

## **Annex C.      HAC T-Coil Test Result**

HAC Testing Results are shown as below.

# Test Result for GSM

## Codec Investigation

|  | Band   | Channel | Codec Setting | Probe Orientation | ABM1 (dB A/m) | ABM2 (dB A/m) | Frequency Response Margin (dB) | Frequency Response | SNR (dB) |
|--|--------|---------|---------------|-------------------|---------------|---------------|--------------------------------|--------------------|----------|
|  | GSM850 | 189     | FR V1         | Axial (Z)         | 11.17         | -30.18        | 2                              | Pass               | 41.35    |
|  | GSM850 | 189     | HR V1         | Axial (Z)         | 11.11         | -33.16        | 1.84                           | Pass               | 44.27    |

## Official Testing

| Plot No. | Band    | Channel | Codec Setting | Probe Orientation | ABM1 (dB A/m) | ABM2 (dB A/m) | Ambient Noise (dB A/m) | Frequency Response Margin (dB) | Frequency Response | SNR (dB) | FCC Limit (dB) | FCC Margin (dB) | T-Rating |
|----------|---------|---------|---------------|-------------------|---------------|---------------|------------------------|--------------------------------|--------------------|----------|----------------|-----------------|----------|
| 1        | GSM850  | 189     | FR V1         | Axial (Z)         | 11.17         | -30.18        | -43.58                 | 2                              | Pass               | 41.35    | 20             | -21.35          | T4       |
|          | GSM850  | 189     | FR V1         | Radial (Y)        | -7.33         | -45.66        | -51.9                  |                                |                    | 38.33    | 20             | -18.33          | T4       |
| 2        | GSM1900 | 661     | FR V1         | Axial (Z)         | 12.01         | -31.41        | -43.58                 | 2                              | Pass               | 43.42    | 20             | -23.42          | T4       |
|          | GSM1900 | 661     | FR V1         | Radial (Y)        | -5.91         | -46.32        | -51.9                  |                                |                    | 40.41    | 20             | -20.41          | T4       |

# Test Result for WCDMA

## Codec Investigation

|  | Band    | Channel | Codec Setting | Probe Orientation | ABM1 (dB A/m) | ABM2 (dB A/m) | Frequency Response Margin (dB) | Frequency Response | SNR (dB) |
|--|---------|---------|---------------|-------------------|---------------|---------------|--------------------------------|--------------------|----------|
|  | WCDMA V | 4182    | AMR 4.75kbps  | Axial (Z)         | 13.75         | -36.12        | 1.36                           | Pass               | 49.87    |
|  | WCDMA V | 4182    | AMR 7.95kbps  | Axial (Z)         | 14            | -35.6         | 2                              | Pass               | 49.6     |
|  | WCDMA V | 4182    | AMR 12.2kbps  | Axial (Z)         | 14.51         | -37.92        | 2                              | Pass               | 52.43    |

## Test Summary

| Plot No. | Band     | Channel | Codec Setting | Probe Orientation | ABM1 (dB A/m) | ABM2 (dB A/m) | Ambient Noise (dB A/m) | Frequency Response Margin (dB) | Frequency Response | SNR (dB) | FCC Limit (dB) | FCC Margin (dB) | T-Rating |
|----------|----------|---------|---------------|-------------------|---------------|---------------|------------------------|--------------------------------|--------------------|----------|----------------|-----------------|----------|
| 3        | WCDMA II | 9400    | AMR 7.95kbps  | Axial (Z)         | 14.25         | -35.39        | -43.58                 | 2                              | Pass               | 49.64    | 20             | -29.64          | T4       |
|          | WCDMA II | 9400    | AMR 7.95kbps  | Radial (Y)        | 5.79          | -47.98        | -51.9                  |                                |                    | 53.77    | 20             | -33.77          | T4       |
| 4        | WCDMA V  | 4182    | AMR 7.95kbps  | Axial (Z)         | 14            | -35.6         | -43.58                 | 2                              | Pass               | 49.6     | 20             | -29.6           | T4       |
|          | WCDMA V  | 4182    | AMR 7.95kbps  | Radial (Y)        | 5.47          | -48.48        | -51.9                  |                                |                    | 53.95    | 20             | -33.95          | T4       |

# Test Result for VoLTE

## Radio Configuration Investigation

|  | Air Interface | Band    | Bandwidth (MHz) | Modulation | RB Size | RB Offset | Channel | Codec Setting  | UL-DL Configuration | Probe Orientation | ABM1 (dB A/m) | ABM2 (dB A/m) | SNR (dB) |
|--|---------------|---------|-----------------|------------|---------|-----------|---------|----------------|---------------------|-------------------|---------------|---------------|----------|
|  | FDD-LTE       | LTE B2  | 20              | QPSK       | 1       | 0         | 18900   | AMR WB 6.6kbps |                     | Axial (Z)         | 13.8          | -35.3         | 49.1     |
|  | FDD-LTE       | LTE B2  | 20              | QPSK       | 1       | 50        | 18900   | AMR WB 6.6kbps |                     | Axial (Z)         | 14.19         | -35.01        | 49.2     |
|  | FDD-LTE       | LTE B2  | 20              | QPSK       | 1       | 99        | 18900   | AMR WB 6.6kbps |                     | Axial (Z)         | 14.84         | -37.81        | 52.65    |
|  | FDD-LTE       | LTE B2  | 20              | QPSK       | 50      | 0         | 18900   | AMR WB 6.6kbps |                     | Axial (Z)         | 14.17         | -38.16        | 52.33    |
|  | FDD-LTE       | LTE B2  | 20              | QPSK       | 50      | 25        | 18900   | AMR WB 6.6kbps |                     | Axial (Z)         | 14.34         | -38.04        | 52.38    |
|  | FDD-LTE       | LTE B2  | 20              | QPSK       | 50      | 50        | 18900   | AMR WB 6.6kbps |                     | Axial (Z)         | 14.27         | -37.9         | 52.17    |
|  | FDD-LTE       | LTE B2  | 20              | QPSK       | 100     | 0         | 18900   | AMR WB 6.6kbps |                     | Axial (Z)         | 14.21         | -35.41        | 49.62    |
|  | FDD-LTE       | LTE B2  | 20              | 16QAM      | 1       | 0         | 18900   | AMR WB 6.6kbps |                     | Axial (Z)         | 14.73         | -37.61        | 52.34    |
|  | FDD-LTE       | LTE B2  | 20              | 64QAM      | 1       | 0         | 18900   | AMR WB 6.6kbps |                     | Axial (Z)         | 14.49         | -37.72        | 52.21    |
|  | FDD-LTE       | LTE B2  | 15              | QPSK       | 1       | 0         | 18900   | AMR WB 6.6kbps |                     | Axial (Z)         | 14.76         | -37.53        | 52.29    |
|  | FDD-LTE       | LTE B2  | 10              | QPSK       | 1       | 0         | 18900   | AMR WB 6.6kbps |                     | Axial (Z)         | 14.65         | -37.42        | 52.07    |
|  | FDD-LTE       | LTE B2  | 5               | QPSK       | 1       | 0         | 18900   | AMR WB 6.6kbps |                     | Axial (Z)         | 14.43         | -37.34        | 51.77    |
|  | FDD-LTE       | LTE B2  | 3               | QPSK       | 1       | 0         | 18900   | AMR WB 6.6kbps |                     | Axial (Z)         | 13.74         | -35.38        | 49.12    |
|  | FDD-LTE       | LTE B2  | 1.4             | QPSK       | 1       | 0         | 18900   | AMR WB 6.6kbps |                     | Axial (Z)         | 14.24         | -35.03        | 49.27    |
|  | TDD-LTE       | LTE B48 | 20              | QPSK       | 1       | 0         | 56210   | AMR WB 6.6kbps | 0                   | Axial (Z)         | 11.12         | -33.53        | 44.65    |
|  | TDD-LTE       | LTE B48 | 20              | QPSK       | 1       | 0         | 56210   | AMR WB 6.6kbps | 1                   | Axial (Z)         | 11.19         | -34.48        | 45.67    |
|  | TDD-LTE       | LTE B48 | 20              | QPSK       | 1       | 0         | 56210   | AMR WB 6.6kbps | 2                   | Axial (Z)         | 11.25         | -34.61        | 45.86    |
|  | TDD-LTE       | LTE B48 | 20              | QPSK       | 1       | 0         | 56210   | AMR WB 6.6kbps | 3                   | Axial (Z)         | 10.75         | -36.75        | 47.5     |
|  | TDD-LTE       | LTE B48 | 20              | QPSK       | 1       | 0         | 56210   | AMR WB 6.6kbps | 4                   | Axial (Z)         | 11.31         | -36.44        | 47.75    |
|  | TDD-LTE       | LTE B48 | 20              | QPSK       | 1       | 0         | 56210   | AMR WB 6.6kbps | 5                   | Axial (Z)         | 11.29         | -36.32        | 47.61    |
|  | TDD-LTE       | LTE B48 | 20              | QPSK       | 1       | 0         | 56210   | AMR WB 6.6kbps | 6                   | Axial (Z)         | 11.33         | -33.39        | 44.72    |

## Codec Investigation

|  | Band    | Bandwidth (MHz) | Modulation | RB Size | RB Offset | Channel | Codec Setting    | Probe Orientation | ABM1 (dB A/m) | ABM2 (dB A/m) | Frequency Response Margin (dB) | Frequency Response | SNR (dB) |
|--|---------|-----------------|------------|---------|-----------|---------|------------------|-------------------|---------------|---------------|--------------------------------|--------------------|----------|
|  | LTE B2  | 20              | QPSK       | 1       | 0         | 18900   | AMR NB 4.75kbps  | Axial (Z)         | 13.8          | -35.4         | 1.43                           | Pass               | 49.2     |
|  | LTE B2  | 20              | QPSK       | 1       | 0         | 18900   | AMR NB 12.2kbps  | Axial (Z)         | 14.2          | -37.69        | 2                              | Pass               | 51.89    |
|  | LTE B2  | 20              | QPSK       | 1       | 0         | 18900   | AMR WB 6.6kbps   | Axial (Z)         | 13.8          | -35.3         | 2                              | Pass               | 49.1     |
|  | LTE B2  | 20              | QPSK       | 1       | 0         | 18900   | AMR WB 23.85kbps | Axial (Z)         | 14.31         | -37.74        | 1.98                           | Pass               | 52.05    |
|  | LTE B48 | 20              | QPSK       | 1       | 0         | 56210   | AMR NB 4.75kbps  | Axial (Z)         | 10.29         | -34.44        | 2                              | Pass               | 44.73    |
|  | LTE B48 | 20              | QPSK       | 1       | 0         | 56210   | AMR NB 12.2kbps  | Axial (Z)         | 10.32         | -34.36        | 2                              | Pass               | 44.68    |
|  | LTE B48 | 20              | QPSK       | 1       | 0         | 56210   | AMR WB 6.6kbps   | Axial (Z)         | 11.12         | -33.53        | 2                              | Pass               | 44.65    |
|  | LTE B48 | 20              | QPSK       | 1       | 0         | 56210   | AMR WB 23.85kbps | Axial (Z)         | 11.15         | -33.64        | 1.9                            | Pass               | 44.79    |

## Test Summary

| Plot No. | Band    | Bandwidth (MHz) | Modulation | RB Size | RB Offset | Channel | UL-DL Configuration | Codec Setting  | Probe Orientation | ABM1 (dB A/m) | ABM2 (dB A/m) | Ambient Noise (dB A/m) | Frequency Response Margin (dB) | Frequency Response | SNR (dB) | FCC Limit (dB) | FCC Margin (dB) | T-Rating |
|----------|---------|-----------------|------------|---------|-----------|---------|---------------------|----------------|-------------------|---------------|---------------|------------------------|--------------------------------|--------------------|----------|----------------|-----------------|----------|
| 5        | LTE B2  | 20              | QPSK       | 1       | 0         | 18900   |                     | AMR WB 6.6kbps | Axial (Z)         | 13.8          | -35.3         | -43.03                 | 2                              | Pass               | 49.1     | 20             | -29.1           | T4       |
|          | LTE B2  | 20              | QPSK       | 1       | 0         | 18900   |                     | AMR WB 6.6kbps | Radial (Y)        | 4.82          | -47.53        | -51.72                 |                                |                    | 52.35    | 20             | -32.35          | T4       |
| 6        | LTE B4  | 20              | QPSK       | 1       | 0         | 20175   |                     | AMR WB 6.6kbps | Axial (Z)         | 13.8          | -35.16        | -43.03                 | 2                              | Pass               | 48.96    | 20             | -28.96          | T4       |
|          | LTE B4  | 20              | QPSK       | 1       | 0         | 20175   |                     | AMR WB 6.6kbps | Radial (Y)        | 5.45          | -47.88        | -51.72                 |                                |                    | 53.33    | 20             | -33.33          | T4       |
| 7        | LTE B5  | 10              | QPSK       | 1       | 0         | 20525   |                     | AMR WB 6.6kbps | Axial (Z)         | 13.91         | -37.82        | -43.03                 | 1.71                           | Pass               | 51.73    | 20             | -31.73          | T4       |
|          | LTE B5  | 10              | QPSK       | 1       | 0         | 20525   |                     | AMR WB 6.6kbps | Radial (Y)        | 5.52          | -48.81        | -51.72                 |                                |                    | 54.33    | 20             | -34.33          | T4       |
| 8        | LTE B7  | 20              | QPSK       | 1       | 0         | 21100   |                     | AMR WB 6.6kbps | Axial (Z)         | 14.3          | -37.34        | -43.03                 | 2                              | Pass               | 51.64    | 20             | -31.64          | T4       |
|          | LTE B7  | 20              | QPSK       | 1       | 0         | 21100   |                     | AMR WB 6.6kbps | Radial (Y)        | 4.92          | -48.46        | -51.72                 |                                |                    | 53.38    | 20             | -33.38          | T4       |
| 9        | LTE B12 | 10              | QPSK       | 1       | 0         | 23095   |                     | AMR WB 6.6kbps | Axial (Z)         | 13.6          | -35.52        | -43.03                 | 2                              | Pass               | 49.12    | 20             | -29.12          | T4       |
|          | LTE B12 | 10              | QPSK       | 1       | 0         | 23095   |                     | AMR WB 6.6kbps | Radial (Y)        | 5.28          | -47.51        | -51.72                 |                                |                    | 52.79    | 20             | -32.79          | T4       |
| 10       | LTE B13 | 10              | QPSK       | 1       | 0         | 23230   | 0                   | AMR WB 6.6kbps | Axial (Z)         | 14.5          | -37.49        | -43.03                 | 1.58                           | Pass               | 51.99    | 20             | -31.99          | T4       |
|          | LTE B13 | 10              | QPSK       | 1       | 0         | 23230   |                     | AMR WB 6.6kbps | Radial (Y)        | 5.32          | -47.34        | -51.72                 |                                |                    | 52.66    | 20             | -32.66          | T4       |
| 11       | LTE B48 | 20              | QPSK       | 1       | 0         | 56210   |                     | AMR WB 6.6kbps | Axial (Z)         | 11.12         | -33.53        | -43.03                 | 2                              | Pass               | 44.65    | 20             | -24.65          | T4       |
|          | LTE B48 | 20              | QPSK       | 1       | 0         | 56210   |                     | AMR WB 6.6kbps | Radial (Y)        | -1.66         | -41.26        | -51.72                 |                                |                    | 39.6     | 20             | -19.6           | T4       |
| 12       | LTE B66 | 20              | QPSK       | 1       | 0         | 132322  |                     | AMR WB 6.6kbps | Axial (Z)         | 14.19         | -37.58        | -43.03                 | 1.84                           | Pass               | 51.77    | 20             | -31.77          | T4       |
|          | LTE B66 | 20              | QPSK       | 1       | 0         | 132322  |                     | AMR WB 6.6kbps | Radial (Y)        | 5.07          | -47.36        | -51.72                 |                                |                    | 52.43    | 20             | -32.43          | T4       |
| 13       | LTE B71 | 20              | QPSK       | 1       | 0         | 133297  |                     | AMR WB 6.6kbps | Axial (Z)         | 14.14         | -37.87        | -43.03                 | 1.7                            | Pass               | 52.01    | 20             | -32.01          | T4       |
|          | LTE B71 | 20              | QPSK       | 1       | 0         | 133297  |                     | AMR WB 6.6kbps | Radial (Y)        | 5.44          | -47.59        | -51.72                 |                                |                    | 53.03    | 20             | -33.03          | T4       |

# Test Result for VoWiFi

## Radio Configuration Investigation

|  | Band      | Mode          | Data Rate | Channel | Probe Orientation | ABM1 (dB A/m) | ABM2 (dB A/m) | SNR (dB) |
|--|-----------|---------------|-----------|---------|-------------------|---------------|---------------|----------|
|  | WLAN 2.4G | 802.11b       | 1Mbps     | 6       | Axial (Z)         | 11.7          | -36.68        | 48.38    |
|  | WLAN 2.4G | 802.11b       | 1Mbps     | 6       | Axial (Z)         | 11.43         | -37.05        | 48.48    |
|  | WLAN 2.4G | 802.11g       | 6Mbps     | 6       | Axial (Z)         | 11.38         | -38.14        | 49.52    |
|  | WLAN 2.4G | 802.11g       | 54Mbps    | 6       | Axial (Z)         | 11.45         | -38.14        | 49.59    |
|  | WLAN 2.4G | 802.11n HT20  | MCS0      | 6       | Axial (Z)         | 11.22         | -38.06        | 49.28    |
|  | WLAN 2.4G | 802.11n HT20  | MCS7      | 6       | Axial (Z)         | 11.28         | -38.12        | 49.4     |
|  | WLAN 5G   | 802.11a       | 6Mbps     | 40      | Axial (Z)         | 11.3          | -38.73        | 50.03    |
|  | WLAN 5G   | 802.11a       | 54Mbps    | 40      | Axial (Z)         | 11.36         | -38.79        | 50.15    |
|  | WLAN 5G   | 802.11n HT20  | MCS0      | 40      | Axial (Z)         | 12.1          | -38.14        | 50.24    |
|  | WLAN 5G   | 802.11n HT20  | MCS7      | 40      | Axial (Z)         | 11.55         | -38.59        | 50.14    |
|  | WLAN 5G   | 802.11n HT40  | MCS0      | 38      | Axial (Z)         | 11.42         | -38.81        | 50.23    |
|  | WLAN 5G   | 802.11n HT40  | MCS7      | 38      | Axial (Z)         | 11.72         | -38.44        | 50.16    |
|  | WLAN 5G   | 802.11ac HT20 | MCS0      | 40      | Axial (Z)         | 11.88         | -38.19        | 50.07    |
|  | WLAN 5G   | 802.11ac HT20 | MCS8      | 40      | Axial (Z)         | 11.95         | -38.2         | 50.15    |
|  | WLAN 5G   | 802.11ac HT40 | MCS0      | 38      | Axial (Z)         | 11.55         | -38.62        | 50.17    |
|  | WLAN 5G   | 802.11ac HT40 | MCS9      | 38      | Axial (Z)         | 11.35         | -38.77        | 50.12    |

## Codec Investigation

|  | Band      | Mode    | Data Rate | Channel | Codec Setting   | Probe Orientation | ABM1 (dB A/m) | ABM2 (dB A/m) | Frequency Response Margin (dB) | Frequency Response | SNR (dB) |
|--|-----------|---------|-----------|---------|-----------------|-------------------|---------------|---------------|--------------------------------|--------------------|----------|
|  | WLAN 2.4G | 802.11b | 1Mbps     | 6       | AMR NB 4.75kbps | Axial (Z)         | 10.78         | -37.91        | 2                              | Pass               | 48.69    |
|  | WLAN 2.4G | 802.11b | 1Mbps     | 6       | AMR NB 12.2kbps | Axial (Z)         | 11.22         | -37.5         | 2                              | Pass               | 48.72    |
|  | WLAN 2.4G | 802.11b | 1Mbps     | 6       | AMR WB 6.6kbps  | Axial (Z)         | 11.7          | -36.68        | 1.99                           | Pass               | 48.38    |
|  | WLAN 2.4G | 802.11b | 1Mbps     | 6       | AMR WB          | Axial (Z)         | 12.41         | -36.24        | 2                              | Pass               | 48.65    |

## Test Summary

| Plot No. | Band      | Mode    | Data Rate | Channel | Codec Setting  | Probe Orientation | ABM1 (dB A/m) | ABM2 (dB A/m) | Ambient Noise (dB A/m) | Frequency Response Margin (dB) | Frequency Response | SNR (dB) | FCC Limit (dB) | FCC Margin (dB) | T-Rating |
|----------|-----------|---------|-----------|---------|----------------|-------------------|---------------|---------------|------------------------|--------------------------------|--------------------|----------|----------------|-----------------|----------|
| 14       | WLAN 2.4G | 802.11b | 1Mbps     | 6       | AMR WB 6.6kbps | Axial (Z)         | 11.7          | -36.68        | -43.23                 | 1.99                           | Pass               | 48.38    | 20             | -28.38          | T4       |
|          | WLAN 2.4G | 802.11b | 1Mbps     | 6       | AMR WB 6.6kbps | Radial (Y)        | 2.1           | -47.39        | -51.73                 |                                |                    | 49.49    | 20             | -29.49          | T4       |
| 15       | WLAN 5.2G | 802.11a | 6Mbps     | 40      | AMR WB 6.6kbps | Axial (Z)         | 11.3          | -38.73        | -43.23                 | 2                              | Pass               | 50.03    | 20             | -30.03          | T4       |
|          | WLAN 5.2G | 802.11a | 6Mbps     | 40      | AMR WB 6.6kbps | Radial (Y)        | 3.46          | -48.19        | -51.73                 |                                |                    | 51.65    | 20             | -31.65          | T4       |
| 16       | WLAN 5.3G | 802.11a | 6Mbps     | 56      | AMR WB 6.6kbps | Axial (Z)         | 11.52         | -37.62        | -43.23                 | 2                              | Pass               | 49.14    | 20             | -29.14          | T4       |
|          | WLAN 5.3G | 802.11a | 6Mbps     | 56      | AMR WB 6.6kbps | Radial (Y)        | 2.97          | -48.28        | -51.73                 |                                |                    | 51.25    | 20             | -31.25          | T4       |
| 17       | WLAN 5.6G | 802.11a | 6Mbps     | 124     | AMR WB 6.6kbps | Axial (Z)         | 11.41         | -37.65        | -43.23                 | 1.99                           | Pass               | 49.06    | 20             | -29.06          | T4       |
|          | WLAN 5.6G | 802.11a | 6Mbps     | 124     | AMR WB 6.6kbps | Radial (Y)        | 2.86          | -48.27        | -51.73                 |                                |                    | 51.13    | 20             | -31.13          | T4       |
| 18       | WLAN 5.8G | 802.11a | 6Mbps     | 157     | AMR WB 6.6kbps | Axial (Z)         | 11.2          | -38.03        | -43.23                 | 2                              | Pass               | 49.23    | 20             | -29.23          | T4       |
|          | WLAN 5.8G | 802.11a | 6Mbps     | 157     | AMR WB 6.6kbps | Radial (Y)        | 3.36          | -47.76        | -51.73                 |                                |                    | 51.12    | 20             | -31.12          | T4       |

## OTT Voice Calling Test Result

The device supported a pre-installed application, Google Duo, whose features allow the option of voice-only communications. According to KDB 285076 D02, all air interfaces via a data connection with an application providing voice functionality need to be considered for HAC testing. The Google Duo uses the audio codec as Opus and supports codec bit rate from 6 kbps to 75 kbps. All air interfaces capable of a data connection were evaluated.

HAC OTT Testing Results are shown as below.

Test Result for OTT Voice Calling  
Codec Investigation

|  | Band    | Mode | Channel | Application | Codec Setting | Probe Orientation | ABM1 (dB A/m) | ABM2 (dB A/m) | Frequency Response Margin (dB) | Frequency Response | SNR (dB) |
|--|---------|------|---------|-------------|---------------|-------------------|---------------|---------------|--------------------------------|--------------------|----------|
|  | GSM850  | EDGE | 189     | Duo         | Opus 6kbps    | Axial (Z)         | 7.92          | -33.46        | 1.35                           | Pass               | 41.38    |
|  | GSM850  | EDGE | 189     | Duo         | Opus 75kbps   | Axial (Z)         | 6.02          | -33.4         | 1.4                            | Pass               | 39.42    |
|  | WCDMA V | HSPA | 4182    | Duo         | Opus 6kbps    | Axial (Z)         | 10.24         | -38.43        | 1.27                           | Pass               | 48.67    |
|  | WCDMA V | HSPA | 4182    | Duo         | Opus 75kbps   | Axial (Z)         | 10.29         | -38.3         | 1.18                           | Pass               | 48.59    |

Test Summary

| Plot No. | Band      | Mode    | Channel | Codec Setting   | Probe Orientation | ABM1 (dB A/m) | ABM2 (dB A/m) | Ambient Noise (dB A/m) | Frequency Response Margin (dB) | Frequency Response | SNR (dB) | FCC Limit (dB) | FCC Margin (dB) | T-Rating |
|----------|-----------|---------|---------|-----------------|-------------------|---------------|---------------|------------------------|--------------------------------|--------------------|----------|----------------|-----------------|----------|
| 19       | GSM850    | EDGE    | 189     | Duo Opus 75kbps | Axial (Z)         | 6.02          | -33.4         | -42.36                 | 1.4                            | Pass               | 39.42    | 20             | -19.42          | T4       |
|          | GSM850    | EDGE    | 189     | Duo Opus 75kbps | Radial (Y)        | -4.01         | -40.38        | -51.42                 |                                |                    | 36.37    | 20             | -16.37          | T4       |
| 20       | GSM1900   | EDGE    | 661     | Duo Opus 75kbps | Axial (Z)         | 7.62          | -35.97        | -42.36                 | 1.67                           | Pass               | 43.59    | 20             | -23.59          | T4       |
|          | GSM1900   | EDGE    | 661     | Duo Opus 75kbps | Radial (Y)        | -4.23         | -43.1         | -51.42                 |                                |                    | 38.87    | 20             | -18.87          | T4       |
| 21       | WCDMA II  | HSPA    | 9400    | Duo Opus 75kbps | Axial (Z)         | 10.38         | -38.24        | -45.29                 | 1.24                           | Pass               | 48.62    | 20             | -28.62          | T4       |
|          | WCDMA II  | HSPA    | 9400    | Duo Opus 75kbps | Radial (Y)        | 2.24          | -47.44        | -52.88                 |                                |                    | 49.68    | 20             | -29.68          | T4       |
| 22       | WCDMA V   | HSPA    | 4182    | Duo Opus 75kbps | Axial (Z)         | 10.29         | -38.3         | -45.29                 | 1.18                           | Pass               | 48.59    | 20             | -28.59          | T4       |
|          | WCDMA V   | HSPA    | 4182    | Duo Opus 75kbps | Radial (Y)        | 2.31          | -47.84        | -52.88                 |                                |                    | 50.15    | 20             | -30.15          | T4       |
| 23       | LTE B2    | QPSK20M | 18900   | Duo Opus 75kbps | Axial (Z)         | 10.3          | -37.97        | -45.29                 | 1.29                           | Pass               | 48.27    | 20             | -28.27          | T4       |
|          | LTE B2    | QPSK20M | 18900   | Duo Opus 75kbps | Radial (Y)        | 2.02          | -47.75        | -52.88                 |                                |                    | 49.77    | 20             | -29.77          | T4       |
| 24       | LTE B4    | QPSK20M | 20175   | Duo Opus 75kbps | Axial (Z)         | 10.68         | -37.81        | -43.2                  | 1.28                           | Pass               | 48.49    | 20             | -28.49          | T4       |
|          | LTE B4    | QPSK20M | 20175   | Duo Opus 75kbps | Radial (Y)        | 2.27          | -48.11        | -51.01                 |                                |                    | 50.38    | 20             | -30.38          | T4       |
| 25       | LTE B5    | QPSK10M | 20525   | Duo Opus 75kbps | Axial (Z)         | 10.71         | -38.51        | -45.29                 | 1.34                           | Pass               | 49.22    | 20             | -29.22          | T4       |
|          | LTE B5    | QPSK10M | 20525   | Duo Opus 75kbps | Radial (Y)        | 2.74          | -47.47        | -52.88                 |                                |                    | 50.21    | 20             | -30.21          | T4       |
| 26       | LTE B48   | QPSK20M | 56210   | Duo Opus 75kbps | Axial (Z)         | 8.21          | -38.97        | -43.2                  | 1.21                           | Pass               | 47.18    | 20             | -27.18          | T4       |
|          | LTE B48   | QPSK20M | 56210   | Duo Opus 75kbps | Radial (Y)        | -1.35         | -40.12        | -51.01                 |                                |                    | 38.77    | 20             | -18.77          | T4       |
| 27       | LTE B66   | QPSK20M | 132322  | Duo Opus 75kbps | Axial (Z)         | 10.33         | -38.2         | -45.29                 | 1.22                           | Pass               | 48.53    | 20             | -28.53          | T4       |
|          | LTE B66   | QPSK20M | 132322  | Duo Opus 75kbps | Radial (Y)        | 2.19          | -47.31        | -52.88                 |                                |                    | 49.5     | 20             | -29.5           | T4       |
| 28       | LTE B71   | QPSK20M | 133297  | Duo Opus 75kbps | Axial (Z)         | 10.74         | -38.18        | -45.29                 | 1.28                           | Pass               | 48.92    | 20             | -28.92          | T4       |
|          | LTE B71   | QPSK20M | 133297  | Duo Opus 75kbps | Radial (Y)        | 2.66          | -47.62        | -52.88                 |                                |                    | 50.28    | 20             | -30.28          | T4       |
| 29       | WLAN 2.4G | 802.11b | 6       | Duo Opus 75kbps | Axial (Z)         | 10.75         | -36.97        | -43.2                  | 1.14                           | Pass               | 47.72    | 20             | -27.72          | T4       |
|          | WLAN 2.4G | 802.11b | 6       | Duo Opus 75kbps | Radial (Y)        | 2.13          | -47.78        | -51.01                 |                                |                    | 49.91    | 20             | -29.91          | T4       |
| 30       | WLAN 5.6G | 802.11a | 124     | Duo Opus 75kbps | Axial (Z)         | 10.66         | -37.93        | -43.2                  | 1.22                           | Pass               | 48.59    | 20             | -28.59          | T4       |
|          | WLAN 5.6G | 802.11a | 124     | Duo Opus 75kbps | Radial (Y)        | 2.53          | -48.15        | -51.01                 |                                |                    | 50.68    | 20             | -30.68          | T4       |

## Interim Procedure for OTT VOIP over 5G NR

The following procedure listed in KDB 285076 D03 is used to evaluate OTT VoIP over 5G NR.

1. This procedure is applicable for 5G FR1 calls that use the same protocol, codec(s), and reference level as OTT calls
2. Establish the  $ABM_{1_{5G\ FR1}}$  value by using the  $ABM_{1_{LTE}}$  magnetic intensity for an LTE call in the same band as the 5G FR1 band under test.
3. Also note the actual  $ABM_{2_{LTE}}$  OTT value.
4. Establish an  $ABM_{2_{5G\ FR1}}$  value, using a 5G manufacture test mode over 5G FR1 channels for the same band under test.
5. Calculate the rating by following steps:
  - a. Record both  $ABM_{2_{LTE}}$  and  $ABM_{2_{5G\ FR1}}$  for comparison.
  - b.  $ABM1 = ABM_{1_{LTE}}$
  - c.  $AMB2 = ABM_{2_{5G\ FR1}}$
  - d.  $SNNR = (ABM_{1_{LTE}} - ABM_{2_{5G\ FR1}}) - 3\text{ dB}$ ; A 3dB margin is built in to ensure conservative results with this interim procedure.

The above is only applicable for OTT VoIP scenarios, this device does not support VoNR over IMS.

The manufacturer has confirmed the handset as designed is expected to exhibit similar audio intensity levels between an OTT VoIP call placed over LTE and 5G FR1 data connection.

**Note:**

Due to test equipment limitations,  $ABM1$  measurements were not possible. Therefore, the interim procedure for OTT VoIP over 5G NR was followed to obtain SNR values. Additionally, frequency response measurements were not possible due to test equipment limitations.

Codec Investigation-NR OTT VoIP SNNR by Radio Configuration

|  | Air Interface | WaveForm  | Bandwidth (MHz) | Modulation | RB Size | RB Offset | Channel | Codec Setting   | UL-DL Configuration | Probe Orientation | ABM1 LTE (dB A/m) | ABM2 NR (dB A/m) | SNR NR (dB) |
|--|---------------|-----------|-----------------|------------|---------|-----------|---------|-----------------|---------------------|-------------------|-------------------|------------------|-------------|
|  | 5G NR n2      | CP-OFDM   | 20              | QPSK       | 1       | 1         | 376000  | Duo Opus 75kbps |                     | Axial (Z)         | 10.3              | -22.23           | 32.53       |
|  | 5G NR n2      | CP-OFDM   | 20              | QPSK       | 1       | 53        | 376000  | Duo Opus 75kbps |                     | Axial (Z)         | 10.3              | -23.08           | 33.38       |
|  | 5G NR n2      | CP-OFDM   | 20              | QPSK       | 1       | 104       | 376000  | Duo Opus 75kbps |                     | Axial (Z)         | 10.3              | -23.41           | 33.71       |
|  | 5G NR n2      | CP-OFDM   | 20              | QPSK       | 50      | 0         | 376000  | Duo Opus 75kbps |                     | Axial (Z)         | 10.3              | -23.82           | 34.12       |
|  | 5G NR n2      | CP-OFDM   | 20              | QPSK       | 50      | 28        | 376000  | Duo Opus 75kbps |                     | Axial (Z)         | 10.3              | -23.8            | 34.1        |
|  | 5G NR n2      | CP-OFDM   | 20              | QPSK       | 50      | 56        | 376000  | Duo Opus 75kbps |                     | Axial (Z)         | 10.3              | -26.69           | 36.99       |
|  | 5G NR n2      | CP-OFDM   | 20              | QPSK       | 100     | 0         | 376000  | Duo Opus 75kbps |                     | Axial (Z)         | 10.3              | -27.01           | 37.31       |
|  | 5G NR n2      | CP-OFDM   | 20              | 16QAM      | 1       | 1         | 376000  | Duo Opus 75kbps |                     | Axial (Z)         | 10.3              | -27.75           | 38.05       |
|  | 5G NR n2      | CP-OFDM   | 20              | 64QAM      | 1       | 1         | 376000  | Duo Opus 75kbps |                     | Axial (Z)         | 10.3              | -28.72           | 39.02       |
|  | 5G NR n2      | CP-OFDM   | 20              | 256QAM     | 1       | 1         | 376000  | Duo Opus 75kbps |                     | Axial (Z)         | 10.3              | -25.06           | 35.36       |
|  | 5G NR n2      | CP-OFDM   | 15              | Worst      | 1       | 1         | 376000  | Duo Opus 75kbps |                     | Axial (Z)         | 10.3              | -22.88           | 33.18       |
|  | 5G NR n2      | CP-OFDM   | 10              | Worst      | 1       | 1         | 376000  | Duo Opus 75kbps |                     | Axial (Z)         | 10.3              | -23              | 33.3        |
|  | 5G NR n2      | CP-OFDM   | 5               | Worst      | 1       | 1         | 376000  | Duo Opus 75kbps |                     | Axial (Z)         | 10.3              | -23.31           | 33.61       |
|  | 5G NR n2      | DFTS-OFDM | 20              | QPSK       | 1       | 1         | 376000  | Duo Opus 75kbps |                     | Axial (Z)         | 10.3              | -21.8            | 32.1        |
|  | 5G NR n2      | DFTS-OFDM | 20              | QPSK       | 1       | 53        | 376000  | Duo Opus 75kbps |                     | Axial (Z)         | 10.3              | -23.09           | 33.39       |
|  | 5G NR n2      | DFTS-OFDM | 20              | QPSK       | 1       | 104       | 376000  | Duo Opus 75kbps |                     | Axial (Z)         | 10.3              | -22.26           | 32.56       |
|  | 5G NR n2      | DFTS-OFDM | 20              | QPSK       | 50      | 0         | 376000  | Duo Opus 75kbps |                     | Axial (Z)         | 10.3              | -23.28           | 33.58       |
|  | 5G NR n2      | DFTS-OFDM | 20              | QPSK       | 50      | 28        | 376000  | Duo Opus 75kbps |                     | Axial (Z)         | 10.3              | -24.06           | 34.36       |
|  | 5G NR n2      | DFTS-OFDM | 20              | QPSK       | 50      | 56        | 376000  | Duo Opus 75kbps |                     | Axial (Z)         | 10.3              | -24.13           | 34.43       |
|  | 5G NR n2      | DFTS-OFDM | 20              | QPSK       | 100     | 0         | 376000  | Duo Opus 75kbps |                     | Axial (Z)         | 10.3              | -24.21           | 34.51       |
|  | 5G NR n2      | DFTS-OFDM | 20              | 16QAM      | 1       | 1         | 376000  | Duo Opus 75kbps |                     | Axial (Z)         | 10.3              | -24.11           | 34.41       |
|  | 5G NR n2      | DFTS-OFDM | 20              | 64QAM      | 1       | 1         | 376000  | Duo Opus 75kbps |                     | Axial (Z)         | 10.3              | -24.02           | 34.32       |
|  | 5G NR n2      | DFTS-OFDM | 20              | 256QAM     | 1       | 1         | 376000  | Duo Opus 75kbps |                     | Axial (Z)         | 10.3              | -23.54           | 33.84       |
|  | 5G NR n2      | DFTS-OFDM | 15              | QPSK       | 1       | 1         | 376000  | Duo Opus 75kbps |                     | Axial (Z)         | 10.3              | -21.91           | 32.21       |
|  | 5G NR n2      | DFTS-OFDM | 10              | QPSK       | 1       | 1         | 376000  | Duo Opus 75kbps |                     | Axial (Z)         | 10.3              | -21.86           | 32.16       |
|  | 5G NR n2      | DFTS-OFDM | 5               | QPSK       | 1       | 1         | 376000  | Duo Opus 75kbps |                     | Axial (Z)         | 10.3              | -21.98           | 32.28       |
|  | 5G NR n2      | DFTS-OFDM | 20              | QPSK       | 1       | 1         | 376000  | Duo Opus 75kbps |                     | Axial (Z)         | 10.3              | -21.8            | 32.1        |
|  | 5G NR n5      | DFTS-OFDM | 20              | QPSK       | 1       | 1         | 167300  | Duo Opus 75kbps |                     | Axial (Z)         | 10.71             | -21.26           | 31.97       |
|  | 5G NR n66     | DFTS-OFDM | 40              | QPSK       | 1       | 1         | 349000  | Duo Opus 75kbps |                     | Axial (Z)         | 10.33             | -30.6            | 40.93       |
|  | 5G NR n71     | DFTS-OFDM | 20              | QPSK       | 1       | 1         | 136100  | Duo Opus 75kbps |                     | Axial (Z)         | 10.74             | -23.84           | 34.58       |

Test Summary

| Plot No. | Band     | Mode          | Channel | Codec Setting   | Probe Orientation | ABM1 LTE (dB A/m) | ABM2 NR (dB A/m) | SNR OTT LTE (dB) | ABM2 LTE (dB A/m) | Ambient Noise (dB A/m) | Frequency Response Margin (dB) | Frequency Response | SNR (dB) | SNR-3 (dB) | FCC Limit (dB) | FCC Margin (dB) | T-Rating |
|----------|----------|---------------|---------|-----------------|-------------------|-------------------|------------------|------------------|-------------------|------------------------|--------------------------------|--------------------|----------|------------|----------------|-----------------|----------|
| 31       | 5G NR n5 | DFT-S_QPSK20M | 167300  | Duo Opus 75kbps | Axial (Z)         | 10.71             | -21.26           | 49.22            | -38.51            | N/A                    | n/a                            | Pass               | 31.97    | 28.97      | 20             | -8.97           | T3       |
| 31       | 5G NR n5 | DFT-S_QPSK20M | 167300  | Duo Opus 75kbps | Radial (Y)        | 2.74              | -28.33           | 50.21            | -47.47            | N/A                    |                                |                    | 31.07    | 28.07      | 20             | -8.07           | T3       |