

INDEPENDENT QUALITY OF SERVICE SURVEY IN CITIES OF PAKISTAN

SECOND QUARTER 2021

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 Twelve (12) different cities of Punjab, Khyber Pakhtunkhwa (KPK) and Balochistan. The name of cities along with survey dates are shown in **Table 1.1: QoS Survey Cities & Dates:**

S. #	Province	City	Survey Dates
1.	Punjab	Gujranwala	24 ~ 27 May 2021
2.		Kasur	31 st May ~ 4 th June 2021
3.		Faisalabad	7 th ~ 11 th June 2021
4.		Rahim Yar Khan	21 st ~ 25 th June 2021
5.	Khyber Pakhtunkhwa	Kohat	24 ~ 27 May 2021
6.		Swabi	31 st May ~ 4 th June 2021
7.		Haripur	7 th ~ 11 th June 2021
8.		Abbottabad	14 th ~ 18 th June 2021
9.	Balochistan	Pishin	24 ~ 27 May 2021
10.		Sibbi	31 st May ~ 4 th June 2021
11.		Noshki	7 th ~ 11 th June 2021
12.		Khuzdar	14 th ~ 18 th June 2021

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 of cities. During Voice Calls and SMS Sessions, both A-Party and B-Party mobile handsets were kept in auto detect mode, whereas, in case of Data Sessions the mobile handset were locked in 4G/LTE and 3G modes. The Voice Calls and SMS Samples were distributed as 70% ON-NET and 30% OFF-NET.

MOBILE NETWORK COVERAGE

3.1. Mobile Network Signal Strength is measured in decibels (dBm). Signal Strength can range from approximately -30 dBm upto -120 dBm. The closer that number is to zero, the stronger the signal. In general, anything better than -100 decibel is considered a usable signal. The different ranges of signal strength and its effects on broadband speed and sustainability can be seen in **Table3.1: Signal Strength and Broadband Speed.**

S. #	Signal Strength (dBm)	Signal Strength
1.	-65 to 0	Strong Signal with Maximum Data Speed
2.	-75 to -65	Strong Signal with Good Data Speed
3.	-85 to -75	Fair, Useful & Reliable Data Speed is Attainable
4.	-100 to -85	Marginal Data Speed with Possibility of Drop-Out
5.	-140 to -100	Performance will Drop Drastically

Table3.1: Signal Strength and Broadband Speed

3.2. **4G / LTE SIGNAL STRENGTH.** During the survey, 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 analysis of recorded signal strength revealed following:

- a. **COMPLIANCE.** The cities where CMOs remained compliant are mentioned in **Table 3.2: Compliance of 4G/LTE (RSRP) Signal Strength.**

S. #	Operator	Cities	
		Count	Names
1.	Jazz	9	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Haripur, Abbottabad, Pishin & Sibbi
2.	Telenor	11	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Swabi, Abbottabad, Pishin, Sibbi, Noshki & Khuzdar
3.	Ufone	8	Gujranwala, Rahim Yar Khan, Kohat, Haripur, Abbottabad, Pishin, Noshki & Khuzdar
4.	ZonG	12	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Swabi, Haripur, Abbottabad, Pishin, Sibbi, Noshki & Khuzdar

Table 3.2: Compliance of 4G/LTE (RSRP) Signal Strength

- b. **NON-COMPLIANCE.** The cities where CMOs remained non-compliant are mentioned in **Table 3.3: Non-Compliance of 4G/LTE (RSRP) Signal Strength.**

S. #	Operator	Cities	
		Count	Names
1.	Jazz	2	Swabi & Khuzdar
2.	Telenor	1	Haripur
3.	Ufone	2	Faisalabad & Swabi

Table 3.3: Non-Compliance of 4G/LTE (RSRP) Signal Strength

3.3. **3G SIGNAL STRENGTH.** During the survey 3G 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 analysis of recorded signal strength revealed following:

- a. **COMPLIANCE.** The cities where CMOs remained compliant are mentioned in **Table 3.4: Compliance of 3G (RSCP) Signal Strength.**

S. #	Operator	Cities	
		Count	Names
1.	Jazz	9	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Swabi Haripur, Abbottabad & Pishin
2.	Telenor	11	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Swabi, Haripur, Abbottabad, Pishin, Noshki & Khuzdar
3.	Ufone	11	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Swabi, Haripur, Abbottabad, Pishin, Noshki & Khuzdar
4.	ZonG	11	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Swabi, Haripur, Abbottabad, Pishin, Noshki & Khuzdar

Table 3.4: Compliance of 3G (RSCP) Signal Strength

- b. **NON-COMPLIANCE.** The cities where CMOs remained non-compliant are mentioned in **Table 3.5: Non-Compliance of 3G (RSCP) Signal Strength.**

S. #.	Operator	Cities	
		Count	Names
1.	Ufone	1	Sibbi

Table 3.5: Non-Compliance of 3G (RSCP) Signal Strength

MOBILE BROADBAND SERVICE

- 4.1. **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 analysis of Survey Results of User Data Throughput revealed following:

- a. **COMPLIANCE.** The cities where CMOs remained compliant are mentioned in **Table 4.1: Compliance of 4G User Data Throughput > 2 Mbps.**

S. #.	Operator	Cities	
		Count	Names
1.	Jazz	11	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Swabi, Haripur, Abbottabad, Pishin, Sibbi & Khuzdar
2.	Telenor	10	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Swabi, Haripur, Abbottabad & Sibbi
3.	Ufone	6	Gujranwala, Faisalabad, Rahim Yar Khan, Swabi, Haripur, & Abbottabad
4.	ZonG	11	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Swabi, Haripur, Abbottabad, Pishin, Sibbi & Khuzdar

Table 4.1: Compliance of 4G User Data Throughput > 2Mbps

- b. **NON-COMPLIANCE.** The cities where CMOs remained non-compliant are mentioned in **Table 4.2: Non-Compliance of 4G User Data Throughput > 2Mbps.**

S. #.	Operator	Cities	
		Count	Names
1.	Telenor	2	Noshki & Khuzdar
2.	Ufone	4	Kohat, Pishin, Noshki & Khuzdar
3.	ZonG	1	Noshki

Table 4.2: Non-Compliance of 4G User Data Throughput > 2Mbps

- 4.2. **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 analysis of Survey Results of User Data Throughput revealed following:

- a. **COMPLIANCE.** The cities where CMOs remained compliant are mentioned in **Table 4.3: Compliance of 3G User Data Throughput > 256 Kbps.**

S. #.	Operator	Cities	
		Count	Names
1.	Jazz	9	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Swabi, Haripur, Abbottabad & Pishin
2.	Telenor	11	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Swabi, Haripur, Abbottabad, Pishin, Noshki & Khuzdar
3.	Ufone	12	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Swabi, Haripur, Abbottabad, Pishin, Sibbi, Noshki & Khuzdar

S. #.	Operator	Cities	
		Count	Names
4.	ZonG	10	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Swabi, Haripur, Abbottabad, Pishin & Khuzdar

Table 4.3: Compliance of 3G User Data Throughput > 256 Kbps

- b. **NON-COMPLIANCE.** The cities where CMOs remained non-compliant are mentioned in **Table 4.4: Non-Compliance of 3G User Data Throughput > 256 Kbps.**

S. #.	Operator	Cities	
		Count	Names
1.	ZonG	1	Noshki

Table 4.4: Non-Compliance of 3G User Data Throughput > 256 Kbps

VOICE SERVICE

5.1. 7 x QoS KPIs have been measured while testing voice services. The results of voice QoS KPIs are as under:

- a. **NETWORK ACCESSIBILITY.** The analysis of QoS KPI **Network Accessibility > 99%** in all surveyed cities revealed following:

- i. **COMPLIANCE.** The cities where CMOs remained compliant are mentioned in **Table 5.1: Compliance of Network Accessibility > 99%**

S. #.	Operator	Cities	
		Count	Names
1.	Jazz	11	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Swabi, Haripur, Abbottabad, Sibbi, Noshki & Khuzdar
2.	Telenor	11	Gujranwala, Kasur, Faisalabad, Kohat, Swabi, Haripur, Abbottabad, Pishin, Sibbi, Noshki & Khuzdar
3.	Ufone	11	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Swabi, Abbottabad, Pishin, Sibbi, Noshki & Khuzdar
4.	ZonG	12	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Swabi, Haripur, Abbottabad, Pishin, Sibbi, Noshki & Khuzdar

Table 5.1: Compliance of Network Accessibility > 99%

- ii. **NON-COMPLIANCE.** The cities where CMOs remained non-compliant are mentioned in **Table 5.2: Non-Compliance of Network Accessibility > 99%**

S. #.	Operator	Cities	
		Count	Names
1.	Jazz	1	Pishin
2.	Telenor	1	Rahim Yar Khan
3.	Ufone	1	Haripur

Table 5.2: Non-Compliance of Network Accessibility > 99%

- b. **SERVICE ACCESSIBILITY.** The analysis of QoS KPI **Service Accessibility of > 98%** in surveyed cities revealed following.

- i. **COMPLIANCE.** The cities where CMOs remained compliant are mentioned in **Table 5.3: Compliance of Service Accessibility > 98%**

S. #.	Operator	Cities	
		Count	Names
1.	Jazz	3	Kasur, Sibbi & Khuzdar
	Telenor	1	Kasur
2.	Ufone	4	Kasur, Faisalabad, Pishin & Noshki
3.	ZonG	5	Kasur, Faisalabad, Kohat, Sibbi & Noshki

Table 5.3: Compliance of Service Accessibility > 98%

- ii. **NON-COMPLIANCE.** The cities where CMOs remained non-compliant are mentioned in **Table 5.4: Non-Compliance of Service Accessibility > 98%.**

S. #.	Operator	Cities	
		Count	Names
1.	Jazz	9	Gujranwala, Faisalabad, Rahim Yar Khan, Kohat, Swabi, Haripur, Abbottabad, Pishin, & Noshki
2.	Telenor	11	Gujranwala, Faisalabad, Rahim Yar Khan, Kohat, Swabi, Haripur, Abbottabad, Pishin, Sibbi, Noshki & Khuzdar
3.	Ufone	8	Gujranwala, Rahim Yar Khan, Kohat, Swabi, Haripur, Abbottabad, Sibbi & Khuzdar
4.	ZonG	7	Gujranwala, Rahim Yar Khan, Swabi, Haripur, Abbottabad, Pishin & Khuzdar

Table 5.4: Non-Compliance of Service Accessibility > 98%

- c. **CALL CONNECTION TIME.** The analysis of QoS KPI **Call Connection Time of < 6.5 Seconds** in all the surveyed cities revealed following.

- i. **COMPLIANCE.** The cities where CMOs remained compliant are mentioned in **Table 5.5: Compliance of Call Connection Time < 6.5 Seconds.**

S. #.	Operator	Cities	
		Count	Names
1.	Jazz	6	Gujranwala, Kasur, Kohat, Swabi, Abbottabad & Pishin
2.	Telenor	10	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Abbottabad, Pishin, Sibbi, Noshki & Khuzdar
3.	Ufone	11	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Swabi, Haripur, Abbottabad, Pishin, Sibbi & Khuzdar
4.	ZonG	8	Kasur, Faisalabad, Rahim Yar Khan, Kohat, Swabi, Haripur, Abbottabad & Sibbi

Table 5.5: Compliance of Call Connection Time < 6.5 Seconds

- ii. **NON-COMPLIANCE.** The cities where CMOs remained non-compliant are mentioned in **Table 5.6: Non-Compliance of Call Connection Time < 6.5 Seconds.**

S. #.	Operator	Cities	
		Count	Names
1.	Jazz	6	Faisalabad, Rahim Yar Khan, Haripur, Sibbi, Noshki & Khuzdar
2.	Telenor	2	Swabi & Haripur
3.	Ufone	1	Noshki
4.	ZonG	4	Gujranwala, Pishin, Noshki & Khuzdar

Table 5.6: Non-Compliance of Call Connection Time < 6.5 Seconds

d. **CALL COMPELETION RATIO.** The analysis of QoS KPI Call Completion Ratio of > 98% in surveyed cities revealed following:

i. **COMPLIANCE.** The cities where CMOs remained compliant are mentioned in **Table 5.7: Compliance of Call Completion Ratio > 98%.**

S. #.	Operator	Cities	
		Count	Names
1.	Jazz	12	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Swabi, Haripur, Abbottabad, Pishin, Sibbi, Noshki & Khuzdar
2.	Telenor	11	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Swabi, Haripur, Abbottabad, Pishin, Sibbi & Noshki
3.	Ufone	10	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Swabi, Abbottabad, Pishin, Sibbi, Noshki & Khuzdar
4.	ZonG	11	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Swabi, Haripur, Abbottabad, Pishin, Sibbi & Noshki

Table 5.7: Compliance of Call Completion Ratio > 98%

ii. **NON-COMPLIANCE.** The cities where CMOs remained non-compliant are mentioned in **Table 5.8: Non-Compliance of Call Completion Ratio > 98%.**

S. #.	Operator	Cities	
		Count	Names
1.	Telenor	1	Khuzdar
2.	Ufone	2	Kohat & Haripur
3.	ZonG	1	Khuzdar

Table 5.8: Non-Compliance of Call Completion Ratio > 98%

e. **END-TO-END SPEECH QUALITY / MEAN OPINION SCORE.** The analysis of QoS KPI End-to-End Speech Quality/ Mean Opinion Score of > 3 in all the surveyed cities revealed following:

i. **COMPLIANCE.** The cities where CMOs remained compliant are mentioned in **Table 5.9: Compliance of Mean Opinion Score > 3.**

S. #.	Operator	Cities	
		Count	Names
1.	Telenor	5	Kasur, Rahim Yar Khan, Pishin, Sibbi & Khuzdar
2.	Ufone	7	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Swabi, Abbottabad & Sibbi
3.	ZonG	10	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Swabi, Haripur, Abbottabad, Pishin & Sibbi

Table 5.9: Compliance of Mean Opinion Score > 3

ii. **NON-COMPLIANCE.** The cities where CMOs remained non-compliant are mentioned in **Table 5.10: Non-Compliance of Mean Opinion Score > 3.**

S. #.	Operator	Cities	
		Count	Names
1.	Jazz	12	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Swabi, Haripur, Abbottabad, Pishin, Sibbi, Noshki & Khuzdar
2.	Telenor	7	Gujranwala, Faisalabad, Kohat, Swabi, Haripur, Abbottabad & Noshki
3.	Ufone	5	Kohat, Haripur, Pishin, Noshki & Khuzdar
4.	ZonG	2	Noshki & Khuzdar

Table 5.10: Non-Compliance of Mean Opinion Score > 3

f. **INTER SYSTEM HANDOVER OF CIRCUIT SWITCHED VOICE.** The analysis of QoS KPI **Inter System Handover of Circuit Switched Voice > 98%** in surveyed cities revealed following:

i. **COMPLIANCE.** The cities where CMOs remained compliant are mentioned in **Table 5.11: Compliance of ISHO for Circuit Switched Voice > 98%.**

S. #.	Operator	Cities	
		Count	Names
1.	Jazz	11	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Swabi, Haripur, Abbottabad, Pishin, Sibbi & Khuzdar
2.	Telenor	11	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Swabi, Haripur, Pishin, Sibbi, Noshki & Khuzdar
3.	Ufone	8	Gujranwala, Faisalabad, Rahim Yar Khan, Abbottabad, Pishin, Sibbi, Noshki & Khuzdar
4.	ZonG	12	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Swabi, Haripur, Abbottabad, Pishin, Sibbi, Noshki & Khuzdar

Table 5.11: Compliance of ISHO for Circuit Switched Voice > 98%

ii. **NON-COMPLIANCE.** The cities where CMOs remained non-compliant are mentioned in **Table 5.12: Non-Compliance of ISHO for Circuit Switched Voice > 98%.**

S. #.	Operator	Cities	
		Count	Names
1.	Jazz	1	Noshki
2.	Telenor	1	Abbottabad
3.	Ufone	4	Kasur, Kohat, Swabi & Haripur

Table 5.12: Non-Compliance of ISHO for Circuit Switched Voice > 98%

g. **RAB SETUP SUCCESS RATE.** All CMOs have achieved the QoS KPI **RAB Setup Success Rate > 98%** in all 12 x surveyed cities.

SMS SERVICE

6.1. 2 x QoS KPIs i.e. "SMS Success Rate" and "SMS End to End Delivery Time" have been measured and the results are as under:

a. **SMS SUCCESS RATE.** The analysis of QoS KPI **SMS Success Rate of 99%** in all the 12 x surveyed cities revealed following:

i. **COMPLIANCE.** The cities where CMOs remained compliant are mentioned in **Table 6.1: Compliance of SMS Success Rate > 99%.**

S. #.	Operator	Cities	
		Count	Names
1.	Jazz	1	Kohat
2.	Telenor	1	Swabi
3.	Ufone	3	Rahim Yar Khan, Abbottabad & Pishin
4.	ZonG	1	Swabi

Table 6.1: Compliance of SMS Success Rate > 99%

- ii. **NON-COMPLIANCE.** The cities where CMOs remained non-compliant are mentioned in **Table 6.2: Non-Compliance of SMS Success Rate > 99%.**

S. #.	Operator	Cities	
		Count	Names
1.	Jazz	11	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Swabi, Haripur, Abbottabad, Pishin, Sibbi, Noshki & Khuzdar
2.	Telenor	11	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Haripur, Abbottabad, Pishin, Sibbi, Noshki & Khuzdar
3.	Ufone	9	Gujranwala, Kasur, Faisalabad, Kohat, Swabi, Haripur, Sibbi, Noshki & Khuzdar
4.	ZonG	11	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Haripur, Abbottabad, Pishin, Sibbi, Noshki & Khuzdar

Table 6.2: Non-Compliance of SMS Success Rate > 99%

- b. **SMS END-TO-END DELIVERY TIME.** The analysis of QoS KPI **SMS End-to-End Delivery time of 12 Seconds** in 12 x surveyed cities revealed following:

- i. **COMPLIANCE.** The cities where CMOs remained compliant are mentioned in **Table 6.3: Compliance of SMS End-To-End Delivery Time ≤ 12 Seconds.**

S. #.	Operator	Cities	
		Count	Names
1.	Jazz	12	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Swabi, Haripur, Abbottabad, Pishin, Sibbi, Noshki & Khuzdar
2.	Telenor	11	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Swabi, Haripur, Pishin, Sibbi, Noshki & Khuzdar
3.	Ufone	10	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Swabi, Abbottabad, Pishin, Noshki & Khuzdar
4.	ZonG	12	Gujranwala, Kasur, Faisalabad, Rahim Yar Khan, Kohat, Swabi, Haripur, Abbottabad, Pishin, Sibbi, Noshki & Khuzdar

Table 6.3: Compliance of SMS End-To-End Delivery Time ≤ 12 Seconds

- ii. **NON-COMPLIANCE.** The cities where CMOs remained non-compliant are mentioned in **Table 6.4: Non-Compliance of SMS End-To-End Delivery Time ≤ 12 Seconds.**

S. #.	Operator	Cities	
		Count	Names
1.	Telenor	1	Abbottabad
2.	Ufone	2	Haripur & Sibbi

Table 6.4: Non-Compliance of SMS End-To-End Delivery Time ≤ 12 Seconds

SURVEY MAPS & GRAPHICAL RESULTS

7.1 The 4G/LTE (RSRP) and 3G (RSCP) Signal Strength samples, recorded during drive test on survey routes plotted on maps along-with Voice & SMS QoS KPIs survey results in graphical form, are shown at **Annex-A, Annex-B & Annex-C** for Cities of Punjab, Khyber Pakhtunkhwa & Balochistan respectively.

STANDING IN SURVEY

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

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

S. #.	Operator	Compliance Level – Number of Cities		Standing
		Compliant	Non-Compliant	
1.	ZonG	23	-	1 st
2.	Telenor	22	1	2 nd
3.	Ufone	19	3	3 rd
4.	Jazz	18	2	4 th

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 in surveyed cities 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 st	2 nd	3 rd	4 th	1 st	2 nd	3 rd	4 th		
1.	ZonG	11	1	-	-	1	2	3	5	1 st	4 th
2.	Jazz	1	9	1	-	1	2	4	2	2 nd	3 rd
3.	Telenor	-	1	7	4	1	5	4	1	3 rd	2 nd
4.	Ufone	-	1	4	5	9	2	-	1	4 th	1 st

Table 8.2: CMOs Standing in Mobile Broadband Service

- c. **VOICE SERVICE.** The categorization of each CMOs, as per the maximum compliant in 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	70	14	1 st
2.	Ufone	63	21	2 nd
3.	Telenor	61	23	3 rd
4.	Jazz	55	29	4 th

Table 8.3: CMOs Standing in Voice Service

- d. **SMS SERVICE.** The categorization of each CMOs, as per the maximum compliant in SMS QoS KPIs which is shown in **Table 8.4: CMOs Standing in SMS Service**

S. #.	Operator	SMS QoS KPIs		Standing
		Compliant	Non-Compliant	
1.	Jazz	12	12	1 st
2.	Telenor	12	12	1 st
3.	Ufone	12	12	1 st

S. #.	Operator	SMS QoS KPIs		Standing
		Compliant	Non-Compliant	
4.	ZonG	12	12	1 st

Table 8.4: CMOs Standing in SMS Service

- e. **OVERALL STANDING.** The overall standing of each CMOs in each category of service is mentioned in **Table 8.5: CMOs Overall Standing in QoS Survey.**

S. #.	Service		STANDING			
			1 st	2 nd	3 rd	4 th
1.	Mobile Network Coverage		ZonG	Telenor	Ufone	Jazz
2.	Mobile Broadband	3G	Ufone	Telenor	Jazz	ZonG
		4G	ZonG	Jazz	Telenor	Ufone
3.	Voice		ZonG	Ufone	Telenor	Jazz
4.	SMS		Jazz, Ufone, Telenor & ZonG (<i>Equal Rank</i>)			

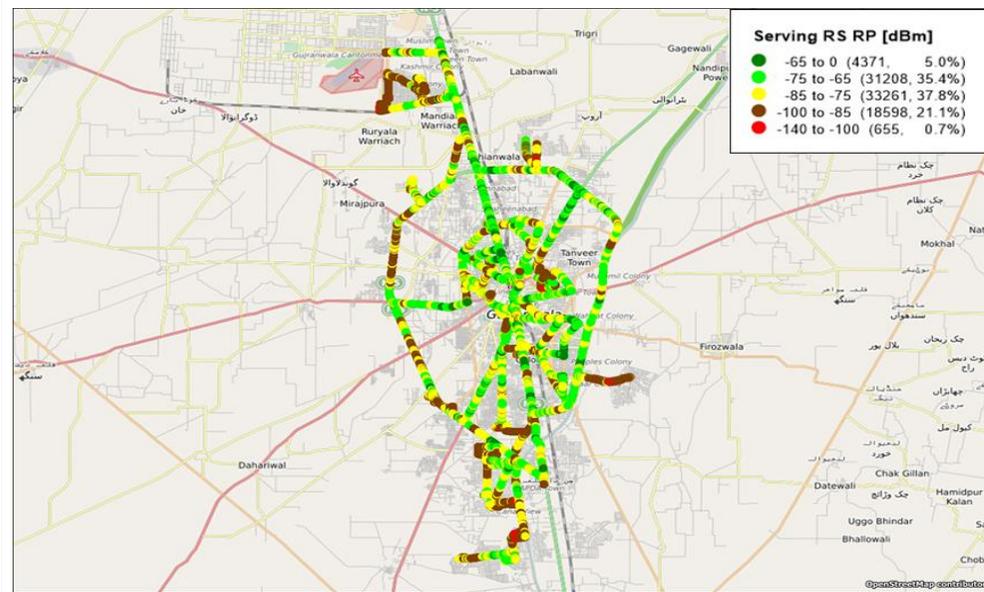
Table 8.5: CMOs Overall Standing in QoS Survey

ANNEX – A

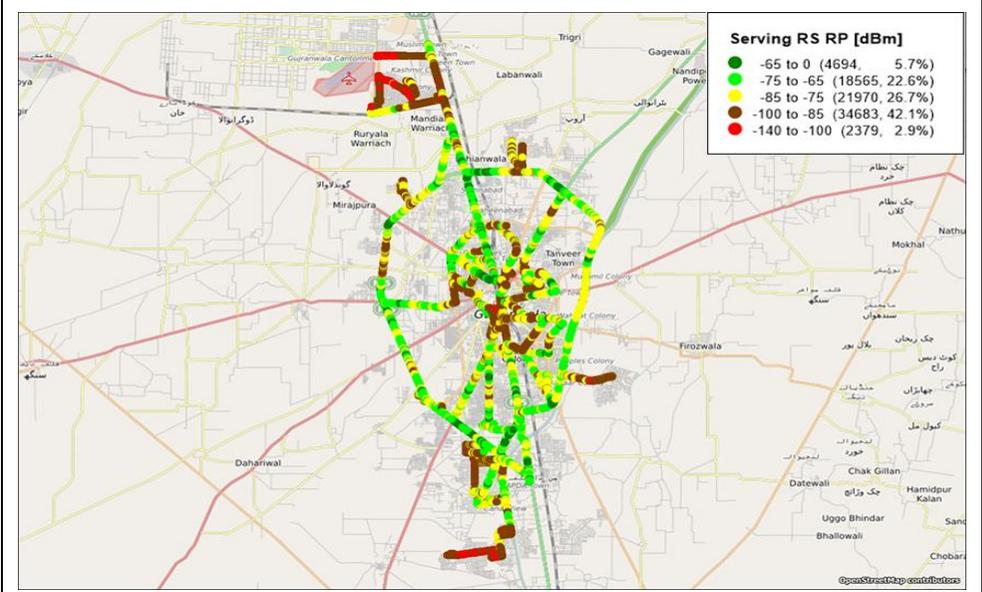
PUNJAB

4G MOBILE COVERAGE IN CITIES- SIGNAL STRENGTH (RSRP)

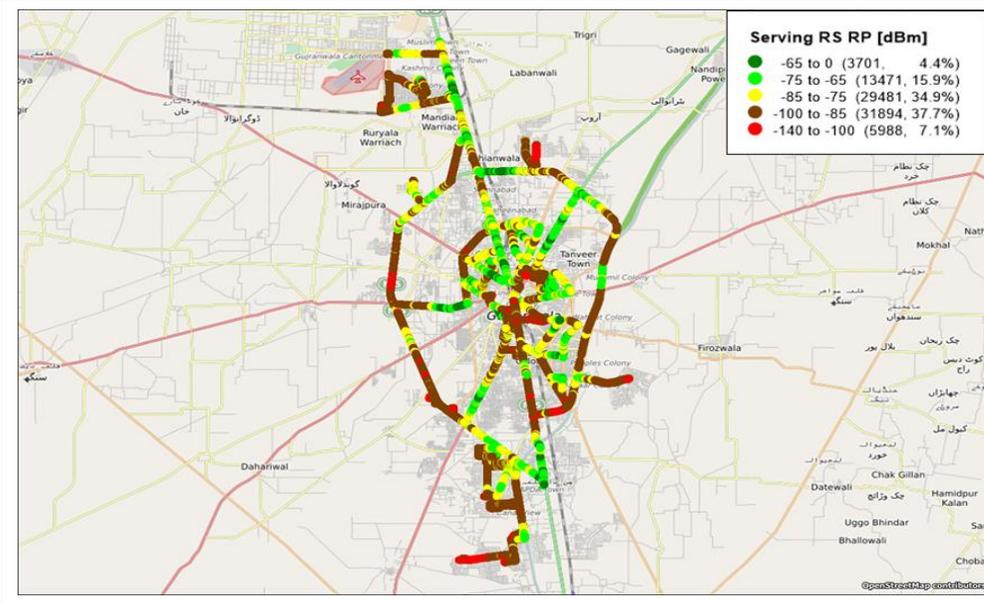
JAZZ 4G NETWORK COVERAGE - GUJRANWALA



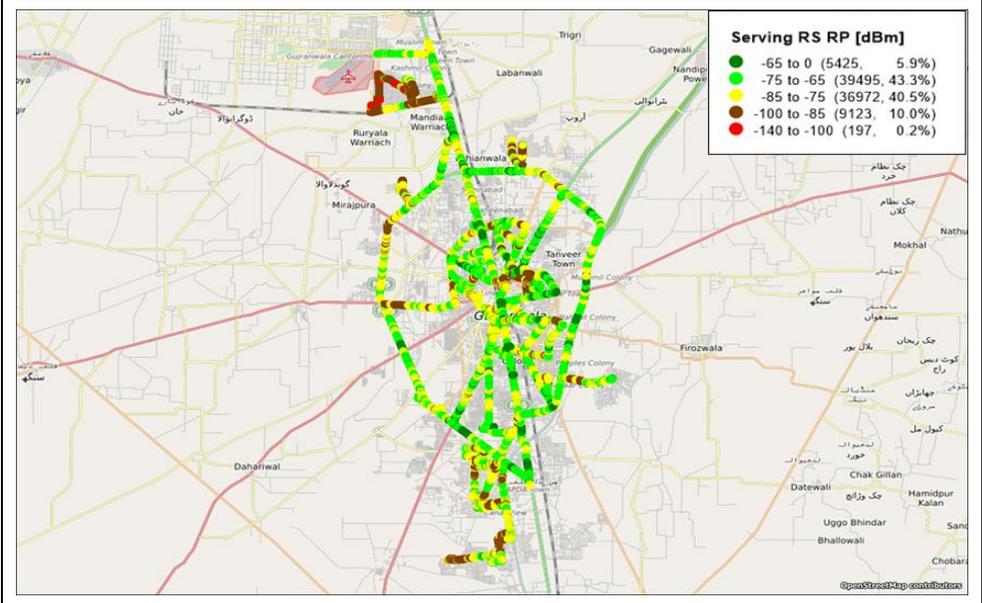
TELEOR 4G NETWORK COVERAGE - GUJRANWALA



UFONE 4G NETWORK COVERAGE - GUJRANWALA

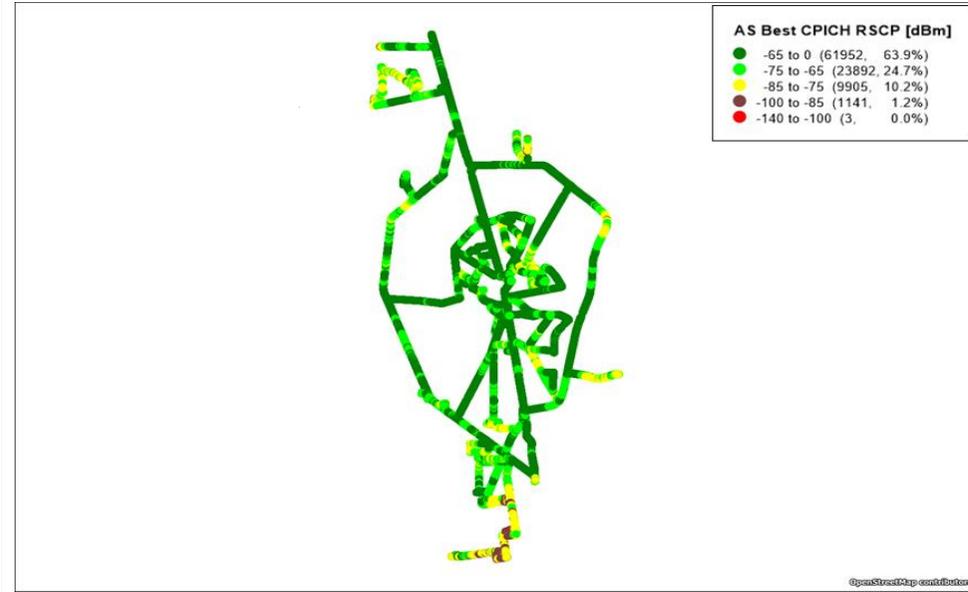


ZONG 4G NETWORK COVERAGE - GUJRANWALA

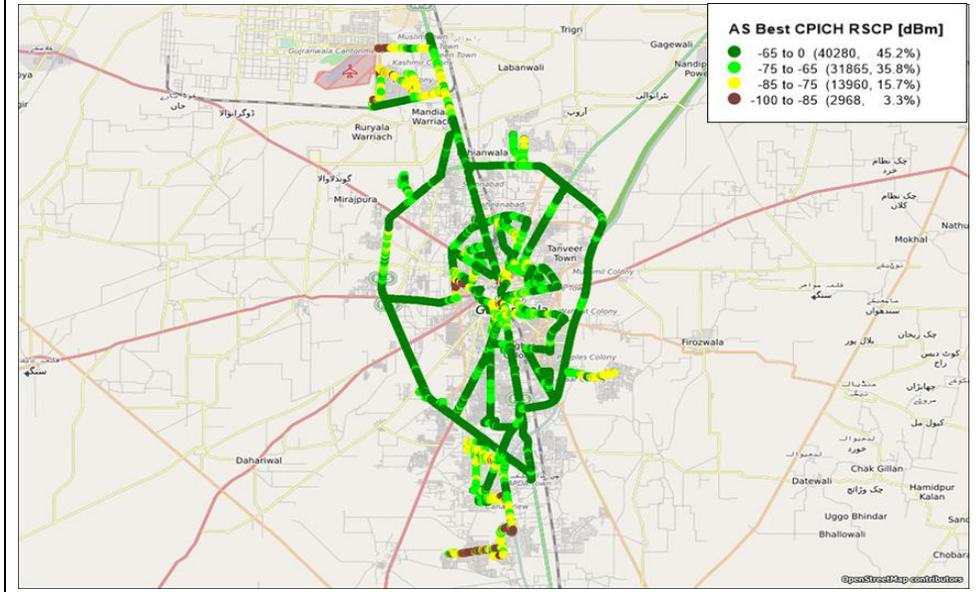


3G MOBILE COVERAGE IN CITIES- SIGNAL STRENGTH (RSCP)

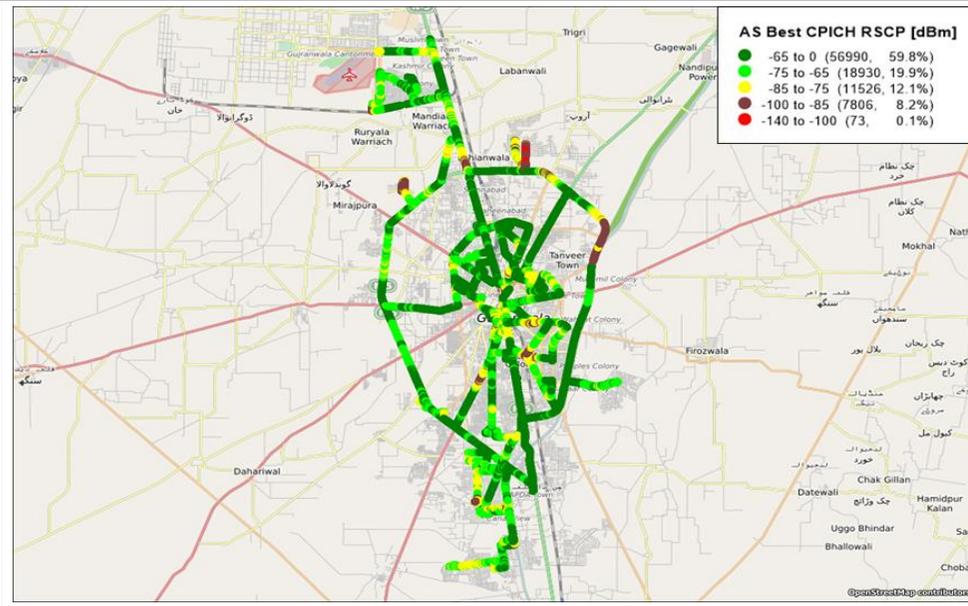
JAZZ 3G NETWORK COVERAGE - GUJRANWALA



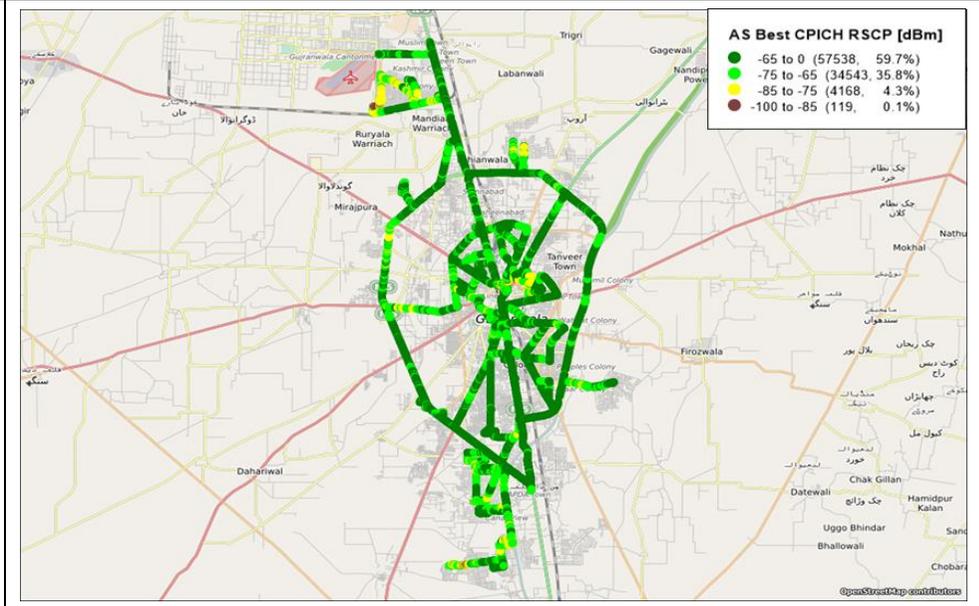
TELENOR 3G NETWORK COVERAGE - GUJRANWALA



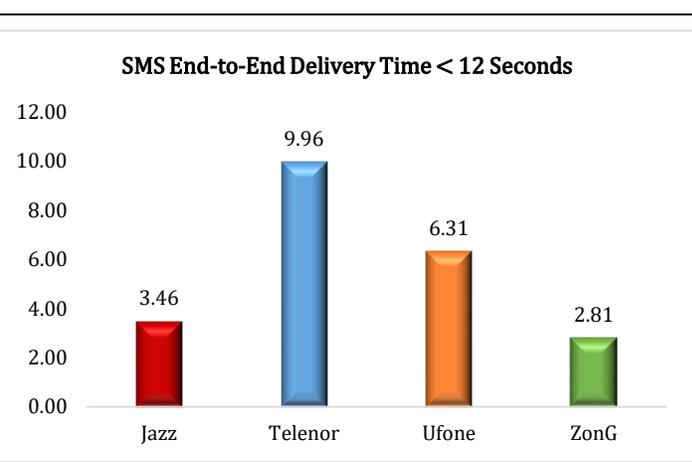
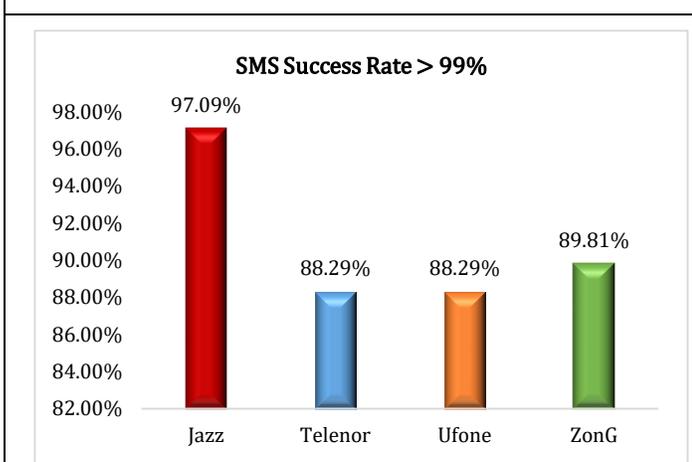
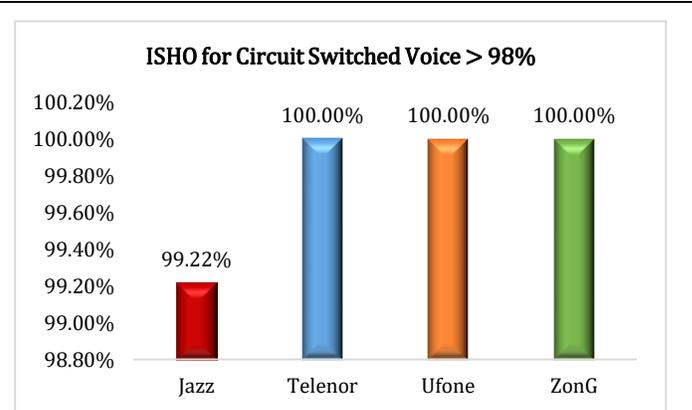
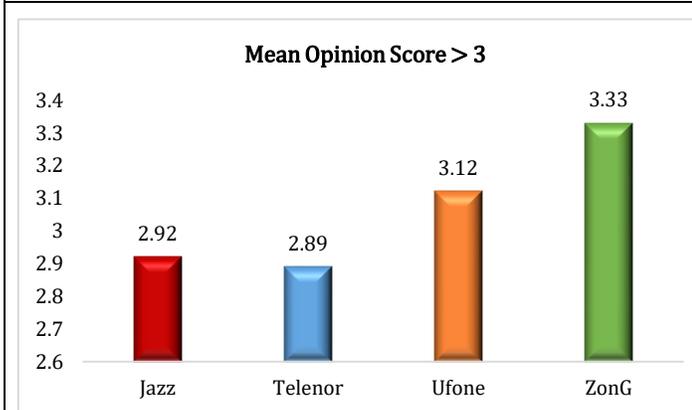
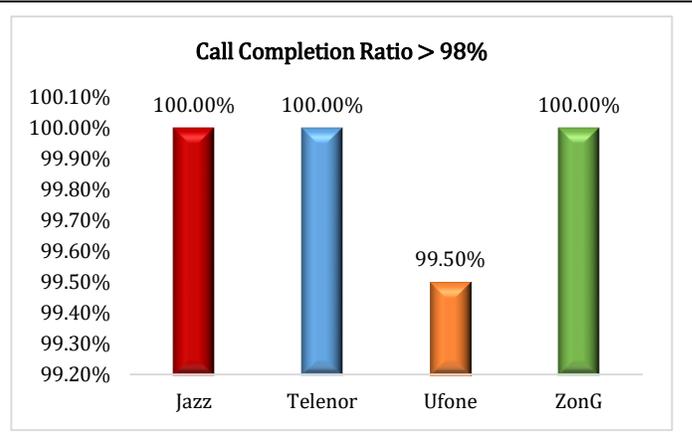
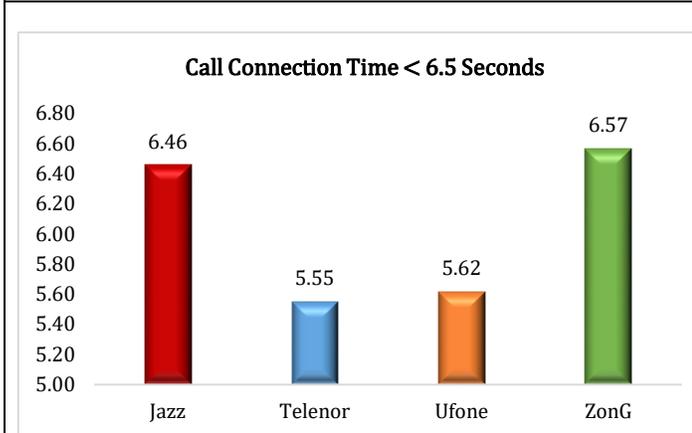
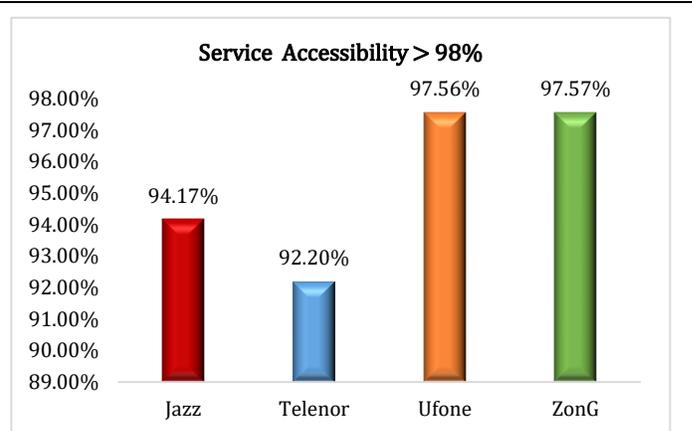
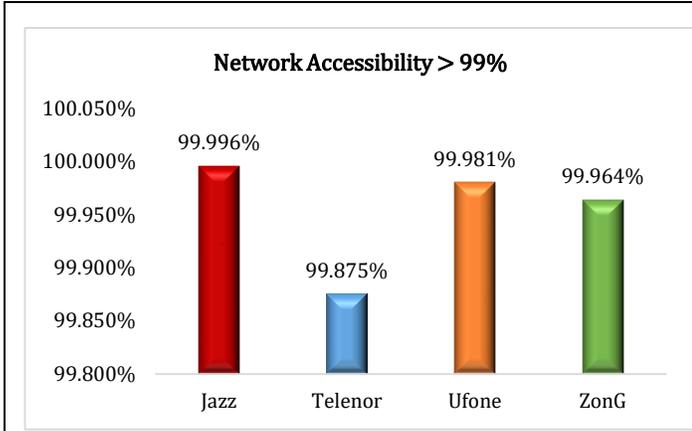
UFONE 3G NETWORK COVERAGE - GUJRANWALA



ZONG 3G NETWORK COVERAGE - GUJRANWALA

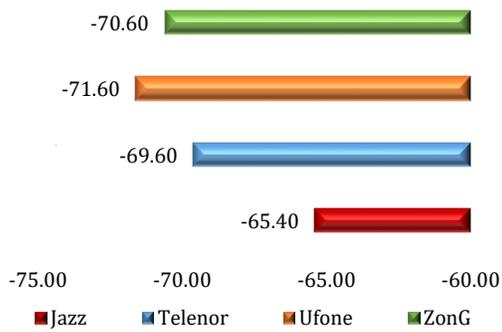


QUALITY OF SERVICE SURVEY RESULTS – GUJRANWALA

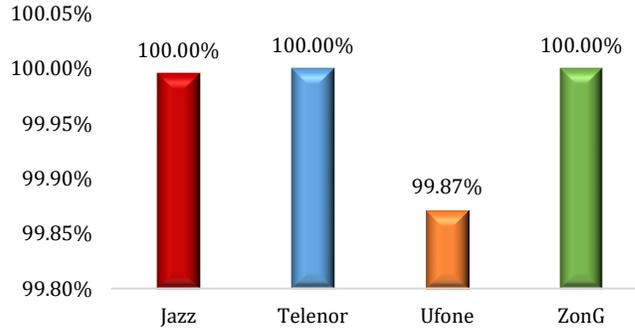


QUALITY OF SERVICE SURVEY RESULTS – GUJRANWALA

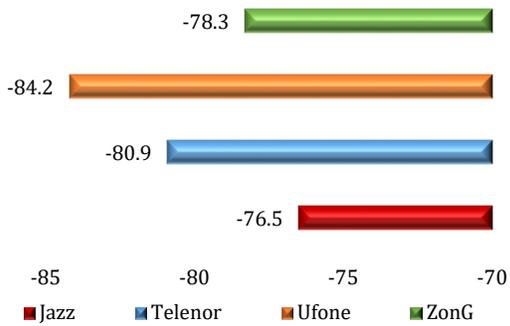
3G Signal Strength (RSCP) > -100dBm



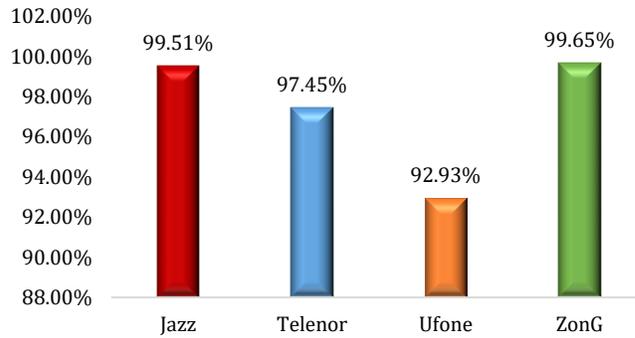
3G Signal Strength (RSCP) Confidencel Level > 90%



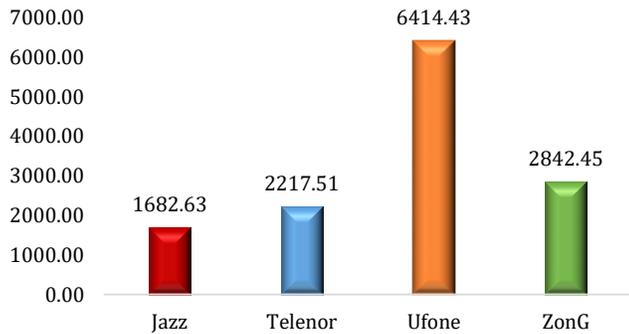
4G Signal Strength (RSRP) > -100dBm



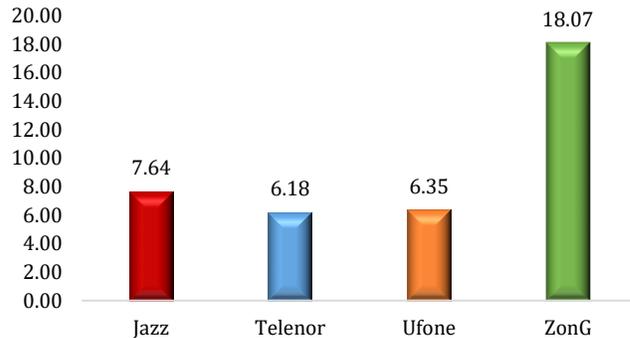
4G Signal Strength (RSRP) Confidencel Level > 90%



User Data Throughput (3G) > 256Kbps

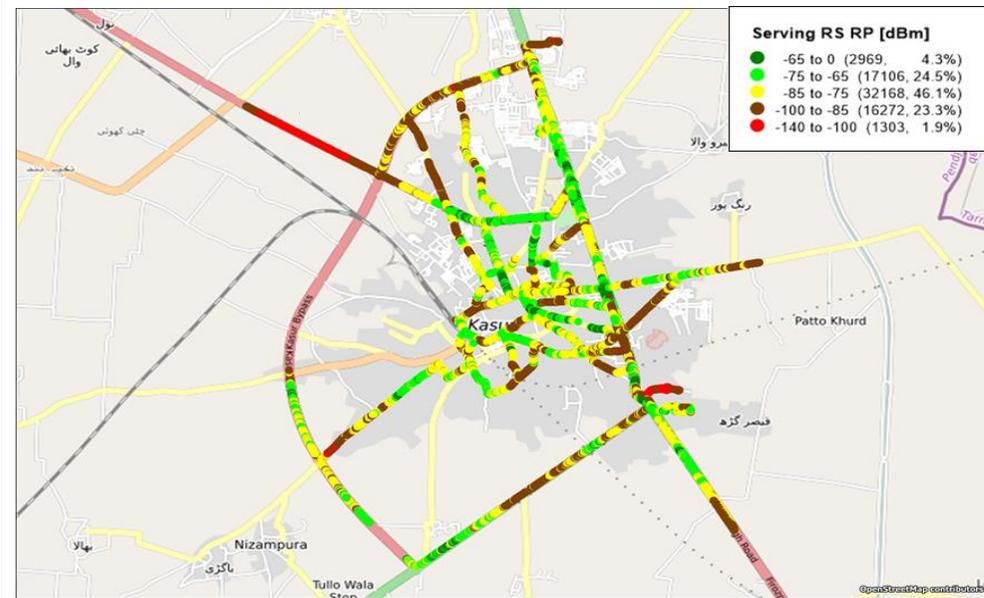


User Data Throughput (4G) > 2Mbps

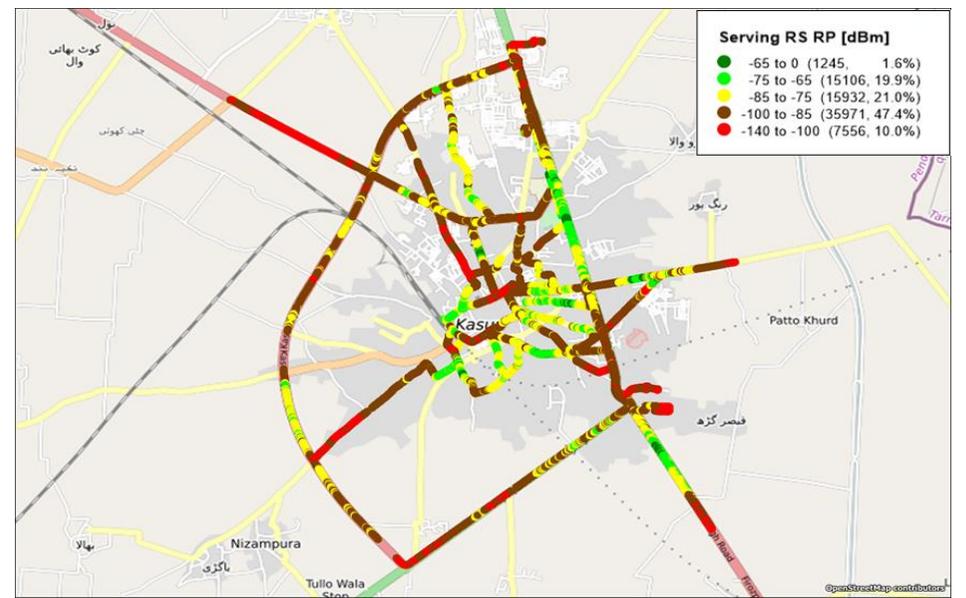


4G MOBILE COVERAGE IN CITIES- SIGNAL STRENGTH (RSRP)

JAZZ 4G NETWORK COVERAGE - KASUR



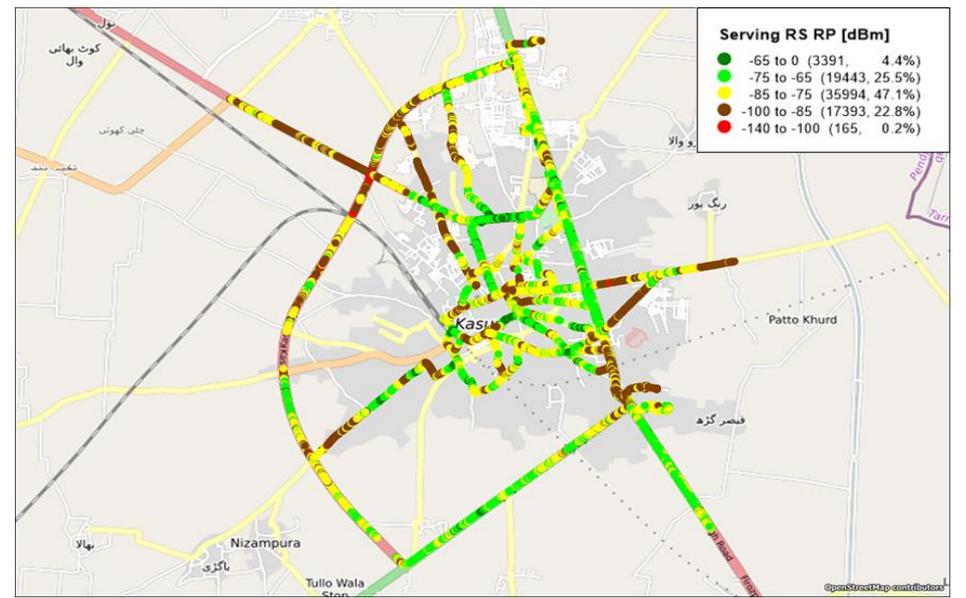
TELENOR 4G NETWORK COVERAGE - KASUR



UFONE 4G NETWORK COVERAGE - KASUR

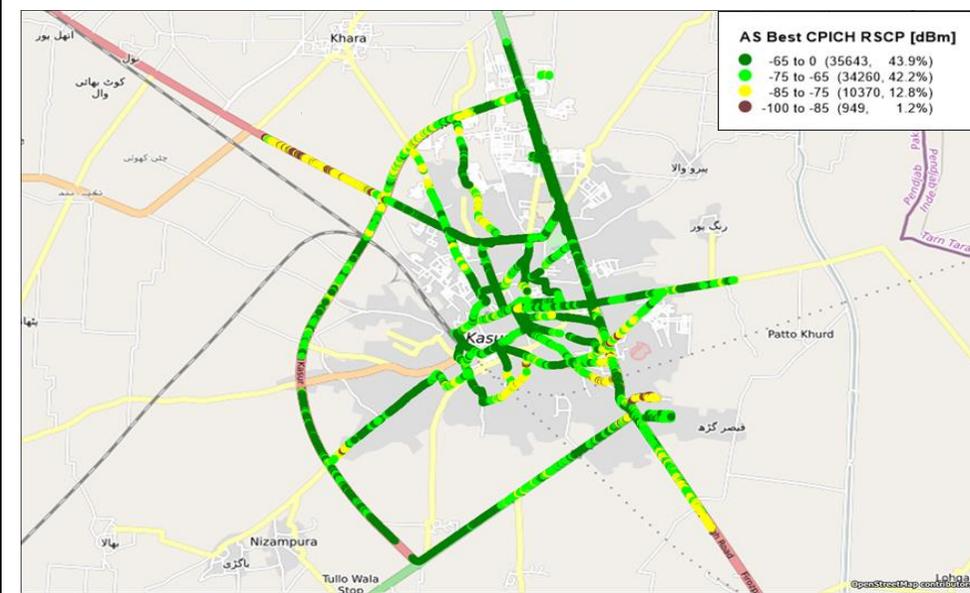
NO 4G NETWORK

ZONG 4G NETWORK COVERAGE - KASUR

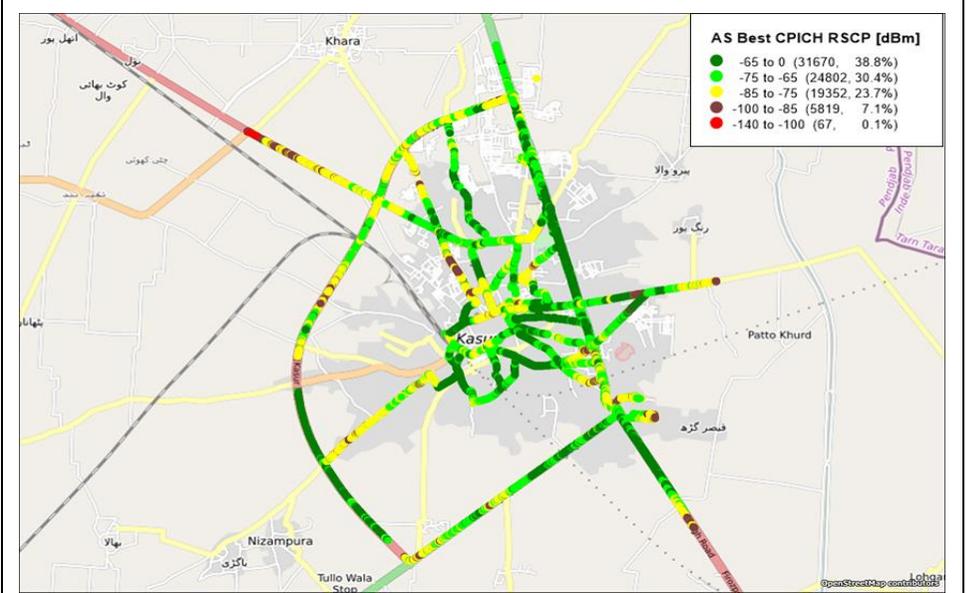


3G MOBILE COVERAGE IN CITIES- SIGNAL STRENGTH (RSCP)

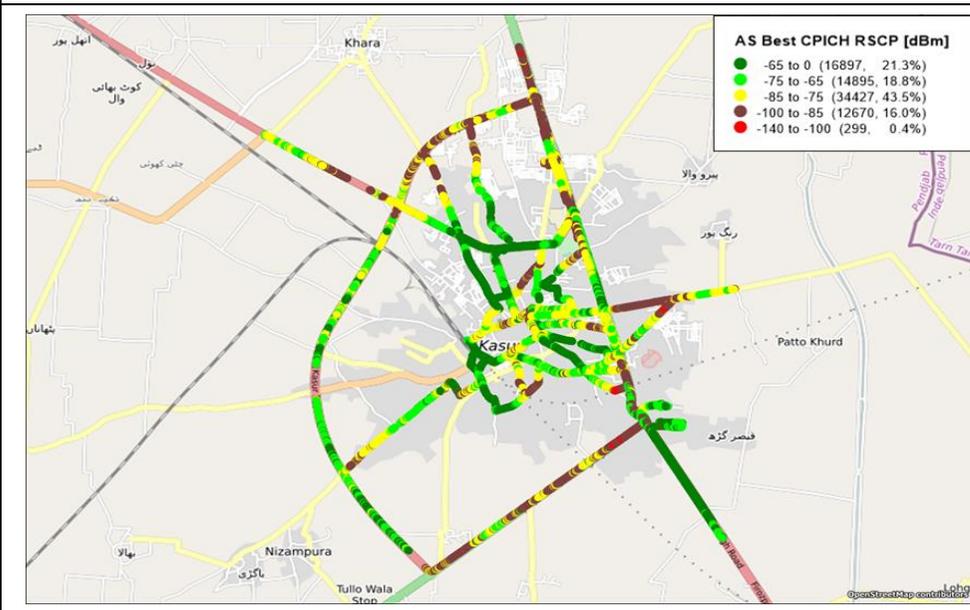
JAZZ 3G NETWORK COVERAGE - KASUR



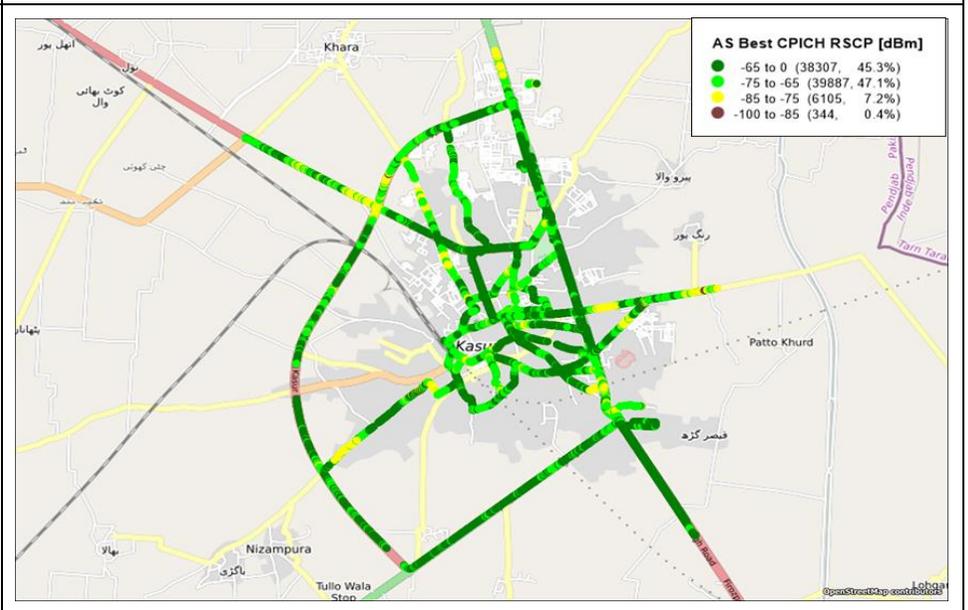
TELENOR 3G NETWORK COVERAGE - KASUR



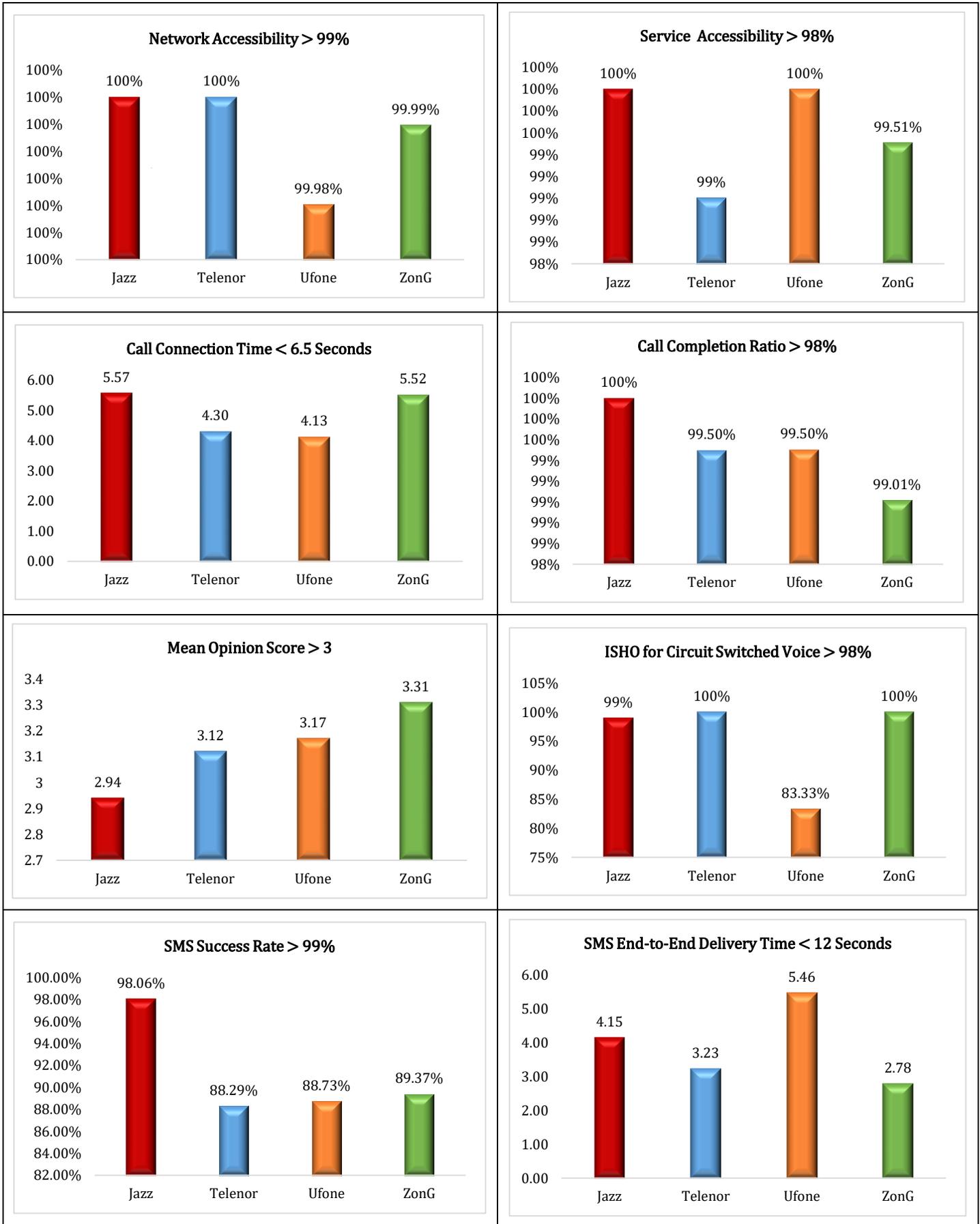
UFONE 3G NETWORK COVERAGE - KASUR



ZONG 3G NETWORK COVERAGE - KASUR

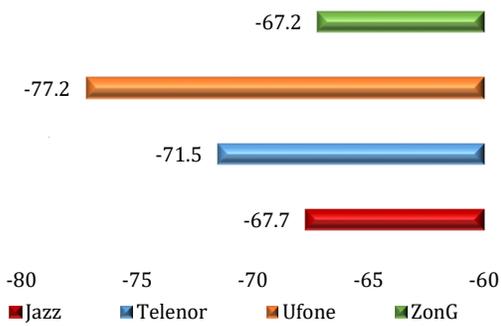


QUALITY OF SERVICE SURVEY RESULTS – KASUR

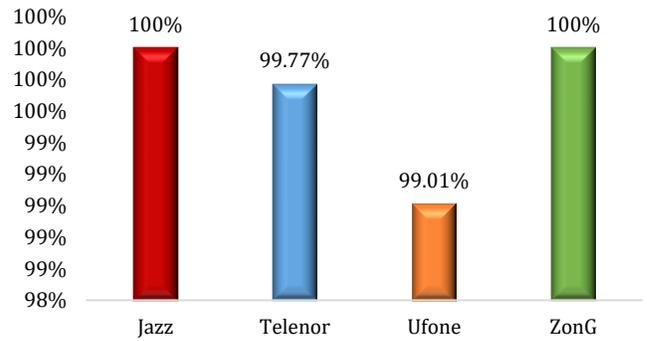


QUALITY OF SERVICE SURVEY RESULTS – KASUR

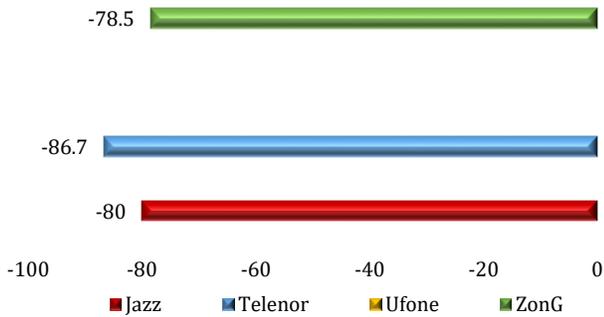
3G Signal Strength (RSCP) > -100dBm



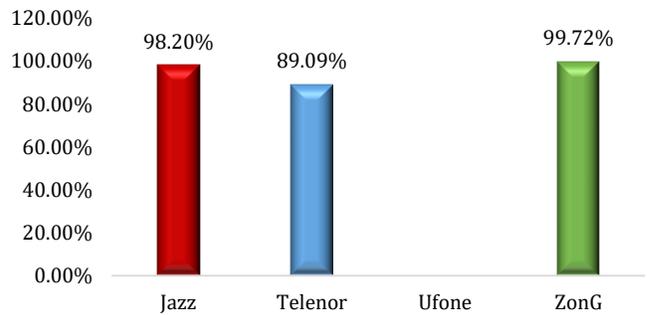
3G Signal Strength (RSCP) Confidencel Level > 90%



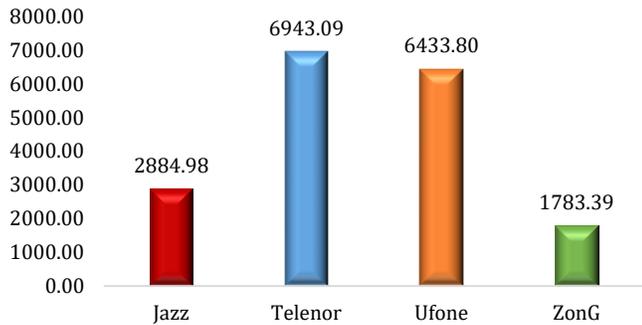
4G Signal Strength (RSRP) > -100dBm



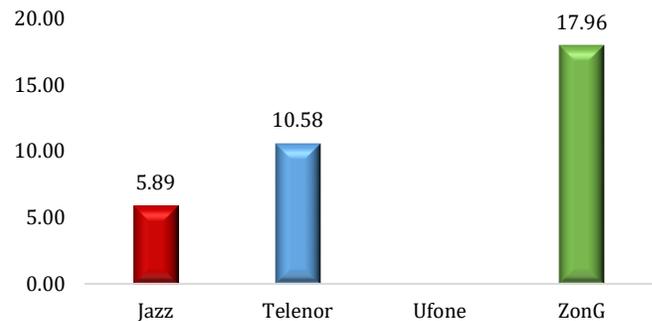
4G Signal Strength (RSRP) Confidencel Level > 90%



User Data Throughput (3G) > 256Kbps

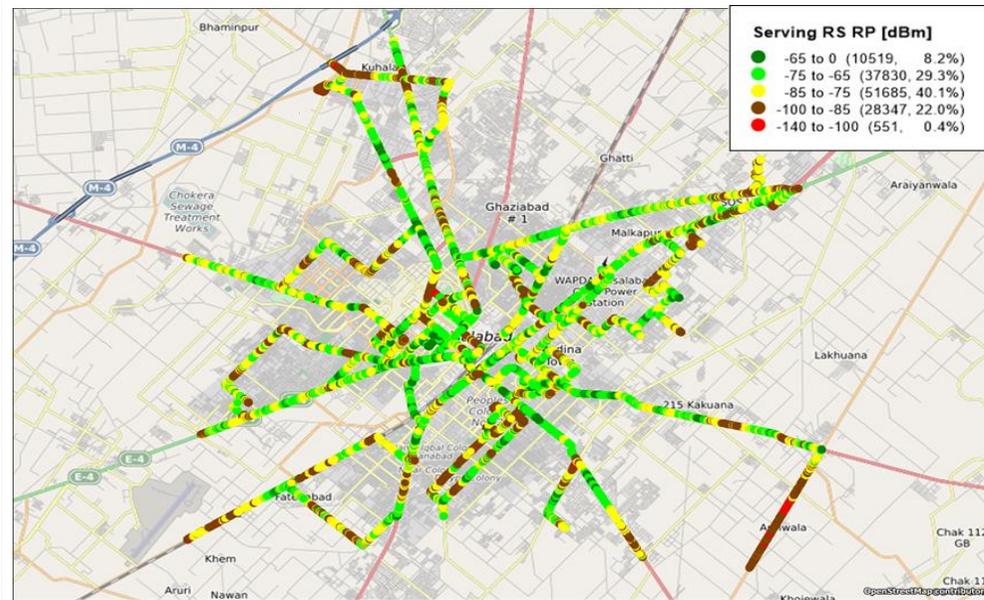


User Data Throughput (4G) > 2Mbps

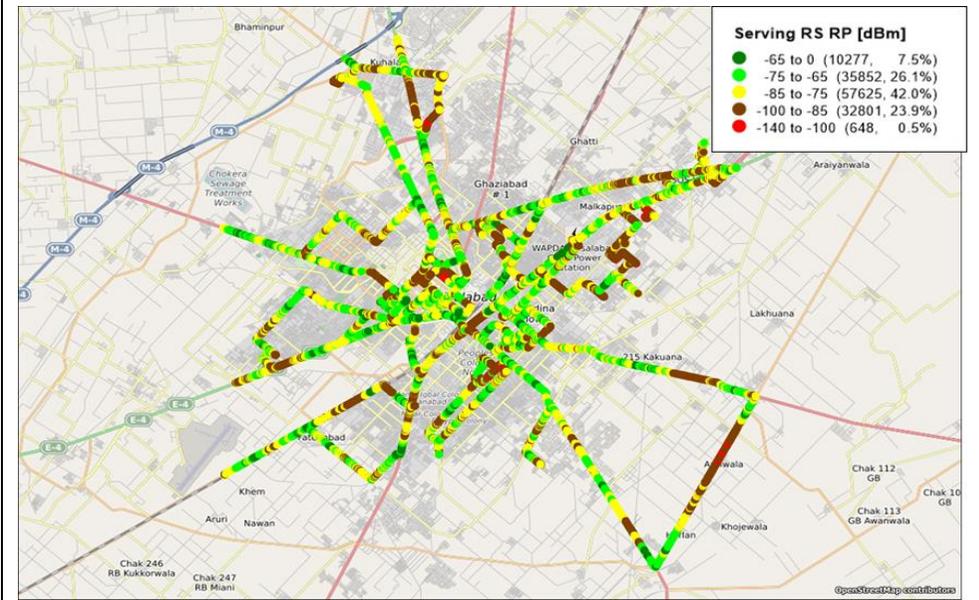


4G MOBILE COVERAGE IN CITIES- SIGNAL STRENGTH (RSRP)

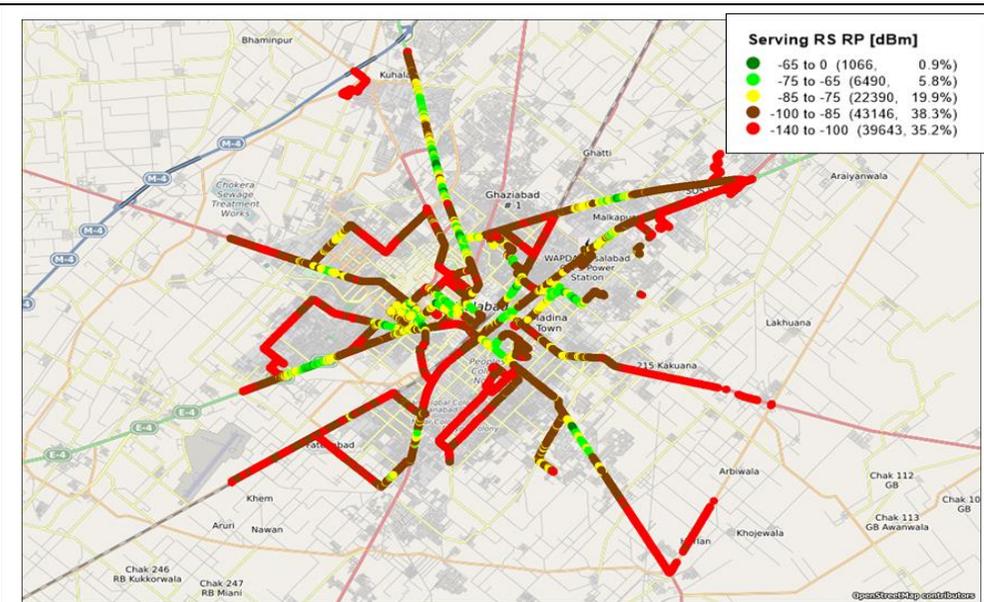
JAZZ 4G NETWORK COVERAGE - FAISALABAD



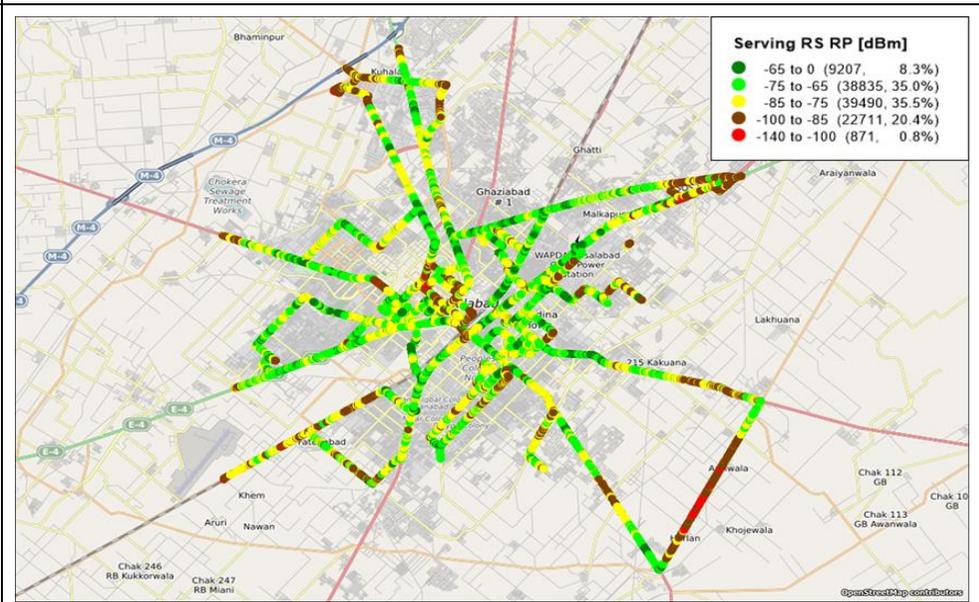
TELENOR 4G NETWORK COVERAGE - FAISALABAD



UFONE 4G NETWORK COVERAGE - FAISALABAD

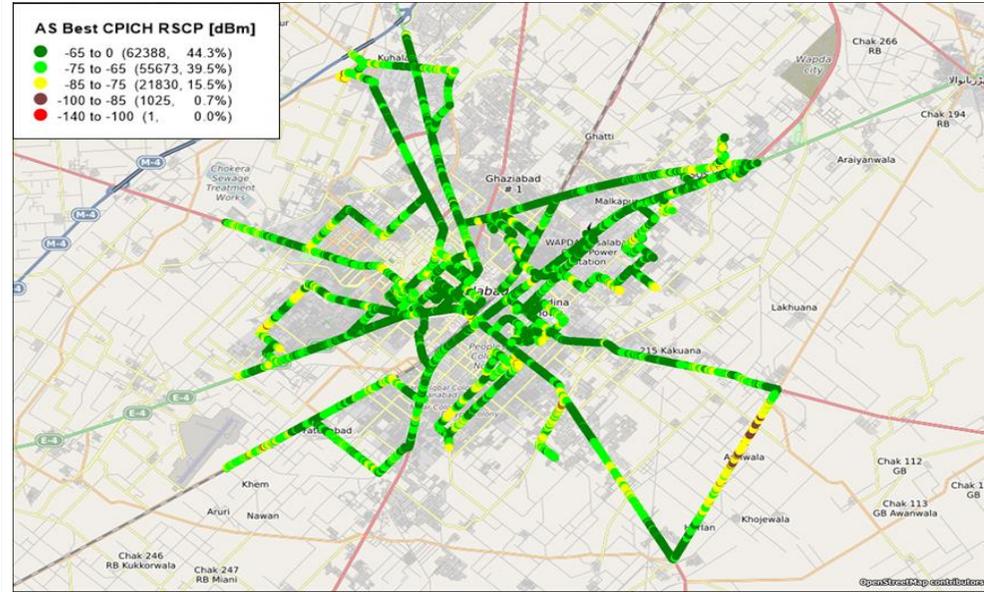


ZONG 4G NETWORK COVERAGE - FAISALABAD

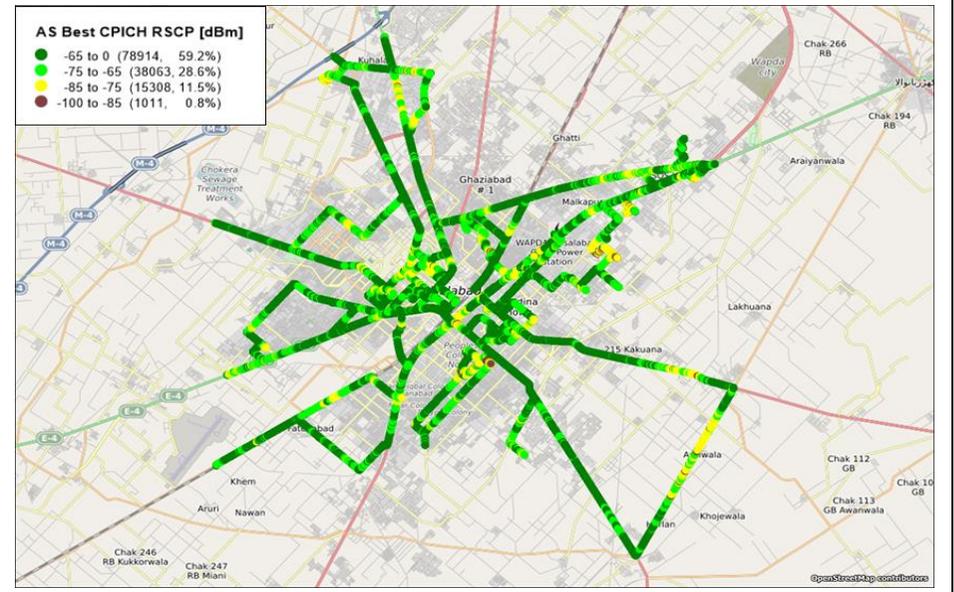


3G MOBILE COVERAGE IN CITIES- SIGNAL STRENGTH (RSCP)

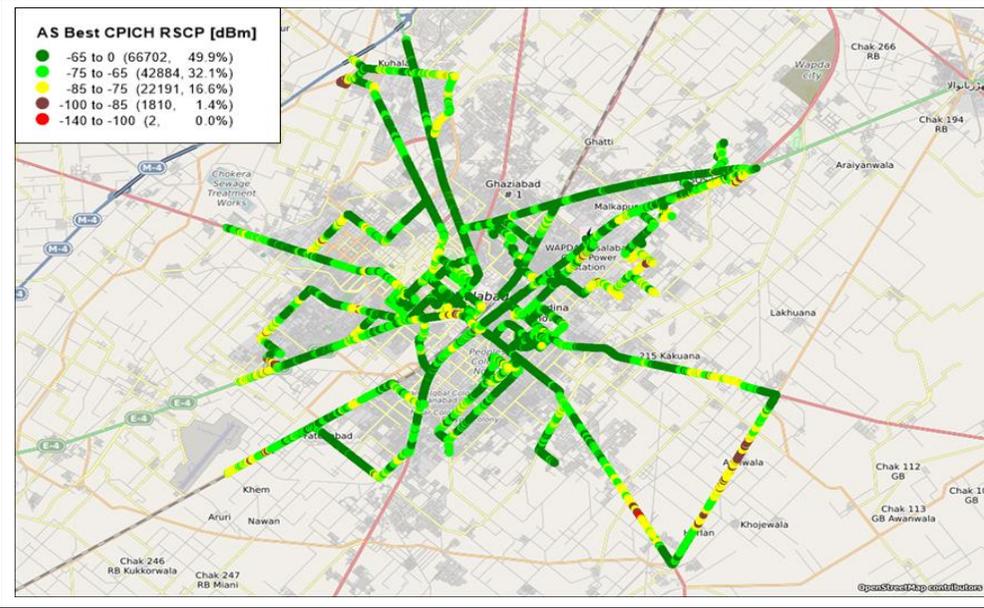
JAZZ 3G NETWORK COVERAGE - FAISALABAD



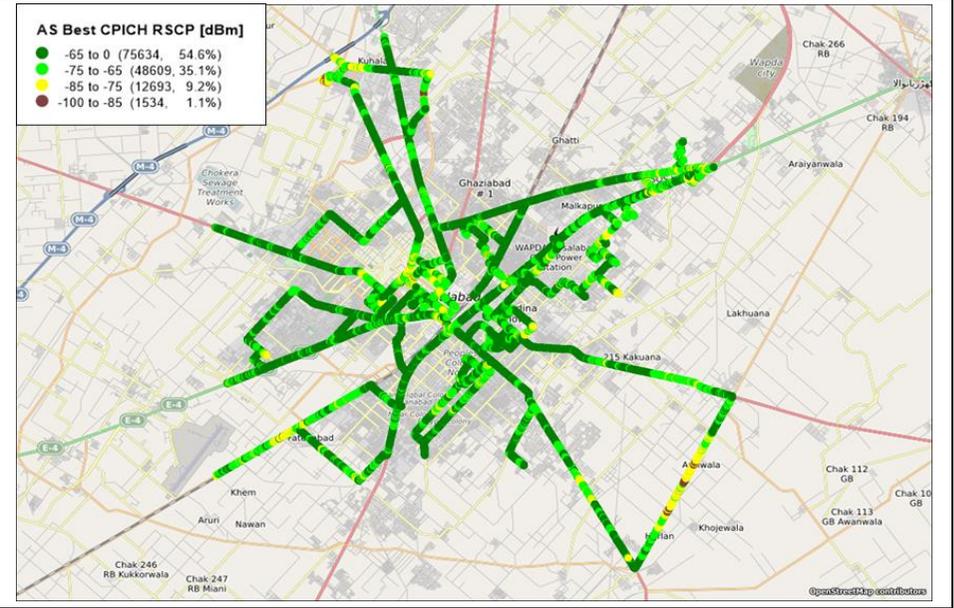
TELENOR 3G NETWORK COVERAGE - FAISALABAD



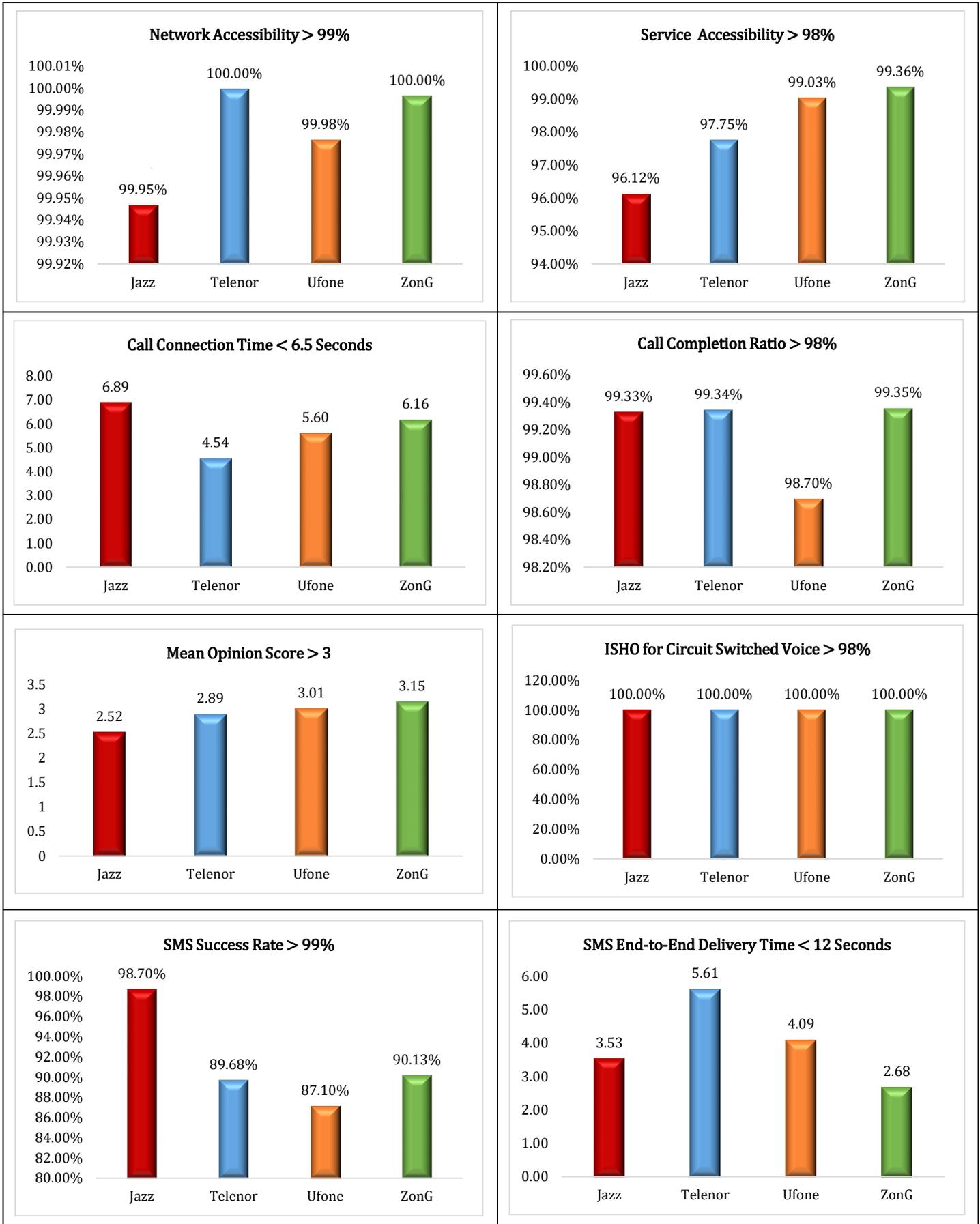
UFONE 3G NETWORK COVERAGE - FAISALABAD



ZONG 3G NETWORK COVERAGE - FAISALABAD

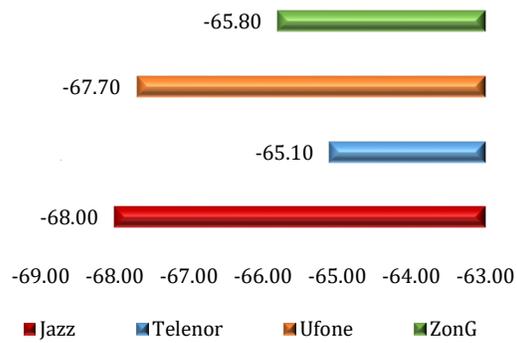


QUALITY OF SERVICE SURVEY RESULTS – FAISALABAD

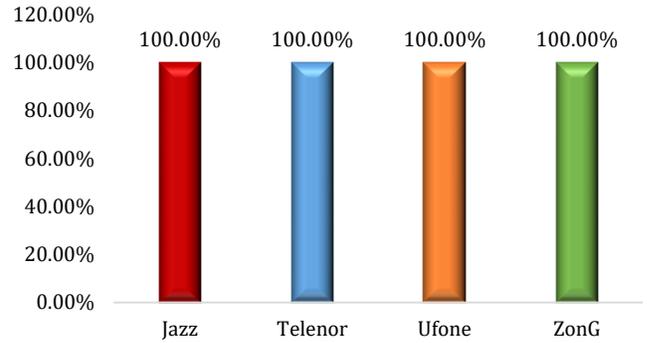


QUALITY OF SERVICE SURVEY RESULTS – FAISALABAD

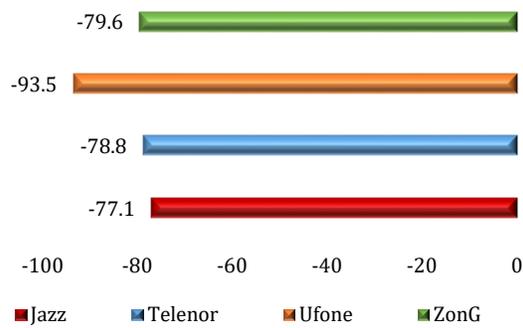
3G Signal Strength (RSCP) > -100dBm



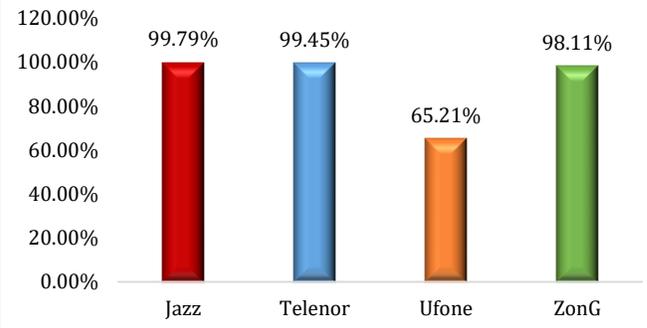
3G Signal Strength (RSCP) Confidencel Level > 90%



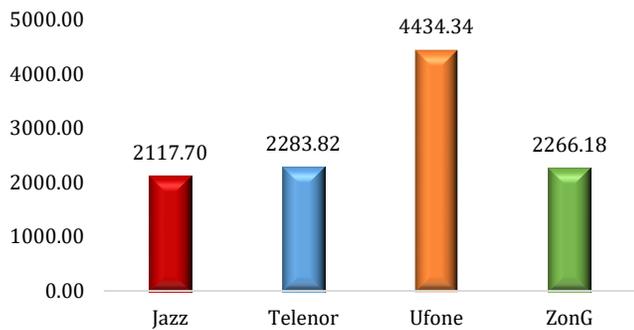
4G Signal Strength (RSRP) > -100dBm



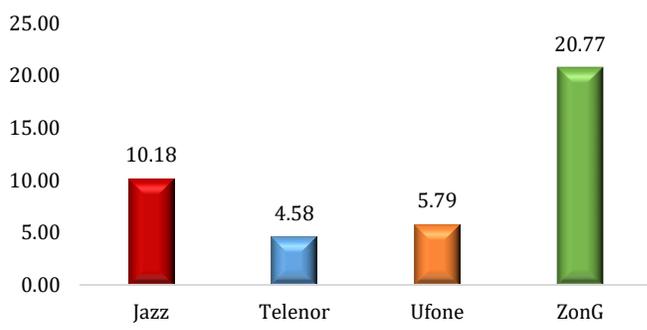
4G Signal Strength (RSRP) Confidencel Level > 90%



User Data Throughput (3G) > 256Kbps

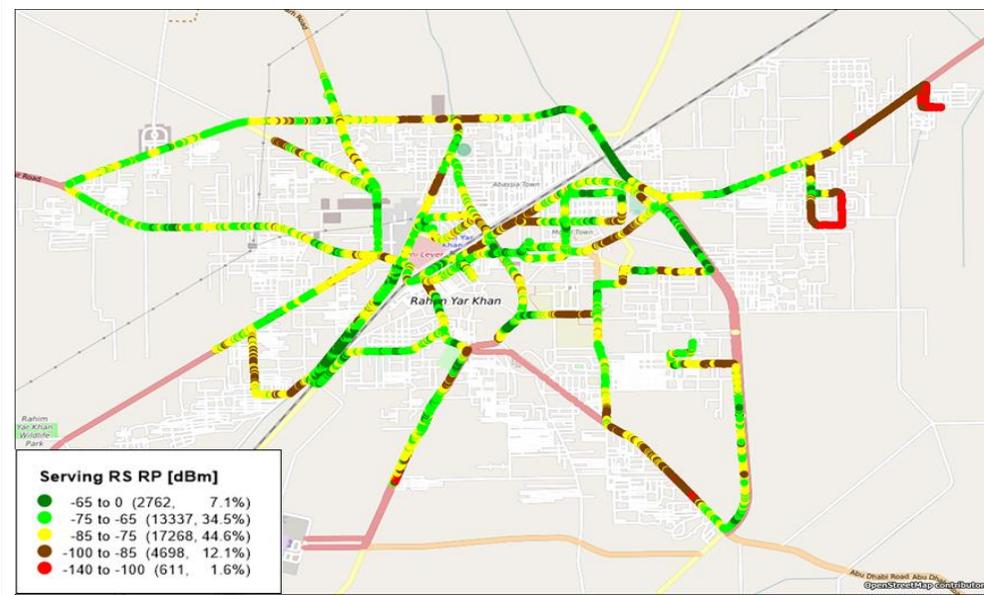


User Data Throughput (4G) > 2Mbps

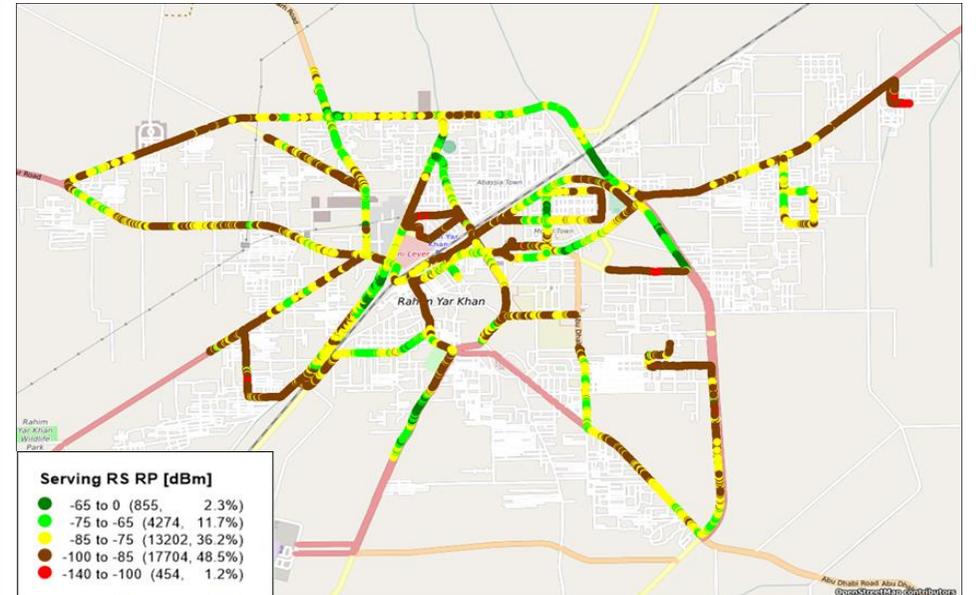


4G MOBILE COVERAGE IN CITIES- SIGNAL STRENGTH (RSRP)

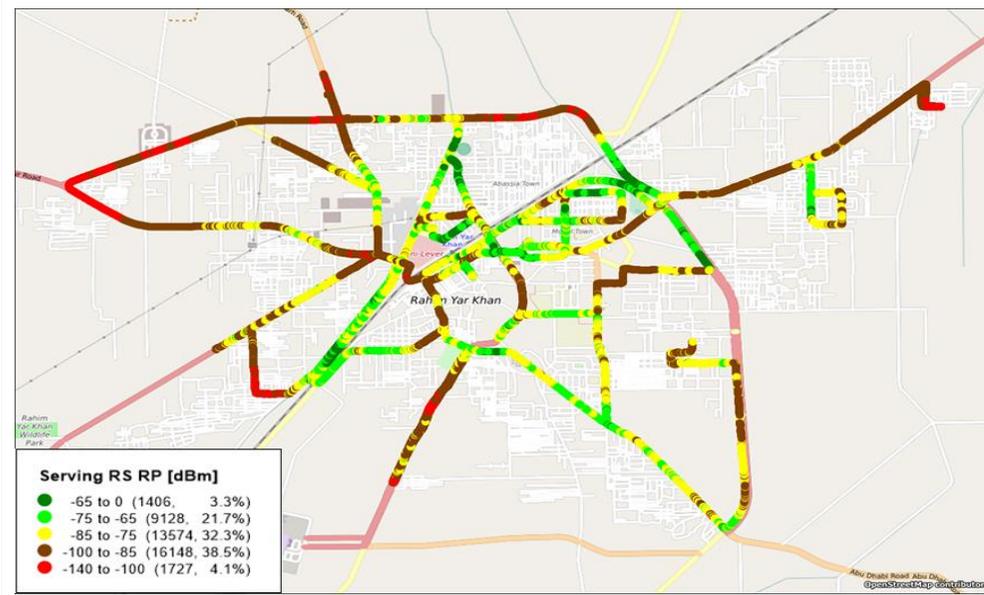
JAZZ 4G NETWORK COVERAGE - RAHIM YAR KHAN



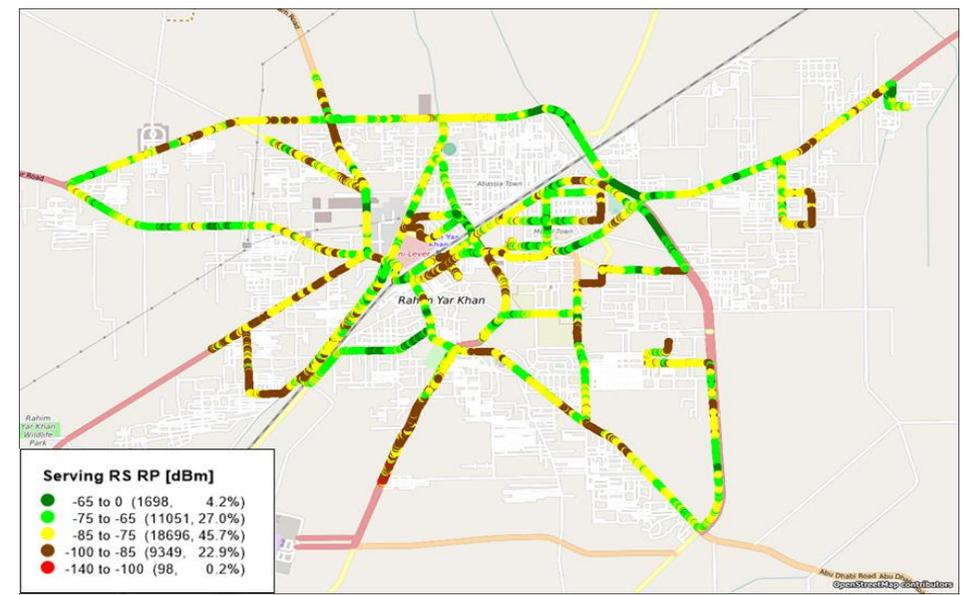
TELENOR 4G NETWORK COVERAGE - RAHIM YAR KHAN



UFONE 4G NETWORK COVERAGE - RAHIM YAR KHAN

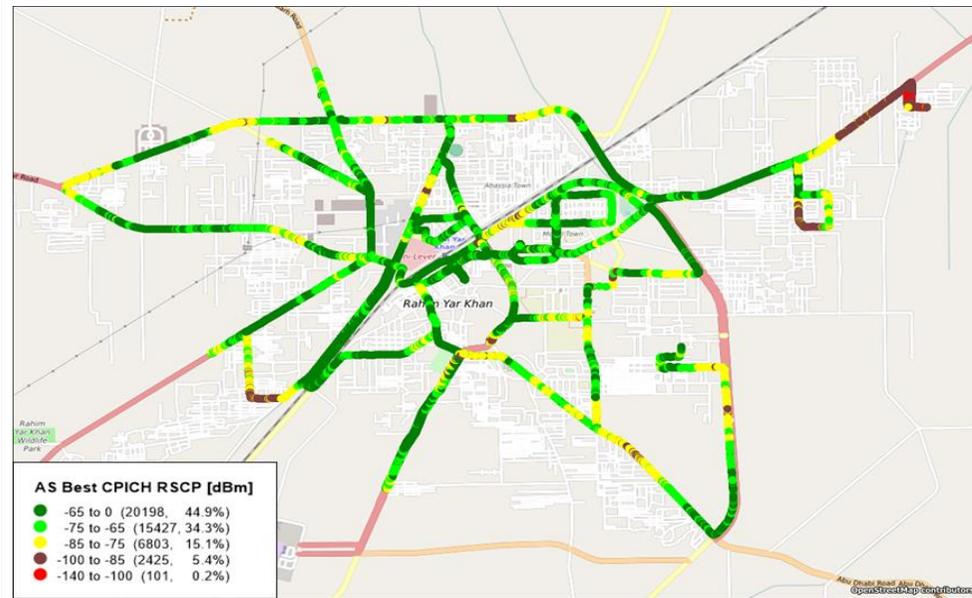


ZONG 4G NETWORK COVERAGE - RAHIM YAR KHAN

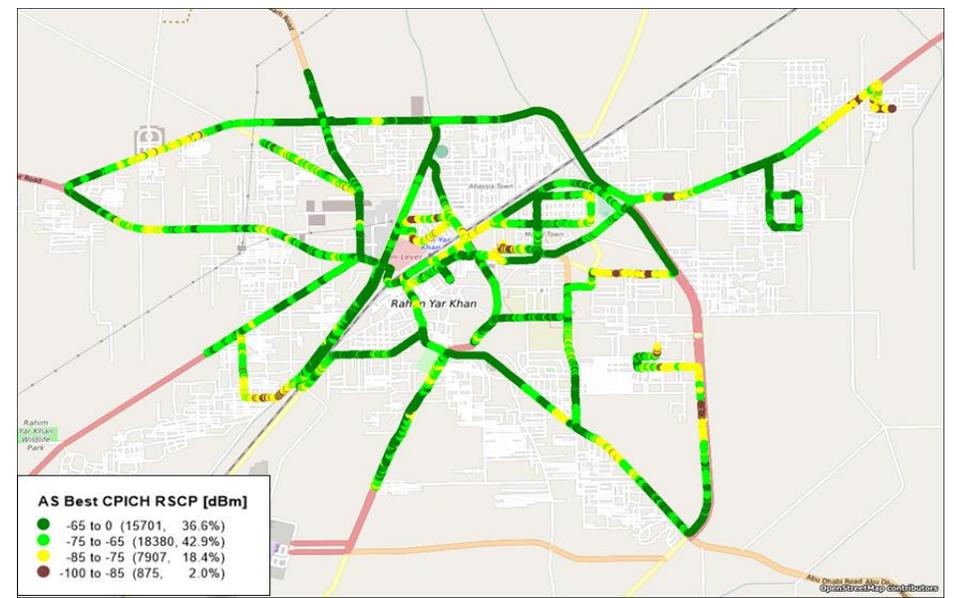


3G MOBILE COVERAGE IN CITIES- SIGNAL STRENGTH (RSCP)

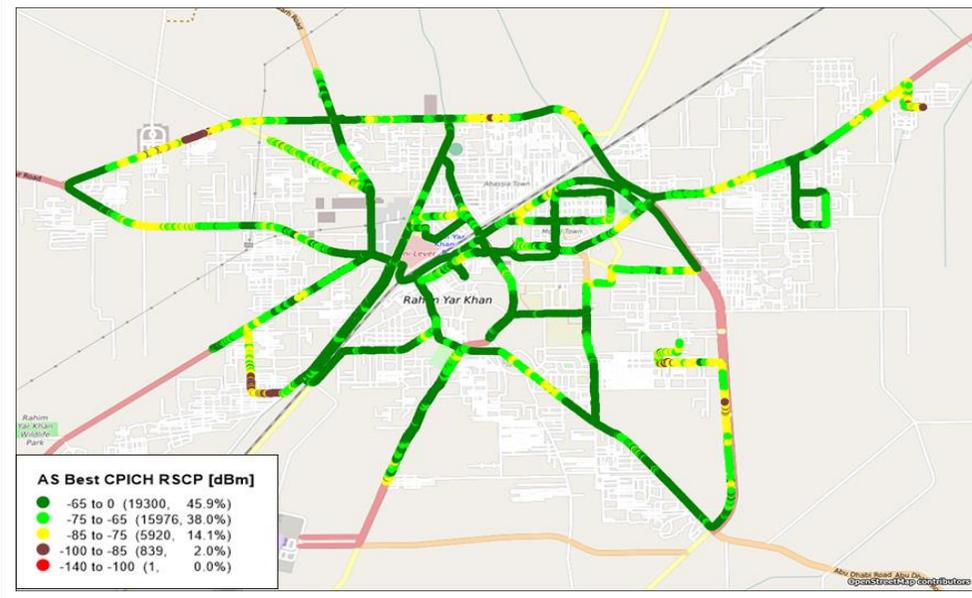
JAZZ 3G NETWORK COVERAGE – RAHIM YAR KHAN



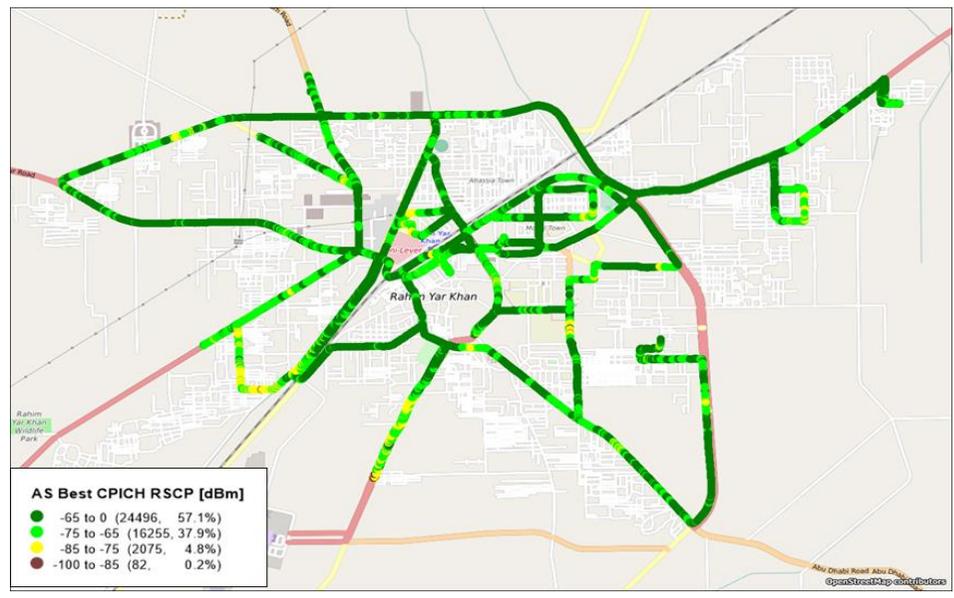
TELENOR 3G NETWORK COVERAGE – RAHIM YAR KHAN



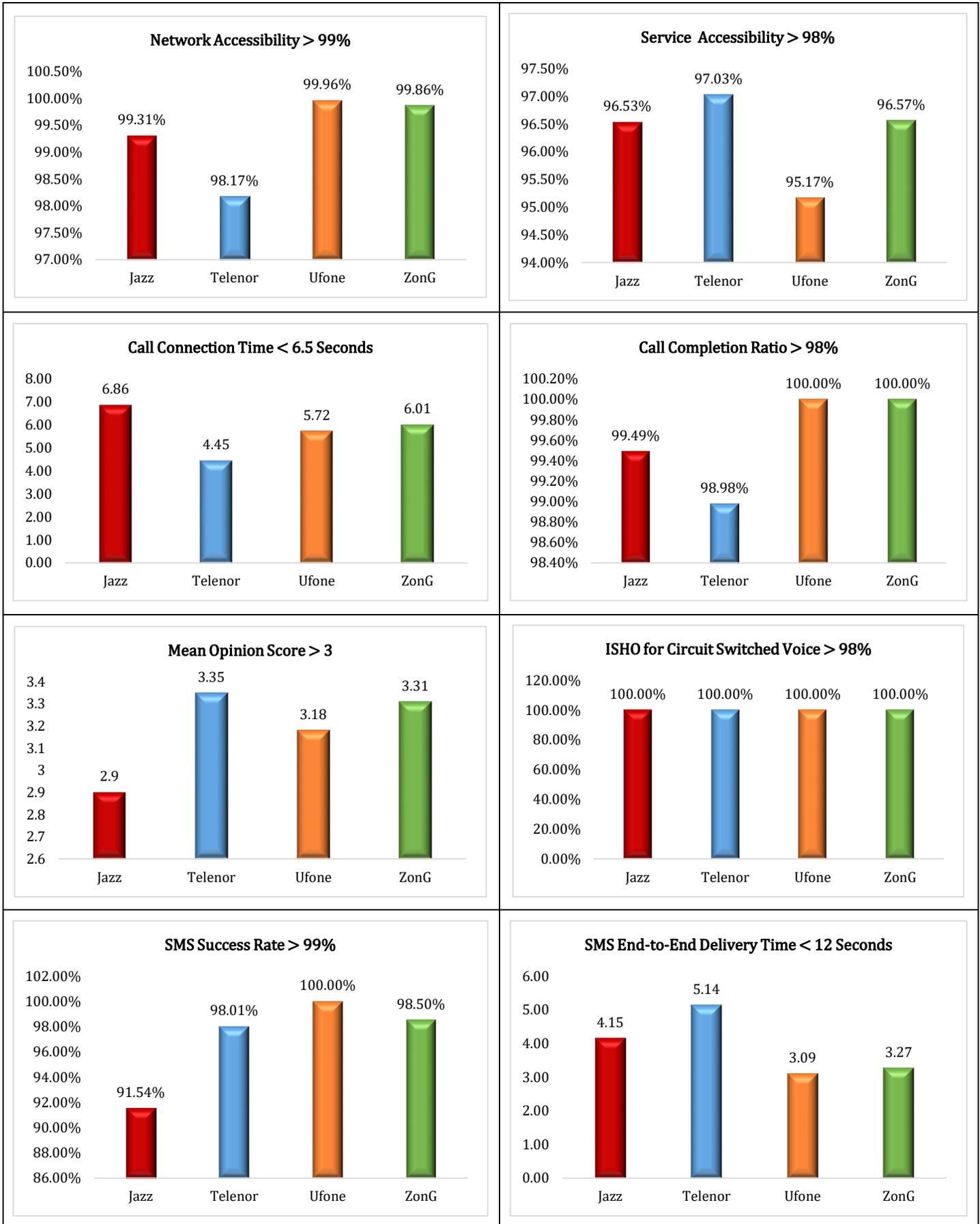
UFONE 3G NETWORK COVERAGE – RAHIM YAR KHAN



ZONG 3G NETWORK COVERAGE – RAHIM YAR KHAN

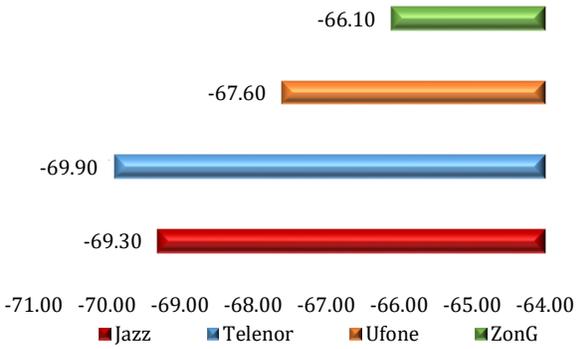


QUALITY OF SERVICE SURVEY RESULTS – RAHIM YAR KHAN

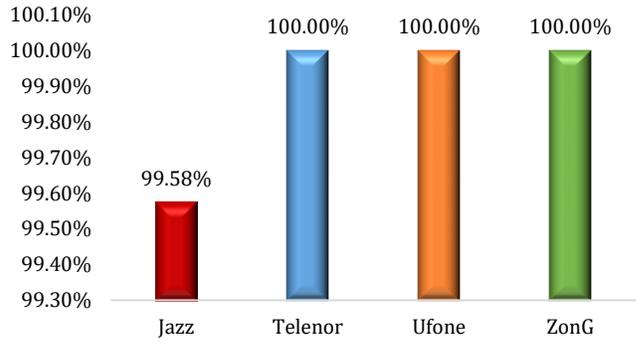


QUALITY OF SERVICE SURVEY RESULTS – RAHIM YAR KHAN

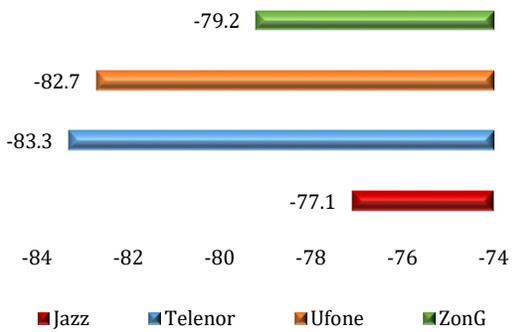
3G Signal Strength (RSCP) > -100dBm



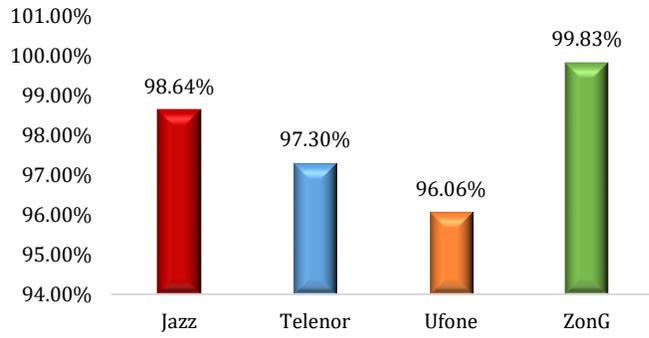
3G Signal Strength (RSCP) Confidencel Level > 90%



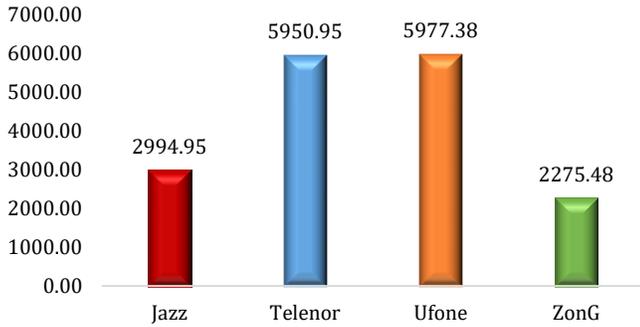
4G Signal Strength (RSRP) > -100dBm



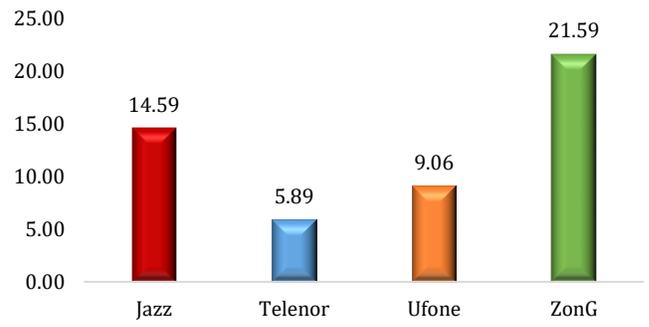
4G Signal Strength (RSRP) Confidencel Level > 90%



User Data Throughput (3G) > 256Kbps



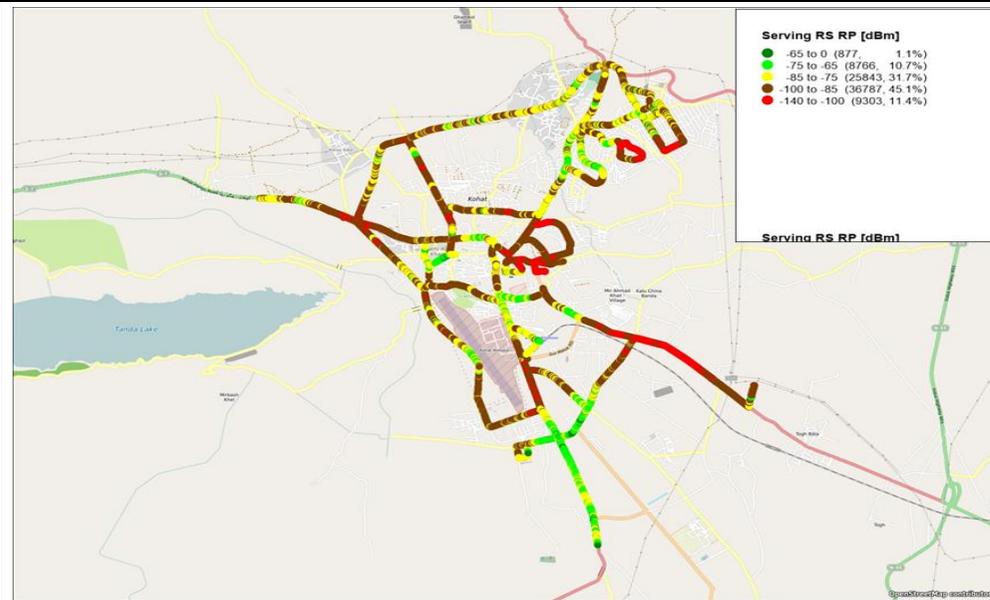
User Data Throughput (4G) > 2Mbps



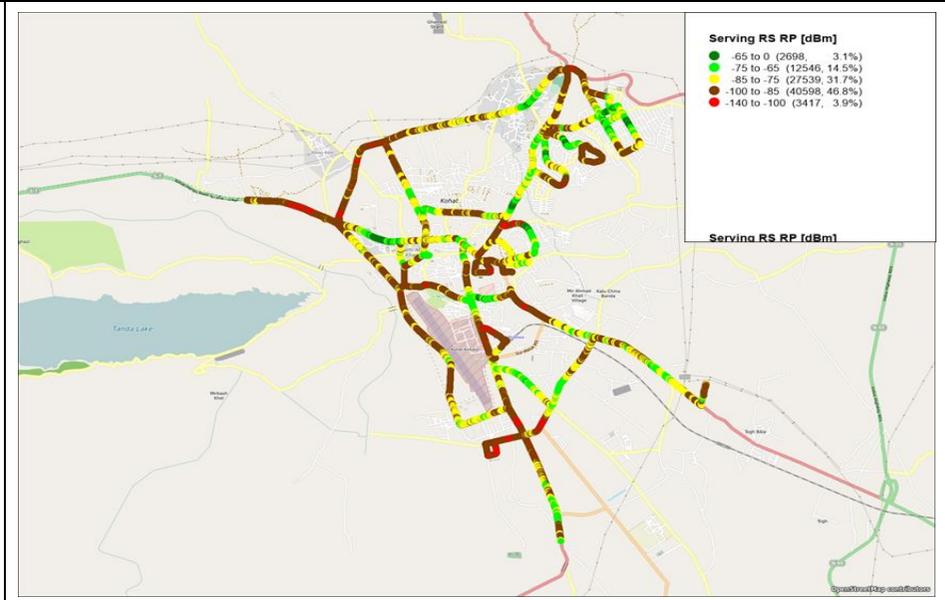
KHYBER PAKHTUNKHWA

4G MOBILE COVERAGE IN CITIES- SIGNAL STRENGTH (RSRP)

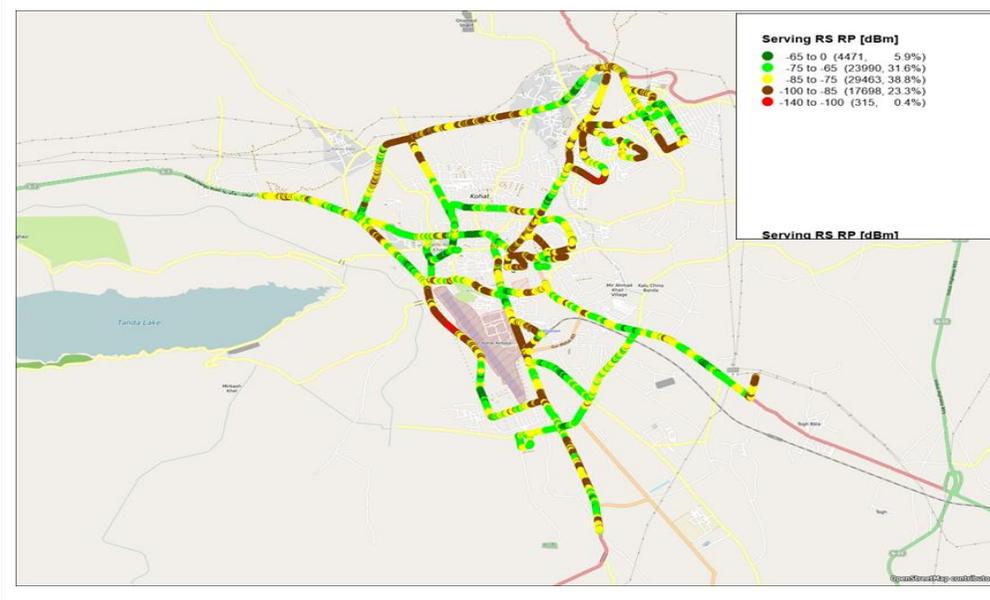
JAZZ 4G NETWORK COVERAGE - KOHAT



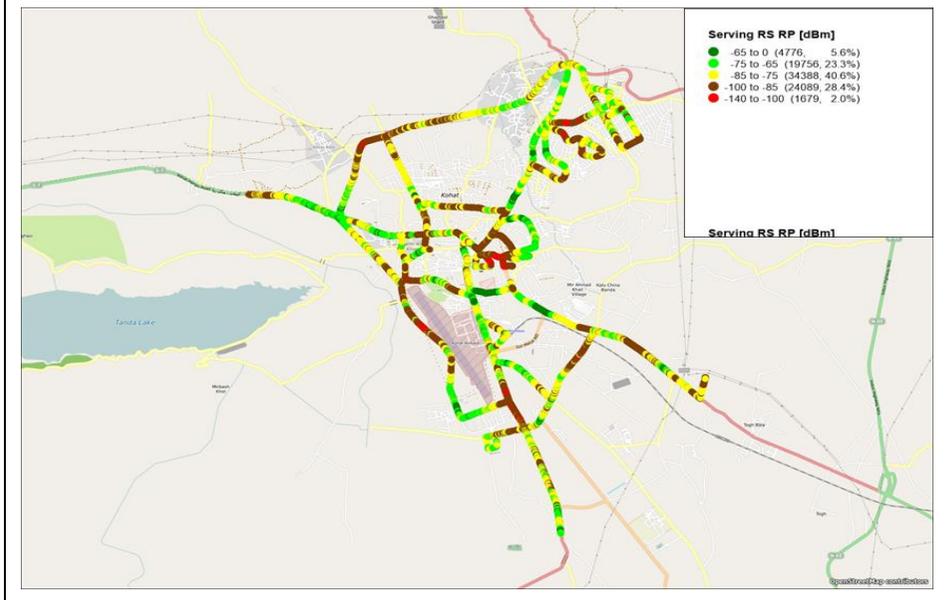
TELENOR 4G NETWORK COVERAGE - KOHAT



UFONE 4G NETWORK COVERAGE - KOHAT

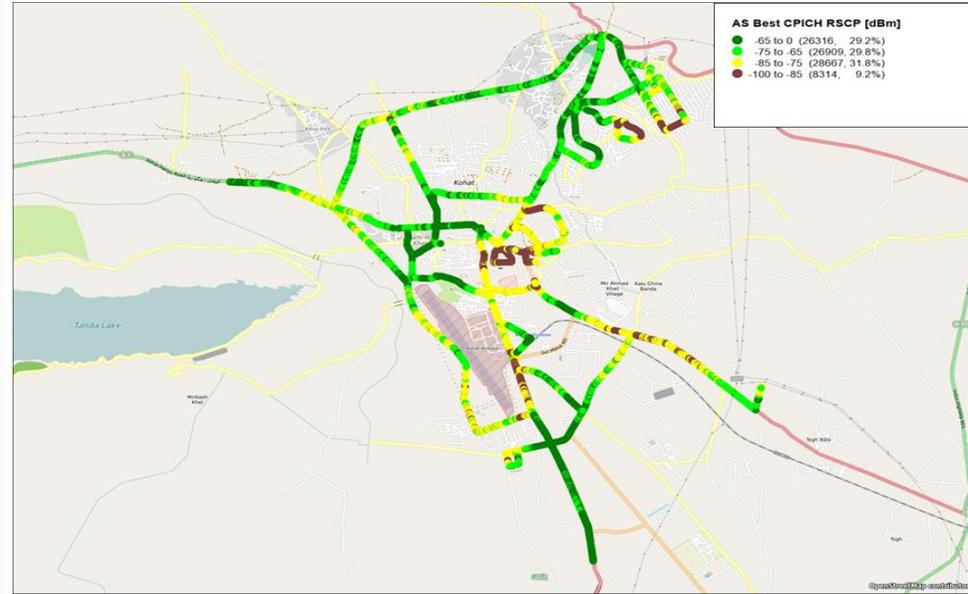


ZONG 4G NETWORK COVERAGE - KOHAT

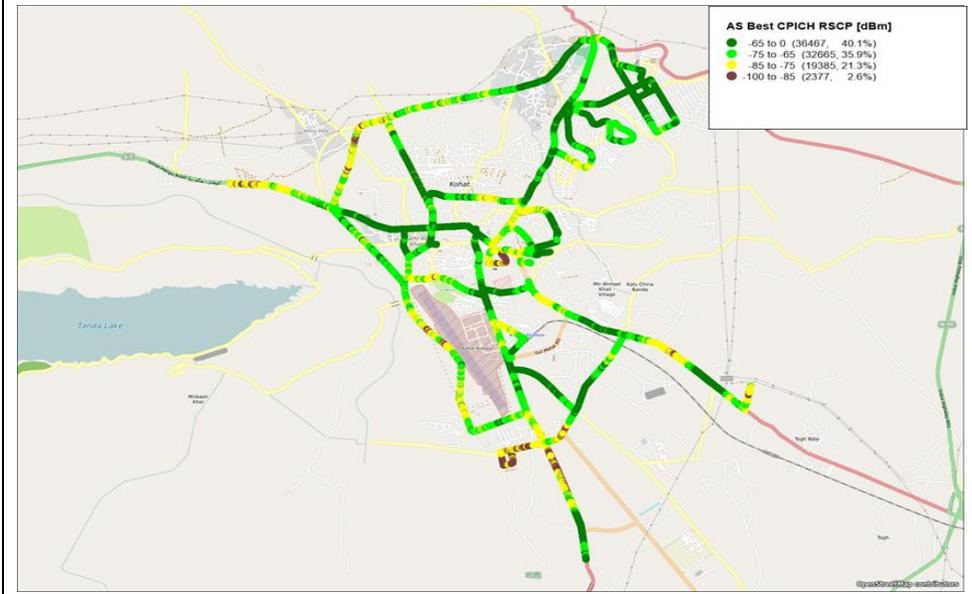


3G MOBILE COVERAGE IN CITIES- SIGNAL STRENGTH (RSCP)

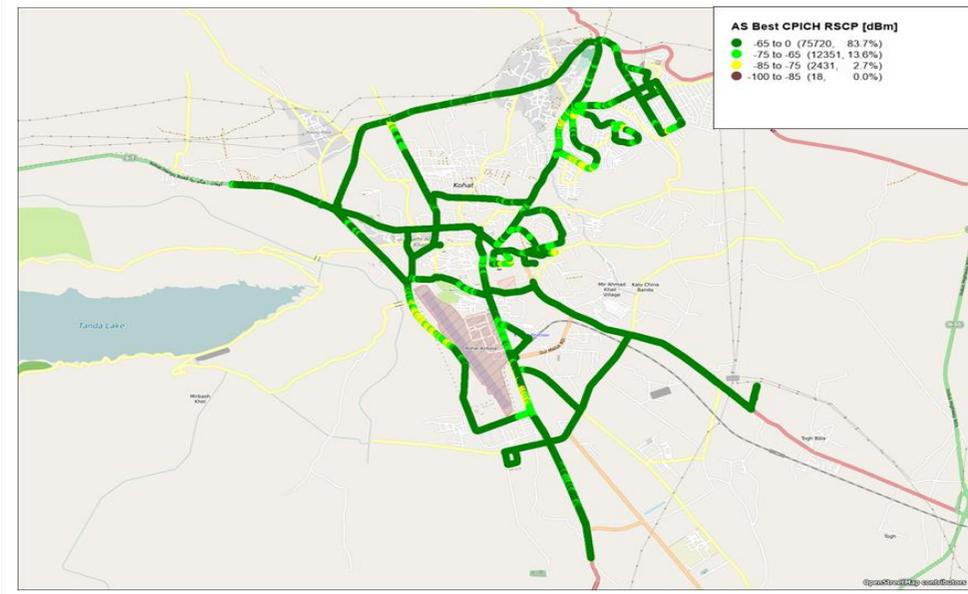
JAZZ 3G NETWORK COVERAGE - KOHAT



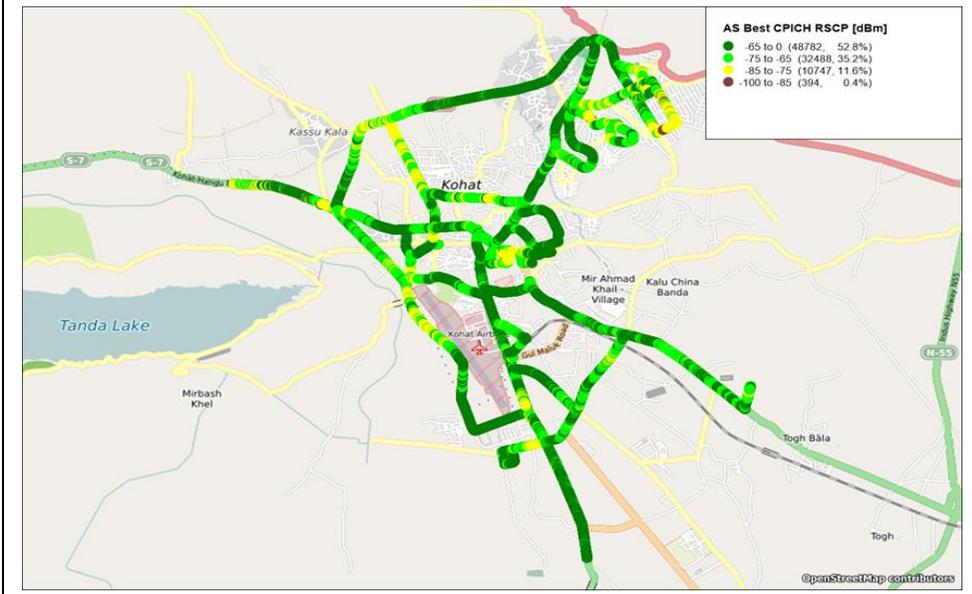
TELENOR 3G NETWORK COVERAGE - KOHAT



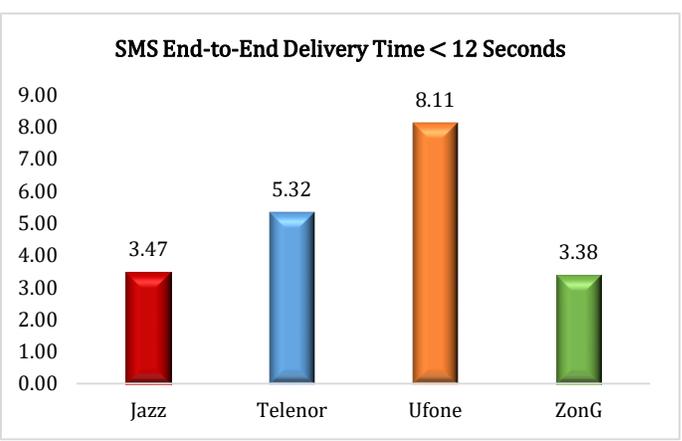
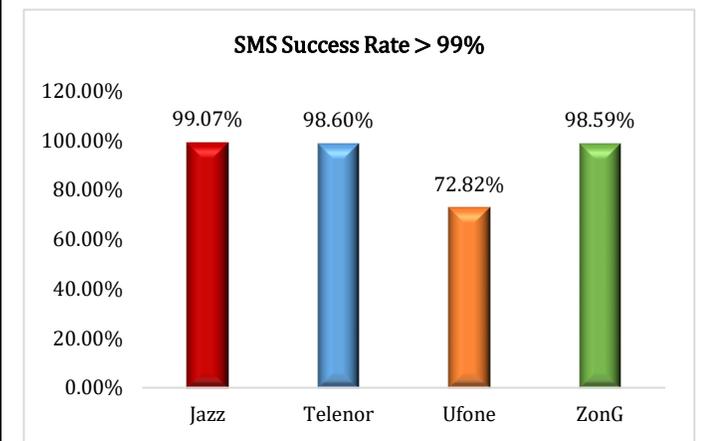
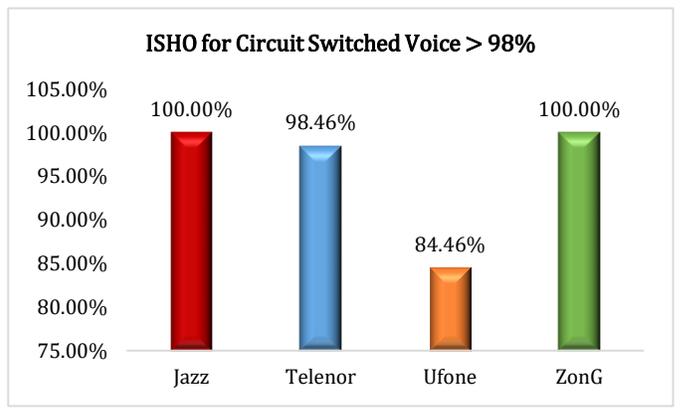
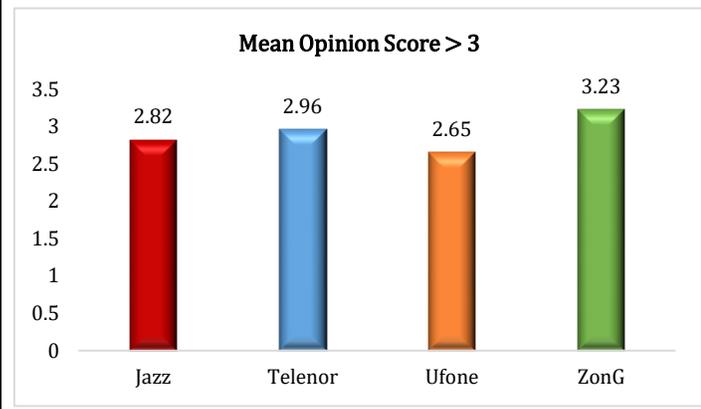
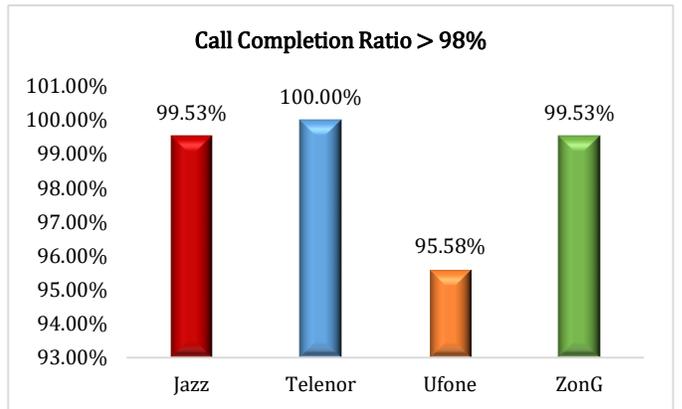
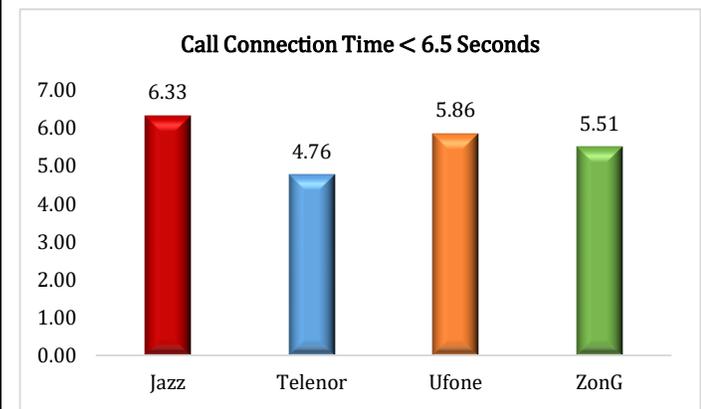
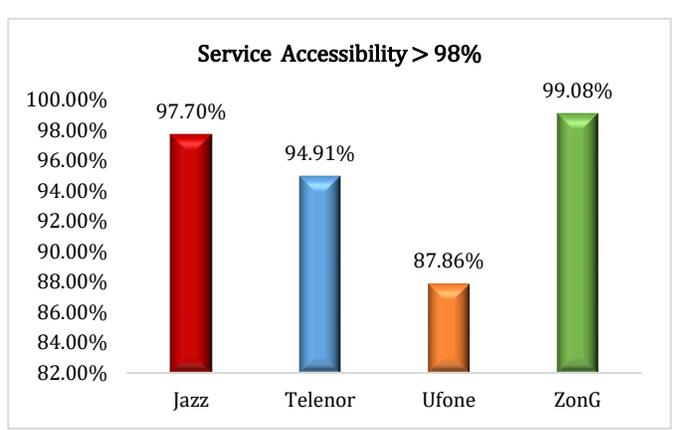
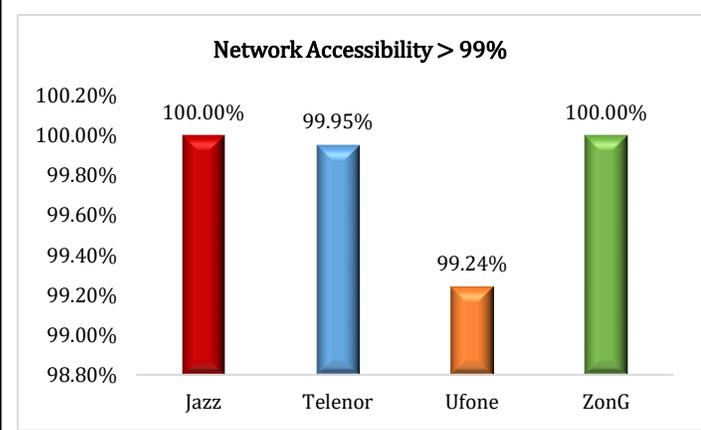
UFONE 3G NETWORK COVERAGE - KOHAT



ZONG 3G NETWORK COVERAGE - KOHAT

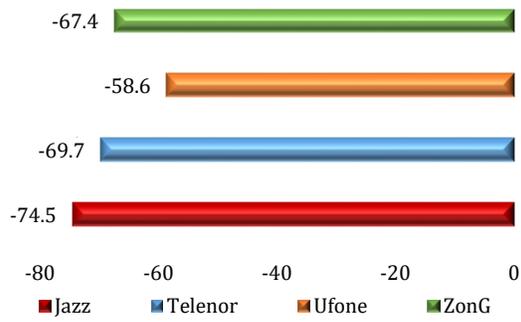


QUALITY OF SERVICE SURVEY RESULTS – KOHAT

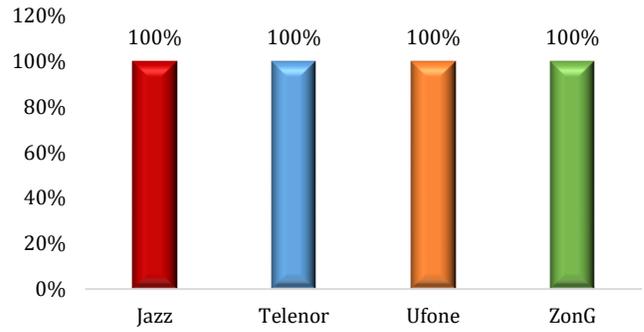


QUALITY OF SERVICE SURVEY RESULTS – KOHAT

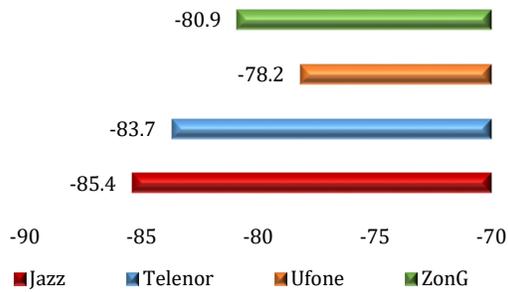
3G Signal Strength (RSCP) > -100dBm



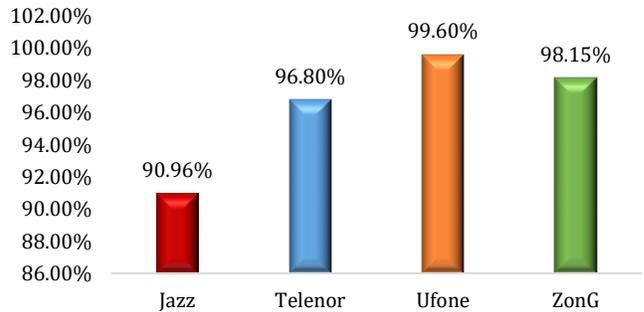
3G Signal Strength (RSCP) Confidencel Level > 90%



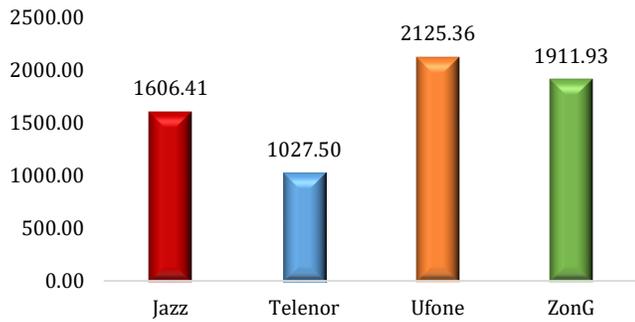
4G Signal Strength (RSRP) > -100dBm



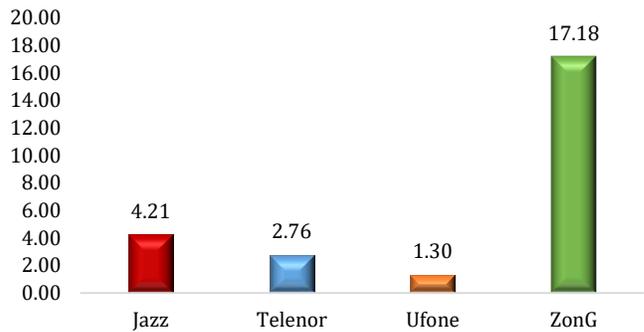
4G Signal Strength (RSRP) Confidencel Level > 90%



User Data Throughput (3G) > 256Kbps

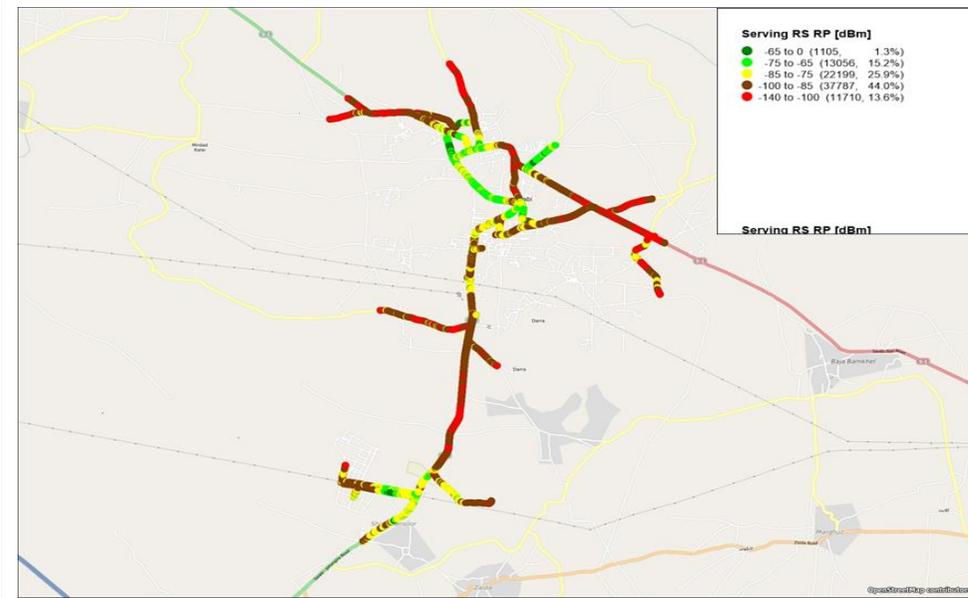


User Data Throughput (4G) > 2Mbps

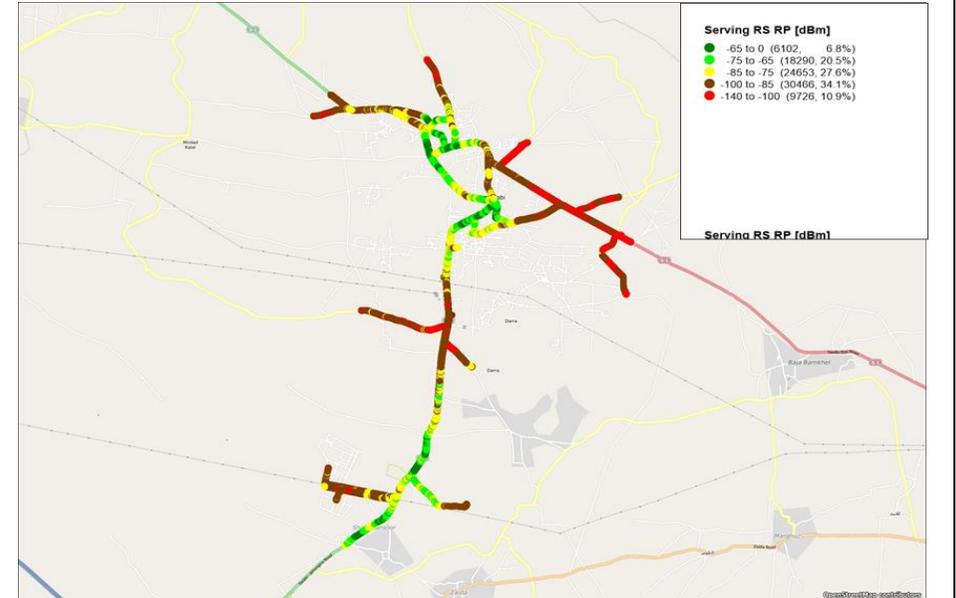


4G MOBILE COVERAGE IN CITIES- SIGNAL STRENGTH (RSRP)

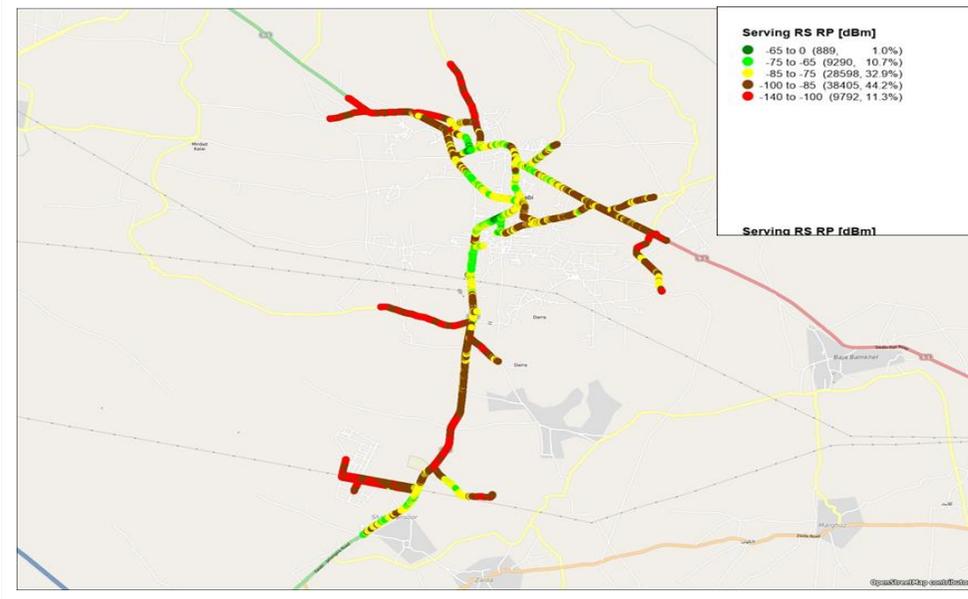
JAZZ 4G NETWORK COVERAGE - SWABI



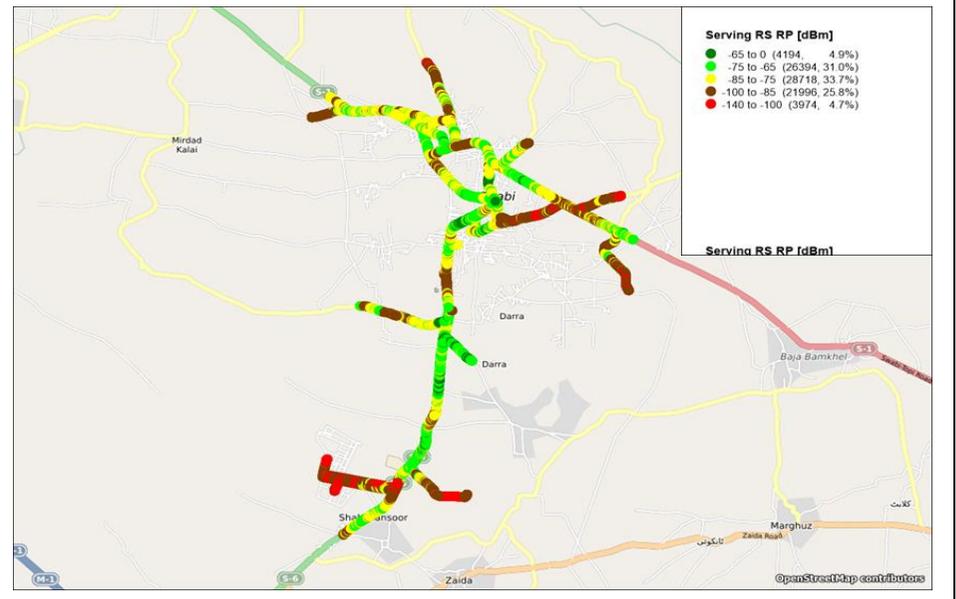
TELENOR 4G NETWORK COVERAGE - SWABI



UFONE 4G NETWORK COVERAGE - SWABI

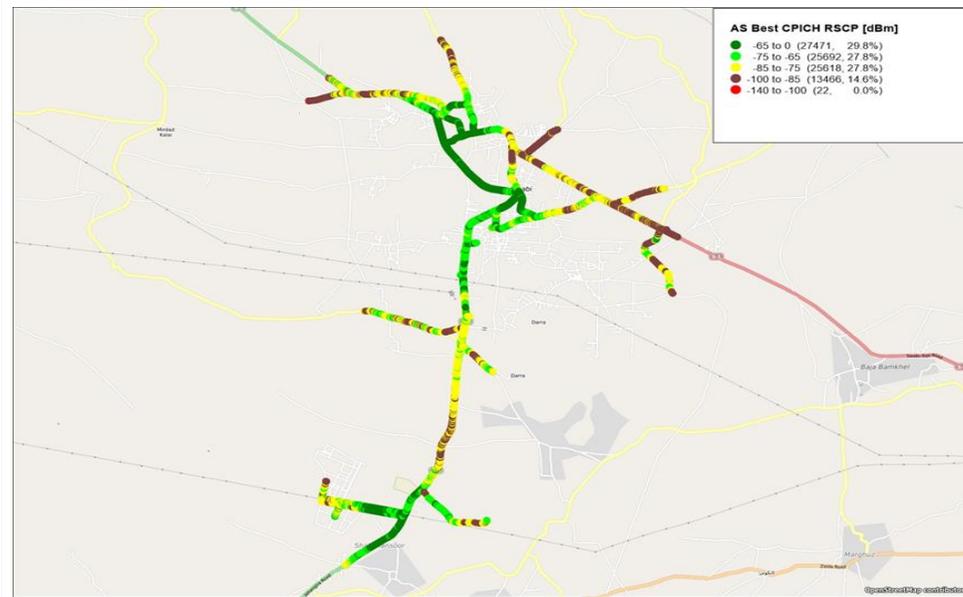


ZONG 4G NETWORK COVERAGE - SWABI

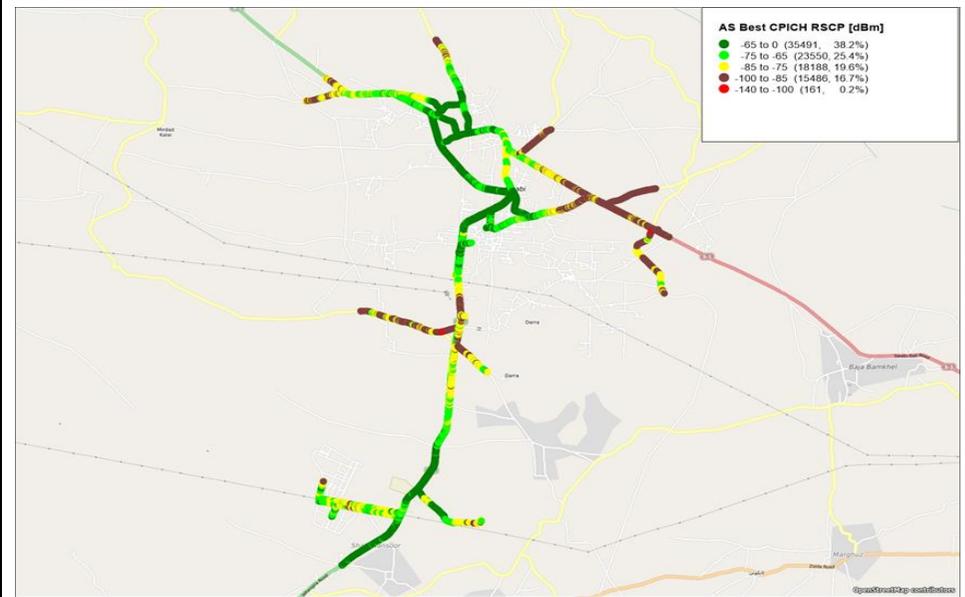


3G MOBILE COVERAGE IN CITIES- SIGNAL STRENGTH (RSCP)

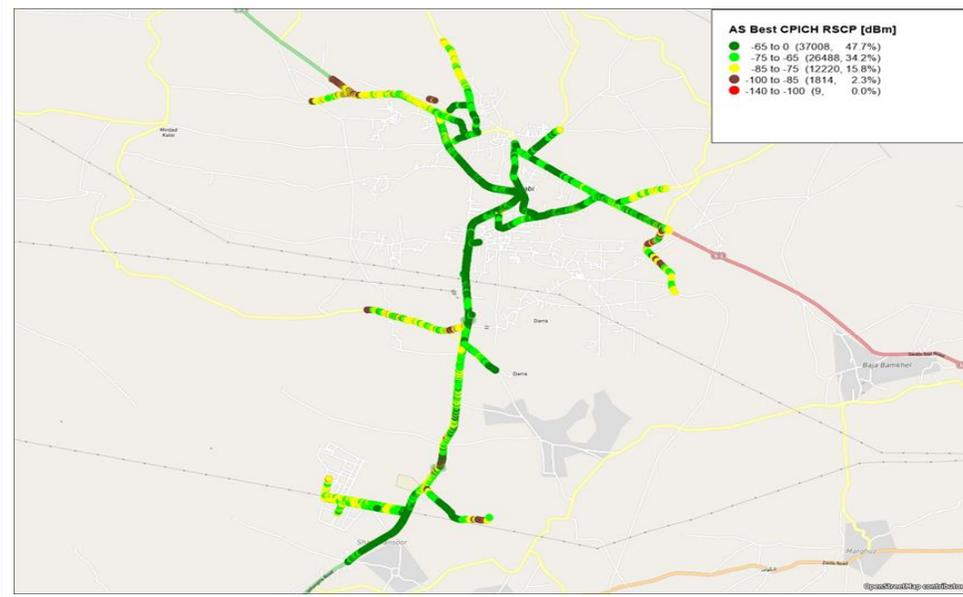
JAZZ 3G NETWORK COVERAGE – SWABI



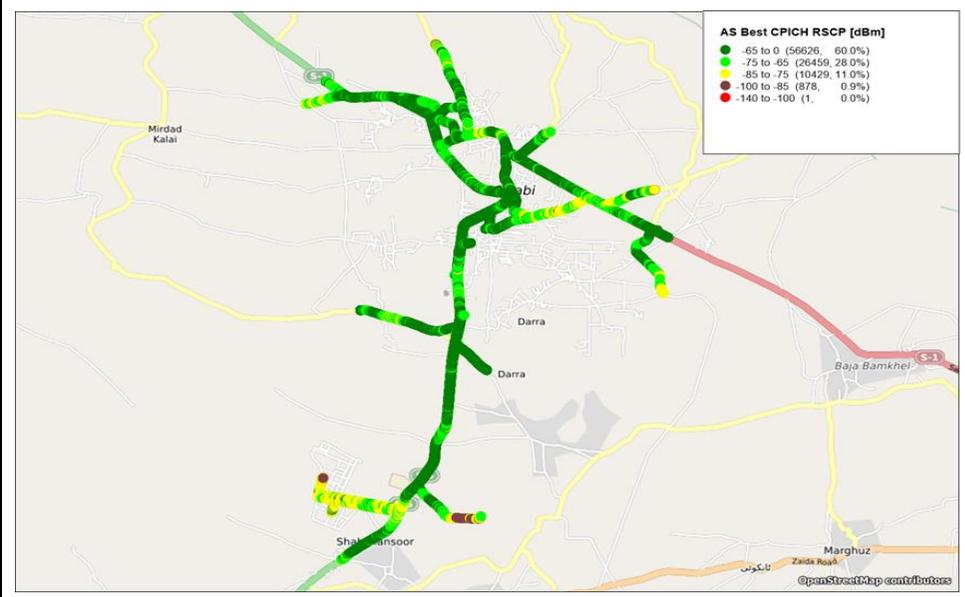
TELENOR 3G NETWORK COVERAGE – SWABI



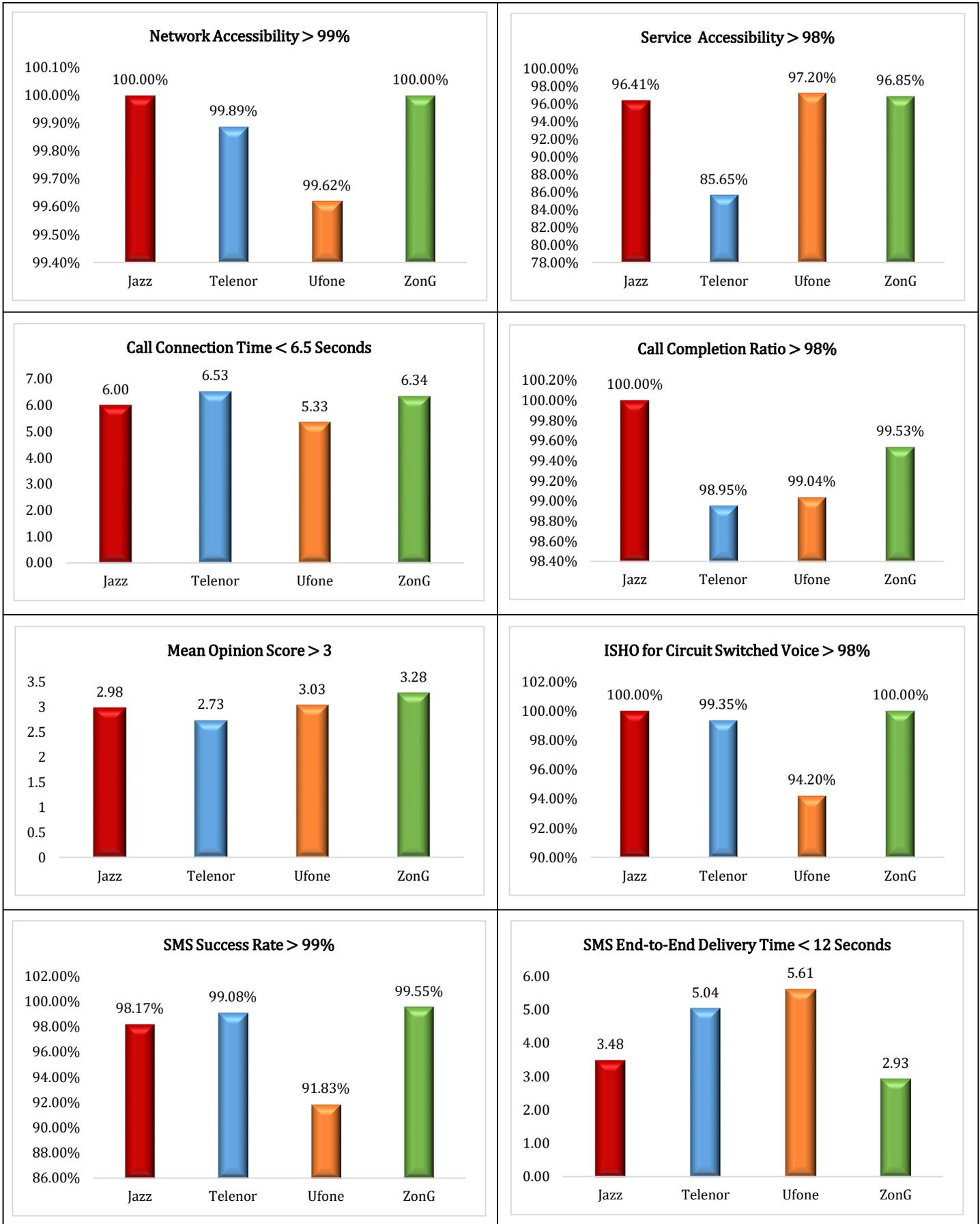
UFONE 3G NETWORK COVERAGE – SWABI



ZONG 3G NETWORK COVERAGE – SWABI

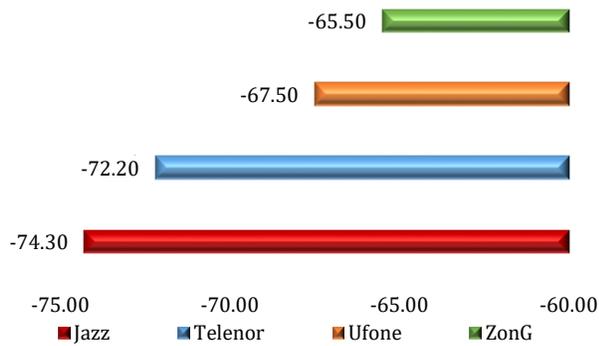


QUALITY OF SERVICE SURVEY RESULTS – SWABI

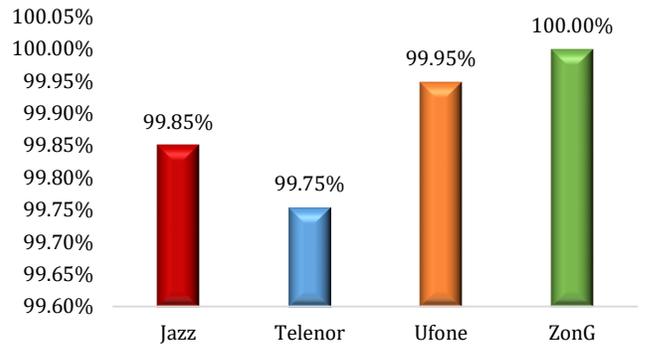


QUALITY OF SERVICE SURVEY RESULTS – SWABI

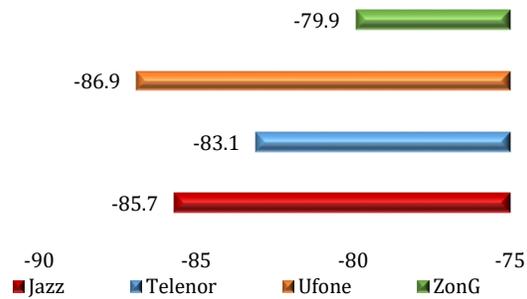
3G Signal Strength (RSCP) > -100dBm



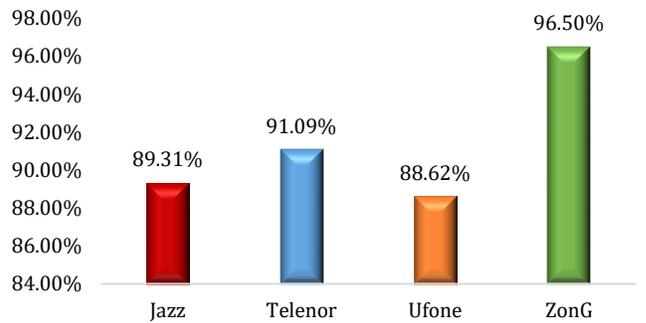
3G Signal Strength (RSCP) Confidencel Level > 90%



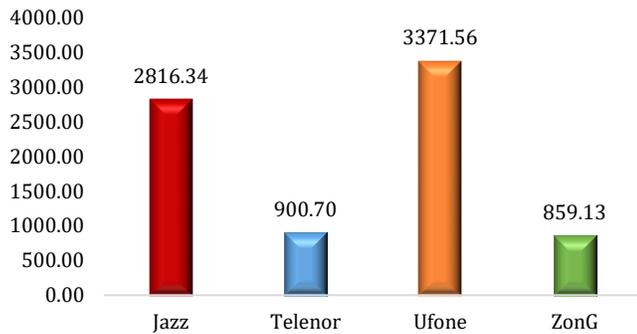
4G Signal Strength (RSRP) > -100dBm



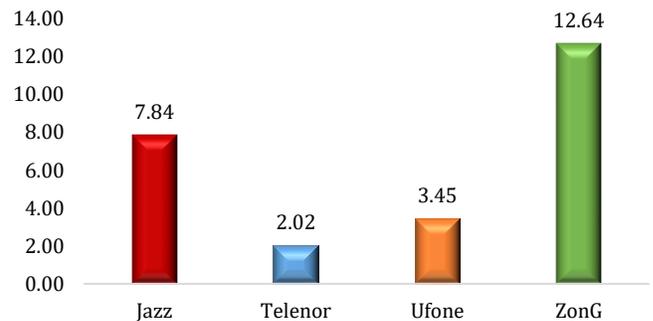
4G Signal Strength (RSRP) Confidencel Level > 90%



User Data Throughput (3G) > 256Kbps

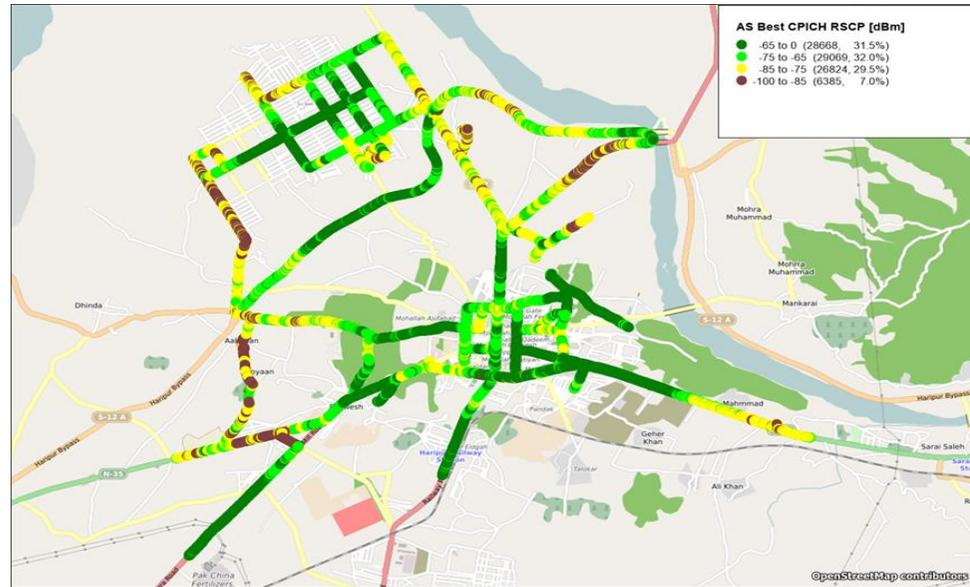


User Data Throughput (4G) > 2Mbps

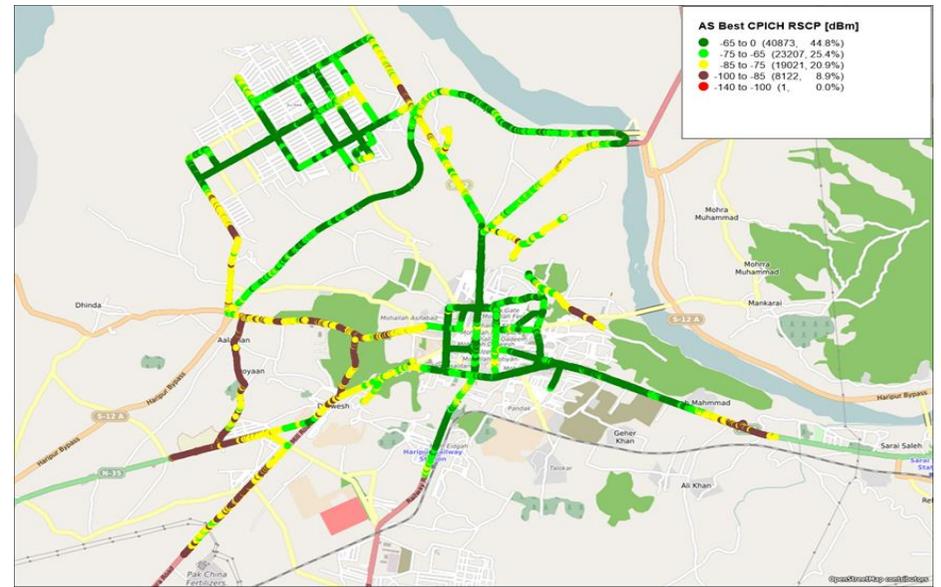


3G MOBILE COVERAGE IN CITIES- SIGNAL STRENGTH (RSCP)

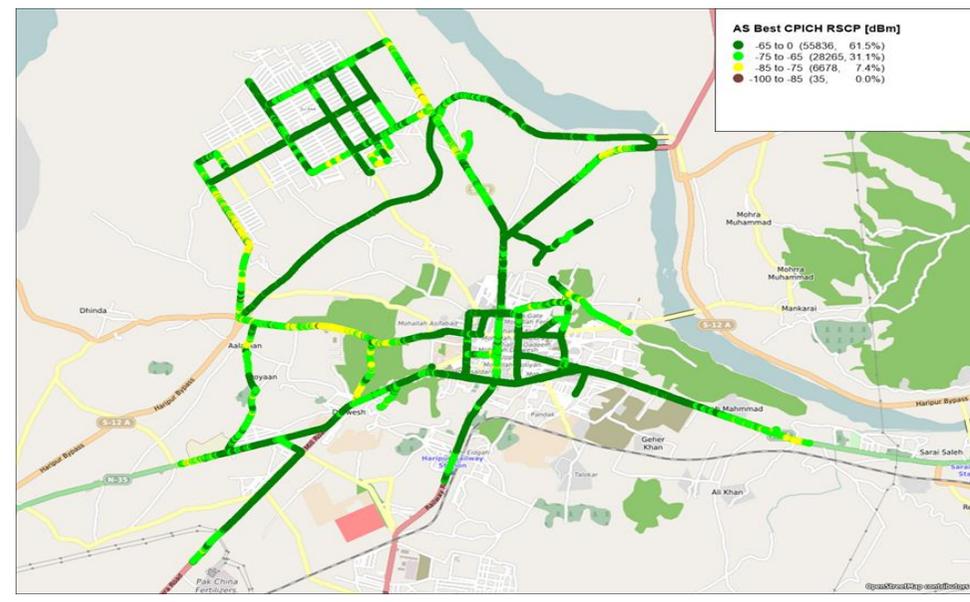
JAZZ 3G NETWORK COVERAGE - HARIPUR



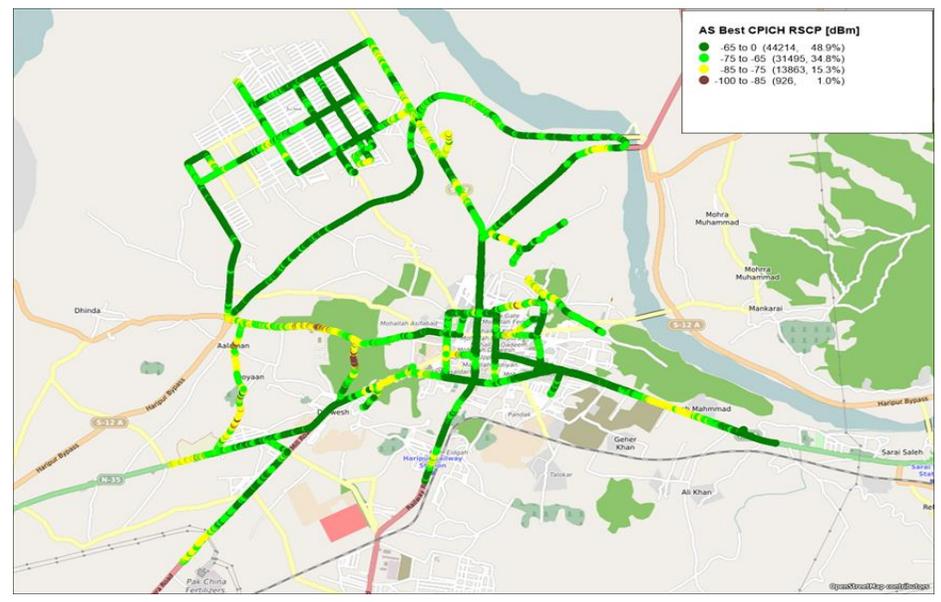
TELENOR 3G NETWORK COVERAGE - HARIPUR



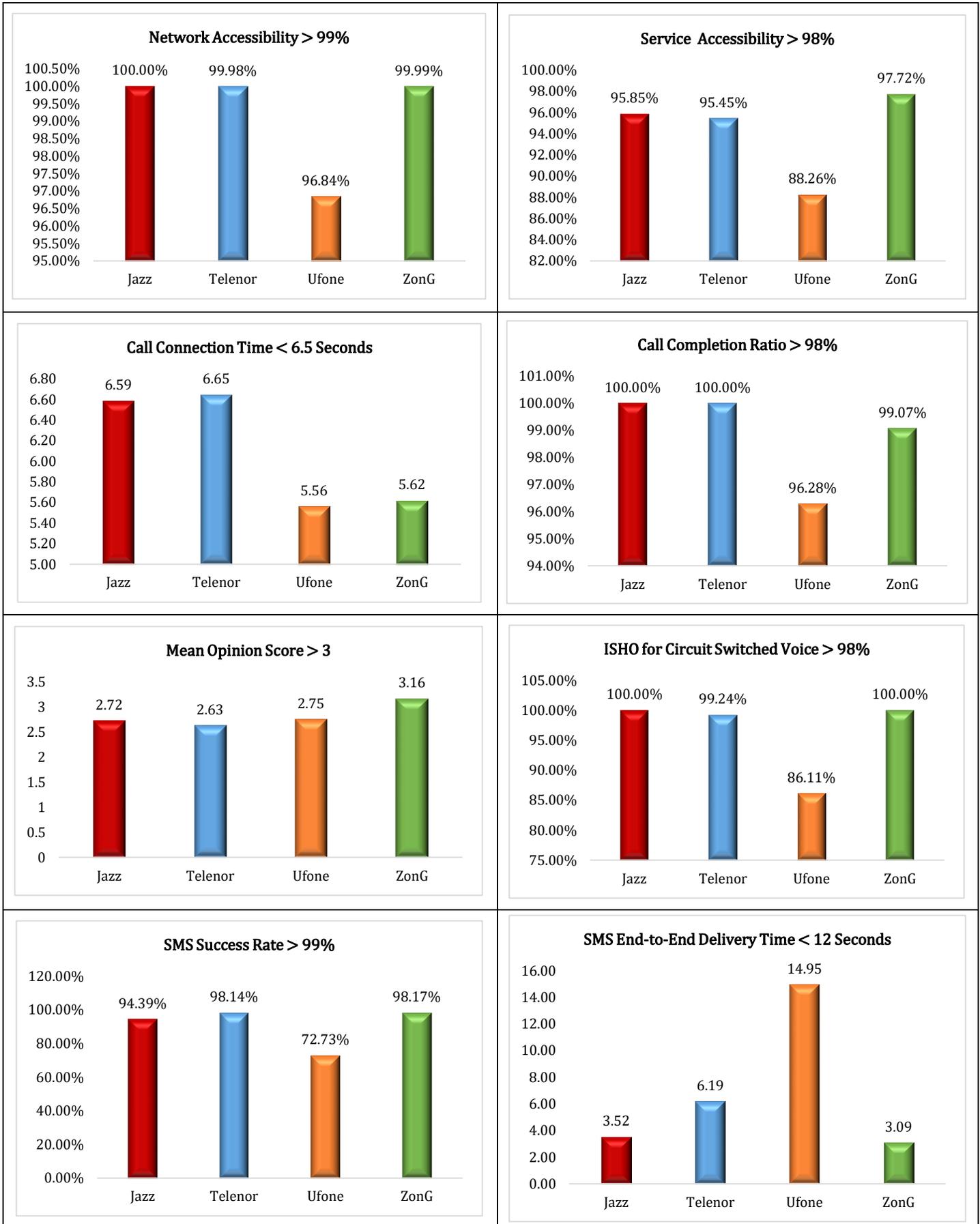
UFONE 3G NETWORK COVERAGE - HARIPUR



ZONG 3G NETWORK COVERAGE - HARIPUR

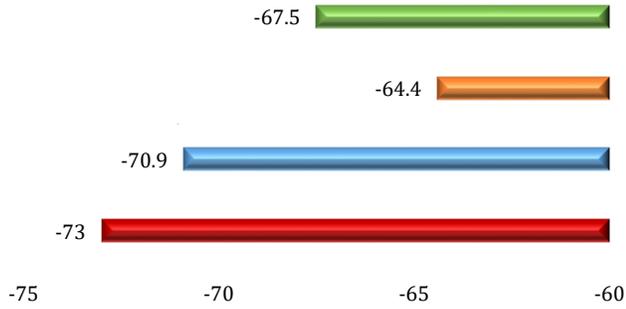


QUALITY OF SERVICE SURVEY RESULTS – HARIPUR

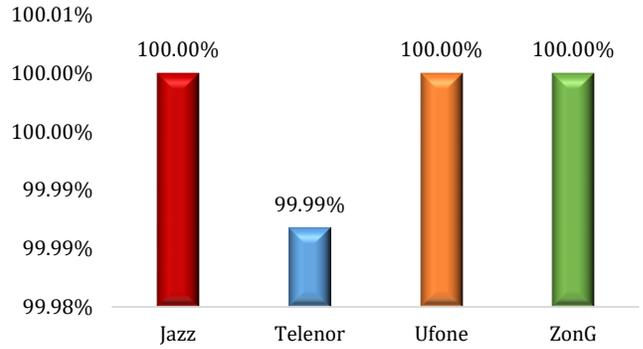


QUALITY OF SERVICE SURVEY RESULTS – HARIPUR

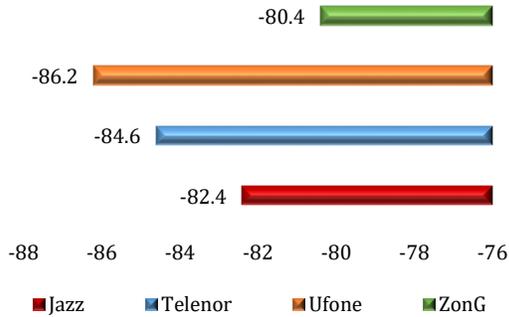
3G Signal Strength (RSCP) > -100dBm



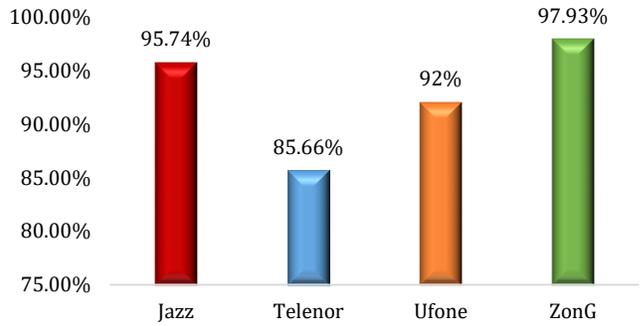
3G Signal Strength (RSCP) Confidencel Level > 90%



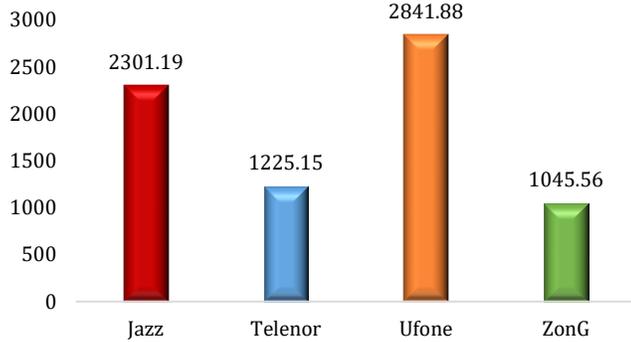
4G Signal Strength (RSRP) > -100dBm



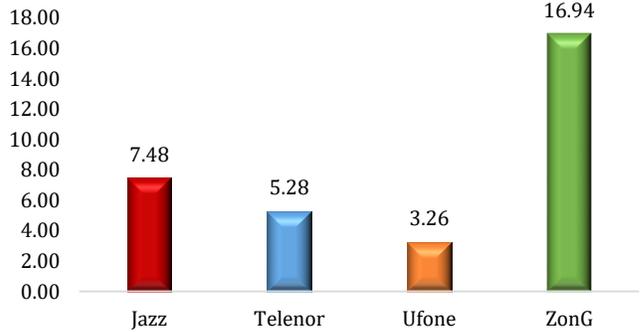
4G Signal Strength (RSRP) Confidencel Level > 90%



User Data Throughput (3G) > 256Kbps

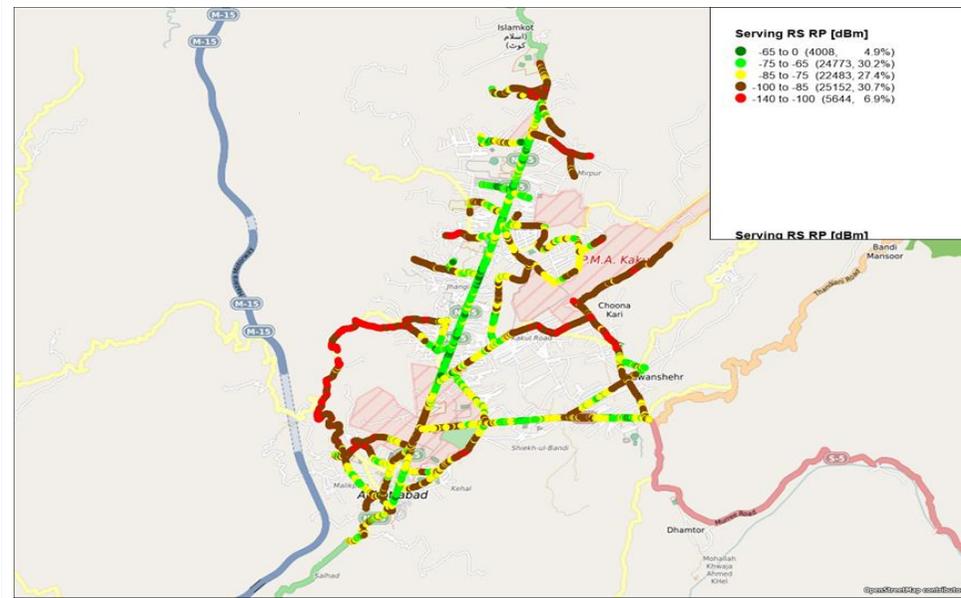


User Data Throughput (4G) > 2Mbps

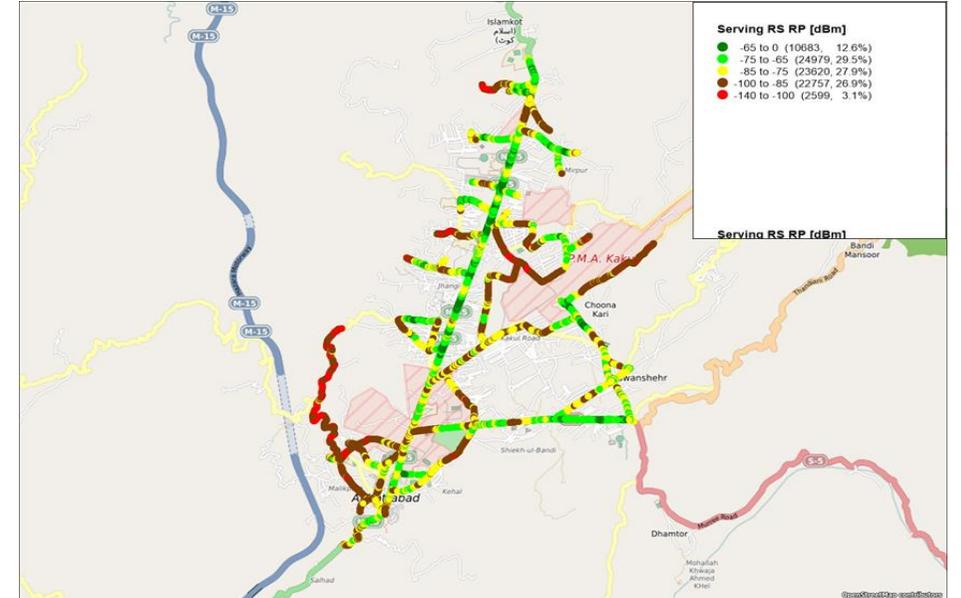


4G MOBILE COVERAGE IN CITIES- SIGNAL STRENGTH (RSRP)

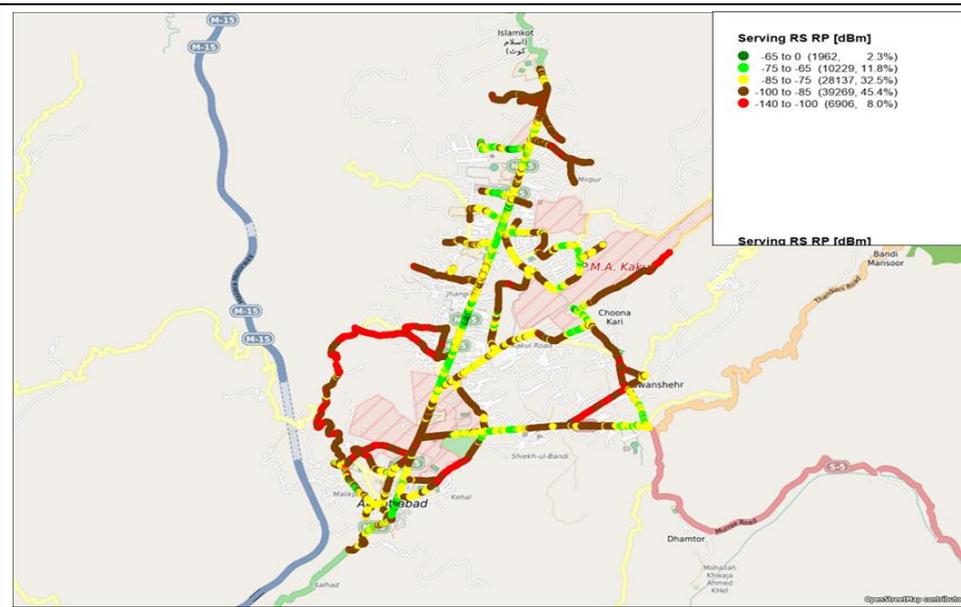
JAZZ 4G NETWORK COVERAGE - ABBOTTABAD



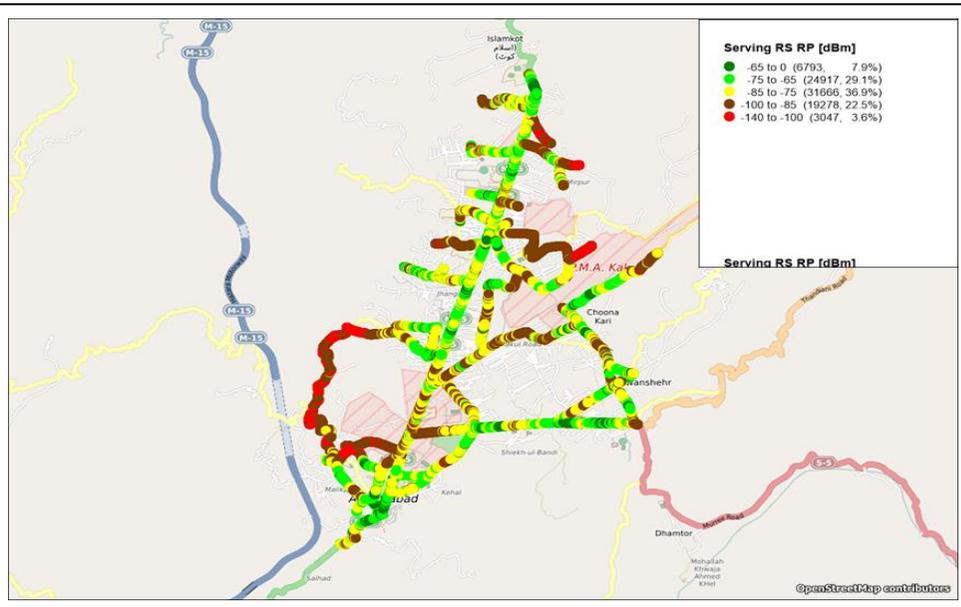
TELEOR 4G NETWORK COVERAGE - ABBOTTABAD



UFONE 4G NETWORK COVERAGE - ABBOTTABAD

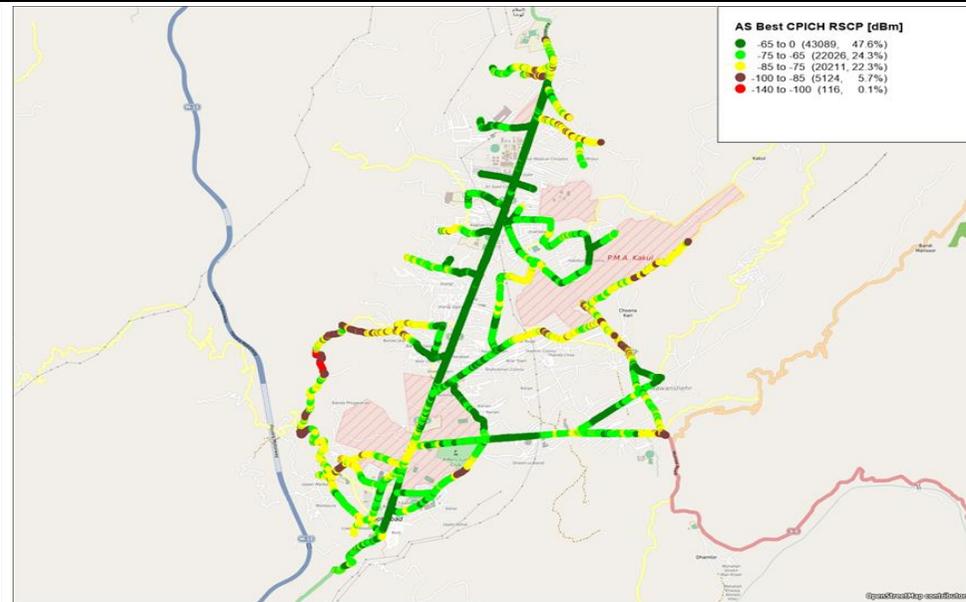


ZONG 4G NETWORK COVERAGE - ABBOTTABAD

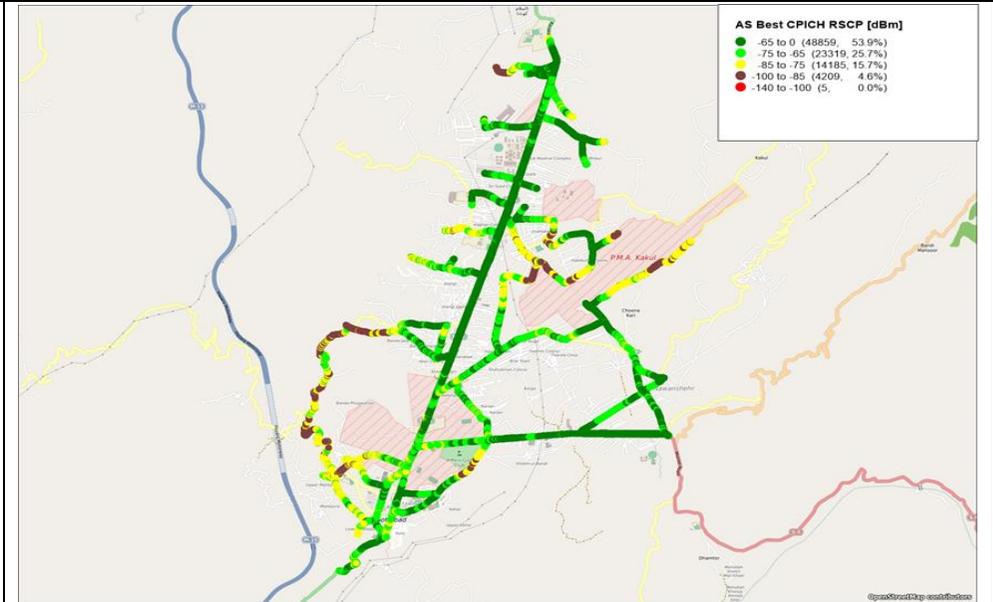


3G MOBILE COVERAGE IN CITIES- SIGNAL STRENGTH (RSCP)

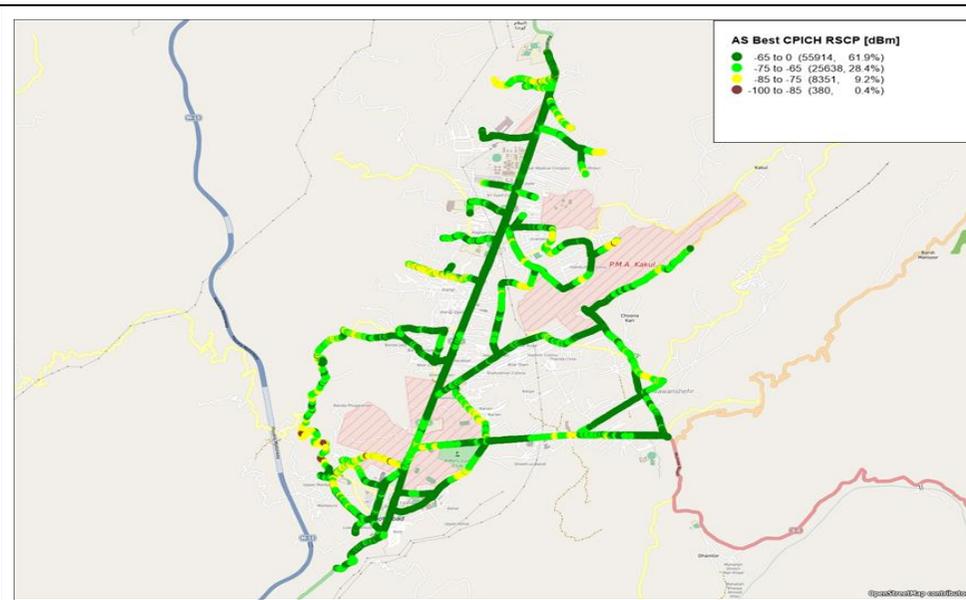
JAZZ 3G NETWORK COVERAGE - ABBOTTABAD



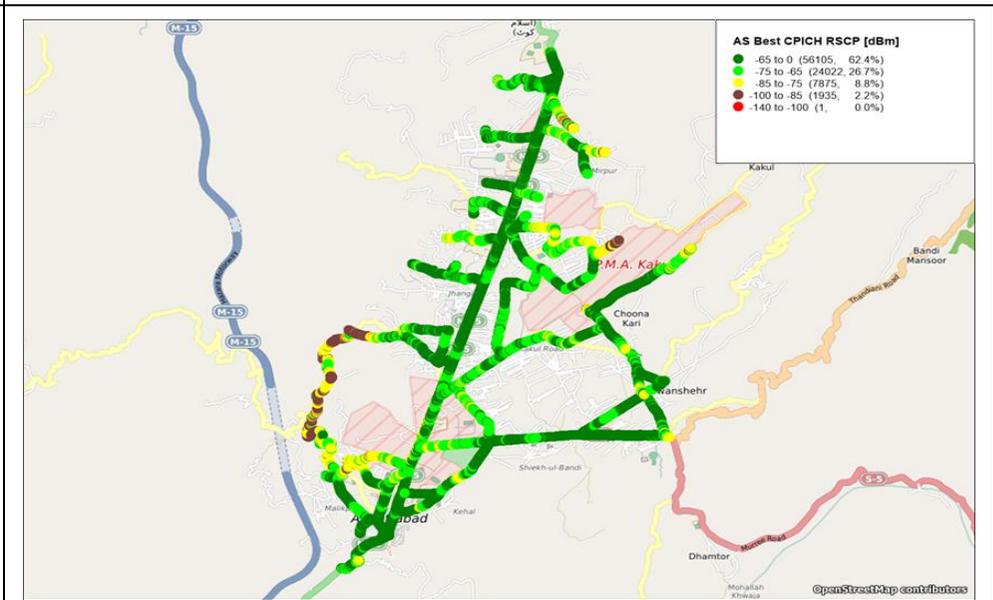
TELENOR 3G NETWORK COVERAGE - ABBOTTABAD



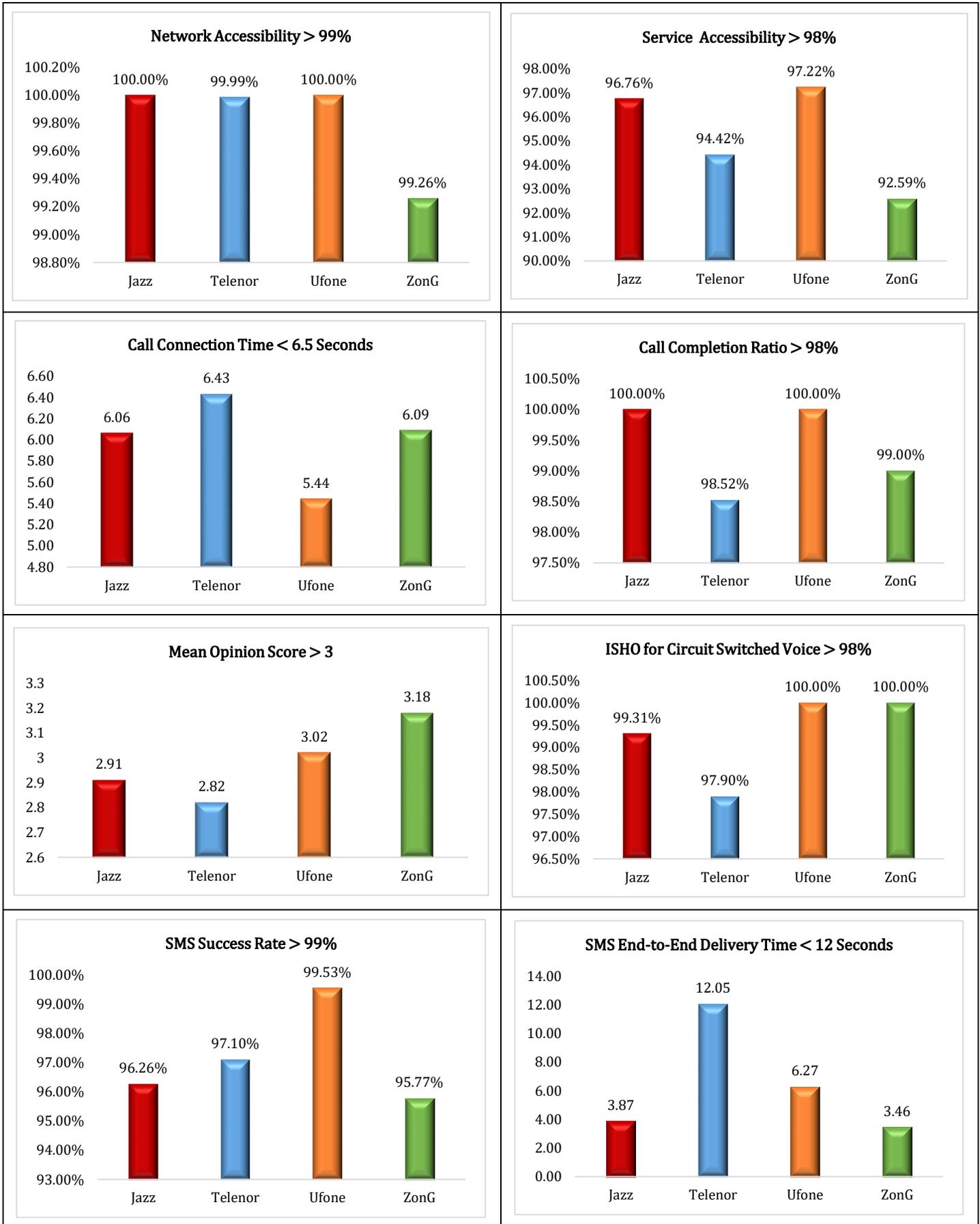
UFONE 3G NETWORK COVERAGE - ABBOTTABAD



ZONG 3G NETWORK COVERAGE - ABBOTTABAD

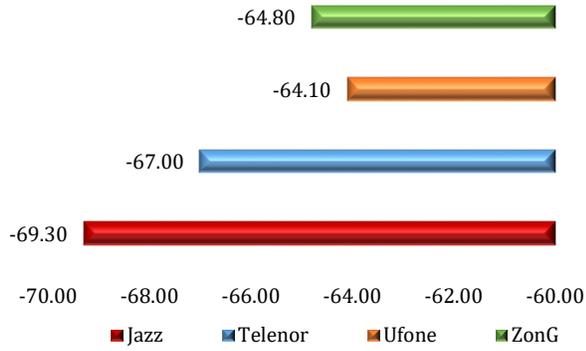


QUALITY OF SERVICE SURVEY RESULTS – ABBOTTABAD

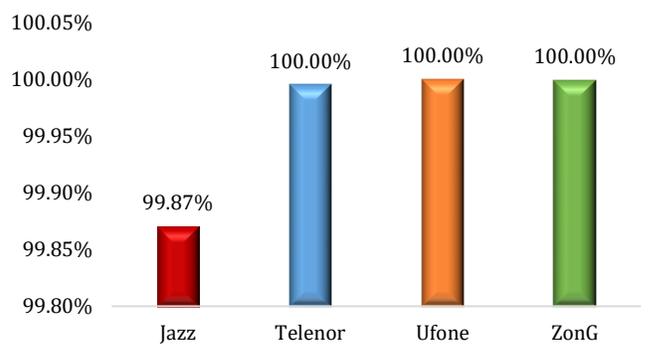


QUALITY OF SERVICE SURVEY RESULTS – ABBOTTABAD

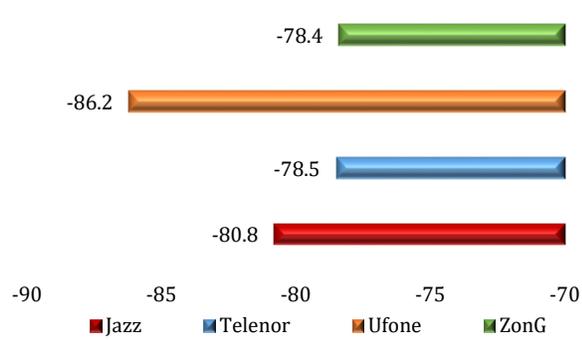
3G Signal Strength (RSCP) > -100dBm



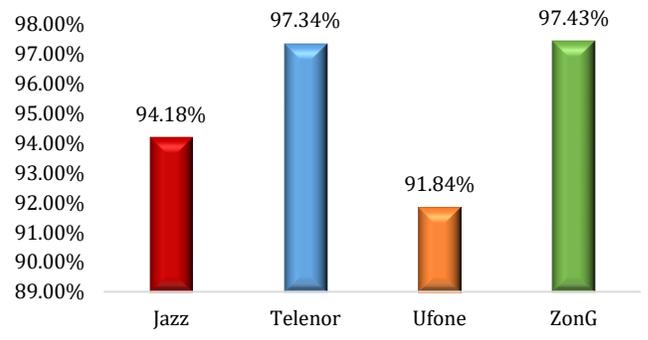
3G Signal Strength (RSCP) Confidencel Level > 90%



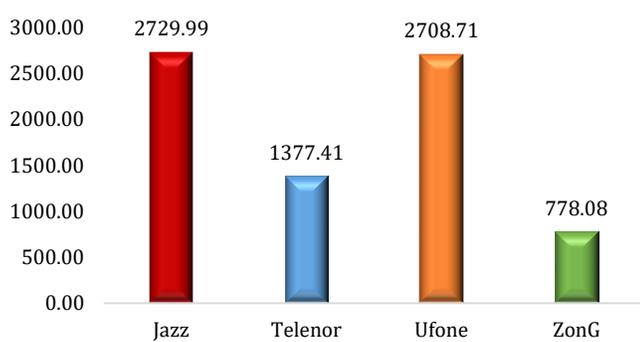
4G Signal Strength (RSRP) > -100dBm



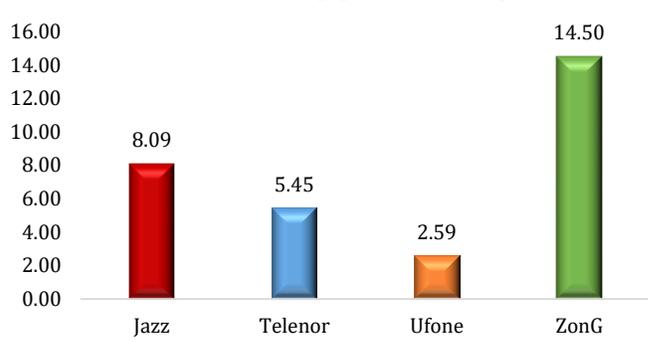
4G Signal Strength (RSRP) Confidencel Level > 90%



User Data Throughput (3G) > 256Kbps



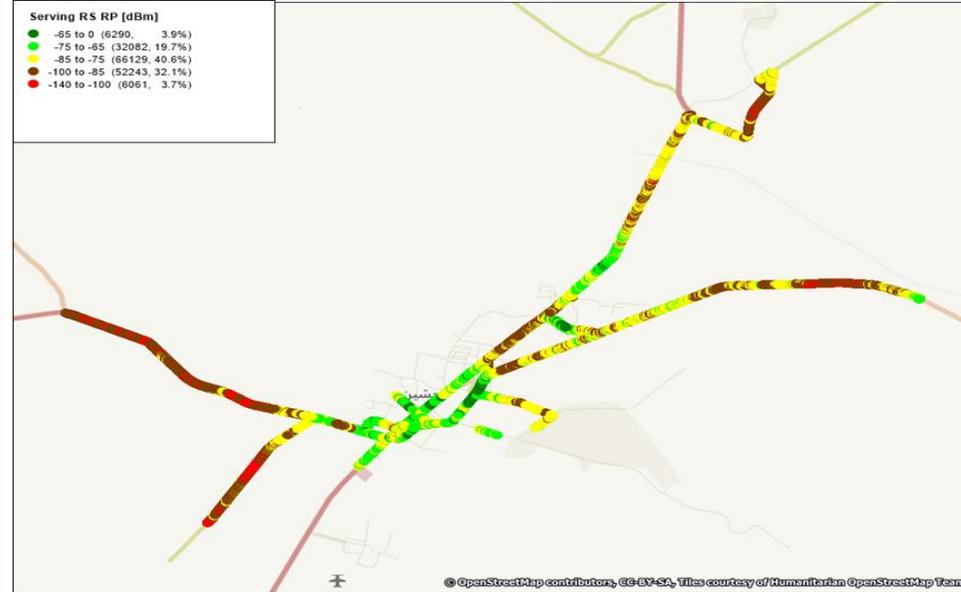
User Data Throughput (4G) > 2Mbps



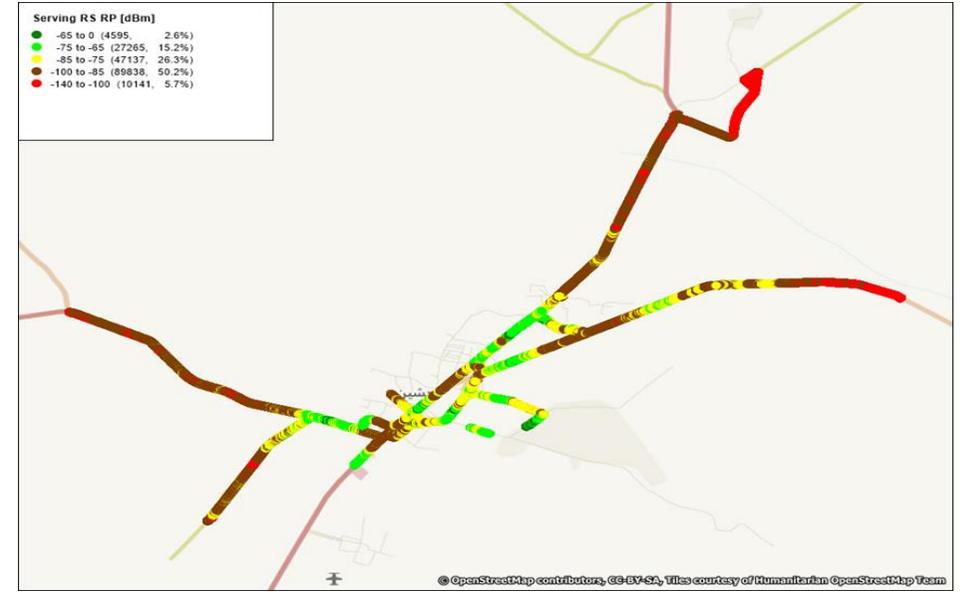
BALUCHISTAN

4G MOBILE COVERAGE IN CITIES- SIGNAL STRENGTH (RSRP)

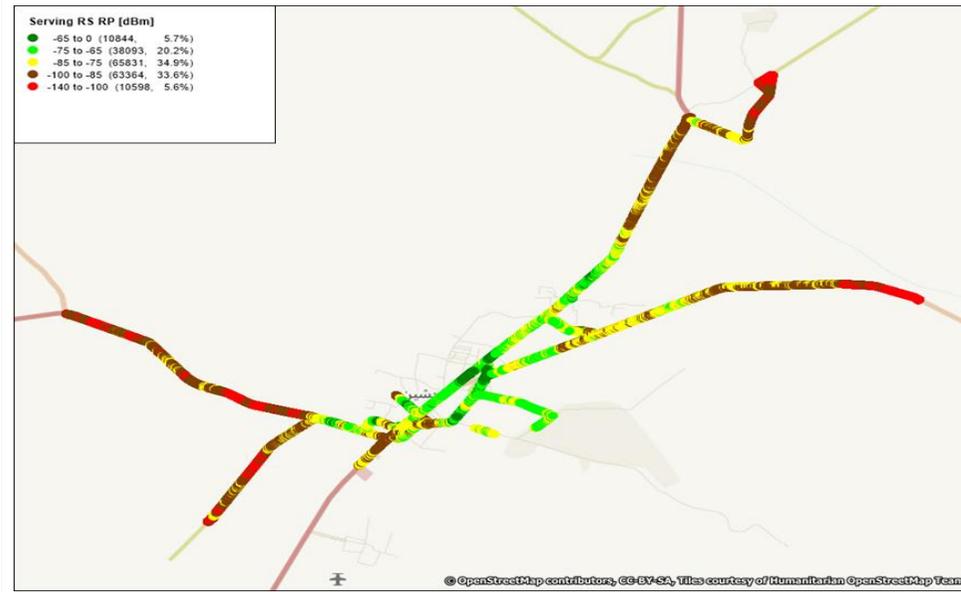
JAZZ 4G NETWORK COVERAGE - PISHIN



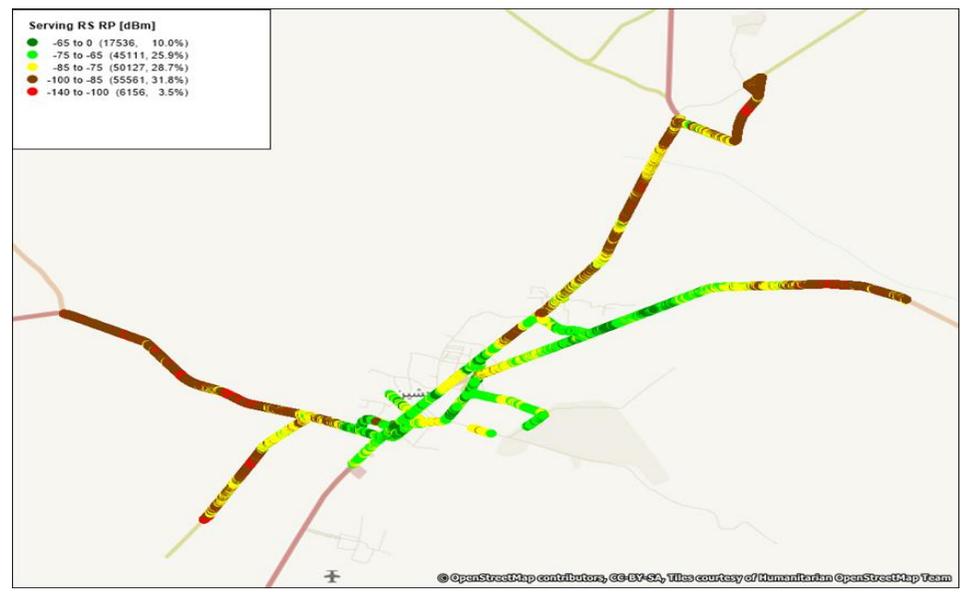
TELENOR 4G NETWORK COVERAGE - PISHIN



UFONE 4G NETWORK COVERAGE - PISHIN

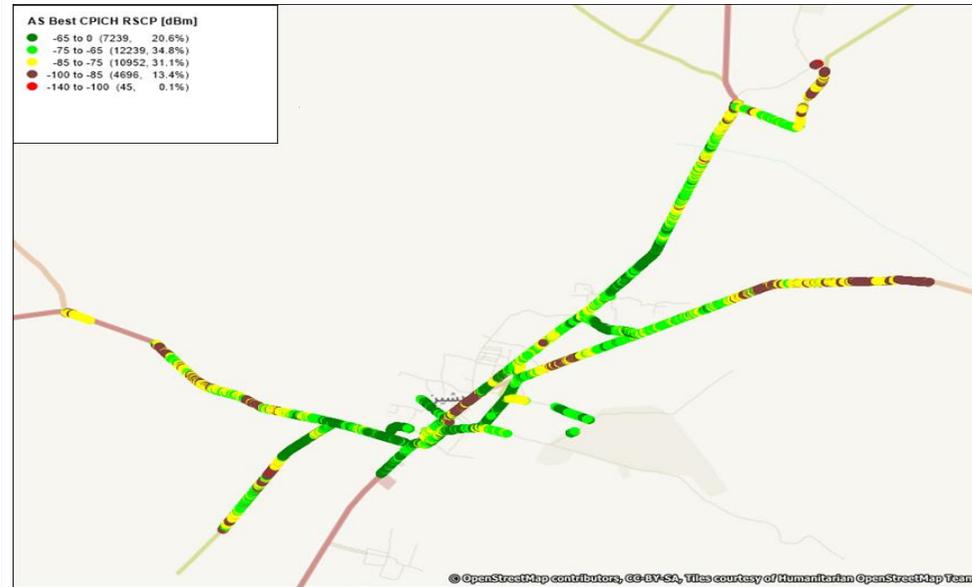


ZONG 4G NETWORK COVERAGE - PISHIN

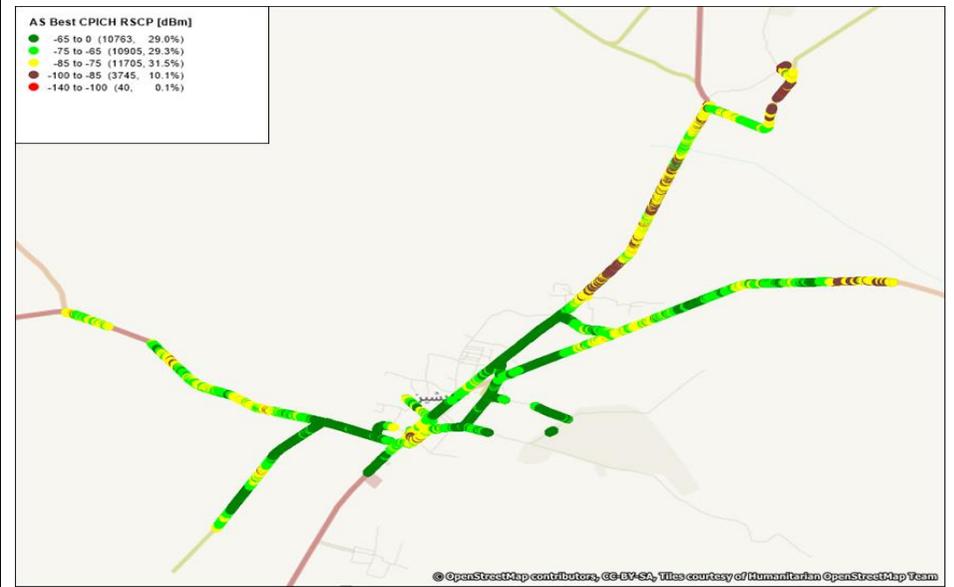


3G MOBILE COVERAGE IN CITIES- SIGNAL STRENGTH (RSCP)

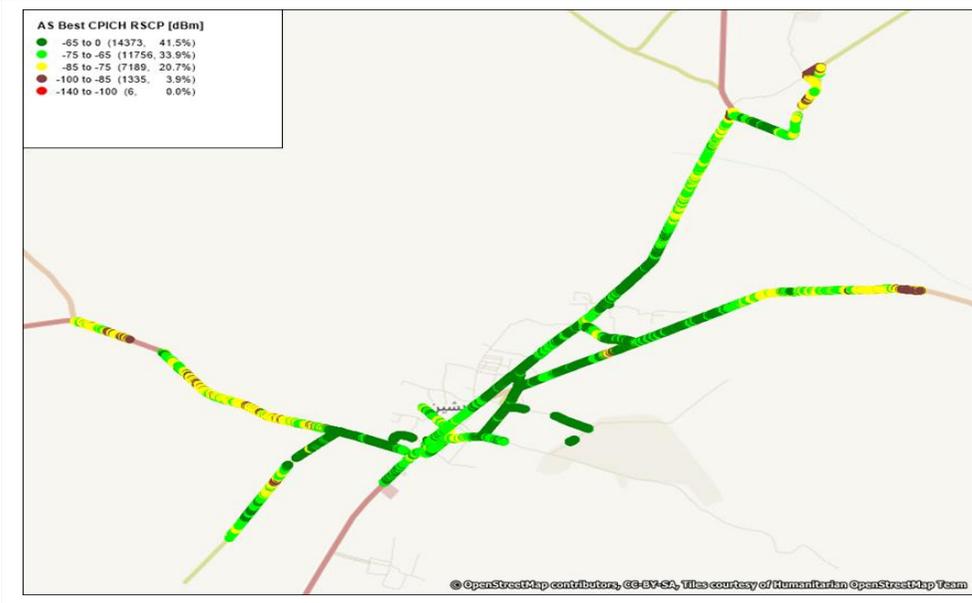
JAZZ 3G NETWORK COVERAGE - PISHIN



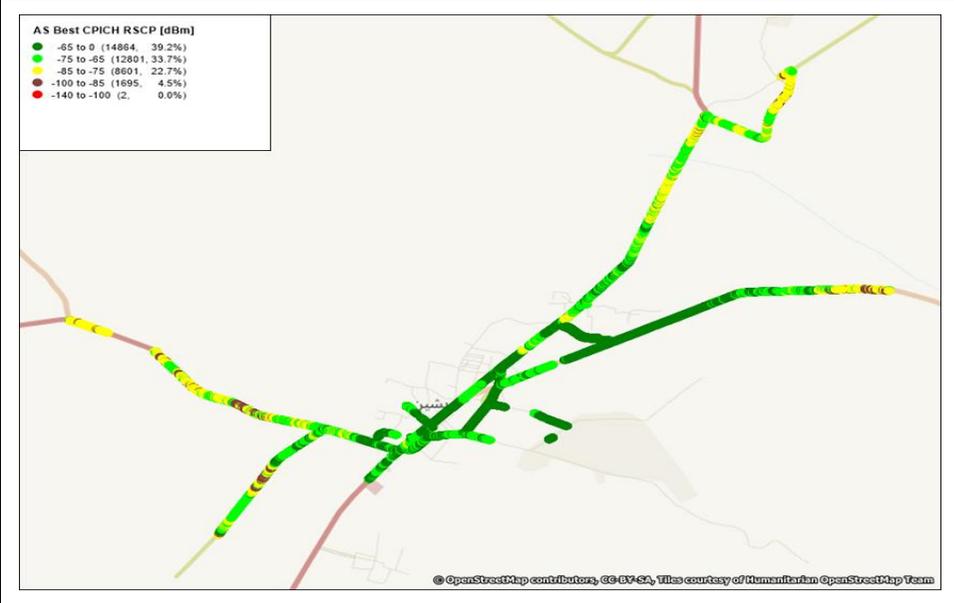
TELENOR 3G NETWORK COVERAGE - PISHIN



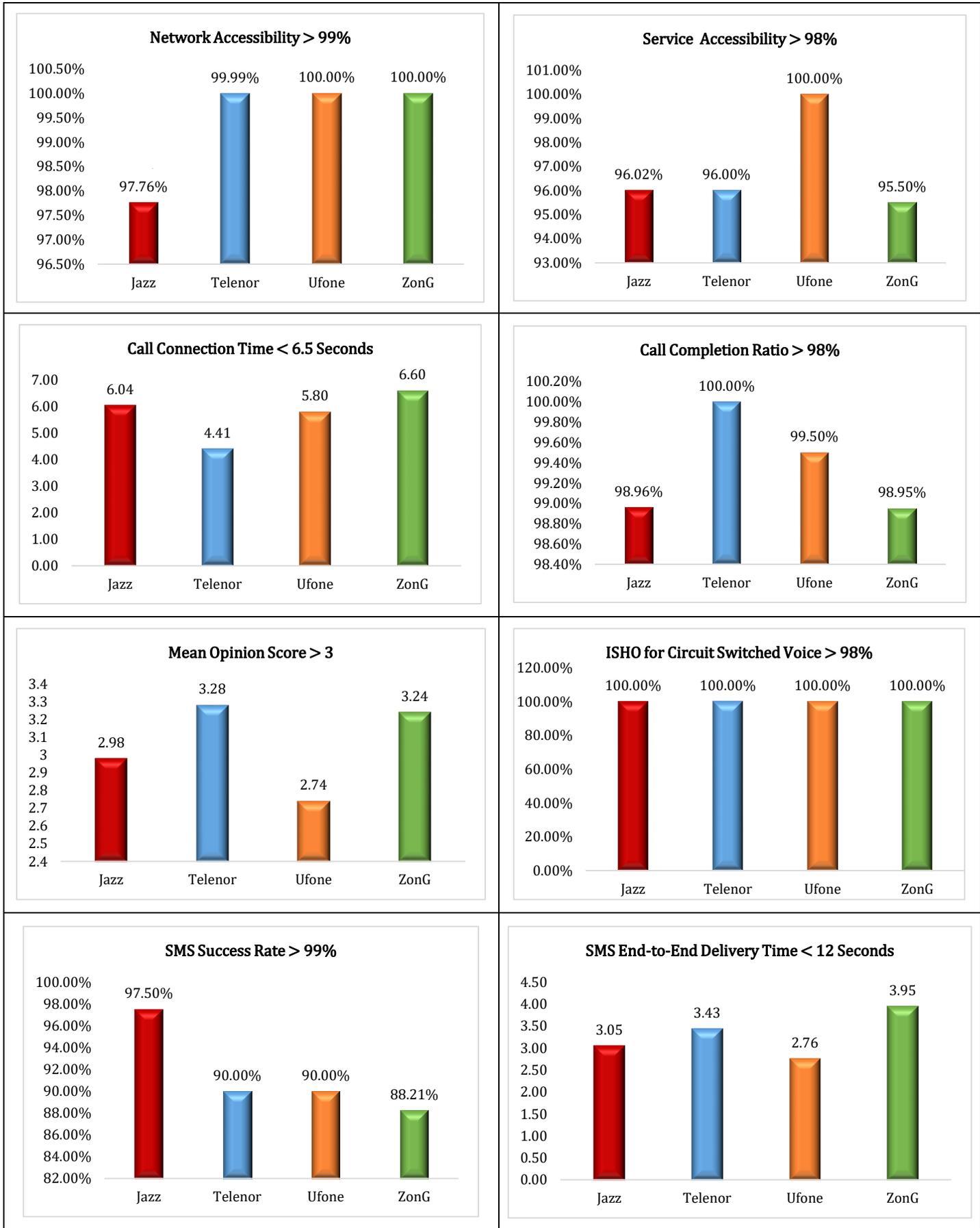
UFONE 3G NETWORK COVERAGE - PISHIN



ZONG 3G NETWORK COVERAGE - PISHIN

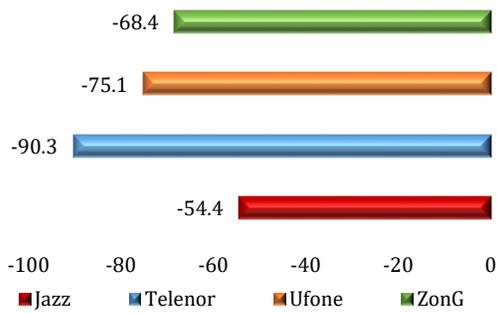


QUALITY OF SERVICE SURVEY RESULTS – PISHIN

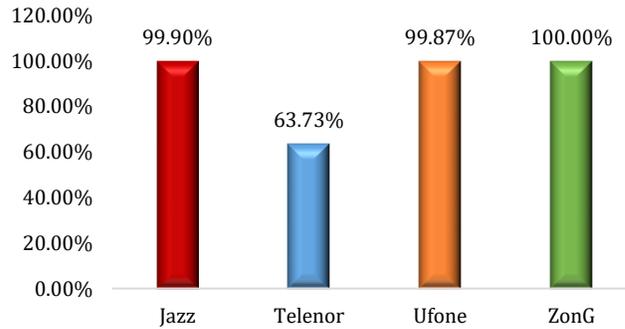


QUALITY OF SERVICE SURVEY RESULTS – PISHIN

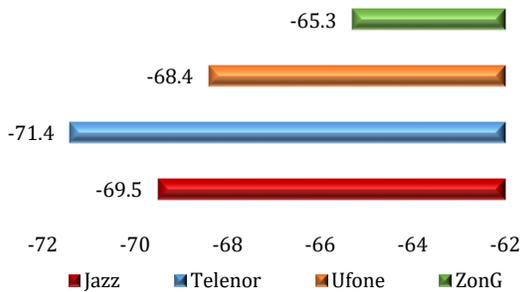
3G Signal Strength (RSCP) > -100dBm



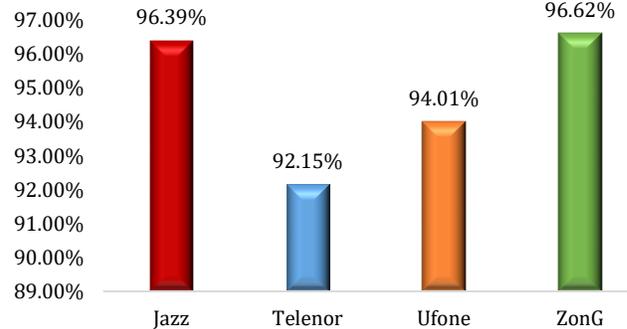
3G Signal Strength (RSCP) Confidencel Level > 90%



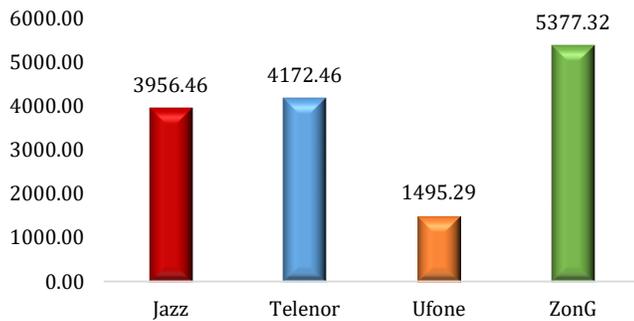
4G Signal Strength (RSRP) > -100dBm



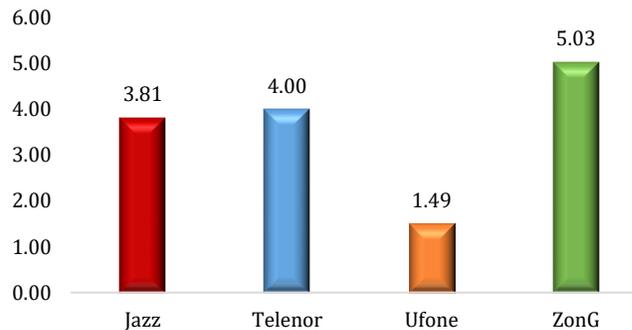
4G Signal Strength (RSRP) Confidencel Level > 90%



User Data Throughput (3G) > 256Kbps



User Data Throughput (4G) > 2Mbps

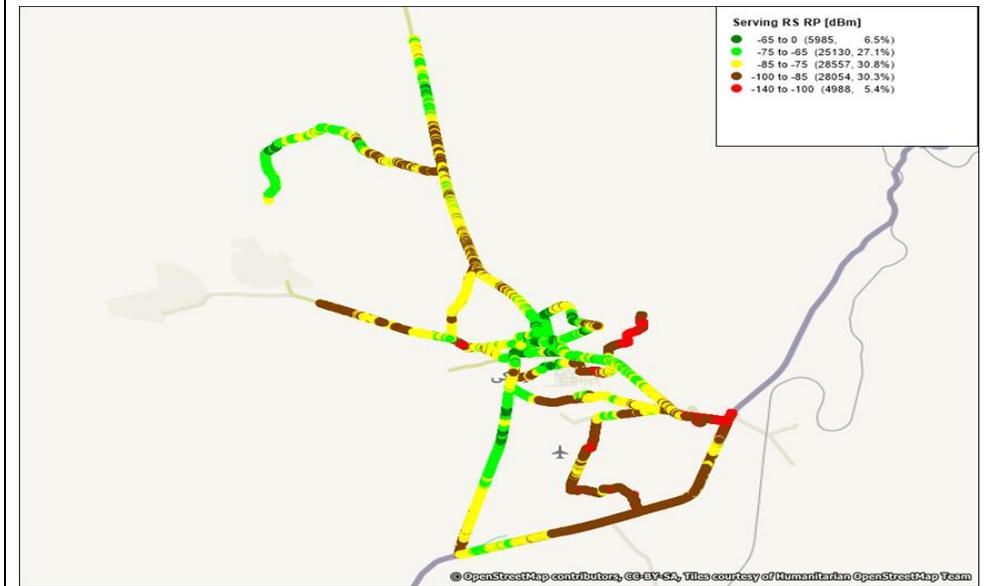


4G MOBILE COVERAGE IN CITIES- SIGNAL STRENGTH (RSRP)

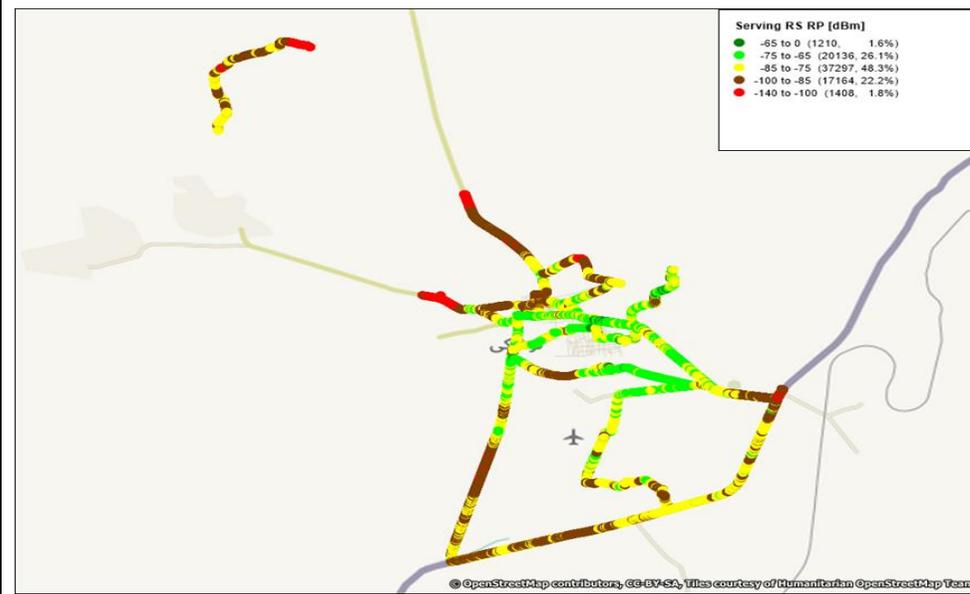
JAZZ 4G NETWORK COVERAGE - NOSHKI

NO 4G NETWORK

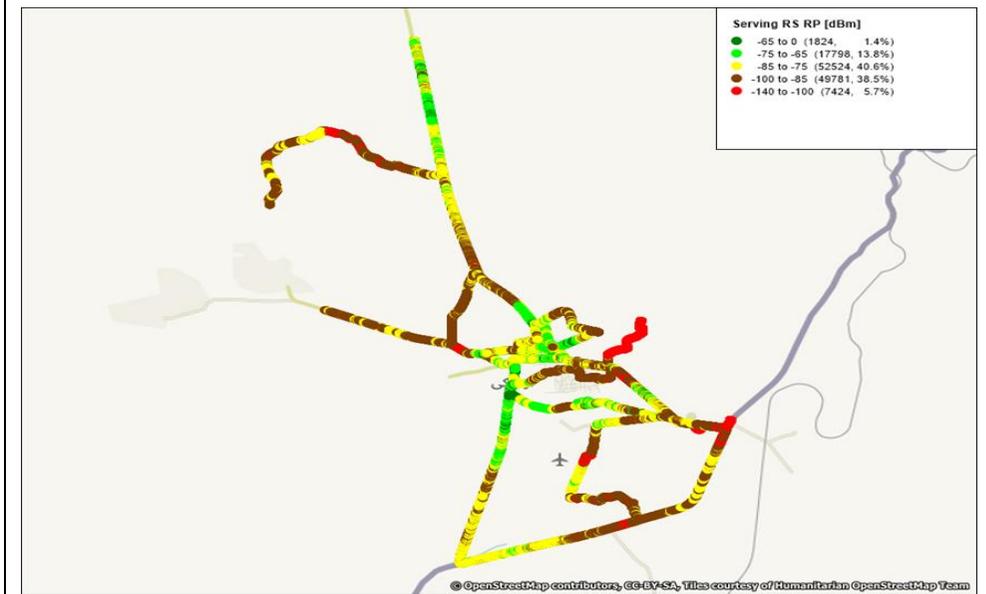
TELENOR 4G NETWORK COVERAGE - NOSHKI



UFONE 4G NETWORK COVERAGE - NOSHKI

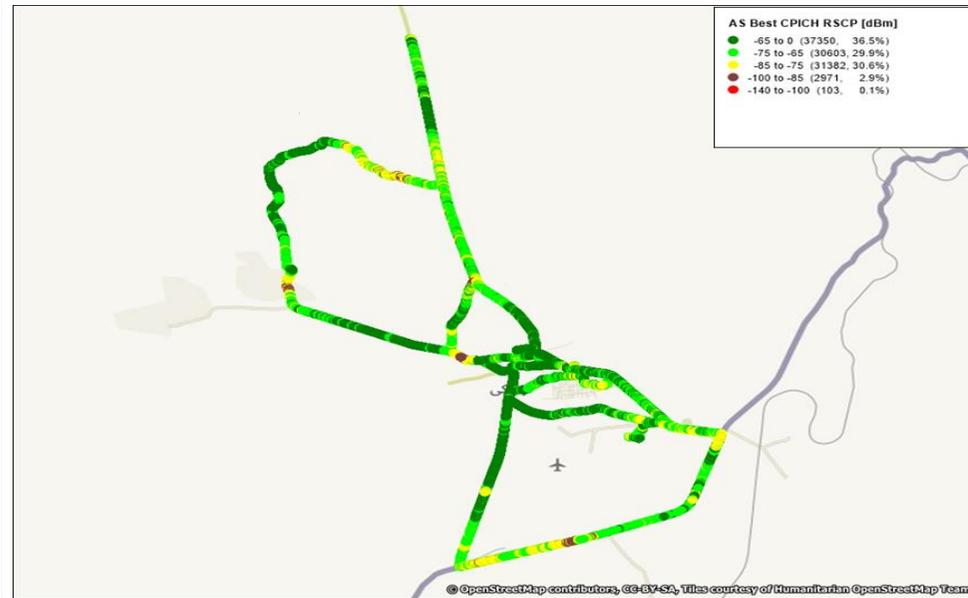


ZONG 4G NETWORK COVERAGE - NOSHKI

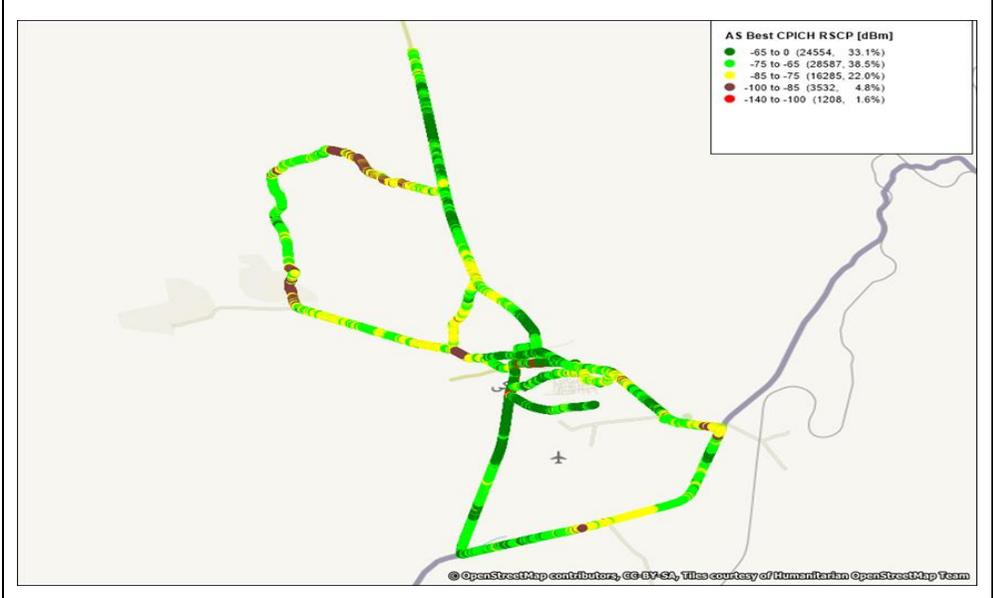


3G MOBILE COVERAGE IN CITIES- SIGNAL STRENGTH (RSCP)

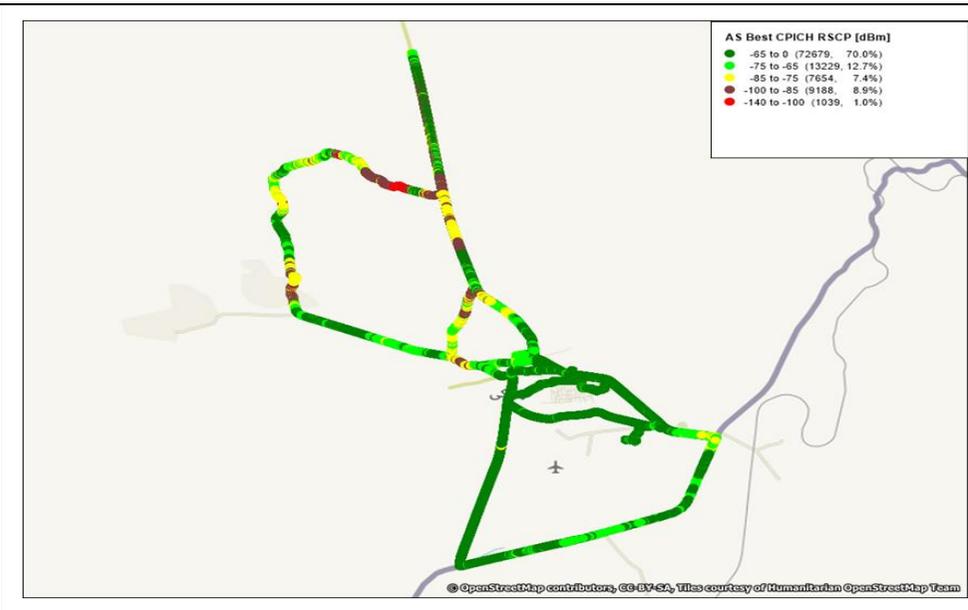
TELENOR 3G NETWORK COVERAGE - NOSHKI



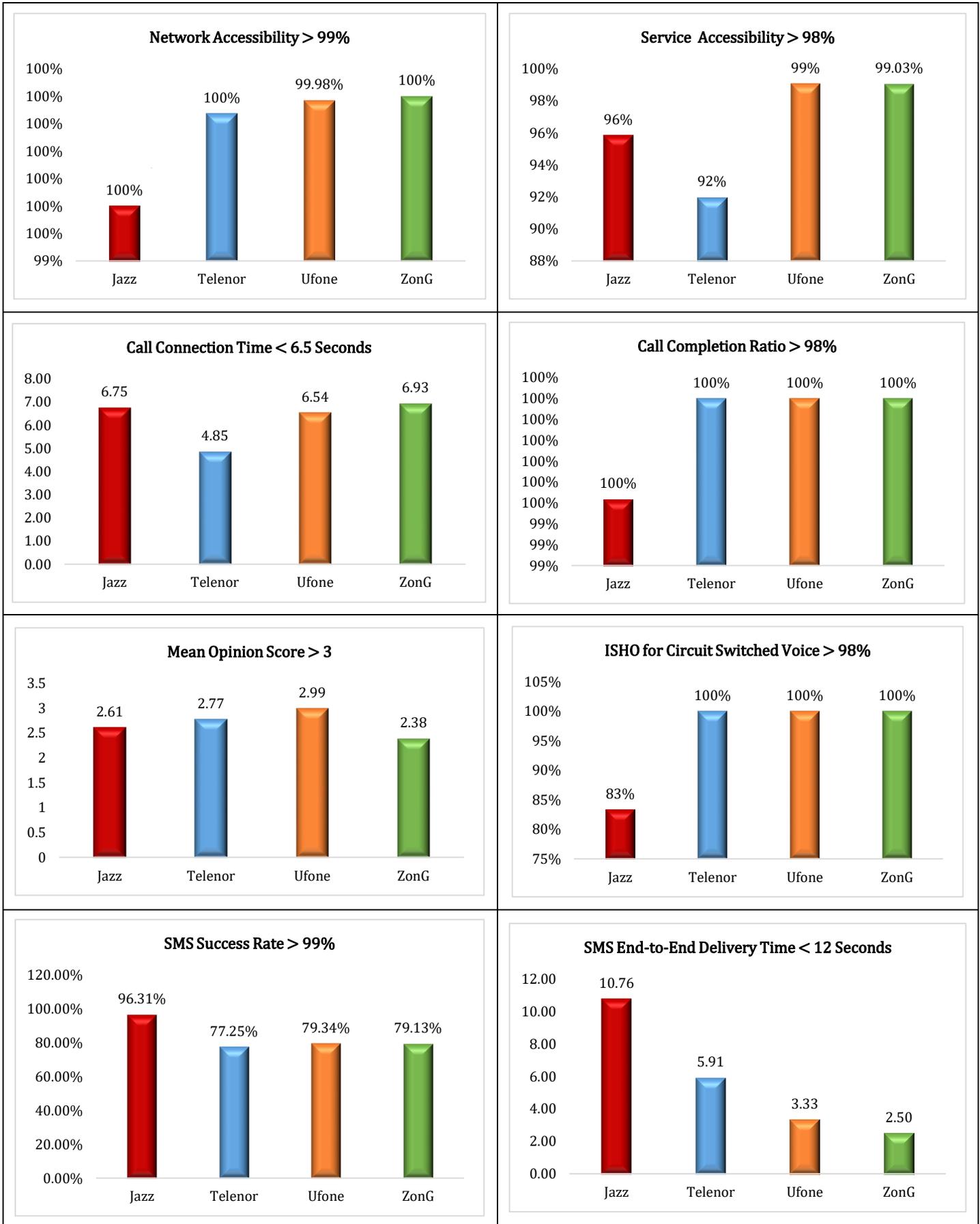
ZONG 3G NETWORK COVERAGE - NOSHKI



UFONE 3G NETWORK COVERAGE - NOSHKI

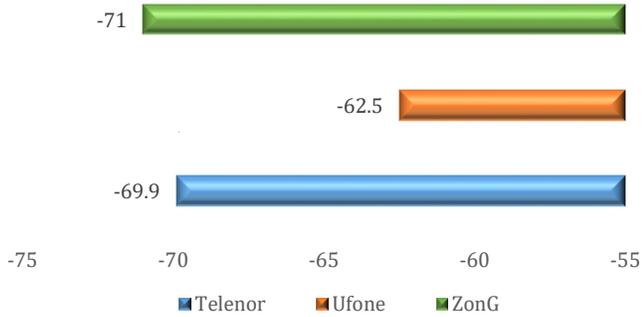


QUALITY OF SERVICE SURVEY RESULTS – NOSHKI

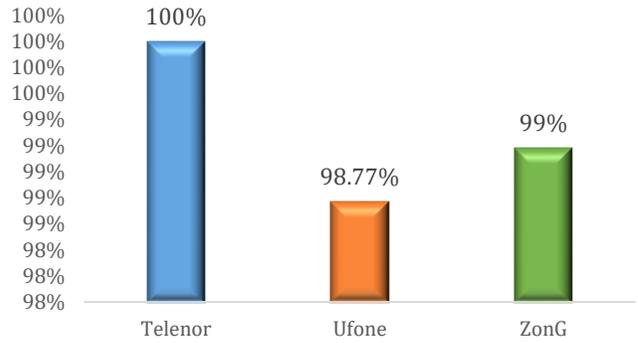


QUALITY OF SERVICE SURVEY RESULTS – NOSHKI

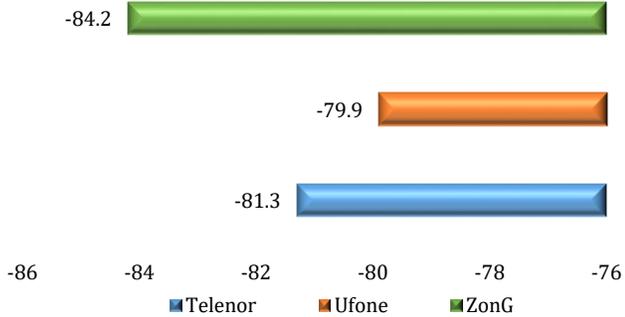
3G Signal Strength (RSCP) > -100dBm



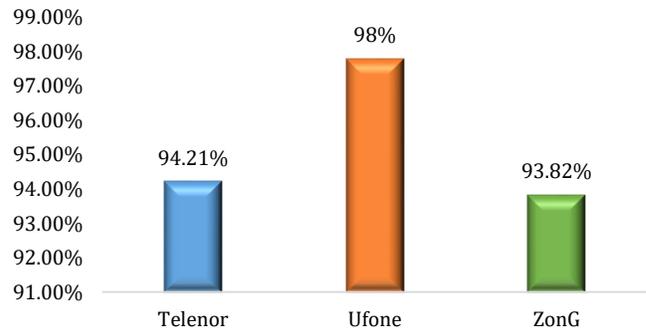
3G Signal Strength (RSCP) Confidencel Level > 90%



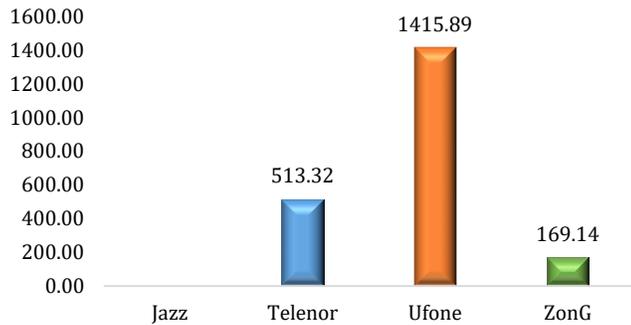
4G Signal Strength (RSRP) > -100dBm



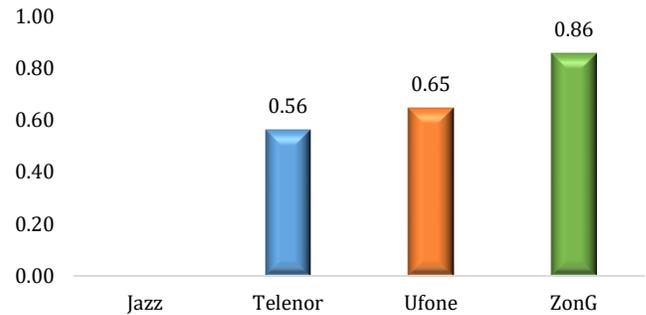
4G Signal Strength (RSRP) Confidencel Level > 90%



User Data Throughput (3G) > 256Kbps

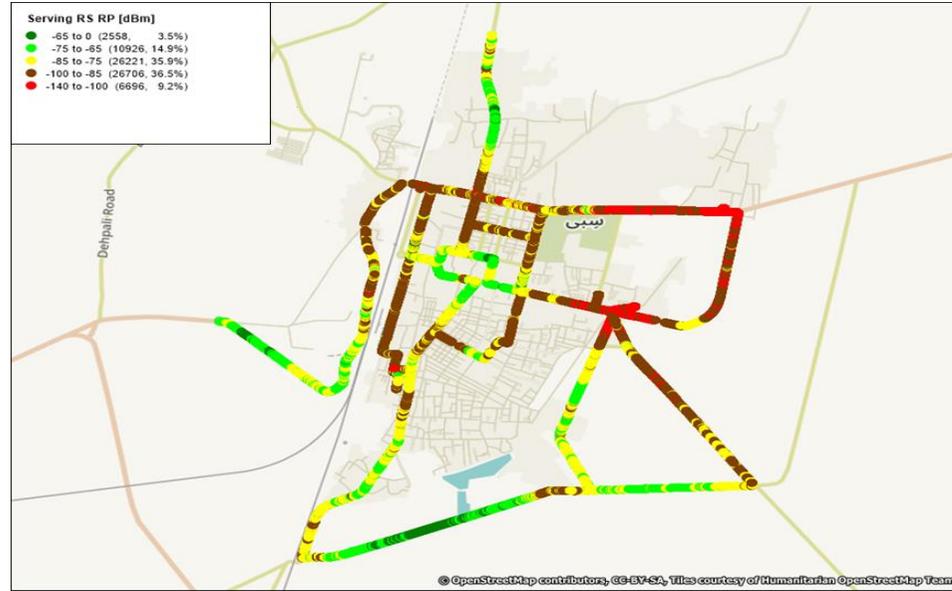


User Data Throughput (4G) > 2Mbps

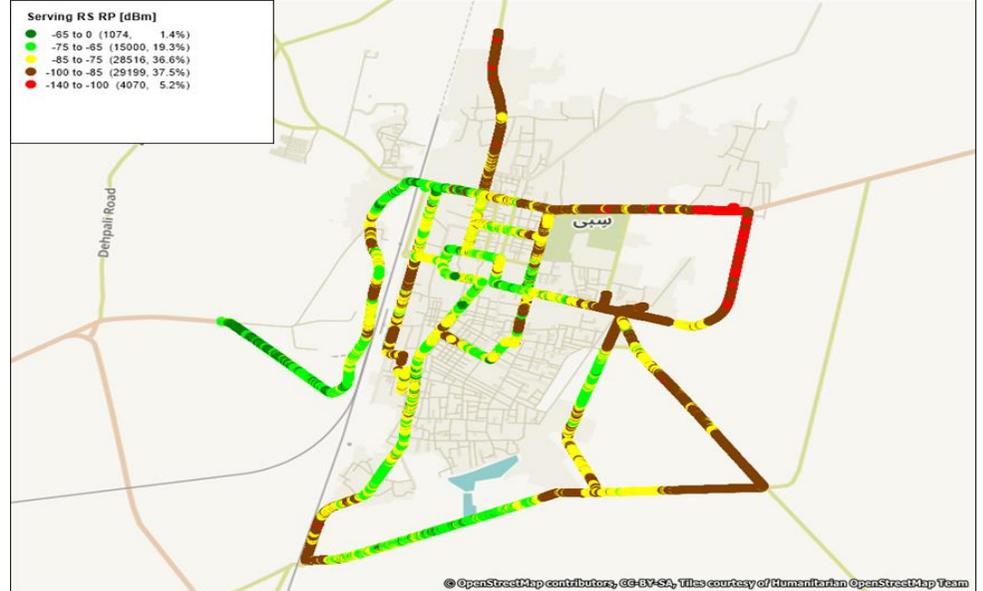


4G MOBILE COVERAGE IN CITIES- SIGNAL STRENGTH (RSRP)

JAZZ 4G NETWORK COVERAGE - SIBBI



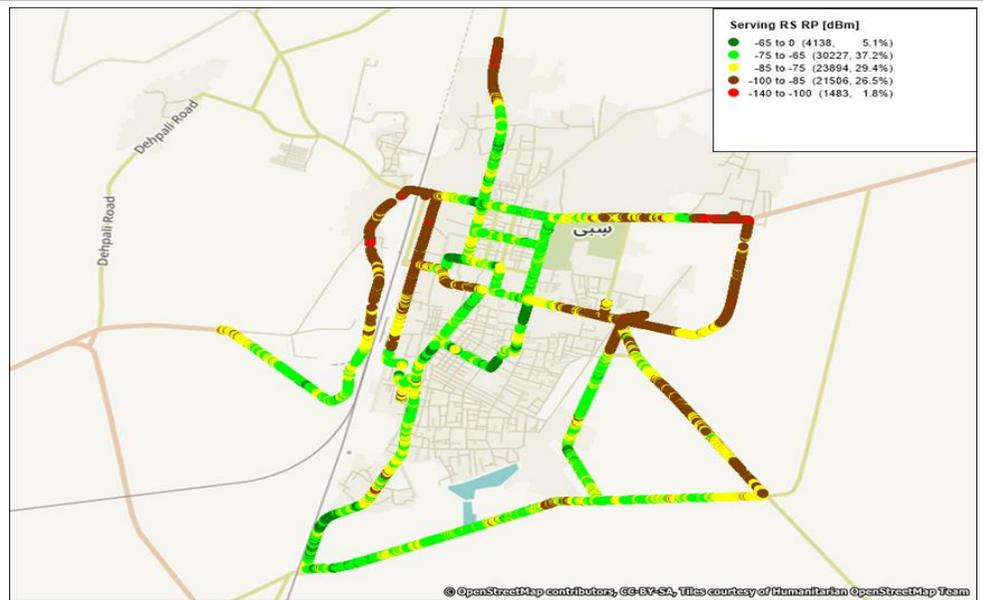
TELENOR 4G NETWORK COVERAGE - SIBBI



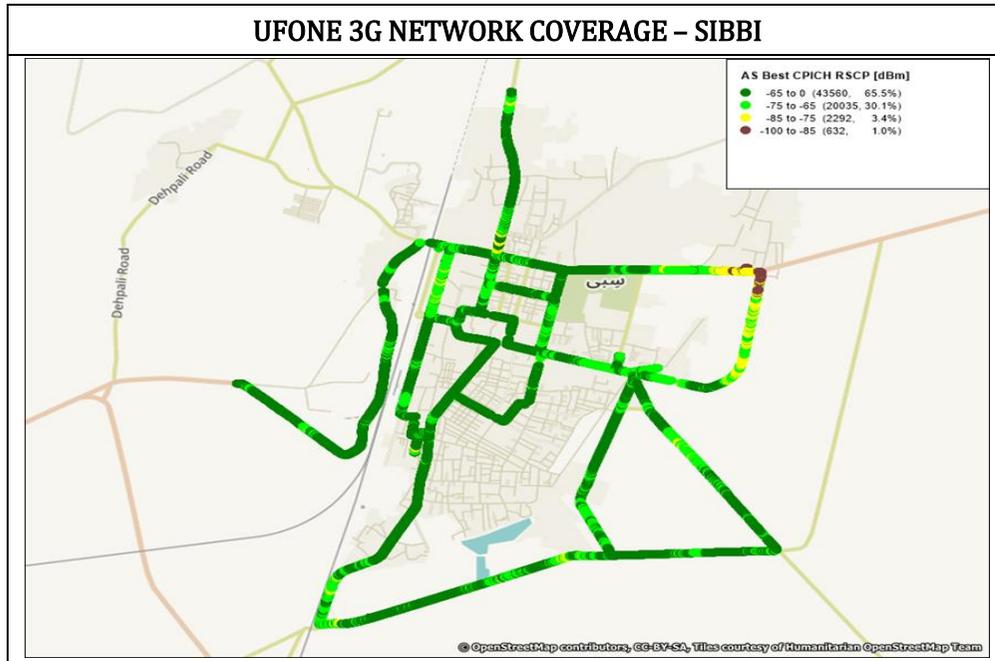
UFONE 4G NETWORK COVERAGE - SIBBI

NO 4G NETWORK

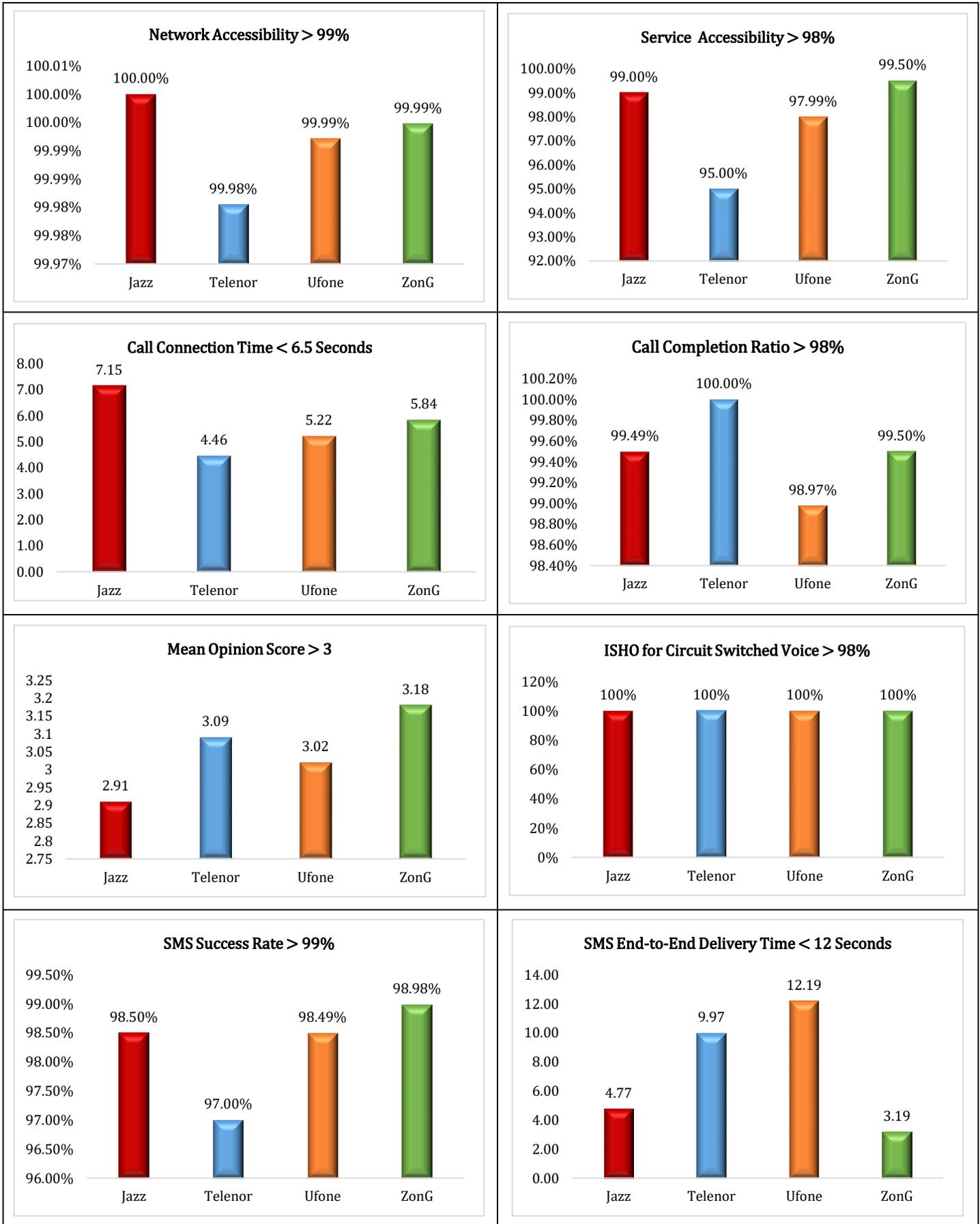
ZONG 4G NETWORK COVERAGE - SIBBI



3G MOBILE COVERAGE IN CITIES- SIGNAL STRENGTH (RSCP)



QUALITY OF SERVICE SURVEY RESULTS – SIBBI

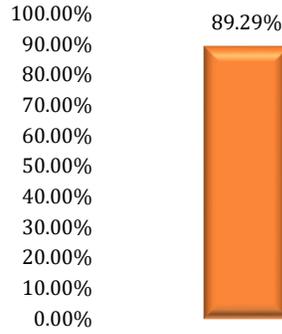


QUALITY OF SERVICE SURVEY RESULTS – SIBBI

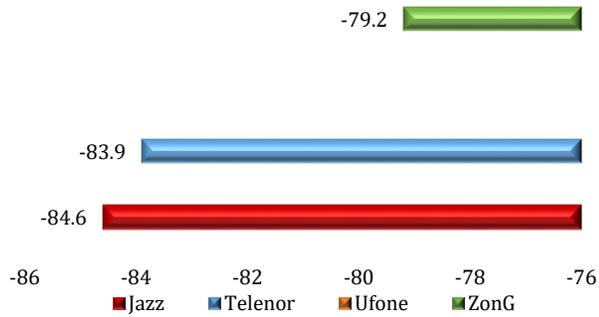
3G Signal Strength (RSCP) > -100dBm



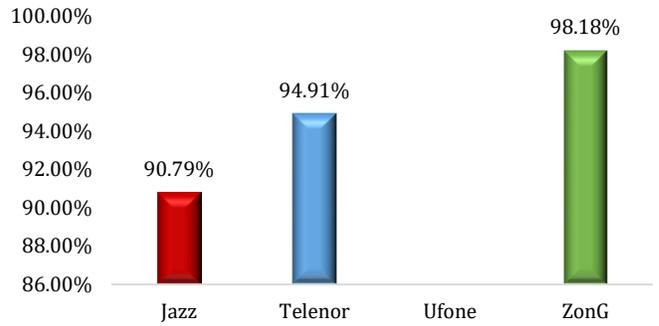
3G Signal Strength (RSCP) Confidencel Level > 90%



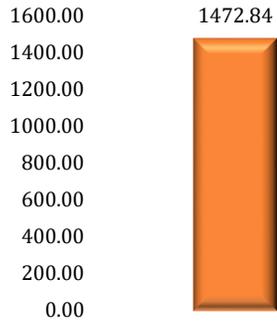
4G Signal Strength (RSRP) > -100dBm



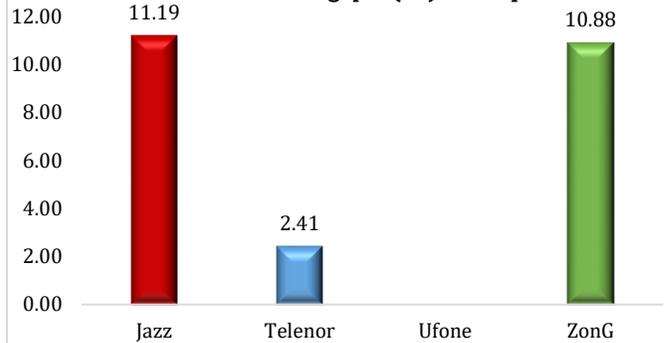
4G Signal Strength (RSRP) Confidencel Level > 90%



User Data Throughput (3G) > 256Kbps

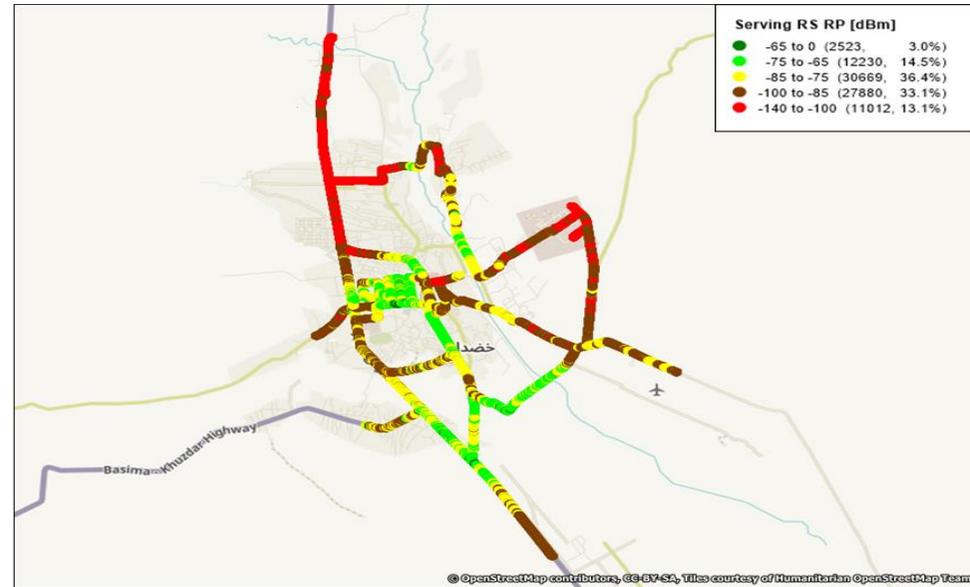


User Data Throughput (4G) > 2Mbps

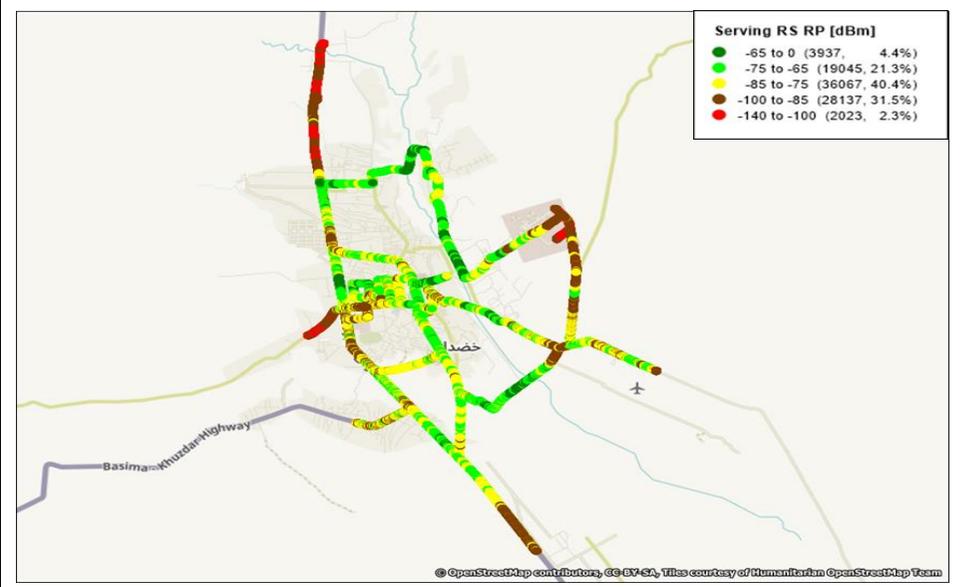


4G MOBILE COVERAGE IN CITIES- SIGNAL STRENGTH (RSRP)

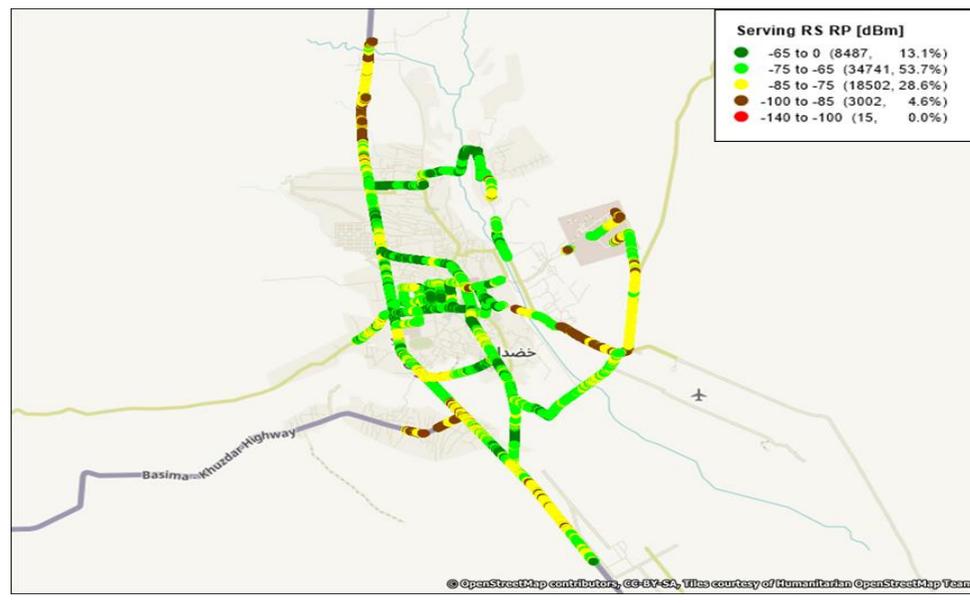
JAZZ 4G NETWORK COVERAGE - KHUZDAR



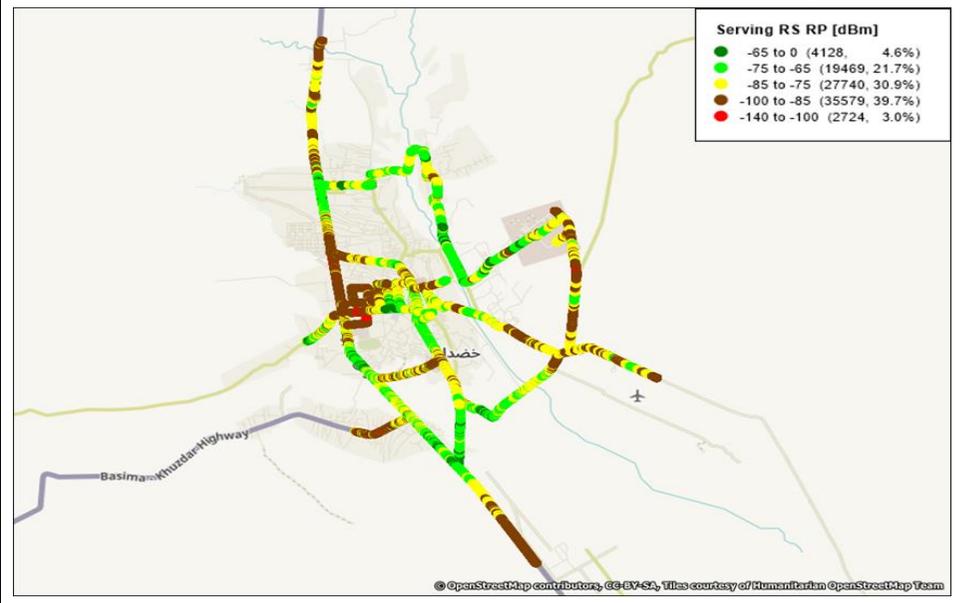
TELENOR 4G NETWORK COVERAGE - KHUZDAR



UFONE 4G NETWORK COVERAGE - KHUZDAR

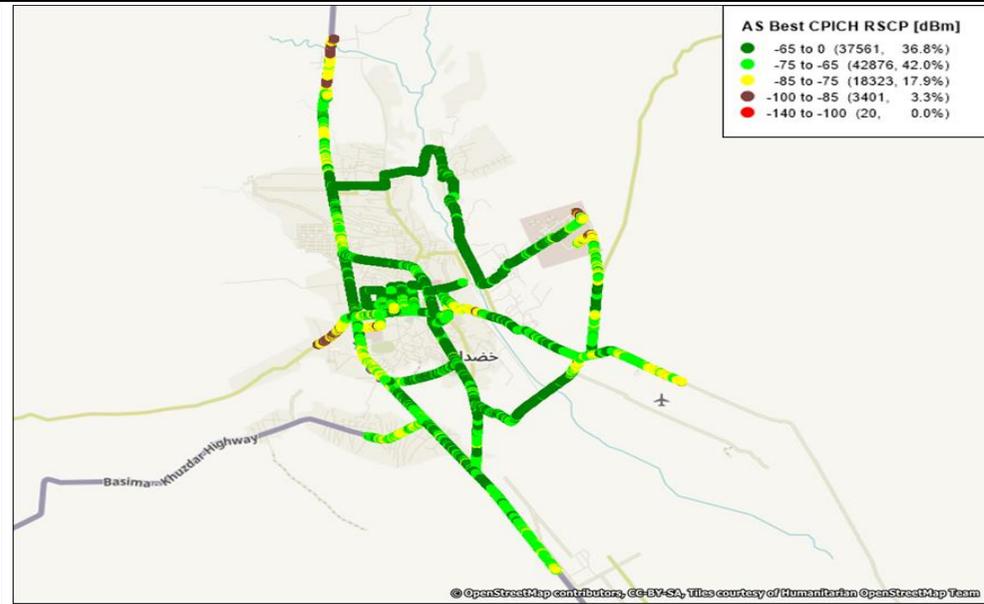


ZONG 4G NETWORK COVERAGE - KHUZDAR

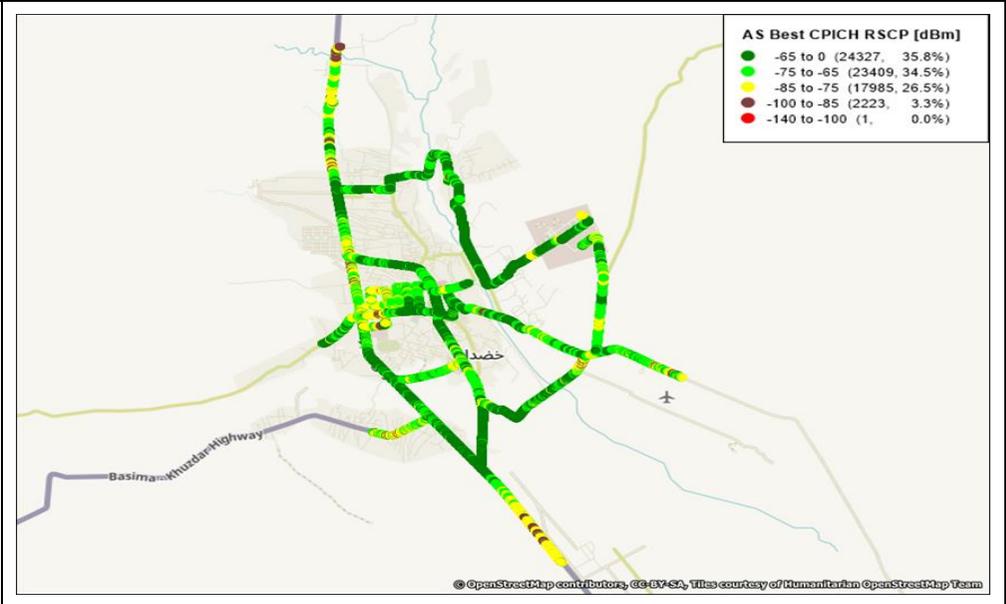


3G MOBILE COVERAGE IN CITIES- SIGNAL STRENGTH (RSCP)

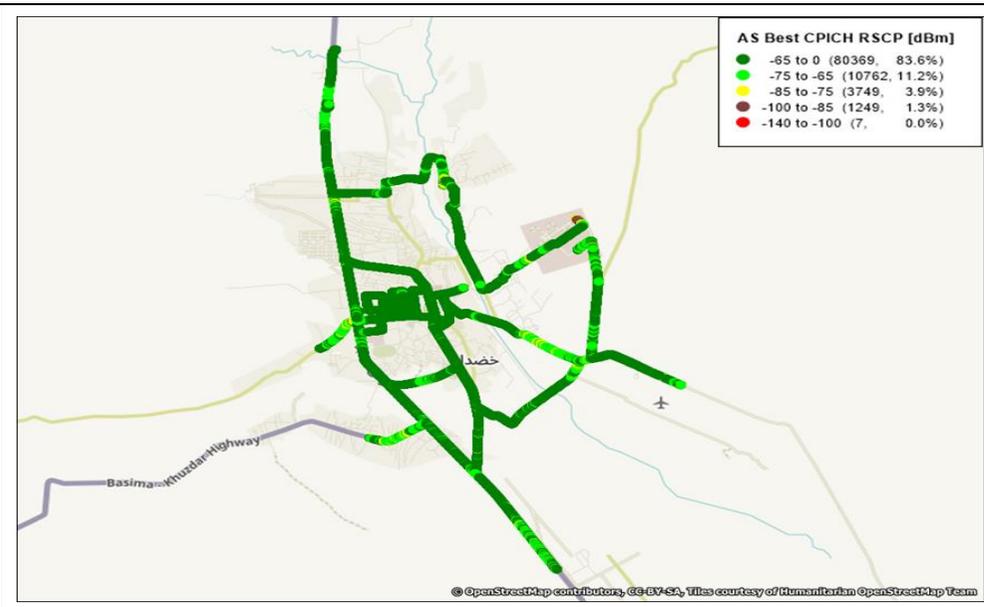
TELENOR 3G NETWORK COVERAGE - KHUZDAR



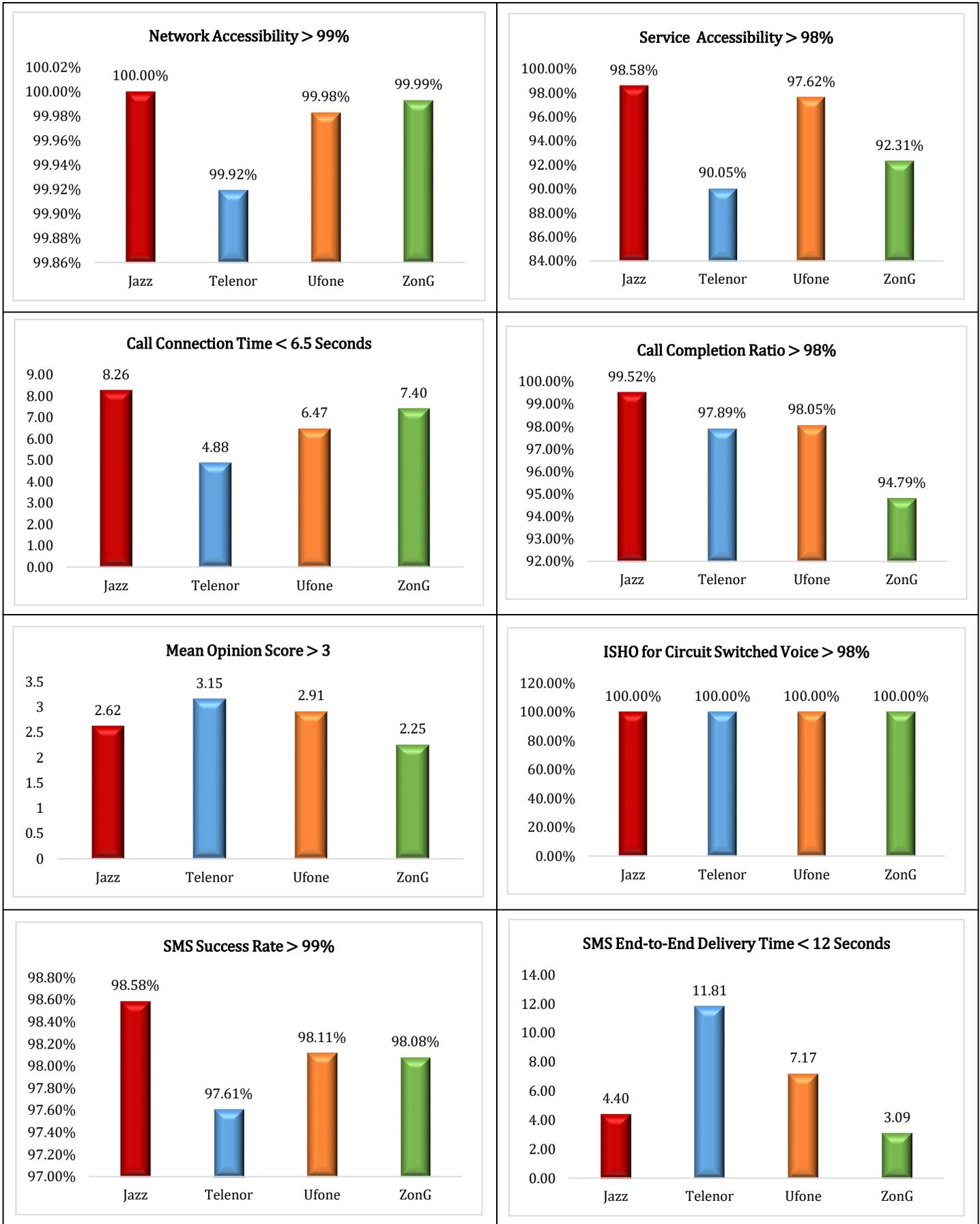
ZONG 3G NETWORK COVERAGE - KHUZDAR



UFONE 3G NETWORK COVERAGE - KHUZDAR



QUALITY OF SERVICE SURVEY RESULTS – KHUZDAR



QUALITY OF SERVICE SURVEY RESULTS – KHUZDAR

