भादूविप्रा
TRAI

Independent Drive Test Report

Jammu & Kashmir LSA

February 2026

Contents

1. Introduction

TRAI Act, 1997 mandates the Authority to ensure the services delivered through various telecommunications networks meet the 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 interests of the consumers of telecommunications services.

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 Jammu & Kashmir License Service Area (LSA) during the month of February-2026 under the supervision of TRAI Regional Office (RO) Delhi. Details of route/area covered during the IDT are as given below:

S. No	Drive test route	Type of route	Distance covered (KMs)	From date	To date
1	Jammu	City	178.2	04-Feb-2026	05-Feb-2026
2	Jammu	Inter Operator Calling	1 Location	05-Feb-2026	05-Feb-2026
3	Jammu	Hotspot	06 Locations	03-Feb-2026	05-Feb-2026
4	Jammu	Walk test	3.5	05-Feb-2026	05-Feb-2026
5	Delhi to Jammu	Highway	620.5	02-Feb-2026	03-Feb-2026

Table-1: Drive test summary.

2.2 Drive test routes

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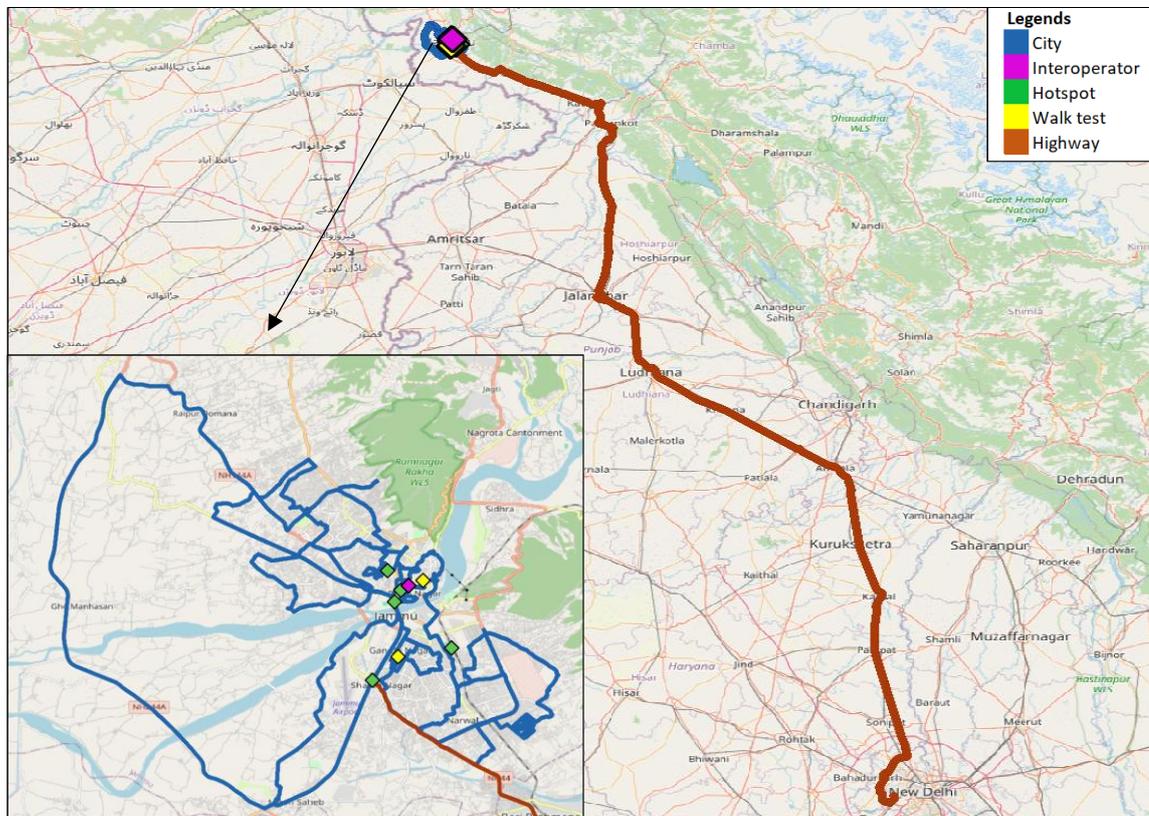
Figure-1: Drive test routes

2.3 Summary of areas covered

a) **City-**Prem Nagar, Gandhi Nagar, Shastri Nagar, Miran Saheb, Gho Manhasan, Raipur Domana and Narwal etc.

b) **Hotspot**
1. Govt Medical College Jammu
2. Jammu Bus Stand
3. Jammu Tawi Railway Station
4. Jewel Chowk Jammu
5. Raghunath Temple Jammu
6. Satwari Chowk Jammu

c) **Walk Test**
1. Gole Market Jammu
2. Hari Market Jammu

d) **Highway-**Delhi to Jammu passing through Dwarka, Kundli, Karnal, Ambala, Ludhiana, Phagwara, Jalandhar, Dasuya, Pathankot, Lakhanpur, Samba and Bari Brahmana etc.

2.4 Telecom service providers detected frequency bands

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

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

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

Note-
- The above band details represent a combination of four LSAs: Delhi, Haryana, Punjab and Jammu & Kashmir.
- 5G technology has been observed across the highway route only for VIL.

2.5 Performance against key QoS parameters

CSSR: Call Setup Success Rate (in %), **CST**: Call Setup Time (in seconds), **DCR**: Drop Call Rate (in %) & **MOS**: Mean Opinion Score.
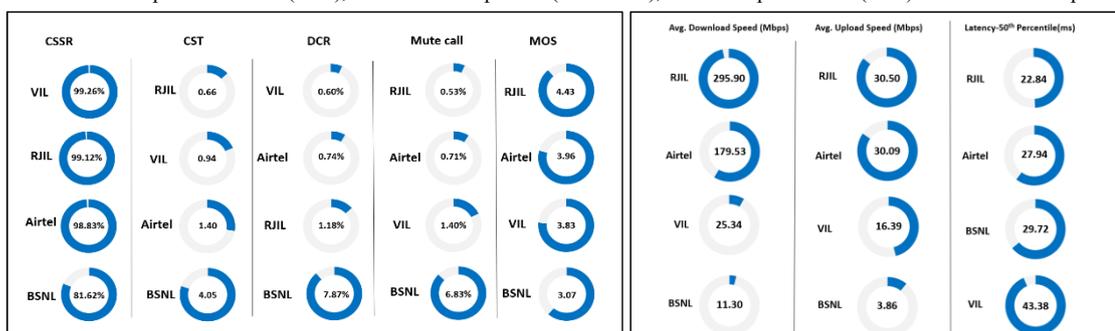
Summary-Voice services	Summary-Data services
Call Setup Success Rate: Airtel, BSNL, RJIL and VIL have 98.83%, 81.62%, 99.12% and 99.26% call setup success rate respectively in Auto-selection mode (5G/4G/3G/2G).	**Data Download performance (Overall):** Average download speed of Airtel (5G/4G/2G) is 179.53 Mbps, BSNL (4G/3G/2G) is 11.30 Mbps, RJIL (5G/4G) is 295.90 Mbps and VIL (5G/4G/2G) is 25.34 Mbps.
Call Setup Time: Airtel, BSNL, RJIL and VIL have call setup time of 1.40, 4.05, 0.66 and 0.94 seconds respectively in Auto-selection mode (5G/4G/3G/2G).	**Data Upload performance (Overall):** Average upload speed of Airtel (5G/4G/2G) is 30.09 Mbps, BSNL (4G/3G/2G) is 3.86 Mbps, RJIL (5G/4G) is 30.50 Mbps and VIL (5G/4G/2G) is 16.39 Mbps.
Drop Call Rate: Airtel, BSNL, RJIL and VIL have drop call rate of 0.74%, 7.87%, 1.18% and 0.60% respectively in Auto-selection mode (5G/4G/3G/2G).	**Latency (Overall):** Airtel, BSNL, RJIL and VIL 50th percentile latency is 27.94 ms, 29.72 ms, 22.84 ms, 43.38 ms respectively.

Call Silence/Mute Rate: Airtel, BSNL, RJIL and VIL have silence call rate 0.71%, 6.83%, 0.53% and 1.40% respectively in packet switched network (4G/5G).	**Data performance - Hotspots (in Mbps):**
	Airtel- 4G D/L: 35.93 4G U/L: 10.01
	          5G D/L: 178.53 5G U/L: 47.22
	BSNL- 4G D/L: 13.08 4G U/L: 5.44
	RJIL- 4G D/L: 41.57 4G U/L: 9.23
	          5G D/L: 298.52 5G U/L: 37.97
	VIL- 4G D/L: 25.07 4G U/L: 10.81

Mean Opinion Score (MOS): Airtel, BSNL, RJIL and VIL have average MOS of 3.96, 3.07, 4.43 and 3.83 respectively.	**Note- "D/L" Download speed, "U/L" Upload speed**

- The Poor signal strength in auto-selection mode (5G/4G/3G/2G) during **voice** testing has been observed in 0.09%, 7.86%, 0.81% & 0.70% of the **City IDT route** in case of Airtel, BSNL, RJIL and VIL respectively. {refer **figure- 55 to 58** as per the **Section 6.1** under Para-6 (Annexure)}

- The Poor signal strength in auto-selection mode (5G/4G/3G/2G) during **data** testing has been observed in 1.18%, 7.51%, 6.05% & 2.14% of the **City IDT route** in case of Airtel, BSNL, RJIL and VIL respectively. {refer **figure- 59 to 62** as per the **Section 6.1** under Para-6 (Annexure)}

- The Poor signal strength in auto-selection mode (5G/4G/3G/2G) during **voice** testing has been observed in 0.51%, 15.69%, 0.91% & 2.59% of the **Highway IDT route** in case of Airtel, BSNL, RJIL and VIL respectively. {refer **figure- 66 to 69** as per the **Section 6.1** under Para-6 (Annexure)}

- The Poor signal strength in auto-selection mode (5G/4G/3G/2G) during **data** testing has been observed in 5.30%, 15.15%, 9.47% & 4.83% of the **Highway IDT route** in case of Airtel, BSNL, RJIL and VIL respectively. {refer **figure- 70 to 73** as per the **Section 6.1** under Para-6 (Annexure)}

QoS Performance Analysis-Jammu & Kashmir 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 Jammu & Kashmir LSA during the month of February-2026 covering city drive, hotspots, walk test and highway. (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	586	643	569
Call Setup Success Rate %	95.05	83.98	98.77
Drop Call Rate %	2.15	6.11	3.02
Call Setup Time-Average (Second)	3.33	3.83	4.00
Handover Success Rate %	98.42	98.87	96.43

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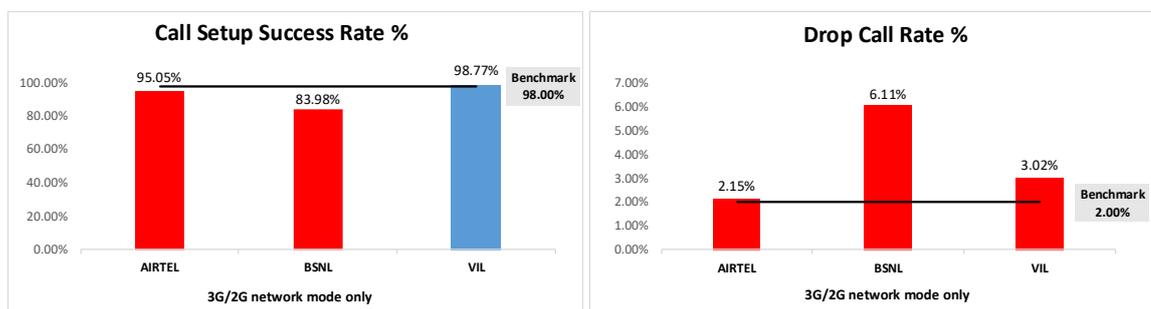
Figure-2: Call setup success rate and drop call rate performance.

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	183	NA
2G	1503	392	1240

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	681	778	683	676
Call Setup Success Rate %	98.83	81.62	99.12	99.26
Drop Call Rate %	0.74	7.87	1.18	0.60
Call Setup Time-Average (Second)	1.40	4.05	0.66	0.94
Handover Success Rate %	99.88	98.39	99.87	100.00

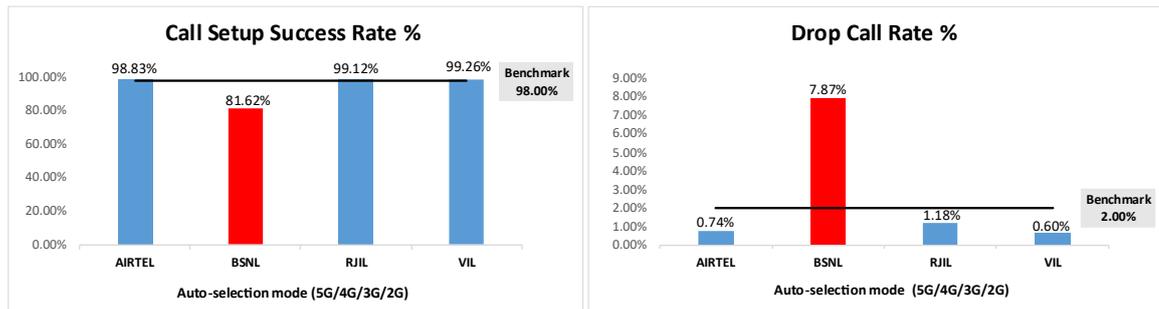**Table-5:** Summary of voice call performance in network auto-selection mode.

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)	567	527	562	572
Number of silences call for >4 Sec	4	36	3	8
Silence Call Rate %	0.71	6.83	0.53	1.40
Number of silence instances for >4 Sec	5	56	4	12
Number of silence instances for >3 Sec	14	89	13	17
Number of silence instances for >2 sec	39	148	47	35
RTP Jitter (4G & 5G) in ms	4.64	8.71	16.26	16.47
Packet loss Rate Downlink %	0.56	5.51	1.22	1.15
Packet loss Rate Uplink %	0.45	5.67	1.15	1.11

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

Number of unique cell Id's covered in Voice test- Technology wise				
Technology	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
5G	0	NA	1501	0
4G	2692	896	1293	1770
3G	NA	63	NA	NA
2G	25	329	NA	51

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

Note-
- NA- Service provider doesn't provide services in respective technology.
- 0- No cell Id's were found in 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 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 table-6	5044	4159	4998	5027
Speech Quality (Average MOS)	3.96	3.07	4.43	3.83
Number of samples with MOS >=4 to <5 (Excellent)	4049	1267	4324	2978
Number of samples with MOS >=3 to <4 (Good)	784	808	380	1482
Number of samples with MOS >=2 to <3 (Fair)	123	1393	132	389
Number of samples with MOS >=1 to <2 (Poor)	88	691	162	178
%age of samples with MOS >=4 to <5 (Excellent)	80.27%	30.46%	86.51%	59.24%
%age of samples with MOS >=3 to <4 (Good)	15.54%	19.43%	7.60%	29.48%
%age of samples with MOS >=2 to <3 (Fair)	2.44%	33.49%	2.64%	7.74%
%age of samples with MOS >=1 to <2 (Poor)	1.74%	16.61%	3.24%	3.54%

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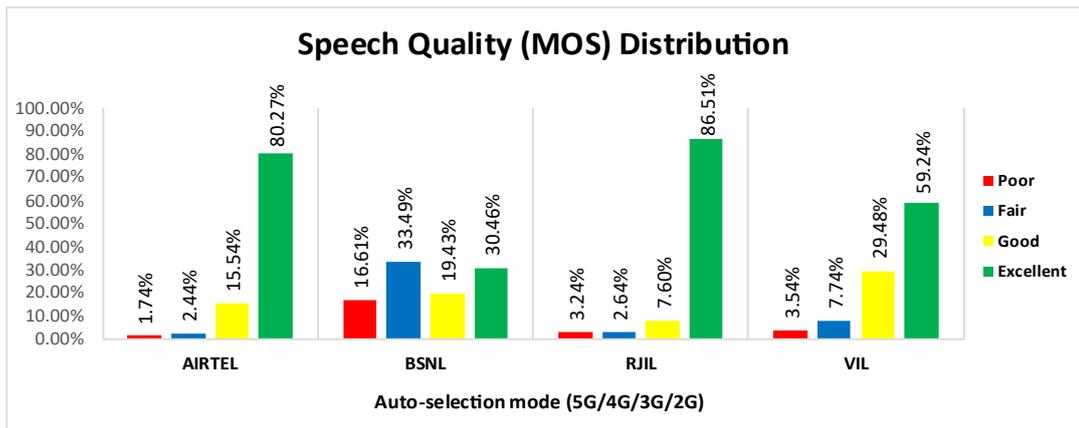

Figure- 4: Distribution of samples in MOS range.

(d) Inter-service provider voice call performance:
To check the performance of inter-service providers call setup success rate, total 16 to 22 inter operator calls were attempted at one location which is Raghunath Temple Jammu. The call setup success rate and call setup time observation is as below.

Call Setup Success Rate %				
From Service Provider	To Service Provider			
	AIRTEL	BSNL	RJIL	VIL
AIRTEL	NA	100.00	88.89	100.00
BSNL	100.00	NA	100.00	53.33
RJIL	94.12	100.00	NA	100.00
VIL	100.00	93.75	100.00	NA

Table-9: Call setup success rate across service providers

Note-
- NA- Only inter-operator calls were measured during test.

Call setup time average (seconds)				
From Service Provider	**To Service Provider**			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
AIRTEL	NA	3.54	1.40	2.59
BSNL	3.48	NA	3.09	2.57
RJIL	1.96	2.84	NA	1.73
VIL	2.07	2.51	1.56	NA

Table-10: Call setup time across service providers.

Note-
- NA- Only inter-operator calls were measured during test.

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**	179.53	11.30	295.90	25.34
	80th Percentile	247.06	19.64	466.84	38.12
	20th Percentile	91.81	1.91	128.26	11.73
Upload Throughput (Mbits/s)	**Average**	30.09	3.86	30.50	16.39
	80th Percentile	51.32	6.47	55.84	26.13
	20th Percentile	7.79	1.22	5.75	6.31
Latency (ms)	**50th Percentile**	27.94	29.72	22.84	43.38

Table-11: Summary of data performance in network auto-selection mode.
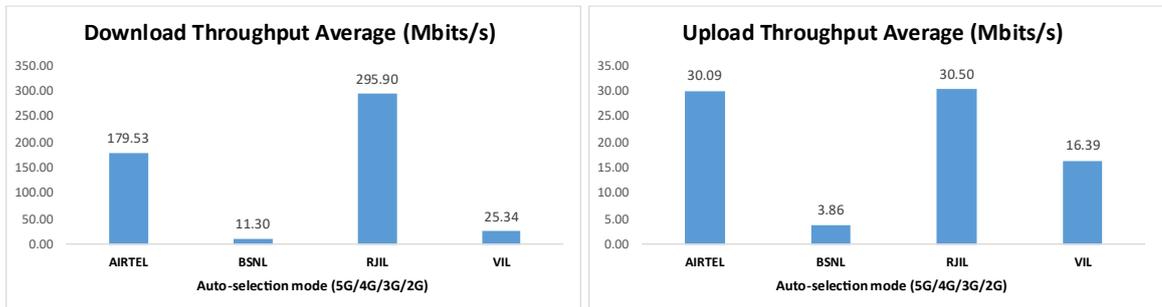
Figure- 5: Download and Upload throughput

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	1910	0
4G	2948	1132	361	1876
3G	NA	82	NA	NA
2G	0	20	NA	37

Table-12: Technology wise number of network cell Id's latched during drive test.

Note-
- NA- Service provider doesn't provide services in respective technology.
- 0- No cell Id's were found 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 highway 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 on 4th & 5th February 2026 in Jammu city. (Refer Table-1)
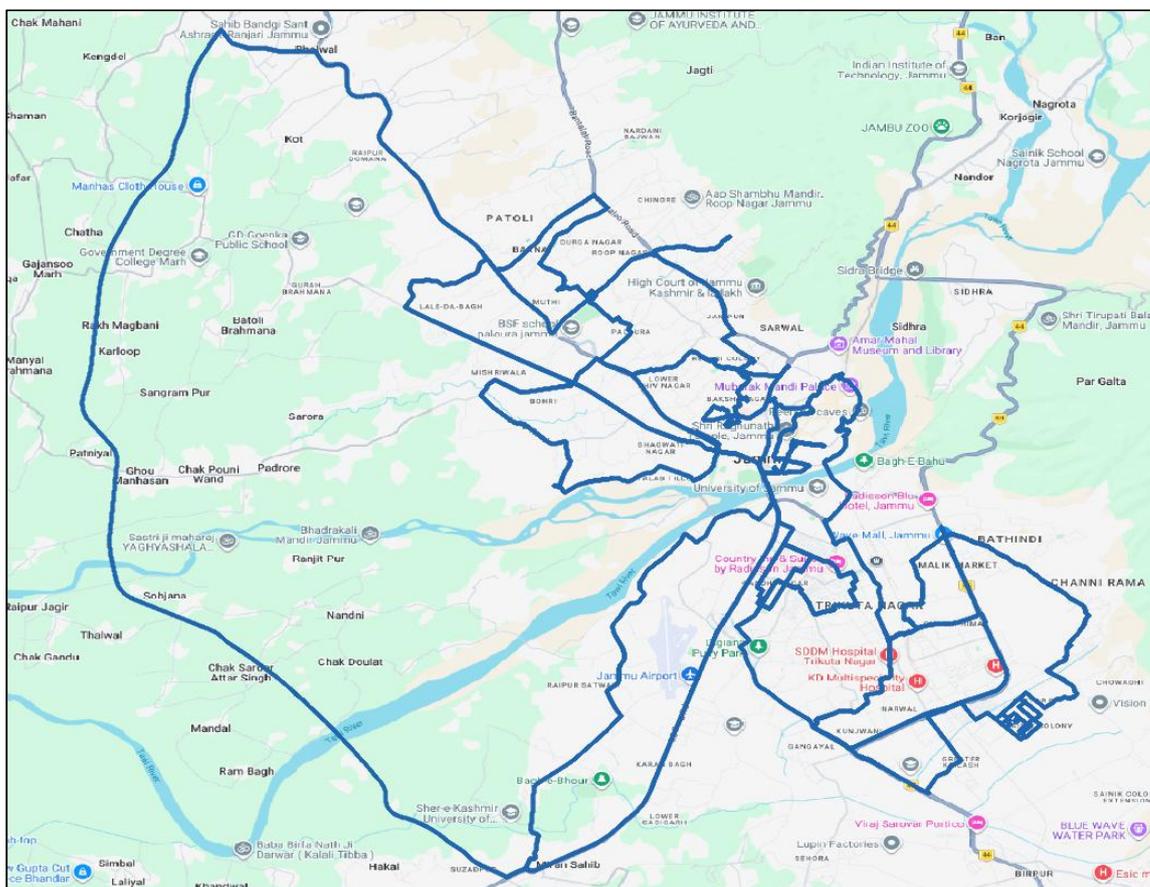
4.2.1 Drive test route

Figure- 6: Drive test routes

4.2.2 Areas covered

Prem Nagar, Gandhi Nagar, Shastri Nagar, Miran Saheb, Gho Manhasan, Raipur Domana and Narwal 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	319	376	319
Call Setup Success Rate %	99.37	77.93	99.37
Drop Call Rate %	0.00	4.10	0.95
Call Setup Time-Average (Second)	2.94	4.49	3.31
Handover Success Rate %	99.23	98.49	95.41

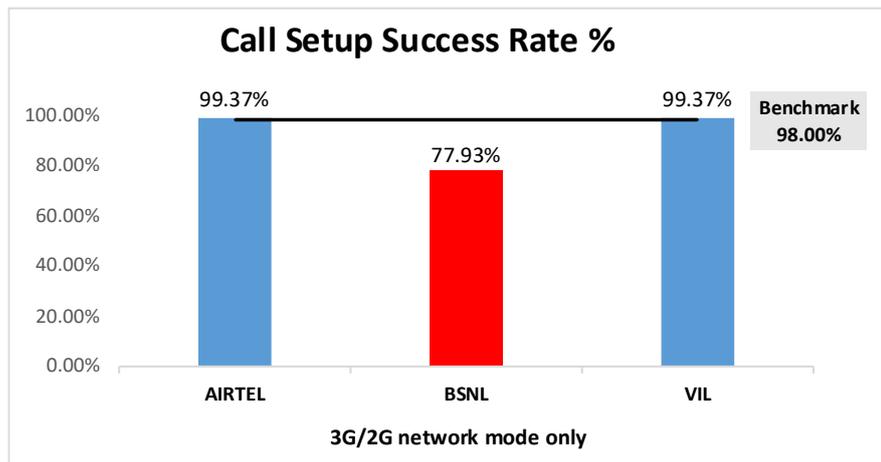**Table-13:** Summary of voice call performance in 3G/2G network mode only**.**

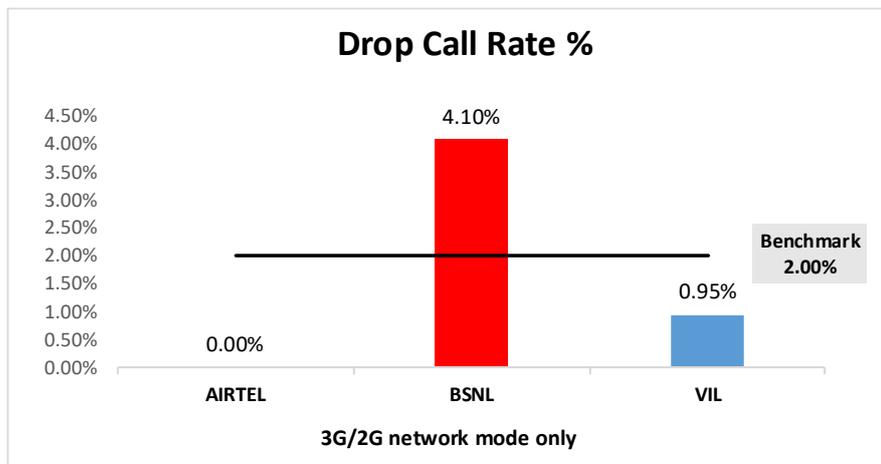**Figure-7:** Performance for call setup success rate.

Figure-8: Performance for drop call rate.

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

Technology	Service Provider		
	AIRTEL	BSNL	VIL
3G	NA	43.21%	NA
2G	100.00%	55.70%	99.87%
Limited Service	0.00%	1.09%	0.13%

Table-14: Time spent on technology during drive test 3G/2G network mode.

Note-
- NA**-** Service provider doesn't provide services in respective technology.
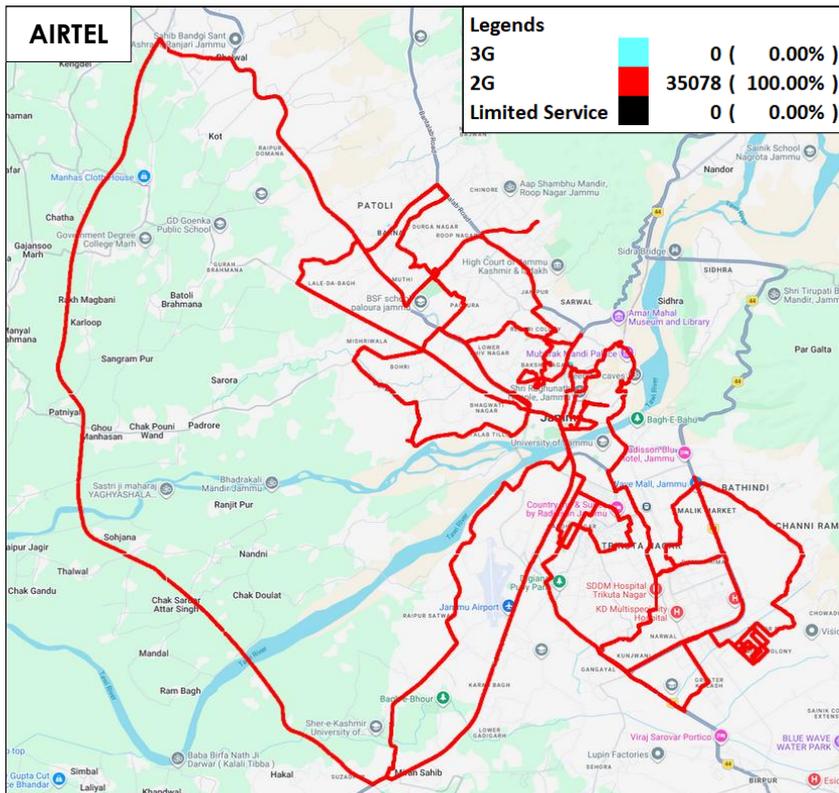
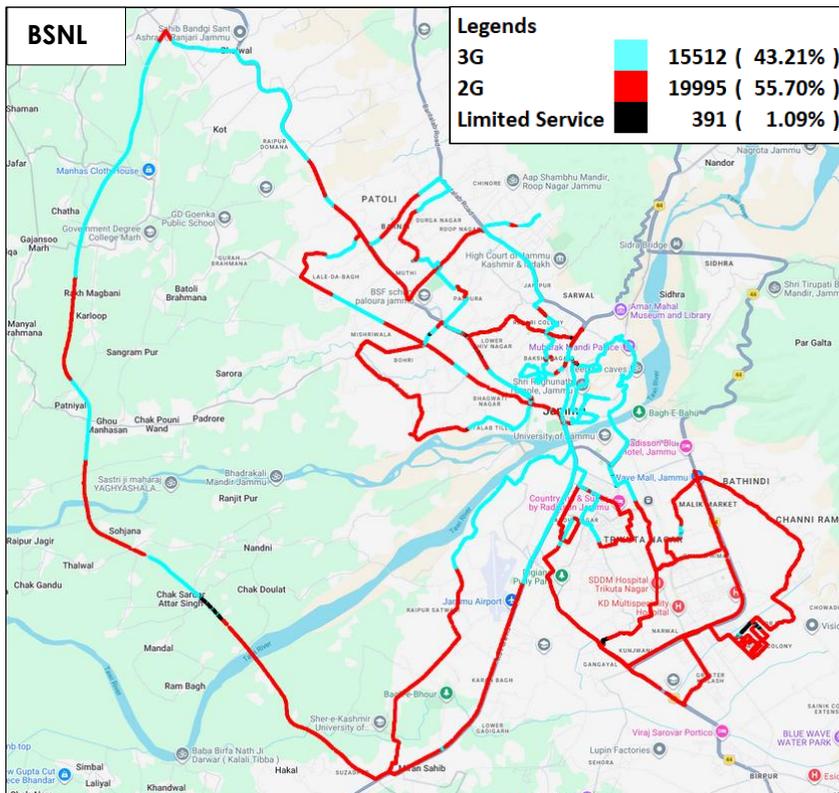**Figure-9:** Serving technology plots 3G/2G network mode - AIRTEL

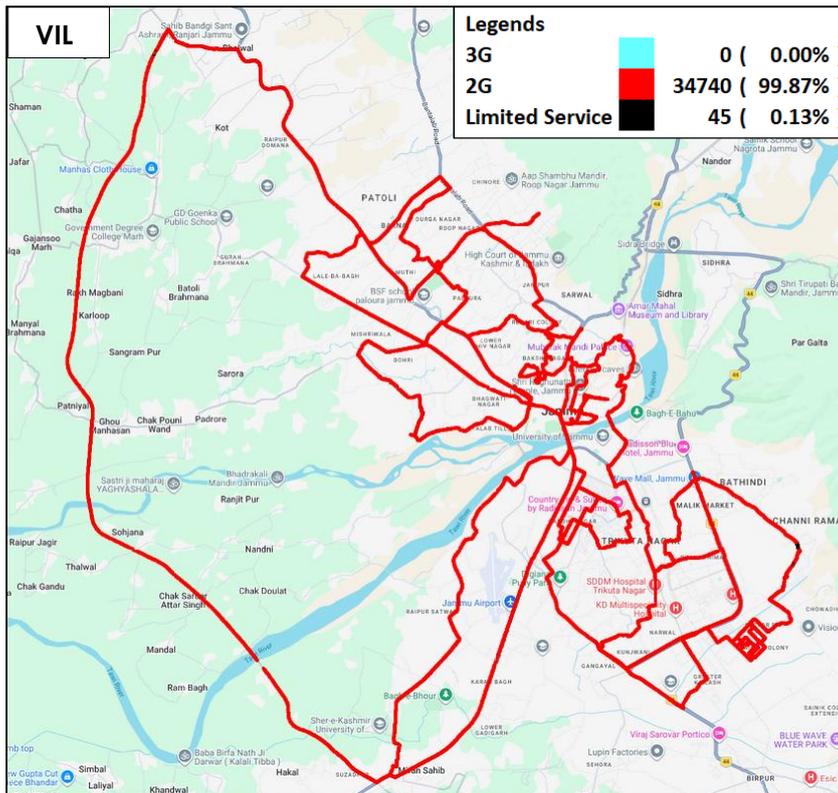**Figure-10:** Serving technology plots 3G/2G network mode - BSNL.

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- 52, 53 & 54 for map view)
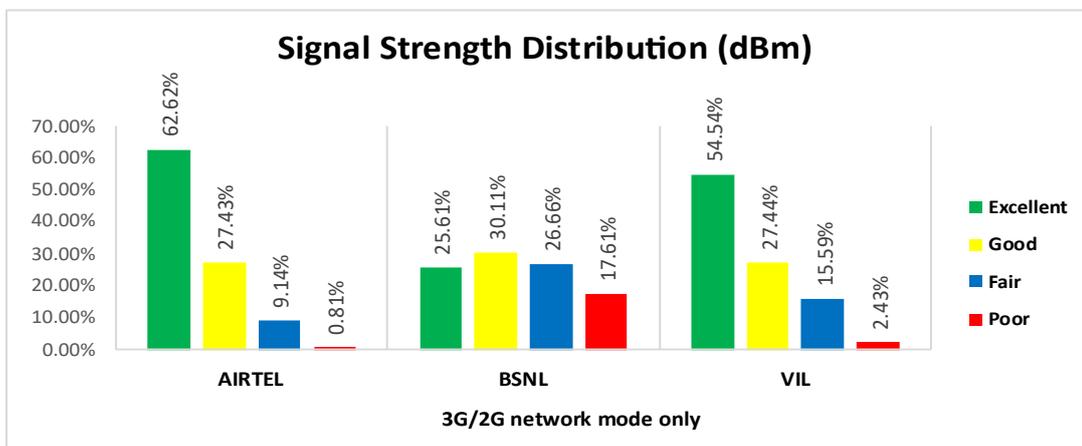

Figure-12: Signal strength distribution 3G/2G network mode only.

Observations:

- Airtel has 63% of samples falling in the excellent signal strength category.
- BSNL has 26% of samples falling in the excellent signal strength category.
- VIL has 55% 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	331	394	335	332
Call Setup Success Rate %	100.00	72.08	99.70	100.00
Drop Call Rate %	0.30	4.58	1.50	0.30
Call Setup Time Average (Second)	1.42	5.05	0.66	0.54
Handover Success Rate %	99.93	98.29	99.70	100.00

Table-15: Summary of voice call performance in network auto-selection mode.
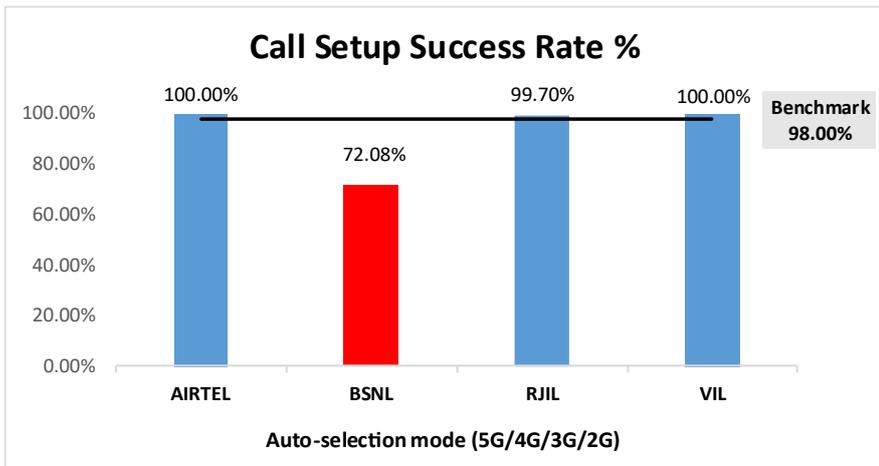

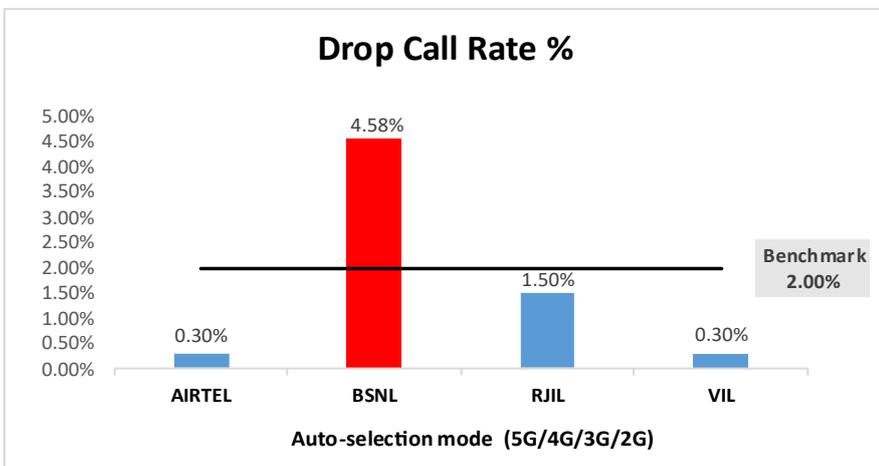**Figure-13:** Performance for call setup success rate.

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)	320	296	318	325
Number of silences call for >4 Sec	0	8	1	3
Silence Call Rate %	0.00	2.70	0.31	0.92
Number of silence instances for >4 Sec	0	9	1	4
Number of silence instances for >3 Sec	0	19	2	7
Number of silence instances for >2 sec	1	33	14	14
RTP Jitter (4G & 5G) in ms	3.42	8.11	17.36	16.95
Packet loss Rate Downlink %	0.16	4.35	1.20	0.85
Packet loss Rate Uplink %	0.18	5.74	1.10	0.71

Table-16: Summary of silence instances & packet loss rate for mobile to mobile call.

(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 value 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-16	1919	1594	1890	1914
Speech Quality (Average MOS)	4.05	3.20	4.47	3.90
Number of samples with MOS >=4 to <5 (Excellent)	1699	559	1664	1142
Number of samples with MOS >=3 to <4 (Good)	197	385	128	643
Number of samples with MOS >=2 to <3 (Fair)	16	413	42	86
Number of samples with MOS >=1 to <2 (Poor)	7	237	56	43
%age of samples with MOS >=4 to <5 (Excellent)	88.54%	35.07%	88.04%	59.67%
%age of samples with MOS >=3 to <4 (Good)	10.27%	24.15%	6.77%	33.59%
%age of samples with MOS >=2 to <3 (Fair)	0.83%	25.91%	2.22%	4.49%
%age of samples with MOS >=1 to <2 (Poor)	0.36%	14.87%	2.96%	2.25%

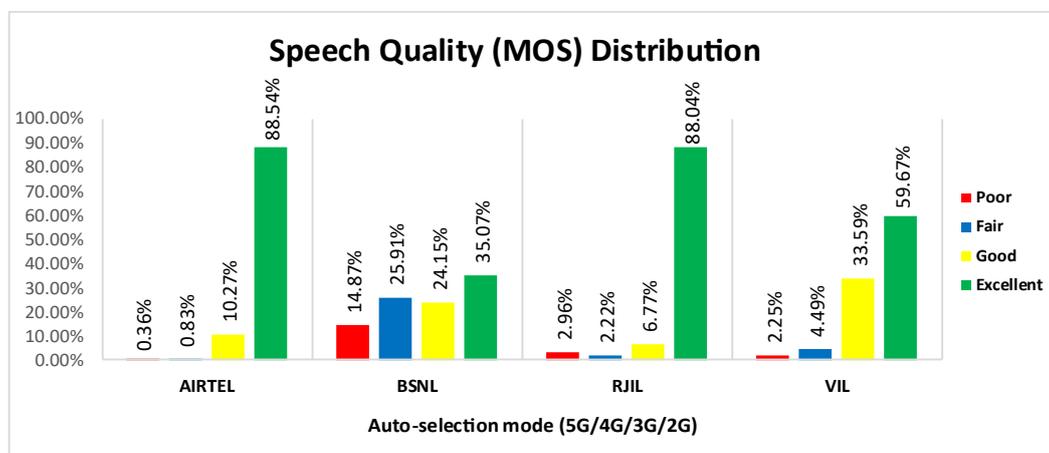**Table-17:** Summary of speech quality (MOS) samples.

Figure-15: Distribution of samples in MOS range.

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

Technology	Service Provider			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	3.23%	NA	75.50%	NA
4G	96.77%	71.17%	24.50%	99.55%
3G	NA	11.06%	NA	NA
2G	0.00%	17.09%	NA	0.45%
Limited Service	0.00%	0.68%	0.00%	0.00%

Table-18: Time spent on technology during drive test in auto-selection mode (5G/4G/3G/2G) voice.

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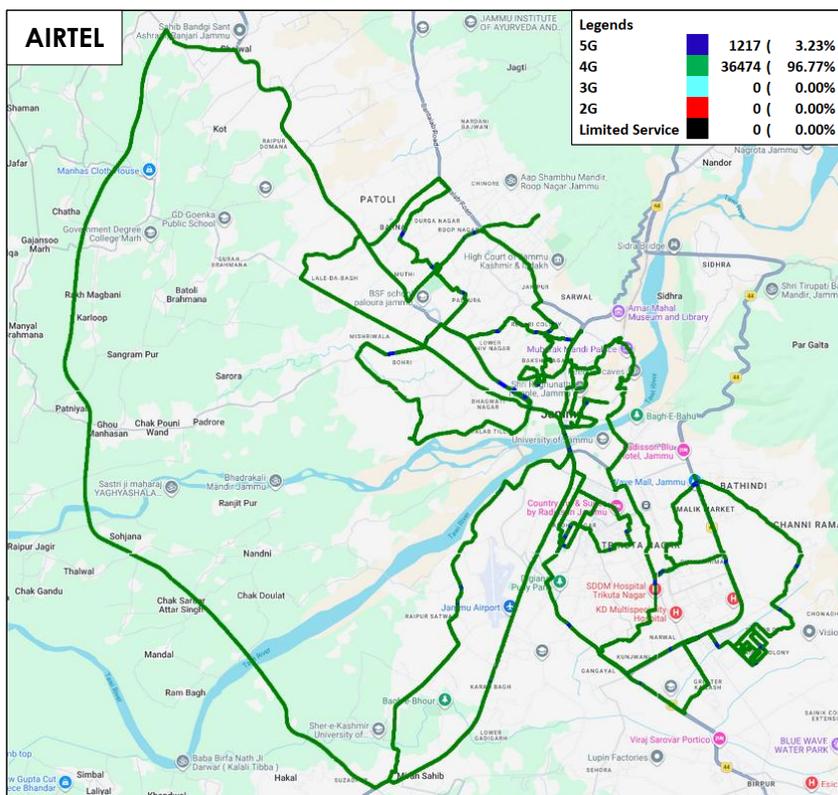- NA- Service provider doesn't provide services in respective technology.

Figure-16: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - AIRTEL.
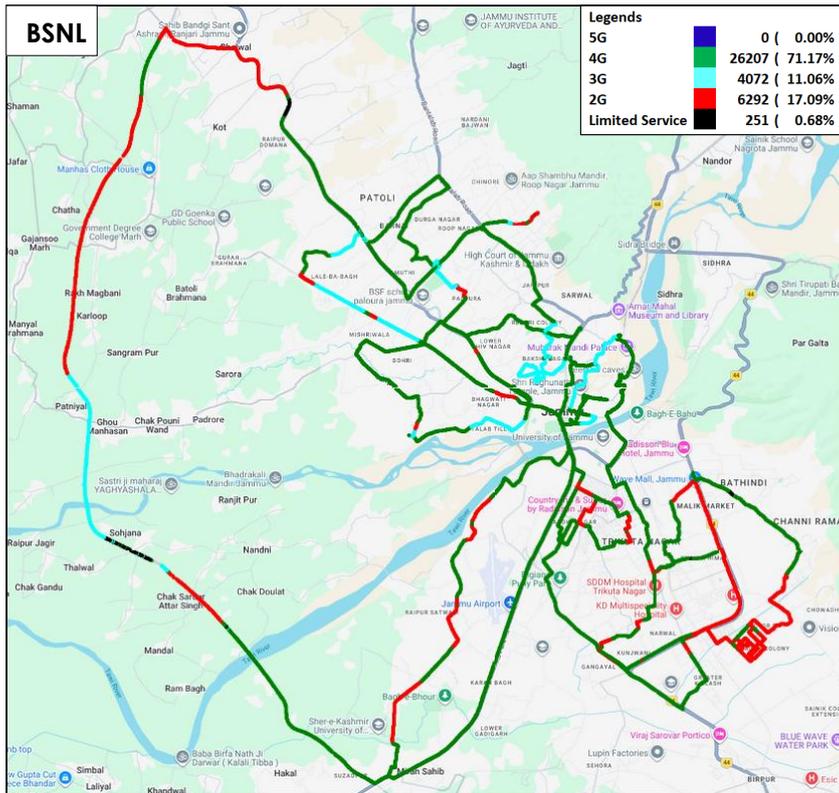
Figure-17: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - BSNL.
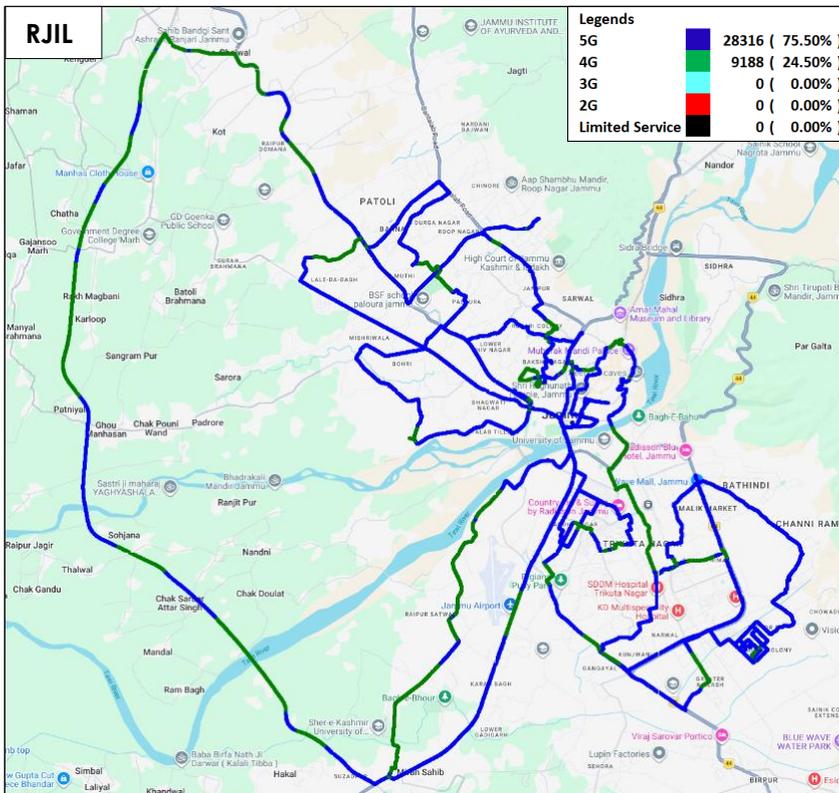

Figure-18: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - RJIL.
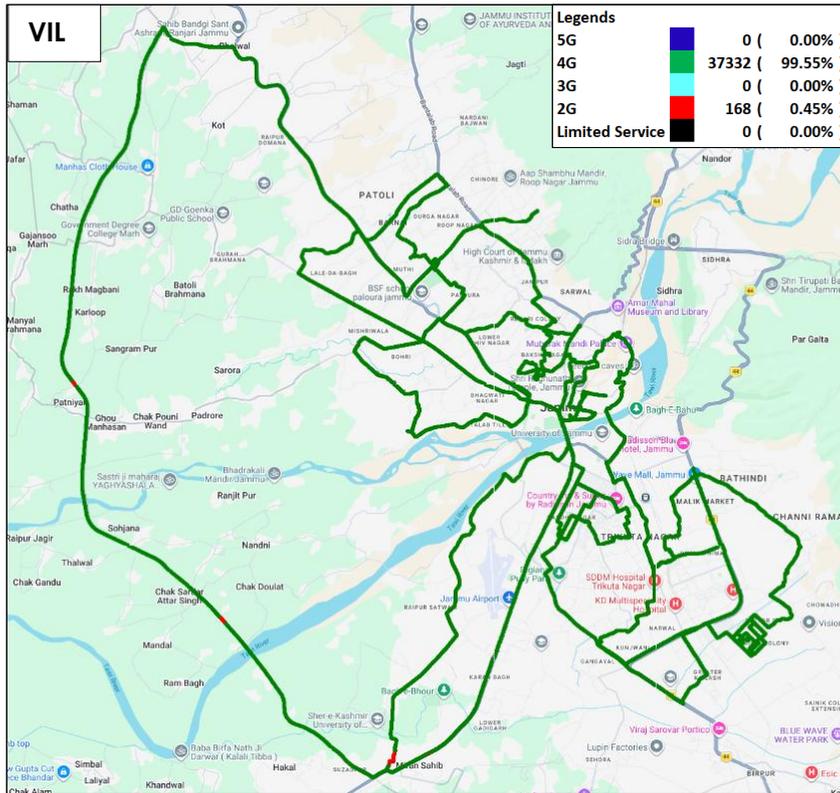
Figure-19: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - VIL

(g) Network Signal Strength Distribution: The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G) voice. (Refer figure-55, 56, 57 & 58 for map view)

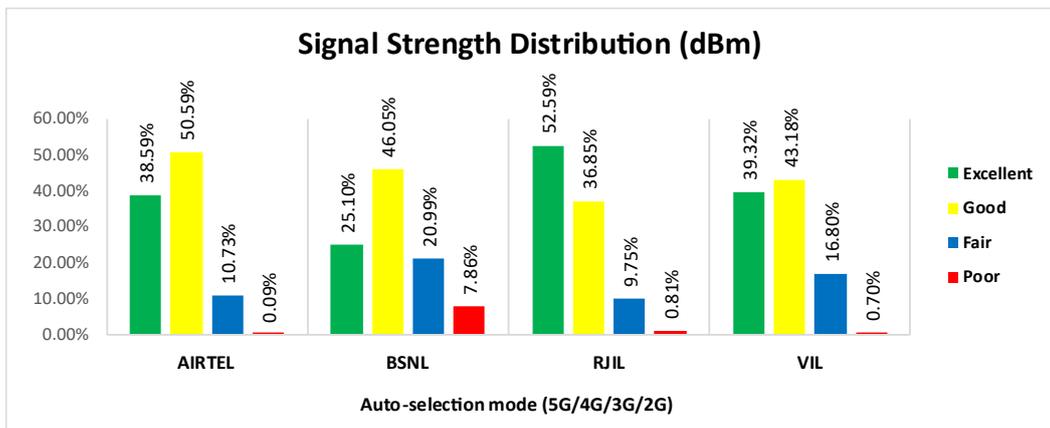**Figure-20:** Signal strength distribution auto-selection mode (5G/4G/3G/2G) voice.

Observations:

- Airtel has 39% of samples falling in the excellent signal strength category.
- BSNL has 25% of samples falling in the excellent signal strength category.
- RJIL has 53% of samples falling in the excellent signal strength category.
- VIL has 39% 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	202.76	7.73	361.50	26.94
	80th Percentile	263.29	14.37	525.15	38.48
	20th Percentile	118.63	0.03	179.79	14.40
Upload Throughput (Mbits/s)	Average	30.09	3.11	37.48	16.70
	80th Percentile	51.36	4.73	62.82	26.05
	20th Percentile	7.95	1.20	8.71	6.72
Latency (ms)	50th Percentile	26.95	32.30	23.50	41.39

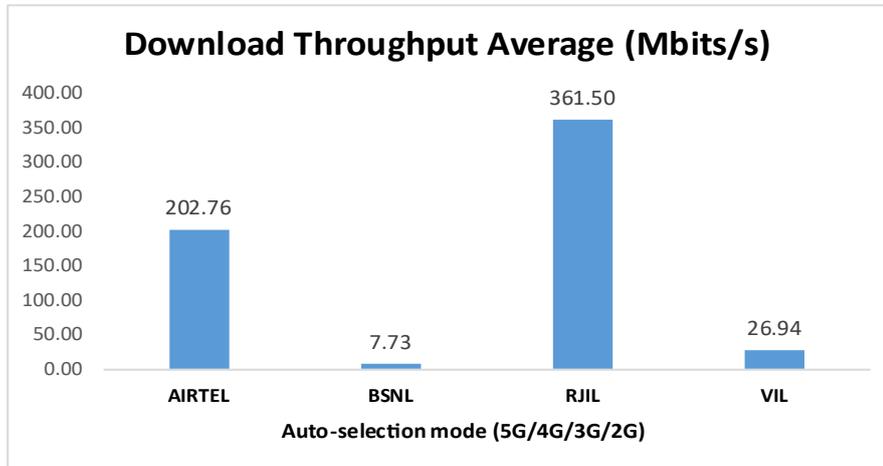**Table-19:** Summary of Data performance in network auto-selection mode.
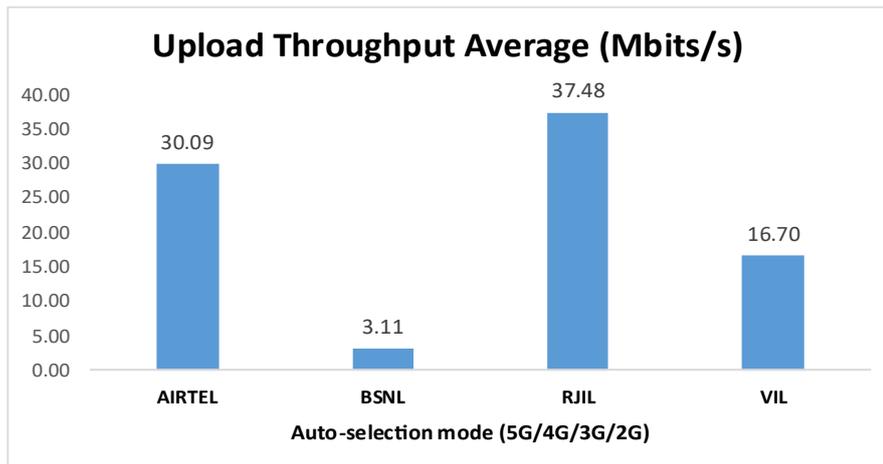

Figure- 21: Download throughput

Figure- 22: Upload throughput

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

Technology	Service Provider			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	93.81%	NA	95.92%	NA
4G	6.19%	86.26%	4.08%	100.00%
3G	NA	11.58%	NA	NA
2G	0.00%	1.90%	NA	0.00%
Limited Service	0.00%	0.26%	0.00%	0.00%

Table-20: Time spent on technology during drive test in auto-selection mode (5G/4G/3G/2G) data.

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

Figure-23: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data -AIRTEL.
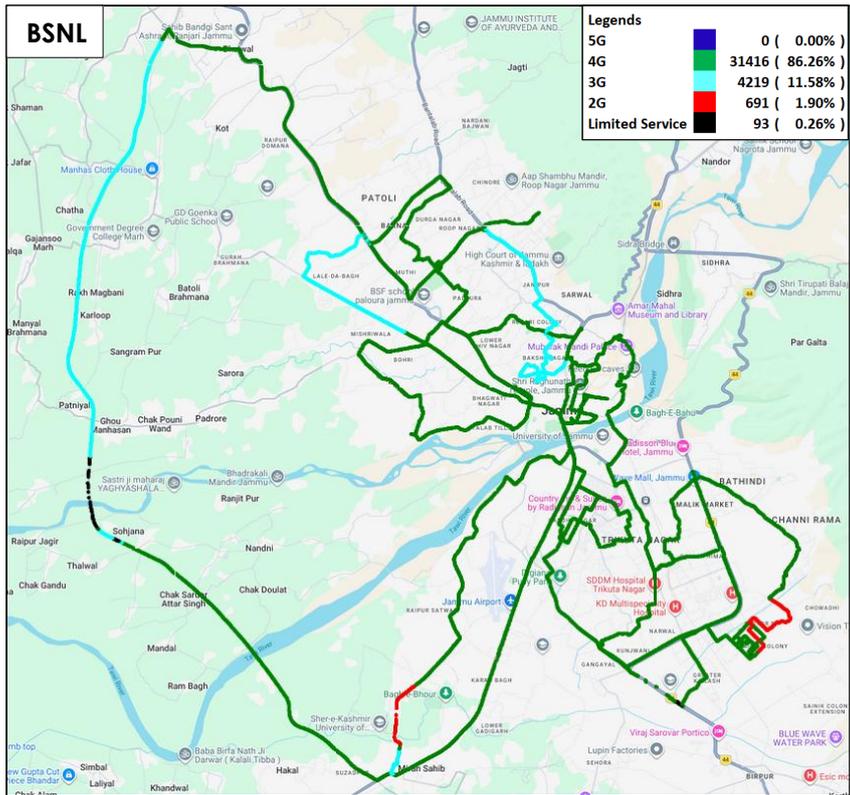
Figure-24: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data-BSNL.
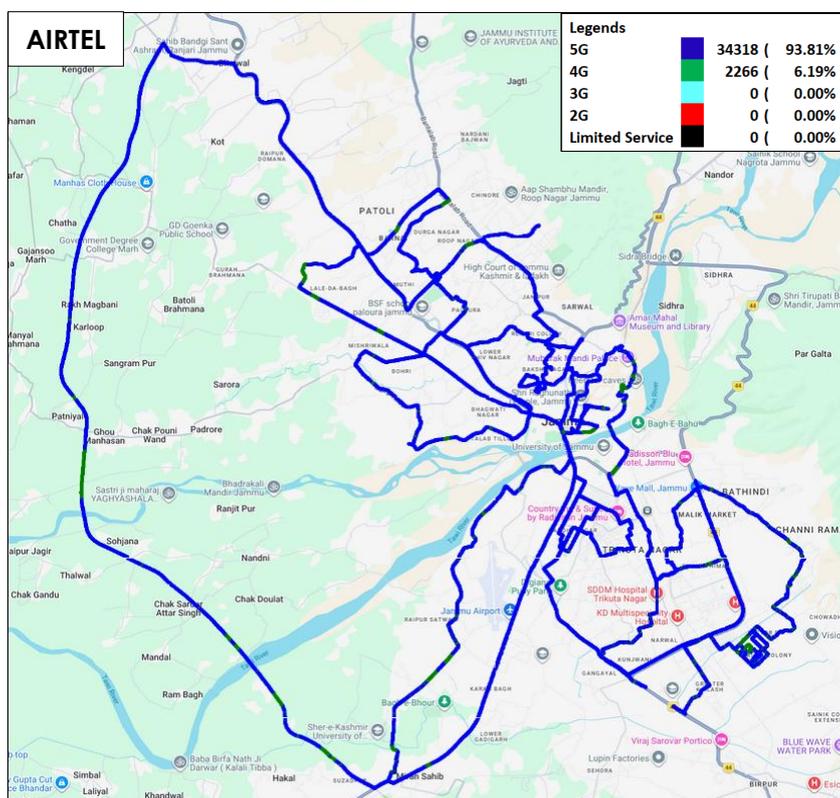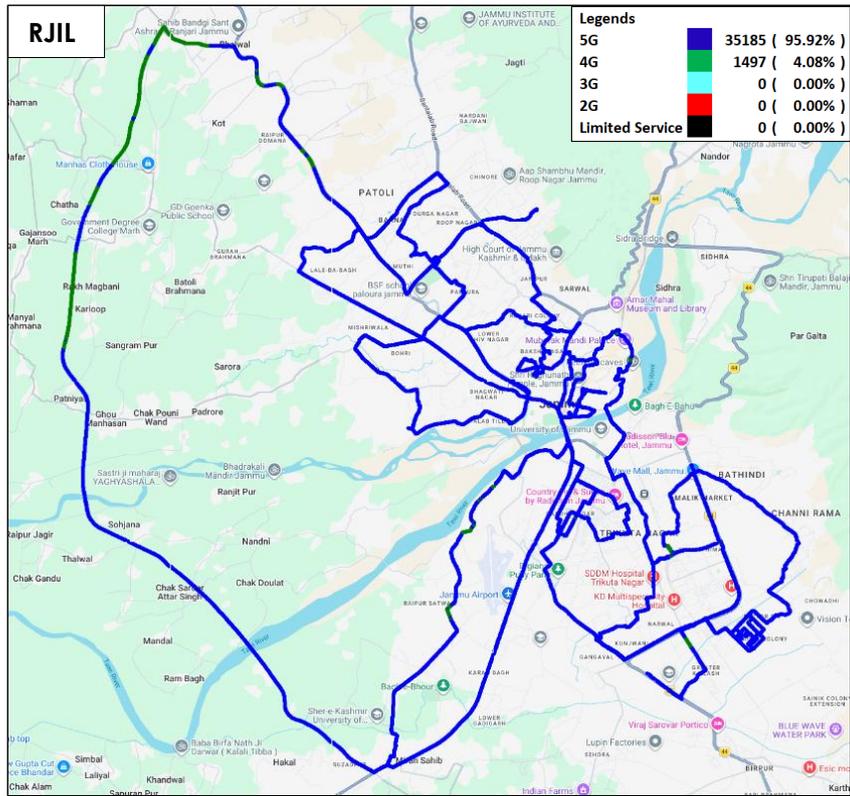

Figure-25: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data- RJIL.
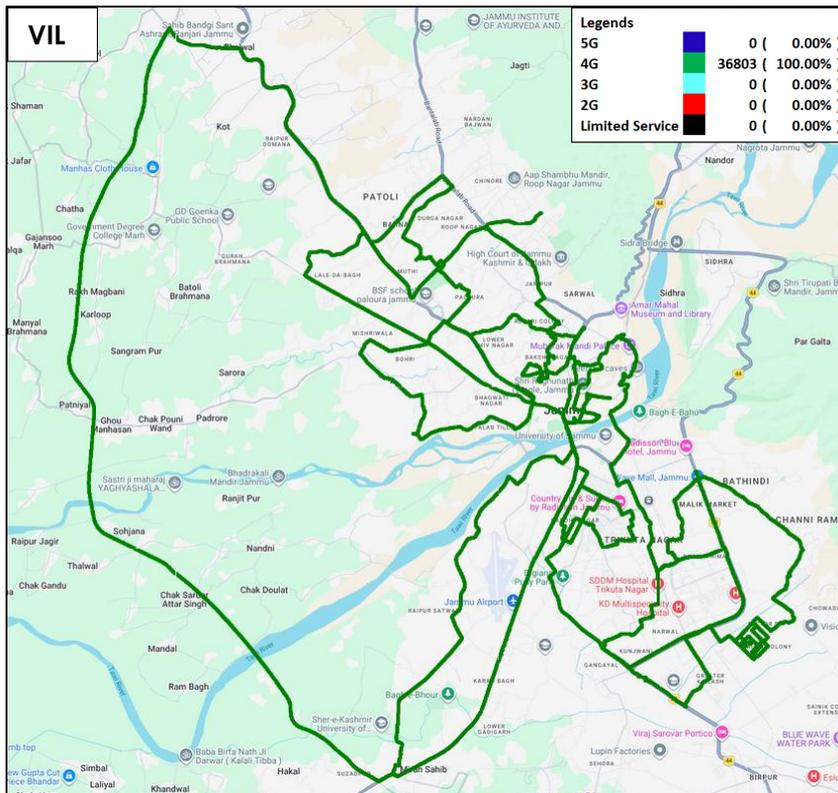
Figure-26: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data– VIL

(c) Network Signal Strength Distribution: The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G) data. (Refer figure-59, 60, 61 & 62 for map view)
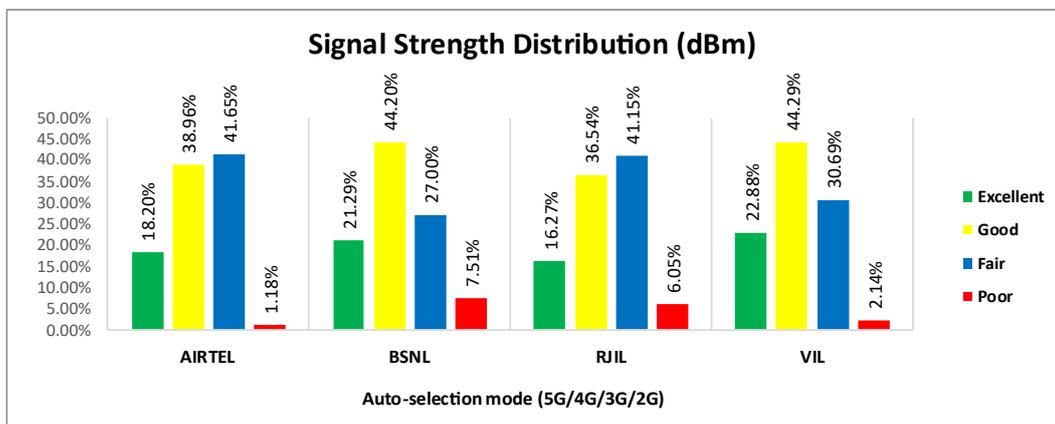
Figure-27: Signal strength distribution auto-selection mode (5G/4G/3G/2G) data.

Observations:

- Airtel has 18% of samples falling in the excellent signal strength category.
- BSNL has 21% of samples falling in the excellent signal strength category.
- RJIL has 16% of samples falling in the excellent signal strength category.
- VIL has 23% of samples falling in the excellent signal strength category.

4.3 Hotspots

Hotspot testing has been conducted on 3rd and 5th February 2026. Six locations have been tested in the city. (Refer Table-1)

4.3.1 Locations
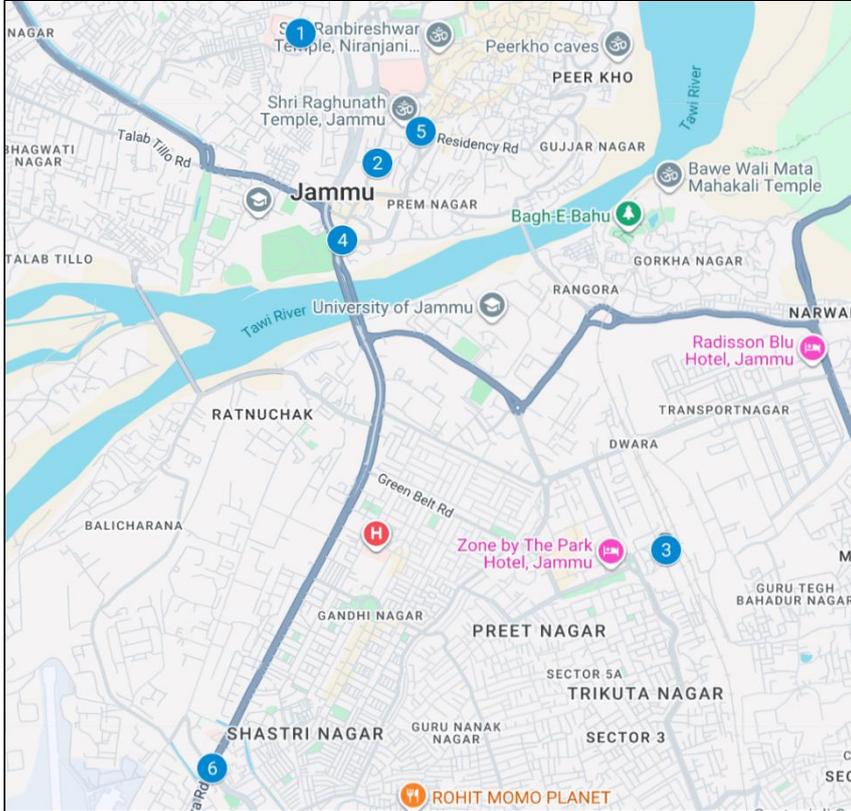
Figure- 28: Hotspot locations

4.3.2 Hotspot covered

1. Govt Medical College Jammu
2. Jammu Bus Stand
3. Jammu Tawi Railway Station
4. Jewel Chowk Jammu
5. Raghunath Temple Jammu
6. Satwari Chowk Jammu

4.3.3 Voice performance

| Overall Voice Performance				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	60	60	60	60
Call Setup Success Rate %	100.00	95.00	100.00	100.00
Drop Call Rate %	0.00	1.75	0.00	0.00
Call Setup Time-Average (Second)	1.42	2.56	0.58	0.50

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

Govt Medical College Jammu				
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	10.00	0.00	0.00
Call Setup Time-Average (Second)	1.44	3.48	0.55	0.51

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

Jammu 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 (Second)	1.43	1.93	0.54	0.49

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

Jammu Tawi Railway Station				
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 (Second)	1.43	2.97	0.61	0.47

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

Jewel Chowk Jammu				
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 (Second)	1.41	2.22	0.56	0.54

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

Raghunath Temple Jammu				
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	70.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.37	2.30	0.60	0.47

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

Satwari Chowk Jammu				
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 (Second)	1.40	2.37	0.63	0.53

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

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)	207.32	12.18	286.67	34.49
Download Throughput 80th Percentile (Mbit/s)	231.34	20.39	364.94	47.74
Download Throughput 20th Percentile (Mbit/s)	162.42	0.03	189.81	23.76
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	40.12	2.50	35.49	13.72
Upload Throughput 80th Percentile (Mbit/s)	48.24	3.46	61.77	26.44
Upload Throughput 20th Percentile (Mbit/s)	29.86	1.23	7.83	4.32
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	4.19	4.43	4.30	5.21
Youtube Initial Buffer Delay (Second)	0.66	1.72	0.63	0.90
Latency (ms) - 50th Percentile	27.86	28.49	24.39	44.89
Jitter (ms)	6.38	3.08	4.28	6.07
Packet Loss Rate%	0.22	0.87	0.15	0.62
Packet Loss Rate- 90th percentile	0.58	2.46	0.20	2.22

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

Govt Medical College Jammu				
Parameters	**Service Provider**			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	159.92	8.57	211.98	26.97
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	13.97	2.01	6.11	12.39
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	3.90	1.65	4.54	4.96
Youtube Initial Buffer Delay (Second)	0.58	2.78	0.60	0.84
Latency (ms) - 50th Percentile	26.66	26.72	22.81	40.44
Jitter (ms)	10.28	2.45	2.57	4.88
Packet Loss Rate%	0.50	2.10	0.00	0.10

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

Jammu Bus Stand				
Parameters	**Service Provider**			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	179.65	20.37	249.65	31.54
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	49.62	3.31	38.86	6.12
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	3.87	5.83	4.15	4.93
Youtube Initial Buffer Delay (Second)	0.72	0.80	0.68	0.82
Latency (ms) - 50th Percentile	41.34	27.43	22.92	47.38
Jitter (ms)	7.16	2.91	3.10	5.49
Packet Loss Rate%	0.20	0.60	0.20	0.30

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

Jammu Tawi Railway Station				
Parameters	**Service Provider**			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	258.80	20.03	515.92	13.52
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	57.85	2.55	77.98	5.10
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	3.40	3.88	4.32	6.34
Youtube Initial Buffer Delay (Second)	0.54	2.08	0.45	0.98
Latency (ms) – 50th Percentile	24.99	28.80	24.42	49.59
Jitter (ms)	4.29	1.97	2.74	12.78
Packet Loss Rate%	0.00	0.30	0.10	0.60

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

Jewel Chowk Jammu				
Parameters	**Service Provider**			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	224.13	0.03	160.23	28.72
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	43.51	1.21	8.73	3.41
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	5.31	-	3.96	5.34
Youtube Initial Buffer Delay (Second)	0.83	-	0.88	1.07
Latency (ms) - 50th Percentile	31.55	30.70	28.23	46.08
Jitter (ms)	4.74	4.90	7.22	5.23
Packet Loss Rate%	0.10	1.70	0.00	2.50

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

Note- "-" Web Browsing and Youtube tests were failed.

Raghunath Temple Jammu				
Parameters	**Service Provider**			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	240.24	5.76	241.62	61.23
Download Session Setup Success Rate%	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	31.40	2.00	61.45	30.51
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	4.70	5.50	5.37	4.90
Youtube Initial Buffer Delay (Second)	0.61	1.04	0.57	0.77
Latency (ms)- 50th Percentile	31.79	27.63	22.27	41.97
Jitter (ms)	4.89	3.57	6.63	3.30
Packet Loss Rate%	0.10	0.30	0.20	0.00

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

Satwari Chowk Jammu				
Parameters	**Service Provider**			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	181.21	18.29	340.63	44.96
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	44.35	3.91	19.81	24.76
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	3.95	5.48	3.41	4.79
Youtube Initial Buffer Delay (Second)	0.69	1.32	0.59	0.93
Latency (ms) - 50th Percentile	25.57	32.49	25.29	45.42
Jitter (ms)	6.92	2.75	3.44	4.74
Packet Loss Rate%	0.40	0.20	0.40	0.20

Table-34: 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)**	178.53	-	298.52	-
	Upload Throughput Average (Mbits/s)	47.22	-	37.97	-
4G	**Download Throughput Average (Mbits/s)**	35.93	13.08	41.57	25.07
	Upload Throughput Average (Mbits/s)	10.01	5.44	9.23	10.81

Table-35: Overall Summary of 5G only & 4G only data download & upload speed.

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

Govt Medical College Jammu					
	Parameters	**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	**Download Throughput Average (Mbits/s)**	158.43	-	198.50	-
	Upload Throughput Average (Mbits/s)	19.72	-	12.05	-
4G	**Download Throughput Average (Mbits/s)**	1.92	10.62	25.58	12.60
	Upload Throughput Average (Mbits/s)	3.74	3.31	2.84	13.48

Table-36: Overall Summary of 5G only & 4G only data download & upload speed.

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

Jammu Bus Stand					
	Parameters	**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	**Download Throughput Average (Mbits/s)**	155.22	-	275.88	-
	Upload Throughput Average (Mbits/s)	46.49	-	41.71	-
4G	**Download Throughput Average (Mbits/s)**	81.88	18.90	24.20	27.58
	Upload Throughput Average (Mbits/s)	7.73	9.07	3.77	3.63

Table-37: Overall Summary of 5G only & 4G only data download & upload speed.

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

Jammu Tawi Railway Station					
Parameters		**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	Download Throughput Average (Mbits/s)	207.13	-	503.85	-
	Upload Throughput Average (Mbits/s)	64.78	-	80.01	-
4G	Download Throughput Average (Mbits/s)	59.54	12.37	41.76	17.36
	Upload Throughput Average (Mbits/s)	12.22	5.01	20.00	13.54

Table-38: Overall Summary of 5G only & 4G only data download & upload speed.

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

Jewel Chowk Jammu					
Parameters		**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	Download Throughput Average (Mbits/s)	140.59	-	134.42	-
	Upload Throughput Average (Mbits/s)	73.64	-	11.90	-
4G	Download Throughput Average (Mbits/s)	19.19	0.02	74.44	22.76
	Upload Throughput Average (Mbits/s)	14.79	1.14	9.34	2.81

Table-39: Overall Summary of 5G only & 4G only data download & upload speed.

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

Raghunath Temple Jammu					
Parameters		**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	Download Throughput Average (Mbits/s)	216.16	-	264.74	-
	Upload Throughput Average (Mbits/s)	26.58	-	62.06	-
4G	Download Throughput Average (Mbits/s)	31.51	18.19	49.47	36.09
	Upload Throughput Average (Mbits/s)	9.01	6.98	9.07	17.56

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

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

Satwari Chowk Jammu					
Parameters		**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	Download Throughput Average (Mbits/s)	193.67	-	413.73	-
	Upload Throughput Average (Mbits/s)	52.10	-	20.07	-
4G	Download Throughput Average (Mbits/s)	21.52	18.39	33.96	34.03
	Upload Throughput Average (Mbits/s)	12.57	7.15	10.35	13.82

Table-41: Overall 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 5th February 2026. Two locations have been tested in the city. (Refer Table-1)

4.4.1 Walk test locations
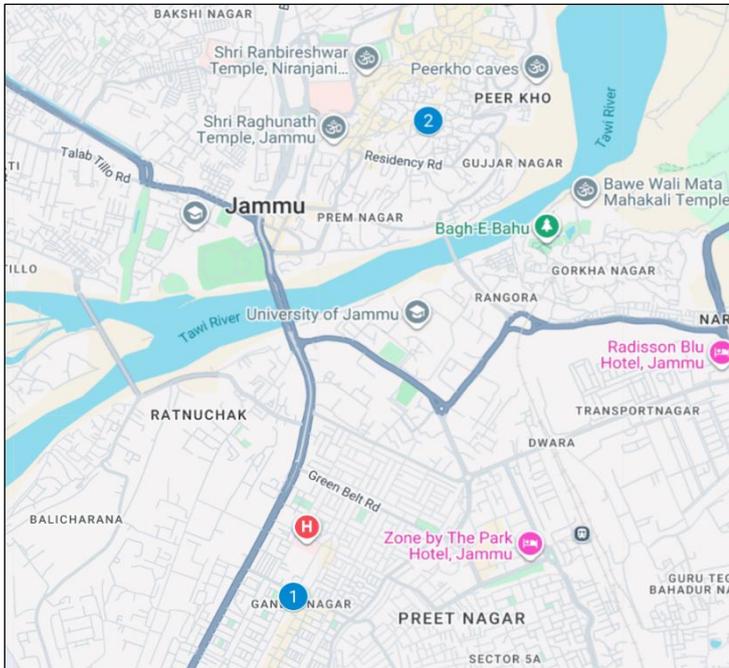
Figure-29: Walk Test locations.

4.4.2 Walk Test Covered

1. Gole Market Jammu
2. Hari Market Jammu

4.4.3 Voice Performance

Gole Market Jammu				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	15	15	15	16
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)	1.38	2.85	0.58	0.47

Table-42: Summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

Hari Market Jammu				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	18	18	19	18
Call Setup Success Rate %	100.00	100.00	94.74	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.38	2.30	0.67	0.51

Table-43: 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)

Gole Market Jammu				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	108.66	16.61	311.19	27.56
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	52.99	7.40	46.85	31.93
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Latency (ms) - 50th Percentile	28.68	26.93	22.93	45.09

Table-44: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Hari Market Jammu				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	241.65	16.19	510.47	33.13
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	26.24	4.73	63.63	21.88
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Latency (ms) - 50th Percentile	25.25	27.16	22.88	47.71

Table-45: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

4.5 Highway

Drive test has been conducted on 2nd and 3rd February 2026 covering one Highway route. (Refer Table-1)

4.5.1 Drive test route
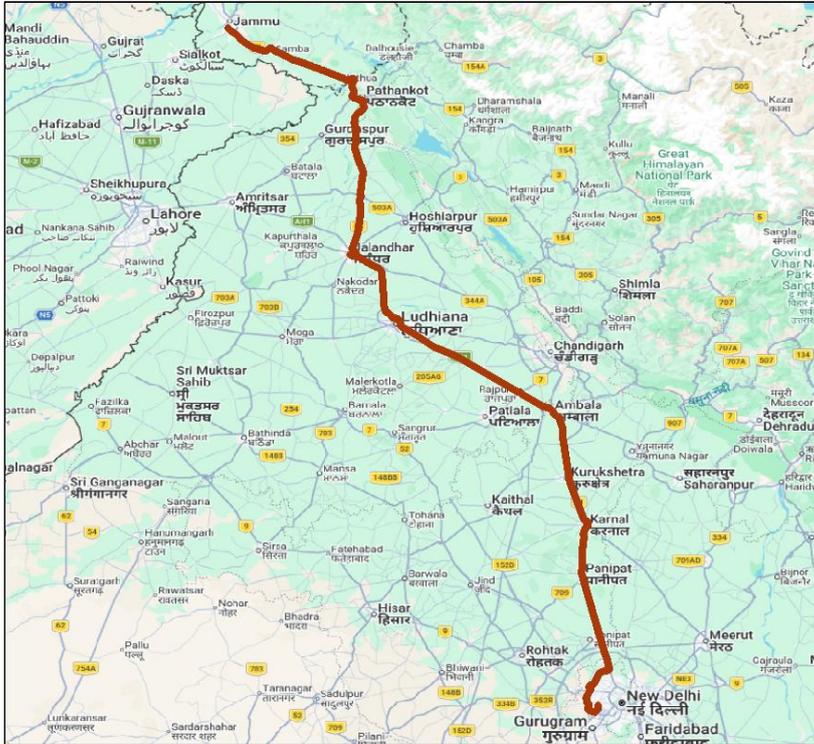
Figure-30: Drive test route Highway.

4.5.2 Routes Covered

Delhi to Jammu passing through Dwarka, Kundli, Karnal, Ambala, Ludhiana, Phagwara, Jalandhar, Dasuya, Pathankot, Lakhanpur and Samba and Bari Brahmana etc.

4.5.3 Voice performance

(a) Voice Call Performance in 3G/2G network mode only: 3G/2G network mode testing has been done to reflect the 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	267	267	250
Call Setup Success Rate %	89.89	92.51	98.00
Drop Call Rate %	5.00	8.50	5.71
Call Setup Time-Average (Second)	3.84	3.04	4.90
Handover Success Rate %	97.87	99.15	97.16

Table-46: Summary of voice call performance in 3G/2G network mode only.
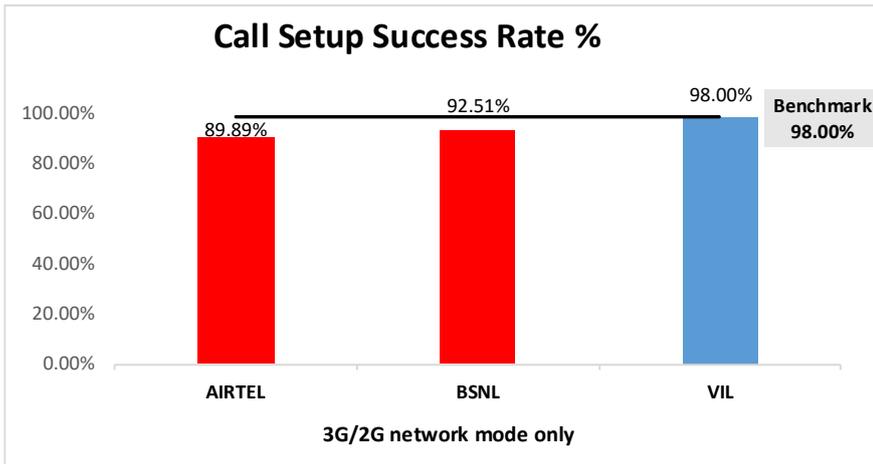
Figure-31: Performance for call setup success rate.
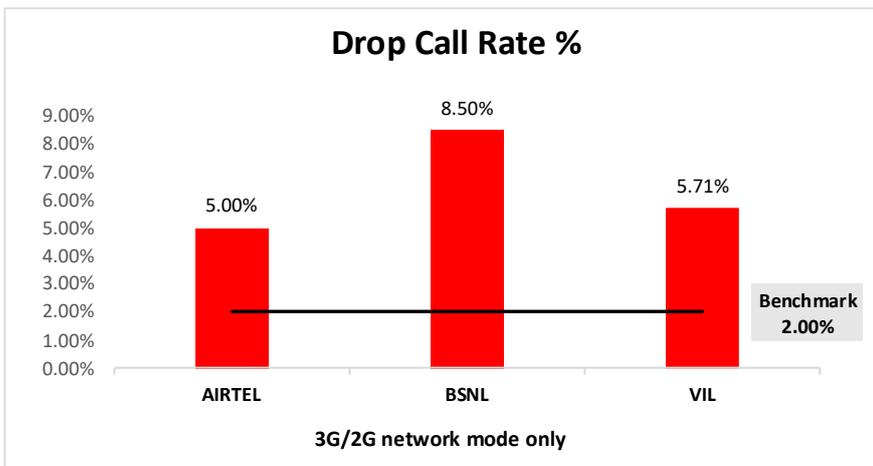
Figure-32: Performance for drop call rate.

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

Technology	Service Provider		
	AIRTEL	**BSNL**	**VIL**
3G	NA	57.66%	NA
2G	99.91%	42.16%	99.95%
Limited Service	0.09%	0.18%	0.05%

Table-47: Time spent on technology during drive test 3G/2G network mode only.
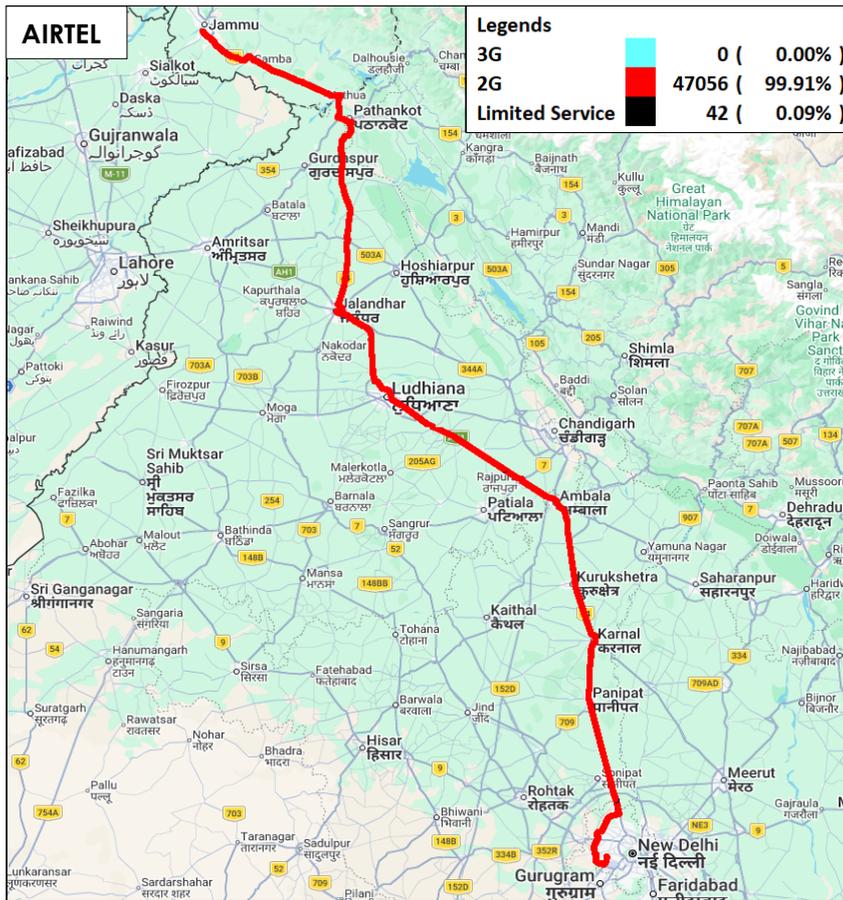
Figure-33: Serving technology plots 3G/2G network mode - AIRTEL.
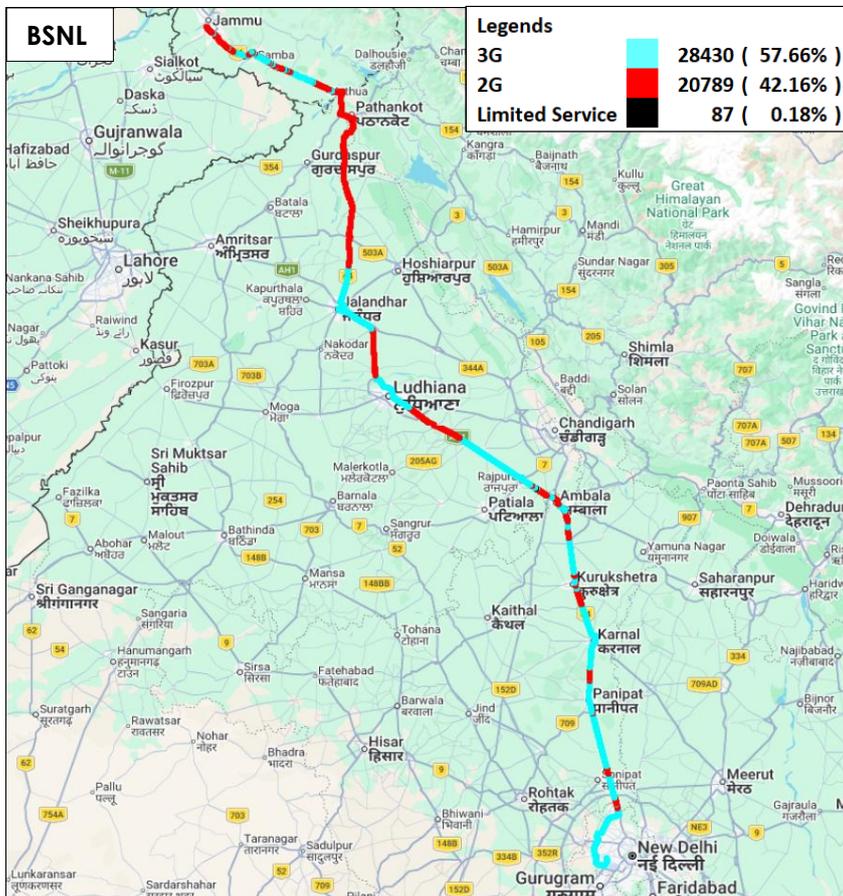
Figure-34: Serving technology plots 3G/2G network mode - BSNL.
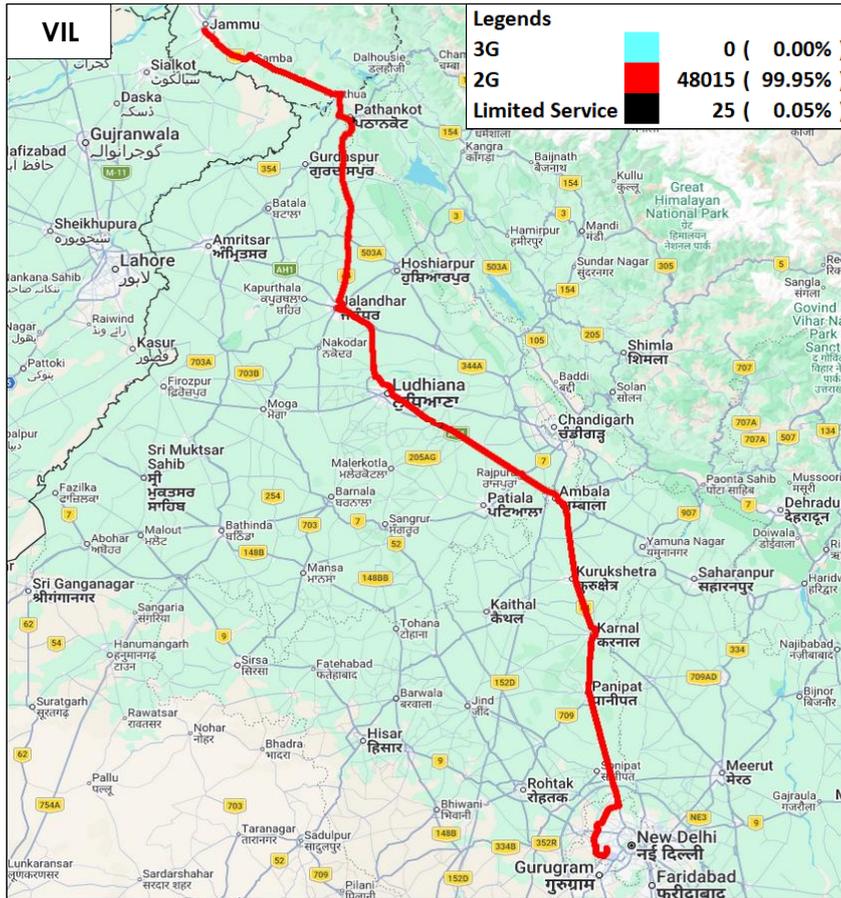
Figure 35: Serving technology plots 3G/2G network mode - VIL.

(c) Network Signal Strength Distribution: The following chart represents signal strength distribution for 3G/2G network mode only. (Refer figure-63, 64 & 65 for map view)
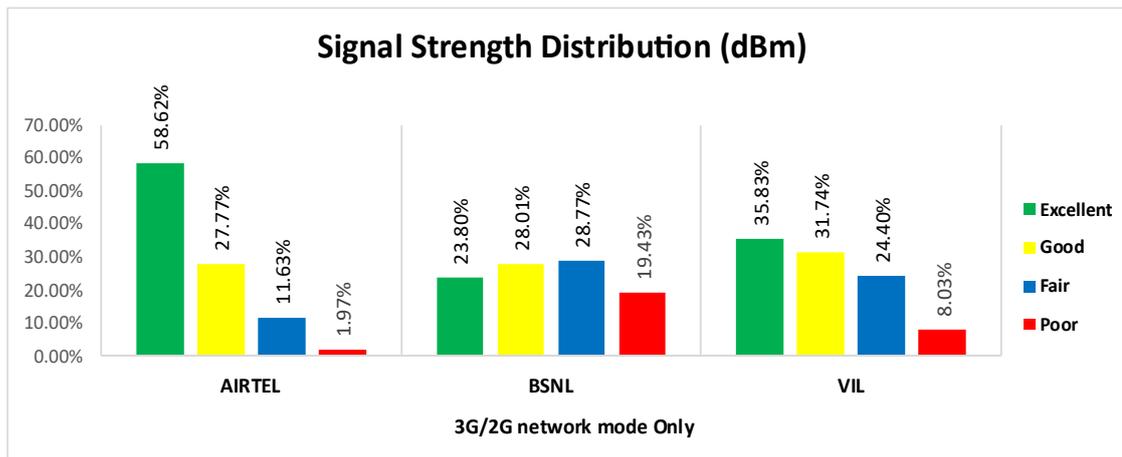
Figure-36: Signal strength distribution 3G/2G network mode only.

Observations:

- Airtel has 59% of samples falling in the excellent signal strength category.
- BSNL has 24% of samples falling in the excellent signal strength category.
- VIL has 36% 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	257	291	254	250
Call Setup Success Rate %	96.89	89.69	98.43	98.00
Drop Call Rate %	1.61	13.79	1.20	1.22
Call Setup Time Average (Second)	1.38	3.47	0.68	1.64
Handover Success Rate %	99.85	98.41	99.95	100.00

Table-48: Summary of voice call performance in network auto-selection mode.
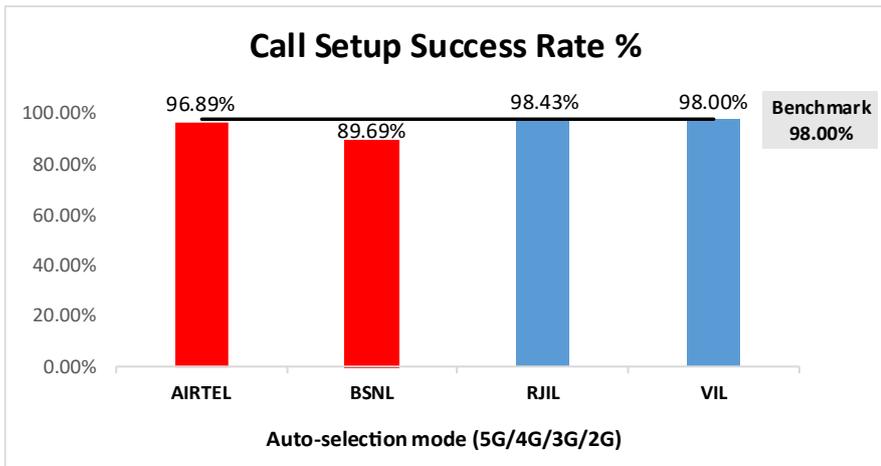
Figure-37: Performance for call setup success rate.
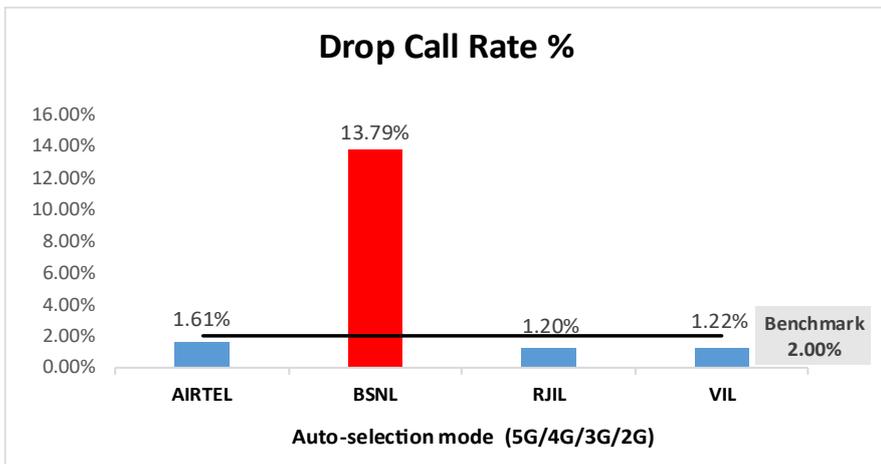
Figure-38: Performance for drop call rate.

Parameter	Service Provider Mobile-to-Mobile (5G/4G - Open Mode)			
	AIRTEL	BSNL	RJIL	VIL
Call Established (within service provider Network)	247	231	244	247
Number of silence call for >4 Sec	4	28	2	5
Silence Call Rate %	1.62	12.12	0.82	2.02
Number of silence instances for >4 Sec	5	47	3	8
Number of silence instances for >3 Sec	14	70	11	10
Number of silence instances for >2 sec	38	115	33	21
RTP Jitter (4G & 5G) in ms	5.44	9.16	15.53	16.09
Packet loss Rate Downlink %	1.07	7.28	1.24	1.57
Packet loss Rate Uplink %	0.81	5.58	1.22	1.64

Table-49: Summary of silence instances & packet loss rate for mobile to mobile call.

(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 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-49	3125	2565	3108	3113
Speech Quality (Average MOS)	3.91	2.99	4.41	3.78
Number of samples with MOS >=4 to <5 (Excellent)	2350	708	2660	1836
Number of samples with MOS >=3 to <4 (Good)	587	423	252	839
Number of samples with MOS >=2 to <3 (Fair)	107	980	90	303
Number of samples with MOS >=1 to <2 (Poor)	81	454	106	135
%age of samples with MOS >=4 to <5 (Excellent)	75.20%	27.60%	85.59%	58.98%
%age of samples with MOS >=3 to <4 (Good)	18.78%	16.49%	8.11%	26.95%
%age of samples with MOS >=2 to <3 (Fair)	3.42%	38.21%	2.90%	9.73%
%age of samples with MOS >=1 to <2 (Poor)	2.59%	17.70%	3.41%	4.34%

Table-50: Summary of speech quality (MOS) samples.
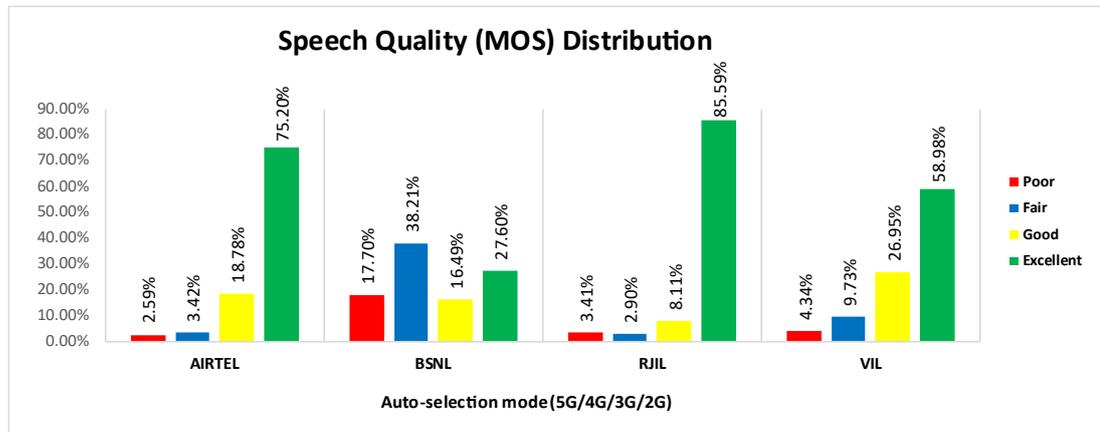
Figure-39: Distribution of samples in MOS range.
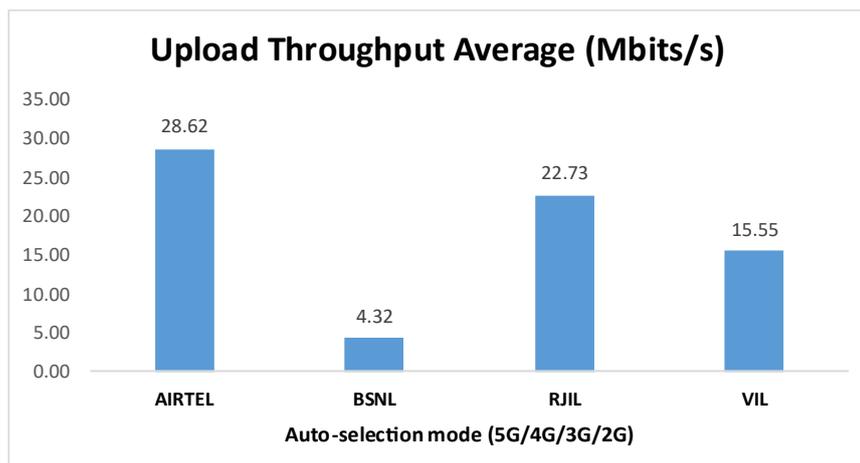
(f) Network Technology: This section represents time spent on various network technologies.

Technology	Service Provider			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	1.01%	NA	68.54%	0.20%
4G	96.30%	47.68%	31.46%	94.80%
3G	NA	13.10%	NA	NA
2G	2.67%	38.48%	NA	5.00%
Limited Service	0.03%	0.73%	0.00%	0.00%

Table-51: Time spent on technology during drive test in auto-selection mode (5G/4G/3G/2G) voice.

Note-
- NA- Service provider doesn't provide services in respective technology.
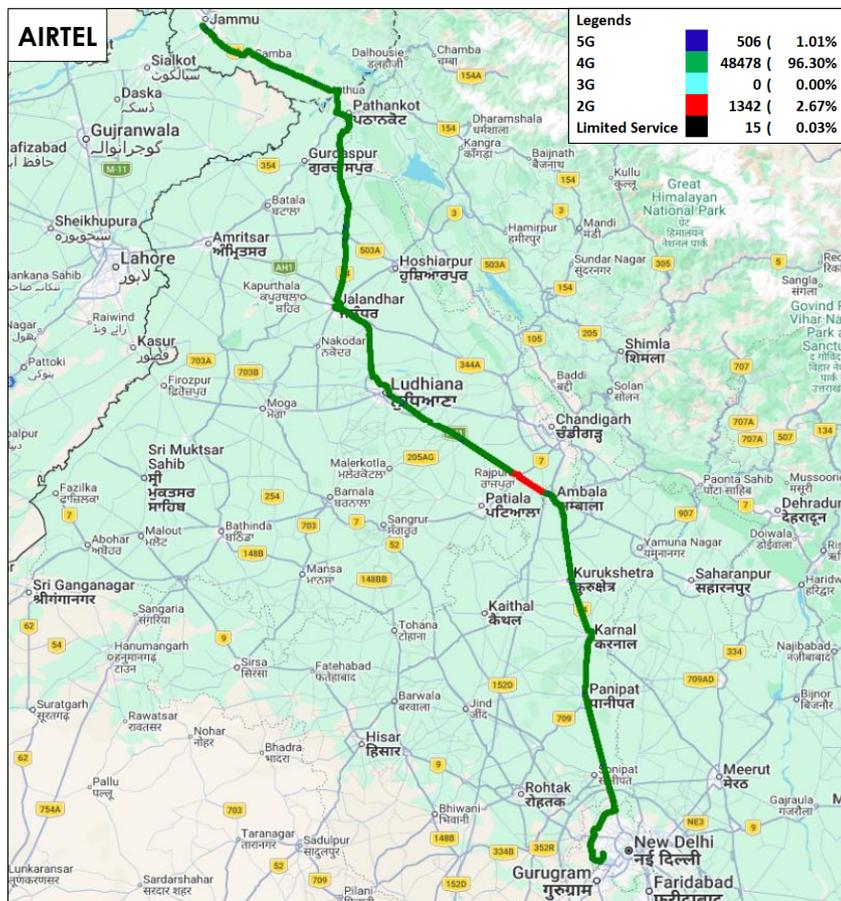
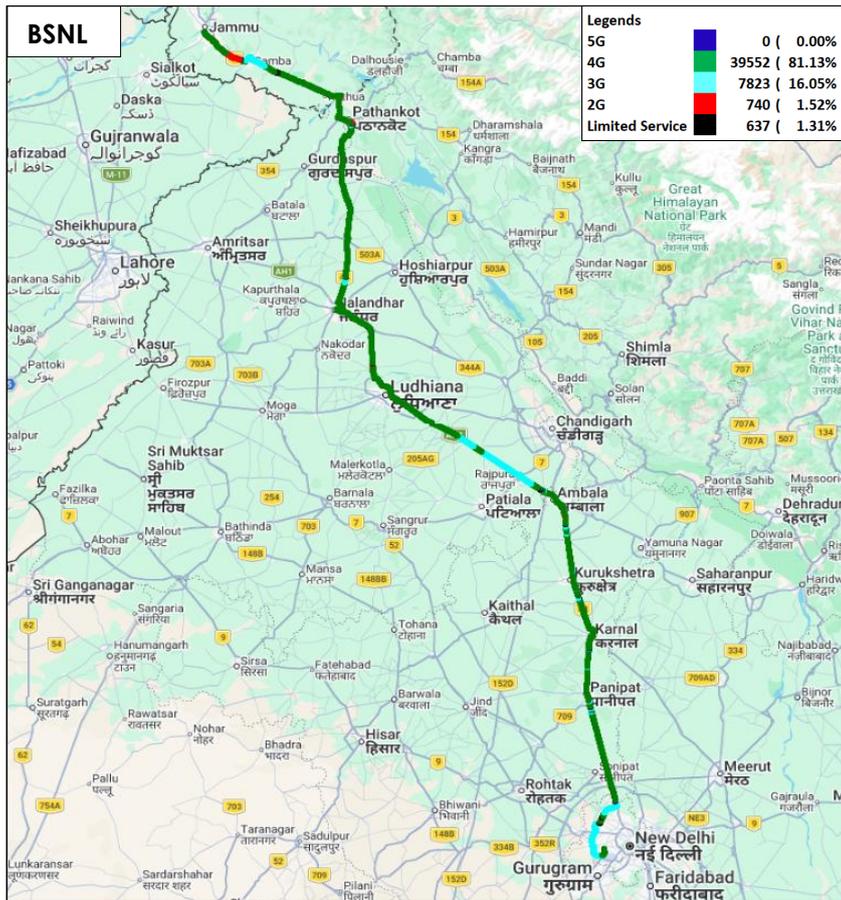**Figure-40:** Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - AIRTEL
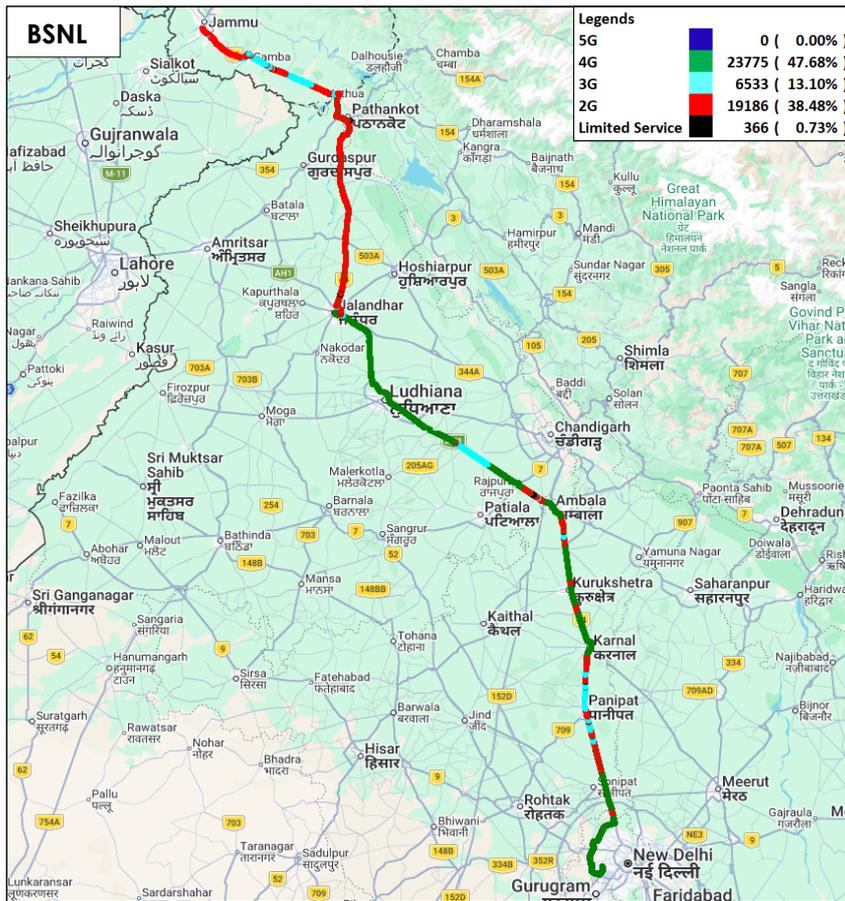
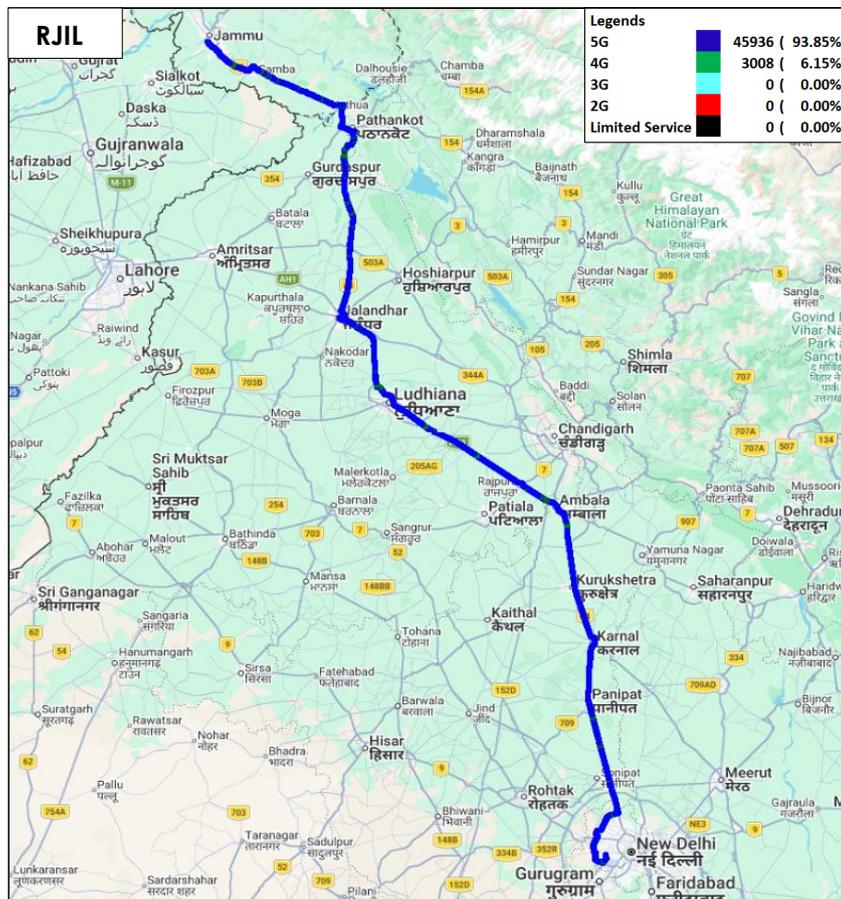**Figure-41:** Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - BSNL.
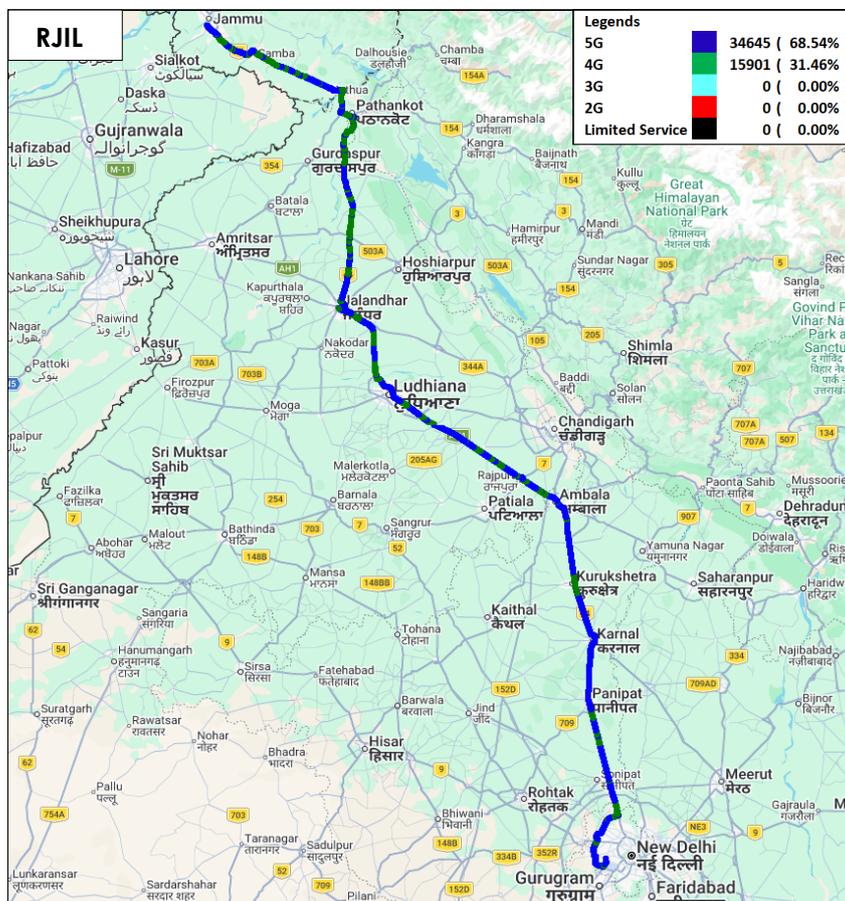
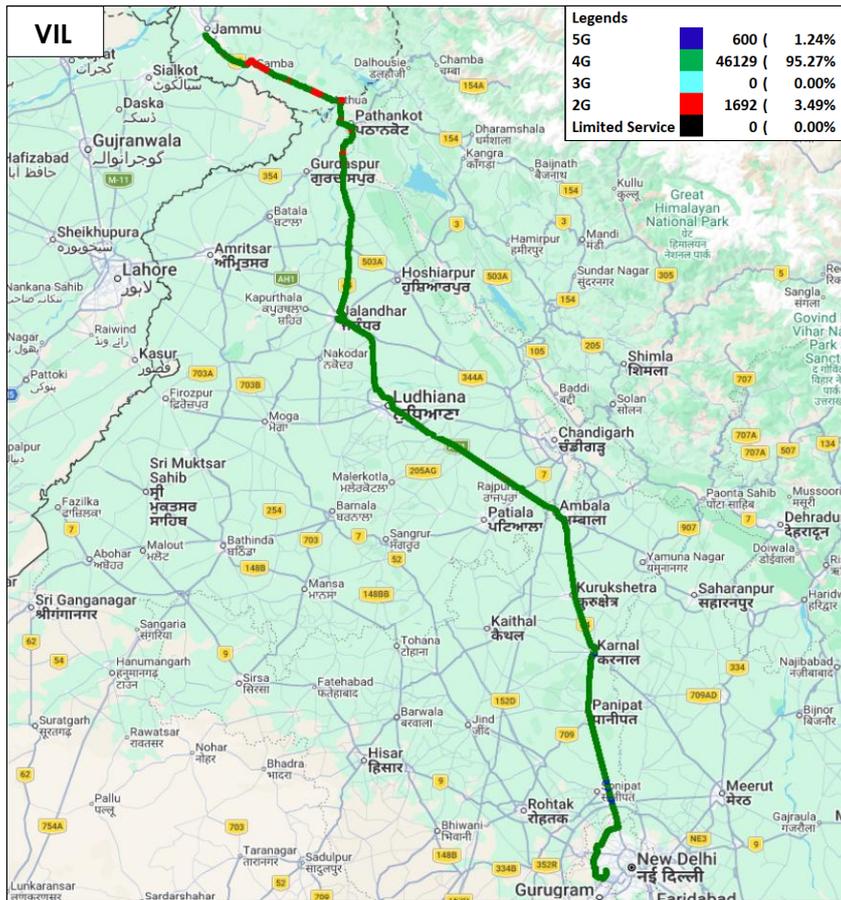**Figure-42:** Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - RJIL.
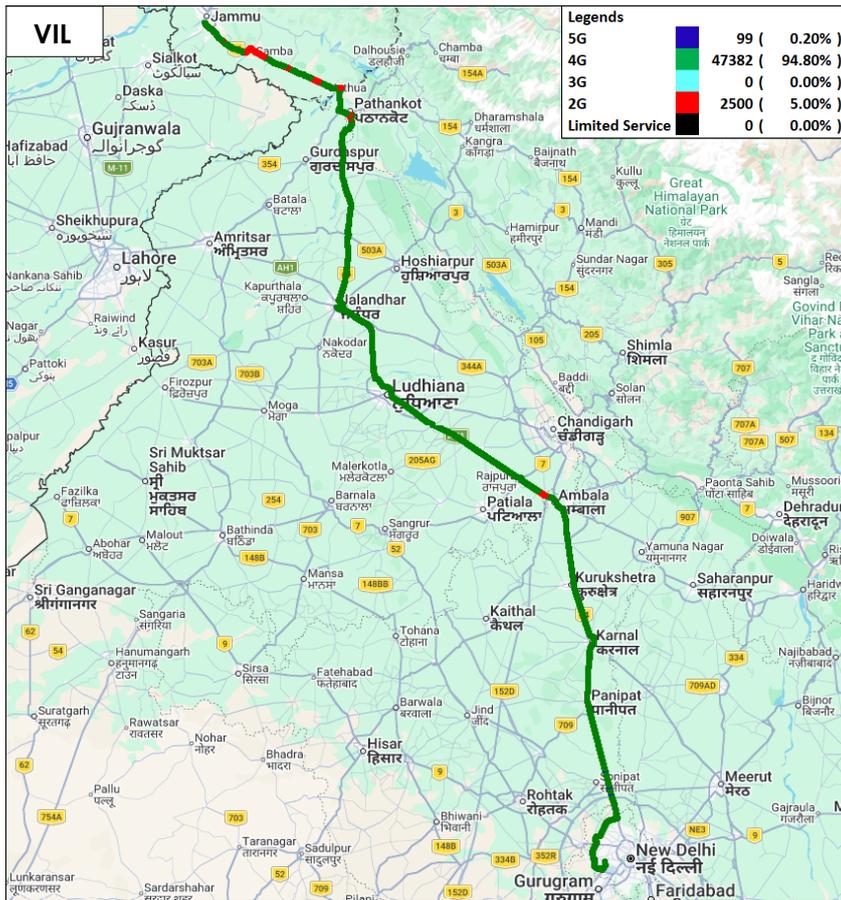
Figure-43: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - VIL.

(g) Network Signal Strength Distribution: The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G) voice. (Refer figure-66, 67, 68 & 69 for map view)
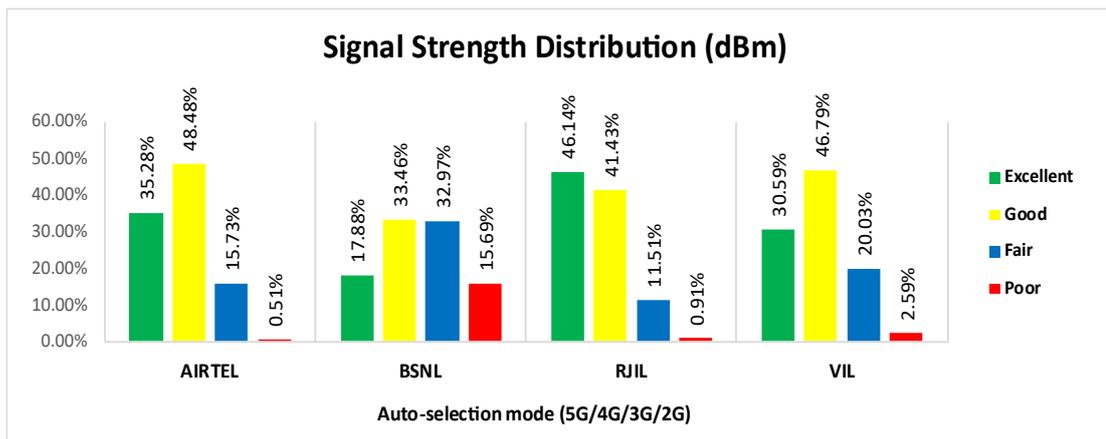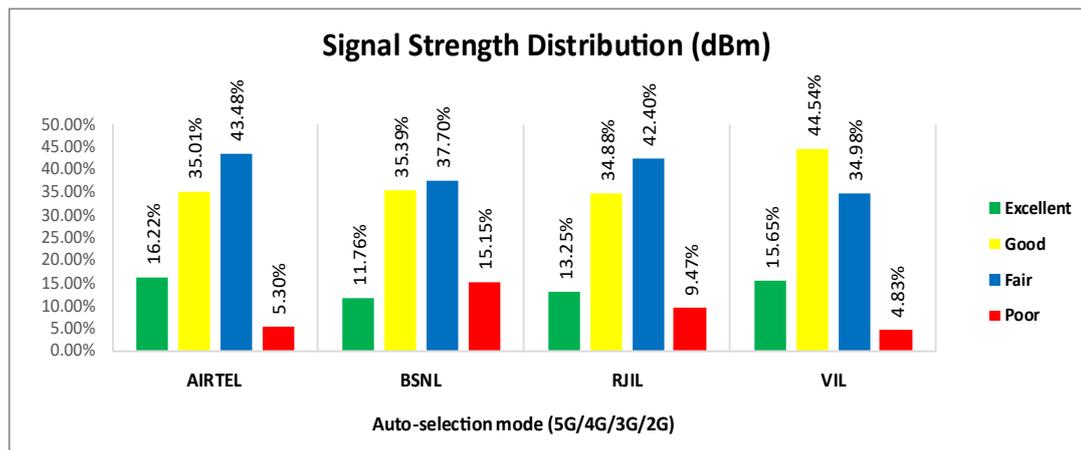

Figure-44: Signal strength distribution auto-selection mode (5G/4G/3G/2G) voice.

Observations:

- Airtel has 35% of samples falling in the excellent signal strength category.
- BSNL has 18% of samples falling in the excellent signal strength category.
- RJIL has 46% of samples falling in the excellent signal strength category.
- VIL has 31% 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	159.30	13.29	235.57	23.03
	80th Percentile	235.96	22.09	370.15	35.97
	20th Percentile	71.19	3.18	88.83	9.67
Upload Throughput (Mbits/s)	Average	28.62	4.32	22.73	15.55
	80th Percentile	50.22	7.10	41.33	25.00
	20th Percentile	6.73	1.26	4.24	5.26
Latency (ms)	50th Percentile	29.29	29.68	21.80	44.59

Table-52: Summary of Data performance in network auto-selection mode.
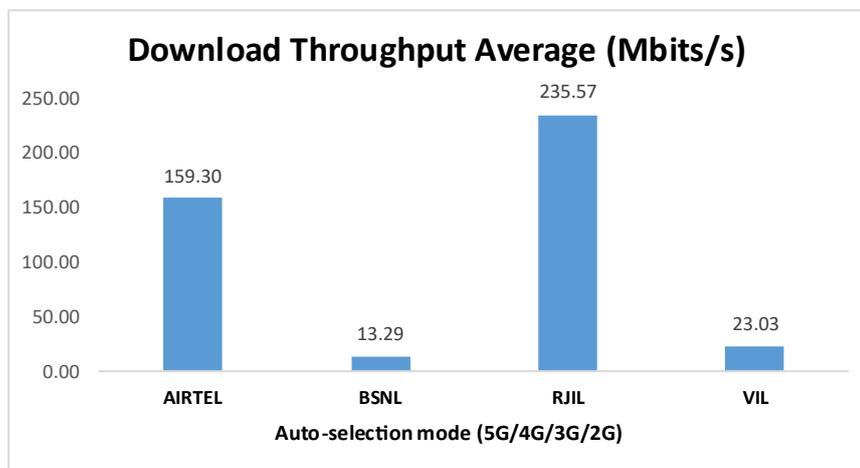
Figure 45: Download throughput.

Figure-46: Upload throughput.

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

Technology	Service Provider			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	81.66%	NA	93.85%	1.24%
4G	18.34%	81.13%	6.15%	95.27%
3G	NA	16.05%	NA	NA
2G	0.00%	1.52%	NA	3.49%
Limited Service	0.00%	1.31%	0.00%	0.00%

Table-53: Time spent on technology during drive test in auto-selection mode (5G/4G/3G/2G) data.

> **Note-**
> - NA- Service provider doesn't provide services in respective technology.
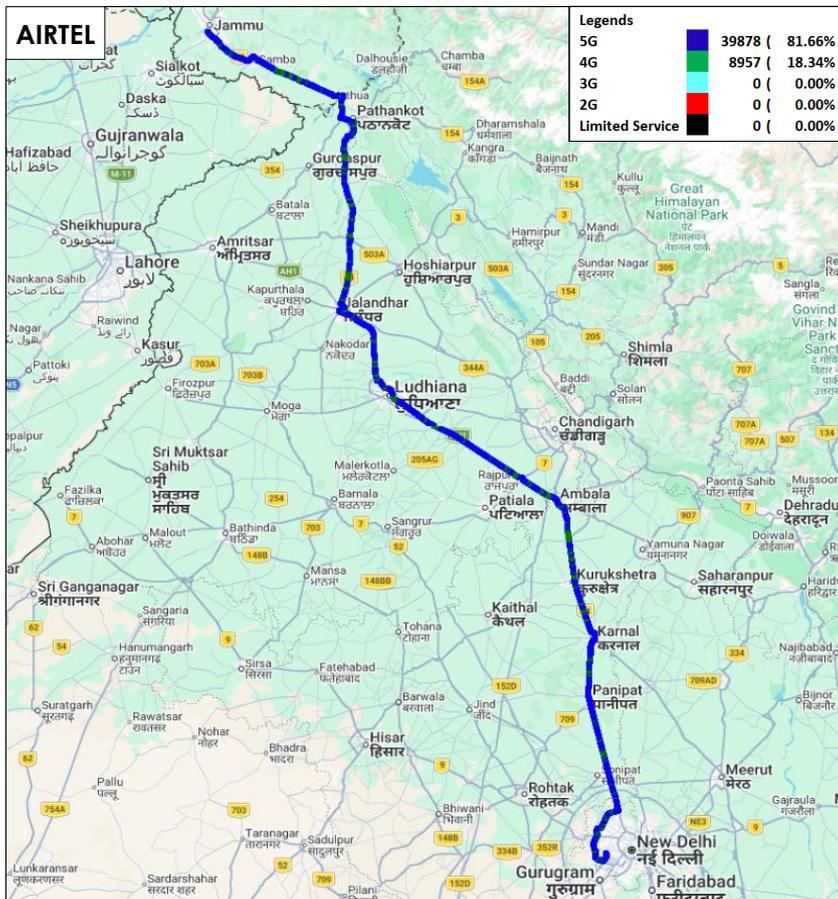
Figure-47: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - AIRTEL

Figure-48: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - BSNL.

Figure-49: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - RJIL.

Figure-50: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - VIL.

(c) Network Signal Strength Distribution: The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G) data. (Refer figure-70, 71, 72 & 73 for map view)

Figure-51: Signal strength distribution auto-selection mode (5G/4G/3G/2G) data.

Observations:

- Airtel has 16% of samples falling in the excellent signal strength category.
- BSNL has 12% of samples falling in the excellent signal strength category.
- RJIL has 13% of samples falling in the excellent signal strength category.
- VIL has 16% of samples falling in the excellent signal strength category.

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5. Voice & Data Key findings

5.1 Overall Voice

1. Call Setup Success Rate:
a) Airtel, BSNL and VIL have 95.05%, 83.98% and 98.77% call setup success rate respectively in 3G/2G network mode. (refer table-3)

b) Airtel, BSNL, RJIL and VIL have 98.83%, 81.62%, 99.12% and 99.26% call setup success rate respectively in auto-selection mode (5G/4G/3G/2G). (refer table-5)

c) Airtel had a 100.00% call setup success when calling BSNL and VIL whereas call blocking was observed when calling RJIL. (refer table-9)

d) BSNL had a 100.00% call setup success when calling Airtel & RJIL whereas call blocking was observed when calling VIL. (refer table-9)

e) RJIL had a 100.00% call setup success when calling BSNL & VIL whereas call blocking was observed when calling Airtel. (refer table-9)

f) VIL had a 100.00% call setup success when calling Airtel and RJIL whereas call blocking was observed when calling BSNL. (refer table-9)

2. Call Setup Time:
a) Airtel, BSNL and VIL call setup time is 3.33, 3.83 and 4.00 seconds respectively in 3G/2G network mode. (refer table-3)

b) Airtel, BSNL, RJIL & VIL call setup time is 1.40, 4.05, 0.66 & 0.94 seconds respectively in auto-selection mode (5G/4G/3G/2G). (refer table-5)

3. Call Silence/Mute Rate: In packet switched network (4G/5G) BSNL, VIL, Airtel and RJIL have 6.83%, 1.40%, 0.71%, 0.53% silence call rate respectively. Further BSNL has higher RTP packet loss rate in downlink (5.51%) compared to RJIL (1.22%), VIL (1.15%), Airtel (0.56%). In uplink the RTP packet loss rate is higher for BSNL (5.67%) compared to RJIL (1.15%), VIL (1.11%), Airtel (0.45%). (refer table-6)

4. Drop Call Rate:
a) Airtel, BSNL and VIL drop call rate is 2.15%, 6.11% and 3.02% respectively in 3G/2G network mode. (refer table-3)

b) Airtel, BSNL, RJIL and VIL drop call rate is 0.74%, 7.87%, 1.18% and 0.60% respectively in auto-selection mode (5G/4G/3G/2G). (refer table-5)

5.2 Overall Data

1. Data download and upload performance (Overall i.e. LSA):
a) Airtel, BSNL, RJIL and VIL average download speeds are 179.53 Mbps, 11.30 Mbps, 295.90 Mbps and 25.34 Mbps respectively. (refer table-11)

b) Airtel, BSNL, RJIL and VIL average upload speeds are 30.09 Mbps, 3.86 Mbps, 30.50 Mbps and 16.39 Mbps respectively. (refer table-11)

2. Data download and upload performance (static i.e. while stationary):
a) Airtel, BSNL, RJIL and VIL average download speeds are 207.32 Mbps, 12.18 Mbps, 286.67 Mbps and 34.49 Mbps respectively. (refer table-28)

b) Airtel, BSNL, RJIL and VIL average upload speeds are 40.12 Mbps, 2.50 Mbps, 35.49 Mbps and 13.72 Mbps respectively. (refer table-28)

3. **Data session setup success rate (static i.e. while stationary):**
   a) All operators have 100.00% download session setup success rate. (refer table-28)

   b) All operators have 100.00% upload session setup success rate. (refer table-28)

5.3 Operator wise Key Findings
1. Airtel:
Voice

- 95.05% call setup success rate and 2.15% drop call rate have been observed in 3G/2G network mode for LSA. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-3)

- 98.83% call setup success rate and 0.74% 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)

- 99.37% call setup success rate and 0.00% drop call rate have been observed in 3G/2G network mode 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 0.30% 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-15)

- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for all hotspot locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-21)

- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) at both walk test locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-42 & 43)

- 89.89% call setup success rate and 5.00% drop call rate have been observed in 3G/2G network mode for highway drive. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-46)

- 96.89% call setup success rate and 1.61% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for highway drive. Performance is not meeting the benchmark of 98.00% for call setup success rate. (refer table-48)

Data

- Airtel has 179.53 Mbps average download speed & 30.09 Mbps average upload speed for LSA. (refer table-11)

- Airtel has 202.76 Mbps average download speed & 30.09 Mbps average upload speed across measured routes for city drive. (refer table-19)

- Govt Medical College Jammu has less upload speed (less than 20 Mbps) out of total 6 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-29)

- Airtel has 159.30 Mbps average download speed & 28.62 Mbps average upload speed across measured routes for highway drive. (refer table-52)

2. BSNL:
Voice

- 83.98% call setup success rate and 6.11% drop call rate have been observed in 3G/2G network mode for LSA. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-3)

- 81.62% call setup success rate and 7.87% drop call rate have been observed for auto-selection mode (5G/4G/3G/2G) for LSA. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-5)

- 77.93% call setup success rate and 4.10% drop call rate have been observed in 3G/2G network mode for city drive. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-13)

- 72.08% call setup success rate and 4.58% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for city drive. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-15)

- 95.00% call setup success rate and 1.75% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for all hotspot locations. Performance is not meeting the benchmark of 98.00% for call setup success rate. (refer table-21)

- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) at both walk test locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table- 42 & 43)

- 92.51% call setup success rate and 8.50% drop call rate have been observed in 3G/2G network mode for highway drive. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-46)

- 89.69% call setup success rate and 13.79% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for highway drive. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-48)

Data

- BSNL has 11.30 Mbps average download speed & 3.86 Mbps average upload speed for LSA. (refer table-11)

- BSNL has 7.73 Mbps average download speed & 3.11 Mbps average upload speed across measured routes for city drive. (refer table-19)

- Govt Medical College Jammu, Jewel Chowk Jammu & Raghunath Temple Jammu have less download speed (less than 10 Mbps) out of total 6 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-29, 32 & 33)

- Jewel Chowk Jammu has less upload speed (less than 2 Mbps) out of total 6 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-32)

- BSNL has 13.29 Mbps average download speed & 4.32 Mbps average upload speed across measured routes for highway drive. (refer table-52)

3. RJIL:
Voice

- 99.12% call setup success rate and 1.18% 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)

- 99.70% call setup success rate and 1.50% 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-15)

- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for all hotspot locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-21)

- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) at Gole Market Jammu walk test location. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-42)

- 94.74% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) at Hari Market Jammu walk test location. Performance is not meeting the benchmark of 98.00% for call setup success rate. (refer table-43)

- 98.43% call setup success rate and 1.20% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for highway drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-48)

Data
- RJIL has 295.90 Mbps average download speed & 30.50 Mbps average upload speed for LSA. (refer table-11)

- RJIL has 361.50 Mbps average download speed & 37.48 Mbps average upload speed across measured routes for city drive. (refer table-19)

- Govt Medical College Jammu, Jewel Chowk Jammu & Satwari Chowk Jammu have less upload speed (less than 20 Mbps) out of total 6 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-29, 32 & 34)

- RJIL has 235.57 Mbps average download speed & 22.73 Mbps average upload speed across measured routes for highway drive. (refer table-52)

4. VIL:
Voice
- 98.77% call setup success rate and 3.02% drop call rate have been observed in 3G/2G network mode for LSA. Performance is not meeting the benchmark of 2.00% for call drop rate. (refer table-3)

- 99.26% call setup success rate and 0.60% 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)

- 99.37% call setup success rate and 0.95% drop call rate have been observed in 3G/2G network mode 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 0.30% 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-15)

- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for all hotspot locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-21)

- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) at both walk test locations.

Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table- 42 & 43)

- 98.00% call setup success rate and 5.71% drop call rate have been observed in 3G/2G network mode for highway drive. Performance is not meeting the benchmark of 2.00% for call drop rate. (refer table-46)

- 98.00% call setup success rate and 1.22% drop call rate have been observed for auto-selection mode (5G/4G/3G/2G) for highway drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-48)

Data

- VIL has 25.34 Mbps average download speed & 16.39 Mbps average upload speed for LSA. (refer table-11)

- VIL has 26.94 Mbps average download speed & 16.70 Mbps average upload speed across measured routes for city drive. (refer table-19)

- VIL has 23.03 Mbps average download speed & 15.55 Mbps average upload speed across measured routes for highway drive. (refer table-52)

6. Annexure

6.1 Route wise coverage map

6.1.1 City
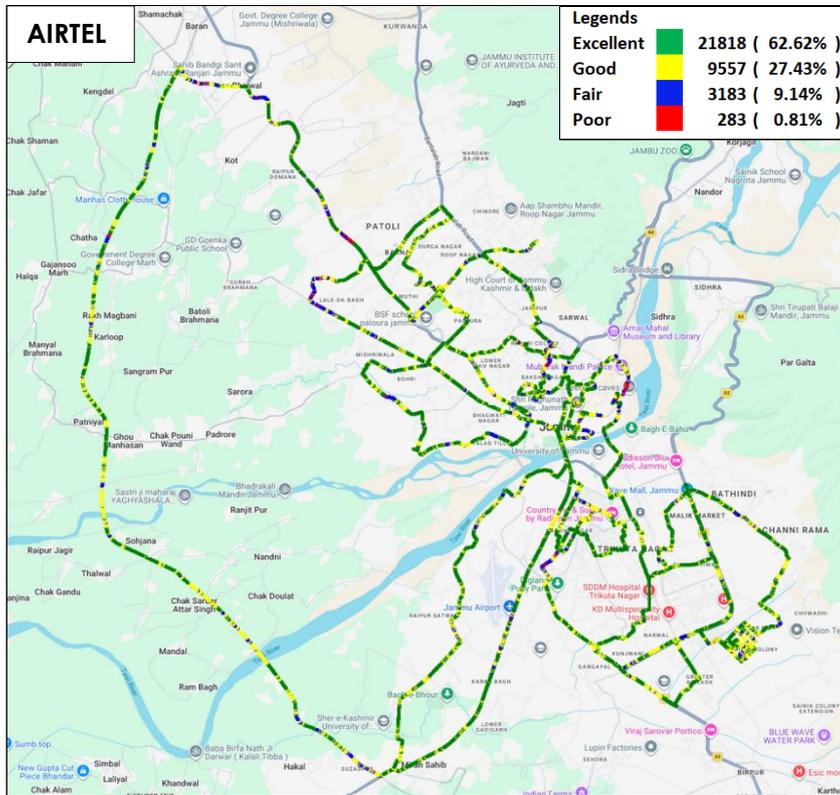
Figure-52: Signal strength 3G/2G network mode voice - AIRTEL.
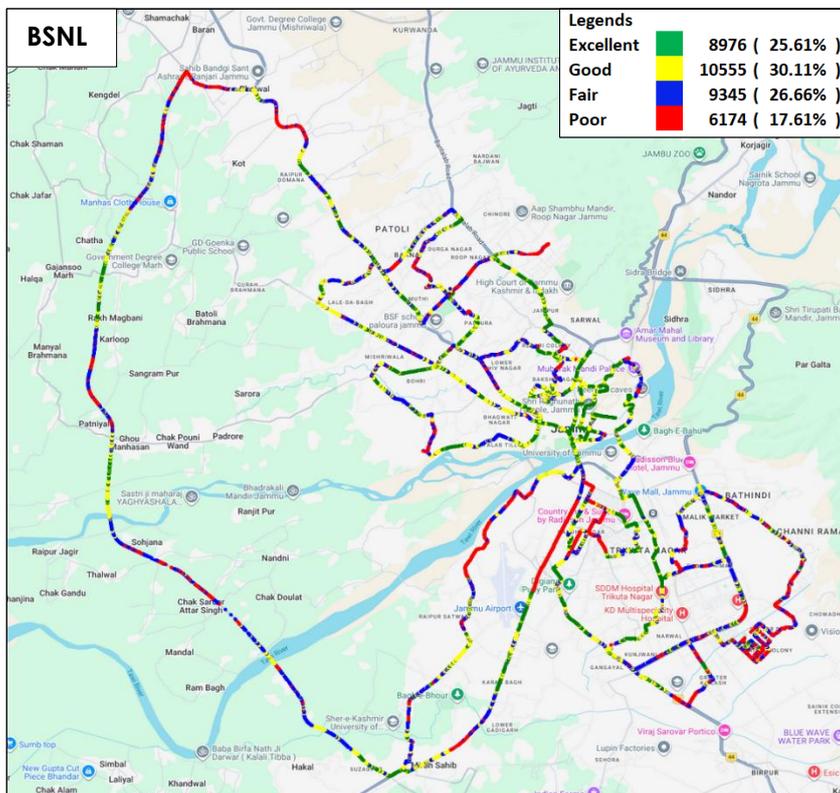
Figure-53: Signal strength 3G/2G network mode voice - BSNL.
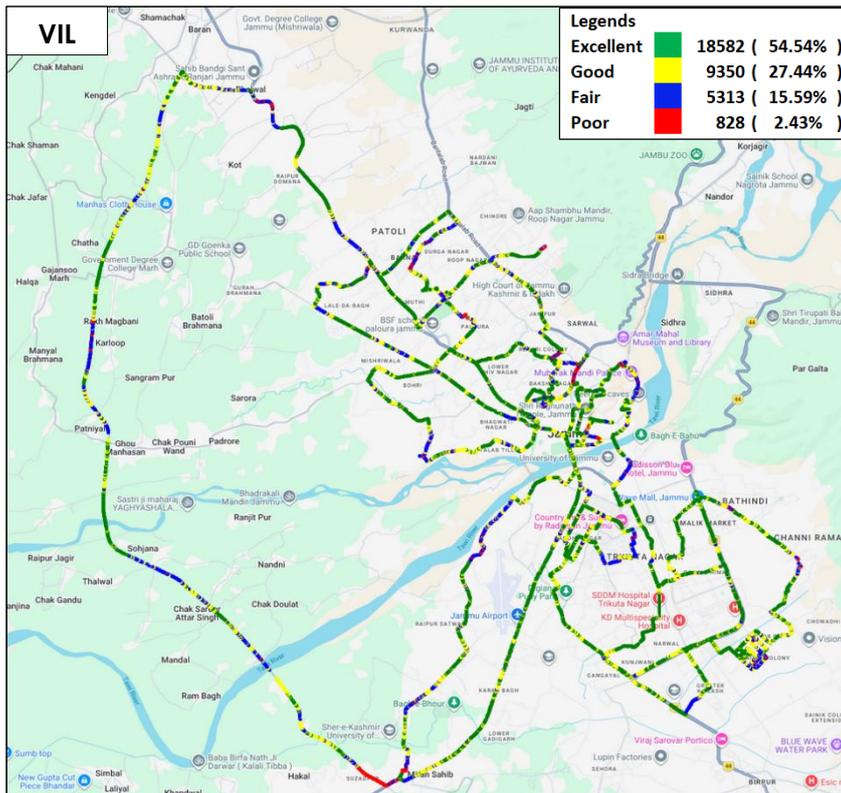
Figure-54: Signal strength 3G/2G network mode voice - VIL.
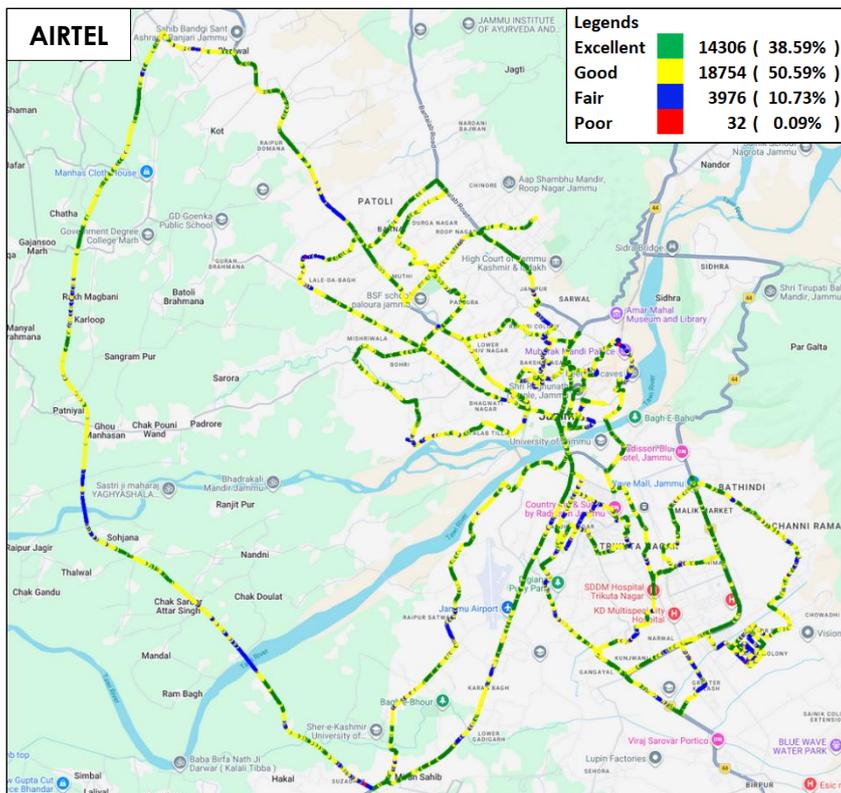
Figure-55: Signal strength auto-selection mode (5G/4G/3G/2G) voice - AIRTEL.
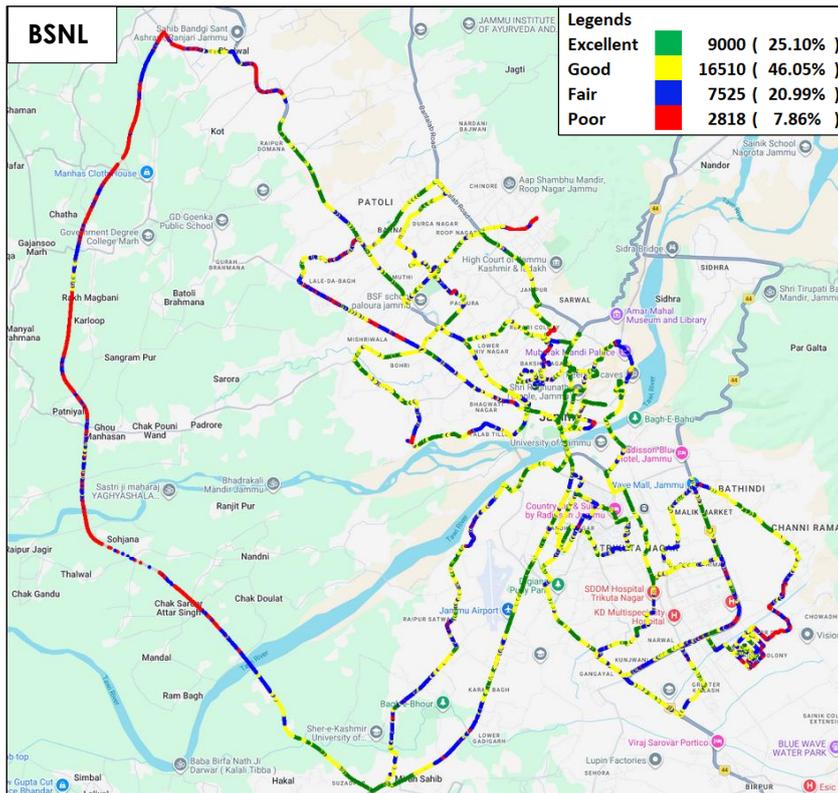
Figure-56: Signal strength auto-selection mode (5G/4G/3G/2G) voice - BSNL.
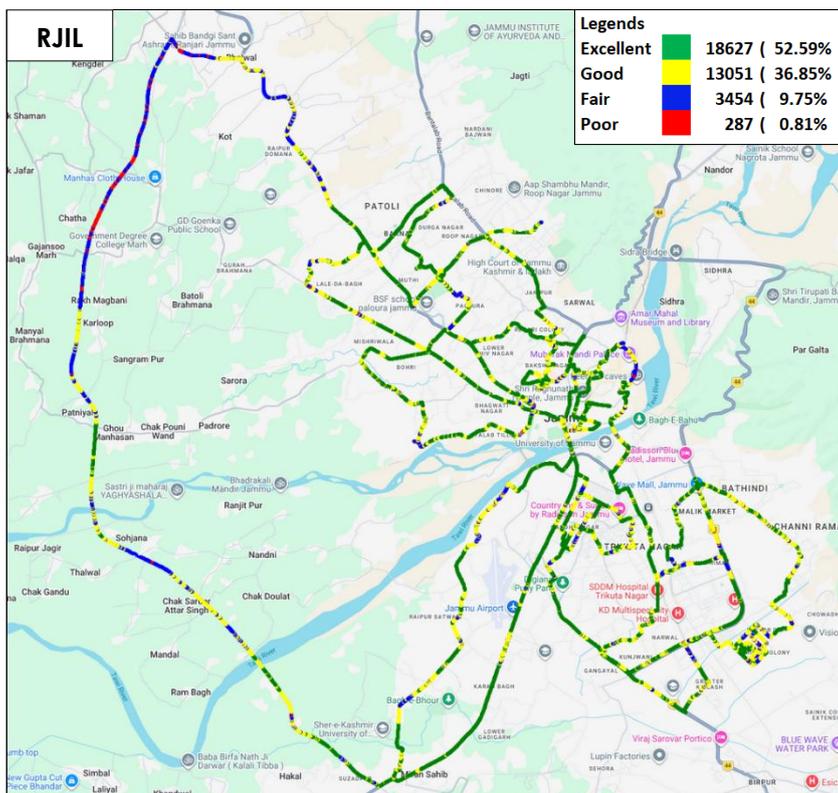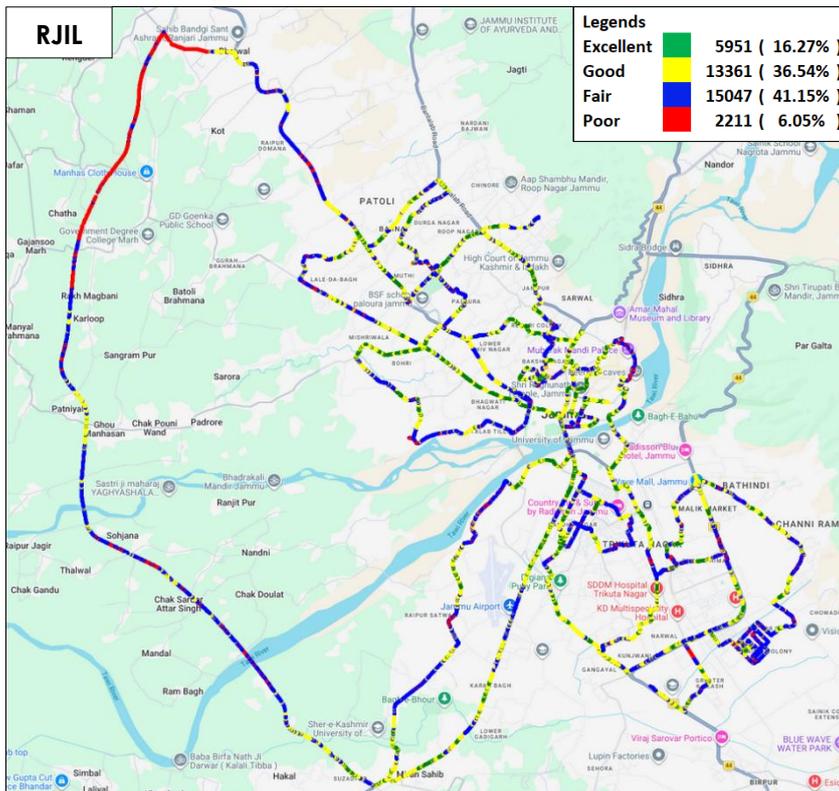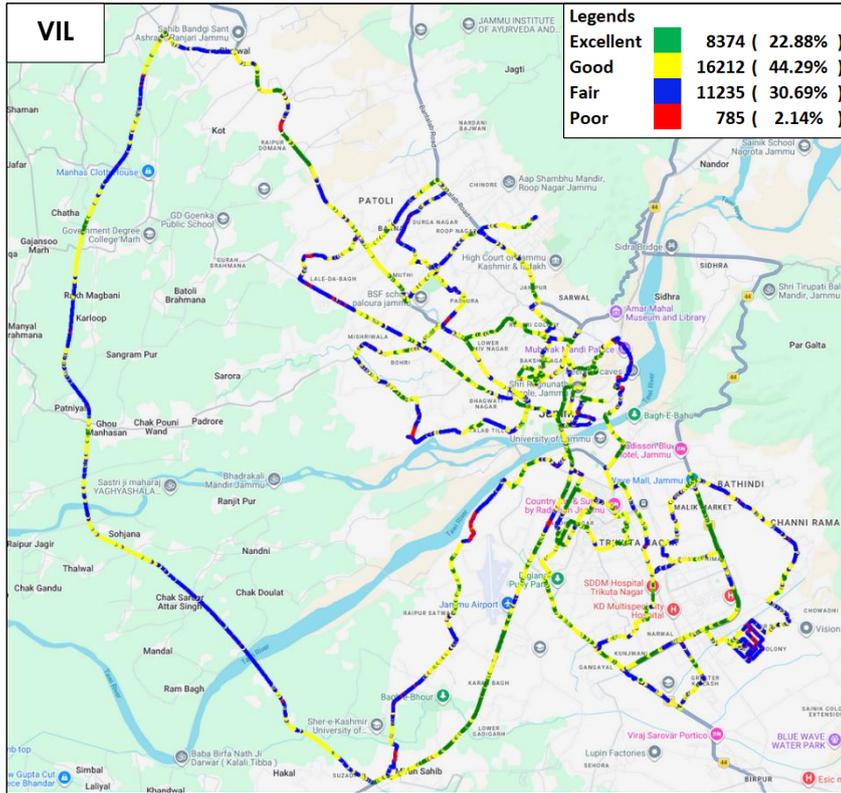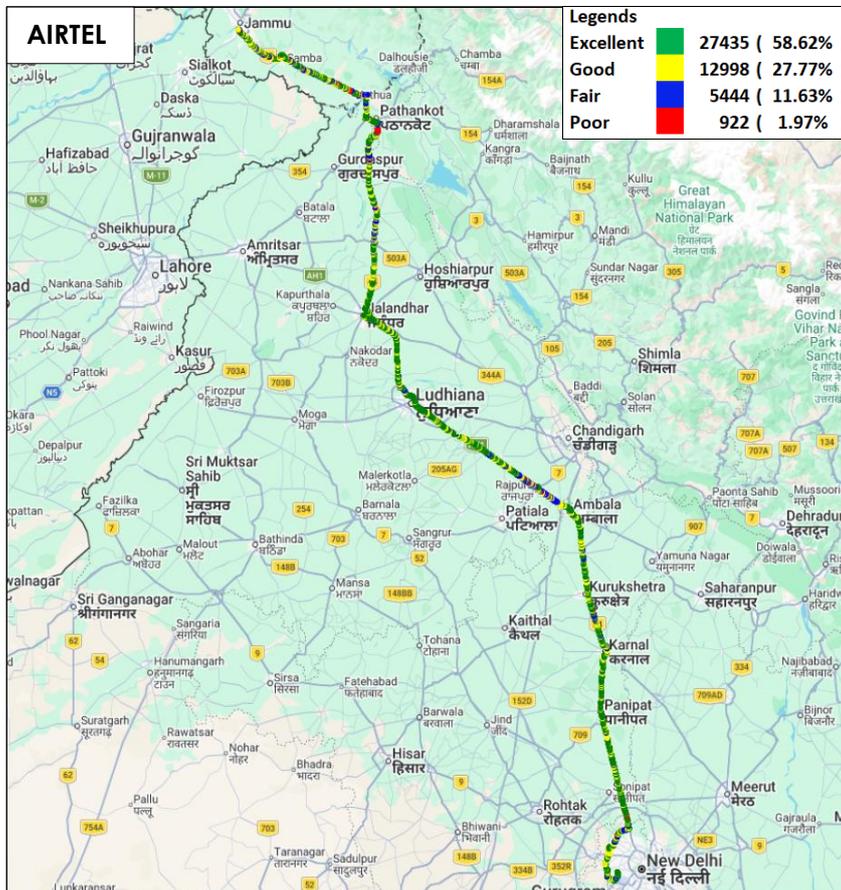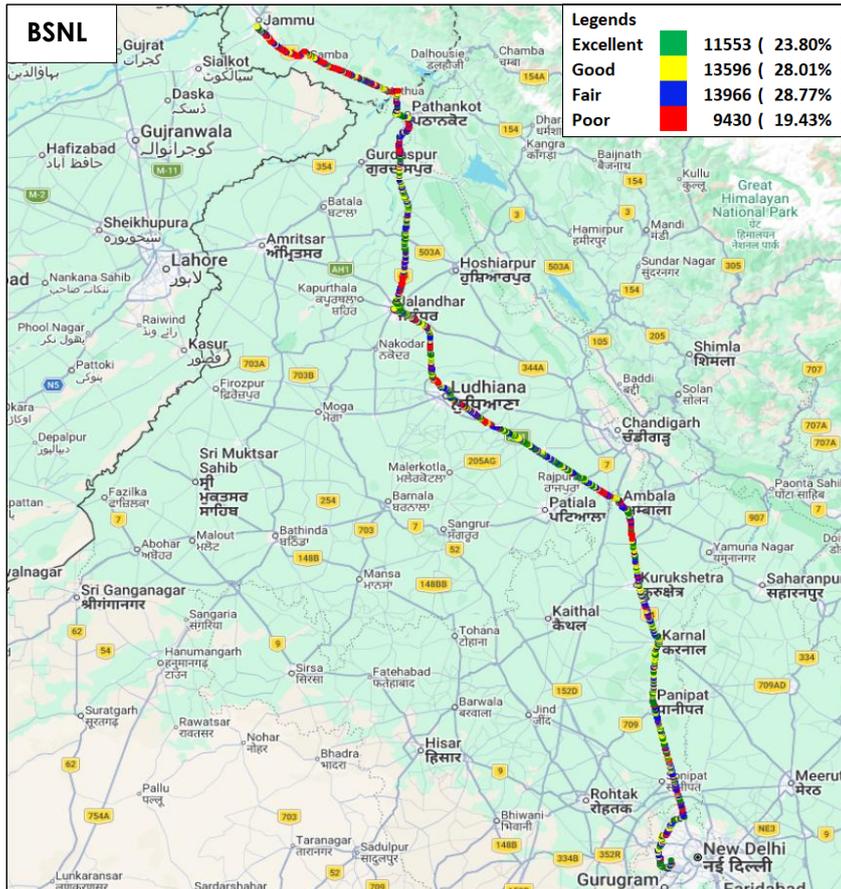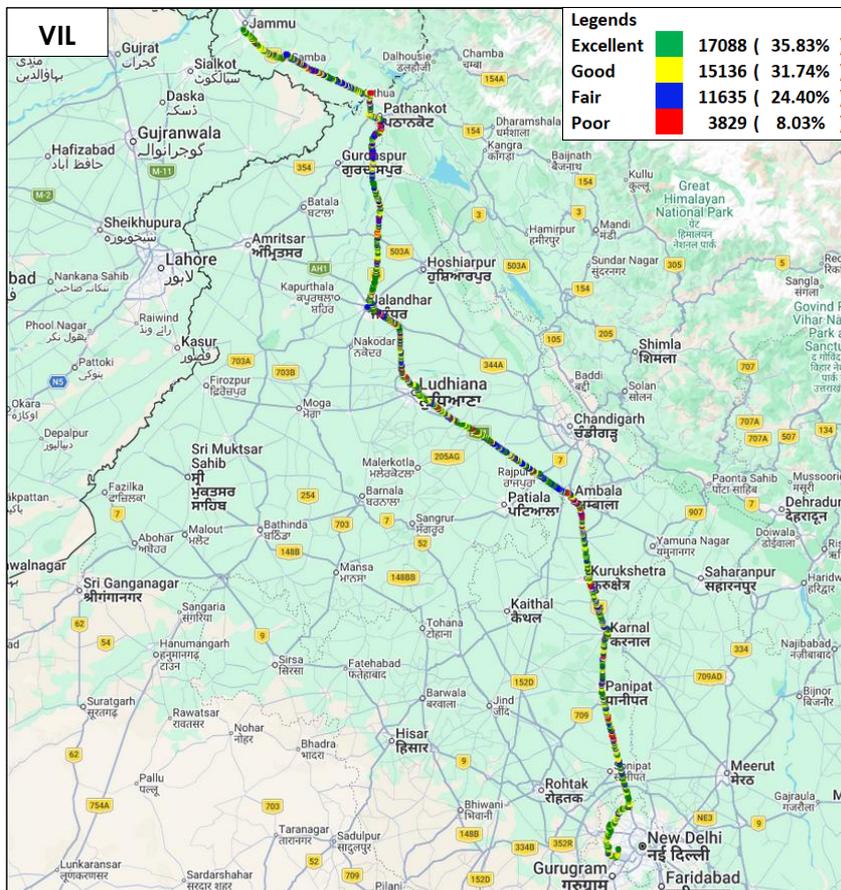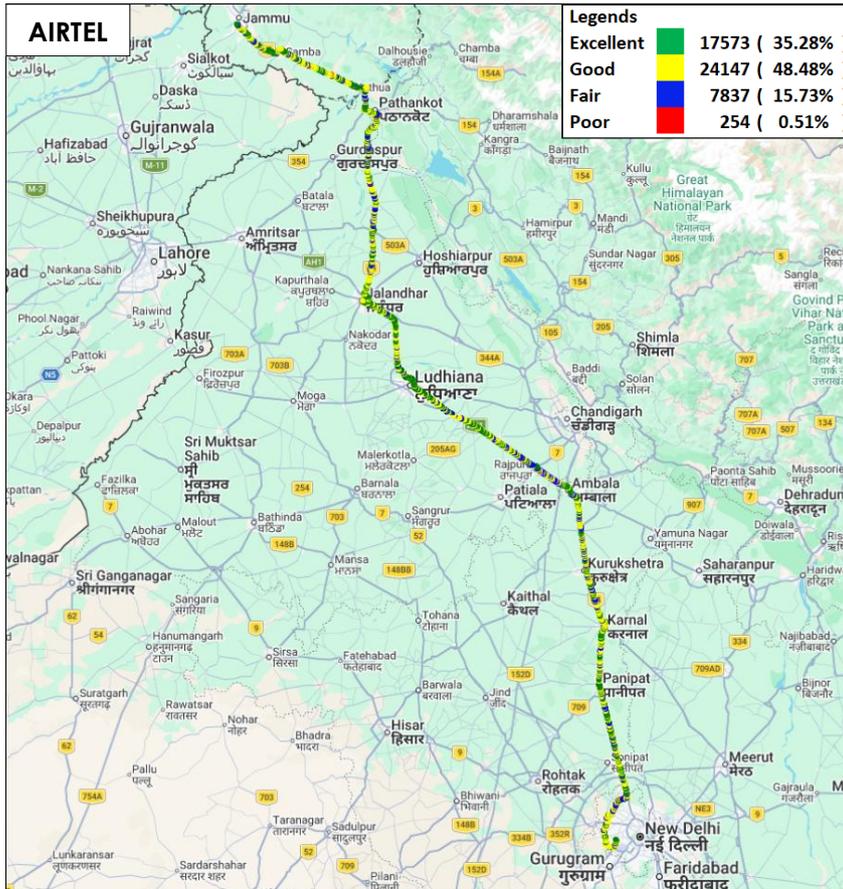

Figure-57: Signal strength auto-selection mode (5G/4G/3G/2G) voice - RJIL.
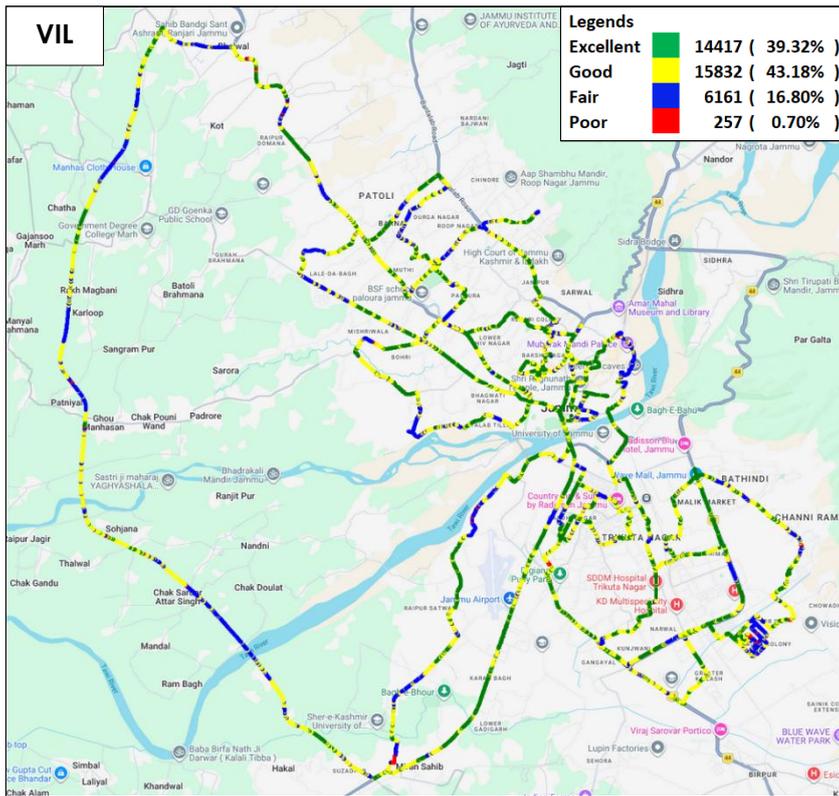
Figure-58: Signal strength auto-selection mode (5G/4G/3G/2G) voice - VIL.
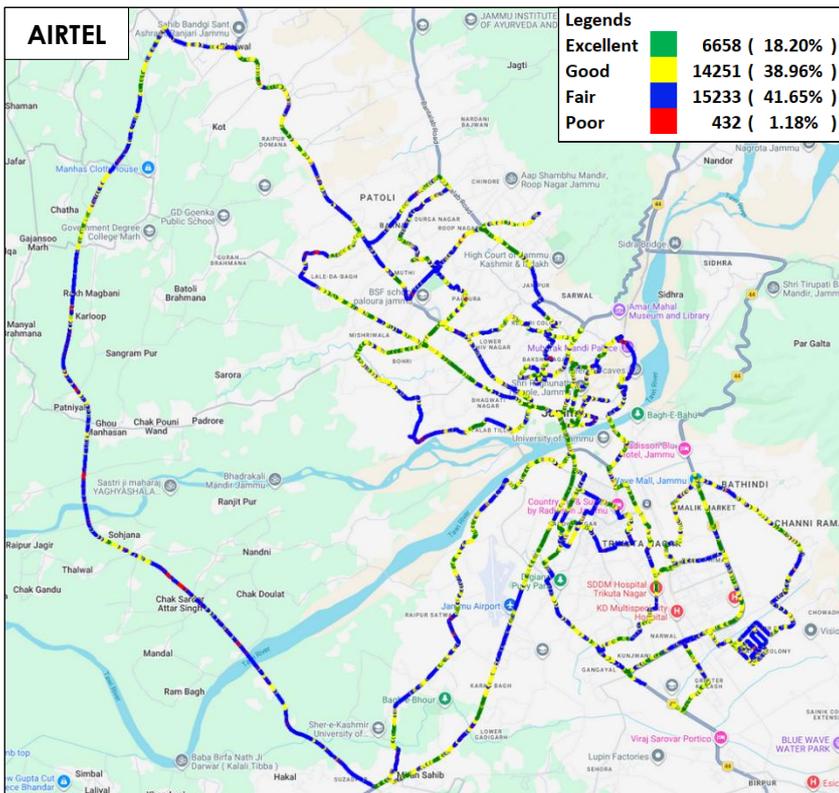
Figure-59: Signal strength auto-selection mode (5G/4G/3G/2G) data - AIRTEL.
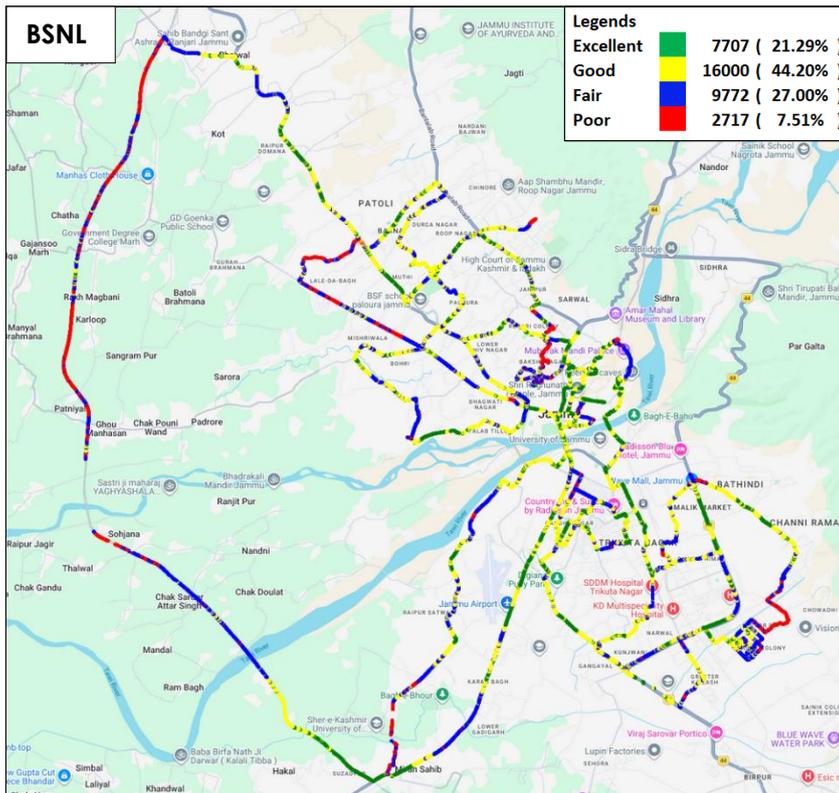
Figure-60: Signal strength auto-selection mode (5G/4G/3G/2G) data - BSNL.

Figure-61: Signal strength auto-selection mode (5G/4G/3G/2G) data - RJIL.

Figure-62: Signal strength auto-selection mode (5G/4G/3G/2G) data - VIL.

6.1.2 Highway

i) Delhi to Jammu

Figure-63: Signal strength 3G/2G network mode voice - AIRTEL.

Figure-64: Signal strength 3G/2G network mode voice - BSNL.

Figure-65: Signal strength 3G/2G network mode voice - VIL.

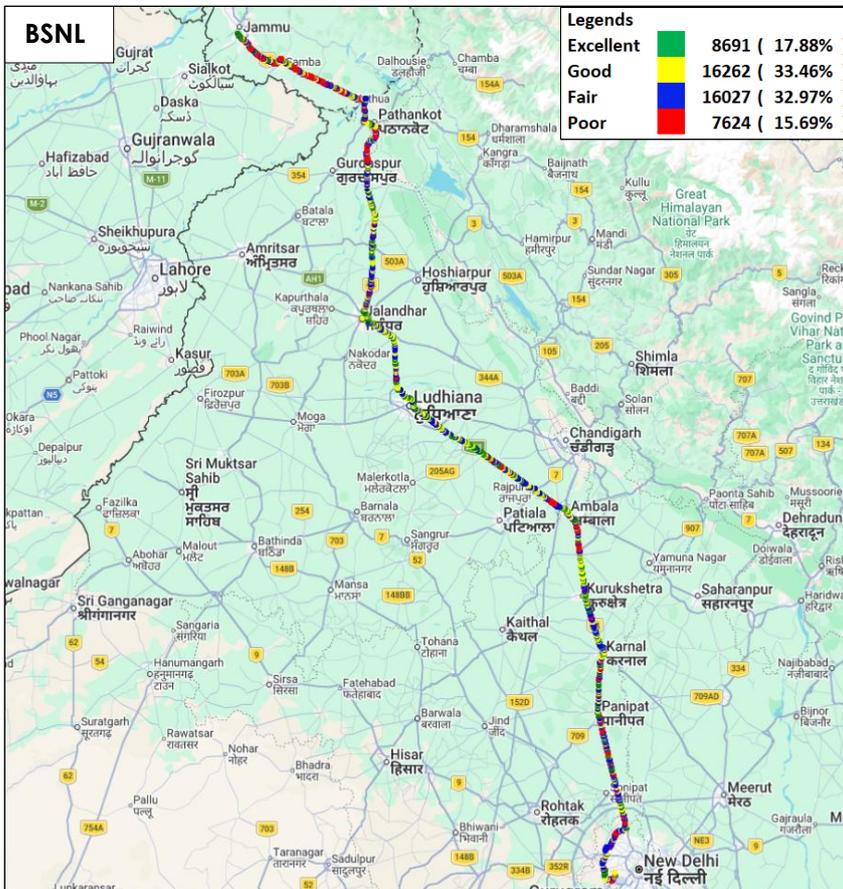**Figure-66:** Signal strength auto-selection mode (5G/4G/3G/2G) voice - AIRTEL.

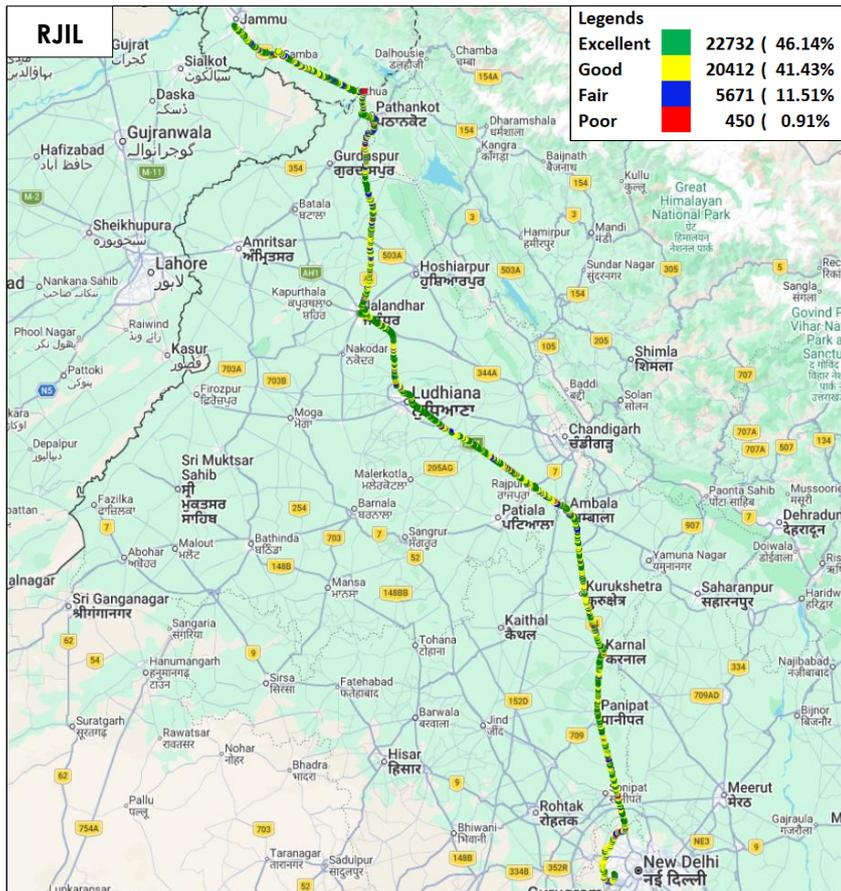**Figure-67:** Signal strength auto-selection mode (5G/4G/3G/2G) voice - BSNL.

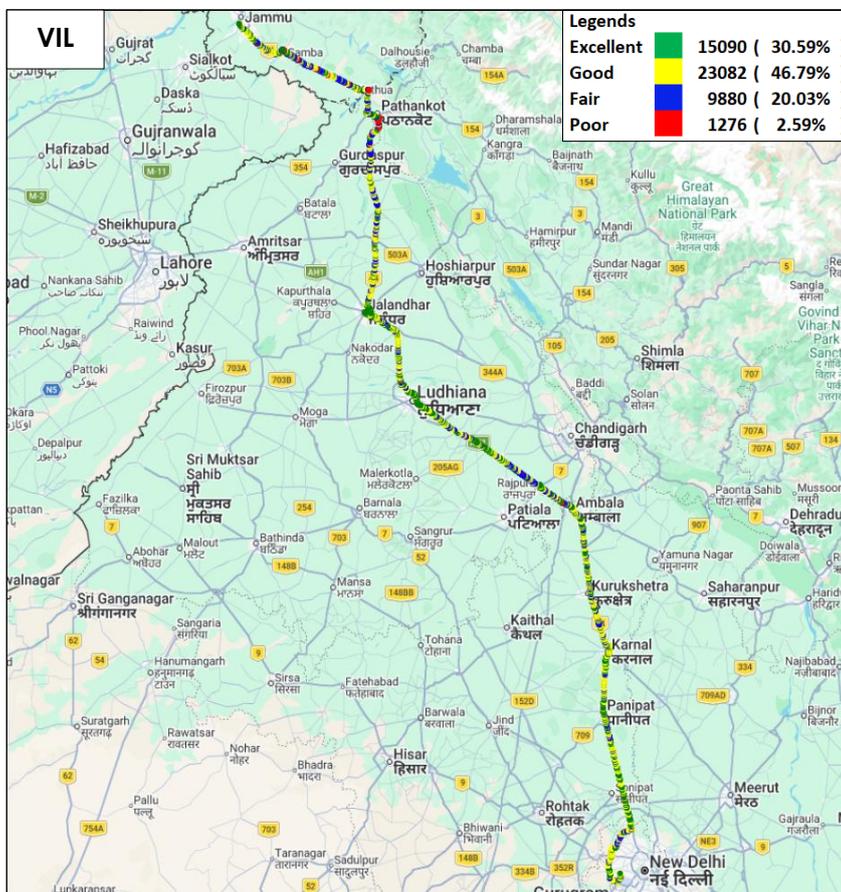**Figure-68:** Signal strength auto-selection mode (5G/4G/3G/2G) voice - RJIL.

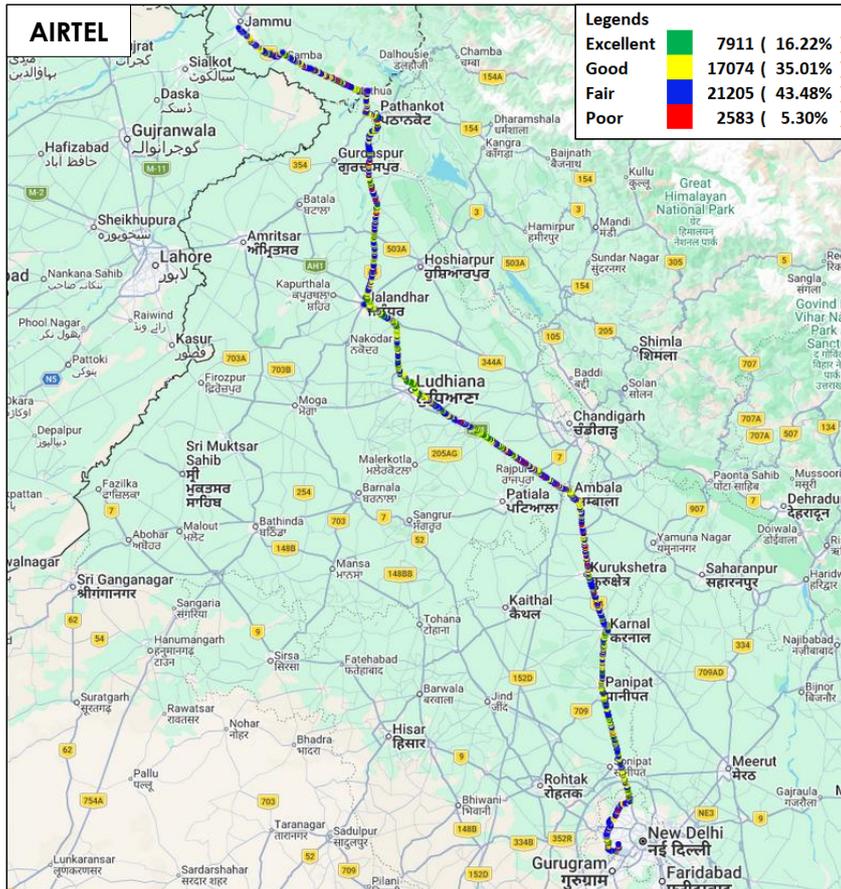**Figure-69:** Signal strength auto-selection mode (5G/4G/3G/2G) voice - VIL.

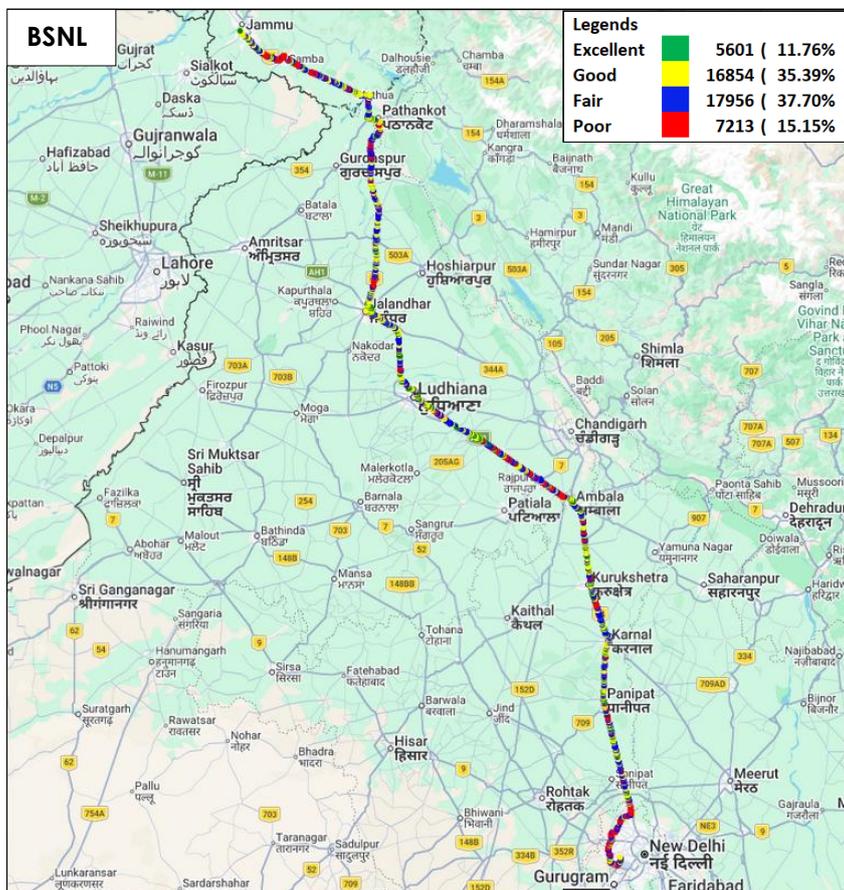**Figure-70:** Signal strength auto-selection mode (5G/4G/3G/2G) data - AIRTEL.

Figure-71: Signal strength auto-selection mode (5G/4G/3G/2G) data - BSNL.
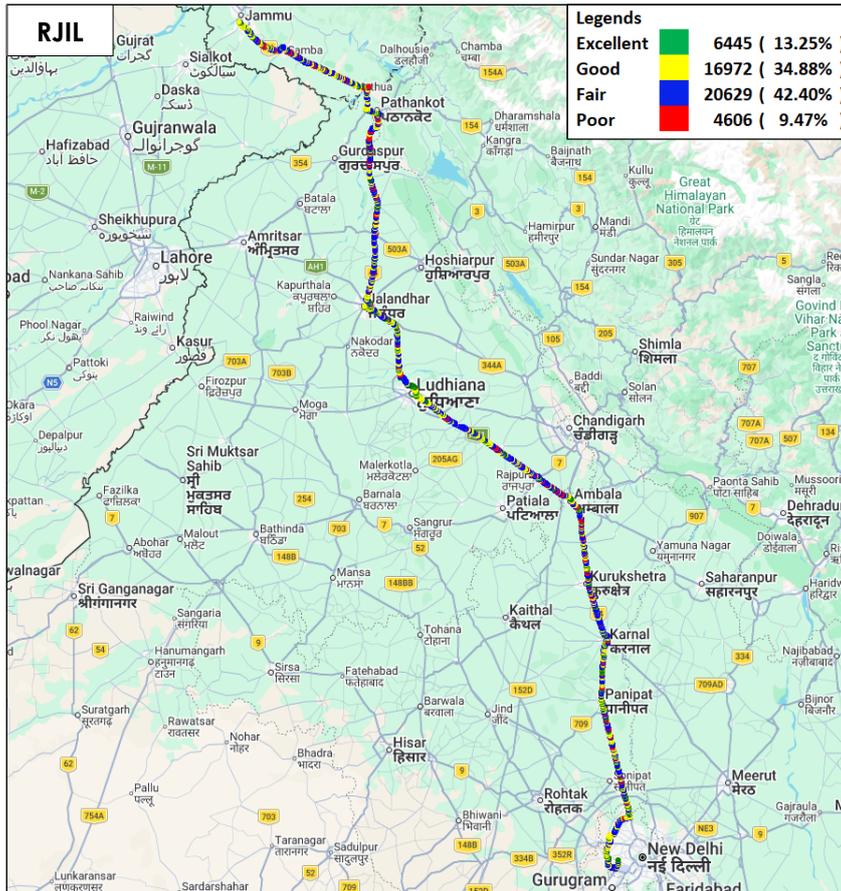
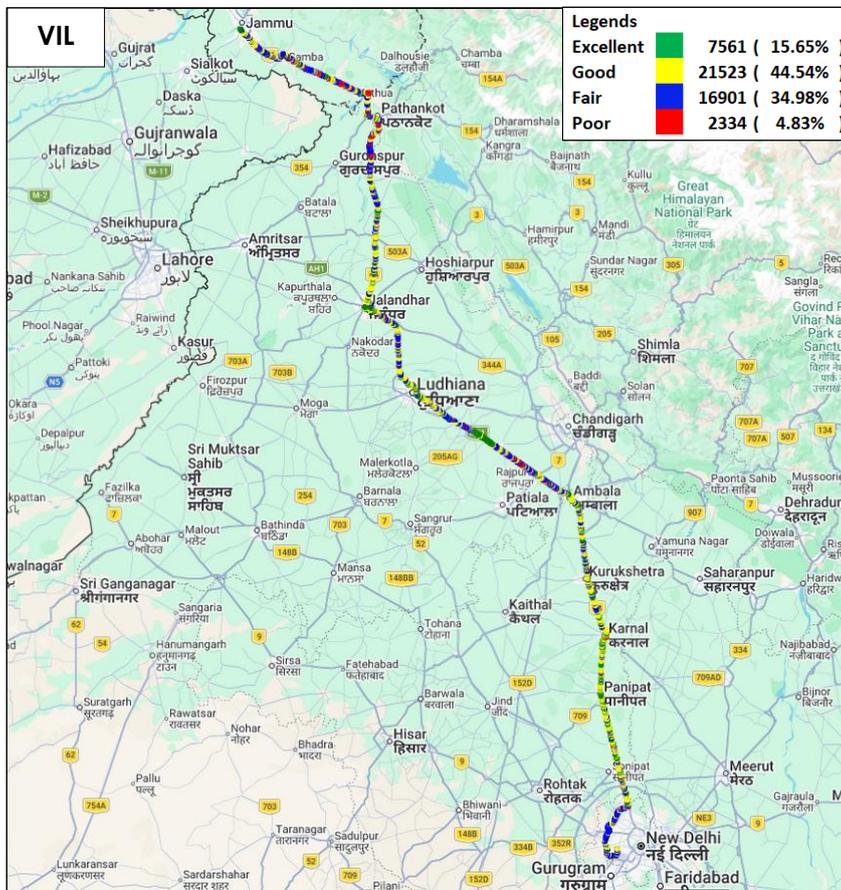**Figure-72:** Signal strength auto-selection mode (5G/4G/3G/2G) data - RJIL.

Figure-73: Signal strength auto-selection mode (5G/4G/3G/2G) data - 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		90/180 seconds
Wait/ Guard Time		15 Sec

Table-54: 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.
> - 90 Sec calls were made in highway route drive.

Data Test		
Test Type	**Technology**	**Detail**
FTP/HTTP Download	5G/4G/3G/2G Auto Mode	500 MB File- 30 Sec Timeout, (Multithread 3- TCP Connection at a time)
FTP/HTTP 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.irctc.co.in, sbi.bank.in) 20 sec timeout (only at Hotspot)

Latency & Jitter (TWAMP-UDP)		25 count- Dynamic 500 count- Hotspot Payload- 42 bytes in all drive
Packet Loss Rate (TWAMP-UDP & TCP)		500 counts (TWAMP-UDP) 500 counts (TCP) at each hotspot Payload- 42 bytes in all drive

Table-55: 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.
> - TWAMP-UDP & TCP 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.
> - Delhi-based TRAI server was used for HTTP Download, HTTP Upload, TCP and TWAMP testing for Airtel and BSNL in all type of drive tests.
> - RJIL server was used for FTP Download, FTP Upload, TCP and TWAMP testing, for RJIL in City drive tests.
> - Delhi Based TRAI server was used for HTTP Download, HTTP Upload, TCP and TWAMP testing, for RJIL in Highway drive test.
> - VIL server was used for HTTP Download, HTTP Upload, TCP and TWAMP testing, for VIL in all type of drive tests.

Figure-74: Number of handsets used in city & highway drive
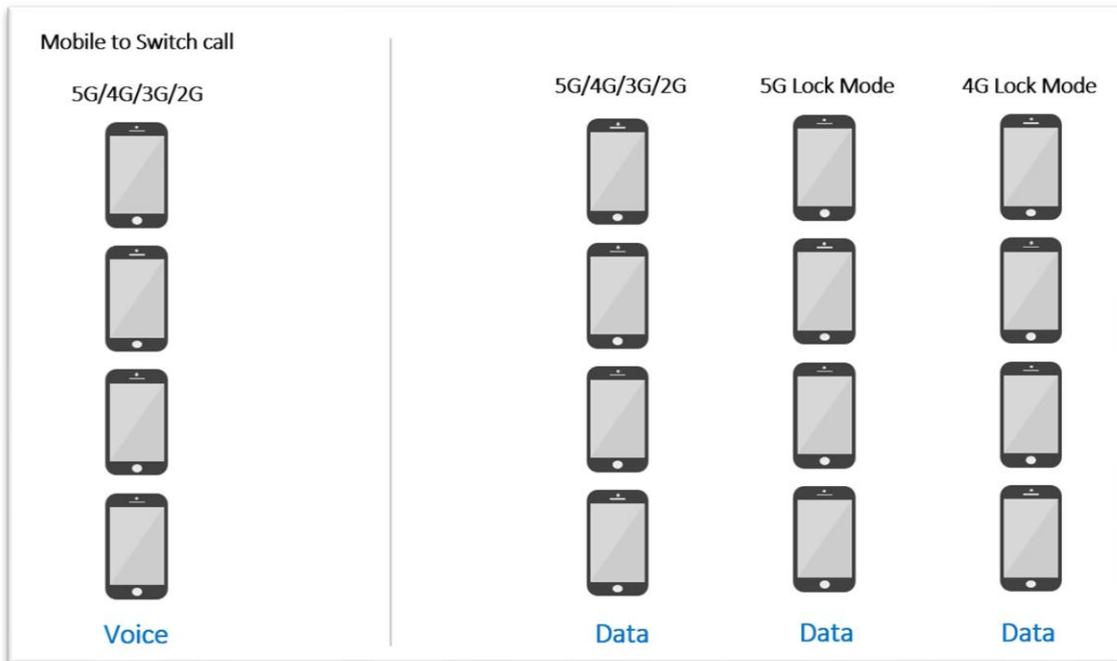
MO: Mobile originating

MT: Mobile terminating

Figure-75: Number of handsets used in railway/metro/walktest/hotspot/coastal area.

Note- 5G & 4G Lock mode testing has been performed at hotspot locations only.

7.1.2 Drive test Methodology

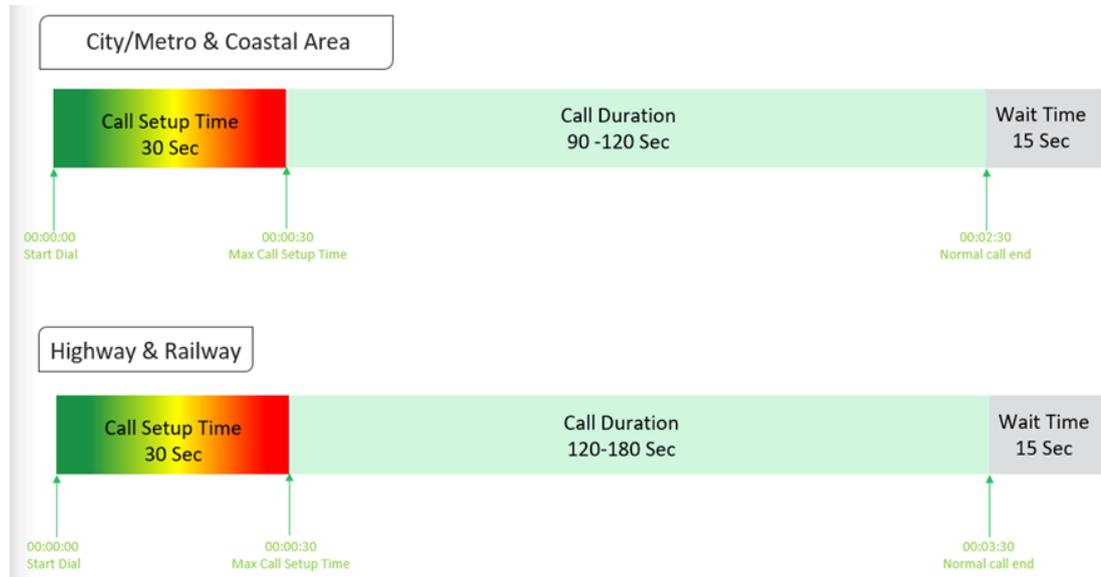### (a) Dynamic voice testing (on the move)

Figure-76: 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-77: 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.
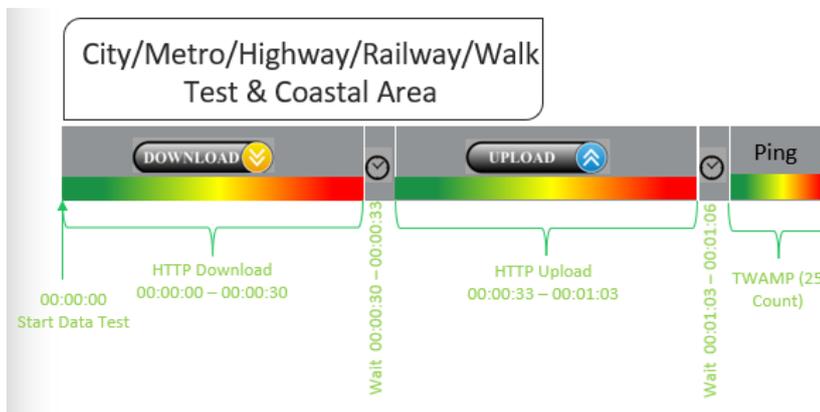
(c) Dynamic Data (internet) test

Figure-78: Data test script used in city/metro/railway/highway/walk test & coastal area
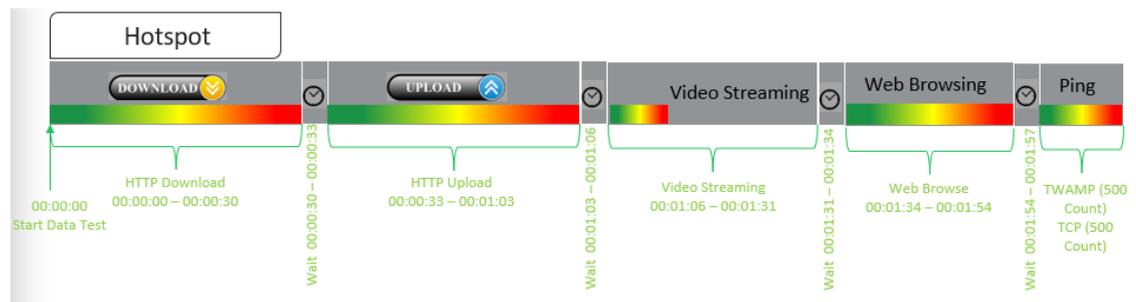
(d) Static Data(internet) testing

Figure-79: 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.
- One ping iteration (with 500 Count of each- TWAMP & TCP) done at hotspot location.

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	Call drop 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 Call Drop/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. See table below.

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-56: 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 (TWAMP-UDP)	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 (TWAMP-UDP)	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 (TWAMP-UDP & TCP)	Number of packets lost out of total packet transferred during test. Packet loss rate = (Total packet lost / Total packet sent) *100 * Packet delay (using TWAMP-UDP & TCP) >90 ms considered as packet loss and included in packet loss rate. * Packet loss rate is calculated based on TWAMP-UDP & TCP. *90th percentile for Packet loss rate has been reported in overall Hotspot performance summary.

Table-57: 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.