



# INDEPENDENT DRIVE TEST REPORT

*For*

# Mumbai

May 2018

WEST ZONE

**Key Performance Indicators: All TSPs have met the Drop Call Rate (DCR) benchmark of 2% except MTNL 3G & Tata CDMA. All TSPs have met the Call Setup Success Rate (CSSR) of 95% .**

The Independent Drive Test has been carried out by M/s PhiMetrics Technologies Pvt. Ltd. on behalf of TRAI in Mumbai City & adjoining areas from 9:00 AM to 9:00 PM; 2<sup>nd</sup> May to 11<sup>th</sup> May 2018. The drive test covered an drive route of 780 KMs & 12 hotspots. Approximately 650 calls were made for each of the 11 networks: five 2G networks, four 3G networks, one CDMA network and one LTE network covering 6 unique TSPs

Overview

Voice Summary

Data Summary

# Overview

## Overview:

Telecom Regulatory Authority of India has been entrusted with the task of laying down the standards of quality of service to be provided by the service providers and ensuring its enforcement; and also TRAI is 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

TRAI is regularly monitoring the performance of Telecom Service Providers (TSP) against the benchmarks for the various Quality of Service (QoS) parameters laid down by the Authority. TSPs submit Performance Monitoring Reports to TRAI every quarter. TRAI also undertakes audit and assessment of Quality of Service through independent agencies to verify the Quality of Service claimed. The Audit agencies conduct sample 'Drive tests' across various cities in the country as part of audit and assessment of the TSPs' performance.

In view of complaints on call drops and other network quality issues, on behalf of TRAI, an Independent Drive Test (IDT) was conducted by PhiMetrics Technologies Pvt. Ltd. From **2nd May to 11th May 2018** covering various locations in Mumbai City & surrounding region. The performance of **Airtel, Idea, MTNL, Tata, Vodafone and Jio** were monitored across various technologies (2G, 3G, 4G & CDMA). The drive test route was defined on the basis of several factors that include - areas from where call drop complaints are commonly received; areas of heavy usage; residential areas away from arterial roads; office areas; areas where previous Drive tests showed network issues; etc.

The test results obtained from these drive tests were utilized to assess the network quality for Voice and Data services in terms of **Voice: Coverage, Quality, Handover Success Rate, Call Setup Success Rate, Drop Call Rate and Block Call Rate.**

**Date: Download and Upload Throughputs, Web Browsing Delay, Video Streaming Delay and Latency**

## Drive Test Details For Mumbai:

Independent Drive test was conducted from 2nd May to 11th May 2018 in Mumbai city & surrounding areas from 9:00 AM to 9:00 PM. Calls were made for 90 sec duration with wait time of 10 sec between calls in all technologies.

**Voice Tests:** The drive test covered a drive route of approximately 780 KMs from 2nd May to 9th May 2018. Approximately 650 calls were made for each of the 11 networks: five 2G (Lock Mode) networks, four 3G (Dual mode) networks, one CDMA Network and 1 VoLTE network covering 6 unique TSPs.

\* In case of multiple call failure in similar geo location in given period of 60sec has been counted as one call failure

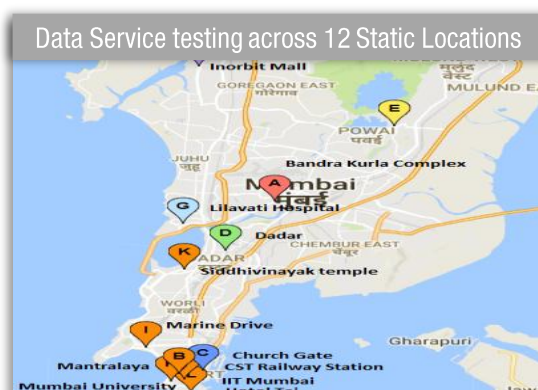
**Data Tests:** Data Tests were performed at 12 static locations for 2 days on 10th May 2018 to 12th May 2018; five 2G (Lock mode) networks, four 3G (Dual mode) networks one CDMA Network and four 4G (Free mode) networks covering 7 unique TSPs were tested.

\* For Voice and Data KPI's, 2G measurement is done with UE locked on 2G, 3G measurement is done with UE in Dual mode (2G & 3G) and 4G measurement is done with UE in Free Mode.

\* 3G KPI's which are calculated from UE in Dual Mode (2G & 3G) includes samples and events of 2G.

\* 4G KPI's which are calculated from the UE in Free Mode included samples and events of 2G & 3G.

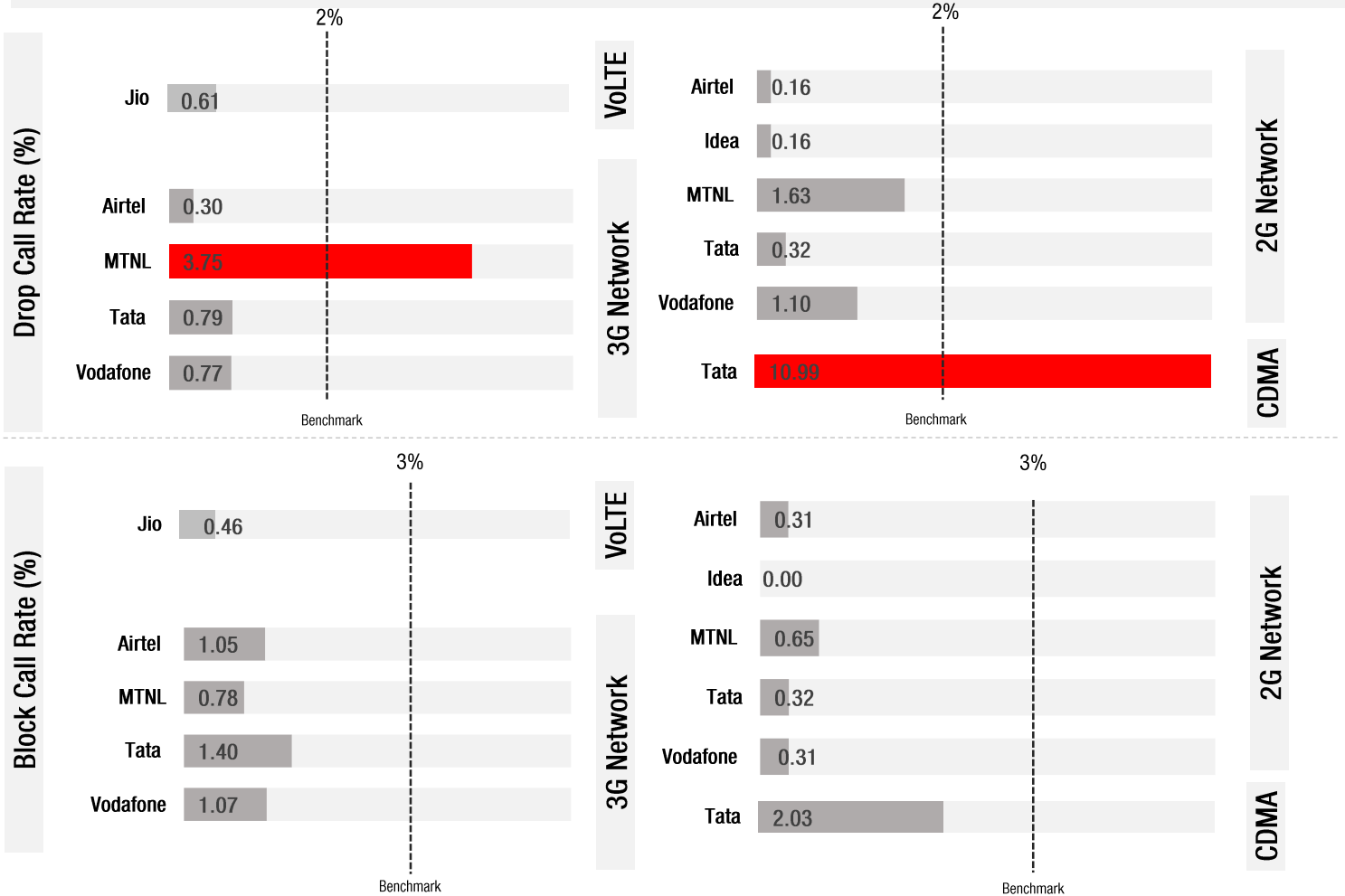
Service	Specifications
Download	2G (Locked) - 500KB, 3G (Dual) - 20 MB, 4G (Free) - 40 MB
Upload	2G (Locked) - 100KB, 3G (Dual) - 5 MB, 4G (Free) - 10 MB
Web Browsing	3 links of e/m commerce website www.amazon.in, www.flipkart.com and PayTm
Video Streaming	130 sec clip
Latency	32 Bytes on www.google.com



# Voice Calls

## Key Observations

QoS compliance of the TSPs in Mumbai for Voice across technologies 2G/3G/4G-VoLTE is given below:



KPI	2G Networks				
	Airtel	Idea	MTNL	Tata	Vodafone
SDCCH Congestion%	0.15%	0.00%	0.48%	0.16%	0.31%
TCH Congestion %	0.16%	0.00%	0.17%	0.16%	0.00%

KPI	3G Networks			
	Airtel	MTNL	Tata	Vodafone
SDCCH Congestion%	0.00%	0.15%	0.00%	0.00%
RRC Congestion%	0.60%	0.16%	0.62%	0.92%
SDCCH & RRC Congestion%	0.60%	0.31%	0.62%	0.92%
TCH Congestion %	0.00%	0.31%	0.78%	0.15%
RAB Congestion %	0.45%	0.16%	0.00%	0.00%
TCH & RAB Congestion %	0.45%	0.47%	0.78%	0.15%

- a) All TSPs have met the 2% QOS benchmark of Drop Call Rate (DCR%) except MTNL 3G & Tata CDMA.
- b) Call Block Rate (CBR%) benchmark of 3% was achieved by all TSP's.

Not meeting Benchmark

# Voice Calls

## Key Observations

### Coverage

a) Percentage of coverage samples for 2G  $\geq$  -85 dBm.

TSPs	2G					CDMA
	Airtel	Idea	MTNL	Tata	Vodafone	Tata
Coverage%	97.40%	98.29%	73.42%	96.27%	98.10%	79.62%

b) Percentage of coverage samples for 2G  $\geq$  -85 dBm, 3G  $\geq$  -90 dBm & LTE  $\geq$  -110 dBm.

TSPs	3G				VoLTE
	Airtel	MTNL	Tata	Vodafone	Jio
Coverage %	99.68%	75.32%	98.39%	91.68%	99.65%

c) Percentage of time spent on 3G network:

TSPs	3G			
	Airtel	MTNL	Tata	Vodafone
Time Spent on 3G%	96.09%	31.95%	91.38%	97.99%

d) Percentage of RLT  $\geq$ 48

TSPs	2G				
	Airtel	Idea	MTNL	Tata	Vodafone
%RLT $\geq$ 48	0.00%	0.00%	0.00%	0.00%	0.00%

# Summary

## City Level Summary

Voice Call	2G					CDMA
	Airtel	Idea	MTNL	Tata	Vodafone	Tata
Call Attempt	647	643	619	633	636	641
Blocked Call Rate (%)	0.3%	0.0%	0.6%	0.3%	0.3%	2.0%
CSSR% (Accessibility)	99.7%	100.0%	99.4%	99.7%	99.7%	98.0%
Drop Call Rate (%)	0.2%	0.2%	1.6%	0.3%	1.1%	11.0%
Mobility HOSR (%)	98.2%	98.2%	96.8%	98.1%	97.5%	100.0%
Rx Quality (%)	98.9%	97.2%	99.3%	98.2%	98.0%	88.5%

Voice Call	3G				VoLTE
	Airtel	MTNL	Tata	Vodafone	Jio
Call Attempt	666	645	645	655	658
Blocked Call Rate (%)	1.1%	0.8%	1.4%	1.1%	0.5%
CSSR% (Accessibility)	98.9%	99.2%	98.6%	98.9%	99.5%
Drop Call Rate (%)	0.3%	3.8%	0.8%	0.8%	0.6%
Mobility HOSR (%)	100.0%	96.9%	100.0%	100.0%	99.6%
Rx Quality (%)	96.6%	98.5%	94.0%	74.4%	90.53%

# Data Services

## Key Observations

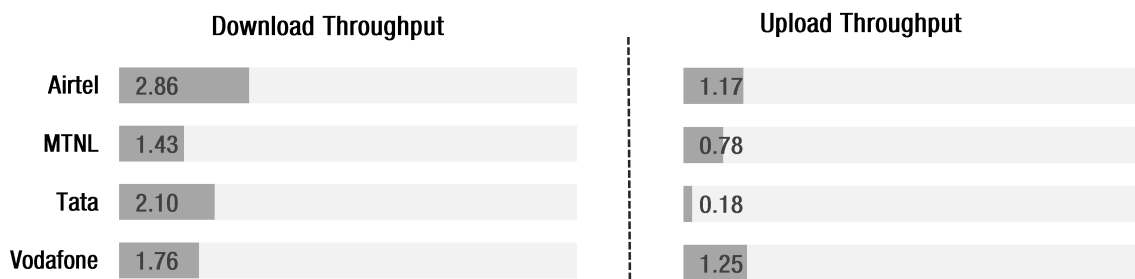
Data was tested at 12 locations. Following services were tested: Data Download/Upload, Latency (www.google.com), Video Streaming (YouTube) and Web browsing (Flipkart, Amazon, PayTm)

### Data Download and Upload Performance (Mbps)

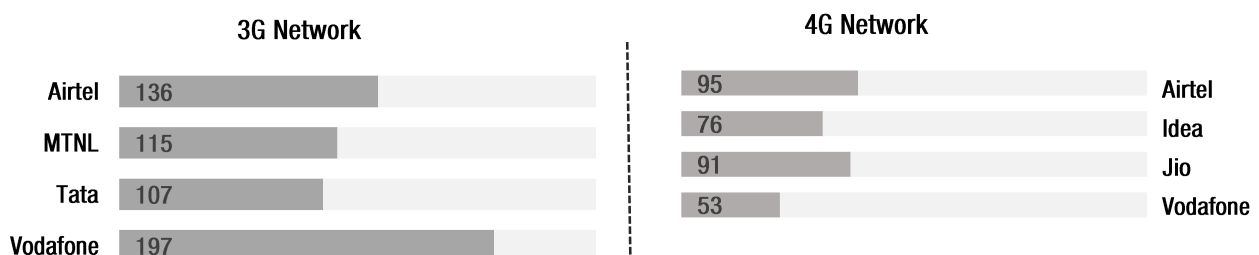
#### 4G Network:



#### 3G Network:



### Latency (msec)

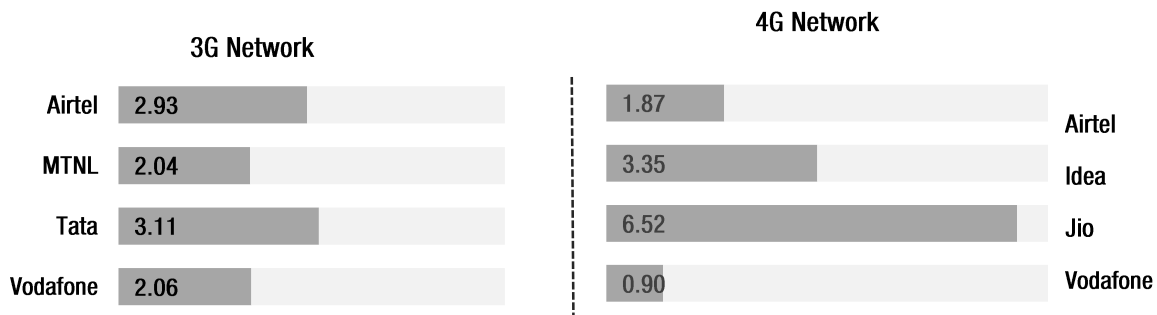


# Data Services

## Key Observations

### Video Streaming Performance (130 sec YouTube video sample sizes)

Streaming (sec)

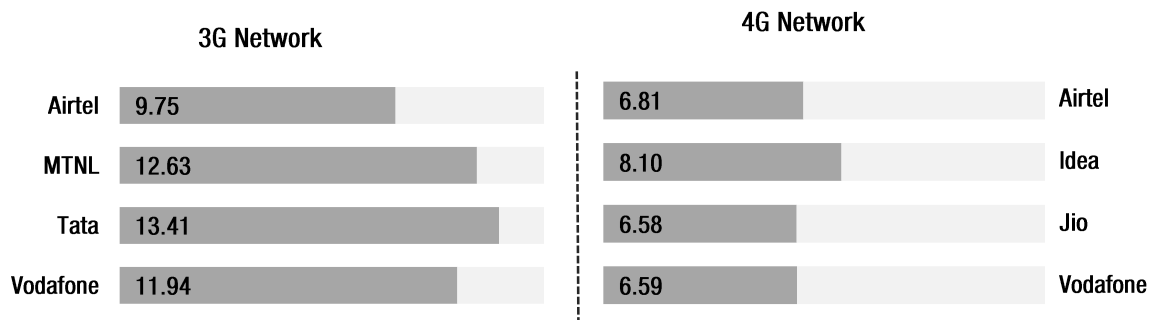


Streaming Delay further broken into 2 parameters which form the end-user perception to assess consistency on Video streaming.

- Initial Start time
- Interruption time while playing the video.

Video Streaming	3G				4G			
	Airtel	MTNL	Tata	Vodafone	Airtel	Idea	Jio	Vodafone
Avg. Initial Start Time (sec)	2.28	2.04	3.11	2.06	1.87	3.35	3.69	0.90
Avg. Interruption Time (sec)	0.65						2.83	

### Web Page Download Time (sec)



Web browsing experience is the average time taken to fully load the websites tested.

# Summary

## City Level Summary(contd.)

Data Service	2G				
	Airtel	Idea	MTNL	Tata	Vodafone*
Download Throughput (Kbps)	119.38	32.51	104.11	87.68	127.57
Upload Throughput (kbps)	128.35	57.61	125.48	156.31	141.28
Web Browsing Delay (sec)	23.78	18.79	27.23	39.83	35.69
Latency (msec)	380	690	275	417	335

Data Services	3G				4G			
	Airtel	MTNL	Tata	Vodafone	Airtel	Idea	Jio	Vodafone
Download Throughput (Mbps)	2.86	1.43	2.10	1.76	8.46	5.33	5.86	9.77
Upload Throughput (Mbps)	1.17	0.78	0.18	1.25	2.74	4.89	6.24	4.18
Web Browsing Delay (sec)	9.75	12.63	13.41	11.94	6.81	8.10	6.58	6.59
Video Streaming Delay (sec)	2.93	2.04	3.11	2.06	1.87	3.35	6.52	0.90
Latency (msec)	136	115	107	197	95	76.3	91	53



# Summary

## City Level Summary(contd.)

Mumbai University	2G				
	Airtel	Idea	MTNL	Tata	Vodafone *
Download Throughput (Kbps)	49.80	76.51	0.47	32.69	89.71
Upload Throughput (kbps)	18.41	139.46	36.23	21.78	78.52
Web Browsing Delay (sec)	23.38	28.99	16.50	63.19	40.21
Latency (msec)	363	212	745	713	331

Mumbai University	3G				4G			
	Airtel	MTNL	Tata	Vodafone	Airtel	Idea	Jio	Vodafone*
Download Throughput (Mbps)	5.14	0.78	0.26	1.48	3.92	0.07	2.74	4.89
Upload Throughput (Mbps)	1.66	0.09	0.06	1.00	1.33	1.93	5.18	4.05
Web Browsing Delay (sec)	6.73	16.69	9.63	10.66	7.83	9.58	6.59	9.25
Video Streaming Delay (sec)	1.12	2.23	15.10	1.86	2.32	12.58	6.11	1.94
Latency (msec)	84	117	142	207	166	271	56	42

Mantralaya	2G				
	Airtel	Idea	MTNL	Tata	Vodafone
Download Throughput (Kbps)	131.36	128.15	5.63	72.40	190.22
Upload Throughput (kbps)	162.14	155.43	18.72	180.71	174.09
Web Browsing Delay (sec)	26.63	25.72	7.64	31.45	37.78
Latency (msec)	315	164	795	227	311

Mantralaya	3G				4G			
	Airtel	MTNL	Tata	Vodafone	Airtel	Idea	Jio	Vodafone
Download Throughput (Mbps)	1.98	1.04	1.66	3.09	2.91	8.17	8.40	9.14
Upload Throughput (Mbps)	1.04	0.25	0.18	1.92	0.05	5.27	10.05	6.28
Web Browsing Delay (sec)	9.56	12.69	13.52	9.97	13.80	11.22	4.24	5.04
Video Streaming Delay (sec)	8.12	1.98	3.30	1.00	6.23	1.25	0.78	0.79
Latency (msec)	159	204	102	285	145	52.3	78	58

# Summary

## City Level Summary(contd.)

CST Railway Station	2G				
	Airtel	Idea	MTNL	Tata	Vodafone *
Download Throughput (Kbps)	122.94	50.60	30.75	77.36	108.21
Upload Throughput (kbps)	177.51	52.33	78.99	197.90	102.00
Web Browsing Delay (sec)	21.71	25.02	12.65	44.20	36.53
Latency (msec)	492	719	640	381	293

CST Railway Station	3G				4G			
	Airtel	MTNL	Tata	Vodafone	Airtel		Jio	Vodafone*
Download Throughput (Mbps)	4.55	0.66	3.15	0.20	5.32	0.58	5.49	5.42
Upload Throughput (Mbps)	0.47	0.06	0.19	0.62	3.00	2.10	3.39	2.97
Web Browsing Delay (sec)	10.68	16.78	12.75	20.06	6.07	12.47	4.74	11.68
Video Streaming Delay (sec)	1.75	5.62	1.38	1.55	1.56	8.52	1.40	0.78
Latency (msec)	160	183	104	176	77	75	56	66

Church Gate	2G				
	Airtel	Idea	MTNL	Tata	Vodafone
Download Throughput (Kbps)	97.47	105.01	12.65	84.62	135.19
Upload Throughput (kbps)	99.12	131.42	71.74	110.88	336.80
Web Browsing Delay (sec)	27.13	23.10	10.65	43.68	39.87
Latency (msec)	425	189	918	356	277

Church Gate	3G				4G			
	Airtel	MTNL	Tata	Vodafone	Airtel	Idea	Jio	Vodafone
Download Throughput (Mbps)	1.54	0.98	0.30	1.78	5.63	0.43	0.66	8.97
Upload Throughput (Mbps)	0.13	1.00	0.14	0.77	0.19	5.74	0.75	5.42
Web Browsing Delay (sec)	14.47	17.94	14.25	12.38	5.74	6.27	13.33	8.56
Video Streaming Delay (sec)	5.10	2.90	4.41	2.06	1.30	1.26	16.22	0.85
Latency (msec)	219	129	105	282	77	54	179	38

# Summary

## City Level Summary(contd.)

Hotel Taj	2G				
	Airtel	Idea	MTNL	Tata	Vodafone *
Download Throughput (Kbps)	151.10	37.39	30.74	115.04	69.53
Upload Throughput (kbps)	151.10	75.83	30.03	106.54	58.29
Web Browsing Delay (sec)	19.15	34.92	10.90	45.29	29.74
Latency (msec)	378	879	506	295	657

Hotel Taj	3G				4G			
	Airtel	MTNL	Tata	Vodafone	Airtel	Idea	Jio	Vodafone*
Download Throughput (Mbps)	3.77	2.29	2.58	1.39	14.81	3.09	3.09	2.37
Upload Throughput (Mbps)	3.14	1.32	0.21	0.38	5.09	0.02	0.02	4.49
Web Browsing Delay (sec)	5.26	10.06	14.05	11.76	3.55	10.00	10.00	6.29
Video Streaming Delay (sec)	2.00	1.07	1.84	10.12	0.99	4.48	4.48	0.94
Latency (msec)	81	97	128	138	79	272	272	53

Marine Drive	2G				
	Airtel	Idea	MTNL	Tata	Vodafone
Download Throughput (Kbps)	44.17	15.29	24.97	65.33	171.12
Upload Throughput (kbps)	28.14	37.32	71.40	155.00	148.05
Web Browsing Delay (sec)	16.67	42.41	31.78	42.03	38.22
Latency (msec)	334	808	692	603	278

Marine Drive	3G				4G			
	Airtel	MTNL	Tata	Vodafone	Airtel	Idea	Jio	Vodafone
Download Throughput (Mbps)	2.03	2.01	2.15	3.02	15.67	6.30	6.30	32.81
Upload Throughput (Mbps)	1.29	0.53	0.18	0.95	3.50	6.53	6.53	5.95
Web Browsing Delay (sec)	8.66	16.80	13.15	9.20	4.82	4.83	4.83	5.39
Video Streaming Delay (sec)	1.69	1.23	2.10	1.14	1.00	0.97	0.97	0.65
Latency (msec)	106	102	94	225	87	55	55	61

# Summary

## City Level Summary(contd.)

Inorbit Mall	2G				
	Airtel	Idea	MTNL	Tata	Vodafone *
Download Throughput (Kbps)	134.21	195.65	-	81.52	81.52
Upload Throughput (kbps)	127.77	167.64	69.39	139.15	162.84
Web Browsing Delay (sec)	26.59	24.98	7.27	30.58	30.58
Latency (msec)	524	161	-	495	495

Inorbit Mall	3G				4G			
	Airtel	MTNL	Tata	Vodafone	Airtel	Idea	Jio	Vodafone*
Download Throughput (Mbps)	1.32	2.09	1.44	0.41	14.63	8.27	2.12	12.91
Upload Throughput (Mbps)	0.71	1.07	0.15	2.80	3.46	6.82	4.53	3.15
Web Browsing Delay (sec)	12.74	10.83	14.76	14.39	5.50	5.83	6.86	5.02
Video Streaming Delay (sec)	5.46	1.47	3.88	1.03	1.08	1.40	3.21	0.68
Latency (msec)	241	94	101	172	72	65	67	57

IIT Mumbai	2G				
	Airtel	Idea	MTNL	Tata	Vodafone
Download Throughput (Kbps)	114.07	133.80	-	133.38	128.76
Upload Throughput (kbps)	152.34	142.50	11.08	171.15	97.03
Web Browsing Delay (sec)	21.16	25.69	-	34.41	31.83
Latency (msec)	285	359	-	394	244

IIT Mumbai	3G				4G			
	Airtel	MTNL	Tata	Vodafone	Airtel	Idea	Jio	Vodafone
Download Throughput (Mbps)	2.68	2.10	3.16	1.73	22.99	2.19	12.40	14.04
Upload Throughput (Mbps)	1.49	1.08	0.21	1.67	4.61	6.04	5.65	1.59
Web Browsing Delay (sec)	7.79	10.06	11.34	12.86	5.12	7.18	5.13	4.95
Video Streaming Delay (sec)	1.22	1.44	1.50	1.61	1.18	1.84	1.26	1.08
Latency (msec)	88	94	115	145	88	54	75	60

# Summary

## City Level Summary(contd.)

Bandra Kurla Complex	2G				
	Airtel	Idea	MTNL	Tata	Vodafone *
Download Throughput (Kbps)	40.67	123.17	3.32	20.27	40.68
Upload Throughput (kbps)	39.49	165.01	90.44	27.37	82.06
Web Browsing Delay (sec)	29.46	27.23	23.89	24.88	33.84
Latency (msec)	260	168	740	419	653

Bandra Kurla Complex	3G				4G			
	Airtel	MTNL	Tata	Vodafone	Airtel	Idea	Jio	Vodafone*
Download Throughput (Mbps)	2.17	0.90	1.83	0.30	2.61	0.31	2.78	3.80
Upload Throughput (Mbps)	0.28	0.08	0.14	0.52	2.79	0.46	4.73	2.06
Web Browsing Delay (sec)	11.34	14.63	16.84	16.26	7.59	15.02	7.15	8.09
Video Streaming Delay (sec)	1.79	2.15	2.01	2.21	1.53	5.13	12.37	0.97
Latency (msec)	476	115	114	230	79	73	61	37

Lilavati Hospital	2G				
	Airtel	Idea	MTNL	Tata	Vodafone
Download Throughput (Kbps)	179.20	160.36	132.43	113.62	161.68
Upload Throughput (kbps)	203.00	155.75	91.65	222.66	154.97
Web Browsing Delay (sec)	26.69	25.40	23.33	35.76	32.31
Latency (msec)	414	174	607	288	257

Lilavati Hospital	3G				4G			
	Airtel	MTNL	Tata	Vodafone	Airtel	Idea	Jio	Vodafone
Download Throughput (Mbps)	4.21	1.60	2.57	3.04	1.72	11.22	7.03	24.07
Upload Throughput (Mbps)	1.68	2.02	0.21	1.63	2.38	7.56	14.10	4.03
Web Browsing Delay (sec)	9.29	6.72	11.62	9.26	11.34	6.25	5.02	5.14
Video Streaming Delay (sec)	1.30	0.87	1.30	0.73	2.15	1.31	0.78	0.78
Latency (msec)	98	57	93	121	99	66	61	70

# Summary

## City Level Summary(contd.)

Dadar	2G				
	Airtel	Idea	MTNL	Tata	Vodafone *
Download Throughput (Kbps)	185.12	125.35	13.49	120.27	188.89
Upload Throughput (kbps)	256.90	125.65	60.11	203.60	134.19
Web Browsing Delay (sec)	20.45	25.43	16.85	41.27	39.03
Latency (msec)	442	191	722	418	280

Dadar	3G				4G			
	Airtel	MTNL	Tata	Vodafone	Airtel	Idea	Jio	Vodafone*
Download Throughput (Mbps)	1.92	1.36	2.67	1.14	3.77	3.28	12.07	1.15
Upload Throughput (Mbps)	1.09	0.77	0.21	0.86	3.14	4.03	4.56	3.73
Web Browsing Delay (sec)	9.23	10.42	13.98	10.49	5.26	7.40	5.89	4.86
Video Streaming Delay (sec)	2.01	2.27	1.73	2.33	2.00	2.32	15.59	0.71
Latency (msec)	121	94	92	155	81	68	78	68

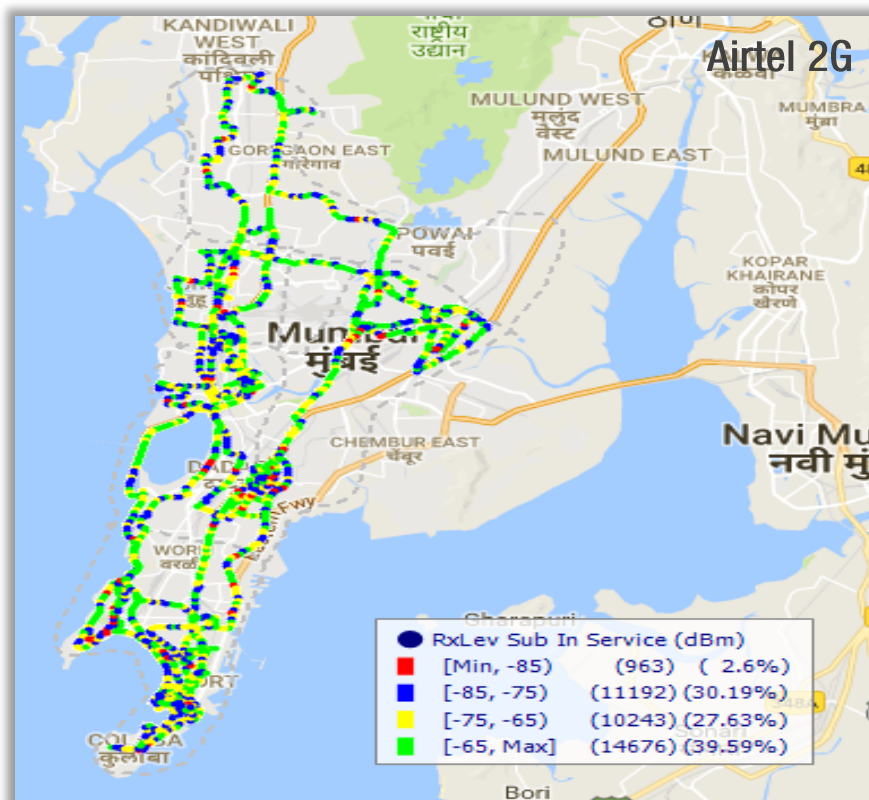
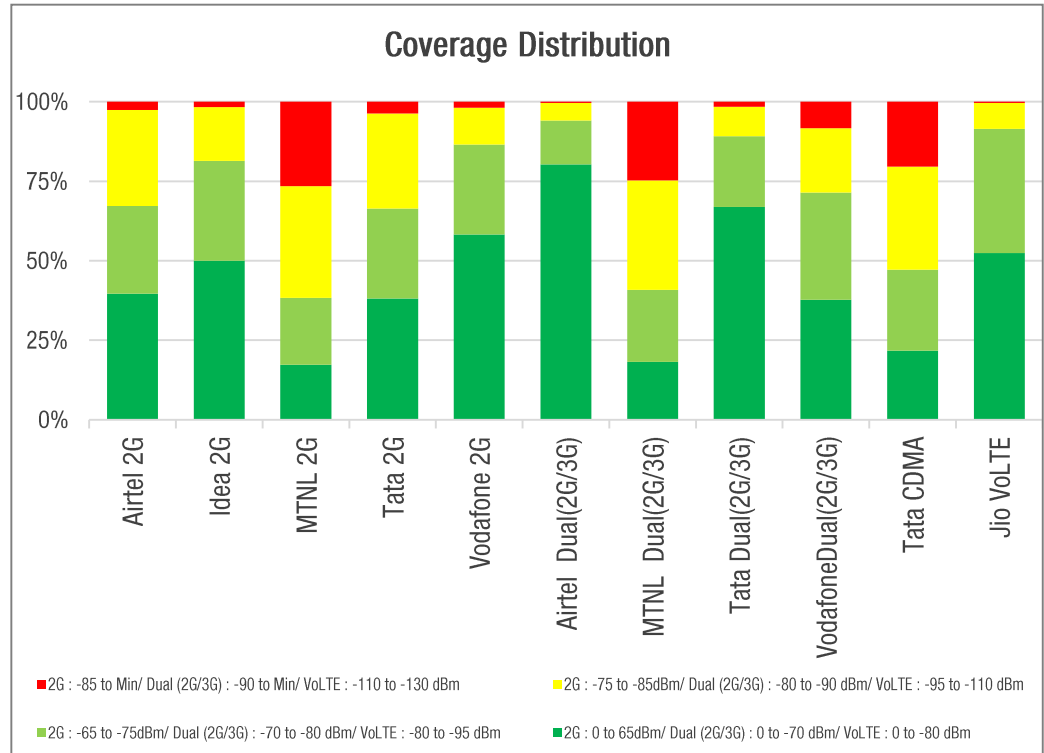
siddhivinayak temple	2G				
	Airtel	Idea	MTNL	Tata	Vodafone
Download Throughput (Kbps)	182.38	126.09	27.95	100.35	149.92
Upload Throughput (kbps)	124.25	125.00	40.79	252.99	166.47
Web Browsing Delay (sec)	25.60	25.79	21.06	47.06	36.10
Latency (msec)	330	446	602	540	262

siddhivinayak temple	3G				4G			
	Airtel	MTNL	Tata	Vodafone	Airtel	Idea	Jio	Vodafone
Download Throughput (Mbps)	3.01	1.33	2.26	3.55	7.55	10.62	6.02	5.38
Upload Throughput (Mbps)	1.06	1.07	0.21	1.82	3.39	7.77	9.43	6.37
Web Browsing Delay (sec)	11.72	9.30	13.27	7.10	5.60	5.74	5.14	6.87
Video Streaming Delay (sec)	2.94	1.04	1.99	1.51	1.12	1.30	15.71	0.50
Latency (msec)	69	113	102	217	90	48	61	33

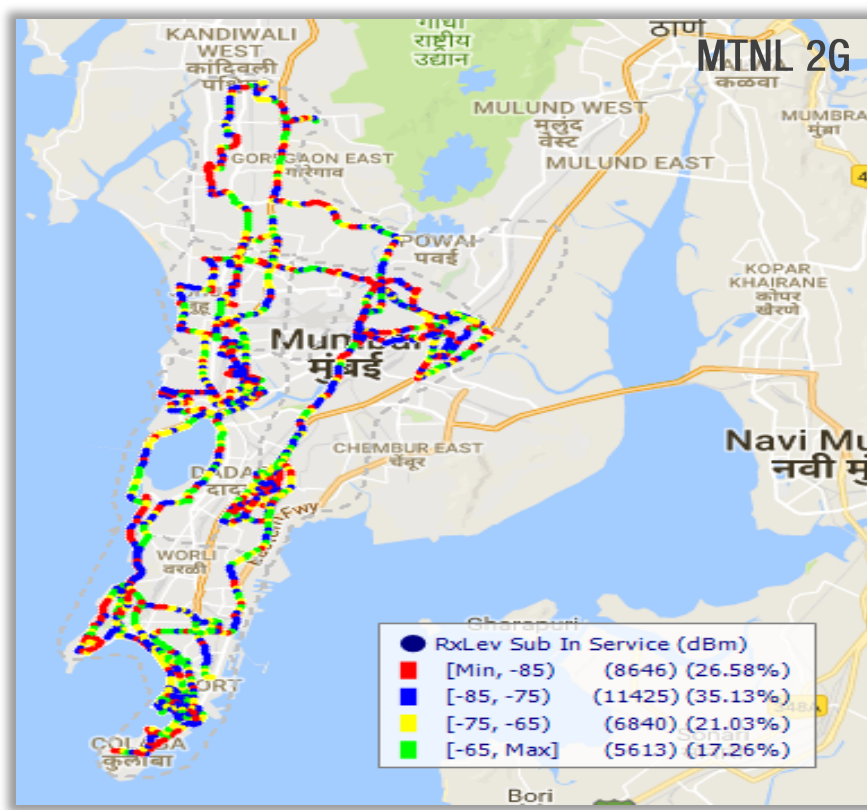
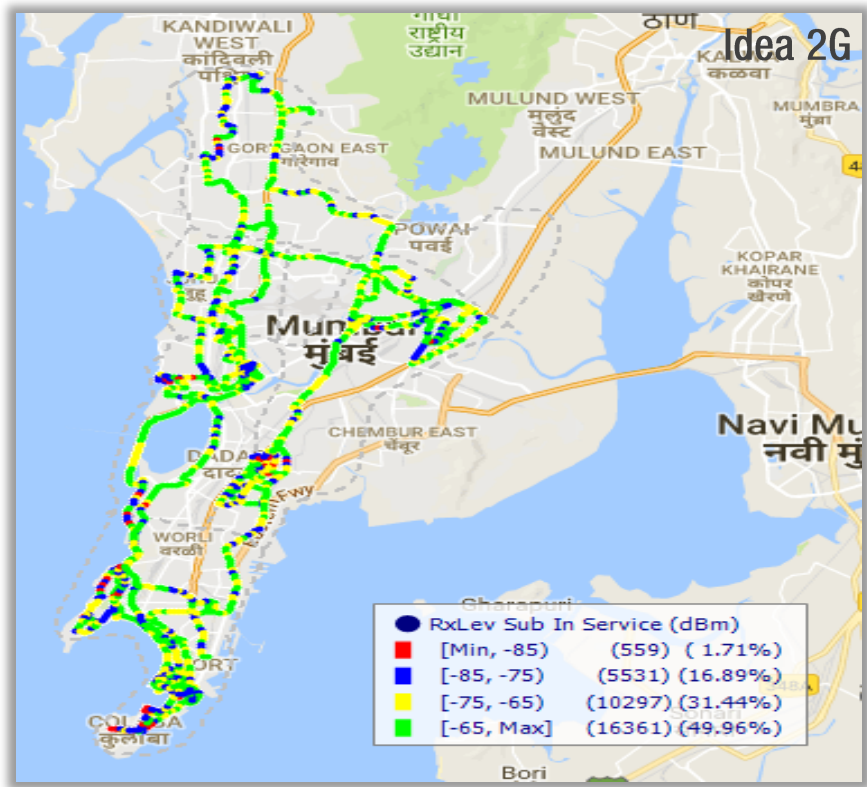
# I. Coverage Details

RF Coverage relates to the geographical footprint within the system that has sufficient RF signal strength to provide for a call/data session. The Coverage rate of an TSP is calculated on the basis of % of samples in which the Rx level  $\geq -85$  dBm, RSCP is  $\geq -90$  dBm & RSRP  $\geq -110$  dBm. The details are as follows.

TSP	Coverage Rate
Airtel 2G	97.40%
Idea 2G	98.29%
MTNL 2G	73.42%
Tata 2G	96.27%
Vodafone 2G	98.10%
Airtel Dual(2G/3G)	99.68%
MTNL Dual(2G/3G)	75.32%
Tata Dual(2G/3G)	98.39%
Vodafone Dual(2G/3G)	91.68%
Tata CDMA	79.62%
Jio VoLTE	99.65%

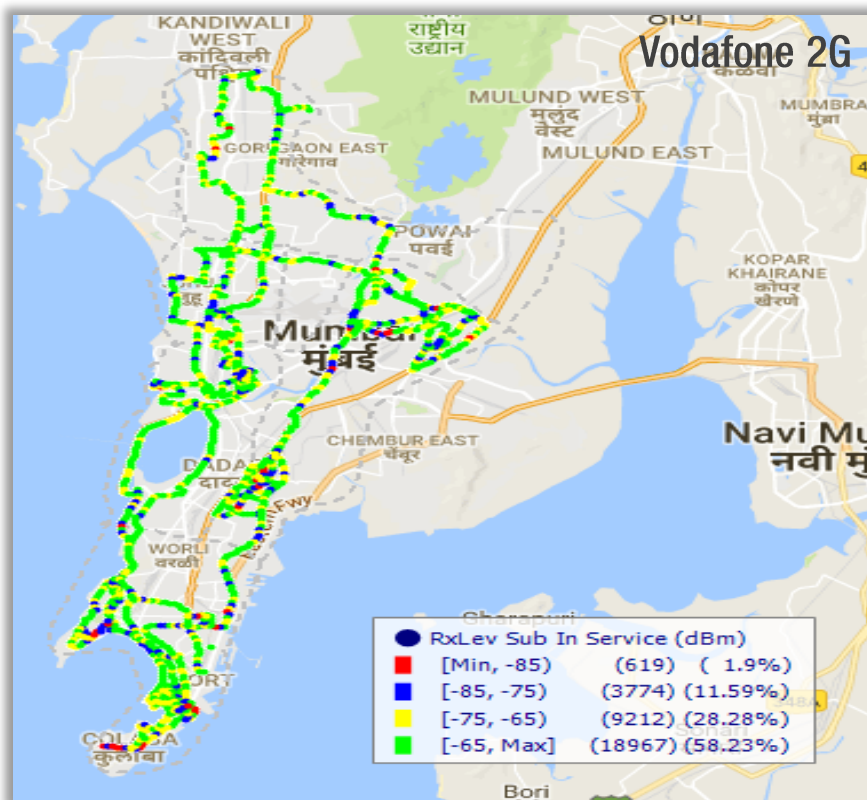
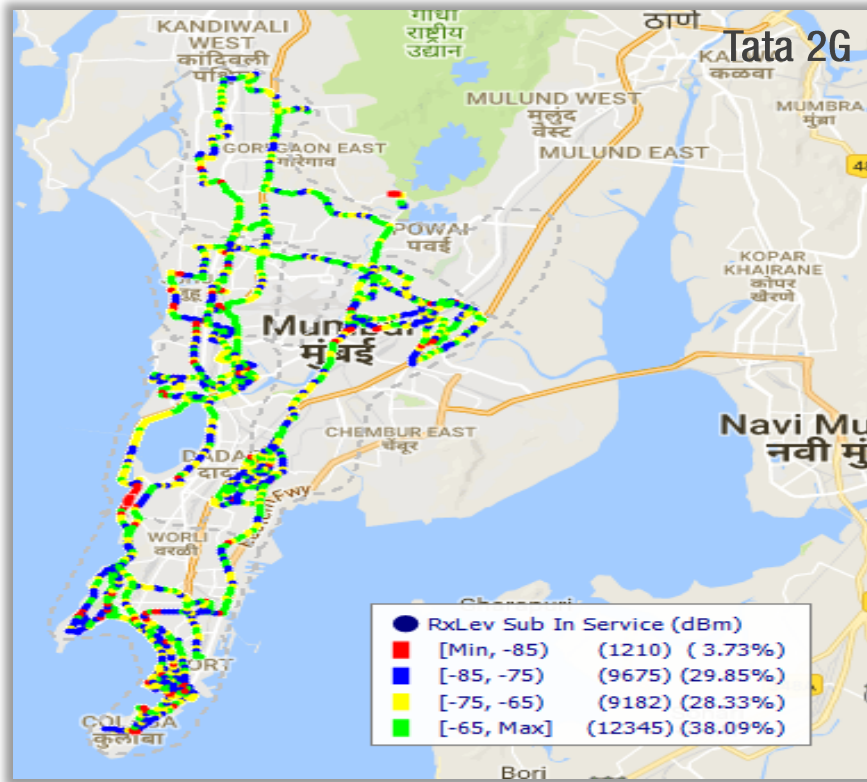


# I. Coverage Details (contd.)

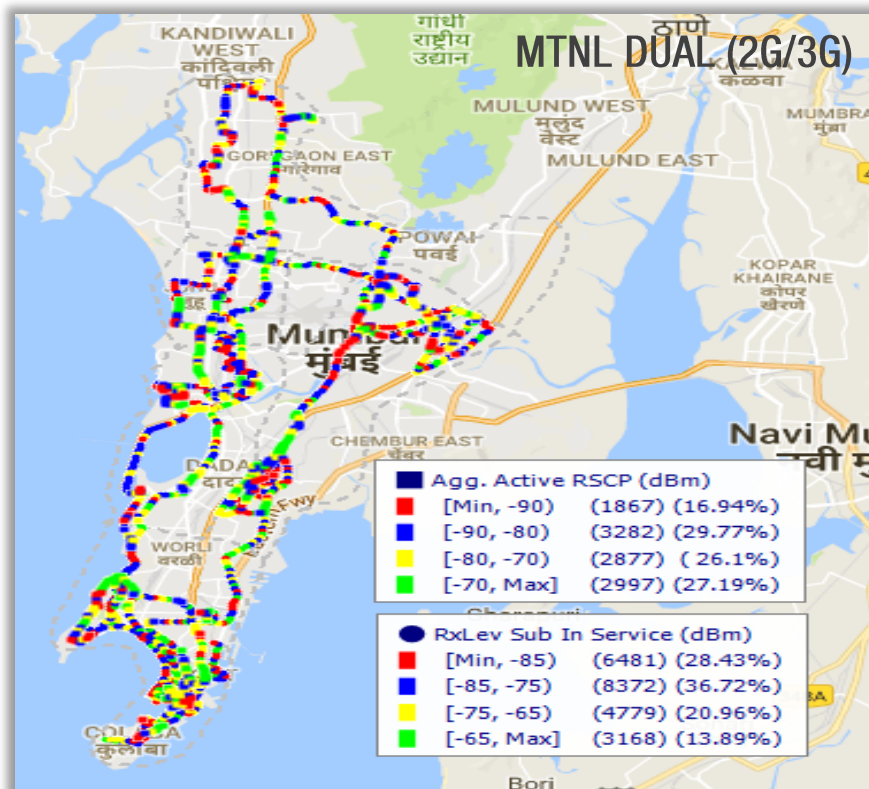
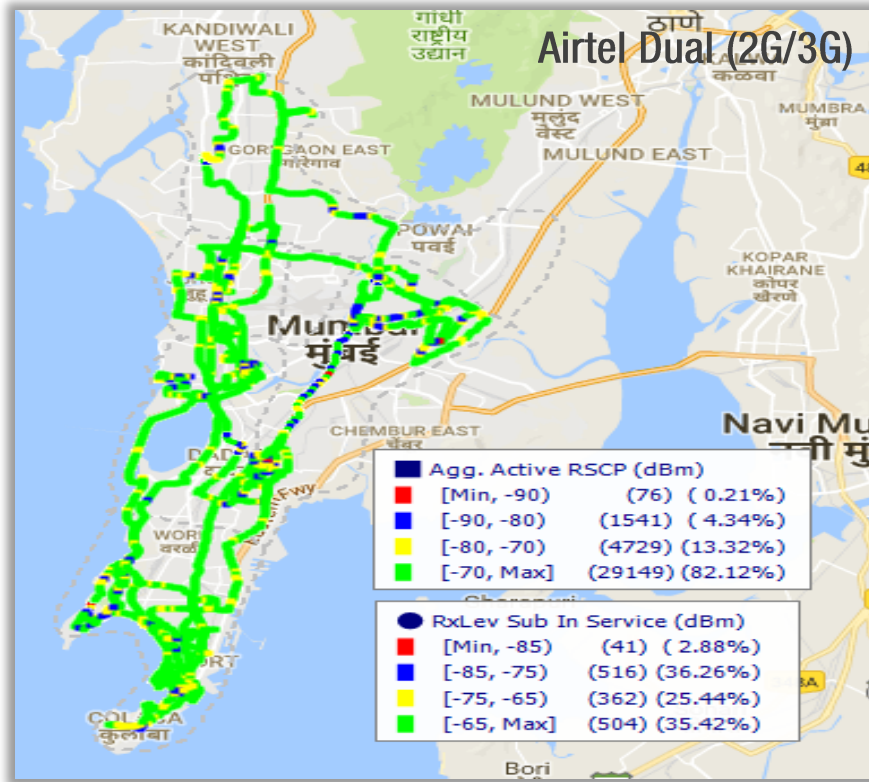




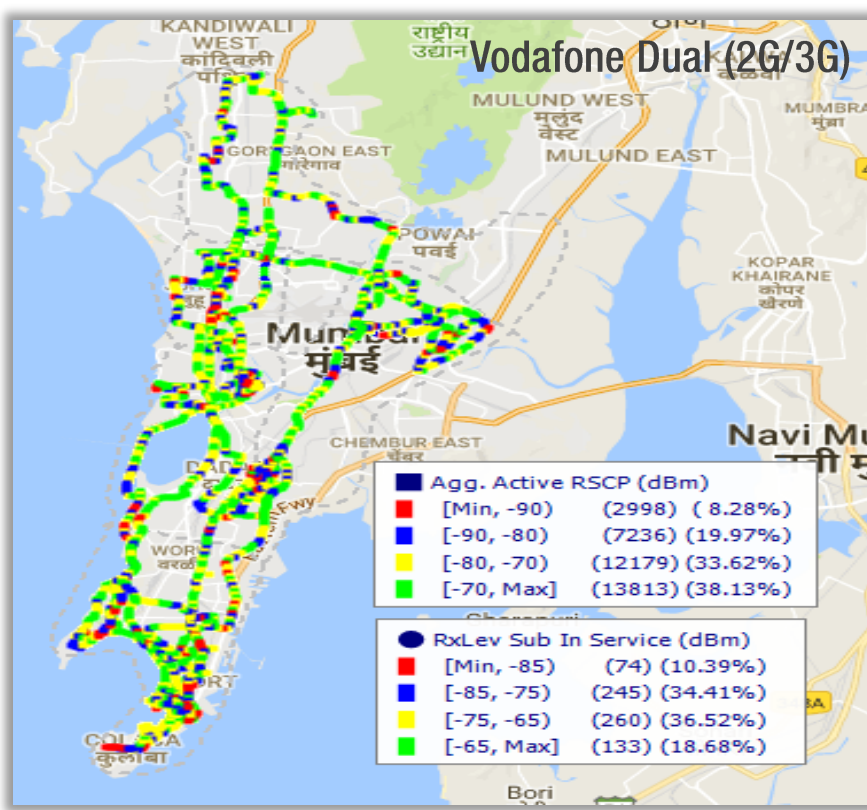
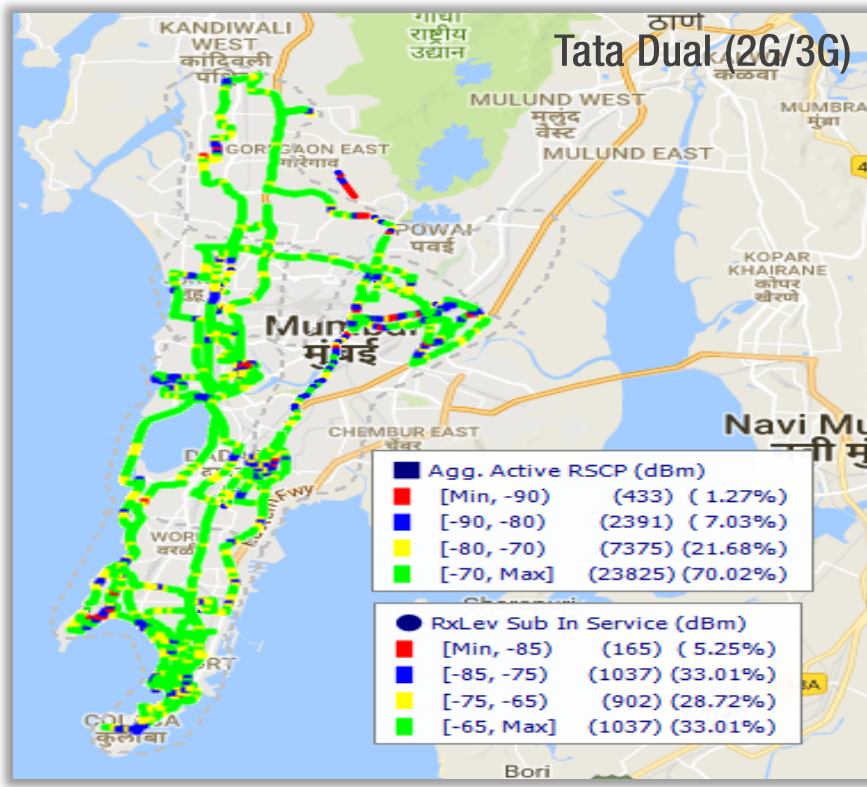
# I. Coverage Details (contd.)



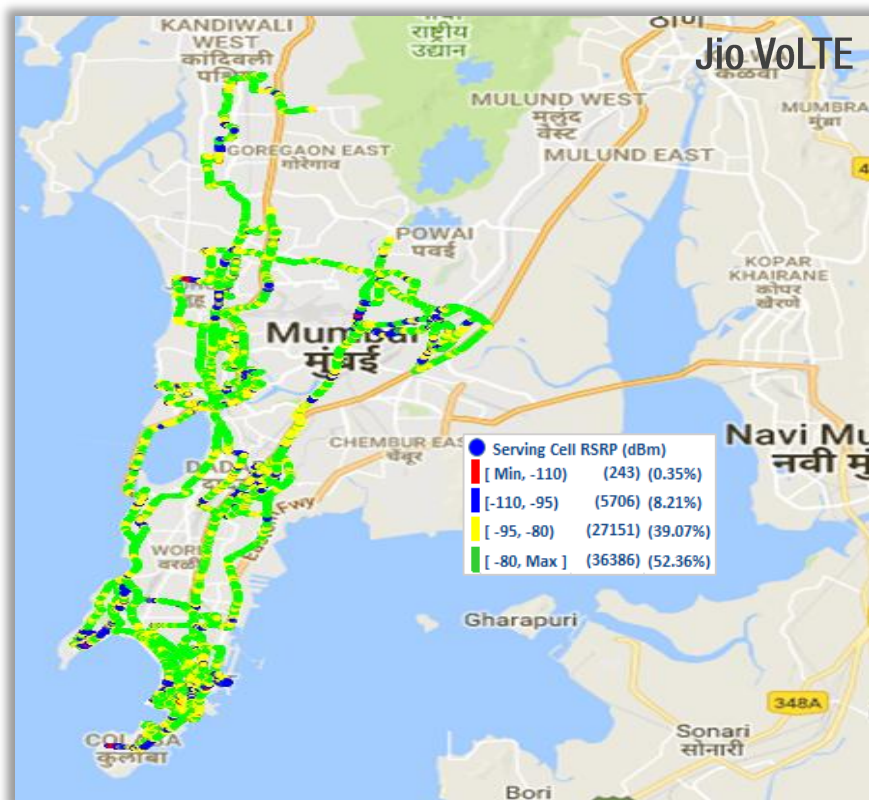
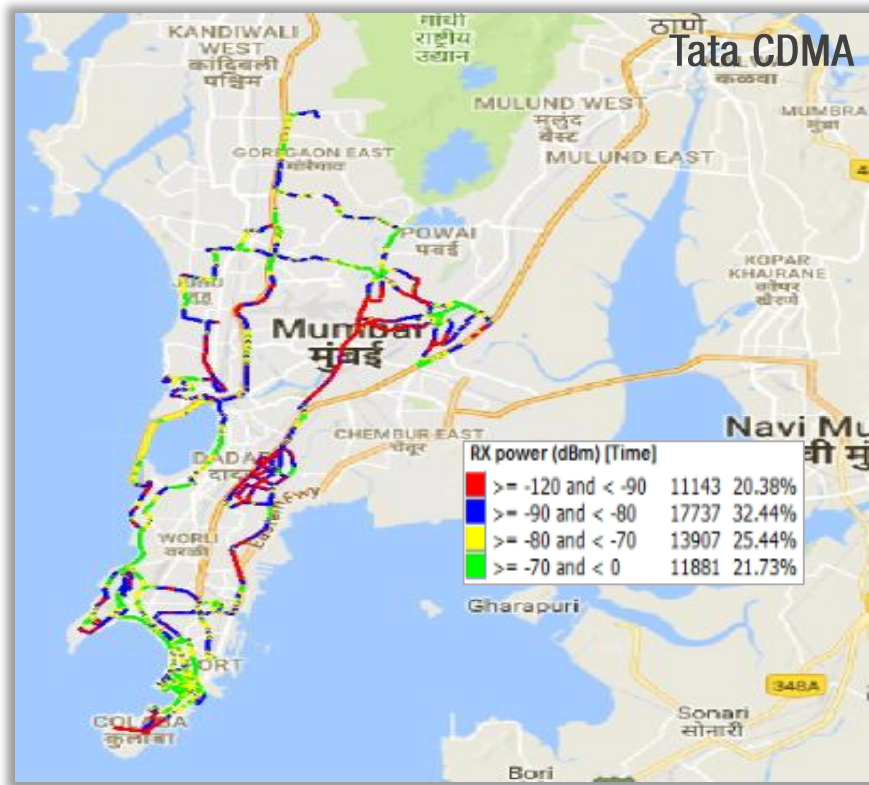
# I. Coverage Details (contd.)



# I. Coverage Details (contd.)



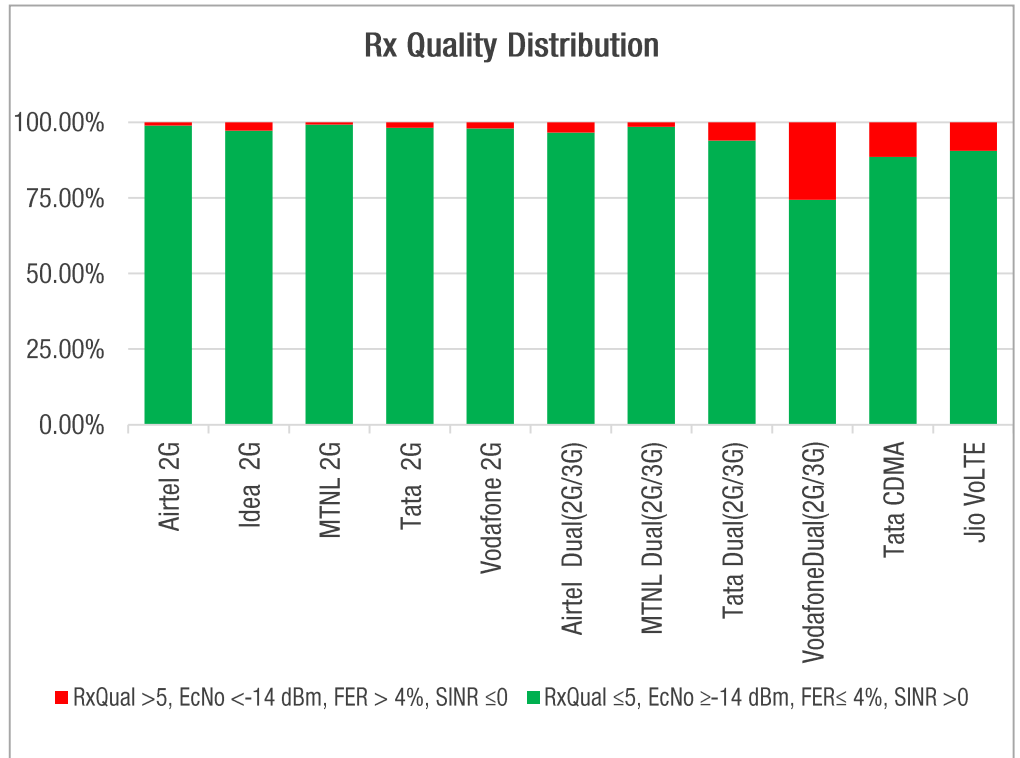
# I. Coverage Details (contd.)



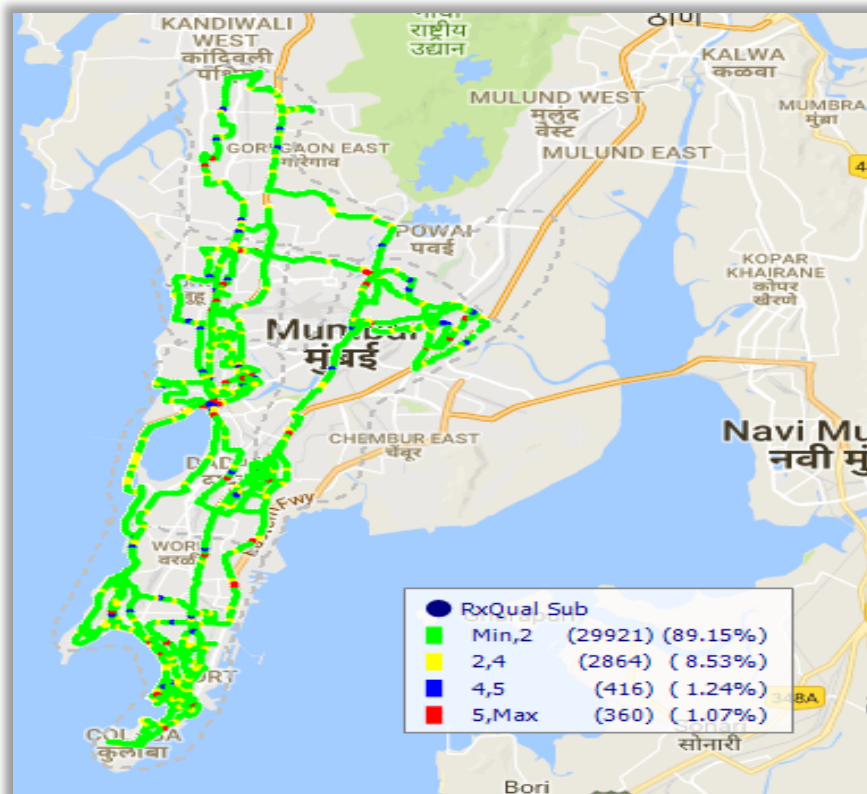
## II. Quality Details

For measuring voice quality, as per the QoS norms, RxQual  $\leq 5$  for GSM TSPs, EcNo  $\geq -14$  dBm for 3G TSP sand SINR  $\geq 0$  in case of VoLTE is considered to be good, where as quality beyond this benchmark is considered to be bad. The benchmark should usually be  $\geq 95\%$ .

TSP	Rx Quality
Airtel 2G	98.93%
Idea 2G	97.20%
MTNL 2G	99.30%
Tata 2G	98.20%
Vodafone 2G	97.95%
Airtel Dual (2G/3G)	96.61%
MTNL Dual (2G/3G)	98.53%
Tata Dual (2G/3G)	93.96%
Vodafone Dual (2G/3G)	74.42%
Tata CDMA	88.52%
Jio VoLTE	90.53%

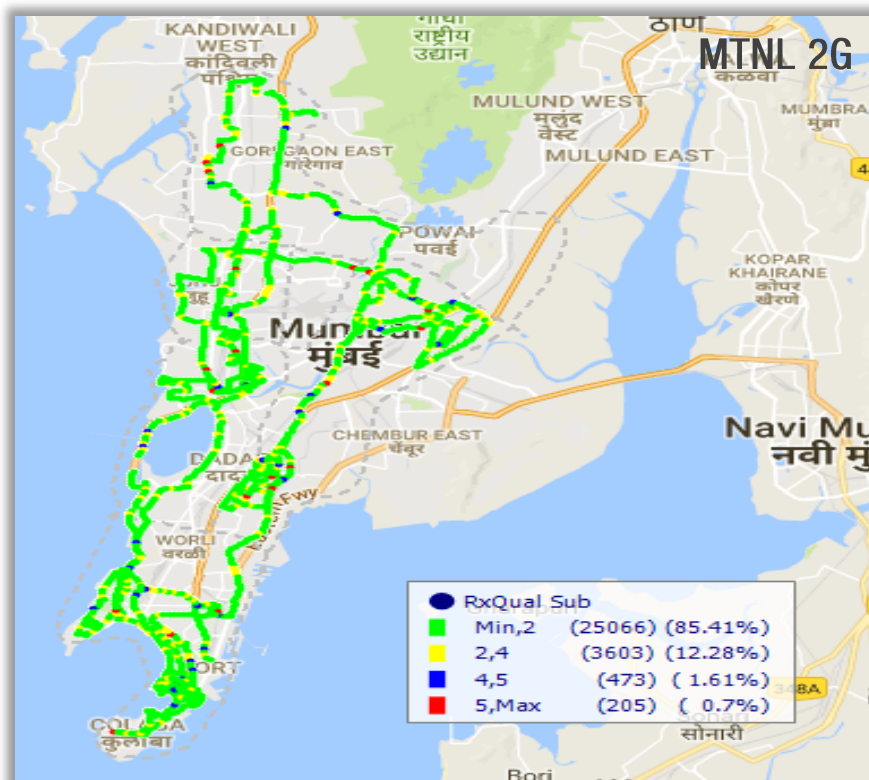
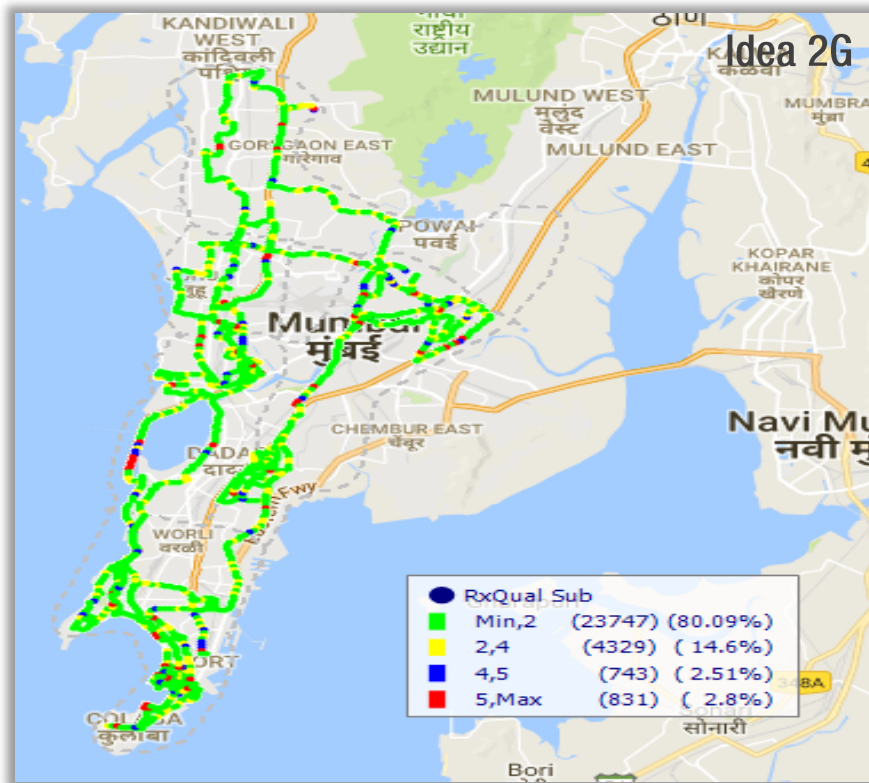


— TSPs not meeting the Benchmark

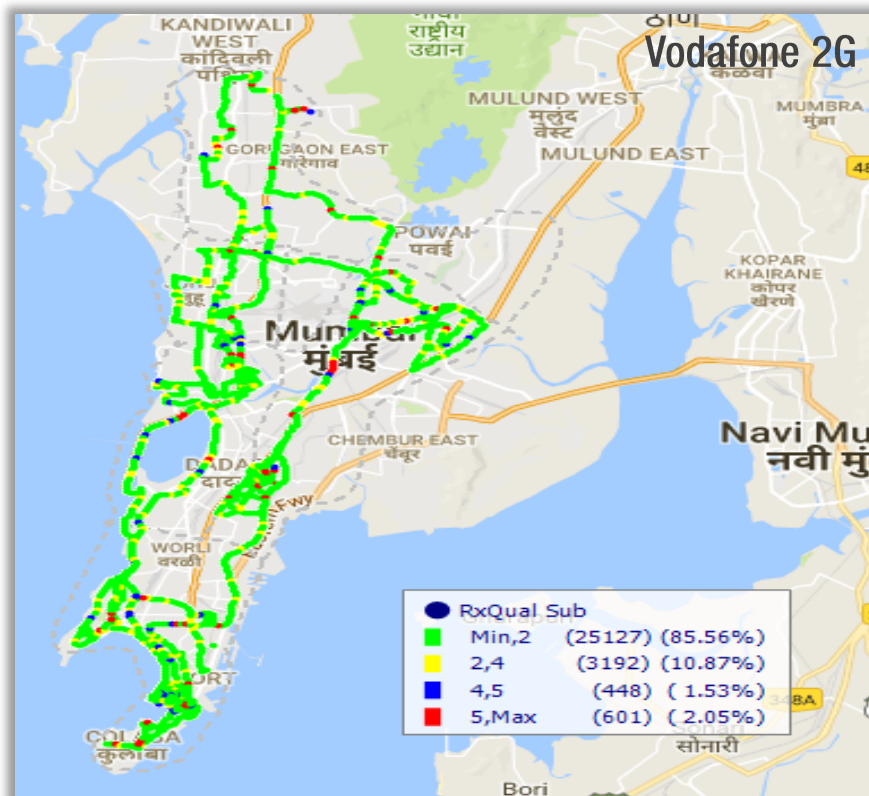
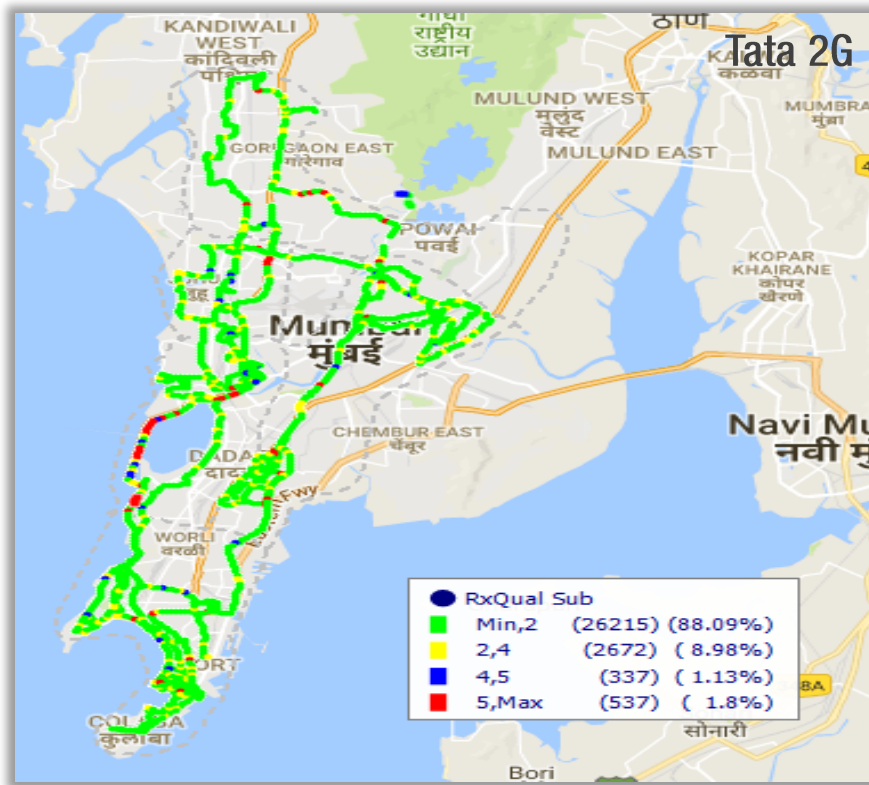


Airtel 2G

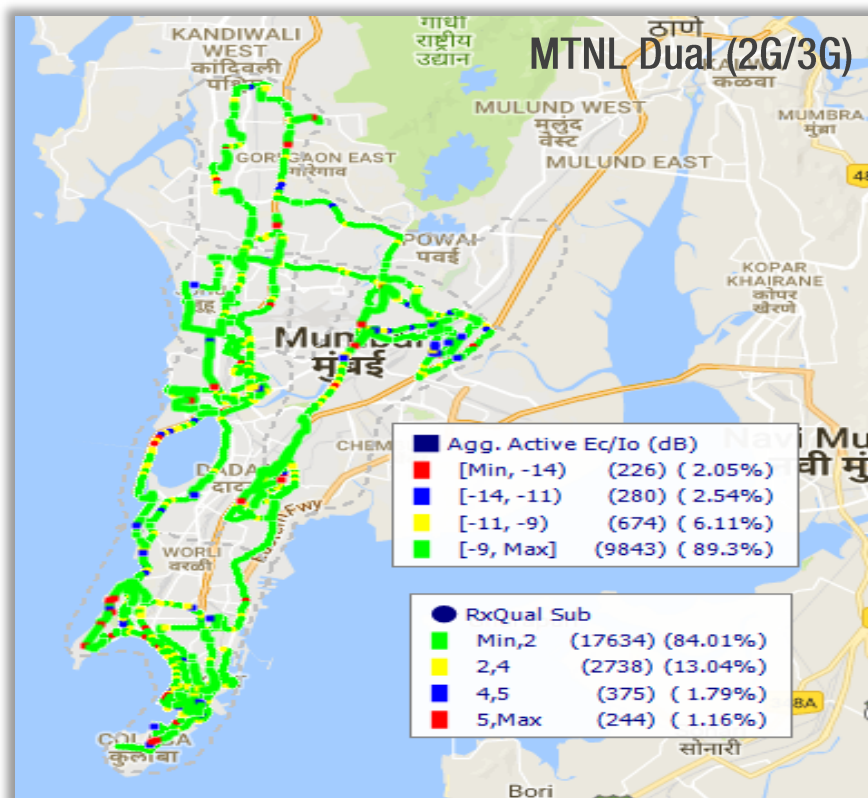
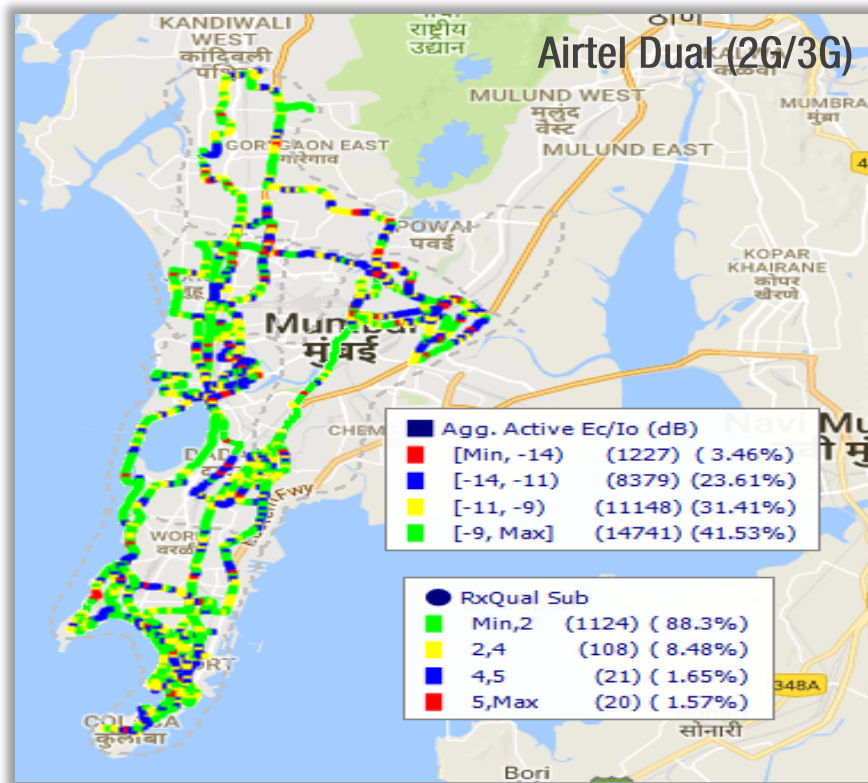
## II. Quality Details (contd.)



## II. Quality Details (contd.)

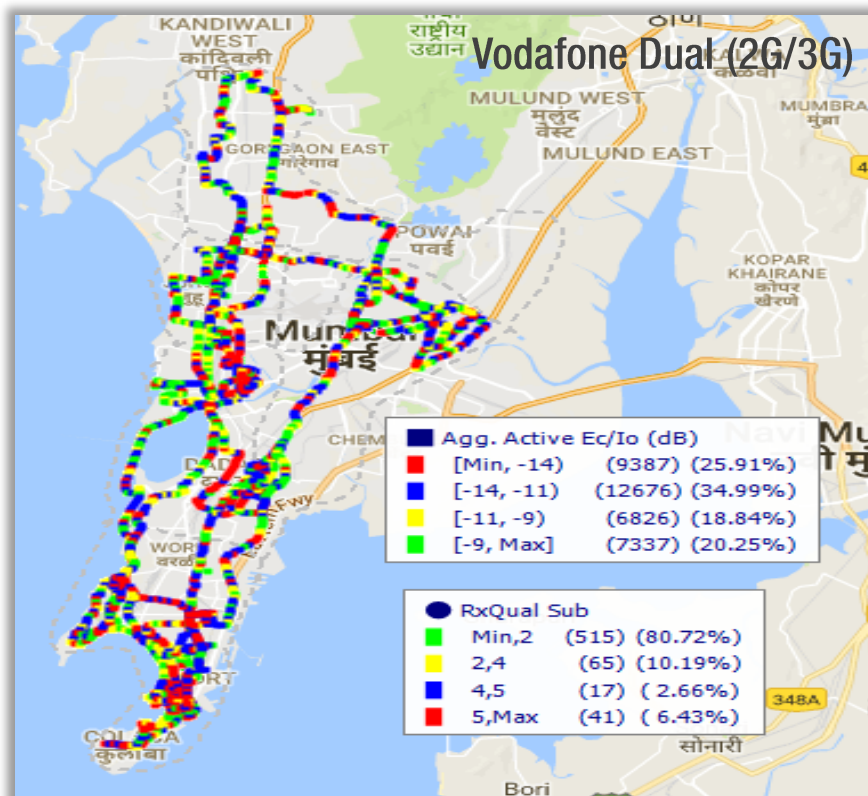
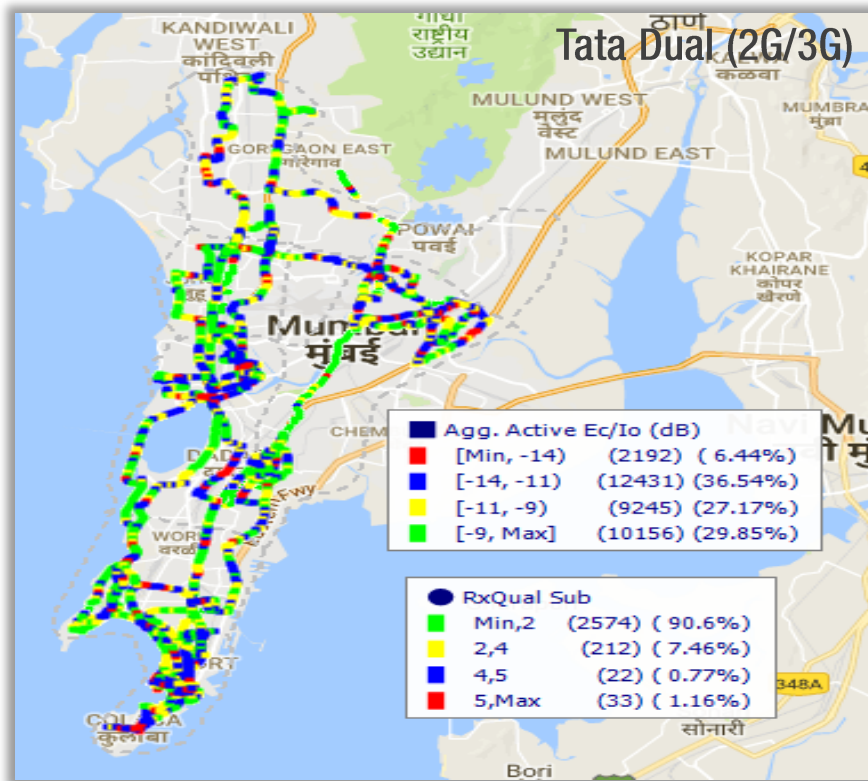


## II. Quality Details (contd.)

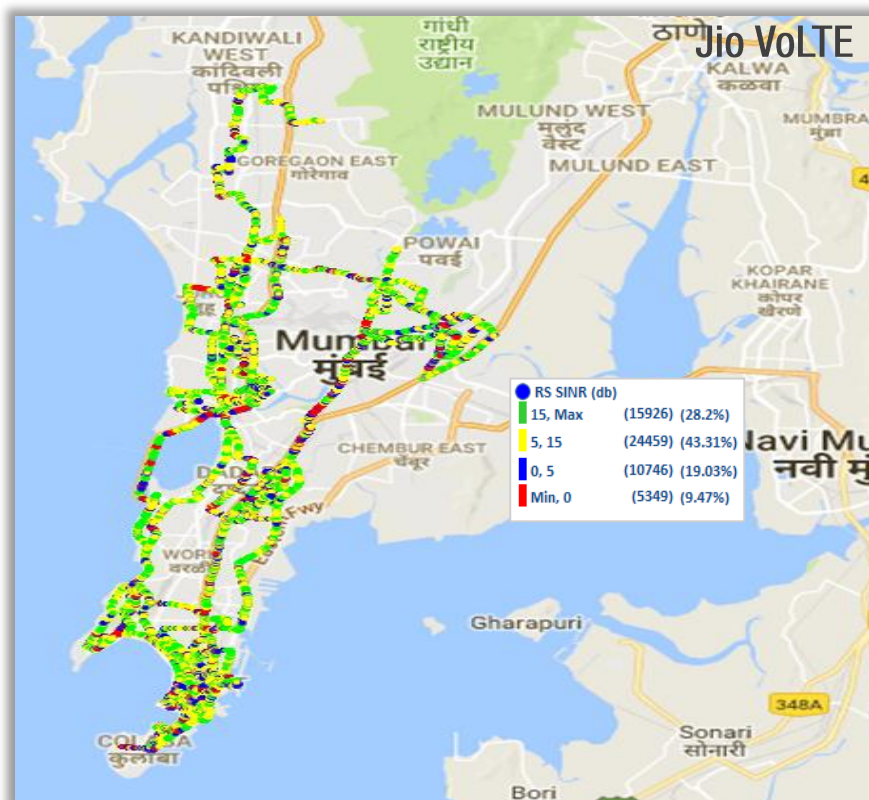
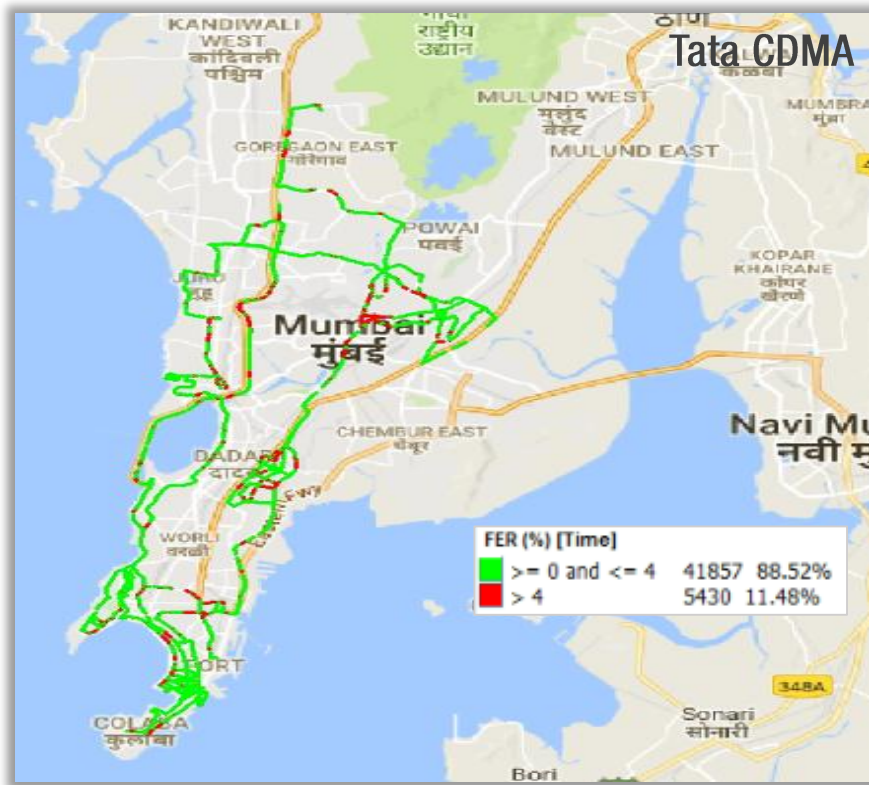




## II. Quality Details (contd.)

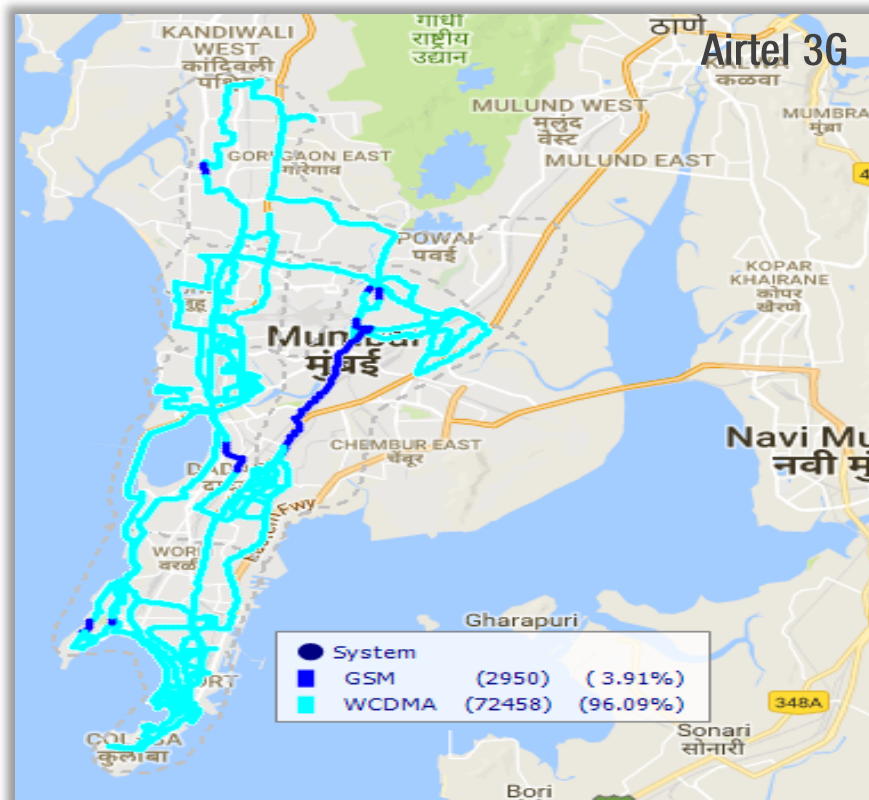
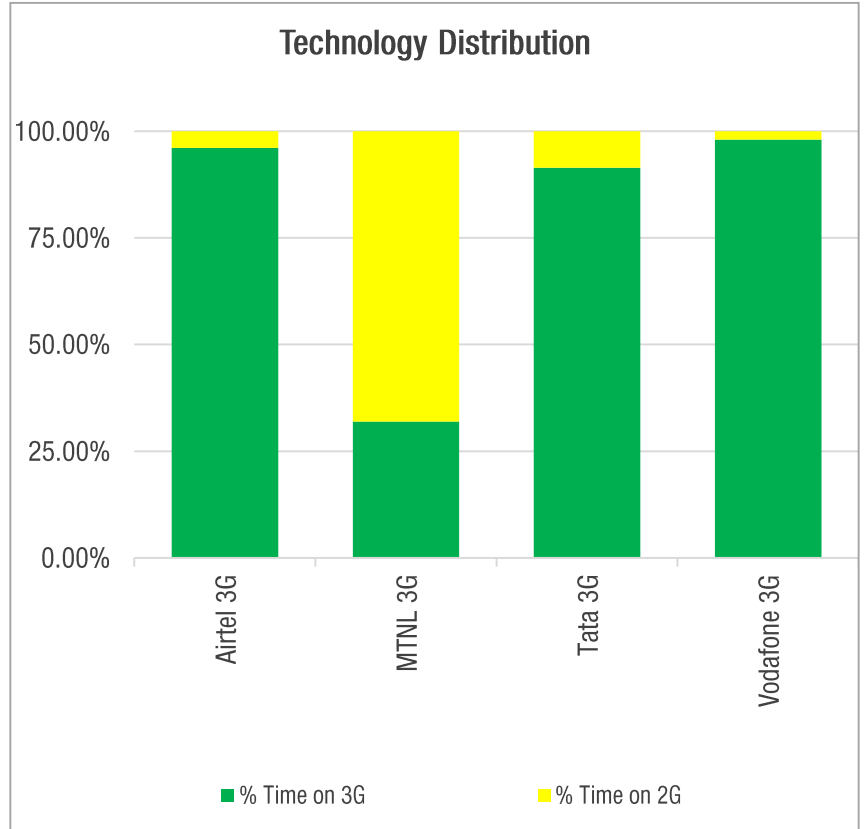


# I. Coverage Details (contd.)

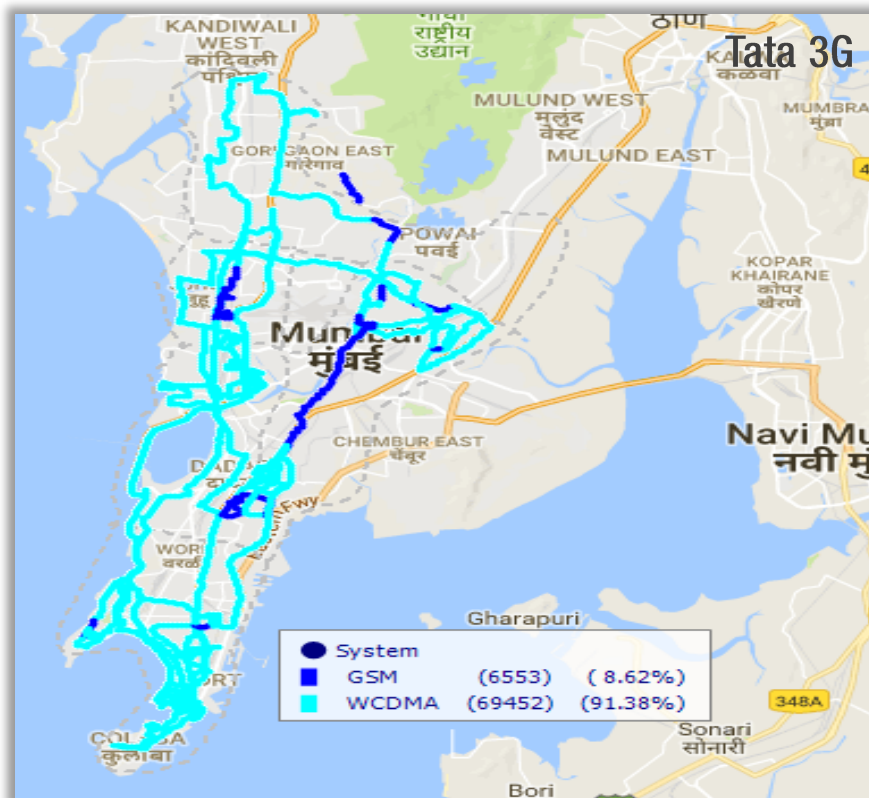
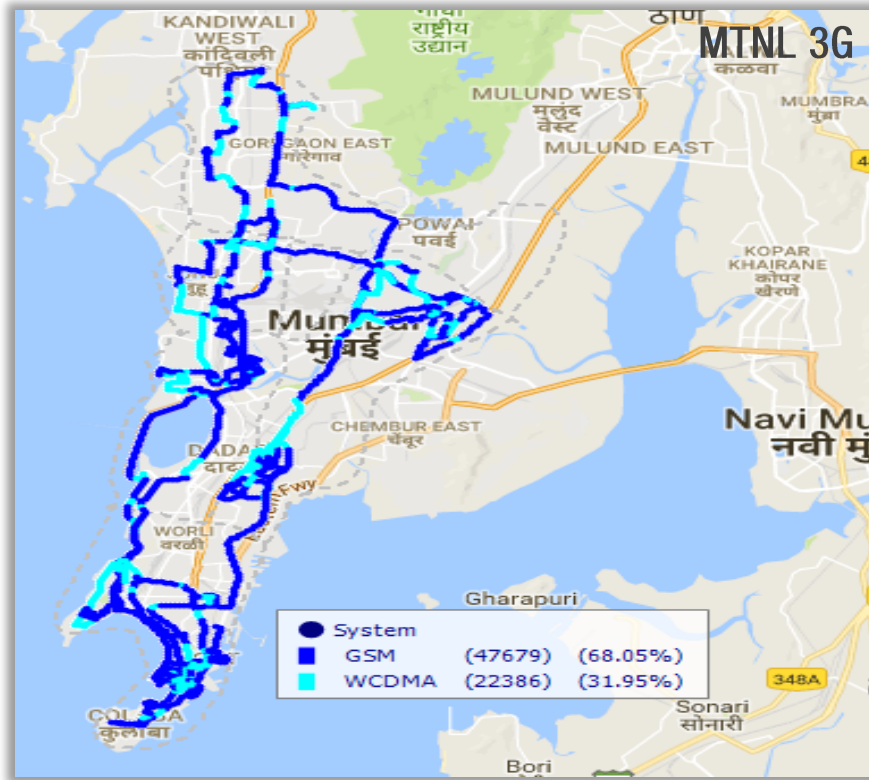


### III. Technology Details

TSP	% Time on 3G
Airtel 3G	96.09%
MTNL 3G	31.95%
Tata 3G	91.38%
Vodafone 3G	97.99%



### III. Technology Details<sub>(contd.)</sub>



### III. Technology Details<sub>(contd.)</sub>

