



## **TELECOM REGULATORY AUTHORITY OF INDIA**

*Independent Drive Test Report*

*Karnataka LSA*

*December 2025*

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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 Karnataka License Service Area (LSA) during the month of December-2025 under the supervision of TRAI Regional Office (RO) Bengaluru. Details of route / area covered during the IDT are as given below:

S. No	Drive test route	Type of route	Distance covered (KMs)	From date	To date
1	Chitradurga	City	393.2	02-Dec-2025	04-Dec-2025
2	Chitradurga	Inter Operator Calling	01 Location	05-Dec-2025	05-Dec-2025
3	Chitradurga	Hotspot	13 Locations	02-Dec-2025	05-Dec-2025
4	Chitradurga	Walk test	8.0	03-Dec-2025	5-Dec-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.

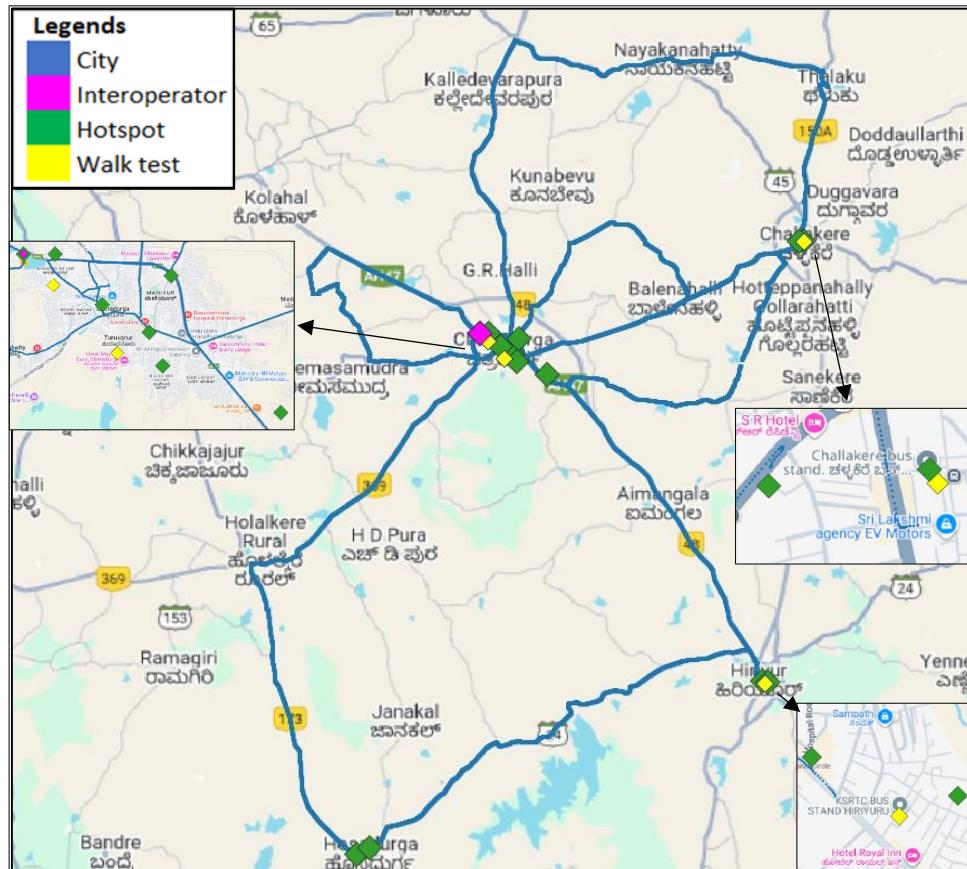


Figure-1: Drive test routes

## 2.3 Summary of areas covered

**a) City**-Nearby Adarsha Nagar, Seebara, Vijapur, Obavanagathihalli, Hunasekatte, Malappanahatty, Shivaganga, Holalkere, Herur, Hosadurga, Madadhakere, Beererahalli, Hiriyur, Aimangala, Kyadiggere, Kalliroppa, Vittala Nagar, Nandanahalli, Madakripura, Haikal, Challakere, Thalaku, Mustur, Bogalerahatty, G. R. Halli, Pillekerenahalli etc.

### b) Hotspot

1. Challakere Bus Stand
2. Challakere Taluk Office
3. Chitradurga District Hospital
4. Chitradurga KSRTC Bus Stand
5. Chitradurga RTO Office
6. District Collector Office Chitradurga
7. Hiriyur Government Hospital
8. Hiriyur KSRTC Bus Stand
9. Hosadurga Government Hospital
10. Hosadurga New Bus Stand
11. Muruga Rajendra Mata
12. Onake Obavva Stadium Chitradurga
13. SJM Institute Of Technology

### c) Walk Test

1. APMC Market
2. Chandravalli Kere Park
3. Chitradurga Fort
4. Chitradurga Railway Station

## 2.4 Telecom service providers detected frequency bands

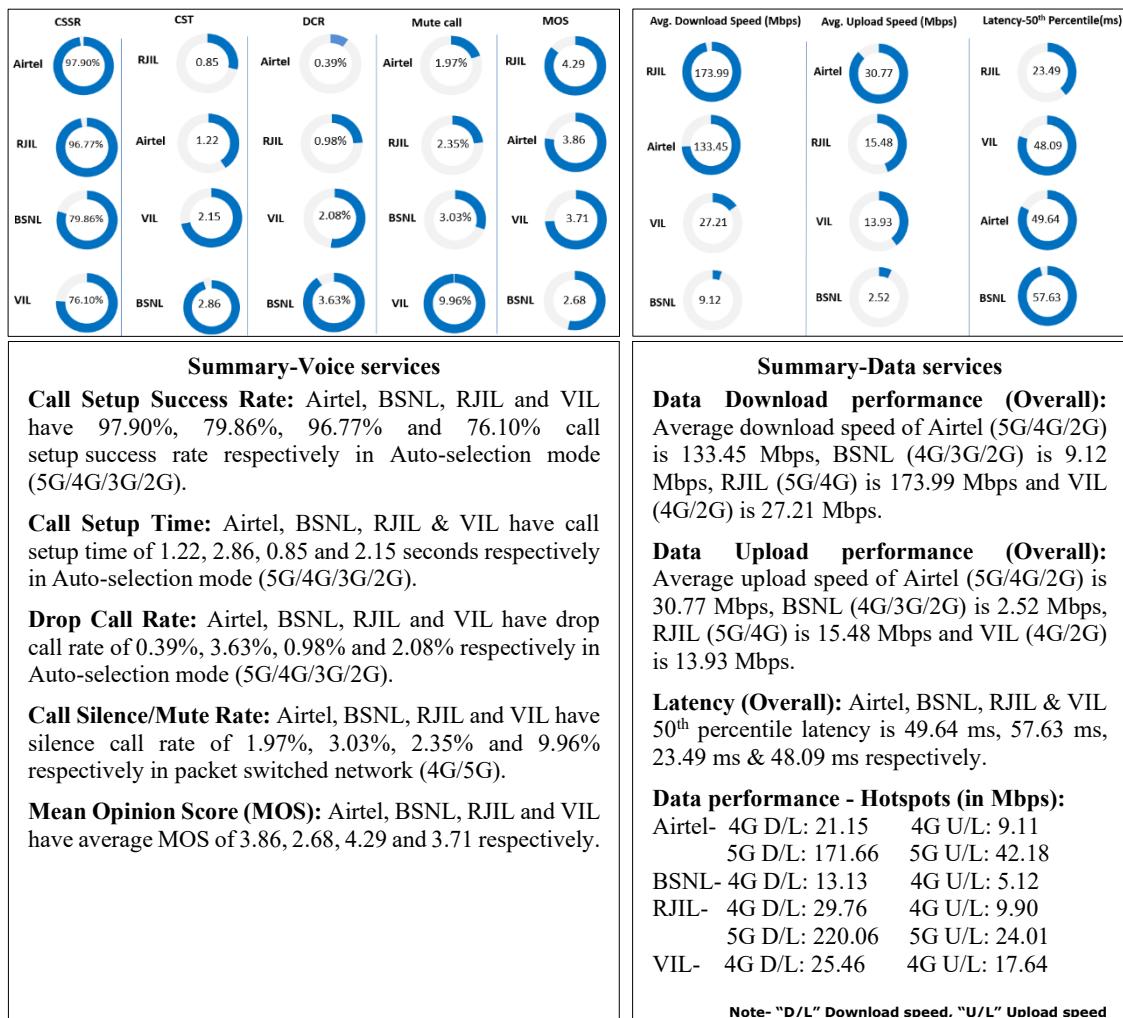
Technologies covered during the IDT and frequency bands in use are summarised in table below:

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

**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.



- The poor Signal Strength in auto-selection mode (5G/4G/3G/2G) during **voice** testing has been observed as 4.23%, 60.54%, 10.84% & 23.95% in the **city IDT route** in case of Airtel, BSNL, RJIL & VIL respectively. {refer figure- 33 to 36 as per the **Section 6.1** under Para-6(Annexure)}
- The poor Signal Strength in auto-selection mode (5G/4G/3G/2G) during **data** testing has been observed as 15.07%, 53.53%, 27.81% & 29.07% in the **city IDT route** in case of Airtel, BSNL, RJIL & VIL respectively. {refer figure- 37 to 40 as per the **Section 6.1** under Para-6(Annexure)}

# QoS Performance Analysis- Karnataka LSA

### 3. QoS performance analysis-LSA level

#### 3.1 Overview

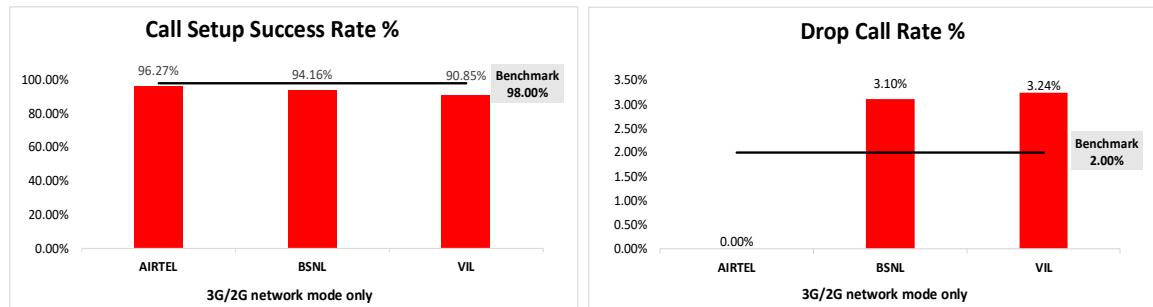
This section provides summary of overall QoS performance of the telecom service provider's network in the LSA by aggregating the results of drive tests conducted in the Karnataka LSA during the month of December-2025 covering city drive, hotspots and walk test. (Refer Table 1)

#### 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
<b>Call Attempts</b>	295	308	306
<b>Call Setup Success Rate %</b>	96.27	94.16	90.85
<b>Drop Call Rate %</b>	0.00	3.10	3.24
<b>Call Setup Time-Average (Second)</b>	4.76	3.45	5.93
<b>Handover Success Rate %</b>	98.17	98.90	97.78

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



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

Technology	Number of unique cell Id's covered in Voice test- Technology wise		
	Service Provider		
	3G/2G network mode only		
<b>3G</b>	AIRTEL	NA	NA
<b>2G</b>	BSNL	53	NA
	VIL	318	212

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

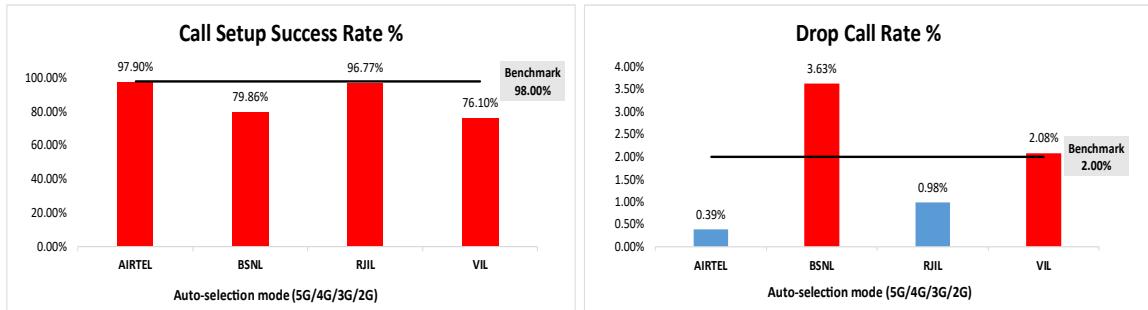
**Note-**

- 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
<b>Call Attempts</b>	523	586	527	569
<b>Call Setup Success Rate %</b>	97.90	79.86	96.77	76.10
<b>Drop Call Rate %</b>	0.39	3.63	0.98	2.08
<b>Call Setup Time-Average (Second)</b>	1.22	2.86	0.85	2.15
<b>Handover Success Rate %</b>	100.00	99.40	99.63	99.90

**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
<b>Call Established (within service provider Network)</b>	304	264	298	271
<b>Number of silence call for &gt;4 Sec</b>	6	8	7	27
<b>Silence Call Rate %</b>	1.97	3.03	2.35	9.96
<b>Number of silence instances for &gt;4 Sec</b>	9	12	8	39
<b>Number of silence instances for &gt;3 Sec</b>	22	20	17	64
<b>Number of silence instances for &gt;2 sec</b>	39	35	31	94
<b>RTP Jitter (4G &amp; 5G) in ms</b>	4.24	7.90	13.45	14.43
<b>Packet loss Rate Downlink %</b>	1.07	6.92	2.76	4.73
<b>Packet loss Rate Uplink %</b>	1.10	6.61	1.91	2.87

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

Technology	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
<b>5G</b>	0	NA	255	NA
<b>4G</b>	640	128	715	289
<b>3G</b>	NA	36	NA	NA
<b>2G</b>	2	96	NA	105

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

**Note-**

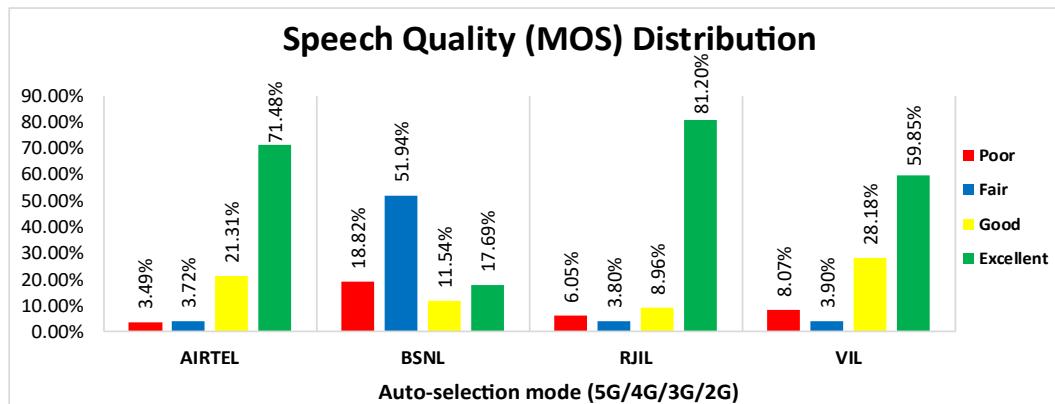
- NA- Service provider doesn't provide services in respective technology.
- 0- No cell Id's were found in respective technology.

**(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
<b>Total Number of MOS Samples for calls table-6</b>	1746	797	1686	1437
<b>Speech Quality (Average MOS)</b>	3.86	2.68	4.29	3.71
<b>Number of samples with MOS &gt;=4 to &lt;5 (Excellent)</b>	1248	141	1369	860
<b>Number of samples with MOS &gt;=3 to &lt;4 (Good)</b>	372	92	151	405
<b>Number of samples with MOS &gt;=2 to &lt;3 (Fair)</b>	65	414	64	56
<b>Number of samples with MOS &gt;=1 to &lt;2 (Poor)</b>	61	150	102	116
<b>%age of samples with MOS &gt;=4 to &lt;5 (Excellent)</b>	71.48%	17.69%	81.20%	59.85%
<b>%age of samples with MOS &gt;=3 to &lt;4 (Good)</b>	21.31%	11.54%	8.96%	28.18%
<b>%age of samples with MOS &gt;=2 to &lt;3 (Fair)</b>	3.72%	51.94%	3.80%	3.90%
<b>%age of samples with MOS &gt;=1 to &lt;2 (Poor)</b>	3.49%	18.82%	6.05%	8.07%

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



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

**(d) Inter-service provider voice call performance:** To check the performance of inter-service providers call setup success rate, total 9 to 14 inter operator calls were attempted at one location which is near Muruga Rajendra Mata. The call setup success rate and call setup time observation is as below.

From Service Provider	Call Setup Success Rate %			
	AIRTEL	BSNL	RJIL	VIL
<b>AIRTEL</b>	NA	90.00	100.00	100.00
<b>BSNL</b>	92.31	NA	44.44	100.00
<b>RJIL</b>	100.00	100.00	NA	100.00
<b>VIL</b>	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
<b>AIRTEL</b>	NA	2.00	1.09	1.65
<b>BSNL</b>	2.92	NA	1.74	2.48
<b>RJIL</b>	1.44	1.93	NA	1.31
<b>VIL</b>	2.05	2.11	1.57	NA

**Table-10:** Call setup time across service providers

**Note-**

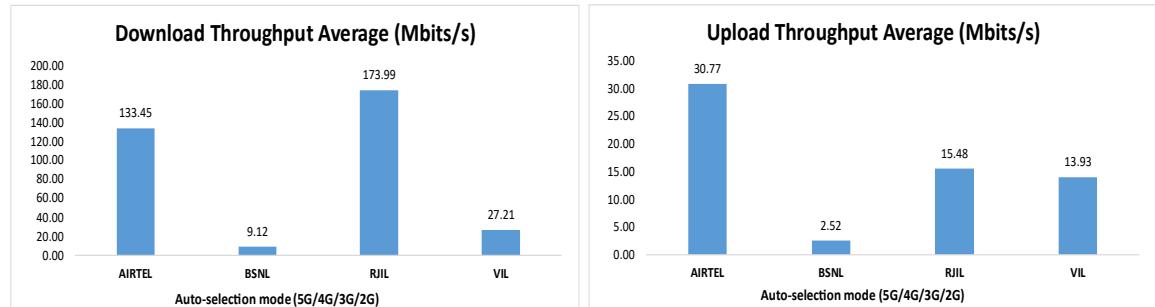
- NA- Only inter-operator calls were measured during test.

### 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	
<b>Download Throughput (Mbits/s)</b>	<b>Average</b>	133.45	9.12	173.99	27.21
	<b>80th Percentile</b>	229.79	14.99	351.78	46.88
	<b>20th Percentile</b>	28.11	3.06	9.91	8.02
<b>Upload Throughput (Mbits/s)</b>	<b>Average</b>	30.77	2.52	15.48	13.93
	<b>80th Percentile</b>	56.21	3.53	29.19	25.93
	<b>20th Percentile</b>	4.06	1.22	1.63	2.47
<b>Latency (ms)</b>	<b>50th Percentile</b>	49.64	57.63	23.49	48.09

**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
<b>5G</b>	0	NA	317	NA
<b>4G</b>	799	148	528	333
<b>3G</b>	NA	42	NA	NA
<b>2G</b>	1	94	NA	88

**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 02<sup>nd</sup> December 2025 to 04<sup>th</sup> December 2025 in Chitradurga. (Refer Table-1)

#### 4.2.1 Drive test route

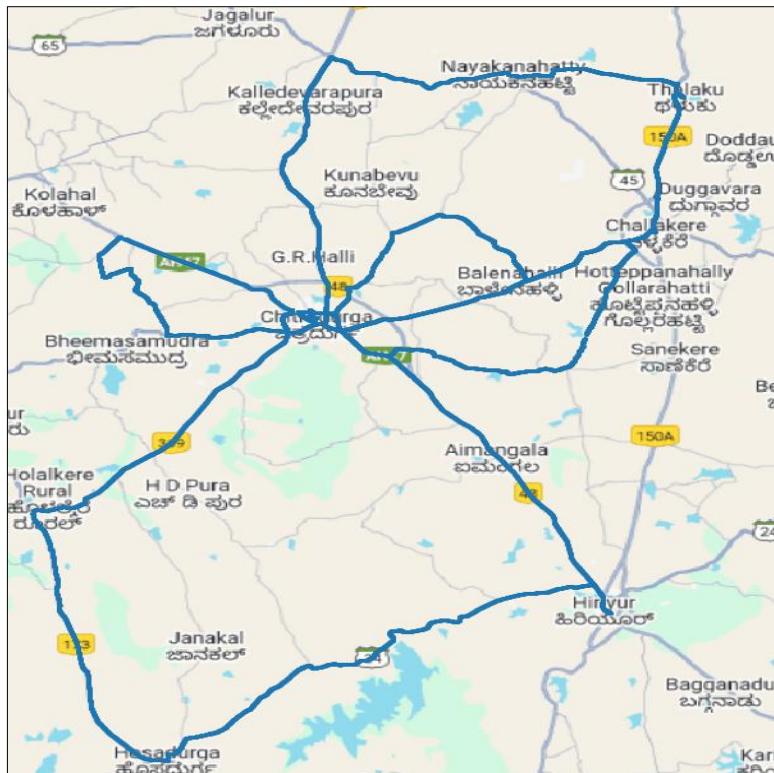


Figure- 6: Drive test routes

#### 4.2.2 Areas covered

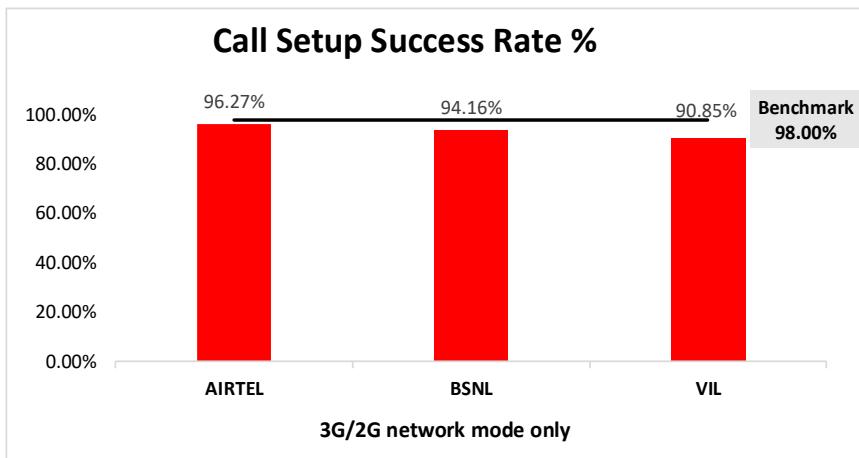
Nearby Adarsha Nagar, Seebara, Vijapur, Obavanagathihalli, Hunasekatte, Malappanahatty, Shivaganga, Holalkere, Herur, Hosadurga, Madadhakere, Beeranahalli, Hiriyur, Aimangala, Kyadiggere, Kalliroppa, Vittala Nagar, Nandanahalli, Madakaripura, Haikal, Challakere, Thalaku, Mustur, Bogalerahatty, G. R. Halli, Pillekerenahalli etc.

### 4.2.3 Voice performance

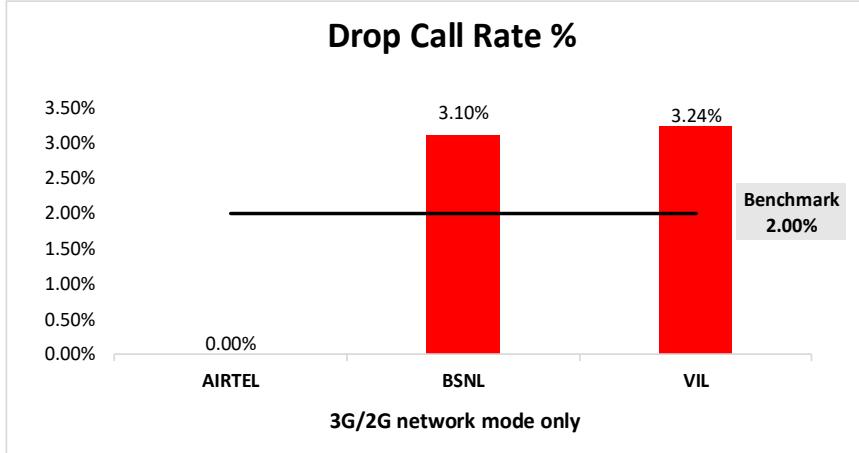
**(a) Voice Call Performance in 3G/2G network mode only:** 3G/2G network mode testing has been done to reflect experience for respective users as they have only 3G/2G compatible handsets.

Parameters	Service Provider		
	3G/2G network mode only		
	AIRTEL	BSNL	VIL
<b>Call Attempts</b>	295	308	306
<b>Call Setup Success Rate %</b>	96.27	94.16	90.85
<b>Drop Call Rate %</b>	0.00	3.10	3.24
<b>Call Setup Time-Average (Second)</b>	4.76	3.45	5.93
<b>Handover Success Rate %</b>	98.17	98.90	97.78

**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.

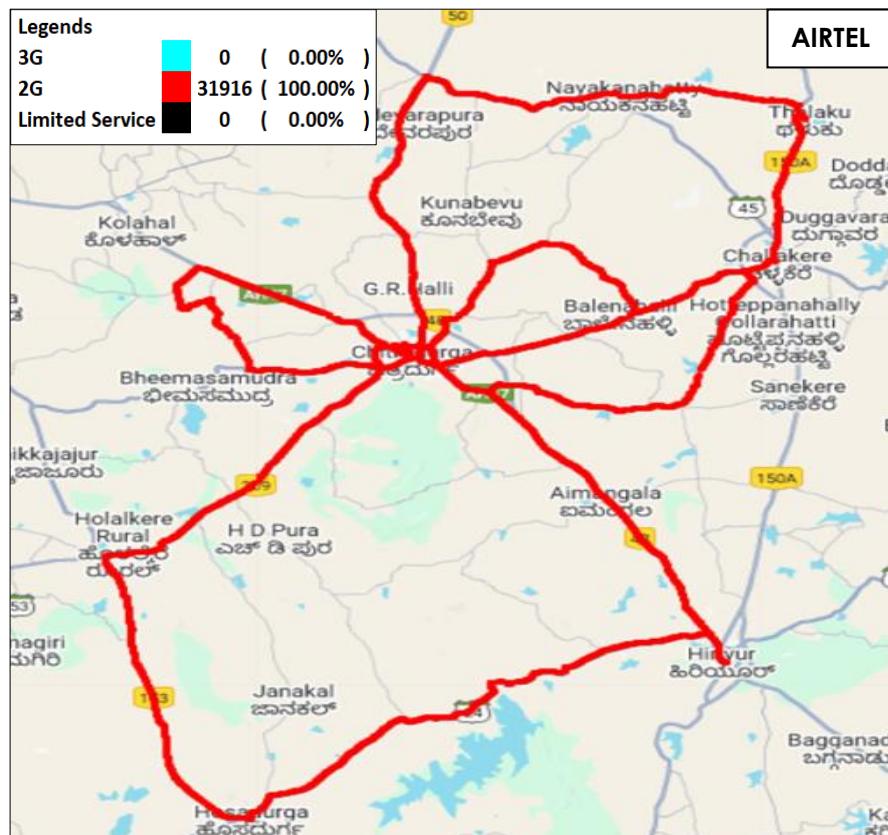
**(b) Network Technology:** This section represent time spent on various network technologies.

Technology	Service Provider		
	AIRTEL	BSNL	VIL
<b>3G</b>	NA	34.55%	NA
<b>2G</b>	100.00%	64.44%	99.60%
<b>Limited Service</b>	0.00%	1.01%	0.40%

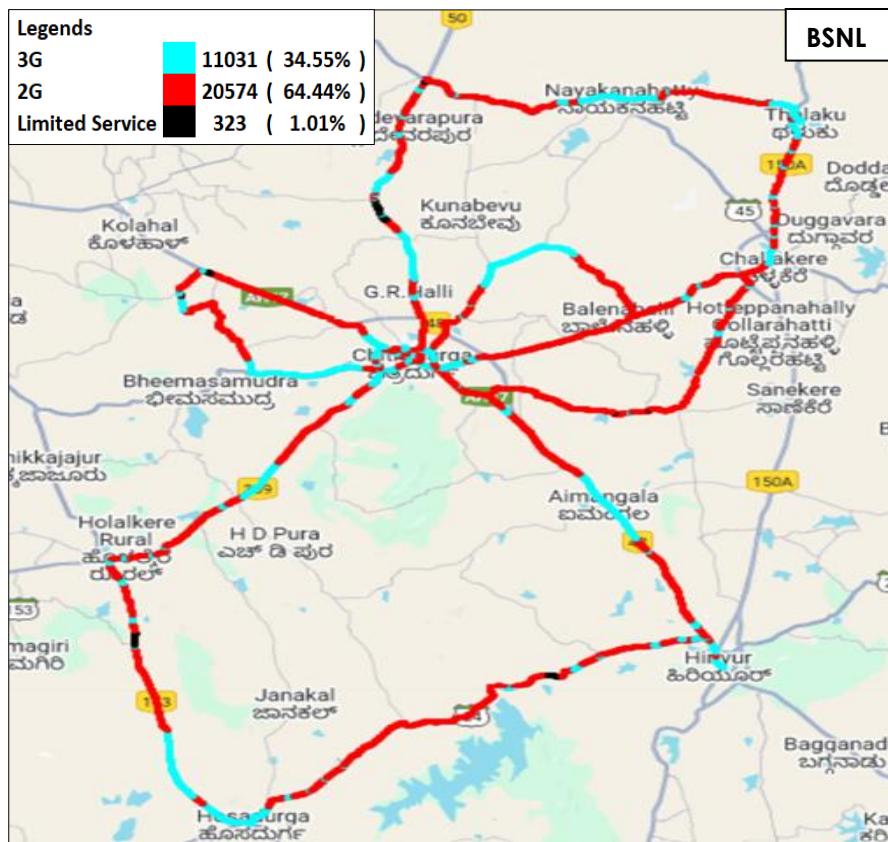
**Table-14:** Time spent on technology during drive test 3G/2G network mode.

**Note-**

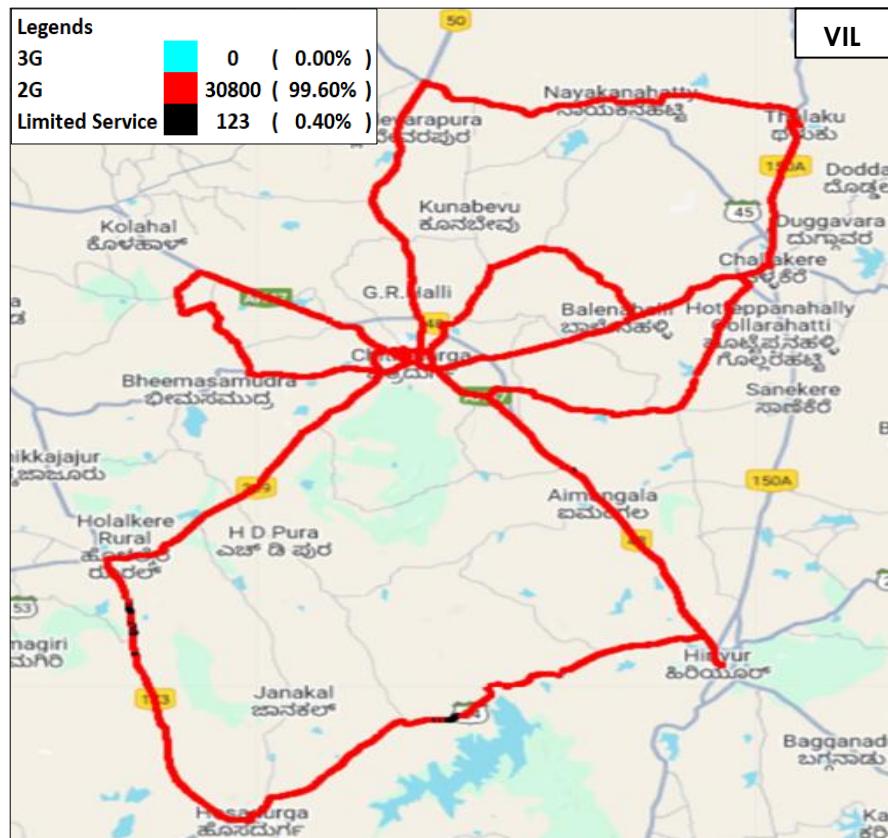
- NA- Service provider doesn't provide services in respective technology.



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

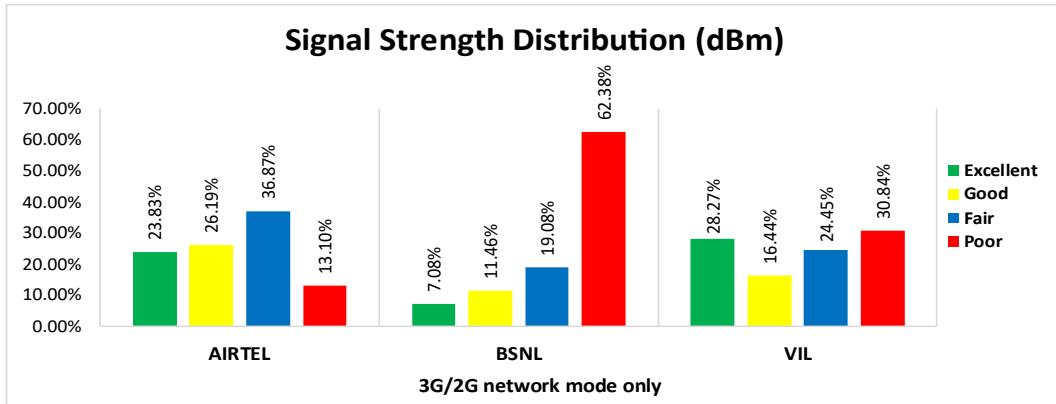


**Figure-10:** Serving technology plots 3G/2G network mode - BSNL.



**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- 30, 31 & 32 for map view)



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

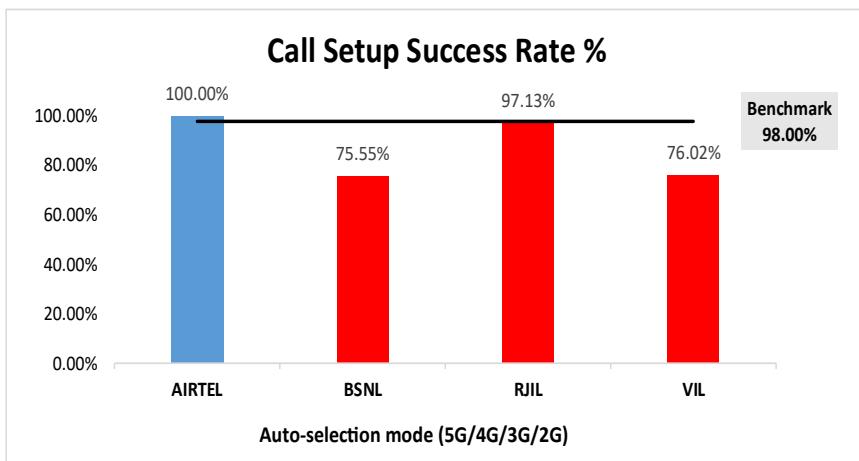
**Observations:**

- Airtel has 24% of samples falling in the excellent signal strength category.
- BSNL has 7% of samples falling in the excellent signal strength category.
- VIL has 28% of samples falling in the excellent signal strength category.

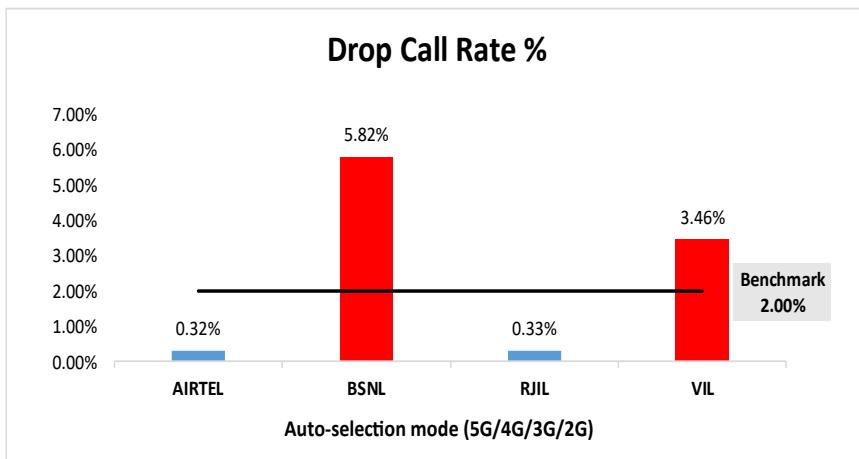
**(d) Voice Call Performance in auto network selection mode (5G/4G/3G/2G)**

Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempts	310	364	314	342
Call Setup Success Rate %	100.00	75.55	97.13	76.02
Drop Call Rate %	0.32	5.82	0.33	3.46
Call Setup Time Average (Second)	1.14	3.88	0.76	2.18
Handover Success Rate %	100.00	99.42	99.66	99.88

**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
<b>Call Established (within service provider Network)</b>	304	264	298	271
<b>Number of silence call for &gt;4 Sec</b>	6	8	7	27
<b>Silence Call Rate %</b>	1.97	3.03	2.35	9.96
<b>Number of silence instances for &gt;4 Sec</b>	9	12	8	39
<b>Number of silence instances for &gt;3 Sec</b>	22	20	17	64
<b>Number of silence instances for &gt;2 sec</b>	39	35	31	94
<b>RTP Jitter (4G &amp; 5G) in ms</b>	4.24	7.90	13.45	14.43
<b>Packet loss Rate Downlink %</b>	1.07	6.92	2.76	4.73
<b>Packet loss Rate Uplink %</b>	1.10	6.61	1.91	2.87

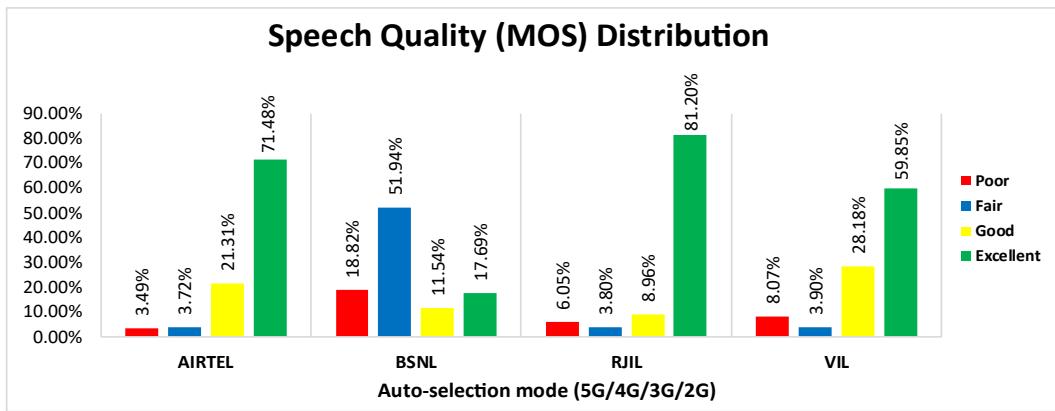
**Table-16:** Summary of silence instances & packet loss rate for mobile to mobile call.

#### **(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
<b>Total Number of MOS Samples for calls in table-16</b>	1746	797	1686	1437
<b>Speech Quality (Average MOS)</b>	3.86	2.68	4.29	3.71
<b>Number of samples with MOS &gt;=4 to &lt;5 (Excellent)</b>	1248	141	1369	860
<b>Number of samples with MOS &gt;=3 to &lt;4 (Good)</b>	372	92	151	405
<b>Number of samples with MOS &gt;=2 to &lt;3 (Fair)</b>	65	414	64	56
<b>Number of samples with MOS &gt;=1 to &lt;2 (Poor)</b>	61	150	102	116
<b>%age of samples with MOS &gt;=4 to &lt;5 (Excellent)</b>	71.48%	17.69%	81.20%	59.85%
<b>%age of samples with MOS &gt;=3 to &lt;4 (Good)</b>	21.31%	11.54%	8.96%	28.18%
<b>%age of samples with MOS &gt;=2 to &lt;3 (Fair)</b>	3.72%	51.94%	3.80%	3.90%
<b>%age of samples with MOS &gt;=1 to &lt;2 (Poor)</b>	3.49%	18.82%	6.05%	8.07%

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



**Figure-15:** Distribution of samples in MOS range.

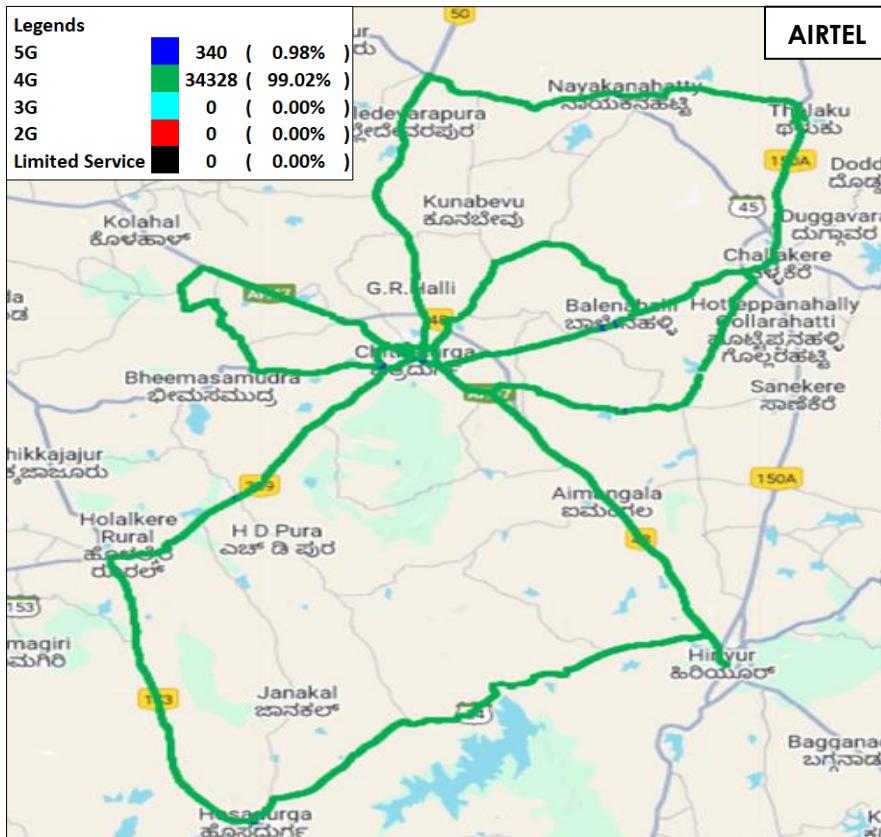
**(f) Network Technology:** This section represents time spent on various network technologies.

Technology	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
<b>5G</b>	0.98%	NA	29.60%	NA
<b>4G</b>	99.02%	29.05%	70.31%	72.54%
<b>3G</b>	NA	18.25%	NA	NA
<b>2G</b>	0.00%	47.58%	NA	24.55%
<b>Limited Service</b>	0.00%	5.13%	0.09%	2.91%

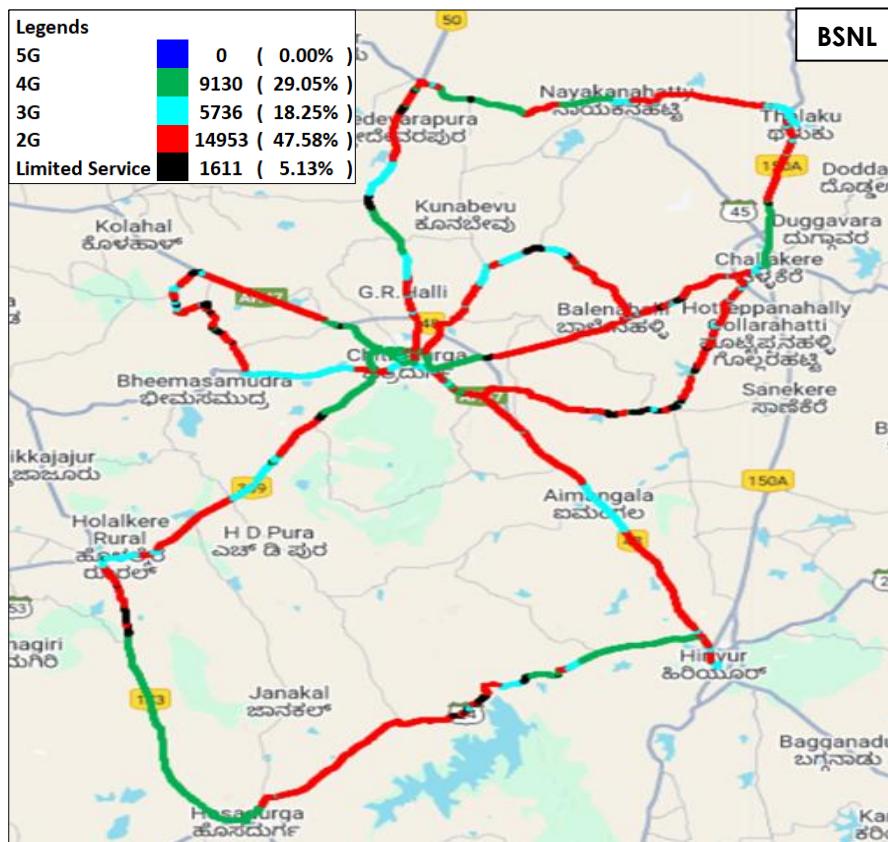
**Table-18:** Time spent on technology during drive test in auto-selection mode (5G/4G/3G/2G) voice.

**Note-**

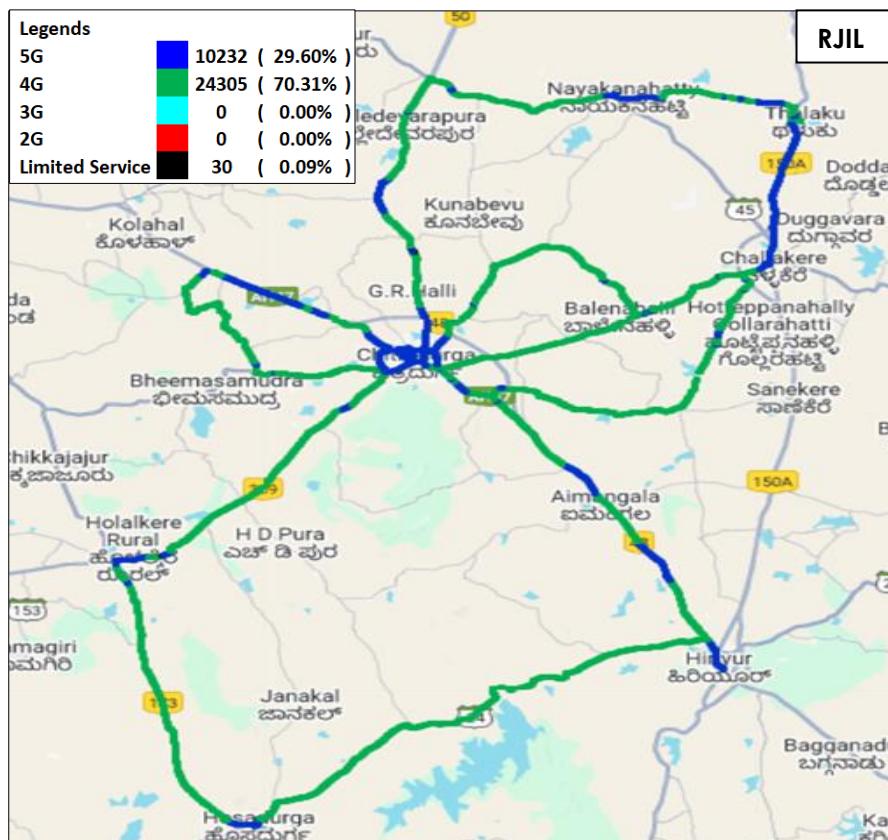
- NA- Service provider doesn't provide services in respective technology.



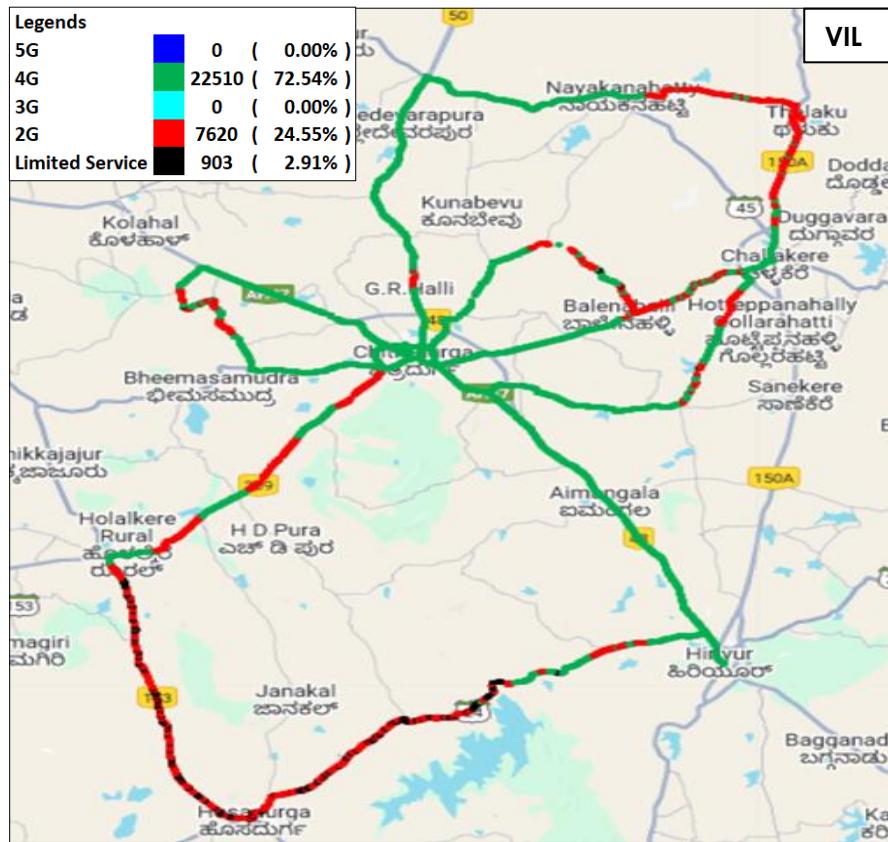
**Figure-16:** Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - AIRTEL.



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

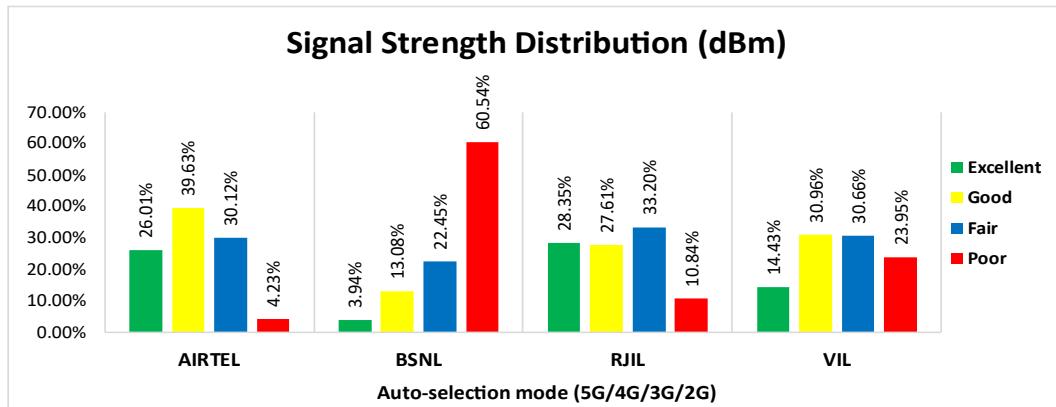


**Figure-18:** Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - RJIL.



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

**(g) Network Signal Strength Distribution:** The following chart provide signal strength distribution for auto-selection mode (5G/4G/3G/2G) voice. (Refer figure-33, 34, 35 & 36 for map view)



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

#### Observations:

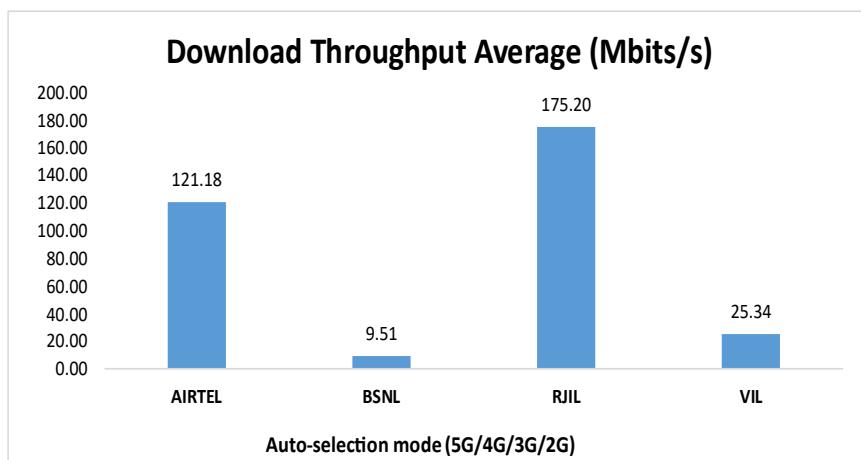
- Airtel has 26% of samples falling in the excellent signal strength category.
- BSNL has 4% of samples falling in the excellent signal strength category.
- RJIL has 28% of samples falling in the excellent signal strength category.
- VIL has 14% of samples falling in the excellent signal strength category.

#### 4.2.4 Data performance

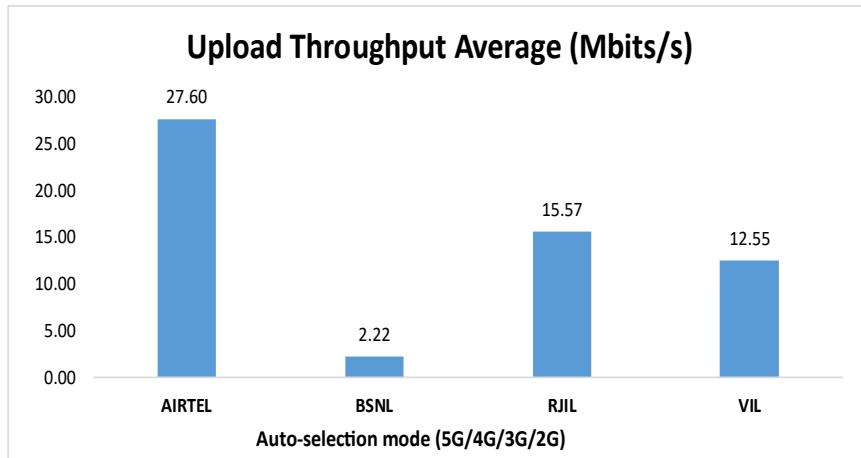
##### (a) Data Parameters (Auto-selection mode- 5G/4G/3G/2G)

Parameters	Service Provider				
	Auto-selection mode (5G/4G/3G/2G)				
	AIRTEL	BSNL	RJIL	VIL	
Download Throughput (Mbits/s)	<b>Average</b>	121.18	9.51	175.20	25.34
	<b>80th Percentile</b>	209.63	17.74	370.13	44.02
	<b>20th Percentile</b>	25.52	2.19	7.88	8.06
Upload Throughput (Mbits/s)	<b>Average</b>	27.60	2.22	15.57	12.55
	<b>80th Percentile</b>	47.11	2.89	31.24	24.43
	<b>20th Percentile</b>	3.41	1.22	1.38	2.02
<b>Latency (ms)</b>	<b>50th Percentile</b>	49.73	69.51	23.12	46.58

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



**Figure- 21:** Download throughput



**Figure- 22:** Upload throughput

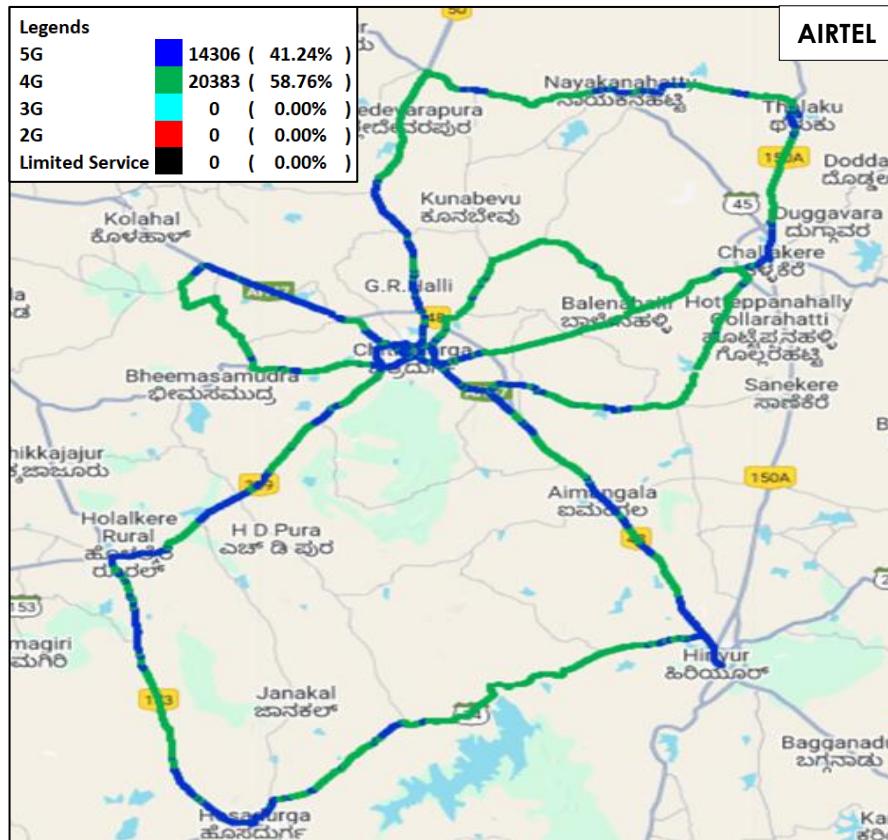
**(b) Network Technology:** This section represents time spent on various network technologies.

Technology	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
<b>5G</b>	41.24%	NA	53.34%	NA
<b>4G</b>	58.76%	53.39%	46.61%	88.48%
<b>3G</b>	NA	25.18%	NA	NA
<b>2G</b>	0.00%	14.71%	NA	9.05%
<b>Limited Service</b>	0.00%	6.72%	0.05%	2.47%

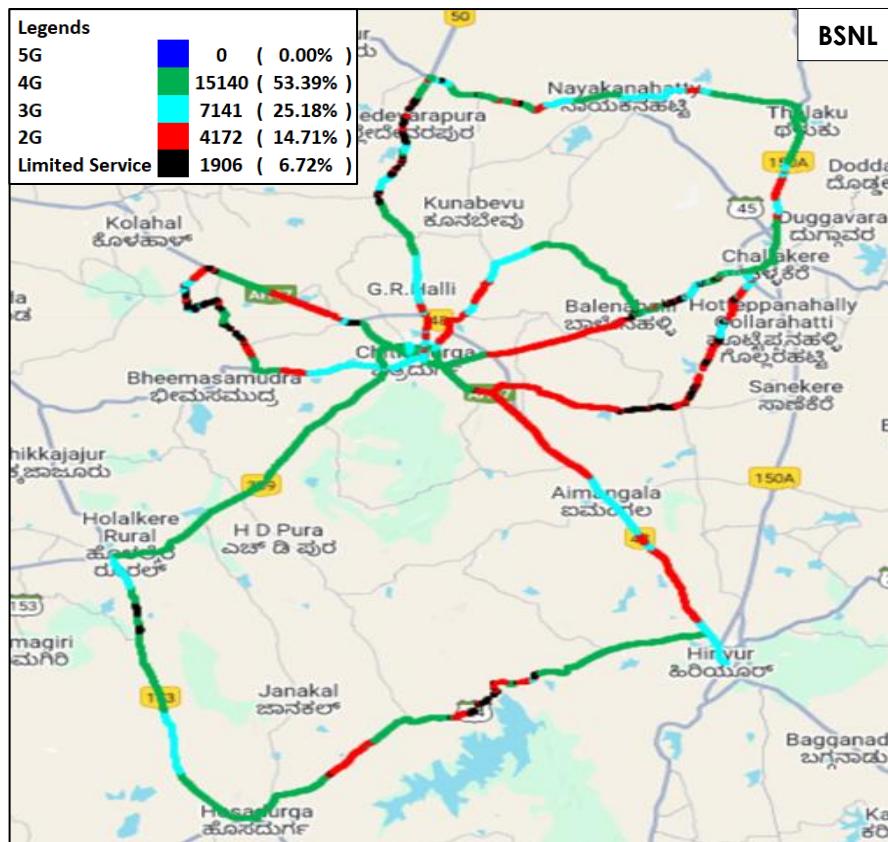
**Table-20:** Time spent on technology during drive test in auto-selection mode (5G/4G/3G/2G) data.

**Note-**

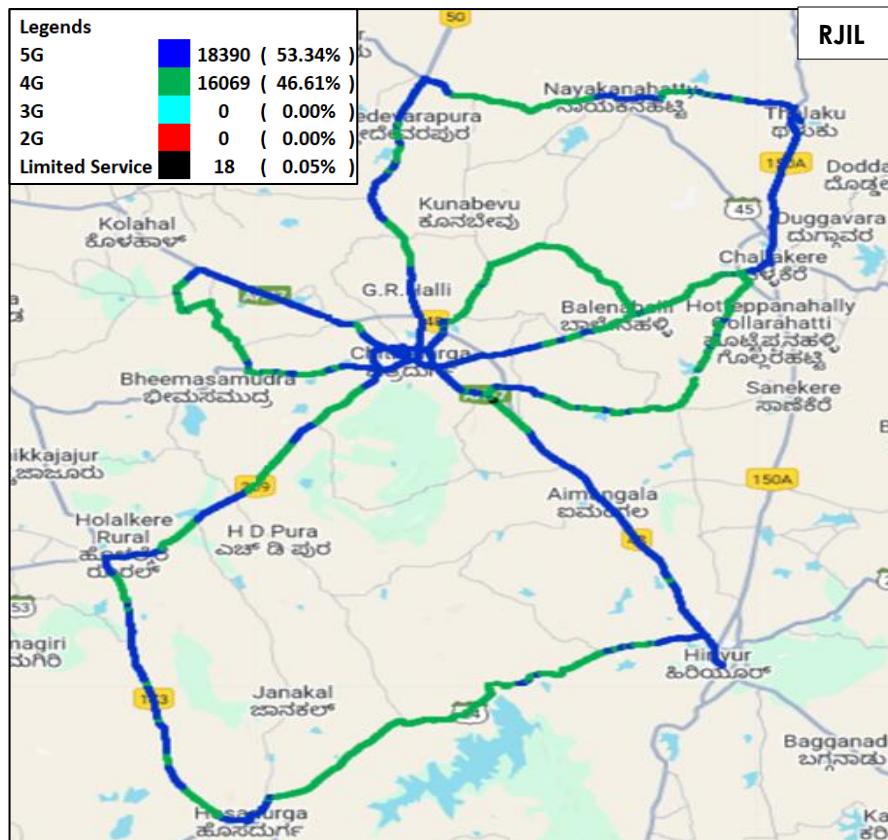
- NA- Service provider doesn't provide services in respective technology.



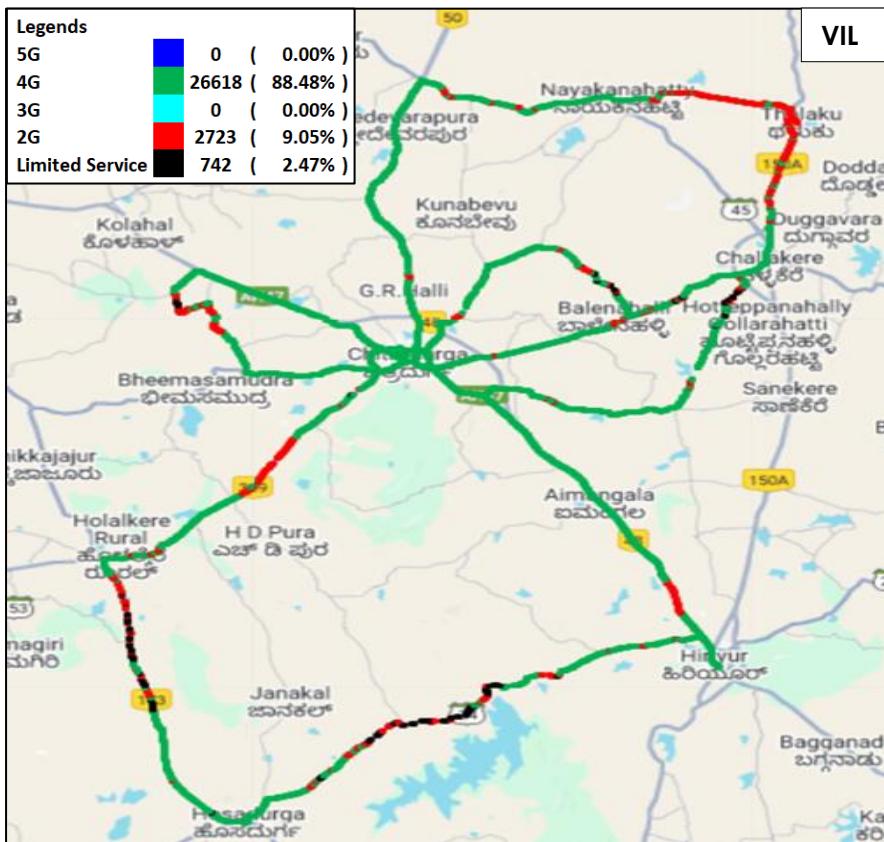
**Figure-23:** Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - AIRTEL.



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

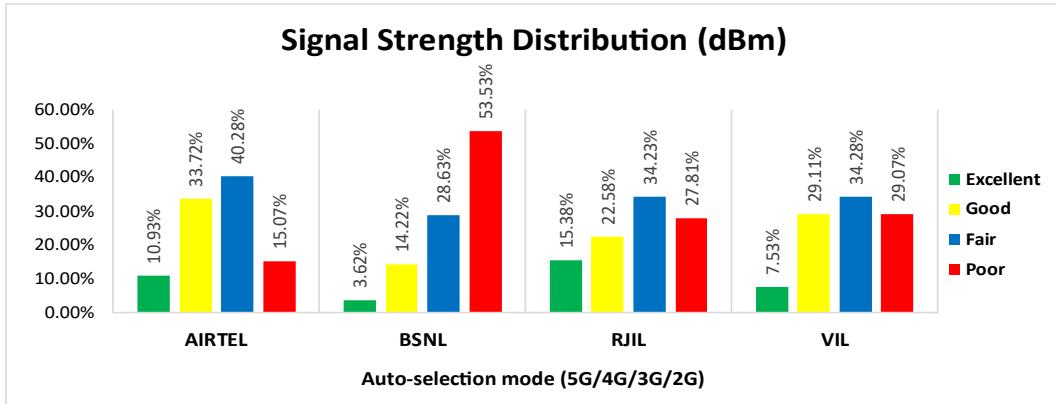


**Figure-25:** Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - RJIL.



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

**(c) Network Signal Strength Distribution:** The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G) data. (Refer figure-37, 38, 39 & 40 for map view)



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

#### Observations:

- Airtel has 11% of samples falling in the excellent signal strength category.
- BSNL has 4% of samples falling in the excellent signal strength category.
- RJIL has 15% of samples falling in the excellent signal strength category.
- VIL has 8% of samples falling in the excellent signal strength category.

## 4.3 Hotspots

Hotspot testing has been done on 02<sup>nd</sup> December 2025 to 05<sup>th</sup> December 2025. Thirteen locations have been tested in the city. (refer table-1)

### 4.3.1 Locations

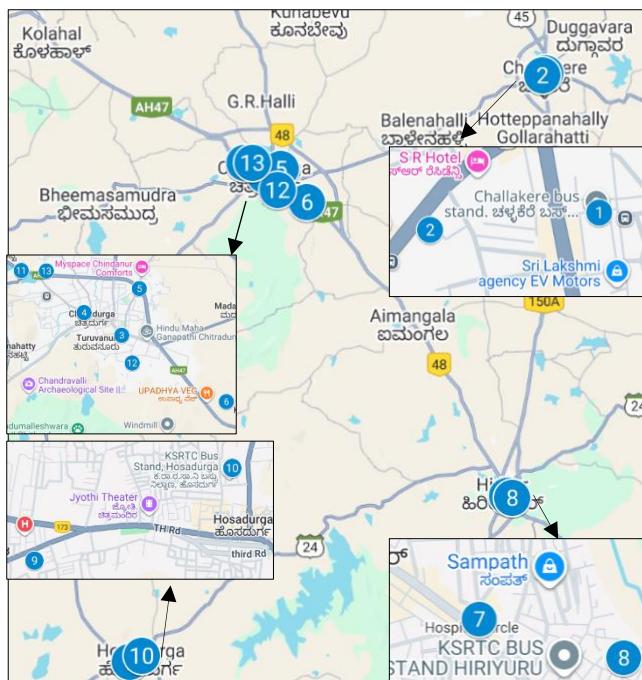


Figure- 28: Hotspot locations

### 4.3.2 Hotspot covered

1. Challakere Bus Stand
2. Challakere Taluk Office
3. Chitradurga District Hospital
4. Chitradurga KSRTC Bus Stand
5. Chitradurga RTO Office
6. District Collector Office Chitradurga
7. Hiriyur Government Hospital
8. Hiriyur KSRTC Bus Stand
9. Hosadurga Government Hospital
10. Hosadurga New Bus Stand
11. Muruga Rajendra Mata
12. Onake Obavva Stadium Chitradurga
13. SJM Institute Of Technology

### 4.3.3 Voice performance

Overall Voice Performance				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
<b>Call Attempt</b>	130	138	130	130
<b>Call Setup Success Rate %</b>	100.00	86.96	100.00	99.23
<b>Drop Call Rate %</b>	0.00	0.00	0.77	0.00
<b>Call Setup Time-Average (Second)</b>	1.15	0.85	0.55	1.76

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

Challakere Bus Stand				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
<b>Call Attempt</b>	10	10	10	10
<b>Call Setup Success Rate %</b>	100.00	90.00	100.00	100.00
<b>Drop Call Rate %</b>	0.00	0.00	0.00	0.00
<b>Call Setup Time-Average (Second)</b>	1.08	0.69	0.45	1.86

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

Challakere Taluk Office				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
<b>Call Attempt</b>	10	11	10	10
<b>Call Setup Success Rate %</b>	100.00	90.91	100.00	90.00
<b>Drop Call Rate %</b>	0.00	0.00	0.00	0.00
<b>Call Setup Time-Average (Second)</b>	1.09	0.69	0.48	2.28

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

Chitradurga District Hospital				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
<b>Call Attempt</b>	10	11	10	10
<b>Call Setup Success Rate %</b>	100.00	81.82	100.00	100.00
<b>Drop Call Rate %</b>	0.00	0.00	0.00	0.00
<b>Call Setup Time-Average (Second)</b>	1.10	0.62	0.46	1.71

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

Chitradurga KSRTC Bus Stand				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
<b>Call Attempt</b>	10	10	10	10
<b>Call Setup Success Rate %</b>	100.00	100.00	100.00	100.00
<b>Drop Call Rate %</b>	0.00	0.00	0.00	0.00
<b>Call Setup Time-Average (Second)</b>	1.11	0.61	1.09	1.82

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

Chitradurga RTO Office				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
<b>Call Attempt</b>	10	10	10	10
<b>Call Setup Success Rate %</b>	100.00	90.00	100.00	100.00
<b>Drop Call Rate %</b>	0.00	0.00	0.00	0.00
<b>Call Setup Time-Average (Second)</b>	1.13	0.95	0.51	1.75

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

<b>District Collector Office Chitradurga</b>				
<b>Parameters</b>	<b>Service Provider</b>			
	<b>Auto-selection mode (5G/4G/3G/2G)</b>			
	<b>AIRTEL</b>	<b>BSNL</b>	<b>RJIL</b>	<b>VIL</b>
<b>Call Attempt</b>	10	11	10	10
<b>Call Setup Success Rate %</b>	100.00	81.82	100.00	100.00
<b>Drop Call Rate %</b>	0.00	0.00	0.00	0.00
<b>Call Setup Time-Average (Second)</b>	1.09	0.66	0.44	1.48

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

<b>Hiriyur Government Hospital</b>				
<b>Parameters</b>	<b>Service Provider</b>			
	<b>Auto-selection mode (5G/4G/3G/2G)</b>			
	<b>AIRTEL</b>	<b>BSNL</b>	<b>RJIL</b>	<b>VIL</b>
<b>Call Attempt</b>	10	10	10	10
<b>Call Setup Success Rate %</b>	100.00	100.00	100.00	100.00
<b>Drop Call Rate %</b>	0.00	0.00	0.00	0.00
<b>Call Setup Time-Average (Second)</b>	1.35	2.62	0.54	1.71

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

<b>Hiriyur KSRTC Bus Stand</b>				
<b>Parameters</b>	<b>Service Provider</b>			
	<b>Auto-selection mode (5G/4G/3G/2G)</b>			
	<b>AIRTEL</b>	<b>BSNL</b>	<b>RJIL</b>	<b>VIL</b>
<b>Call Attempt</b>	10	10	10	10
<b>Call Setup Success Rate %</b>	100.00	100.00	100.00	100.00
<b>Drop Call Rate %</b>	0.00	0.00	0.00	0.00
<b>Call Setup Time-Average (Second)</b>	1.08	0.71	0.45	1.06

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

<b>Hosadurga Government Hospital</b>				
<b>Parameters</b>	<b>Service Provider</b>			
	<b>Auto-selection mode (5G/4G/3G/2G)</b>			
	<b>AIRTEL</b>	<b>BSNL</b>	<b>RJIL</b>	<b>VIL</b>
<b>Call Attempt</b>	10	10	10	10
<b>Call Setup Success Rate %</b>	100.00	80.00	100.00	100.00
<b>Drop Call Rate %</b>	0.00	0.00	0.00	0.00
<b>Call Setup Time-Average (Second)</b>	1.11	0.67	0.48	2.33

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

<b>Hosadurga New Bus Stand</b>				
<b>Parameters</b>	<b>Service Provider</b>			
	<b>Auto-selection mode (5G/4G/3G/2G)</b>			
	<b>AIRTEL</b>	<b>BSNL</b>	<b>RJIL</b>	<b>VIL</b>
<b>Call Attempt</b>	10	10	10	10
<b>Call Setup Success Rate %</b>	100.00	100.00	100.00	100.00
<b>Drop Call Rate %</b>	0.00	0.00	10.00	0.00
<b>Call Setup Time-Average (Second)</b>	1.32	0.65	0.74	1.62

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

<b>Muruga Rajendra Mata</b>				
<b>Parameters</b>	<b>Service Provider</b>			
	<b>Auto-selection mode (5G/4G/3G/2G)</b>			
	<b>AIRTEL</b>	<b>BSNL</b>	<b>RJIL</b>	<b>VIL</b>
<b>Call Attempt</b>	10	12	10	10
<b>Call Setup Success Rate %</b>	100.00	83.33	100.00	100.00
<b>Drop Call Rate %</b>	0.00	0.00	0.00	0.00
<b>Call Setup Time-Average (Second)</b>	1.07	0.62	0.46	1.72

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

<b>Onake Obavva Stadium Chitradurga</b>				
<b>Parameters</b>	<b>Service Provider</b>			
	<b>Auto-selection mode (5G/4G/3G/2G)</b>			
	<b>AIRTEL</b>	<b>BSNL</b>	<b>RJIL</b>	<b>VIL</b>
<b>Call Attempt</b>	10	11	10	10
<b>Call Setup Success Rate %</b>	100.00	72.73	100.00	100.00
<b>Drop Call Rate %</b>	0.00	0.00	0.00	0.00
<b>Call Setup Time-Average (Second)</b>	1.07	0.72	0.46	1.63

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

<b>SJM Institute Of Technology</b>				
<b>Parameters</b>	<b>Service Provider</b>			
	<b>Auto-selection mode (5G/4G/3G/2G)</b>			
	<b>AIRTEL</b>	<b>BSNL</b>	<b>RJIL</b>	<b>VIL</b>
<b>Call Attempt</b>	10	12	10	10
<b>Call Setup Success Rate %</b>	100.00	66.67	100.00	100.00
<b>Drop Call Rate %</b>	0.00	0.00	0.00	0.00
<b>Call Setup Time-Average (Second)</b>	1.30	0.65	0.64	1.98

**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)**

<b>Overall Data Performance</b>				
<b>Parameters</b>	<b>Service Provider</b>			
	<b>Auto-selection mode (5G/4G/3G/2G)</b>			
	<b>AIRTEL</b>	<b>BSNL</b>	<b>RJIL</b>	<b>VIL</b>
<b>Download Throughput Average (Mbits/s)</b>	165.70	10.11	201.28	29.80
<b>Download Throughput 80th Percentile (Mbit/s)</b>	251.05	14.24	367.49	44.52
<b>Download Throughput 20th Percentile (Mbit/s)</b>	77.69	5.57	55.90	7.98
<b>Download Session Setup Success Rate %</b>	100.00	96.92	100.00	100.00
<b>Upload Throughput Average (Mbits/s)</b>	40.90	2.95	19.36	14.76
<b>Upload Throughput 80th Percentile (Mbit/s)</b>	64.05	4.28	33.26	28.01
<b>Upload Throughput 20th Percentile (Mbit/s)</b>	18.07	1.37	4.94	3.15
<b>Upload Session Setup Success Rate %</b>	100.00	98.46	100.00	100.00
<b>Web Browsing Delay (Second)</b>	6.40	5.04	4.17	2.39
<b>Youtube Initial Buffer Delay (Second)</b>	1.55	2.05	0.83	1.09
<b>Latency (ms) - 50th Percentile</b>	49.62	56.87	24.43	48.53
<b>Jitter (ms)</b>	13.55	159.56	37.94	10.87
<b>Packet Loss Rate%</b>	7.90	12.54	5.55	5.25
<b>Packet Loss Rate- 90th percentile</b>	20.00	36.60	17.30	2.80

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

<b>Challakere Bus Stand</b>				
<b>Parameters</b>	<b>Service Provider</b>			
	<b>Auto-Selection Mode (5G/4G/3G/2G)</b>			
	<b>AIRTEL</b>	<b>BSNL</b>	<b>RJIL</b>	<b>VIL</b>
<b>Download Throughput Average (Mbits/s)</b>	136.20	4.80	267.12	7.82
<b>Download Session Setup Success Rate %</b>	100.00	100.00	100.00	100.00
<b>Upload Throughput Average (Mbits/s)</b>	56.36	5.73	28.27	15.07
<b>Upload Session Setup Success Rate %</b>	100.00	100.00	100.00	100.00
<b>Web Browsing Delay (Second)</b>	5.65	2.18	4.00	1.69
<b>Youtube Initial Buffer Delay (Second)</b>	2.08	1.82	0.77	0.75
<b>Latency (ms) - 50th Percentile</b>	53.55	54.77	25.24	51.64
<b>Jitter (ms)</b>	8.12	4.20	51.60	39.22
<b>Packet Loss Rate%</b>	0.90	0.50	1.10	1.60

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

<b>Challakere Taluk Office</b>				
<b>Parameters</b>	<b>Service Provider</b>			
	<b>Auto-Selection Mode (5G/4G/3G/2G)</b>			
	<b>AIRTEL</b>	<b>BSNL</b>	<b>RJIL</b>	<b>VIL</b>
<b>Download Throughput Average (Mbits/s)</b>	344.81	7.85	419.91	30.82
<b>Download Session Setup Success Rate %</b>	100.00	60.00	100.00	100.00
<b>Upload Throughput Average (Mbits/s)</b>	65.20	1.27	52.38	20.47
<b>Upload Session Setup Success Rate %</b>	100.00	80.00	100.00	100.00
<b>Web Browsing Delay (Second)</b>	4.43	8.72	4.93	2.18
<b>Youtube Initial Buffer Delay (Second)</b>	0.86	-	0.92	1.11
<b>Latency (ms) - 50th Percentile</b>	41.65	64.14	25.74	49.21
<b>Jitter (ms)</b>	5.45	2514.42	3.91	12.10
<b>Packet Loss Rate%</b>	0.10	71.00	0.10	1.10

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

**Note-** "-" "Youtube tests were failed.

<b>Chitradurga District Hospital</b>				
<b>Parameters</b>	<b>Service Provider</b>			
	<b>Auto-Selection Mode (5G/4G/3G/2G)</b>			
	<b>AIRTEL</b>	<b>BSNL</b>	<b>RJIL</b>	<b>VIL</b>
<b>Download Throughput Average (Mbits/s)</b>	200.05	17.63	161.54	48.21
<b>Download Session Setup Success Rate %</b>	100.00	100.00	100.00	100.00
<b>Upload Throughput Average (Mbits/s)</b>	56.12	3.35	20.88	34.50
<b>Upload Session Setup Success Rate %</b>	100.00	100.00	100.00	100.00
<b>Web Browsing Delay (Second)</b>	7.95	6.50	4.40	1.74
<b>Youtube Initial Buffer Delay (Second)</b>	1.70	1.43	0.53	0.64
<b>Latency (ms) - 50<sup>th</sup> Percentile</b>	51.17	57.34	22.78	47.82
<b>Jitter (ms)</b>	17.36	3.87	5.11	3.57
<b>Packet Loss Rate%</b>	0.60	0.10	0.00	0.30

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

<b>Chitradurga KSRTC Bus Stand</b>				
<b>Parameters</b>	<b>Service Provider</b>			
	<b>Auto-Selection Mode (5G/4G/3G/2G)</b>			
	<b>AIRTEL</b>	<b>BSNL</b>	<b>RJIL</b>	<b>VIL</b>
<b>Download Throughput Average (Mbits/s)</b>	133.04	14.07	176.06	7.35
<b>Download Session Setup Success Rate %</b>	100.00	100.00	100.00	100.00
<b>Upload Throughput Average (Mbits/s)</b>	37.47	3.56	4.77	2.90
<b>Upload Session Setup Success Rate %</b>	100.00	100.00	100.00	100.00
<b>Web Browsing Delay (Second)</b>	4.55	5.73	5.67	2.09
<b>Youtube Initial Buffer Delay (Second)</b>	0.66	1.03	1.01	1.21
<b>Latency (ms) - 50th Percentile</b>	46.36	50.23	25.29	48.79
<b>Jitter (ms)</b>	10.10	2.80	10.92	5.99
<b>Packet Loss Rate%</b>	0.20	0.20	1.60	0.70

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

<b>Chitradurga RTO Office</b>				
<b>Parameters</b>	<b>Service Provider</b>			
	<b>Auto-Selection Mode (5G/4G/3G/2G)</b>			
	<b>AIRTEL</b>	<b>BSNL</b>	<b>RJIL</b>	<b>VIL</b>
<b>Download Throughput Average (Mbits/s)</b>	198.60	5.86	80.73	15.21
<b>Download Session Setup Success Rate%</b>	100.00	100.00	100.00	100.00
<b>Upload Throughput Average (Mbits/s)</b>	15.07	2.29	3.64	9.47
<b>Upload Session Setup Success Rate %</b>	100.00	100.00	100.00	100.00
<b>Web Browsing Delay (Second)</b>	9.48	2.66	5.35	1.90
<b>Youtube Initial Buffer Delay (Second)</b>	0.89	2.60	0.80	0.88
<b>Latency (ms)- 50th Percentile</b>	52.53	58.22	35.31	49.28
<b>Jitter (ms)</b>	10.27	10.79	271.91	7.97
<b>Packet Loss Rate%</b>	0.90	5.30	18.20	0.70

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

<b>District Collector Office Chitradurga</b>				
<b>Parameters</b>	<b>Service Provider</b>			
	<b>Auto-Selection Mode (5G/4G/3G/2G)</b>			
	<b>AIRTEL</b>	<b>BSNL</b>	<b>RJIL</b>	<b>VIL</b>
<b>Download Throughput Average (Mbits/s)</b>	54.85	5.95	58.46	6.81
<b>Download Session Setup Success Rate%</b>	100.00	100.00	100.00	100.00
<b>Upload Throughput Average (Mbits/s)</b>	12.27	1.70	2.93	8.11
<b>Upload Session Setup Success Rate %</b>	100.00	100.00	100.00	100.00
<b>Web Browsing Delay (Second)</b>	6.25	7.67	4.18	2.03
<b>Youtube Initial Buffer Delay (Second)</b>	3.75	3.26	0.88	1.10
<b>Latency (ms)- 50th Percentile</b>	48.07	52.86	25.71	45.18
<b>Jitter (ms)</b>	9.14	4.59	87.39	4.92
<b>Packet Loss Rate%</b>	4.60	0.30	17.30	0.60

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

Hiriyur Government Hospital					
Parameters	Service Provider				
	Auto-Selection Mode (5G/4G/3G/2G)				
	AIRTEL	BSNL	RJIL	VIL	
<b>Download Throughput Average (Mbits/s)</b>	141.03	8.30	93.98	25.94	
<b>Download Session Setup Success Rate%</b>	100.00	100.00	100.00	100.00	
<b>Upload Throughput Average (Mbits/s)</b>	24.90	3.22	10.22	1.39	
<b>Upload Session Setup Success Rate %</b>	100.00	100.00	100.00	100.00	
<b>Web Browsing Delay (Second)</b>	5.20	2.76	3.43	4.48	
<b>Youtube Initial Buffer Delay (Second)</b>	0.68	2.32	0.87	3.30	
<b>Latency (ms)- 50th Percentile</b>	46.76	58.80	41.52	58.86	
<b>Jitter (ms)</b>	11.49	4.01	9.96	17.38	
<b>Packet Loss Rate%</b>	0.90	0.50	4.00	1.90	

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

Hiriyur KSRTC Bus Stand					
Parameters	Service Provider				
	Auto-Selection Mode (5G/4G/3G/2G)				
	AIRTEL	BSNL	RJIL	VIL	
<b>Download Throughput Average (Mbits/s)</b>	114.88	7.81	82.00	72.99	
<b>Download Session Setup Success Rate%</b>	100.00	100.00	100.00	100.00	
<b>Upload Throughput Average (Mbits/s)</b>	73.91	1.72	9.57	23.81	
<b>Upload Session Setup Success Rate %</b>	100.00	100.00	100.00	100.00	
<b>Web Browsing Delay (Second)</b>	4.85	4.94	3.18	3.26	
<b>Youtube Initial Buffer Delay (Second)</b>	1.13	1.88	0.83	0.85	
<b>Latency (ms)- 50th Percentile</b>	52.04	-	42.99	47.86	
<b>Jitter (ms)</b>	10.66	-	26.84	4.63	
<b>Packet Loss Rate%</b>	58.30	52.00	3.60	43.80	

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

**Note-** “-” Ping tests were failed.

Hosadurga Government Hospital					
Parameters	Service Provider				
	Auto-Selection Mode (5G/4G/3G/2G)				
	AIRTEL	BSNL	RJIL	VIL	
<b>Download Throughput Average (Mbits/s)</b>	77.14	10.53	167.01	26.58	
<b>Download Session Setup Success Rate%</b>	100.00	100.00	100.00	100.00	
<b>Upload Throughput Average (Mbits/s)</b>	20.41	1.66	14.49	2.90	
<b>Upload Session Setup Success Rate %</b>	100.00	100.00	100.00	100.00	
<b>Web Browsing Delay (Second)</b>	9.31	6.15	2.79	2.06	
<b>Youtube Initial Buffer Delay (Second)</b>	3.46	5.33	0.64	1.07	
<b>Latency (ms)- 50th Percentile</b>	50.77	58.67	19.93	58.42	
<b>Jitter (ms)</b>	7.78	1.83	5.15	17.19	
<b>Packet Loss Rate%</b>	21.20	15.60	1.10	16.30	

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

<b>Hosadurga New Bus Stand</b>				
<b>Parameters</b>	<b>Service Provider</b>			
	<b>Auto-Selection Mode (5G/4G/3G/2G)</b>			
	<b>AIRTEL</b>	<b>BSNL</b>	<b>RJIL</b>	<b>VIL</b>
<b>Download Throughput Average (Mbits/s)</b>	79.91	7.46	7.28	18.95
<b>Download Session Setup Success Rate%</b>	100.00	100.00	100.00	100.00
<b>Upload Throughput Average (Mbits/s)</b>	36.58	3.43	16.46	19.54
<b>Upload Session Setup Success Rate %</b>	100.00	100.00	100.00	100.00
<b>Web Browsing Delay (Second)</b>	7.48	2.89	1.98	3.68
<b>Youtube Initial Buffer Delay (Second)</b>	2.14	1.52	0.76	0.74
<b>Latency (ms)- 50th Percentile</b>	54.40	56.71	25.90	48.86
<b>Jitter (ms)</b>	13.58	3.35	1.90	7.98
<b>Packet Loss Rate%</b>	0.70	0.10	24.50	0.30

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

<b>Muruga Rajendra Mata</b>				
<b>Parameters</b>	<b>Service Provider</b>			
	<b>Auto-Selection Mode (5G/4G/3G/2G)</b>			
	<b>AIRTEL</b>	<b>BSNL</b>	<b>RJIL</b>	<b>VIL</b>
<b>Download Throughput Average (Mbits/s)</b>	268.22	16.41	367.78	78.78
<b>Download Session Setup Success Rate%</b>	100.00	100.00	100.00	100.00
<b>Upload Throughput Average (Mbits/s)</b>	82.96	6.54	33.48	36.71
<b>Upload Session Setup Success Rate %</b>	100.00	100.00	100.00	100.00
<b>Web Browsing Delay (Second)</b>	5.34	5.08	4.24	2.03
<b>Youtube Initial Buffer Delay (Second)</b>	0.51	1.01	0.53	0.63
<b>Latency (ms)- 50th Percentile</b>	47.04	55.59	17.93	44.94
<b>Jitter (ms)</b>	6.13	3.38	3.63	6.48
<b>Packet Loss Rate%</b>	0.10	0.00	0.30	0.10

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

<b>Onake Obavva Stadium Chitradurga</b>				
<b>Parameters</b>	<b>Service Provider</b>			
	<b>Auto-Selection Mode (5G/4G/3G/2G)</b>			
	<b>AIRTEL</b>	<b>BSNL</b>	<b>RJIL</b>	<b>VIL</b>
<b>Download Throughput Average (Mbits/s)</b>	255.49	7.03	296.42	12.69
<b>Download Session Setup Success Rate%</b>	100.00	100.00	100.00	100.00
<b>Upload Throughput Average (Mbits/s)</b>	44.56	1.78	6.49	7.26
<b>Upload Session Setup Success Rate %</b>	100.00	100.00	100.00	100.00
<b>Web Browsing Delay (Second)</b>	7.06	3.15	4.29	1.38
<b>Youtube Initial Buffer Delay (Second)</b>	0.76	2.13	1.56	0.86
<b>Latency (ms)- 50th Percentile</b>	51.06	53.53	22.46	47.84
<b>Jitter (ms)</b>	8.19	13.00	11.63	9.73
<b>Packet Loss Rate%</b>	9.30	17.30	0.30	0.90

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

<b>SJM Institute Of Technology</b>				
<b>Parameters</b>	<b>Service Provider</b>			
	<b>Auto-Selection Mode (5G/4G/3G/2G)</b>			
	<b>AIRTEL</b>	<b>BSNL</b>	<b>RJIL</b>	<b>VIL</b>
<b>Download Throughput Average (Mbits/s)</b>	149.85	16.78	438.39	35.22
<b>Download Session Setup Success Rate%</b>	100.00	100.00	100.00	100.00
<b>Upload Throughput Average (Mbits/s)</b>	5.88	1.83	48.13	9.70
<b>Upload Session Setup Success %</b>	100.00	100.00	100.00	100.00
<b>Web Browsing Delay (Second)</b>	7.49	9.64	4.27	2.39
<b>Youtube Initial Buffer Delay (Second)</b>	1.69	3.15	0.67	1.03
<b>Latency (ms)- 50th Percentile</b>	62.01	58.11	21.66	46.55
<b>Jitter (ms)</b>	57.86	2.64	4.52	4.26
<b>Packet Loss Rate%</b>	4.90	0.10	0.10	0.00

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

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

<b>Overall Data Performance</b>					
<b>Parameters</b>		<b>Service Provider</b>			
		<b>AIRTEL</b>	<b>BSNL</b>	<b>RJIL</b>	<b>VIL</b>
<b>5G</b>	<b>Download Throughput Average (Mbits/s)</b>	171.66	-	220.06	-
	<b>Upload Throughput Average (Mbits/s)</b>	42.18	-	24.01	-
<b>4G</b>	<b>Download Throughput Average (Mbits/s)</b>	21.15	13.13	29.76	25.46
	<b>Upload Throughput Average (Mbits/s)</b>	9.11	5.12	9.90	17.64

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

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

<b>Challakere Bus Stand</b>					
<b>Parameters</b>		<b>Service Provider</b>			
		<b>AIRTEL</b>	<b>BSNL</b>	<b>RJIL</b>	<b>VIL</b>
<b>5G</b>	<b>Download Throughput Average (Mbits/s)</b>	165.85	-	231.16	-
	<b>Upload Throughput Average (Mbits/s)</b>	67.77	-	25.12	-
<b>4G</b>	<b>Download Throughput Average (Mbits/s)</b>	14.79	4.52	11.31	6.77
	<b>Upload Throughput Average (Mbits/s)</b>	9.89	3.50	6.08	33.77

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

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

<b>Challakere Taluk Office</b>					
<b>Parameters</b>		<b>Service Provider</b>			
		<b>AIRTEL</b>	<b>BSNL</b>	<b>RJIL</b>	<b>VIL</b>
<b>5G</b>	<b>Download Throughput Average (Mbits/s)</b>	362.32	-	452.76	-
	<b>Upload Throughput Average (Mbits/s)</b>	78.65	-	61.58	-
<b>4G</b>	<b>Download Throughput Average (Mbits/s)</b>	34.31	3.37	82.73	24.47
	<b>Upload Throughput Average (Mbits/s)</b>	13.02	1.36	16.61	22.63

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

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

Chitradurga District Hospital						
Parameters		Service Provider				
		AIRTEL	BSNL	RJIL	VIL	
5G	Download Throughput Average (Mbits/s)	147.43	-	488.05	-	
	Upload Throughput Average (Mbits/s)	56.28	-	48.08	-	
4G	Download Throughput Average (Mbits/s)	19.61	16.38	56.52	35.81	
	Upload Throughput Average (Mbits/s)	5.53	5.10	12.01	28.77	

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

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

Chitradurga KSRTC Bus Stand						
Parameters		Service Provider				
		AIRTEL	BSNL	RJIL	VIL	
5G	Download Throughput Average (Mbits/s)	134.55	-	92.48	-	
	Upload Throughput Average (Mbits/s)	16.96	-	3.58	-	
4G	Download Throughput Average (Mbits/s)	14.70	13.82	14.05	6.28	
	Upload Throughput Average (Mbits/s)	2.29	7.75	1.40	2.45	

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

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

Chitradurga RTO Office						
Parameters		Service Provider				
		AIRTEL	BSNL	RJIL	VIL	
5G	Download Throughput Average (Mbits/s)	253.48	-	89.45	-	
	Upload Throughput Average (Mbits/s)	22.96	-	3.43	-	
4G	Download Throughput Average (Mbits/s)	18.40	11.57	38.30	12.77	
	Upload Throughput Average (Mbits/s)	9.72	6.68	9.15	9.46	

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

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

District Collector Office Chitradurga						
Parameters		Service Provider				
		AIRTEL	BSNL	RJIL	VIL	
5G	Download Throughput Average (Mbits/s)	48.92	-	51.34	-	
	Upload Throughput Average (Mbits/s)	11.38	-	8.04	-	
4G	Download Throughput Average (Mbits/s)	13.04	10.01	49.96	4.78	
	Upload Throughput Average (Mbits/s)	8.30	3.14	16.35	9.00	

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

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

Hiriyur Government Hospital						
Parameters		Service Provider				
		AIRTEL	BSNL	RJIL	VIL	
5G	Download Throughput Average (Mbits/s)	152.33	-	120.00	-	
	Upload Throughput Average (Mbits/s)	29.29	-	8.00	-	
4G	Download Throughput Average (Mbits/s)	1.62	8.50	8.78	24.54	
	Upload Throughput Average (Mbits/s)	2.80	5.52	4.78	7.61	

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

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

Hiriyur KSRTC Bus Stand						
Parameters		Service Provider				
		AIRTEL	BSNL	RJIL	VIL	
5G	Download Throughput Average (Mbps)	156.31	-	72.07	-	
	Upload Throughput Average (Mbps)	70.02	-	9.72	-	
4G	Download Throughput Average (Mbps)	39.20	7.49	16.72	72.88	
	Upload Throughput Average (Mbps)	10.61	1.79	4.94	25.14	

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

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

Hosadurga Government Hospital						
Parameters		Service Provider				
		AIRTEL	BSNL	RJIL	VIL	
5G	Download Throughput Average (Mbps)	88.88	-	7.42	-	
	Upload Throughput Average (Mbps)	22.40	-	23.14	-	
4G	Download Throughput Average (Mbps)	5.40	38.85	4.72	29.77	
	Upload Throughput Average (Mbps)	8.45	7.12	8.11	10.38	

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

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

Hosadurga New Bus Stand						
Parameters		Service Provider				
		AIRTEL	BSNL	RJIL	VIL	
5G	Download Throughput Average (Mbps)	75.40	-	6.56	-	
	Upload Throughput Average (Mbps)	55.75	-	16.98	-	
4G	Download Throughput Average (Mbps)	4.14	8.72	4.72	19.33	
	Upload Throughput Average (Mbps)	4.15	7.35	13.24	28.35	

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

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

Muruga Rajendra Mata						
Parameters		Service Provider				
		AIRTEL	BSNL	RJIL	VIL	
5G	Download Throughput Average (Mbps)	226.11	-	438.52	-	
	Upload Throughput Average (Mbps)	69.44	-	40.52	-	
4G	Download Throughput Average (Mbps)	70.79	22.34	28.68	72.59	
	Upload Throughput Average (Mbps)	21.63	11.04	18.50	34.52	

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

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

Onake Obavva Stadium Chitradurga						
Parameters		Service Provider				
		AIRTEL	BSNL	RJIL	VIL	
5G	Download Throughput Average (Mbps)	233.55	-	329.47	-	
	Upload Throughput Average (Mbps)	42.54	-	8.40	-	
4G	Download Throughput Average (Mbps)	30.71	6.00	30.32	10.54	
	Upload Throughput Average (Mbps)	14.76	2.64	4.95	7.58	

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

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

SJM Institute Of Technology						
Parameters		Service Provider				
		AIRTEL	BSNL	RJIL	VIL	
5G	Download Throughput Average (Mbits/s)	217.33	-	481.50	-	
	Upload Throughput Average (Mbits/s)	15.83	-	55.58	-	
4G	Download Throughput Average (Mbits/s)	8.20	19.07	40.11	10.42	
	Upload Throughput Average (Mbits/s)	7.25	3.55	12.57	9.66	

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

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

## 4.4 Walk Test

Walk Test has been conducted from 03<sup>rd</sup> December 2025 to 05<sup>th</sup> December 2025. Four locations have been tested in the city. (refer table-1)

### 4.4.1 Walk test locations

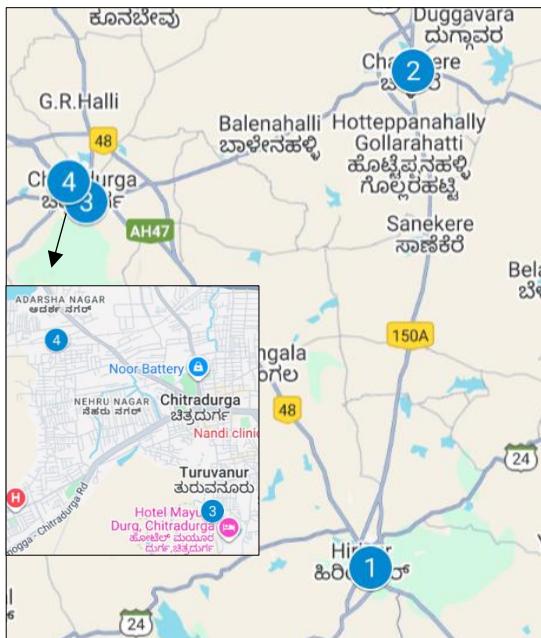


Figure-29: Walk Test locations.

### 4.4.2 Walk Test Covered

1. APMC Market
2. Chandravalli Kere Park
3. Chitradurga Fort
4. Chitradurga Railway Station

### 4.4.3 Voice Performance

APMC Market				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
<b>Call Attempt</b>	17	17	17	17
<b>Call Setup Success Rate %</b>	100.00	100.00	100.00	100.00
<b>Drop Call Rate %</b>	0.00	0.00	0.00	0.00
<b>Call Setup Time-Average (Second)</b>	1.00	1.80	0.46	1.81

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

Chandravalli Kere Park				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
<b>Call Attempt</b>	21	19	22	18
<b>Call Setup Success Rate %</b>	57.14	73.68	63.64	88.89
<b>Drop Call Rate %</b>	0.00	0.00	21.43	0.00
<b>Call Setup Time-Average (Second)</b>	2.07	4.36	2.03	5.00

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

Chitradurga Fort				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
<b>Call Attempt</b>	34	35	33	51
<b>Call Setup Success Rate %</b>	94.12	88.57	100.00	0.00
<b>Drop Call Rate %</b>	3.13	3.23	0.00	-
<b>Call Setup Time-Average (Second)</b>	2.15	2.43	2.67	-

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

**Note-** “-” Drop call rate & Call setup time have not been reported as all calls were failed at this location.

Chitradurga Railway Station				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
<b>Call Attempt</b>	11	13	11	11
<b>Call Setup Success Rate %</b>	100.00	84.62	100.00	100.00
<b>Drop Call Rate %</b>	0.00	0.00	0.00	0.00
<b>Call Setup Time-Average (Second)</b>	1.09	0.80	0.49	2.35

**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)

APMC Market				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
<b>Download Throughput Average (Mbits/s)</b>	249.14	5.85	220.16	39.87
<b>Download Session Setup Success Rate %</b>	100.00	100.00	100.00	100.00
<b>Upload Throughput Average (Mbits/s)</b>	62.64	1.53	21.61	26.55
<b>Upload Session Setup Success Rate %</b>	100.00	100.00	100.00	100.00
<b>Latency (ms) - 50th Percentile</b>	43.39	58.94	19.49	41.52

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

Chandravalli Kere Park				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
<b>Download Throughput Average (Mbits/s)</b>	27.10	4.16	7.53	4.47
<b>Download Session Setup Success Rate %</b>	76.47	33.33	60.00	80.00
<b>Upload Throughput Average (Mbits/s)</b>	2.44	1.75	1.24	2.96
<b>Upload Session Setup Success Rate %</b>	72.22	66.67	70.00	90.00
<b>Latency (ms) - 50th Percentile</b>	190.13	409.88	19.87	45.30

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

Chitradurga Fort				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
<b>Download Throughput Average (Mbits/s)</b>	157.80	5.63	81.22	-
<b>Download Session Setup Success Rate %</b>	96.15	57.58	100.00	0.00
<b>Upload Throughput Average (Mbits/s)</b>	32.08	2.33	3.87	-
<b>Upload Session Setup Success Rate %</b>	100.00	59.38	100.00	0.00
<b>Latency (ms) - 50th Percentile</b>	51.52	59.88	28.49	-

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

**Note-** “-” Download & Upload tests were failed.

Chitradurga Railway Station				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
<b>Download Throughput Average (Mbits/s)</b>	150.91	13.56	224.96	47.62
<b>Download Session Setup Success Rate %</b>	100.00	100.00	100.00	90.91
<b>Upload Throughput Average (Mbits/s)</b>	32.06	7.59	17.91	27.07
<b>Upload Session Setup Success Rate %</b>	100.00	100.00	100.00	100.00
<b>Latency (ms) - 50th Percentile</b>	58.33	52.10	18.48	49.42

**Table-70:** 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 96.27%, 94.16% and 90.85% call setup success rate respectively in 3G/2G network mode. (refer table-3)
- b) Airtel, BSNL, RJIL and VIL have 97.90%, 79.86%, 96.77% and 76.10% call setup success rate respectively in auto-selection mode (5G/4G/3G/2G). (refer table-5)
- c) RJIL & VIL have 100.00% call setup success rate while calling on peer service provider's network for inter-operator calls. (refer table-9)
- d) Airtel had a 100.00% call setup success when calling RJIL and VIL whereas call blocking was observed when calling BSNL. (refer table-9)
- e) BSNL had a 100.00% call setup success when calling VIL whereas call blocking was observed when calling Airtel & RJIL. (refer table-9)

#### 2. Call Setup Time:

- a) Airtel, BSNL and VIL call setup time is 4.76, 3.45 & 5.93 seconds respectively in 3G/2G network mode. (refer table-3)
- b) Airtel, BSNL, RJIL & VIL call setup time is 1.22, 2.86, 0.85 & 2.15 seconds respectively in auto-selection mode (5G/4G/3G/2G). (refer table-5)

#### 3. Call Silence/Mute Rate:

In packet switched network (4G/5G) VIL, BSNL, RJIL, & Airtel have 9.96%, 3.03%, 2.35% & 1.97% silence call rate respectively. Further BSNL has higher RTP packet loss rate in downlink (6.92%) compared to VIL (4.73%), RJIL (2.76%) & Airtel (1.07%). In uplink the RTP packet loss rate is higher for BSNL (6.61%) compared to VIL (2.87%), RJIL (1.91%) & Airtel (1.10%). (refer table-6)

#### 4. Drop Call Rate:

- a) Airtel, BSNL and VIL drop call rate is 0.00%, 3.10% and 3.24% respectively in 3G/2G network mode. (refer table-3)
- b) Airtel, BSNL, RJIL and VIL drop call rate is 0.39%, 3.63%, 0.98% and 2.08% 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 133.45 Mbps, 9.12 Mbps, 173.99 Mbps and 27.21 Mbps respectively. (refer table-11)
- b) Airtel, BSNL, RJIL and VIL average upload speeds are 30.77 Mbps, 2.52 Mbps, 15.48 Mbps and 13.93 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 165.70 Mbps, 10.11 Mbps, 201.28 Mbps and 29.80 Mbps respectively. (refer table-35)
- b) Airtel, BSNL, RJIL and VIL average upload speeds are 40.90 Mbps, 2.95 Mbps, 19.36 Mbps and 14.76 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%, 96.92%, 100.00% and 100.00% download session setup success rate respectively. (refer table-35)

- b) Airtel, BSNL, RJIL and VIL have 100.00%, 98.46%, 100.00% and 100.00% upload session setup success rate respectively. (refer table-35)

## 5.3 Operator wise Key Findings

### 1. Airtel:

#### Voice

- 96.27% call setup success rate and 0.00% 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)
- 97.90% call setup success rate and 0.39% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for LSA. Performance is not meeting the benchmark of 98.00% for call setup success rate. (refer table-5)
- 100.00% call setup success rate and 0.32% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for city drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-15)
- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for all hotspot locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-21)
- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) at APMC Market & Chitradurga Railway Station walk test locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-63 and 66)
- 57.14% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) at Chandravalli Kere Park walk test location. Performance is not meeting the benchmark of 98.00% for call setup success rate. (refer table-64)
- 94.12% call setup success rate and 3.13% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) at Chitradurga Fort walk test location. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-65)

#### Data

- Airtel has 133.45 Mbps average download speed & 30.77 Mbps average upload speed for LSA. (refer table-11)
- Airtel has 121.18 Mbps average download speed & 27.60 Mbps average upload speed across the measured routes for city drive. (refer table-19)
- District Collector Office Chitradurga, Hosadurga Government Hospital and Hosadurga New Bus Stand have less download speed (less than 100 Mbps) out of total 13 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table- 41, 44, & 45)
- Chitradurga RTO Office, District Collector Office Chitradurga and SJM Institute Of Technology have less upload speed (less than 20 Mbps) out of total 13 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table- 40, 41 & 48)
- Chandravalli Kere Park has less download speed (less than 100 Mbps) out of total 4 walk test locations for auto-selection mode (5G/4G/3G/2G). (refer table- 68)

- Chandravalli Kere Park has less upload speed (less than 20 Mbps) out of total 4 walk test locations for auto-selection mode (5G/4G/3G/2G). (refer table- 68)

## 2. BSNL:

### Voice

- 94.16% call setup success rate and 3.10% 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)
- 79.86% call setup success rate and 3.63% 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)
- 75.55% call setup success rate and 5.82% 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)
- 86.96% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for all hotspot locations. Performance is not meeting the benchmark of 98.00% for call setup success rate. (refer table-21)
- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) at APMC Market walk test location. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-63)
- 73.68% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) at Chandravalli Kere Park walk test location. Performance is not meeting the benchmark of 98.00% for call setup success rate. (refer table-64)
- 88.57% call setup success rate and 3.23% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) at Chitradurga Fort walk test location. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-65)
- 84.62% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) at Chitradurga Railway Station walk test location. Performance is not meeting the benchmark of 98.00% for call setup success rate. (refer table-66)

### Data

- BSNL has 9.12 Mbps average download speed & 2.52 Mbps average upload speed for LSA. (refer table-11)
- BSNL has 9.51 Mbps average download speed & 2.22 Mbps average upload speed across the measured routes for city drive. (refer table-19)
- Challakere Bus Stand, Challakere Taluk Office, Chitradurga RTO Office, District Collector Office Chitradurga, Hiriyur Government Hospital, Hiriyur KSRTC Bus Stand, Hosadurga New Bus Stand and Onake Obavva Stadium Chitradurga have less download speed (less than 10 Mbps) out of total 13 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table- 36, 37, 40, 41, 42, 43, 45 & 47)
- Challakere Taluk Office, District Collector Office Chitradurga, Hiriyur KSRTC Bus Stand, Hosadurga Government Hospital, Onake Obavva Stadium Chitradurga and SJM Institute Of Technology have less upload speed (less than 2 Mbps) out

of total 13 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-37, 41, 43, 44, 47 & 48)

- All locations have less download speed (less than 10 Mbps) except Chitradurga Railway Station for auto-selection mode (5G/4G/3G/2G). (refer table- 67, 68 & 69)
- APMC Market & Chandravalli Kere Park have less upload speed (less than 2 Mbps) out of total 4 walktest locations for auto-selection mode (5G/4G/3G/2G). (refer table- 67 & 68)

### **3. RJIL:**

#### **Voice**

- 96.77% call setup success rate and 0.98% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for LSA. Performance is not meeting the benchmark of 98.00% for call setup success rate. (refer table-5)
- 97.13% call setup success rate and 0.33% 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% for call setup success rate. (refer table-15)
- 100.00% call setup success rate and 0.77% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for all hotspot locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-21)
- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) at APMC Market, Chitradurga Fort & Chitradurga Railway Station walk test locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-63, 65 and 66)
- 63.64% call setup success rate and 21.43% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) at Chandravalli Kere Park walk test location. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-64)

#### **Data**

- RJIL has 173.99 Mbps average download speed & 15.48 Mbps average upload speed for LSA. (refer table-11)
- RJIL has 175.20 Mbps average download speed & 15.57 Mbps average upload speed across the measured routes for city drive. (refer table-19)
- Chitradurga RTO Office, District Collector Office Chitradurga, Hiriyur Government Hospital, Hiriyur KSRTC Bus Stand and Hosadurga New Bus Stand have less download speed (less than 100 Mbps) out of total 13 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table- 40, 41, 42, 43 & 45)
- Chitradurga KSRTC Bus Stand, Chitradurga RTO Office, District Collector Office Chitradurga, Hiriyur Government Hospital, Hiriyur KSRTC Bus Stand, Hosadurga Government Hospital, Hosadurga New Bus Stand and Onake Obavva Stadium Chitradurga have less upload speed (less than 20 Mbps) out of total 13 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-39, 40, 41, 42, 43, 44, 45 & 47)
- Chandravalli Kere Park and Chitradurga Fort have less download speed (less than 100 Mbps) out of total 4 walk test locations for auto-selection mode (5G/4G/3G/2G). (refer table- 68 & 69)

- Chandravalli Kere Park, Chitradurga Fort and Chitradurga Railway Station have less upload speed (less than 20 Mbps) out of total 4 walk test locations for auto-selection mode (5G/4G/3G/2G). (refer table- 68, 69 & 70)

#### **4. VIL:**

##### **Voice**

- 90.85% call setup success rate and 3.24% 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)
- 76.10% call setup success rate and 2.08% 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)
- 76.02% call setup success rate and 3.46% 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)
- 99.23% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for all hotspot locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-21)
- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) at APMC Market & Chitradurga Railway Station walk test locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table- 63 and 66)
- 88.89% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) at Chandravalli Kere Park walk test location. Performance is not meeting the benchmark of 98.00% for call setup success rate. (refer table-64)
- 0.00% call setup success rate and drop call rate has not been observed as all call were blocked in auto-selection mode (5G/4G/3G/2G) at Chitradurga Fort walk test location. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-65)

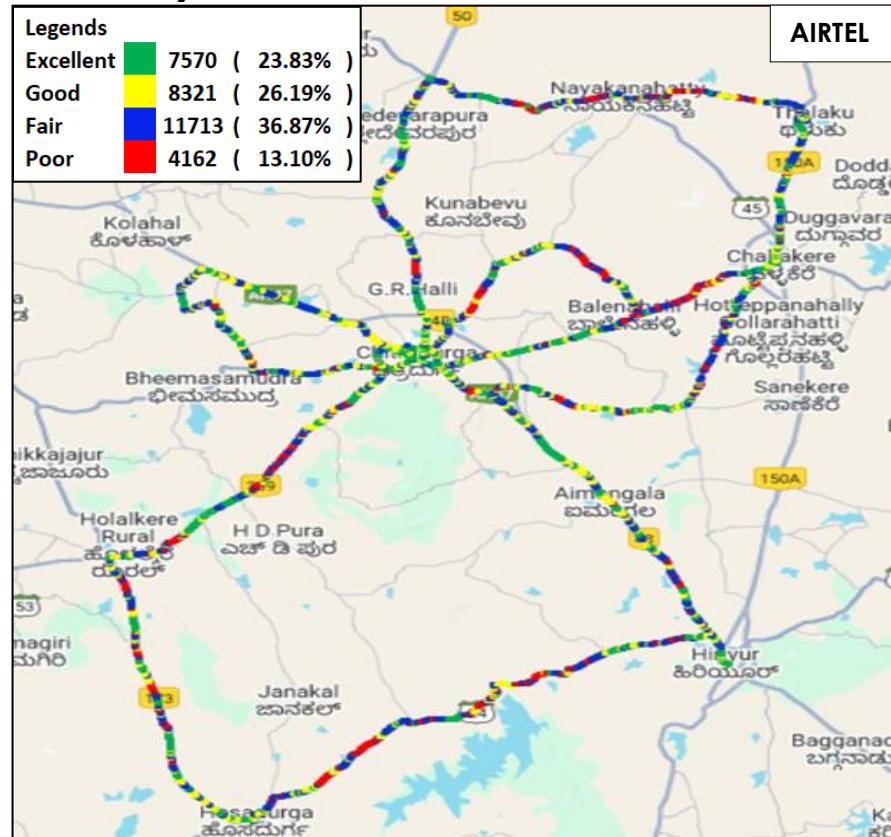
##### **Data**

- VIL has 27.21 Mbps average download speed & 13.93 Mbps average upload speed for LSA. (refer table-11)
- VIL has 25.34 Mbps average download speed & 12.55 Mbps average upload speed across the measured routes for city drive. (refer table-19)
- Challakere Bus Stand, Chitradurga KSRTC Bus Stand and District Collector Office Chitradurga have less download speed (less than 10 Mbps) out of total 13 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table- 36, 39 & 41)
- Hiriyur Government Hospital has less upload speed (less than 2 Mbps) out of total 13 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table- 42)
- Chandravalli Kere Park & Chitradurga Fort have less download speed (less than 10 Mbps) out of total 4 walk test locations for auto-selection mode (5G/4G/3G/2G). (refer table- 68 & 69)
- Chitradurga Fort has less upload speed (less than 2 Mbps) out of total 4 walk test locations for auto-selection mode (5G/4G/3G/2G). (refer table- 69)

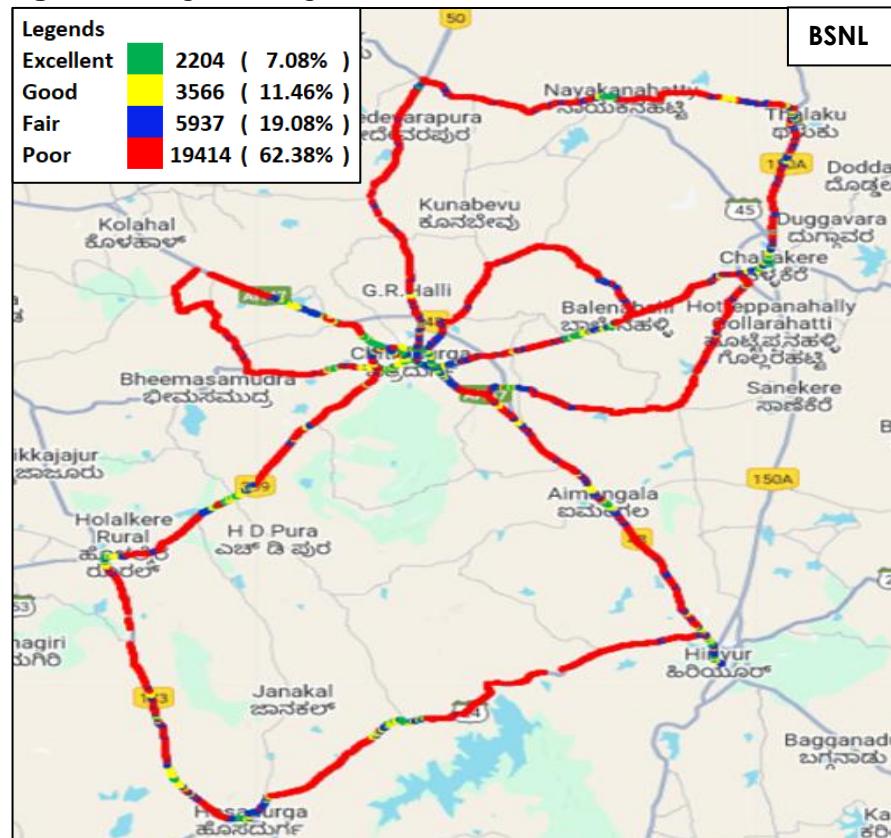
## 6. Annexure

### 6.1 Route wise coverage map

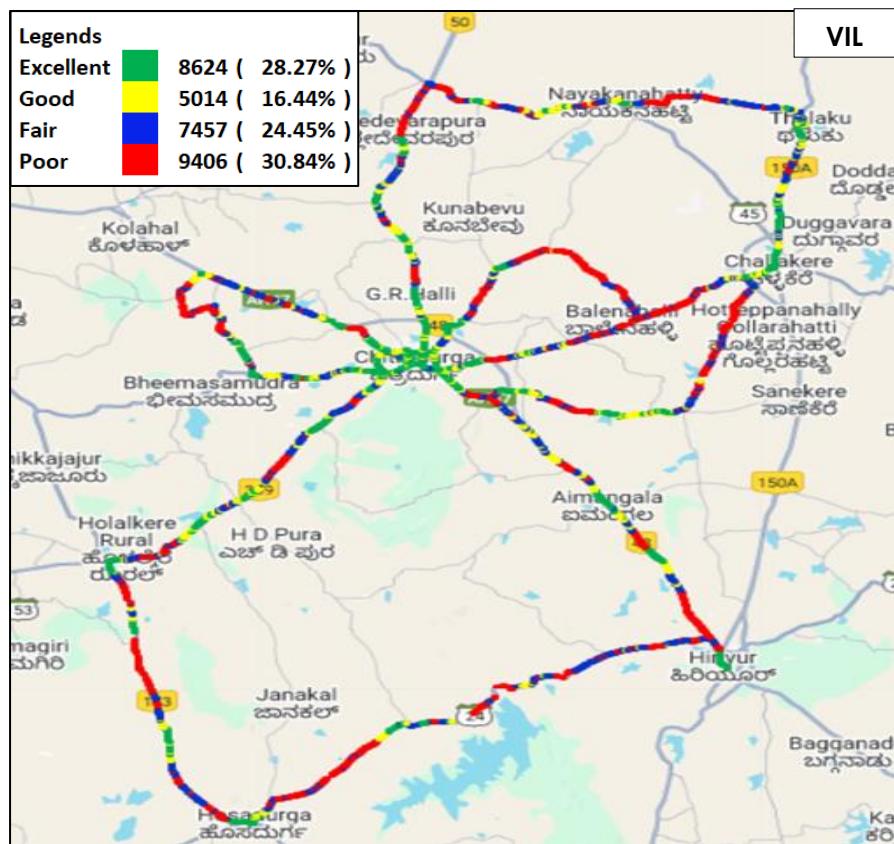
#### 6.1.1 City



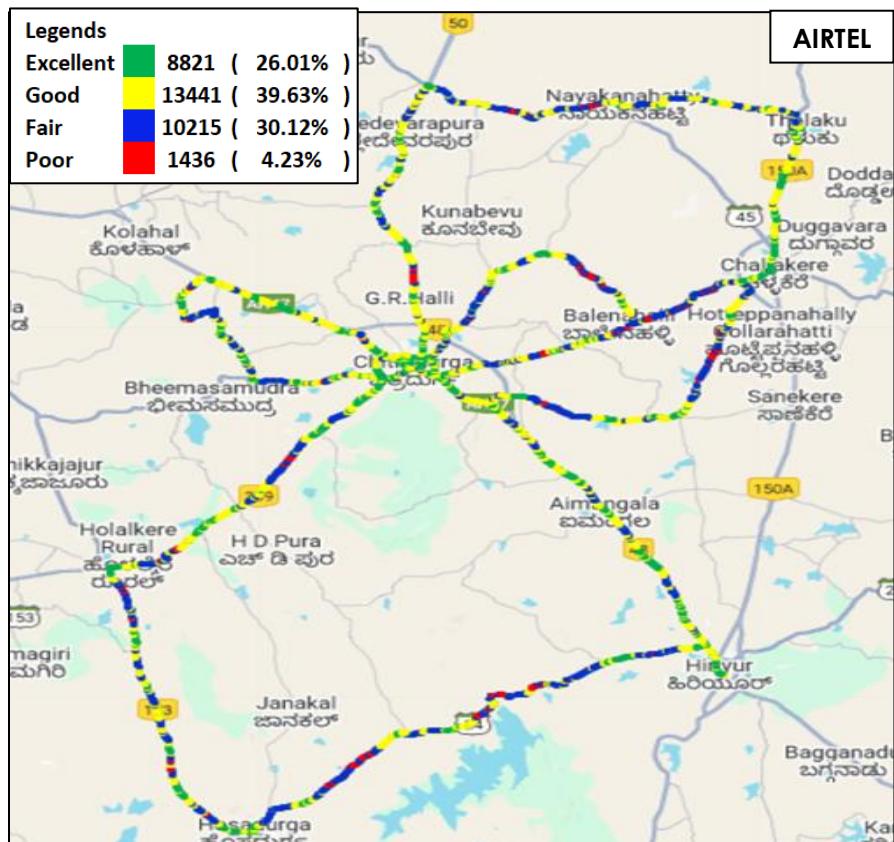
**Figure-30:** Signal strength 3G/2G network mode - AIRTEL.



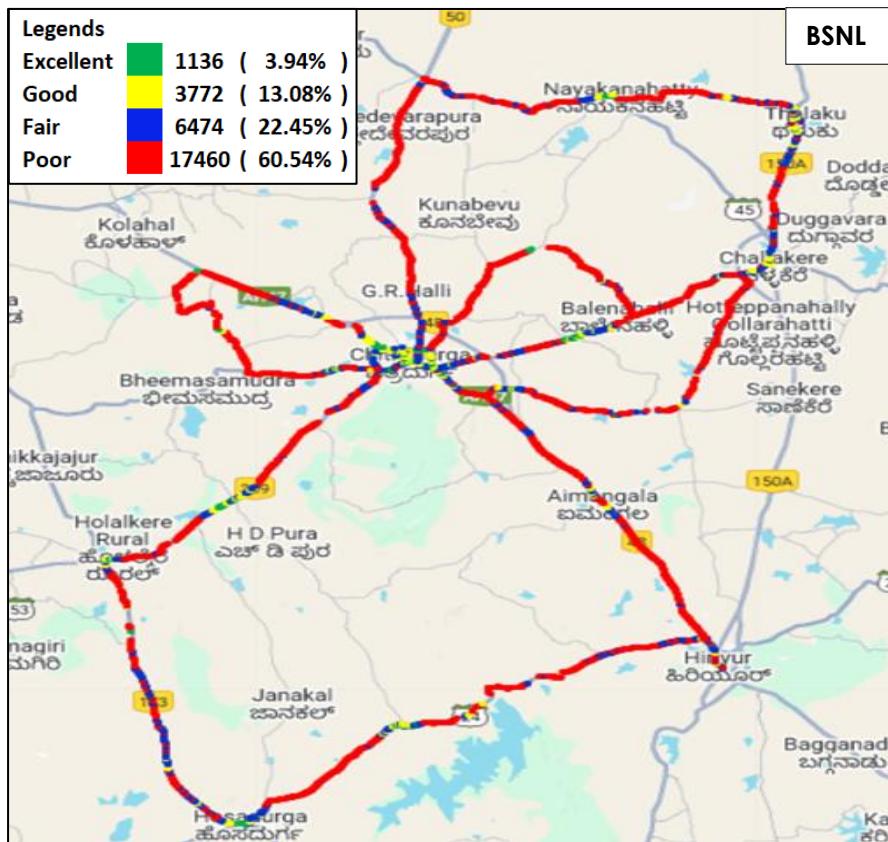
**Figure-31:** Signal strength 3G/2G network mode - BSNL.



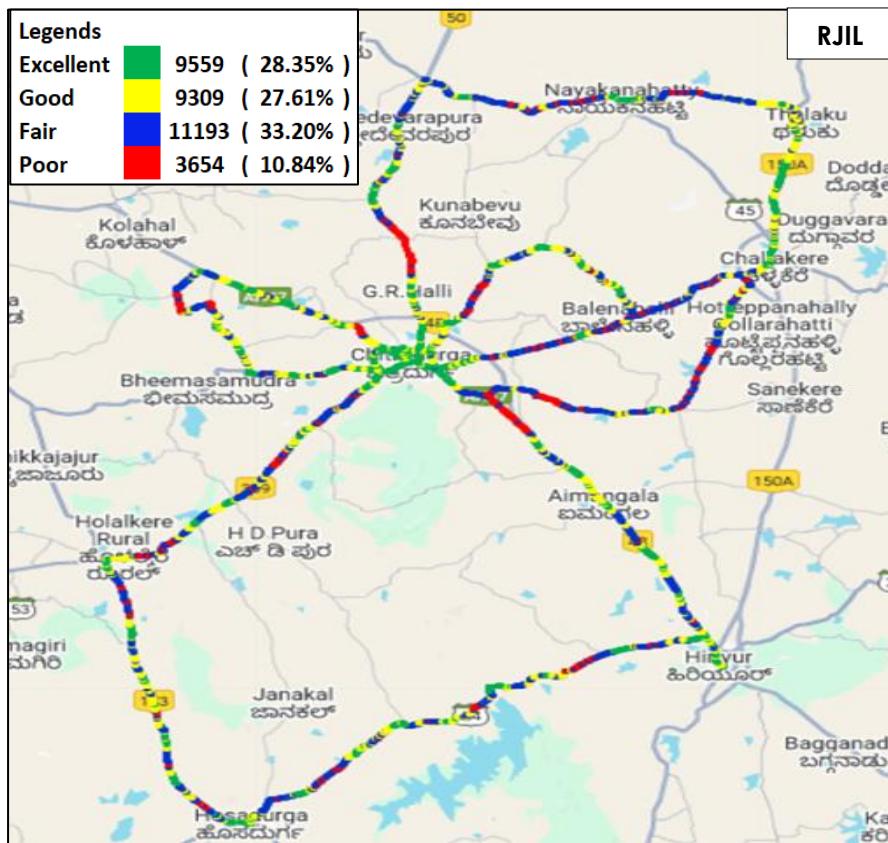
**Figure-32:** Signal strength 3G/2G network mode - VIL.



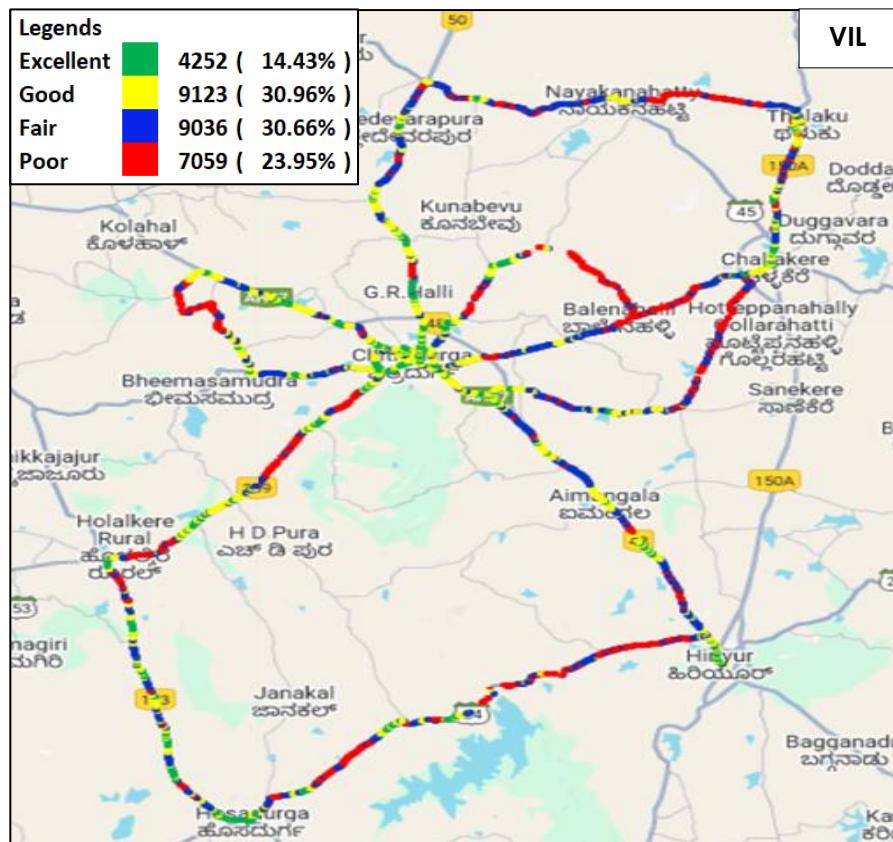
**Figure-33:** Signal strength auto-selection mode (5G/4G/3G/2G) voice - AIRTEL.



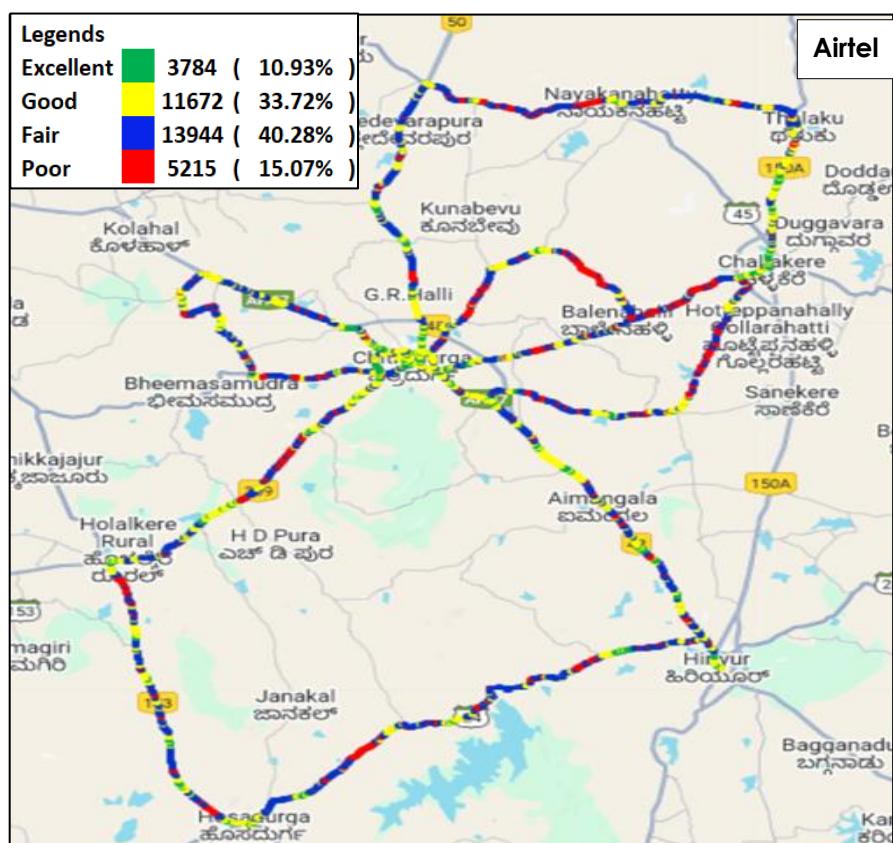
**Figure-34:** Signal strength auto-selection mode (5G/4G/3G/2G) voice - BSNL.



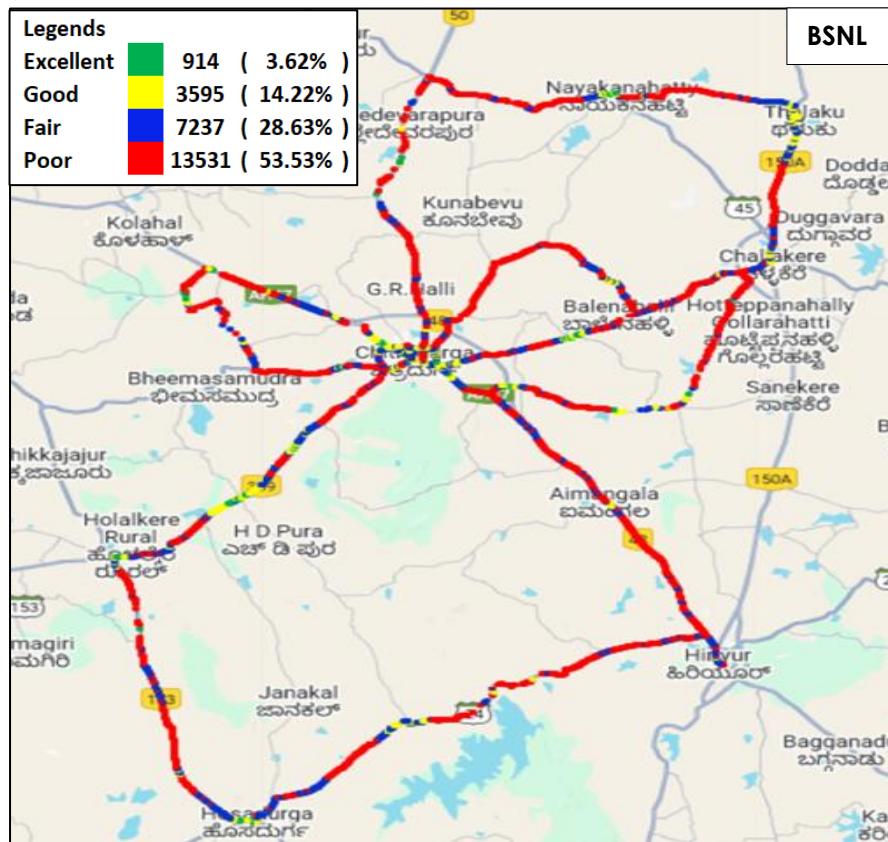
**Figure-35:** Signal strength auto-selection mode (5G/4G/3G/2G) voice - RJIL.



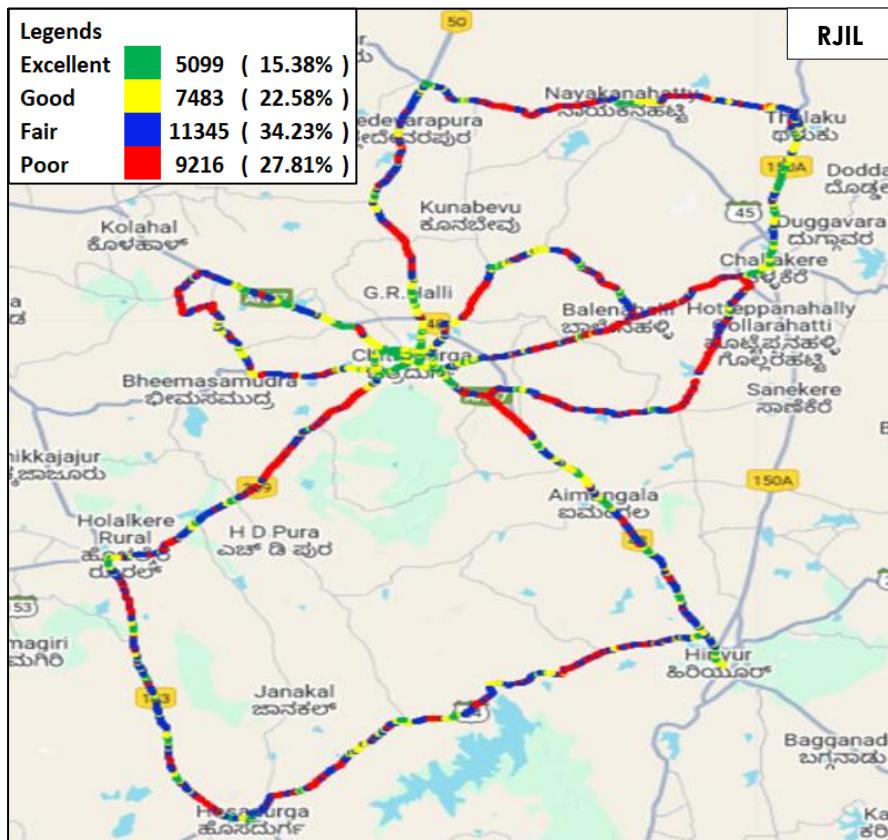
**Figure-36:** Signal strength auto-selection mode (5G/4G/3G/2G) voice - VIL.



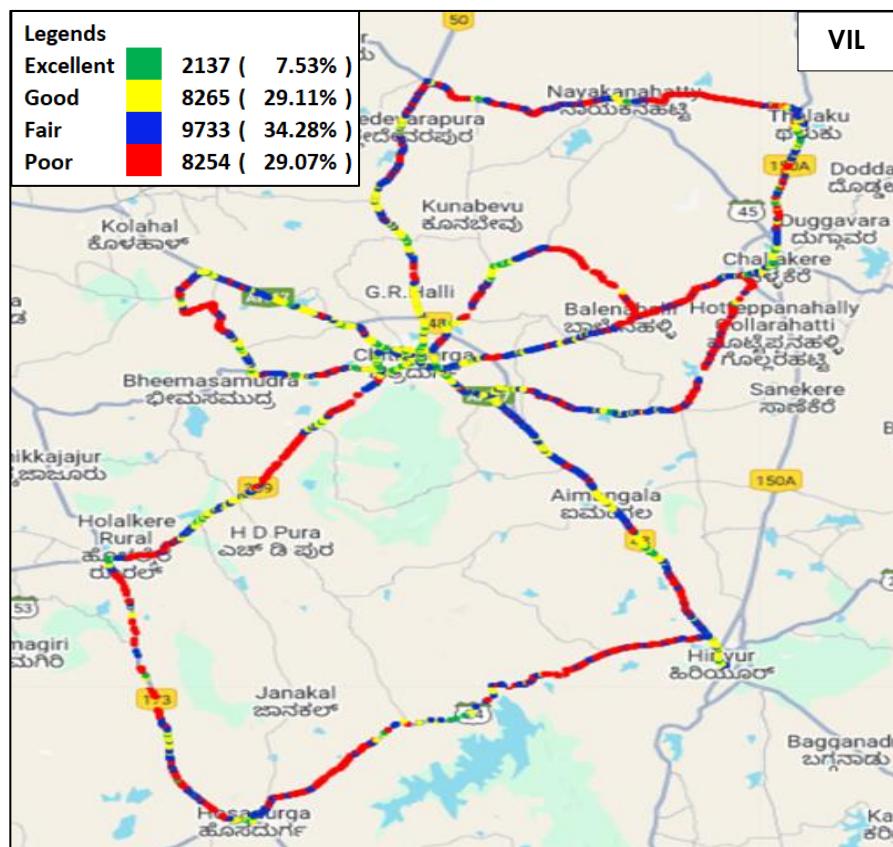
**Figure-37:** Signal strength auto-selection mode (5G/4G/3G/2G) data - AIRTEL.



**Figure-38:** Signal strength auto-selection mode (5G/4G/3G/2G) data - BSNL.



**Figure-39:** Signal strength auto-selection mode (5G/4G/3G/2G) data - RJIL.



**Figure-40:** 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 Sec
Wait/ Guard Time		15 Sec

**Table-71:** 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.

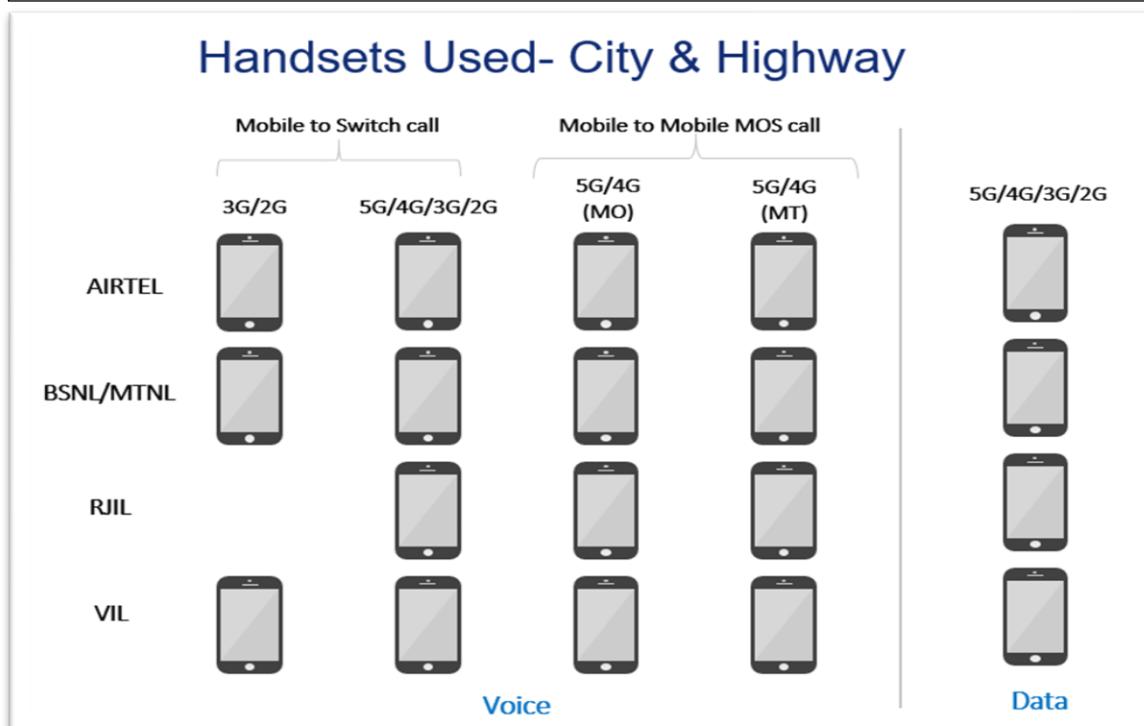
Data Test		
Test Type	Technology	Detail
HTTP/FTP Download	5G/4G/3G/2G Auto Mode	500 MB File- 30 Sec Timeout, (Multithread 3- TCP Connection at a time)
HTTP/FTP Upload		250 MB File- 30 Sec Timeout, (Multithread 3- TCP Connection at a time)
YouTube Streaming		20 Sec Video & 25 sec Timeout (Only at Hotspot)
Web Browsing		3 popular websites ( <a href="http://www.google.co.in">www.google.co.in</a> , <a href="http://www.irctc.co.in">www.irctc.co.in</a> , <a href="http://sbi.bank.in">sbi.bank.in</a> ) 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-72:** Data test detail

**Note-**

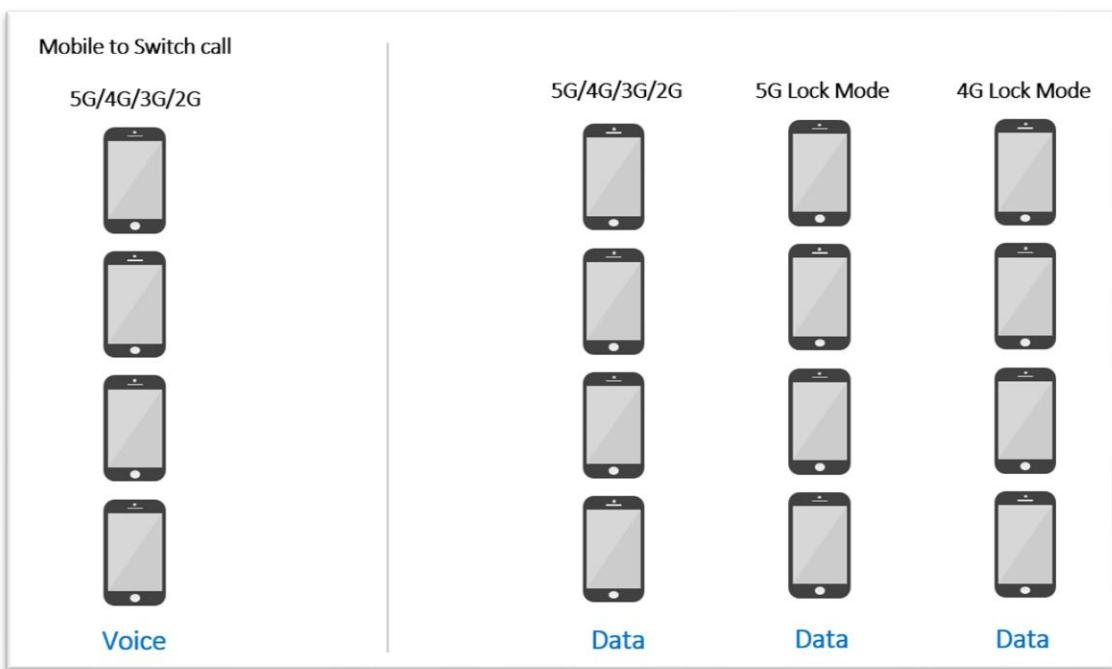
- 5 Data iteration to be done at each hotspot location.
- Minimum 5 iteration to be made during the walk test. Iteration count will be increased based on walk test distance.
- TWAMP-UDP & TCP test to be performed only once at hotspot location.
- Youtube & Web browsing test to be performed at static location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



**Figure-41:** Number of handsets used in city & highway drive

MO: Mobile originating

MT: Mobile terminating

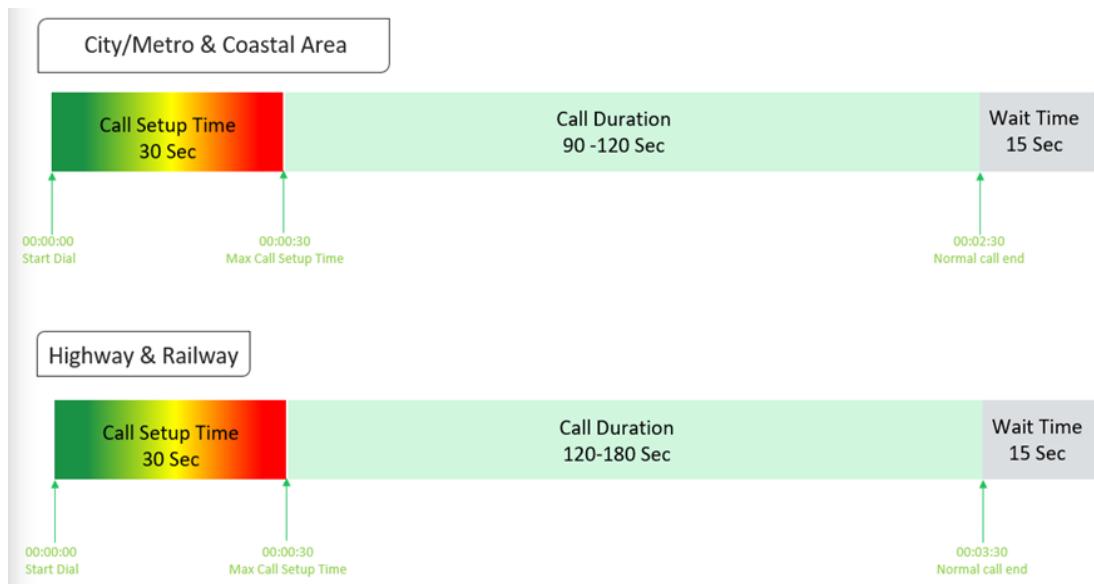


**Figure-42:** Number of handsets used in railway/metro/walktest/hotspot/coastal area

**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-43:** 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.

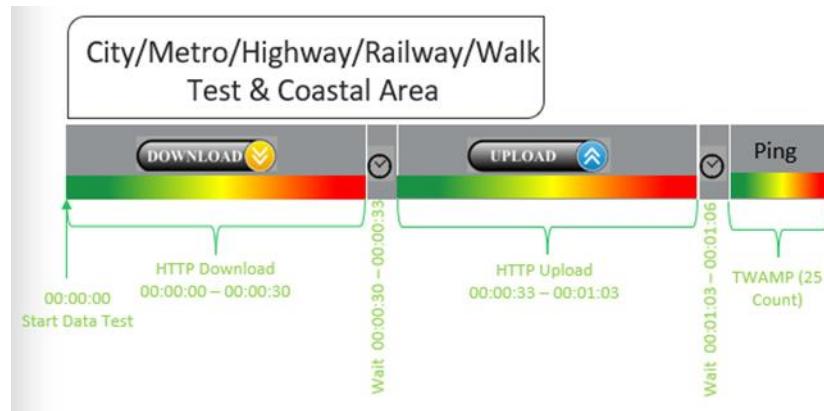
### (b) Hotspot voice testing



**Figure-44:** Voice test script for walktest/hotspot

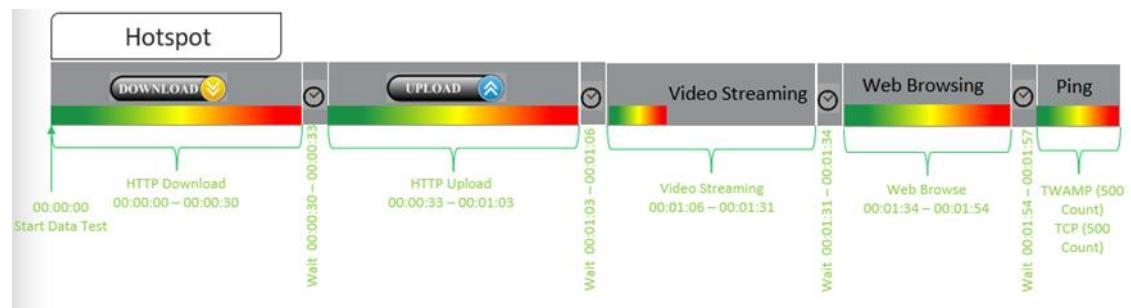
- 10 calls to be made at each Hotspot location.
- Minimum 10 Calls to be made during the walk test. Call count will be increased based on walk test distance.

### (c) Dynamic Data (internet) test



**Figure-45:** Data test script used in city/metro/railway/highway/walk test & coastal area

### (d) Static Data(internet) testing



**Figure-46:** 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
<b>Call Setup Success Rate</b>	<p>(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:</p> <ul style="list-style-type: none"> <li>(a) Call attempt is made</li> <li>(b) The signaling channel is allocated</li> <li>(c) The call is routed to the outwards path of the terminating network</li> <li>(d) An alert signal is received by caller in the form of ring back tone, busy tone, or an announcement.</li> </ul> <p><math>\text{CSSR} = (\text{Total Call Established} / \text{Total Call Attempt}) * 100</math></p> <p>As per QoS Regulation 2024 benchmark value is <b><math>\geq 98\%</math></b></p>
<b>Drop Call Rate</b>	<p>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</p> <p><math>\text{Drop Call Rate} = (\text{Total Call Drop} / \text{Total Call Established}) * 100</math></p> <p>As per QoS Regulation 2024 benchmark value is <b><math>\leq 2\%</math></b></p>
<b>Call Setup Time</b>	<p>Time taken from call initiate to call alerting/ringing.</p> <p><math>\text{Call Setup Time} = \text{T2} - \text{T1}</math></p> <p>T2- Ringing (VoLTE/VoNR) &amp; Alerting (for WCDMA &amp; GSM), T1- Invite (VoLTE/VoNR) &amp; CM Service Request (for WCDMA &amp; GSM)</p>
<b>Voice Quality (MOS)</b>	<p>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:</p> <p>Excellent: <math>\text{MOS} \geq 4</math> and <math>&lt; 5</math>      Good : <math>\text{MOS} \geq 3</math> and <math>&lt; 4</math>      Fair : <math>\text{MOS} \geq 2</math> and <math>&lt; 3</math>      Poor : <math>\text{MOS} \geq 1</math> and <math>&lt; 2</math></p>
<b>Handover Success Rate</b>	<p>Handover Success Rate = Count of successful handovers (All Technology Handover combined) / Total count of Handover Attempt (All Technology Handover combined) *100</p> <p>Handover type which are considered- 2G Inter &amp; Intra cell, 3G Soft &amp; IRAT, 4G Inter &amp; Intra frequency &amp; SRVCC, 5G Inter &amp; Intra frequency &amp; 5G to 4G handovers.</p>
<b>Silence Call</b>	<p>A call which has <math>\geq 4</math> sec continuous RTP gap is considered as a Silence Call.</p> <p><math>\text{Silence call rate} = (\text{count of silence call} / \text{Total calls established}) * 100</math></p> <p>If a call observes multiple silence count <math>\geq 4</math> sec in a particular established call it has been taken as one silent event.</p>

<b>Jitter</b>	<p>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 <math>S_i</math> is the RTP timestamp from packet <math>i</math>, and <math>R_i</math> is the time of arrival in RTP timestamps units for packet <math>i</math>, then for two packets <math>i</math> and <math>j</math> the inter-arrival jitter <math>D</math> can be expressed as:</p> $D(i,j) = (R_j - R_i) - (S_j - S_i)$ <p>The interarrival jitter is calculated continuously as each data packet <math>i</math> is received from source <math>SSRC_n</math>, using this difference <math>D</math> for that packet and the previous packet <math>i-1</math> in order of arrival (not necessarily in sequence), according to the formula</p> $J(i) = J(i-1) + ( D(i-1,i)  - J(i-1))/16 \text{ or } 8$																																		
<b>Downlink Packet Drop Rate</b>	<p>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)</p>																																		
<b>Uplink Packet Drop Rate</b>	<p>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).</p>																																		
<b>Signal Strength</b>	<p>Signal strength is the signal power level received by the wireless user.</p> <table border="1"> <thead> <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> </thead> <tbody> <tr> <td>Rx Level</td> <td>GSM</td> <td>0 to <math>\geq -65</math></td> <td><math>&lt;-65</math> to <math>\geq -75</math></td> <td><math>&lt;-75</math> to <math>\geq -85</math></td> <td><math>&lt;-85</math> to min</td> </tr> <tr> <td>RSCP</td> <td>WCDMA</td> <td>0 to <math>\geq -70</math></td> <td><math>&lt;-70</math> to <math>\geq -80</math></td> <td><math>&lt;-80</math> to <math>\geq -90</math></td> <td><math>&lt;-90</math> to min</td> </tr> <tr> <td>RSRP</td> <td>LTE</td> <td>0 to <math>\geq -80</math></td> <td><math>&lt;-80</math> to <math>\geq -95</math></td> <td><math>&lt;-95</math> to <math>\geq -110</math></td> <td><math>&lt;-110</math> to min</td> </tr> <tr> <td>SS_RSRP</td> <td>NR</td> <td>0 to <math>\geq -80</math></td> <td><math>&lt;-80</math> to <math>\geq -95</math></td> <td><math>&lt;-95</math> to <math>\geq -110</math></td> <td><math>&lt;-110</math> to min</td> </tr> </tbody> </table>	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
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**Table-73:** Network performance parameter and definition voice

### 7.2.2 Network Performance Parameters Data tests

Parameter Name	Definition
<b>Download Speed (Mbps)</b>	<p>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.</p> <p>Download Speed = Total bytes transferred during download / Total time for transfer</p> <ul style="list-style-type: none"> <li>80th percentile (upper range) &amp; 20th percentile (lower range) value has been calculated for download throughput in dynamic drive and Hotspot combine data</li> </ul>
<b>Upload Speed (Mbps)</b>	<p>The upload speed is the data transmission rate that is achieved for uploading a test file from a test device to a test server.</p> <p>Upload Speed = Total bytes transferred during upload / Total time for transfer.</p> <ul style="list-style-type: none"> <li>80th percentile (upper range) &amp; 20th percentile (lower range) value has been calculated for upload throughput in dynamic drive and Hotspot combine data.</li> </ul>
<b>Download Session Setup Success Rate</b>	<p>(total download session established (successfully connected to server)/ total download session attempt) *100. This KPI has been calculated for Hotspot only.</p>

<b>Upload Session Setup Success Rate</b>	(total upload session established (successfully connected to server)/ total upload session attempt)*100. This KPI need to report for Hotspot only.
<b>Web Page Download Time</b>	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.
<b>Video Streaming Delay</b>	The Video streaming delay is time taken from start of video transfer to First video frame displayed in player.
<b>Latency (TWAMP-UDP)</b>	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.
<b>Jitter (TWAMP-UDP)</b>	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  $\text{IPDV}(i) = D(i) - D(i-1)$ then Stdvs of IPDV is considered as jitter.
<b>Packet Loss Rate (TWAMP-UDP &amp; TCP)</b>	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.  *90 <sup>th</sup> percentile for Packet loss rate has been reported in overall Hotspot performance summary.

**Table-74:** 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.