Operator Assisted Drive Test Report

Rajasthan Service Area

Sawaimadhopur City - Sawaimadhopur to Karauli Highway & Karauli City

(22nd Sept 2025 to 24th Sept 2025)

TRAI Regional Office Jaipur

Contents

1. Introduction

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

Accordingly, TRAI with help of TSPs teams undertake assessment of Quality of Service of mobile service through Operator Assisted Drive Test (OADT).

In OADT, 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 finalized based on various objective criteria like reported network performance, consumer complaints etc.

2. Executive Summary

2.1 Drive test details

This report covers the findings of the OADT undertaken in Rajasthan License Service Area (LSA) during the month of September 2025 under the supervision of TRAI Regional Office (RO), Jaipur. Details of route/area covered during the OADT is as given below:

| Start Date	To Date	Drive Test Route	Type of Route	Distance Covered (Km)/ Hotspot Locations (Nos)
22 Sept 2025	22 Sept 2025	Sawaimadhopur	City	85
22 Sept 2025	22 Sept 2025	Sawaimadhopur	Hotspot	3
23 Sept 2025	23 Sept 2025	Sawaimadhopur to Karauli	Highway	140
24 Sept 2025	24 Sept 2025	Karauli	City	42
24 Sept 2025	24 Sept 2025	Karauli	Hotspot	2

Table-**1:** Drive test summary
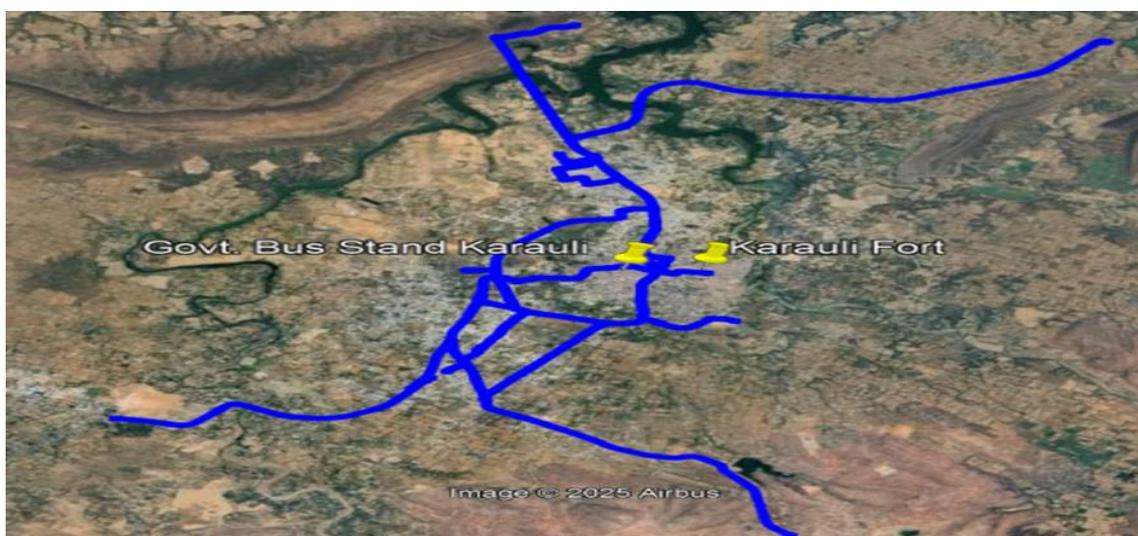
2.2 Drive test routes

The map provides overview of drive test routes indicating city drive, highway drive and hotspots as per the legends shown on the map.
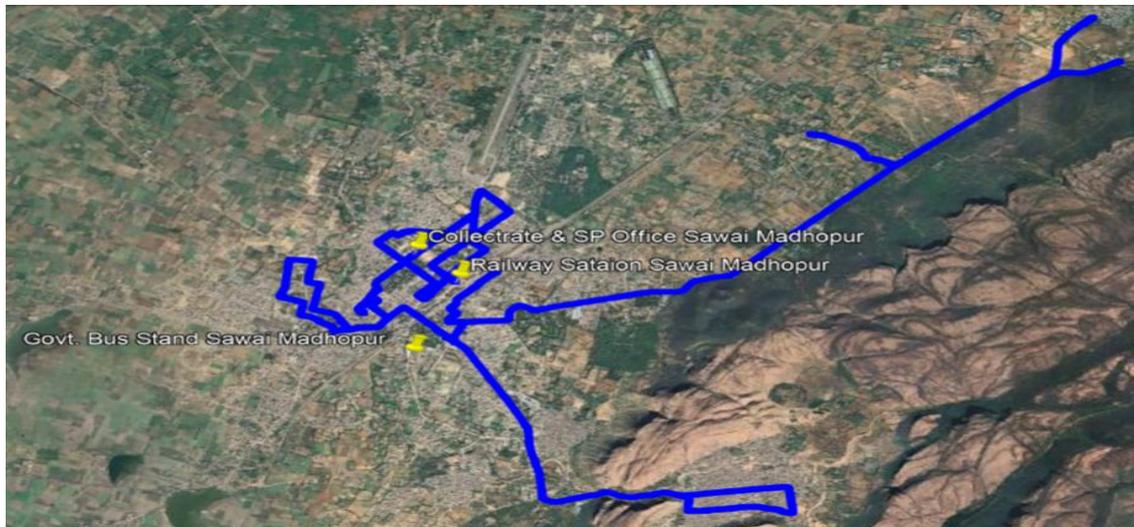
Figure-1: Drive Test Route map (Sawaimadhopur)
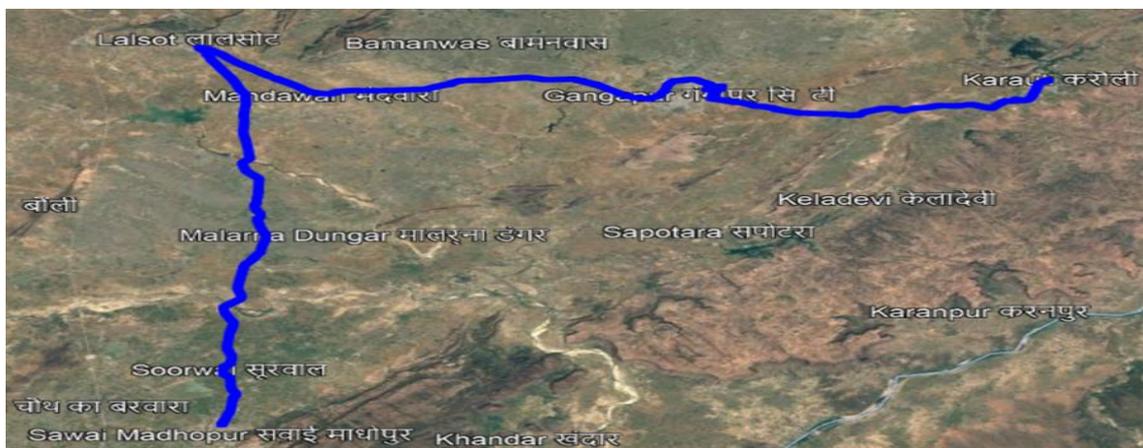
Figure-2: Drive Test Route map (Sawaimadhopur to Karauli Highway

Figure-3: Drive Test Route map (Karauli)

2.3 Areas covered

(a) Sawaimadhopur, Sawaimadhopur to Karauli Highway & Karauli City

- **Sawaimadhopur City**- Sawai Madhopur Railway Station,Main Bazar Market, Maharana Pratap Colony, Collectorate,Balmandir Colony,Indira Colony,Kherda Industrial Area,Ranthambor Circle to Alanpur,Government General Hospital to Bheru Darwaja to 72 Stairs School to Khandar Road to City Bus Stand. Ranthambor Circle to Railway Colony,Ranthambor Road, Mathurapura, Sherpur, rajiv Gandhi Museum.
- **Sawaimadhopur to Karauli Highway.**
- **Karauli City-** Govt Bus Stand Karauli, Collector circle, Gaushala, Vajirpur Gate, Sarafa Bazar, Foota Kot, Madanmohan Ji Temple, Karauli Fort ,Hindaun Gate, Sabji Mandi, Police Station, Govt Hospital , Ganesh Gate, Mela Gate, Power House Road, Bhanwar Vilas Place, Shikar Ganj, Rangawa Taal, Lovekush Vatika, Vaishali Nagar, Gomti Colony, SP Office, Teen Bad Chauraha, Anaj Mandi karauli, Police Thana Sadar Karauli, Gadka Ki Chawki, Gulab Bag, Stadium road, Masalpur Chungi, Deeppura, Reliance Pump, Anjani Mata Temple, Bhim Nagar, Aravali Nagar , Rajput Colony.

(b)Hot spots Covered:

S.No	City	Hotspot Locations
1	Sawaimadhopur	Railway Station
2		Govt.Bus Stand
3		Collectorate
4	Karauli	Govt. Bus stand
5		Karauli Fort

Table 2: Hot spot locations covered in OADT

2.4 Telecom service providers detected frequency bands

Technologies covered during the OADT and frequency bands in use are summarized in below table.

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	700,850,2500
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

**Table 3:** Frequency Bands of Telecom service provider (TSP) covered in OADT.

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3.Detailed QoS Performance Analysis Sawai Madhopur City :

This section provides summary of overall QoS performance of the telecom service provider's network in the Sawai madhopur and Karauli City of and Sawai madhopur to Karauli Highway Rajasthan LSA by aggregating the results of drive tests conducted in month of September 2025 covering city drive, hotspots and Highway.

(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	101	90	72
Call Setup Success Rate %	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.92	2.48	3.32
Handover Success Rate %	99.02	100	98.84

Table-4: Summary of voice call performance in 3G/2G network mode only.
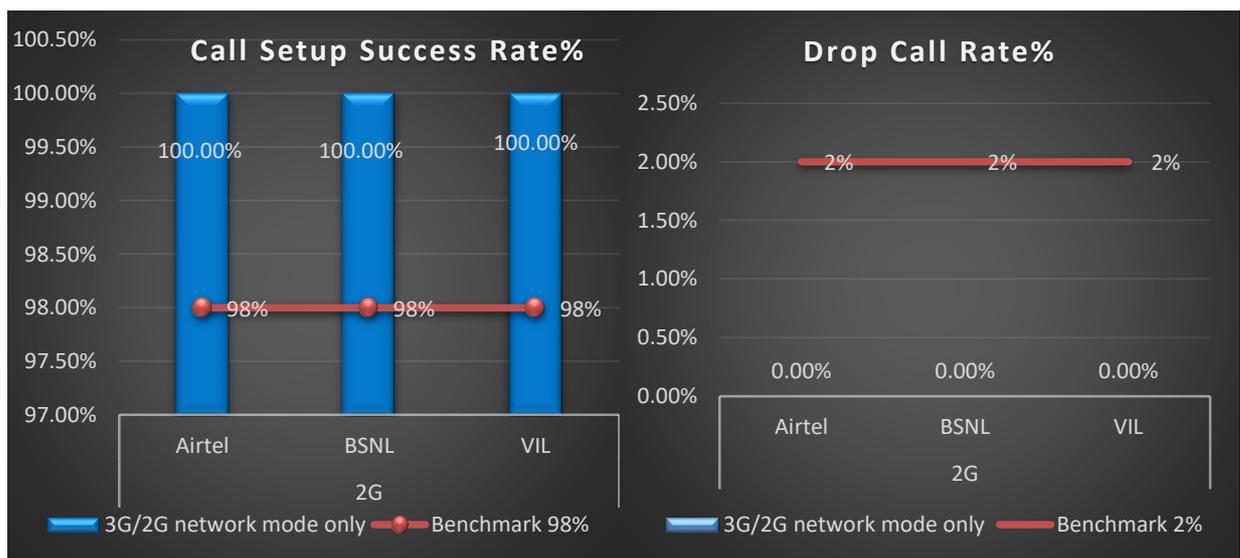
Figure-4: Call setup success rate and drop call rate performance.

Number of unique cell id's covered in Voice test- Technology wise			
Technology	Service Provider		
	3G/2G network mode only		
	AIRTEL	BSNL	VIL
3G	N/A	45	N/A
2G	54	42	47

**Table-5:** 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	103	96	108	78
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	1.04	0.00	0.00
Call Setup Time-Average (Second)	1.86	2.98	0.68	0.53
Handover Success Rate %	99.42	100.00	99.76	99.64

Table-6: Summary of voice call performance in network auto-selection mode.
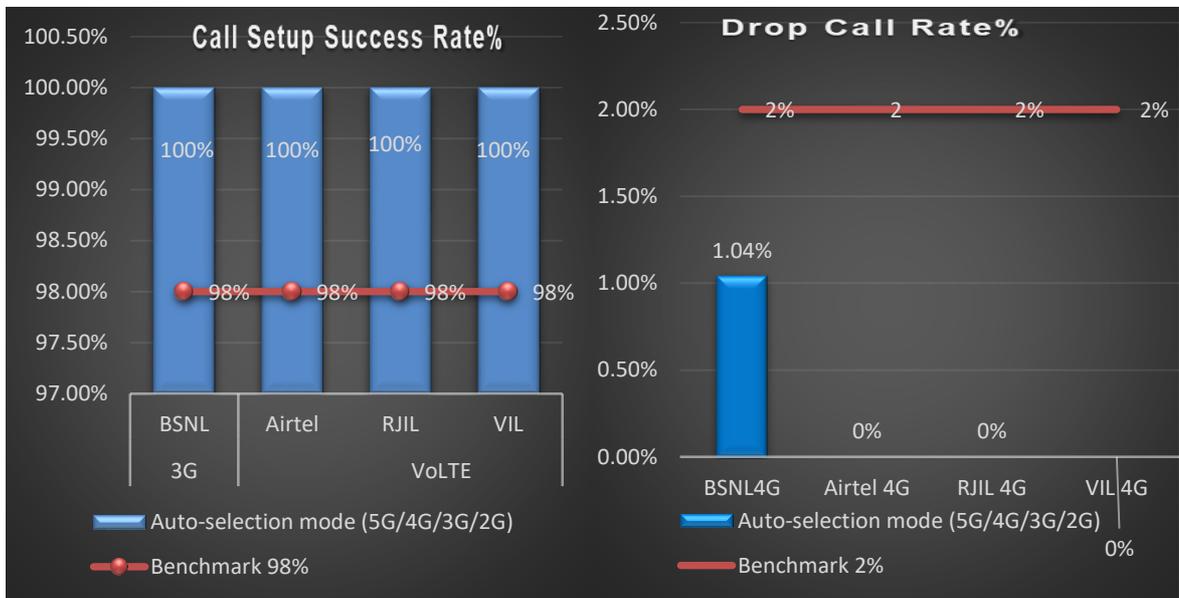
Figure-3: Performance for call setup success rate and drop call rate.

Parameter	Service Provider			
	Mobile-to-Mobile (5G/4G - Open Mode)			
	AIRTEL	BSNL	RJIL	VIL
Call Established (within service provider Network)	101	NA	107	80
Number of silence call for >4 Sec	2	NA	0	0
Silence Call Rate %	0.99	NA	0.00	0.00
Number of silence instances for >4 Sec	2	NA	0	0
Number of silence instances for >3 Sec	3	NA	0	0
Number of silence instances for >2 sec	3	NA	2	0
RTP Jitter (4G & 5G) in ms	2.14	NA	7.90	36.22
Packet loss Rate Downlink %	0.11	NA	0.86	0.40
Packet loss Rate Uplink %	0.08	NA	0.80	0.20

Table-7: Summary of silence instances & packet loss rate for mobile-to-mobile call

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Number of unique cell ids covered during Voice test				
	AIRTEL	BSNL	RJIL	VIL
3G	NA	-	NA	NA
2G	0	49	NA	86
4G	93	48	48	NA
5G	0	45	34	0

Table-8: Technology wise number of network cell id's latched during drive test.

Note-NA- Service provider doesn't provide services on 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 score values means: 5- Excellent, 4-Good, 3-Fair, 2-Poor, 1-Bad.

Speech Quality (MOS) distribution	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
Total Number of MOS Samples for calls in table-6	505	NA	528	539
Speech Quality (Average MOS Score)	4.11	NA	4.29	4.00
Number of samples with MOS >=4 to <5 (Excellent)	465	NA	445	410
Number of samples with MOS >=3 to <4 (Good)	75	NA	63	107
Number of samples with MOS >=2 to <3 (Fair)	3	NA	18	13
Number of samples with MOS >=1 to <2 (Poor)	1	NA	2	9
%age of samples with MOS >=4 to <5 (Excellent)	92.17%	NA	84.28%	76.07%
%age of samples with MOS >=3 to <4 (Good)	7.43%	NA	11.93%	19.85%
%age of samples with MOS >=2 to <3 (Fair)	0.30%	NA	3.41%	2.41%
%age of samples with MOS >=1 to <2 (Poor)	0.10%	NA	0.38%	1.67%

Table-9: Summary of speech quality (MOS) samples.

(d) Data performance. (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	119.72	16.08	378.64	31.27
	80th Percentile	207.73	22.28	465.92	49.02
	20th Percentile	25.82	10	298.14	13.84
Upload Throughput (Mbits/s)	Average	27.97	8	93.82	10.63
	80th Percentile	47.17	10	132.91	18.45
	20th Percentile	10.95	6	48.75	1.85
Latency (ms)	50th Percentile	25.5	35.0	7.0	23.5

Table-10: Summary of data performance in network auto-selection mode.

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	95	NA
4G	93	49	6	83
3G	NA	36	NA	NA
2G	0	38	NA	0

Table-11: Technology wise number of network cell id's latched during drive test.

(e) Hotspots

Hotspot testing has been done on 22 September 2025. 3 locations have been tested in the city.

i. **Hotspot covered :**
- Govt. Bus Stand, Sawai Madhopur.
- Collectrate & SP office Sawai Madhopur.
- Railway Sataion Sawai Madhopur.

ii. **Locations**

Figure- 6: Hotspot locations

iii. **Voice performance**

Overall Voice Performance				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	30	30	30	30
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 (Sec)	1.82	2.97	0.65	0.53

Table-12: Overall summary of voice call performance in network auto-selection mode   (5G/4G/3G/2G).

Gvot. Bus Stand , Sawai Madhopur				
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 (Sec)	1.81	2.91	0.67	0.59

Table-13: Summary of voice call performance in network auto-selection mode 5G/4G/3G/2G).

Collectrate & SP SP office , Sawai Madhopur				
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 (Sec)	1.82	3.06	0.57	0.53

Table-14: Summary of voice call performance in network auto-selection mode 5G/4G/3G/2G).

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Railway Sataion , Sawai madhopur				
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 (Sec)	1.83	2.95	0.71	0.47

Table-15: Summary of voice call performance in network auto-selection mode 5G/4G/3G/2G).

iv. **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)	218.76	23.82	612.29	49.57
Download Throughput 80th Percentile (Mbit/s)	314.46	31.23	687.04	60.06
Download Throughput 20th Percentile (Mbit/s)	48.56	9.48	522.77	38.79
Download Session Setup Success Rate %	100.00 %	100	100.00	100.00
Upload Throughput Average (Mbits/s)	45.14	6.08	163.17	8.01
Upload Throughput 80th Percentile (Mbit/s)	52.33	9.66	189.54	7.49
Upload Throughput 20th Percentile (Mbit/s)	18.74	2.48	144.64	2.70
Upload Session Setup Success Rate %	100	100	100	100
Web Browsing Delay (Second)	1.83	0.38	0.24	3.23
Youtube Initial Buffer Delay (Second)	0.83	2.7	0.57	2.42
Latency (ms)-50th Percentile	20.01	45	19	23.83
Jitter (ms)	2.03	19	8.73	8.00
Packet Loss Rate%	0.00	0	0.27	0.00
Packet Loss Rate- 90th percentile	0	0	0.64	0.00

Table-16: Overall Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Govt. Bus Stand , Sawai Madhopur				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	281.67	25.24	571.75	54.11
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	48.27	6.54	180.48	5.26
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	1.66	0.35	0.31	5.18
Youtube Initial Buffer Delay (Second)	0.83	1.54	0.54	1.93
Latency (ms)-50th Percentile	15.02	0.42	19	22.50
Jitter (ms)	2.26	15	5.59	8.21
Packet Loss Rate%	0.00	0	0.00	0.00

Table-17: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G)

Collectrate & SP SP office , Sawai Madhopur				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	198.45	22	708.56	57.75
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	50.36	6	132.14	14.78
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	2.6	0.39	0.23	2.92
Youtube Initial Buffer Delay (Second)	0.86	2.36	0.74	3.26
Latency (ms)-50th Percentile	21.97	46.0	15.50	22.00
Jitter (ms)	1.68	19	5.41	5.80
Packet Loss Rate%	0.00	0	0.00	0.00

Table-18: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Railway Sataion , Sawai Madhopur				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	176.16	26	498.86	36.83
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	36.79	8.02	163.96	4.00
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	1.23	0.49	0.20	1.59
Youtube Initial Buffer Delay (Second)	0.81	2.11	0.42	2.08
Latency (ms)-50th Percentile	23.03	42	27	27.00
Jitter (ms)	2.14	19	15.19	9.99
Packet Loss Rate%	0.00	0	0.80	0.00

Table-19: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

(f) TSP Wise signal Strength :

Technology	Parameter	Range	Colour
2G	Rx Level	≥ -85 dBm	
		<-85 dBm	
3G	RSCP	≥ -90 dBm	
		< -90 dBm	
4G	RSRP	≥ -110 dBm	
		<-110 dBm	
5G	RSRP	≥ -110 dBm	
		<-110 dBm	

Table-20 : Signal strength legend format.

A. Airtel

Figure-7: Signal strength 2G /3G network mode – AIRTEL
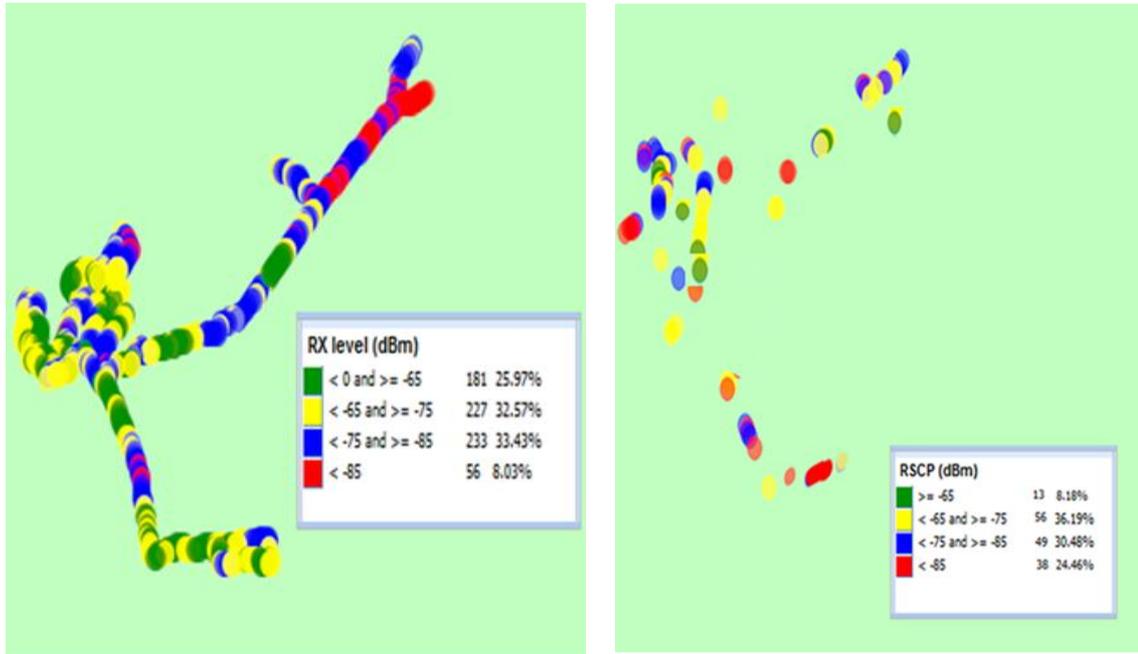

Figure-6: Signal strength auto-selection mode 4G– AIRTEL.

B. BSNL

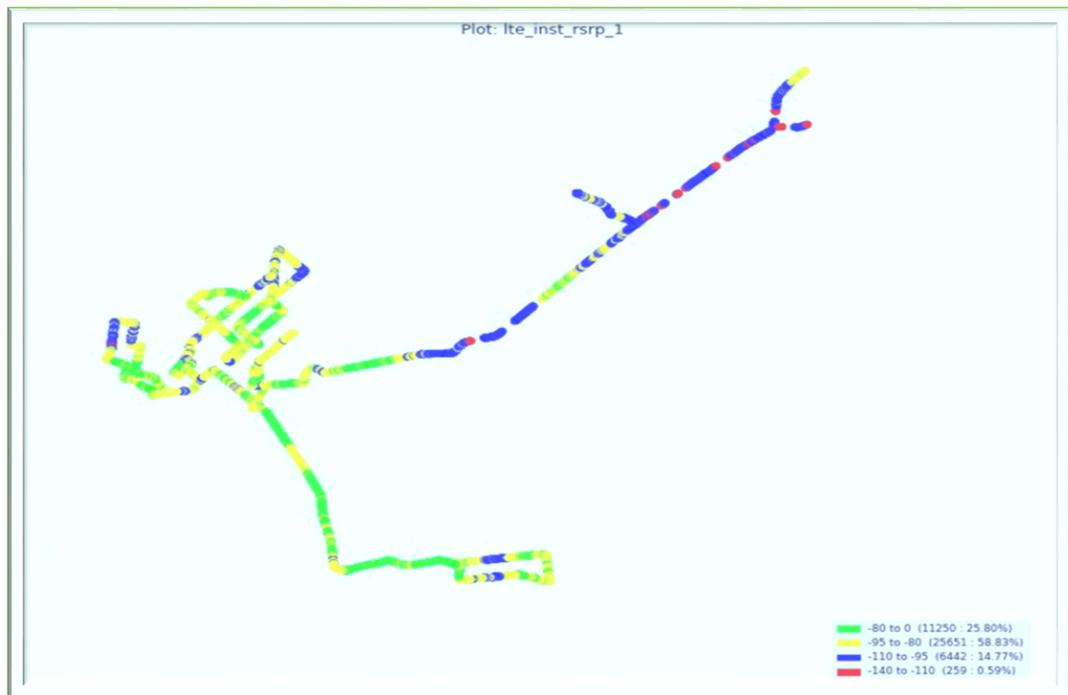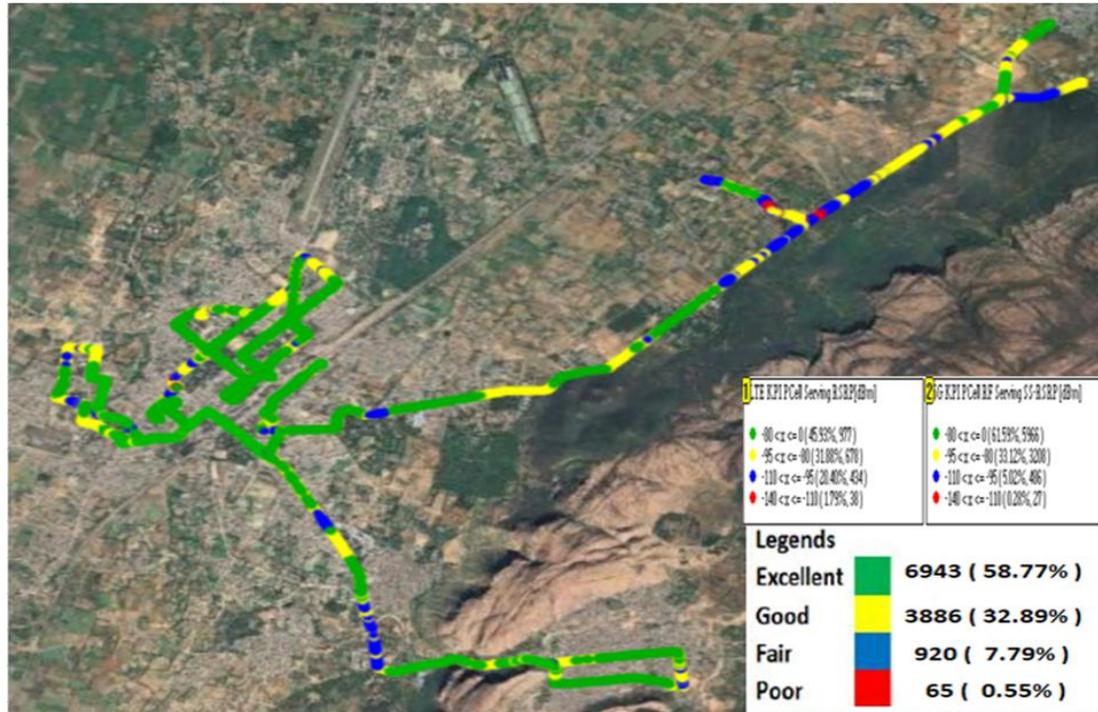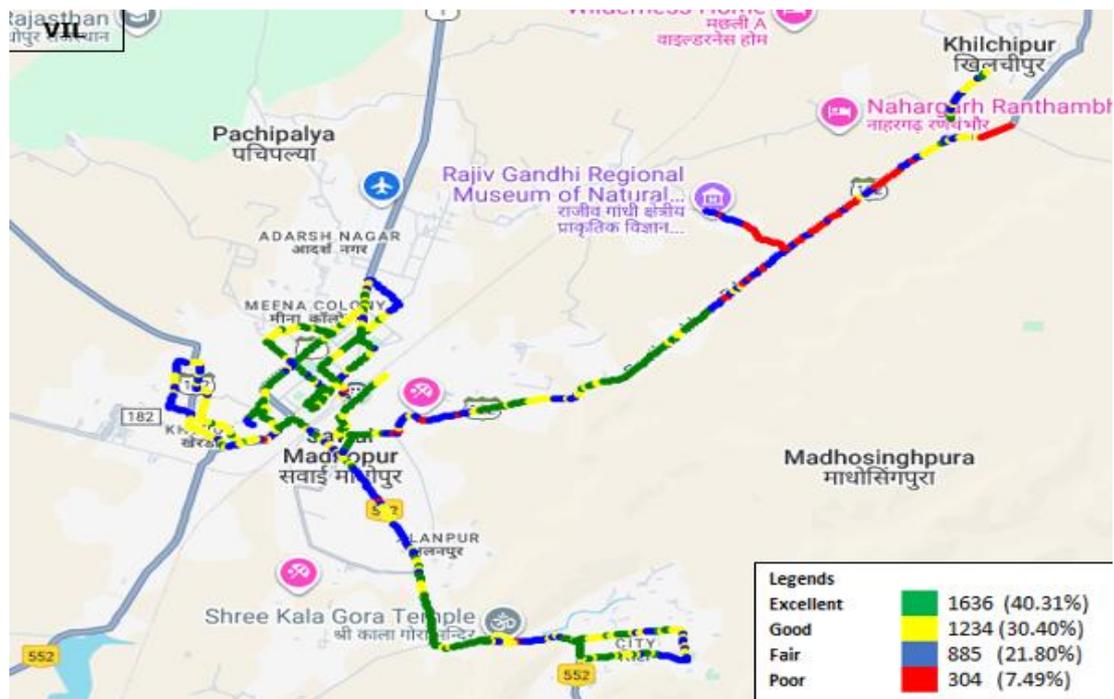Figure-7: Signal strength auto-selection mode 3G/2G – BSNL

Figure-8: Serving technology plots in auto-selection mode (5G/4G/3G/2G) –BSNL.

C. RJIL

Figure-9: Signal strength auto-selection mode 5G/4G/3G/2G – RJIL.

D. VIL
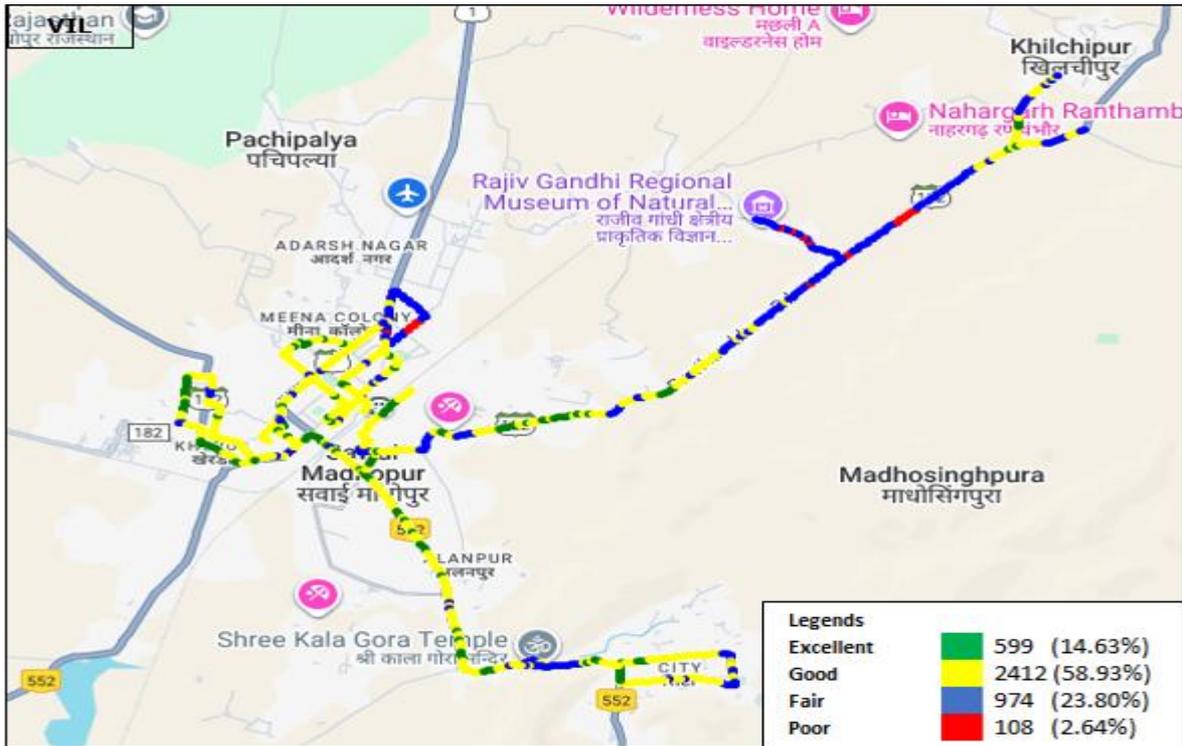

Figure-10: Signal strength 3G/2G network mode – VIL.

Figure 11-: Signal strength auto-selection mode 5G/4G/3G/2G – VIL

Conclusion:

The operator wise comparative Analysis of various key parameters is given in table below:

S.No.	KPIs (Auto-selection mode (5G/4G/3G/2G)	Measured in	AIRTEL	BSNL	RJIL	VIL
1	Call Setup Success Rate (CSSR)	%	100.00	100.00	100.00	100.00
2	Drop Call Rate (DCR)	%	0.00	1.04	0.00	0.00
3	Call Silence rate (Mute Call)	%	0.99	NA	0.00	0.00
4	Average MOS Score	1-5	4.11	NA	4.29	4.00
5	TSP Offered typical download speed (In Mbps)	(Mbits/s)	27.64	4	15	15
6	Average Download Throughput (Data Speed)	(Mbits/s)	119.72	16.08	378.64	31.27
7	TSP Offered typical upload speed (In Mbps)	(Mbits/s)	11.5	2	7	8
8	Average Upload Throughput (Data Speed)	(Mbits/s)	27.97	8	93.82	10.63

Table-20 : Operator wise comparative Analysis of various key parameters

4. QoS performance analysis- Sawai Madhopur to Karauli Highway :

This section provides summary of overall QoS performance of the telecom service provider's network in the Sawaimadhopur to Karauli Highway Rajasthan LSA by aggregating the results of drive tests conducted in month of September 2025 covering city drive, hotspots and Highway.

(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	56	86	63
Call Setup Success Rate %	100.00	100.00	100.00
Drop Call Rate %	0	0	0
Call Setup Time-Average (Second)	2.09	3.26	3.30
Handover Success Rate %	97.08	98.22	96.21

Table-21: Summary of voice call performance in 3G/2G network mode only.
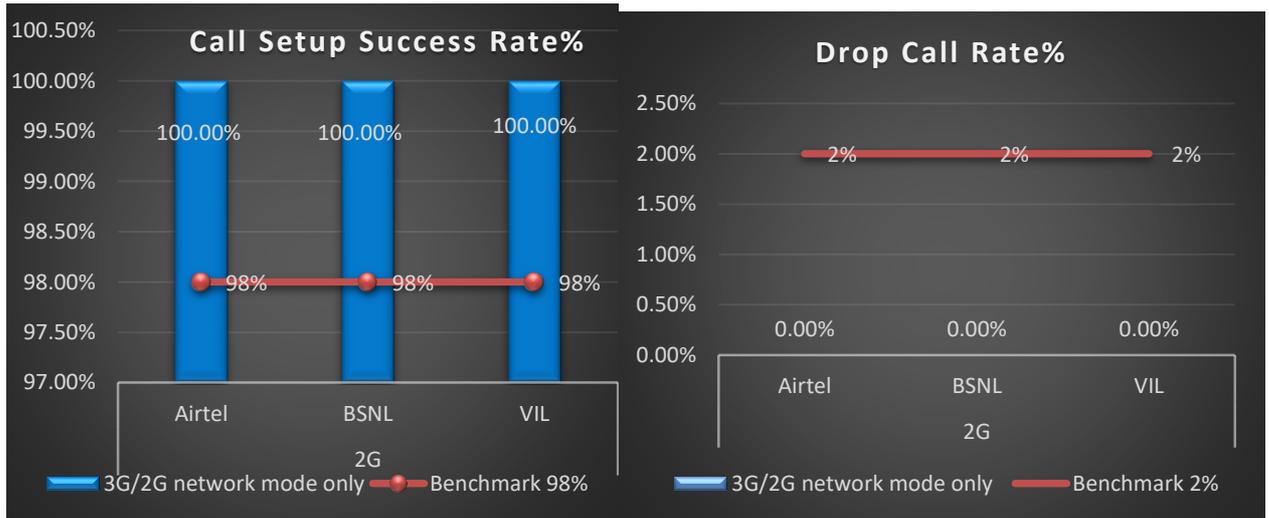
Figure-12: Call setup success rate and drop call rate performance.

Number of unique cell id's covered in Voice test- Technology wise			
Technology	Service Provider 3G/2G network mode only		
	AIRTEL	BSNL	VIL
3G	N/A	46	N/A
2G	138	48	109

**Table-22:** 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	59	92	62	61
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	1.08	0.00	0.00
Call Setup Time-Average (Second)	1.82	2.95	0.63	0.54
Handover Success Rate %	99.29	98.14	99.82	99.38

Table-23: Summary of voice call performance in network auto-selection mode.
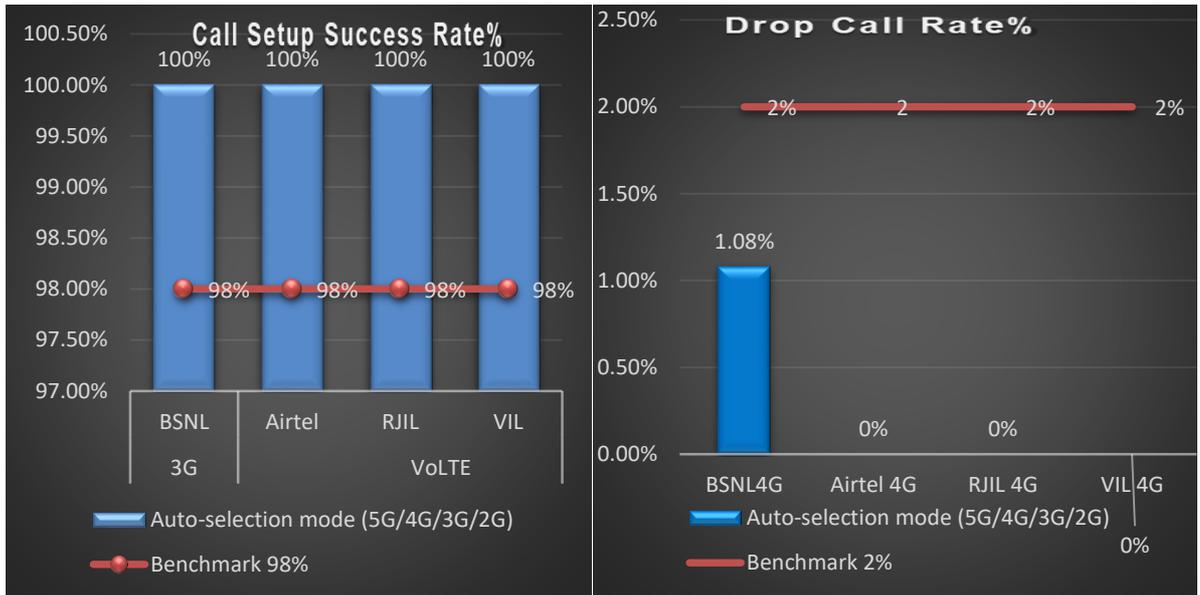
Figure-13: Performance for call setup success rate and drop call rate.

Parameter	Service Provider			
	Mobile-to-Mobile (5G/4G - Open Mode)			
	AIRTEL	BSNL	RJIL	VIL
Call Established (within service provider Network)	66	NA	58	62
Number of silence call for >4 Sec	1	NA	0	0
Silence Call Rate %	1.52	NA	0	0.00
Number of silence instances for >4 Sec	1	NA	0	0
Number of silence instances for >3 Sec	3	NA	1	0
Number of silence instances for >2 sec	4	NA	4	0
RTP Jitter (4G & 5G) in ms	1.48	NA	13.21	18.9
Packet loss Rate Downlink %	0.48	NA	0.92	1.2
Packet loss Rate Uplink %	0.38	NA	0.98	1.2

Table-24: Summary of silence instances & packet loss rate for mobile-to-mobile call

	Number of unique cell ids covered during Voice test			
	AIRTEL	BSNL	RJIL	VIL
3G	**NA**	58	NA	NA
2G	**0**	62	NA	0
4G	**215**	98	214	198
5G	**0**	**NA**	21	0

Table-25: Technology wise number of network cell id's latched during drive test.

> **Note**-NA- Service provider doesn't provide services on 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 score values means: 5- Excellent, 4-Good, 3-Fair, 2-Poor, 1-Bad.

Speech Quality (MOS) distribution	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
Total Number of MOS Samples for calls in table-6	1876	NA	579	833
Speech Quality (Average MOS Score)	4.06	NA	4.22	3.92
Number of samples with MOS >=4 to <5 (Excellent)	1691	NA	485	601
Number of samples with MOS >=3 to <4 (Good)	144	NA	59	166
Number of samples with MOS >=2 to <3 (Fair)	22	NA	18	36
Number of samples with MOS >=1 to <2 (Poor)	19	NA	17	30
%age of samples with MOS >=4 to <5 (Excellent)	90.14%	NA	83.76%	72.15%
%age of samples with MOS >=3 to <4 (Good)	7.68%	NA	10.19%	19.93%
%age of samples with MOS >=2 to <3 (Fair)	1.17%	NA	3.11%	4.32%
%age of samples with MOS >=1 to <2 (Poor)	1.01%	NA	2.94%	3.60%

Table-26: Summary of speech quality (MOS) samples.

(d) Data performance. (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**		63.38	5.34	322.97	27.72
	80th Percentile		98.34	6.94	453.93	44.31
	20th Percentile		20.15	4.34	177.89	9.66
Upload Throughput (Mbits/s)	**Average**		17.94	3.52	70.11	10.7
	80th Percentile		24.91	4.90	91.72	18.71
	20th Percentile		9.79	1.88	34.92	2.3
Latency (ms)	**50th Percentile**		33	39	8	23.5

Table-27: Summary of data performance in network auto-selection mode.

| 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	52	NA
4G	215	96	47	180
3G	NA	58	NA	NA
2G	0	62	NA	NA

Table-28: Technology wise number of network cell id's latched during drive test.

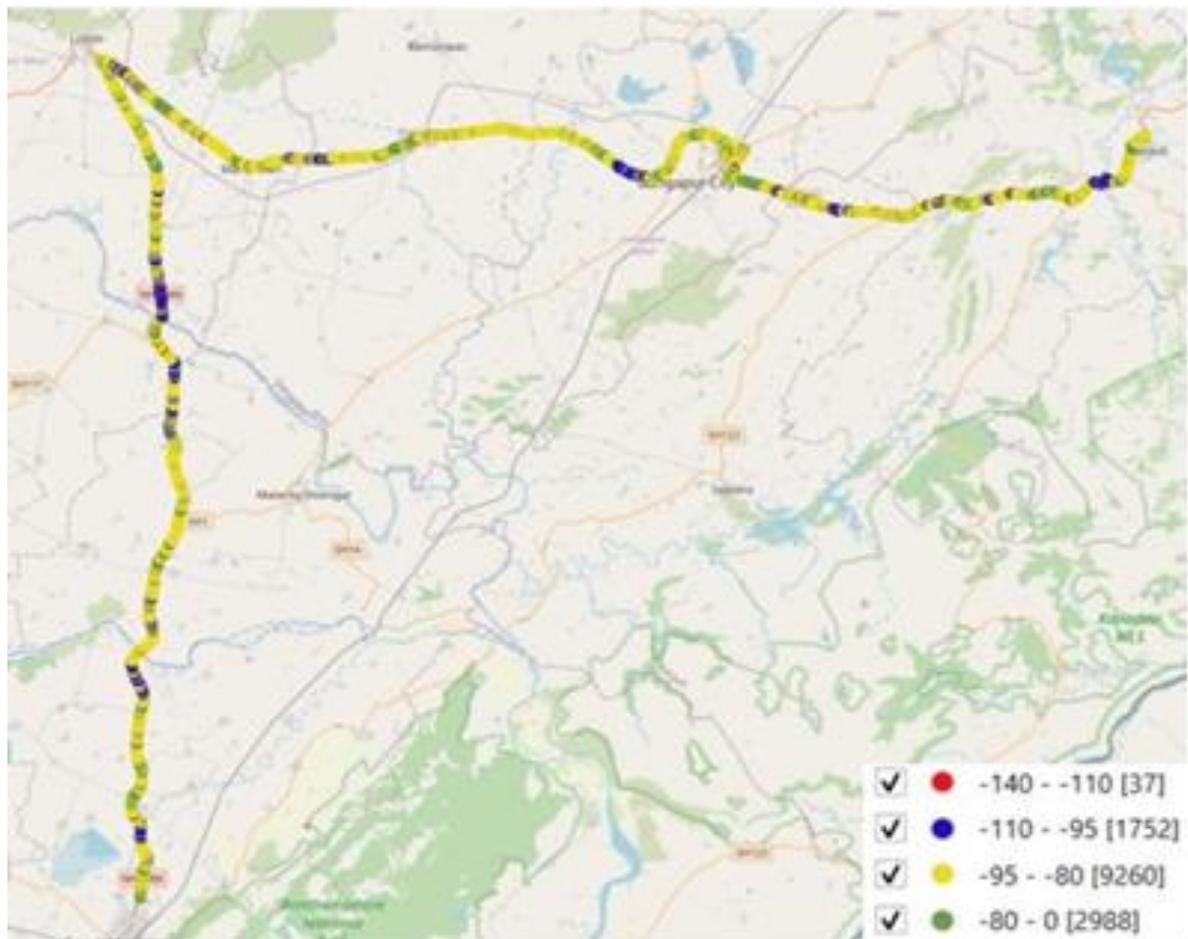## (e) TSP Wise signal Strength (Sawai Madhopur to Karauli Highway)

Technology	Parameter	Range	Colour
2G	Rx Level	≥ -85 dBm	
		<-85 dBm	
3G	RSCP	≥ -90 dBm	
		< -90 dBm	
4G	RSRP	≥ -110 dBm	
		< -110 dBm	
5G	RSRP	≥ -110 dBm	
		< -110 dBm	

Table- 29 : Signal strength legend format.

19
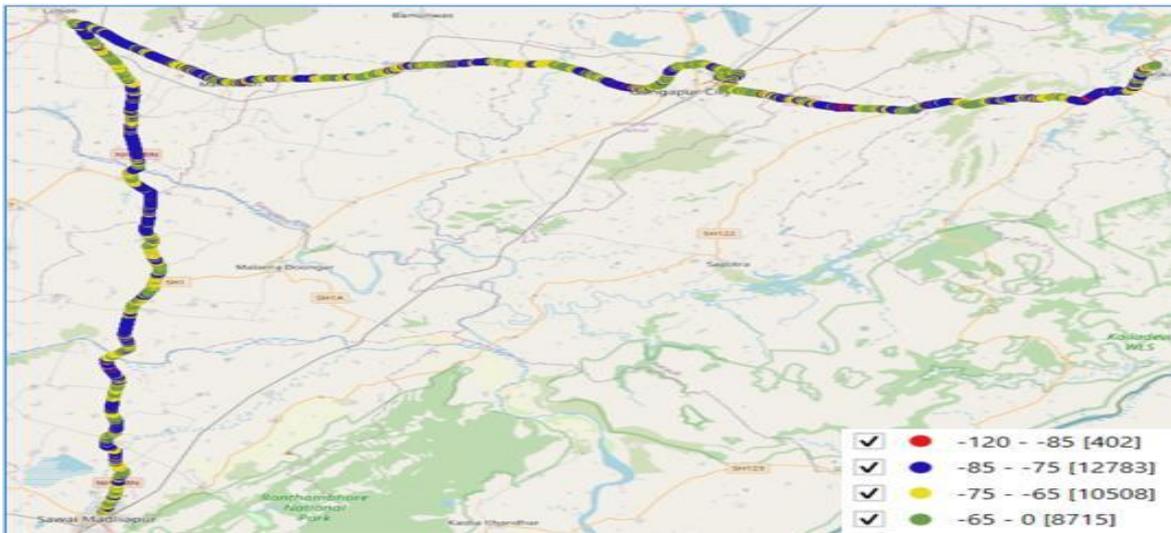
A. Airtel

Figure-14: Signal strength 2G /3G network mode – AIRTEL

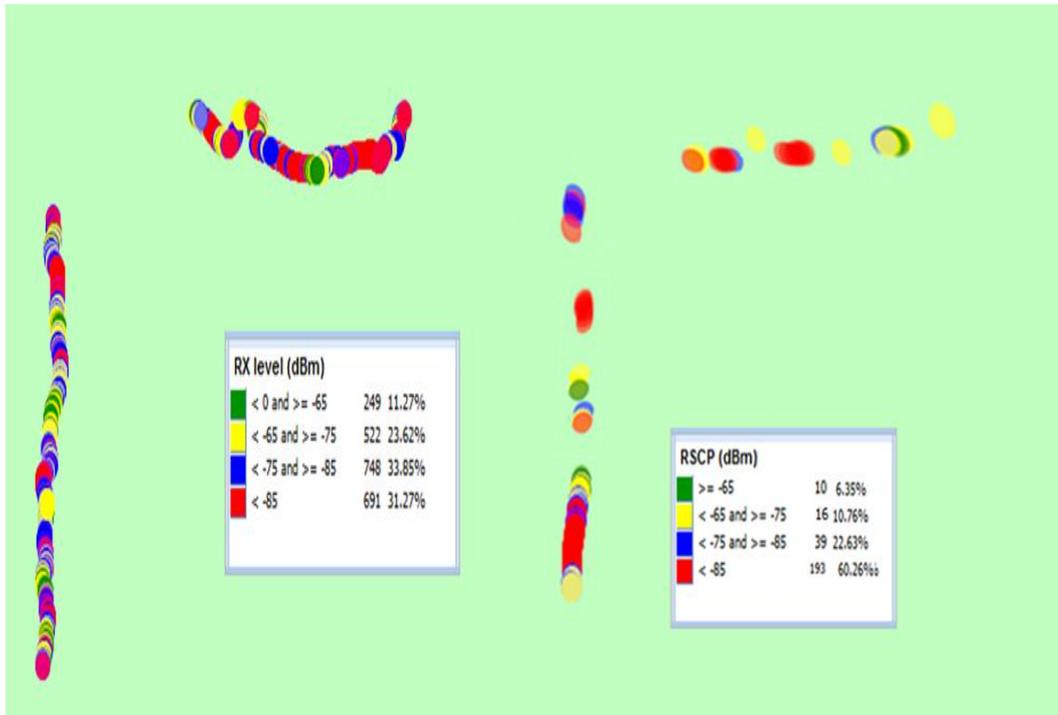Figure-15: Signal strength auto-selection mode 5G/4G/3G/2G– AIRTEL.

E. BSNL

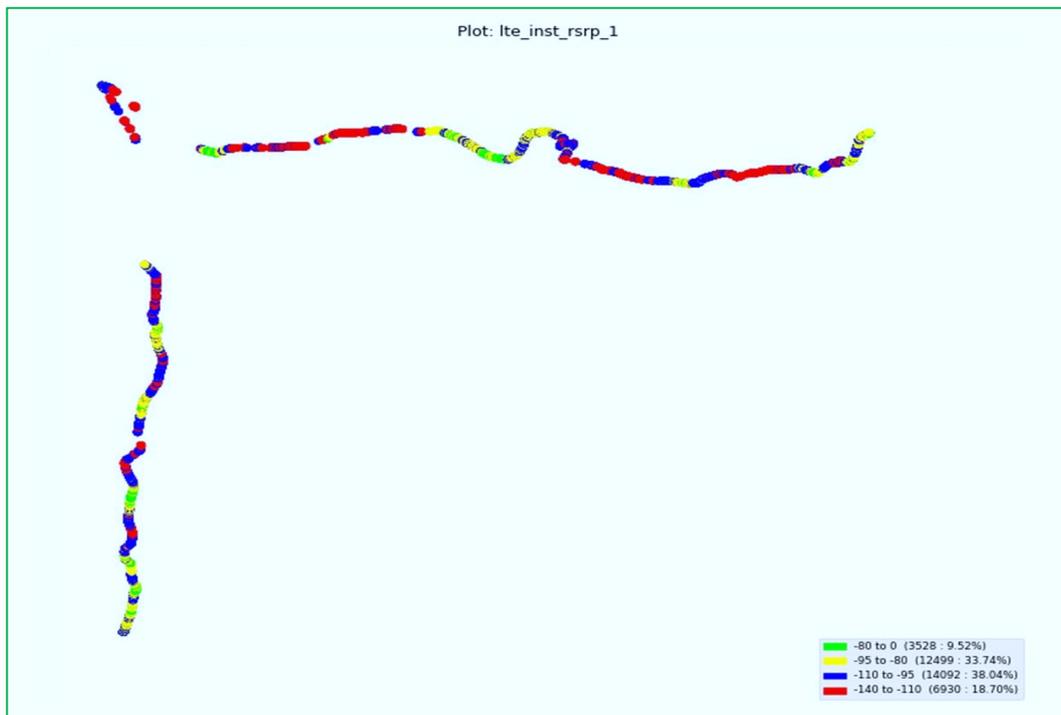Figure-16: Signal strength auto-selection mode 3G/2G – BSNL
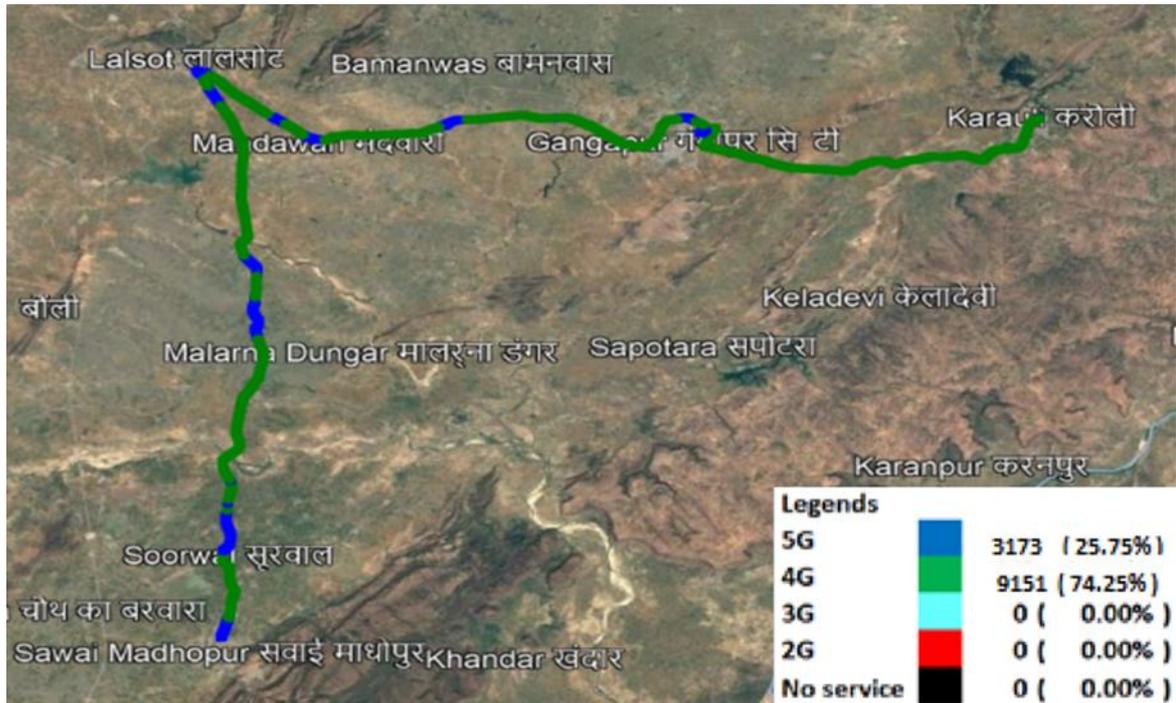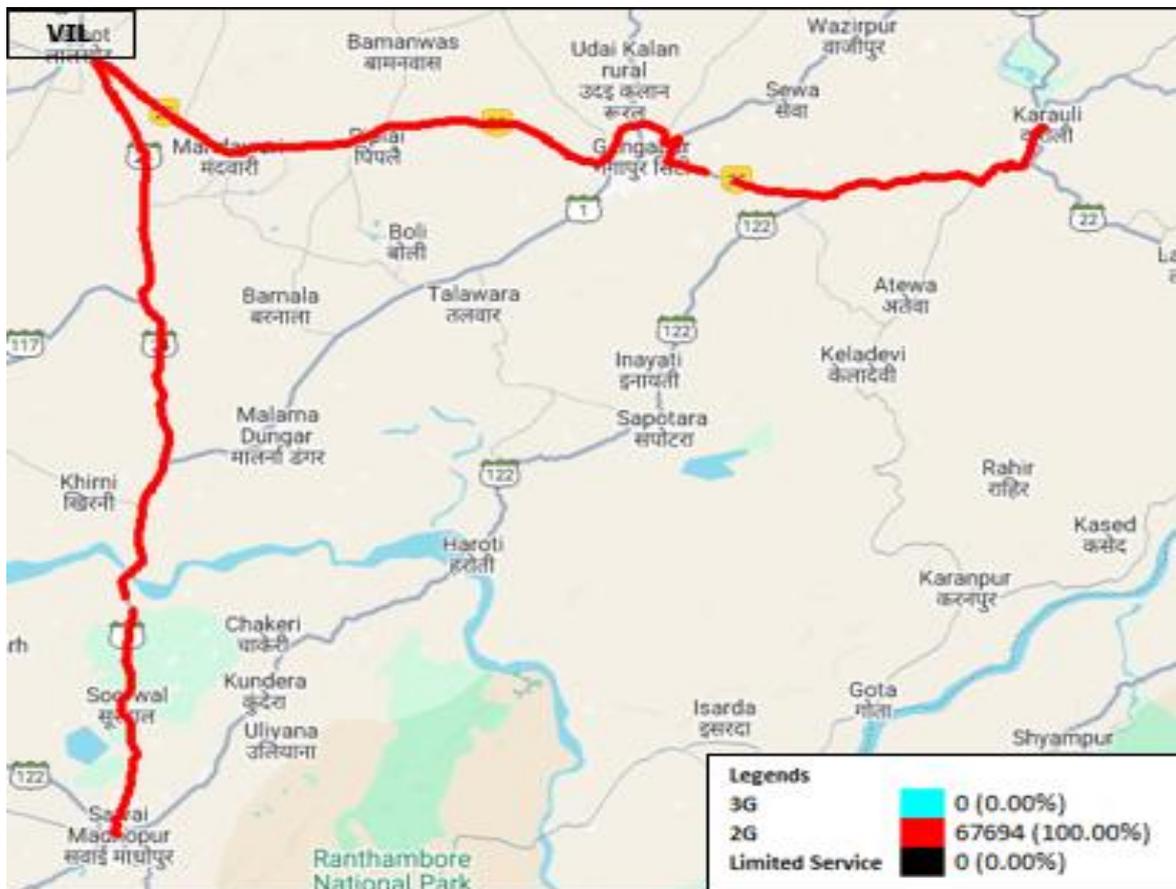

Figure-17: Serving technology plots in auto-selection mode (5G/4G/3G/2G) –BSNL.
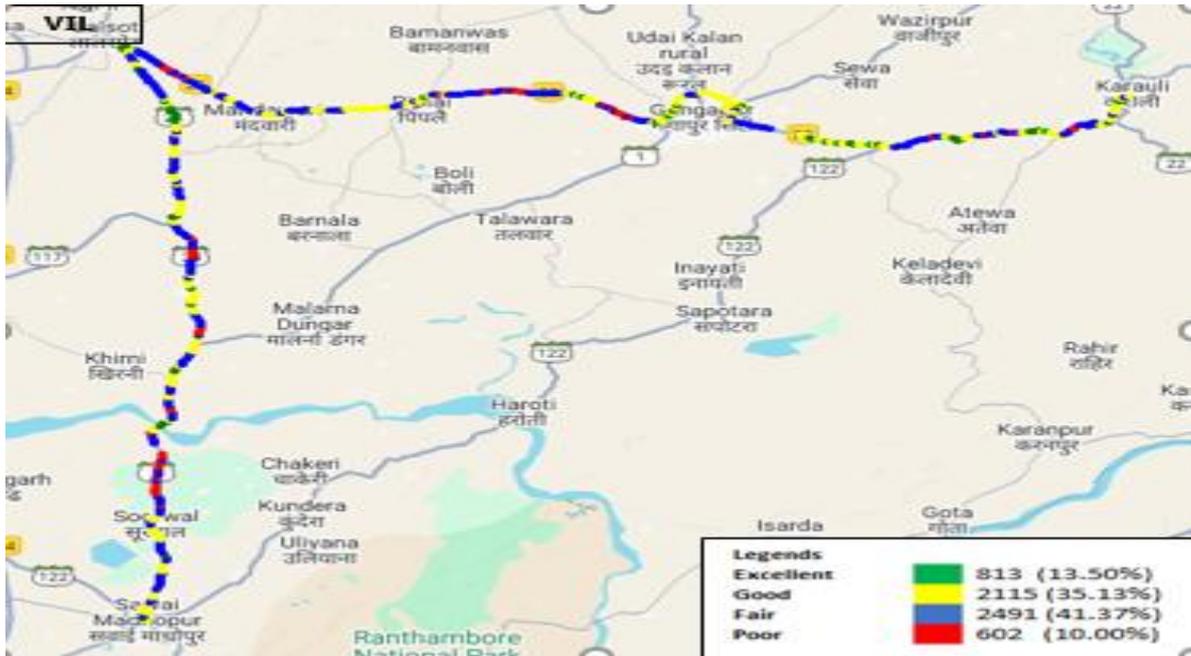
F. RJIL

Figure-18: Signal strength auto-selection mode 5G/4G/3G/2G – RJIL.

G. VIL

Figure-19: Signal strength 3G/2G network mode – VIL.

Figure 20-: Signal strength auto-selection mode 5G/4G/3G/2G – VIL

(f) Conclusion: **The operator wise comparative Analysis of various key parameters is given in table below:**

S.No.	KPIs (Auto-selection mode (5G/4G/3G/2G)	Measured in	AIRTEL	BSNL	RJIL	VIL
1	Call Setup Success Rate (CSSR)	%	100.00	100.00	100.00	100.00
2	Drop Call Rate (DCR)	%	0.00	1.08	0.00	0.00
3	Call Silence rate (Mute Call)	%	1.52	NA	0	0.00
4	Average MOS Score	1-5	4.06	NA	4.22	3.92
5	TSP Offered typical download speed (In Mbps)	(Mbits/s)	27.64	4.0	15.0	15.0
6	Average Download Throughput (Data Speed)	(Mbits/s)	63.38	5.34	322.97	27.72
7	TSP Offered typical upload speed (In Mbps)	(Mbits/s)	11.5	2.0	7.0	8.0
8	Average Upload Throughput (Data Speed)	(Mbits/s)	17.94	3.52	70.11	10.7

**Table-30:** operator wise comparative Analysis of various key parameters

5 QoS performance analysis- Karauli City

This section provides summary of overall QoS performance of the telecom service provider's network in the Karauli City of Rajasthan LSA by aggregating the results of drive tests conducted in month of September 2025 covering city drive, hotspots and Highway.

(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	70	53	74
Call Setup Success Rate %	100	100	100
Drop Call Rate %	0	0	0
Call Setup Time-Average (Second)	3.11	3.02	3.38
Handover Success Rate %	98.13	98.86	97.41

Table-31: Summary of voice call performance in 3G/2G network mode only.
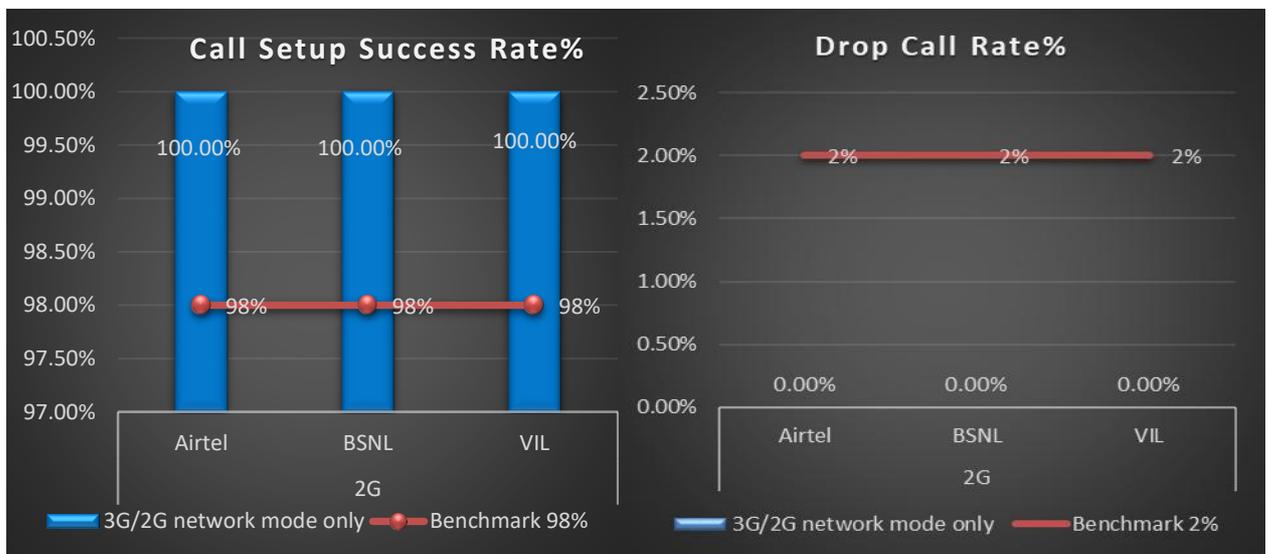
Figure-21: Call setup success rate and drop call rate performance.

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	29	NA
2G	46	26	38

Table-32: 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.

(a) 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	72	53	**75**	76
Call Setup Success Rate %	100%	100%	100%	100%
Drop Call Rate %	0.00%	0.00%	0.00%	0.00%
Call Setup Time-Average (Second)	1.88	2.77	0.58	0.52
Handover Success Rate %	99.03	100	100	99.70

Table-33: Summary of voice call performance in network auto-selection mode.
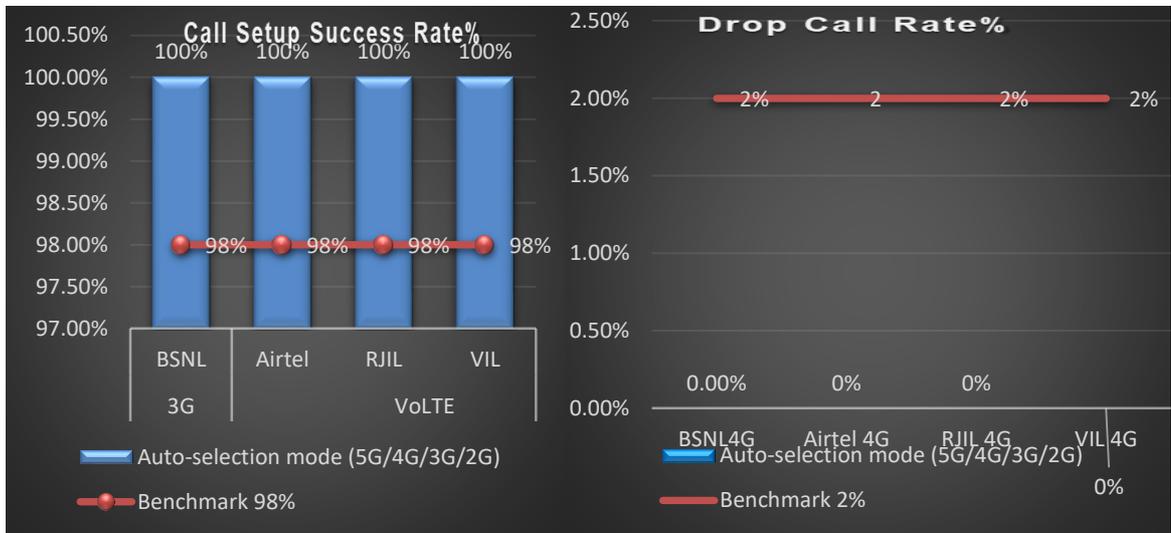
Figure-22: Performance for call setup success rate and drop call rate.

Parameter	Service Provider			
	Mobile-to-Mobile (5G/4G - Open Mode)			
	AIRTEL	BSNL	RJIL	VIL
Call Established (within service provider Network)	142	53	69	78
Number of silence call for >4 Sec	1	NA	0	0
Silence Call Rate %	0.7	NA	0.00	0.00
Number of silence instances for >4 Sec	1	NA	0	0
Number of silence instances for >3 Sec	2	NA	2	0
Number of silence instances for >2 sec	3	NA	4	0
RTP Jitter (4G & 5G) in ms	1.55	NA	14.40	45.78
Packet loss Rate Downlink %	0.44	NA	0.91	0.40
Packet loss Rate Uplink %	0.41	NA	0.94	0.40

Table-34: Summary of silence instances & packet loss rate for mobile-to-mobile call

Number of unique cell ids covered during Voice test				
	AIRTEL	BSNL	RJIL	VIL
3G	0	-	17	NA
2G	99	21	56	97
4G	NA	28	NA	NA
5G	0	26	NA	0

Table-35: Technology wise number of network cell id's latched during drive test.

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

(b) 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 score values means: 5- Excellent, 4-Good, 3-Fair, 2-Poor, 1-Bad.

Speech Quality (MOS) distribution	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
Total Number of MOS Samples for calls in table-6	927	NA	337	528
Speech Quality (Average MOS Score)	4.08	NA	4.23	4.02
Number of samples with MOS >=4 to <5 (Excellent)	846	NA	337	401
Number of samples with MOS >=3 to <4 (Good)	67	NA	46	112
Number of samples with MOS >=2 to <3 (Fair)	9	NA	8	10
Number of samples with MOS >=1 to <2 (Poor)	5	NA	8	5
%age of samples with MOS >=4 to <5 (Excellent)	91.26%	NA	81.61%	75.95%
%age of samples with MOS >=3 to <4 (Good)	7.23%	NA	13.65%	21.12%
%age of samples with MOS >=2 to <3 (Fair)	0.97%	NA	2.37%	1.89%
%age of samples with MOS >=1 to <2 (Poor)	0.54%	NA	2.37%	0.95%

Table-36: Summary of speech quality (MOS) samples.

(c) Data performance. (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	128.79	15.21	398.50	33.9
	80th Percentile	206.59	18	476.58	55.47
	20th Percentile	45.49	7.28	305.90	12.12
Upload Throughput (Mbits/s)	Average	25.57	6.07	66.16	11.88
	80th Percentile	38.64	7.02	91.92	21.99
	20th Percentile	12.98	3.02	37.86	2.78
Latency (ms)	50th Percentile	30.5	40	8.5	23.5

Table-37: Summary of data performance in network auto-selection mode.

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	64	NA
4G	99	21	1	76
3G	NA	27	NA	NA
2G	0	25	NA	0

Table-38: Technology wise number of network cell id's latched during drive test.

(d) Hotspots:

i. *Locations:* Hotspot testing has been done on 24 September 2025. 2 locations have been tested in the city.

Figure- 23: Hotspot locations

ii. Hotspot covered :

- Bus Stand Karauli.
- Madan Mohan Ji Fort.

iii. Voice performance:

Overall Voice Performance				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	20	20	20	20
Call Setup Success Rate %	100%	100%	100.00	100
Drop Call Rate %	0	0	0.00	0.00
Call Setup Time-Average (Sec)	1.85	3.23	0.63	0.50

Table-39: Overall summary of voice call performance in network auto-selection mode   (5G/4G/3G/2G).

Bus Stand Karauli				
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	100%	100.00	100.00
Drop Call Rate %	0	0	0.00	0.00
Call Setup Time-Average (Sec)	1.83	3.12	0.58	0.50

Table-40: Summary of voice call performance in network auto-selection mode 5G/4G/3G/2G.

Madan Mohan Ji Fort				
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	100%	100.00	100.00
Drop Call Rate %	0	0	0.00	0.00
Call Setup Time-Average (Sec)	1.87	3.35	0.67	0.51

Table-41: Summary of voice call performance in network auto-selection mode 5G/4G/3G/2G.

iv. 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)	166.3	23.82	375.52	51.04
Download Throughput 80th Percentile (Mbit/s)	231.46	31.23	392.59	57.95
Download Throughput 20th Percentile (Mbit/s)	41.32	9.48	350.92	43.76
Download Session Setup Success Rate %	100	100	100.00	100.00
Upload Throughput Average (Mbits/s)	30.34	6.08	151.31	22.19
Upload Throughput 80th Percentile (Mbit/s)	48.76	9.66	183.09	39.33
Upload Throughput 20th Percentile (Mbit/s)	17.45	2.48	136.46	6.61
Upload Session Setup Success Rate %	100%	100	100.00	100.00
Web Browsing Delay (Second)	1.83	38ms	0.32	4.06
Youtube Initial Buffer Delay (Second)	0.85	2.7	0.44	1.20
Latency (ms)-50th Percentile	18	45	17	21.25
Jitter (ms)	2.78	19	6.47	9.97
Packet Loss Rate%	0.00%	0	0.35	0.00
Packet Loss Rate- 90th percentile	0	0	0.39	0.00

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

Bus Stand Karauli				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	*174.05*	28	381.28	50.11
Download Session Setup Success Rate %	*100*	100	100.00	100.00
Upload Throughput Average (Mbits/s)	*38.59*	6.62	156.37	6.72
Upload Session Setup Success Rate %	*100%*	100	100.00	100.00
Web Browsing Delay (Second)	*1.76*	41	0.30	3.47
Youtube Initial Buffer Delay (Second)	*0.81*	1.28	0.46	1.12
Latency (ms)-50th Percentile	*15.5*	38	16.50	22.50
Jitter (ms)	*2.41*	18ms	5.93	7.23
Packet Loss Rate%	*0%*	0	0.40	0.00

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

Madan Mohan Ji Fort				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	*158.55*	24.5	369.75	51.97
Download Session Setup Success Rate %	*100*	100	100.00	100.00
Upload Throughput Average (Mbits/s)	*22.08*	7.01	146.25	37.64
Upload Session Setup Success Rate %	*100%*	100	100.00	100.00
Web Browsing Delay (Second)	*1.9*	38	0.34	4.65
Youtube Initial Buffer Delay (Second)	*0.89*	2.23	0.42	1.28
Latency (ms)-50th Percentile	*20.5*	40	17.50	20.00
Jitter (ms)	*2.14*	18ms	7.01	4.71
Packet Loss Rate%	*0%*	0	0.30	0.00

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

v.   TSP Wise signal Strength (Karauli City) :

Technology	Parameter	Range	Colour
2G	Rx Level	≥ -85 dBm	
		<-85 dBm	
3G	RSCP	≥ -90 dBm	
		< -90 dBm	
4G	RSRP	≥ -110 dBm	
		< -110 dBm	
5G	RSRP	≥ -110 dBm	
		< -110 dBm	

Table:45 Signal strength legend format.

A. Airtel

Figure-24: Signal strength 2G /3G network mode – AIRTEL

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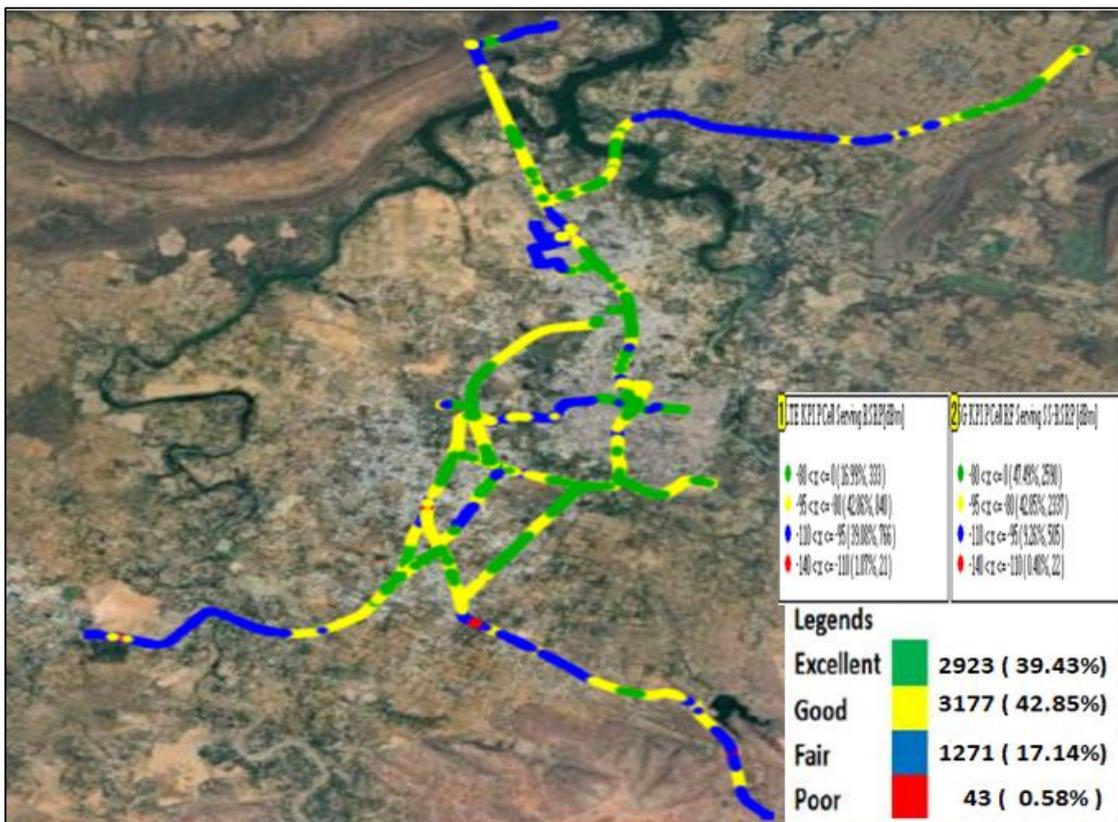Figure-25: Signal strength auto-selection mode 4G– AIRTEL.

B. BSNL
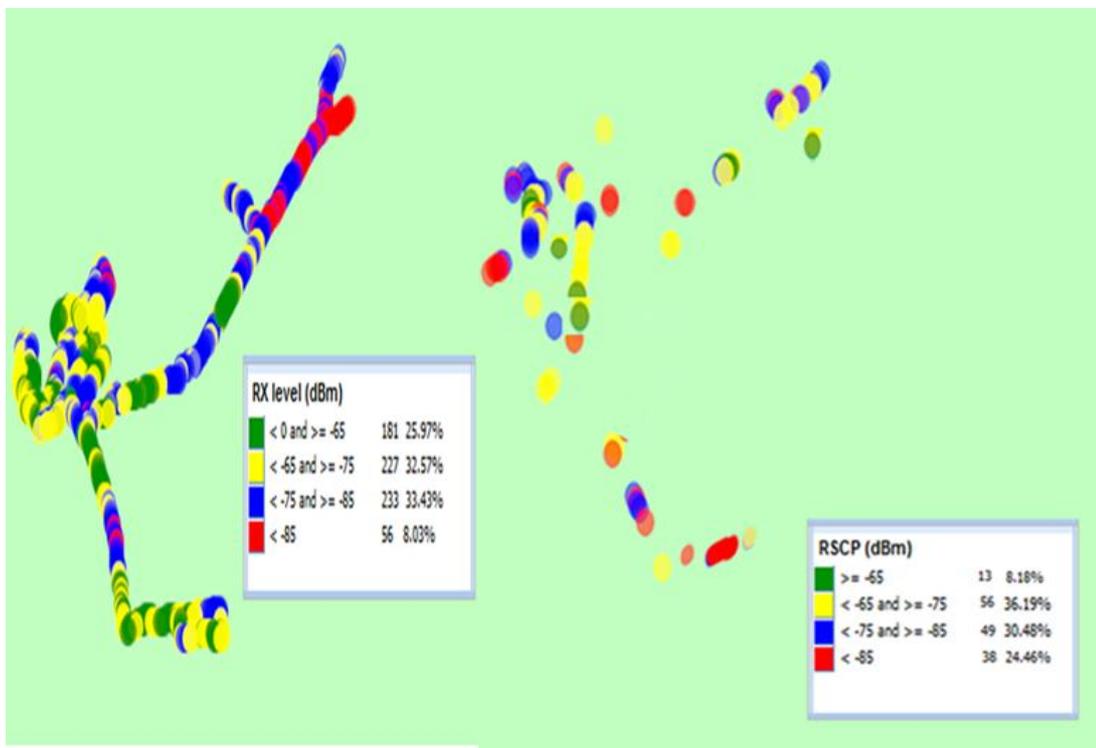
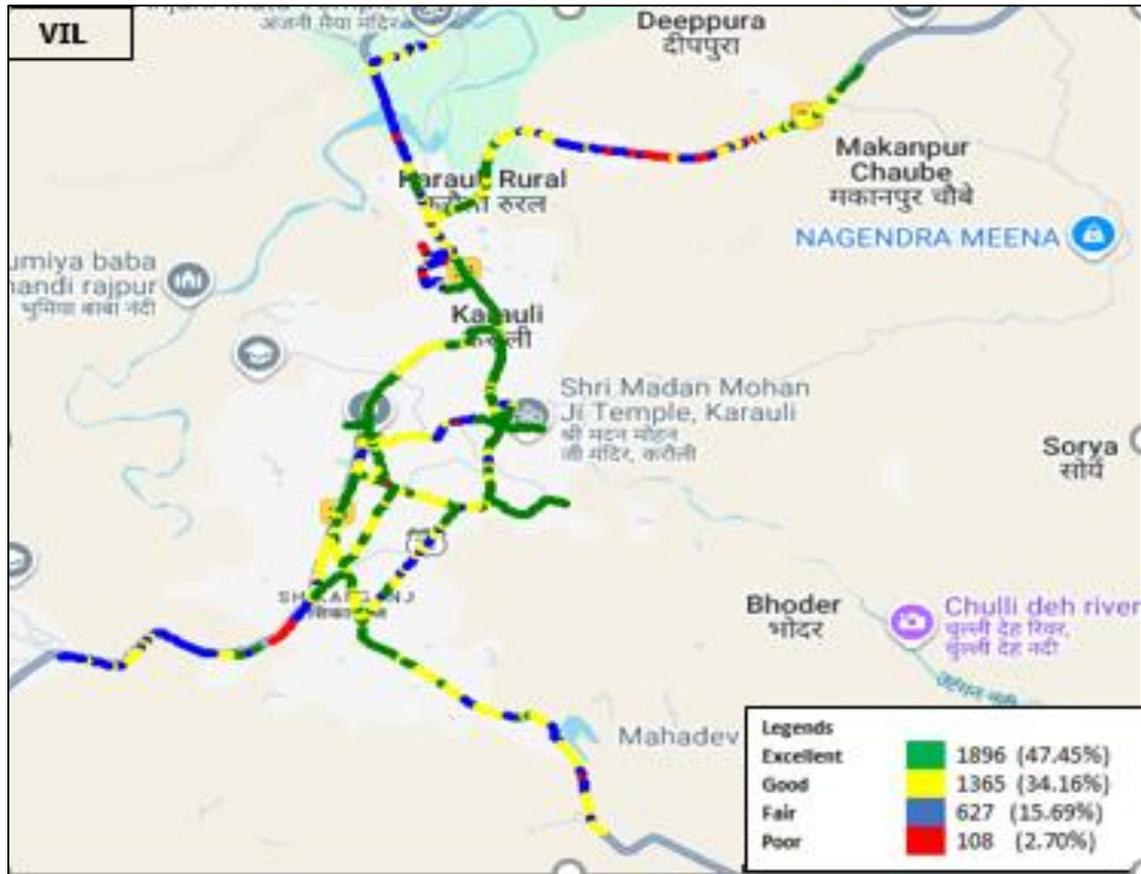Figure-26: Signal strength auto-selection mode 3G/2G – BSNL
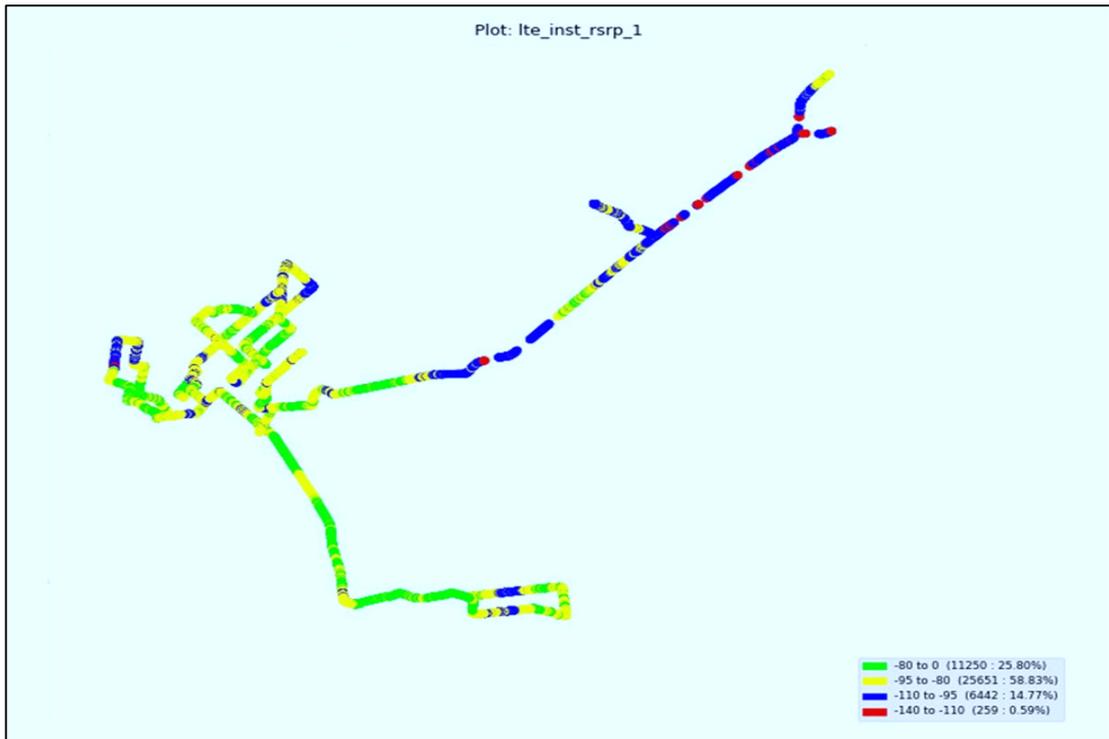
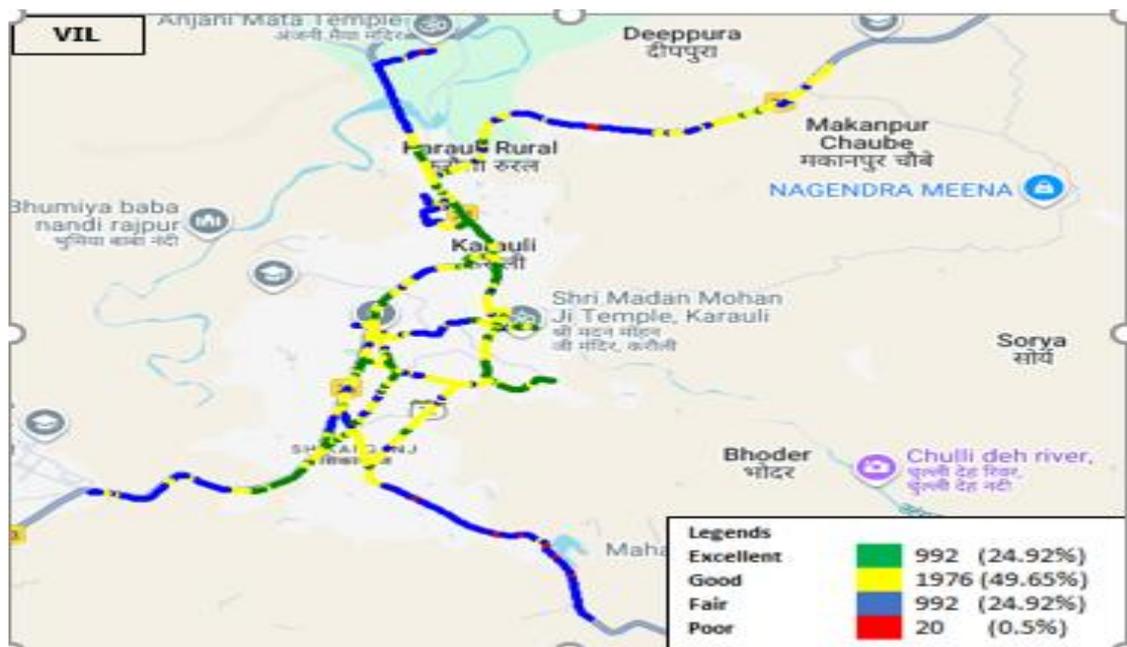**Figure-27:** Serving technology plots in auto-selection mode (5G/4G/3G/2G) –BSNL.

C. RJIL

Figure-28: Signal strength auto-selection mode 5G/4G/3G/2G – RJIL

D. VIL

Figure-29: Signal strength 3G/2G network mode – VIL.

Figure 30-: Signal strength auto-selection mode 5G/4G/3G/2G – VIL

vi. Conclusion: The operator wise comparative Analysis of various key parameters is given in table below:

S.No.	KPIs (Auto-selection mode (5G/4G/3G/2G)	Measured in	AIRTEL	BSNL	RJIL	VIL
1	Call Setup Success Rate (CSSR)	%	100	100	100	100
2	Drop Call Rate (DCR)	%	0.00	0.00	0.00	0.00
3	Call Silence rate (Mute Call)	%	0.7	NA	0.00	0.00
4	Average MOS Score	1-5	4.08	NA	4.23	4.02
5	TSP Offered typical download speed (In Mbps)	(Mbits/s)	27.64	4	15	15
6	Average Download Throughput (Data Speed)	(Mbits/s)	128.79	15.21	398.50	33.9
7	TSP Offered typical upload speed (In Mbps)	(Mbits/s)	11.5	2	7	8
8	Average Upload Throughput (Data Speed)	(Mbits/s)	25.57	6.07	66.16	11.88

Table-45 : operator wise comparative Analysis of various key parameters