

INDEPENDENT QUALITY OF SERVICE SURVEY – MOTORWAYS AND HIGHWAYS OF PAKISTAN

THIRD 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 on thirteen (13) x Motorways and Highways during 3rd Quarter i.e. July ~ September 2022. The name of Motorways, Highways and Inter-Cities Roads along with survey dates are mentioned in **Table 1.1: QoS Survey Roads & Dates:**

| Motorways/ Highways/ Inter Cities Roads | | | | |
|---|-------|---------------|--------------|---|
| S. # | Name | From | To | Survey Date |
| 1. | M-15 | Hasan Abdal | Thakot | 27 th ~ 28 th July, 2022 |
| 2. | N-25 | Quetta | Karachi | 29 th July, 2022 |
| 3. | N-125 | Haripur | Taxila | 22 nd August, 2022 |
| 4. | M-4 | Pindi Bhatian | Multan | 22 nd ~ 24 th August, 2022 |
| 5. | M-1 | Islamabad | Peshawar | 23 rd August ~ 29 th August, 2022 |
| 6. | M-2 | Lahore | Islamabad | 23 rd ~ 24 th August, 2022 |
| 7. | M-5 | Multan | Sukkur | 24 th ~ 25 th August, 2022 |
| 8. | N-5 | Rawalpindi | Turkham | 25 th ~ 26 th August, 2022 |
| 9. | M-3 | Lahore | Abdul Hakeem | 29 th August, 2022 |
| 10. | N-75 | Islamabad | Kohala | 29 th August, 2022 |
| 11. | M-11 | Lahore | Sialkot | 30 th August, 2022 |
| 12. | M-16 | Swabi | Katlang | 5 th September, 2022 |
| 13. | N-45 | Nowshera | Chitral | 12 th ~ 15 th September, 2022 |

Table 1.1: QoS Survey Roads & Dates

DRIVE TEST DETAILS

2.1. The QoS survey was carried out using Automated QoS Monitoring & Benchmarking Tool i.e. "**SMARTBENCHMARKER**". Drive test teams covered Motorways and Highways from one city to another city. During the survey, mobile handsets for Voice Calls, SMS were kept in auto detect mode whereas in case of Data Sessions, the mobile handsets were kept both in auto detect as well as locked mode.

MOBILE NETWORK COVERAGE

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

Table 3.1: 4G Signal Strength Technology Auto Detect Mode -100 dBm with 90% Confidence Level & (ii). Table 3.2: 4G Signal Strength Technology Locked Mode -100 dBm with 90% Confidence Level.

| 4G Signal Strength -100dBm with 90% Confidence Level – Technology Auto Detect Mode | | | | | | | | |
|--|-----------|---------|--------|--------|--------------------|---------|-------|------|
| Road Name | Operators | | | | Compliant (Yes/No) | | | |
| | Jazz | Telenor | Ufone | ZonG | Jazz | Telenor | Ufone | ZonG |
| <i>Hazara Motorway</i> | 77.53% | 67.74% | 84.18% | 77.06% | No | No | No | No |
| <i>Quetta To Karachi</i> | 71.97% | 80.44% | 93.68% | 81.18% | No | No | Yes | No |
| <i>Haripur To Taxila</i> | 56.56% | 76.36% | 85.62% | 67.35% | No | No | No | No |

| | | | | | | | | |
|--------------------------------|--------|--------|--------|--------|-----|-----|-----|-----|
| <i>Pindi Bhatian To Multan</i> | 91.04% | 85.07% | 80.38% | 79.96% | Yes | No | No | No |
| <i>Multan to Sukkur</i> | 87.47% | 61.28% | 66.56% | 73.63% | No | No | No | No |
| <i>Nowshera To Chitral</i> | 85.46% | 87.47% | 88.16% | 86.41% | No | No | No | No |
| <i>Swabi To Katlang</i> | 69.27% | 94.27% | 0.00% | 61.56% | No | Yes | No | No |
| <i>Islamabad To Kohala</i> | 82.58% | 70.40% | 74.68% | 79.54% | No | No | No | No |
| <i>Islamabad To Peshawar</i> | 80.14% | 84.65% | 92.80% | 88.05% | No | No | Yes | No |
| <i>Lahore to Abdul Hakeem</i> | 94.57% | 93.80% | N/A | 94.78% | Yes | Yes | N/A | Yes |
| <i>Lahore to Islamabad</i> | 87.69% | 78.30% | 92.28% | 79.08% | No | No | Yes | No |
| <i>Lahore To Sialkot</i> | 98.90% | 99.30% | N/A | 98.35% | Yes | Yes | N/A | Yes |
| <i>Rawalpindi To Turkham</i> | 87.38% | 89.81% | 93.05% | 86.49% | No | No | Yes | No |

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

| Road Name | Operators | | | | Compliant (Yes/No) | | | |
|--------------------------------|-----------|---------|--------|--------|--------------------|---------|-------|------|
| | Jazz | Telenor | Ufone | ZonG | Jazz | Telenor | Ufone | ZonG |
| <i>Hazara Motorway</i> | 78.79% | 68.53% | 67.99% | 76.76% | No | No | No | No |
| <i>Haripur To Taxila</i> | 60.52% | 62.81% | 67.09% | 71.24% | No | No | No | No |
| <i>Pindi Bhatian To Multan</i> | 87.73% | 84.66% | 73.25% | 77.71% | No | No | No | No |
| <i>Multan to Sukkur</i> | 88.77% | 67.51% | 67.76% | 82.64% | No | No | No | No |
| <i>Nowshera To Chitral</i> | 83.57% | 84.66% | 85.87% | 88.62% | No | No | No | No |
| <i>Swabi To Katlang</i> | 63.10% | 94.49% | 78.69% | 74.07% | No | Yes | No | No |
| <i>Islamabad To Kohala</i> | 82.94% | 70.66% | 79.67% | 84.77% | No | No | No | No |
| <i>Islamabad To Peshawar</i> | 85.58% | 87.15% | 94.03% | 87.24% | No | No | Yes | No |
| <i>Lahore to Abdul Hakeem</i> | 97.65% | 91.03% | 93.52% | 96.08% | Yes | Yes | Yes | Yes |
| <i>Lahore to Islamabad</i> | 92.01% | 83.88% | 87.56% | 85.31% | Yes | No | No | No |
| <i>Lahore To Sialkot</i> | 98.64% | 98.86% | 96.12% | 97.09% | Yes | Yes | Yes | Yes |
| <i>Rawalpindi To Turkham</i> | 89.81% | 86.31% | 90.35% | 86.05% | No | No | Yes | No |

Table 3.2: 4G Signal Strength Technology Locked Mode -100 dBm with 90% Confidence Level

3.2. **3G SIGNAL STRENGTH IN TECNHOLGY AUTO DETECT MODE.** During the survey, the signal strength samples were recorded on survey routes, wherever network switched to 3G while keeping the mobile handset in technology auto detect mode and also in technology locked mode. As per Next Generation Mobile Service (NGMS) licenses, licensees are required to meet the threshold of -100 dBm or above of Received Signal Code Power (RSCP) with 90% confidence level. Road wise compliance of 90% confidence level of signal strength is shown in (i). Table 3.3: 3G Signal Strength Technology Auto Detect Mode -100 dBm with 90% Confidence Level (ii). Table 3.4: 3G Signal Strength Technology Locked Mode -100 dBm with 90% Confidence Level.

| Road Name | 3G Signal Strength -100dBm with 90% Confidence Level – Technology Auto Detect Mode | | | | | | | |
|--------------------------|--|---------|--------|--------|--------------------|---------|-------|------|
| | Operators | | | | Compliant (Yes/No) | | | |
| | Jazz | Telenor | Ufone | ZonG | Jazz | Telenor | Ufone | ZonG |
| <i>Hazara Motorway</i> | 72.54% | 93.62% | 78.23% | 78.79% | No | Yes | No | No |
| <i>Quetta To Karachi</i> | 89.56% | 86.36% | 97.19% | 91.39% | No | No | Yes | Yes |

| | | | | | | | | |
|--------------------------------|---------------|---------------|---------------|---------------|-----|-----|-----|-----|
| <i>Haripur To Taxila</i> | 56.56% | 76.36% | 85.62% | 67.35% | No | No | No | No |
| <i>Pindi Bhatian To Multan</i> | N/A | 100.00% | 95.85% | 100.00% | N/A | Yes | Yes | Yes |
| <i>Multan to Sukkur</i> | N/A | | | | | | | |
| <i>Nowshera To Chitral</i> | 91.36% | 91.36% | 90.10% | 91.44% | Yes | Yes | Yes | Yes |
| <i>Swabi To Katlang</i> | N/A | 100.00% | 98.24% | 100.00% | N/A | Yes | Yes | Yes |
| <i>Islamabad To Kohala</i> | 99.74% | 100.00% | 96.12% | N/A | Yes | Yes | Yes | N/A |
| <i>Islamabad To Peshawar</i> | 80.14% | 84.65% | 92.80% | 88.05% | No | No | Yes | No |
| <i>Lahore to Abdul Hakeem</i> | N/A | 100.00% | 95.38% | 100.00% | N/A | Yes | Yes | Yes |
| <i>Lahore to Islamabad</i> | 99.68% | 98.75% | 96.95% | 94.74% | Yes | Yes | Yes | Yes |
| <i>Lahore To Sialkot</i> | 98.90% | 99.30% | N/A | 98.35% | Yes | Yes | N/A | Yes |
| <i>Rawalpindi To Turkham</i> | 87.38% | 89.81% | 93.05% | 86.49% | No | No | Yes | No |

Table 3.3: 3G Signal Strength Technology Auto Detect Mode -100 dBm with 90% Confidence Level

| 3G Signal Strength -100dBm with 90% Confidence Level – Technology Locked Mode | | | | | | | | |
|---|---------------|---------|---------------|---------|--------------------|---------|-------|------|
| Road Name | Operators | | | | Compliant (Yes/No) | | | |
| | Jazz | Telenor | Ufone | ZonG | Jazz | Telenor | Ufone | ZonG |
| <i>Hazara Motorway</i> | 87.81% | 93.83% | 91.90% | 95.90% | No | Yes | Yes | Yes |
| <i>Haripur To Taxila</i> | 73.26% | 97.81% | 93.90% | 97.51% | No | Yes | Yes | Yes |
| <i>Pindi Bhatian To Multan</i> | 99.98% | 100.00% | 95.09% | 99.93% | Yes | Yes | Yes | Yes |
| <i>Multan to Sukkur</i> | 96.90% | 97.76% | 69.19% | 98.66% | Yes | Yes | No | Yes |
| <i>Nowshera To Chitral</i> | 84.74% | 98.14% | 89.87% | 97.25% | No | Yes | No | Yes |
| <i>Swabi To Katlang</i> | 82.41% | 99.92% | 95.47% | 98.42% | No | Yes | Yes | Yes |
| <i>Islamabad To Kohala</i> | 92.94% | 98.15% | 95.79% | 99.75% | Yes | Yes | Yes | Yes |
| <i>Islamabad To Peshawar</i> | 95.14% | 99.33% | 100.00% | 99.81% | Yes | Yes | Yes | Yes |
| <i>Lahore to Abdul Hakeem</i> | 99.95% | 100.00% | 94.13% | 100.00% | Yes | Yes | Yes | Yes |
| <i>Lahore to Islamabad</i> | 99.60% | 98.17% | 99.73% | 99.67% | Yes | Yes | Yes | Yes |
| <i>Lahore To Sialkot</i> | 100.00% | 100.00% | 99.90% | 100.00% | Yes | Yes | Yes | Yes |
| <i>Rawalpindi To Turkham</i> | 98.01% | 97.71% | 97.33% | 98.04% | Yes | Yes | Yes | Yes |

Table 3.4: 3G Signal Strength Technology Locked Mode -100 dBm with 90% Confidence Level

MOBILE BROADBAND SERVICE

4.1. **DATA SESSIONS IN TECHNOLOGY AUTO DETECT MODE & LOCKED MODE.** A series of data tests including Capacity Tests, Data Transfer Tests, Web Browsing and Ping were carried out wherein Key Performance Indicators (KPIs) of Upload and Download User Data Throughput (i.e. Speed), Webpage Loading Time and Latency have been measured. In Fixed Duration Testing, a File of 10GB was downloaded and Uploaded for 3 minutes duration whereas in Fixed Size Testing, a File of 5MB and 2MB was completely downloaded and uploaded respectively. In order to measure Webpage Loading Time, different national webpages were checked and in case of Latency international and national host were pinged to measure Round Trip Time (RTT)/Latency. The 4G/LTE, 3G and 2G signal strength, Number of Tests, Upload and Download User Data Throughput, Webpage Loading Time and Latency detail is mentioned in **Table 4.1: Data Tests Statistics.**

| DESCRIPTION | | | JAZZ | TELENOR | UFONE | ZONG | | |
|-------------------------|---------------------------|--|-----------------------|---------------------|--------|--------|--------|--------|
| AUTO DETECT MODE | <i>CAPACITY TEST</i> | <i>DOWNLOAD</i> | <i>ATTEMPTS</i> | 2257 | 2240 | 2257 | 2139 | |
| | | | <i>SPEED (Mbps)</i> | 13.131 | 4.185 | 13.184 | 14.046 | |
| | | <i>UPLOAD</i> | <i>ATTEMPTS</i> | 2263 | 2244 | 2262 | 2141 | |
| | | | <i>SPEED (Mbps)</i> | 15.551 | 5.214 | 12.483 | 15.426 | |
| | <i>DATA TRANSFER TEST</i> | <i>DOWNLOAD</i> | <i>ATTEMPTS</i> | 2024 | 2076 | 1426 | 1977 | |
| | | | <i>SPEED (Mbps)</i> | 7.626 | 4.588 | 9.887 | 8.541 | |
| | | <i>UPLOAD</i> | <i>ATTEMPTS</i> | 2288 | 2270 | 2282 | 2167 | |
| | | | <i>SPEED (Mbps)</i> | 5.912 | 5.178 | 7.028 | 6.672 | |
| | <i>BROWSING TEST</i> | <i>ATTEMPTS</i> | | 11362 | 11281 | 11368 | 10749 | |
| | | <i>LOADING TIME (Seconds)</i> | | 7.09 | 8.03 | 6.78 | 7.22 | |
| | <i>PING TEST</i> | <i>ATTEMPTS</i> | | 4599 | 4572 | 4591 | 4358 | |
| | | <i>LATENCY (msec)</i> | | 284.71 | 258.58 | 276.22 | 260.3 | |
| LOCKED MODE | <i>4G</i> | <i>DATA TRANSFER TEST</i> | <i>DOWNLOAD</i> | <i>ATTEMPTS</i> | 763 | 756 | 767 | 766 |
| | | | | <i>SPEED (Mbps)</i> | 8.572 | 2.154 | 14.256 | 9.902 |
| | | | <i>UPLOAD</i> | <i>ATTEMPTS</i> | 757 | 749 | 761 | 759 |
| | | | | <i>SPEED (Mbps)</i> | 14.071 | 3.996 | 12.523 | 10.808 |
| | | <i>PING TEST</i> | <i>ATTEMPTS</i> | | 783 | 774 | 783 | 783 |
| | | | <i>LATENCY (msec)</i> | | 94.79 | 106.63 | 103.64 | 128.06 |
| | <i>3G</i> | <i>DATA TRANSFER TEST</i> | <i>DOWNLOAD</i> | <i>ATTEMPTS</i> | 411 | 771 | 680 | 739 |
| | | | | <i>SPEED (Mbps)</i> | 1.579 | 1.912 | 2.55 | 1.378 |
| | | | <i>UPLOAD</i> | <i>ATTEMPTS</i> | 292 | 758 | 658 | 734 |
| | | | | <i>SPEED (Mbps)</i> | 0.767 | 1.324 | 2.124 | 1.289 |
| | | <i>PING TEST</i> | <i>ATTEMPTS</i> | | 845 | 847 | 836 | 847 |
| | | | <i>LATENCY (msec)</i> | | 486.07 | 580.62 | 481.32 | 275.15 |
| | | <i>AVERAGE 4G SIGNAL STRENGTH (RSRP) dBm</i> | | -86.5 | -89.2 | -89.9 | -88 | |
| | | <i>AVERAGE 3G SIGNAL STRENGTH (RSCP) dBm</i> | | -76.76 | -74.56 | -76.32 | -73.69 | |

Table 4.1: Data Tests Statistics

4.2. **DOWNLOAD USER DATA THROUGHPUT.** As per Next Generation Mobile Service (NGMS) licenses, licensees are required to meet the threshold of minimum of 2Mbps of 4G/LTE & 256Kbps of 3G Download User Data Throughput. The results of Data Service QoS KPI i.e. Download User Data Throughput is shown in (i). Table 4.2: Download User Data Throughput Technology Auto Detect Mode [Fixed Duration] \geq 2Mbps, (ii). Table 4.3: Download User Data Throughput Technology Auto Detect Mode [Fixed Size] \geq 2Mbps, (iii). Table 4.4: Download User Data Throughput IN 4G/LTE Technology Locked Mode [Fixed Duration] \geq 2Mbps & (iv). Table 4.5: Download User Data Throughput IN 3G Technology Locked Mode [Fixed Duration] \geq 256Kbps.

| DOWNLOAD USER DATA THROUGHPUT IN TECHNOLOGY AUTO DETECT MODE (FIXED DURATION) | | | | | | | | |
|---|-----------------------------|---------|-------|-------|-------------------|---------|--------|--------|
| Road | User Data Throughput [Mbps] | | | | Operator Position | | | |
| | Jazz | Telenor | Ufone | ZonG | Jazz | Telenor | Ufone | ZonG |
| Hazara Motorway | 16.95 | 4.60 | 15.66 | 11.50 | First | Fourth | Second | Third |
| Quetta To Karachi | 6.66 | 3.58 | 5.16 | 5.76 | First | Fourth | Third | Second |
| Haripur To Taxila | 12.04 | 2.97 | 11.64 | 10.67 | First | Fourth | Second | Third |
| Pindi Bhatian To Multan | 9.43 | 3.78 | 17.01 | 14.27 | Third | Fourth | First | Second |
| Multan to Sukkur | 6.53 | 4.00 | 15.30 | 8.97 | Third | Fourth | First | Second |
| Nowshera To Chitral | 17.17 | 3.26 | 15.90 | 15.81 | First | Fourth | Second | Third |
| Swabi To Katlang | 18.82 | 2.95 | 2.31 | 6.28 | First | Third | Fourth | Second |
| Islamabad To Kohala | 16.20 | 5.47 | 10.59 | 17.95 | Second | Fourth | Third | First |
| Islamabad To Peshawar | 15.89 | 6.13 | 15.83 | 17.65 | Second | Fourth | Third | First |
| Lahore to Abdul Hakeem | 9.31 | 2.51 | 2.48 | 13.77 | Second | Third | Fourth | First |
| Lahore to Islamabad | 15.42 | 6.20 | 19.08 | 24.83 | Third | Fourth | Second | First |
| Lahore To Sialkot | 7.84 | 1.85 | 2.68 | 9.20 | Second | Fourth | Third | First |
| Rawalpindi To Turkham | 13.09 | 4.79 | 8.02 | 14.10 | Second | Fourth | Third | First |

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

| DOWNLOAD USER DATA THROUGHPUT IN TECHNOLOGY AUTO DETECT MODE (FIXED SIZE) | | | | | | | | |
|---|-----------------------------|---------|-------|-------|-------------------|---------|--------|--------|
| Road | User Data Throughput [Mbps] | | | | Operator Position | | | |
| | Jazz | Telenor | Ufone | ZonG | Jazz | Telenor | Ufone | ZonG |
| Hazara Motorway | 9.21 | 5.02 | 11.33 | 8.70 | Second | Fourth | First | Third |
| Quetta To Karachi | 2.59 | 2.18 | 3.00 | 2.98 | Third | Fourth | First | Second |
| Haripur To Taxila | 8.58 | 3.75 | 8.48 | 9.06 | Second | Fourth | Third | First |
| Pindi Bhatian To Multan | 7.78 | 4.37 | 10.14 | 8.79 | Third | Fourth | First | Second |
| Multan to Sukkur | 6.61 | 4.94 | 10.24 | 7.33 | Third | Fourth | First | Second |
| Nowshera To Chitral | 6.12 | 4.06 | 8.66 | 9.36 | Third | Fourth | Second | First |
| Swabi To Katlang | 9.67 | 2.36 | 3.09 | 6.20 | First | Fourth | Third | Second |
| Islamabad To Kohala | 10.66 | 6.25 | 7.83 | 10.46 | First | Fourth | Third | Second |
| Islamabad To Peshawar | 9.70 | 5.98 | 8.06 | 10.19 | Second | Fourth | Third | First |
| Lahore to Abdul Hakeem | 6.75 | 4.05 | 3.14 | 6.75 | Second | Third | Fourth | First |
| Lahore to Islamabad | 8.64 | 5.52 | 11.34 | 12.42 | Third | Fourth | Second | First |
| Lahore To Sialkot | 5.83 | 3.56 | 3.37 | 6.87 | Second | Third | Fourth | First |
| Rawalpindi To Turkham | 7.10 | 4.27 | 6.30 | 6.99 | First | Fourth | Third | Second |

Table4.3: Download User Data Throughput Technology Auto Detect Mode [Fixed Size] \geq 2Mbps

| DOWNLOAD USER DATA THROUGHPUT IN 4G/LTE TECHNOLOGY LOCKED MODE (FIXED DURATION) | | | | | | | | |
|---|-----------------------------|---------|-------|-------|-------------------|---------|--------|--------|
| Road | User Data Throughput [Mbps] | | | | Operator Position | | | |
| | Jazz | Telenor | Ufone | ZonG | Jazz | Telenor | Ufone | ZonG |
| Hazara Motorway | 10.58 | 1.12 | 18.06 | 10.32 | Second | Fourth | First | Third |
| Haripur To Taxila | 7.29 | 0.58 | 0.94 | 9.80 | Second | Fourth | Third | First |
| Pindi Bhatian To Multan | 8.31 | 2.12 | 15.90 | 9.50 | Third | Fourth | First | Second |
| Multan to Sukkur | 3.73 | 2.45 | 14.70 | 6.19 | Third | Fourth | First | Second |
| Nowshera To Chitral | 10.38 | 1.52 | 8.70 | 10.91 | Second | Fourth | Third | First |
| Swabi To Katlang | 19.35 | 1.04 | 9.33 | 5.45 | First | Fourth | Second | Third |
| Islamabad To Kohala | 8.49 | 2.12 | 2.57 | 0.26 | First | Third | Second | Fourth |
| Islamabad To Peshawar | 6.08 | 2.22 | 4.64 | 5.22 | First | Fourth | Third | Second |
| Lahore to Abdul Hakeem | 5.84 | 1.70 | 13.40 | 9.51 | Third | Fourth | First | Second |
| Lahore to Islamabad | 10.06 | 4.34 | 16.84 | 16.16 | Third | Fourth | First | Second |
| Lahore To Sialkot | 2.86 | 1.65 | 10.38 | 7.10 | Third | Fourth | First | Second |

| DOWNLOAD USER DATA THROUGHPUT IN 4G/LTE TECHNOLOGY LOCKED MODE (FIXED DURATION) | | | | | | | | |
|---|-----------------------------|---------|-------|-------|-------------------|---------|-------|-------|
| Road | User Data Throughput [Mbps] | | | | Operator Position | | | |
| | Jazz | Telenor | Ufone | ZonG | Jazz | Telenor | Ufone | ZonG |
| Rawalpindi To Turkham | 7.51 | 2.52 | 6.10 | 12.40 | Second | Fourth | Third | First |

Table 4.4: Download User Data Throughput 4G/LTE Technology Locked Mode [Fixed Duration] \geq 2Mbps

| DOWNLOAD USER DATA THROUGHPUT IN 3G TECHNOLOGY LOCKED MODE (FIXED DURATION) | | | | | | | | |
|---|-----------------------------|---------|---------|---------|-------------------|---------|--------|--------|
| Road | User Data Throughput [Kbps] | | | | Operator Position | | | |
| | Jazz | Telenor | Ufone | ZonG | Jazz | Telenor | Ufone | ZonG |
| Hazara Motorway | 1955.9 | 1478.29 | 2348.89 | 1393.01 | Second | Third | First | Fourth |
| Haripur To Taxila | 697.27 | 1385.09 | 2399.72 | 131.66 | Third | Second | First | Fourth |
| Pindi Bhatian To Multan | 1647.03 | 1904.81 | 2680.02 | 918.04 | Third | Second | First | Fourth |
| Multan to Sukkur | 1643.6 | 3147.14 | 1587.1 | 646.08 | Second | First | Third | Fourth |
| Nowshera To Chitral | 1180.13 | 1417.41 | 1677.85 | 1907.97 | Fourth | Third | Second | First |
| Swabi To Katlang | 1938.08 | 1339.16 | 1252.98 | 622.78 | First | Second | Third | Fourth |
| Islamabad To Kohala | 3422.54 | 2336.79 | 2627.78 | 2007.15 | First | Third | Second | Fourth |
| Islamabad To Peshawar | 2976.32 | 1305.6 | 3068.88 | 1434.13 | Second | Fourth | First | Third |
| Lahore to Abdul Hakeem | 2121.33 | 1535.92 | 2092.59 | 989.21 | First | Third | Second | Fourth |
| Lahore to Islamabad | 2739.34 | 2975.32 | 4634.16 | 2048.26 | Third | Second | First | Fourth |
| Lahore To Sialkot | 2157.72 | 928.77 | 1924.17 | 818.9 | First | Third | Second | Fourth |
| Rawalpindi To Turkham | 2253.39 | 1546.59 | 2377.6 | 1472.11 | Second | Third | First | Fourth |

Table 4.5: Download User Data Throughput IN 3G Technology Locked Mode [Fixed Duration] \geq 256Kbps

4.3. **UPLOAD USER DATA THROUGHPUT.** As per Cellular Mobile Network Quality of Service (QoS) Regulations 2021, licensees are required to meet the threshold of minimum of 512Kbps of 4G/LTE & 64Kbps of 3G of Upload User Data Throughput. The results of Data Service QoS KPI i.e. Upload User Data Throughput is shown in (i). Table 4.6: Upload User Data Throughput Technology Auto Detect Mode [Fixed Duration] \geq 512Kbps, (ii). Table 4.7: Upload User Data Throughput Technology Auto Detect Mode [Fixed Size] \geq 512Kbps, (iii). Table 4.8: Upload User Data Throughput in 4G/LTE Technology Locked Mode [Fixed Duration] \geq 512Kbps & (iv). Table 4.9: Upload User Data Throughput in 3G Technology Locked Mode [Fixed Duration] \geq 64Kbps.

| UPLOAD USER DATA THROUGHPUT IN TECHNOLOGY AUTO DETECT MODE (FIXED DURATION) | | | | | | | | |
|---|-----------------------------|---------|----------|----------|-------------------|---------|--------|--------|
| Road | Auto mode Throughput [Kbps] | | | | Operator Position | | | |
| | Jazz | Telenor | Ufone | ZonG | Jazz | Telenor | Ufone | ZonG |
| Hazara Motorway | 14587.87 | 5416.84 | 15077.61 | 13642.47 | Second | Fourth | First | Third |
| Quetta To Karachi | 8491.89 | 3801.03 | 10367.01 | 11640.69 | Third | Fourth | Second | First |
| Haripur To Taxila | 11230.98 | 3653.45 | 17372 | 10498.46 | Second | Fourth | First | Third |
| Pindi Bhatian To Multan | 18223.57 | 4808.59 | 15714.5 | 18452.18 | Second | Fourth | Third | First |
| Multan to Sukkur | 13614.95 | 4384.23 | 11527.43 | 16233.88 | Second | Fourth | Third | First |
| Nowshera To Chitral | 15235.01 | 5250.9 | 10240.83 | 14477.26 | First | Fourth | Third | Second |
| Swabi To Katlang | 10775.42 | 5762.55 | 2093.47 | 9508.54 | First | Third | Fourth | Second |
| Islamabad To Kohala | 15324.11 | 5745.56 | 11357.11 | 13673.78 | First | Fourth | Third | Second |
| Islamabad To Peshawar | 19723.39 | 5862.22 | 22065.95 | 13875.12 | Second | Fourth | First | Third |
| Lahore to Abdul Hakeem | 18904.1 | 5752.4 | 2110.75 | 21756.6 | Second | Third | Fourth | First |
| Lahore to Islamabad | 17620.53 | 5773.94 | 19572.67 | 17343.71 | Second | Fourth | First | Third |
| Lahore To Sialkot | 18184.6 | 5559.8 | 2451.13 | 20152.1 | Second | Third | Fourth | First |
| Rawalpindi To Turkham | 17573.25 | 7585.72 | 10333.83 | 15882.4 | First | Fourth | Third | Second |

Table 4.6: Upload User Data Throughput Technology Auto Detect Mode [Fixed Duration] \geq 512Kbps

| UPLOAD USER DATA THROUGHPUT IN TECHNOLOGY AUTO DETECT MODE (FIXED SIZE) | | | | | | | | |
|---|-----------------------------|----------|----------|----------|-------------------|---------|--------|--------|
| Road | Auto mode Throughput [Kbps] | | | | Operator Position | | | |
| | Jazz | Telenor | Ufone | ZonG | Jazz | Telenor | Ufone | ZonG |
| Hazara Motorway | 11277.13 | 11955.54 | 15793.16 | 11945.39 | Fourth | Second | First | Third |
| Quetta To Karachi | 11897 | 9124.49 | 14158.15 | 13133.52 | Third | Fourth | First | Second |
| Haripur To Taxila | 10855.47 | 11574.86 | 17626.95 | 15376.93 | Fourth | Third | First | Second |
| Pindi Bhatian To Multan | 12467.58 | 9391.43 | 13408.3 | 13347.91 | Third | Fourth | First | Second |
| Multan to Sukkur | 12626.25 | 9222.23 | 14443.06 | 12854.12 | Third | Fourth | First | Second |
| Nowshera To Chitral | 9660.75 | 9990.72 | 11110.27 | 12326.74 | Fourth | Third | Second | First |
| Swabi To Katlang | 9542.08 | 10843.03 | 5504.21 | 11129.15 | Third | Second | Fourth | First |
| Islamabad To Kohala | 14695.38 | 12393.14 | 14181.18 | 16116.53 | Second | Fourth | Third | First |
| Islamabad To Peshawar | 13681.64 | 11928.61 | 17152.59 | 11595.09 | Second | Third | First | Fourth |
| Lahore to Abdul Hakeem | 13808.88 | 10344.5 | 5774.5 | 14285.05 | Second | Third | Fourth | First |
| Lahore to Islamabad | 12067.95 | 9920.51 | 15794.79 | 14636.3 | Third | Fourth | First | Second |
| Lahore To Sialkot | 13667.47 | 10953.91 | 5657.78 | 15119.6 | Second | Third | Fourth | First |
| Rawalpindi To Turkham | 9729.05 | 11804.16 | 17091.28 | 12090.92 | Fourth | Third | First | Second |

Table 4.7: Upload User Data Throughput Technology Auto Detect Mode [Fixed Size] $\geq 512\text{Kbps}$

| UPLOAD USER DATA THROUGHPUT IN 4G TECHNOLOGY LOCKED MODE (FIXED DURATION) | | | | | | | | |
|---|-----------------------------|---------|----------|----------|-------------------|---------|--------|--------|
| Road | Auto mode Throughput [Kbps] | | | | Operator Position | | | |
| | Jazz | Telenor | Ufone | ZonG | Jazz | Telenor | Ufone | ZonG |
| Hazara Motorway | 10258.97 | 4061.56 | 13169.52 | 7597.3 | Second | Fourth | First | Third |
| Haripur To Taxila | 9560.75 | 2167.31 | 11186.58 | 8702.39 | Second | Fourth | First | Third |
| Pindi Bhatian To Multan | 17150.97 | 3059.61 | 14390.69 | 16463.88 | First | Fourth | Third | Second |
| Multan to Sukkur | 12453.16 | 4392.83 | 11418.73 | 12532.56 | Second | Fourth | Third | First |
| Nowshera To Chitral | 13791.42 | 3139.82 | 9803.97 | 11155.9 | First | Fourth | Third | Second |
| Swabi To Katlang | 5518.89 | 5513.87 | 10016.8 | 11979.98 | Third | Fourth | Second | First |
| Islamabad To Kohala | 10518.23 | 3201.49 | 10200.91 | 8288.97 | First | Fourth | Second | Third |
| Islamabad To Peshawar | 14691.95 | 4740.2 | 18397.65 | 11038.42 | Second | Fourth | First | Third |
| Lahore to Abdul Hakeem | 17299.71 | 4319.14 | 18906.56 | 17310.84 | Third | Fourth | First | Second |
| Lahore to Islamabad | 17449.2 | 5216.95 | 17747.46 | 1844.93 | Second | Third | First | Fourth |
| Lahore To Sialkot | 12709.87 | 3988.12 | 23249.75 | 12846.39 | Third | Fourth | First | Second |
| Rawalpindi To Turkham | 16438.33 | 5939.69 | 4749.6 | 10311.89 | First | Third | Fourth | Second |

Table 4.8: Upload User Data Throughput in 4G Technology Locked Mode [Fixed Duration] $\geq 512\text{Kbps}$

| UPLOAD USER DATA THROUGHPUT IN 3G TECHNOLOGY LOCKED MODE (FIXED DURATION) | | | | | | | | |
|---|-----------------------------|---------|---------|---------|-------------------|---------|--------|--------|
| Road | Auto mode Throughput [Kbps] | | | | Operator Position | | | |
| | Jazz | Telenor | Ufone | ZonG | Jazz | Telenor | Ufone | ZonG |
| Hazara Motorway | 908.11 | 1097.57 | 1855.78 | 655.26 | Third | Second | First | Second |
| Haripur To Taxila | 469.16 | 1083.17 | 2333.1 | 455.95 | Third | Second | First | Fourth |
| Pindi Bhatian To Multan | 1296.13 | 1557.07 | 2686.8 | 1450.44 | Fourth | Second | First | Third |
| Multan to Sukkur | 1137.81 | 1940.33 | 1040.37 | 1412.12 | Third | First | Fourth | Second |
| Nowshera To Chitral | 664.38 | 1127.39 | 1998.98 | 1788.13 | Fourth | Third | First | Second |
| Swabi To Katlang | 1004.01 | 1349.04 | 1502.95 | 1817.04 | Fourth | Third | Second | First |
| Islamabad To Kohala | 1426.44 | 1327.28 | 2237.87 | 712.11 | Second | Third | First | Fourth |
| Islamabad To Peshawar | 956.43 | 1146.28 | 2443.47 | 1128.38 | Fourth | Second | First | Third |

| UPLOAD USER DATA THROUGHPUT IN 3G TECHNOLOGY LOCKED MODE (FIXED DURATION) | | | | | | | | |
|---|-----------------------------|---------|---------|---------|-------------------|---------|-------|--------|
| Road | Auto mode Throughput [Kbps] | | | | Operator Position | | | |
| | Jazz | Telenor | Ufone | Zong | Jazz | Telenor | Ufone | Zong |
| Lahore to Abdul Hakeem | 940.23 | 1267.22 | 1822.39 | 1499.33 | Fourth | Third | First | Second |
| Lahore to Islamabad | 878.31 | 1389.54 | 3135.34 | 1080.02 | Fourth | Second | First | Third |
| Lahore To Sialkot | 785.51 | 1141.83 | 2454.86 | 1698.94 | Fourth | Third | First | Second |
| Rawalpindi To Turkham | 846.98 | 1388.86 | 1587.24 | 922.82 | Fourth | Second | First | Third |

Table 4.9: Upload User Data Throughput in 3G Technology Locked Mode [Fixed Duration] \geq 64Kbps

4.4. **WEBPAGE LOADING TIME.** As per Cellular Mobile Network Quality of Service (QoS) Regulations 2021, licensees are required to meet Webpage Loading Time threshold of 5 Seconds. The results of Webpage Loading Time is shown in **Table 4.10: Webpage Loading Time < 5 Seconds**.

| WEBPAGE LOADING TIME IN TECHNOLOGY AUTO DETECT MODE ON ROADS | | | | | | | | |
|--|--------------------------------|---------|-------|------|--------------------|---------|-------|------|
| Road | Webpage Loading Time [Seconds] | | | | Compliant (Yes/No) | | | |
| | Jazz | Telenor | Ufone | Zong | Jazz | Telenor | Ufone | Zong |
| Hazara Motorway | 6 | 6 | 5 | 6 | No | No | No | No |
| Quetta To Karachi | 6 | 6 | 6 | 6 | No | No | No | No |
| Haripur To Taxila | 7 | 8 | 5 | 6 | No | No | No | No |
| Pindi Bhatian To Multan | 7 | 8 | 7 | 7 | No | No | No | No |
| Multan to Sukkur | 7 | 8 | 6 | 7 | No | No | No | No |
| Nowshera To Chitral | 7 | 8 | 7 | 7 | No | No | No | No |
| Swabi To Katlang | 6 | 9 | 8 | 7 | No | No | No | No |
| Islamabad To Kohala | 6 | 7 | 6 | 5 | No | No | No | Yes |
| Islamabad To Peshawar | 6 | 7 | 6 | 5 | No | No | No | No |
| Lahore to Abdul Hakeem | 6 | 8 | 8 | 6 | No | No | No | No |
| Lahore to Islamabad | 5 | 7 | 6 | 6 | No | No | No | No |
| Lahore To Sialkot | 7 | 8 | 8 | 6 | No | No | No | No |
| Rawalpindi To Turkham | 7 | 8 | 6 | 7 | No | No | No | No |

Table 4.10: Webpage Loading Time < 5 Seconds

4.5. **LATENCY.** As per Cellular Mobile Network Quality of Service (QoS) Regulations 2021, licensees are required to meet threshold of 75 milliseconds of 4G/LTE Technology & 150 milliseconds of 3G Technology of Latency. The results of QoS KPI Latency is shown in (i). **Table 4.11: Latency in Technology Auto Detect Mode < 75 milliseconds**, (ii). **Table 4.12: Latency in 4G/LTE Technology Locked Mode < 75 milliseconds** & (iii) **Table 4.13: Latency in 3G Technology Locked Mode < 150 milliseconds**.

| LATENCY IN TECHNOLOGY AUTO DETECT MODE | | | | | | | | |
|--|------------------------|---------|-------|------|--------------------|---------|-------|------|
| Road | Latency (milliseconds) | | | | Compliant (Yes/No) | | | |
| | Jazz | Telenor | Ufone | Zong | Jazz | Telenor | Ufone | Zong |
| Hazara Motorway | 286 | 263 | 254 | 241 | No | No | No | No |
| Quetta To Karachi | 305 | 290 | 227 | 269 | No | No | No | No |
| Haripur To Taxila | 294 | 286 | 214 | 241 | No | No | No | No |
| Pindi Bhatian To Multan | 223 | 234 | 232 | 282 | No | No | No | No |
| Multan to Sukkur | 247 | 262 | 335 | 262 | No | No | No | No |
| Nowshera To Chitral | 354 | 249 | 417 | 293 | No | No | No | No |
| Swabi To Katlang | 307 | 279 | 316 | 264 | No | No | No | No |
| Islamabad To Kohala | 243 | 248 | 250 | 210 | No | No | No | No |
| Islamabad To Peshawar | 283 | 269 | 212 | 266 | No | No | No | No |
| Lahore to Abdul Hakeem | 259 | 267 | 280 | 263 | No | No | No | No |

| LATENCY IN TECHNOLOGY AUTO DETECT MODE | | | | | | | | |
|--|------------------------|---------|-------|------|--------------------|---------|-------|------|
| Road | Latency (milliseconds) | | | | Compliant (Yes/No) | | | |
| | Jazz | Telenor | Ufone | ZonG | Jazz | Telenor | Ufone | ZonG |
| Lahore to Islamabad | 266 | 258 | 215 | 237 | No | No | No | No |
| Lahore To Sialkot | 266 | 228 | 268 | 247 | No | No | No | No |
| Rawalpindi To Turkham | 304 | 237 | 225 | 262 | No | No | No | No |

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

| LATENCY IN 4G/LTE TECHNOLOGY LOCKED MODE | | | | | | | | |
|--|------------------------|---------|--------|--------|--------------------|---------|-------|------|
| Road | Latency [milliseconds] | | | | Compliant (Yes/No) | | | |
| | Jazz | Telenor | Ufone | ZonG | Jazz | Telenor | Ufone | ZonG |
| Hazara Motorway | 69.68 | 119.82 | 125.24 | 78.72 | Yes | No | No | No |
| Haripur To Taxila | 76.50 | 105.77 | 82.28 | 227.84 | No | No | No | No |
| Pindi Bhatian To Multan | 65.00 | 81.00 | 93.00 | 79.00 | Yes | No | No | No |
| Multan to Sukkur | 116.59 | 88.40 | 133.92 | 94.14 | No | No | No | No |
| Nowshera To Chitral | 90.66 | 126.42 | 124.63 | 151.97 | No | No | No | No |
| Swabi To Katlang | 162.04 | 120.59 | 105.77 | 86.65 | No | No | No | No |
| Islamabad To Kohala | 73.04 | 77.25 | 95.02 | 184.34 | Yes | No | No | No |
| Islamabad To Peshawar | 73.60 | 201.39 | 84.72 | 310.71 | Yes | No | No | No |
| Lahore to Abdul Hakeem | 116.73 | 74.52 | 89.87 | 83.52 | No | Yes | No | No |
| Lahore to Islamabad | 76.38 | 89.92 | 78.16 | 226.17 | No | No | No | No |
| Lahore To Sialkot | 91.16 | 99.16 | 77.23 | 89.92 | No | No | No | No |
| Rawalpindi To Turkham | 148.73 | 110.48 | 92.70 | 126.75 | No | No | No | No |

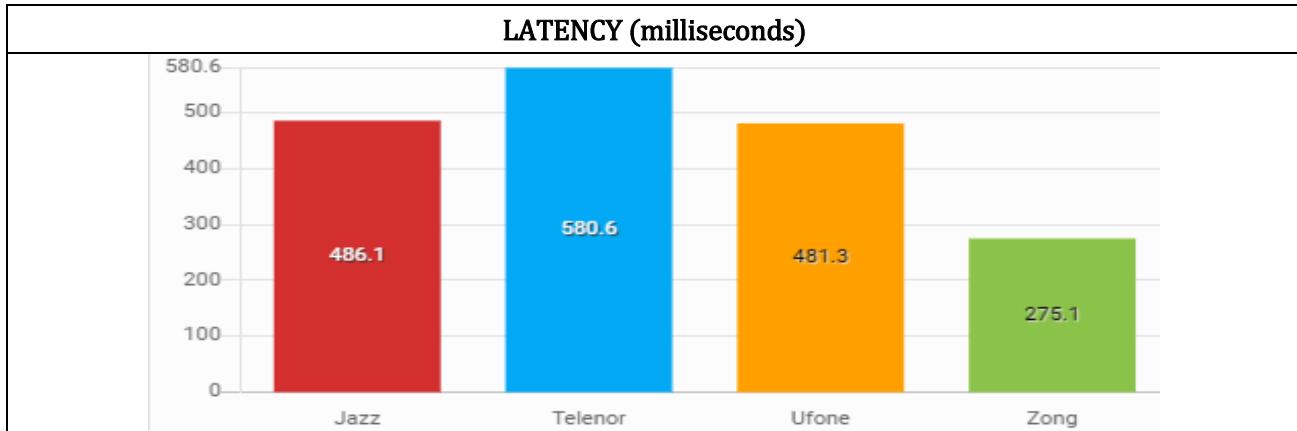
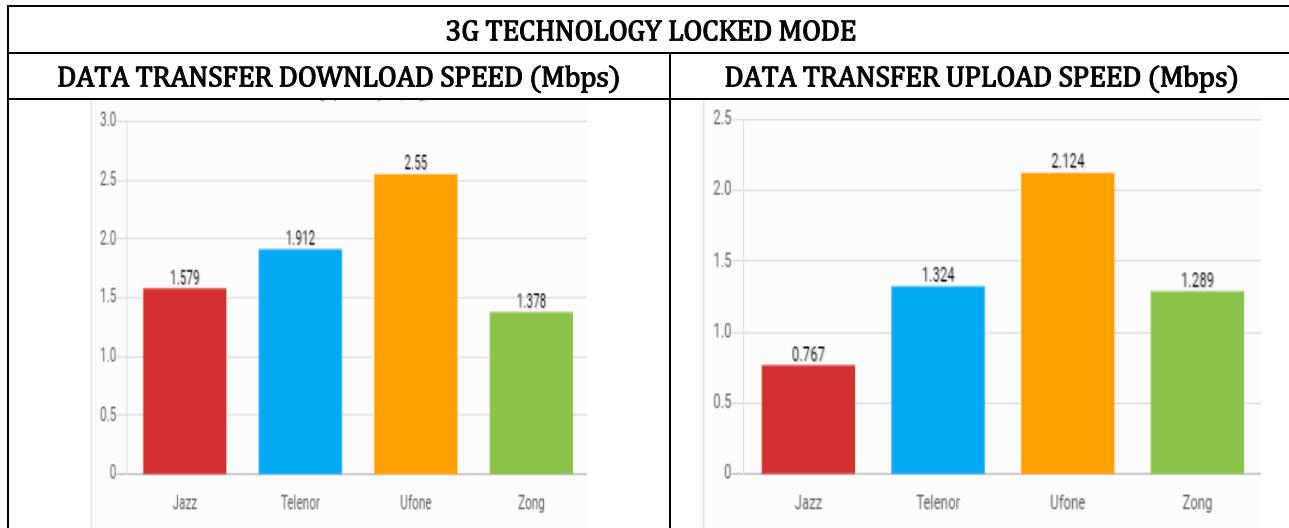
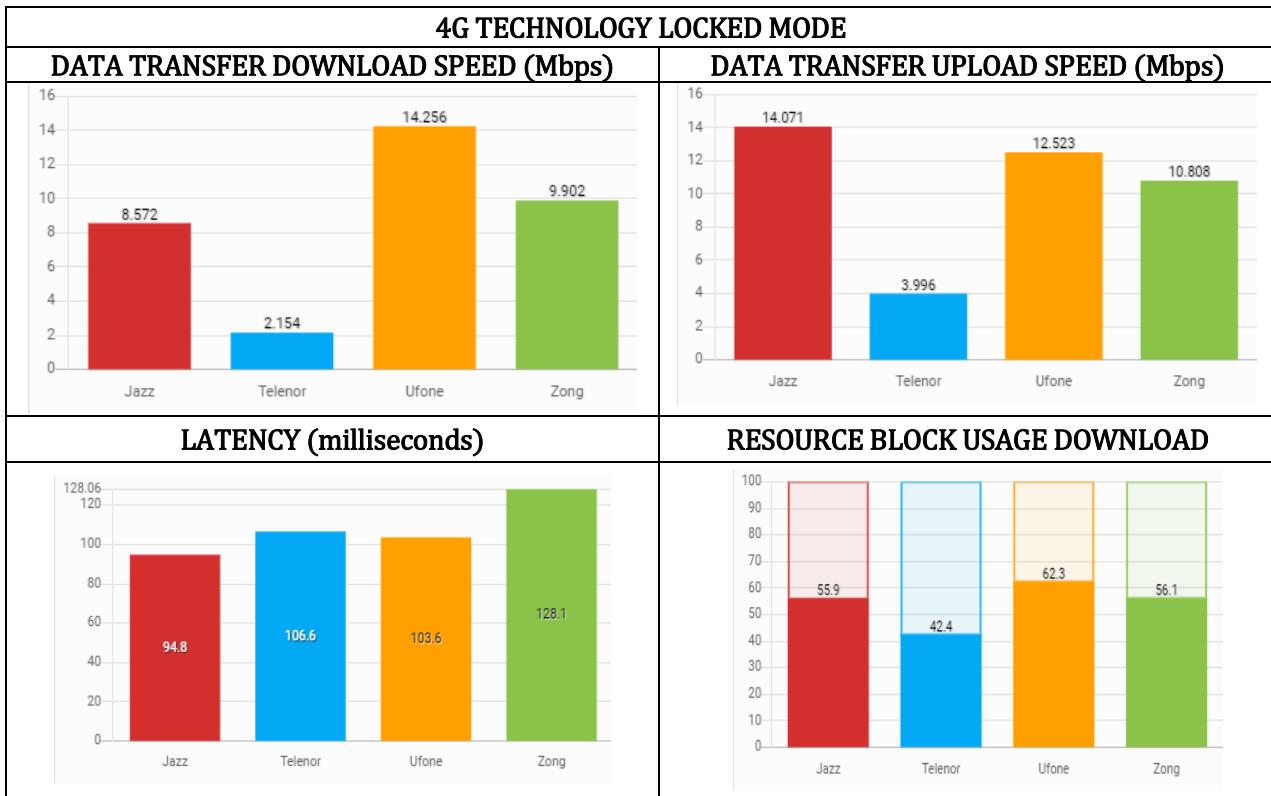
Table 4.12: Latency in 4G/LTE Technology Locked Mode < 75 milliseconds

| LATENCY IN 3G TECHNOLOGY LOCKED MODE | | | | | | | | |
|--------------------------------------|------------------------|---------|-------|------|--------------------|---------|-------|------|
| Road | Latency [milliseconds] | | | | Compliant (Yes/No) | | | |
| | Jazz | Telenor | Ufone | ZonG | Jazz | Telenor | Ufone | ZonG |
| Hazara Motorway | 510 | 337 | 465 | 207 | No | No | No | No |
| Haripur To Taxila | 547 | 480 | 431 | 187 | No | No | No | No |
| Pindi Bhatian To Multan | 253 | 739 | 484 | 204 | No | No | No | No |
| Multan to Sukkur | 353 | 955 | 602 | 216 | No | No | No | No |
| Nowshera To Chitral | 575 | 735 | 480 | 448 | No | No | No | No |
| Swabi To Katlang | 569 | 377 | 531 | 476 | No | No | No | No |
| Islamabad To Kohala | 474 | 294 | 392 | 169 | No | No | No | No |
| Islamabad To Peshawar | 542 | 292 | 430 | 209 | No | No | No | No |
| Lahore to Abdul Hakeem | 468 | 665 | 488 | 147 | No | No | No | Yes |
| Lahore to Islamabad | 517 | 495 | 459 | 187 | No | No | No | No |
| Lahore To Sialkot | 508 | 393 | 448 | 205 | No | No | No | No |
| Rawalpindi To Turkham | 601 | 425 | 523 | 463 | No | No | No | No |

Table 4.13: Latency in 3G Technology Locked Mode < 150 milliseconds

4.6. 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.





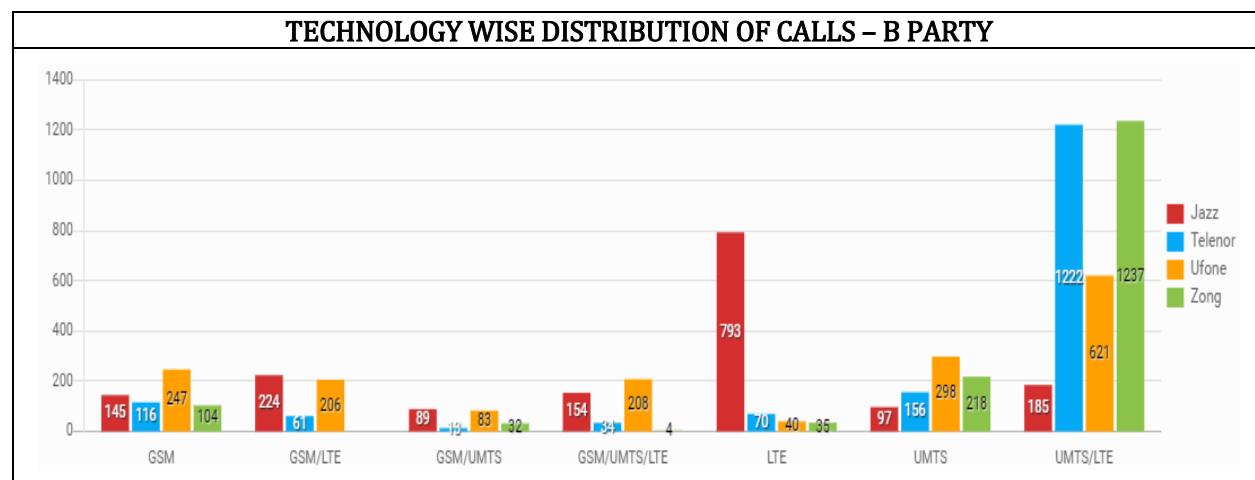
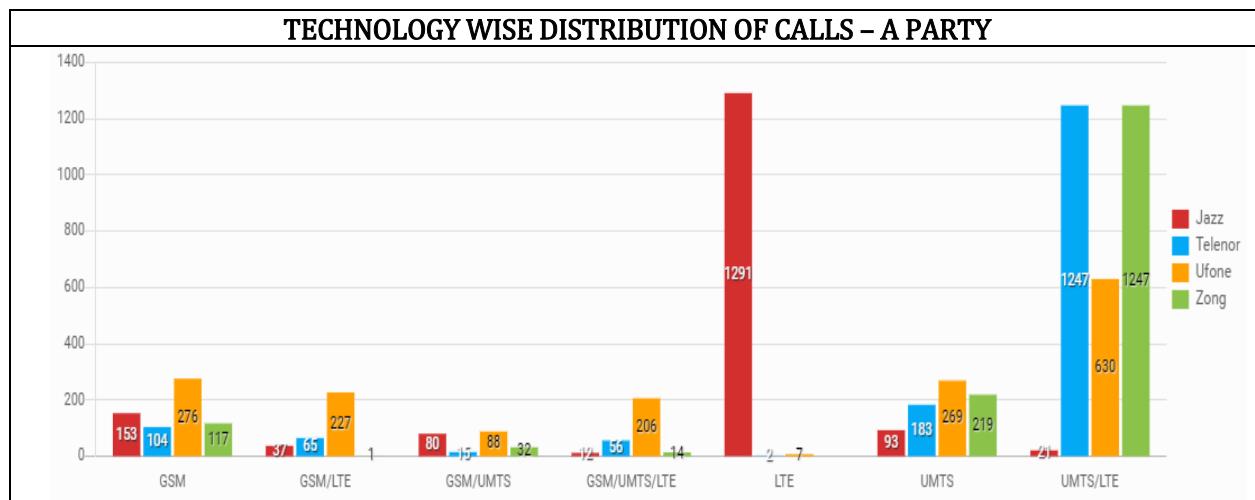
VOICE SERVICE

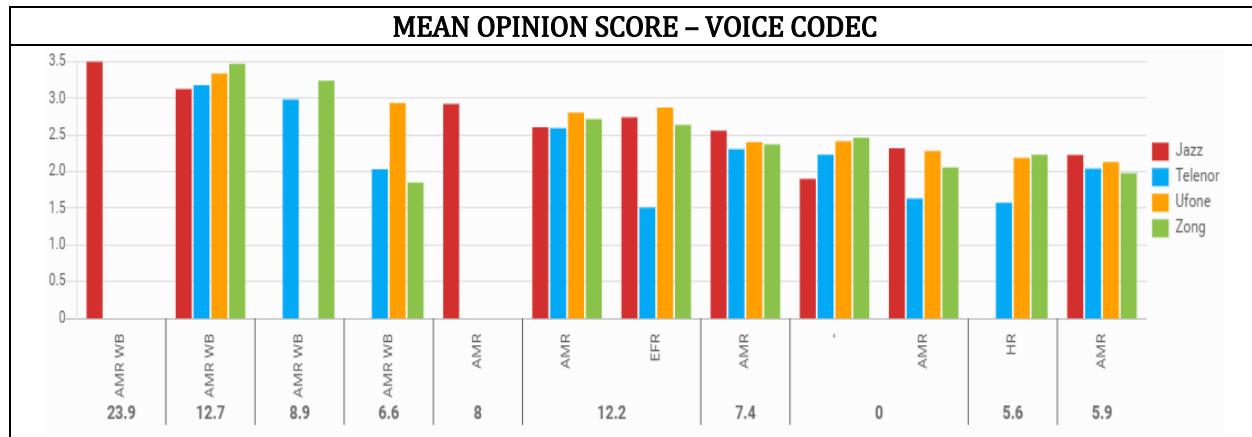
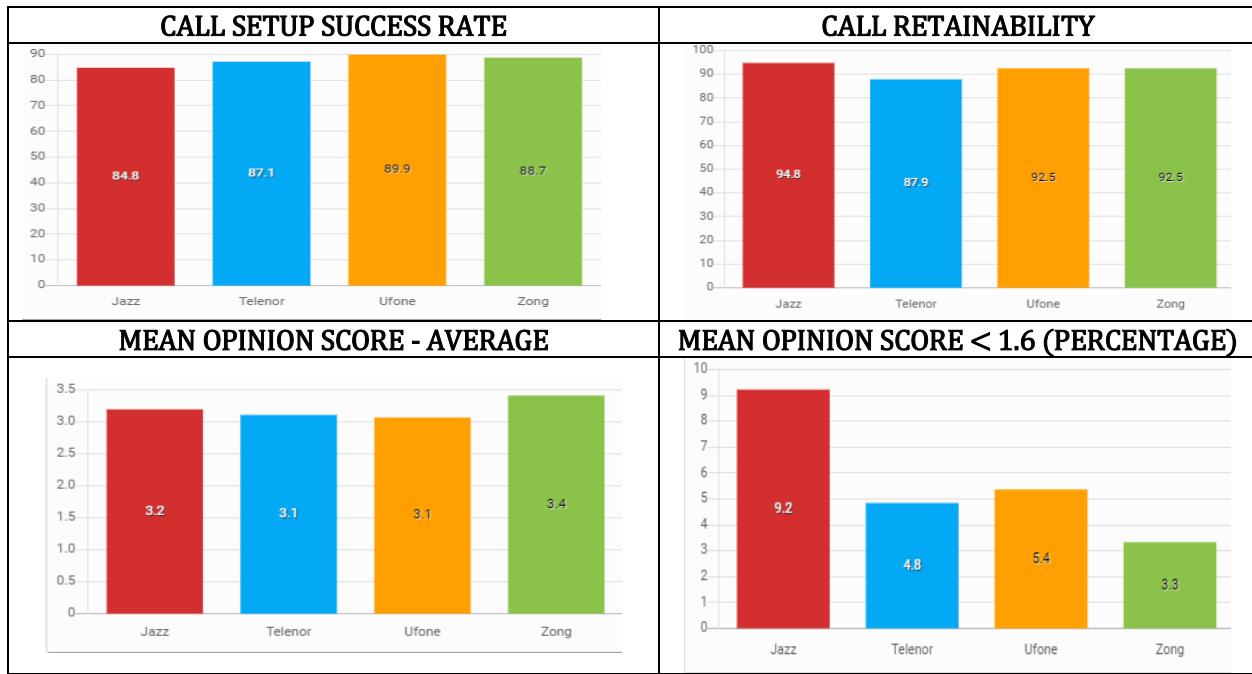
5.1. A total of **6697 Call attempts** were made and out of which **828 were failed attempts**. In **5869 successful call attempts**, **284 calls dropped** prior to completion of two minutes duration, whereas, **5585 calls remained connected** for the complete duration of two minutes. The company wise call statistics is shown in **Table 5.1: Call Statistics**.

| DESCRIPTION | JAZZ | TELENOR | UFONE | ZONG |
|---|----------------|----------------|----------------|----------------|
| <i>TOTAL CALLS ATTEMPTS</i> | 1690 | 1673 | 1703 | 1631 |
| <i>FAILED CALLS ATTEMPTS</i> | 257 | 215 | 172 | 184 |
| <i>ESTABLISHED CALLS ATTEMPTS</i> | 1433 | 1458 | 1531 | 1447 |
| <i>DROPPED CALLS ATTEMPTS</i> | 66 | 109 | 67 | 42 |
| <i>COMPLETED CALLS ATTEMPTS</i> | 1367 | 1349 | 1464 | 1405 |
| <i>CALL SETUP SUCCESS RATE</i> | 84.79 % | 87.15 % | 89.9 % | 88.72 % |
| <i>CALL SETUP TIME</i> | 6.66 | 9.66 | 8.22 | 8.04 |
| <i>CALL COMPLETION RATE</i> | 94.78 % | 87.86 % | 92.51 % | 92.52 % |
| <i>ISHO SUCCESS RATE</i> | 100 % | 100 % | 99.08 % | - |
| <i>RAB SETUP SUCCESS RATE</i> | 100 % | 99.96 % | 99.87 % | 99.9 % |
| <i>MEAN OPINION SCORE</i> | 3.19 | 3.11 | 3.07 | 3.41 |
| <i>MEAN OPINION SCORE EXCESS RATIO - MOS < 1.6</i> | 9.22 % | 4.84 % | 5.37 % | 3.33 % |
| <i>TOTAL SPEECH TEST</i> | 14033 | 14107 | 15056 | 14208 |

Table 5.1: Call Statistics

5.2. The overall Call Setup Success Rate and Call Retainability along with Mean Opinion Score (MOS), the percentage of mute calls 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 13 x surveyed roads of Pakistan. The compliance level of threshold values of voice QoS KPIs is shown in each **Table 5.1 & Table 5.2: Voice QoS KPIs Compliance Level**.

| VOICE CALLS ROADS – COMPLIANCE (YES/NO) | | | | | | | | |
|---|-------------|-----------------|-------------------|-------------------|-------------------------|------------------|---------------------|------------------|
| Operator | *Voice KPIs | Hazara Motorway | Quetta To Karachi | Haripur To Taxila | Pindi Bhatian To Multan | Multan to Sukkur | Nowshera To Chitral | Swabi To Katlang |
| Jazz | NA | Yes | No | Yes | Yes | Yes | Yes | Yes |
| | SA | No | No | No | Yes | No | No | Yes |
| | CCT | Yes | Yes | Yes | Yes | Yes | No | Yes |
| | CCR | No | No | No | Yes | No | No | Yes |
| | MOS | Yes | Yes | No | Yes | Yes | No | No |
| | ISHO | Yes | Yes | Yes | N/A | Yes | Yes | Yes |
| | RSSR | Yes | Yes | Yes | N/A | Yes | Yes | Yes |
| Telenor | NA | Yes | No | Yes | Yes | Yes | Yes | Yes |
| | SA | No | No | No | No | No | No | No |
| | CCT | No | Yes | No | Yes | Yes | Yes | Yes |
| | CCR | No | No | No | No | No | No | No |
| | MOS | No | No | No | Yes | Yes | Yes | Yes |
| | ISHO | N/A | Yes | N/A | N/A | Yes | Yes | Yes |
| | RSSR | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Ufone | NA | Yes | Yes | Yes | Yes | Yes | No | No |
| | SA | No | No | No | No | No | No | Yes |
| | CCT | Yes | Yes | Yes | No | No | Yes | Yes |
| | CCR | No | No | No | Yes | Yes | No | No |
| | MOS | Yes | Yes | Yes | No | No | Yes | No |
| | ISHO | No | Yes | Yes | No | No | No | No |
| | RSSR | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Zong | NA | Yes | No | Yes | Yes | Yes | No | No |
| | SA | No | No | No | No | No | No | Yes |
| | CCT | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| | CCR | Yes | No | No | No | Yes | No | Yes |
| | MOS | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| | ISHO | N/A | | | | | | |
| | RSSR | 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 5.1: Voice QoS KPIs Compliance Level

| VOICE CALLS ROADS – COMPLIANCE (YES/NO) | | | | | | | |
|---|-------------|---------------------|-----------------------|------------------------|---------------------|-------------------|-----------------------|
| Operator | *Voice KPIs | Islamabad To Kohala | Islamabad To Peshawar | Lahore to Abdul Hakeem | Lahore to Islamabad | Lahore To Sialkot | Rawalpindi To Turkham |
| Jazz | NA | Yes | Yes | Yes | Yes | Yes | Yes |
| | SA | No | No | No | No | No | No |
| | CCT | Yes | Yes | N/A | No | N/A | No |
| | CCR | No | Yes | No | Yes | No | No |
| | MOS | No | No | Yes | Yes | Yes | Yes |
| | ISHO | Yes | Yes | Yes | No | N/A | No |
| | RSSR | Yes | Yes | Yes | Yes | N/A | Yes |
| Telenor | NA | Yes | Yes | Yes | Yes | Yes | Yes |
| | SA | No | No | No | No | No | No |
| | CCT | No | No | Yes | No | Yes | Yes |
| | CCR | No | No | No | No | No | No |
| | MOS | No | No | Yes | No | No | Yes |

| | | | | | | | |
|-------|------|------------|-----------|-----------|------------|-----------|------------|
| | ISHO | N/A | Yes | Yes | Yes | Yes | N/A |
| | RSSR | Yes | Yes | Yes | Yes | Yes | Yes |
| Ufone | NA | Yes | Yes | Yes | Yes | Yes | Yes |
| | SA | No | No | No | No | No | No |
| | CCT | Yes | Yes | No | Yes | No | Yes |
| | CCR | No | No | No | No | No | No |
| | MOS | No | Yes | No | Yes | No | Yes |
| | ISHO | Yes | No | Yes | Yes | Yes | Yes |
| | RSSR | Yes | Yes | Yes | Yes | Yes | Yes |
| ZonG | NA | Yes | Yes | Yes | Yes | Yes | Yes |
| | SA | No | No | No | No | No | No |
| | CCT | Yes | Yes | Yes | Yes | Yes | No |
| | CCR | No | No | No | Yes | No | No |
| | MOS | Yes | Yes | Yes | Yes | Yes | Yes |
| | ISHO | | | | N/A | | |
| | RSSR | 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

SURVEY MAPS & GRAPHICAL RESULTS

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

STANDING IN SURVEY

8.1. CMOs have been prioritized/ placed at 1st, 2nd, 3rd & 4th position in each category i.e. Mobile Network Coverage, Mobile Broadband Service and Voice Service based upon the compliance level against each QoS KPI in each category in 13 x surveyed roads of Pakistan.

- a. **MOBILE NETWORK COVERAGE.** The categorization of CMOs as per QoS KPI i.e. Signal Strength of 4G/LTE and 3G Networks measured in Technology Auto Detect and Locked Mode is shown in **Table 8.1: CMOs Standing in Mobile Network Coverage – Technology Auto Detect Mode** & **Table 8.2: CMOs Standing in Mobile Network Coverage – Technology Locked Mode**

| S. #. | Operator | Compliance Level – Number of Roads | | | | | | Standing | |
|-------|----------|------------------------------------|----|-------|---------------|----|-------|-----------------|--|
| | | Technology Auto Detect Mode | | | | | | | |
| | | Compliant | | | Non-Compliant | | | | |
| | | 4G | 3G | Total | 4G | 3G | Total | | |
| 1. | Ufone | 4 | 9 | 13 | 7 | 2 | 9 | 1 st | |
| 2. | Telenor | 3 | 8 | 11 | 10 | 4 | 14 | 2 nd | |
| 3. | ZonG | 2 | 7 | 9 | 11 | 4 | 15 | 3 rd | |
| 4. | Jazz | 3 | 4 | 7 | 10 | 5 | 15 | 4 th | |

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

| S. # | Operator | Compliance Level – Number of Roads Technology Locked Mode | | | | | | Standing | |
|------|----------|--|----|-------|---------------|----|-------|-----------------|--|
| | | Compliant | | | Non-Compliant | | | | |
| | | 4G | 3G | Total | 4G | 3G | Total | | |
| 1. | Telenor | 3 | 12 | 15 | 9 | - | 9 | 1 st | |
| 2. | ZonG | 2 | 12 | 14 | 10 | - | 10 | 2 nd | |
| 3. | Ufone | 4 | 10 | 14 | 8 | 2 | 10 | 2 nd | |
| 4. | Jazz | 3 | 8 | 11 | 9 | 4 | 13 | 3 rd | |

Table 8.2: CMOs Standing in Mobile Network Coverage – Technology Locked Mode

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

- (i) User Download Data Throughput. The User Download Data Throughput in Fixed Duration and Fixed Size Testing, as per the highest to lowest obtained results, is shown in **Table 8.3: CMOs Standing in User Download Data Throughput – Technology Auto Detect Mode & Table 8.4: CMOs Standing in User Download Data Throughput – Technology Locked Mode.**

| S. # | Operator | Highest Download Throughput – Number of Roads | | | | | | | | Standing | | | |
|------|----------|---|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|--|--|
| | | Technology Auto Detect Mode | | | | | | | | Fixed Duration | Fixed Size | | |
| | | Fixed Duration | | | | Fixed Size | | | | | | | |
| | | 1 st | 2 nd | 3 rd | 4 th | 1 st | 2 nd | 3 rd | 4 th | | | | |
| 1. | ZonG | 6 | 4 | 3 | - | 6 | 6 | 1 | - | 1 st | 1 st | | |
| 2. | Ufone | 2 | 4 | 5 | 2 | 4 | 2 | 5 | 2 | 3 rd | 2 nd | | |
| 3. | Jazz | 5 | 5 | 3 | - | 3 | 5 | 5 | - | 2 nd | 3 rd | | |
| 4. | Telenor | - | - | 2 | 11 | - | - | 2 | 11 | 4 th | 4 th | | |

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

| S. # | Operator | Highest Download Throughput – Number of Roads | | | | | | | | Standing | | | |
|------|----------|---|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|----------------------|----------------------|--|--|
| | | 4G Locked Mode | | | | 3G Locked Mode | | | | 4G Fixed Duration | 3G Fixed Duration | | |
| | | Fixed Duration | | | | Fixed Duration | | | | | | | |
| | | 1 st | 2 nd | 3 rd | 4 th | 1 st | 2 nd | 3 rd | 4 th | | | | |
| 1. | Ufone | 6 | 2 | 4 | - | 6 | 4 | 2 | - | 1 st | 1 st | | |
| 2. | Jazz | 3 | 4 | 5 | - | 4 | 4 | 3 | 1 | 3 rd | 2 nd | | |
| 3. | Telenor | - | - | 1 | 11 | 1 | 4 | 6 | 1 | 4 th | 3 rd | | |
| 4. | Zong | 3 | 6 | 2 | 1 | 1 | - | 1 | 10 | 2 nd | 4 th | | |

Table 8.4: CMOs Standing in User Download Data Throughput
Technology Locked Mode

- (ii) User Upload Data Throughput. The User Upload Data Throughput in Fixed Duration and Fixed Size Testing, as per the highest to lowest obtained results, is shown in **Table 8.5: CMOs Standing in User Upload Data Throughput – Technology Auto Detect Mode & Table 8.6: CMOs Standing in User Upload Data Throughput – Technology Locked Mode.**

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

**Table 8.5: CMOs Standing in User Upload Data Throughput
Technology Auto Detect Mode**

| S. # | Operator | Highest Upload Throughput – Number of Roads | | | | | | | | Standing | | | |
|------|----------|---|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-------------------|-------------------|--|--|
| | | 4G Locked Mode | | | | 3G Locked Mode | | | | 4G Fixed Duration | 3G Fixed Duration | | |
| | | Fixed Duration | | | | Fixed Duration | | | | | | | |
| | | 1 st | 2 nd | 3 rd | 4 th | 1 st | 2 nd | 3 rd | 4 th | | | | |
| 1. | Ufone | 6 | 2 | 3 | 1 | 10 | 1 | - | 1 | 1 st | 1 st | | |
| 2. | Telenor | - | - | 2 | 10 | 1 | 6 | 5 | - | 4 th | 2 nd | | |
| 3. | ZonG | 2 | 5 | 4 | 1 | 1 | 5 | 4 | 2 | 3 rd | 3 rd | | |
| 4. | Jazz | 4 | 5 | 3 | - | - | 1 | 3 | 8 | 2 nd | 4 th | | |

Table 8.6: CMOs Standing in User Upload Data Throughput – Technology Locked Mode

- (iii) Webpage Loading Time. The categorization of each CMOs, as per the maximum compliant of Webpage Loading Time QoS KPIs is shown, is shown in **Table 8.7: CMOs Standing in Webpage Loading Time**.

| S. # | Operator | Webpage Loading Time - Number of Roads | | | | | | | | Standing | |
|------|----------|--|--|--|--|---------------|--|--|--|------------------------------------|--|
| | | Compliant | | | | Non-Compliant | | | | | |
| 1. | ZonG | 1 | | | | | | | | 1 st | |
| 2. | Jazz | 0 | | | | | | | | CMO not compliant at any location. | |
| 3. | Telenor | 0 | | | | | | | | | |
| 4. | Ufone | 0 | | | | | | | | | |

Table 8.7: CMOs Standing in Webpage Loading Time

- (iv) Latency. The categorization of each CMOs, as per the maximum compliant of Webpage Loading Time QoS KPIs is shown in **Table 8.8: CMOs Standing in Latency**.

| S. # | Operator | Latency - Number of Roads | | | | | | | | Standing | |
|------|----------|---------------------------|----|----|-------|---------------|----|----|-------|-----------------|--|
| | | Compliant | | | | Non-Compliant | | | | | |
| | | Auto | 4G | 3G | Total | Auto | 4G | 3G | Total | | |
| 1. | Jazz | 0 | 4 | 0 | 4 | 13 | 8 | 12 | 33 | 1 st | |
| 2. | Telenor | 0 | 1 | 0 | 1 | 13 | 11 | 12 | 36 | 2 nd | |
| 3. | ZonG | 0 | 0 | 1 | 1 | 13 | 12 | 11 | 36 | 2 nd | |
| 4. | Ufone | 0 | 0 | 0 | 0 | 13 | 12 | 12 | 37 | 3 rd | |

Table 8.8: CMOs Standing in Latency

- c. **VOICE SERVICE.** The categorization of each CMOs, as per the maximum compliant of Voice QoS KPIs is shown in **Table 8.8: CMOs Standing in Voice Service**.

| S. # | Operator | Voice QoS KPIs | | Standing |
|------|----------|----------------|---------------|-----------------|
| | | Compliant | Non-Compliant | |
| 1. | ZonG | 53 | 25 | 1 st |
| 2. | Jazz | 54 | 31 | 2 nd |
| 3. | Ufone | 50 | 41 | 3 rd |
| 4. | Telenor | 47 | 39 | 4 th |

Table 8.8: CMOs Standing in Voice Service

- d. **OVERALL STANDING.** The overall standing of each CMOs in different category of services is mentioned in **Table 8.9: CMOs Overall Standing in QoS Survey**.

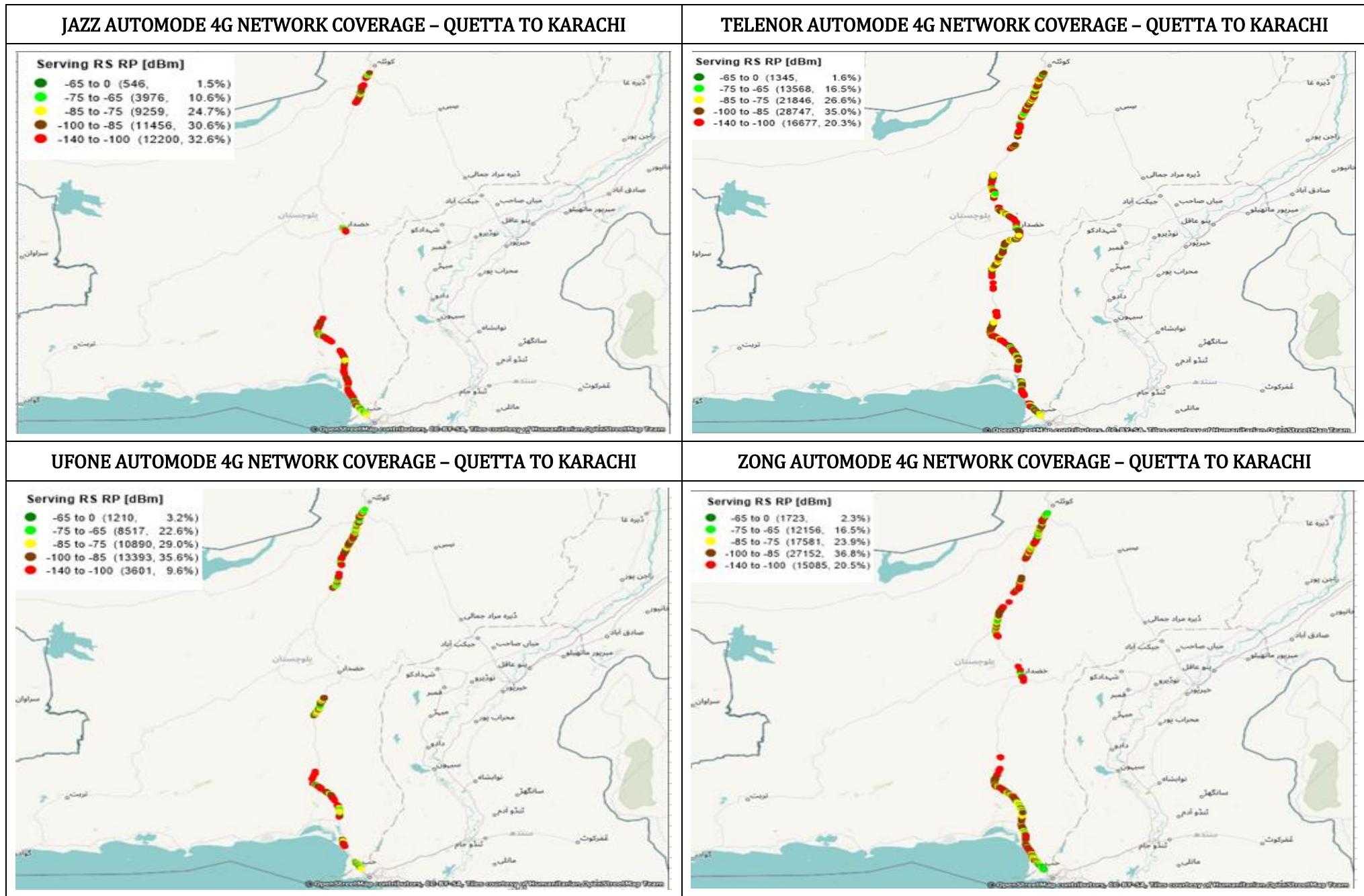
| S. #. | Service | | | STANDING | | | |
|-------|---------------------------------|-------------|-----------|-----------------|------------------------------------|-----------------|-----------------|
| | | | | 1 st | 2 nd | 3 rd | 4 th |
| 1. | Mobile Network Coverage | Auto Mode | Ufone | Telenor | ZonG | Jazz | |
| | | Locked Mode | Telenor | Ufone & Zong | Jazz | - | |
| 2. | Mobile Broadband Fixed Duration | Auto Mode | ZonG | Jazz | Ufone | Telenor | |
| | | 4G | Ufone | ZonG | Jazz | Telenor | |
| | | 3G | Ufone | Jazz | Telenor | ZonG | |
| | | Auto Mode | ZonG | Jazz | Ufone | Telenor | |
| | | 4G | Ufone | Jazz | ZonG | Telenor | |
| | | 3G | Ufone | Telenor | ZonG | Jazz | |
| | Fixed Size | Download | Auto Mode | ZonG | Ufone | Jazz | Telenor |
| | | Upload | Auto Mode | Ufone | ZonG | Jazz | Telenor |
| | Webpage Loading Time | | | ZonG | CMO not compliant at any location. | | |
| | Latency | | | Jazz | Telenor & Zong | Ufone | - |
| 3. | Voice | | | ZonG | Jazz | Ufone | Telenor |

Table 8.9: CMOs Overall Standing in QoS Survey

Annex-A (Coverage Maps)

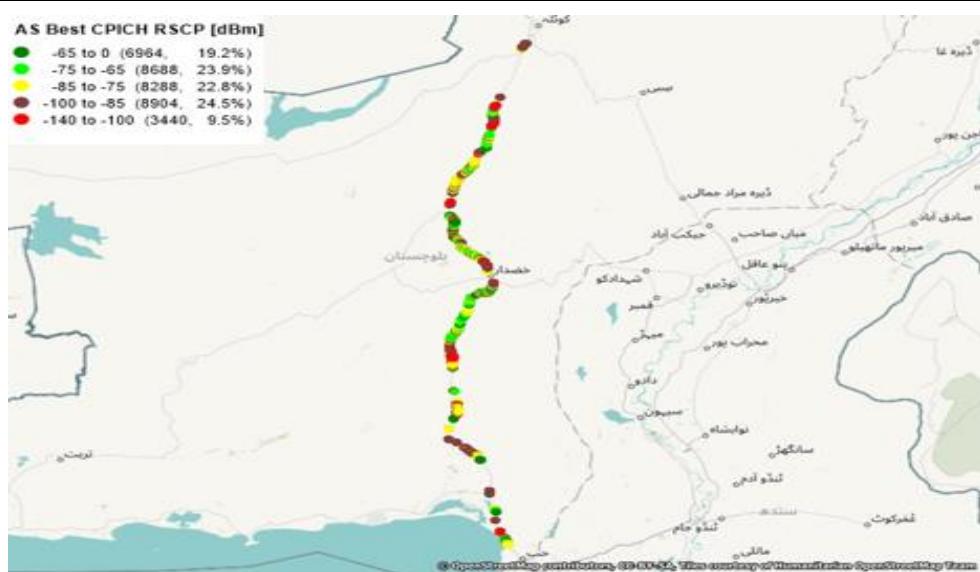
COVERAGE MAPS (AUTOMODE)

AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

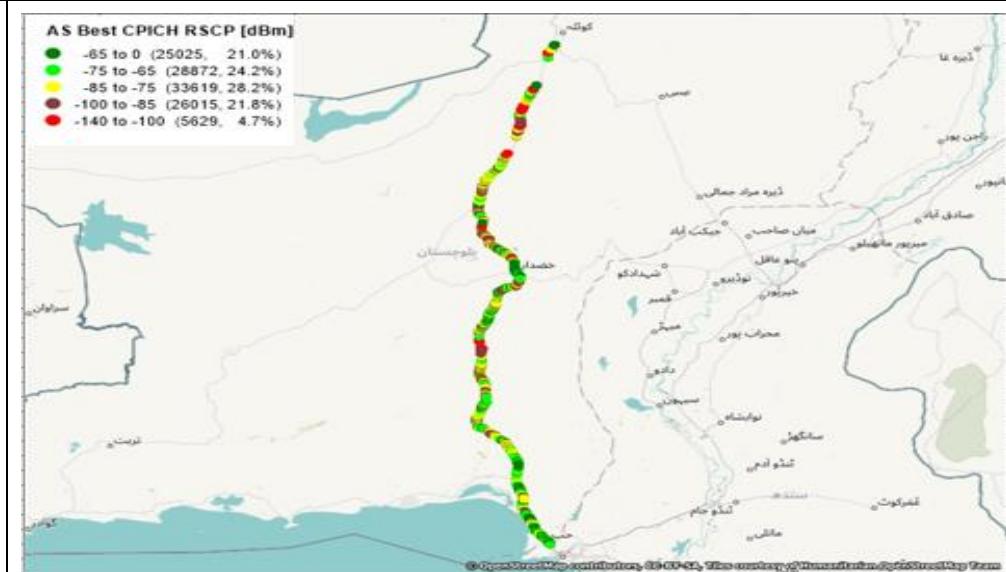


AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

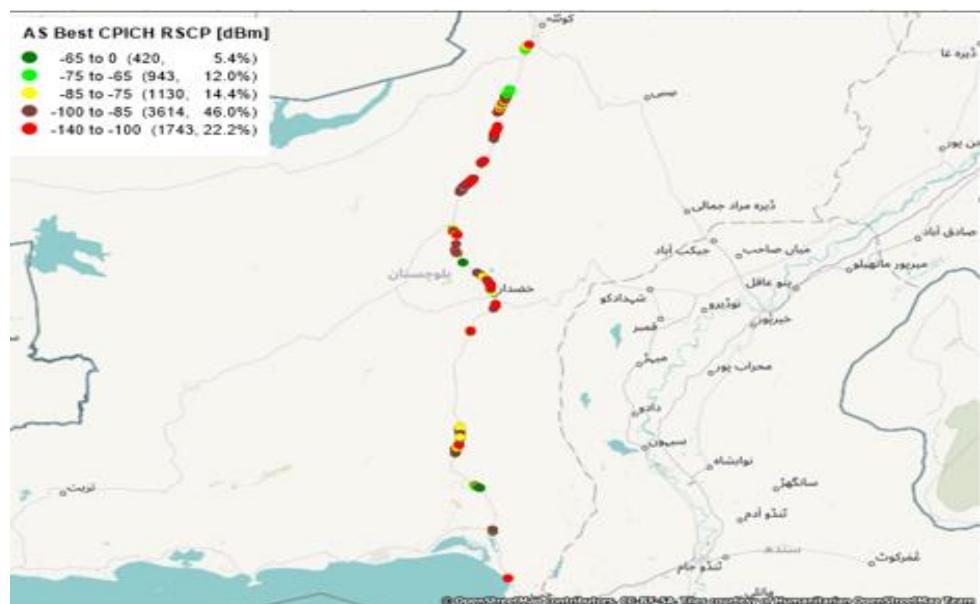
TELENOX AUTOMODE 3G NETWORK COVERAGE – QUETTA TO KARACHI



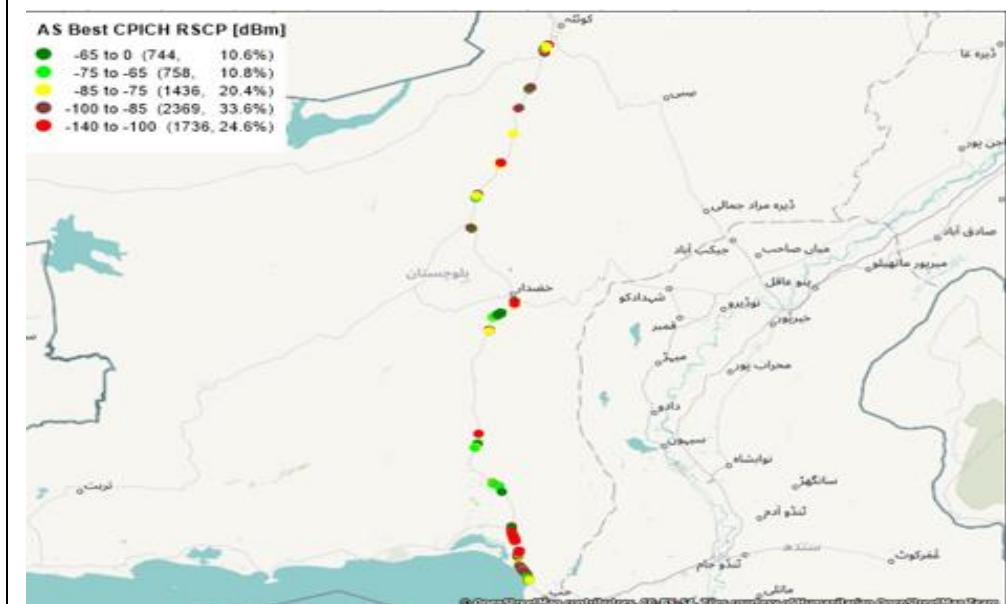
UFONE AUTOMODE 3G NETWORK COVERAGE – QUETTA TO KARACHI



ZONG AUTOMODE 3G NETWORK COVERAGE – QUETTA TO KARACHI

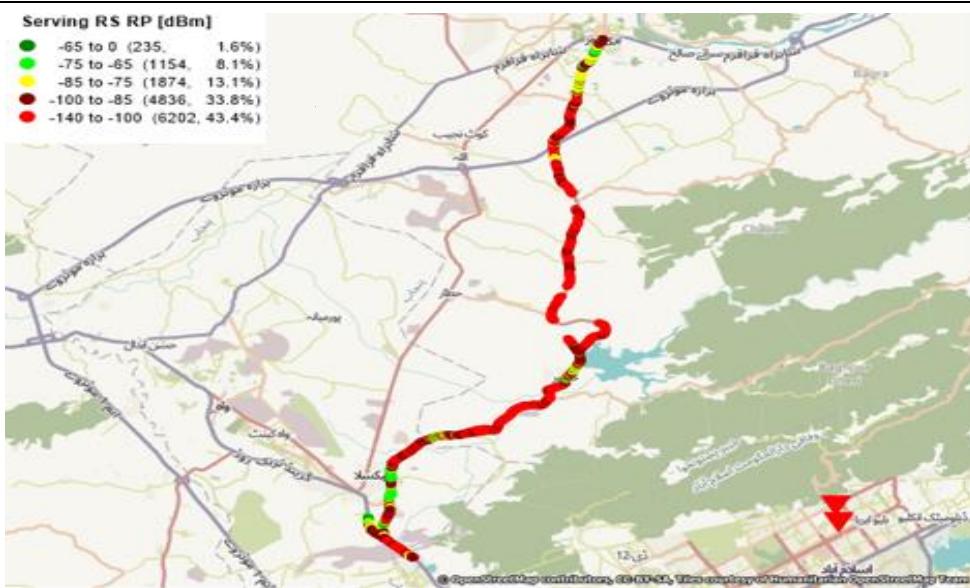


JAZZ AUTOMODE 3G NETWORK COVERAGE – QUETTA TO KARACHI

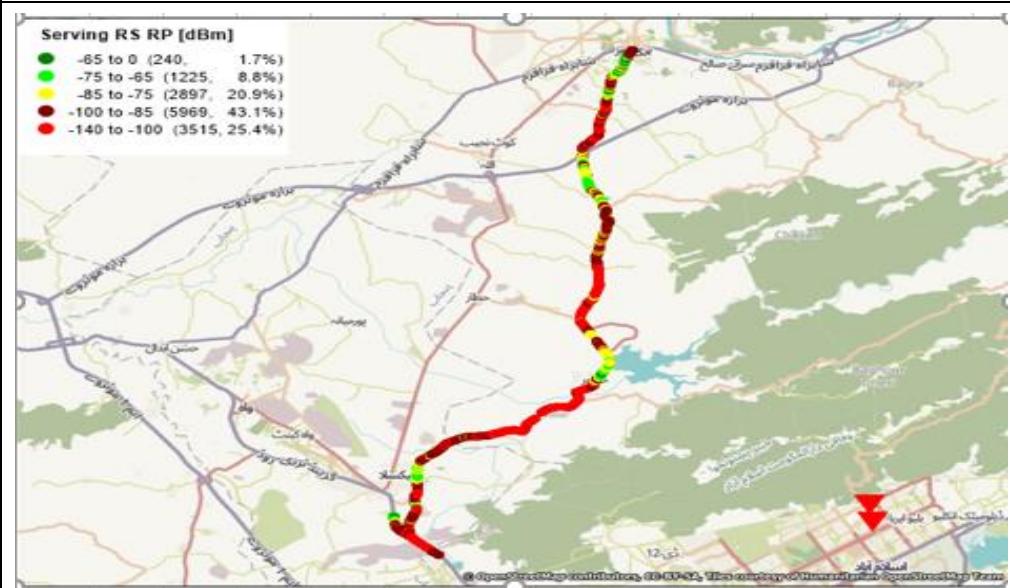


AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

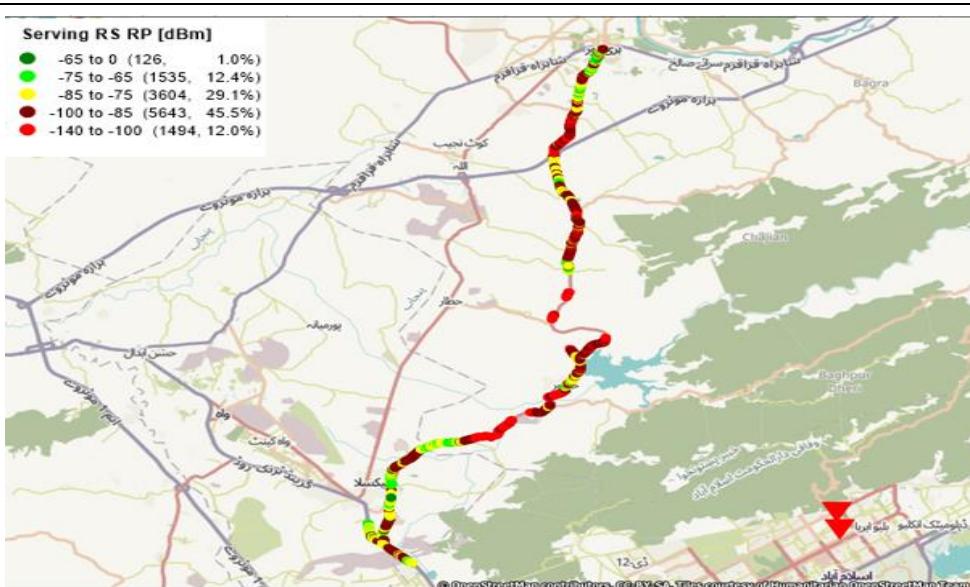
JAZZ AUTOMODE 4G NETWORK COVERAGE – HARIPUR TO TAXILA



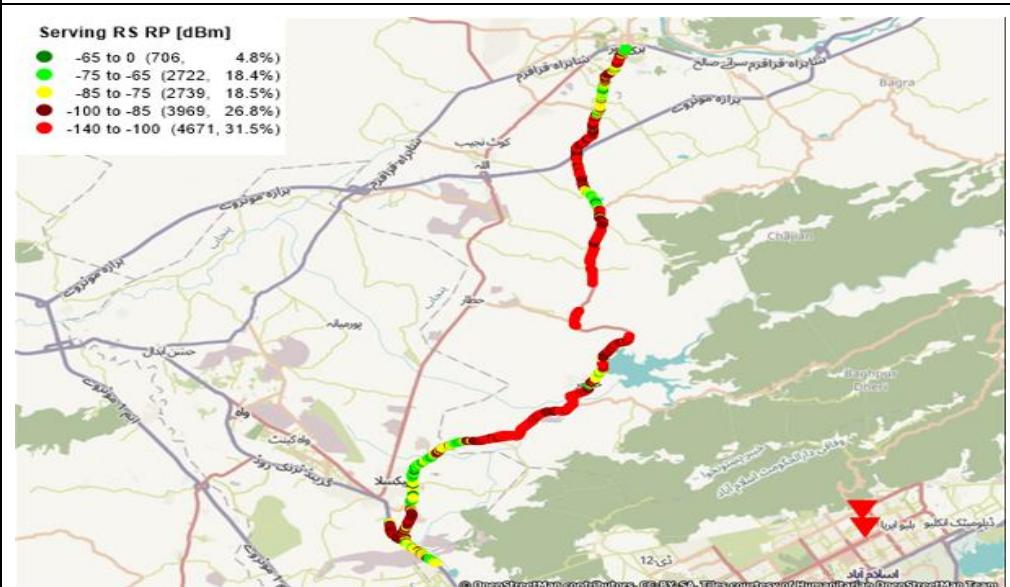
TELENOR AUTOMODE 4G NETWORK COVERAGE – HARIPUR TO TAXILA



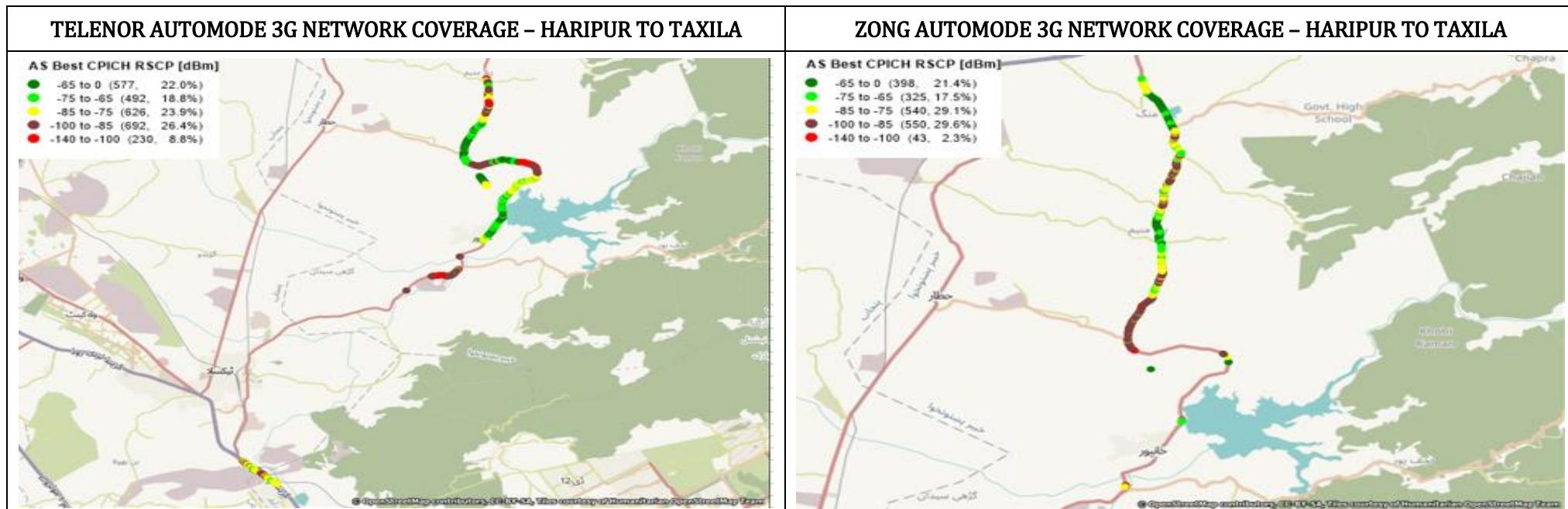
UFONE AUTOMODE 4G NETWORK COVERAGE – HARIPUR TO TAXILA



ZONG AUTOMODE 4G NETWORK COVERAGE – HARIPUR TO TAXILA

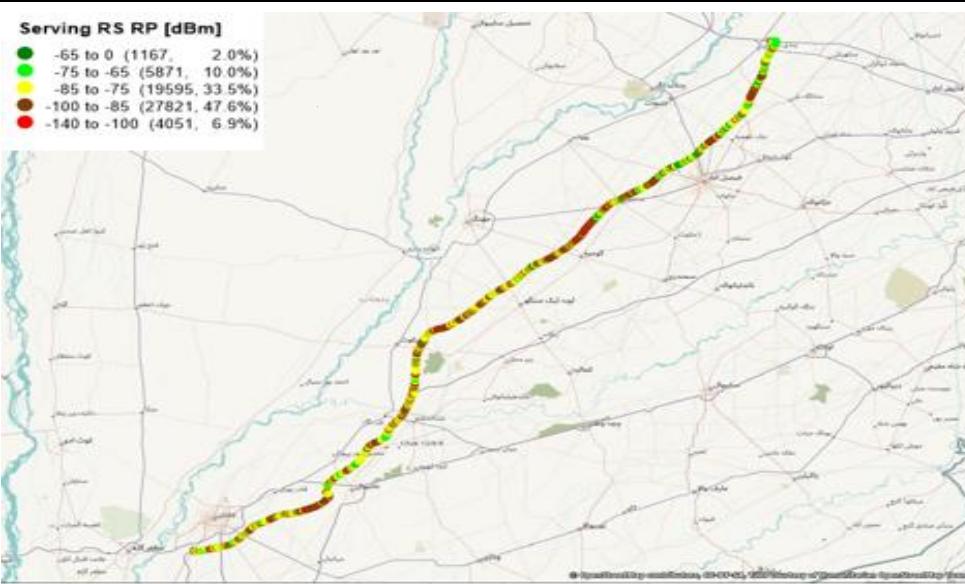


AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

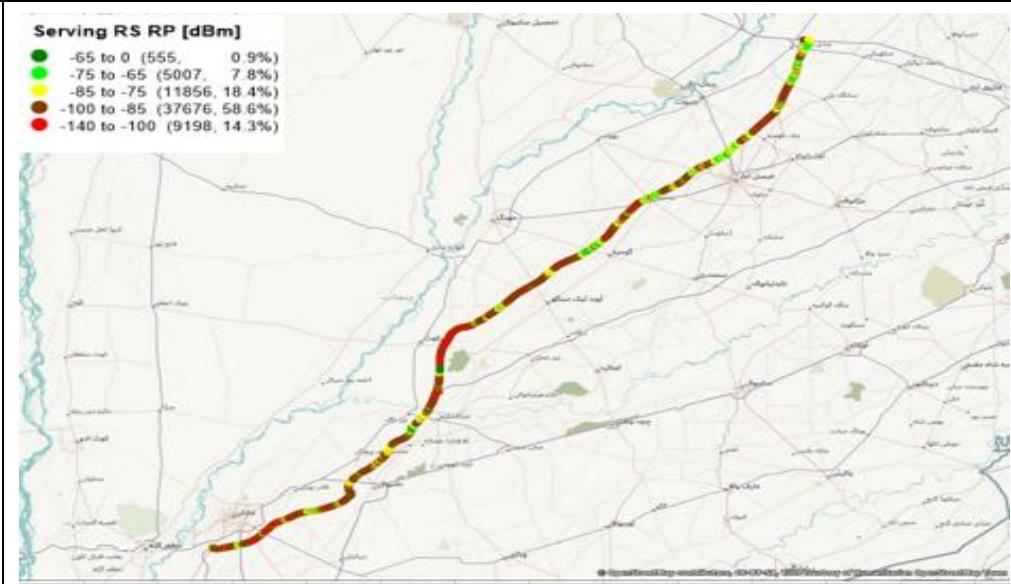


AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

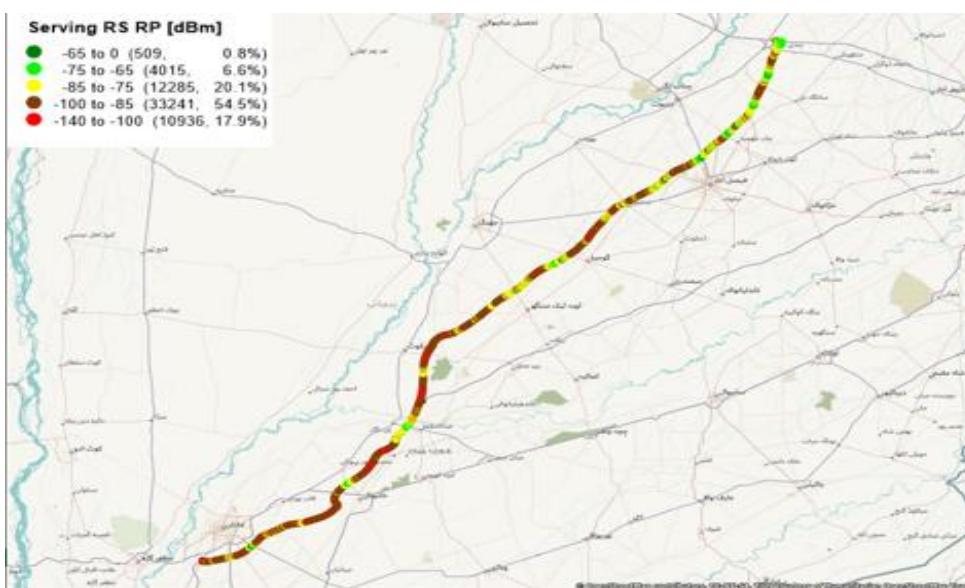
JAZZ AUTOMODE 4G NETWORK COVERAGE – PINDI BHATIAN TO MULTAN



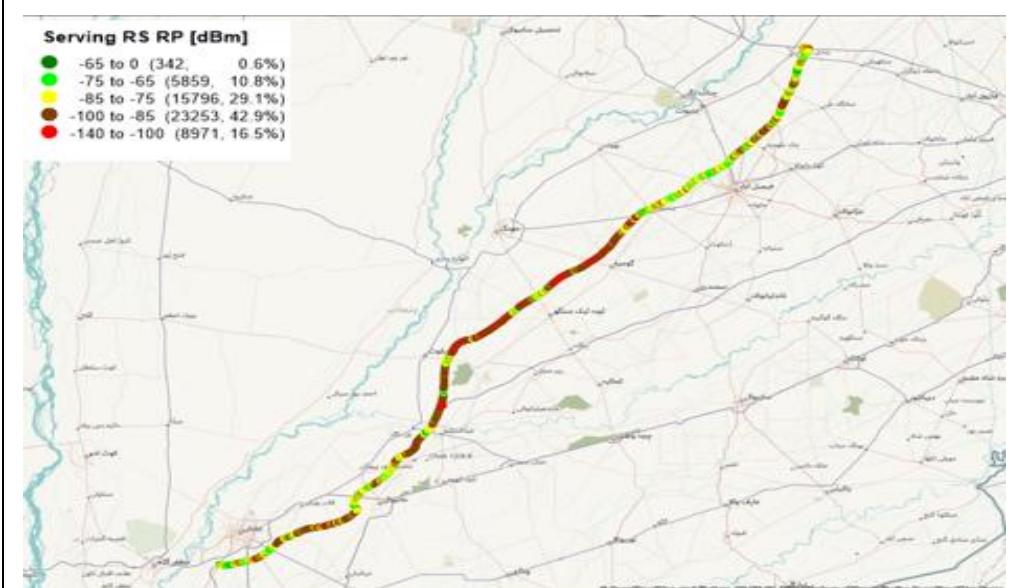
TELENOR AUTOMODE 4G NETWORK COVERAGE – PINDI BHATIAN TO MULTAN



UFONE AUTOMODE 4G NETWORK COVERAGE – PINDI BHATIAN TO MULTAN

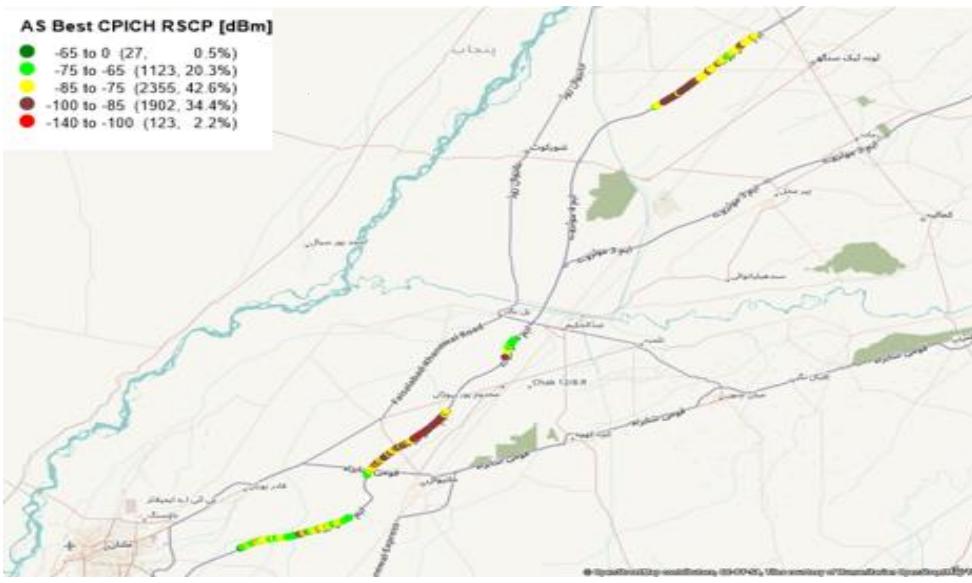


ZONG AUTOMODE 4G NETWORK COVERAGE – PINDI BHATIAN TO MULTAN



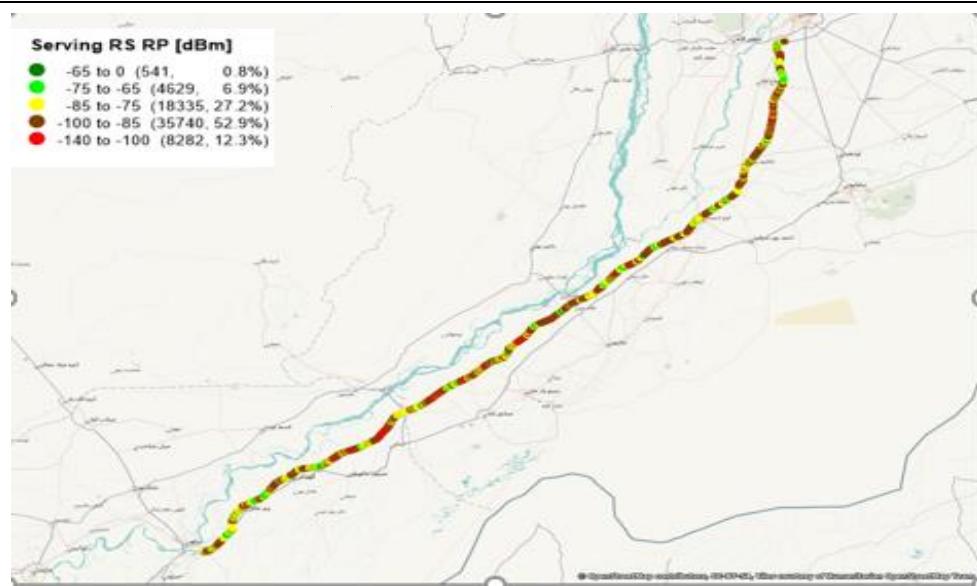
AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

UFONE AUTOMODE 3G NETWORK COVERAGE – PINDI BHATIAN TO MULTAN

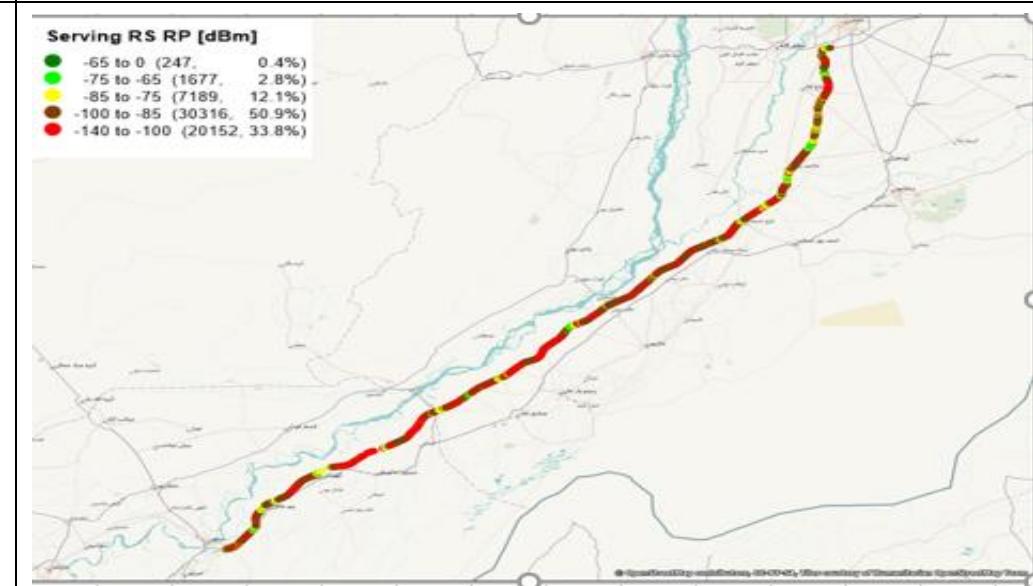


AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

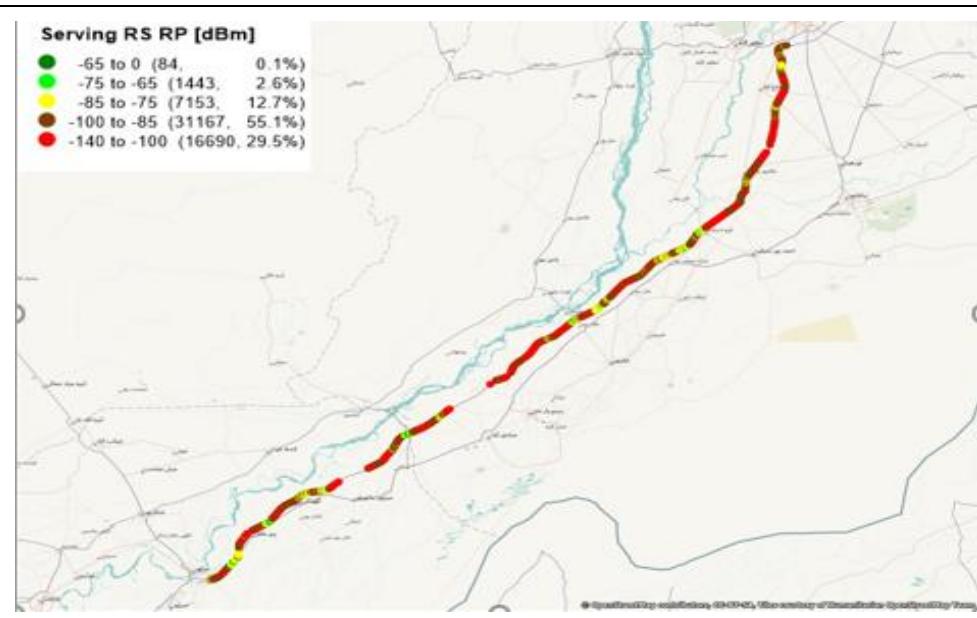
JAZZ AUTOMODE 4G NETWORK COVERAGE – MULTAN TO SUKKUR



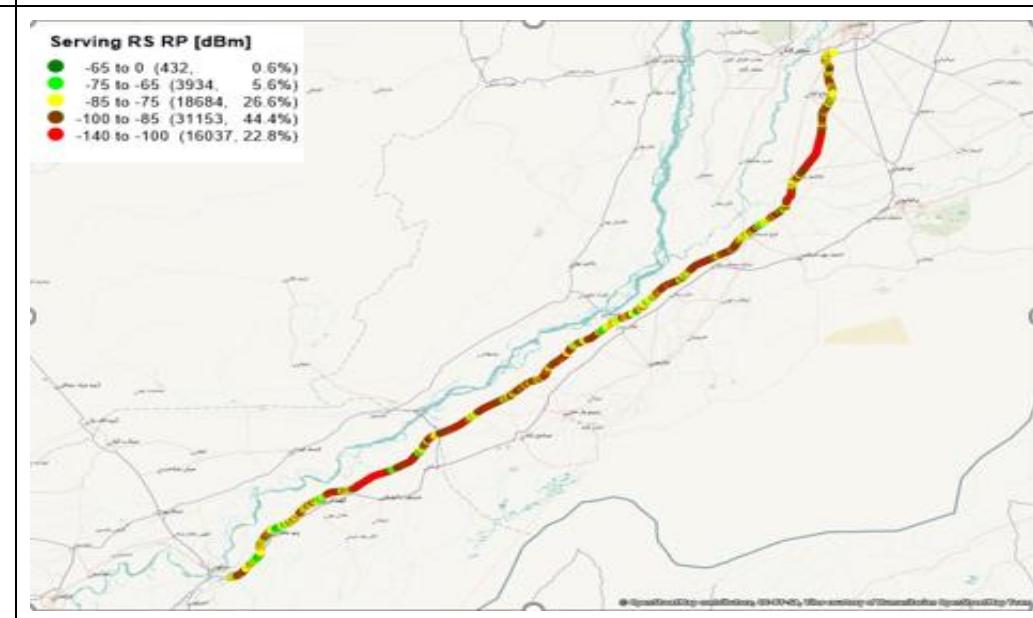
TELENOR AUTOMODE 4G NETWORK COVERAGE – MULTAN TO SUKKUR



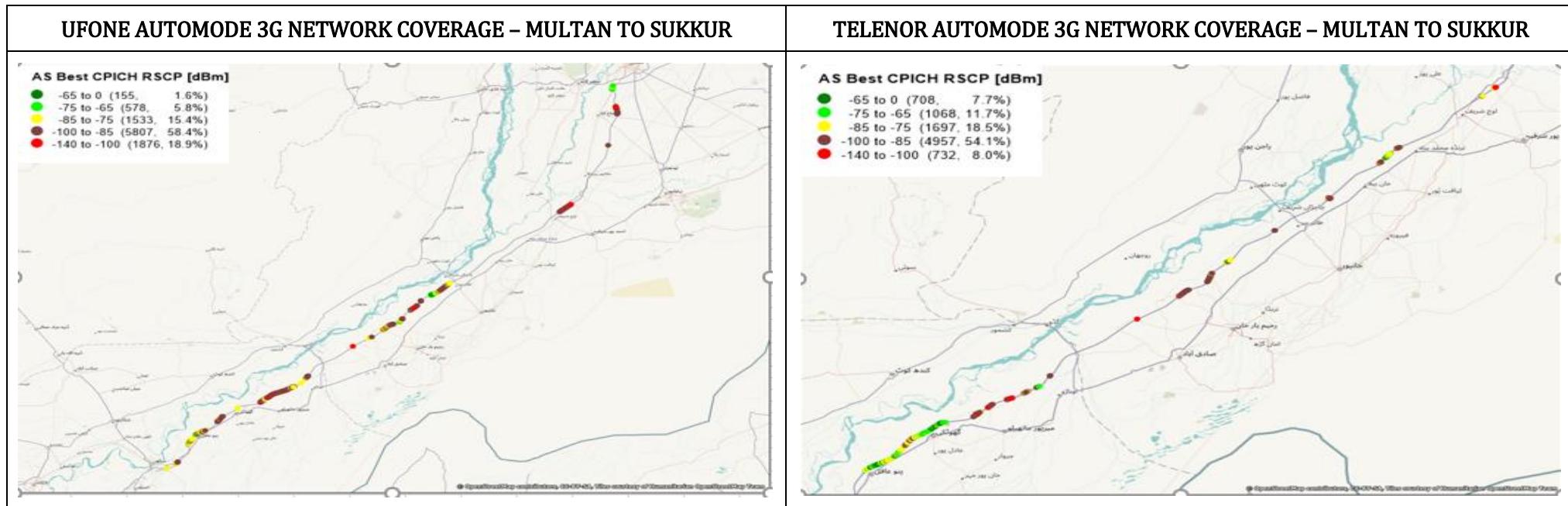
UFONE AUTOMODE 4G NETWORK COVERAGE – MULTAN TO SUKKUR



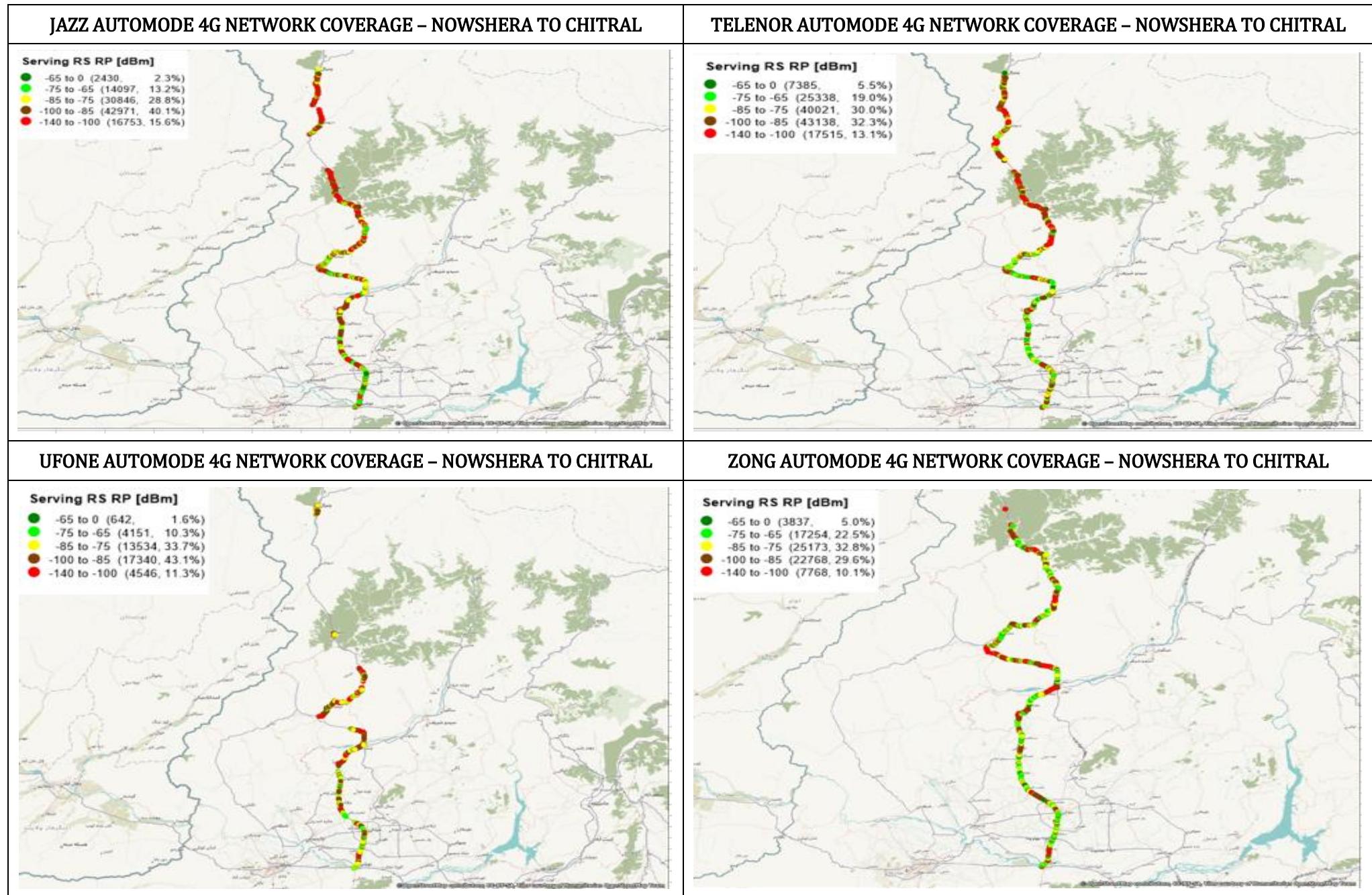
ZONG AUTOMODE 4G NETWORK COVERAGE – MULTAN TO SUKKUR



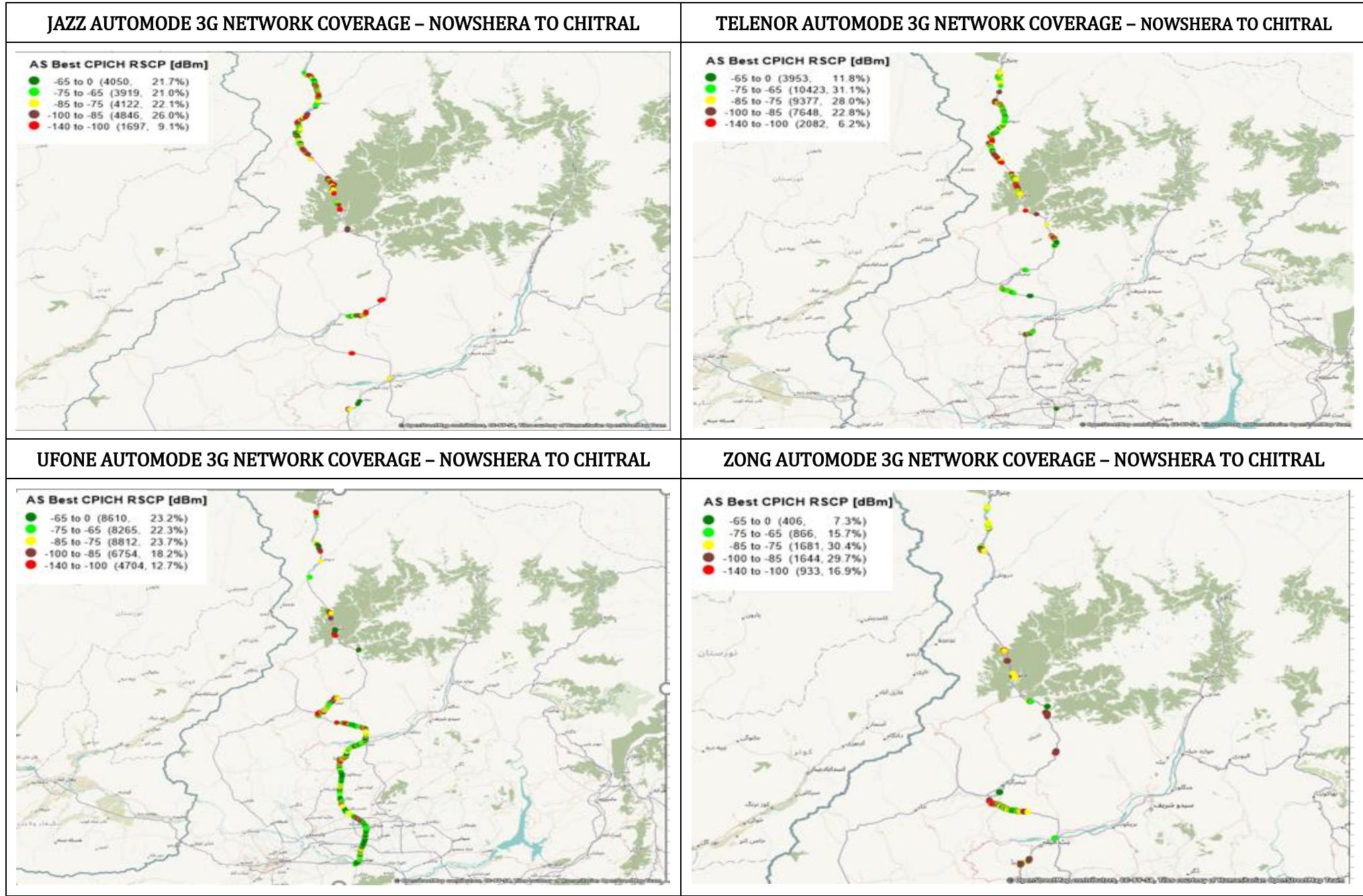
AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)



AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

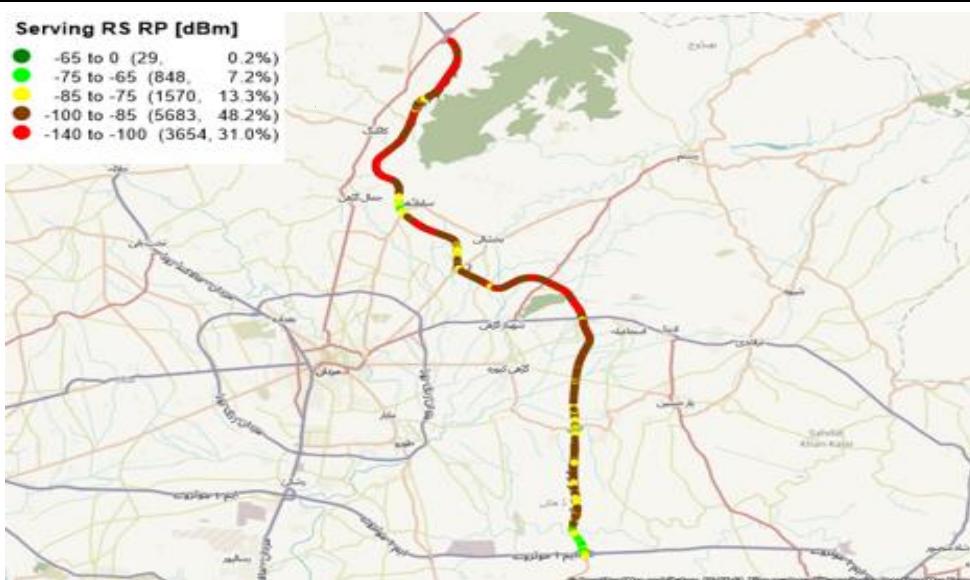


AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

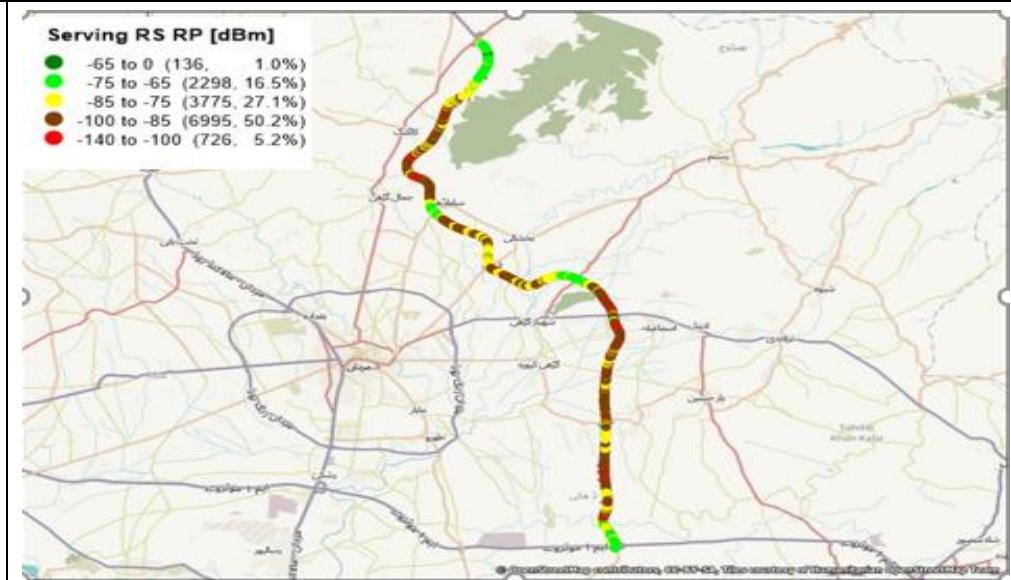


AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

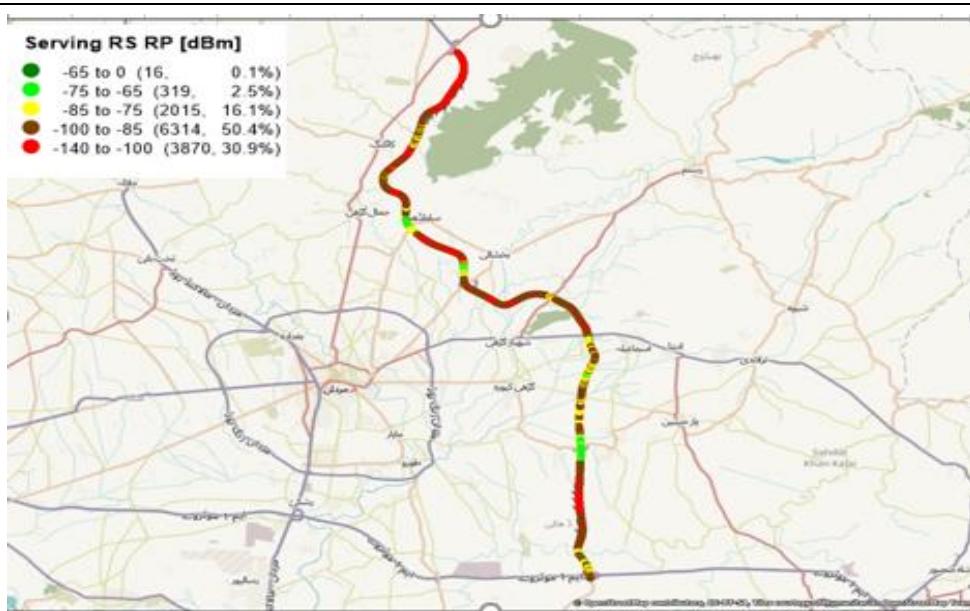
JAZZ AUTOMODE 4G NETWORK COVERAGE – SWABI TO KATLANG



TELENOR AUTOMODE 4G NETWORK COVERAGE – SWABI TO KATLANG

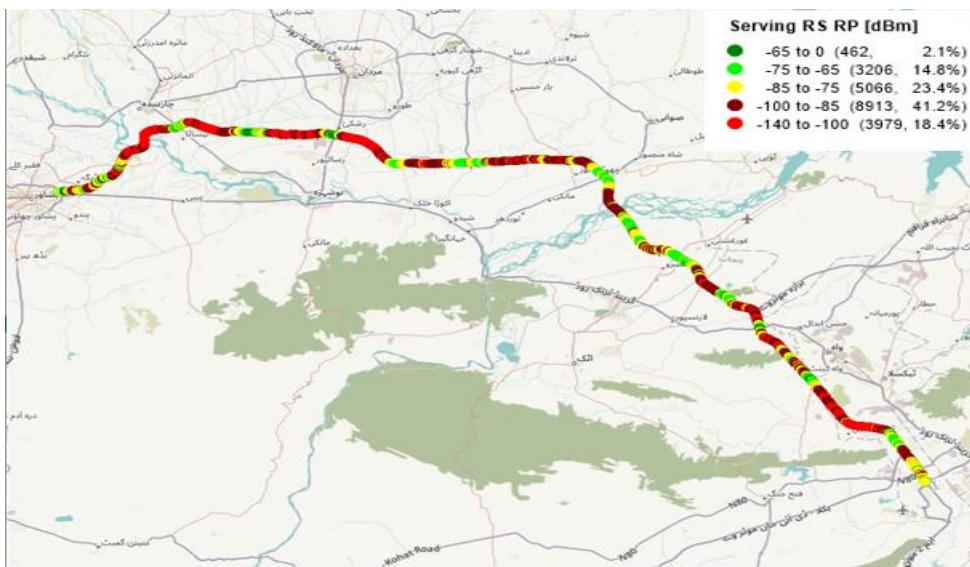


ZONG AUTOMODE 4G NETWORK COVERAGE – SWABI TO KATLANG

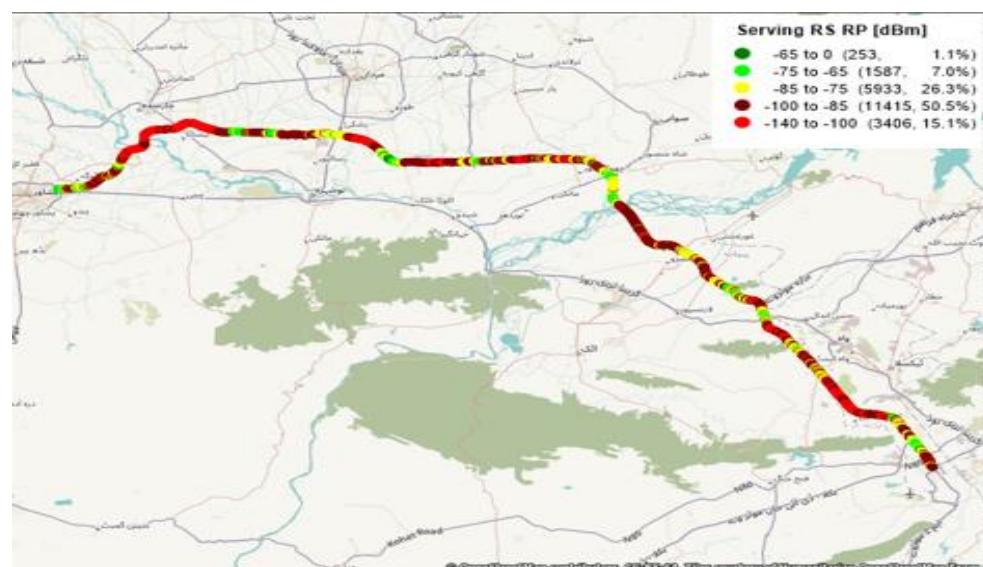


AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

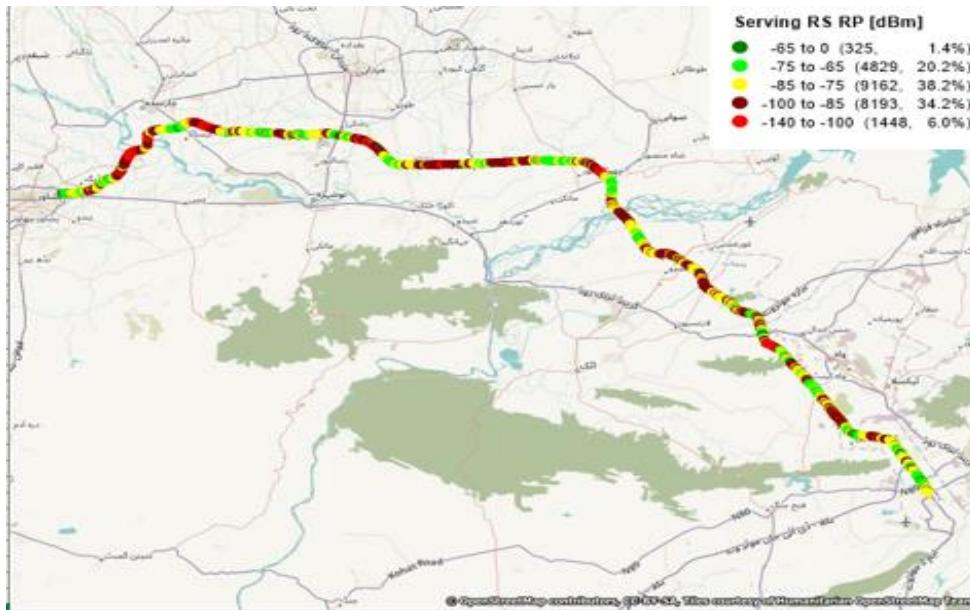
JAZZ AUTOMODE 4G NETWORK COVERAGE – ISLAMABAD TO PESHAWAR



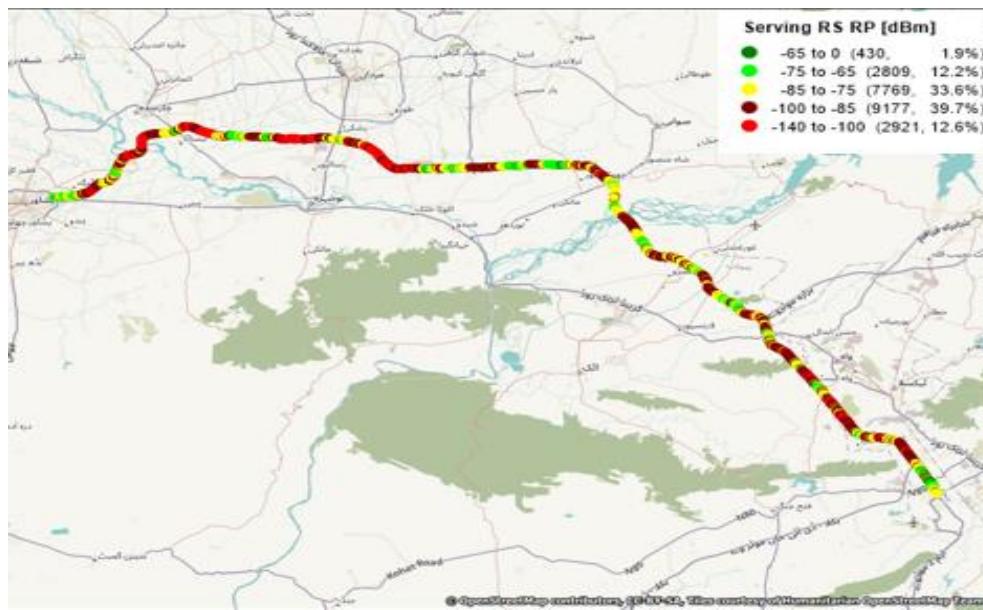
TELENOR AUTOMODE 4G NETWORK COVERAGE – ISLAMABAD TO PESHAWAR



UFONE AUTOMODE 4G NETWORK COVERAGE – ISLAMABAD TO PESHAWAR

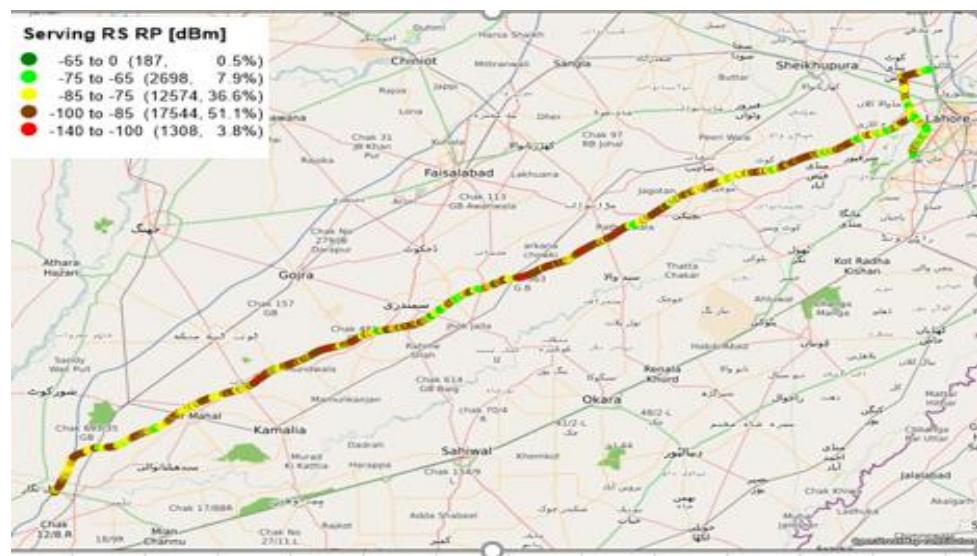


ZONG AUTOMODE 4G NETWORK COVERAGE – ISLAMABAD TO PESHAWAR

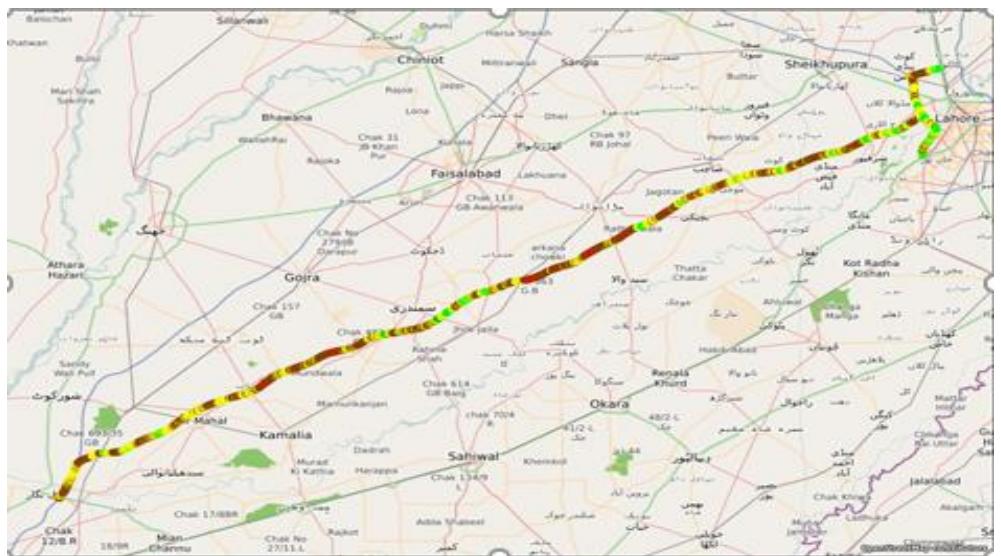


AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

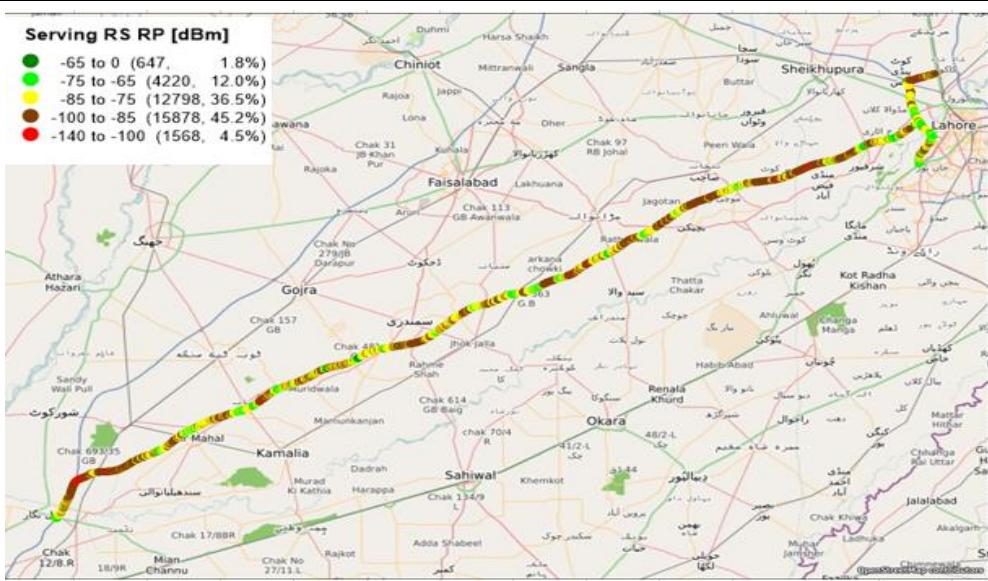
JAZZ AUTOMODE 4G NETWORK COVERAGE – LAHORE TO ABDUL HAKEEM



TELENOR AUTOMODE 4G NETWORK COVERAGE – LAHORE TO ABDUL HAKEEM

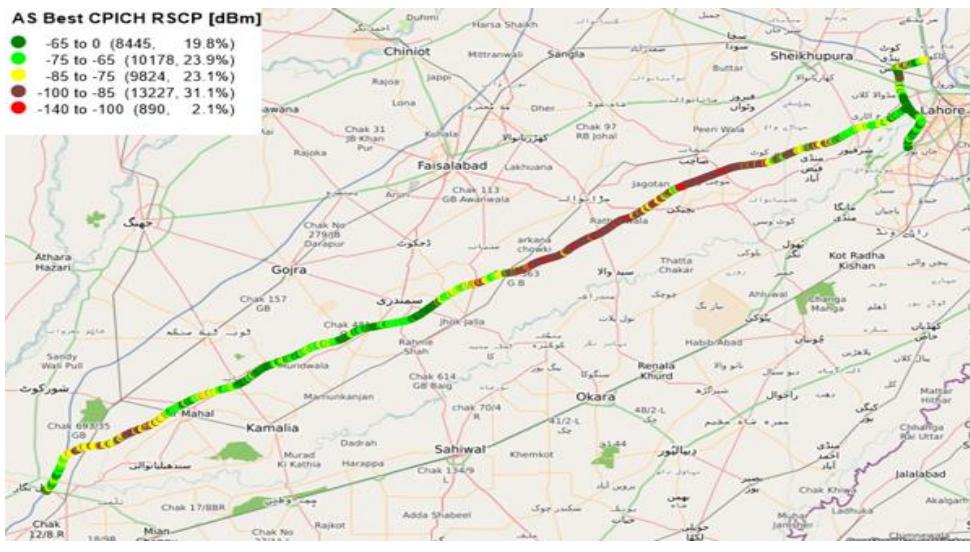


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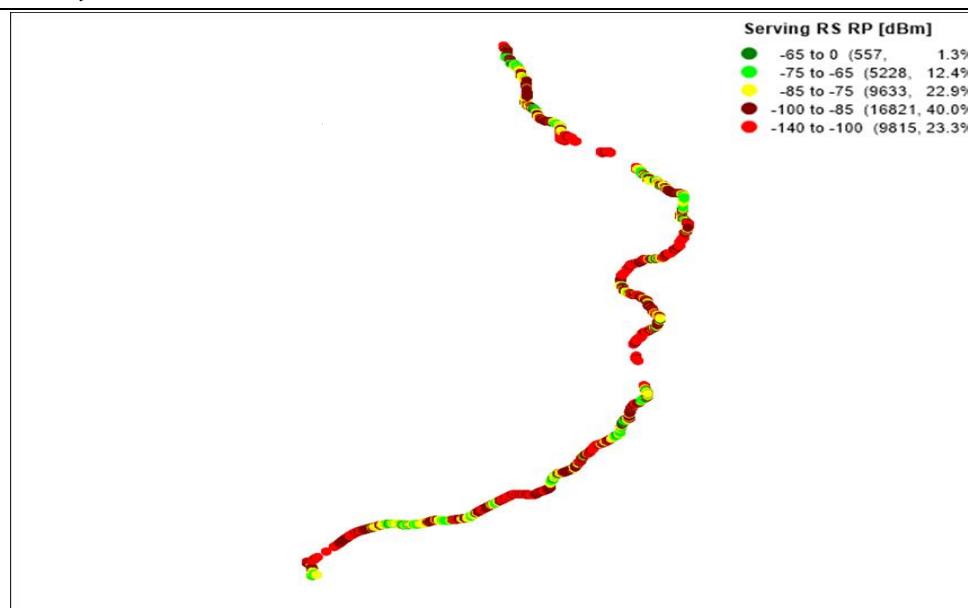
AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

UFONE AUTOMODE 3G NETWORK COVERAGE – LAHORE TO ABDUL HAKEEM

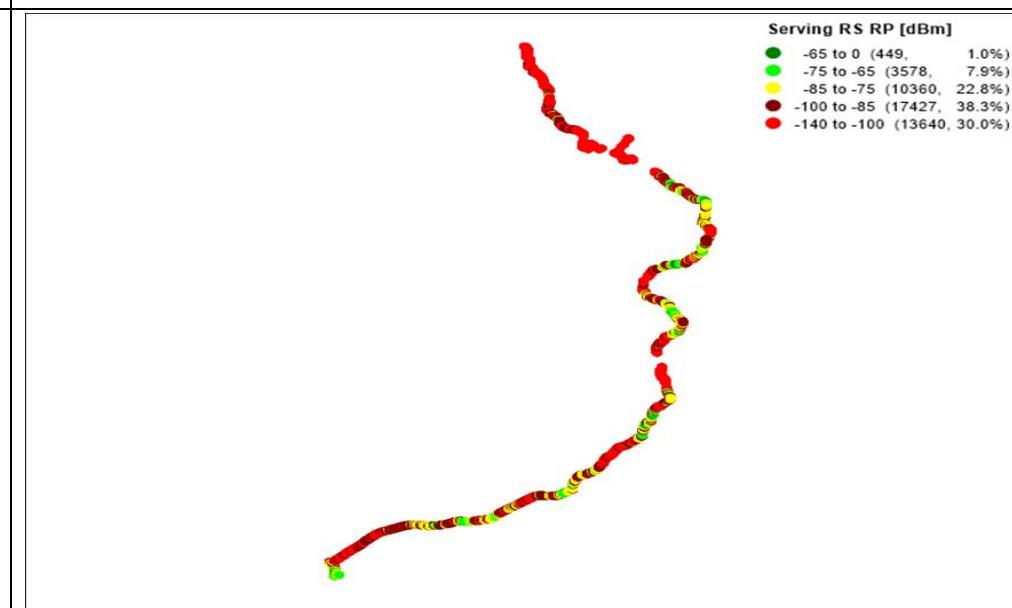


AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

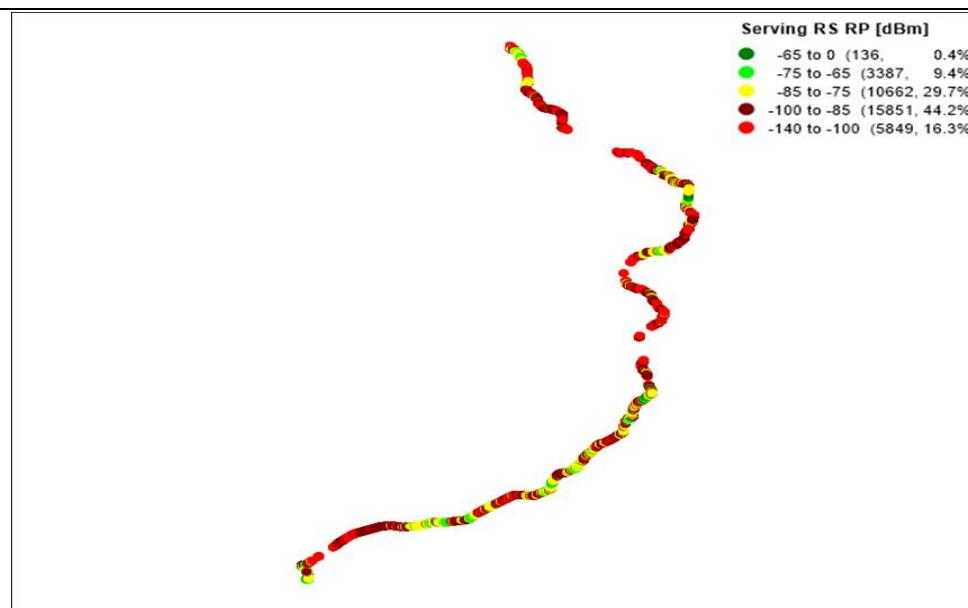
JAZZ AUTOMODE 4G NETWORK COVERAGE – HAZARA MOTORWAY



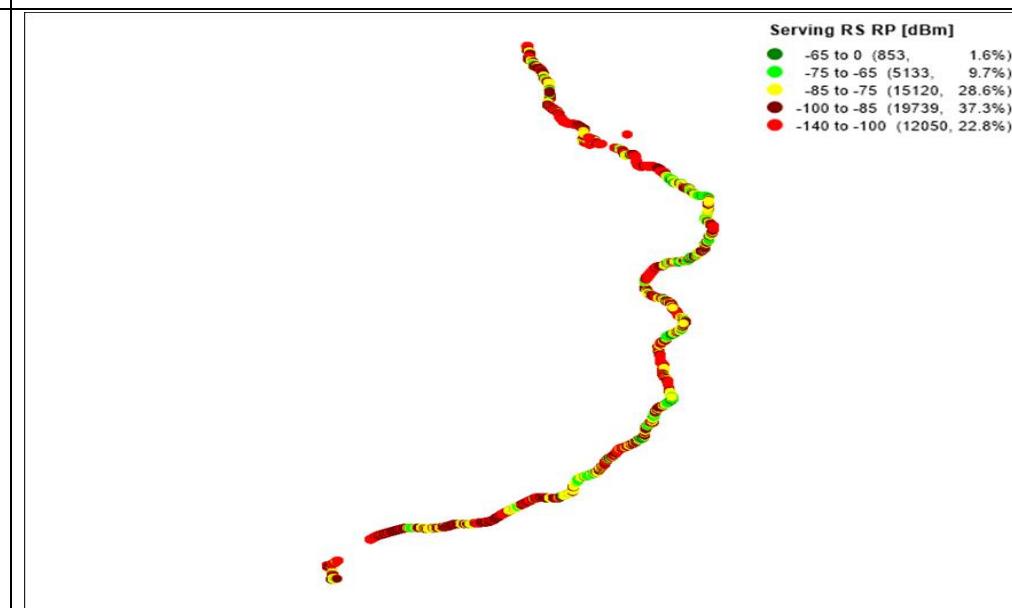
TELENOR AUTOMODE 4G NETWORK COVERAGE – HAZARA MOTORWAY



UFONE AUTOMODE 4G NETWORK COVERAGE – HAZARA MOTORWAY

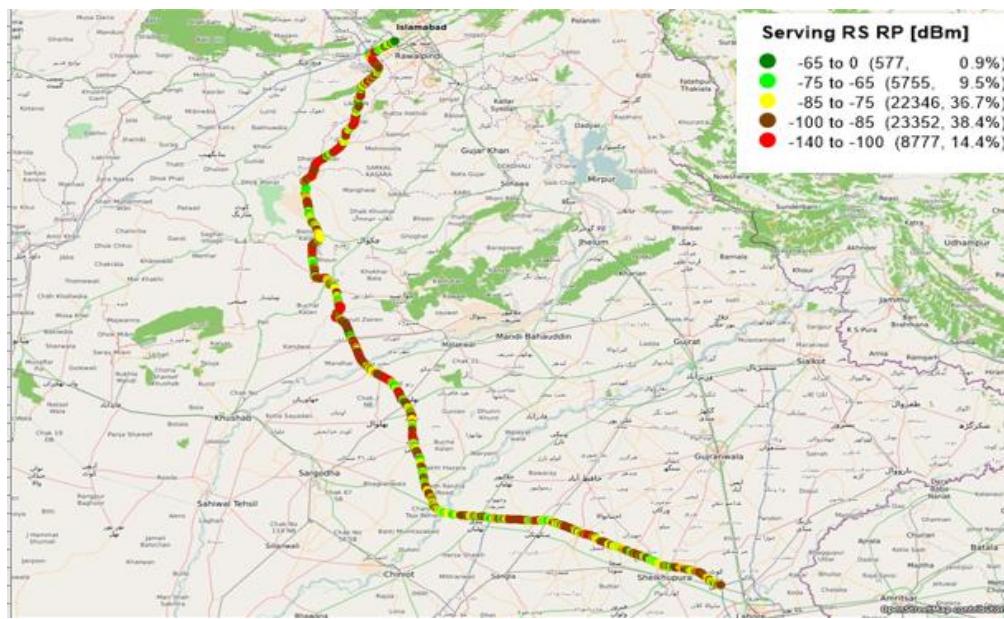


ZONG AUTOMODE 4G NETWORK COVERAGE – HAZARA MOTORWAY

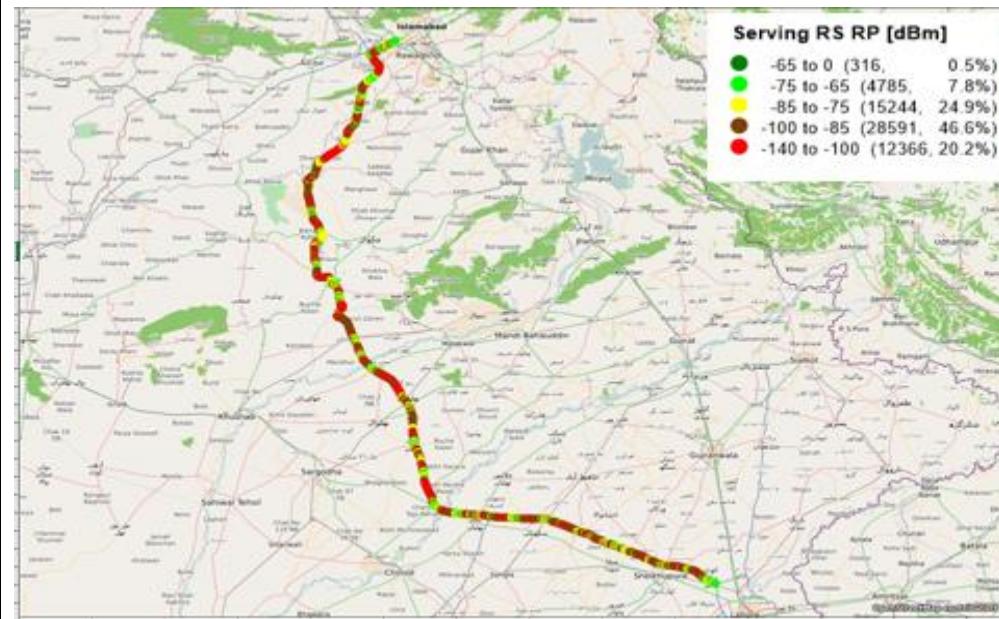


AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

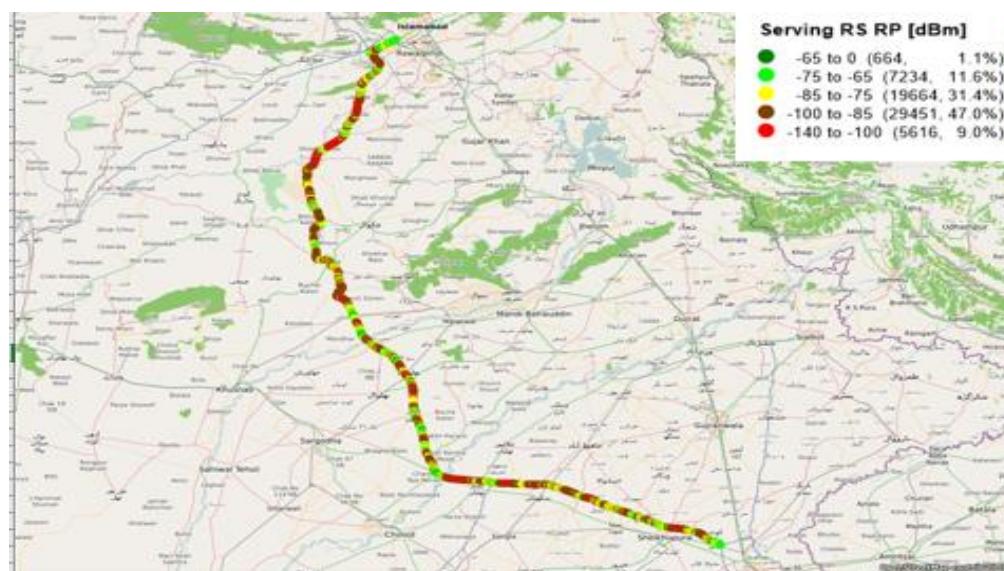
JAZZ AUTOMODE 4G NETWORK COVERAGE – LAHORE TO ISLAMABAD



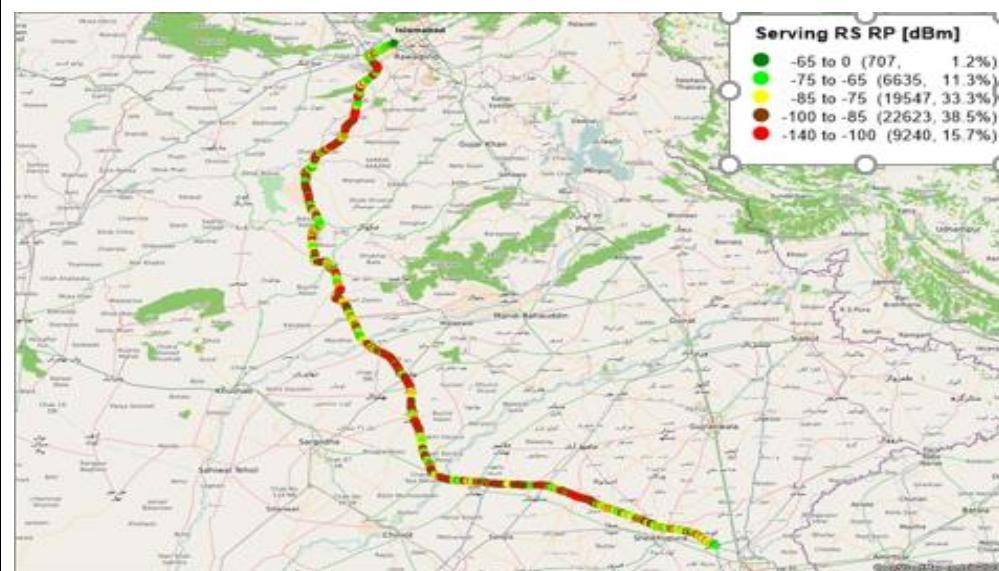
TELENOR AUTOMODE 4G NETWORK COVERAGE – LAHORE TO ISLAMABAD



UFONE AUTOMODE 4G NETWORK COVERAGE – LAHORE TO ISLAMABAD

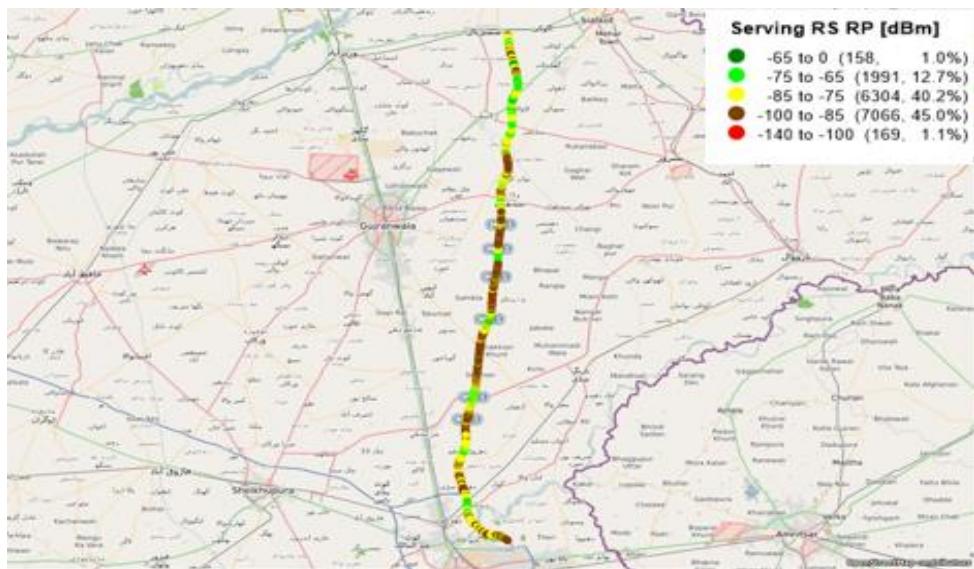


ZONG AUTOMODE 4G NETWORK COVERAGE – LAHORE TO ISLAMABAD

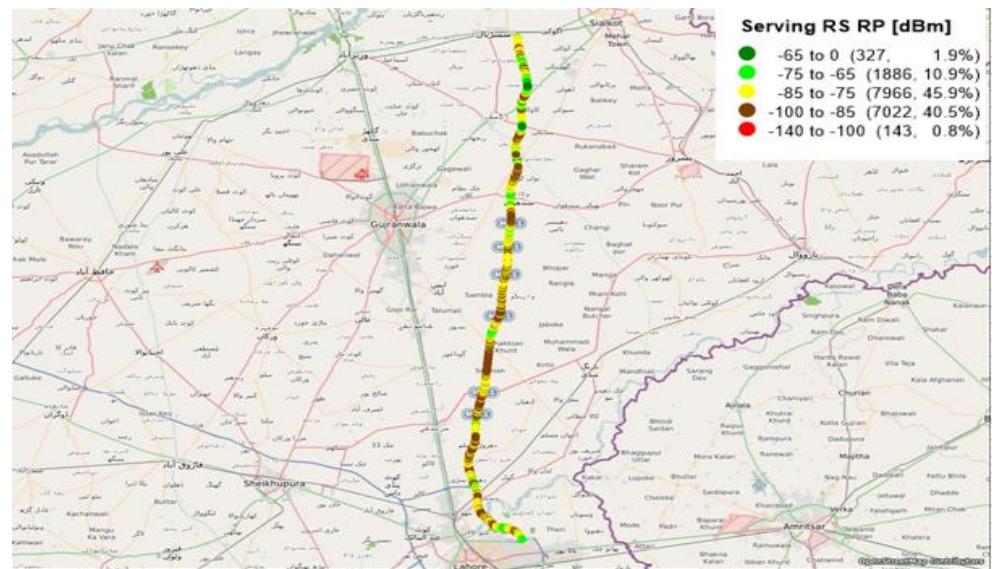


AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

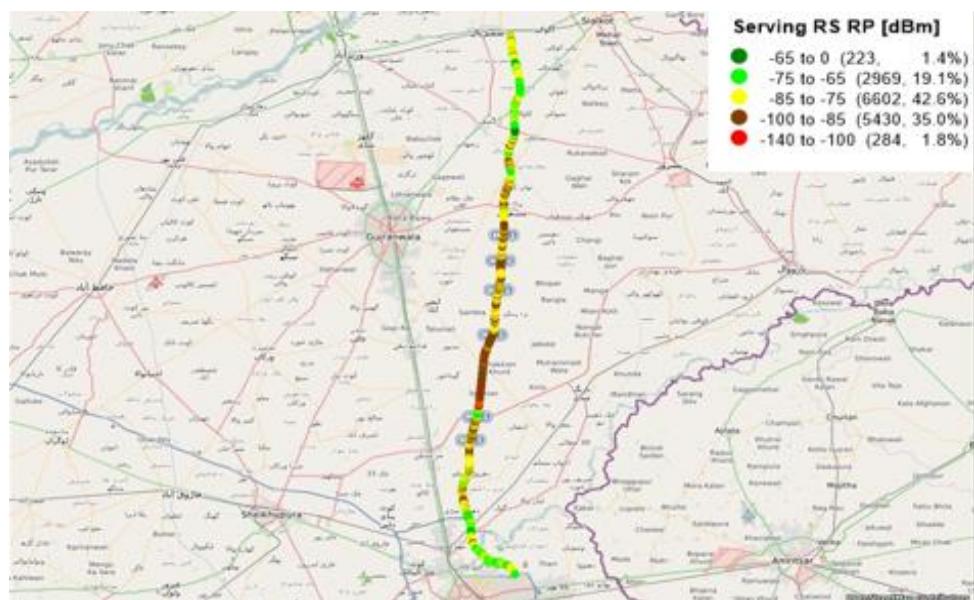
JAZZ AUTOMODE 4G NETWORK COVERAGE – LAHORE TO SIALKOT



TELENOR AUTOMODE 4G NETWORK COVERAGE – LAHORE TO SIALKOT

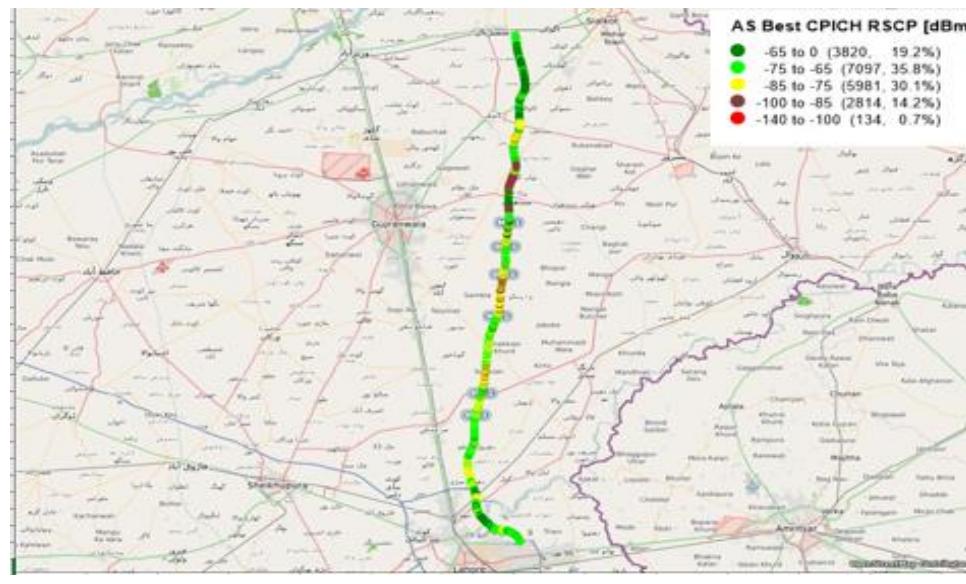


ZONG AUTOMODE 4G NETWORK COVERAGE – LAHORE TO SIALKOT



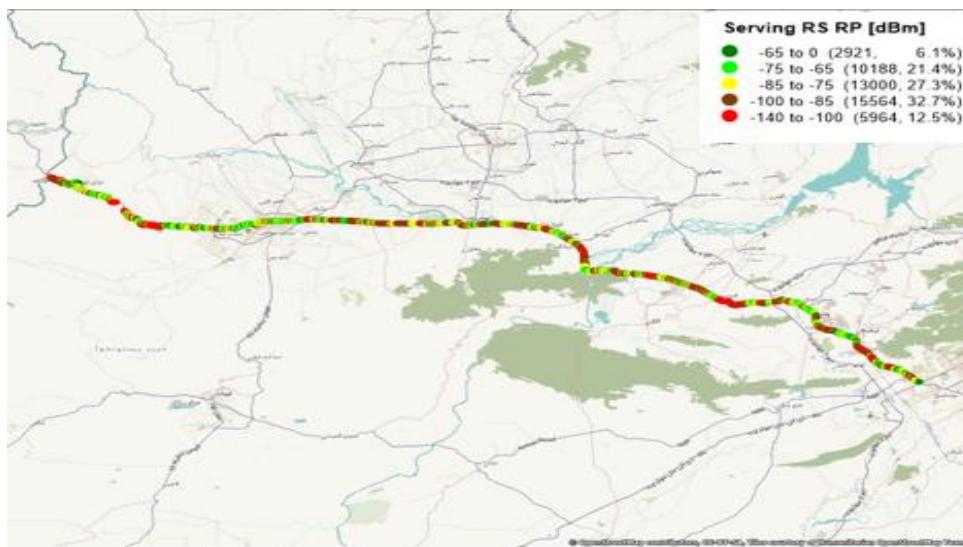
AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

UFONE AUTOMODE 3G NETWORK COVERAGE – LAHORE TO SIALKOT

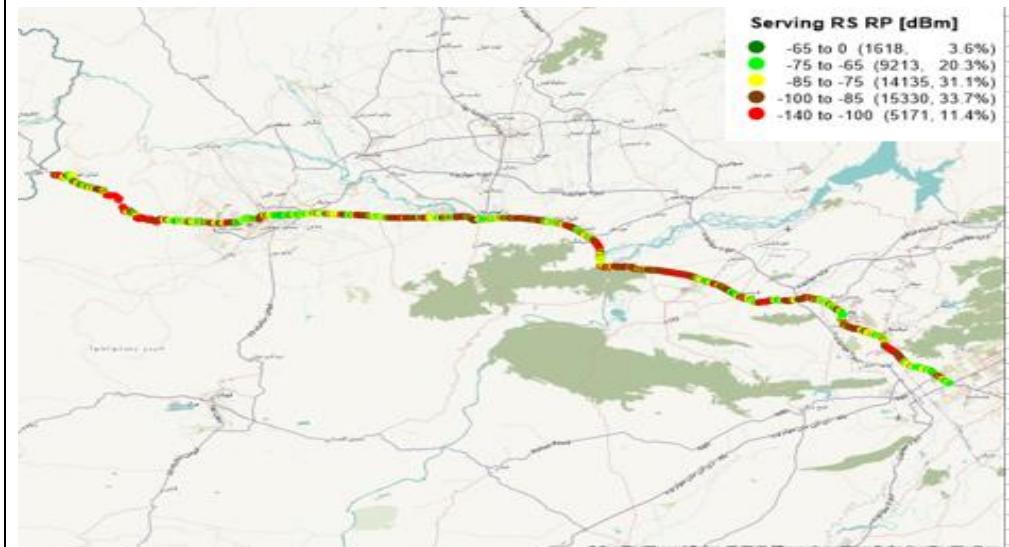


AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

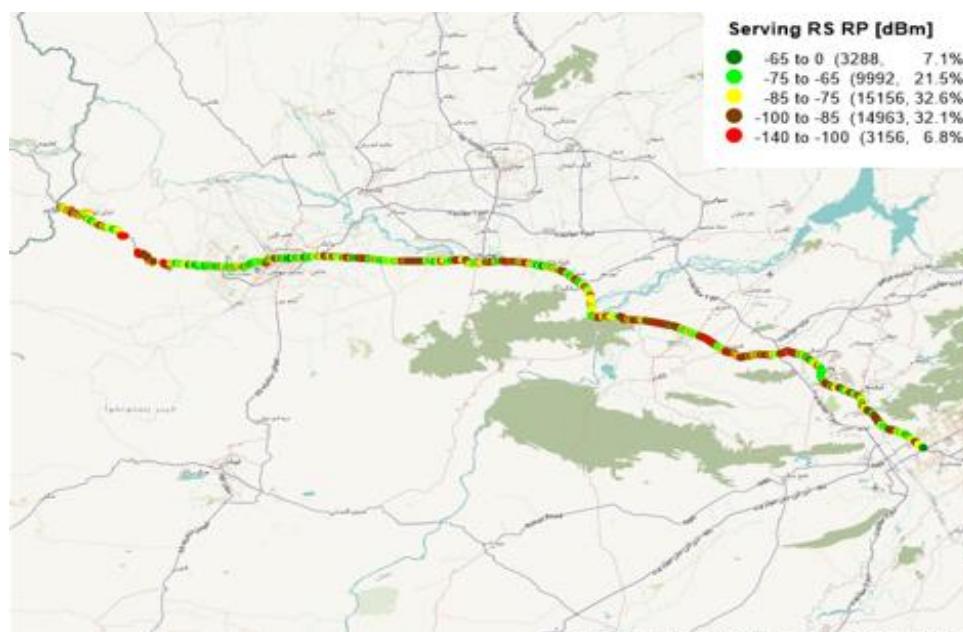
JAZZ AUTOMODE 4G NETWORK COVERAGE – RAWALPINDI TO TORKHUM



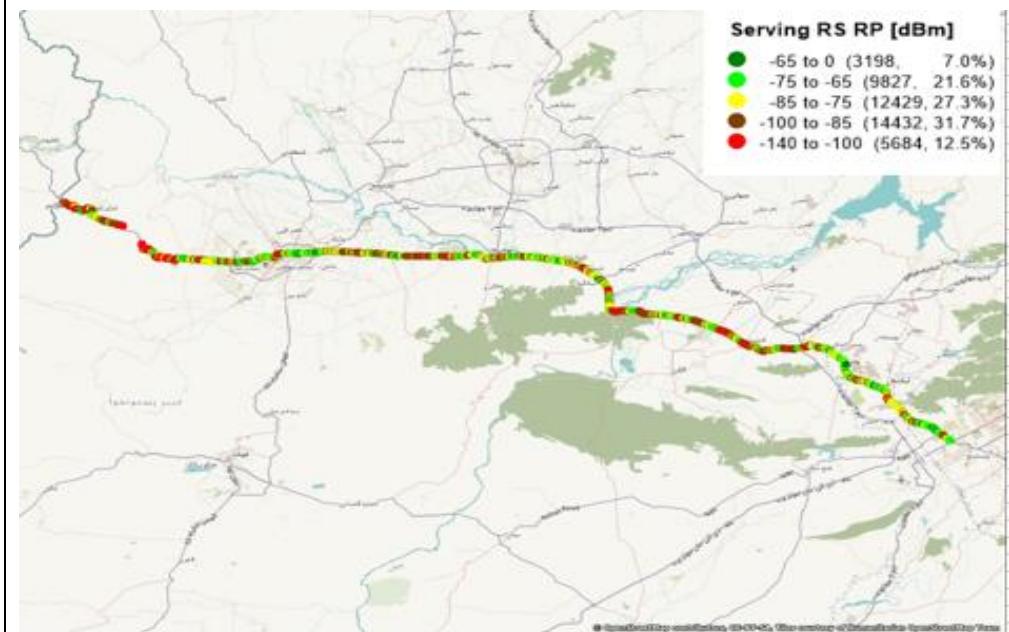
TELENOR AUTOMODE 4G NETWORK COVERAGE – RAWALPINDI TO TORKHUM



UFONE AUTOMODE 4G NETWORK COVERAGE – RAWALPINDI TO TORKHUM

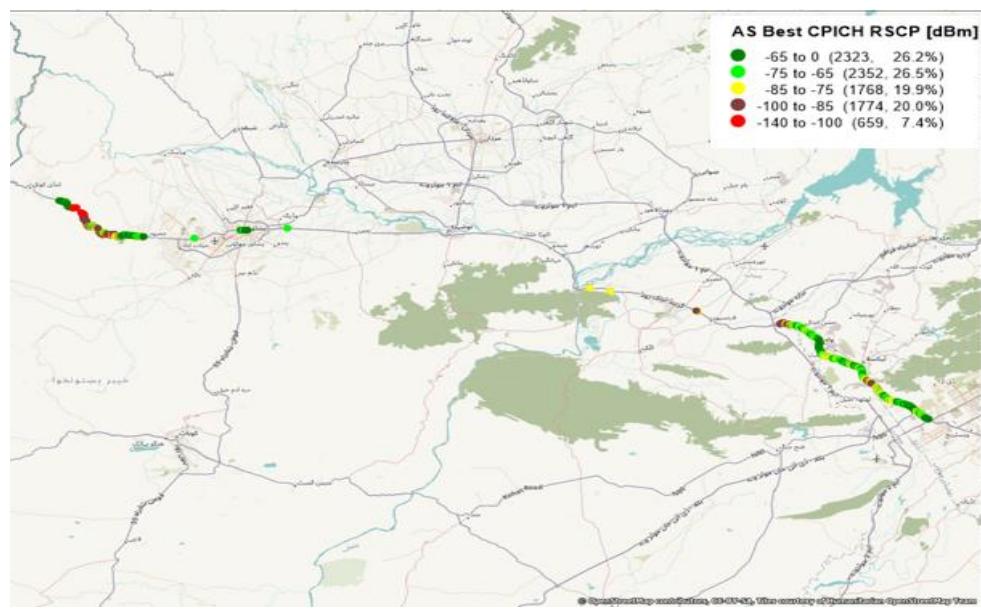


ZONG AUTOMODE 4G NETWORK COVERAGE – RAWALPINDI TO TORKHUM



AUTOMODE MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

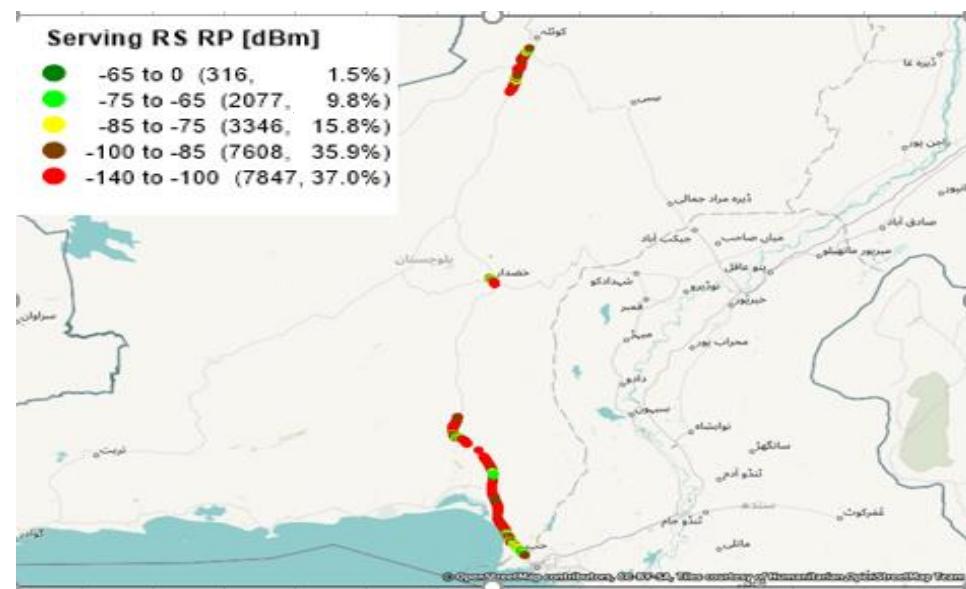
UFONE AUTOMODE 3G NETWORK COVERAGE – RAWALPINDI TO TORKHUM



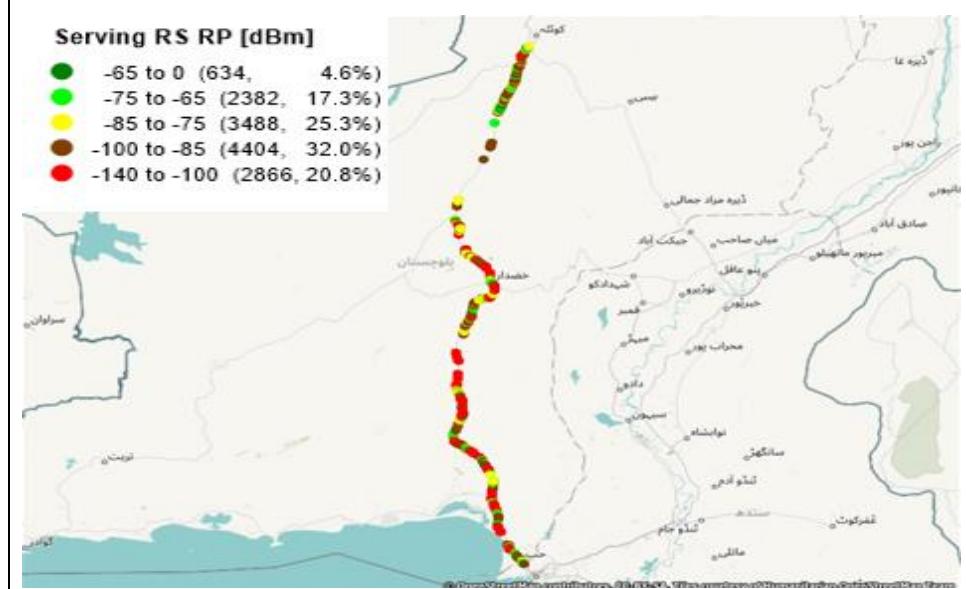
COVERAGE MAPS (4G)

4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

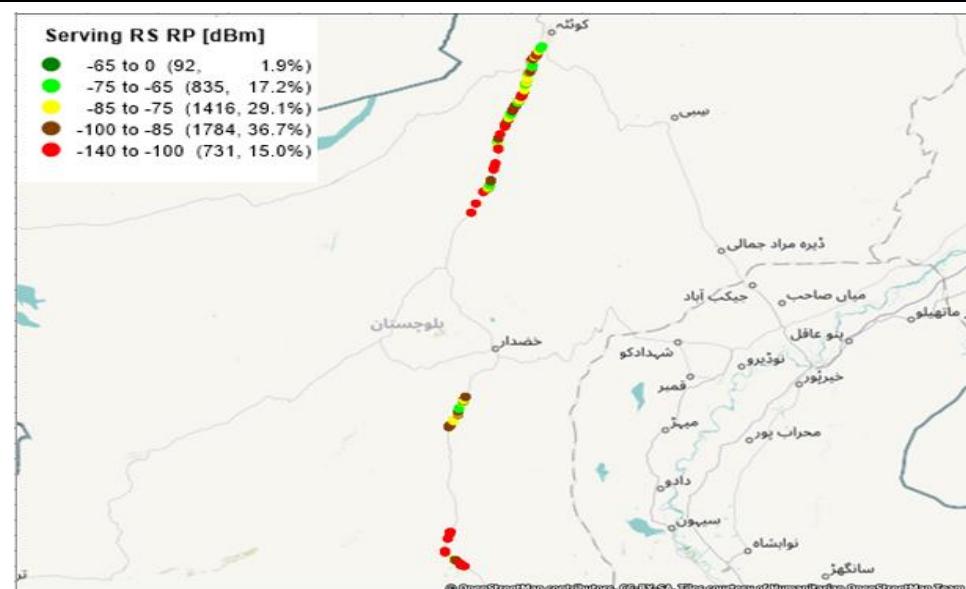
JAZZ 4G NETWORK COVERAGE – QUETTA TO KARACHI



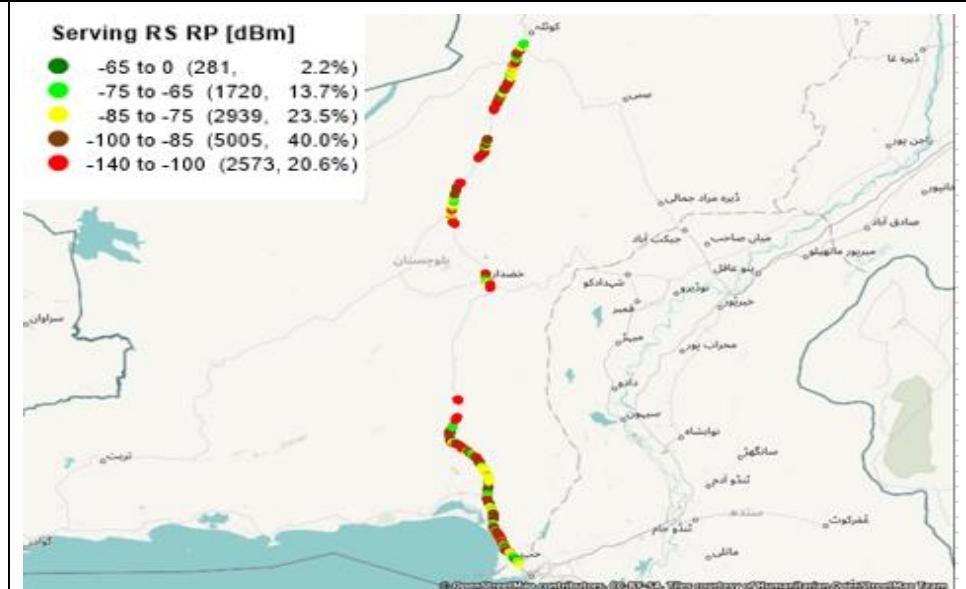
TELENOR 4G NETWORK COVERAGE – QUETTA TO KARACHI



UFONE 4G NETWORK COVERAGE – QUETTA TO KARACHI

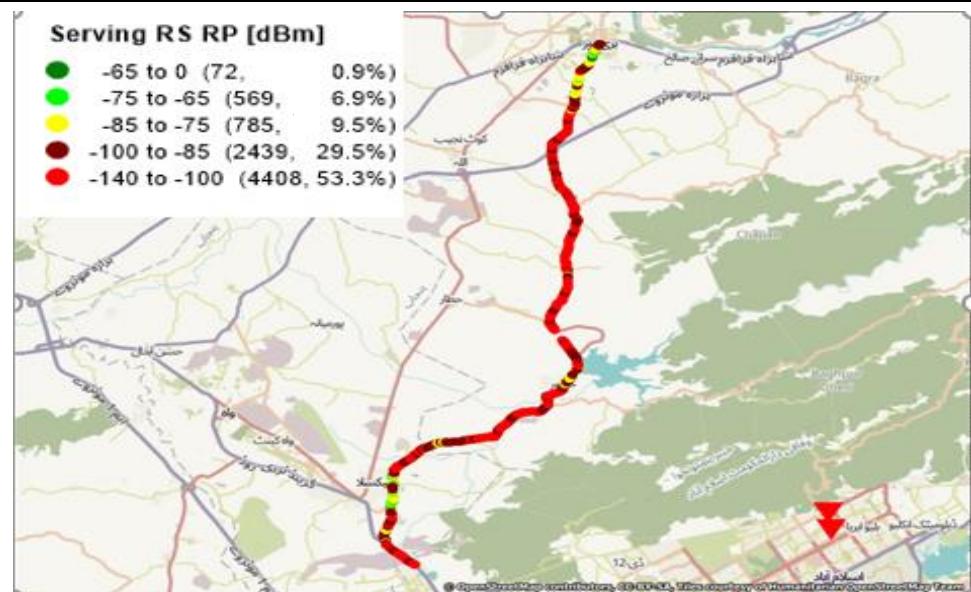


ZONG 4G NETWORK COVERAGE – QUETTA TO KARACHI

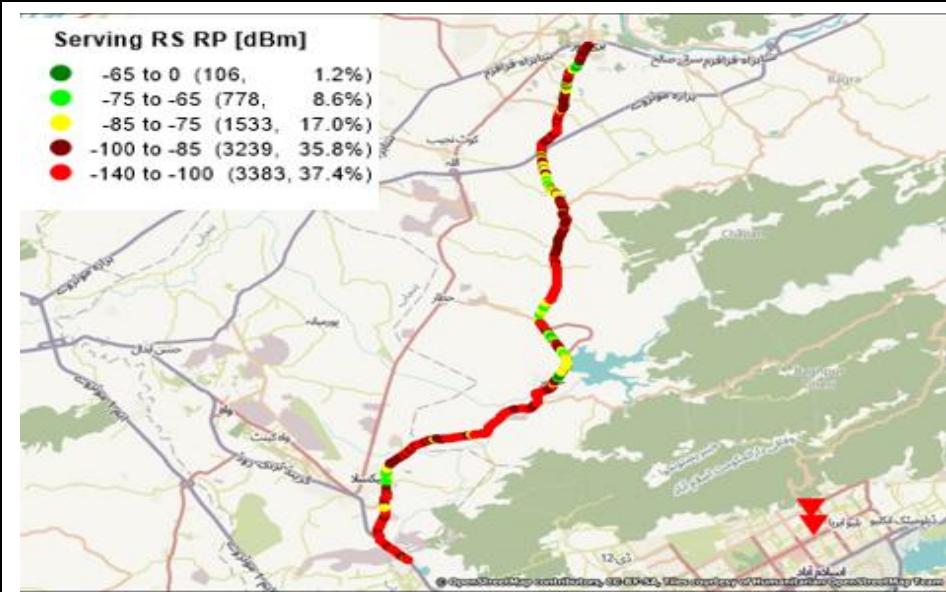


4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

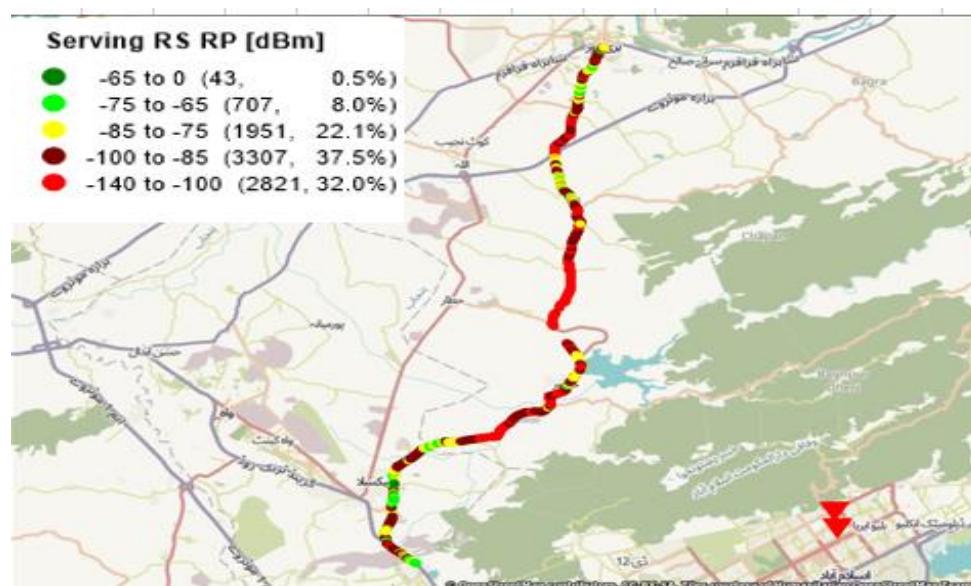
JAZZ 4G NETWORK COVERAGE – HARIPUR TO TAXILA



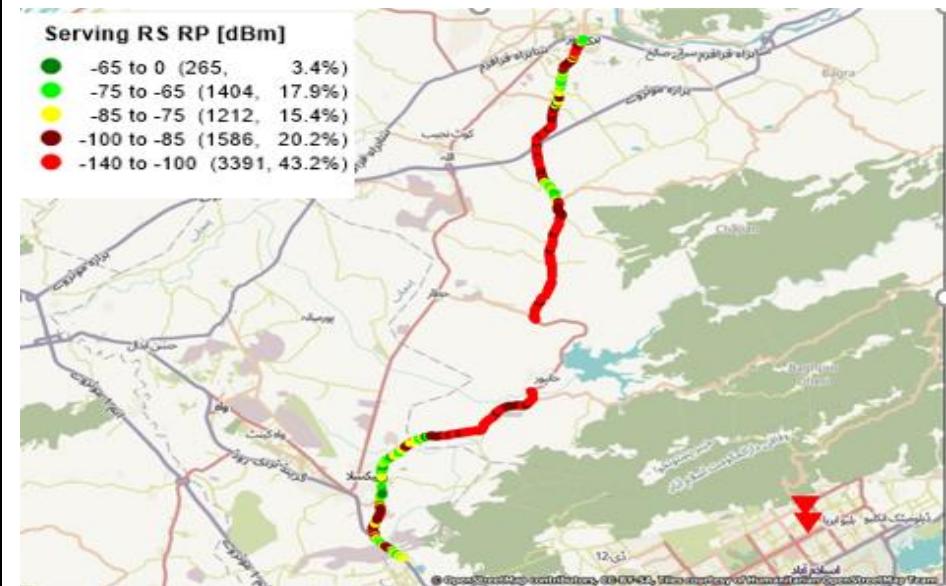
TELENOR 4G NETWORK COVERAGE – HARIPUR TO TAXILA



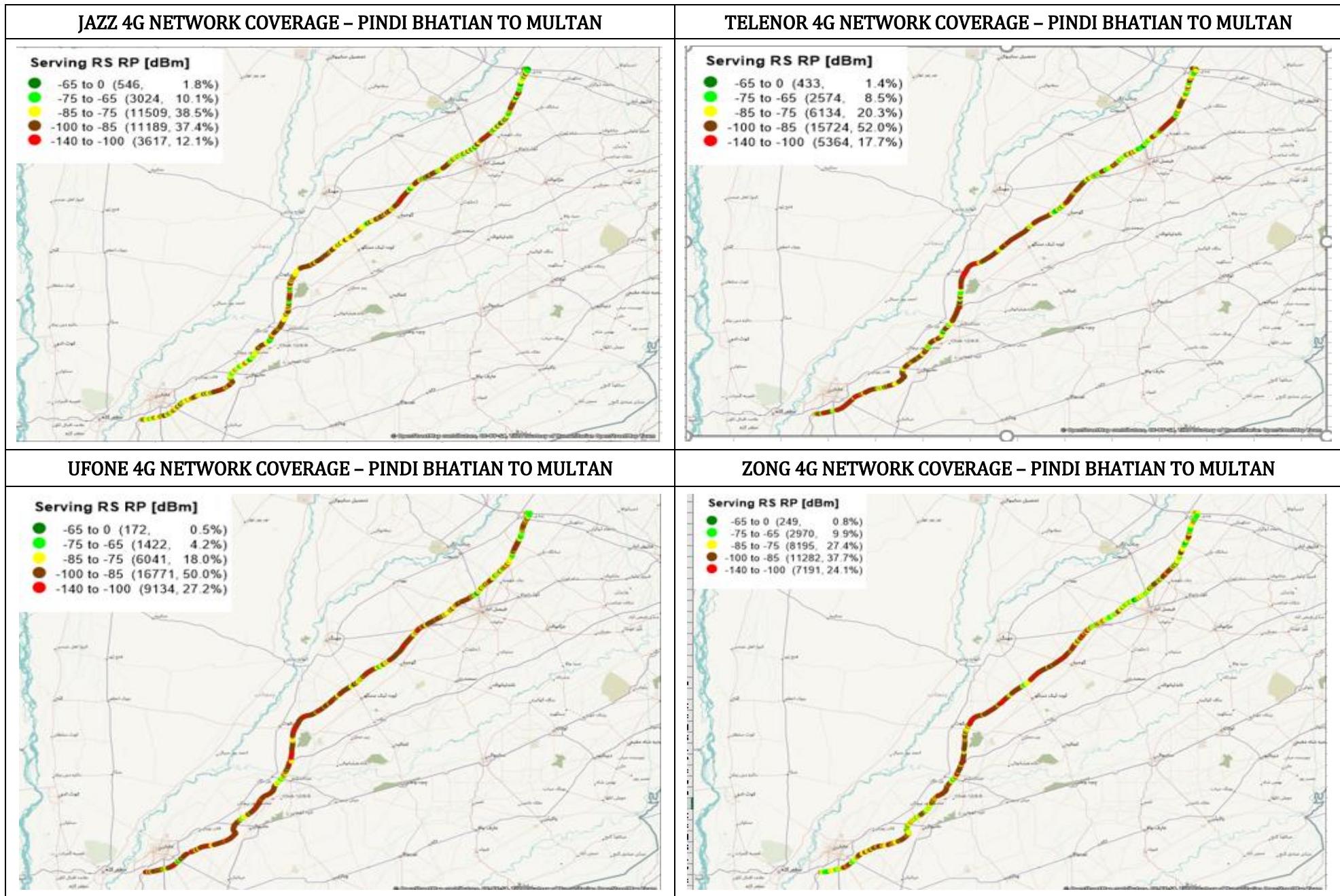
UFONE 4G NETWORK COVERAGE – HARIPUR TO TAXILA



ZONG 4G NETWORK COVERAGE – HARIPUR TO TAXILA

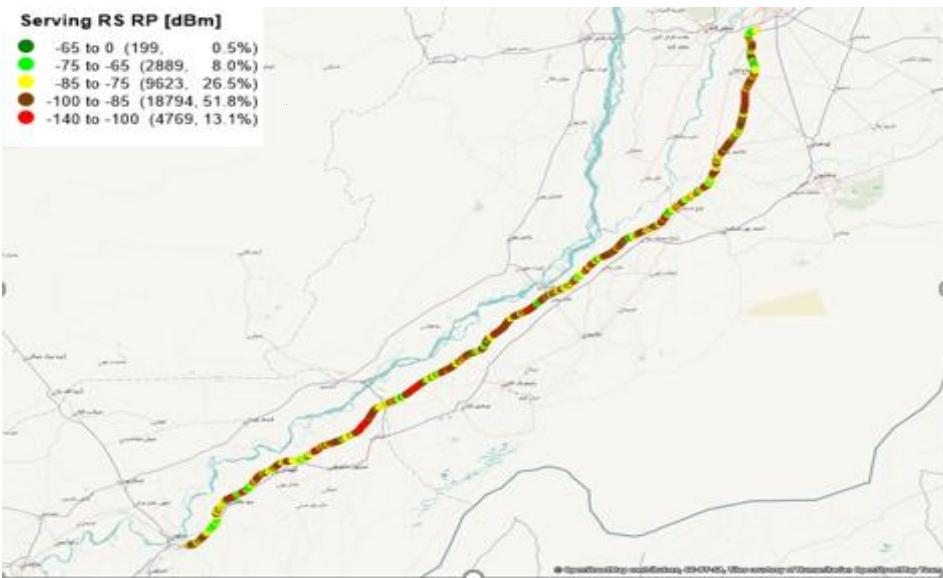


4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

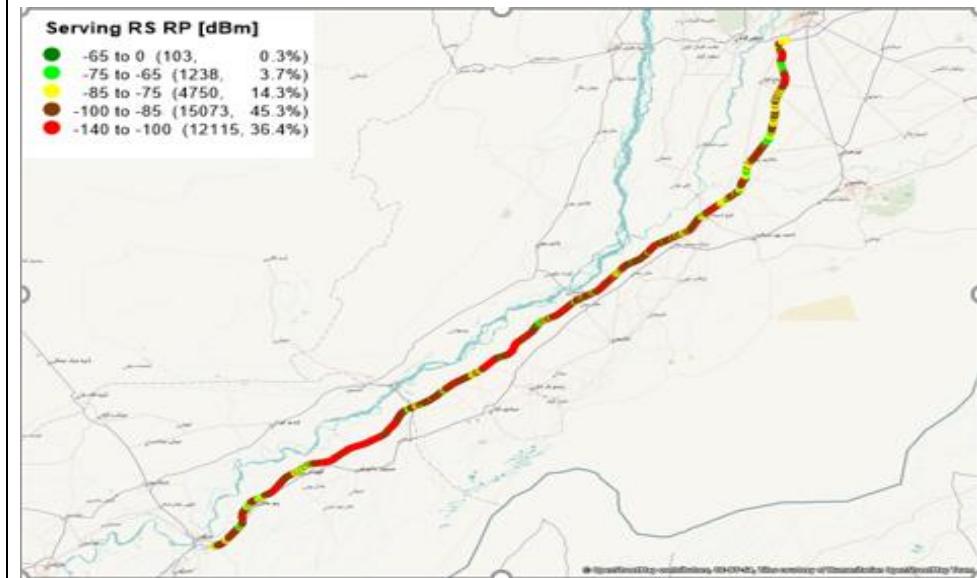


4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

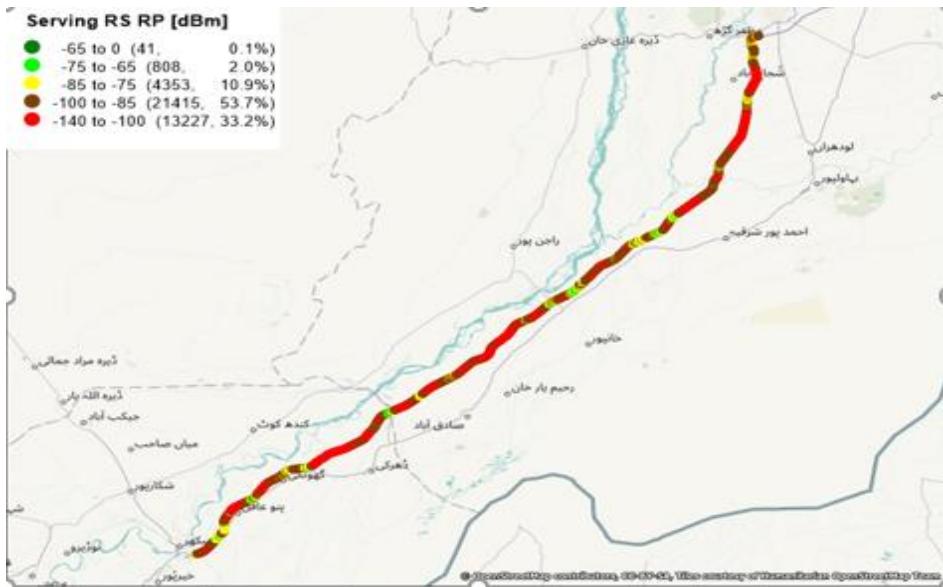
JAZZ 4G NETWORK COVERAGE – MULTAN TO SUKKUR



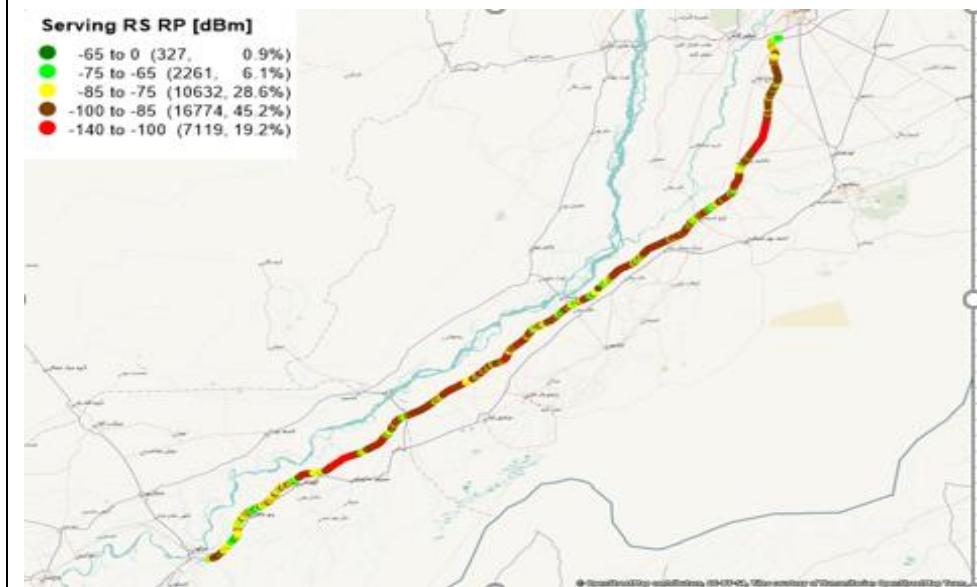
TELENOR 4G NETWORK COVERAGE – MULTAN TO SUKKUR



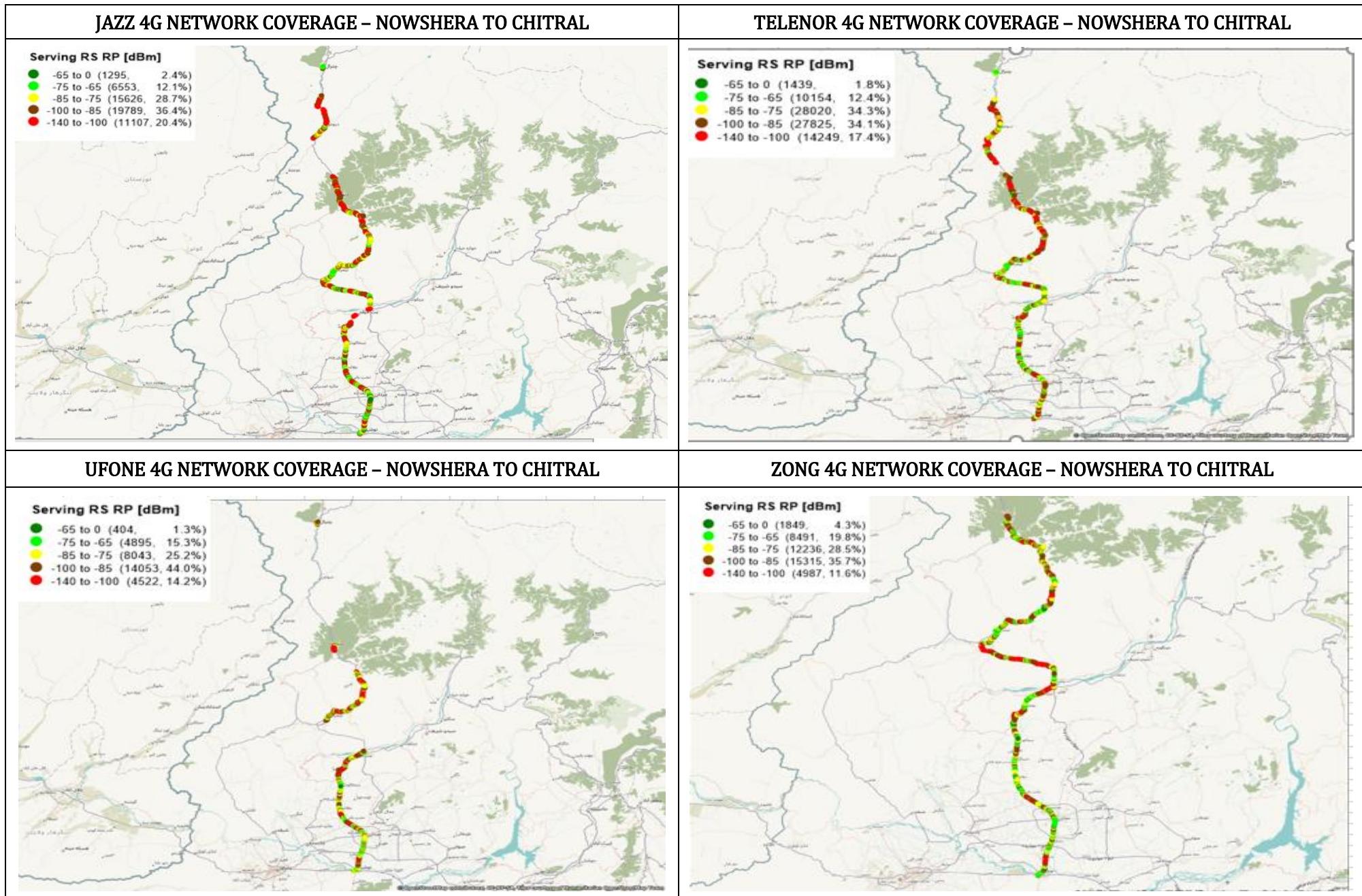
UFONE 4G NETWORK COVERAGE – MULTAN TO SUKKUR



ZONG 4G NETWORK COVERAGE – MULTAN TO SUKKUR

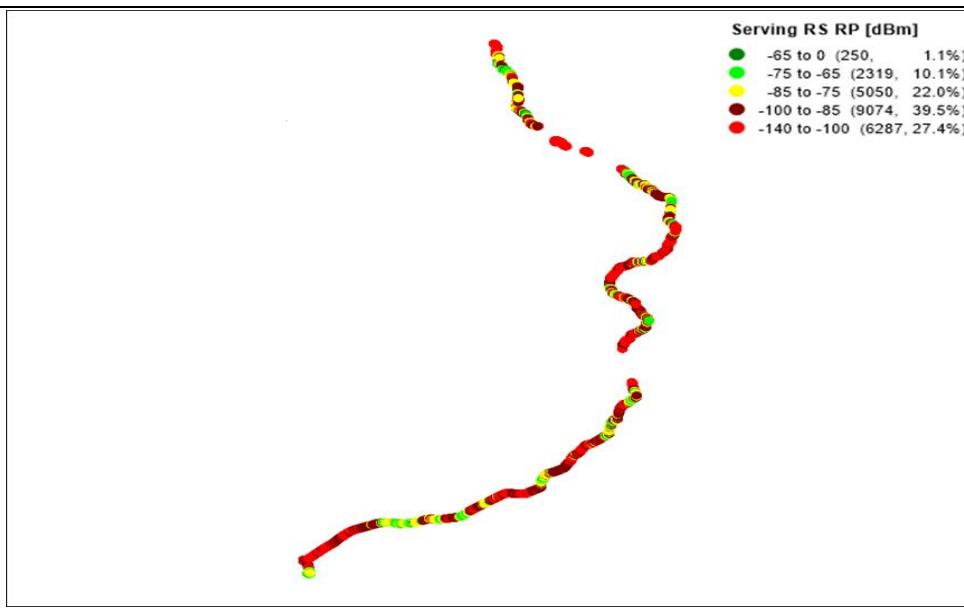


4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

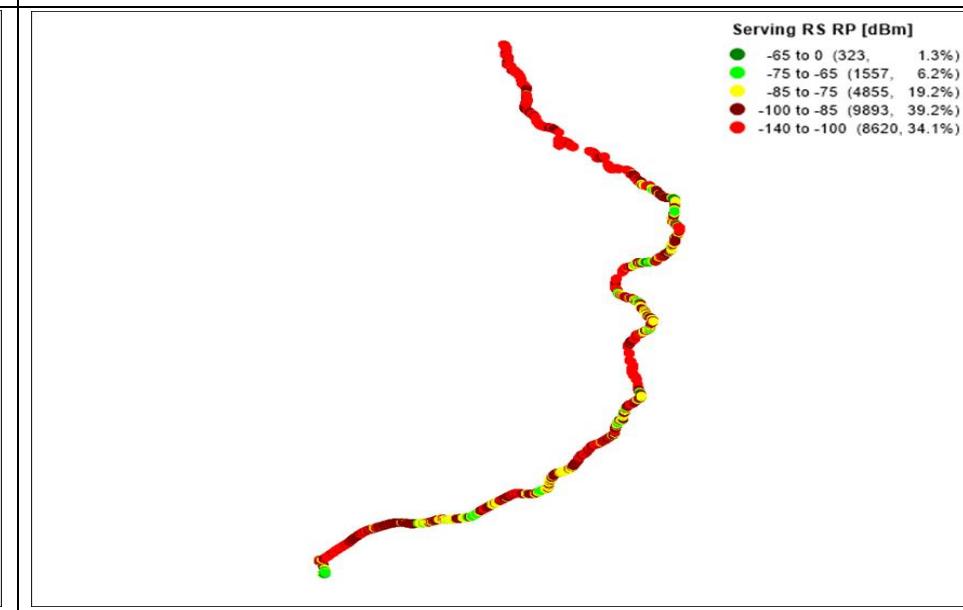


4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

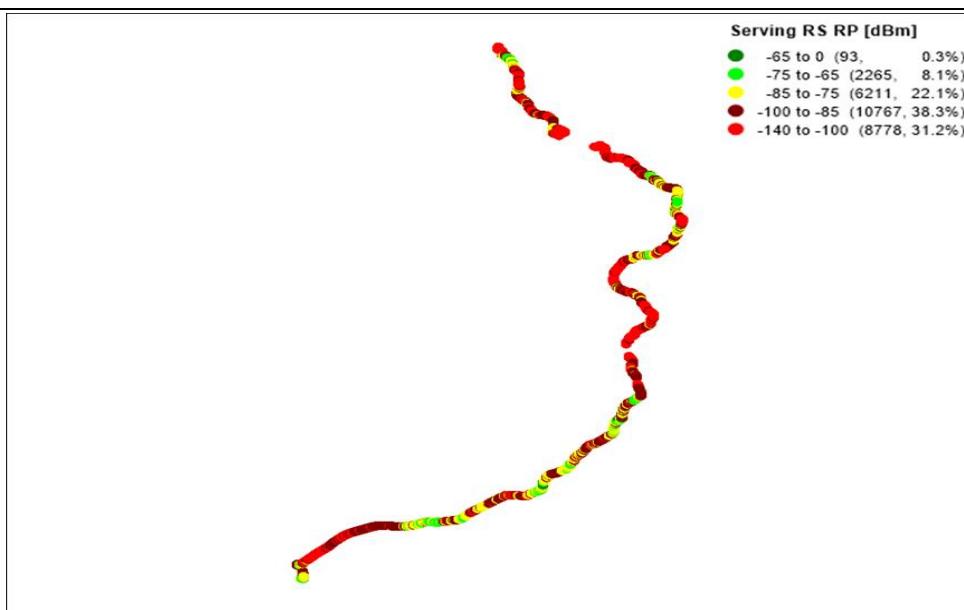
JAZZ 4G NETWORK COVERAGE – HAZARA MOTORWAY



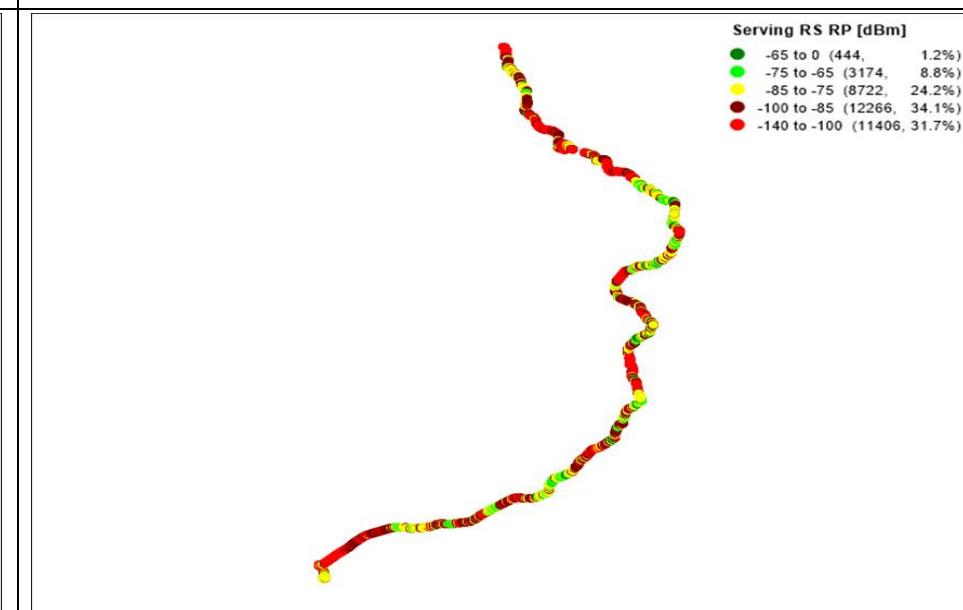
TELENOR 4G NETWORK COVERAGE – HAZARA MOTORWAY



UFONE 4G NETWORK COVERAGE – HAZARA MOTORWAY

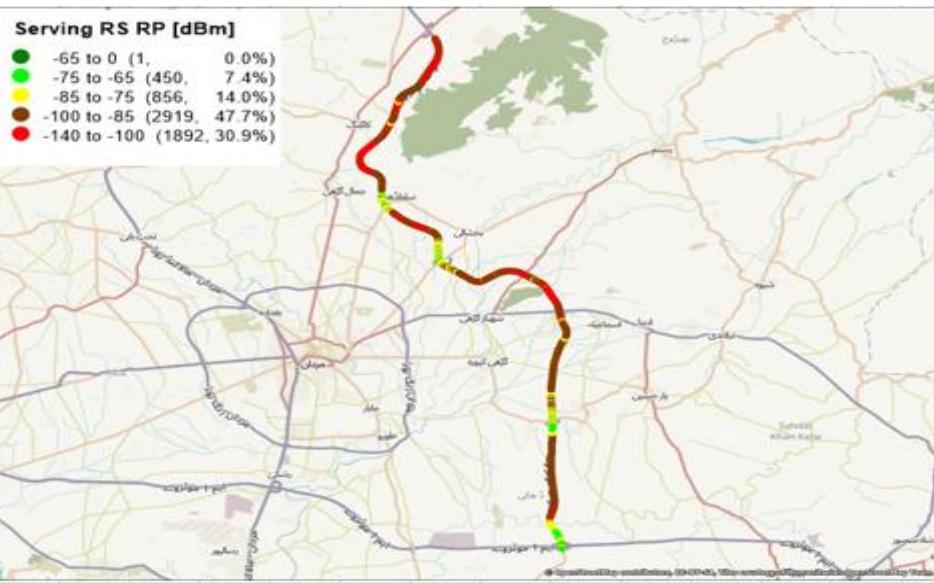


ZONG 4G NETWORK COVERAGE – HAZARA MOTORWAY

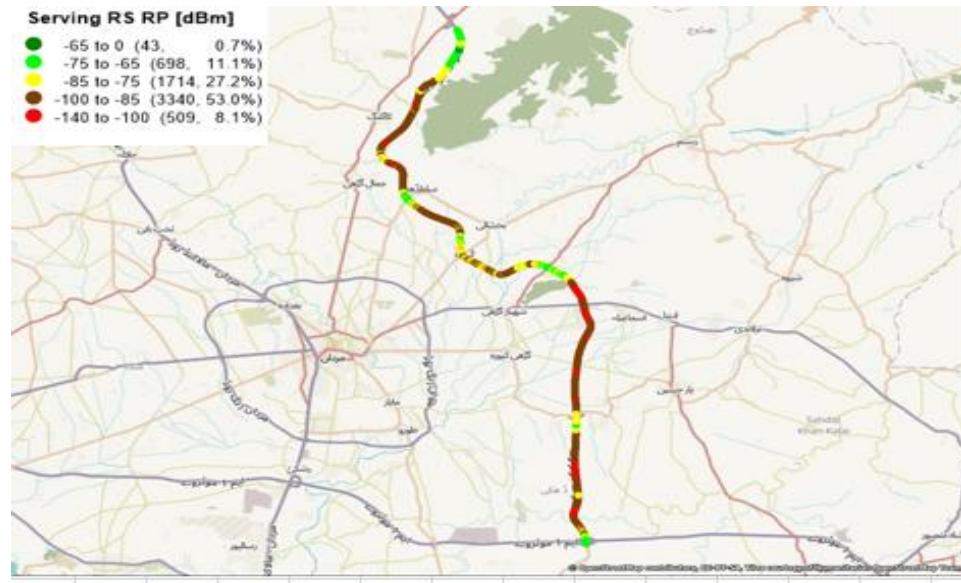


4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

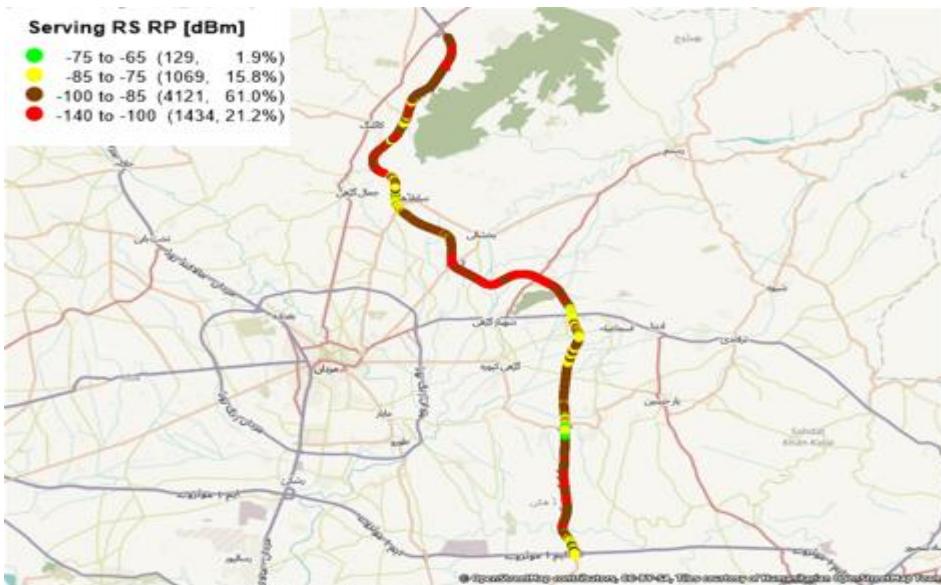
JAZZ 4G NETWORK COVERAGE – SWABI TO KATLANG



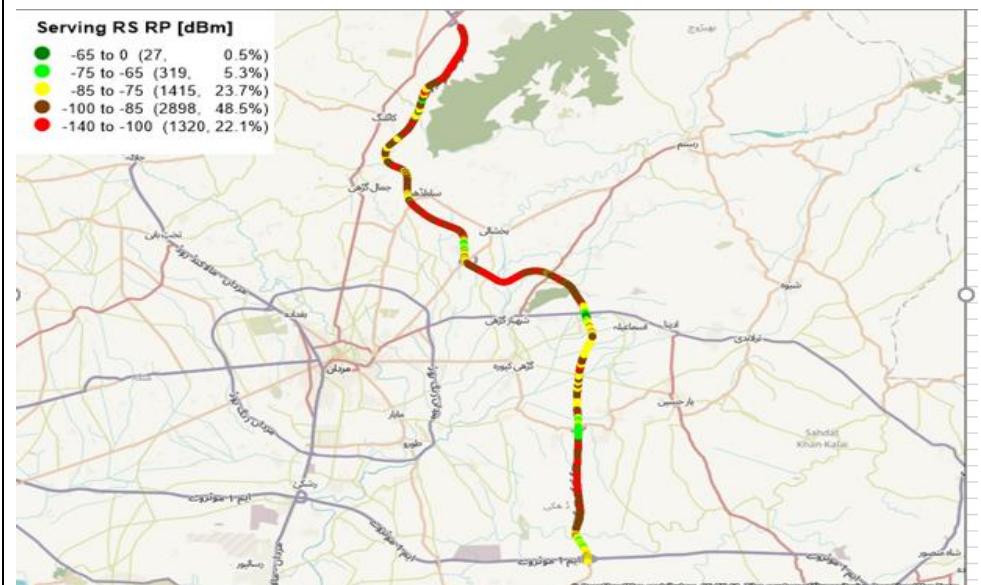
TELENO 4G NETWORK COVERAGE – SWABI TO KATLANG



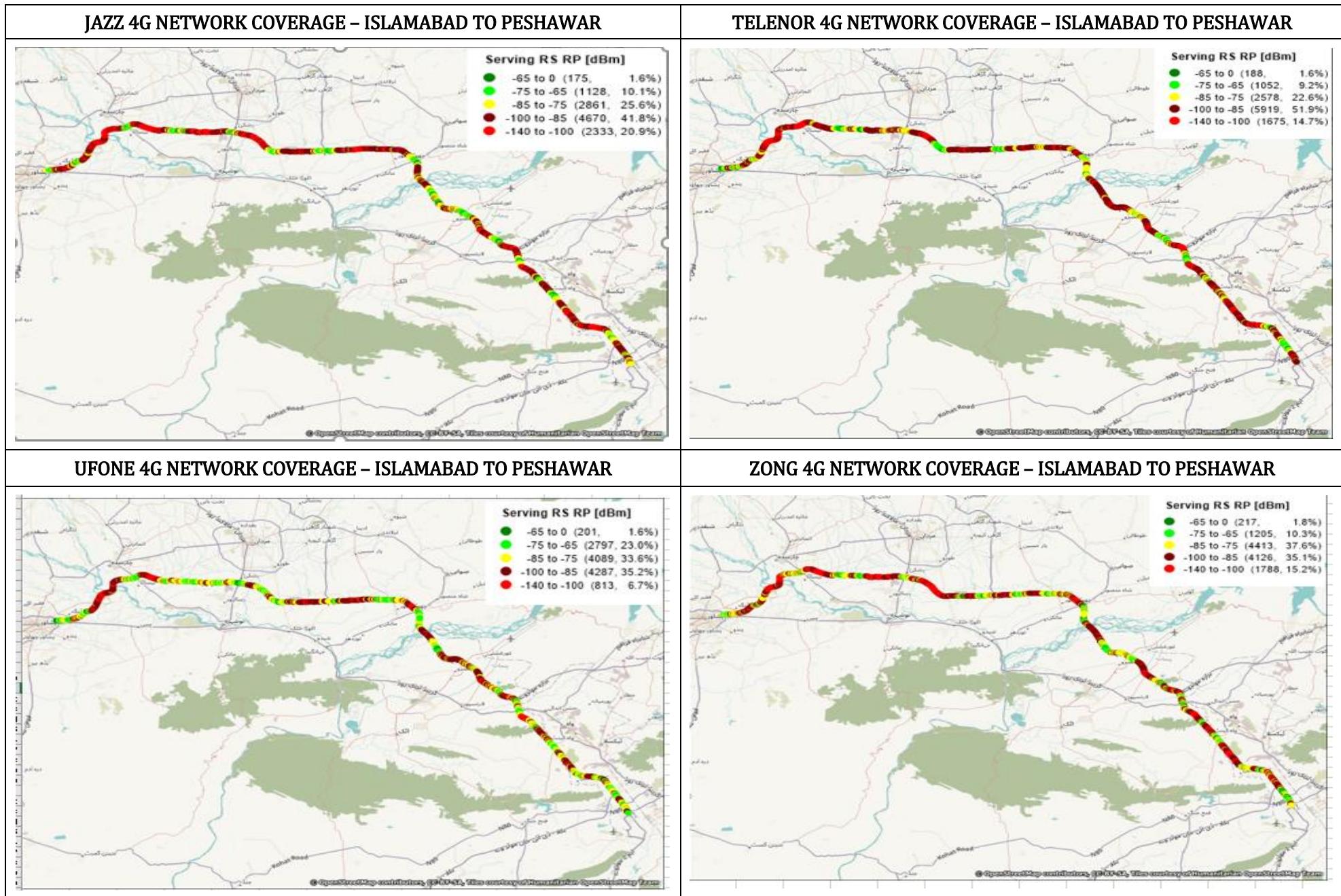
UFONE 4G NETWORK COVERAGE – SWABI TO KATLANG



ZONG 4G NETWORK COVERAGE – SWABI TO KATLANG

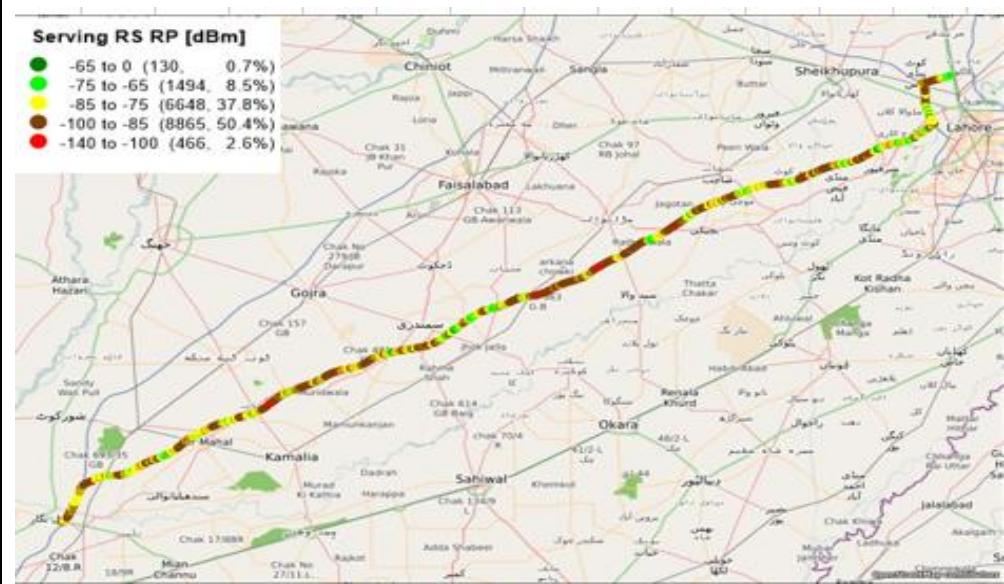


4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

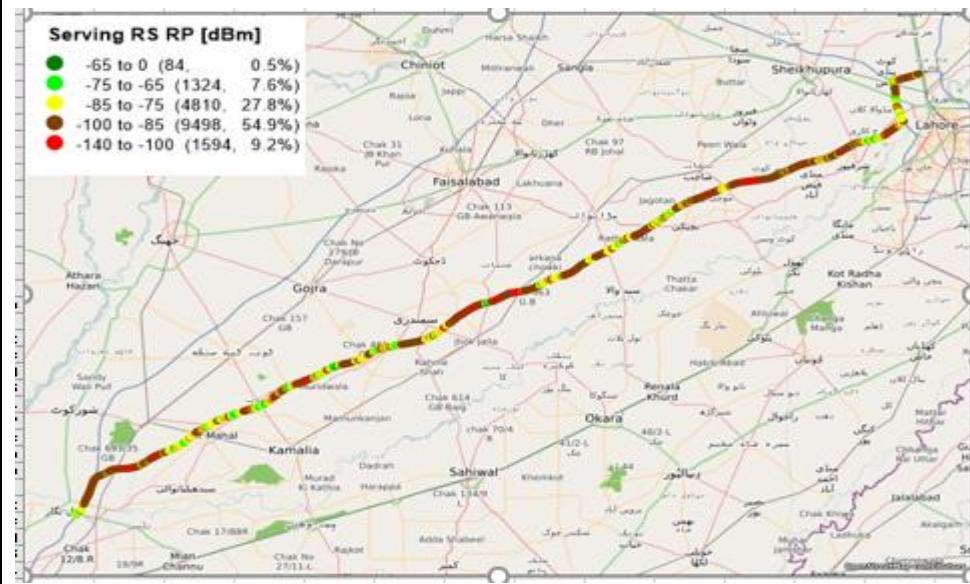


4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

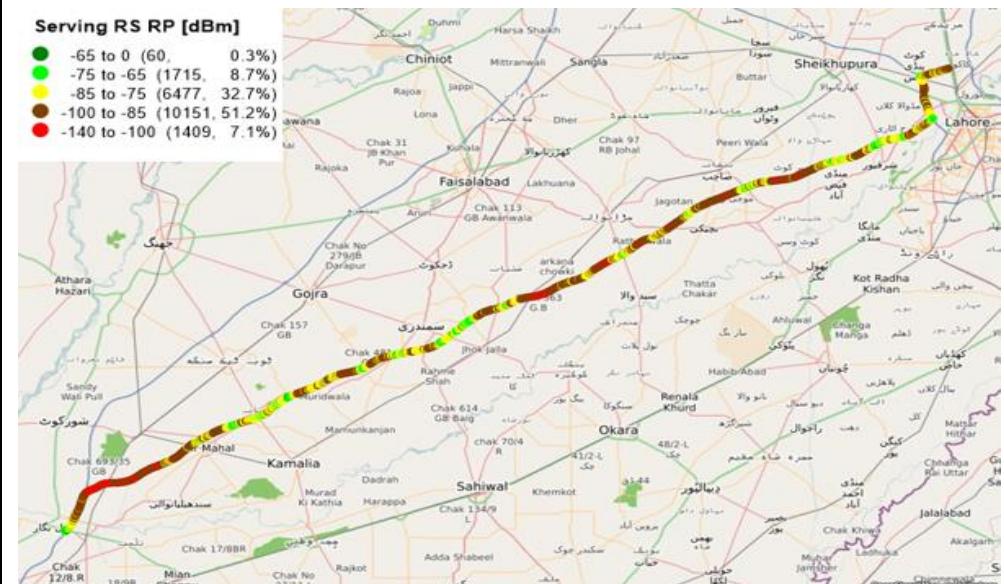
JAZZ 4G NETWORK COVERAGE – LAHORE TO ABDUL HAKEEM



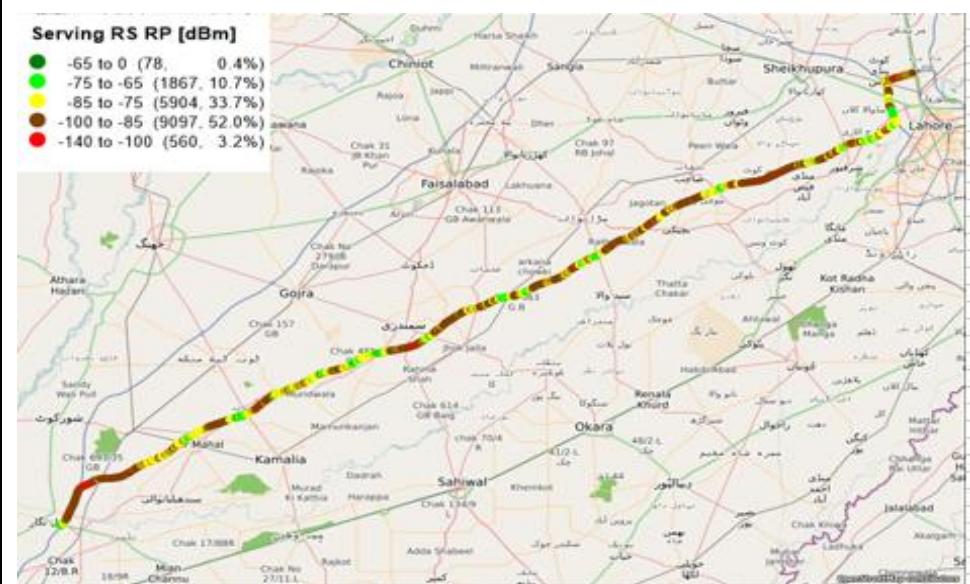
TELENOR 4G NETWORK COVERAGE – LAHORE TO ABDUL HAKEEM



UFONE 4G NETWORK COVERAGE – LAHORE TO ABDUL HAKEEM

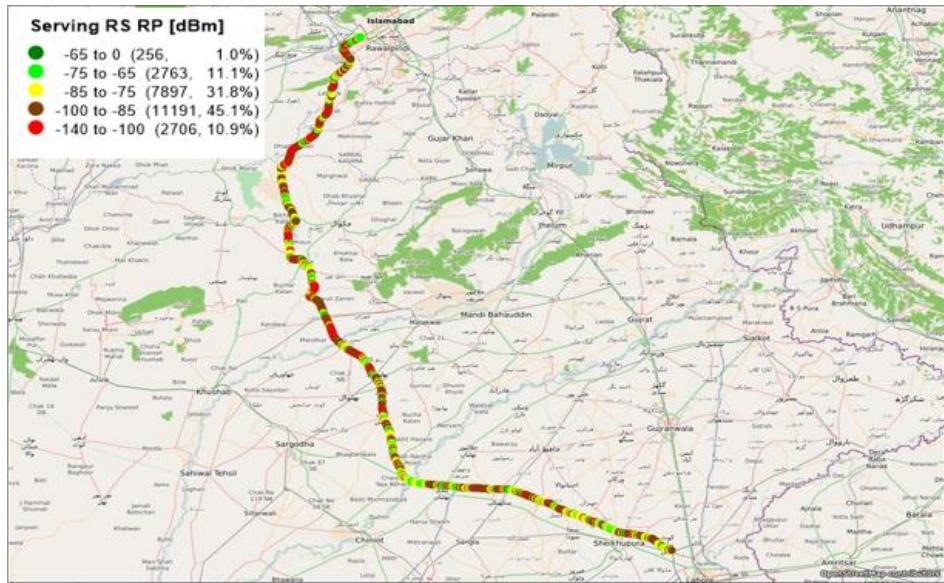


ZONG 4G NETWORK COVERAGE – LAHORE TO ABDUL HAKEEM

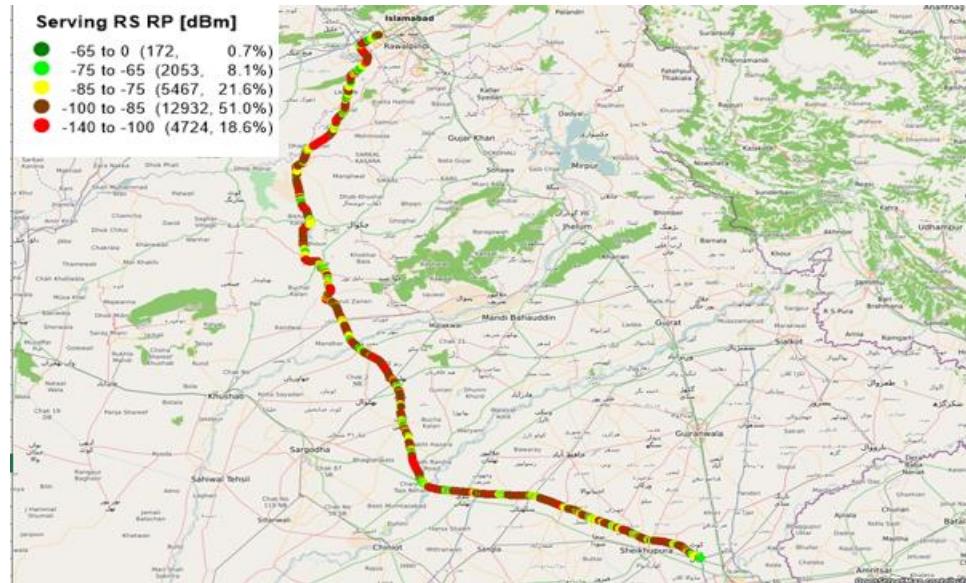


4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

JAZZ 4G NETWORK COVERAGE – LAHORE TO ISLAMABAD



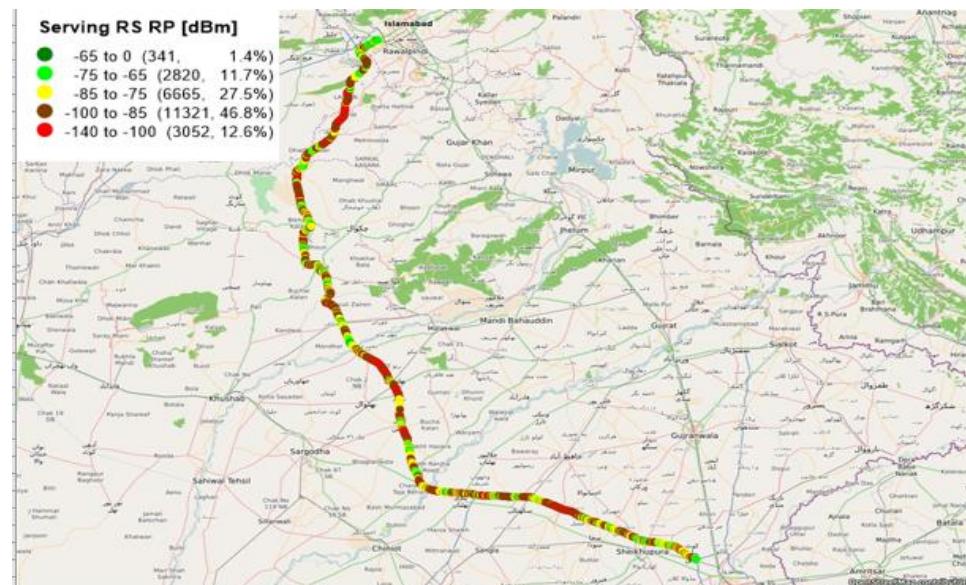
TELENOR 4G NETWORK COVERAGE – LAHORE TO ISLAMABAD



UFONE 4G NETWORK COVERAGE – LAHORE TO ISLAMABAD

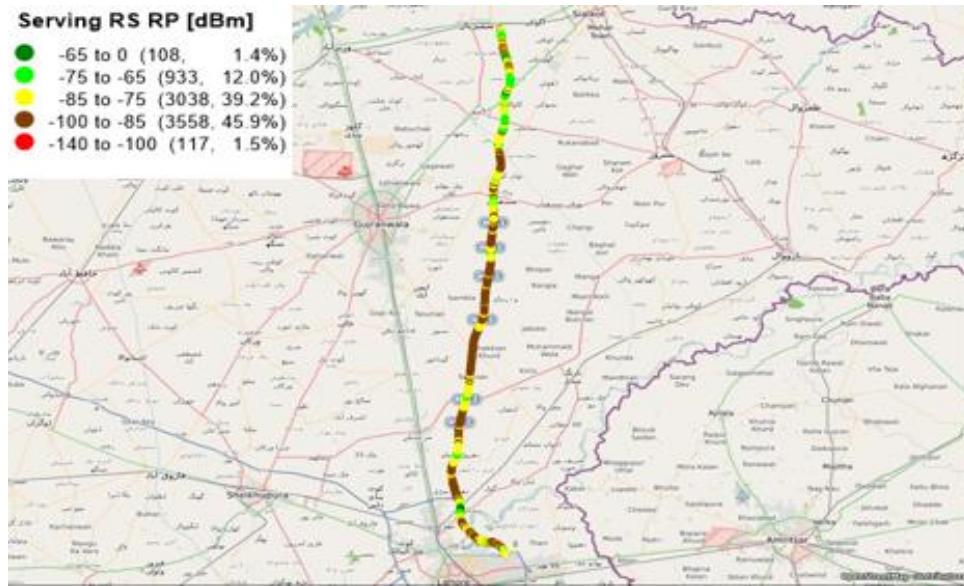


ZONG 4G NETWORK COVERAGE – LAHORE TO ISLAMABAD

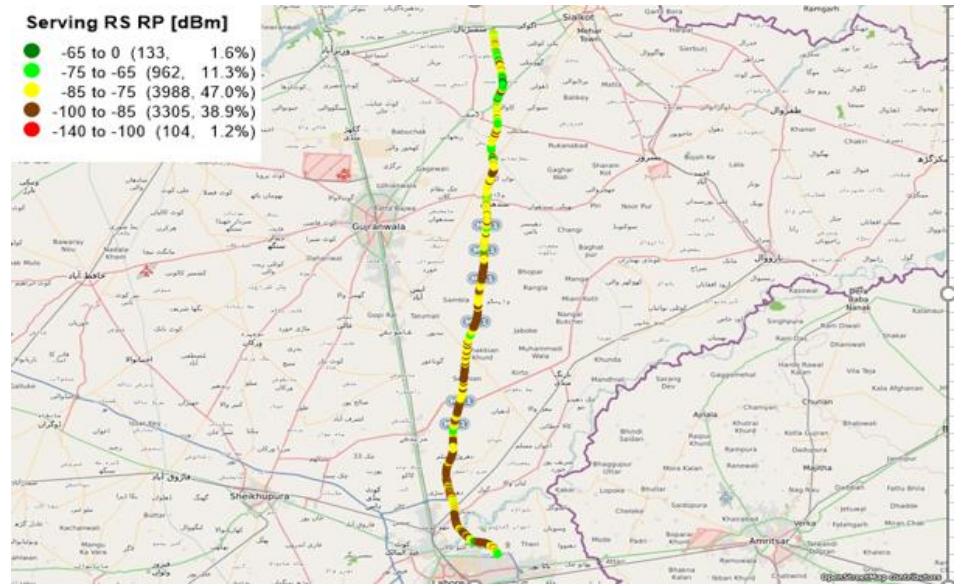


4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

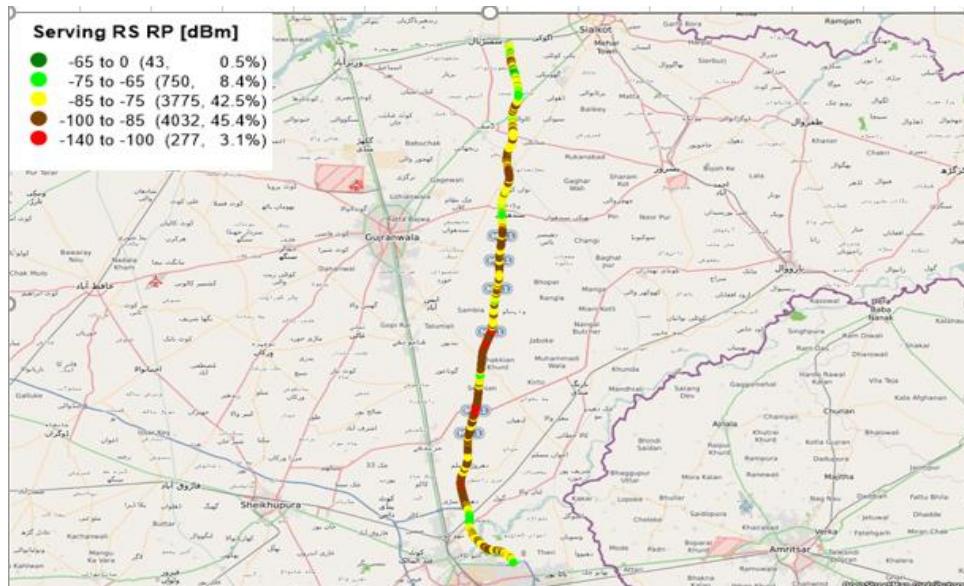
JAZZ 4G NETWORK COVERAGE – LAHORE TO SIALKOT



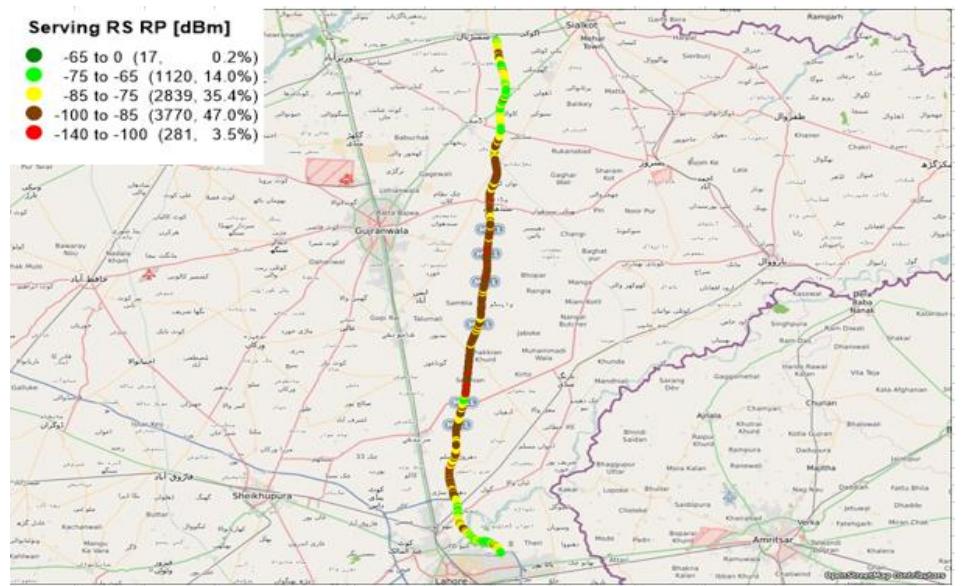
TELENOR 4G NETWORK COVERAGE – LAHORE TO SIALKOT



UFONE 4G NETWORK COVERAGE – LAHORE TO SIALKOT

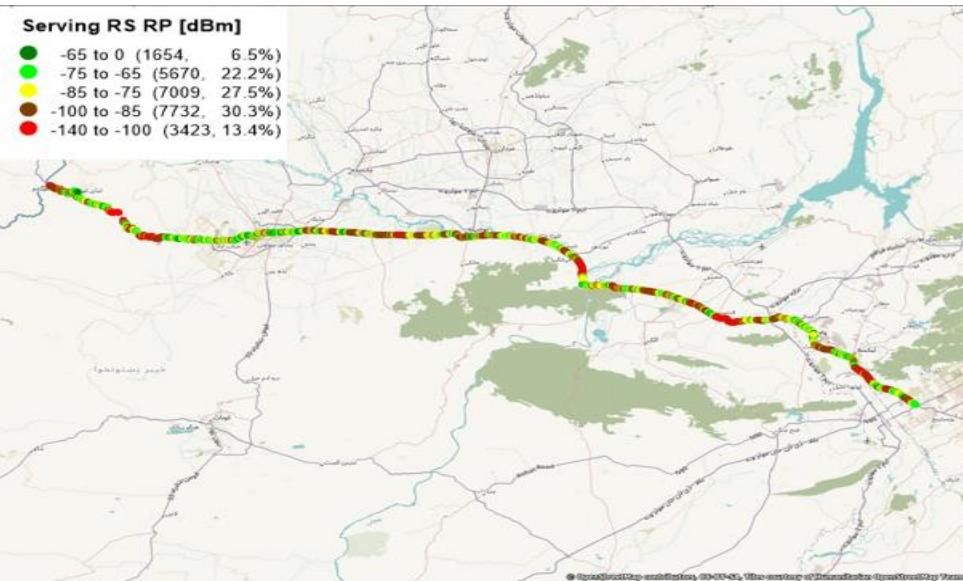


ZONG 4G NETWORK COVERAGE – LAHORE TO SIALKOT

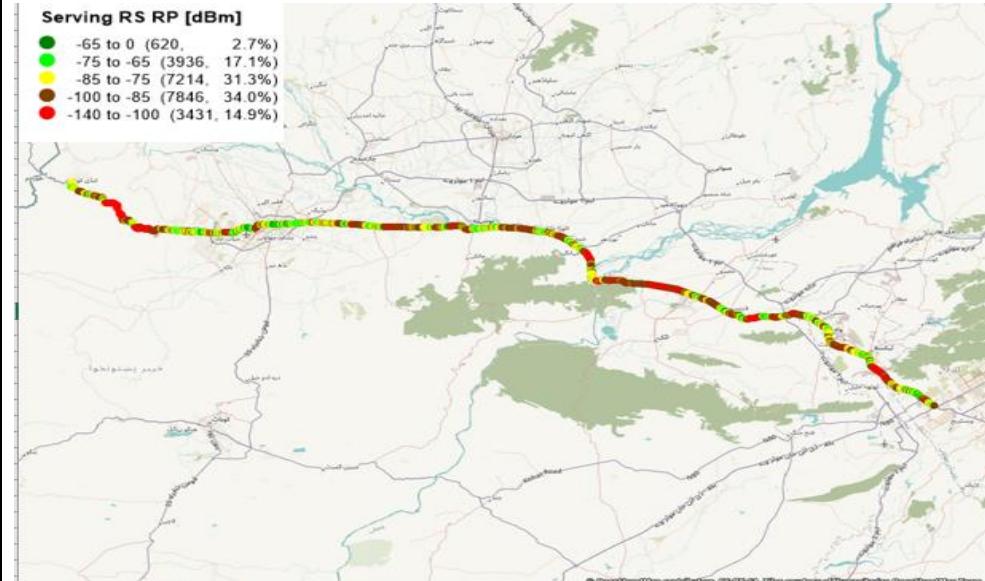


4G MOBILE COVERAGE – SIGNAL STRENGTH (RSRP)

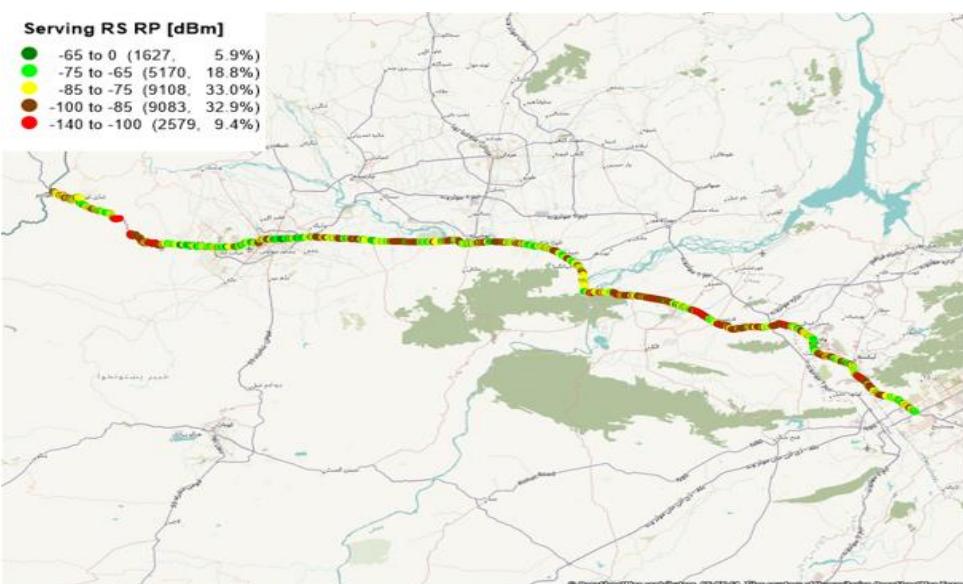
JAZZ 4G NETWORK COVERAGE – RAWALPINDI TO TORKHUM



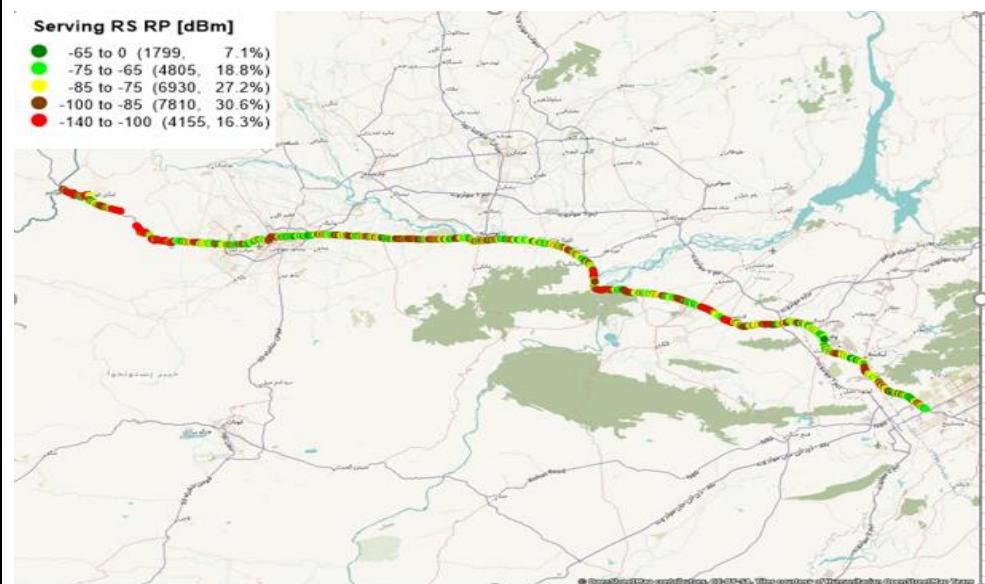
TELENOR 4G NETWORK COVERAGE – RAWALPINDI TO TORKHUM



UFONE 4G NETWORK COVERAGE – RAWALPINDI TO TORKHUM

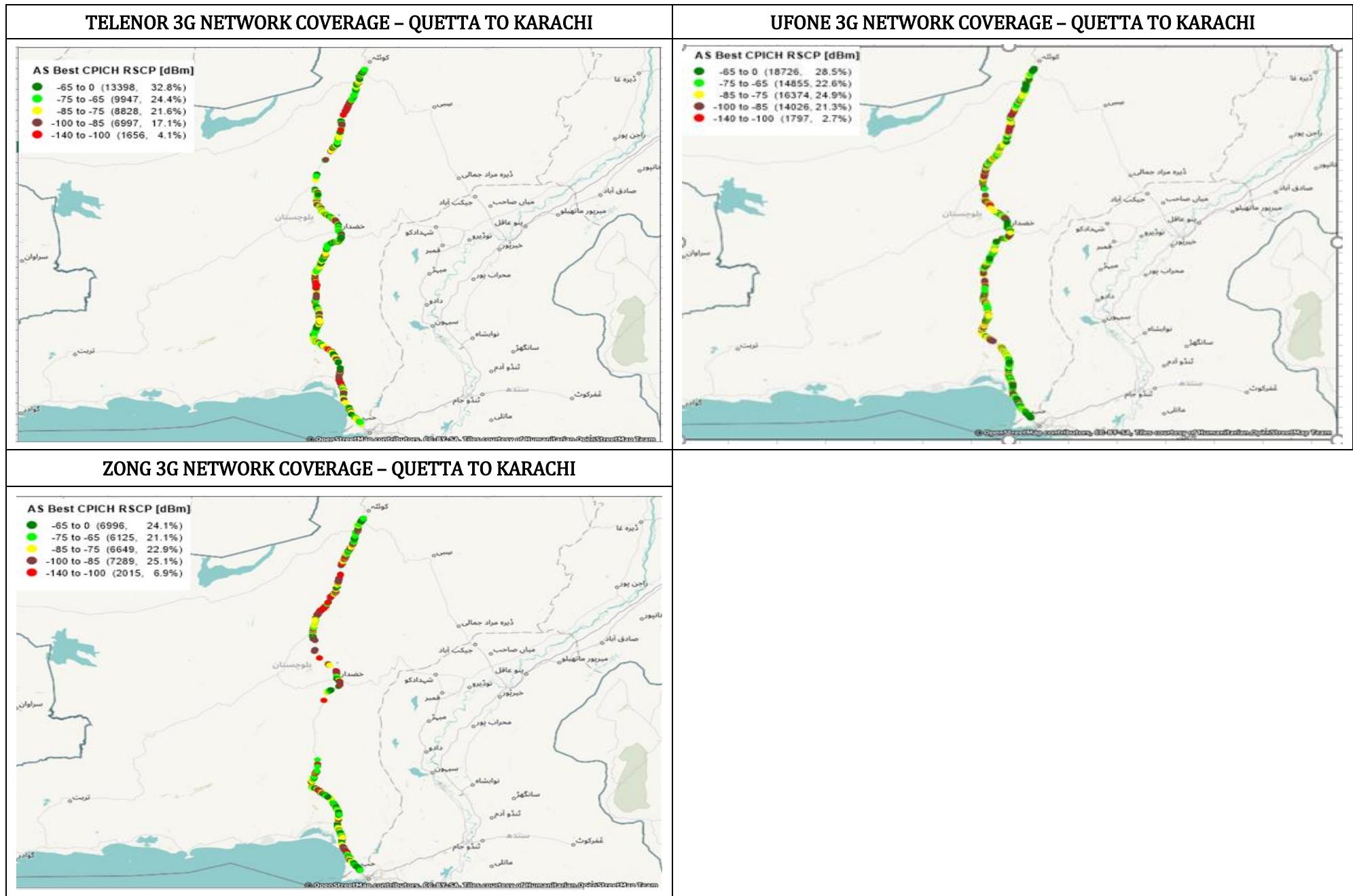


ZONG 4G NETWORK COVERAGE – RAWALPINDI TO TORKHUM



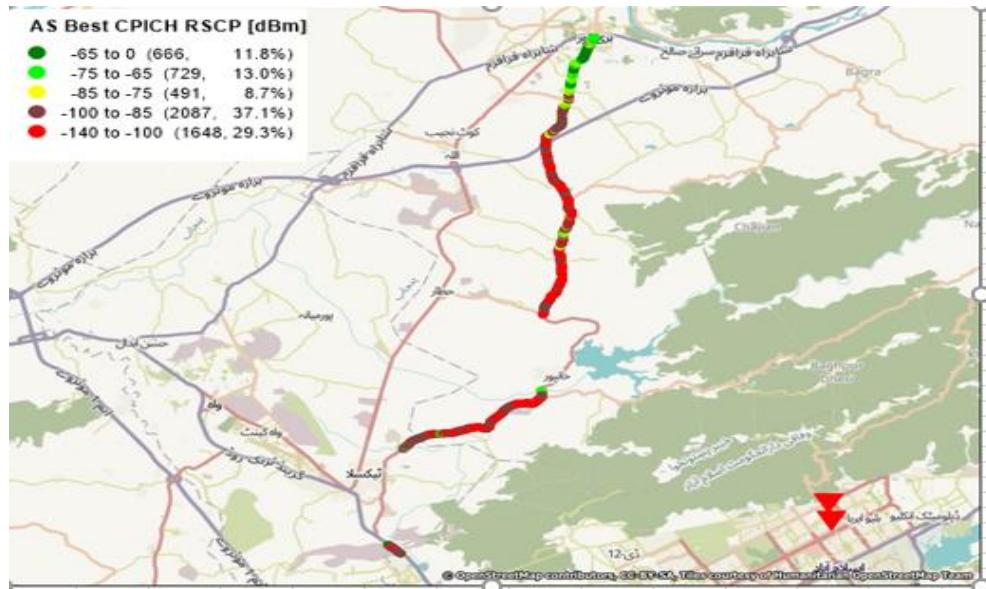
COVERAGE MAPS (3G)

3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

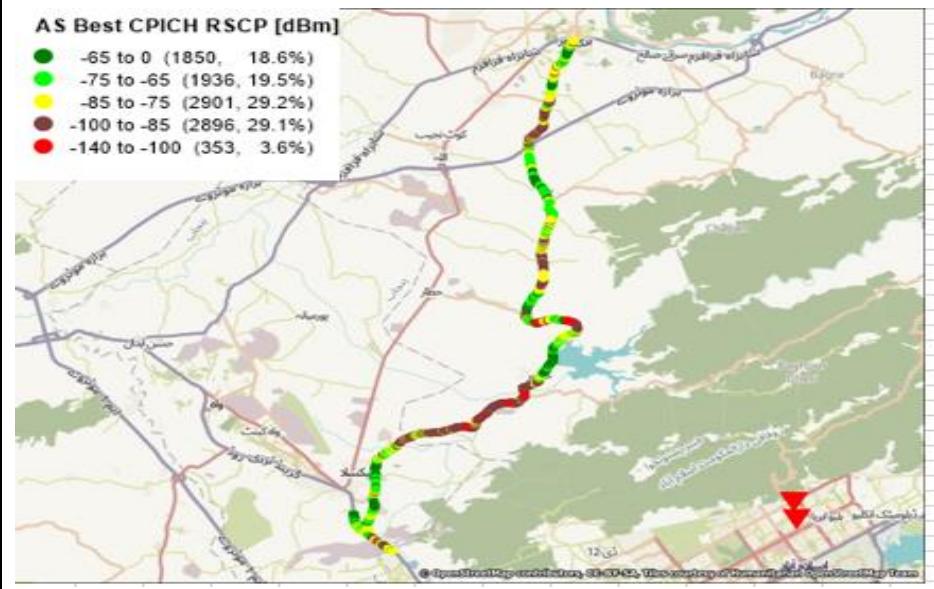


3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

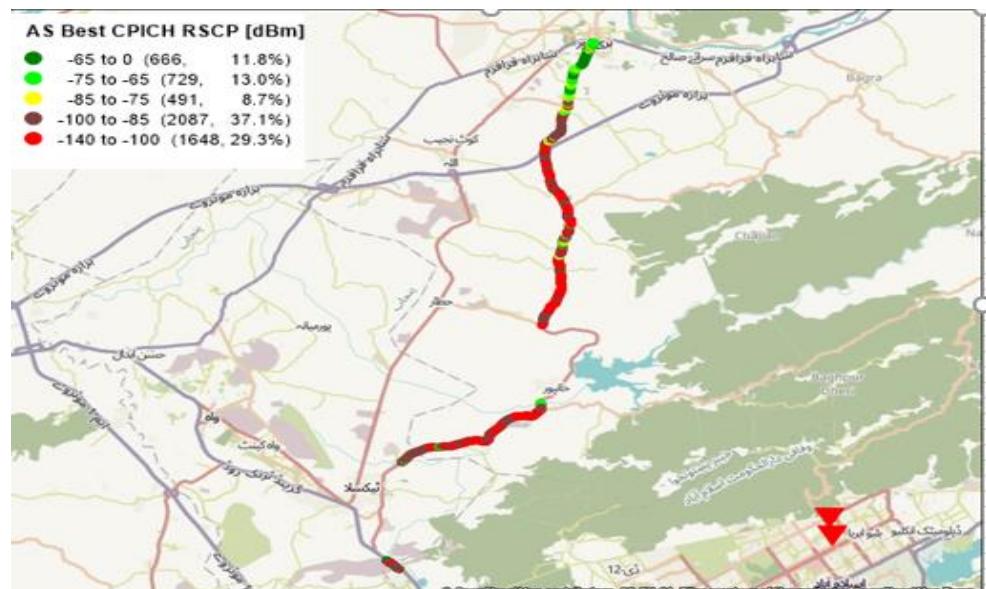
JAZZ 3G NETWORK COVERAGE – HARIPUR TO TAXILA



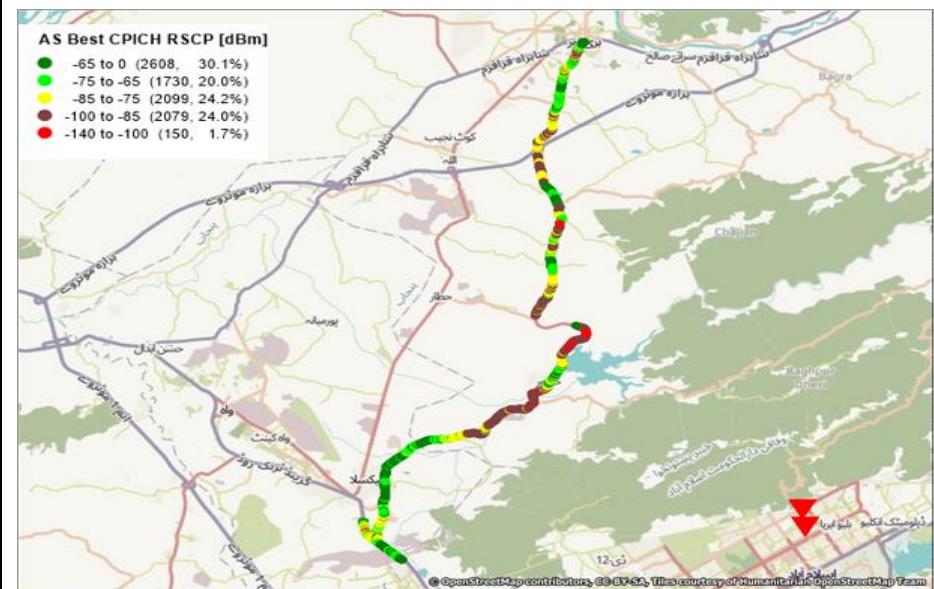
TELENOR 3G NETWORK COVERAGE – HARIPUR TO TAXILA



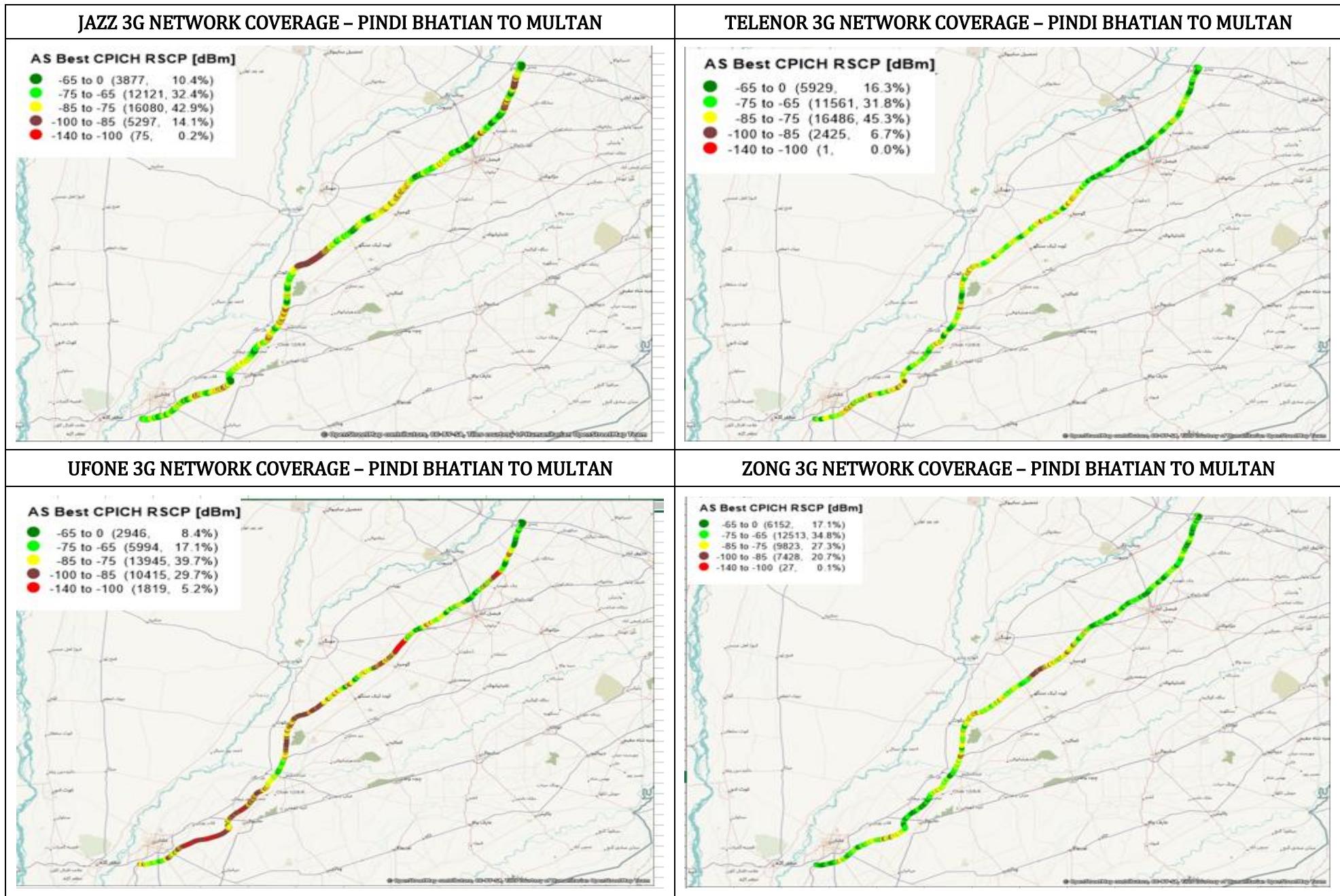
UFONE 3G NETWORK COVERAGE – HARIPUR TO TAXILA



ZONG 3G NETWORK COVERAGE – HARIPUR TO TAXILA

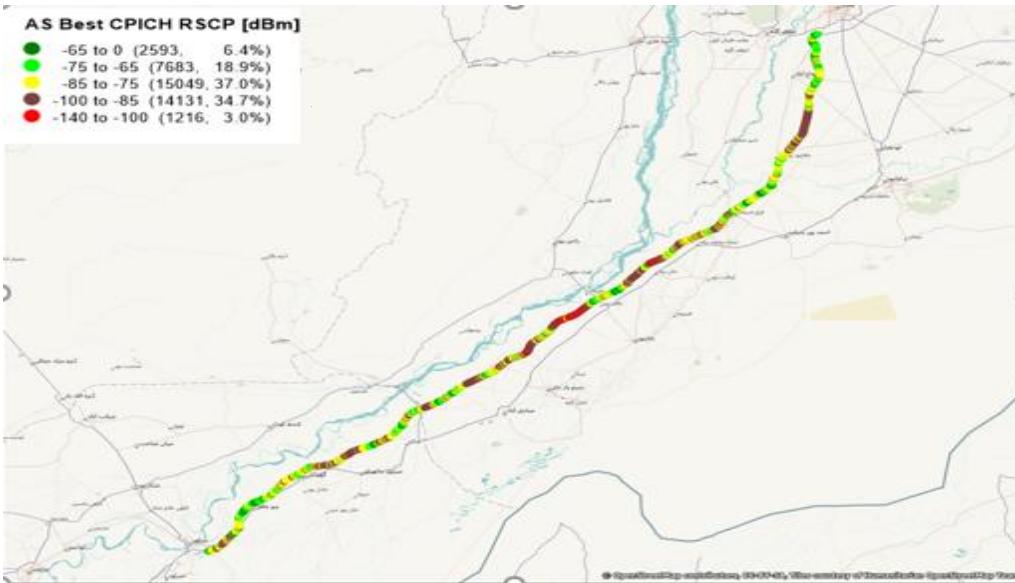


3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

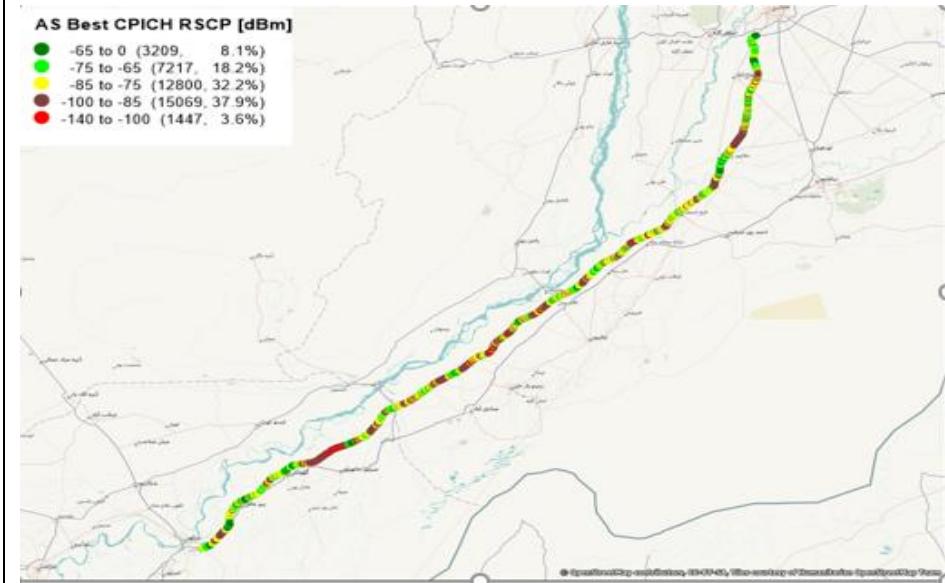


3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

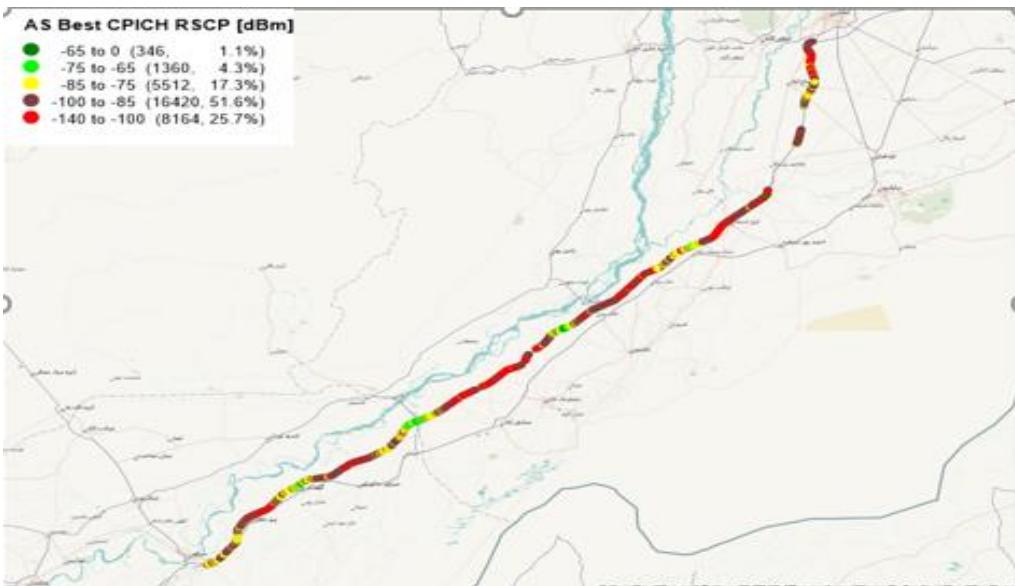
JAZZ 3G NETWORK COVERAGE – MULTAN TO SUKKUR



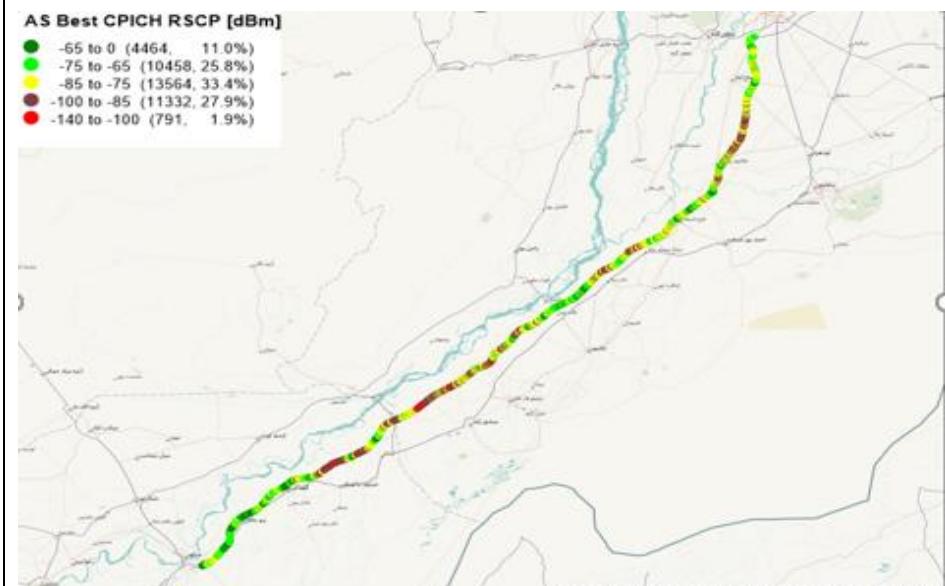
TELENOR 3G NETWORK COVERAGE – MULTAN TO SUKKUR



UFONE 3G NETWORK COVERAGE – MULTAN TO SUKKUR

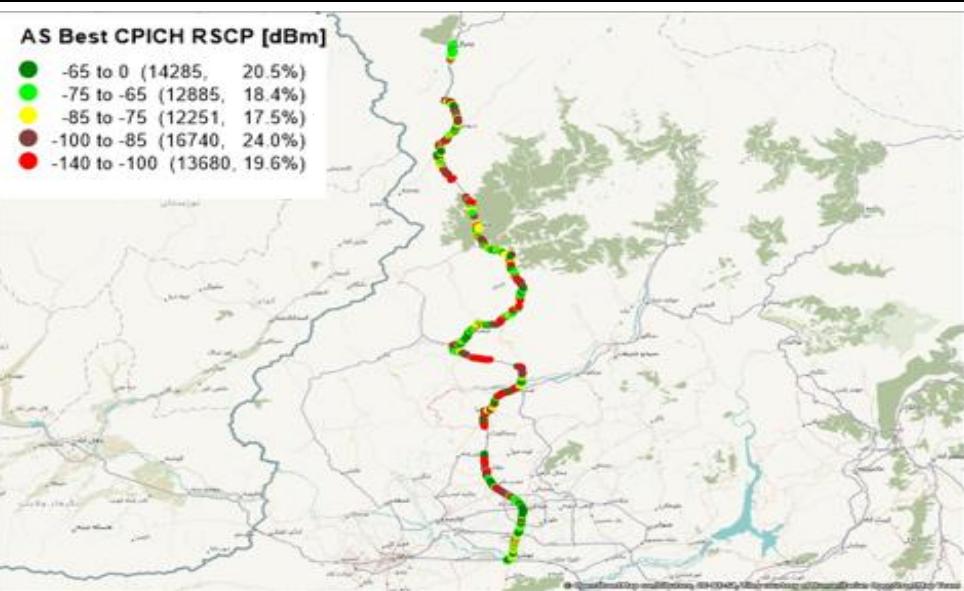


ZONG 3G NETWORK COVERAGE – MULTAN TO SUKKUR

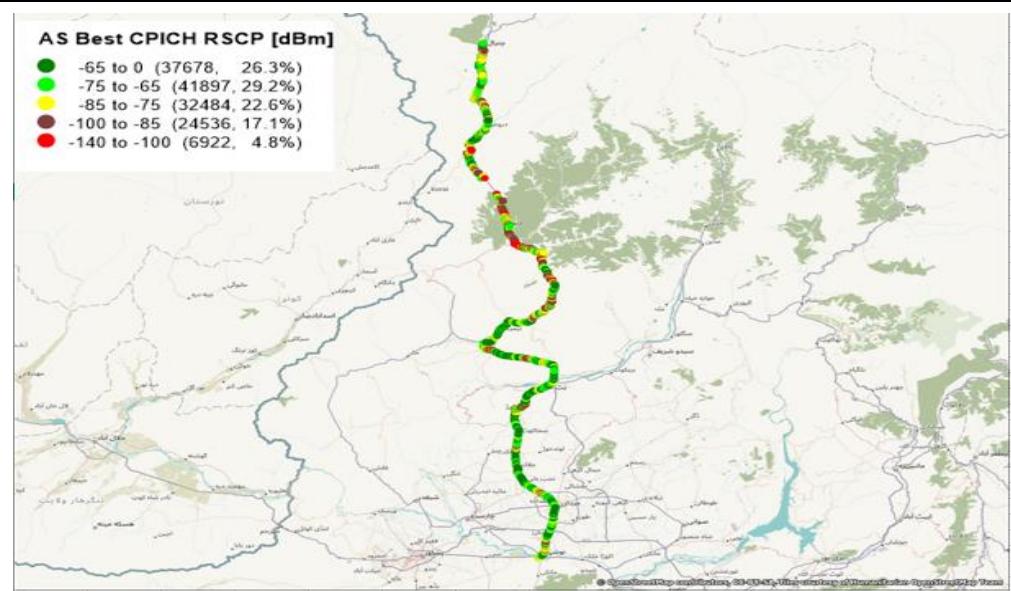


3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

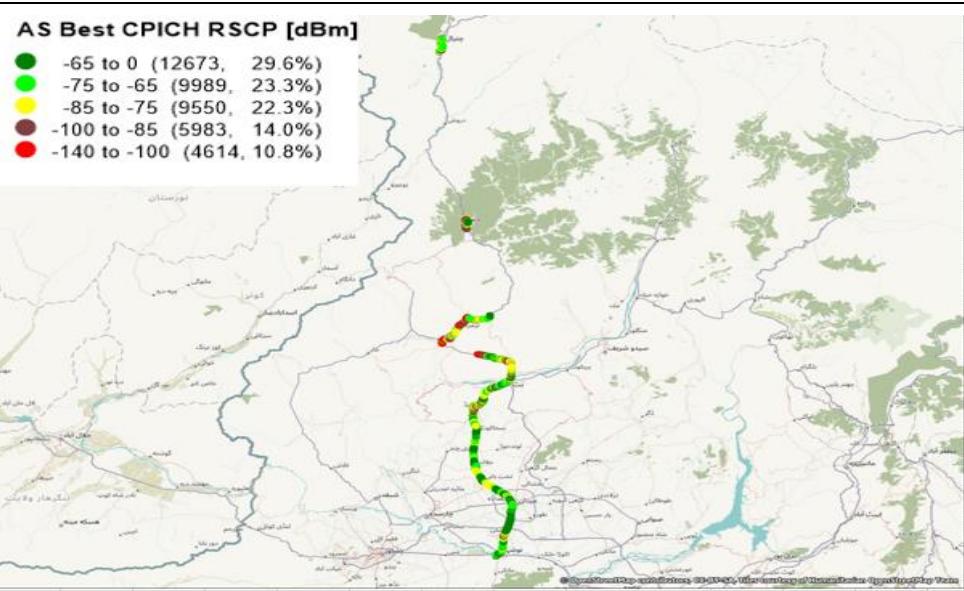
JAZZ 3G NETWORK COVERAGE – NOWSHERA TO CHITRAL



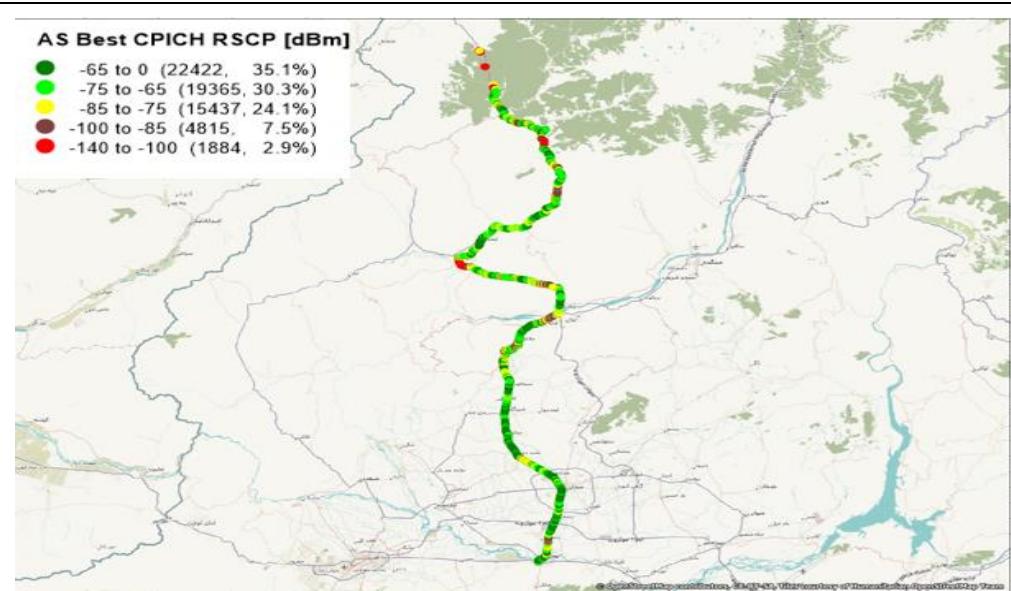
TELENOR 3G NETWORK COVERAGE – NOWSHERA TO CHITRAL



UFONE 3G NETWORK COVERAGE – NOWSHERA TO CHITRAL

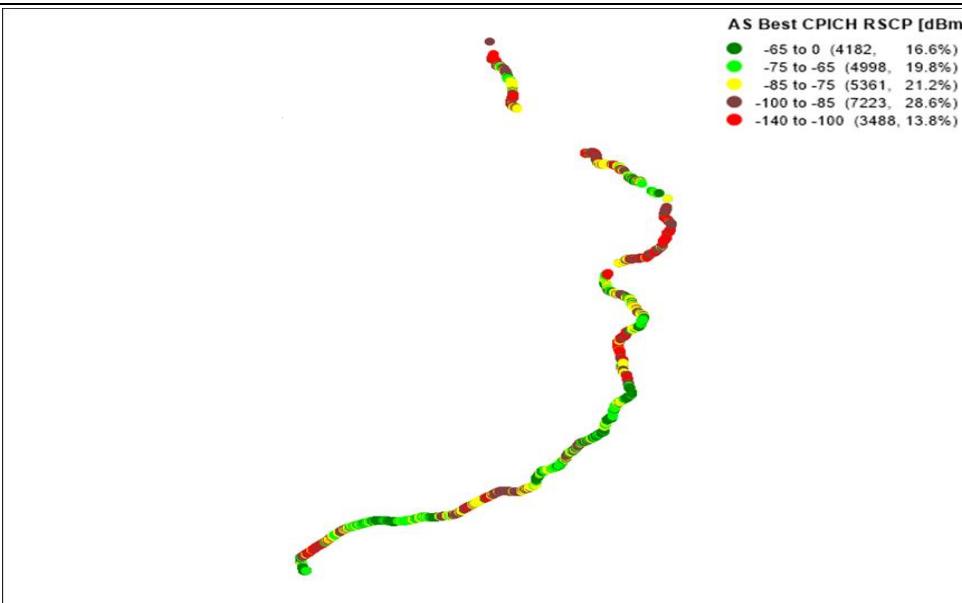


ZONG 3G NETWORK COVERAGE – NOWSHERA TO CHITRAL

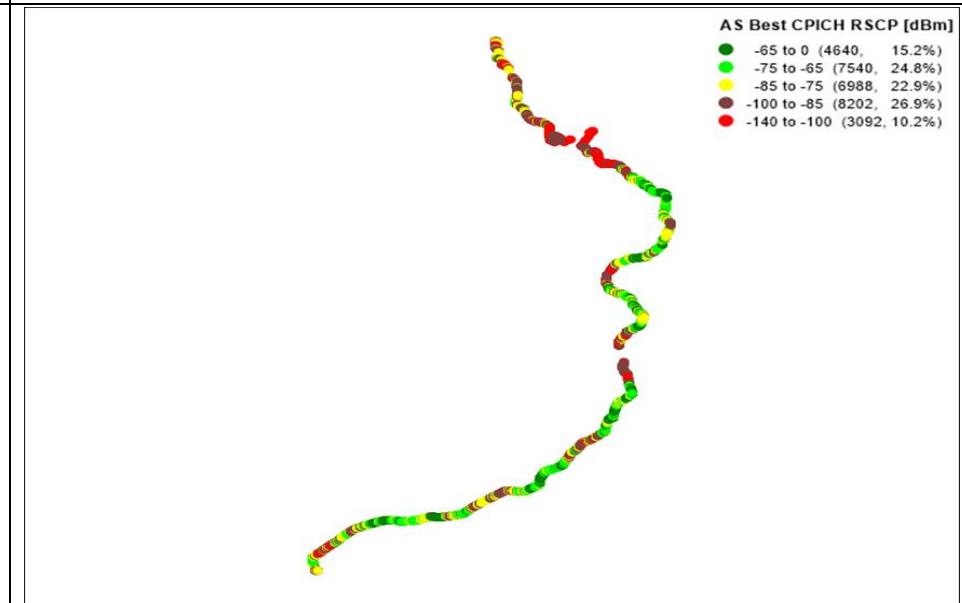


3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

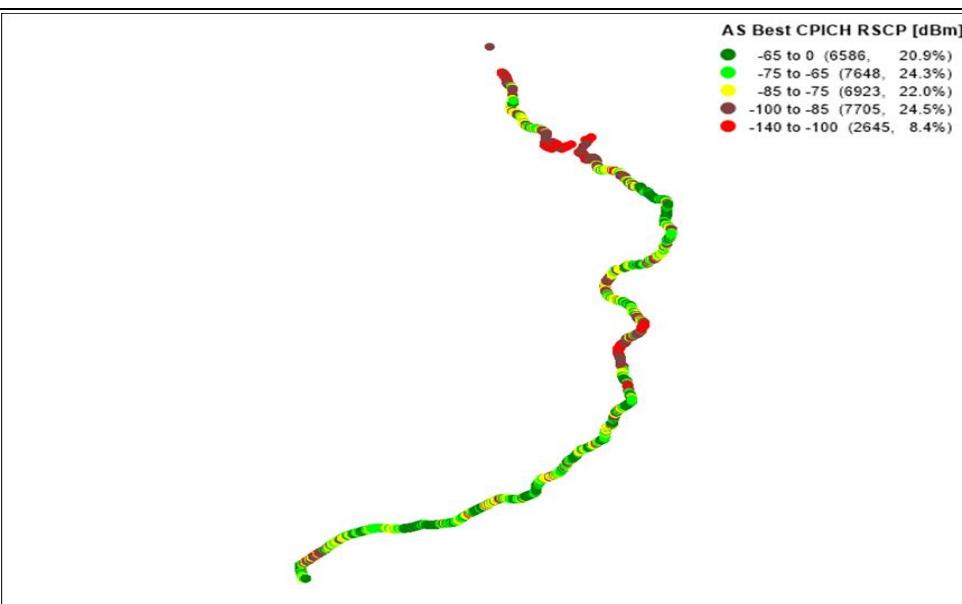
JAZZ 3G NETWORK COVERAGE – HAZARA MOTORWAY



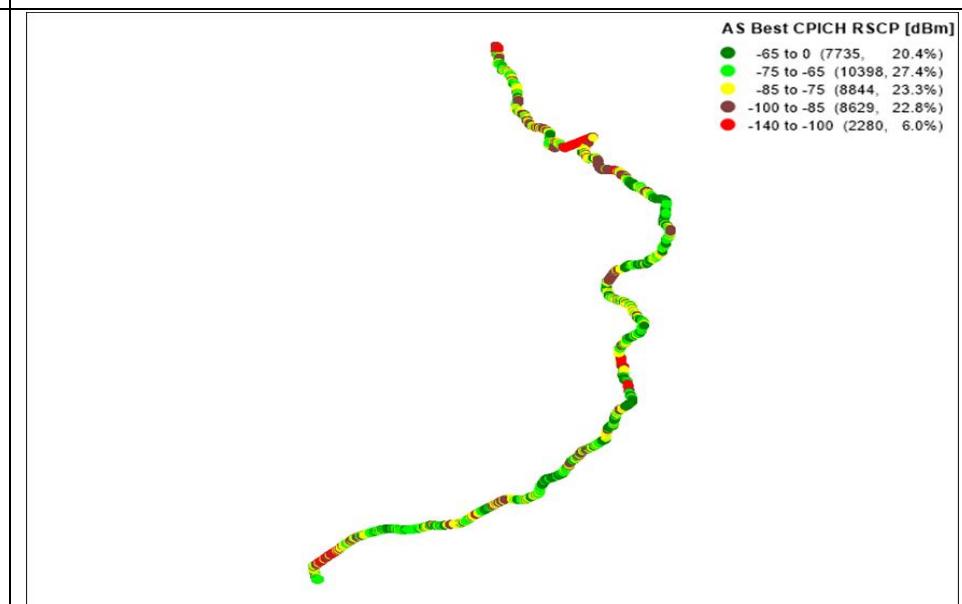
TELENOR 3G NETWORK COVERAGE – HAZARA MOTORWAY



UFONE 3G NETWORK COVERAGE – HAZARA MOTORWAY

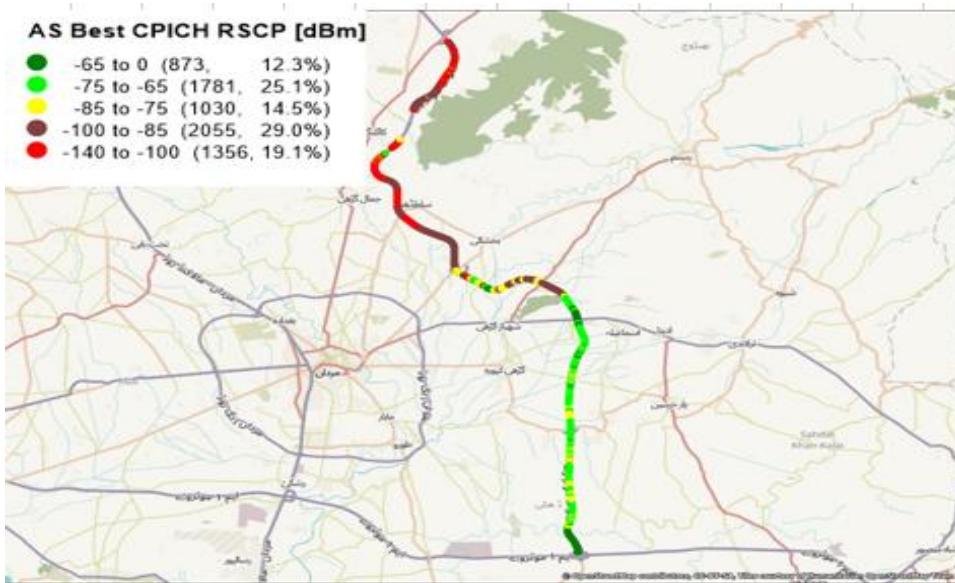


ZONG 3G NETWORK COVERAGE – HAZARA MOTORWAY

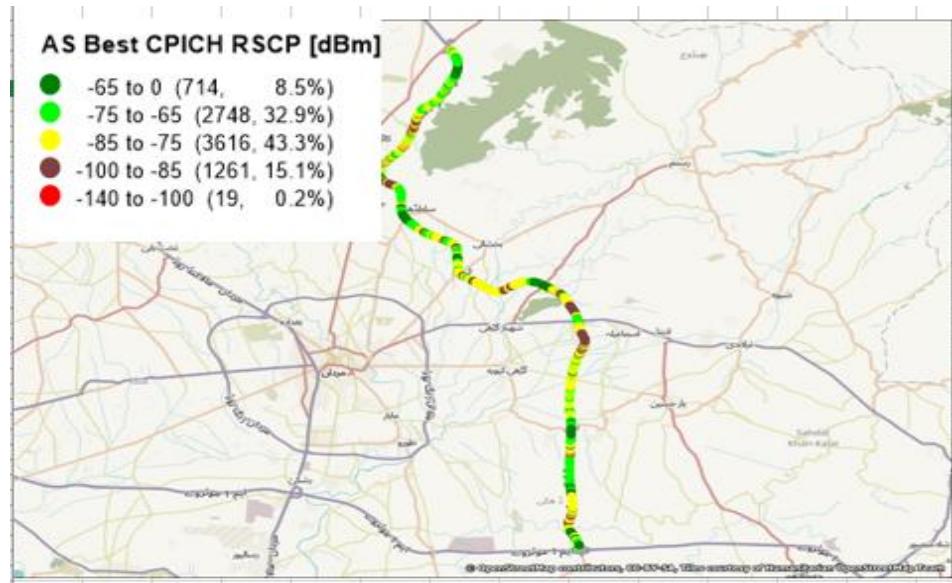


3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

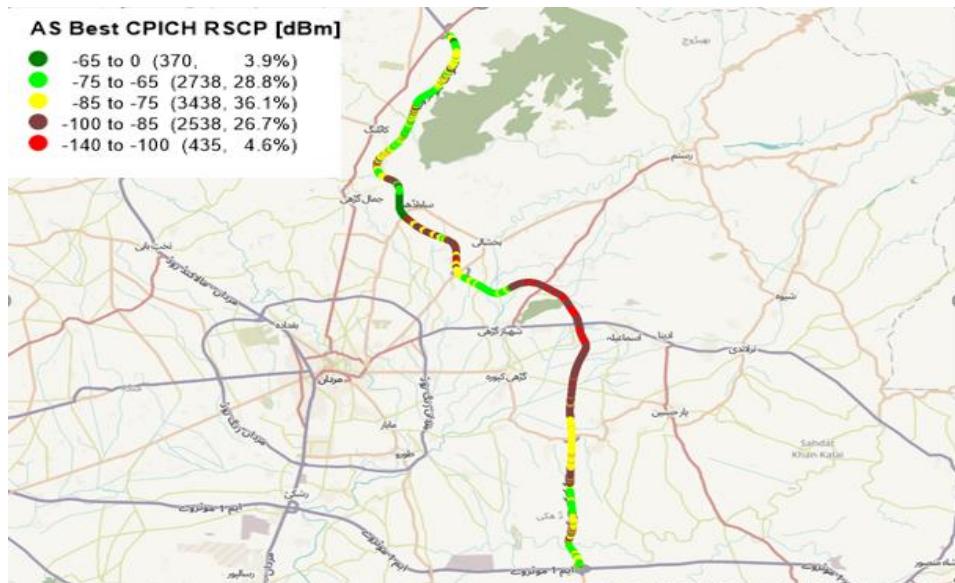
JAZZ 3G NETWORK COVERAGE – SWABI TO KATLANG



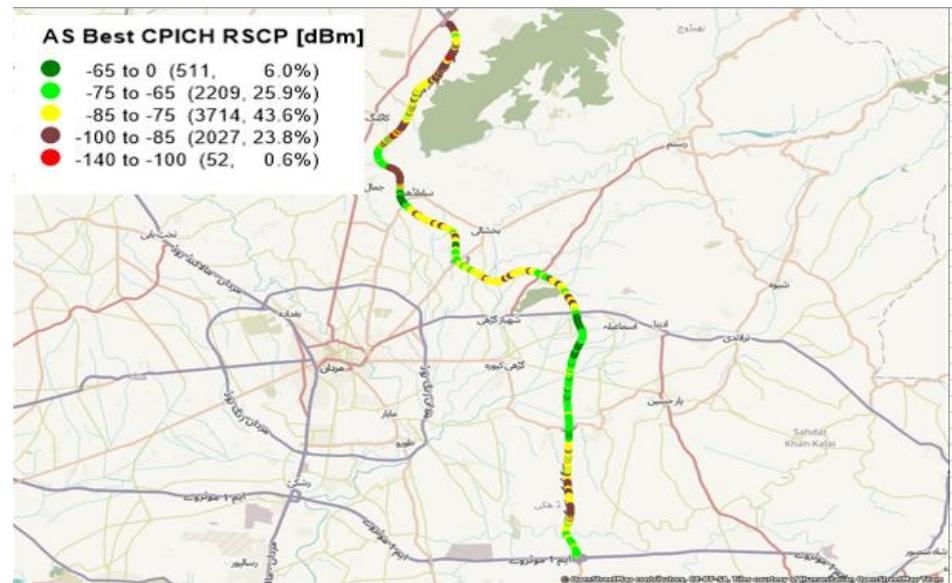
TELENOR 3G NETWORK COVERAGE – SWABI TO KATLANG



UFONE 3G NETWORK COVERAGE – SWABI TO KATLANG

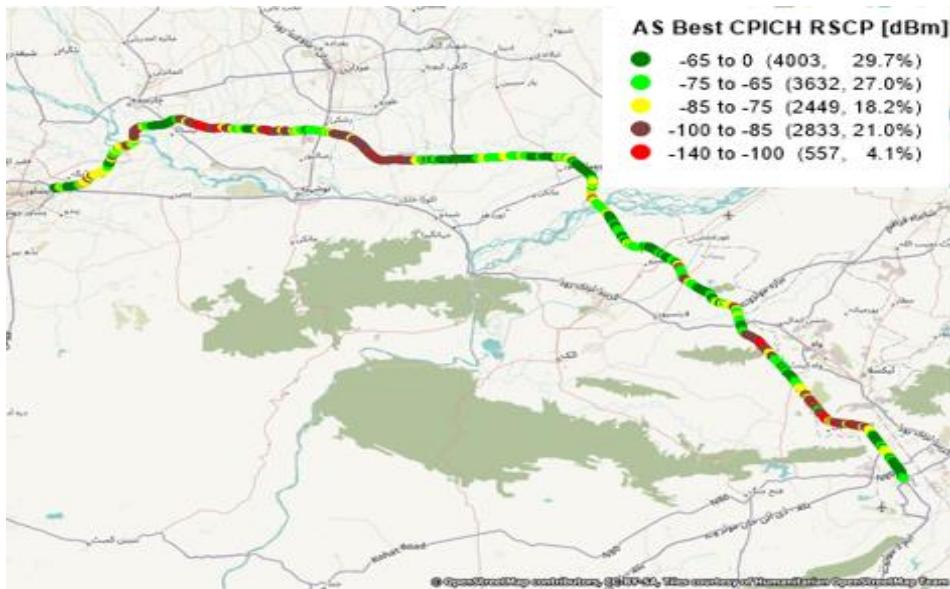


ZONG 3G NETWORK COVERAGE – SWABI TO KATLANG

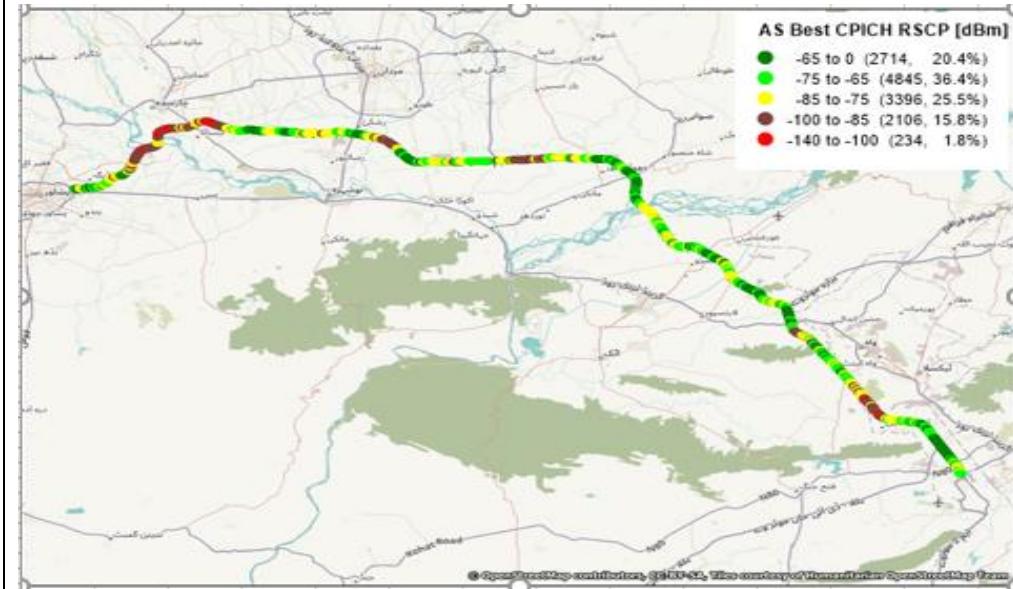


3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

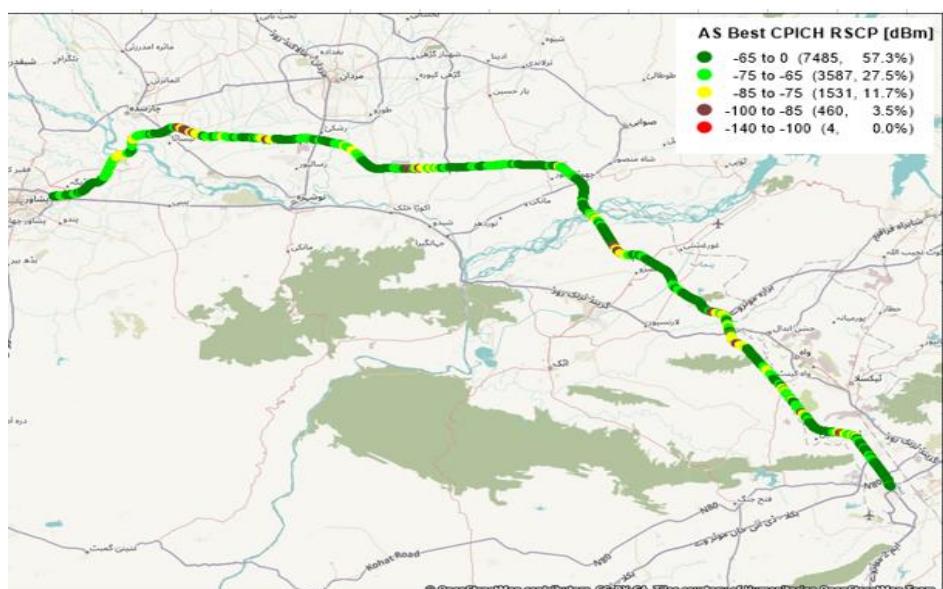
JAZZ 3G NETWORK COVERAGE – ISLAMABAD TO PESHAWAR



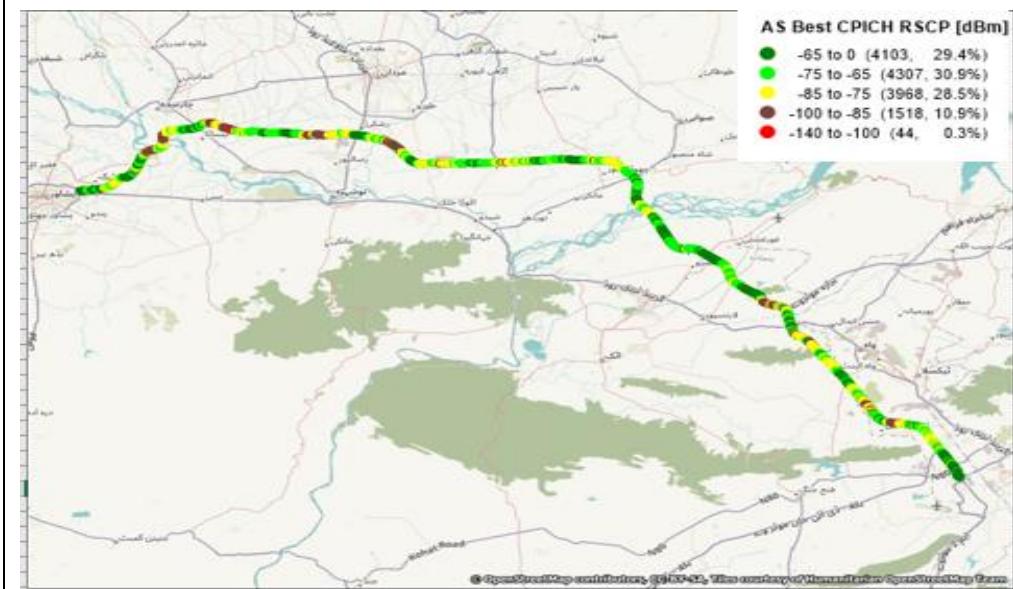
TELENOR 3G NETWORK COVERAGE – ISLAMABAD TO PESHAWAR



UFONE 3G NETWORK COVERAGE – ISLAMABAD TO PESHAWAR

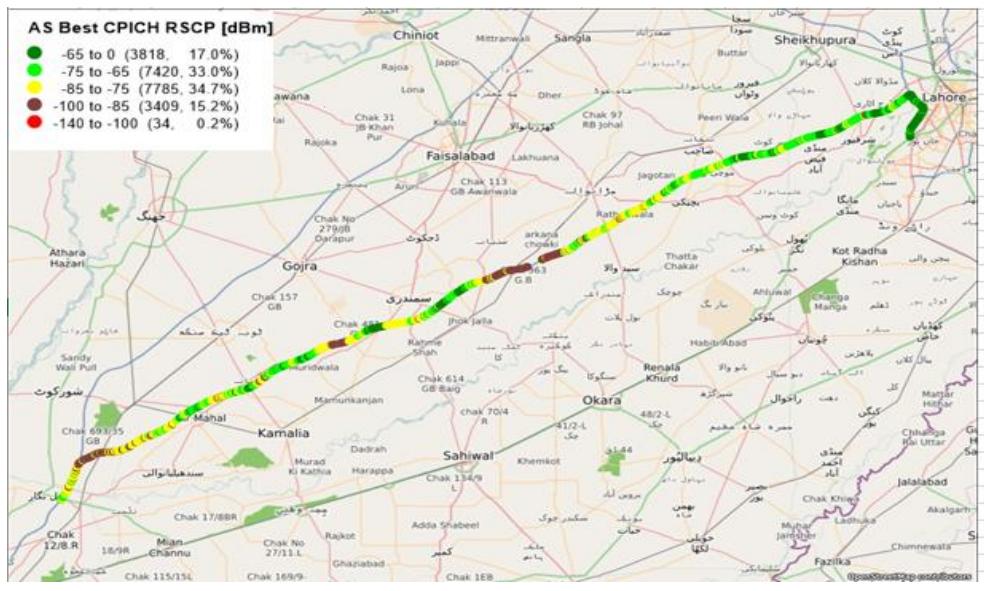


ZONG 3G NETWORK COVERAGE – ISLAMABAD TO PESHAWAR

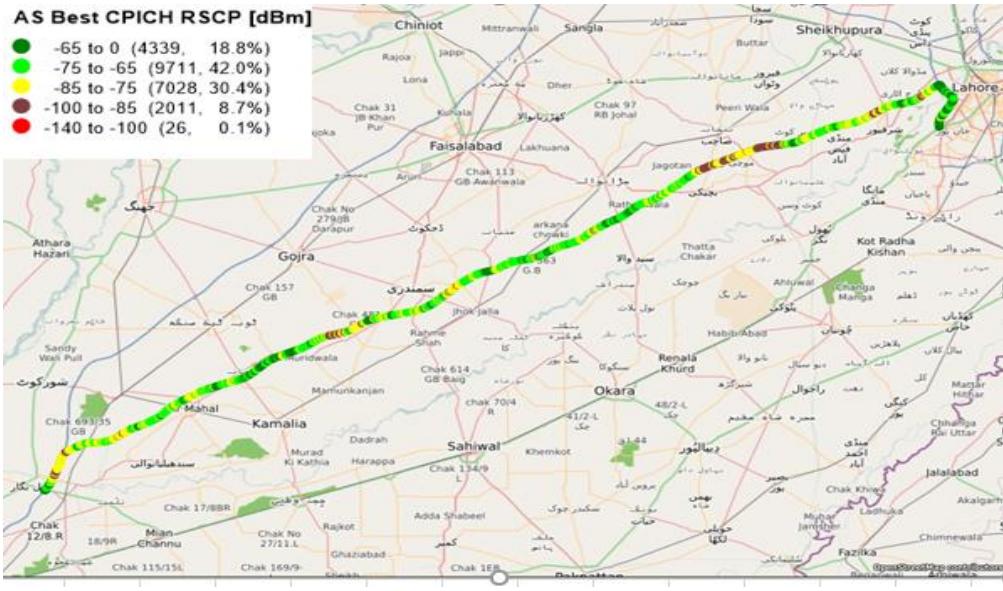


3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

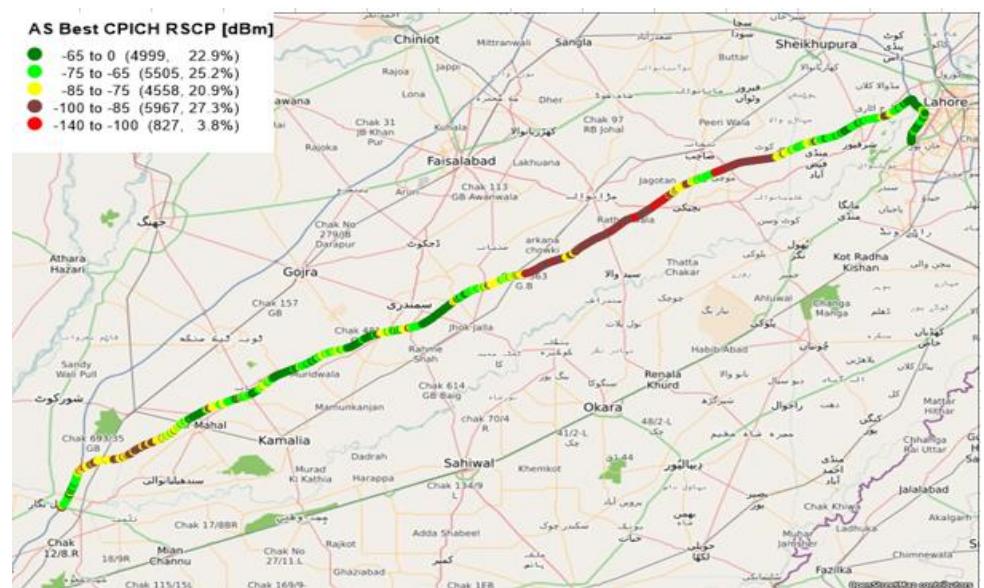
JAZZ 3G NETWORK COVERAGE – LAHORE TO ABDUL HAKEEM



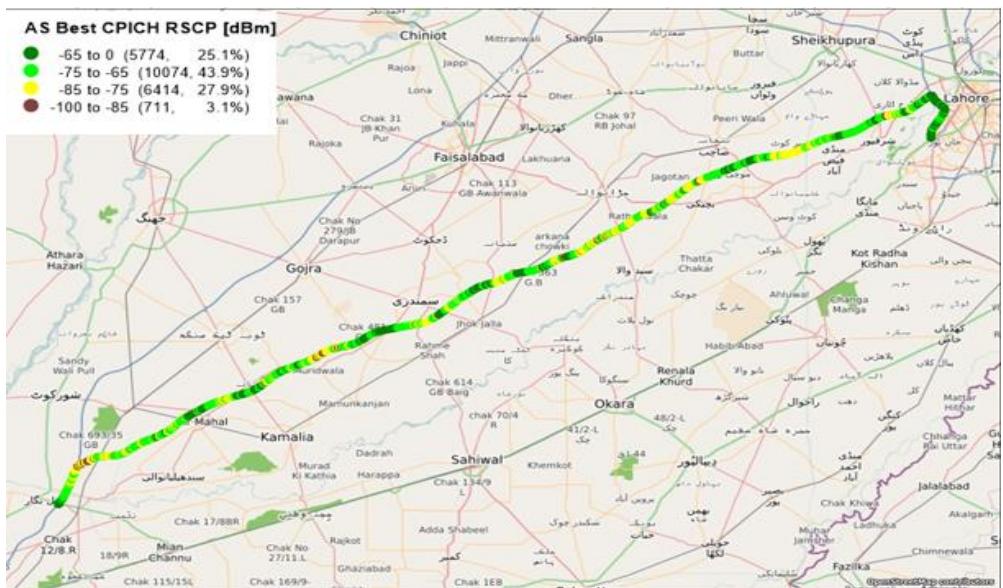
TELENOR 3G NETWORK COVERAGE – LAHORE TO ABDUL HAKEEM



UFONE 3G NETWORK COVERAGE – LAHORE TO ABDUL HAKEEM

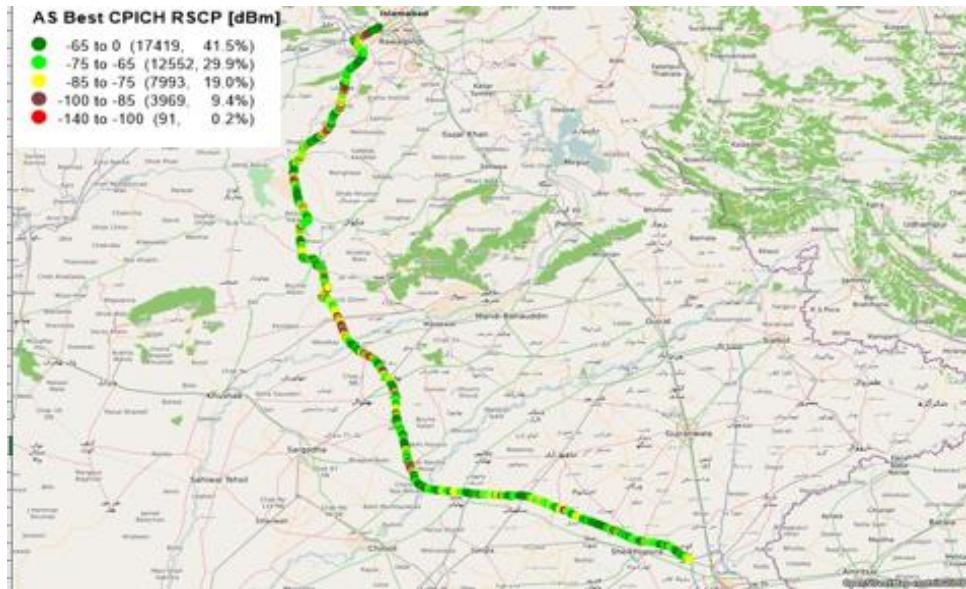


ZONG 3G NETWORK COVERAGE – LAHORE TO ABDUL HAKEEM

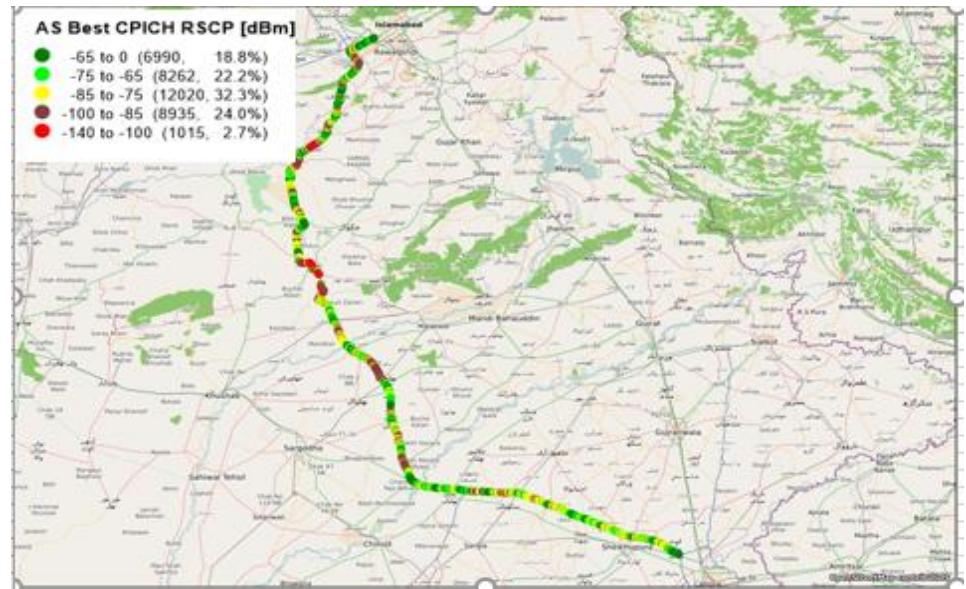


3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

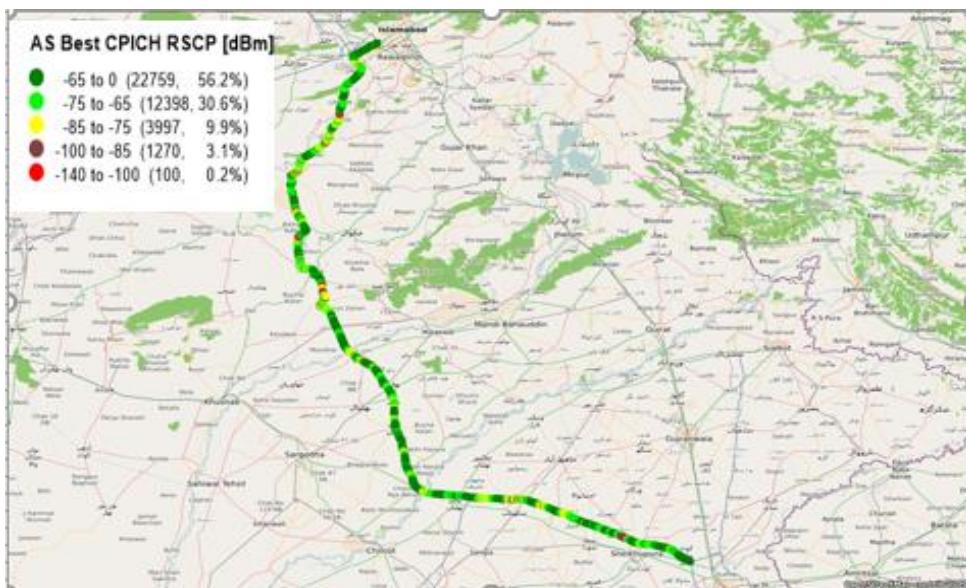
JAZZ 3G NETWORK COVERAGE – LAHORE TO ISLAMABAD



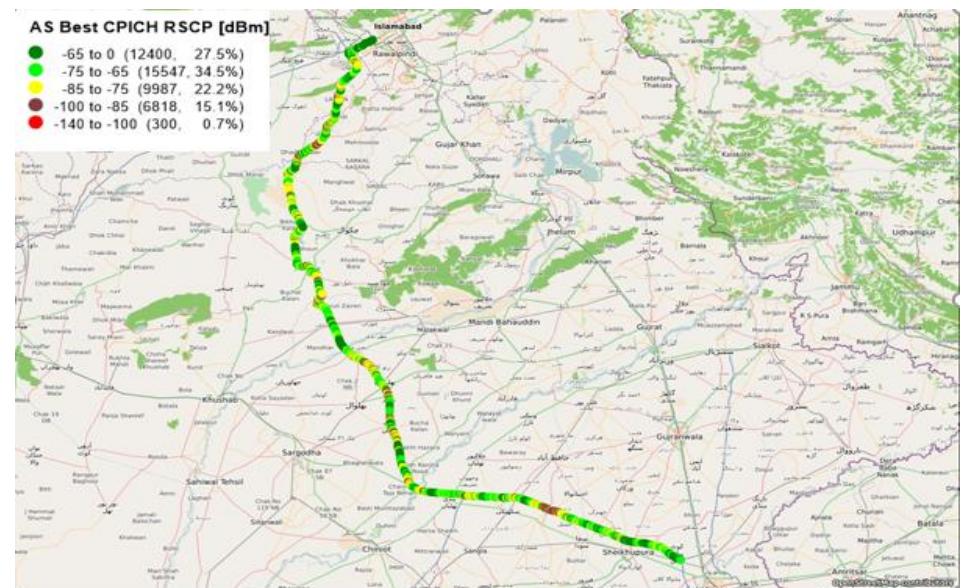
TELENOR 3G NETWORK COVERAGE – LAHORE TO ISLAMABAD



UFONE 3G NETWORK COVERAGE – LAHORE TO ISLAMABAD

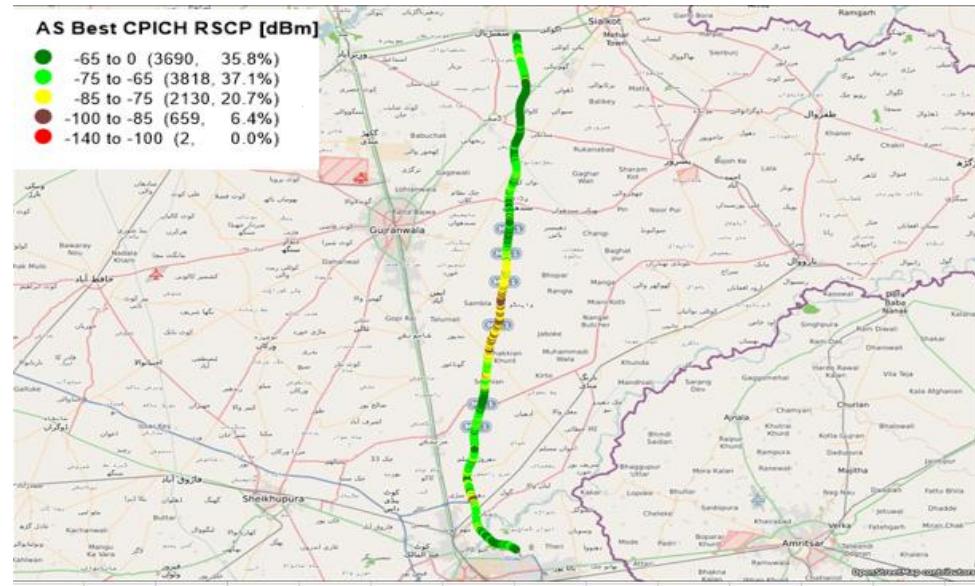


ZONG 3G NETWORK COVERAGE – LAHORE TO ISLAMABAD

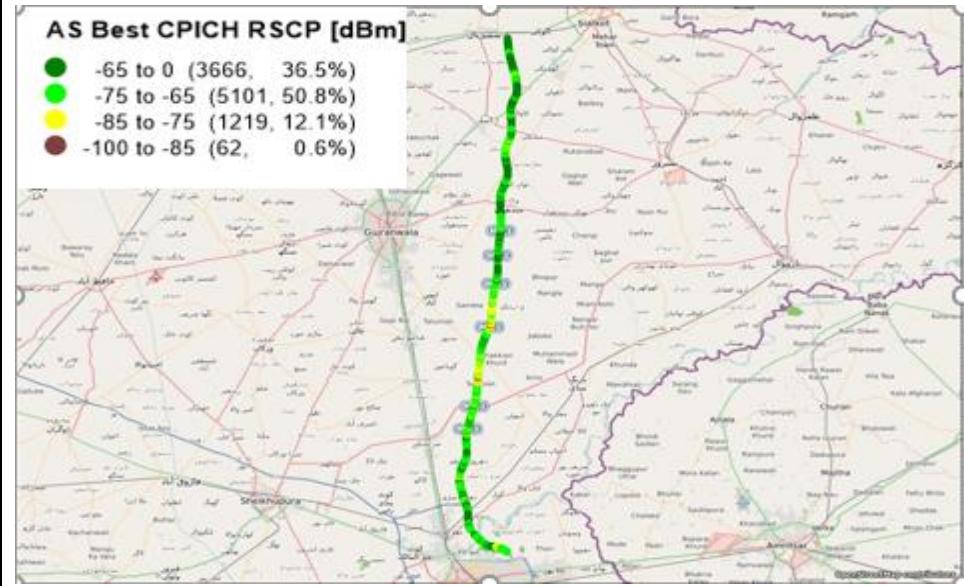


3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

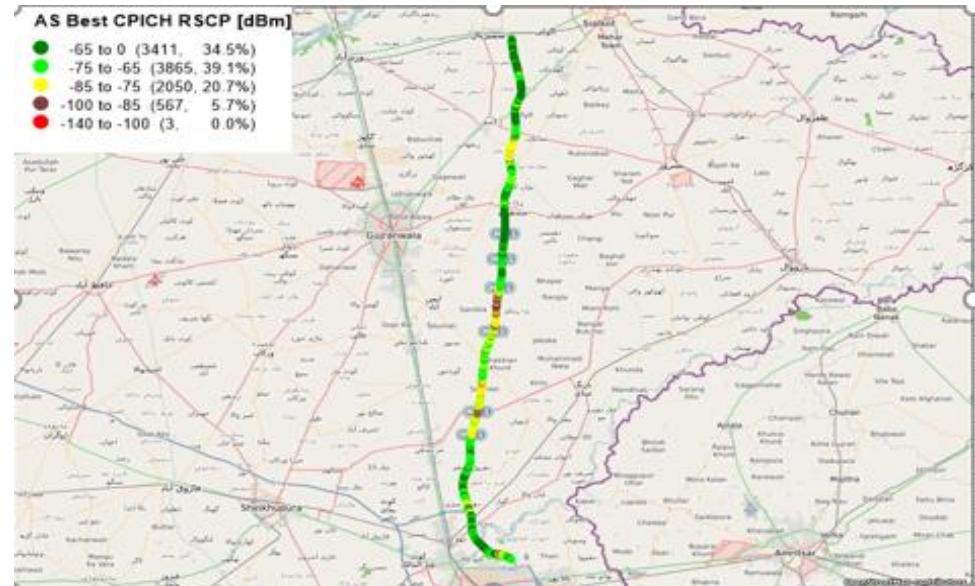
JAZZ 3G NETWORK COVERAGE – LAHORE TO SIALKOT



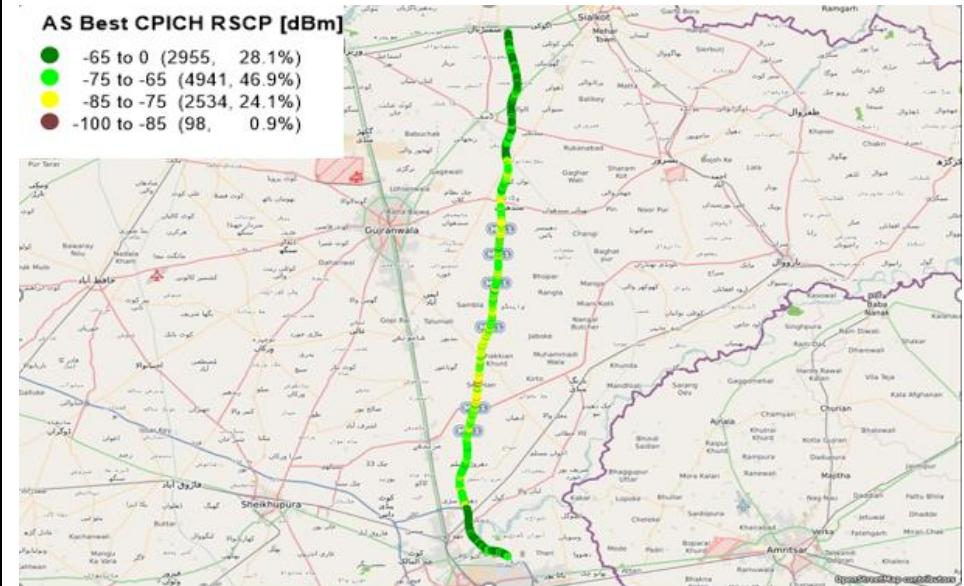
TELENOR 3G NETWORK COVERAGE – LAHORE TO SIALKOT



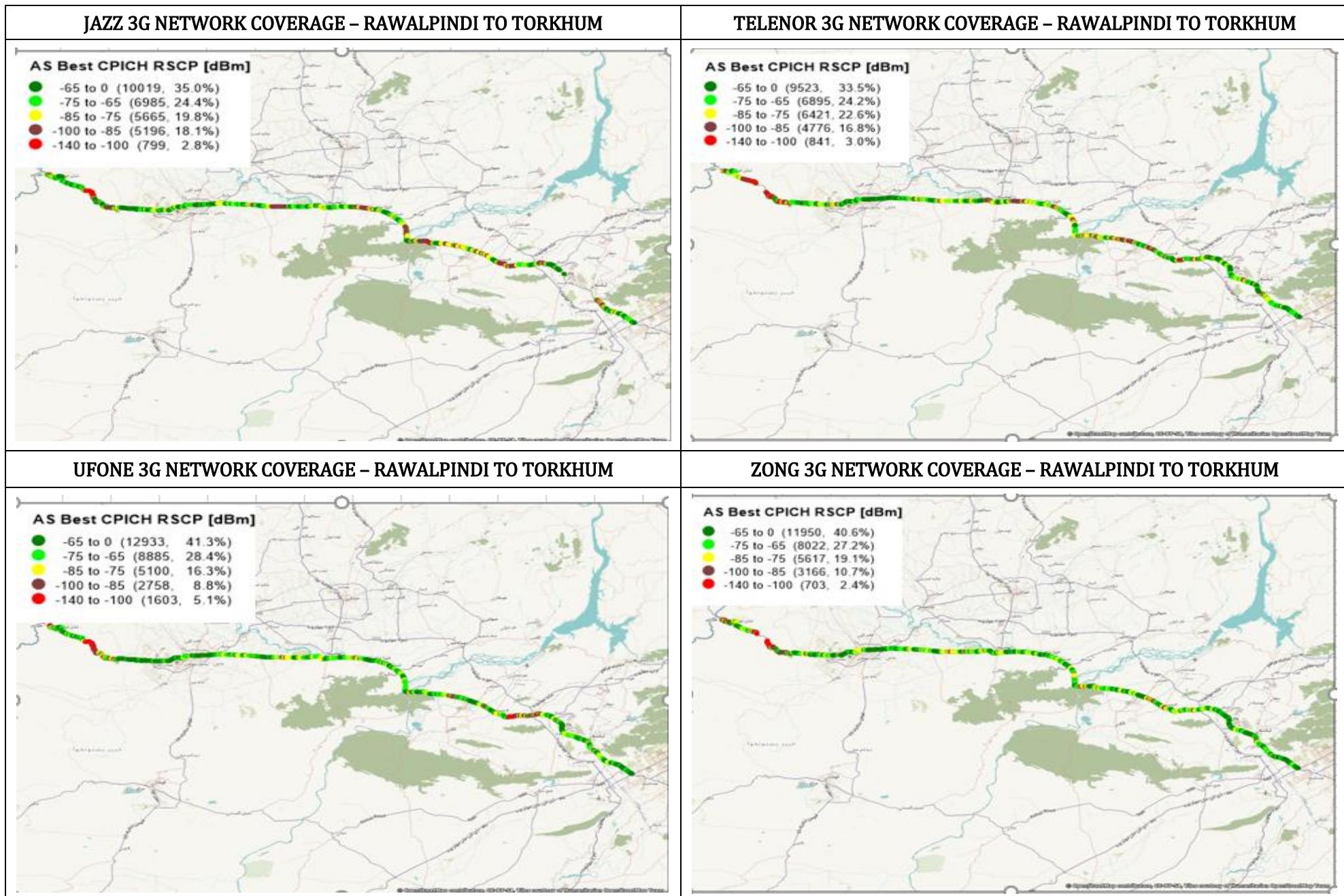
UFONE 3G NETWORK COVERAGE – LAHORE TO SIALKOT



ZONG 3G NETWORK COVERAGE – LAHORE TO SIALKOT



3G MOBILE COVERAGE – SIGNAL STRENGTH (RSCP)

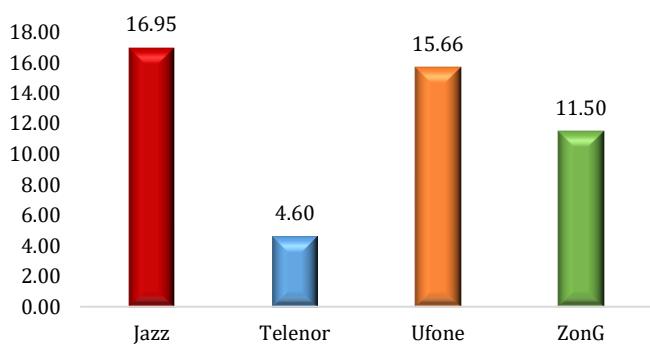


Annex-B (Data QoS Results)

QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE)

QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – HAZARA MOTORWAY

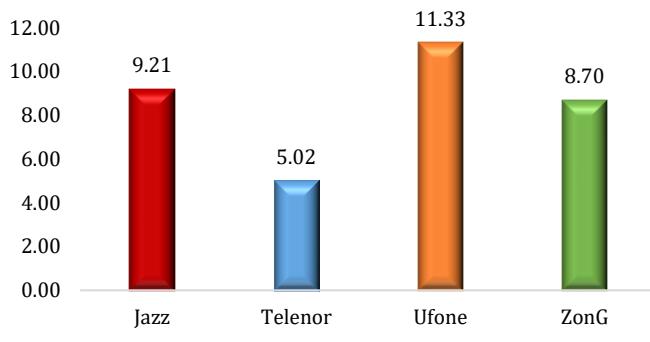
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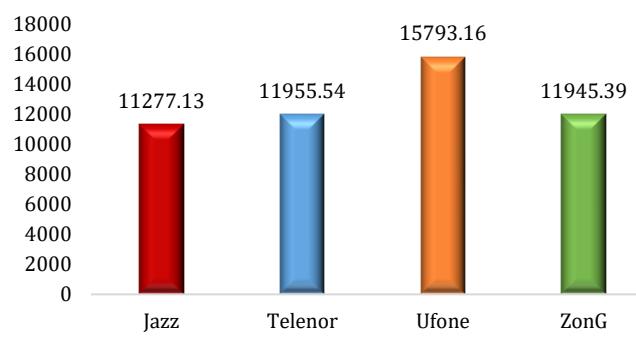
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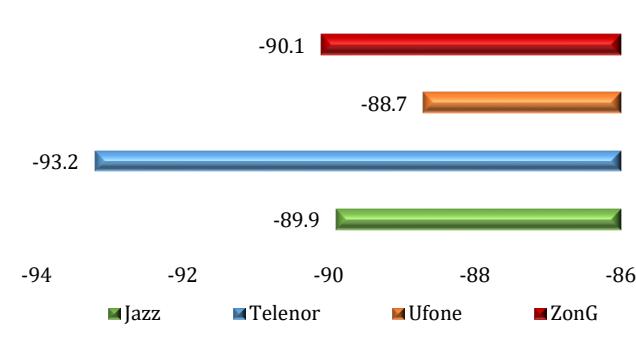
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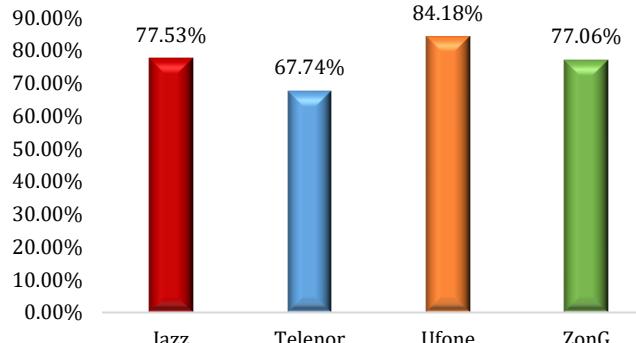
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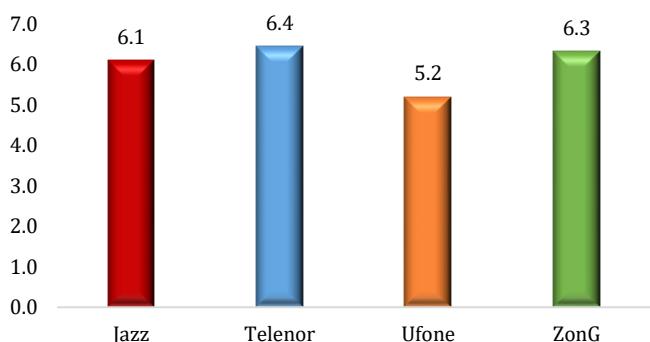
Signal Strength (RSRP) > -100dBm



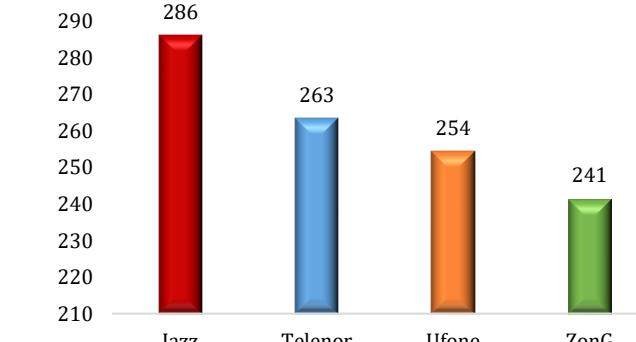
Signal Strength (RSRP) Confidence Level > 90%



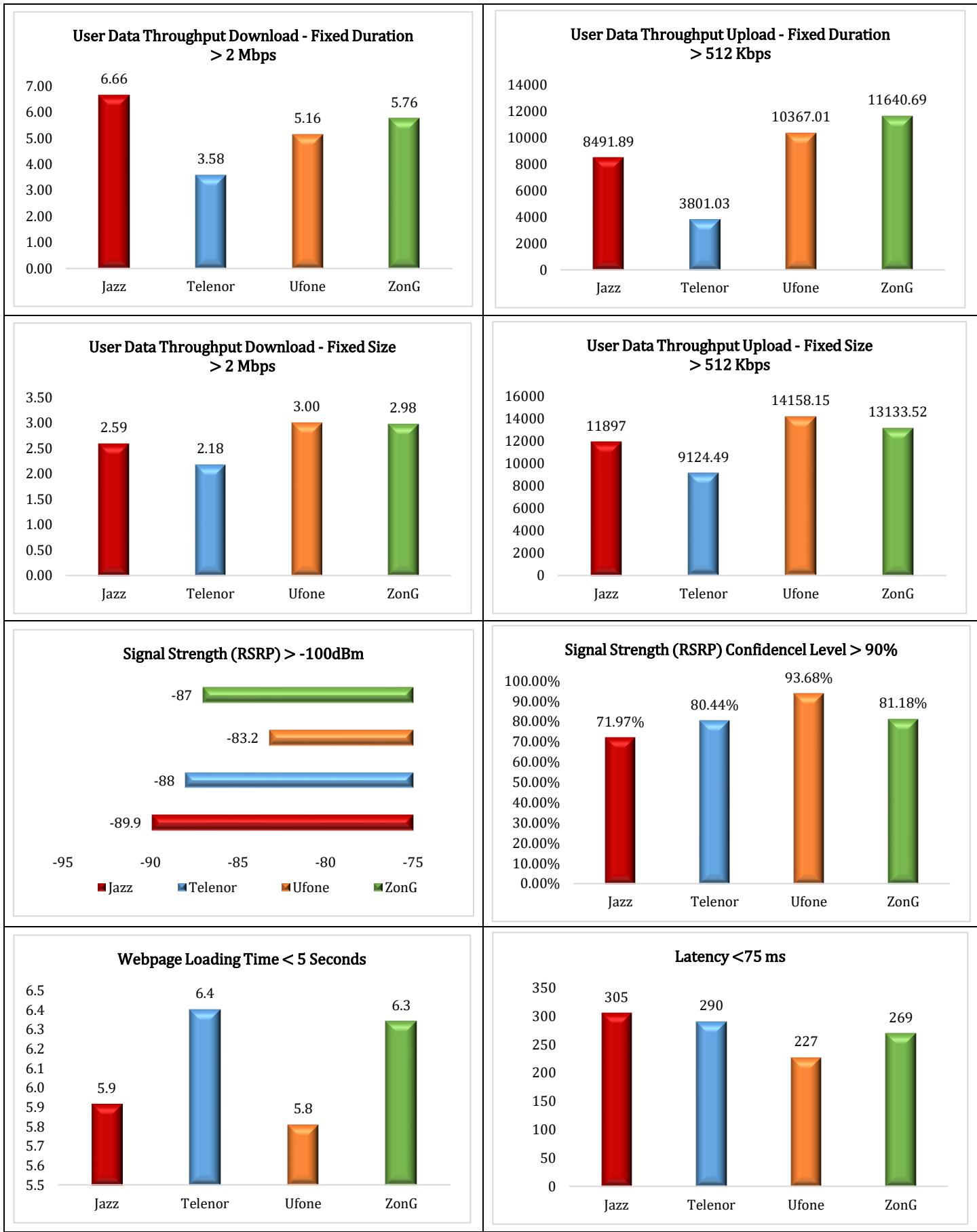
Webpage Loading Time < 5 Seconds



Latency <75 ms

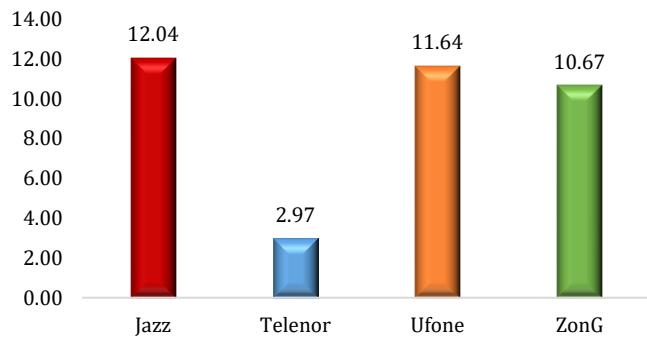


QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – QUETTA TO KARACHI

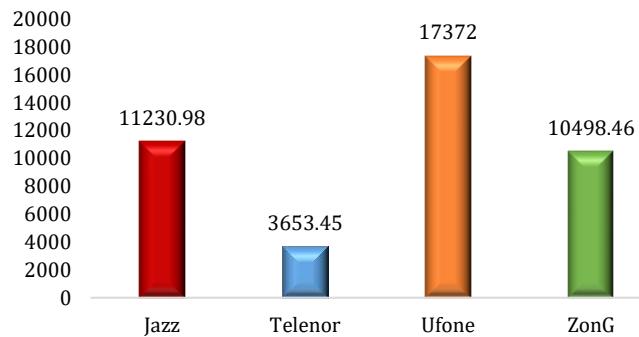


QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – HARIPUR TO TAXILA

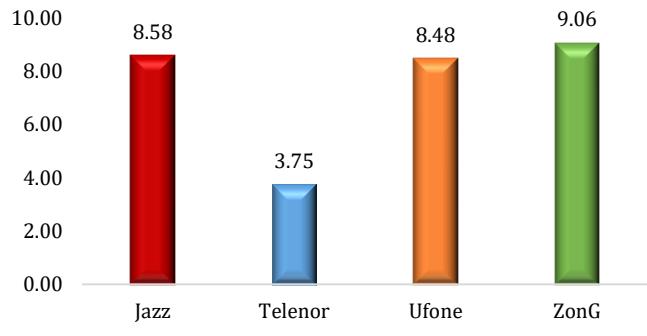
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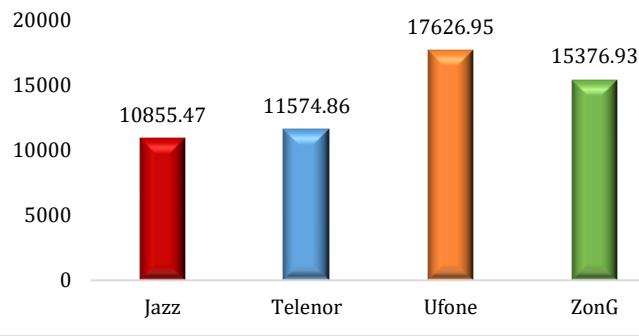
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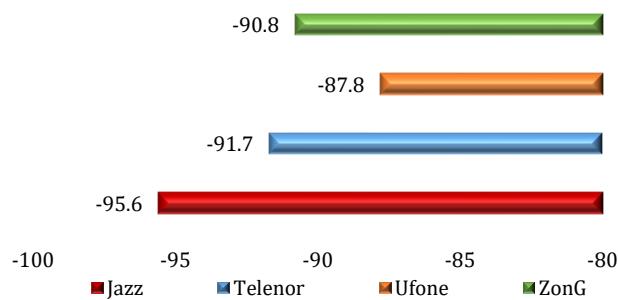
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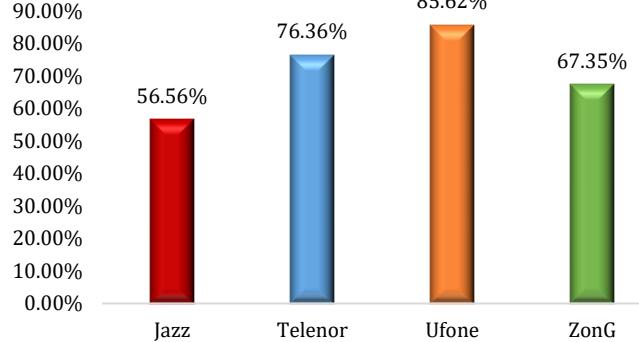
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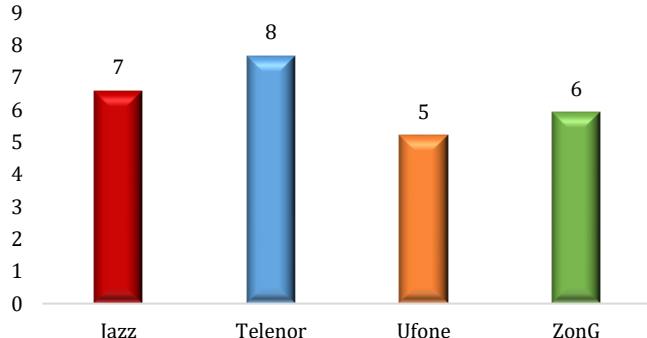
Signal Strength (RSRP) > -100dBm



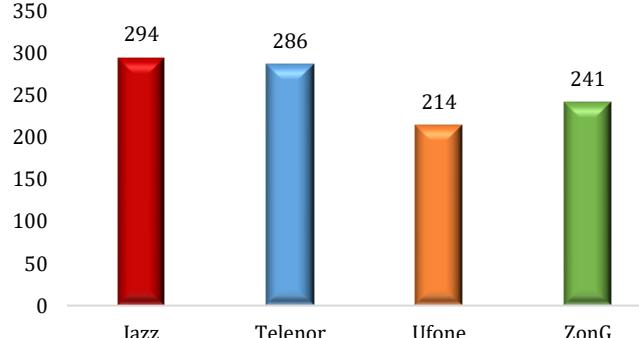
Signal Strength (RSRP) Confidence Level > 90%



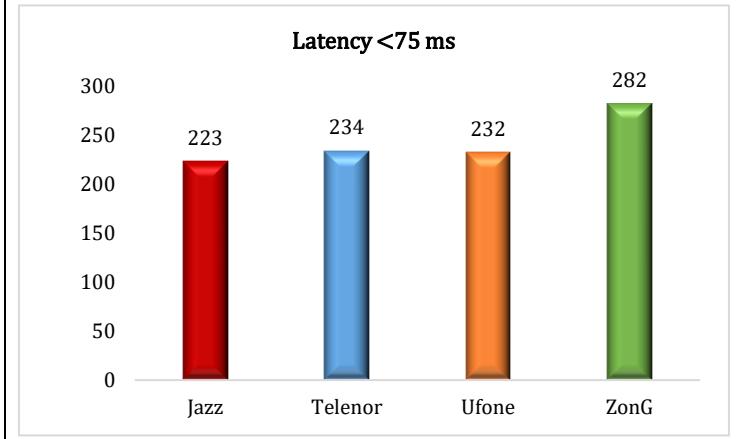
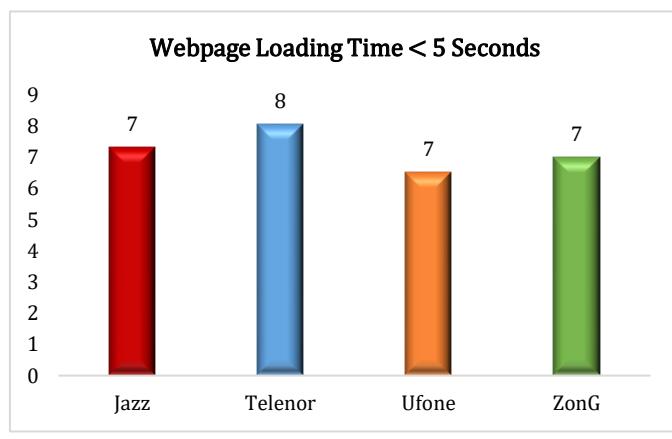
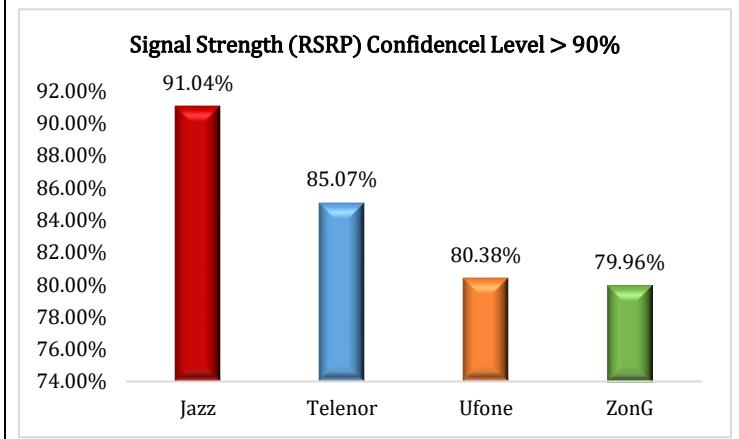
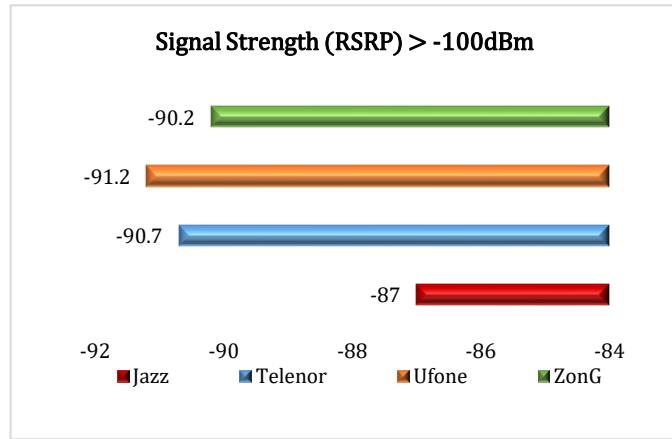
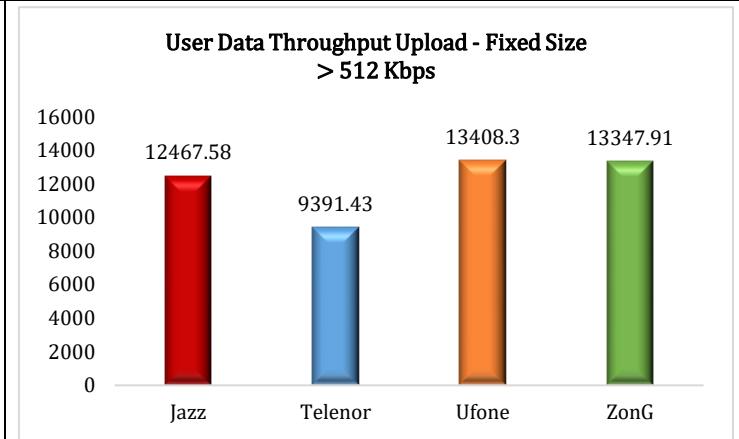
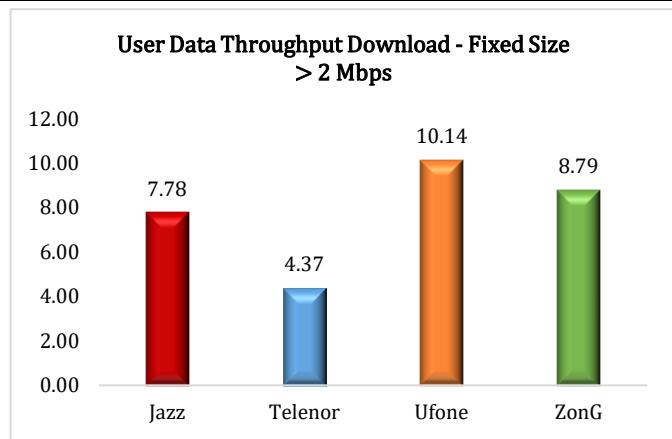
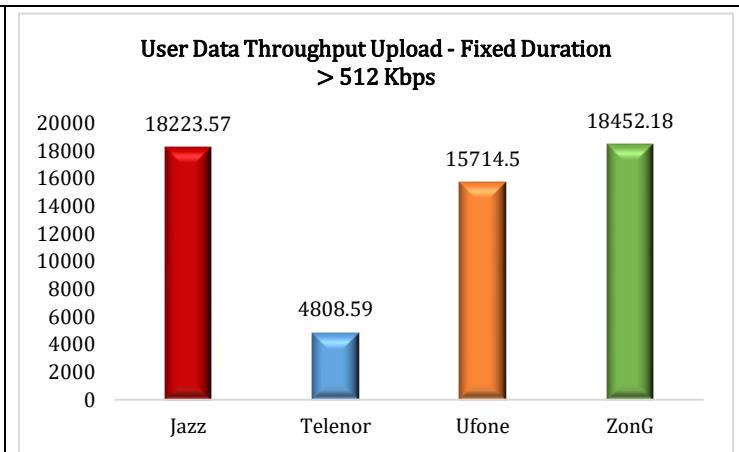
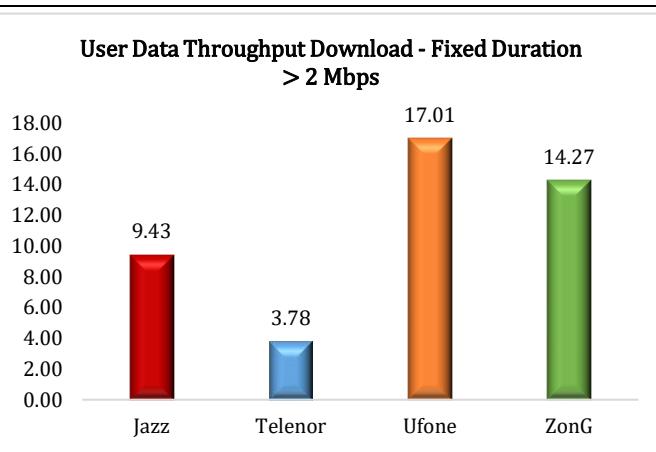
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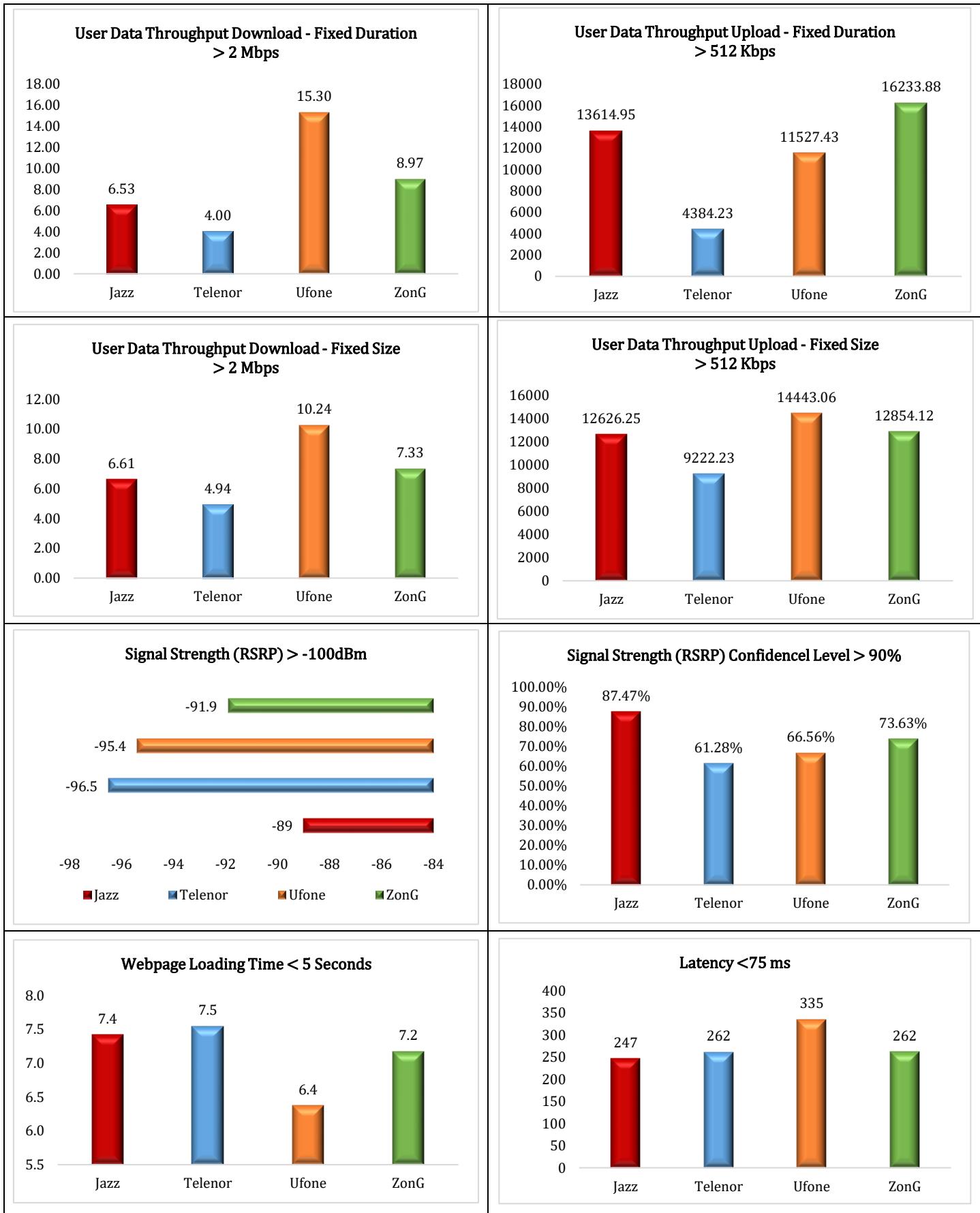
Latency < 75 ms



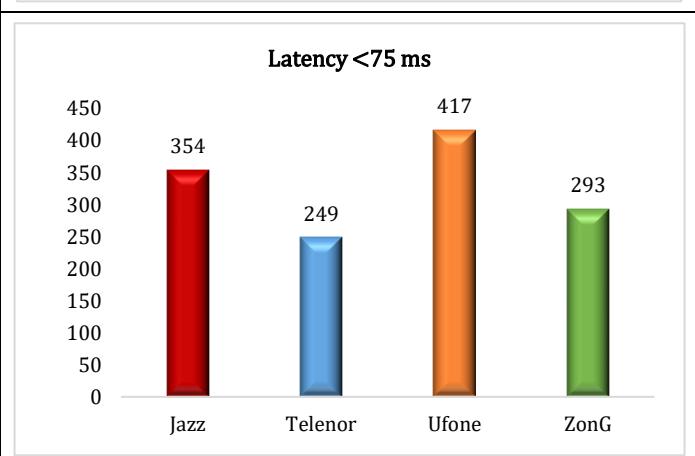
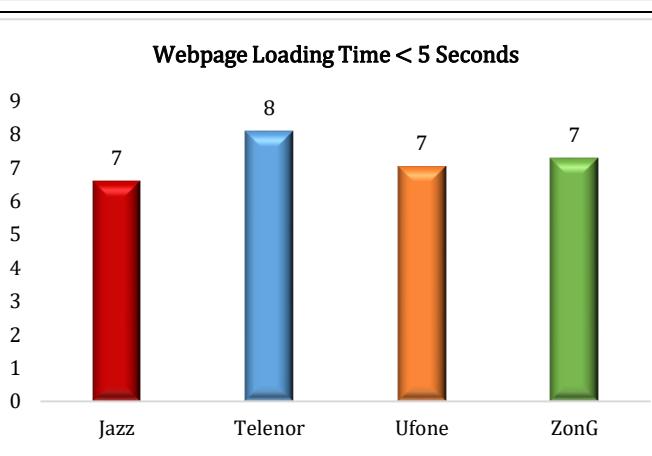
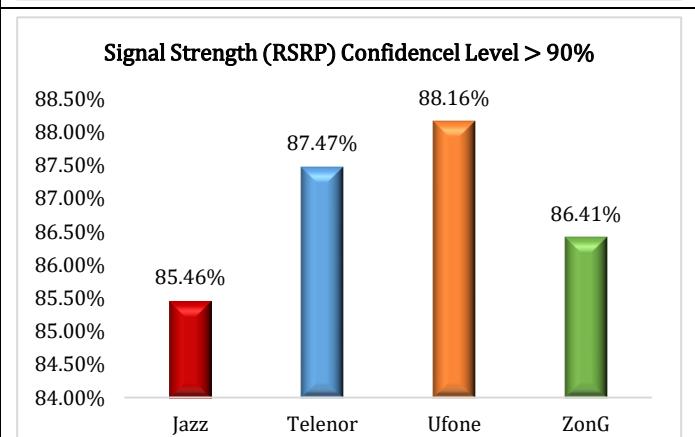
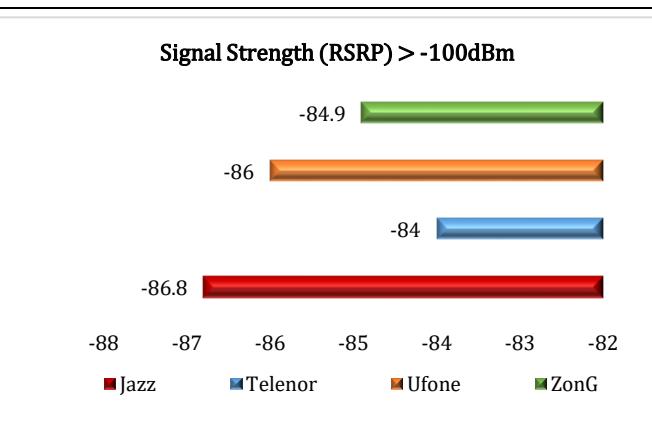
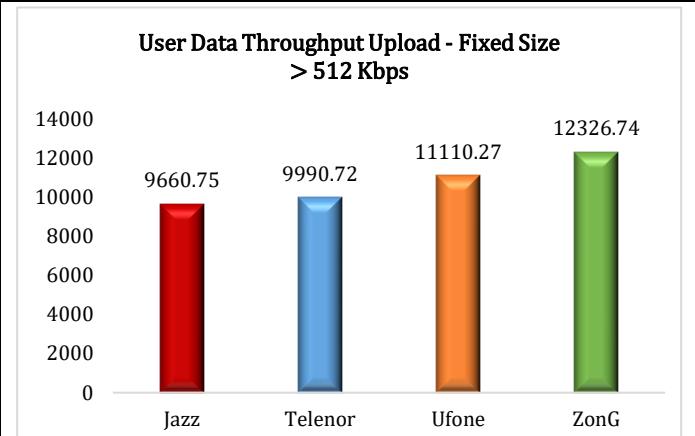
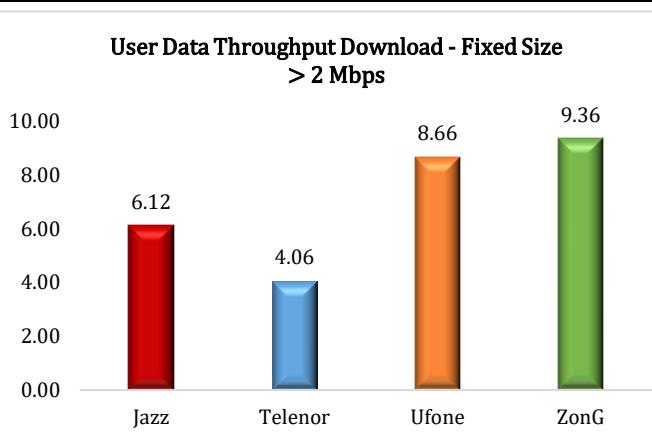
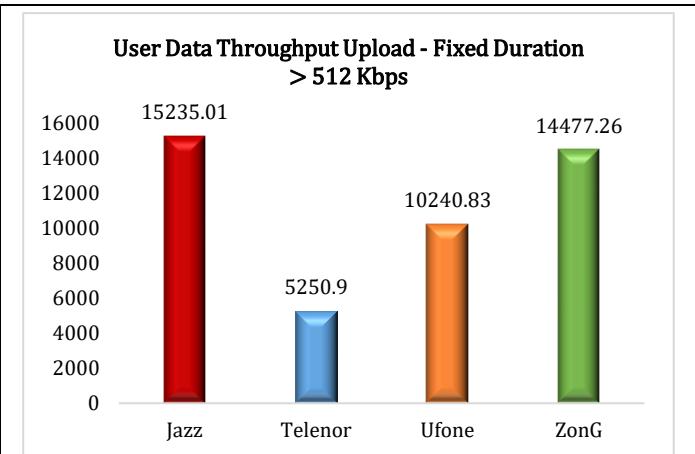
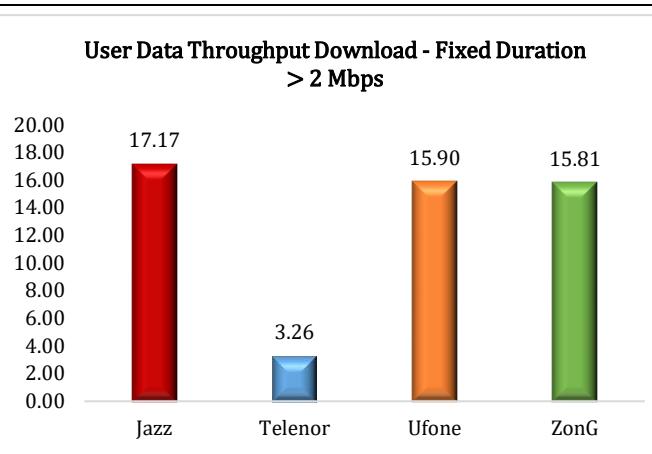
QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – PINDI BHATIAN TO MULTAN



QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – MULTAN TO SUKKUR

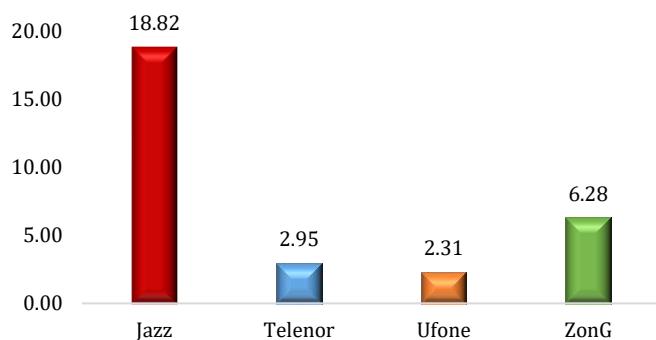


QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – NOWSHERA TO CHITRAL

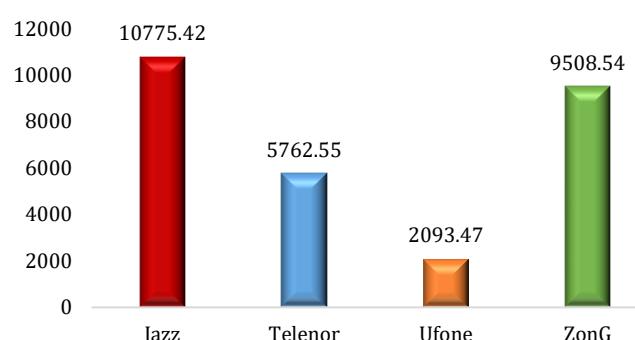


QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – SWABI TO KATLANG

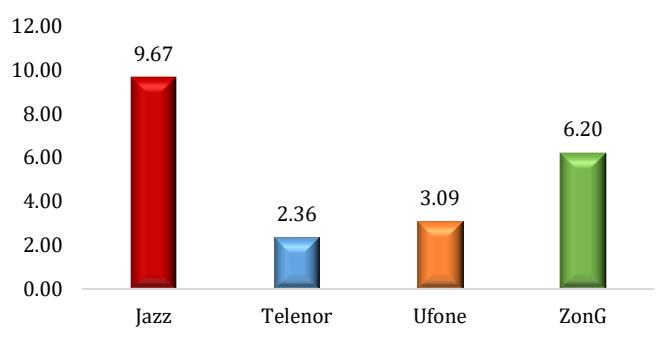
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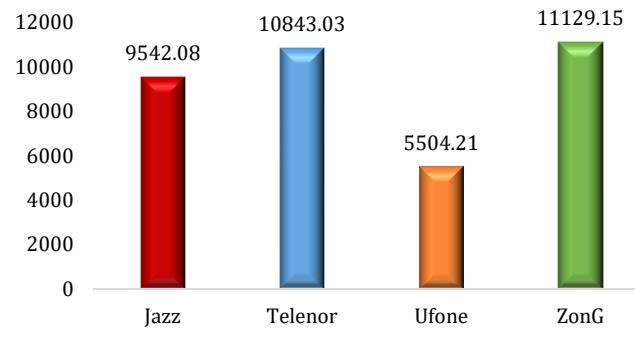
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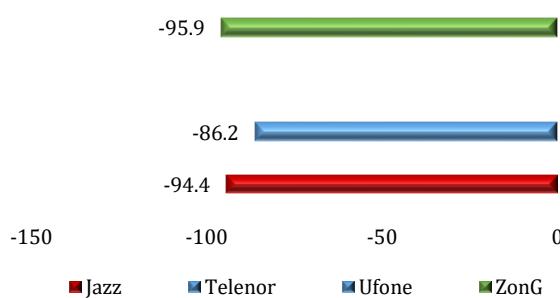
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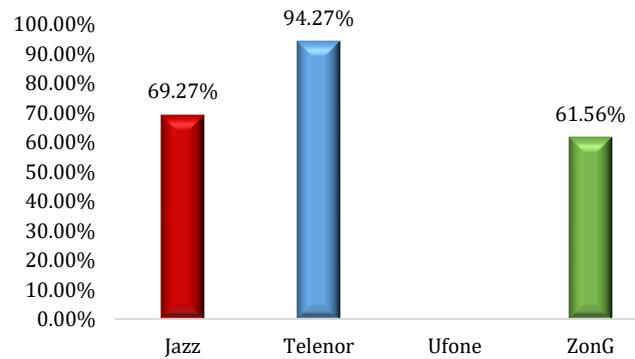
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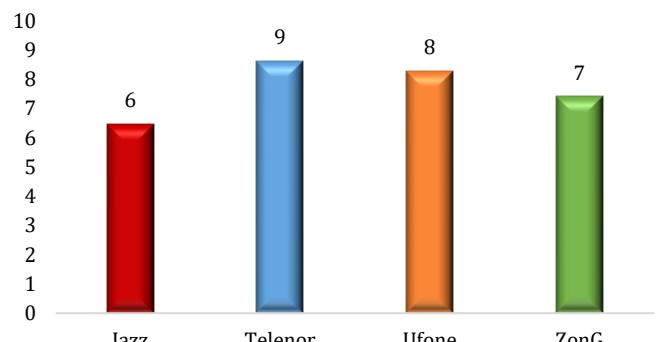
Signal Strength (RSRP) > -100dBm



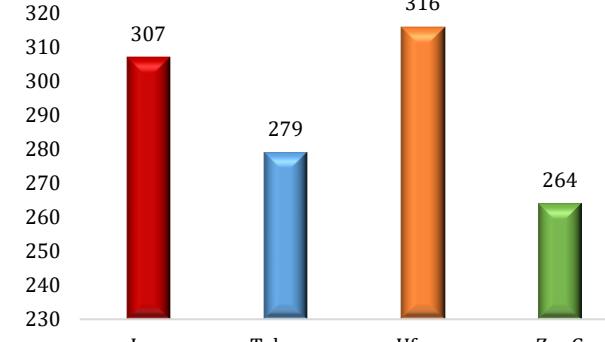
Signal Strength (RSRP) Confidence Level > 90%



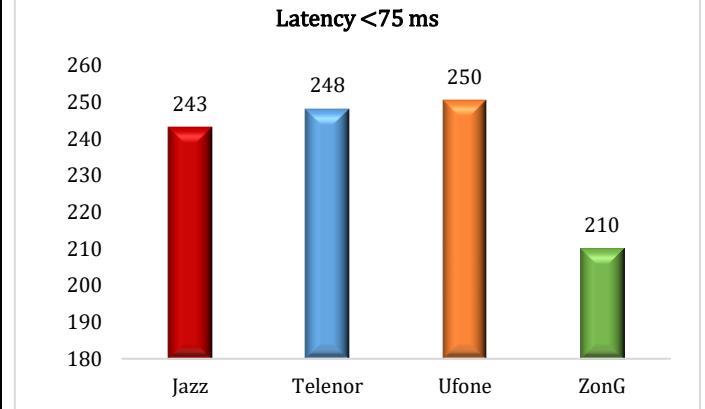
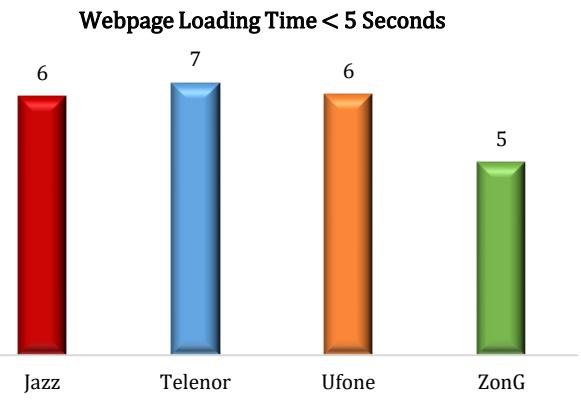
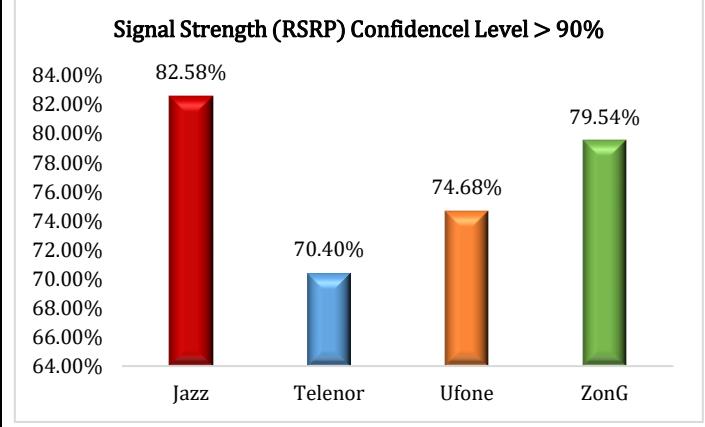
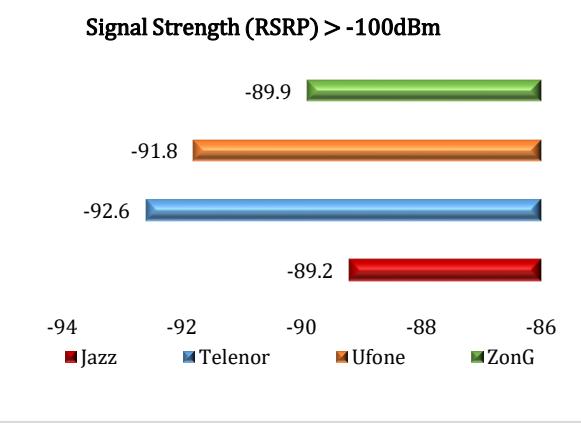
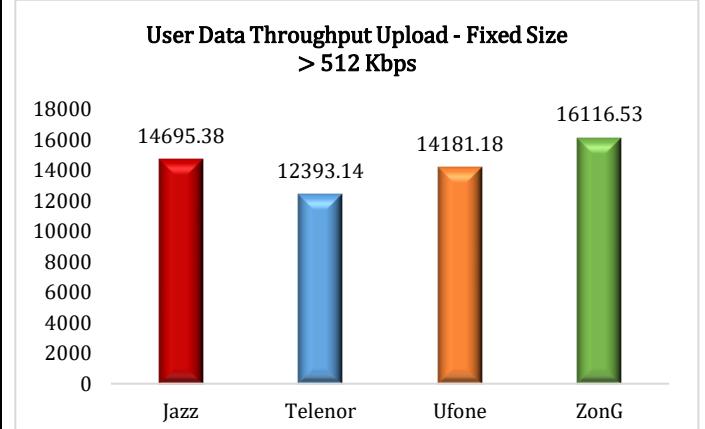
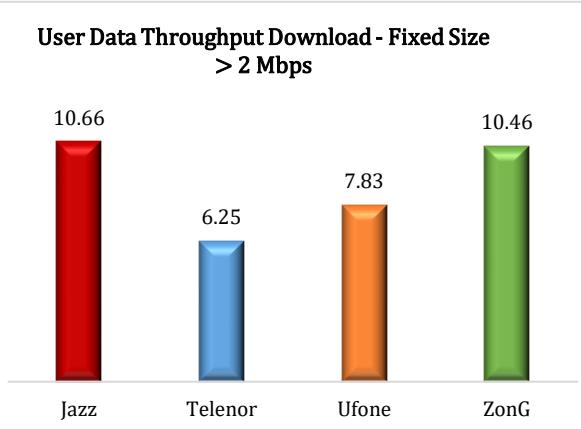
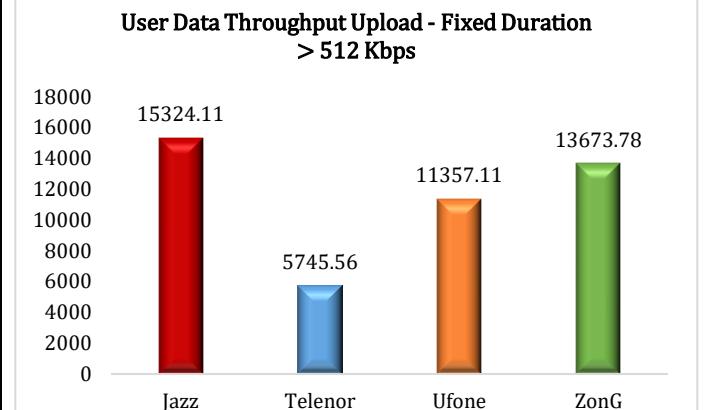
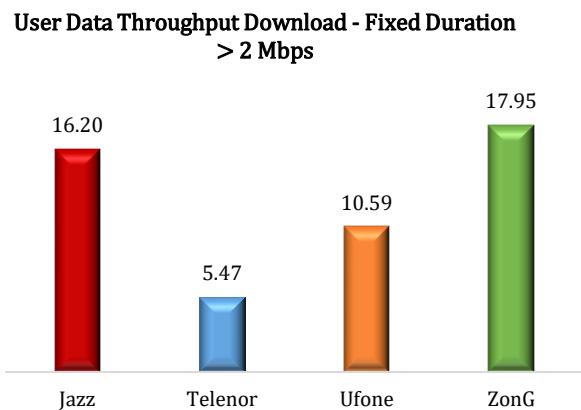
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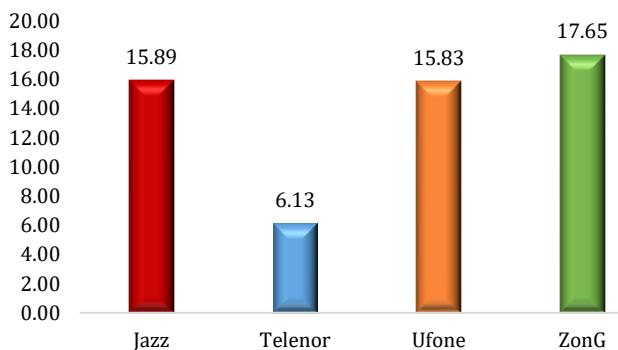


QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – ISLAMABAD TO KOHALA



QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – ISLAMABAD TO PESHAWAR

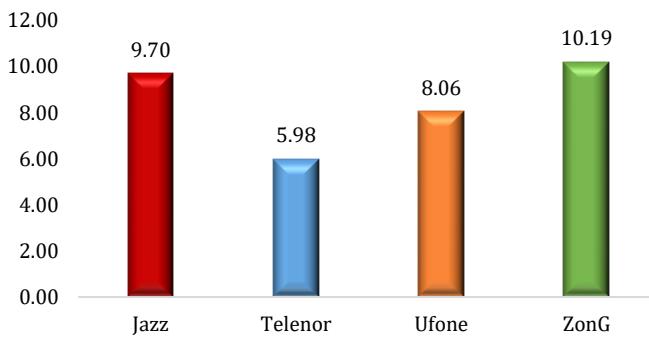
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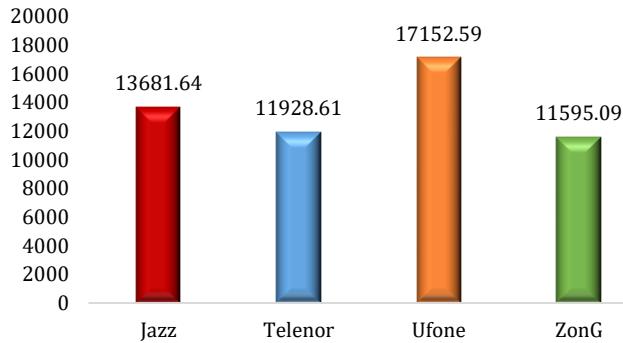
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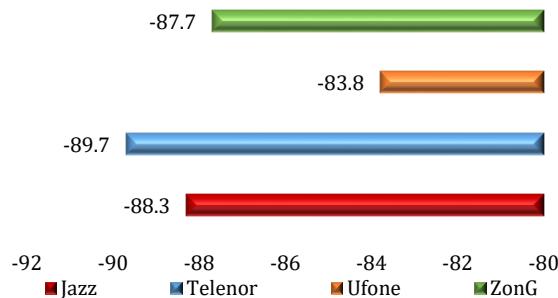
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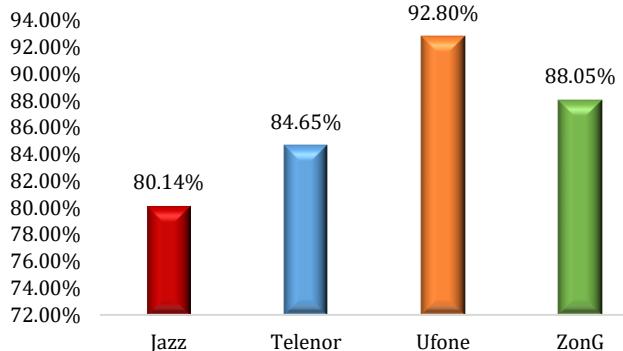
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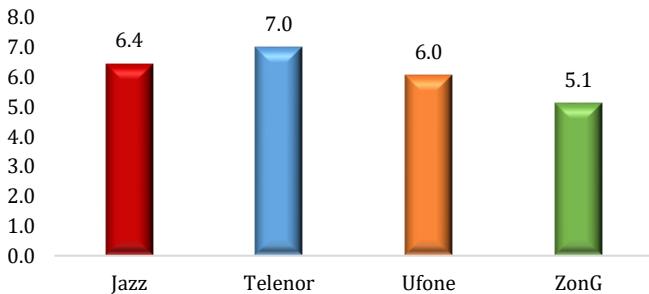
Signal Strength (RSRP) > -100dBm



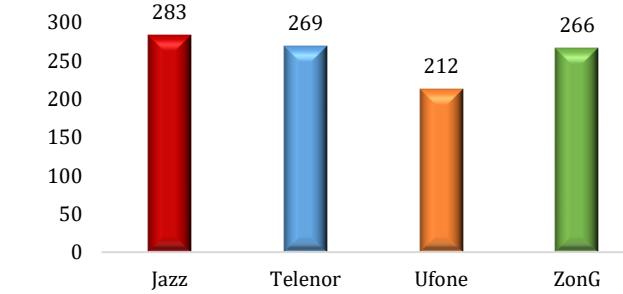
Signal Strength (RSRP) Confidence Level > 90%



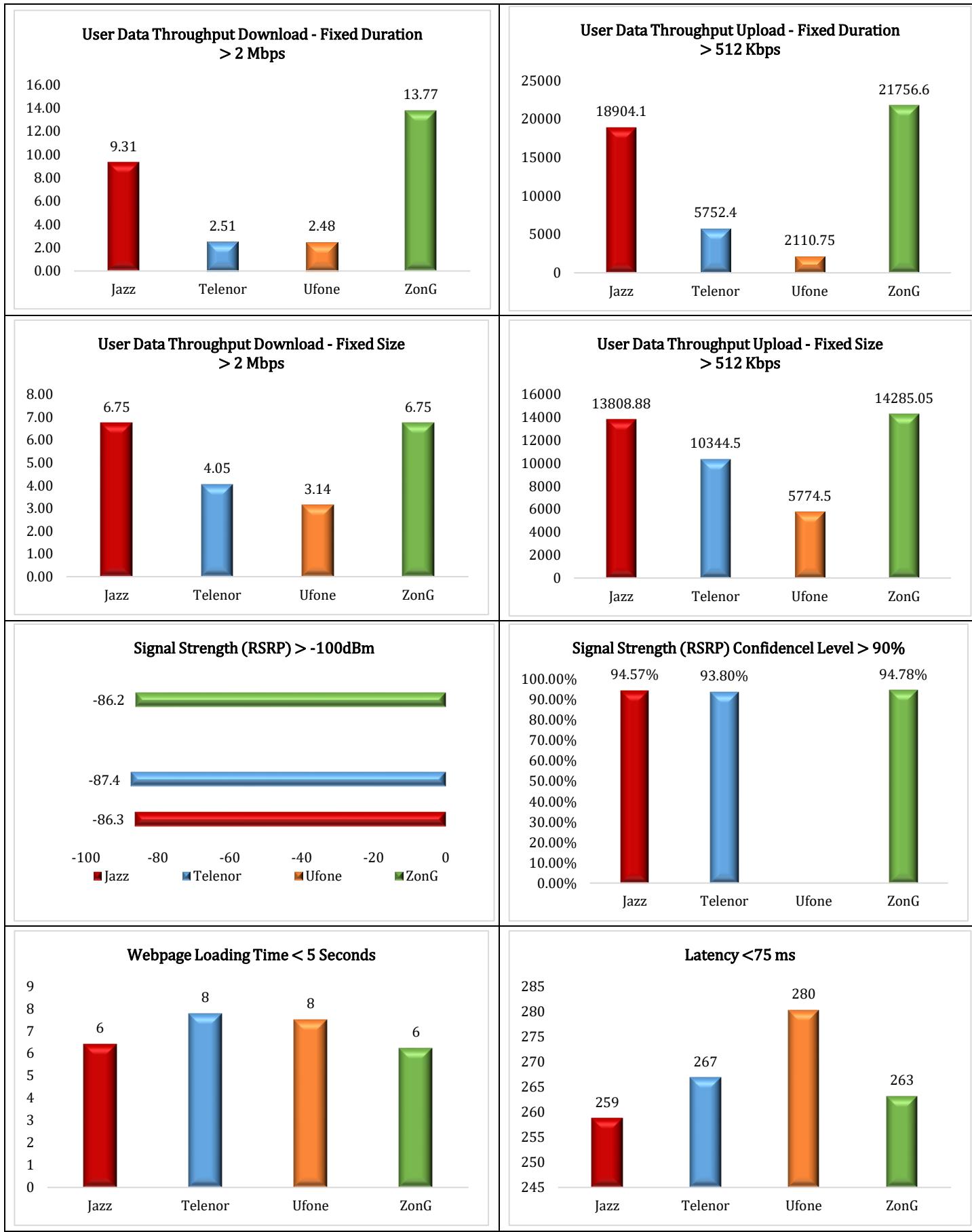
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Latency <75 ms

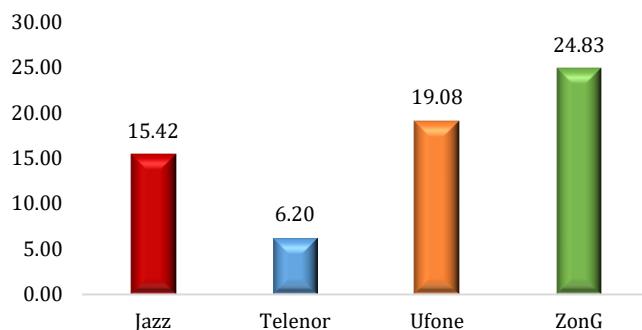


QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – LAHORE TO ABDUL HAKEEM

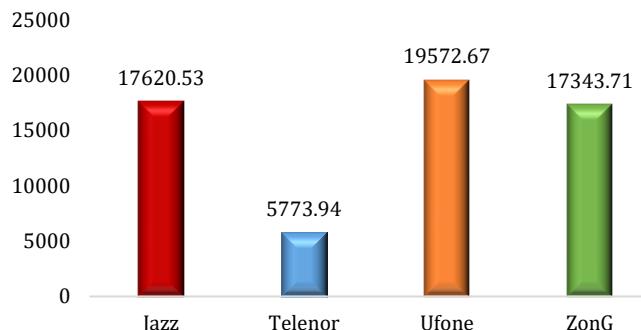


QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – LAHORE TO ISLAMABAD

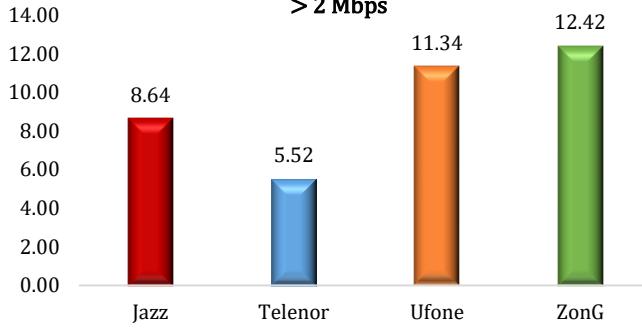
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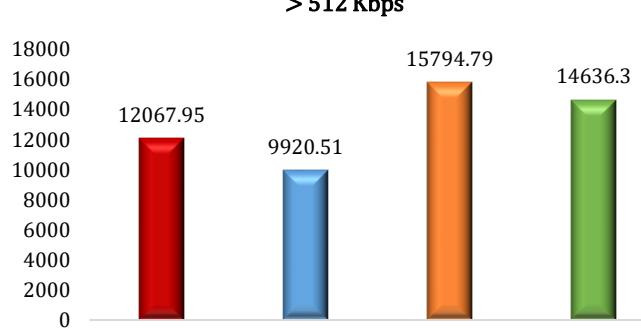
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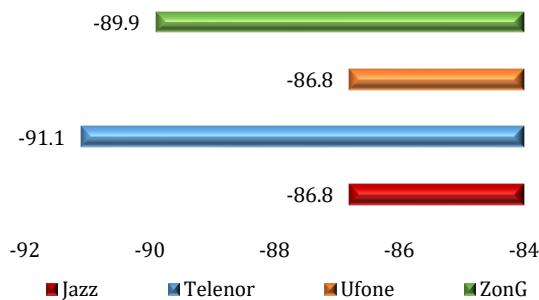
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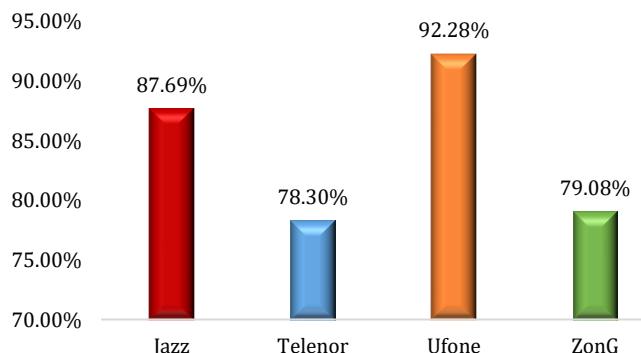
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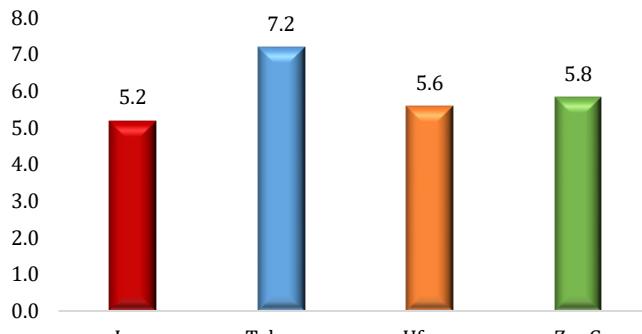
Signal Strength (RSRP) > -100dBm



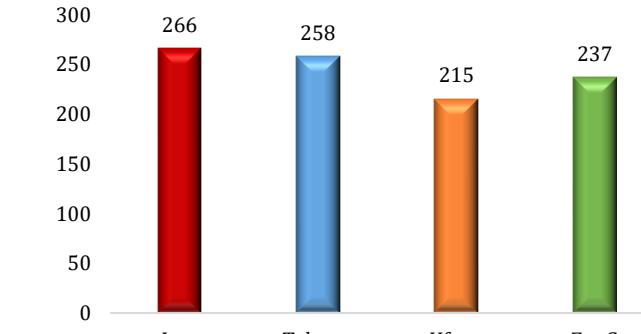
Signal Strength (RSRP) Confidence Level > 90%



Webpage Loading Time < 5 Seconds

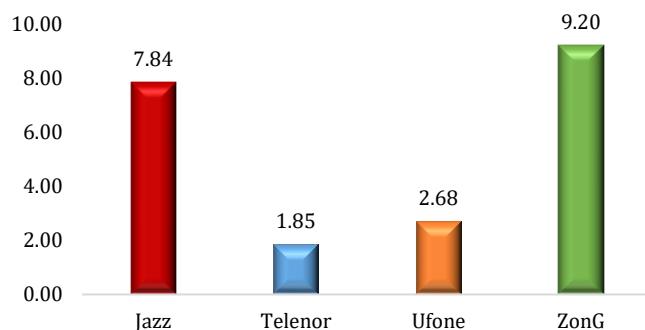


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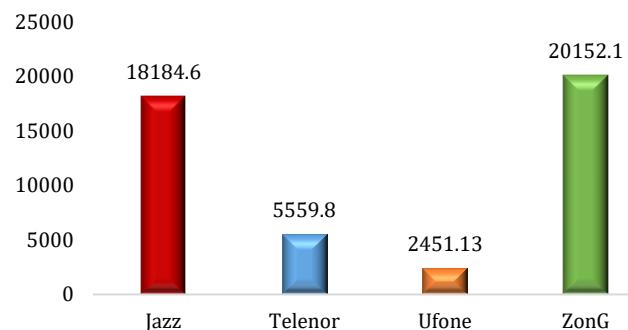


QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – LAHORE TO SIALKOT

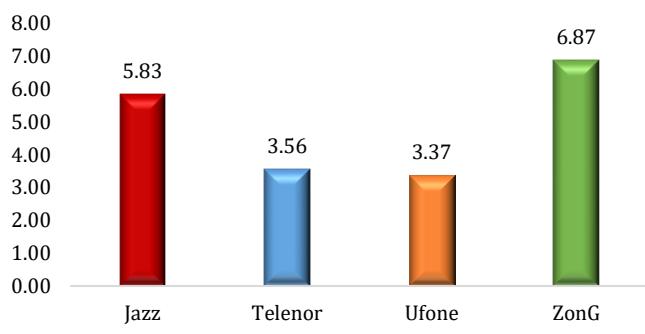
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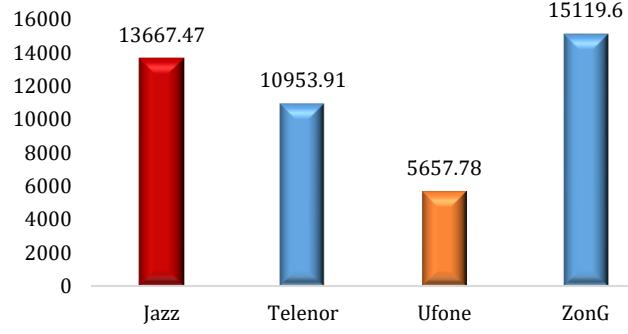
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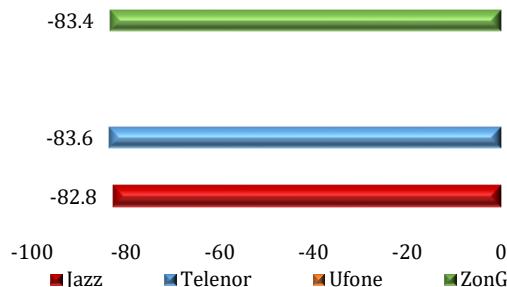
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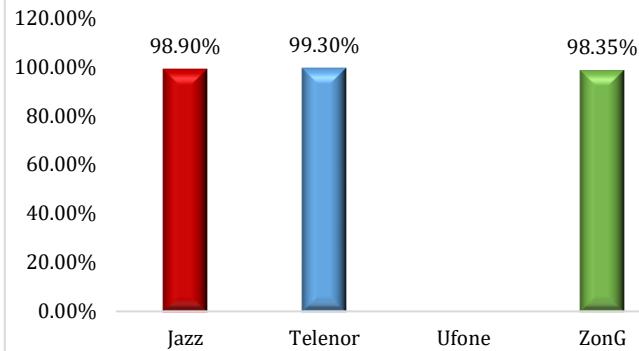
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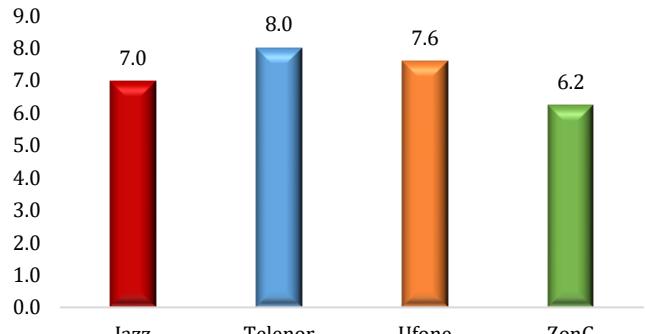
Signal Strength (RSRP) > -100dBm



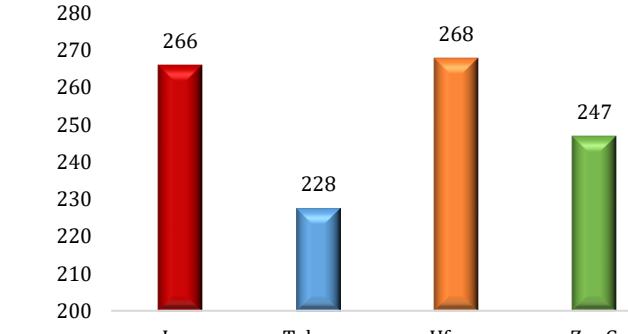
Signal Strength (RSRP) Confidence Level > 90%



Webpage Loading Time < 5 Seconds



Latency <75 ms

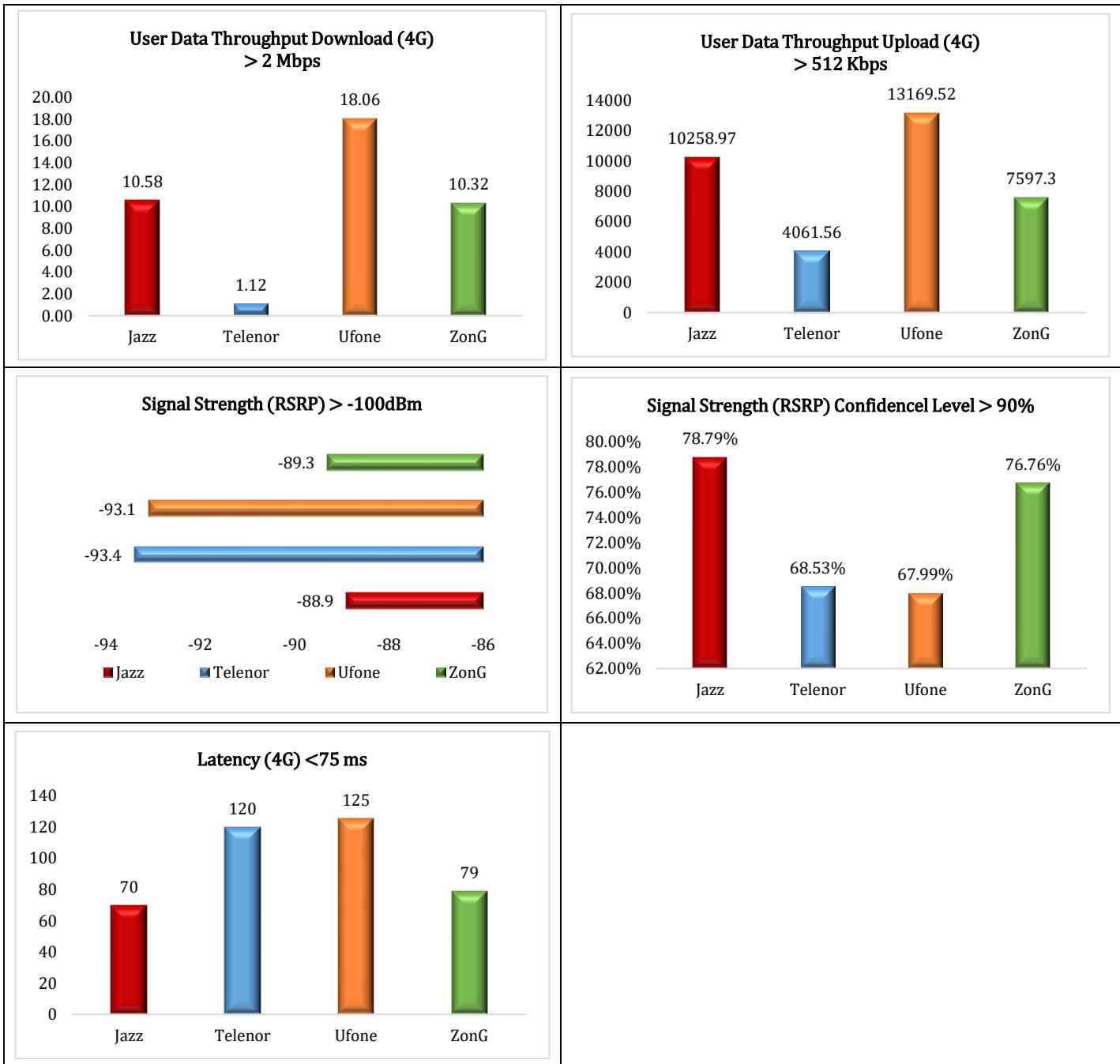


QUALITY OF SERVICE SURVEY RESULTS (AUTOMODE) – RAWALPINDI TO TORKHUM

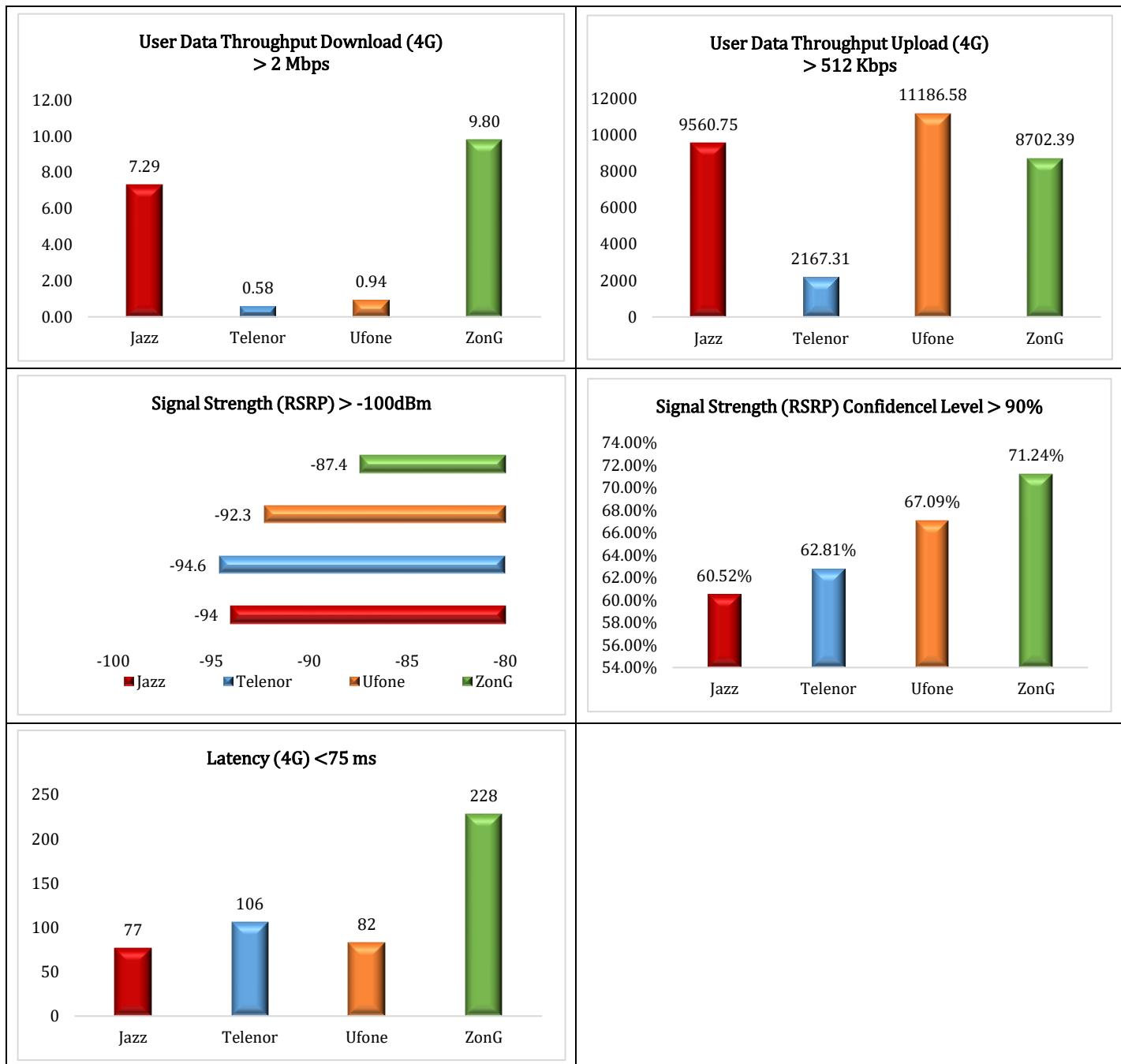


QUALITY OF SERVICE SURVEY RESULTS (4G)

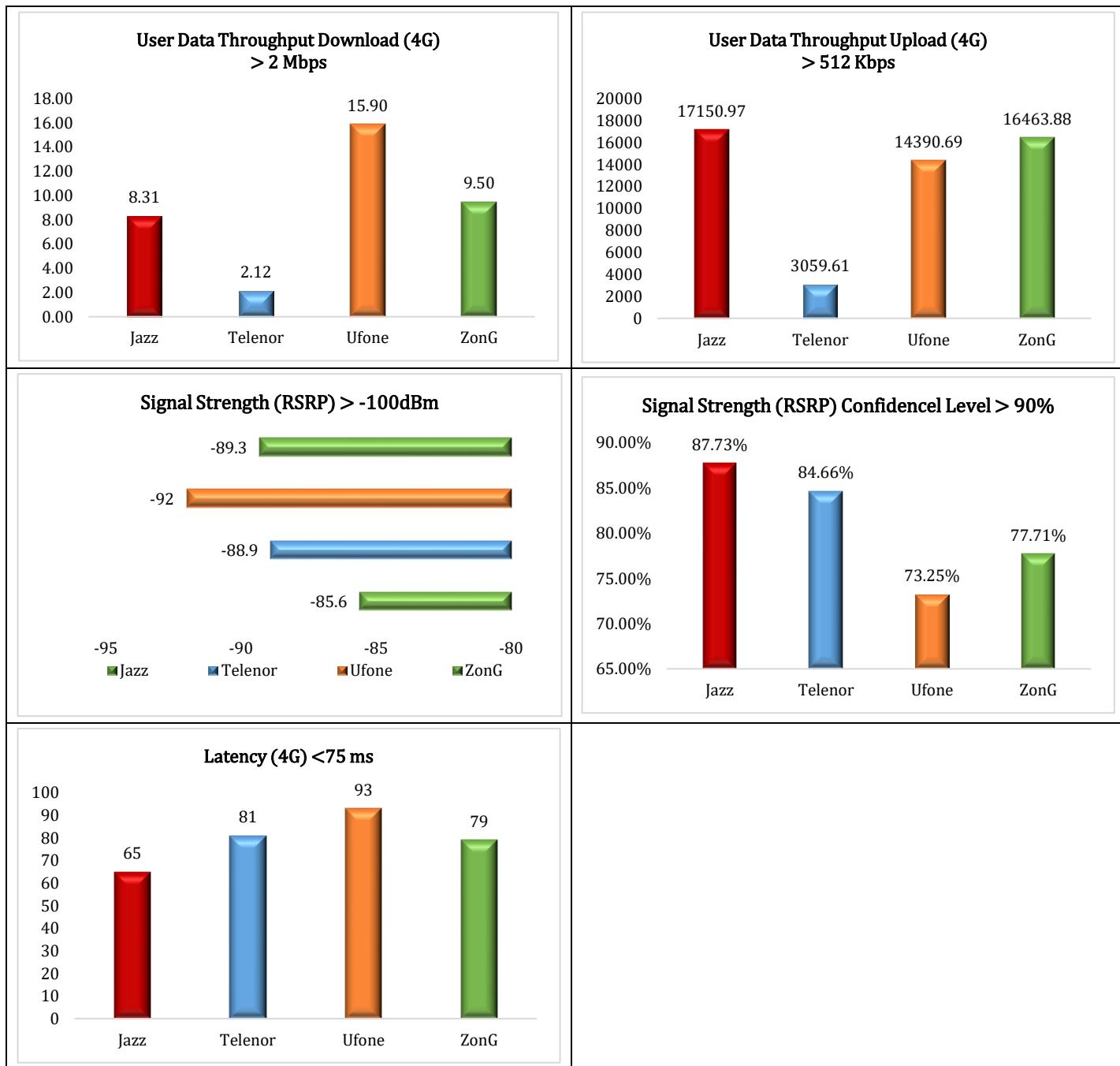
QUALITY OF SERVICE SURVEY RESULTS (4G) – HAZARA MOTORWAY



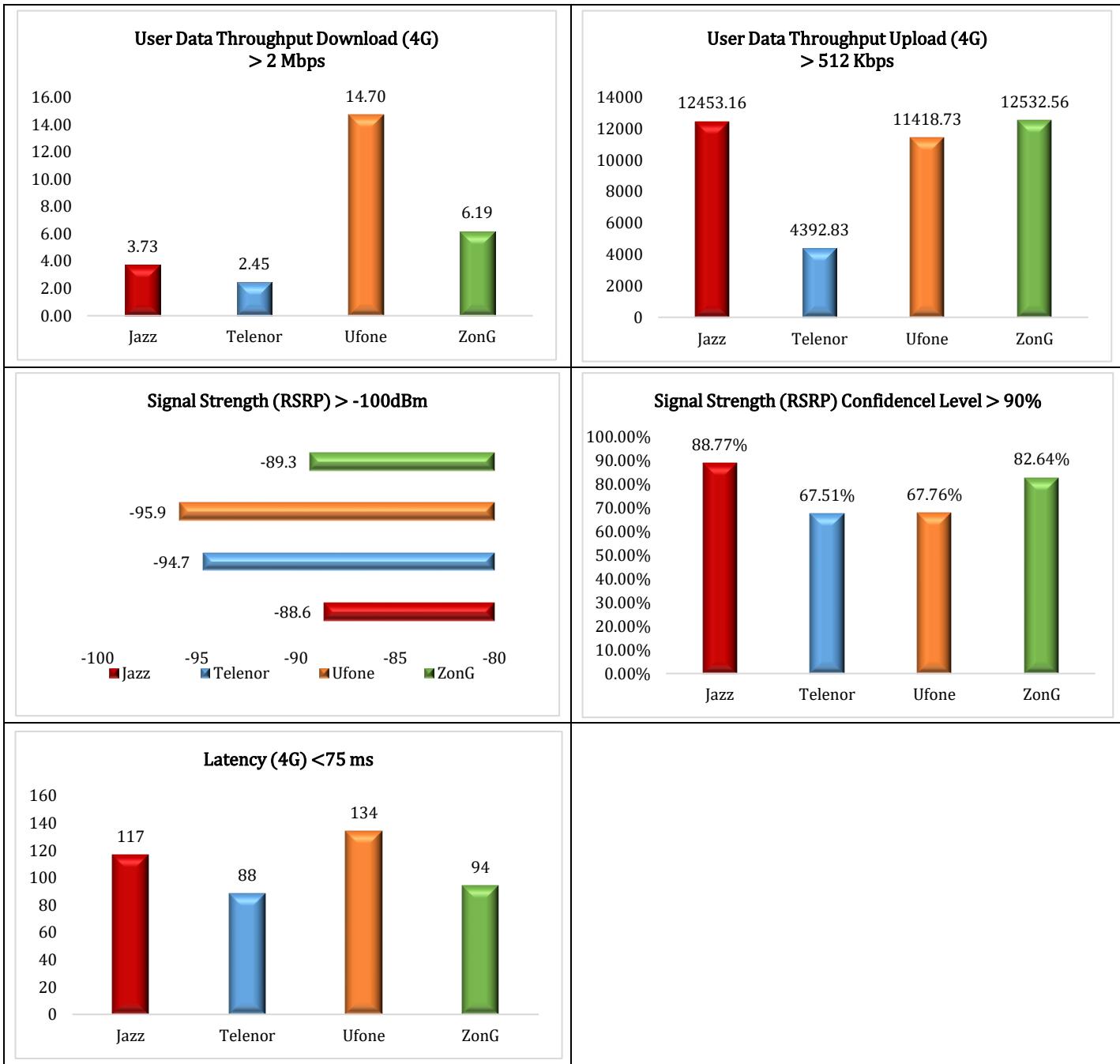
QUALITY OF SERVICE SURVEY RESULTS (4G) – HARIPUR TO TAXILA



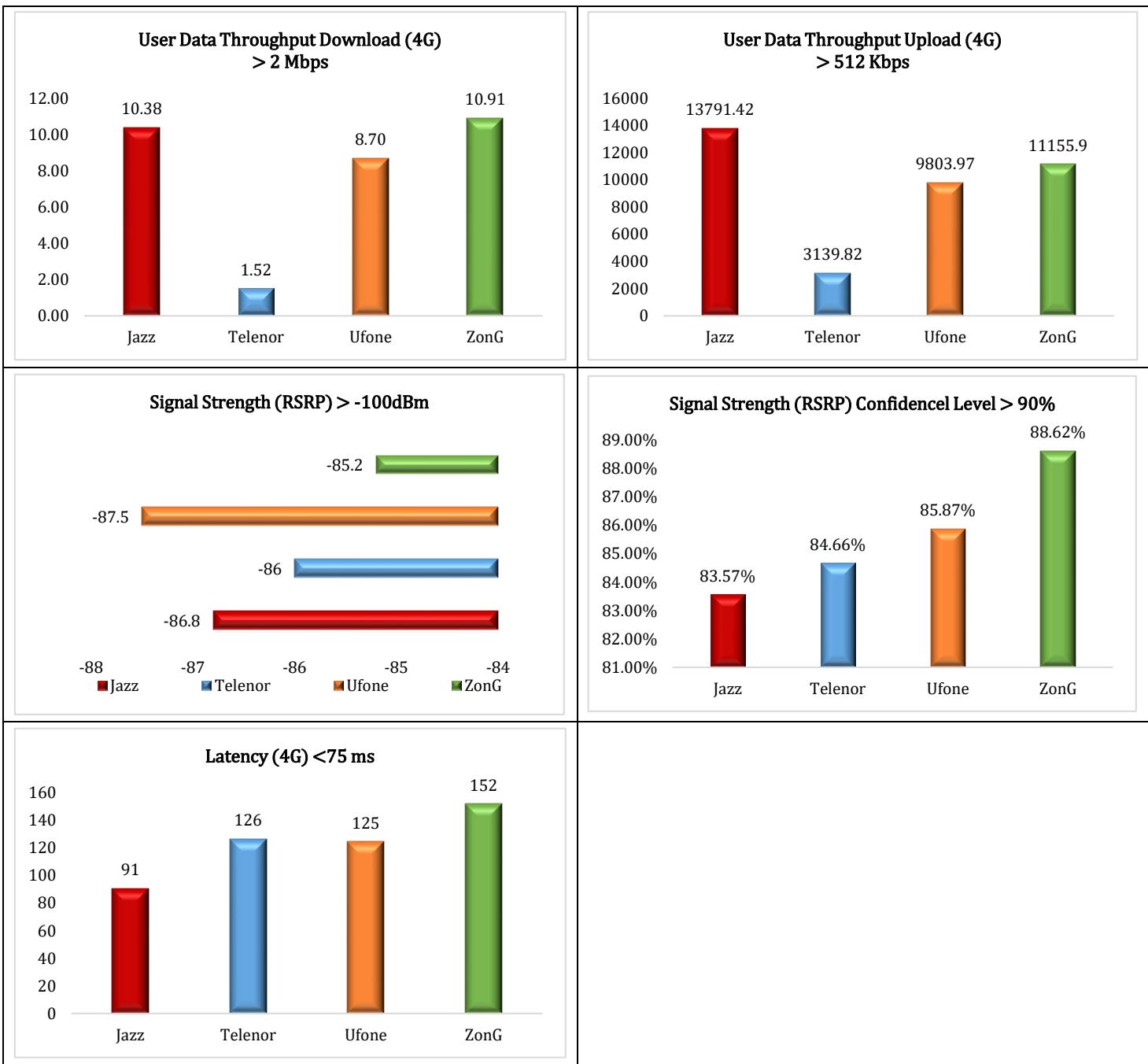
QUALITY OF SERVICE SURVEY RESULTS (4G) – PINDI BHATIAN TO MULTAN



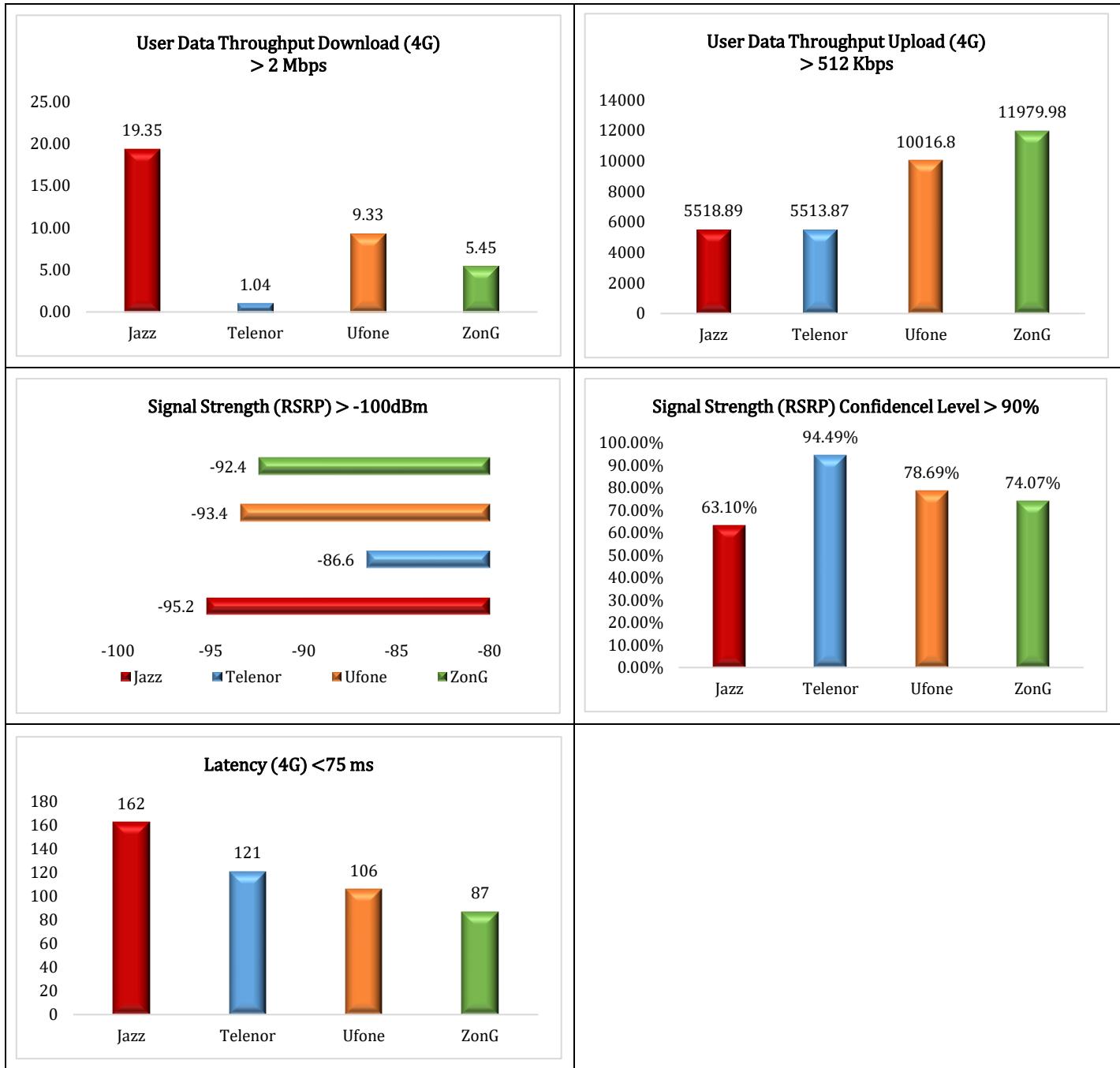
QUALITY OF SERVICE SURVEY RESULTS (4G) – MULTAN TO SUKKUR



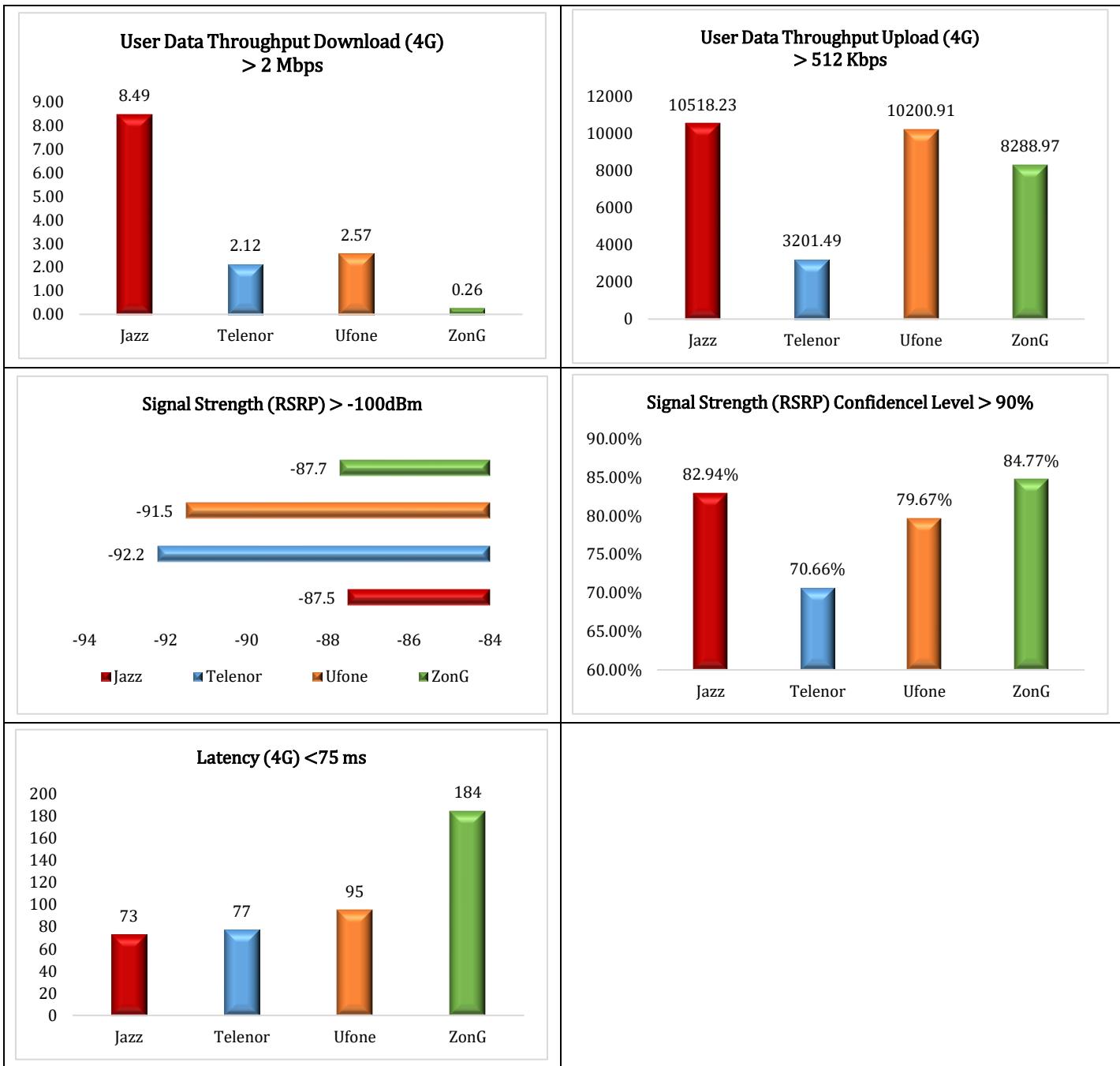
QUALITY OF SERVICE SURVEY RESULTS (4G) – NOWSHERA TO CHITRAL



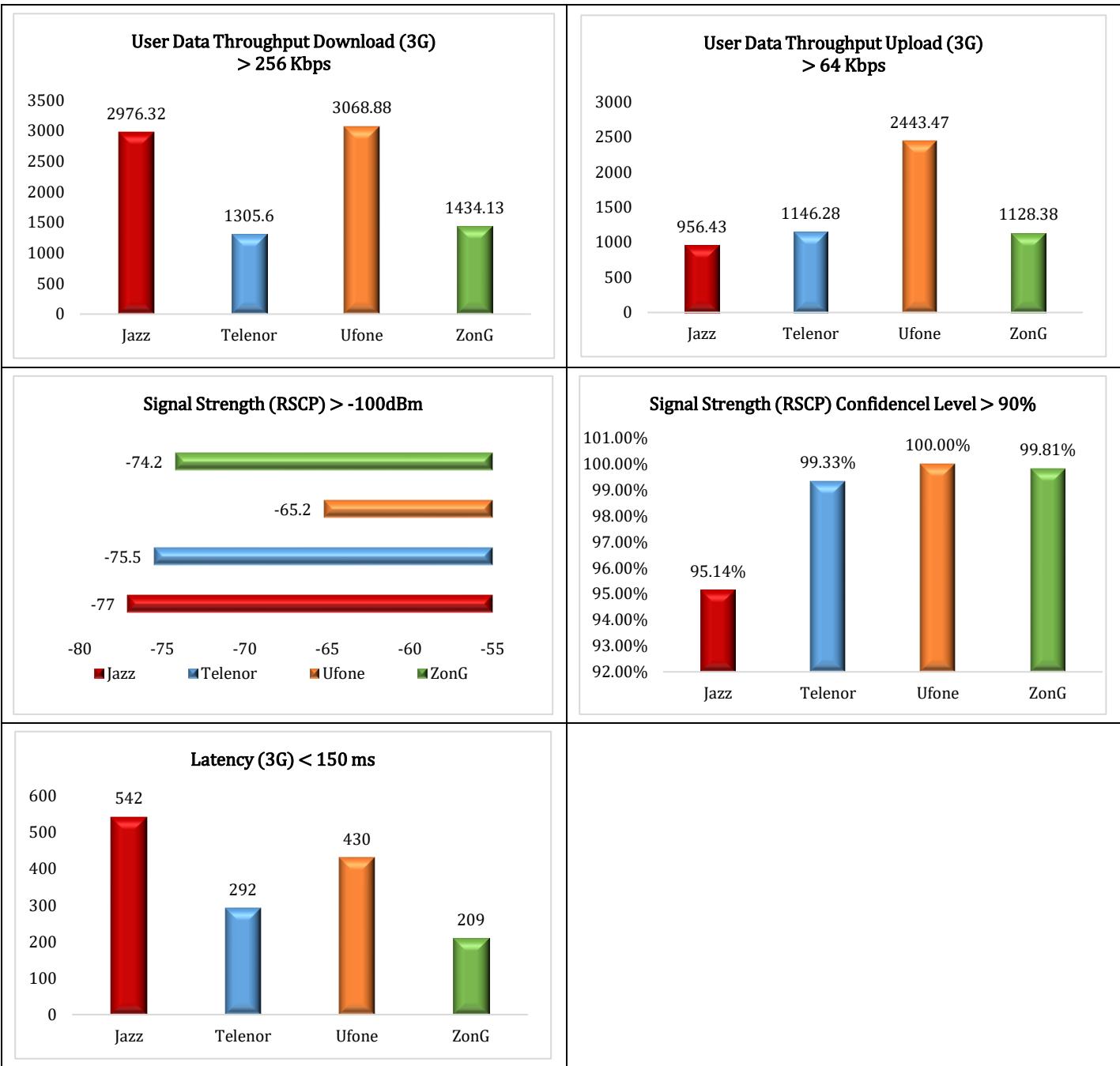
QUALITY OF SERVICE SURVEY RESULTS (4G) – SWABI TO KATLANG



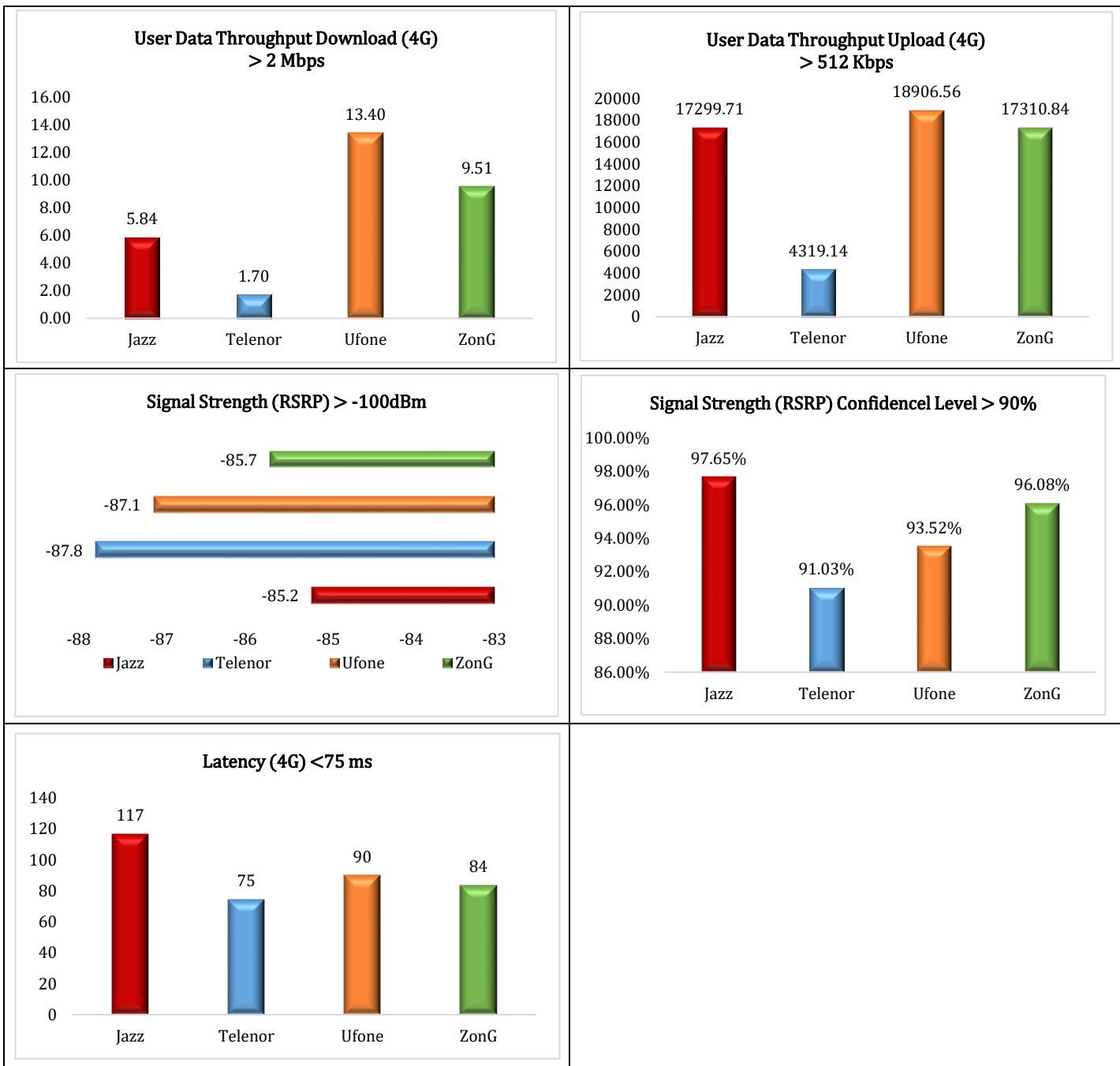
QUALITY OF SERVICE SURVEY RESULTS (4G) – ISLAMABAD TO KOHALA



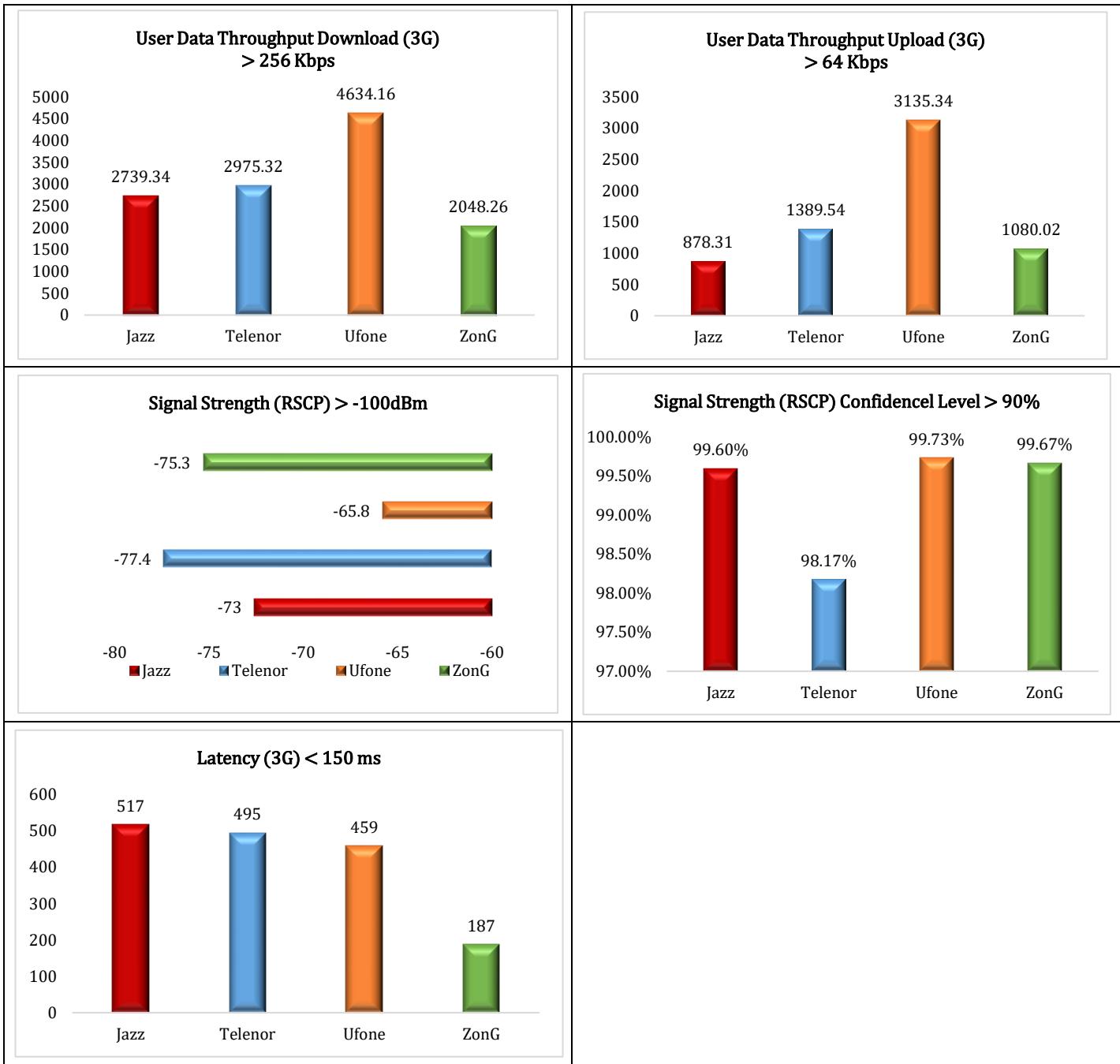
QUALITY OF SERVICE SURVEY RESULTS (4G) – ISLAMABAD TO PESHAWAR



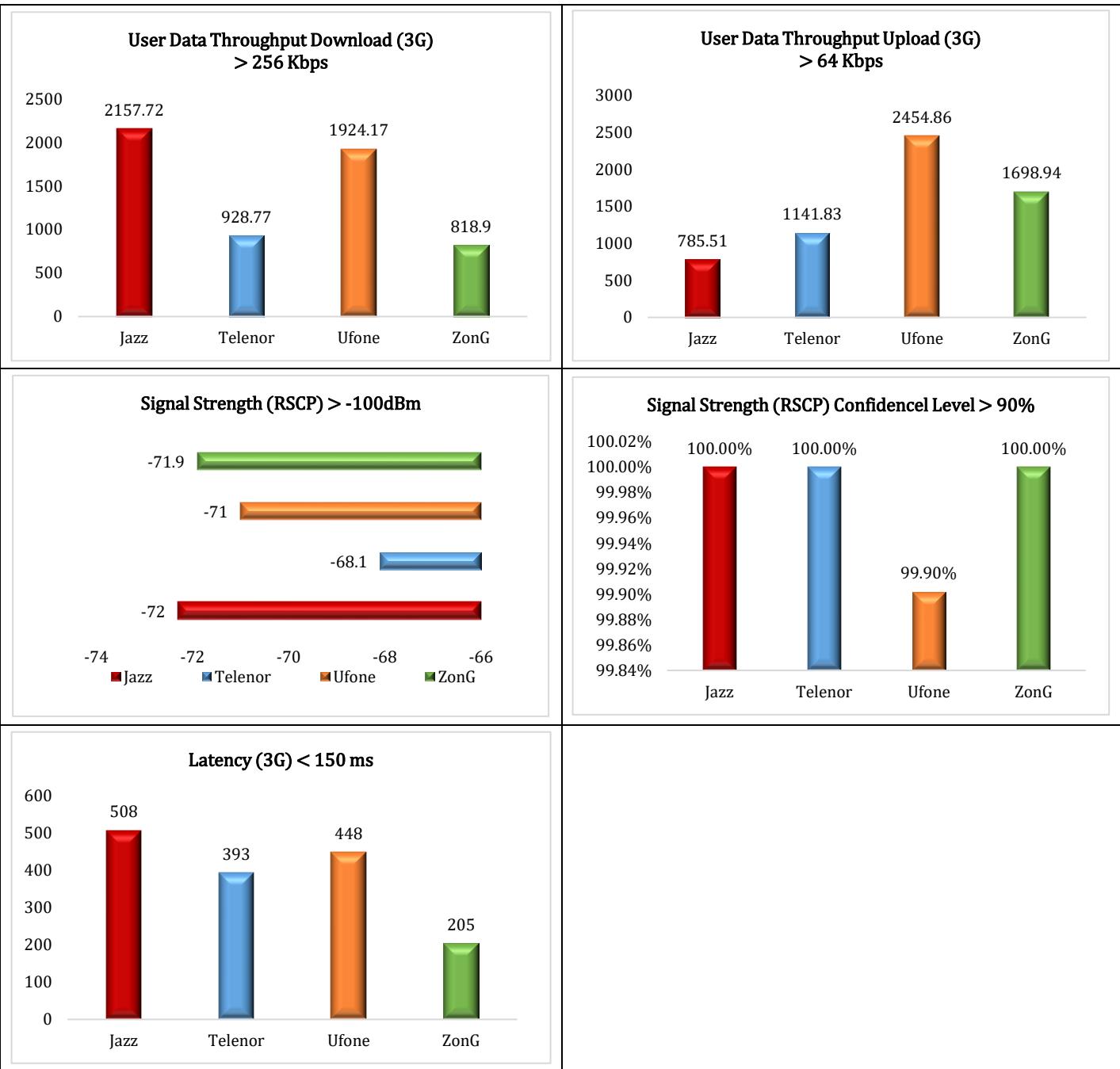
QUALITY OF SERVICE SURVEY RESULTS (4G) – LAHORE TO ABDUL HAKEEM



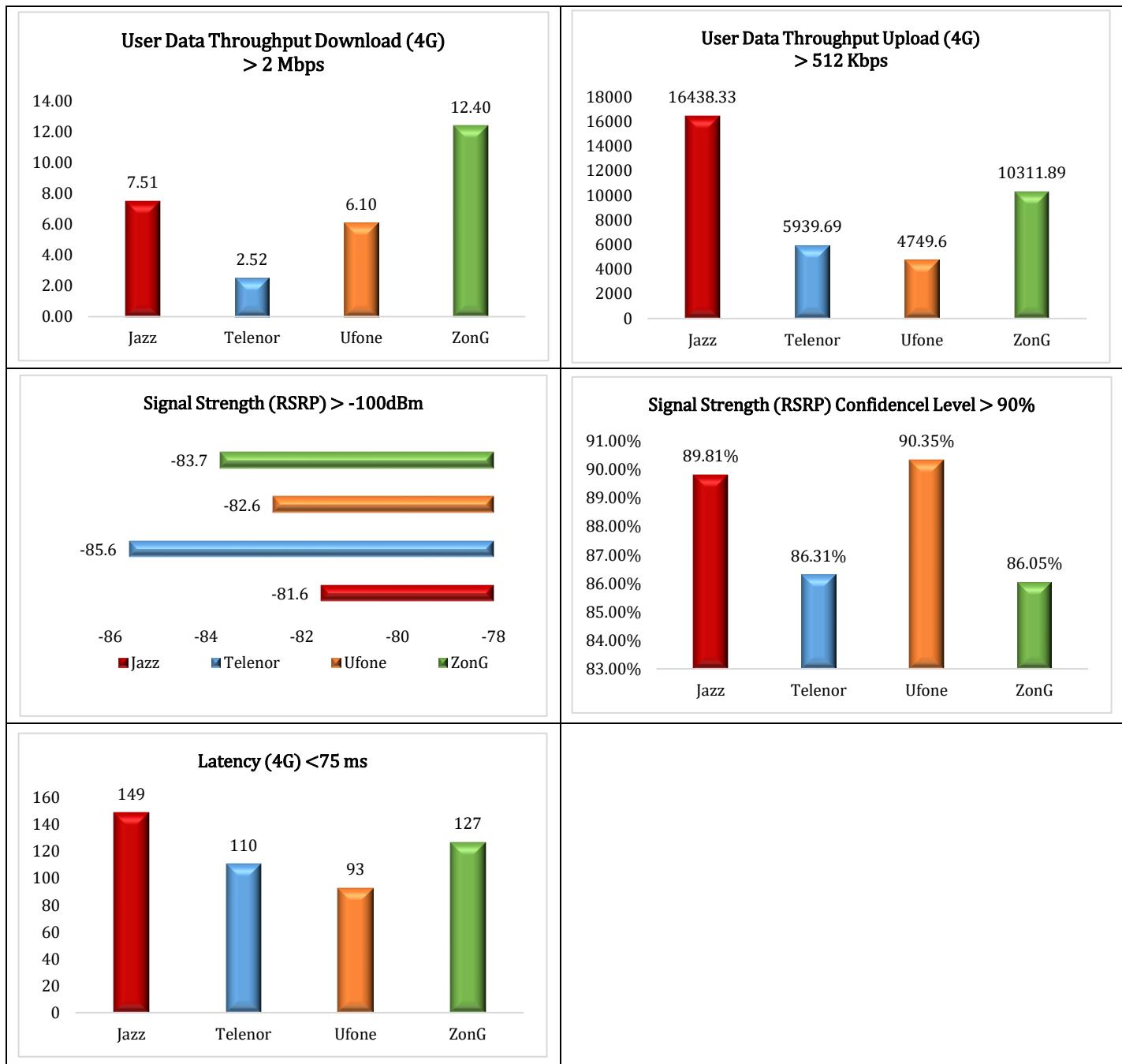
QUALITY OF SERVICE SURVEY RESULTS (4G) – LAHORE TO ISLAMABAD



QUALITY OF SERVICE SURVEY RESULTS (4G) – LAHORE TO SIALKOT



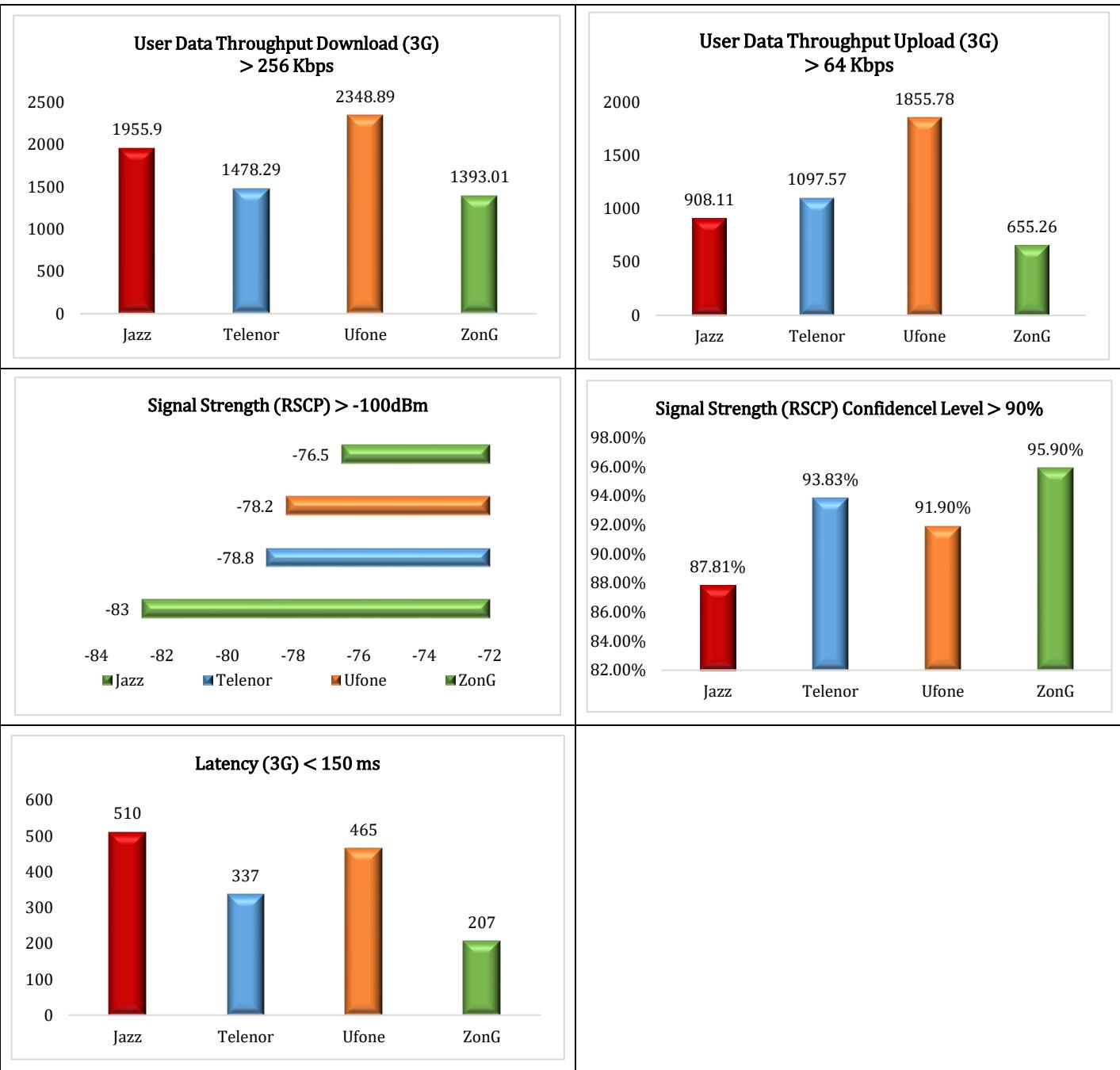
QUALITY OF SERVICE SURVEY RESULTS (4G) – RAWALPINDI TO TORKHUM



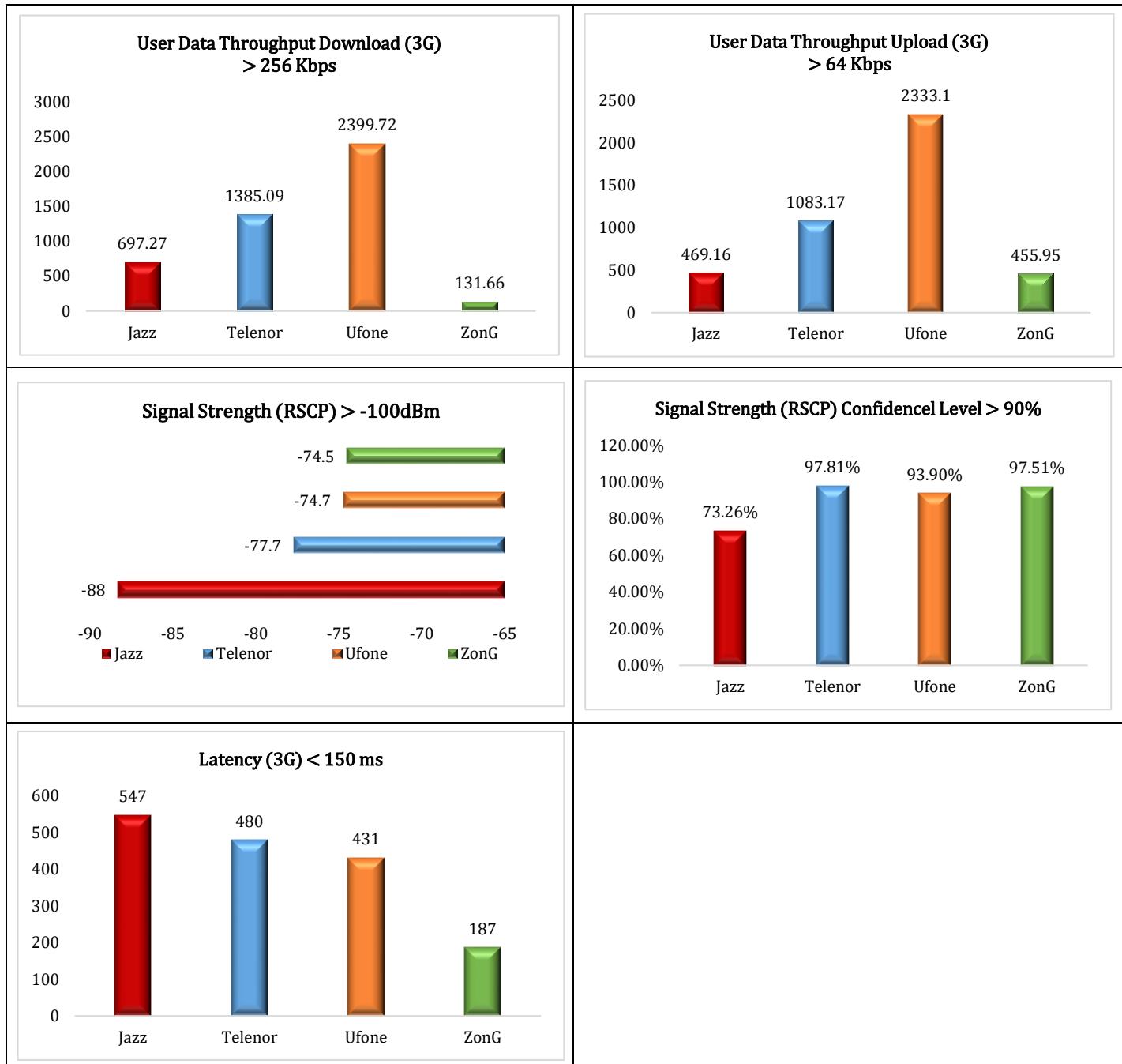
QUALITY OF SERVICE SURVEY RESULTS

(3G)

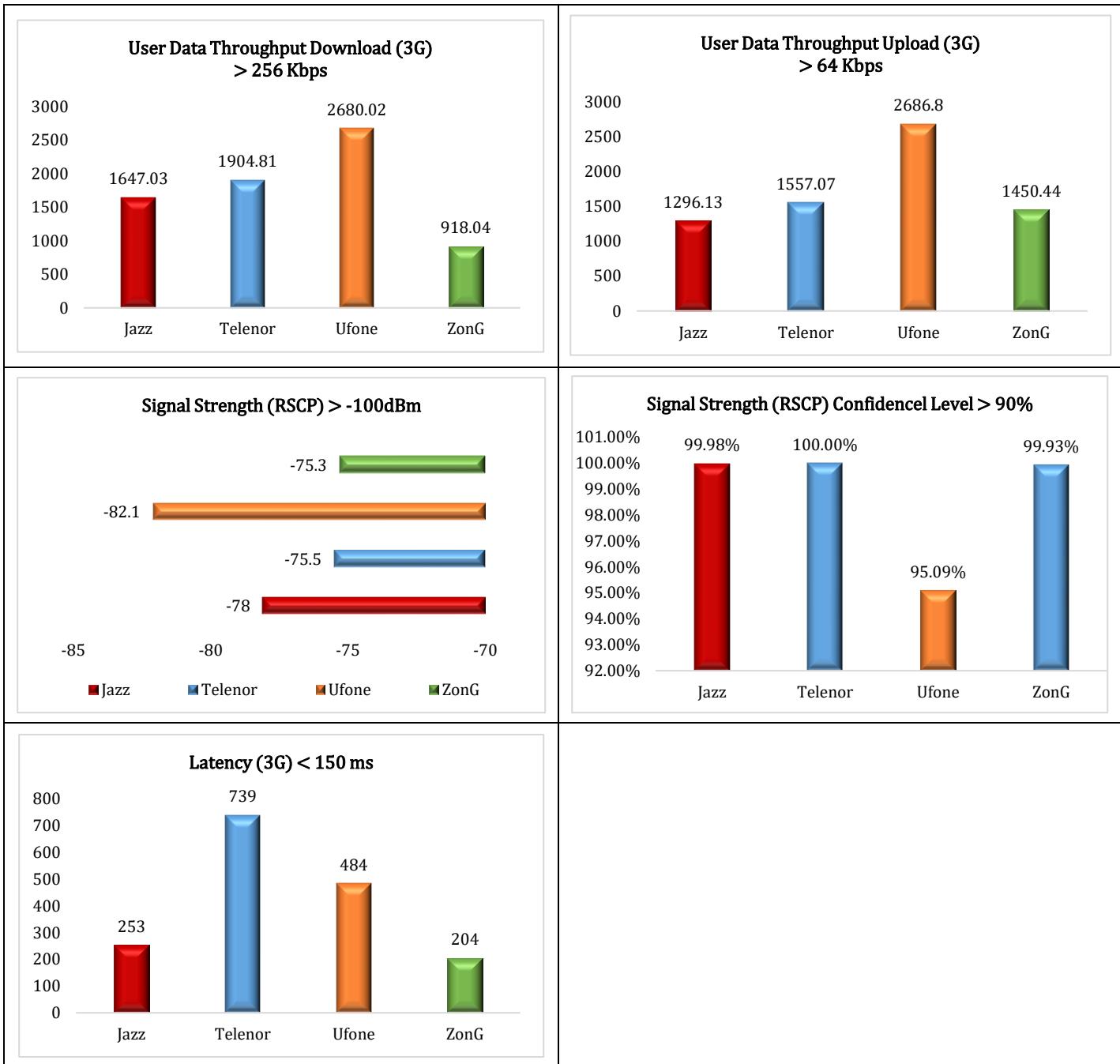
QUALITY OF SERVICE SURVEY RESULTS (3G) – HAZARA MOTORWAY



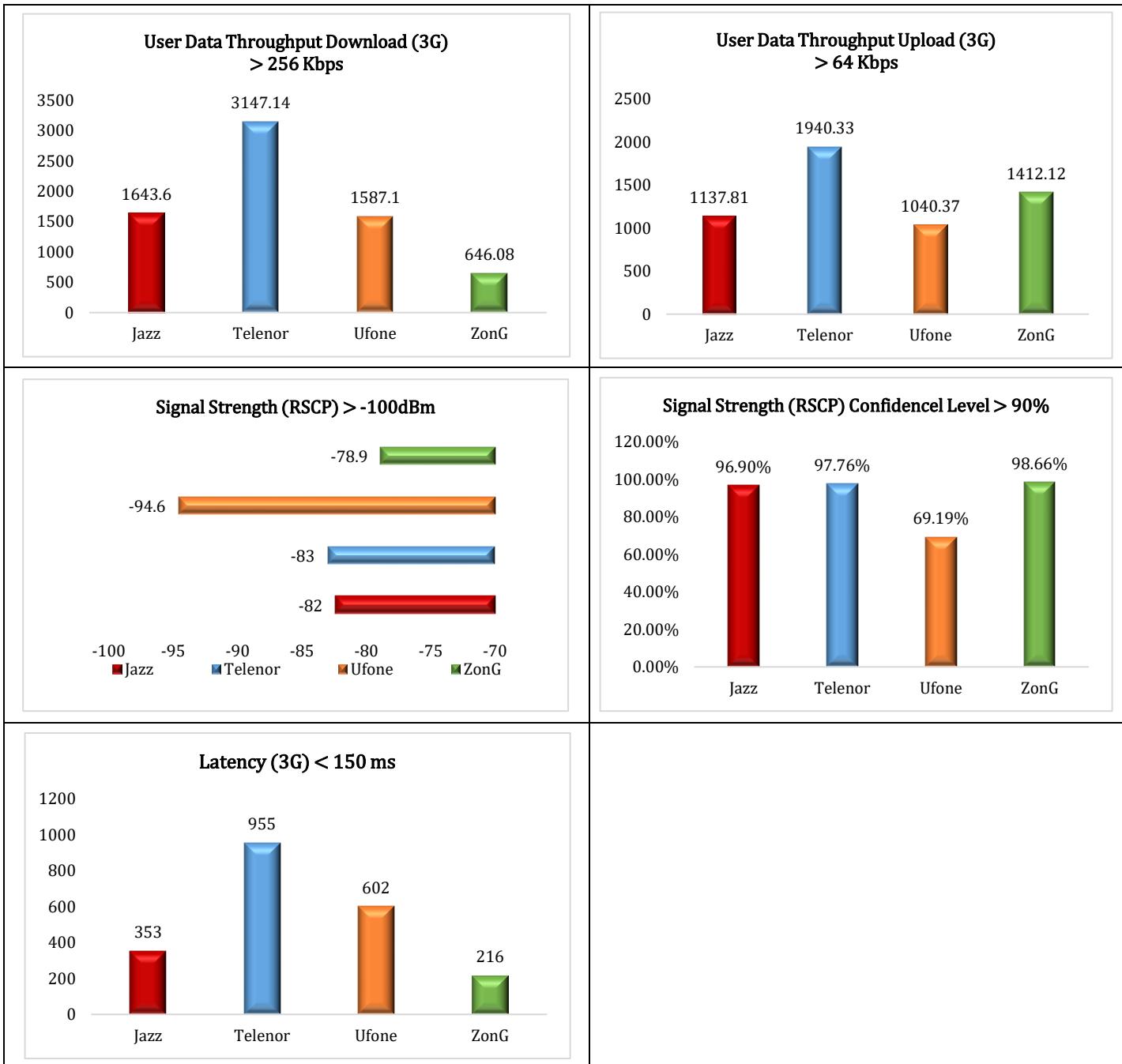
QUALITY OF SERVICE SURVEY RESULTS (3G) – HARIPUR TO TAXILA



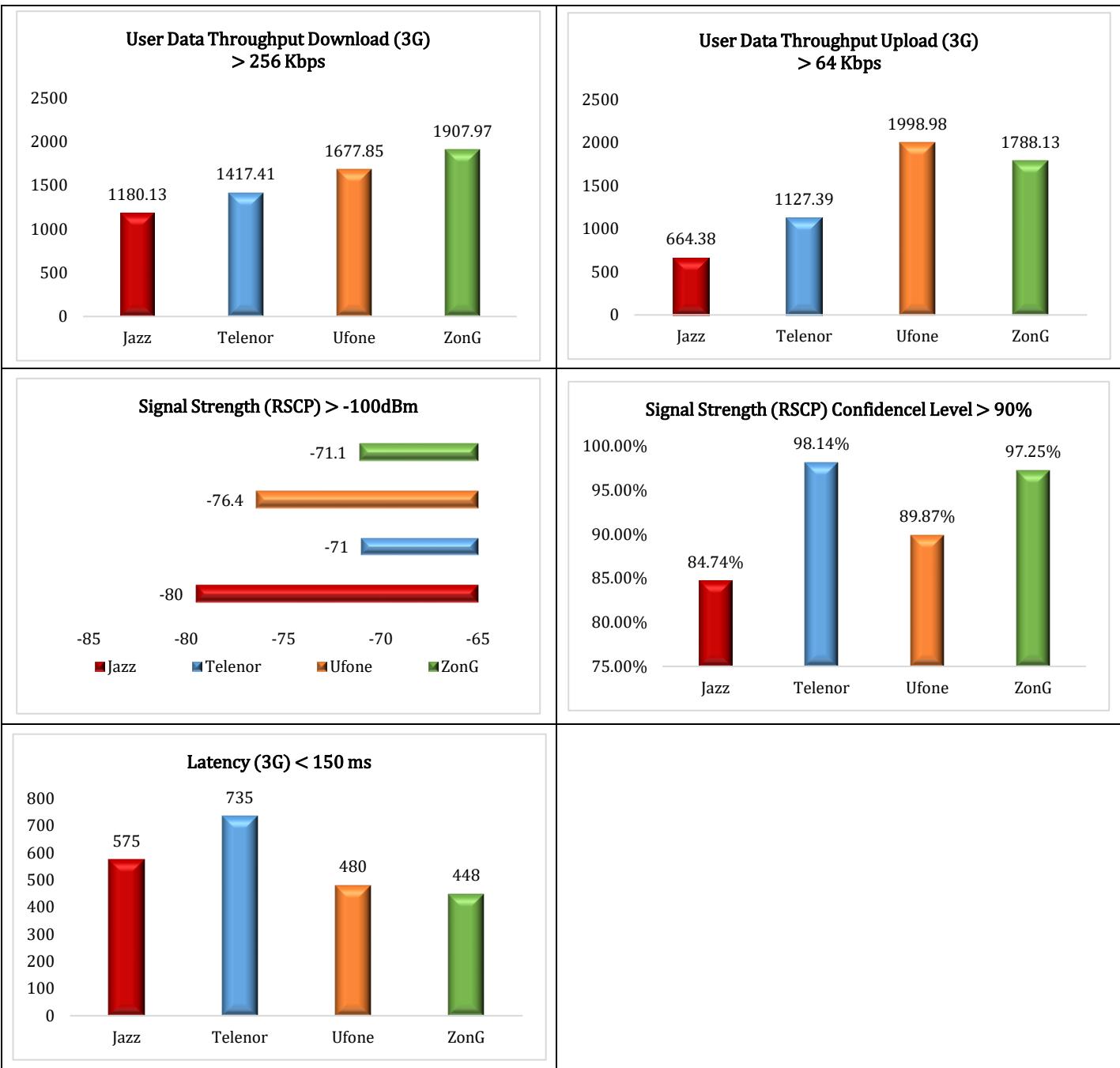
QUALITY OF SERVICE SURVEY RESULTS (3G) – PINDI BHATIAN TO MULTAN



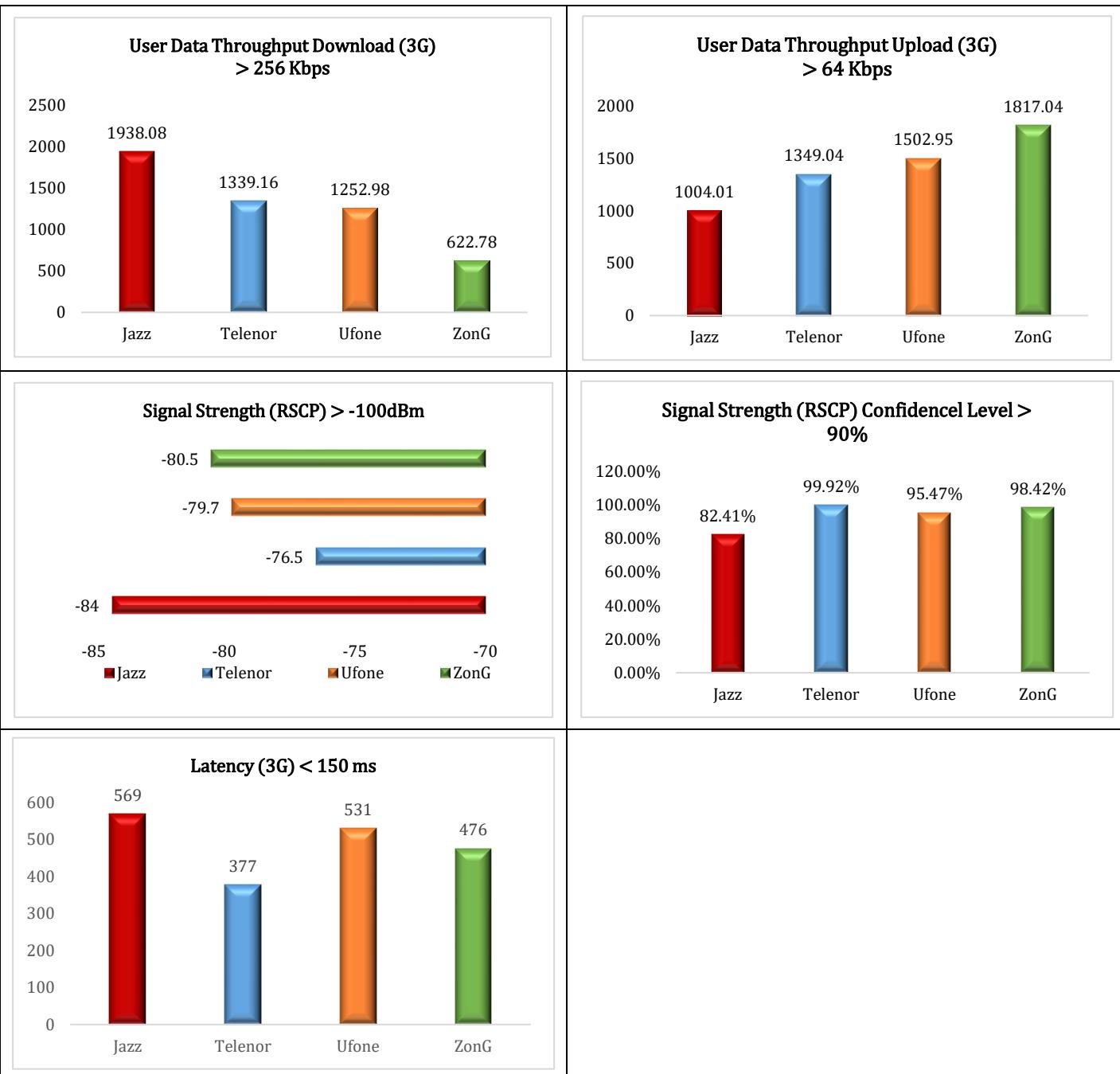
QUALITY OF SERVICE SURVEY RESULTS (3G) – MULTAN TO SUKKUR



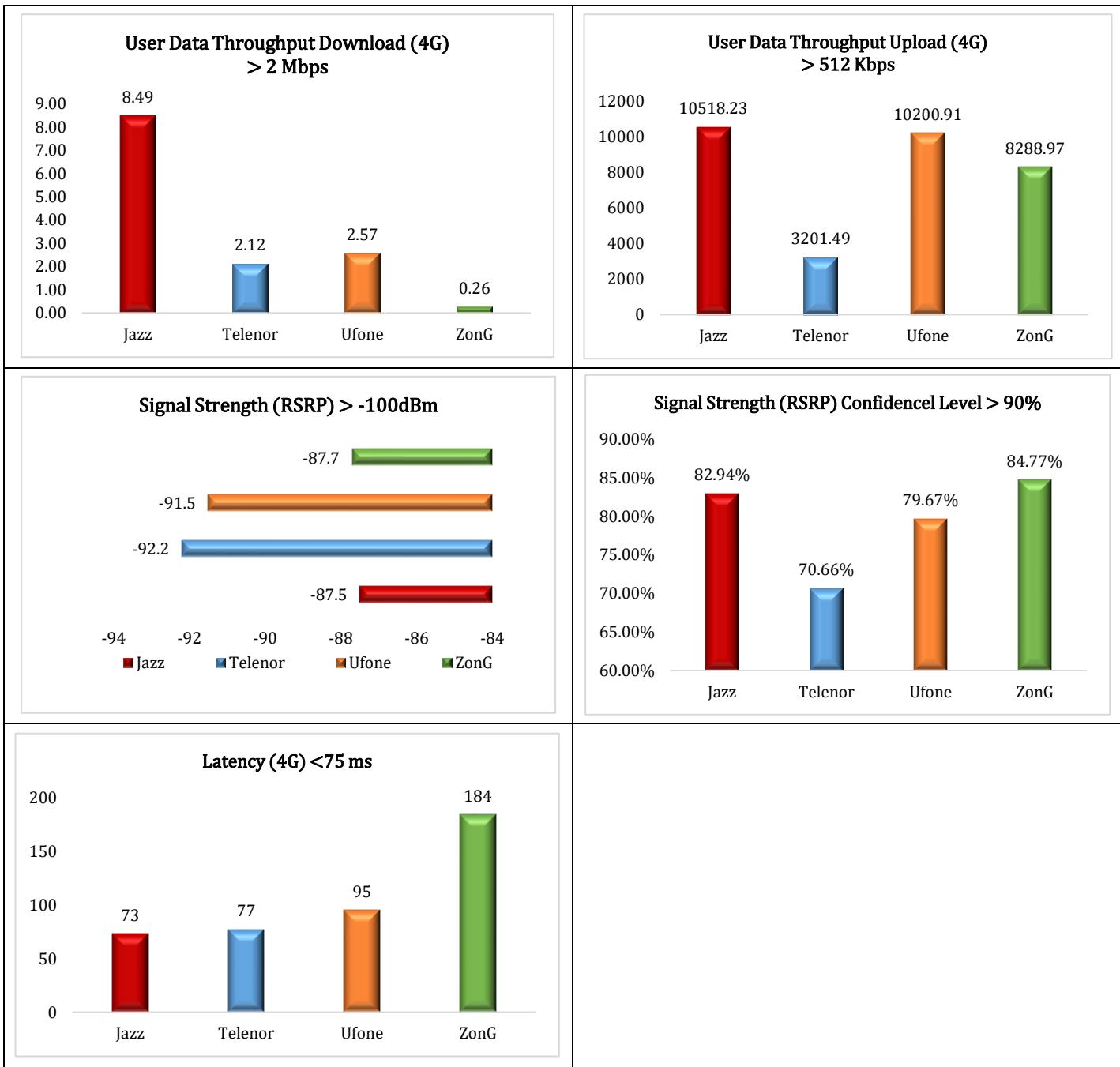
QUALITY OF SERVICE SURVEY RESULTS (3G) – NOWSHERA TO CHITRAL



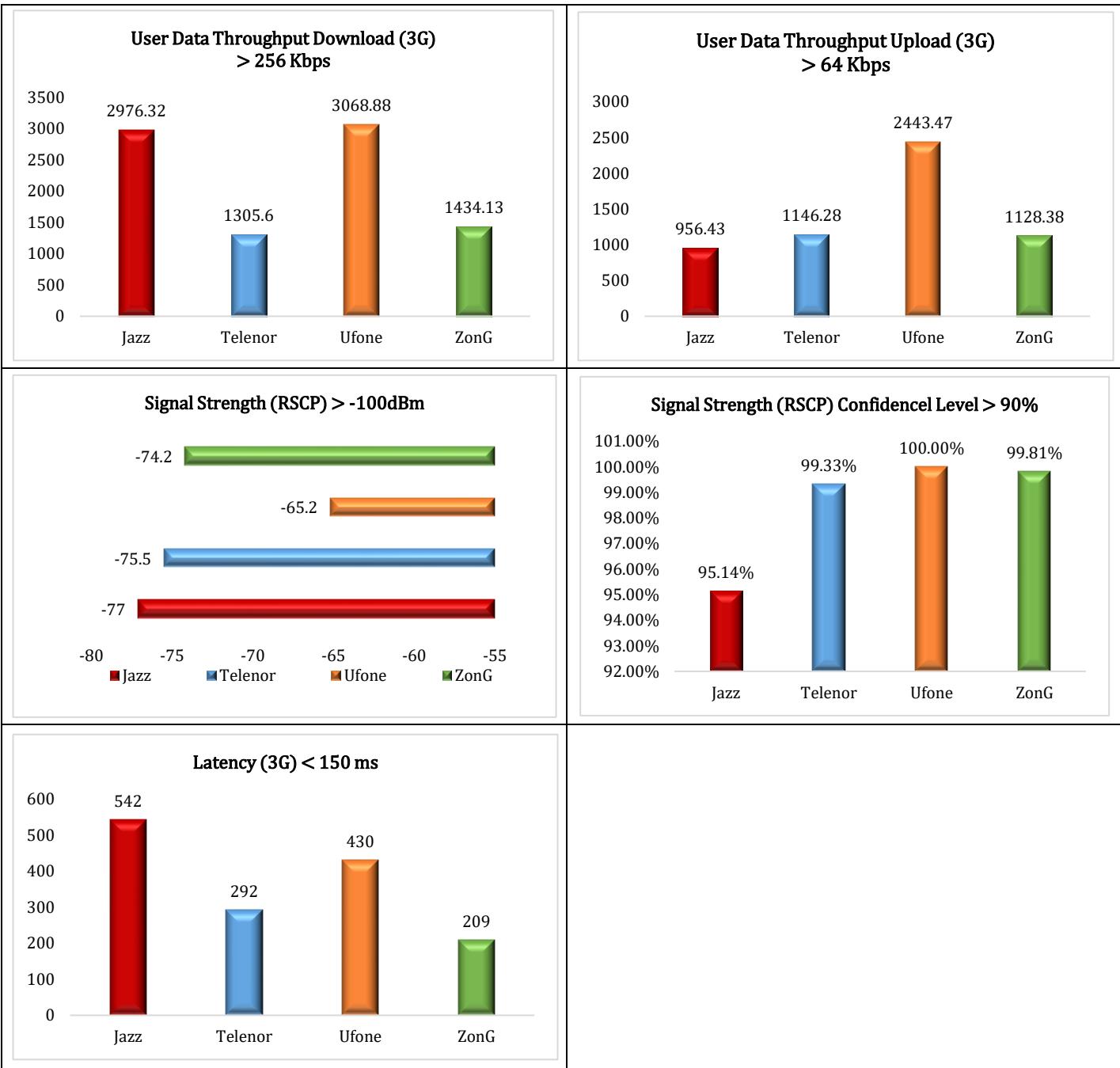
QUALITY OF SERVICE SURVEY RESULTS (3G) – SWABI TO KATLANG



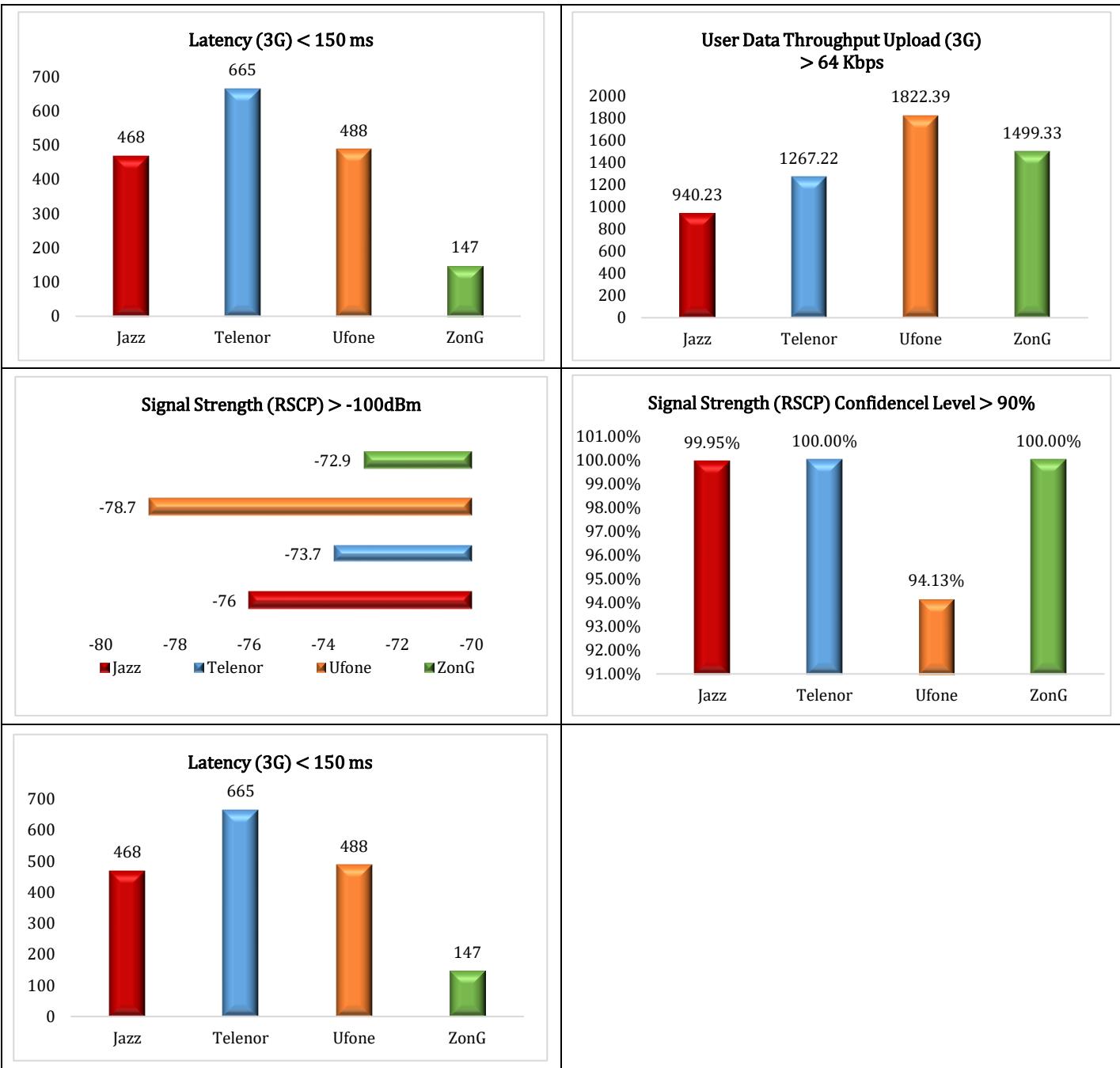
QUALITY OF SERVICE SURVEY RESULTS (3G) – ISLAMABAD TO KOHALA



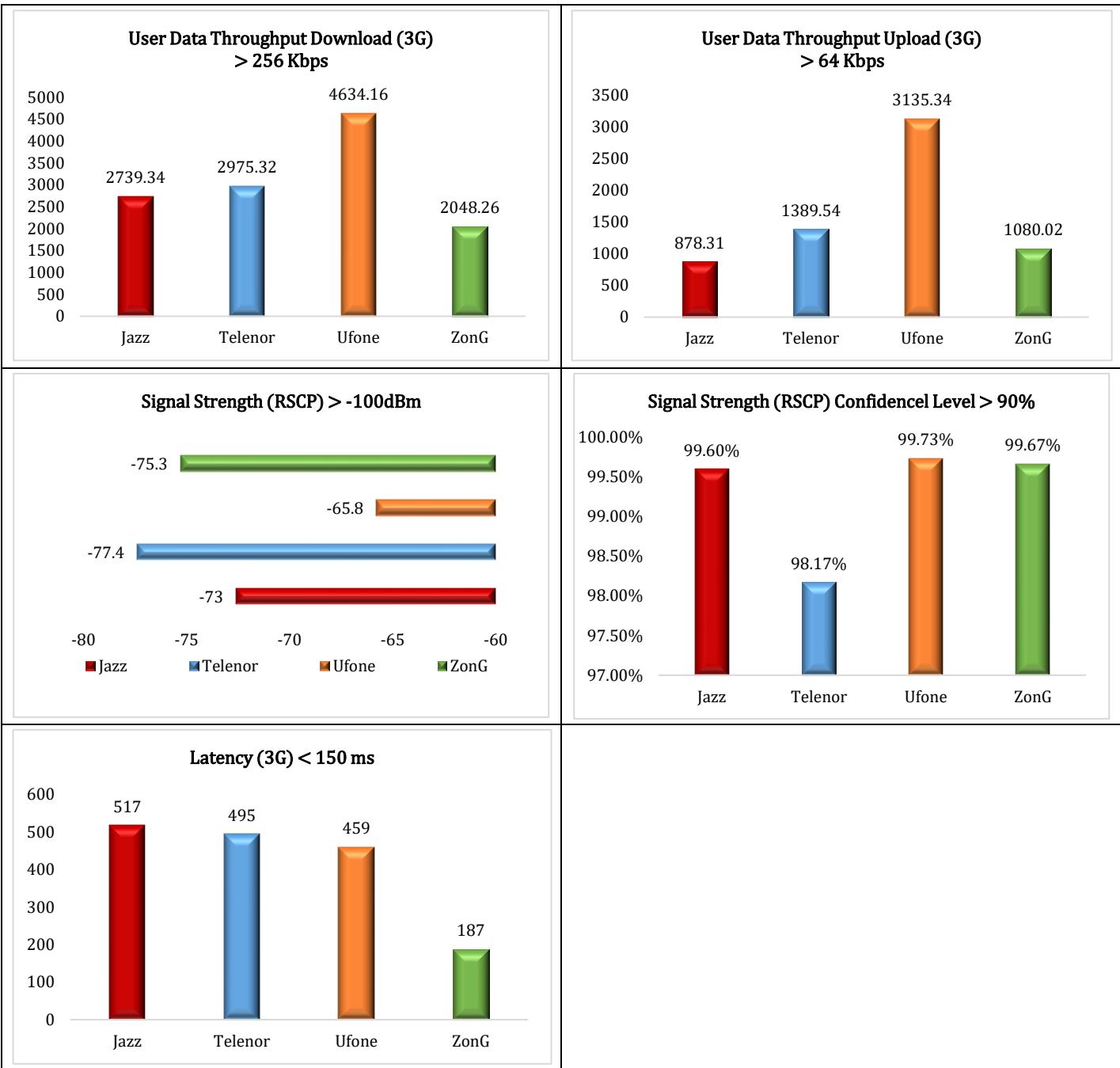
QUALITY OF SERVICE SURVEY RESULTS (3G) – ISLAMABAD TO PESHAWAR



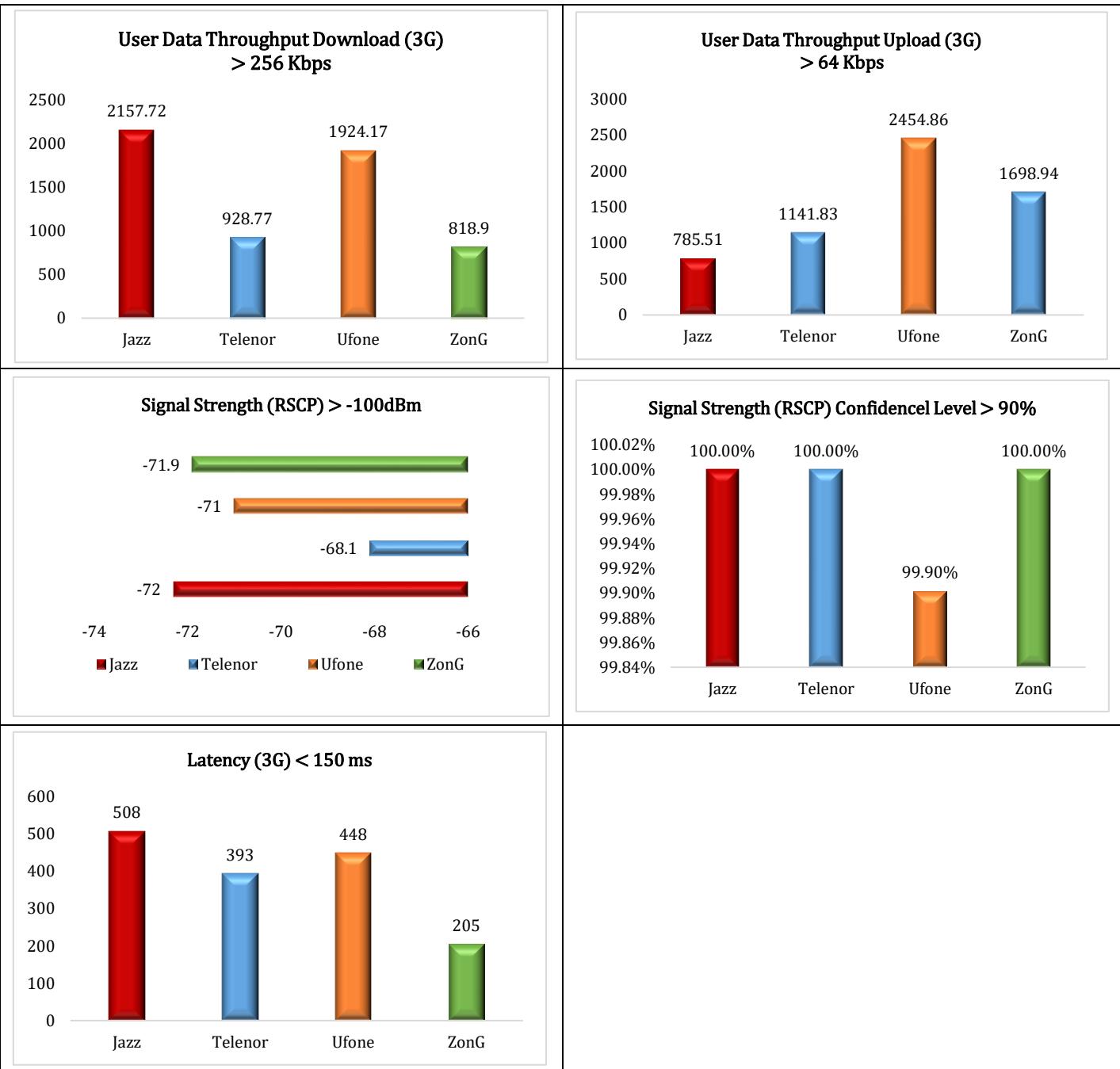
QUALITY OF SERVICE SURVEY RESULTS (3G) – LAHORE TO ABDUL HAKEEM



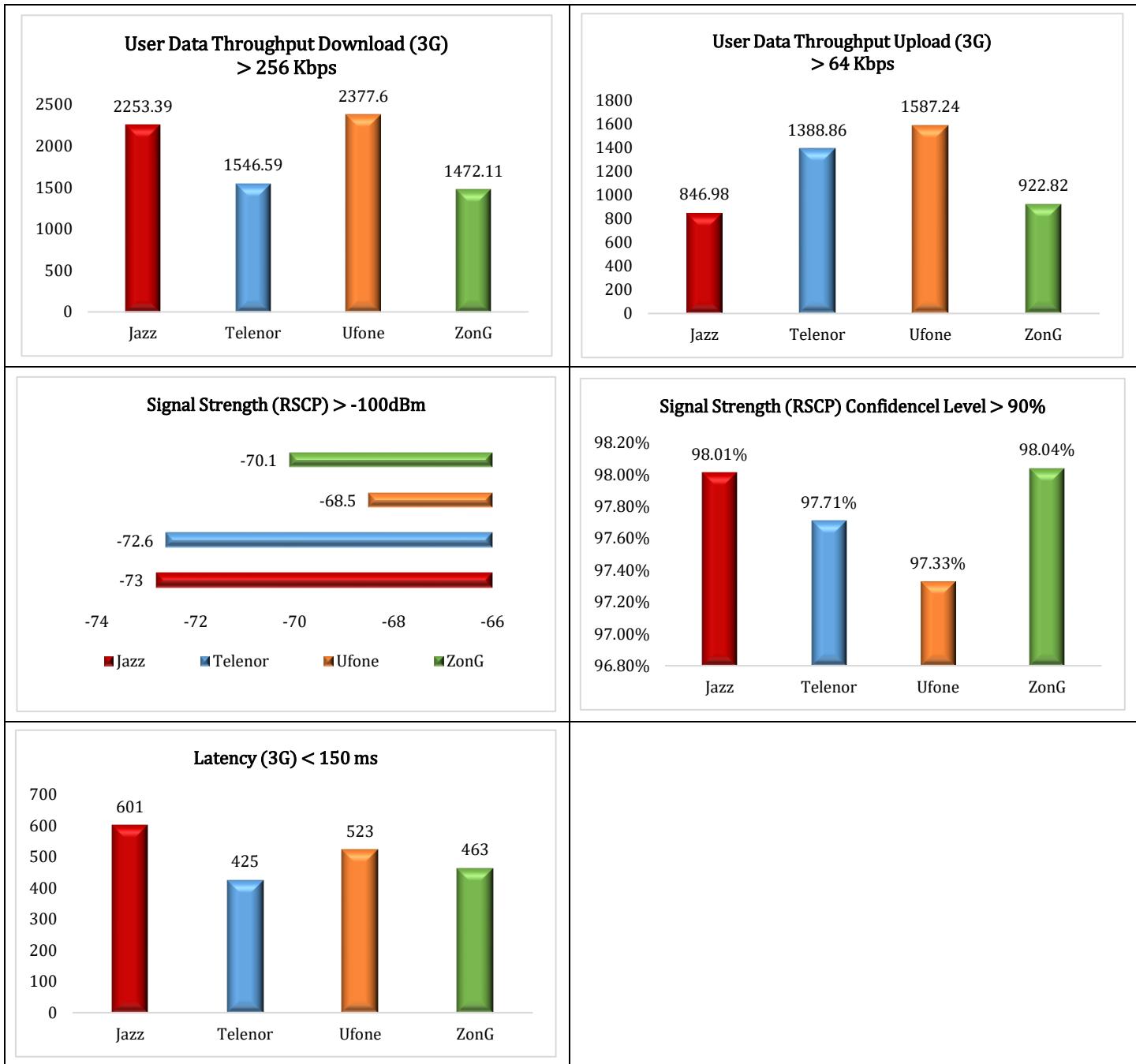
QUALITY OF SERVICE SURVEY RESULTS (3G) – LAHORE TO ISLAMABAD



QUALITY OF SERVICE SURVEY RESULTS (3G) – LAHORE TO SIALKOT

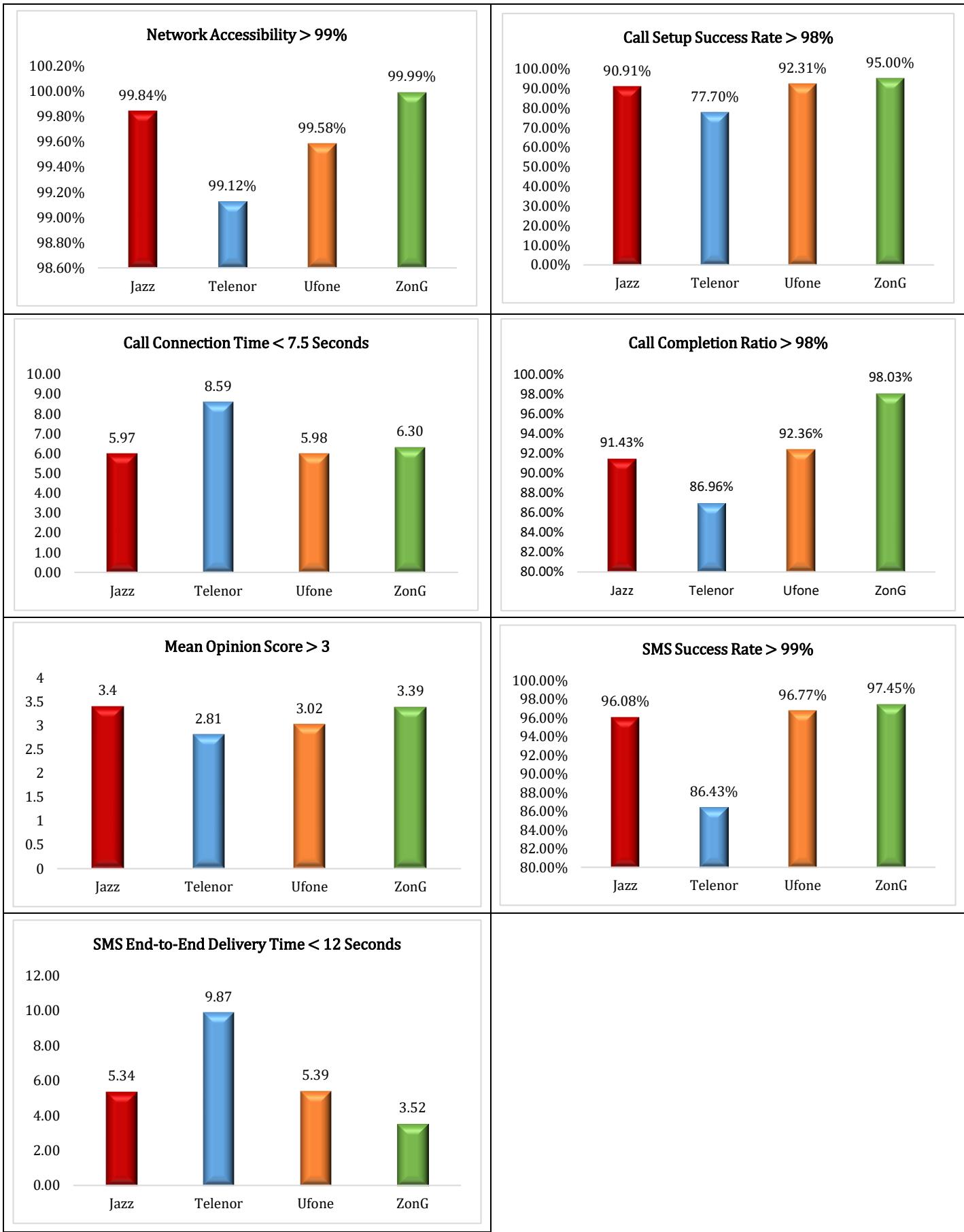


QUALITY OF SERVICE SURVEY RESULTS (3G) – RAWALPINDI TO TORKHUM

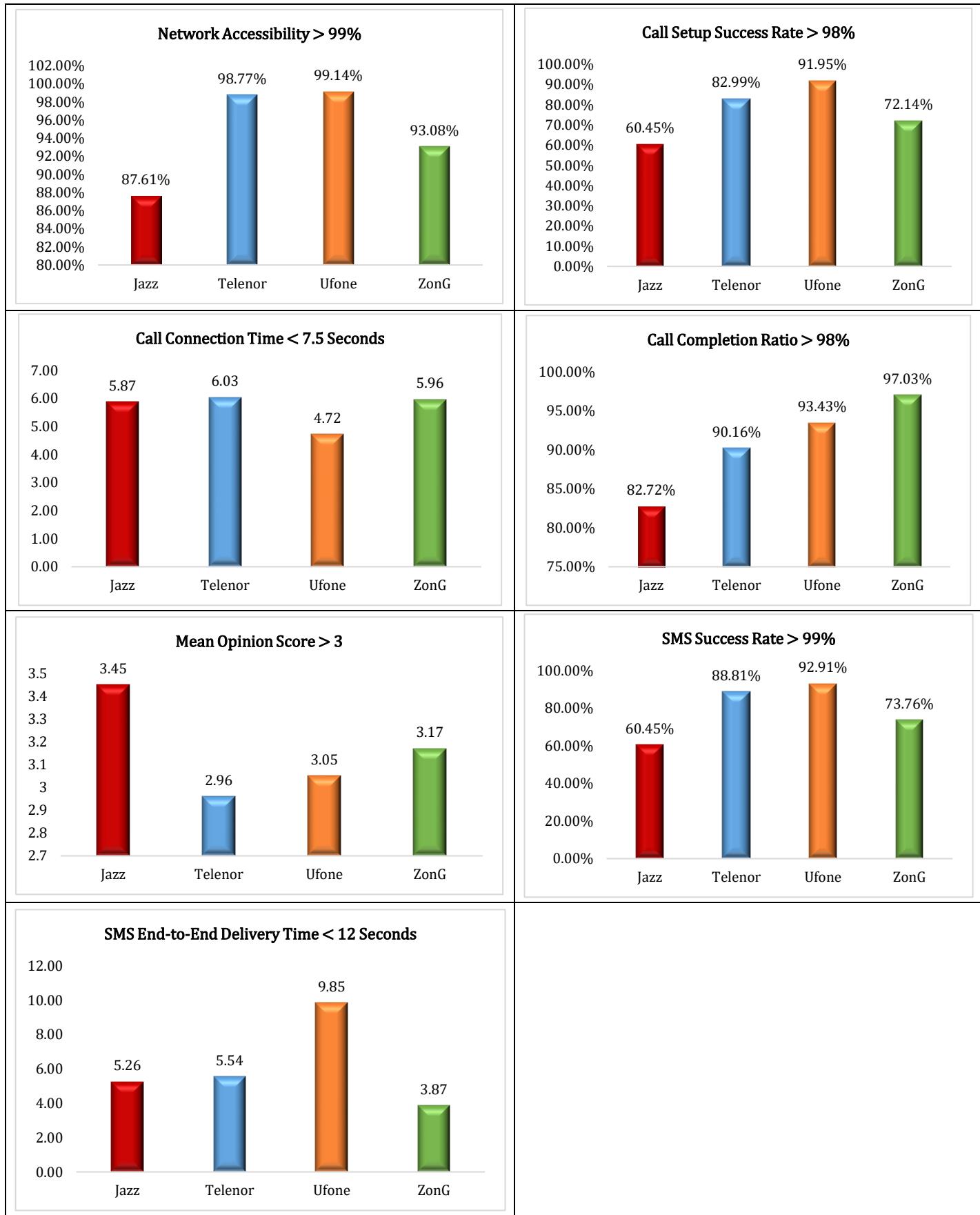


Annex-C (Voice & SMS Results)

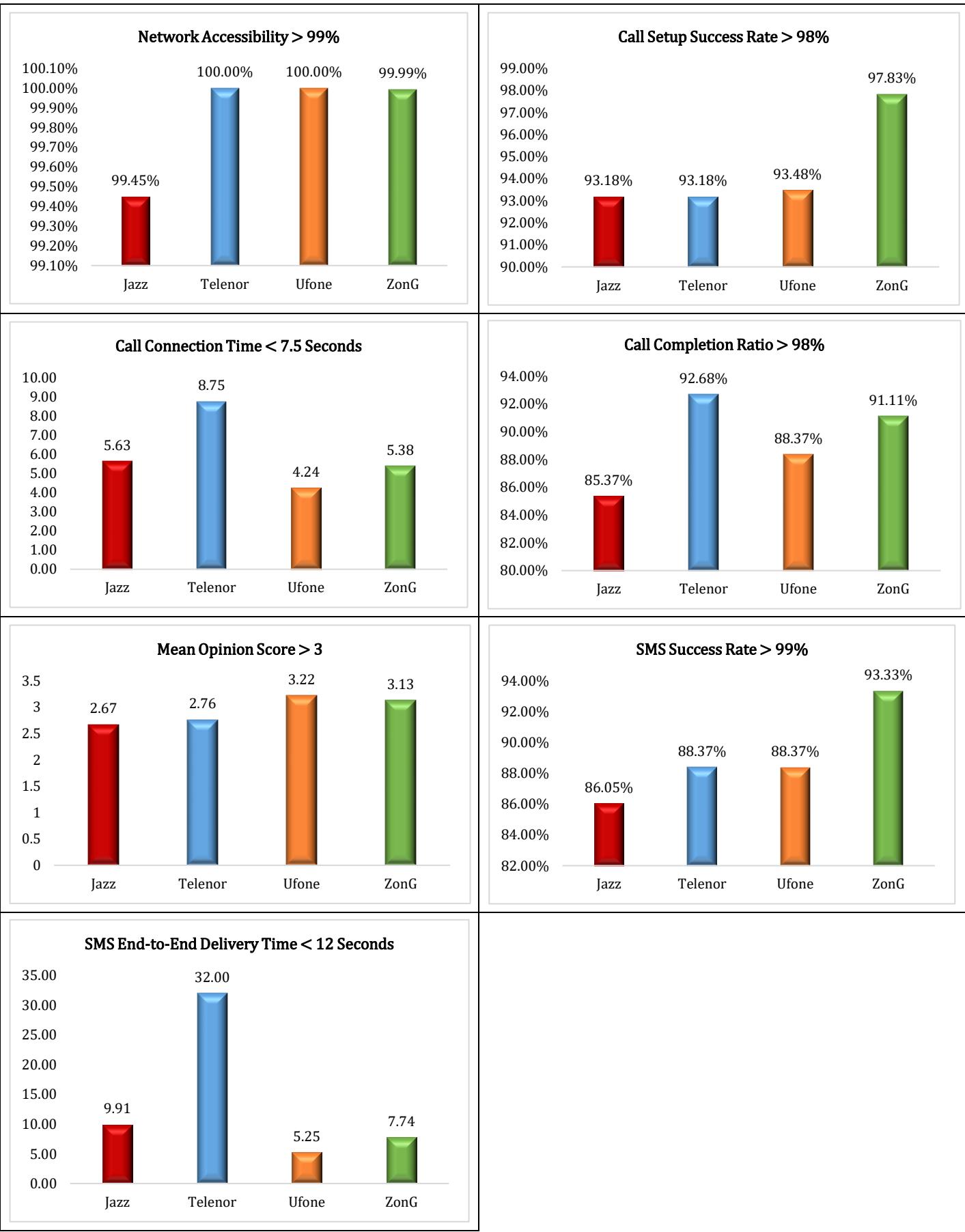
QUALITY OF SERVICE SURVEY RESULTS – HAZARA MOTORWAY



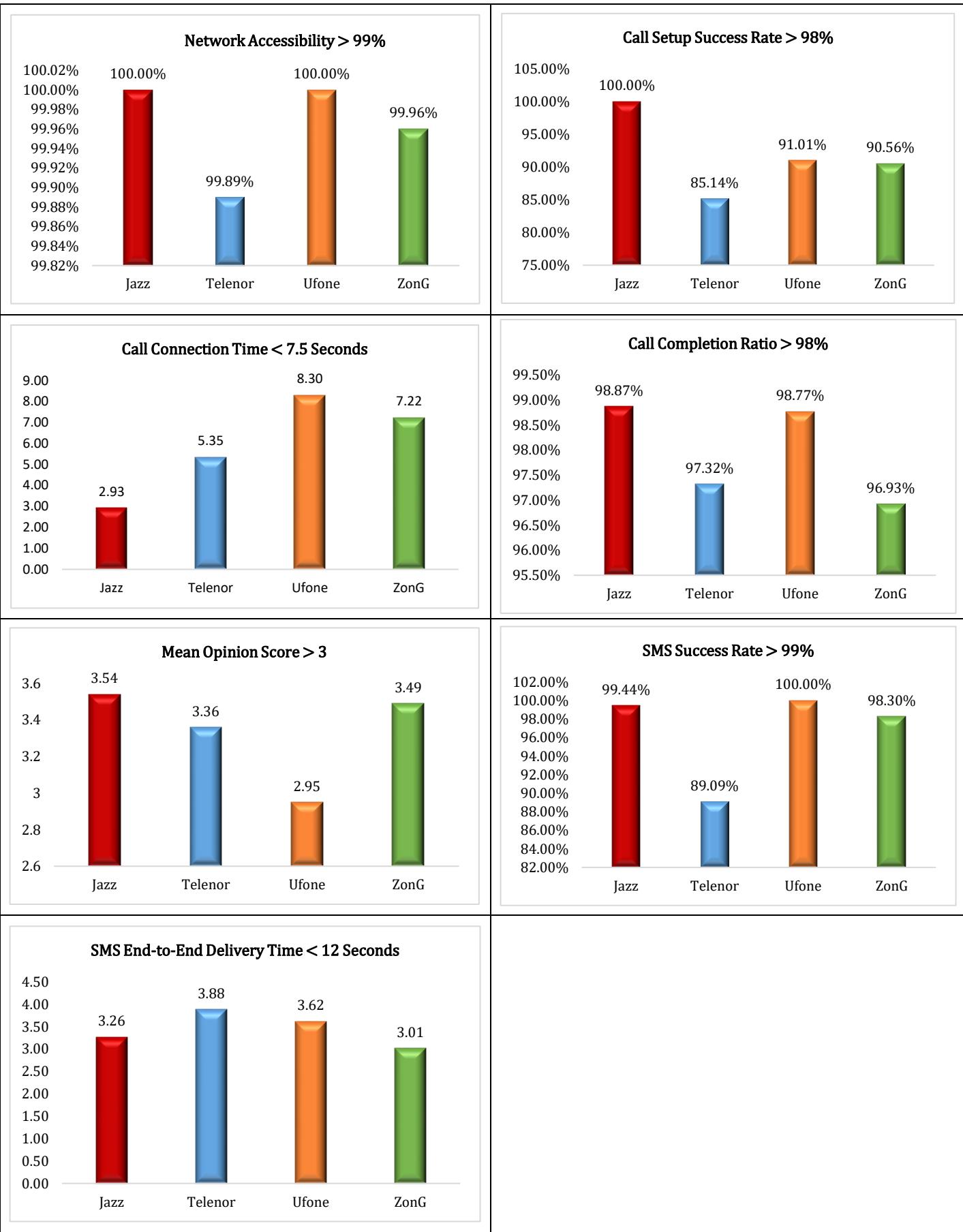
QUALITY OF SERVICE SURVEY RESULTS – QUETTA TO KARACHI



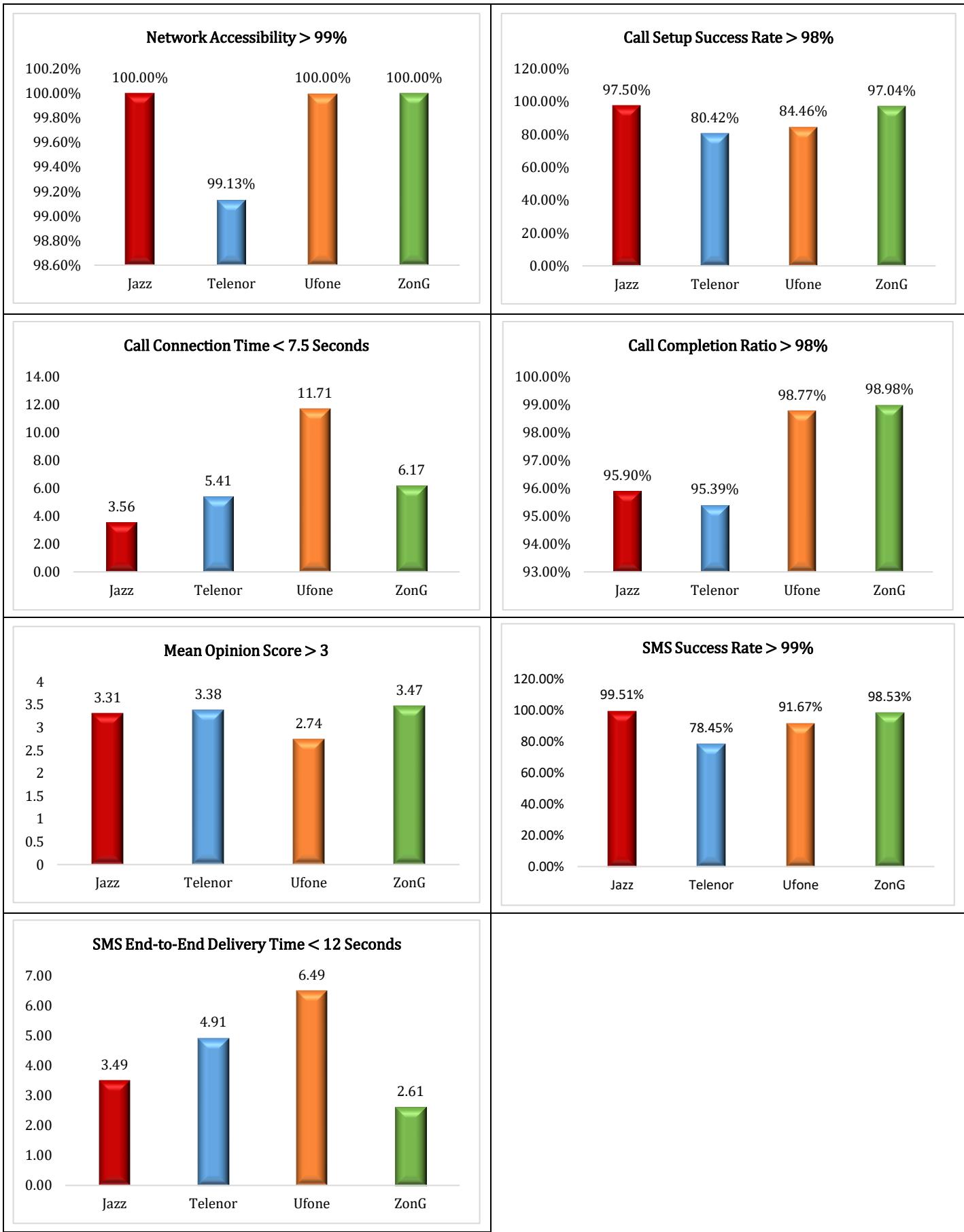
QUALITY OF SERVICE SURVEY RESULTS – HARIPUR TO TAXILA



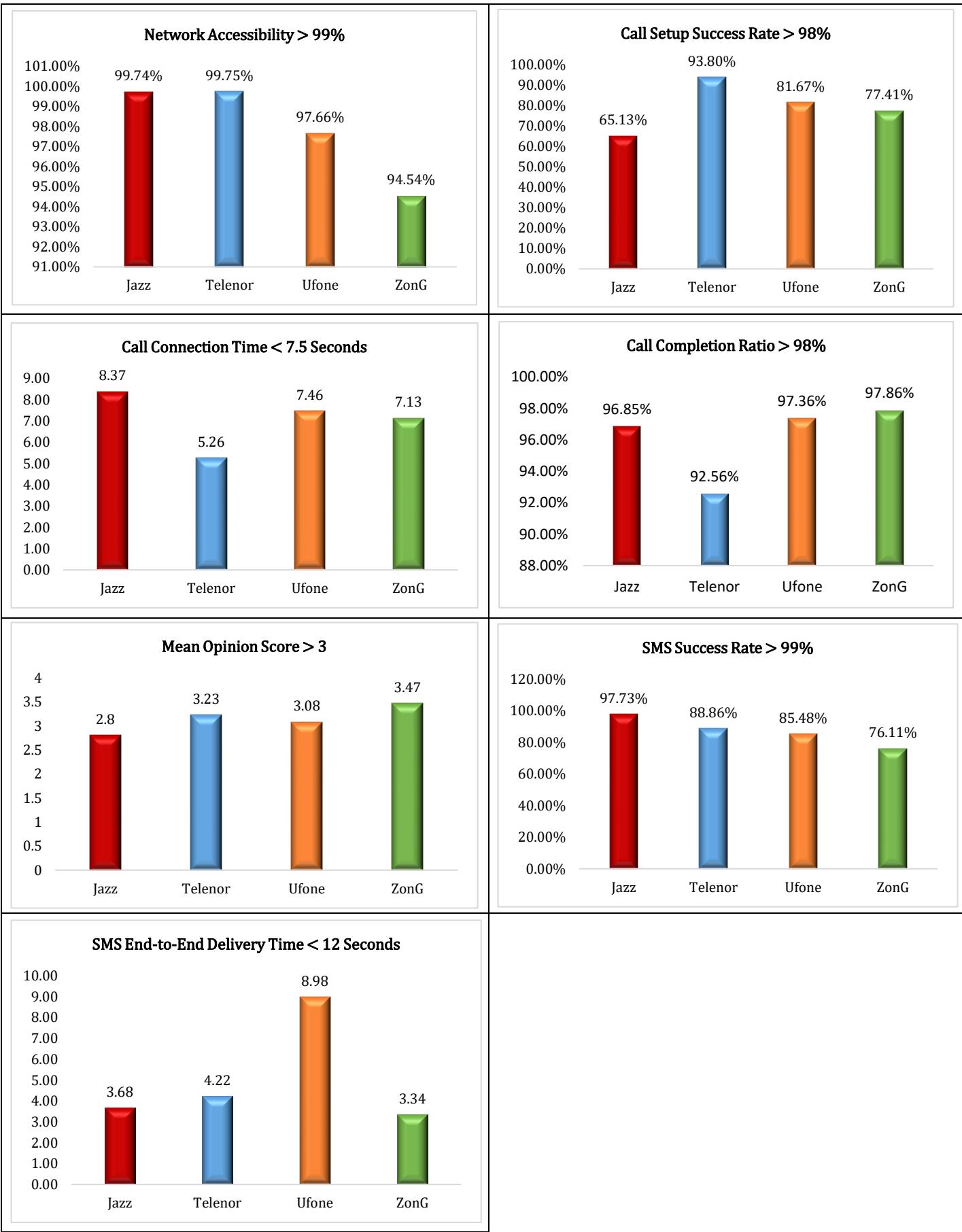
QUALITY OF SERVICE SURVEY RESULTS – PINDI BHATIAN TO MULTAN



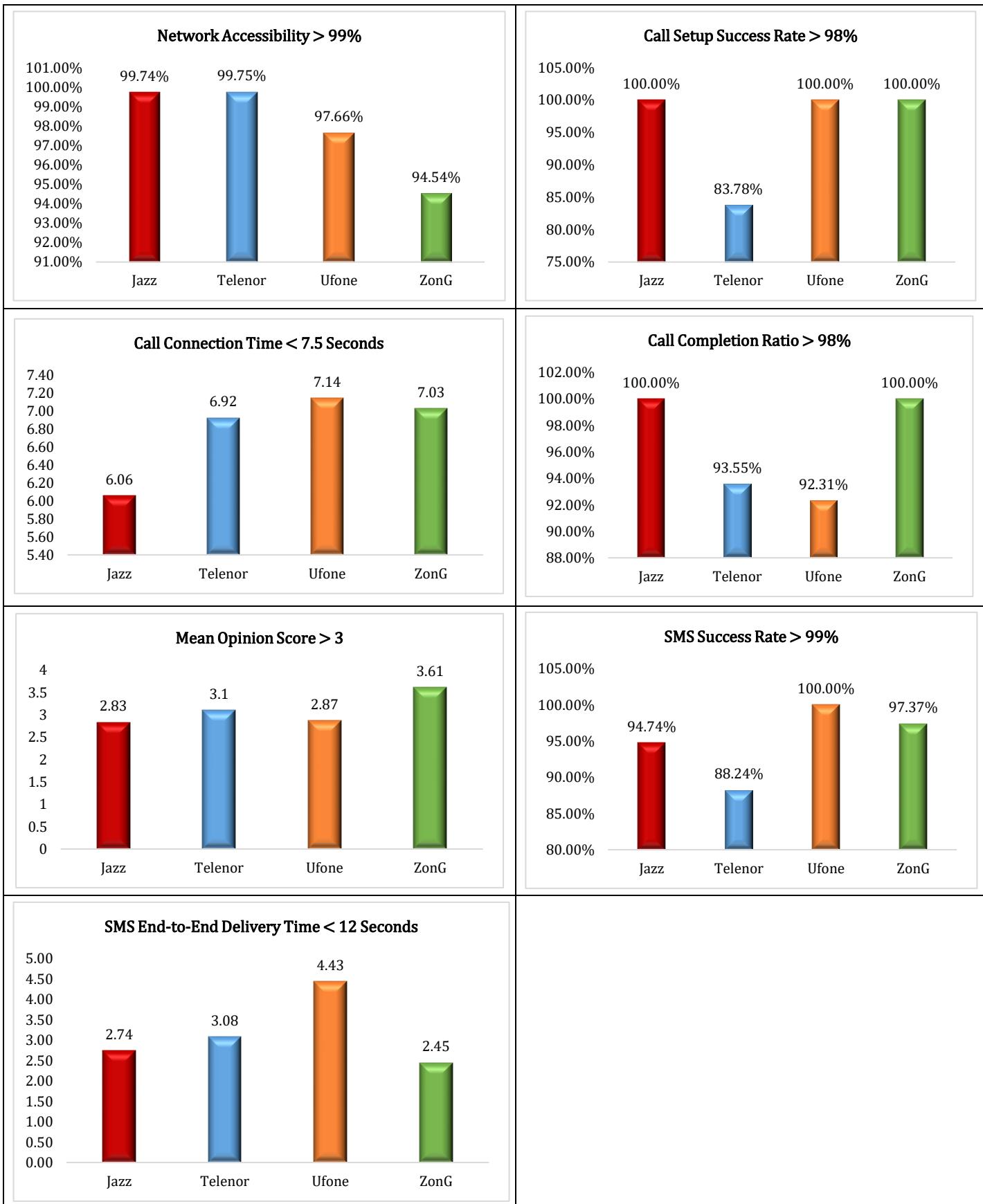
QUALITY OF SERVICE SURVEY RESULTS – MULTAN TO SUKKUR



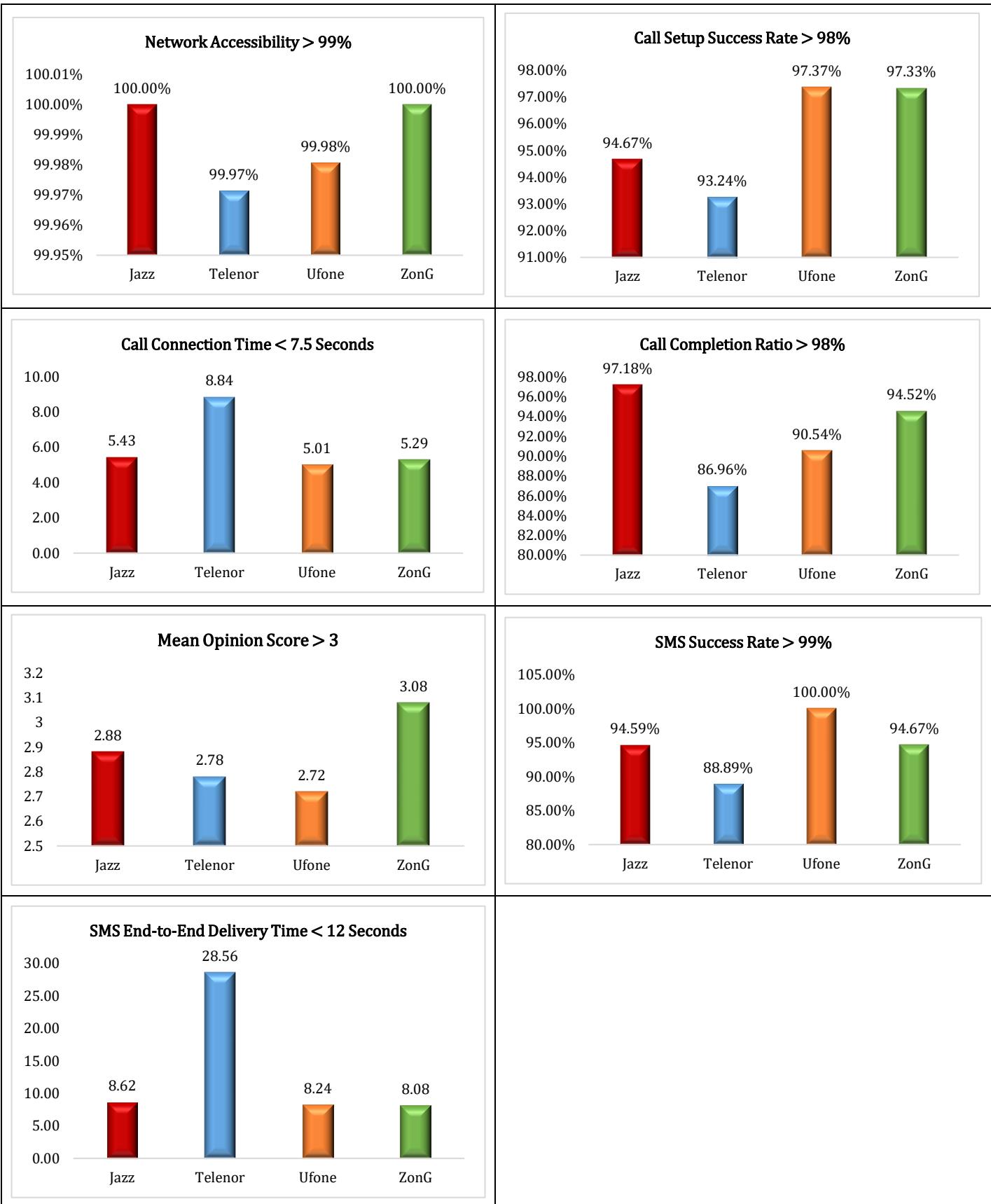
QUALITY OF SERVICE SURVEY RESULTS –NOWSHERA TO CHITRAL



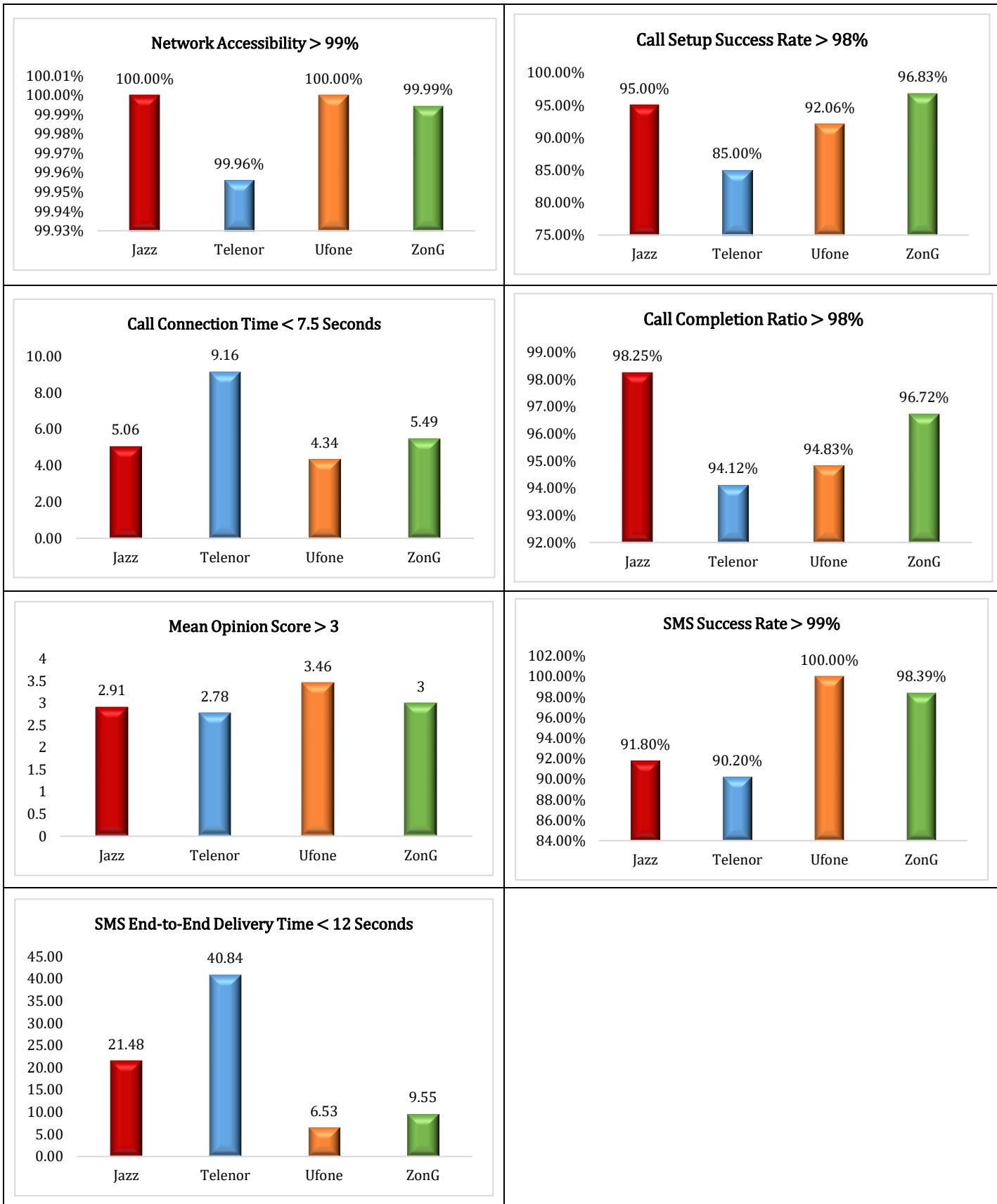
QUALITY OF SERVICE SURVEY RESULTS – SWABI TO KATLANG



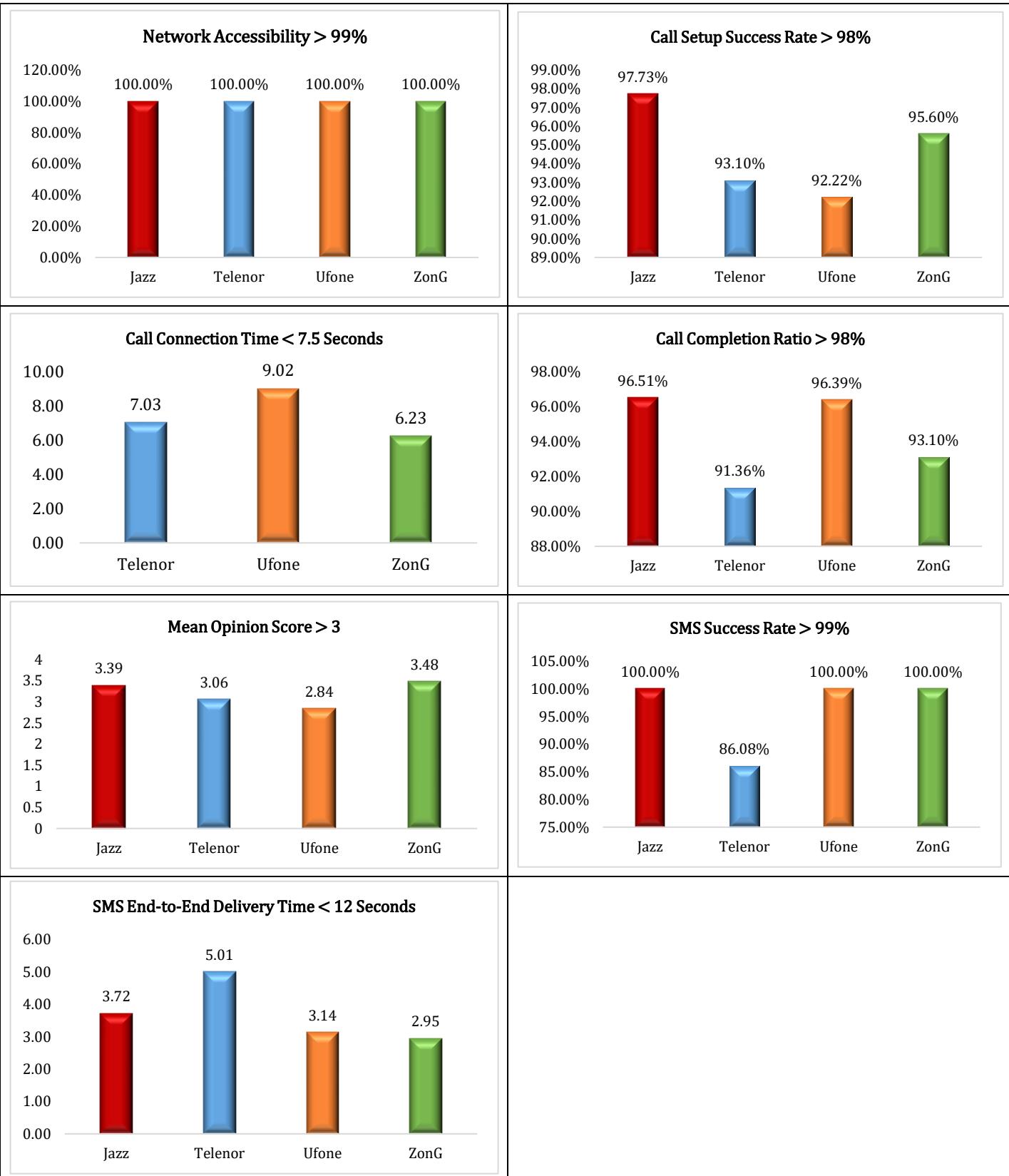
QUALITY OF SERVICE SURVEY RESULTS – ISLAMABAD TO KOHALA



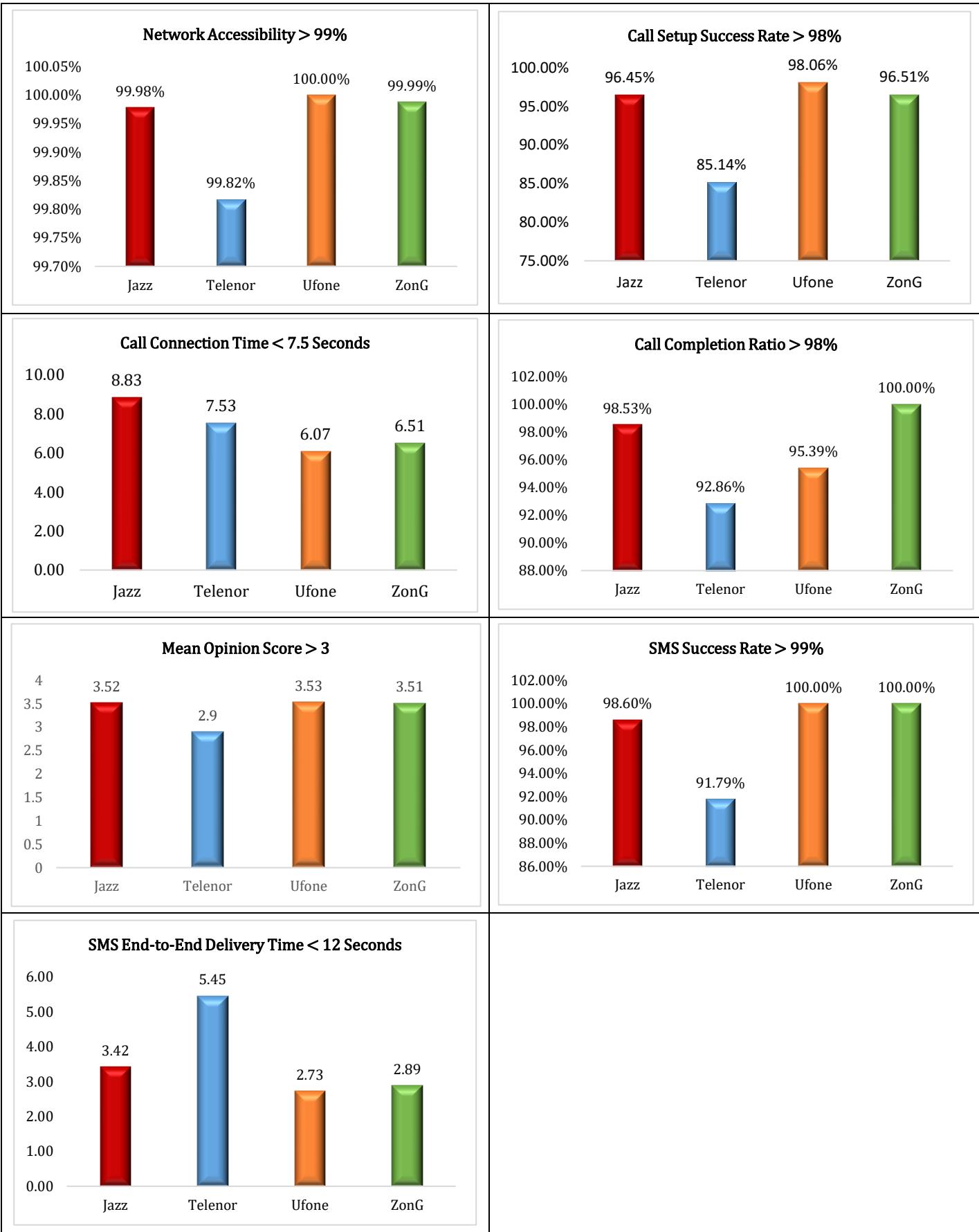
QUALITY OF SERVICE SURVEY RESULTS – ISLAMABAD TO PESHAWAR



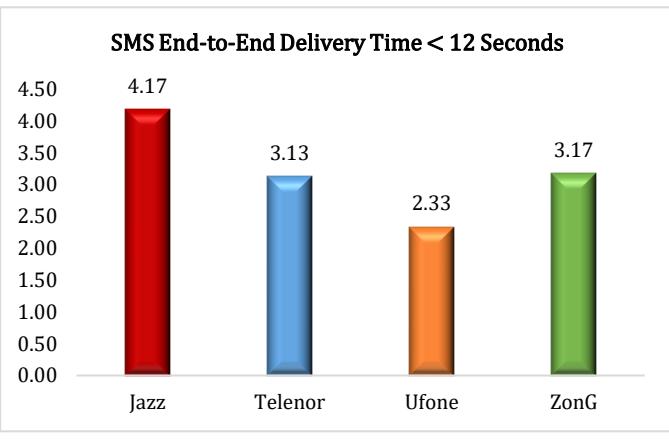
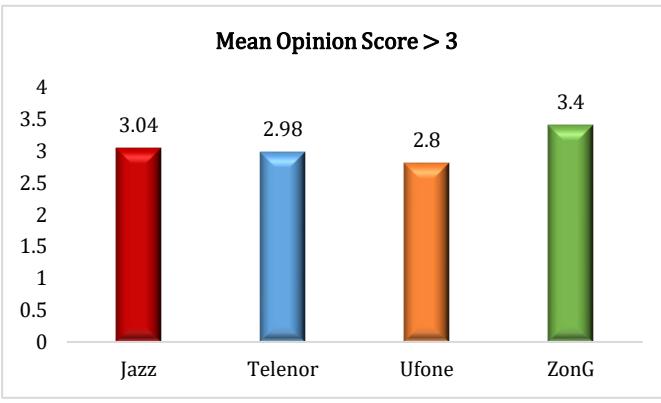
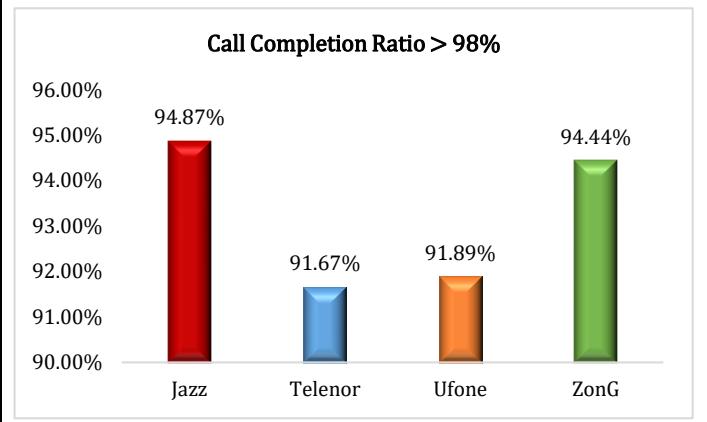
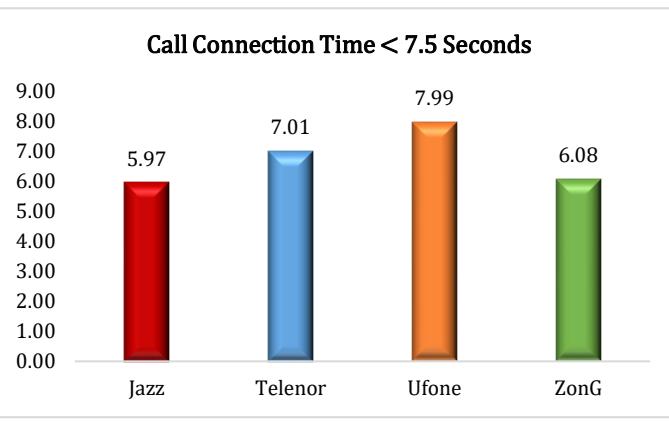
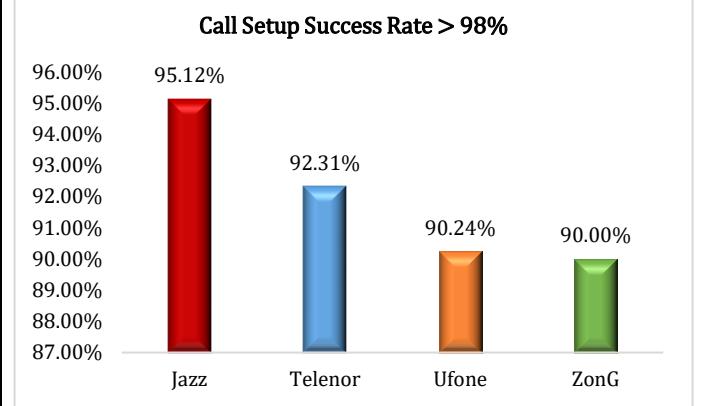
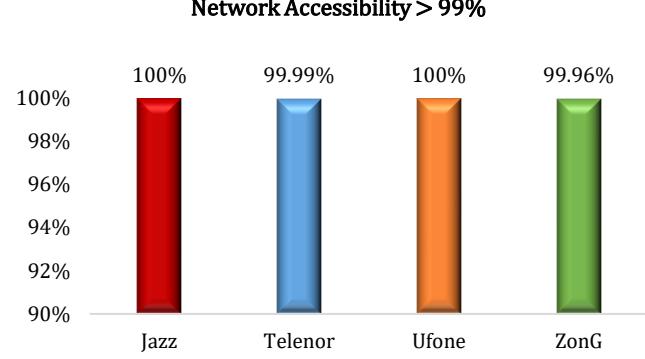
QUALITY OF SERVICE SURVEY RESULTS – LAHORE TO ABDUL HAKEEM



QUALITY OF SERVICE SURVEY RESULTS – LAHORE TO ISLAMABAD



QUALITY OF SERVICE SURVEY RESULTS – LAHORE TO SIALKOT



QUALITY OF SERVICE SURVEY RESULTS – RAWALPINDI TO TURKHAM

