

Operator Assisted Drive Test Report

KRISHNA SSA

JUNE 2024

(RO, HYDERABAD)

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%. All TSPs have met the Rx Quality of 95% except Airtel & VIL VoLTE.

The Operator Assisted Drive Test (OADT) has been carried out by TRAI RO Hyderabad with the help of Service Providers in Krishna and surrounding areas Vijayawada, Machilipatnam, Gudivada, Mylavaram, Tiruvuru, Nuzivedu, Jaggaiahpeta from 9:00 AM to 8:00 PM during 18th to 21st June 2024. The drive test covered drive route of 520 KMs & 6 hotspot over a period of 4 days. Approximately 746 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

TRAI Hyderabad conducted Operator Assisted Drive Test from 18th to 21st June 2024 covering various locations in Krishna surrounding regions Vijayawada, Machilipatnam, Jaggaiahpetta. The performance of Airtel, BSNL, Jio and Vodafone Idea Limited were 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 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 520 KMs over a period of 4 days from 22nd to 25th Jan'2024. Approximately 746 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:

1. Dynamic data test was conducted for 520 kms over a period of 3 days for download throughput for 3G & 4G technologies.

Data Tests were performed at 6 static locations for 2G, 3G & 4G technologies of five iterations at each location.

2. For Voice and Data KPI's, 2G measurement is done with UE locked mode, 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 www.myntra.com
Video Streaming	130 Sec Clip
Latency	32 Bytes on www.google.com

Overview

Voice & Dynamic Data Test Drive Route



Day-1 Areas Covered -Vijayawada to Machilipatnam

Poranki	Vuyyuru By pass
Vuyyuru By pass	Pamarru By pass
Pamarru By pass	Machilipatnam
Machilipatnam Town	Koneru Centre
Machilipatnam Town	Pedana
Pedana	Gudlavalleru
Gudlavalleru	Gudiwada
Gudiwada Town	Railwaystation
Gudiwada Town	Pamarru By pass

Day-2 Ibrahimpatnam-Tiruvur-Nuzividu-Agiripalli-Vijayawada

Ibrahimpatnam	Kondapalli
Kondapalli	Mylavaram
Mylavaram	Tiruvur Town
Tiruvur Town	Vissannapeta
Vissannapeta	Nuzividu Town
Nuzividu Town	Agiripalli
Agiripalli	Vijayawada

Day-3 Vijayawada City Drive

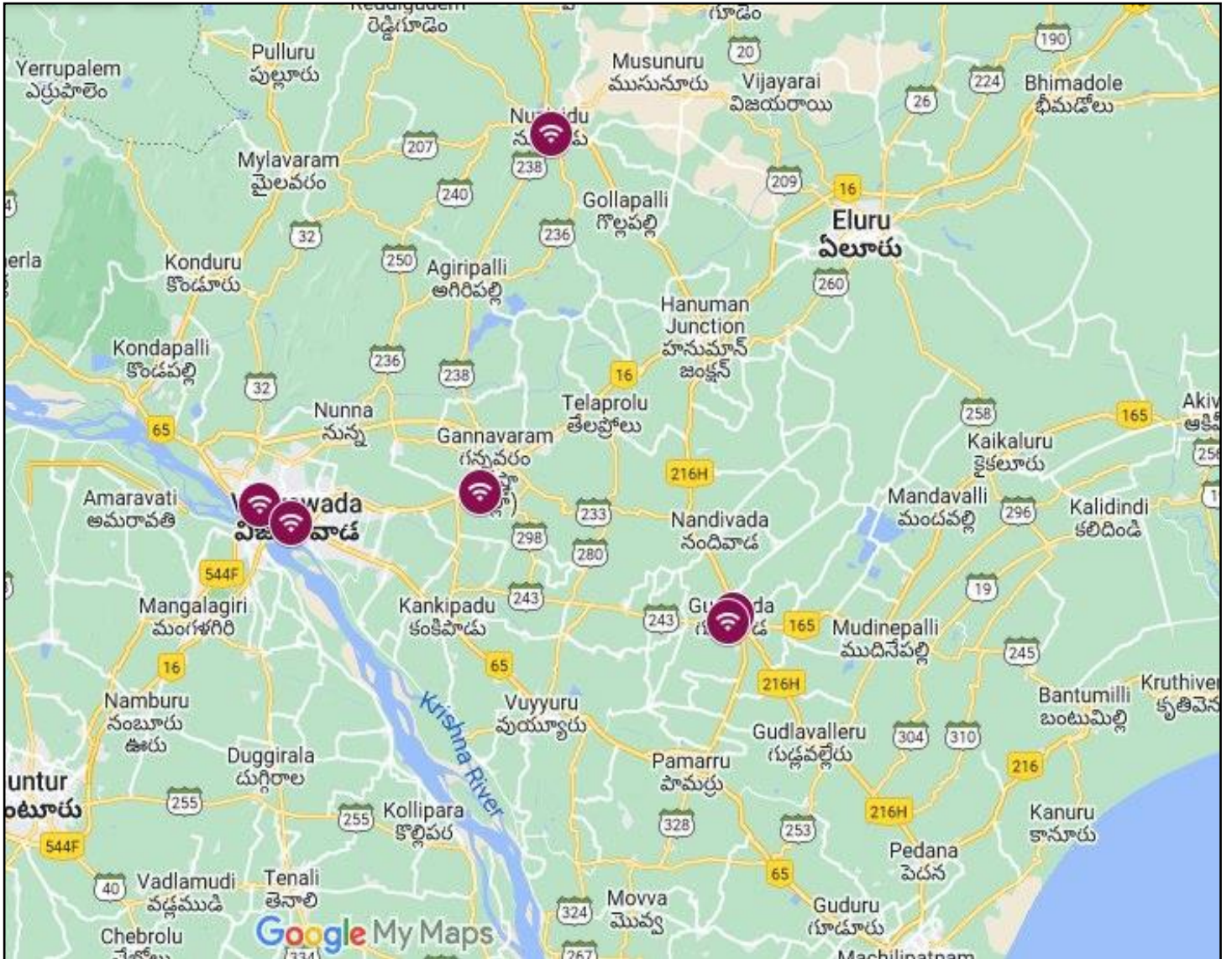
Vijayawada	Gollapudi
Nidamanuru	Poranki
Eluru road	Bundar road
Brts road	MG Road
Ibrahimpatnam	Nunna
Singh Nagar	Bhavanipuram
Autonagar	Krishnalanka

Day-4 Areas Covered - Ibrahimpatnam to Jaggayyapeta

Ibrahimpatnam	Jaggayyapeta
Jaggayyapeta	Jaggayyapeta town
Jaggayyapeta town	Nandigama town
Nandigama town	Kanchikacherla Town
Nidamanuru	Gannavaram Airport

Overview

Data Service Test- Static Locations



6 Static Locations

Machilipatnam Bus Stand

Gudivada Railway Station

Nuziveedu bus stand

Vijayawada Airport

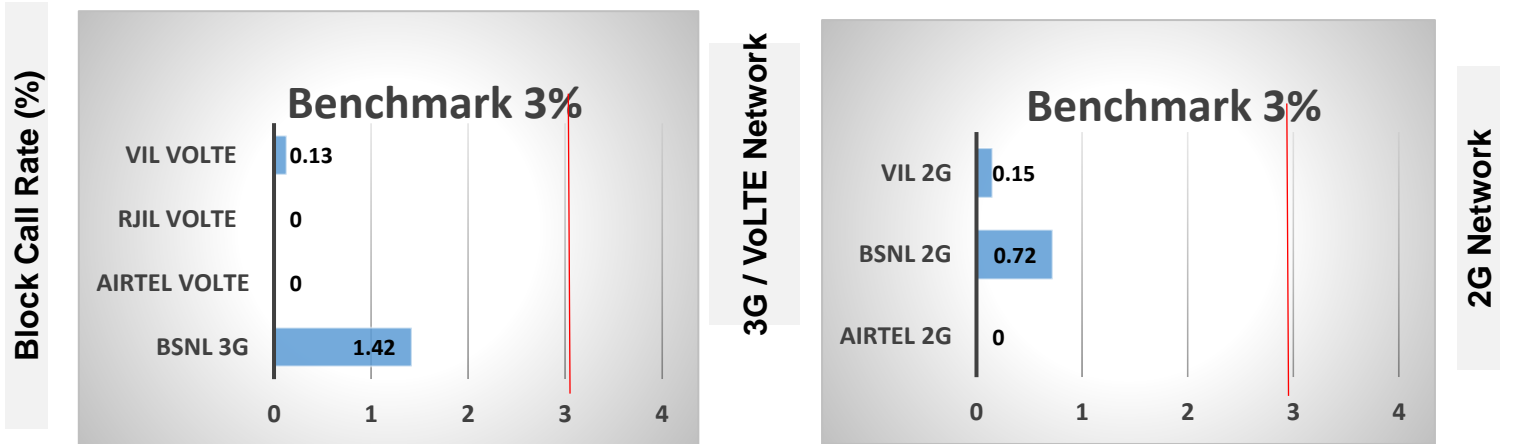
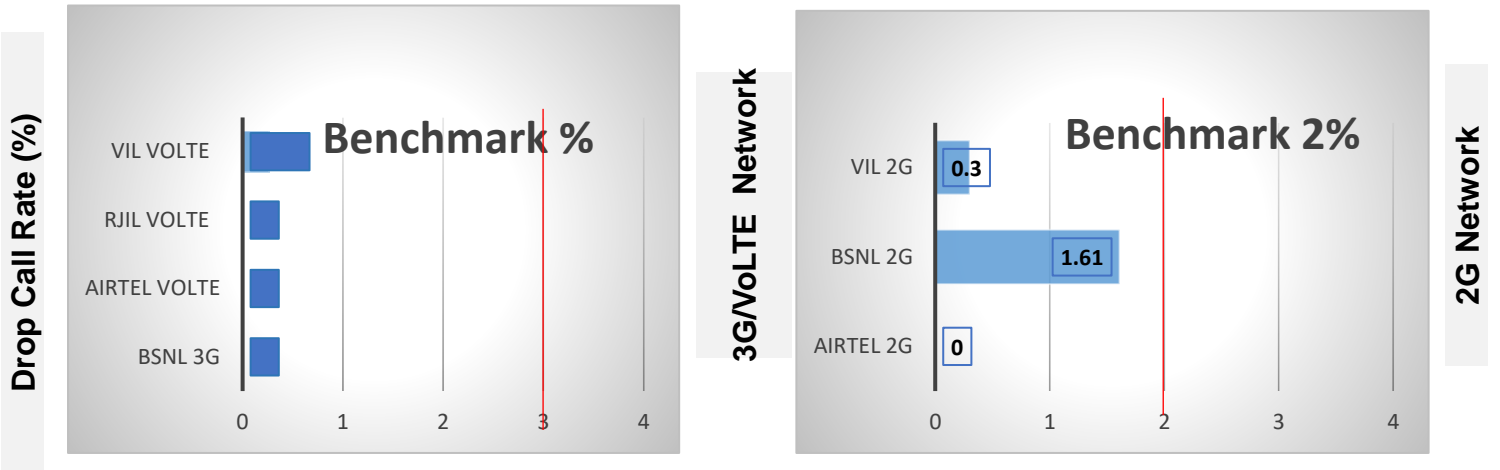
Vijayawada PVP mall

Vijayawada Railway Station

Voice Calls

Key Observations

QoS compliance of the TSPs in Krishna SSA for Voice across technologies 2G/3G/VoLTE:



KPIs	2G			3G	VoLTE`		
	Airtel	BSNL	VIL	BSNL	Airtel	JIO	VIL
Drop Call Rate %	0	1.61	0.3	0	0	0	0.27
Block Call Rate %	0	0.72	0.15	1.42	0	0	0.13

- 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 %	84.2	87.59	88.73

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

TSP	3G	VoLTE (\geq -110 dBm)			VoLTE (-110 to \geq -120 dBm)		
	BSNL	Airtel	JIO	VIL	Airtel	JIO	VIL
Coverage %	72.96	97.9	98.37		1.42	1.63	94.14

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

TSP	3G	VoLTE		
	BSNL	Airtel	JIO	VIL
Time spent %	42.77	100	100	99.5

Data Services Static

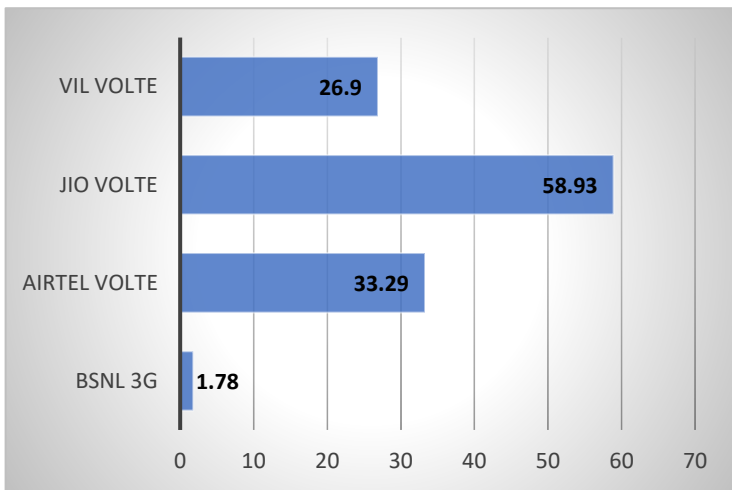
**Key Observations
(Average of 6
Hotspots)**

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

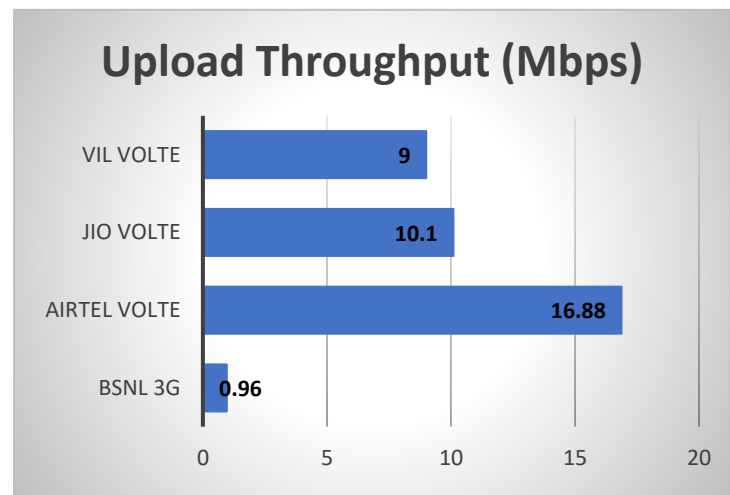
Data Download and Upload Performance (Mbps)

3G/4G/ Network:

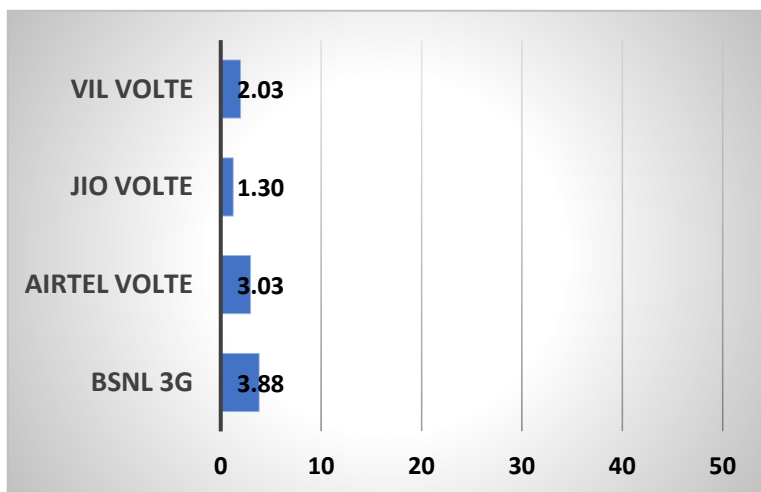
Download Throughput (Mbps)



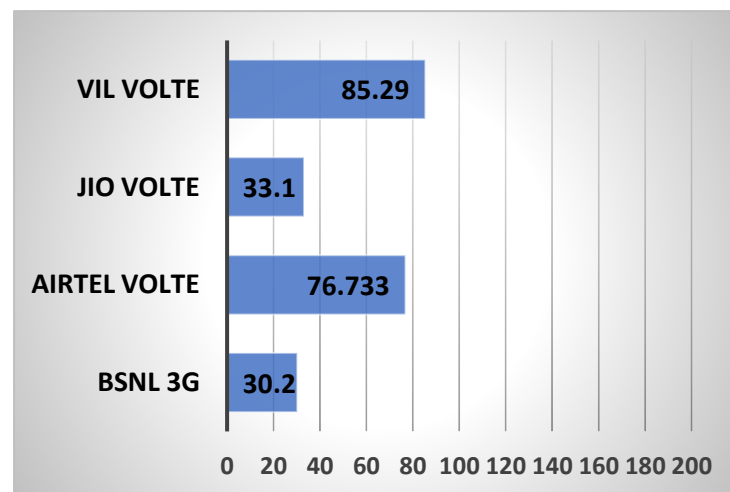
Upload Throughput (Mbps)



Web Browsing delay (Sec)



Latency (ms)



Data Services Dynamic

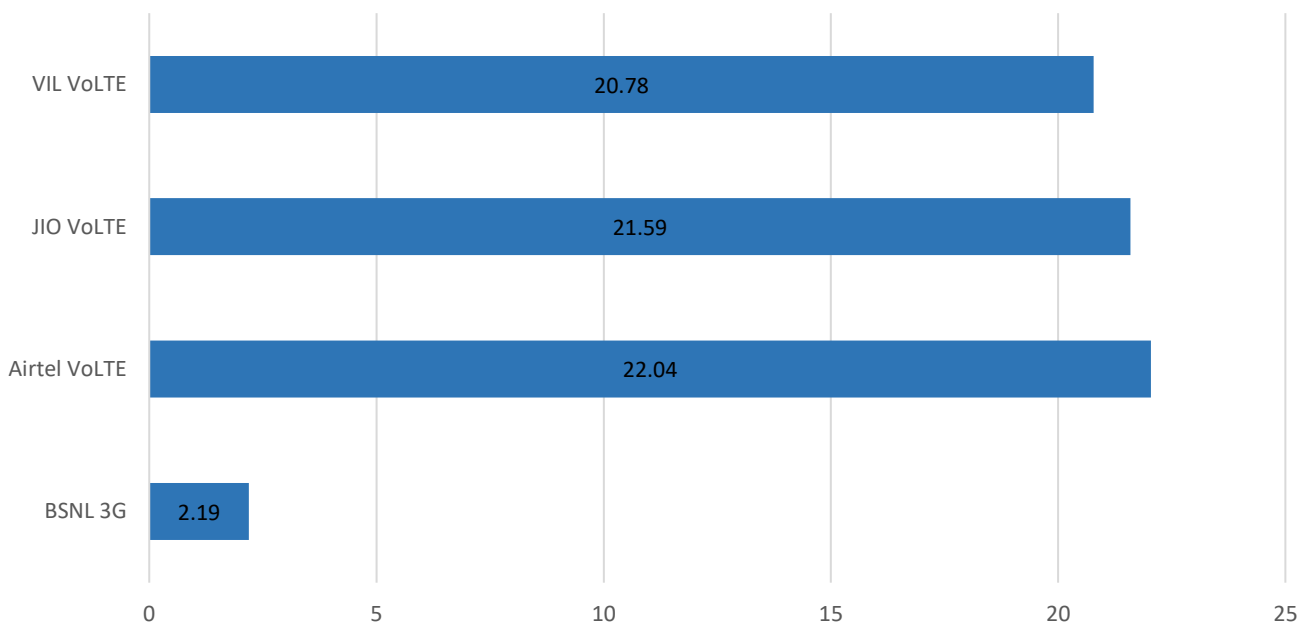
Key Observations

Dynamic Data was tested for 520 Kms. Download Throughput was tested.

Data Download Performance (kbps) - Dynamic

3G/4G/ Network:

Data Services Dynamic



Data Services Dynamic	3G / 4G			
	BSNL 3G	Airtel 4G	JIO 4G	VIL 4G
Download throughput in Mbps	2.19	22.04	21.59	20.78

Summary

SSA Level Summary-Voice

Voice Calls	2G		
	Airtel	BSNL	VIL
Call attempts	723	694	666
Block call rate %	0	0.72	0.15
CSSR %	100	99.28	99.85
Drop call rate %	0	1.61	0.30
Mobility HOSR %	97.25	98.67	99.78
RX Quality %	95.16	96.6	97.84

TSP (For 3G)	3G	VoLTE		
	BSNL	Airtel	JIO	VIL
Call attempts	281	746	743	738
Block call rate %	1.42	0	0	0.13
CSSR %	98.57	100	99.73	99.87
Drop call rate %	0	0	0.13	0.27
Mobility HOSR %	98.89	100	99.15	99.73
RX Quality %	95.2	93.56	95.02	94

Summary

SSA Level Summary- (Average of 6 hotspots)- Data Services

Data Services Static	2G		
	Airtel	BSNL	VIL
Download throughput in Kbps	230.4	145.72	128.15
Upload Throughput in Kbps	85.647	92.20	49.97
Web browsing delay in second	4.4167	66.30	12.67
Latency in (msec)	211.4	101.09	171.23

Data Services Static	3G / 4G			
	BSNL 3G	Airtel 4G	JIO 4G	VIL 4G
Download throughput in Mbps	1.78	33.29	58.93	26.9
Upload Throughput in Mbps	0.96	16.88	10.1	9
Web browsing delay in second	3.88	3.03	1.3	2.03
Latency in (msec)	30.20	76.73	33.1	85.29

Machilipatnam Bus Stand	2G		
	Airtel	BSNL	VIL
Download Throughput (kbps)	229.9	139.32	109.52
Upload Throughput (kbps)	124.4	83.89	50.12
Web Browsing Delay (sec)	4.7	93.97	15.42
Latency (msec)	99.6	104.12	198

Gudivada Railway Station	2G		
	Airtel	BSNL	VIL
Download Throughput (kbps)	232.6	130.15	98.65
Upload Throughput (kbps)	39.7	117.34	43.12
Web Browsing Delay (sec)	4.1	95.6	11.4
Latency (msec)	105	98.98	150.4

Nuziveedu Bus Stand	2G		
	Airtel	BSNL	VIL
Download Throughput (kbps)	257.9	165.9	129.34
Upload Throughput (kbps)	154.8	79.43	68.87
Web Browsing Delay (sec)	5	96.8	10.21
Latency (msec)	89.9	92.1	158.3

Vijayawada Airport	2G		
	Airtel	BSNL	VIL
Download Throughput (kbps)	196.5	153.92	124.43
Upload Throughput (kbps)	48.5	86.34	48.45
Web Browsing Delay (sec)	3.9	26.8	14.3
Latency (msec)	103.2	165.89	164

Vijayawada PVP Mall	2G		
	Airtel	BSNL	VIL
Download Throughput (kbps)	249.7	144.98	143.64
Upload Throughput (kbps)	81.3	98.91	38.98
Web Browsing Delay (sec)	4.3	50.6	13.3
Latency (msec)	102.2	75.85	180.4

Vijayawada Railway Station	2G		
	Airtel	BSNL	VIL
Download Throughput (kbps)	216.0	140.02	163.32
Upload Throughput (kbps)	65.3	87.29	50.32
Web Browsing Delay (sec)	4.5	34.04	11.43
Latency (msec)	134.3	69.6	176.3

Machilipatnam Bus Stand	3G	LTE		
	BSNL	Airtel	JIO	VIL
Download Throughput (Mbps)	1.50	39.36	52.74	38.43
Upload Throughput (Mbps)	1.02	19.6	8.45	10.43
Web Browsing Delay (sec)	4.33	3.3	1.21	2.21
Latency (msec)	36.07	19.4	37	68.3

Gudivada Railway Station	3G	LTE		
	BSNL	Airtel	JIO	VIL
Download Throughput (Mbps)	2.06	33.06	20.87	27.4
Upload Throughput (Mbps)	0.91	11.12	8.42	8.65
Web Browsing Delay (sec)	3.42	1.8	1.49	1.73
Latency (msec)	24.32	20.1	40	72.4

Nuziveedu Bus Stand	3G	LTE		
	BSNL	Airtel	JIO	VIL
Download Throughput (Mbps)	No 3G Service	26.28	63.56	22.32
Upload Throughput (Mbps)		13.14	11.09	9.43
Web Browsing Delay (sec)		1.7	1.35	2.13
Latency (msec)		19.4	27	80.23

Vijayawada Airport	3G	LTE		
	BSNL	Airtel	JIO	VIL
Download Throughput (Mbps)	No 3G Service	55.32	92.22	25.53
Upload Throughput (Mbps)		23.3	13.18	6.28
Web Browsing Delay (sec)		4.2	1.26	1.78
Latency (msec)		19.1	32	98.27

Vijayawada PVP Mall	3G	LTE		
	BSNL	Airtel	JIO	VIL
Download Throughput (Mbps)	No 3G Service	23.62	60.63	24.34
Upload Throughput (Mbps)		20.96	8.36	10.23
Web Browsing Delay (sec)		4.7	1.32	1.98
Latency (msec)		19.3	36	112.2

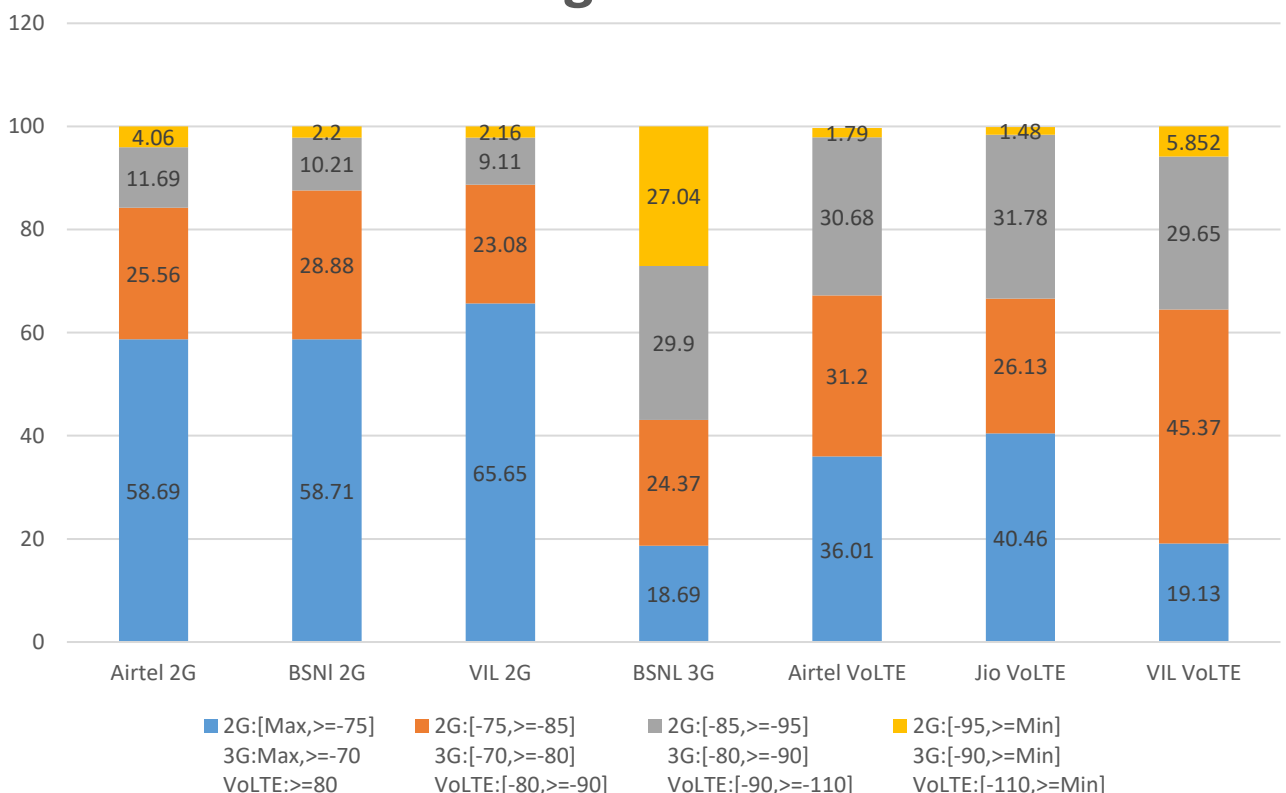
Vijayawada Railway Station	3G	LTE		
	BSNL	Airtel	JIO	VIL
Download Throughput (Mbps)	No 3G Service	22.1	63.56	23.43
Upload Throughput (Mbps)		13.16	11.09	8.98
Web Browsing Delay (sec)		2.5	1.20	2.32
Latency (msec)		19.2	27	80.32

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	84.2
BSNL 2G	87.59
VIL 2G	88.73
BSNL 3G	72.96
Airtel VoLTE	97.9
JIO VoLTE	98.37
VIL VoLTE	94.14

Coverage Details

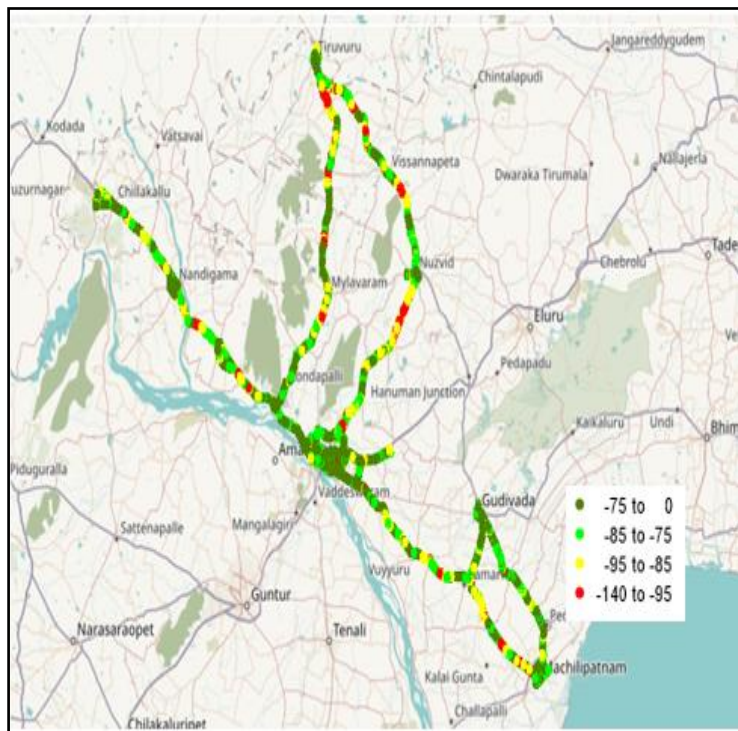


I. Coverage Details

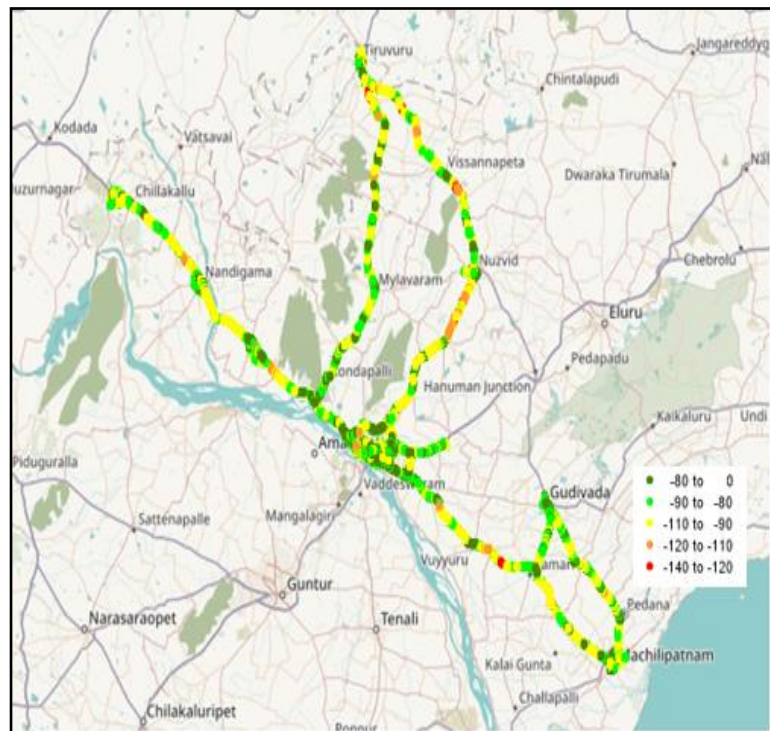
AIRTEL

Technology99.2	Coverage Rate %
2G	84.2
3G	
VoLTE	97.9

2G



VoLTE



2G

Overall RxLevel	# Samples	%
[Max, >=-75]	3199061	58.69
[-75, >=-85]	1393389	25.56
[-85, >=-95]	637314	11.69
[-95, >=Min]	220099	4.06
Total	5449863	

VoLTE

Overall RSRP	# Samples	%
[Max, >=-80]	3604685	36.01
[-80, >=-90]	3123294	31.20
[-90, >=-110]	3071775	30.68
[-110, >=-120]	179210	1.79
[-120, >=Min]	32133	0.32
Total	10011097	

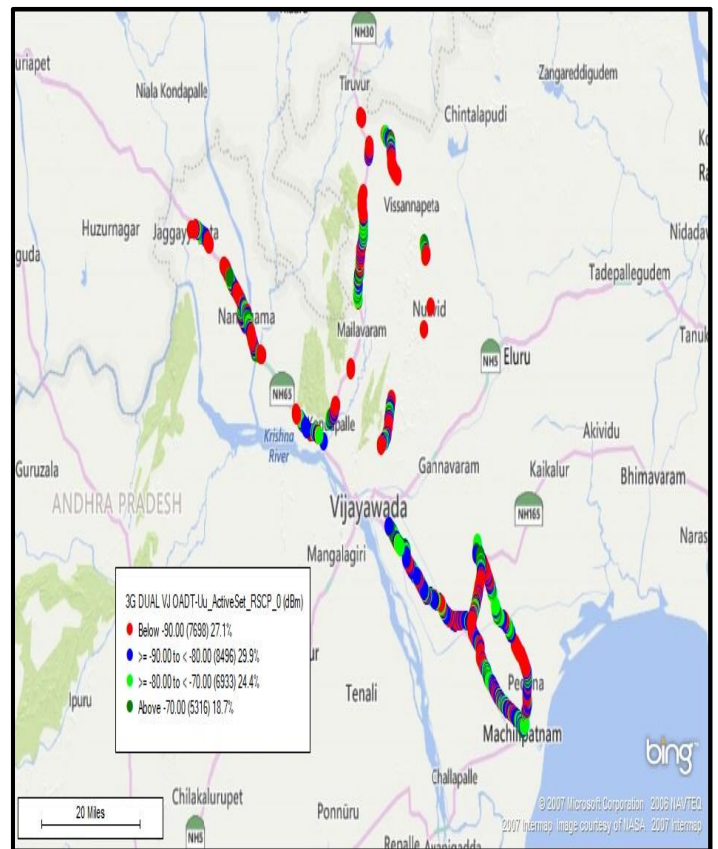
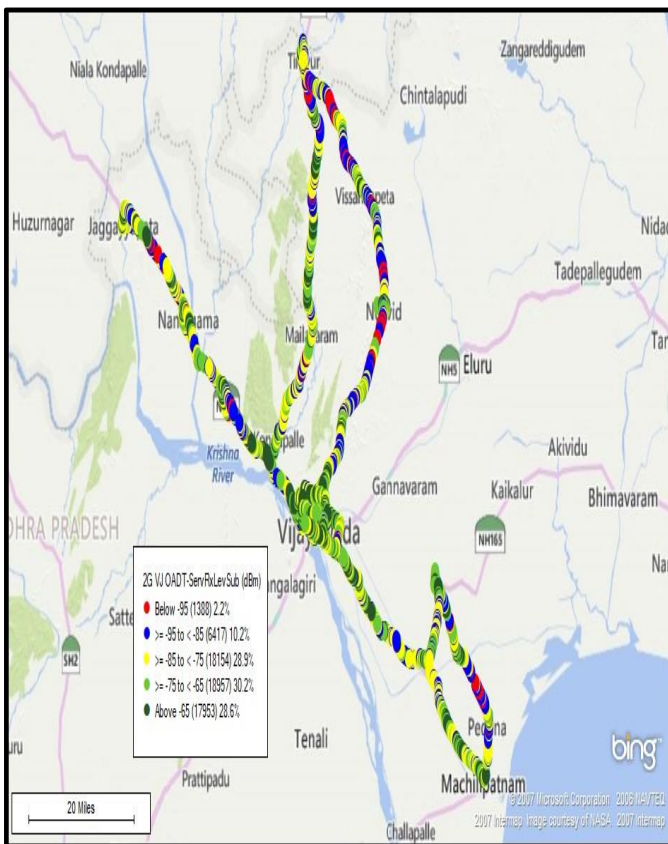
I. Coverage Details

BSNL

Technology	Coverage Rate %
2G	87.59
3G	72.96

2G

3G



2G		
Overall RxLevel	# Samples	% PDF
[Max, >=-75]	36910	58.71
[-75, >=-85]	18154	28.88
[-85, >=-95]	6417	10.21
[-95, >=Min)	1388	2.2
Total	62869	100

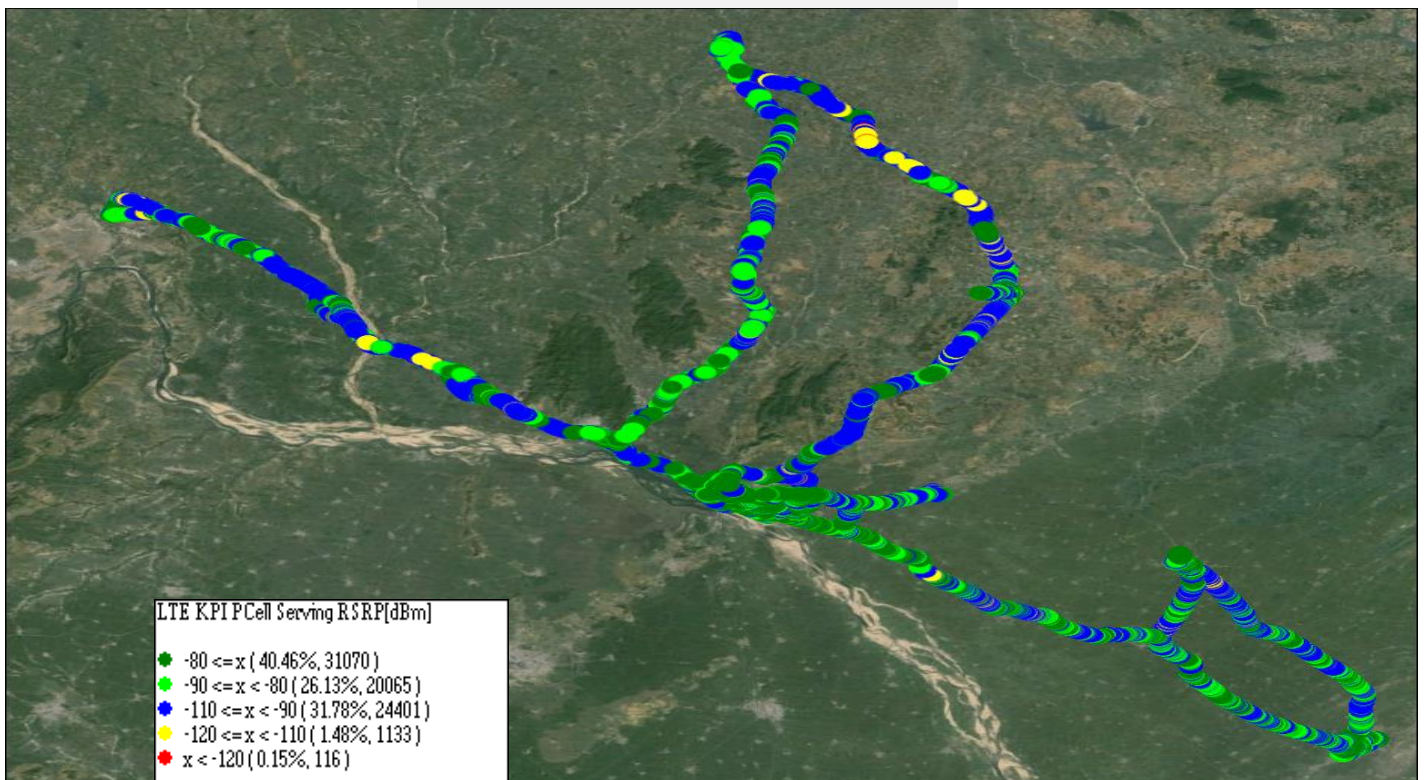
3G		
Overall RSCP	# Samples	% PDF
[Max, >=-70]	5316	18.69
[-70, >=-80]	6933	24.37
[-80, >=-90]	8496	29.90
[-90, >=Min)	7698	27.04
Total	28443	100

I. Coverage Details

JIO

Technology	Coverage Rate %
2G	
3G	
VoLTE	98.37

VoLTE



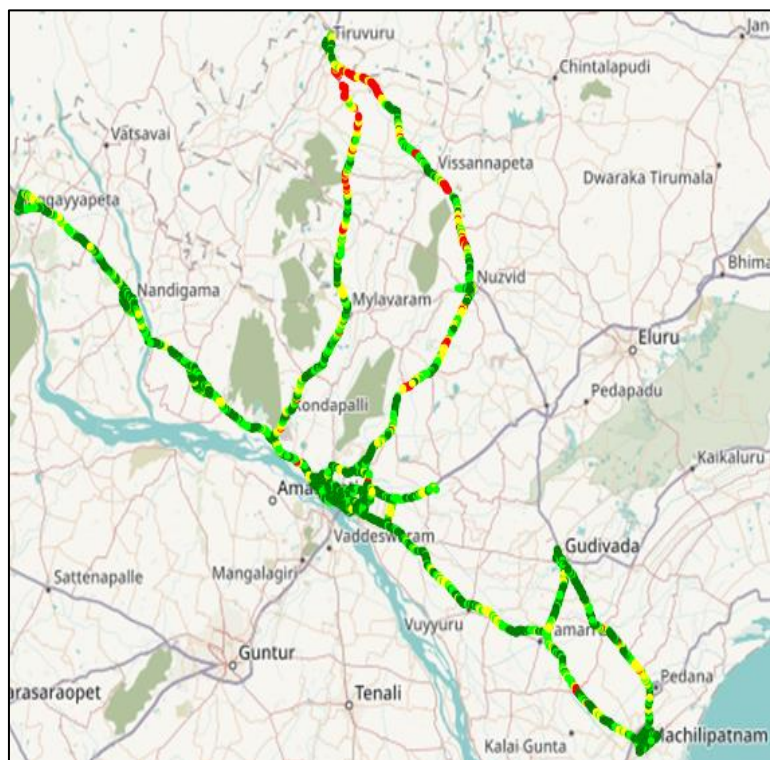
VoLTE		
Overall RSRP	# Samples	%
[Max, >=-80]	31070	40.46
[-80, >=-90]	20065	26.13
[-90, >=-110]	24401	31.78
[-110, >=-120]	1133	1.48
[-120, >=Min]	116	0.15
Total	76785	100

I. Coverage Details

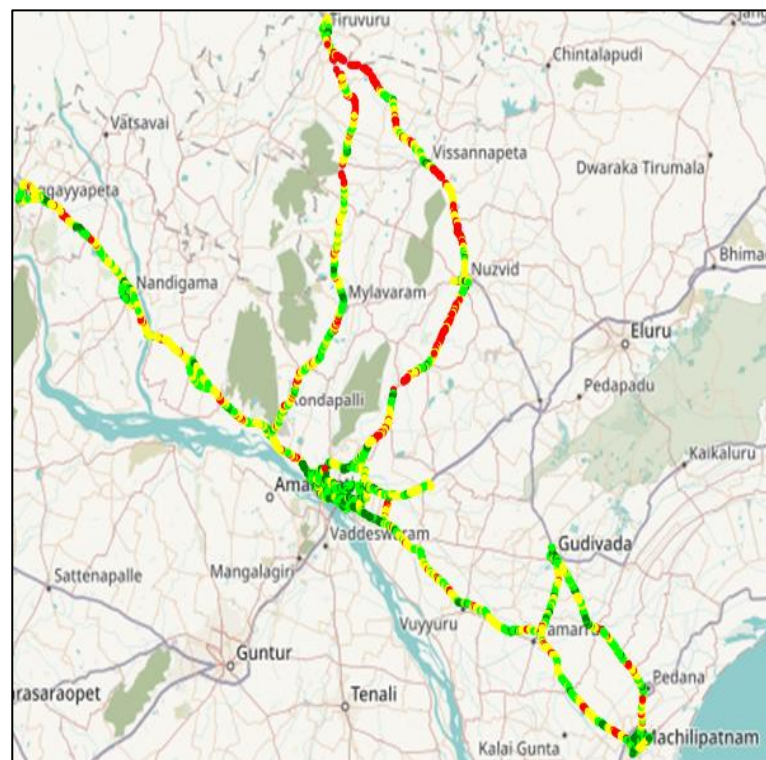
VIL

Technology	Coverage Rate %
2G	97.84
VoLTE	94.14

2G



VoLTE



2G

Overall Rx Level	# Samples	%
[Max, >=-75]	51384	65.65
[-75, >=-85]	18063	23.08
[-85, >=-95]	7133	9.11
[-95, >=Min]	1690	2.16
Total	78270	100

VoLTE

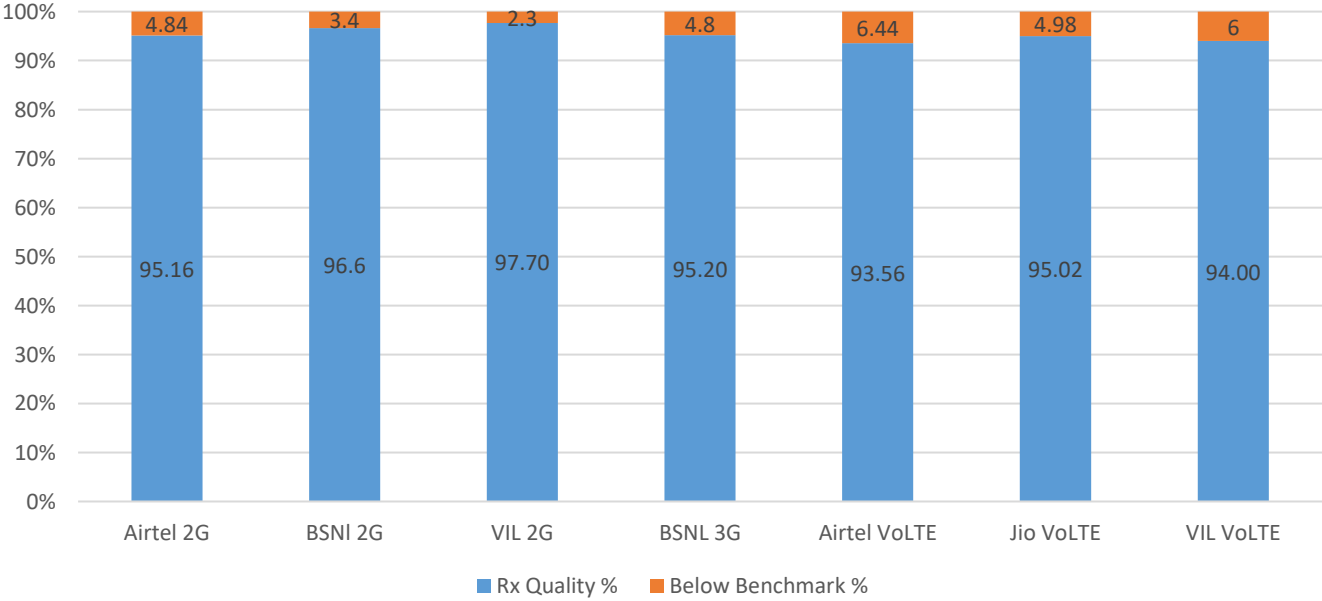
Overall RSRP	# Samples	%
[Max, >=-80]	16010	19.13
[-80, >=-90]	37981	45.37
[-90, >=-110]	24818	29.65
[-110, >=Min]	4899	5.852
Total	83708	100

II. Quality Details

For measuring voice quality, as per the QoS norms, Rx Qual ≤ 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	95.16
BSNL 2G	96.60
VIL 2G	97.7
BSNL 3G	95.20
Airtel VoLTE	93.56
JIO VoLTE	95.02
VIL VoLTE	94

RX Quality Distribution

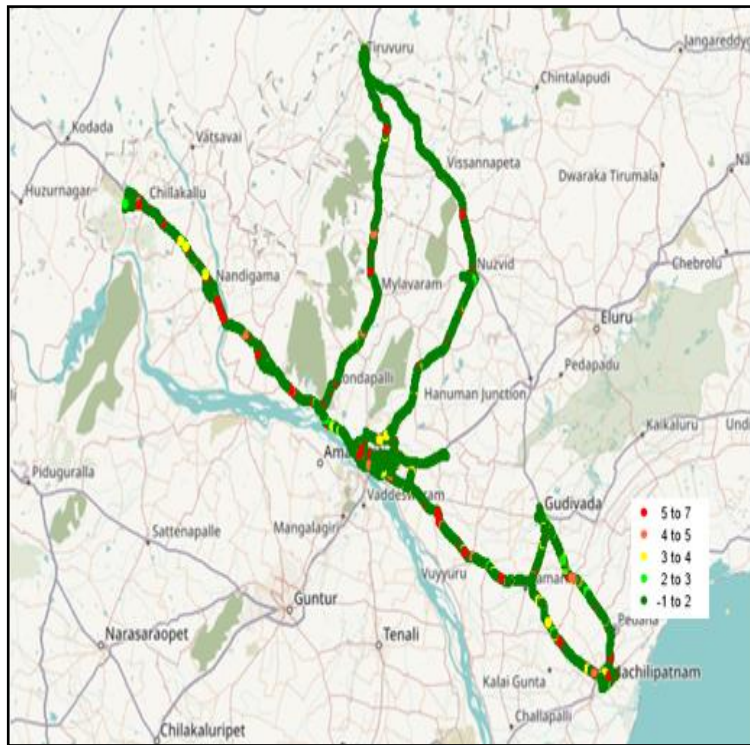


II. Quality Details

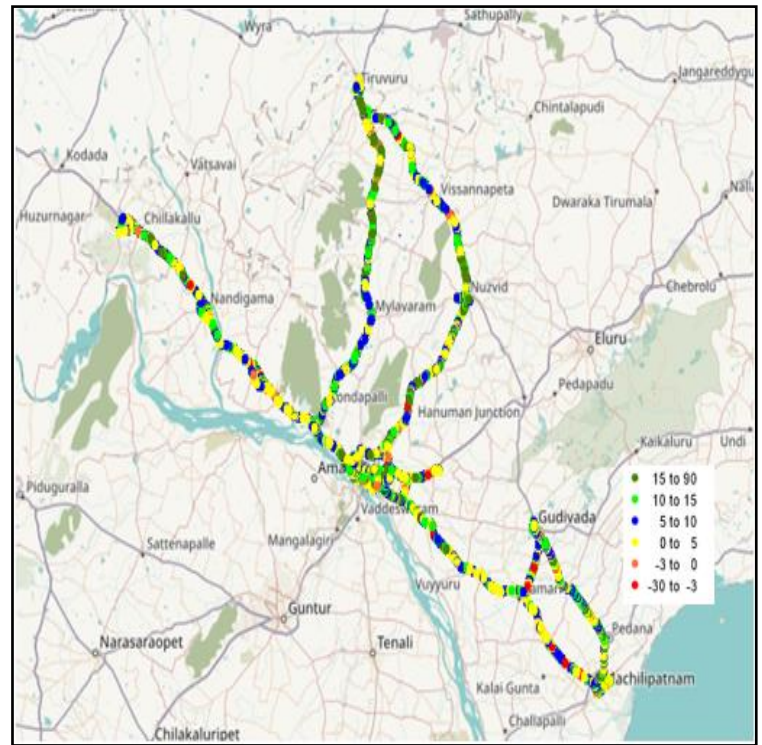
Airtel

Technology	Rx Quality %
2G	95.16
3G	
VoLTE	93.56

2G



VoLTE



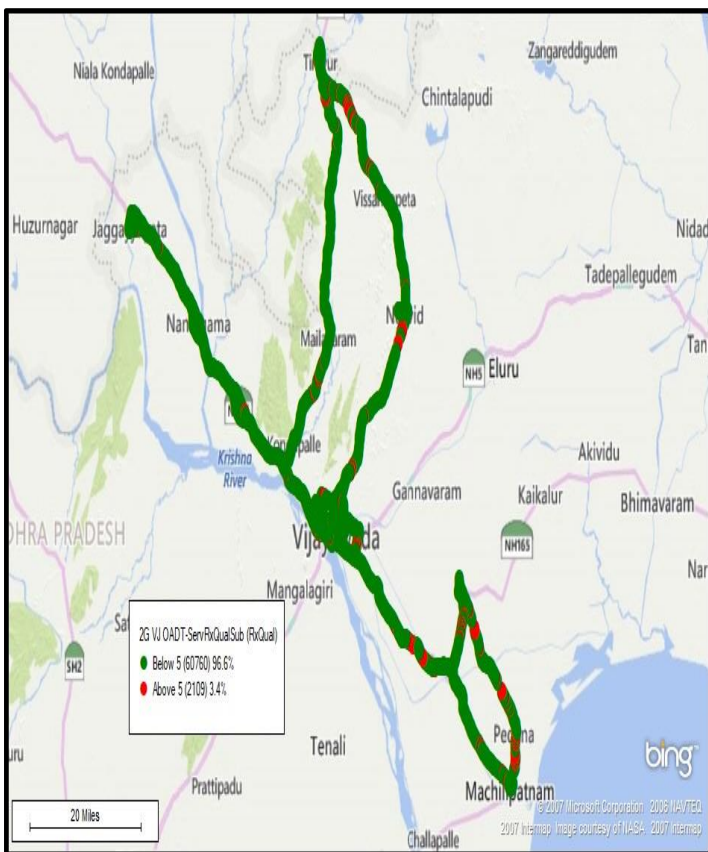
Overall Rx Quality	# Samples	%
(Min, <=2)	4493791	89.16
(2, <=3)	102454	2.03
(3, <=4)	101435	2.01
(4, <=5)	98592	1.96
(5, <=Max)	244094	4.84
Total	5040366	

Overall SINR	# Samples	%
(Min, <=-3)	314518	3.04
(-3, <=0)	343174	3.4
(0, <=5)	2880721	28.21
(5, <=10)	2622849	25.69
(10, <=15)	2396053	23.47
(15, <=Max)	1652681	16.19
Total	10209996	

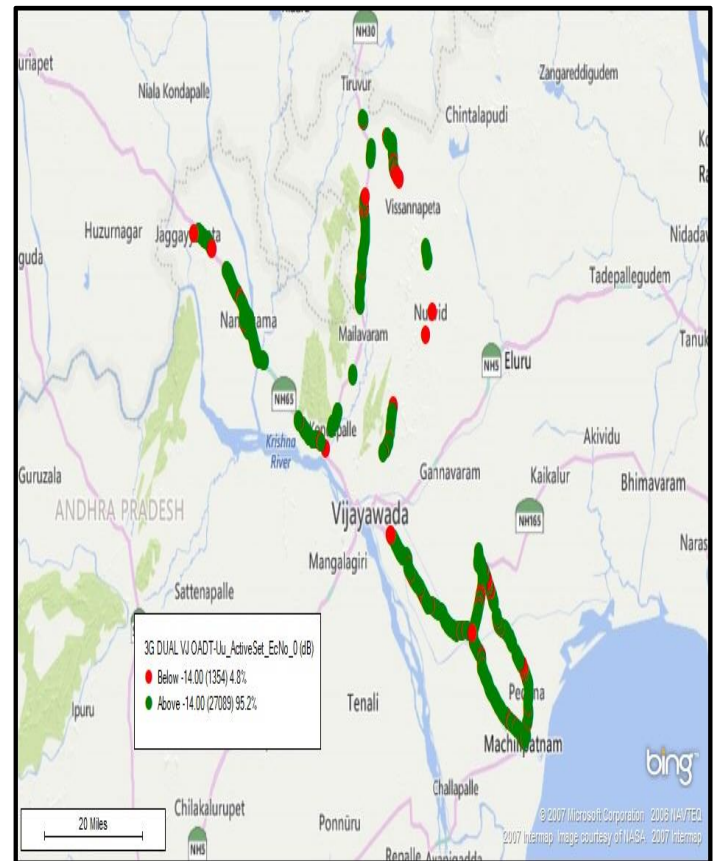
II. Quality Details

Technology	Rx Quality %
BSNL 2G	96.6
BSNL 3G	95.2

2G



3G



2G

Overall Rx Quality	# Samples	% PDF
(Min, <=5)	60760	96.6
(>5 , Max)	2109	3.4
Total	62869	100%

3G

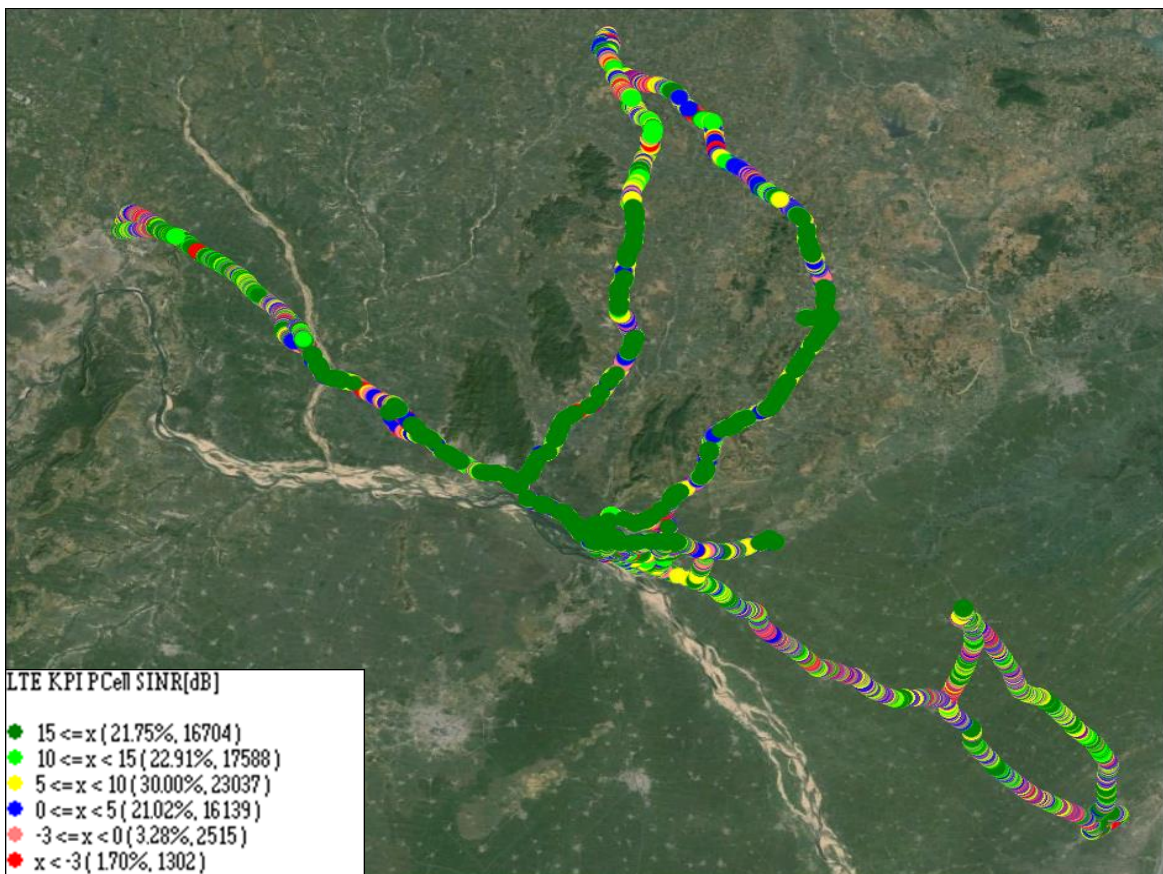
Overall EcNo	# Samples	% PDF
(Max, >--14)	27089	95.2
(<= -14, Min)	1354	4.8
Total	28443	100%

II. Quality Details

JIO

Technology	Rx Quality %
VoLTE	95.02

VoLTE



Overall SINR	# Samples	%
(Min, ≤-3)	1302	1.70
(-3, ≤0)	2515	3.28
(0, ≤5)	16139	21.02
(5, ≤10)	23037	30.00
(10, ≤15)	17588	22.91
(15, ≤Max)	16194	21.09
Total	76785	100

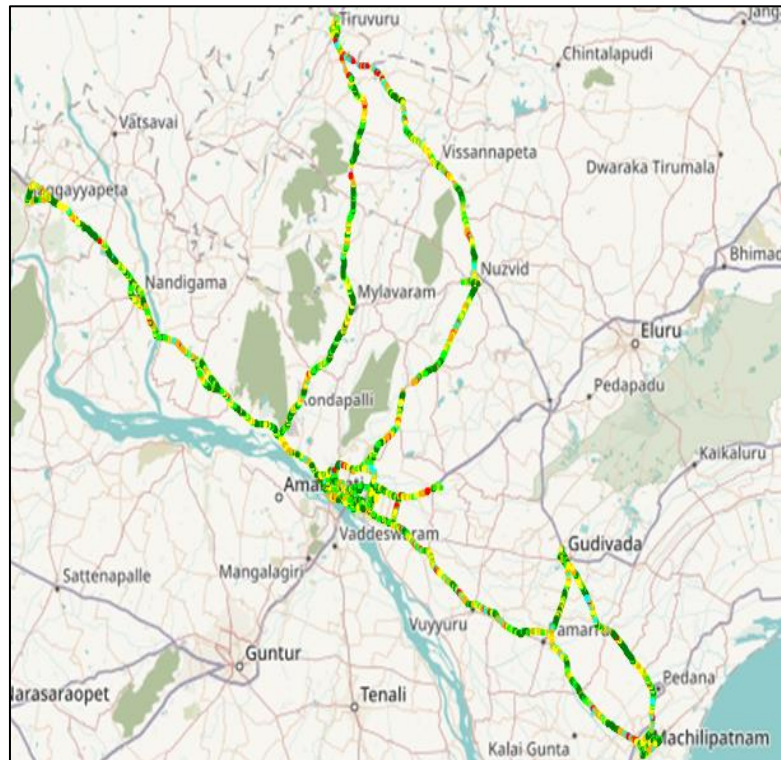
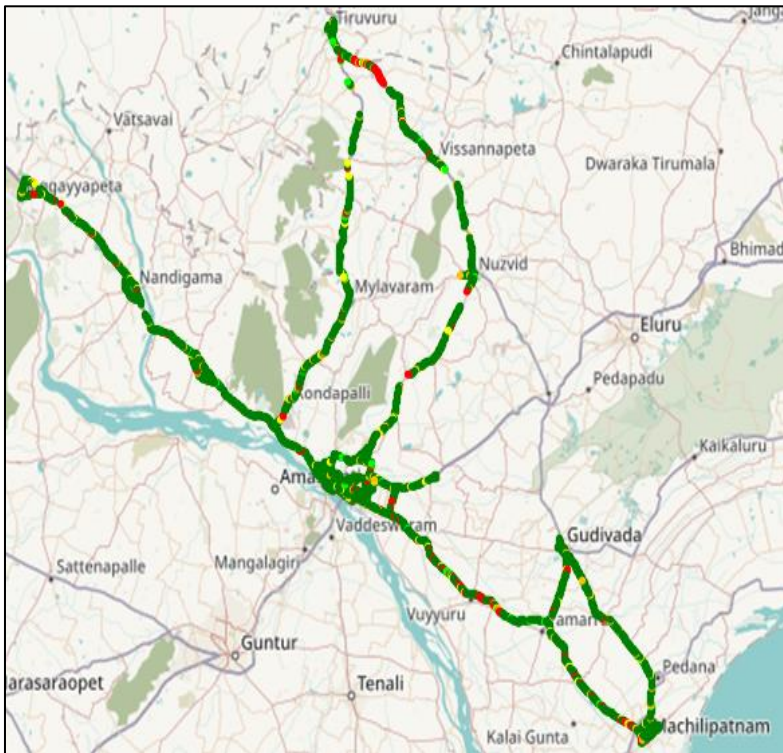
II. Quality Details

VIL

Technology	Rx Quality %
2G	97.7
VoLTE	94

2G

VoLTE

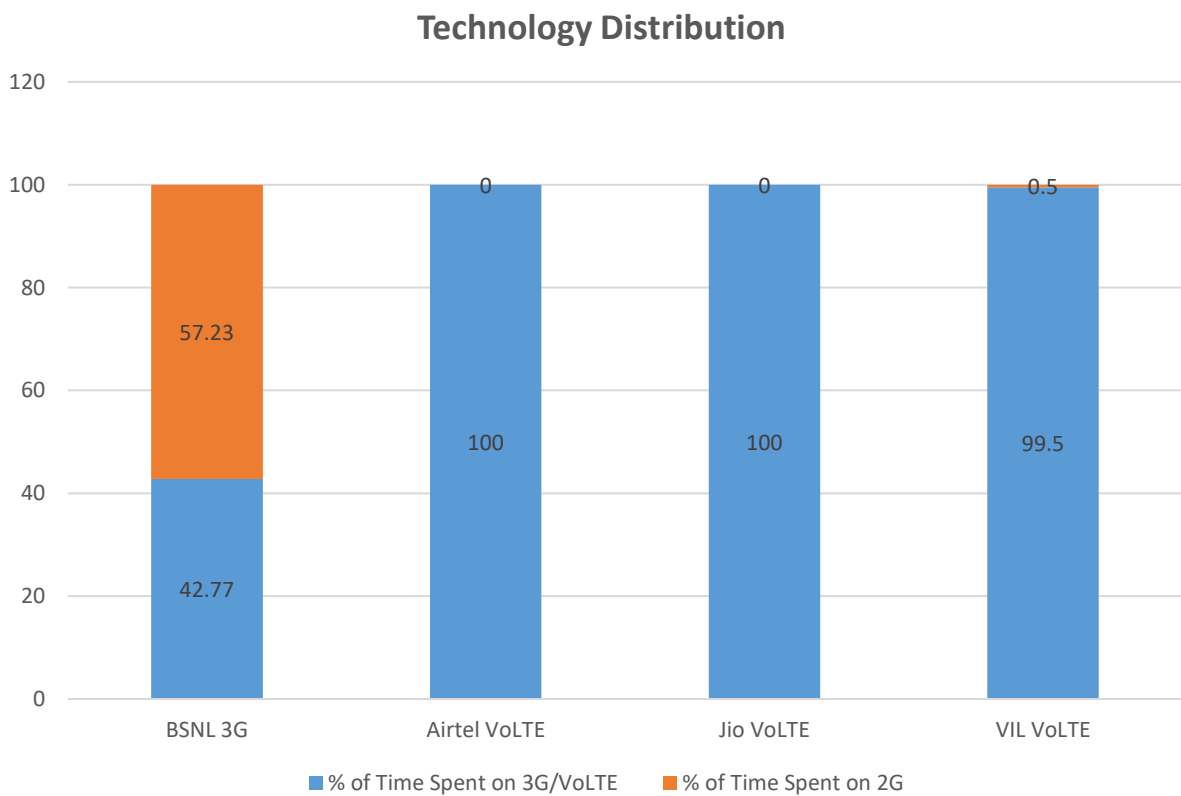


Overall Rx Quality	# Samples	%
(Min, <=2)	65562	92.5
(2, <=3)	954	1.3
(3, <=4)	1192	1.7
(4, <=5)	1498	2.1
(5, <=Max)	1634	2.3
Total	70840	

Overall SINR	# Samples	%
(Min, <=-3)	1538	1.8
(-3, <=0)	3520	4.2
(0, <=5)	11765	14.1
(5, <=10)	17175	20.5
(10, <=15)	18234	21.8
(15, <=Max)	31466	37.6
Total	83698	

III. Technology Details

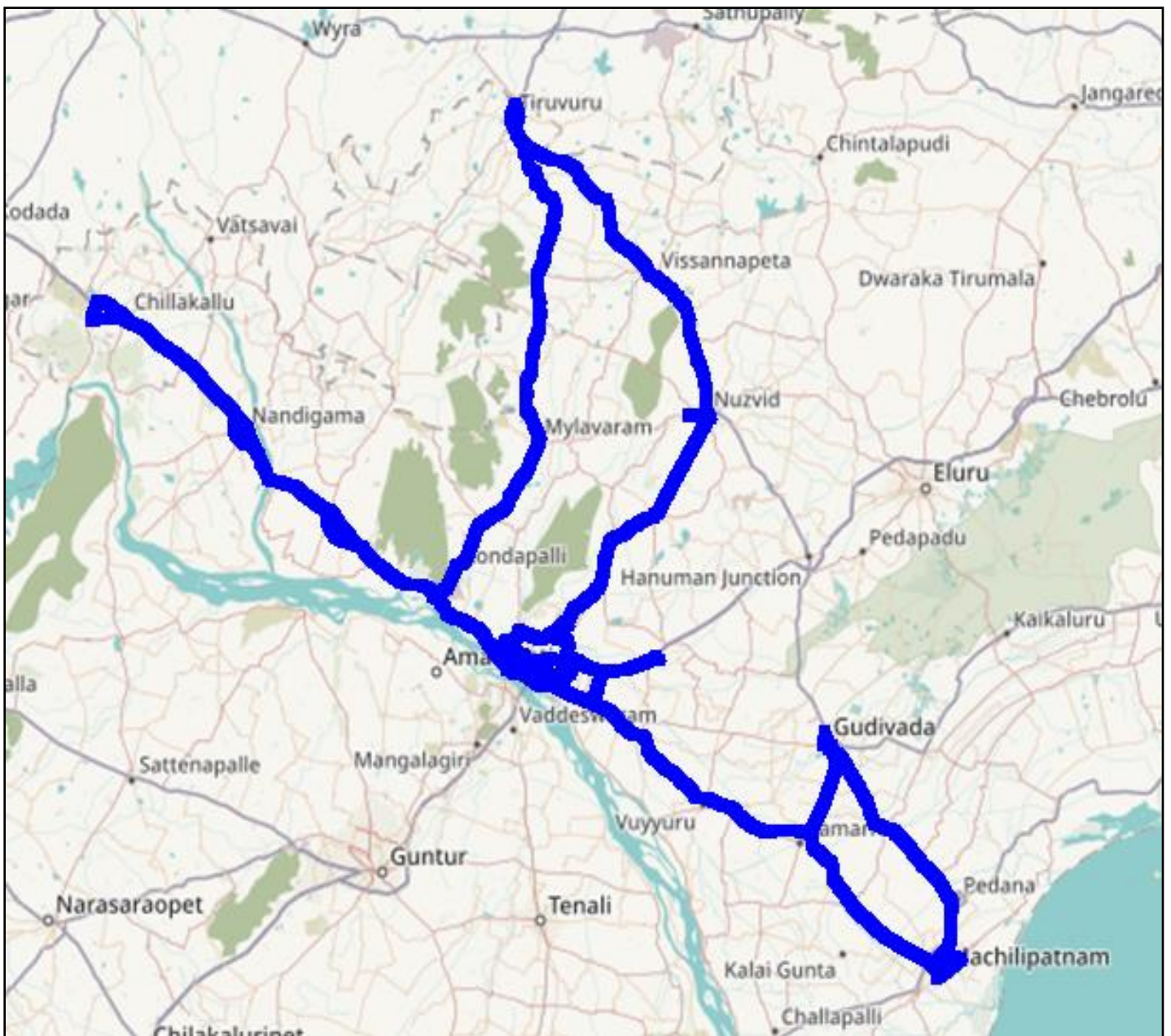
TSP	% of Time Spent on 3G/VoLTE
BSNL 3G	42.77
Airtel VoLTE	100
Jio VoLTE	100
VIL VoLTE	99.5



III. Technology Details

Airtel

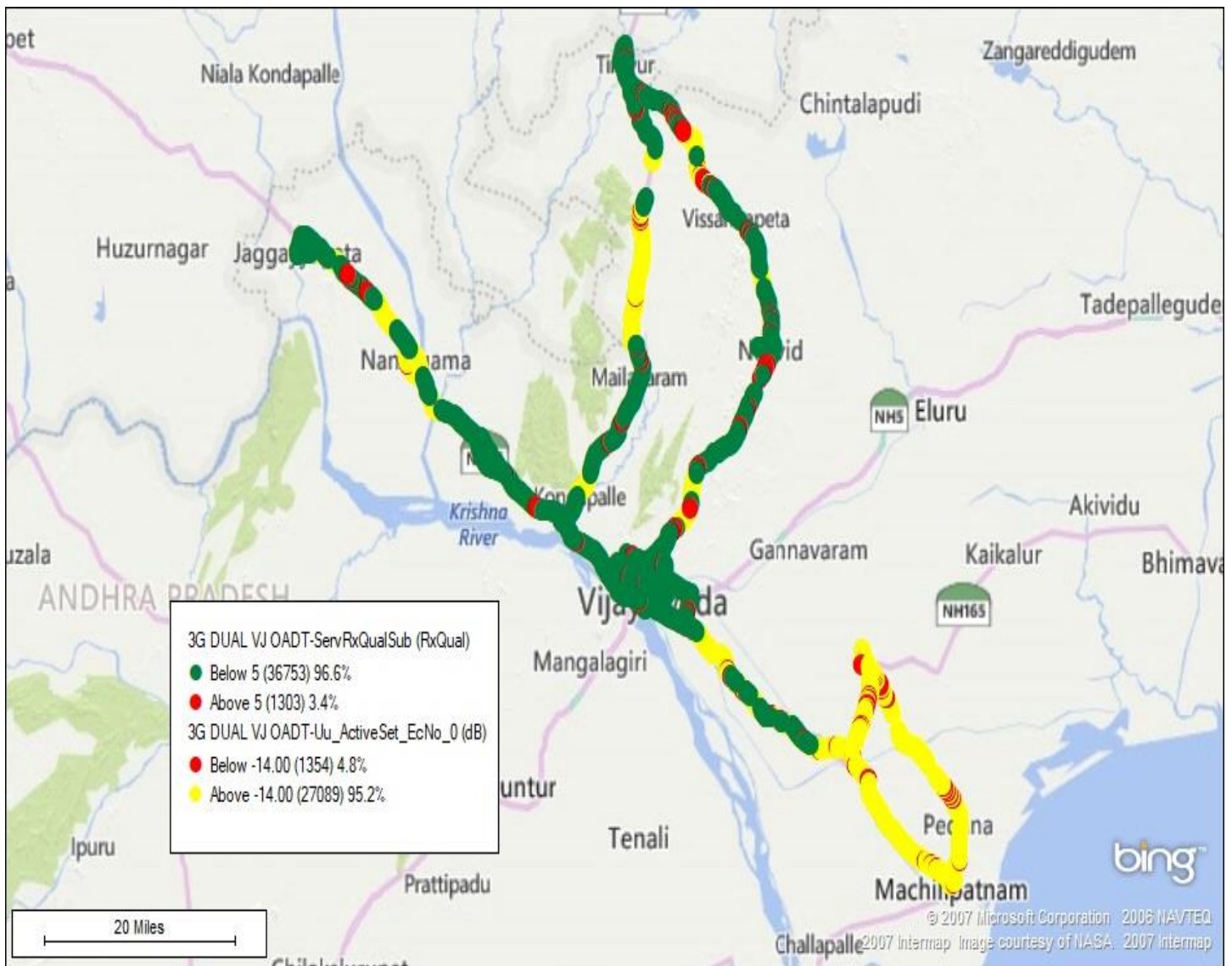
Technology	Time Spent %
3G / VoLTE	100



III. Technology Details

BSNL

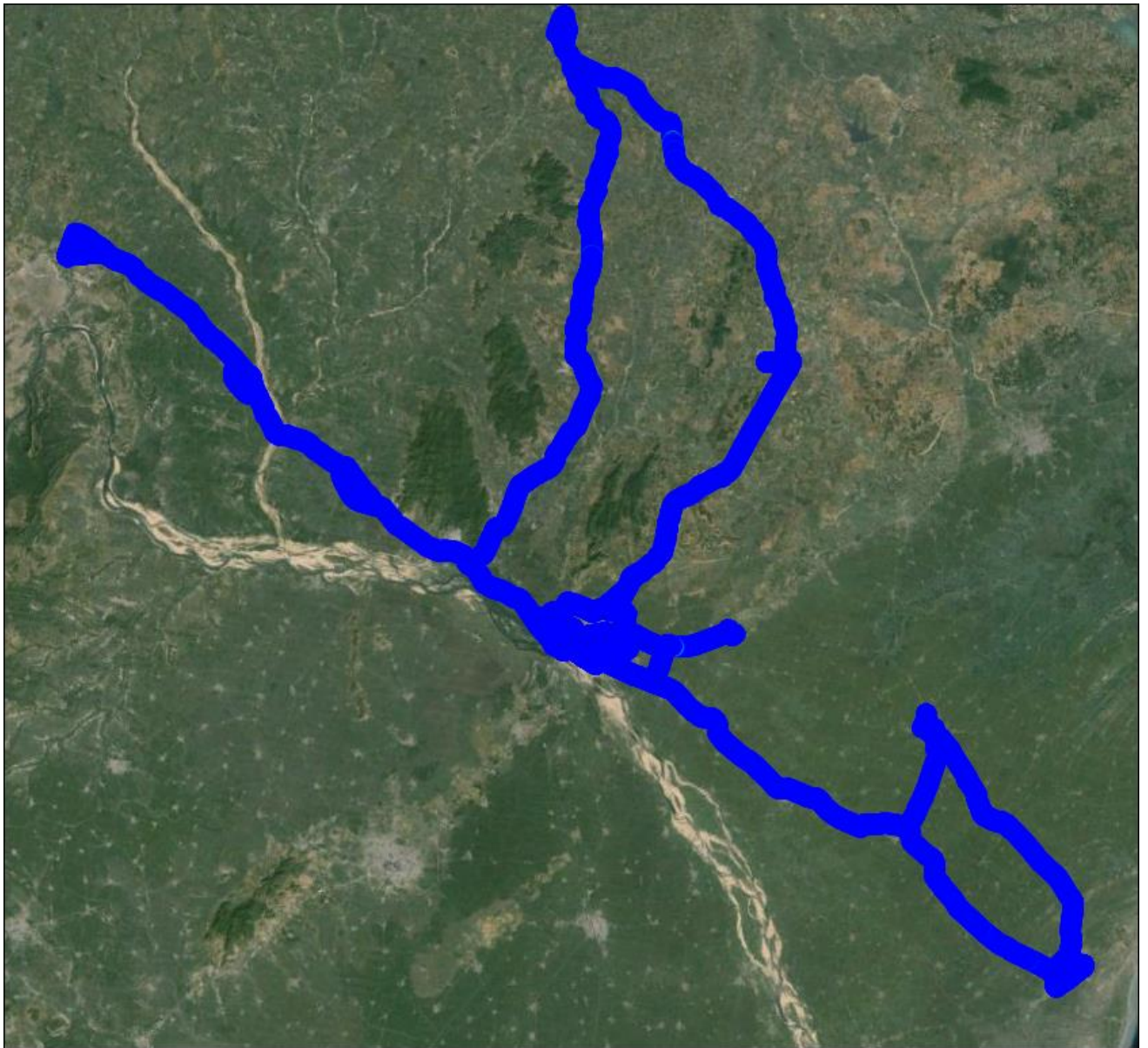
Technology	Time Spent on 3G
3G	42.77



III. Technology Details

JIO

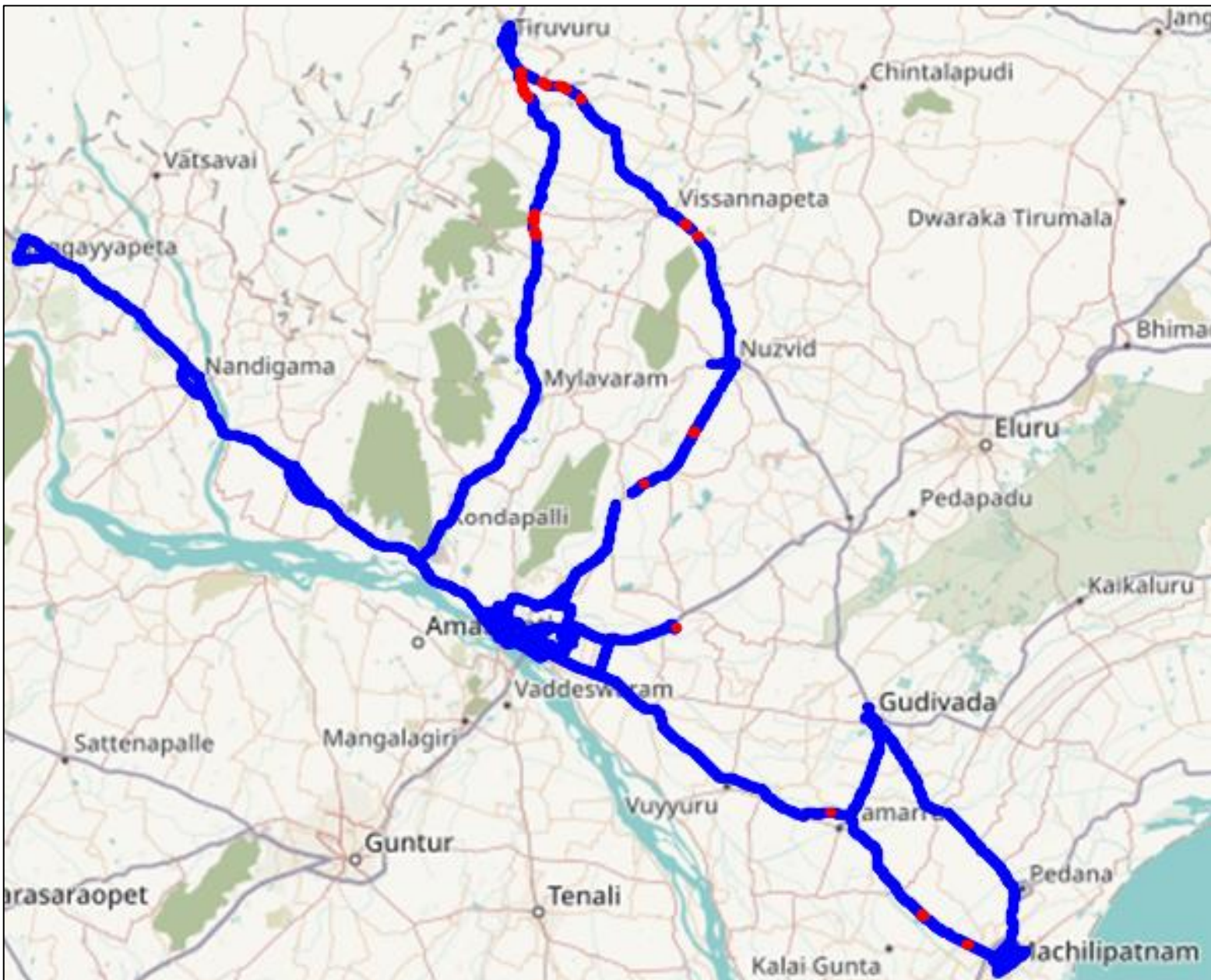
Technology	Time Spent %
3G / VoLTE	100



III. Technology Details

VIL

Technology	Time Spent %
3G / VoLTE	99.5%

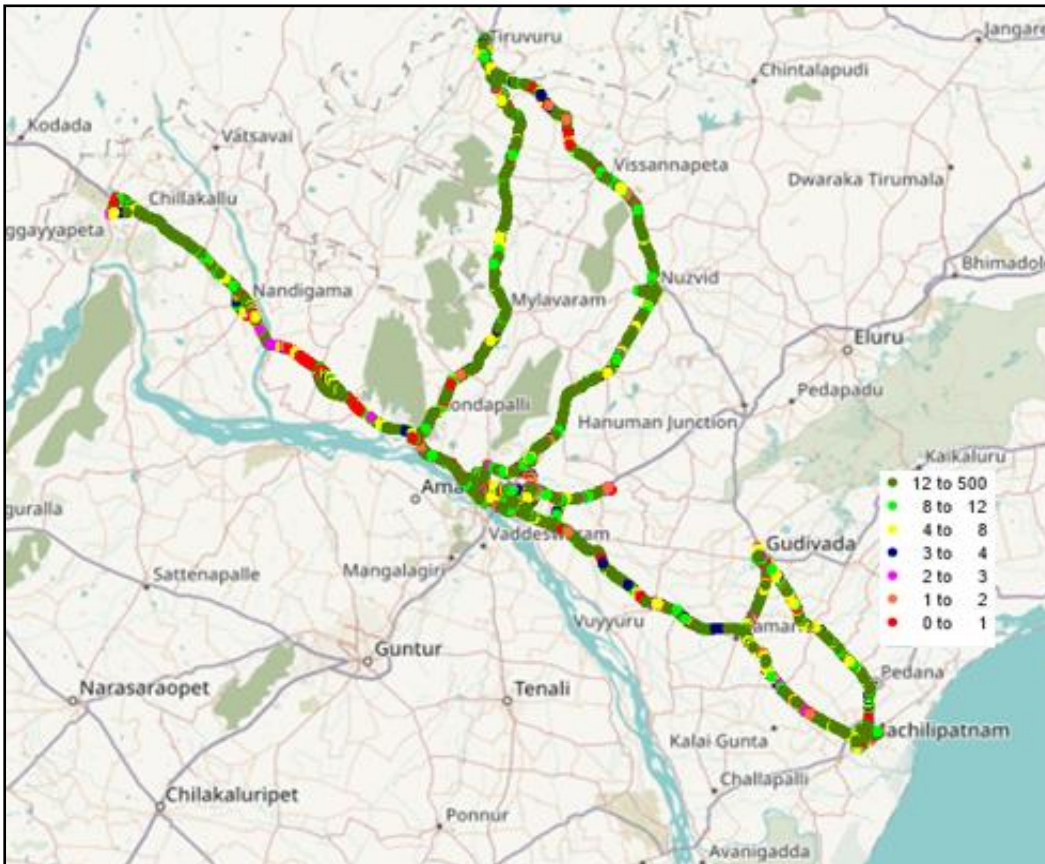


IV. Dynamic Data Test- 3G / 4G DL Details

Airtel

Data Statistics - Dynamic Complete SSA 520 Kms

Data KPIs - Overall	3G / 4G
Download Throughput (Mbps)	22.04



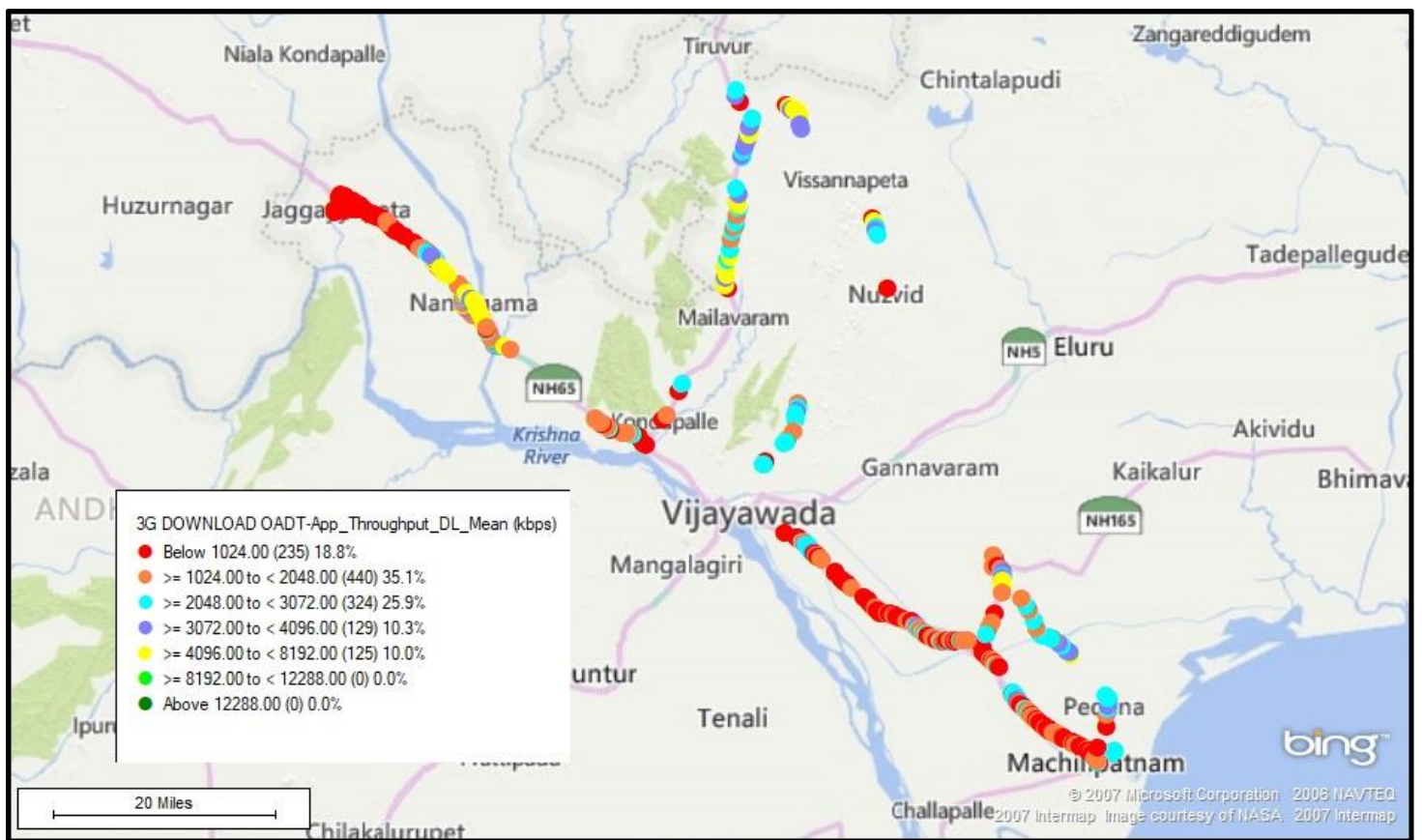
DL throughput	No of Sample	%
0 to 1 Mbps	411361	2.1
1 to 2 Mbps	310347	1.6
2 to 3 Mbps	551281	2.9
3 to 4 Mbps	377295	2.0
4 to 8 Mbps	1698634	8.9
8 to 12 Mbps	1597785	8.31
>12 Mbps	14216644	74.19
Total	19163347	100

IV. Dynamic Data Test- 3G DL Details

BSNL

Data Statistics - Dynamic Complete SSA 520Kms

Data KPIs - Overall	3G
Download Throughput (Mbps)	2.19



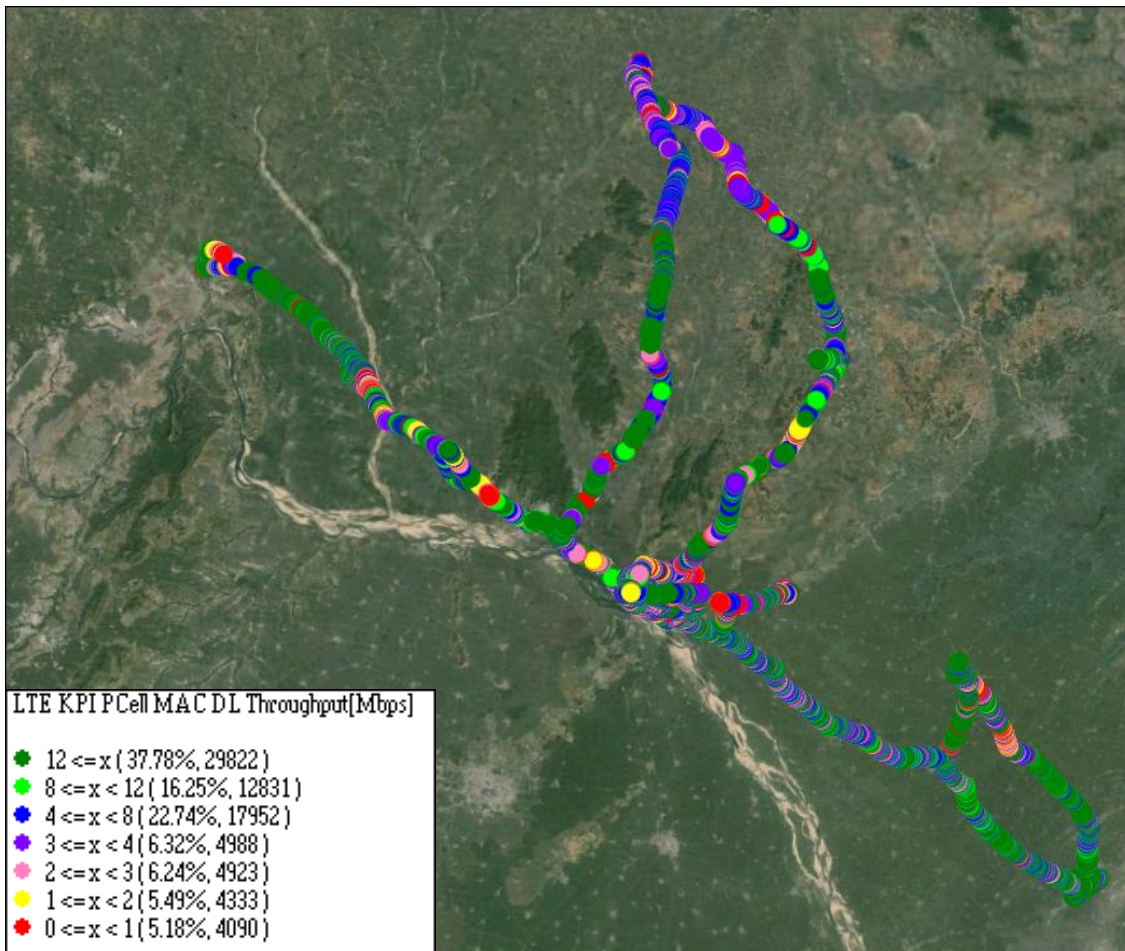
DL throughput	No of Samples	%
0 to 1 Mbps	235	18.8
1 to 2 Mbps	440	35.1
2 to 3 Mbps	324	25.9
3 to 4 Mbps	129	10.3
4 to 8 Mbps	125	10.0
8 to 12 Mbps	0	0.0
>12 Mbps	0	0.0

IV. Dynamic Data Test- 3G / 4G DL Details

JIO

Data Statistics - Dynamic Complete SSA 520 Kms

Data KPIs - Overall	3G / 4G
Download Throughput (Mbps)	21.59



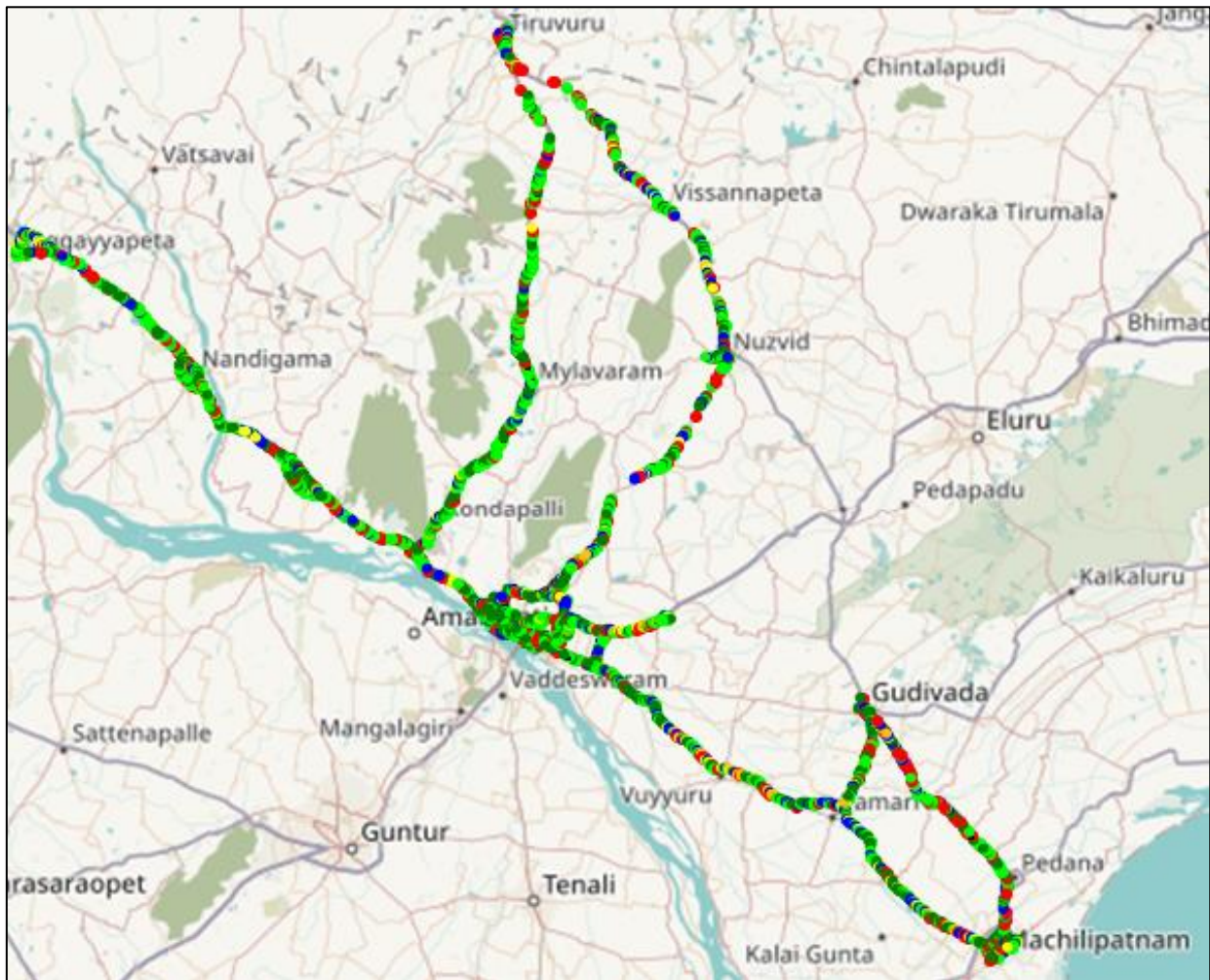
DL Throughput	No of Sample	%
0 to 1 Mbps	4090	5.18
1 to 2 Mbps	4333	5.49
2 to 3 Mbps	4923	6.24
3 to 4 Mbps	4988	6.32
4 to 8 Mbps	17952	22.74
8 to 12 Mbps	12831	16.25
>12 Mbps	29822	37.78

IV. Dynamic Data Test- 3G / 4G DL Details

VIL

Data Statistics - Dynamic Complete SSA 520 Kms

Data KPIs - Overall	3G / 4G
Download Throughput (Mbps)	20.78



DL throughput	No of Sample	%
0 to 1 Mbps	6963	9.4346
1 to 2 Mbps	6014	8.1487
2 to 3 Mbps	2018	2.7343
3 to 4 Mbps	2079	2.817
4 to 8 Mbps	8332	11.29
8 to 12 Mbps	20387	27.624
>12 Mbps	28010	37.952
Total	73803	100

V. TRAI MySpeed App

Airtel

Technology 4G	1. Machilipatnam Bus stand	2. Gudivada Railway Station	3. Nuziveedu Bus stand	4. Vijayawada Airport	5. Vijayawada PVP Mall	6. Vijayawada Railway Station
Download in Mbps	34.87	72.91	75.16	42.64	54.47	60.18
Upload in Mbps	5.49	20.54	38.41	19.99	25.12	11.93

BSNL

Technology 3G/4G	1. Machilipatnam Bus stand	2. Gudivada Railway Station	3. Nuziveedu Bus stand	4. Vijayawada Airport	5. Vijayawada PVP Mall	6. Vijayawada Railway Station
Download in Mbps	1.64	4.01	33.91	12.02	14.59	9.3
Upload in Mbps	1.67	1.37	10.78	11.58	10.56	5.53

JIO

Technology 4G	1. Machilipatnam Bus stand	2. Gudivada Railway Station	3. Nuziveedu Bus stand	4. Vijayawada Airport	5. Vijayawada PVP Mall	6. Vijayawada Railway Station
Download in Mbps	57.69	57.56	75.88	76.25	55.84	76.25
Upload in Mbps	5.27	8.65	9.42	11.44	8.87	11.44

VIL

Technology 4G	1. Machilipatnam Bus stand	2. Gudivada Railway Station	3. Nuziveedu Bus stand	4. Vijayawada Airport	5. Vijayawada PVP Mall	6. Vijayawada Railway Station
Download in Mbps	30.28	28.55	40.06	20.03	40.71	41.11
Upload in Mbps	9.51	15.33	10.5	7.00	15.07	18.72

VI. NH/SH Routes covered

NH/SH Routes covered in OADT by Airtel/BSNL/RJIL/VIL			
No of NH/SH routes	NH routes	SH routes	Distance(Km)
NH-65	Poranki-Pamarru Bypass-Machilipatnam	YES	60
216H	Machilipatnam -Pedana-Gudlavalleru -Gudiwada	YES	38
NH-165	Gudiwada - Pamarru Bypass	YES	15
NH-30,NH-216H,238	Ibrahimpattanam-Mylavaram-Tiruvur-Vissannapeta-Nuzividu-Agiripalli-Vijayawada	YES	168
NH-16 & SH -65	Vijayawada City Drive	YES	130
NH-65	Ibrahimpattanam - Jaggayyapeta	YES	85
NH-16	Nidamanuru - Gannavaram Airport	YES	9