

INDEPENDENT QUALITY OF SERVICE SURVEY IN PAKISTAN – 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 Seventeen (17) x Cities of Khyber Pakhtunkhwa, Punjab, Balochistan and Sindh during 4th Quarter i.e. Oct ~ Dec 2023. The names of cities along with survey dates are mentioned in **Table 1.1: QoS Survey Cities & Dates:**

S. #.	City	Province	Days	Survey Dates
1	PESHAWAR	KHYBER PAKHTUNKHWA	04	23 rd ~26 th October, 2023
2	NOWSHERA		04	30 th October ~2 nd November, 2023
3	BATTAGRAM		04	27 th ~30 th November, 2023
4	BESHAM		04	20 th ~23 rd November, 2023
5	DASKA	PUNJAB	04	13 th ~16 th November, 2023
6	OKARA		04	4 th ~7 th December, 2023
7	ISLAMABAD		04	18 th ~20 th & 23 rd October, 2023
8	JHANG		05	29 th ~31 st Oct & 01 st 02 nd Nov, 2023
9	KHUSHAB		04	06 th ~09 th November, 2023
10	MUZAFARGARH		04	20 th ~23 rd November, 2023
11	QUETTA	BALOCHISTAN	03	13 th ~15 th November, 2023
12	DERA ALLAH YAR		05	29 th November ~3 rd December, 2023
13	SEHWAN	SINDH	04	06 th ~09 th November, 2023
14	THATTA		04	20 th ~23 rd November, 2023
15	MIRPUR KHAS		04	13 th ~16 th November, 2023
16	GHOTKI		03	23 rd ~25 th October, 2023
17	DADU		03	30 th October ~01 st 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 Mobile Broadband/Data Sessions were kept in technology auto detect mode.

MOBILE NETWORK COVERAGE

3.1. **4G / LTE SIGNAL STRENGTH.** During the survey, while conducting data test in technology auto detect mode, 4G/LTE signal strength samples were recorded on survey routes. As per Next Generation Mobile Service (NGMS) licenses, licensees are required to meet the threshold of -100 dBm or above of Reference Signal Receive Power (RSRP) with 90% confidence level. City wise compliance of 90% Confidence Level of signal strength is shown in **Table 3.1: 4G Signal Strength Technology Auto Detect Mode -100 dBm with 90% Confidence Level.**

4G Signal Strength -100dBm with 90% Confidence Level – Technology Auto Detect Mode								
City	Confidence Level (%)				Compliant (Yes/No)			
	Jazz	Telenor	Ufone	ZonG	Jazz	Telenor	Ufone	ZonG
BATTAGRAM	95.04%	97.42%	98.57%	97.83%	Yes	Yes	Yes	Yes
BESHAM	96.90%	87.44%	N/A	59.91%	Yes	No	N/A	No
DADU	89.79%	85.23%	92.40%	99.34%	No	No	Yes	Yes
DASKA	94.71%	90.39%	99.00%	98.80%	Yes	Yes	Yes	Yes

4G Signal Strength -100dBm with 90% Confidence Level – Technology Auto Detect Mode								
City	Confidence Level (%)				Compliant (Yes/No)			
	Jazz	Telenor	Ufone	ZonG	Jazz	Telenor	Ufone	ZonG
DERA ALLAH YAR	98.08%	97.00%	99.19%	97.80%	Yes	Yes	Yes	Yes
GHOTKI	98.39%	74.93%	94.29%	98.85%	Yes	No	Yes	Yes
ISLAMABAD	95.53%	94.68%	99.48%	99.00%	Yes	Yes	Yes	Yes
JHANG	97.08%	99.72%	97.13%	99.52%	Yes	Yes	Yes	Yes
KHUSHAB	99.68%	76.86%	90.87%	98.59%	Yes	No	Yes	Yes
MUZAFARGARH	97.43%	97.18%	94.33%	98.35%	Yes	Yes	Yes	Yes
MIRPUR KHAS	90.53%	90.30%	99.55%	98.44%	Yes	Yes	Yes	Yes
NOWSHERA	95.45%	95.47%	99.68%	97.19%	Yes	Yes	Yes	Yes
OKARA	93.97%	83.61%	93.06%	98.74%	Yes	No	Yes	Yes
PESHAWAR	95.06%	91.43%	98.78%	89.40%	Yes	Yes	Yes	No
QUETTA	99.10%	93.12%	99.91%	99.81%	Yes	Yes	Yes	Yes
SEHWAN	97.76%	100.00%	90.05%	97.51%	Yes	Yes	Yes	Yes
THATTA	98.76%	94.72%	96.96%	100.00%	Yes	Yes	Yes	Yes

Table 3.1: 4G Signal Strength Technology Auto Detect Mode -100 dBm with 90 Confidence Level

3.2. **3G SIGNAL STRENGTH IN TECNHOLGY AUTO DETECT MODE.** During the survey, 3G signal strength samples were also recorded on survey routes, wherever network switched to 3G while keeping the mobile handset in technology auto detect mode. As per Next Generation Mobile Service (NGMS) licenses, licensees are required to meet the threshold of -100 dBm or above of Received Signal Code Power (RSCP) with 90% confidence level. City wise compliance of 90% Confidence Level of signal strength is shown in **Table 3.2: 3G Signal Strength Technology Auto Detect Mode -100 dBm with 90% Confidence Level**

3G Signal Strength -100dBm with 90% Confidence Level – Technology Auto Detect Mode								
City	Confidence Level (%)				Compliant (Yes/No)			
	Jazz	Telenor	Ufone	ZonG	Jazz	Telenor	Ufone	ZonG
BATTAGRAM	N/A	100%	100%	99.99%	N/A	Yes	Yes	Yes
BESHAM	N/A	100%	100%	96.11%	N/A	Yes	Yes	Yes
DADU	100%	N/A	100%	100%	Yes	N/A	Yes	Yes
DASKA	100%	N/A	100%	N/A	Yes	N/A	Yes	N/A
DERA ALLAH YAR	98.08%	97%	99.19%	97.80%	Yes	Yes	Yes	Yes
GHOTKI	100%	97.30%	100%	100%	Yes	Yes	Yes	Yes
ISLAMABAD	100%	100%	100%	100%	Yes	Yes	Yes	Yes
JHANG	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
KHUSHAB	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MUZAFARGARH	100%	100%	99.89%	100%	Yes	Yes	Yes	Yes
MIRPUR KHAS	N/A	100%	99.95%	100%	N/A	Yes	Yes	Yes
NOWSHERA	100%	100%	100%	100%	Yes	Yes	Yes	Yes
OKARA	100%	100%	99.17%	100%	Yes	Yes	Yes	Yes
PESHAWAR	N/A	100%	100%	100%	N/A	Yes	Yes	Yes
QUETTA	N/A	100%	100%	100%	N/A	Yes	Yes	Yes
SEHWAN	99.65%	100%	90.05%	99.61%	Yes	Yes	Yes	Yes
THATTA	N/A	99.91%	93.54%	100%	N/A	Yes	Yes	Yes

Note: N/A means No Fallback to 3G Network

Table 3.2: 3G Signal Strength Technology Auto Detect Mode -100 dBm with 90% Confidence Level

MOBILE BROADBAND SERVICE

4.1. **DATA SESSIONS IN TECHNOLOGY AUTO DETECT MODE.** 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. In Fixed Duration Testing, a File of 10GB was downloaded and Uploaded for 3 minutes duration whereas in Fixed Size Testing, a File of 5MB and 2MB was completely downloaded and uploaded respectively. In order to measure Webpage Loading Time, different webpages were checked and in case of Latency, different website(s) were pinged to measure Round Trip Time (RTT)/Latency. The 4G and 3G signal strengths, Number of Tests, Upload and Download User Data Throughput, Webpage Loading Time and Latency detail is mentioned in **Table4.1: Data Tests Statistics.**

DESCRIPTION			JAZZ	TELENOR	UFONE	ZONG		
CAPACITY TEST	DOWNLOAD	ATTEMPTS	6794	6860	6846	6900		
		SPEED (Mbps)	25.93	6.42	8.65	19.82		
	UPLOAD	ATTEMPTS	6807	6870	6871	6911		
		SPEED (Mbps)	23.17	6.35	16.14	19.88		
DATA TRANSFER TEST	DOWNLOAD	ATTEMPTS	6839	6927	6461	6916		
		SPEED (Mbps)	10.253	5.42	6.801	9.771		
	UPLOAD	ATTEMPTS	6831	6923	6435	6905		
		SPEED (Mbps)	5.388	4.124	5.684	5.995		
BROWSING TEST	ATTEMPTS		25507	25767	25641	25847		
	LOADING TIME (Seconds)		3.16	4.33	3.43	3.04		
PING TEST	ATTEMPTS		6870	6973	6952	6975		
	LATENCY (msec)		72.41	64.37	74.65	72.05		
AVERAGE 4G SIGNAL STRENGTH (RSRP) dBm			-81	-84	-79.4	-78.9		
AVERAGE 3G SIGNAL STRENGTH (RSCP) dBm			-78.37	-79.14	-66.36	-63.23		

Table 4.1: Data Tests Statistics

4.2. **DOWNLOAD USER DATA THROUGHPUT.** As per Next Generation Mobile Service (NGMS) licenses, licensees are required to meet the threshold of minimum of 4 Mbps of 4G/LTE & 1 Mbps of 4G Download User Data Throughput. The results of Data Service QoS KPI i.e. Download User Data Throughput are shown in (i). **Table 4.2: Download User Data Throughput Technology Auto Detect Mode [Fixed Duration] ≥ 4Mbps**, (ii). **Table 4.3: Download User Data Throughput Technology Auto Detect Mode [Fixed Size] ≥ 4Mbps**,

DOWNLOAD USER DATA THROUGHPUT IN TECHNOLOGY AUTO DETECT MODE (FIXED DURATION)									
City	Download User Data Throughput [Mbps]				Operator Position				ZonG
	Jazz	Telenor	Ufone	ZonG	Jazz	Telenor	Ufone	ZonG	
BATTAGRAM	23.00	2.10	7.40	16.05	First	Fourth	Third	Second	
BESHAM	46.70	2.60	N/A	25.94	First	Third	N/A	Second	
DADU	19.57	5.41	6.63	19.88	Second	Fourth	Third	First	
DASKA	22.69	4.90	15.64	21.25	First	Fourth	Third	Second	
DERA ALLAH YAR	20.5	4.4	5.21	18.70	First	Fourth	Third	Second	
GHOTKI	15.38	6.72	3.56	17.34	Second	Third	Fourth	First	
ISLAMABAD	26.63	5.54	7.07	18.10	First	Fourth	Third	Second	
JHANG	32.83	7.47	10.79	17.00	First	Fourth	Third	Second	
KHUSHAB	24.77	12.38	4.37	18.05	First	Third	Fourth	Second	
MUZAFARGARH	22.30	13.40	8.00	24.07	Second	Third	Fourth	First	

DOWNLOAD USER DATA THROUGHPUT IN TECHNOLOGY AUTO DETECT MODE (FIXED DURATION)								
City	Download User Data Throughput [Mbps]				Operator Position			
	Jazz	Telenor	Ufone	ZonG	Jazz	Telenor	Ufone	ZonG
MIRPUR KHAS	29.70	6.50	11.20	23.41	First	Fourth	Third	Second
NOWSHERA	28.25	5.02	6.29	15.75	First	Fourth	Third	Second
OKARA	23.30	7.60	11.52	22.96	First	Fourth	Third	Second
PESHAWAR	23.47	3.89	4.79	12.20	First	Fourth	Third	Second
QUETTA	24.20	7.80	6.81	14.92	First	Third	Fourth	Second
SEHWAN	14.70	8.21	12.38	23.80	Second	Fourth	Third	First
THATTA	34.60	9.30	8.20	23.74	First	Third	Fourth	Second

Table4.2: Download User Data Throughput Technology Auto Detect Mode [Fixed Duration] \geq 4Mbps

DOWNLOAD USER DATA THROUGHPUT IN TECHNOLOGY AUTO DETECT MODE (FIXED SIZE)								
City	Download User Data Throughput [Mbps]				Operator Position			
	Jazz	Telenor	Ufone	ZonG	Jazz	Telenor	Ufone	ZonG
BATTAGRAM	12.10	3.10	8.04	11.04	First	Fourth	Third	Second
BESHAM	15.70	4.50	N/A	15.73	Second	Third	N/A	First
DADU	10.65	5.04	6.39	10.22	First	Fourth	Third	Second
DASKA	10.38	4.99	10.74	11.66	Third	Fourth	Second	First
DERA ALLAH YAR	20.50	4.40	5.21	18.70	First	Fourth	Third	Second
GHOTKI	9.29	6.17	4.66	10.13	Second	Third	Fourth	First
ISLAMABAD	12.75	5.56	6.40	10.43	First	Fourth	Third	Second
JHANG	13.76	6.51	6.50	9.20	First	Third	Fourth	Second
KHUSHAB	13.24	8.52	4.05	10.87	First	Third	Fourth	Second
MUZAFARGARH	12.10	8.70	6.58	13.68	Second	Third	Fourth	First
MIRPUR KHAS	12.50	5.90	8.85	14.19	Second	Fourth	Third	First
NOWSHERA	12.25	4.77	6.85	8.95	First	Fourth	Third	Second
OKARA	9.60	6.80	8.84	11.23	Second	Fourth	Third	First
PESHAWAR	11.12	4.63	5.30	7.80	First	Fourth	Third	Second
QUETTA	11.80	6.70	6.02	10.55	First	Third	Fourth	Second
SEHWAN	10.84	6.68	7.70	12.60	Second	Fourth	Third	First
THATTA	16.40	8.00	7.59	14.23	First	Third	Fourth	Second

Table4.3: Download User Data Throughput Technology Auto Detect Mode [Fixed Size] \geq 4Mbps

4.3. **UPLOAD USER DATA THROUGHPUT.** As per Cellular Mobile Network Quality of Service (QoS) Regulations 2021, licensees are required to meet the threshold of minimum of 1 Mbps of 4G/LTE. The results of Data Service QoS KPI i.e. Upload User Data Throughput is shown in (i). Table 4.4: Upload User Data Throughput Technology Auto Detect Mode [Fixed Duration] \geq 1 Mbps, (ii). Table 4.5: Upload User Data Throughput Technology Auto Detect Mode [Fixed Size] \geq 1Mbps,

UPLOAD USER DATA THROUGHPUT IN TECHNOLOGY AUTO DETECT MODE (FIXED DURATION)								
City	Upload User Data Throughput [Mbps]				Operator Position			
	Jazz	Telenor	Ufone	ZonG	Jazz	Telenor	Ufone	ZonG
BATTAGRAM	24.3	4.6	18.88	11.72	First	Fourth	Second	Third
BESHAM	23.1	5.0	N/A	13.4	First	Third	N/A	Second
DADU	20.33	3.69	15.56	22.23	Second	Fourth	Third	First
DASKA	21.8	5.3	19.7	26.6	Second	Fourth	Third	First
DERA ALLAH YAR	1.90	2.90	3.20	1.80	Third	Second	First	Fourth
GHOTKI	25.21	5.28	14.80	22.04	First	Fourth	Third	Second
ISLAMABAD	19.39	7.56	14.11	13.52	First	Fourth	Second	Third
JHANG	23.26	5.95	18.61	24.87	Second	Fourth	Third	First

UPLOAD USER DATA THROUGHPUT IN TECHNOLOGY AUTO DETECT MODE (FIXED DURATION)								
City	Upload User Data Throughput [Mbps]				Operator Position			
	Jazz	Telenor	Ufone	ZonG	Jazz	Telenor	Ufone	ZonG
KHUSHAB	25.01	5.92	12.99	23.44	First	Fourth	Third	Second
MUZAFARGARH	24.9	8.3	16.2	23.51	First	Fourth	Third	Second
MIRPUR KHAS	23.5	3.8	23.6	22.04	Second	Fourth	First	Third
NOWSHERA	23.45	8.26	15.13	17.94	First	Fourth	Third	Second
OKARA	21	7.3	17.77	20	First	Fourth	Third	Second
PESHAWAR	21.98	6.22	11.89	16.35	First	Fourth	Third	Second
QUETTA	20.4	5.9	12.91	13.33	First	Fourth	Third	Second
SEHWAN	20.96	65.12	6.8	26	Third	First	Fourth	Second
THATTA	33.1	6.5	21.57	27.57	First	Fourth	Third	Second

Table 4.4: Upload User Data Throughput Technology Auto Detect Mode [Fixed Duration] ≥ 1 Mbps

UPLOAD USER DATA THROUGHPUT IN TECHNOLOGY AUTO DETECT MODE (FIXED SIZE)								
City	Upload User Data Throughput [Kbps]				Operator Position			
	Jazz	Telenor	Ufone	ZonG	Jazz	Telenor	Ufone	ZonG
BATTAGRAM	6.2	4	7.48	5.9	Second	Fourth	First	Third
BESHAM	6.8	4.2	N/A	4.84	First	Third	N/A	Second
DADU	6.08	3.42	6.28	6.41	Third	Fourth	Second	First
DASKA	6.4	4.2	7.2	8.2	Third	Fourth	Second	First
DERA ALLAH YAR	24.5	3.7	16.07	19.06	First	Fourth	Third	Second
GHOTKI	6.13	4.27	5.73	6.11	First	Fourth	Third	Second
ISLAMABAD	6.00	5.00	6.19	5.92	Second	Fourth	First	Third
JHANG	6.37	4.44	7.29	6.68	Third	Fourth	First	Second
KHUSHAB	6.32	4.27	5.44	6.81	Second	Fourth	Third	First
MUZAFARGARH	5.8	5.5	6.33	7.03	Third	Fourth	Second	First
MIRPUR KHAS	7.8	3.6	9.14	8.38	Third	Fourth	First	Second
NOWSHERA	5.90	5.36	6.70	6.07	Third	Fourth	First	Second
OKARA	5.8	5	6.7	6.43	Third	Fourth	First	Second
PESHAWAR	5.63	4.36	5.05	5.92	Second	Fourth	Third	First
QUETTA	5.8	4.6	6.43	7.26	Third	Fourth	Second	First
SEHWAN	6.54	4.9	2.3	8.5	Second	Third	Fourth	First
THATTA	8.6	5.3	8.76	9.71	Third	Fourth	Second	First

Table 4.5: Upload User Data Throughput Technology Auto Detect Mode [Fixed Size] ≥ 1 Mbps

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 **Table 4.6: Webpage Loading Time < 5 Seconds**.

WEBPAGE LOADING TIME IN TECHNOLOGY AUTO DETECT MODE								
City	Webpage Loading Time [seconds]				Compliant (Yes/No)			
	Jazz	Telenor	Ufone	ZonG	Jazz	Telenor	Ufone	ZonG
BATTAGRAM	2.40	7.00	1.90	2.30	Yes	No	Yes	Yes
BESHAM	2.20	6.60	N/A	2.20	Yes	No	N/A	Yes
DADU	2.68	2.86	3.35	2.21	Yes	Yes	Yes	Yes
DASKA	2.47	3.18	2.30	2.27	Yes	Yes	Yes	Yes
DERA ALLAH YAR	1.9	2.9	3.2	1.8	Yes	Yes	Yes	Yes
GHOTKI	2.11	2.66	3.16	2.16	Yes	Yes	Yes	Yes

WEBPAGE LOADING TIME IN TECHNOLOGY AUTO DETECT MODE								
City	Webpage Loading Time [seconds]				Compliant (Yes/No)			
	Jazz	Telenor	Ufone	ZonG	Jazz	Telenor	Ufone	ZonG
ISLAMABAD	2.54	2.87	2.58	2.71	Yes	Yes	Yes	Yes
JHANG	1.06	0.75	0.31	0.24	Yes	Yes	Yes	Yes
KHUSHAB	1.04	0.96	0.20	0.21	Yes	Yes	Yes	Yes
MUZAFARGARH	0.70	0.80	0.40	0.30	Yes	Yes	Yes	Yes
MIRPUR KHAS	4.40	6.80	6.20	4.90	Yes	No	No	Yes
NOWSHERA	2.35	6.34	2.73	2.26	Yes	No	Yes	Yes
OKARA	2.50	2.50	2.00	1.80	Yes	Yes	Yes	Yes
PESHAWAR	2.90	6.12	2.57	2.56	Yes	No	Yes	Yes
QUETTA	2.30	3.10	3.50	2.00	Yes	Yes	Yes	Yes
SEHWAN	4.60	5.90	7.00	4.90	Yes	No	No	Yes
THATTA	3.40	5.10	6.40	4.80	Yes	No	No	Yes

Table 4.6: Webpage Loading Time < 5 Seconds

4.5. **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 4.7: Latency in Technology Auto Detect Mode < 75 milliseconds.**

LATENCY IN TECHNOLOGY AUTO DETECT MODE								
City	Latency [milliseconds]				Compliant (Yes/No)			
	Jazz	Telenor	Ufone	ZonG	Jazz	Telenor	Ufone	ZonG
BATTAGRAM	70	61	57	75	Yes	Yes	Yes	No
BESHAM	62	69	N/A	84	Yes	Yes	N/A	No
DADU	101	56	61	70	No	Yes	Yes	Yes
DASKA	90	61	54	53	No	Yes	Yes	Yes
DERA ALLAH YAR	53	74	66	41	Yes	Yes	Yes	Yes
GHOTKI	49	58	55	63	Yes	Yes	Yes	Yes
ISLAMABAD	58	68	81	142	Yes	Yes	No	No
JHANG	55	70	94	57	Yes	Yes	No	Yes
KHUSHAB	66	58	200	56	Yes	Yes	No	Yes
MUZAFARGARH	87	57	48	47	No	Yes	Yes	Yes
MIRPUR KHAS	76	95	35	34	No	No	Yes	Yes
NOWSHERA	67	72	75	75	Yes	Yes	No	No
OKARA	86	63	165	55	No	Yes	No	Yes
PESHAWAR	75	62	77	125	No	Yes	No	No
QUETTA	72	82	97	43	Yes	No	No	Yes
SEHWAN	61	51	38	45	Yes	Yes	Yes	Yes
THATTA	39	40	39	32	Yes	Yes	Yes	Yes

Table 4.7: Latency in Technology Auto Detect Mode < 75 milliseconds

4.6. **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 4.8: Ookla Tests Statistics**. Whereas the City wise results of Ookla Download Throughput, Upload Throughput and Latency are shown in (i). **Table 4.9: Ookla Download Throughput in Technology Auto Detect Mode**, (ii). **Table 4.10: Ookla Upload Throughput in Technology Auto Detect Mode**, (iii) **Table 4.11 Ookla Latency in Technology Auto Detect Mode < 75 Milliseconds.**

DESCRIPTION			JAZZ	TELENOR	UFONE	ZONG	
Ookla Tests	THROUGHPUT TEST	DOWNLOAD	ATTEMPTS	10296	10397	10412	9826
			SPEED (Mbps)	35.085	5.71	10.565	26.891
	PING TEST	UPLOAD	ATTEMPTS	10296	10397	10412	9826
			SPEED (Mbps)	26.198	6.591	18.676	22.744
ATTEMPTS			10296	10397	10412	9826	
LATENCY (msec)			35.3	44.6	38.5	50.4	

Table 4.8: Ookla Tests Statistics

OOKLA DOWNLOAD THROUGHPUT IN TECHNOLOGY AUTO DETECT MODE								
Cities	Download Throughput (Mbps)				Operator Position			
	Jazz	Telenor	Ufone	ZonG	Jazz	Telenor	Ufone	ZonG
BATTAGRAM	28.7	1.9	12.1	24.85	First	Fourth	Third	Second
BESHAM	66	2.7	N/A	37.2	First	Third	N/A	Second
DADU	26.8	7	8	27.1	Second	Fourth	Third	First
DASKA	26.2	5.3	20.0	30.9	Second	Fourth	Third	First
DERA ALLAH YAR	26.3	5.8	6.09	20.11	First	Fourth	Third	Second
GHOTKI	22.8	9.3	6	19.6	First	Third	Fourth	Second
ISLAMABAD	36.27	3.27	9.4	21.54	First	Fourth	Third	Second
JHANG	47.31	11.54	5.88	29.76	First	Third	Fourth	Second
KHUSHAB	30.09	10.29	8.08	33.9	Second	Third	Fourth	First
MUZAFARGARH	22.3	19	7.93	31.63	Second	Third	Fourth	First
MIRPUR KHAS	36.2	7.1	13.4	27.75	First	Fourth	Third	Second
NOWSHERA	37.4	5.0	9.2	22.1	First	Fourth	Third	Second
OKARA	29.5	8.5	14.16	32.2	Second	Fourth	Third	First
PESHTAWAR	30.6	4.2	6.5	20.0	First	Fourth	Third	Second
QUETTA	33.6	11.7	6.5	15.58	First	Third	Fourth	Second
SEHWAN	21.7	6.8	7.8	31.83	Second	Fourth	Third	First
THATTA	42.9	8.9	8.8	28.62	First	Third	Fourth	Second

Table 4.9: 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	Jazz	Telenor	Ufone	ZonG
BATTAGRAM	32.1	4.2	21.88	22.9	First	Fourth	Third	Second
BESHAM	28.8	4.6	N/A	16.8	First	Third	N/A	Second
DADU	25	3.6	16.8	31.8	Second	Fourth	Third	First
DASKA	18.5	5.3	17.2	27.6	Second	Fourth	Third	First
DERA ALLAH YAR	34.7	4.6	17.97	15.3	First	Fourth	Second	Third
GHOTKI	26	5.6	17.1	29	Second	Fourth	Third	First
ISLAMABAD	24.18	7.15	17.66	17.95	First	Fourth	Third	Second
JHANG	25.61	5.36	23.18	37.32	Second	Fourth	Third	First
KHUSHAB	30.72	9.1	17.35	28.7	First	Fourth	Third	Second
MUZAFARGARH	26.5	9.4	17.16	25.3	First	Fourth	Third	Second
MIRPUR KHAS	19.6	4.8	25.05	23.05	Third	Fourth	First	Second
NOWSHERA	29.1	8.9	18.5	20.7	First	Fourth	Third	Second

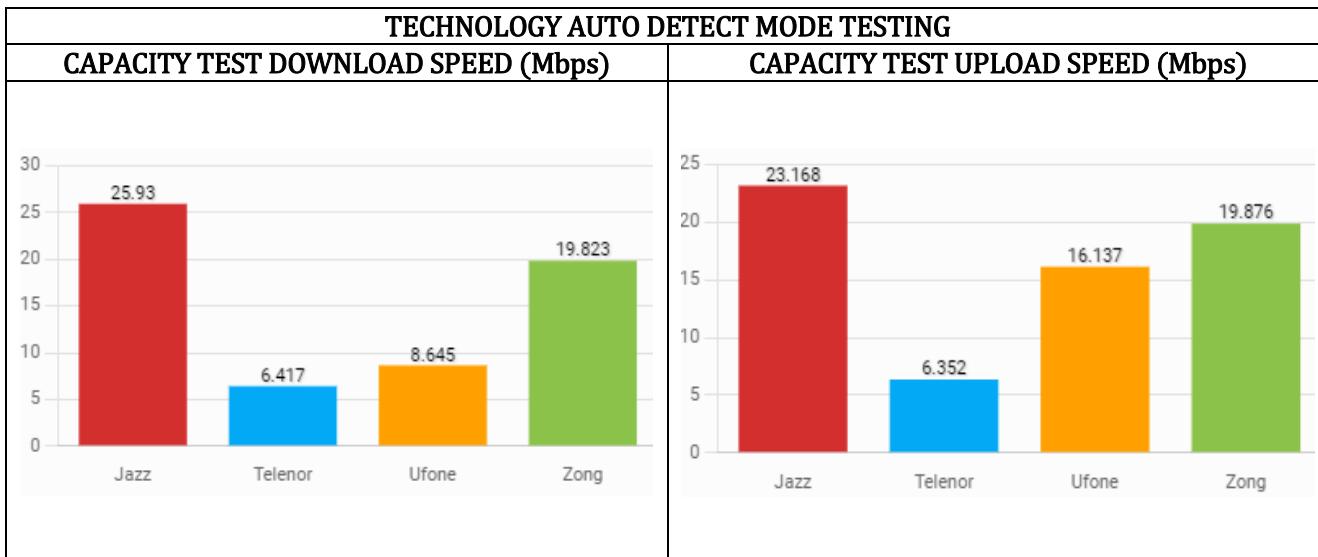
OOKLA UPLOAD THROUGHPUT IN TECHNOLOGY AUTO DETECT MODE								
Cities	Upload Throughput (Kbps)				Operator Position			
	Jazz	Telenor	Ufone	ZonG	Jazz	Telenor	Ufone	ZonG
OKARA	23.9	7.5	20.17	26.74	Second	Fourth	Third	First
PESHAWAR	24.5	6.7	14.7	16.6	First	Fourth	Third	Second
QUETTA	20.9	7.1	14.37	12.29	First	Fourth	Second	Third
SEHWAN	13.1	6.3	16.83	30.81	Third	Fourth	Second	First
THATTA	29.2	7.1	22.3	31.86	Second	Fourth	Third	First

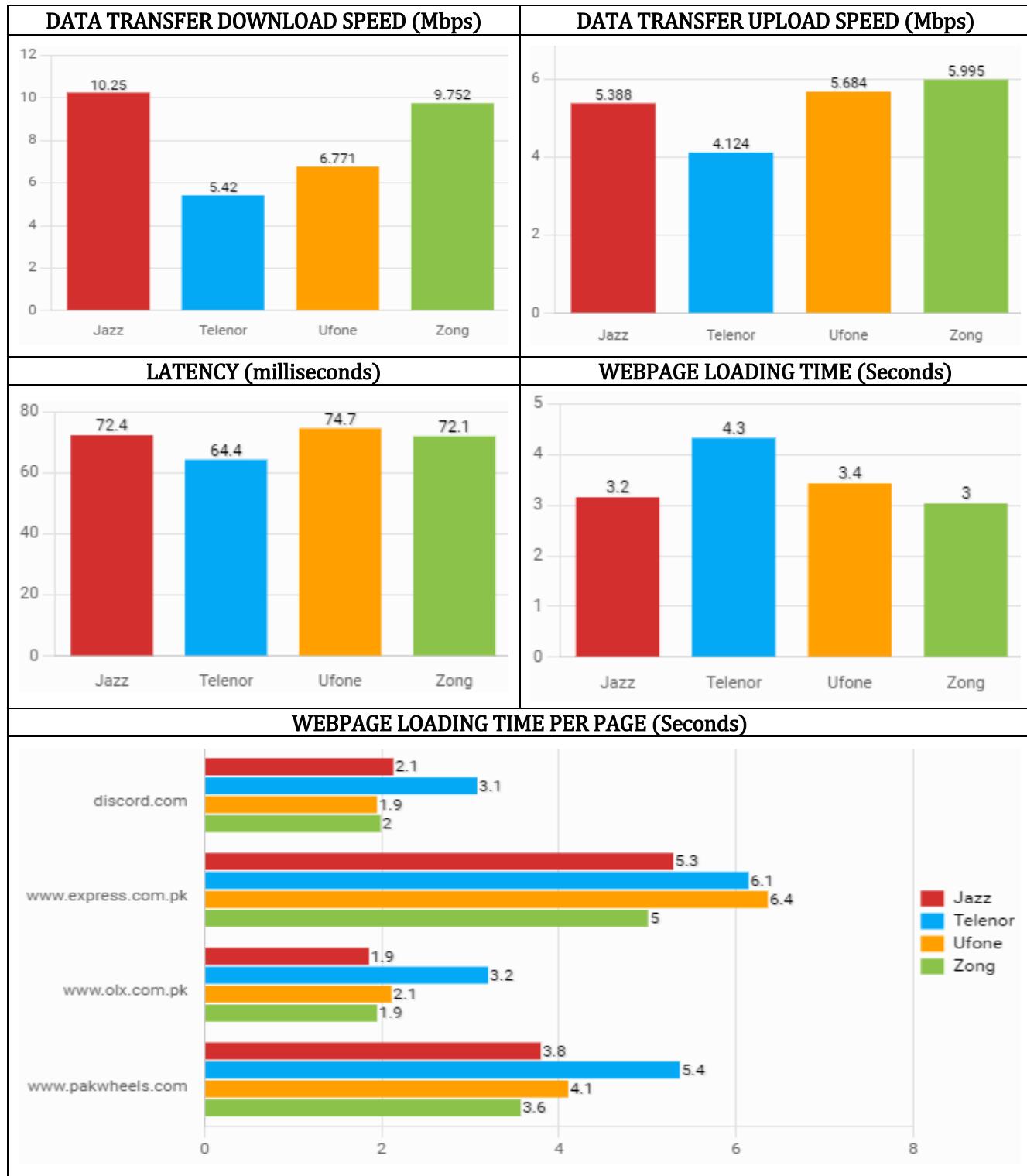
Table 4.10: Ookla Upload Throughput in Technology Auto Detect Mode

City	Latency [milliseconds]				Compliant (Yes/No)			
	Jazz	Telenor	Ufone	ZonG	Jazz	Telenor	Ufone	ZonG
BATTAGRAM	27	48	22	34	Yes	Yes	Yes	Yes
BESHAM	29	43	N/A	76	Yes	Yes	N/A	No
DADU	32	29	58	26	Yes	Yes	Yes	Yes
DASKA	46	19	28	15	Yes	Yes	Yes	Yes
DERA ALLAH YAR	32	52	34	35	Yes	Yes	Yes	Yes
GHOSTKI	25	38	35	42	Yes	Yes	Yes	Yes
ISLAMABAD	22	41	27	68	Yes	Yes	Yes	Yes
JHANG	28	54	70	36	Yes	Yes	Yes	Yes
KHUSHAB	27	57	93	36	Yes	Yes	No	Yes
MUZAFARGARH	53	56	49	32	Yes	Yes	Yes	Yes
MIRPUR KHAS	25	185	27	28	Yes	No	Yes	Yes
NOWSHERA	33	35	25	66	Yes	Yes	Yes	Yes
OKARA	49	36	61	29	Yes	Yes	Yes	Yes
PESHAWAR	41	45	32	83	Yes	Yes	Yes	No
QUETTA	30	47	55	45	Yes	Yes	Yes	Yes
SEHWAN	35	44	26	3	Yes	Yes	Yes	Yes
THATTA	27	42	27	26	Yes	Yes	Yes	Yes

Table 4.11: Ookla Latency in Technology Auto Detect Mode < 75 Milliseconds

4.6. Overall results of Download and Upload Throughputs in Capacity Tests, Data Transfer Tests, Latency (overall) and Latency (Per Web Page), can be seen in attached graphs.





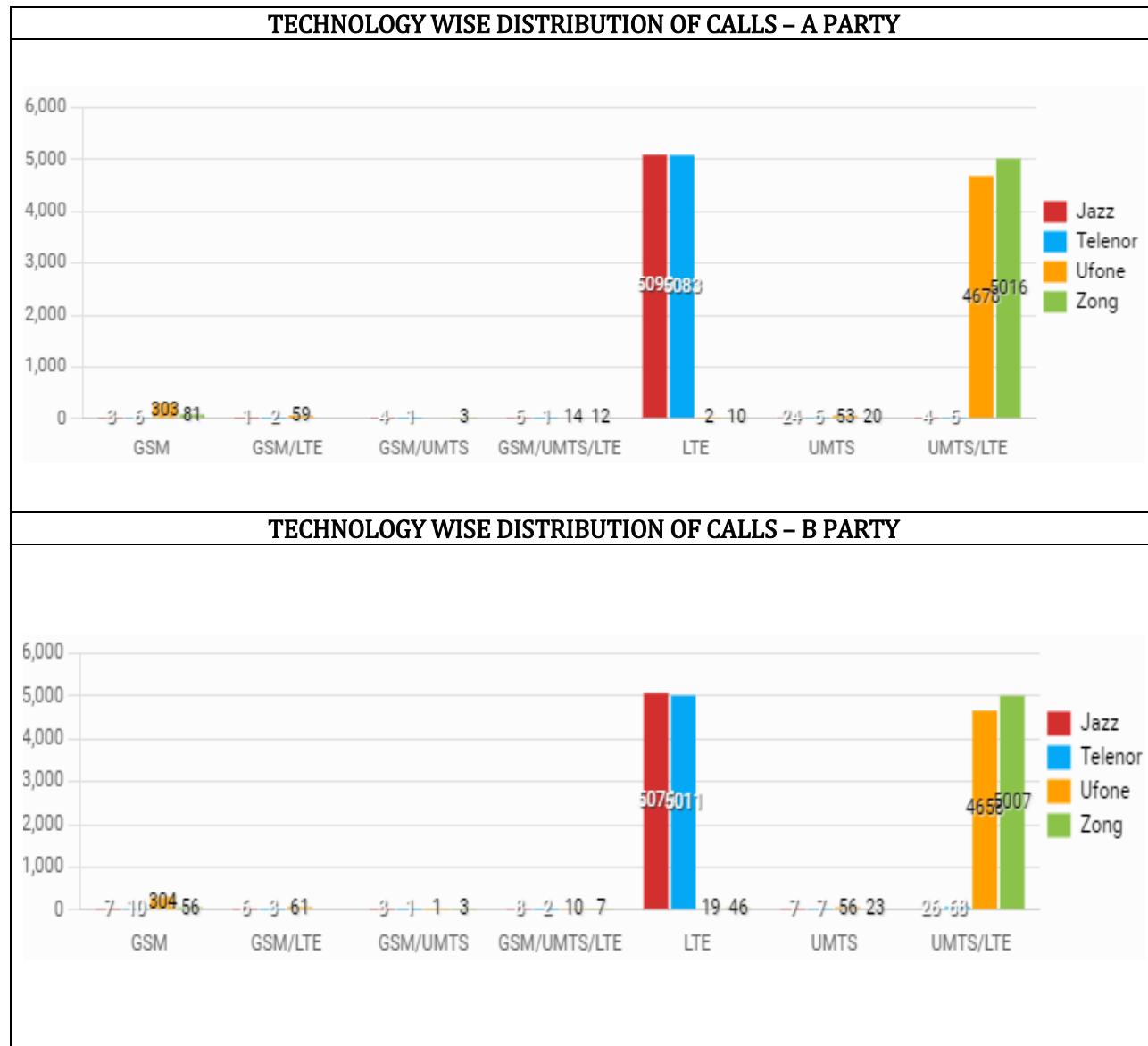
VOICE SERVICE

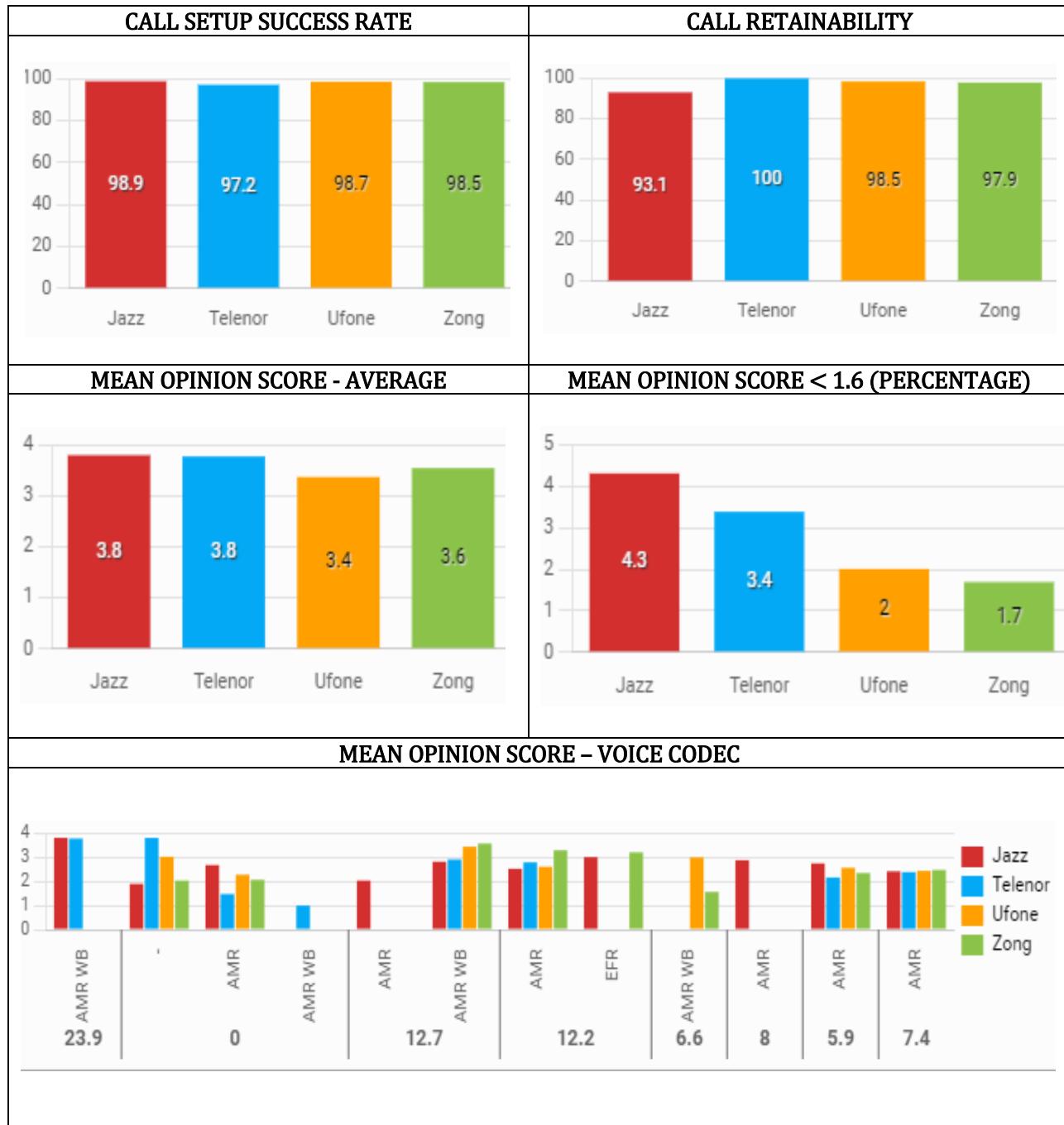
5.1. A total of **20,485 Call attempts** were made and out of which **339** were failed attempts. In **20,146 successful call attempts**, **143** calls dropped prior to completion of two minutes duration, whereas, **20,003 calls remained connected** for the complete duration of two minutes. The company wise call statistics is shown in **Table 5.1: Call Statistics**.

DESCRIPTION	JAZZ	TELENOR	UFONE	ZONG
TOTAL CALLS ATTEMPTS	5131	5103	5109	5142
FAILED CALLS ATTEMPTS	55	141	67	76
ESTABLISHED CALLS ATTEMPTS	5076	4962	5042	5066
DROPPED CALLS ATTEMPTS	16	45	42	40
COMPLETED CALLS ATTEMPTS	5060	4917	5000	5026
CALL SETUP SUCCESS RATE (%)	98.93	97.24	98.69	98.52
CALL SETUP TIME (Sec)	7.55	8.86	7.03	6.96
CALL COMPLETION RATE (%)	93.1	100	98.49	97.92
ISHO SUCCESS RATE (%)	100	-	-	-
RAB SETUP SUCCESS RATE (%)	100	100	100	99.95
MEAN OPINION SCORE	3.8	3.78	3.37	3.55
MEAN OPINION SCORE EXCESS RATIO - MOS <1.6 (%)	4.31	3.38	2.01	1.69
TOTAL SPEECH TEST	51044	49697	50542	50854

Table5.1: Call Statistic

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





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 **17 x surveyed cities** of Pakistan. The compliance level of threshold values of voice QoS KPIs is shown in each **Table 5.2: Voice QoS KPIs Compliance Level**, **Table 5.3: Voice QoS KPIs Compliance Level** and **Table 5.4: Voice QoS KPIs Compliance Level**.

CMO	KPIs	Threshold	BATAGRAM	BESHAM	DADU	DASKA	DERA ALLAH YAR	GHOSTKI
Jazz	NA	$\geq 99\%$	Yes	Yes	Yes	Yes	Yes	Yes
	CSSR	$\geq 98\%$	Yes	Yes	Yes	Yes	No	Yes
	CCT	$\leq 7.5 \text{ sec}$	Yes	Yes	Yes	Yes	Yes	Yes
	CCR	$> 98\%$	Yes	Yes	Yes	Yes	Yes	Yes
	MOS	≥ 3	Yes	Yes	Yes	Yes	Yes	Yes
	ISHO	$\geq 98\%$	N/A	N/A	Yes	Yes	N/A	Yes
	RSSR	$> 98\%$	N/A	N/A	Yes	Yes	Yes	Yes
Telenor	NA	$\geq 99\%$	Yes	Yes	Yes	Yes	Yes	Yes
	CSSR	$\geq 98\%$	Yes	Yes	Yes	No	No	Yes
	CCT	$\leq 7.5 \text{ sec}$	Yes	Yes	Yes	Yes	Yes	Yes
	CCR	$> 98\%$	Yes	Yes	Yes	Yes	Yes	No
	MOS	≥ 3	Yes	Yes	Yes	Yes	Yes	Yes
	ISHO	$\geq 98\%$	N/A	N/A	N/A	N/A	N/A	N/A
	RSSR	$> 98\%$	N/A	N/A	Yes	Yes	Yes	Yes
Ufone	NA	$\geq 99\%$	Yes	No	Yes	Yes	Yes	Yes
	CSSR	$\geq 98\%$	Yes	Yes	Yes	Yes	Yes	Yes
	CCT	$\leq 7.5 \text{ sec}$	Yes	No	Yes	Yes	Yes	Yes
	CCR	$> 98\%$	No	Yes	Yes	Yes	Yes	Yes
	MOS	≥ 3	Yes	No	Yes	Yes	Yes	Yes
	ISHO	$\geq 98\%$	Yes	N/A	N/A	N/A	N/A	N/A
	RSSR	$> 98\%$	Yes	N/A	Yes	Yes	Yes	Yes
ZonG	NA	$\geq 99\%$	Yes	Yes	Yes	Yes	Yes	Yes
	CSSR	$\geq 98\%$	Yes	Yes	Yes	Yes	Yes	Yes
	CCT	$\leq 7.5 \text{ sec}$	Yes	Yes	Yes	Yes	Yes	Yes
	CCR	$> 98\%$	Yes	Yes	Yes	Yes	Yes	Yes
	MOS	≥ 3	Yes	Yes	Yes	Yes	Yes	Yes
	ISHO	$\geq 98\%$	N/A	N/A	N/A	N/A	N/A	N/A
	RSSR	$> 98\%$	Yes	Yes	Yes	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) $\geq 98\%$, Mean Opinion Score (MOS) > 3, Inter System Hand Over (ISHO) > 98% & RAB Setup Success Rate (RSSR) > 98%

Table 5.2: Voice QoS KPIs Compliance Level

CMO	KPIs	Threshold	ISLAMABAD	JHANG	KHUSHAB	MIRPUR KHAS	MUZAFARGARH	NOWSHERA
Jazz	NA	≥ 99%	Yes	Yes	Yes	Yes	Yes	Yes
	CSSR	≥ 98%	Yes	No	Yes	Yes	No	Yes
	CCT	≤ 7.5 sec	Yes	Yes	Yes	Yes	Yes	Yes
	CCR	> 98%	Yes	Yes	Yes	Yes	No	Yes
	MOS	≥ 3	Yes	Yes	Yes	Yes	Yes	Yes
	ISHO	≥ 98%	Yes	Yes	N/A	N/A	N/A	N/A
	RSSR	> 98%	Yes	Yes	Yes	Yes	N/A	N/A
Telenor	NA	≥ 99%	Yes	Yes	Yes	Yes	Yes	Yes
	CSSR	≥ 98%	Yes	Yes	Yes	Yes	Yes	Yes
	CCT	≤ 7.5 sec	Yes	Yes	Yes	Yes	Yes	Yes
	CCR	> 98%	No	Yes	Yes	Yes	Yes	Yes
	MOS	≥ 3	Yes	Yes	Yes	Yes	Yes	Yes
	ISHO	≥ 98%	N/A	N/A	N/A	N/A	N/A	N/A
	RSSR	> 98%	Yes	Yes	N/A	Yes	Yes	Yes
Ufone	NA	≥ 99%	Yes	Yes	Yes	Yes	Yes	Yes
	CSSR	≥ 98%	Yes	Yes	No	Yes	Yes	Yes
	CCT	≤ 7.5 sec	Yes	Yes	Yes	Yes	Yes	Yes
	CCR	> 98%	Yes	Yes	Yes	Yes	Yes	Yes
	MOS	≥ 3	Yes	Yes	Yes	Yes	Yes	Yes
	ISHO	≥ 98%	N/A	N/A	N/A	N/A	N/A	N/A
	RSSR	> 98%	Yes	Yes	Yes	Yes	Yes	Yes
ZonG	NA	≥ 99%	Yes	Yes	Yes	Yes	Yes	Yes
	CSSR	≥ 98%	Yes	Yes	Yes	Yes	Yes	No
	CCT	≤ 7.5 sec	Yes	Yes	Yes	Yes	Yes	Yes
	CCR	> 98%	Yes	Yes	Yes	Yes	Yes	No
	MOS	≥ 3	Yes	Yes	Yes	Yes	Yes	Yes
	ISHO	≥ 98%	N/A	N/A	N/A	N/A	N/A	N/A
	RSSR	> 98%	Yes	Yes	Yes	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

CMO	KPIs	THRESHOLD	OKARA	PESHAWAR	QUETTA	SEHWAN	THATTA
Jazz	NA	$\geq 99\%$	Yes	Yes	Yes	No	Yes
	CSR	$\geq 98\%$	Yes	Yes	Yes	No	Yes
	CCT	≤ 7.5 sec	Yes	Yes	Yes	Yes	Yes
	CCR	$> 98\%$	Yes	Yes	Yes	Yes	Yes
	MOS	≥ 3	Yes	Yes	Yes	Yes	Yes
	ISHO	$\geq 98\%$	N/A	Yes	N/A	N/A	N/A
	RSSR	$> 98\%$	N/A	Yes	N/A	N/A	N/A
Telenor	NA	$\geq 99\%$	Yes	Yes	Yes	Yes	Yes
	CSR	$\geq 98\%$	No	No	No	Yes	Yes
	CCT	≤ 7.5 sec	Yes	Yes	Yes	Yes	Yes
	CCR	$> 98\%$	Yes	Yes	Yes	No	Yes
	MOS	≥ 3	Yes	Yes	Yes	Yes	Yes
	ISHO	$\geq 98\%$	N/A	N/A	N/A	N/A	Yes
	RSSR	$> 98\%$	Yes	N/A	Yes	Yes	Yes
Ufone	NA	$\geq 99\%$	Yes	Yes	Yes	Yes	Yes
	CSR	$\geq 98\%$	Yes	Yes	Yes	No	Yes
	CCT	≤ 7.5 sec	Yes	Yes	Yes	No	Yes
	CCR	$> 98\%$	Yes	Yes	Yes	No	Yes
	MOS	≥ 3	Yes	Yes	Yes	Yes	Yes
	ISHO	$\geq 98\%$	N/A	N/A	N/A	N/A	N/A
	RSSR	$> 98\%$	Yes	Yes	Yes	Yes	Yes
ZonG	NA	$\geq 99\%$	Yes	Yes	Yes	Yes	Yes
	CSR	$\geq 98\%$	Yes	No	No	Yes	Yes
	CCT	≤ 7.5 sec	Yes	Yes	Yes	Yes	Yes
	CCR	$> 98\%$	Yes	Yes	Yes	Yes	Yes
	MOS	≥ 3	Yes	Yes	Yes	Yes	Yes
	ISHO	$\geq 98\%$	N/A	N/A	N/A	N/A	N/A
	RSSR	$> 98\%$	Yes	Yes	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 5.4: Voice QoS KPIs Compliance Level

SMS SERVICE

6.1. A total of **20,433** SMS sending attempts were conducted, out of which **20,372** SMS were successfully transmitted by A-Party while **20,203** SMS were successfully received at B-Party. The company wise SMS Statistics are shown in **Table 6.1: SMS Statistics**

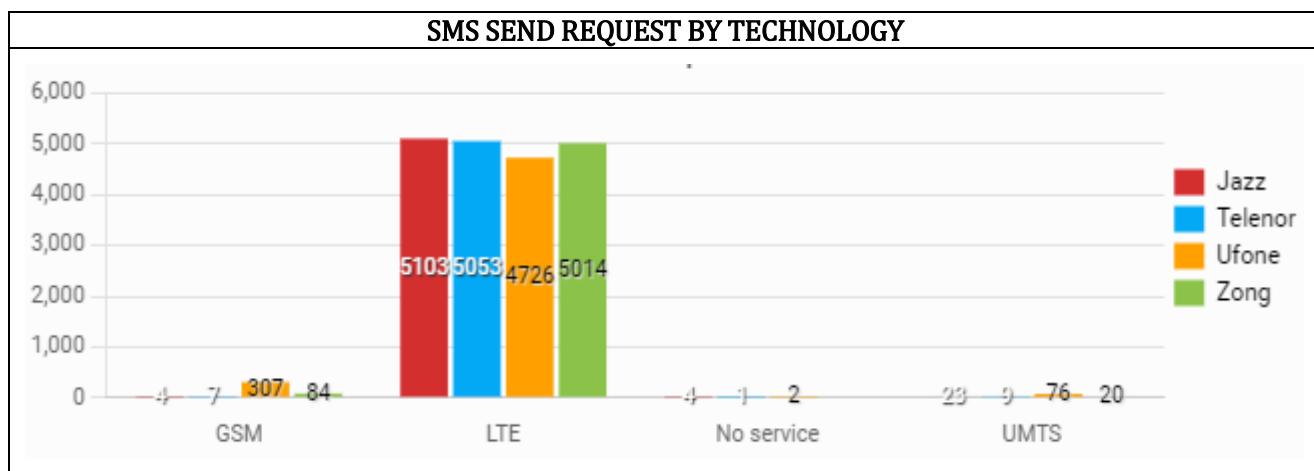
DESCRIPTION	JAZZ	TELENOR	UFONE	ZONG
SMS SEND REQUEST	5134	5070	5111	5118
SMS SUCCESSFULLY TRANSMITTED	5125	5040	5104	5103
SMS SUCCESSFULLY RECEIVED	5105	4941	5074	5083
SMS RECEIVE SUCCESS RATE (%)	99.44	97.46	99.28	99.32
END-TO-END DELIVERY TIME (Sec)	3.07	3.22	2.87	2.7

Table 6.1: SMS Statistics

Surveyed Cities	Operator	Jazz		Telenor		Ufone		ZonG	
	SMS KPI	Success Rate	Delivery Time						
Surveyed Cities	BATTAGRAM	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
	BESHAM	Yes	Yes	No	Yes	No	Yes	Yes	Yes
	DADU	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	DASKA	No	Yes	No	Yes	Yes	Yes	Yes	Yes
	DERA ALLAH YAR	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
	GHOTKI	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
	ISLAMABAD	No	Yes	No	Yes	No	Yes	Yes	Yes
	JHANG	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
	KHUSHAB	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	MUZAFARGARH	No	Yes	Yes	Yes	No	Yes	Yes	Yes
	MIRPUR KHAS	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
	NOWSHERA	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
	OKARA	Yes	Yes	No	Yes	Yes	Yes	No	Yes
	PESHAWAR	No	Yes	No	Yes	Yes	Yes	No	Yes
	QUETTA	Yes	Yes	No	Yes	No	Yes	No	Yes
	SEHWAN	No	Yes	No	Yes	No	Yes	Yes	Yes
	THATTA	Yes	Yes	No	Yes	No	Yes	Yes	Yes

Table 6.2: SMS QoS KPIs Compliance Level

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.





SURVEY MAPS & GRAPHICAL RESULTS

7.1 The 4G/LTE (RSRP) and 3G (RSCP) Signal Strength samples recorded during drive test on survey routes, were plotted on maps. The Signal Strength maps along-with Voice, SMS and Data QoS KPIs survey results in graphical form are shown at **Annex-A (Coverage Maps)**, **Annex-B (Data QoS Results)** and **Annex-C (Voice & SMS Results)**.

STANDING IN SURVEY

8.1. CMOs have been prioritized/ placed at 1st, 2nd, 3rd & 4th position in each category i.e. Mobile Network Coverage, Mobile Broadband Service and Voice Service based upon the compliance level against each QoS KPI in each category in 17 x surveyed cities of Punjab, Balochistan, KPK and Sindh.

- a. **MOBILE NETWORK COVERAGE.** The categorization of CMOs as per QoS KPI i.e. Signal Strength of 4G/LTE and 3G Networks measured in Technology Auto Detect Mode is shown in **Table 8.1: CMOs Standing in Mobile Network Coverage – Technology Auto Detect.**

S. #.	Operator	Compliance Level – Number of Cities						Standing	
		Technology Auto Detect Mode							
		Compliant			Non-Compliant				
4G	3G	Total	4G	3G	Total				
1.	Ufone	16	15	31	-	-	-	1 st	
2.	Jazz	16	9	25	1	-	1	2 nd	
3.	ZonG	15	14	29	2	-	2	3 rd	
4.	Telenor	12	13	25	5	-	5	4 th	

Table 8.1: CMOs Standing in Mobile Network Coverage – Technology Auto Detect Mode

- b. **MOBILE BROADBAND SERVICE.** The categorization of each CMOs in Mobile Broadband Service is as under:

- i. User Download Data Throughput. The User Download Data Throughput in Fixed Duration and Fixed Size Testing, as per the highest to lowest obtained results, is shown in **Table 8.2: 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					
		1 st	2 nd	3 rd	4 th	1 st	2 nd	3 rd	4 th		
1.	Jazz	13	4	-	-	10	6	1	-	1 st 1 st	
2.	ZonG	4	12	-	1	7	10	-	-	2 nd 2 nd	
3.	Ufone	-	1	10	5	-	1	9	6	3 rd 3 rd	
4.	Telenor	1	-	6	10	-	-	7	10	4 th 4 th	

Table 8.2: CMOs Standing in User Download Data Throughput– Technology Auto Detect Mode

- ii. 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 8.3: CMOs Standing in User Upload Data Throughput – Technology Auto Detect Mode**

iii.

S. #.	Operator	Highest Upload Throughput – Number of Cities								Standing	
		Technology Auto Detect Mode									
		Fixed Duration				Fixed Size					
		1 st	2 nd	3 rd	4 th	1 st	2 nd	3 rd	4 th		
1.	Jazz	11	4	2	-	3	5	9	-	1 st 3 rd	
2.	ZonG	3	10	3	1	8	7	2	-	2 nd 1 st	
3.	Ufone	2	2	11	1	6	5	4	1	3 rd 2 nd	
4.	Telenor	1	1	1	14	-	-	2	15	4 th 4 th	

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

- iv. **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 8.4: CMOs Standing in Webpage Loading Time**.

S. #.	Operator	Webpage Loading Time - Number of Cities		Standing
		Compliant	Non-Compliant	
1.	Jazz	17	-	1 st
2.	ZonG	17	-	1 st
3.	Ufone	13	03	2 nd
4.	Telenor	10	07	3 rd

Table 8.4: CMOs Standing in Webpage Loading Time

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

S. #.	Operator	Latency - Number of Cities		Standing
		Compliant	Non-Compliant	
1.	Telenor	15	2	1 st
2.	ZonG	12	5	2 nd
3.	Jazz	11	6	3 rd
4.	Ufone	9	7	4 th

Table 8.5: CMOs Standing in Latency

- vi. **Ookla**. The Ookla Throughput Testing Results for Download and Upload, as per the highest to lowest obtained results, are shown in (i) **Table 8.6: CMOs Standing in Ookla Download Throughput**. (ii) **Table 8.7: CMOs Standing in Ookla Upload Throughput**. (iii) **Table 8.8: CMOs Standing in Ookla Latency**.

S. #.	Operator	Ookla Download Throughput – Number of Cities				Standing
		1 st	2 nd	3 rd	4 th	
1.	Jazz	11	6	-	-	1 st
2.	ZonG	6	11	-	-	2 nd
3.	Ufone	-	-	10	6	3 rd
4.	Telenor	-	-	7	10	4 th

Table 8.6: CMOs Standing in User Download Data Throughput– Technology Auto Detect Mode

S. #.	Operator	Ookla Upload Throughput – Number of Cities				Standing
		1 st	2 nd	3 rd	4 th	
1.	Jazz	9	6	2	-	1 st
2.	ZonG	7	8	2	-	2 nd
3.	Ufone	1	3	12	-	3 rd
4.	Telenor	-	-	1	16	4 th

Table 8.7: CMOs Standing in User Download Data Throughput– Technology Auto Detect Mode

S. #.	Operator	Ookla Latency - Number of Cities		Standing
		Compliant	Non-Compliant	
1.	Jazz	17	-	1 st
2.	Telenor	16	1	2 nd
3.	Ufone	15	1	3 rd
4.	ZonG	15	2	4 th

Table 8.8: CMOs Standing in Ookla Latency

- c. **VOICE SERVICE.** The categorization of each CMOs, as per the maximum compliant of Voice and SMS QoS KPIs are shown in (i) **Table 8.9: CMOs Standing in Voice Service.** (ii) **Table 8.10: CMOs Standing in SMS Service**

S. #.	Operator	Voice QoS KPIs		Standing
		Compliant	Non-Compliant	
1.	ZonG	98	4	1 st
2.	Jazz	94	6	2 nd
3.	Ufone	94	8	3 rd
4.	Telenor	91	8	4 th

Table 8.9: CMOs Standing in Voice Service

S. #.	Operator	SMS QoS KPIs		Standing
		Compliant	Non-Compliant	
1.	ZonG	31	3	1 st
2.	Jazz	29	5	2 nd
3.	Ufone	28	6	3 rd
4.	Telenor	20	14	4 th

Table 8.10: CMOs Standing in SMS Service

- d. **OVERALL STANDING.** The overall standing of each CMOs in different category of services is mentioned in **Table 8.11: CMOs Overall Standing in QoS Survey.**

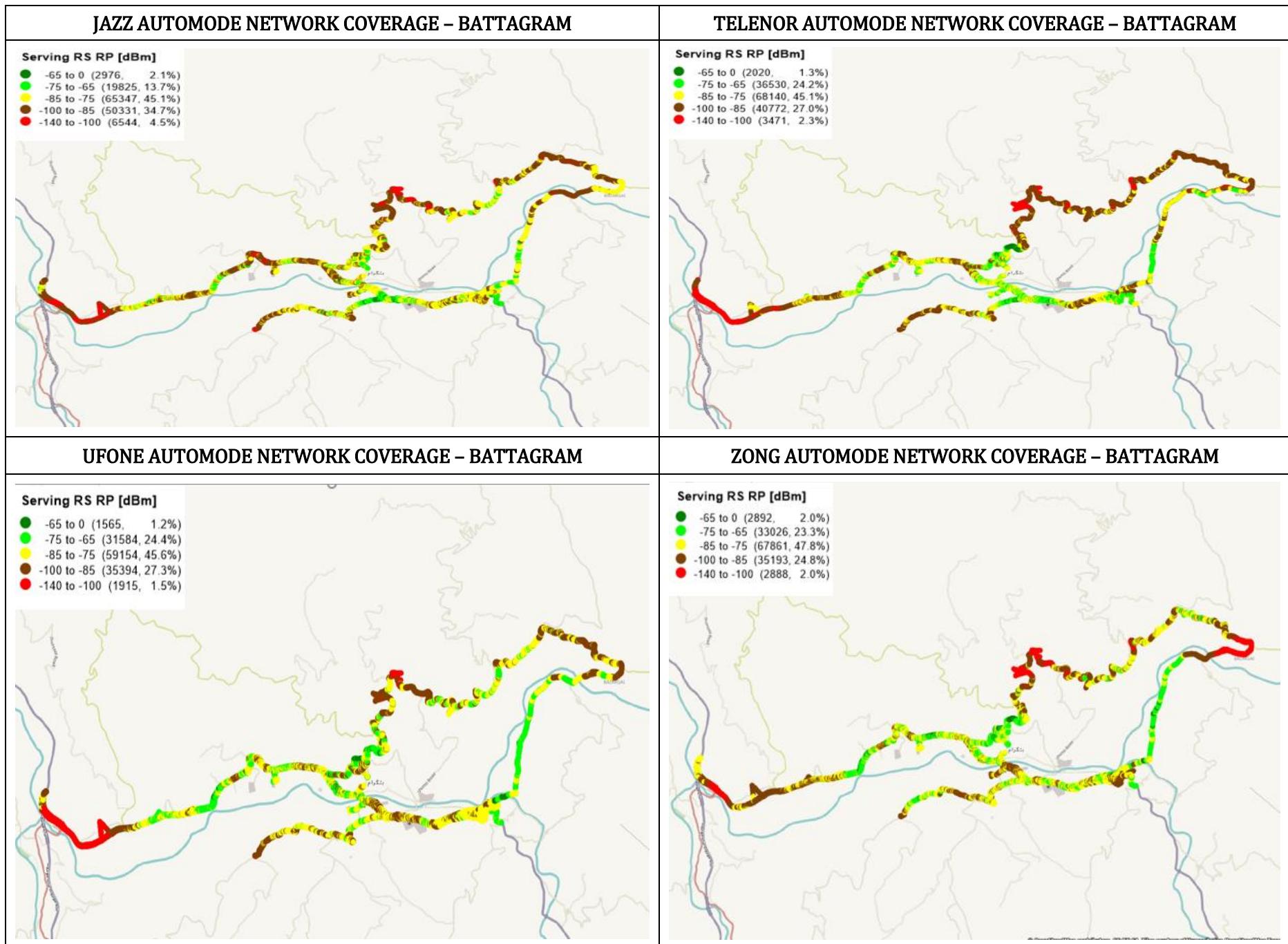
S. #.	Service	STANDING			
		1 st	2 nd	3 rd	4 th
1.	Mobile Network Coverage	Ufone	Jazz	ZonG	Telenor
2.	Mobile Broadband	Fixed Duration	Download	Jazz	ZonG
			Upload	Jazz	ZonG
	Ookla	Fixed Size	Download	Jazz	ZonG
			Upload	ZonG	Ufone
	Latency	Ookla	Download	Jazz	ZonG
			Upload	Jazz	Ufone
3.	Web Page Loading Time	Jazz ZonG	Ufone	Telenor	-
4.	Voice	Automode	Telenor	ZonG	Jazz
		Ookla	Jazz	Telenor	Ufone
4.	SMS	ZonG	Jazz	Ufone	Telenor

Table 8.11: CMOs Overall Standing in QoS Survey

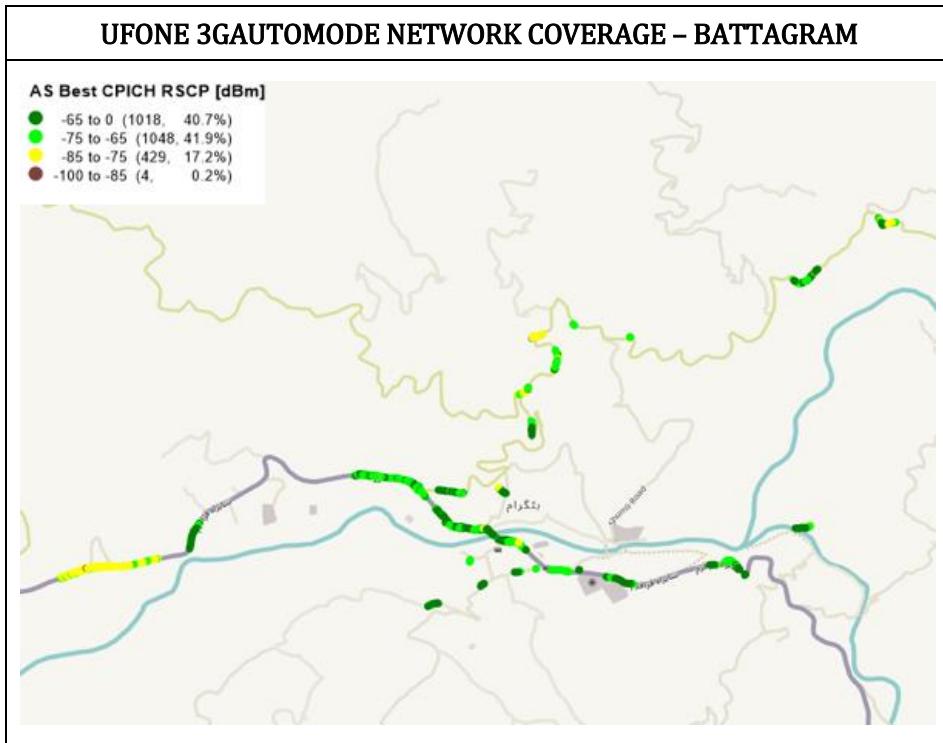
Annex -A(Coverage Maps)

AUTOMODE

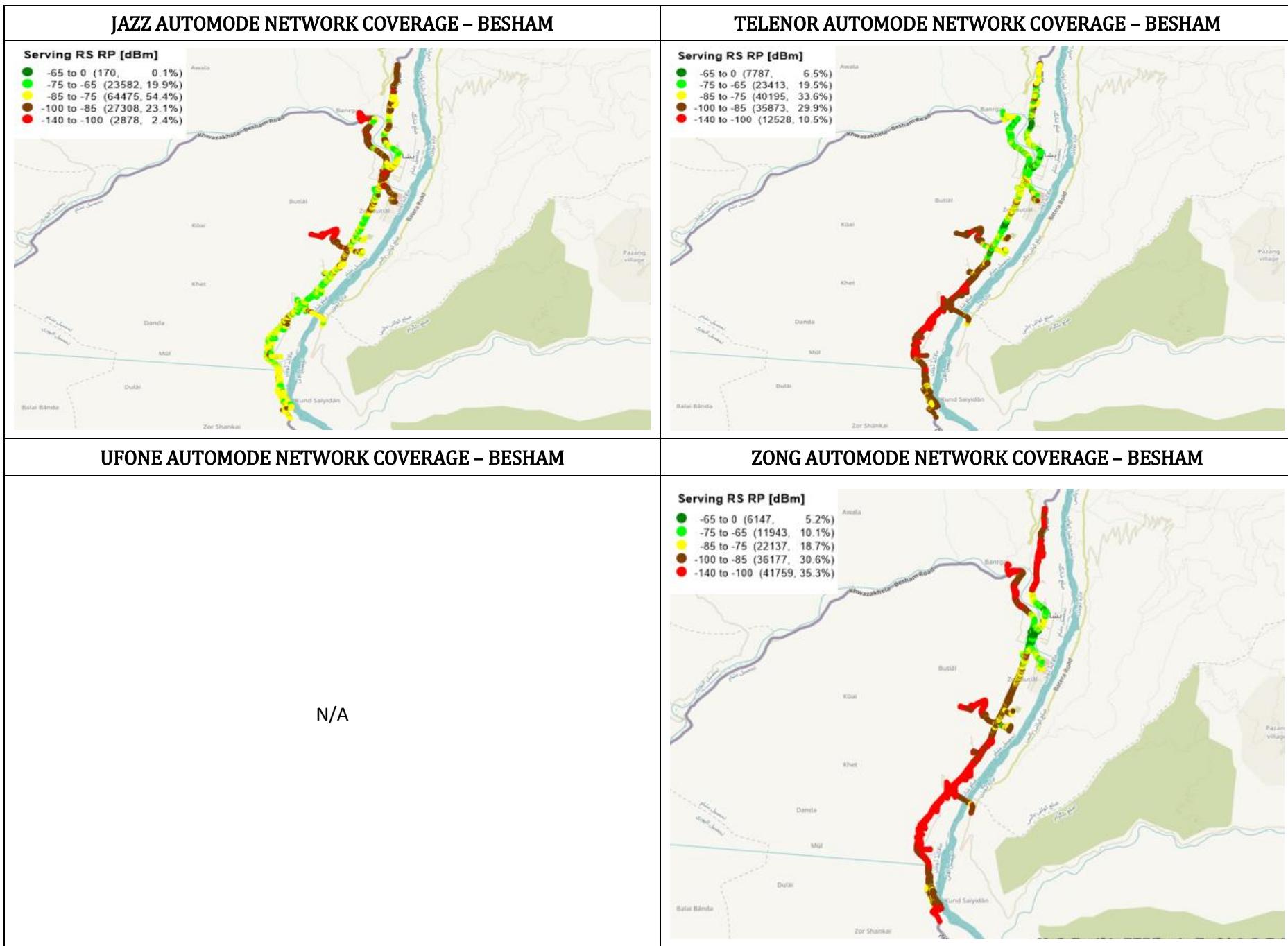
AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)



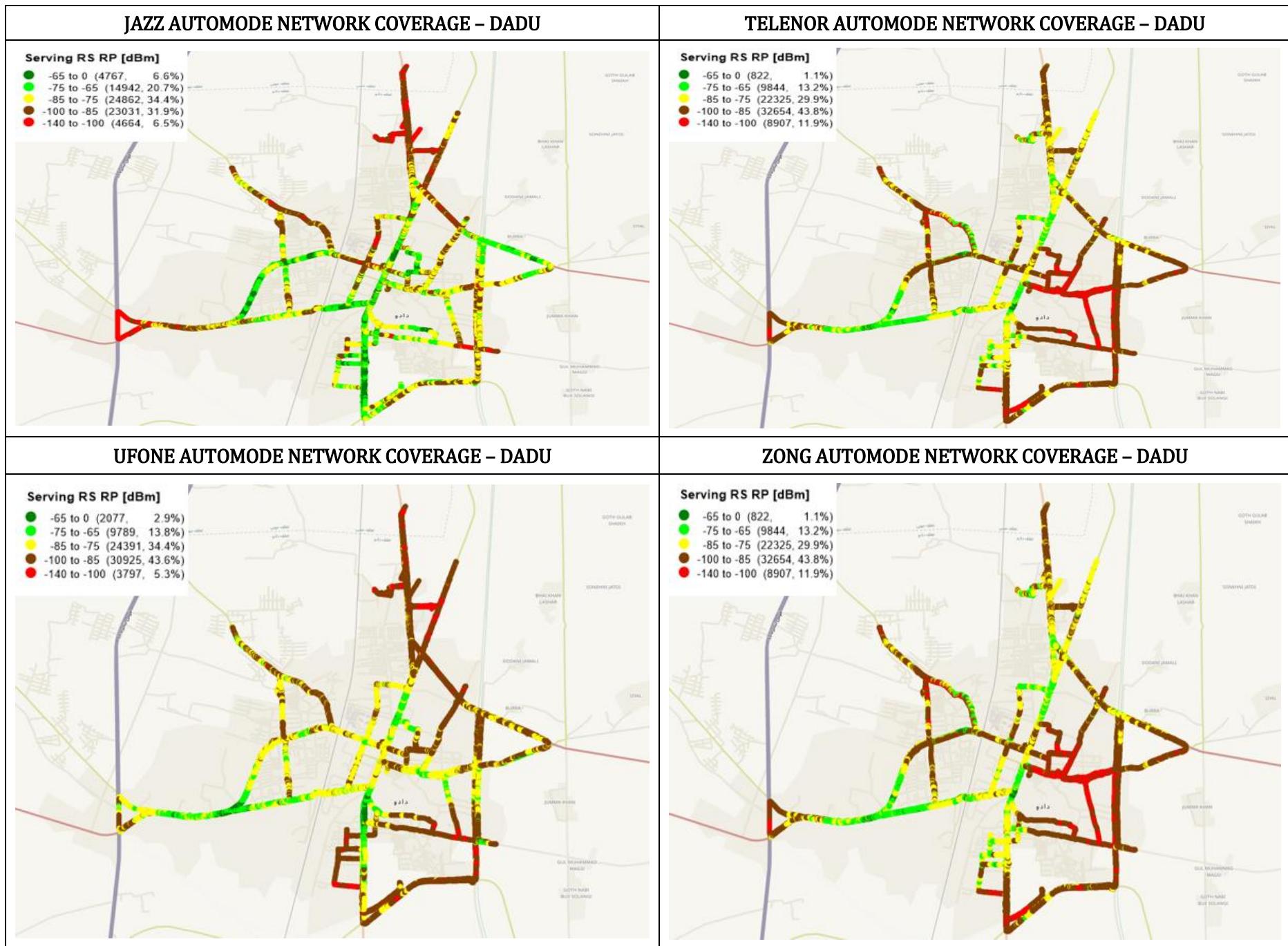
AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)



AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)



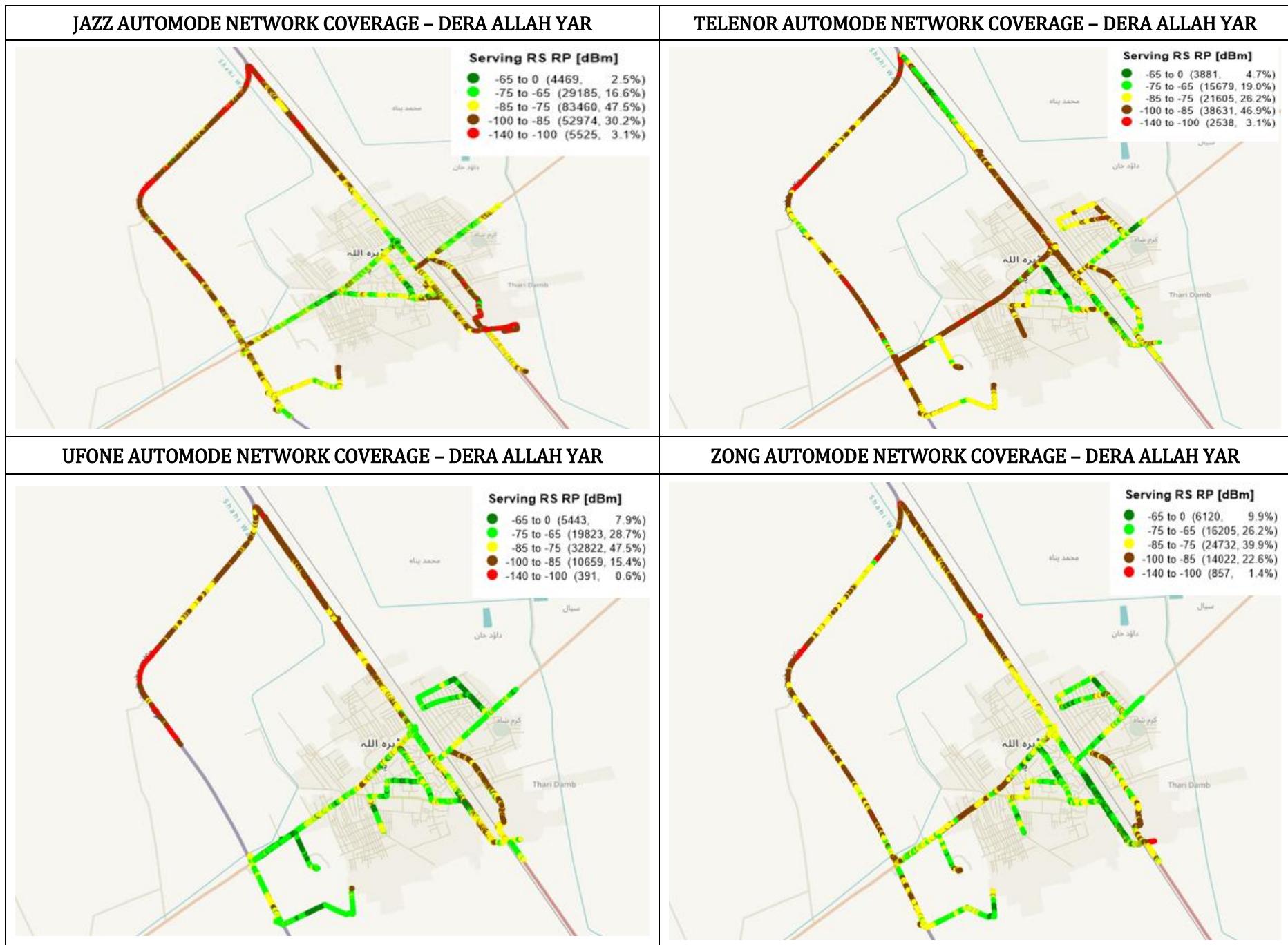
AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)



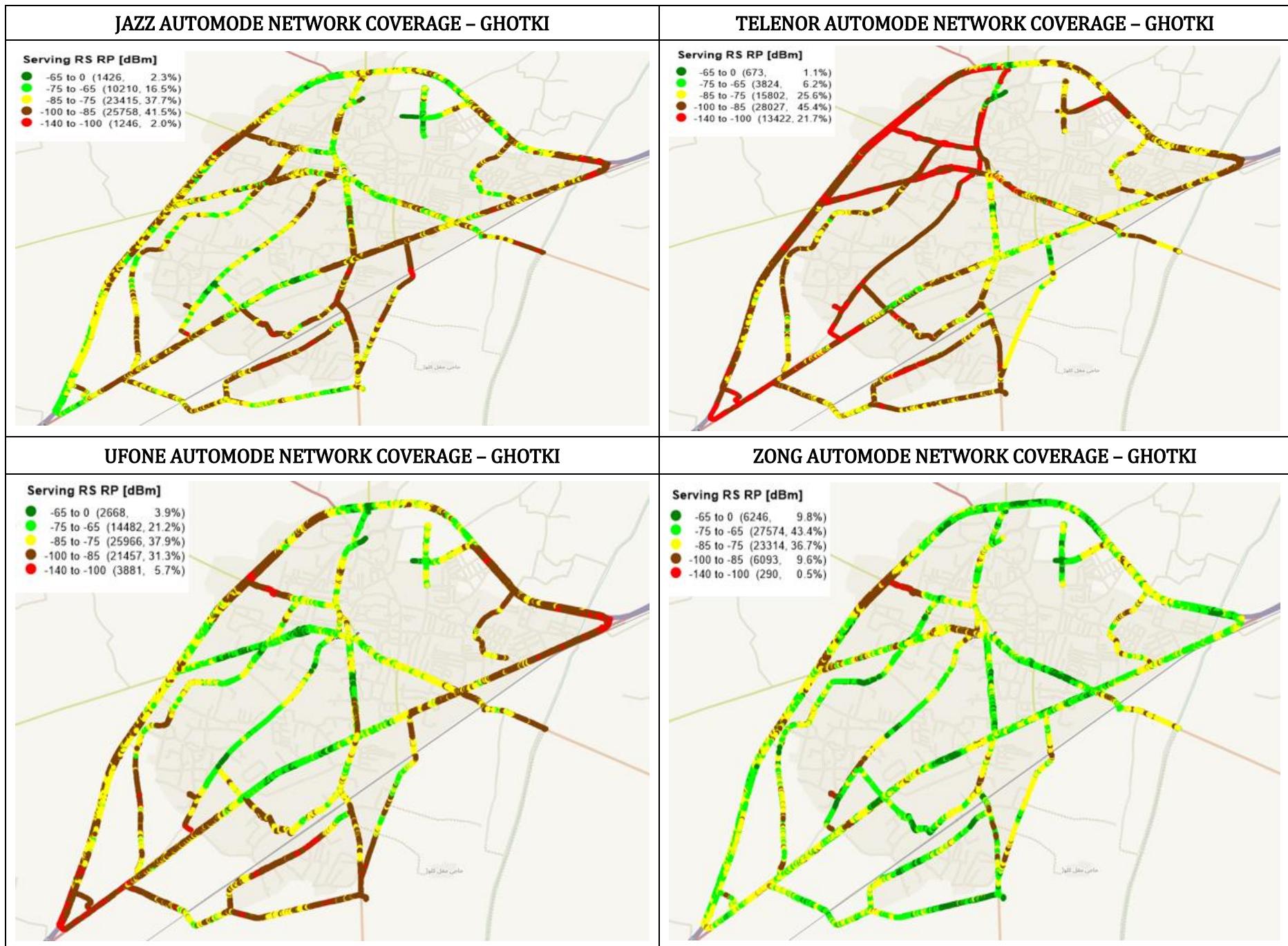
AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)



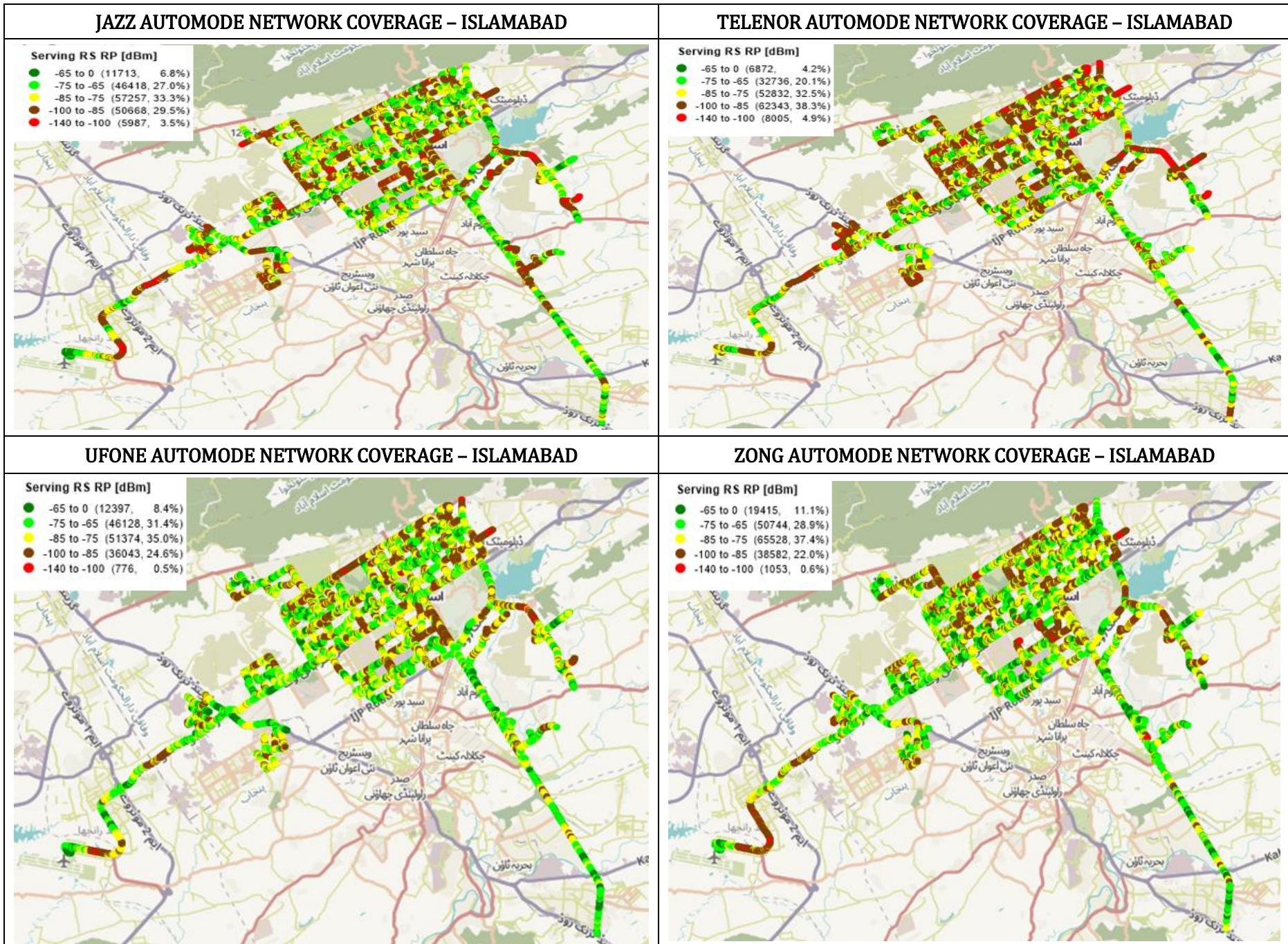
AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)



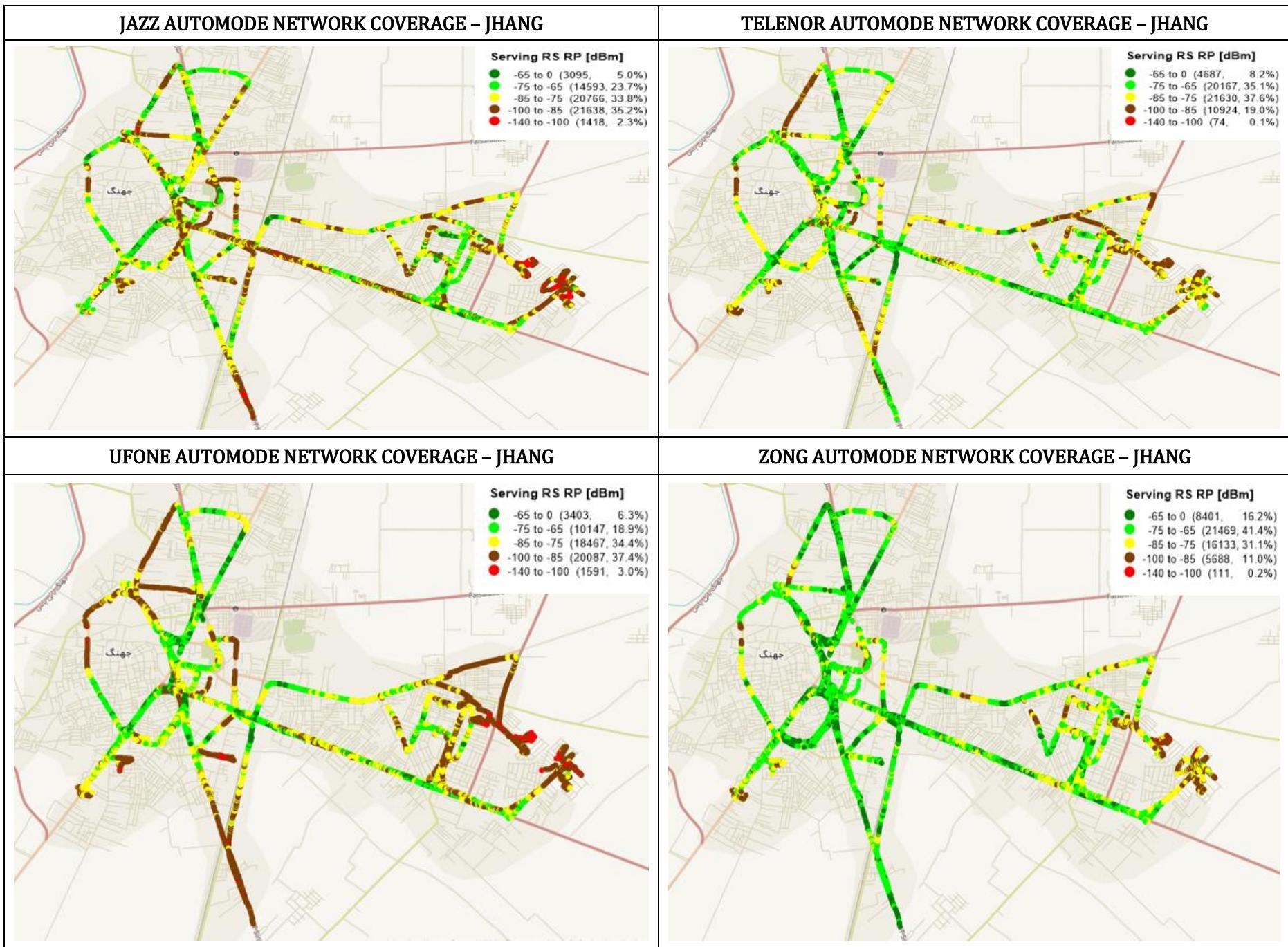
AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)



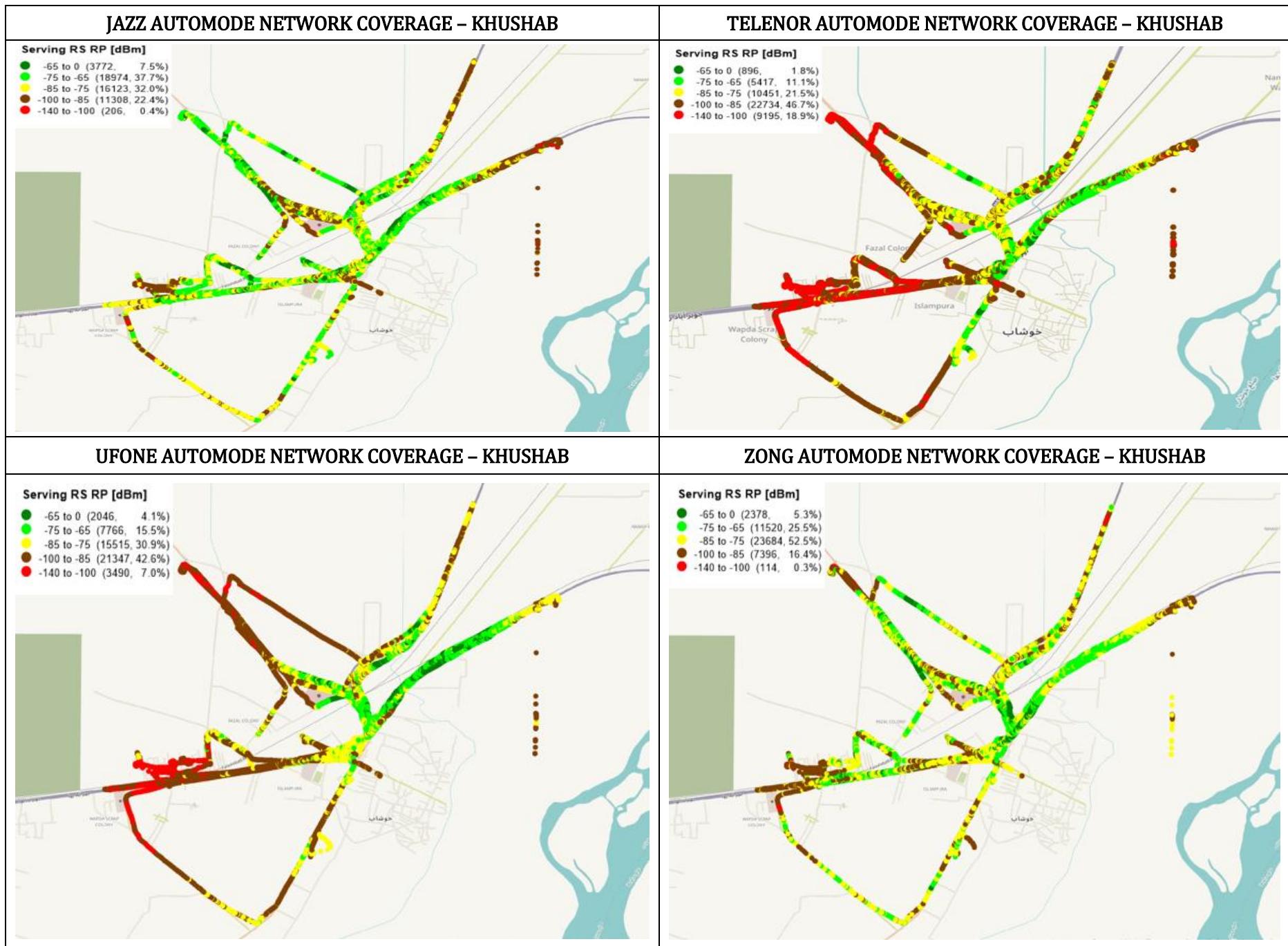
AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)



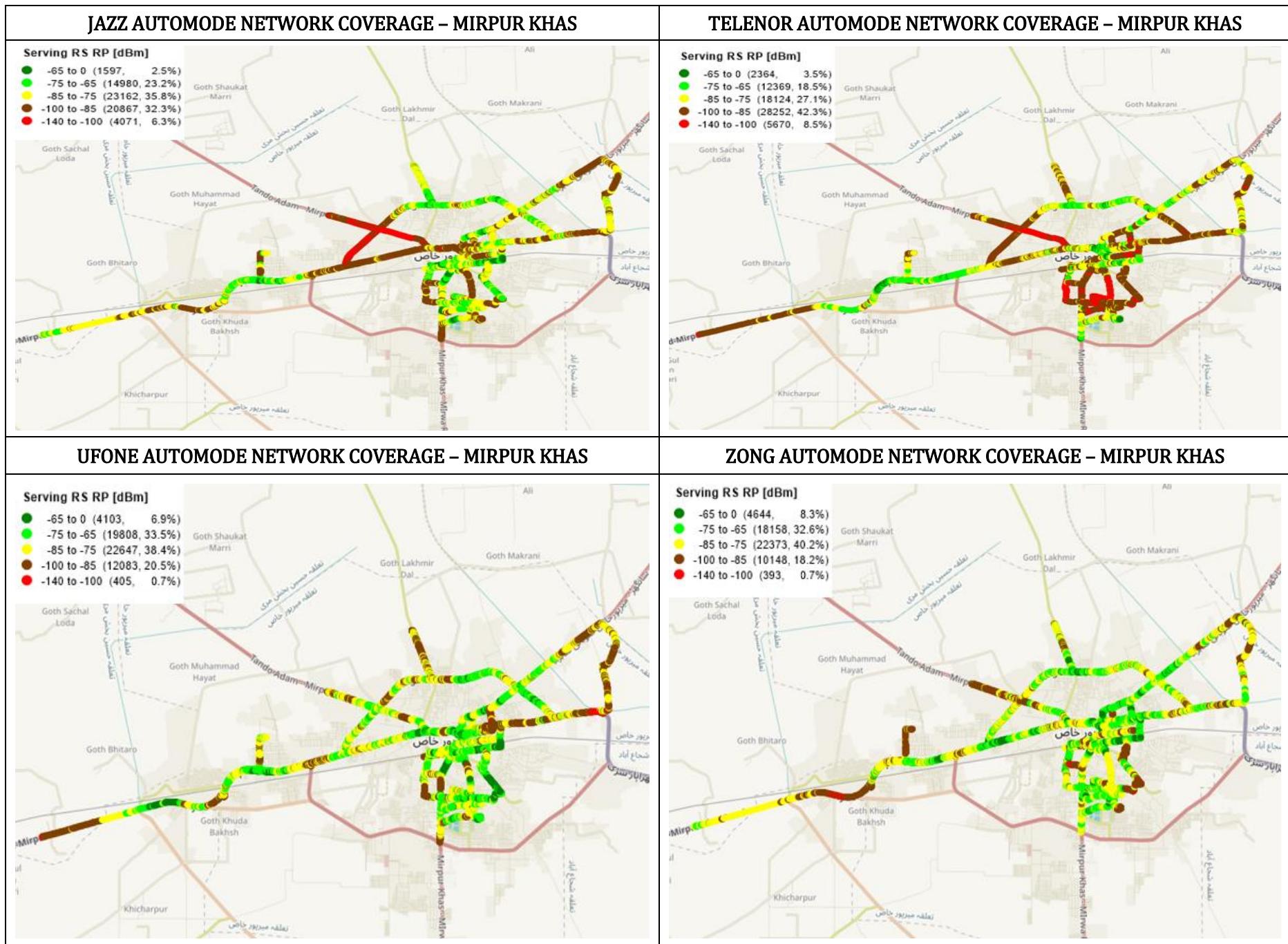
AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)



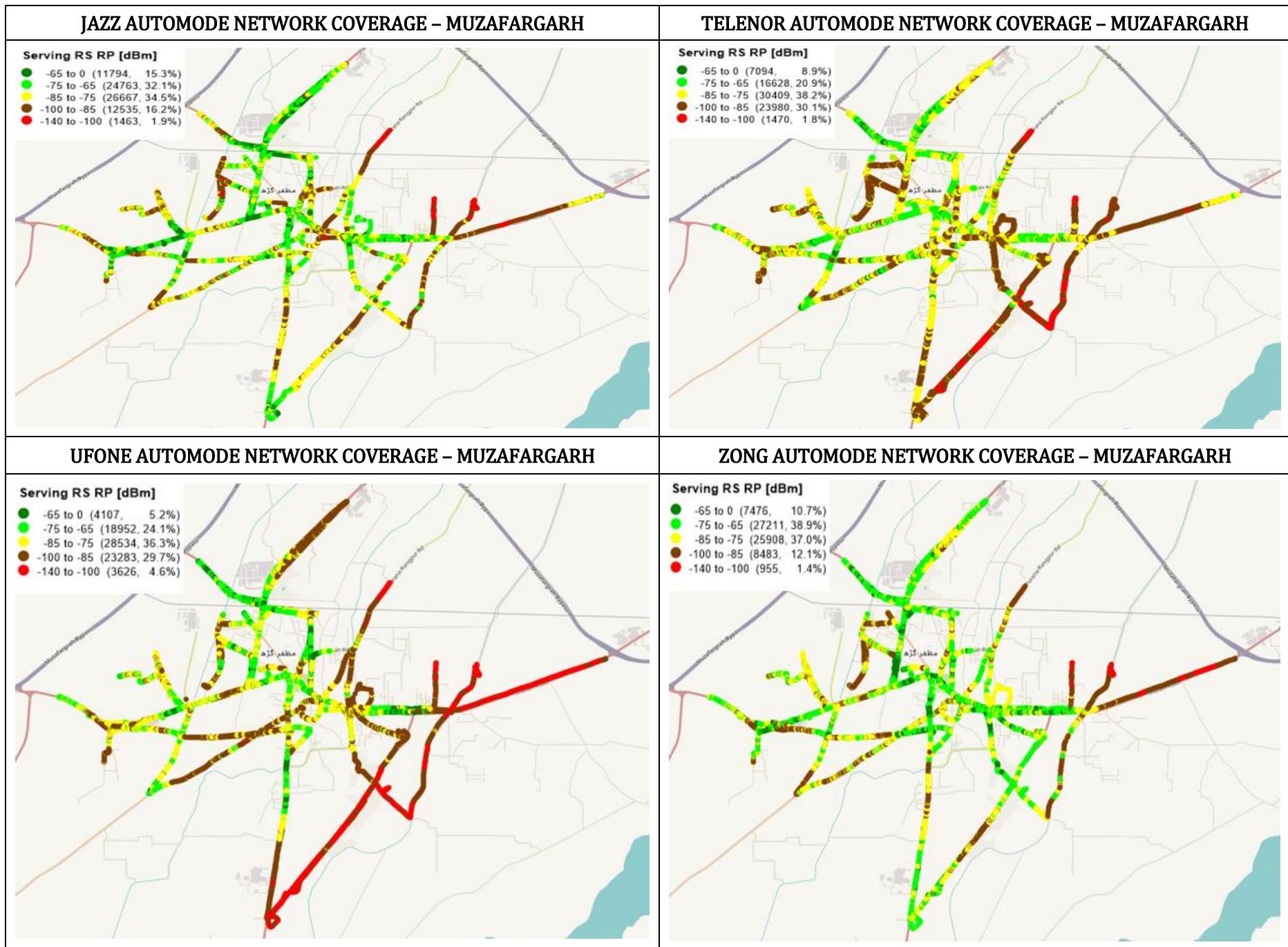
AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)



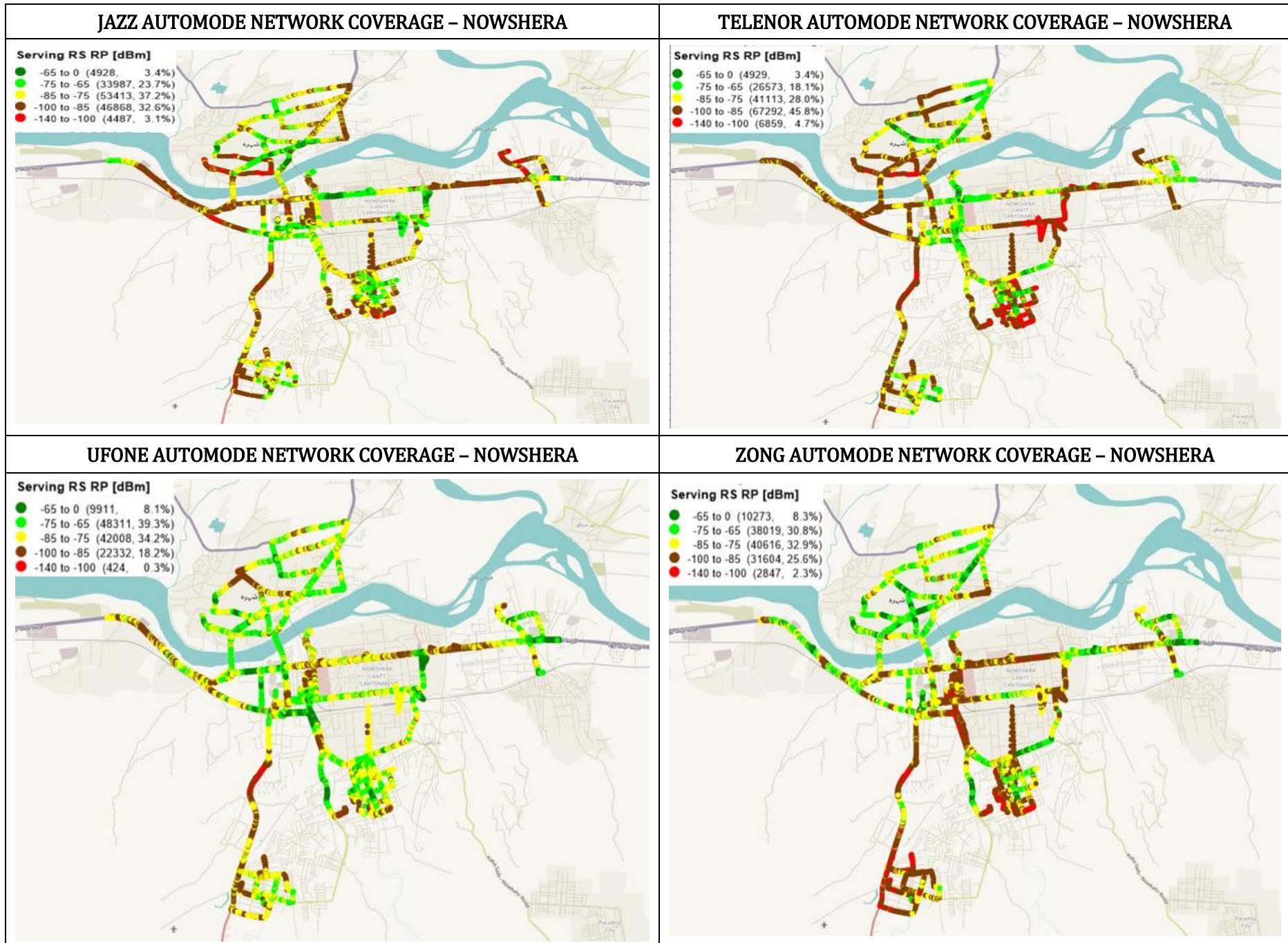
AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)



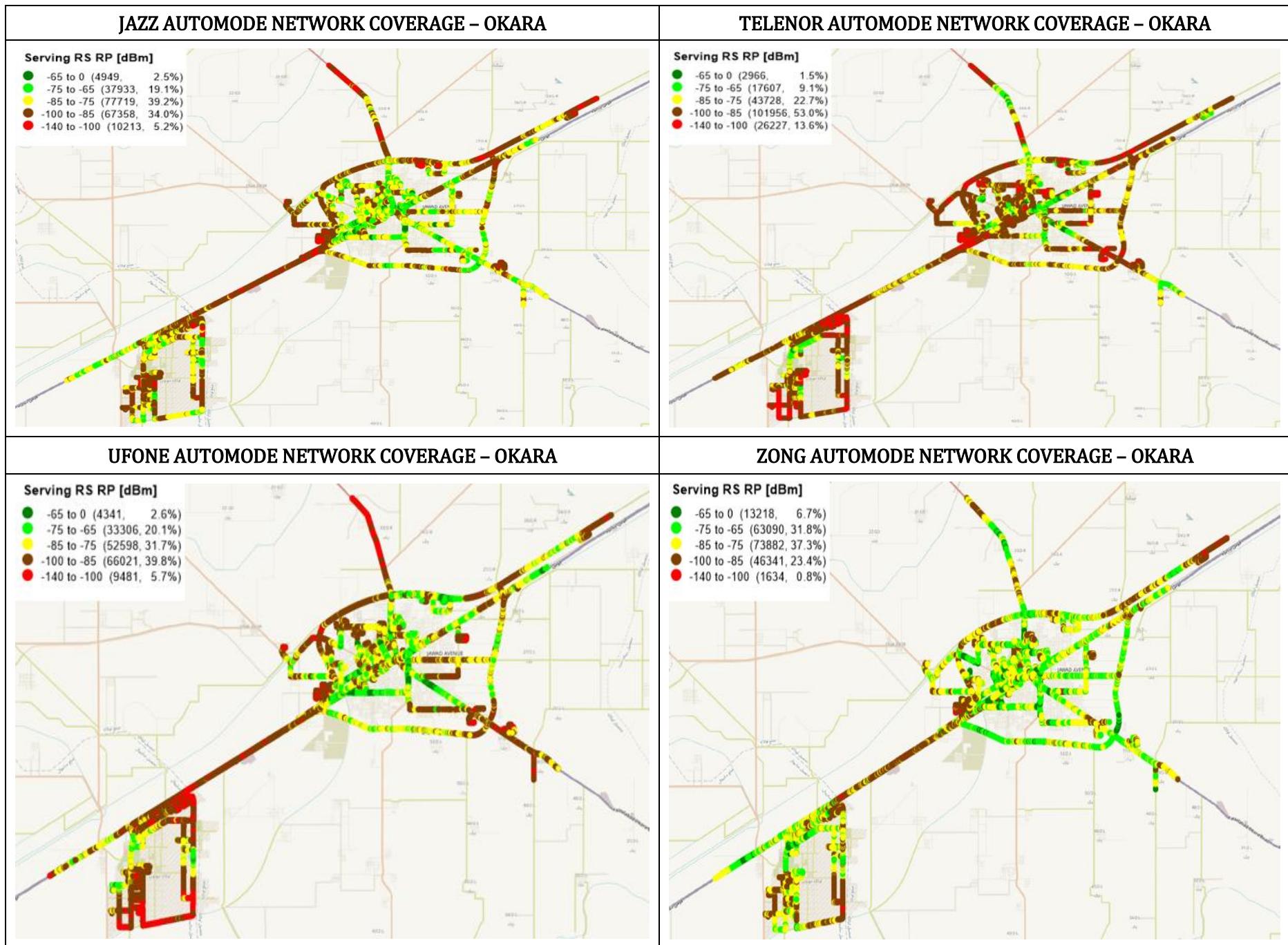
AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)



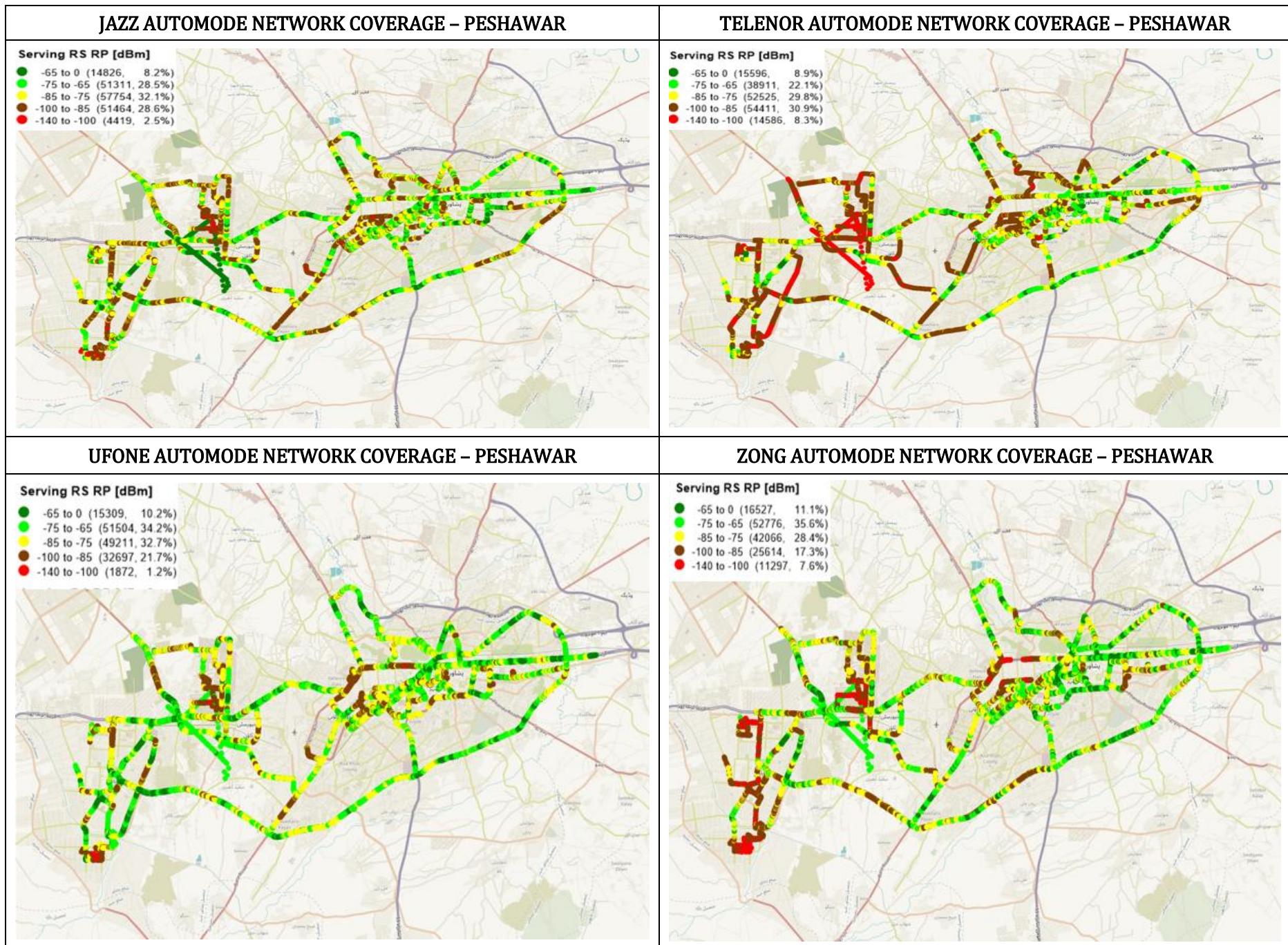
AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)



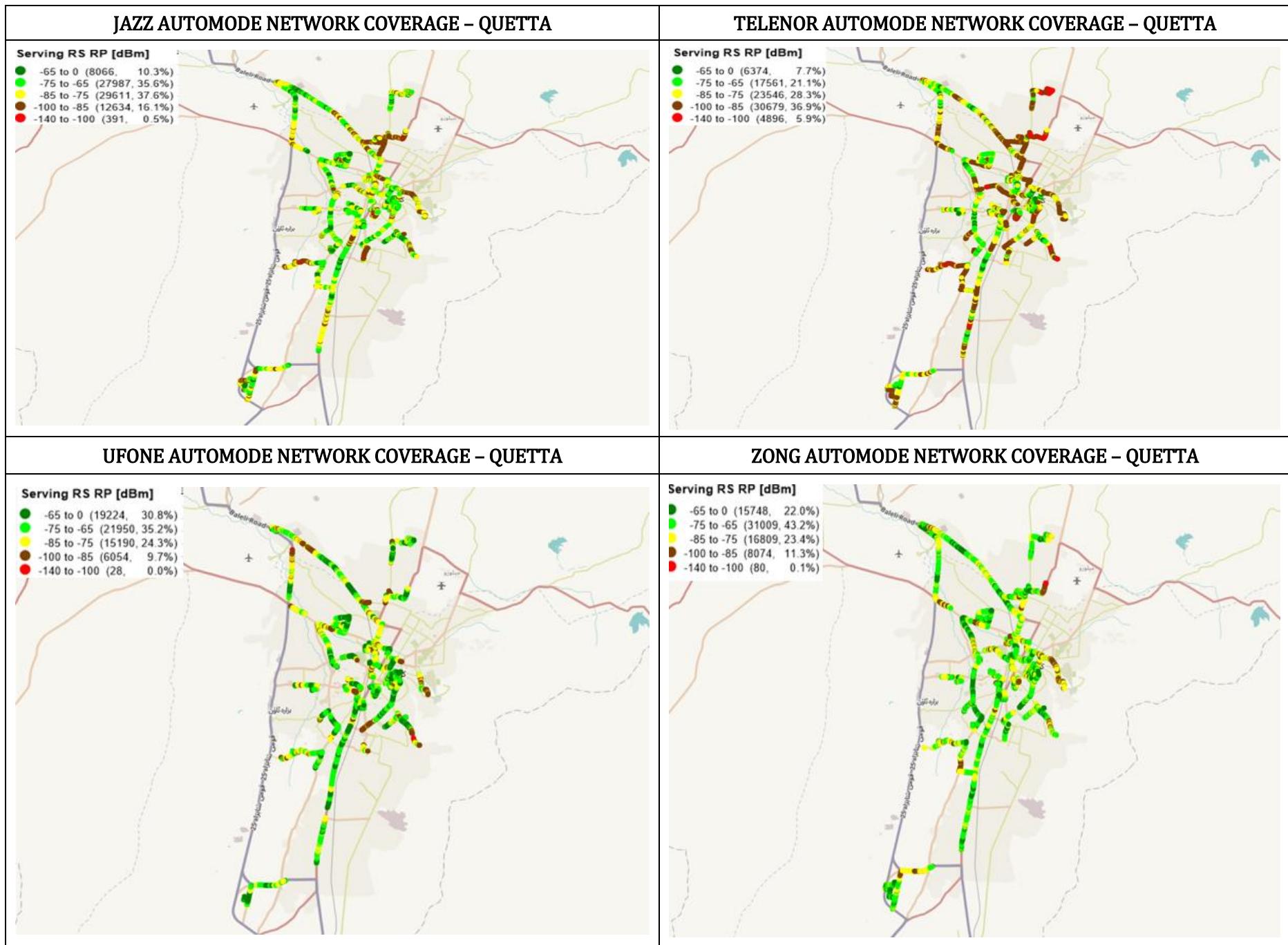
AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)



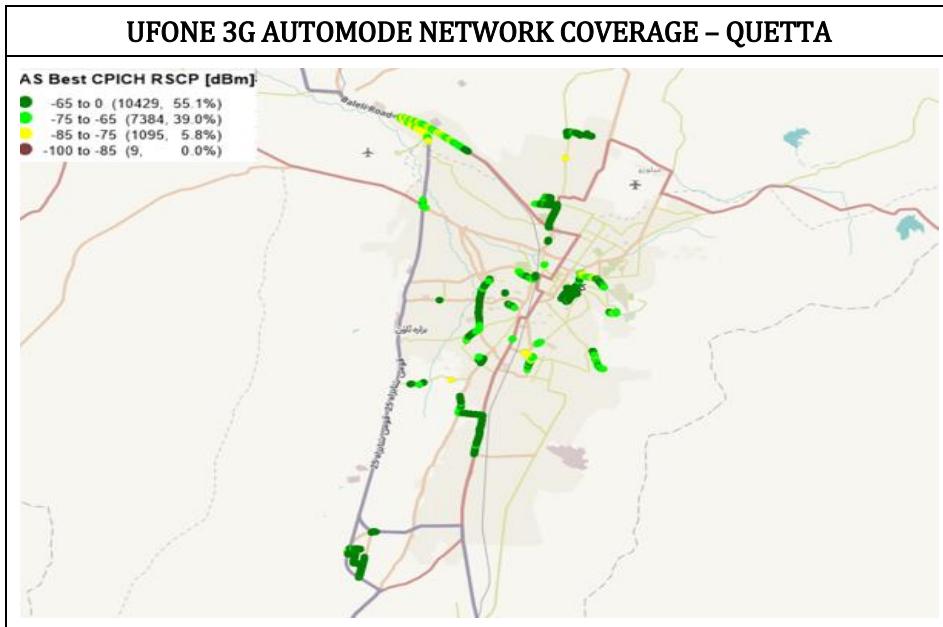
AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)



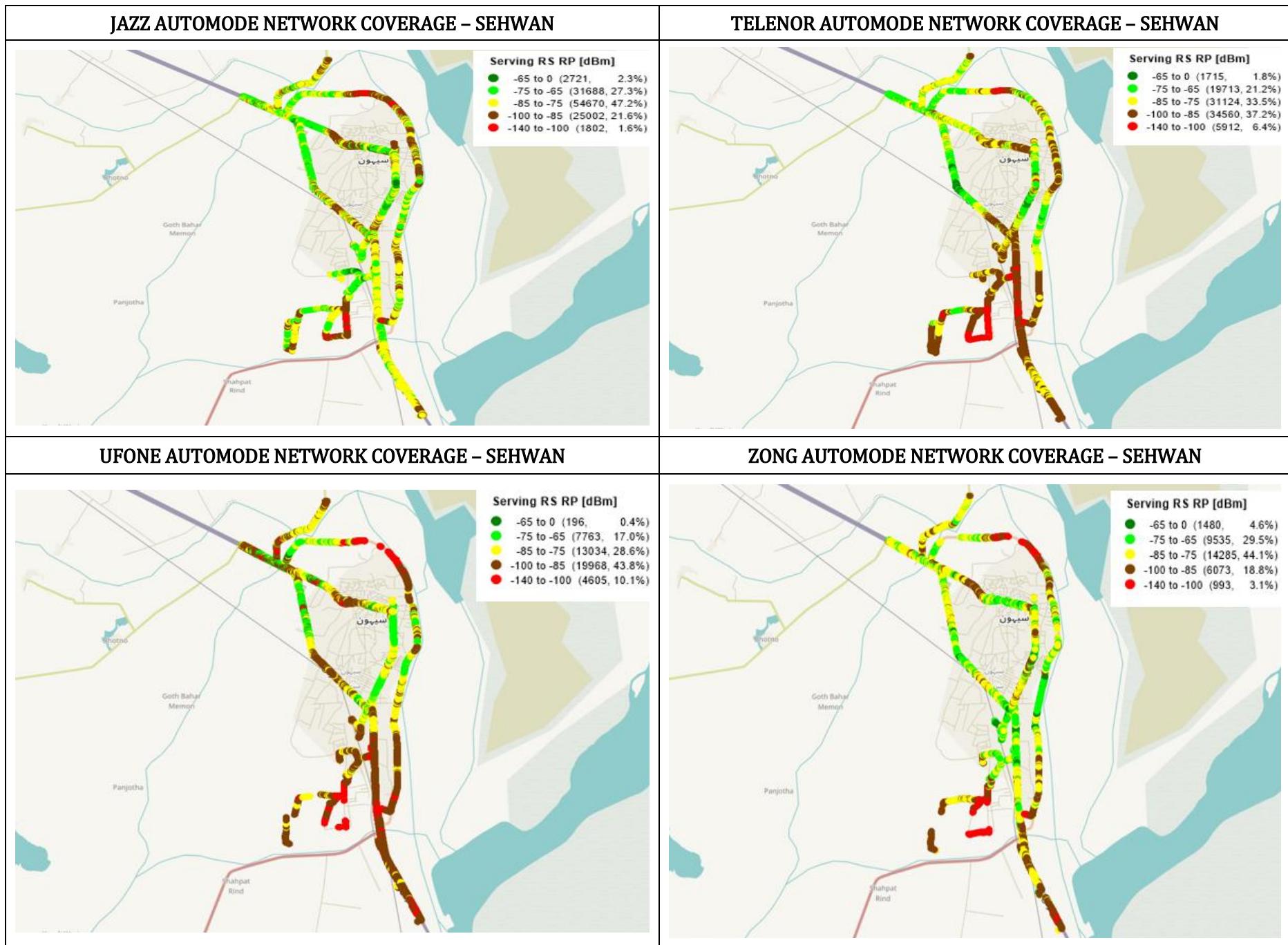
AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)



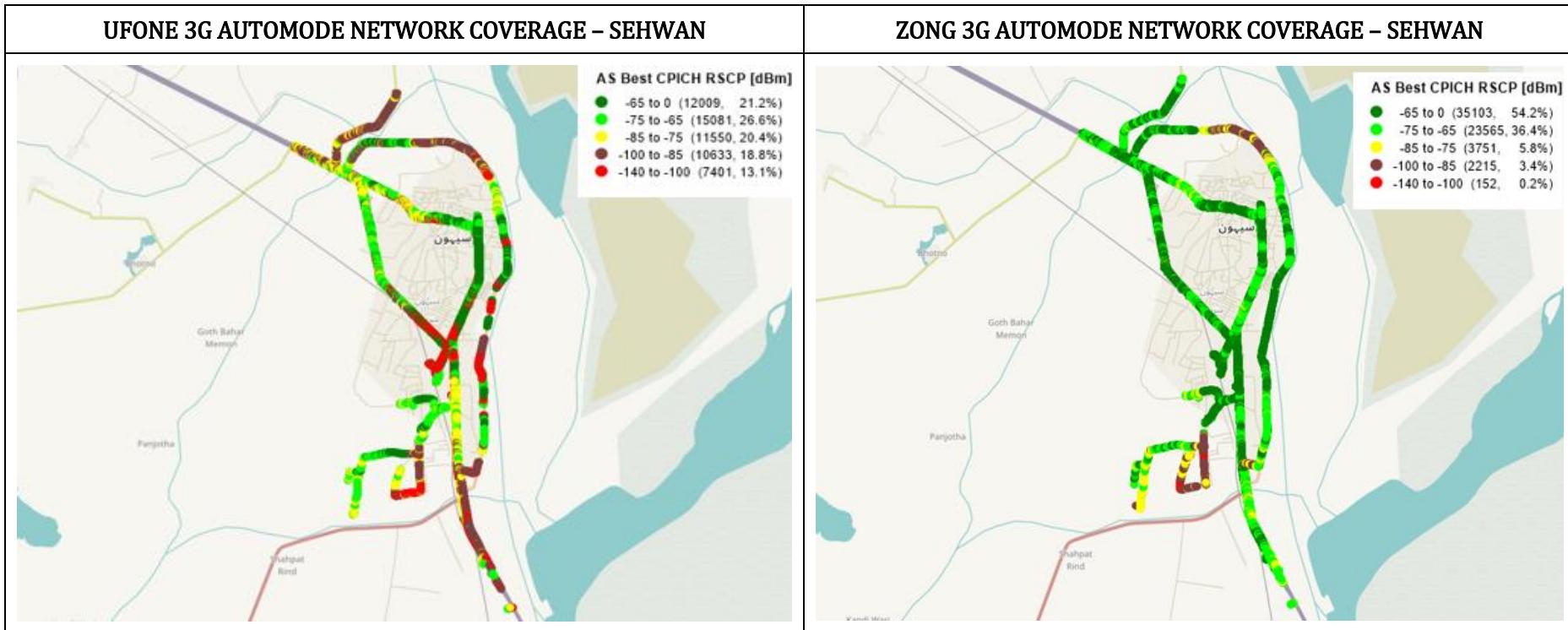
AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)



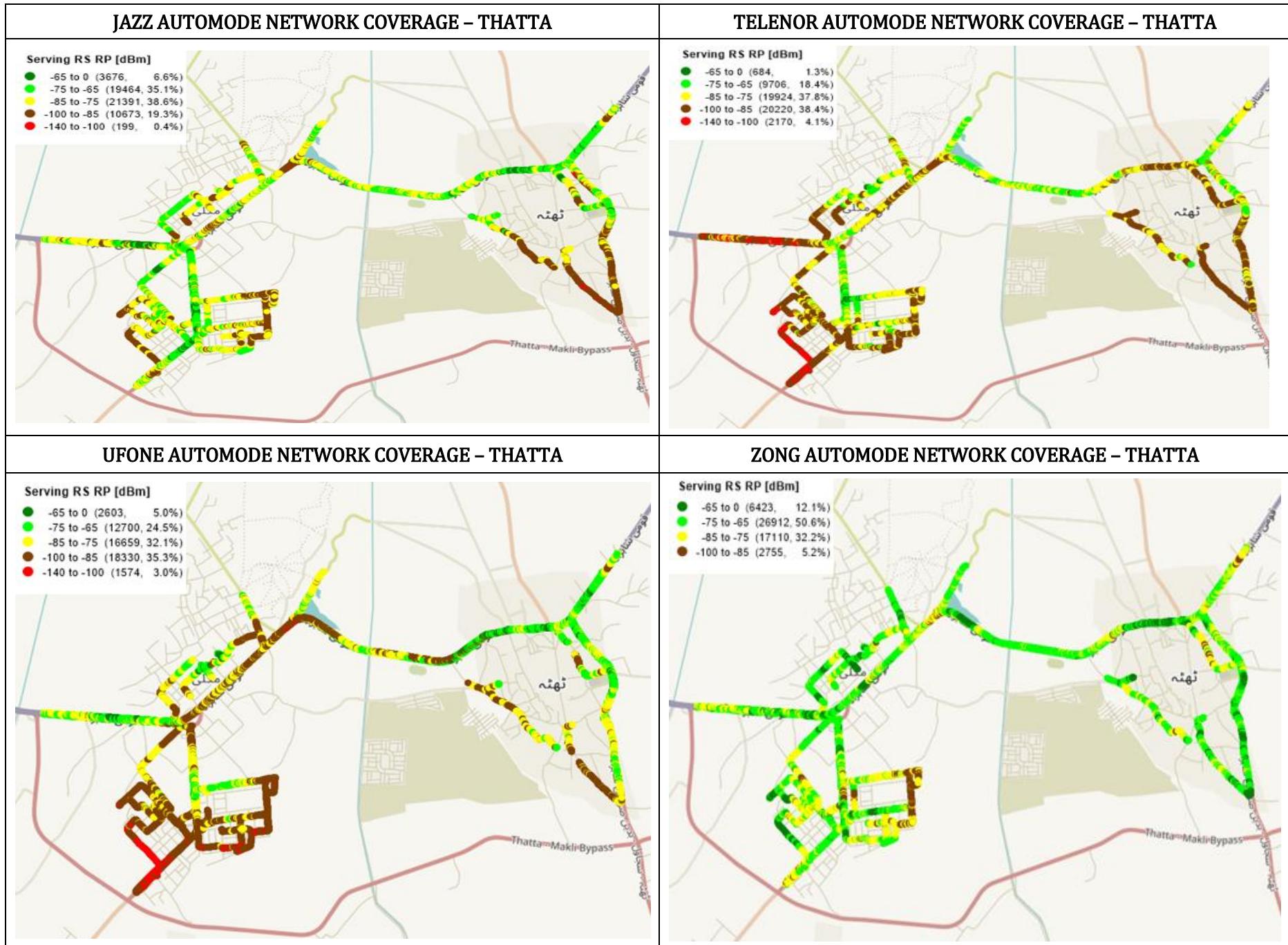
AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)



AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)



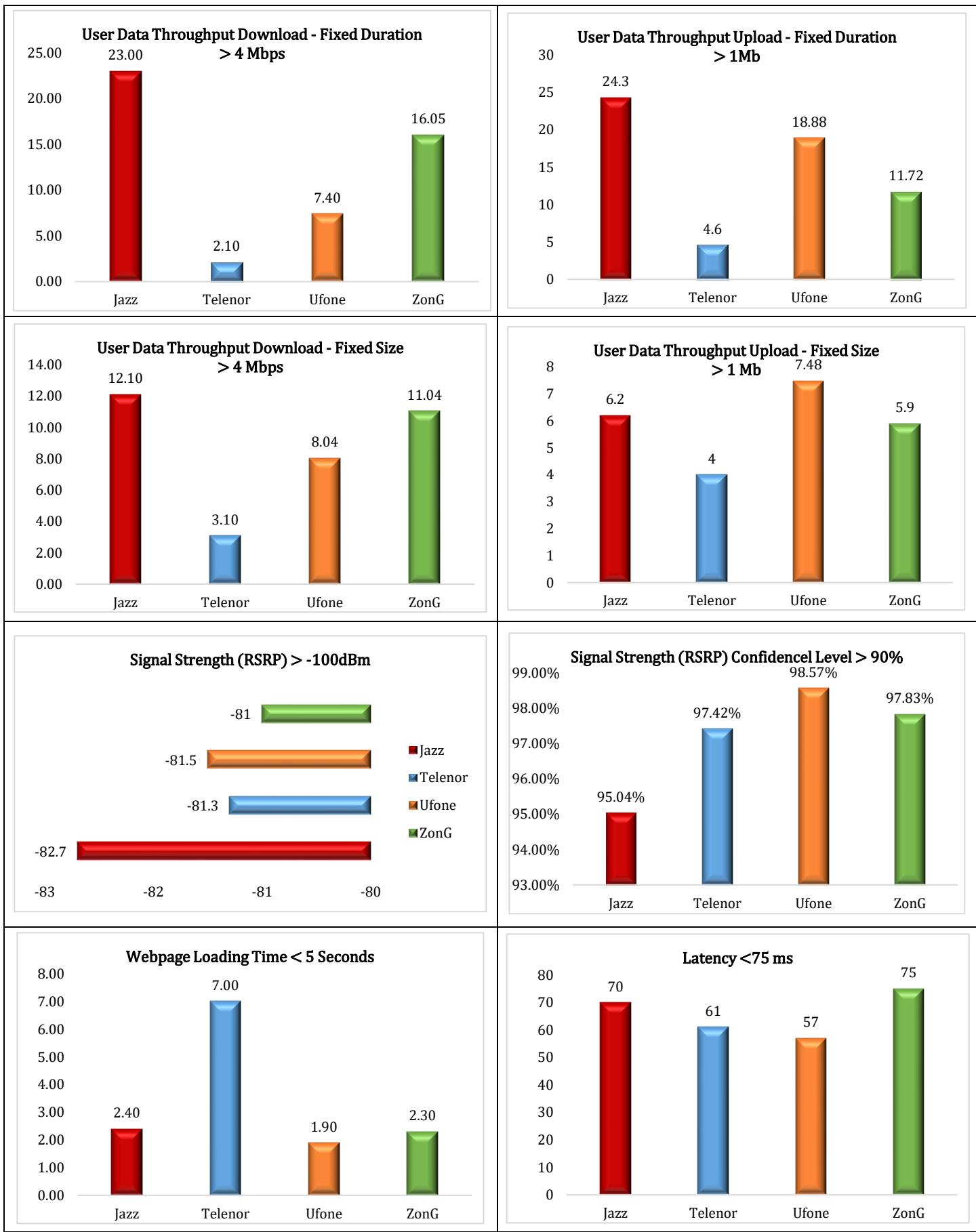
AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)



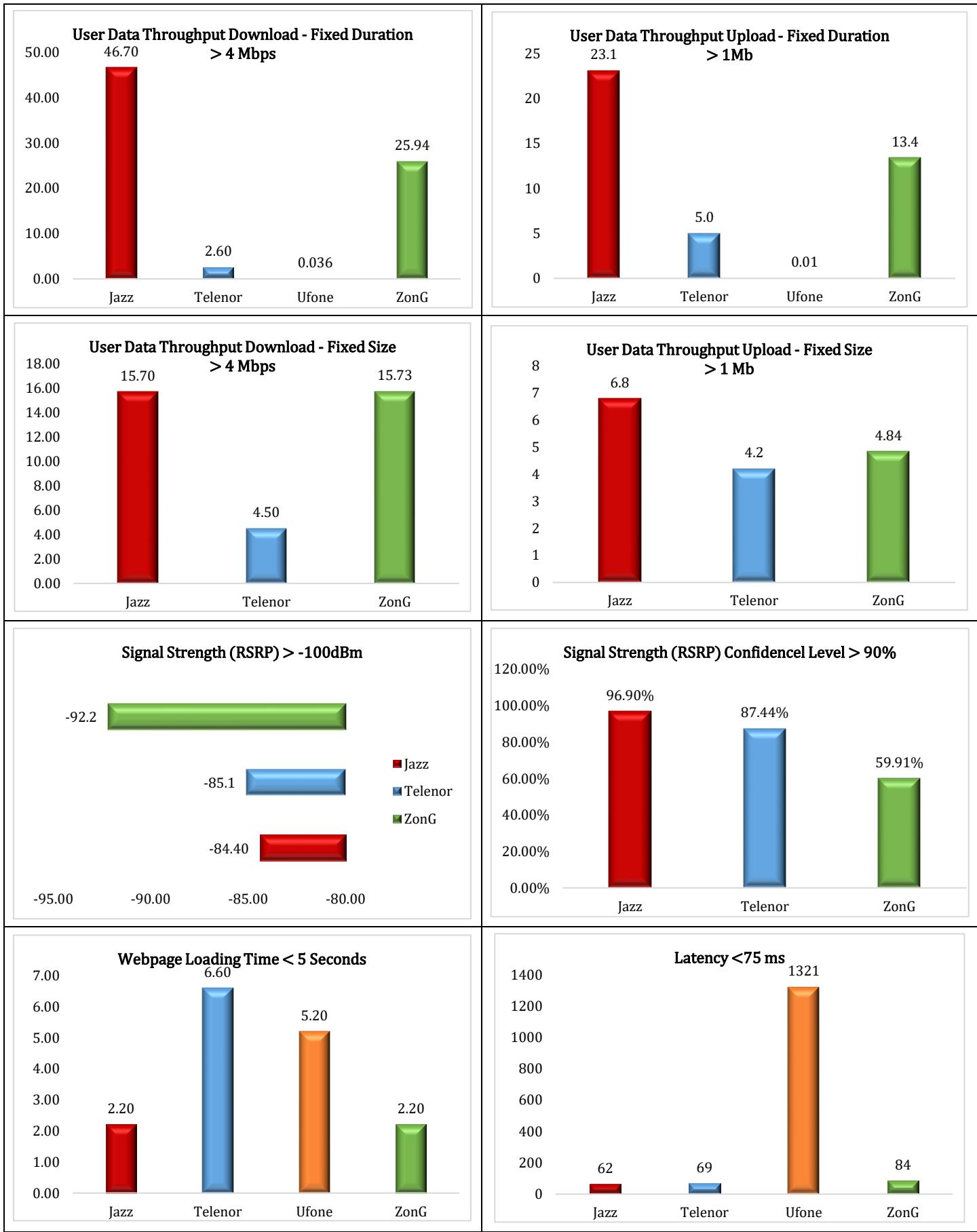
Annex -A1(Data QoS Results)

AUTOMODE

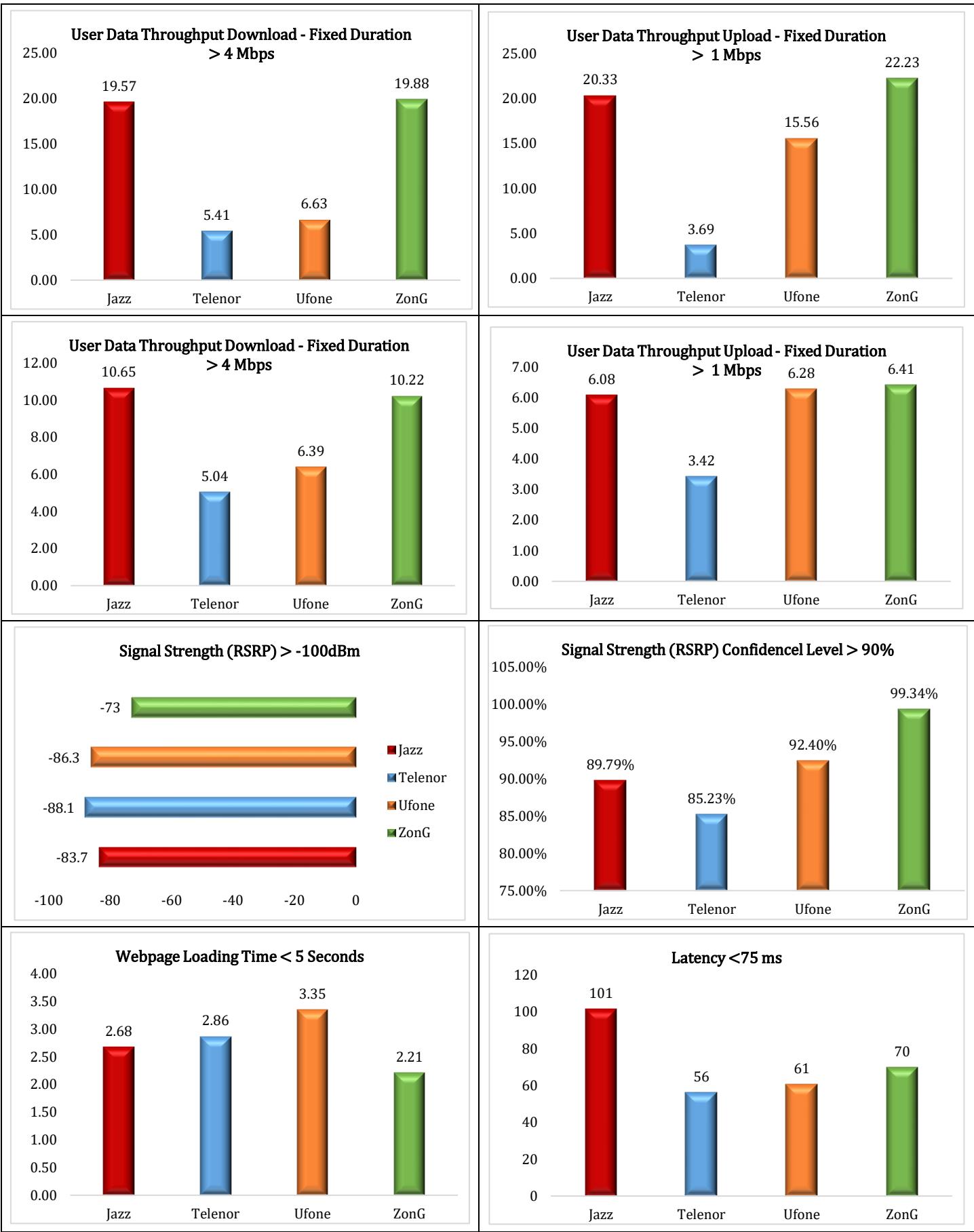
QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – BATTAGRAM



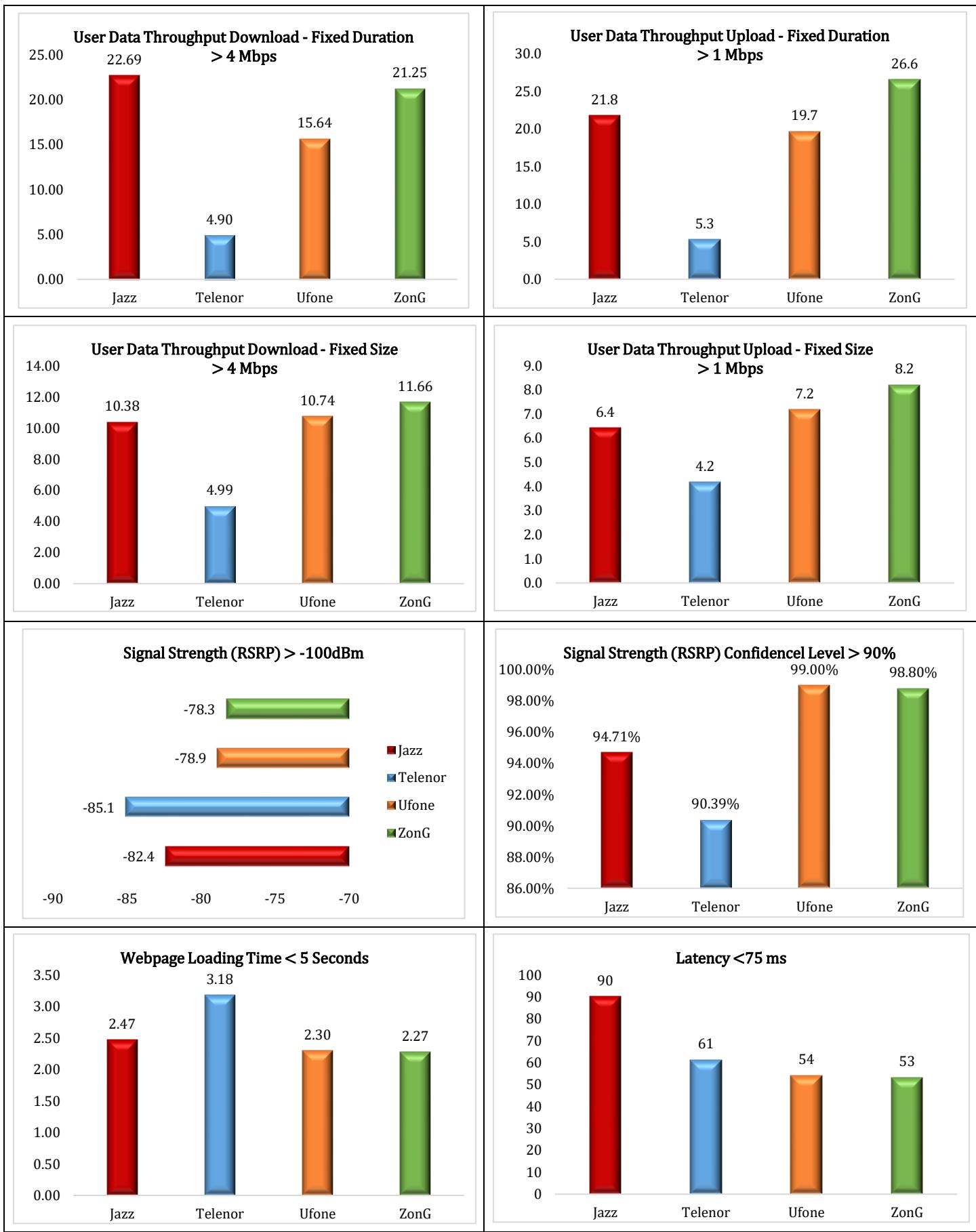
QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – BESHAM



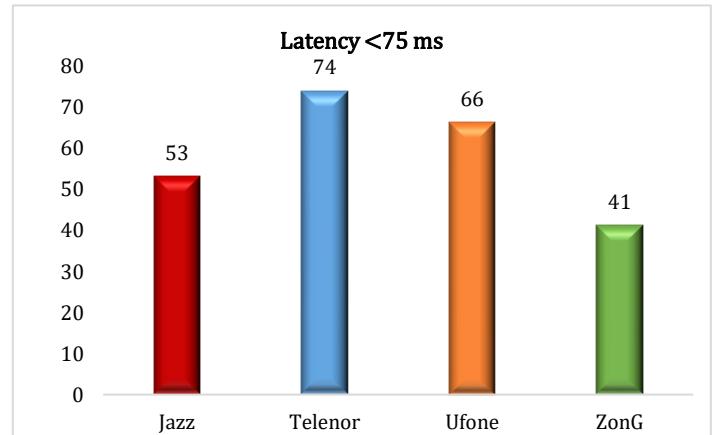
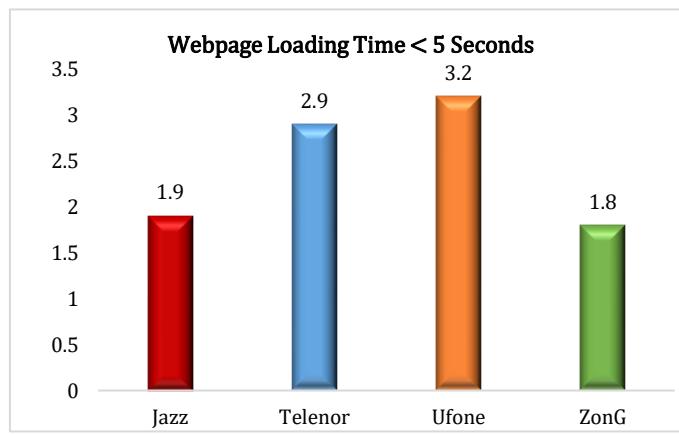
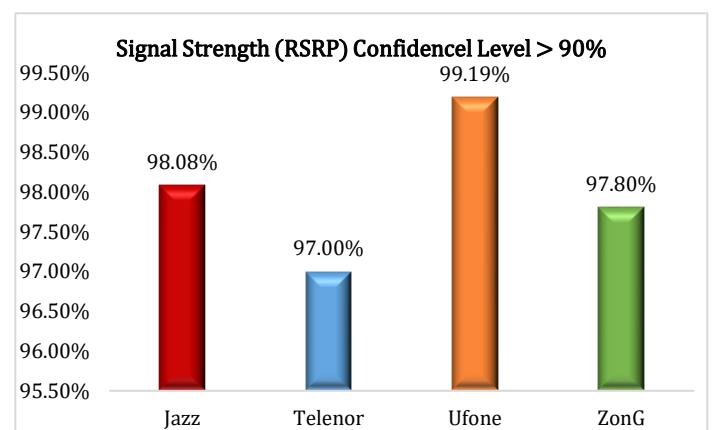
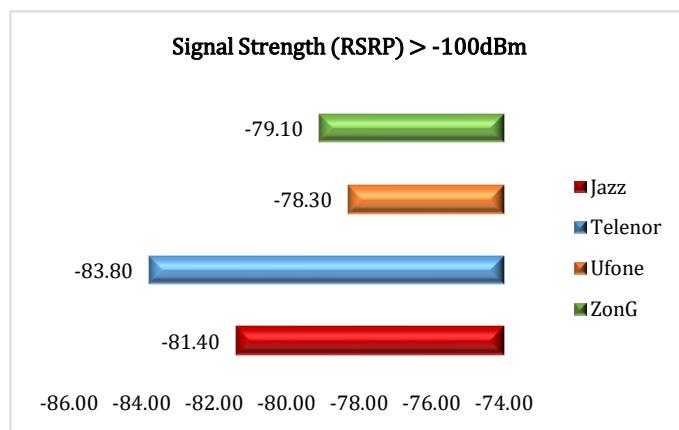
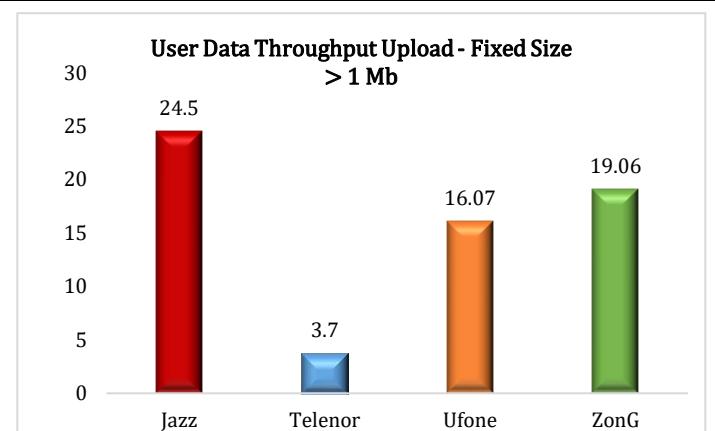
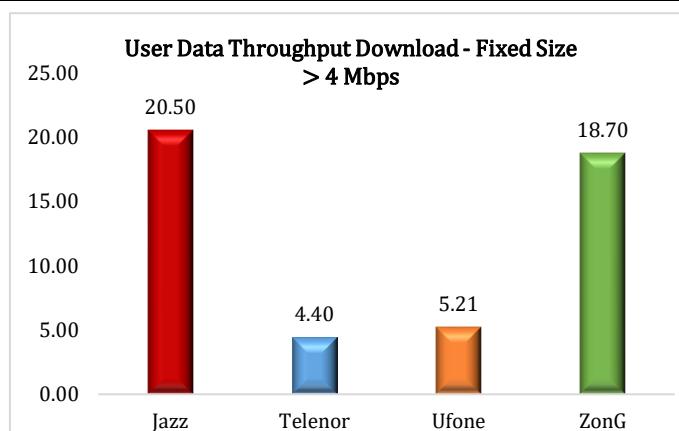
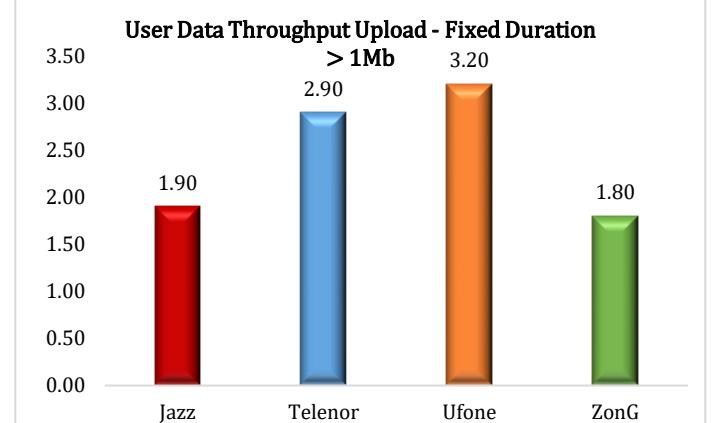
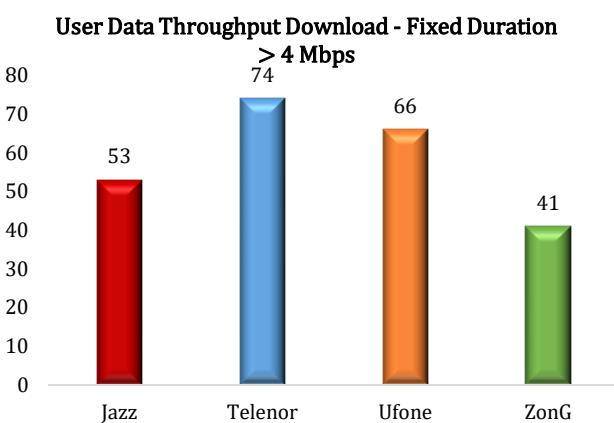
QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – DADU



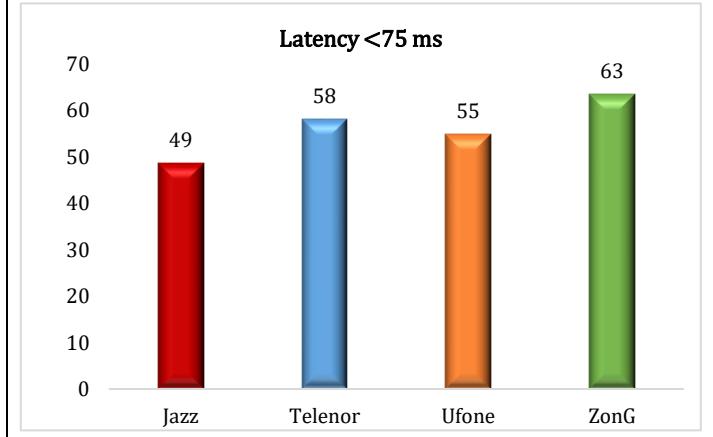
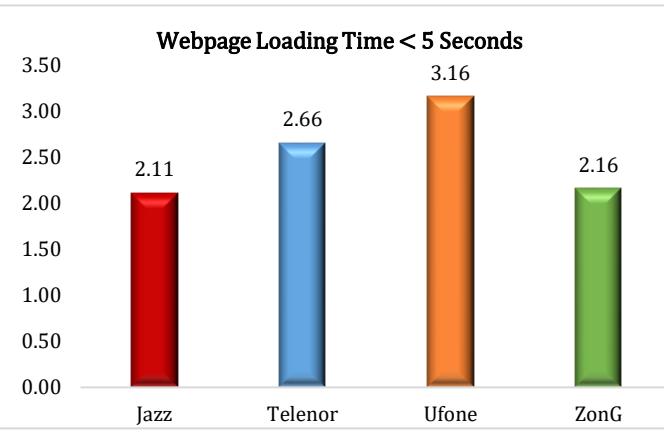
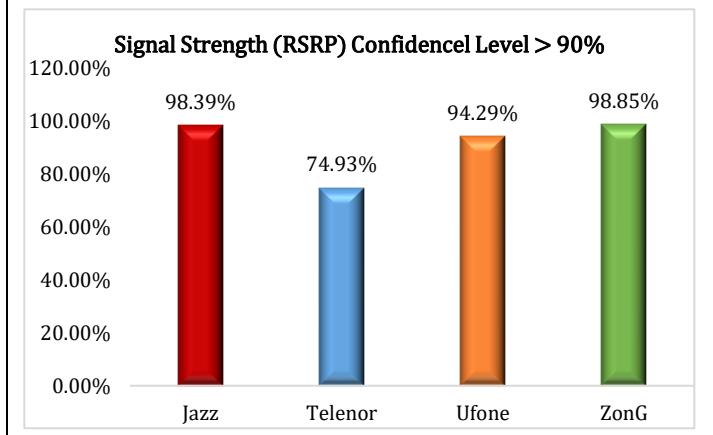
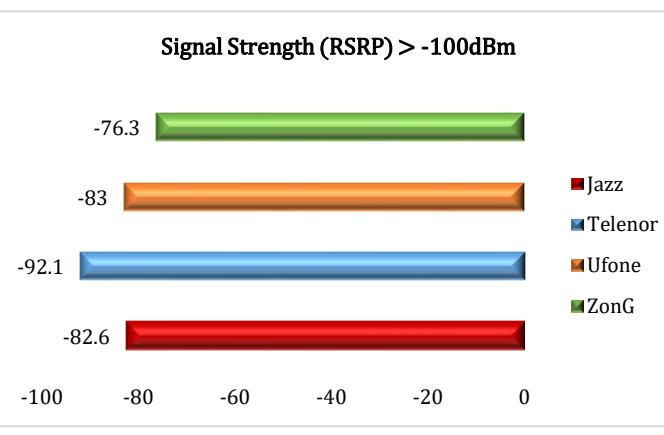
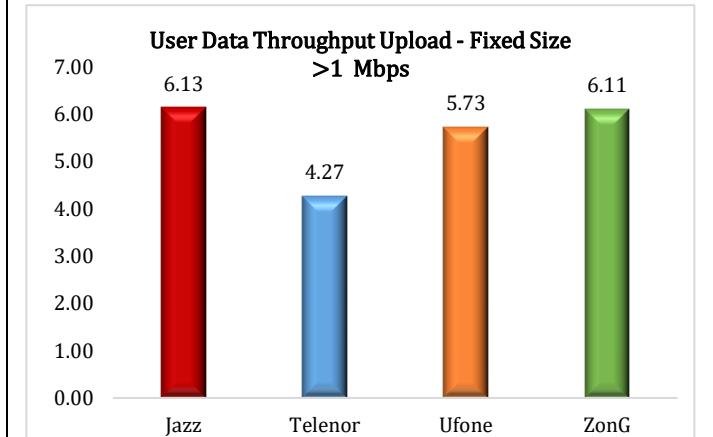
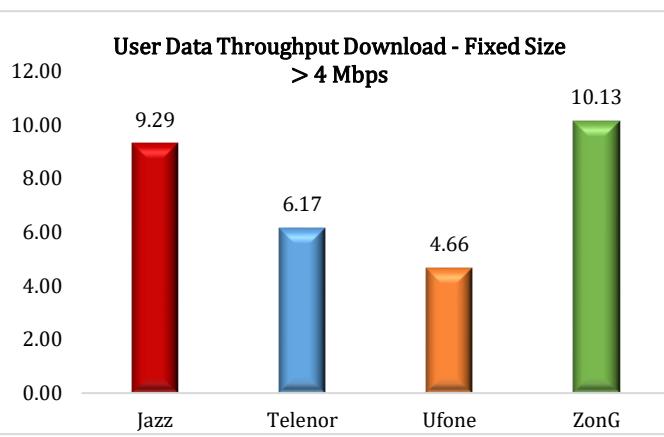
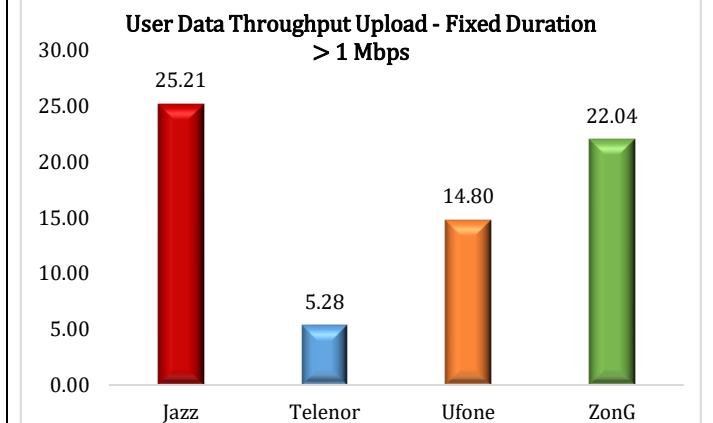
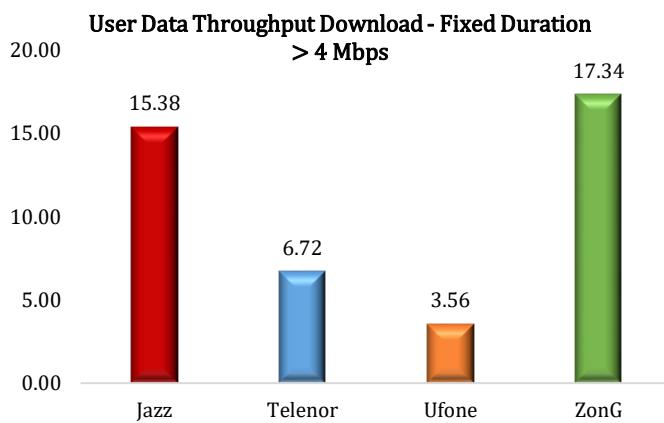
QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – DASKA



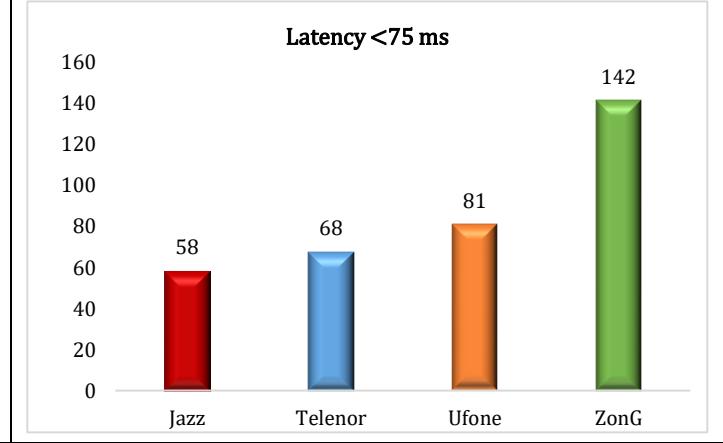
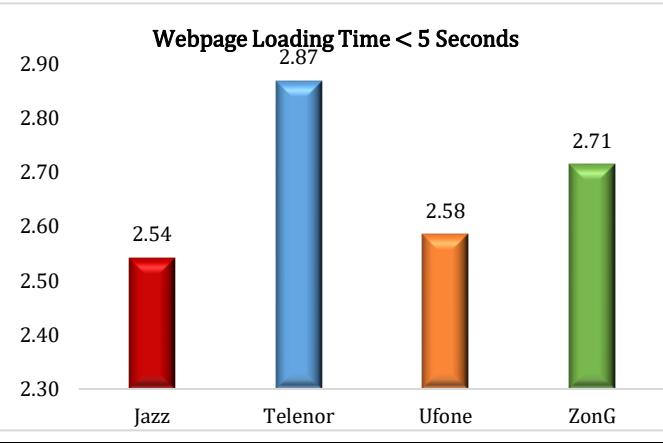
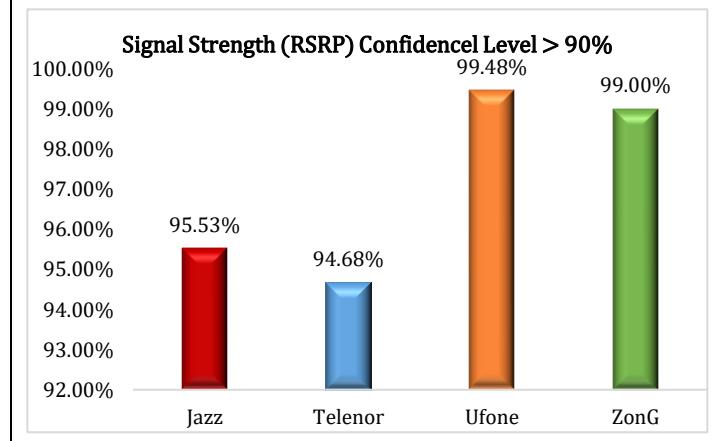
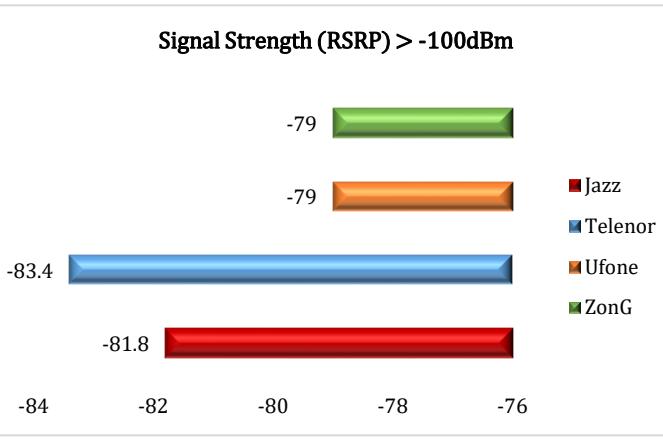
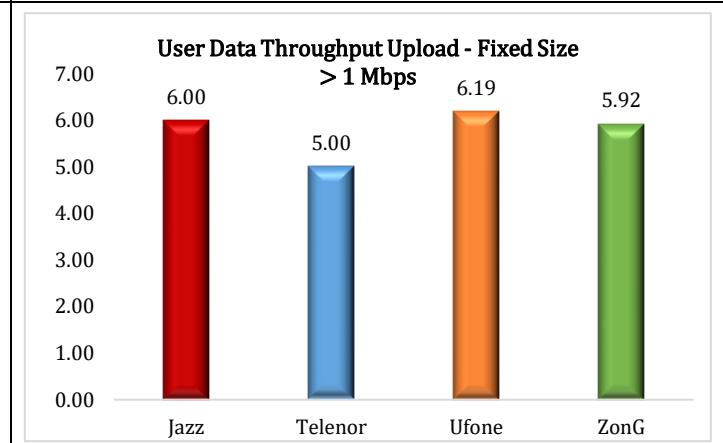
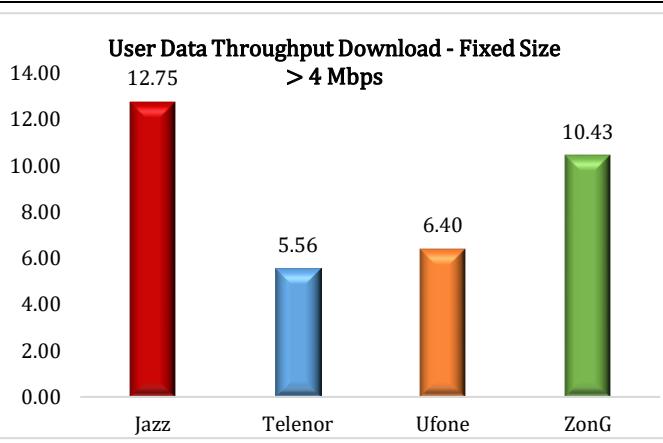
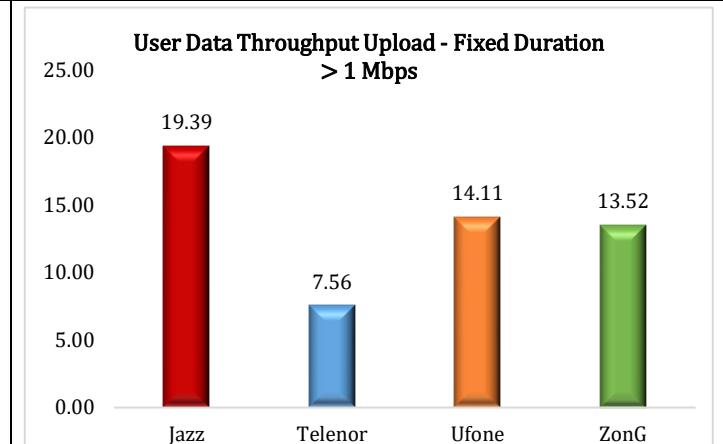
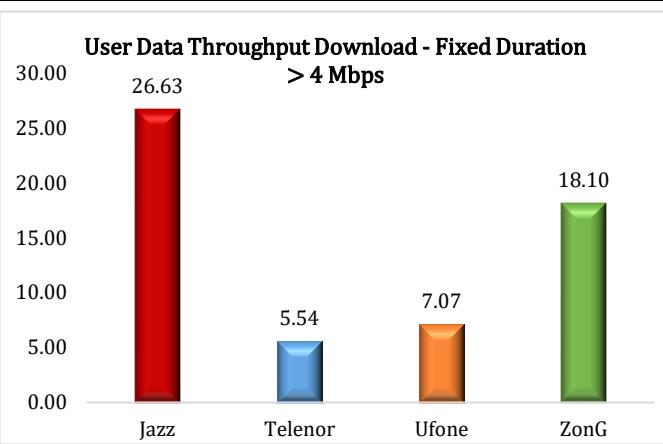
QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – DERA ALLAH YAR



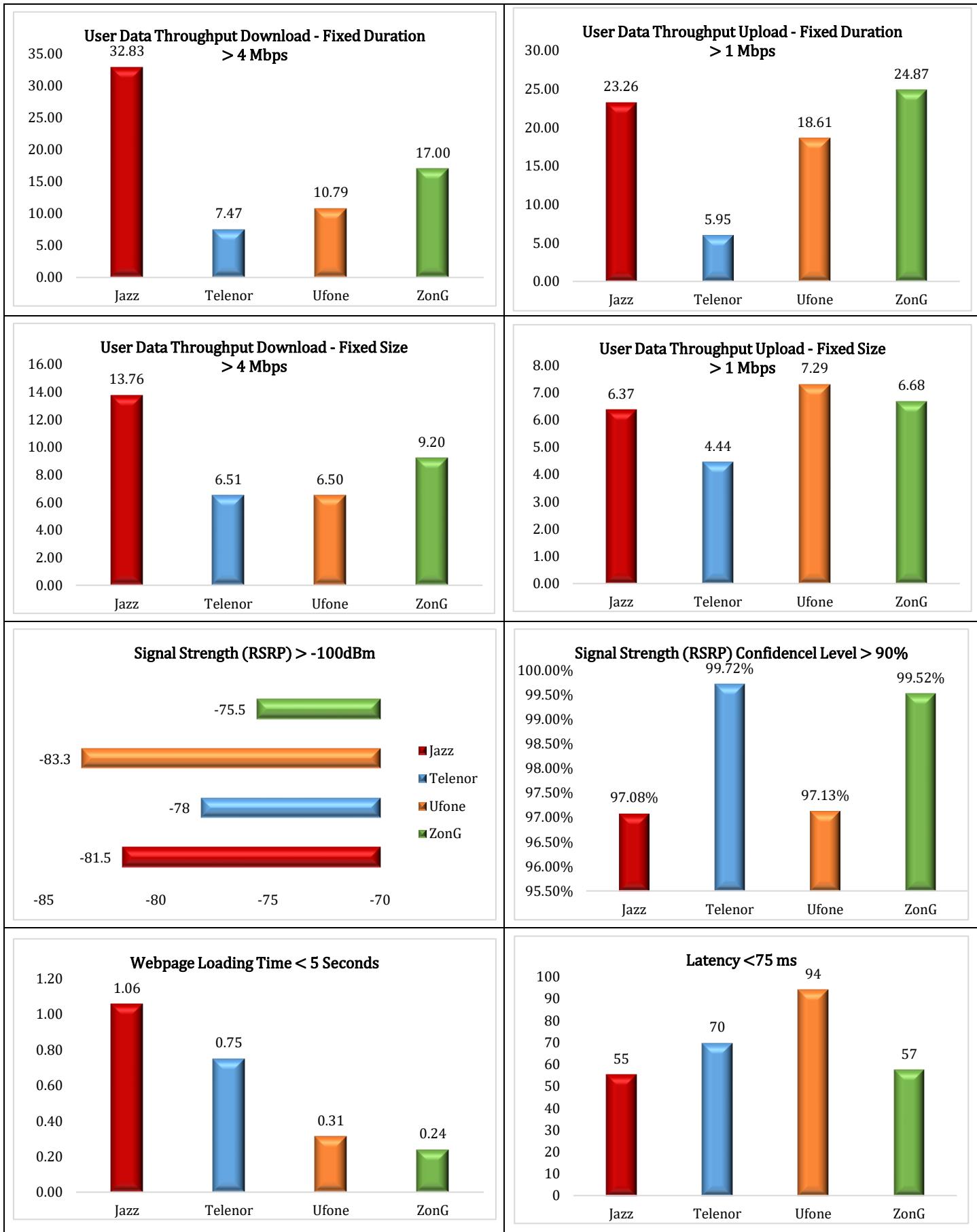
QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – GHOTKI



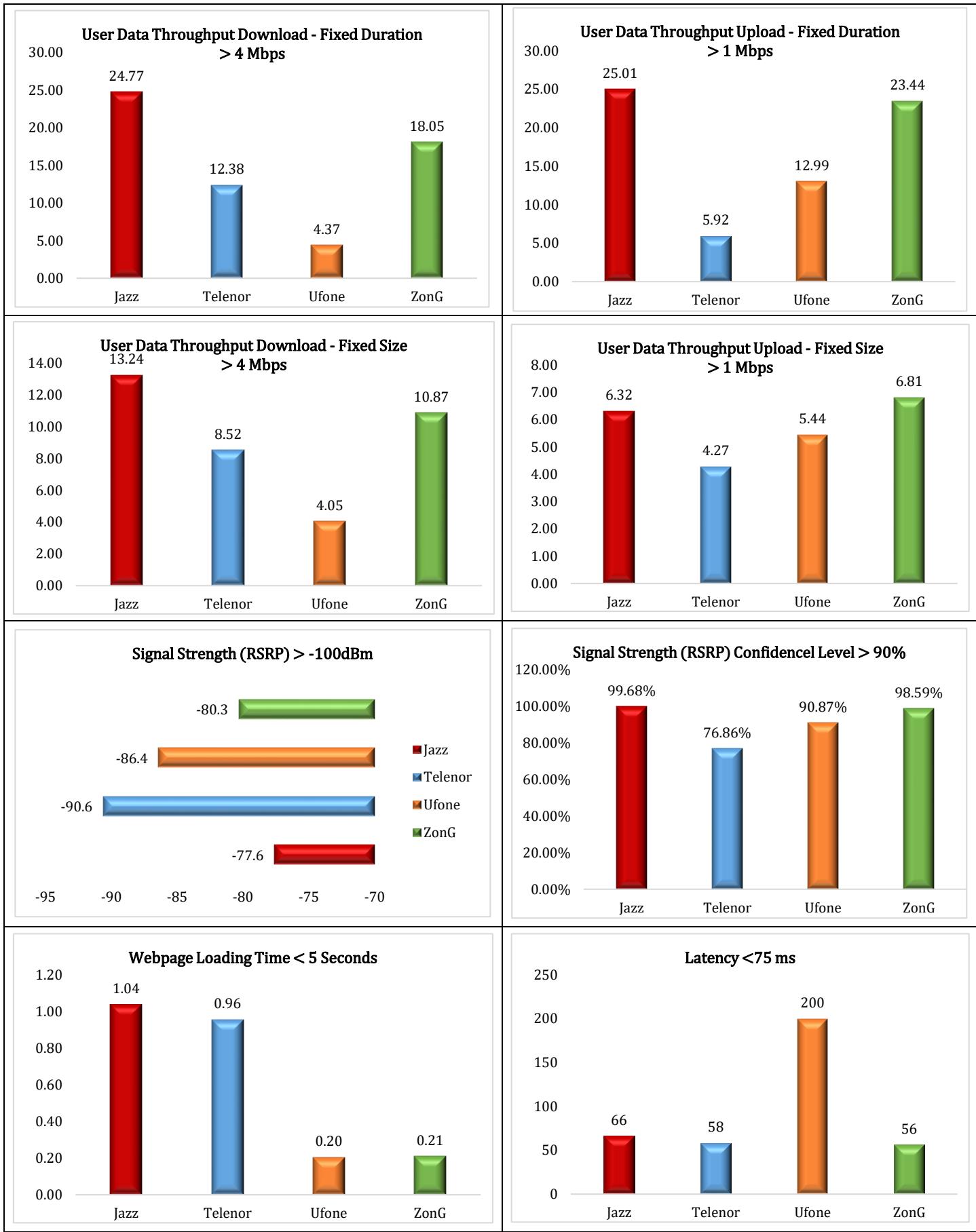
QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – ISLAMABAD



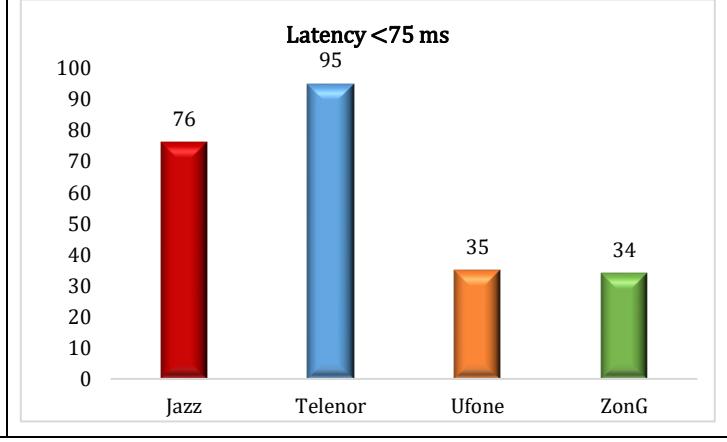
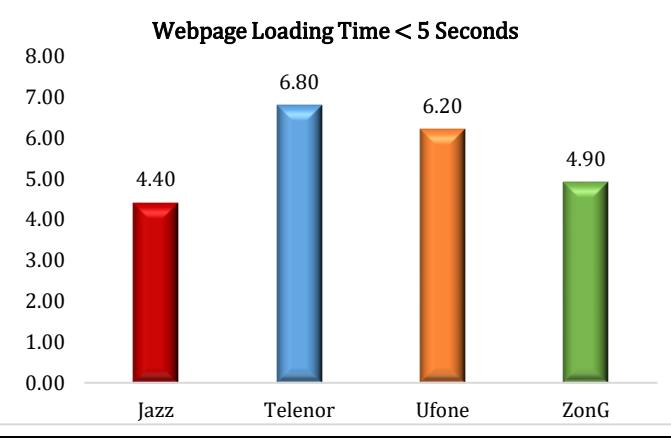
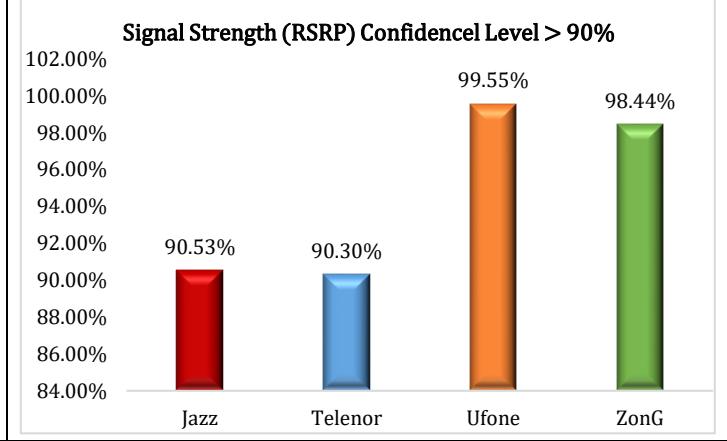
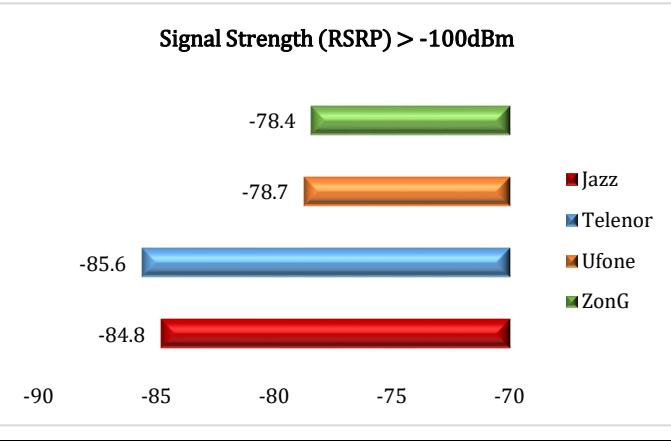
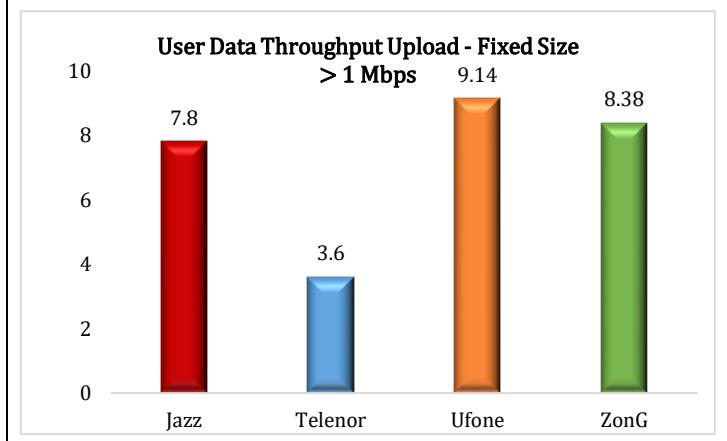
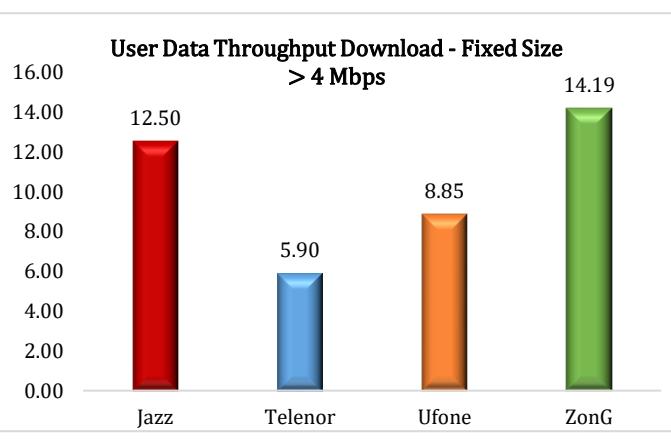
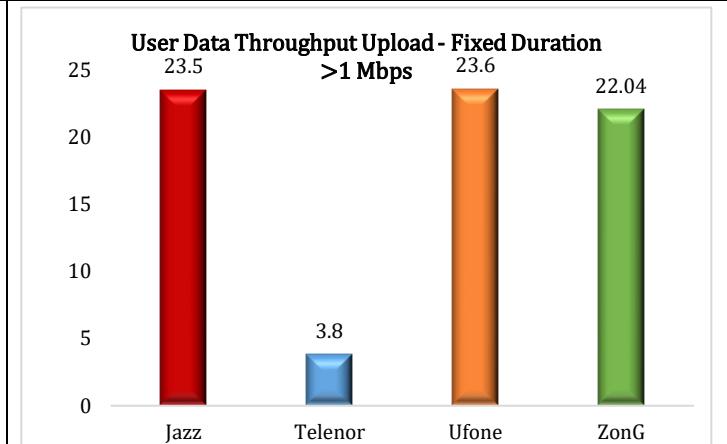
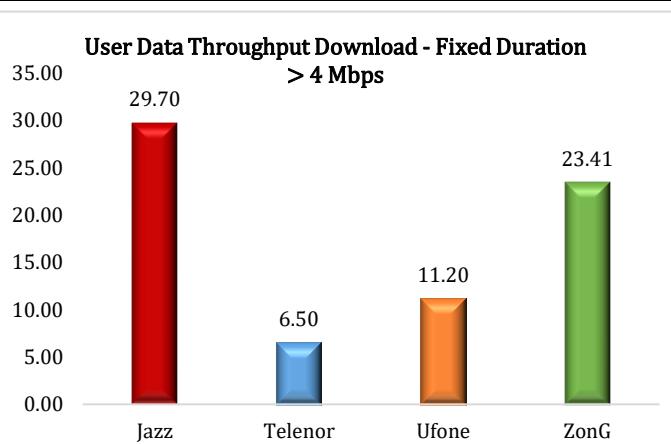
QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – JHANG



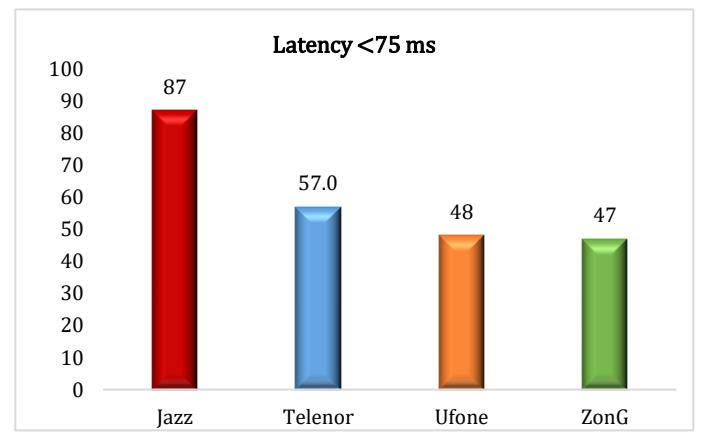
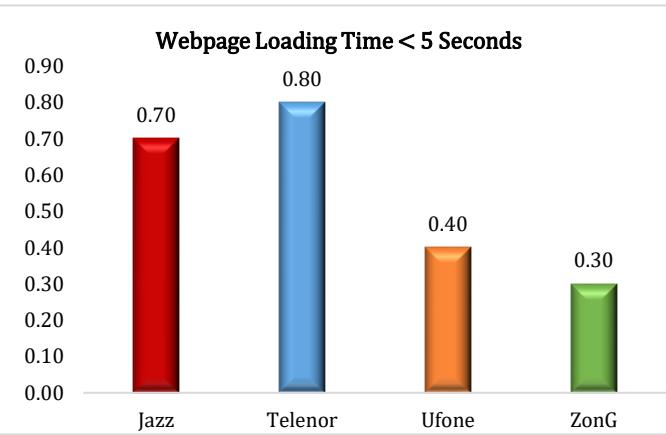
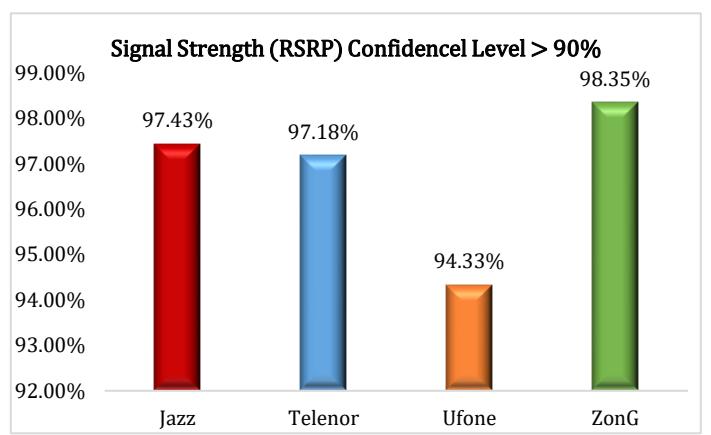
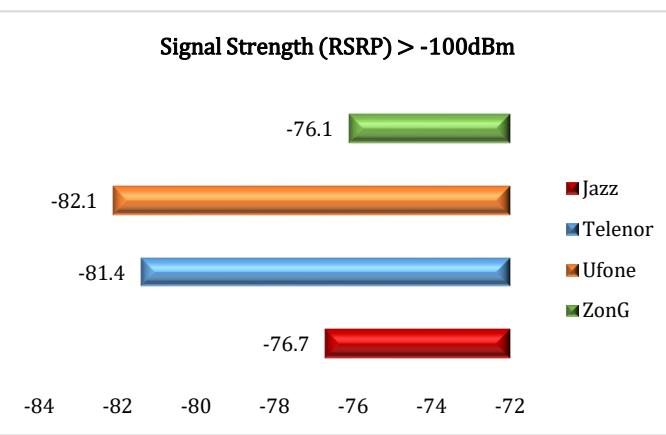
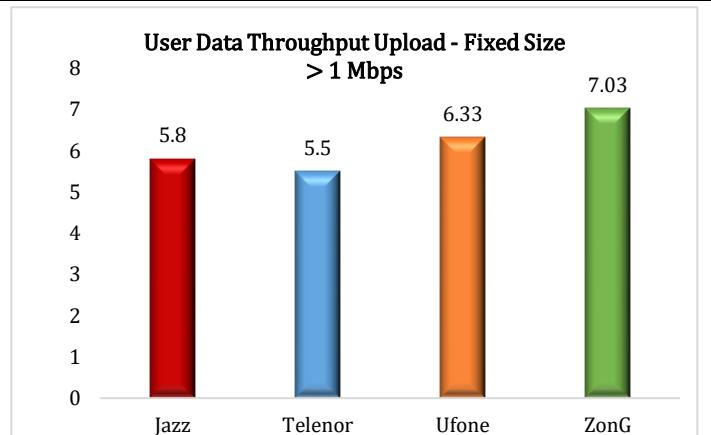
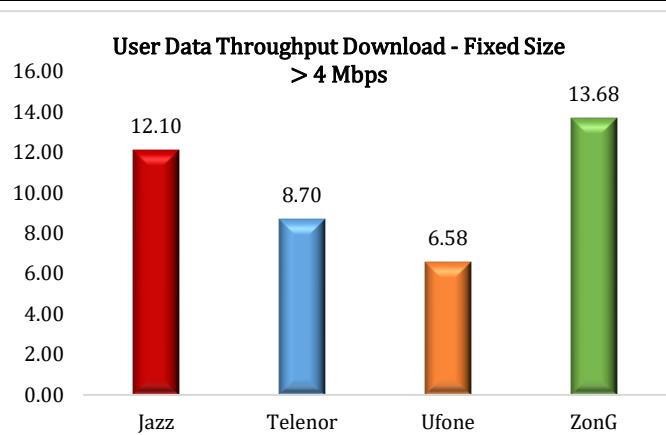
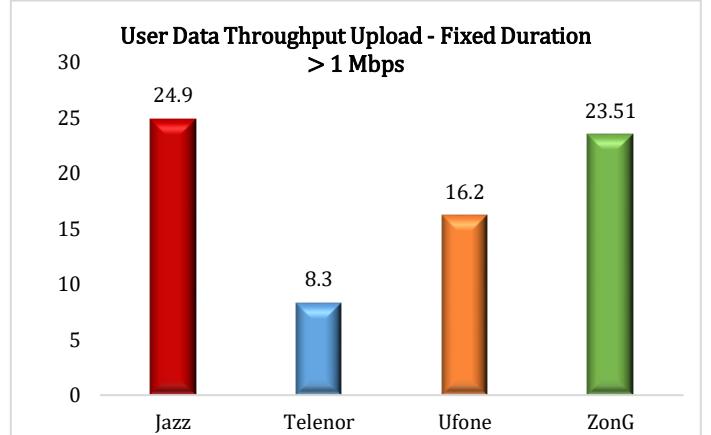
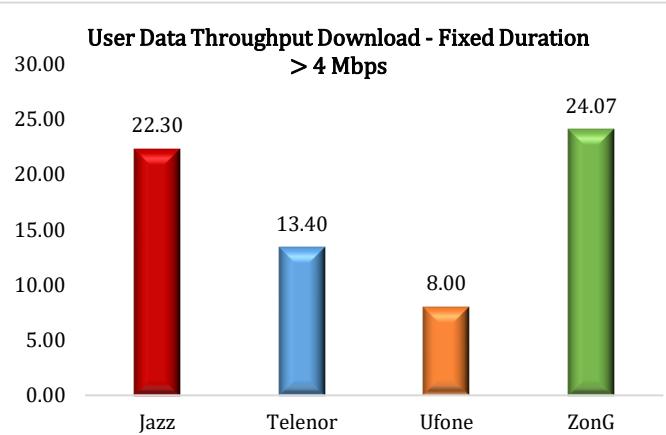
QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – KHUSHAB



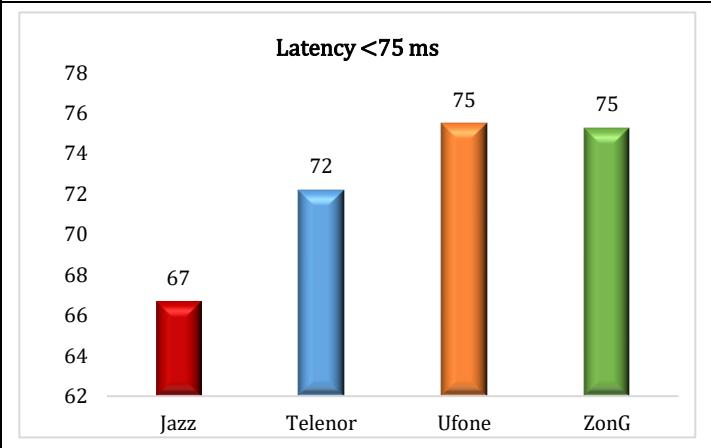
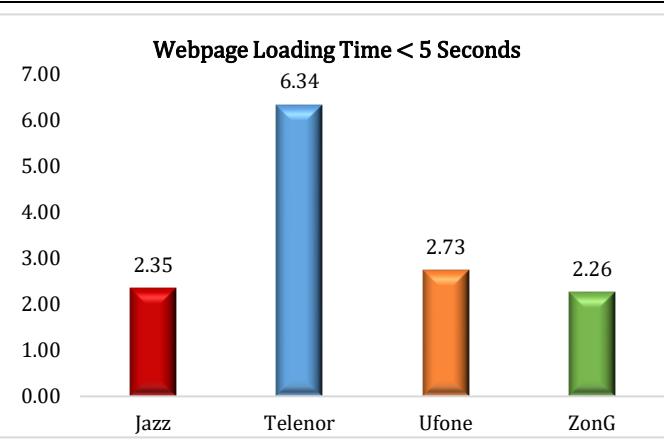
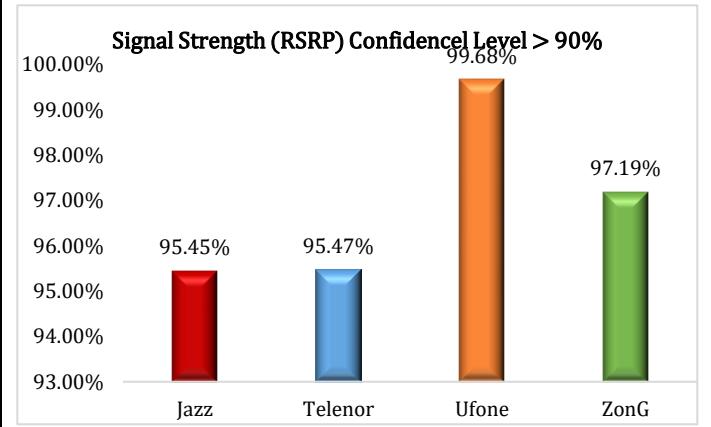
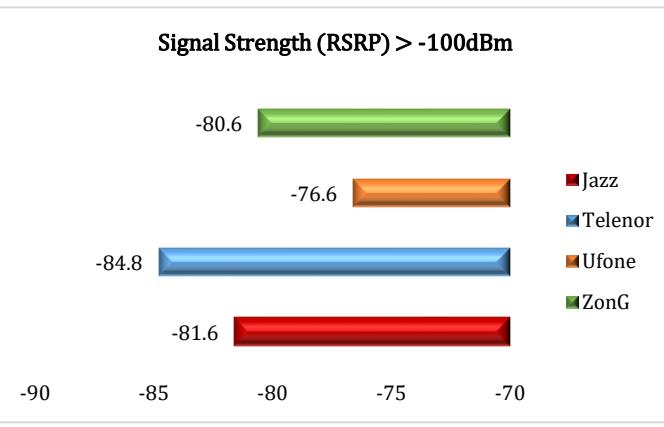
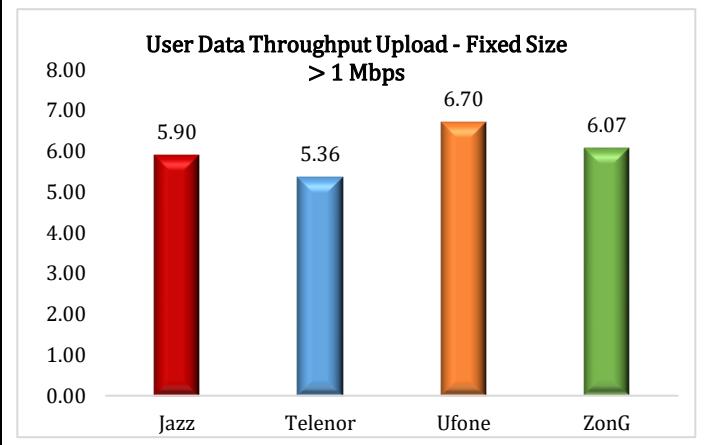
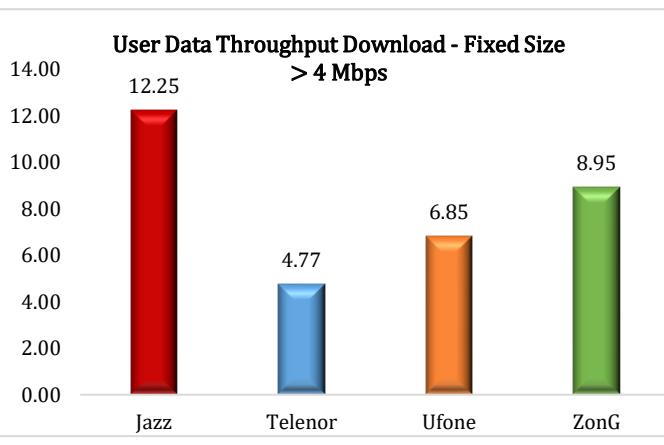
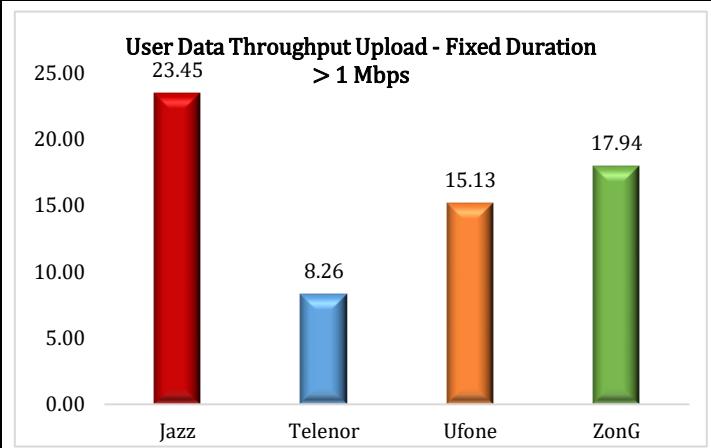
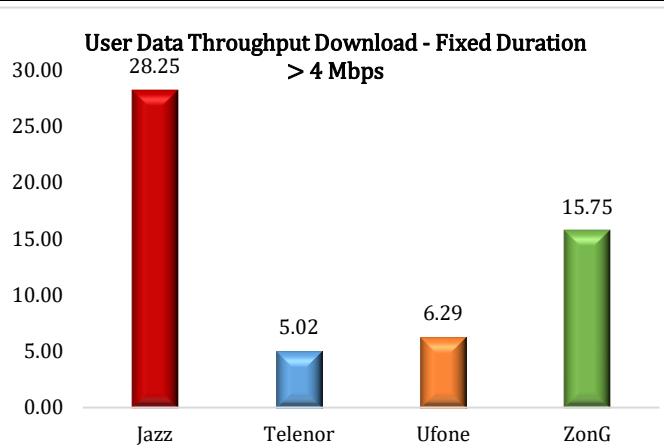
QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – MIRPUR KHAS



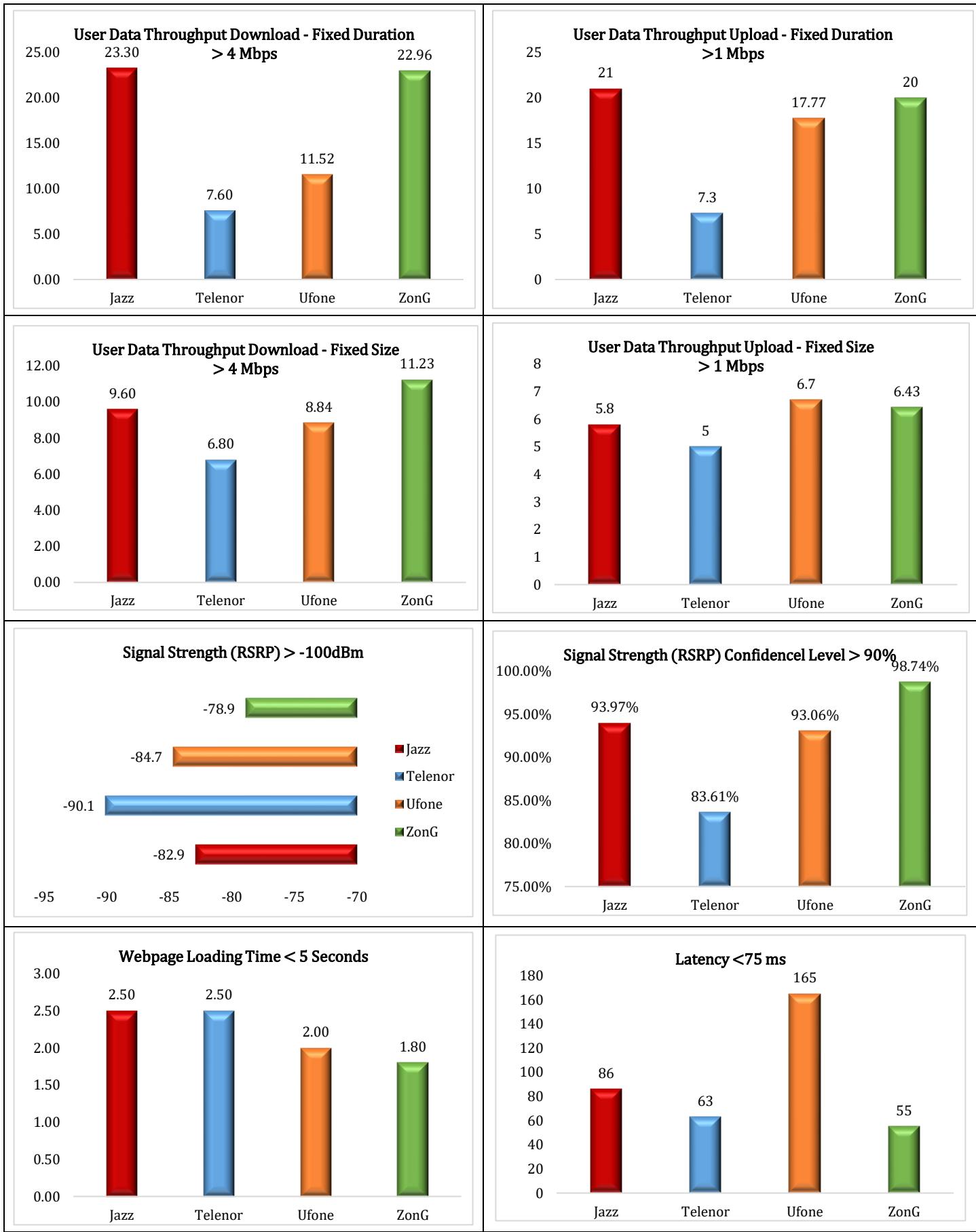
QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – MUZAFARGARH



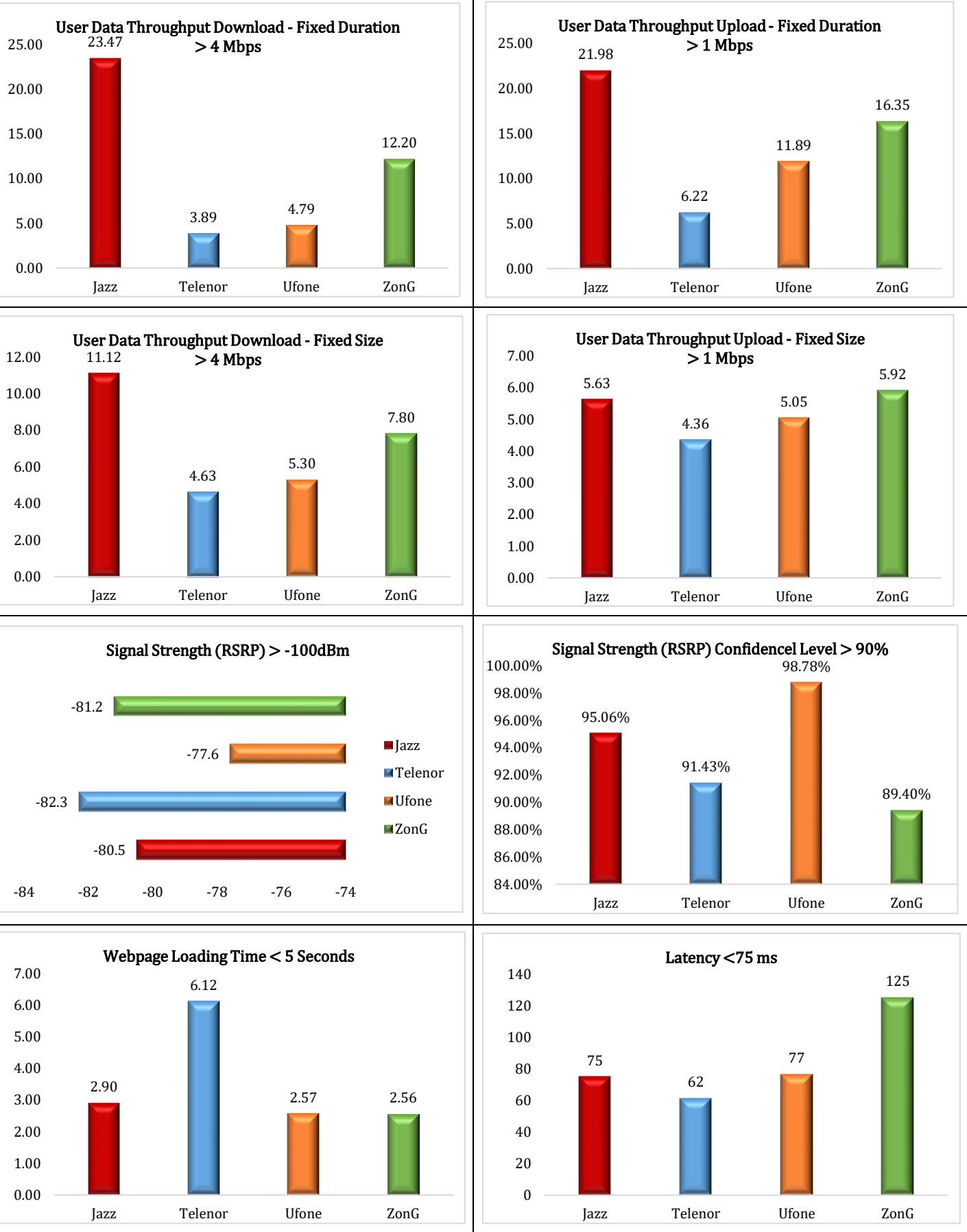
QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – NOWSHERA



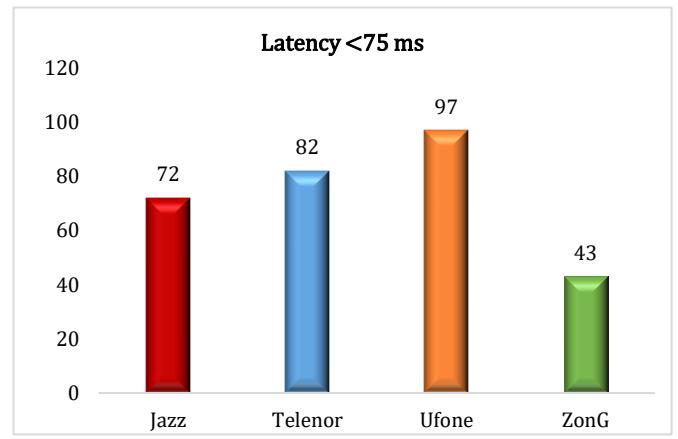
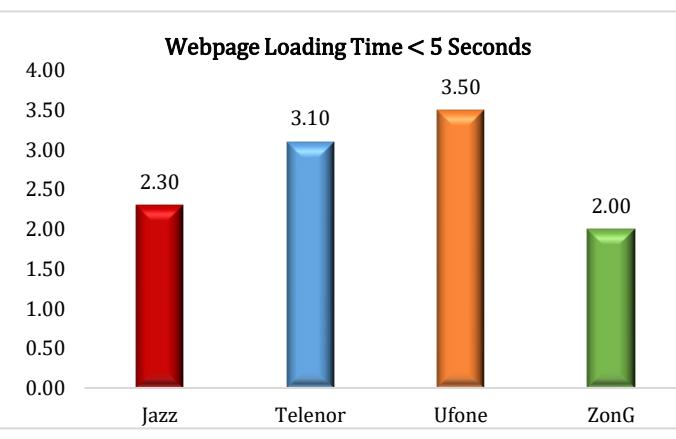
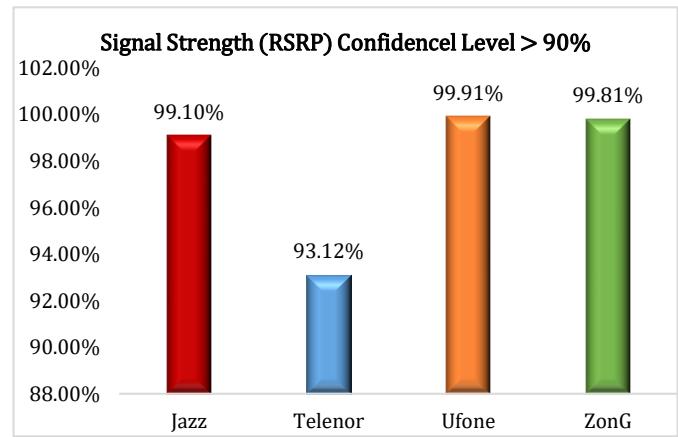
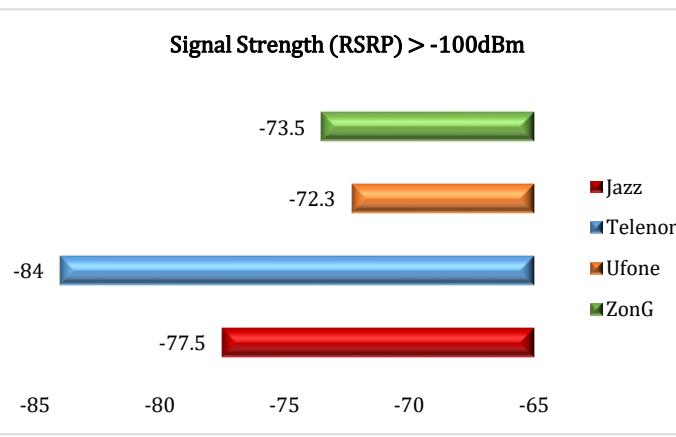
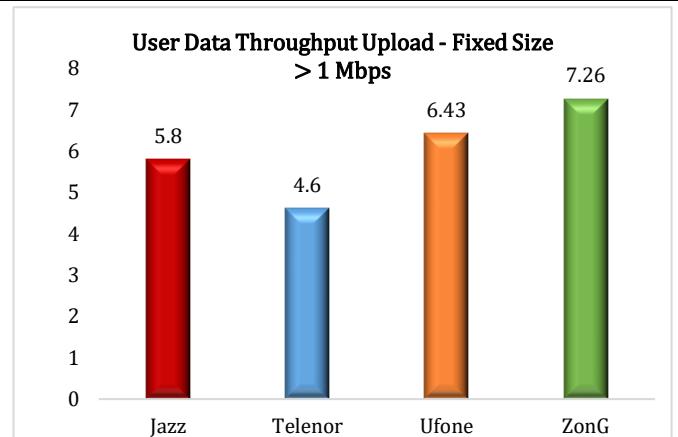
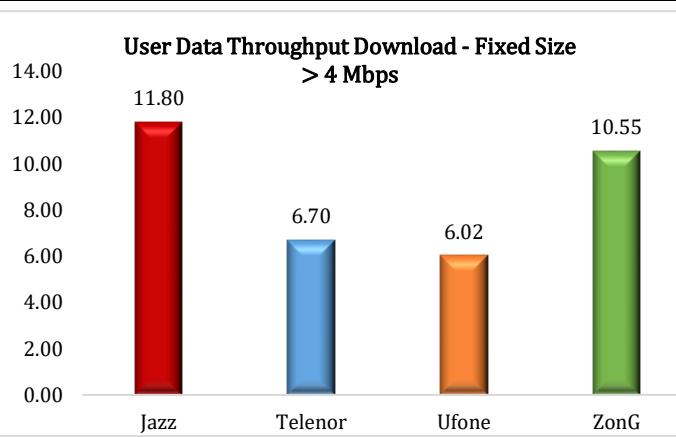
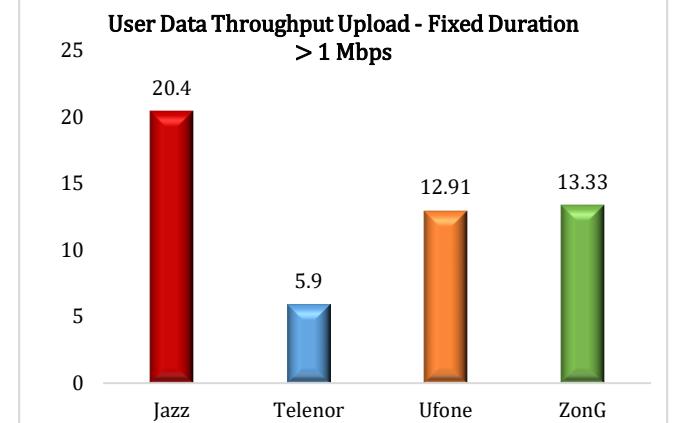
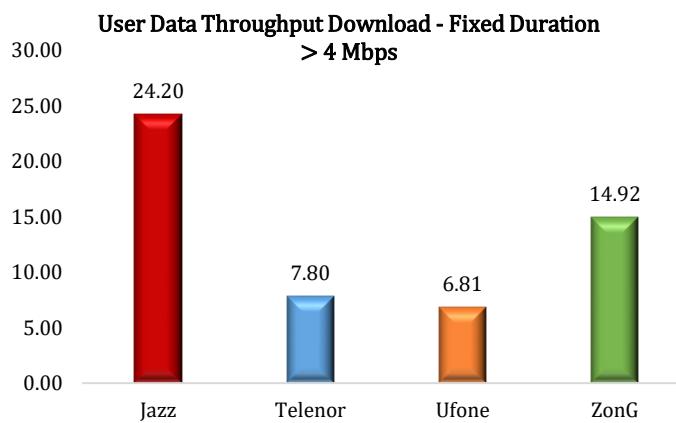
QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – OKARA



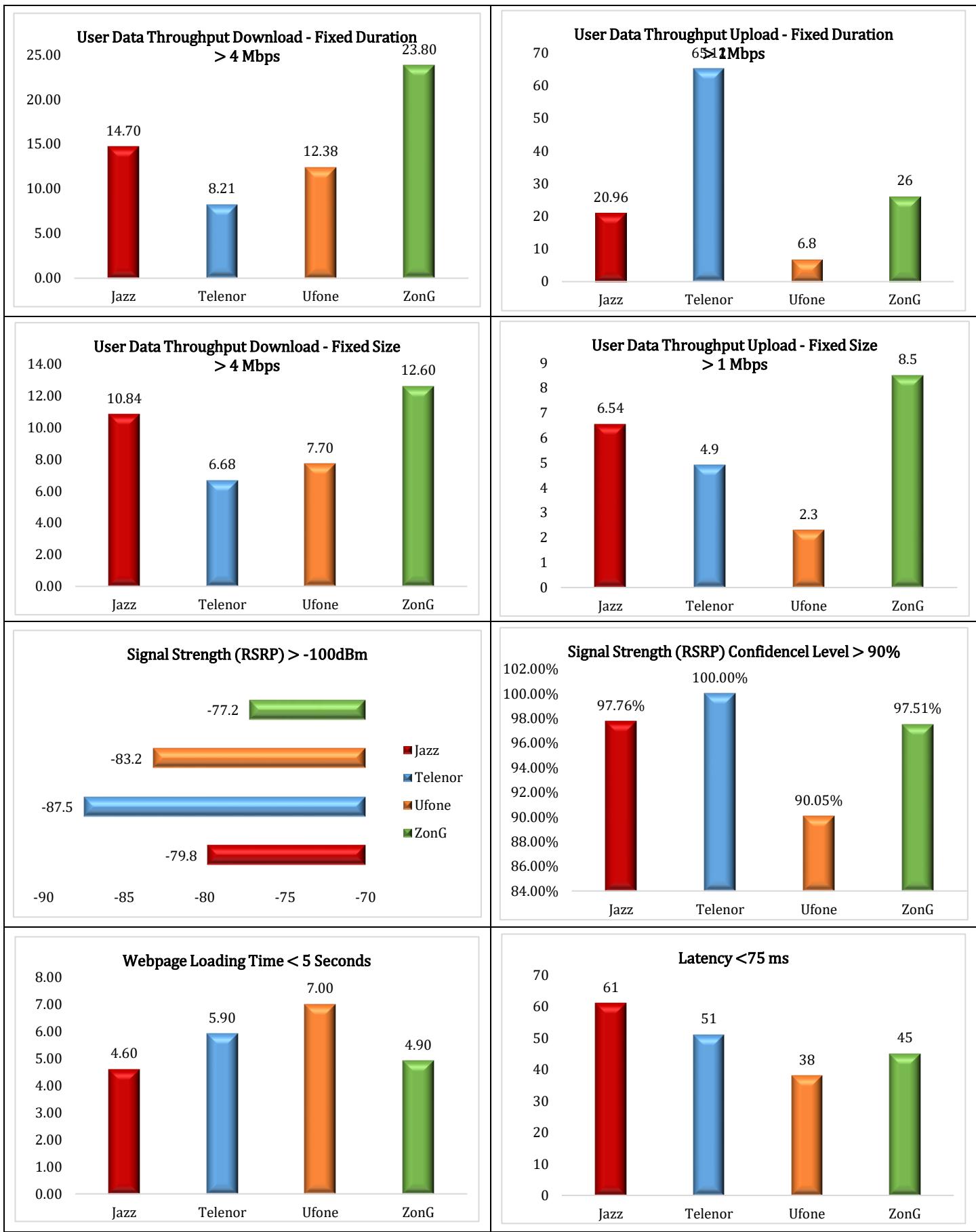
QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – PESHAWAR



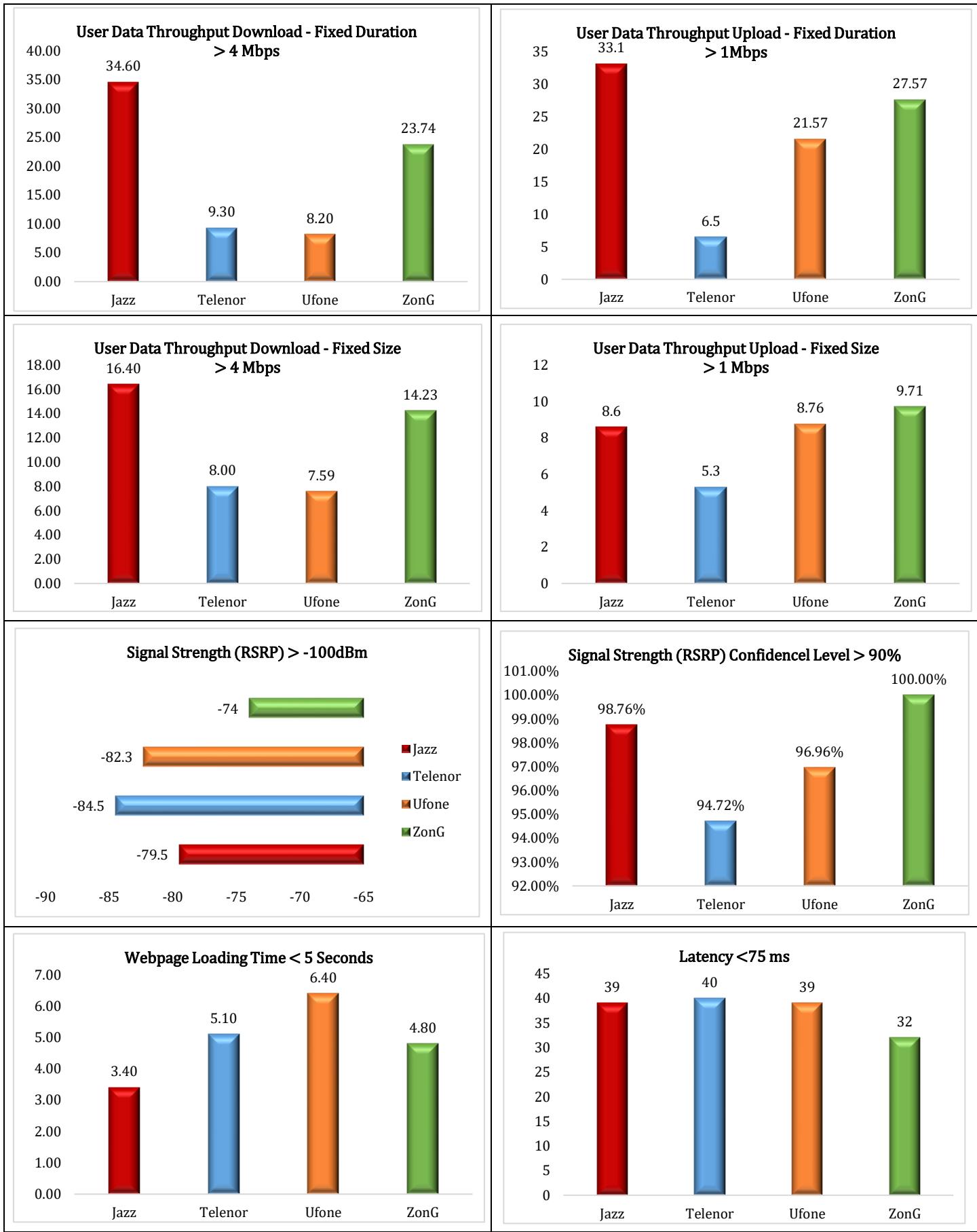
QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – QUETTA



QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – SEHWAN



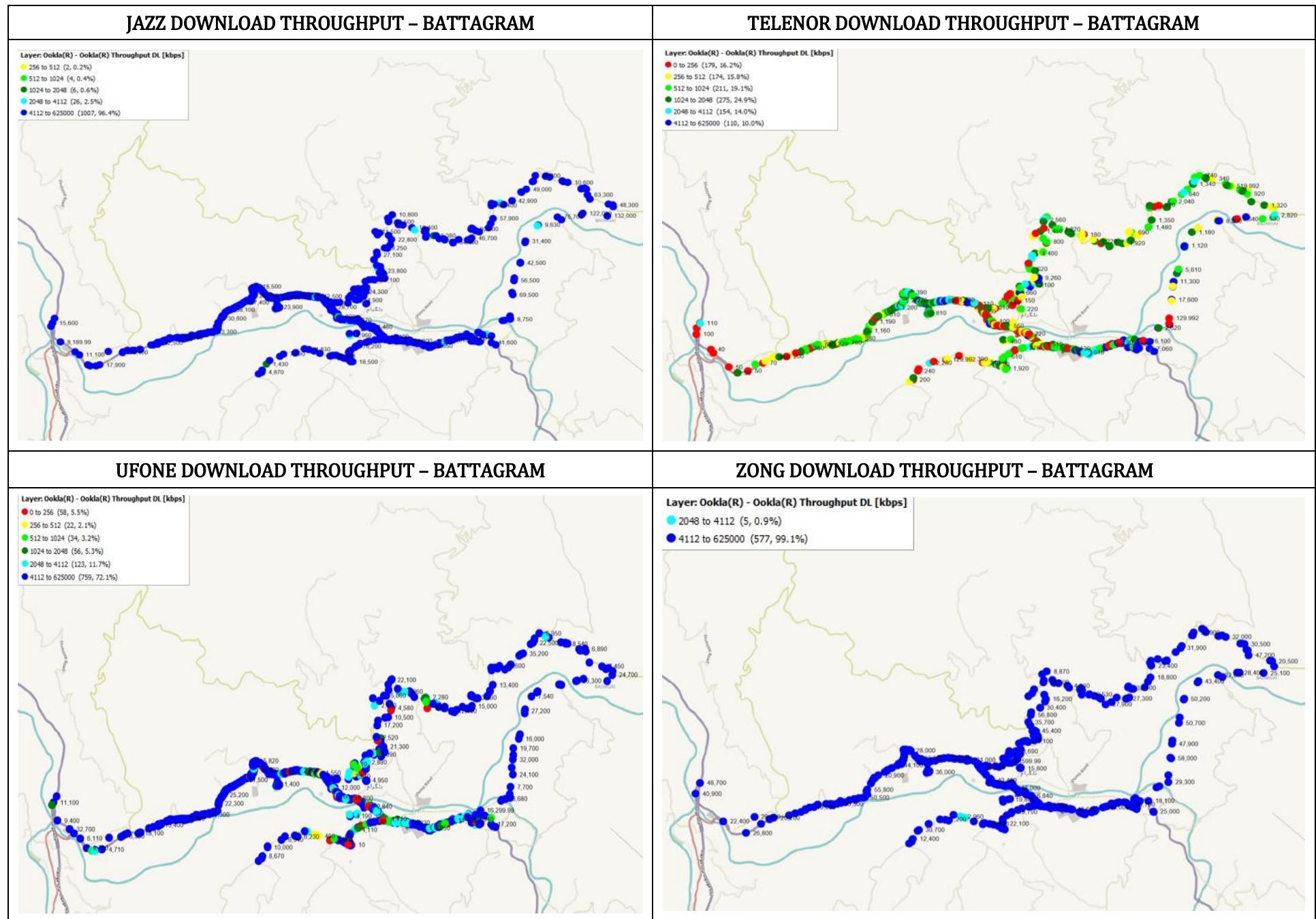
QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – THATTA



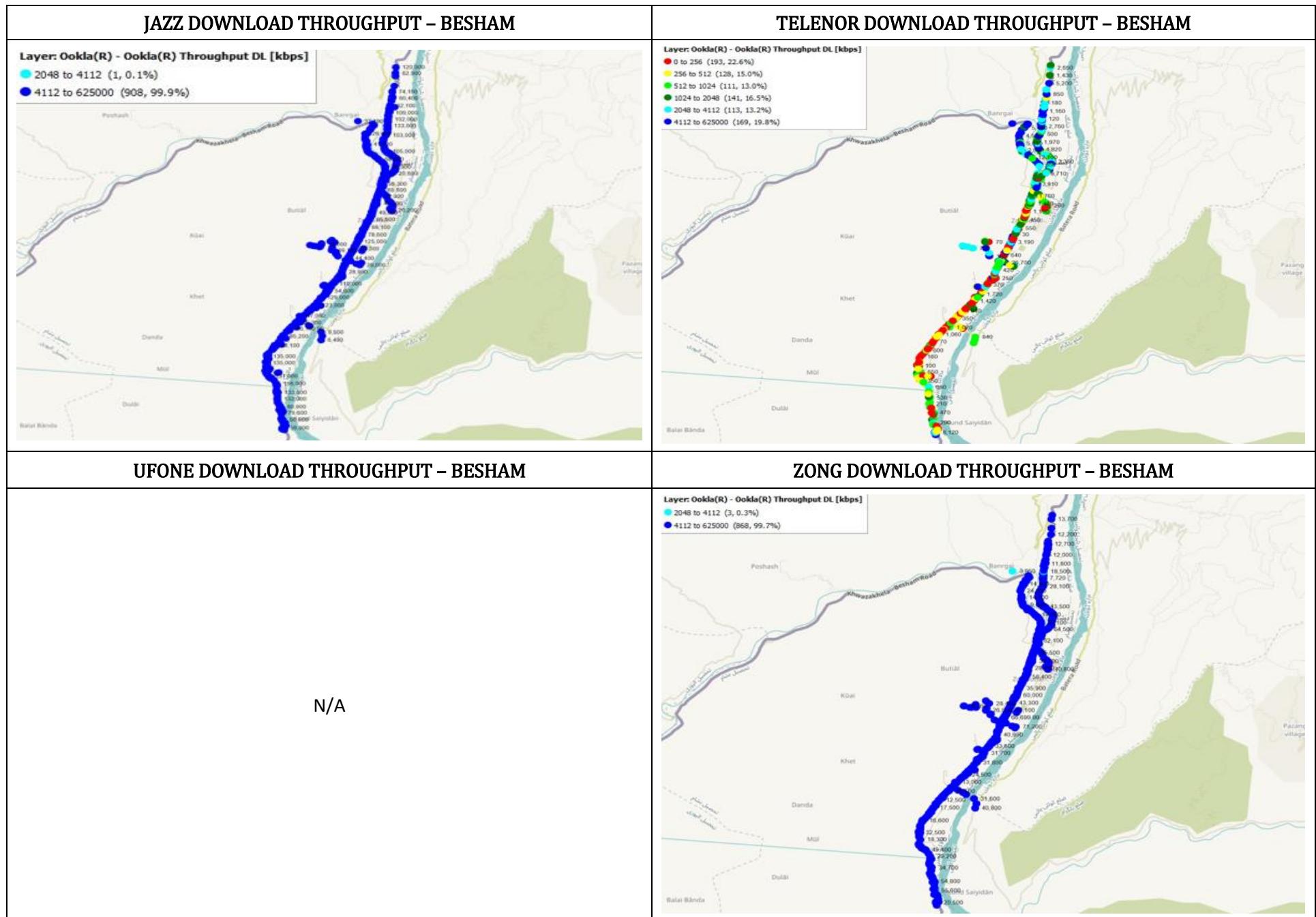
Annex -B(Coverage Maps)

00KLA

OOKLA SPEED TEST RESULTS



OOKLA SPEED TEST RESULTS

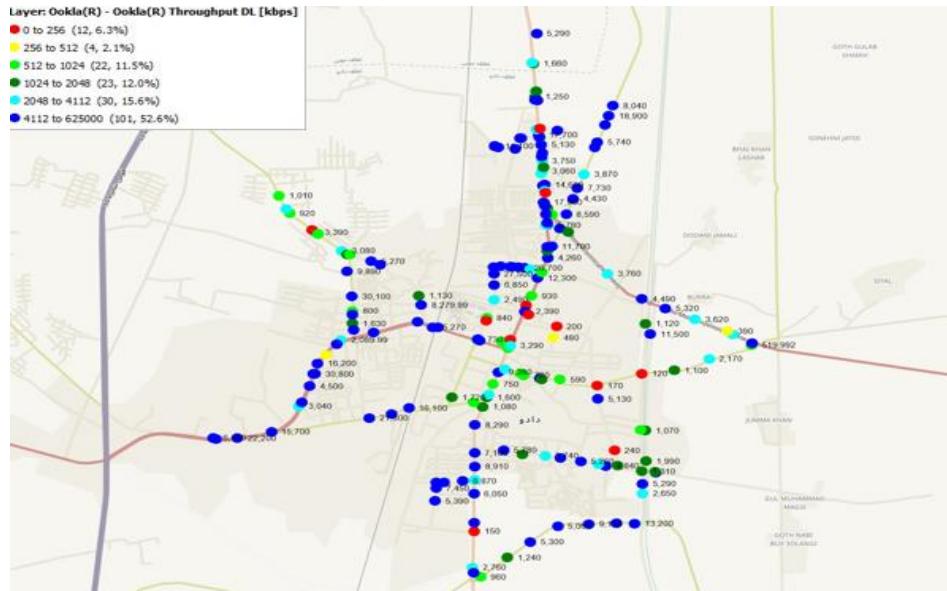


OOKLA SPEED TEST RESULTS

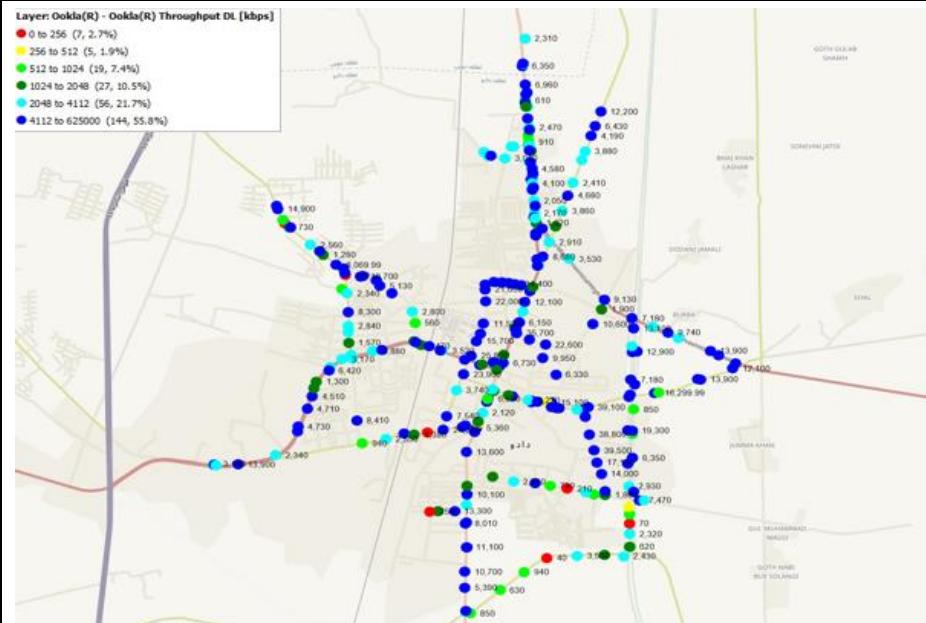
JAZZ DOWNLOAD THROUGHPUT - DADU



TELENOR DOWNLOAD THROUGHPUT - DADU



UFONE DOWNLOAD THROUGHPUT - DADU

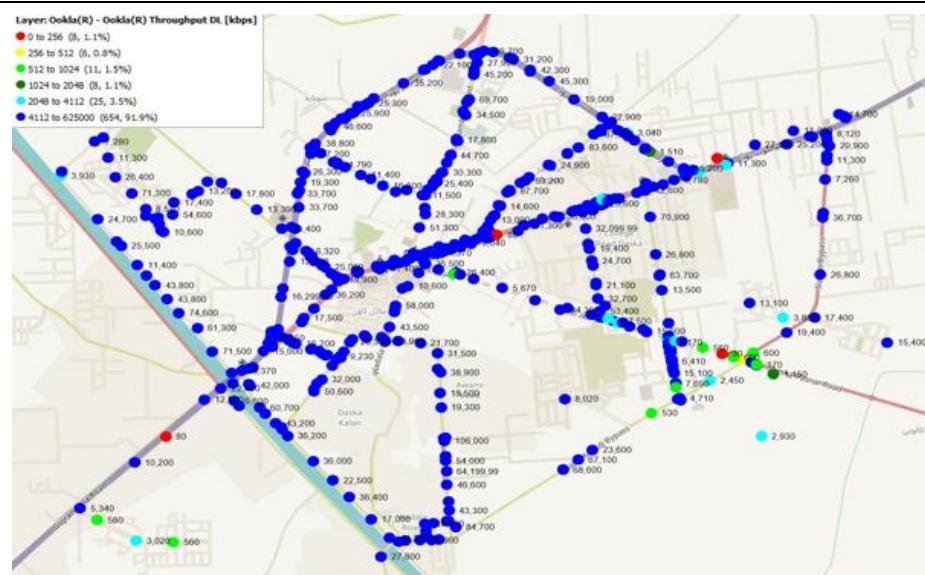


ZONG DOWNLOAD THROUGHPUT - DADU



OOKLA SPEED TEST RESULTS

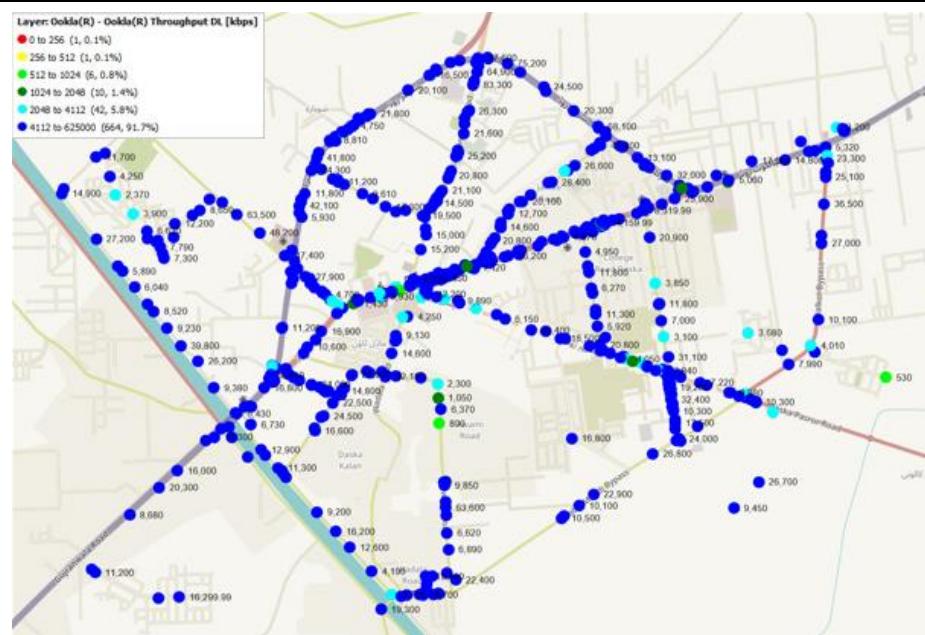
JAZZ DOWNLOAD THROUGHPUT – DASKA



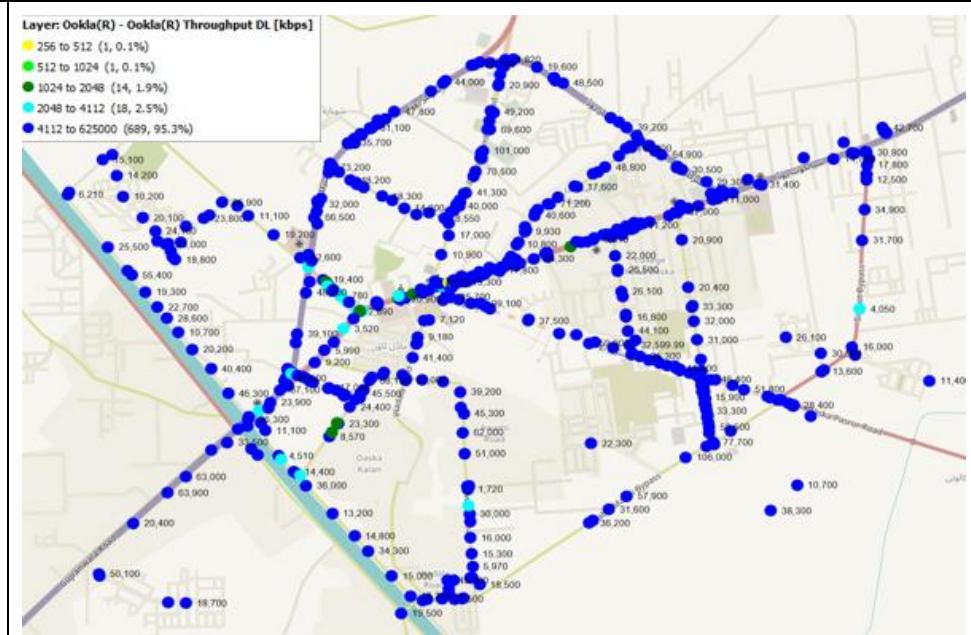
TELENOR DOWNLOAD THROUGHPUT – DASKA



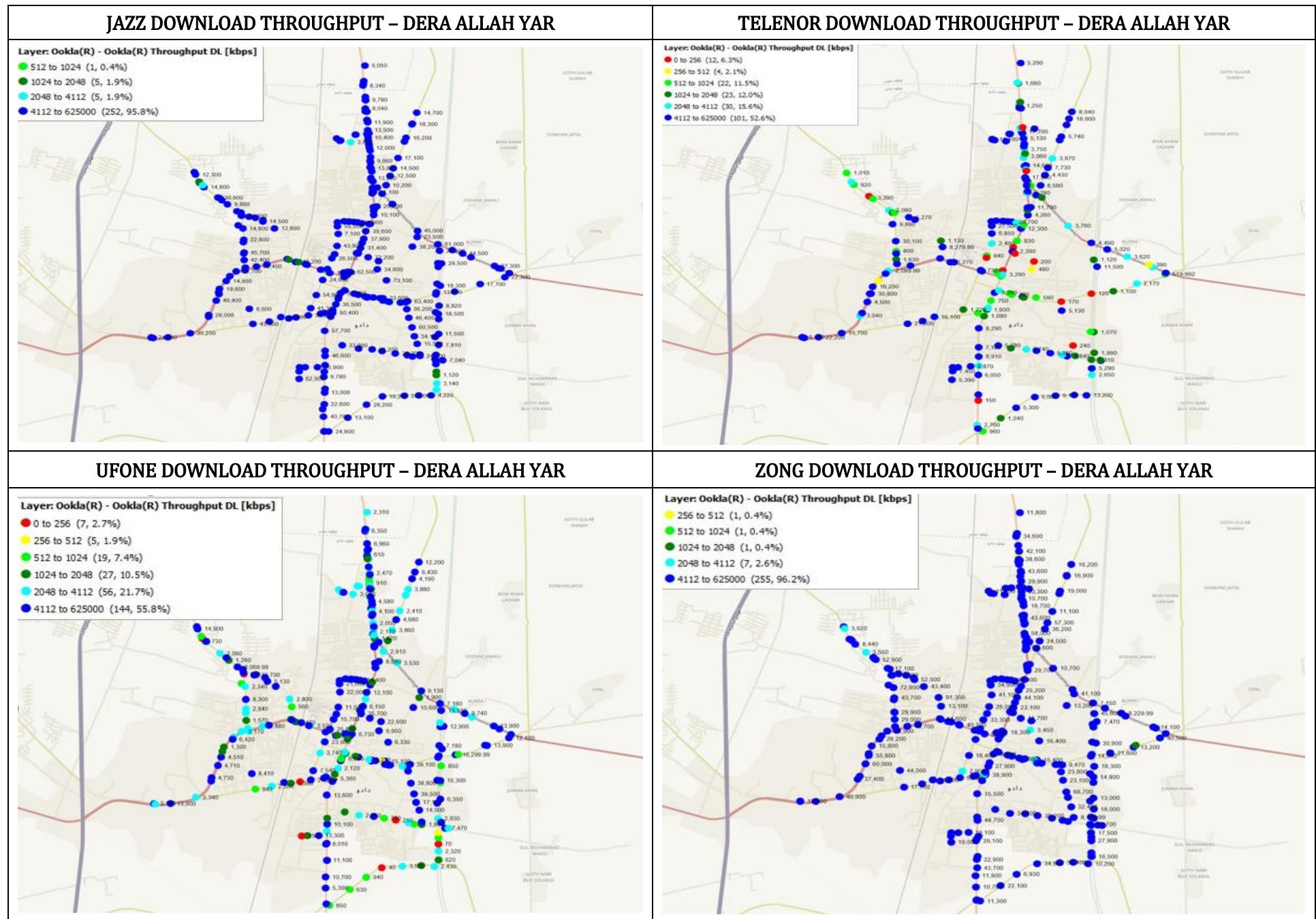
UFONE DOWNLOAD THROUGHPUT – DASKA



ZONG DOWNLOAD THROUGHPUT – DASKA

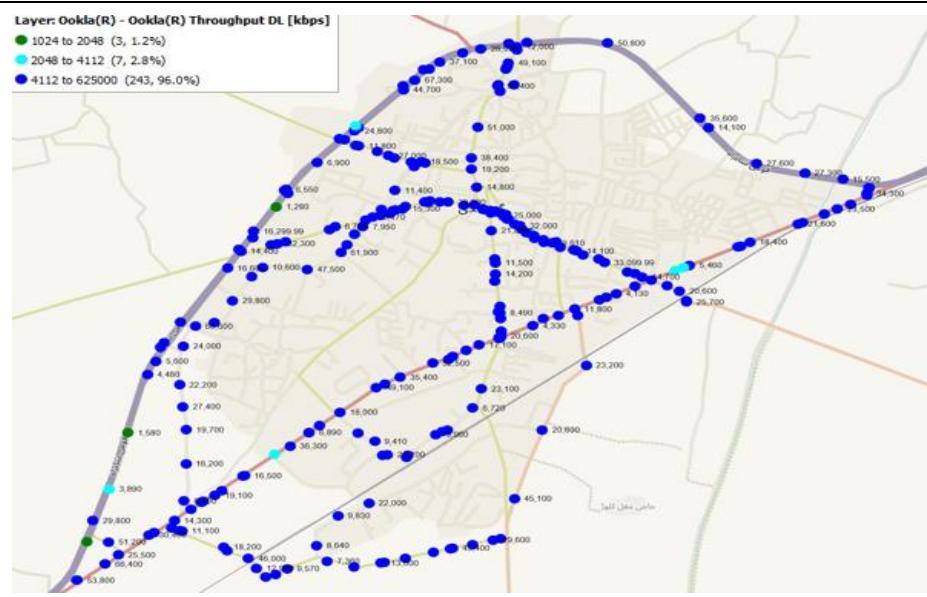


OOKLA SPEED TEST RESULTS



OOKLA SPEED TEST RESULTS

JAZZ DOWNLOAD THROUGHPUT - GHOTKI



TELENOR DOWNLOAD THROUGHPUT - GHOTKI



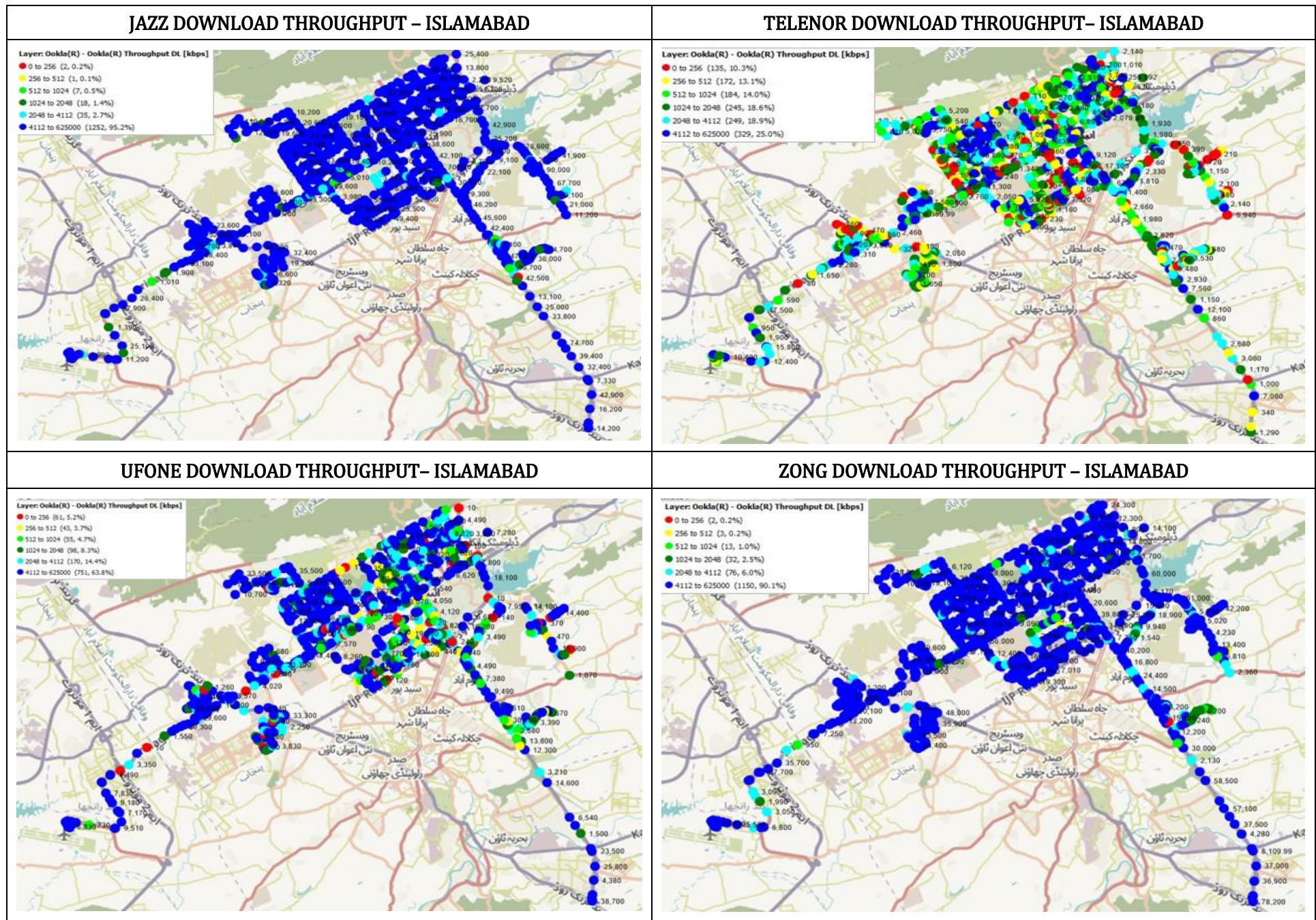
UFONE DOWNLOAD THROUGHPUT - GHOTKI



ZONG DOWNLOAD THROUGHPUT - GHOTKI

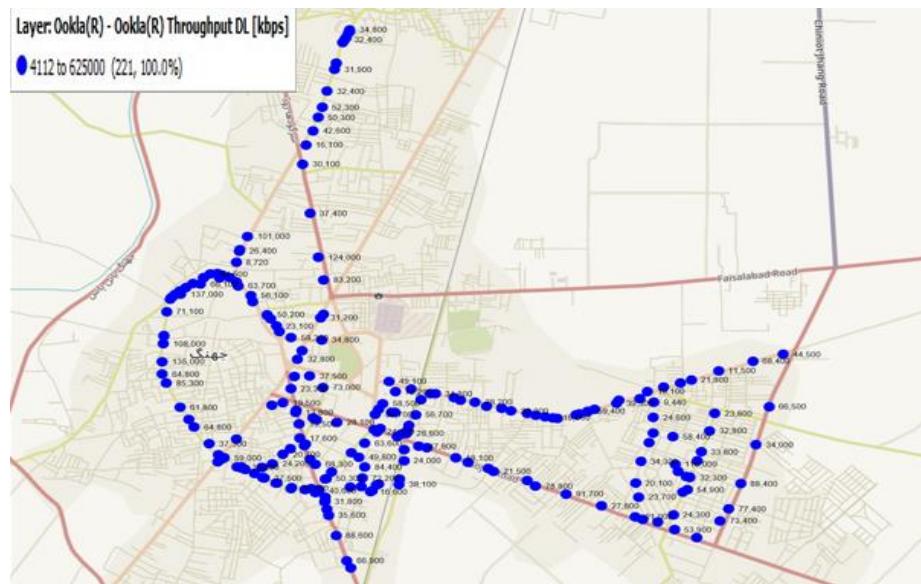


OOKLA SPEED TEST RESULTS

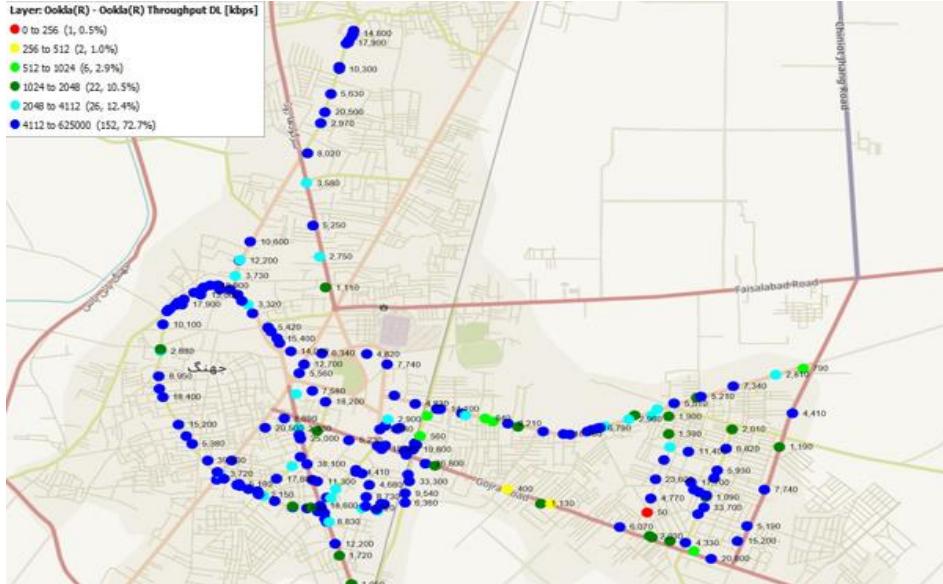


OOKLA SPEED TEST RESULTS

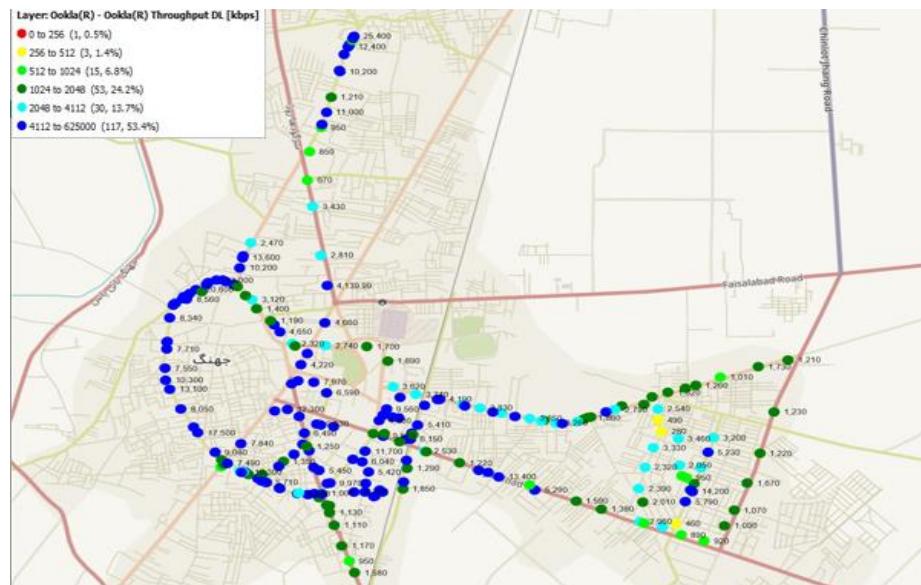
JAZZ DOWNLOAD THROUGHPUT - JHANG



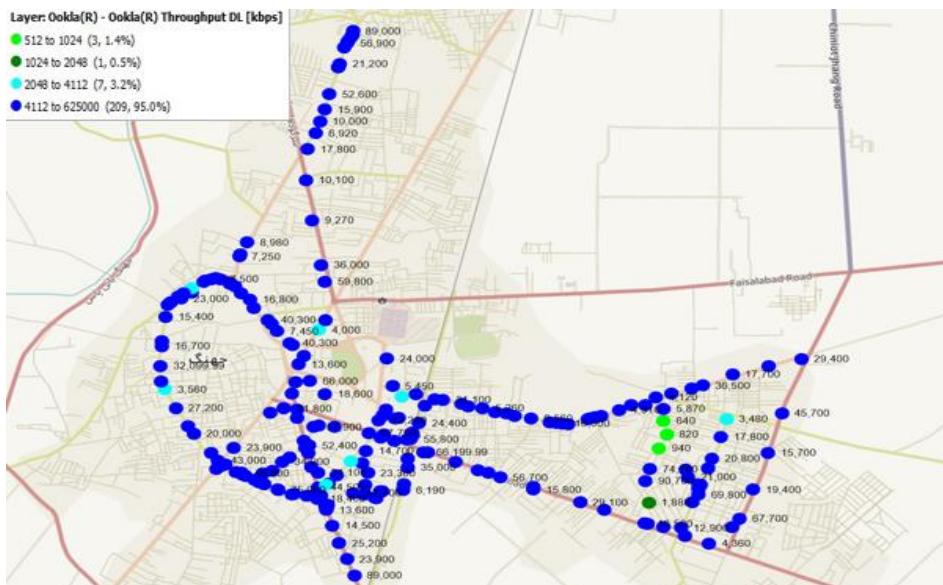
TELENOR DOWNLOAD THROUGHPUT - JHANG



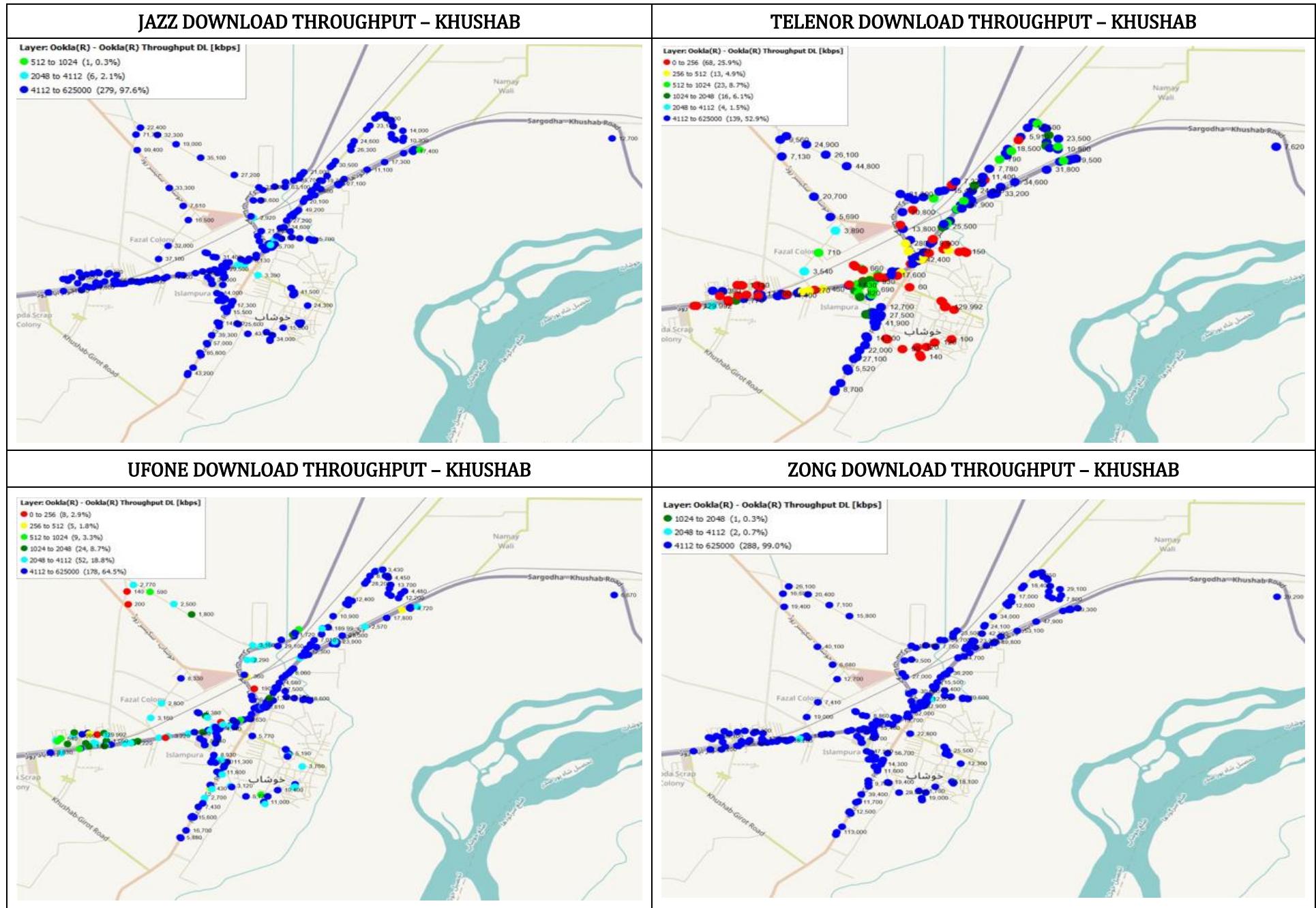
UFONE DOWNLOAD THROUGHPUT - JHANG



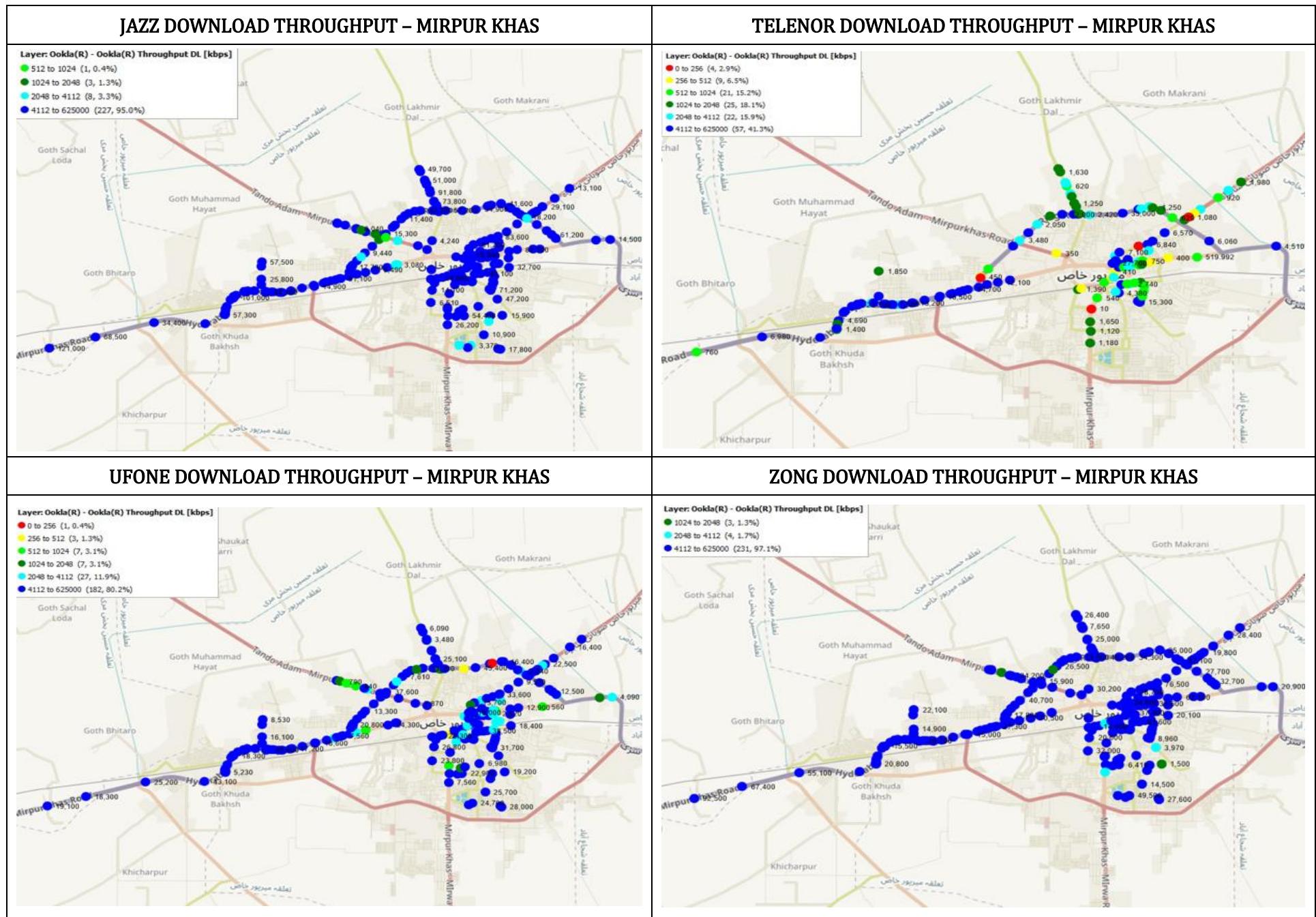
ZONG DOWNLOAD THROUGHPUT - JHANG



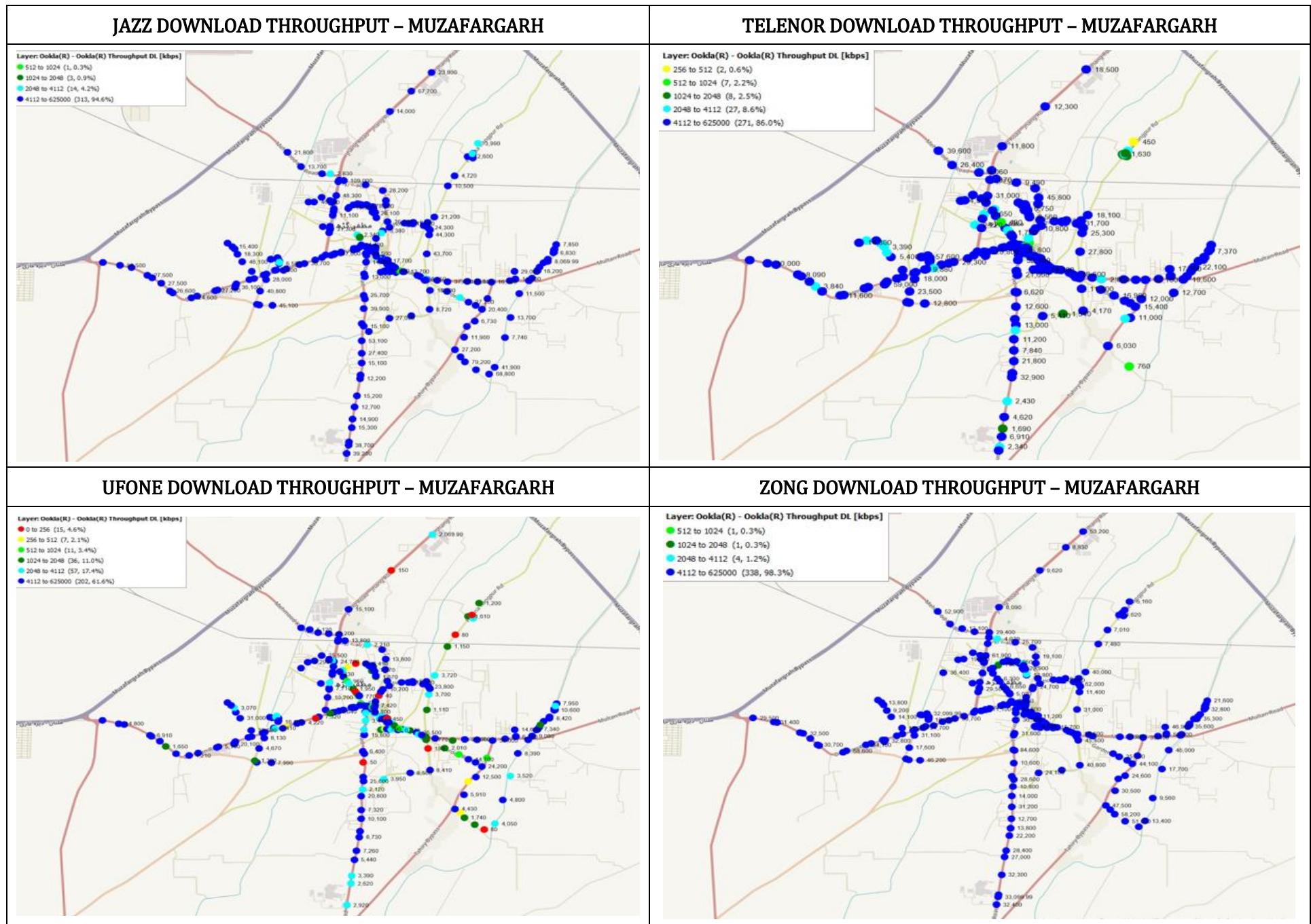
OOKLA SPEED TEST RESULTS



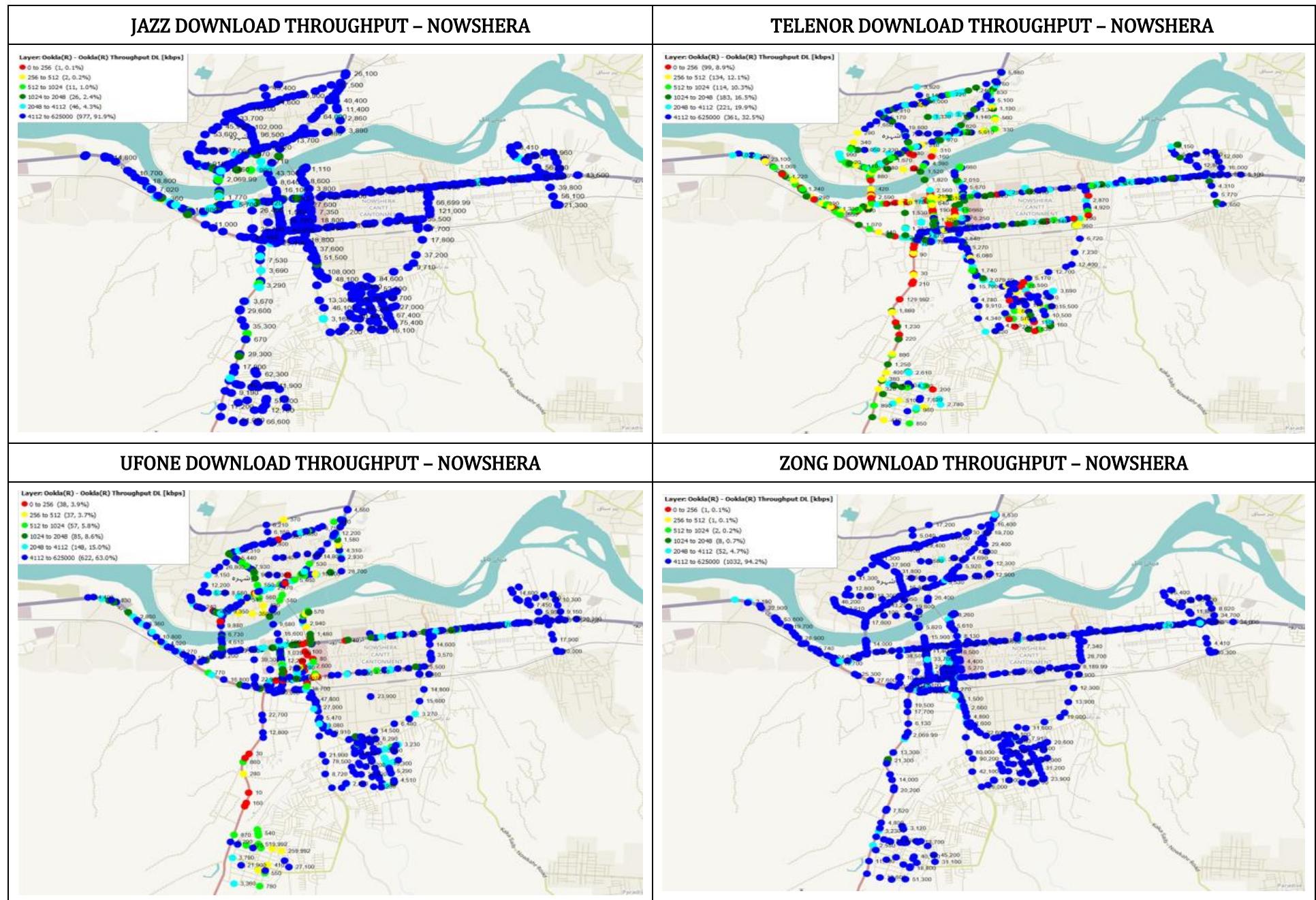
OOKLA SPEED TEST RESULTS



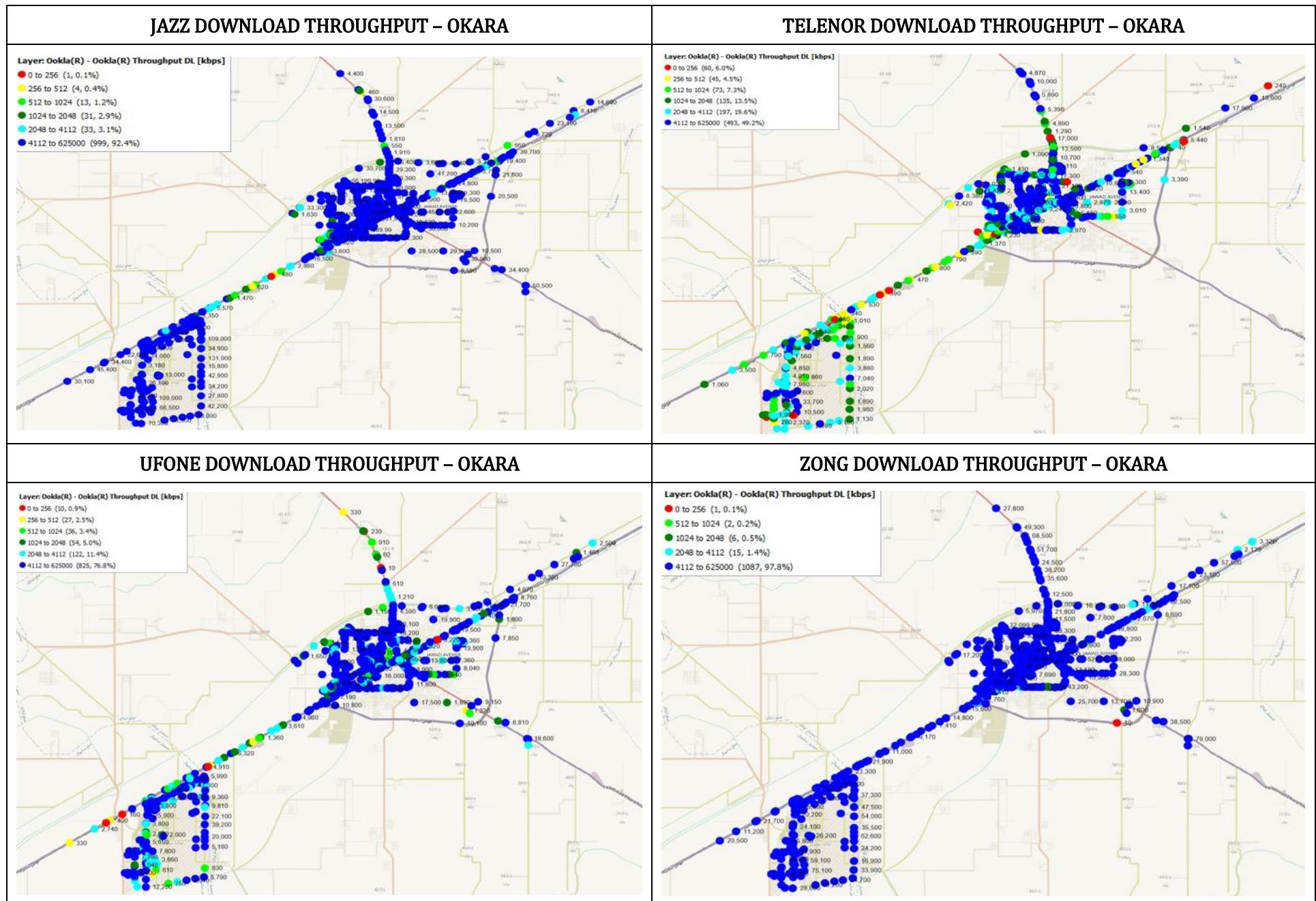
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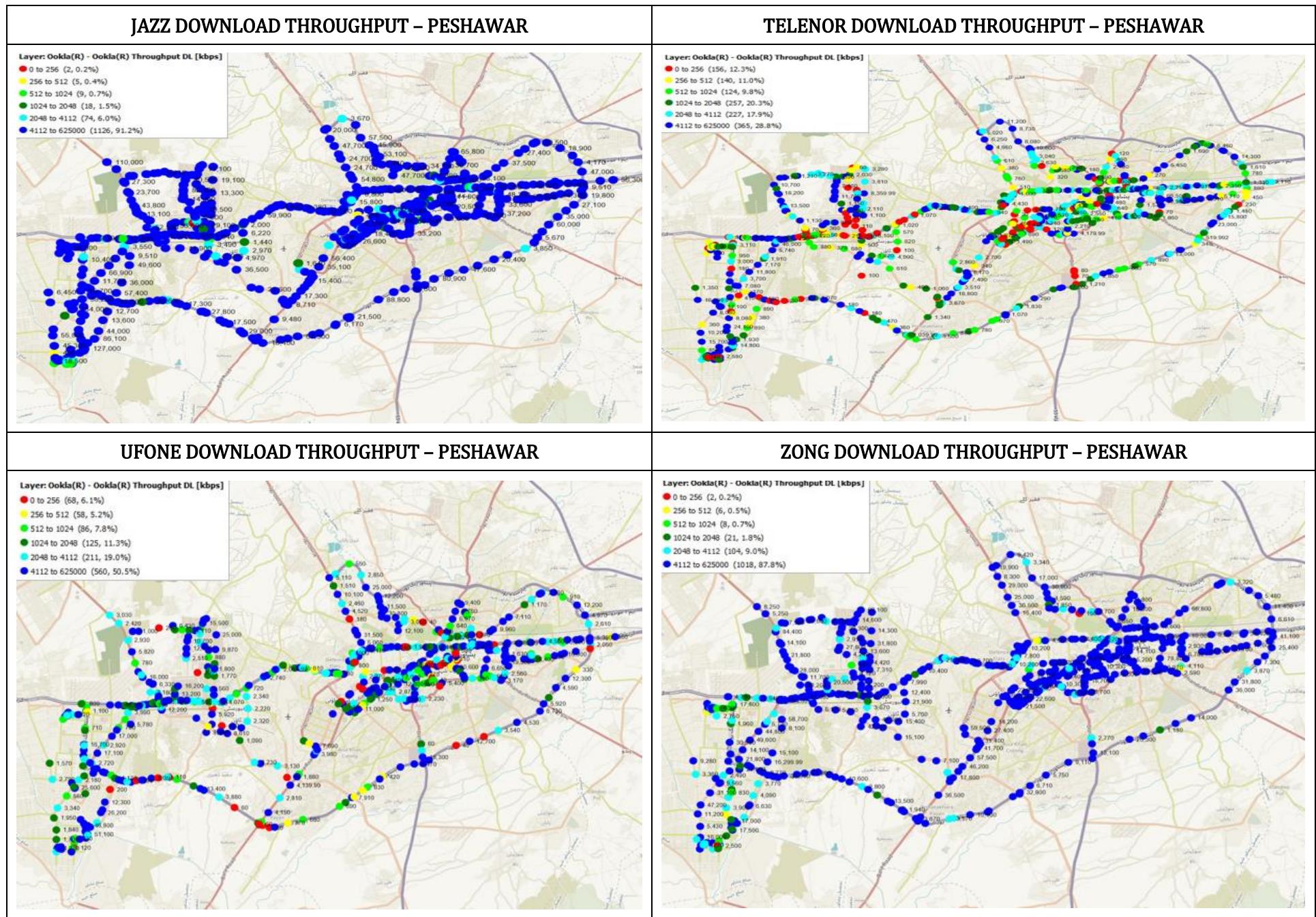
OOKLA SPEED TEST RESULTS



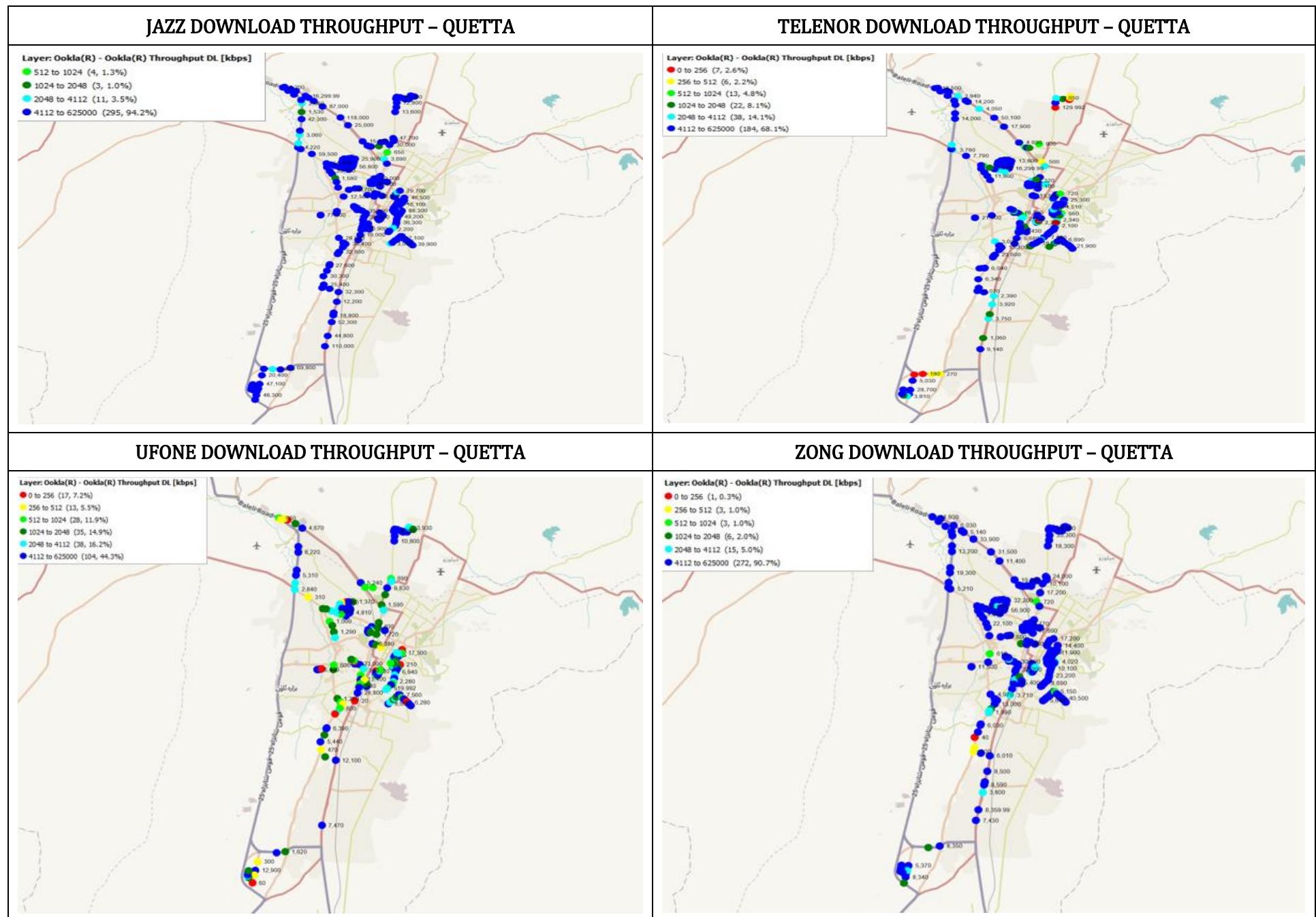
OOKLA SPEED TEST RESULTS



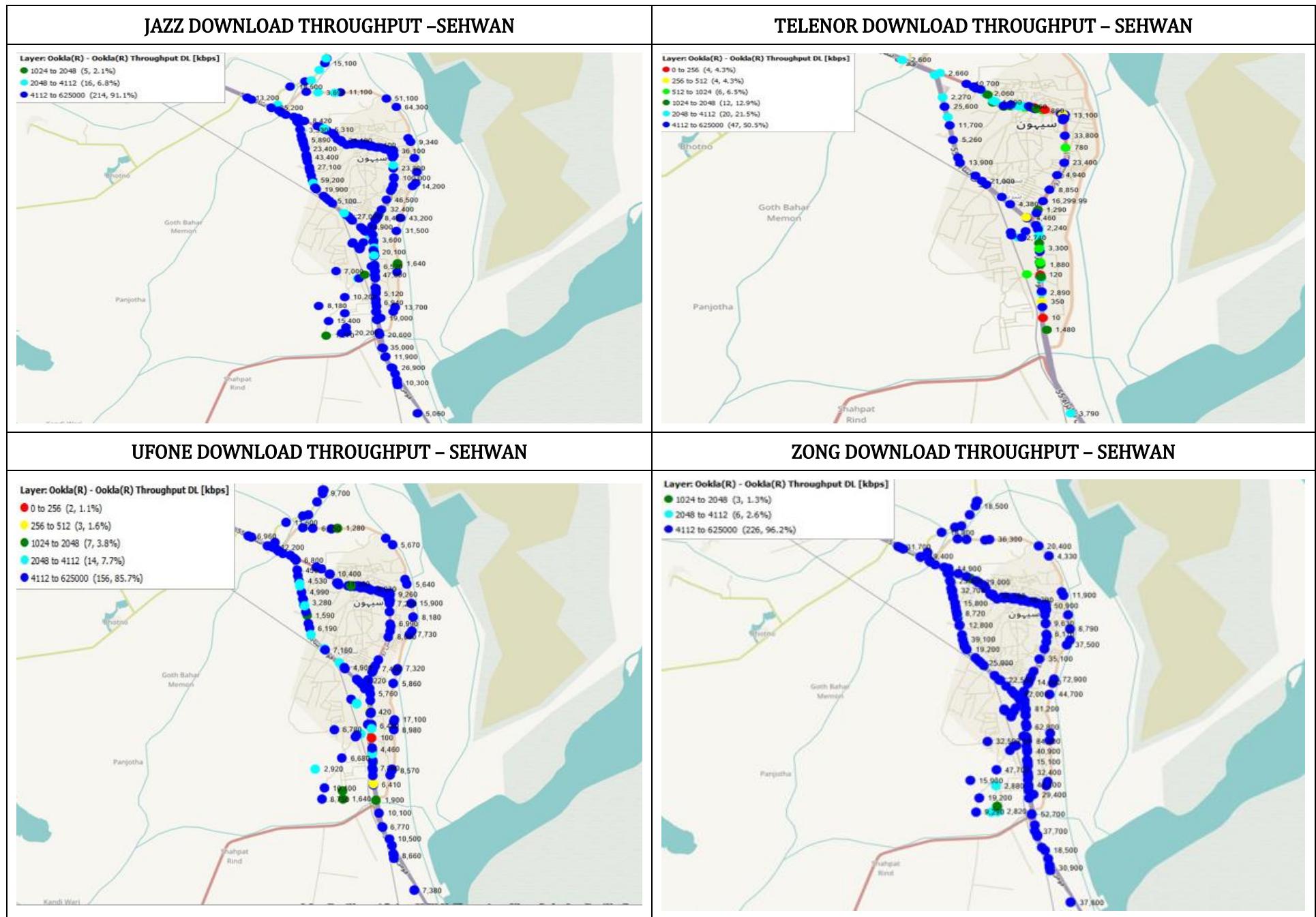
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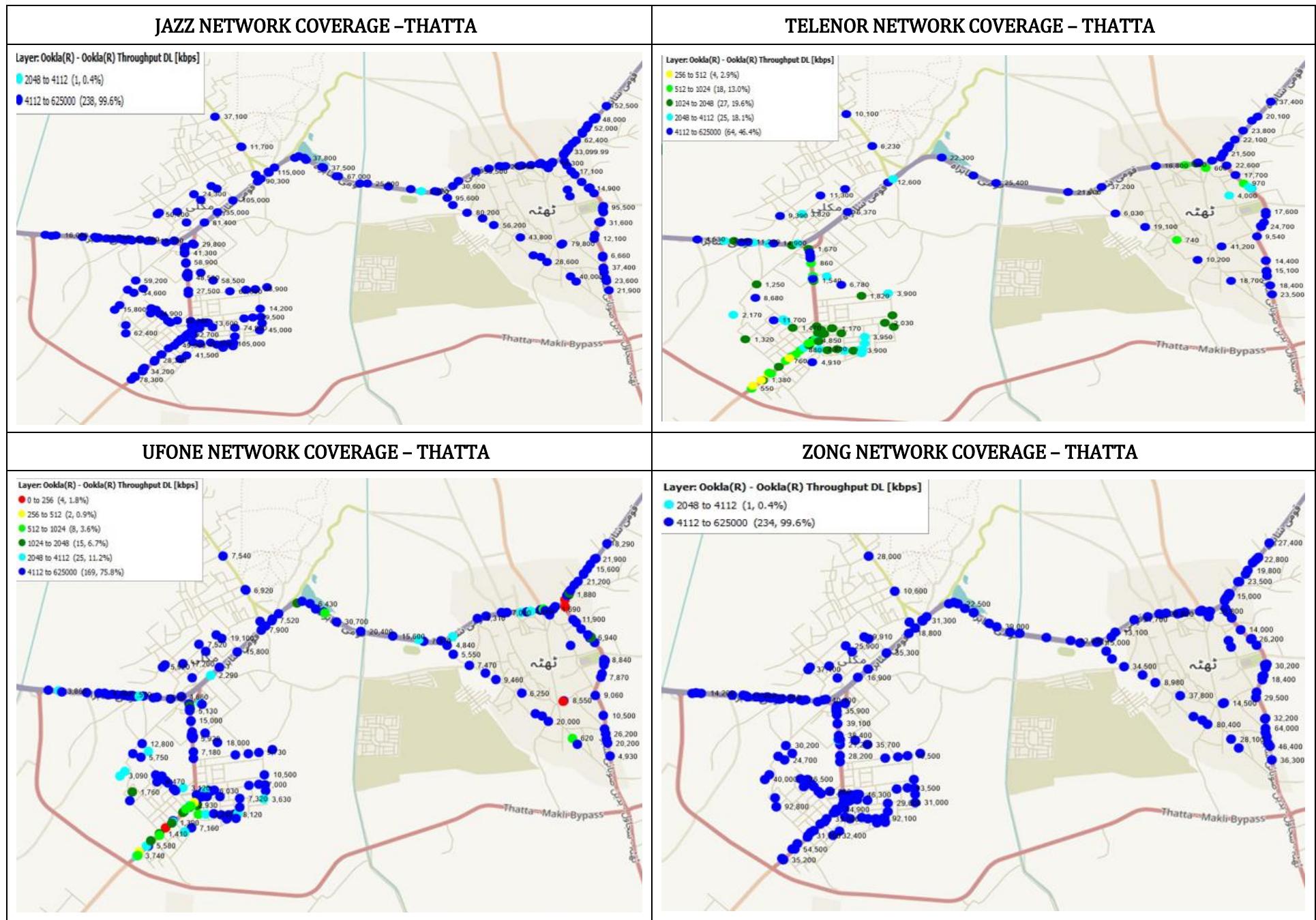
OOKLA SPEED TEST RESULTS



OOKLA SPEED TEST RESULTS



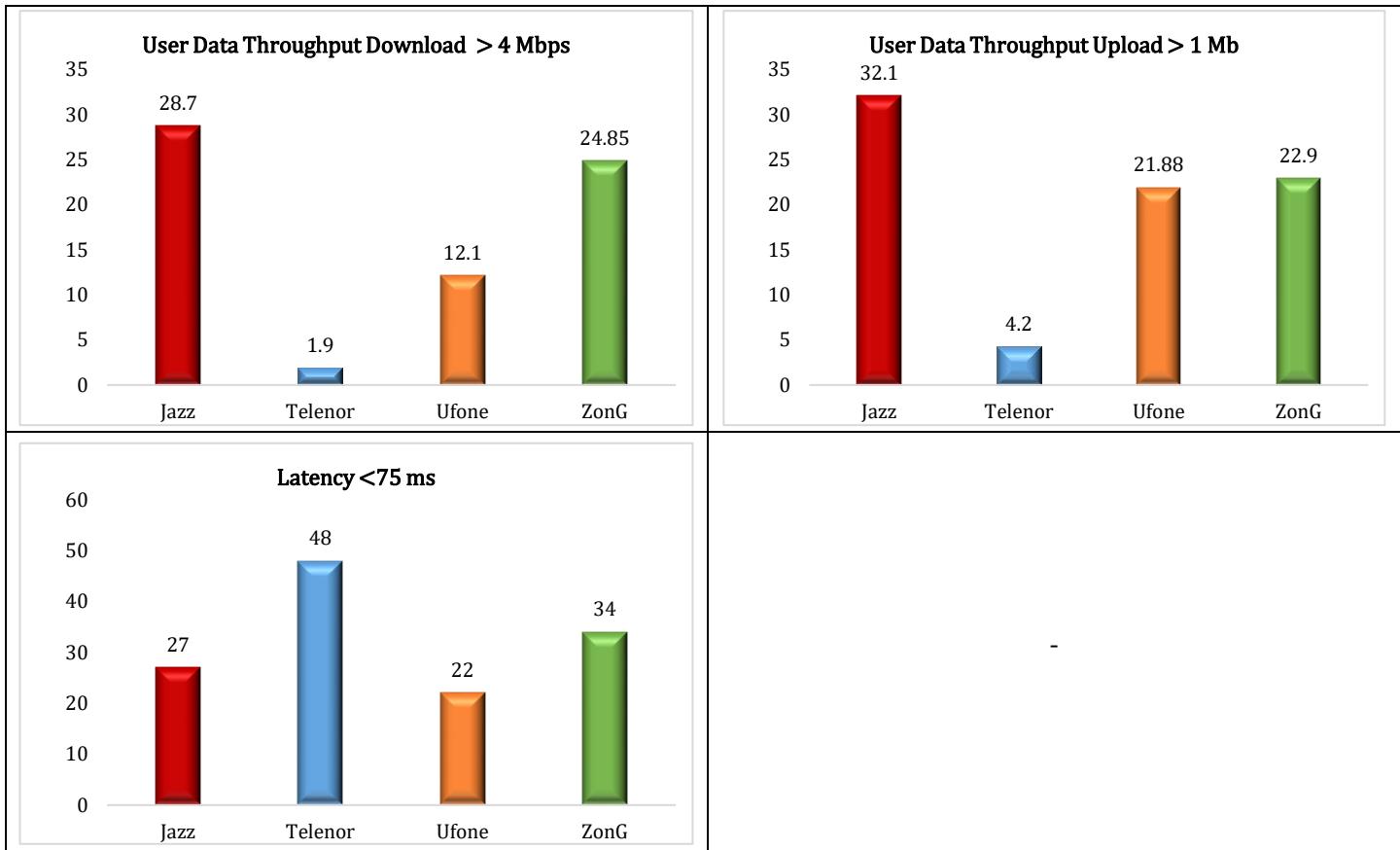
OOKLA SPEED TEST RESULTS



Annex -B1 (Data QoS Results)

0OKLA

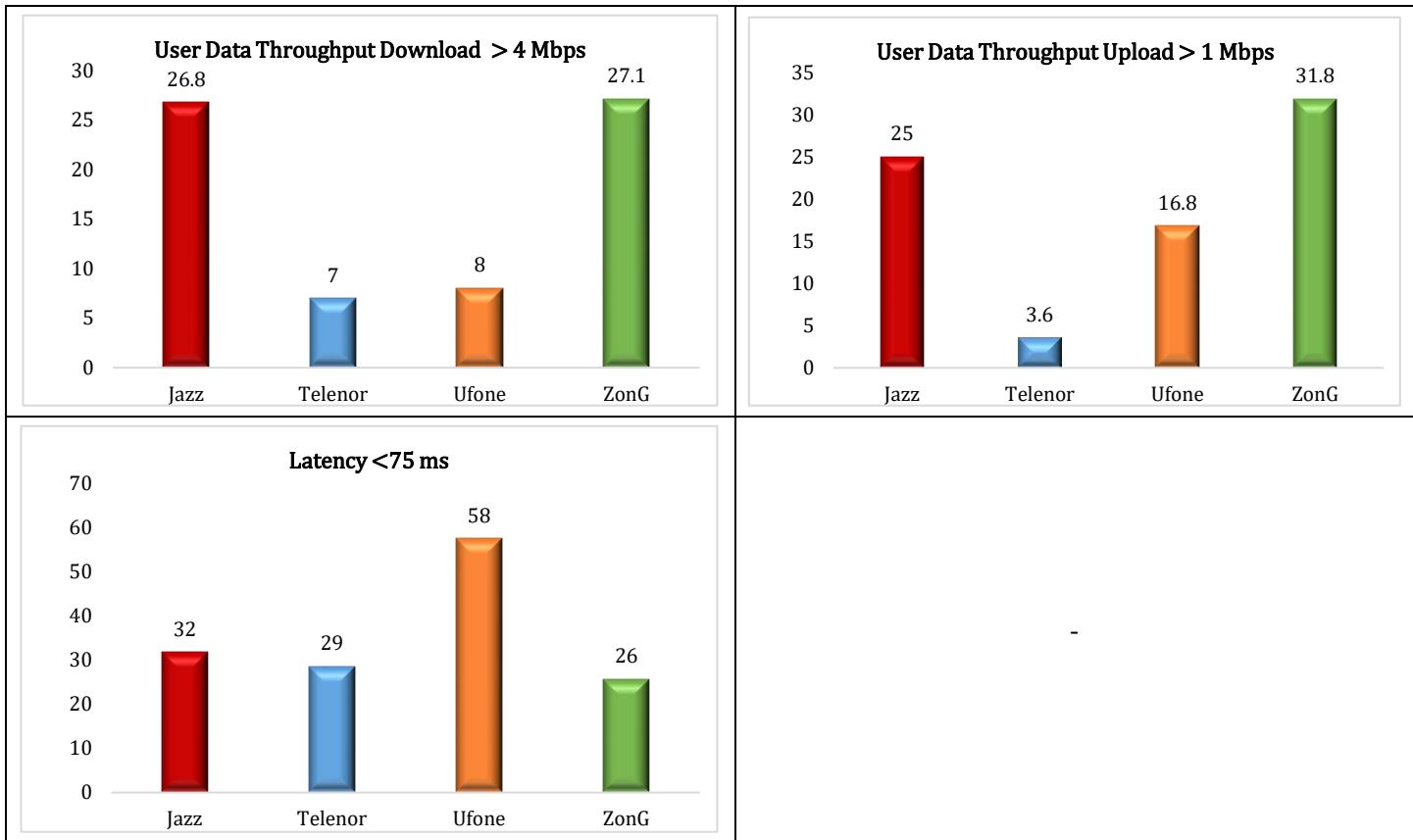
QUALITY OF SERVICE SURVEY RESULTS (OOKLA) -BATTAGRAM



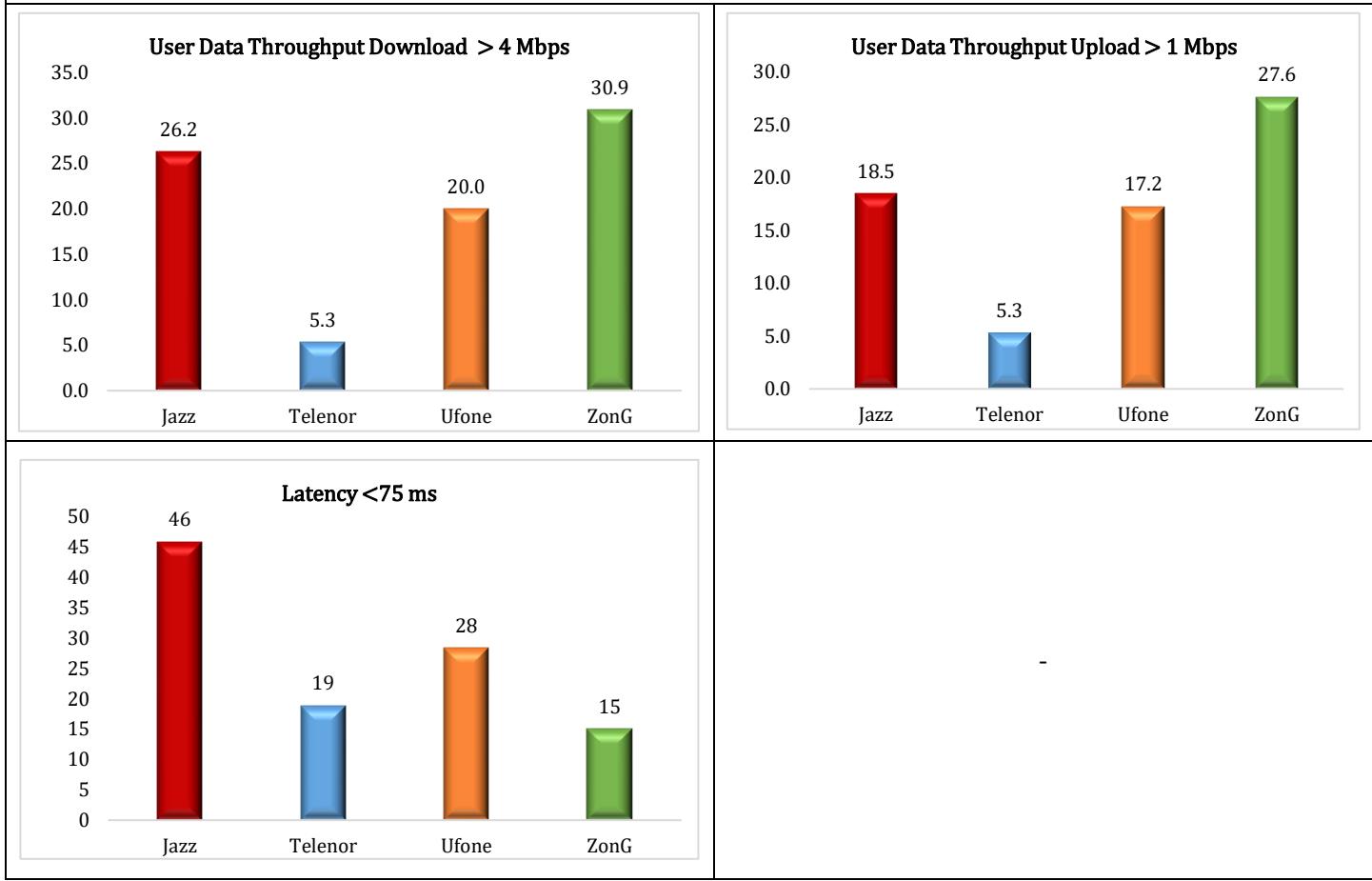
QUALITY OF SERVICE SURVEY RESULTS (OOKLA) -BESHAM



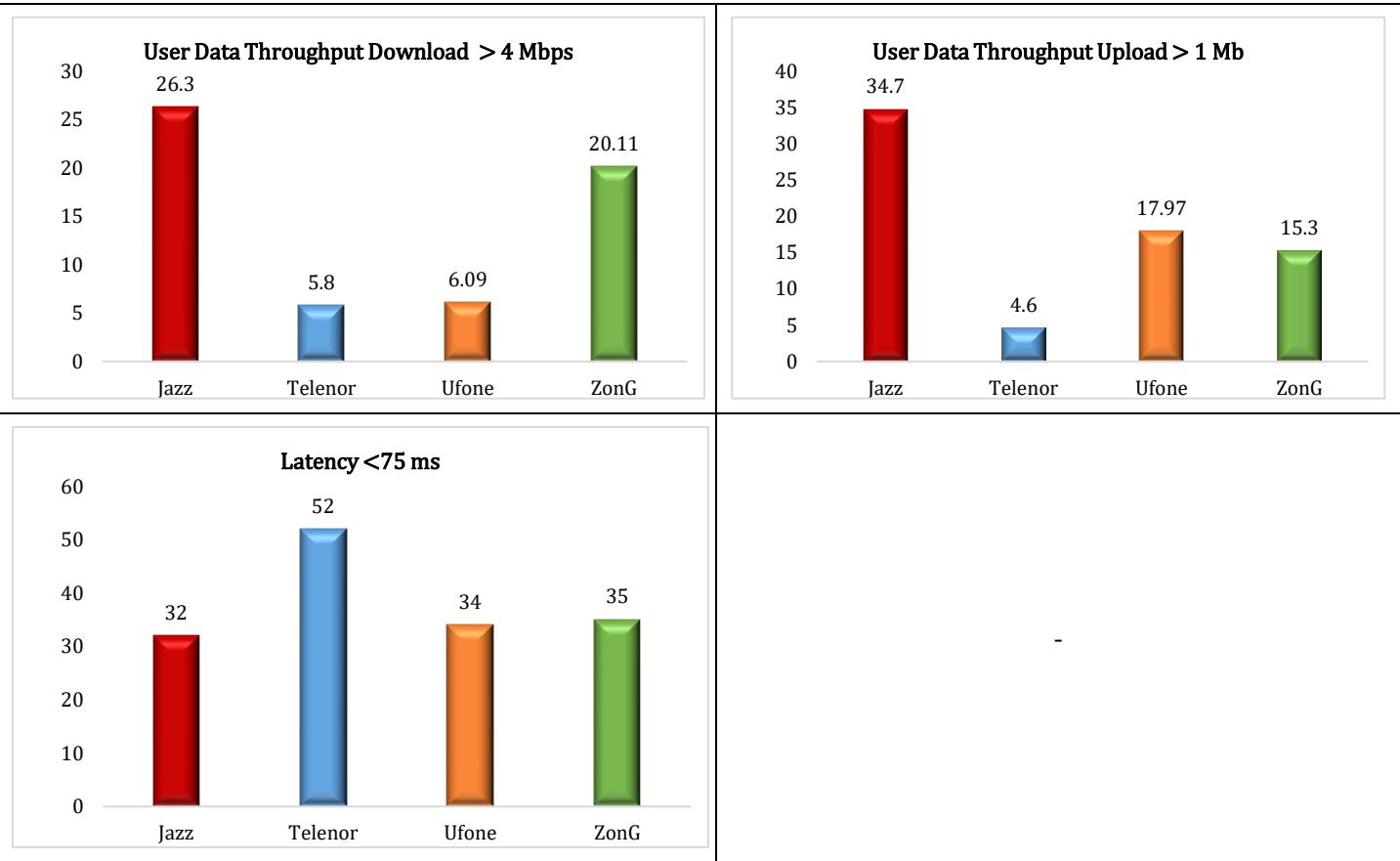
QUALITY OF SERVICE SURVEY RESULTS (OOKLA) -DADU



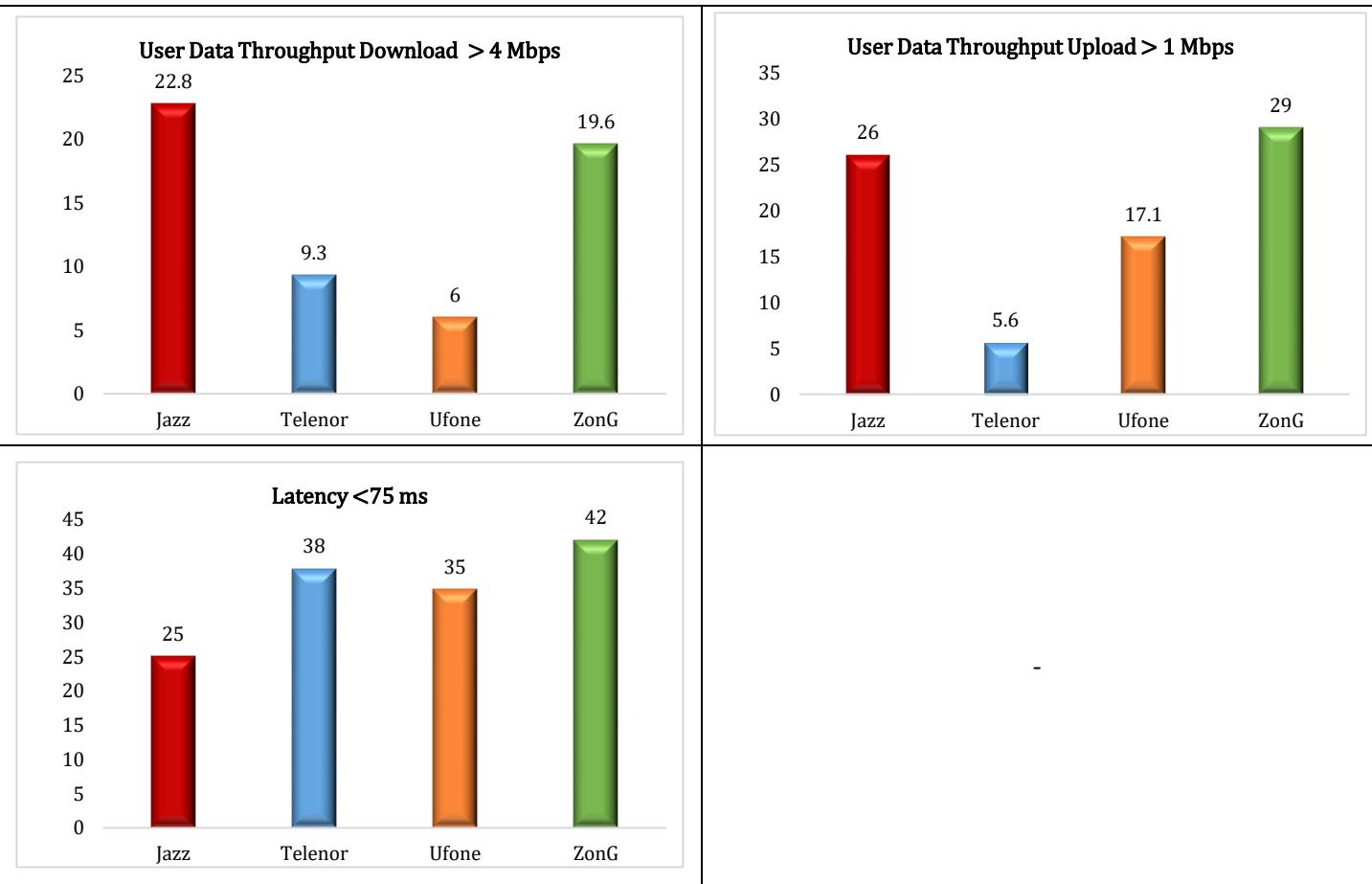
QUALITY OF SERVICE SURVEY RESULTS (OOKLA) -DASKA



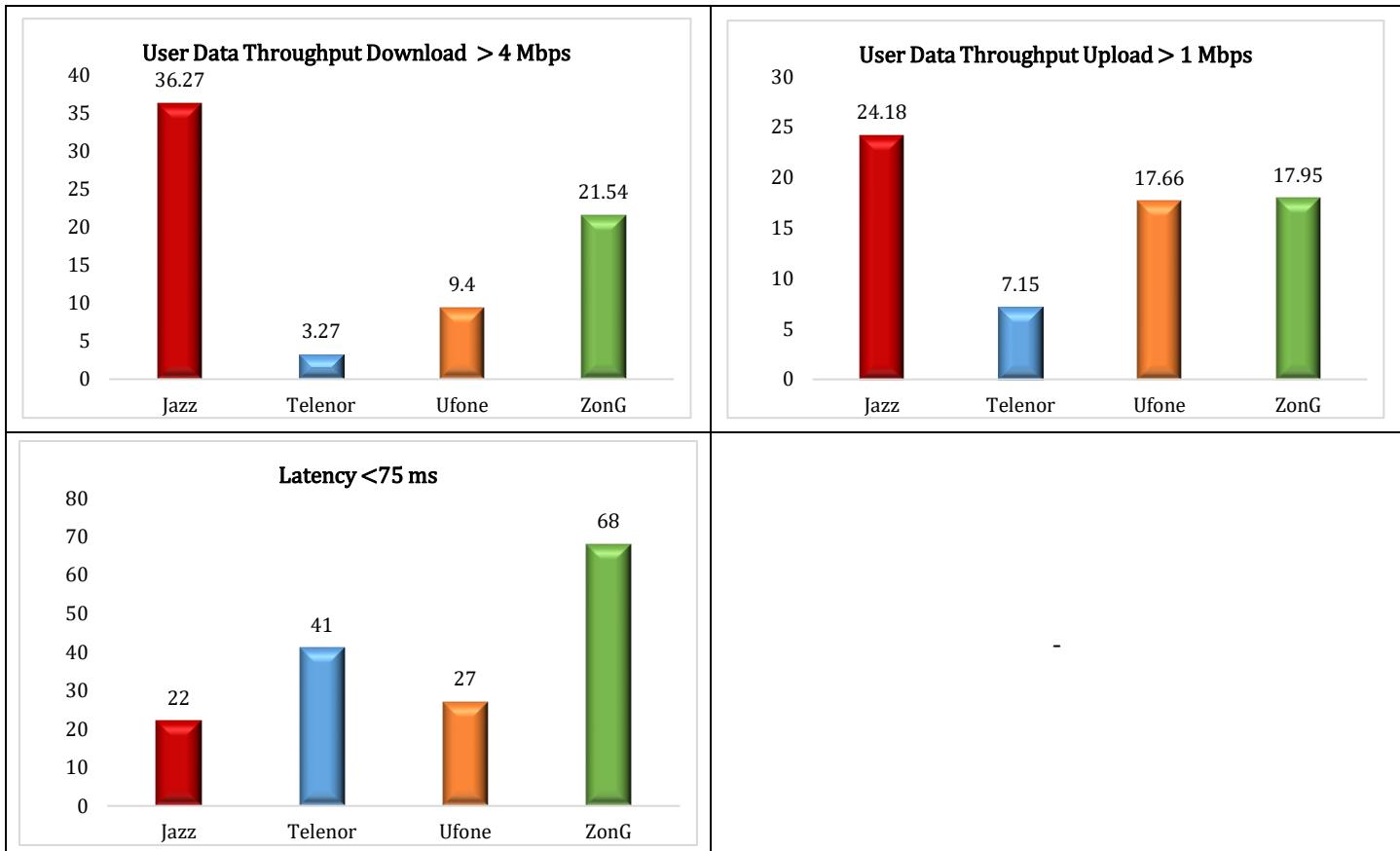
QUALITY OF SERVICE SURVEY RESULTS (OOKLA) -DERA ALLAH YAR



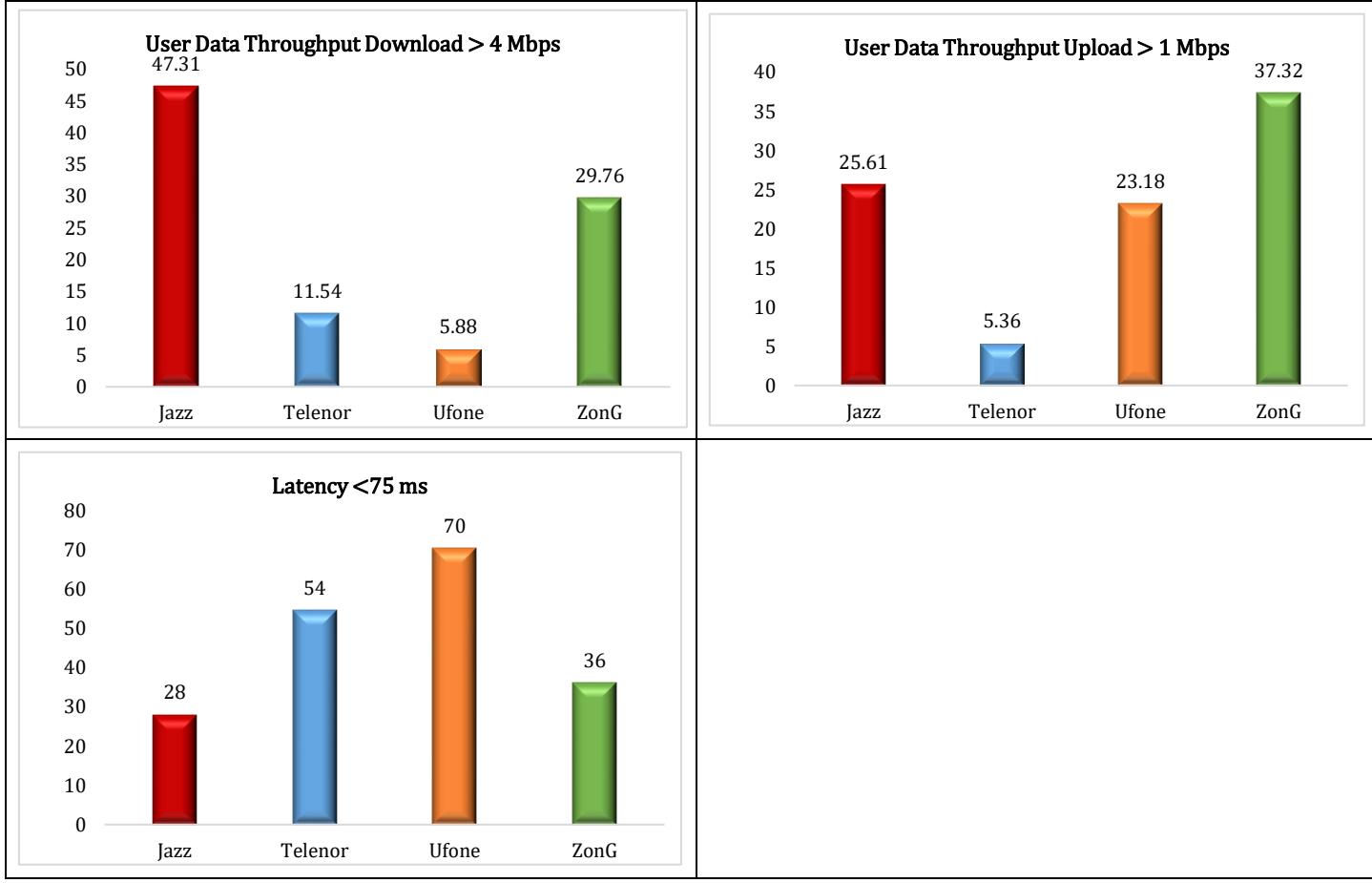
QUALITY OF SERVICE SURVEY RESULTS (OOKLA) -GHOTKI



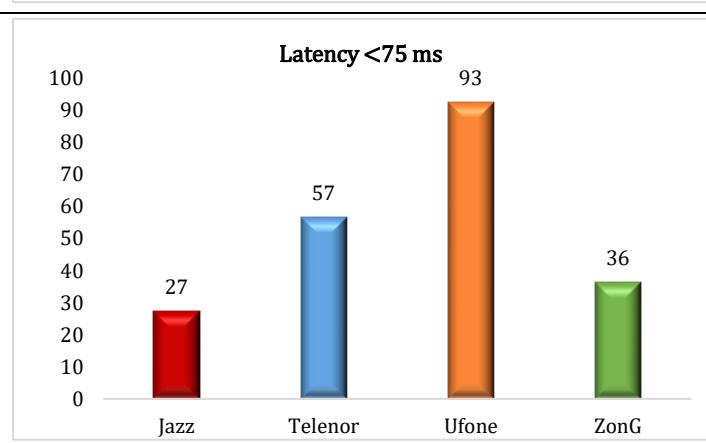
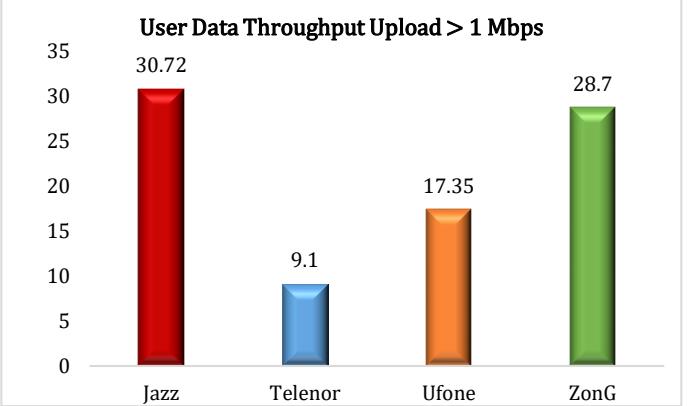
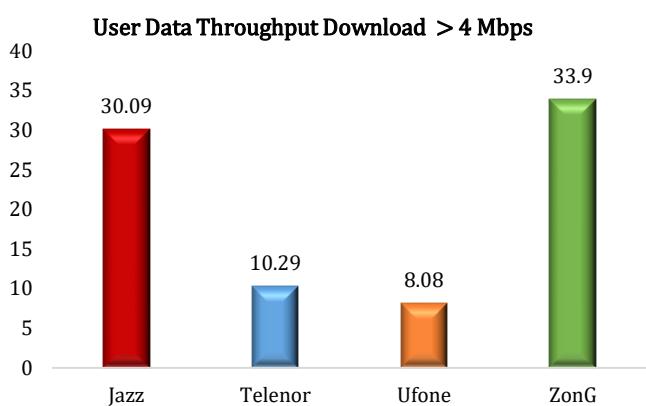
QUALITY OF SERVICE SURVEY RESULTS (OOKLA) -ISLAMABAD



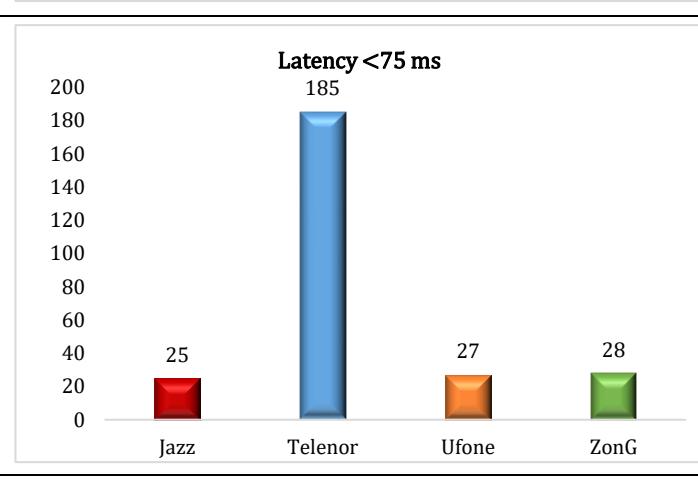
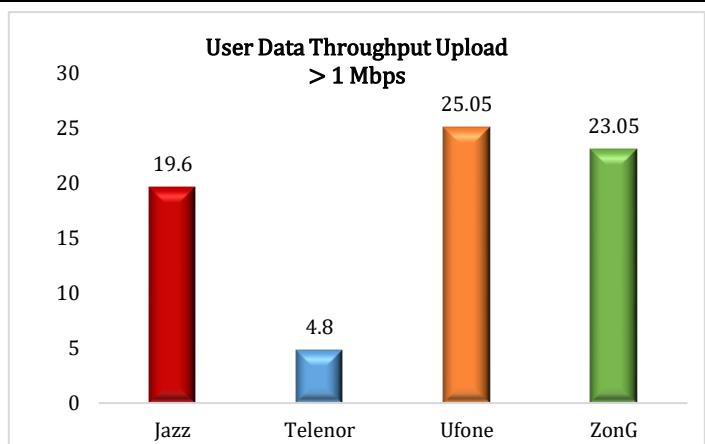
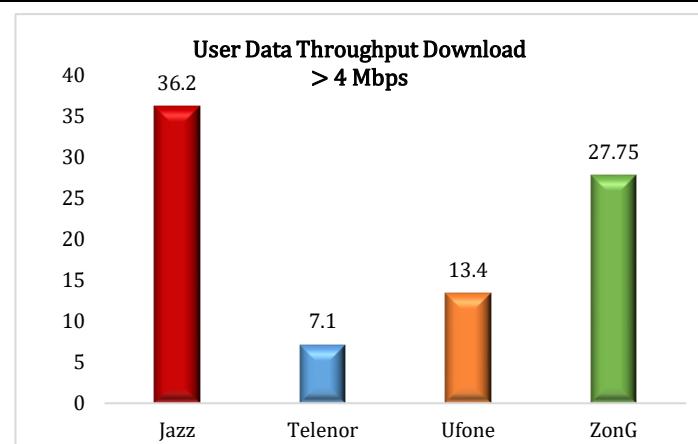
QUALITY OF SERVICE SURVEY RESULTS (OOKLA) -JHANG



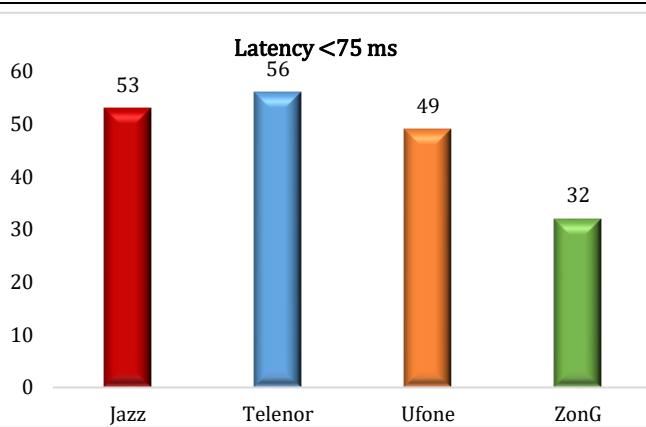
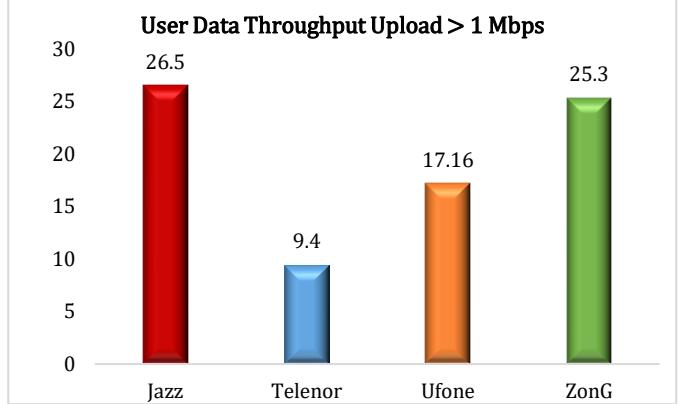
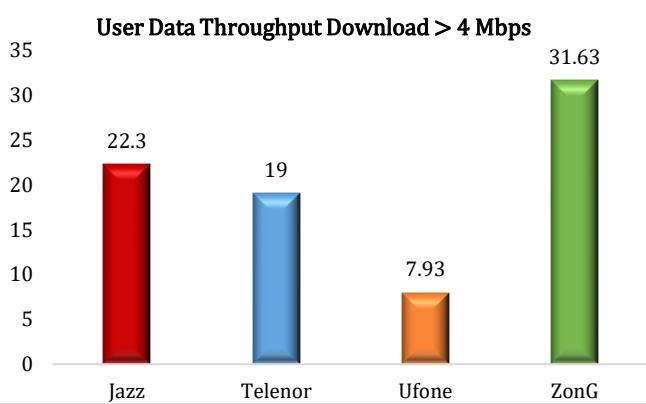
QUALITY OF SERVICE SURVEY RESULTS (OOKLA) -KHUSHAB



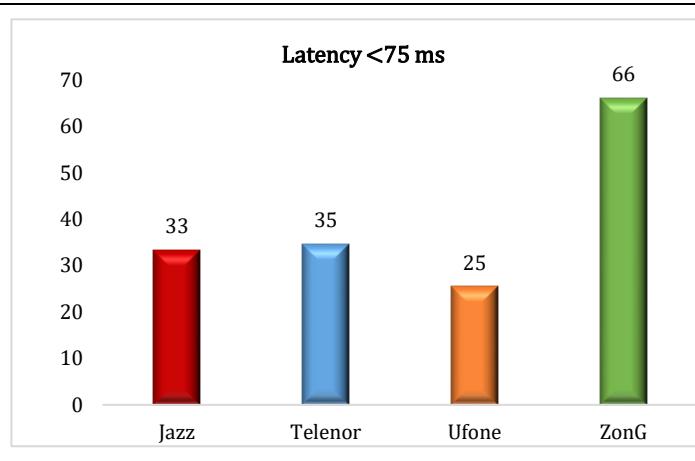
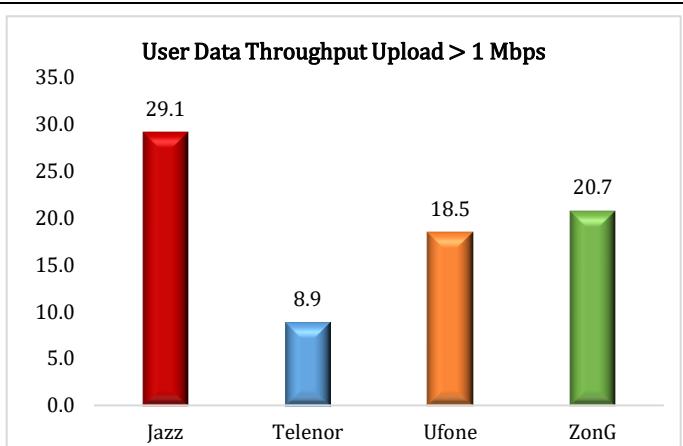
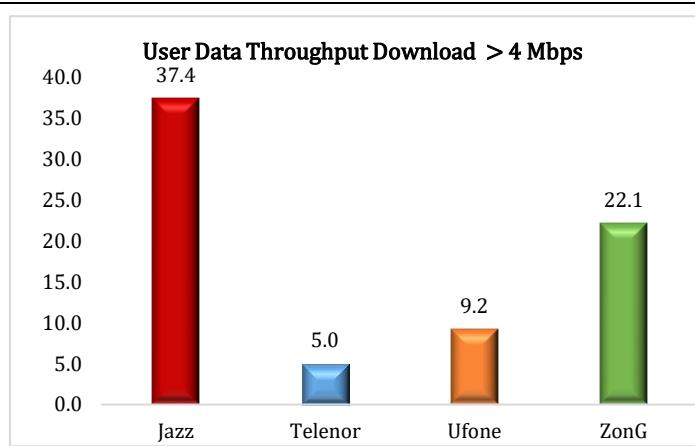
QUALITY OF SERVICE SURVEY RESULTS (OOKLA) -MIRPUR KHAS



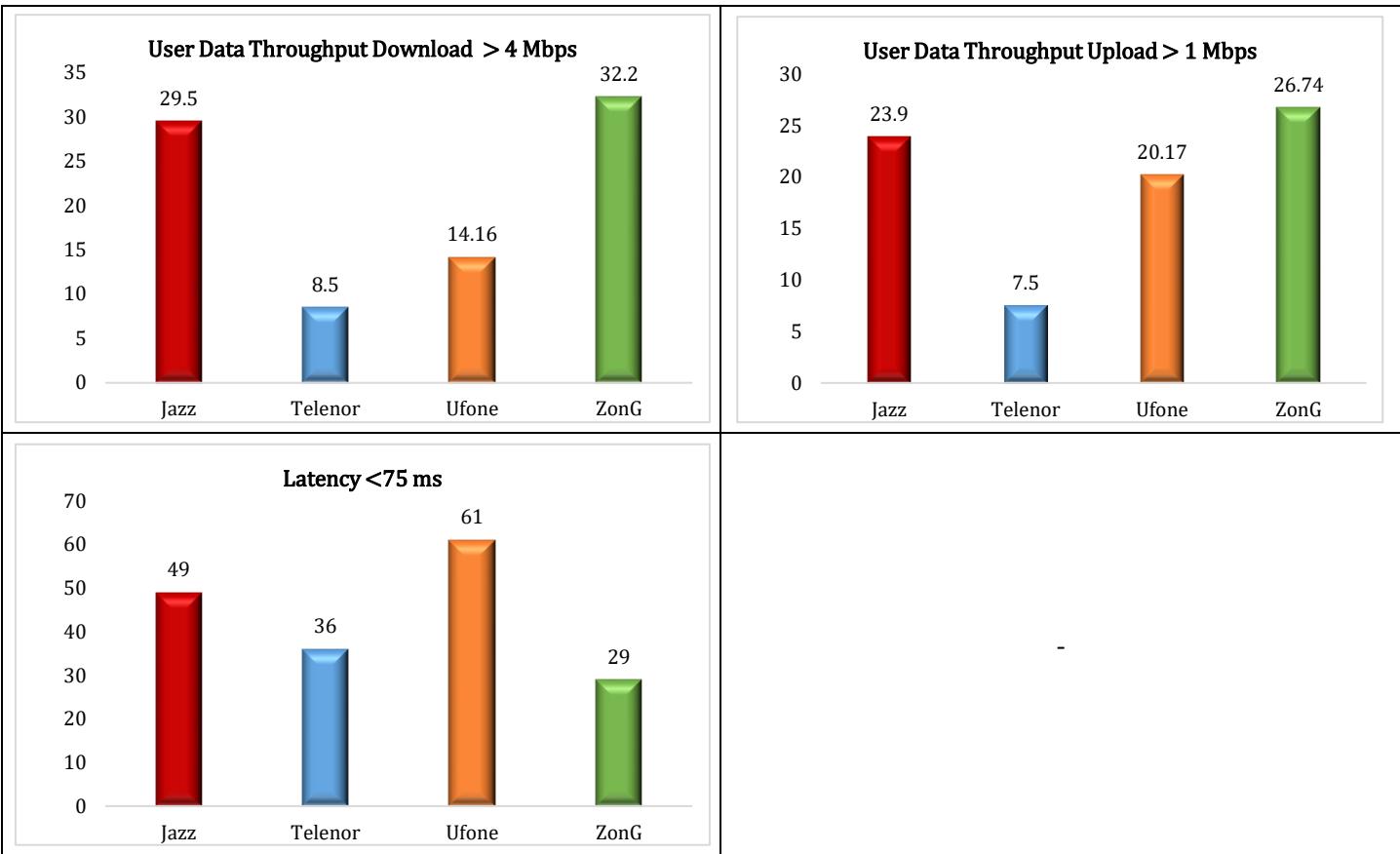
QUALITY OF SERVICE SURVEY RESULTS (OOKLA) –MUZAFARGARH



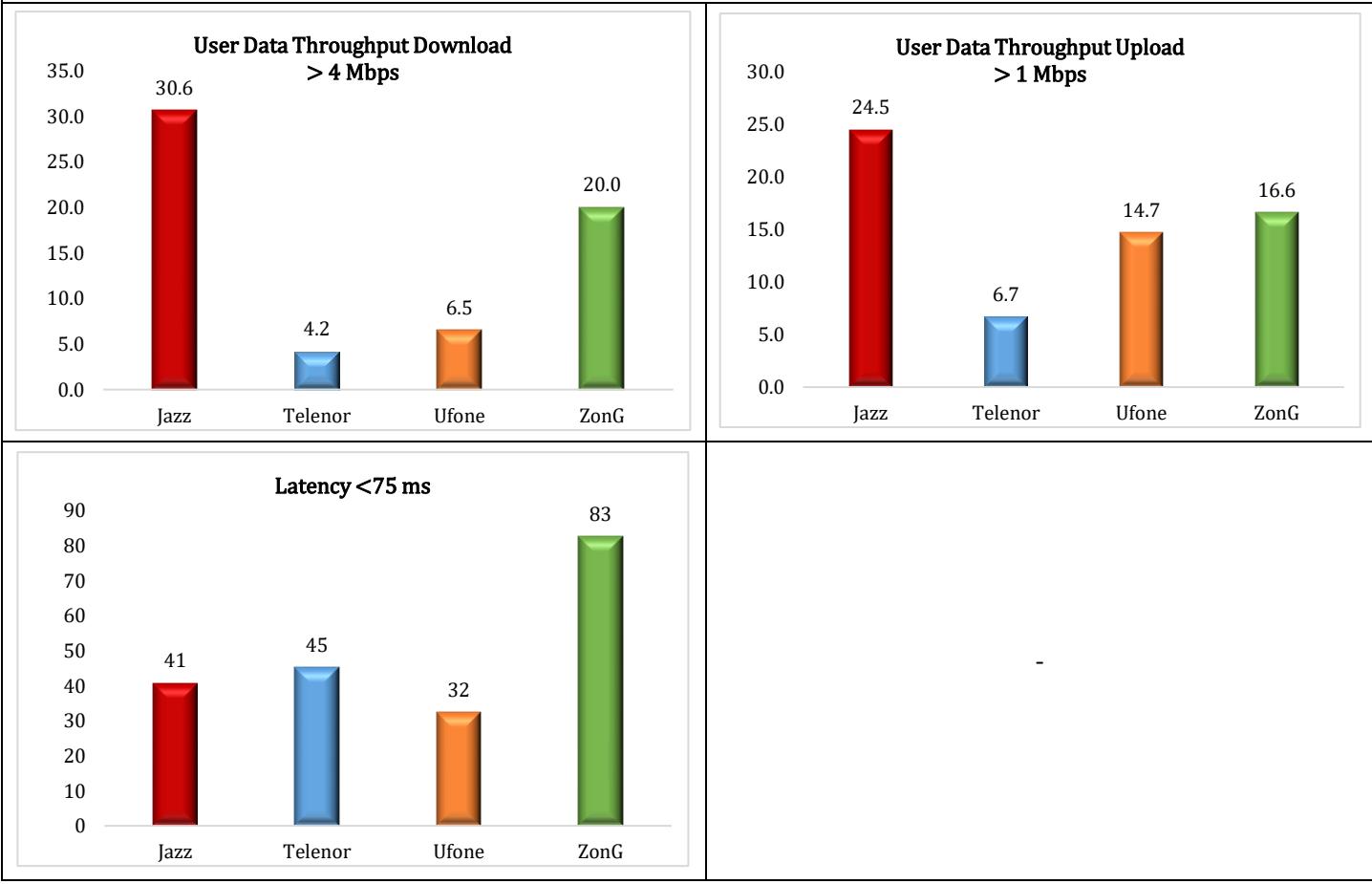
QUALITY OF SERVICE SURVEY RESULTS (OOKLA) –NOWSHERA



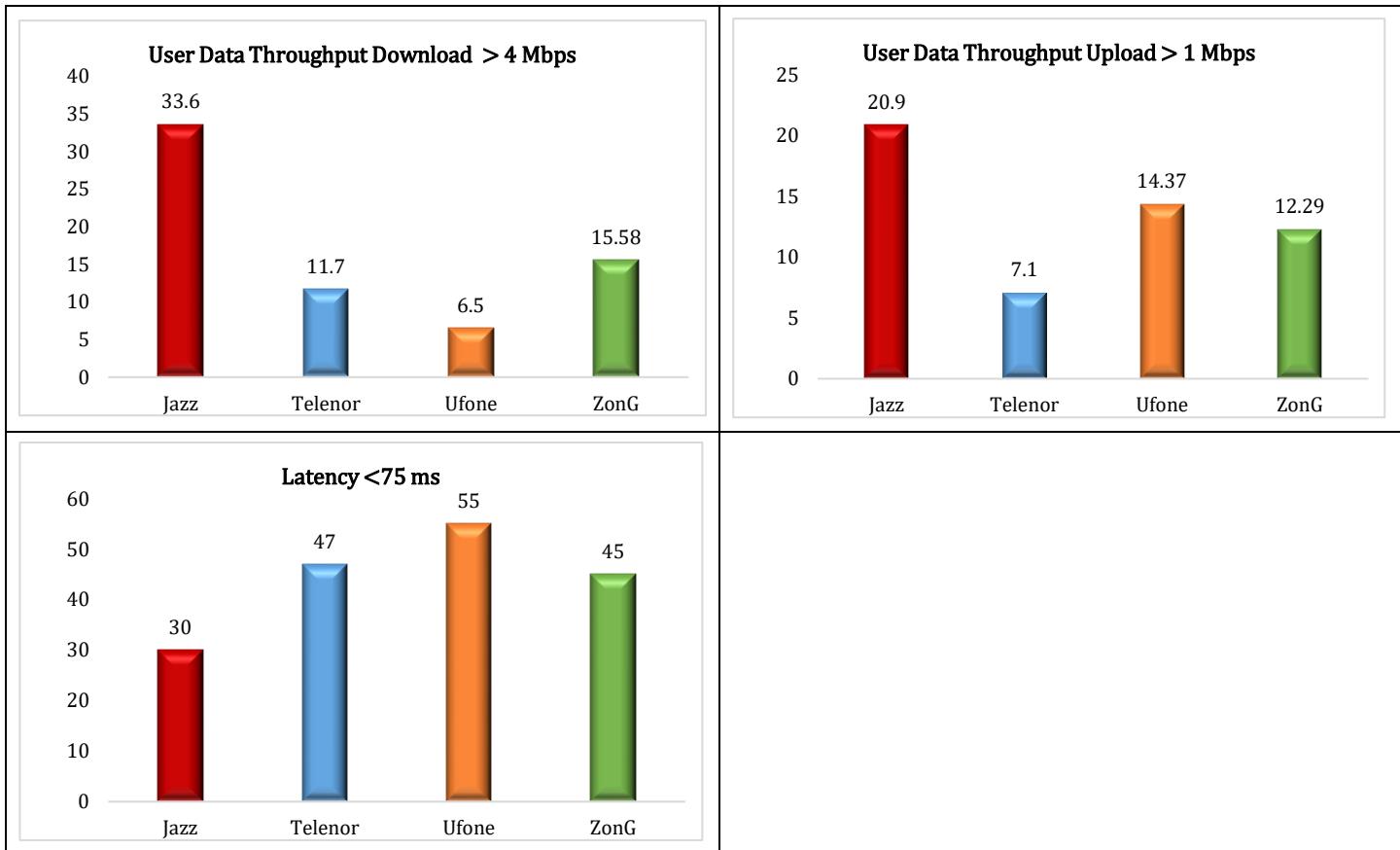
QUALITY OF SERVICE SURVEY RESULTS (OOKLA) -OKARA



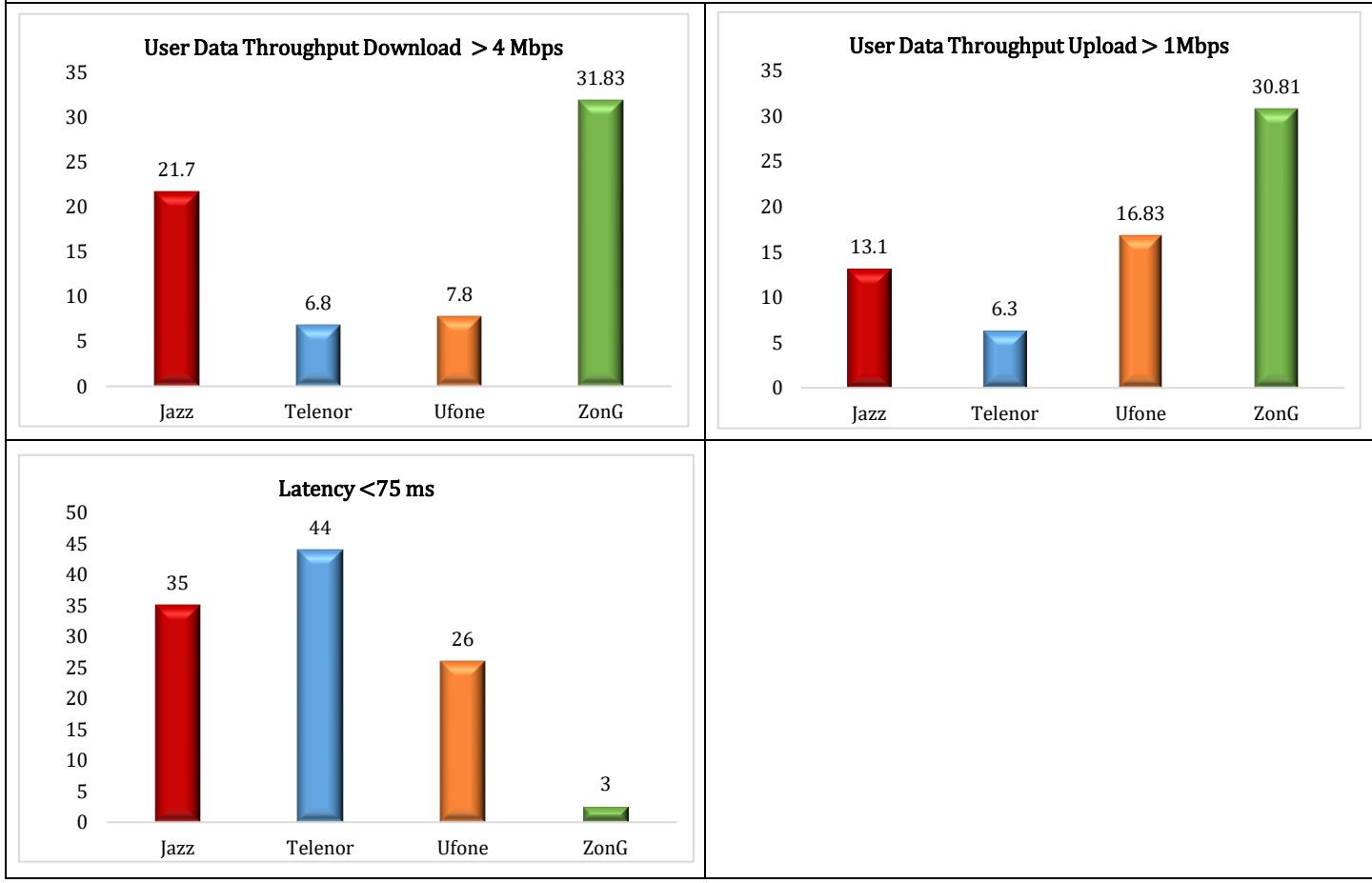
QUALITY OF SERVICE SURVEY RESULTS (OOKLA) -PESHAWAR



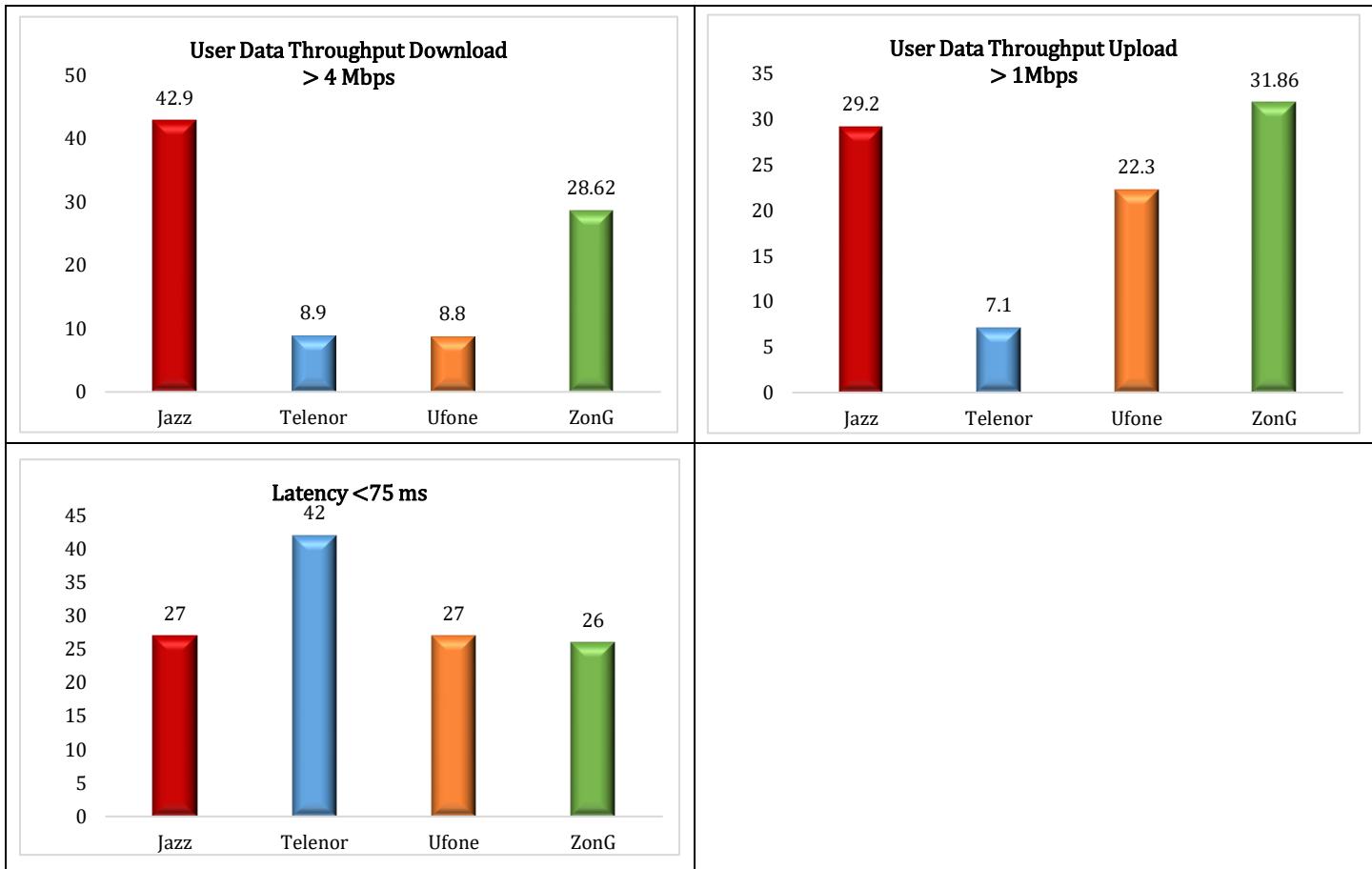
QUALITY OF SERVICE SURVEY RESULTS (OOKLA) -QUETTA



QUALITY OF SERVICE SURVEY RESULTS (OOKLA) -SEHWAN



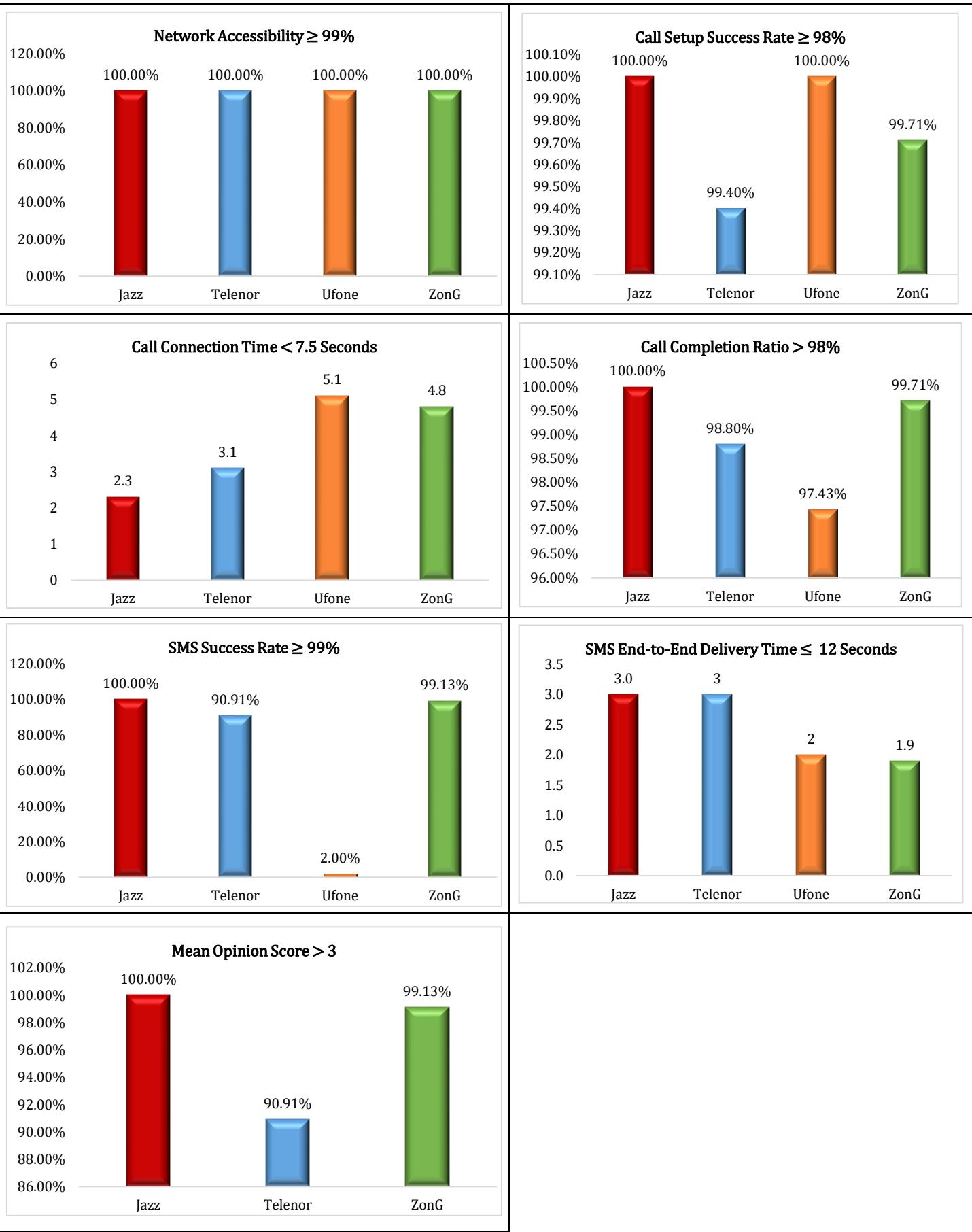
QUALITY OF SERVICE SURVEY RESULTS (OOKLA) - THATTA



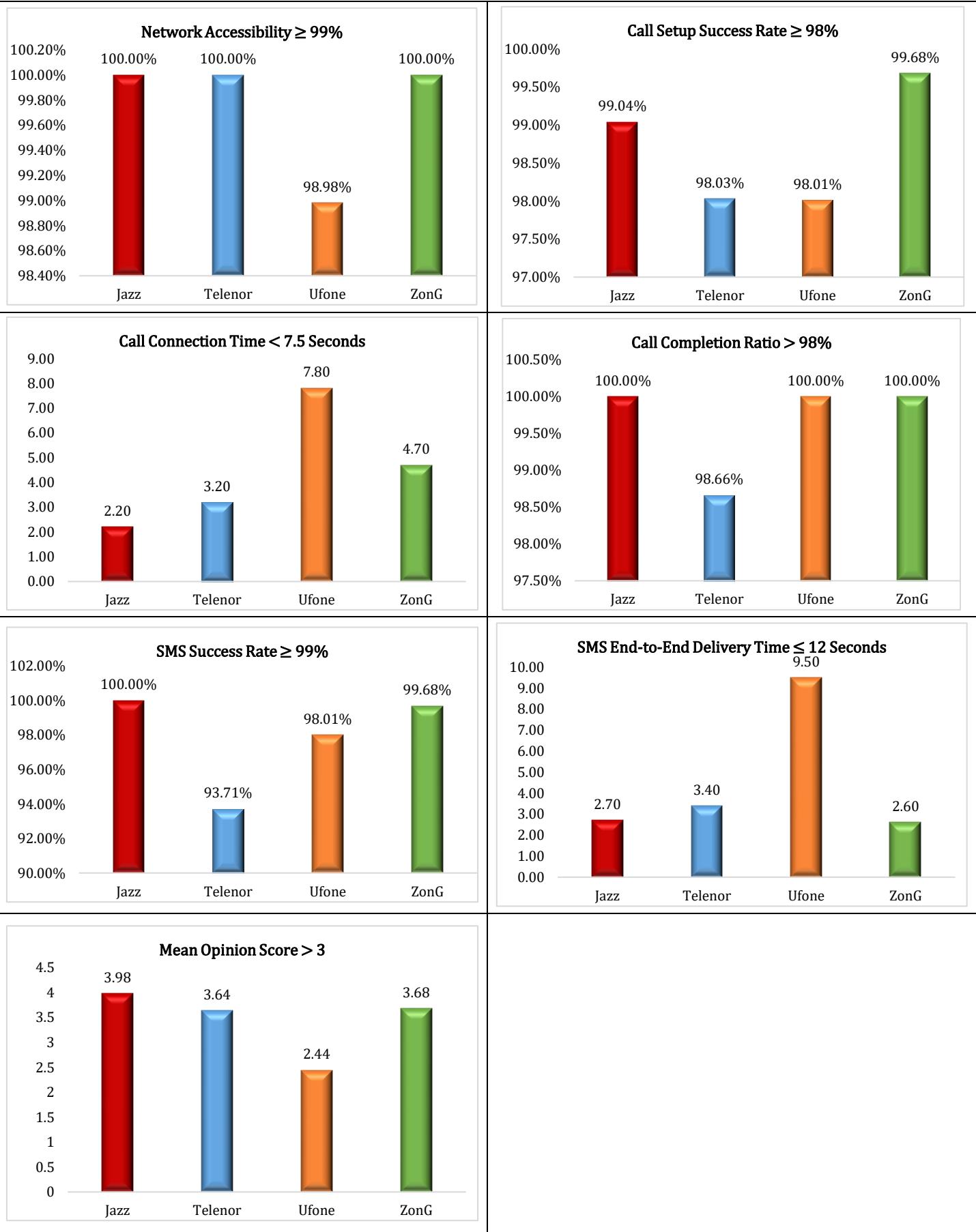
Annex -C(Voice & SMS Results)

VOICE & SMS AUTOMODE

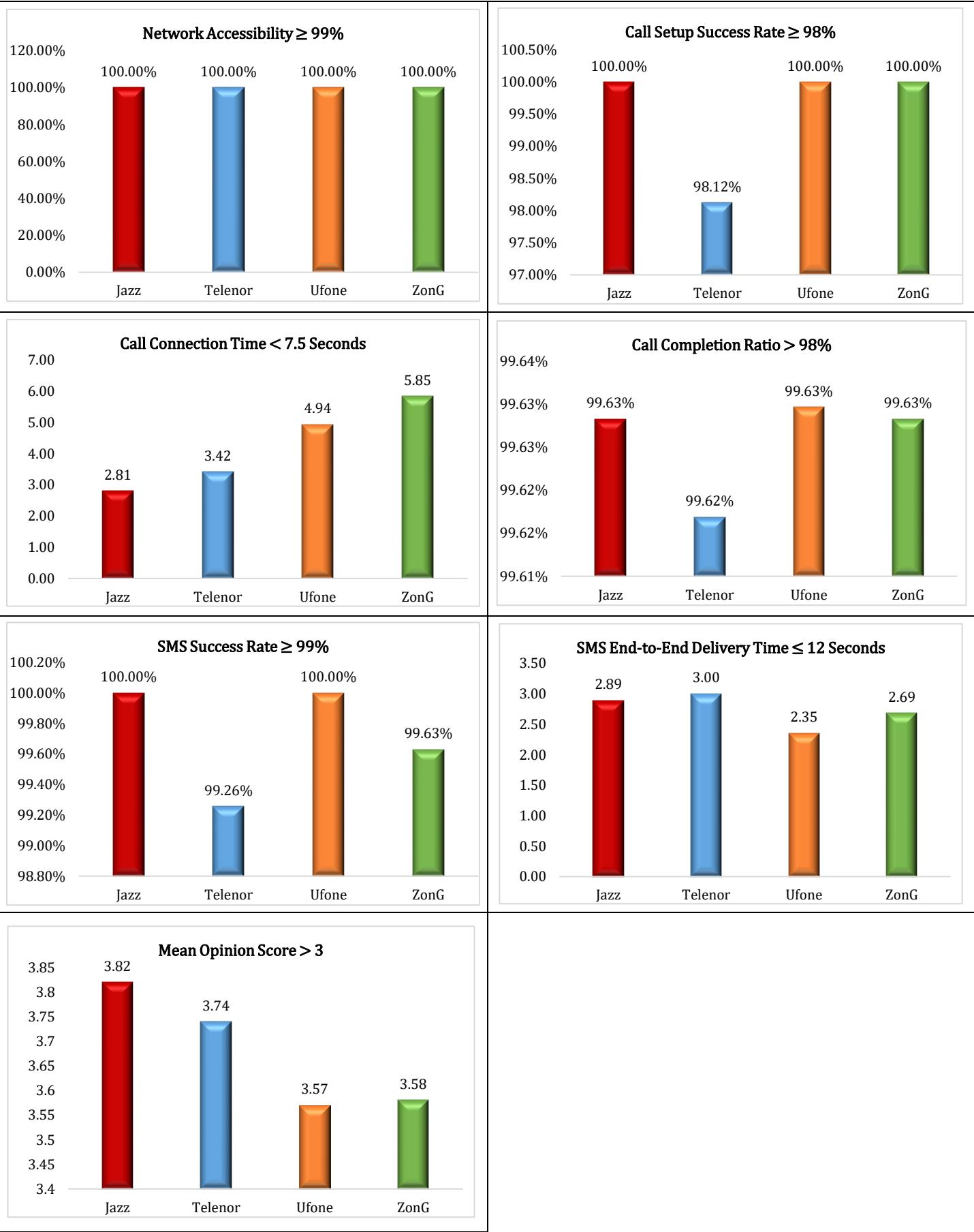
QUALITY OF SERVICE SURVEY RESULTS – BATTAGRAM



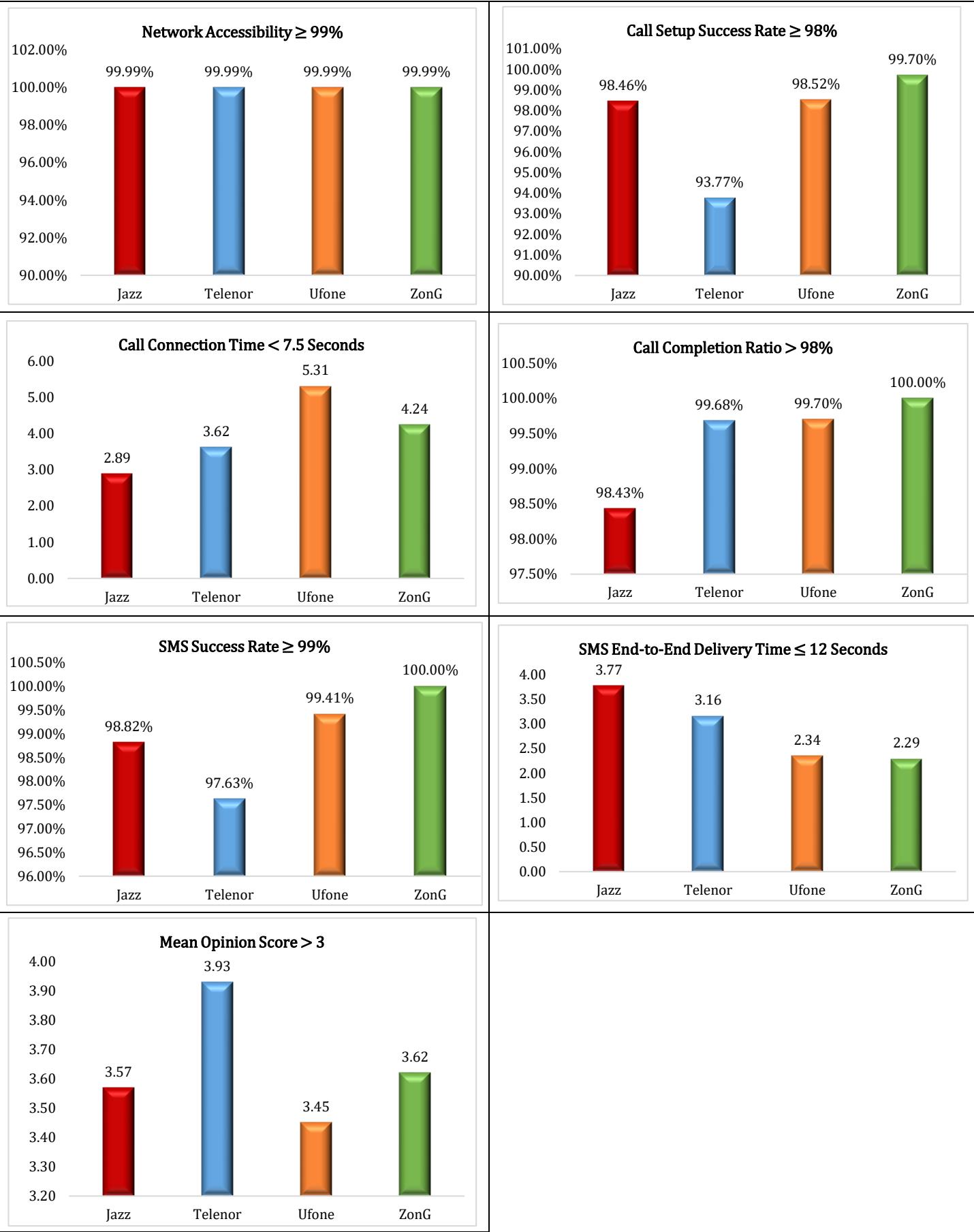
QUALITY OF SERVICE SURVEY RESULTS – BESHAM



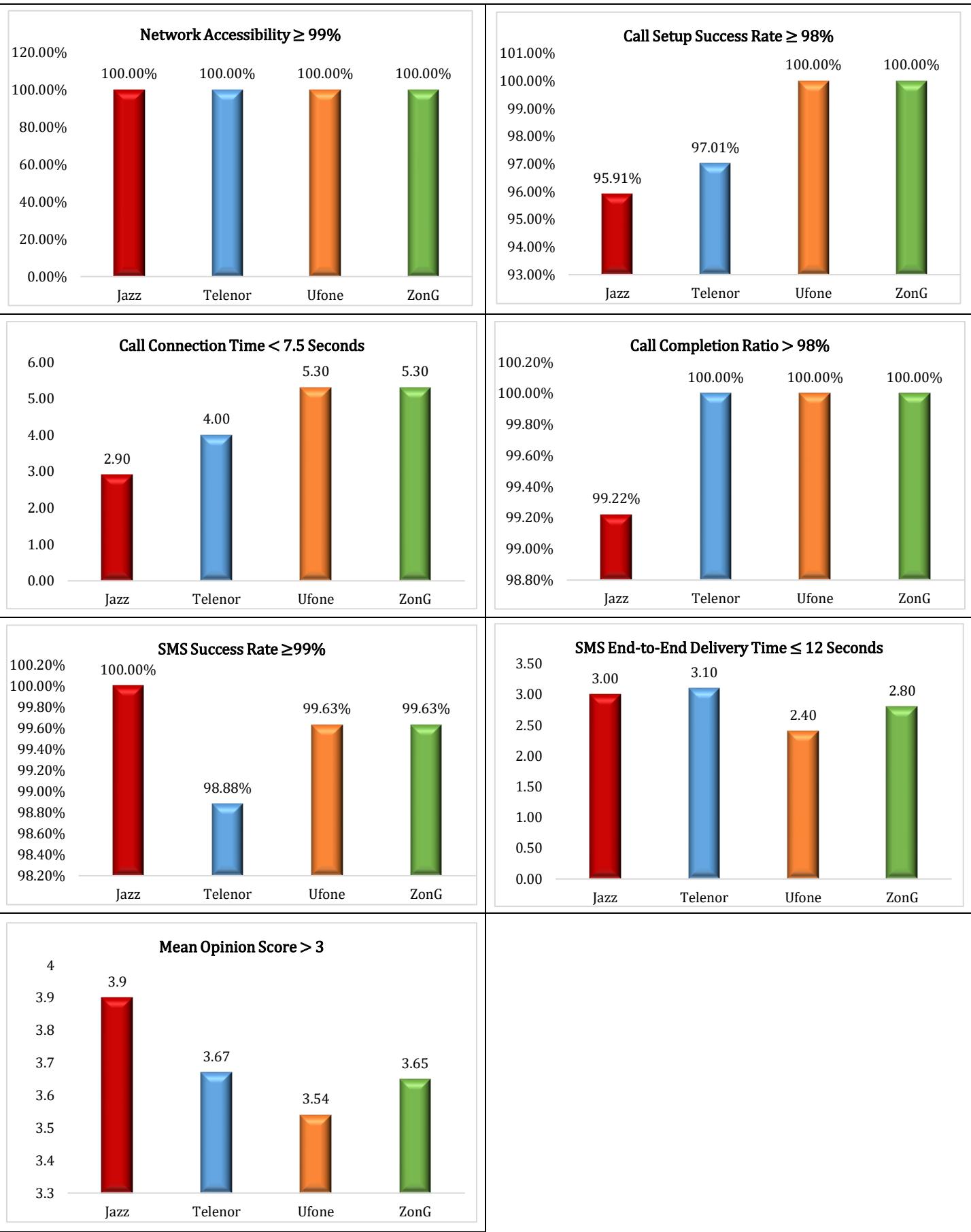
QUALITY OF SERVICE SURVEY RESULTS – DADU



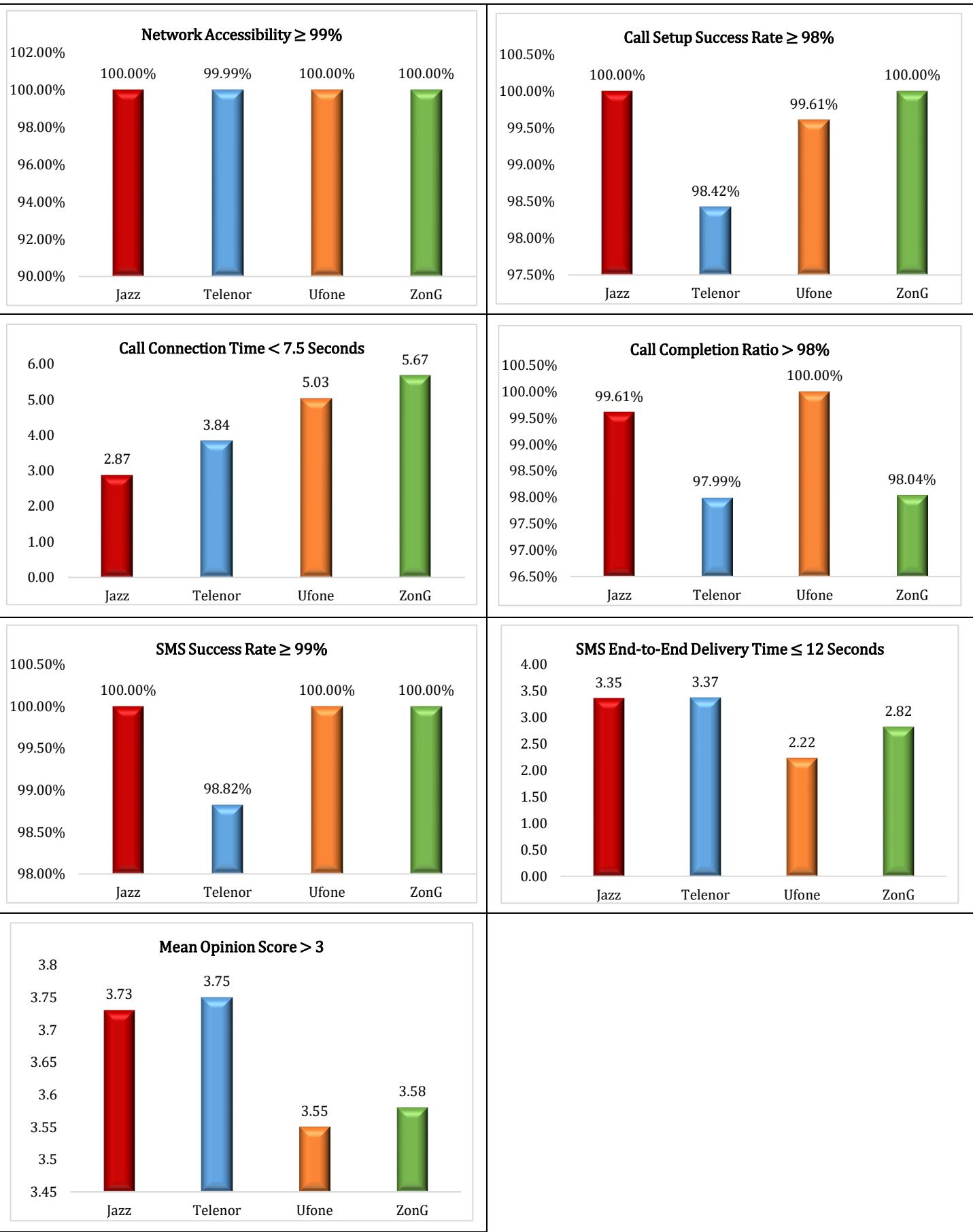
QUALITY OF SERVICE SURVEY RESULTS – DASKA



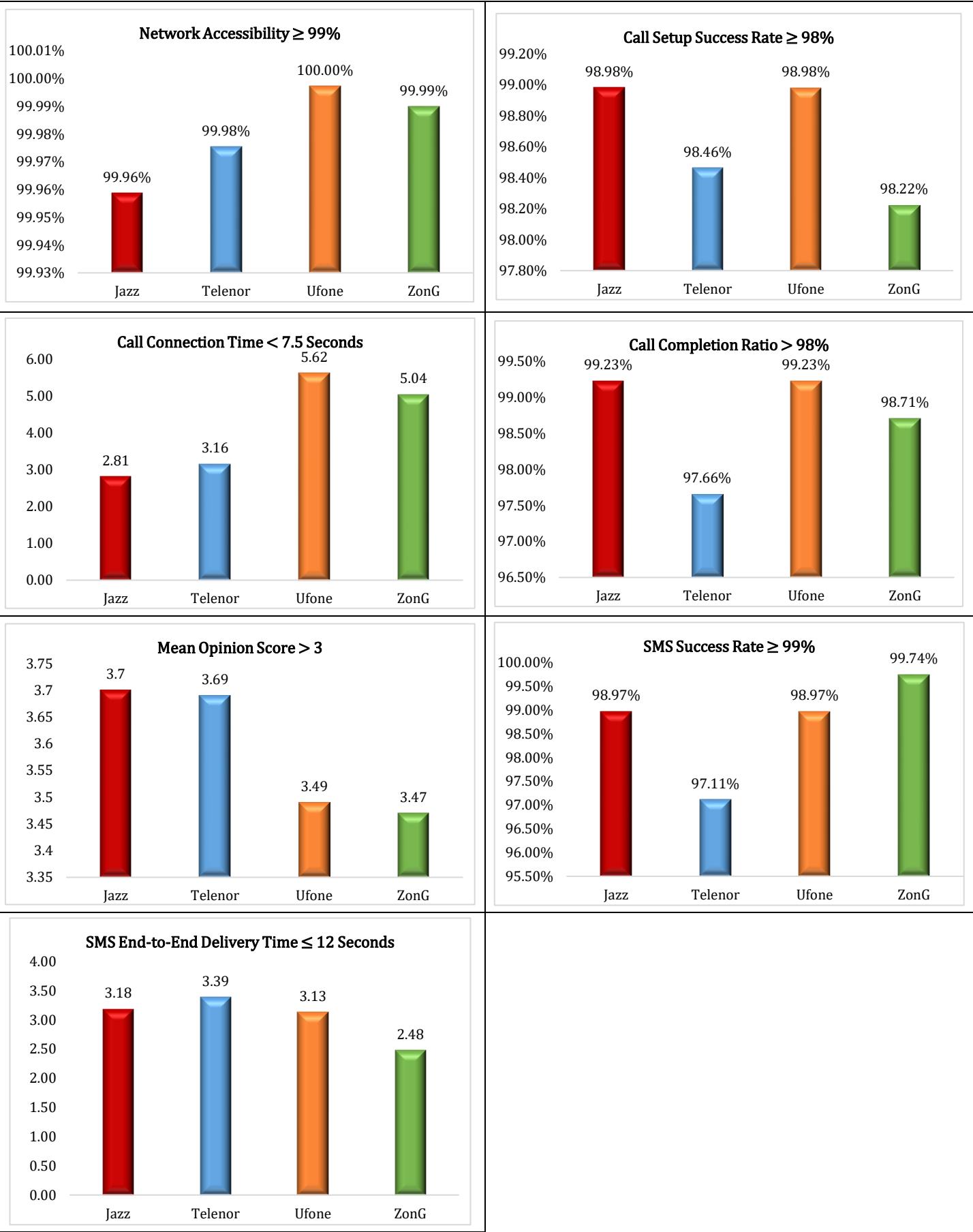
QUALITY OF SERVICE SURVEY RESULTS – DERA ALLAH YAR



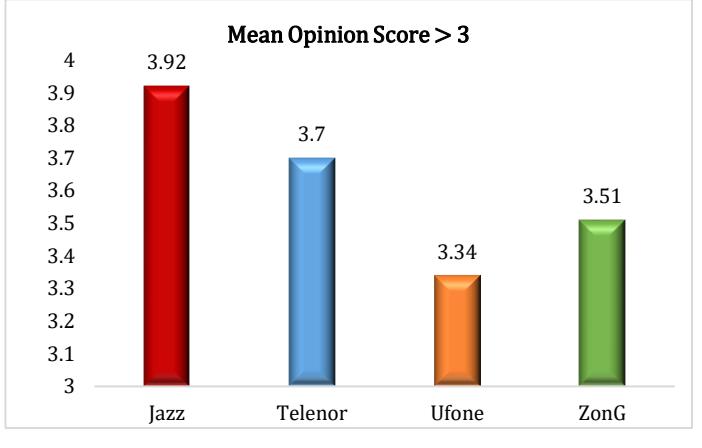
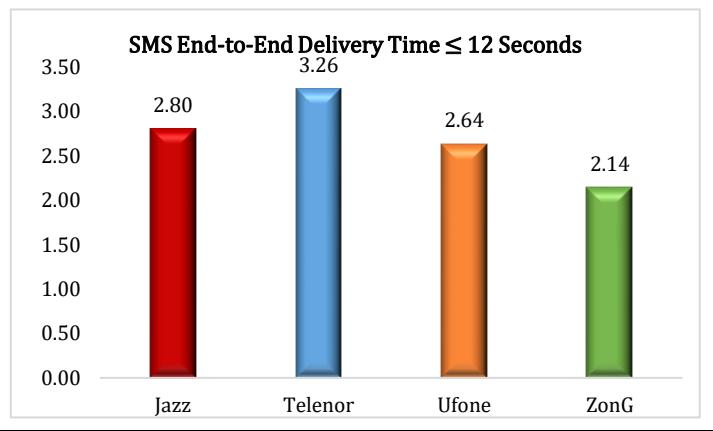
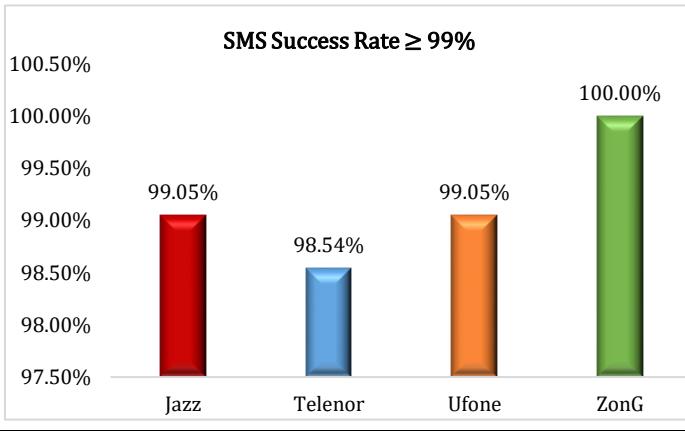
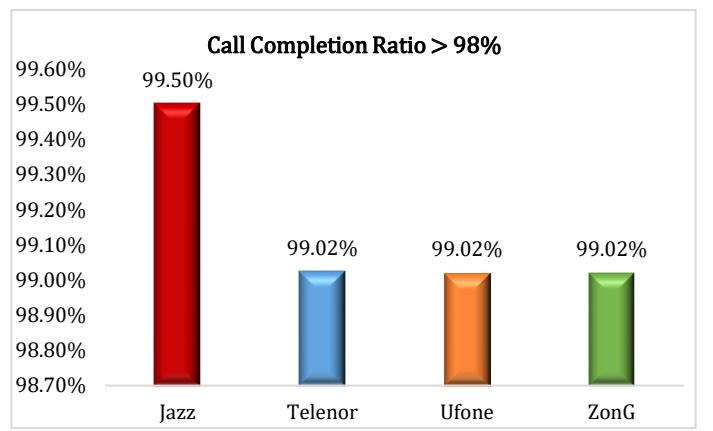
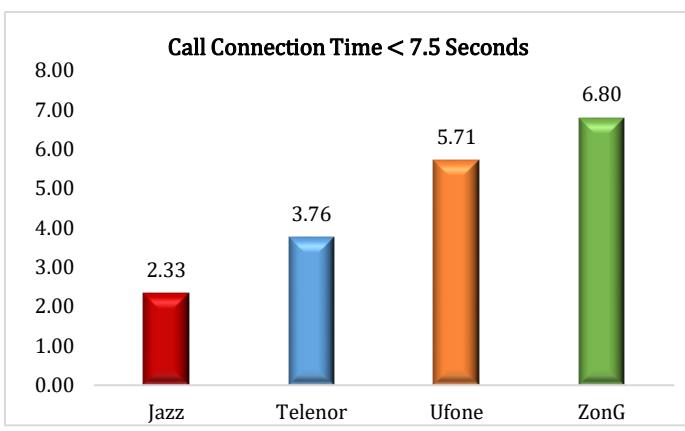
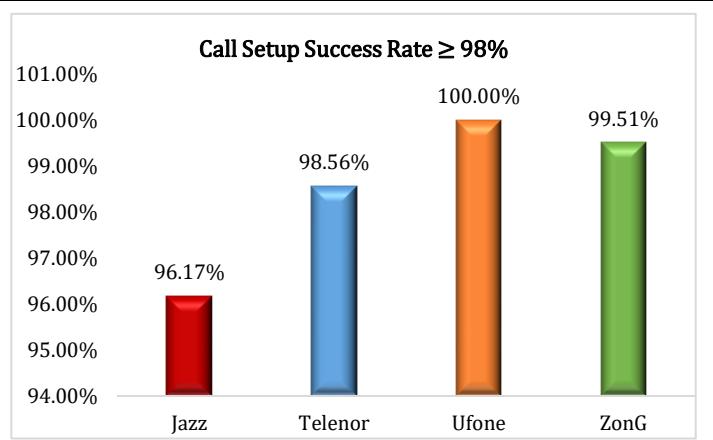
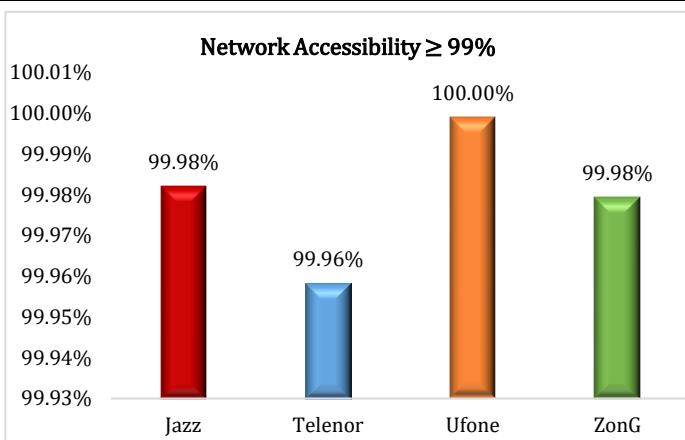
QUALITY OF SERVICE SURVEY RESULTS – GHOTKI



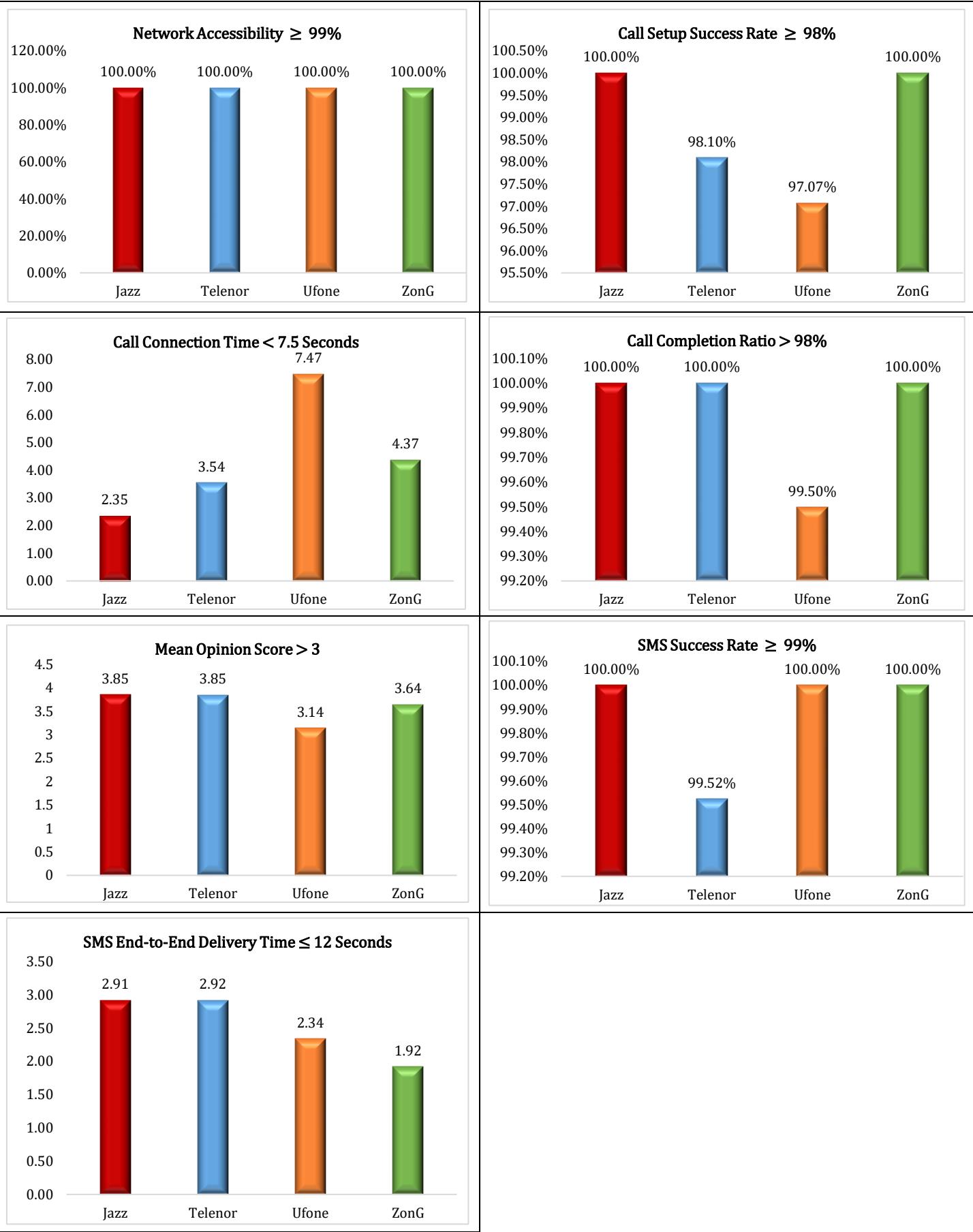
QUALITY OF SERVICE SURVEY RESULTS – ISLAMABAD



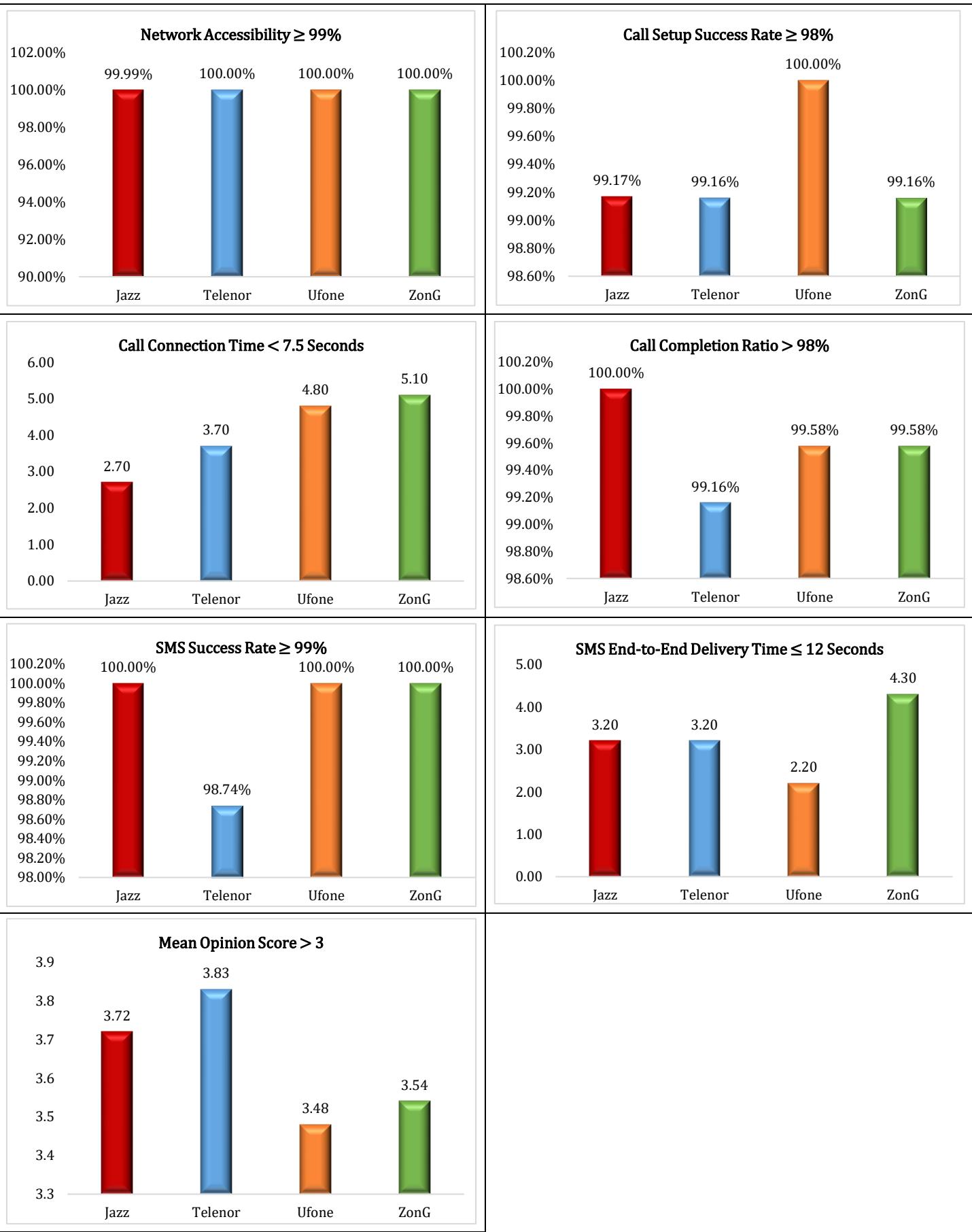
QUALITY OF SERVICE SURVEY RESULTS – JHANG



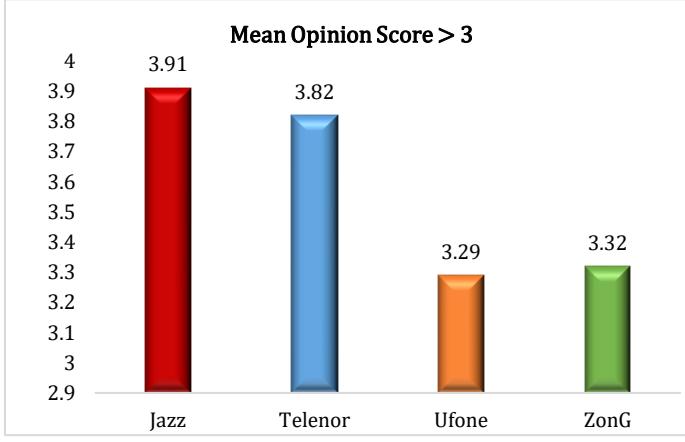
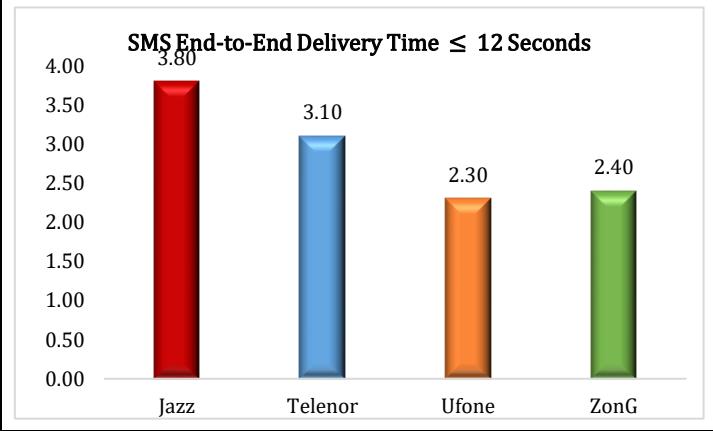
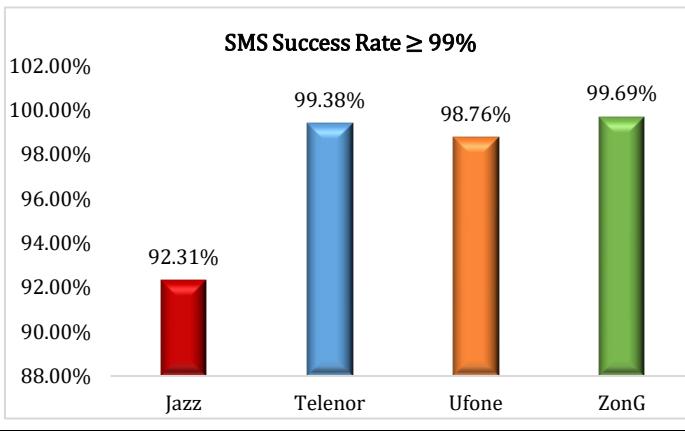
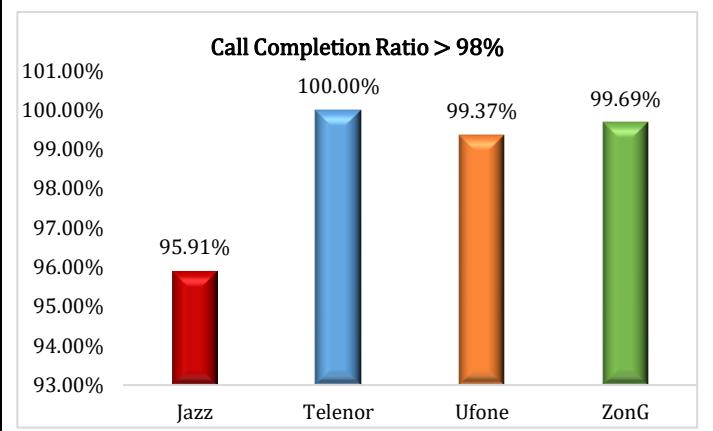
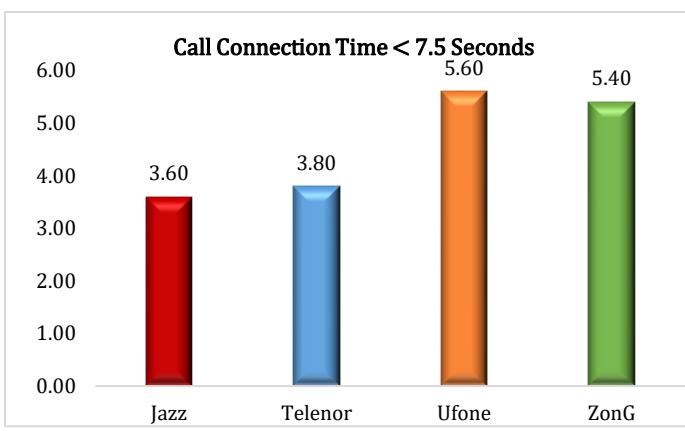
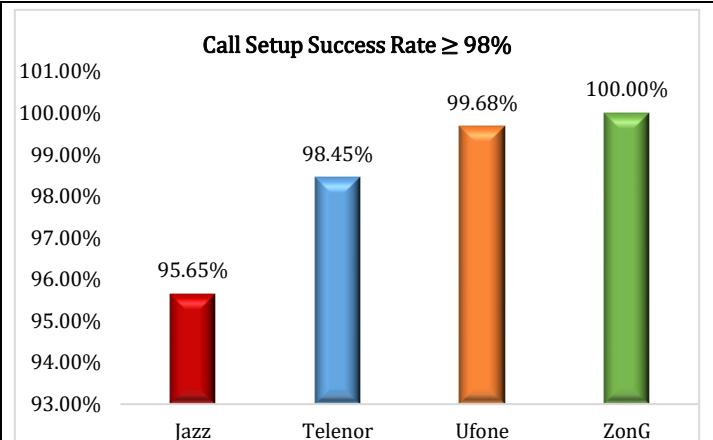
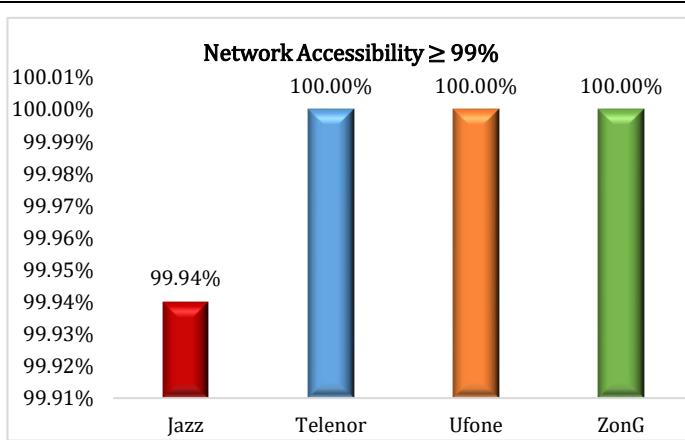
QUALITY OF SERVICE SURVEY RESULTS – KHUSHAB



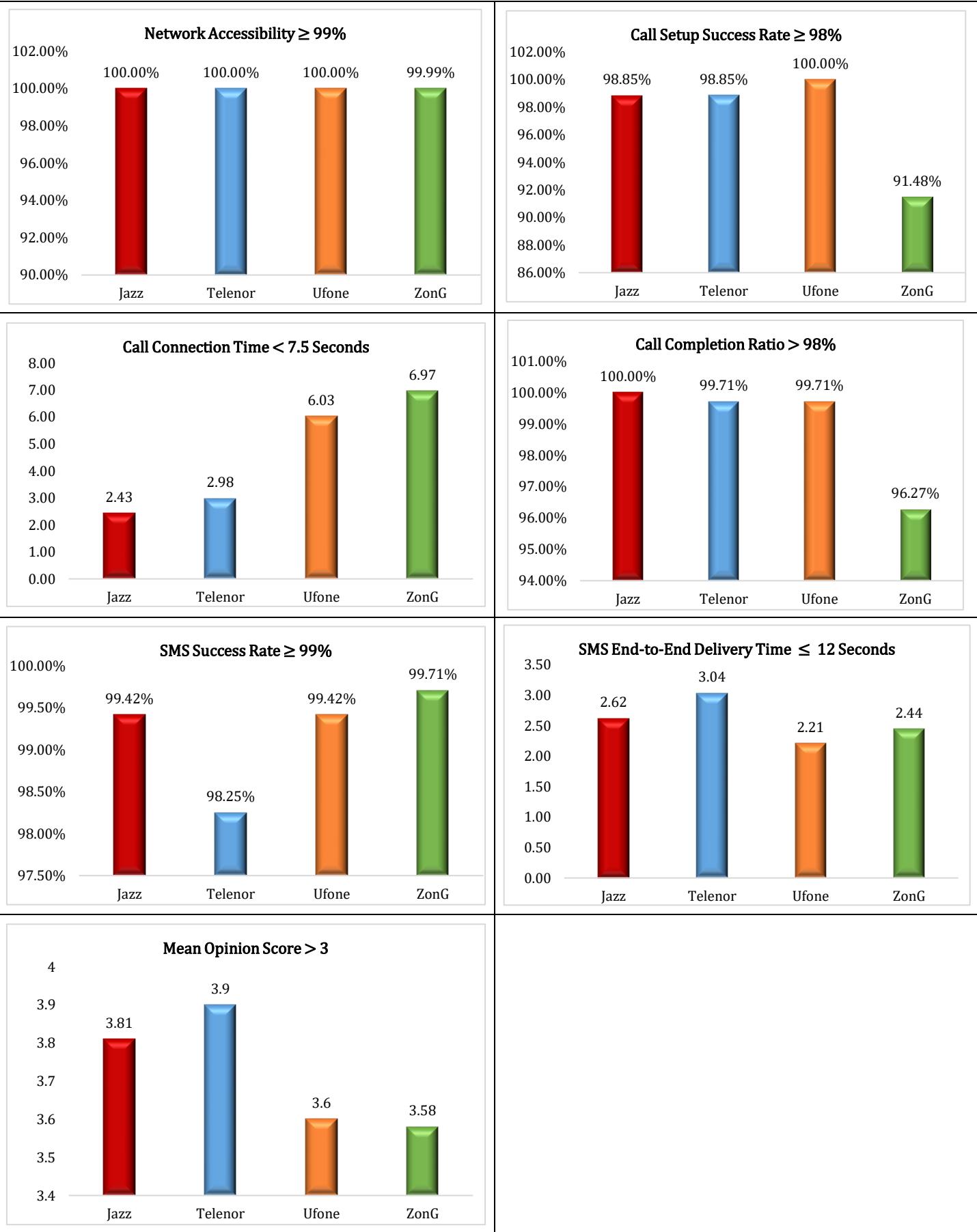
QUALITY OF SERVICE SURVEY RESULTS – MIRPUR KHAS



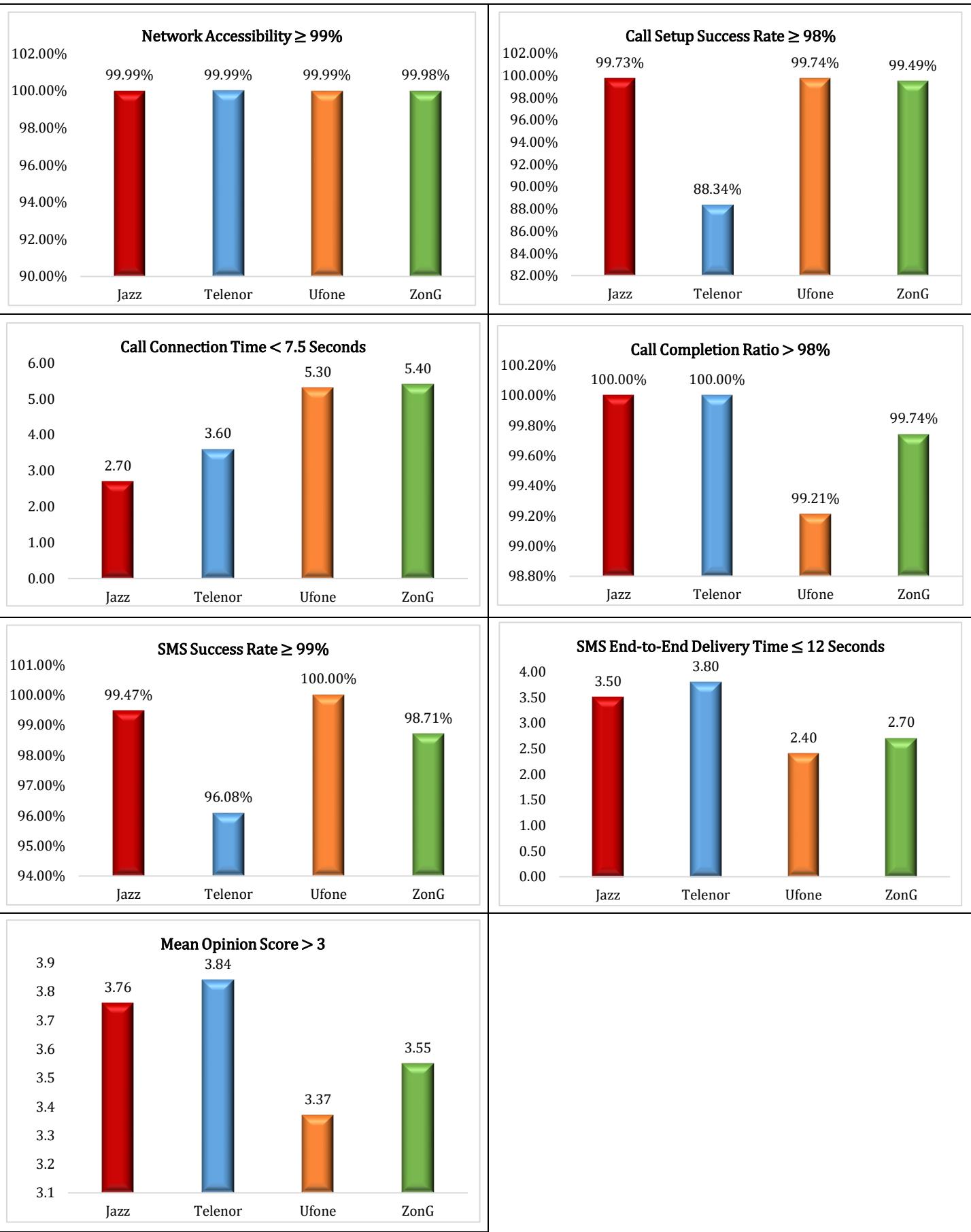
QUALITY OF SERVICE SURVEY RESULTS – MUZAFARGARH



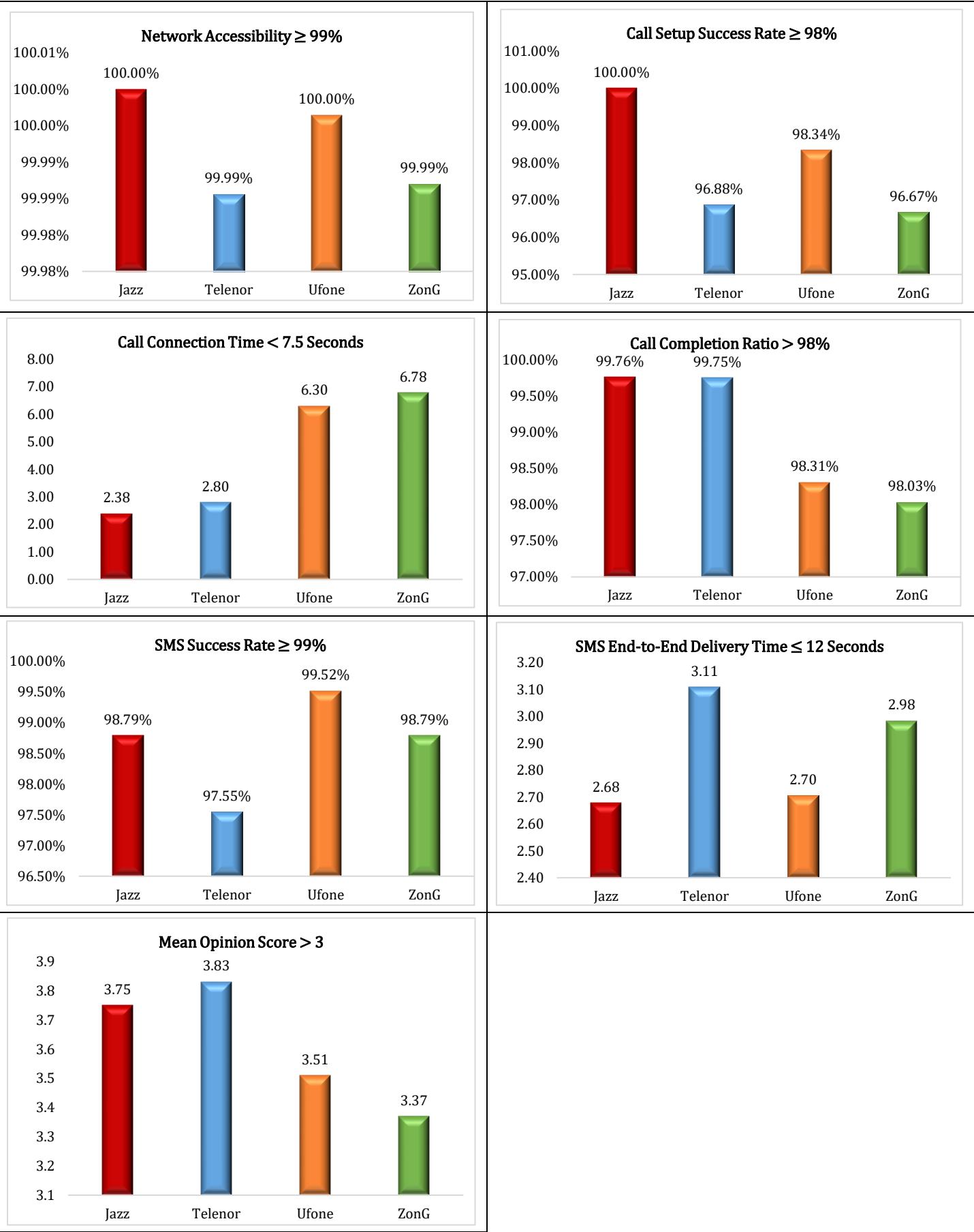
QUALITY OF SERVICE SURVEY RESULTS – NOWSHERA



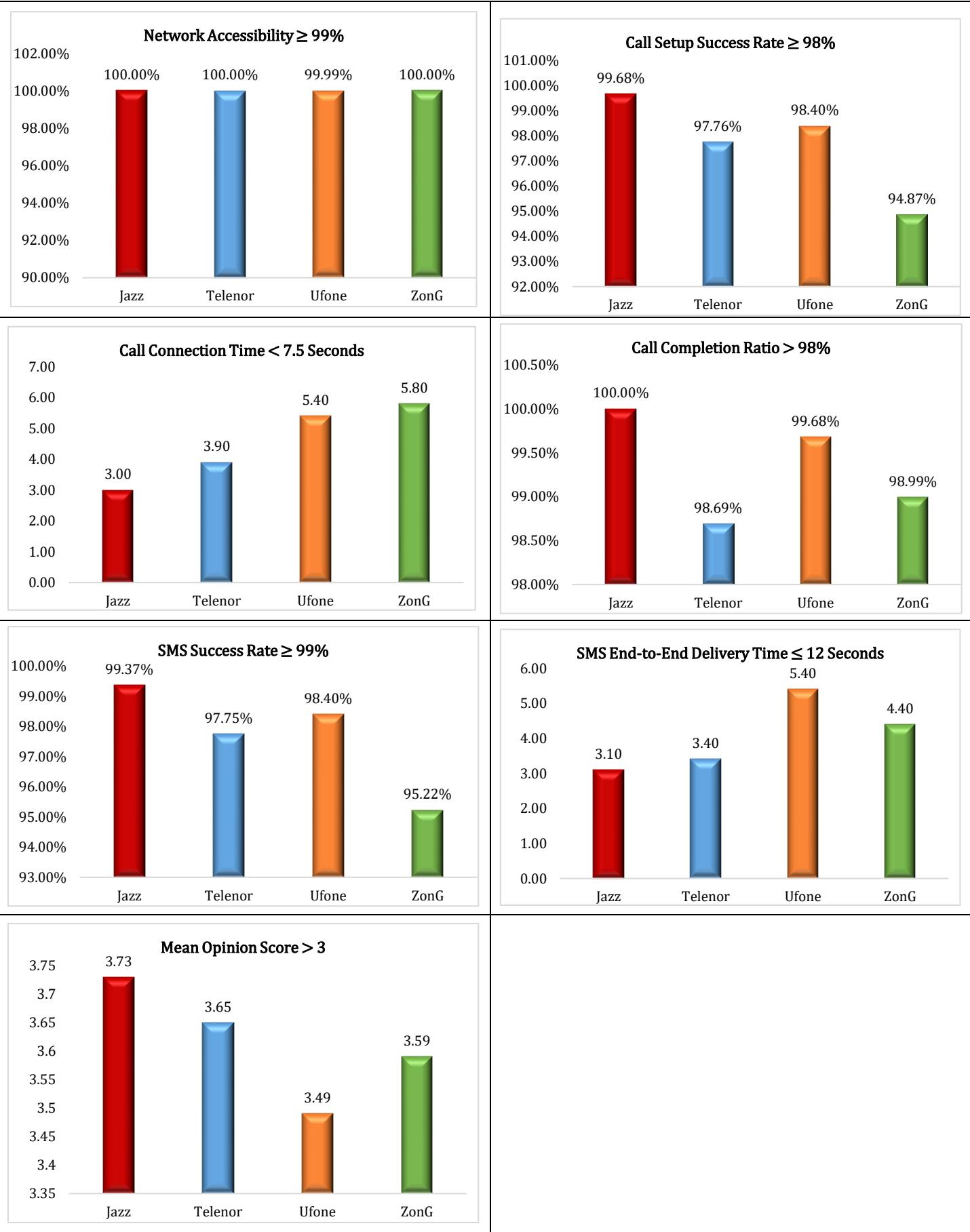
QUALITY OF SERVICE SURVEY RESULTS – OKARA



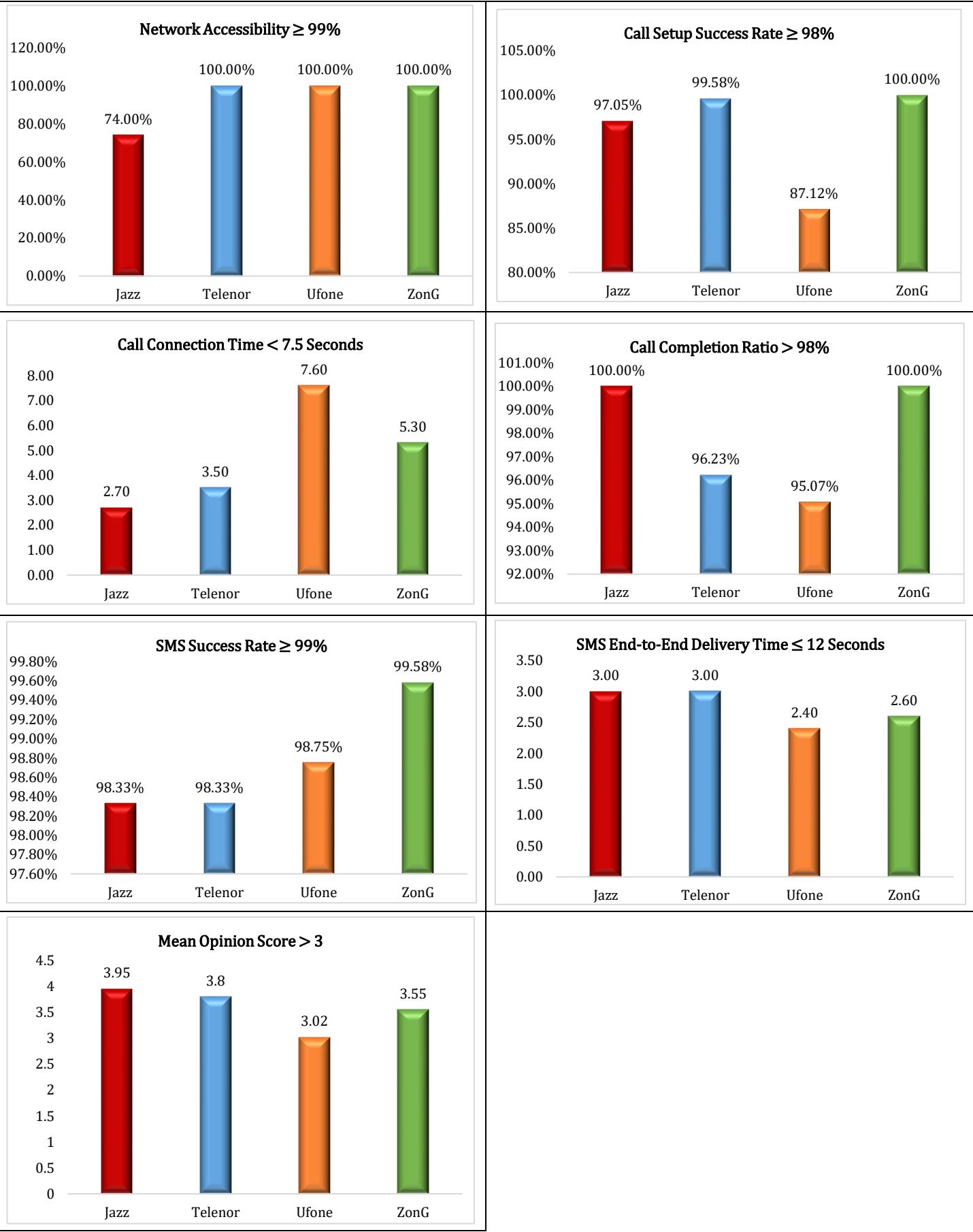
QUALITY OF SERVICE SURVEY RESULTS – PESHAWAR



QUALITY OF SERVICE SURVEY RESULTS – QUETTA



QUALITY OF SERVICE SURVEY RESULTS – SEHWAN



QUALITY OF SERVICE SURVEY RESULTS – THATTA

