



TELECOM REGULATORY AUTHORITY OF INDIA

Independent Drive Test Report

Delhi LSA

July 2026

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

S. No	Drive test route	Type of route	Distance covered (KMs)	From date	To date
1	South Delhi and nearby areas	City	310.4	06-July-2026	08-July-2026
2	South Delhi	Inter Operator Calling	1 Location	10-July-2026	10-July-2026
3	South Delhi	Hotspot	6 Locations	10-July-2026	10-July-2026
4	South Delhi	Walk test	5.5	10-July-2026	10-July-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 and walk test as per the legends shown on the map.

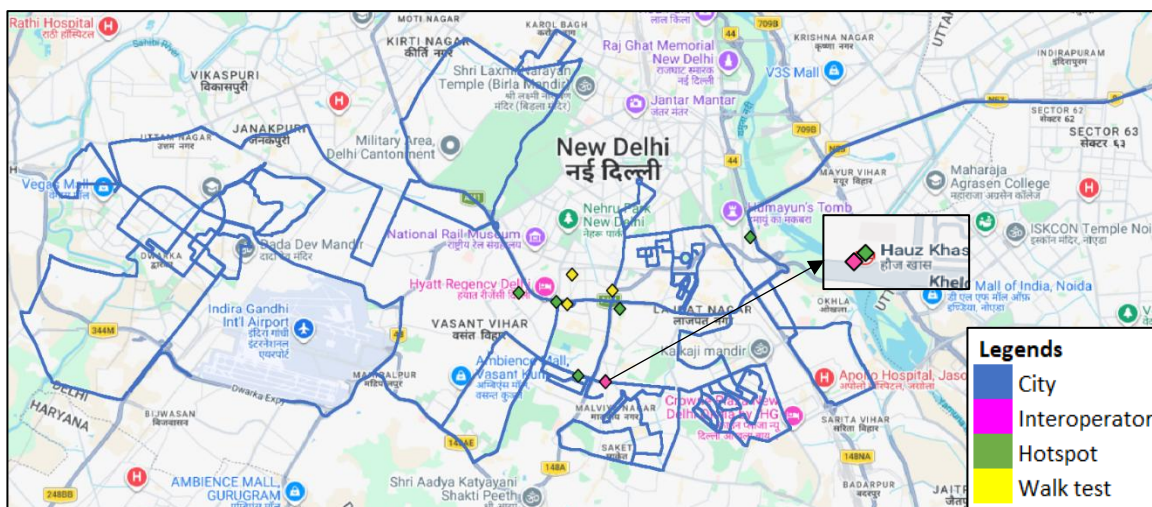


Figure-1: Drive test routes

2.3 Summary of areas covered

a) City- Dwarka, Uttam Nagar, Janakpuri, Mahipalpur, Malviya Nagar, Saket, Lajpat Nagar, Naraina, Patel Nagar, Karol Bagh, Vande Mataram Marg, Mayur Vihar and Noida Sector 62 etc.

b) Hotspot

1. Administrative Building IIT Delhi
2. AIIMS OPD Area
3. Bhikaji Cama Place Metro Station
4. Delhi Public School R.K Puram
5. Hauz Khas Metro Station
6. ISBT Sarai Kale Khan

c) Walk Test

1. Dilli Haat INA
2. Sarojini Nagar Market
3. WTC Nauroji Nagar

2.4 Telecom service providers detected frequency bands

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

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

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

2.5 Key finding of Independent Drive Test

Drive Test Area: The overall mobile network performance across South Delhi and nearby areas (Delhi LSA) for the key parameters has been summarised below:

- a) Coverage Gap** - The signal strength observed during voice testing on the drive test route in auto-selection mode (5G/4G/3G/2G). (refer figure- 28 to 31)

Parameter	AIRTEL	MTNL	RJIL	VIL
Total Number of Samples captured on Drive test route	76581	72804	75172	76883
Number of Samples having poor signal strength	610	50483	1050	527
Number of Samples having limited service (No Coverage)	0	1042	0	0

- b) Dropped Calls** - The TSP-wise details of dropped calls in auto selection mode (5G/4G/3G/2G). (refer figure- 15 & 18)

Parameter	AIRTEL	MTNL	RJIL	VIL
Number of successful Calls Established	684	661	684	689
Number of dropped Calls	3	99	1	3

- c) Call Silence Instance** - The TSP-wise details of Call silence instance in Auto-selection mode (5G/4G). (refer figure- 19 to 21)

Parameter	AIRTEL	MTNL	RJIL	VIL
Call Established (within service provider network)	657	NA	651	661
Number of silences calls for >3 Sec	5	NA	14	12
Total number of silence instances for >3 Sec	11	NA	14	12

- d) Packet loss rate Downlink & Uplink-** The TSP-wise details of packet loss rate in downlink & uplink for Auto-selection mode (5G/4G).

Parameter	AIRTEL	MTNL	RJIL	VIL
Call Established (within service provider network)	657	NA	651	661
Packet loss Rate Downlink %	0.25	NA	1.33	0.54
Packet loss Rate Uplink %	0.36	NA	1.22	0.51

- e) Data Download and Upload Throughput:**

- i) Data Download throughput:** The TSP-wise details of **Average Download (DL) throughput** against declared typical DL Throughput for month, in Auto-selection mode (5G/4G/3G/2G). (refer figure- 33 to 36)

Parameter	Measured in	AIRTEL (upto 5G)	MTNL (upto 3G)	RJIL (upto 5G)	VIL (upto 5G)
Typical Download Throughput declared by TSP	(Mbits/s)	18.00	8.00	15.00	15.00
Average Download Throughput measured during IDT	(Mbits/s)	176.82	4.69	257.03	35.07

- ii) Data Upload throughput:** The TSP-wise details of **Average Upload (UL) throughput** against declared typical UL Throughput for month, in Auto-selection mode (5G/4G/3G/2G). (refer figure-37 to 40)

Parameter	Measured in	AIRTEL (upto 5G)	MTNL (upto 3G)	RJIL (upto 5G)	VIL (upto 5G)
Typical Upload Throughput declared by TSP	(Mbits/s)	8.00	1.00	7.00	8.00
Average Upload Throughput measured during IDT	(Mbits/s)	24.83	1.15	18.98	20.70

QoS Performance Analysis- Delhi 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 Delhi LSA during the month of July-2026 covering city drive, hotspots and walk test. (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	MTNL	VIL
Call Attempts	695	724	671
Call Setup Success Rate %	90.79	90.88	99.25
Drop Call Rate %	1.11	15.05	2.10
Call Setup Time-Average (Second)	3.22	2.87	3.19
Handover Success Rate %	97.98	100.00	97.95

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

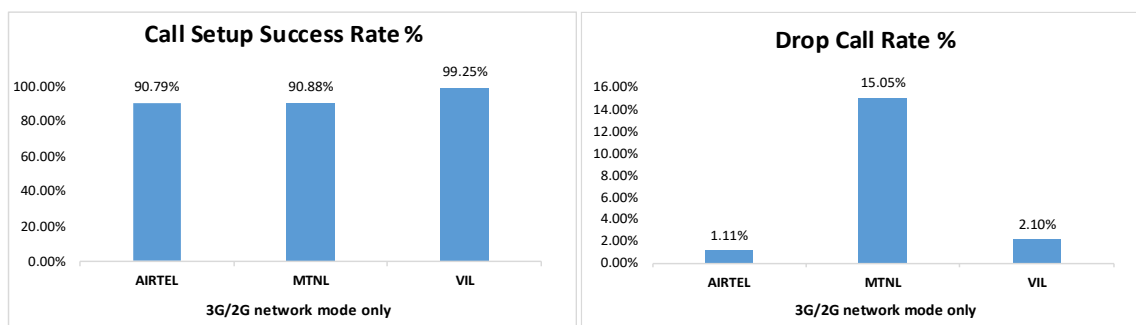


Figure-2: Call setup success rate and drop call rate performance.

Number of unique cell Id's covered in Voice test- Technology wise			
Technology	Service Provider		
	3G/2G network mode only		
	AIRTEL	MTNL	VIL
3G	NA	225	NA
2G	1073	10	1110

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	MTNL	RJIL	VIL
Call Attempts	803	860	803	808
Call Setup Success Rate %	99.88	90.00	99.88	99.88
Drop Call Rate %	0.37	13.44	0.12	0.37
Call Setup Time-Average (Second)	0.74	3.12	0.66	0.53
Handover Success Rate %	99.92	100.00	99.98	99.95

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

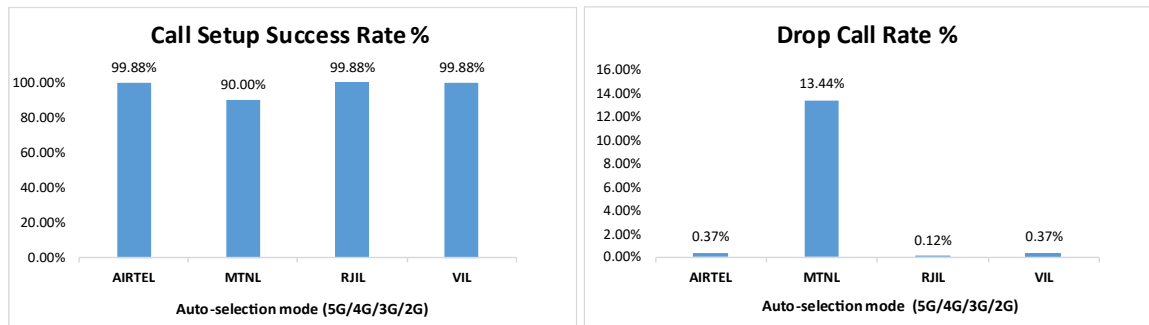


Figure-3: Performance for call setup success rate and drop call rate.

Parameter	Service Provider			
	Mobile-to-Mobile (5G/4G - Open Mode)			
	AIRTEL	MTNL	RJIL	VIL
Call Established (within service provider Network)	657	543	651	661
Number of silences call for >4 Sec	5	NA	8	5
Silence Call Rate %	0.76	NA	1.23	0.76
Number of silence instances for >4 Sec	10	NA	8	5
Number of silence instances for >3 Sec	11	NA	14	12
Number of silence instances for >2 sec	15	NA	34	43
RTP Jitter (4G & 5G) in ms	4.01	NA	16.49	17.26
Packet loss Rate Downlink %	0.25	NA	1.33	0.54
Packet loss Rate Uplink %	0.36	NA	1.22	0.51

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

Note-

- NA- Due to unavailability of packet switched (VoLTE & VoNR) network in MTNL silence instances are not captured.

Number of unique cell Id's covered in Voice test- Technology wise				
Technology	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
5G	0	NA	1485	0
4G	2431	NA	677	1934
3G	NA	223	NA	NA
2G	0	10	NA	0

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	MTNL	RJIL	VIL
Total Number of MOS Samples for calls table-6	3905	2845	3863	3693
Speech Quality (Average MOS)	4.02	2.79	4.44	4.50
Number of samples with MOS ≥ 4 to < 5 (Excellent)	3263	0	3347	3248
Number of samples with MOS ≥ 3 to < 4 (Good)	561	1438	298	340
Number of samples with MOS ≥ 2 to < 3 (Fair)	51	1021	101	70
Number of samples with MOS ≥ 1 to < 2 (Poor)	30	386	117	35
%age of samples with MOS ≥ 4 to < 5 (Excellent)	83.56%	0.00%	86.64%	87.95%
%age of samples with MOS ≥ 3 to < 4 (Good)	14.37%	50.54%	7.71%	9.21%
%age of samples with MOS ≥ 2 to < 3 (Fair)	1.31%	35.89%	2.61%	1.90%
%age of samples with MOS ≥ 1 to < 2 (Poor)	0.77%	13.57%	3.03%	0.95%

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

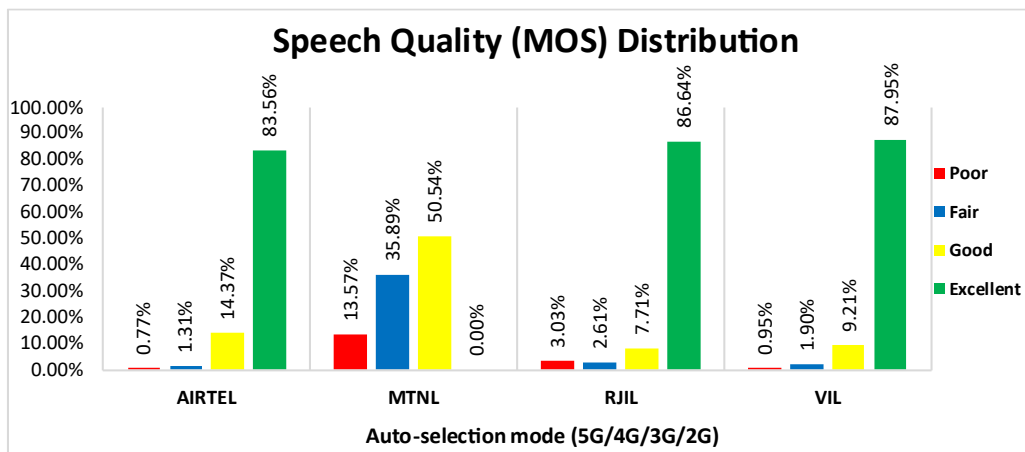


Figure- 4: Distribution of samples in MOS range.

(d) Inter-service provider voice call performance: To check the performance of inter-service providers call setup success rate, total 10 to 11 inter operator calls were attempted at one location which is Hauz Khas. The call setup success rate and call setup time observation is as below.

Call Setup Success Rate %				
From Service Provider	To Service Provider			
	AIRTEL	MTNL	RJIL	VIL
AIRTEL	NA	100.00	100.00	100.00
MTNL	100.00	NA	100.00	100.00
RJIL	100.00	100.00	NA	100.00
VIL	100.00	100.00	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	MTNL	RJIL	VIL
AIRTEL	NA	5.53	1.27	2.74
MTNL	4.38	NA	3.99	4.48
RJIL	1.88	4.16	NA	1.99
VIL	1.27	4.74	1.23	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	MTNL	RJIL	VIL
Download Throughput (Mbits/s)	Average	173.09	4.82	259.70	35.53
	80th Percentile	252.73	7.24	430.16	45.87
	20th Percentile	64.52	2.13	95.12	25.85
Upload Throughput (Mbits/s)	Average	25.05	1.28	19.13	22.07
	80th Percentile	41.57	2.44	34.71	38.76
	20th Percentile	5.94	0.09	2.80	5.63
Latency (ms)	50th Percentile	43.93	21.01	23.43	39.78

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

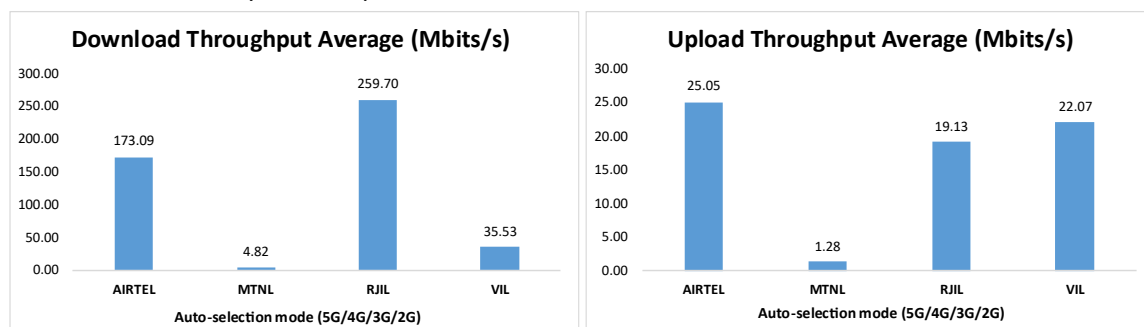


Figure- 5: Download and Upload throughput

Number of unique cell Id's covered in Data test- Technology wise				
Technology	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
5G	0	NA	1281	0
4G	2323	NA	235	1625
3G	NA	233	NA	NA
2G	0	37	NA	1

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 and walk test 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 6th July 2026 to 8th July 2026 in South Delhi and nearby areas. (Refer Table-1)

4.2.1 Drive test route

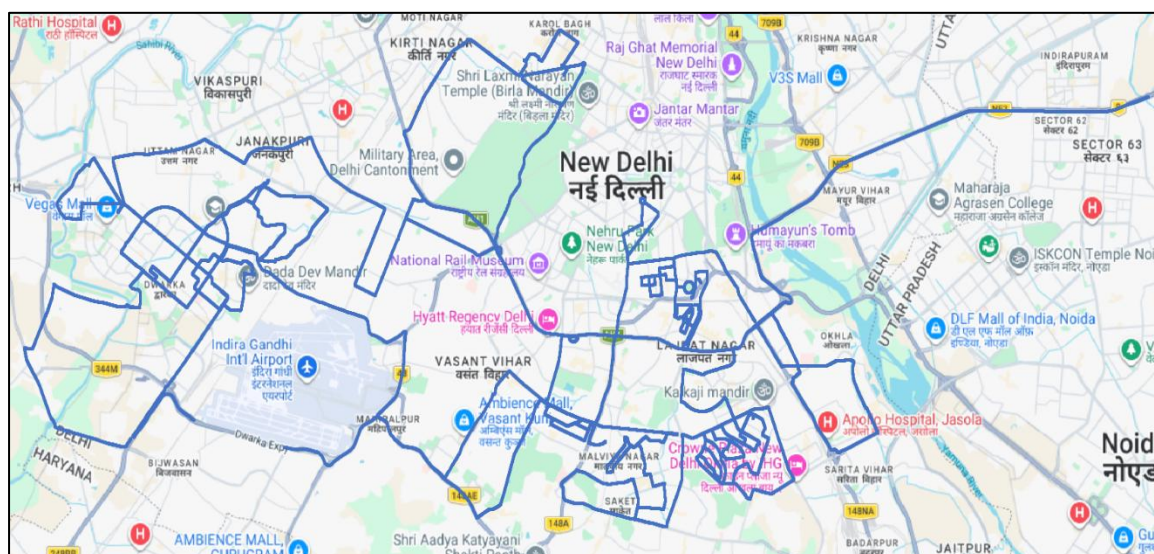


Figure- 6: Drive test routes

4.2.2 Areas covered

Dwarka, Uttam Nagar, Janakpuri, Mahipalpur, Malviya Nagar, Saket, Lajpat Nagar, Naraina, Patel Nagar, Karol Bagh and Vande Mataram Marg, Mayur Vihar and Noida Sector 62 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	MTNL	VIL
Call Attempts	695	724	671
Call Setup Success Rate %	90.79	90.88	99.25
Drop Call Rate %	1.11	15.05	2.10
Call Setup Time-Average (Second)	3.22	2.87	3.19
Handover Success Rate %	97.98	100.00	97.95

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

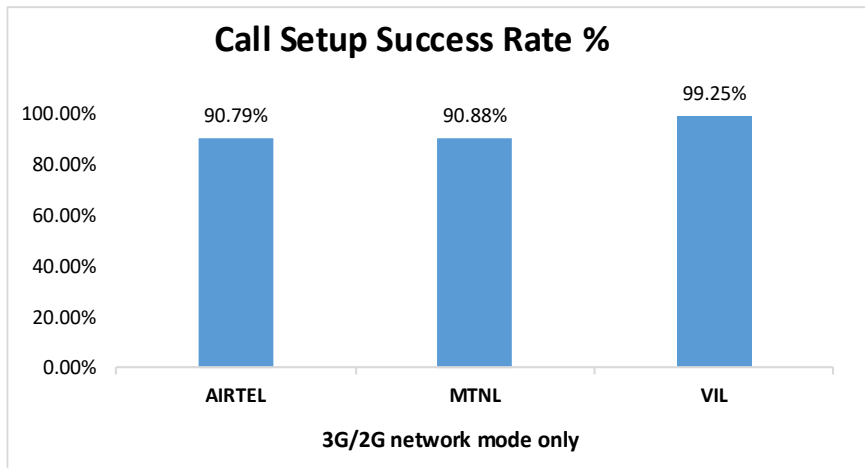


Figure-7: Performance for call setup success rate.

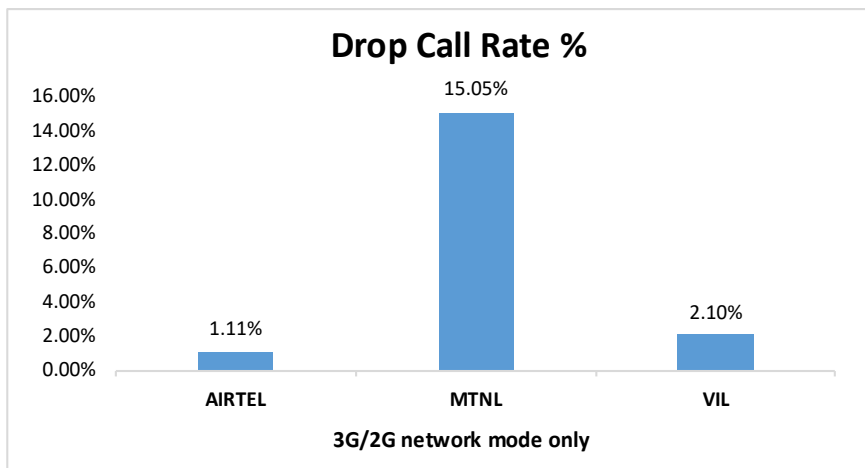


Figure-8: Performance for drop call rate.

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

Technology	Service Provider		
	AIRTEL	MTNL	VIL
3G	NA	98.98%	NA
2G	99.96%	0.12%	99.86%
Limited Service	0.04%	0.90%	0.14%

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

Note-

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

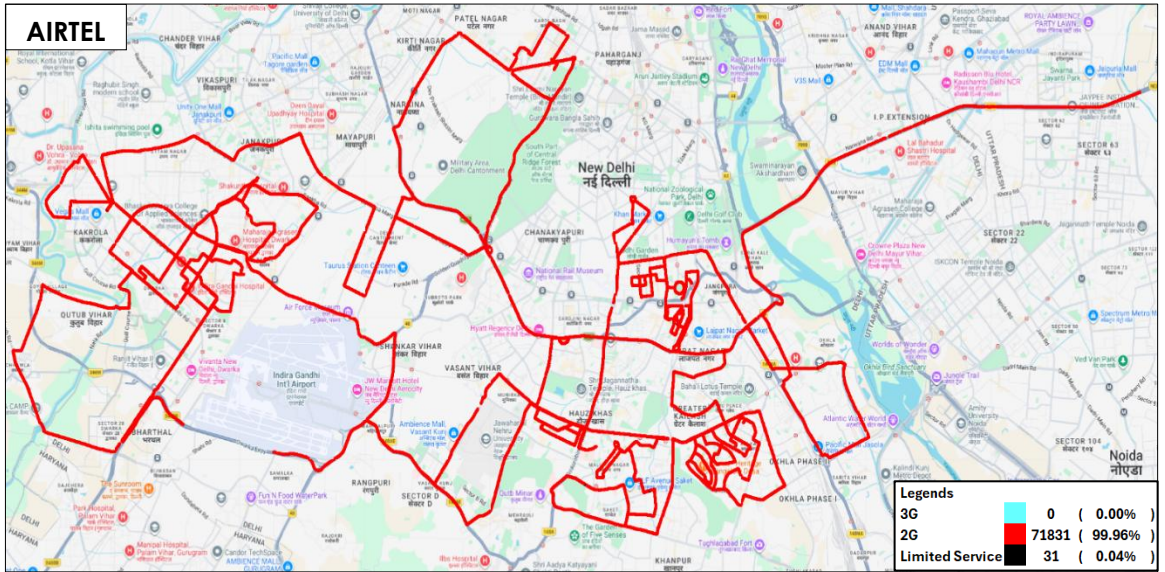


Figure-9: Serving technology plots 3G/2G network mode - AIRTEL.

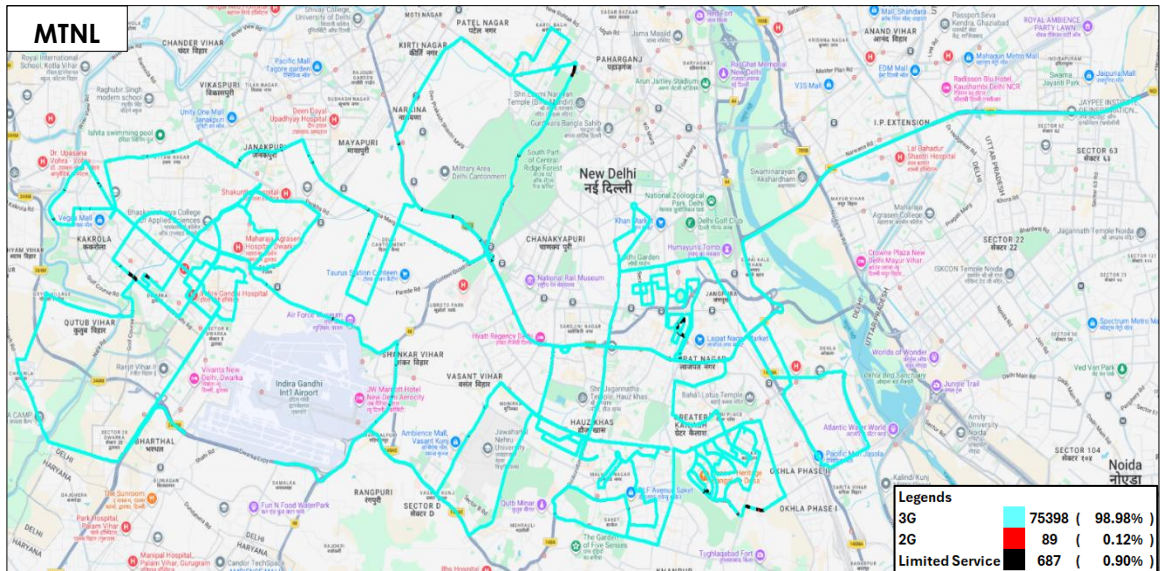


Figure-10: Serving technology plots 3G/2G network mode - MTNL.

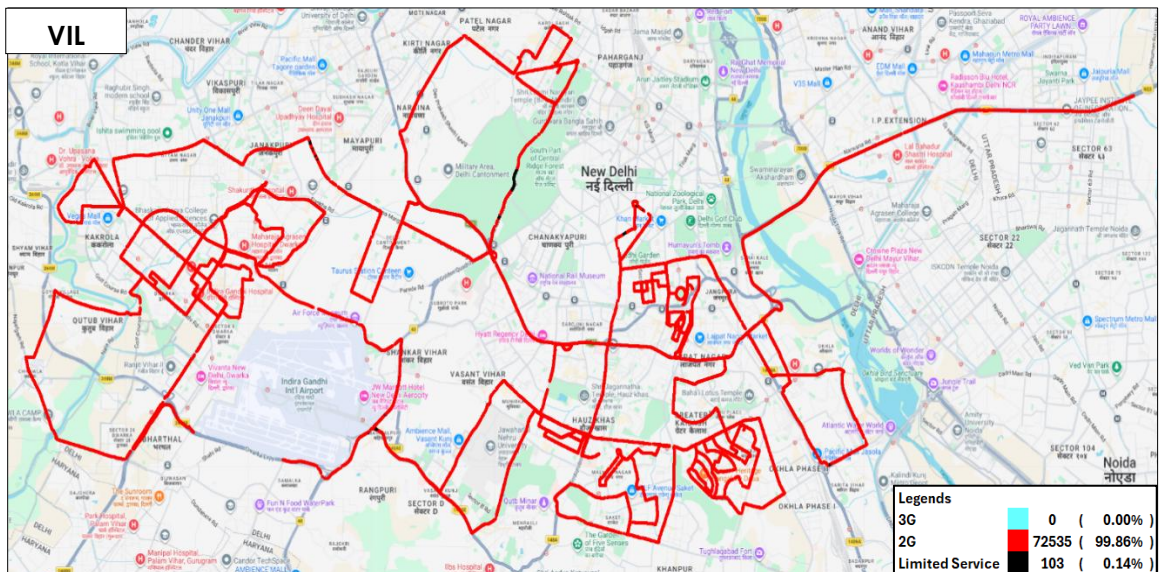


Figure-11: Serving technology plots 3G/2G network mode - VIL.

(c) Network Signal Strength Distribution: The following chart represents signal strength distribution for 3G/2G network mode only. (Refer figure- 48, 49 & 50 for map view)

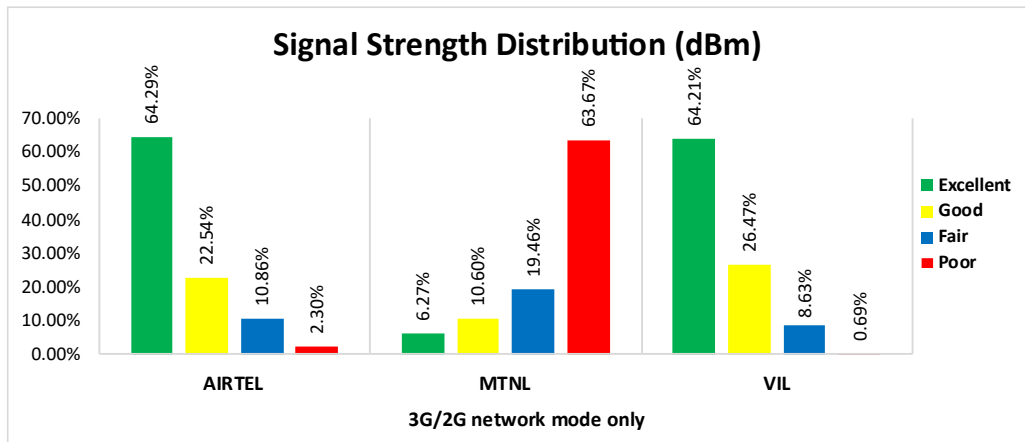


Figure-12: Signal strength distribution 3G/2G network mode only.

Observations:

- Airtel has 64% of samples falling in the excellent signal strength category.
- MTNL has 6% of samples falling in the excellent signal strength category.
- VIL has 64% 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	MTNL	RJIL	VIL
Call Attempts	685	743	685	690
Call Setup Success Rate %	99.85	88.96	99.85	99.86
Drop Call Rate %	0.44	14.98	0.15	0.44
Call Setup Time Average (Second)	0.75	3.05	0.66	0.53
Handover Success Rate %	99.91	100.00	99.98	99.94

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

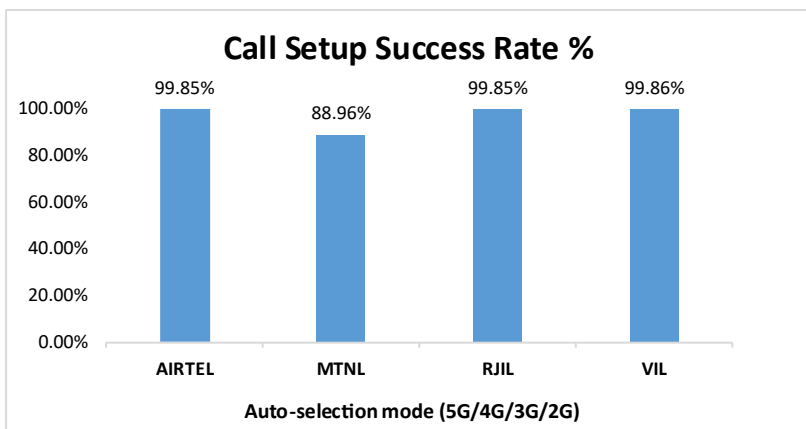


Figure-13: Performance for call setup success rate.

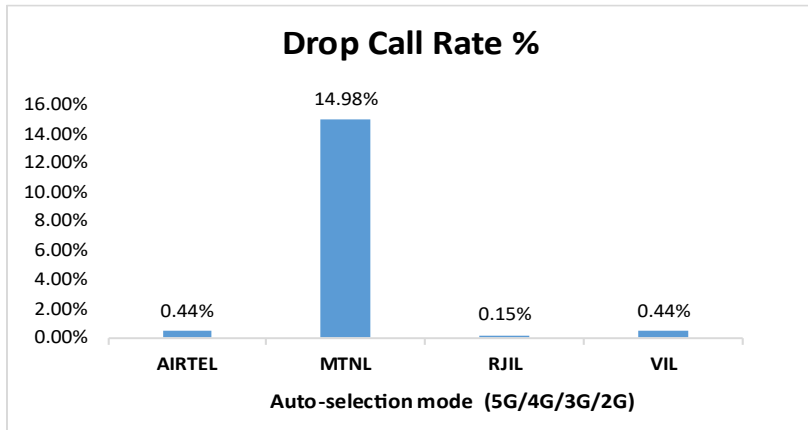


Figure-14: Performance for drop call rate.

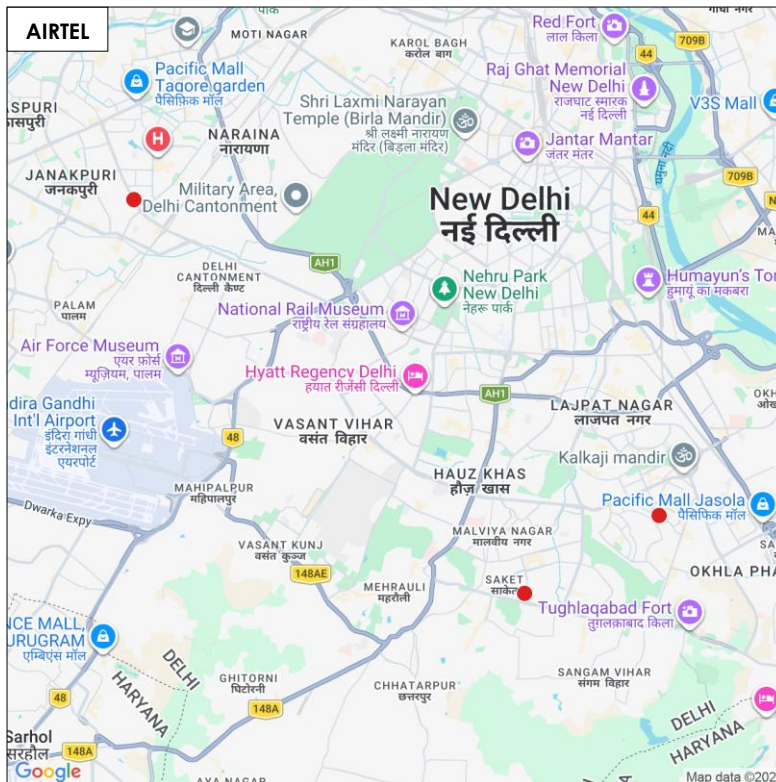


Figure-15: Drop call locations in auto-selection mode (5G/4G/3G/2G) voice - Airtel

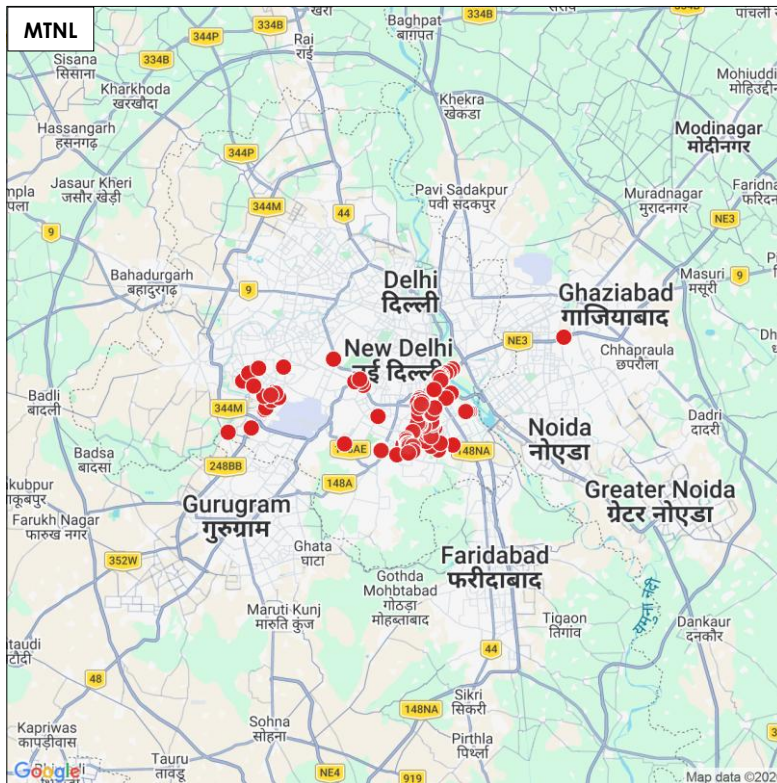


Figure-16: Drop call locations in auto-selection mode (5G/4G/3G/2G) voice - MTNL.

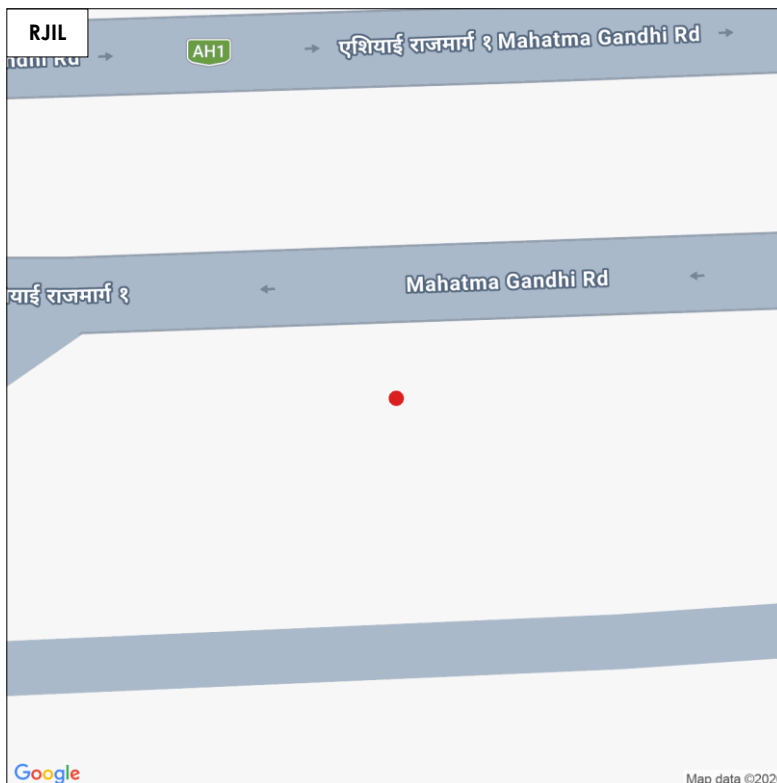


Figure-17: Drop call locations in auto-selection mode (5G/4G/3G/2G) voice - RJIL.

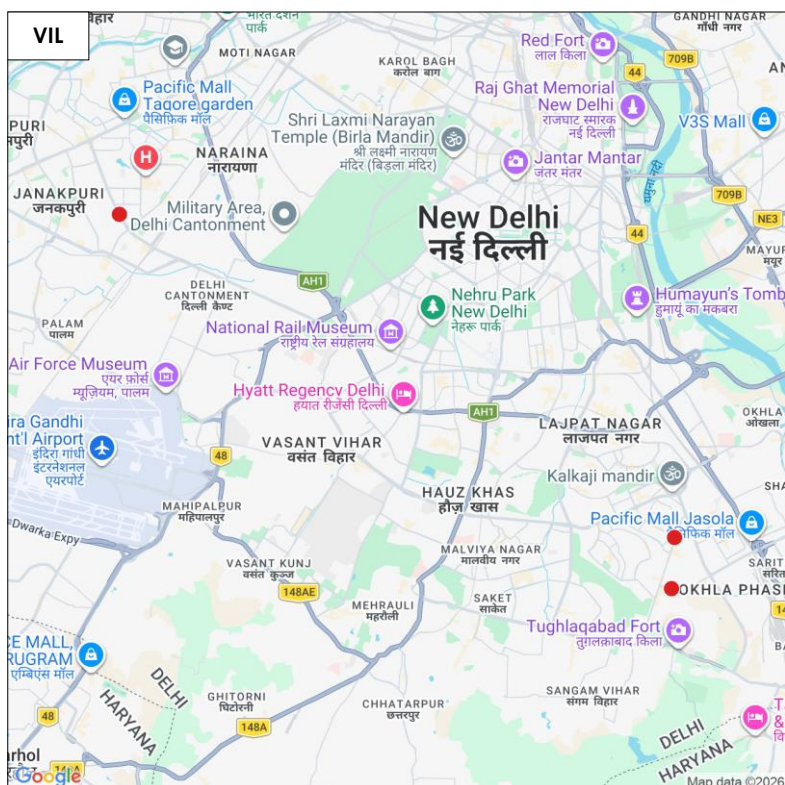


Figure-18: Drop call locations in auto-selection mode (5G/4G/3G/2G) voice - VIL.

Parameter	Service Provider			
	Mobile-to-Mobile (5G/4G - Open Mode)			
	AIRTEL	MTNL	RJIL	VIL
Call Established (within service provider Network)	657	543	651	661
Number of silences call for >4 Sec	5	NA	8	5
Silence Call Rate %	0.76	NA	1.23	0.76
Number of silence instances for >4 Sec	10	NA	8	5
Number of silence instances for >3 Sec	11	NA	14	12
Number of silence instances for >2 sec	15	NA	34	43
RTP Jitter (4G & 5G) in ms	4.01	NA	16.49	17.26
Packet loss Rate Downlink %	0.25	NA	1.33	0.54
Packet loss Rate Uplink %	0.36	NA	1.22	0.51

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

Note-

- NA- Due to unavailability of packet switched (VoLTE & VoNR) network in MTNL silence instances are not captured.

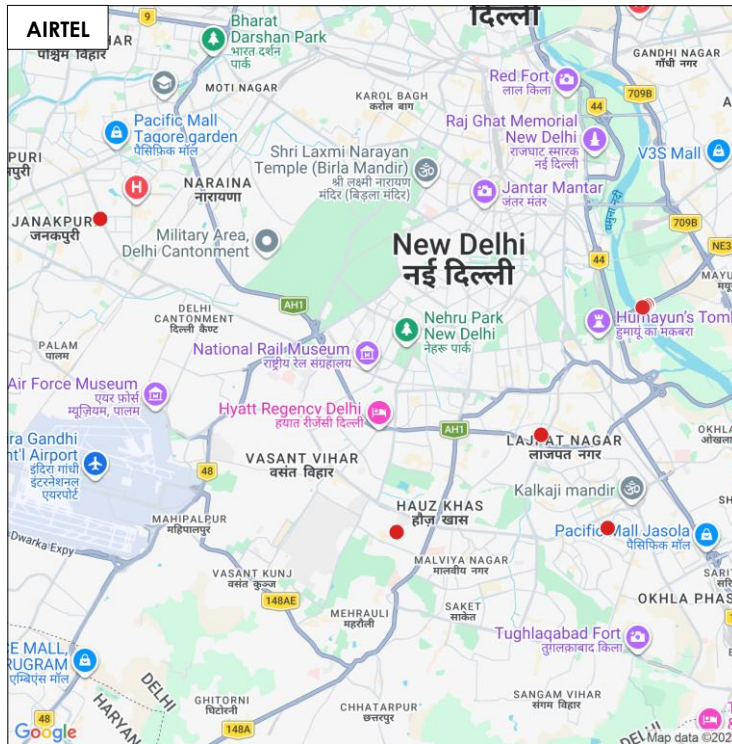


Figure-19: Number of silence instances for >3 Sec Mobile-to-Mobile (5G/4G-Open Mode)- AIRTEL.

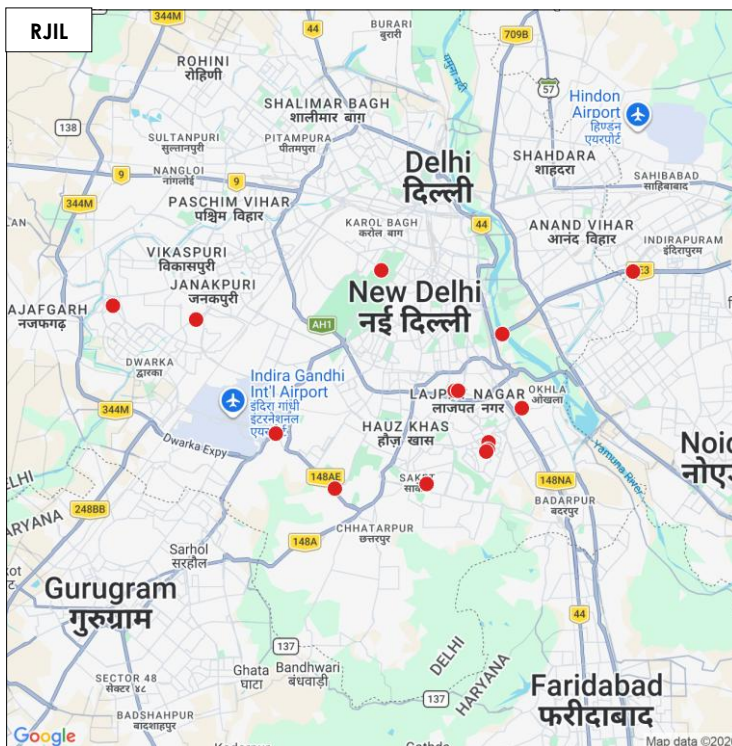


Figure-20: Number of silence instances for >3 Sec Mobile-to-Mobile (5G/4G-Open Mode)- MTNL.

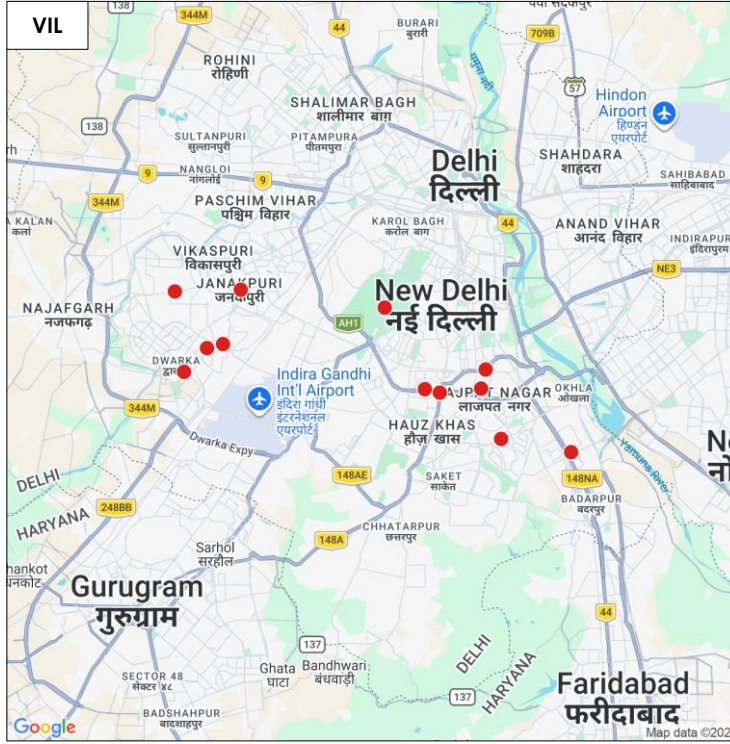


Figure-21: Number of silence instances for >3 Sec Mobile-to-Mobile (5G/4G-Open Mode)- VIL.

(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	MTNL	RJIL	VIL
Total Number of MOS Samples for calls in table-16	3905	2845	3863	3693
Speech Quality (Average MOS)	4.02	2.79	4.44	4.50
Number of samples with MOS ≥ 4 to < 5 (Excellent)	3263	0	3347	3248
Number of samples with MOS ≥ 3 to < 4 (Good)	561	1438	298	340
Number of samples with MOS ≥ 2 to < 3 (Fair)	51	1021	101	70
Number of samples with MOS ≥ 1 to < 2 (Poor)	30	386	117	35
%age of samples with MOS ≥ 4 to < 5 (Excellent)	83.56%	0.00%	86.64%	87.95%
%age of samples with MOS ≥ 3 to < 4 (Good)	14.37%	50.54%	7.71%	9.21%
%age of samples with MOS ≥ 2 to < 3 (Fair)	1.31%	35.89%	2.61%	1.90%
%age of samples with MOS ≥ 1 to < 2 (Poor)	0.77%	13.57%	3.03%	0.95%

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

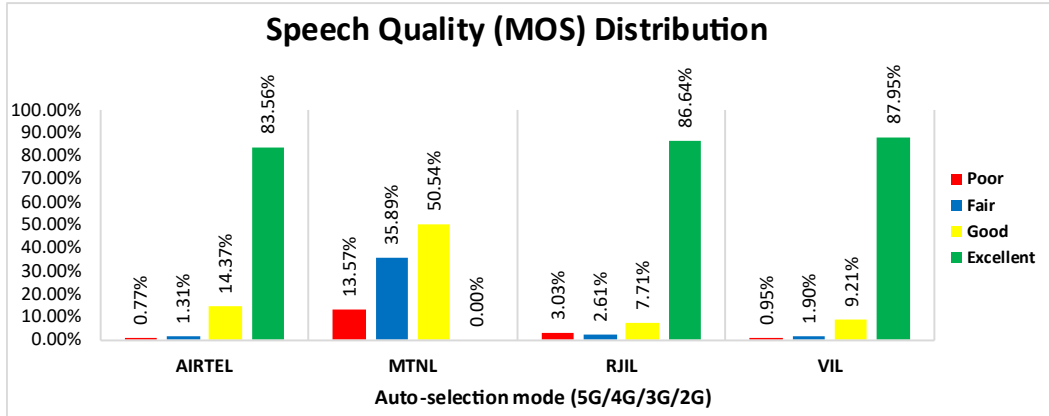


Figure-22: Distribution of samples in MOS range.

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

Technology	Service Provider			
	AIRTEL	MTNL	RJIL	VIL
5G	6.68%	NA	84.41%	0.65%
4G	93.32%	NA	15.59%	99.35%
3G	NA	98.47%	NA	NA
2G	0.00%	0.15%	NA	0.00%
Limited Service	0.00%	1.38%	0.00%	0.00%

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

Note-

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

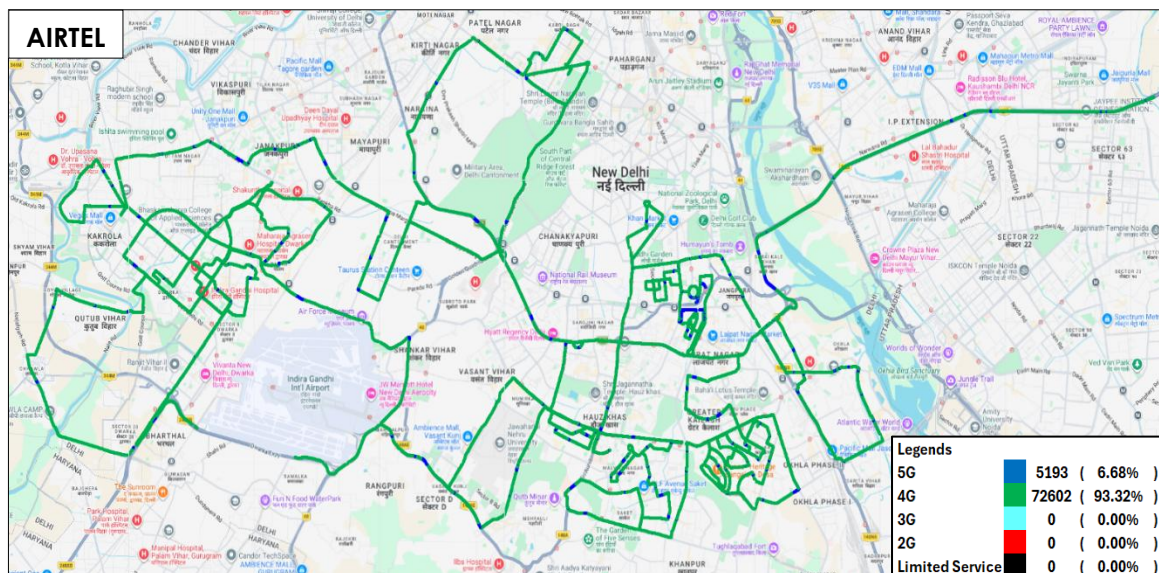


Figure-23: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - AIRTEL.

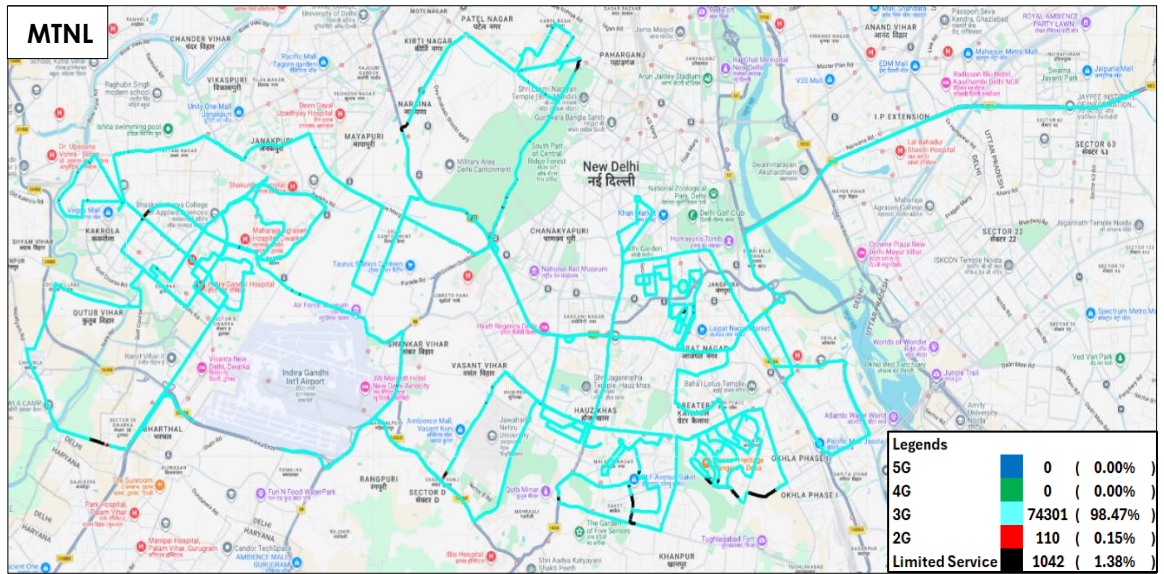


Figure-24: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - MTNL.

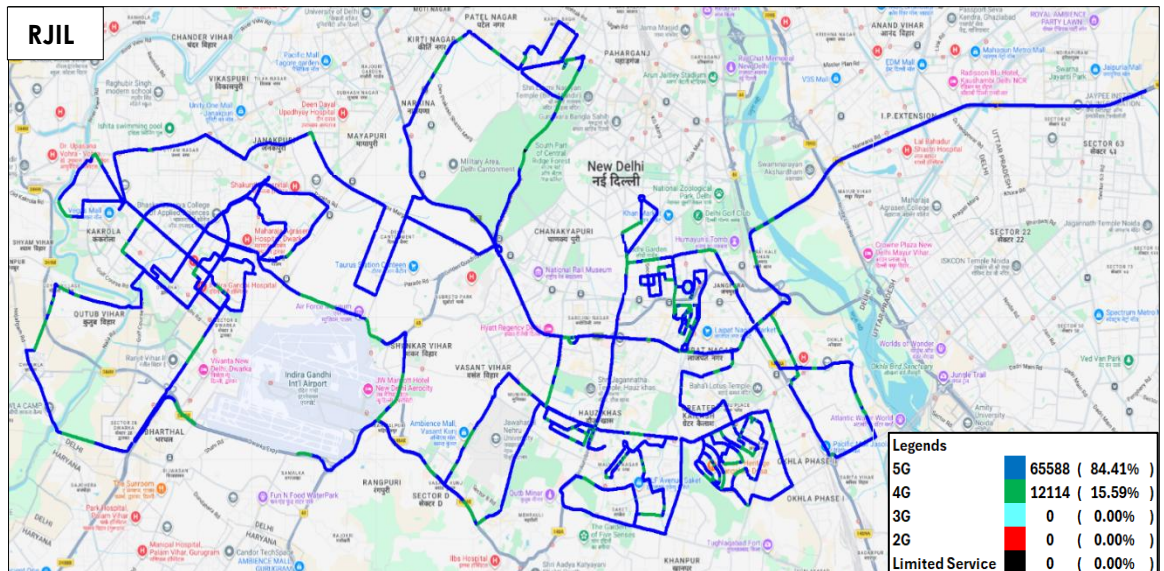


Figure-25: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - RJIL

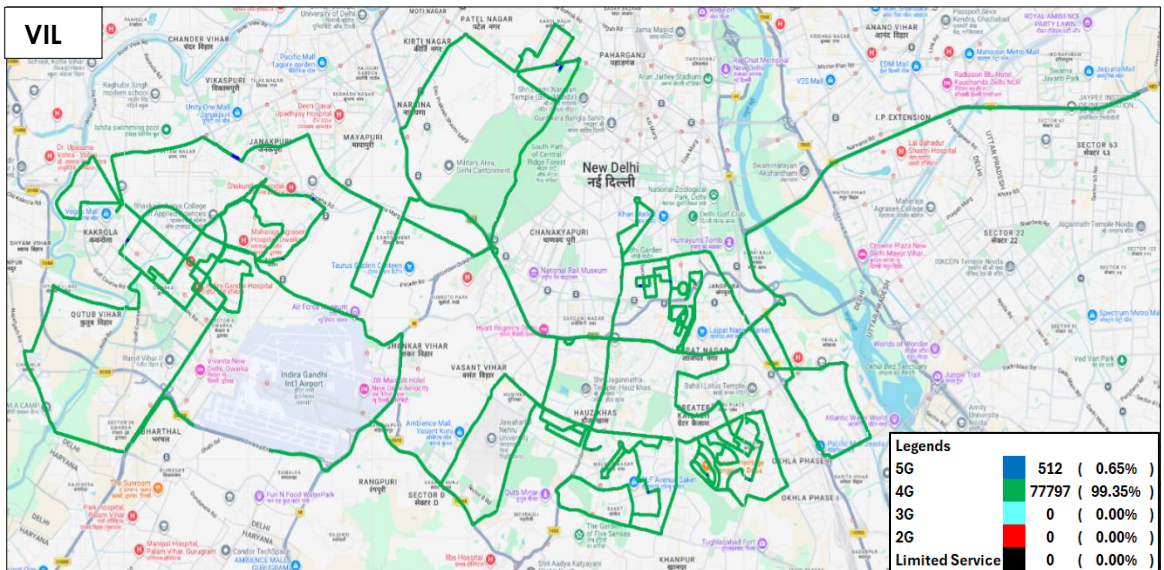


Figure-26: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - VIL.

(g) Network Signal Strength Distribution: The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G) voice. (Refer figure-51, 52, 53 & 54 for map view)

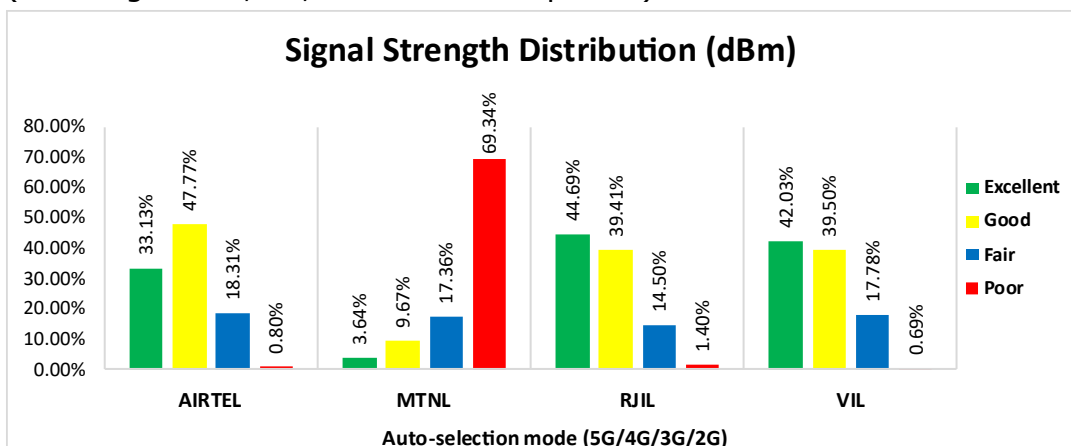


Figure-27: Signal strength distribution auto-selection mode (5G/4G/3G/2G) voice.

Observations:

- Airtel has 33% of samples falling in the excellent signal strength category.
- MTNL has 4% of samples falling in the excellent signal strength category.
- RJIL has 45% of samples falling in the excellent signal strength category.
- VIL has 42% of samples falling in the excellent signal strength category.

(h) Coverage Gap observed

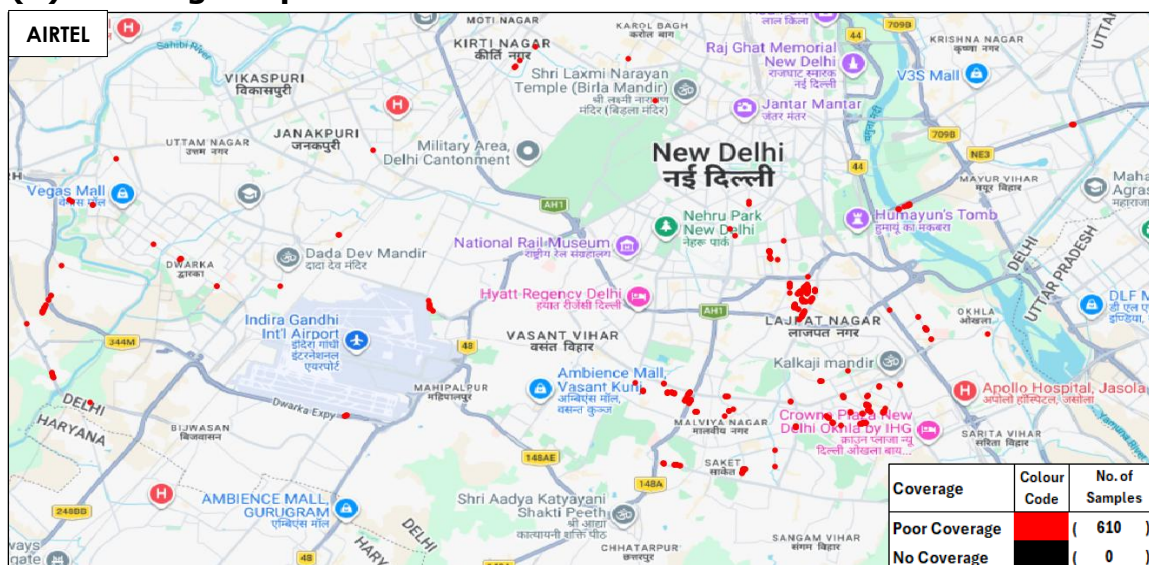


Figure-28: Poor coverage & no coverage locations in auto-selection mode (5G/4G/3G/2G) voice- Airtel.

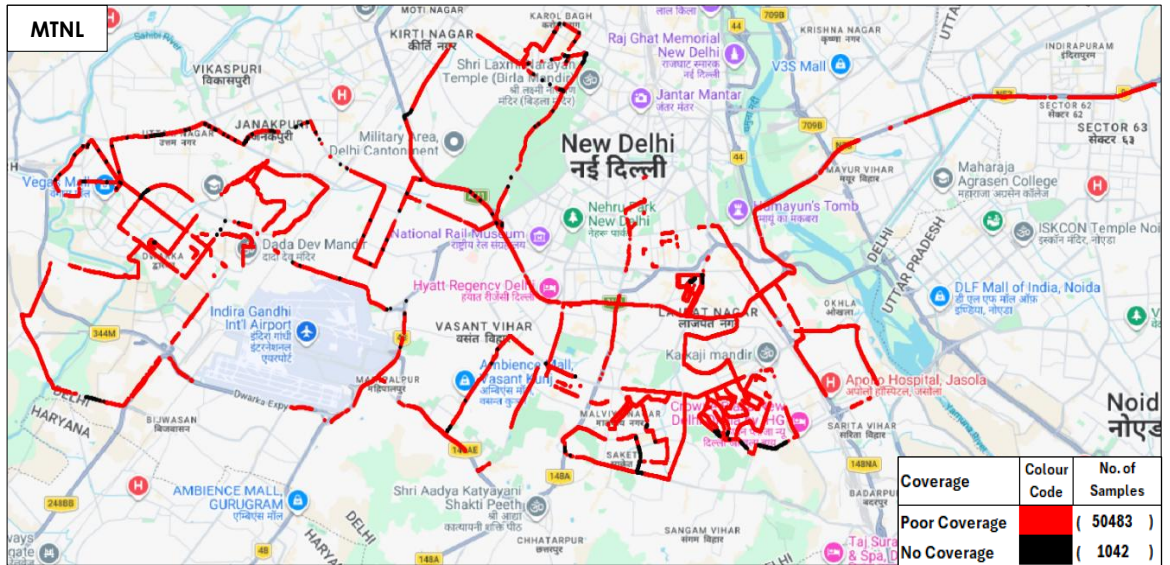


Figure-29: Poor coverage & no coverage locations in auto-selection mode (5G/4G/3G/2G) voice- MTNL.

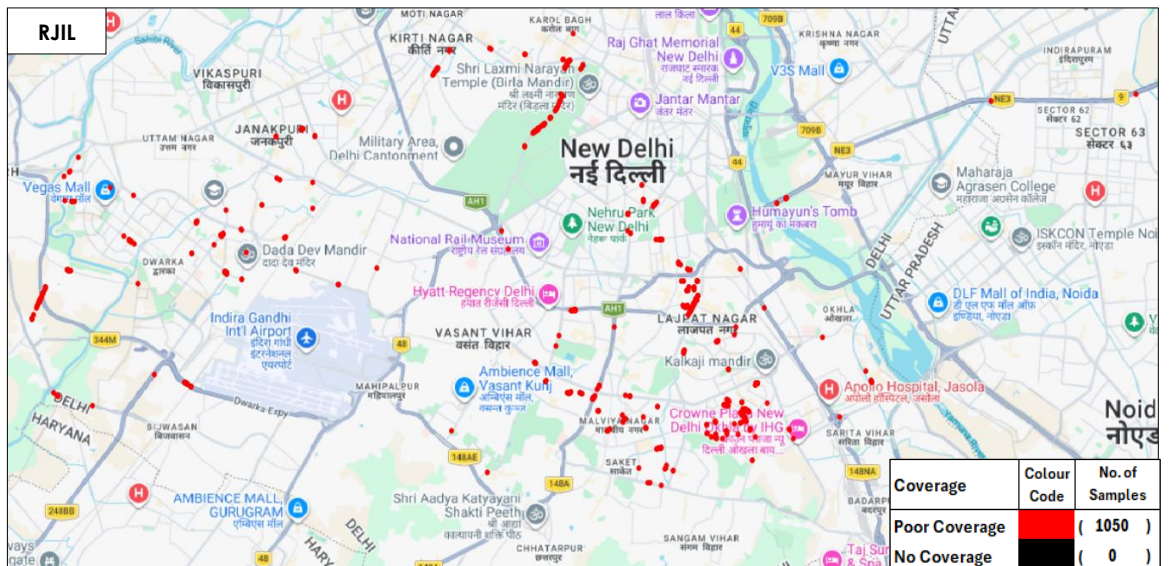


Figure-30: Poor coverage & no coverage locations in auto-selection mode (5G/4G/3G/2G) voice- RJIL.

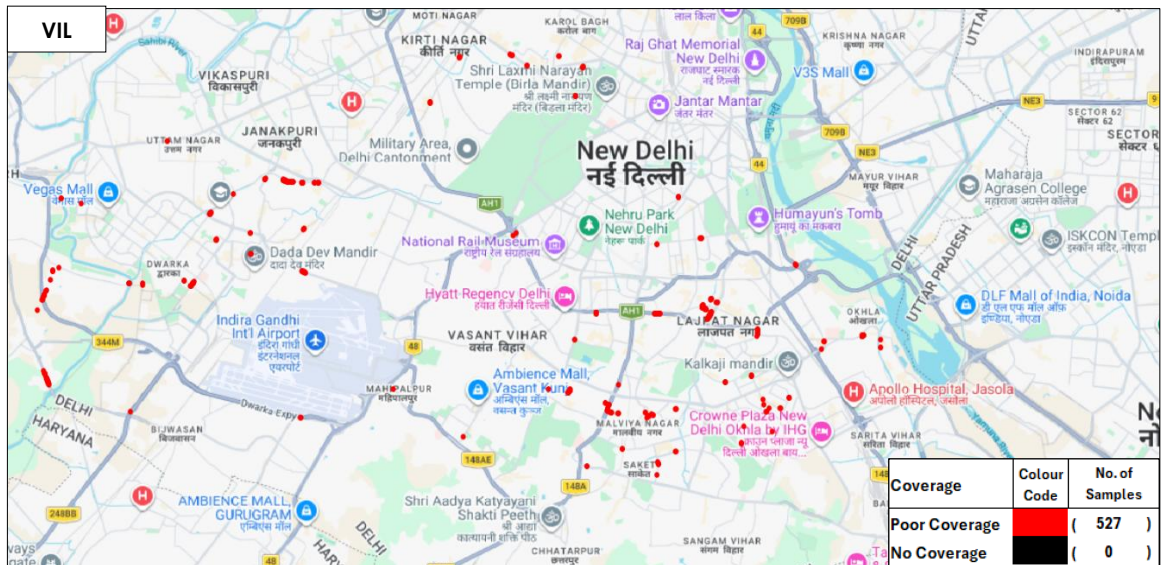


Figure-31: Poor coverage & no coverage locations in auto-selection mode (5G/4G/3G/2G) voice- VIL.

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	MTNL	RJIL	VIL
Download Throughput (Mbps/s)	Average	176.82	4.69	257.03	35.07
	80th Percentile	255.55	6.86	422.93	45.51
	20th Percentile	65.92	1.96	92.40	25.47
Upload Throughput (Mbps/s)	Average	24.83	1.15	18.98	20.70
	80th Percentile	41.58	2.23	34.82	36.78
	20th Percentile	5.56	0.09	2.76	4.97
Latency (ms)	50th Percentile	41.66	21.38	23.25	40.87

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

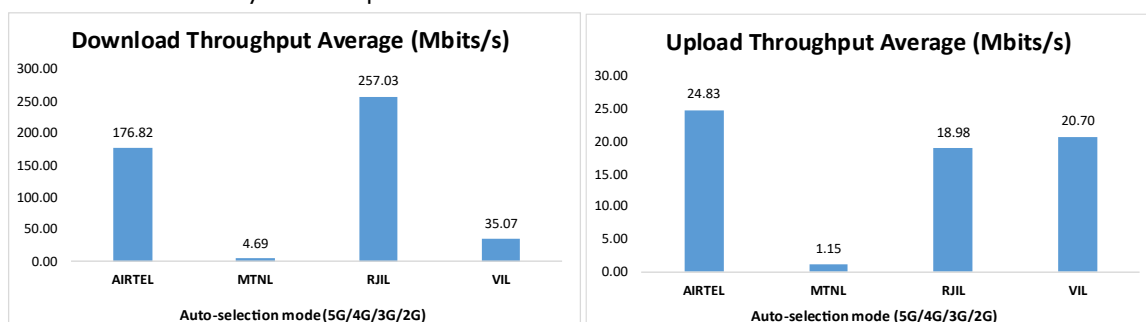


Figure- 32: Download & Upload throughput.

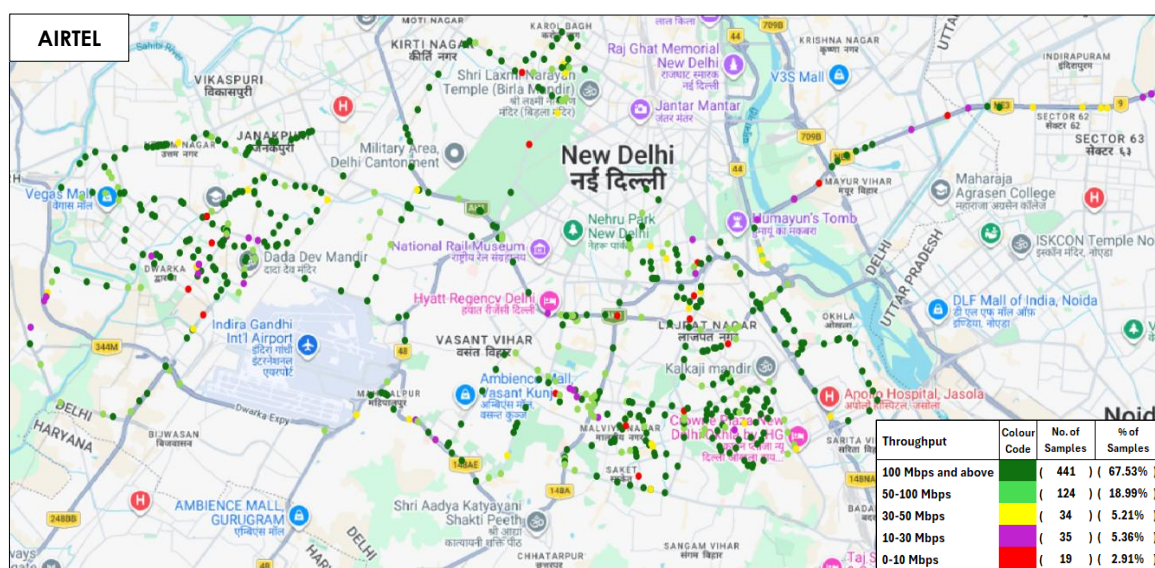


Figure-33: Download throughput distribution auto-selection mode (5G/4G/3G/2G) – AIRTEL

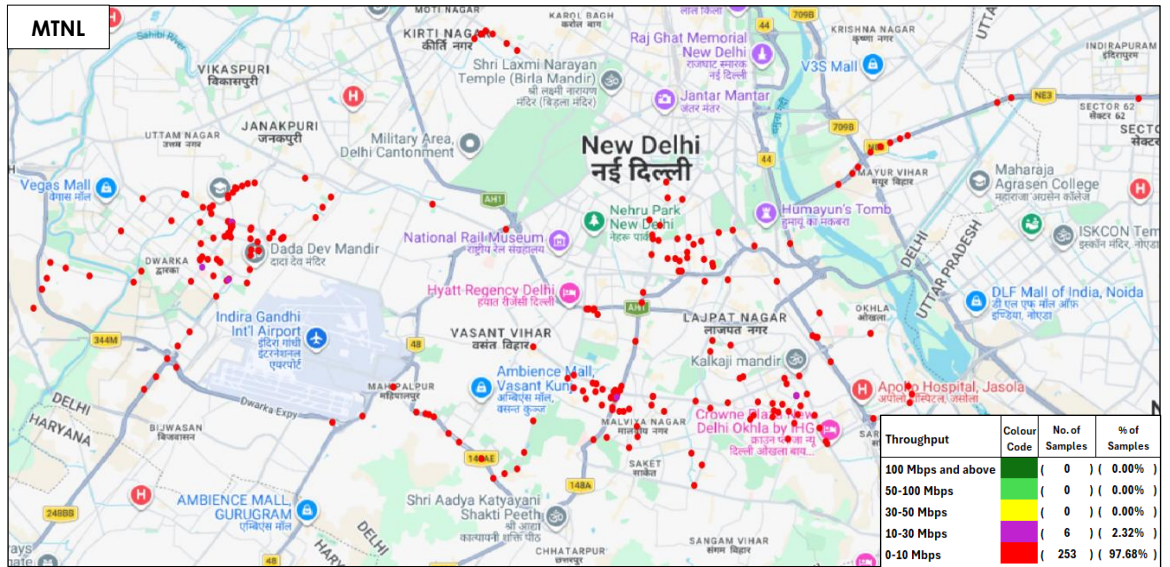


Figure-34: Download throughput distribution auto-selection mode (5G/4G/3G/2G) - MTNL

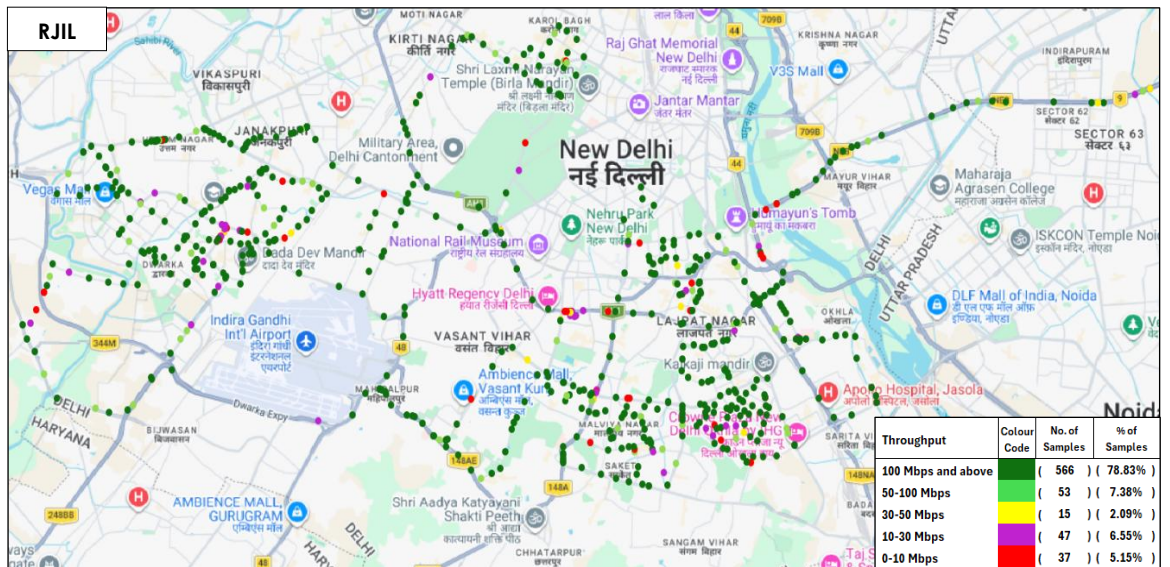


Figure-35: Download throughput distribution auto-selection mode (5G/4G/3G/2G) - RJIL

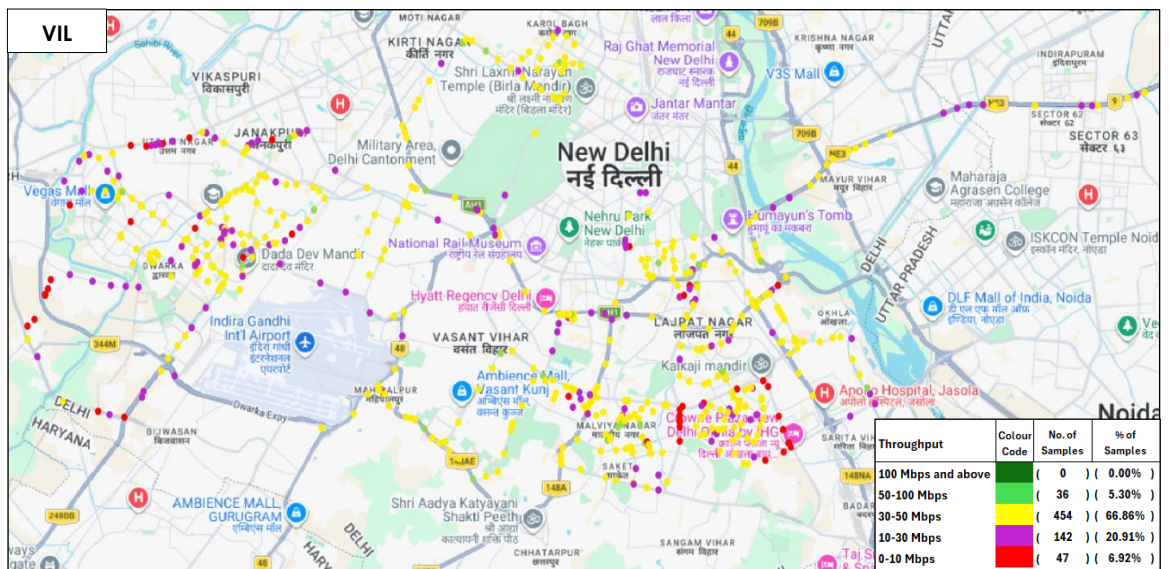


Figure-36: Download throughput distribution auto-selection mode (5G/4G/3G/2G) - VIL

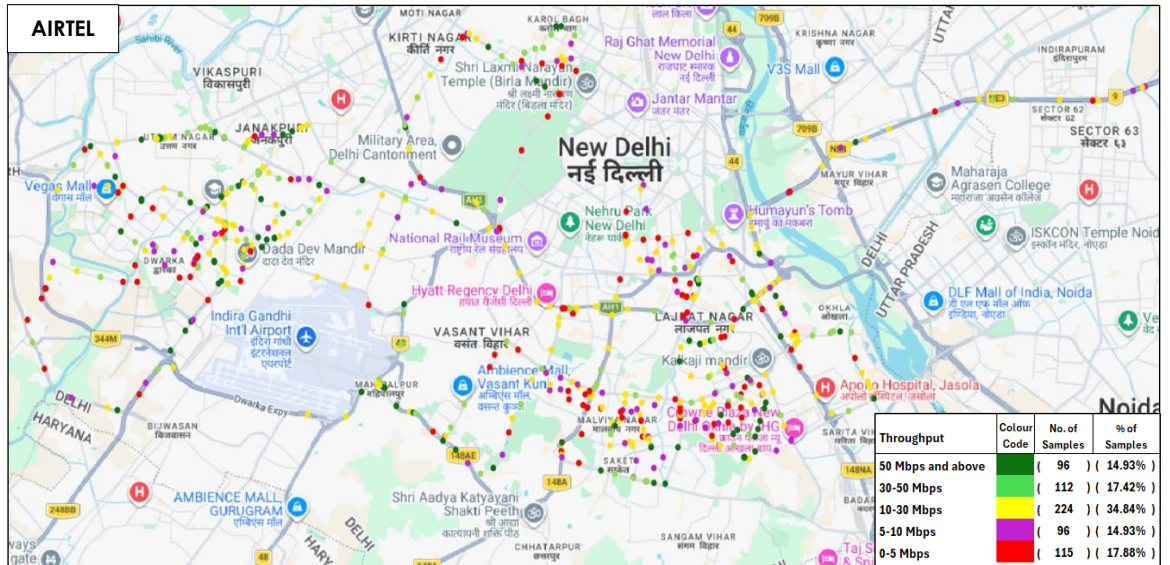


Figure-37: Upload throughput distribution auto-selection mode (5G/4G/3G/2G) - AIRTEL.

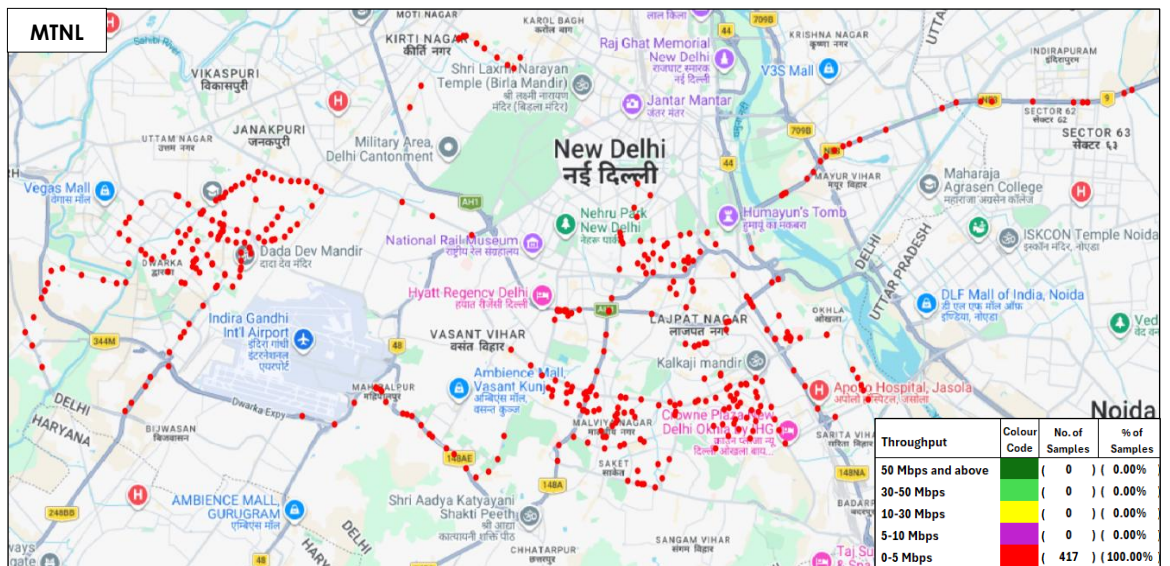


Figure-38: Upload throughput distribution auto-selection mode (5G/4G/3G/2G) - MTNL.

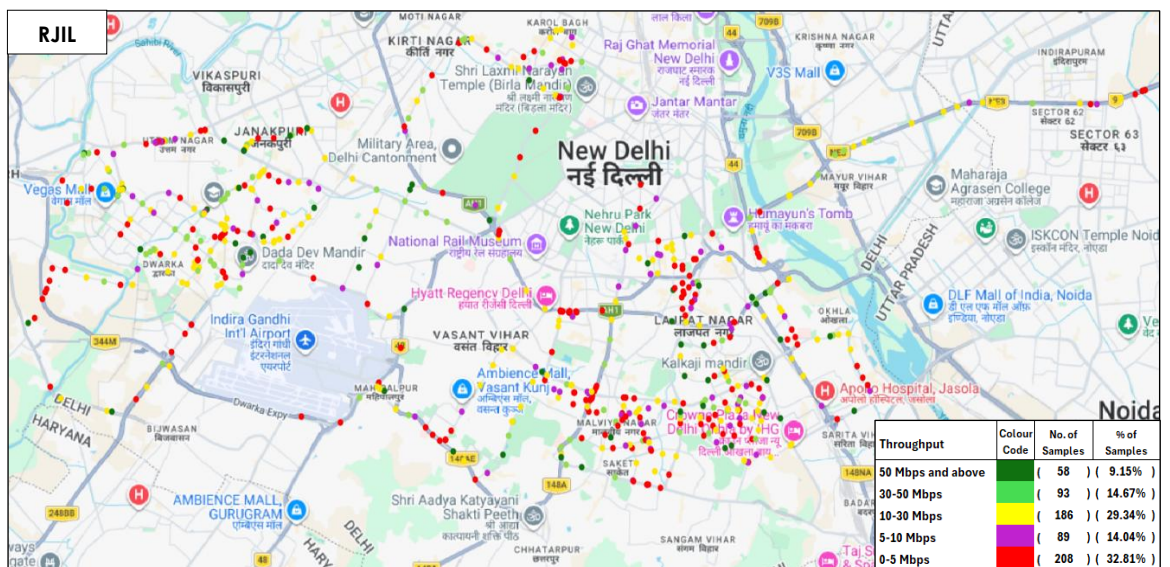


Figure-39: Upload throughput distribution auto-selection mode (5G/4G/3G/2G) - RJIL.

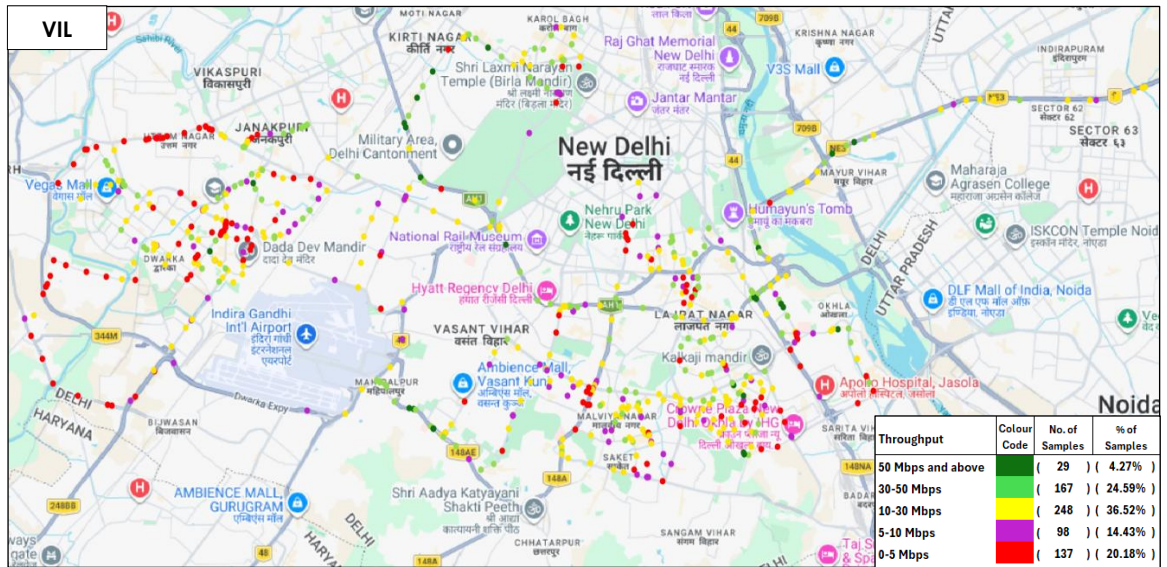


Figure-40: Upload throughput distribution auto-selection mode (5G/4G/3G/2G) - VIL.

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

Technology	Service Provider			
	AIRTEL	MTNL	RJIL	VIL
5G	85.25%	NA	94.33%	75.31%
4G	14.74%	NA	5.67%	24.67%
3G	NA	96.62%	NA	NA
2G	0.00%	0.39%	NA	0.01%
Limited Service	0.01%	2.99%	0.00%	0.01%

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.

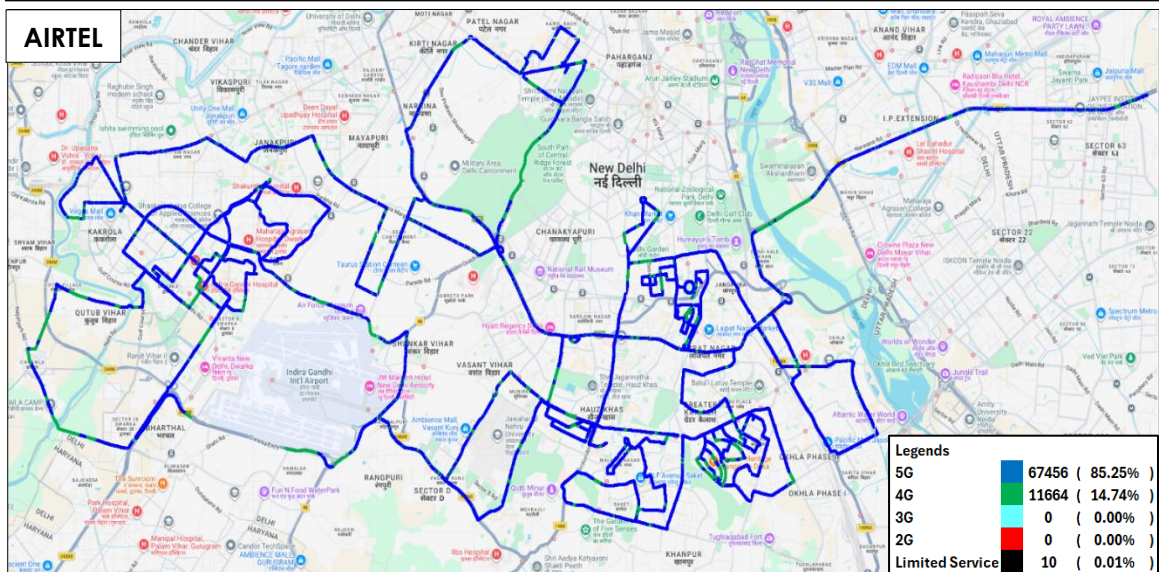


Figure-41: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - AIRTEL.

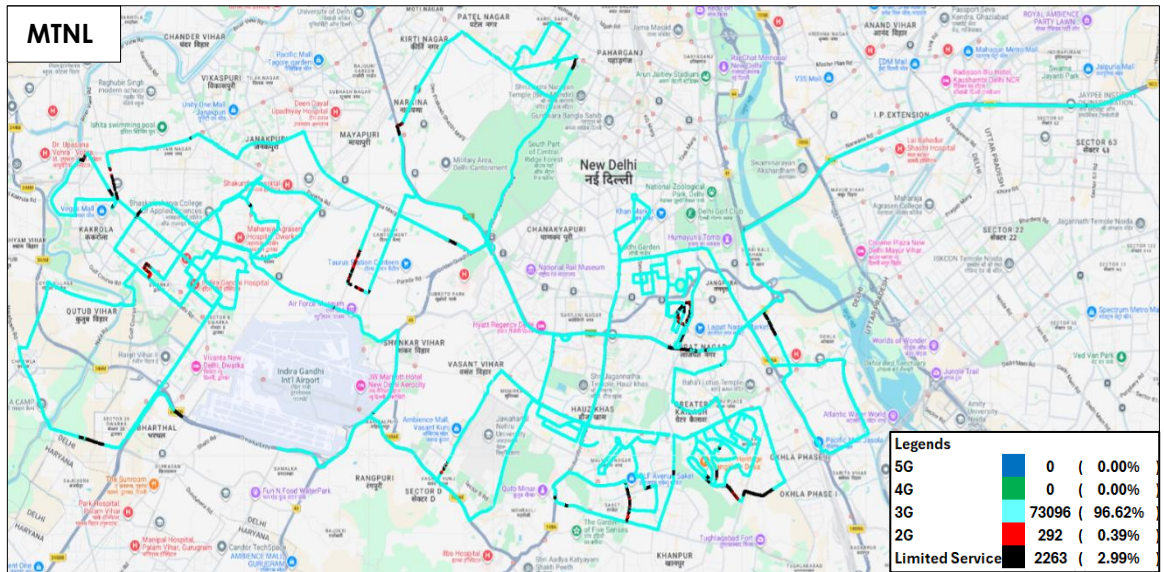


Figure-42: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - MTNL.

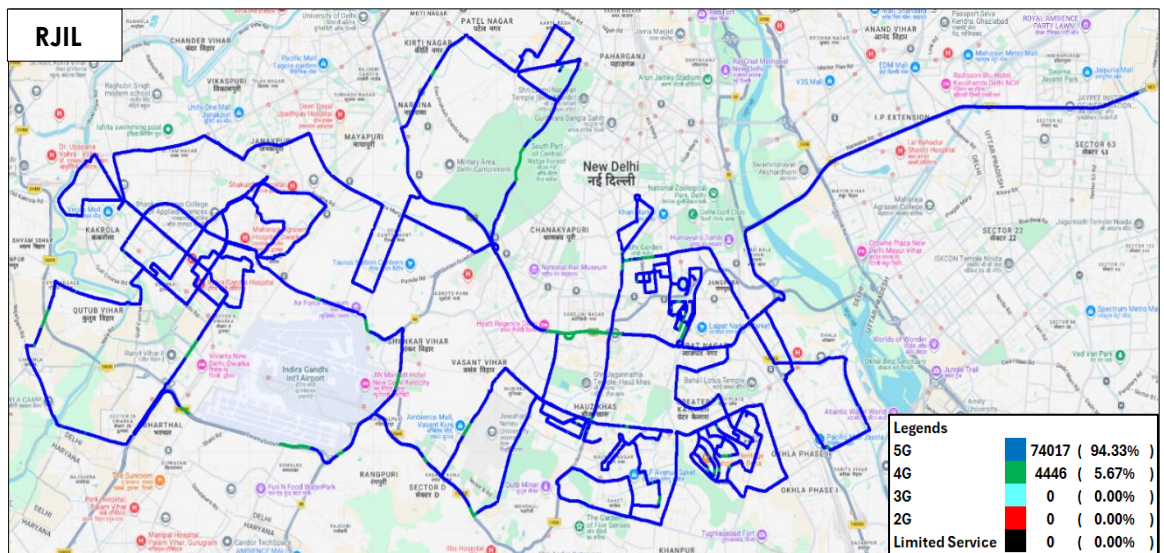


Figure-43: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - RJIL.

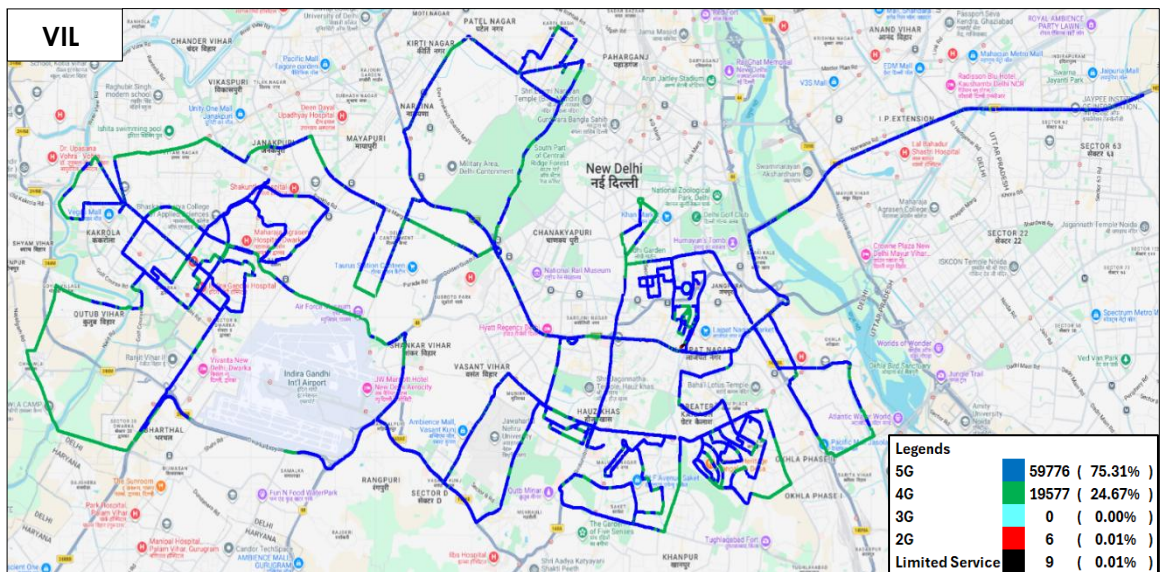


Figure-44: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - VIL.

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

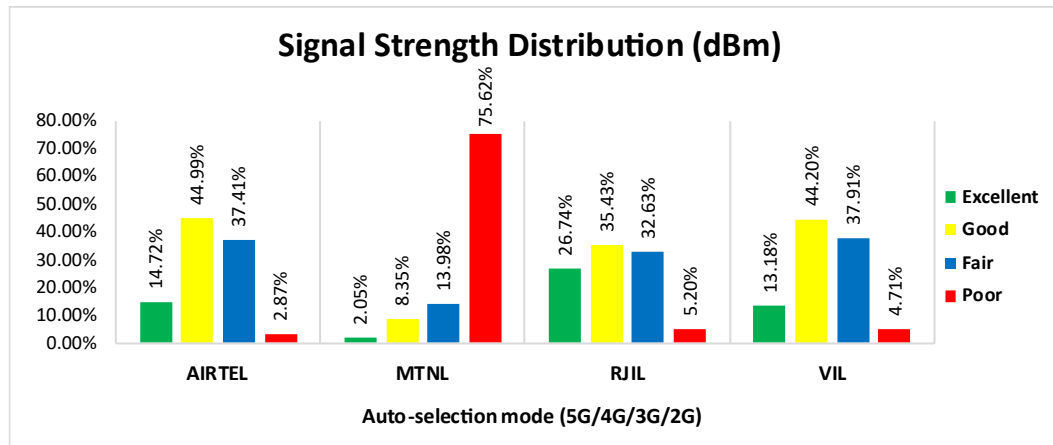


Figure-45: Signal strength distribution auto-selection mode (5G/4G/3G/2G) data.

Observations:

- Airtel has 15% of samples falling in the excellent signal strength category.
- MTNL has 2% of samples falling in the excellent signal strength category.
- RJIL has 27% of samples falling in the excellent signal strength category.
- VIL has 13% of samples falling in the excellent signal strength category.

4.3 Hotspots

Hotspot testing has been done on 10th July 2026. Six locations have been tested in South Delhi. (Refer Table-1)

4.3.1 Locations

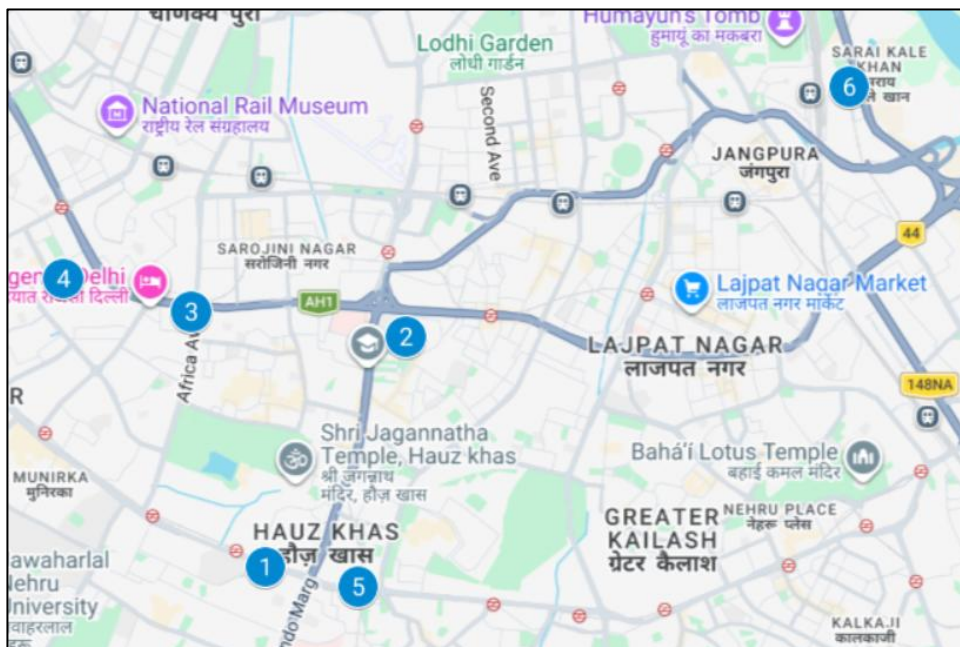


Figure- 46: Hotspot locations

4.3.2 Hotspot covered

1. Administrative Building IIT Delhi
2. AIIMS OPD Area
3. Bhikaji Cama Place Metro Station
4. Delhi Public School R.K Puram
5. Hauz Khas Metro Station
6. ISBT Sarai Kale Khan

4.3.3 Voice performance

Overall Voice Performance				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Call Attempt	60	60	60	60
Call Setup Success Rate %	100.00	96.67	100.00	100.00
Drop Call Rate %	0.00	5.17	0.00	0.00
Call Setup Time-Average (Second)	0.68	3.18	0.66	0.51

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

Administrative Building IIT Delhi				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	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	2.92	0.56	0.51

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

AIIMS OPD Area				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	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)	0.66	3.95	0.64	0.42

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

Bhikaji Cama Place Metro Station				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	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)	0.71	2.56	0.52	0.50

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

Delhi Public School R.K Puram				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	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)	0.72	3.01	0.47	0.45

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

Hauz Khas Metro Station				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	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)	0.71	2.89	0.51	0.65

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

ISBT Sarai Kale Khan				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	80.00	100.00	100.00
Drop Call Rate %	0.00	37.50	0.00	0.00
Call Setup Time-Average (Second)	0.66	3.86	1.28	0.53

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

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

Overall Data Performance				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Download Throughput Average (Mbits/s)	157.60	5.91	254.25	37.65
Download Throughput 80th Percentile (Mbit/s)	223.17	8.80	404.59	48.35
Download Throughput 20th Percentile (Mbit/s)	68.69	2.12	106.22	23.53
Download Session Setup Success Rate %	100.00	56.67	100.00	100.00
Upload Throughput Average (Mbits/s)	31.10	1.62	19.28	35.85
Upload Throughput 80th Percentile (Mbit/s)	50.04	3.95	23.15	50.70
Upload Throughput 20th Percentile (Mbit/s)	8.96	0.25	2.22	23.26
Upload Session Setup Success Rate %	100.00	70.00	100.00	100.00
Web Browsing Delay (Second)	4.57	3.74	3.71	5.15
Youtube Initial Buffer Delay (Second)	1.39	2.18	1.09	1.00
Latency (ms) - 50th Percentile	50.05	20.36	23.30	38.02
Jitter (ms)	9.44	39.23	9.60	11.13
Packet Loss Rate%	6.98	48.03	1.47	0.97
Packet Loss Rate- 90th percentile	5.24	100.00	4.20	1.84

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

Administrative Building IIT Delhi				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Download Throughput Average (Mbits/s)	284.01	9.14	461.36	46.33
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	17.42	4.15	20.42	34.20
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	2.69	1.97	2.76	5.27
Youtube Initial Buffer Delay (Second)	0.75	1.20	0.92	0.81
Latency (ms) - 50th Percentile	67.10	13.57	37.56	39.80
Jitter (ms)	6.82	5.94	8.26	38.67
Packet Loss Rate%	1.00	27.30	2.20	5.00

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

AIIMS OPD Area				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Download Throughput Average (Mbits/s)	77.27	-	51.25	15.85
Download Session Setup Success Rate %	100.00	0.00	100.00	100.00
Upload Throughput Average (Mbits/s)	7.79	0.39	2.09	11.91
Upload Session Setup Success Rate %	100.00	40.00	100.00	100.00
Web Browsing Delay (Second)	4.32	-	7.07	4.93
Youtube Initial Buffer Delay (Second)	1.19	-	-	0.92
Latency (ms) - 50th Percentile	52.40	-	50.90	31.78
Jitter (ms)	5.81	-	15.32	6.83
Packet Loss Rate%	2.80	100.00	4.10	0.20

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

Note- "-Download, Web browsing, Youtube & ping tests were failed.

Bhikaji Cama Place Metro Station				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Download Throughput Average (Mbits/s)	133.34	2.30	113.77	45.01
Download Session Setup Success Rate %	100.00	80.00	100.00	100.00
Upload Throughput Average (Mbits/s)	47.85	0.92	23.36	30.63
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	3.62	4.22	3.74	5.79
Youtube Initial Buffer Delay (Second)	0.88	4.61	1.10	2.17
Latency (ms) – 50 th Percentile	49.02	-	22.13	38.97
Jitter (ms)	10.92	-	6.05	5.66
Packet Loss Rate%	0.60	52.10	0.00	0.10

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

Note- “-”Ping tests were failed.

Delhi Public School R.K Puram				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Download Throughput Average (Mbits/s)	54.89	1.49	345.55	47.91
Download Session Setup Success Rate %	100.00	60.00	100.00	100.00
Upload Throughput Average (Mbits/s)	7.56	0.49	18.80	35.27
Upload Session Setup Success Rate %	100.00	40.00	100.00	100.00
Web Browsing Delay (Second)	6.81	8.29	3.50	6.03
Youtube Initial Buffer Delay (Second)	1.81	-	0.86	0.71
Latency (ms) - 50th Percentile	49.94	22.04	18.81	36.43
Jitter (ms)	16.98	87.00	2.23	4.62
Packet Loss Rate%	1.60	8.20	0.00	0.30

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

Note- “-”Youtube tests were failed.

Hauz Khas Metro Station				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Download Throughput Average (Mbits/s)	216.63	8.24	327.10	31.33
Download Session Setup Success Rate%	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	68.21	1.27	11.58	54.17
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	4.49	2.64	3.08	1.19
Youtube Initial Buffer Delay (Second)	1.78	-	1.25	0.74
Latency (ms)- 50th Percentile	53.72	15.40	24.56	37.53
Jitter (ms)	11.56	24.76	13.47	6.21
Packet Loss Rate%	35.10	0.60	1.90	0.00

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

Note- “-”Youtube tests were failed.

ISBT Sarai Kale Khan				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Download Throughput Average (Mbits/s)	179.49	-	226.44	39.48
Download Session Setup Success Rate %	100.00	0.00	100.00	100.00
Upload Throughput Average (Mbits/s)	37.74	0.32	61.96	48.92
Upload Session Setup Success Rate %	100.00	40.00	100.00	100.00
Web Browsing Delay (Second)	5.59	12.04	2.56	6.37
Youtube Initial Buffer Delay (Second)	1.93	-	1.38	0.66
Latency (ms) – 50 th Percentile	43.46	-	21.75	38.78
Jitter (ms)	4.56	-	12.26	4.81
Packet Loss Rate%	0.80	100.00	0.60	0.20

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

Note- “-” Download, Youtube & Ping tests were failed.

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

Overall Data Performance					
Parameters		Service Provider			
		AIRTEL	MTNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	142.81	-	223.17	40.10
	Upload Throughput Average (Mbits/s)	37.38	-	20.92	41.63
4G	Download Throughput Average (Mbits/s)	17.74	-	57.11	26.93
	Upload Throughput Average (Mbits/s)	8.92	-	12.50	8.96

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

Note- “-”Respective technology was not observed during the test.

Administrative Building IIT Delhi					
Parameters		Service Provider			
		AIRTEL	MTNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	219.55	-	197.84	41.43
	Upload Throughput Average (Mbits/s)	24.85	-	8.02	37.28
4G	Download Throughput Average (Mbits/s)	10.70	-	42.87	37.27
	Upload Throughput Average (Mbits/s)	7.70	-	10.83	15.80

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

Note- “-”Respective technology was not observed during the test.

AIIMS OPD Area					
Parameters		Service Provider			
		AIRTEL	MTNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	67.04	-	38.14	-
	Upload Throughput Average (Mbits/s)	15.58	-	4.96	-
4G	Download Throughput Average (Mbits/s)	22.00	-	63.27	8.77
	Upload Throughput Average (Mbits/s)	14.89	-	8.71	5.01

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

Note- “-”Respective technology was not observed during the test.

Bhikaji Cama Place Metro Station					
Parameters		Service Provider			
		AIRTEL	MTNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	126.90	-	188.53	48.76
	Upload Throughput Average (Mbits/s)	53.22	-	33.98	35.50
4G	Download Throughput Average (Mbits/s)	9.89	-	59.84	30.15
	Upload Throughput Average (Mbits/s)	5.48	-	25.76	2.92

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

Note- “-”Respective technology was not observed during the test.

Delhi Public School R.K Puram					
Parameters		Service Provider			
		AIRTEL	MTNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	37.87	-	335.16	48.89
	Upload Throughput Average (Mbits/s)	13.07	-	24.63	36.77
4G	Download Throughput Average (Mbits/s)	21.87	-	39.24	36.43
	Upload Throughput Average (Mbits/s)	8.28	-	6.82	12.79

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

Note- “-”Respective technology was not observed during the test.

Hauz Khas Metro Station					
Parameters		Service Provider			
		AIRTEL	MTNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	209.07	-	323.47	26.76
	Upload Throughput Average (Mbits/s)	53.39	-	38.04	50.46
4G	Download Throughput Average (Mbits/s)	10.45	-	72.88	21.74
	Upload Throughput Average (Mbits/s)	9.23	-	16.09	12.18

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

Note- “-”Respective technology was not observed during the test.

ISBT Sarai Kale Khan					
Parameters		Service Provider			
		AIRTEL	MTNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	185.14	-	218.86	34.65
	Upload Throughput Average (Mbits/s)	45.10	-	68.58	48.15
4G	Download Throughput Average (Mbits/s)	31.52	-	64.55	27.25
	Upload Throughput Average (Mbits/s)	7.91	-	15.81	5.05

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

Note- “-”Respective technology was not observed during the test.

4.4 Walk Test

Walk Test has been conducted on 10th July 2026. Three locations have been tested in South Delhi. (Refer Table-1)

4.4.1 Walk test locations

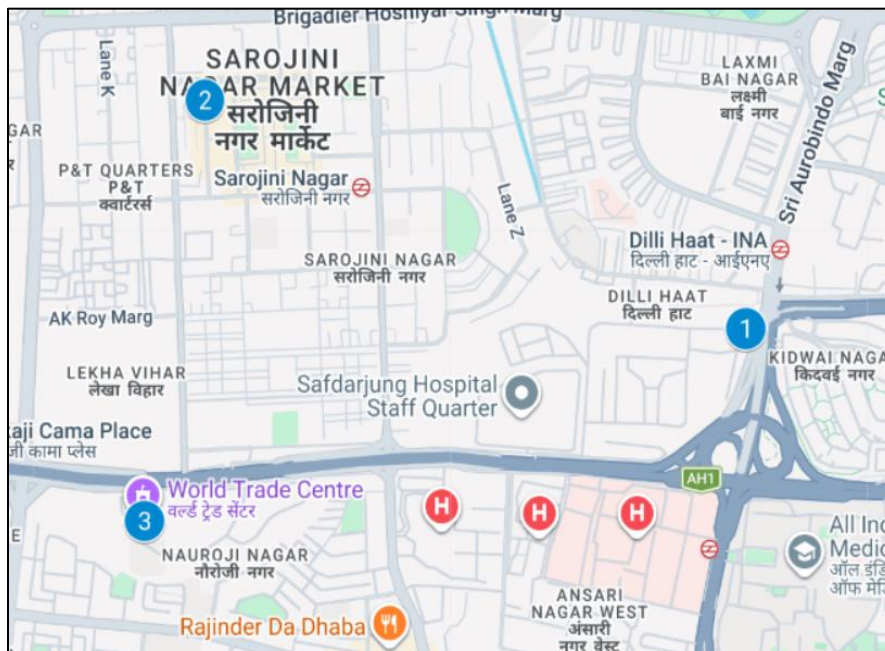


Figure-47: Walk Test locations.

4.4.2 Walk Test Covered

1. Dilli Haat INA
2. Sarojini Nagar Market
3. WTC Nauroji Nagar

4.4.3 Voice Performance

Dilli Haat INA				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Call Attempt	15	15	15	15
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	3.10	0.55	0.52

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

Sarojini Nagar Market				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Call Attempt	14	14	14	14
Call Setup Success Rate %	100.00	85.71	100.00	100.00
Drop Call Rate %	0.00	16.67	0.00	0.00
Call Setup Time-Average (Second)	0.66	7.00	0.56	0.49

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

WTC Nauroji Nagar				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Call Attempt	29	28	29	29
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)	0.76	3.03	0.73	0.52

Table-44: 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)

Dilli Haat INA				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Download Throughput Average (Mbits/s)	141.76	5.40	396.10	43.82
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	29.81	3.51	22.34	41.03
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Latency (ms) - 50th Percentile	54.06	17.93	26.26	39.92

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

Sarojini Nagar Market				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Download Throughput Average (Mbits/s)	164.59	1.68	364.70	33.11
Download Session Setup Success Rate %	100.00	53.33	100.00	100.00
Upload Throughput Average (Mbits/s)	21.42	0.75	33.74	25.69
Upload Session Setup Success Rate %	100.00	78.57	100.00	100.00
Latency (ms) - 50th Percentile	51.43	31.10	27.30	40.43

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

WTC Nauroji Nagar				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Download Throughput Average (Mbits/s)	118.03	6.05	200.36	41.78
Download Session Setup Success Rate %	100.00	89.66	92.86	100.00
Upload Throughput Average (Mbits/s)	22.56	2.08	15.18	30.00
Upload Session Setup Success Rate %	100.00	100.00	96.43	100.00
Latency (ms) - 50th Percentile	49.14	18.40	23.08	39.67

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

5. Voice & Data Key findings

5.1 Overall Voice

1. Call Setup Success Rate:

- a) Airtel, MTNL and VIL have 90.79%, 90.88% and 99.25% call setup success rate respectively in 3G/2G network mode. (refer table-3)
- b) Airtel, MTNL, RJIL and VIL have 99.88%, 90.00%, 99.88% and 99.88% call setup success rate respectively in auto-selection mode (5G/4G/3G/2G). (refer table-5)
- c) All Operators have 100.00% call setup success rate while calling on peer service provider's network for inter-operator calls. (refer table-9)

2. Call Setup Time:

- a) Airtel, MTNL and VIL call setup time is 3.22, 2.87 & 3.19 seconds respectively in 3G/2G network mode. (refer table-3)
- b) Airtel, MTNL, RJIL & VIL call setup time is 0.74, 3.12, 0.66 & 0.53 seconds respectively in auto-selection mode (5G/4G/3G/2G). (refer table-5)

3. Call Silence/Mute Rate:

In packet switched network (4G/5G) RJIL, Airtel & VIL have 1.23%, 0.76% & 0.76 silence call rate respectively. Further RJIL has higher RTP packet loss rate in downlink (1.33%) compared to VIL (0.54%) & Airtel (0.25%). In uplink the RTP packet loss rate is higher for RJIL (1.22%) compared to VIL (0.51%) & Airtel (0.36%). (refer table-6)

4. Drop Call Rate:

- a) Airtel, MTNL and VIL drop call rate is 1.11%, 15.05% and 2.10% respectively in 3G/2G network mode. (refer table-3)
- b) Airtel, MTNL, RJIL and VIL drop call rate is 0.37%, 13.44%, 0.12% and 0.37% 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, MTNL, RJIL and VIL average download speeds are 173.09 Mbps, 4.82 Mbps, 259.70 Mbps and 35.53 Mbps respectively. (refer table-11)
- b) Airtel, MTNL, RJIL and VIL average upload speeds are 25.05 Mbps, 1.28 Mbps, 19.13 Mbps and 22.07 Mbps respectively. (refer table-11)

2. Data download and upload performance (static i.e. while stationary):

- a) Airtel, MTNL, RJIL and VIL average download speeds are 157.60 Mbps, 5.91 Mbps, 254.25 Mbps and 37.65 Mbps respectively. (refer table-28)
- b) Airtel, MTNL, RJIL and VIL average upload speeds are 31.10 Mbps, 1.62 Mbps, 19.28 Mbps and 35.85 Mbps respectively. (refer table-28)

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

- a) Airtel, MTNL, RJIL and VIL have 100.00%, 56.67%, 100.00% and 100.00% download session setup success rate respectively. (refer table-28)
- b) Airtel, MTNL, RJIL and VIL have 100.00%, 70.00%, 100.00% and 100.00% upload session setup success rate respectively. (refer table-28)

5.3 Operator wise Key Findings

1. Airtel:

Voice

- 90.79% call setup success rate and 1.11% drop call rate have been observed in 3G/2G network mode for LSA/city drive. (refer table-3 & 13)
- 99.88% call setup success rate and 0.37% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for LSA. (refer table-5)
- 99.85% call setup success rate and 0.44% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for city drive. (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. (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. (refer table-42, 43 & 44)

Data

- Airtel has 173.09 Mbps average download speed & 25.05 Mbps average upload speed for LSA. (refer table-11)
- Airtel has 176.82 Mbps average download speed & 24.83 Mbps average upload speed across the measured routes for city drive. (refer table-19)
- AIIMS OPD Area and Delhi Public School R.K Puram have less download speed (less than 100 Mbps) out of total 6 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-30 & 32)
- Administrative Building IIT Delhi, AIIMS OPD Area and Delhi Public School R.K Puram Station have less upload speed (less than 20 Mbps) out of total 6 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-29, 30 & 32)

2. MTNL:

Voice

- 90.88% call setup success rate and 15.05% drop call rate have been observed in 3G/2G network mode for LSA/city drive. (refer table-3 & 13)
- 90.00% call setup success rate and 13.44% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for LSA.(refer table-5)
- 88.96% call setup success rate and 14.98% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for city drive. (refer table-15)
- 96.67% call setup success rate and 5.17% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for all hotspot locations. (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 Dilli Haat INA & WTC Nauroji Nagar walk test locations. (refer table- 42 & 44)
- 85.71% call setup success rate and 16.67% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) at Sarojini Nagar Market walk test location. (refer table-43)

Data

- MTNL has 4.82 Mbps average download speed 1.28 Mbps average upload speed for LSA. (refer table-11)
- MTNL has 4.69 Mbps average download speed & 1.15 Mbps average upload speed across the measured routes for city drive. (refer table-19)
- All hotspot locations have less download speed (less than 10 Mbps) for auto-selection mode (5G/4G/3G/2G). (refer table-29 to 34)
- All hotspot locations have less upload speed (less than 2 Mbps) except Administrative Building IIT Delhi for auto-selection mode (5G/4G/3G/2G). (refer table-30, 31, 32, 33 & 34)
- All walk test locations have less download speed (less than 10 Mbps) for auto-selection mode (5G/4G/3G/2G). (refer table-45 to 47)
- Sarojini Nagar Market walk test location has less upload speed (less than 2 Mbps) out of total 3 walk test locations for auto-selection mode (5G/4G/3G/2G). (refer table-46)

3. RJIL:

Voice

- 99.88% call setup success rate and 0.12% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for LSA. (refer table-5)
- 99.85% call setup success rate and 0.15% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for city drive. (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. (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. (refer table-42, 43 & 44)

Data

- RJIL has 259.70 Mbps average download speed & 19.13 Mbps average upload speed for LSA. (refer table-11)
- RJIL has 257.03 Mbps average download speed & 18.98 Mbps average upload speed across the measured routes for city drive. (refer table-19)
- AIIMS OPD Area has less download speed (less than 100 Mbps) out of total 6 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-30)
- AIIMS OPD Area, Delhi Public School R.K Puram and Hauz Khas Metro Station have less upload speed (less than 20 Mbps) out of total 6 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-30, 32 & 33)
- WTC Nauroji Nagar has less upload speed (less than 20 Mbps) out of total 3 walk test locations for auto-selection mode (5G/4G/3G/2G). (refer table-47)

4. VIL:

Voice

- 99.25% call setup success rate and 2.10% drop call rate have been observed in 3G/2G network mode for LSA/city drive. (refer table-3 & 13)

- 99.88% call setup success rate and 0.37% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for LSA. (refer table-5)
- 99.86% call setup success rate and 0.44% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for city drive. (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. (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. (refer table-42, 43 & 44)

Data

- VIL has 35.53 Mbps average download speed & 22.07 Mbps average upload speed for LSA. (refer table-11)
- VIL has 35.07 Mbps average download speed & 20.70 Mbps average upload speed across the measured routes for city drive. (refer table-19)
- All hotspot locations have less download speed (less than 100 Mbps) for auto-selection mode (5G/4G/3G/2G). (refer table-29 to 34)
- AIIMS OPD Area has less upload speed (less than 20 Mbps) out of total 6 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table- 30)
- All Walk test locations have less download speed (less than 100 Mbps) for auto-selection mode (5G/4G/3G/2G). (refer table-45 to 47)

6. Annexure

6.1 Route wise coverage map

6.1.1 City

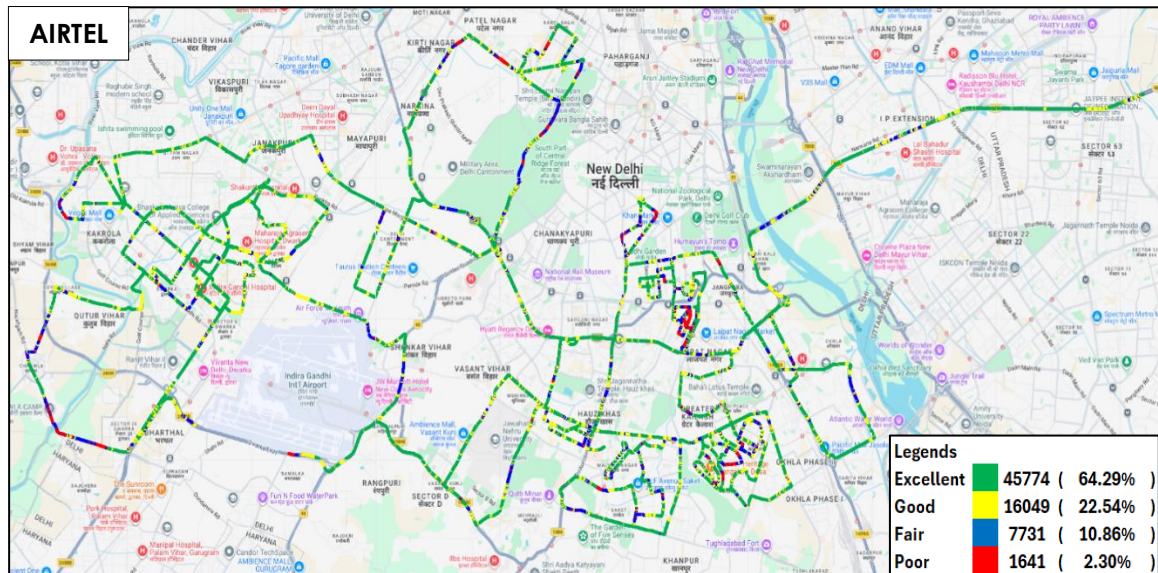


Figure-48: Signal strength 3G/2G network mode voice - AIRTEL.

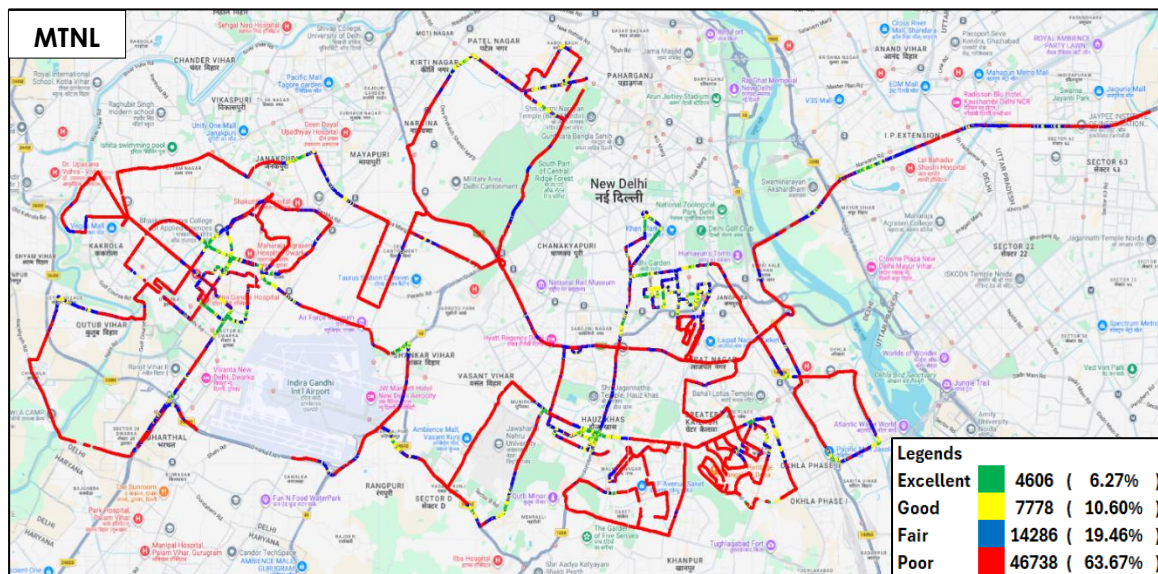


Figure-49: Signal strength 3G/2G network mode voice - MTNL.

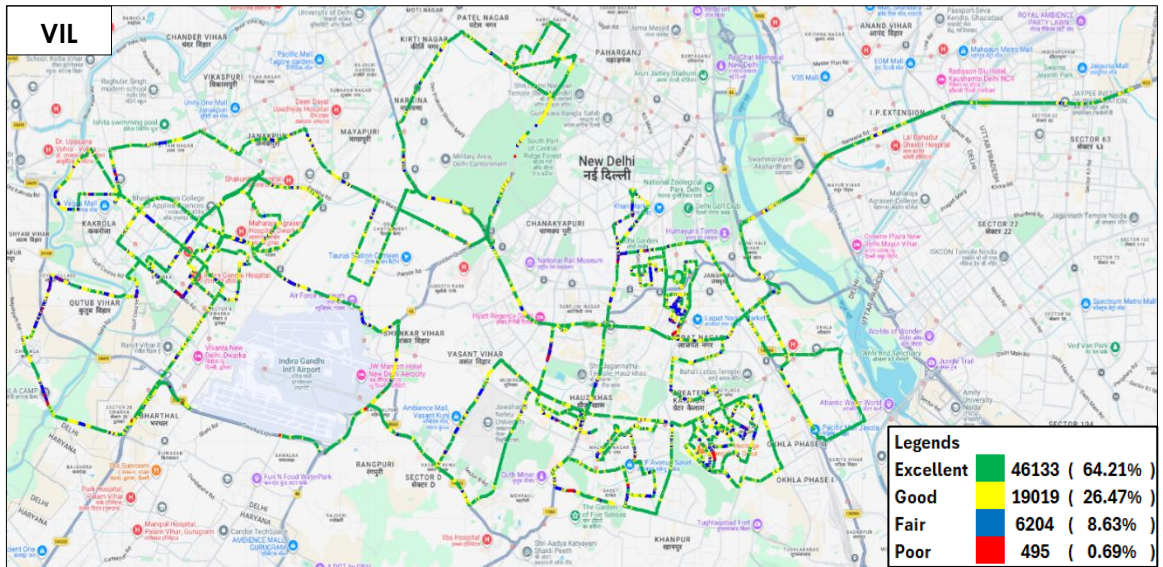


Figure-50: Signal strength 3G/2G network mode voice - VIL.

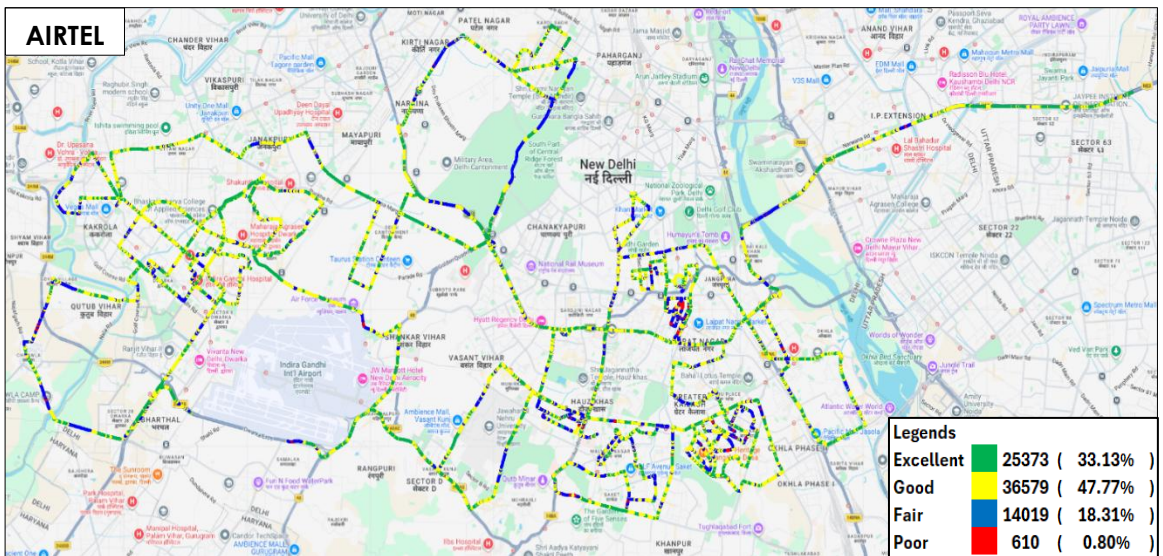


Figure-51: Signal strength auto-selection mode (5G/4G/3G/2G) voice - AIRTEL.

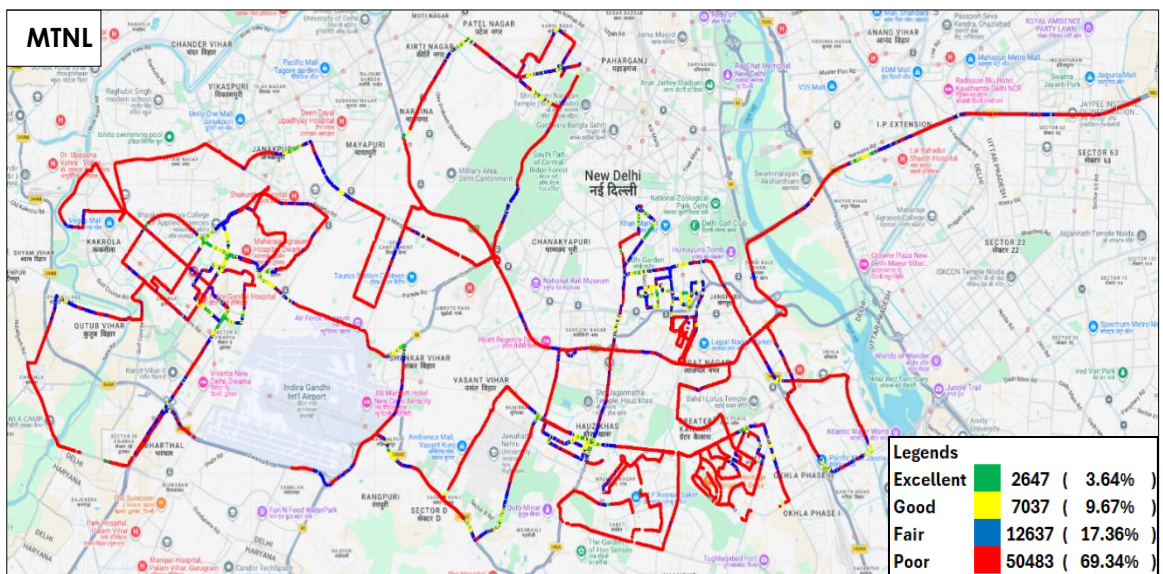


Figure-52: Signal strength auto-selection mode (5G/4G/3G/2G) voice - MTNL.

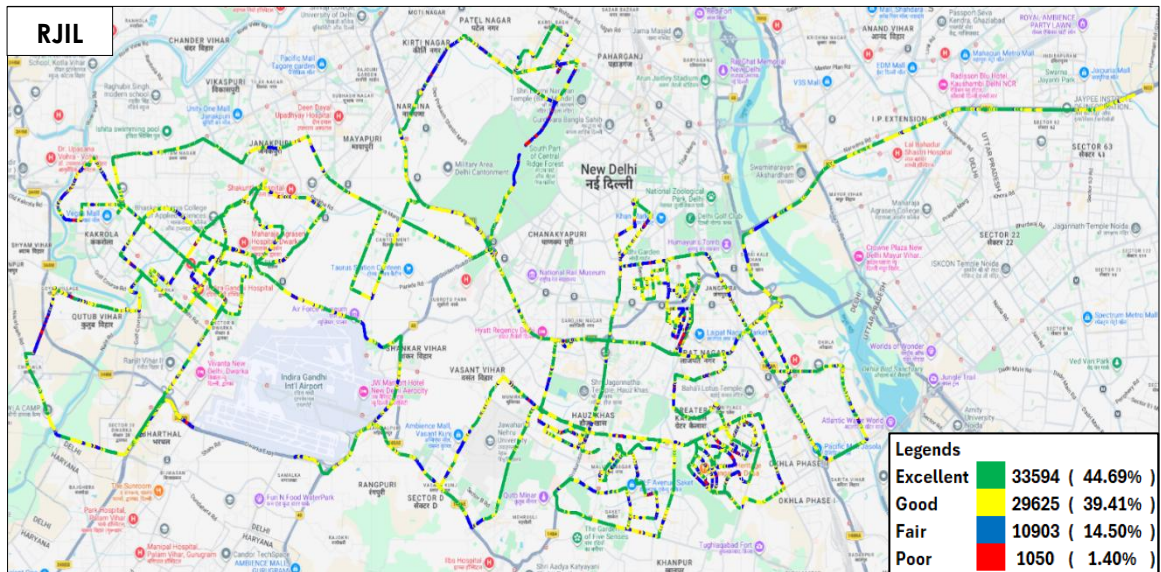


Figure-53: Signal strength auto-selection mode (5G/4G/3G/2G) voice - RJIL.

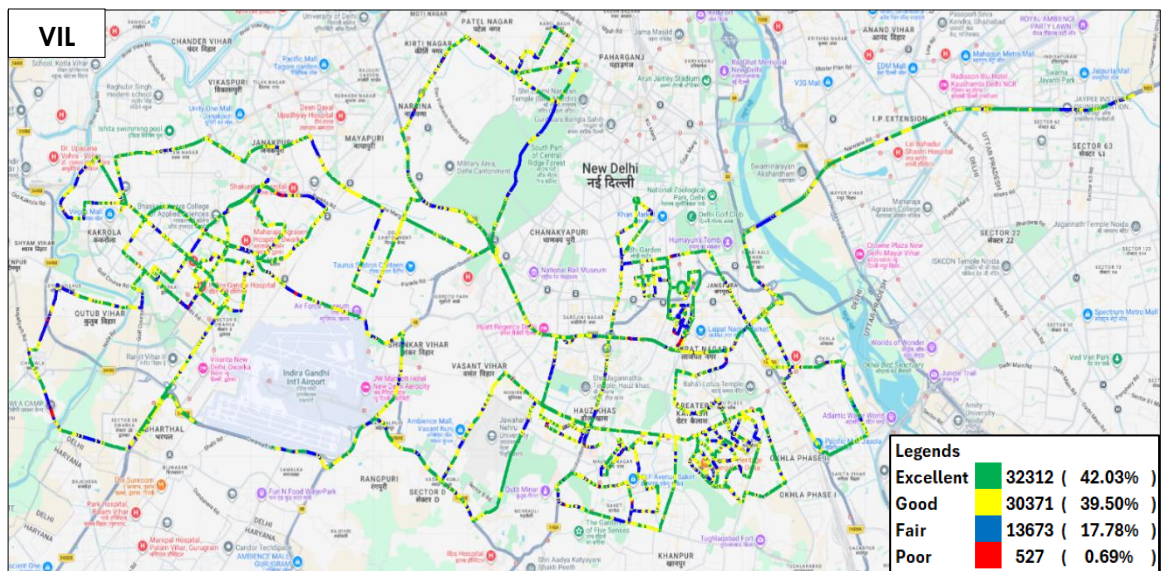


Figure-54: Signal strength auto-selection mode (5G/4G/3G/2G) voice - VIL.

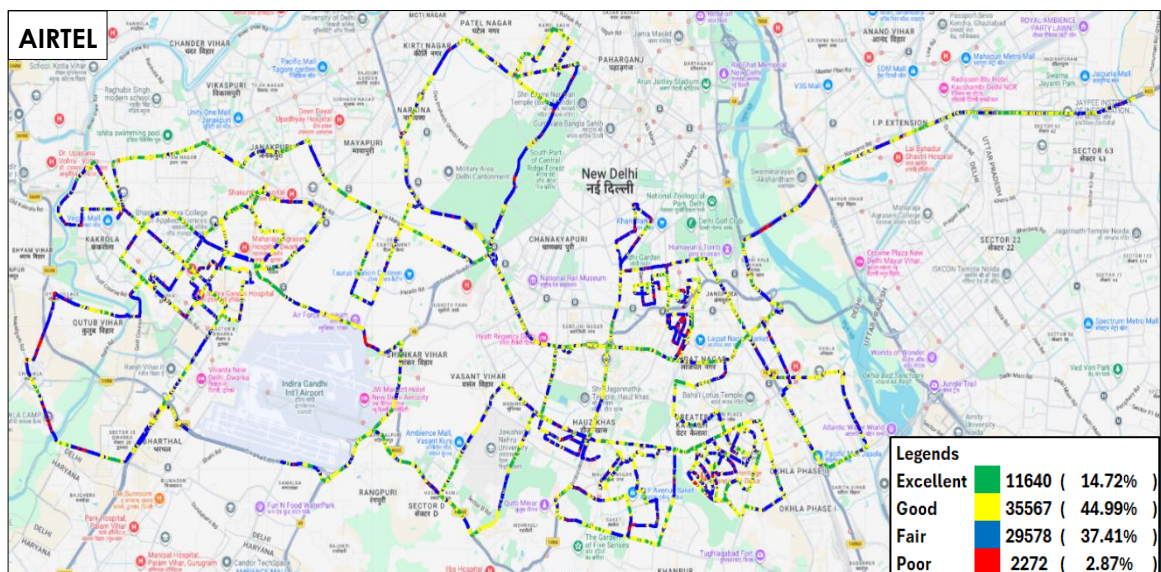


Figure-55: Signal strength auto-selection mode (5G/4G/3G/2G) data - AIRTEL.

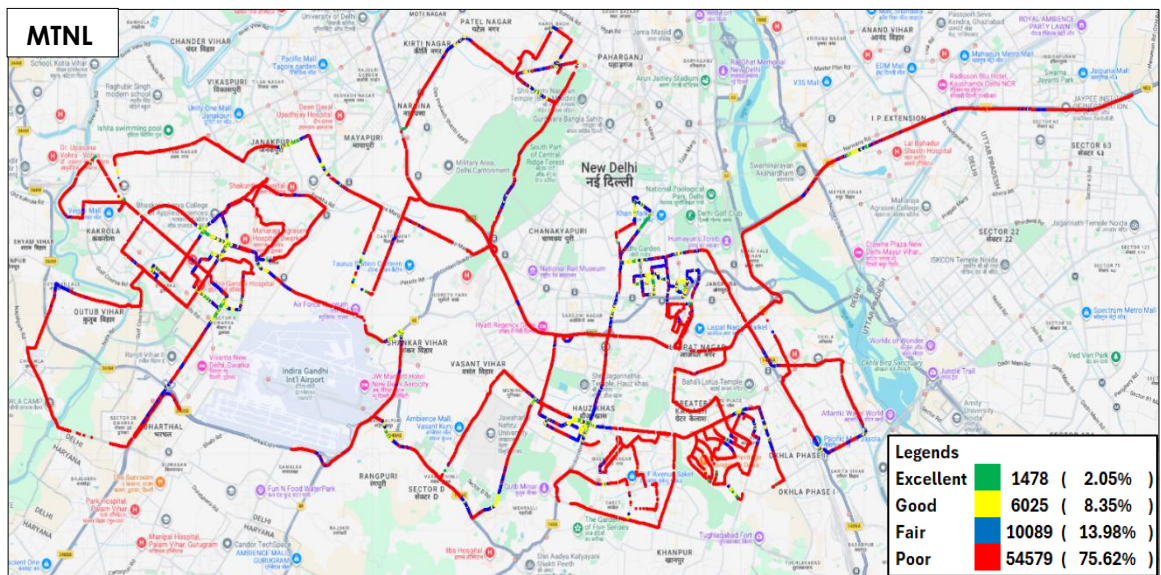


Figure-56: Signal strength auto-selection mode (5G/4G/3G/2G) data - MTNL.

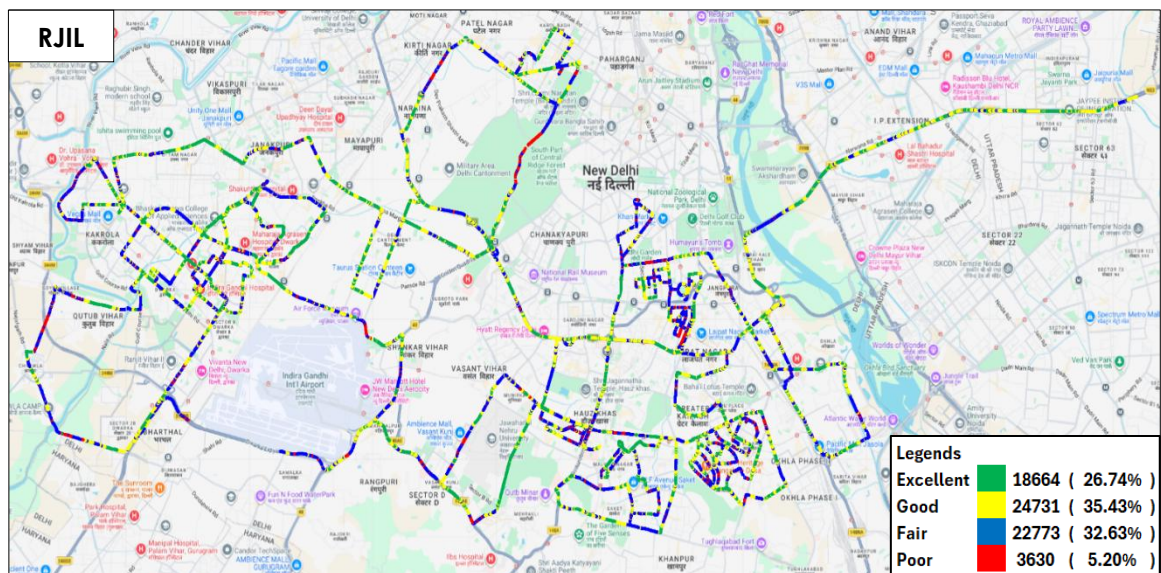


Figure-57: Signal strength auto-selection mode (5G/4G/3G/2G) data - RJIL.

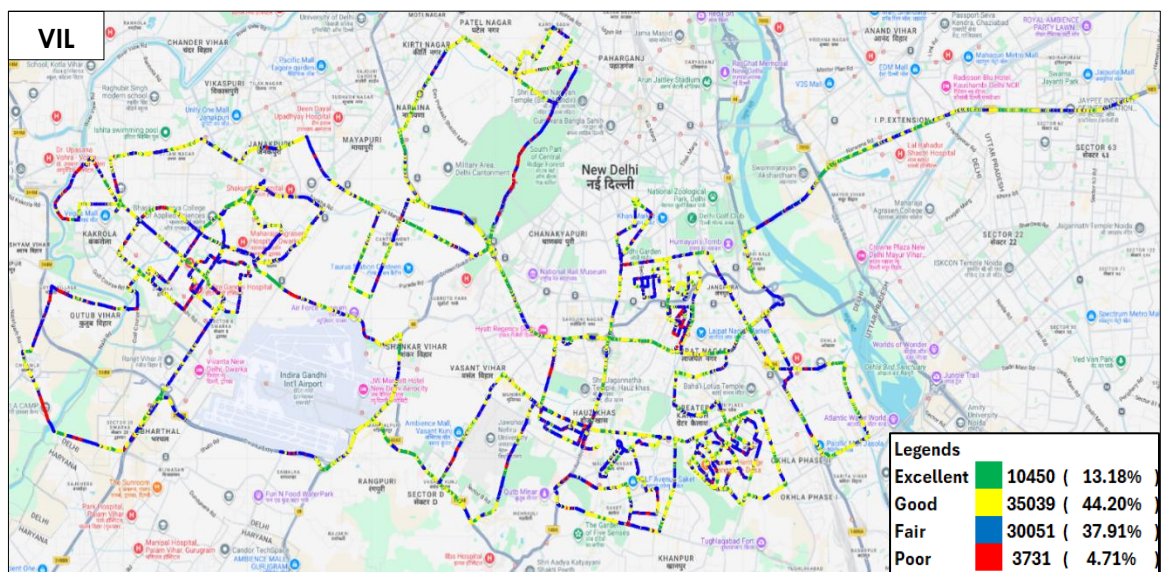


Figure-58: Signal strength auto-selection mode (5G/4G/3G/2G) data - VIL.

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 seconds
Wait/ Guard Time		15 Sec

Table-48: 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 by making Mobile to Mobile call.

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 , www.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-49: 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 MTNL.
- 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.

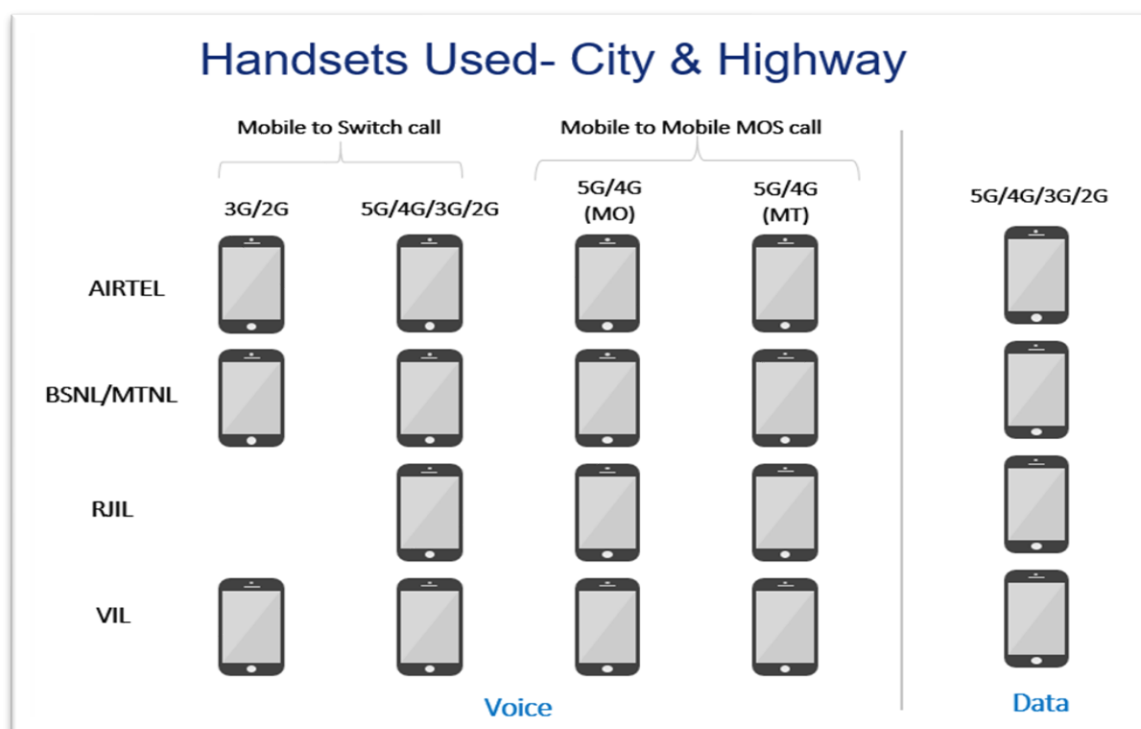


Figure-59: Number of handsets used in city & Airport route drive

MO: Mobile originating

MT: Mobile terminating

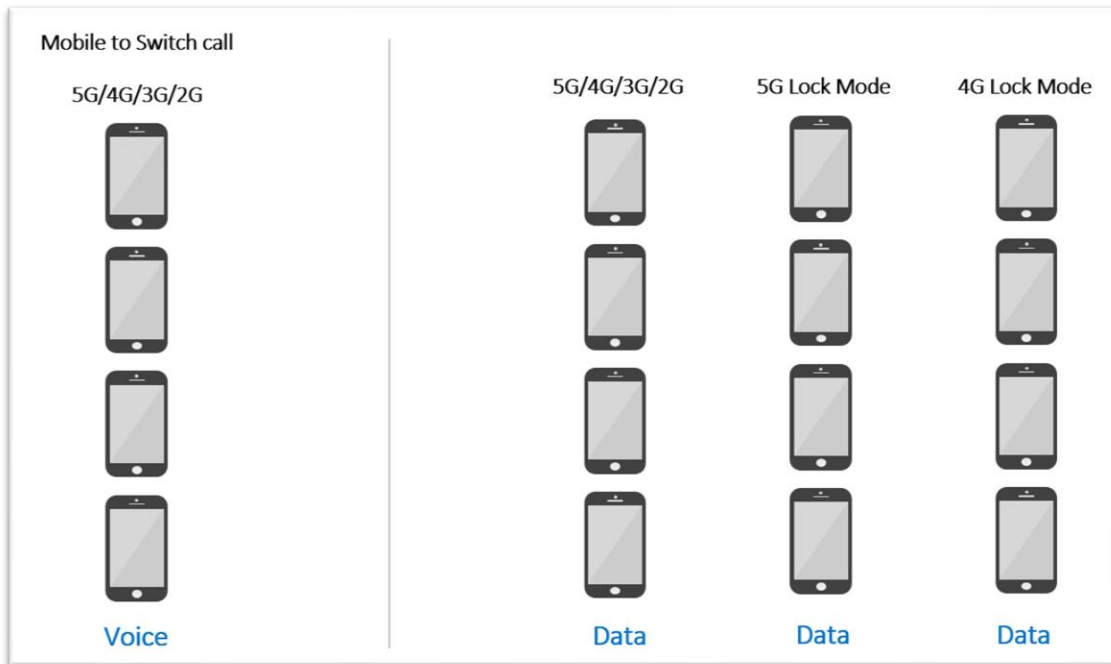


Figure-60: Number of handsets used in railway/metro/walktest/hotspot/coastal area

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)

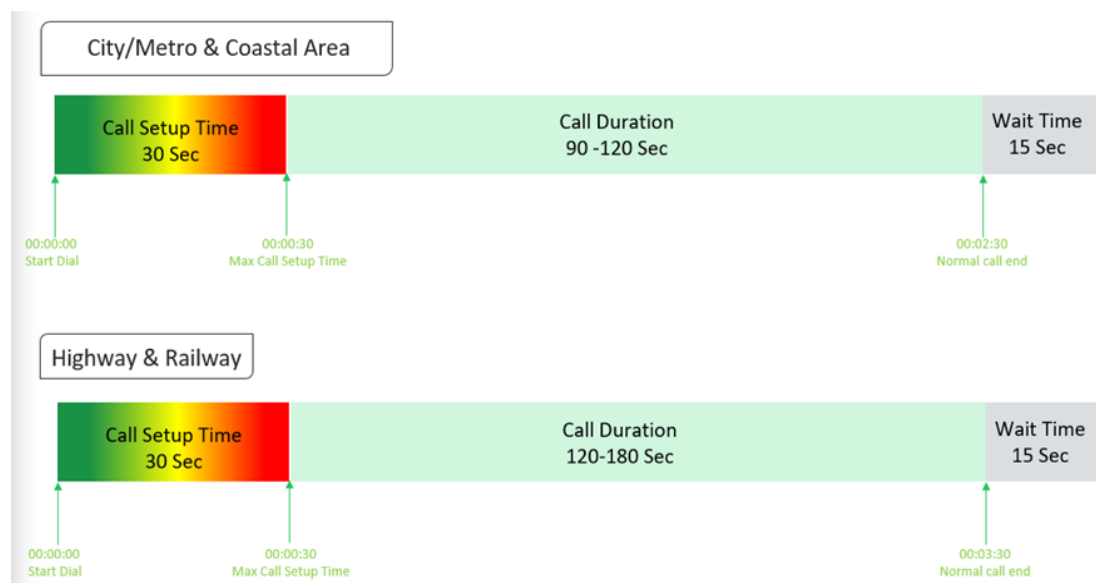


Figure-61: Voice test script for city/railway/metro/Airport route & coastal area

- 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 & Airport route drive by making Mobile to Mobile calls.

(b) Hotspot voice testing



Figure-62: 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

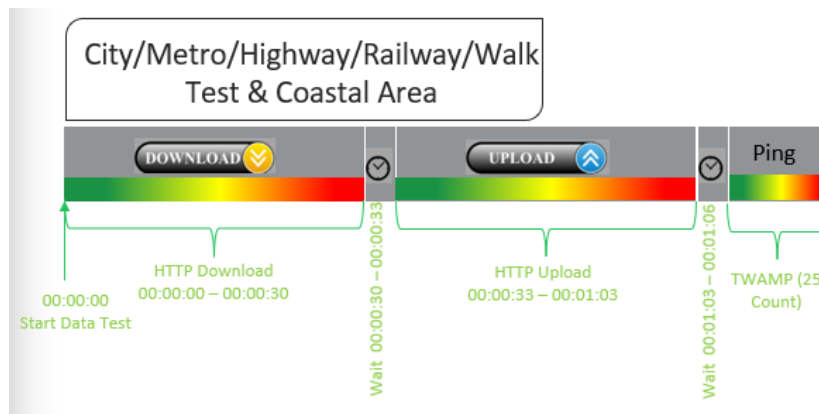


Figure-63: Data test script used in city/metro/railway/Airport route/walk test & coastal area

(d) Static Data(internet) testing

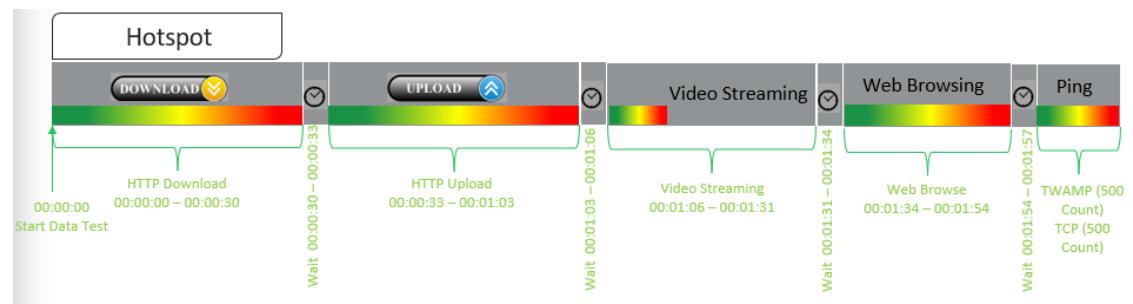


Figure-64: Data test script used at hotspot

- 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 $J(i) = J(i-1) + (D(i-1,i) - J(i-1))/16 \text{ or } 8$																																		
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
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Table-50: 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-51: 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.