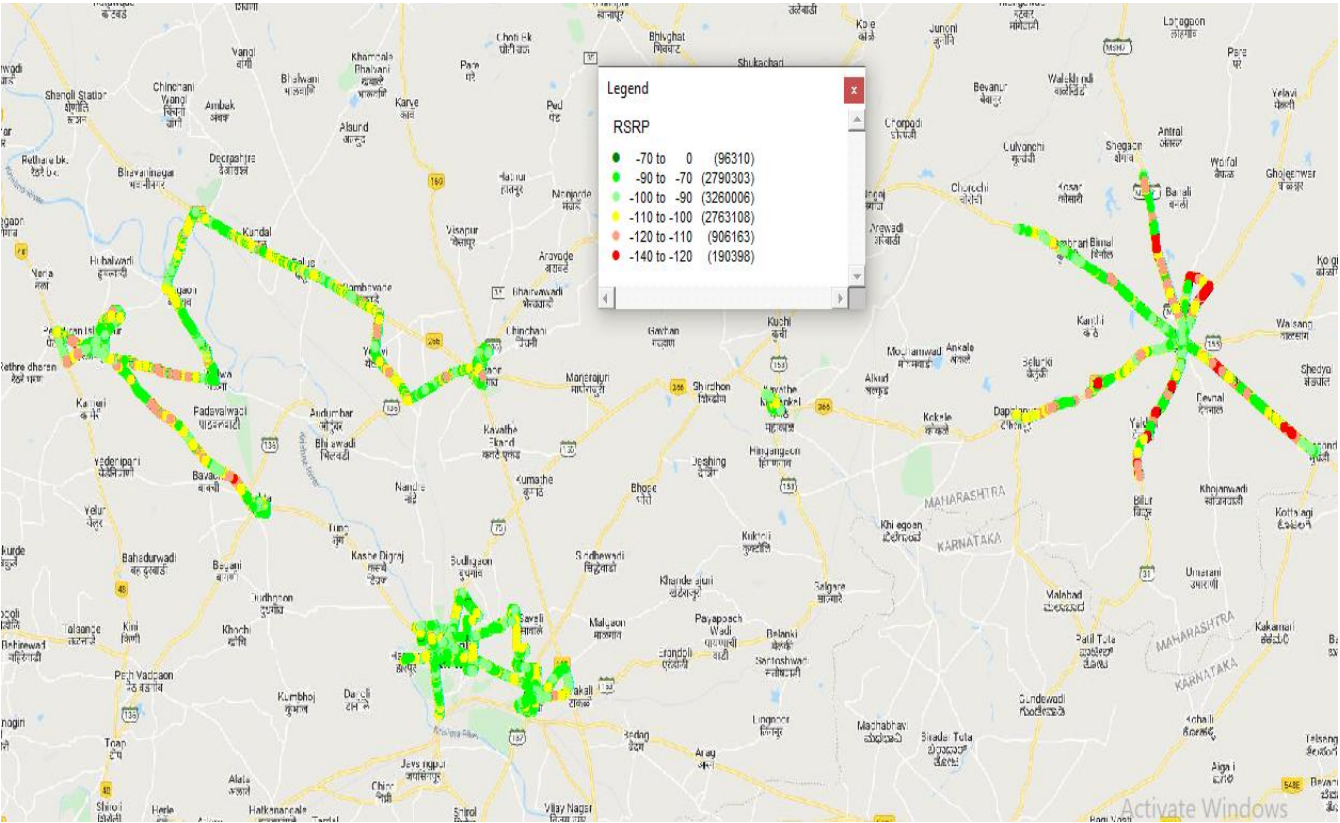
TSP	Percentage of time spent on 3G/4G/VoLTE
BSNL 3G	51.5
Airtel VoLTE	97.79
Jio VoLTE	100
VIL VoLTE	98



III. Technology Details

Airtel

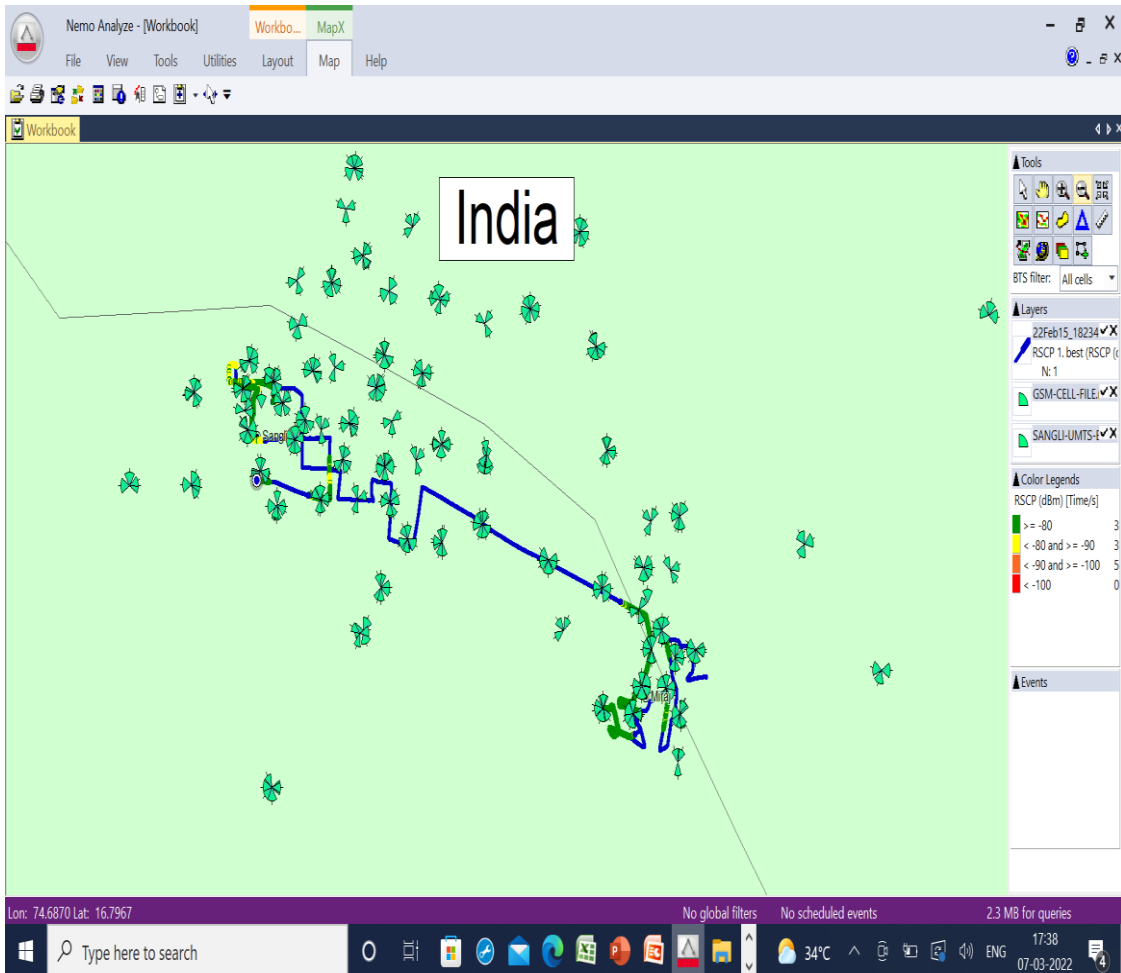
Technology	Time Spent
VoLTE	97.79%



III. Technology Details

BSNL

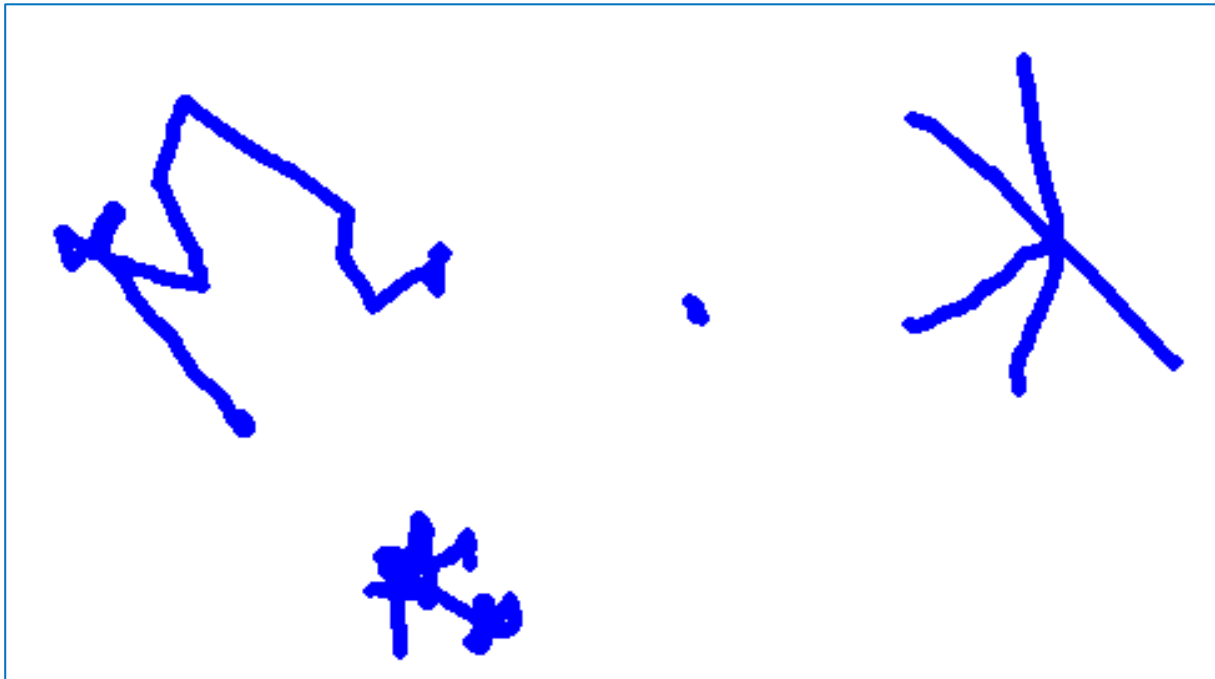
Technology	Time Spent
3G	51.5 %



III. Technology Details

JIO

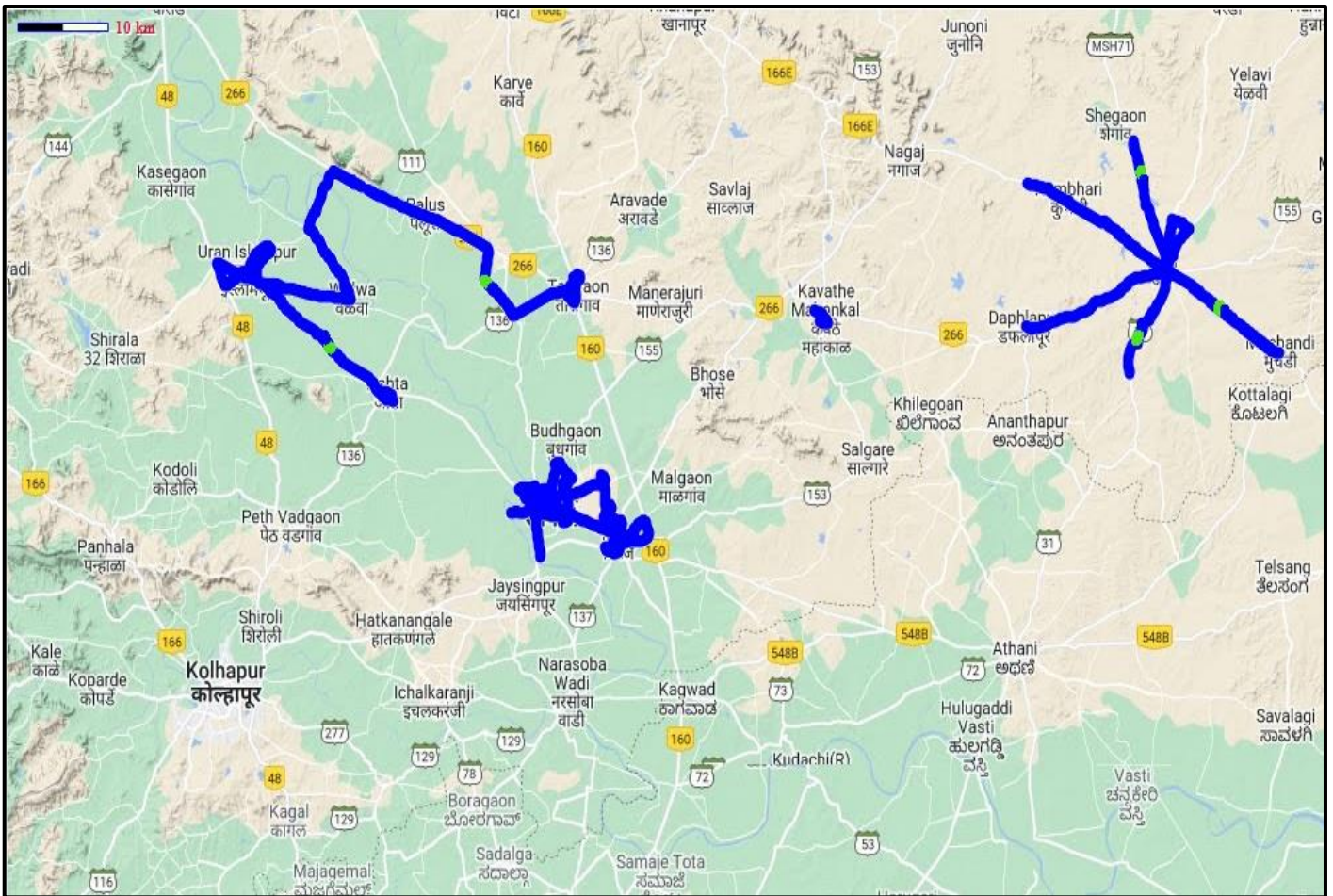
Technology	Time Spent
VoLTE	100 %



III. Technology Details

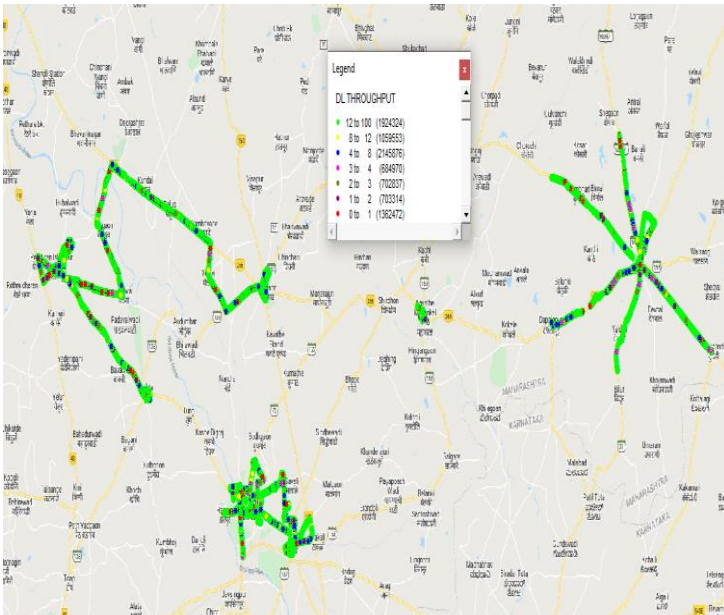
VIL

Technology	Time Spent
VoLTE	98 %

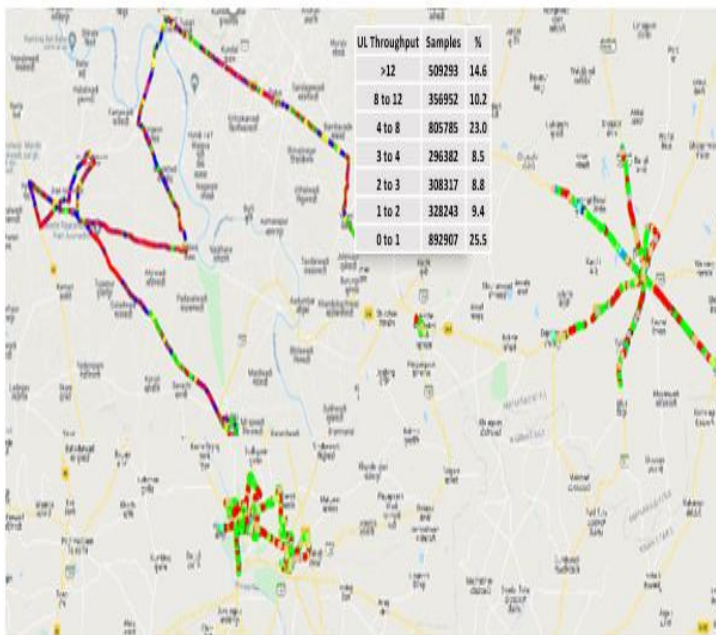


IV. Dynamic Data Test (Data Test on Move) - 4G DL/UL Details

Airtel



DL throughput	No of Sample	%
0 to 1 Mbps	1362472	15.87%
1 to 2 Mbps	703314	8.19%
2 to 3 Mbps	702837	8.19%
3 to 4 Mbps	684970	7.98%
4 to 8 Mbps	2145876	25%
8 to 12 Mbps	1059553	12.34%
>12 Mbps	1924324	22.42%
Total	8583346	



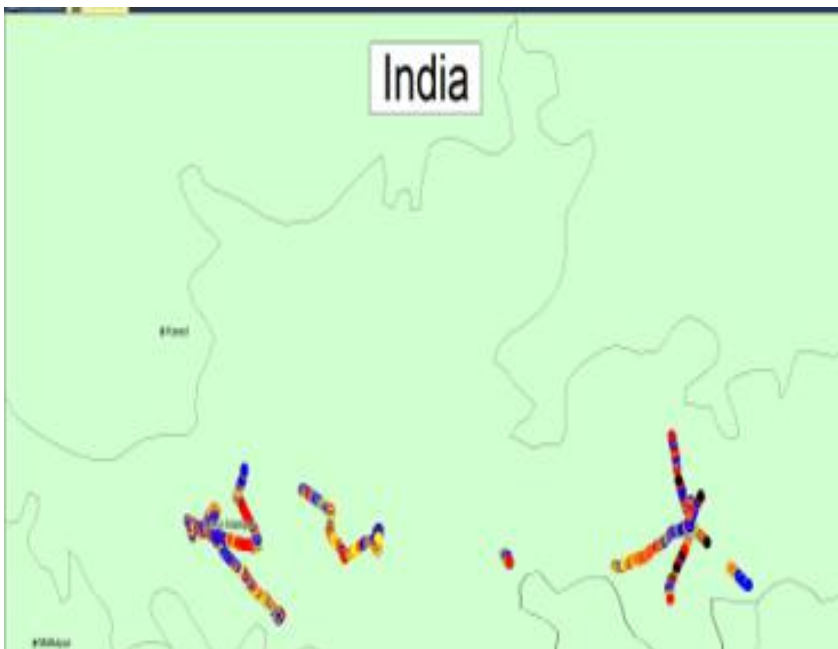
UL Throughput	Samples	%
>12	509293	14.6
8 to 12	356952	10.2
4 to 8	805785	23.0
3 to 4	296382	8.5
2 to 3	308317	8.8
1 to 2	328243	9.4
0 to 1	892907	25.5

IV. Dynamic Data Test (Data Test on Move) - 3G DL/UL Details

BSNL



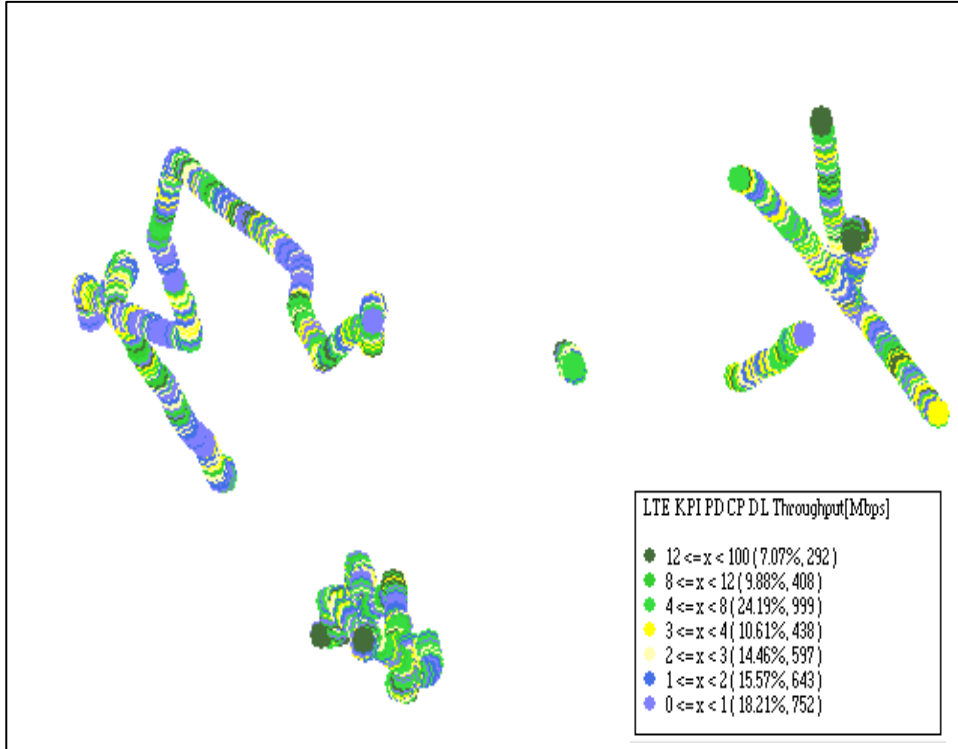
Download Throughput	No. of samples	%
0 to 1 Mbps	17953	52.39
1 to 2 Mbps	5868	17.12
2 to 3 Mbps	3089	9.01
3 to 4 Mbps	2070	6.04
4 to 8 Mbps	4193	12.24
8 to 12 Mbps	1041	3.04
>12 Mbps	55	0.16



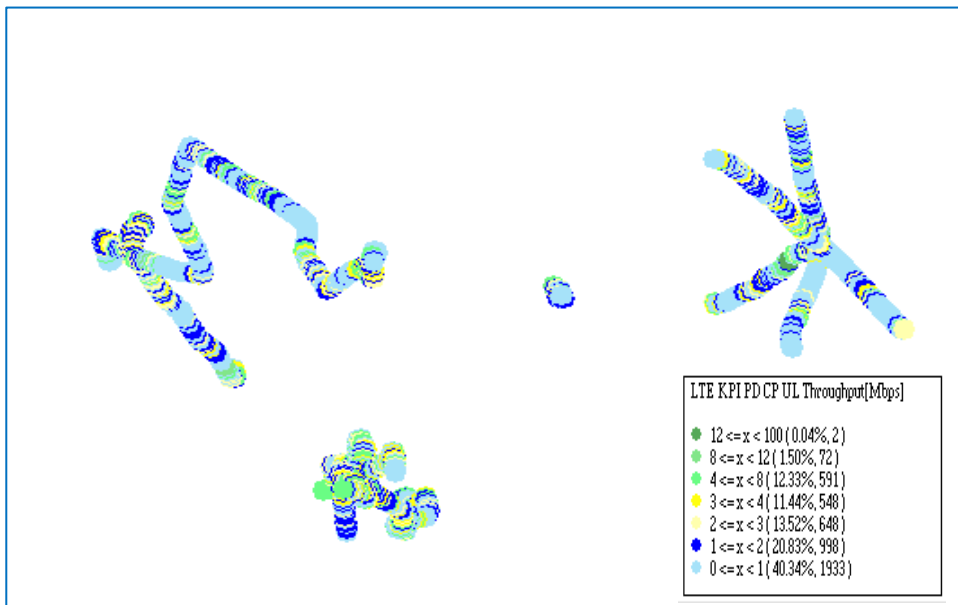
Upload Throughput	No. of samples	%
0 to 256 kbps	1701	11.20
Mbps	1664	10.95
250 to 512 kbps	3831	25.22
512 Kbpsto 1 Mbps	7275	47.89
1 to 2 Mbps	719	4.73
2 to 3 Mbps	0	0.00
3 to 4 Mbps	0	0.00
>4Mbps	0	0.00

IV. Dynamic Data Test (Data Test on Move) - 4G DL/UL Details

JIO



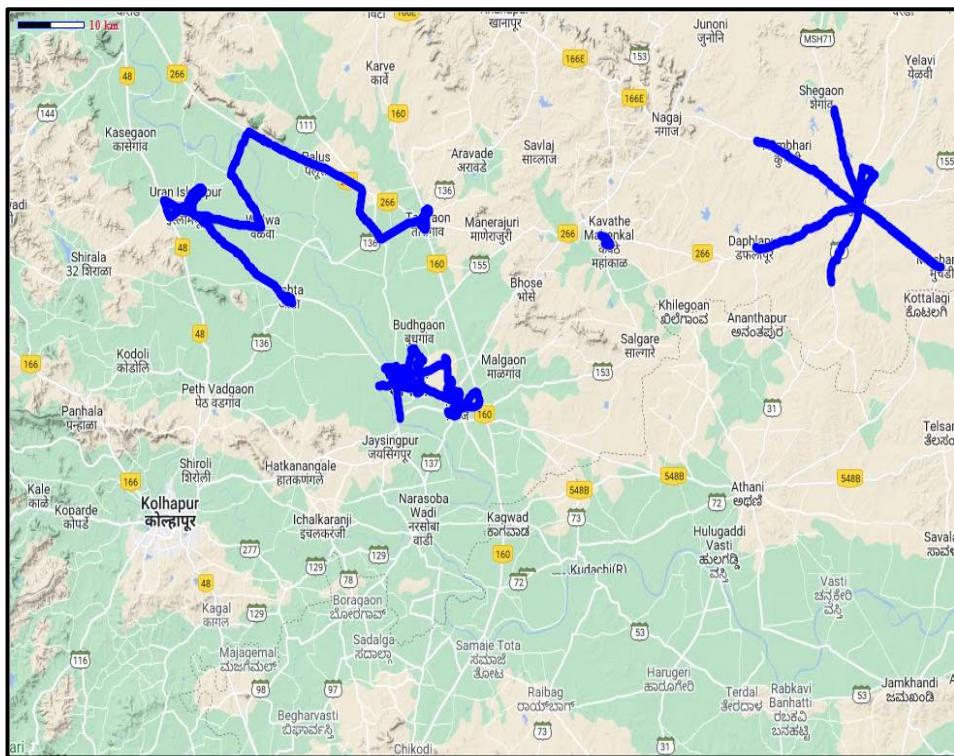
DL throughput	No of Sample	%
0 to 1 Mbps	292	7.07
1 to 2 Mbps	408	9.88
2 to 3 Mbps	999	24.19
3 to 4 Mbps	438	10.61
4 to 8 Mbps	597	14.46
8 to 12 Mbps	643	15.57
>12 Mbps	752	18.21
Total	4129	100



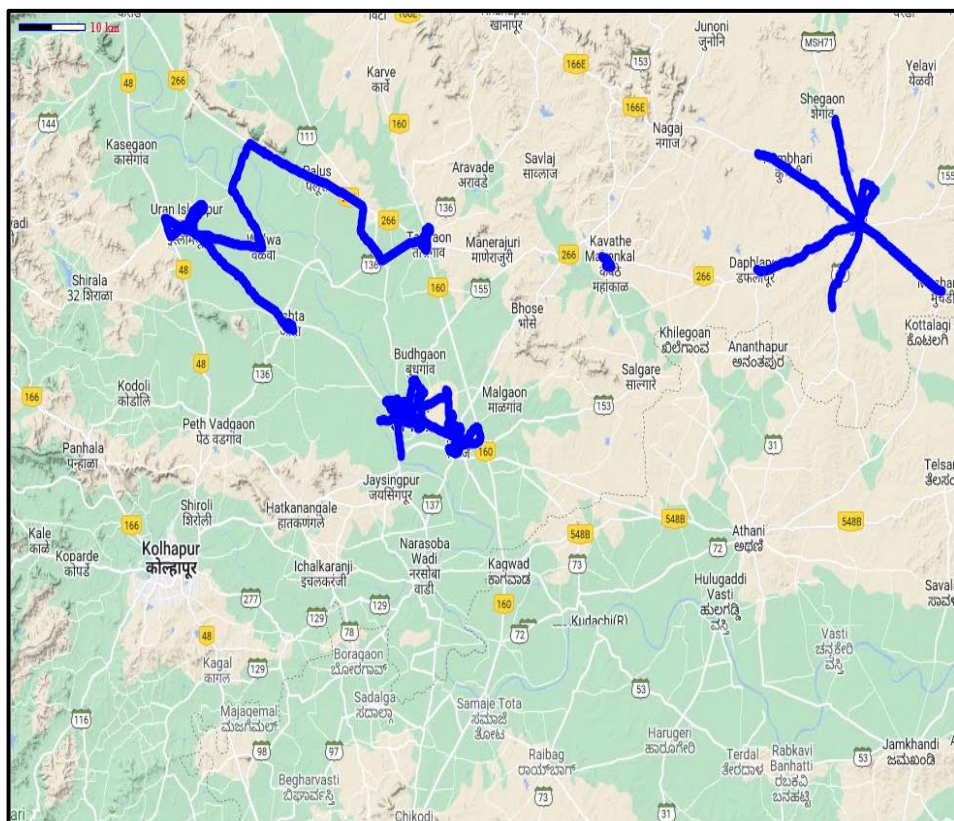
UL throughput	No of Sample	%
0 to 1 Mbps	1933	40.34
1 to 2 Mbps	998	20.83
2 to 3 Mbps	648	13.52
3 to 4 Mbps	548	11.44
4 to 8 Mbps	591	12.33
8 to 12 Mbps	72	1.5
>12 Mbps	2	0.04
Total	4792	100

IV. Dynamic Data Test (Data Test on Move) - 4G DL/UL Details

VIL

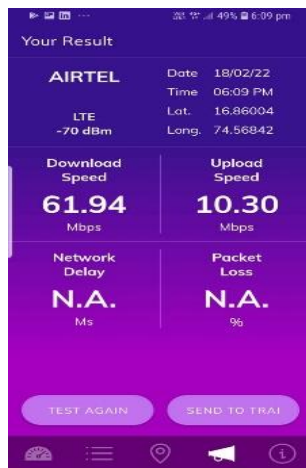
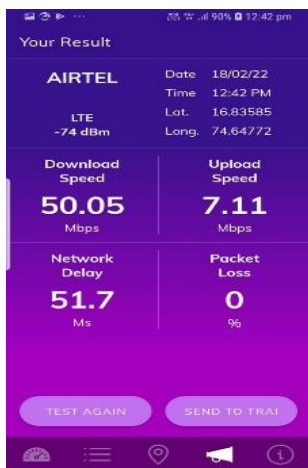
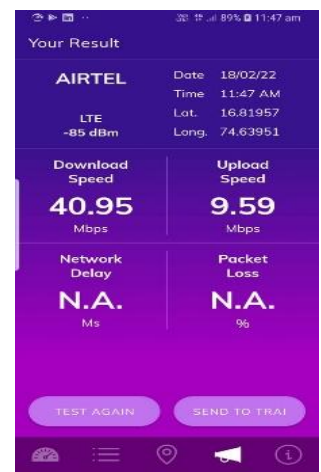
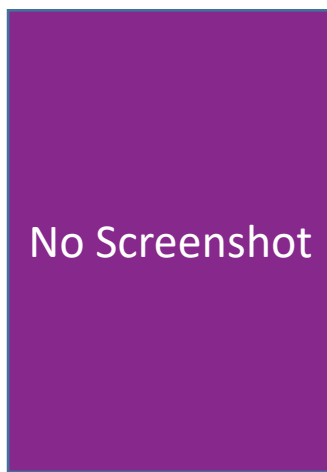


Download Throughput	No. of samples	%
0 to 1 Mbps	13981	49.25
1 to 2 Mbps	2007	7.07
2 to 3 Mbps	1661	5.85
3 to 4 Mbps	1438	5.07
4 to 8 Mbps	4063	14.31
8 to 12 Mbps	2147	7.56
>12 Mbps	3092	10.89

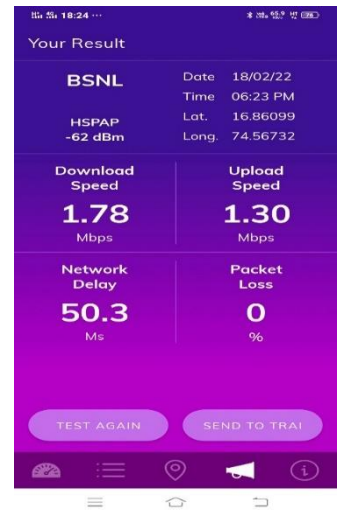
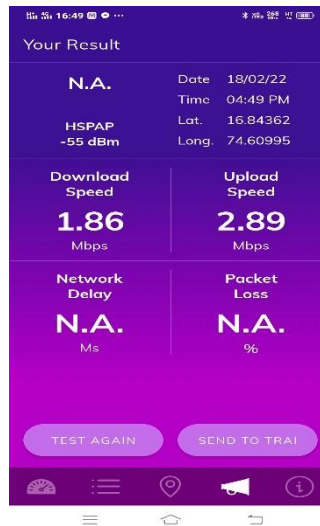
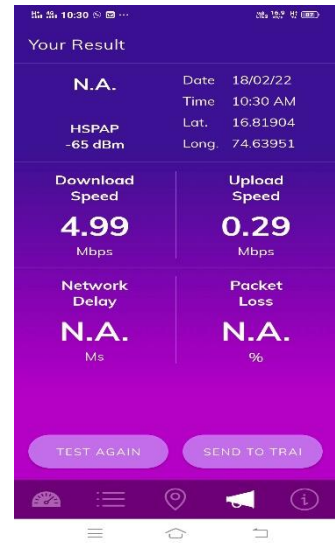


Upload Throughput	No. of samples	%
0 to 256 kbps	10110	37.94
250 to 512 kbps	731	2.74
512 Kbps to 1 Mbps	1677	6.29
1 to 2 Mbps	4699	17.63
2 to 3 Mbps	1831	6.87
3 to 4 Mbps	1187	4.45
>4Mbps	6414	24.07

Techology-4G	Location 1	Location 2	Location 3	Location 4	Location 5	Location 6
Download Speed	21.23	44.75	40.95	50.05	61.94	66.66
Upload Speed	3.17	8.2	9.59	7.11	10.30	2.95
Latency	33.8	33.9	33	51.5	35.6	53.2



Techology-3G	Location 1	Location 2	Location 3	Location 4	Location 5	Location 6
Download Speed		3.20	4.99		1.86	1.78
Upload Speed		3.12	0.29		2.89	1.30
Latency		26.1	-----		-----	50.3



Techology-4G	Location 1 (collector office)	Location 2 Headpost Office)	Location 3 (Miraj Govt Hosp)	Location 4 (Miraj Railway Sta)	Location 5 (Jath Bus stand)	Location 6 (Tasgaon Bus Stand)
Download Speed	19.37	10.79	21.88	43.56	62.43	23.39
Upload Speed	29.13	8.93	16.53	8.66	9.95	17.14
Latency	49.3	50.3	45.8	42.0	52	48.4



Techology-4G	Location 1- Jath ST Stand	Location 2- Tasgaon ST Stand	Location 3- Miraj Railway Station	Location 4- Medical College Miraj	Location 5- Sangli DC Office	Location 6- Sangli Head post Office
Download Speed	10.70	31.30	45.18	22.53	29.47	3.19
Upload Speed	11.80	18.35	27.42	22.59	3.62	1.52
Latency	75	34	32	57	29	33

