



TELECOM REGULATORY AUTHORITY OF INDIA

Independent Drive Test Report

Maharashtra LSA

April 2026

Contents

1. Introduction	3
2. Executive Summary (LSA)	3
2.1 Drive test details	3
2.2 Drive test routes	4
2.3 Summary of areas covered	4
2.4 Telecom service providers detected frequency bands	5
2.5 Performance against key QoS parameters	6
3. QoS performance analysis-LSA level	7
3.1 Overview	8
3.2 Voice performance	8
3.3 Data performance	11
4. Detailed QoS performance analysis	13
4.1 Overview	13
4.2 City	13
4.2.1 Drive test route	13
4.2.2 Areas covered	13
4.2.3 Voice performance	13
4.2.4 Data performance	22
4.3 Hotspots	26
4.3.1 Locations	26
4.3.2 Hotspot covered	26
4.3.3 Voice performance	26
4.3.4 Data performance (Auto-selection mode 5G/4G/3G/2G)	29
4.3.5 Data performance (5G Only & 4G Only Download & Upload Speed)	34
4.4 Walk Test	38
4.4.1 Walk test locations	38
4.4.2 Walk Test Covered	38
4.4.3 Voice Performance	38
4.4.4 Data Performance	39
4.5 Highway	41
4.5.1 Drive test route	41
4.5.2 Routes Covered	41
4.5.3 Voice performance	41
4.5.4 Data performance	50

5. Voice & Data Key findings	54
5.1 Overall Voice.....	54
5.2 Overall Data	54
5.3 Operator wise Key Findings.....	55
6. Annexure	60
6.1 Route wise coverage map	60
6.1.1 City	60
6.1.2 Highway	65
7. Appendix	71
7.1 Appendix-I	71
7.1.1 Drive test setup	71
7.1.2 Drive test Methodology	73
7.2 Appendix-II	75
7.2.1 Network Performance Parameters for Voice calls	75
7.2.2 Network Performance Parameters Data tests	76

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 Maharashtra License Service Area (LSA) during the month of April-2026 under the supervision of TRAI Regional Office (RO) Bengaluru. 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	Sindhudurg District	City	451.7	15-Apr-2026	18-Apr-2026
2	Sindhudurg	Inter Operator Calling	1 Location	18-Apr-2026	18-Apr-2026
3	Sindhudurg District	Hotspot	13 Locations	16-Apr-2026	18-Apr-2026
4	Sindhudurg District	Walk test	8.5	16-Apr-2026	17-Apr-2026
5	Pune to Panaji	Highway	567.3	14-Apr-2026	15-Apr-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.

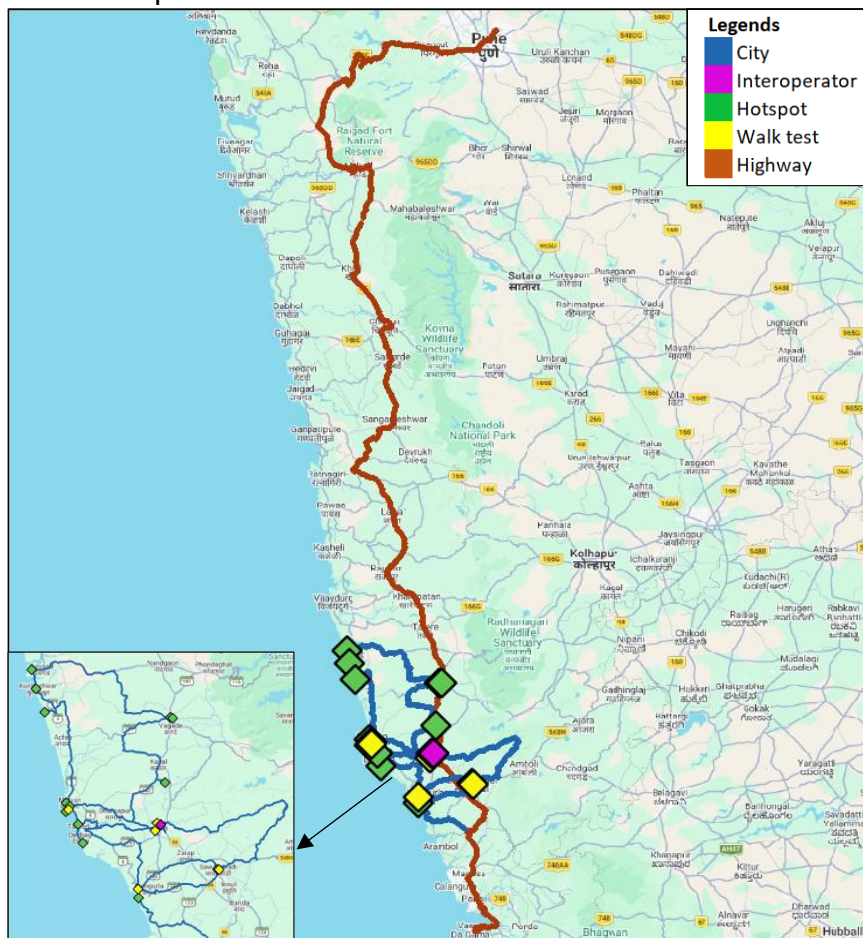


Figure-1: Drive test routes

2.3 Summary of areas covered

a) City-Kunkeshwar, Devgad, Vadade, Kasal, Kudal, Sawantwadi, Vengurla, Tarkarli, Malvan and Achra etc.

b) Hotspot

1. Chivla Beach & Rock Garden
2. Devbagh Beach
3. Devgad Bus Stand & Beach Area
4. Kankavli Bus Stand & Market
5. Kankavli College Road to Court Road to Tilak Chowk Loop
6. Kunkeshwar Temple Area
7. Malvan Market Area
8. Mithbav Beach
9. Oros District Collector Office Area
10. Sawantwadi Market Area
11. Sindhudurg Fort (Malvan)
12. Tarkarli Beach
13. Vengurla Beach & Jetty

c) Walk Test

1. Kudal MIDC Area Internal Roads Loop
2. Kudal Railway Station Area
3. Malvan Jetty to Dandi Beach Road to Wayari Area
4. Sawantwadi Lake Periphery Road Loop
5. Vengurla Market Inner Roads to Camp Area Loop

d) Highway- Pune to Panaji passing through Pirangut, Tamhini, Mangaon, Lonere, Poladpur, Khed, Tural, Sangameshwar, Rajapur, Talere, Kudal and Goa Dabolim International Airport.

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	1800
2	Bharti Airtel Ltd.	4G	850,1800,2100,2300
3	Bharti Airtel Ltd.	5G	3500
4	BSNL	2G	900
5	BSNL	3G	2100
6	BSNL	4G	700,2100,2500
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	900,1800,2100,2300,2500
11	Vodafone Idea Ltd.	5G	3500

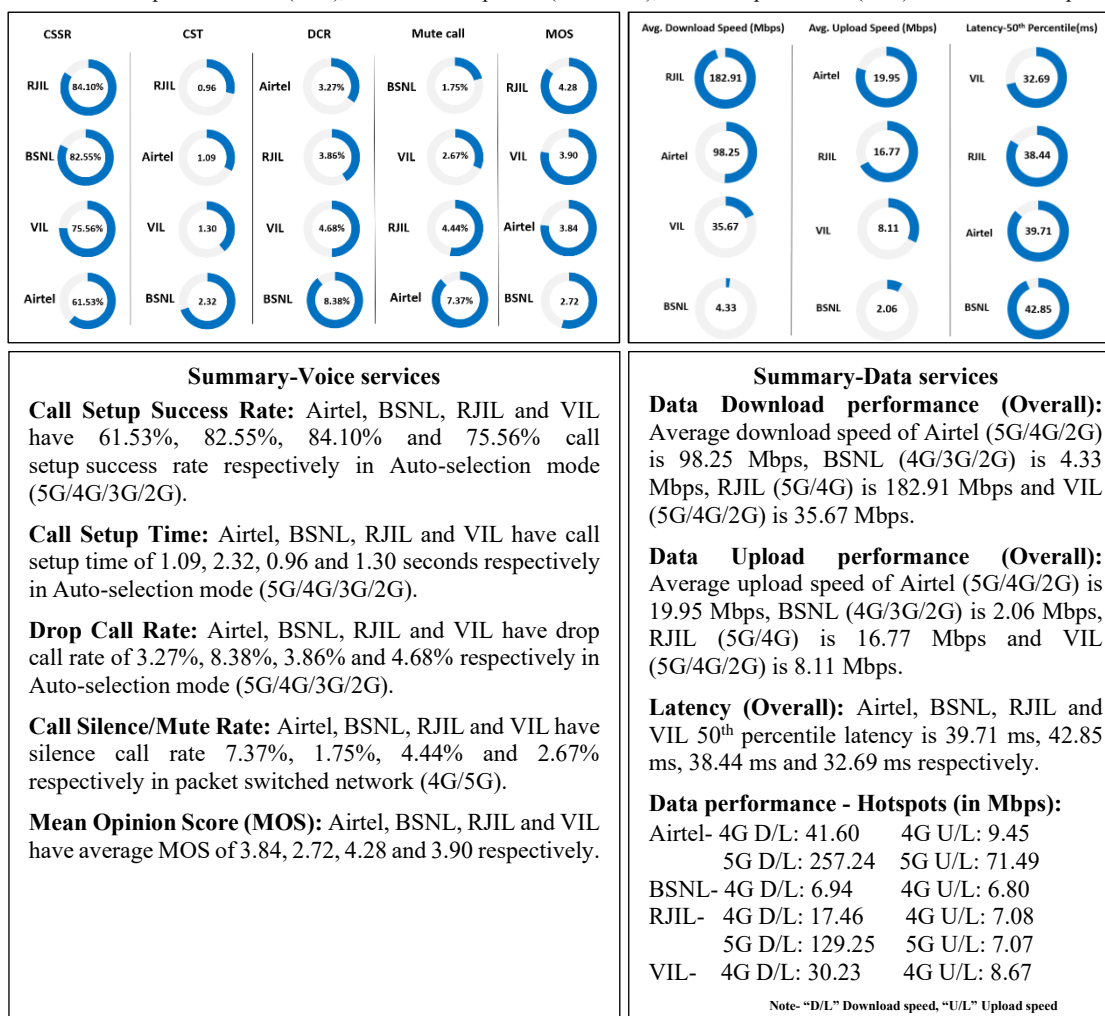
Table-2: Telecom service provider (TSP) covered in IDT.

Note-

- Very few samples of 5G technology were observed in Pune city during the highway drive in 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.



- The Poor signal strength in auto-selection mode (5G/4G/3G/2G) during **voice** testing has been observed in 34.28%, 33.22%, 29.55% and 37.69% 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 38.29%, 47.93%, 51.85% and 38.69% 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 14.26%, 33.53%, 9.06% and 12.98% 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 22.18%, 46.06%, 26.85% and 15.97% 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- Maharashtra 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 Karnataka LSA during the month of April-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	954	764	747
Call Setup Success Rate %	37.11	81.28	74.43
Drop Call Rate %	5.08	8.70	2.34
Call Setup Time-Average (Second)	5.28	3.58	3.15
Handover Success Rate %	98.38	99.97	95.42

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

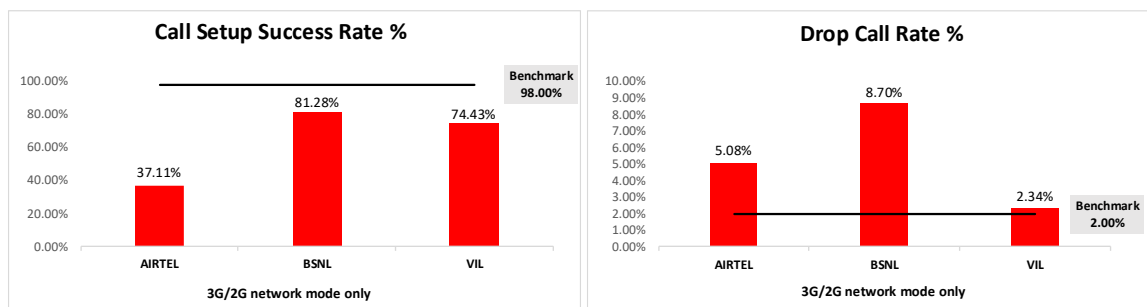


Figure-2: Call setup success rate and drop call rate performance.

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	333	NA
2G	606	171	574

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	1045	997	956	990
Call Setup Success Rate %	61.53	82.55	84.10	75.56
Drop Call Rate %	3.27	8.38	3.86	4.68
Call Setup Time-Average (Second)	1.09	2.32	0.96	1.30
Handover Success Rate %	100.00	98.85	99.68	99.92

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

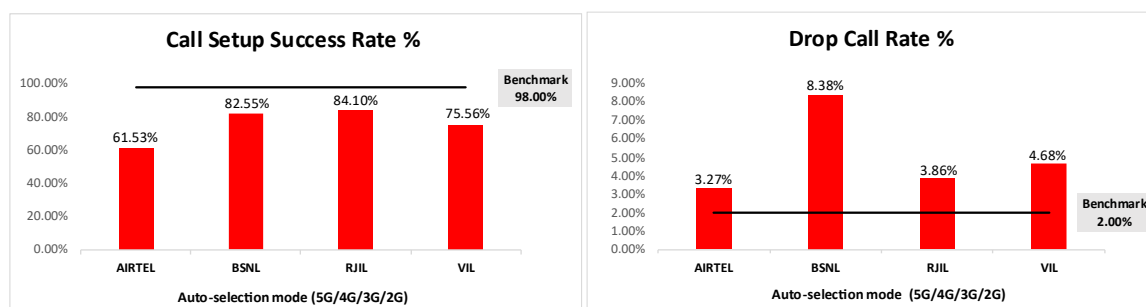


Figure-3: Performance for call setup success rate and drop call rate.

Parameter	Service Provider			
	Mobile-to-Mobile (5G/4G - Open Mode)			
	AIRTEL	BSNL	RJIL	VIL
Call Established (within service provider Network)	434	514	563	524
Number of silences call for >4 Sec	32	9	25	14
Silence Call Rate %	7.37	1.75	4.44	2.67
Number of silence instances for >4 Sec	40	12	29	19
Number of silence instances for >3 Sec	51	17	51	25
Number of silence instances for >2 sec	78	36	103	37
RTP Jitter (4G & 5G) in ms	6.04	4.63	15.61	8.57
Packet loss Rate Downlink %	2.49	3.66	4.81	2.77
Packet loss Rate Uplink %	3.06	3.81	5.07	2.65

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	519	0
4G	1121	633	1196	1131
3G	NA	179	NA	NA
2G	89	184	NA	86

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	3755	3754	4624	4518
Speech Quality (Average MOS)	3.84	2.72	4.28	3.90
Number of samples with MOS ≥ 4 to < 5 (Excellent)	2822	488	3781	3299
Number of samples with MOS ≥ 3 to < 4 (Good)	616	892	364	761
Number of samples with MOS ≥ 2 to < 3 (Fair)	131	1631	142	201
Number of samples with MOS ≥ 1 to < 2 (Poor)	186	743	337	257
%age of samples with MOS ≥ 4 to < 5 (Excellent)	75.15%	13.00%	81.77%	73.02%
%age of samples with MOS ≥ 3 to < 4 (Good)	16.40%	23.76%	7.87%	16.84%
%age of samples with MOS ≥ 2 to < 3 (Fair)	3.49%	43.45%	3.07%	4.45%
%age of samples with MOS ≥ 1 to < 2 (Poor)	4.95%	19.79%	7.29%	5.69%

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

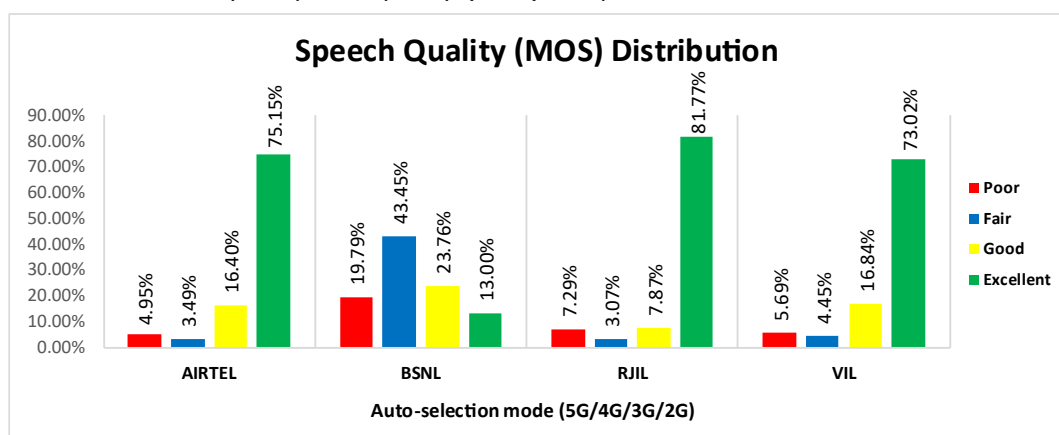


Figure- 4: Distribution of samples in MOS range.

(d) Inter-service provider voice call performance: To check the performance of inter-service providers call setup success rate, total 9 to 12 inter operator calls were attempted at one location which is Kudal Bus stand. 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	100.00	100.00
BSNL	100.00	NA	100.00	100.00
RJIL	100.00	100.00	NA	100.00
VIL	100.00	88.89	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	5.78	1.37	1.42
BSNL	2.46	NA	2.36	2.54
RJIL	1.68	3.91	NA	1.88
VIL	1.66	5.27	1.60	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	98.25	4.33	182.91	35.67
	80th Percentile	185.45	6.66	387.89	54.51
	20th Percentile	13.10	0.40	3.50	3.55
Upload Throughput (Mbits/s)	Average	19.95	2.06	16.77	8.11
	80th Percentile	37.74	2.63	30.98	13.77
	20th Percentile	2.01	0.44	1.34	1.24
Latency (ms)	50th Percentile	39.71	42.85	38.44	32.69

Table-11: Summary of data performance in network auto-selection mode.

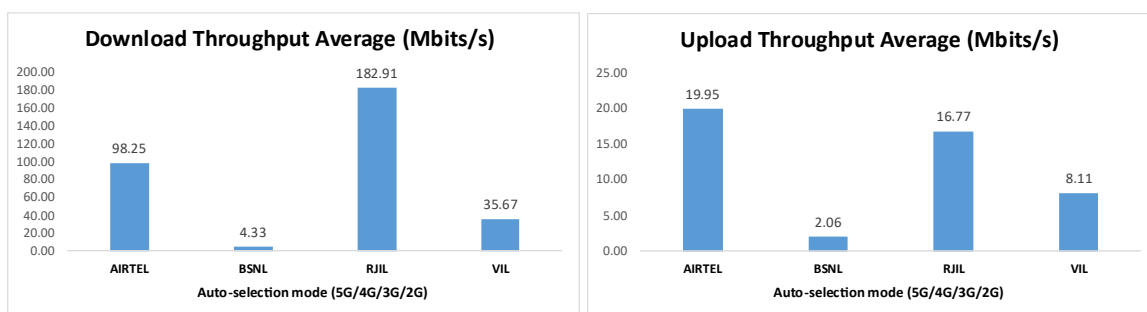


Figure- 5: Download and Upload throughput

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	693	0
4G	1166	476	933	1139
3G	NA	303	NA	NA
2G	81	83	NA	99

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 from 15th April 2026 to 18th April 2026 in Sindhudurg District. (Refer Table-1)

4.2.1 Drive test route

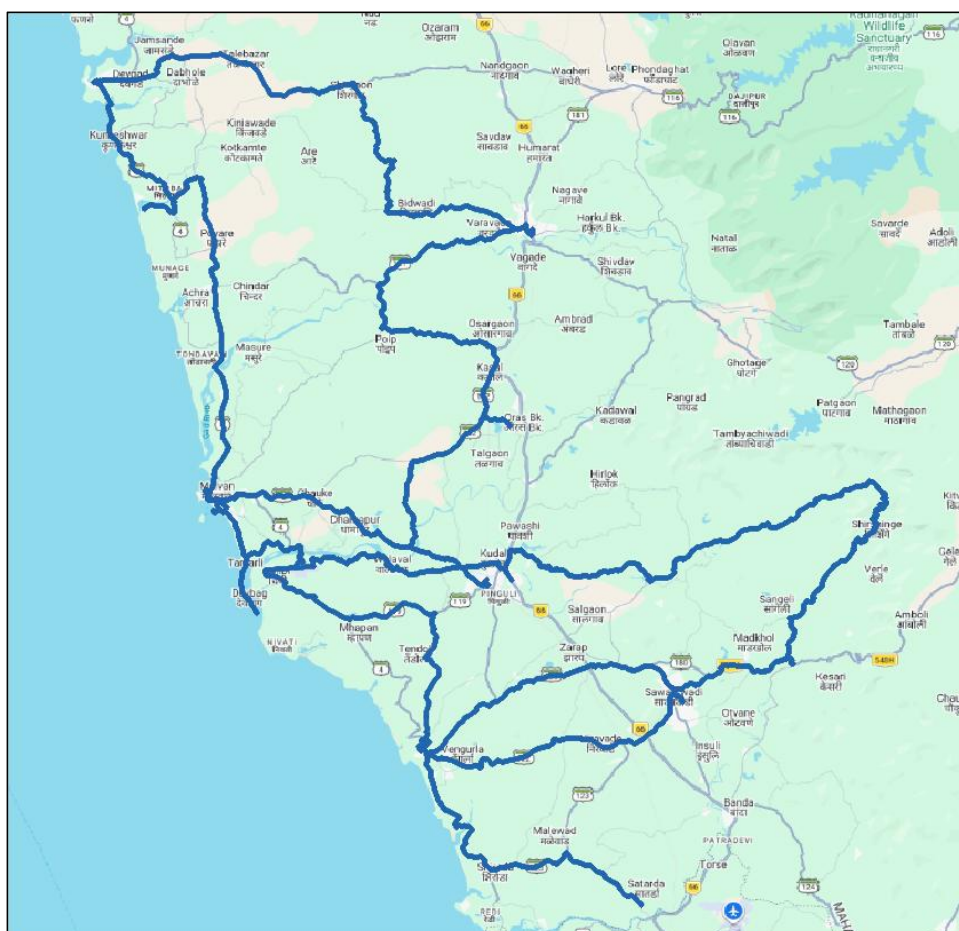


Figure- 6: Drive test routes

4.2.2 Areas covered

Kunkeshwar, Devgad, Vadade, Kasal, Kudal, Sawantwadi, Vengurla, Tarkarli, Malvan and Achra 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	630	461	495
Call Setup Success Rate %	24.44	86.98	66.26
Drop Call Rate %	5.19	5.24	2.74
Call Setup Time-Average (Second)	5.87	3.72	3.14
Handover Success Rate %	98.94	100.00	90.04

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

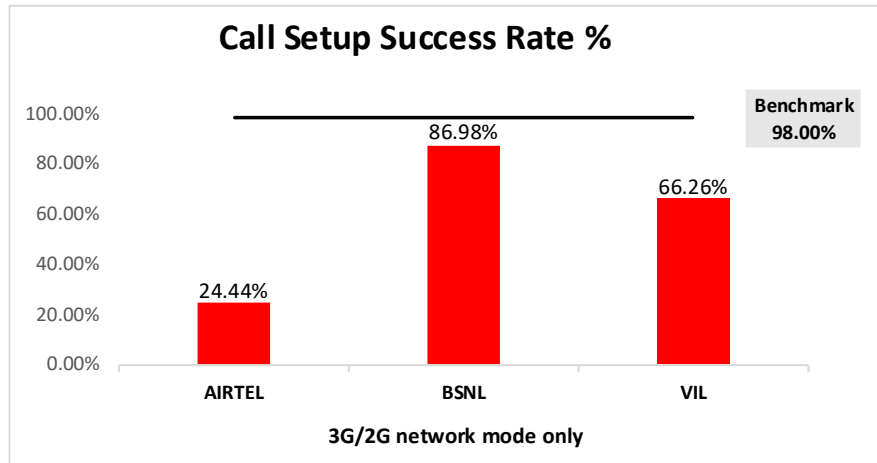


Figure-7: Performance for call setup success rate.

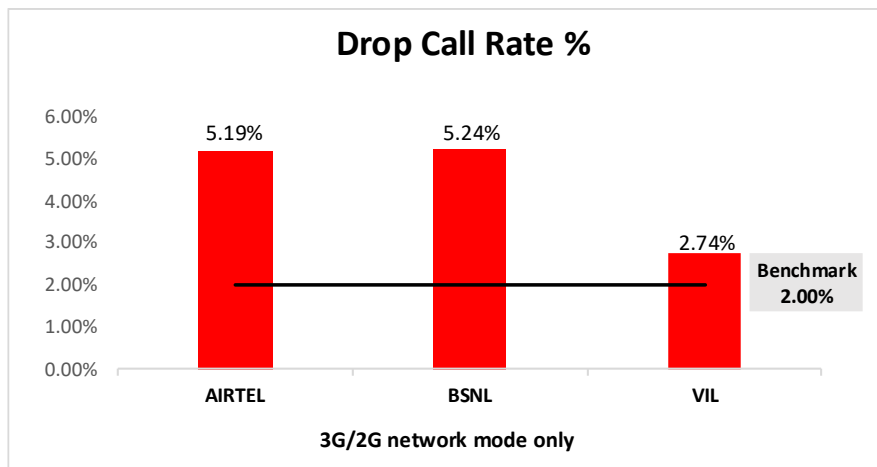


Figure-8: Performance for drop call rate.

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

Technology	Service Provider		
	AIRTEL	BSNL	VIL
3G	NA	84.52%	NA
2G	53.08%	13.74%	79.26%
Limited Service	46.92%	1.74%	20.74%

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

Note-

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

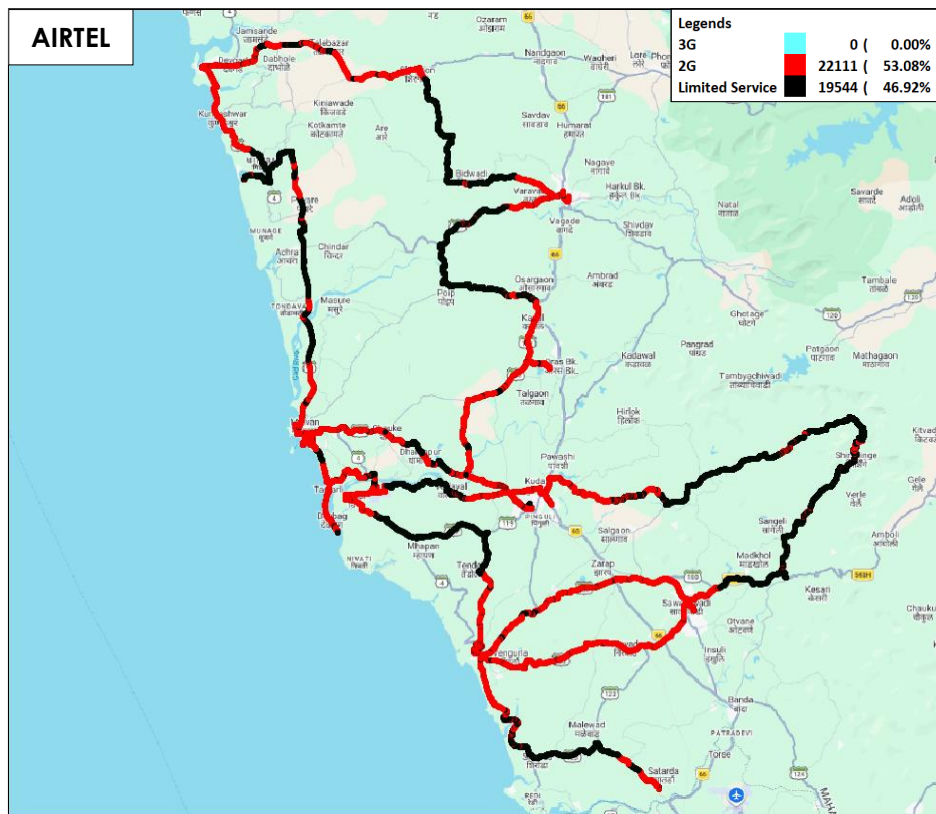


Figure-9: Serving technology plots 3G/2G network mode - AIRTEL

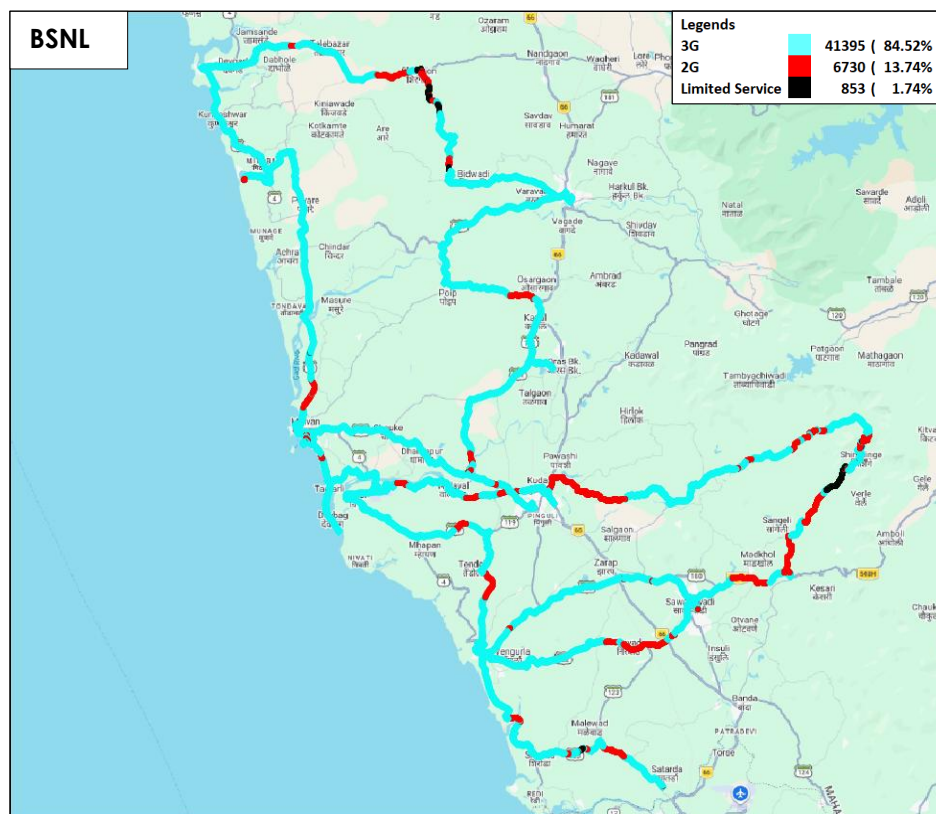


Figure-10: Serving technology plots 3G/2G network mode - BSNL.

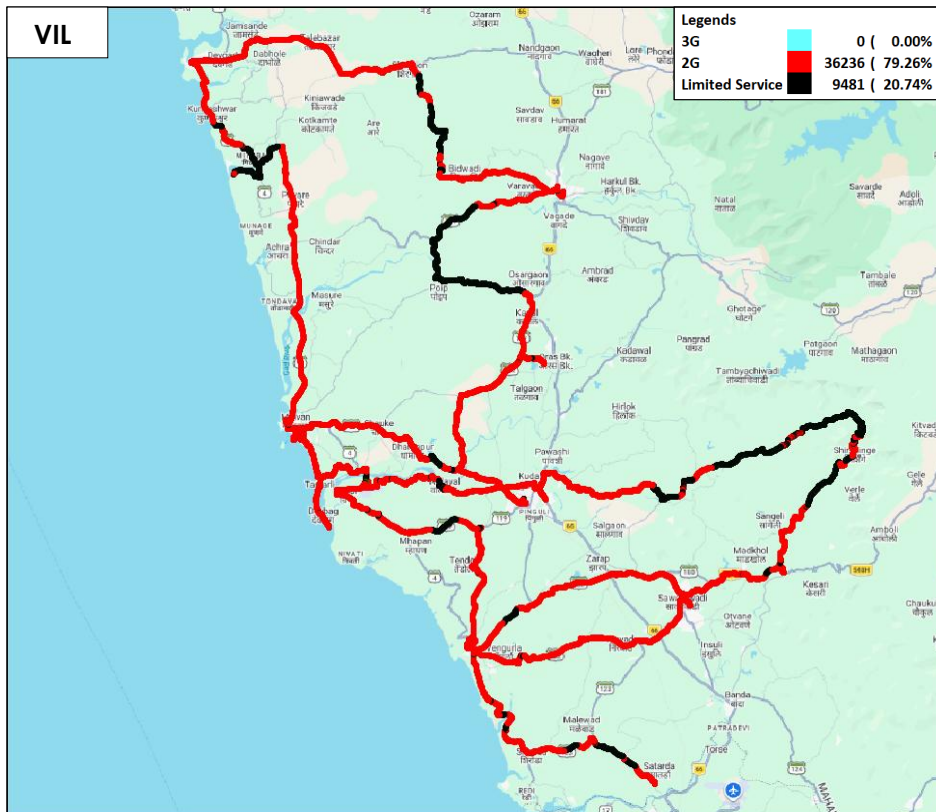


Figure-11: Serving technology plots 3G/2G network mode - VIL.

(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)

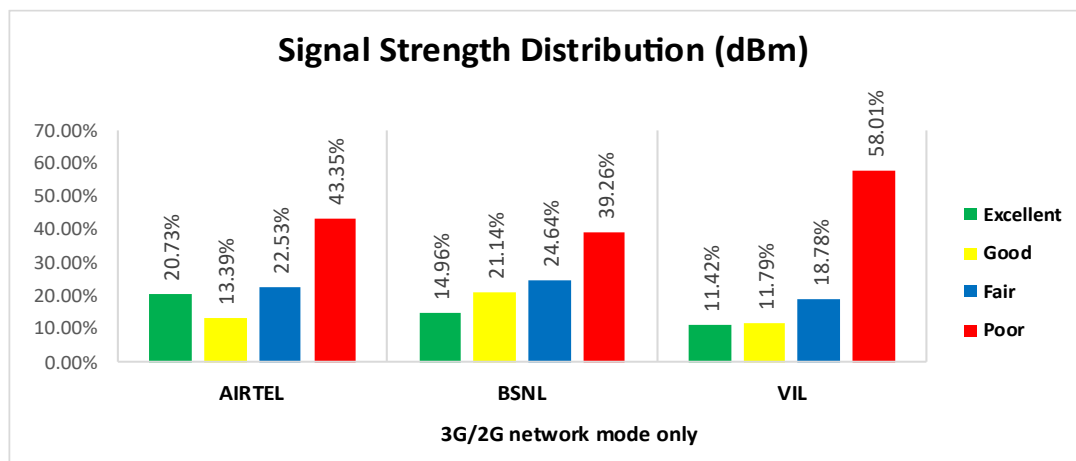


Figure-12: Signal strength distribution 3G/2G network mode only.

Observations:

- Airtel has 21% of samples falling in the excellent signal strength category.
- BSNL has 15% of samples falling in the excellent signal strength category.
- VIL has 11% 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	565	486	496	525
Call Setup Success Rate %	40.00	82.10	73.39	62.29
Drop Call Rate %	3.54	7.52	5.77	7.34
Call Setup Time Average (Second)	1.32	2.44	1.18	1.58
Handover Success Rate %	100.00	99.56	99.76	100.00

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

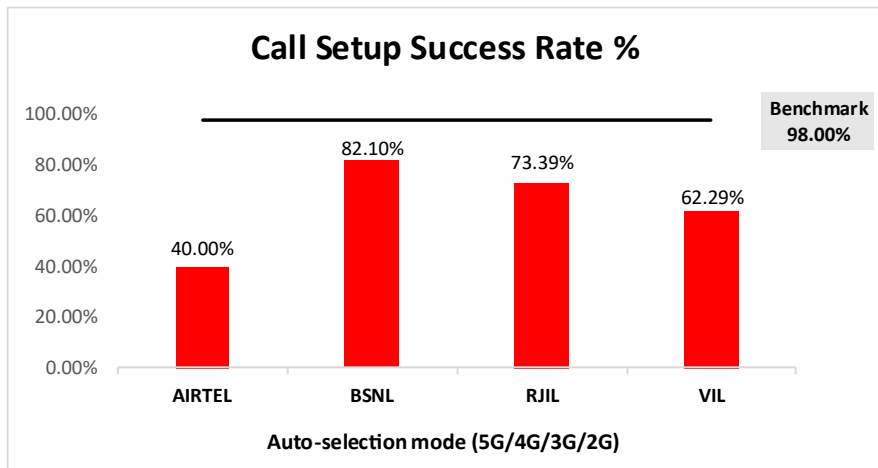


Figure-13: Performance for call setup success rate.

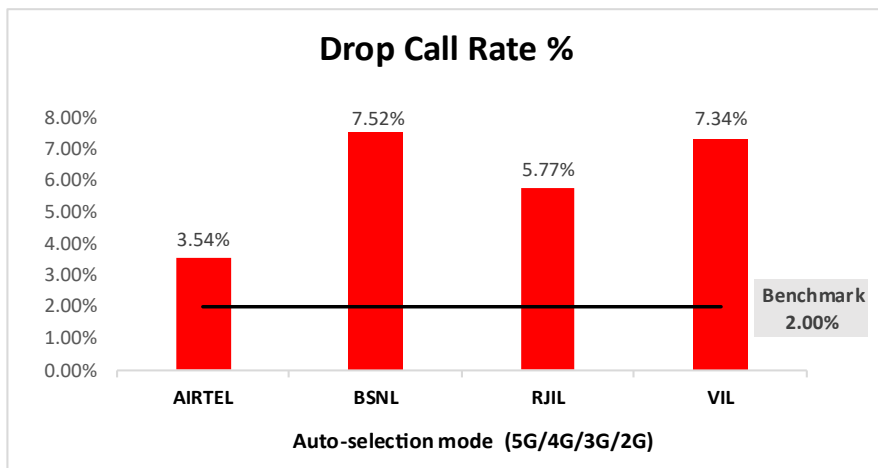


Figure-14: Performance for drop call rate.

Parameter	Service Provider			
	Mobile-to-Mobile (5G/4G - Open Mode)			
	AIRTEL	BSNL	RJIL	VIL
Call Established (within service provider Network)	218	319	330	292
Number of silences call for >4 Sec	15	5	18	11
Silence Call Rate %	6.88	1.57	5.45	3.77
Number of silence instances for >4 Sec	17	5	19	16
Number of silence instances for >3 Sec	19	5	33	19
Number of silence instances for >2 sec	30	15	60	28
RTP Jitter (4G & 5G) in ms	7.37	4.37	15.35	10.05
Packet loss Rate Downlink %	2.48	3.25	6.28	3.92
Packet loss Rate Uplink %	3.43	2.93	6.61	3.73

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	1123	1733	1787	1647
Speech Quality (Average MOS)	3.77	2.82	4.09	3.86
Number of samples with MOS ≥ 4 to < 5 (Excellent)	797	269	1351	1165
Number of samples with MOS ≥ 3 to < 4 (Good)	207	526	157	298
Number of samples with MOS ≥ 2 to < 3 (Fair)	37	610	74	67
Number of samples with MOS ≥ 1 to < 2 (Poor)	82	328	205	117
%age of samples with MOS ≥ 4 to < 5 (Excellent)	70.97%	15.52%	75.60%	70.73%
%age of samples with MOS ≥ 3 to < 4 (Good)	18.43%	30.35%	8.79%	18.09%
%age of samples with MOS ≥ 2 to < 3 (Fair)	3.29%	35.20%	4.14%	4.07%
%age of samples with MOS ≥ 1 to < 2 (Poor)	7.30%	18.93%	11.47%	7.10%

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

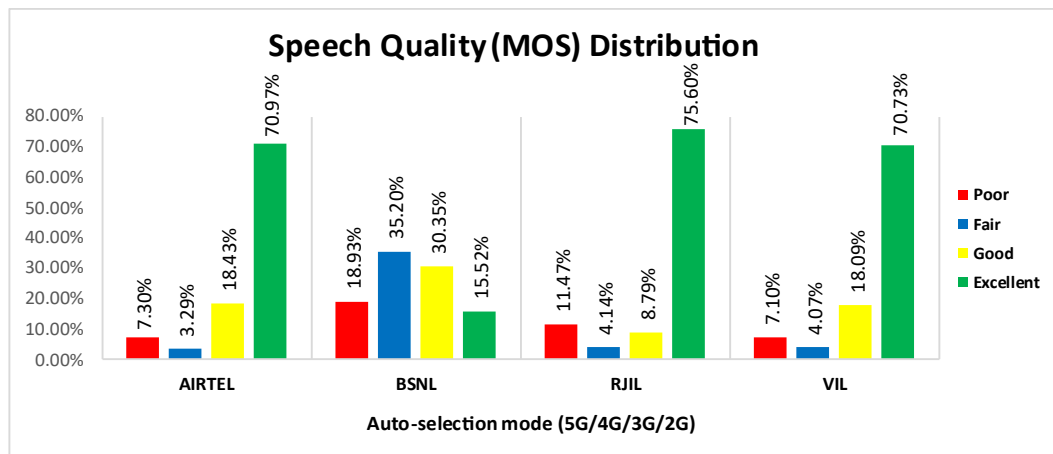


Figure-15: Distribution of samples in MOS range.

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

Technology	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
5G	2.75%	NA	27.24%	NA
4G	55.53%	49.08%	58.11%	67.20%
3G	NA	35.77%	NA	NA
2G	3.33%	11.83%	NA	11.21%
Limited Service	38.39%	3.32%	14.64%	21.59%

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.

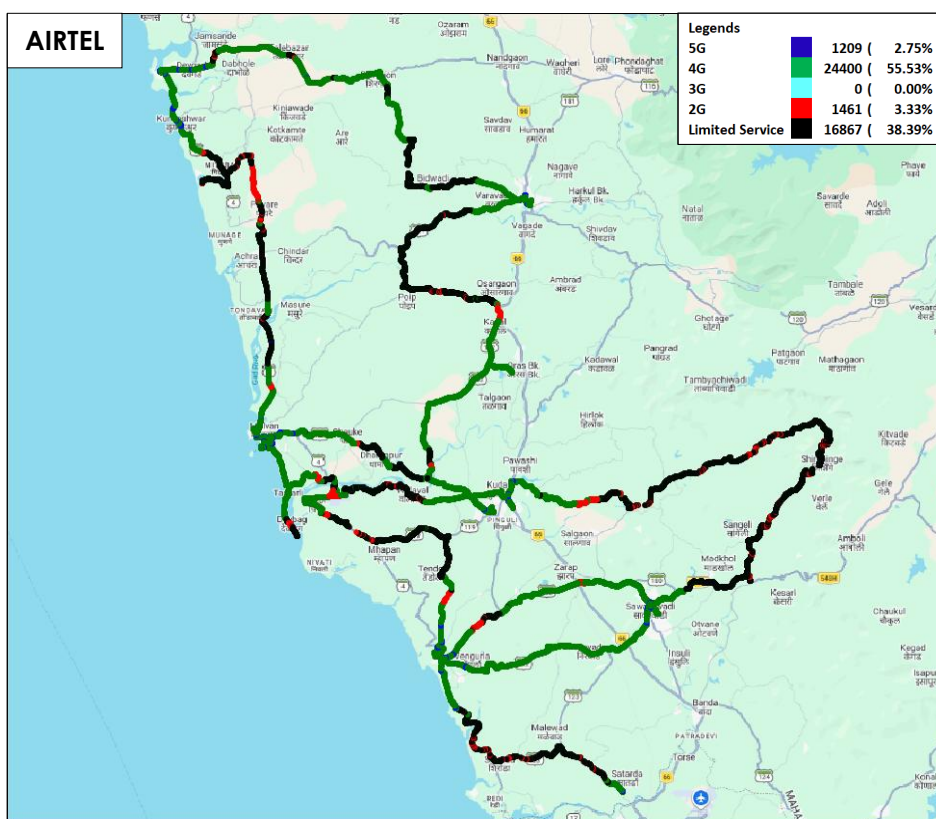


Figure-16: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - AIRTEL.

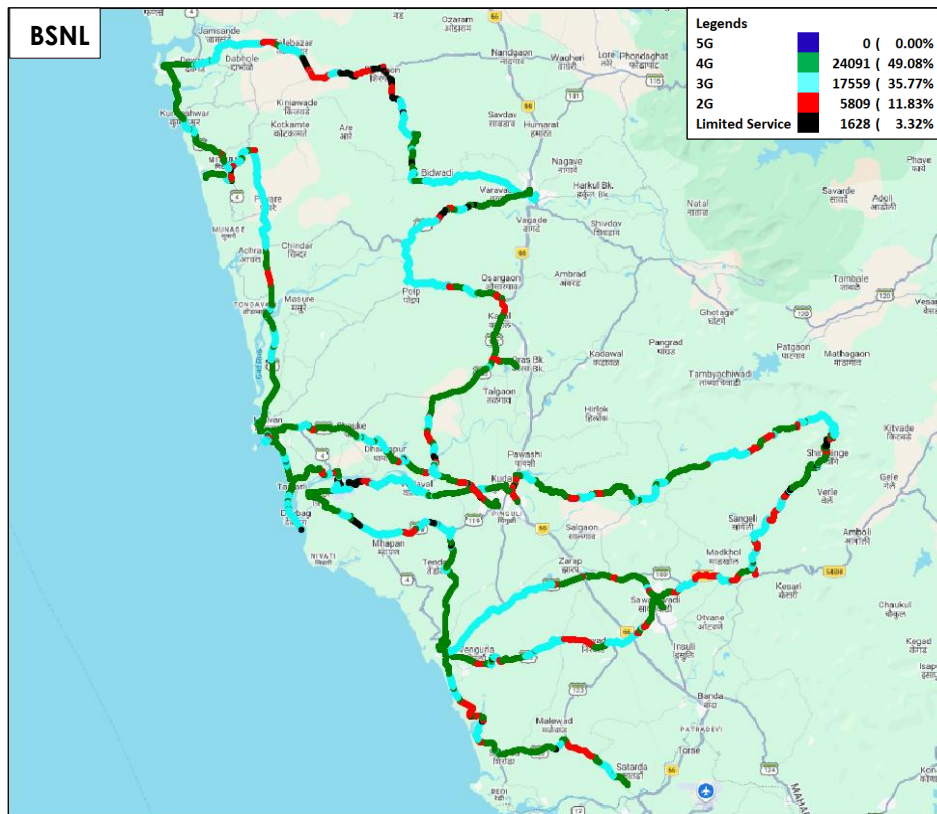


Figure-17: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - BSNL.

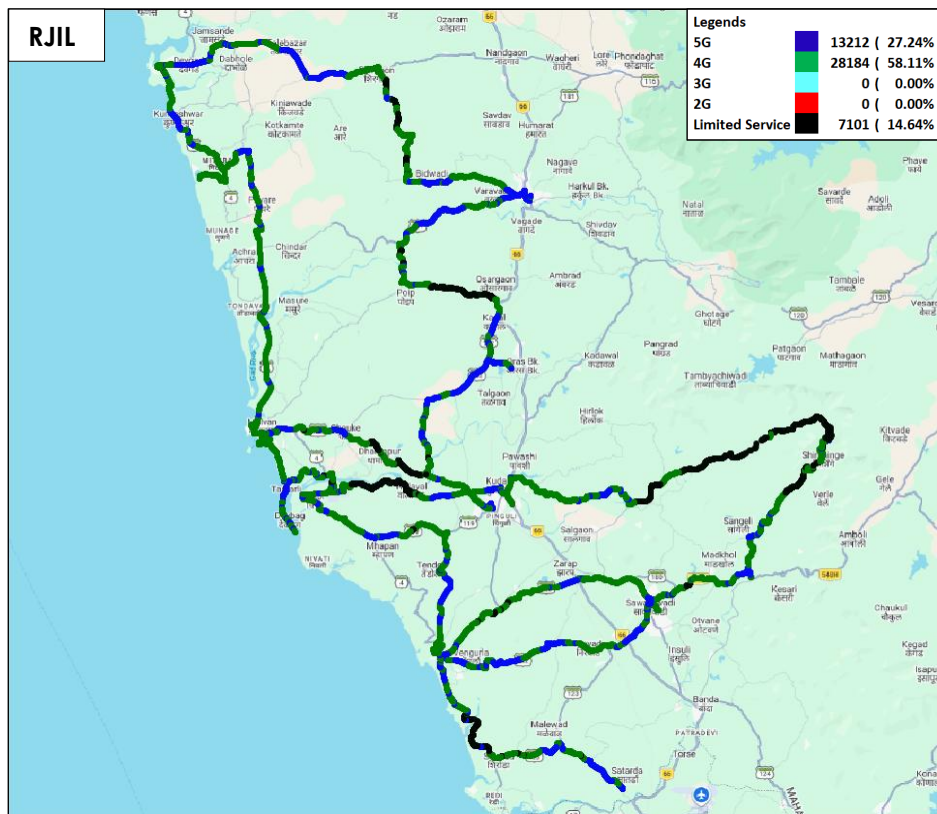


Figure-18: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - RJIL.

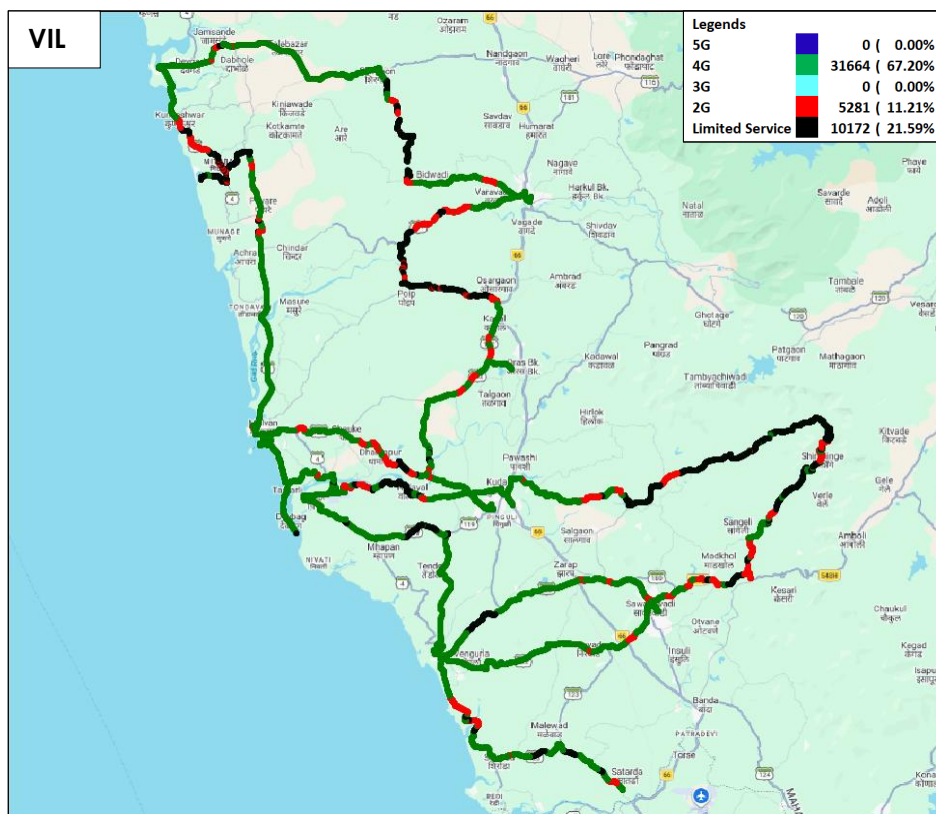


Figure-19: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - VIL

(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)

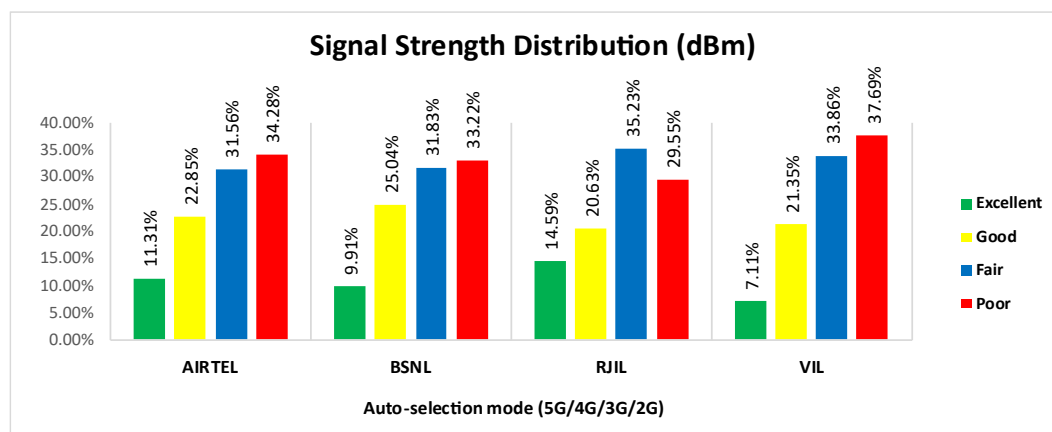


Figure-20: Signal strength distribution auto-selection mode (5G/4G/3G/2G) voice.

Observations:

- Airtel has 11% of samples falling in the excellent signal strength category.
- BSNL has 10% of samples falling in the excellent signal strength category.
- RJIL has 15% of samples falling in the excellent signal strength category.
- VIL has 7% 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	94.50	2.30	127.94	20.51
	80th Percentile	191.34	3.63	293.90	38.14
	20th Percentile	10.94	0.20	0.78	1.40
Upload Throughput (Mbits/s)	Average	17.62	1.62	11.35	3.81
	80th Percentile	36.64	2.19	16.85	5.57
	20th Percentile	1.51	0.28	1.15	0.84
Latency (ms)	50th Percentile	39.37	52.46	39.83	34.47

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

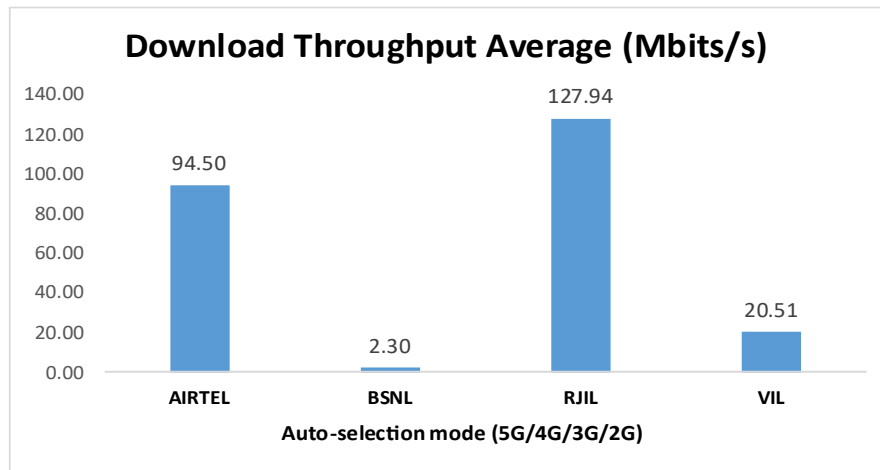


Figure- 21: Download throughput

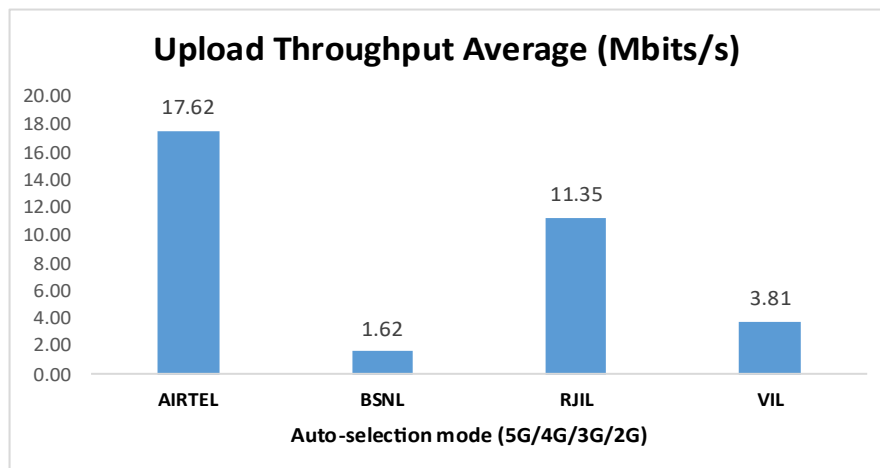


Figure- 22: Upload throughput

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

Technology	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
5G	17.51%	NA	31.35%	NA
4G	29.11%	26.99%	48.41%	66.36%
3G	NA	65.60%	NA	NA
2G	1.74%	3.88%	NA	9.55%
Limited Service	51.64%	3.53%	20.24%	24.09%

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.

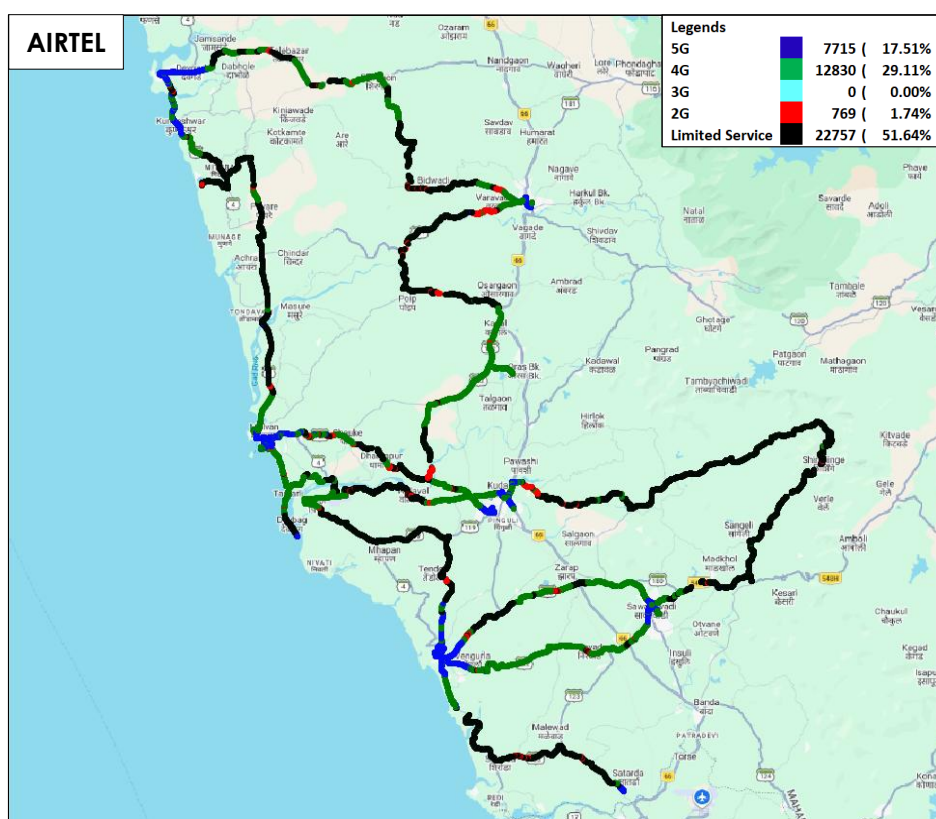


Figure-23: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - AIRTEL.

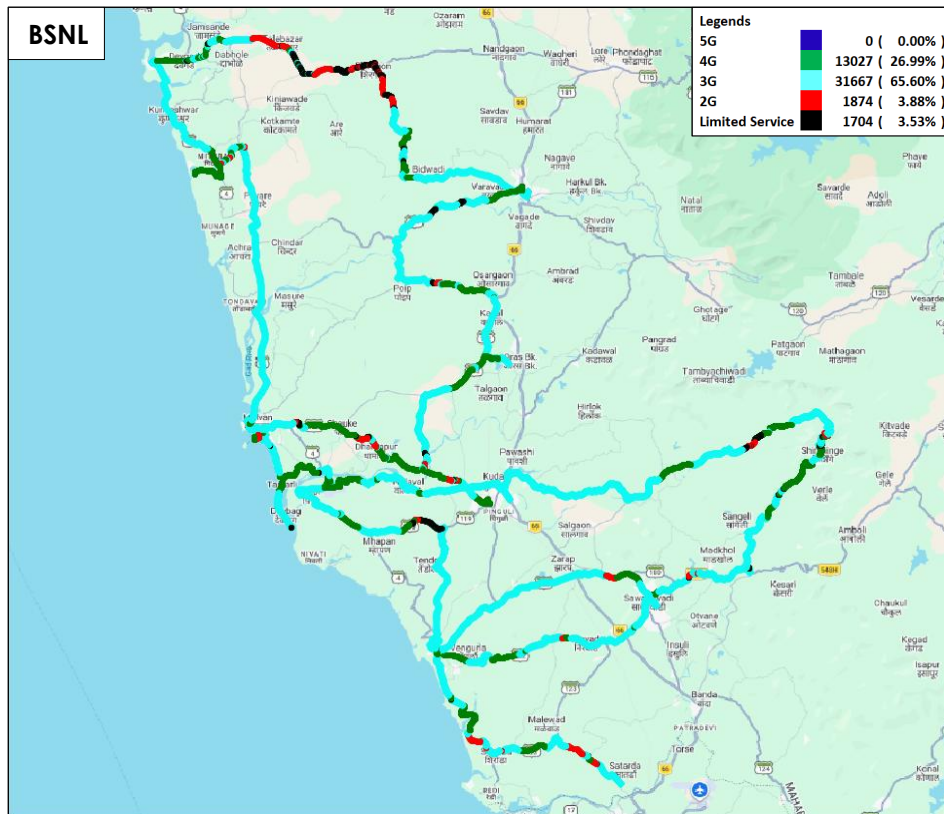


Figure-24: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - BSNL.

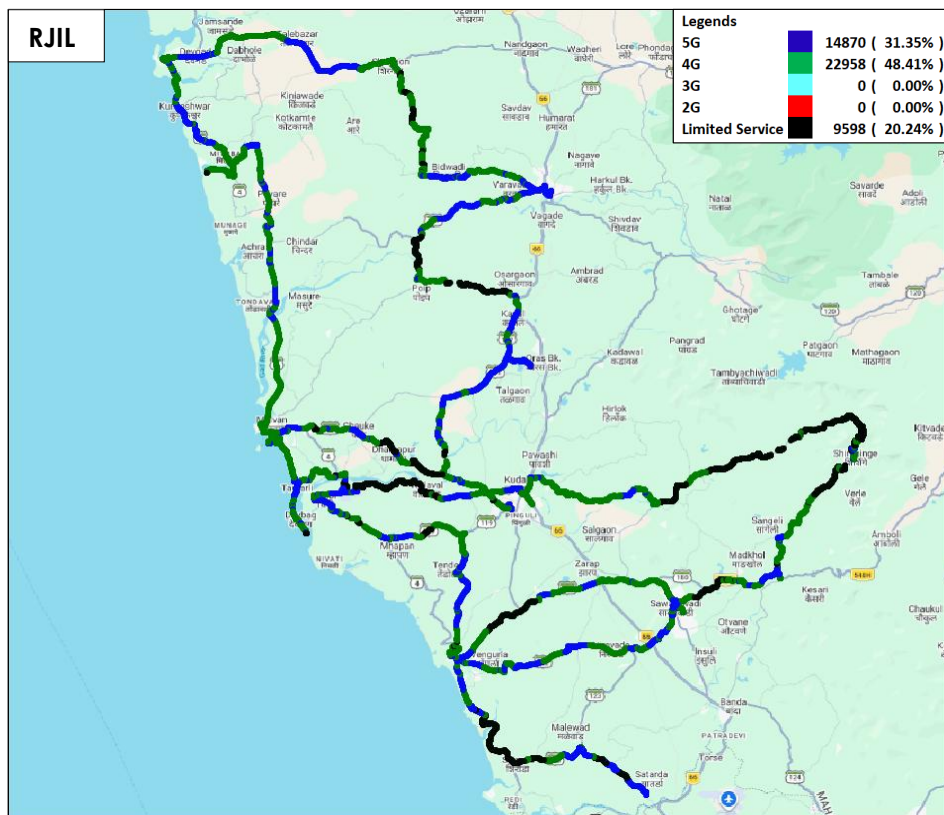


Figure-25: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - RJIL.

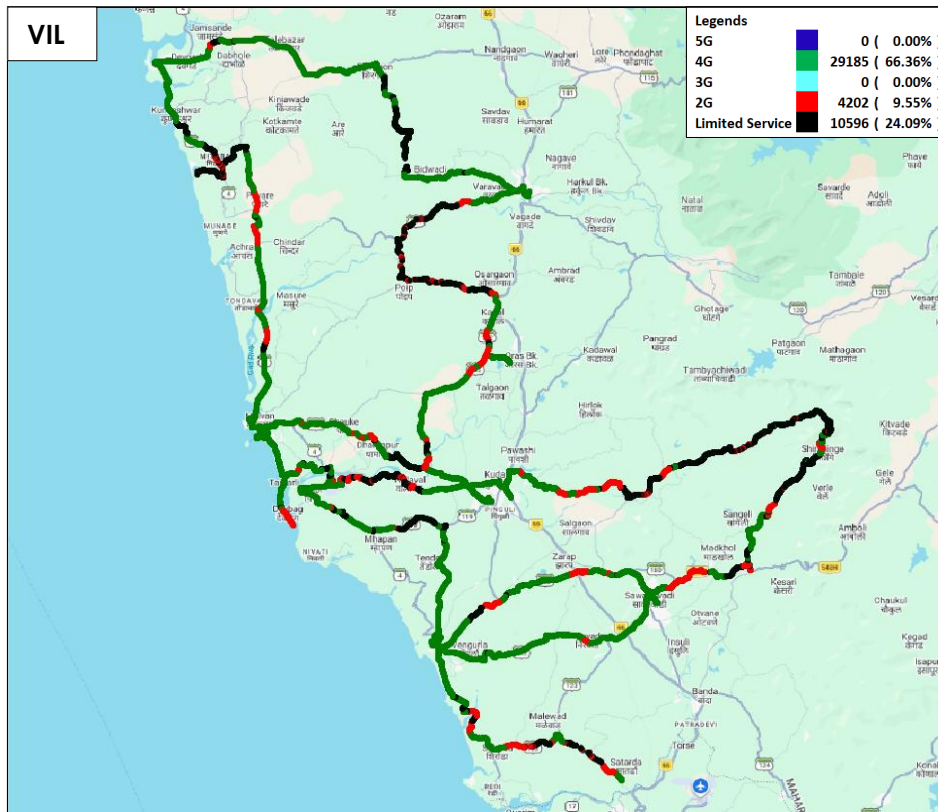


Figure-26: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - VIL

(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)

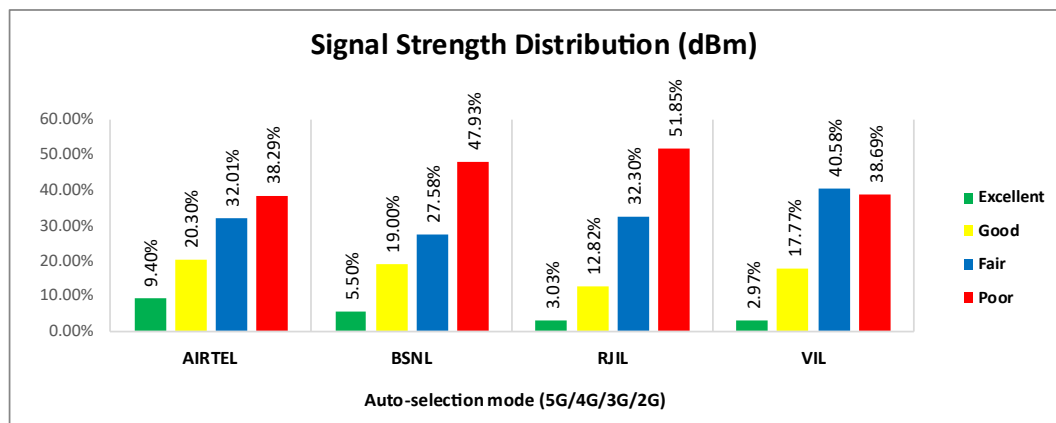


Figure-27: Signal strength distribution auto-selection mode (5G/4G/3G/2G) data.

Observations:

- Airtel has 9% of samples falling in the excellent signal strength category.
- BSNL has 6% of samples falling in the excellent signal strength category.
- RJIL has 3% of samples falling in the excellent signal strength category.
- VIL has 3% of samples falling in the excellent signal strength category.

4.3 Hotspots

Hotspot testing has been conducted from 16th April 2026 to 18th April 2026. Thirteen locations have been tested in Sindhudurg District. (Refer Table-1)

4.3.1 Locations

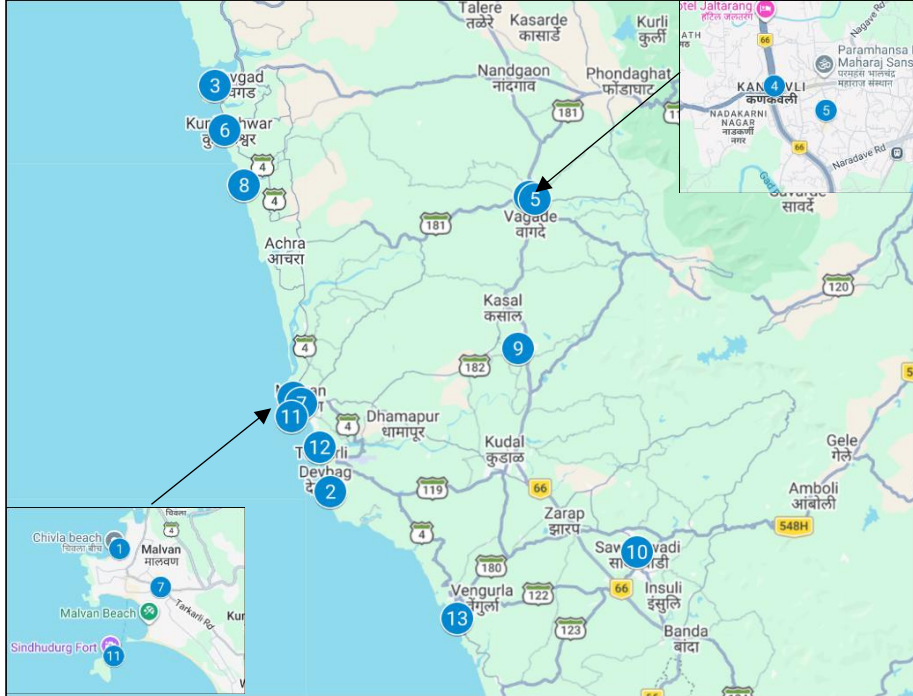


Figure- 28: Hotspot locations

4.3.2 Hotspot covered

1. Chivla Beach & Rock Garden
2. Devbagh Beach
3. Devgad Bus Stand & Beach Area
4. Kankavli Bus Stand & Market
5. Kankavli College Road to Court Road to Tilak Chowk Loop
6. Kunkeshwar Temple Area
7. Malvan Market Area
8. Mithbav Beach
9. Oros District Collector Office Area
10. Sawantwadi Market Area
11. Sindhudurg Fort (Malvan)
12. Tarkarli Beach
13. Vengurla Beach & Jetty

4.3.3 Voice performance

Overall Voice Performance				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	130	130	130	130
Call Setup Success Rate %	91.54	96.92	100.00	89.23
Drop Call Rate %	0.00	3.17	0.00	0.86
Call Setup Time-Average (Second)	0.67	1.80	0.81	1.24

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

Chivla Beach & Rock Garden				
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)	0.75	2.21	1.52	1.06

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

Devbagh Beach				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	10	10	10	10
Call Setup Success Rate %	0.00	100.00	100.00	90.00
Drop Call Rate %	-	10.00	0.00	11.11
Call Setup Time-Average (Second)	-	1.80	0.64	3.48

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

Note- "-" Call setup time & drop rate has not been reported as all calls were failed at this location.

Devgad Bus Stand & Beach Area				
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)	0.57	1.34	0.54	0.76

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

Kankavli Bus Stand & Market				
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)	0.65	1.31	0.74	1.00

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

Kankavli College Road to Court Road to Tilak Chowk Loop				
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	80.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	0.66	1.29	0.53	2.29

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

Kunkeshwar Temple Area				
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)	0.47	1.20	0.53	1.57

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

Malvan Market Area				
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	90.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	0.58	1.63	0.52	1.09

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

Mithbav Beach				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	10	10	10	10
Call Setup Success Rate %	90.00	100.00	100.00	0.00
Drop Call Rate %	0.00	0.00	0.00	-
Call Setup Time-Average (Second)	1.36	1.37	1.31	-

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

Note- "-" Call setup time & drop rate has not been reported as all calls were failed at this location.

Oros District Collector Office Area				
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)	0.65	1.36	0.73	0.72

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

Sawantwadi Market Area				
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	60.00	100.00	100.00
Drop Call Rate %	0.00	16.67	0.00	0.00
Call Setup Time-Average (Second)	0.66	4.38	0.47	0.87

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

Sindhudurg Fort (Malvan)				
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)	0.58	1.32	1.79	0.74

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

Tarkarli Beach				
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)	0.64	1.34	0.66	0.90

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

Vengurla Beach & Jetty				
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)	0.56	3.82	0.50	0.81

Table-34: 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)	115.09	11.30	129.03	21.80
Download Throughput 80th Percentile (Mbit/s)	214.28	19.27	275.47	24.82
Download Throughput 20th Percentile (Mbit/s)	12.32	3.19	1.29	1.81
Download Session Setup Success Rate %	89.23	87.69	83.08	81.54
Upload Throughput Average (Mbits/s)	22.03	4.26	8.33	3.78
Upload Throughput 80th Percentile (Mbit/s)	49.27	6.74	11.81	5.59
Upload Throughput 20th Percentile (Mbit/s)	1.55	1.22	1.01	0.85
Upload Session Setup Success Rate %	87.69	92.31	84.62	84.62
Web Browsing Delay (Second)	5.54	5.18	5.39	5.47
Youtube Initial Buffer Delay (Second)	2.24	2.37	1.81	3.03
Latency (ms) - 50th Percentile	39.84	40.75	41.46	34.43
Jitter (ms)	17.11	141.05	22.52	146.00
Packet Loss Rate%	13.41	20.11	19.62	33.53
Packet Loss Rate- 90th percentile	47.70	78.50	88.30	100.00

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

Chivla Beach & Rock Garden				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	9.84	1.84	0.00	2.18
Download Session Setup Success Rate %	100.00	40.00	20.00	100.00
Upload Throughput Average (Mbits/s)	3.04	1.55	0.38	1.23
Upload Session Setup Success Rate %	100.00	80.00	40.00	100.00
Web Browsing Delay (Second)	7.25	-	-	6.72
Youtube Initial Buffer Delay (Second)	1.01	-	-	9.86
Latency (ms) - 50th Percentile	51.24	54.67	-	41.77
Jitter (ms)	36.71	59.62	-	599.28
Packet Loss Rate%	7.70	12.10	100.00	16.00

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

Note- "-"Respective tests were failed.

Devbagh Beach				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	-	0.01	0.45	0.02
Download Session Setup Success Rate %	0.00	40.00	80.00	40.00
Upload Throughput Average (Mbits/s)	-	0.05	0.83	0.08
Upload Session Setup Success Rate %	0.00	80.00	80.00	60.00
Web Browsing Delay (Second)	-	-	12.20	-
Youtube Initial Buffer Delay (Second)	-	-	-	-
Latency (ms) - 50th Percentile	-	-	127.40	-
Jitter (ms)	-	-	92.89	-
Packet Loss Rate%	100.00	100.00	68.30	100.00

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

Note- "-"Respective tests were failed.

Devgad Bus Stand & Beach Area				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	454.69	8.31	17.05	16.19
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	42.73	3.27	8.57	2.08
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	3.31	5.36	6.38	3.28
Youtube Initial Buffer Delay (Second)	0.66	1.13	0.94	3.11
Latency (ms) – 50 th Percentile	23.76	38.85	38.44	32.57
Jitter (ms)	6.41	36.87	5.49	6.04
Packet Loss Rate%	0.30	9.80	0.40	0.00

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

Kankavli Bus Stand & Market				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	170.24	3.52	251.79	10.28
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	78.93	3.70	13.98	0.84
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	3.29	3.21	4.20	10.14
Youtube Initial Buffer Delay (Second)	0.86	3.53	0.76	6.79
Latency (ms) - 50th Percentile	45.13	58.24	41.17	35.57
Jitter (ms)	3.90	15.45	3.87	16.57
Packet Loss Rate%	0.10	48.40	0.10	1.20

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

Kankavli College Road to Court Road to Tilak Chowk Loop				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	30.18	6.41	176.60	28.63
Download Session Setup Success Rate%	100.00	100.00	100.00	20.00
Upload Throughput Average (Mbits/s)	7.14	10.30	4.24	4.06
Upload Session Setup Success Rate %	100.00	100.00	100.00	80.00
Web Browsing Delay (Second)	5.93	4.23	4.80	7.79
Youtube Initial Buffer Delay (Second)	0.90	1.91	1.74	0.93
Latency (ms)- 50th Percentile	49.33	40.30	44.57	-
Jitter (ms)	10.71	50.87	5.62	-
Packet Loss Rate%	0.80	3.90	6.50	99.80

Table-40: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Note- "- Ping tests were failed.

Kunkeshwar Temple Area				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	357.19	24.61	84.05	1.94
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	45.66	3.41	40.67	0.76
Upload Session Setup Success Rate %	100.00	100.00	100.00	60.00
Web Browsing Delay (Second)	2.94	5.04	4.19	12.06
Youtube Initial Buffer Delay (Second)	0.68	0.98	0.61	-
Latency (ms) - 50th Percentile	23.69	38.14	35.16	93.05
Jitter (ms)	1.80	27.21	3.78	989.49
Packet Loss Rate%	1.40	2.40	0.10	83.10

Table-41: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Note- "- Youtube tests were failed.

Malvan Market Area				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	39.53	2.85	6.46	10.58
Download Session Setup Success Rate%	100.00	60.00	100.00	100.00
Upload Throughput Average (Mbits/s)	2.28	1.36	0.92	1.97
Upload Session Setup Success Rate %	100.00	40.00	100.00	100.00
Web Browsing Delay (Second)	6.73	5.96	16.15	3.93
Youtube Initial Buffer Delay (Second)	2.73	-	8.62	2.80
Latency (ms)- 50th Percentile	45.98	41.81	58.61	37.08
Jitter (ms)	21.60	45.35	44.09	32.63
Packet Loss Rate%	21.00	4.40	2.40	11.20

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

Note- "-" Youtube tests were failed.

Mithbav Beach				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	2.01	6.77	2.71	-
Download Session Setup Success Rate %	60.00	100.00	40.00	0.00
Upload Throughput Average (Mbits/s)	1.76	10.60	1.16	-
Upload Session Setup Success Rate %	40.00	100.00	40.00	0.00
Web Browsing Delay (Second)	5.66	2.24	16.92	-
Youtube Initial Buffer Delay (Second)	6.24	1.42	-	-
Latency (ms) - 50th Percentile	39.11	39.09	48.93	-
Jitter (ms)	9.25	50.25	28.75	-
Packet Loss Rate%	0.80	28.40	3.40	100.00

Table-43: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Note- "-" Respective tests were failed.

Oros District Collector Office Area				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	7.14	12.64	298.62	19.38
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	1.52	4.31	4.08	6.77
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	11.62	5.86	4.57	4.42
Youtube Initial Buffer Delay (Second)	8.93	1.71	2.34	0.94
Latency (ms) - 50th Percentile	44.98	40.41	41.72	29.83
Jitter (ms)	15.08	34.30	3.79	13.26
Packet Loss Rate%	1.40	3.30	0.10	5.20

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

Sawantwadi Market Area				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	204.99	3.71	191.64	98.11
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	54.49	1.21	2.27	15.68
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	2.10	7.79	6.33	4.88
Youtube Initial Buffer Delay (Second)	0.642	9.78	4.20	0.77
Latency (ms) – 50 th Percentile	25.83	39.98	37.54	28.79
Jitter (ms)	3.73	1280.52	5.44	6.03
Packet Loss Rate%	0.10	10.00	0.20	0.30

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

Sindhudurg Fort (Malvan)				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	16.15	11.13	23.03	1.98
Download Session Setup Success Rate %	100.00	100.00	40.00	100.00
Upload Throughput Average (Mbits/s)	12.31	1.77	0.51	4.68
Upload Session Setup Success Rate %	100.00	100.00	40.00	100.00
Web Browsing Delay (Second)	4.34	9.86	4.60	4.02
Youtube Initial Buffer Delay (Second)	1.04	-	3.39	3.08
Latency (ms) - 50th Percentile	35.14	47.89	41.41	35.54
Jitter (ms)	6.53	48.15	54.82	27.40
Packet Loss Rate%	0.10	4.20	1.10	15.80

Table-46: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Note- “-” Youtube tests were failed.

Tarkarli Beach				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	24.37	30.40	0.57	53.52
Download Session Setup Success Rate%	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	1.16	8.83	4.85	3.51
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	11.87	3.56	5.25	1.78
Youtube Initial Buffer Delay (Second)	11.49	0.92	1.51	1.28
Latency (ms)- 50th Percentile	42.05	41.13	-	34.36
Jitter (ms)	14.69	44.51	-	7.80
Packet Loss Rate%	1.30	3.00	72.30	0.30

Table-47: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Note- “-” Ping tests were failed.
--

Vengurla Beach & Jetty				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	19.48	18.87	356.15	11.18
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	1.19	1.89	10.56	1.10
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	10.85	5.87	4.08	6.65
Youtube Initial Buffer Delay (Second)	9.75	2.08	0.69	6.74
Latency (ms) - 50th Percentile	55.48	34.80	34.82	35.83
Jitter (ms)	75.00	32.88	2.70	13.93
Packet Loss Rate%	39.30	31.50	0.10	3.00

Table-48: 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)	257.24	-	129.25	-
	Upload Throughput Average (Mbits/s)	71.49	-	7.07	-
4G	Download Throughput Average (Mbits/s)	41.60	6.94	17.46	30.23
	Upload Throughput Average (Mbits/s)	9.45	6.80	7.08	8.67

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

Note- "--Respective technology was not observed during the test.					
Chivla Beach & Rock Garden					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	-	-	3.24	-
	Upload Throughput Average (Mbits/s)	-	-	1.83	-
4G	Download Throughput Average (Mbits/s)	8.77	2.30	0.20	4.53
	Upload Throughput Average (Mbits/s)	1.79	1.81	0.51	2.59

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

Note- "--Respective technology was not observed during the test.					
Devbagh Beach					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	-	-	0.06	-
	Upload Throughput Average (Mbits/s)	-	-	2.23	-
4G	Download Throughput Average (Mbits/s)	-	2.31	1.75	0.71
	Upload Throughput Average (Mbits/s)	-	1.20	1.01	1.08

Table-51: Overall Summary of 5G only & 4G only data download & upload speed.

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

Devgad Bus Stand & Beach Area					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	448.39	-	2.40	-
	Upload Throughput Average (Mbits/s)	73.28	-	1.75	-
4G	Download Throughput Average (Mbits/s)	165.27	4.20	10.20	40.94
	Upload Throughput Average (Mbits/s)	35.66	6.96	4.93	20.60

Table-52: Overall Summary of 5G only & 4G only data download & upload speed.

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

Kankavli Bus Stand & Market					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	161.92	-	223.72	-
	Upload Throughput Average (Mbits/s)	76.06	-	17.01	-
4G	Download Throughput Average (Mbits/s)	48.38	4.24	10.56	41.92
	Upload Throughput Average (Mbits/s)	20.71	4.10	2.30	4.04

Table-53: Overall Summary of 5G only & 4G only data download & upload speed.

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

Kankavli College Road to Court Road to Tilak Chowk Loop					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	-	-	179.13	-
	Upload Throughput Average (Mbits/s)	-	-	4.12	-
4G	Download Throughput Average (Mbits/s)	22.64	0.68	6.37	17.61
	Upload Throughput Average (Mbits/s)	4.74	5.00	5.58	9.77

Table-54: Overall Summary of 5G only & 4G only data download & upload speed.

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

Kunkeshwar Temple Area					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	328.87	-	352.39	-
	Upload Throughput Average (Mbits/s)	64.39	-	37.05	-
4G	Download Throughput Average (Mbits/s)	73.96	20.94	53.00	2.72
	Upload Throughput Average (Mbits/s)	20.51	11.31	49.54	0.82

Table-55: Overall Summary of 5G only & 4G only data download & upload speed.

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

Malvan Market Area					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	90.26	-	4.71	-
	Upload Throughput Average (Mbits/s)	-	-	1.69	-
4G	Download Throughput Average (Mbits/s)	33.67	6.07	11.42	21.17
	Upload Throughput Average (Mbits/s)	3.85	4.99	0.92	4.92

Table-56: Overall Summary of 5G only & 4G only data download & upload speed.

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

Mithbav Beach					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	-	-	9.27	-
	Upload Throughput Average (Mbits/s)	-	-	1.87	-
4G	Download Throughput Average (Mbits/s)	1.20	8.64	6.77	-
	Upload Throughput Average (Mbits/s)	1.30	19.75	1.50	-

Table-57: Overall Summary of 5G only & 4G only data download & upload speed.

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

Oros District Collector Office Area					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	-	-	286.29	-
	Upload Throughput Average (Mbits/s)	-	-	3.84	-
4G	Download Throughput Average (Mbits/s)	13.75	3.51	15.04	8.17
	Upload Throughput Average (Mbits/s)	2.11	5.48	2.79	10.99

Table-58: Overall Summary of 5G only & 4G only data download & upload speed.

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

Sawantwadi Market Area					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	195.19	-	178.31	-
	Upload Throughput Average (Mbits/s)	71.18	-	3.11	-
4G	Download Throughput Average (Mbits/s)	44.91	7.43	29.37	84.75
	Upload Throughput Average (Mbits/s)	9.13	6.01	7.19	19.57

Table-59: Overall Summary of 5G only & 4G only data download & upload speed.

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

Sindhudurg Fort (Malvan)					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	159.86	-	10.14	-
	Upload Throughput Average (Mbits/s)	-	-	3.01	-
4G	Download Throughput Average (Mbits/s)	23.09	5.43	0.88	15.12
	Upload Throughput Average (Mbits/s)	6.29	2.29	0.66	8.93

Table-60: Overall Summary of 5G only & 4G only data download & upload speed.

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

Tarkarli Beach					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	-	-	0.69	-
	Upload Throughput Average (Mbits/s)	-	-	5.54	-
4G	Download Throughput Average (Mbits/s)	29.24	7.96	0.76	117.56
	Upload Throughput Average (Mbits/s)	1.92	10.16	1.57	18.00

Table-61: Overall Summary of 5G only & 4G only data download & upload speed.

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

Vengurla Beach & Jetty					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	-	-	378.19	-
	Upload Throughput Average (Mbits/s)	-	-	6.91	-
4G	Download Throughput Average (Mbits/s)	34.35	16.21	70.76	7.61
	Upload Throughput Average (Mbits/s)	5.42	8.17	7.08	0.90

Table-62: 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 16th April 2026 and 17th April 2026. Five locations have been tested in Sindhudurg District. (Refer Table-1)

4.4.1 Walk test locations

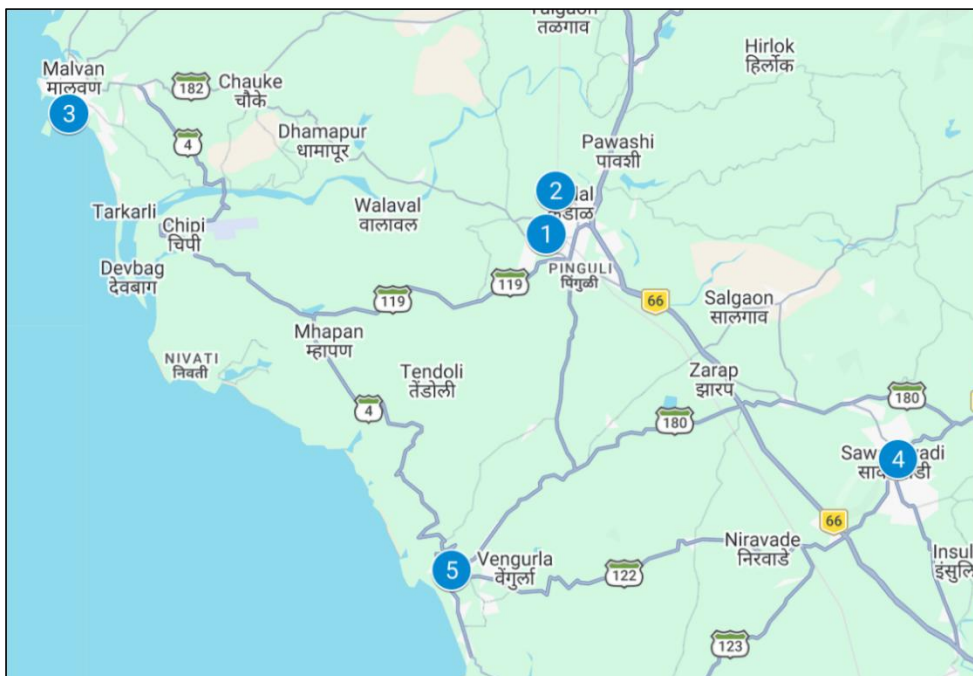


Figure-29: Walk Test locations.

4.4.2 Walk Test Covered

1. Kudal MIDC Area Internal Roads Loop
2. Kudal Railway Station Area
3. Malvan Jetty to Dandi Beach Road to Wayari Area
4. Sawantwadi Lake Periphery Road Loop
5. Vengurla Market Inner Roads to Camp Area Loop

4.4.3 Voice Performance

Kudal MIDC Area Internal Roads Loop				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	20	20	21	20
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)	0.68	1.26	0.50	0.97

Table-63: Summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

Kudal Railway Station Area				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	12	12	12	12
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)	0.77	1.88	0.50	1.05

Table-64: Summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

Malvan Jetty to Dandi Beach Road to Wayari Area				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	16	16	16	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)	0.63	1.30	2.35	0.87

Table-65: Summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

Sawantwadi Lake Periphery Road Loop				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	13	14	13	13
Call Setup Success Rate %	100.00	92.86	100.00	100.00
Drop Call Rate %	0.00	7.69	0.00	0.00
Call Setup Time-Average (Second)	0.51	1.35	0.47	0.78

Table-66: Summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

Vengurla Market Inner Roads to Camp Area Loop				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	11	11	11	11
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)	0.70	1.27	0.49	0.89

Table-67: 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)

Kudal MIDC Area Internal Roads Loop				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	70.99	3.08	263.92	19.77
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	11.27	2.14	20.20	10.46
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Latency (ms) - 50th Percentile	44.65	36.96	42.81	28.87

Table-68: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Kudal Railway Station Area				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	21.60	4.15	286.36	4.55
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	4.14	2.67	21.37	4.12
Upload Session Setup Success Rate %	100.00	90.91	100.00	100.00
Latency (ms) - 50th Percentile	58.82	47.87	41.72	28.89

Table-69: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Malvan Jetty to Dandi Beach Road to Wayari Area				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	125.59	2.84	3.18	27.72
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	54.44	1.33	2.14	6.63
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Latency (ms) - 50th Percentile	28.77	53.52	61.59	31.89

Table-70: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Sawantwadi Lake Periphery Road Loop				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	131.22	7.12	472.89	53.40
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	50.33	5.08	58.31	22.75
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Latency (ms) - 50th Percentile	38.73	41.68	41.19	24.95

Table-71: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Vengurla Market Inner Roads to Camp Area Loop				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	127.90	6.01	338.42	35.04
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	19.45	5.27	27.71	3.81
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Latency (ms) - 50th Percentile	37.80	46.27	30.94	38.51

Table-72: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

4.5 Highway

Drive test has been conducted on 14th April 2026 and 15th April 2026 covering one Highway route. (Refer Table-1)

4.5.1 Drive test route

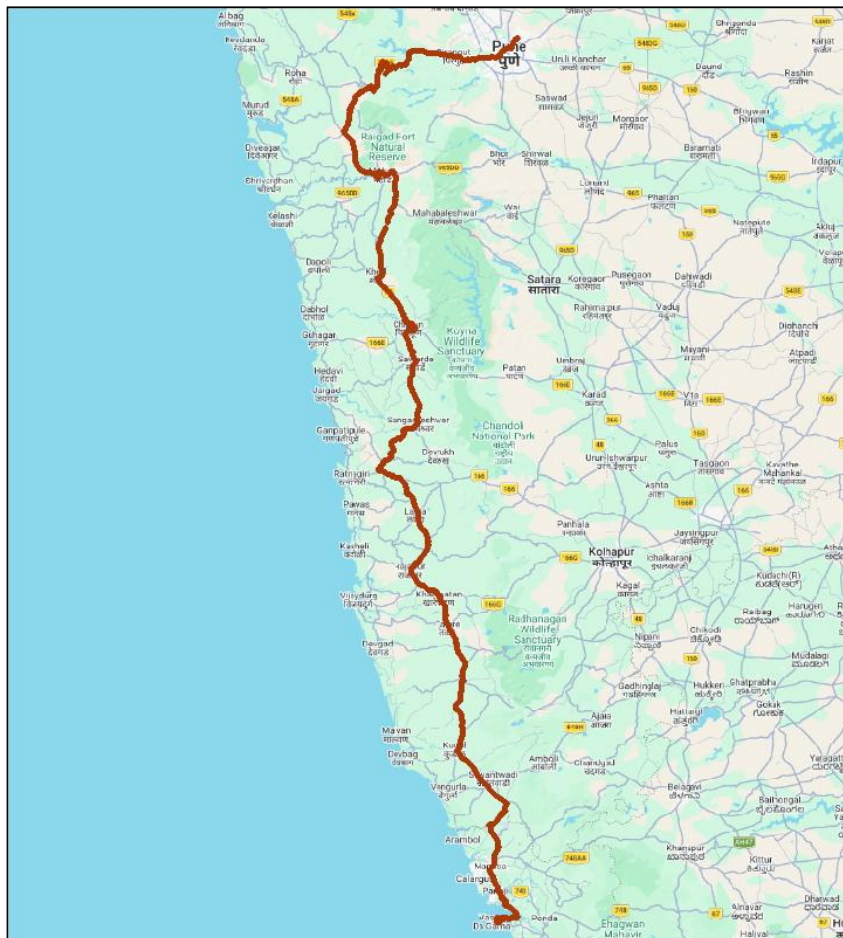


Figure-30: Drive test route Highway.

4.5.2 Routes Covered

Pune to Panaji passing through Pirangut, Tamhini, Mangaon, Lonere, Poladpur, Khed, Tural, Sangameshwar, Rajapur, Talere, Kudal and Goa Dabolim International Airport.

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	324	303	252
Call Setup Success Rate %	61.73	72.61	90.48
Drop Call Rate %	5.00	15.00	1.75
Call Setup Time-Average (Second)	4.82	3.33	3.16
Handover Success Rate %	98.22	99.93	97.41

Table-73: Summary of voice call performance in 3G/2G network mode only.

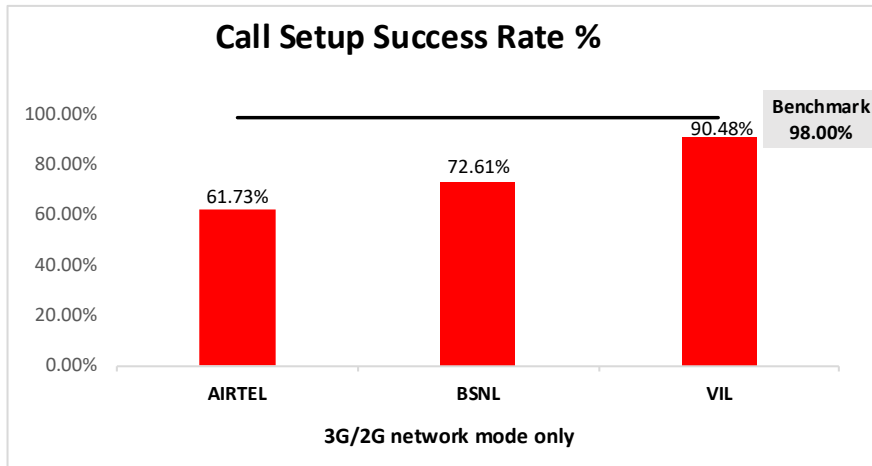


Figure-31: Performance for call setup success rate.

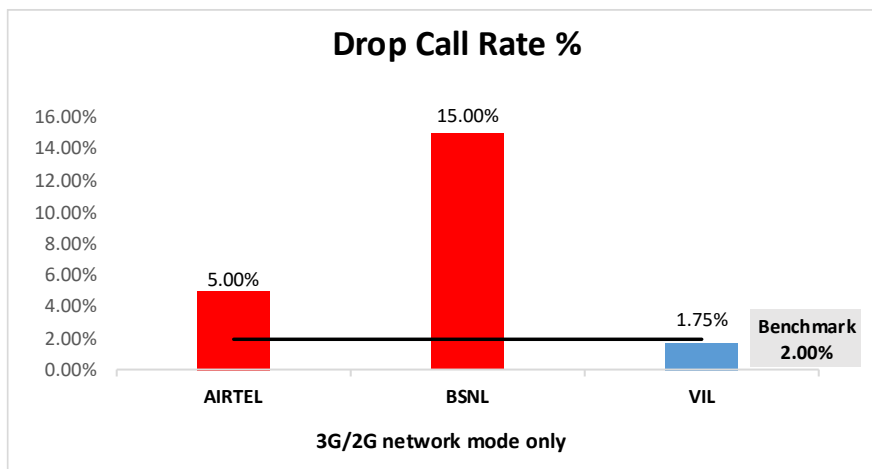


Figure-32: Performance for drop call rate.

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

Technology	Service Provider		
	AIRTEL	BSNL	VIL
3G	NA	64.85%	NA
2G	98.37%	32.21%	99.37%
Limited Service	1.63%	2.94%	0.63%

Table-74: Time spent on technology during drive test 3G/2G network mode only.

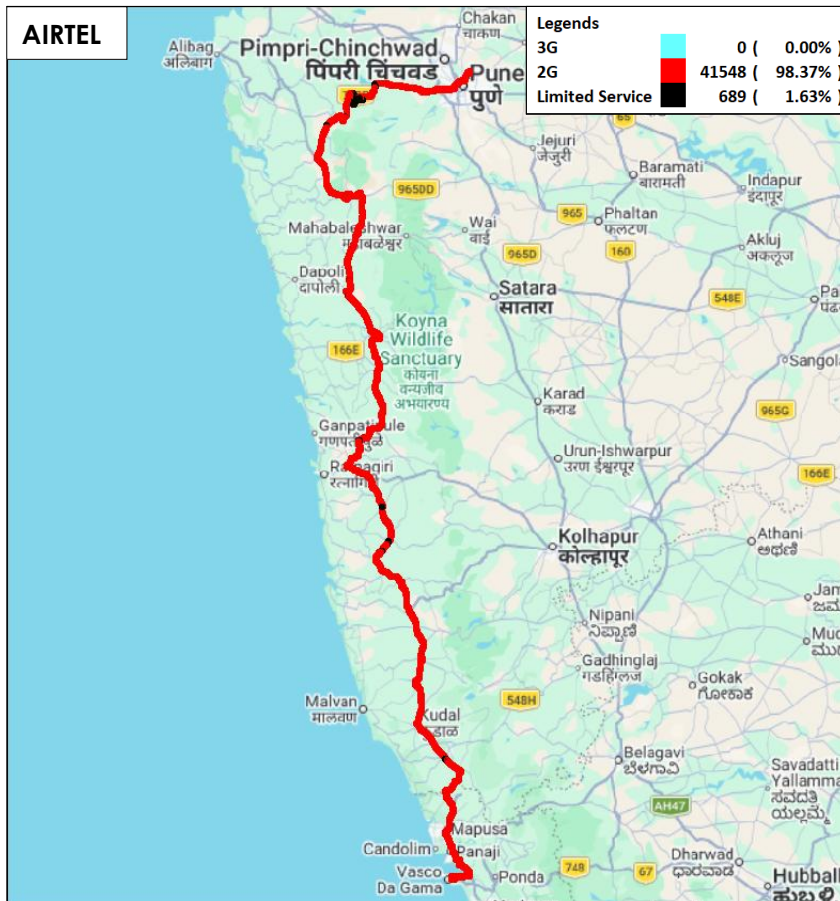


Figure-33: Serving technology plots 3G/2G network mode - AIRTEL.



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)

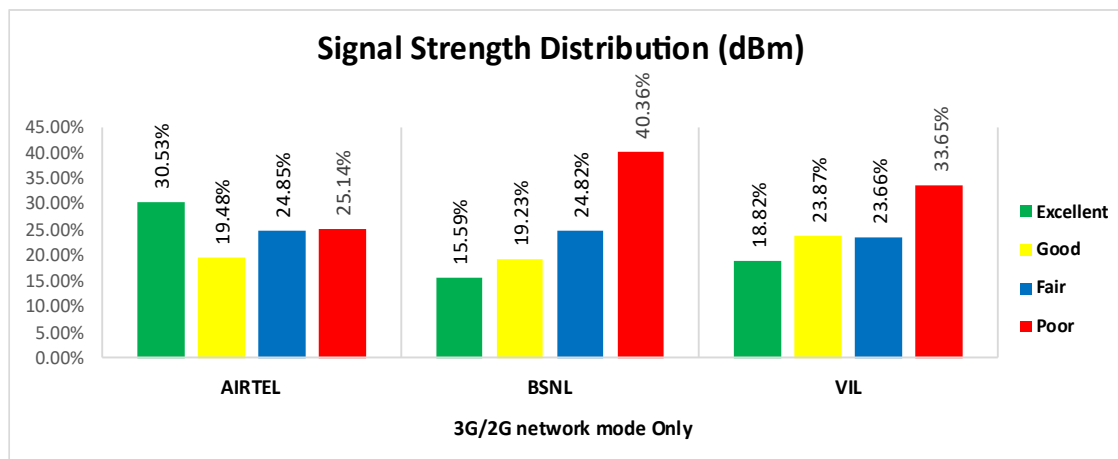


Figure-36: Signal strength distribution 3G/2G network mode only.

Observations:

- Airtel has 31% of samples falling in the excellent signal strength category.
- BSNL has 16% of samples falling in the excellent signal strength category.
- VIL has 19% 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	278	308	257	263
Call Setup Success Rate %	81.29	73.38	92.22	88.59
Drop Call Rate %	5.75	15.04	4.22	4.29
Call Setup Time Average (Second)	1.24	2.71	0.72	1.06
Handover Success Rate %	100.00	97.94	99.53	100.00

Table-75: Summary of voice call performance in network auto-selection mode.

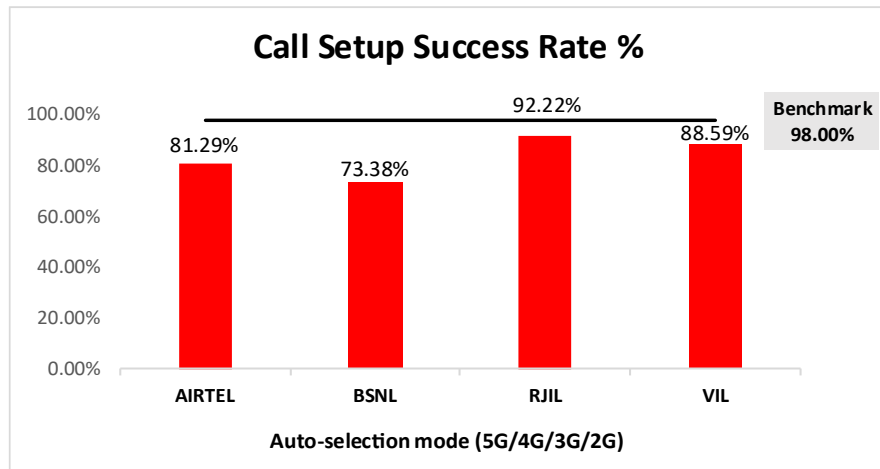


Figure-37: Performance for call setup success rate.

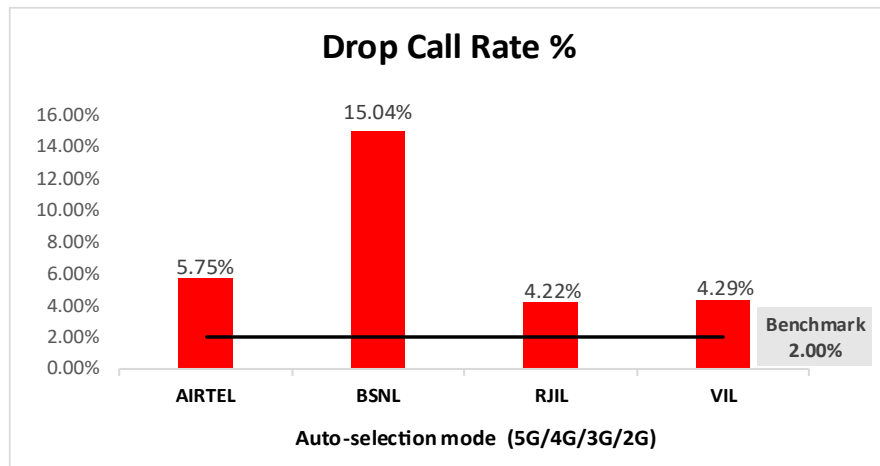


Figure-38: Performance for drop call rate.

Parameter	Service Provider			
	Mobile-to-Mobile (5G/4G - Open Mode)			
	AIRTEL	BSNL	RJIL	VIL
Call Established (within service provider Network)	216	195	233	232
Number of silence call for >4 Sec	17	4	7	3
Silence Call Rate %	7.87	2.05	3.00	1.29
Number of silence instances for >4 Sec	23	7	10	3
Number of silence instances for >3 Sec	32	12	18	6
Number of silence instances for >2 sec	48	21	43	9
RTP Jitter (4G & 5G) in ms	5.42	5.28	15.78	7.63
Packet loss Rate Downlink %	2.51	4.98	2.73	1.28
Packet loss Rate Uplink %	2.71	5.21	2.91	1.26

Table-76: 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-76	2632	2021	2837	2871
Speech Quality (Average MOS)	3.87	2.64	4.39	3.93
Number of samples with MOS >=4 to <5 (Excellent)	2025	219	2430	2134
Number of samples with MOS >=3 to <4 (Good)	409	366	207	463
Number of samples with MOS >=2 to <3 (Fair)	94	1021	68	134
Number of samples with MOS >=1 to <2 (Poor)	104	415	132	140
%age of samples with MOS >=4 to <5 (Excellent)	76.94%	10.84%	85.65%	74.33%
%age of samples with MOS >=3 to <4 (Good)	15.54%	18.11%	7.30%	16.13%
%age of samples with MOS >=2 to <3 (Fair)	3.57%	50.52%	2.40%	4.67%
%age of samples with MOS >=1 to <2 (Poor)	3.95%	20.53%	4.65%	4.88%

Table-77: Summary of speech quality (MOS) samples.

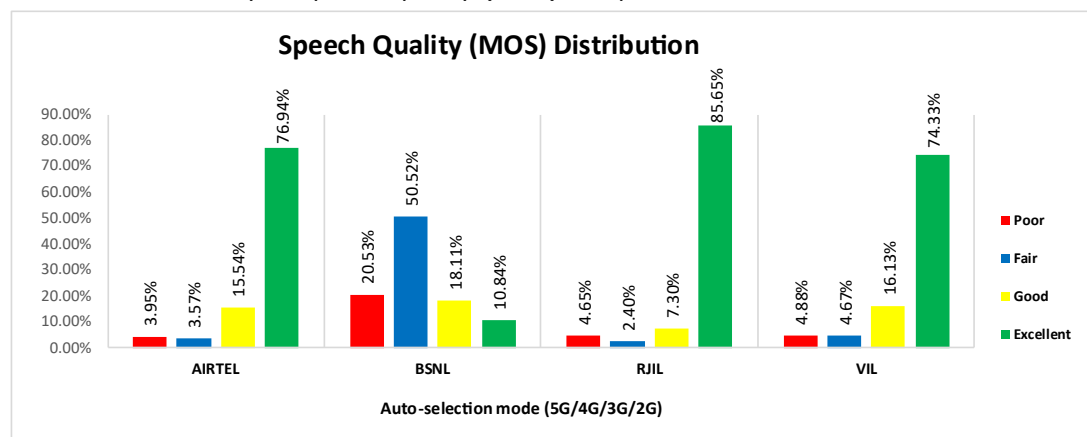


Figure-39: Distribution of samples in MOS range.

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

Technology	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
5G	3.29%	NA	39.13%	0.11%
4G	90.10%	42.45%	60.11%	93.45%
3G	NA	26.24%	NA	NA
2G	3.50%	26.44%	NA	5.07%
Limited Service	3.11%	4.87%	0.76%	1.38%

Table-78: 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.

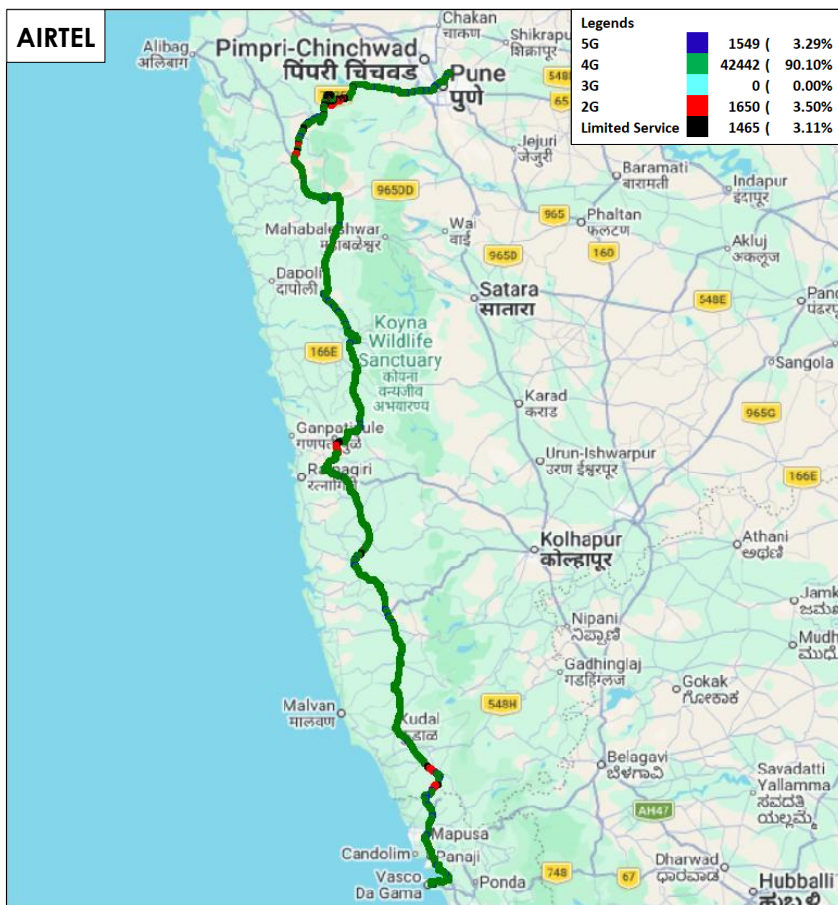


Figure-40: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - AIRTEL

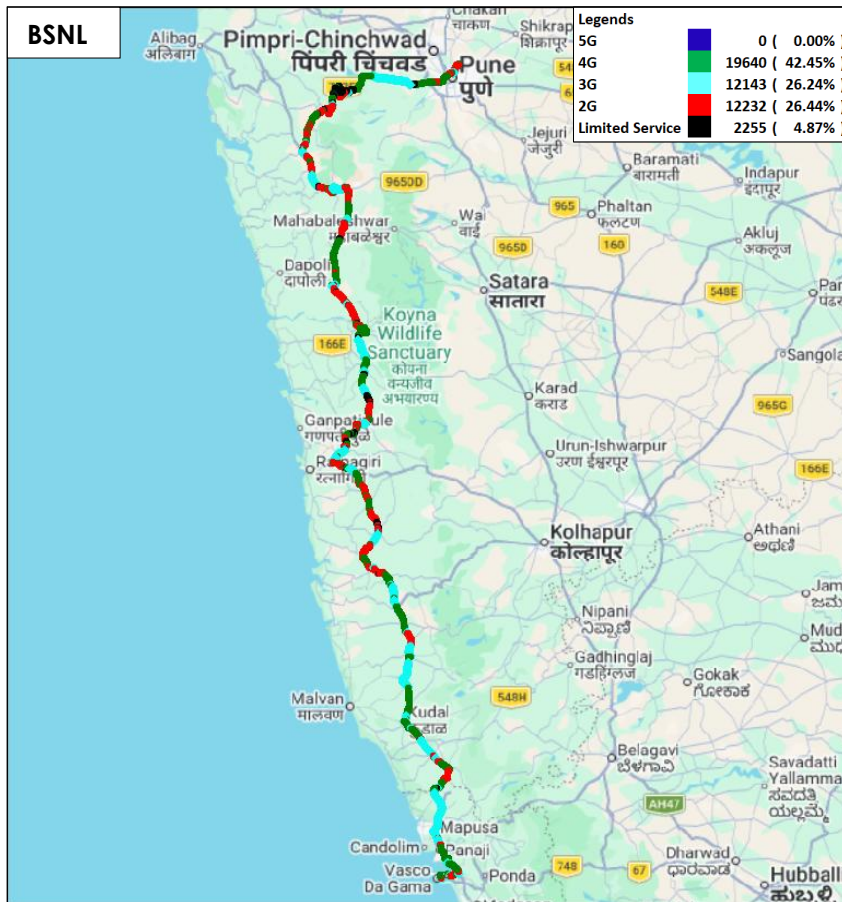


Figure-41: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - BSNL.

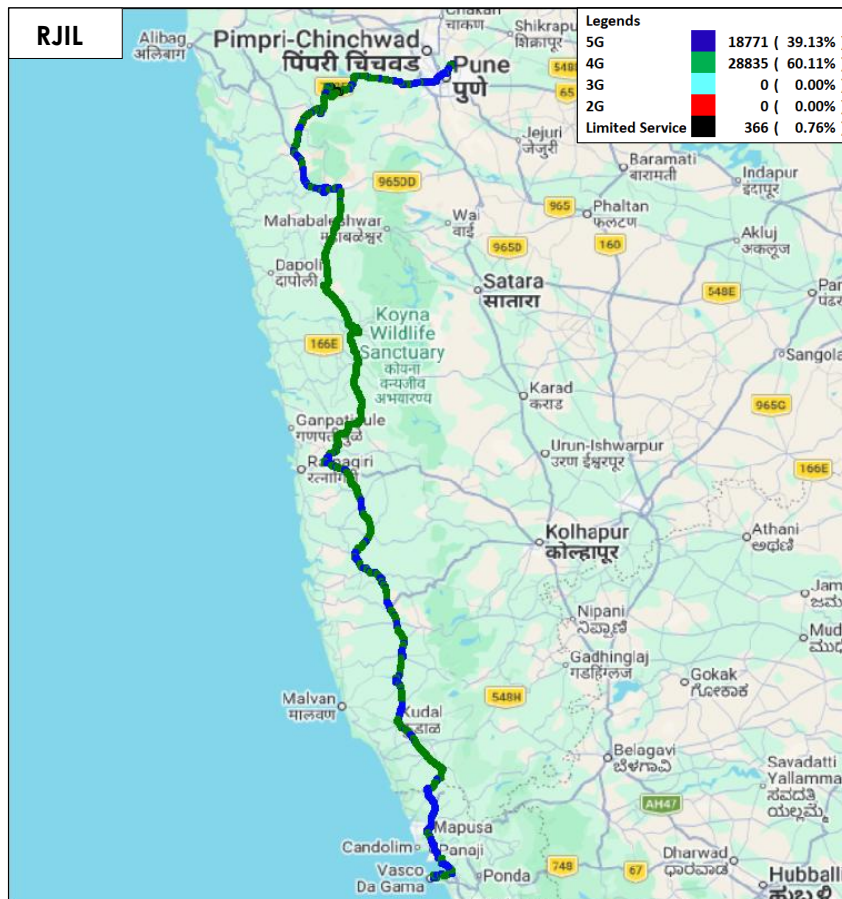


Figure-42: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - RJIL.

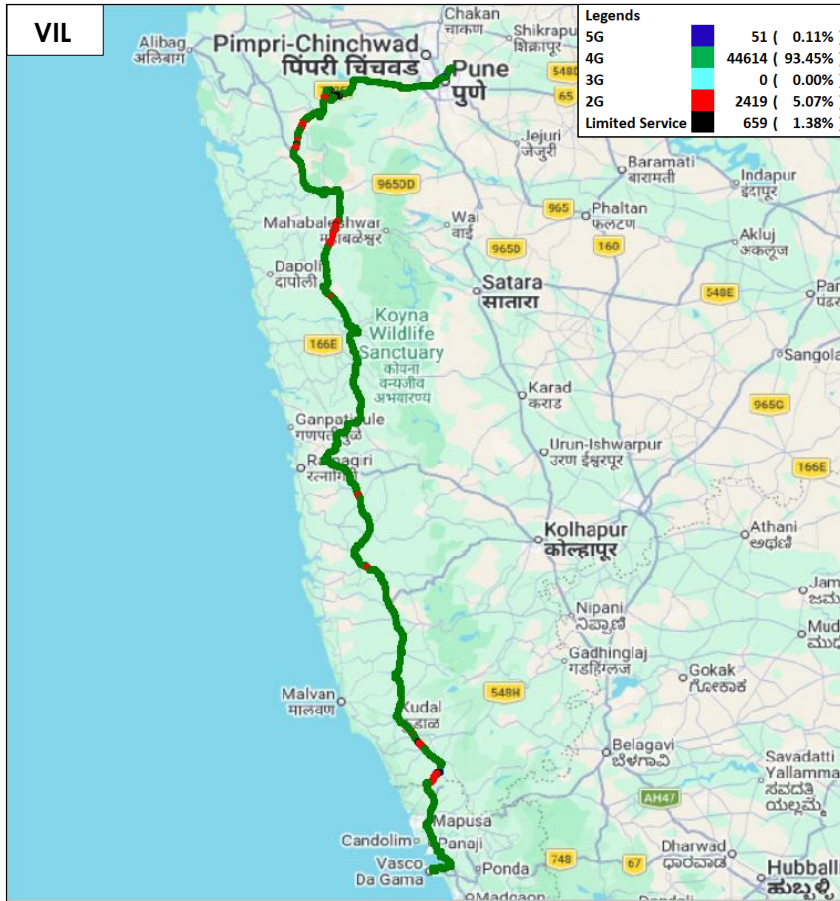


Figure-43: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - VIL.

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

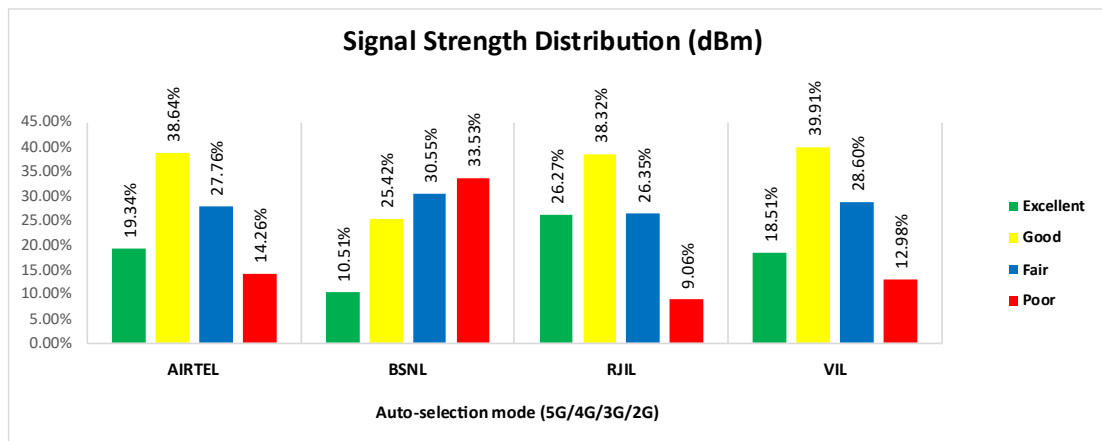


Figure-44: Signal strength distribution auto-selection mode (5G/4G/3G/2G) voice.

Observations:

- Airtel has 19% of samples falling in the excellent signal strength category.
- BSNL has 11% of samples falling in the excellent signal strength category.
- RJIL has 26% of samples falling in the excellent signal strength category.
- VIL has 19% 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	97.74	5.07	209.96	49.24
	80th Percentile	167.37	7.14	419.73	73.34
	20th Percentile	13.69	0.62	10.20	10.41
Upload Throughput (Mbits/s)	Average	19.08	1.87	19.90	11.33
	80th Percentile	33.77	2.50	40.78	17.28
	20th Percentile	2.84	0.34	1.92	2.55
Latency (ms)	50th Percentile	39.71	41.74	32.97	30.69

Table-79: Summary of Data performance in network auto-selection mode.

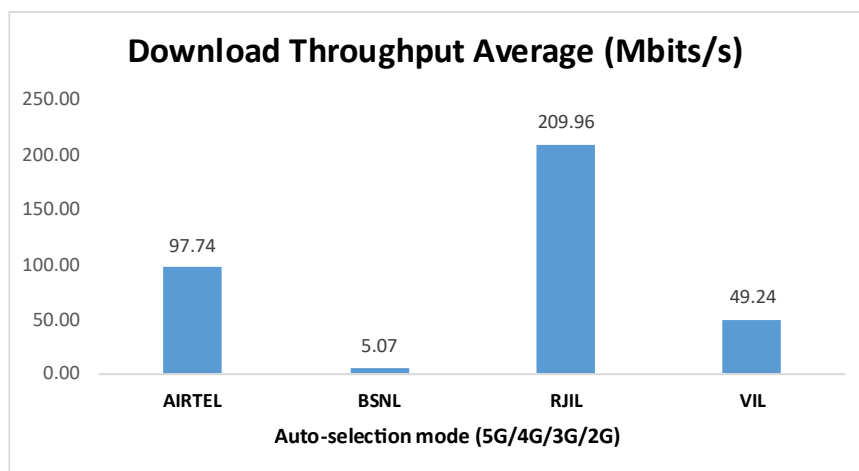


Figure 45: Download throughput.

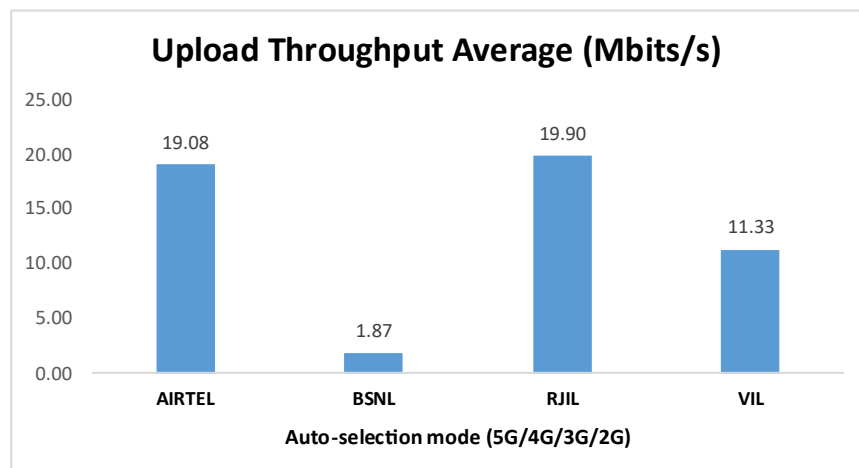


Figure-46: Upload throughput.

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

Technology	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
5G	38.25%	NA	67.26%	4.31%
4G	54.20%	35.73%	32.15%	91.18%
3G	NA	54.90%	NA	NA
2G	0.69%	3.52%	NA	3.03%
Limited Service	6.85%	5.85%	0.59%	1.48%

Table-80: 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.

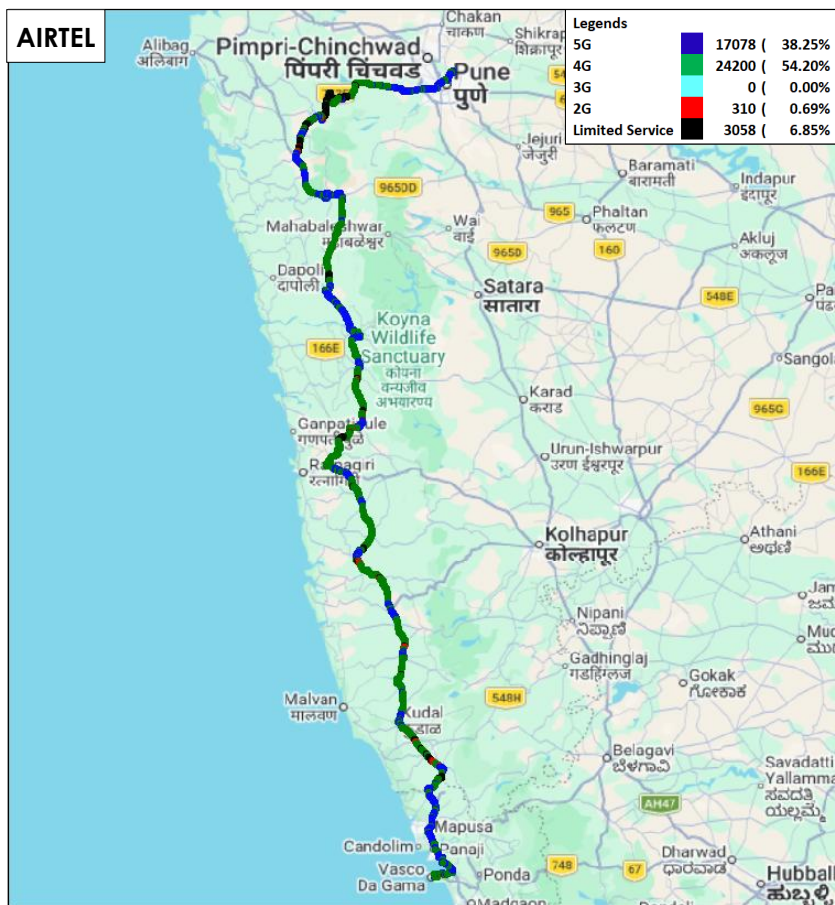


Figure-47: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - AIRTEL

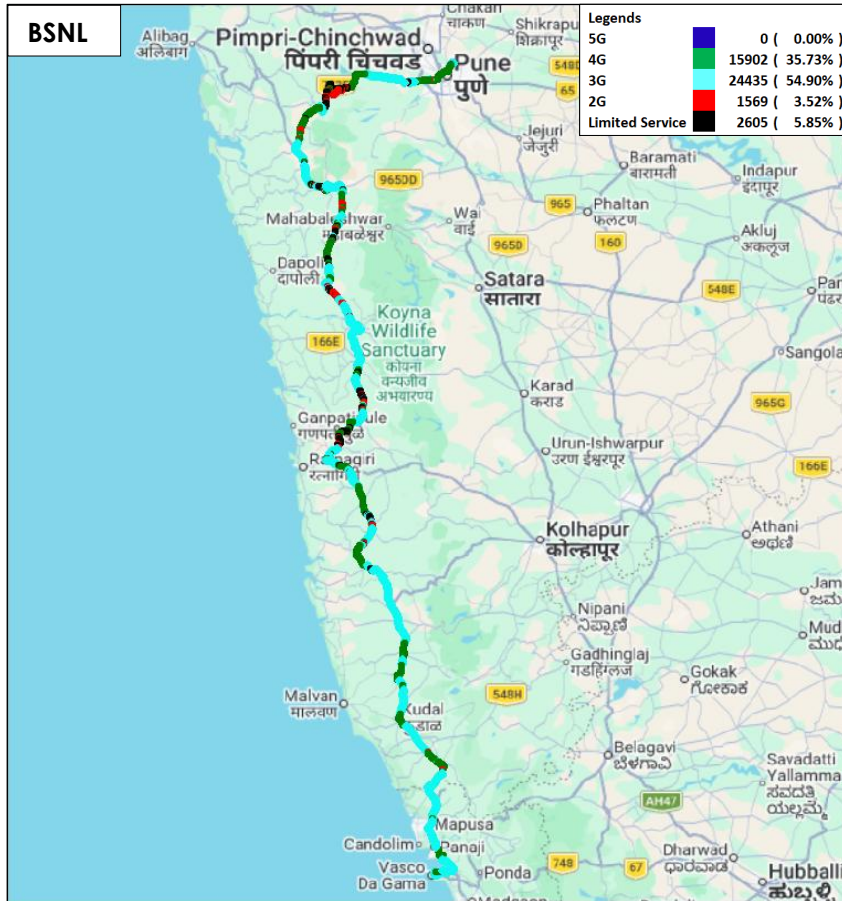


Figure-48: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - BSNL.

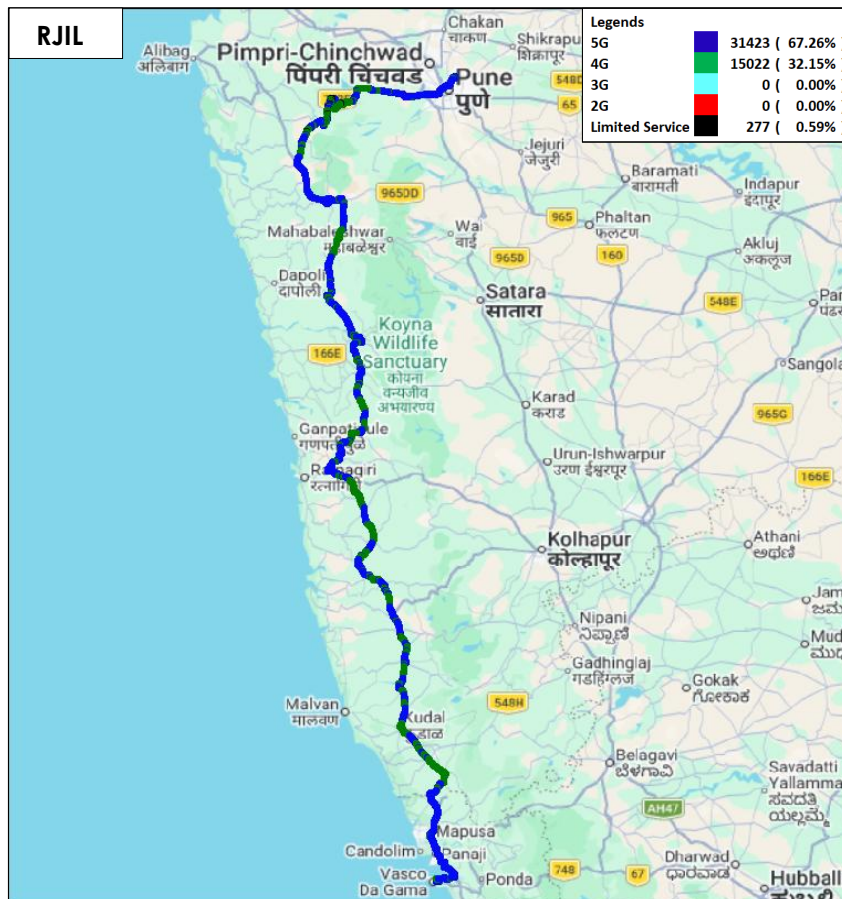


Figure-49: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - RJIL.

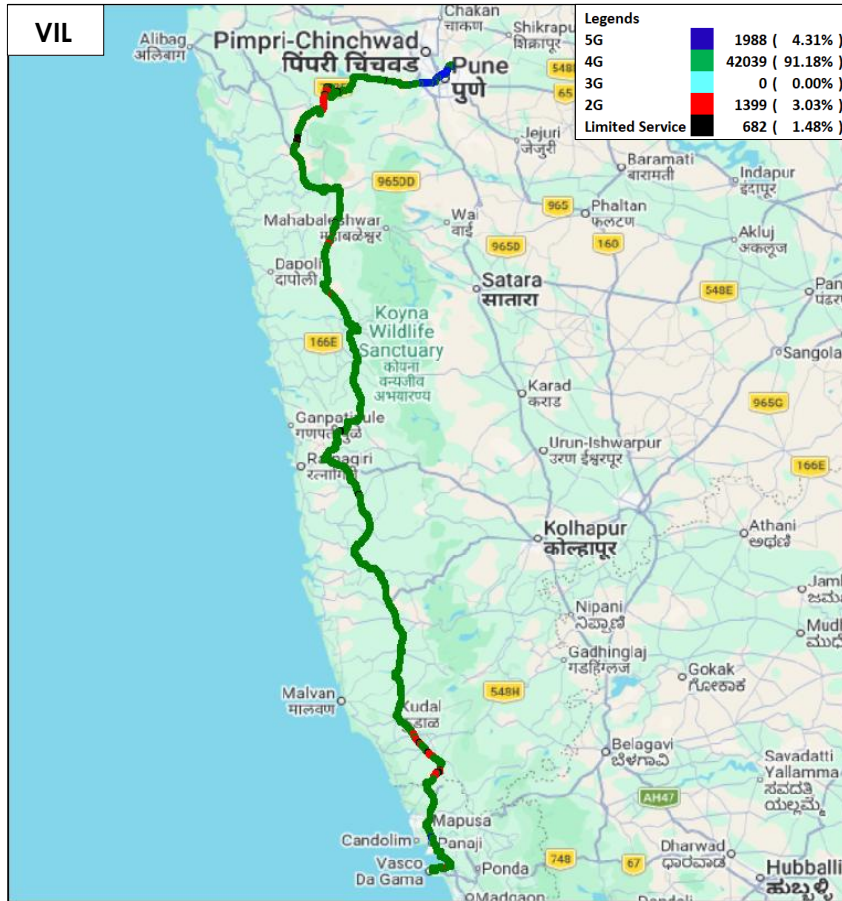


Figure-50: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - VIL.

(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)

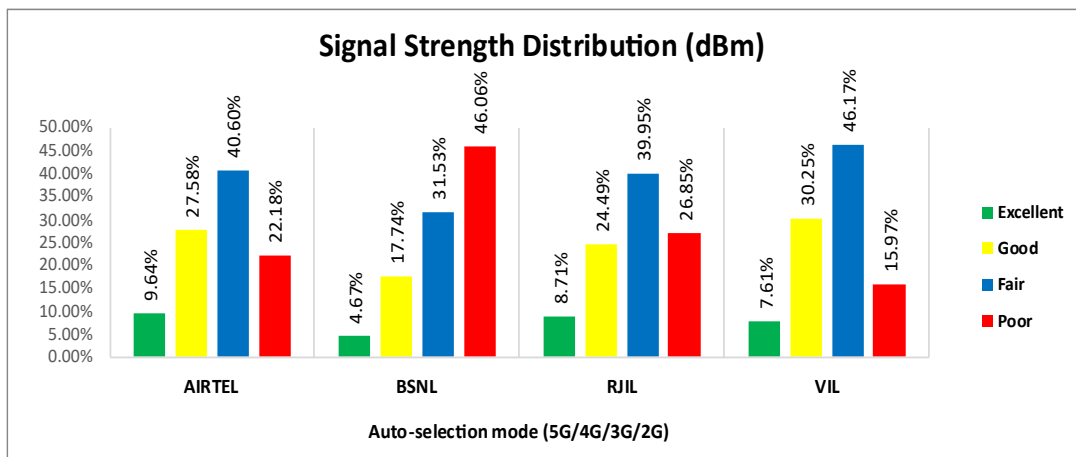


Figure-51: Signal strength distribution auto-selection mode (5G/4G/3G/2G) data.

Observations:

- Airtel has 10% of samples falling in the excellent signal strength category.
- BSNL has 5% of samples falling in the excellent signal strength category.
- RJIL has 9% of samples falling in the excellent signal strength category.
- VIL has 8% of samples falling in the excellent signal strength category.

5. Voice & Data Key findings

5.1 Overall Voice

1. Call Setup Success Rate:

- a) Airtel, BSNL and VIL have 37.11%, 81.28% and 74.43% call setup success rate respectively in 3G/2G network mode. (refer table-3)
- b) Airtel, BSNL, RJIL and VIL have 61.53%, 82.55%, 84.10% and 75.56% call setup success rate respectively in auto-selection mode (5G/4G/3G/2G). (refer table-5)
- c) Airtel, BSNL and RJIL have 100.00% call setup success rate while calling on peer service provider's network for inter-operator calls. (refer table-9)
- d) 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 5.28, 3.58 and 3.15 seconds respectively in 3G/2G network mode. (refer table-3)
- b) Airtel, BSNL, RJIL & VIL call setup time is 1.09, 2.32, 0.96 & 1.30 seconds respectively in auto-selection mode (5G/4G/3G/2G). (refer table-5)

3. Call Silence/Mute Rate:

In packet switched network (4G/5G) Airtel, RJIL, VIL & BSNL have 7.37%, 4.44%, 2.67% and 1.75% silence call rate respectively. Further RJIL has higher RTP packet loss rate in downlink (4.81%) compared to BSNL (3.66%), VIL (2.77%) and Airtel (2.49%). In uplink the RTP packet loss rate is higher for RJIL (5.07%) compared to BSNL (3.81%), Airtel (3.06%) and VIL (2.65%). (refer table-6)

4. Drop Call Rate:

- a) Airtel, BSNL and VIL drop call rate is 5.08%, 8.70% and 2.34% respectively in 3G/2G network mode. (refer table-3)
- b) Airtel, BSNL, RJIL and VIL drop call rate is 3.27%, 8.38%, 3.86% and 4.68% 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 98.25 Mbps, 4.33 Mbps, 182.91 Mbps and 35.67 Mbps respectively. (refer table-11)
- b) Airtel, BSNL, RJIL and VIL average upload speeds are 19.95 Mbps, 2.06 Mbps, 16.77 Mbps and 8.11 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 115.09 Mbps, 11.30 Mbps, 129.03 Mbps and 21.80 Mbps respectively. (refer table-35)
- b) Airtel, BSNL, RJIL and VIL average upload speeds are 22.03 Mbps, 4.26 Mbps, 8.33 Mbps and 3.78 Mbps respectively. (refer table-35)

3. Data session setup success rate (static i.e. while stationary):

- a) Airtel, BSNL, RJIL and VIL have 89.23%, 87.69%, 83.08% and 81.54% download session setup success rate respectively. (refer table-35)

- b) Airtel, BSNL, RJIL and VIL have 87.69%, 92.31%, 84.62% and 84.62% upload session setup success rate respectively. (refer table-35)

5.3 Operator wise Key Findings

1.Airtel:

Voice

- 37.11% call setup success rate and 5.08% 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)
- 61.53% call setup success rate and 3.27% 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% & 2.00% respectively. (refer table-5)
- 24.44% call setup success rate and 5.19% 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)
- 40.00% call setup success rate and 3.54% 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)
- 91.54% 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 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 all walk test locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-63, 64, 65, 66 & 67)
- 61.73% 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-73)
- 81.29% call setup success rate and 5.75% 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-75)

Data

- Airtel has 98.25 Mbps average download speed & 19.95 Mbps average upload speed for LSA. (refer table-11)
- Airtel has 94.50 Mbps average download speed & 17.62 Mbps average upload speed across measured routes for city drive. (refer table-19)
- Devbagh Beach and Vengurla Beach & Jetty have less download speed (less than 100 Mbps) out of total 13 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-37 & 48)
- Devbagh Beach, Kankavli College Road to Court Road to Tilak Chowk Loop, Kunkeshwar Temple Area and Vengurla Beach & Jetty have less upload speed (less than 20 Mbps) out of total 13 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-37, 40, 41 & 48)
- Kudal MIDC Area Internal Roads Loop & Kudal Railway Station Area have less download speed (less than 100 Mbps) out of total 5 walk test locations for auto-selection mode (5G/4G/3G/2G). (refer table-68 & 69)

- Kudal MIDC Area Internal Roads Loop, Kudal Railway Station Area & Vengurla Market Inner Roads to Camp Area Loop have less upload speed (less than 20 Mbps) out of total 5 walk test locations for auto-selection mode (5G/4G/3G/2G). (refer table-68, 69 & 72)
- Airtel has 97.74 Mbps average download speed & 19.08 Mbps average upload speed across measured routes for highway drive. (refer table-79)

2. BSNL:

Voice

- 81.28% call setup success rate and 8.70% 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)
- 82.55% call setup success rate and 8.38% 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% & 2.00% respectively. (refer table-5)
- 86.98% call setup success rate and 5.24% 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)
- 82.10% call setup success rate and 7.52% 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)
- 96.92% call setup success rate and 3.17% 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% & 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 Kudal MIDC Area Internal Roads Loop, Kudal Railway Station Area, Malvan Jetty to Dandi Beach Road to Wayari Area & Vengurla Market Inner Roads to Camp Area Loop walk test locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table- 63, 64, 65 & 67)
- 92.86% call setup success rate and 7.69% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) at Sawantwadi Lake Periphery Road Loop walk test location. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-66)
- 72.61% call setup success rate and 15.00% 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-73)
- 73.38% call setup success rate and 15.04% 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-75)

Data

- BSNL has 4.33 Mbps average download speed & 2.06 Mbps average upload speed for LSA. (refer table-11)
- BSNL has 2.30 Mbps average download speed & 1.62 Mbps average upload speed across measured routes for city drive. (refer table-19)

- All hotspot locations have less download speed (less than 10 Mbps) except Sindhudurg Fort (Malvan) and Vengurla Beach & Jetty for auto-selection mode (5G/4G/3G/2G). (refer table-36, 37, 38, 39, 40, 41, 42, 43, 44, 45 & 47)
- Devgad Bus Stand & Beach Area, Kankavli Bus Stand & Market, Malvan Market Area, Mithbav Beach, Oros District Collector Office Area and Vengurla Beach & Jetty have less upload speed (less than 2 Mbps) out of total 13 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-38, 39, 42, 43, 44 & 48)
- All walk test locations have less download speed (less than 10 Mbps) for auto-selection mode (5G/4G/3G/2G). (refer table- 68, 69, 70, 71 & 72)
- Malvan Jetty to Dandi Beach Road to Wayari Area has less upload speed (less than 2 Mbps) out of total 5 walk test locations for auto-selection mode (5G/4G/3G/2G). (refer table-70)
- BSNL has 5.07 Mbps average download speed & 1.87 Mbps average upload speed across measured routes for highway drive. (refer table-79)

3. RJIL:

Voice

- 84.10% call setup success rate and 3.86% 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% & 2.00% respectively. (refer table-5)
- 73.39% call setup success rate and 5.77% 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)
- 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 all walk test locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-63, 64, 65, 66 & 67)
- 92.22% call setup success rate and 4.22% 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-75)

Data

- RJIL has 182.91 Mbps average download speed & 16.77 Mbps average upload speed for LSA. (refer table-11)
- RJIL has 127.94 Mbps average download speed & 11.35 Mbps average upload speed across measured routes for city drive. (refer table-19)
- Kunkeshwar Temple Area has less download speed (less than 100 Mbps) out of total 13 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-41)
- Devbagh Beach, Kankavli Bus Stand & Market, Kunkeshwar Temple Area, Mithbav Beach, Sawantwadi Market Area and Sindhudurg Fort (Malvan) have less upload speed (less than 20 Mbps) out of total 13 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-37, 39, 41, 43, 45 & 46)

- Malvan Jetty to Dandi Beach Road to Wayari Area has less download speed (less than 100 Mbps) out of total 5 walk test locations for auto-selection mode (5G/4G/3G/2G). (refer table-70)
- Malvan Jetty to Dandi Beach Road to Wayari Area has less upload speed (less than 20 Mbps) out of total 5 walk test locations for auto-selection mode (5G/4G/3G/2G). (refer table-70)
- RJIL has 209.96 Mbps average download speed & 19.90 Mbps average upload speed across measured routes for highway drive. (refer table-79)

4. VIL: Voice

- 74.43% call setup success rate and 2.34% 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)
- 75.56% call setup success rate and 4.68% 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% & 2.00% respectively. (refer table-5)
- 66.26% call setup success rate and 2.74% 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)
- 62.29% call setup success rate and 7.34% 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)
- 89.23% call setup success rate and 0.86% 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 all walk test locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-63, 64, 65, 66 & 67)
- 90.48% call setup success rate and 1.75% drop call rate have been observed in 3G/2G network mode for highway drive. Performance is not meeting the benchmark of 98.00% for call setup success rate. (refer table-73)
- 88.59% call setup success rate and 4.29% 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-75)

Data

- VIL has 35.67 Mbps average download speed & 8.11 Mbps average upload speed for LSA. (refer table-11)
- VIL has 20.51 Mbps average download speed & 3.81 Mbps average upload speed across measured routes for city drive. (refer table-19)
- Devbagh Beach and Kunkeshwar Temple Area have less download speed (less than 10 Mbps) out of total 13 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-37 & 41)
- Kunkeshwar Temple Area has less upload speed (less than 2 Mbps) out of total 13 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-41)

- Kudal Railway Station Area has less download speed (less than 10 Mbps) out of total 5 walk test locations for auto-selection mode (5G/4G/3G/2G). (refer table-69)
- VIL has 49.24 Mbps average download speed & 11.33 Mbps average upload speed across measured routes for highway drive. (refer table-79)

6. Annexure

6.1 Route wise coverage map

6.1.1 City

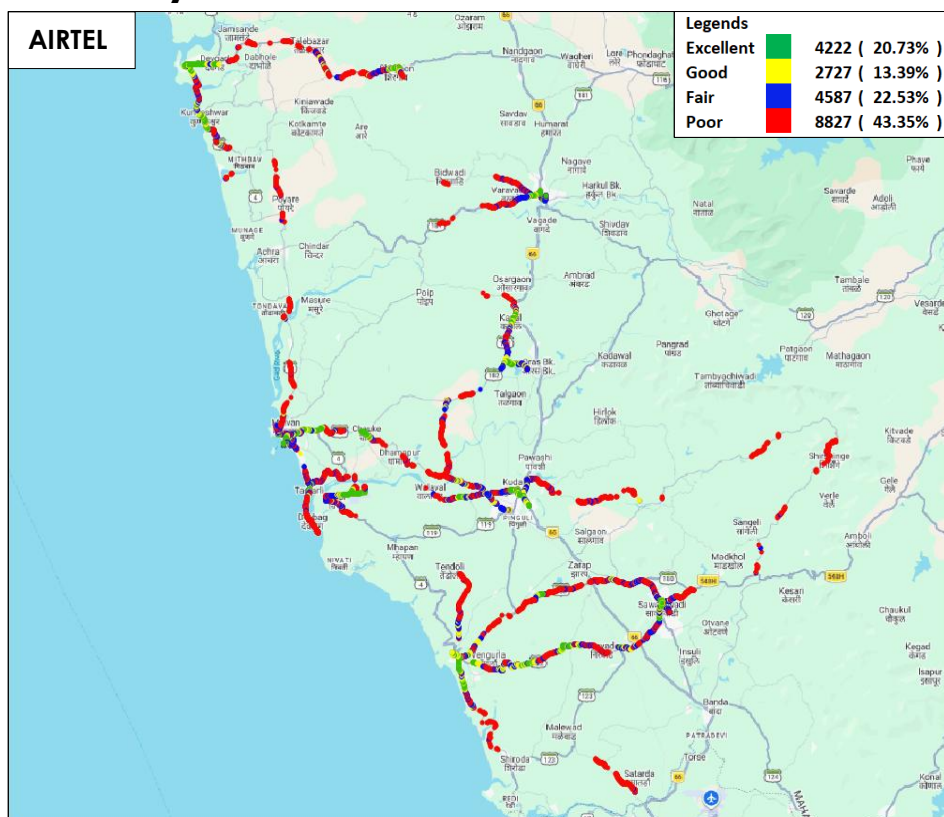


Figure-52: Signal strength 3G/2G network mode voice - AIRTEL.

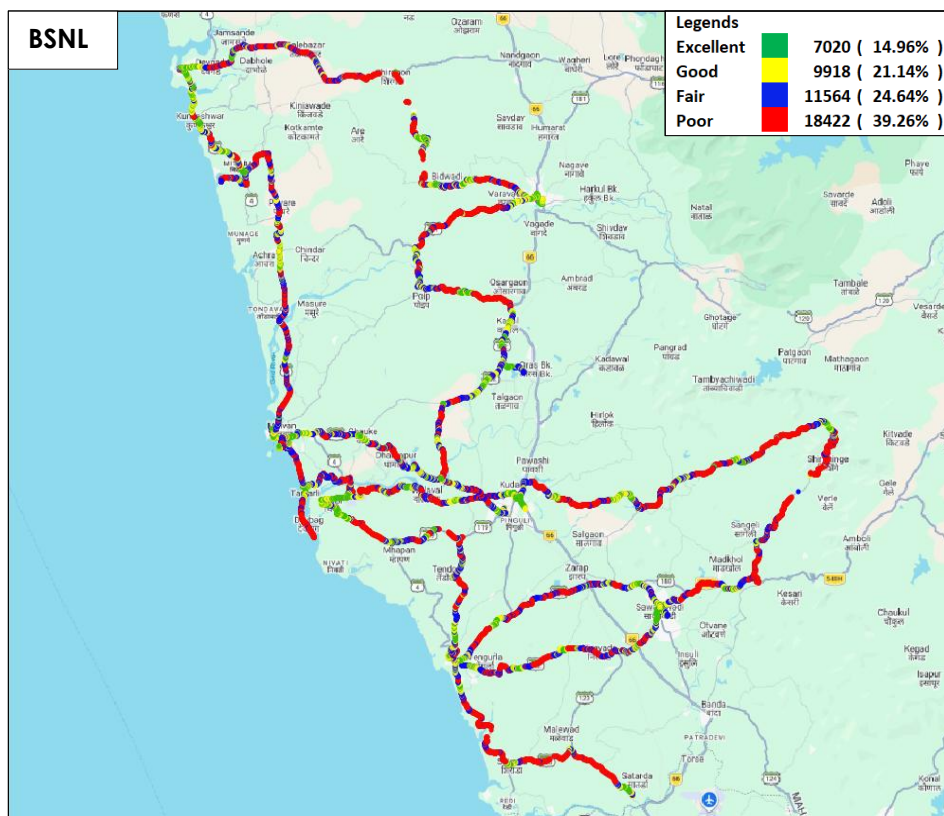


Figure-53: Signal strength 3G/2G network mode voice - BSNL.

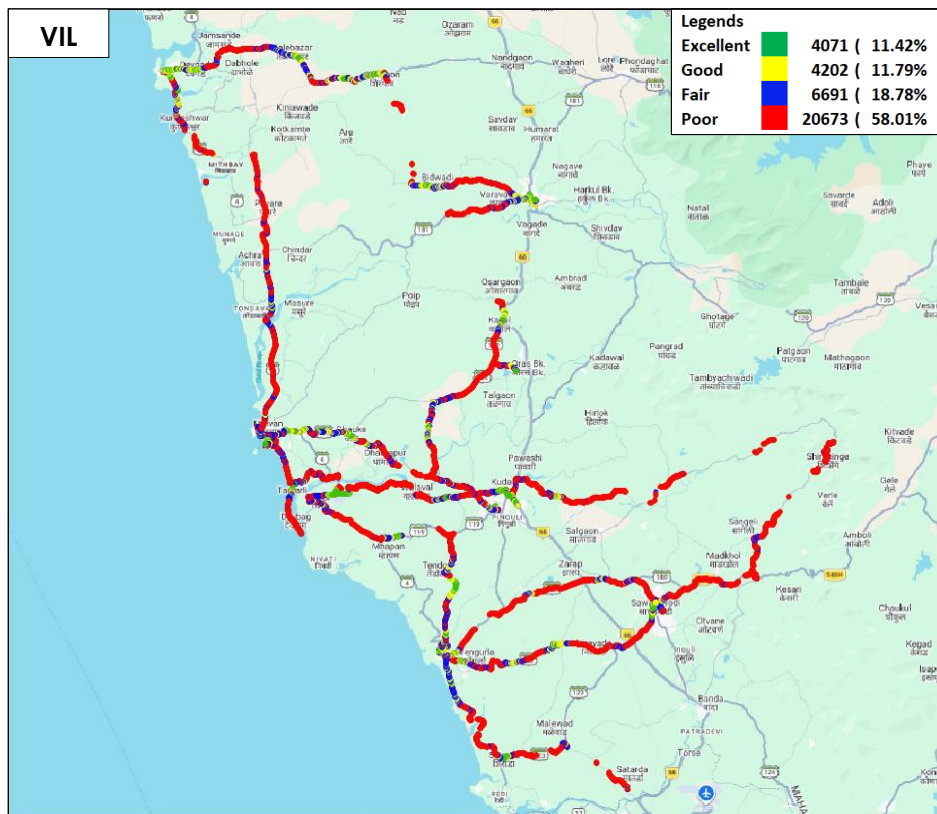


Figure-54: Signal strength 3G/2G network mode voice - VIL.

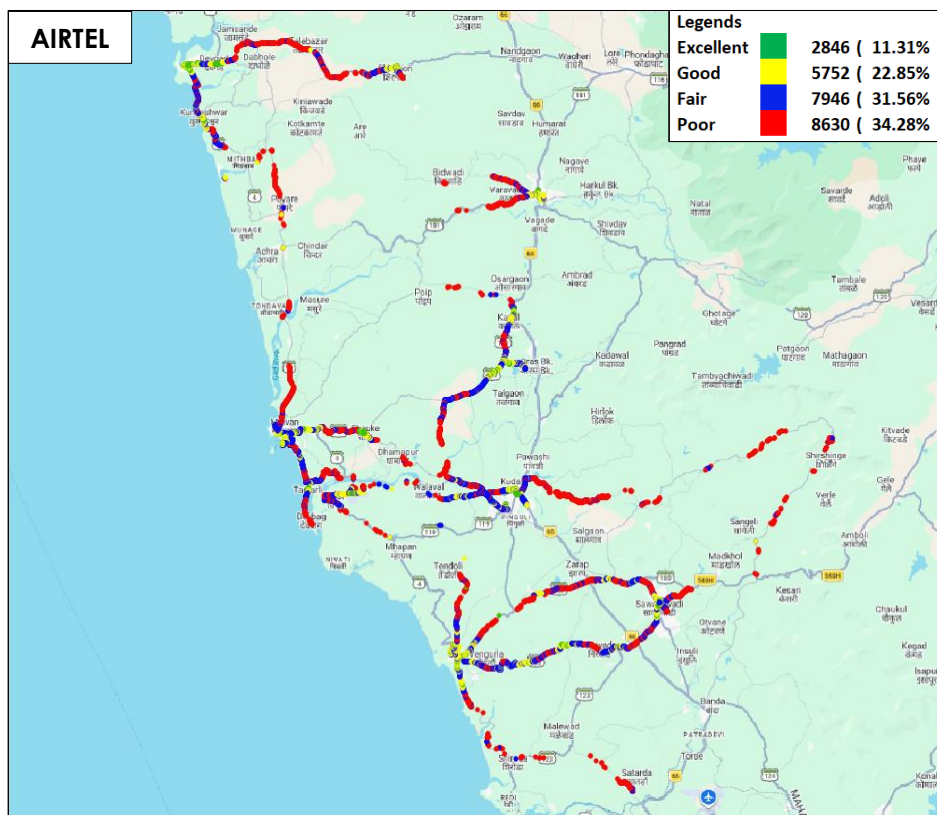


Figure-55: Signal strength auto-selection mode (5G/4G/3G/2G) voice - AIRTEL.

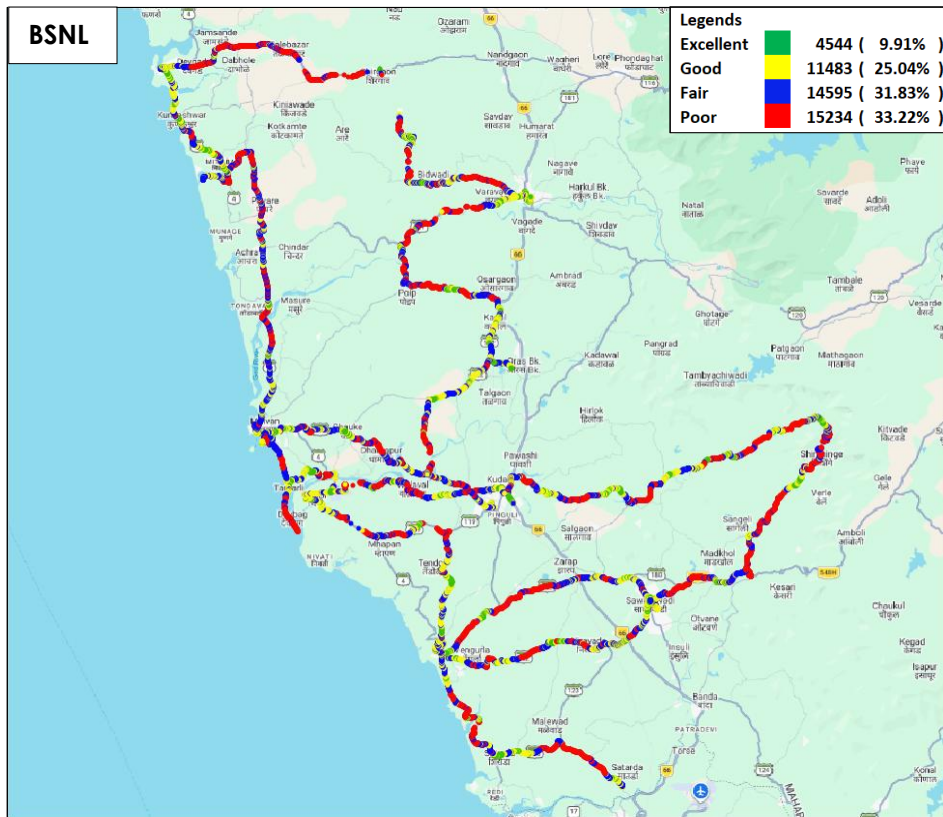


Figure-56: Signal strength auto-selection mode (5G/4G/3G/2G) voice - BSNL.

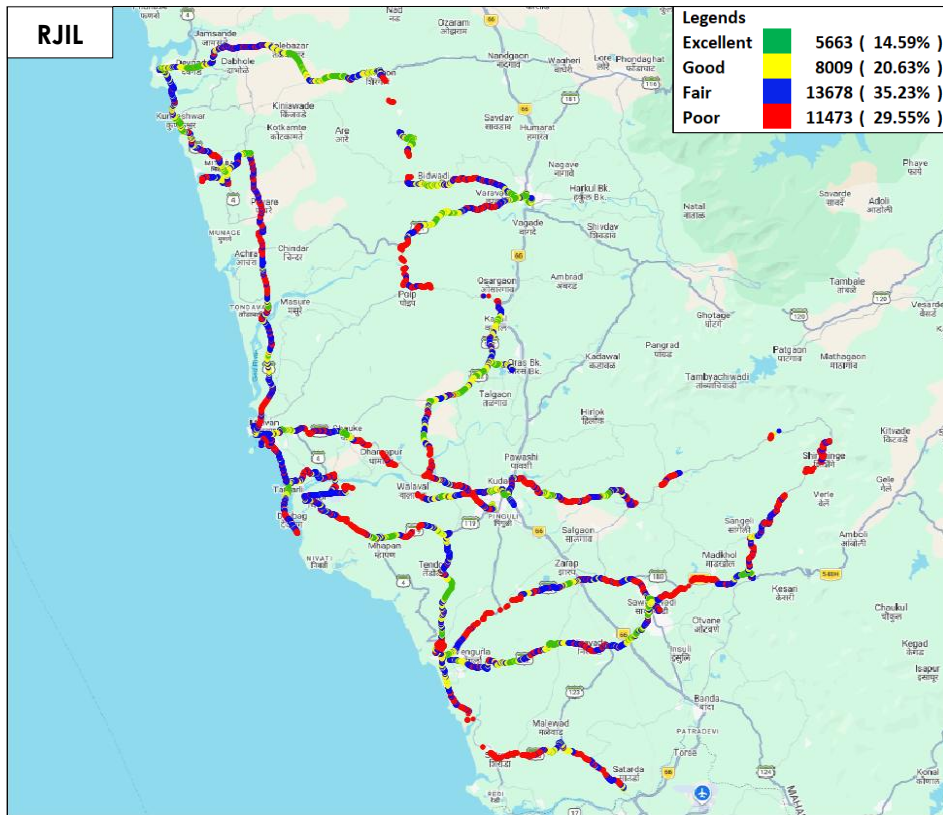


Figure-57: Signal strength auto-selection mode (5G/4G/3G/2G) voice - RJIL.

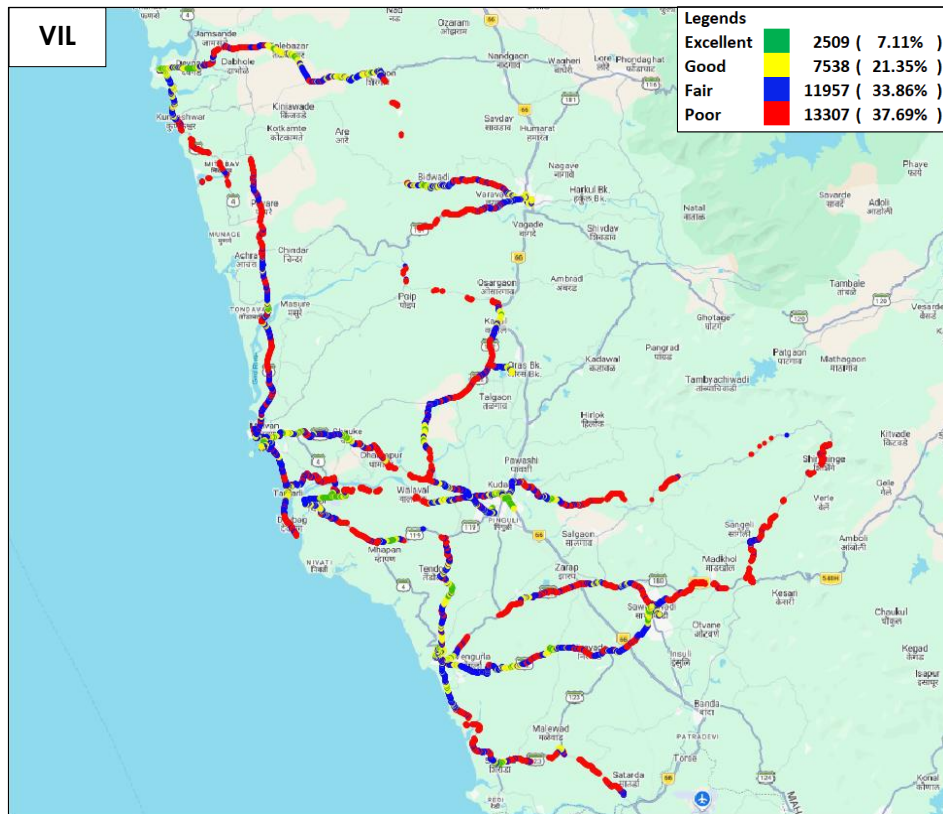


Figure-58: Signal strength auto-selection mode (5G/4G/3G/2G) voice - VIL.

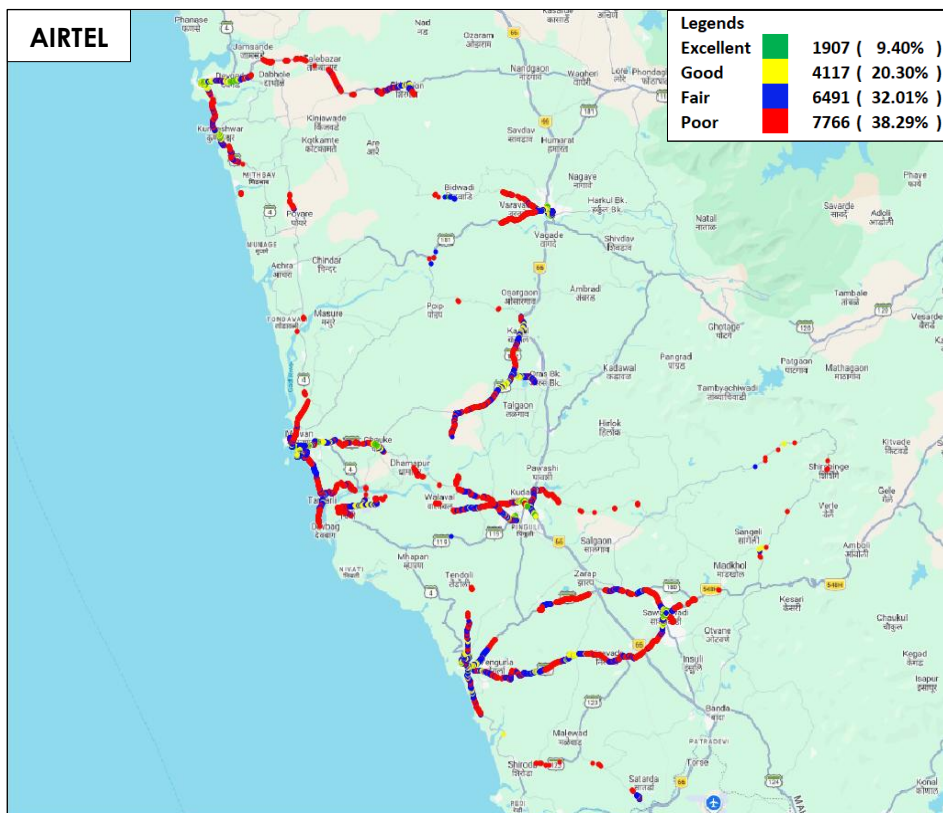


Figure-59: Signal strength auto-selection mode (5G/4G/3G/2G) data - AIRTEL.

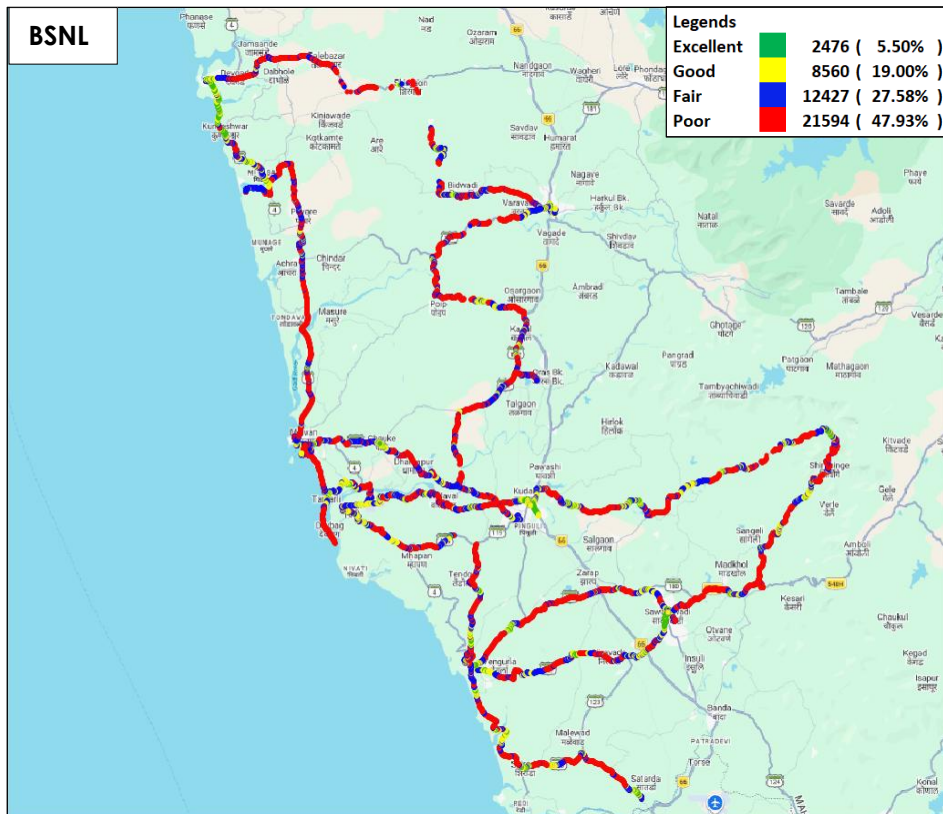


Figure-60: Signal strength auto-selection mode (5G/4G/3G/2G) data – BSNL.

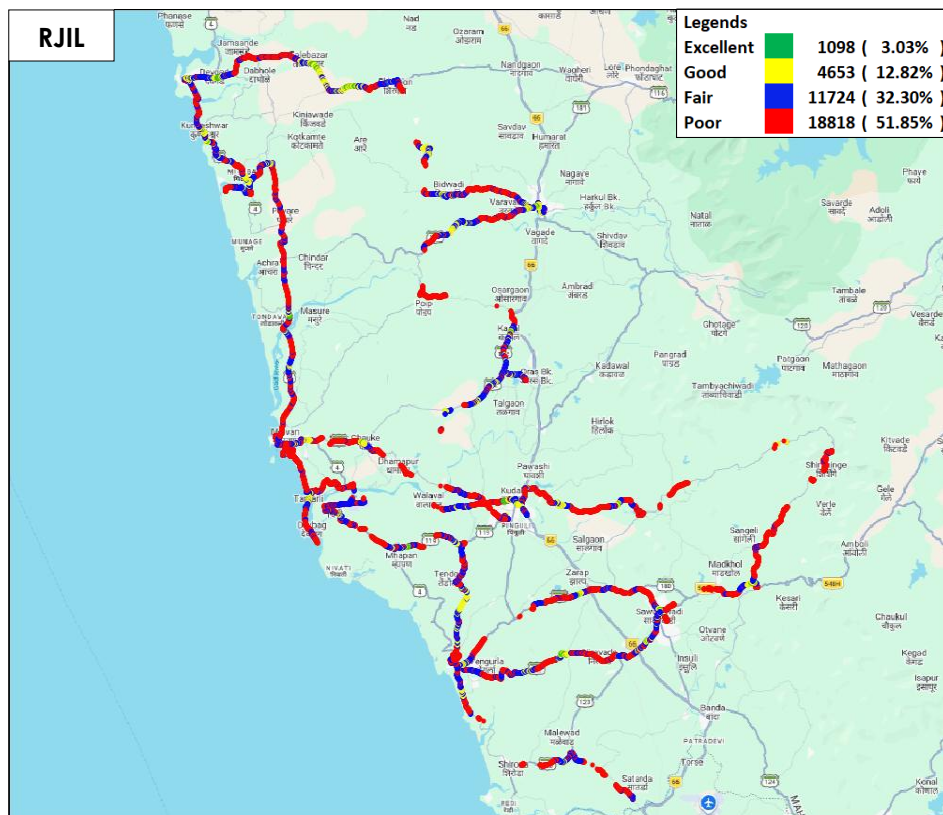


Figure-61: Signal strength auto-selection mode (5G/4G/3G/2G) data - RJIL.

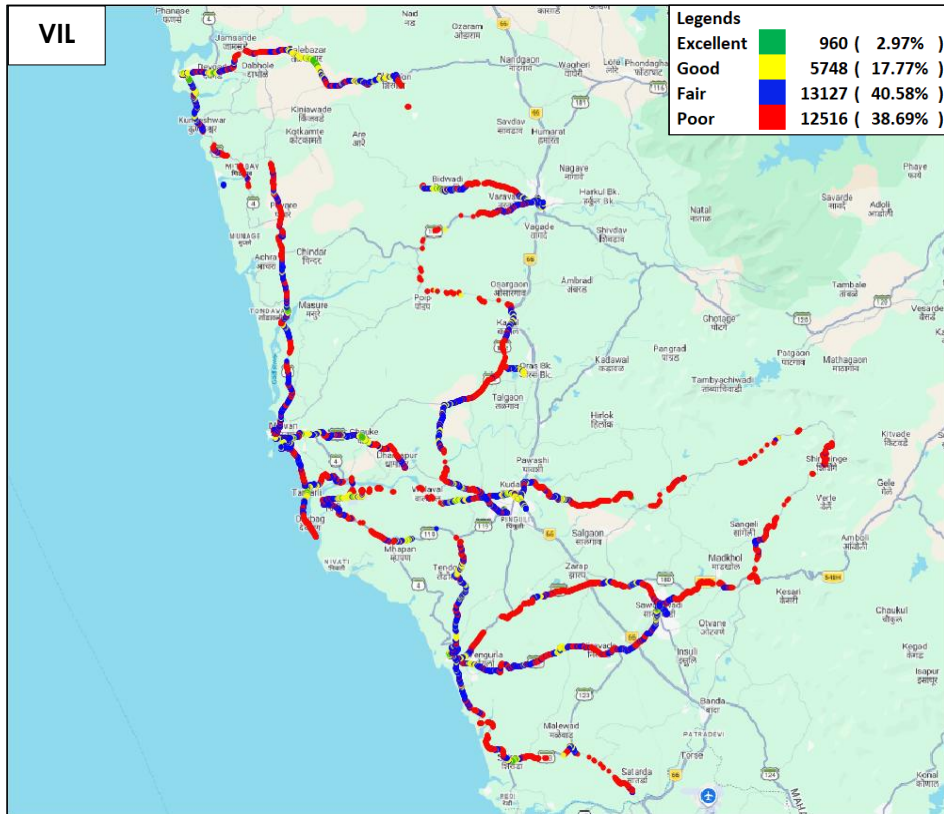


Figure-62: Signal strength auto-selection mode (5G/4G/3G/2G) data - VIL.

6.1.2 Highway

i) Pune to Panaji

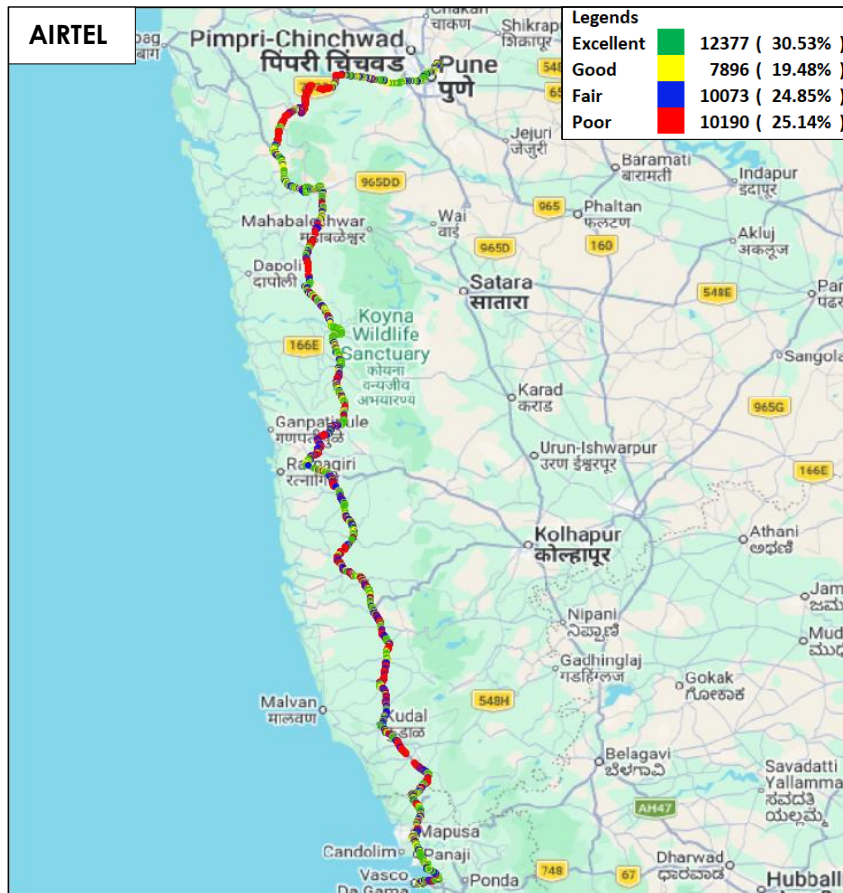


Figure-63: Signal strength 3G/2G network mode voice - AIRTEL.

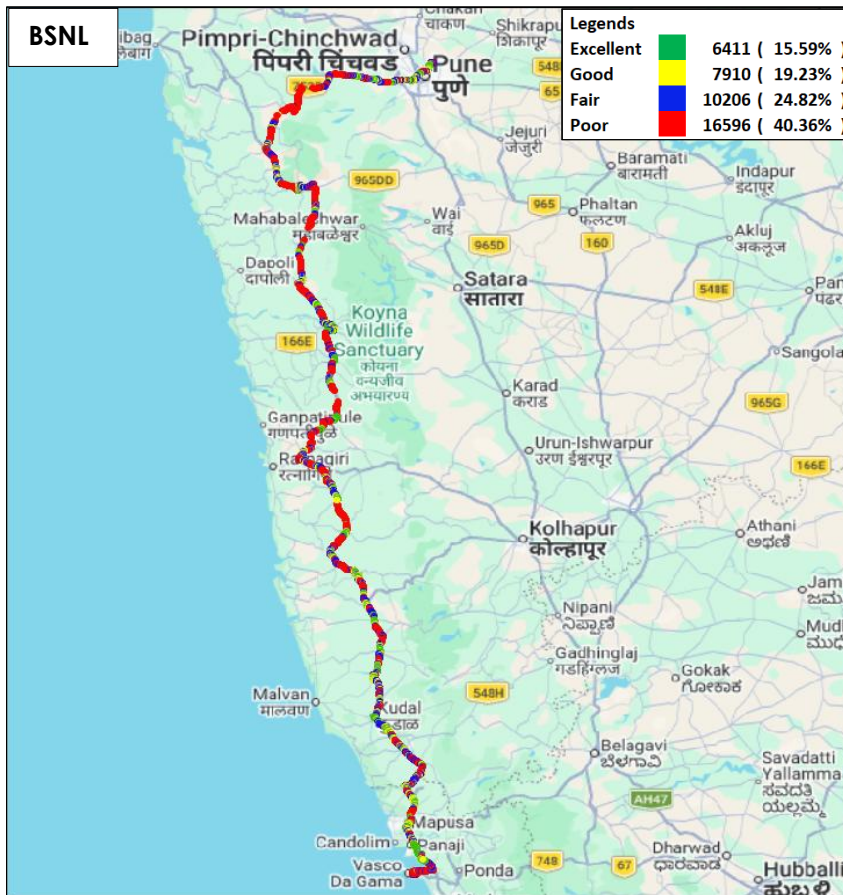


Figure-64: Signal strength 3G/2G network mode voice - BSNL.



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

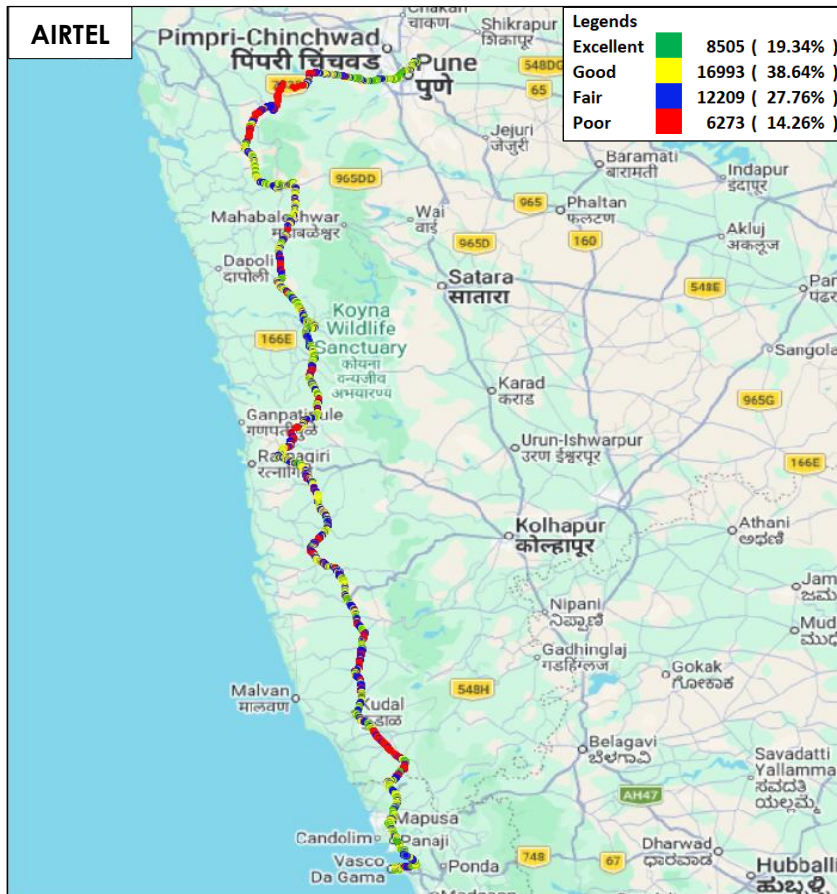


Figure-66: Signal strength auto-selection mode (5G/4G/3G/2G) voice - AIRTEL.



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

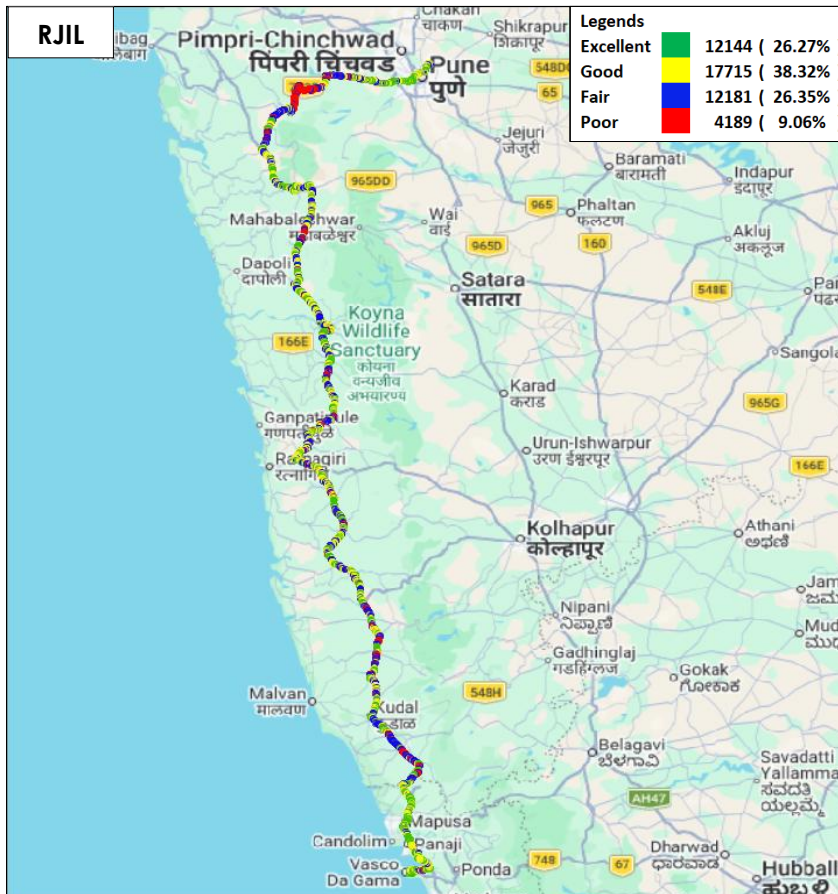


Figure-68: Signal strength auto-selection mode (5G/4G/3G/2G) voice - RJIL.

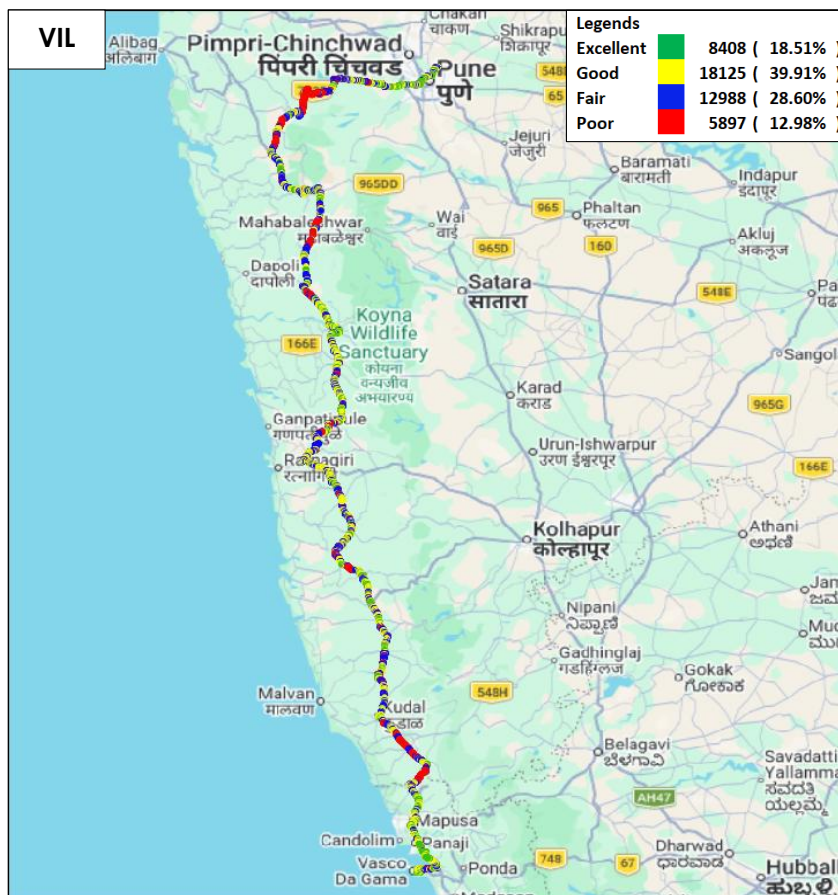


Figure-69: Signal strength auto-selection mode (5G/4G/3G/2G) voice - VIL.

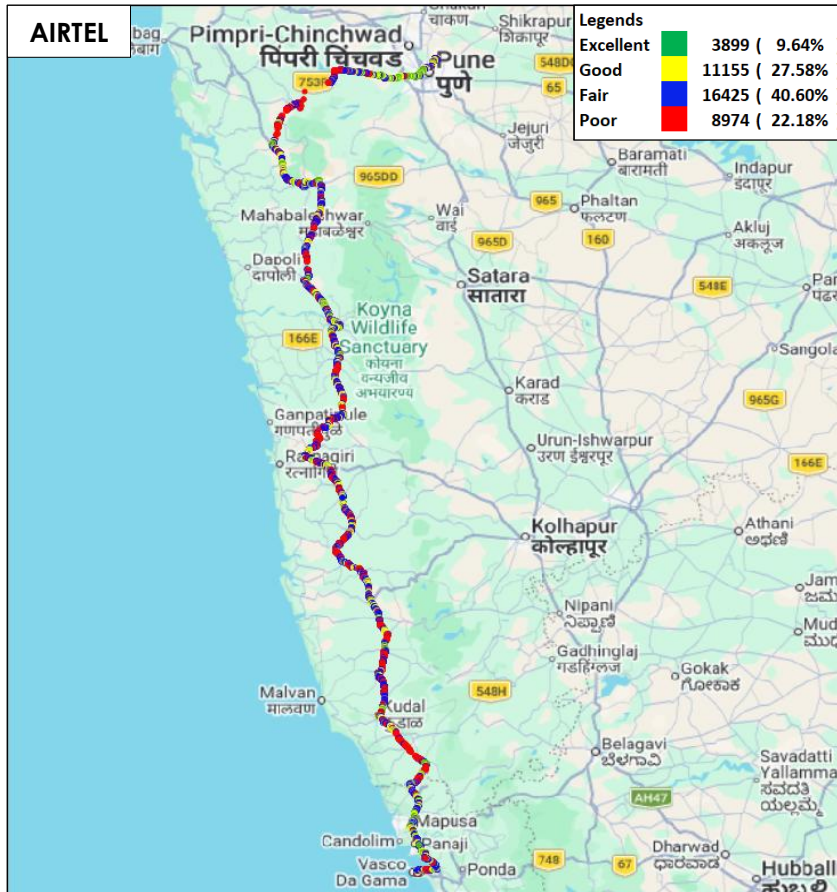


Figure-70: Signal strength auto-selection mode (5G/4G/3G/2G) data - AIRTEL.

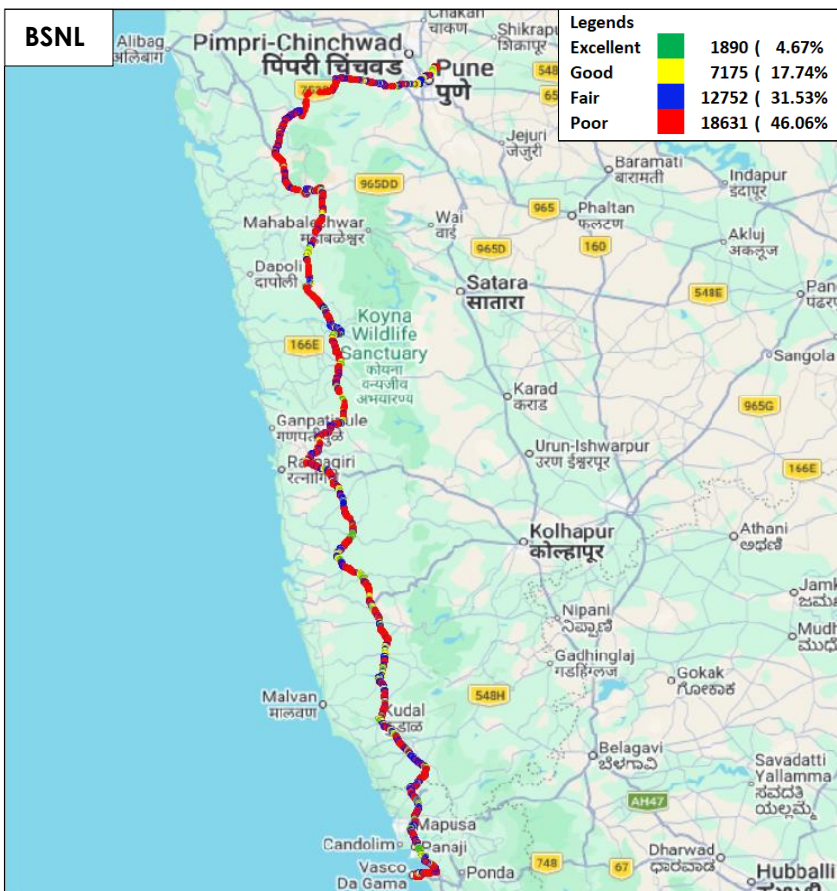


Figure-71: Signal strength auto-selection mode (5G/4G/3G/2G) data - BSNL.

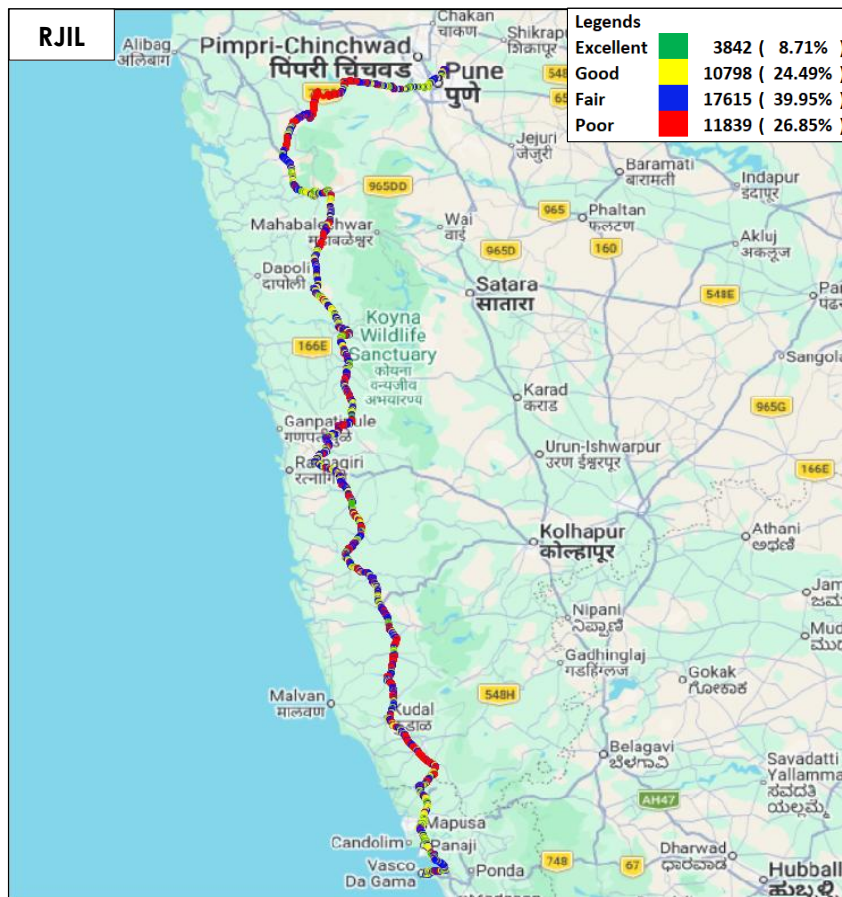


Figure-72: Signal strength auto-selection mode (5G/4G/3G/2G) data - RJIL.

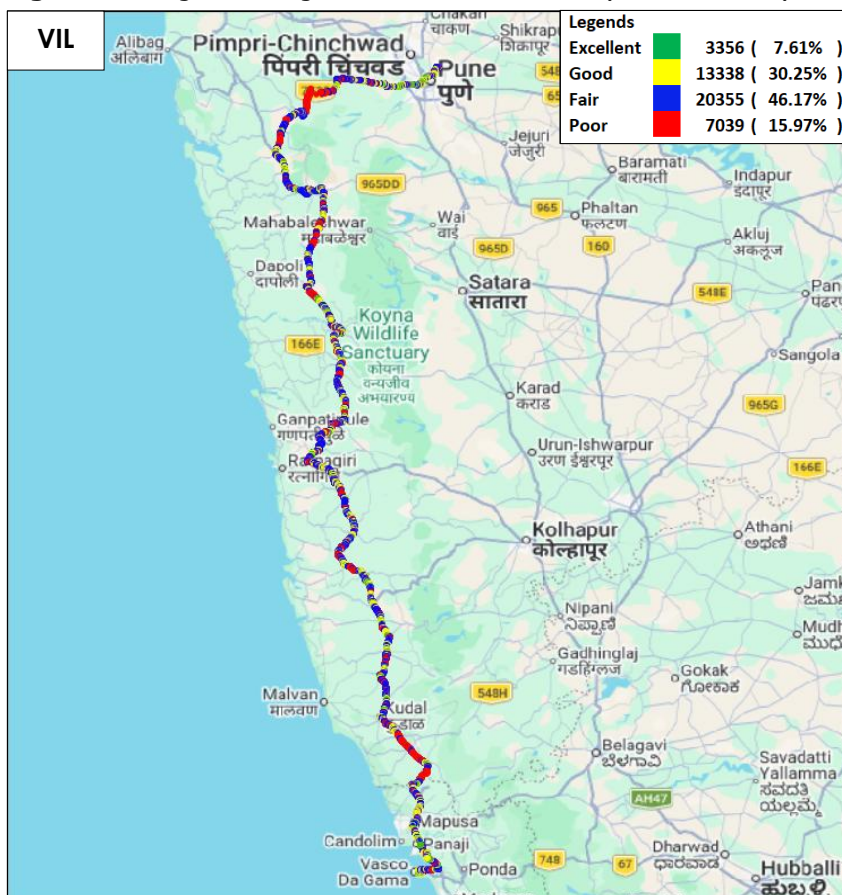


Figure-73: Signal strength auto-selection mode (5G/4G/3G/2G) data - VIL.

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-81: 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 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.ircctc.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-82: 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.
- Airtel server was used for FTP Download, FTP Upload, TCP and TWAMP testing, for Airtel.
- Delhi-based TRAI server was used for HTTP Download, HTTP Upload, TCP and TWAMP testing, for BSNL.
- RJIL server was used for FTP Download, FTP Upload, TCP and TWAMP testing, for RJIL.
- VIL server was used for HTTP Download, HTTP Upload, TCP and TWAMP testing, for VIL.

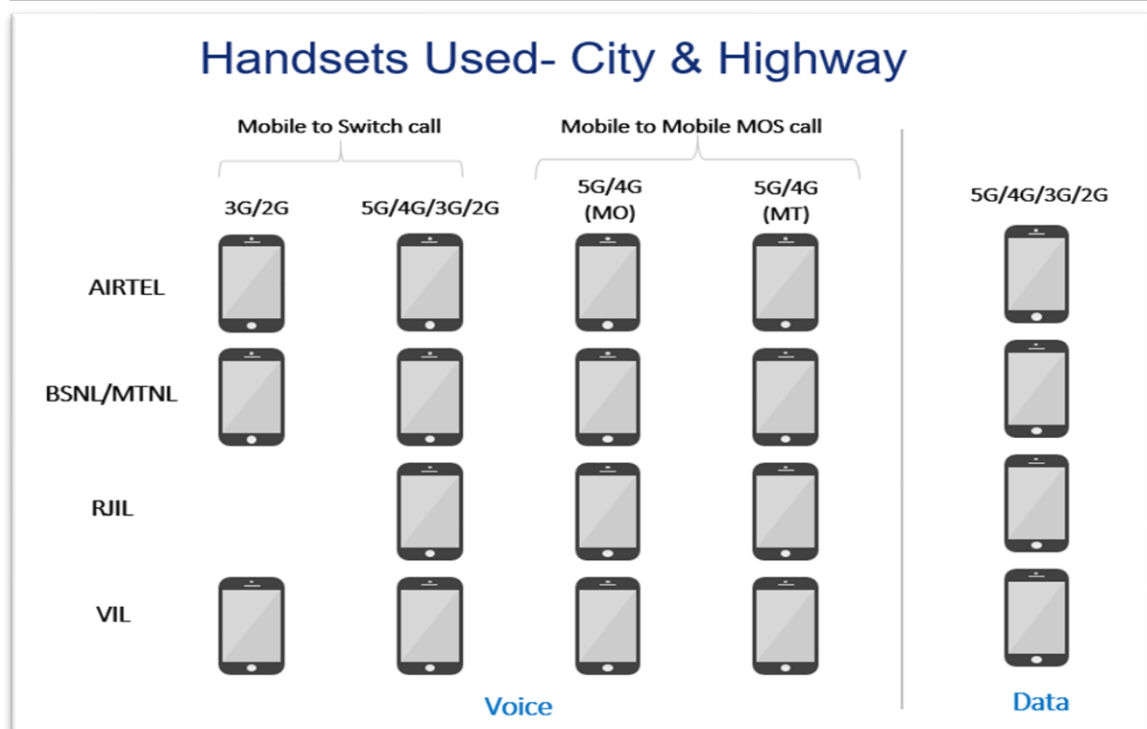


Figure-74: Number of handsets used in city & highway drive

MO: Mobile originating

MT: Mobile terminating

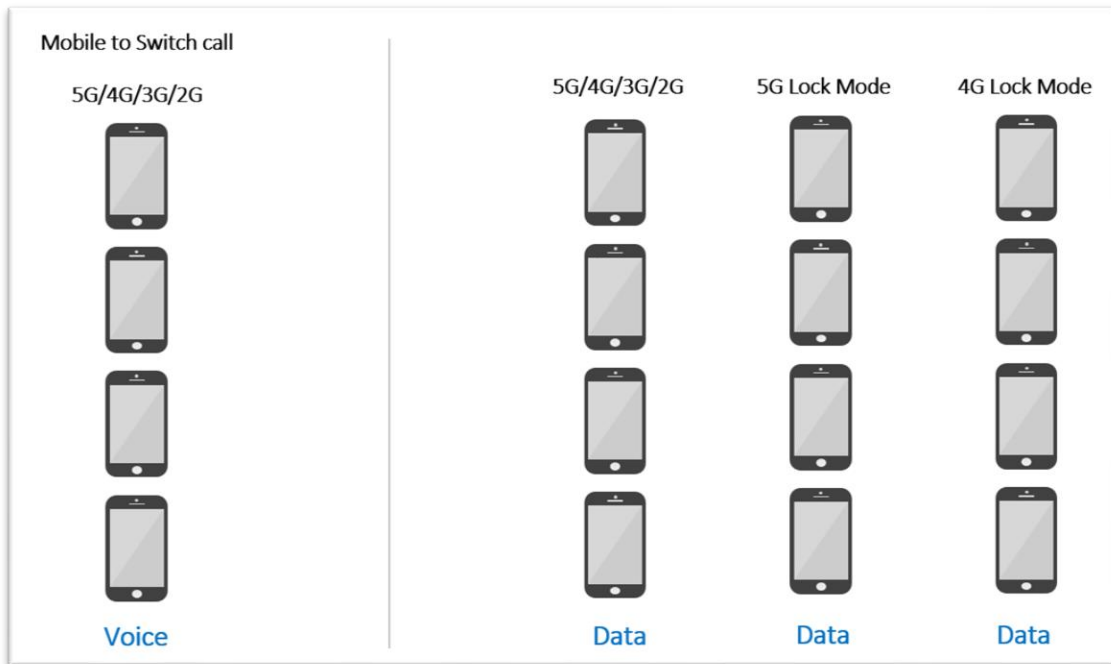


Figure-75: Number of handsets used in railway/metro/walktest/hotspot/coastal area.

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)

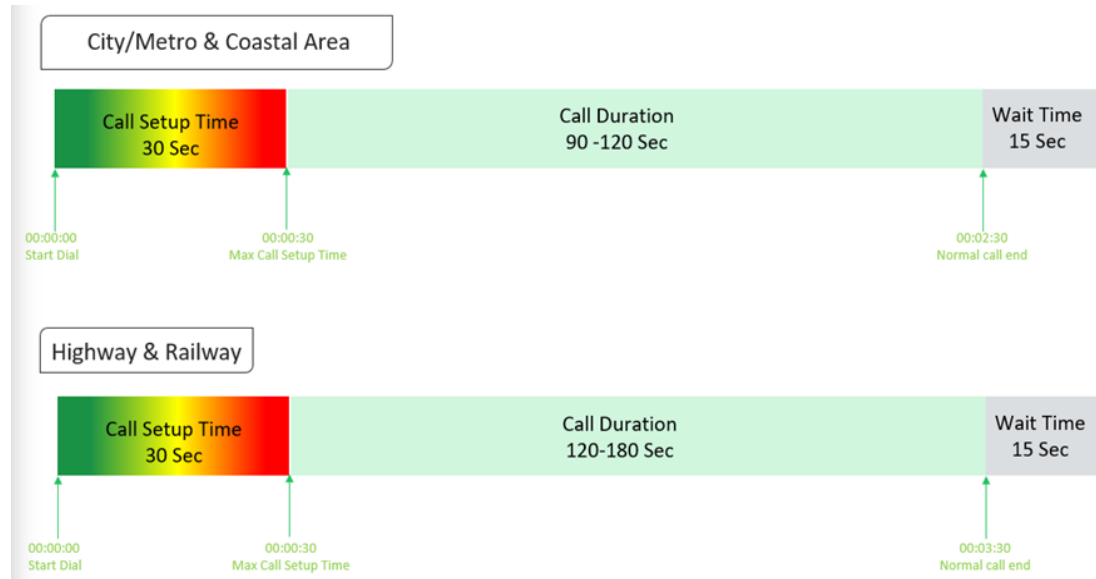


Figure-76: Voice test script for city/railway/metro/highway & coastal area

- 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

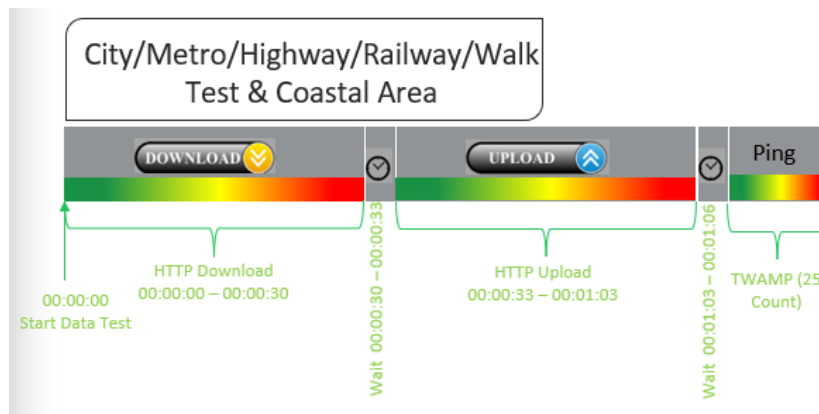


Figure-78: Data test script used in city/metro/railway/highway/walk test & coastal area

(d) Static Data(internet) testing

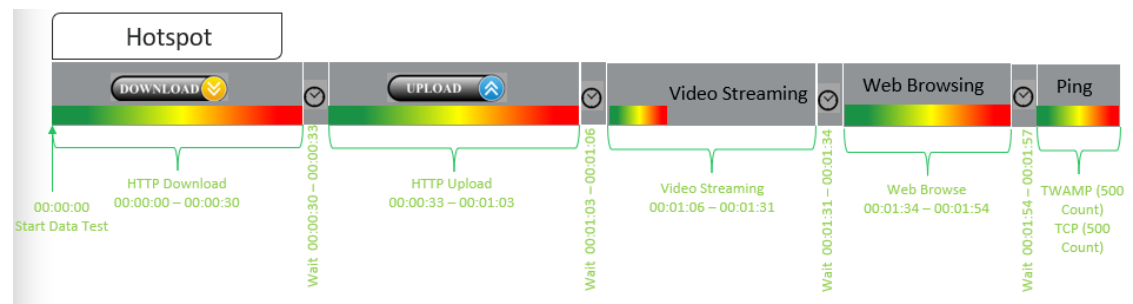


Figure-79: Data test script used at hotspot

- 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 ≥ 4 and < 5 Good : MOS ≥ 3 and < 4 Fair : MOS ≥ 2 and < 3 Poor : MOS ≥ 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 ≥ 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 S_i is the RTP timestamp from packet i, and R_i 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: $D(i,j) = (R_j - R_i) - (S_j - S_i)$ 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. <table><tr><th rowspan="2">Parameter Name</th><th rowspan="2">Technology</th><th colspan="4">Signal Strength (dBm)</th></tr><tr><th>Excellent</th><th>Good</th><th>Fair</th><th>Poor</th></tr><tr><td>Rx Level</td><td>GSM</td><td>0 to ≥ -65</td><td><-65 to ≥ -75</td><td><-75 to ≥ -85</td><td><-85 to min</td></tr><tr><td>RSCP</td><td>WCDMA</td><td>0 to ≥ -70</td><td><-70 to ≥ -80</td><td><-80 to ≥ -90</td><td><-90 to min</td></tr><tr><td>RSRP</td><td>LTE</td><td>0 to ≥ -80</td><td><-80 to ≥ -95</td><td><-95 to ≥ -110</td><td><-110 to min</td></tr><tr><td>SS_RSRP</td><td>NR</td><td>0 to ≥ -80</td><td><-80 to ≥ -95</td><td><-95 to ≥ -110</td><td><-110 to min</td></tr></table>	Parameter Name	Technology	Signal Strength (dBm)				Excellent	Good	Fair	Poor	Rx Level	GSM	0 to ≥ -65	<-65 to ≥ -75	<-75 to ≥ -85	<-85 to min	RSCP	WCDMA	0 to ≥ -70	<-70 to ≥ -80	<-80 to ≥ -90	<-90 to min	RSRP	LTE	0 to ≥ -80	<-80 to ≥ -95	<-95 to ≥ -110	<-110 to min	SS_RSRP	NR	0 to ≥ -80	<-80 to ≥ -95	<-95 to ≥ -110	<-110 to min
Parameter Name	Technology			Signal Strength (dBm)																															
		Excellent	Good	Fair	Poor																														
Rx Level	GSM	0 to ≥ -65	<-65 to ≥ -75	<-75 to ≥ -85	<-85 to min																														
RSCP	WCDMA	0 to ≥ -70	<-70 to ≥ -80	<-80 to ≥ -90	<-90 to min																														
RSRP	LTE	0 to ≥ -80	<-80 to ≥ -95	<-95 to ≥ -110	<-110 to min																														
SS_RSRP	NR	0 to ≥ -80	<-80 to ≥ -95	<-95 to ≥ -110	<-110 to min																														

Table-83: 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-84: 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.