TELECOM REGULATORY AUTHORITY OF INDIA

Independent Drive Test Report

UP East LSA

March 2025

Contents

1. Introduction

TRAI Act, 1997 mandates the Authority to ensure the services delivered through various telecommunications networks meet required quality standards prescribed, to protect the interest of the consumers of telecommunication services. TRAI is also responsible for conducting the periodical audit of such services provided by the service providers so as to protect the interest of the consumers of telecommunications service.

Accordingly, TRAI has engaged M/s RedMango Analytics Pvt. Ltd. to undertake assessment of Quality of Service of mobile service through Independent Drive Test (IDT).

In IDT, the performance of all service providers providing service in a Licensed Service Area (LSA) through various technologies (like 2G/ 3G/ 4G/ 5G) for voice and data are measured by conducting drive test. The drive test routes are finalised based on various objective criteria like reported network performance, consumer complaints etc. Methodology adopted for conducting IDT is elaborated in **APPENDIX-I**.

2. Executive Summary (LSA)

2.1 Drive test details

This report covers the findings of the IDT undertaken in UP East License Service Area (LSA) during the month of March 2025 under the supervision of TRAI Regional Office (RO), Bhopal. Details of route/area covered during the IDT is as given below:

Sl. No	Drive test route	Type of route	Distance covered (KMs)/ Locations	From date	To date
1	Prayagraj	City	270.2	04-Mar-2025	06-Mar-2025
2	Prayagraj	Hotspot	10 Locations	6-Mar-2025	07-Mar-2025
3	Prayagraj	Walk Test	2.9	07-Mar-2025	07-Mar-2025
4	Prayagraj to Kanpur	Railway	194.0	08-Mar-2025	08-Mar-2025

Table-1: Drive test summary

2.2 Drive test routes

The map provides overview of drive test routes indicating city drive, hotspots, walk test and Railway route as per the legends shown on the map.
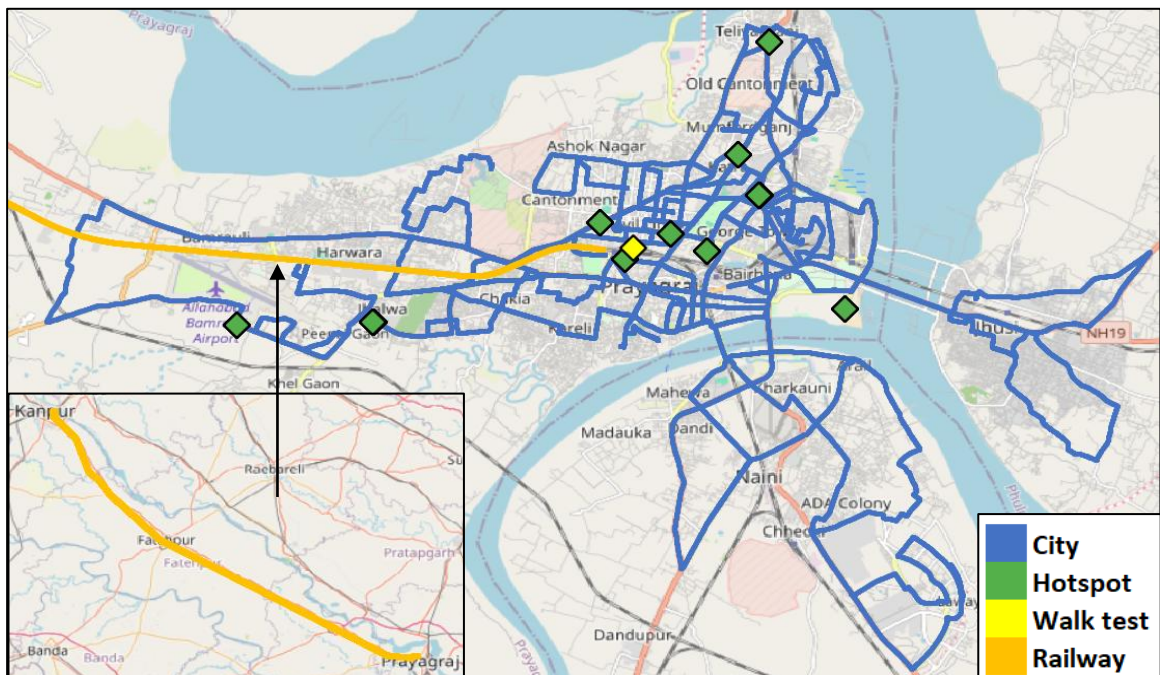
Figure-1: Drive test routes

2.3 Summary of areas covered

a) **City**- Civil Lines, Mamfordganj, Chakia, Jhusi, Ashok Nagar, George Town, Katra, Teliarganj, Kareli, Jhalwa, Mahewa, Naini, Chheoki etc.

b) **Hotspot**
1. Laxmi Talkies Chauraha
2. Civil Line Bus Stand
3. George Town Anand Bhawan
4. High Court
5. IIIT
6. Lete Hanuman Triveni Sangam
7. Medical Chowk Swaroop Rani
8. Prayagraj Airport
9. Prayagraj Railway Station
10. Teliarganj

c) **Walk Test**
1. Prayagraj Railway Station

d) **Railway**
1. Prayagraj to Kanpur

2.4 Telecom service providers detected frequency bands

Technologies covered during the IDT and frequency bands in use are summarised in below table.

S.No.	Name of TSP	Technology	Frequency Bands (In MHz)
1	Bharti Airtel Ltd.	2G	900
2	Bharti Airtel Ltd.	4G	900,1800,2100,2300
3	Bharti Airtel Ltd.	5G	3500
4	BSNL	2G	900
5	BSNL	3G	2100
6	BSNL	4G	700,2100
7	Reliance JIO Infocomm Ltd.	4G	850,1800,2300
8	Reliance JIO Infocomm Ltd.	5G	700,3500
9	Vodafone Idea Ltd.	2G	900
10	Vodafone Idea Ltd.	4G	900,1800,2100,2500

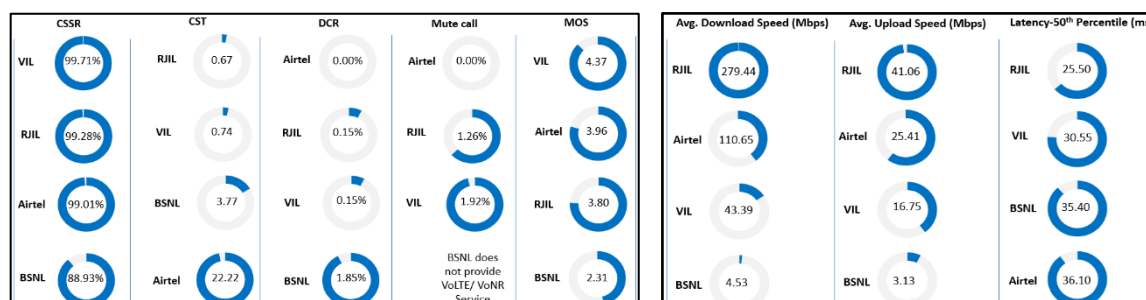**Table-2:** Telecom service provider (TSP) covered in IDT.

2.5 Performance against key QoS parameters

CSSR: Call Setup Success Rate (in %), **CST:** Call Setup Time (in milli seconds), **DCR:** Drop Call Rate (in %) & **MOS:** Mean Opinion Score

Summary-Voice services

Call Setup Success Rate: Airtel, BSNL, RJIL and VIL have call setup success rate of 99.01%, 88.93%, 99.28% and 99.71% respectively in Auto-selection mode (5G/4G/3G/2G).

Call Setup Time: Airtel, BSNL, RJIL and VIL have call setup time of 22.22, 3.77, 0.67, & 0.74 seconds in Auto-selection mode (5G/4G/3G/2G).

Drop Call Rate: Airtel, BSNL, RJIL and VIL have drop call rate of 0.00%, 1.85%, 0.15% and 0.15% respectively in Auto-selection mode (5G/4G/3G/2G).

Call Silence/Mute Rate: Airtel, RJIL and VIL have silence call rate of 0.00%, 1.26% & 1.92% respectively in packet switched network (4G/5G).

Mean Opinion Score (MOS): Airtel, BSNL, RJIL and VIL have average MOS score of 3.96, 2.31, 3.80 & 4.37 respectively.

Summary-Data services

Data Download performance (Overall): Average download speed of Airtel (5G/4G) is 110.65 Mbps, BSNL (4G/3G/2G) is 4.53 Mbps, RJIL (5G/4G) is 279.44 Mbps and VIL (4G/2G) is 43.39 Mbps.

Data Upload performance (Overall): Average upload speed of Airtel (5G/4G) is 25.41 Mbps, BSNL (4G/3G/2G) is 3.13 Mbps, RJIL (5G/4G) is 41.06 Mbps and VIL (4G/2G) is 16.75 Mbps.

Data performance - Hotspots (in Mbps):
Airtel- 4G D/L: 39.90   4G U/L: 10.97
            5G D/L: 175.95   5G U/L: 25.23
BSNL- 4G D/L: 10.70   4G U/L: 7.44
RJIL-   4G D/L: 61.04   4G U/L: 16.31
            5G D/L: 267.29   5G U/L: 48.15
VIL-   4G D/L: 54.99   4G U/L: 19.99

Note- "D/L" Download speed, "U/L" Upload speed

QoS Performance Analysis- UP East LSA

3. QoS performance analysis- LSA level

3.1 Overview

This section provides summary of overall QoS performance of the telecom service provider's network in the LSA by aggregating the results of drive tests conducted in the LSA during the month of March-2025 covering city, hotspot, walk test and railway. (refer table 1)

3.2 Voice performance

(a) Voice Call Performance in 3G/2G network mode only: 3G/2G network mode testing has been done to reflect experience for respective users as they have only 3G/2G compatible handsets.

Parameters	Service Provider		
	3G/2G network mode only		
	AIRTEL	BSNL	VIL
Call Attempts	409	475	462
Call Setup Success Rate %	98.78	96.00	98.27
Drop Call Rate %	0.25	1.54	0.22
Call Setup Time-Average (Second)	19.64	3.26	4.65
Handover Success Rate %	99.54	100.00	98.00

Table-3: Summary of voice call performance in 3G/2G network mode only.
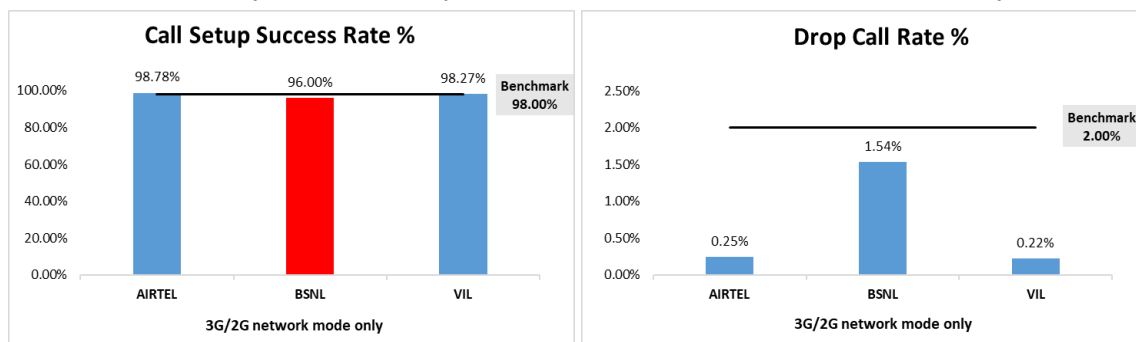
Figure-2: Call setup success rate and drop call rate performance.

Number of unique cell id's covered in Voice test- Technology wise			
Technology	Service Provider		
	3G/2G network mode only		
	AIRTEL	BSNL	VIL
3G	NA	96	NA
2G	586	35	494

Table-4: Technology wise number of network cell id's latched during drive test.

> **Note**-
> * RJIL does not have 3G/2G network.
> * NA- Service provider doesn't provide services in respective technology.

(b) Voice Call Performance in auto network selection mode (5G/4G/3G/2G)

Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempts	604	723	690	682
Call Setup Success Rate %	99.01	88.93	99.28	99.71
Drop Call Rate %	0.00	1.85	0.15	0.15
Call Setup Time-Average (Second)	22.22	3.77	0.67	0.74
Handover Success Rate %	99.98	99.86	100.00	100.00

Table-5: Summary of voice call performance in network auto-selection mode.
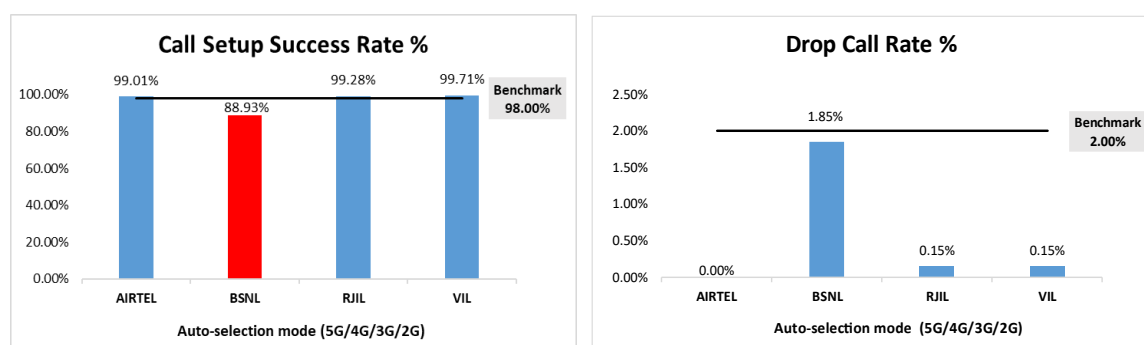
Figure-3: Performance for call setup success rate and drop call rate.

Parameter	Service Provider			
	Mobile-to-Mobile (5G/4G - Open Mode)			
	AIRTEL	BSNL	RJIL	VIL
Call Established (within service provider Network)	398	452	478	469
Number of silence call for >4 Sec	0	NA	6	9
Silence Call Rate %	0.00	NA	1.26	1.92
Number of silence instances for >4 Sec	0	NA	10	10
Number of silence instances for >3 Sec	1	NA	13	18
Number of silence instances for >2 sec	7	NA	27	44
RTP Jitter (4G & 5G) in ms	3.45	NA	16.02	14.15
Packet loss Rate Downlink %	0.34	NA	0.96	0.78
Packet loss Rate Uplink %	0.58	NA	1.22	0.94

Table-6: Summary of silence instances & packet loss rate for mobile to mobile call.

> **Note-**
> - NA- Due to unavailability of packet switched (VoLTE & VoNR) network in BSNL, silence instances are not captured.

Number of unique cell id's covered in Voice test- Technology wise				
Technology	Service Provider			
	Auto Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
5G	0	NA	978	NA
4G	2322	268	1109	1068
3G	NA	94	NA	NA
2G	0	337	NA	29

Table-7: Technology wise number of network cell id's latched during drive test.

Note-
- NA- Service provider doesn't provide services on respective technology.

(c) Mean Opinion Score (MOS) performance for speech quality:

Mean opinion score indicates quality of speech observed during the drive test across different technologies. This parameter has been calculated for mobile-to-mobile calls made within same operator network in auto mode (5G/4G/3G/2G). As per ITU-T Recommendation P.863.1, MOS score values means: 5-Excellent, 4-Good, 3-Fair, 2-Poor, 1-Bad.

Speech Quality (MOS) distribution	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
Total Number of MOS Samples for calls in table-6	2356	1787	2753	2796
Speech Quality (Average MOS Score)	3.96	2.31	3.80	4.37
Number of samples with MOS >=4 to <5 (Excellent)	1924	0	1685	2285
Number of samples with MOS >=3 to <4 (Good)	314	0	840	365
Number of samples with MOS >=2 to <3 (Fair)	85	1414	143	107
Number of samples with MOS >=1 to <2 (Poor)	33	373	85	39
%age of samples with MOS >=4 to <5 (Excellent)	81.66%	0.00%	61.21%	81.72%
%age of samples with MOS >=3 to <4 (Good)	13.33%	0.00%	30.51%	13.05%
%age of samples with MOS >=2 to <3 (Fair)	3.61%	79.13%	5.19%	3.83%
%age of samples with MOS >=1 to <2 (Poor)	1.40%	20.87%	3.09%	1.39%

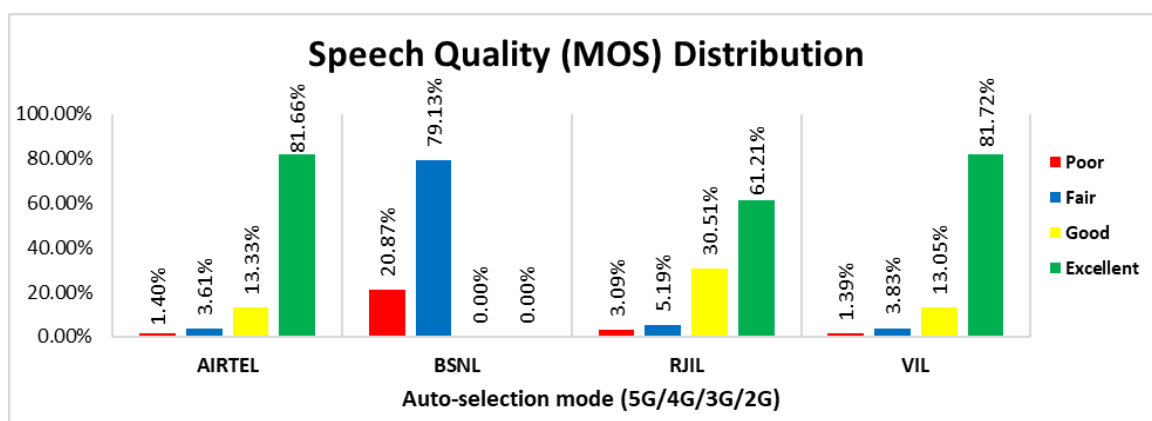**Table-8:** Summary of speech quality (MOS) samples.

Figure- 4: Distribution of samples in MOS score range.

3.3 Data performance

(a) Data Parameters (Auto-selection mode- 5G/4G/3G/2G)

Parameters		Service Provider			
		Auto-selection mode (5G/4G/3G/2G)			
		AIRTEL	BSNL	RJIL	VIL
Download Throughput (Mbits/s)	Average	110.65	4.53	279.44	43.39
	80th Percentile	155.36	6.86	432.39	68.54
	20th Percentile	47.33	0.65	103.62	16.40
Upload Throughput (Mbits/s)	Average	25.41	3.13	41.06	16.75
	80th Percentile	45.01	3.19	69.78	28.35
	20th Percentile	6.43	1.51	9.89	5.33
Latency (ms)	50th Percentile	36.10	35.40	25.50	30.55

Table-9: Summary of data performance in network auto-selection mode.
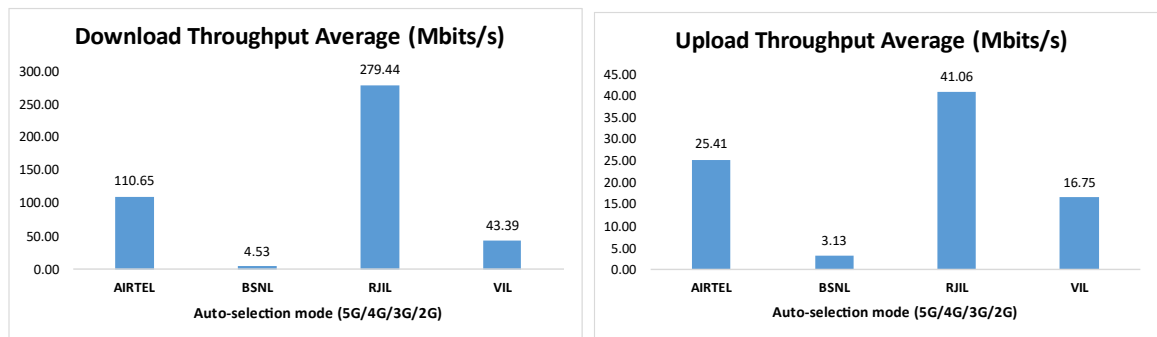
Figure- 5: Download and upload throughput.

Number of unique cell id's covered in Data test- Technology wise				
Technology	Service Provider			
	Auto-selection mode 5G/4G/3G/2G			
	AIRTEL	BSNL	RJIL	VIL
5G	0	NA	1152	NA
4G	2542	283	206	1059
3G	NA	108	NA	NA
2G	0	9	NA	35

Table-10: Technology wise number of network cell id's latched during drive test.

Note-
- NA**-** Service provider doesn't provide services in respective technology.

Detailed QoS Performance Analysis

4. Detailed QoS performance analysis

4.1 Overview

This section covers analysis on performance of various categories of drives like city, hotspots, walk test and railway for all telecom service providers, the results of drive tests conducted are shown individually for respective areas/locations.

4.2 City

Drive test has been conducted from 4th March 2025 to 6th March 2025 in Prayagraj. (refer table-1)

4.2.1 Drive test route

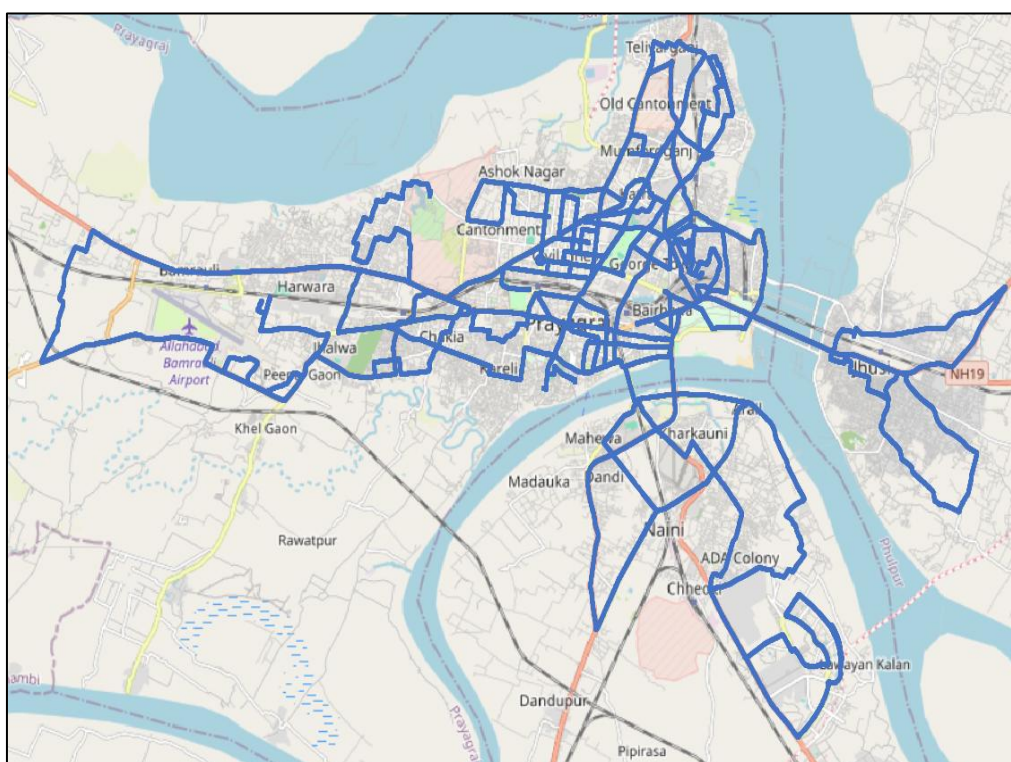**Figure- 6:** Drive test routes.

4.2.2 Areas covered

Civil Lines, Mamfordganj, Chakia, Jhusi, Ashok Nagar, George Town, Katra, Teliarganj, Kareli, Jhalwa, Mahewa, Naini, Chheoki etc.

4.2.3 Voice performance

(a) Voice Call Performance in 3G/2G network mode only: 3G/2G network mode testing has been done to reflect experience for respective users as they have only 3G/2G compatible handsets.

Parameters	Service Provider 3G/2G network mode only		
	AIRTEL	BSNL	VIL
Call Attempts	409	475	462
Call Setup Success Rate %	98.78	96.00	98.27
Drop Call Rate %	0.25	1.54	0.22
Call Setup Time-Average (Second)	19.64	3.26	4.65
Handover Success Rate %	99.54	100.00	98.00

Table-11: Summary of voice call performance in 3G/2G network mode only.
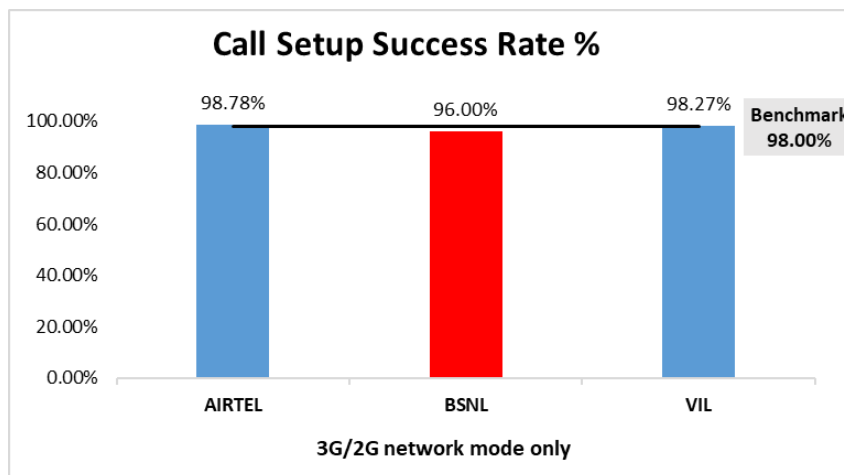
Figure-7: Performance for call setup success rate.
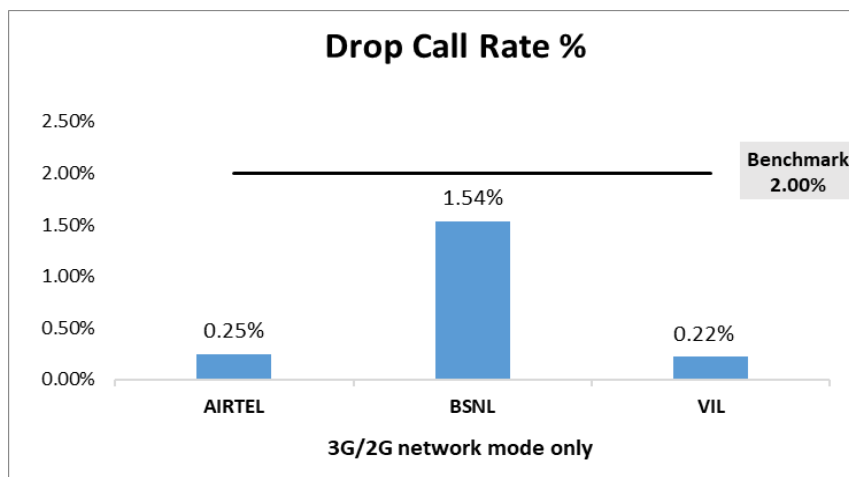
Figure-8: Performance for drop call rate.

(b) Network Technology: This section represents time spent on various network technologies.

Technology	Service Provider		
	AIRTEL	BSNL	VIL
3G	NA	95.01%	NA
2G	99.98%	4.97%	99.96%
Limited Service	0.02%	0.02%	0.04%

Table-12: Time spent on technology during drive test 3G/2G network mode only.
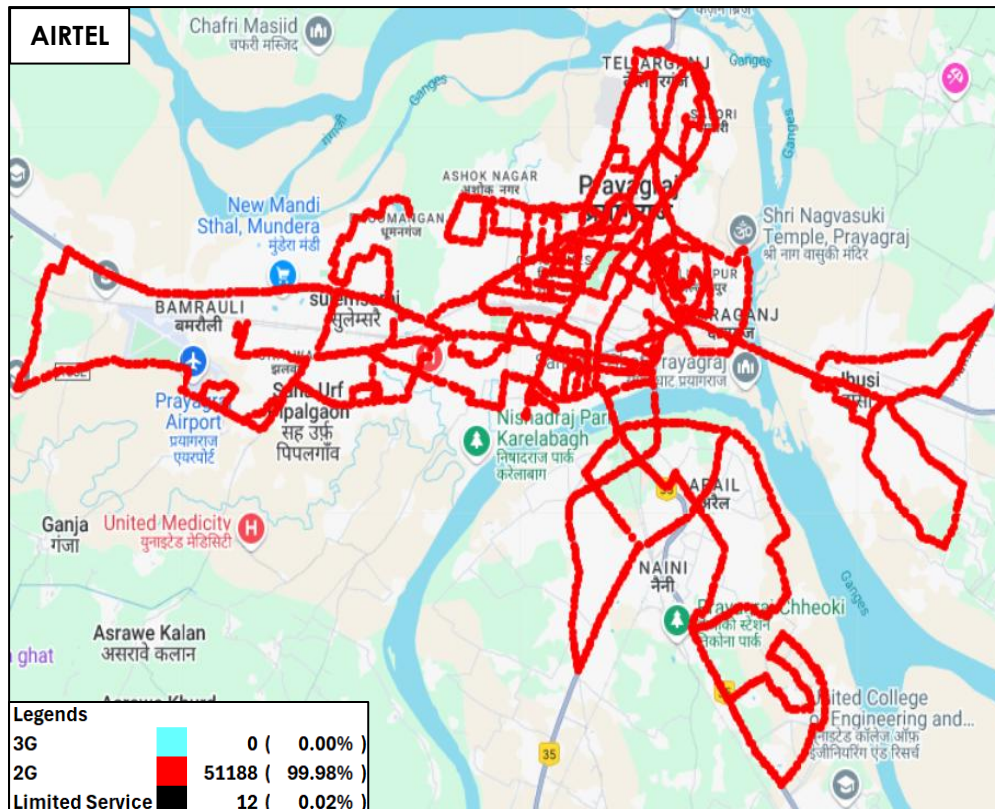
Figure-9: Serving technology plots 3G/2G network mode – AIRTEL.
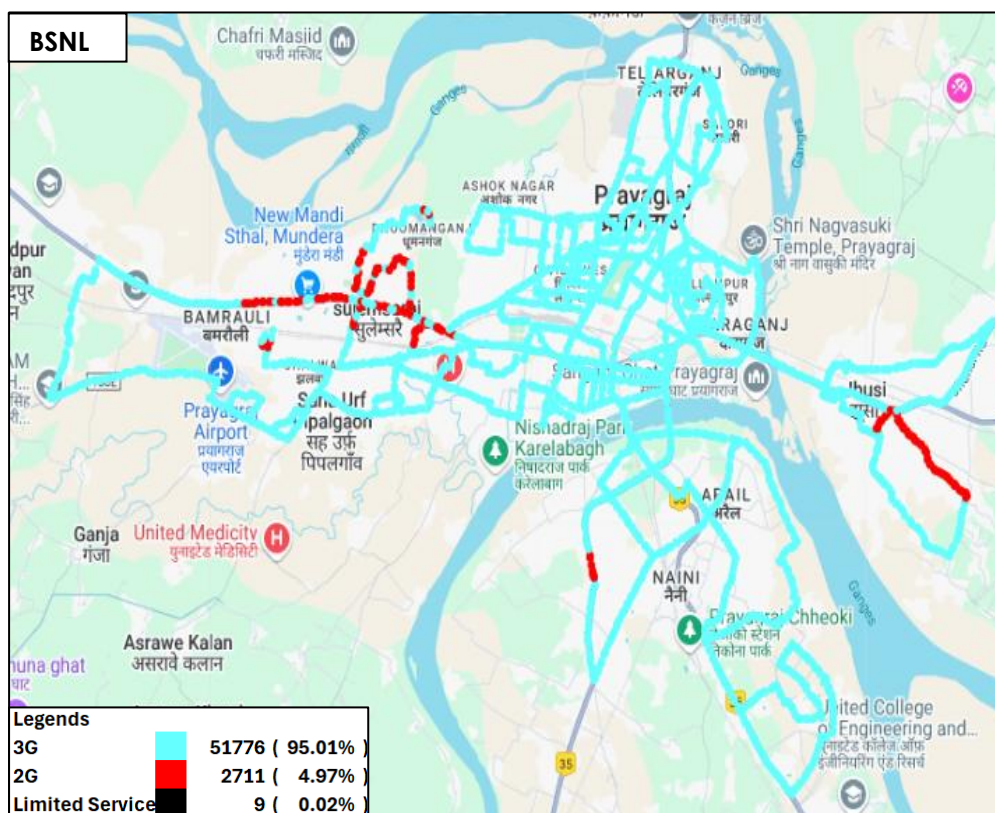
Figure-10: Serving technology plots 3G/2G network mode – BSNL.
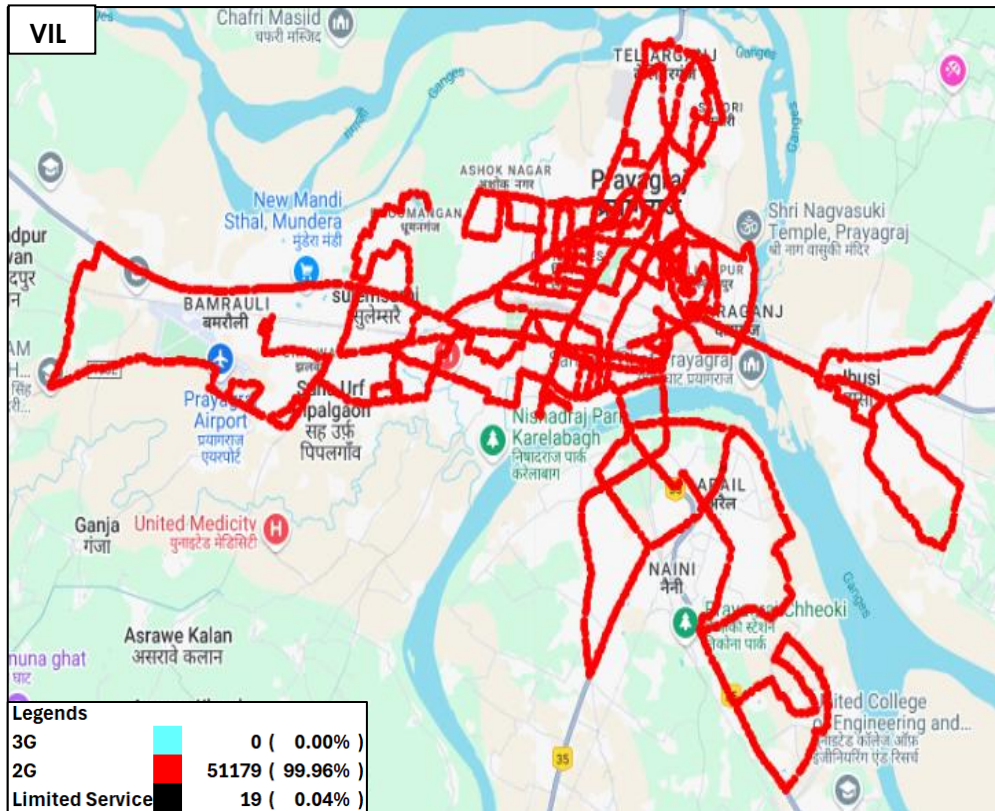
Figure-11: Serving technology plots 3G/2G network mode –VIL.

(c) Network Signal Strength distribution: The following chart represents signal strength distribution for 3G/2G network mode only. (refer figure-35, 36 & 37 for map view)
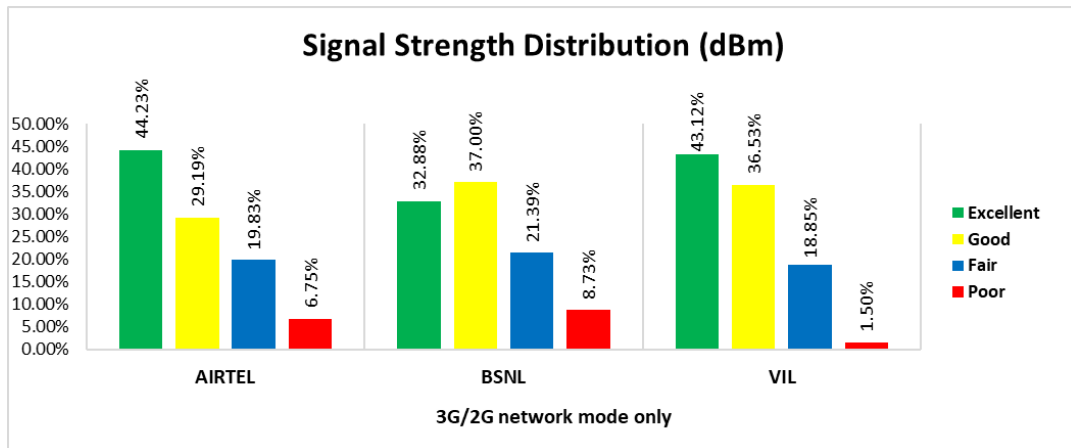
Figure-12: Signal strength distribution 3G/2G network mode only.

Observations:

- Airtel has 44% of samples falling in the excellent signal strength category.
- BSNL has 33% of samples falling in the excellent signal strength category.
- VIL has 43% of samples falling in the excellent signal strength category.

(d) Voice Call Performance in auto network selection mode (5G/4G/3G/2G)

Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempts	417	478	497	487
Call Setup Success Rate %	98.80	97.07	98.99	100.00
Drop Call Rate %	0.00	1.29	0.20	0.00
Call Setup Time Average (Second)	22.17	3.81	0.67	0.66
Handover Success Rate %	100.00	99.85	100.00	100.00

Table-13: Summary of voice call performance in network auto-selection mode.

Figure-13: Performance for call setup success rate.

Figure-14: Performance for drop call rate.

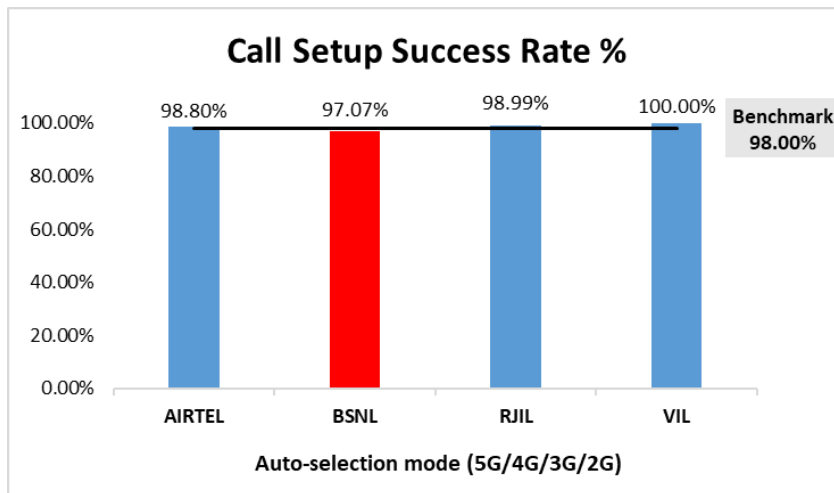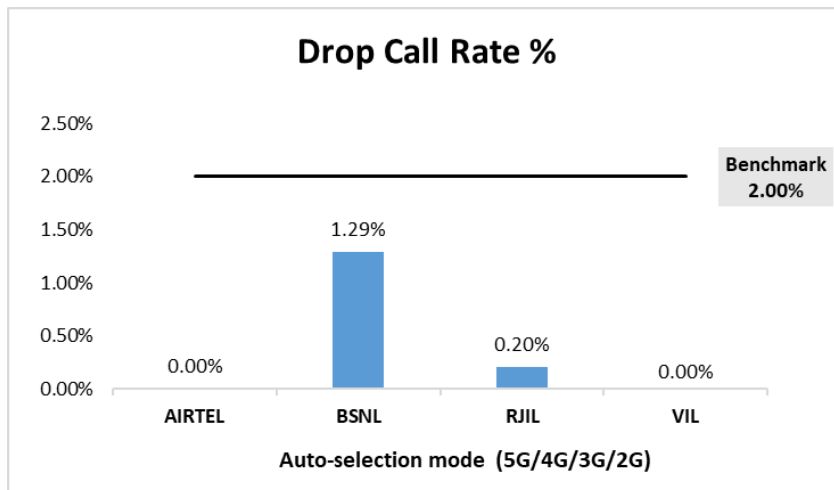| Parameter	Service Provider Mobile-to-Mobile (5G/4G - Open Mode)			
	AIRTEL	BSNL	RJIL	VIL
Call Established (within service provider Network)	398	452	478	469
Number of silence call for >4 Sec	0	NA	6	9
Silence Call Rate %	0.00	NA	1.26	1.92
Number of silence instances for >4 Sec	0	NA	10	10
Number of silence instances for >3 Sec	1	NA	13	18
Number of silence instances for >2 sec	7	NA	27	44
RTP Jitter (4G & 5G) in ms	3.45	NA	16.02	14.15
Packet loss Rate Downlink %	0.34	NA	0.96	0.78
Packet loss Rate Uplink %	0.58	NA	1.22	0.94

Table-14: Summary of silence instances & packet loss rate for mobile to mobile call.

> **Note**-
> • NA- Due to unavailability of packet switched (VoLTE & VoNR) network in BSNL silence instances are not captured.

(e) Mean Opinion Score (MOS) performance for speech quality:

Mean opinion score indicate quality of speech observed during the drive test across different technologies. This parameter has been calculated for mobile to mobile calls made within same operator network in auto mode (5G/4G/3G/2G). As per ITU-T Recommendation P.863.1, MOS score values means: 5-Excellent, 4-Good, 3-Fair, 2-Poor, 1-Bad.

Speech Quality (MOS) distribution	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
Total Number of MOS Samples for calls in table-6	2356	1787	2753	2796
Speech Quality (Average MOS Score)	3.96	2.31	3.80	4.37
Number of samples with MOS >=4 to <5 (Excellent)	1924	0	1685	2285
Number of samples with MOS >=3 to <4 (Good)	314	0	840	365
Number of samples with MOS >=2 to <3 (Fair)	85	1414	143	107
Number of samples with MOS >=1 to <2 (Poor)	33	373	85	39
%age of samples with MOS >=4 to <5 (Excellent)	81.66%	0.00%	61.21%	81.72%
%age of samples with MOS >=3 to <4 (Good)	13.33%	0.00%	30.51%	13.05%
%age of samples with MOS >=2 to <3 (Fair)	3.61%	79.13%	5.19%	3.83%
%age of samples with MOS >=1 to <2 (Poor)	1.40%	20.87%	3.09%	1.39%

Table-15: Summary of speech quality (MOS) samples.
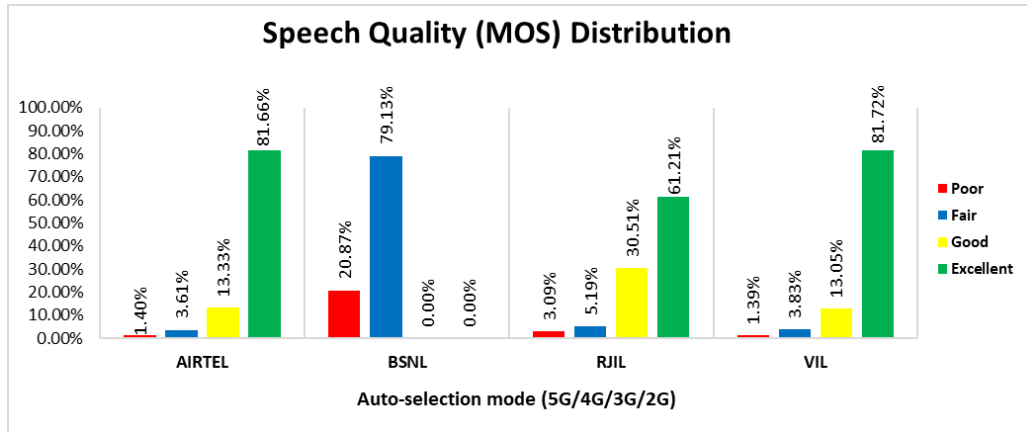
Figure-15: Distribution of samples in MOS score range.

(f) Network Technology: This section represents time spent on various network technologies.

Technology	Service Provider			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	13.88%	NA	71.13%	NA
4G	86.12%	10.15%	28.86%	99.92%
3G	NA	48.00%	NA	NA
2G	0.00%	41.76%	NA	0.08%
Limited Service	0.00%	0.09%	0.01%	0.00%

Table-16: Time spent on technology during drive test.

> **Note**-
> - NA- Service provider doesn't provide services in respective technology.
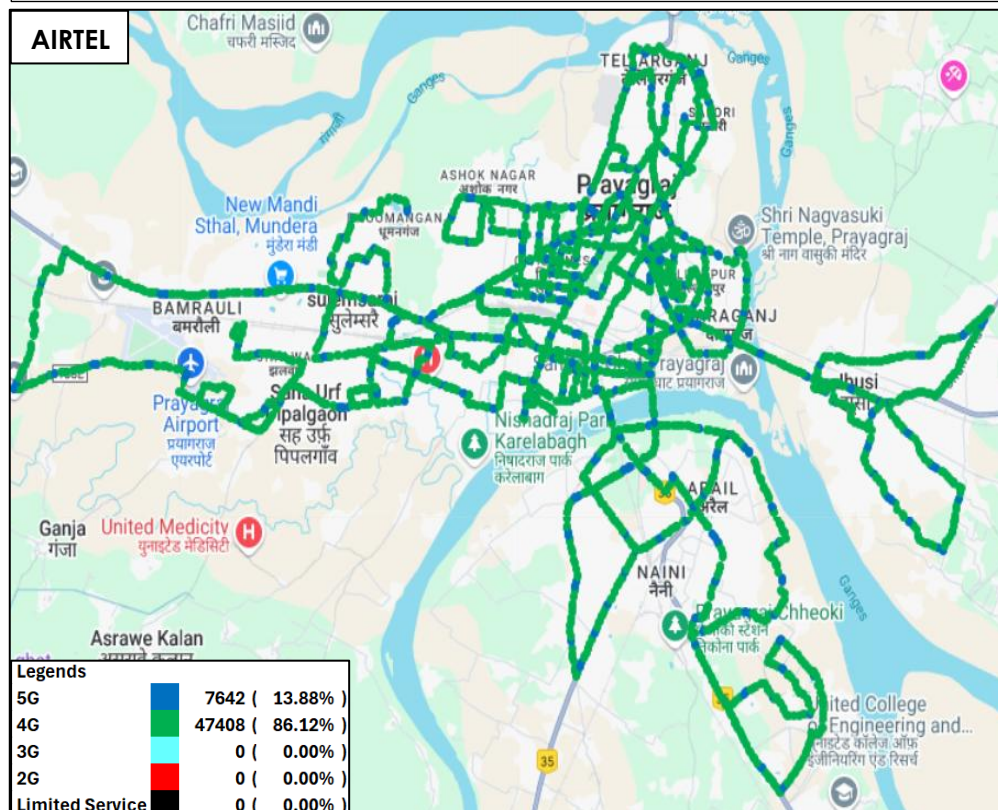
Figure-16: Serving technology plots in auto-selection mode (5G/4G/3G/2G) –AIRTEL.
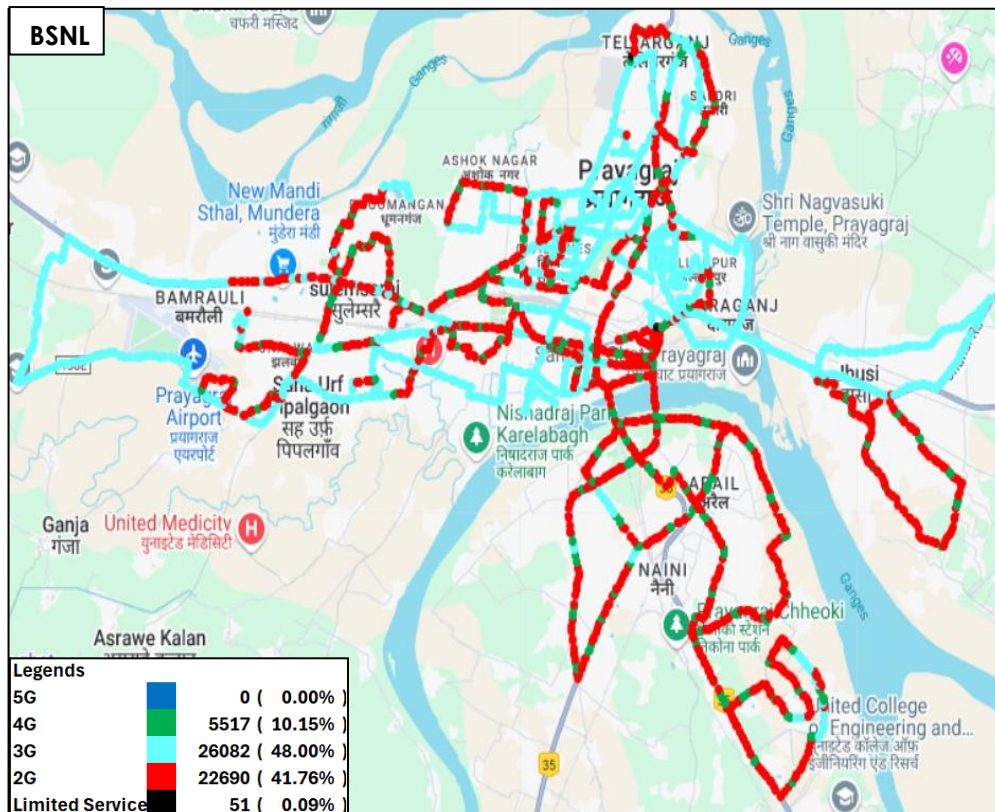
Figure-17: Serving technology plots in auto-selection mode (5G/4G/3G/2G) –BSNL.
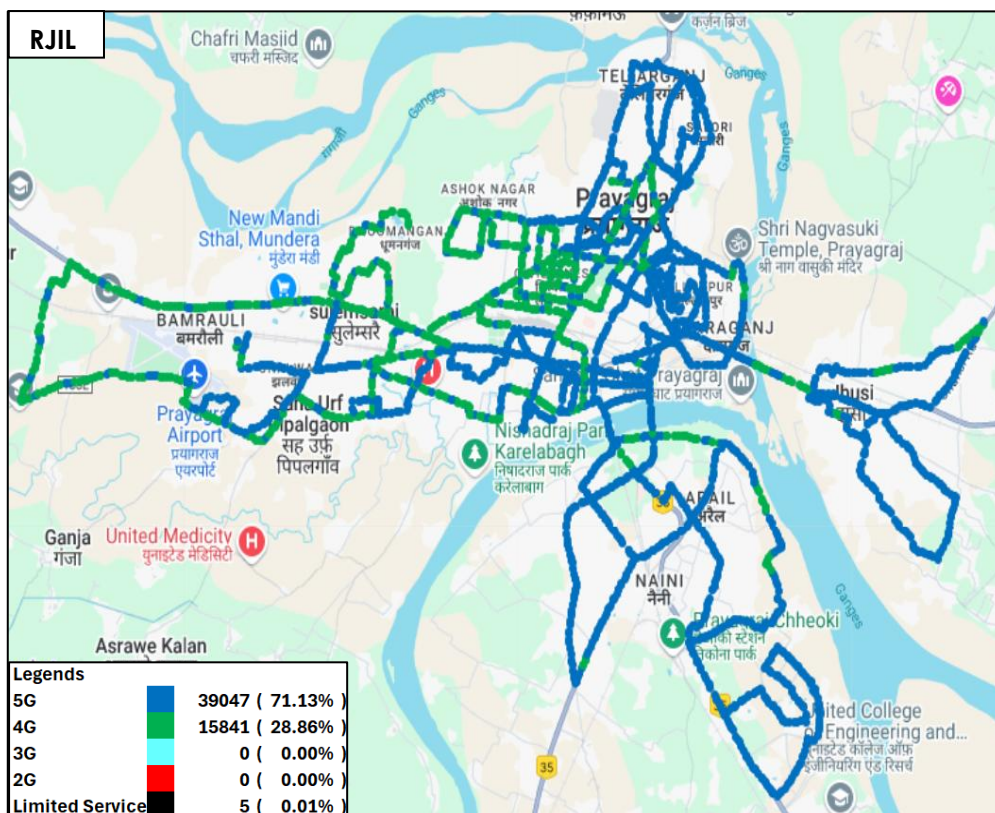
Figure-18: Serving technology plots in auto-selection mode (5G/4G/3G/2G)- RJIL.
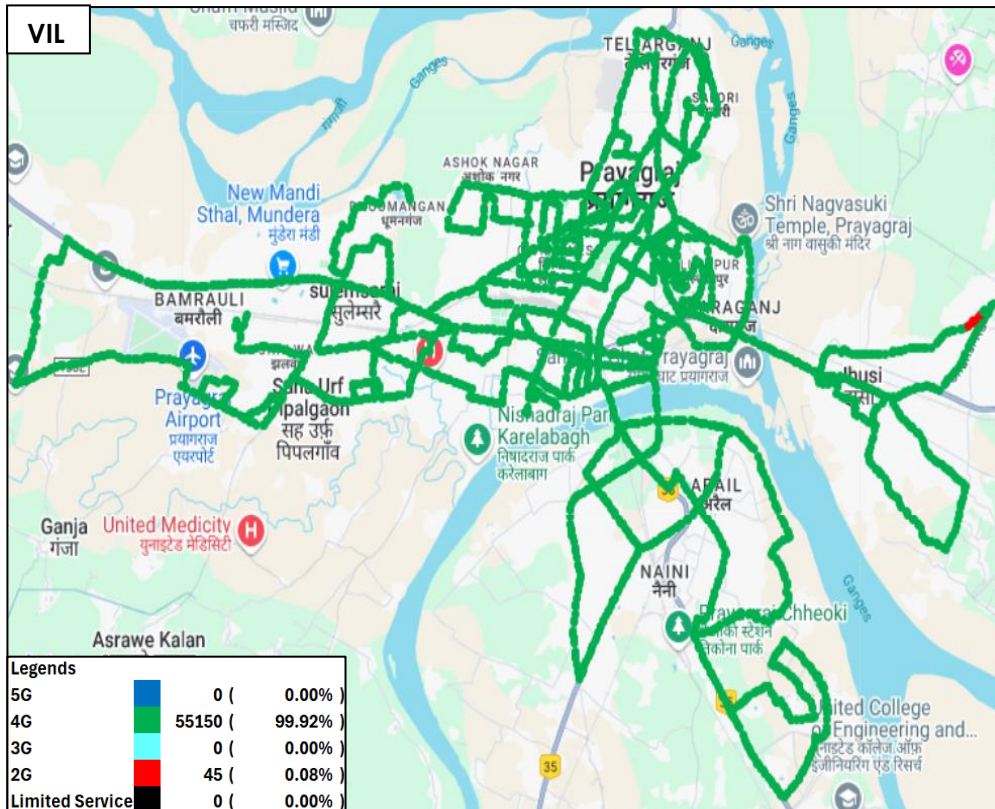
Figure-19: Serving technology plots in auto-selection mode (5G/4G/3G/2G) – VIL.

(g) Network Signal Strength distribution: The following chart provide signal strength distribution for auto-selection mode (5G/4G/3G/2G). (refer figure-38, 39, 40 & 41 for map view)
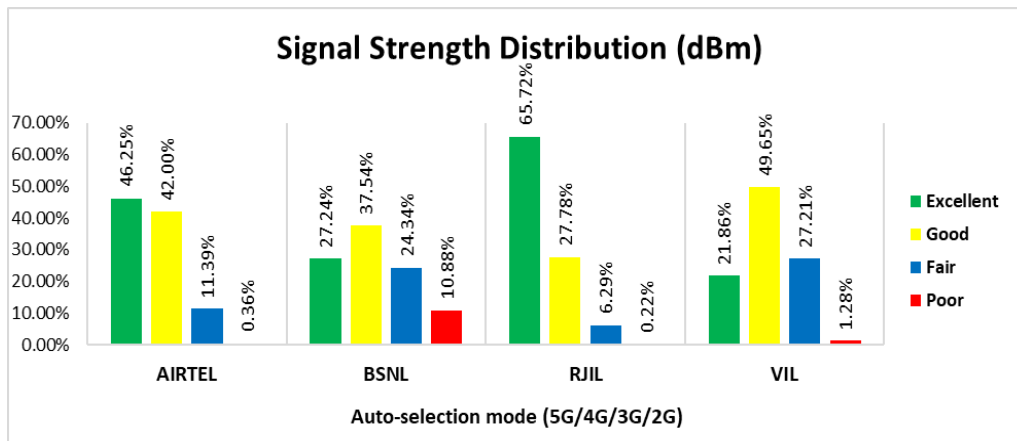
Figure–20: Signal strength distribution auto-selection mode 5G/4G/3G/2G.

Observations:

- Airtel has 46% of samples falling in the excellent signal strength category.
- BSNL has 27% of samples falling in the excellent signal strength category.
- RJIL has 66% of samples falling in the excellent signal strength category.
- VIL has 22% of samples falling in the excellent signal strength category.

4.2.4 Data performance

(a) Data Parameters (Auto-selection mode- 5G/4G/3G/2G)

Parameters		Service Provider			
		Auto-selection mode (5G/4G/3G/2G)			
		AIRTEL	BSNL	RJIL	VIL
Download Throughput (Mbits/s)	Average	120.96	3.41	318.42	47.41
	80th Percentile	163.34	5.11	475.05	71.37
	20th Percentile	64.77	0.55	159.21	18.59
Upload Throughput (Mbits/s)	Average	28.58	2.80	45.72	18.31
	80th Percentile	46.63	2.77	71.15	29.20
	20th Percentile	10.99	1.53	17.06	6.93
Latency (ms)	50th Percentile	37.20	41.98	26.95	30.65

Table-17: Summary of Data performance in network auto-selection mode.
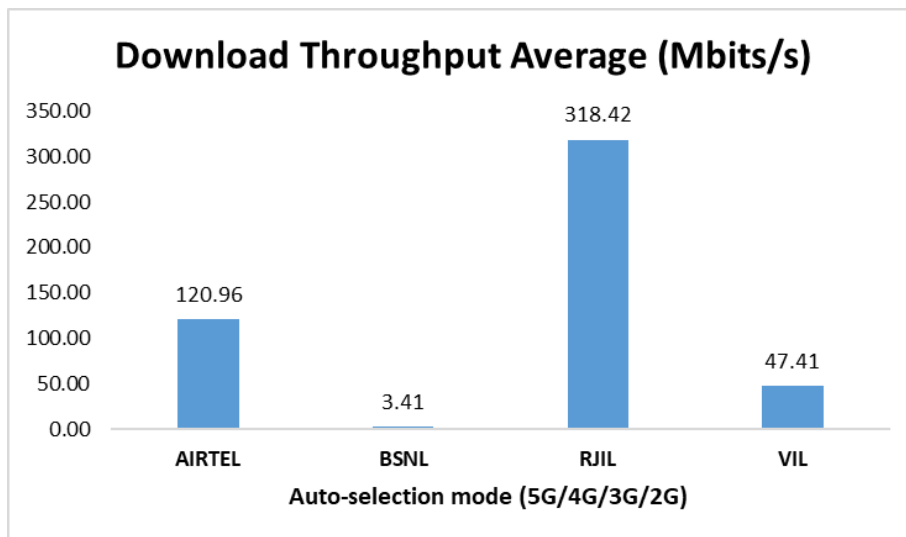
Figure- 21: Download throughput.
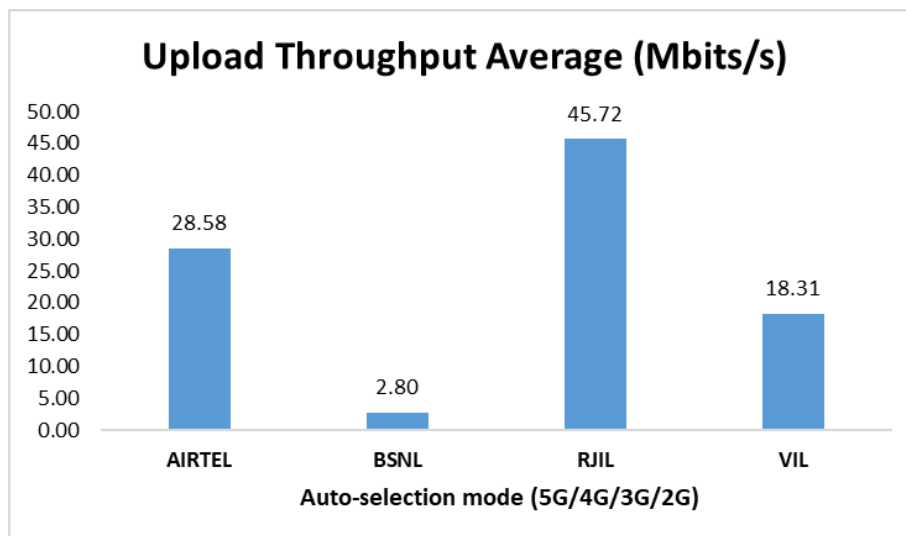
Figure- 22: Upload throughput.

4.3 Hotspots

Hotspot testing has been done on 6th March 2025 and 7th March 2025. Ten locations have been tested in the city.

4.3.1 Locations

Figure- 23: Hotspot locations

4.3.2 Hotspot covered

1. Laxmi Talkies Chauraha
2. Civil Line Bus Stand
3. George Town Anand Bhawan
4. High Court
5. IIIT
6. Lete Hanuman Triveni Sangam
7. Medical Chowk Swaroop Rani
8. Prayagraj Airport
9. Prayagraj Railway Station
10. Teliarganj

4.3.3 Voice performance

Overall Voice Performance				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	100	100	100	100
Call Setup Success Rate %	100.00	95.00	100.00	100.00
Drop Call Rate %	0.00	1.33	0.00	0.00
Call Setup Time-Average (Sec)	22.17	4.14	0.59	0.65

Table-18: Overall summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

Laxmi Talkies Chauraha				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	-	0.00	0.00
Call Setup Time-Average (Sec)	22.24	2.99	0.61	0.62

Table-19: Summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

> **Note**- All calls in BSNL were disconnected after Alerting. Owing to which, no calls were established and drop call rate has not been reported.

Civil Line Bus Stand				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Sec)	22.08	5.00	0.49	0.64

Table-20: Summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

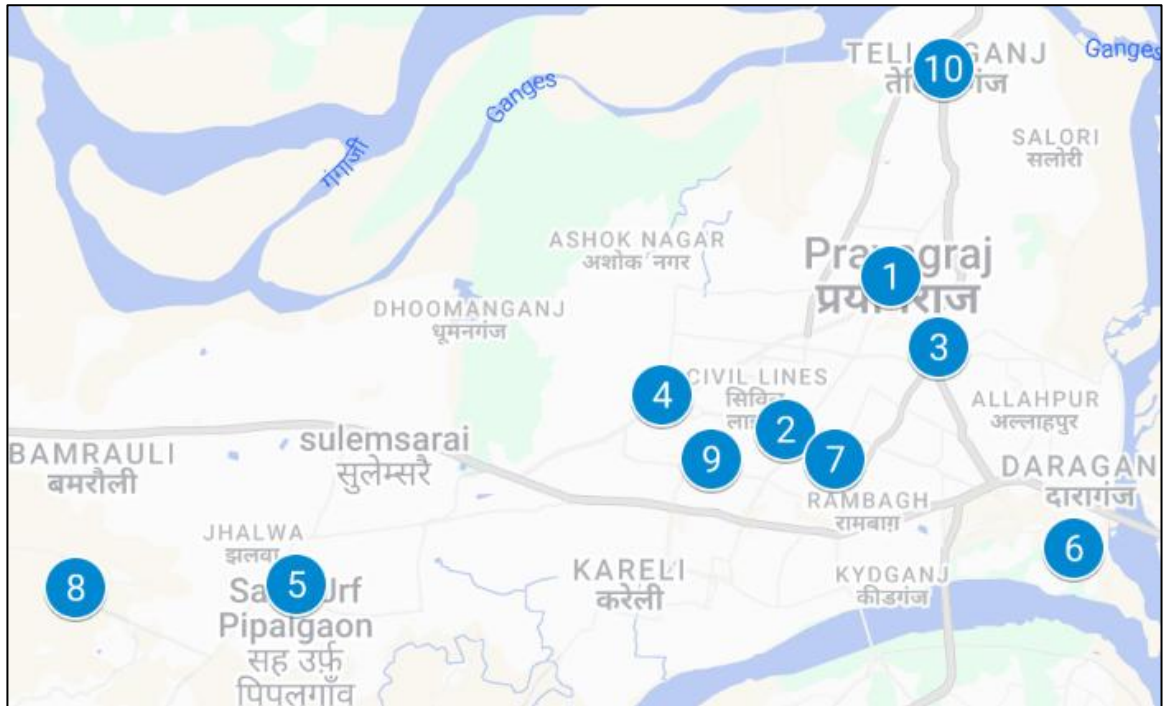| George Town Anand Bhawan				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Sec)	22.16	6.21	0.46	0.72

Table-21: Summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

High Court				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	90.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Sec)	22.11	3.46	0.56	0.62

Table-22: Summary of voice call performance in network auto-selection mode (5G/4G/3G/2G)

IIIT				
	Service Provider			
Parameters	**Auto-selection mode (5G/4G/3G/2G)**			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	70.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Sec)	22.13	5.13	0.61	0.68

Table-23: Summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

Lete Hanuman Triveni Sangam				
	Service Provider			
Parameters	**Auto-selection mode (5G/4G/3G/2G)**			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Sec)	22.22	3.86	0.69	0.60

Table-24: Summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

Medical Chowk Swaroop Rani				
	Service Provider			
Parameters	**Auto-selection mode (5G/4G/3G/2G)**			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Sec)	22.22	3.04	0.70	0.66

Table-25: Summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

Prayagraj Airport				
	Service Provider			
Parameters	**Auto-selection mode (5G/4G/3G/2G)**			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	10.00	0.00	0.00
Call Setup Time-Average (Sec)	22.12	5.32	0.67	0.70

Table-26: Summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

Prayagraj Railway Station				
	Service Provider			
Parameters	**Auto-selection mode (5G/4G/3G/2G)**			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	90.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Sec)	22.29	3.29	0.53	0.63

Table-27: Summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

Teliarganj				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	-	0.00	0.00
Call Setup Time-Average (Sec)	22.18	3.06	0.62	0.65

Table-28: Summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

> **Note**- All calls in BSNL were disconnected after Alerting. Owing to which, no calls were established and drop call rate has not been reported.

4.3.4 Data performance (Auto-selection mode 5G/4G/3G/2G)

Overall Data Performance				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	175.95	12.77	267.29	54.82
Download Throughput 80th Percentile (Mbit/s)	171.29	21.45	394.57	79.70
Download Throughput 20th Percentile (Mbit/s)	90.58	5.48	37.07	35.52
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	25.23	8.49	48.15	22.34
Upload Throughput 80th Percentile (Mbit/s)	41.09	14.01	68.49	33.27
Upload Throughput 20th Percentile (Mbit/s)	10.98	3.37	29.26	11.66
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	4.97	3.53	2.41	5.68
Youtube Initial Buffer Delay (Second)	0.79	1.23	0.75	1.30
Latency (ms)-50th Percentile	35.35	31.25	25.15	30.55
Jitter (ms)	6.86	14.50	6.45	4.12
Packet Loss Rate%	1.15	2.14	0.04	0.75
Packet Loss Rate- 90th percentile	3.50	5.97	0.12	1.63

Table-29: Overall Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Laxmi Talkies Chauraha				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	154.88	11.22	750.59	67.87
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	44.07	5.44	68.15	33.16
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	2.45	4.08	2.46	2.72
Youtube Initial Buffer Delay (Second)	0.66	1.24	0.71	0.82
Latency (ms)-50th Percentile	32.23	29.80	27.43	35.15
Jitter (ms)	5.70	3.16	6.96	7.35
Packet Loss Rate%	0.10	0.30	0.10	2.80

Table-30: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Civil Line Bus Stand				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	32.79	21.33	293.27	28.13
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	53.99	14.13	32.82	10.90
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	8.45	2.68	2.41	6.27
Youtube Initial Buffer Delay (Second)	1.68	0.95	0.70	1.00
Latency (ms)-50th Percentile	32.23	28.80	25.15	31.65
Jitter (ms)	4.52	2.05	6.89	5.20
Packet Loss Rate%	0.50	0.10	0.00	0.30

Table-31: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

George Town Anand Bhawan				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	155.38	6.14	359.53	39.98
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	15.50	4.78	83.58	21.85
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	6.09	3.41	2.22	8.61
Youtube Initial Buffer Delay (Second)	0.66	1.33	0.75	1.74
Latency (ms)-50th Percentile	33.88	31.75	27.80	28.53
Jitter (ms)	4.81	9.50	4.67	2.24
Packet Loss Rate%	0.40	0.90	0.00	0.40

Table-32: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

High Court				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	155.87	6.43	18.73	62.63
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	22.12	3.82	29.72	33.54
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	7.08	4.37	2.28	5.73
Youtube Initial Buffer Delay (Second)	0.57	1.06	0.65	0.73
Latency (ms)-50th Percentile	33.60	34.13	21.15	30.05
Jitter (ms)	4.08	4.66	7.04	2.36
Packet Loss Rate%	0.00	0.60	0.00	0.20

Table-33: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

IIIT				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	116.32	19.22	272.25	39.37
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	11.23	13.87	48.11	12.27
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	2.53	3.14	2.41	6.91
Youtube Initial Buffer Delay (Second)	0.63	1.08	0.62	2.74
Latency (ms)-50th Percentile	38.90	29.00	27.88	27.60
Jitter (ms)	16.21	3.43	7.99	5.44
Packet Loss Rate%	3.10	0.10	0.00	0.70

Table-34: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Lete Hanuman Triveni Sangam				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	655.05	20.18	239.61	7.89
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	9.83	19.52	27.25	4.41
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	7.46	2.47	2.36	8.46
Youtube Initial Buffer Delay (Second)	0.84	1.26	0.80	1.18
Latency (ms)-50th Percentile	34.03	29.00	27.45	30.00
Jitter (ms)	4.21	3.46	9.54	3.43
Packet Loss Rate%	0.00	0.40	0.30	0.30

Table-35: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Medical Chowk Swaroop Rani				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	115.42	10.72	37.70	66.28
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	36.70	4.48	37.52	33.14
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	6.29	3.50	2.52	2.82
Youtube Initial Buffer Delay (Second)	0.61	1.08	0.80	0.85
Latency (ms)-50th Percentile	34.13	32.10	28.23	34.50
Jitter (ms)	3.08	3.84	6.32	5.65
Packet Loss Rate%	0.10	0.80	0.00	1.50

Table-36: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Prayagraj Airport				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	84.85	2.28	392.61	71.90
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	5.57	1.64	52.80	19.21
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	2.88	5.79	2.44	7.57
Youtube Initial Buffer Delay (Second)	1.00	2.92	0.89	0.74
Latency (ms)-50th Percentile	50.50	31.45	27.65	27.90
Jitter (ms)	17.87	7.51	5.83	3.01
Packet Loss Rate%	7.10	12.00	0.00	0.20

Table-37: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Prayagraj Railway Station				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	167.76	25.07	65.57	88.27
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	24.08	7.30	28.78	25.02
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	3.98	2.75	2.36	4.55
Youtube Initial Buffer Delay (Second)	0.60	0.78	0.81	2.14
Latency (ms)-50th Percentile	34.50	31.10	17.38	27.45
Jitter (ms)	4.00	10.44	5.26	2.33
Packet Loss Rate%	0.00	0.90	0.00	0.20

Table-38: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Teliarganj				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	121.18	5.15	243.10	75.87
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	29.19	9.86	72.73	29.89
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	2.53	3.72	2.66	3.19
Youtube Initial Buffer Delay (Second)	0.69	1.66	0.82	1.03
Latency (ms)-50th Percentile	37.20	35.00	27.48	36.55
Jitter (ms)	4.15	99.76	3.99	4.24
Packet Loss Rate%	0.20	5.30	0.00	0.90

Table-39: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

4.3.5 Data performance (5G Only & 4G Only Download & Upload Speed)

		Overall Data Performance			
	Parameters	**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	Download Throughput Average (Mbits/s)	175.95	-	267.29	-
	Upload Throughput Average (Mbits/s)	25.23	-	48.15	-
4G	Download Throughput Average (Mbits/s)	39.90	10.70	61.04	54.99
	Upload Throughput Average (Mbits/s)	10.97	7.44	16.31	19.99

Table-40: Overall Summary of 5G only & 4G only data download & upload speed.

Note- "-"Respective technology was not observed during the test.

		Laxmi Talkies Chauraha			
	Parameters	**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	Download Throughput Average (Mbits/s)	154.88	-	750.59	-
	Upload Throughput Average (Mbits/s)	44.07	-	68.15	-
4G	Download Throughput Average (Mbits/s)	47.22	5.70	45.20	62.24
	Upload Throughput Average (Mbits/s)	20.73	4.28	15.71	34.32

Table-41: Summary of data download & upload speed 5G only & 4G only.

Note- "-"Respective technology was not observed during the test.

		Civil Line Bus Stand			
	Parameters	**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	Download Throughput Average (Mbits/s)	32.79	-	293.27	-
	Upload Throughput Average (Mbits/s)	53.99	-	32.82	-
4G	Download Throughput Average (Mbits/s)	60.98	20.16	60.39	24.50
	Upload Throughput Average (Mbits/s)	24.09	14.07	16.09	8.62

Table-42: Summary of 5G only & 4G only data download & upload speed.

Note- "-"Respective technology was not observed during the test.

		George Town Anand Bhawan			
	Parameters	**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	Download Throughput Average (Mbits/s)	155.38	-	359.53	-
	Upload Throughput Average (Mbits/s)	15.50	-	83.58	-
4G	Download Throughput Average (Mbits/s)	56.87	5.66	26.91	54.00
	Upload Throughput Average (Mbits/s)	6.00	17.08	20.32	17.10

Table-43: Summary of 5G only & 4G only data download & upload speed.

Note- "-"Respective technology was not observed during the test.

High Court		AIRTEL	BSNL	RJIL	VIL
	Parameters	**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	Download Throughput Average (Mbits/s)	155.87	-	18.73	-
	Upload Throughput Average (Mbits/s)	22.12	-	29.72	-
4G	Download Throughput Average (Mbits/s)	17.67	7.53	116.32	39.22
	Upload Throughput Average (Mbits/s)	7.47	2.62	21.71	28.72

Table-44: Summary of 5G only & 4G only data download & upload speed.

Note- "-"Respective technology was not observed during the test.

IIIT		AIRTEL	BSNL	RJIL	VIL
	Parameters	**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	Download Throughput Average (Mbits/s)	116.32	-	272.25	-
	Upload Throughput Average (Mbits/s)	11.23	-	48.11	-
4G	Download Throughput Average (Mbits/s)	39.66	7.38	62.18	41.20
	Upload Throughput Average (Mbits/s)	7.95	3.50	17.09	8.17

Table-45: Summary of 5G only & 4G only data download & upload speed.

Note- "-"Respective technology was not observed during the test.

Lete Hanuman Triveni Sangam		AIRTEL	BSNL	RJIL	VIL
	Parameters	**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	Download Throughput Average (Mbits/s)	655.05	-	239.61	-
	Upload Throughput Average (Mbits/s)	9.83	-	27.25	-
4G	Download Throughput Average (Mbits/s)	28.12	16.42	45.02	9.85
	Upload Throughput Average (Mbits/s)	11.32	11.22	10.62	7.83

Table-46: Summary of 5G only & 4G only data download & upload speed.

Note- "-"Respective technology was not observed during the test.

Medical Chowk Swaroop Rani		AIRTEL	BSNL	RJIL	VIL
	Parameters	**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	Download Throughput Average (Mbits/s)	115.42	-	37.70	-
	Upload Throughput Average (Mbits/s)	36.70	-	37.52	-
4G	Download Throughput Average (Mbits/s)	17.34	5.47	44.96	56.55
	Upload Throughput Average (Mbits/s)	5.38	2.14	9.61	32.00

Table-47: Summary of 5G only & 4G only data download & upload speed.

Note- "-"Respective technology was not observed during the test.

Prayagraj Airport		AIRTEL	BSNL	RJIL	VIL
	Parameters	**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	Download Throughput Average (Mbits/s)	84.85	-	392.61	-
	Upload Throughput Average (Mbits/s)	5.57	-	52.80	-
4G	Download Throughput Average (Mbits/s)	44.81	4.27	51.97	78.40
	Upload Throughput Average (Mbits/s)	5.34	1.45	5.42	10.71

Table-48: Summary of 5G only & 4G only data download & upload speed.

Note- "-"Respective technology was not observed during the test.

Prayagraj Railway Station					
Parameters		**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	**Download Throughput Average (Mbits/s)**	167.76	-	65.57	-
	Upload Throughput Average (Mbits/s)	24.08	-	28.78	-
4G	**Download Throughput Average (Mbits/s)**	51.05	25.73	36.14	100.74
	Upload Throughput Average (Mbits/s)	9.84	6.84	19.45	24.77

Table-49: Summary of 5G only & 4G only data download & upload speed.

Note- "-"Respective technology was not observed during the test.

Teliarganj					
Parameters		**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	**Download Throughput Average (Mbits/s)**	121.18	-	243.10	-
	Upload Throughput Average (Mbits/s)	29.19	-	72.73	-
4G	**Download Throughput Average (Mbits/s)**	35.28	4.68	121.30	83.23
	Upload Throughput Average (Mbits/s)	11.63	8.07	27.05	27.64

Table-50: Summary of 5G only & 4G only data download & upload speed.

Note- "-"Respective technology was not observed during the test.

4.4 Walk Test

Walk Test has been conducted on 7th March 2025. One location has been tested in the city.

4.4.1 Drive test route
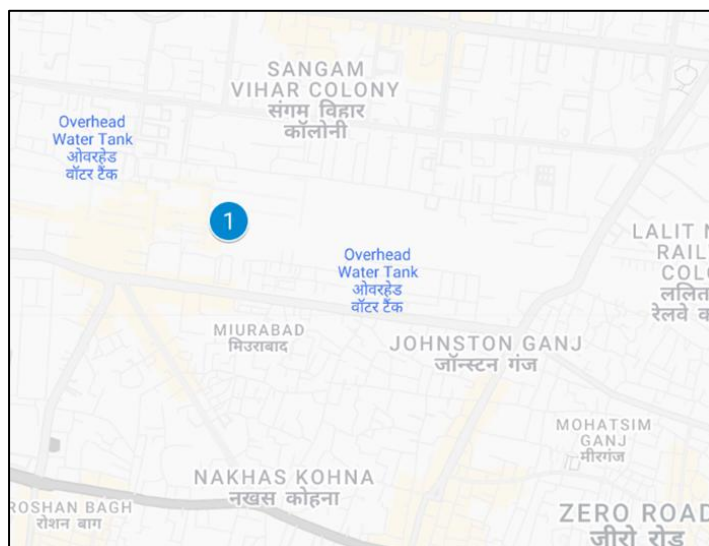
Figure-24: Walk Test location.

4.4.2 Walk Test Covered

- Prayagraj Railway Station

4.4.3 Voice Performance

Prayagraj Railway Station				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	24	27	28	28
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	22.14	3.89	0.61	0.59

Table-51: Summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

4.4.4 Data Performance

(a) Data Parameters (Auto-selection mode- 5G/4G/3G/2G)

Prayagraj Railway Staion				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	102.66	12.92	321.99	28.60
Download Session Setup Success Rate %	100.00	96.97	100.00	100.00
Upload Throughput Average (Mbits/s)	39.03	3.53	69.74	12.90
Upload Session Setup Success Rate %	100.00	93.94	100.00	100.00
Latency (ms) - 50th Percentile	33.05	24.10	25.55	27.50

Table-52: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G)

4.5 Railways

Drive test has been conducted on 8th March 2025 covering one railway route. (refer table-1)

4.5.1 Drive test route
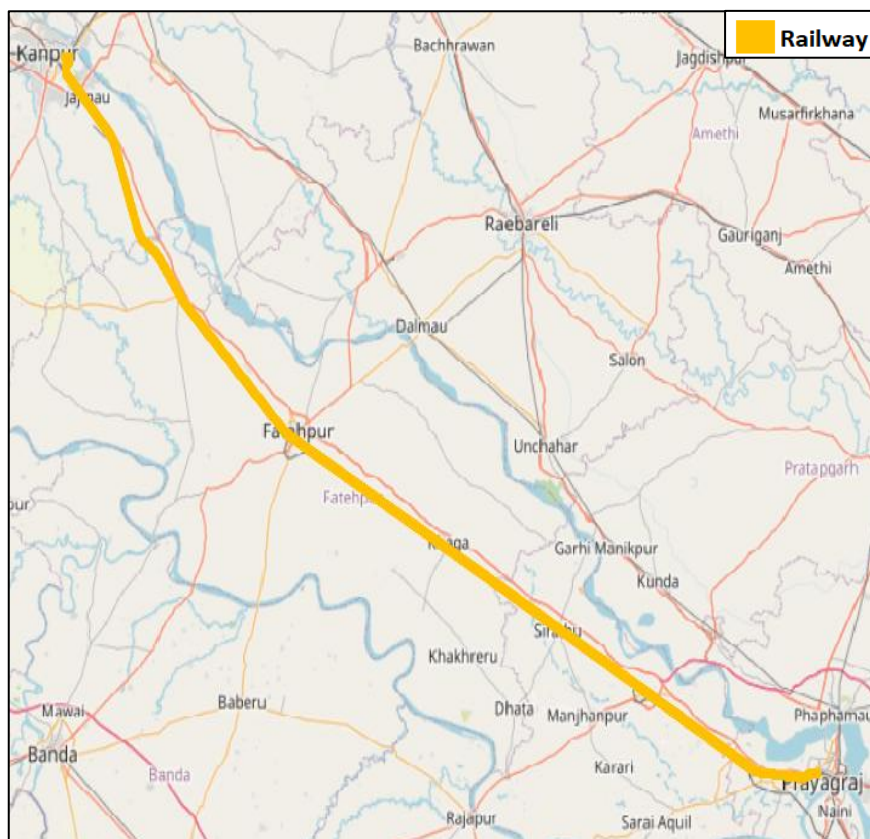
Figure-25: Drive test railway route

4.5.2 Route Covered

1. Prayagraj to Kanpur.

4.5.3 Voice performance

(a) Voice Call Performance in auto network selection mode (5G/4G/3G/2G)

Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempts	63	118	65	67
Call Setup Success Rate %	98.41	48.31	100.00	97.01
Drop Call Rate %	0.00	10.53	0.00	1.54
Call Setup Time-Average (Second)	22.68	3.28	0.80	1.49
Handover Success Rate %	99.94	99.82	100.00	100.00

Table-53: Summary of voice call performance in network auto-selection mode
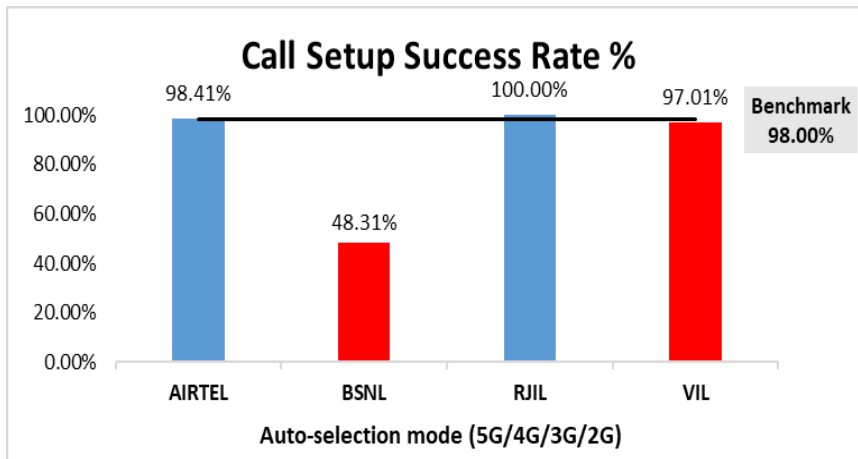
Figure-26: Performance for call setup success rate
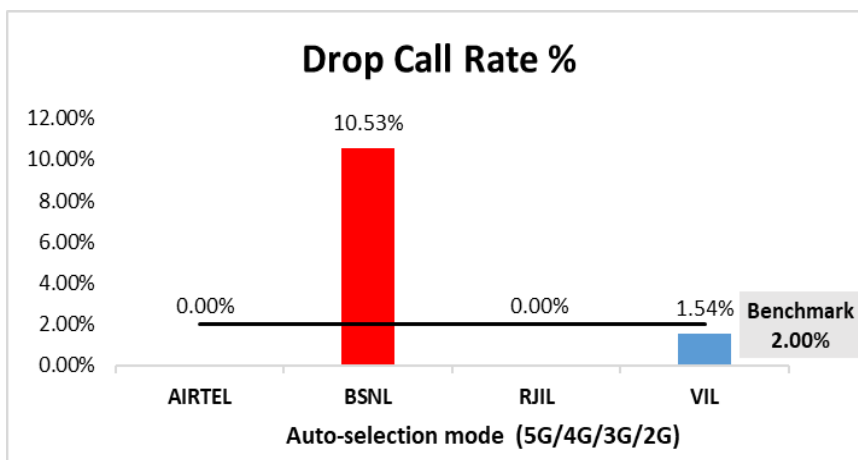
Figure-27: Performance for drop call rate

(b) Network Technology: This section represent time spent on various network technologies.

Technology	Service Provider			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	4.06%	NA	30.67%	NA
4G	95.94%	7.00%	69.33%	81.65%
3G	NA	57.27%	NA	NA
2G	0.00%	35.40%	NA	18.32%
Limited Service	0.00%	0.33%	0.00%	0.03%

Table-54: Time spent on technology during drive test

Note-NA- Service provider doesn't provide services in respective technology.
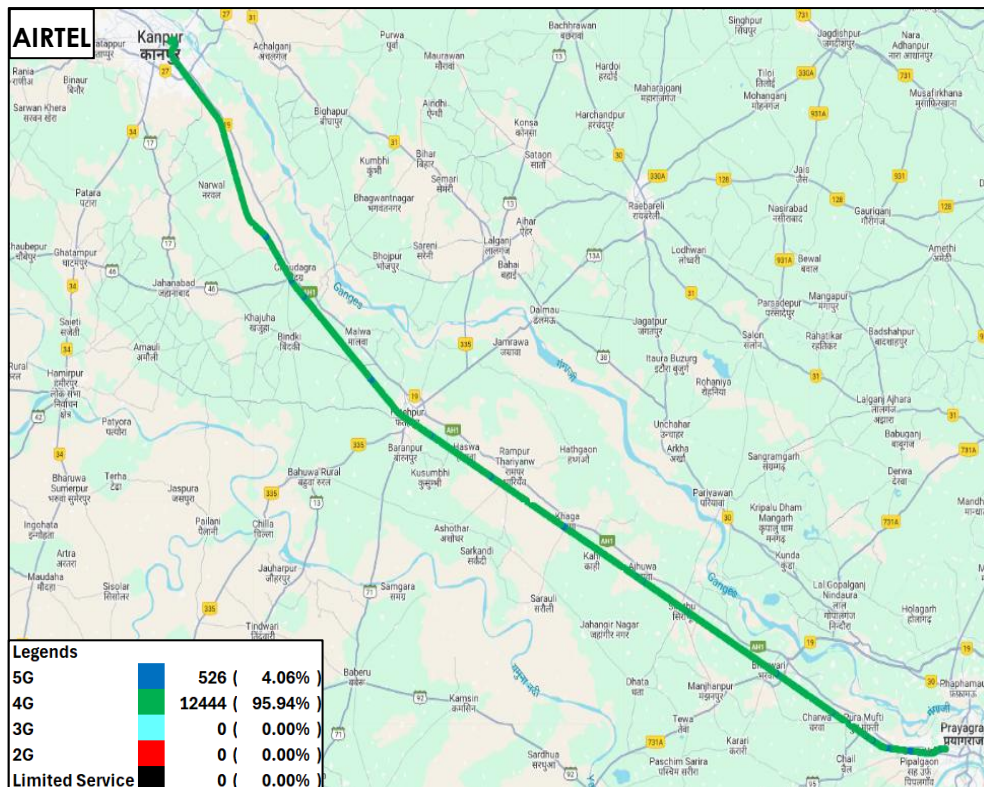
Figure-28: Serving technology plots auto-selection mode 5G/4G/3G/2G –AIRTEL
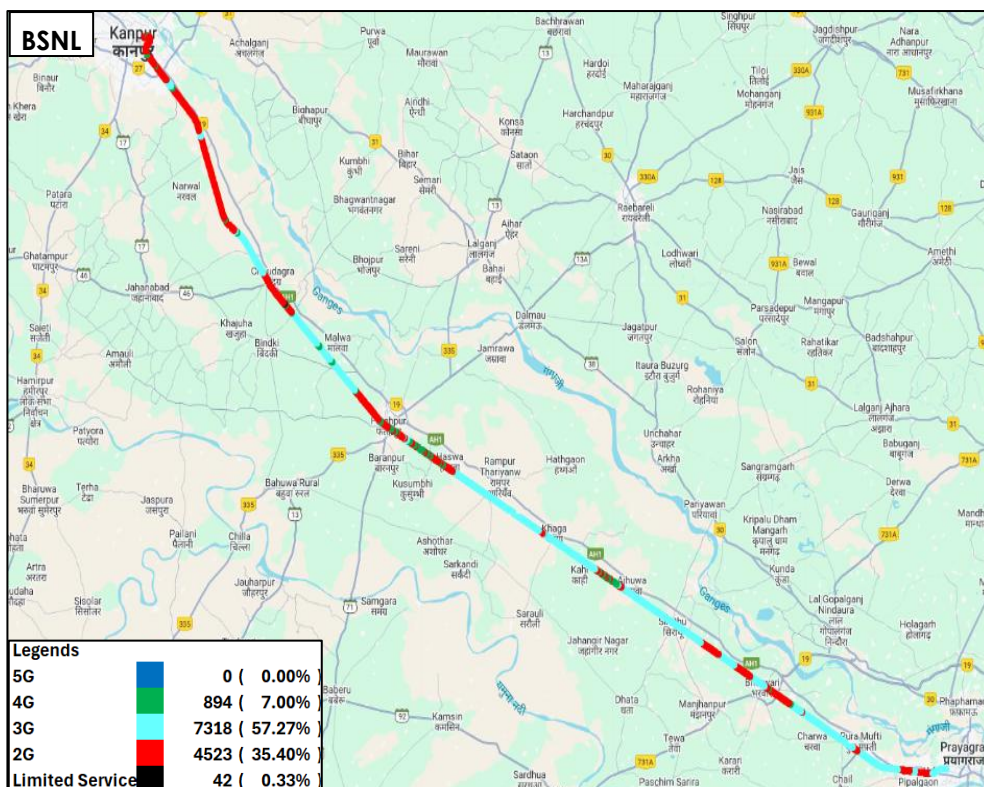
Figure-29: Serving technology plots auto-selection mode 5G/4G/3G/2G –BSNL.
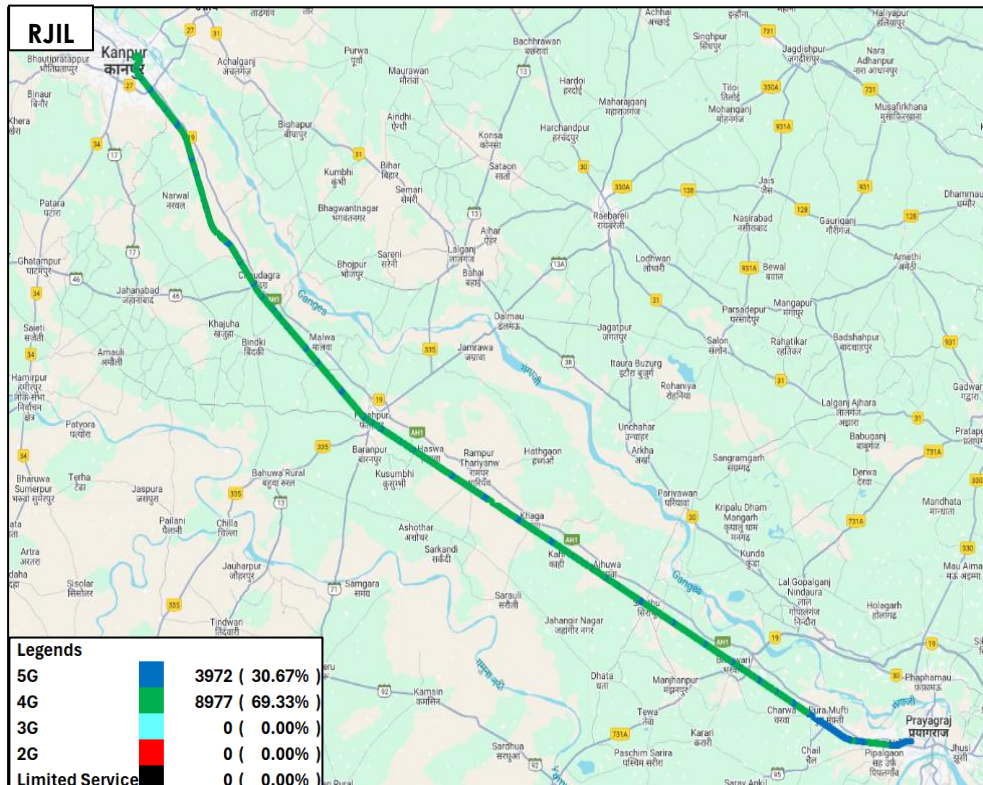
Figure-30: Serving technology plots auto-selection mode 5G/4G/3G/2G –RJIL.
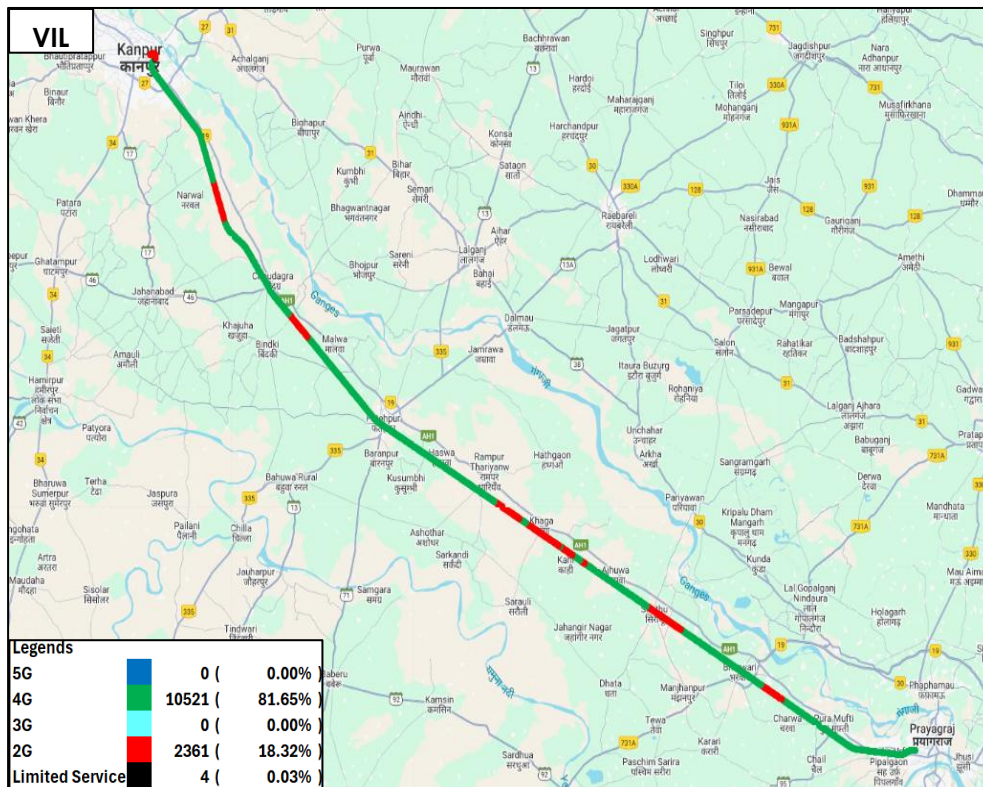
Figure-31: Serving technology plots auto-selection mode 5G/4G/3G/2G – VIL.

(c) Network Signal Strength distribution: The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G) (refer figure-42, 43, 44 & 45 for map view)
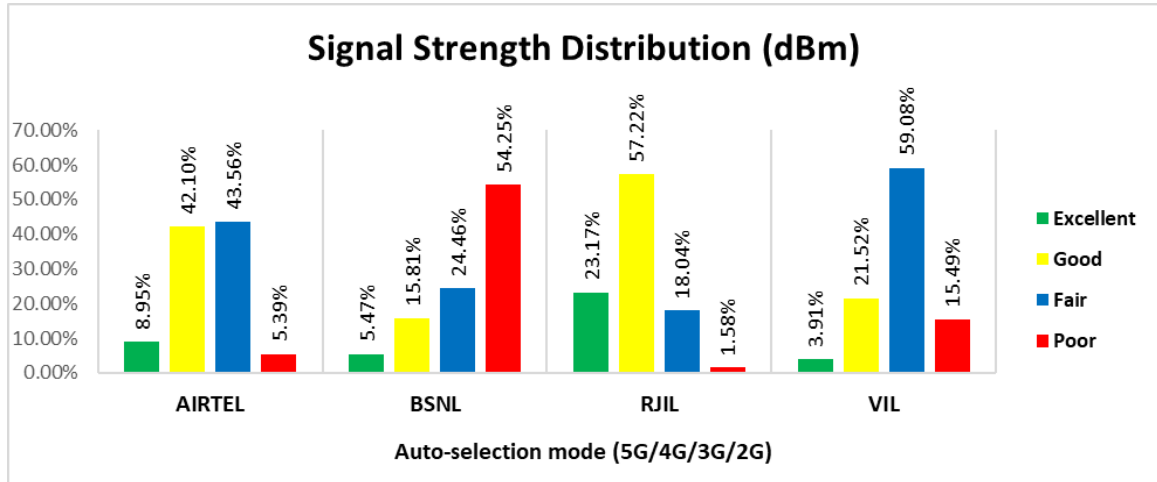
Figure-32: Signal strength distribution for auto-selection mode 5G/4G/3G/2G.

Observations:
- Airtel has 9% of samples falling in the excellent signal strength category.
- BSNL has 5% of samples falling in the excellent signal strength category.
- RJIL has 23% of samples falling in the excellent signal strength category
- VIL has 4% of samples falling in the excellent signal strength category.

4.5.4   Data performance

(a) Data Parameters (Auto-selection mode- 5G/4G/3G/2G)

Parameters		Service Provider			
		Auto-selection mode (5G/4G/3G/2G)			
		AIRTEL	BSNL	RJIL	VIL
Download Throughput (Mbits/s)	Average	42.75	3.42	108.70	20.73
	80th Percentile	85.22	4.68	214.86	33.92
	20th Percentile	2.55	0.62	13.05	1.01
Upload Throughput (Mbits/s)	Average	8.98	2.00	11.26	6.99
	80th Percentile	12.21	2.39	15.40	10.09
	20th Percentile	1.53	0.80	2.35	1.17
Latency (ms)	50th Percentile	34.10	42.40	21.60	31.50

Table-55: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).
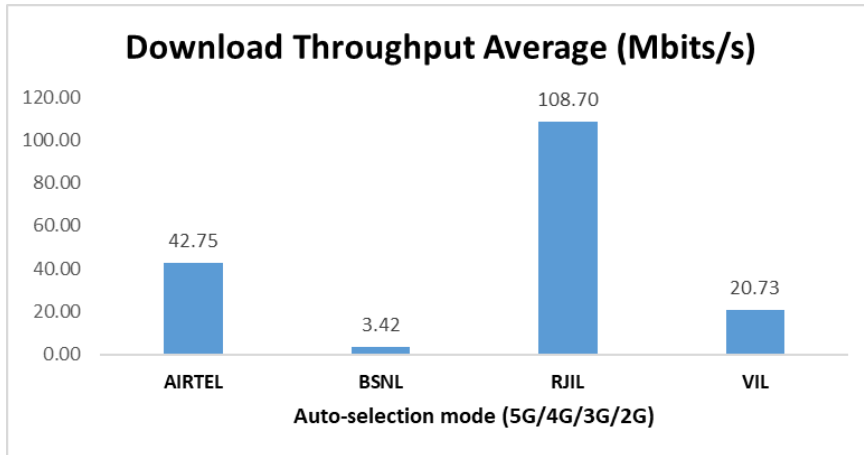
Figure-33: Download throughput
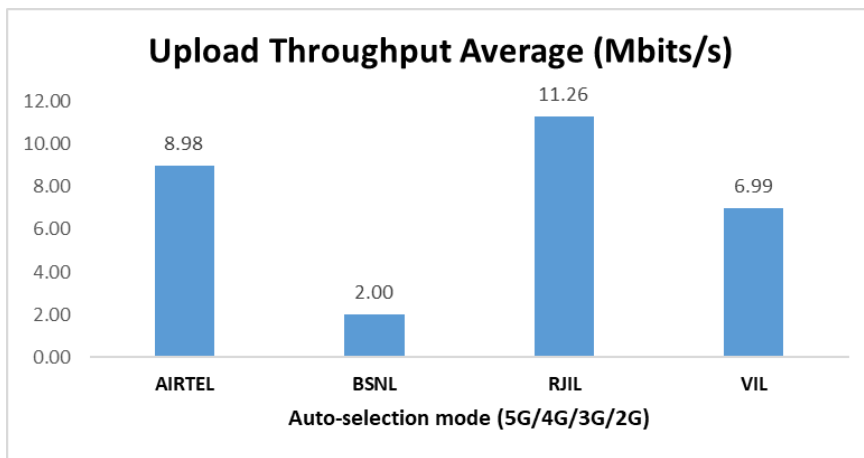
Figure-34: Upload throughput.

5. Voice & Data Key findings

5.1 Overall Voice

1. Call Setup Success Rate:
   a) Airtel, BSNL and VIL have 98.78%, 96.00% and 98.27% call setup success rate respectively in 3G/2G network mode. (refer table-3)

   b) Airtel, BSNL, RJIL and VIL have 99.01%, 88.93%, 99.28% and 99.71% call setup success rate respectively in Auto-selection mode (5G/4G/3G/2G). (refer table-5)

2. Call Setup Time:
   a) Airtel, BSNL and VIL call setup time is 19.64, 3.26 & 4.65 seconds respectively in 3G/2G network mode. (refer table-3)

   b) Airtel, BSNL, RJIL & VIL call setup time is 22.22, 3.77, 0.67 & 0.74 seconds respectively in Auto-selection mode (5G/4G/3G/2G). (refer table-5)

3. Drop Call Rate:
   a) Airtel, BSNL and VIL drop call rate 0.25%, 1.54% & 0.22% respectively in 3G/2G network mode. (refer table-3)

   b) Airtel, BSNL, RJIL and VIL drop call rate 0.00%, 1.85% 0.15% & 0.15% respectively in Auto-selection mode (5G/4G/3G/2G). (refer table-5)

4. Call Silence/Mute Rate: In packet switched network (4G/5G), VIL, RJIL and Airtel have 1.92%, 1.26% & 0.00% silence call rate respectively. Further RJIL has higher RTP packet loss rate in downlink (0.96%) compared to VIL (0.78%) and Airtel (0.34%). In uplink the RTP packet loss rate is higher for RJIL (1.22%) compared to VIL (0.94%) and Airtel (0.58%). (refer table-6)

5.2 Overall Data

1. Data download and upload performance (Overall i.e. LSA):
   a) Airtel, BSNL, RJIL and VIL average download speeds are 110.65 Mbps, 4.53 Mbps, 279.44 Mbps & 43.39 Mbps respectively. (refer table-9)

   b) Airtel, BSNL, RJIL and VIL average upload speeds are 25.41 Mbps, 3.13 Mbps, 41.06 Mbps & 16.75 Mbps respectively. (refer table-9)

2. Data download and upload performance (static i.e. while stationary):
   a) Airtel, BSNL, RJIL and VIL average download speeds are 175.95 Mbps, 12.77 Mbps, 267.29 Mbps & 54.82 Mbps respectively. (refer table-29)

   b) Airtel, BSNL, RJIL and VIL average upload speeds are 25.23 Mbps, 8.49 Mbps, 48.15 Mbps & 22.34 Mbps respectively. (refer table-29)

3. Data session setup success rate (static i.e. while stationary):
   a) Airtel, BSNL, RJIL and VIL have 100.00% download session setup success rate respectively. (refer table-29)

b) Airtel, BSNL, RJIL and VIL have 100.00% upload session setup success rate respectively. (refer table-29)

5.3 Operator wise Key Findings

1. Airtel:

Voice

- 98.78% call setup success rate and 0.25% drop call rate have been observed in 3G/2G network mode respectively for LSA & city drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-3 & 11)

- 99.01% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) respectively for LSA. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-5)

- 98.80% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) respectively for city drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-13)

- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) respectively for all hotspot locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-18)

- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) respectively for walk test location. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-51)

- 98.41% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) respectively for railway route. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-53)

Data

- Airtel has average download throughput of 110.65 Mbps and average upload throughput of 25.41 Mbps across measured routes for LSA. (refer table-9)

- Airtel has average download throughput of 120.96 Mbps and average upload throughput of 28.58 Mbps across the measured routes during the city drive. (refer table -17)

- Civil Line Bus Stand and Prayagraj Airport have less download speed (less than 100 Mbps) out of total 10 Hotspots for auto-selection mode (5G/4G/3G/2G). (refer table-31 and 37)

- George Town Anand Bhawan, IIIT, Lete Hanuman Triveni Sangam and Prayagraj Airport have less upload speed (less than 20 Mbps) out of total 10 Hotspots for auto-selection mode (5G/4G/3G/2G). (refer table-32, 34, 35 and 37)

- Airtel has average download throughput of 42.75 Mbps and average upload throughput of 8.98 Mbps across the measured routes during the railway drive. (refer table-55)

2. BSNL:

Voice
- 96.00% call setup success rate and 1.54% drop call rate have been observed in 3G/2G network mode for LSA & city drive. Performance is not meeting benchmark of 98.00% for call setup success rate. (refer table-3 & 11)

- 88.93% call setup success rate and 1.85% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for LSA. Performance is not meeting the benchmark of 98.00% for call setup success rate. (refer table-5)

- 97.07% call setup success rate and 1.29% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for city drive. Performance is not meeting benchmark of 98.00% for call setup success rate. (refer table-13)

- 95.00% call setup success rate and 1.33% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for overall hotspot locations. Performance is not meeting benchmark of 98.00% for call setup success rate. (refer table-18)

- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for walk test location. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-51)
- 48.31% call setup success rate and 10.53% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for railway route. Performance is not meeting benchmark of 98.00% & 2.00% respectively. (refer table–53)

Data
- BSNL has 4.53 Mbps average download throughput & 3.13 Mbps average upload throughput across measured routes for LSA. (refer table-9)

- BSNL has 3.41 Mbps average download throughput & 2.80 Mbps average upload throughput across measured routes for city drive. (refer table-17)

- George Town Anand Bhawan, High Court, Prayagraj Airport and Teliarganj have less download speed (less than 10 Mbps) out of total 10 Hotspots in auto-selection mode (5G/4G/3G/2G). (refer table-32, 33, 37 and 39)

- Prayagraj Airport has less upload speed (less than 2 Mbps) out of total 10 Hotspots in auto-selection mode (5G/4G/3G/2G). (refer table-37)

- BSNL has average download throughput of 3.42 Mbps and average upload throughput of 2.00 Mbps across the measured routes during the railway drive. (refer table-55)

3. RJIL:

Voice

- 99.28% call setup success rate and 0.15% drop call rate have been observed in the auto-selection mode for LSA. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-5)

- 98.99% call setup success rate and 0.20% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for city drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-13)

- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for overall hotspot locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table–18)

- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for walk test location. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table–51)
- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for railway route. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table–53)

Data

- RJIL has 279.44 Mbps average download speed & 41.06 Mbps average upload speed across measured routes for LSA. (refer table-9)

- RJIL has 318.42 Mbps average download speed & 45.72 Mbps average upload speed across measured routes for city drive. (refer table-17)

- High Court, Medical Chowk Swaroop Rani and Prayagraj Railway Station have less download speed (less than 100 Mbps) out of total 10 Hotspots for auto-selection mode (5G/4G/3G/2G). (refer table-33, 36 and 38)

- RIL has average download throughput of 108.70 Mbps and average upload throughput of 11.26 Mbps across the measured routes during the railway drive. (refer table-55)

4. VIL:

Voice

- 98.27% call setup success rate and 0.22% drop call rate have been observed in 3G/2G network mode for LSA & city drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-3 & 11)

- 99.71% call setup success rate and 0.15% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for LSA. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-5)

- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for city drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-13)

- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for overall hotspot locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-18)

- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for walk test location. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-51)

- 97.01% call setup success rate and 1.54% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for railway route. Performance is not meeting the benchmark of 98.00% for call setup success rate. (refer table–53)

Data
- VIL has 43.39 Mbps average download speed & 16.75 Mbps average upload speed across measured routes for LSA. (refer table-9)

- VIL has 47.41 Mbps average download speed & 18.31 Mbps average upload speed across measured routes for city drive. (refer table-17)

- Lete Hanuman Triveni Sangam has less download speed (less than 10 Mbps) out of total 10 Hotspots for auto-selection mode (5G/4G/3G/2G). (refer table-35)

- VIL has average download throughput of 20.73 Mbps and average upload throughput of 6.99 Mbps across the measured routes during the railway drive. (refer table-55)

6. Annexure
6.1 Route wise coverage map
6.1.1 City

Legends		
Excellent	22520 (	44.23%)
Good	14862 (	29.19%)
Fair	10096 (	19.83%)
Poor	3436 (	6.75%)
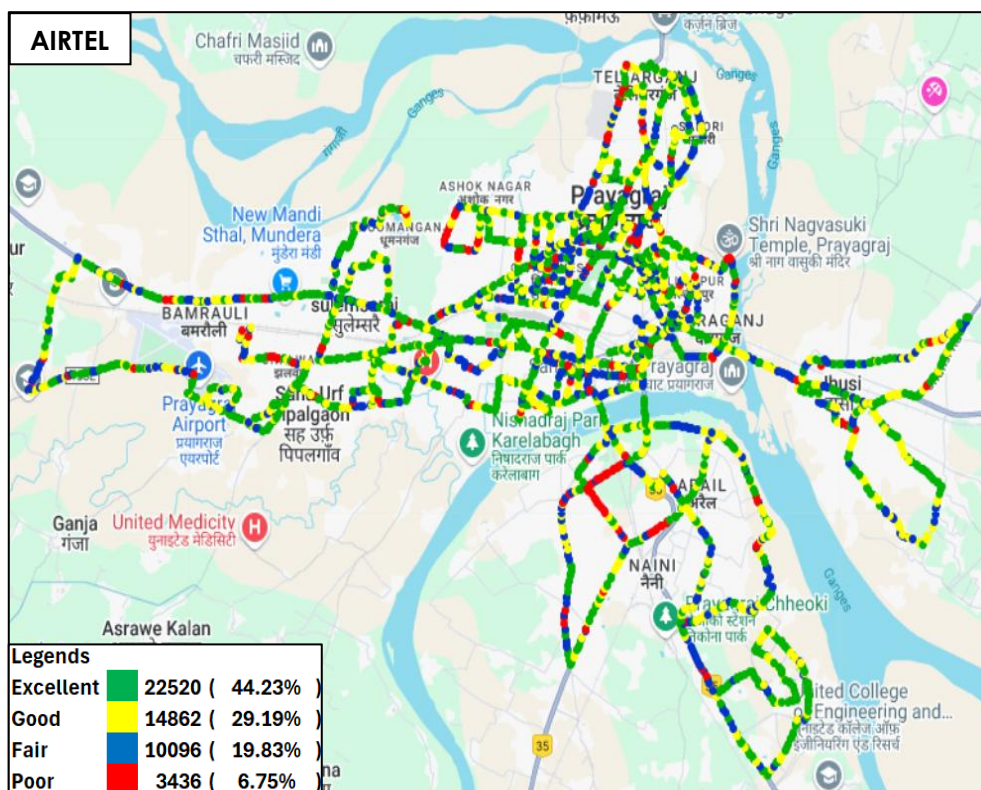
Figure-35: Signal strength 3G/2G network mode – AIRTEL.

Legends		
Excellent	17255 (	32.88%)
Good	19416 (	37.00%)
Fair	11227 (	21.39%)
Poor	4581 (	8.73%)
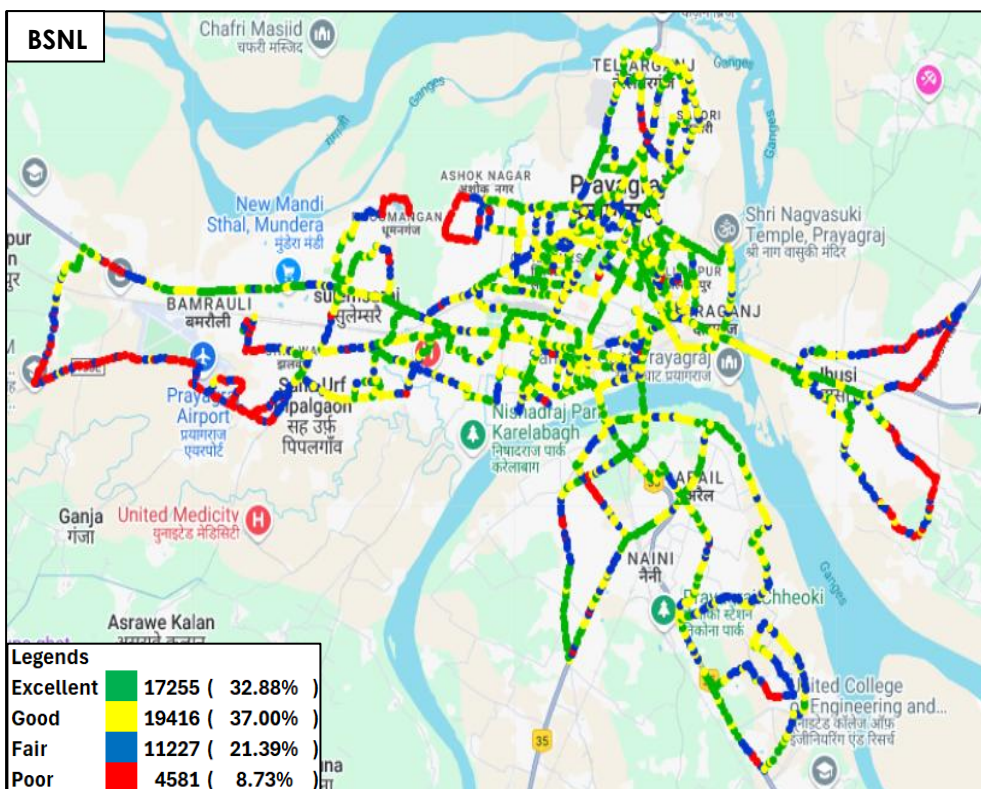
Figure-36: Signal strength 3G/2G network mode – BSNL.

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Figure-37: Signal strength 3G/2G network mode – VIL.

Figure-38: Signal strength auto-selection mode 5G/4G/3G/2G – AIRTEL.

Legends		
Excellent	14467 (	27.24%)
Good	19934 (	37.54%)
Fair	12928 (	24.34%)
Poor	5776 (	10.88%)
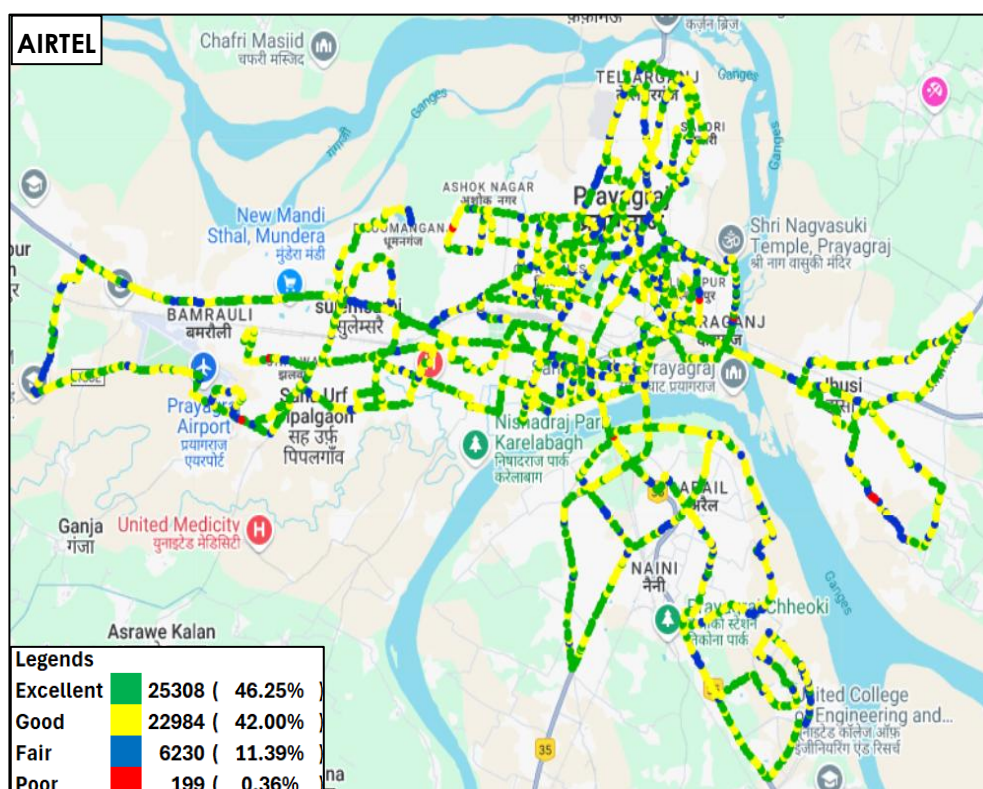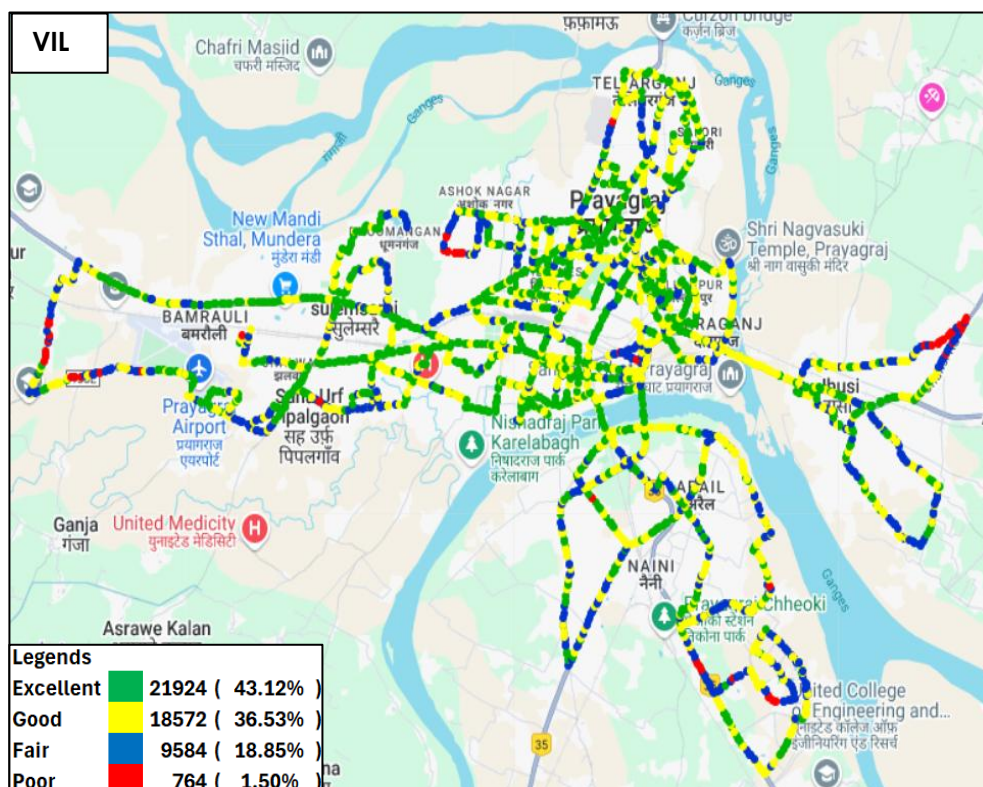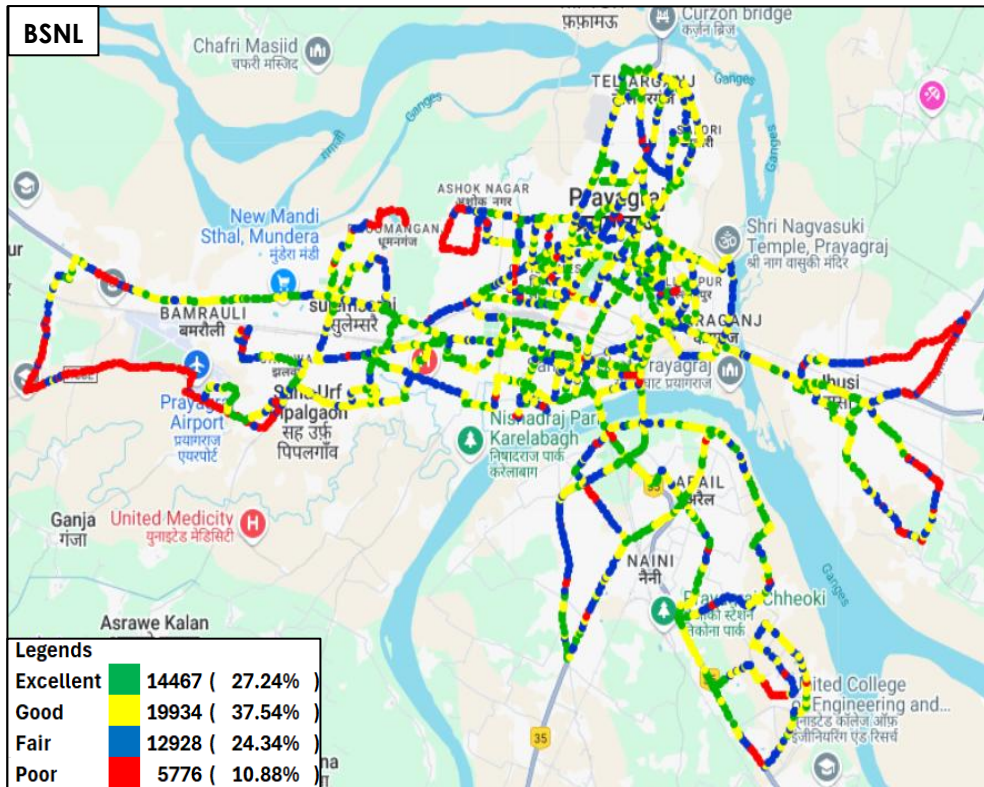
Figure-39: Signal strength auto-selection mode 5G/4G/3G/2G – BSNL.

Legends		
Excellent	34617 (	65.72%)
Good	14631 (	27.78%)
Fair	3311 (	6.29%)
Poor	115 (	0.22%)
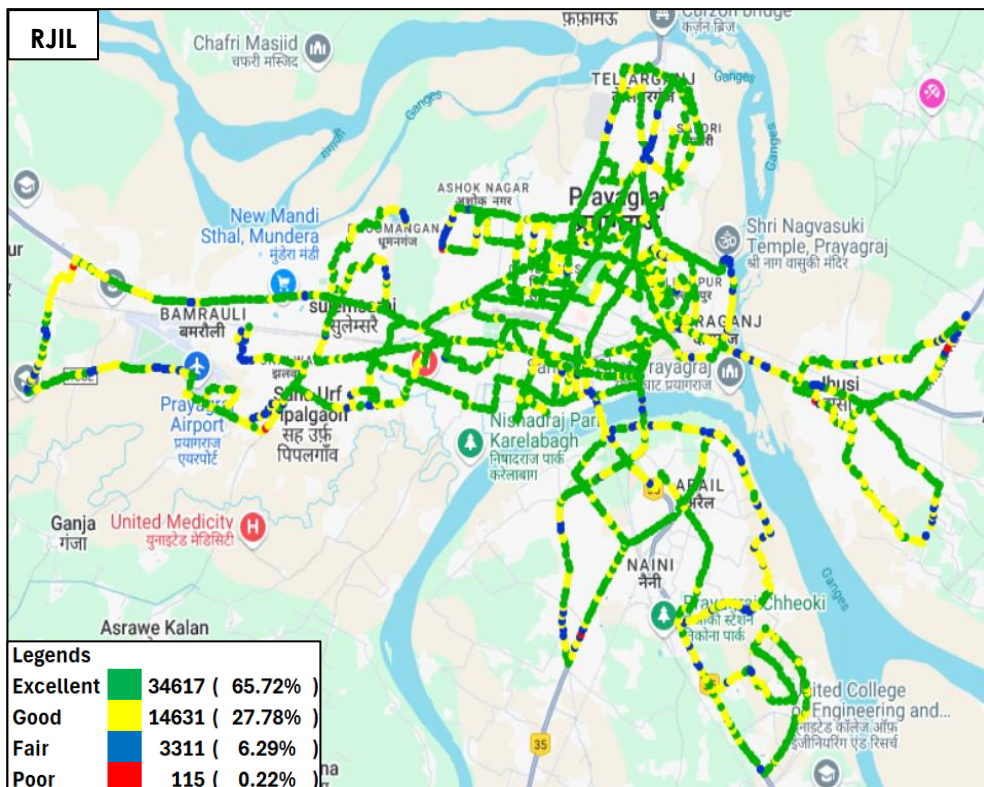
Figure-40: Signal strength auto-selection mode 5G/4G/3G/2G – RJIL.

Legends		
Excellent	11837	(21.86%)
Good	26885	(49.65%)
Fair	14738	(27.21%)
Poor	694	(1.28%)
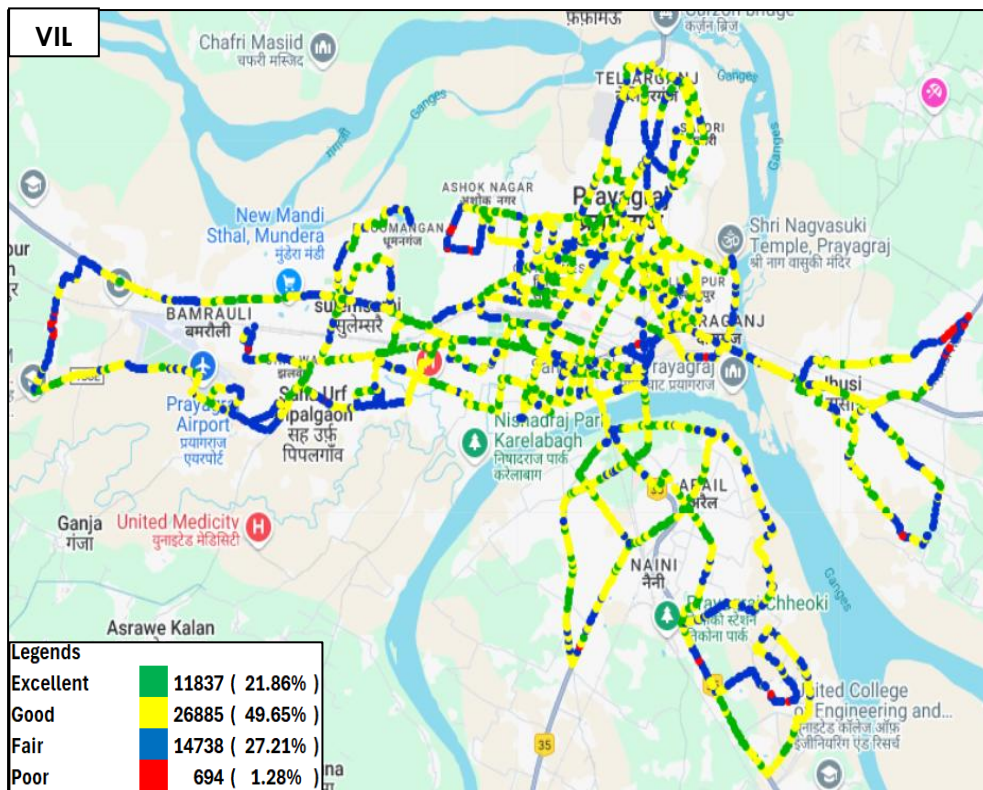
Figure-41: Signal strength auto-selection mode 5G/4G/3G/2G – VIL.

6.1.2 Railway Route

i) Prayagraj to Kanpur

Legends		
Excellent	1152	(8.95%)
Good	5419	(42.10%)
Fair	5607	(43.56%)
Poor	694	(5.39%)
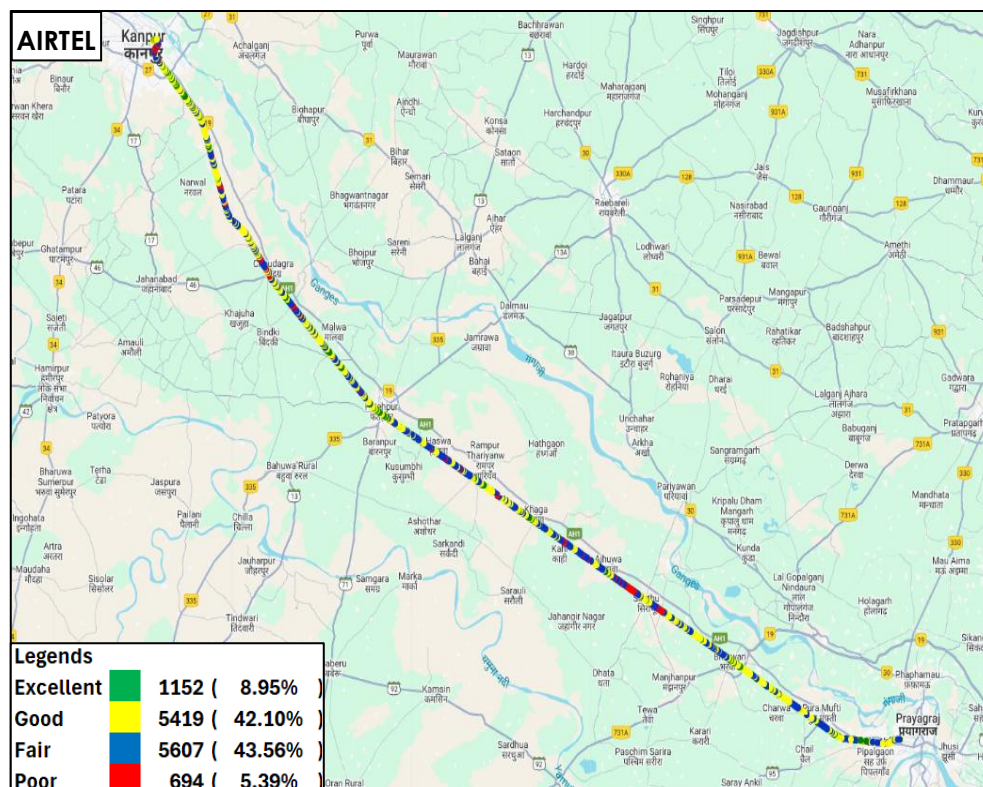
Figure-42: Signal strength auto-selection mode 5G/4G/3G/2G – AIRTEL.
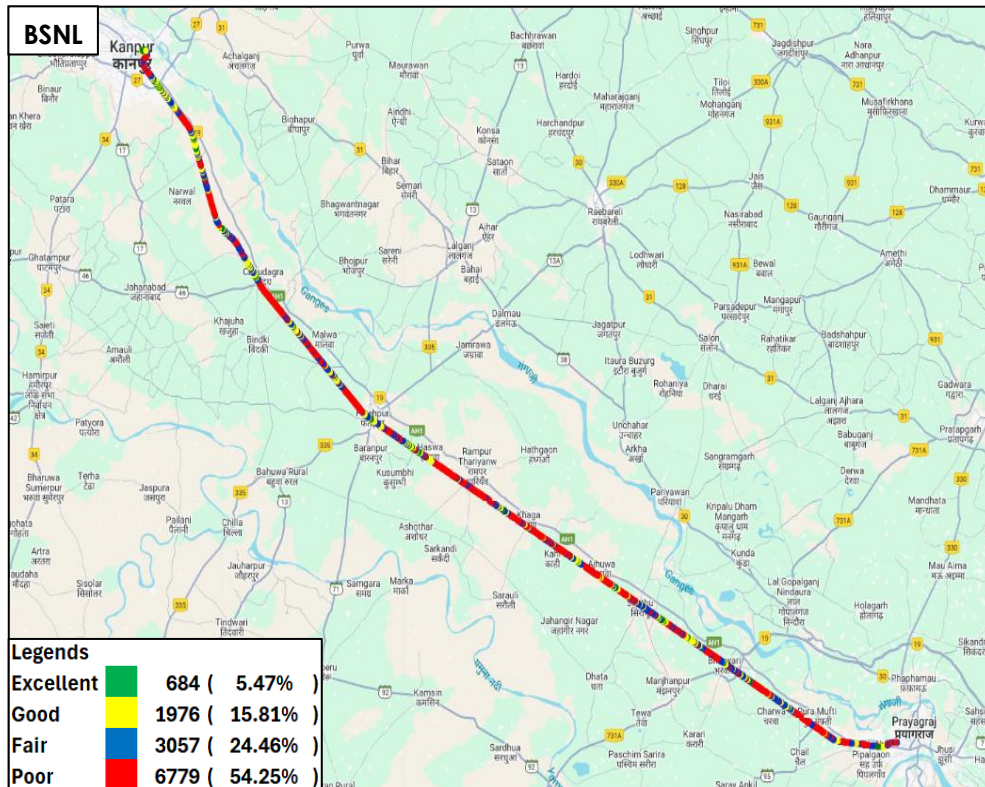
Figure-43: Signal strength auto-selection mode 5G/4G/3G/2G – BSNL.
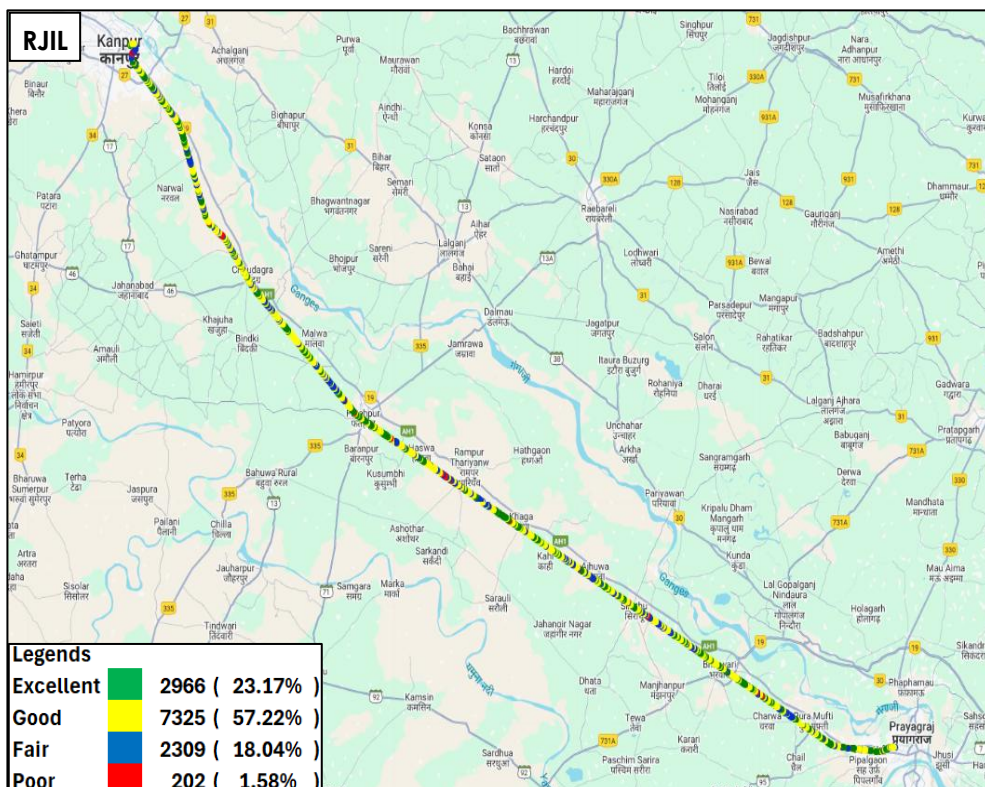
Figure-44: Signal strength auto-selection mode 5G/4G/3G/2G – RJIL.

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Legends			
Excellent		498 (3.91%)
Good		2743 (21.52%)
Fair		7530 (59.08%)
Poor		1974 (15.49%)
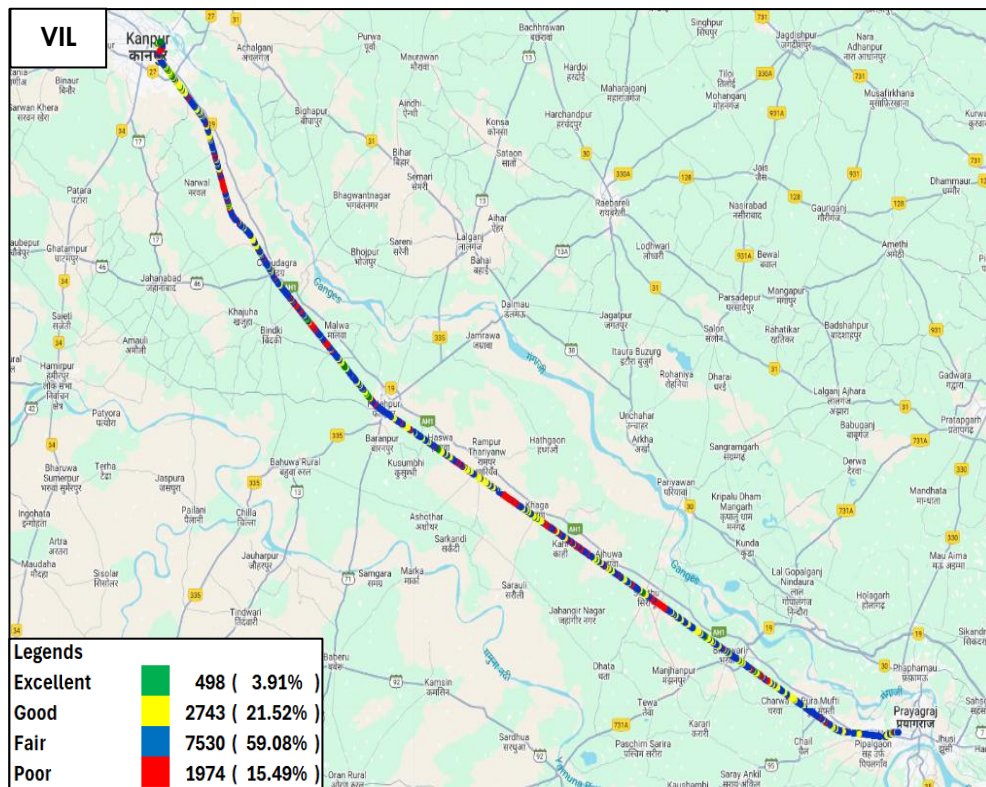
Figure-45: Signal strength auto-selection mode 5G/4G/3G/2G – VIL.

7. Appendix

The details of the setup used for conducting the drive test and the network or performance parameters captured under different conditions may be seen at Appendix-I. The calculation method of each QoS parameter is given in Appendix-II of the report. The summary of key equipment used in technical setup is as under

- **Device-1**: OnePlus Nord CE3 for 3G/2G CAT-15 Smartphone.
- **Device-2**: Samsung Galaxy S23 for 5G/4G/3G/2G CAT-20 Smartphone
- **Drive test Software**: Azenqos Engineering capable Applications to capture actual user experience.

7.1 Appendix-I
7.1.1 Drive test setup

Voice Call		
Call details	**Technology**	**Detail**
Call Setup Timeout	• 3G/2G auto mode- switch Call • 5G/4G/3G/2G auto mode- switch Call • 5G/4G MOS Call	30 Sec
Call Duration		90 Sec/180 Sec.
Wait/ Guard Time		15 Sec

Table-56: Voice test detail

> **Note-**
> - There is 15 sec wait time after locking and before starting first call in 3G/2G call.
> - 10 calls to be made at each Hotspot location.
> - Minimum 10 Calls to be made during the walk test. Call count will be increased based on walk test distance.
> - Speech quality (MOS) has been measured only in city drive & highway by making Mobile to Mobile call.
> - 180 Sec calls were made only in highway & railway route drive.
> - 5G/4G/3G/2G auto mode MOS call were made in BSNL as BSNL don't have VoLTE & VoNR network availability.

Data Test		
Test Type	**Technology**	**Detail**
HTTP/FTP Download	5G/4G/3G/2G Auto Mode	500 MB File- 30 Sec Timeout, (Multithread 3- TCP Connection at a time)
HTTP/FTP Upload		250 MB File- 30 Sec Timeout, (Multithread 3- TCP Connection at a time)
YouTube Streaming		20 Sec Video & 25 sec Timeout (Only at Hotspot)
Web Browsing		3 popular websites (www.google.co.in, www.amazon.in, www.facebook.com) 20 sec timeout (only at Hotspot)

Latency		25 count- Dynamic 1000 count- Hotspot Payload- 42 bytes in all drive

Table-57: Data test detail

> **Note-**
> - 5 Data iteration to be done at each hotspot location.
> - Minimum 5 iteration to be made during the walk test. Iteration count will be increased based on walk test distance.
> - Ping test to be performed only once at hotspot location.
> - Youtube & Web browsing test to be performed at static location only.
> - All values are taken up to two decimal places with round off.
> - Download and upload testing has been done on FTP server for Airtel, BSNL & RJIL. (Airtel, BSNL & RJIL not provided HTTP server)
> - VIL download and upload testing is done on HTTP Server.
> - Download & Upload test performed at hotspot in 4G/3G/2G auto-selection also.
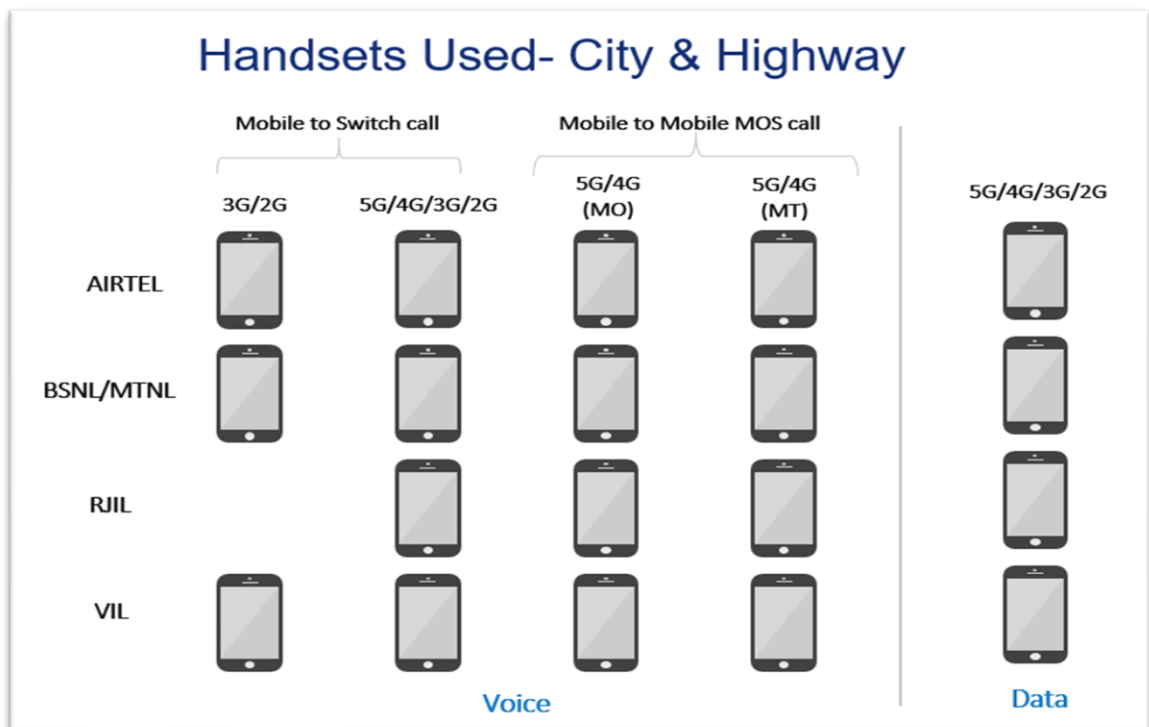
Figure-46: Number of handsets used in city & highway drive
MO: Mobile originating
MT: Mobile terminating
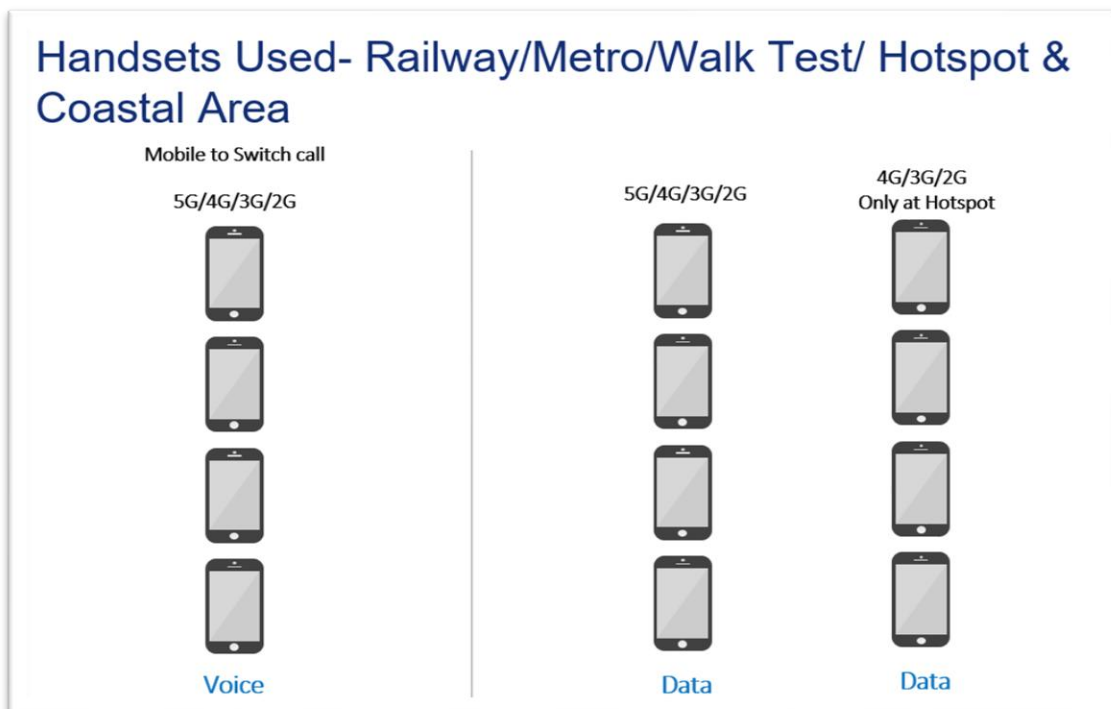
Figure-47: Number of handsets used in railway/metro/walktest/hotspot & coastal area

7.1.2 Drive test Methodology

(a) Dynamic voice testing (on the move)
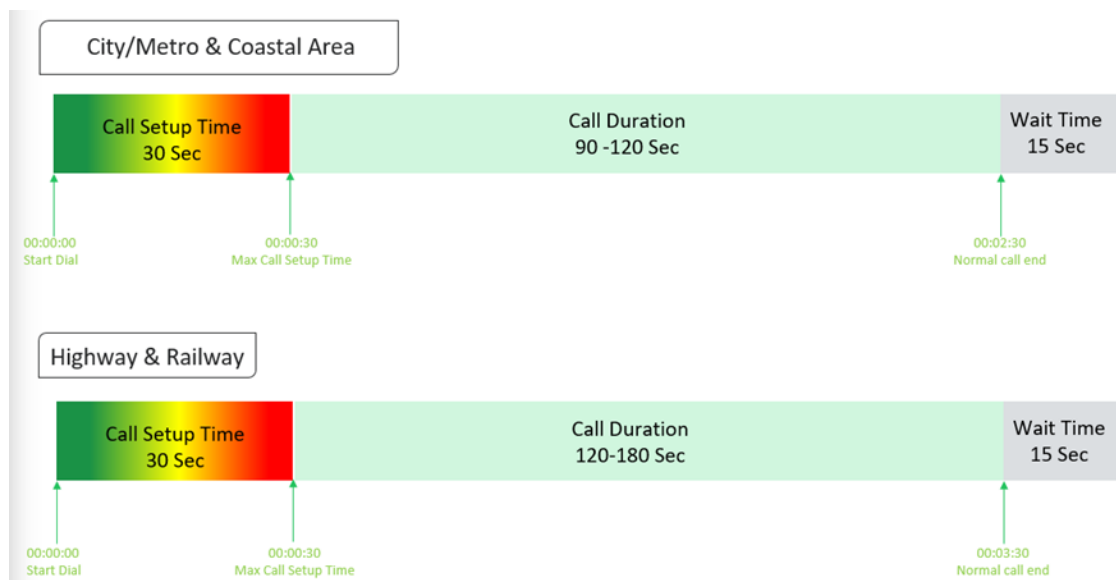
Figure-48: Voice test script for city/railway/metro/highway & coastal area

- 15 sec wait time is applied after locking Radio Access Technology (RAT) to 3G/2G and before starting first call in 3G/2G call.
- Speech quality (MOS) will be measured only City & Highway drive by making Mobile to Mobile calls.

(b) Hotspot voice testing

Figure-49: Voice test script for walktest/hotspot

- 10 calls to be made at each Hotspot location.
- Minimum 10 Calls to be made during the walk test. Call count will be increased based on walk test distance.

(c) Dynamic Data (internet) test
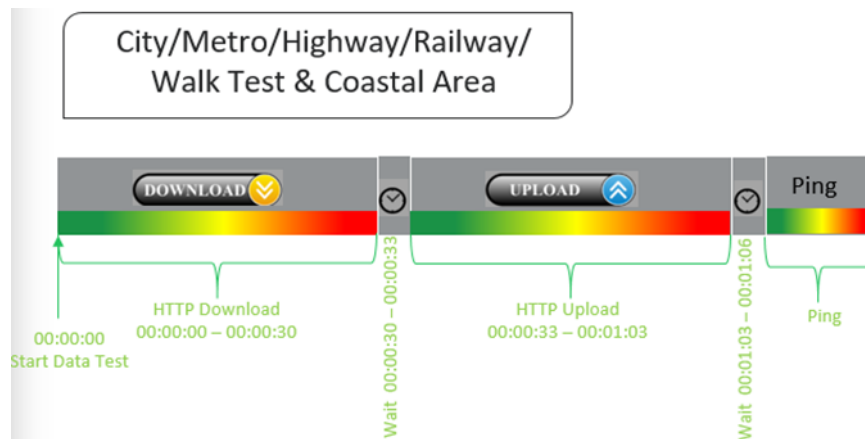
Figure-50: Data test script used in city/metro/railway/highway/walk test & coastal area

(d) Static Data(internet) testing
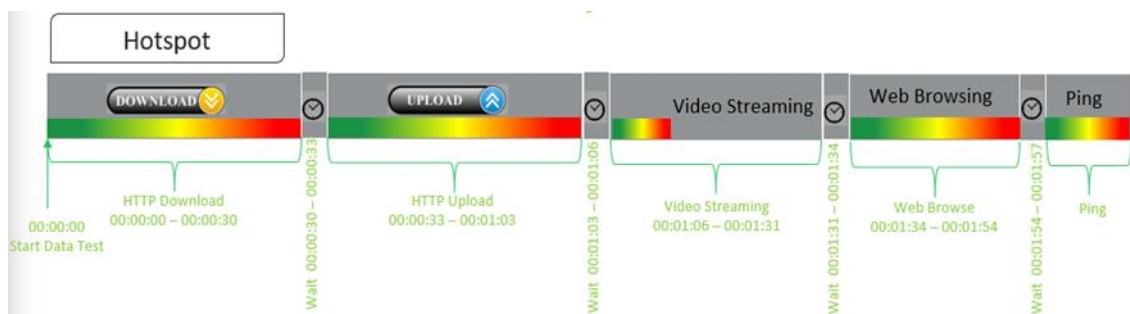
Figure-51: Data test script used at hotspot

- 5 Data iteration done at each hotspot location.
- Min. 5 iteration made during the walk test.
- Web browsing duration mentioned above is for one web site only.
- Only 1 ping iteration (with 1000 Count) done at hotspot location.
- Download & Upload test performed at hotspot in 4G/3G/2G auto-selection also.

7.2 Appendix-II

7.2.1 Network Performance Parameters for Voice calls

Parameter Name	Definition
Call Setup Success Rate	(i) Call Setup Success Rate is defined as the ratio of Established Calls to Call Attempts. 'Established Calls' mean the following events have happened in call setup: (a) Call attempt is made (b) The signaling channel is allocated (c) The call is routed to the outwards path of the terminating network (d) An alert signal is received by caller in the form of ring back tone, busy tone, or an announcement. CSSR = (Total Call Established/ Total Call Attempt) *100 As per QoS Regulation 2024 benchmark value is **>=98%**
Drop Call Rate	Drop call represents the service provider network's ability to maintain a call once it has been successfully established. This parameter shall include both incoming calls and outgoing calls which, once they have been established and have an assigned traffic channel/ bearer, are dropped, or interrupted before their normal completion by the user, the cause of the early termination being within the service provider's network Drop Call Rate = (Total Drop Call/Total Call Established) *100 As per QoS Regulation 2024 benchmark value is **<=2%**
Call Setup Time	Time taken from call initiate to call alerting/ringing. Call Setup Time = T2- T1 T2- Ringing (VoLTE/VoNR) & Alerting (for WCDMA & GSM), T1- Invite (VoLTE/VoNR) & CM Service Request (for WCDMA & GSM)
Voice Quality (MOS)	Voice quality in mobile networks is measured with algorithms based on ITU-T P.863 (POLQA). The grading for Voice quality has been given as: Excellent: MOS $\geq$ 4 and < 5 Good : MOS $\geq$ 3 and < 4 Fair : MOS $\geq$ 2 and < 3 Poor : MOS $\geq$ 1 and < 2
Handover Success Rate	Handover Success Rate = Count of successful handovers (All Technology Handover combined) / Total count of Handover Attempt (All Technology Handover combined) *100 Handover type which are considered- 2G Inter & Intra cell, 3G Soft & IRAT, 4G Inter & Intra frequency & SRVCC, 5G Inter & Intra frequency & 5G to 4G handovers.
Silence Call -	A call which has $\geq$ 4 sec continuous RTP gap is considered as a Silence Call. Silence call rate = (count of silence call / Total calls established) *100 If a call observes multiple silence count >=4 sec in a particular established call it has been taken as one silent event.

Jitter	The inter arrival jitter is the difference in the relative transit time for two packets. The relative transit time is the difference between a packet's Real-time Transport Protocol (RTP) timestamp and the receiver's clock at the time of arrival, measured in the same units. If Si is the RTP timestamp from packet i, and Ri is the time of arrival in RTP timestamps units for packet i, then for two packets i and j the inter-arrival jitter D can be expressed as: **D(i,j) = (Rj - Ri) - (Sj - Si)** The interarrival jitter is calculated continuously as each data packet i is received from source SSRC_n, using this difference D for that packet and the previous packet i-1 in order of arrival (not necessarily in sequence), according to the formula **J(i) = J(i-1) + (|D(i-1,i)| - J(i-1))/16 or 8**
Downlink Packet Drop Rate	Number of RTP (Real-time Transport Protocol) Packets lost divided by total RTP packet received (against each source_SSRC and sequence number) at call originating handset. This KPI is calculated from MOS call for packet call only (VoNR/VoLTE)
Uplink Packet Drop Rate	Number of RTP (Real-time Transport Protocol) Packets lost divided by total RTP packet received (against each source_SSRC and sequence number) at call terminating handset. This KPI is calculated from MOS call for packet call only (VoNR/VoLTE).
Signal Strength	Signal strength is the signal power level received by the wireless user.

Parameter Name	Technology	Signal Strength (dBm)			
		Excellent	Good	Fair	Poor
Rx Level	GSM	0 to $\geq$ -65	<-65 to $\geq$ -75	<-75 to $\geq$-85	<-85 to min
RSCP	WCDMA	0 to $\geq$ -70	<-70 to $\geq$ -80	<-80 to $\geq$ -90	<-90 to min
RSRP	LTE	0 to $\geq$ -80	<-80 to $\geq$ -95	<-95 to $\geq$-110	<-110 to min
SS_RSRP	NR	0 to $\geq$ -80	<-80 to $\geq$ -95	<-95 to $\geq$-110	<-110 to min

Table-58: Network performance parameter and definition voice

7.2.2 Network Performance Parameters Data tests

Parameter Name	Definition
Download Speed (Mbps)	The download speed is defined as the data transmission rate that is achieved for downloading a test file from a test server to a test device. Download Speed = Total bytes transferred during download / Total time for transfer • 80th percentile (upper range) & 20th percentile (lower range) value has been calculated for download throughput in dynamic drive and Hotspot combine data
Upload Speed (Mbps)	The upload speed is the data transmission rate that is achieved for uploading a test file from a test device to a test server. Upload Speed = Total bytes transferred during upload / Total time for transfer. • 80th percentile (upper range) & 20th percentile (lower range) value has been calculated for upload throughput in dynamic drive and Hotspot combine data.

Download Session Setup Success Rate	(total download session established (successfully connected to server)/ total download session attempt) *100. This KPI has been calculated for Hotspot only.
Upload Session Setup Success Rate	(total upload session established (successfully connected to server)/ total upload session attempt)*100. This KPI need to report for Hotspot only.
Web Page Download Time	Web browsing test is used to measure performance in terms of opening a web/HTTP page. Time taken to open the web page successfully is considered as web browsing delay/web page download time.
Video Streaming Delay	The Video streaming delay is time taken from start of video transfer to First video frame displayed in player.
Latency	Latency is the time it takes for a small data set to be transmitted from a device to a server on the Internet and back to the same device again. The Latency is measured in milliseconds (ms). To calculate the one-way latency we just do half of the round-trip time. 50th percentile of one way latency has been reported.
Jitter	Measure of variation in time in arrival of packets from a source to destination The consideration of packet delay jitter is considered by standard deviation of Inter Packet Delay Variation. If IPDV is used. By standard deviation is meant the average of standard deviation of IPDV on DL $IPDV(i) = D(i) - D(i-1)$ then Stdvs of IPDV is considered as jitter.
Packet Loss Rate	Number of packets lost out of total packet transferred during test. Packet loss rate = (Total packet lost / Total packet sent) *100 * Packet delay (using ping) >90 ms considered as packet loss and included in packet loss rate. * Packet loss rate is calculated based on ICMP * 90th percentile for Packet loss rate has been reported in overall Hotspot performance summary.

Table-59: Network performance parameter and definition Data

Disclaimer: The observations presented above and, in the reports, represent the performance of the service providers on the area/route under test on the day/time of conducting the drive test and no inference whatsoever may be drawn regarding the quality of the telecom service by the service providers in the whole city/state/licensed service area.