



प्रभावी विनियमन – सुगम संचार
Effective Regulation – Ease of Communication

Operator Assisted Drive Test Report

Bhopal – Jabalpur Highway (Via Bareli, Udaypura, Belkhedi)

04/05/2023

By

TRAI Regional Office Bhopal

The Operator Assisted Drive Test has been carried out by Regional Office, Bhopal with the help of Telecom Service Providers for Bhopal to Jabalpur Highway from 9:00 AM to 8:00 PM on 04/05/2023. The drive test covered drive route of around 300 KMs.

TSP	Network tested
Airtel	2G & VoLTE
BSNL	2G & 3G
JIO	VoLTE
VIL	2G & VoLTE

Key Performance Indicators:

KPI	Benchmark	Observations
Block call rate %	$\leq 3\%$	All TSPs achieved the benchmark
Drop call rate %	$\leq 2\%$	All TSPs achieved the benchmark
CSSR %	$\geq 95\%$	All TSPs achieved the benchmark
Mobility HOSR %	$\geq 95\%$	All TSPs achieved the benchmark
Good RX Quality %	$\geq 95\%$	All TSPs achieved the benchmark, except Airtel and JIO in VoLTE

Overview

Regional Office, TRAI Bhopal conducted Operator Assisted Drive Test. 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

Drive Test Details :

Voice Tests:

- i. 2G – measurement – UE Locked in 2G
- ii. 3G – measurement – UE in Dual mode (2G and 3G)
- iii. 4G – measurement – UE in Free mode

Calls were made for the **90-sec** duration with a wait time of **10 sec** between calls in all technologies.

Data Tests:

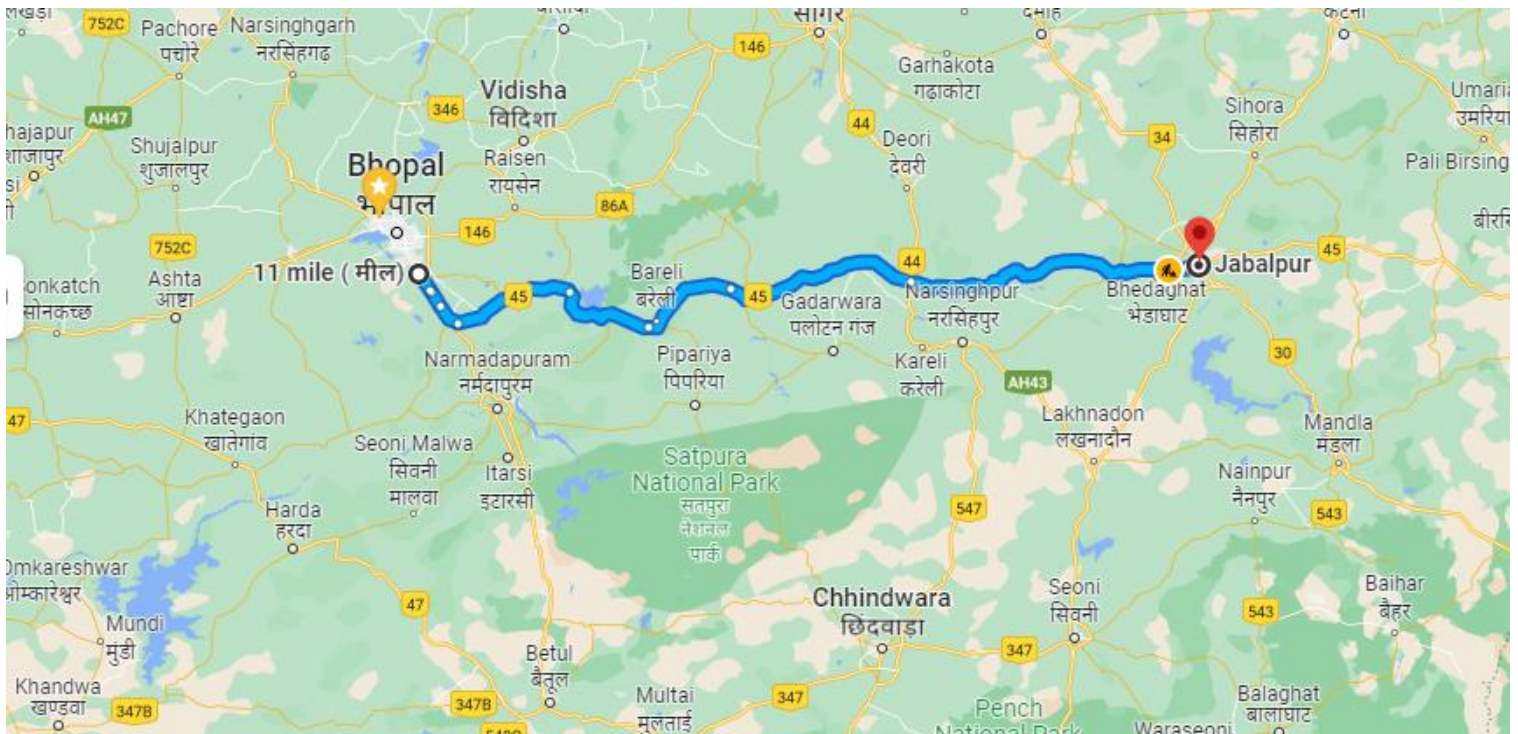
Dynamic data – repeat data file download (to check throughput on the entire route)

- i. 2G – measurement – UE Locked in 2G file size- 500KB
- ii. 3G – measurement – UE in 3G File Size- 20MB
- iii. 4G – measurement – UE in LTE File Size- 40MB

Static Data: Download and Upload Throughputs, Web Browsing Delay, Video Streaming Delay, and Latency

- i. Download- 2G - 500KB ,3G - 20 MB, 4G - 40MB
- ii. Upload - 2G -100KB ,3G - 5 MB, 4G - 10MB
- iii. Web browsing - 3 links of e-commerce websites <https://www.amazon.in>, <https://www.flipkart.com>, <https://paytm.com>.
- iv. Video Streaming – 130 sec clip (only in 3G and LTE)
- v. Latency – 32 Bytes on www.google.com.

Voice & Dynamic Data Test Drive Route



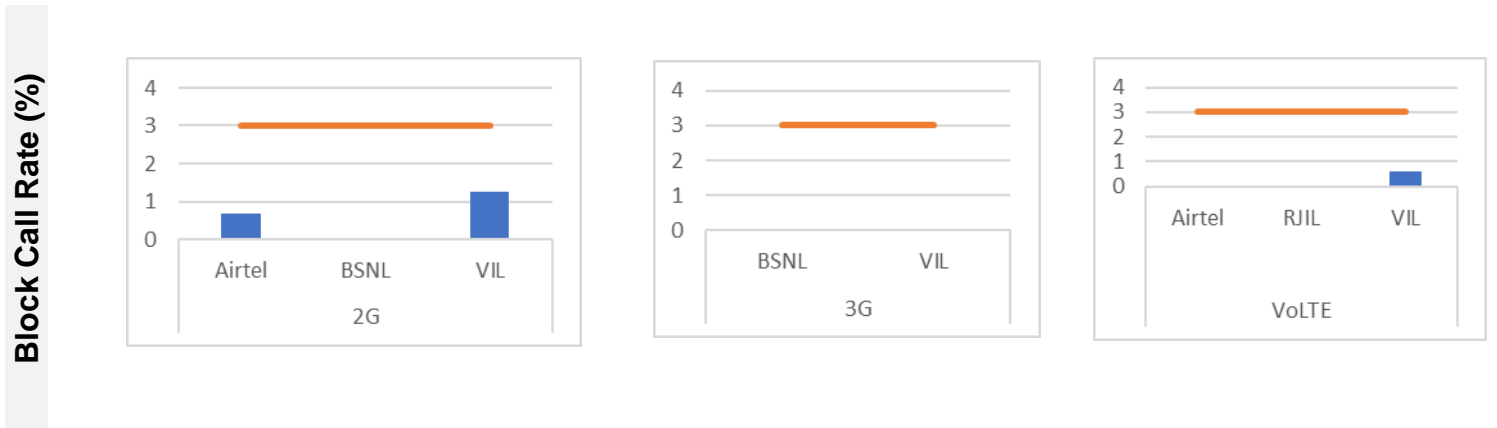
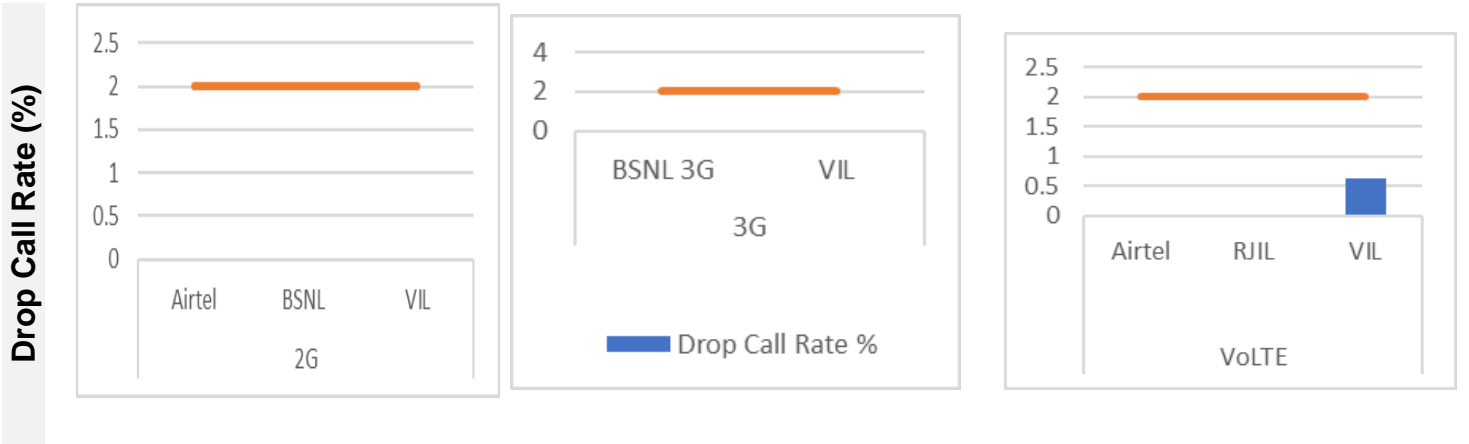
List of important area covered during the drive test

1. 11 Mile Bhopal
2. Obdullaganj
3. Goharganj
4. Badi
5. Bareli
6. Udaipura
7. Deori
8. Tendukheda
9. Belkhedi
10. Jabalpur

Voice Calls

Key Observations

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



KPIs	2G			3G		VoLTE		
	Airtel	BSNL	VIL	BSNL	VIL	Airtel	RJIL	VIL
Drop Call Rate %	0	0	0.00	0	NA	0	0	0.62
Block Call Rate %	0.67	0	1.27	0	NA	0	0	0.61

- 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 %	54.12	65.87	54.49

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

TSPs	3G	
	BSNL	VIL
Coverage %	55.8	NA

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

TSPs	VoLTE		
	Airtel	JIO	VIL
Coverage %	89.95	95.24	97.18

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

TSPs	3G		VoLTE		
	BSNL	VIL	Airtel	VIL	JIO
Time Spent on 3G/4G %	55.8	NA	100	61.04	100

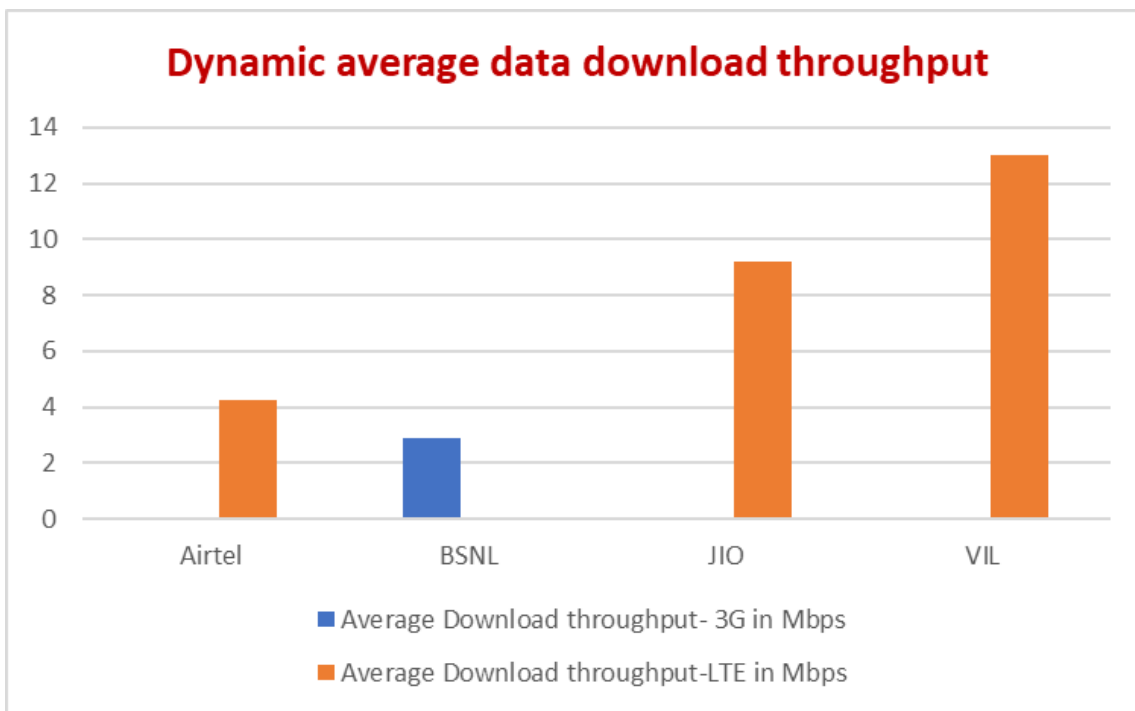
Data Services Dynamic

Key Observations

Dynamic data-download Throughput was tested.

Data Download Performance - Dynamic

3G/4G/ Network:



TSP	Airtel	BSNL	JIO	VIL
Average Download throughput- 2G In Kbps	33.07	118	NA	118.85
Average Download throughput- 3G In Mbps	NA	2.87	NA	NA
Average Download throughput-LTE In Mbps	4.28	NA	9.21	13

Summary

Highway Summary- Voice

TSP (For 2G)	Airtel	BSNL	JIO	VIL
Call attempts	150	106	NA	158
Block call rate %	0.67	0	NA	1.27
CSSR %	100	100	NA	98.73
Drop call rate %	0	0	NA	0.00
Mobility HOSR %	100	100	NA	98.72
RX Quality %	96.04	96.86	NA	96.59
Average CST Sec	4.20	90	NA	2.42

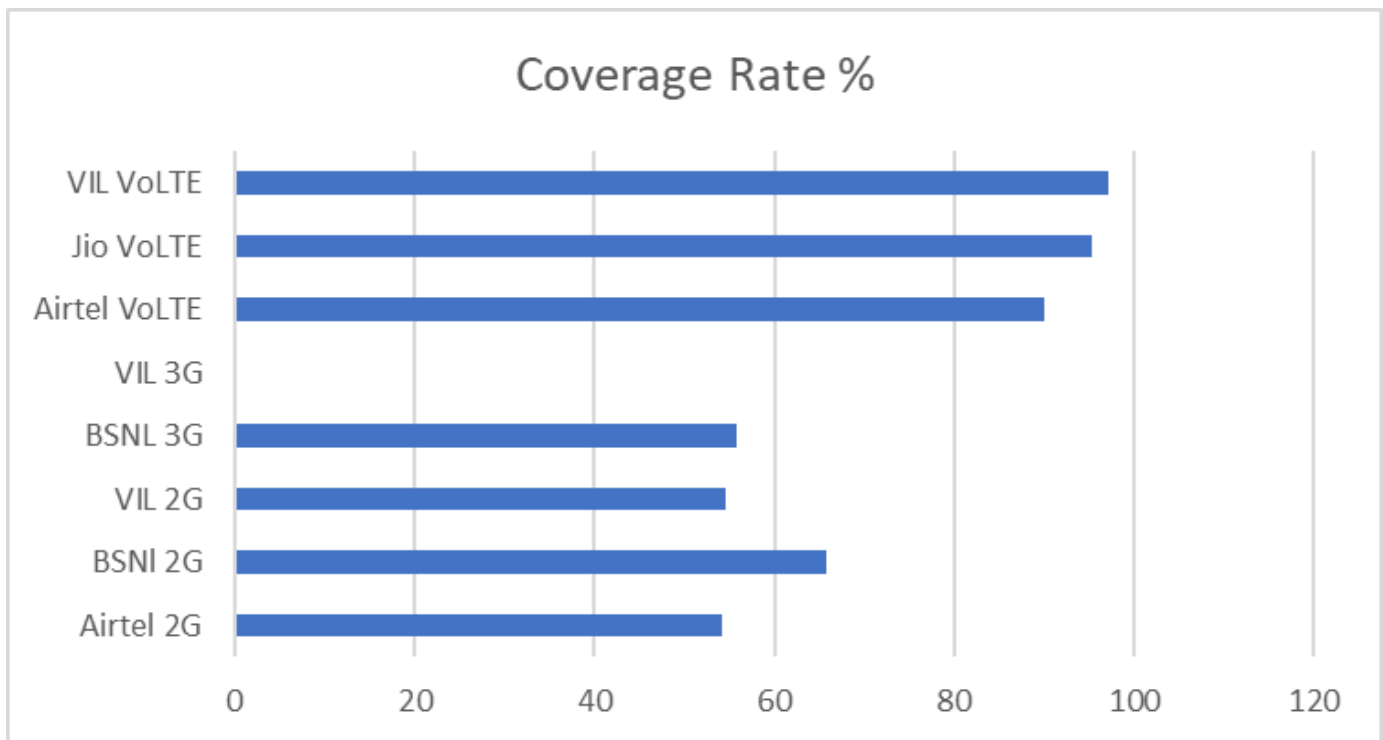
TSP (For 3G)	Airtel	BSNL	JIO	VIL
Call attempts	NA	99	NA	NA
Block call rate %	NA	0	NA	NA
CSSR %	NA	100	NA	NA
Drop call rate %	NA	0	NA	NA
Mobility HOSR %	NA	97.56	NA	NA
RX Quality %	NA	98.3	NA	NA
Average CST (Sec)	NA	90	NA	NA

TSP (For VoLTE)	Airtel	BSNL	JIO	VIL
Call attempts	160	NA	182	162
Block call rate %	0	NA	-	0.62
CSSR %	99.37	NA	97.25	99.38
Drop call rate %	0.62	NA	0	0.62
Mobility HOSR %	97.93	NA	98.27	100
RX Quality %	71.6	NA	84.78	95.92
Average CST(Sec)	0.60	NA	2.06	2.00

Coverage Details

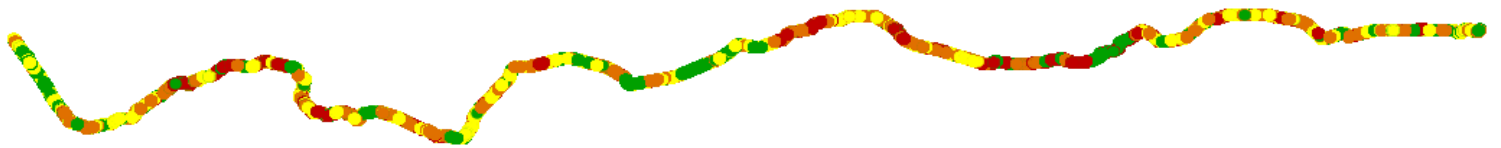
RF Coverage relates to the geographical footprint within the system that has sufficient RF signal strength to provide for a call session. The Coverage rate is calculated on the basis of % of samples in which the Rx level \geq -85 dBm, RSCP is \geq -90 dBm & RSRP \geq -110dBm. The details are as follows.





TSP	Coverage Rate %
Airtel 2G	54.12
BSNI 2G	65.87
VIL 2G	54.49
BSNL 3G	55.8
VIL 3G	NA
Airtel VoLTE	89.95
Jio VoLTE	95.24
VIL VoLTE	97.18



TSP- Airtel

Technology	Coverage %
2G	54.12

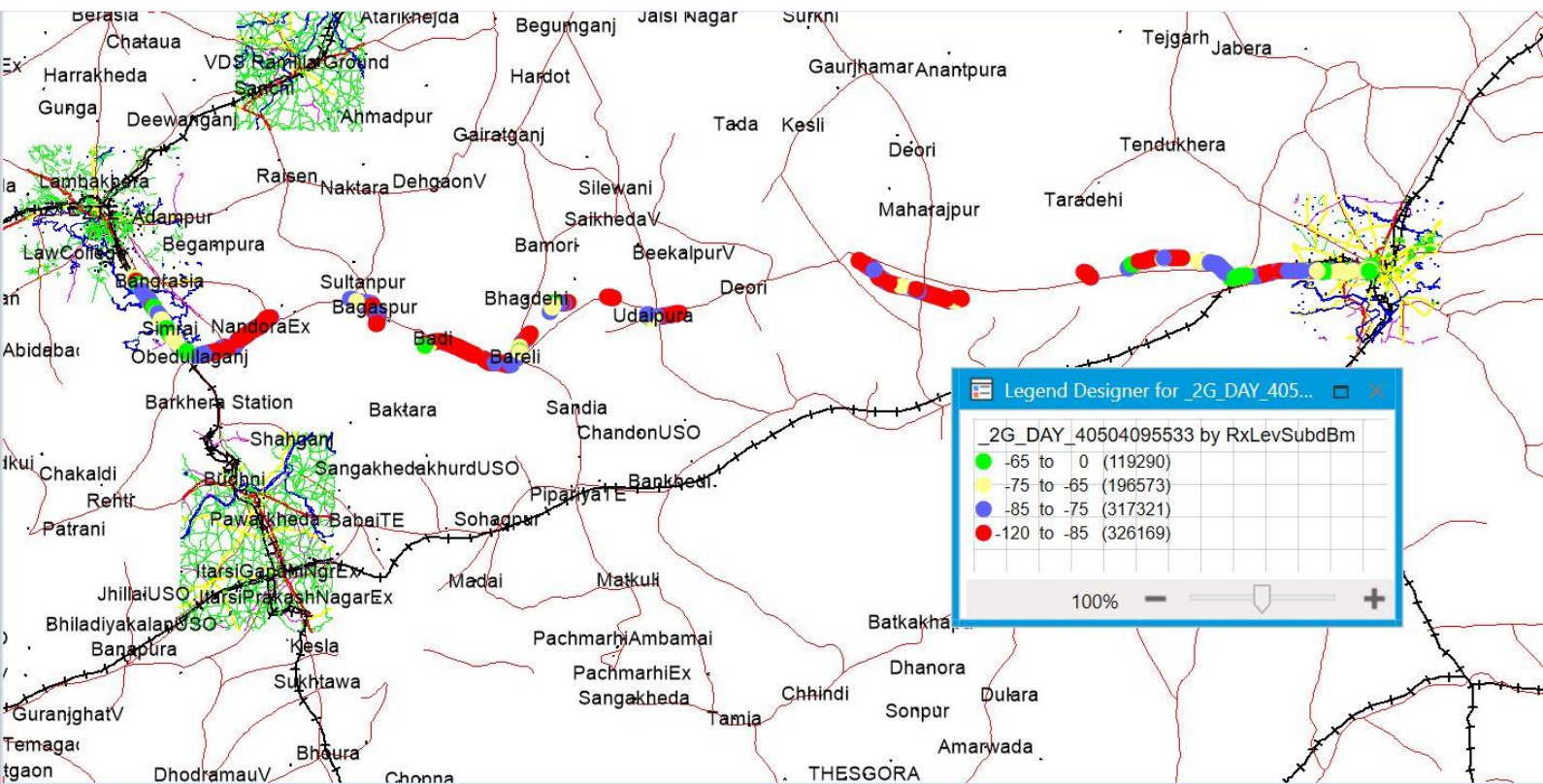






2G			
Overall RxLevel	# Samples	% PDF	Legends
[Max, >=-75]	500204	26.33056	
[-75, >=-85)	527997	27.79357	
[-85, >=-95)	617896	32.52582	
[-95, >=Min)	253612	13.35004	
Total			

Coverage Details

TSP- BSNL

Technology	Coverage %
2G	65.87%

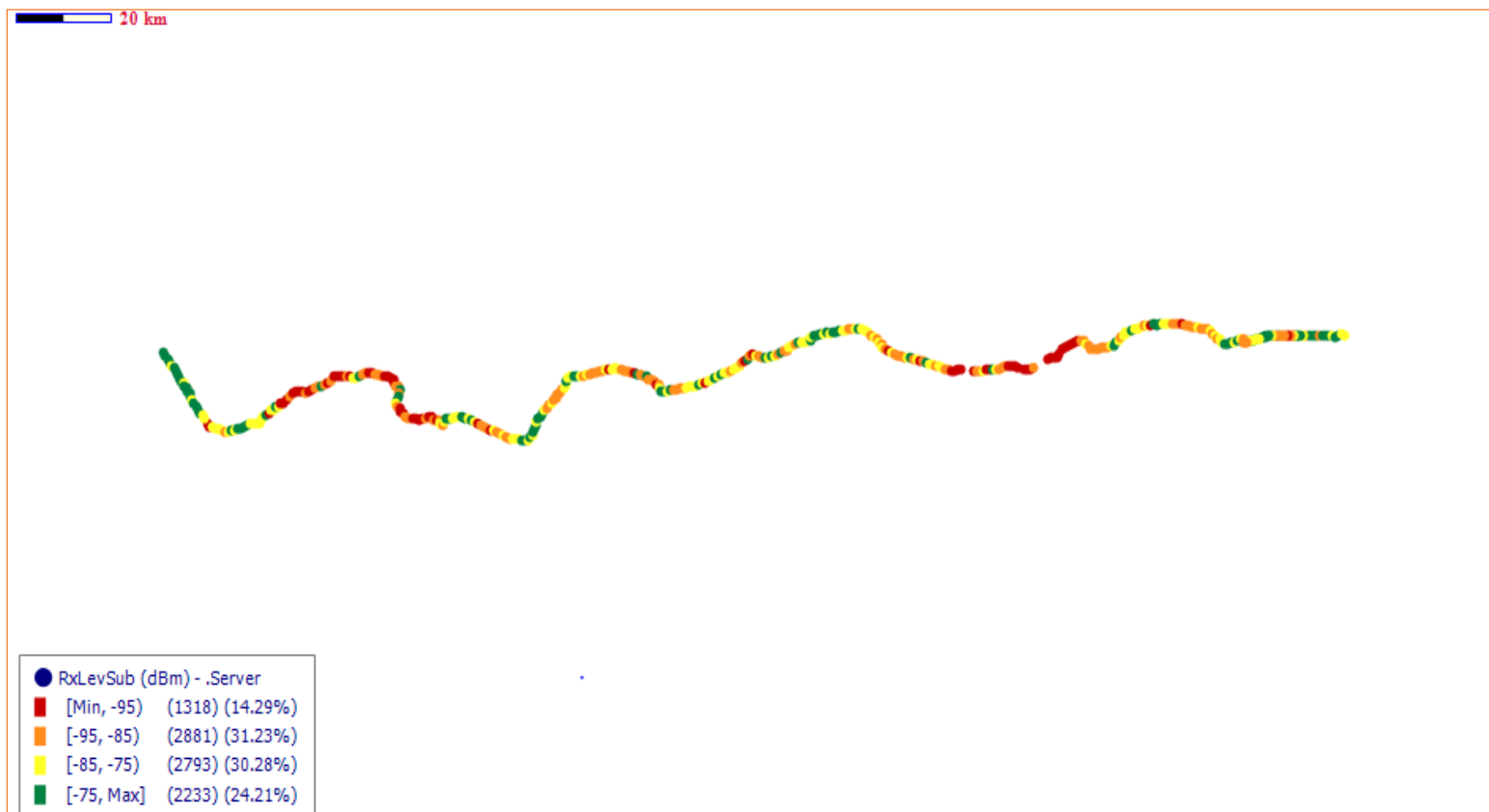


2G			
Overall RxLevel	# Samples	% PDF	Legends
[Max, >=-65]	119290	12.4	
[-65, >=-75)	196573	20.4	
[-75, >=-85)	317321	33.07	
[-85, >=Min)	326169	33.99	
Total			

Coverage Details

TSP-VI

Technology	Coverage %
2G	54.49%

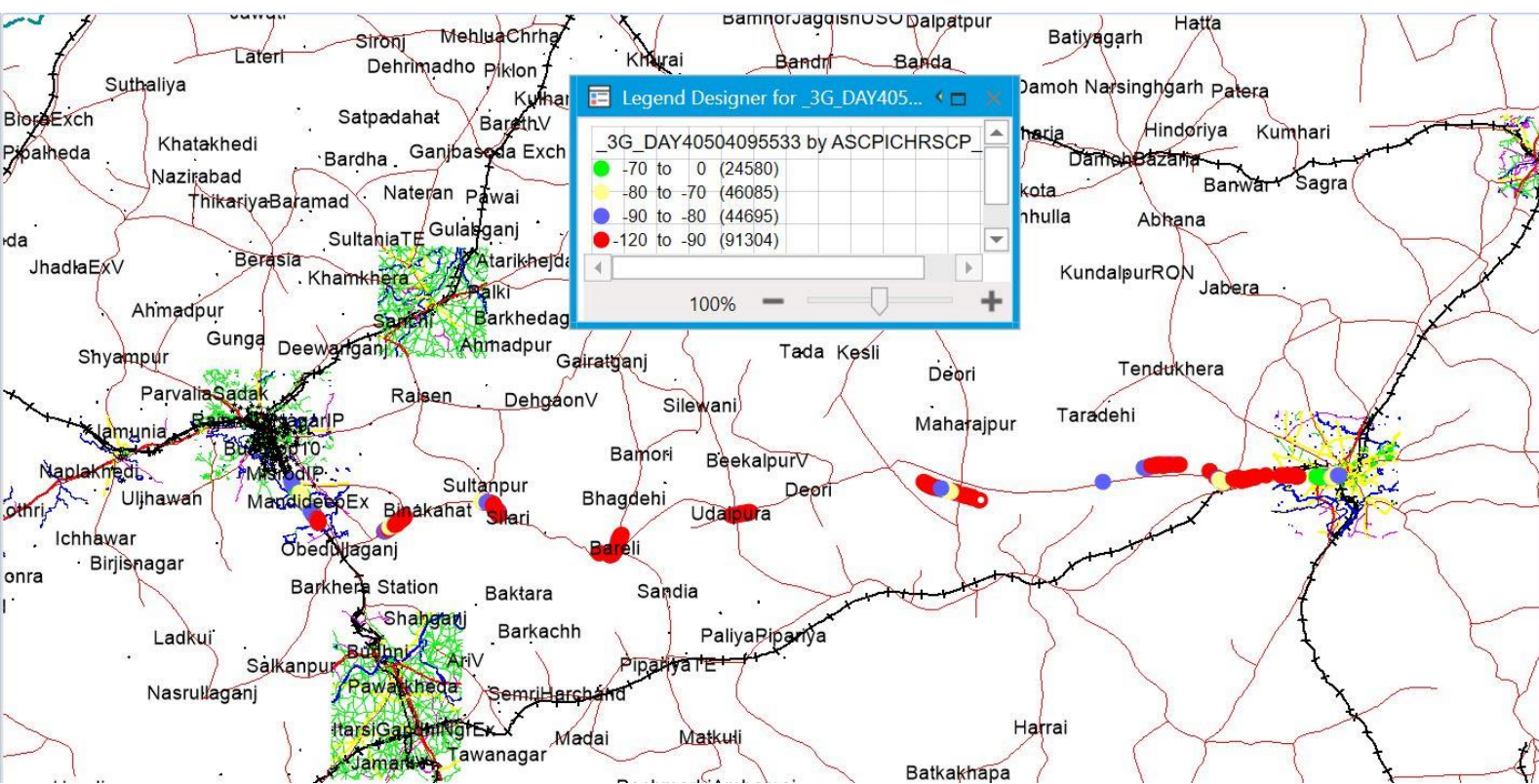






2G			
Overall RxLevel	# Samples	% PDF	Legends
[Max, >=-75]	2233	24.21%	
[-75, >=-85)	2793	30.28%	
[-85, >=-95)	2881	31.23%	
[-95, >=Min)	1318	14.29%	
Total	9225	100%	

Coverage Details

TSP- BSNL

Technology	Coverage %
3G	55.8%

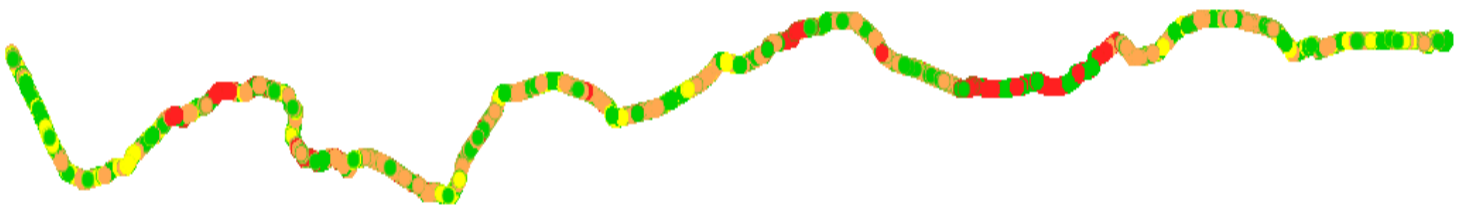


3G			
Overall RSCP	# Samples	% PDF	Legends
[Max, >=-70]	24580	11.89	
[-70, >=-80)	46085	22.29	
[-80, >=-90)	44695	21.62	
[-90, >=Min)	91304	44.17	
Total			

Coverage Details

TSP-Airtel

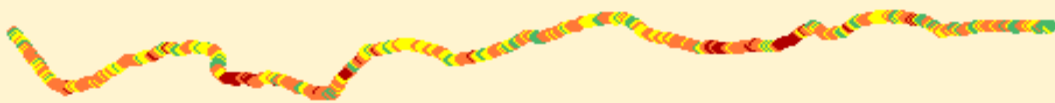
Technology	Coverage %
VoLTE	89.95







VoLTE			
Overall RSRP	# Samples	% PDF	Legends
[Max, >=-80]	1187659	35.56711	
[-80, >=-90)	552892	16.55759	
[-90, >=-110)	1263217	37.82986	
[-110, >=Min)	335438	10.04544	
Total			

TSP- JIO

Technology	Coverage %
VoLTE	95.24%



VoLTE			
Overall RSRP	# Samples	% PDF	Legends
[Max, >=-80]	3419	16.61%	
[-80, >=-90)	6222	30.22%	
[-90, >=-110)	9966	48.41%	
[-110, >=Min)	979	4.76%	
Total	20586		

Coverage Details

TSP-VI

Technology	Coverage %
VoLTE	97.18%

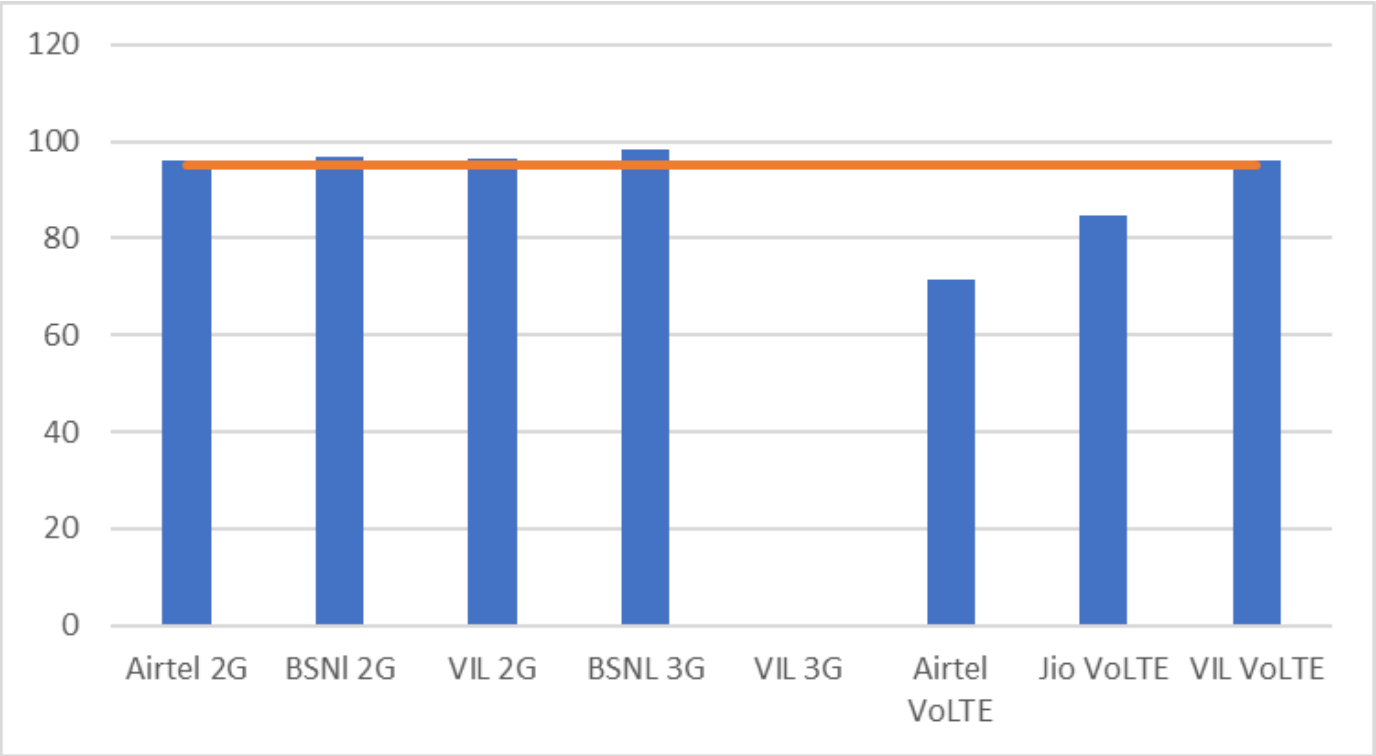


VoLTE			
Overall RSRP	# Samples	% PDF	Legends
[Max, >=-80]	6146	48.44%	
[-80, >=-90]	2240	17.66%	
[-90, >=-110]	3943	31.08%	
[-110, >=Min]	358	2.82%	
Total	12687	100.00%	

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	96.04
BSNI 2G	96.86
VIL 2G	96.59
BSNL 3G	98.3
VIL 3G	NA
Airtel VoLTE	71.6
Jio VoLTE	84.78
VIL VoLTE	95.92

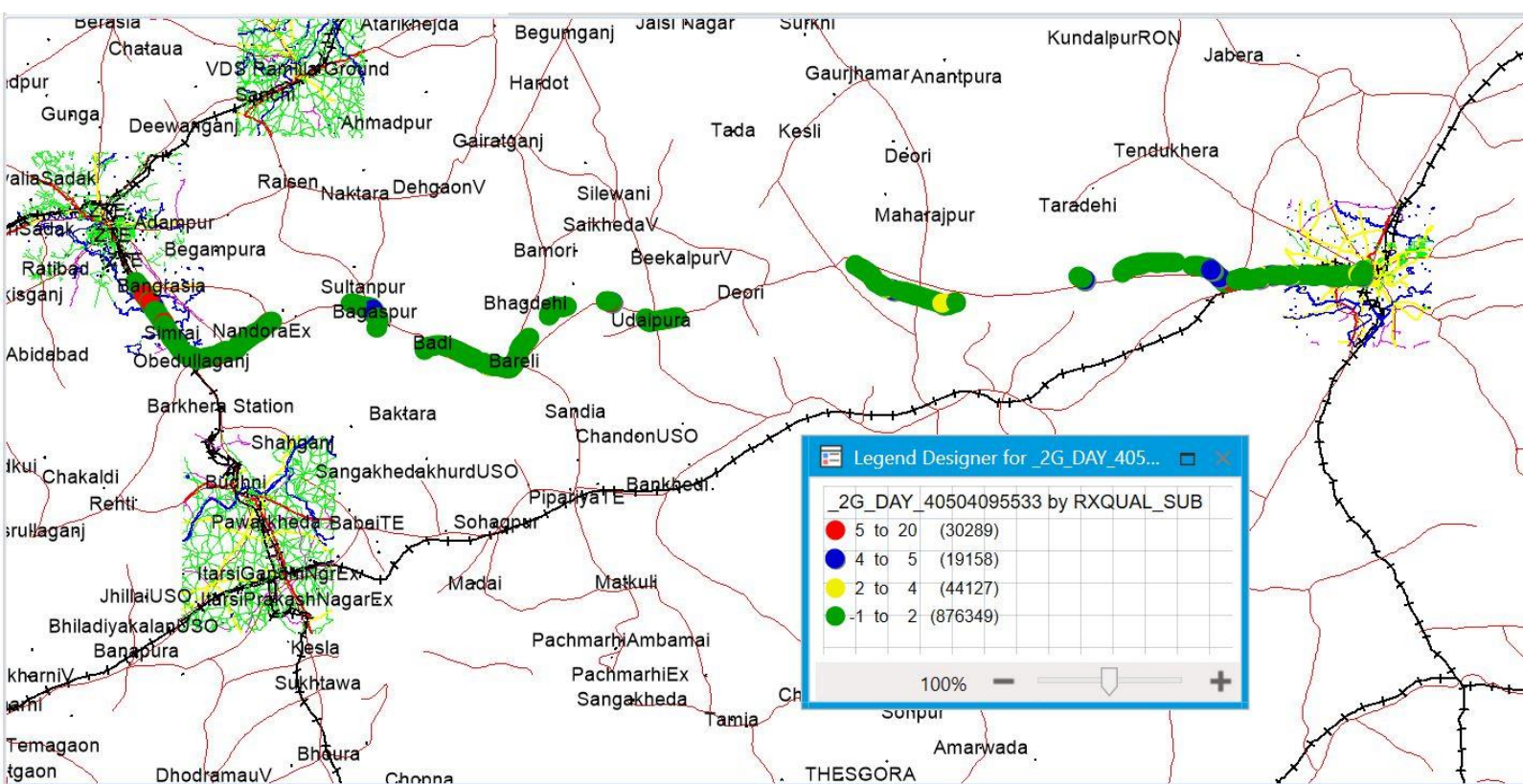


Quality Details

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 $\geq 95\%$.

TSP- BSNL

Technology	Rx Quality %
2G	96.86



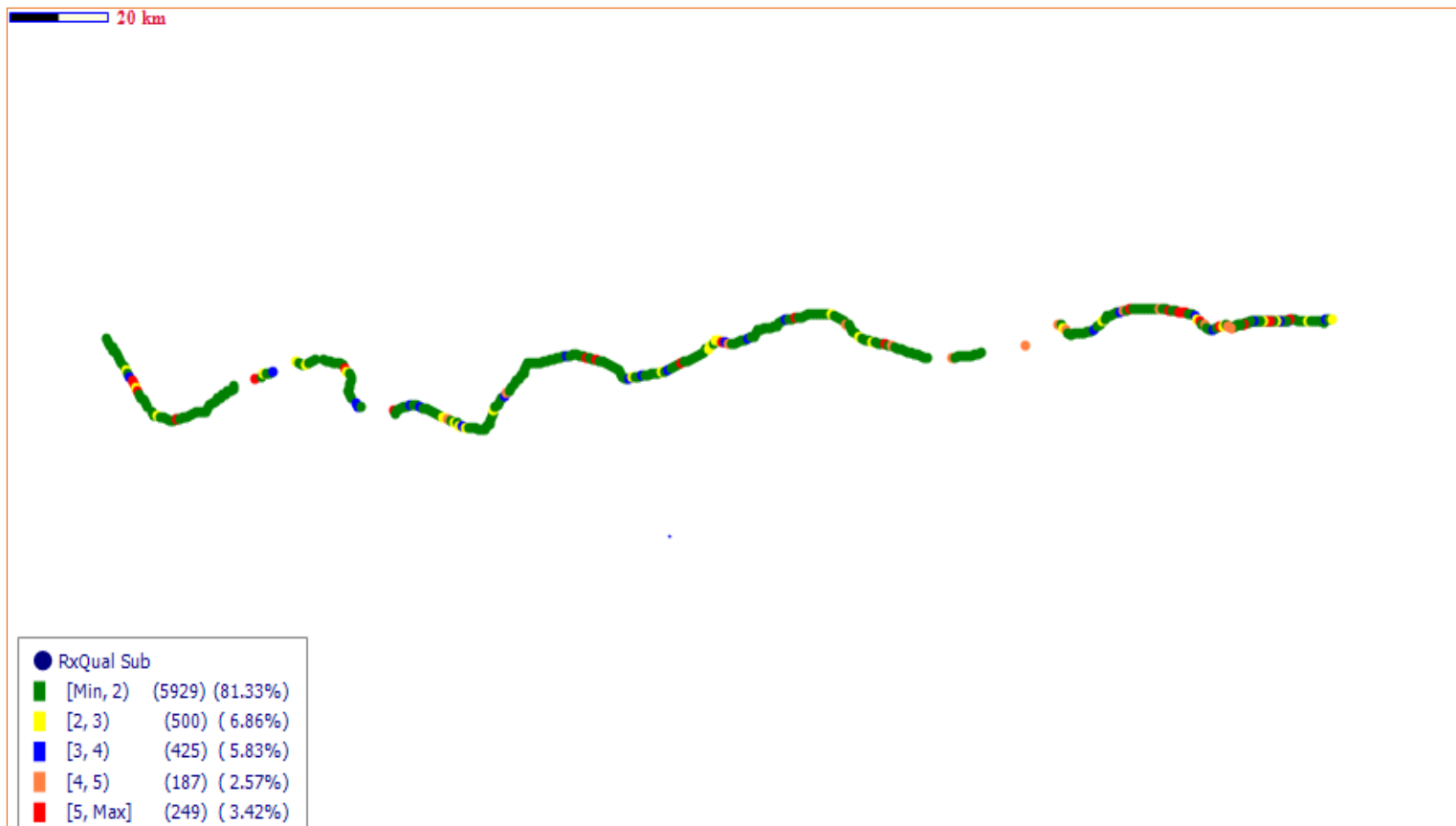
Overall Rx Quality	# Samples	% PDF	Legends
(Min, ≤ 2)	876349	90.35	
(2, ≤ 4)	44127	4.54	
(4, ≤ 5)	19158	1.97	
(5, \leq Max)	30289	3.12	
Total			

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 $\geq 95\%$.

TSP- VI

Technology	Rx Quality %
2G	96.59%



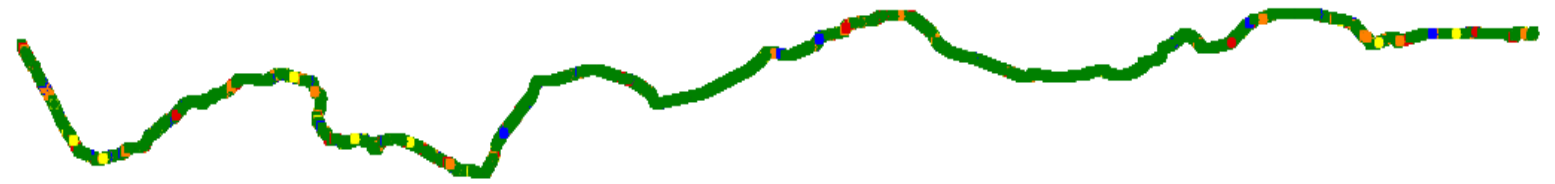
Overall Rx Quality	# Samples	% PDF	Legends
(Min, ≤ 2)	5929	81.33%	
(2, ≤ 3)	500	6.86%	
(3, ≤ 4)	425	5.83%	
(4, ≤ 5)	187	2.57%	
(5, $\leq \text{Max}$)	249	3.42%	
Total	7290	100%	






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 $\geq 95\%$.

TSP-Airtel

Technology	Rx Quality %
2G	96.04



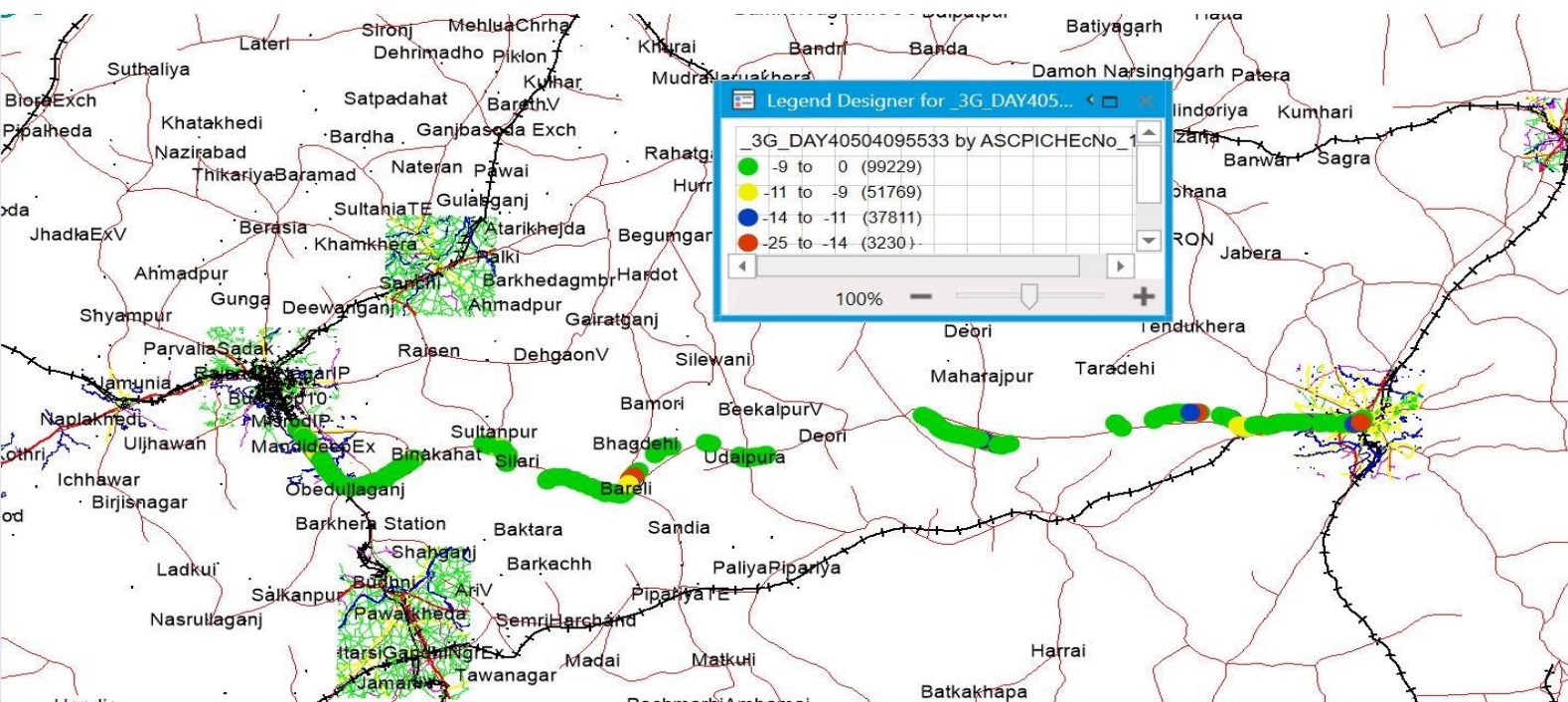
Overall Rx Quality	# Samples	% PDF	Legends
(Min, ≤ 2)	1617310	85.13	
(2, ≤ 3)	54832	2.88	
(3, ≤ 4)	56870	2.99	
(4, ≤ 5)	106495	5.6	
(5, $\leq \text{Max}$)	64202	3.96	
Total			

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 $\geq 95\%$.

TSP- BSNL

Technology	Rx Quality %
3G	98.3



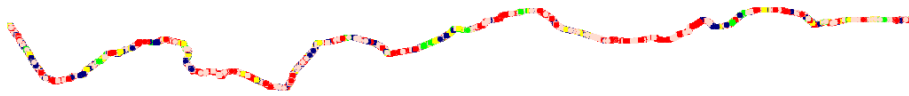
Overall Ec/No	# Samples	% PDF	Legends
(Max, ≤ -9)	99229	51.67	
(-9, ≤ -11)	51769	26.95	
(-11, ≤ -14)	37811	19.68	
(-14, \leq Min)	3230	1.68	
Total			

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-Airtel

Technology	Rx Quality %
VoLTE	71.6



Overall SINR	# Samples	% PDF	Legends
(Min, ≤ 0)	948276	28.40	Red
(0, ≤ 5)	1511083	45.26	Orange
(5, ≤ 10)	393446	11.79	Blue
(10, ≤ 15)	278413	8.34	Yellow
(15, $\leq \text{Max}$)	207288	6.21	Green
Total			

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- JIO

Technology	Rx Quality %
VoLTE	84.78%



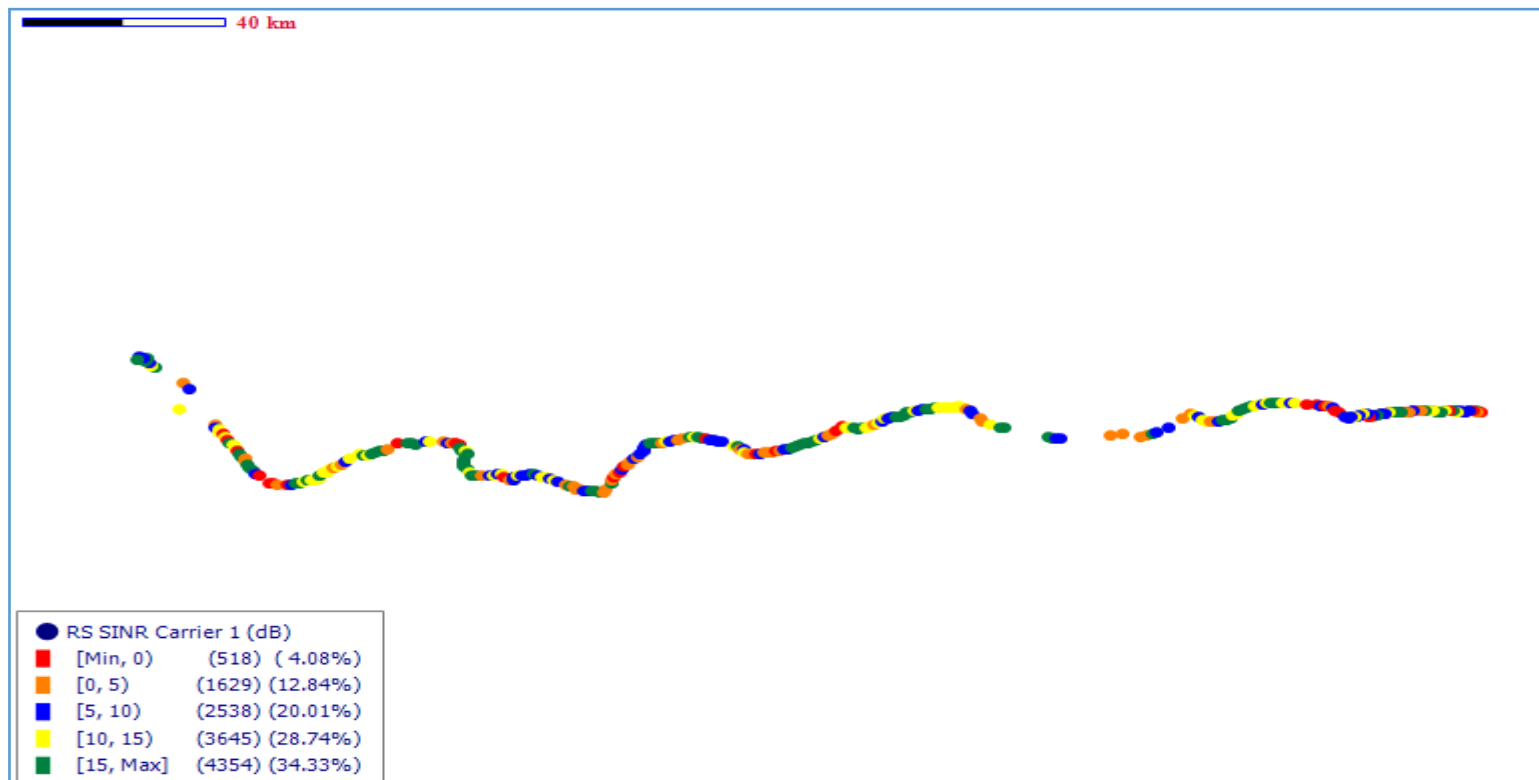
Overall SINR	# Samples	% PDF	Legends
(Min, ≤ 0)	3133	15.22%	Red
(0, ≤ 5)	3900	18.94%	Orange
(5, ≤ 10)	4489	21.81%	Blue
(10, ≤ 15)	4460	21.67%	Yellow
(15, $\leq \text{Max}$)	4604	22.36%	Green
Total	20586		

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 $\geq 95\%$.

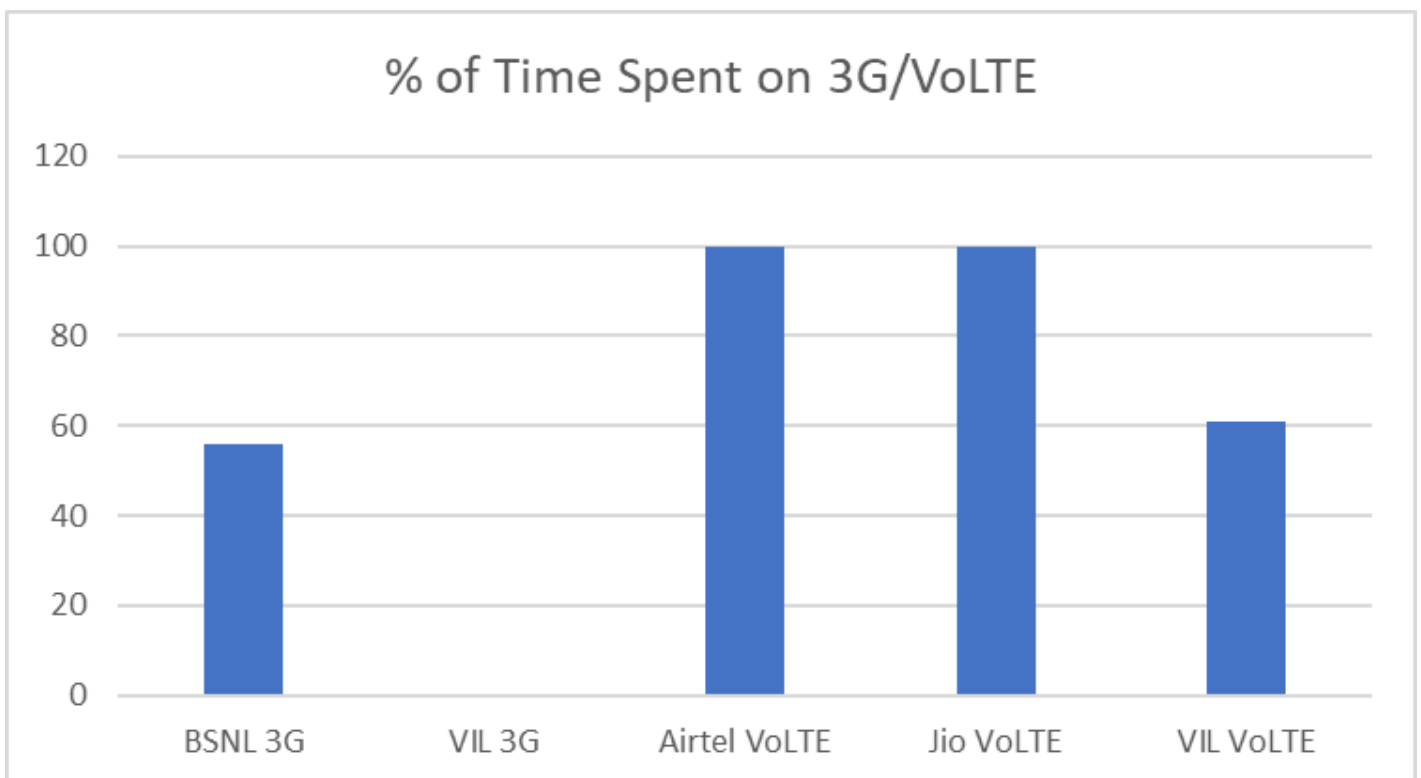
TSP- VI

Technology	Rx Quality %
VoLTE	95.92%



Overall SINR	# Samples	% PDF	Legends
(Min, ≤ 0)	518	4.08%	
(0, ≤ 5)	1629	12.84%	
(5, ≤ 10)	2538	20.01%	
(10, ≤ 15)	3645	28.74%	
(15, $\leq \text{Max}$)	4354	34.33%	
Total	12684	100.00%	

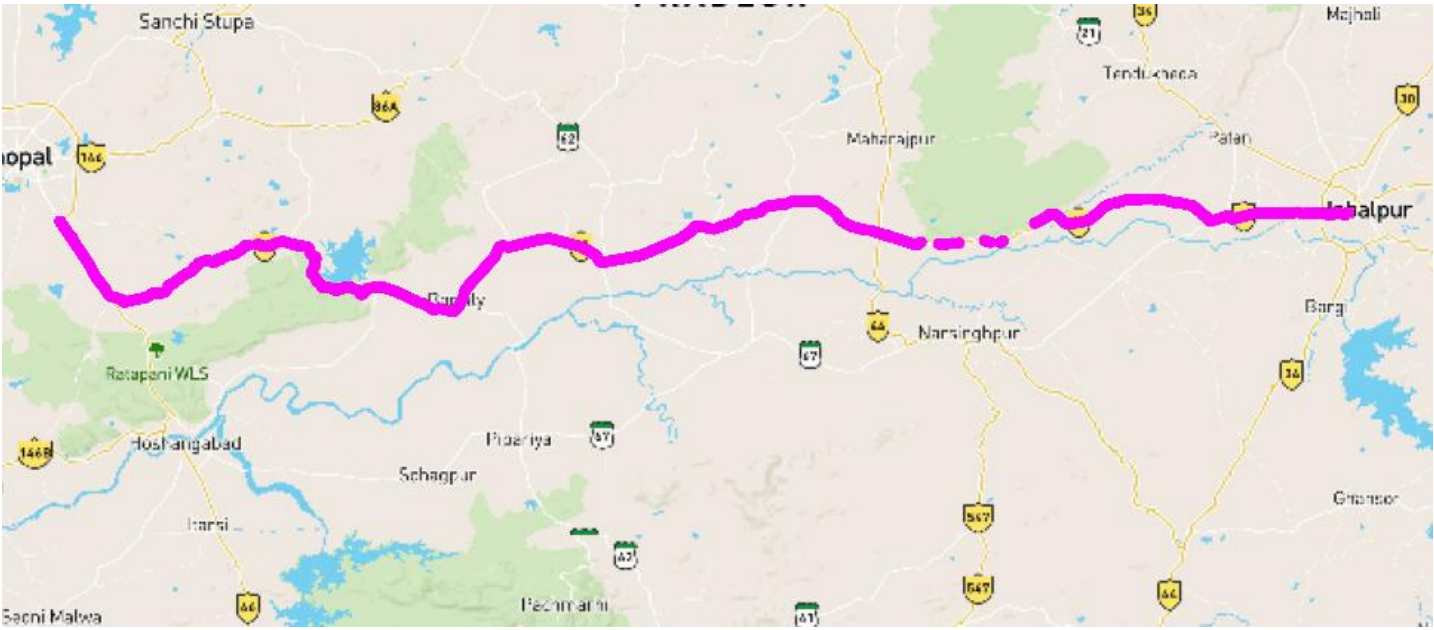
TSP	% of Time Spent on 3G/VoLTE
BSNL 3G	55.8
VIL 3G	NA
Airtel VoLTE	100
Jio VoLTE	100
VIL VoLTE	61.04



Technology Details

TSP-Airtel

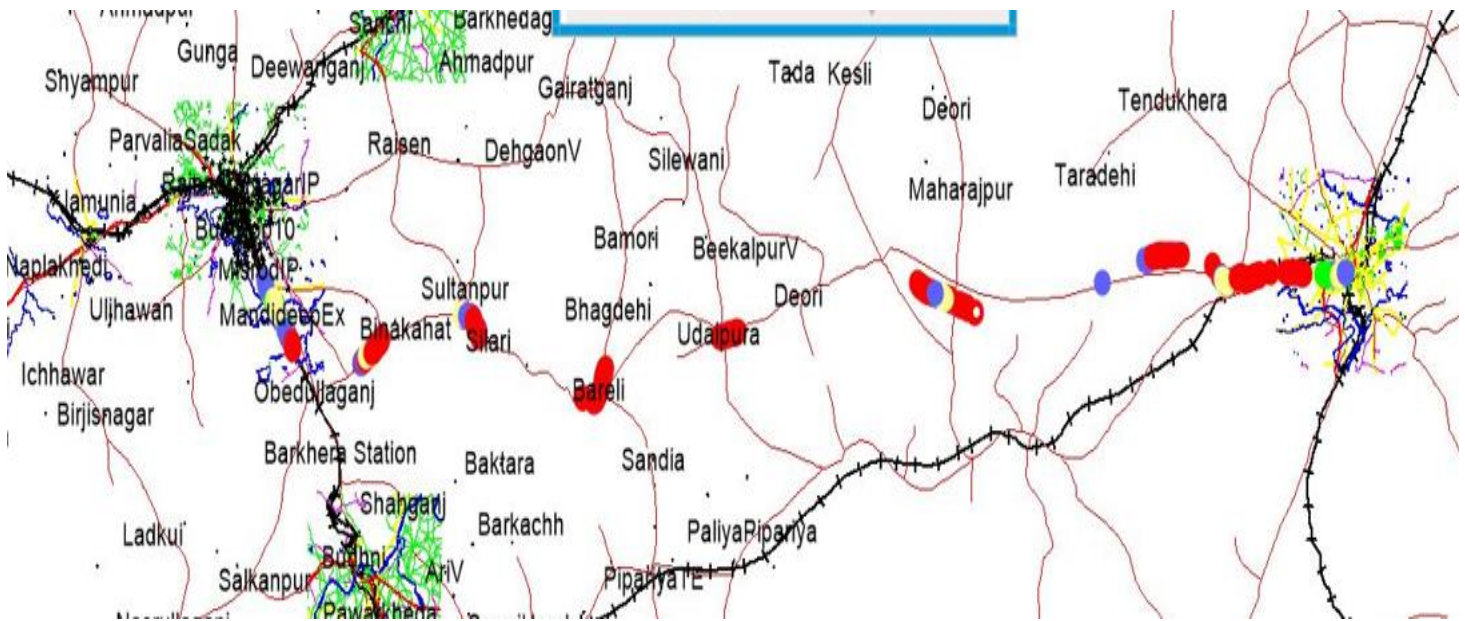
Technology	% of Time Spent on
3G	
VoLTE	100%



Technology Details

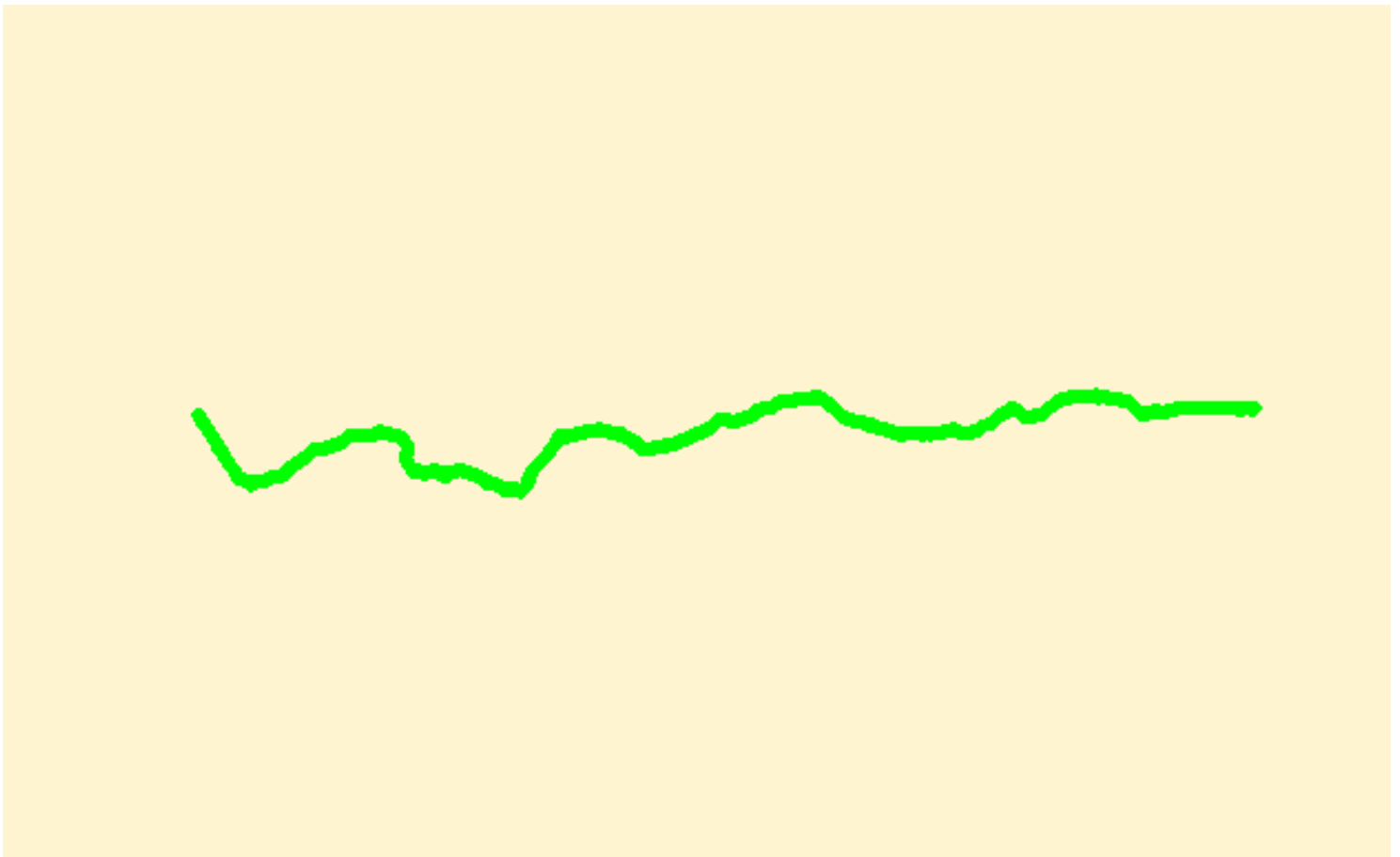
TSP- BSNL

Technology	% of Time Spent on
3G	55.8%
VoLTE	



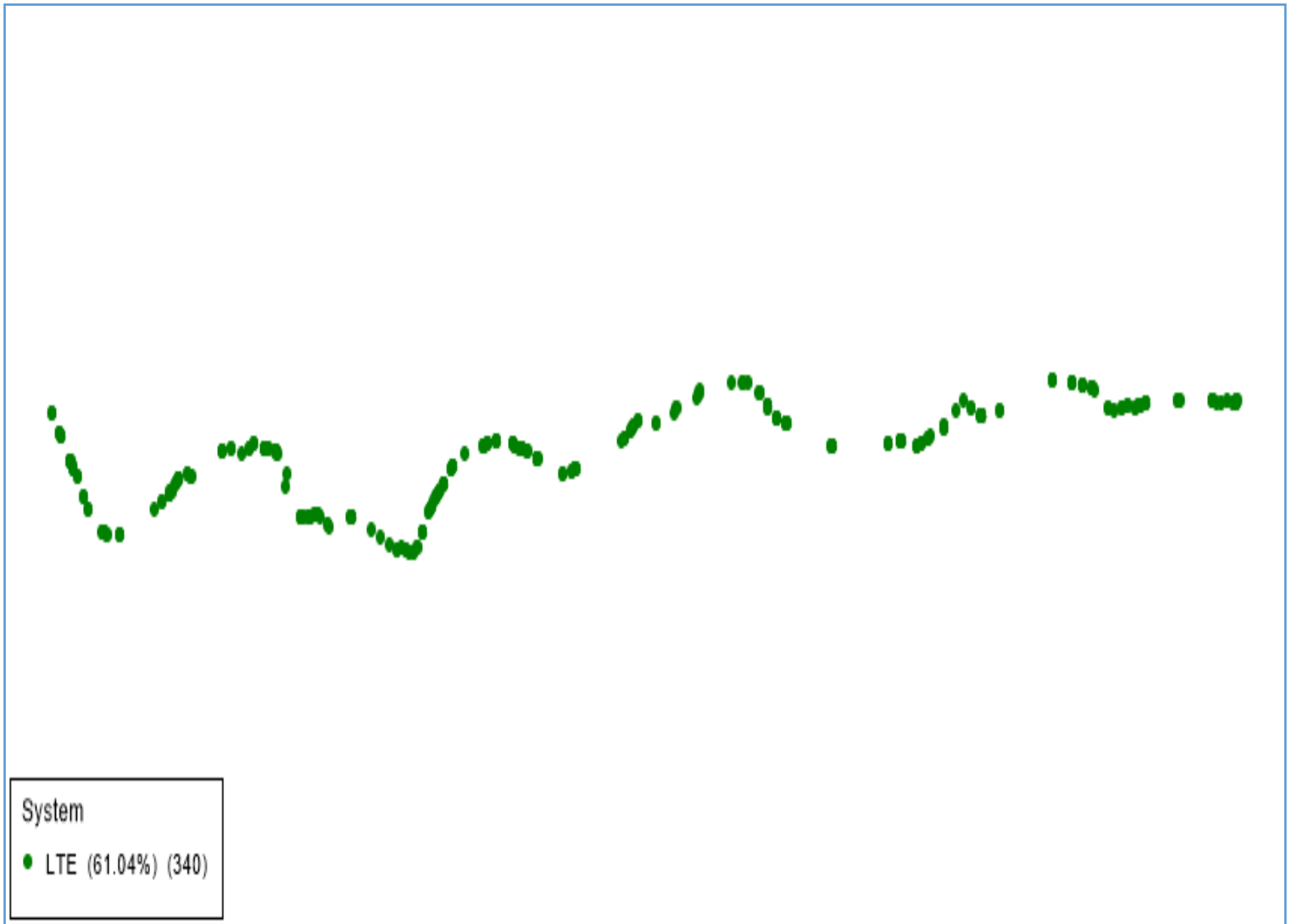
TSP- JIO

Technology	% of Time Spent on
3G	
VoLTE	100%



TSP- VI

Technology	% of Time Spent on
3G	
VoLTE	61.04%

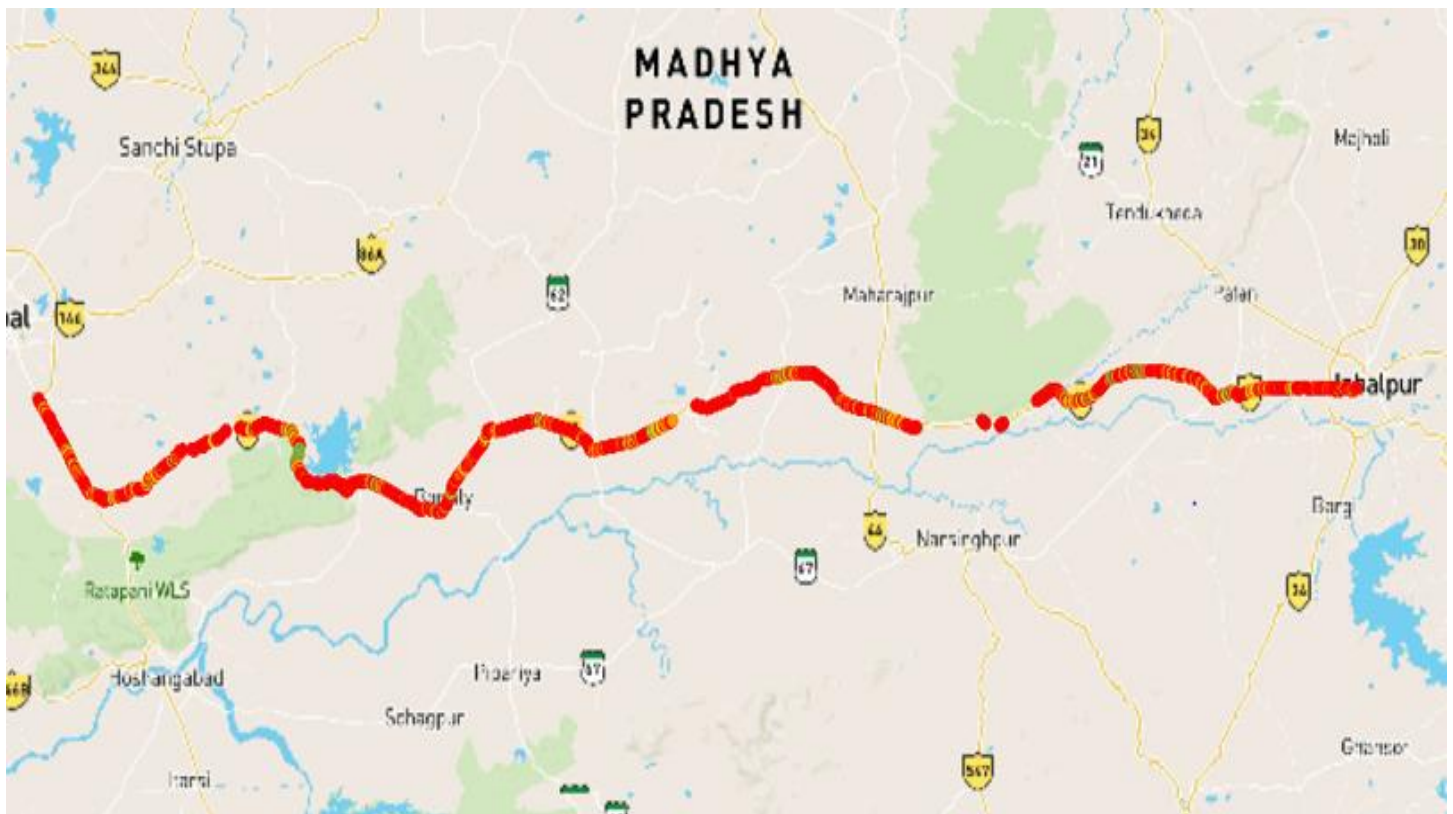


Dynamic Data Test

TSP-Airtel

Data Statistics - Dynamic data testing

Data KPIs - Overall	2G
Download Throughput (Kbps)	33.07



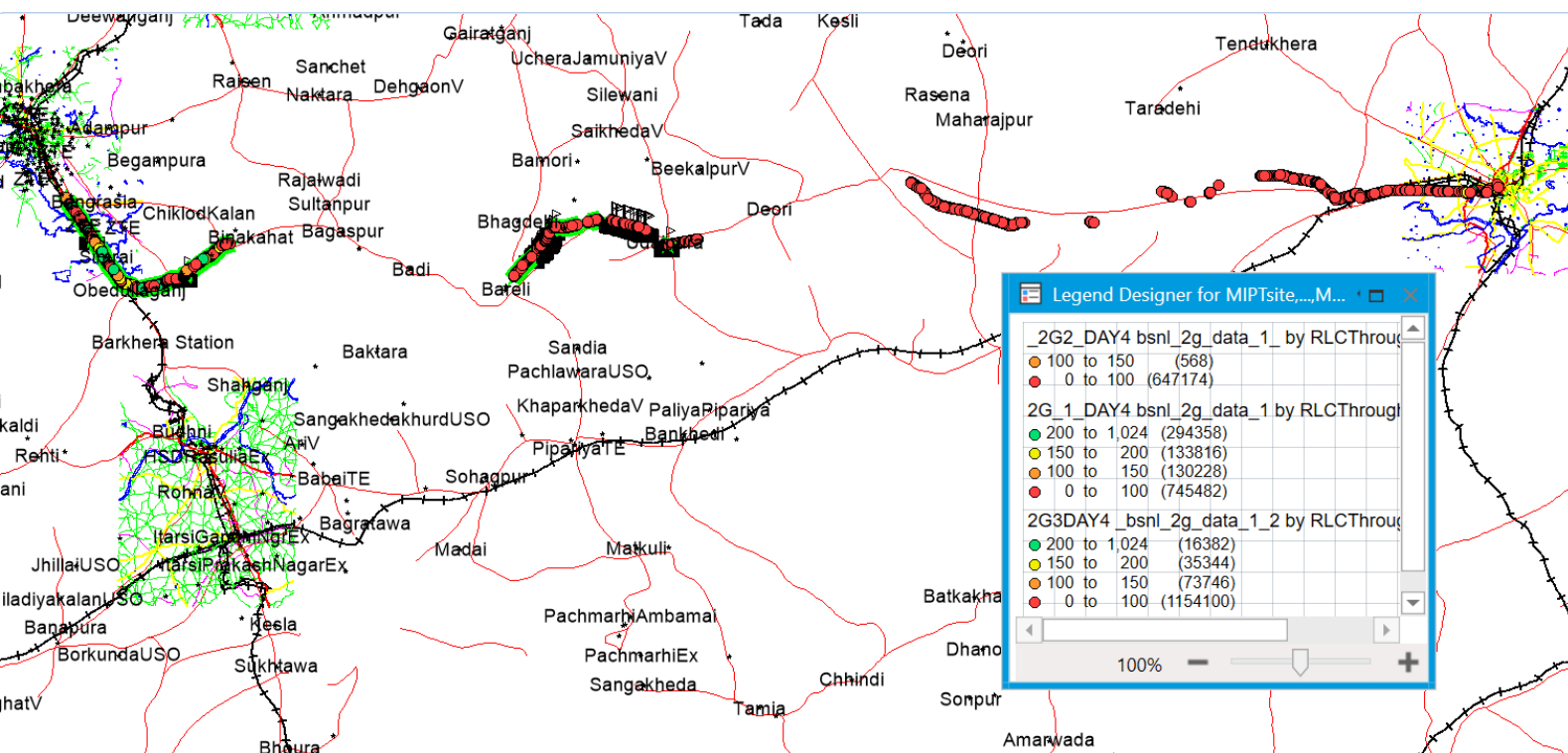
DL throughput	No of Sample	%	Legends
< 100 Kbps	11531	75.64	Red
100-150Kbps	1370	8.99	Orange
150-200Kbps	1417	9.3	Yellow
>200Kbps	926	6.07	Green

Dynamic Data Test

TSP- BSNL

Data Statistics - Dynamic data testing

Data KPIs - Overall	2G
Download Throughput (Kbps)	118 Kbps



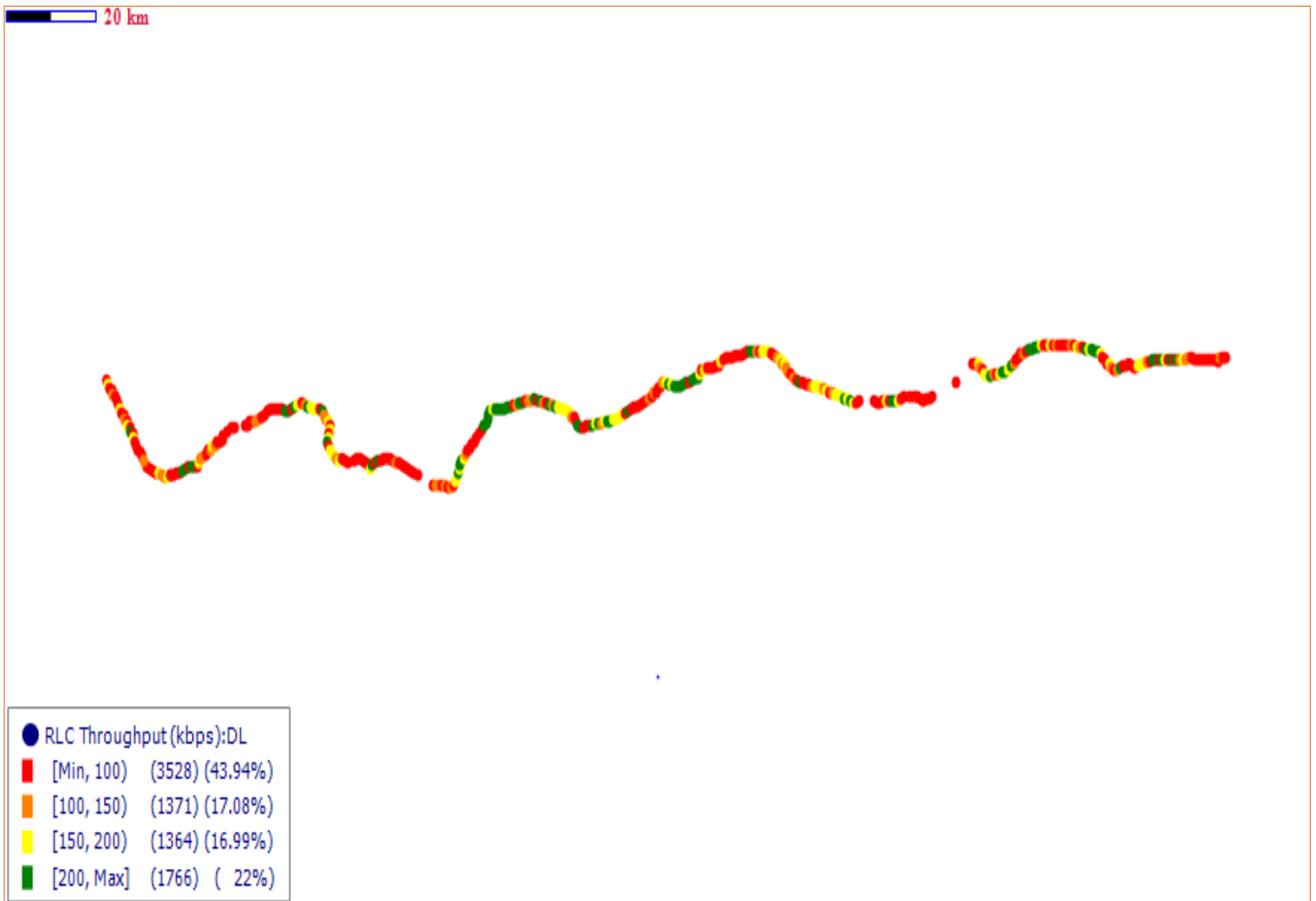
DL throughput	No of Sample	%	Legends
< 100 Kbps	2546756	78.81%	Red
100-150Kbps	204542	6.33%	Orange
150-200Kbps	169160	5.23%	Yellow
>200Kbps	310740	9.61%	Green

Dynamic Data Test

TSP-VI

Data Statistics - Dynamic data testing

Data KPIs - Overall	2G
Download Throughput (Kbps)	118.85kbps



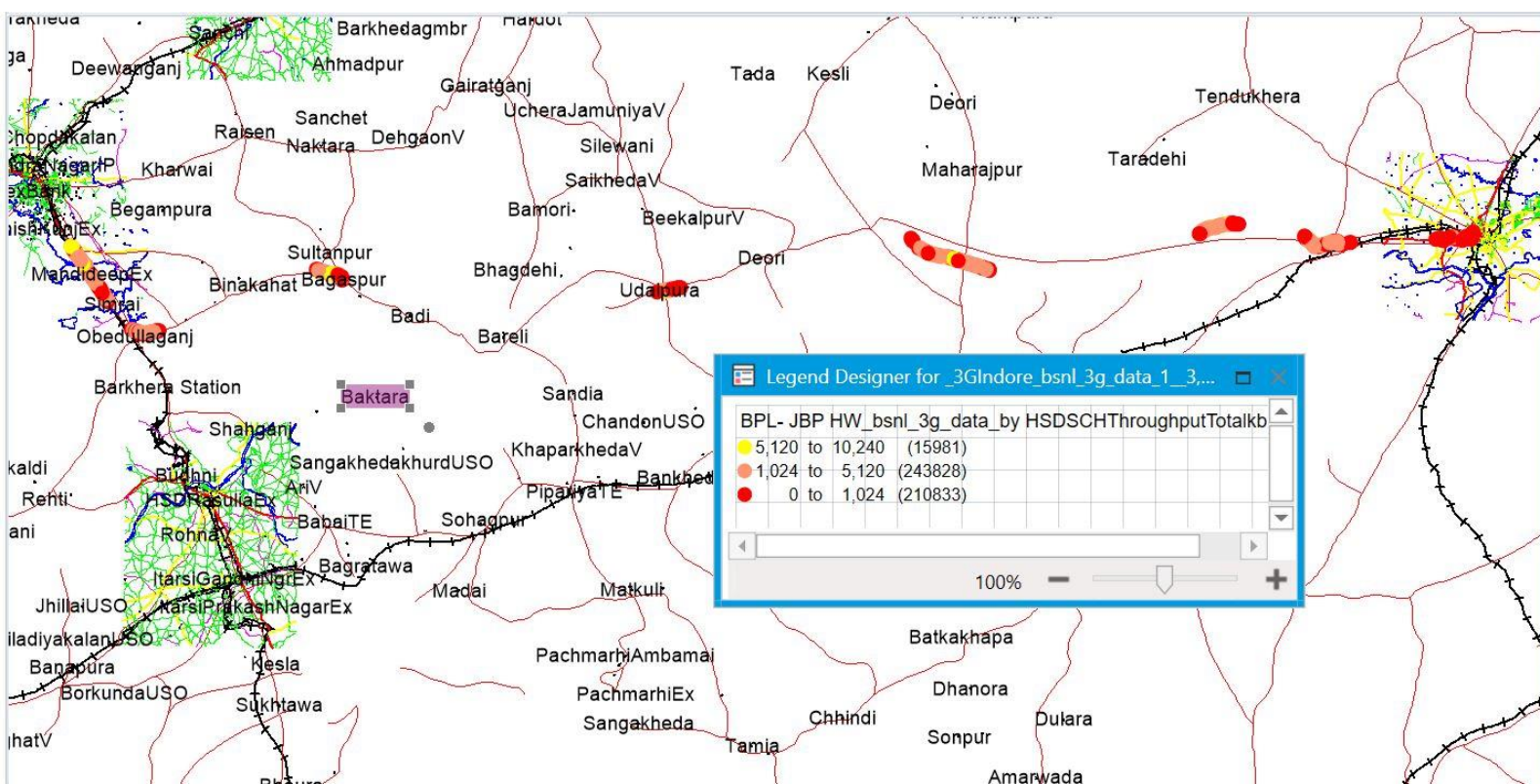
DL throughput	No of Sample	%	Legends
< 100 Kbps	3528	43.94%	■
100-150Kbps	1371	17.08%	■
150-200Kbps	1364	16.99%	■
>200Kbps	1766	22%	■

Dynamic Data Test

TSP- BSNL

Data Statistics - Dynamic data testing

Data KPIs - Overall	3G
Download Throughput (Mbps)	2.87 Mbps



DL throughput	No of Sample	%	Legends
< 1 Mbps	210833	44.79	Red
1-5 Mbps	243828	51.80	Orange
5-10 Mbps	15981	3.39	Yellow
>10Mbps	0	0	Green

Dynamic Data Test

TSP- Airtel

Data Statistics - Dynamic data testing

Data KPIs – Overall	LTE
Download Throughput (Mbps)	4.28

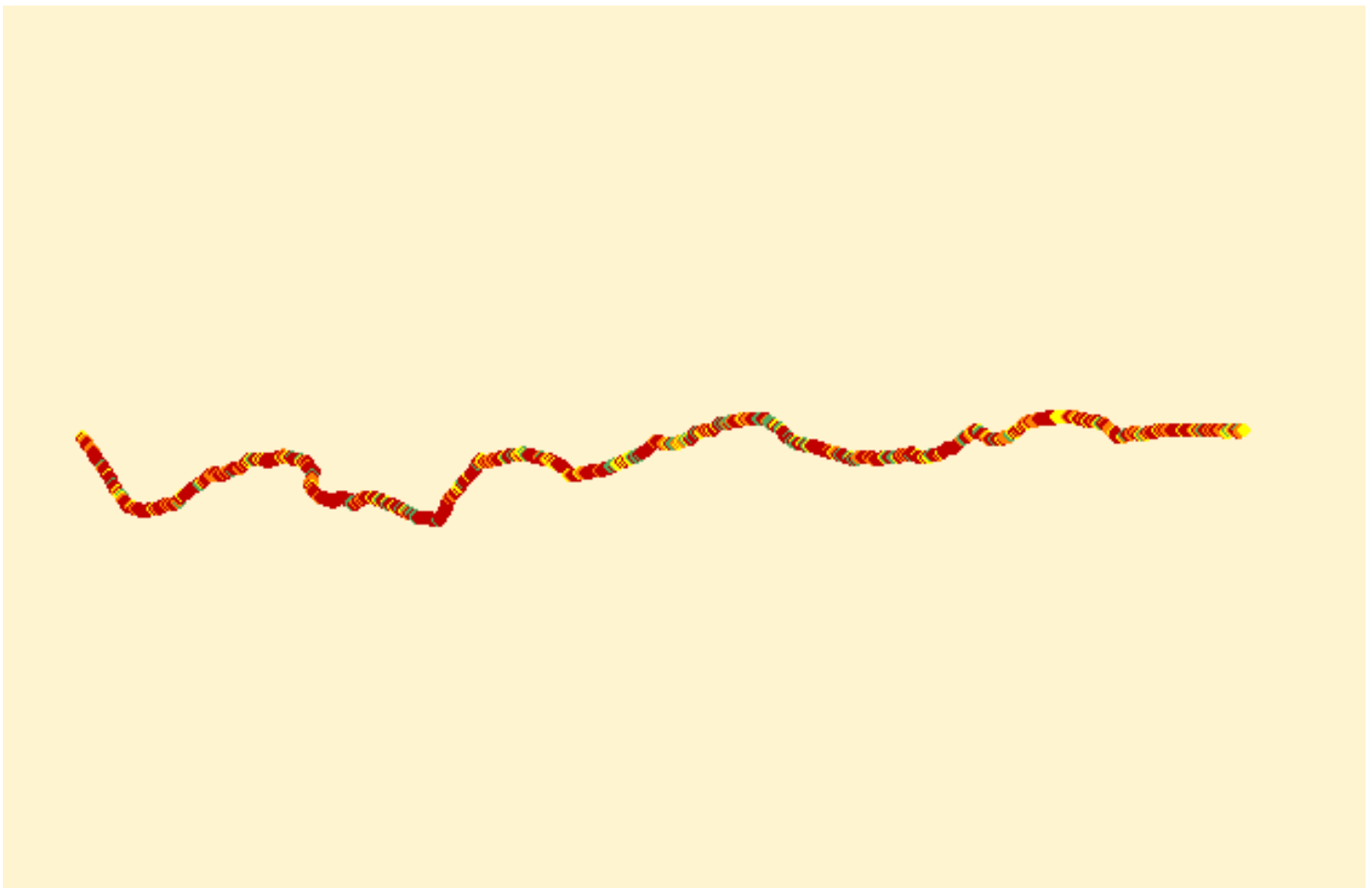


DL throughput	No of Sample	%	Legends
< 2Mbps	4651	22.5	Red
2-5 Mbps	4323	20.91	Orange
5-10 Mbps	6699	32.41	Yellow
>10Mbps	4998	24.18	Green

TSP- JIO

Data Statistics - Dynamic data testing

Data KPIs - Overall	LTE
Download Throughput (Mbps)	9.21

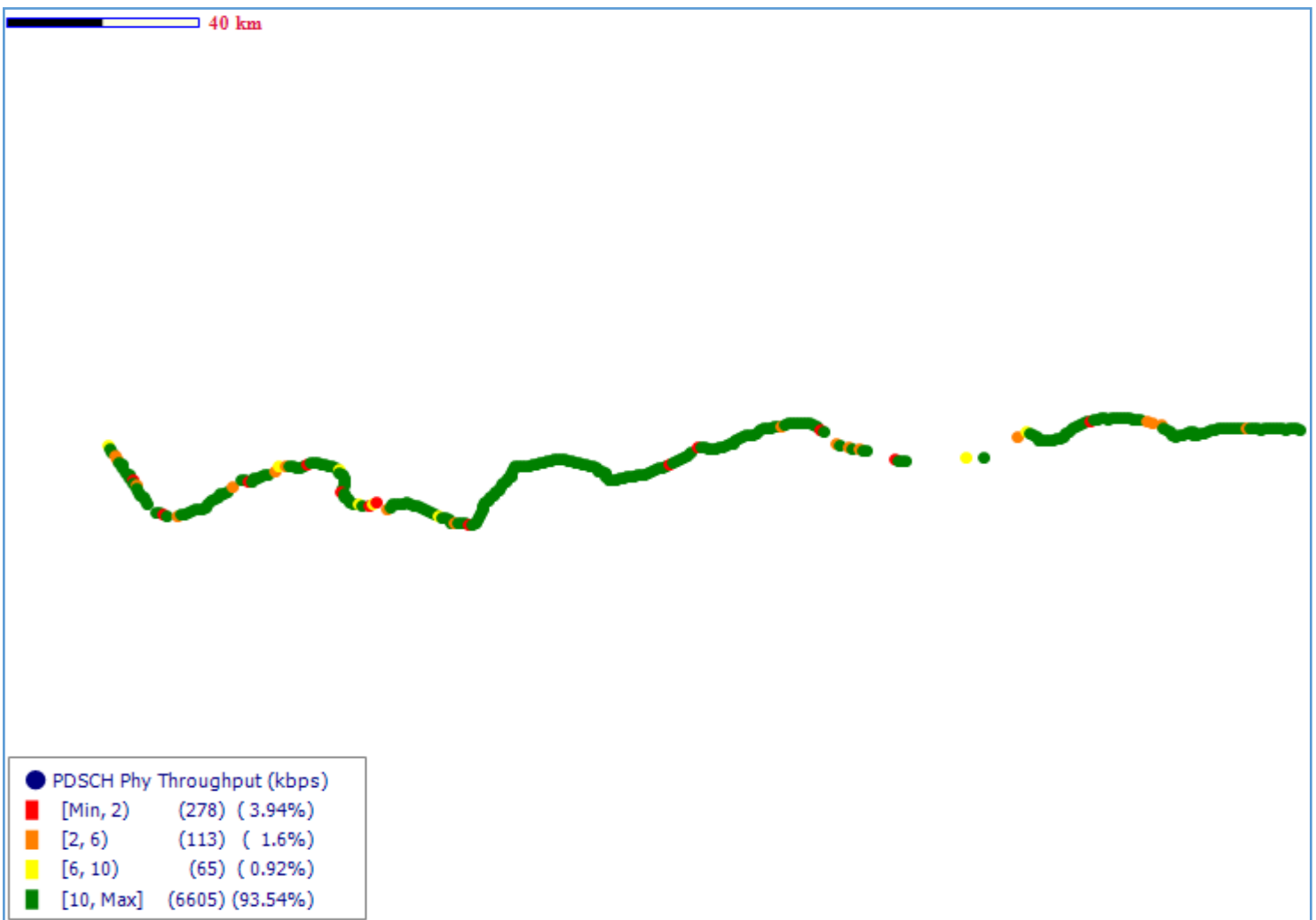


DL throughput	No of Sample	%	Legends
< 2Mbps	10547	55.40%	Red
2-5 Mbps	3794	19.93%	Orange
5-10 Mbps	2557	13.43%	Yellow
>10Mbps	2140	11.24%	Green

TSP-VI

Data Statistics - Dynamic data testing

Data KPIs - Overall	LTE
Download Throughput (Mbps)	13mbps



DL throughput	No of Sample	%	Legends
< 2Mbps	278	3.94%	
2-5 Mbps	113	1.6%	
5-10 Mbps	65	0.92%	
>10Mbps	6605	93.54%	