TELECOM REGULATORY AUTHORITY OF INDIA

Independent Drive Test Report

Gujarat LSA

November 2025

Contents

1. Introduction

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

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

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

2. Executive Summary (LSA)

2.1 Drive test details

This report covers the findings of the IDT undertaken in Gujarat License Service Area (LSA) during the month of November-2025 under the supervision of TRAI Regional Office (RO) Jaipur. 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	Surat	City	412.0	03-Nov-2025	07-Nov-2025
2	Surat	Inter Operator Calling	01 Location	07-Nov-2025	07-Nov-2025
3	Surat	Hotspot	14 Locations	04-Nov-2025	07-Nov-2025
4	Surat	Walk test	2.0	07-Nov-2025	07-Nov-2025

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.
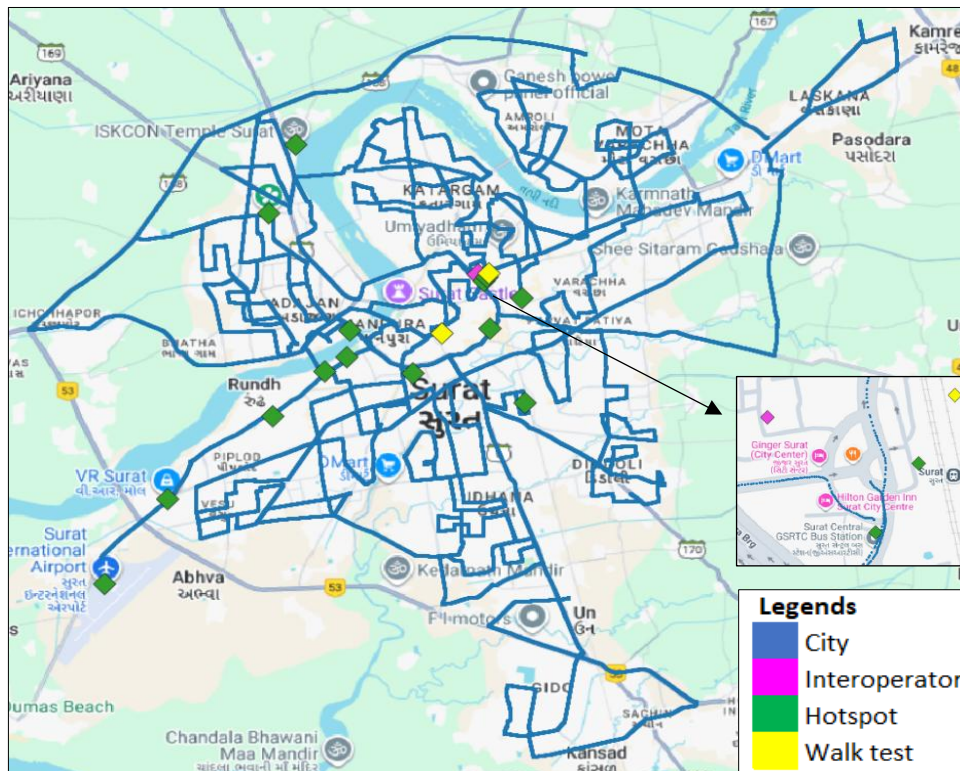
Figure-1: Drive test routes

2.3 Summary of areas covered

a) **City**-Nearby Diamond Nagar, Ambaba Commerce College, Transport Nagar, Parvat Patiya, Dindoli, Udhna Bus Depot, Bhestan, Unn Patiya, Sachin INA, Shiv Nagar, Raj Nagar, Dildar Nagar, Bamroli, New City Light, Gandhi Kutir, Pandesara, Parle Point, Gaviyer, Vesu, Adajan Gam, Ichchhapor, Bhesan, Pal Gam, Rander, Katargam, Mota Varachha, Patel Nagar, Vanakala etc.

b) **Hotspot**
1. Adarsh Market I - II
2. BAPS Swaminarayan Temple
3. Civil Hospital
4. District Collectorate
5. District Court
6. Govt Bus Stand
7. ISKCON Temple
8. Mumbai Market
9. Sardar Vallabhbhai Patel NIT
10. Sneh Rashmi Botanical Garden
11. Surat Airport
12. Surat Railway Station
13. Udhana Junction Railway Station
14. VR Mall Surat

c) **Walk Test**
1. Gopi Talav
2. Surat Railway Station

2.4 Telecom service providers detected frequency bands

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

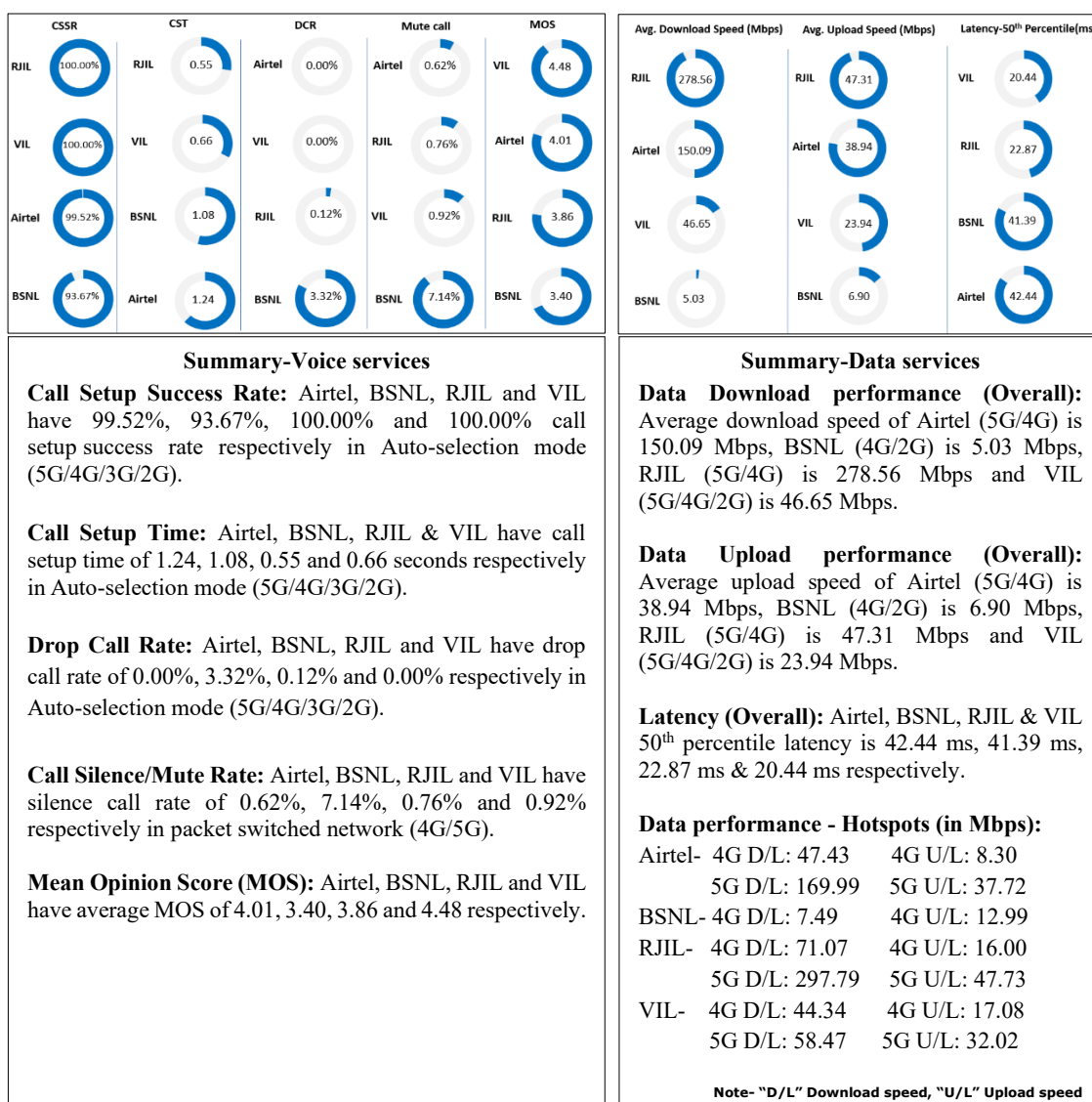| S.no.	Name of TSP	Technology	Frequency Bands (In MHz)
1	Bharti Airtel Ltd.	2G	1800
2	Bharti Airtel Ltd.	4G	900,1800,2100,2300
3	Bharti Airtel Ltd.	5G	3500
4	BSNL	2G	900
5	BSNL	3G	2100
6	BSNL	4G	700,2100,2500
7	Reliance JIO Infocomm Ltd.	4G	850,1800,2300
8	Reliance JIO Infocomm Ltd.	5G	700,3500
9	Vodafone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

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

2.5 Performance against key QoS parameters

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

Summary-Voice services

Call Setup Success Rate: Airtel, BSNL, RJIL and VIL have 99.52%, 93.67%, 100.00% and 100.00% call setup success rate respectively in Auto-selection mode (5G/4G/3G/2G).

Call Setup Time: Airtel, BSNL, RJIL & VIL have call setup time of 1.24, 1.08, 0.55 and 0.66 seconds respectively in Auto-selection mode (5G/4G/3G/2G).

Drop Call Rate: Airtel, BSNL, RJIL and VIL have drop call rate of 0.00%, 3.32%, 0.12% and 0.00% respectively in Auto-selection mode (5G/4G/3G/2G).

Call Silence/Mute Rate: Airtel, BSNL, RJIL and VIL have silence call rate of 0.62%, 7.14%, 0.76% and 0.92% respectively in packet switched network (4G/5G).

Mean Opinion Score (MOS): Airtel, BSNL, RJIL and VIL have average MOS of 4.01, 3.40, 3.86 and 4.48 respectively.

Summary-Data services

Data Download performance (Overall): Average download speed of Airtel (5G/4G) is 150.09 Mbps, BSNL (4G/2G) is 5.03 Mbps, RJIL (5G/4G) is 278.56 Mbps and VIL (5G/4G/2G) is 46.65 Mbps.

Data Upload performance (Overall): Average upload speed of Airtel (5G/4G) is 38.94 Mbps, BSNL (4G/2G) is 6.90 Mbps, RJIL (5G/4G) is 47.31 Mbps and VIL (5G/4G/2G) is 23.94 Mbps.

Latency (Overall): Airtel, BSNL, RJIL & VIL 50th percentile latency is 42.44 ms, 41.39 ms, 22.87 ms & 20.44 ms respectively.

Data performance - Hotspots (in Mbps):
Airtel- 4G D/L: 47.43   4G U/L: 8.30
         5G D/L: 169.99   5G U/L: 37.72
BSNL- 4G D/L: 7.49   4G U/L: 12.99
RJIL- 4G D/L: 71.07   4G U/L: 16.00
         5G D/L: 297.79   5G U/L: 47.73
VIL- 4G D/L: 44.34   4G U/L: 17.08
         5G D/L: 58.47   5G U/L: 32.02

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

QoS Performance Analysis-Gujarat 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 Gujarat LSA during the month of November-2025 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	BSNL	VIL
Call Attempts	652	649	669
Call Setup Success Rate %	97.55	100.00	91.48
Drop Call Rate %	3.14	0.77	1.63
Call Setup Time-Average (Second)	5.49	4.01	4.59
Handover Success Rate %	98.75	98.67	98.23

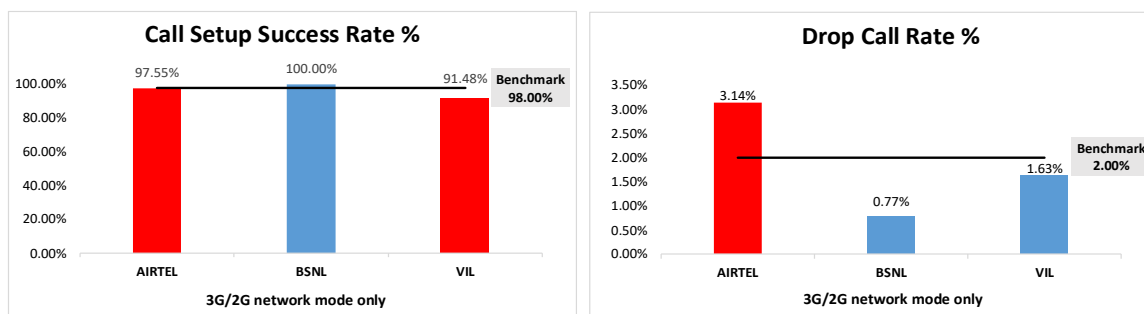**Table-3:** Summary of voice call performance in 3G/2G network mode only.

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	3	NA
2G	1154	425	1066

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	830	869	837	832
Call Setup Success Rate %	99.52	93.67	100.00	100.00
Drop Call Rate %	0.00	3.32	0.12	0.00
Call Setup Time-Average (Second)	1.24	1.08	0.55	0.66
Handover Success Rate %	100.00	97.79	100.00	99.95

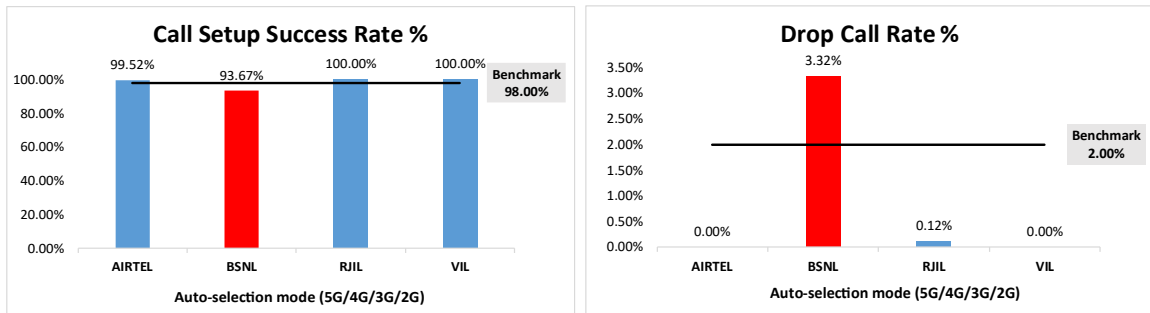**Table-5:** Summary of voice call performance in network auto-selection mode.

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

Parameter	Service Provider			
	Mobile-to-Mobile (5G/4G - Open Mode)			
	AIRTEL	BSNL	RJIL	VIL
Call Established (within service provider Network)	647	658	656	651
Number of silence call for >4 Sec	4	47	5	6
Silence Call Rate %	0.62	7.14	0.76	0.92
Number of silence instances for >4 Sec	4	64	6	10
Number of silence instances for >3 Sec	7	120	15	17
Number of silence instances for >2 sec	31	234	37	58
RTP Jitter (4G & 5G) in ms	5.33	9.35	17.66	12.03
Packet loss Rate Downlink %	0.42	6.66	0.74	0.55
Packet loss Rate Uplink %	0.33	5.99	0.65	0.46

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	1369	0
4G	2008	956	474	2009
3G	NA	0	NA	NA
2G	0	18	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	BSNL	RJIL	VIL
Total Number of MOS Samples for calls table-6	3827	3387	3838	3826
Speech Quality (Average MOS)	4.01	3.40	3.86	4.48
Number of samples with MOS >=4 to <5 (Excellent)	3162	1584	2507	3330
Number of samples with MOS >=3 to <4 (Good)	577	873	1121	410
Number of samples with MOS >=2 to <3 (Fair)	53	453	119	60
Number of samples with MOS >=1 to <2 (Poor)	35	477	91	26
%age of samples with MOS >=4 to <5 (Excellent)	82.62%	46.77%	65.32%	87.04%
%age of samples with MOS >=3 to <4 (Good)	15.08%	25.78%	29.21%	10.72%
%age of samples with MOS >=2 to <3 (Fair)	1.38%	13.37%	3.10%	1.57%
%age of samples with MOS >=1 to <2 (Poor)	0.91%	14.08%	2.37%	0.68%

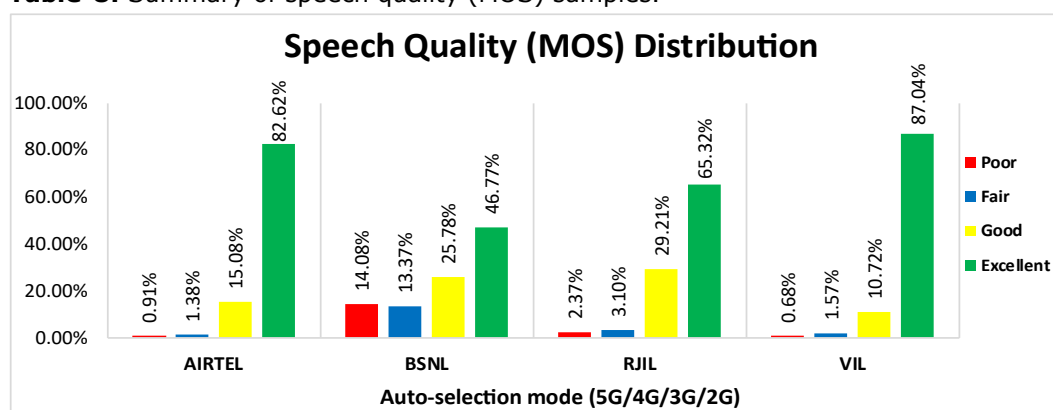**Table-8:** Summary of speech quality (MOS) samples.

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 15 to 18 inter operator calls were attempted at one location which is near Govt. 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	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	**BSNL**	**RJIL**	**VIL**
AIRTEL	NA	2.04	0.93	1.83
BSNL	2.57	NA	1.72	2.04
RJIL	1.81	1.63	NA	1.59
VIL	1.43	1.71	1.25	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**	150.09	5.03	278.56	46.65
	80th Percentile	224.96	6.94	404.36	61.83
	20th Percentile	58.45	2.64	138.86	29.40
Upload Throughput (Mbits/s)	**Average**	38.94	6.90	47.31	23.94
	80th Percentile	61.85	10.76	71.83	34.30
	20th Percentile	13.77	2.59	21.33	12.41
Latency (ms)	**50th Percentile**	42.44	41.39	22.87	20.44

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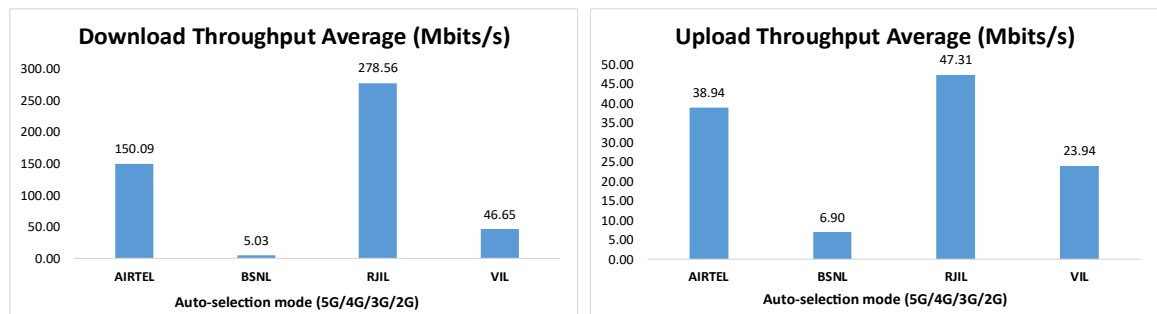
Figure- 5: Download and Upload throughput

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	1342	0
4G	2037	938	185	2117
3G	NA	0	NA	NA
2G	0	22	NA	2

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 03rd November 2025 to 07th November 2025 in Surat. (Refer Table-1)

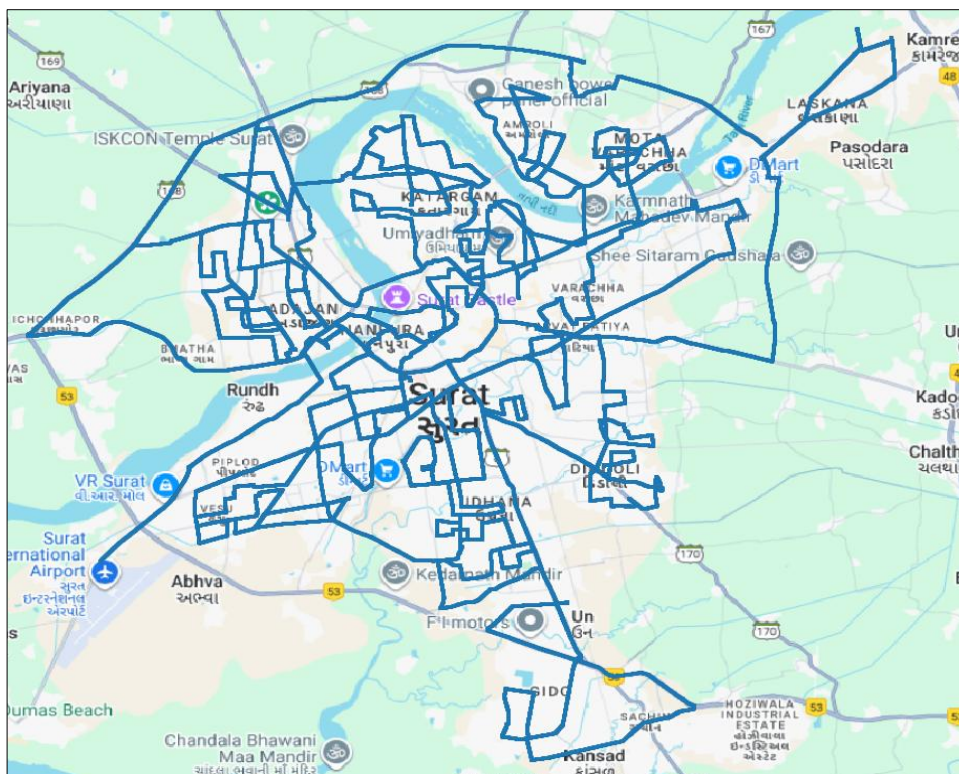### 4.2.1 Drive test route

Figure- 6: Drive test routes

4.2.2 Areas covered

Nearby Diamond Nagar, Ambaba Commerce College, Transport Nagar, Parvat Patiya, Dindoli, Udhna Bus Depot, Bhestan, Unn Patiya, Sachin INA, Shiv Nagar, Raj Nagar, Dildar Nagar, Bamroli, New City Light, Gandhi Kutir, Pandesara, Parle Point, Gaviyer, Vesu, Adajan Gam, Ichchhapor, Bhesan, Pal Gam, Rander, Katargam, Mota Varachha, Patel Nagar, Vanakala 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	652	649	669
Call Setup Success Rate %	97.55	100.00	91.48
Drop Call Rate %	3.14	0.77	1.63
Call Setup Time-Average (Second)	5.49	4.01	4.59
Handover Success Rate %	98.75	98.67	98.23

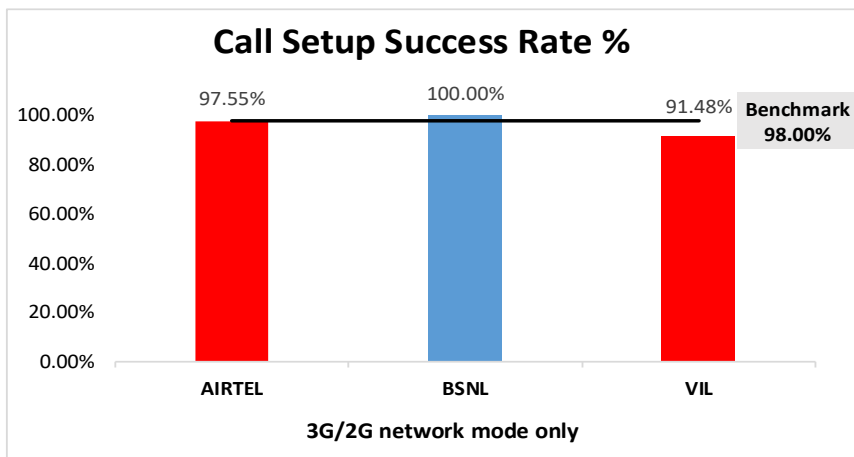**Table-13:** Summary of voice call performance in 3G/2G network mode only.

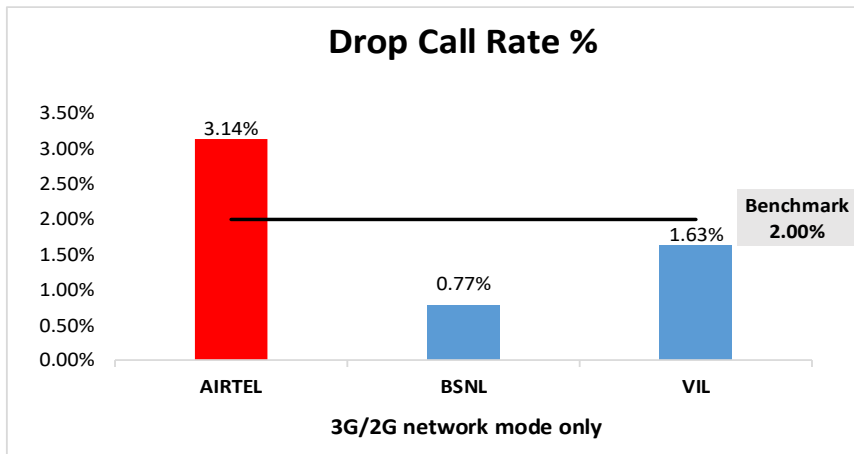**Figure-7:** Performance for call setup success rate.

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	0.62%	NA
2G	99.99%	99.36%	99.84%
Limited Service	0.01%	0.02%	0.16%

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

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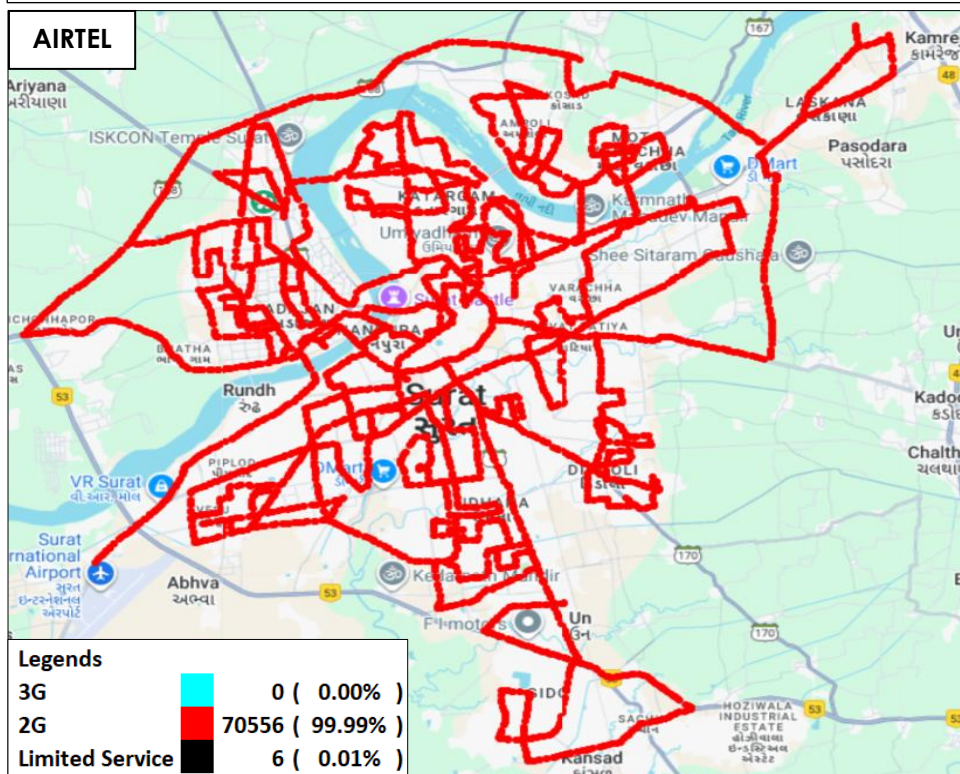

Figure-9: Serving technology plots 3G/2G network mode – AIRTEL
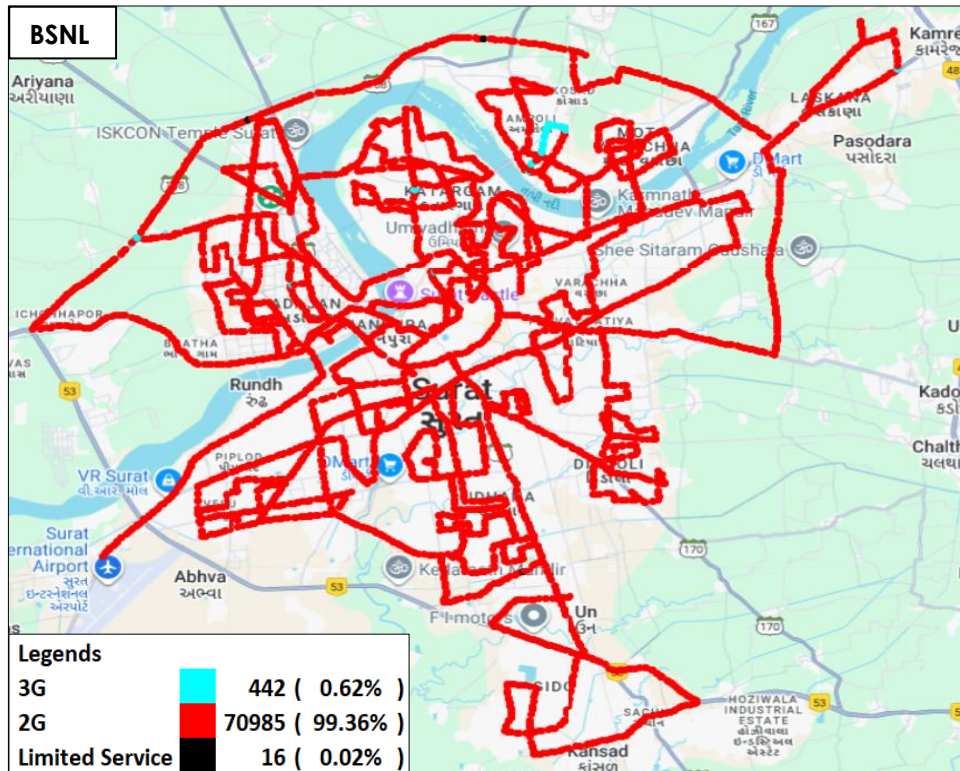
Figure-10: Serving technology plots 3G/2G network mode –BSNL.
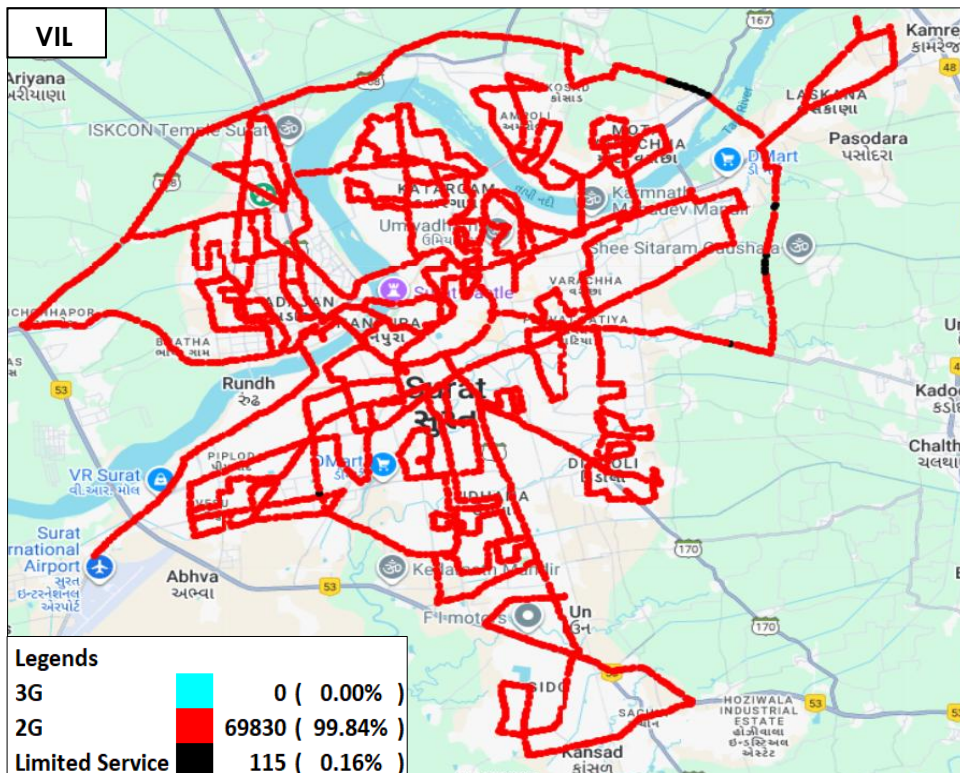

Figure-11: Serving technology plots 3G/2G network mode –VIL.

(c) Network Signal Strength Distribution: The following chart represents signal strength distribution for 3G/2G network mode only. (Refer figure- 25, 26 & 27 for map view)
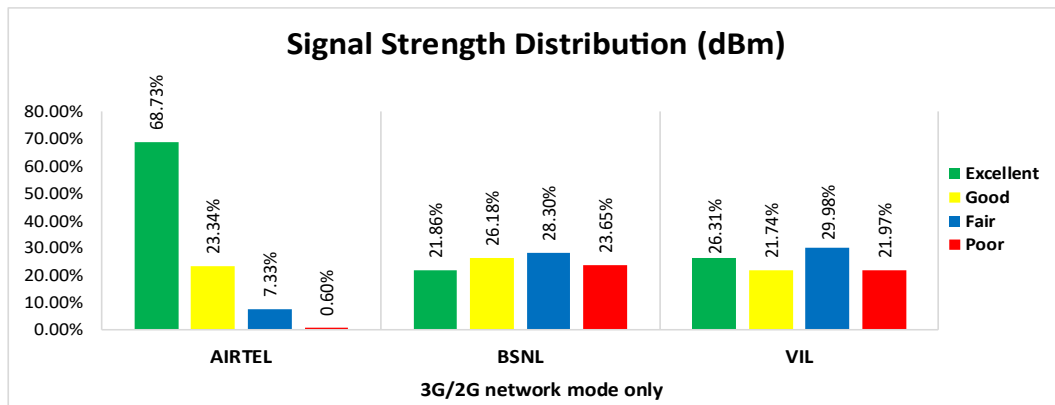

Figure-12: Signal strength distribution 3G/2G network mode only.

Observations:

- Airtel has 69% of samples falling in the excellent signal strength category.
- BSNL has 22% of samples falling in the excellent signal strength category.
- VIL has 26% 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	672	710	678	673
Call Setup Success Rate %	99.55	92.82	100.00	100.00
Drop Call Rate %	0.00	4.10	0.15	0.00
Call Setup Time Average (Second)	1.24	1.15	0.56	0.66
Handover Success Rate %	100.00	97.72	100.00	99.95

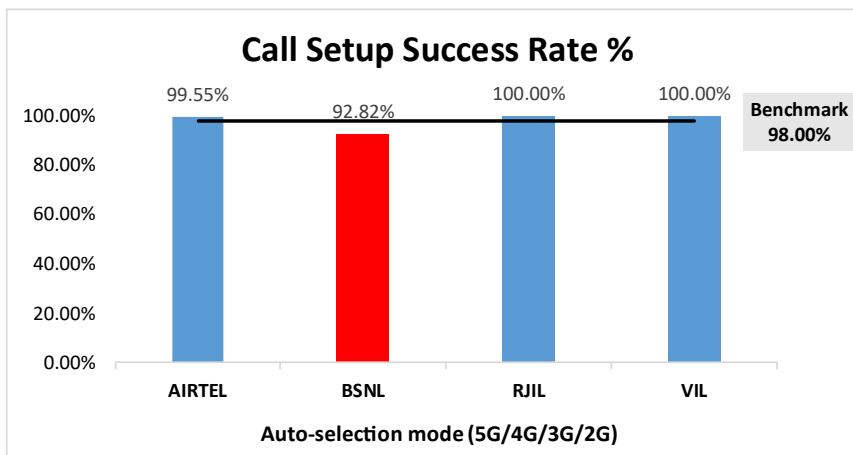**Table-15:** Summary of voice call performance in network auto-selection mode.
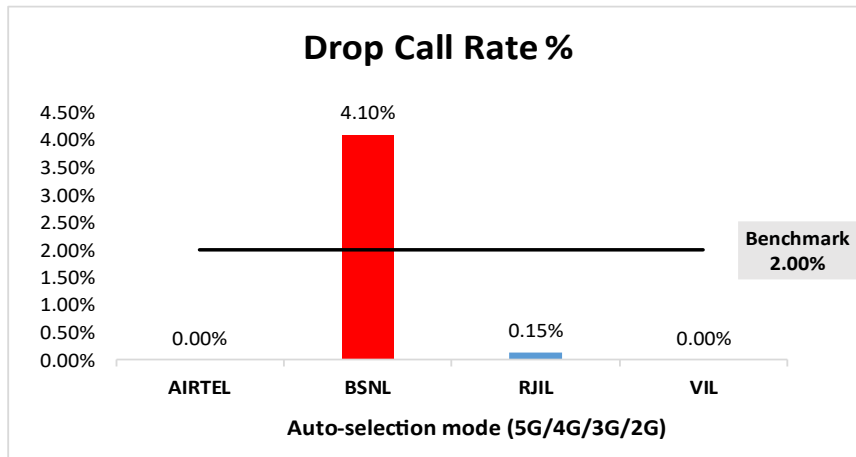

Figure-13: Performance for call setup success rate.

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)	647	658	656	651
Number of silence call for >4 Sec	4	47	5	6
Silence Call Rate %	0.62	7.14	0.76	0.92
Number of silence instances for >4 Sec	4	64	6	10
Number of silence instances for >3 Sec	7	120	15	17
Number of silence instances for >2 sec	31	234	37	58
RTP Jitter (4G & 5G) in ms	5.33	9.35	17.66	12.03
Packet loss Rate Downlink %	0.42	6.66	0.74	0.55
Packet loss Rate Uplink %	0.33	5.99	0.65	0.46

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	3827	3387	3838	3826
Speech Quality (Average MOS)	4.01	3.40	3.86	4.48
Number of samples with MOS >=4 to <5 (Excellent)	3162	1584	2507	3330
Number of samples with MOS >=3 to <4 (Good)	577	873	1121	410
Number of samples with MOS >=2 to <3 (Fair)	53	453	119	60
Number of samples with MOS >=1 to <2 (Poor)	35	477	91	26
%age of samples with MOS >=4 to <5 (Excellent)	82.62%	46.77%	65.32%	87.04%
%age of samples with MOS >=3 to <4 (Good)	15.08%	25.78%	29.21%	10.72%
%age of samples with MOS >=2 to <3 (Fair)	1.38%	13.37%	3.10%	1.57%
%age of samples with MOS >=1 to <2 (Poor)	0.91%	14.08%	2.37%	0.68%

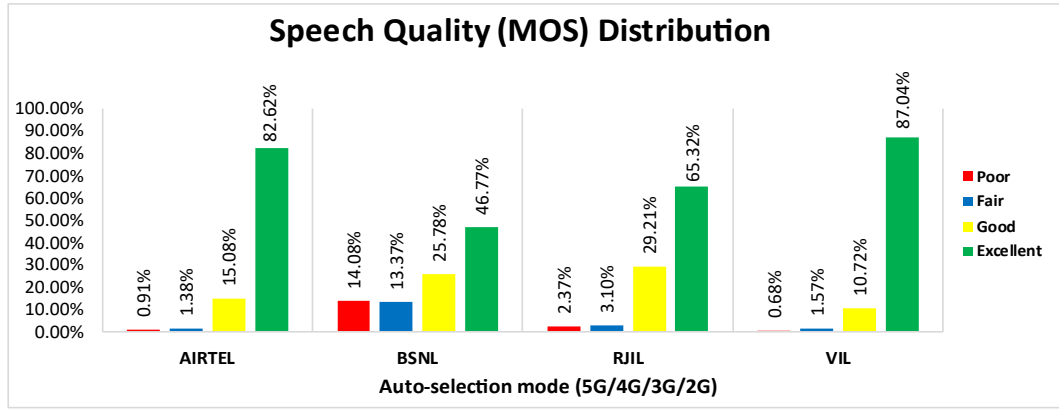**Table-17:** Summary of speech quality (MOS) samples.

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	9.24%	NA	90.27%	3.09%
4G	90.76%	97.69%	9.73%	96.91%
3G	NA	0.00%	NA	NA
2G	0.00%	2.23%	NA	0.00%
Limited Service	0.00%	0.08%	0.00%	0.00%

Table-18: Time spent on technology during drive test.

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

Legends		
5G	■	7036 (9.24%)
4G	■	69108 (90.76%)
3G	■	0 (0.00%)
2G	■	0 (0.00%)
Limited Service	■	0 (0.00%)

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

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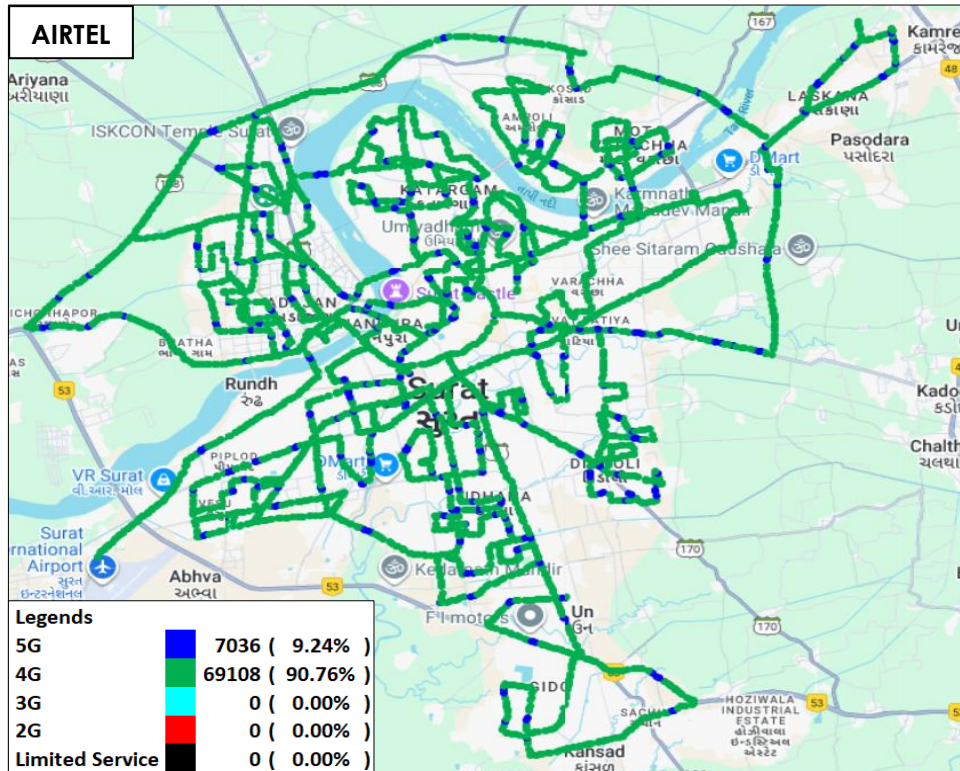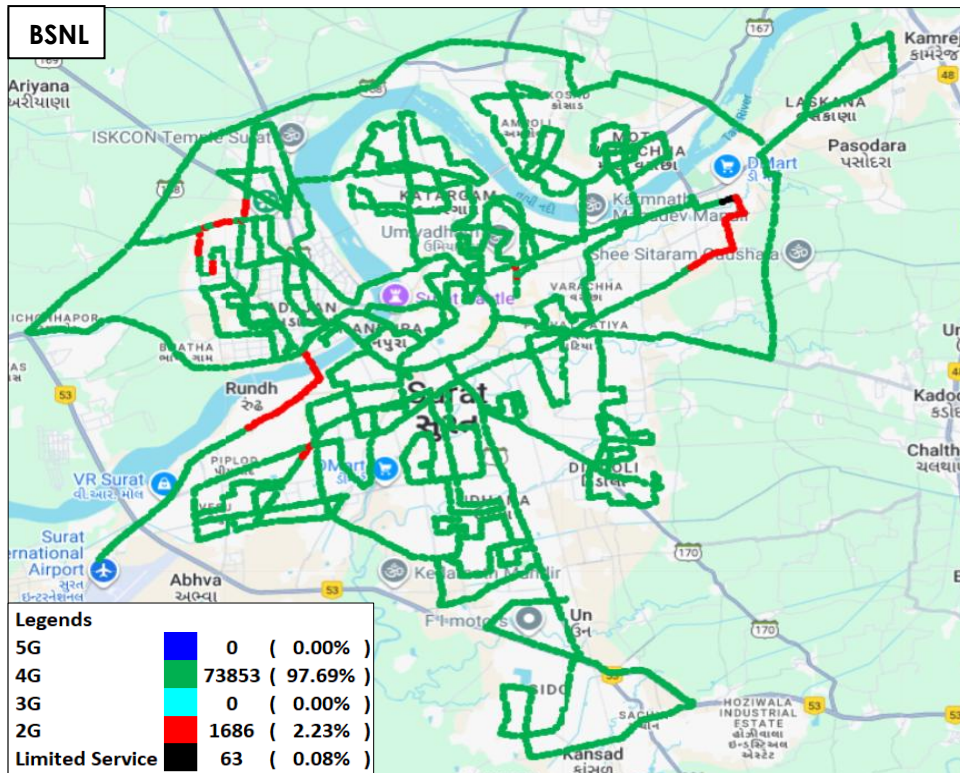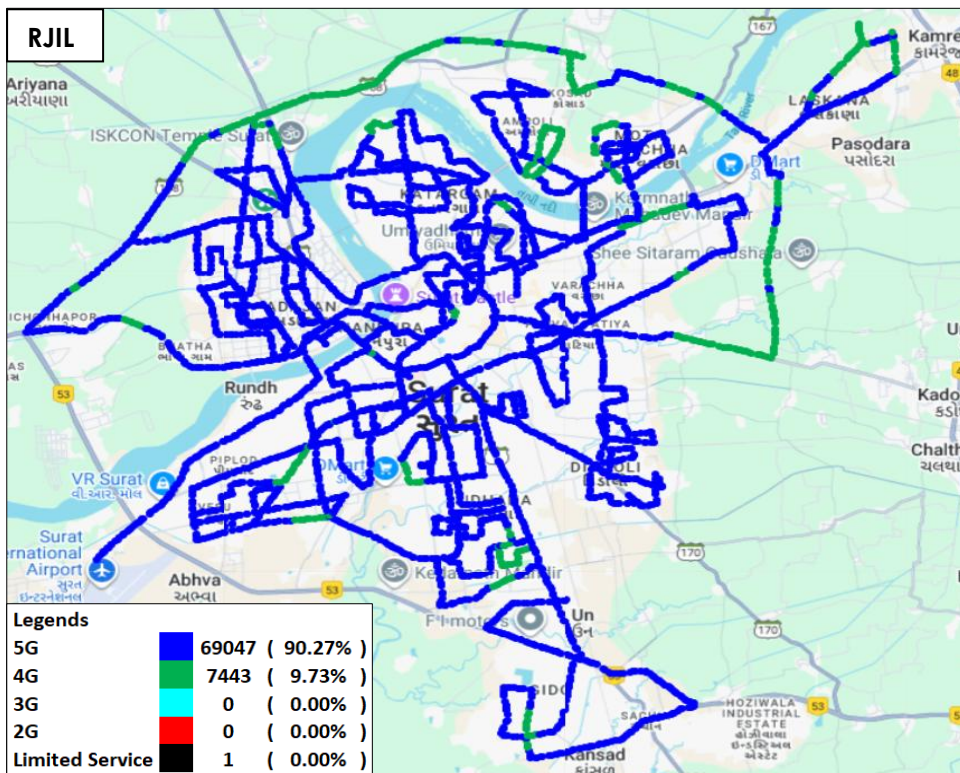

Figure-18: Serving technology plots in auto-selection mode (5G/4G/3G/2G)- RJIL.
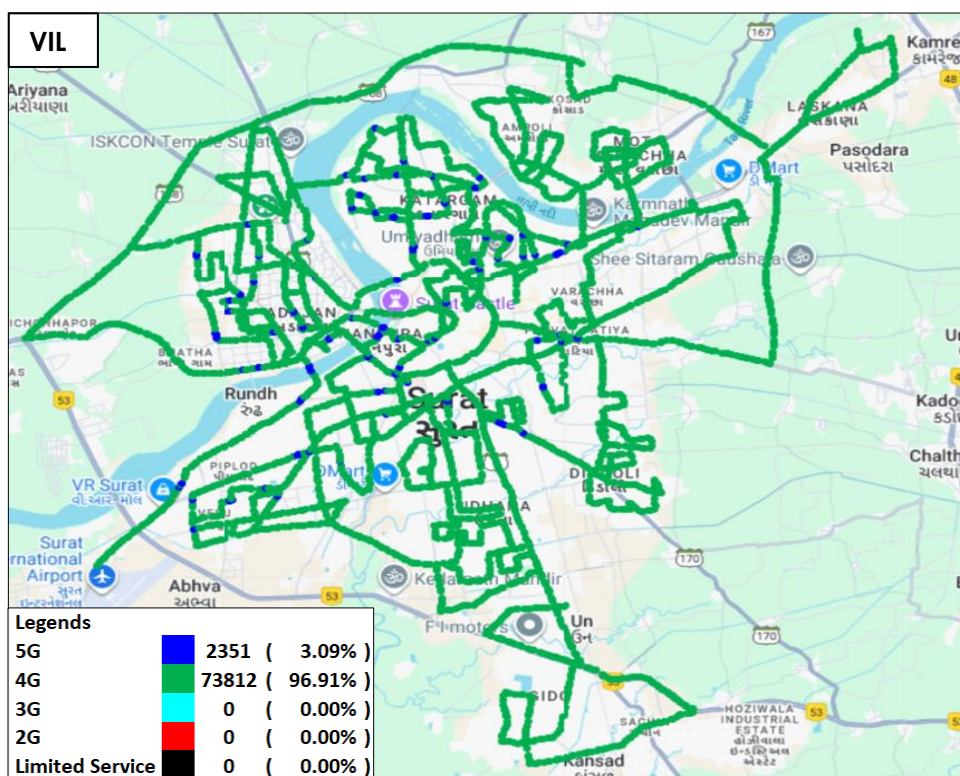
Figure-19: Serving technology plots in auto-selection mode (5G/4G/3G/2G) – VIL

(g) Network Signal Strength Distribution: The following chart provide signal strength distribution for auto-selection mode (5G/4G/3G/2G). (Refer figure-28, 29, 30 & 31 for map view)
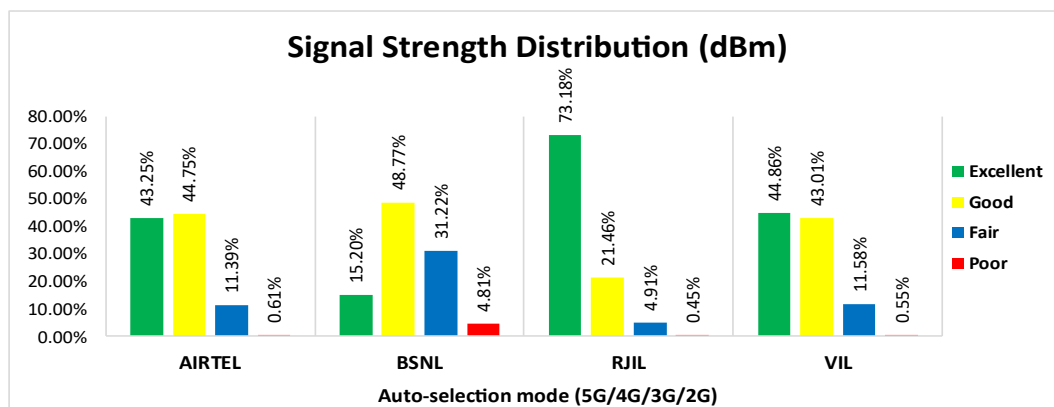
Figure-20: Signal strength distribution auto-selection mode 5G/4G/3G/2G.

Observations:

- Airtel has 43% of samples falling in the excellent signal strength category.
- BSNL has 15% of samples falling in the excellent signal strength category.
- RJIL has 73% of samples falling in the excellent signal strength category.
- VIL has 45% 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	149.11	4.83	279.36	45.02
	80th Percentile	224.73	6.70	402.69	60.39
	20th Percentile	58.48	2.42	142.44	27.87
Upload Throughput (Mbits/s)	Average	39.01	6.60	46.54	23.24
	80th Percentile	61.50	10.36	71.22	32.74
	20th Percentile	15.00	2.53	20.94	11.94
Latency (ms)	50th Percentile	40.73	41.88	22.74	21.36

Table-19: Summary of Data performance in network auto-selection mode.
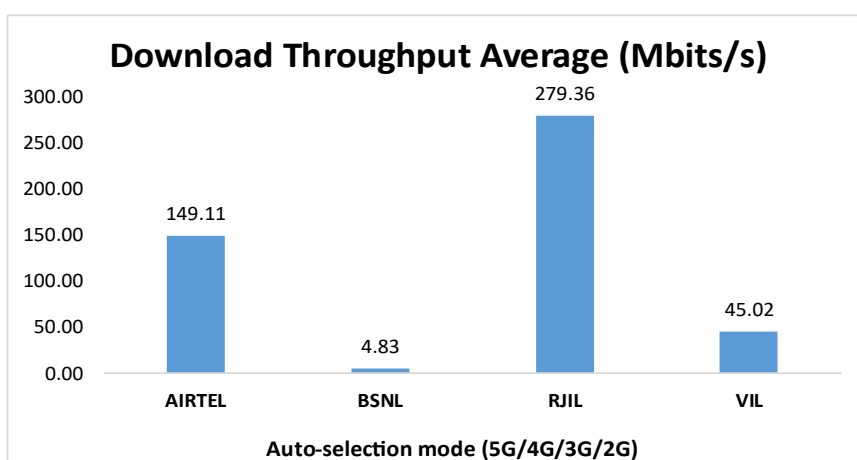
Figure- 21: Download throughput
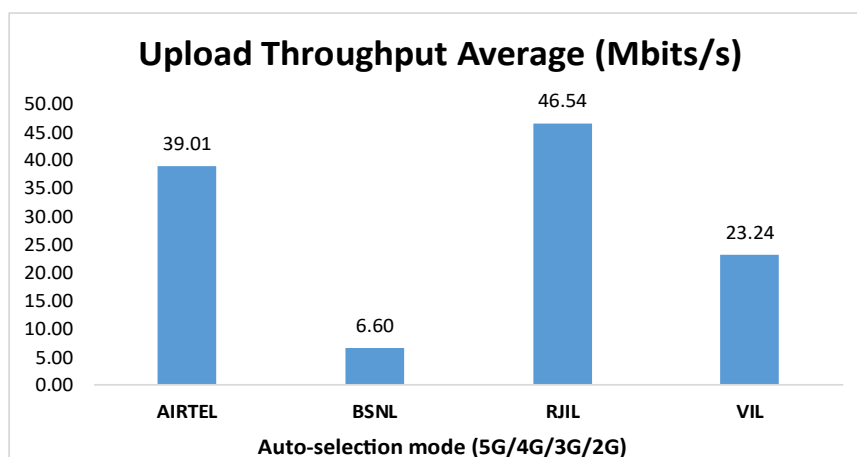
Figure- 22: Upload throughput

4.3 Hotspots

Hotspot testing has been done on 04th November to 07th November 2025. Fourteen locations have been tested in the city.

4.3.1 Locations
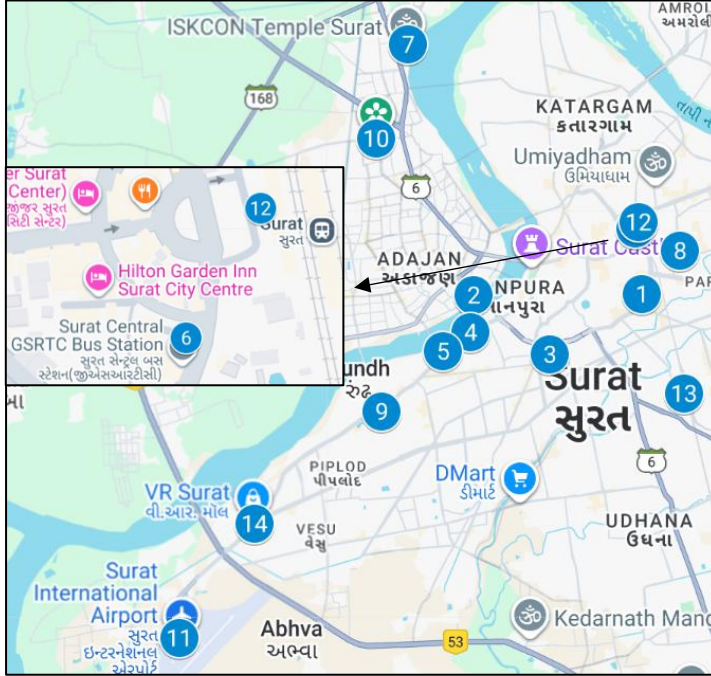
Figure- 23: Hotspot locations

4.3.2 Hotspot covered

1. Adarsh Market I - II
2. BAPS Swaminarayan Temple
3. Civil Hospital
4. District Collectorate
5. District Court
6. Govt Bus Stand
7. ISKCON Temple
8. Mumbai Market
9. Sardar Vallabhbhai Patel NIT
10. Sneh Rashmi Botanical Garden
11. Surat Airport
12. Surat Railway Station
13. Udhana Junction Railway Station
14. VR Mall Surat

4.3.3 Voice performance

Overall Voice Performance				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	140	140	140	140
Call Setup Success Rate %	99.29	97.86	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.23	0.81	0.50	0.64

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

Adarsh Market I - II				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.22	0.66	0.50	0.59

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

BAPS Swaminarayan Temple				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.23	1.57	0.50	0.60

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

Civil Hospital				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.26	0.68	0.54	0.62

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

District Collectorate				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.17	0.73	0.48	0.58

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

District Court				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.21	0.71	0.52	0.60

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

Govt Bus Stand				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.26	1.31	0.42	0.76

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

ISKCON Temple				
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	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.20	0.69	0.53	0.69

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

Mumbai 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)	1.26	0.72	0.48	0.79

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

Sardar Vallabhbhai Patel NIT				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	90.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.21	0.68	0.53	0.52

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

Sneh Rashmi Botanical 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)	1.24	0.76	0.50	0.62

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

Surat Airport				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.18	0.72	0.51	0.58

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

Surat Railway Station				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.29	0.73	0.51	0.68

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

Udhana Junction Railway Station				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.22	0.68	0.51	0.65

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

VR Mall Surat				
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	80.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.22	0.65	0.51	0.62

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)	169.72	6.55	287.11	58.57
Download Throughput 80th Percentile (Mbit/s)	245.48	8.46	441.89	68.63
Download Throughput 20th Percentile (Mbit/s)	67.68	3.87	128.18	47.95
Download Session Setup Success Rate %	100.00	97.14	97.14	100.00
Upload Throughput Average (Mbits/s)	36.07	8.98	48.09	27.84
Upload Throughput 80th Percentile (Mbit/s)	64.77	13.59	74.63	41.24
Upload Throughput 20th Percentile (Mbit/s)	12.58	3.37	25.09	14.75
Upload Session Setup Success Rate %	100.00	98.57	98.57	100.00
Web Browsing Delay (Second)	1.47	2.00	1.24	1.60
Youtube Initial Buffer Delay (Second)	0.99	1.67	0.85	0.97
Latency (ms) - 50th Percentile	45.29	40.79	22.75	19.57
Jitter (ms)	9.33	16.62	8.93	5.53
Packet Loss Rate%	11.20	19.90	2.89	0.06
Packet Loss Rate- 90th percentile	33.96	93.14	4.02	0.20

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

Adarsh Market I - II				
Parameters	**Service Provider**			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	315.19	8.16	133.78	67.18
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	66.58	10.54	10.45	38.71
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	1.37	1.48	1.15	2.32
Youtube Initial Buffer Delay (Second)	0.94	1.20	0.61	2.67
Latency (ms) - 50th Percentile	44.26	40.69	26.77	19.54
Jitter (ms)	2.32	9.21	5.25	3.30
Packet Loss Rate%	28.60	28.20	0.00	0.20

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

BAPS Swaminarayan Temple				
Parameters	**Service Provider**			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	45.22	0.02	420.55	57.24
Download Session Setup Success Rate %	100.00	80.00	100.00	100.00
Upload Throughput Average (Mbits/s)	11.79	1.78	31.41	17.32
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	1.32	4.46	1.08	2.14
Youtube Initial Buffer Delay (Second)	0.95	-	0.91	0.66
Latency (ms) - 50th Percentile	45.37	-	22.74	18.77
Jitter (ms)	19.61	-	3.45	1.26
Packet Loss Rate%	12.00	87.20	0.00	0.00

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

Note- "- "Youtube & Ping tests were failed.

Civil Hospital				
Parameters	**Service Provider**			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	98.02	6.42	17.72	40.20
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	5.01	15.01	1.75	23.83
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	1.45	1.86	2.66	1.32
Youtube Initial Buffer Delay (Second)	0.92	1.34	12.46	0.90
Latency (ms) – 50th Percentile	79.08	39.92	45.37	23.24
Jitter (ms)	17.80	14.27	63.47	4.83
Packet Loss Rate%	36.20	2.30	13.80	0.20

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

District Collectorate				
Parameters	**Service Provider**			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	300.03	7.89	206.24	77.18
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	13.69	14.01	43.51	25.20
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	1.13	1.56	1.16	1.40
Youtube Initial Buffer Delay (Second)	0.74	1.12	0.73	0.82
Latency (ms) - 50th Percentile	35.60	40.58	27.82	22.34
Jitter (ms)	3.23	15.98	5.18	4.33
Packet Loss Rate%	0.80	1.90	0.10	0.00

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

District Court				
Parameters	**Service Provider**			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	193.79	4.85	733.41	60.65
Download Session Setup Success Rate%	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	26.83	5.26	98.42	50.91
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	1.44	2.19	1.21	1.25
Youtube Initial Buffer Delay (Second)	1.91	2.09	0.52	0.75
Latency (ms)- 50th Percentile	58.27	44.64	20.50	21.92
Jitter (ms)	7.98	16.66	3.55	3.01
Packet Loss Rate%	0.10	1.30	0.00	0.10

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

Govt Bus Stand				
Parameters	**Service Provider**			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	209.14	4.29	159.26	58.52
Download Session Setup Success Rate%	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	74.70	2.90	50.53	43.73
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	1.78	1.74	1.12	1.88
Youtube Initial Buffer Delay (Second)	0.74	2.23	0.51	0.64
Latency (ms)- 50th Percentile	43.17	40.01	500.04	17.01
Jitter (ms)	8.91	10.82	15.44	4.57
Packet Loss Rate%	0.80	1.50	26.30	0.00

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

ISKCON Temple				
Parameters	**Service Provider**			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	233.62	23.18	467.03	48.37
Download Session Setup Success Rate%	100.00	80.00	100.00	100.00
Upload Throughput Average (Mbits/s)	14.40	19.85	53.07	7.23
Upload Session Setup Success Rate %	100.00	80.00	100.00	100.00
Web Browsing Delay (Second)	1.43	1.18	1.00	1.38
Youtube Initial Buffer Delay (Second)	0.73	0.93	0.50	0.77
Latency (ms)- 50th Percentile	58.01	-	21.48	20.29
Jitter (ms)	15.29	-	2.60	3.32
Packet Loss Rate%	23.80	100.00	0.00	0.00

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

Note- "- " Ping tests were failed.

Mumbai Market				
Parameters	**Service Provider**			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	208.54	5.53	392.01	68.01
Download Session Setup Success Rate%	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	63.03	10.53	68.21	22.33
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	1.23	2.26	1.19	1.71
Youtube Initial Buffer Delay (Second)	0.88	1.13	0.71	0.70
Latency (ms)- 50th Percentile	37.55	41.72	21.00	13.65
Jitter (ms)	2.98	18.81	3.18	6.83
Packet Loss Rate%	44.50	46.40	0.00	0.20

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

Sardar Vallabhbhai Patel NIT				
Parameters	**Service Provider**			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	54.99	3.46	185.17	69.64
Download Session Setup Success Rate%	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	55.96	6.70	30.37	28.07
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	1.18	2.01	1.31	1.82
Youtube Initial Buffer Delay (Second)	1.05	1.47	0.63	0.73
Latency (ms)- 50th Percentile	39.00	39.93	22.32	18.57
Jitter (ms)	13.90	15.91	3.53	2.14
Packet Loss Rate%	1.70	2.40	0.00	0.00

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

Sneh Rashmi Botanical Garden				
Parameters	**Service Provider**			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	201.34	4.60	326.56	44.90
Download Session Setup Success Rate%	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	61.35	9.33	56.13	22.35
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	1.11	1.63	1.21	1.07
Youtube Initial Buffer Delay (Second)	0.74	1.27	0.51	0.90
Latency (ms)- 50th Percentile	46.19	39.45	19.42	28.05
Jitter (ms)	4.26	16.73	3.21	4.58
Packet Loss Rate%	0.10	1.90	0.00	0.00

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

Surat Airport				
Parameters	**Service Provider**			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	140.20	9.03	332.73	47.91
Download Session Setup Success Rate%	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	9.97	13.22	68.86	9.89
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	1.61	2.11	1.20	1.46
Youtube Initial Buffer Delay (Second)	1.42	1.20	0.82	1.91
Latency (ms)- 50th Percentile	45.34	36.50	23.42	23.17
Jitter (ms)	4.87	24.32	3.91	3.12
Packet Loss Rate%	1.30	2.10	0.00	0.00

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

Surat Railway Station				
Parameters	**Service Provider**			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	31.65	3.36	93.37	44.91
Download Session Setup Success Rate%	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	20.83	2.21	17.77	34.00
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	2.44	2.62	1.40	2.36
Youtube Initial Buffer Delay (Second)	1.11	4.31	0.73	0.69
Latency (ms)- 50th Percentile	58.56	45.10	22.16	29.71
Jitter (ms)	12.52	16.87	3.80	23.74
Packet Loss Rate%	6.70	1.80	0.30	0.10

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

Udhana Junction Railway Station				
Parameters	**Service Provider**			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	184.00	4.48	146.05	77.78
Download Session Setup Success Rate%	100.00	100.00	60.00	100.00
Upload Throughput Average (Mbits/s)	68.38	8.17	75.46	48.38
Upload Session Setup Success Rate %	100.00	100.00	80.00	100.00
Web Browsing Delay (Second)	1.58	2.17	1.36	1.64
Youtube Initial Buffer Delay (Second)	0.79	1.09	0.64	0.55
Latency (ms)- 50th Percentile	45.06	48.47	27.89	15.05
Jitter (ms)	11.68	18.47	5.34	3.65
Packet Loss Rate%	0.20	0.80	0.00	0.00

Table-48: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

VR Mall Surat				
Parameters	**Service Provider**			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	160.40	8.43	349.26	57.50
Download Session Setup Success Rate%	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	12.40	8.34	72.86	17.76
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	1.59	2.33	1.01	1.12
Youtube Initial Buffer Delay (Second)	0.91	2.20	0.87	0.86
Latency (ms)- 50th Percentile	43.31	39.03	20.78	13.75
Jitter (ms)	5.23	21.38	3.56	8.76
Packet Loss Rate%	0.00	0.80	0.00	0.10

Table-49: 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)**	169.99	-	297.79	58.47
	Upload Throughput Average (Mbits/s)	37.72	-	47.73	32.02
4G	**Download Throughput Average (Mbits/s)**	47.43	7.49	71.07	44.34
	Upload Throughput Average (Mbits/s)	8.30	12.99	16.00	17.08

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

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

Adarsh Market I - II					
	Parameters	**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	**Download Throughput Average (Mbits/s)**	305.90	-	127.64	78.02
	Upload Throughput Average (Mbits/s)	58.73	-	19.92	41.12
4G	**Download Throughput Average (Mbits/s)**	47.28	8.71	54.13	45.99
	Upload Throughput Average (Mbits/s)	16.90	14.58	12.30	9.19

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

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

BAPS Swaminarayan Temple					
	Parameters	**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	**Download Throughput Average (Mbits/s)**	124.43	-	377.64	51.47
	Upload Throughput Average (Mbits/s)	4.41	-	31.83	27.69
4G	**Download Throughput Average (Mbits/s)**	47.06	0.89	101.85	49.67
	Upload Throughput Average (Mbits/s)	8.59	1.45	26.06	26.84

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

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

Civil Hospital					
Parameters		**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	Download Throughput Average (Mbits/s)	100.07	-	15.69	-
	Upload Throughput Average (Mbits/s)	7.12	-	1.81	-
4G	Download Throughput Average (Mbits/s)	12.64	14.29	49.52	32.03
	Upload Throughput Average (Mbits/s)	2.32	18.16	5.17	19.36

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

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

District Collectorate					
Parameters		**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	Download Throughput Average (Mbits/s)	204.08	-	270.07	65.83
	Upload Throughput Average (Mbits/s)	24.50	-	48.15	22.69
4G	Download Throughput Average (Mbits/s)	32.80	5.06	111.36	69.26
	Upload Throughput Average (Mbits/s)	2.06	8.60	14.32	14.29

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

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

District Court					
Parameters		**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	Download Throughput Average (Mbits/s)	185.50	-	735.92	64.50
	Upload Throughput Average (Mbits/s)	25.50	-	97.25	31.88
4G	Download Throughput Average (Mbits/s)	133.68	4.15	129.09	52.99
	Upload Throughput Average (Mbits/s)	16.06	10.24	24.32	25.48

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

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

Govt Bus Stand					
Parameters		**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	Download Throughput Average (Mbits/s)	216.82	-	148.64	50.82
	Upload Throughput Average (Mbits/s)	71.72	-	48.66	35.48
4G	Download Throughput Average (Mbits/s)	70.00	4.95	36.06	36.80
	Upload Throughput Average (Mbits/s)	11.70	8.00	13.90	15.88

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

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

ISKCON Temple					
Parameters		**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	Download Throughput Average (Mbits/s)	239.52	-	495.70	-
	Upload Throughput Average (Mbits/s)	37.66	-	60.85	-
4G	Download Throughput Average (Mbits/s)	53.96	11.88	27.83	43.98
	Upload Throughput Average (Mbits/s)	9.15	20.22	9.05	16.48

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

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

Mumbai Market		AIRTEL	BSNL	RJIL	VIL
Parameters		**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	Download Throughput Average (Mbits/s)	148.46	-	359.37	48.45
	Upload Throughput Average (Mbits/s)	58.69	-	63.11	42.06
4G	Download Throughput Average (Mbits/s)	47.62	20.09	72.75	16.25
	Upload Throughput Average (Mbits/s)	6.18	19.74	18.94	5.82

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

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

Sardar Vallabhbhai Patel NIT		AIRTEL	BSNL	RJIL	VIL
Parameters		**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	Download Throughput Average (Mbits/s)	39.01	-	231.53	65.64
	Upload Throughput Average (Mbits/s)	64.28	-	35.92	26.72
4G	Download Throughput Average (Mbits/s)	33.94	2.04	168.33	65.91
	Upload Throughput Average (Mbits/s)	7.36	19.49	27.25	21.74

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

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

Sneh Rashmi Botanical Garden		AIRTEL	BSNL	RJIL	VIL
Parameters		**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	Download Throughput Average (Mbits/s)	301.16	-	367.83	-
	Upload Throughput Average (Mbits/s)	67.03	-	64.79	-
4G	Download Throughput Average (Mbits/s)	40.67	4.62	41.76	48.95
	Upload Throughput Average (Mbits/s)	11.59	12.65	14.29	13.69

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

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

Surat Airport		AIRTEL	BSNL	RJIL	VIL
Parameters		**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	Download Throughput Average (Mbits/s)	-	-	545.73	-
	Upload Throughput Average (Mbits/s)	-	-	68.07	-
4G	Download Throughput Average (Mbits/s)	59.79	9.67	58.48	40.57
	Upload Throughput Average (Mbits/s)	5.08	17.73	5.78	19.10

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

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

Surat Railway Station		AIRTEL	BSNL	RJIL	VIL
Parameters		**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	Download Throughput Average (Mbits/s)	6.81	-	62.26	37.73
	Upload Throughput Average (Mbits/s)	19.68	-	20.73	18.84
4G	Download Throughput Average (Mbits/s)	9.44	5.86	25.53	44.33
	Upload Throughput Average (Mbits/s)	2.66	5.30	11.18	22.38

Table-62: Overall Summary of 5G only & 4G only data download & upload speed.

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

Udhana Junction Railway Station					
Parameters		**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	**Download Throughput Average (Mbits/s)**	179.91	-	181.92	62.35
	Upload Throughput Average (Mbits/s)	69.63	-	81.50	40.45
4G	**Download Throughput Average (Mbits/s)**	40.91	4.76	38.57	58.10
	Upload Throughput Average (Mbits/s)	12.12	9.32	15.02	13.55

Table-63: Overall Summary of 5G only & 4G only data download & upload speed.

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

VR Mall Surat					
Parameters		**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	**Download Throughput Average (Mbits/s)**	95.90	-	225.92	67.93
	Upload Throughput Average (Mbits/s)	12.96	-	25.59	32.51
4G	**Download Throughput Average (Mbits/s)**	34.27	7.85	73.23	15.98
	Upload Throughput Average (Mbits/s)	4.46	14.02	26.50	15.38

Table-64: 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 07th November 2025. Two locations have been tested in the city.

4.4.1 Walk test locations
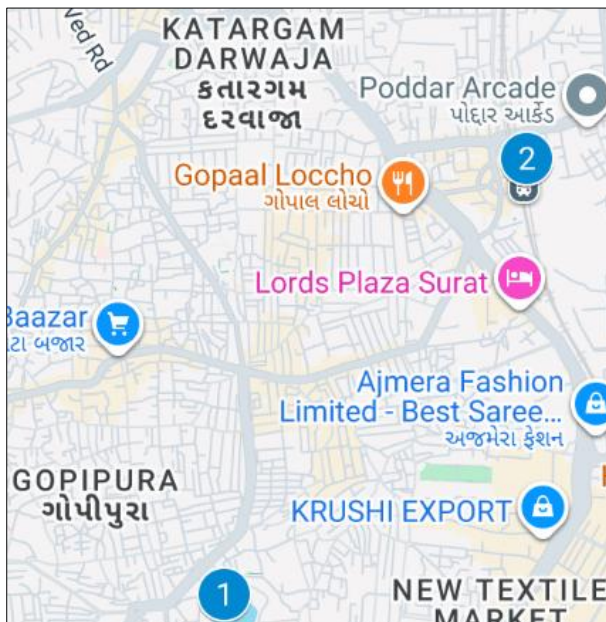
Figure-24: Walk Test locations.

4.4.2 Walk Test Covered

1. Gopi Talav
2. Surat Railway Station

4.4.3 Voice Performance

	Gopi Talav			
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	9	10	10	10
Call Setup Success Rate %	100.00	90.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.25	0.92	0.59	0.83

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

	Surat Railway Station			
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	9	9	9	9
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.19	0.72	0.49	0.64

Table-66: 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)

Gopi Talav				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	140.79	4.00	296.07	76.54
Download Session Setup Success Rate %	90.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	51.24	5.90	68.05	34.61
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Latency (ms) - 50th Percentile	40.89	40.11	28.11	12.75

Table-67: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Surat Railway Station				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	78.28	5.03	148.94	43.00
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	42.42	7.99	64.20	33.39
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Latency (ms) - 50th Percentile	39.10	41.25	32.39	16.91

Table-68: 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, BSNL and VIL have 97.55%, 100.00% and 91.48% call setup success rate respectively in 3G/2G network mode. (refer table-3)

   b) Airtel, BSNL, RJIL and VIL have 99.52%, 93.67%, 100.00% and 100.00% 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. (refer table-9)

2. Call Setup Time:
   a) Airtel, BSNL and VIL call setup time is 5.49, 4.01 & 4.59 seconds respectively in 3G/2G network mode. (refer table-3)

   b) Airtel, BSNL, RJIL & VIL call setup time is 1.24, 1.08, 0.55 & 0.66 seconds respectively in auto-selection mode (5G/4G/3G/2G). (refer table-5)

3. Call Silence/Mute Rate: In packet switched network (4G/5G) BSNL, VIL, RJIL, & Airtel have 7.14%, 0.92%, 0.76% & 0.62% silence call rate respectively. Further BSNL has higher RTP packet loss rate in downlink (6.66%) compared to RJIL (0.74%), VIL (0.55%) & Airtel (0.42%). In uplink the RTP packet loss rate is higher for BSNL (5.99%) compared to RJIL (0.65%), VIL (0.46%) & Airtel (0.33%). (refer table-6)

4. Drop Call Rate:
   a) Airtel, BSNL and VIL drop call rate is 3.14%, 0.77% and 1.63% respectively in 3G/2G network mode. (refer table-3)

   b) Airtel, BSNL, RJIL and VIL drop call rate is 0.00%, 3.32%, 0.12% and 0.00% 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 150.09 Mbps, 5.03 Mbps, 278.56 Mbps and 46.65 Mbps respectively. (refer table-11)

   b) Airtel, BSNL, RJIL and VIL average upload speeds are 38.94 Mbps, 6.90 Mbps, 47.31 Mbps and 23.94 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 169.72 Mbps, 6.55 Mbps, 287.11 Mbps and 58.57 Mbps respectively. (refer table-35)

   b) Airtel, BSNL, RJIL and VIL average upload speeds are 36.07 Mbps, 8.98 Mbps, 48.09 Mbps and 27.84 Mbps respectively. (refer table-35)

3. Data session setup success rate (static i.e. while stationary):
   a) Airtel, BSNL, RJIL and VIL have 100.00%, 97.14%, 97.14% and 100.00% download session setup success rate respectively. (refer table-35)

   b) Airtel, BSNL, RJIL and VIL have 100.00%, 98.57%, 98.57% and 100.00% upload session setup success rate respectively. (refer table-35)

5.3 Operator wise Key Findings

1. Airtel:

Voice

- 97.55% call setup success rate and 3.14% drop call rate have been observed in 3G/2G network mode for LSA/city drive. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-3 and 13)

- 99.52% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for LSA. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-5)

- 99.55% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for city drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-15)

- 99.29% 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-20)

- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for walk test location. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-65 and 66)

Data

- Airtel has 150.09 Mbps average download speed & 38.94 Mbps average upload speed for LSA. (refer table-11)

- Airtel has 149.11 Mbps average download speed & 39.01 Mbps average upload speed across the measured routes for city drive. (refer table-19)

- BAPS Swaminarayan Temple, Civil Hospital, Sardar Vallabhbhai Patel NIT and Surat Railway Station have less download speed (less than 100 Mbps) out of total 14 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-37, 38, 44 & 47)

- BAPS Swaminarayan Temple, Civil Hospital, District Collectorate, ISKCON Temple, Surat Airport and VR Mall Surat have less upload speed (less than 20 Mbps) out of total 14 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table- 37, 38, 39, 42, 46 & 49)

- Surat Railway Station has less download speed (less than 100 Mbps) out of total 2 walktest locations for auto-selection mode (5G/4G/3G/2G). (refer table-68)

2. BSNL:

Voice

- 100.00% call setup success rate and 0.77% drop call rate have been observed in 3G/2G network mode for LSA/city drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-3 and 13)

- 93.67% call setup success rate and 3.32% 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)

- 92.82% call setup success rate and 4.10% 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)

- 97.86% 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-20)

- 90.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for walk test location. Performance is not meeting the benchmark of 98.00% for call setup success rate. (refer table-65)

- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for walk test location. Performance is well within the benchmark of 98.00% % 2.00% respectively. (refer table-66)

Data
- BSNL has 5.03 Mbps average download speed & 6.90 Mbps average upload speed for LSA. (refer table-11)

- BSNL has 4.83 Mbps average download speed & 6.60 Mbps average upload speed across the measured routes for city drive. (refer table-19)

- Adarsh Market I – II, BAPS Swaminarayan Temple, Civil Hospital, District Collectorate, District Court, Govt Bus Stand, Mumbai Market, Sardar Vallabhbhai Patel NIT, Sneh Rashmi Botanical Garden, Surat Airport, Surat Railway Station, Udhana Junction Railway Station and VR Mall Surat have less download speed (less than 10 Mbps) out of total 14 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table- 36, 37, 38, 39, 40, 41, 43, 44, 45, 46, 47, 48 & 49)

- BAPS Swaminarayan Temple has less upload speed (less than 2 Mbps) out of total 14 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-37)

- Gopi Talav and Surat Railway Station have less download speed (less than 10 Mbps) out of total 2 walktest locations for auto-selection mode (5G/4G/3G/2G). (refer table- 67 & 68)

3. RJIL:
Voice
- 100.00% call setup success rate and 0.12% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for LSA. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-5)

- 100.00% call setup success rate and 0.15% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for city drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-15)

- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for all hotspot locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-20)

- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for walk test location. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-65 and 66)

Data
- RJIL has 278.56 Mbps average download speed & 47.31 Mbps average upload speed for LSA. (refer table-11)

- RJIL has 279.36 Mbps average download speed & 46.54 Mbps average upload speed across the measured routes for city drive. (refer table-19)

- Civil Hospital and Surat Railway Station have less download speed (less than 100 Mbps) out of total 14 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-38 & 47)

- Adarsh Market I – II, Civil Hospital and Surat Railway Station have less upload speed (less than 20 Mbps) out of total 14 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-36, 38 & 47)

4. VIL:

Voice

- 91.48% call setup success rate and 1.63% drop call rate have been observed in 3G/2G network mode for LSA/city drive. Performance is not meeting the benchmark of 98.00% for call setup success rate. (refer table-3 and 13)

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

- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for city drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-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-20)

- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for walk test location. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-65 & 66)

Data

- VIL has 46.65 Mbps average download speed & 23.94 Mbps average upload speed for LSA. (refer table-11)

- VIL has 45.02 Mbps average download speed & 23.24 Mbps average upload speed across the measured routes for city drive. (refer table-19)

- All locations have less download speed (less than 100 Mbps) out of total 14 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48 & 49)

- BAPS Swaminarayan Temple, ISKCON Temple, Surat Airport and VR Mall Surat have less upload speed (less than 20 Mbps) out of total 14 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-37, 42, 46 & 49)

- Gopi Talav and Surat Railway Station have less download speed (less than 100 Mbps) out of total 2 walktest locations for auto-selection mode (5G/4G/3G/2G). (refer table- 67 & 68)

6. Annexure

6.1 Route wise coverage map

6.1.1 City
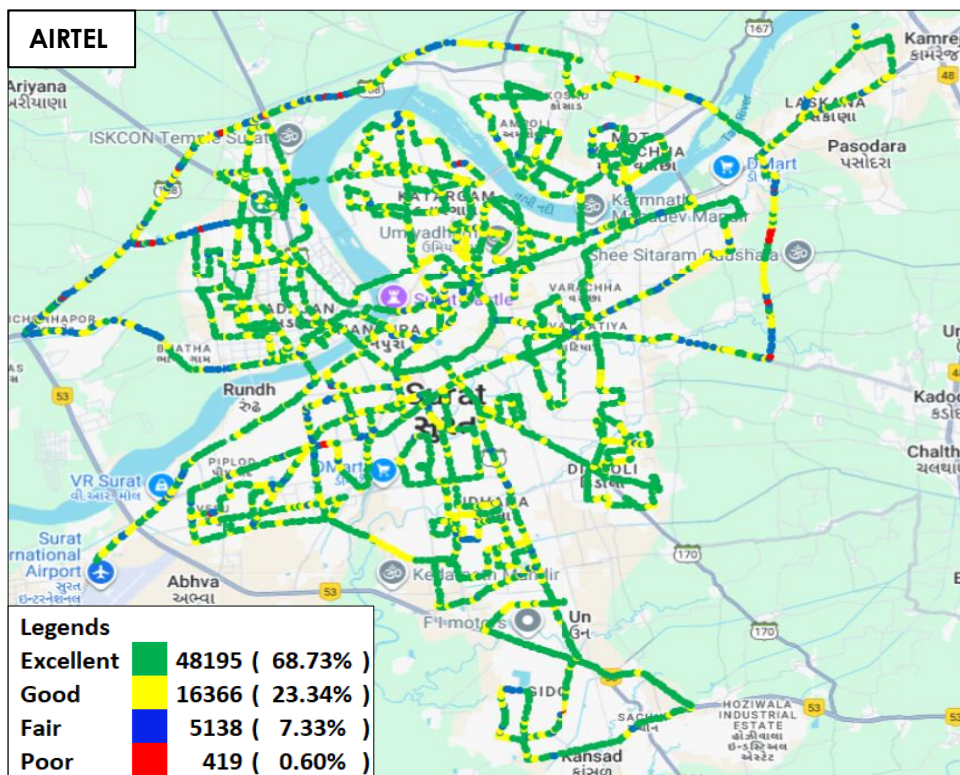
Figure-25: Signal strength 3G/2G network mode – AIRTEL.
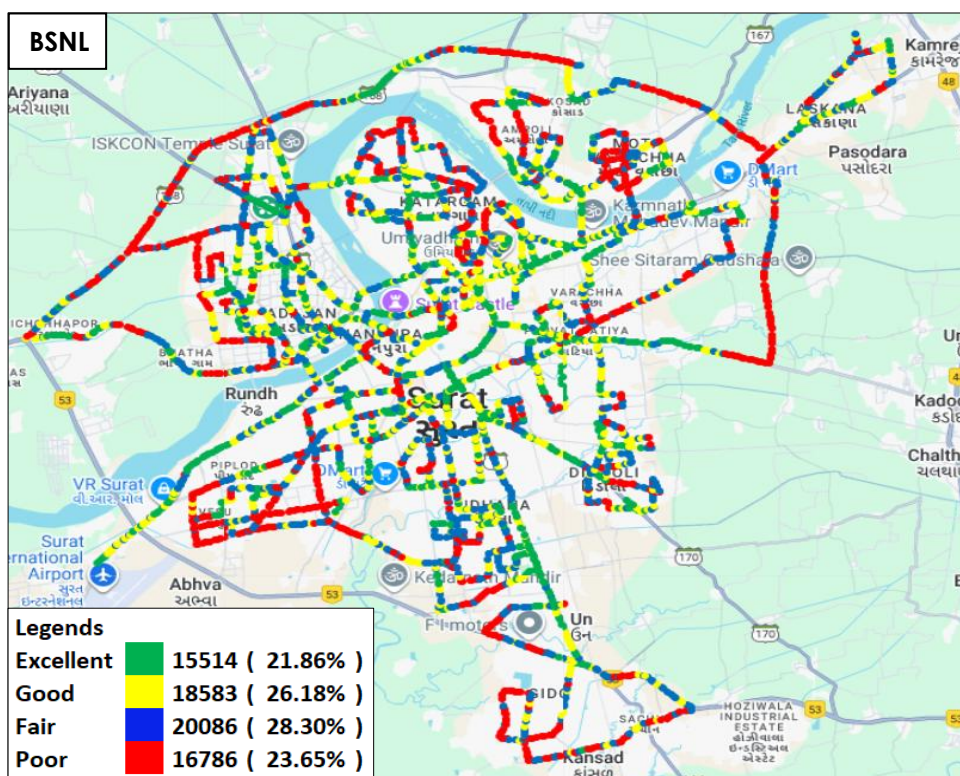
Figure-26: Signal strength 3G/2G network mode – BSNL.
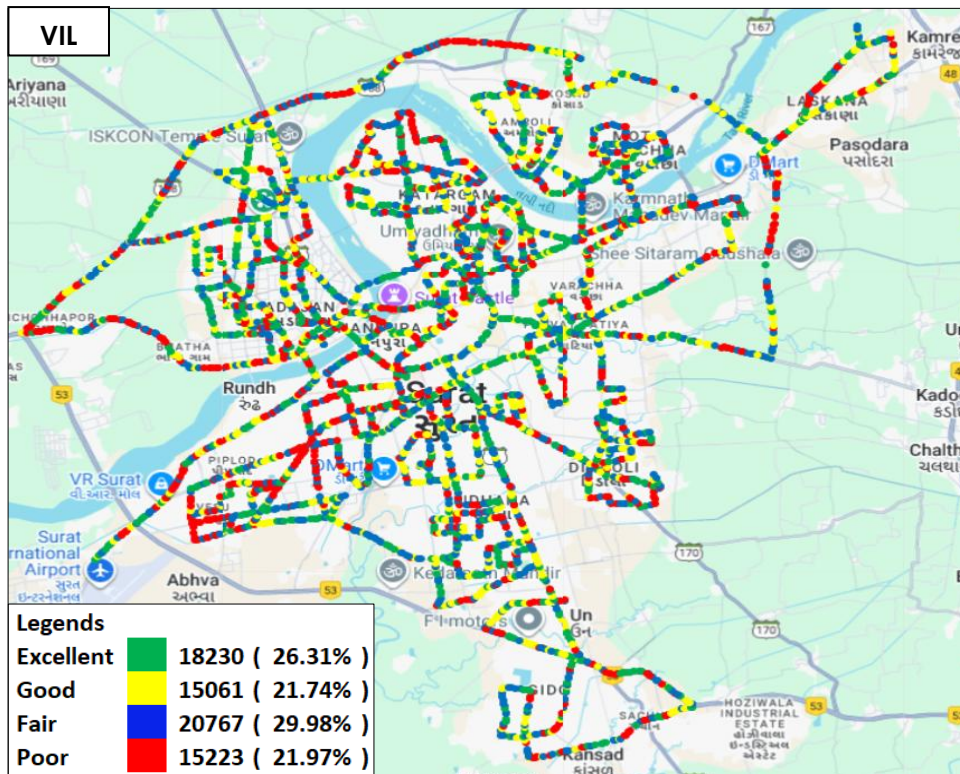
Figure-27: Signal strength 3G/2G network mode – VIL.
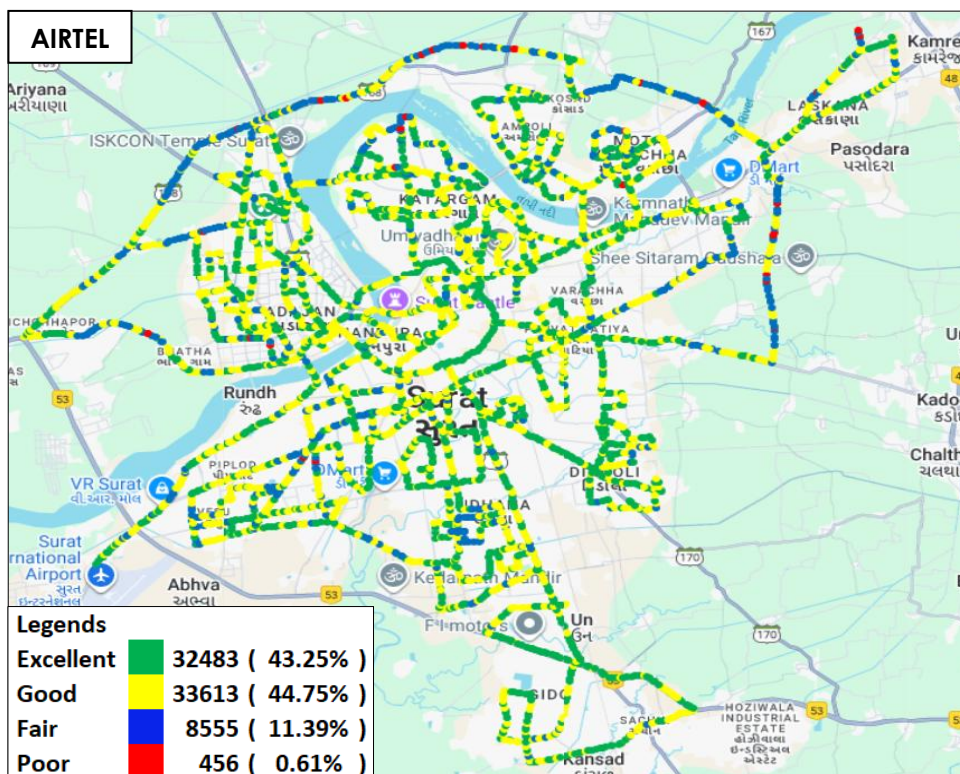
Figure-28: Signal strength auto-selection mode 5G/4G/3G/2G – AIRTEL.
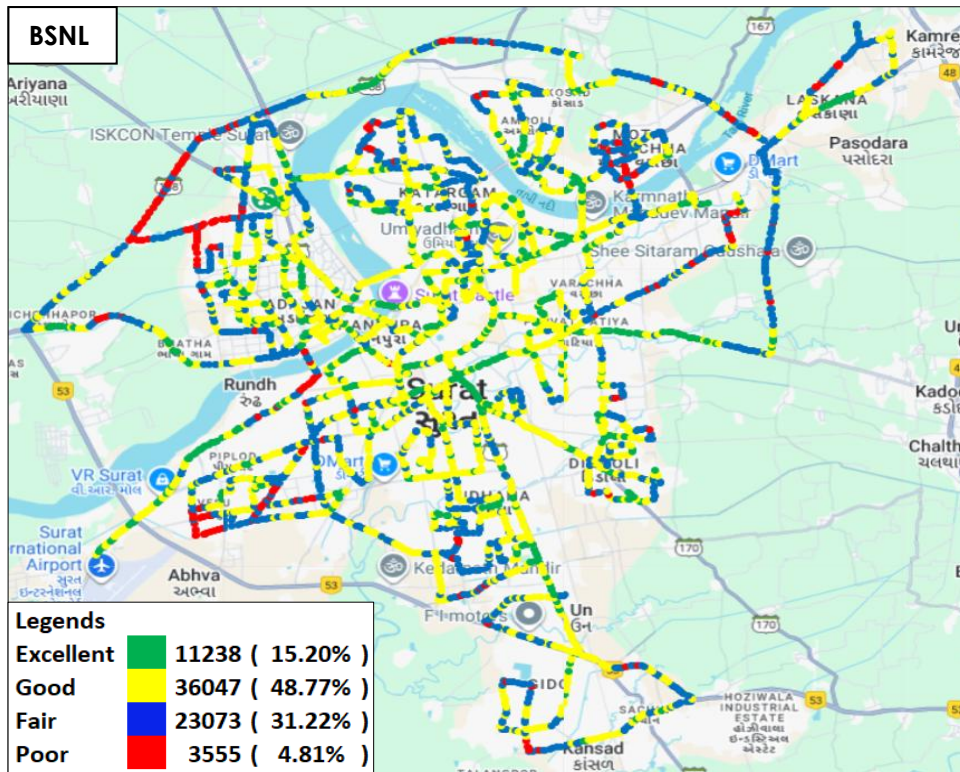
Figure-29: Signal strength auto-selection mode 5G/4G/3G/2G – BSNL.
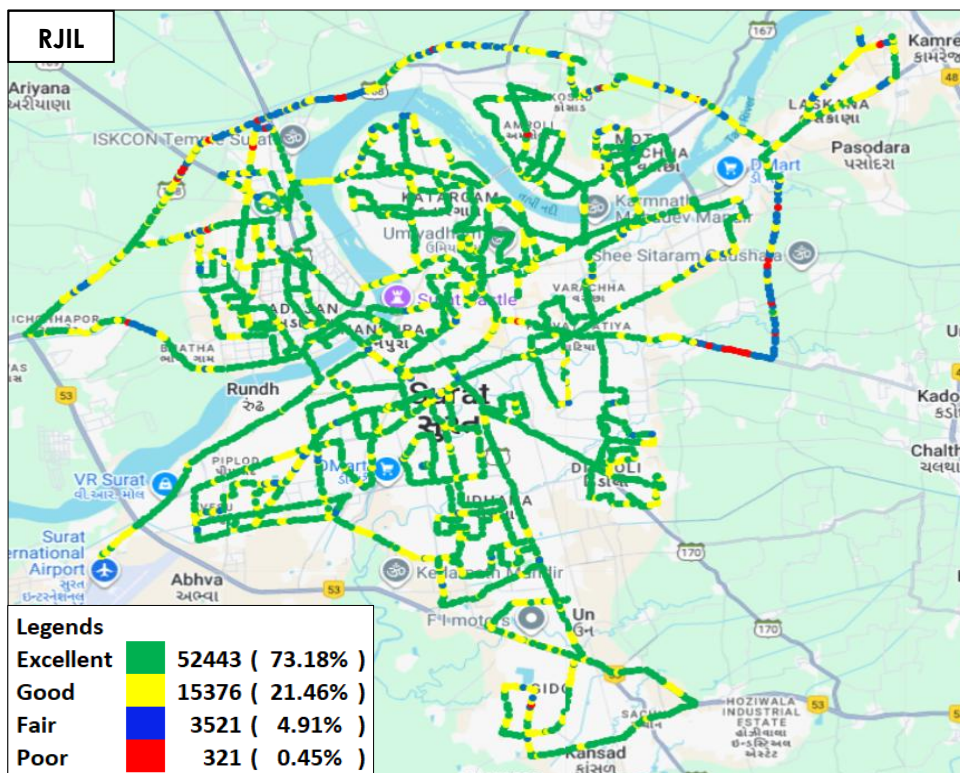
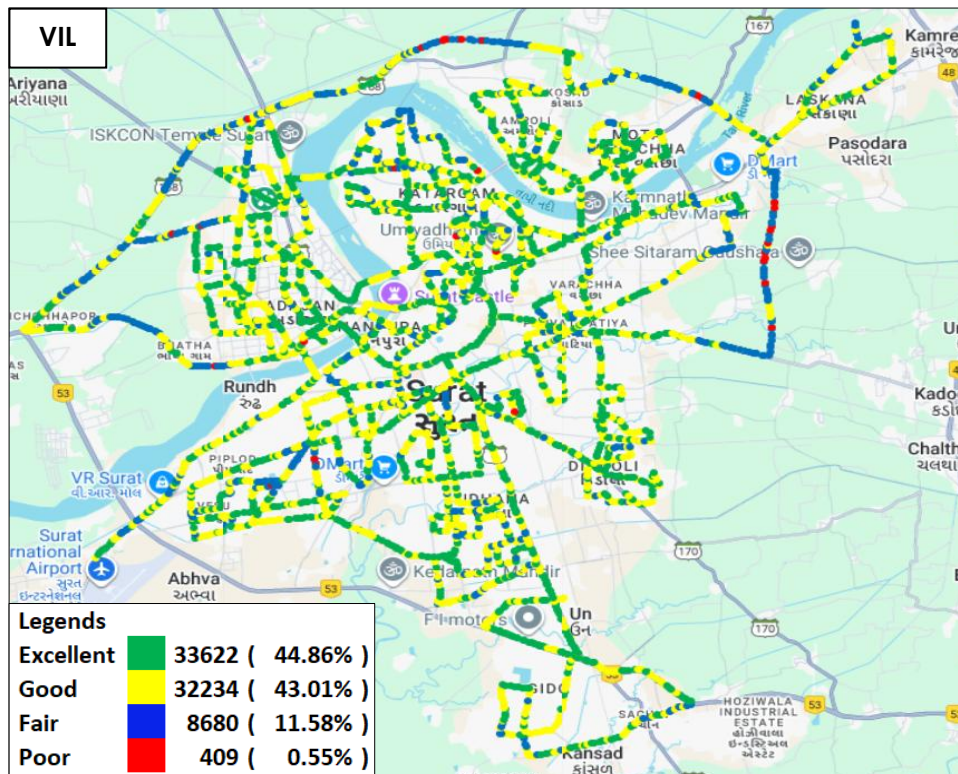**Figure-30:** Signal strength auto-selection mode 5G/4G/3G/2G – RJIL.

Figure-31: Signal strength auto-selection mode 5G/4G/3G/2G – VIL.

7. Appendix

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

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

7.1 Appendix-I

7.1.1 Drive test setup

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

Table-69: Voice test detail

> **Note-**
> - There is 15 sec wait time after locking and before starting first call in 3G/2G call.
> - 10 calls to be made at each Hotspot location.
> - Minimum 10 Calls to be made during the walk test. Call count will be increased based on walk test distance.
> - Speech quality (MOS) has been measured only in city drive & highway by making Mobile to Mobile call.
> - 180 Sec calls were made only in highway & railway route drive.

Data Test		
Test Type	**Technology**	**Detail**
HTTP/FTP Download	5G/4G/3G/2G Auto Mode	500 MB File- 30 Sec Timeout, (Multithread 3- TCP Connection at a time)
HTTP/FTP Upload		250 MB File- 30 Sec Timeout, (Multithread 3- TCP Connection at a time)
YouTube Streaming		20 Sec Video & 25 sec Timeout (Only at Hotspot)
Web Browsing		3 popular websites (www.google.co.in, www.irctc.co.in, www.sbi.co.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-70: Data test detail

Note-
- 5 Data iteration to be done at each hotspot location.
- Minimum 5 iteration to be made during the walk test. Iteration count will be increased based on walk test distance.
- TWAMP-UDP & TCP test to be performed only once at hotspot location.
- Youtube & Web browsing test to be performed at static location only.
- All values are taken up to two decimal places with round off.
- Delhi Based TRAI server being used for HTTP download, Upload, TCP & TWAMP for Airtel & BSNL while VIL provides own server for respective testing.
- RJIL provides own server for Download, Upload and TCP & TWAMP.
- FTP being used in RJIL for Download and upload.

Figure-32: Number of handsets used in city & highway drive
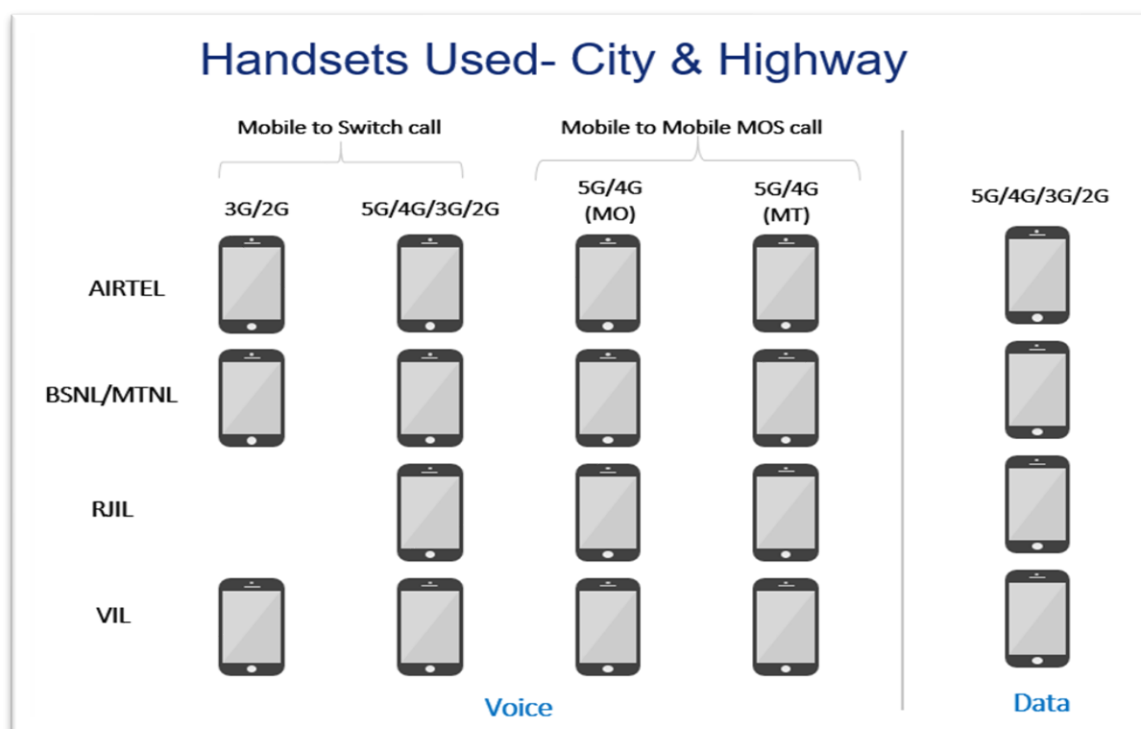
MO: Mobile originating
MT: Mobile terminating
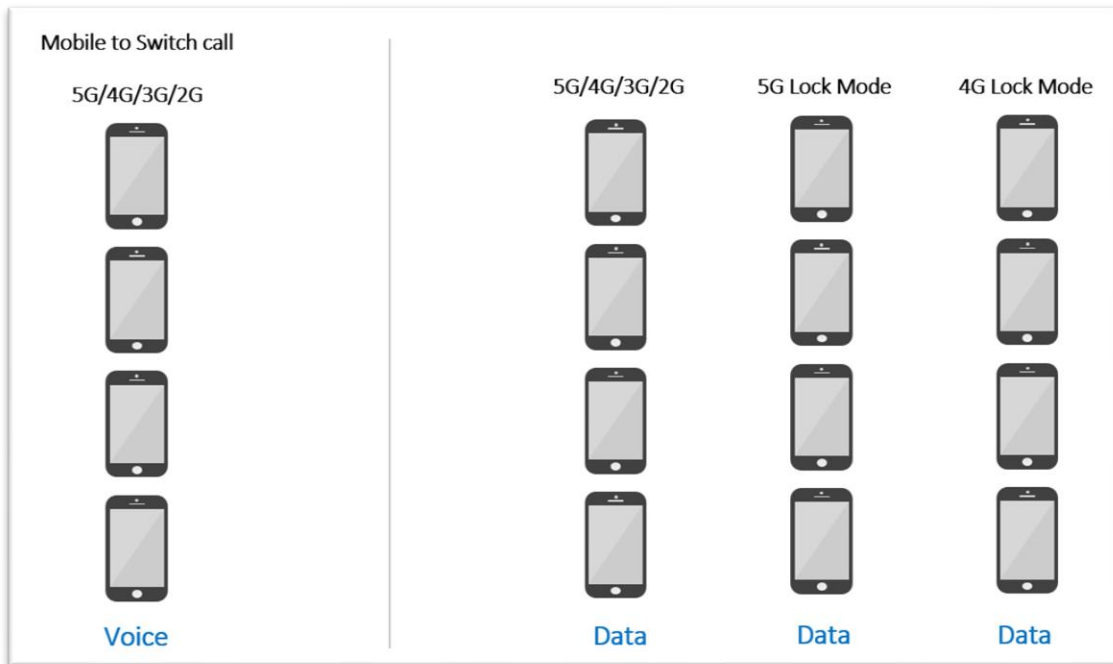
Figure-33: Number of handsets used in railway/metro/walktest/hotspot/ coastal area

> **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)
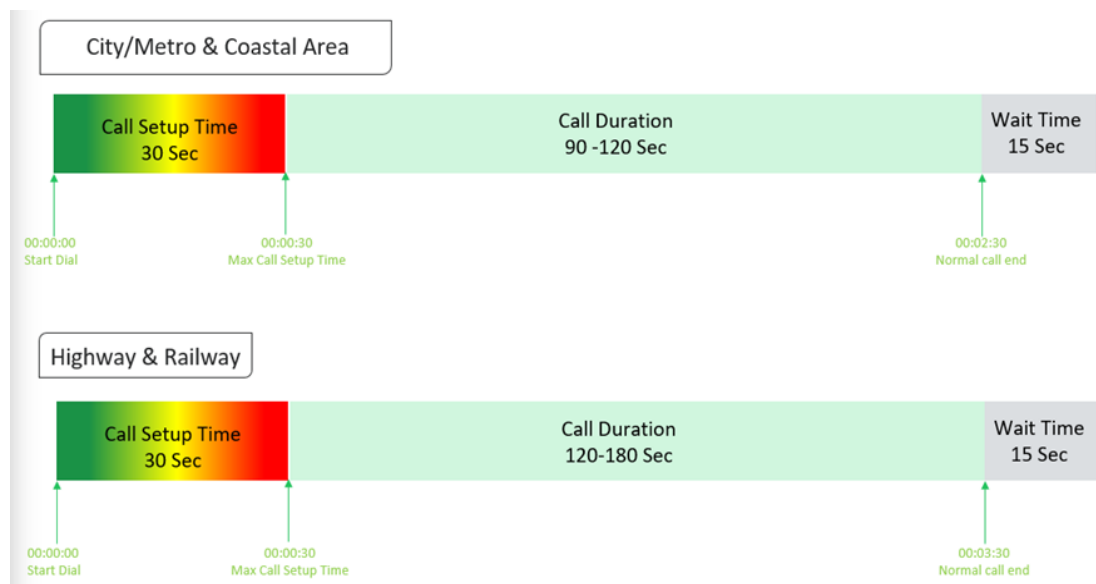
Figure-34: Voice test script for city/railway/metro/highway & coastal area

- 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-35: 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
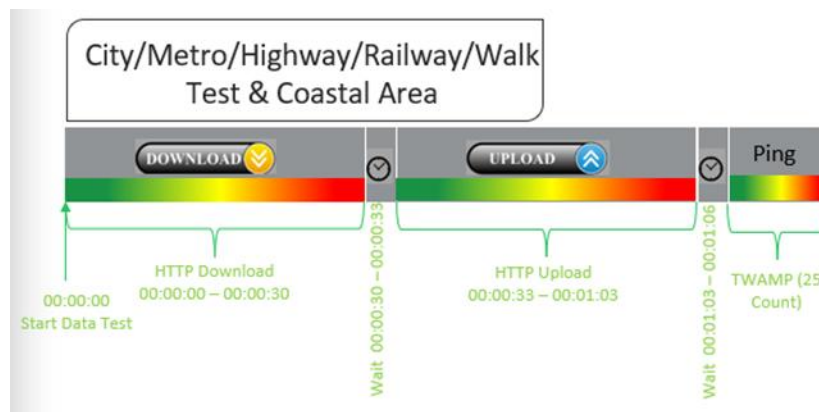
Figure-36: Data test script used in city/metro/railway/highway/walk test & coastal area

(d) Static Data(internet) testing
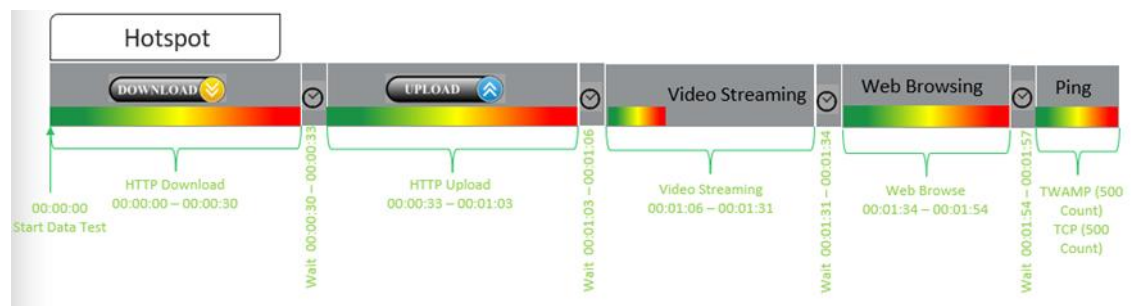
Figure-37: Data test script used at hotspot

- 5 Data iteration done at each hotspot location
- Min. 5 iteration made during the walk test.
- Web browsing duration mentioned above is for one web site only.
- Only 1 ping iteration (with 500 Count of each- TWAMP & TCP) done at hotspot location.

7.2 Appendix-II

7.2.1 Network Performance Parameters for Voice calls

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

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

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

Table-71: 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-72: 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.