



प्रभावी विनियमन – सुगम संचार
Effective Regulation – Ease of Communication

Operator Assisted Drive Test Report

Ujjain – Sendhwa Highway

20/10/2022

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 Ujjain to Sendhwa Highway from 9:00 AM to 8:00 PM on 20/10/2022. The drive test covered drive route of around 247KMs. Approximately 360 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)

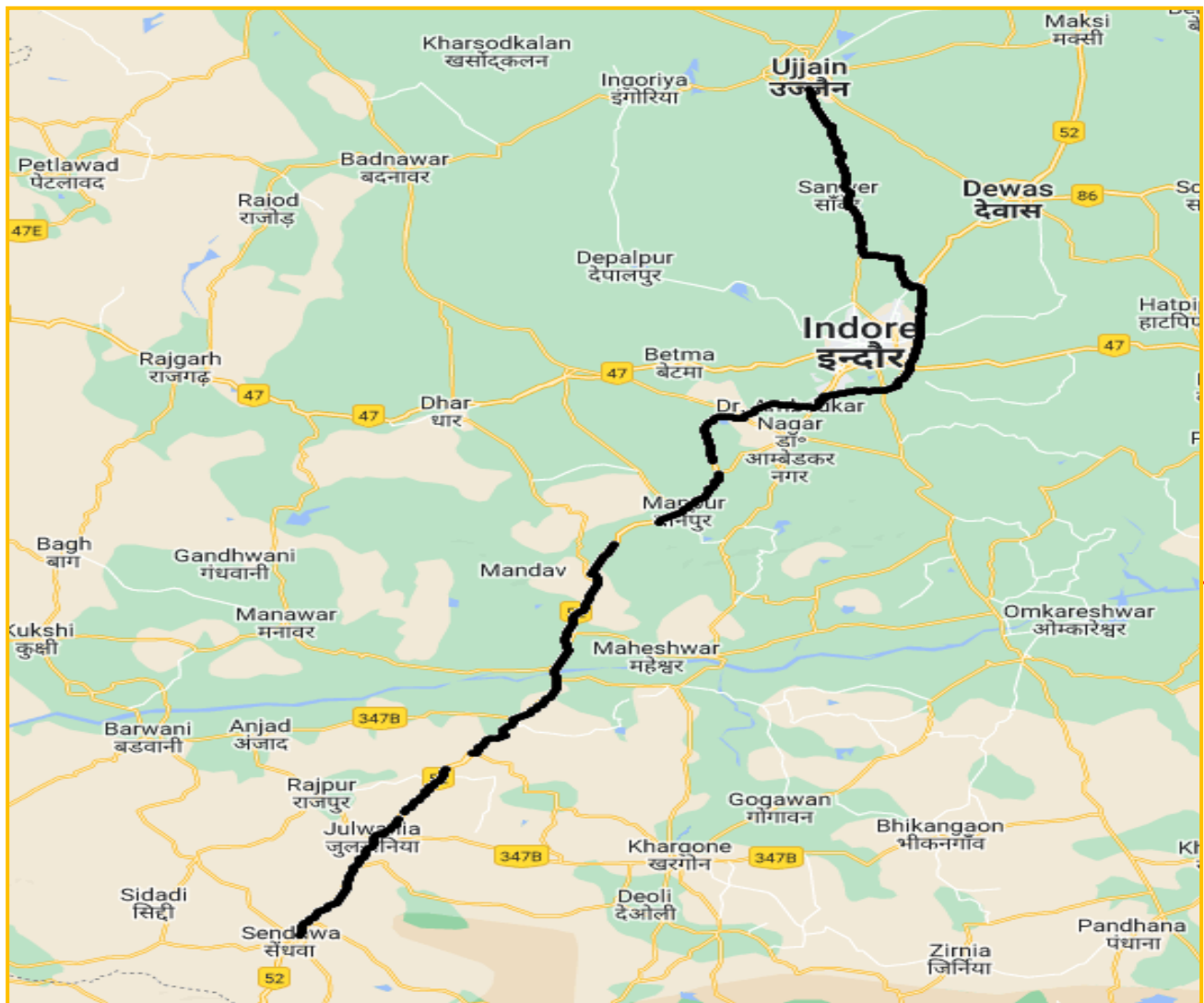
- i. 2G – measurement – UE Locked in 2G file size- 500KB
- ii. 3G – measurement – UE in 3G File Size- 20MB
- iii. 4G – measurement – UE in LTE File Size- 40MB

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

Ujjain-Sanwer by pass

Mangaliya-Indore by pass

Pithampur by pass, Manpur

Dhamnod, Khalghat, Nimrani

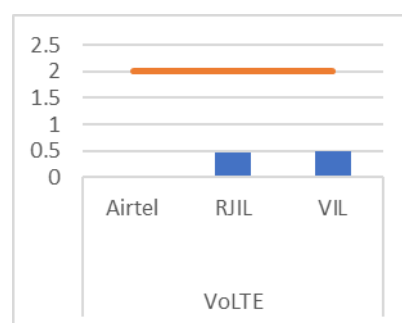
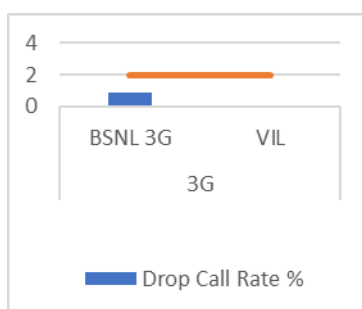
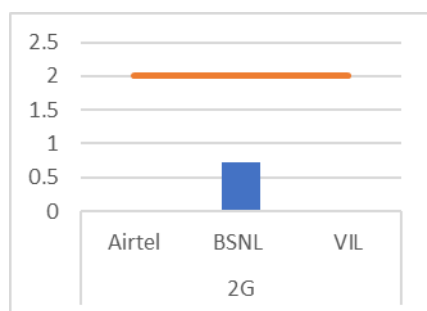
Thikari-Sendhwa

Voice Calls

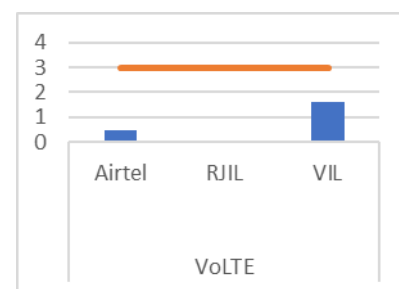
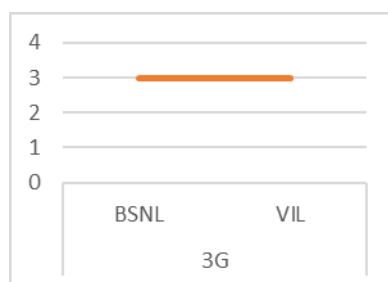
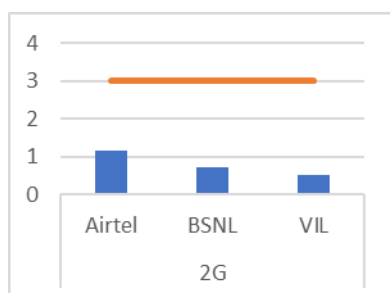
Key Observations

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	0.72	0	0.89	NA	0	0.47	0.5
Block Call Rate %	1.18	0.71	0.51	0.0	NA	0	0	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 %	78.52	71.56	79.51

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

TSPs	3G	
	BSNL	VIL
Coverage %	63.49	NA

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

TSPs	VoLTE		
	Airtel	JIO	VIL
Coverage %	96.01	96.4	96.87

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	95.51	100

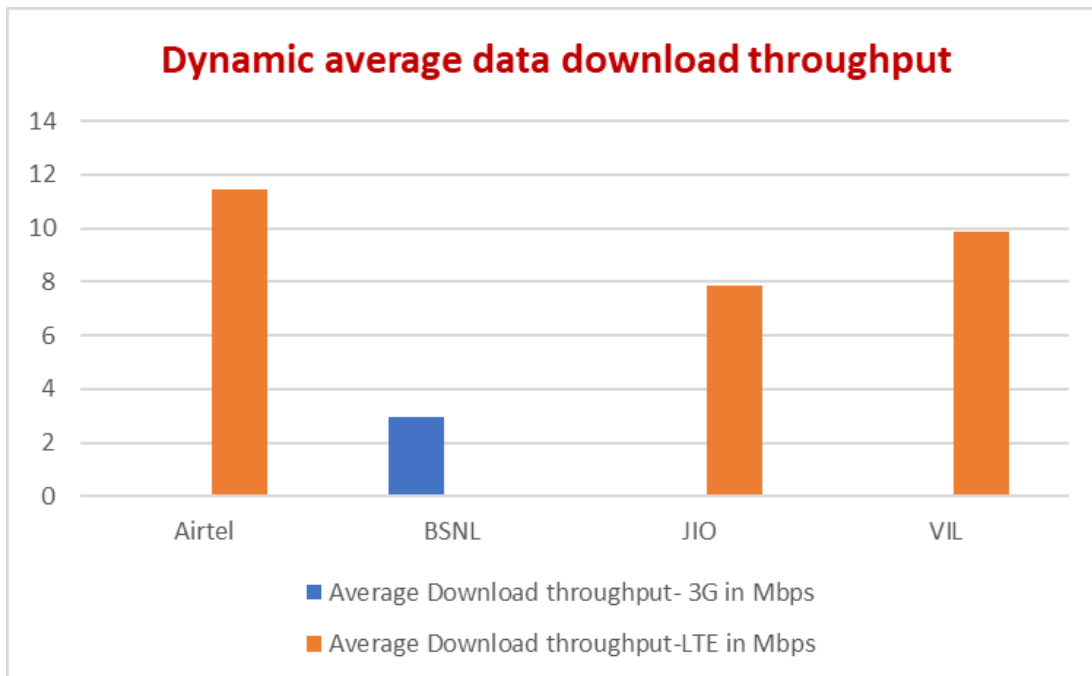
Data Services Dynamic

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	128.03	171	NA	104.46
Average Download throughput- 3G In Mbps	NA	2.96	NA	NA
Average Download throughput-LTE In Mbps	11.45	NA	7.84	9.90

Summary

Highway Summary- Voice

TSP (For 2G)	Airtel	BSNL	JIO	VIL
Call attempts	170	140	NA	195
Block call rate %	1.18	0.71	NA	0.51
CSSR %	98.82	98.57	NA	99.49
Drop call rate %	0	0.72	NA	0
Mobility HOSR %	98.70	97.81	NA	98.48
RX Quality %	96.26	98.79	NA	96.54
Average CST Sec	3.88	2.2	NA	2.51

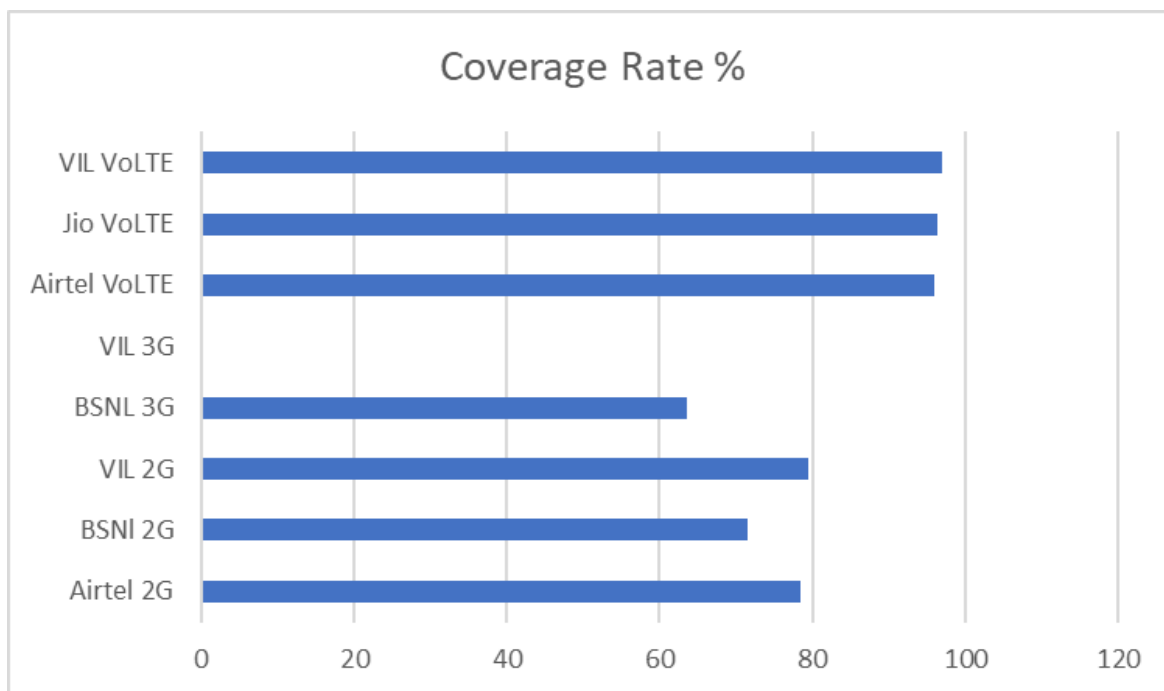
TSP (For 3G)	Airtel	BSNL	JIO	VIL
Call attempts	NA	112	NA	NA
Block call rate %	NA	0.0	NA	NA
CSSR %	NA	99.10	NA	NA
Drop call rate %	NA	0.89	NA	NA
Mobility HOSR %	NA	98.51	NA	NA
RX Quality %	NA	96.12	NA	NA
Average CST (Sec)	NA	2.1	NA	NA

TSP (For VoLTE)	Airtel	BSNL	JIO	VIL
Call attempts	190	NA	214	204
Block call rate %	0	NA	-	0.98
CSSR %	100	NA	100	99.02
Drop call rate %	0	NA	0.47	0.50
Mobility HOSR %	96.92	NA	98.25	99.51
RX Quality %	76.55	NA	84.04	96.31
Average CST(Sec)	0.64	NA	1.53	1.34

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.

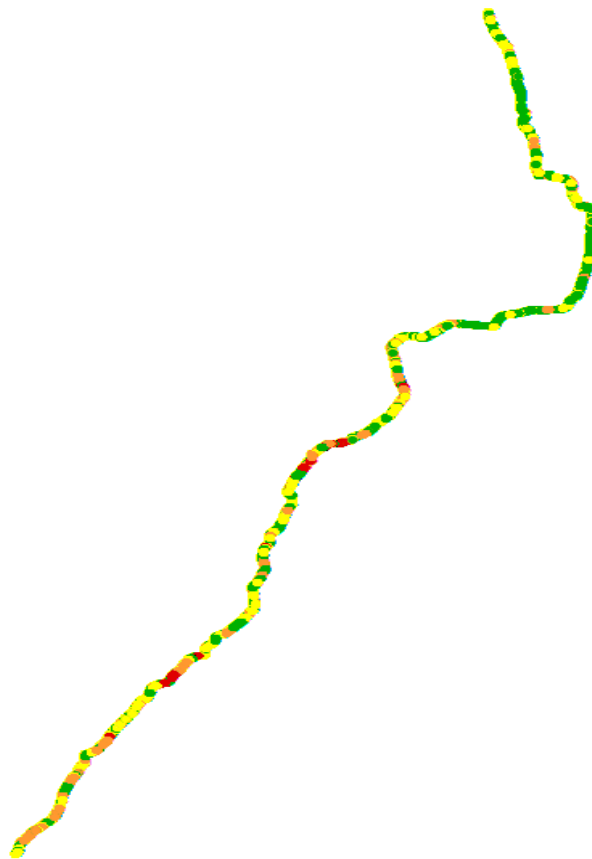
TSP	Coverage Rate %
Airtel 2G	78.52
BSNI 2G	71.56
VIL 2G	79.51
BSNL 3G	63.49
VIL 3G	NA
Airtel VoLTE	96.01
Jio VoLTE	96.4
VIL VoLTE	96.87







Coverage Details

TSP-Airtel

Technology	Coverage %
2G	78.52

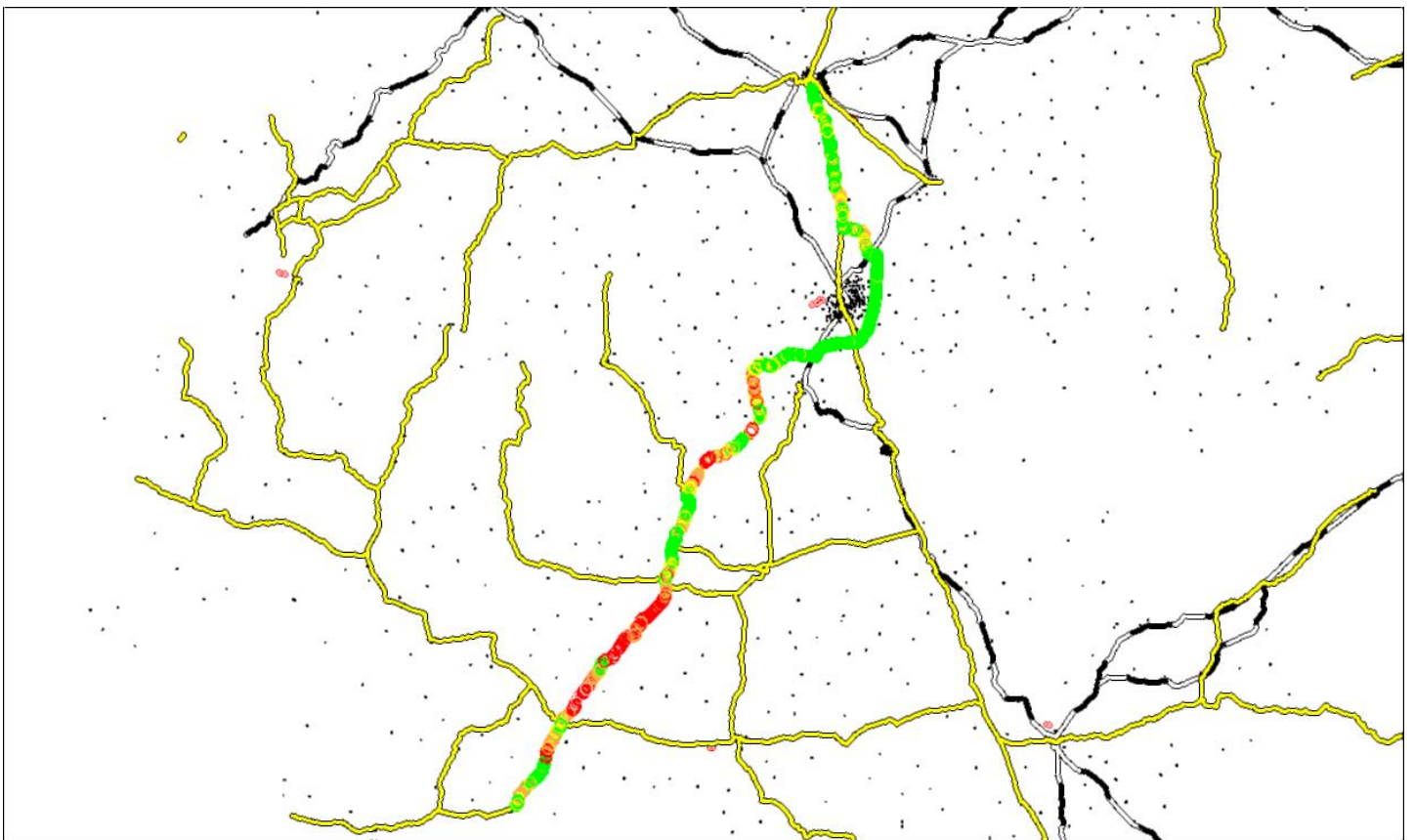


2G			
Overall RxLevel	# Samples	% PDF	Legends
[Max, >=-75]	885655	43.12	
[-75, >=-85)	727205	35.40	
[-85, >=-95)	388885	18.93	
[-95, >=Min)	52232	2.54	
Total	2053977	100	





Coverage Details

TSP-BSNL

Technology	Coverage %
2G	100 %



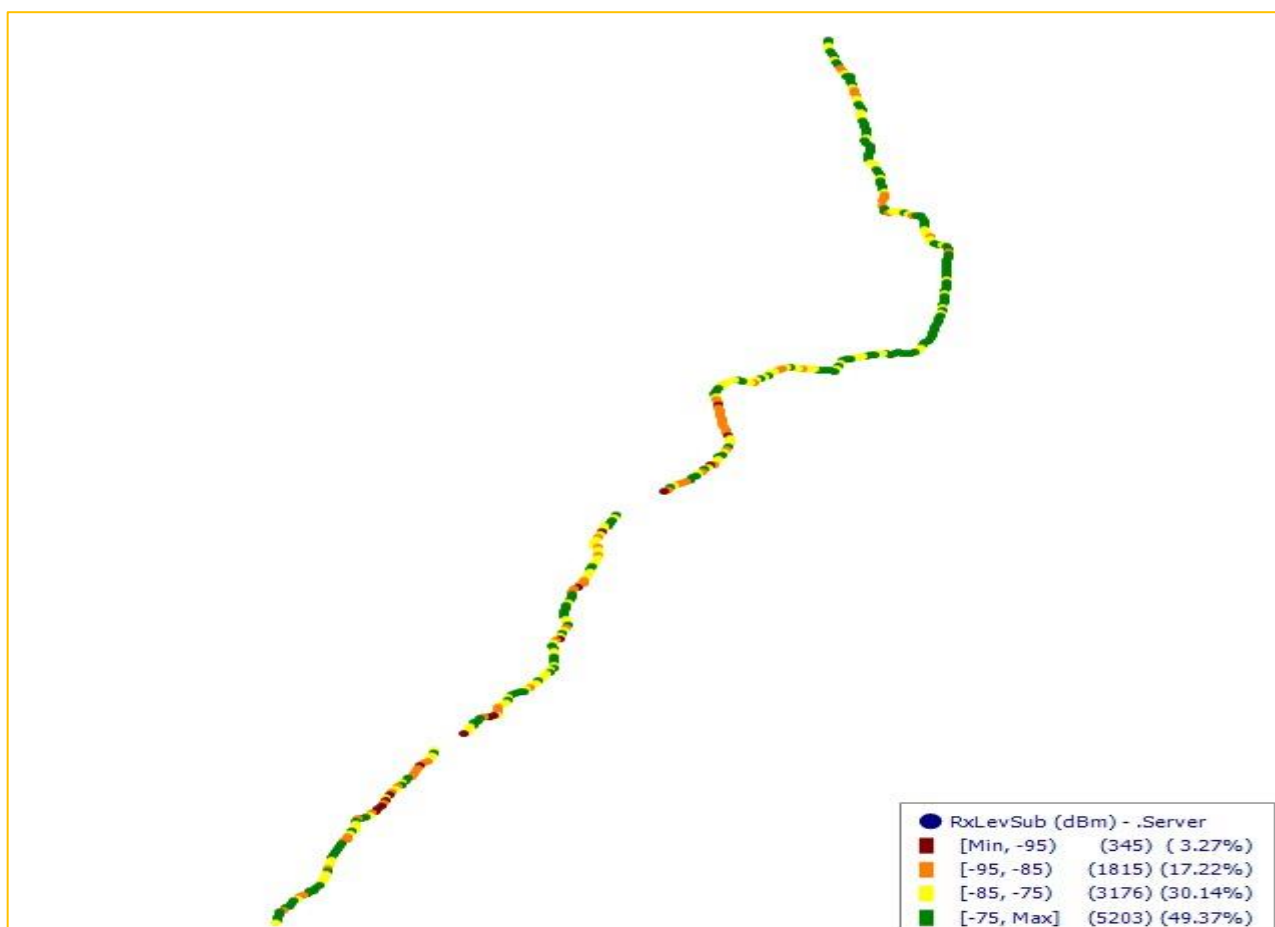
2G

Overall RxLevel	# Samples	% PDF	Legends
[Max, >=-75]	247833	52.64%	
[-75, >=-85)	89098	18.92%	
[-85, >=-95)	72470	15.39%	
[-95, >=Min)	61420	13.05%	
Total	470821	100.00%	

Coverage Details

TSP- VIL

Technology	Coverage %
2G	79.51

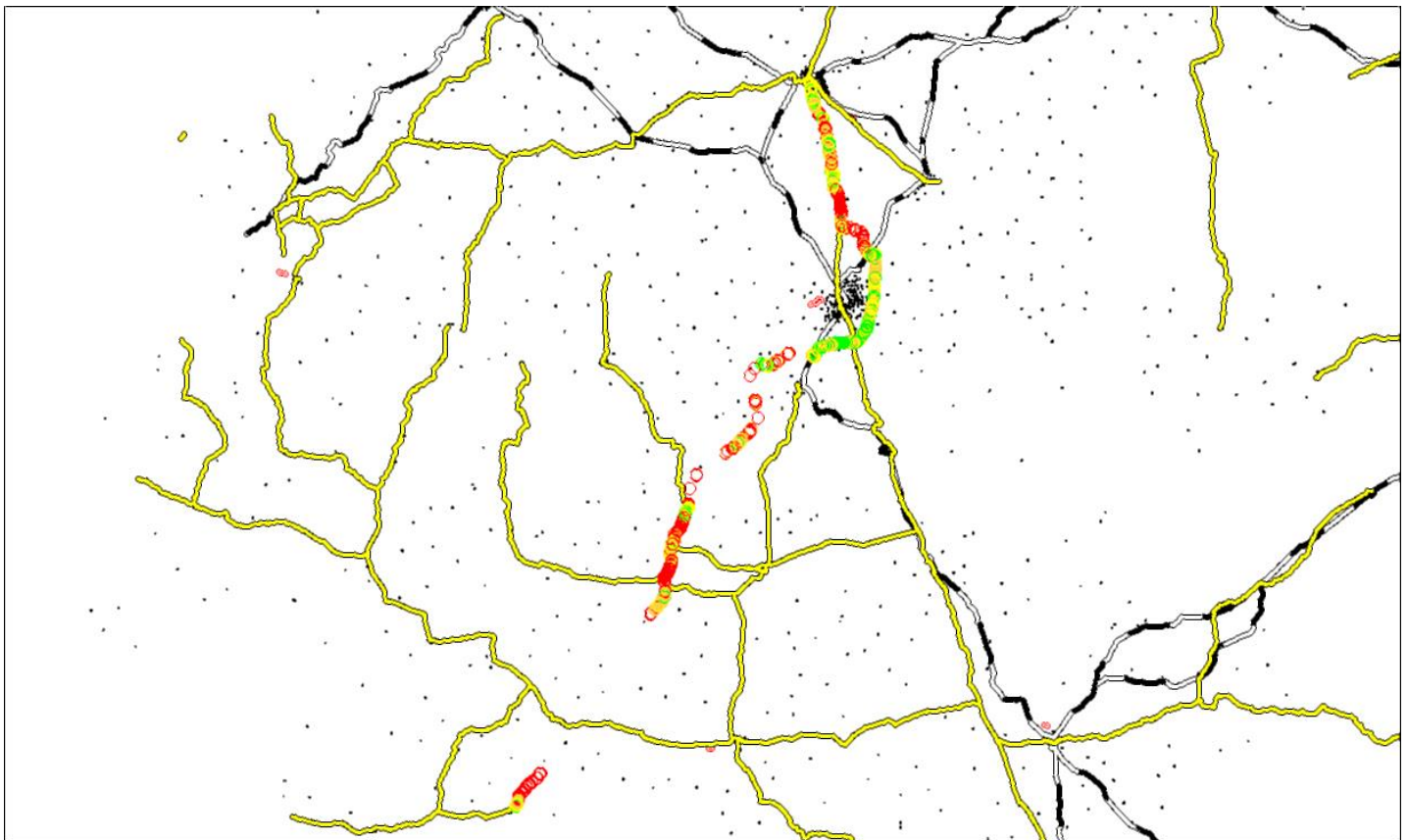


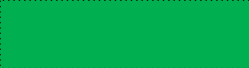



2G			
Overall RxLevel	# Samples	% PDF	Legends
[Max, >=-75]	5203	49.37%	
[-75, >=-85)	3176	30.14%	
[-85, >=-95)	1815	17.22%	
[-95, >=Min)	345	3.27%	
Total	10539	100%	

Coverage Details

TSP-BSNL

Technology	Coverage %
3G	80 %

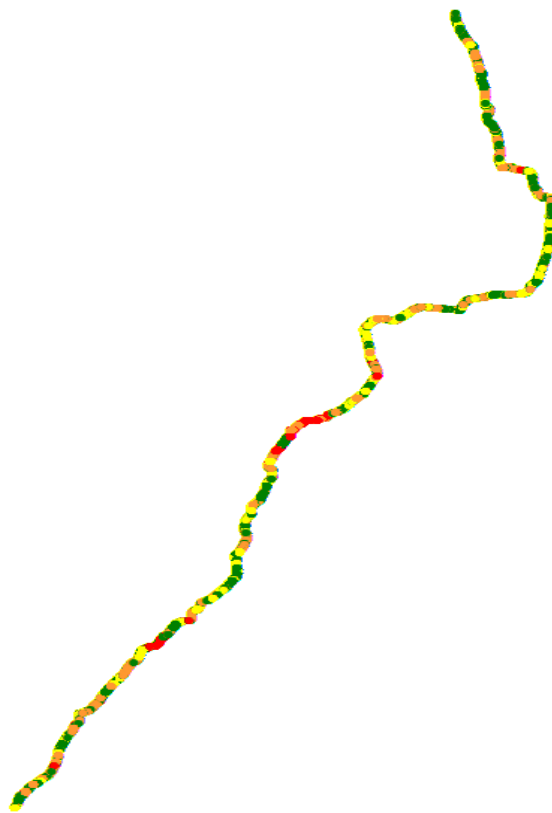


3G			
Overall RSCP	# Samples	% PDF	Legends
[Max, >=-70]	92208	17.77%	
[-70, >=-80)	107891	20.80%	
[-80, >=-90)	129279	24.92%	
[-90, >=Min)	189441	36.51%	
Total	518819	100.00%	

Coverage Details

TSP- Airtel

Technology	Coverage %
VoLTE	96.01

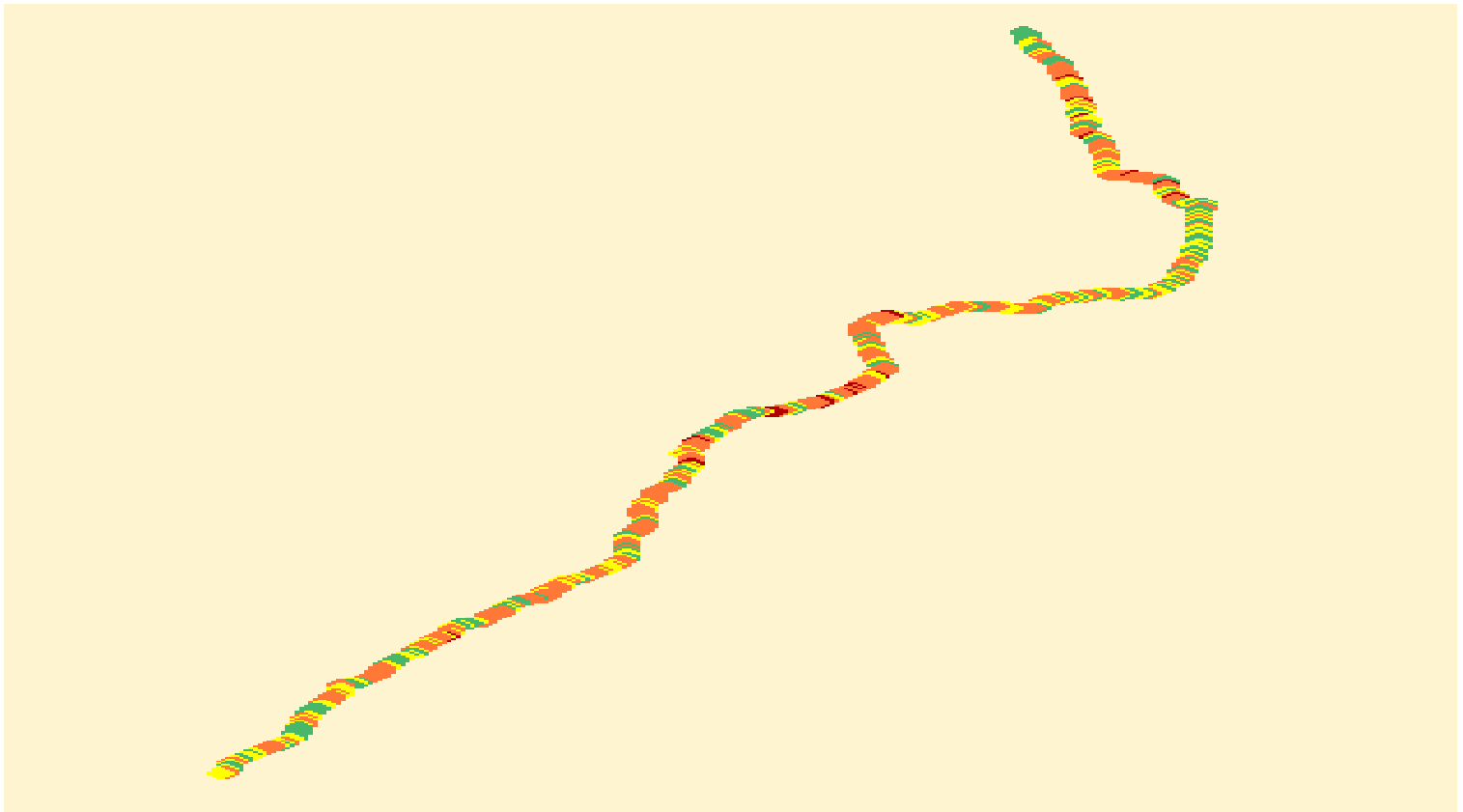


VoLTE			
Overall RSRP	# Samples	% PDF	Legends
[Max, >=-80]	1903250	46.02	
[-80, >=-90)	901935	21.81	
[-90, >=-110)	1165324	28.18	
[-110, >=Min)	164933	3.99	
Total	4135442	100	

Coverage Details

TSP- JIO

Technology	Coverage %
VoLTE	96.4%

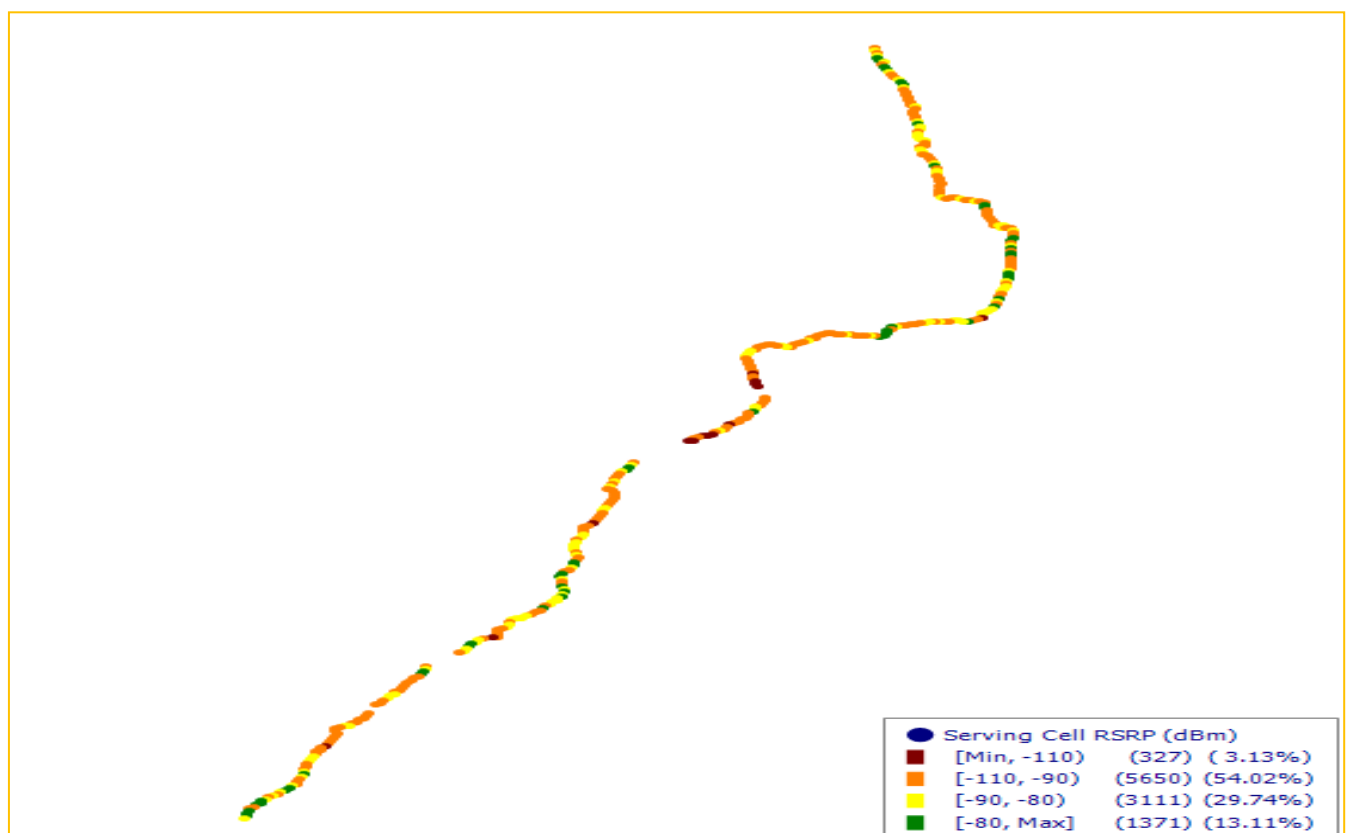


VoLTE			
Overall RSRP	# Samples	% PDF	Legends
[Max, >=-80]	5003	23.54	
[-80, >=-90)	5370	25.27	
[-90, >=-110)	10115	47.59	
[-110, >=Min)	766	3.6	
Total	21254	100%	

Coverage Details

TSP- VIL

Technology	Coverage %
VoLTE	96.87

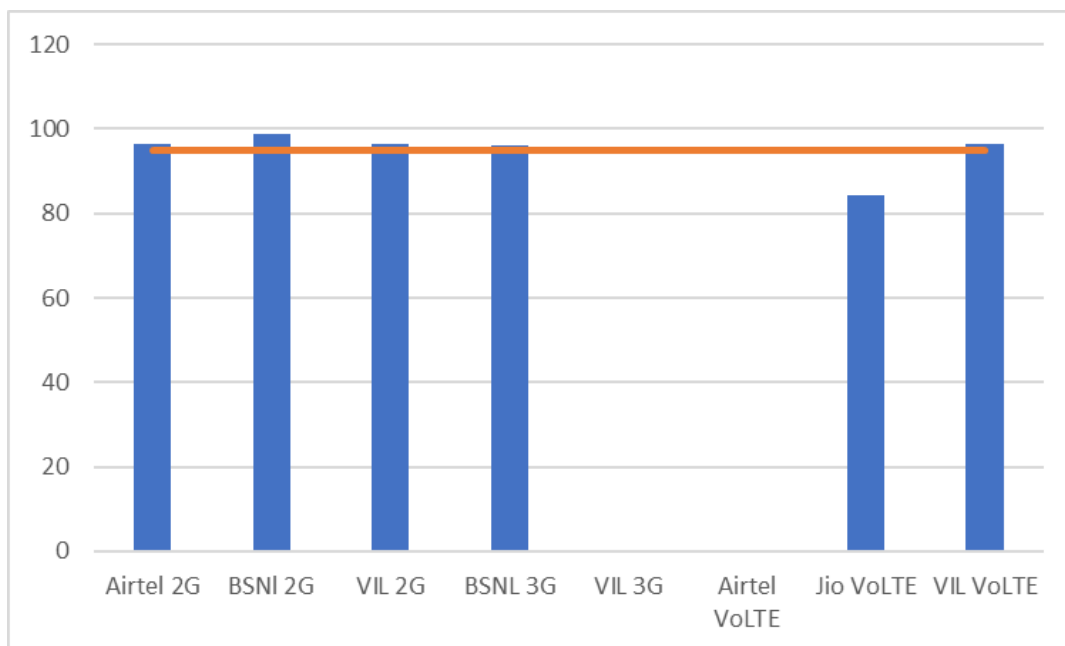


VoLTE			
Overall RSRP	# Samples	% PDF	Legends
[Max, >=-80]	1371	13.11%	
[-80, >=-90)	3111	29.74%	
[-90, >=-110)	5650	54.02%	
[-110, >=Min)	327	3.13%	
Total	10459	100%	

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	96.26
BSNI 2G	98.79
VIL 2G	96.54
BSNL 3G	96.12
VIL 3G	NA
Airtel VoLTE	76.55
Jio VoLTE	84.4
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	96.26



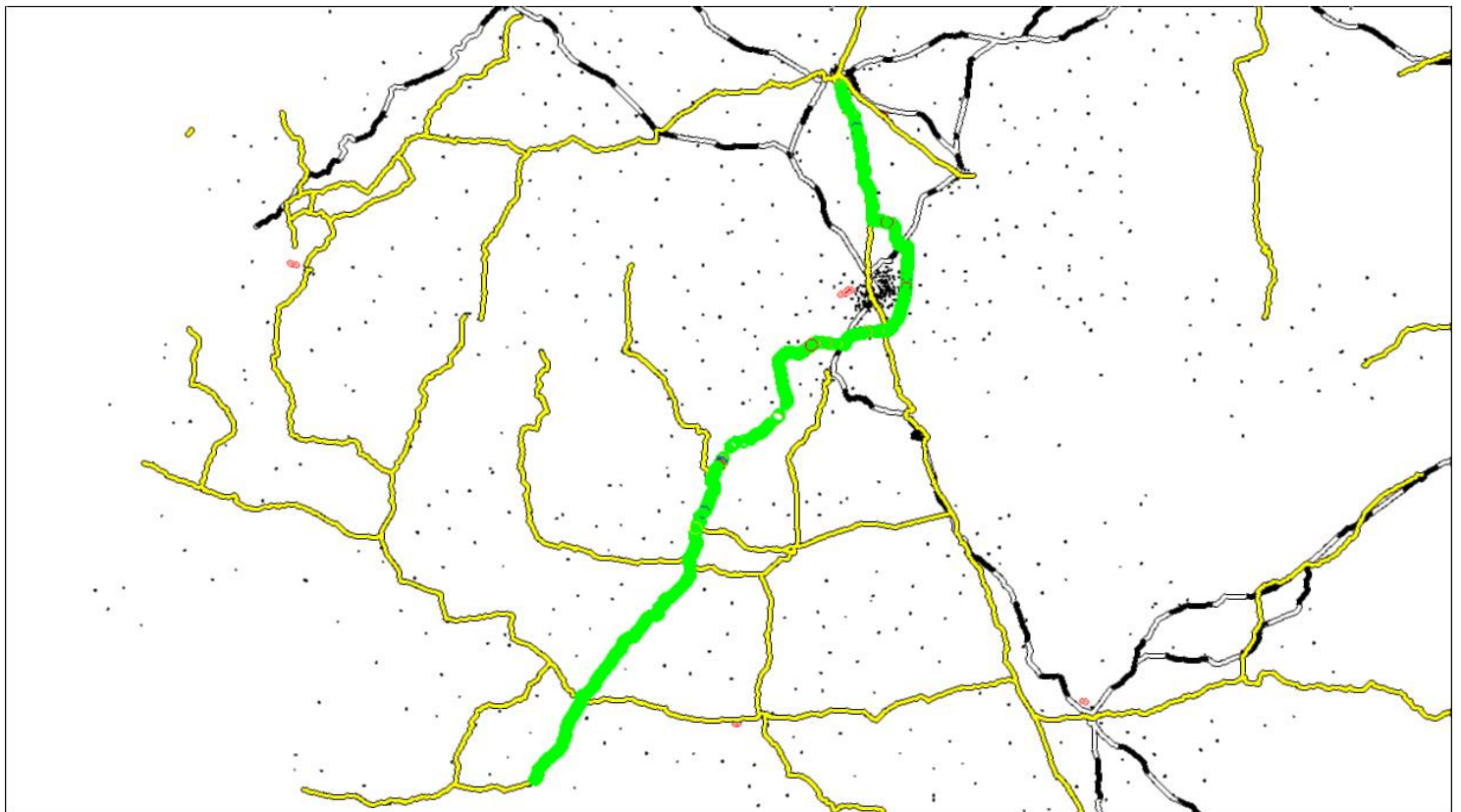
Overall Rx Quality	# Samples	% PDF	Legends
(Min, ≤ 2)	1650105	80.34	
(2, ≤ 3)	97422	4.74	
(3, ≤ 4)	91453	4.45	
(4, ≤ 5)	138214	6.73	
(5, $\leq \text{Max}$)	76783	3.74	
Total	2053977	100	

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	98.79 %



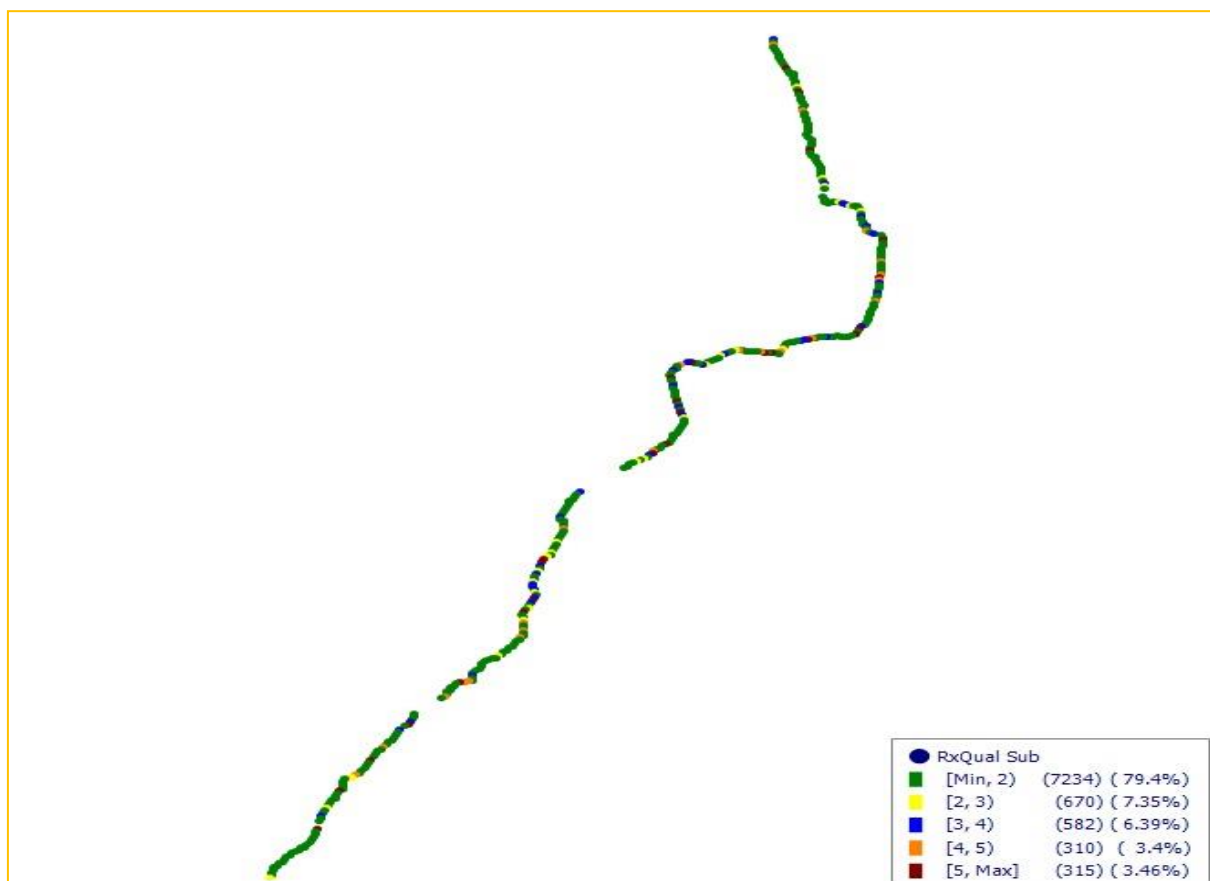
Overall Rx Quality	# Samples	% PDF	Legends
(Min, ≤ 2)	2787118	97.26%	
(2, ≤ 3)	15024	0.52%	
(3, ≤ 4)	14844	0.52%	
(4, ≤ 5)	13829	0.48%	
(5, $\leq \text{Max}$)	34764	1.21%	
Total	2865579	100.00%	

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-VIL

Technology	Rx Quality %
2G	96.54%



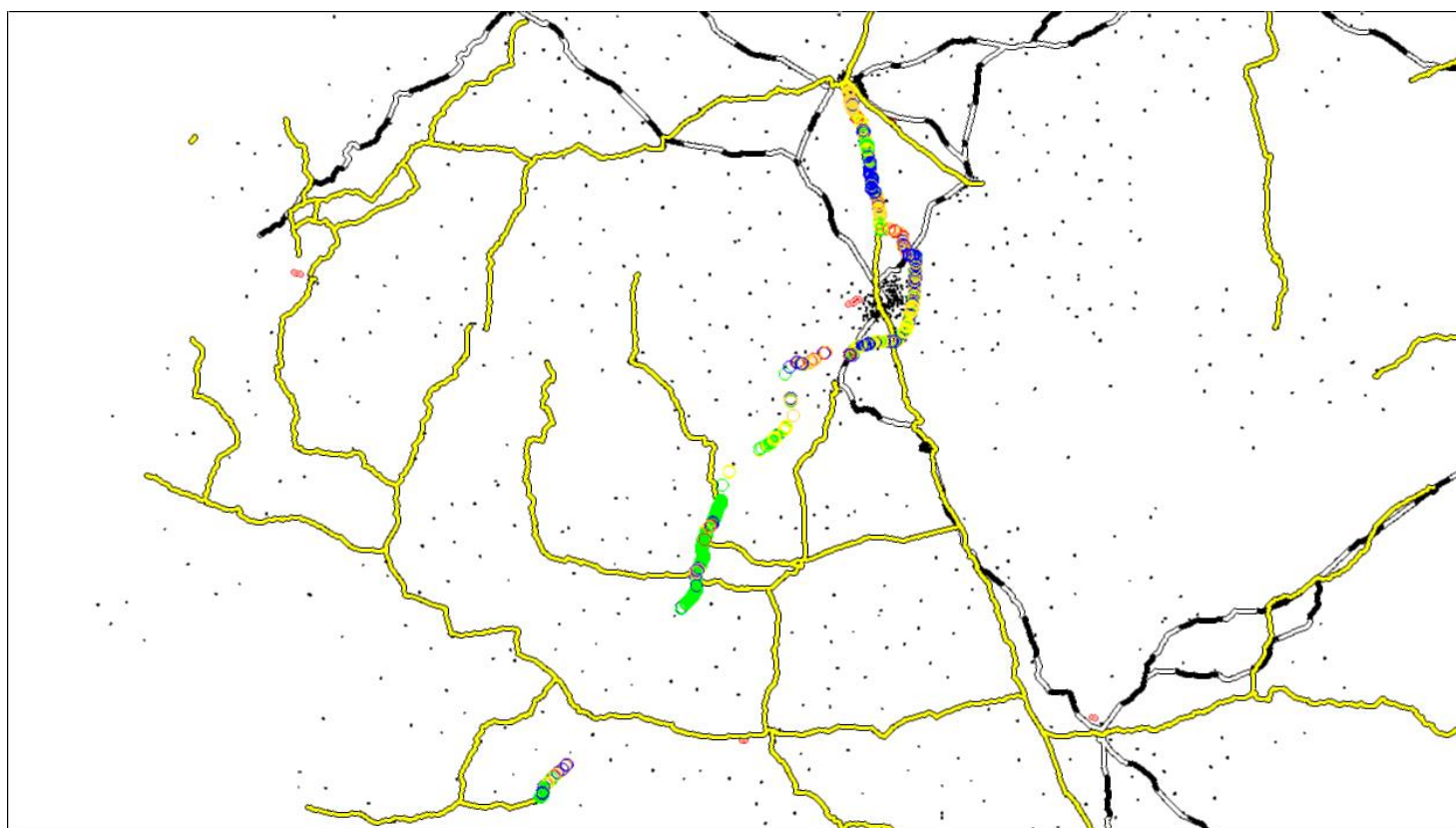
Overall Rx Quality	# Samples	% PDF	Legends
(Min, ≤ 2)	7234	79.4%	
(2, ≤ 3)	670	7.35%	
(3, ≤ 4)	582	6.39%	
(4, ≤ 5)	310	3.4%	
(5, $\leq \text{Max}$)	315	3.46%	
Total	9111	100%	

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	96.12 %



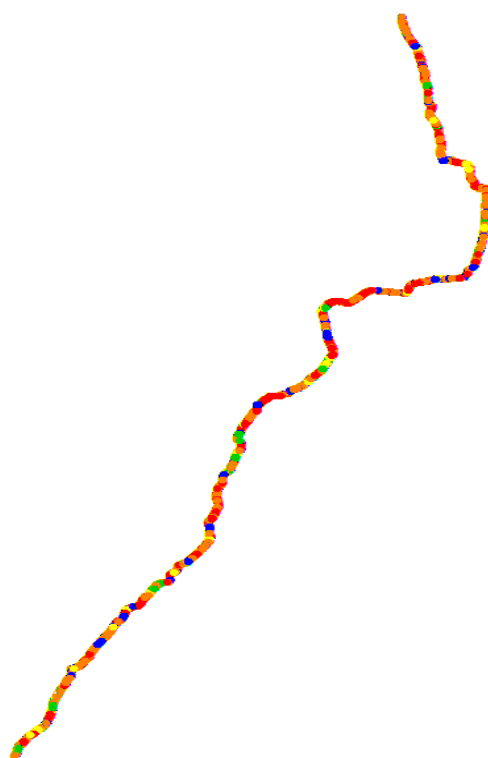
Overall Ec/No	# Samples	% PDF	Legends
(Max, ≤ -6)	164829	32.73%	Green
(-6, ≤ -9)	128672	25.55%	Yellow
(-9, ≤ -11)	112868	22.41%	Blue
(-11, ≤ -14)	77728	15.43%	Orange
(-14, \leq Min)	19517	3.88%	Red
Total	503614	100.00%	

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	76.55



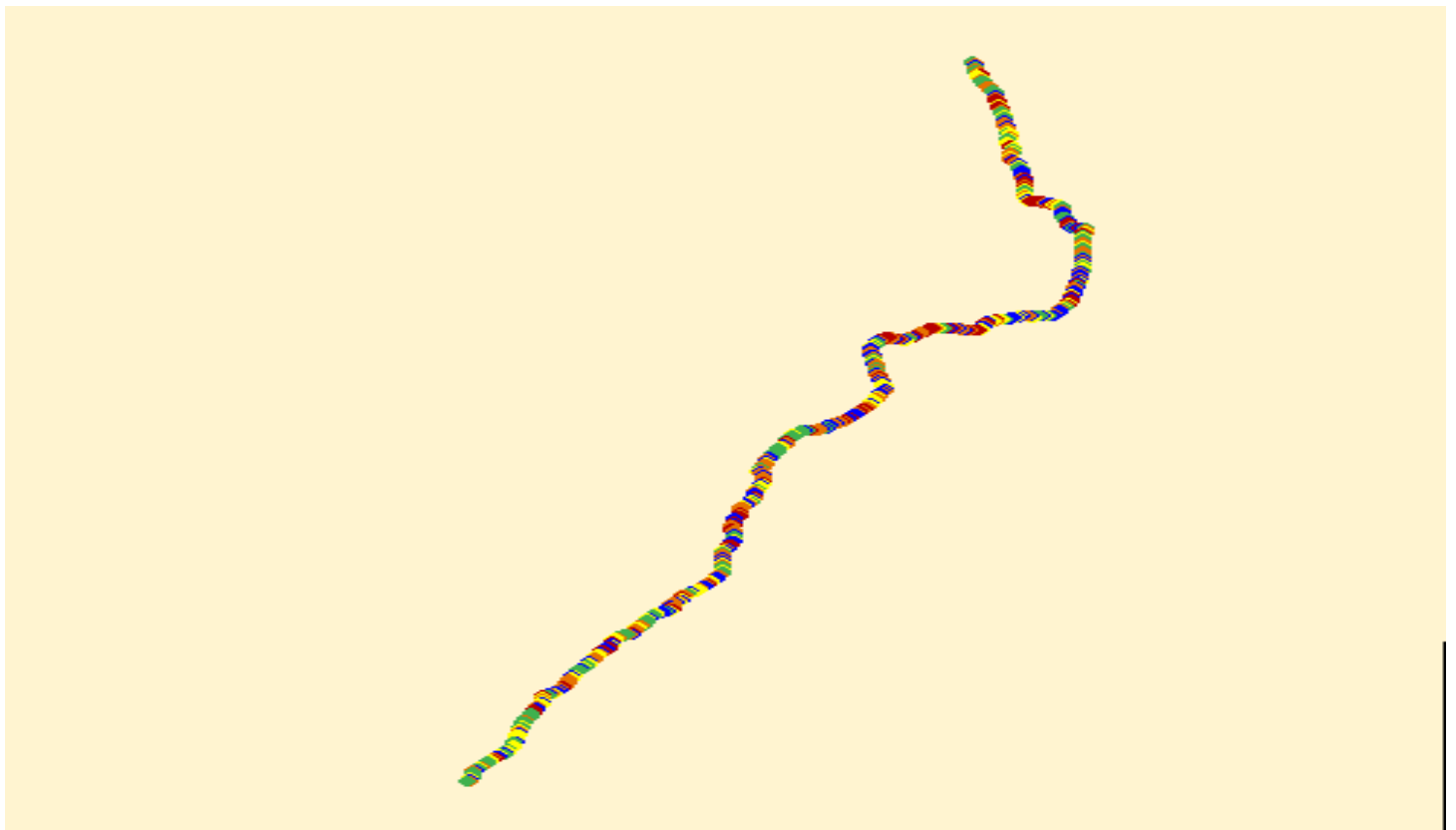
Overall SINR	# Samples	% PDF	Legends
(Min, ≤ 0)	359209	8.70	
(0, ≤ 5)	300593	7.28	
(5, ≤ 10)	523434	12.68	
(10, ≤ 15)	1976179	47.88	
(15, $\leq \text{Max}$)	967824	23.45	
Total	4127239	100	

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	84.04%



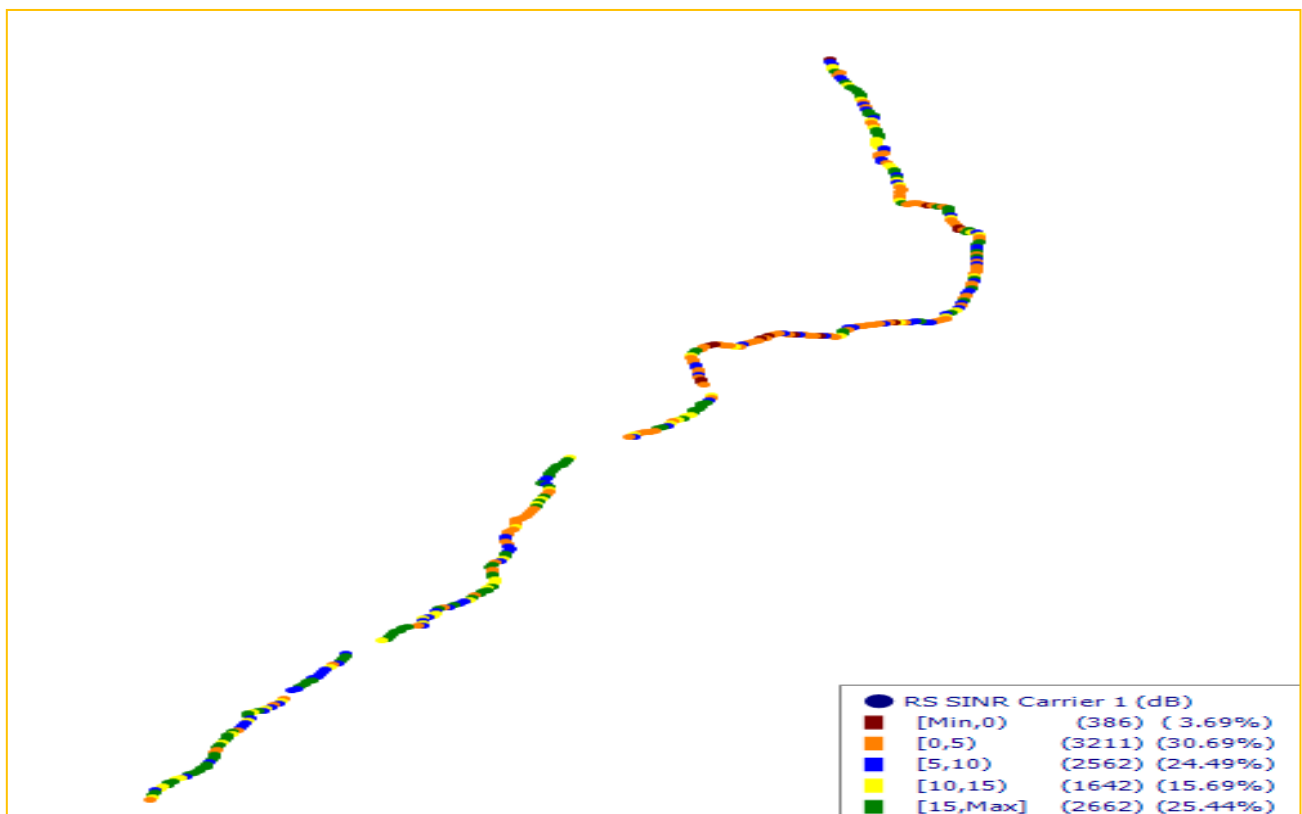
Overall SINR	# Samples	% PDF	Legends
(Min, ≤ 0)	3392	15.96%	
(0, ≤ 5)	4742	22.31%	
(5, ≤ 10)	4745	22.33%	
(10, ≤ 15)	3640	17.13%	
(15, $\leq \text{Max}$)	4735	22.28%	
Total	21254	100%	

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 $\geq 95\%$.

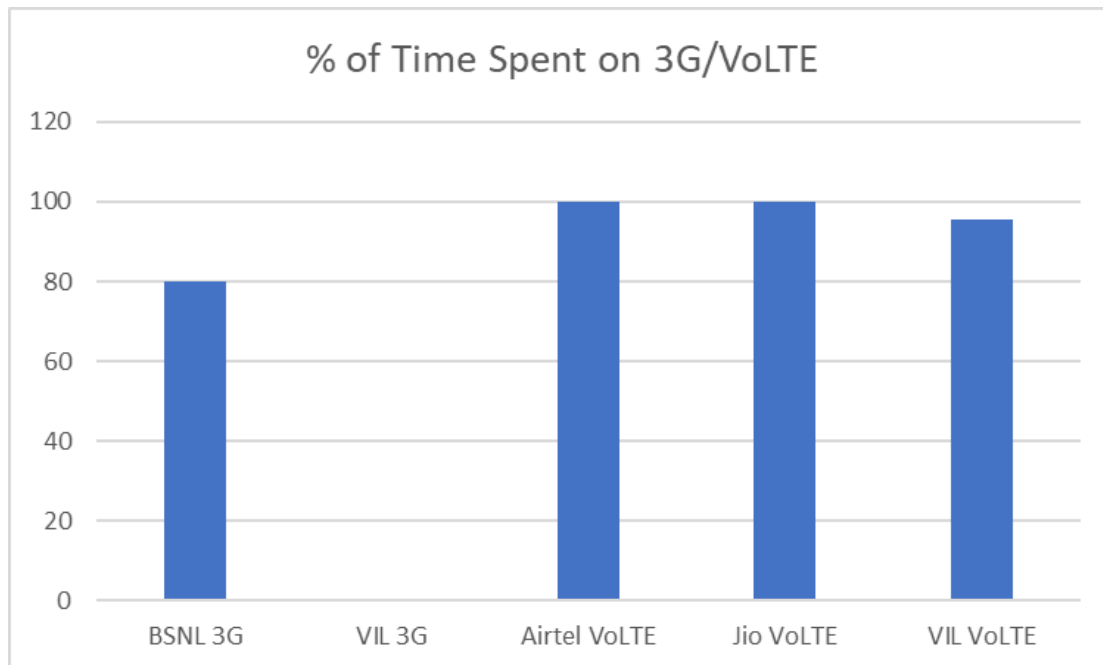
TSP- VIL

Technology	Rx Quality %
VoLTE	96.31%



Overall SINR	# Samples	% PDF	Legends
(Min, ≤ 0)	386	3.69%	
(0, ≤ 5)	3211	30.69%	
(5, ≤ 10)	2562	24.49%	
(10, ≤ 15)	1642	15.69%	
(15, $\leq \text{Max}$)	2662	25.44%	
Total	10463	100%	

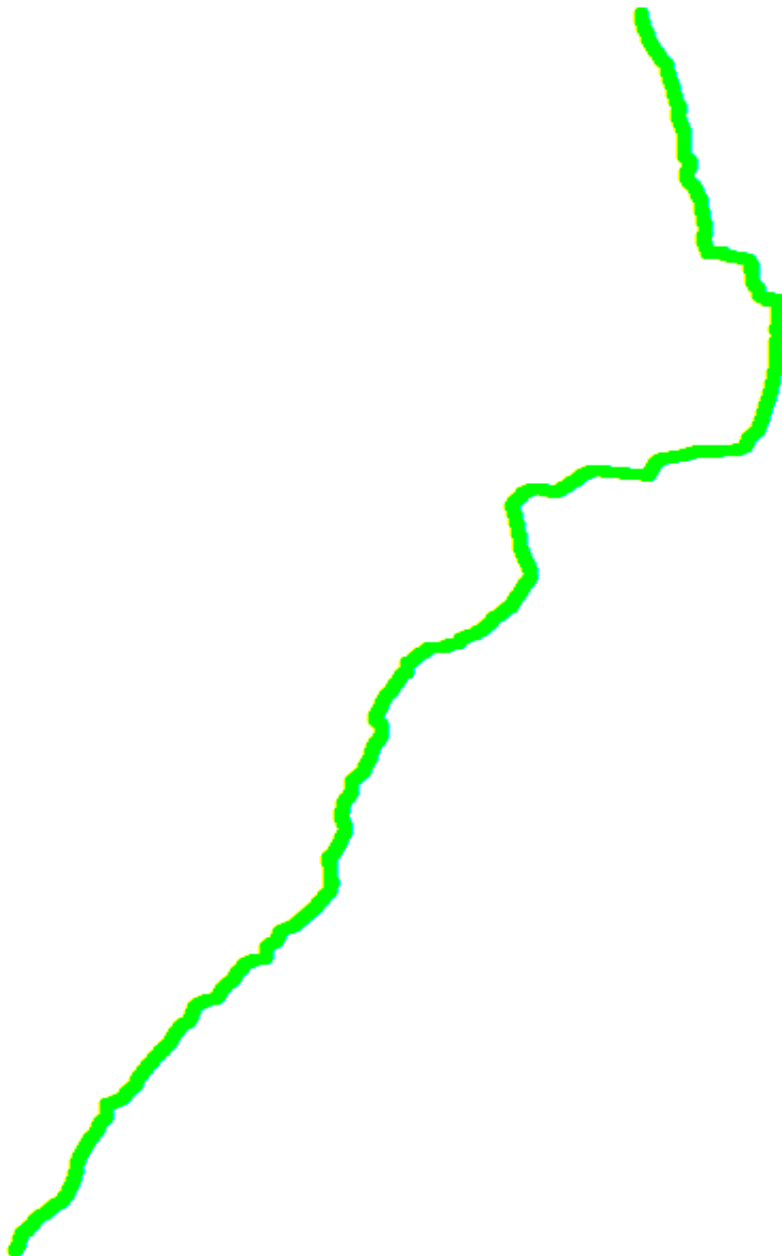
TSP	% of Time Spent on 3G/VoLTE
BSNL 3G	80
VIL 3G	NA
Airtel VoLTE	100
Jio VoLTE	100
VIL VoLTE	95.51



Technology Details

TSP-Airtel

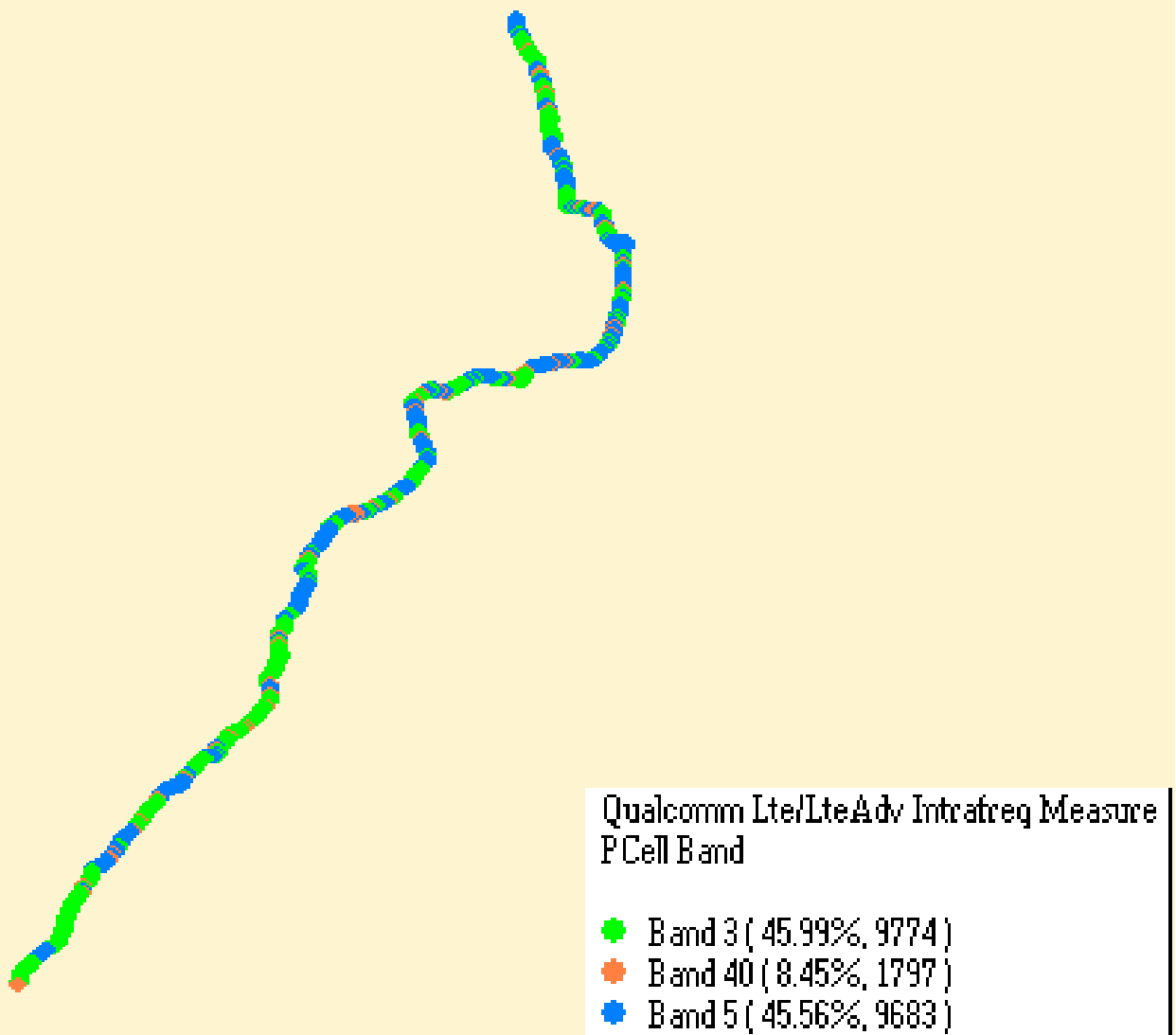
Technology	% of Time Spent on
3G	
VoLTE	100



Technology Details

TSP- Jio

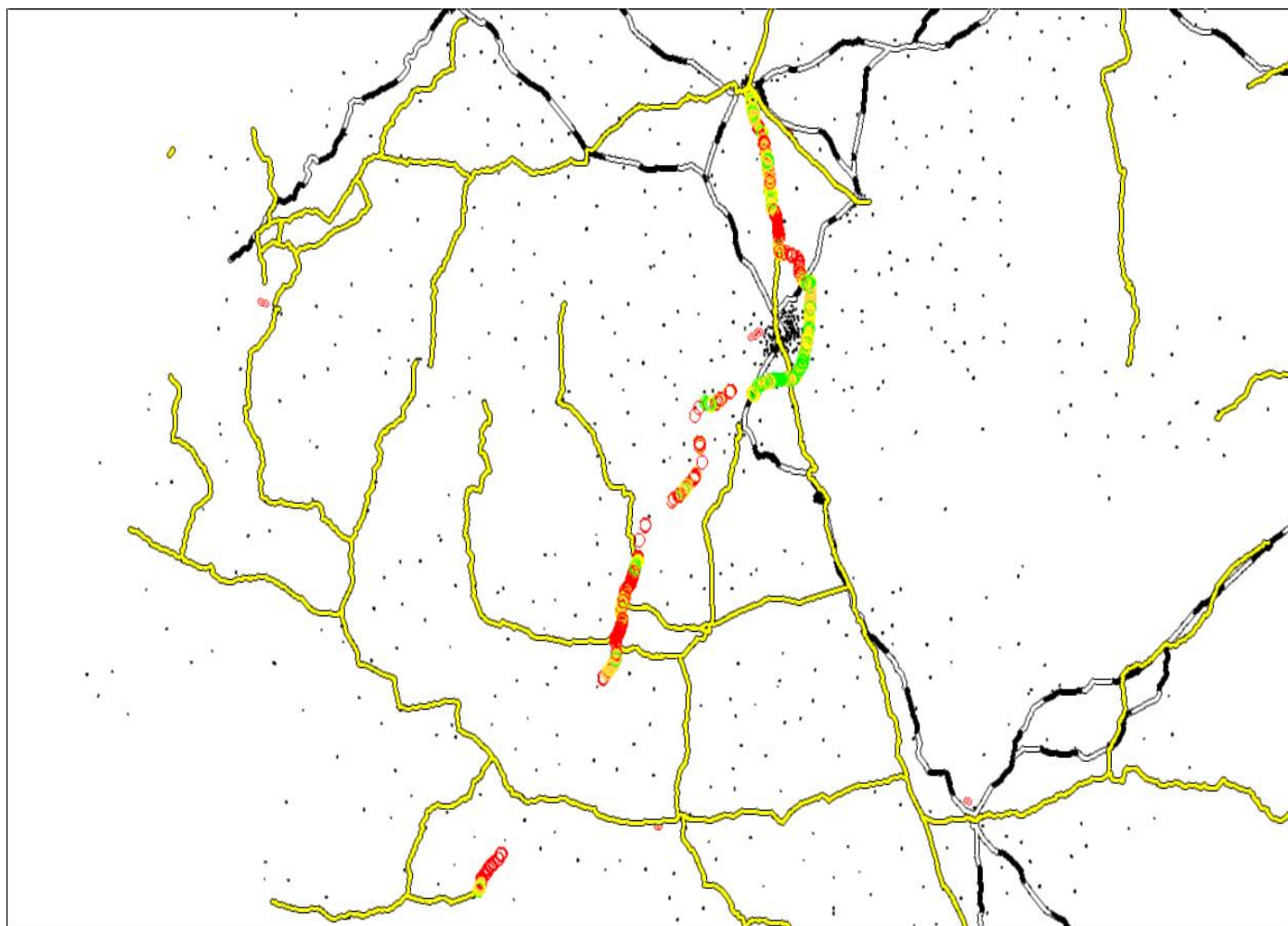
Technology	% of Time Spent on
3G	
VoLTE	100%



Technology Details

TSP-BSNL

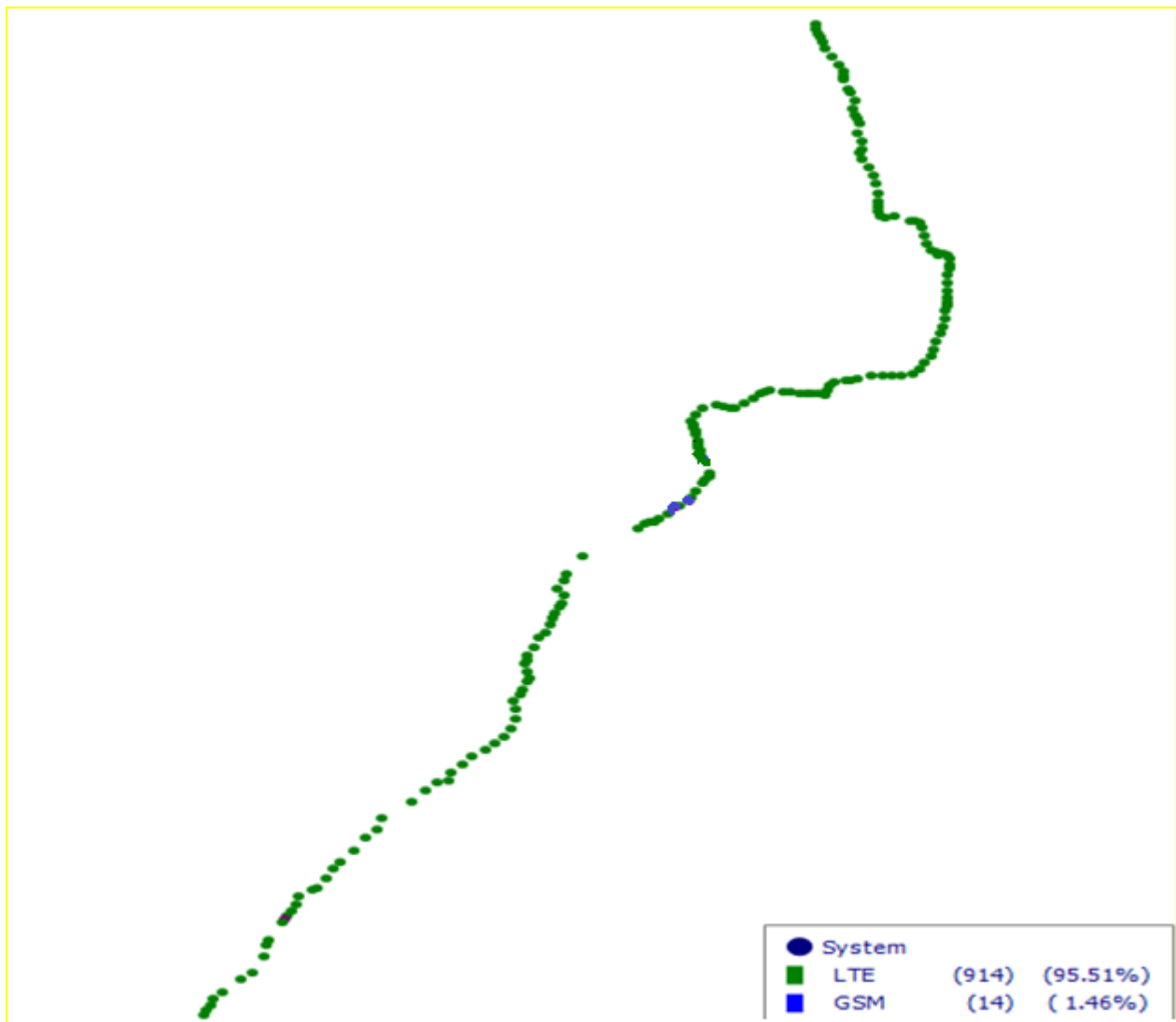
Technology	% of Time Spent on
3G	80.0 %
VoLTE	



Technology Details

TSP- VIL

Technology	% of Time Spent on
3G	NA
VoLTE	95.51%

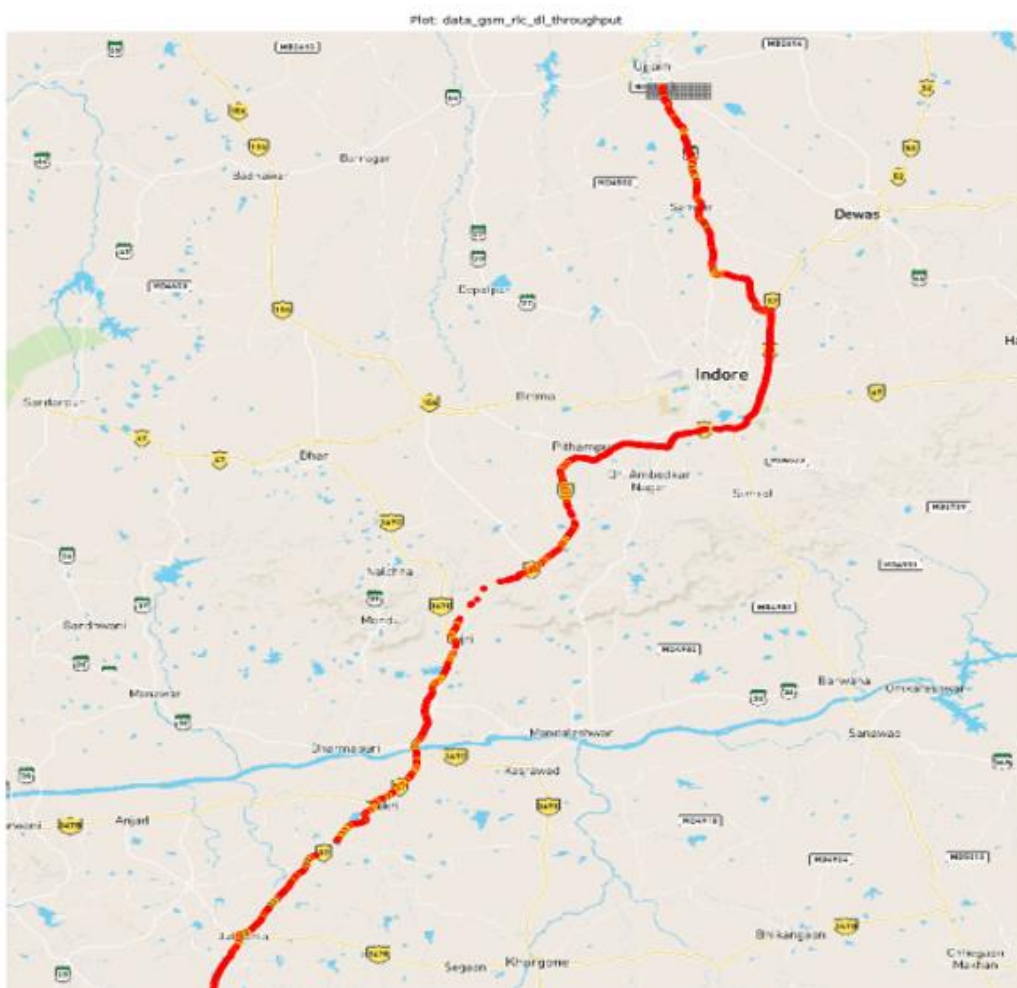


Dynamic Data Test

TSP-Airtel

Data Statistics - Dynamic data testing

Data KPIs - Overall	2G
Download Throughput (Kbps)	128.03

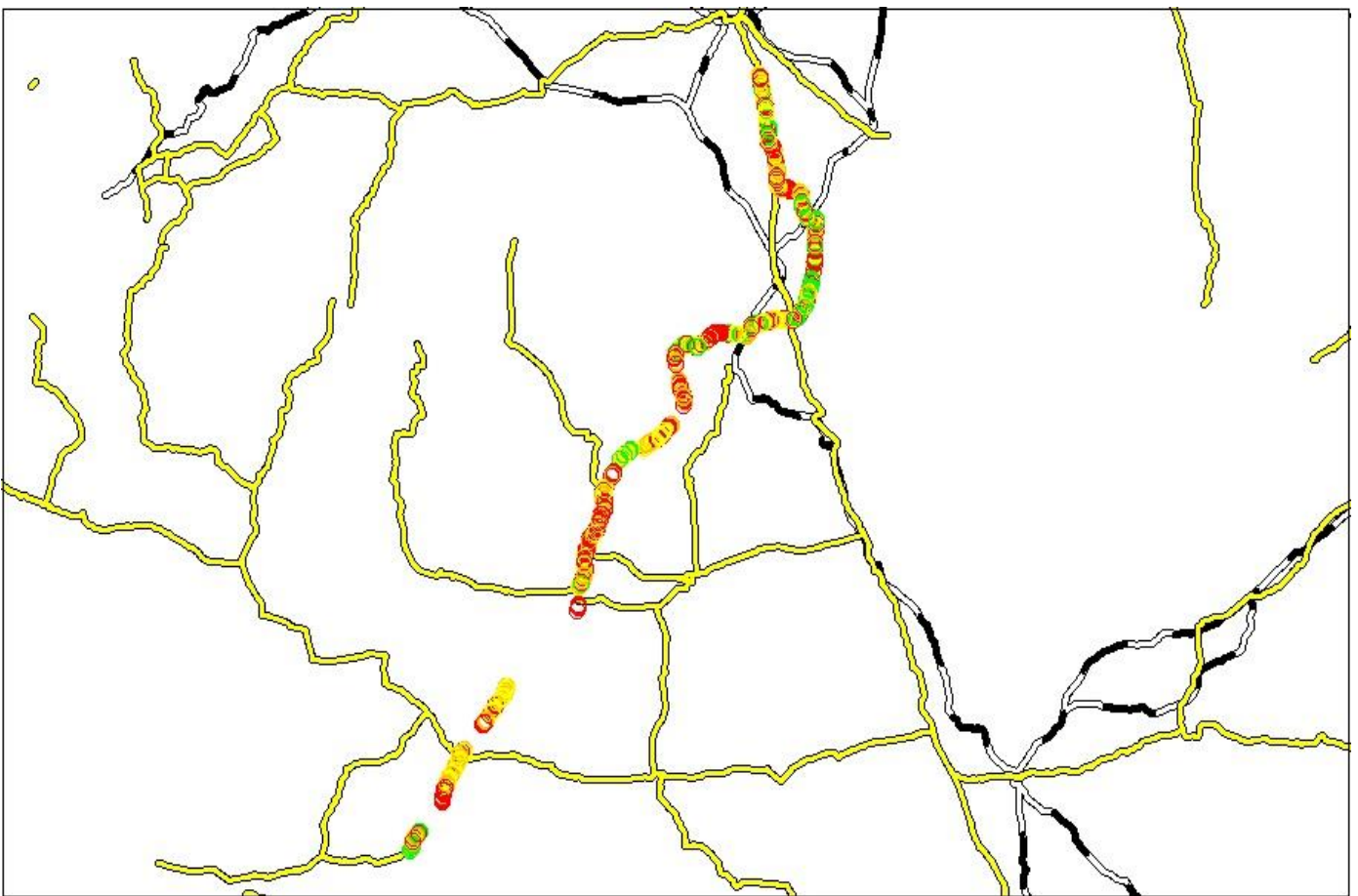


DL throughput	No of Sample	%	Legends
< 100 Kbps	12773	73.44	
100-150Kbps	1927	11.08	
150-200Kbps	2095	12.05	
>200Kbps	597	3.43	

TSP-BSNL

Data Statistics - Dynamic data testing

Data KPIs - Overall	2G
Download Throughput (Kbps)	174

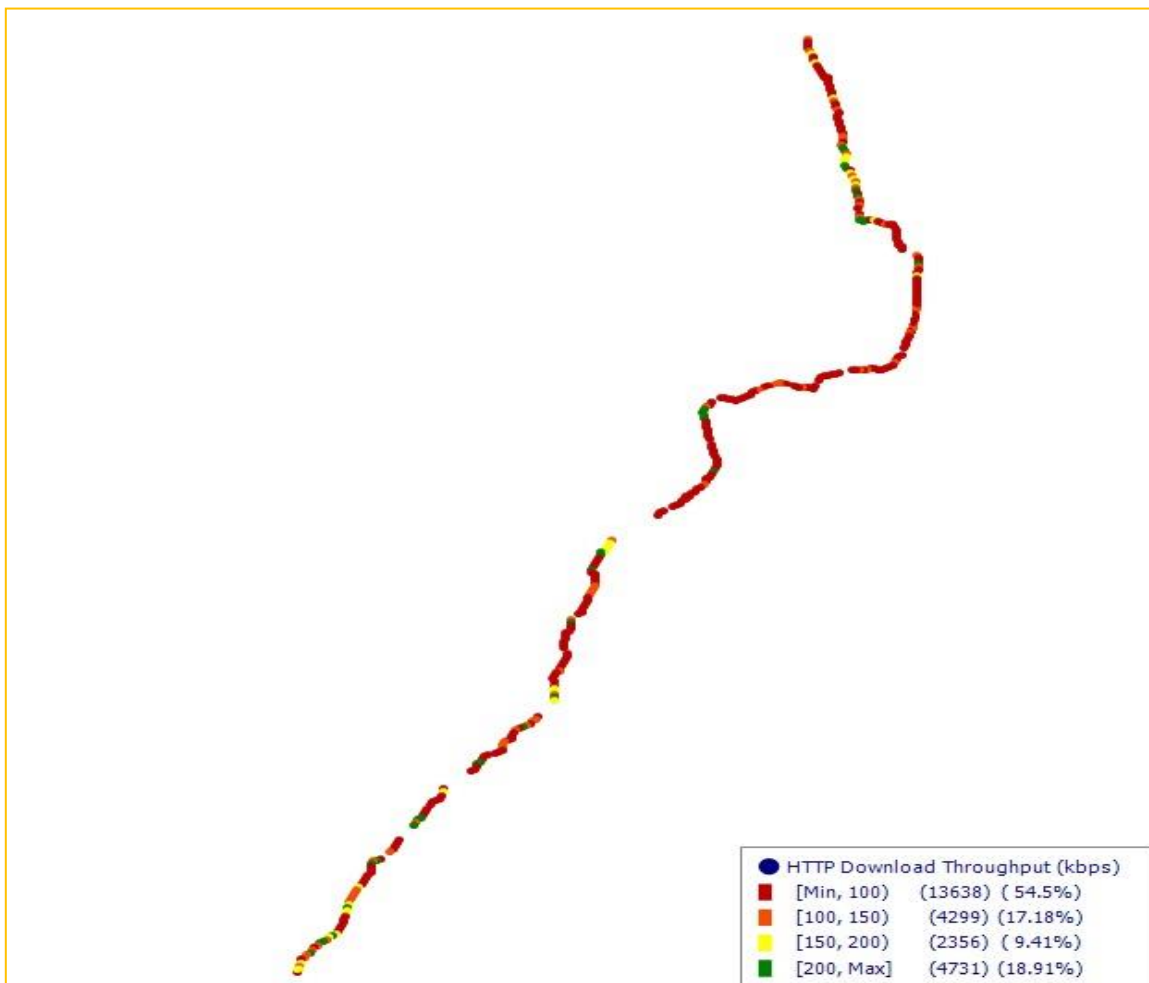


DL throughput	No of Sample	%	Legends
< 100 Kbps	765339	20.98%	
100-150Kbps	843470	23.12%	
150-200Kbps	1171298	32.11%	
>200Kbps	867595	23.78%	

TSP- VIL

Data Statistics - Dynamic data testing - ...247..... Kms

Data KPIs - Overall	2G
Download Throughput (Kbps)	104.46

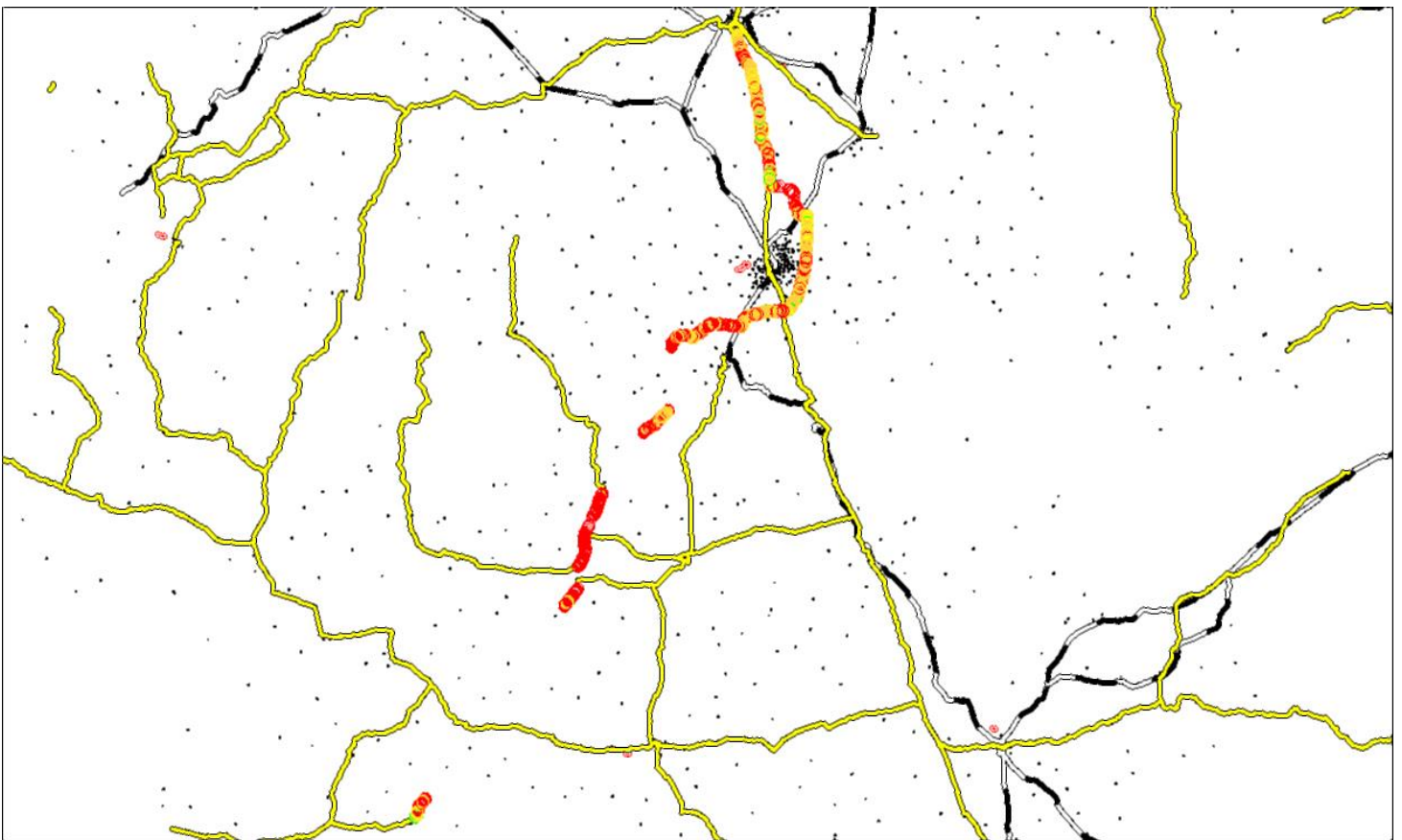


DL throughput	No of Sample	%	Legends
< 100 Kbps	13638	54.5%	
100-150Kbps	4299	17.18%	
150-200Kbps	2356	9.41%	
>200Kbps	4731	18.91%	

TSP-BSNL

Data Statistics - Dynamic data testing

Data KPIs - Overall	3G
Download Throughput (Mbps)	2.96 Mbps



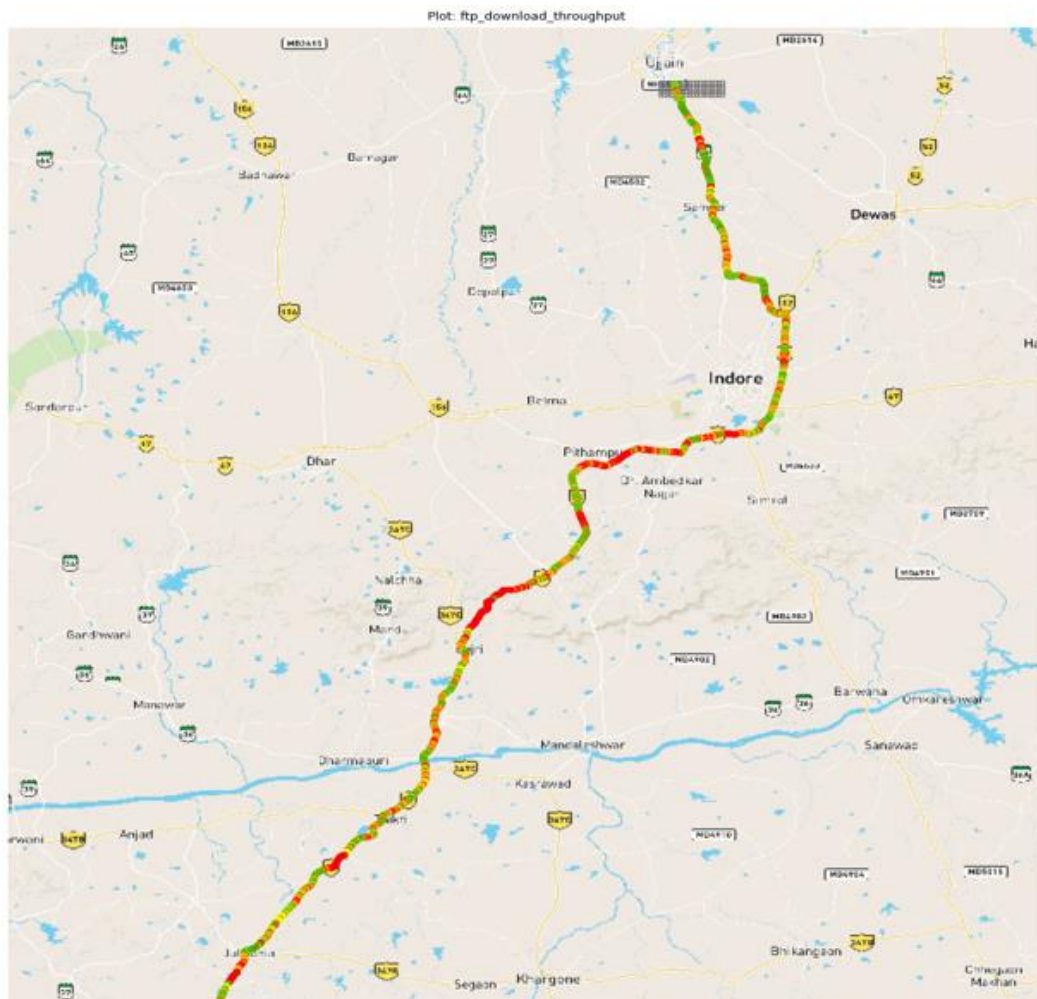
DL throughput	No of Sample	%	Legends
< 1 Mbps	373297	28.25%	
1-5 Mbps	777990	58.87%	
5-10 Mbps	117622	8.90%	
>10Mbps	52524	3.97%	

Dynamic Data Test

TSP- Airtel

Data Statistics - Dynamic data testing

Data KPIs - Overall	LTE
Download Throughput (Mbps)	11.45

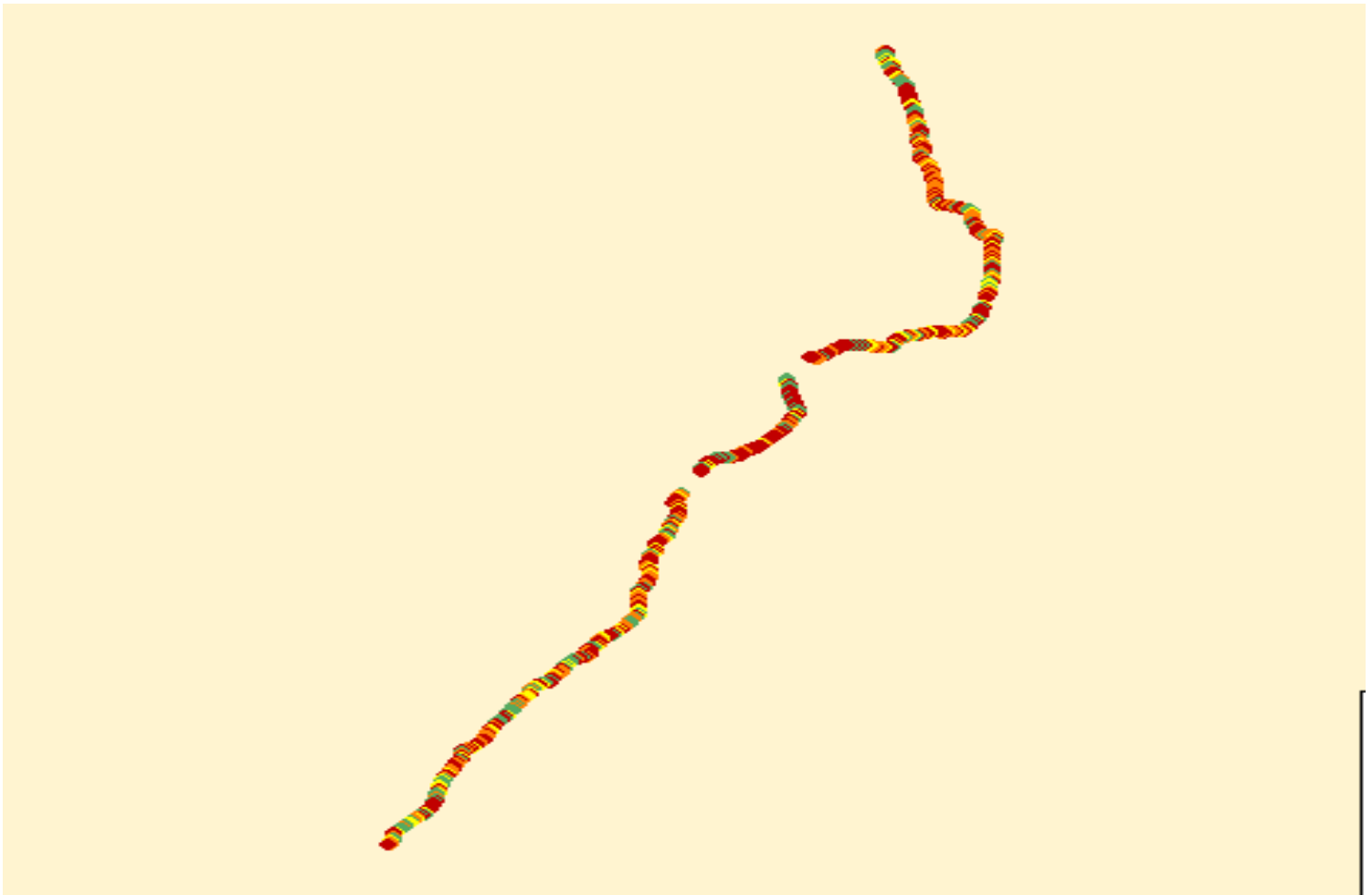


DL throughput	No of Sample	%	Legends
< 2Mbps	6014	30.44	
2-5 Mbps	5045	25.54	
5-10 Mbps	5045	20.17	
>10Mbps	4713	23.86	

TSP- Jio

Data Statistics - Dynamic data testing

Data KPIs - Overall	LTE
Download Throughput (Mbps)	7.84

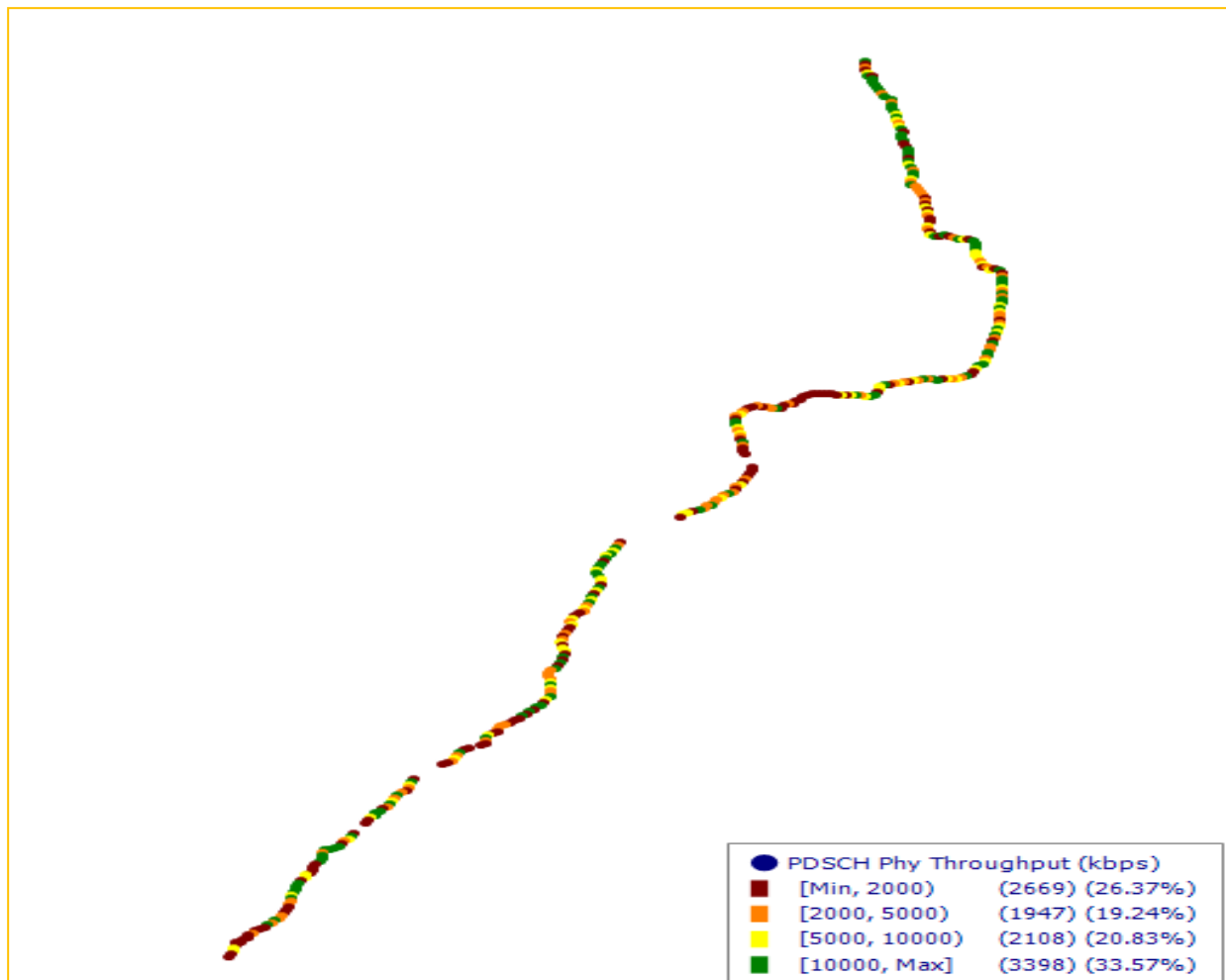


DL throughput	No of Sample	%	Legends
< 2Mbps	6987	37.10%	
2-5 Mbps	5243	27.84%	
5-10 Mbps	2630	13.97%	
>10Mbps	3972	21.09%	

TSP- VIL

Data Statistics - Dynamic data testing - ...247..... Kms

Data KPIs - Overall	LTE
Download Throughput (Mbps)	9.90



DL throughput	No of Sample	%	Legends
< 2Mbps	2669	26.37%	
2-5 Mbps	1947	19.24%	
5-10 Mbps	2108	20.83%	
>10Mbps	3398	33.57%	