

# **INDEPENDENT QUALITY OF SERVICE** **SURVEY - CITIES**

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FIRST QUARTER 2022

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 Eleven (11) x cities of Punjab, Sindh, Khyber Pakhtunkhwa (KPK) and Balochistan during 1<sup>st</sup> quarter i.e. January ~ March 2022. The name of cities along with survey dates are mentioned in **Table 1.1: QoS Survey Cities & Dates:**

S. #.	Province	City	Days	Survey Dates
1.	Punjab	Sadiqabad	2	08 ~ 09 February 2022
2.		Kharian	2	14 ~ 15 February 2022
3.		Khanpur	3	14 ~ 16 February 2022
4.		Sialkot	2	07 ~ 08 March 2022
5.		Wazirabad	2	16 ~ 17 March 2022
6.	Sindh	Kotri	3	08 ~ 10 February 2022
7.		Jaccobabad	3	15 ~ 17 February 2022
8.		Dadu	3	18,22 & 23 February 2022
9.		Tando Allah Yar	2	22 ~ 23 March 2022
10.	Khyber Pakhtunkhwa	Dera Ismail Khan	3	21 ~ 23 February 2022
11.	Balochistan	Gwadar	4	07 ~ 10 March 2022

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 mode.

## MOBILE NETWORK COVERAGE

3.1. **4G / LTE 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 awarded, 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**.

City	4G Signal Strength -100dBm with 90% Confidence Level				Compliant (Yes/No)			
	Jazz	Telenor	Ufone	ZonG	Jazz	Telenor	Ufone	ZonG
Khanpur	98.59%	95.37%	<b>66.74%</b>	99.94%	Yes	Yes	No	Yes
Sadiqabad	99.81%	96.50%	<b>73.40%</b>	99.88%	Yes	Yes	No	Yes
Kharian	96.57%	<b>88.68%</b>	<b>84.02%</b>	92.24%	Yes	No	No	Yes
Wazirabad	99.55%	<b>88.65%</b>	95.91%	96.30%	Yes	No	Yes	Yes
Kotri	98.47%	97.42%	<b>63.19%</b>	98.65%	Yes	Yes	No	Yes
Jaccobabad	96.88%	<b>88.82%</b>	94.73%	98.91%	Yes	No	Yes	Yes
Dadu	94.53%	93.22%	<b>53.98%</b>	99.90%	Yes	Yes	No	Yes
Tando Allah Yar	98.75%	95.31%	<b>80.18%</b>	99.31%	Yes	Yes	No	Yes
Sialkot	99.23%	98.21%	98.14%	98.98%	Yes	Yes	Yes	Yes
Gwadar	94.30%	<b>89.80%</b>	99.83%	96.92%	Yes	No	Yes	Yes
D.I Khan	95.87%	98.89%	98.15%	97.92%	Yes	Yes	Yes	Yes

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

3.2. **3G SIGNAL STRENGTH.** During the survey, while conducting data test in auto mode, wherever network switched to 3G, the signal strength samples were recorded on survey routes. As per Next Generation Mobile Service (NGMS) licenses awarded, licensees are required to meet the threshold of -100dBm or above of Received 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**.

City	Confidence Level				Compliant (Yes/No)			
	Jazz	Telenor	Ufone	ZonG	Jazz	Telenor	Ufone	ZonG
Khanpur	100.00%	100.00%	100.00%	100.00%	Yes	Yes	Yes	Yes
Sadiqabad	100.00%	99.75%	99.93%	100.00%	Yes	Yes	Yes	Yes
Kharian	100.00%	100.00%	99.88%	100.00%	Yes	Yes	Yes	Yes
Wazirabad	100.00%	99.91%	99.95%	100.00%	Yes	Yes	Yes	Yes
Kotri	100.00%	100.00%	100.00%	100.00%	Yes	Yes	Yes	Yes
Jacobabad	99.90%	96.84%	100.00%	100.00%	Yes	Yes	Yes	Yes
Dadu	99.93%	100.00%	96.25%	100.00%	Yes	Yes	Yes	Yes
Tando Allah Yar	100.00%	99.99%	100.00%	100.00%	Yes	Yes	Yes	Yes
Sialkot	100.00%	100.00%	100.00%	100.00%	Yes	Yes	Yes	Yes
Gwadar	100.00%	97.80%	99.99%	98.83%	Yes	Yes	Yes	Yes
D.I Khan	99.88%	100.00%	100.00%	100.00%	Yes	Yes	Yes	Yes

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

#### MOBILE BROADBAND SERVICE

4.1. A total of **26,498** download test attempts made, out of which **19,541** were successful in 11 x surveyed cities. The company wise average User Data Throughput, 4G/LTE, 3G and 2G signal strength detail is mentioned in **Table4.1: Data Tests Statistics**.

Description	Jazz	Telenor	Ufone	ZonG
<i><b>TOTAL DATA TEST ATTEMPTS</b></i>	5388	11339	5358	4413
<i><b>SUCCESSFUL DATA TEST ATTEMPTS</b></i>	5162	5091	5002	4286
<i><b>TEST ATTEMPTS SUCCESS RATIO (%)</b></i>	95.81	44.9	93.36	97.12
<i><b>USER DATA THROUGHPUT (Mbps)</b></i>	6.55	3.044	7.337	7.403
<i><b>AVERAGE 4G SIGNAL STRENGTH (RSRP) dBm</b></i>	-81.2	-84.1	-83.6	-79.5
<i><b>AVERAGE 4G SIGNAL STRENGTH (RSCP) dBm</b></i>	-68.26	-71.71	-68.81	-67.33
<i><b>AVERAGE 4G SIGNAL STRENGTH (RXLEV) dBm</b></i>	-70.24	-76.69	-75.71	-65.46

**Table4.1: Data Tests Statistics**

4.2. **4G USER DATA THROUGHPUT.** As per Next Generation Mobile Service (NGMS) licenses awarded, licensees are required to meet the threshold of minimum of 2Mbps of 4G User Data Throughput. The results of Data Service QoS KPI i.e. User Data Throughput is shown in **Table4.2.1: 4G User Data Throughput in Pakistan ≥ 2 Mbps & Table4.2.2: 4G User Data Throughput in AJK ≥ 2 Mbps**.

City	4G User Data Throughput (Mbps)				Operator Position			
	Jazz	Telenor	Ufone	ZonG	Jazz	Telenor	Ufone	ZonG
Khanpur	12.58	3.43	15.03	12.34	Second	Fourth	First	Third
Sadiqabad	11.67	6.55	25.18	16.50	Third	Fourth	First	Second
Kharian	10.70	3.13	<b>1.35</b>	14.26	Second	Third	<b>Fourth</b>	First
Wazirabad	7.72	3.97	12.30	15.19	Third	Fourth	Second	First
Kotri	20.14	6.27	9.38	16.75	First	Fourth	Third	Second

City	4G User Data Throughput (Mbps)				Operator Position			
	Jazz	Telenor	Ufone	ZonG	Jazz	Telenor	Ufone	ZonG
Jacobabad	16.50	3.24	3.10	14.97	First	Third	Fourth	Second
Dadu	8.57	2.37	19.73	12.75	Third	Fourth	First	Second
Tando Allah Yar	13.84	4.21	9.92	10.78	First	Fourth	Third	Second
Sialkot	9.16	3.84	18.31	15.23	Third	Fourth	First	Second
Gwadar	3.86	2.35	2.09	7.32	Second	Third	Fourth	First
D.I Khan	12.27	2.04	7.90	16.80	Second	Fourth	Third	First

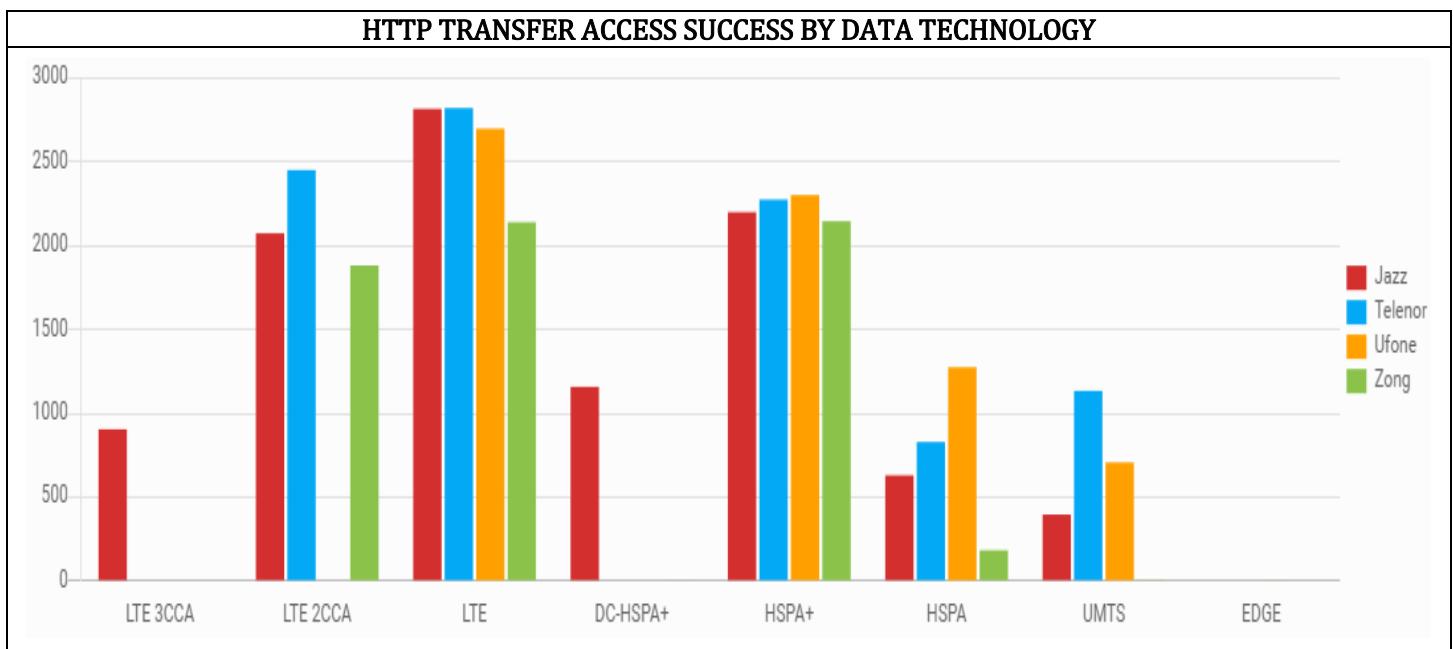
Table4.2.1: 4G User Data Throughput in Pakistan  $\geq$  2 Mbps

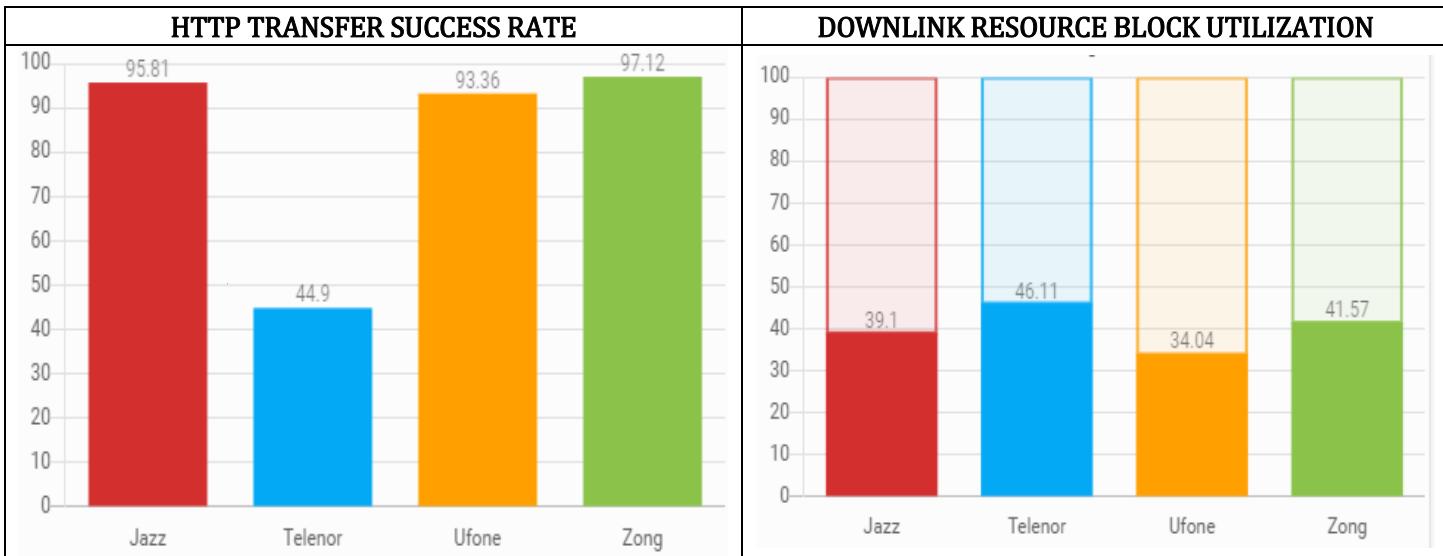
4.3. **3G USER DATA THROUGHPUT.** As per Next Generation Mobile Service (NGMS) licenses awarded, licensees are required to meet the threshold of minimum of 256Kbps of 3G User Data Throughput. The results of Data Service QoS KPI i.e. User Data Throughput is shown in **Table 4.3: 3G User Data Throughput in Pakistan  $\geq$  256Kbps**.

City	3G User Data Throughput (Kbps)				Operator Position			
	Jazz	Telenor	Ufone	ZonG	Jazz	Telenor	Ufone	ZonG
Khanpur	3069.50	3810.87	3566.99	1944.04	Third	Second	First	Fourth
Sadiqabad	3213.56	4789.25	3656.23	2046.48	Third	First	Second	Fourth
Kharian	1677.81	1836.83	3685.05	2031.25	Fourth	Third	First	Second
Wazirabad	1249.90	2083.82	5159.92	2332.42	Fourth	Third	First	Second
Kotri	1298.83	2923.11	5706.80	1376.28	Fourth	Second	First	Third
Jacobabad	4119.01	2539.55	2225.21	1057.98	First	Second	Third	Fourth
Dadu	3074.27	2285.97	3856.25	1196.27	Second	Third	First	Fourth
Tando Allah Yar	1054.34	2686.46	2817.79	961.31	Third	Second	First	Fourth
Sialkot	2098.40	2677.96	3386.38	1879.95	Third	Second	First	Fourth
Gwadar	2527.18	3871.15	2756.26	763.26	Third	First	Second	Fourth
D.I Khan	2054.03	939.90	2638.49	2127.99	Third	Fourth	First	Second

Table4.3: 3G User Data Throughput  $\geq$  256Kbps

4.4. During the survey, the deployed technologies by Cellular Mobile Operators (CMOs), Success Rate of http Transfer Download Tests and Resource Block Utilization have been recorded. The details can be seen in attached graphs.





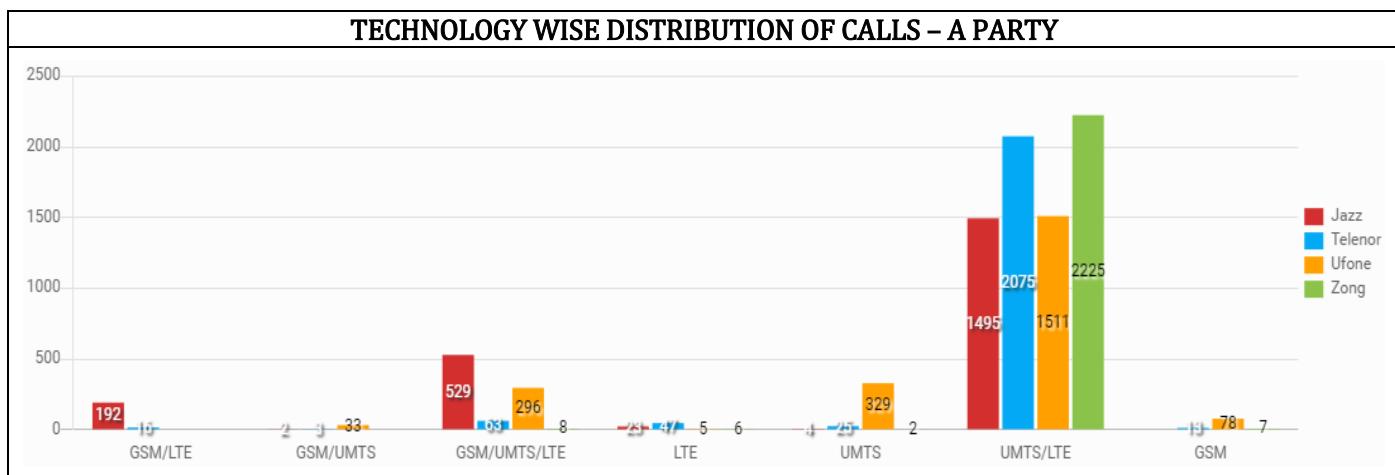
### VOICE SERVICE

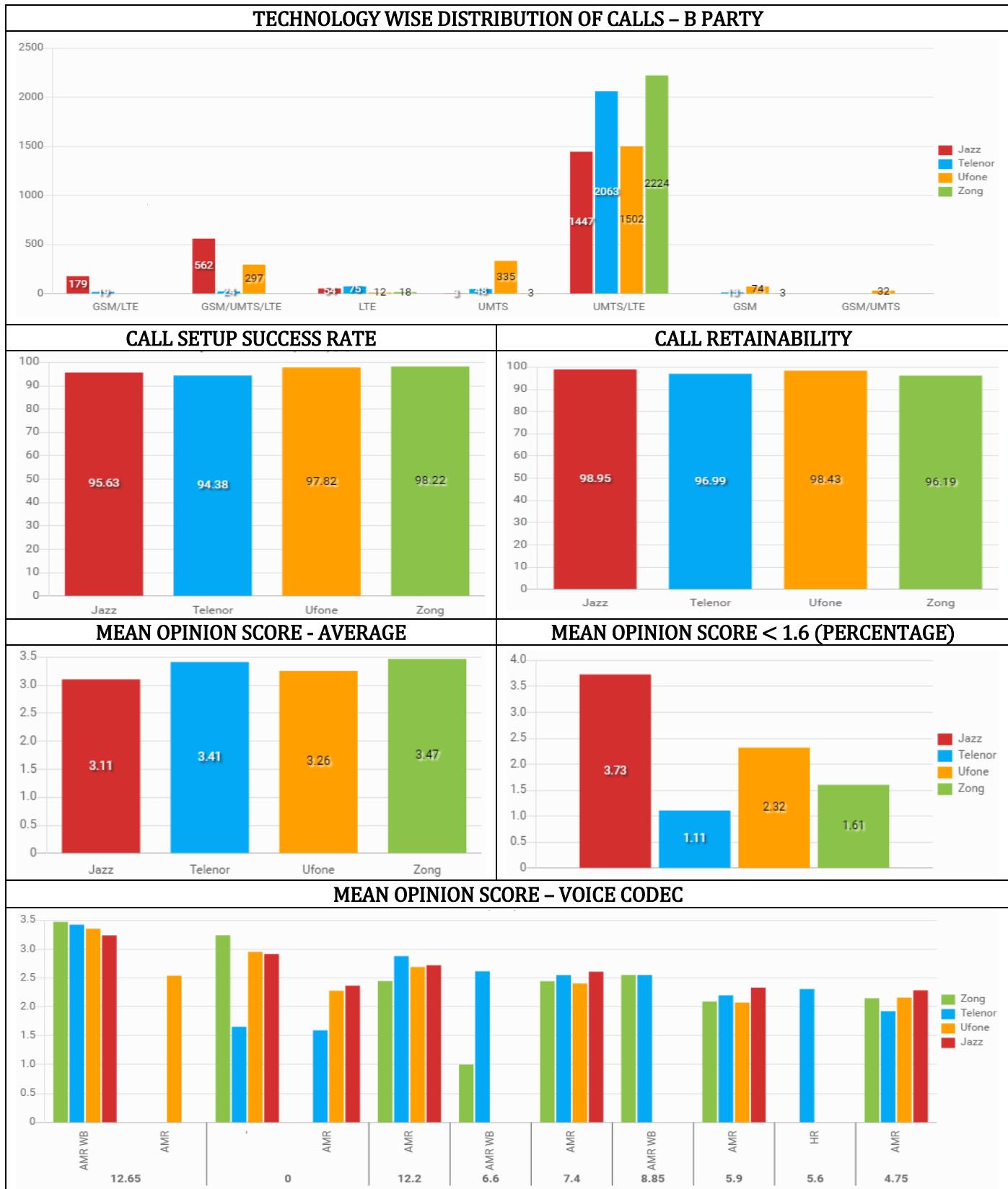
5.1. A total of **8,987** Call attempts made and out of which **313** were failed attempts. In **8,674** successful call attempts, **72** calls dropped prior to completion of two minutes duration, whereas, **8,602** calls remained connected for the complete duration of two minutes. The company wise call statistics is shown in **Table5.1: Call Statistics**.

DESCRIPTION	JAZZ	TELENOR	UFONE	ZONG
<i>TOTAL CALLS ATTEMPTS</i>	2245	2242	2252	2248
<i>FAILED CALLS ATTEMPTS</i>	98	126	49	40
<i>ESTABLISHED CALLS ATTEMPTS</i>	2147	2116	2203	2208
<i>DROPPED CALLS ATTEMPTS</i>	18	27	13	14
<i>COMPLETED CALLS ATTEMPTS</i>	2129	2089	2190	2194
<i>CALL SETUP SUCCESS RATE</i>	95.63 %	94.38 %	97.82 %	98.22 %
<i>CALL SETUP TIME</i>	7.95 s	8.48 s	6.87 s	7.91 s
<i>CALL COMPLETION RATE</i>	98.95 %	96.99 %	98.43 %	96.19 %
<i>ISHO SUCCESS RATE</i>	99.62 %	95 %	99.35 %	-
<i>RAB SETUP SUCCESS RATE</i>	100 %	100 %	100 %	99.97 %
<i>MEAN OPINION SCORE</i>	3.11 MOS	3.41 MOS	3.26 MOS	3.47 MOS
<i>MEAN OPINION SCORE EXCESS RATIO - MOS &lt; 1.6</i>	3.73 %	1.11 %	2.32 %	1.61 %
<i>TOTAL SPEECH TEST</i>	21293	21067	21989	21951

Table5.1: Call Statistics

5.2. The overall Call Setup Success Rate and Call Retainability alongwith 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 **11 x surveyed cities** of Pakistan. The compliance level of threshold values of voice QoS KPIs is shown in each **Table 5.2.1 & 5.2.2: Voice QoS KPIs Compliance Level**.

VOICE CALLS CITIES- COMPLIANCE (YES/NO)													
Operator	* QoS KPIs	Khanpur	Sadiqabad	Kharian	Wazirabad	Kotri	Jaccobabad	Dadu	Tando Allah Yar	Sialkot	Gwadar	D.I Khan	
Jazz	NA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	SA	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No
	CCT	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes
	CCR	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No	Yes
	MOS	Yes	Yes	Yes	Yes	No	No	Yes	No	Yes	Yes	Yes	Yes
	ISHO	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	RSSR	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Telenor	NA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	SA	Yes	Yes	Yes	No	No	No	No	No	Yes	No	No	No
	CCT	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	CCR	Yes	Yes	Yes	Yes	No	No	Yes	No	Yes	Yes	Yes	No
	MOS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	ISHO	N/A	N/A	N/A	N/A	Yes	Yes	No	Yes	N/A	N/A	N/A	N/A
	RSSR	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ufone	NA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	SA	No	Yes	Yes	No	Yes	Yes	No	Yes	No	Yes	No	Yes
	CCT	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	CCR	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
	MOS	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
	ISHO	Yes	Yes	Yes	Yes	N/A	Yes	N/A	Yes	Yes	Yes	Yes	Yes
	RSSR	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ZonG	NA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	SA	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
	CCT	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	CCR	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	MOS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	ISHO	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	RSSR	Yes	Yes	Yes	Yes	Yes	Yes	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 5.2: Voice QoS KPIs Compliance Level

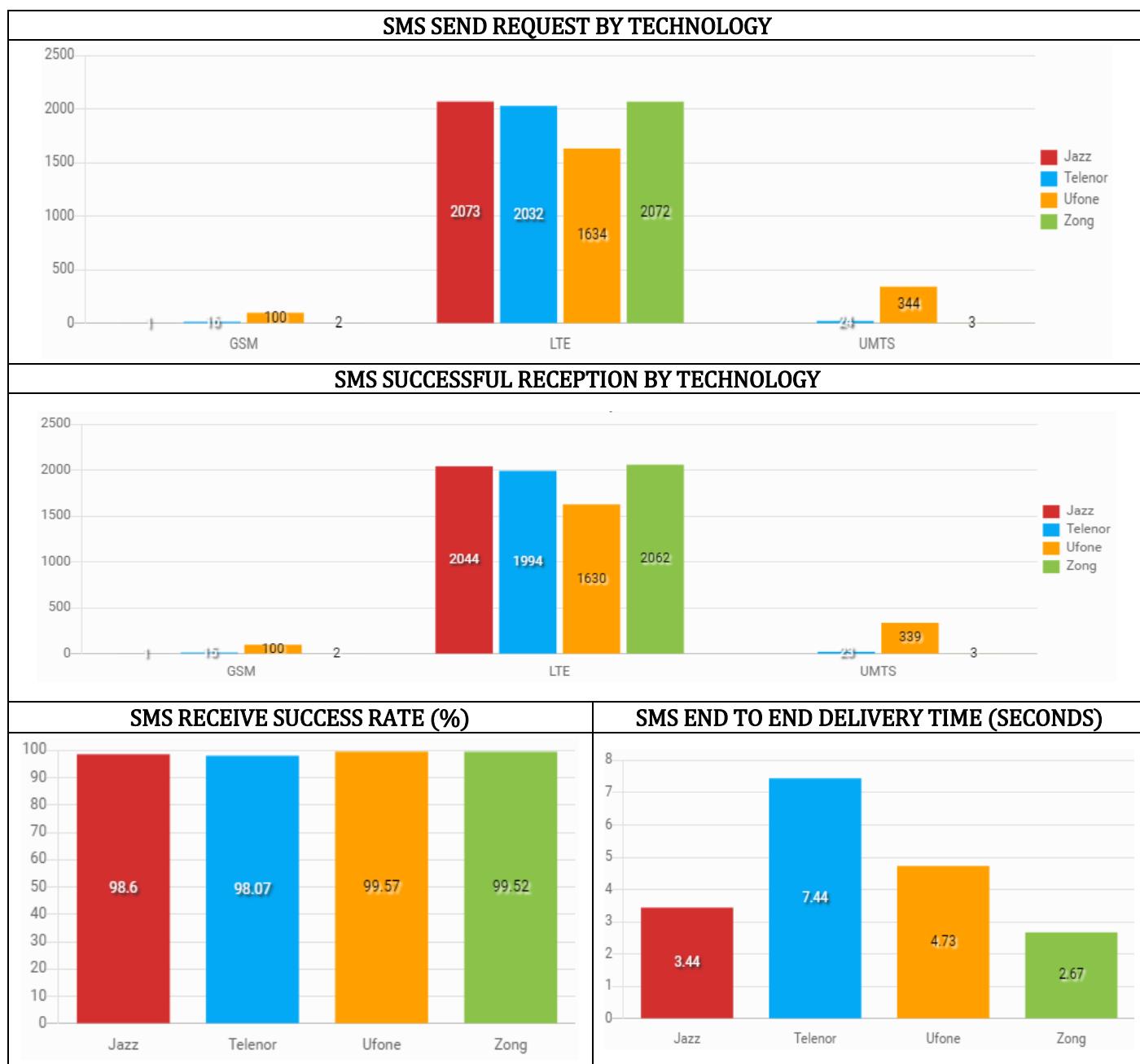
## SMS SERVICE

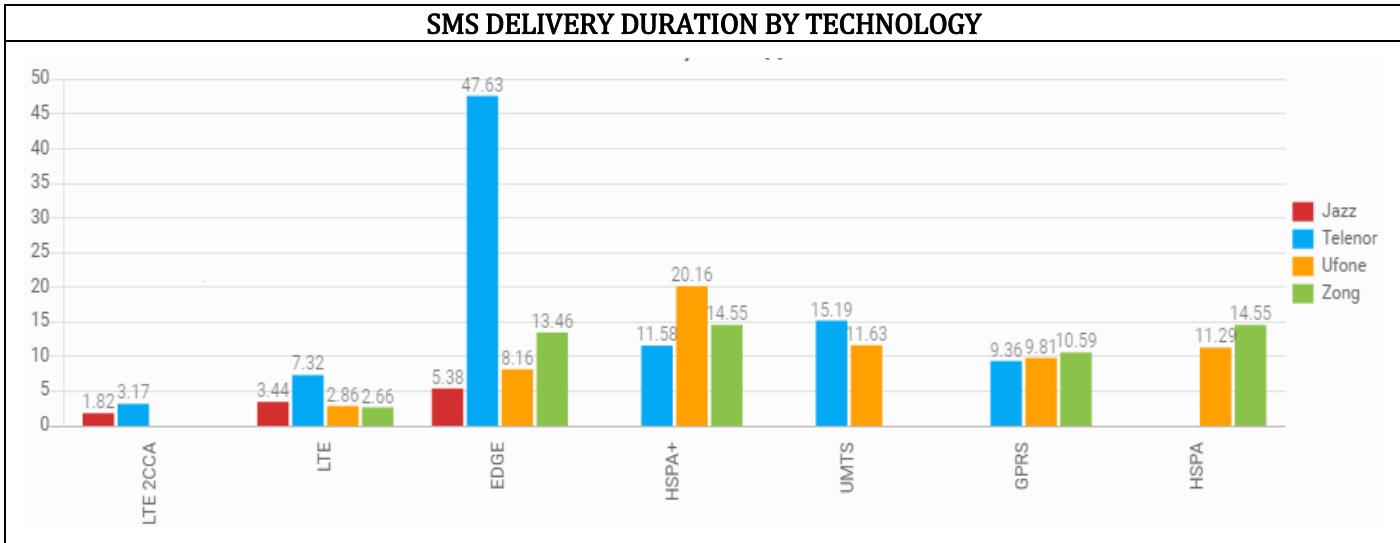
6.1. A total of 15,325 SMS sending attempts conducted, out of which 15,128 SMS successfully received at B-Party. The company wise SMS Statistics are shown in **Table6.1: SMS Statistics**

DESCRIPTION	JAZZ	TELENOR	UFONE	ZONG
SMS SEND REQUEST	2074	2072	2078	2077
SMS SUCCESSFULLY TRANSMITTED	2072	2046	2075	2067
SMS SUCCESSFULLY RECEIVED	2045	2032	2069	2067
SMS RECEIVE SUCCESS RATE	98.6 %	98.07 %	99.57 %	99.52 %
END-TO-END DELIVERY TIME	3.44 s	7.44 s	4.73 s	2.67 s

Table6.1: SMS Statistics

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 and plotted on maps. The Signal Strength maps along-with Voice & SMS QoS KPIs survey results in graphical form are shown at **Annex-A, Annex-B, Annex-C & Annex-D** for Cities of Punjab, Sindh, Khyber Pakhtunkhwa and Balochistan respectively.

### STANDING IN SURVEY

8.1. CMOs have been prioritized/ placed at 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> & 4<sup>th</sup> 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 11 x surveyed cities.

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

S. #.	Operator	Compliance Level – Number of Cities				Standing	
		Compliant		Non-Compliant			
		4G	3G	4G	3G		
1.	Jazz	11	11	-	-	1 <sup>st</sup>	
2.	ZonG	11	11	-	-	1 <sup>st</sup>	
3.	Telenor	7	11	4	11	2 <sup>nd</sup>	
4.	Ufone	5	11	6	11	3 <sup>rd</sup>	

**Table 8.1: CMOs Standing in Mobile Network Coverage**

- b. **MOBILE BROADBAND SERVICE.** The categorization of each CMOs, as per the highest to lowest obtained User Data Throughput in 4G/LTE and 3G Networks is shown in **Table 8.2: CMOs Standing in Mobile Broadband Service**.

S. #.	Operator	Highest Throughput – Number of Cities								Standing	
		4G				3G				4G	3G
		1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>		
1.	ZonG	4	6	1	-	-	3	1	7	1 <sup>st</sup>	4 <sup>th</sup>

2.	Ufone	4	1	3	3	8	2	1	-	2 <sup>nd</sup>	1 <sup>st</sup>
3.	Jazz	3	4	4	-	1	1	6	3	3 <sup>rd</sup>	3 <sup>rd</sup>
4.	Telenor	-	-	3	8	2	5	3	1	4 <sup>th</sup>	2 <sup>nd</sup>

Table 8.2: CMOs Standing in Mobile Broadband Service

- c. **VOICE SERVICE.** The categorization of each CMOs, as per the maximum compliant of Voice QoS KPIs is shown in **Table 8.3: CMOs Standing in Voice Service.**

S. #.	Operator	Voice QoS KPIs		Standing
		Compliant	Non-Compliant	
1.	ZonG	64	2	1 <sup>st</sup>
2.	Ufone	68	7	2 <sup>nd</sup>
3.	Telenor	58	12	3 <sup>rd</sup>
4.	Jazz	63	14	4 <sup>th</sup>

Table 8.3: CMOs Standing in Voice Service

- d. **OVERALL STANDING.** The overall standing of each CMOs in different category of services is mentioned in **Table 8.4: CMOs Overall Standing in QoS Survey.**

S. #.	Service	STANDING			
		1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>
1.	Mobile Network Coverage	Jazz & ZonG	Telenor	Ufone	-
2.	Mobile Broadband	3G	Ufone	Telenor	Jazz
		4G	ZonG	Ufone	Jazz
3.	Voice	ZonG	Ufone	Telenor	Jazz

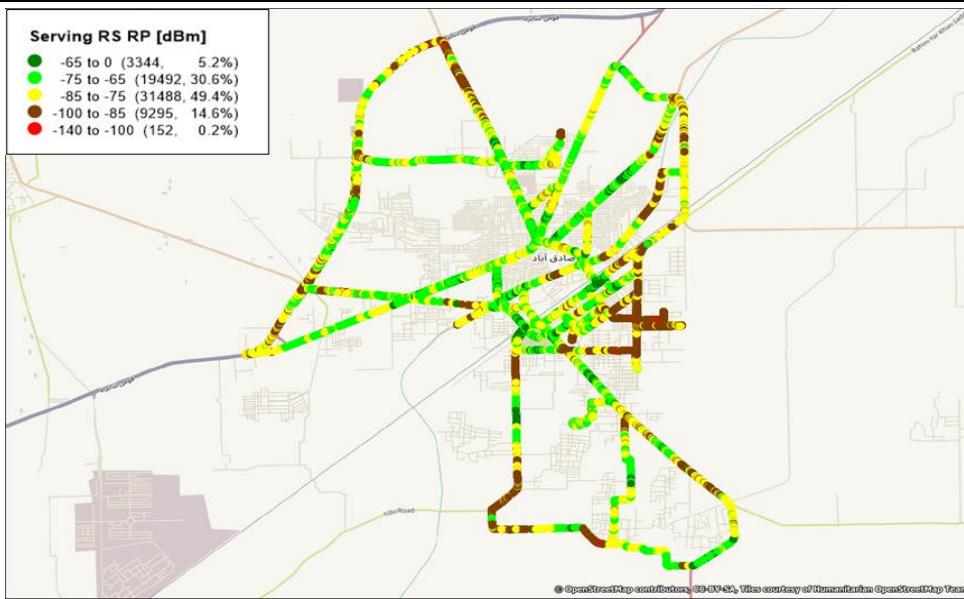
Table 8.4: CMOs Overall Standing in QoS Survey

**ANNEX - A**

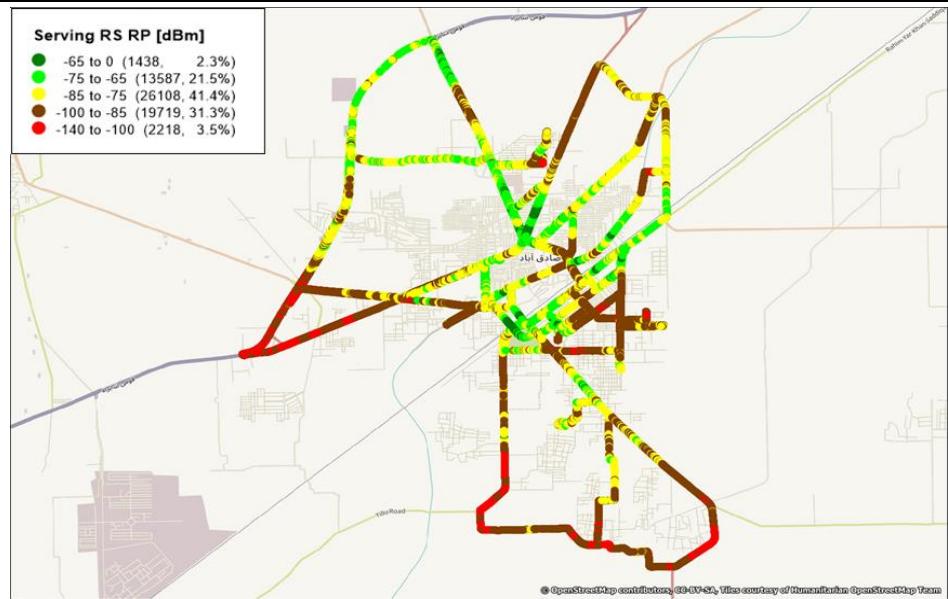
**PUNJAB**

## 4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

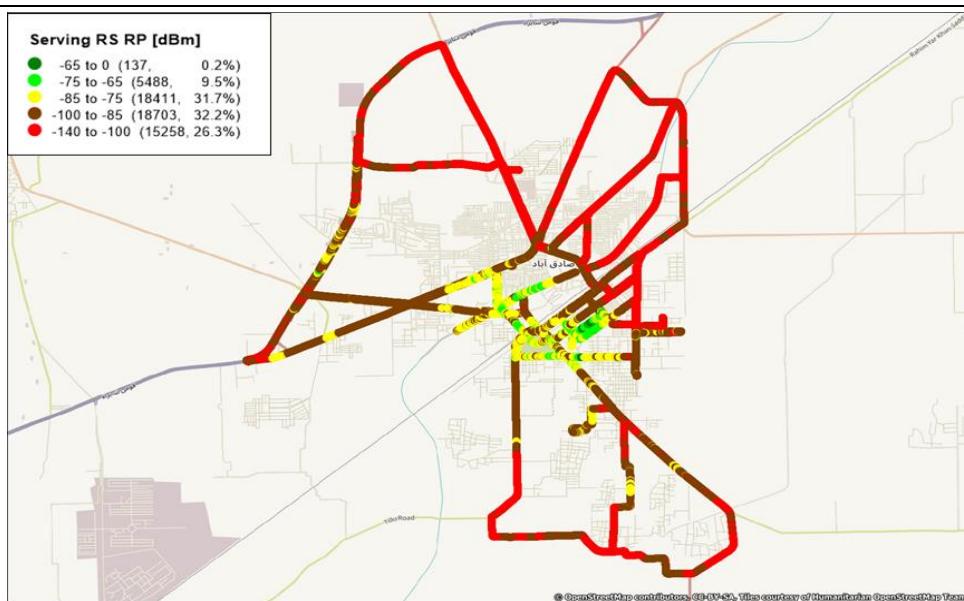
JAZZ 4G NETWORK COVERAGE – SADIQABAD



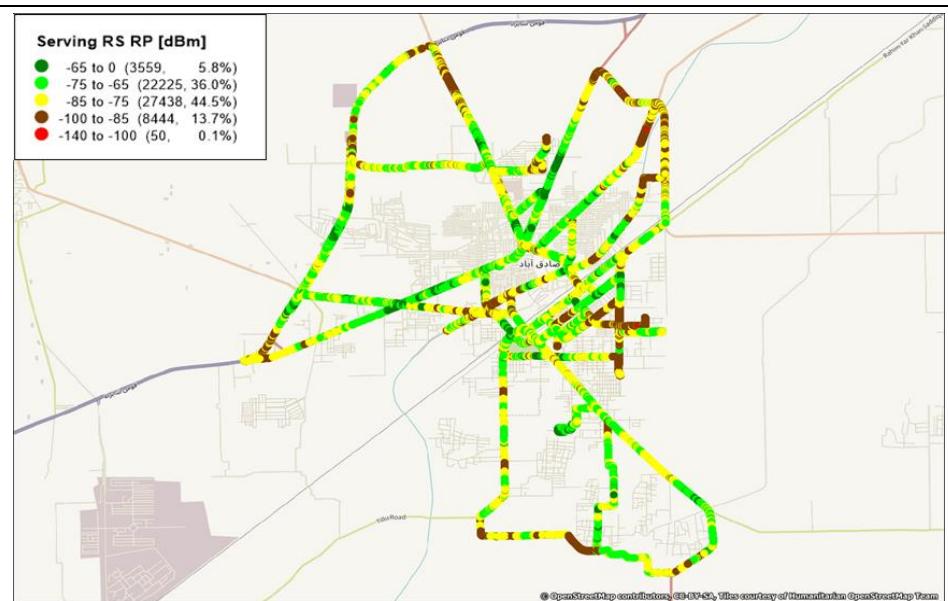
TELENOR 4G NETWORK COVERAGE – SADIQABAD



UFONE 4G NETWORK COVERAGE – SADIQABAD

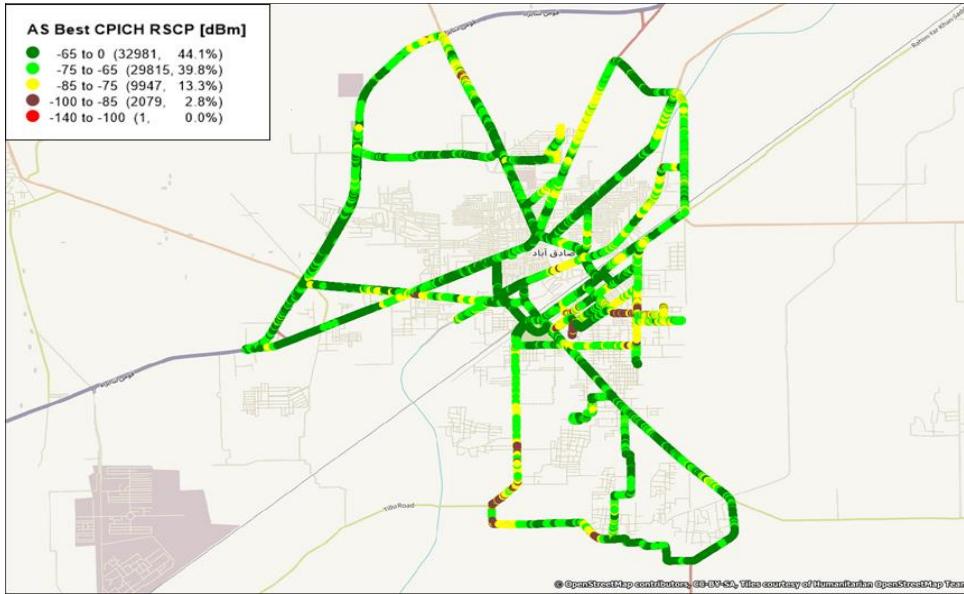


ZONG 4G NETWORK COVERAGE – SADIQABAD

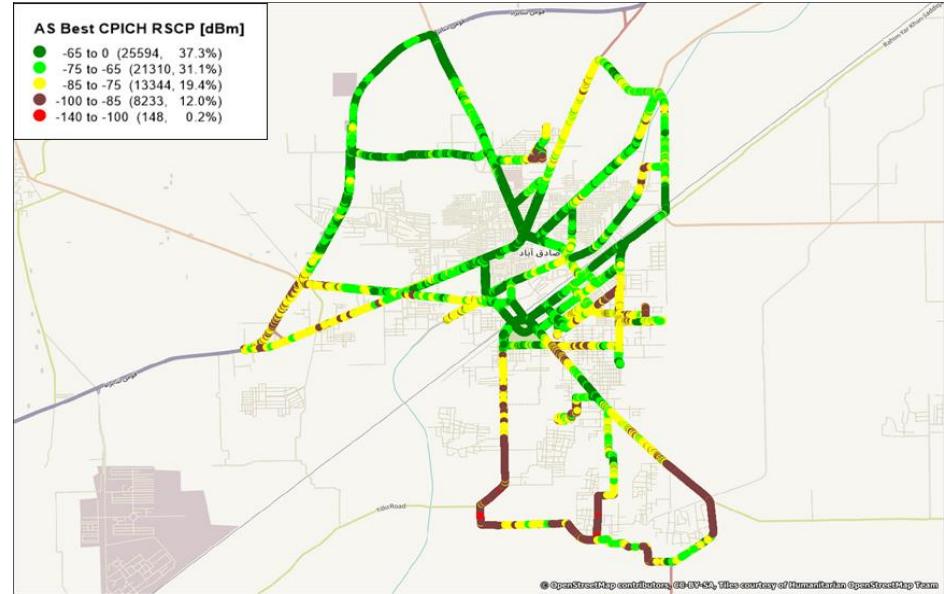


## 3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

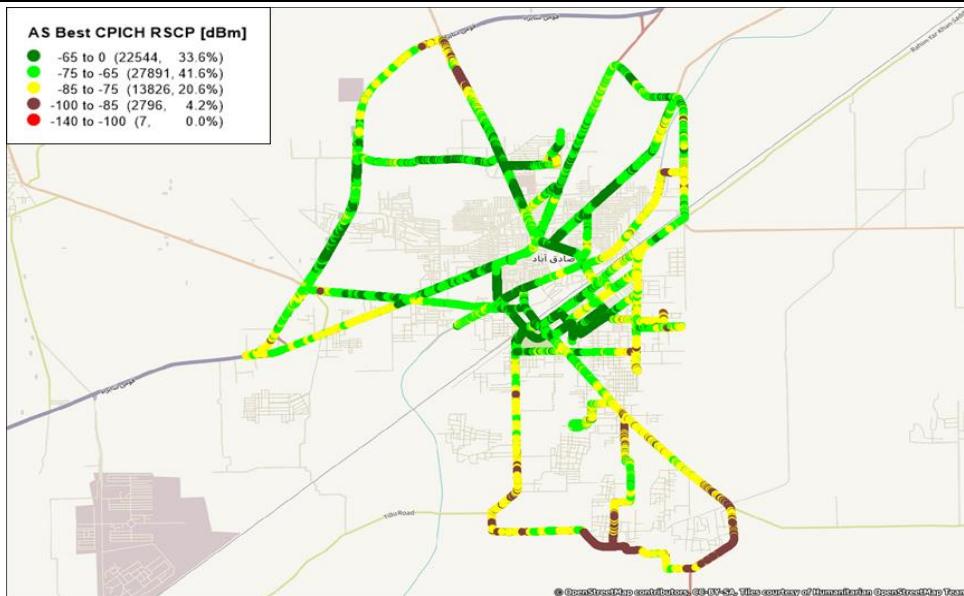
JAZZ 3G NETWORK COVERAGE – SADIQABAD



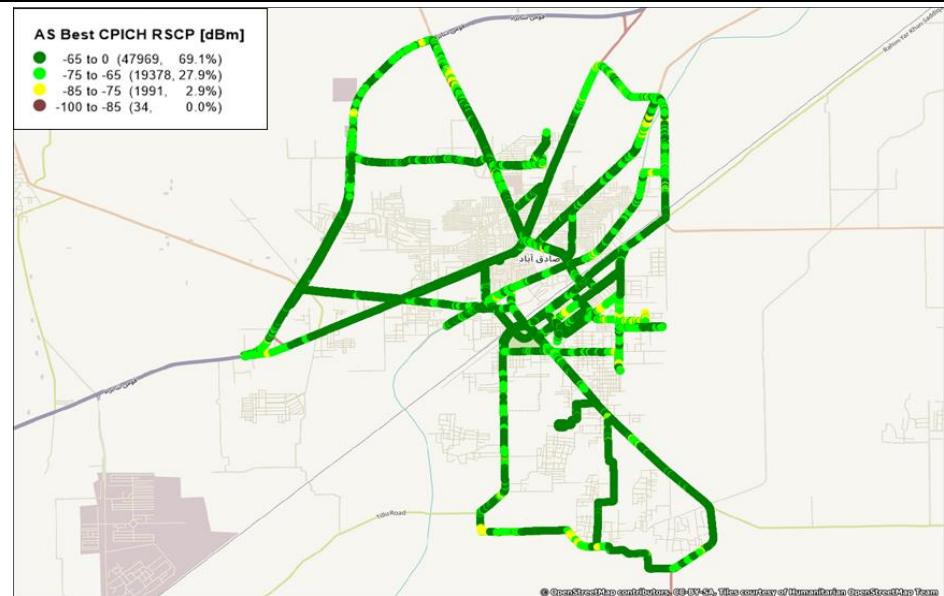
TELENOR 3G NETWORK COVERAGE – SADIQABAD



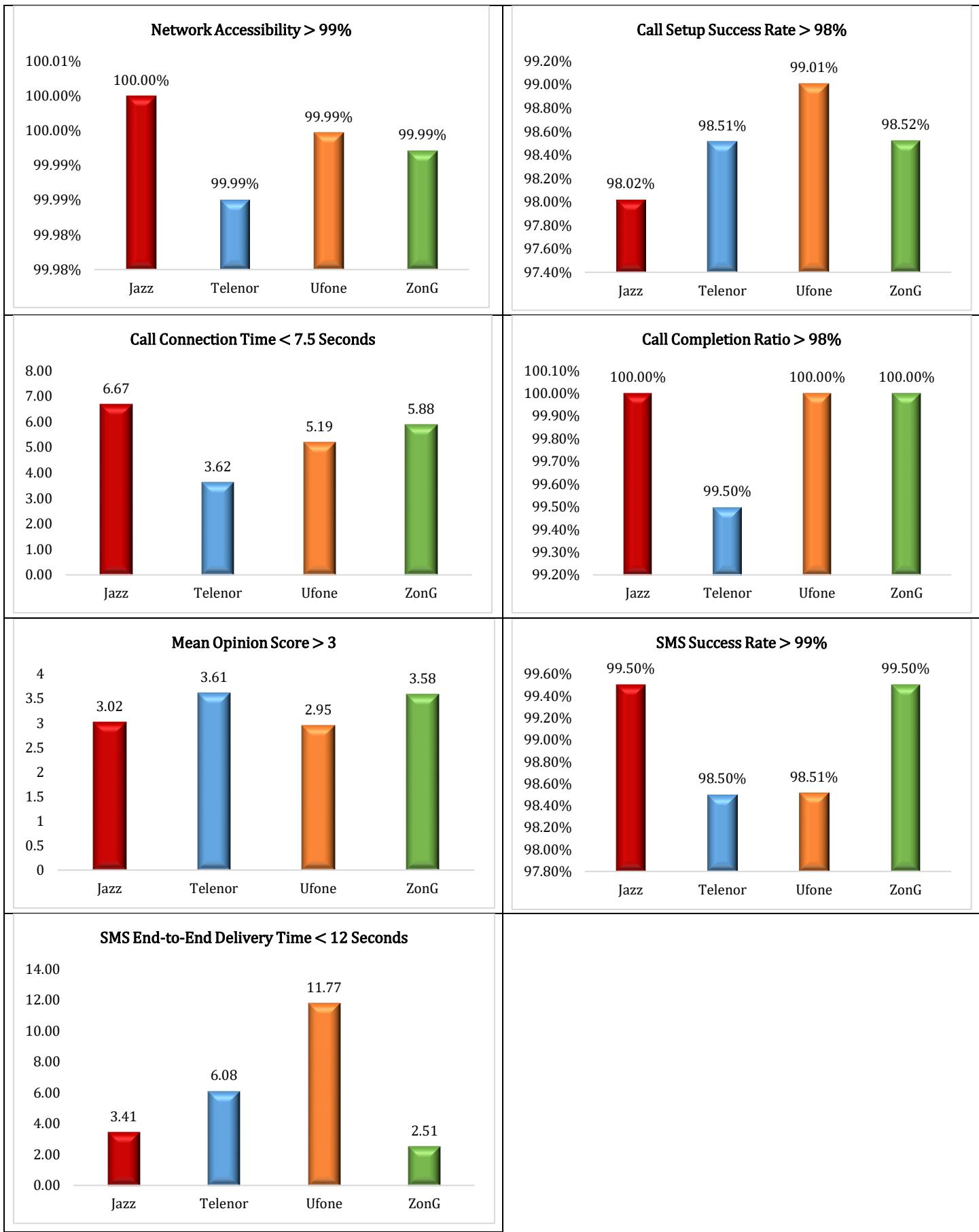
UFONE 3G NETWORK COVERAGE – SADIQABAD



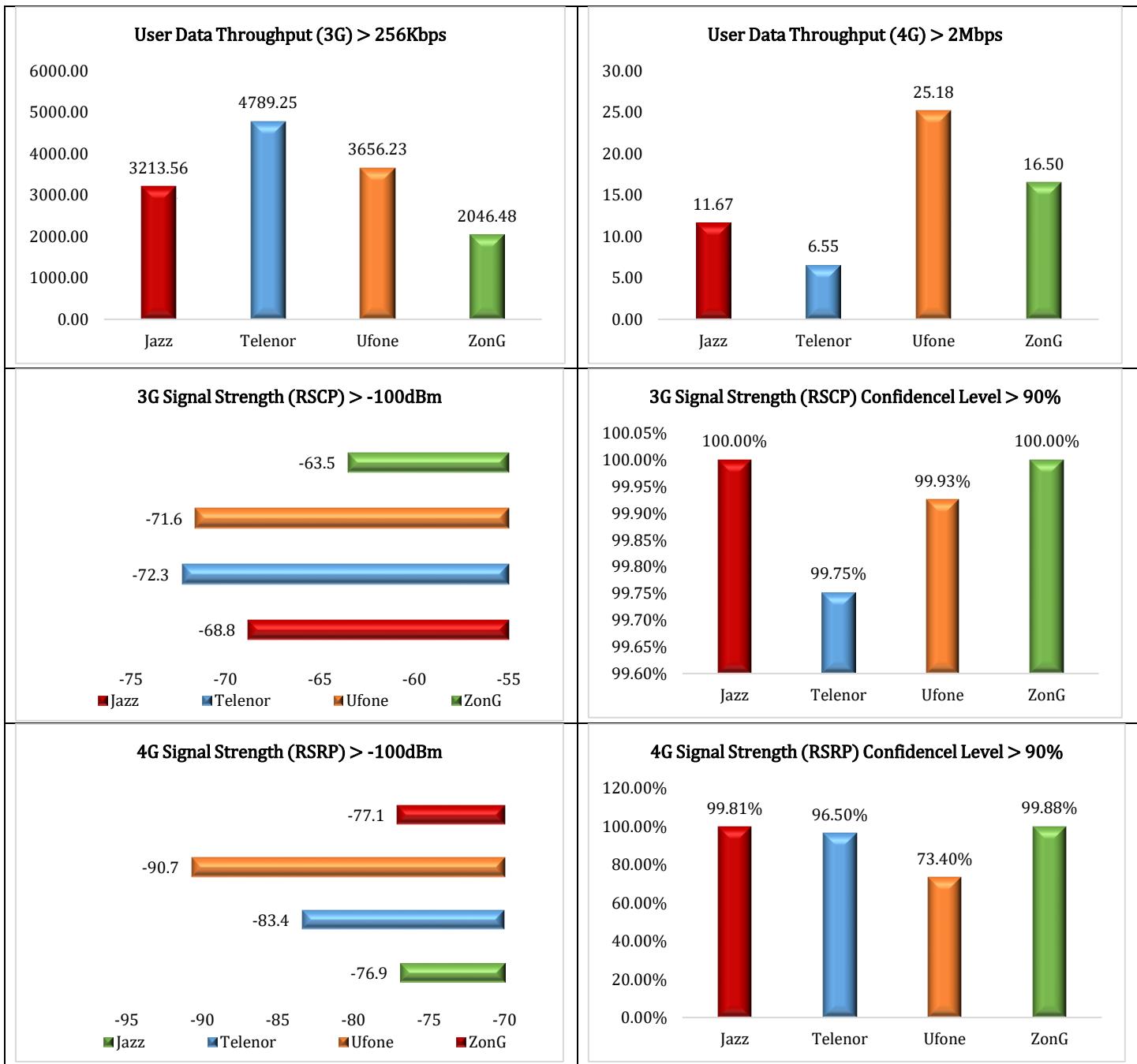
ZONG 3G NETWORK COVERAGE – SADIQABAD



## QUALITY OF SERVICE SURVEY RESULTS – SADIQABAD

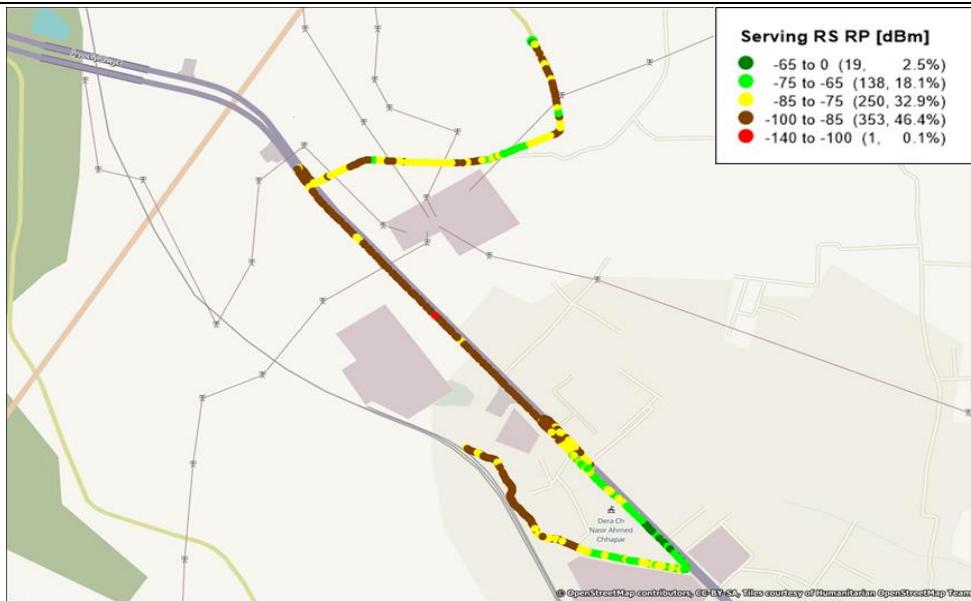


## QUALITY OF SERVICE SURVEY RESULTS – SADIQABAD

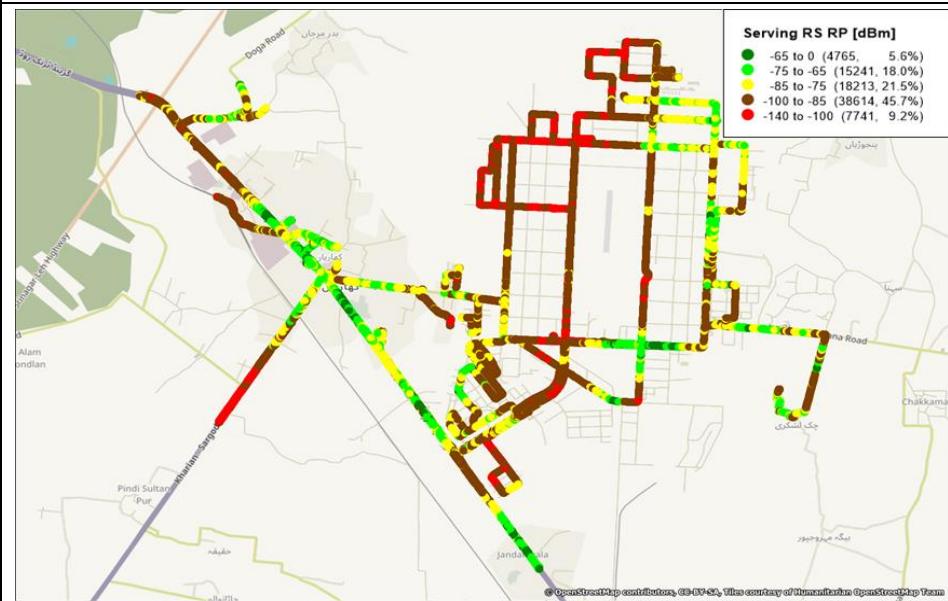


## 4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

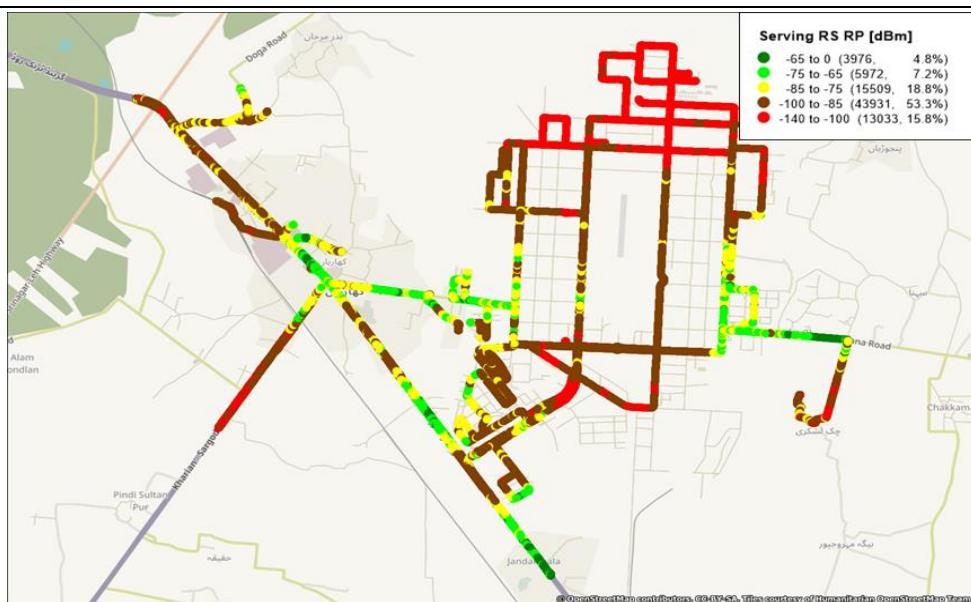
JAZZ 4G NETWORK COVERAGE – KHARIAN



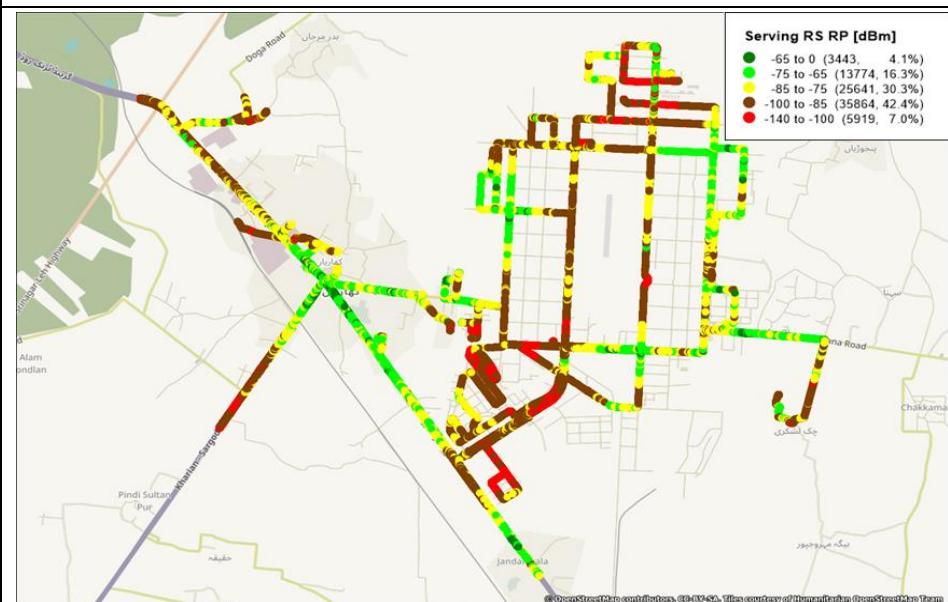
TELENOR 4G NETWORK COVERAGE – KHARIAN



UFONE 4G NETWORK COVERAGE – KHARIAN

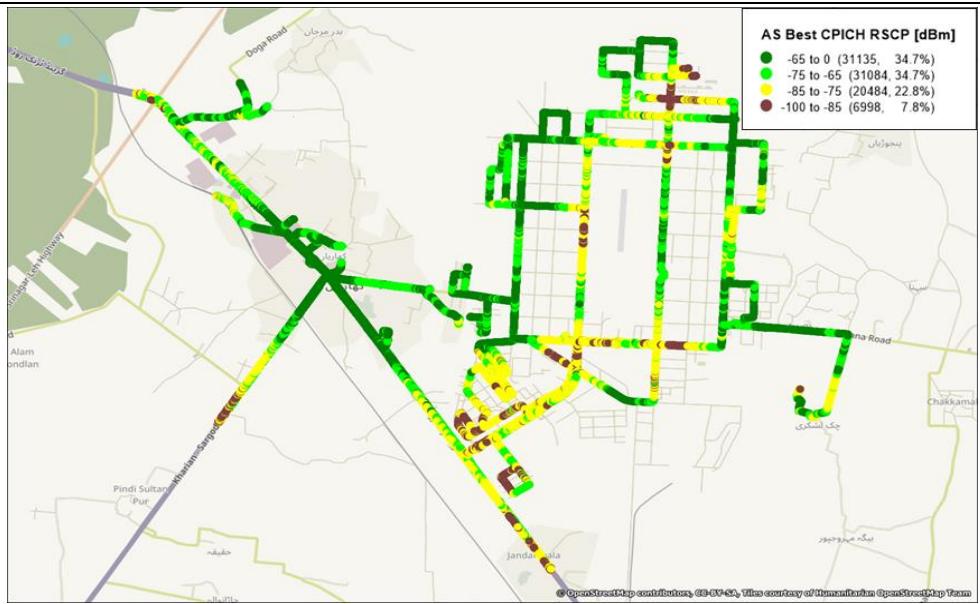


ZONG 4G NETWORK COVERAGE – KHARIAN

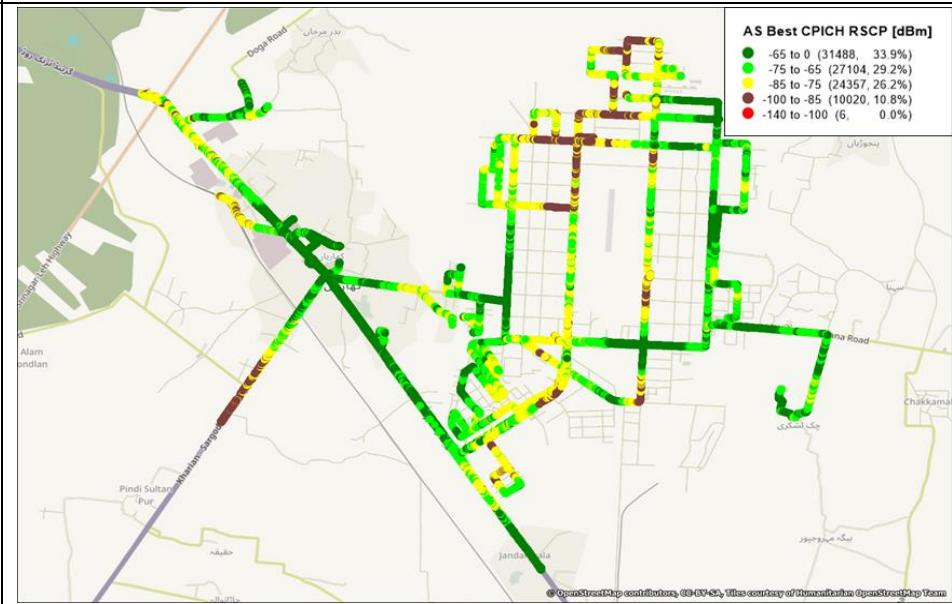


## 3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

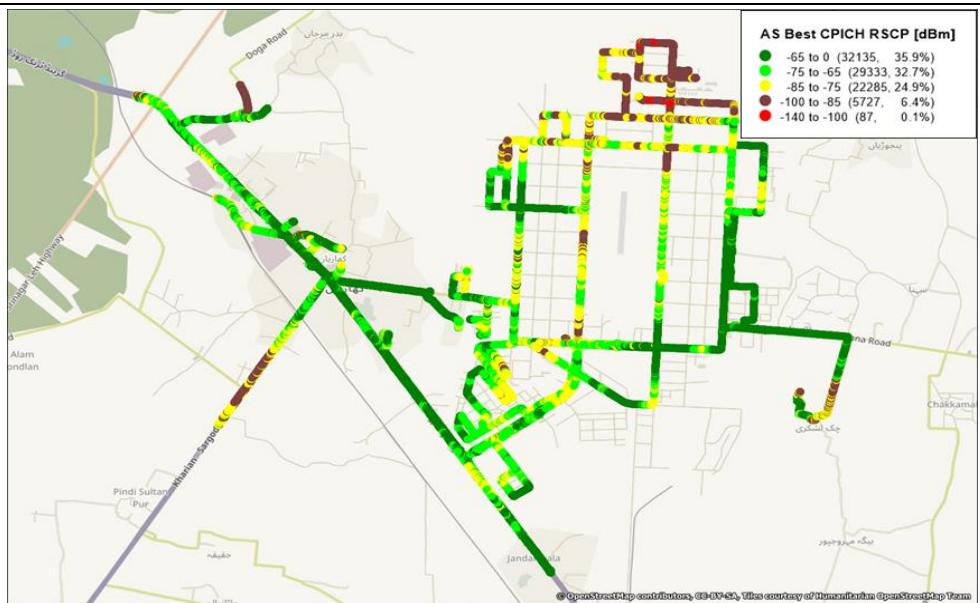
JAZZ 3G NETWORK COVERAGE – KHARIAN



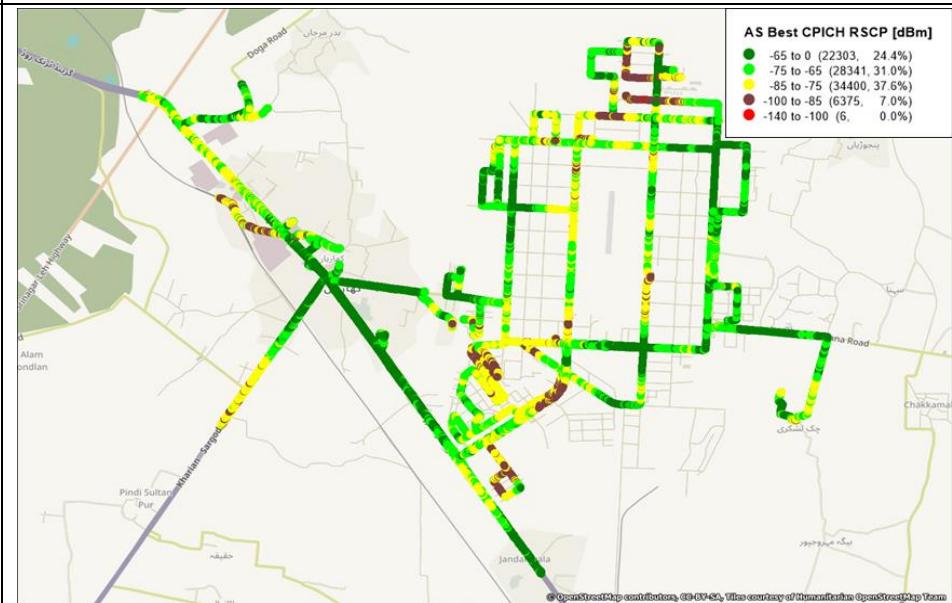
TELENOR 3G NETWORK COVERAGE – KHARIAN



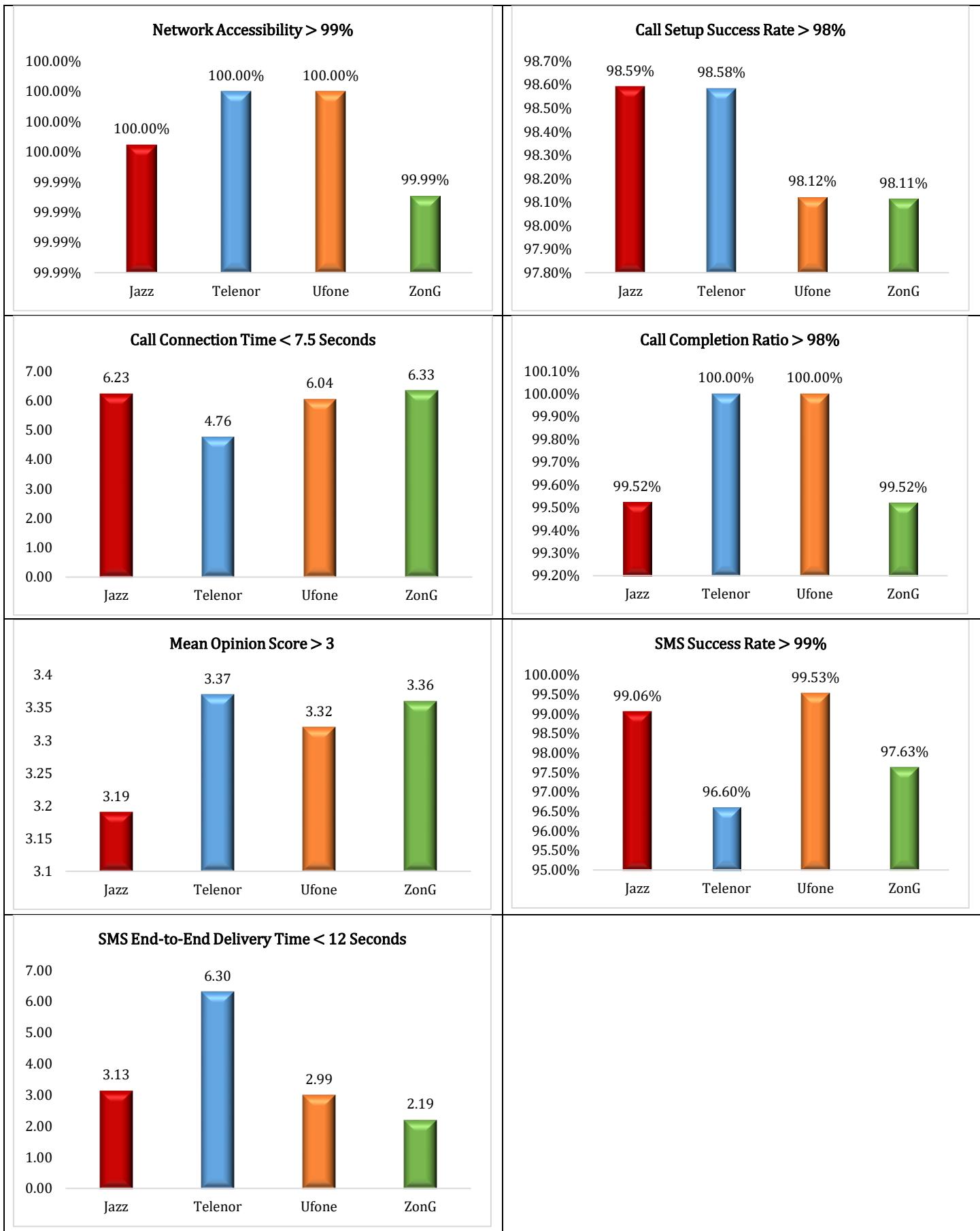
UFONE 3G NETWORK COVERAGE – KHARIAN



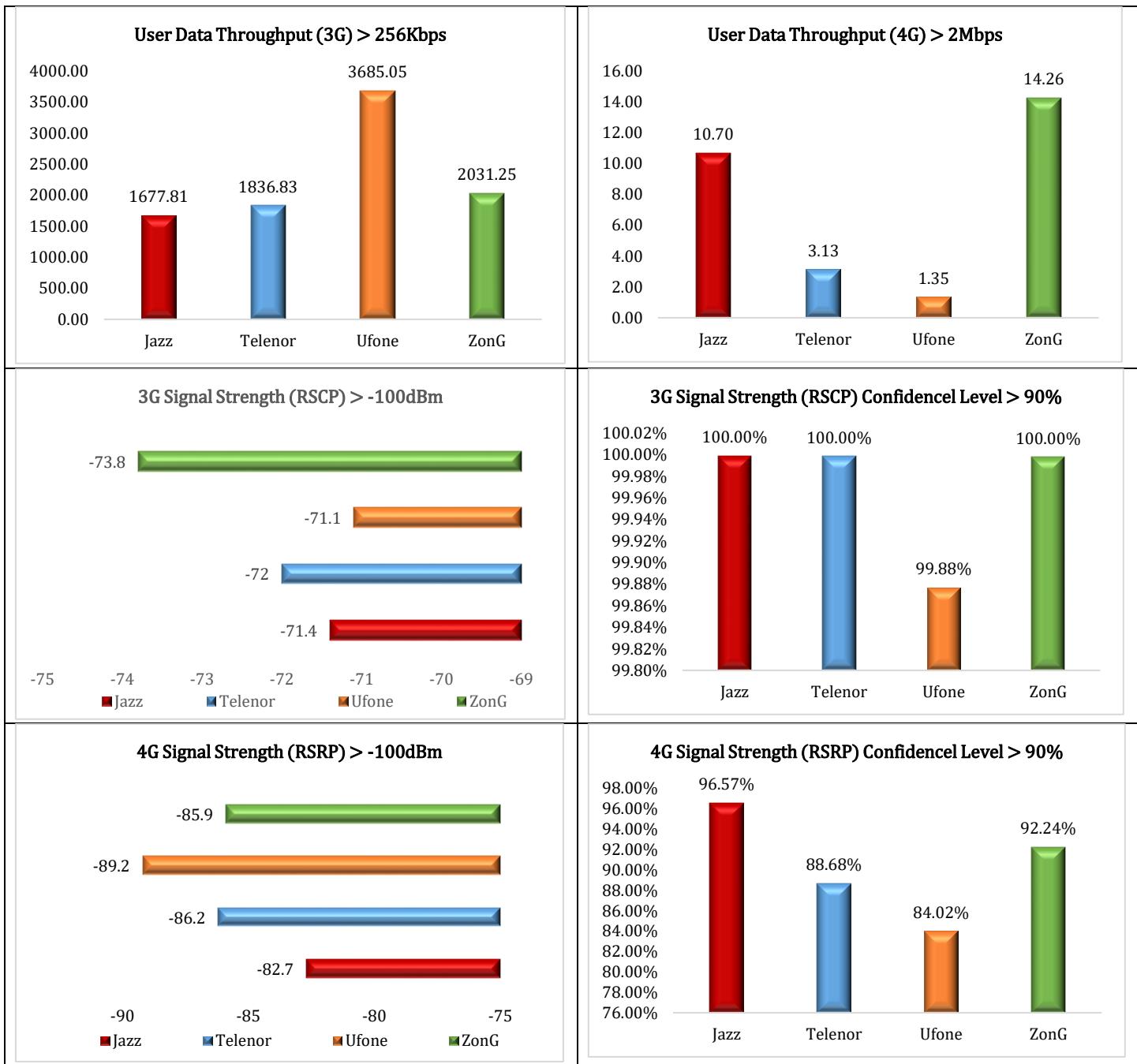
ZONG 3G NETWORK COVERAGE – KHARIAN



## QUALITY OF SERVICE SURVEY RESULTS – KHARIAN

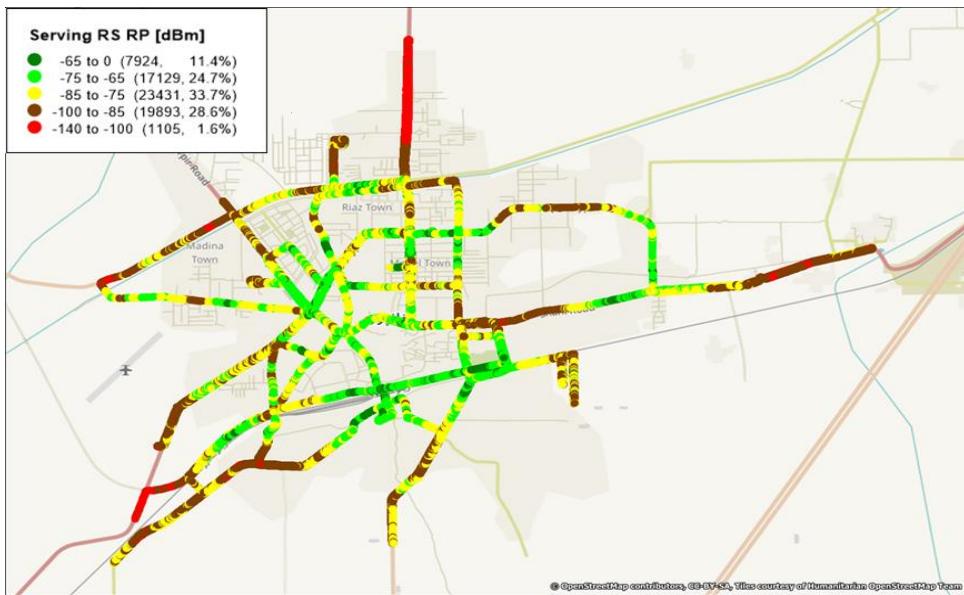


## QUALITY OF SERVICE SURVEY RESULTS – KHARIAN

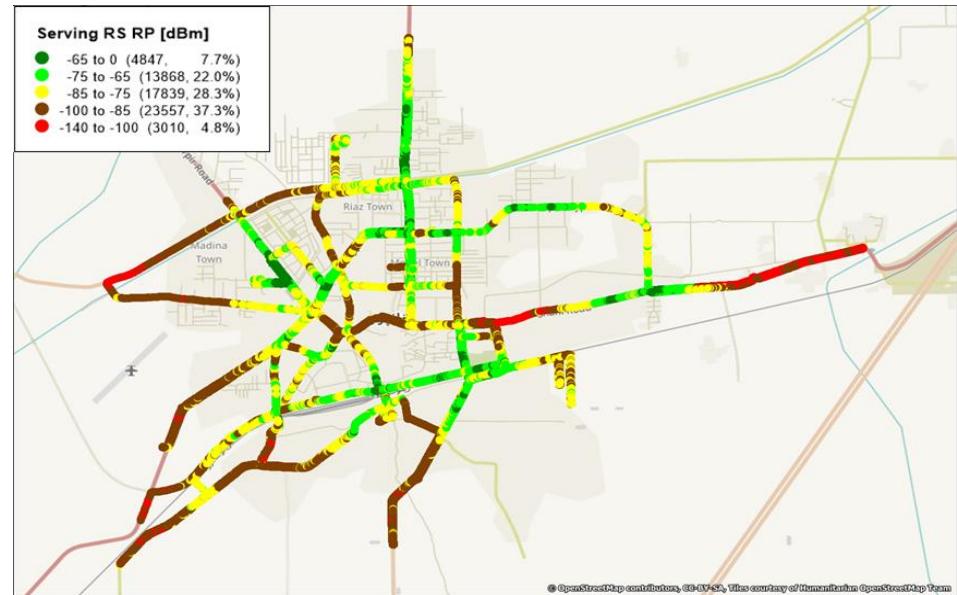


## 4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

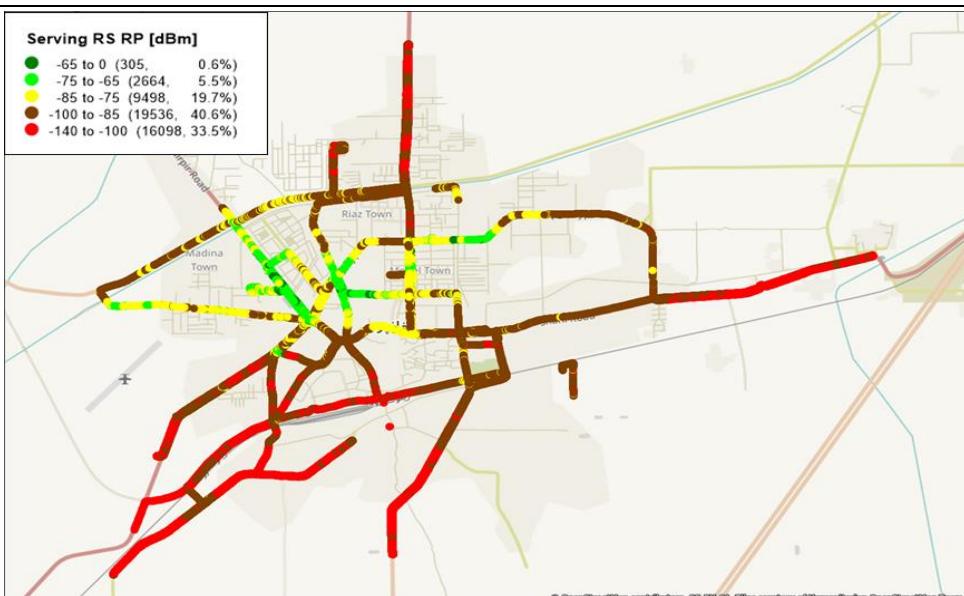
JAZZ 4G NETWORK COVERAGE – KHANPUR



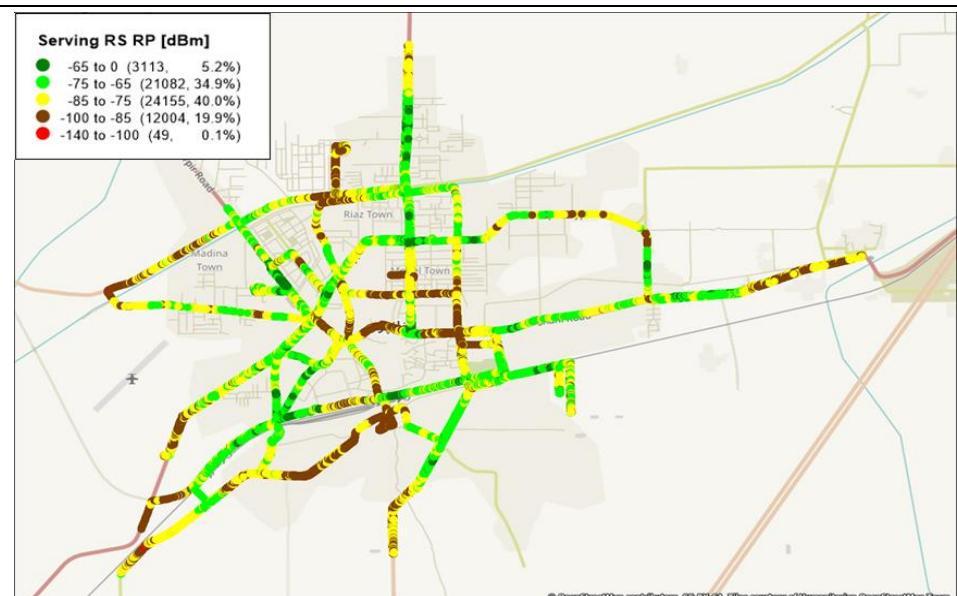
TELENOR 4G NETWORK COVERAGE – KHANPUR



UFONE 4G NETWORK COVERAGE – KHANPUR

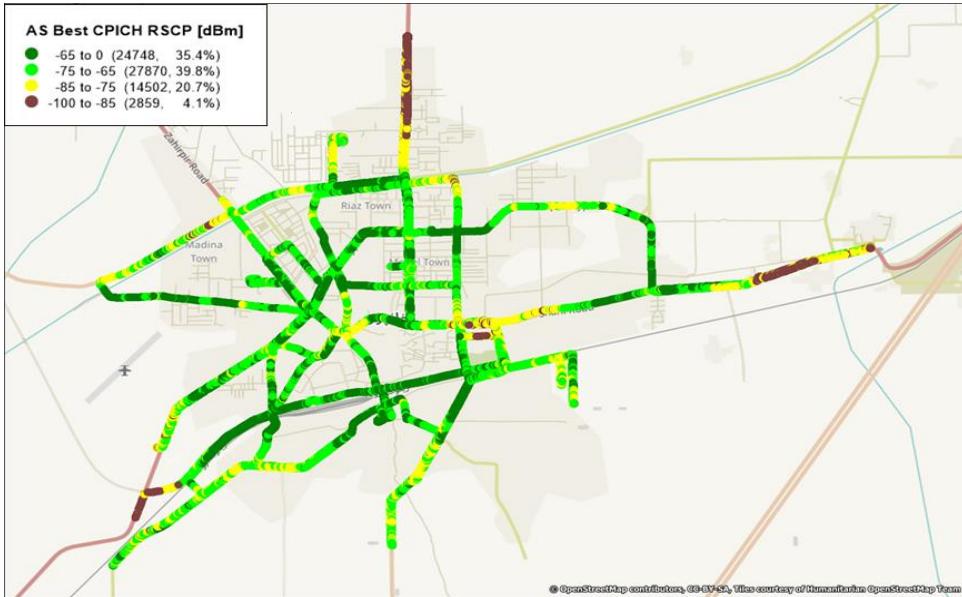


ZONG 4G NETWORK COVERAGE – KHANPUR

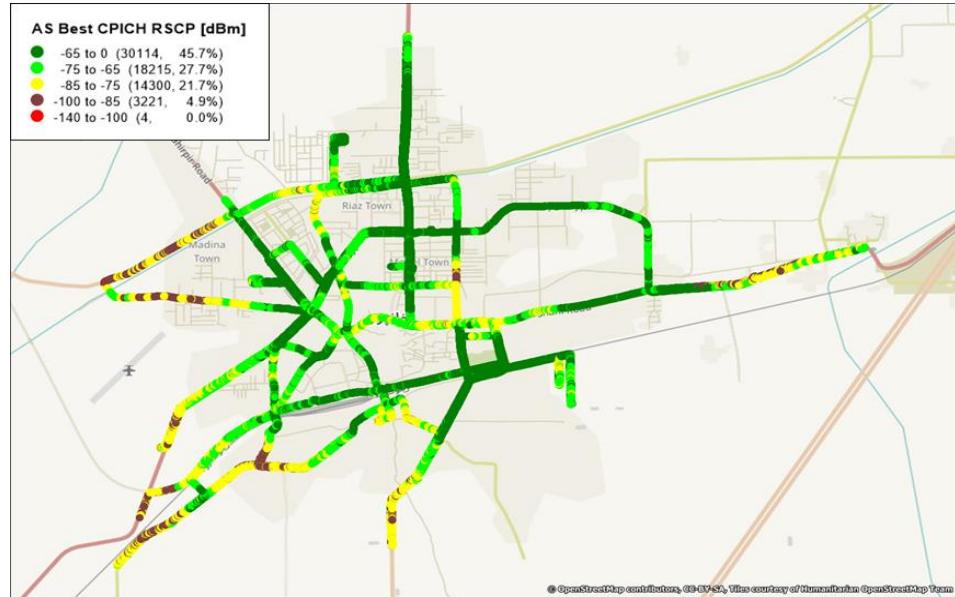


## 3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

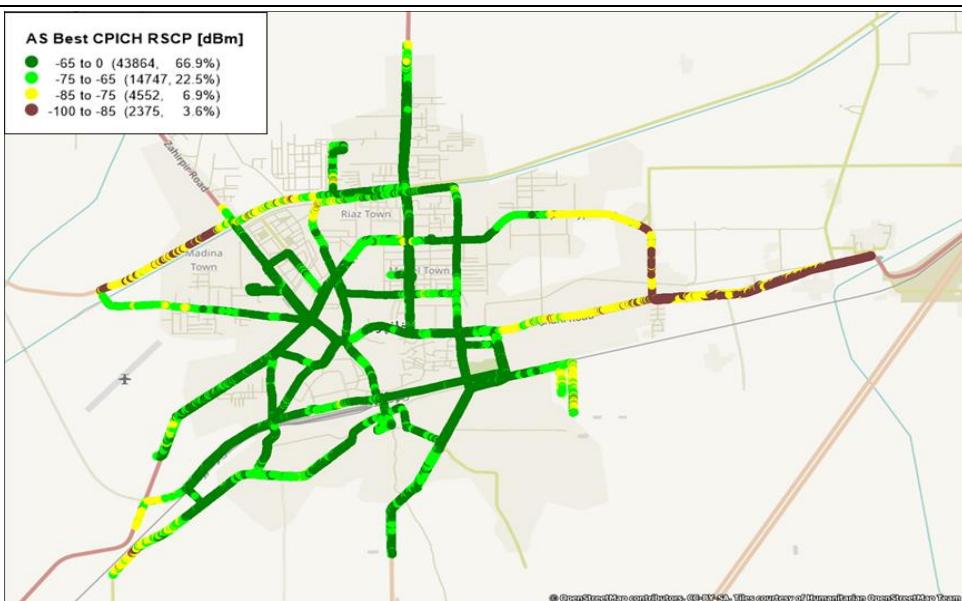
JAZZ 3G NETWORK COVERAGE – KHANPUR



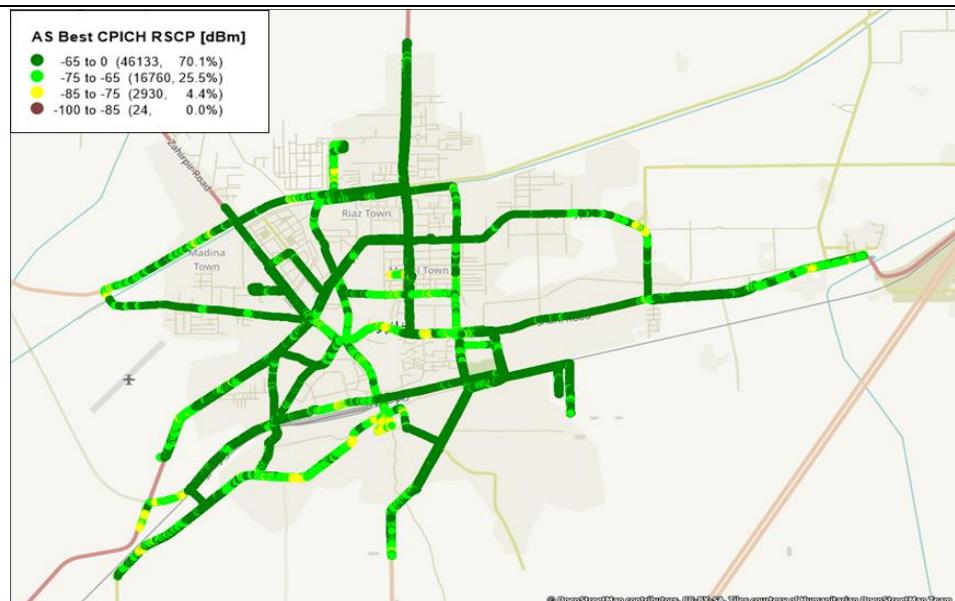
TELENOR 3G NETWORK COVERAGE – KHANPUR



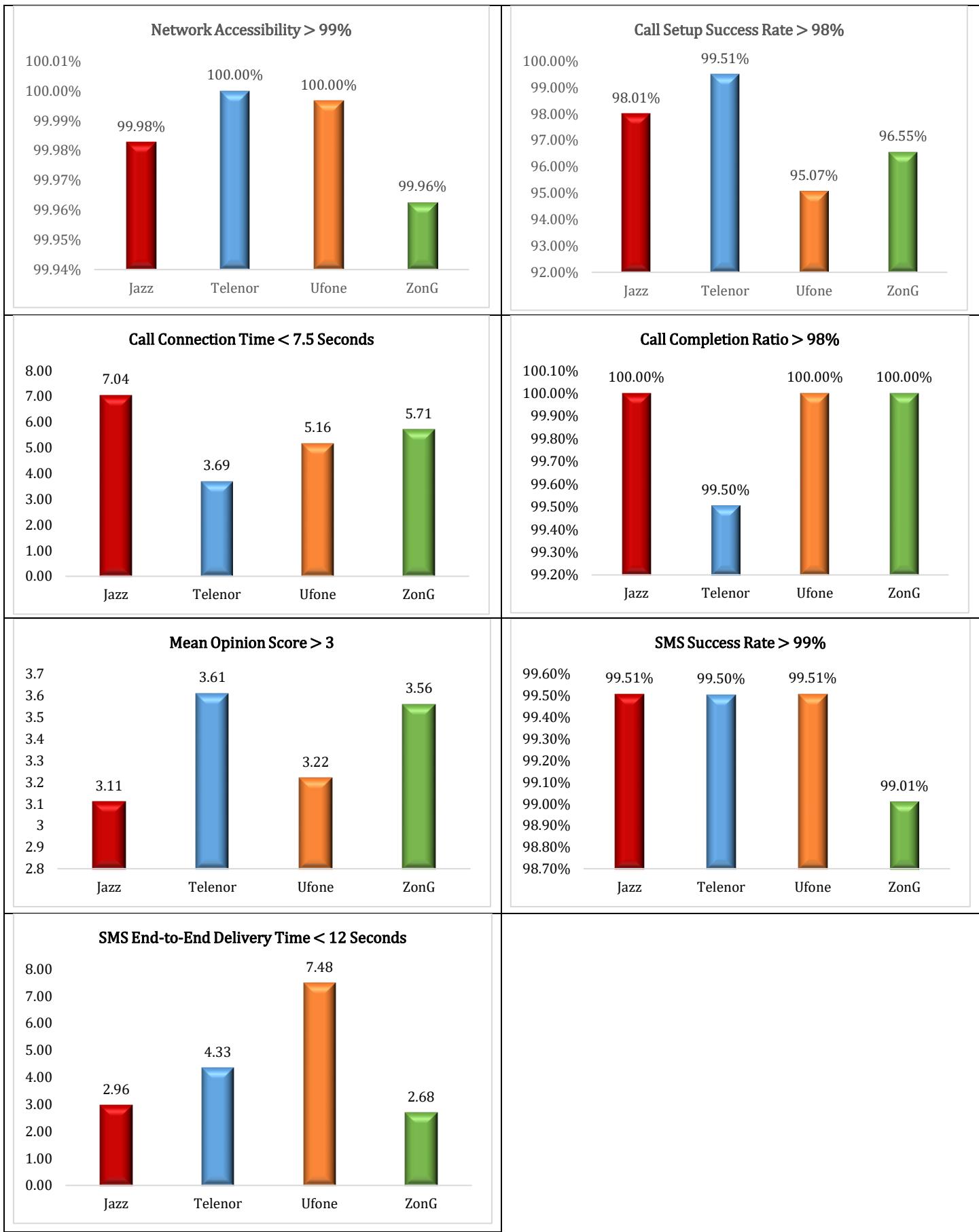
UFONE 3G NETWORK COVERAGE – KHANPUR



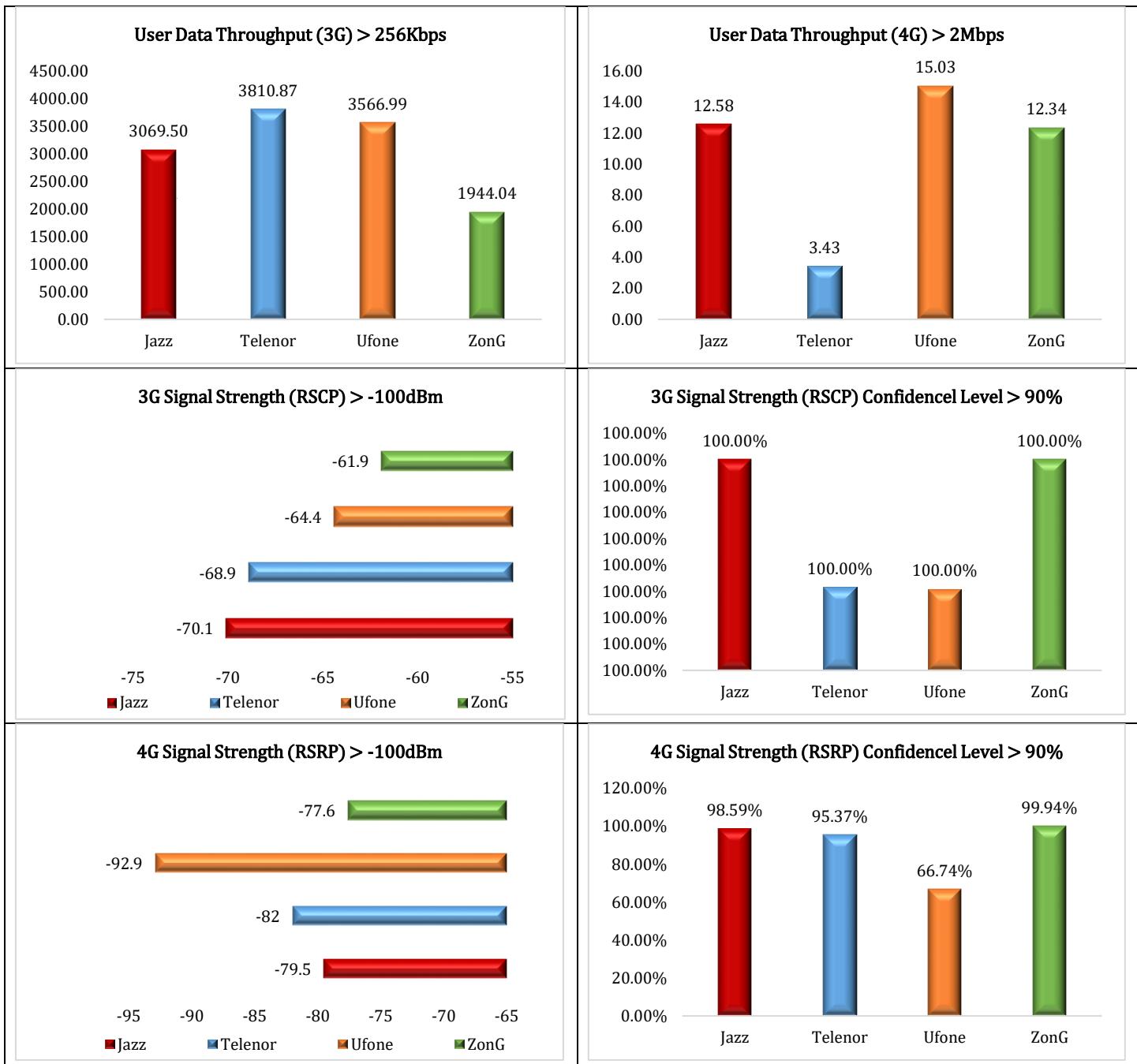
ZONG 3G NETWORK COVERAGE – KHANPUR



## QUALITY OF SERVICE SURVEY RESULTS – KHANPUR

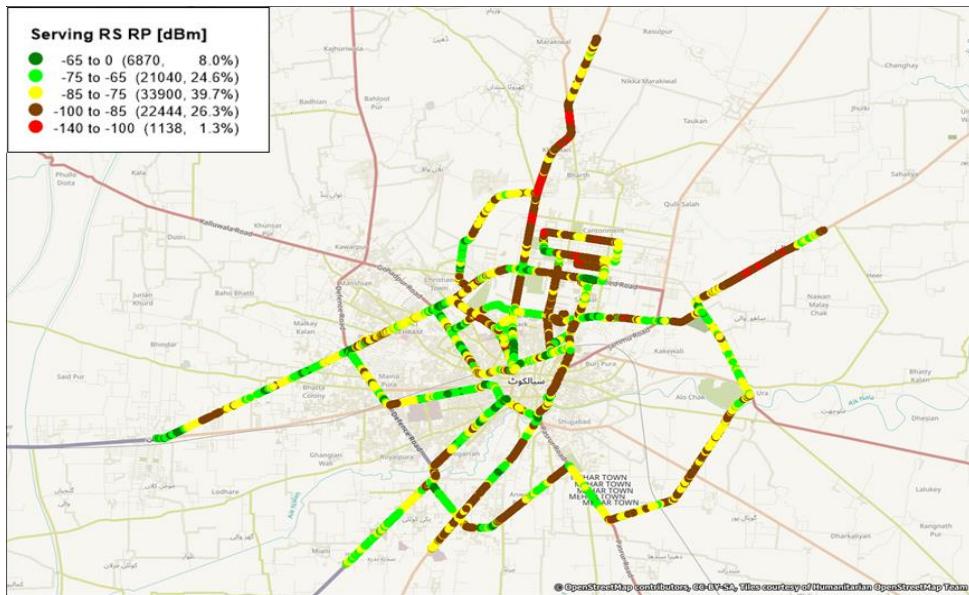


## QUALITY OF SERVICE SURVEY RESULTS – KHANPUR

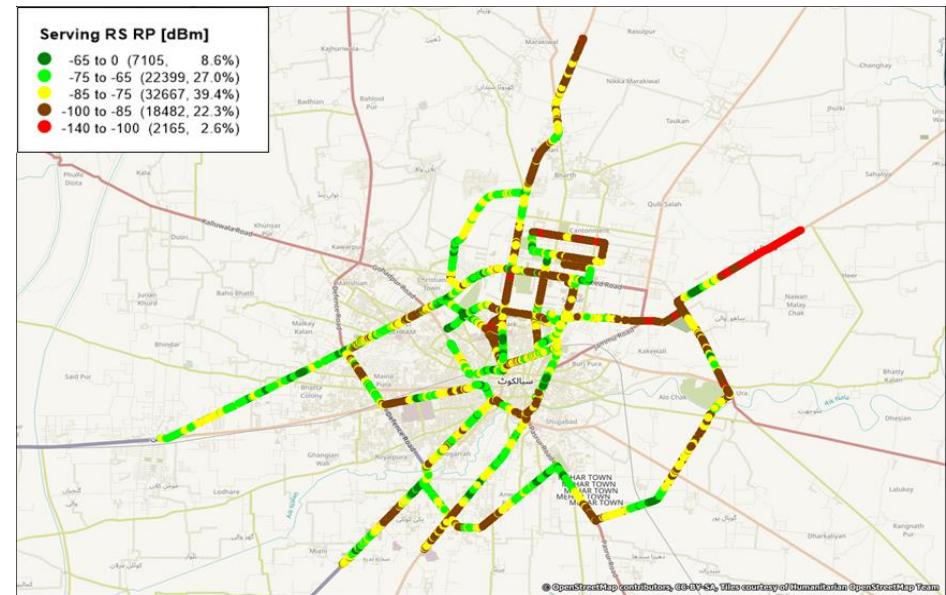


## 4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

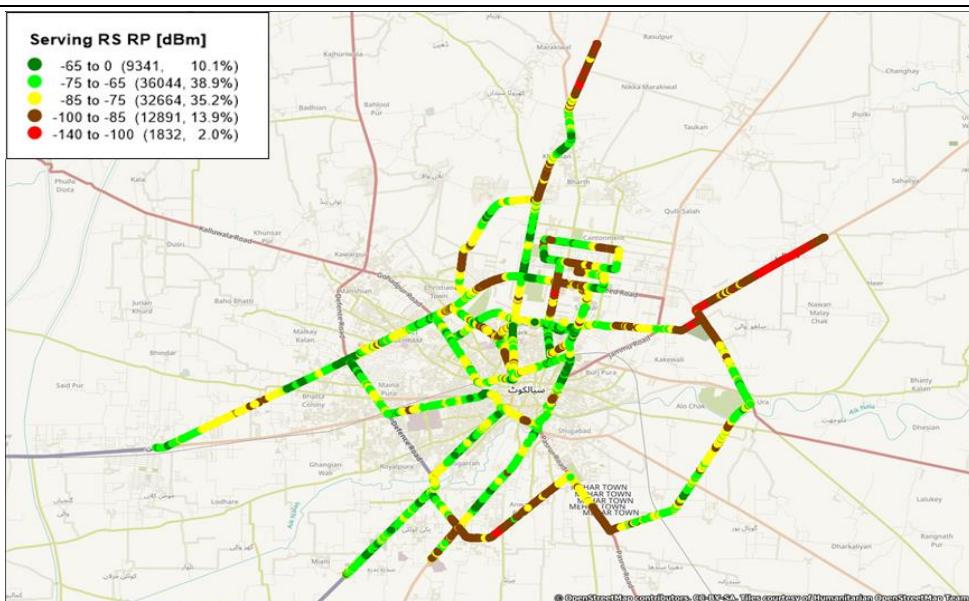
JAZZ 4G NETWORK COVERAGE – SIALKOT



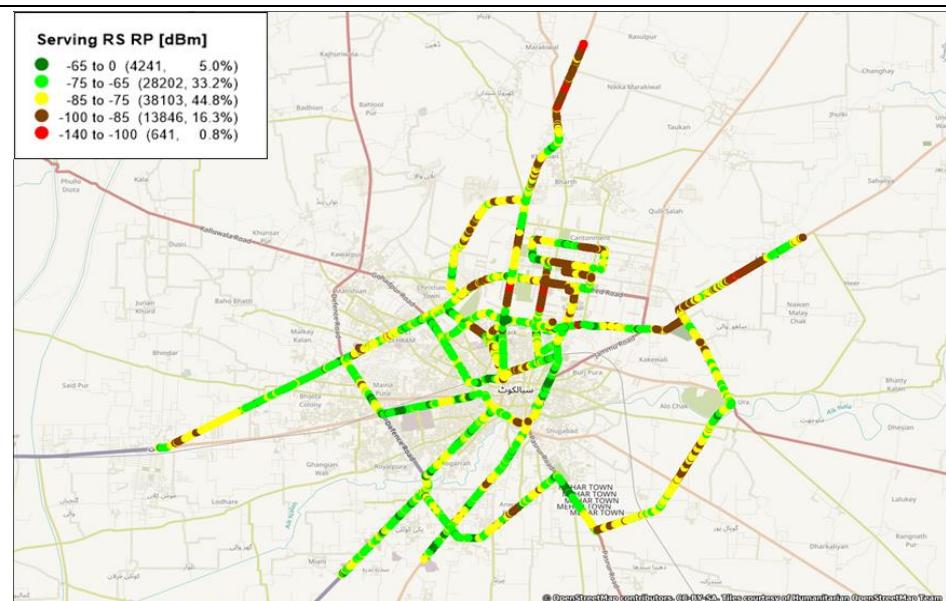
TELENOR 4G NETWORK COVERAGE – SIALKOT



UFONE 4G NETWORK COVERAGE – SIALKOT

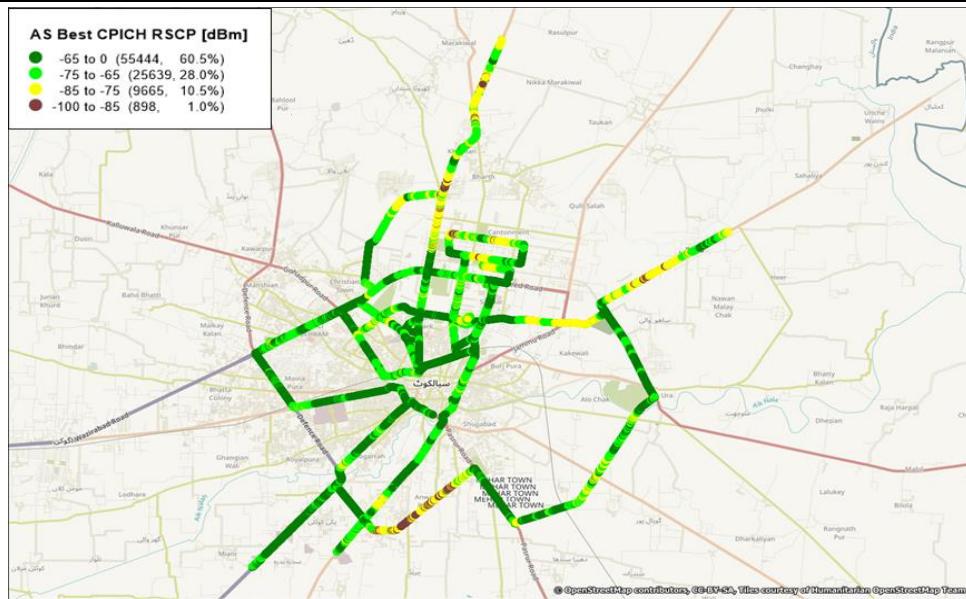


ZONG 4G NETWORK COVERAGE – SIALKOT

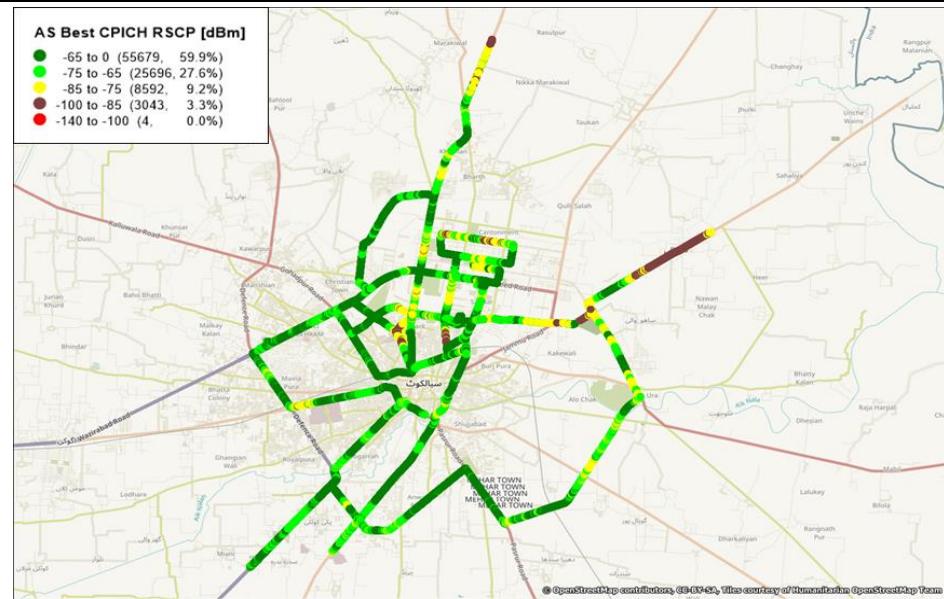


## 3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

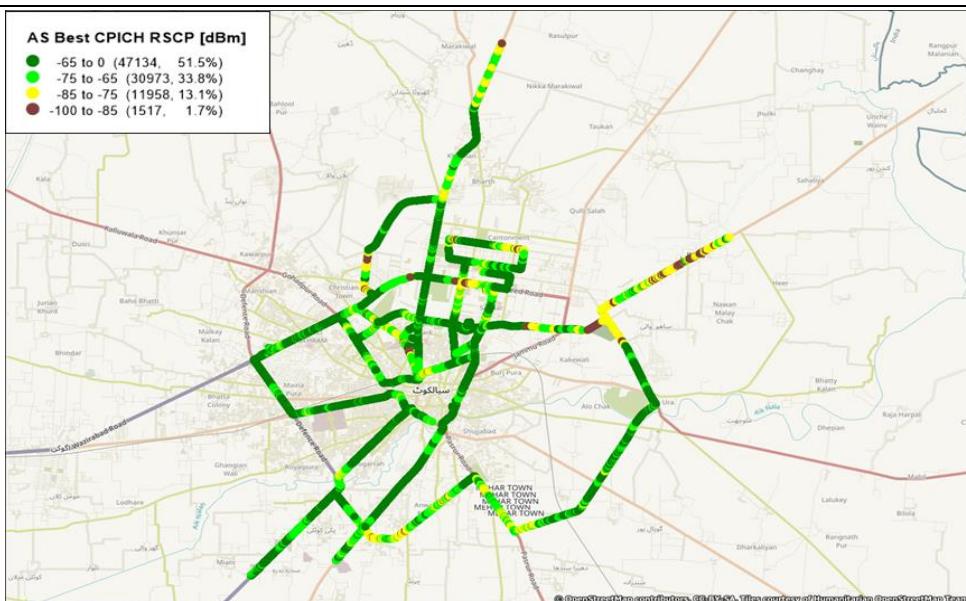
JAZZ 3G NETWORK COVERAGE – SIALKOT



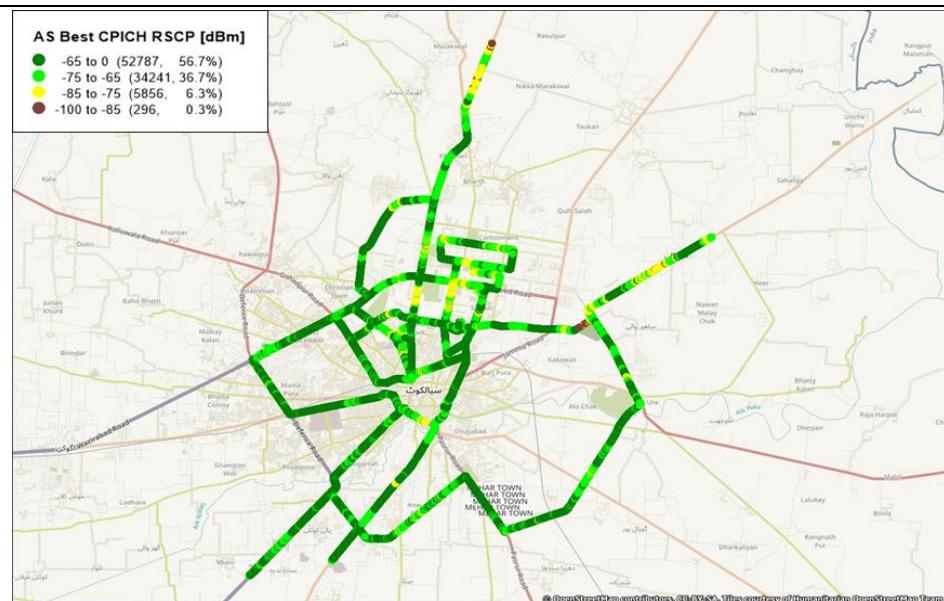
TELENOR 3G NETWORK COVERAGE – SIALKOT



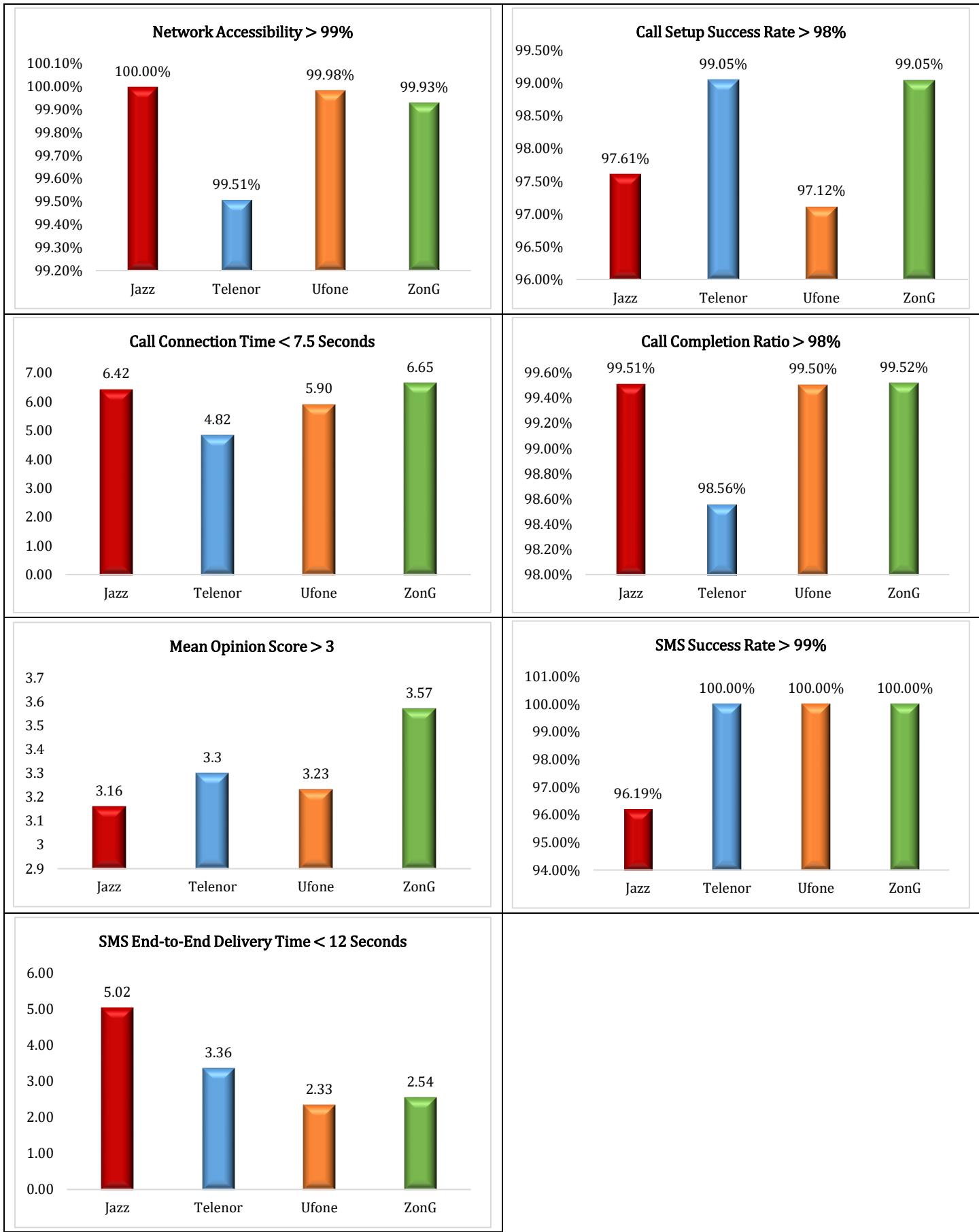
UFONE 3G NETWORK COVERAGE – SIALKOT



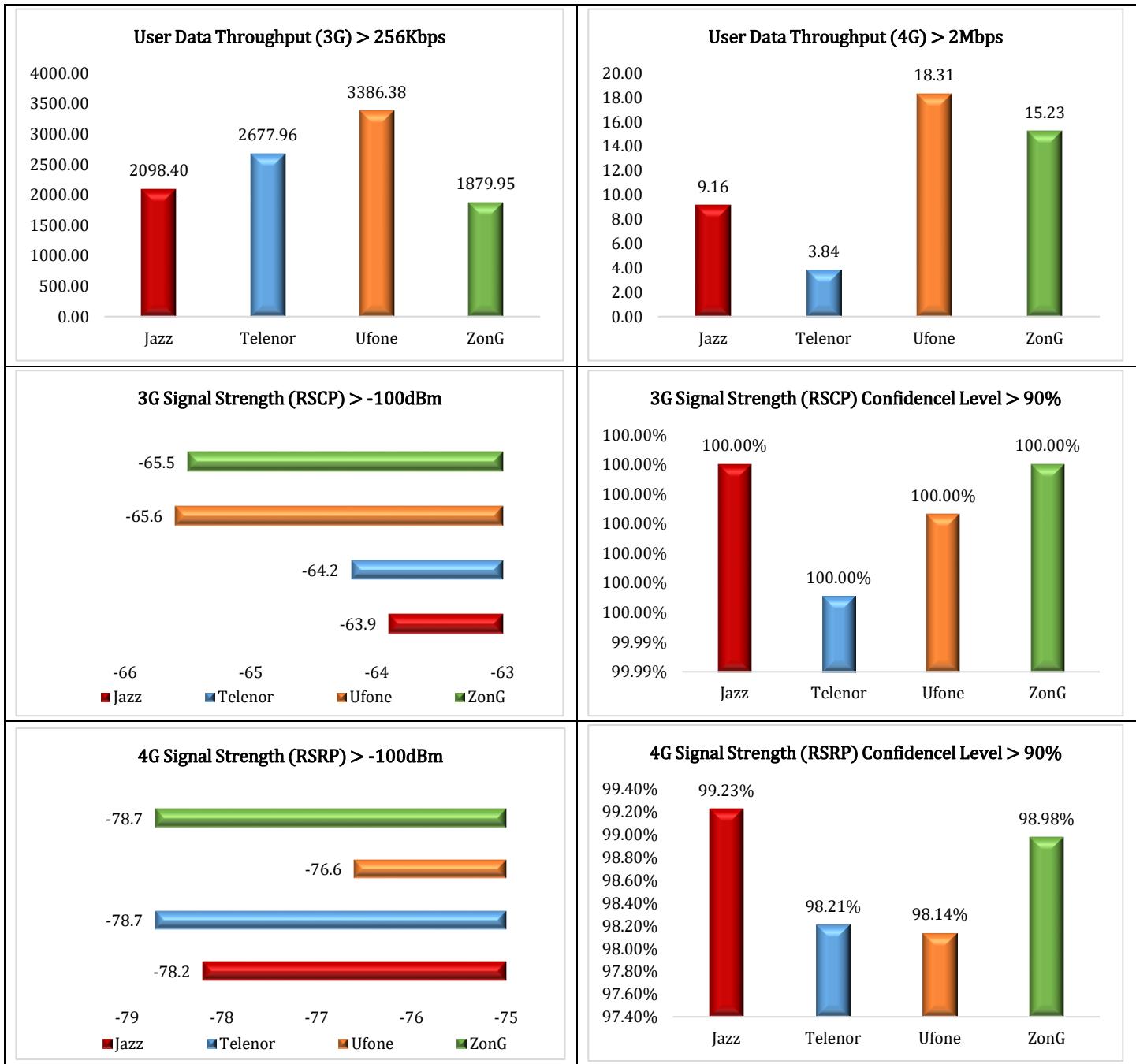
ZONG 3G NETWORK COVERAGE – SIALKOT



## QUALITY OF SERVICE SURVEY RESULTS – SIALKOT

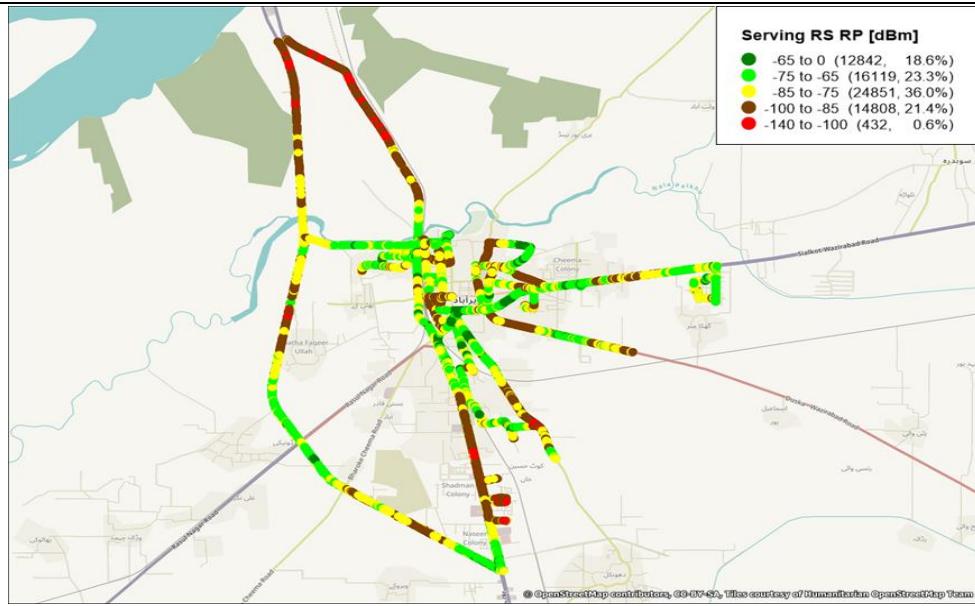


## QUALITY OF SERVICE SURVEY RESULTS – SIALKOT

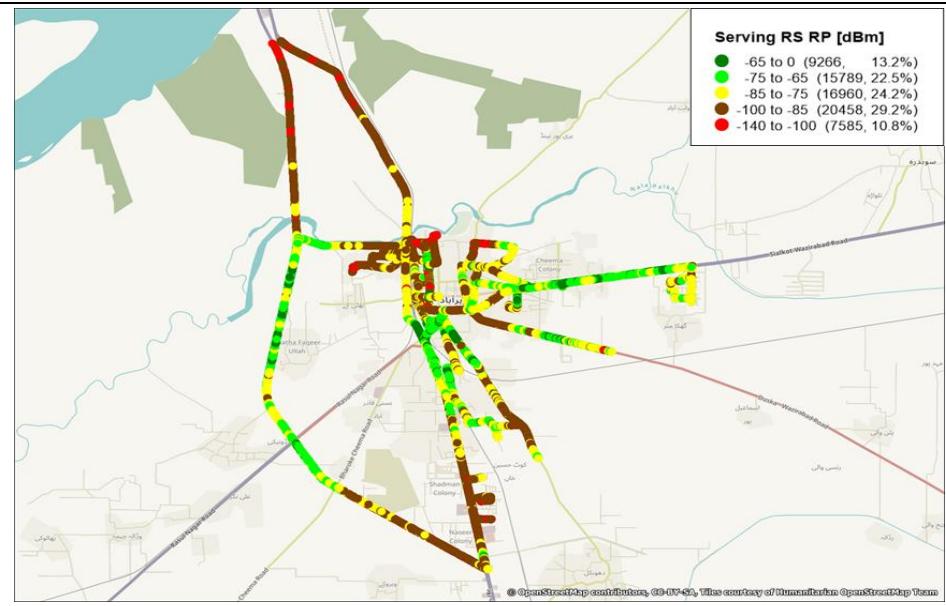


## 4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

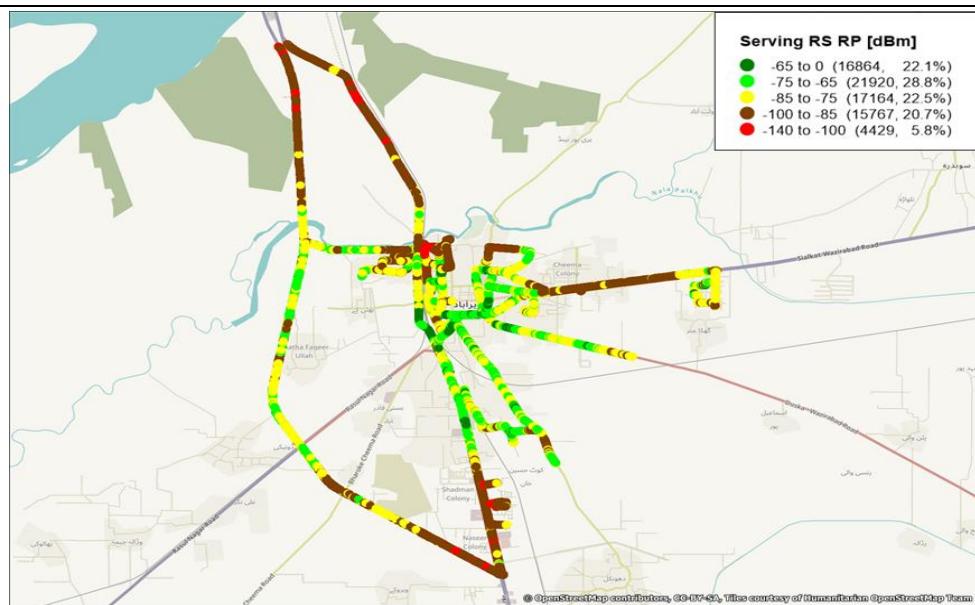
JAZZ 4G NETWORK COVERAGE – WAZIRABAD



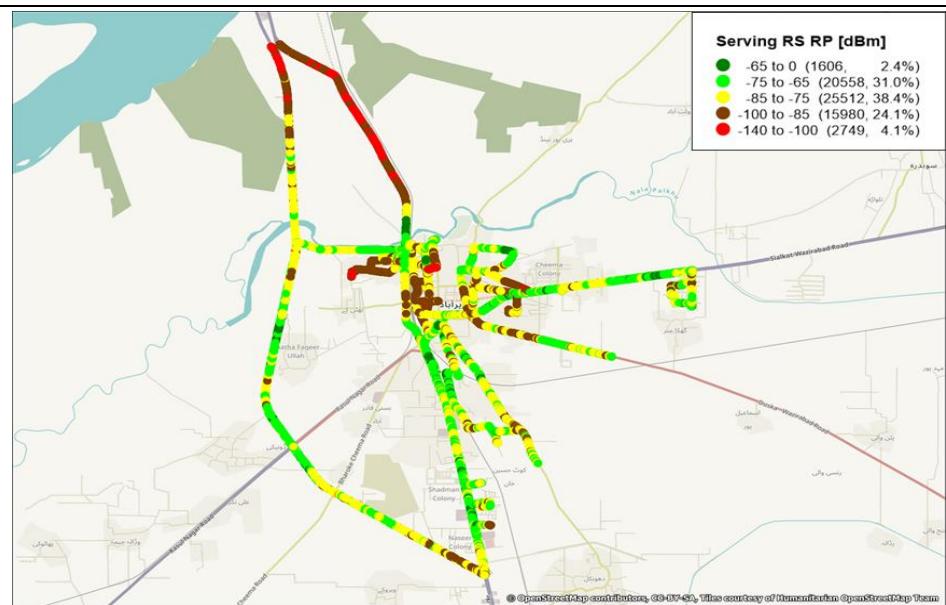
TELENOR 4G NETWORK COVERAGE – WAZIRABAD



UFONE 4G NETWORK COVERAGE – WAZIRABAD

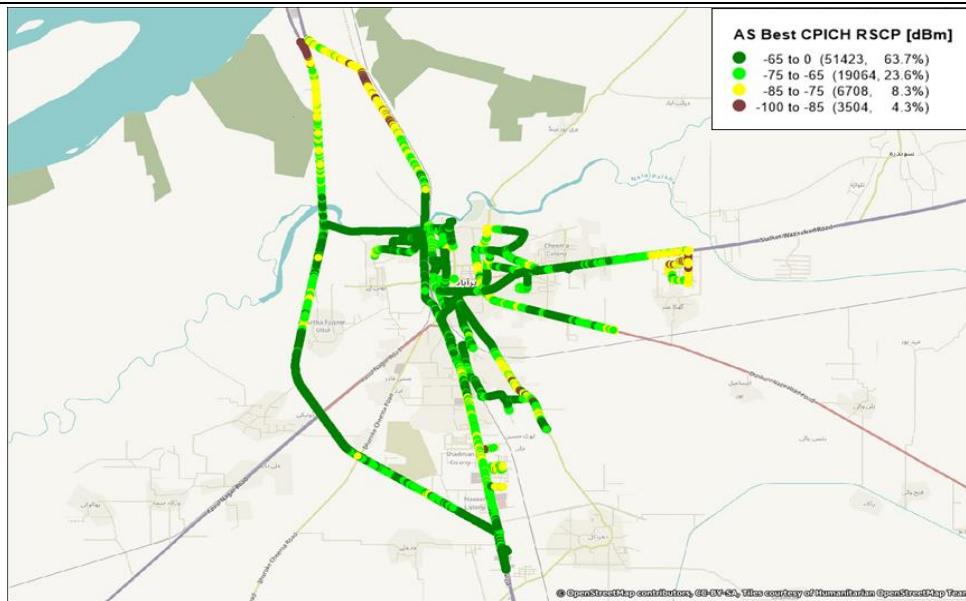


ZONG 4G NETWORK COVERAGE – WAZIRABAD

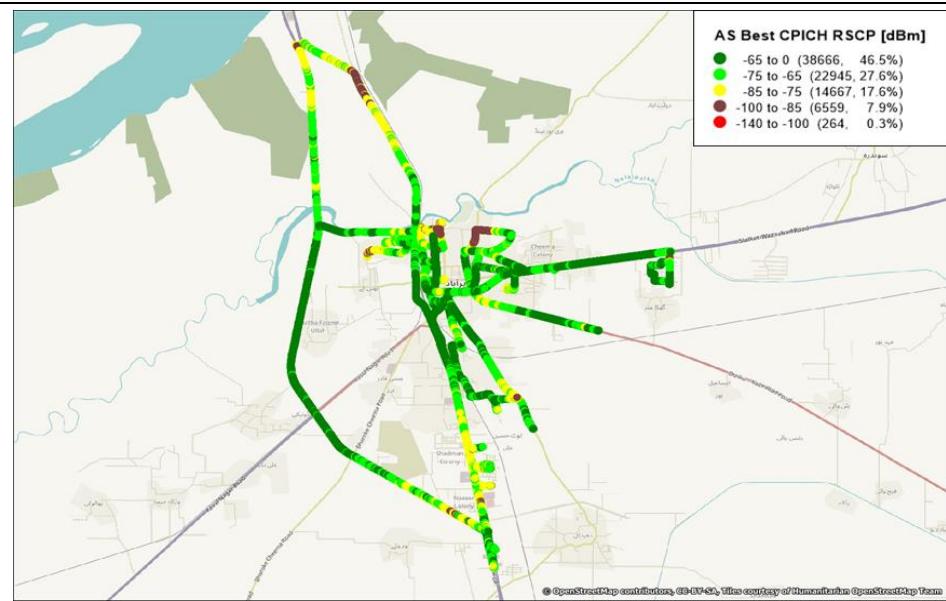


## 3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

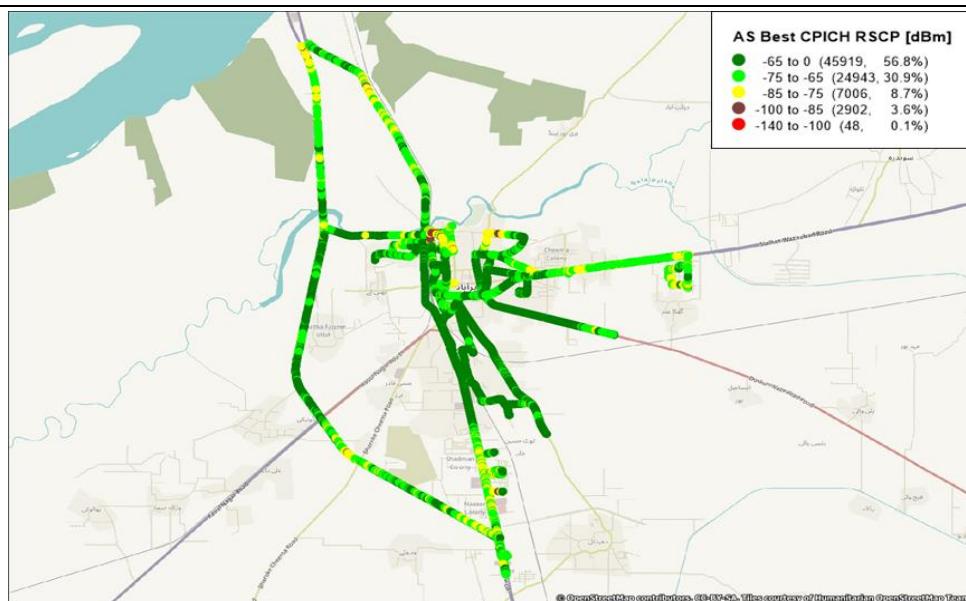
JAZZ 3G NETWORK COVERAGE – WAZIRABAD



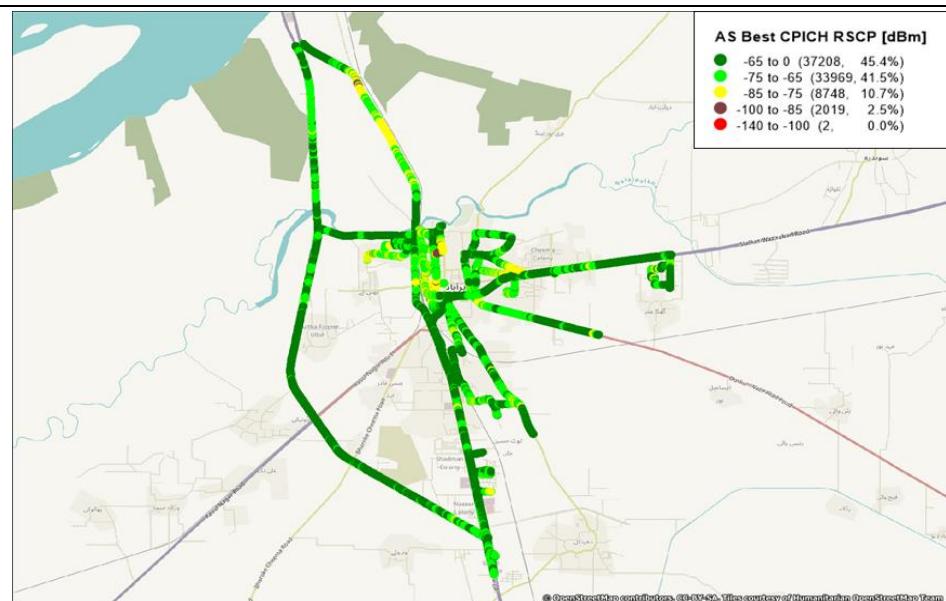
TELENOR 3G NETWORK COVERAGE – WAZIRABAD



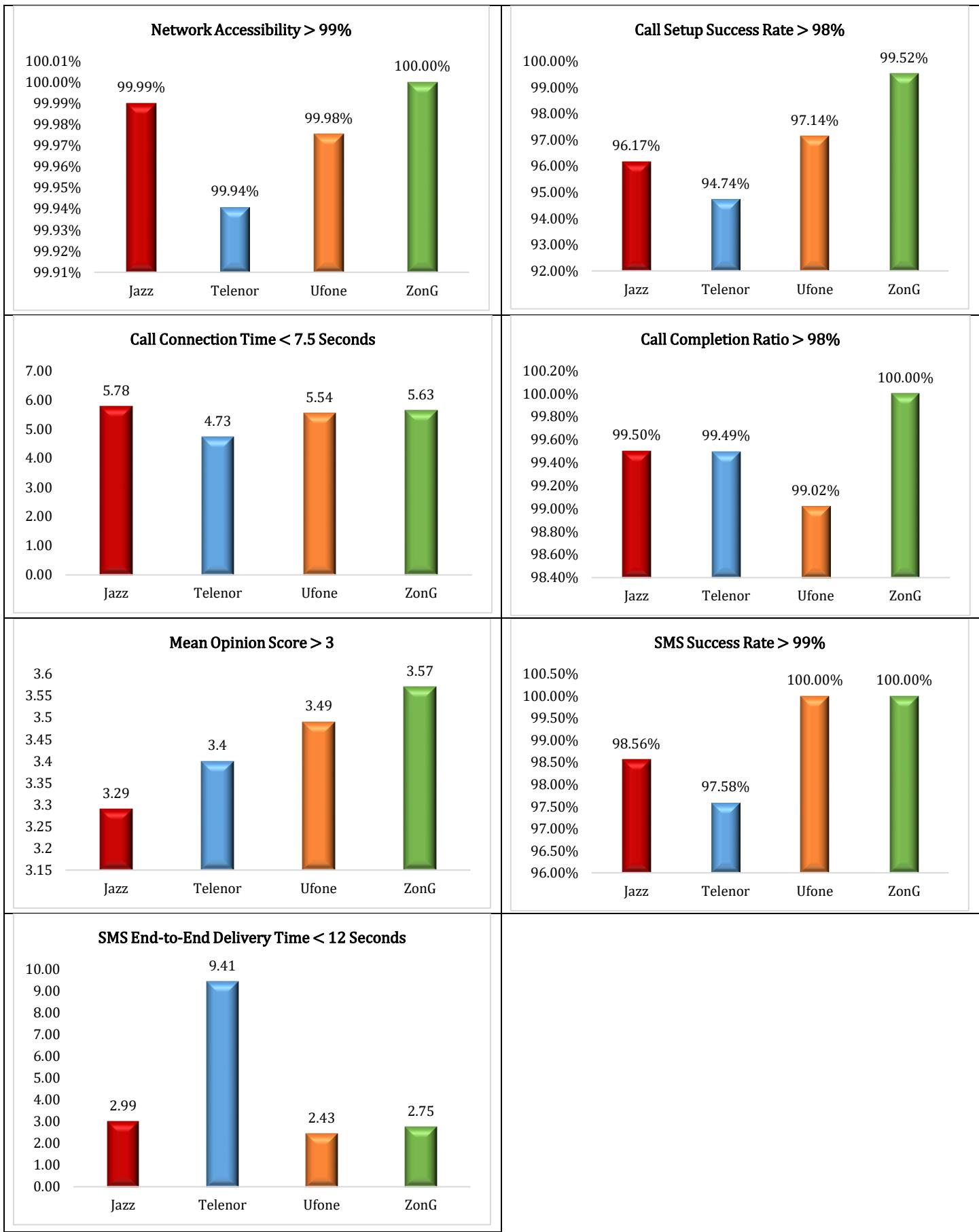
UFONE 3G NETWORK COVERAGE – WAZIRABAD



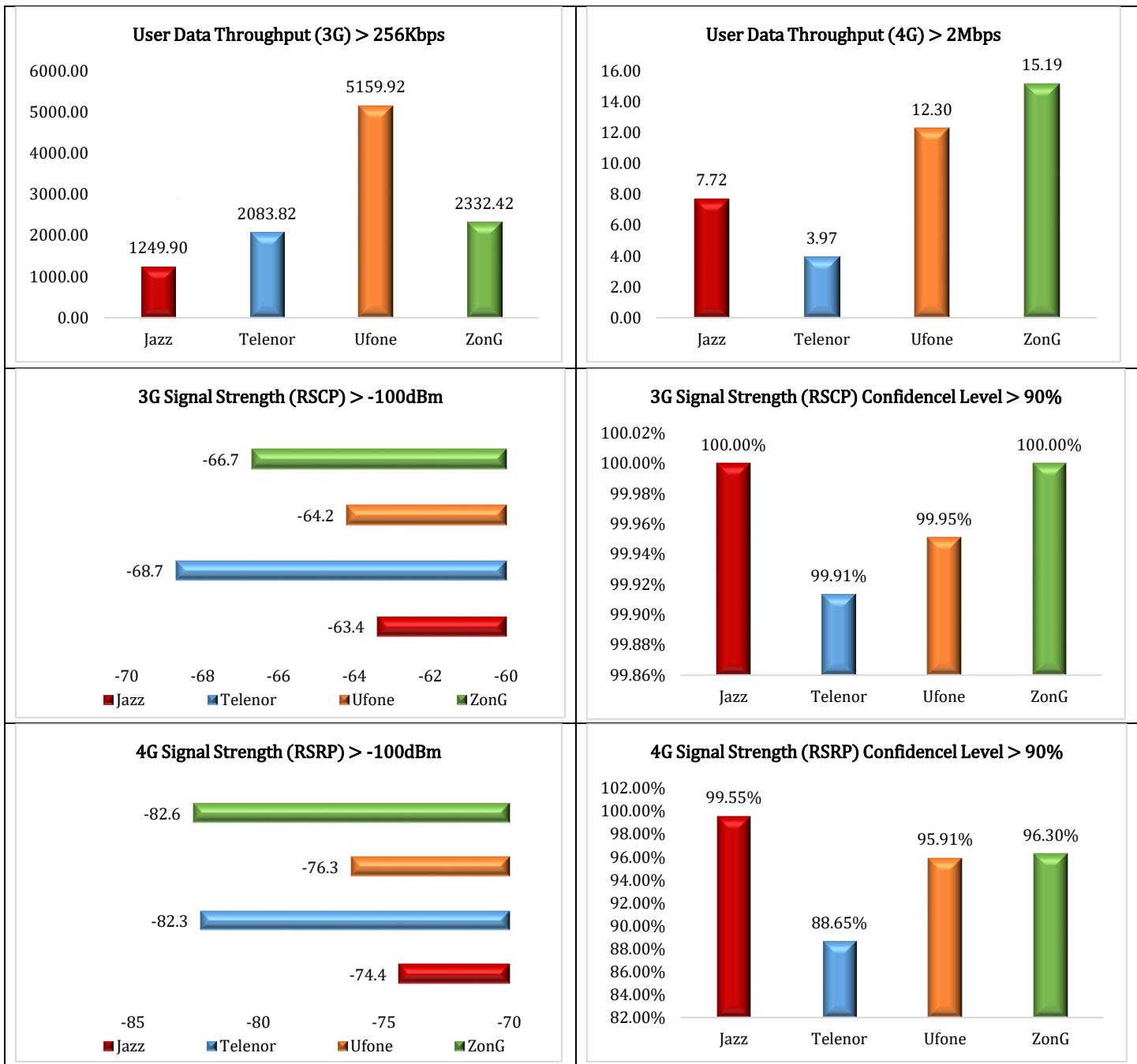
ZONG 3G NETWORK COVERAGE – WAZIRABAD



## QUALITY OF SERVICE SURVEY RESULTS – WAZIRABAD



## QUALITY OF SERVICE SURVEY RESULTS – WAZIRABAD

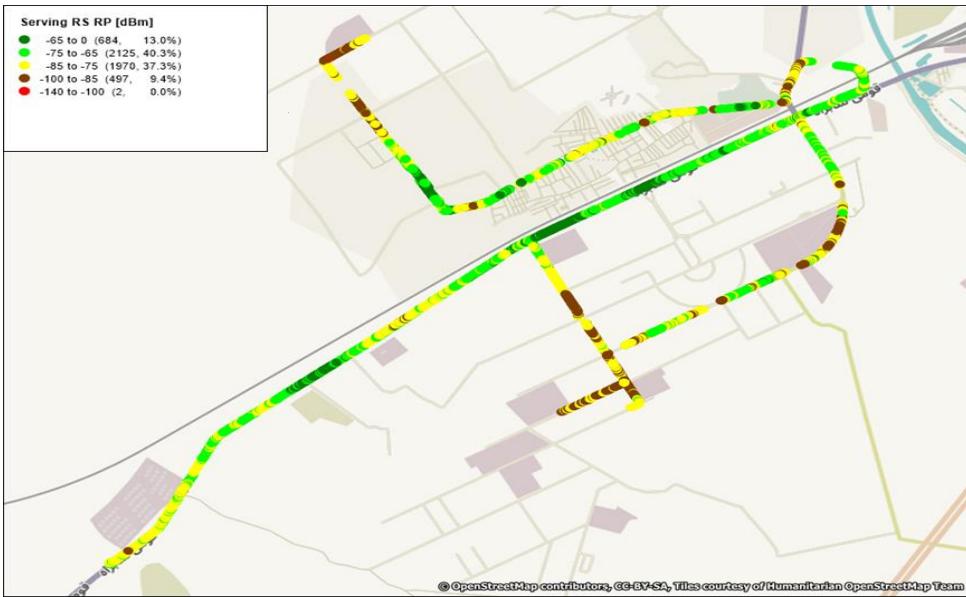


**ANNEX – B**

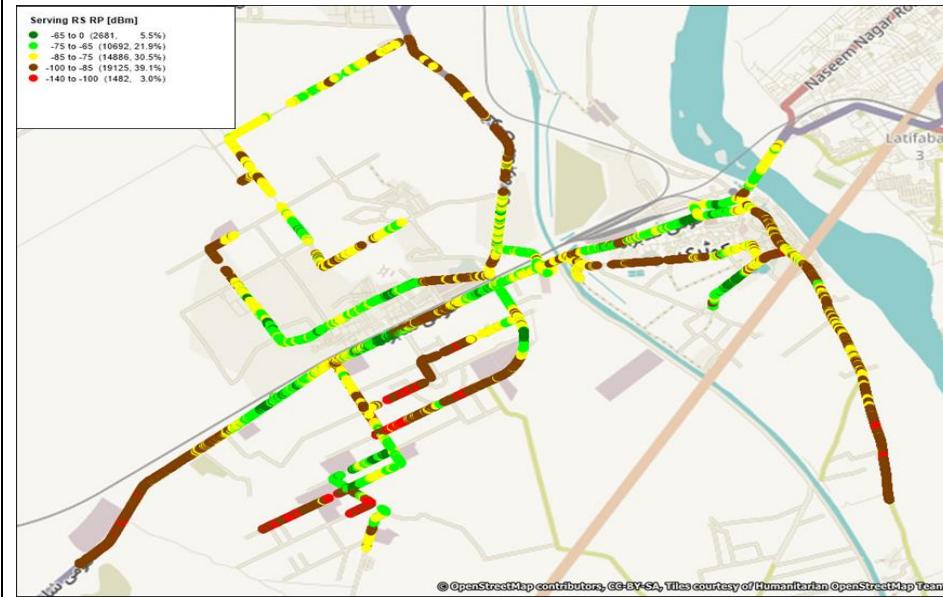
**SINDH**

## 4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

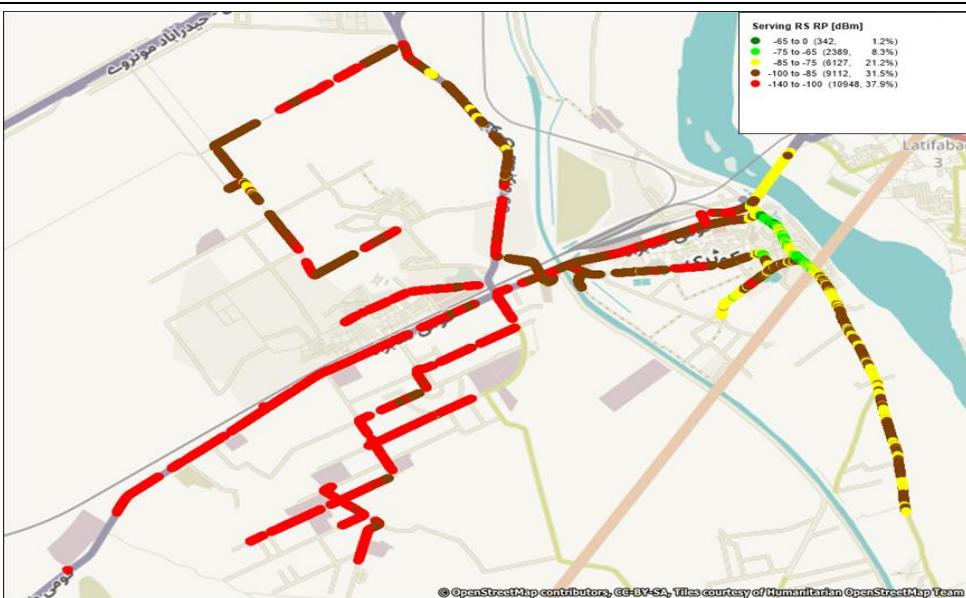
JAZZ 4G NETWORK COVERAGE – KOTRI



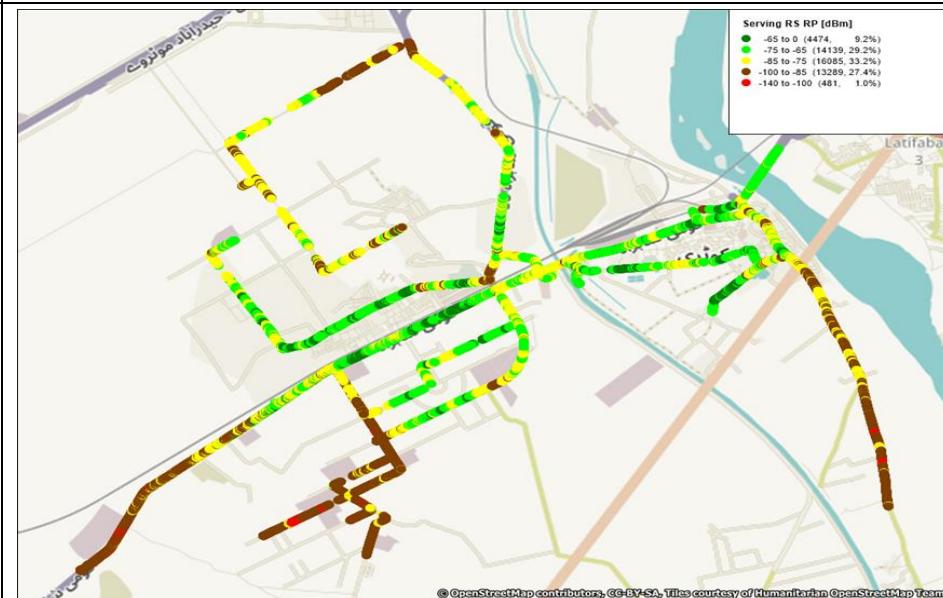
TELENOR 4G NETWORK COVERAGE – KOTRI



UFONE 4G NETWORK COVERAGE – KOTRI

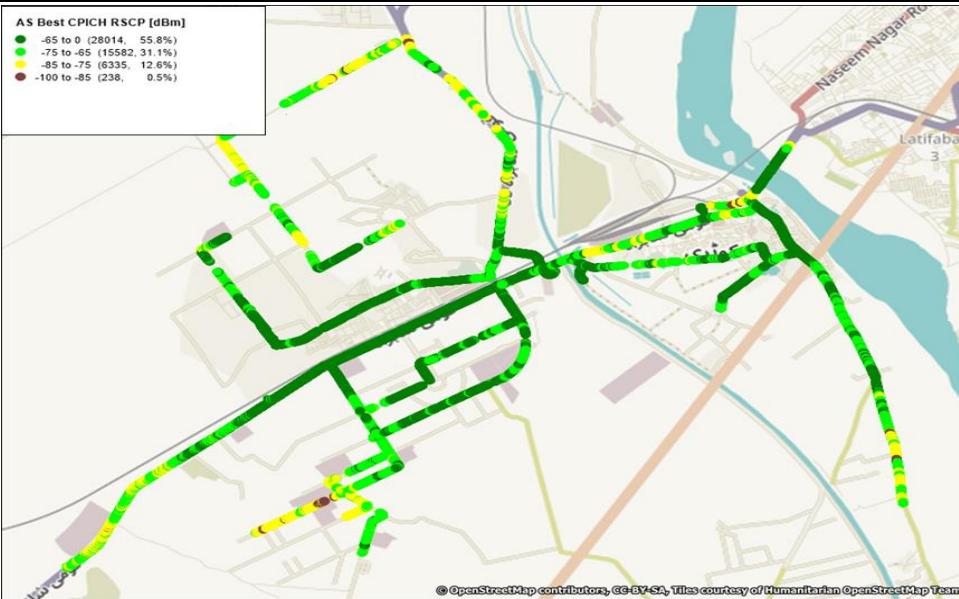


ZONG 4G NETWORK COVERAGE – KOTRI

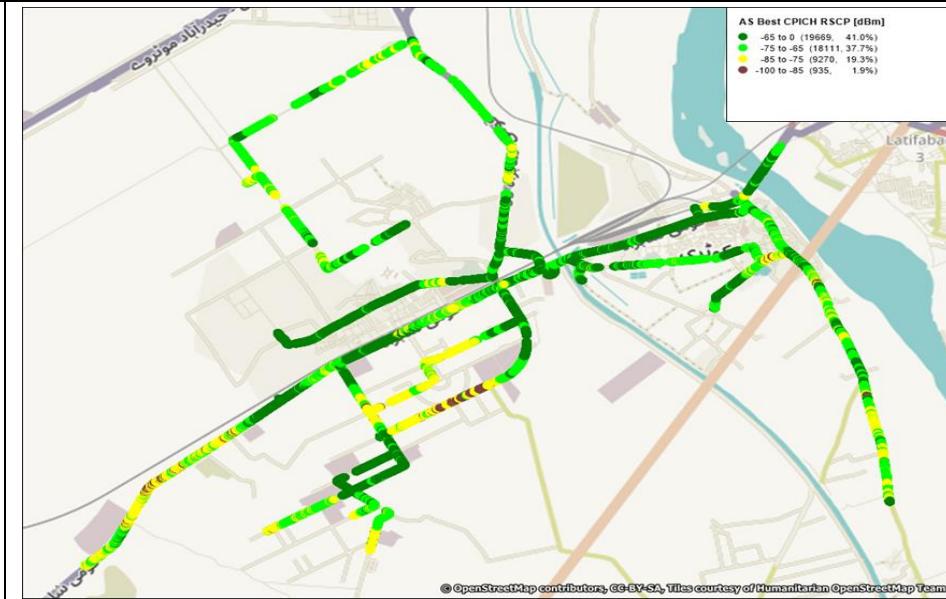


## 3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

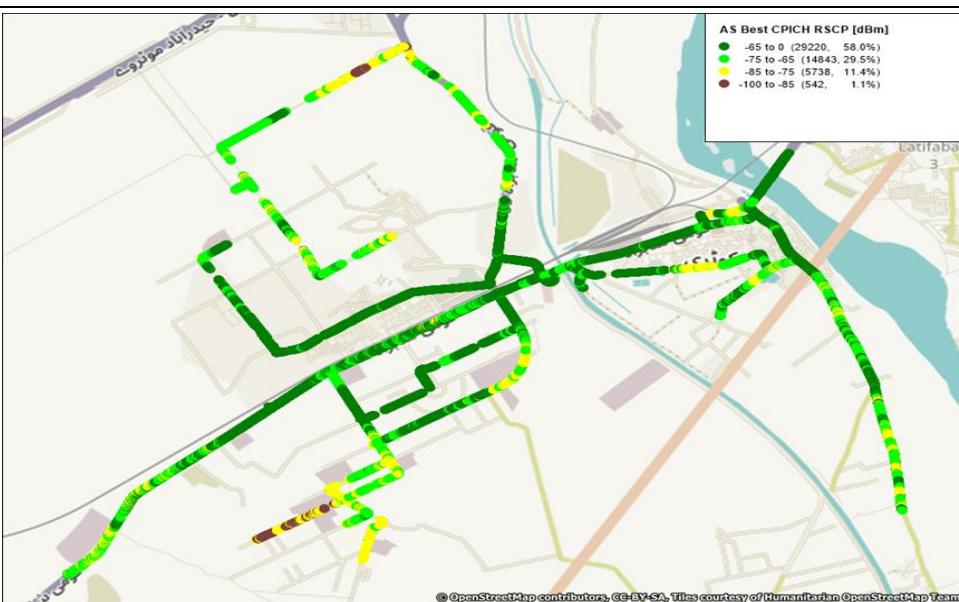
JAZZ 3G NETWORK COVERAGE – KOTRI



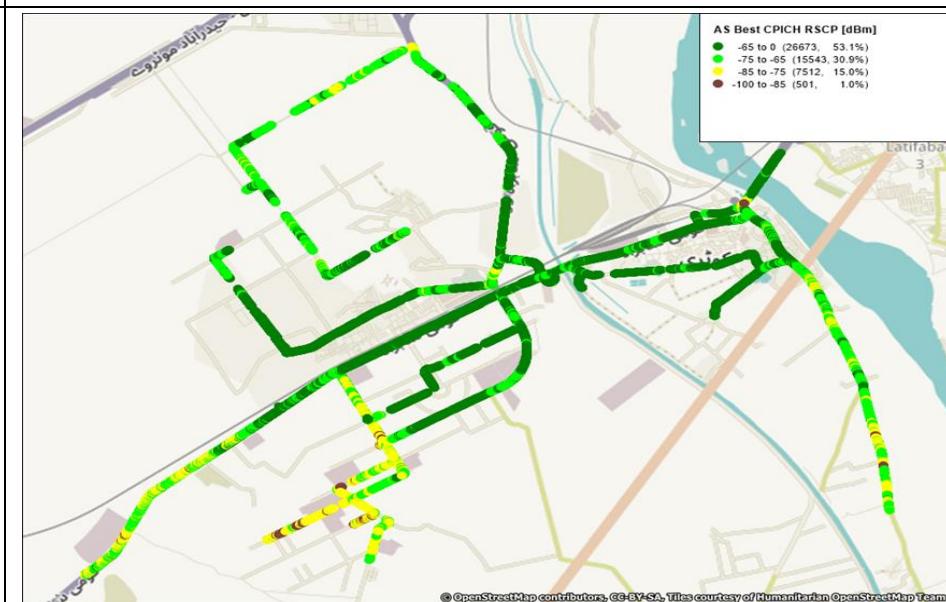
TELENOR 3G NETWORK COVERAGE – KOTRI



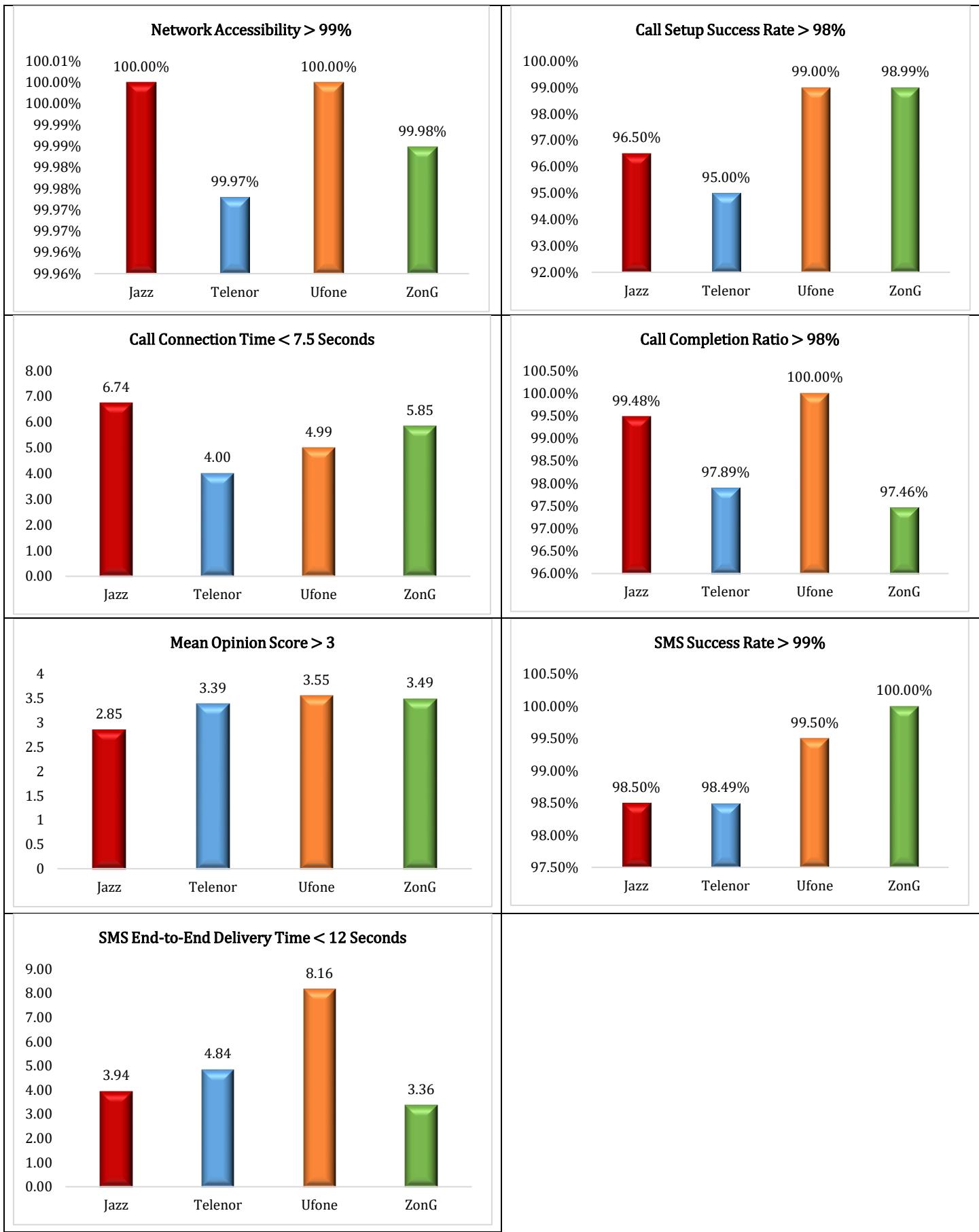
UFONE 3G NETWORK COVERAGE – KOTRI



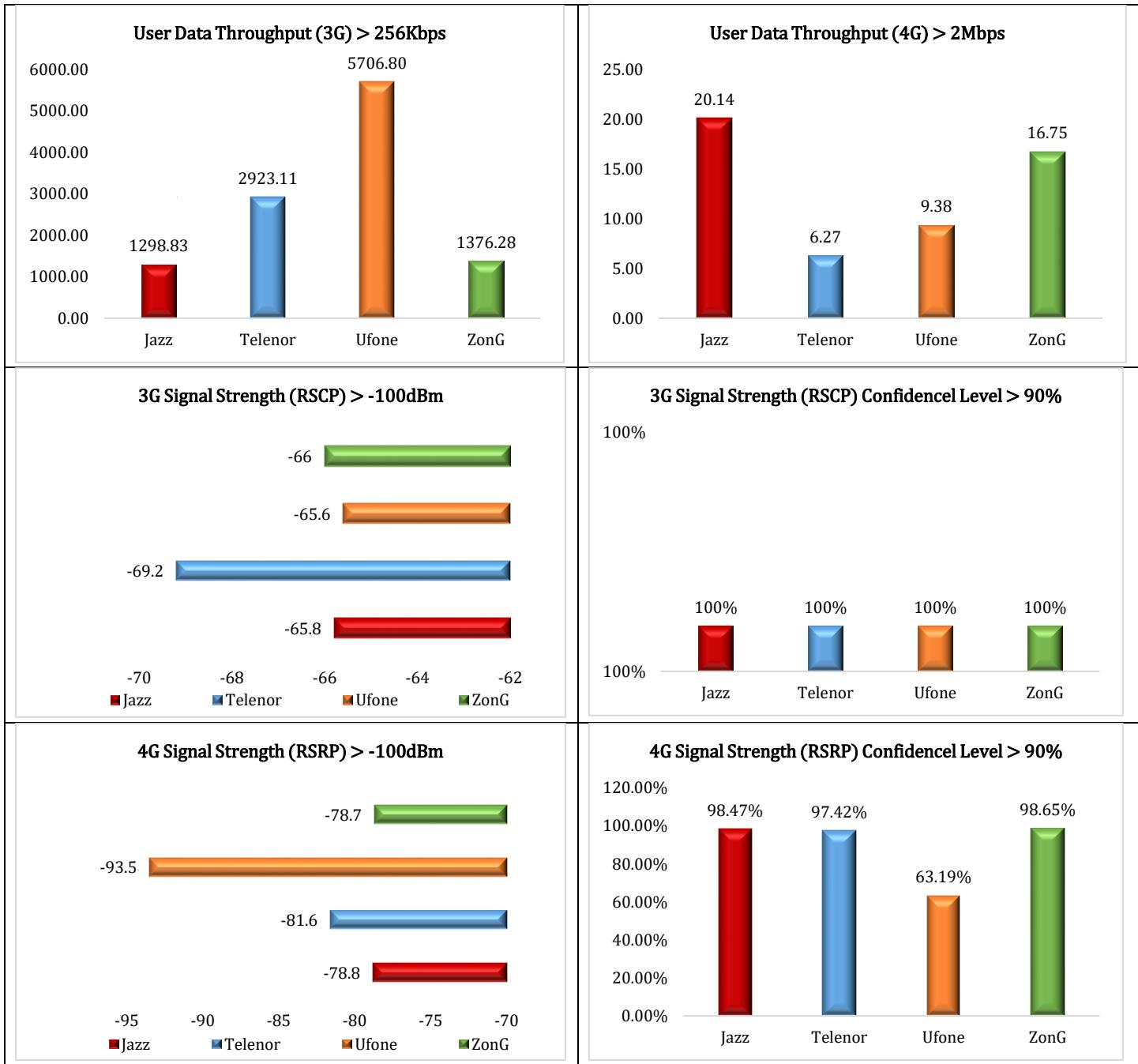
ZONG 3G NETWORK COVERAGE – KOTRI



## QUALITY OF SERVICE SURVEY RESULTS – KOTRI

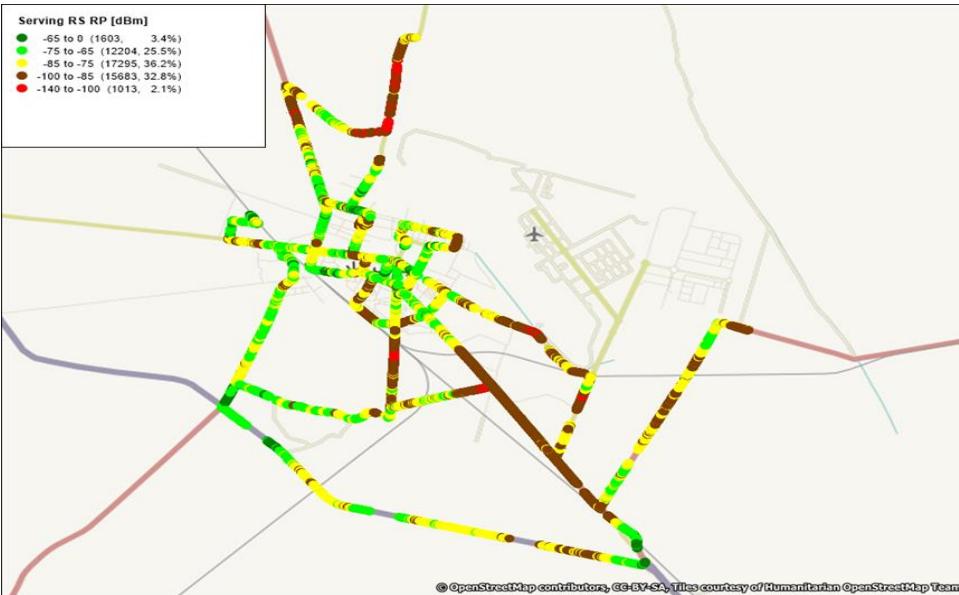


## QUALITY OF SERVICE SURVEY RESULTS – KOTRI

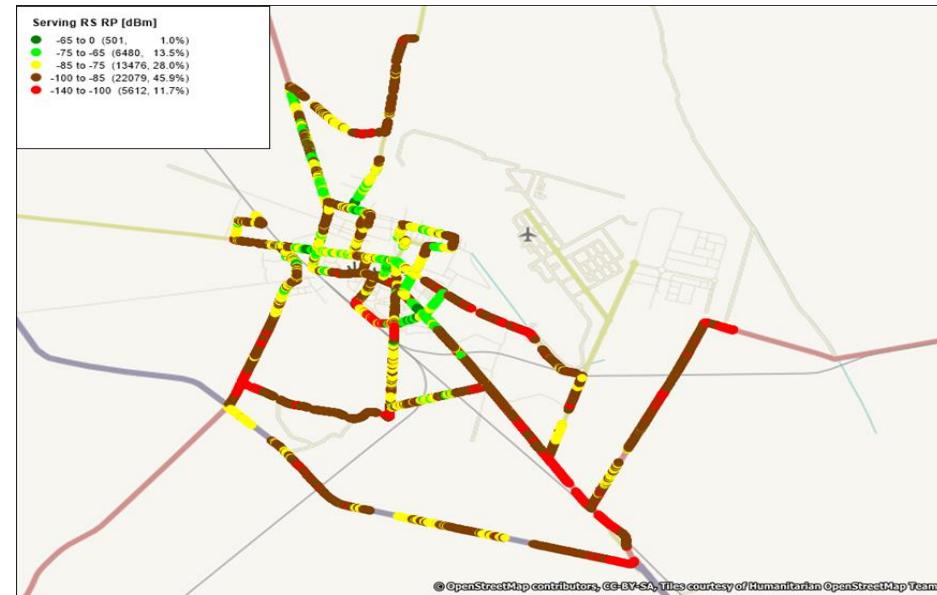


## 4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

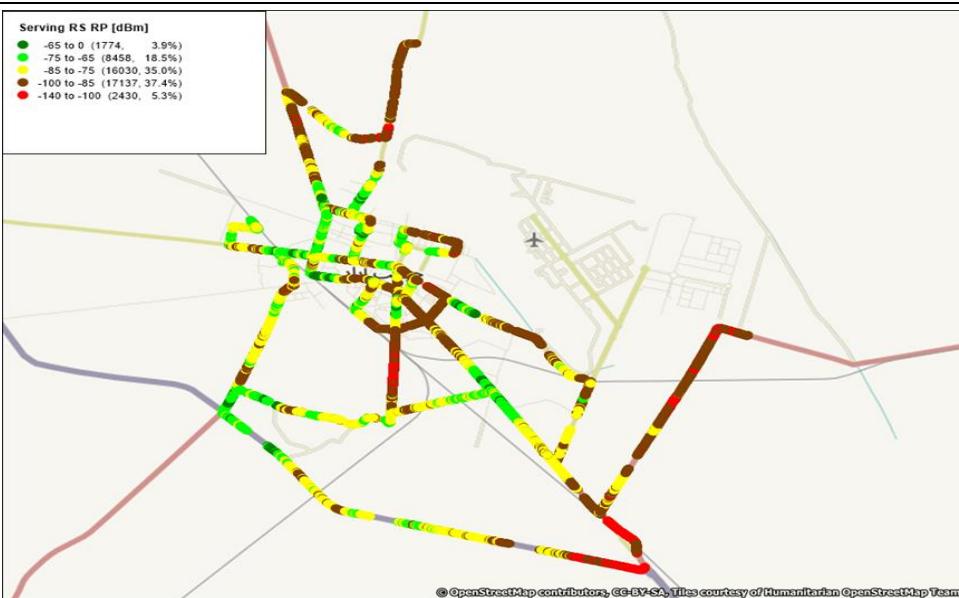
JAZZ 4G NETWORK COVERAGE – JACOBABAD



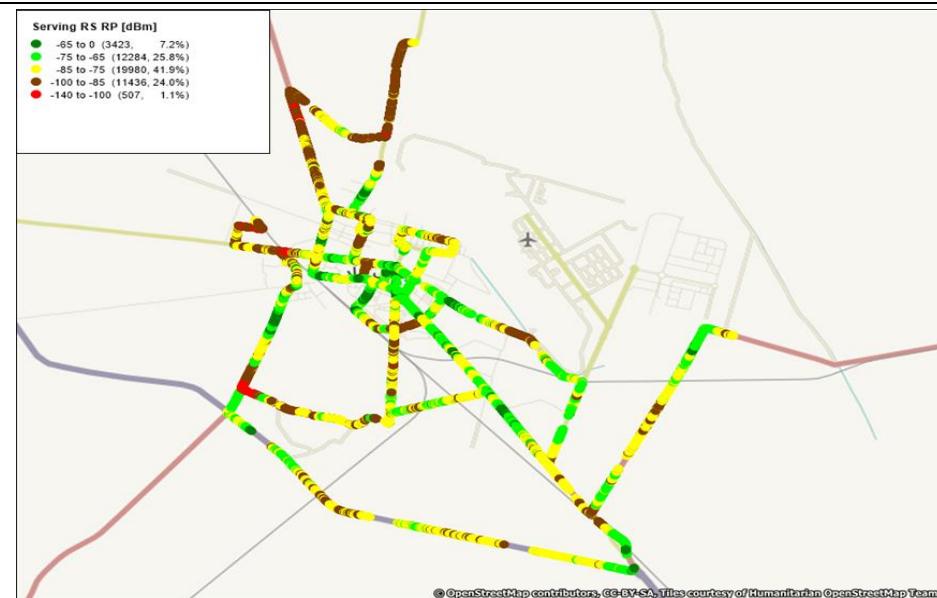
TELENOR 4G NETWORK COVERAGE – JACOBABAD



UFONE 4G NETWORK COVERAGE – JACOBABAD

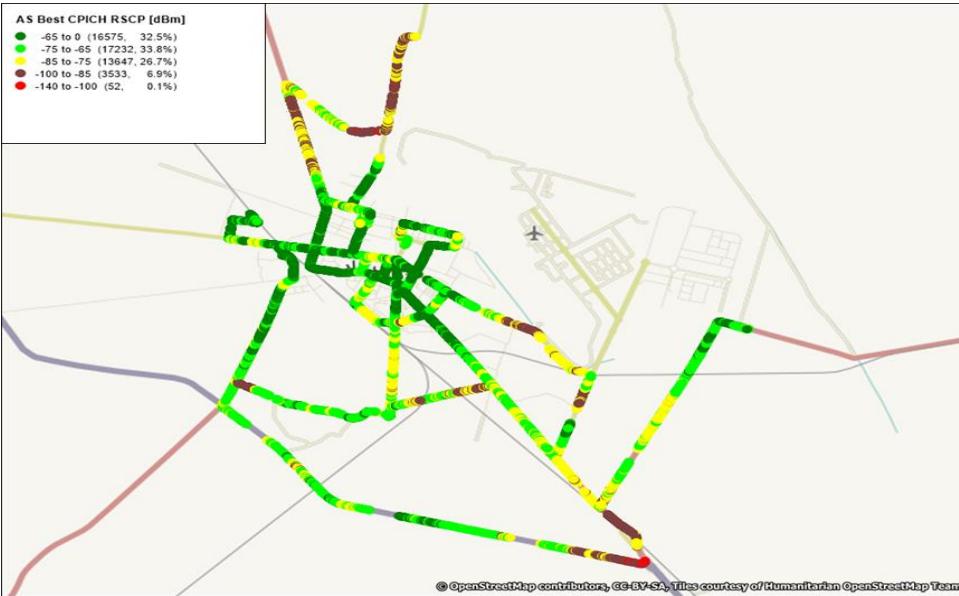


ZONG 4G NETWORK COVERAGE – JACOBABAD

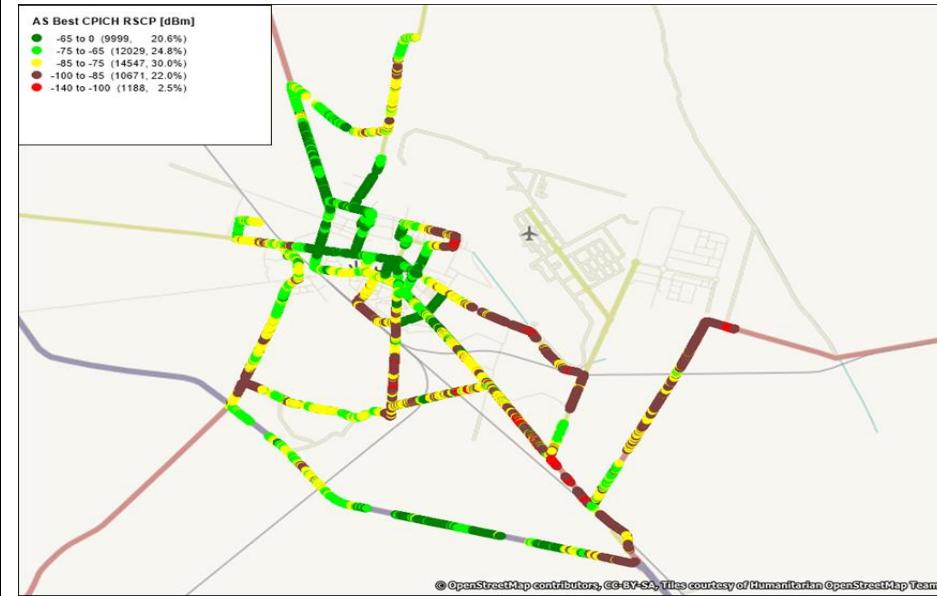


## 3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

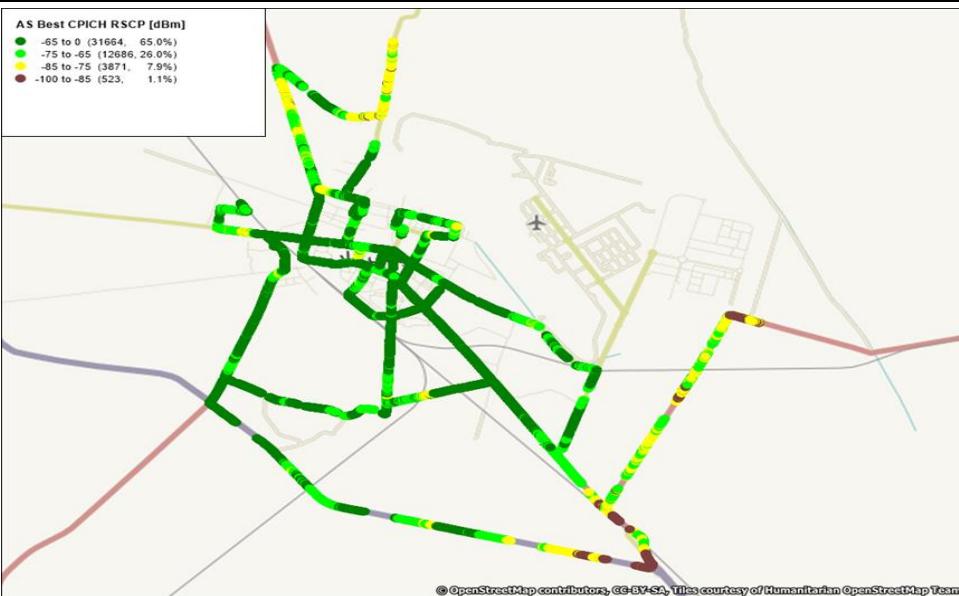
JAZZ 3G NETWORK COVERAGE – JACOBABAD



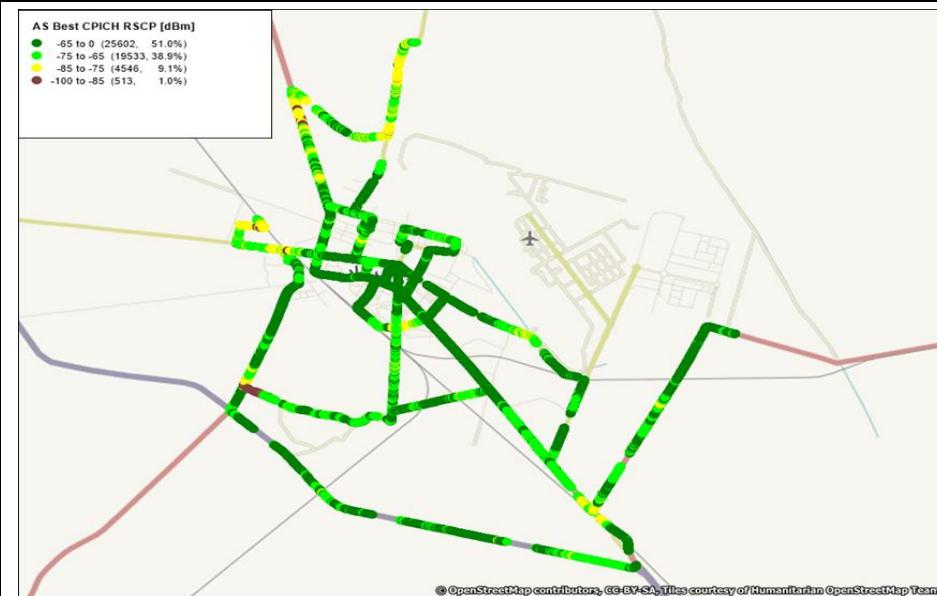
TELENOR 3G NETWORK COVERAGE – JACOBABAD



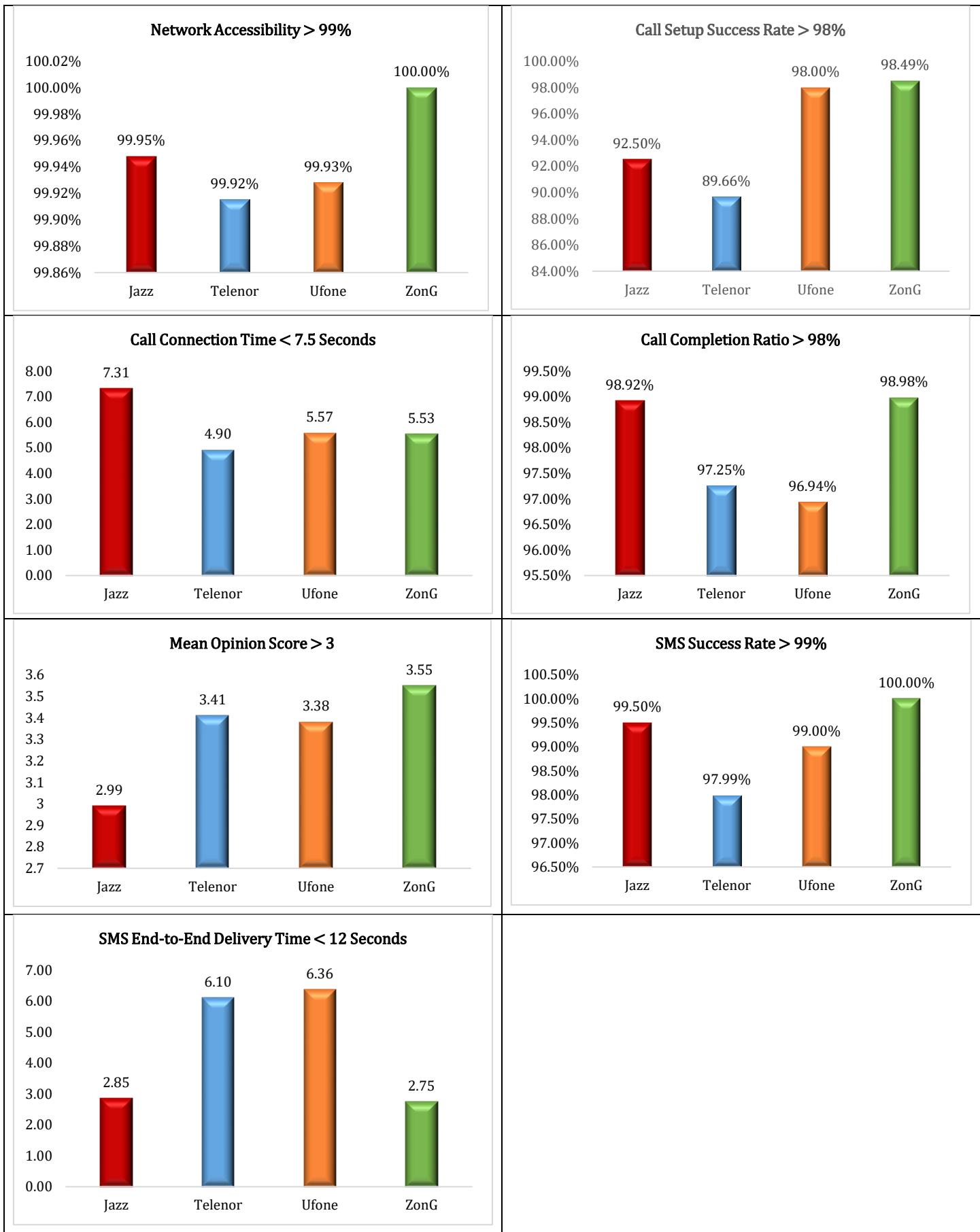
UFONE 3G NETWORK COVERAGE – JACOBABAD



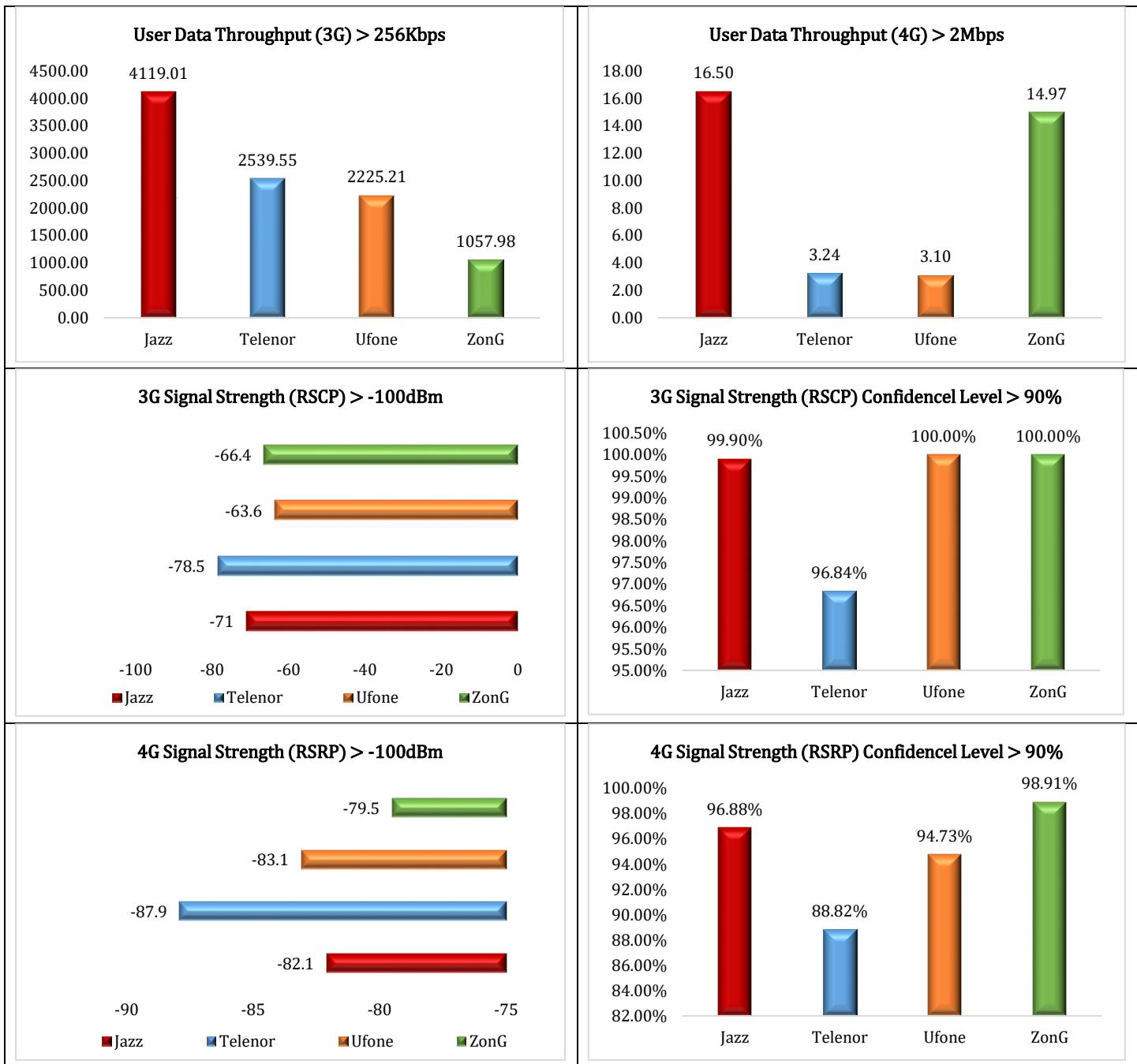
ZONG 3G NETWORK COVERAGE – JACOBABAD



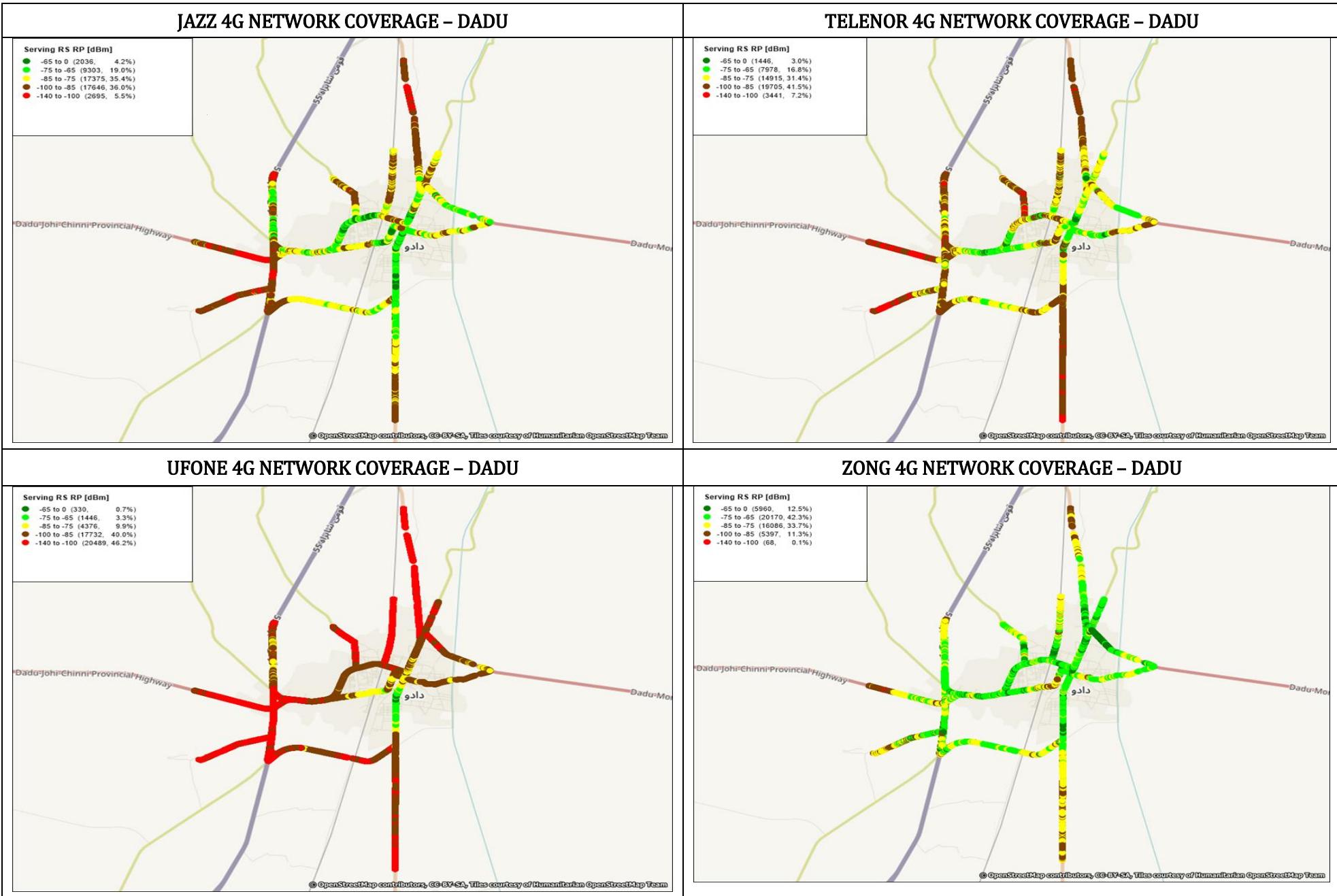
## QUALITY OF SERVICE SURVEY RESULTS – JACOBABAD



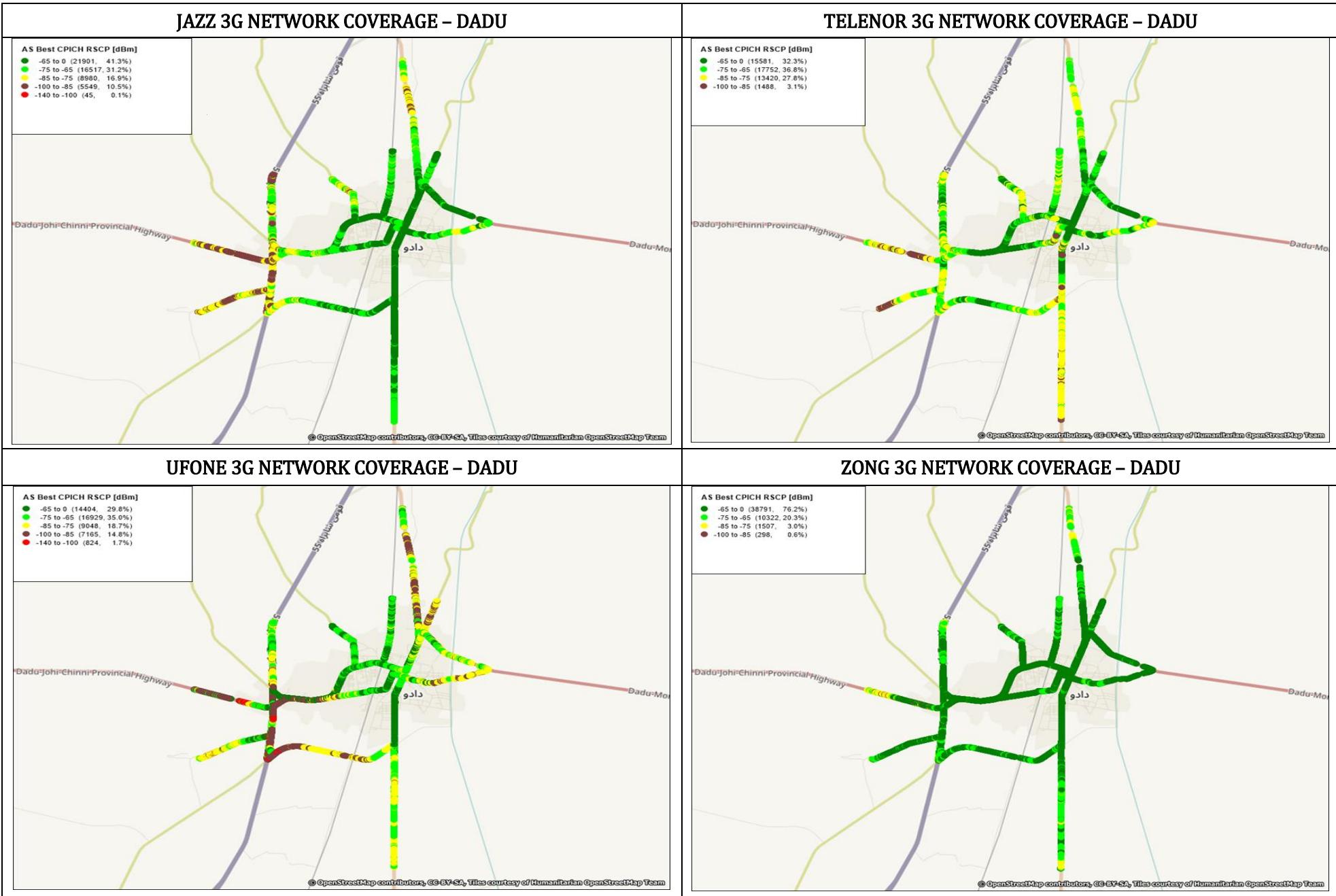
## QUALITY OF SERVICE SURVEY RESULTS – JACOBABAD



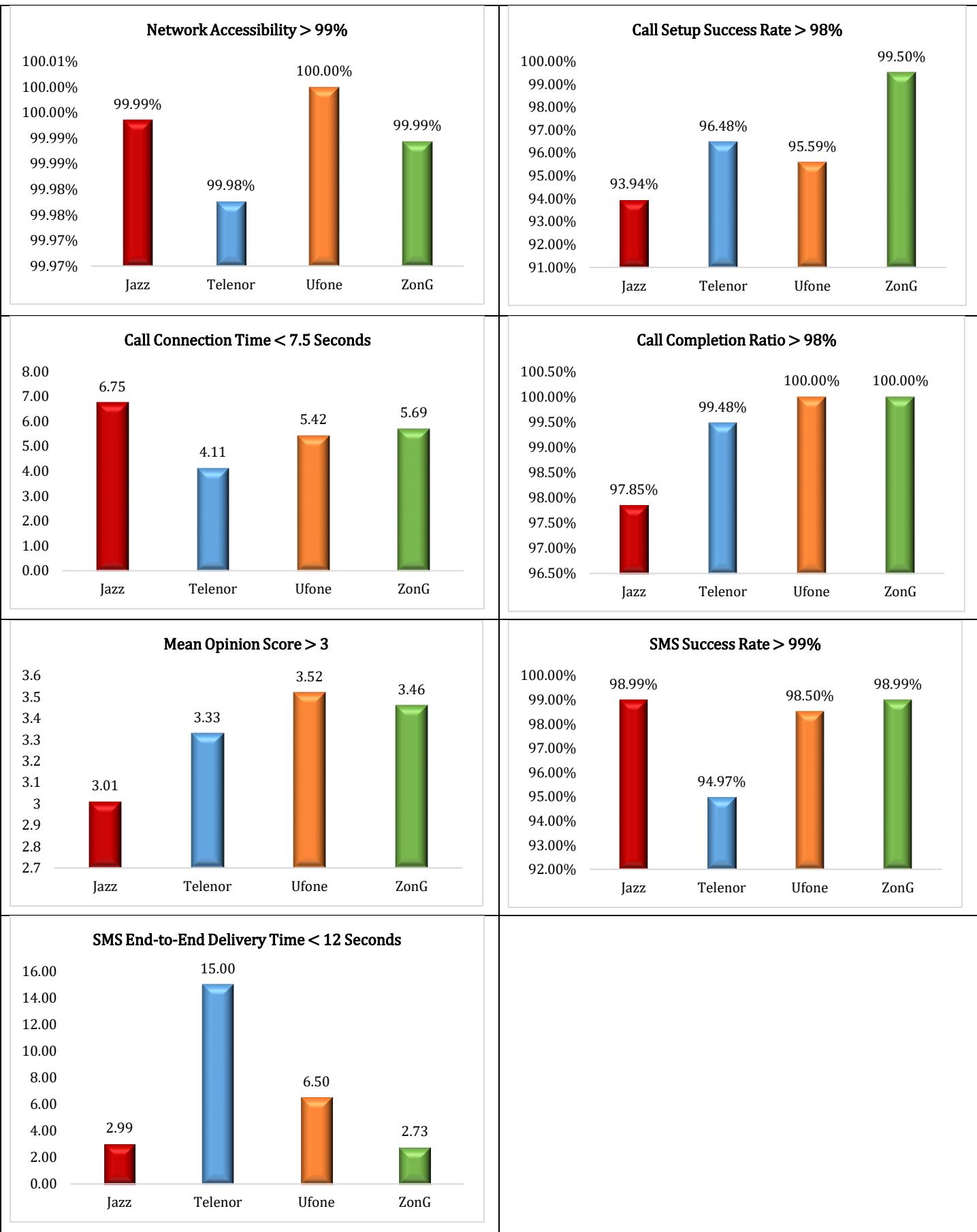
## 4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)



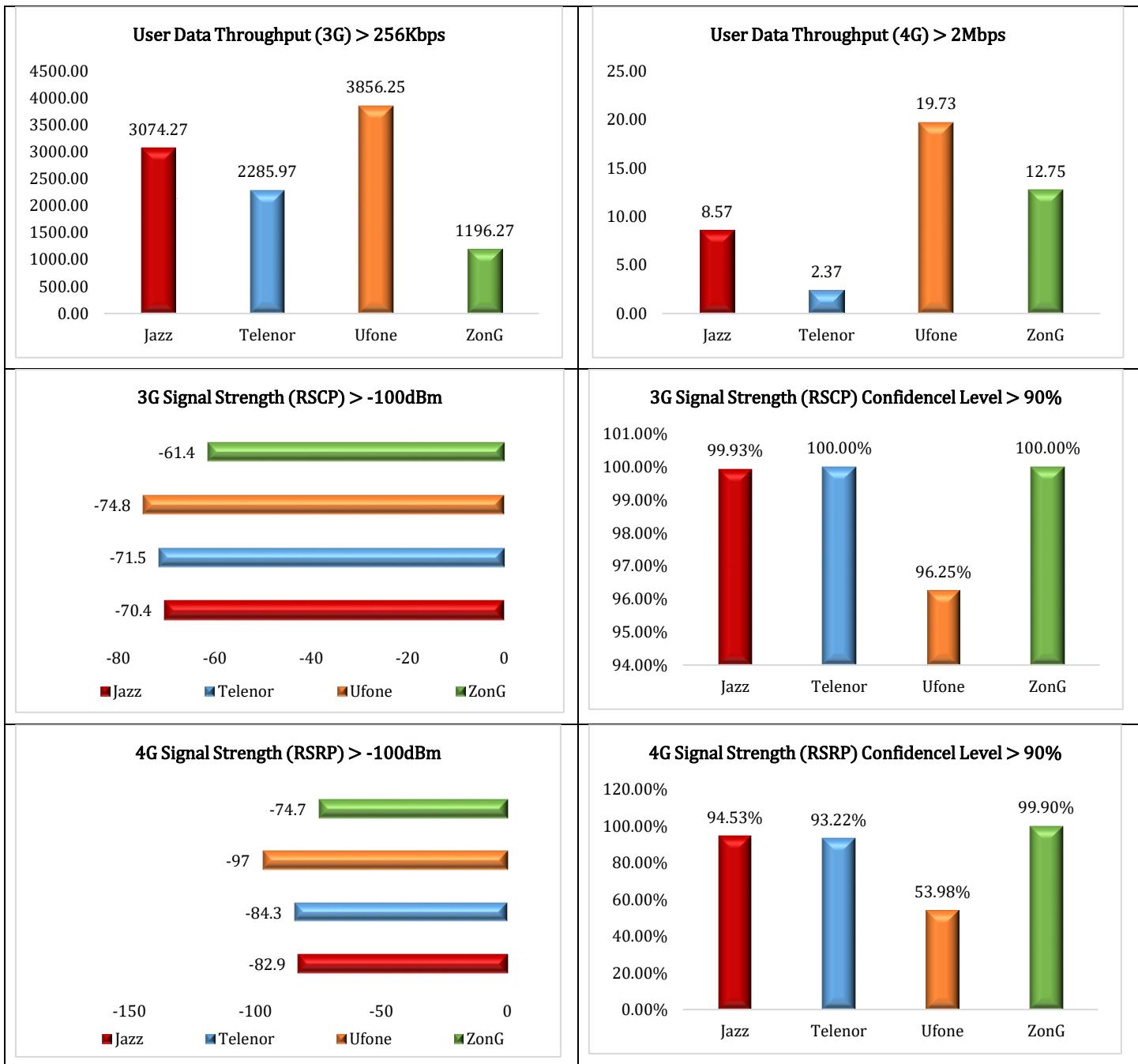
## 3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)



## QUALITY OF SERVICE SURVEY RESULTS – DADU

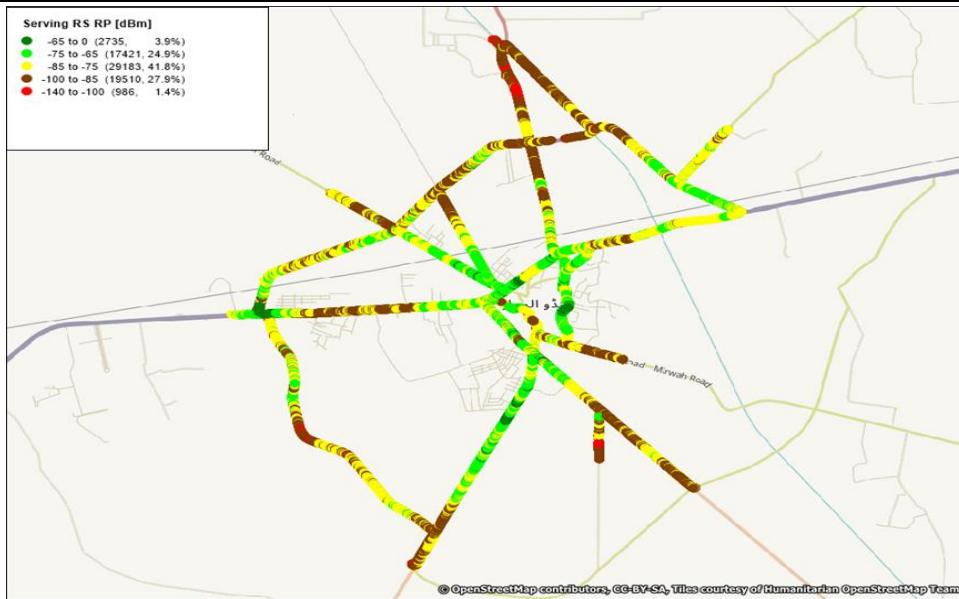


## QUALITY OF SERVICE SURVEY RESULTS – DADU

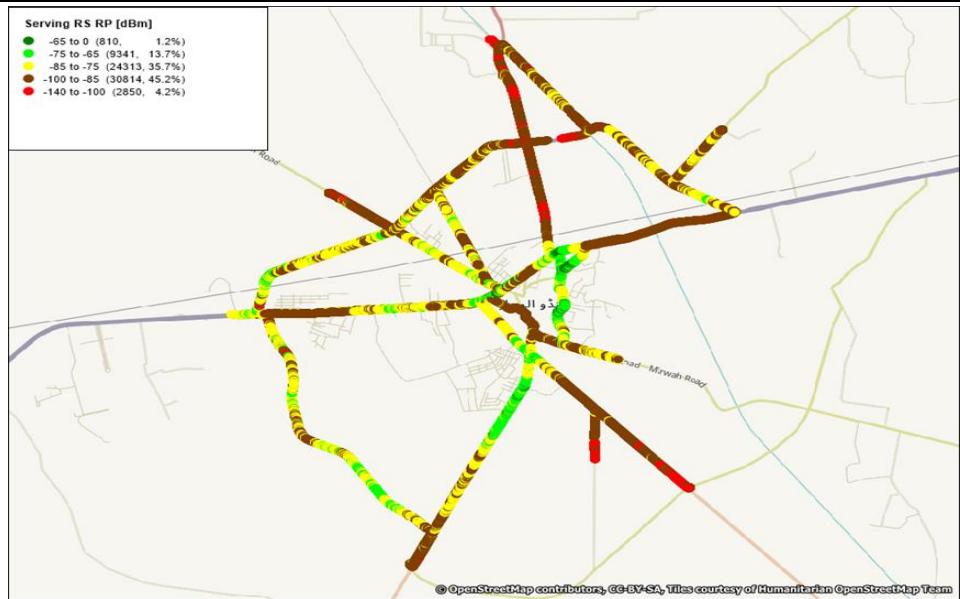


## 4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

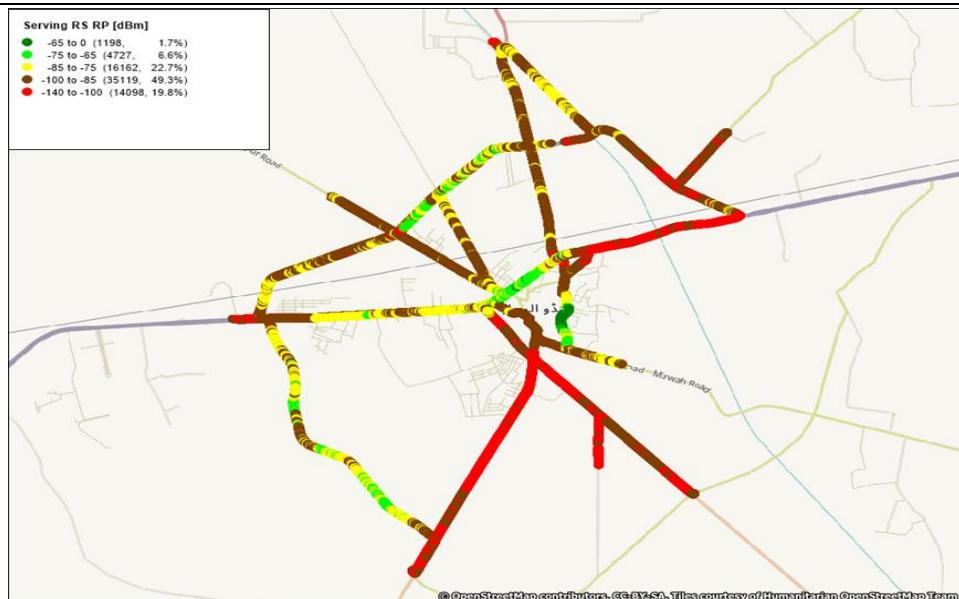
JAZZ 4G NETWORK COVERAGE – TANDO ALLAH YAR



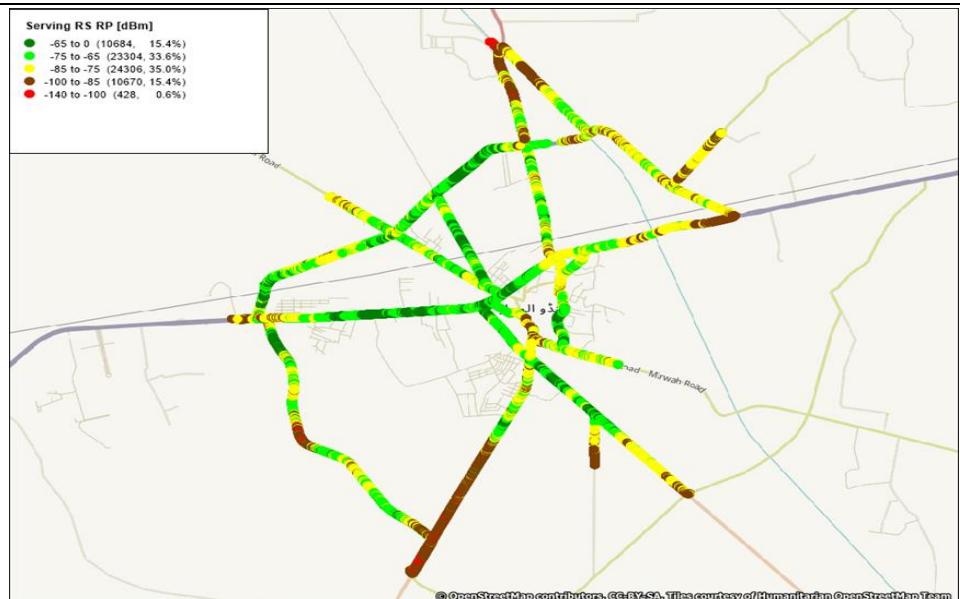
TELENOR 4G NETWORK COVERAGE – TANDO ALLAH YAR



UFONE 4G NETWORK COVERAGE – TANDO ALLAH YAR

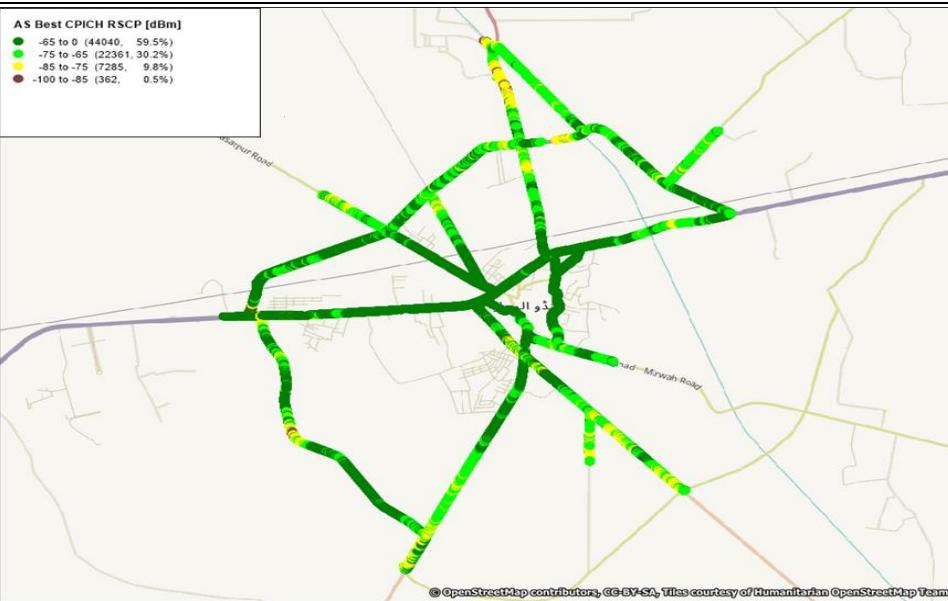


ZONG 4G NETWORK COVERAGE – TANDO ALLAH YAR

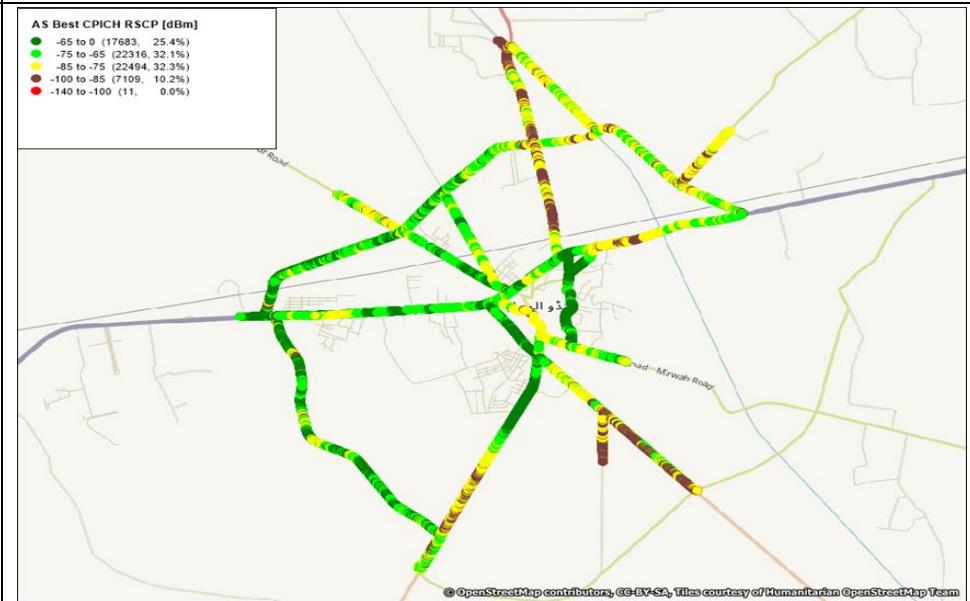


## 3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

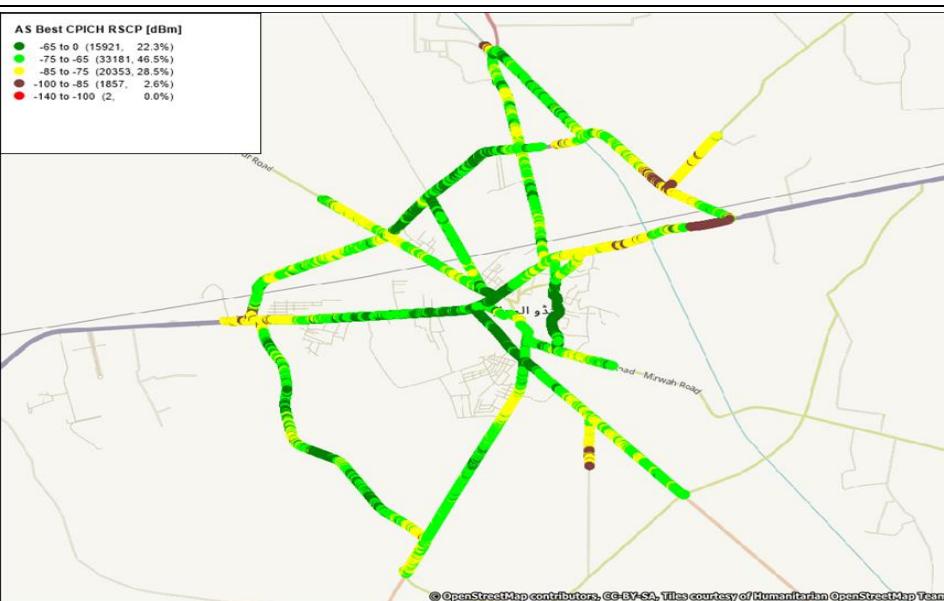
JAZZ 3G NETWORK COVERAGE – TANDO ALLAH YAR



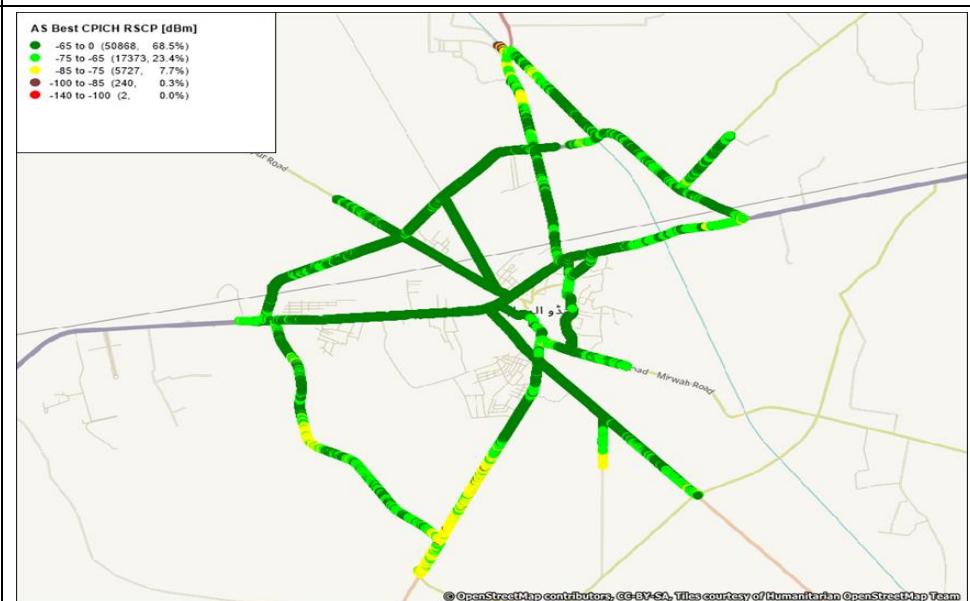
TELENOR 3G NETWORK COVERAGE – TANDO ALLAH YAR



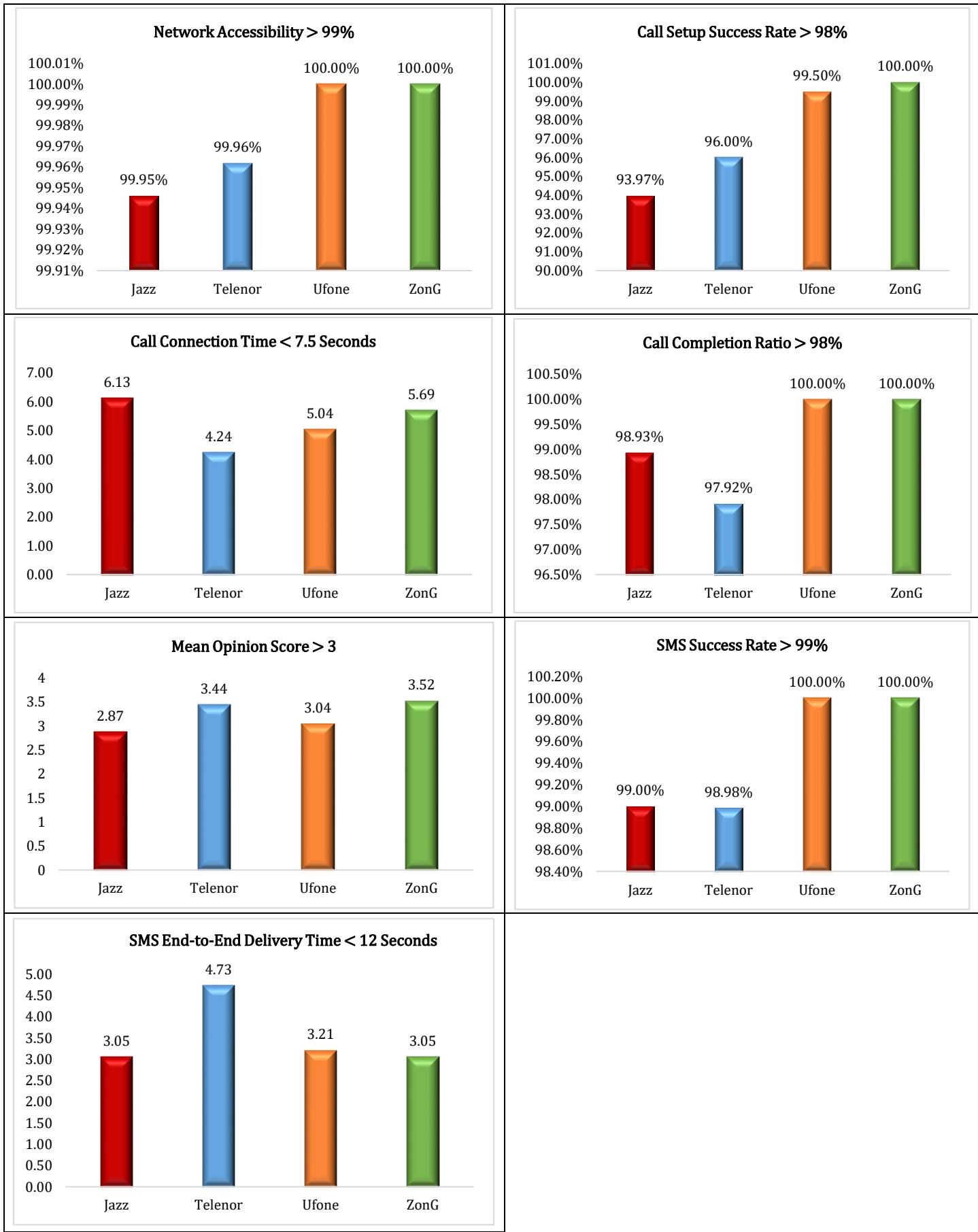
UFONE 3G NETWORK COVERAGE – TANDO ALLAH YAR



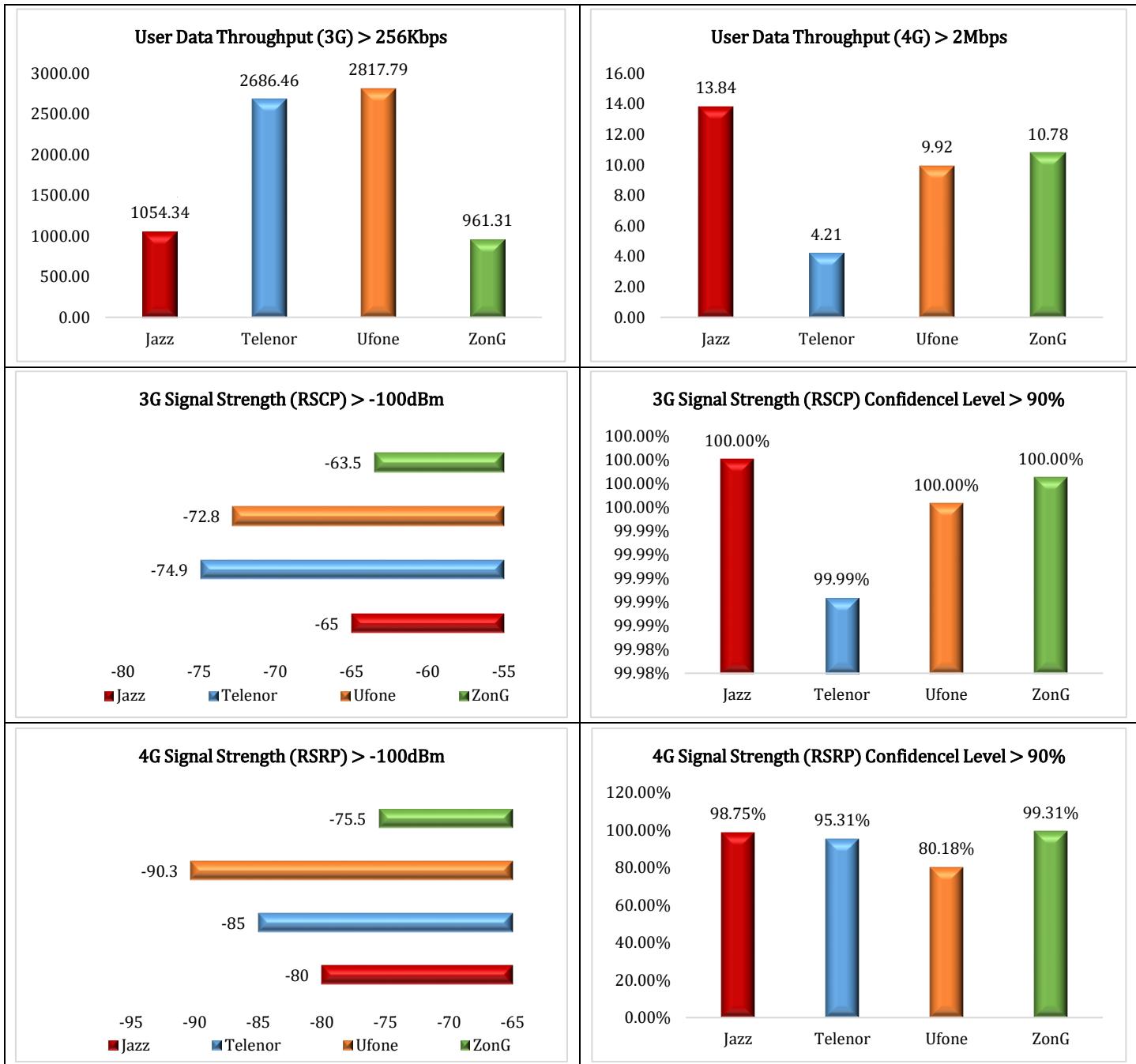
ZONG 3G NETWORK COVERAGE – TANDO ALLAH YAR



## QUALITY OF SERVICE SURVEY RESULTS – TANDO ALLAH YAR



## QUALITY OF SERVICE SURVEY RESULTS – TANDO ALLAH YAR

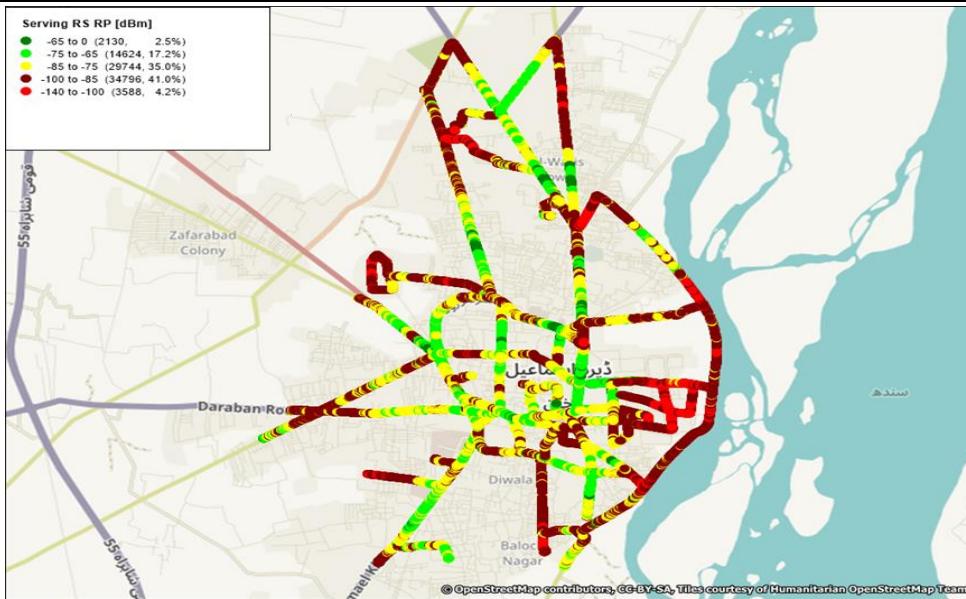


**ANNEX – C**

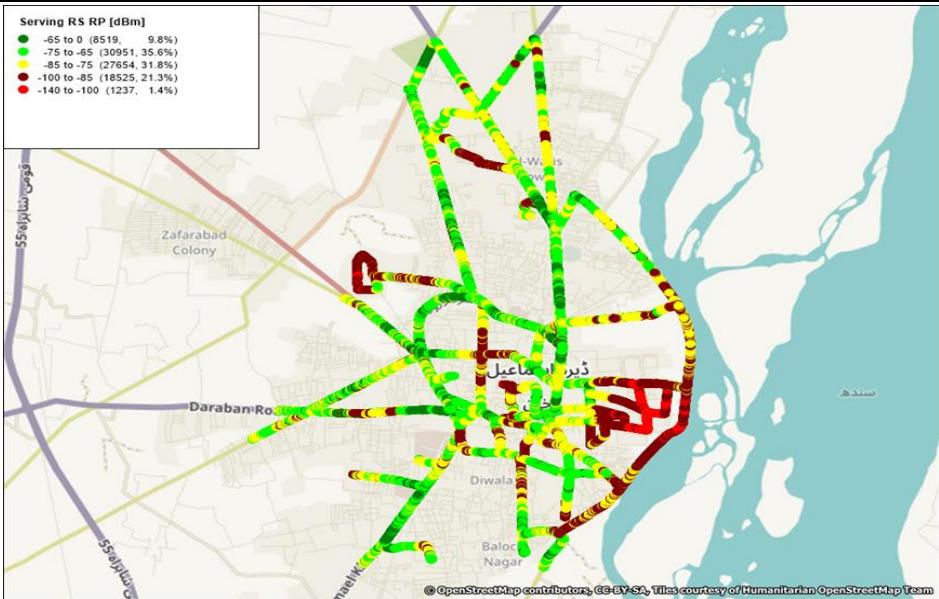
**KHYBER PAKHTUNKHWA**

## 4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

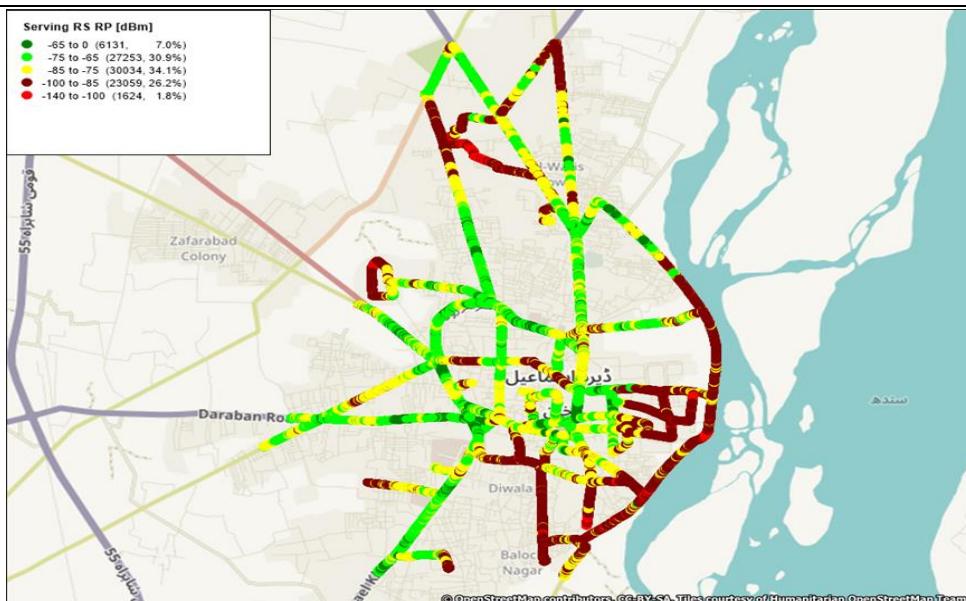
JAZZ 4G NETWORK COVERAGE – DI KHAN



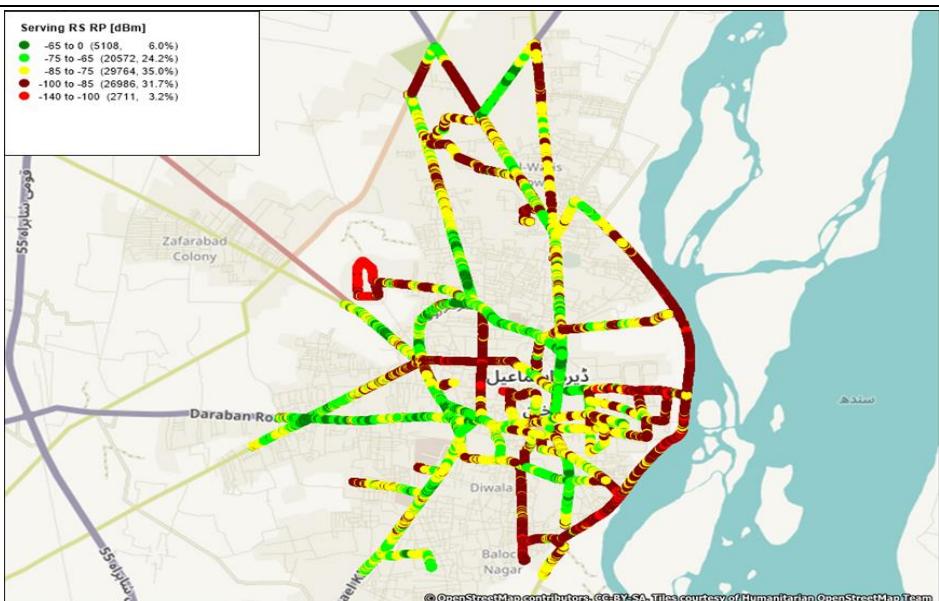
TELENOR 4G NETWORK COVERAGE – DI KHAN



UFONE 4G NETWORK COVERAGE – DI KHAN

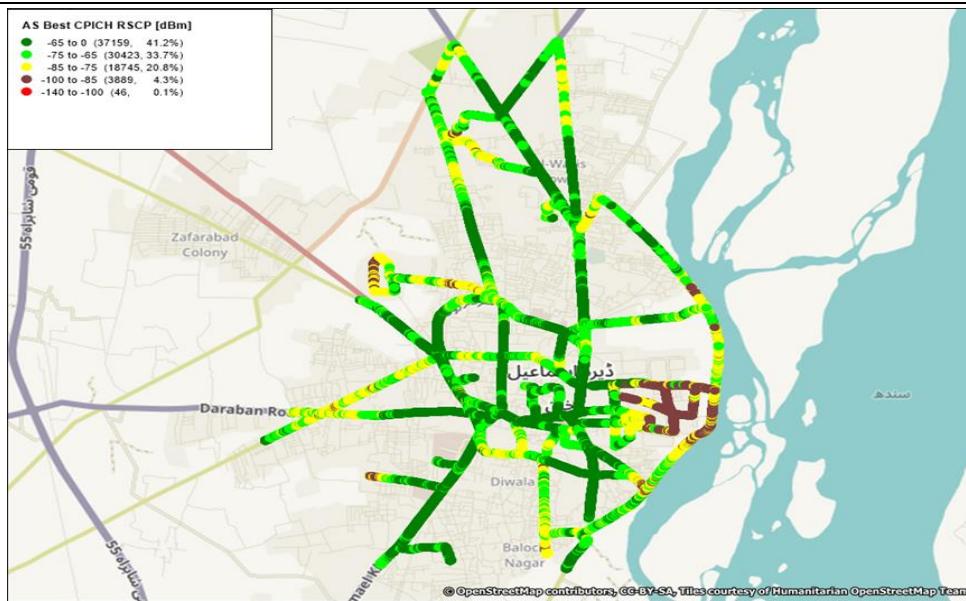


ZONG 4G NETWORK COVERAGE – DI KHAN

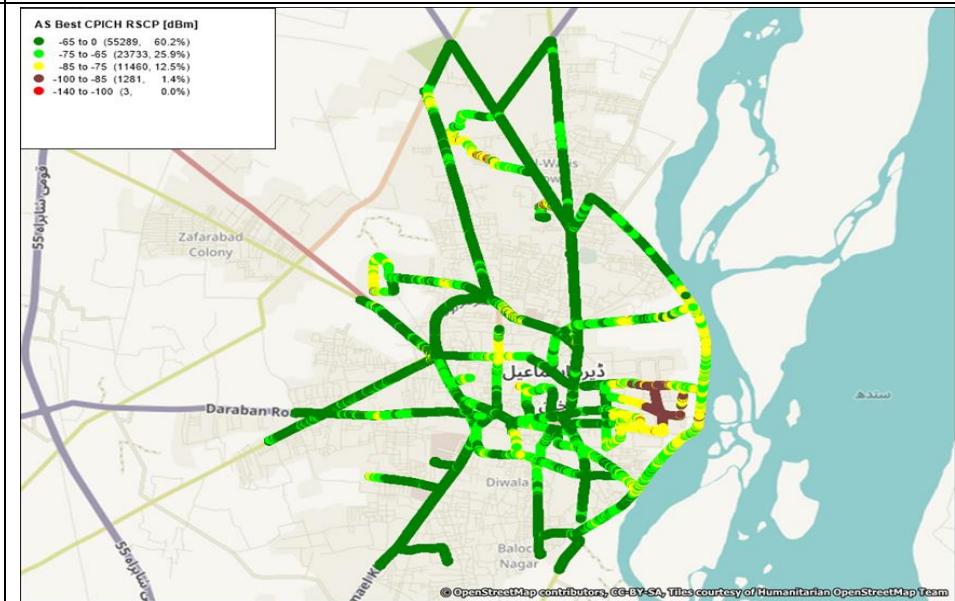


## 3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

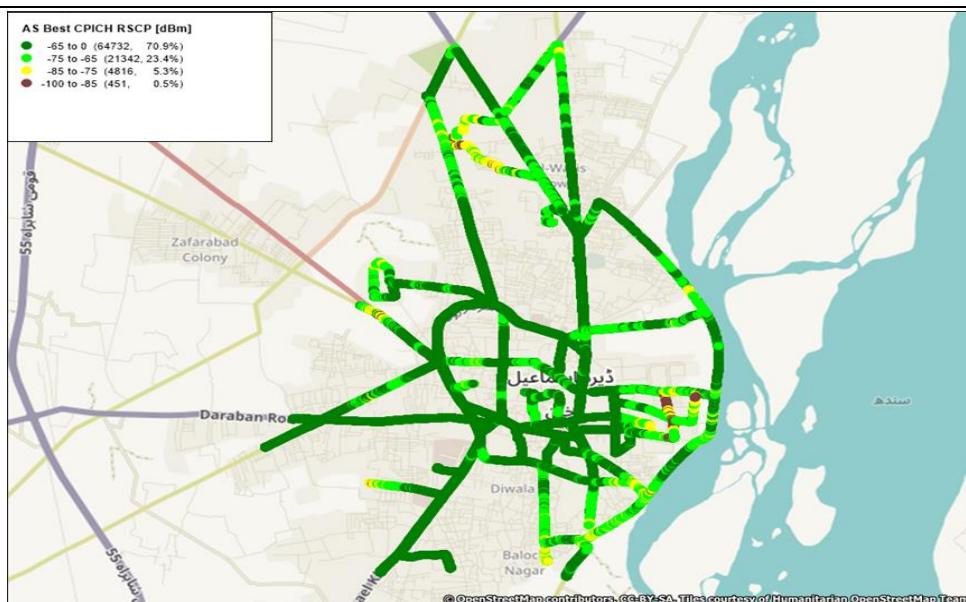
JAZZ 3G NETWORK COVERAGE – DI KHAN



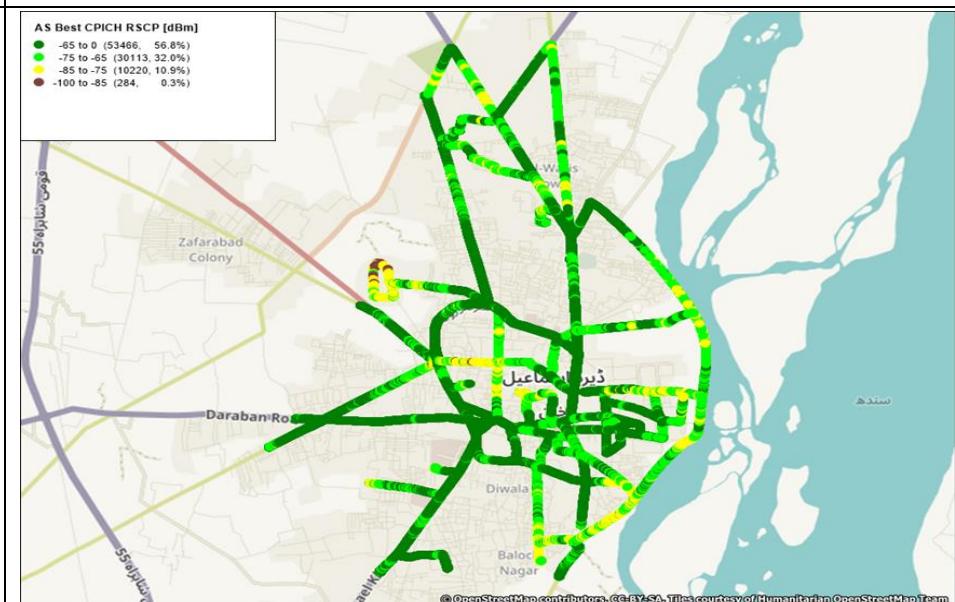
TELENOR 3G NETWORK COVERAGE – DI KHAN



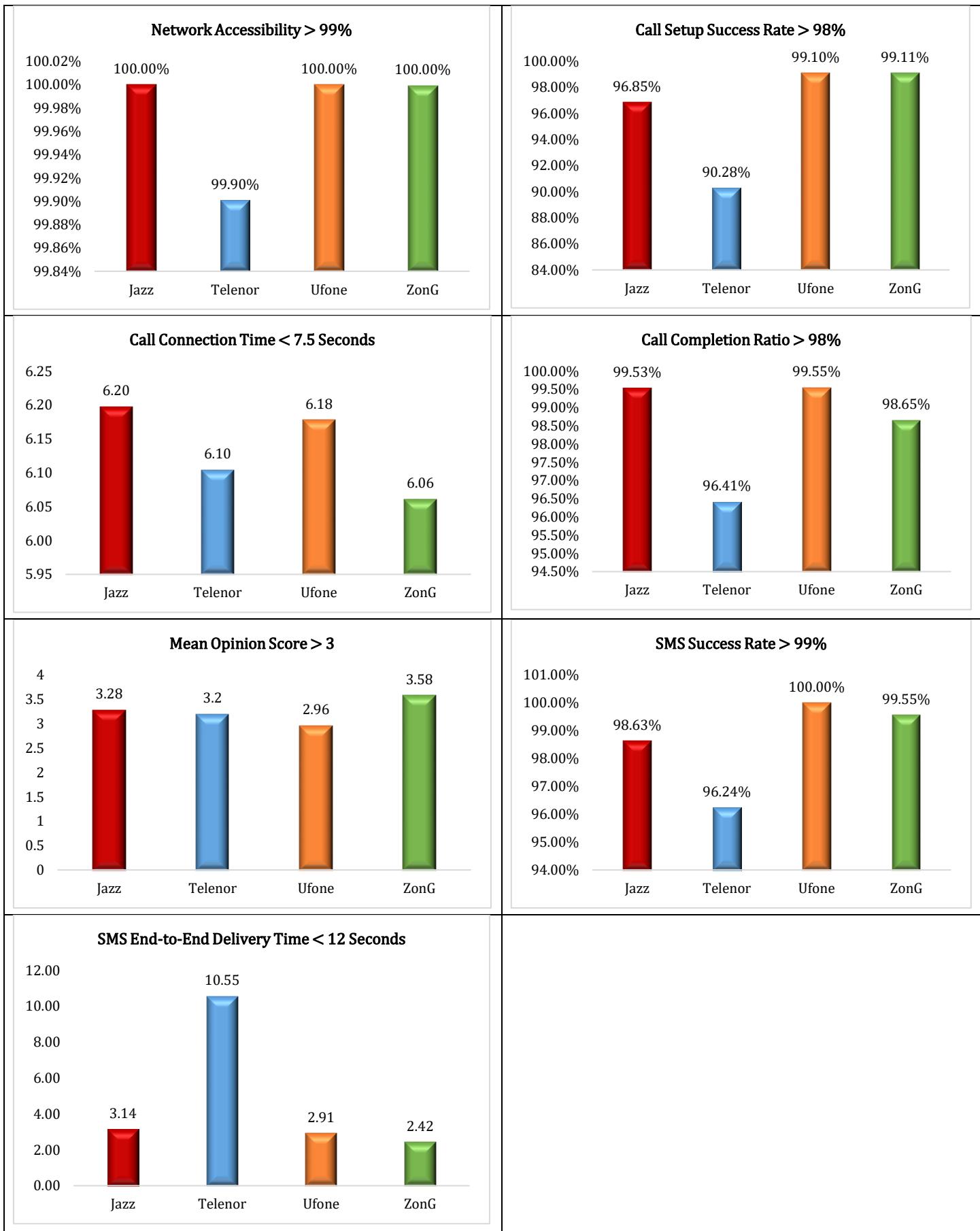
UFONE 3G NETWORK COVERAGE – DI KHAN



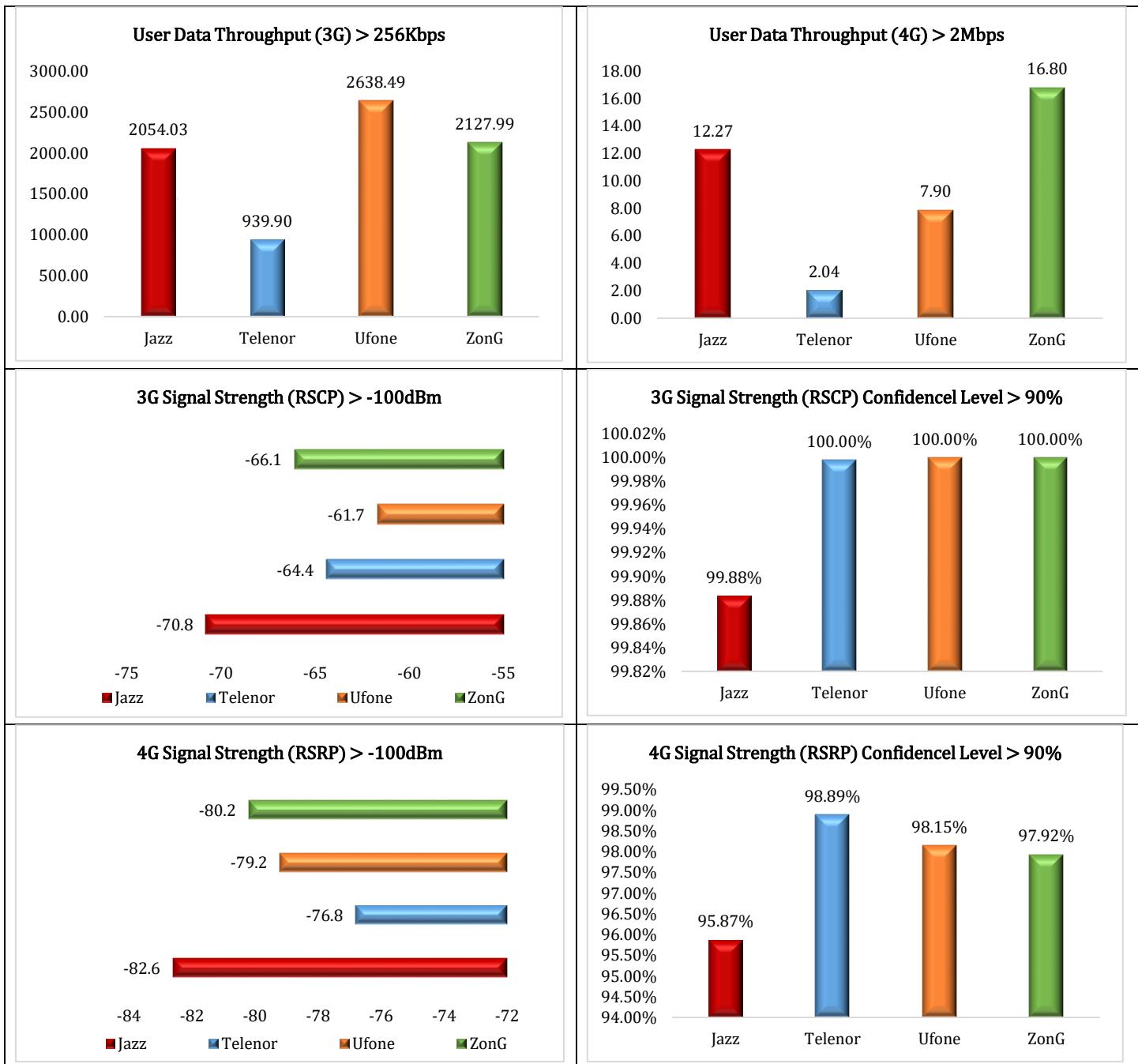
ZONG 3G NETWORK COVERAGE – DI KHAN



## QUALITY OF SERVICE SURVEY RESULTS – DI KHAN



## QUALITY OF SERVICE SURVEY RESULTS – DI KHAN

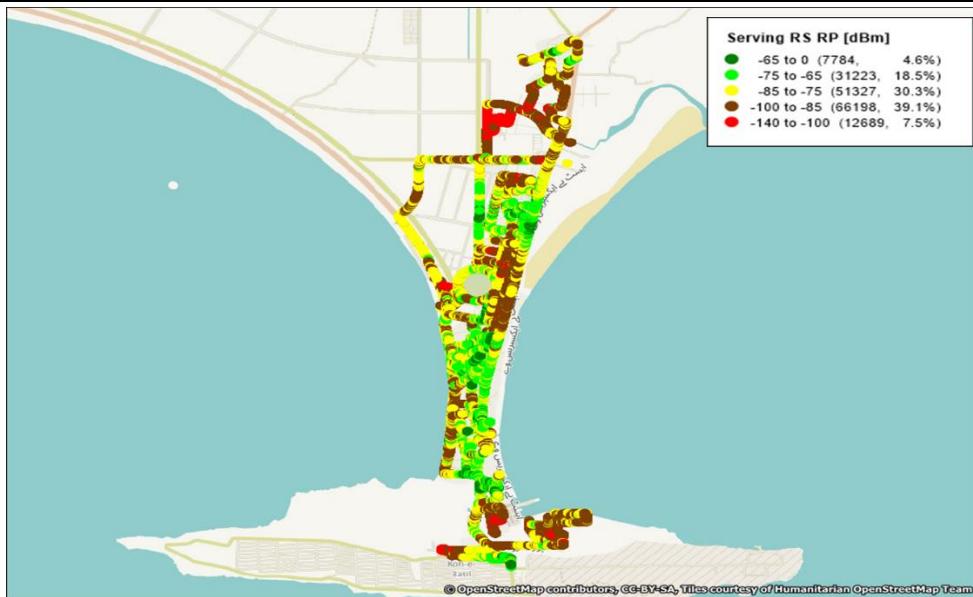


## **ANNEX – D**

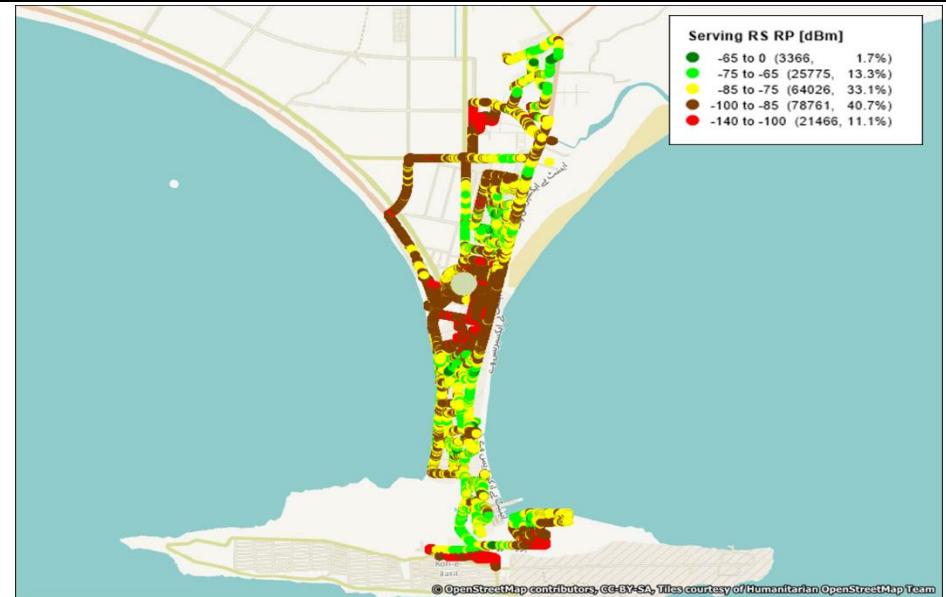
# **BALOCHISTAN**

## 4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

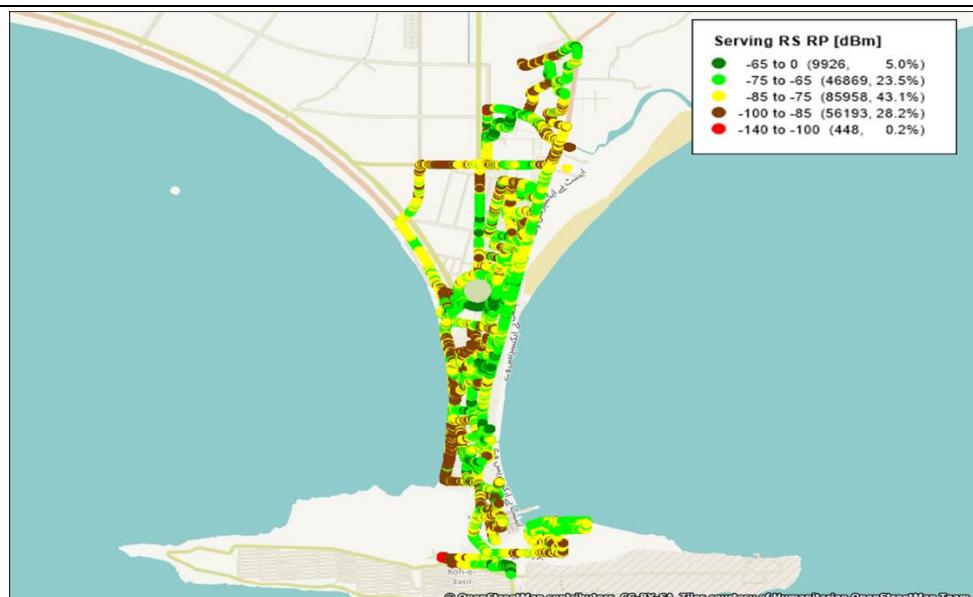
JAZZ 4G NETWORK COVERAGE – GAWADAR



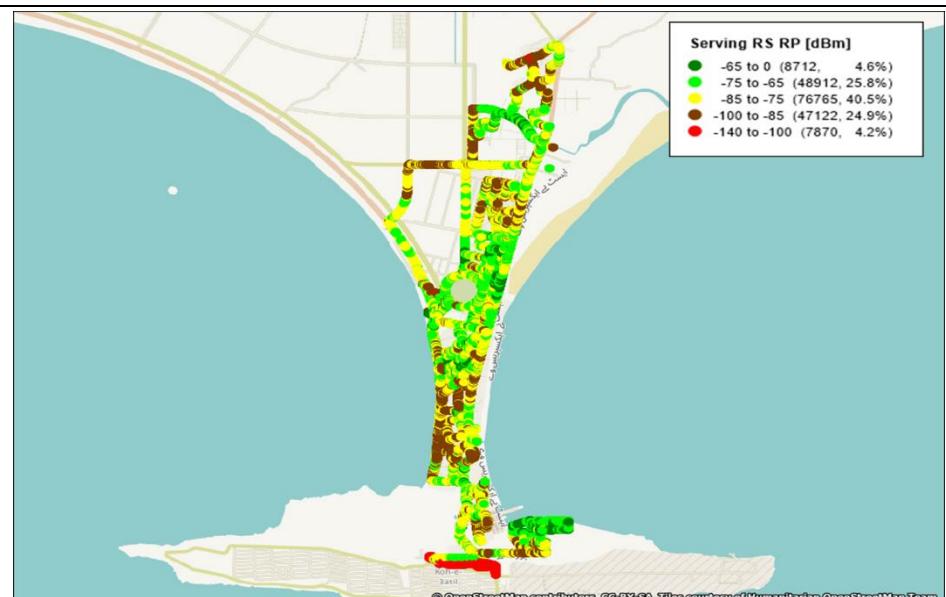
TELENOR 4G NETWORK COVERAGE – GAWADAR



UFONE 4G NETWORK COVERAGE – GAWADAR

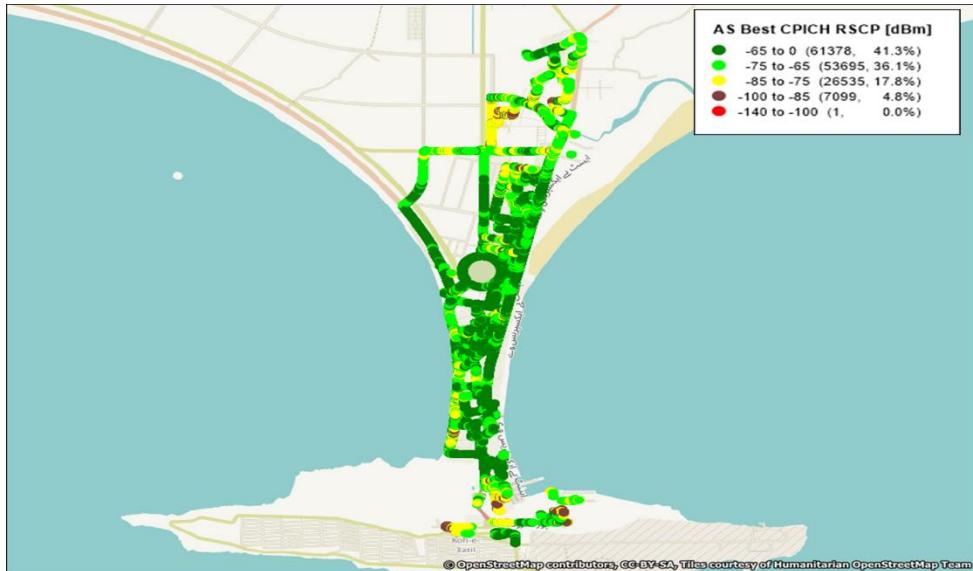


ZONG 4G NETWORK COVERAGE – GAWADAR

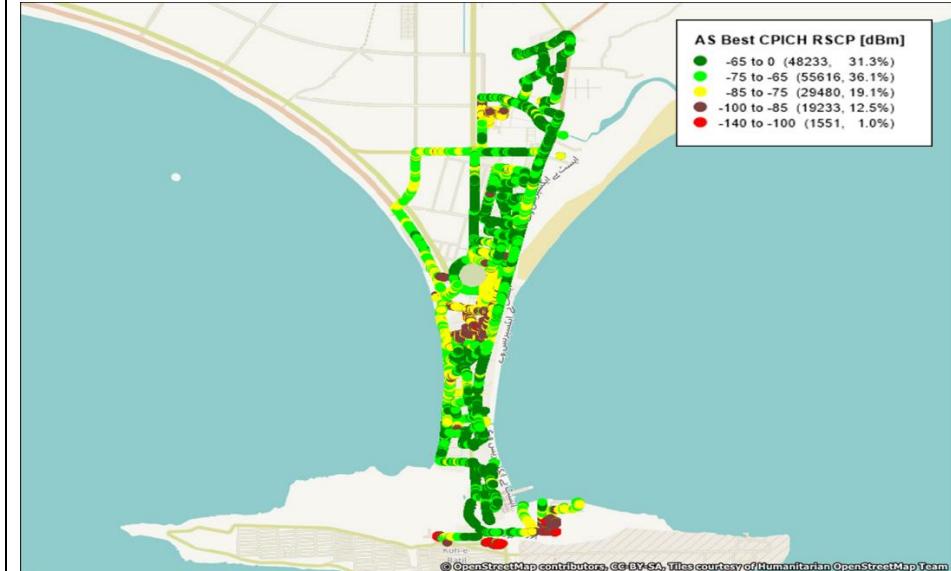


## 3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

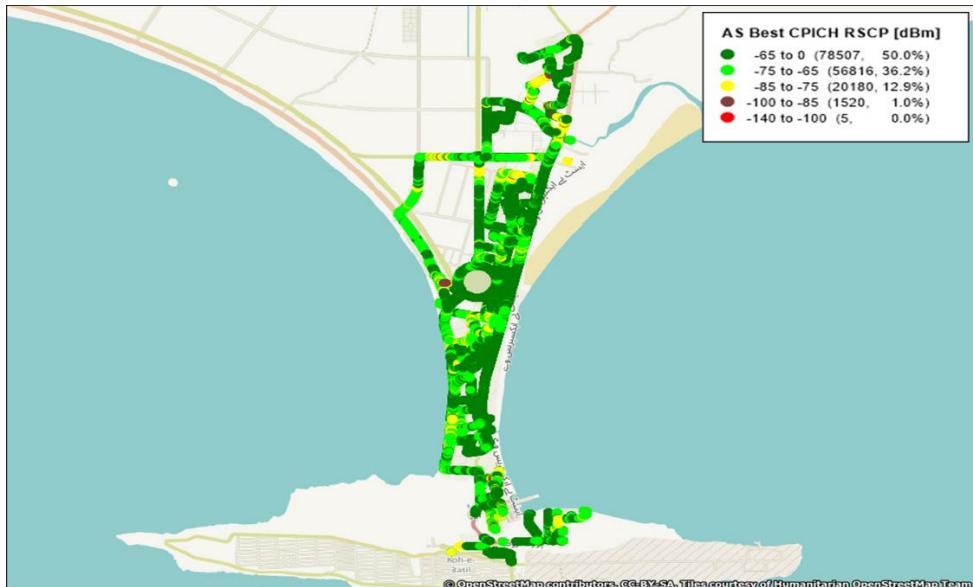
JAZZ 3G NETWORK COVERAGE – GAWADAR



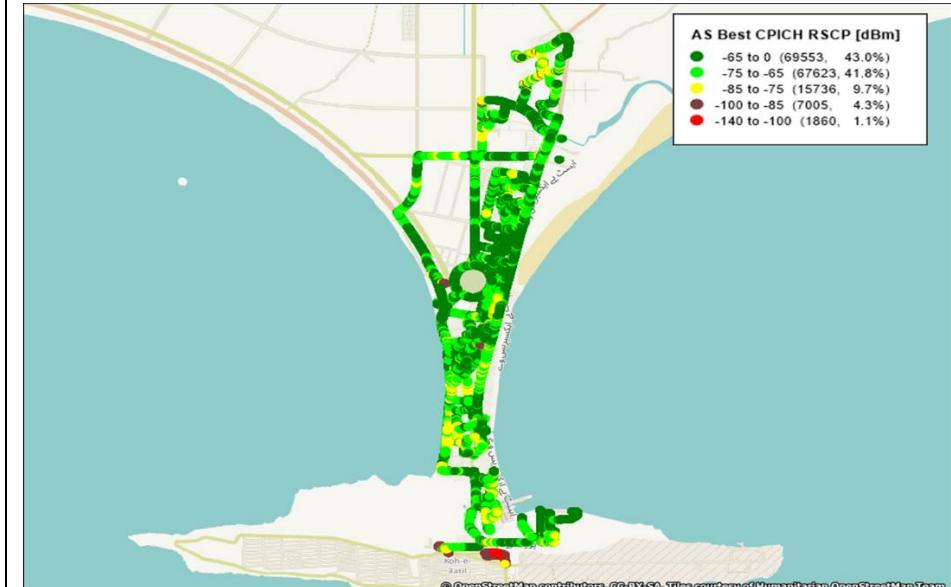
TELENOR 3G NETWORK COVERAGE – GAWADAR



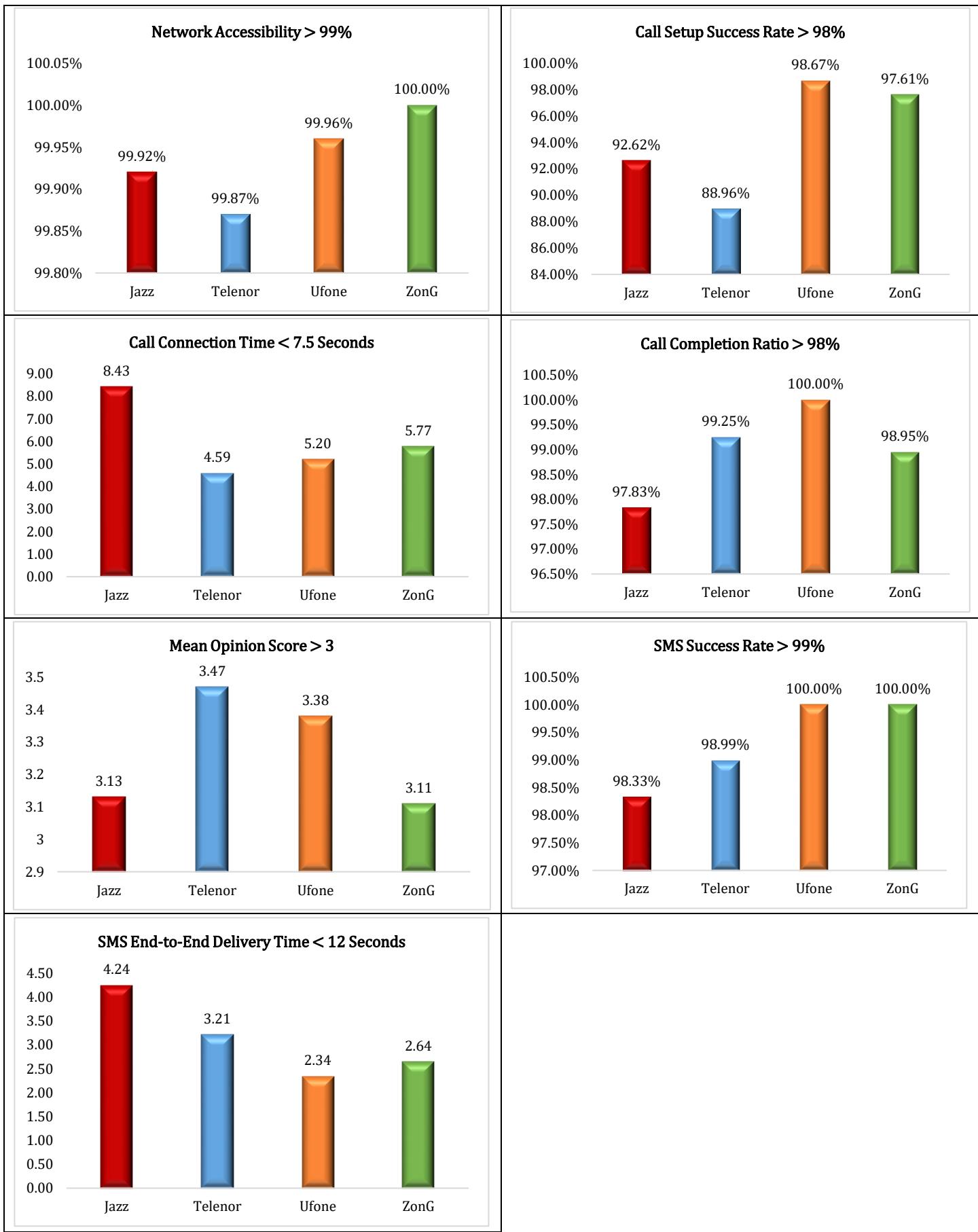
UFONE 3G NETWORK COVERAGE – GAWADAR



ZONG 3G NETWORK COVERAGE – GAWADAR



## QUALITY OF SERVICE SURVEY RESULTS – GAWADAR



## QUALITY OF SERVICE SURVEY RESULTS – GAWADAR

