INDEPENDENT QUALITY OF SERVICE SURVEY IN AJK - CITIES

FOURTH QUARTER 2023

ENFORCEMENT WIRELESS – II DIRECTORATE
PTA | F-5/1, ISLAMABAD

INDEPENDENT QUALITY OF SERVICE SURVEY REPORT

INTRODUCTION

1.1. In order to measure the performance and service quality of Cellular Mobile Operators (CMOs), an independent Quality of Service (QoS) Survey has been carried out in three (03) x cities of Azad Jammu & Kashmir (AJK), in Fourth Quarter 2023. The name of cities along with survey dates are mentioned in **Table 1.1: QoS Survey Cities & Dates**:

S. #.	City	Days	Survey Dates
1.	KOTLI	4	21st ~24th November 2023
2.	MUZAFFARABAD	6	31st Oct~1st,6th,7th,8th&10th Nov, 2023
3.	MIRPUR	4	14th ~18th November 2023

Table 1.1: QoS Survey Dates and Samples

DRIVE TEST DETAILS

2.1. The QoS survey was carried out using Automated QoS Monitoring & Benchmarking Tool i.e. **"SMARTBENCHMARKER**". Drive test teams selected survey routes in such a manner to cover main roads, service roads and majority of sectors/colonies. During the survey, mobile handsets for Voice Calls, SMS and Data Sessions, were kept in Auto Detect and 3G Locked modes.

MOBILE NETWORK COVERAGE

3.1. **4G SIGNAL STRENGTH**. During the survey, while conducting data test in auto mode, 4G/LTE signal strength samples were recorded on survey routes. As per Next Generation Mobile Service (NGMS) licenses and Cellular Mobile Network Quality of Service (QoS) Regulations 2021, licensees are required to meet **the threshold of -100dBm or above of Reference Signal Receive Power (RSRP) with 90% confidence level.** The Confidence Level and Compliance of signal strength is shown in **Table 3.1: 4G Signal Strength -100dBm with 90% Confidence Level in AJK**

4G Signal Strength -100dBm with 90% Confidence Level										
City	Confidence Level					Compliant (Yes/No)				
	Jazz	Telenor	Ufone	ZonG	SCOM	Jazz	Telenor	Ufone	ZonG	SCOM
MUZAFARABAD	96.95	97.03	99.69	99.11	92.64	Yes	Yes	Yes	Yes	Yes
MIRPUR	93.73	92.62	94.73	94.62	**81.39**	Yes	Yes	Yes	Yes	**No**
KOTLI	92.82	91.91	93.67	100.00	**86.84**	Yes	Yes	Yes	Yes	**No**

Table 3.1: 4G Signal Strength -100dBm with 90% Confidence Level in AJK

3.1. **3G SIGNAL STRENGTH**. Special Communication Organization (SCOM) is the only Cellular Mobile Operator (CMO) offering 3G services in Azad Jammu & Kashmir. As per Next Generation Mobile Service (NGMS) licenses and Cellular Mobile Network Quality of Service (QoS) Regulations 2021, licensees are required to meet **the threshold of -100dBm or above of Reference Signal Code Power (RSCP) with 90% confidence level**. The Confidence Level and Compliance of signal strength is shown in **Table 3.2: 3G Signal Strength -100dBm with 90% Confidence Level.**

3G Signal Strength -100dBm with 90% Confidence Level		
City	Confidence Level	Compliant (Yes/No)
	SCOM	SCOM
MUZAFARABAD	96.57%	Yes
MIRPUR	96.71%	Yes
KOTLI	99.40%	Yes

Table 3.2: 3G Signal Strength -100dBm with 90% Confidence Level in AJK

MOBILE BROADBAND SERVICE

4.1. A series of data tests including Capacity Tests, Data Transfer Tests, Web Browsing and Ping were carried out wherein Key Performance Indicators (KPIs) of Upload and Download User Data Throughput (i.e. Speed), Webpage Loading Time and Latency have been measured. Technology wise signal strength, number of tests, Upload and Download User Data Throughput, Webpage Loading Time and Latency detail is mentioned in (i) **Table 4.1: Auto Detect Mode Data Tests Statistics** and (ii) **Table 4.2: 3G Locked Mode Data Tests Statistics**.

DESCRIPTION				JAZZ	SCOM	TELENOR	UFONE	ZONG
AUTO DETECT MODE	CAPACITY TEST	DOWNLOAD	ATTEMPTS	999	1002	1000	1000	1004
			SPEED (Mbps)	6.761	6.461	6.867	6.634	14.275
		UPLOAD	ATTEMPTS	1005	1008	1002	1008	1009
			SPEED (Mbps)	7.137	11.843	8.512	11.333	20.718
	DATA TRANSFER TEST	DOWNLOAD	ATTEMPTS	985	990	1011	1008	1007
			SPEED (Mbps)	5.422	5.53	5.082	5.717	7.499
		UPLOAD	ATTEMPTS	979	985	1016	1017	1006
			SPEED (Mbps)	4.105	4.723	4.298	5.342	6.161
	BROWSING TEST	ATTEMPTS		4038	4040	4017	4006	4027
		LOADING TIME (Seconds)		2.45	2.54	2.46	2.26	2.26
	PING TEST	ATTEMPTS		1025	1025	1025	1025	1025
		LATENCY (msec)		**101.44**	74.36	**79.59**	**75.06**	**119.86**
	AVERAGE 4G SIGNAL STRENGTH (RSRP) dBm			-84.9	-86.7	-84.7	-82	-81.8

Table 4.1: Auto Detect Mode Data Tests Statistics

DESCRIPTION				SCOM
3G LOCKED MODE	DATA TRANSFER TEST	DOWNLOAD	ATTEMPTS	602
			SPEED (Mbps)	4.725
		UPLOAD	ATTEMPTS	599
			SPEED (Mbps)	1.564
	PING TEST	ATTEMPTS		607
		LATENCY (msec)		94.57
	AVERAGE 3G SIGNAL STRENGTH (RSCP) dBm			-74.53

Table 4.2: 3G Locked Mode Data Tests Statistics

4.2. **4G USER DATA THROUGHPUT.** As per Next Generation Mobile Service (NGMS) licenses and Cellular Mobile Network Quality of Service (QoS) Regulations 2021, licensees are required to meet **the threshold of minimum of 3 Mbps Download of 4G User Data Throughput.** Similarly, **the threshold of minimum of 768 Kbps (Upload) of 4G User Data Throughput** is also required to be met in AJK. The results of Data Service QoS KPIs i.e. User Data Throughputs are shown in (i) **Table 4.3: 4G User Data Download Throughput in AJK (Fixed Size) > 3 Mbps,** (ii) **Table 4.4: 4G User Data Download Throughput in AJK (Fixed Duration) > 3 Mbps,** (iii) **Table 4.5: 4G User Data Upload Throughput in AJK (Fixed Size) > 768 Kbps** and (iv) **Table 4.6: 4G User Data Upload Throughput in AJK (Fixed Duration) > 768 Kbps.**

City	4G User Data Throughput Download (Mbps) Fixed Size					Operator Position				
	Jazz	Telenor	Ufone	ZonG	SCOM	Jazz	Telenor	Ufone	ZonG	SCOM
MUZAFARABAD	5.01	4.24	5.77	7.04	7.68	Fourth	Fifth	Third	Second	First
MIRPUR	6.63	6.16	6.85	9.69	6.38	Third	Fifth	Second	First	Fourth
KOTLI	5.73	6.09	5.49	8.73	3.56	Third	Second	Fourth	First	Fifth

Table 4.3: 4G User Data Download Throughput in AJK (Fixed Size) ≥ 3 Mbps

City	4G User Data Throughput Download (Mbps) Fixed Duration					Operator Position				
	Jazz	Telenor	Ufone	ZonG	SCOM	Jazz	Telenor	Ufone	ZonG	SCOM
MUZAFARABAD	5.7	4.5	5.4	10.9	8.2	Third	Fifth	Fourth	First	Second
MIRPUR	8.3	7.9	8.1	17.7	7.6	Second	Fourth	Third	First	Fifth
KOTLI	5.3	7.5	5.6	12.8	**2.5**	Fourth	Second	Third	First	**Fifth**

Table 4.4: 4G User Data Download Throughput in AJK (Fixed Duration) ≥ 3 Mbps

City	4G User Data Throughput Upload (Mbps) Fixed Size					Operator Position				
	Jazz	Telenor	Ufone	ZonG	SCOM	Jazz	Telenor	Ufone	ZonG	SCOM
MUZAFARABAD	5398	4214	6076	6843	5960	Fourth	Fifth	Second	First	Third
MIRPUR	5473	5586	7875	7264	5710	Fifth	Fourth	First	Second	Third
KOTLI	3151	5360	4675	7512	4817	Fifth	Second	Fourth	First	Third

Table 4.5: 4G User Data Upload Throughput in AJK (Fixed Size) ≥ 768 Kbps

City	4G User Data Throughput Upload (Mbps) Fixed Duration					Operator Position				
	Jazz	Telenor	Ufone	ZonG	SCOM	Jazz	Telenor	Ufone	ZonG	SCOM
MUZAFARABAD	7495	5645	9841	22988	13267	Fourth	Fifth	Third	First	Second
MIRPUR	7726	10682	14298	22783	12918	Fifth	Fourth	Second	First	Third
KOTLI	6081	8946	9385	15846	8984	Fifth	Fourth	Second	First	Third

Table 4.6: 4G User Data Upload Throughput in AJK (Fixed Duration) ≥ 768 Kbps

4.3. **3G USER DATA THROUGHPUT.** As per Next Generation Mobile Service (NGMS) licenses and Cellular Mobile Network Quality of Service (QoS) Regulations 2021, licensees are required to meet **the threshold of minimum of 512 Kbps (Download) of 3G User Data Throughput.** Similarly, **the threshold of minimum of 128 Kbps (Upload) of 3G User Data Throughput** is also required to be met in AJK. SCOM is the only 3G Data services provider in AJK , therefore the results of QoS KPIs i.e. User Data Throughputs are shown in (i) **Table 4.7: 3G User Data Download Throughput in AJK (Fixed Size and Fixed Duration) > 512 Kbps,** and (ii) **Table 4.8: 3G User Data Upload Throughput in AJK (Fixed Size and Fixed Duration) > 128 Kbps .**

City	3G User Data Throughput Download (Kbps) Fixed Size	3G User Data Throughput Download (Kbps) Fixed Duration	Operator Position
	SCOM	SCOM	SCOM
MUZAFARABAD	5149	5798	First
MIRPUR	5964	6751	
KOTLI	4101	3452	

Table 4.7: 3G User Data Download Throughput in AJK (Fixed Size and Fixed Duration) ≥ 512 Kbps

City	3G User Data Throughput Upload (Kbps) Fixed Size	3G User Data Throughput Upload (Kbps) Fixed Duration	Operator Position
	SCOM	SCOM	SCOM
MUZAFARABAD	1666	1483	First
MIRPUR	1757	1470	
KOTLI	1542	1328	

Table 4.8: 3G User Data Upload Throughput in AJK (Fixed Size and Fixed Duration) ≥ 128 Kbps

4.4 **WEBPAGE LOADING TIME.** As per Cellular Mobile Network Quality of Service (QoS) Regulations 2021, licensees are required to meet Webpage Loading Time threshold of 5 Seconds. The results of Webpage Loading Time are shown in (i) **Table 4.9: Webpage Loading Time < 5 Seconds (Automode)** and (ii) **Table 4.10: Webpage Loading Time < 5 Seconds (3G Locked Mode).**

WEBPAGE LOADING TIME IN IN TECHNOLOGY AUTO DETECT MODE										
City	Webpage Loading Time [seconds]					Compliant (Yes/No)				
	Jazz	Telenor	Ufone	ZonG	SCOM	Jazz	Telenor	Ufone	ZonG	SCOM
MUZAFARABAD	1.6	2.2	1.5	1.6	1.6	Yes	Yes	Yes	Yes	Yes
MIRPUR	1.58	1.48	1.38	1.52	1.70	Yes	Yes	Yes	Yes	Yes
KOTLI	1.66	1.75	1.70	1.26	1.87	Yes	Yes	Yes	Yes	Yes

Table 4.9: Webpage Loading Time < 5 Seconds (Automode)

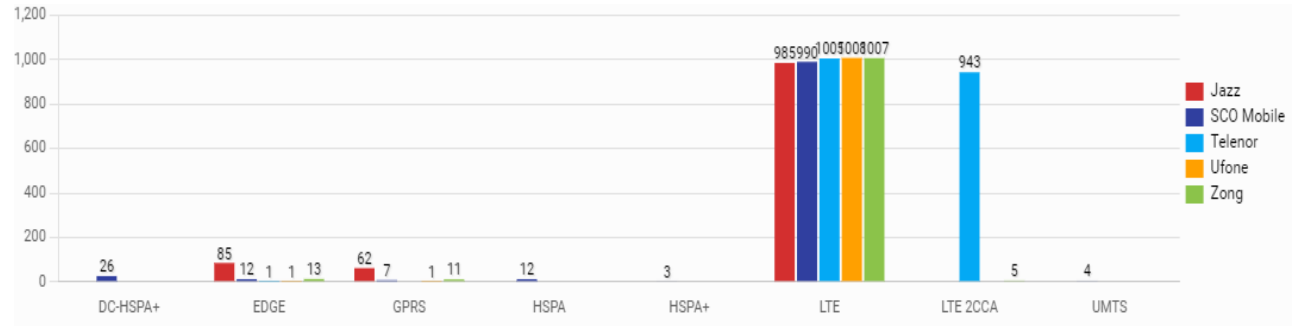
WEBPAGE LOADING TIME IN 3G LOCKED MODE		
City	Webpage Loading Time [seconds]	Compliant (Yes/No)
	SCOM	SCOM
MUZAFARABAD	1.65	Yes
MIRPUR	1.58	Yes
KOTLI	1.72	Yes

Table 4.10: Webpage Loading Time < 5 Seconds (3G Locked Mode)

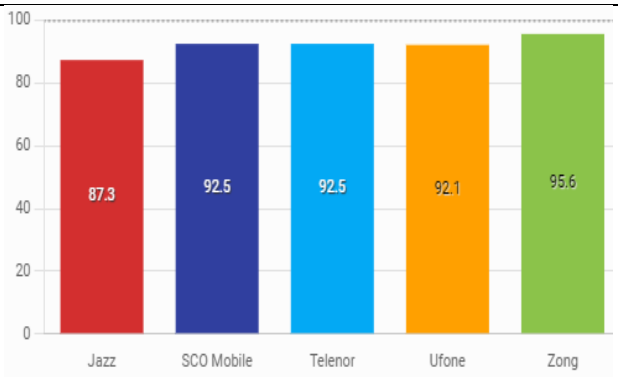
4.4. Overall results of HTTP Browsing, Download & Upload Throughputs in Capacity Tests, Data Transfer Tests, and Latency can be seen in attached graphs

AUTO MODE DATA TESTING

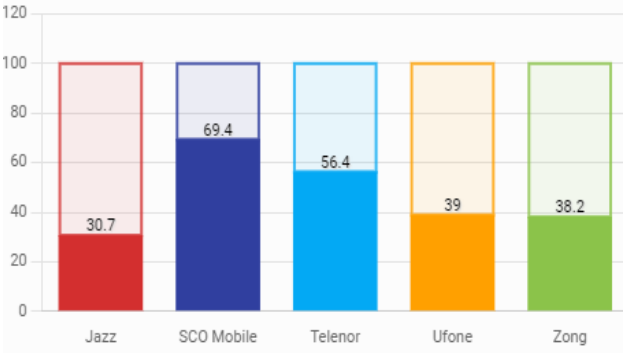
HTTP TRANSFER DOWNLOAD SUCCESS BY TECHNOLOGY



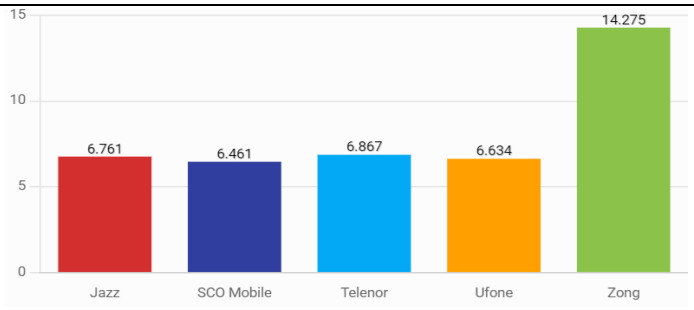
HTTP BROWSING SUCCESS RATIO



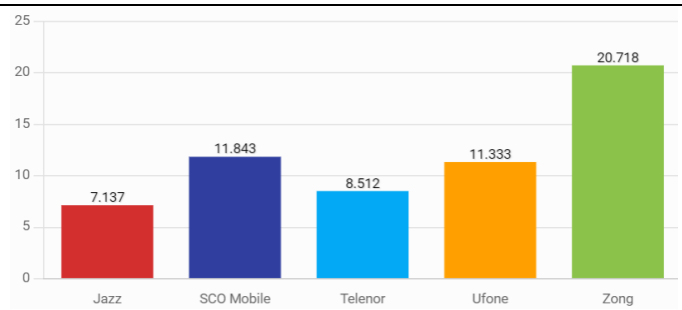
DOWNLINK RESOURCE BLOCK UTILIZATION



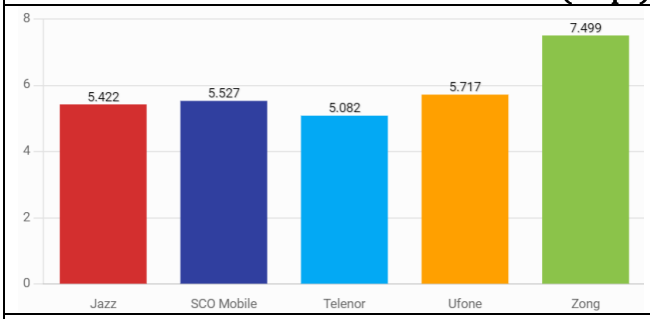
CAPACITY TEST DOWNLOAD SPEED (Mbps)



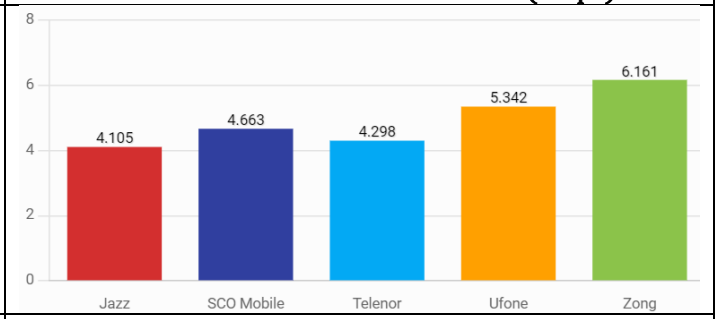
CAPACITY TEST UPLOAD SPEED (Mbps)



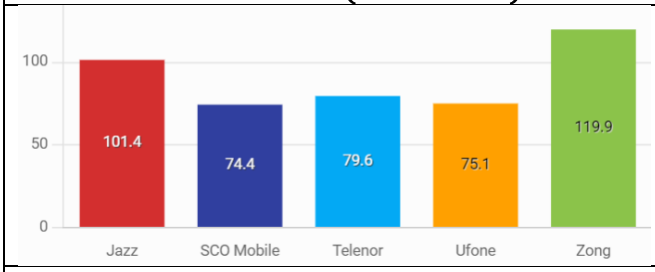
DATA TRANSFER DOWNLOAD SPEED (Mbps)



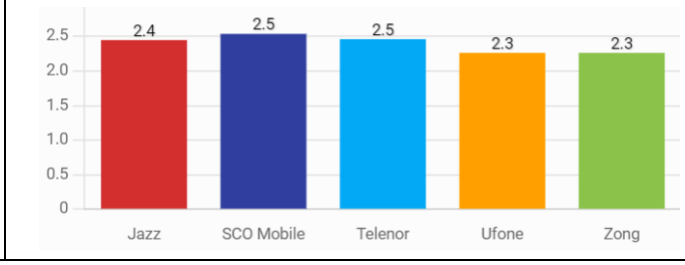
DATA TRANSFER UPLOAD SPEED (Mbps)



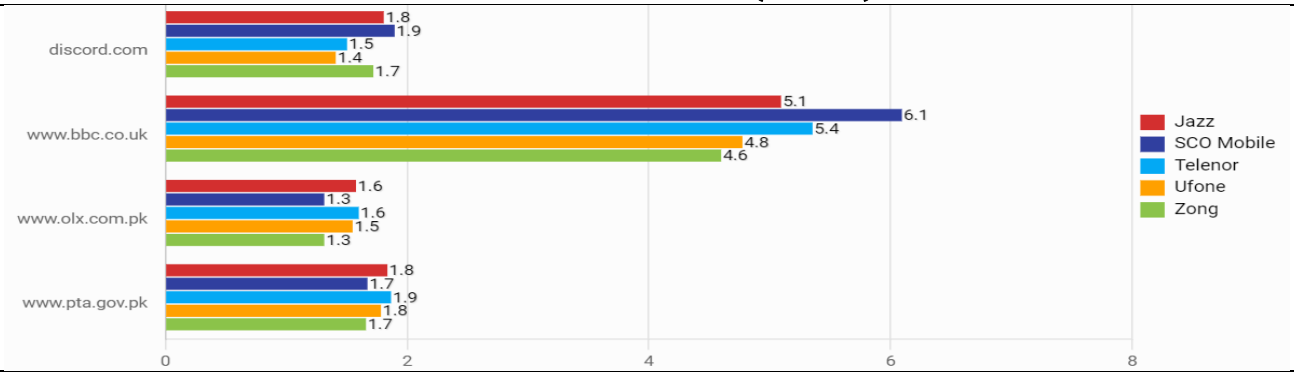
LATENCY (milliseconds)



WEBPAGE LOADING TIME (Seconds)

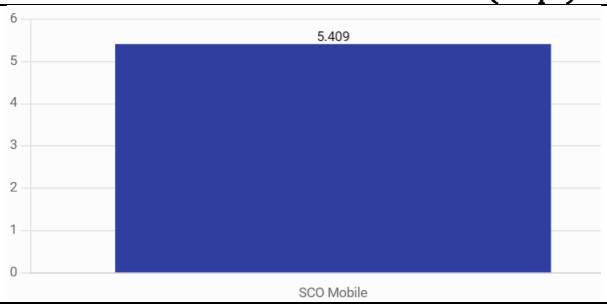


WEBPAGE LOADING TIME (Seconds)

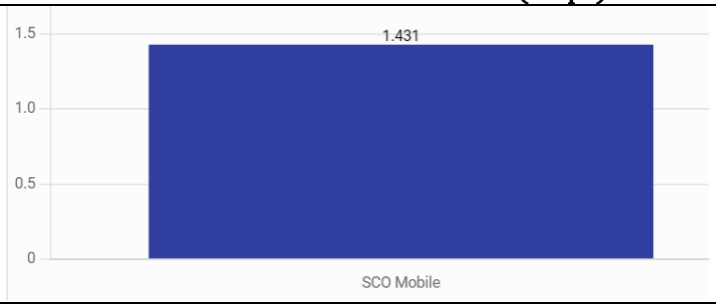


3G LOCKED MODE DATA TESTING

CAPACITY TEST DOWNLOAD SPEED (Mbps)

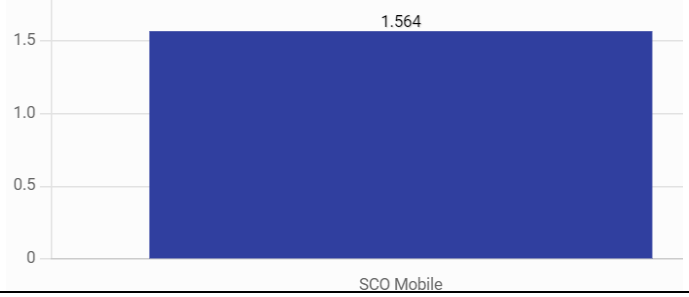


CAPACITY TEST UPLOAD SPEED (Mbps)

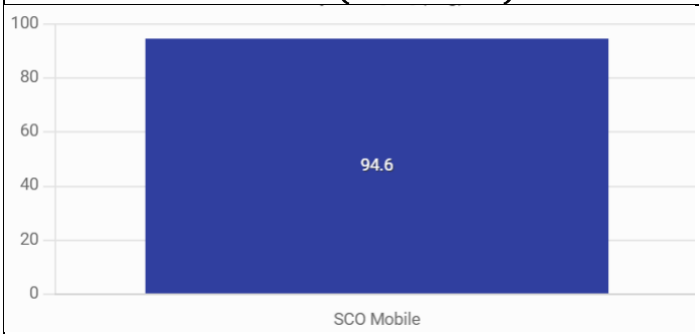


DATA TRANSFER DOWNLOAD SPEED (Mbps)

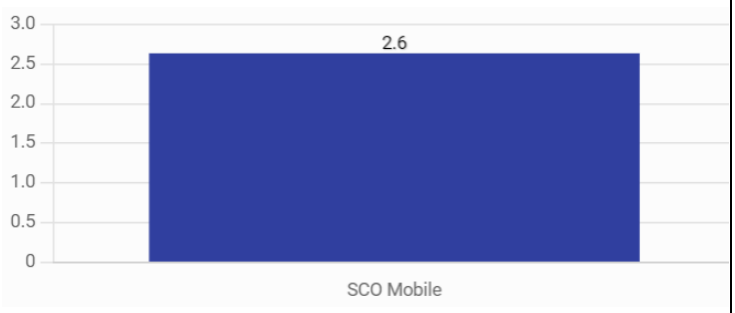
DATA TRANSFER UPLOAD SPEED (Mbps)



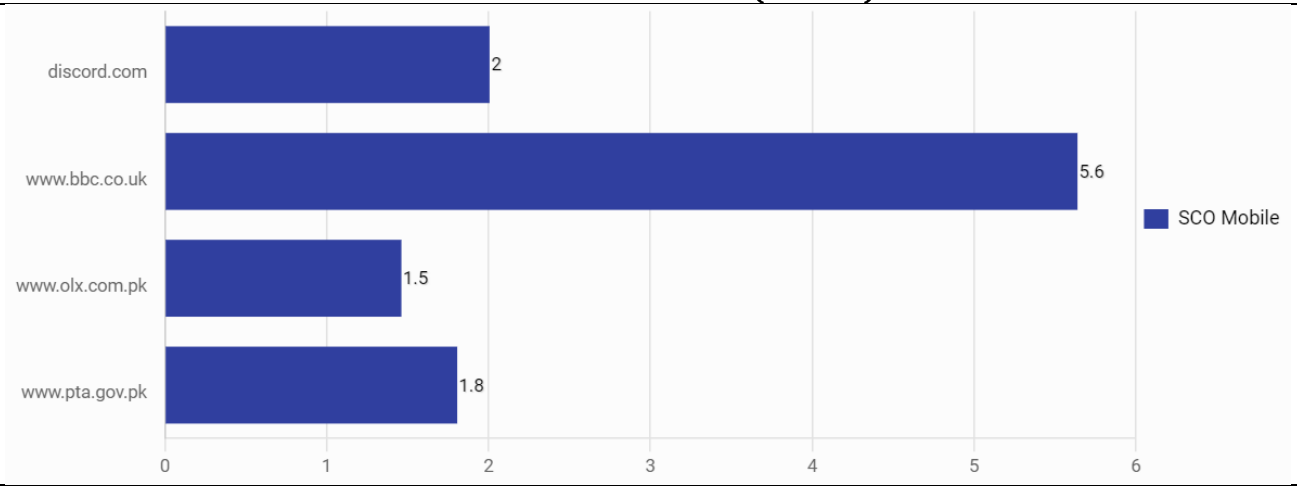
LATENCY (milliseconds)



WEBPAGE LOADING TIME (Seconds)



WEBPAGE LOADING TIME (Seconds)



LATENCY. As per Cellular Mobile Network Quality of Service (QoS) Regulations 2021, licensees are required to meet threshold of 75 milliseconds of 4G/LTE Technology & 150 milliseconds of 3G Technology of Latency. The results of QoS KPI Latency are shown in. **Table 4.11: Latency in Technology Auto Detect Mode < 75 milliseconds and** (ii) **Table 4.12: Latency in 3G Locked Mode < 150 milliseconds.**

LATENCY IN TECHNOLOGY AUTO DETECT MODE										
City	Latency [milliseconds]					Compliant (Yes/No)				
	Jazz	Telenor	Ufone	ZonG	SCOM	Jazz	Telenor	Ufone	ZonG	SCOM
MUZAFARABAD	105	91	73	97	68	No	No	Yes	No	Yes
MIRPUR	108	72	50	103	81	No	Yes	Yes	No	No
KOTLI	90	78	108	164	74	No	No	No	No	Yes

Table 4.11: Latency in Technology Auto Detect Mode < 75 milliseconds

LATENCY IN 3G LOCKED MODE		
City	Latency [milliseconds]	Compliant (Yes/No)
	SCOM	SCOM
MUZAFARABAD	83	Yes
MIRPUR	98	Yes
KOTLI	103	Yes

Table 4.12: Latency in Technology Auto Detect Mode < 150 millisecond

OOKLA SPEED TEST. In addition, Ookla Speed Test was also carried out to measure Download and Upload User Data Throughput and Round-Trip Time/Latency. The Number of Tests, Upload and Download User Data Throughput and Latency detail is mentioned in **Table 4.13: Ookla Tests Statistics.** City wise results of Ookla Download Throughput, Upload Throughput and Latency are shown in (i).

Table 4.14: Ookla Download Throughput in Technology Auto Detect Mode, (ii). **Table 4.15: Ookla Upload Throughput in Technology Auto Detect Mode**, (iii) **Table 4.16 Ookla Latency in Technology Auto Detect Mode < 75 Milliseconds**

DESCRIPTION				JAZZ	TELENOR	UFONE	ZONG	SCOM
Ookla Tests	THROUGHPUT TEST	DOWNLOAD	ATTEMPTS	1149	1147	1113	1147	1148
			SPEED (Mbps)	7.493	7.595	8.287	8.186	18.64
		UPLOAD	ATTEMPTS	1149	1147	1113	1147	1148
			SPEED (Mbps)	7.674	12.95	7.907	12.94	23.70
	PING TEST	ATTEMPTS		1149	1147	1113	1147	1148
		LATENCY (msec)		27.5	28.4	38	43.5	67.4

Table 4.13: Ookla Tests Statistics

OOKLA DOWNLOAD THROUGHPUT IN TECHNOLOGY AUTO DETECT MODE										
Cities	Download Throughput (Kbps)					Operator Position				
	Jazz	Telenor	Ufone	ZonG	SCOM	Jazz	Telenor	Ufone	ZonG	SCOM
MUZAFARABAD	6.55	5.06	5.95	12.92	9.48	Third	Fifth	Fourth	First	Second
MIRPUR	8.75	9.82	10.52	24.02	9.47	Fifth	Third	Second	First	Fourth
KOTLI	6.51	9.45	7.08	16.99	**3.23**	Fourth	Second	Third	First	Fifth

Table 4.14: Ookla Download Throughput in Technology Auto Detect Mode

OOKLA UPLOAD THROUGHPUT IN TECHNOLOGY AUTO DETECT MODE										
Cities	Upload Throughput (Kbps)					Operator Position				
	Jazz	Telenor	Ufone	ZonG	SCOM	Jazz	Telenor	Ufone	ZonG	SCOM
MUZAFARABAD	8599	4365	12020	27717	14196	Fourth	Fifth	Third	First	Second
MIRPUR	7686	10237	15383	23612	14096	Fifth	Fourth	Second	First	Third
KOTLI	6732	8882	11641	20015	10350	Fifth	Fourth	Second	First	Third

Table 4.15: Ookla Upload Throughput in Technology Auto Detect Mode

OOKLA LATENCY IN TECHNOLOGY AUTO DETECT MODE										
City	Latency [milliseconds]					Compliant (Yes/No)				
	Jazz	Telenor	Ufone	ZonG	SCOM	Jazz	Telenor	Ufone	ZonG	SCOM
MUZAFARABAD	26.09	32.14	20.45	63.14	26.31	Yes	Yes	Yes	Yes	Yes
MIRPUR	29.73	33.76	21.47	65.69	22.92	Yes	Yes	Yes	Yes	Yes
KOTLI	26.04	35.34	**93.64**	**103.77**	36.47	Yes	Yes	**No**	**No**	Yes

Table 4.16: Ookla Upload Throughput in Technology Auto Detect Mode

VOICE SERVICE

5.1. A total of **3,506 Call attempts** made and out of which **167 were failed attempts**. In **3,339 successful call attempts**, **98 calls dropped** prior to completion of two minutes duration, whereas, **3,241 calls remained connected** for the complete duration of two minutes. The company wise call statistics is shown in **Table5.1: Call Statistics.**

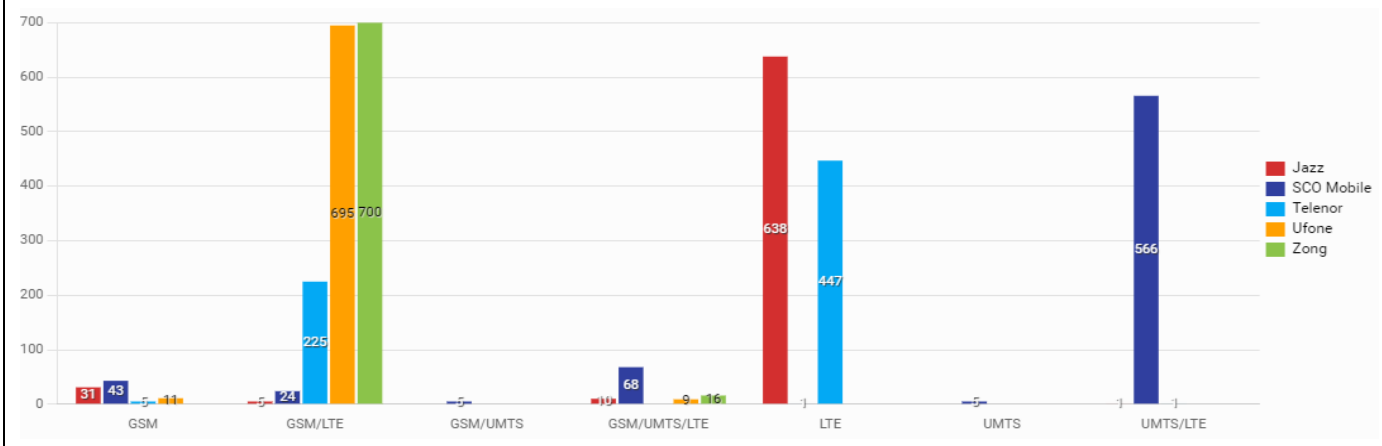
DESCRIPTION	JAZZ	SCOM	TELENOR	UFONE	ZONG
TOTAL CALLS ATTEMPTS	685	712	678	715	716
FAILED CALLS ATTEMPTS	25	32	67	23	20
ESTABLISHED CALLS ATTEMPTS	660	680	611	692	696
DROPPED CALLS ATTEMPTS	33	17	21	4	23
COMPLETED CALLS ATTEMPTS	627	663	590	688	673
CALL SETUP SUCCESS RATE %	**96.35**	**95.51**	**90.12**	**96.78**	**97.21**
CALL SETUP TIME (s)	**7.67**	**7.63**	**7.64**	**10.24**	**8.72**
CALL COMPLETION RATE %	**97.44**	**85.59**	100	**97.05**	98.01
ISHO SUCCESS RATE %	-	100	-	-	-
RAB SETUP SUCCESS RATE %	100	100	-	-	-

DESCRIPTION	JAZZ	SCOM	TELENOR	UFONE	ZONG
MEAN OPINION SCORE (MOS)	3.79	3.52	3.74	3.29	3.31
MOS EXCESS RATIO – MOS < 1.6 %	10.47	4.75	3.33	1.89	2.22
TOTAL SPEECH TEST	6534	6864	6097	7022	6981

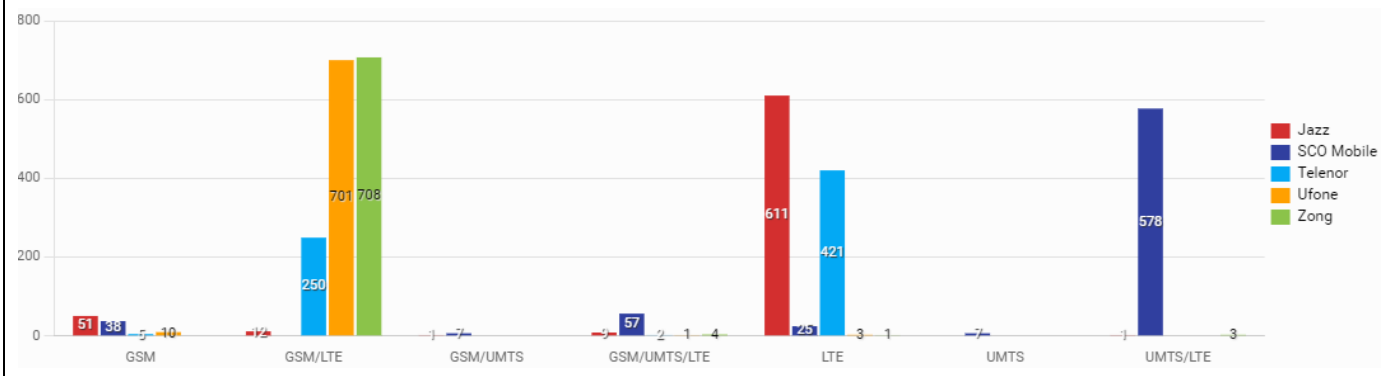
Table5.1: Call Statistics

5.2. The overall Call Setup Success Rate and Call Retainability along with Mean Opinion Score (MOS), the percentage of mute calls, MOS with respect to Voice CODEC and Technology per band is shown as under:

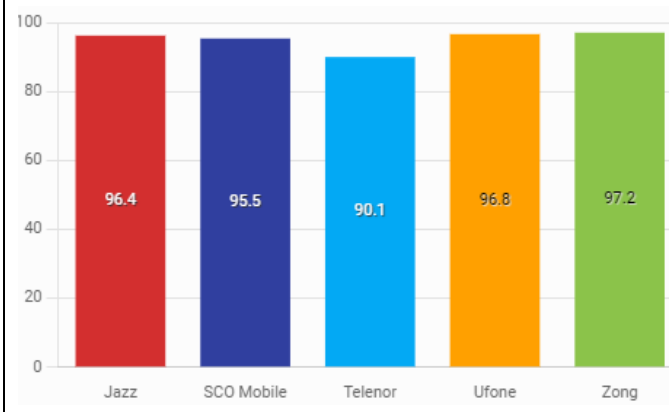
TECHNOLOGY WISE DISTRIBUTION OF CALLS – A PARTY



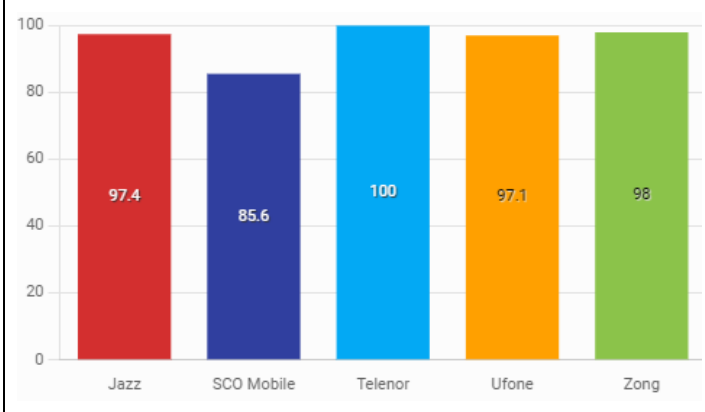
TECHNOLOGY WISE DISTRIBUTION OF CALLS – B PARTY



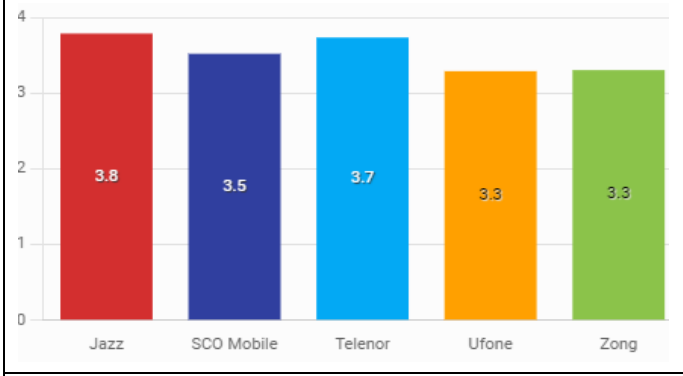
CALL SETUP SUCCESS RATE



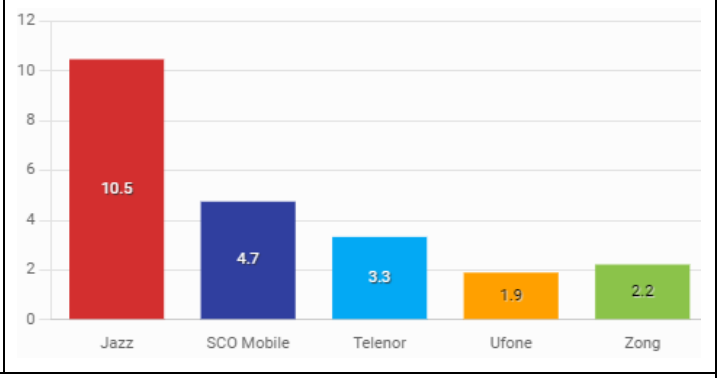
CALL RETAINABILITY



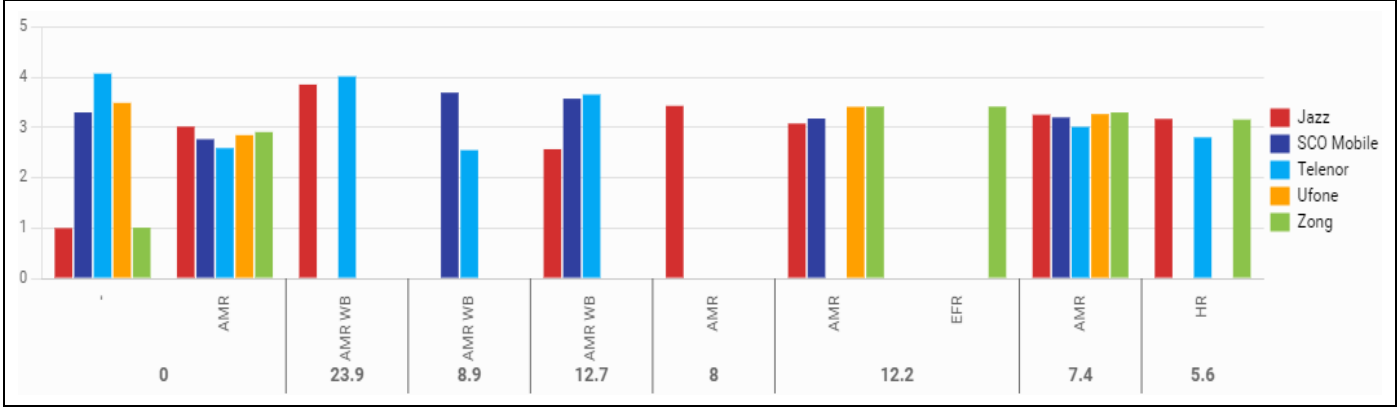
MEAN OPINION SCORE - AVERAGE



MEAN OPINION SCORE < 1.6 (PERCENTAGE)



MEAN OPINION SCORE – VOICE CODEC



5.3. The 7 x QoS KPIs *(i.e. Network Accessibility, Call Setup Success Rate, Call Setup Time, Call Completion Rate, Mean Opinion Score, Inter System Handover Success Rate & RAB Setup Success Rate)* have been measured while testing voice services in **3 x surveyed cities** of AJK. The compliance level of threshold values of voice QoS KPIs in 9 x Cities is shown in each **Table 5.3: Voice QoS KPIs Compliance Level.**

Voice Service Cities - Compliance (Yes/No)					
Operator	**Voice KPIs**	**THRESHOLD**	**KOTLI**	**MUZAFFARBAD**	**MIRPUR**
Jazz	NA	≥ 99%	Yes	Yes	Yes
	CSSR	≥ 98%	**No**	**No**	**No**
	CCT	≤ 7.5 sec	Yes	Yes	Yes
	CCR	> 98%	**No**	**No**	**No**
	MOS	≥ 3	Yes	Yes	Yes
	ISHO	≥ 98%	**N/A**	**N/A**	**N/A**
	RSSR	> 98%	**N/A**	**N/A**	Yes
Telenor	NA	≥ 99%	Yes	Yes	Yes
	CSSR	≥ 98%	**No**	**No**	**No**
	CCT	≤ 7.5 sec	Yes	Yes	Yes
	CCR	> 98%	**No**	**No**	Yes
	MOS	≥ 3	Yes	Yes	Yes
	ISHO	≥ 98%	Yes	Yes	Yes
	RSSR	> 98%	Yes	Yes	Yes
Ufone	NA	≥ 99%	Yes	Yes	Yes
	CSSR	≥ 98%	Yes	**No**	Yes
	CCT	≤ 7.5 sec	**No**	**No**	**No**

Voice Service Cities - Compliance (Yes/No)					
Operator	Voice KPIs	THRESHOLD	KOTLI	MUZAFFARBAD	MIRPUR
	CCR	> 98%	Yes	Yes	Yes
	MOS	≥ 3	Yes	Yes	Yes
	ISHO	≥ 98%	Yes	Yes	Yes
	RSSR	> 98%	Yes	Yes	Yes
ZonG	NA	≥ 99%	Yes	Yes	Yes
	CSSR	≥ 98%	Yes	**No**	**No**
	CCT	≤ 7.5 sec	**No**	**No**	Yes
	CCR	> 98%	Yes	**No**	**No**
	MOS	≥ 3	Yes	Yes	Yes
	ISHO	≥ 98%	**N/A**	**N/A**	**N/A**
	RSSR	> 98%	**N/A**	**N/A**	Yes
SCOM	NA	≥ 99%	Yes	Yes	Yes
	CSSR	≥ 98%	**No**	**No**	Yes
	CCT	≤ 7.5 sec	Yes	Yes	Yes
	CCR	> 98%	Yes	**No**	**No**
	MOS	≥ 3	Yes	Yes	Yes
	ISHO	≥ 98%	Yes	Yes	**No**
	RSSR	> 98%	Yes	Yes	Yes
** Note Voice QoS KPIs: Network Accessibility (NA) > 99%, Service Accessibility (SA)> 98%, Call Connection Time (CCT) ≤ 7.5 Seconds, Call Completion Ratio (CCR) ≥ 98%, Mean Opinion Score (MOS) > 3, Inter System Hand Over (ISHO) > 98% & RAB Setup Success Rate (RSSR) > 98%*					

Table 5.3: Voice QoS KPIs Compliance Level

SMS SERVICE

6.1. A total of **3,500 SMS sending attempts** conducted, out of which **3,364 SMS successfully received** at B-Party. The company wise SMS Statistics are shown in **Table6.1: SMS Statistics ,** whrerein city wise compliance is shown in **Table 6.2: City Wise SMS Compliance**

DESCRIPTION	JAZZ	SCOM	TELENOR	UFONE	ZONG
SMS SEND REQUEST	688	709	678	714	711
SMS SUCCESSFULLY RECEIVED	645	689	616	711	703
SMS RECEIVE SUCCESS RATE %	93.75	97.18	90.86	99.58	98.87
END-TO-END DELIVERY TIME (s)	3.85	2.6	3.34	2.92	2.93

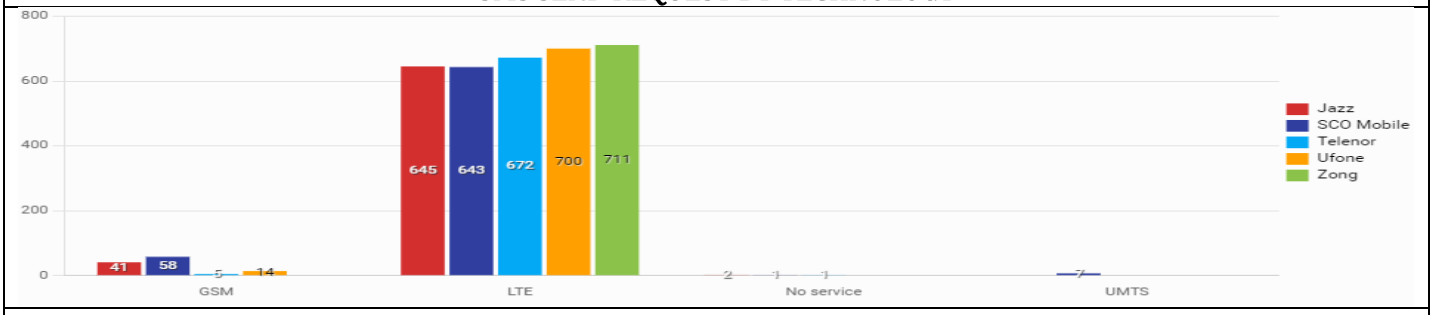
Table 6.1: SMS Statistics

SMS KPI		Muzaffarabad		Mirpur		Kotli	
		Success Rate	Delivery Time	Success Rate	Delivery Time	Success Rate	Delivery Time
Operator	Jazz	**No**	Yes	**No**	Yes	**No**	Yes
	Telenor	**No**	Yes	**No**	Yes	**No**	Yes
	Ufone	Yes	Yes	Yes	Yes	Yes	Yes
	Zong	**No**	Yes	**No**	Yes	Yes	Yes
	SCOM	**No**	Yes	**No**	Yes	**No**	Yes

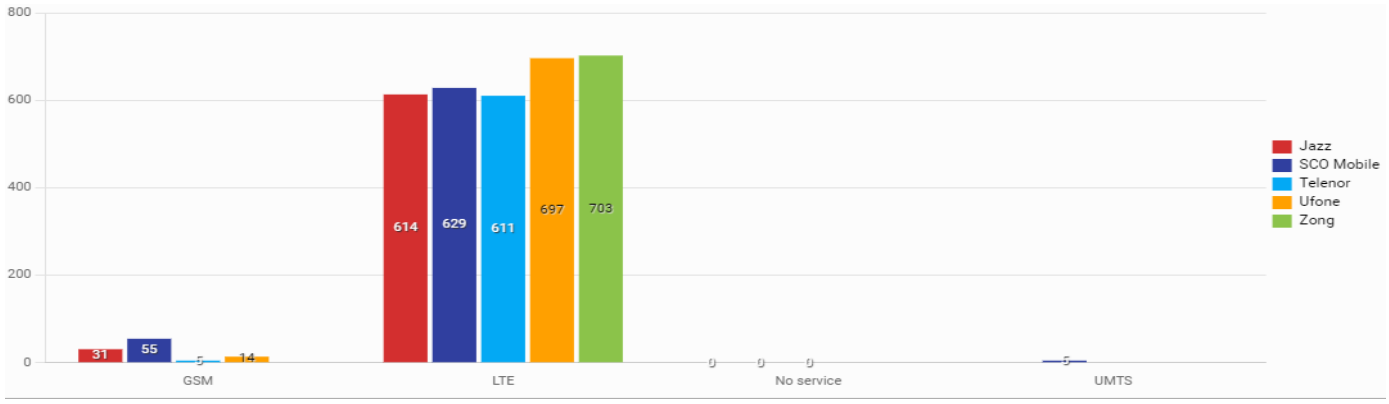
Table 6.2: City Wise SMS Compliance

6.2. The SMS Send Request & Successful Reception by Technology, Average Success Rate & End to End Delivery Time and Delivery Duration by Technology are shown in the graphs.

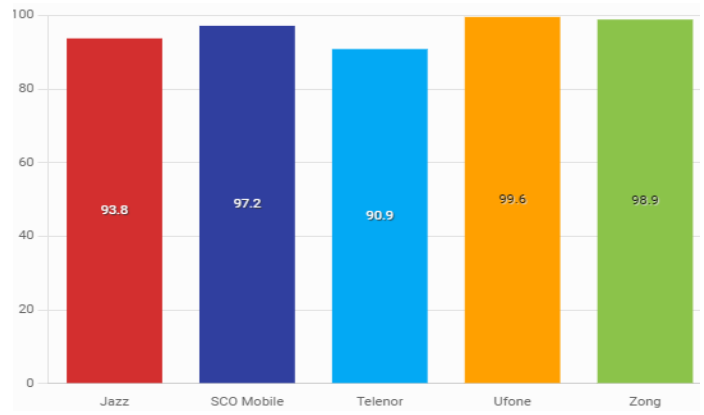
SMS SEND REQUEST BY TECHNOLOGY



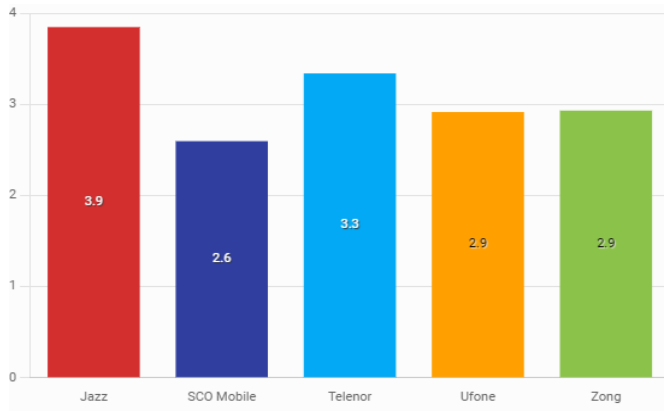
SMS SUCCESSFUL RECEPTION BY TECHNOLOGY



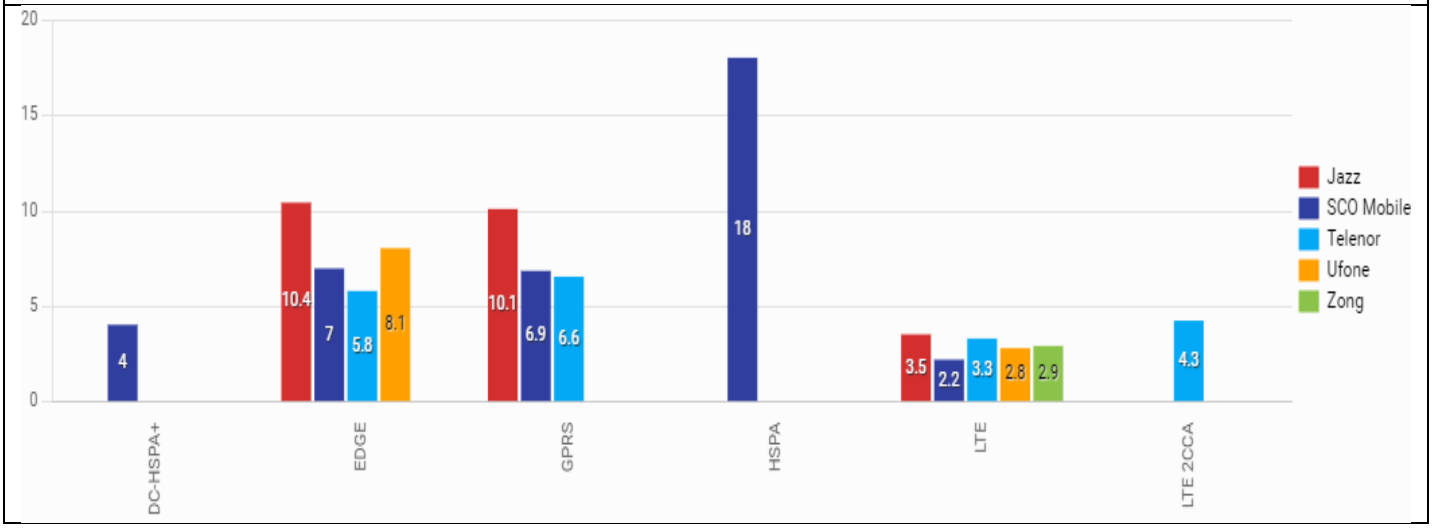
SMS RECEIVE SUCCESS RATE (%)



SMS END TO END DELIVERY TIME (SECONDS)



SMS DELIVERY DURATION BY TECHNOLOGY



SURVEY MAPS & GRAPHICAL RESULTS

7.1 The 4G/LTE (RSRP), 3G(RSCP), and Ookla Signal Strength samples recorded during drive test on survey routes and plotted on maps. The Signal Strength maps are attached as **Annex-A** while the Voice & SMS QoS KPIs survey results in graphical form are shown at **Annex-B,** for 3x surveyed Cities of AJK.

STANDING IN SURVEY

8.1. CMOs have been prioritized/ placed at 1st, 2nd, 3rd, 4th & 5th position in each category i.e. Mobile Network Coverage, Mobile Broadband Service and Voice Service based on the compliance level against each QoS KPI in each category in **3 x surveyed cities**.

a. **MOBILE NETWORK COVERAGE.** The categorization of CMOs as per QoS KPI i.e. Signal Strength of 4G/LTE Networks is shown in **Table 8.1: CMOs Standing in Mobile Network Coverage (Automode)**, and Signal Strength of 3G Networks is shown in **Table 8.2: CMOs Standing in Mobile Network Coverage (3G Locked Mode)**.

S. #.	Operator	Compliance Level – Number of Cities		Standing
		Compliant	Non-Compliant	
1.	Ufone	3	-	1st
2.	ZonG	3	-	1st
3.	Telenor	3	-	1st
4.	Jazz	3	-	1st
5.	SCOM	1	2	2nd

Table 8.1: CMOs Standing in Mobile Network Coverage (Automode)

S. #.	Operator	Compliance Level – Number of Cities		Standing
		Compliant	Non-Compliant	
1.	SCOM	3	-	1st
2.	Ufone	3G Services Not Offered by Other CMOs		
3.	ZonG			
4.	Telenor			
5.	Jazz			

Table 8.2: CMOs Standing in Mobile Network Coverage (3G Locked Mode)

b. **MOBILE BROADBAND SERVICE.** The categorization of each CMOs, as per the highest to lowest obtained User Data Throughput in 4G/LTE Networks is shown in **Table 8.3: CMOs Standing in User Download Data Throughput – Technology Auto Detect Mode.**

S. #.	Operator	Highest Download Throughput – Number of Cities										Standing	
		Technology Auto Detect Mode											
		Fixed Duration					Fixed Size					Fixed Duration	Fixed Size
		1st	2nd	3rd	4th	5th	1st	2nd	3rd	4th	5th		
1.	ZonG	3	-	-	-	-	2	1	-	-	-	1st	1st
2.	Jazz	-	1	1	1	-	-	-	2	1	-	2nd	5th
3.	Telenor	-	1	-	1	1	-	1	-	-	2	3rd	4th
4.	SCOM	-	1	-	-	2	1	-	-	1	1	4th	2nd
5.	Ufone	-	-	2	1	-	-	1	1	1	-	5th	3rd

Table 8.3: CMOs Standing in User Download Data Throughput – Technology Auto Detect Mode

(i) User Upload Data Throughput: The User Upload Data Throughput in Fixed Duration and Fixed Size Testing, as per the highest to lowest obtained results, is shown in **Table 8.4: CMOs Standing in User Upload Data Throughput – Technology Auto Detect Mode**

S. #.	Operator	Highest Upload Throughput – Number of Cities										Standing	
		Technology Auto Detect Mode										Fixed Duration	Fixed Size
		Fixed Duration					Fixed Size						
		1st	2nd	3rd	4th	5th	1st	2nd	3rd	4th	5th		
2.	ZonG	3	-	-	-	-	2	1	-	-	-	1st	1st
3.	Ufone	-	2	1	-	-	1	1	-	1	-	2nd	2nd
5.	SCOM	-	1	2	-	-	-	-	3	-	-	3rd	4th
4.	Telenor	-	-	-	2	1	-	1	-	1	1	4th	3rd
1.	Jazz	-	-	-	1	2	-	-	-	1	2	5th	5th

Table 8.4: CMOs Standing in User Upload Data Throughput – Technology Auto Detect Mode

(ii) Webpage Loading Time. The categorization of each CMOs, as per the maximum compliant of Webpage Loading Time QoS KPIs is shown, is shown in **Table 8.5: CMOs Standing in Webpage Loading Time.**

S. #.	Operator	Webpage Loading Time - Number of Cities		Standing
		Compliant	Non-Compliant	
1.	Jazz	3	-	1st
2.	ZonG	3	-	1st
3.	Ufone	3	-	1st
4.	Telenor	3	-	1st
5.	SCOM	3	-	1st

Table 8.5: CMOs Standing in Webpage Loading Time

(iii) Latency. The categorization of each CMOs, as per the maximum compliant of Latency KPIs is shown in **Table 8.6: CMOs Standing in Automode Latency.**

S. #.	Operator	Latency - Number of Cities		Standing
		Compliant	Non-Compliant	
1.	Ufone	2	1	1st
2.	SCOM	2	1	1st
3.	Telenor	1	2	2nd
4.	Jazz	0	3	3rd
5.	ZonG	0	3	3rd

Table 8.6: CMOs Standing in Automode Latency

(iv) Ookla. The Ookla Throughput Testing Results for Download and Upload, as per the highest to lowest obtained results, are shown in (i) **Table 8.7: CMOs Standing in Ookla Download Throughput.** (ii) **Table 8.8: CMOs Standing in Ookla Upload Throughput.** (ii) **Table 8.9: CMOs Standing in Ookla Latency.**

S. #.	Operator	Ookla Download Throughput – Number of Cities					Standing
		1st	2nd	3rd	4th	5th	
1.	ZonG	3	-	-	-	-	1st
2.	Ufone	-	1	1	1	-	2nd
3.	Telenor	-	1	1	-	1	3rd
4.	SCOM	-	1	-	1	1	4th
5.	Jazz	-	-	1	1	1	5th

Table 8.7: CMOs Standing in Ookla Download Throughput.

S. #.	Operator	Ookla Upload Throughput – Number of Cities					Standing
		1st	2nd	3rd	4th	5th	
1.	ZonG	3	-	-	-	-	1st
3.	Ufone	-	2	1	-	-	2nd
2.	SCOM	-	1	2	-	-	3rd
4.	Telenor	-	-	-	2	1	4th
5.	Jazz	-	-	-	1	2	5th

Table 8.8: CMOs Standing in Ookla Upload Throughput.

S. #.	Operator	Ookla Latency - Number of Cities		Standing
		Compliant	Non-Compliant	
1.	Jazz	3	0	1st
2.	Telenor	3	0	1st
3.	SCOM	3	0	1st
4.	Ufone	2	1	2nd
5.	ZonG	2	1	2nd

Table 8.9: CMOs Standing in Ookla Latency

c. **VOICE SERVICE.** The categorization of each CMOs, as per the maximum compliant of Voice QoS KPIs is shown in **Table 8.10: CMOs Standing in Voice Service.**

S. #.	Operator	Voice QoS KPIs		Standing
		Compliant	Non-Compliant	
1.	Ufone	17	4	1st
2.	SCOM	16	5	2nd
3.	Telenor	16	5	2nd
4.	ZonG	10	6	3rd
5.	Jazz	10	6	3rd

Table 8.10: CMOs Standing in Voice Service

d. **SMS SERVICE.** The categorization of each CMOs, as per the maximum compliant of SMS QoS KPIs is shown in **Table 8.11: CMOs Standing in SMS Service.**

S. #.	Operator	SMS QoS KPIs		Standing
		Compliant	Non-Compliant	
1.	Ufone	6	0	1st
2.	Zong	4	2	2nd
3.	Jazz	3	3	3rd
4.	Telenor	3	3	3rd
5.	SCOM	3	3	3rd

Table 8.11: CMOs Standing in SMS Service

e. **OVERALL STANDING.** The overall standing of each CMOs in different category of services is mentioned in **Table 8.12: CMOs Overall Standing in QoS Survey.**

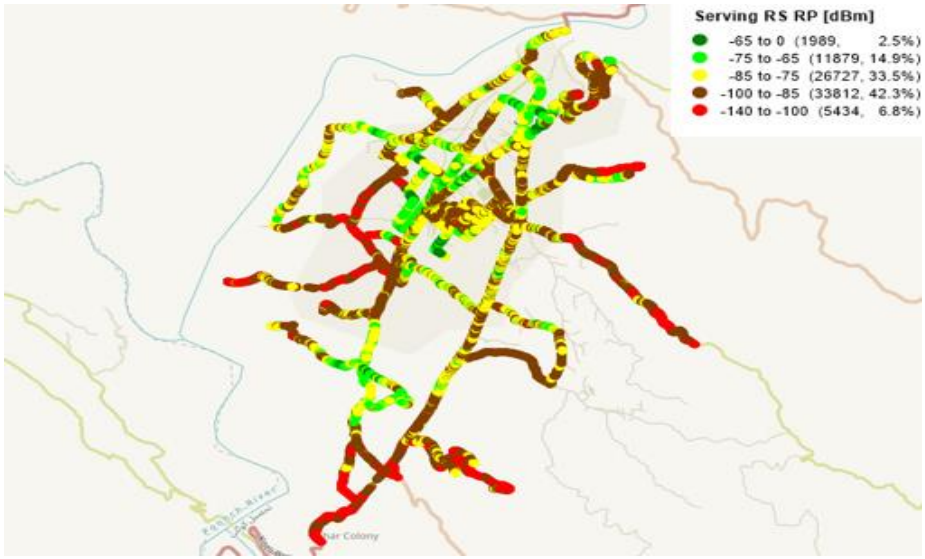
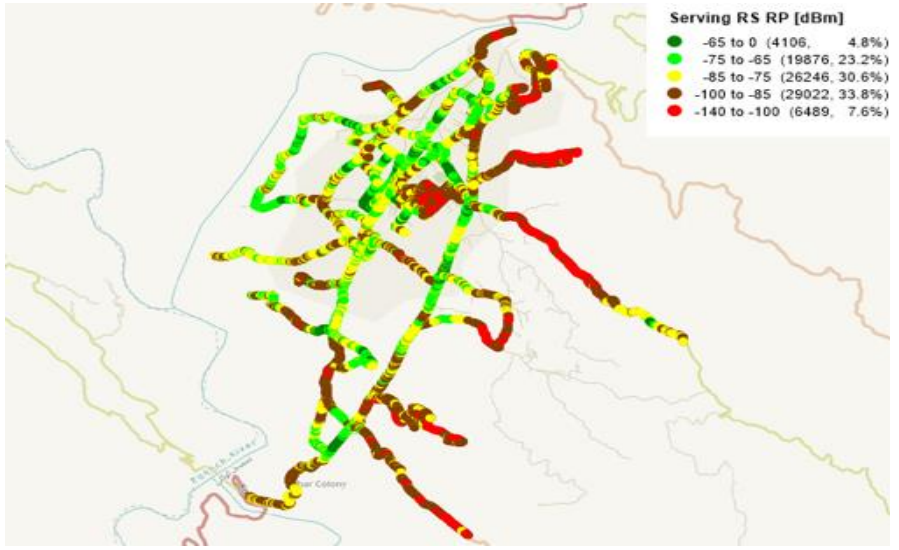
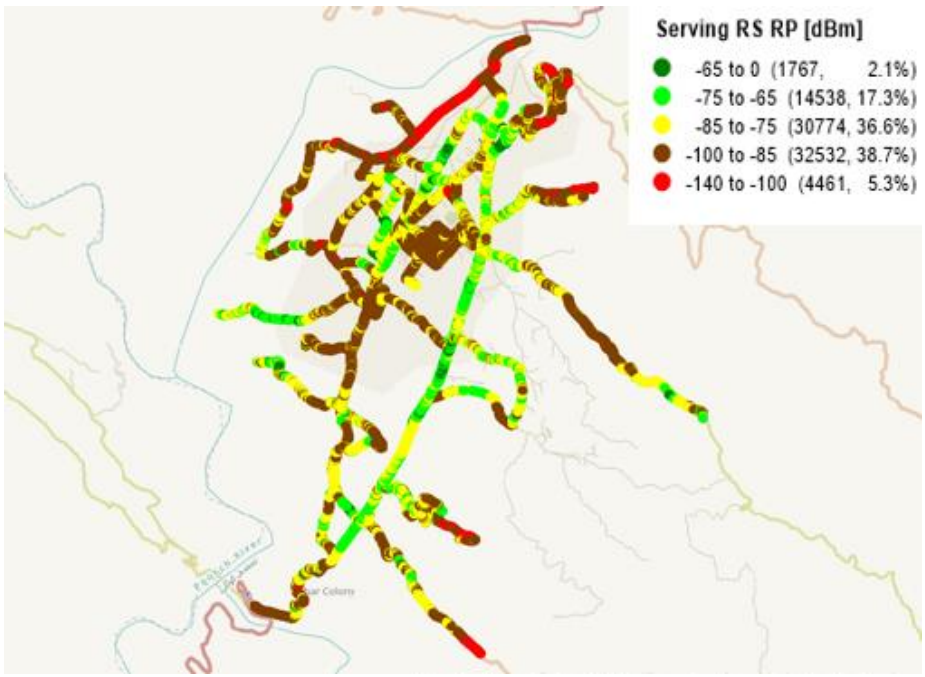
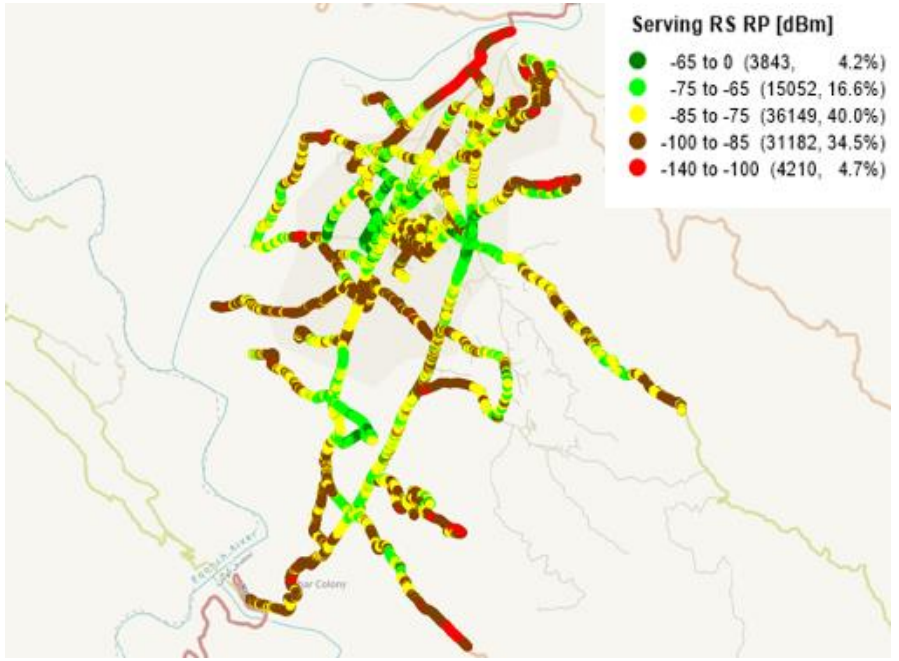
S. #.	Service				STANDING				
					1st	2nd	3rd	4th	5th
1.	Mobile Network Coverage	Automode			Jazz, Telenor, Ufone, ZonG	SCOM	-	-	-
		3G			SCOM	3G Services Not Offered by Other CMOs			
2.	Mobile Broadband	Automode	Fixed Duration	Download	ZonG	Jazz	Telenor	SCOM	Ufone
				Upload	ZonG	Ufone	SCOM	Telenor	Jazz
			Fixed Size	Download	ZonG	SCOM	Ufone	Telenor	Jazz
				Upload	ZonG	Ufone	Telenor	SCOM	Jazz
		3G	Fixed Duration	Download	SCOM	3G Services Not Offered By Other CMOs			
				Upload					
			Fixed Size	Download					
				Upload					
		Ookla		Download	ZonG	Ufone	Telenor	SCOM	Jazz
				Upload	ZonG	Ufone	SCOM	Telenor	Jazz
		Automode		Web Page Loading Time	Jazz, Telenor, Ufone, ZonG, SCOM	-	-	-	-
		3G			SCOM	3G Services Not Offered By Other CMOs			
		Auto mode		Latency	Ufone, SCOM	Telenor	ZonG, Jazz	-	-
		Ookla			Jazz, Telenor, SCOM	Ufone, ZonG	-	-	-
		3G			SCOM	3G Services Not Offered By Other CMOs			
3.	Voice				Ufone	SCOM, Telenor	ZonG, Jazz	-	-
4	SMS				Ufone	ZonG	Jazz, Telenor, SCOM		

Table 8.12: CMOs Overall Standing in QoS Survey

Annex-A (Coverage Maps)

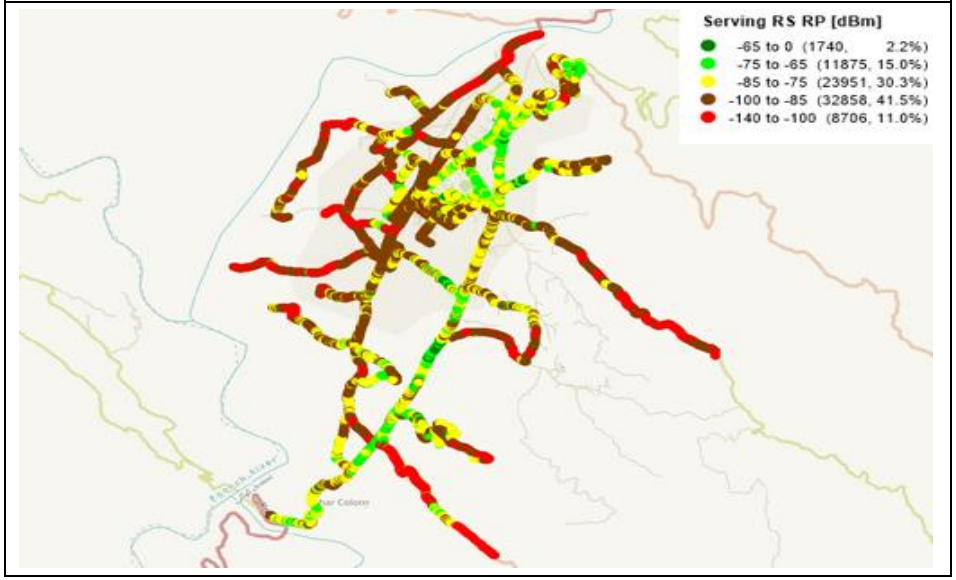
DATA AUTOMODE

AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

JAZZ AUTOMODE NETWORK COVERAGE – KOTLI	TELENOR AUTOMODE NETWORK COVERAGE – KOTLI
	
UFONE AUTOMODE NETWORK COVERAGE – KOTLI	**ZONG AUTOMODE NETWORK COVERAGE – KOTLI**
	

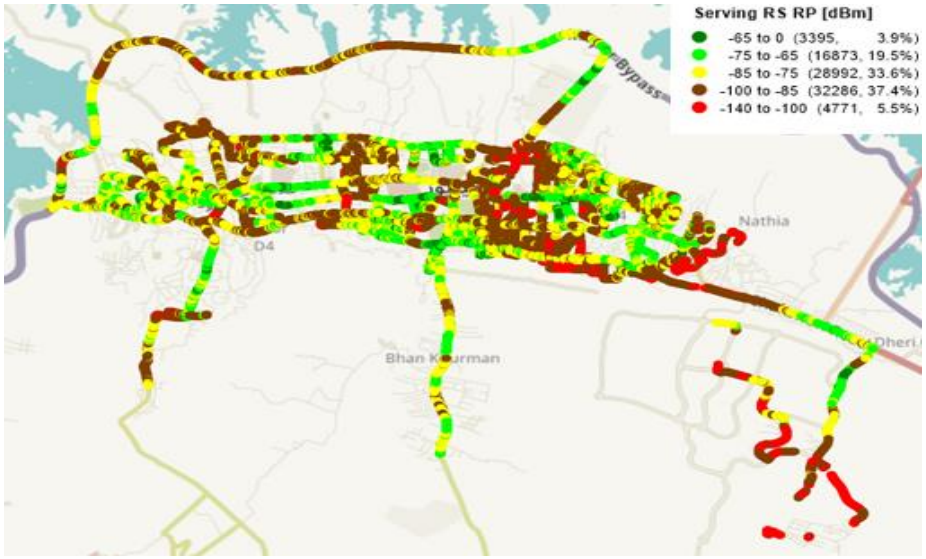
AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

SCO AUTOMODE NETWORK COVERAGE – KOTLI

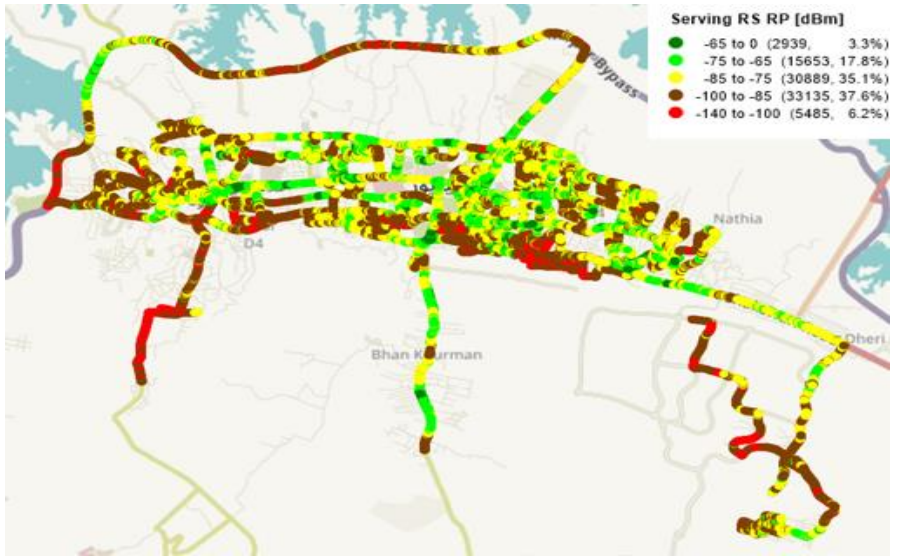


AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

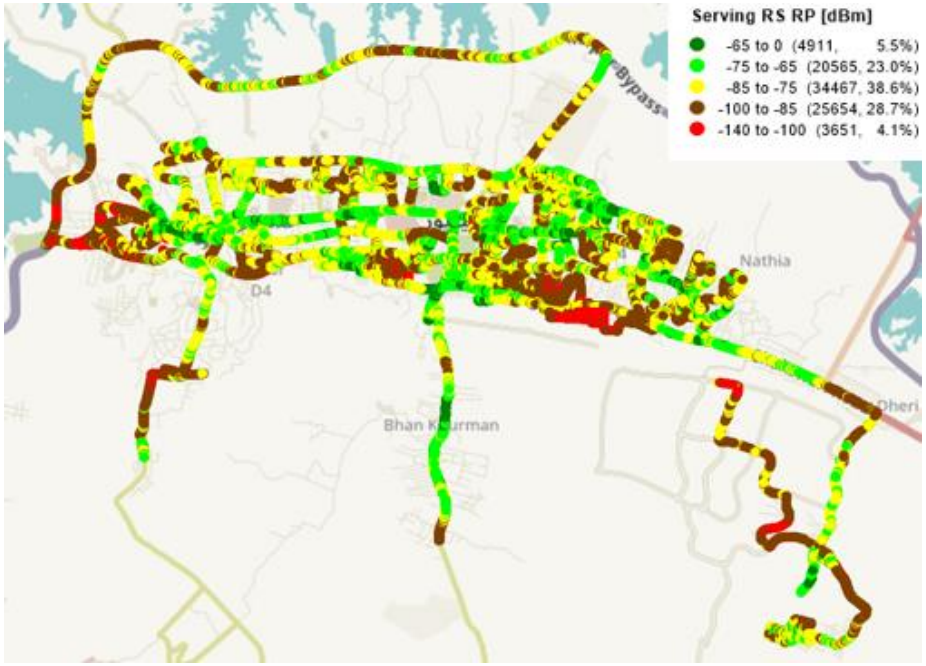
JAZZ AUTOMODE NETWORK COVERAGE – MIRPUR



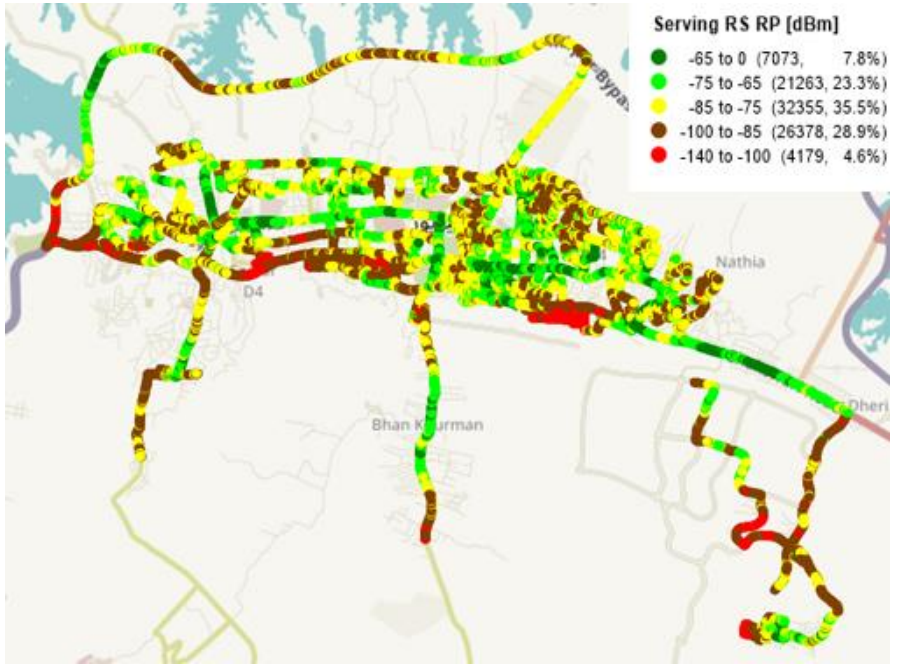
TELENOR AUTOMODE NETWORK COVERAGE – MIRPUR



UFONE AUTOMODE NETWORK COVERAGE – MIRPUR

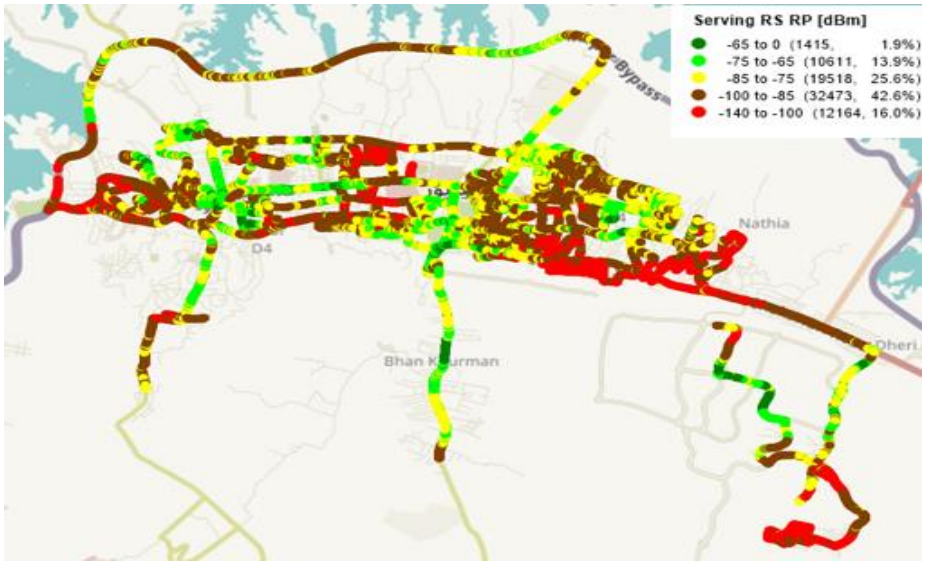


ZONG AUTOMODE NETWORK COVERAGE – MIRPUR



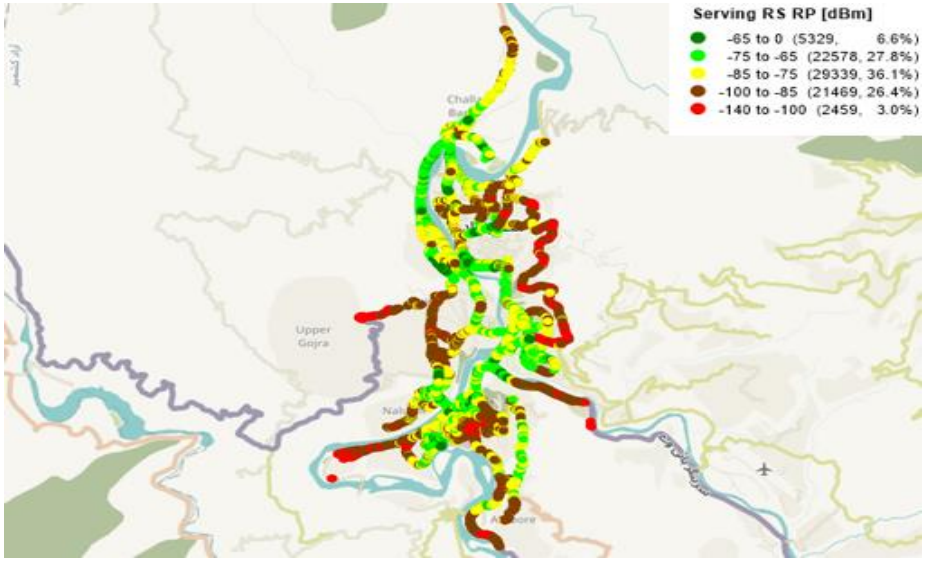
AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

SCO AUTOMODE NETWORK COVERAGE – MIRPUR

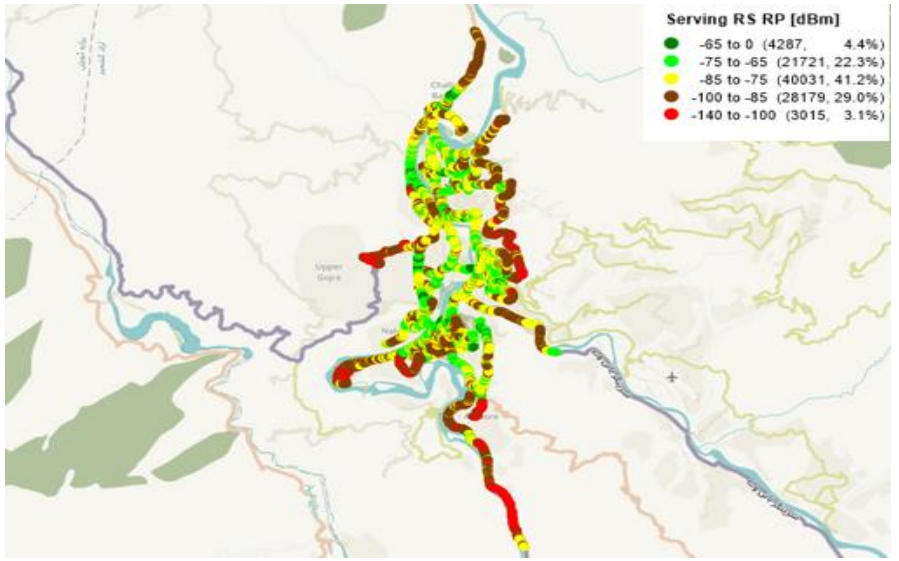


AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

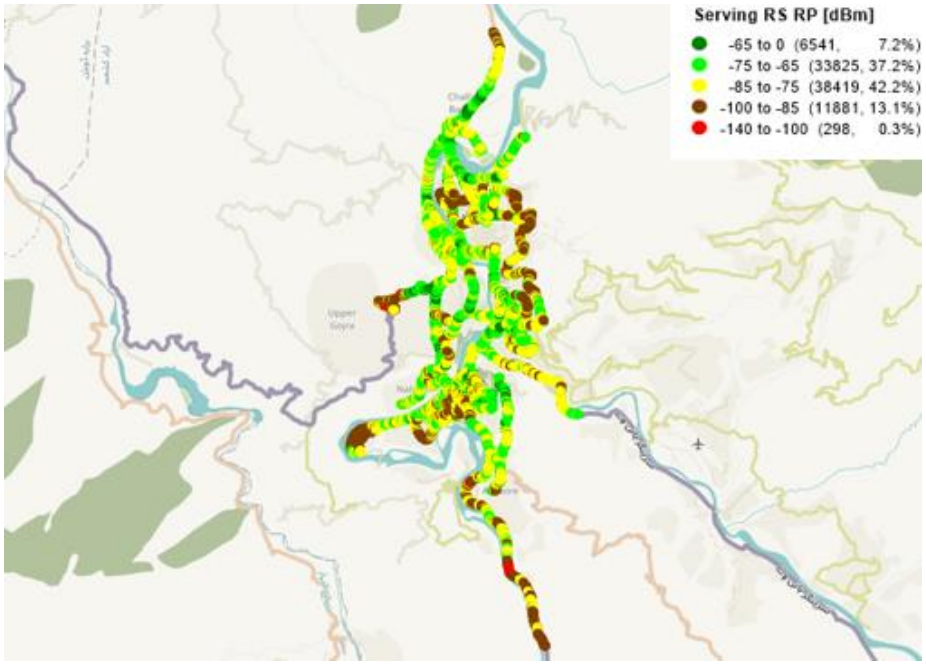
JAZZ AUTOMODE NETWORK COVERAGE – MUZAFARABAD



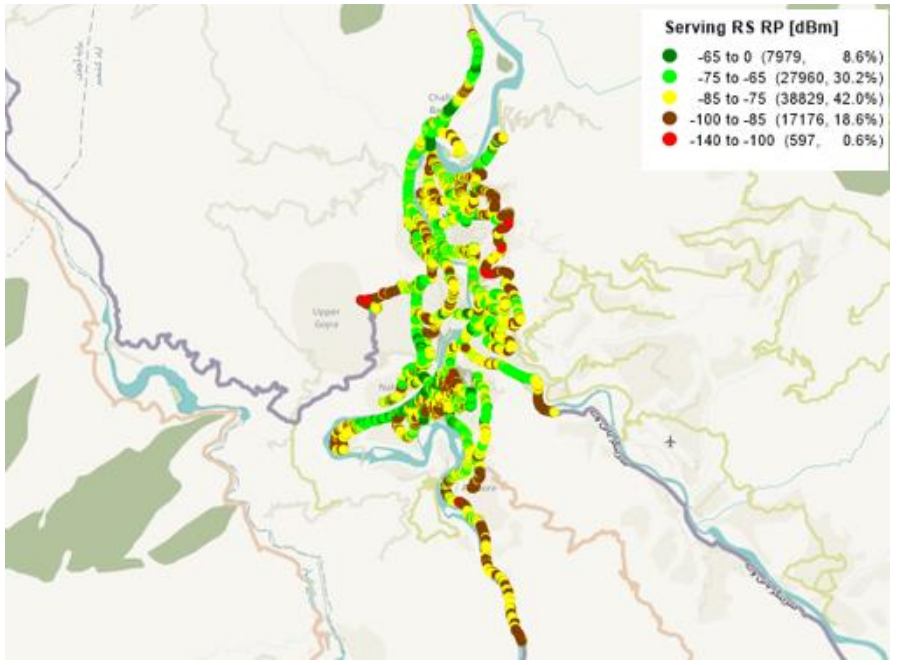
TELENOR AUTOMODE NETWORK COVERAGE – MUZAFARABAD



UFONE AUTOMODE NETWORK COVERAGE – MUZAFARABAD

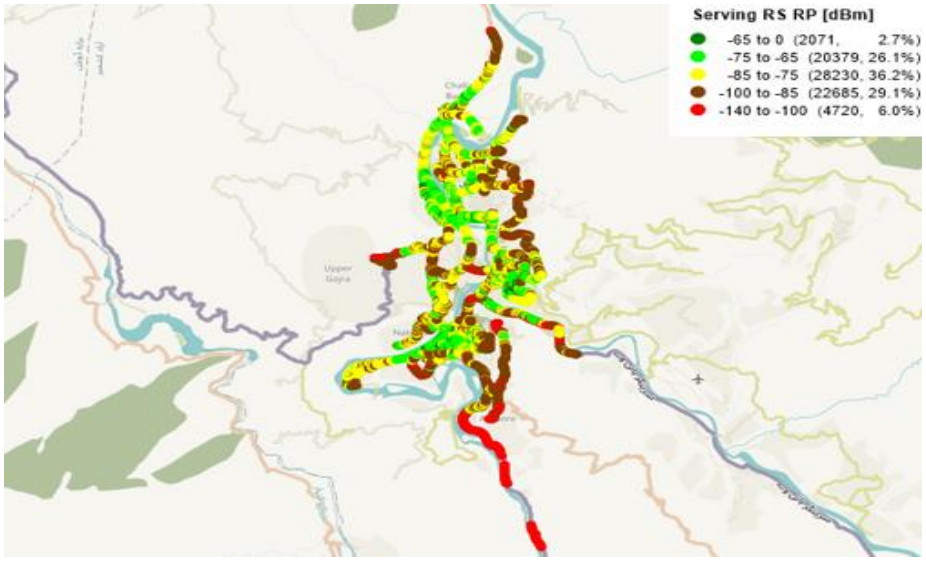


ZONG AUTOMODE NETWORK COVERAGE – MUZAFARABAD



AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

SCO AUTOMODE NETWORK COVERAGE – MUZAFARABAD

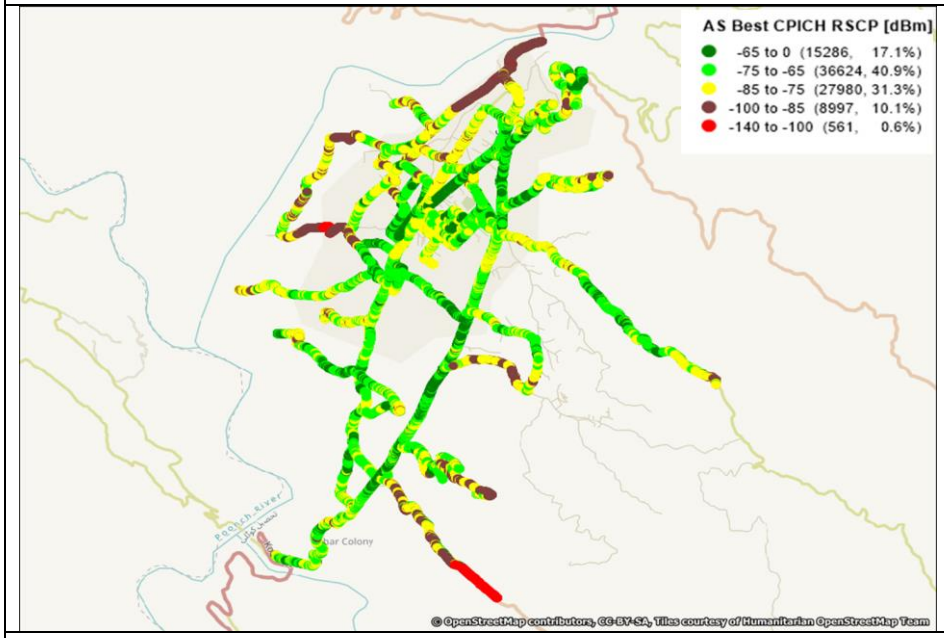


Annex-A (Coverage Maps)

DATA 3G LOCKED MODE

3G LOCKED MODE MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

SCOM 3G NETWORK COVERAGE – KOTLI



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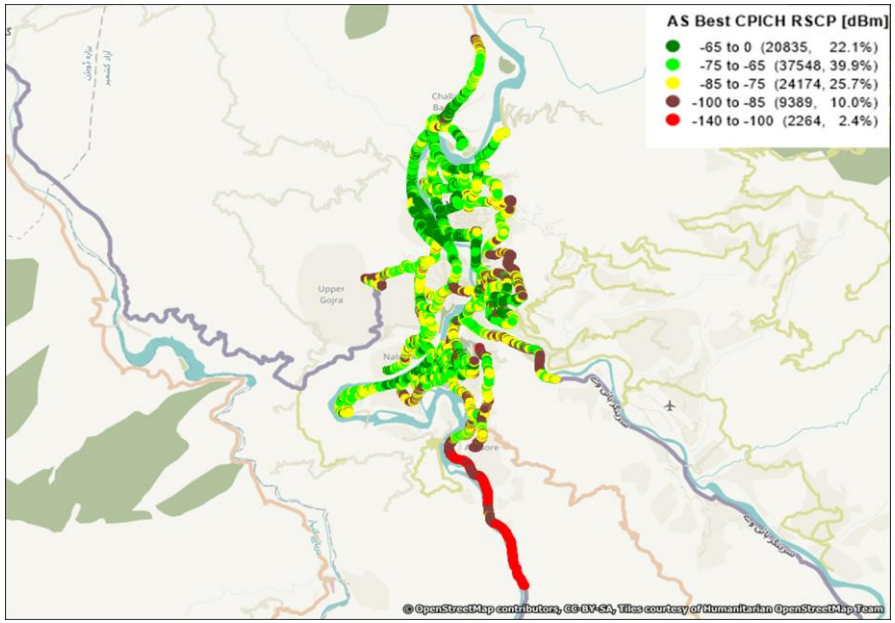
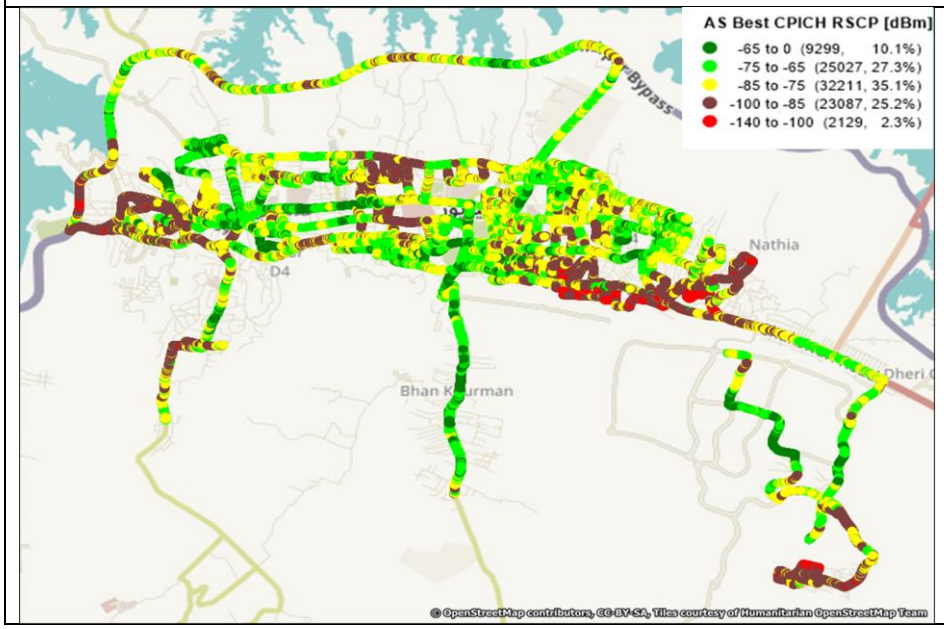


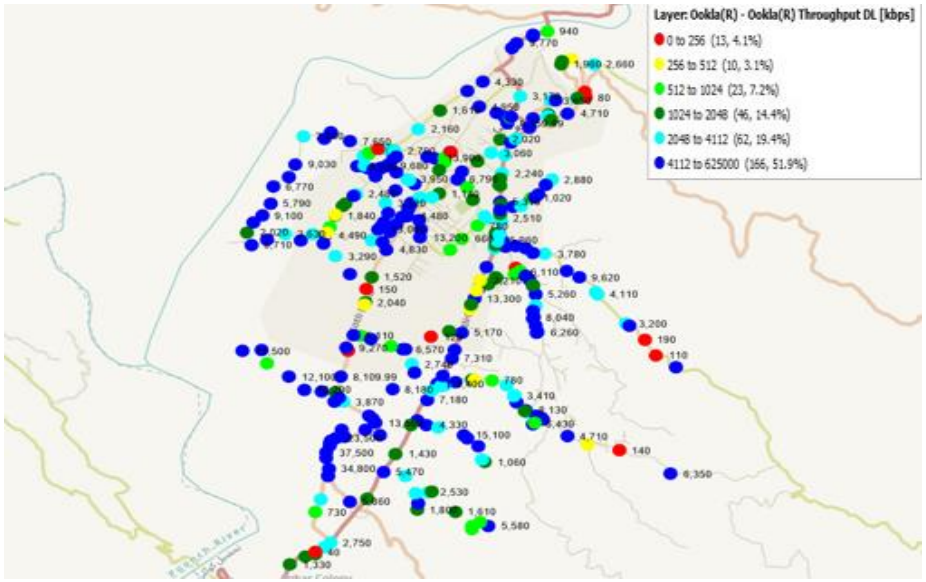
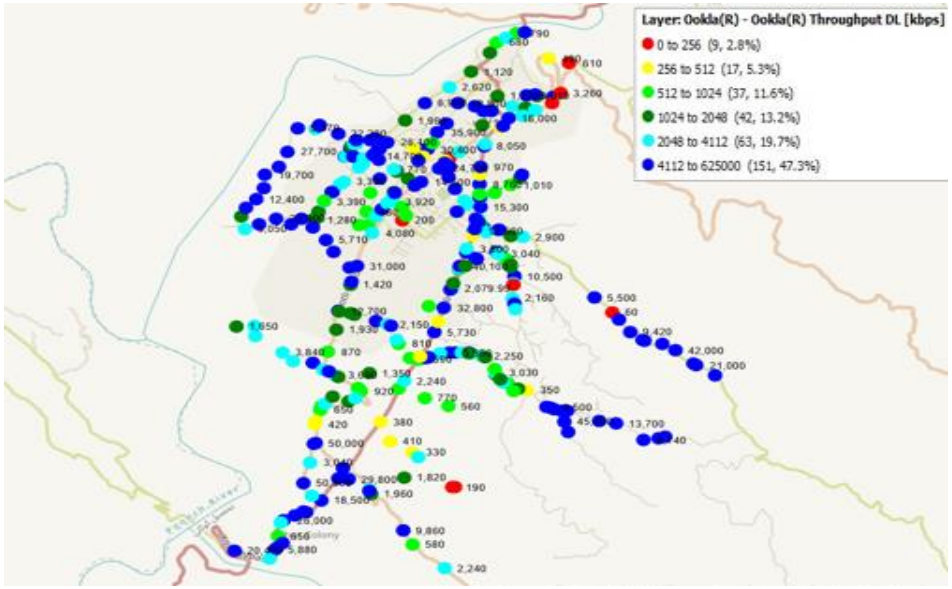
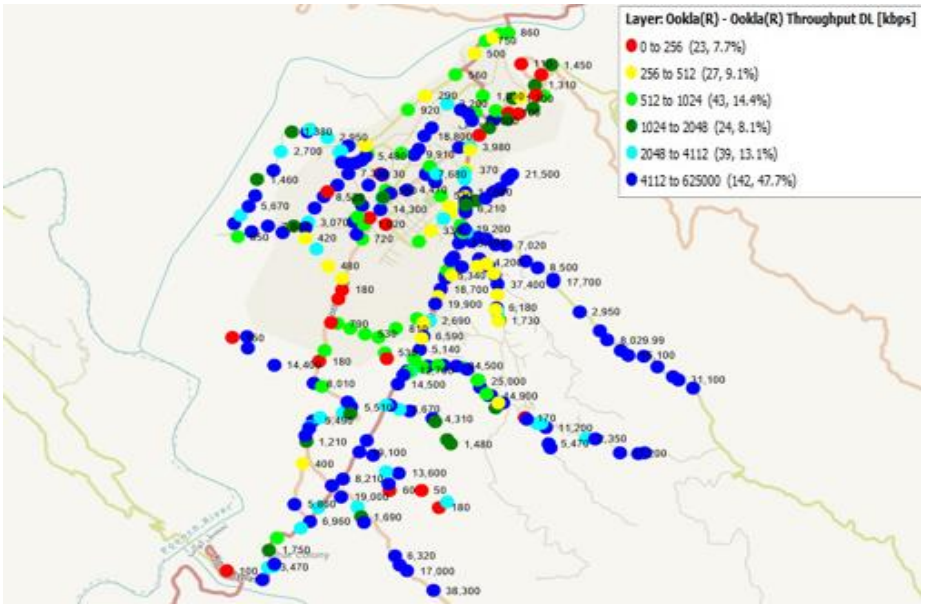
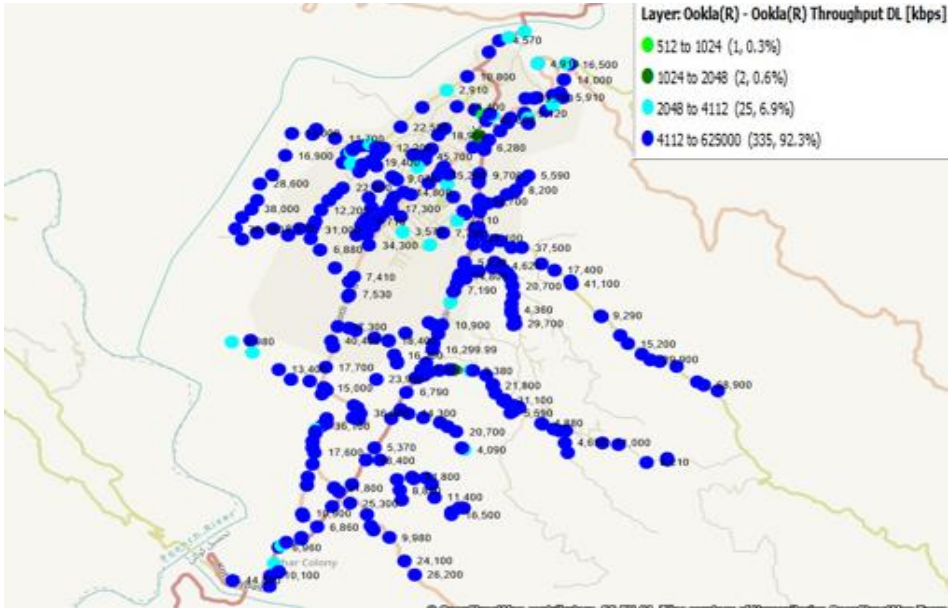
SCOM 3G NETWORK COVERAGE – MIRPUR



Annex-A (Coverage Maps)

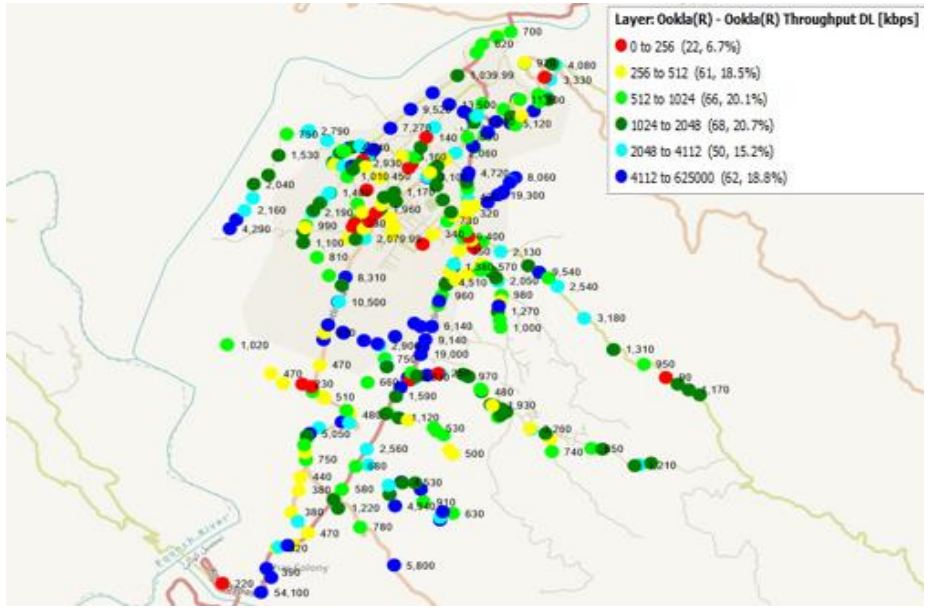
OOKLA

OOKLA SPEED TEST RESULTS

JAZZ DOWNLOAD THROUGHPUT – KOTLI	TELENOR DOWNLOAD THROUGHPUT – KOTLI
	
UFONE DOWNLOAD THROUGHPUT – KOTLI	**ZONG DOWNLOAD THROUGHPUT – KOTLI**
	

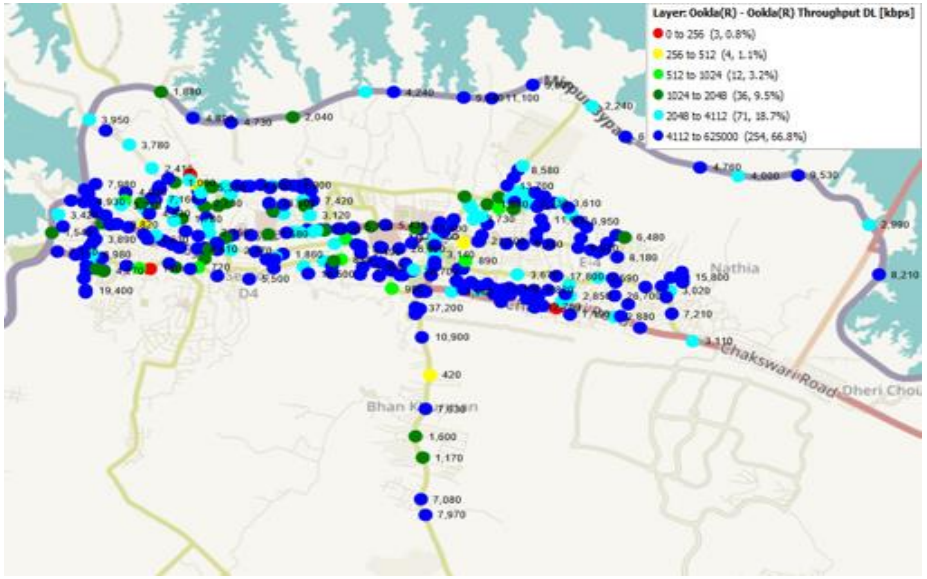
OOKLA SPEED TEST RESULTS

SCO DOWNLOAD THROUGHPUT – KOTLI

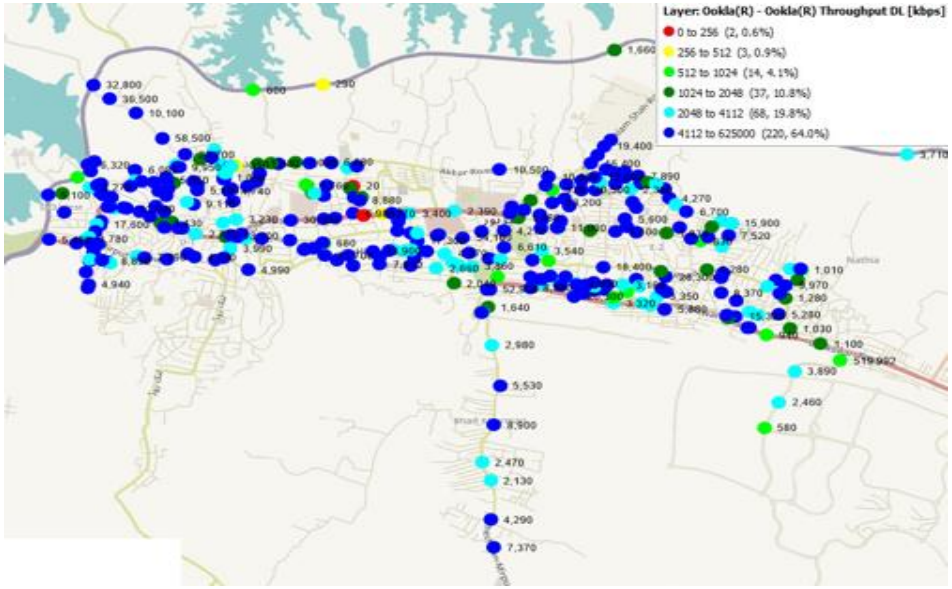


OOKLA SPEED TEST RESULTS

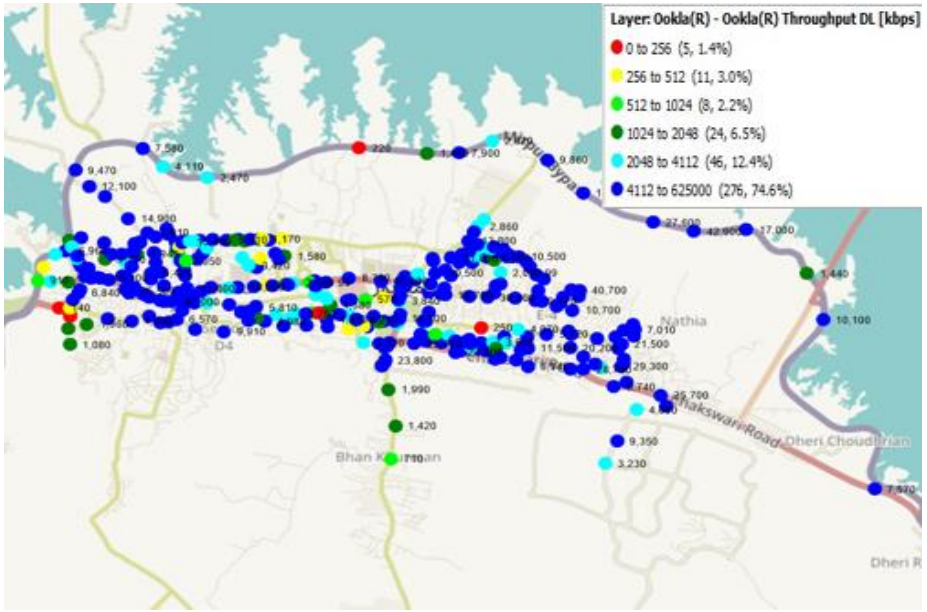
JAZZ DOWNLOAD THROUGHPUT – MIRPUR



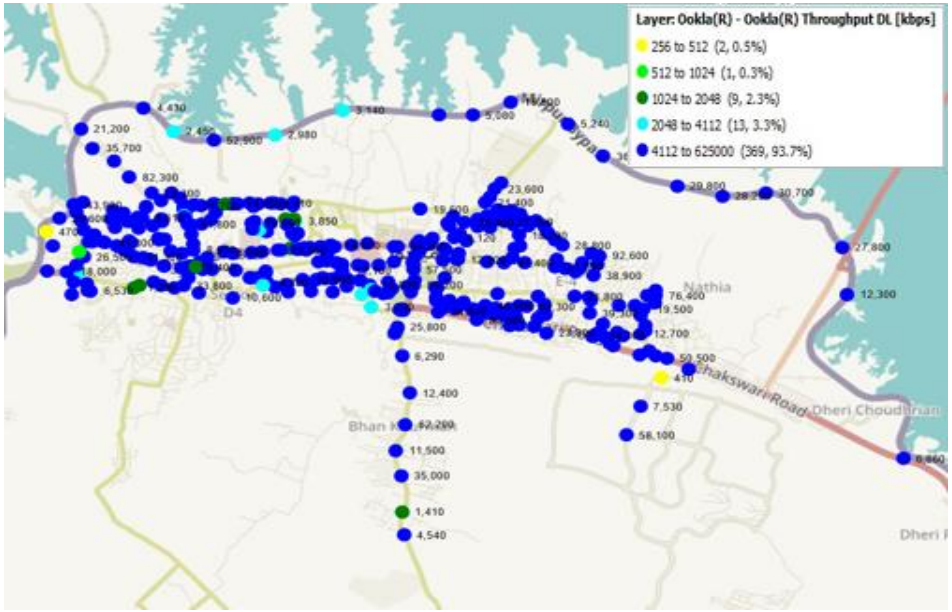
TELENOR DOWNLOAD THROUGHPUT – MIRPUR



UFONE DOWNLOAD THROUGHPUT – MIRPUR

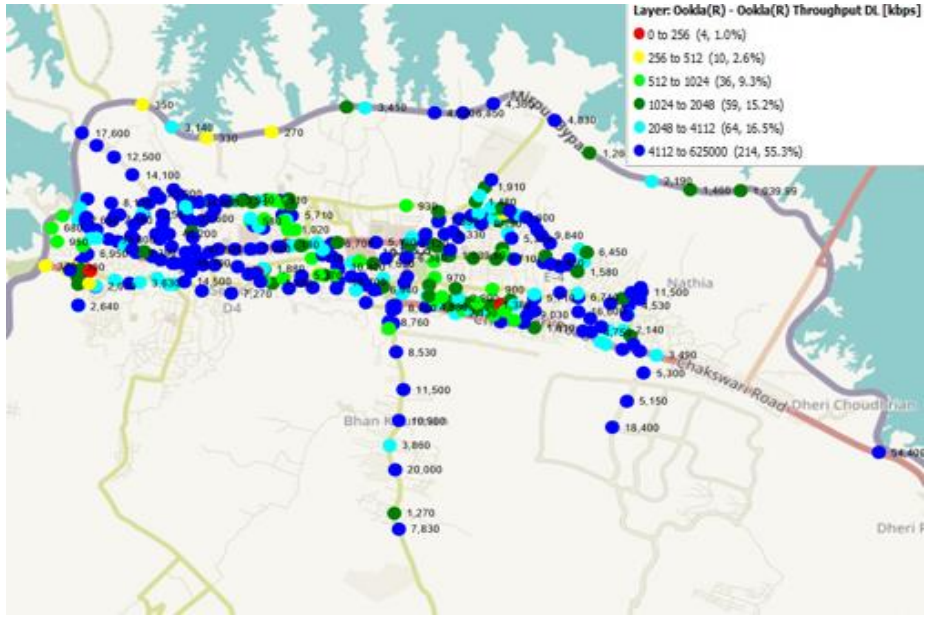


ZONG DOWNLOAD THROUGHPUT – MIRPUR



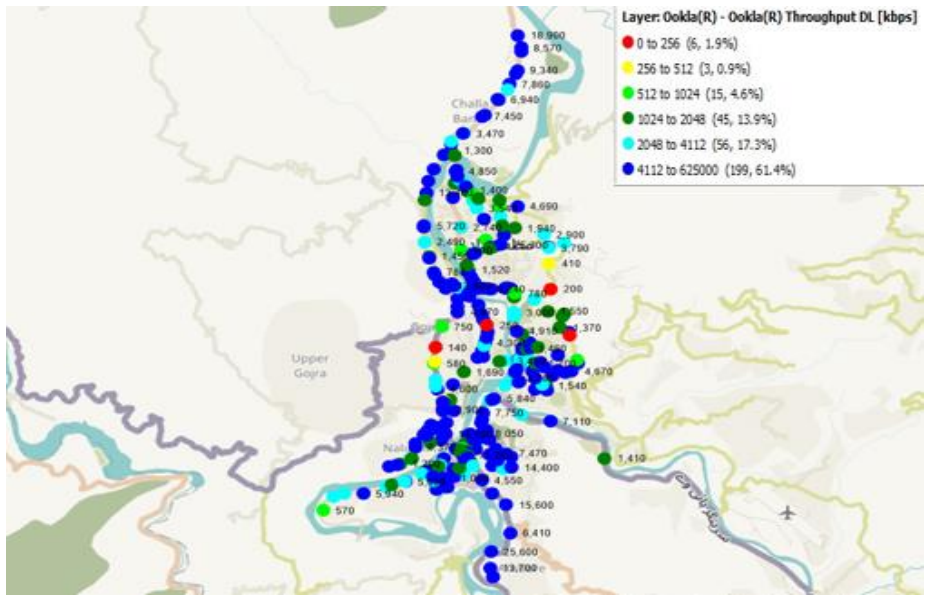
OOKLA SPEED TEST RESULTS

SCO DOWNLOAD THROUGHPUT – MIRPUR

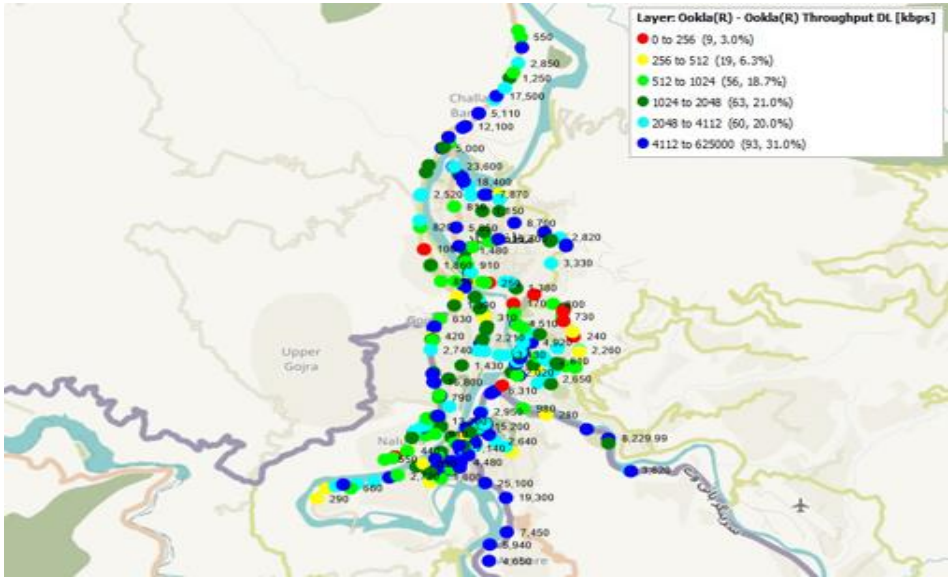


OOKLA SPEED TEST RESULTS

JAZZ DOWNLOAD THROUGHPUT – MUZAFARABAD



TELENOR DOWNLOAD THROUGHPUT – MUZAFARABAD



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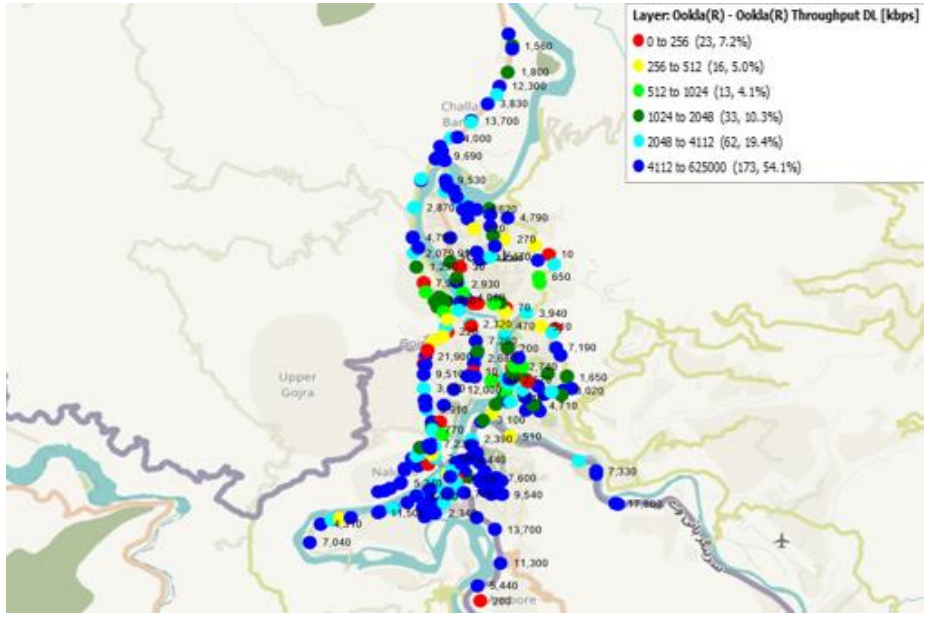

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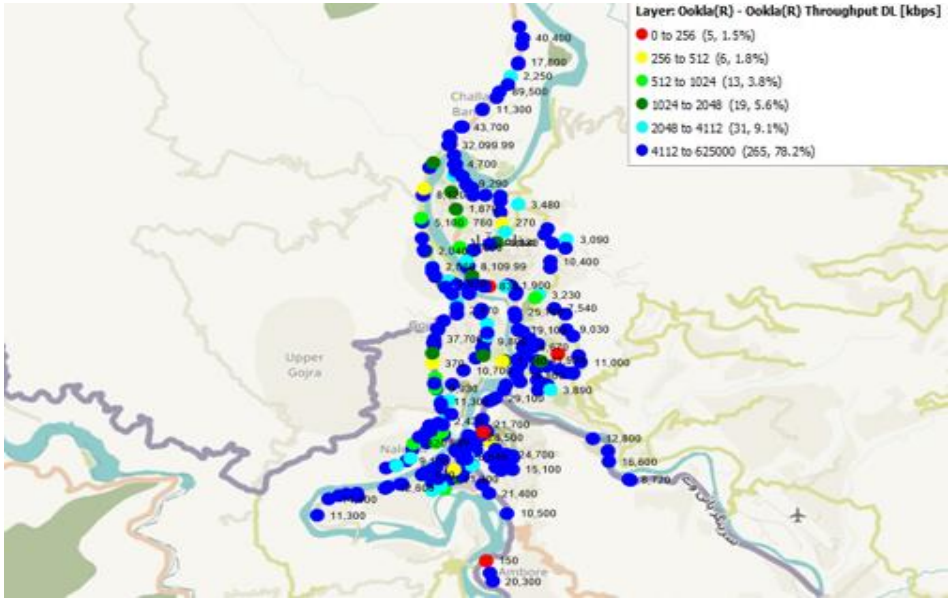
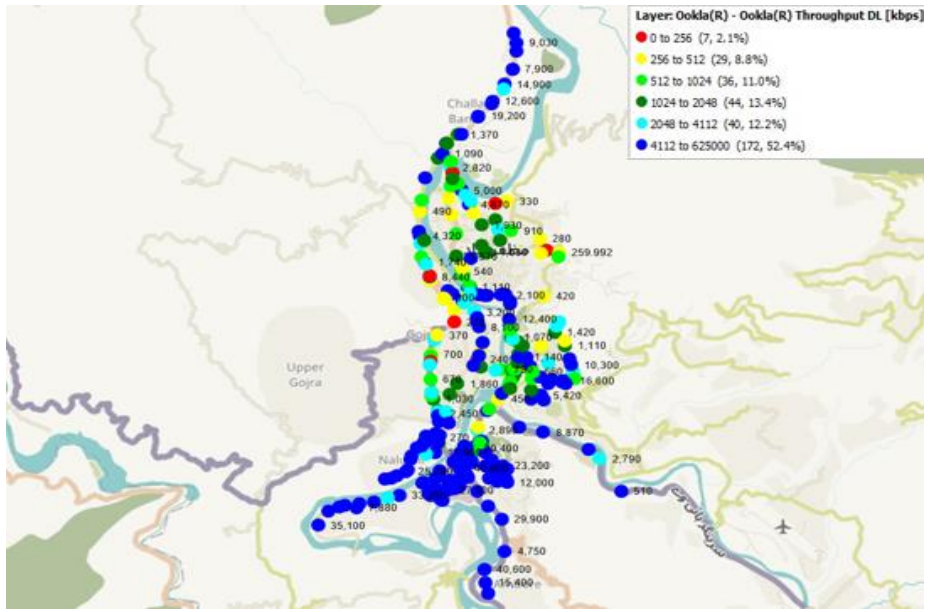


OOKLA SPEED TEST RESULTS

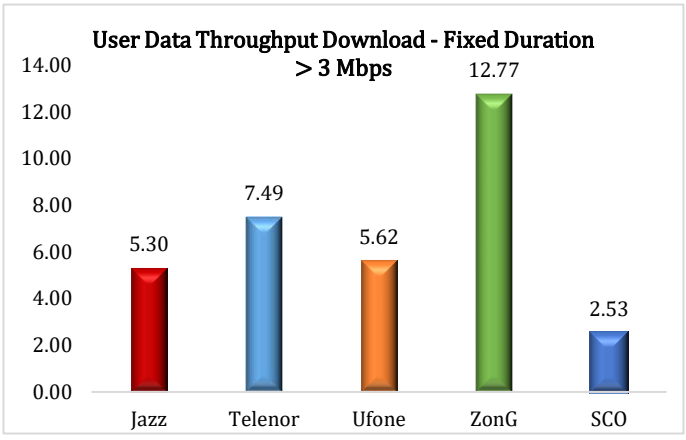
SCO DOWNLOAD THROUGHPUT – MUZAFARABAD

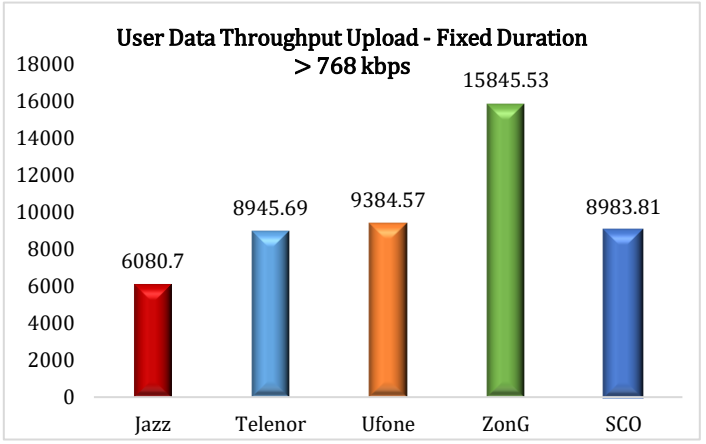


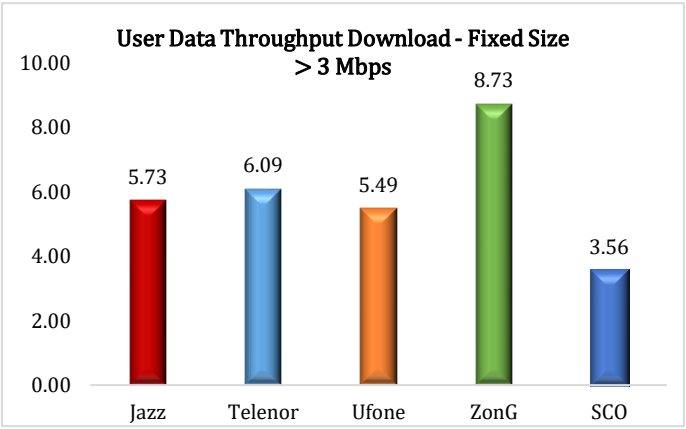
Annex-B (QoS KPIs)

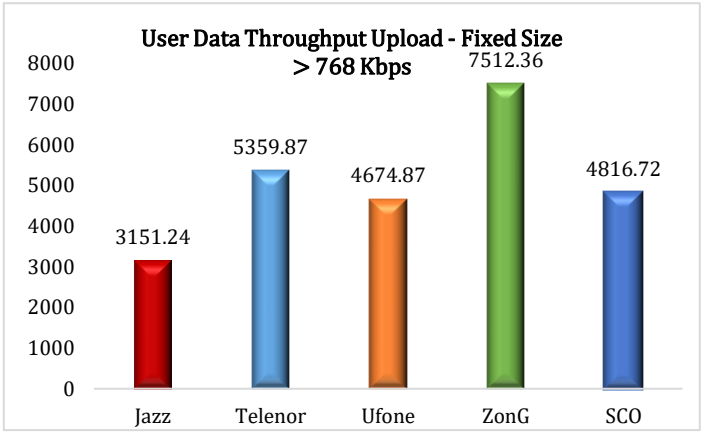
DATA AUTOMODE

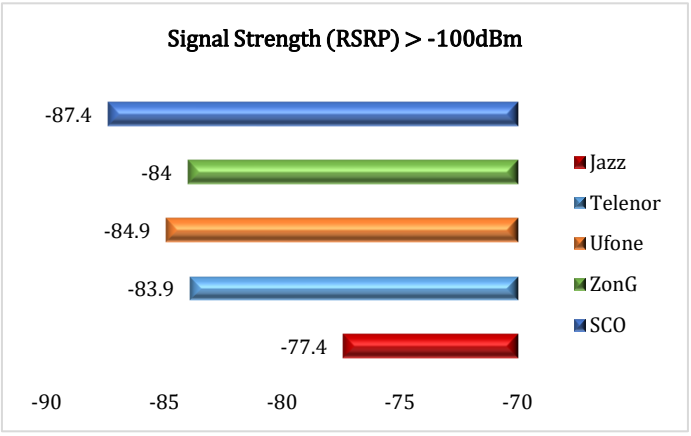
QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – KOTLI

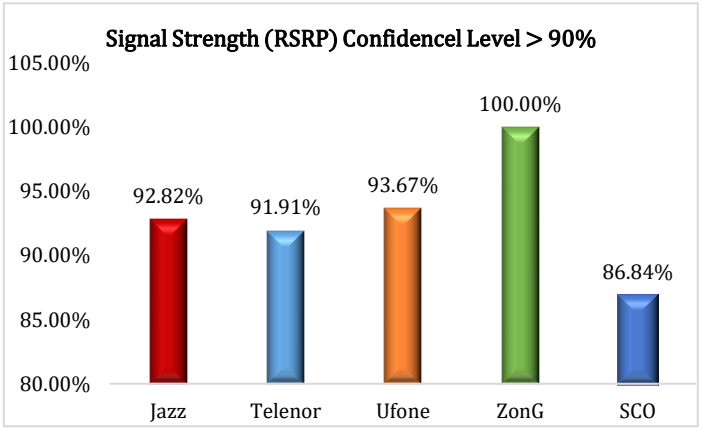


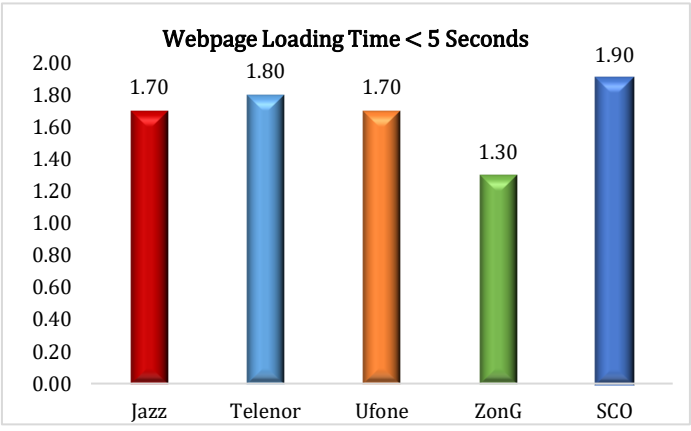


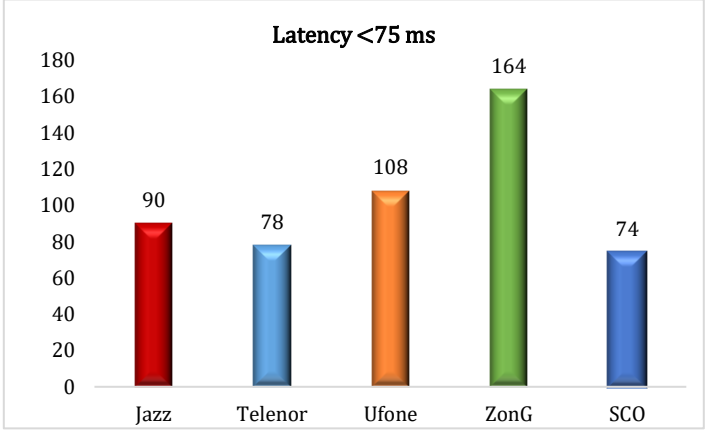




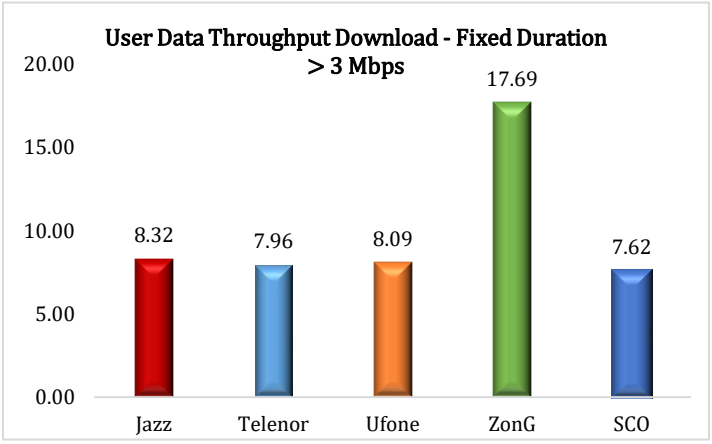


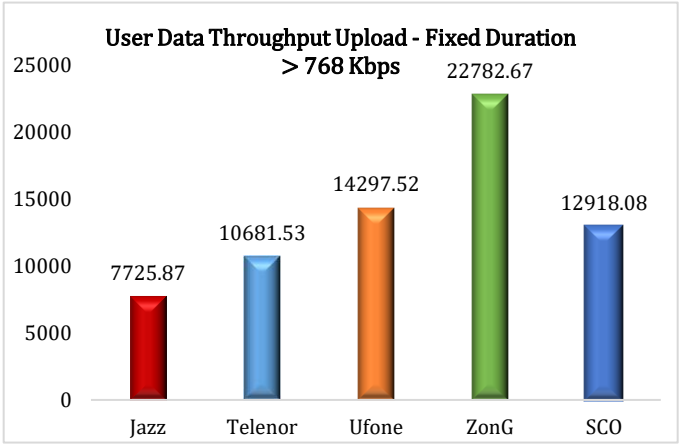


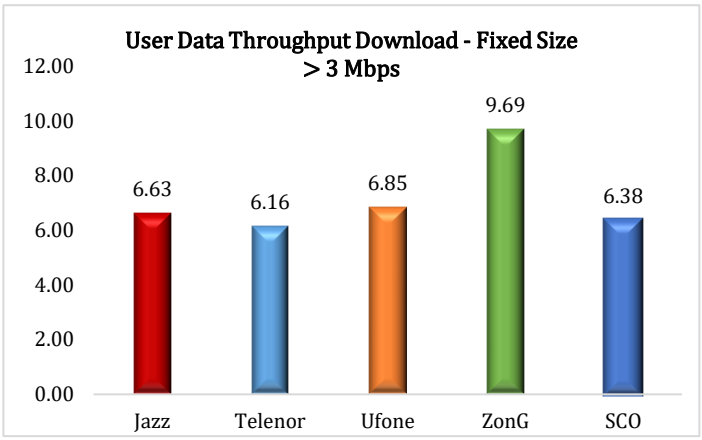


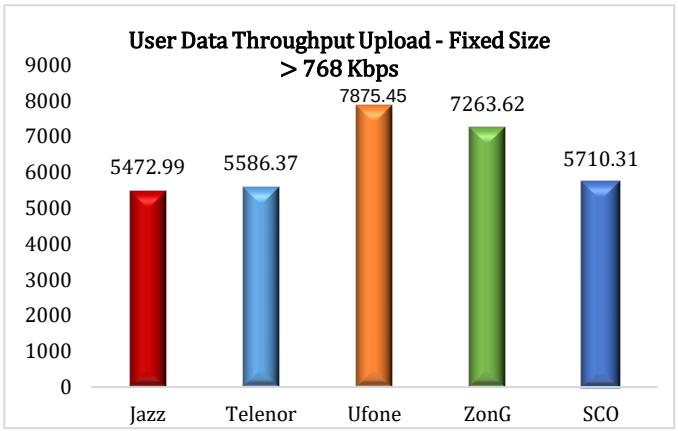


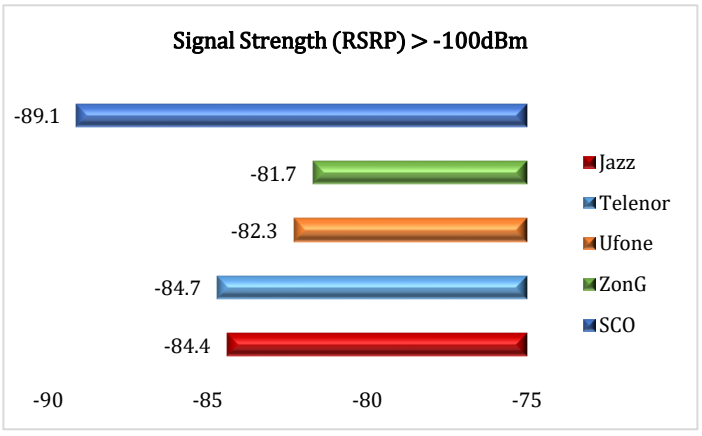
QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – MIRPUR

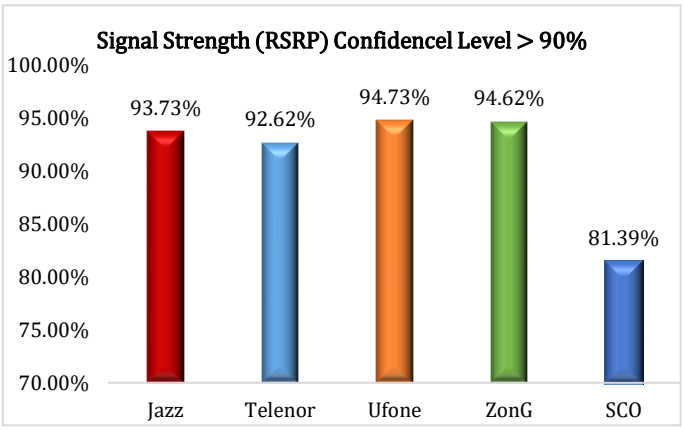


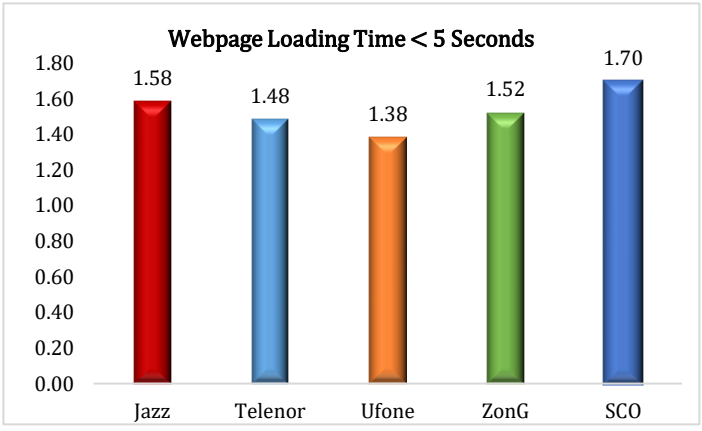


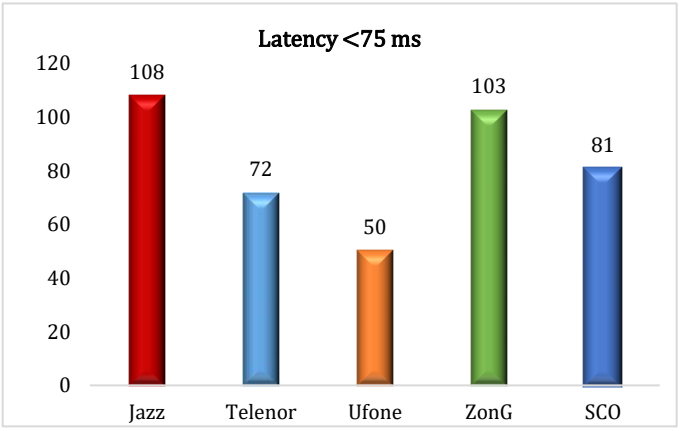




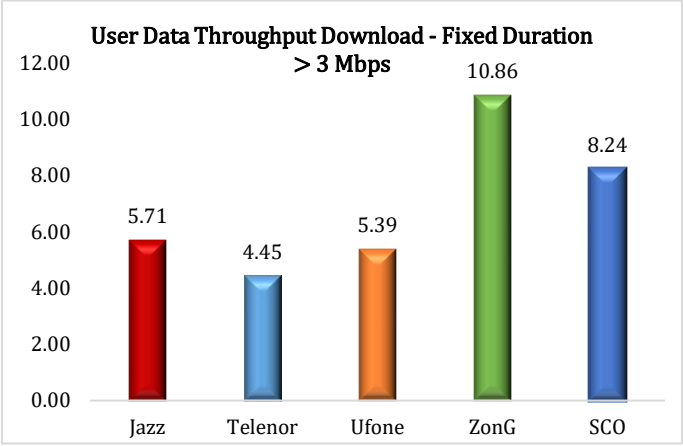


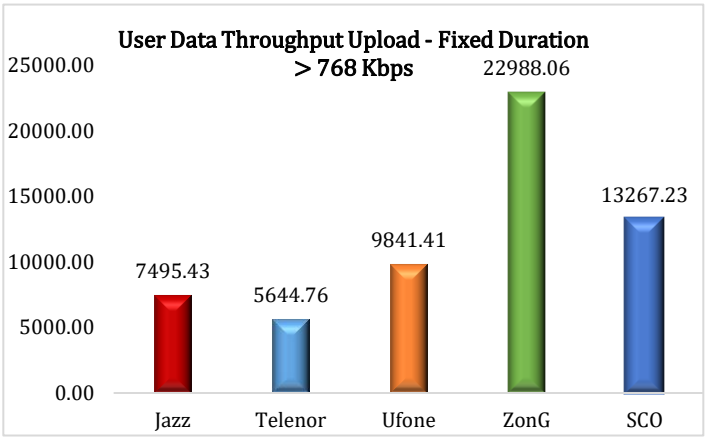


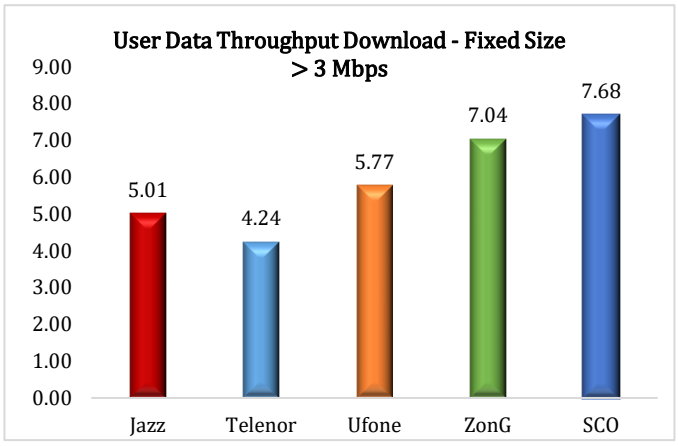


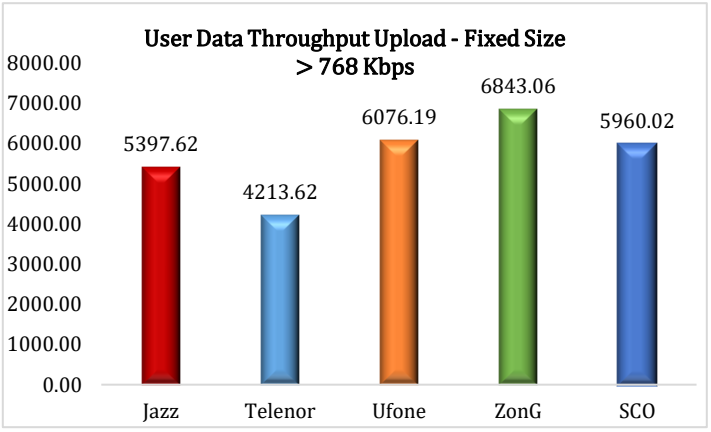


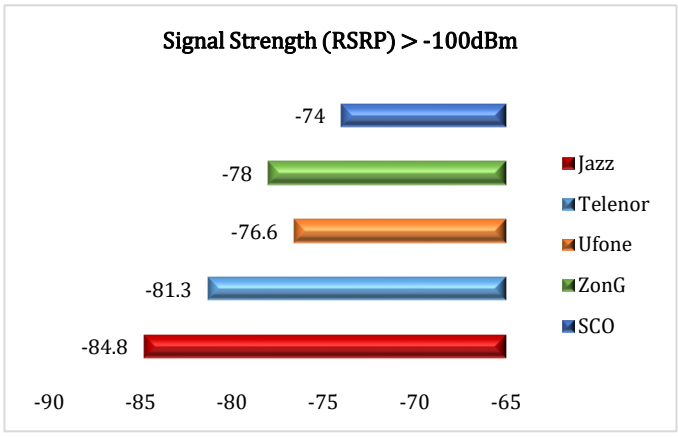
QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – MUZAFARABAD

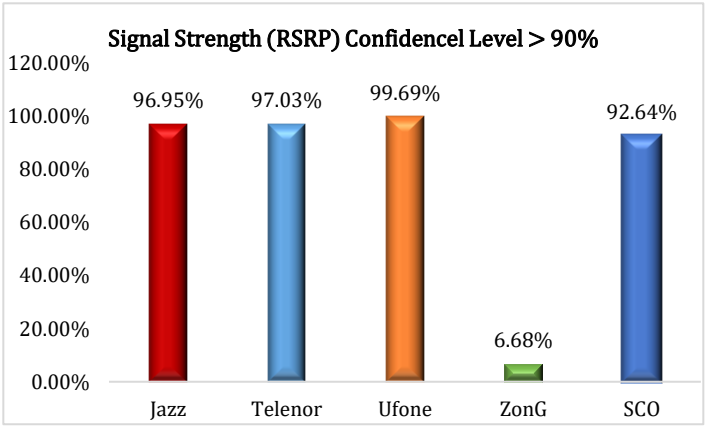


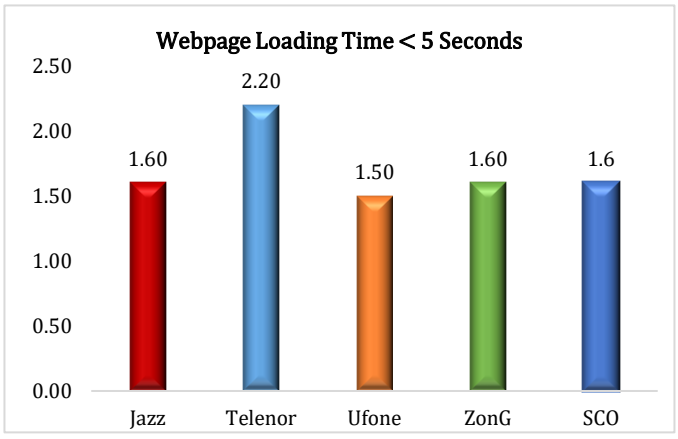


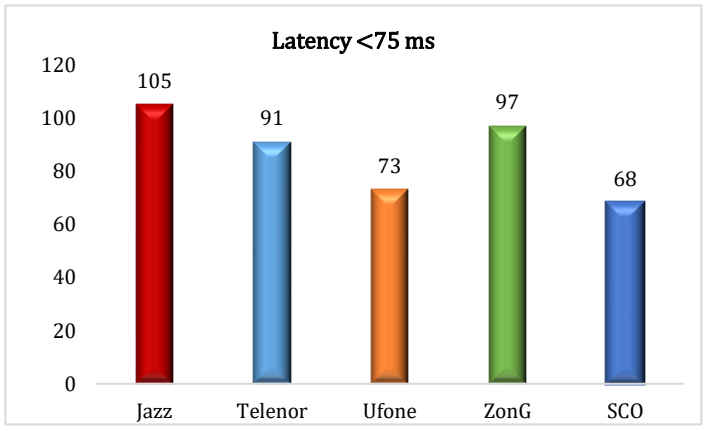








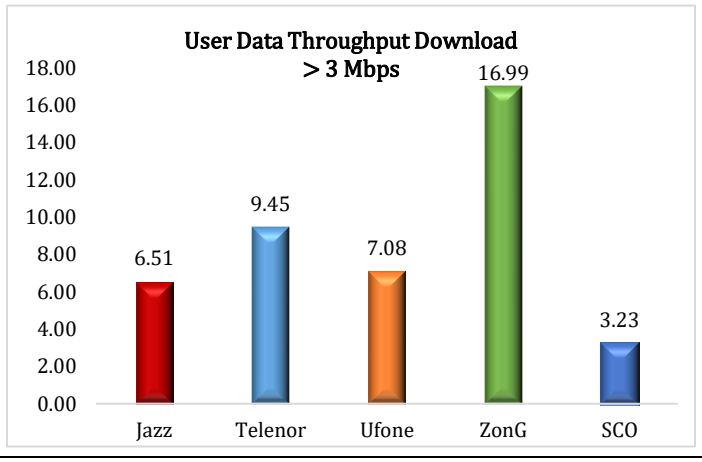


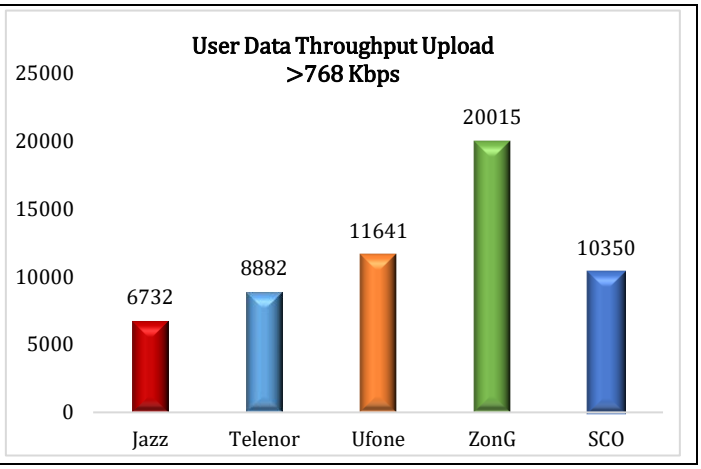


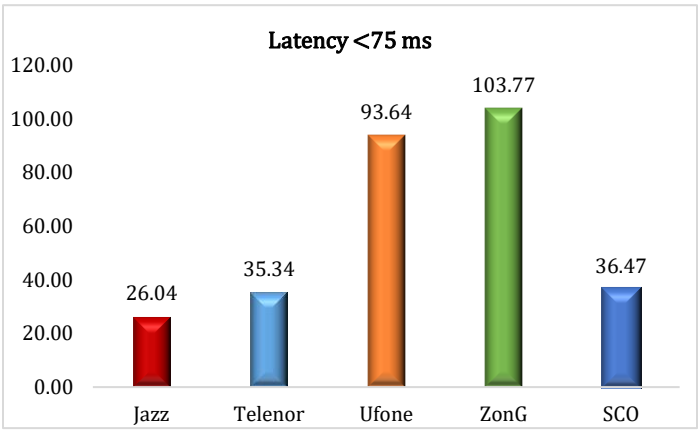
Annex-B (QoS KPIs)

OOKLA

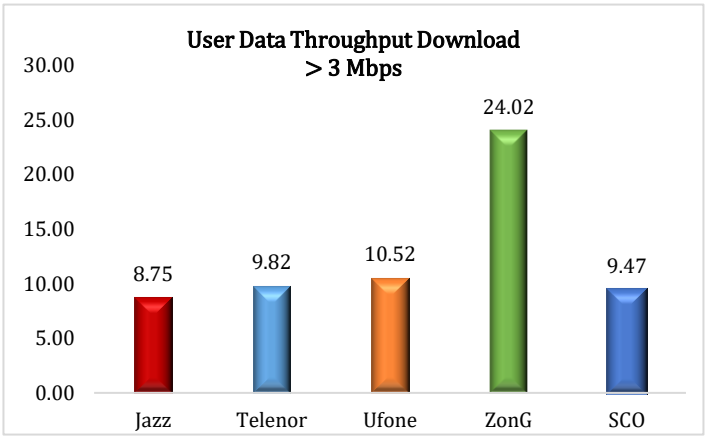
QUALITY OF SERVICE SURVEY RESULTS (Ookla) –KOTLI

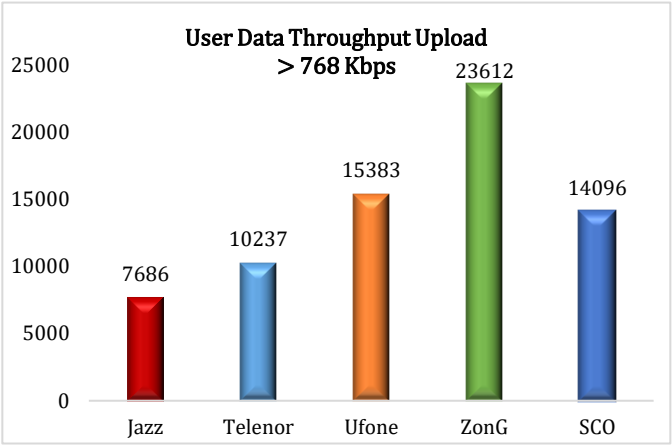


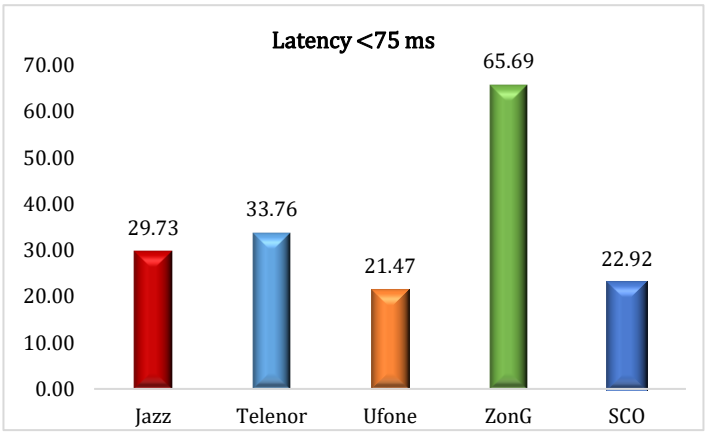




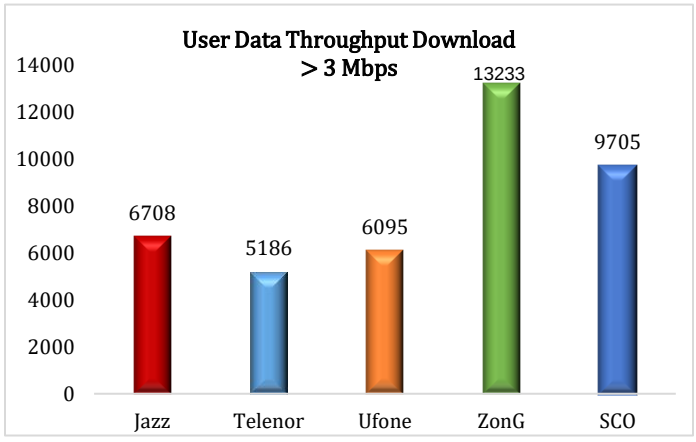
QUALITY OF SERVICE SURVEY RESULTS (Ookla) –MIRPUR

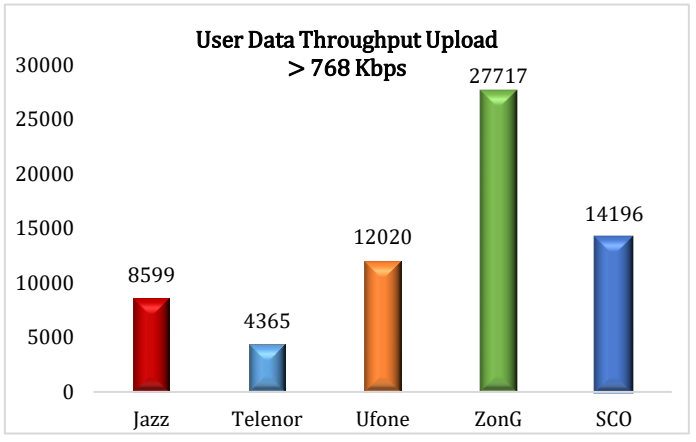


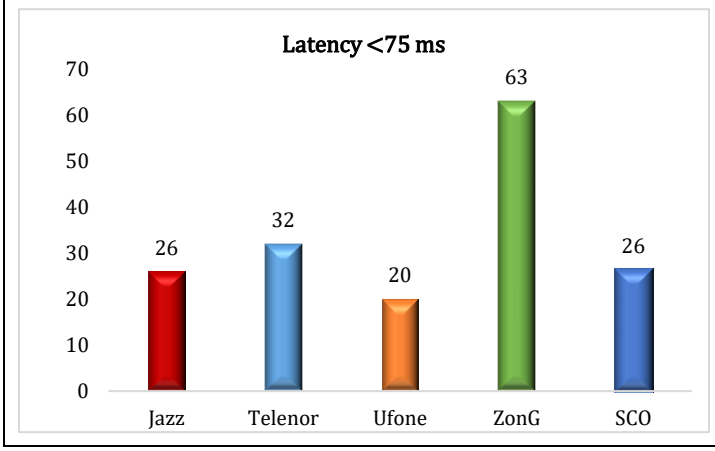




QUALITY OF SERVICE SURVEY RESULTS (Ookla) –MUZAFARABAD



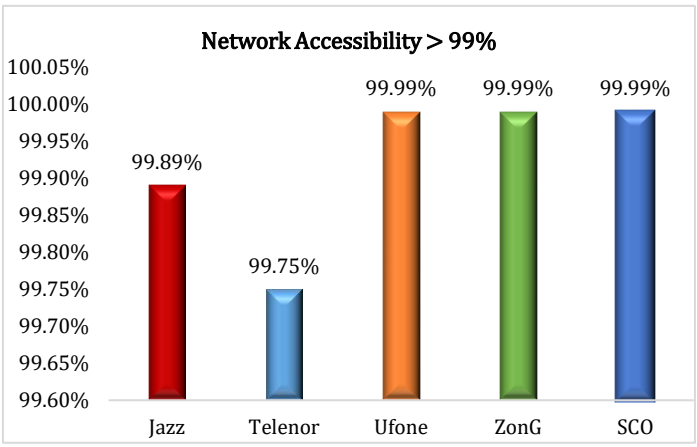


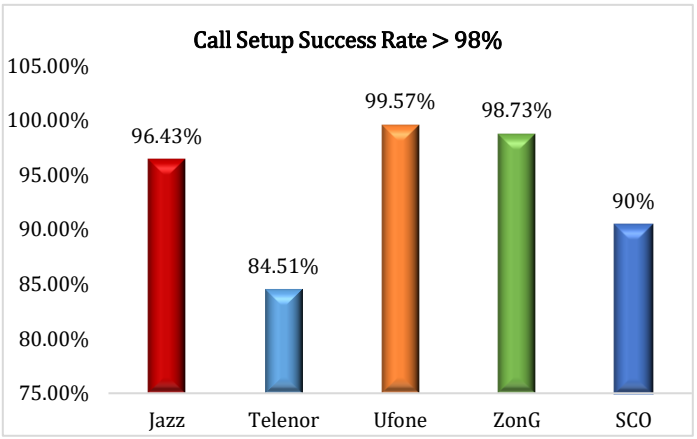


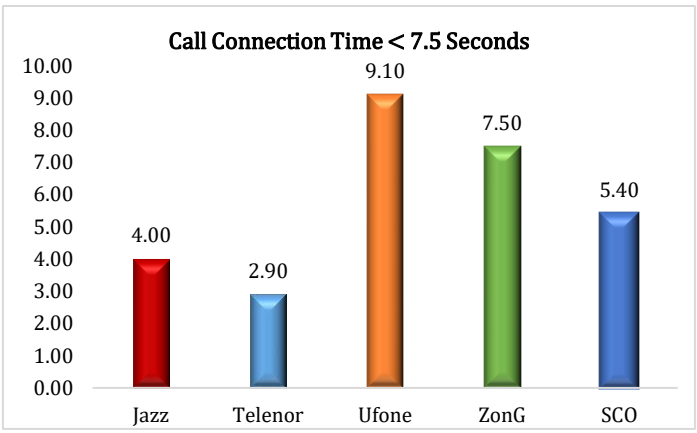
Annex-B (QoS KPIs)

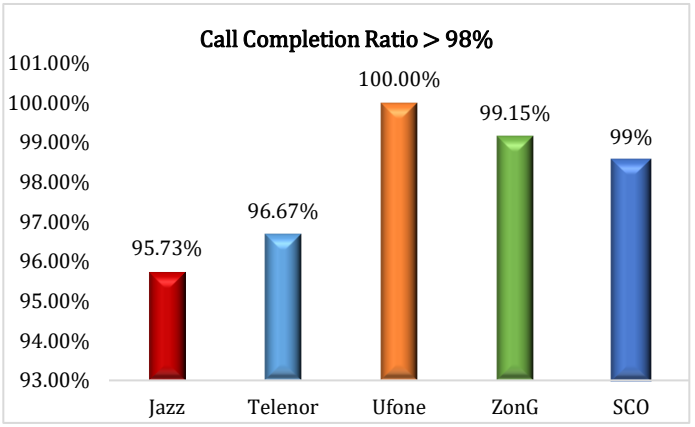
VOICE

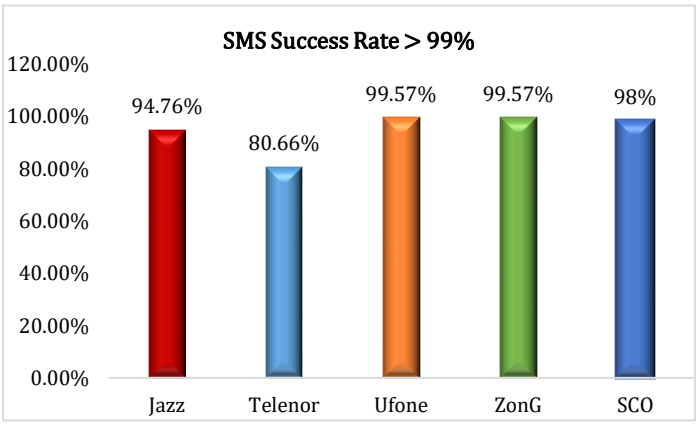
QUALITY OF SERVICE SURVEY RESULTS – KOTLI

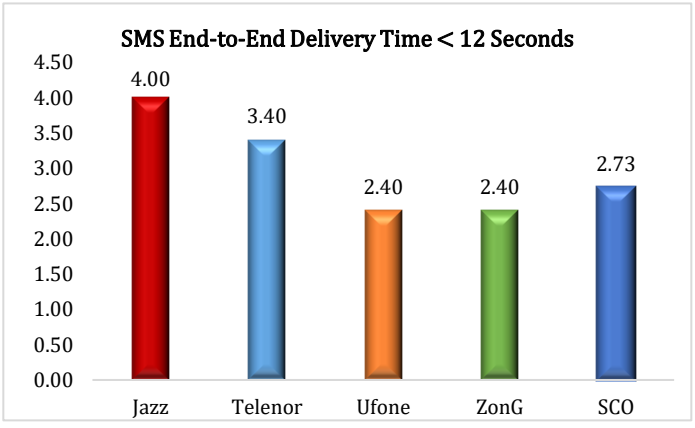


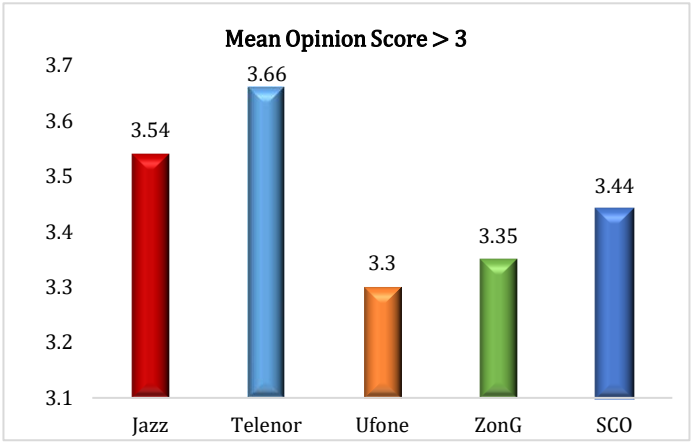




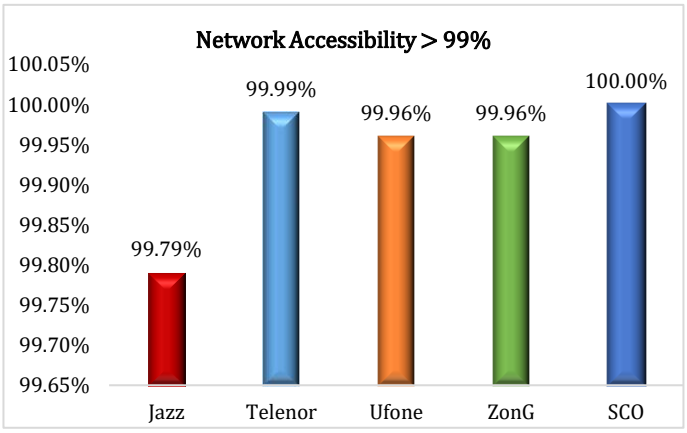


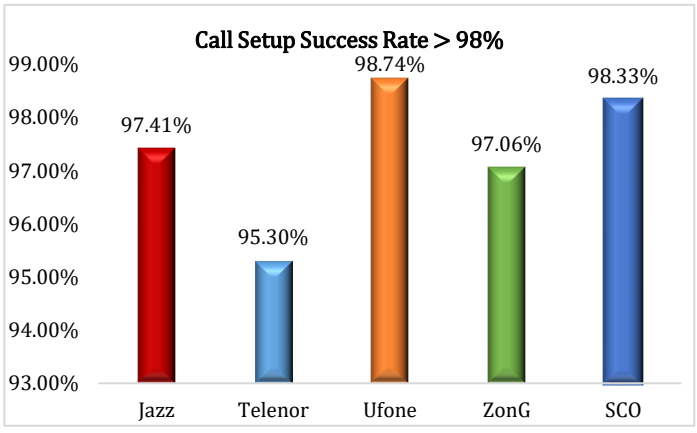


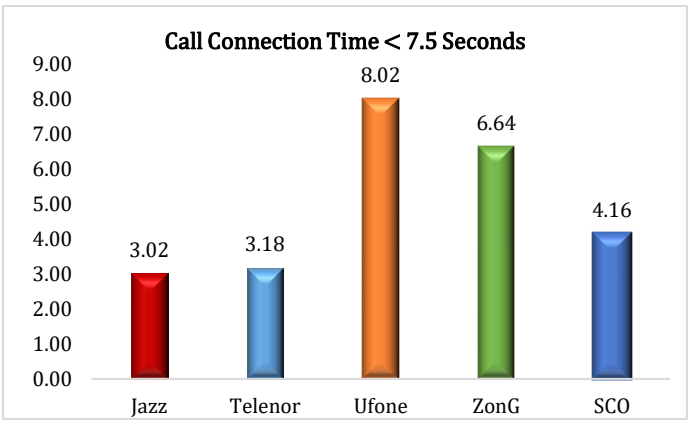


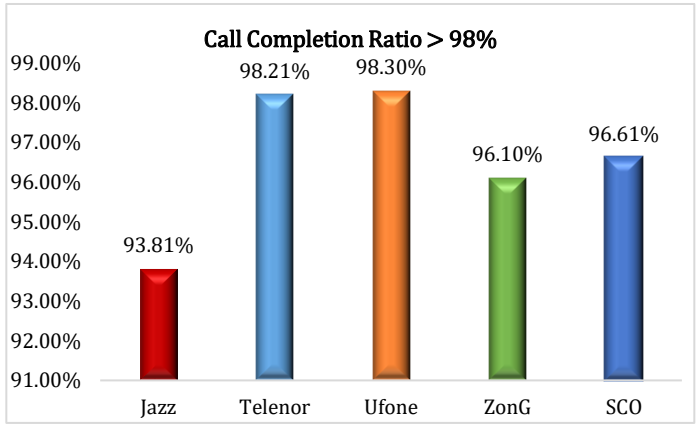


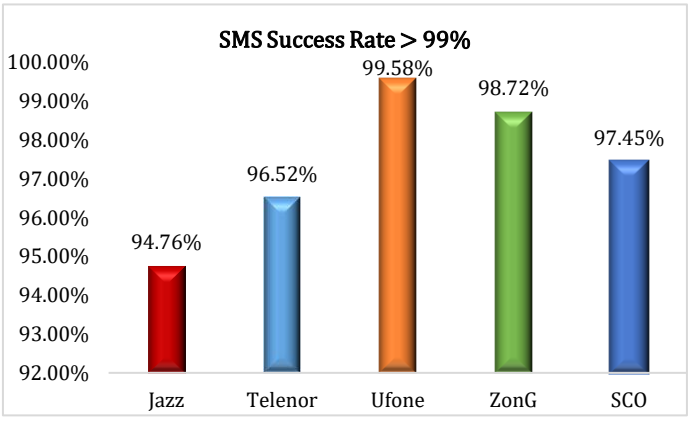
QUALITY OF SERVICE SURVEY RESULTS – MIRPUR

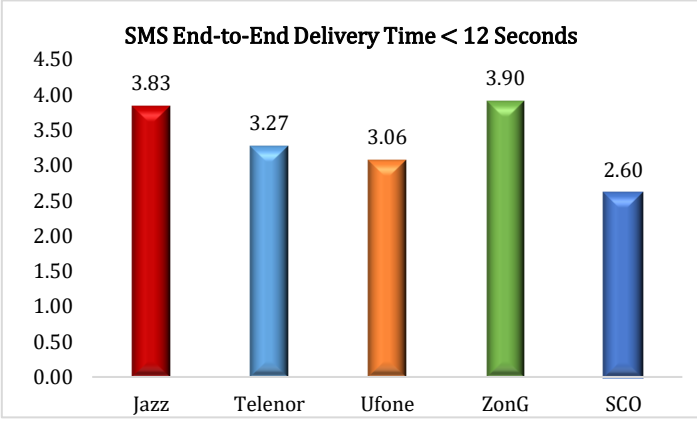


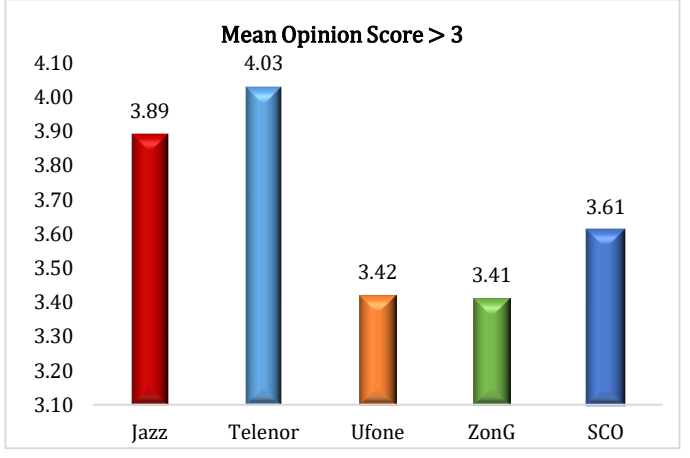




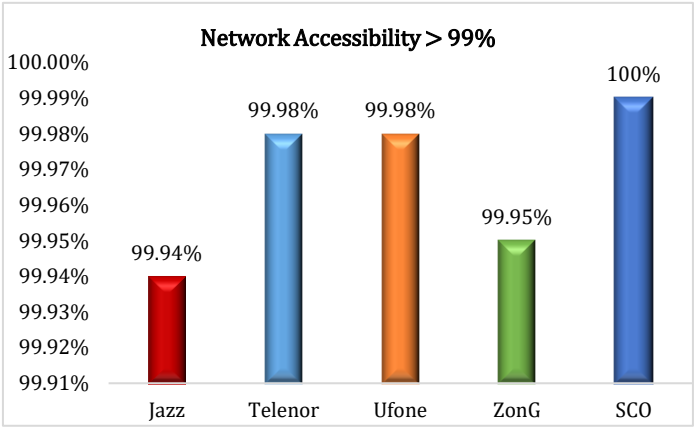


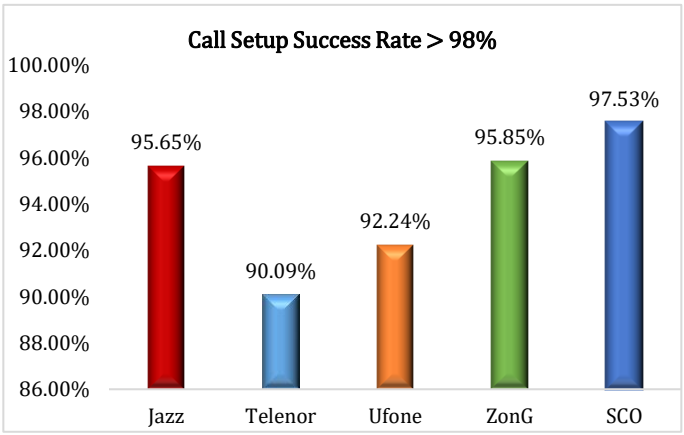


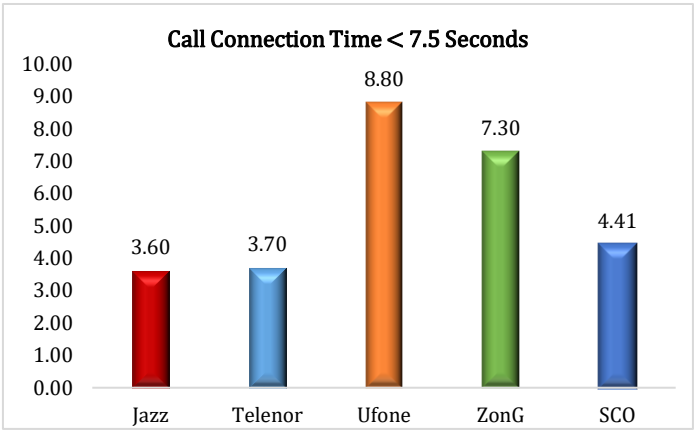


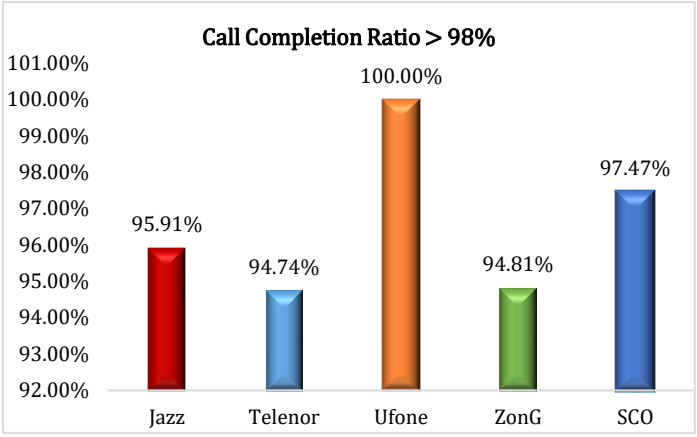


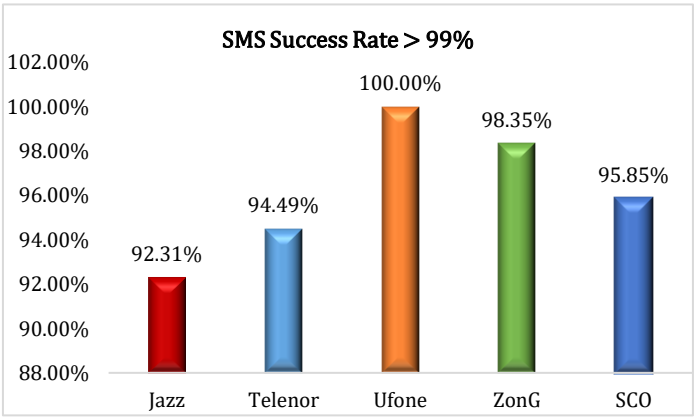
QUALITY OF SERVICE SURVEY RESULTS – MUZAFARABAD

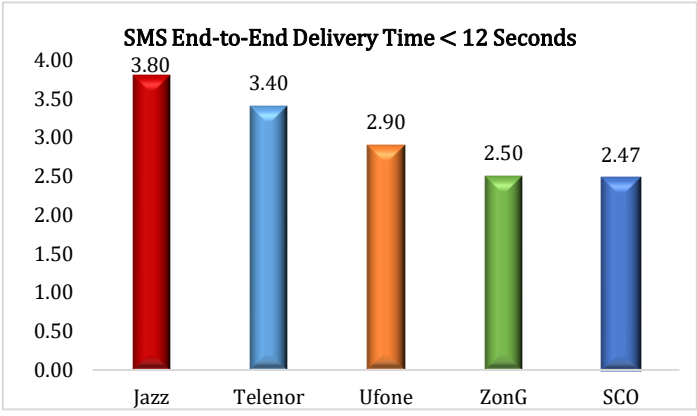


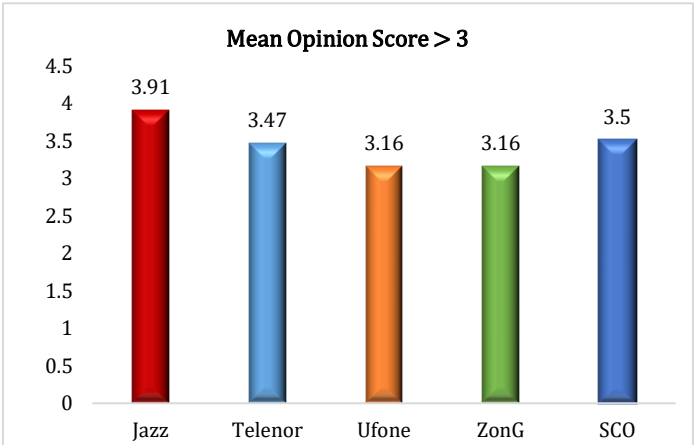




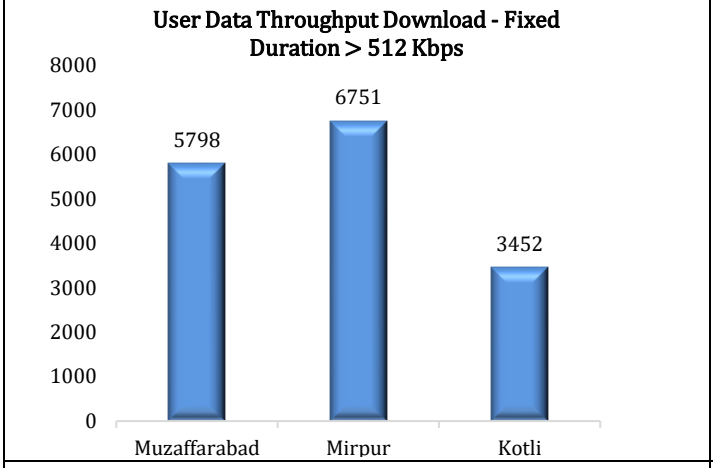


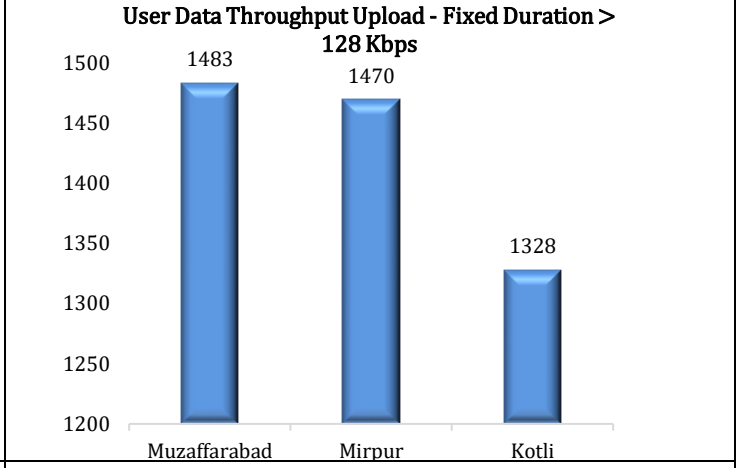


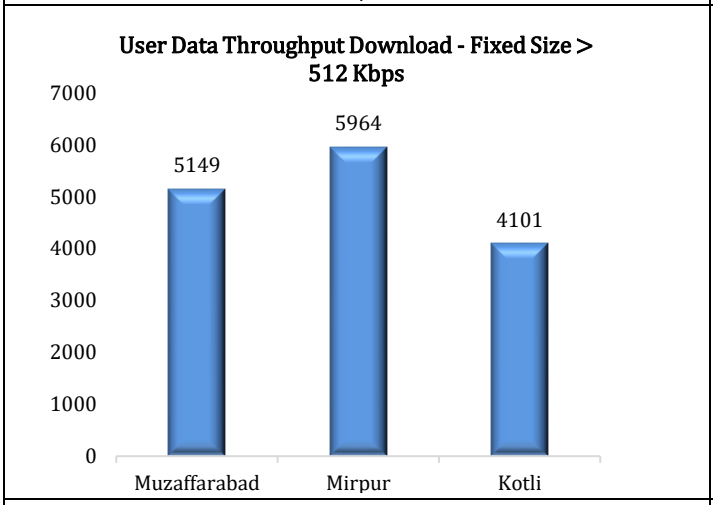


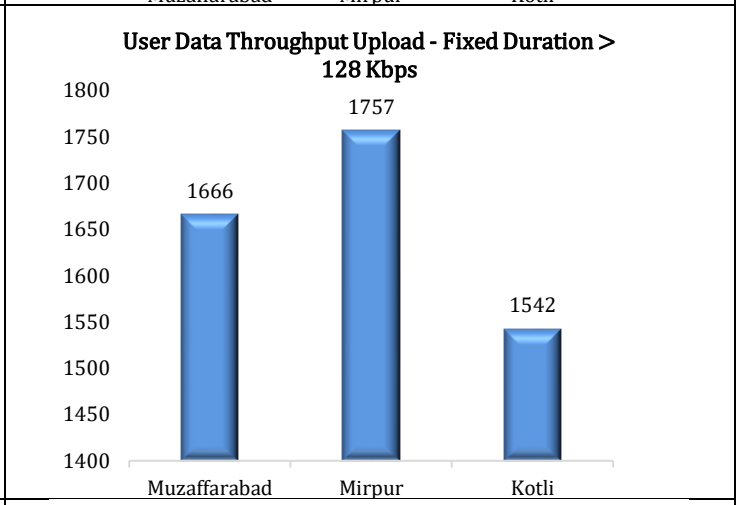


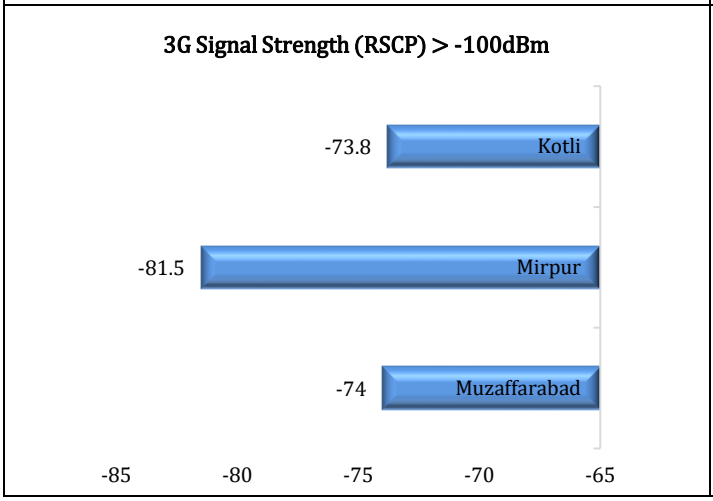
SCOM QUALITY OF SERVICE SURVEY RESULTS (3G LOCKED MODE)

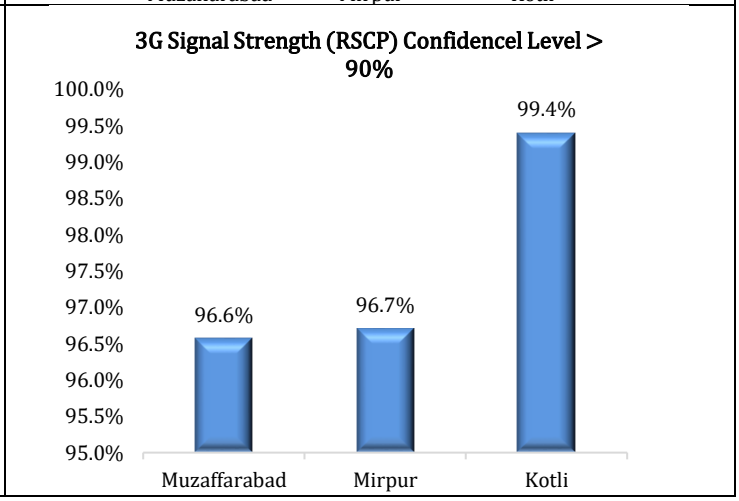


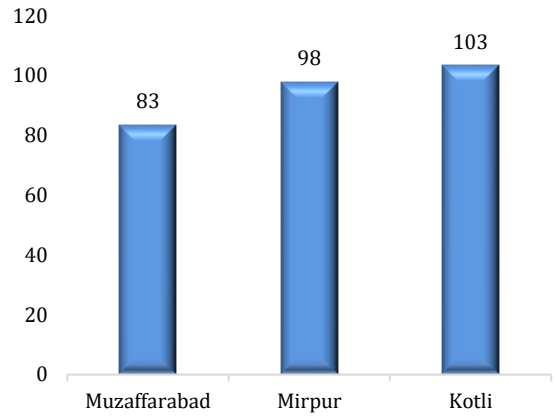








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Mirpur
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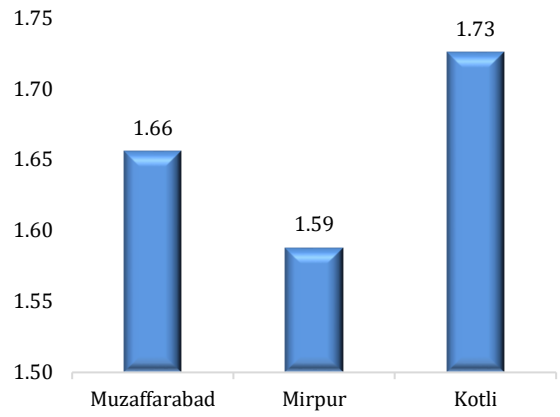
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