



प्रभावी विनियमन – सुगम संचार
Effective Regulation – Ease of Communication

Operator Assisted Drive Test Report

Bhopal to Sagar

17/12/2022 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 Sagar and surrounding areas from 9:00 AM to 8:00 PM from 17/12/2022. The drive test covered drive route of around 215 KMs. Approximately 130. calls were made for each of the 2G/3G/4G.

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 & 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)

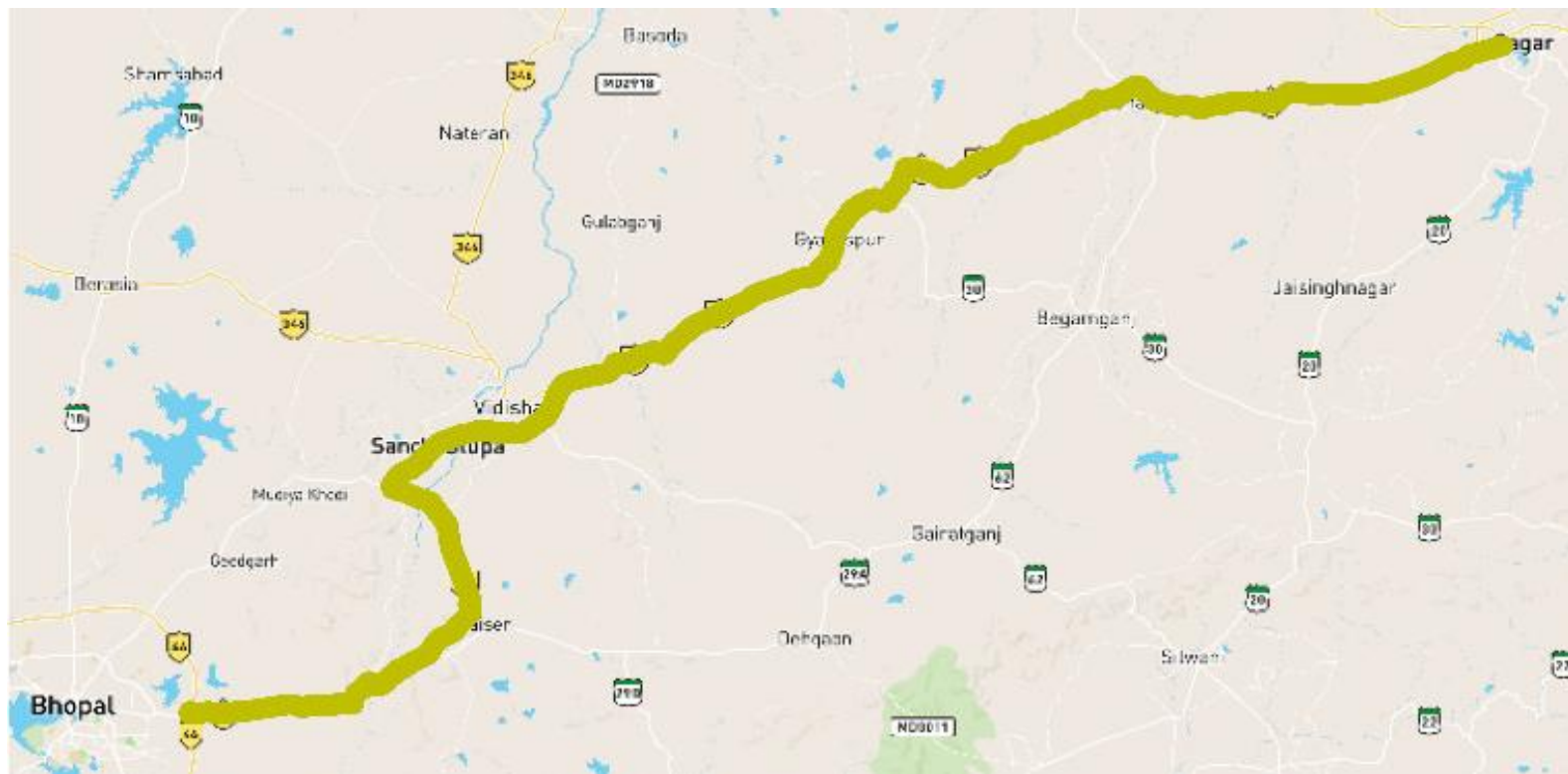
- i. 2G – measurement – UE Locked in 2G file size- 500KB
- ii. 3G – measurement – UE in 3G File Size- 20MB
- iii. 4G – measurement – UE in LTE File Size- 40MB

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.

Overview

Voice & Dynamic Data Test Drive Route



List of important area covered during the drive test

Bhopal Bypass

Raisen

Sanchi

Vidisha

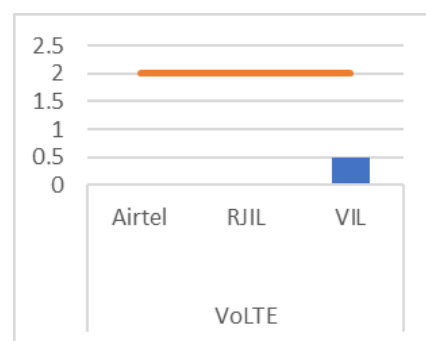
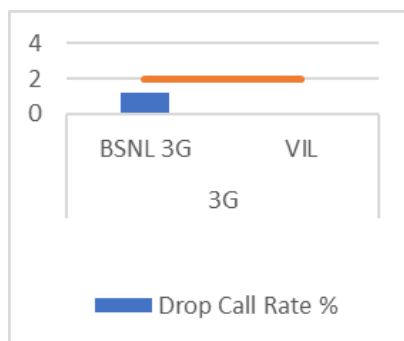
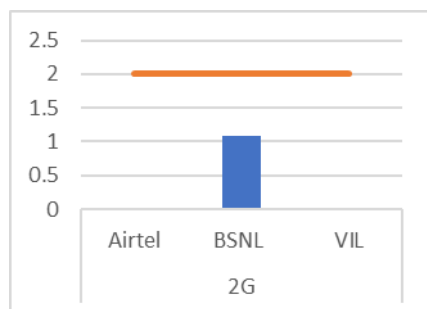
Sagar

Voice Calls

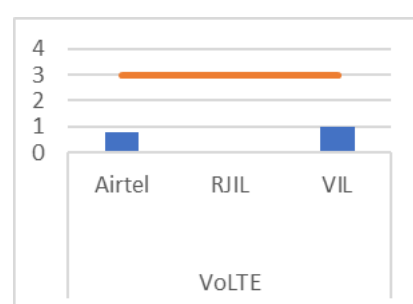
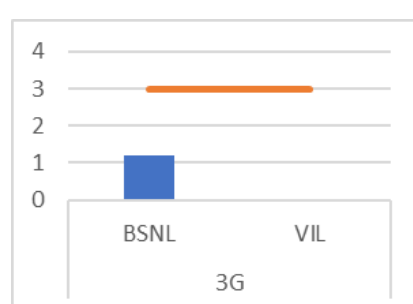
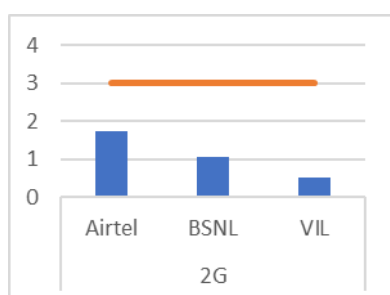
Key Observations

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

Drop Call Rate (%)



Block Call Rate (%)



KPIs	2G			3G		VoLTE		
	Airtel	BSNL	VIL	BSNL	VIL	Airtel	RJIL	VIL
Drop Call Rate %	0	1.08	0	1.21		0	0	0.50
Block Call Rate %	1.74	1.06	0.51	1.20		0.77	NA	0.98

- All TSPs have met the 2% QOS benchmark of Drop Call Rate (DCR%)
- 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 %	56.74	70.97	73.04

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

TSPs	3G	
	BSNL	VIL
Coverage %	67.76	NA

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

TSPs	VoLTE		
	Airtel	JIO	VIL
Coverage %	96.71	95.66	95.69

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

TSPs	3G		VoLTE		
	BSNL	VIL	Airtel	VIL	JIO
Time Spent on 3G/4G %	80	NA	100	31.21	100

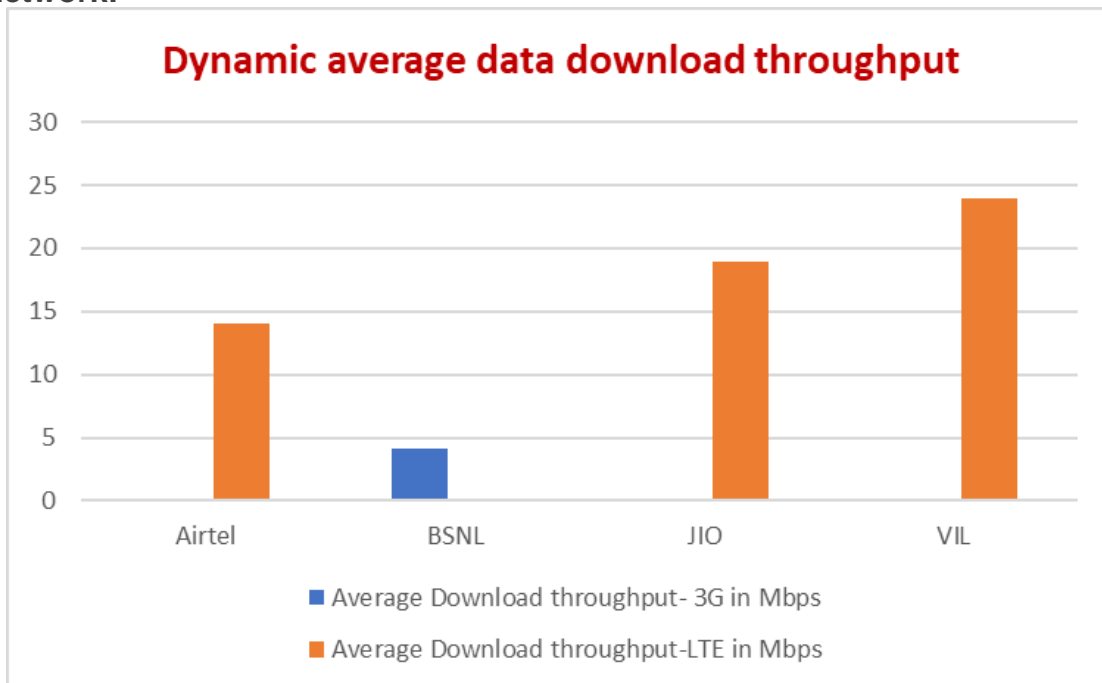
Data Services Dynamic

Key Observations

Dynamic Data -Download Throughput was tested.

Data Download Performance - Dynamic

3G/4G/ Network:



TSP (For 2G)	Airtel	BSNL	JIO	VIL
Average Download throughput- 2G in Kbps	70.05	181	NA	NA
Average Download throughput- 3G In Mbps	NA	4.12	NA	NA
Average Download throughput-LTE in Mbps	14.02	NA	18.90	24

Summary

Highway Summary- Voice

TSP (For 2G)	Airtel	BSNL	JIO	VIL
Call attempts	115	94	NA	62
Block call rate %	1.74	1.06	NA	0.51
CSSR %	98.26	97.87	NA	99.49
Drop call rate %	0	1.08	NA	0
Mobility HOSR %	100	95.45	NA	98.48
RX Quality %	97.06	95.65	NA	96.95
Average CST Sec	3.22	2.2	NA	2.51

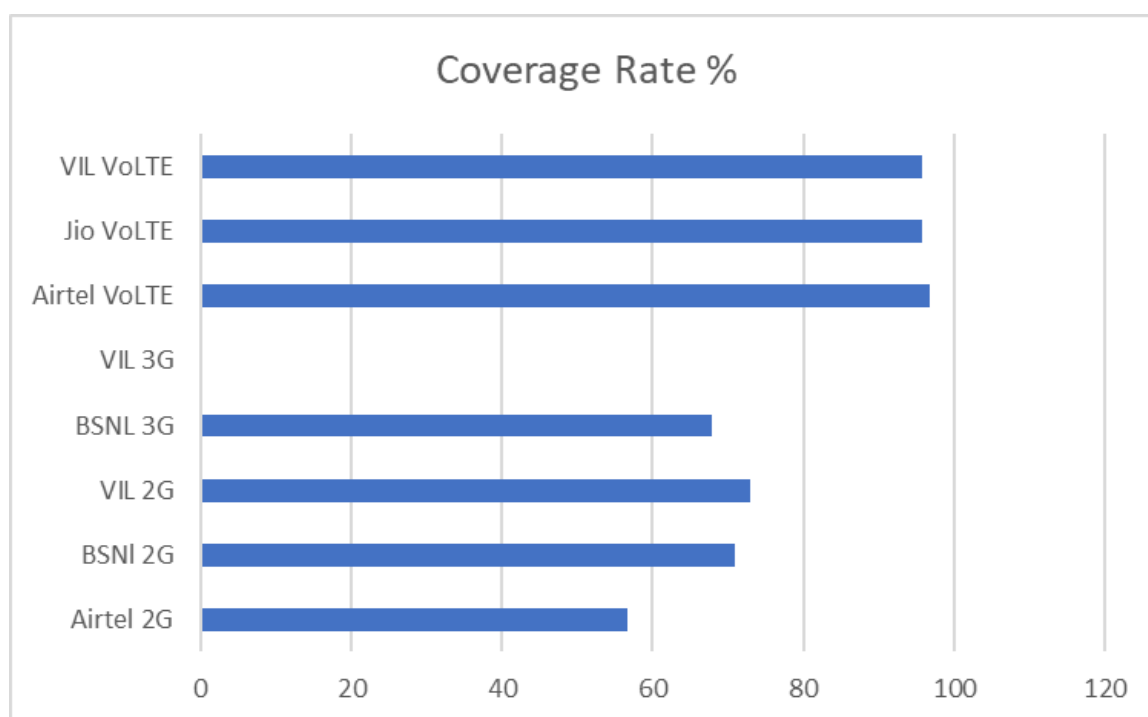
TSP (For 3G)	Airtel	BSNL	JIO	VIL
Call attempts	NA	83	NA	NA
Block call rate %	NA	1.20	NA	NA
CSSR %	NA	98.79	NA	NA
Drop call rate %	NA	1.21	NA	NA
Mobility HOSR %	NA	97.29	NA	NA
RX Quality %	NA	98.30	NA	NA
Average CST (Sec)	NA	2.1	NA	NA

TSP (For VoLTE)	Airtel	BSNL	JIO	VIL
Call attempts	130	NA	110	61
Block call rate %	0.77	NA	NA	0.98
CSSR %	99.23	NA	100	99.02
Drop call rate %	0	NA	0	0.50
Mobility HOSR %	1.1	NA	97.66	99.51
RX Quality %	76.59	NA	88.10	96.31
Average CST(Sec)	0.66	NA	0.68	0.95

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.

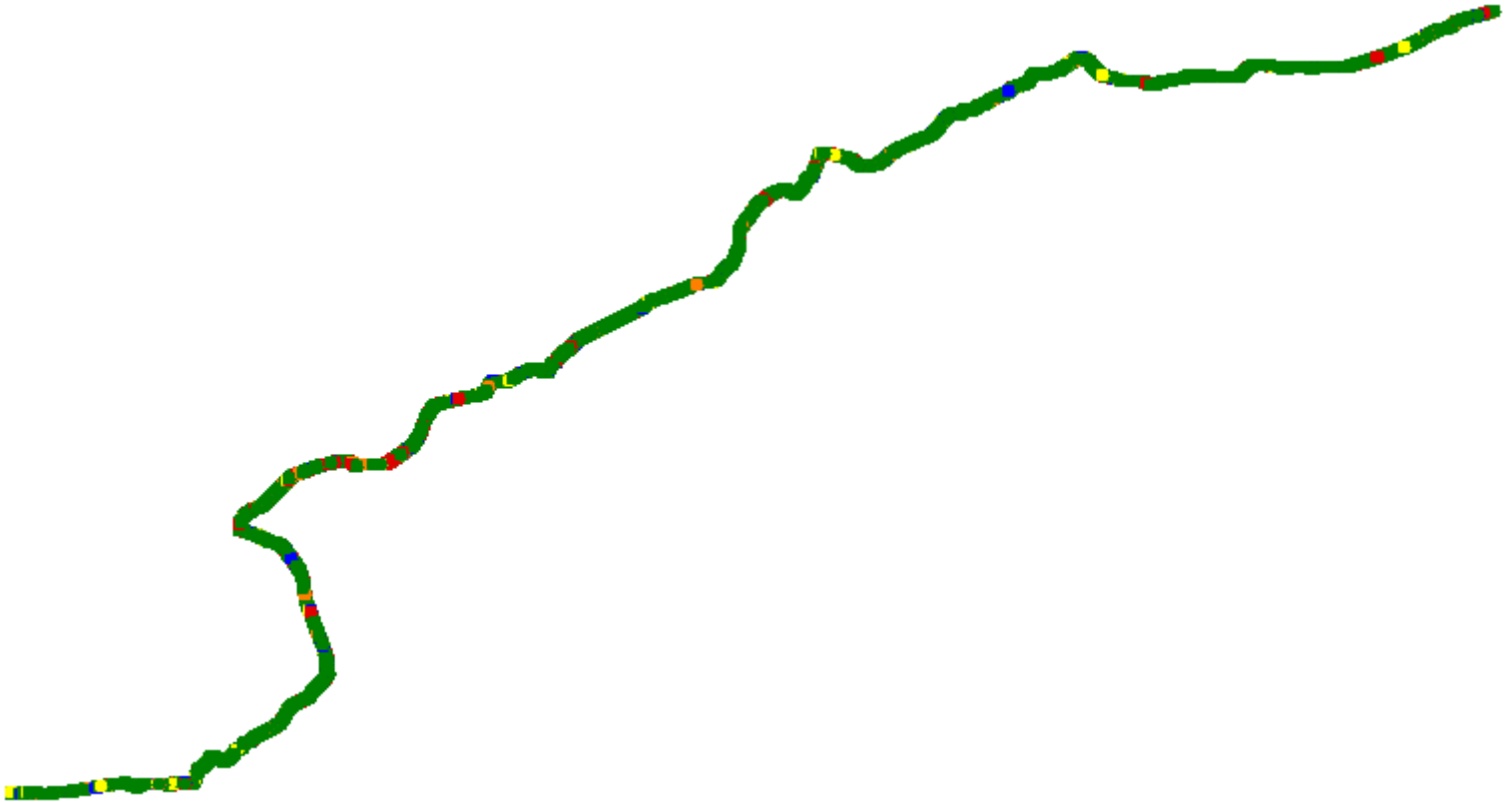
TSP	Coverage Rate %
Airtel 2G	56.74
BSNI 2G	70.97
VIL 2G	73.04
BSNL 3G	67.76
VIL 3G	NA
Airtel VoLTE	96.71
Jio VoLTE	95.66
VIL VoLTE	95.69



Coverage Details

TSP- Airtel

Technology	Coverage %
2G	56.74

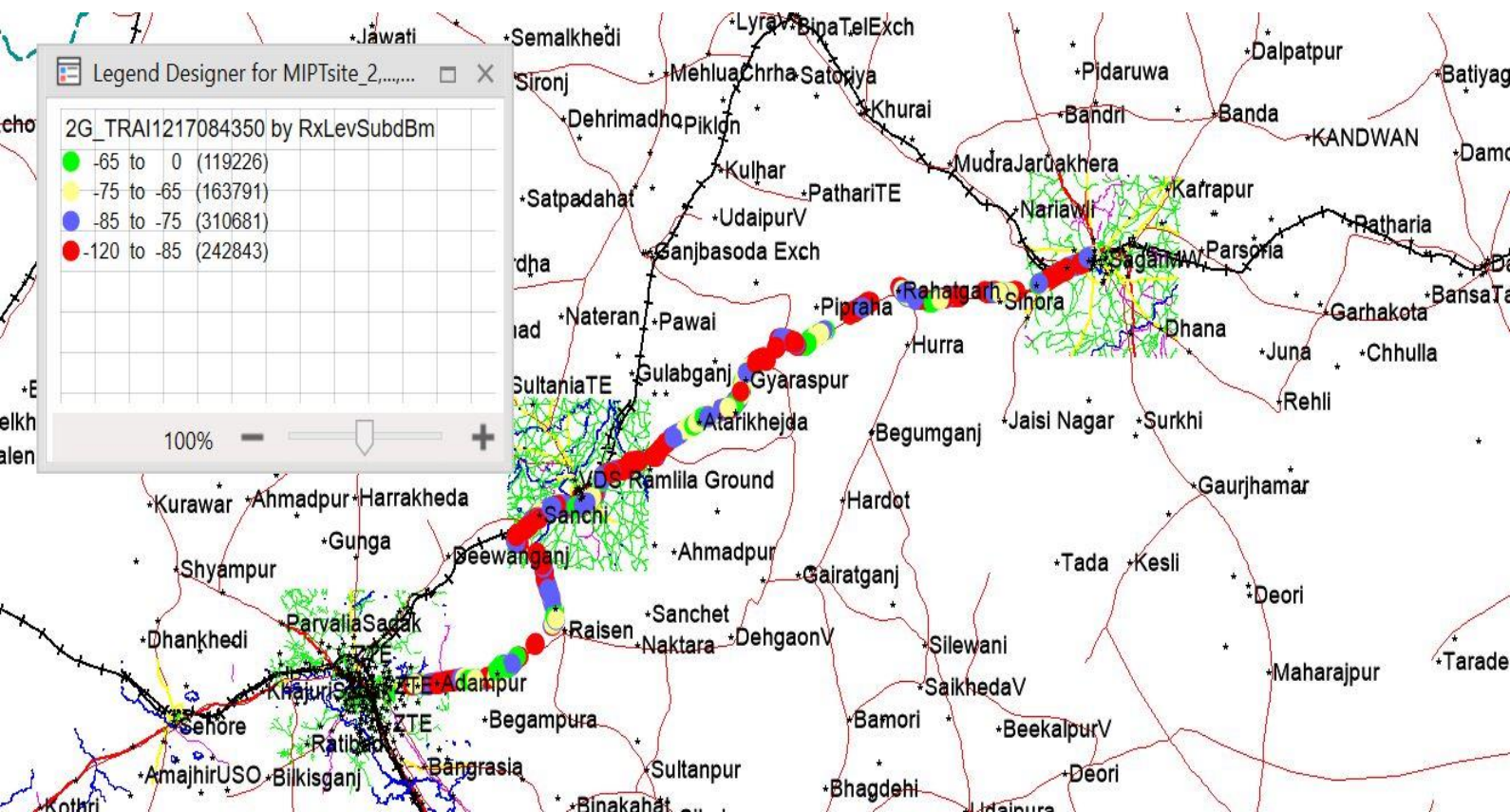


2G			
Overall RxLevel	# Samples	% PDF	Legends
[Max, >=-75]	335189	24.32	
[-75, >=-85)	446813	32.42	
[-85, >=-95)	490750	35.61	
[-95, >=Min)	105451	7.65	
Total	1378203	100	

Coverage Details

TSP-BSNL

Technology	Coverage %
2G	70.97 %

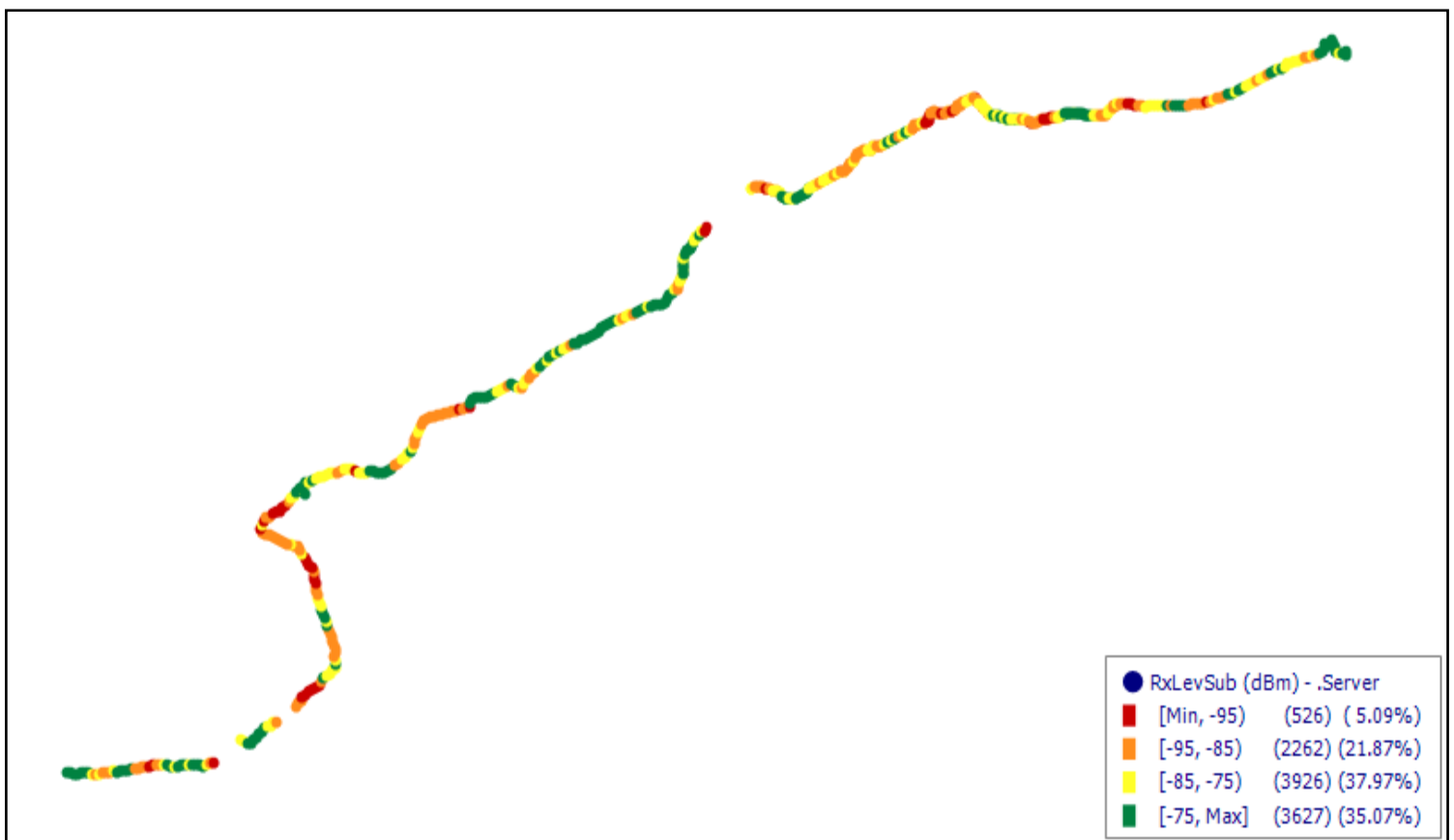


2G			
Overall RxLevel	# Samples	% PDF	Legends
[Max, >=-65]	119226	14.25%	Green
[-65, >=-75)	163791	19.57%	Yellow
[-75, >=-85)	310681	37.13%	Blue
[-85, >=Min)	242843	29.02%	Red
Total	836541	100.00%	

Coverage Details

TSP- Vi

Technology	Coverage %
2G	73.04



2G			
Overall RxLevel	# Samples	% PDF	Legends
[Max, >=-75]	3627	35.07%	
[-75, >=-85)	3926	37.97%	
[-85, >=-95)	2262	21.87%	
[-95, >=Min)	526	5.09%	
Total	10341	100%	

Coverage Details

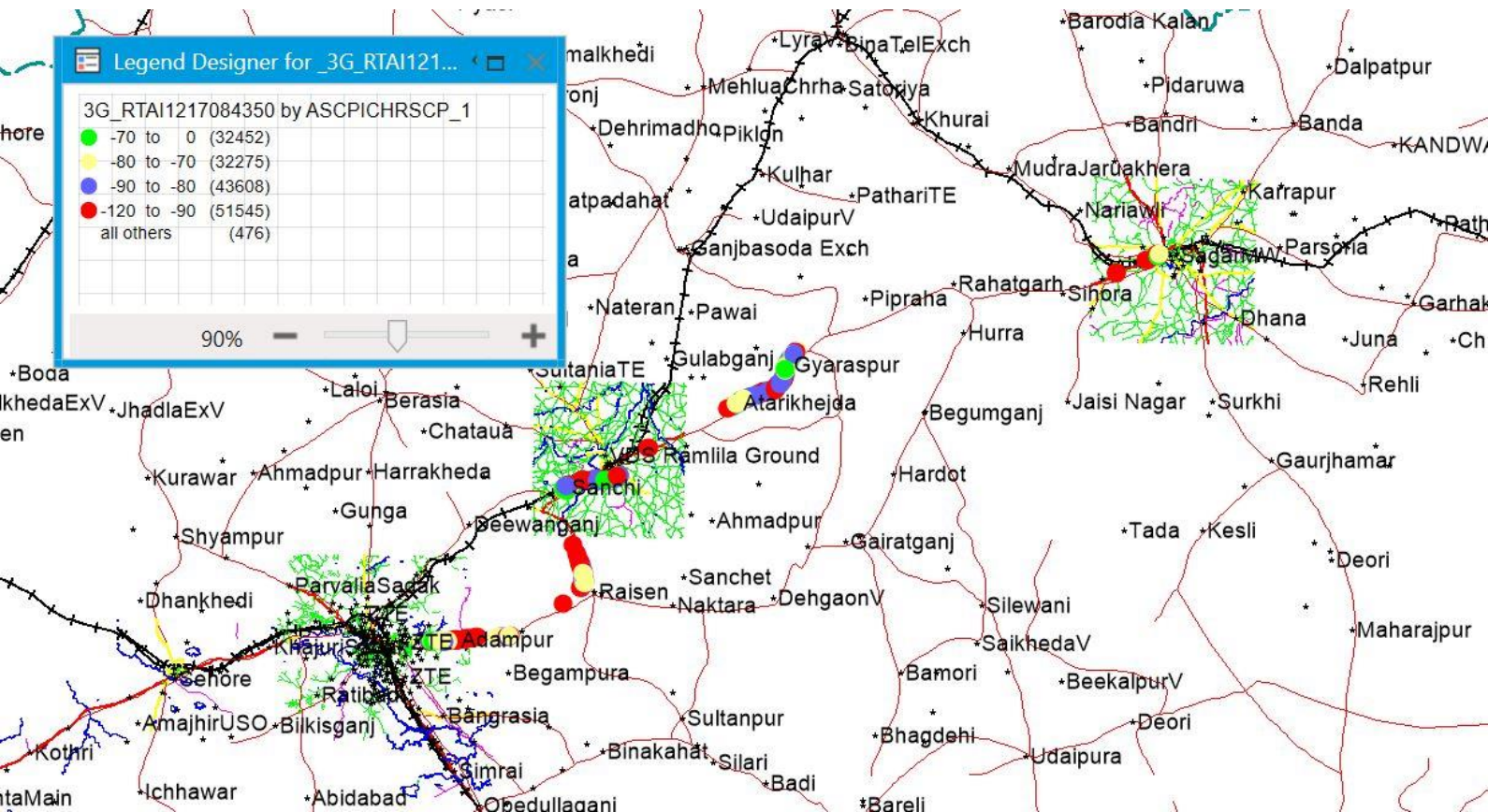
TSP-BSNL

Technology

Coverage %

3G

67.76 %



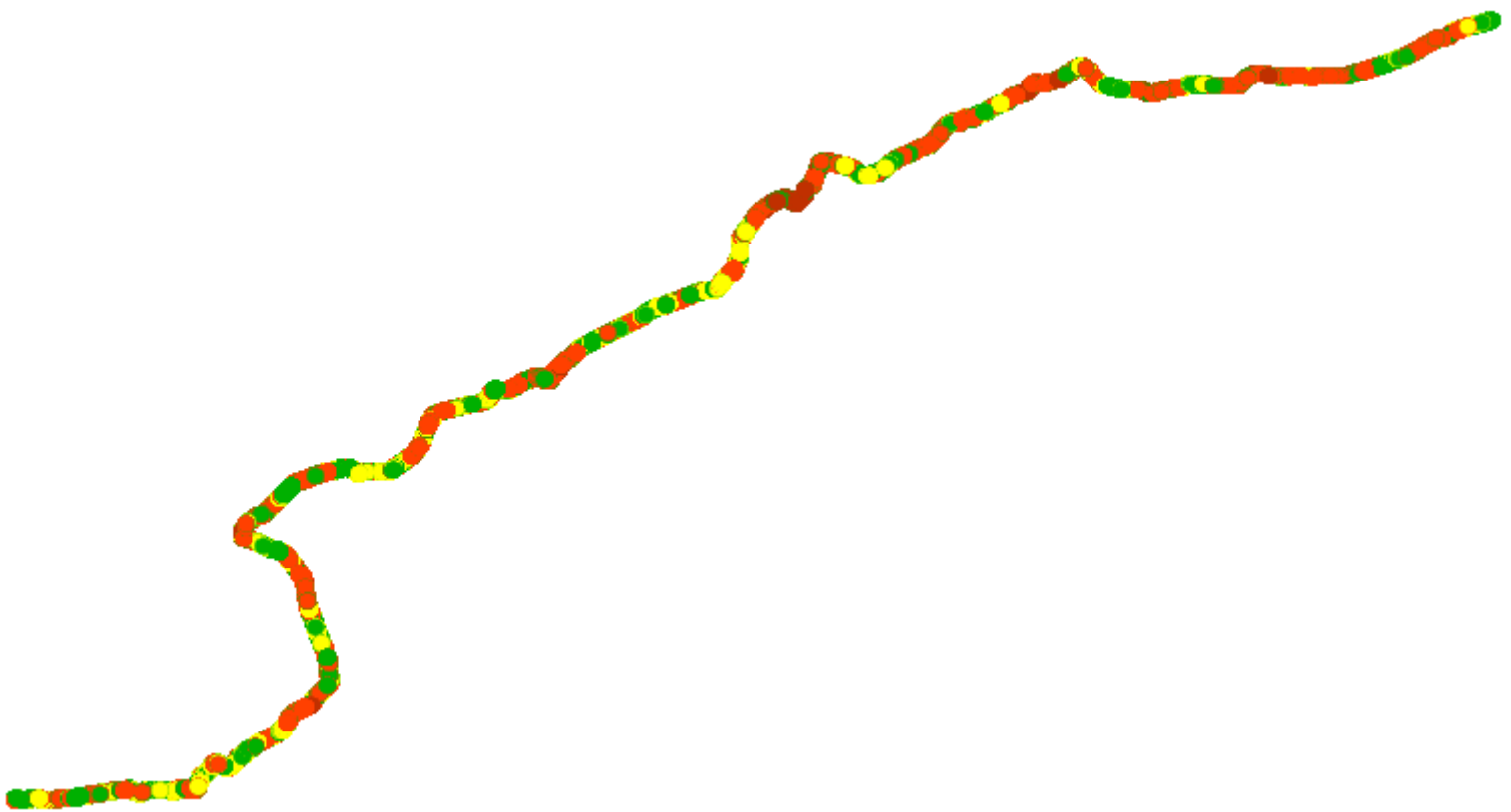
3G

Overall RSCP	# Samples	% PDF	Legends
[Max, >=-70]	32452	20.29%	
[-70, >=-80)	32275	20.18%	
[-80, >=-90)	43608	27.27%	
[-90, >=Min)	51545	32.23%	
Total	159880	100.00%	

Coverage Details

TSP-Airtel

Technology	Coverage %
VoLTE	96.71

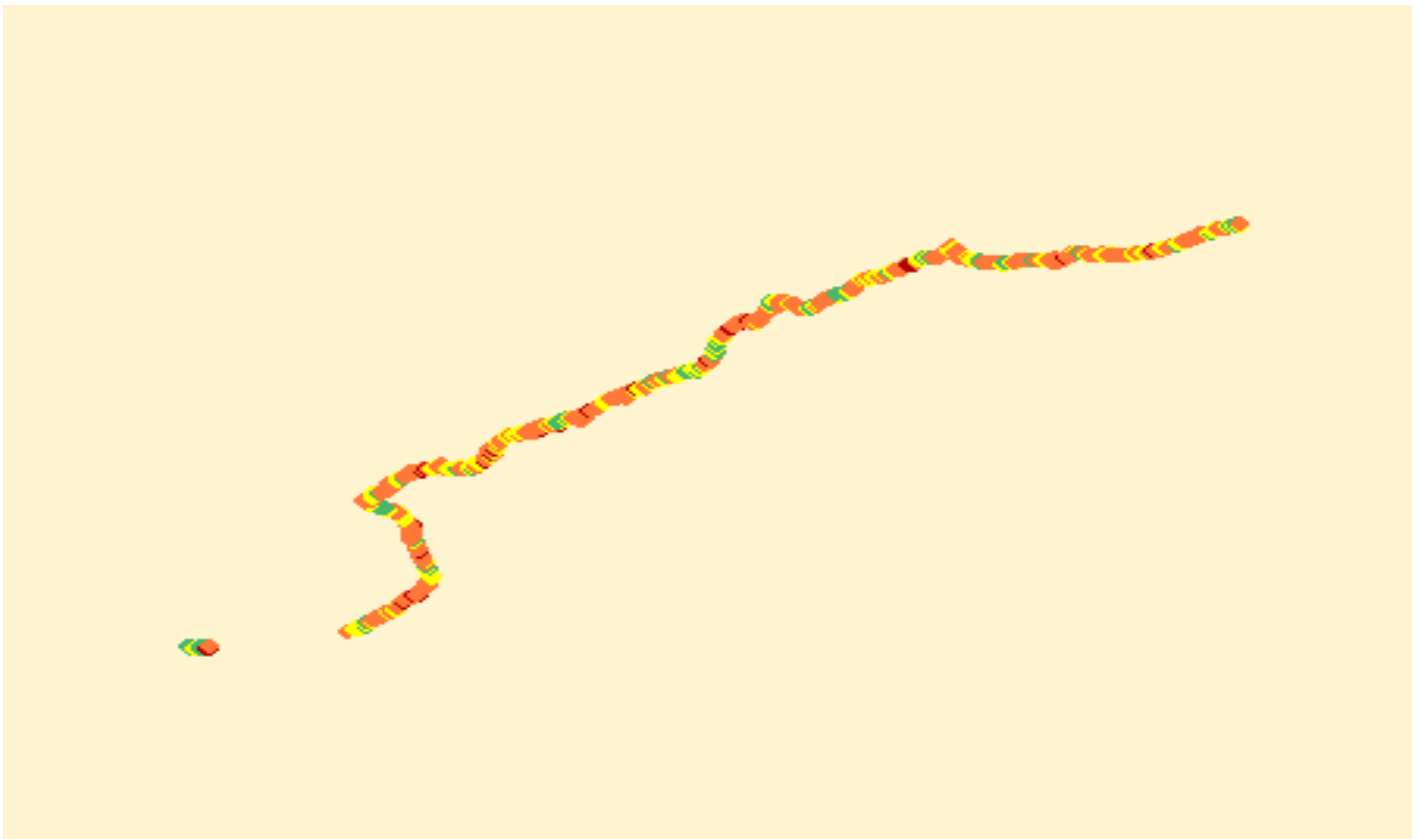


VoLTE			
Overall RSRP	# Samples	% PDF	Legends
[Max, >=-80]	910786	35.80	
[-80, >=-90)	563031	22.13	
[-90, >=-110)	986395	38.78	
[-110, >=Min)	83791	3.29	
Total	2544003	100	

Coverage Details

TSP- JIO

Technology	Coverage %
VoLTE	95.66%

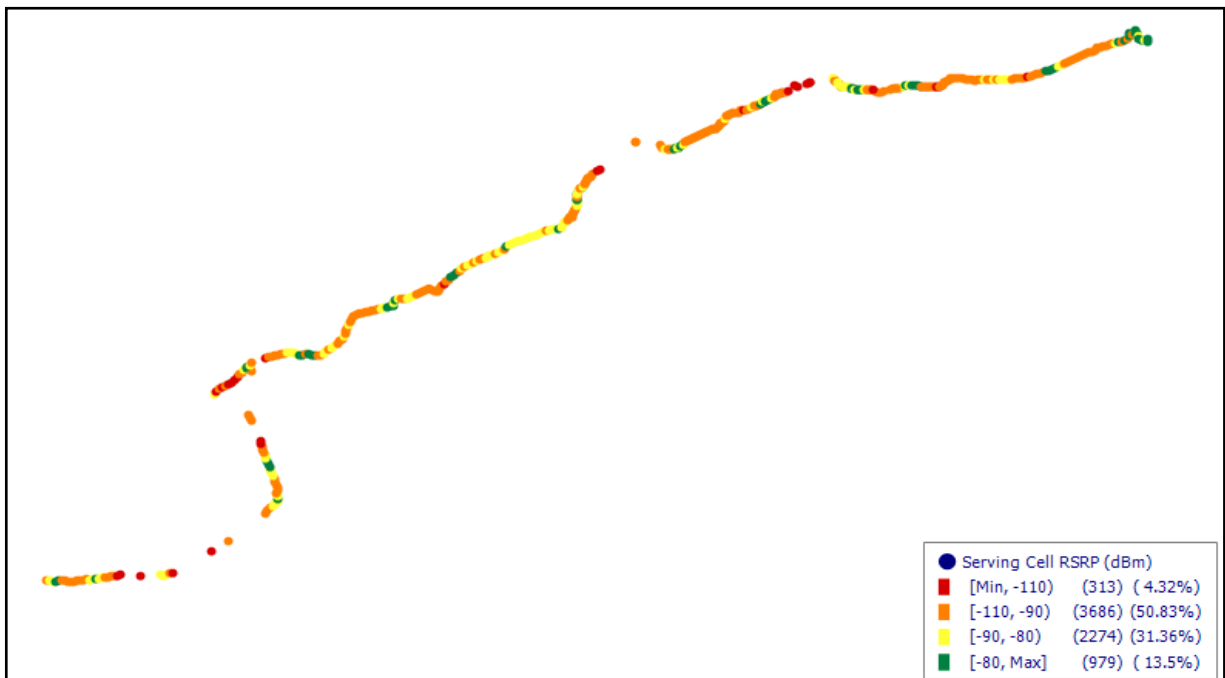


VoLTE			
Overall RSRP	# Samples	% PDF	Legends
[Max, >=-80]	1547	11.98%	
[-80, >=-90)	3453	26.74%	
[-90, >=-110)	7353	55.94%	
[-110, >=Min)	561	4.34%	
Total	12914		

Coverage Details

TSP- Vi

Technology	Coverage %
VoLTE	95.69

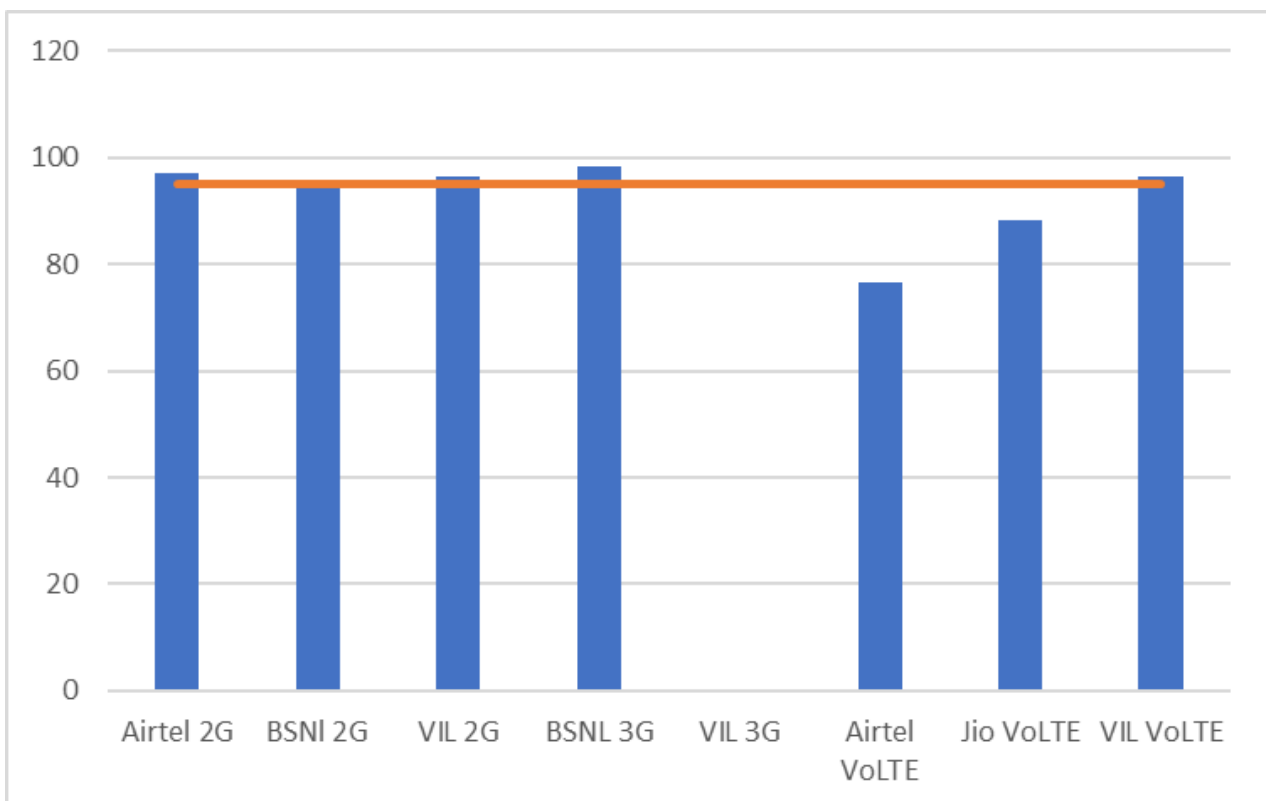


VoLTE			
Overall RSRP	# Samples	% PDF	Legends
[Max, >=-80]	979	13.5%	
[-80, >=-90)	2274	31.36%	
[-90, >=-110)	3686	50.83%	
[-110, >=Min)	313	4.32%	
Total	7252	100%	

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	Rx Quality %
Airtel 2G	97.06
BSNI 2G	95.65
VIL 2G	96.54
BSNL 3G	98.30
VIL 3G	NA
Airtel VoLTE	76.59
Jio VoLTE	88.1
VIL VoLTE	96.31

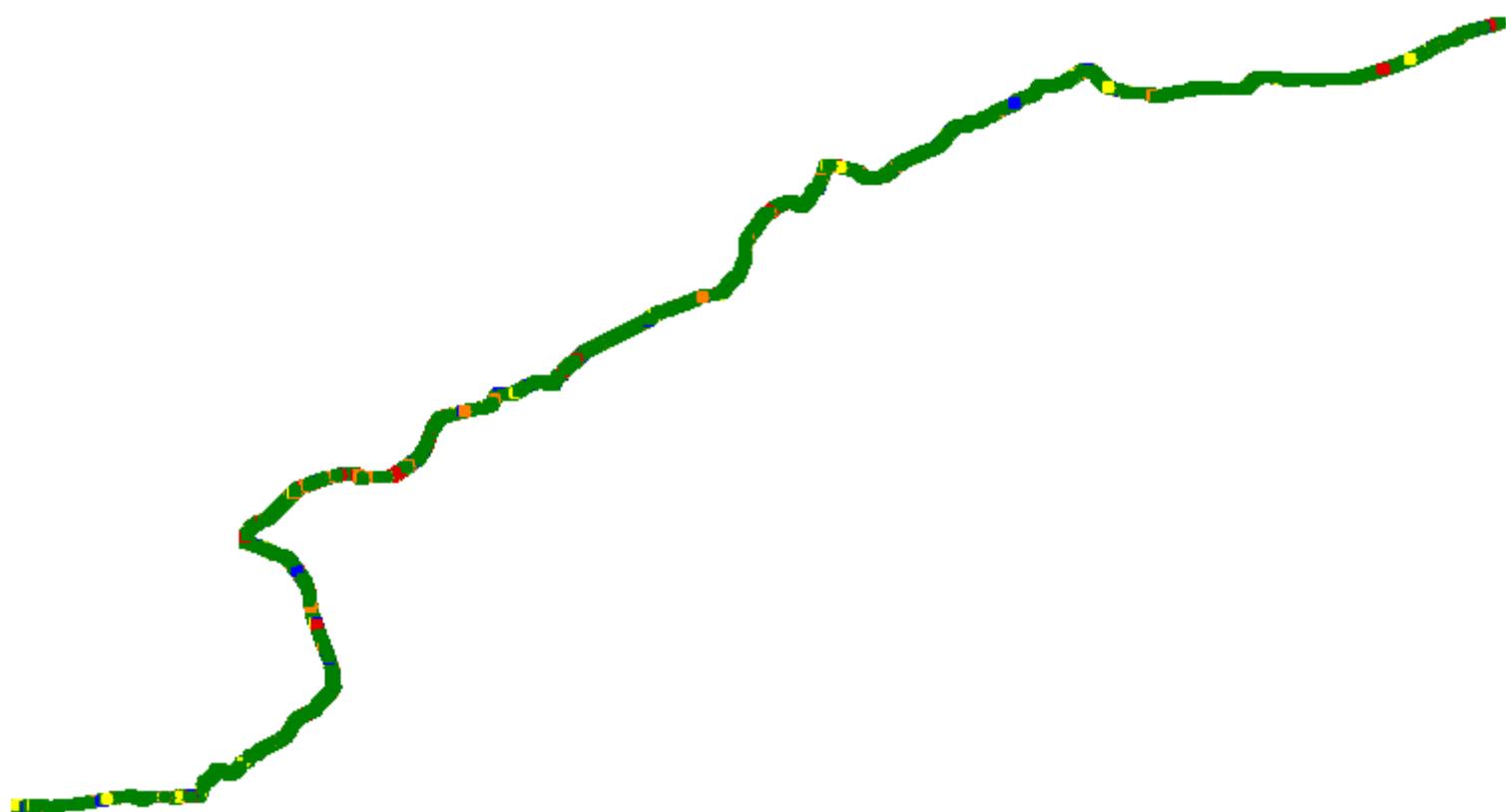


Quality Details

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	97.06



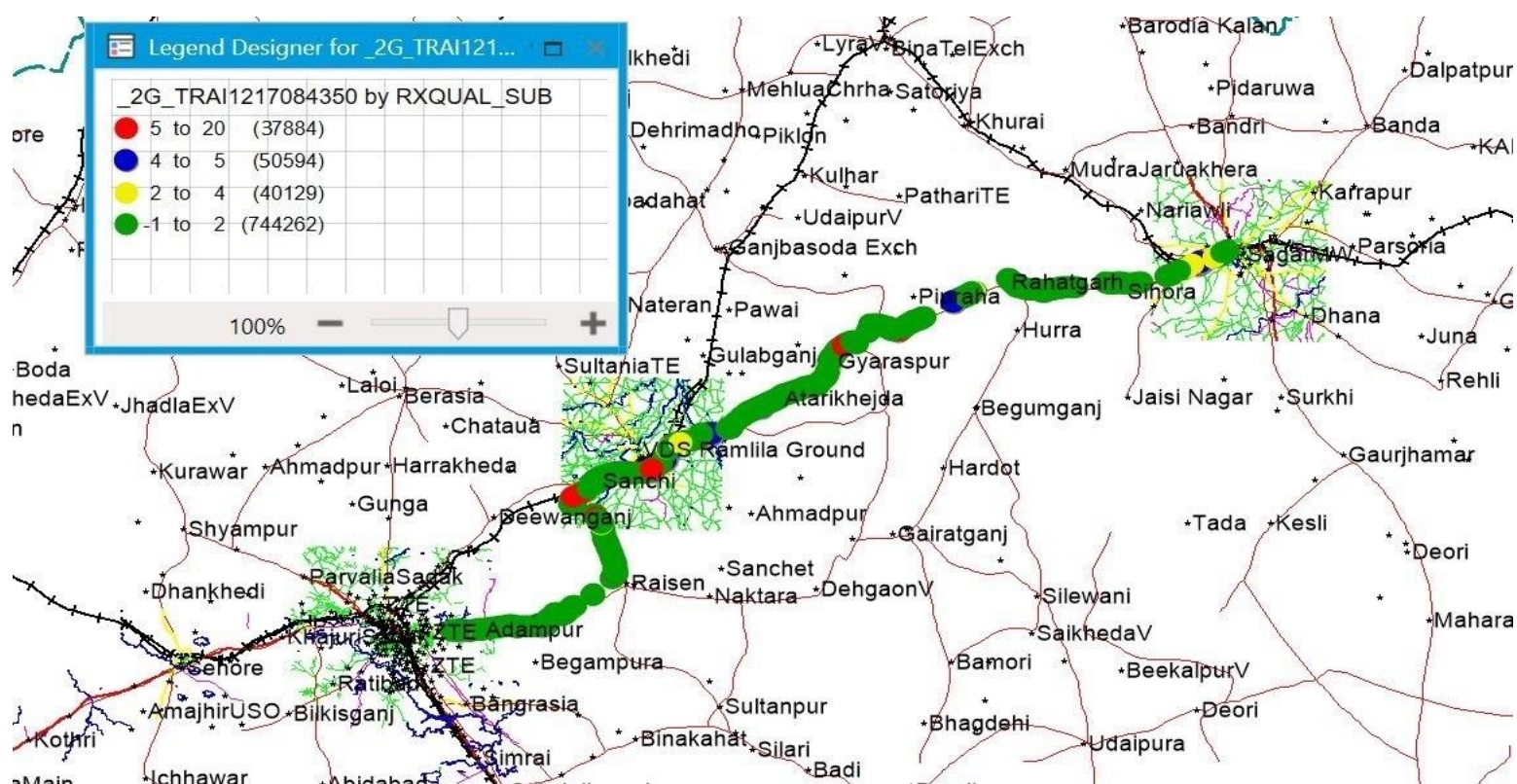
Overall Rx Quality	# Samples	% PDF	Legends
(Min, ≤ 2)	1185713	86.03	
(2, ≤ 3)	43524	3.16	
(3 , ≤ 4)	39274	2.85	
(4 , ≤ 5)	69172	5.02	
(5 , $\leq \text{Max}$)	40520	2.94	
Total	1378203	100	

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-BSNL

Technology	Rx Quality %
2G	95.65 %



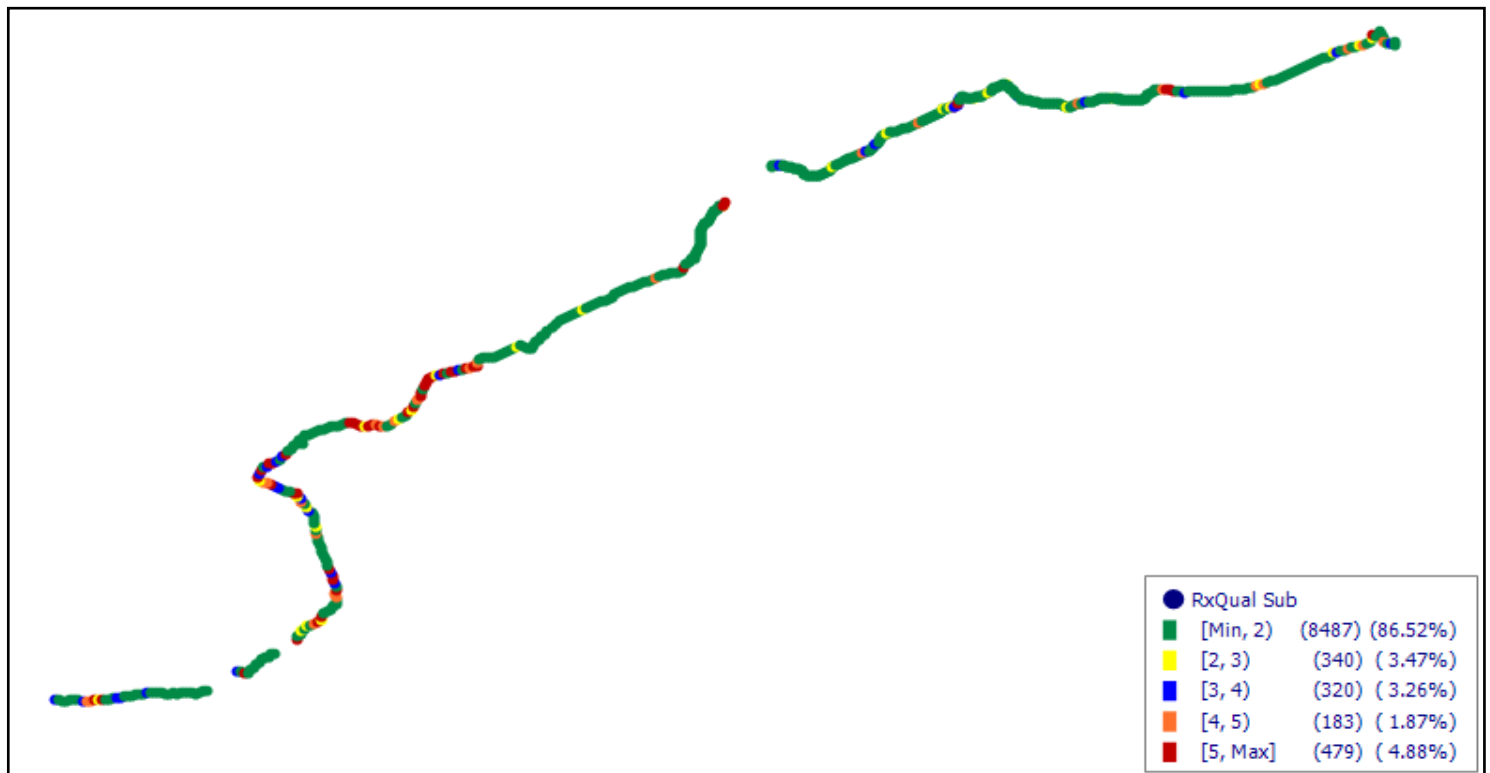
Overall Rx Quality	# Samples	% PDF	Legends
(-1, ≤ 2)	744262	85.26%	
(2, ≤ 4)	40129	4.59%	
(4, ≤ 5)	50594	5.79%	
(5, ≤ 20)	37884	4.34%	
Total	872869	100.00%	

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	96.54%



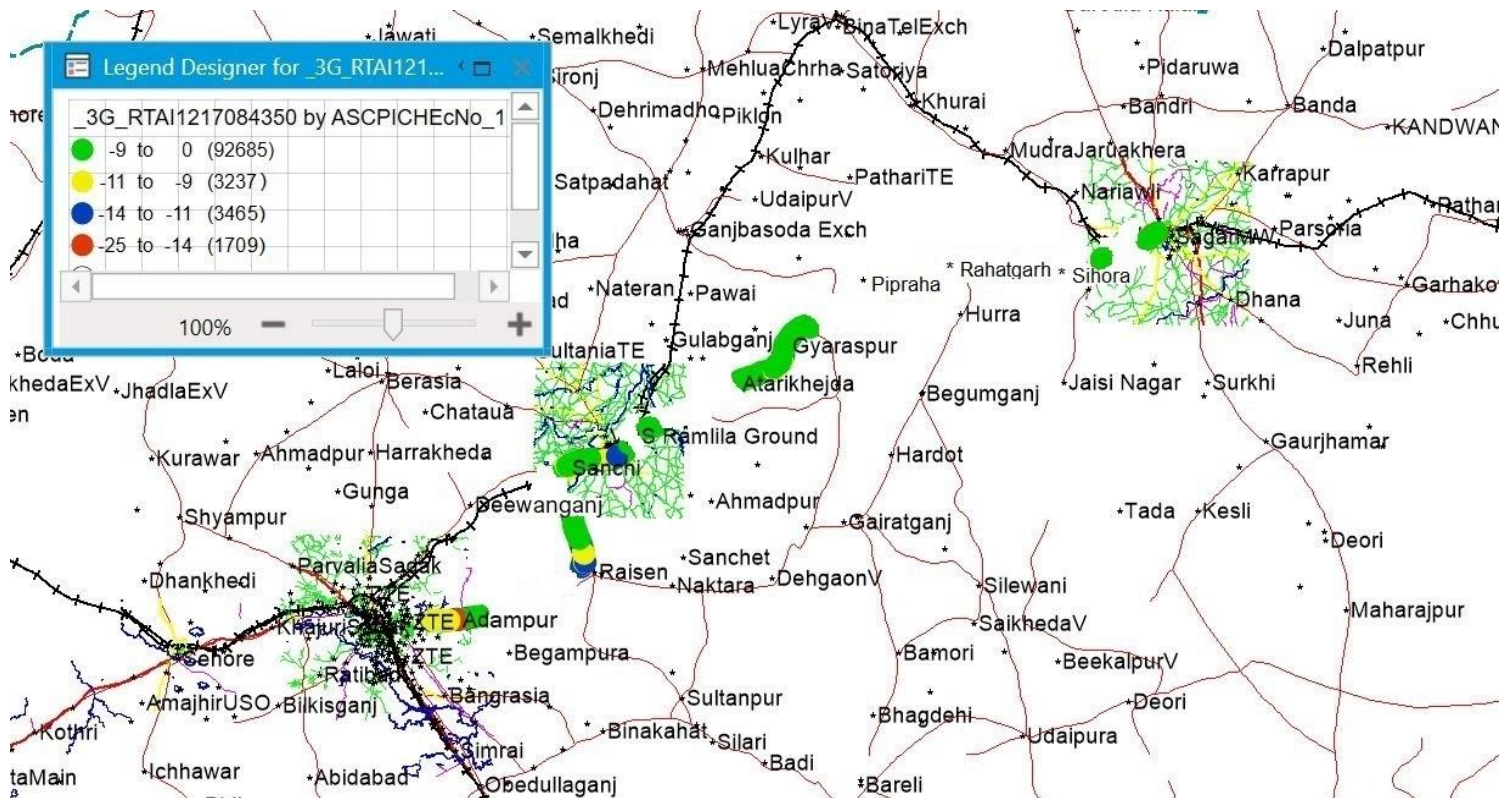
Overall Rx Quality	# Samples	% PDF	Legends
(Min, ≤ 2)	8487	86.52%	
(2, ≤ 3)	370	3.47%	
(3, ≤ 4)	320	3.26%	
(4, ≤ 5)	183	1.87%	
(5, $\leq \text{Max}$)	479	4.88%	
Total	9839	100%	

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-BSNL

Technology	Rx Quality %
3G	98.30 %



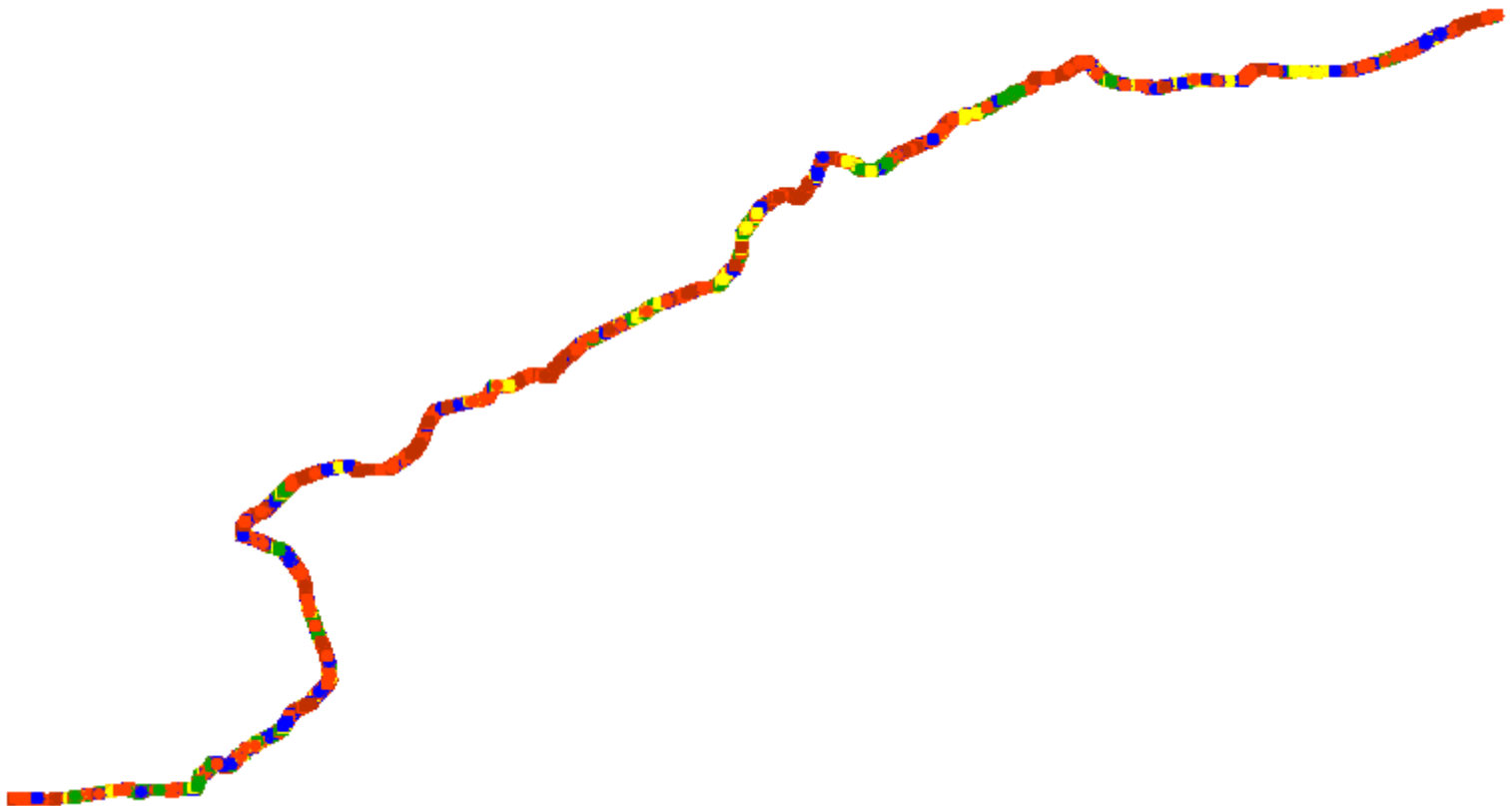
Overall Ec/No	# Samples	% PDF	Legends
(Max, ≤ -9)	92685	91.68 %	
(-9, ≤ -11)	3237	3.20 %	
(-11, ≤ -14)	3465	3.42 %	
(-14, \leq Min)	1709	1.69 %	
Total	101096	100.00%	

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 %
VoLTE	76.59



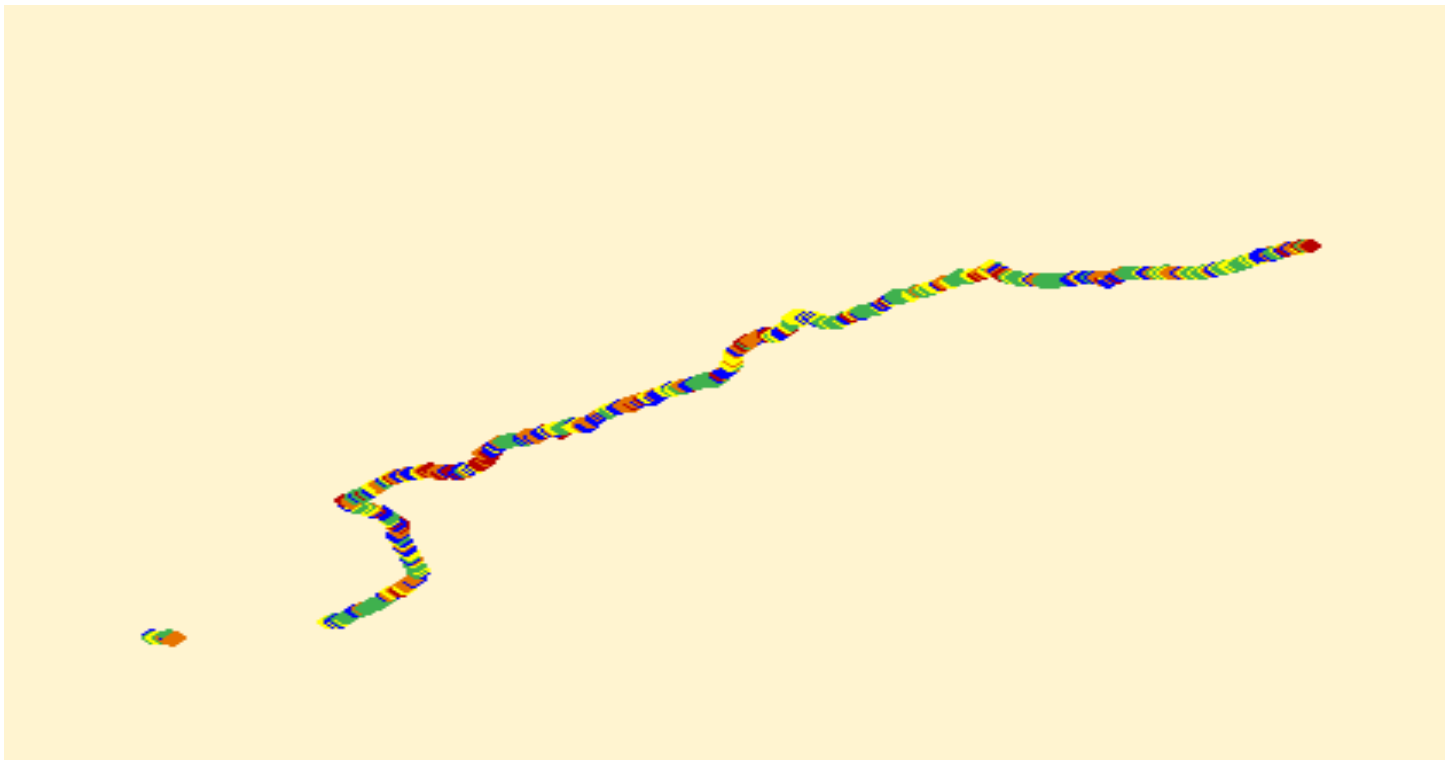
Overall SINR	# Samples	% PDF	Legends
(Min, ≤ 0)	595954	23.41	
(0, ≤ 5)	1106248	43.46	
(5, ≤ 10)	299349	11.76	
(10, ≤ 15)	254072	9.98	
(15, $\leq \text{Max}$)	289933	11.39	
Total	2545556	100	

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-JIO

Technology	Rx Quality %
VoLTE	88.10%



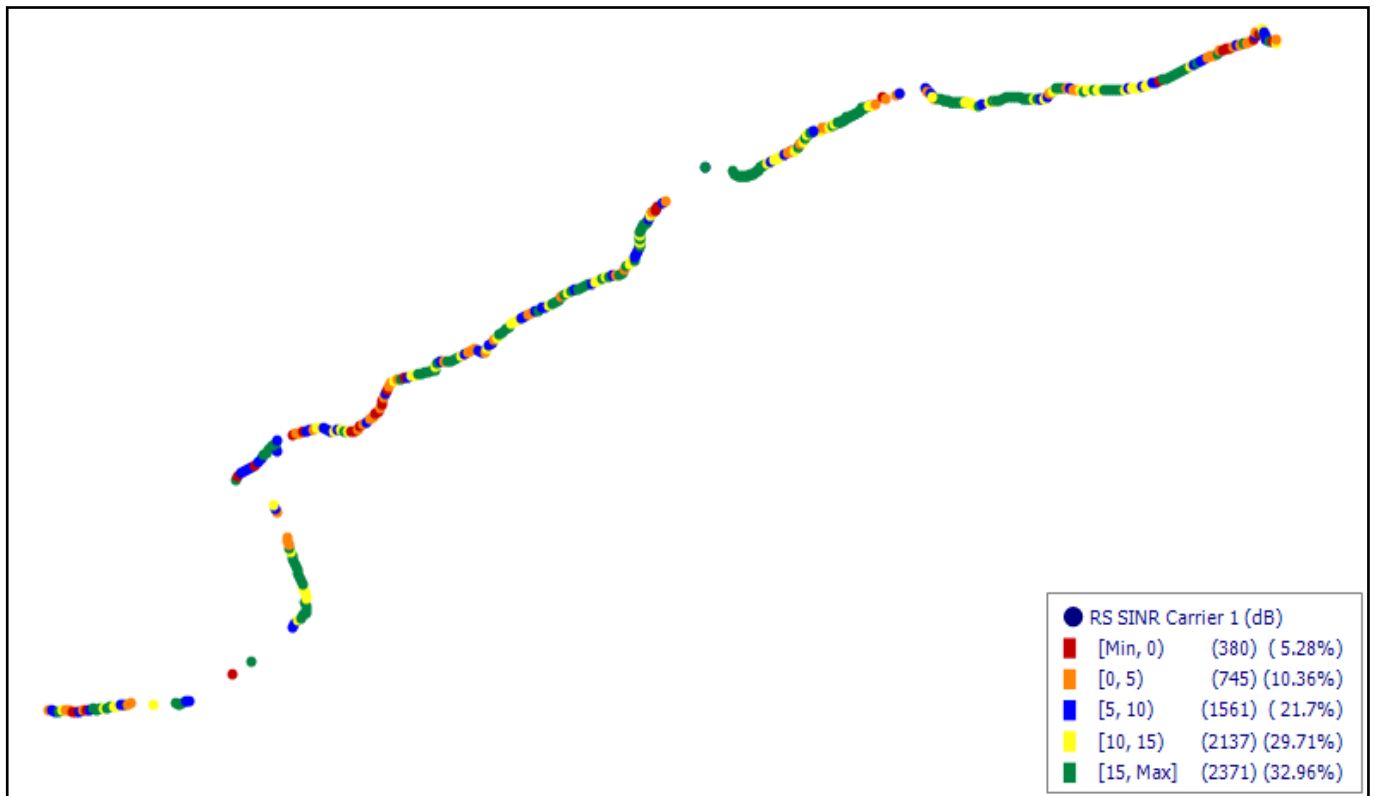
Overall SINR	# Samples	% PDF	Legends
(Min, ≤ 0)	1537	11.90%	
(0, ≤ 5)	2397	18.56%	
(5, ≤ 10)	2813	21.78%	
(10, ≤ 15)	2422	18.75%	
(15, $\leq \text{Max}$)	3745	29.00%	
Total	12914		

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

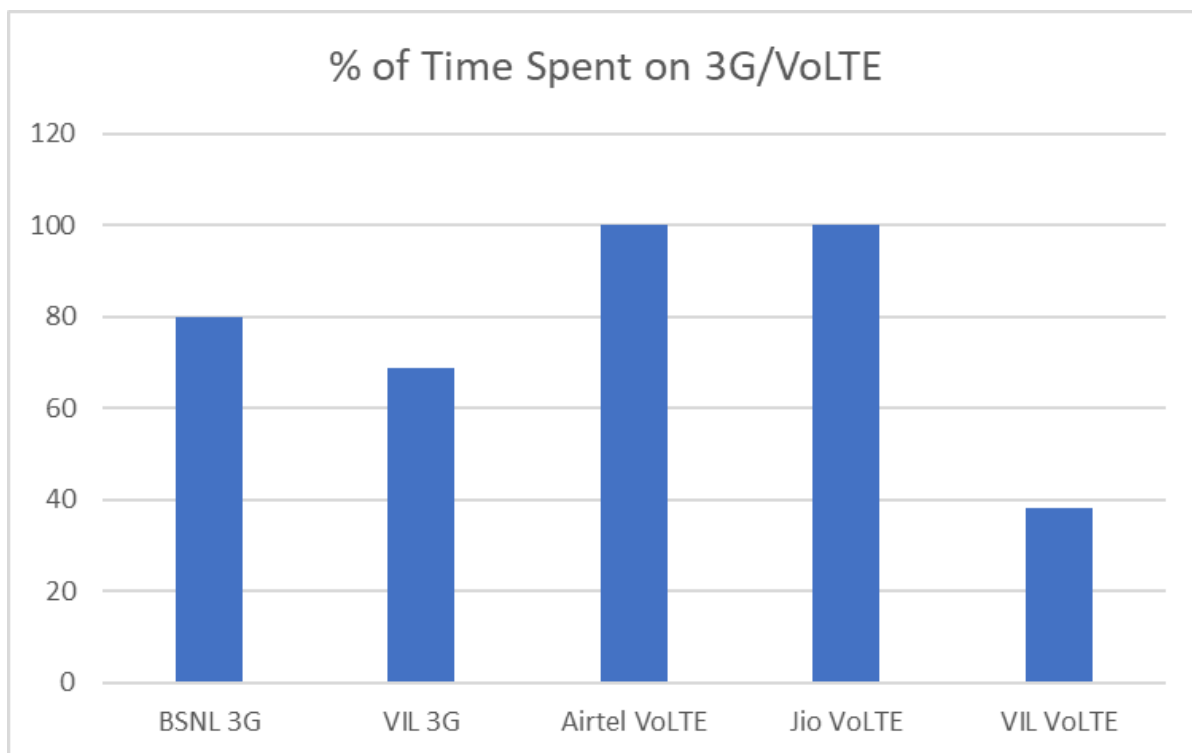
Technology	Rx Quality %
VoLTE	96.31%



Overall SINR	# Samples	% PDF	Legends
(Min, ≤ 0)	380	5.28%	
(0, ≤ 5)	745	10.36%	
(5, ≤ 10)	1561	21.7%	
(10, ≤ 15)	2137	29.71%	
(15, $\leq \text{Max}$)	2371	32.96%	
Total	7194	100%	

Technology Details

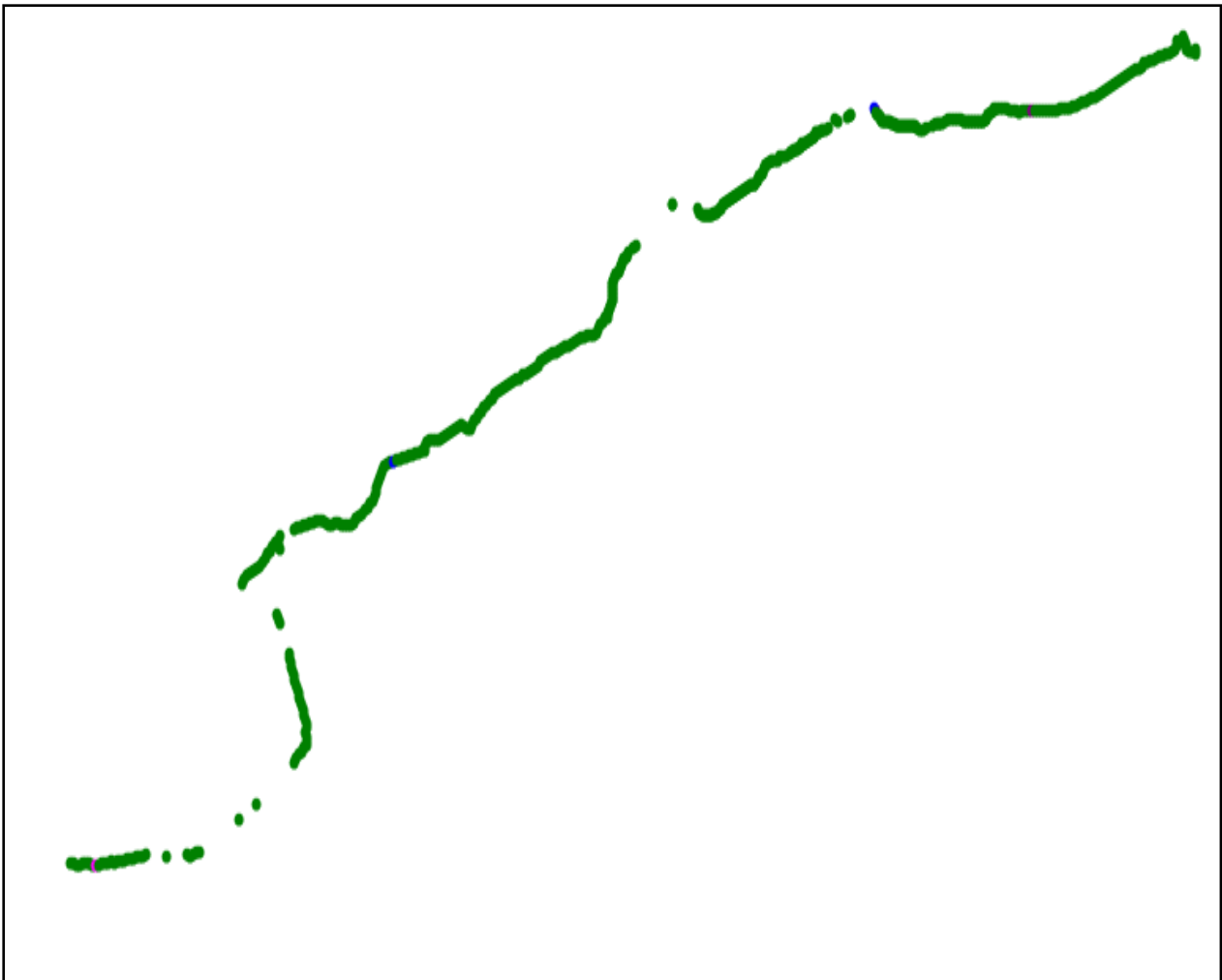
TSP	% of Time Spent on 3G/VoLTE
BSNL 3G	80
VIL 3G	68.79
Airtel VoLTE	100
Jio VoLTE	100
VIL VoLTE	38.21



Technology Details

TSP- Vi

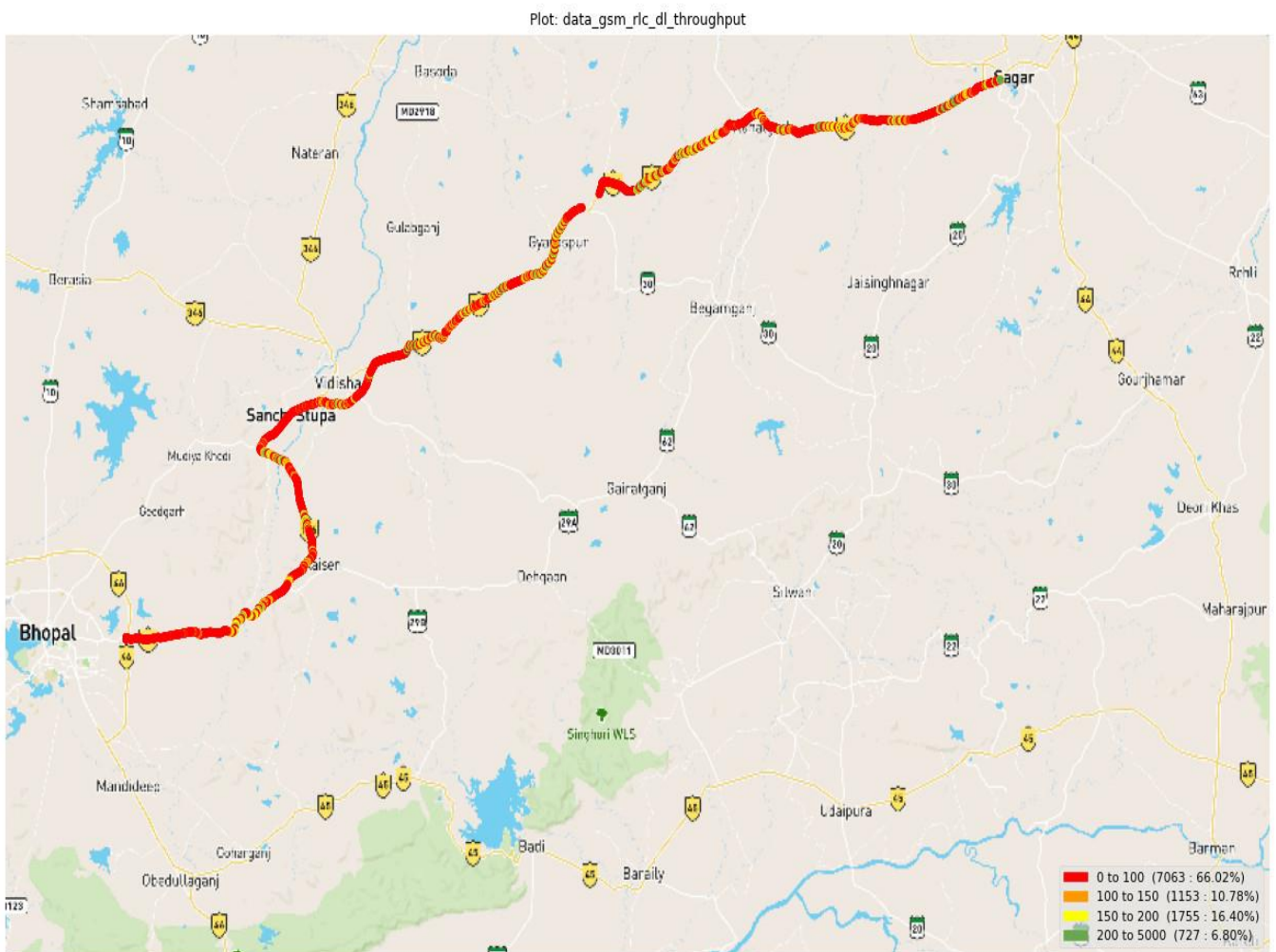
Technology	% of Time Spent on
VIL Non Volte	68.79%
VoLTE	31.21%



TSP-Airtel

Data Statistics - Dynamic data testing

Data KPIs - Overall	2G
Download Throughput (Kbps)	70.05



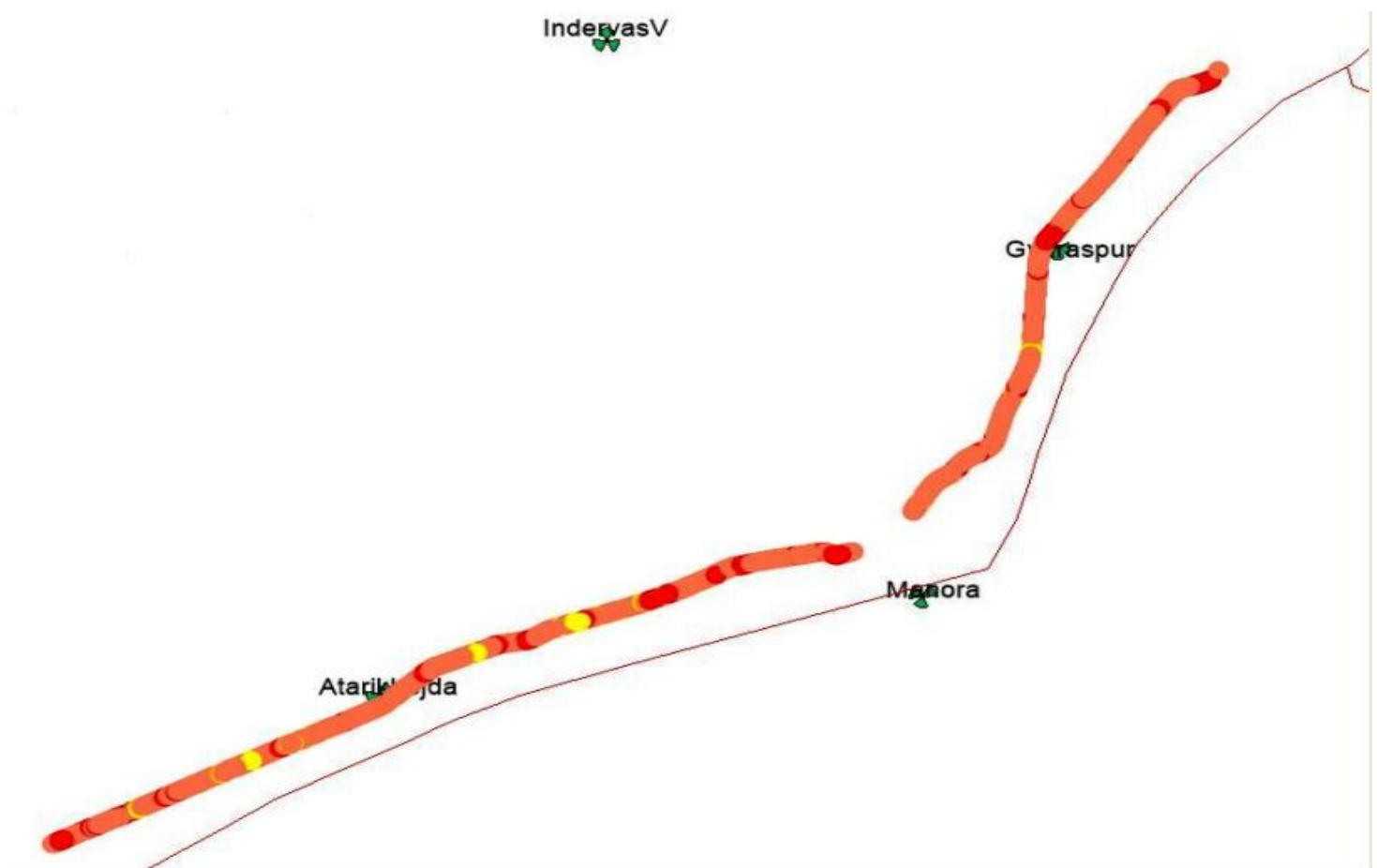
DL throughput	No of Sample	%	Legends
< 100 Kbps	7063	66.02	
100-150Kbps	1153	10.78	
150-200Kbps	1755	16.40	
>200Kbps	727	6.80	

Dynamic Data Test

TSP-BSNL

Data Statistics - Dynamic data testing

Data KPIs - Overall	2G
Download Throughput (Kbps)	



DL throughput	No of Sample	%	Legends
< 100 Kbps	1920339	52.65%	
100-150Kbps	783470	21.48%	
150-200Kbps	231298	6.34%	
>200Kbps	712595	19.54%	

TSP-BSNL

Data Statistics - Dynamic data testing

Data KPIs - Overall	3G
Download Throughput (Mbps)	



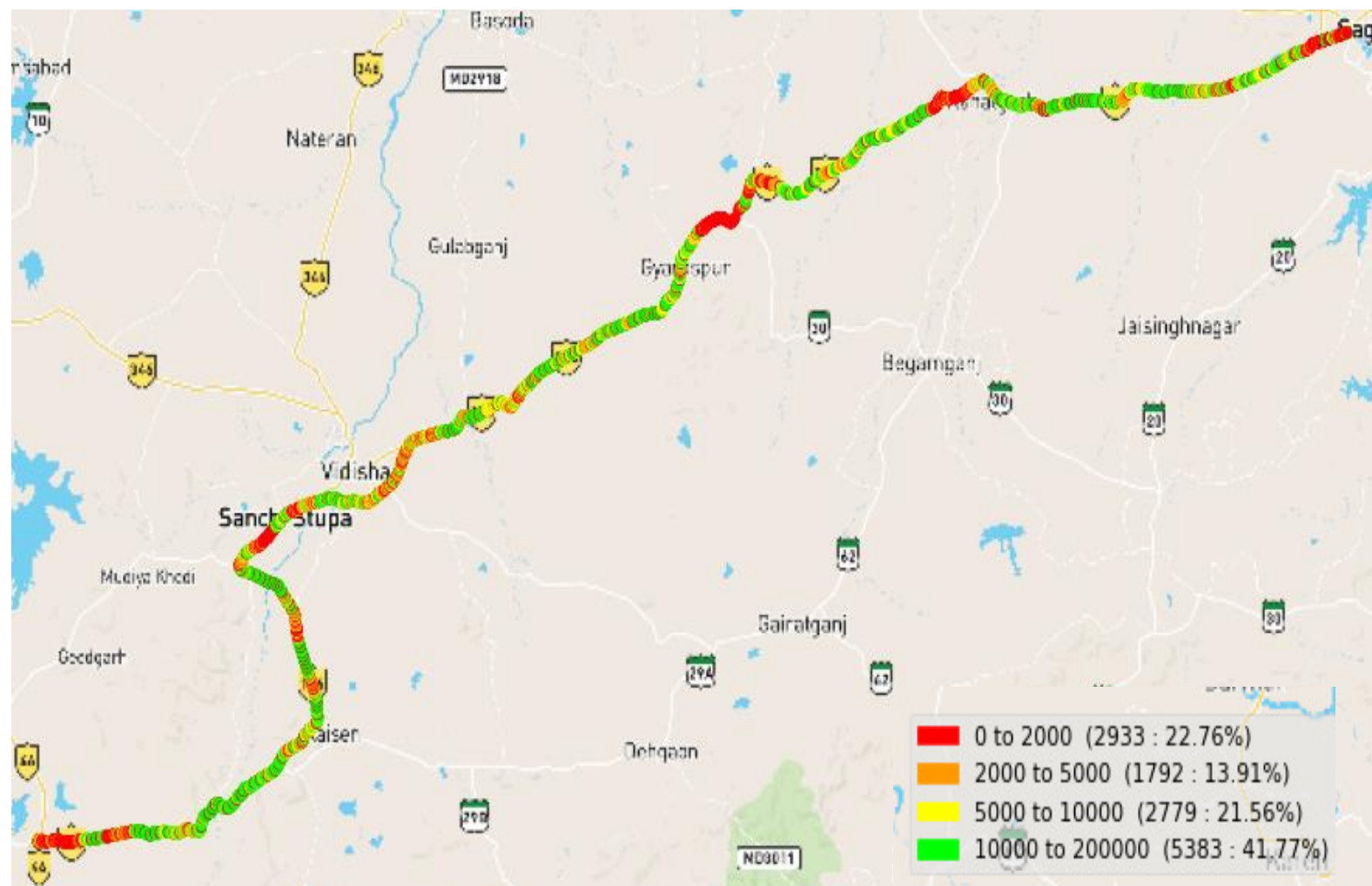
DL throughput	No of Sample	%	Legends
< 1 Mbps	373297	28.25%	
1-5 Mbps	777990	58.87%	
5-10 Mbps	117622	8.90%	
>10Mbps	52524	3.97%	

Dynamic Data Test

TSP- Airtel

Data Statistics - Dynamic data testing

Data KPIs - Overall	LTE
Download Throughput (Mbps)	14.02

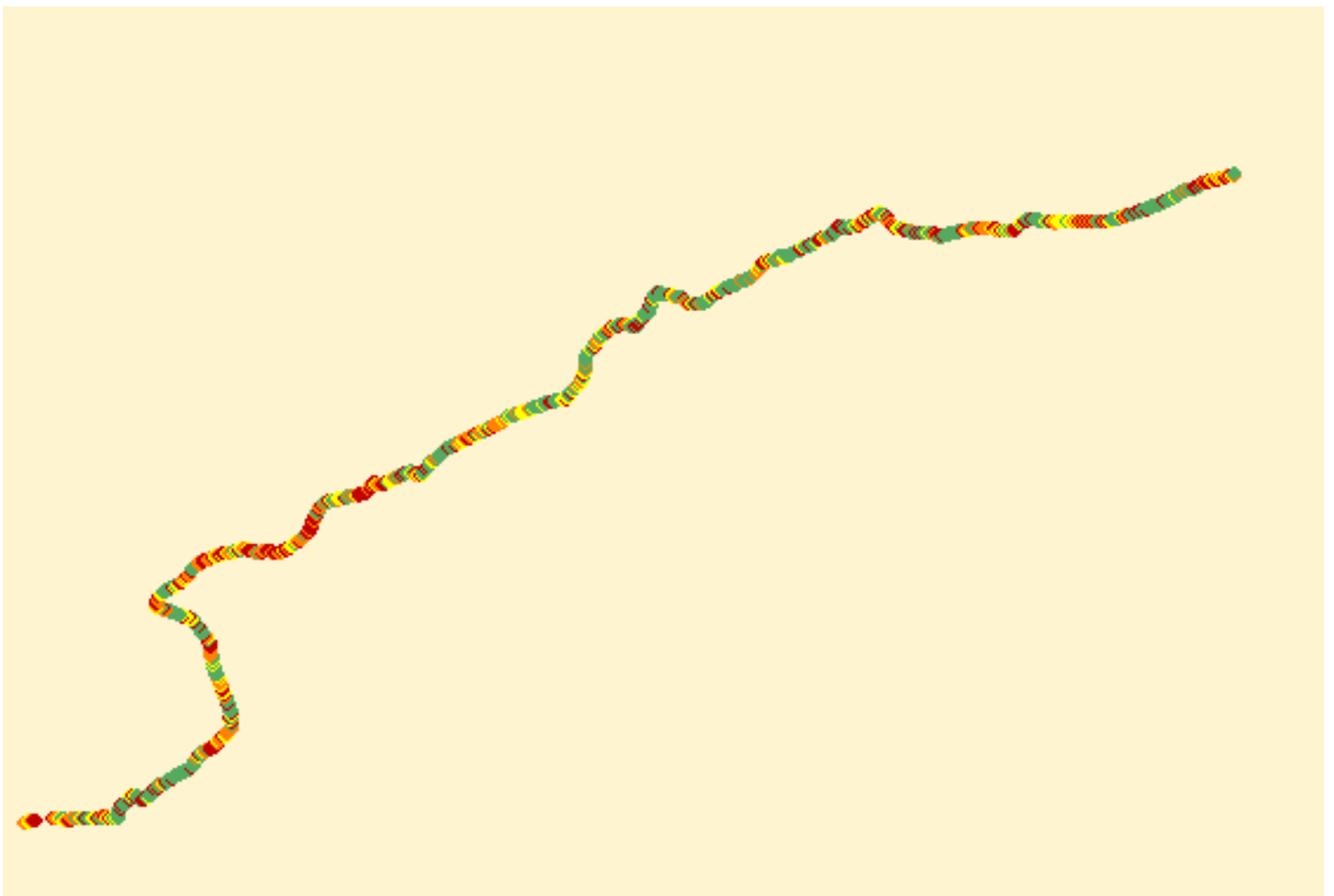


DL throughput	No of Sample	%	Legends
< 2Mbps	2933	22.76	
2-5 Mbps	1792	13.91	
5-10 Mbps	2779	21.56	
>10Mbps	5383	41.77	

TSP- JIO

Data Statistics - Dynamic data testing

Data KPIs - Overall	LTE
Download Throughput (Mbps)	18.90



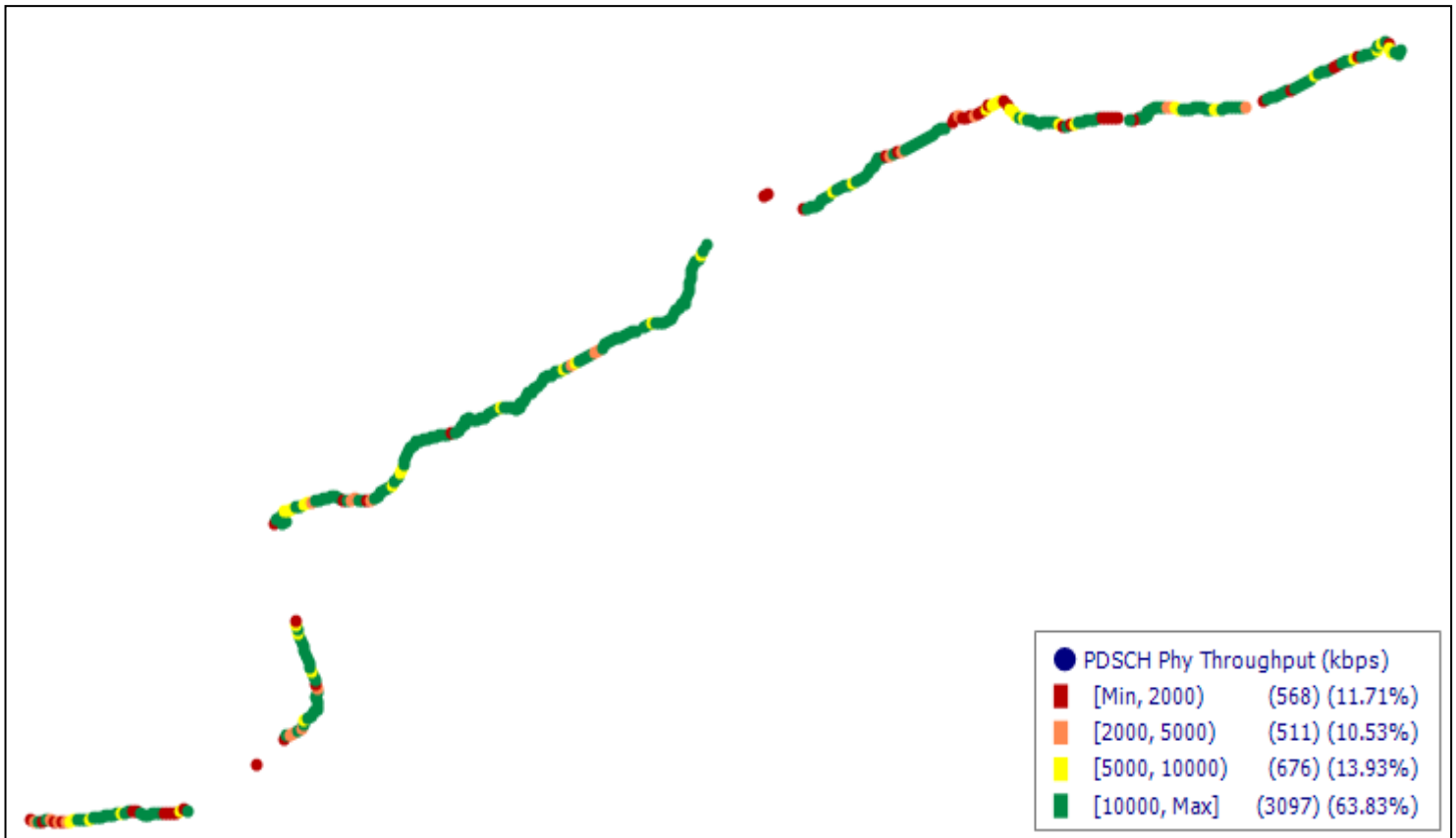
DL throughput	No of Sample	%	Legends
< 2Mbps	2849	22.45%	
2-5 Mbps	2287	18.02%	
5-10 Mbps	2474	19.50%	
>10Mbps	5079	40.03%	

Dynamic Data Test

TSP- Vi

Data Statistics - Dynamic data testing - 178 Kms

Data KPIs - Overall	LTE
Download Throughput (Mbps)	24



DL throughput	No of Sample	%	Legends
< 2Mbps	568	11.71%	
2-5 Mbps	511	10.53%	
5-10 Mbps	676	13.93%	
>10Mbps	3097	63.83%	