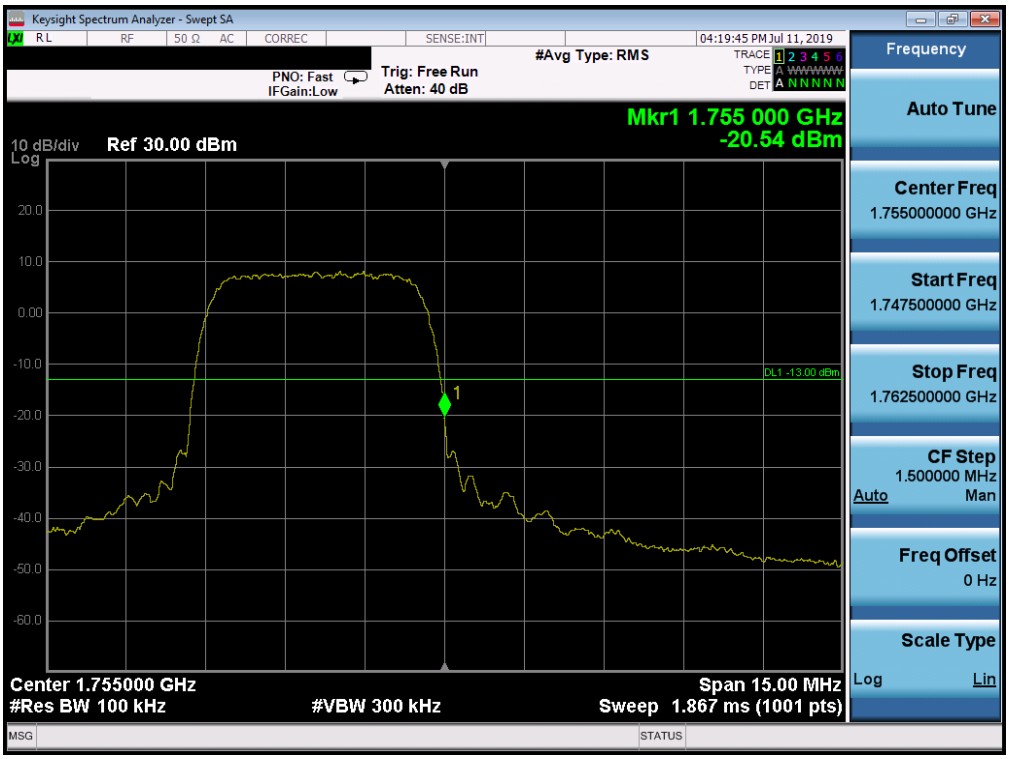
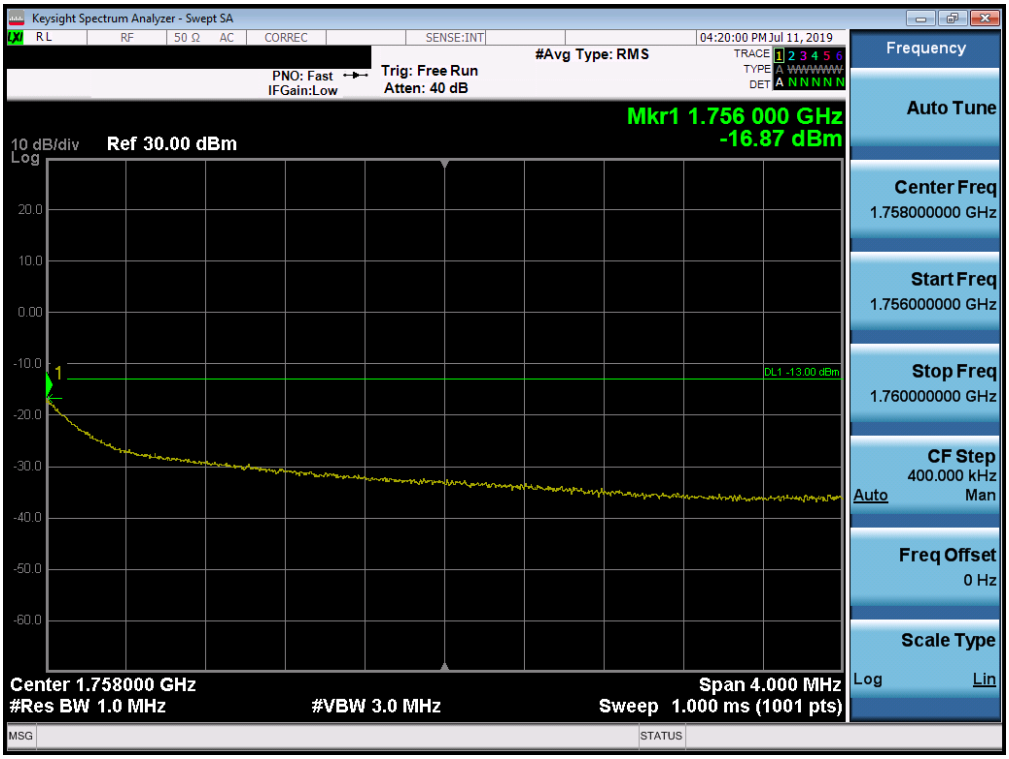
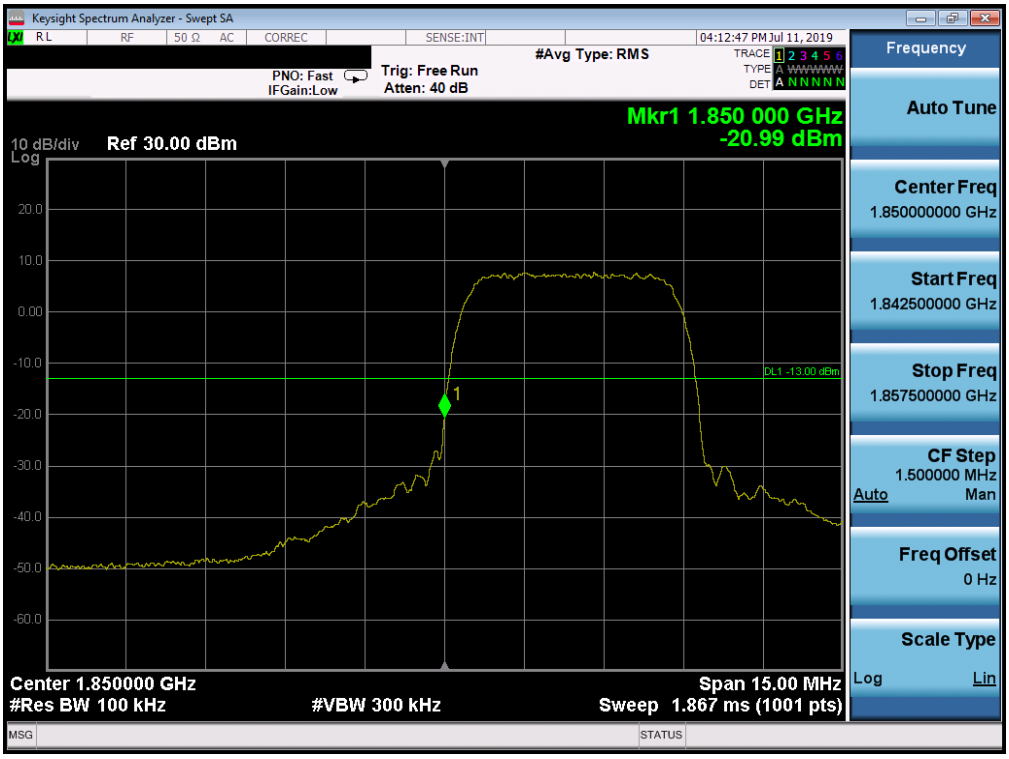


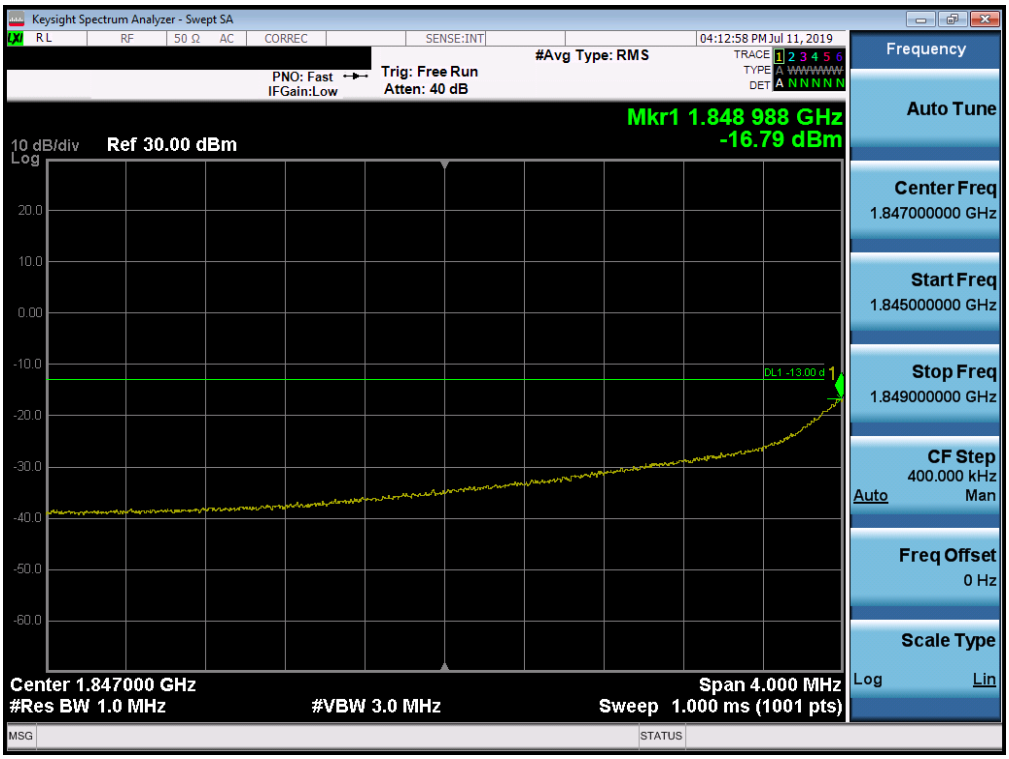

**Plot 7-89. Band Edge Plot (AWS WCDMA Mode - High Channel)**



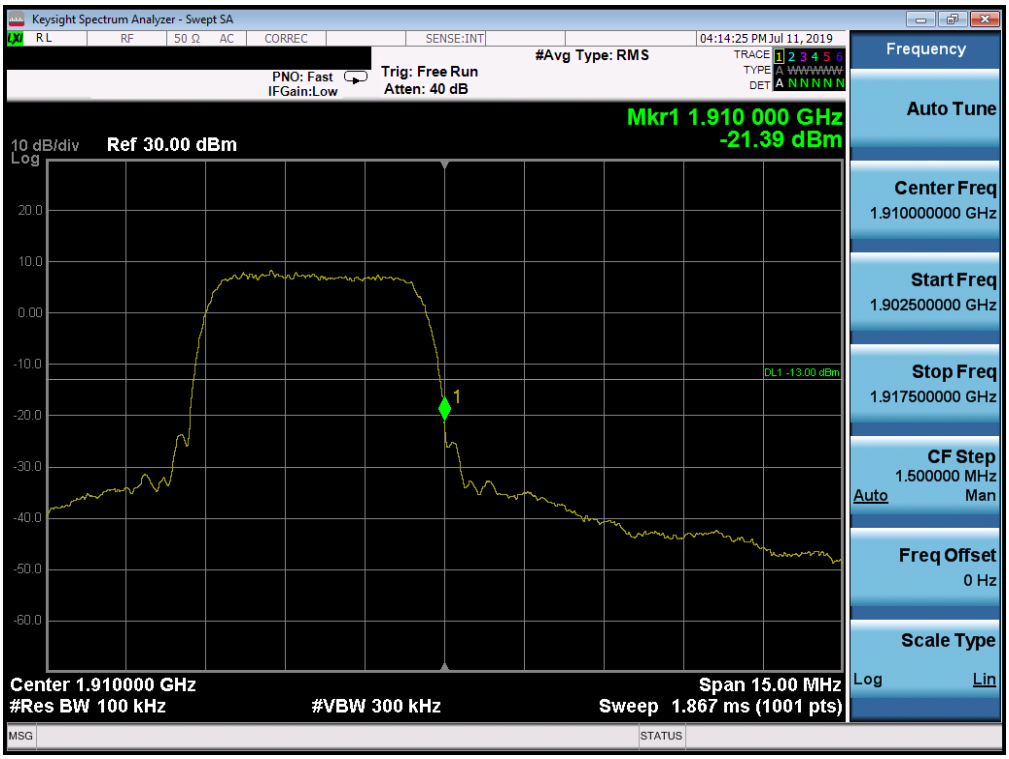

**Plot 7-90. 4MHz Span Plot (AWS WCDMA Mode - High Channel)**



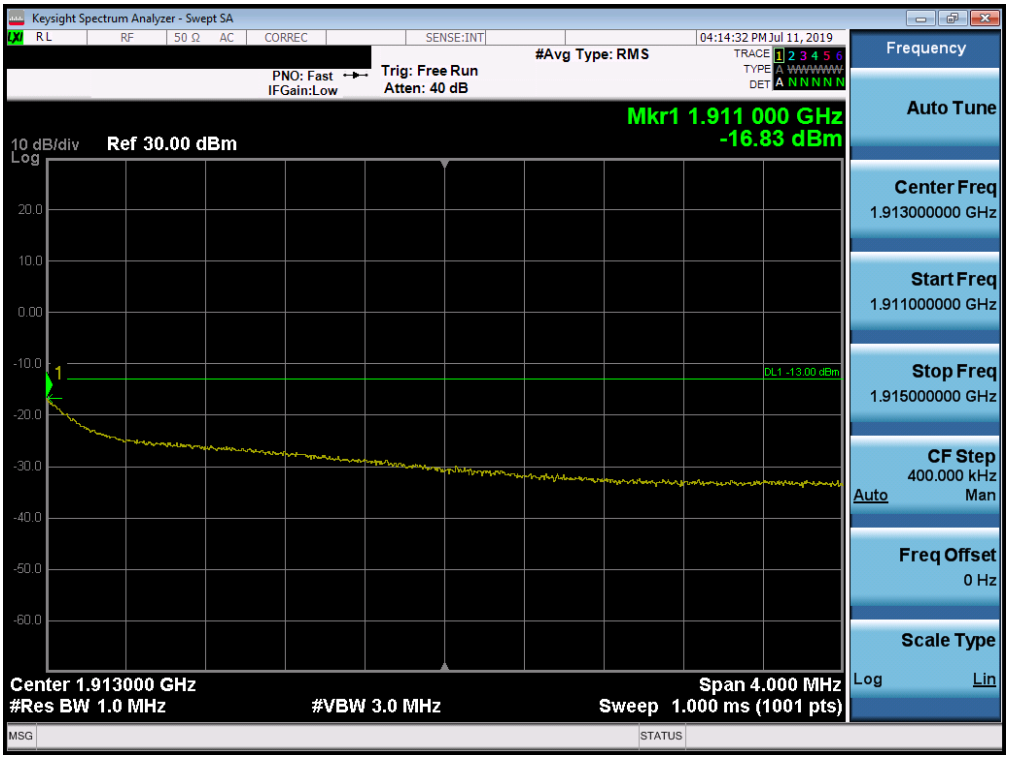

**Plot 7-91. Band Edge Plot (PCS WCDMA Mode - Low Channel)**




**Plot 7-92. 4MHz Span Plot (PCS WCDMA Mode - Low Channel)**




**Plot 7-93. Band Edge Plot (PCS WCDMA Mode - High Channel)**




**Plot 7-94. 4MHz Span Plot (PCS WCDMA Mode - High Channel)**

## 7.5 Peak-Average Ratio

**Test Overview**

A peak to average ratio measurement is performed at the conducted port of the EUT. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level.

**Test Procedure Used**

KDB 971168 D01 v03r01 – Section 5.7.1

**Test Settings**

1. The signal analyzer's CCDF measurement profile is enabled
2. Frequency = carrier center frequency
3. Measurement BW > Emission bandwidth of signal
4. The signal analyzer was set to collect one million samples to generate the CCDF curve
5. The measurement interval was set depending on the type of signal analyzed. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms. For burst transmissions, the spectrum analyzer is set to use an internal "RF Burst" trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the "on time" of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power

**Test Setup**

The EUT and measurement equipment were set up as shown in the diagram below.

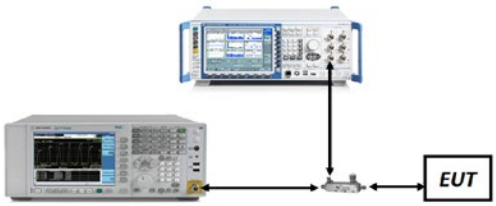
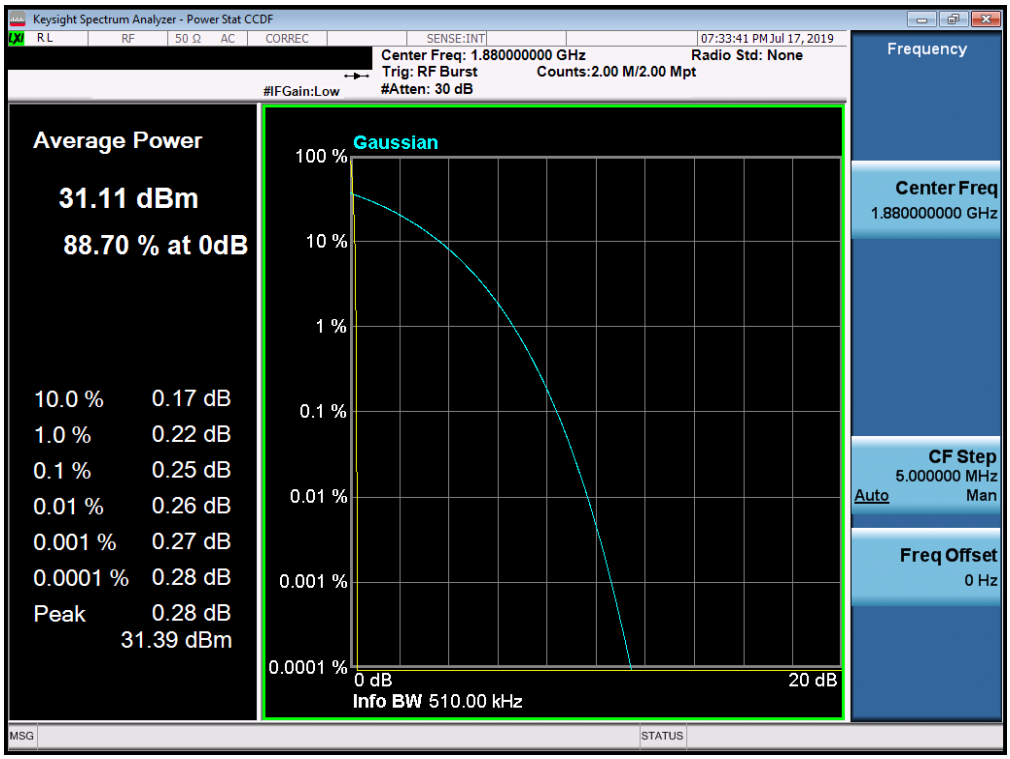


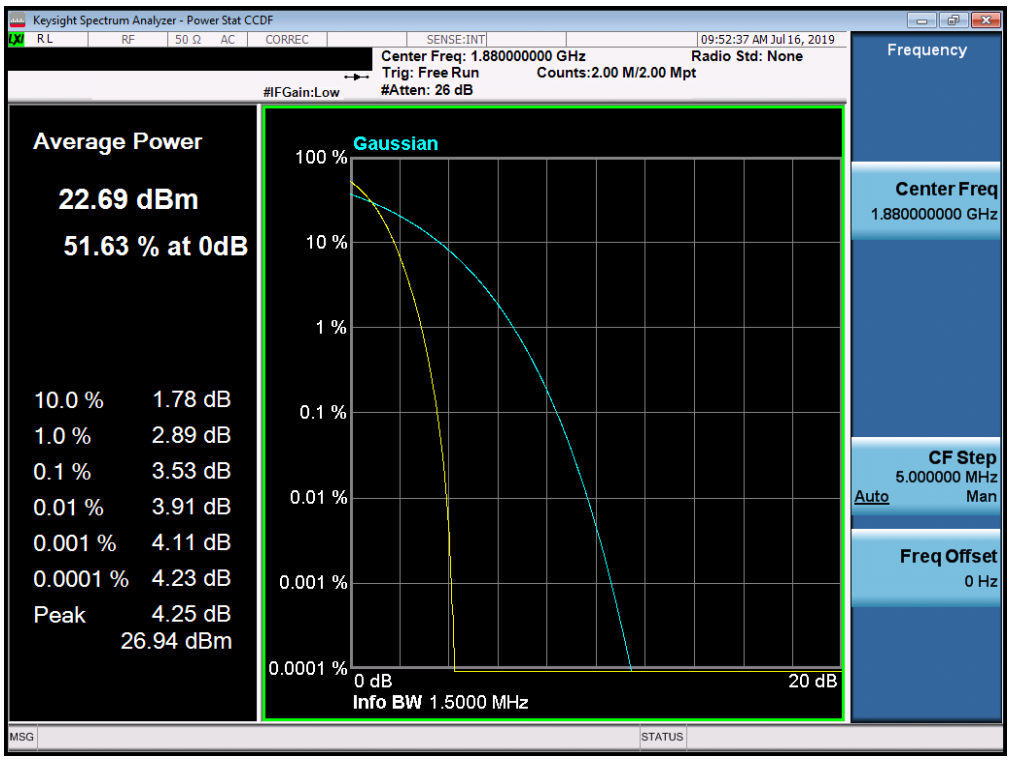

**Figure 7-4. Test Instrument & Measurement Setup**

**Test Notes**

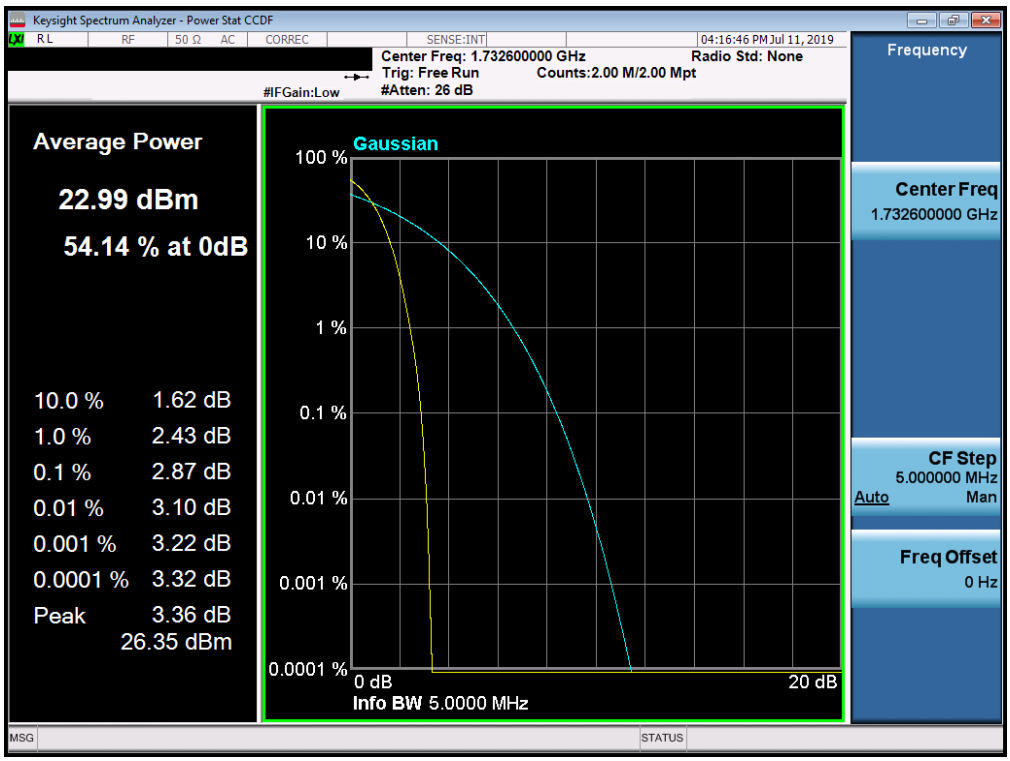
None



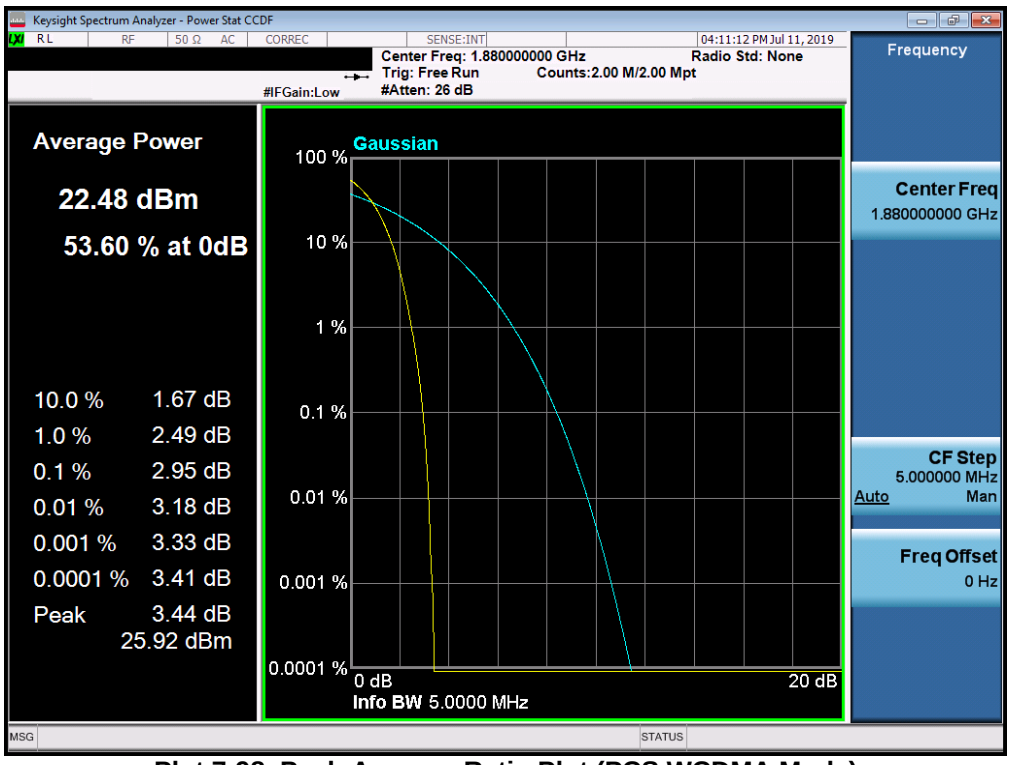

**Plot 7-95. Peak-Average Ratio Plot (PCS GPRS Mode)**




**Plot 7-96. Peak-Average Ratio Plot (PCS CDMA Mode)**




**Plot 7-97. Peak-Average Ratio Plot (AWS WCDMA Mode)**




**Plot 7-98. Peak-Average Ratio Plot (PCS WCDMA Mode)**

## 7.6 Radiated Power (ERP/EIRP)

**Test Overview**

Effective Radiated Power (ERP) and Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as RMS average measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

**Test Procedures Used**

KDB 971168 D01 v03r01 – Section 5.2.1

ANSI/TIA-603-E-2016 – Section 2.2.17

**Test Settings**

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation. For signals with burst transmission, the signal analyzer's "time domain power" measurement capability is used
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW ≥ 3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points ≥ 2 x span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto". Trigger is set to enable triggering only on full power bursts with the sweep time set less than or equal to the transmission burst duration
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation. For signals with burst transmission, the "gating" function was enabled to ensure that measurements are performed during times in which the transmitter is operating at its maximum power
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

## Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

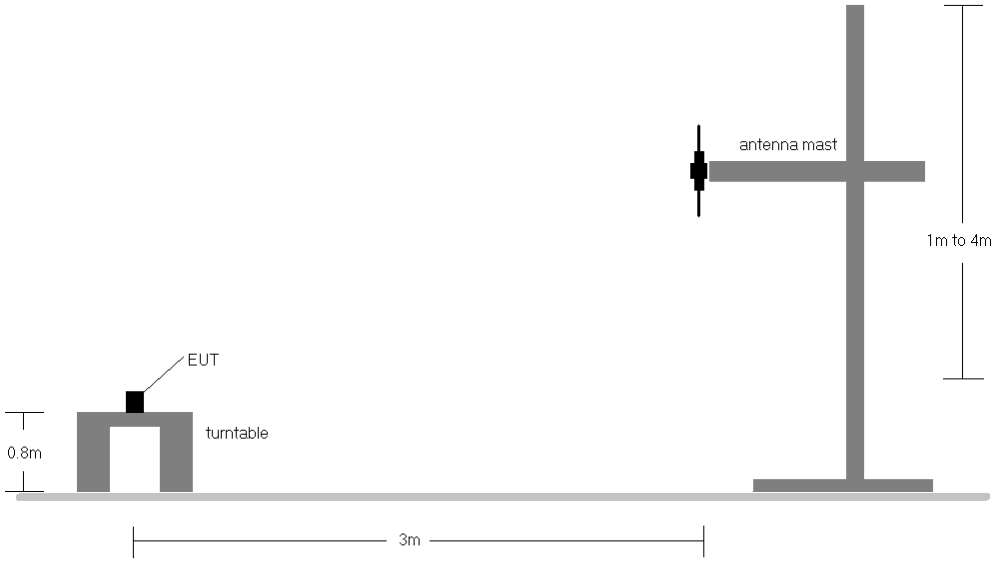



**Figure 7-5. Radiated Test Setup <1GHz**

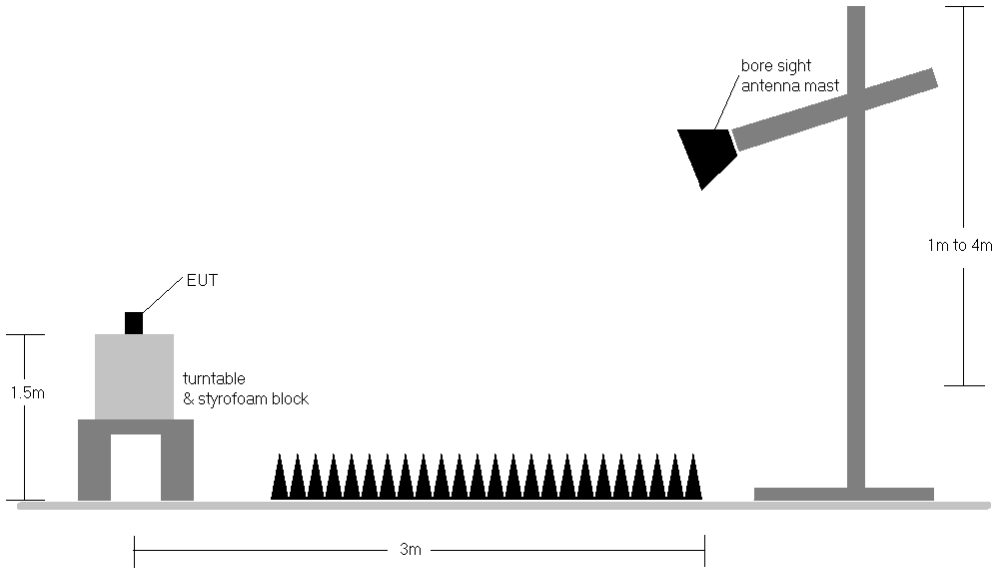



**Figure 7-6. Radiated Test Setup >1GHz**

## Test Notes

1) This device employs GSM, GPRS, and EDGE capabilities. The EUT was tested under all configurations and the highest power is reported in GPRS mode while transmitting with one slot active.

2) This device employs UMTS technology with WCDMA (AMR/RMC), HSDPA, and HSUPA capabilities. For WCDMA and HSUPA transmission, all configurations were investigated and the worst case UMTS emissions were found in RMC WCDMA mode at 12.2kbps with HSDPA inactive and TPC bits all set to "1."

3) For CDMA mode, the device was tested under all RC and SO combinations and the worst case is reported with RC3/SO55 with "All Up" power control bits.

4) This unit was tested with its standard battery.

5) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case setup is reported in the tables below.

| Frequency [MHz] | Mode | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Substitute Level [dBm] | Ant. Gain [dBi] | ERP [dBm] | ERP [Watts] | ERP Limit [dBm] | Margin [dB] | EIRP [dBm] | EIRP [Watts] | EIRP Limit [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 824.20 | GPRS850 | V | 111 | 331 | 21.94 | 6.70 | 26.49 | 0.446 | 38.45 | -11.96 | 28.64 | 0.731 | 40.61 | -11.97 |
| 836.60 | GPRS850 | V | 100 | 334 | 21.95 | 6.70 | 26.50 | 0.447 | 38.45 | -11.95 | 28.65 | 0.733 | 40.61 | -11.96 |
| 848.80 | GPRS850 | V | 138 | 325 | 22.50 | 6.70 | **27.05** | **0.507** | 38.45 | -11.40 | **29.20** | **0.832** | 40.61 | -11.41 |
| 848.80 | GPRS850 | H | 112 | 255 | 21.23 | 6.70 | 25.78 | 0.378 | 38.45 | -12.67 | 27.93 | 0.621 | 40.61 | -12.68 |
| 848.80 | EDGE850 | V | 138 | 325 | 17.01 | 6.70 | **21.56** | 0.143 | 38.45 | -16.89 | **23.71** | **0.235** | 40.61 | -16.90 |

**Table 7-2. ERP/EIRP (Cellular GPRS)**

| Frequency [MHz] | Mode | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Substitute Level [dBm] | Ant. Gain [dBi] | ERP [dBm] | ERP Limit [dBm] | Margin [dB] | EIRP [dBm] | EIRP Limit [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 824.70 | CDMA850 | V | 132 | 312 | 14.59 | 6.70 | 19.14 | 38.45 | -19.31 | 21.29 | 40.61 | -19.32 |
| 836.52 | CDMA850 | V | 117 | 310 | 14.94 | 6.70 | 19.49 | 38.45 | -18.96 | 21.64 | 40.61 | -18.97 |
| 848.31 | CDMA850 | V | 132 | 312 | 15.94 | 6.70 | **20.49** | 38.45 | -17.96 | **22.64** | 40.61 | -17.97 |
| 848.31 | CDMA850 | H | 182 | 166 | 14.81 | 6.70 | 19.36 | 38.45 | -19.09 | 21.51 | 40.61 | -19.10 |

**Table 7-3. ERP/EIRP (Cellular CDMA)**

| Frequency [MHz] | Mode | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Substitute Level [dBm] | Ant. Gain [dBi] | ERP [dBm] | ERP Limit [dBm] | Margin [dB] | EIRP [dBm] | EIRP Limit [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 826.40 | WCDMA850 | V | 139 | 131 | 13.96 | 6.70 | 18.51 | 38.45 | -19.94 | 20.66 | 40.61 | -19.95 |
| 836.60 | WCDMA850 | V | 119 | 151 | 13.86 | 6.70 | 18.41 | 38.45 | -20.04 | 20.56 | 40.61 | -20.05 |
| 846.60 | WCDMA850 | V | 119 | 130 | 14.32 | 6.60 | **18.77** | 38.45 | -19.68 | **20.92** | 40.61 | -19.69 |
| 846.60 | WCDMA850 | H | 200 | 170 | 13.49 | 6.60 | 17.94 | 38.45 | -20.51 | 20.09 | 40.61 | -20.52 |

**Table 7-4. ERP/EIRP (Cellular WCDMA)**

| Frequency [MHz] | Mode | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Substitute Level [dBm] | Ant. Gain [dBi] | EIRP [dBm] | EIRP Limit [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 1712.40 | WCDMA1700 | H | 100 | 546 | 13.16 | 9.43 | 22.59 | 30.00 | -7.41 |
| 1732.60 | WCDMA1700 | H | 174 | 48 | 14.12 | 9.31 | 23.43 | 30.00 | -6.57 |
| 1752.60 | WCDMA1700 | H | 100 | 44 | 14.27 | 9.21 | **23.48** | 30.00 | -6.52 |
| 1752.60 | WCDMA1700 | V | 200 | 172 | 13.17 | 9.21 | 22.38 | 30.00 | -7.62 |

**Table 7-5. EIRP (AWS WCDMA)**

| Frequency [MHz] | Mode | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Substitute Level [dBm] | Ant. Gain [dBi] | EIRP [dBm] | EIRP [Watts] | EIRP Limit [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|---|
| 1850.20 | GPRS1900 | H | 117 | 12 | 21.95 | 9.48 | 31.43 | 1.389 | 33.01 | -1.58 |
| 1880.00 | GPRS1900 | H | 121 | 11 | 21.45 | 9.90 | 31.35 | 1.365 | 33.01 | -1.66 |
| 1909.80 | GPRS1900 | H | 110 | 2 | 21.20 | 10.26 | **31.46** | **1.398** | 33.01 | -1.55 |
| 1909.80 | GPRS1900 | V | 190 | 10 | 19.65 | 10.26 | 29.91 | 0.979 | 33.01 | -3.10 |
| 1909.80 | EDGE1900 | H | 110 | 2 | 14.86 | 10.26 | **25.12** | 0.325 | 33.01 | -7.89 |

**Table 7-6. EIRP (PCS GPRS)**

| Frequency [MHz] | Mode | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Substitute Level [dBm] | Ant. Gain [dBi] | EIRP [dBm] | EIRP [Watts] | EIRP Limit [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|---|
| 1851.25 | CDMA1900 | H | 122 | 18 | 14.87 | 9.49 | 24.36 | 0.273 | 33.01 | -8.65 |
| 1880.00 | CDMA1900 | H | 118 | 16 | 15.32 | 9.90 | **25.22** | **0.333** | 33.01 | -7.79 |
| 1908.75 | CDMA1900 | H | 110 | 17 | 14.90 | 10.25 | 25.15 | 0.327 | 33.01 | -7.86 |
| 1880.00 | CDMA1900 | V | 108 | 130 | 13.92 | 9.90 | 23.82 | 0.241 | 33.01 | -9.19 |

**Table 7-7. EIRP (PCS CDMA)**

| Frequency [MHz] | Mode | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Substitute Level [dBm] | Ant. Gain [dBi] | EIRP [dBm] | EIRP [Watts] | EIRP Limit [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|---|
| 1852.40 | WCDMA1900 | H | 103 | 24 | 15.86 | 9.51 | 25.37 | 0.344 | 33.01 | -7.64 |
| 1880.00 | WCDMA1900 | H | 104 | 26 | 15.34 | 9.90 | 25.24 | 0.334 | 33.01 | -7.77 |
| 1907.60 | WCDMA1900 | H | 100 | 260 | 15.50 | 10.24 | **25.74** | **0.375** | 33.01 | -7.27 |
| 1907.60 | WCDMA1900 | V | 190 | 233 | 13.93 | 10.24 | 24.17 | 0.261 | 33.01 | -8.84 |

**Table 7-8. EIRP (PCS WCDMA)**

## 7.7 Radiated Spurious Emissions Measurements

**Test Overview**

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using horizontally and vertically polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as peak measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

**Test Procedures Used**

KDB 971168 D01 v03r01 – Section 5.8

ANSI/TIA-603-E-2016 – Section 2.2.12

**Test Settings**

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW ≥ 3 x RBW
3. Span = 1.5 times the OBW
4. No. of sweep points ≥ 2 x span / RBW
5. Detector = RMS
6. Trace mode = Average (Max Hold for pulsed emissions)
7. The trace was allowed to stabilize

## Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

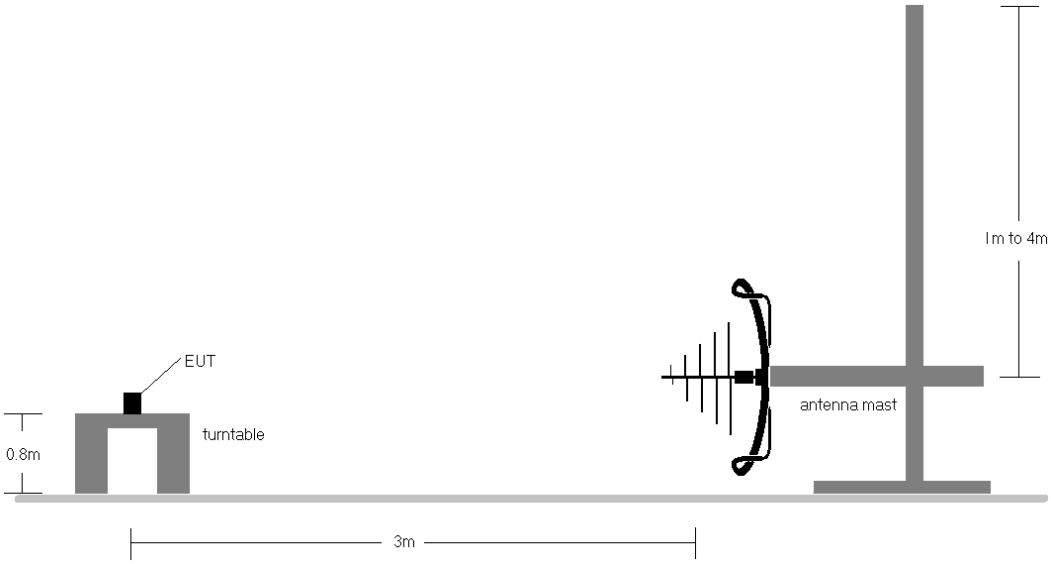



**Figure 7-7. Test Instrument & Measurement Setup < 1GHz**

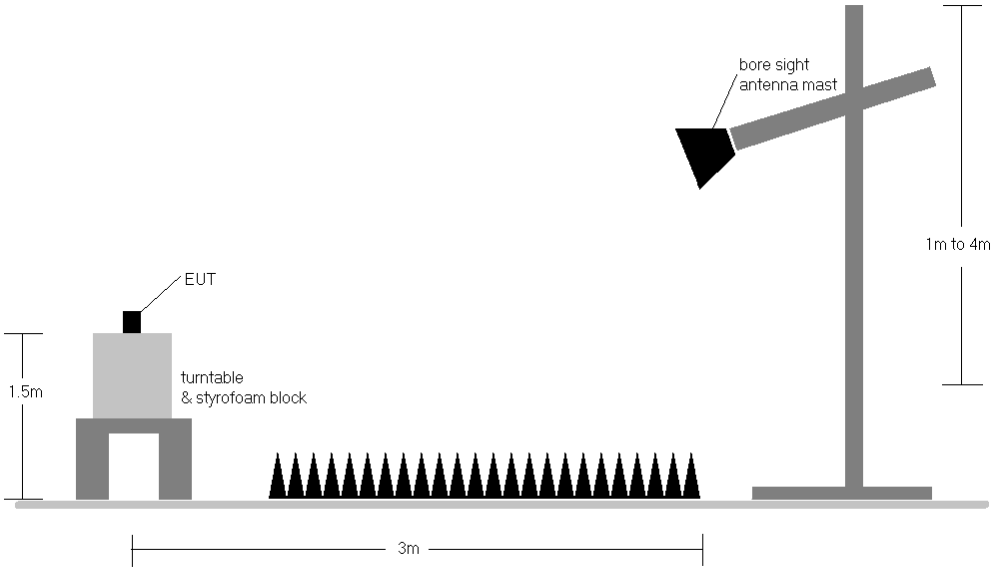



**Figure 7-8. Test Instrument & Measurement Setup >1 GHz**

## Test Notes

1) This device employs GSM, GPRS, and EDGE capabilities. The EUT was tested under all configurations and the highest power is reported in GPRS mode while transmitting with one slot active.

2) This device employs UMTS technology with WCDMA (AMR/RMC), HSDPA, and HSUPA capabilities. For WCDMA and HSUPA transmission, all configurations were investigated and the worst case UMTS emissions were found in RMC WCDMA mode at 12.2kbps with HSDPA inactive and TPC bits all set to "1."

3) For CDMA mode, the device was tested under all RC and SO combinations and the worst case is reported with RC3/SO55 with "All Up" power control bits.

4) This unit was tested with its standard battery.

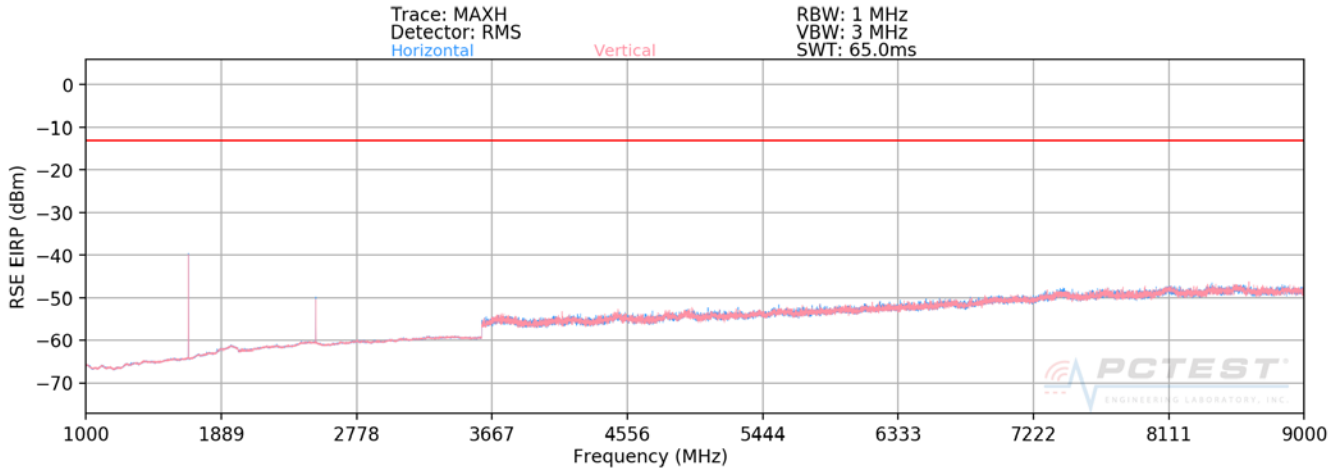
5) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case setup is reported in the tables below.

6) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.

7) Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.

8) The "-" shown in the following RSE tables are used to denote a noise floor measurement.

## Cellular GPRS Mode




**Plot 7-99. Radiated Spurious Plot above 1GHz (Cellular GPRS Mode)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 824.20 | MHz |
| MODULATION SIGNAL: | GPRS (GMSK) | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 1648.40 | V | 400 | 288 | -46.99 | 8.94 | -38.05 | -25.0 |
| 2472.60 | V | 400 | 99 | -49.08 | 9.64 | -39.44 | -26.4 |
| 3296.80 | V | - | - | -68.70 | 9.57 | -59.12 | -46.1 |

**Table 7-9. Radiated Spurious Data (Cellular GPRS Mode – Ch. 128)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 836.60 | MHz |
| MODULATION SIGNAL: | GPRS (GMSK) | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 1673.20 | V | 398 | 240 | -49.82 | 8.95 | -40.87 | -27.9 |
| 2509.80 | V | 210 | 64 | -56.75 | 9.75 | -47.00 | -34.0 |
| 3346.40 | V | - | - | -69.31 | 9.60 | -59.71 | -46.7 |

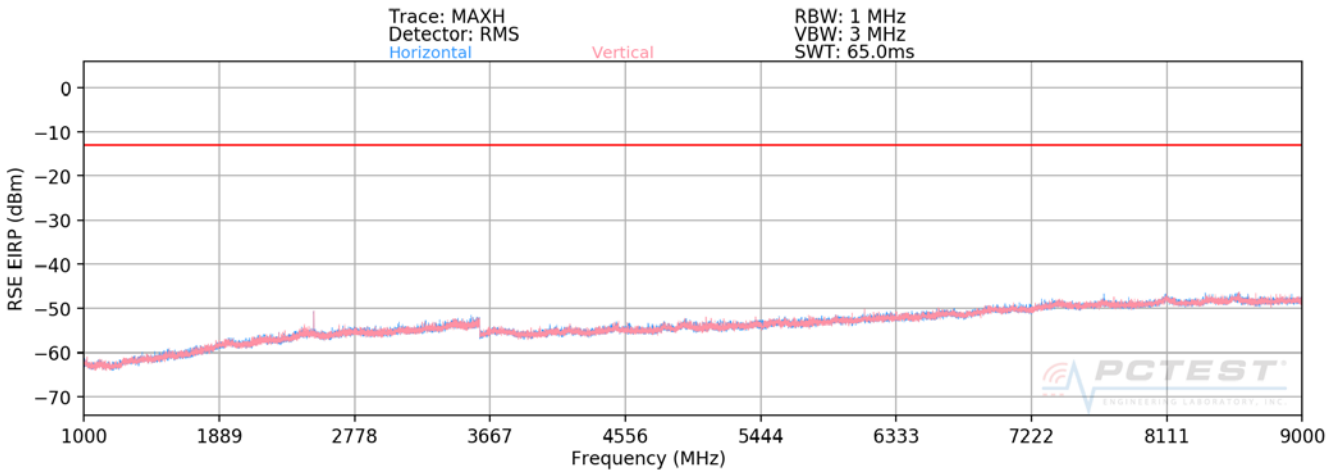
**Table 7-10. Radiated Spurious Data (Cellular GPRS Mode – Ch. 190)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 848.80 | MHz |
| MODULATION SIGNAL: | GPRS (GMSK) | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 1697.60 | V | 307 | 282 | -53.82 | 8.95 | -44.87 | -31.9 |
| 2546.40 | V | 115 | 131 | -57.79 | 9.74 | -48.05 | -35.1 |
| 3395.20 | V | - | - | -70.26 | 9.78 | -60.48 | -47.5 |

**Table 7-11. Radiated Spurious Data (Cellular GPRS Mode – Ch. 251)**

## Cellular CDMA Mode




**Plot 7-100. Radiated Spurious Plot above 1GHz (Cellular CDMA Mode)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 824.70 | MHz |
| MODULATION SIGNAL: | CDMA | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 1649.40 | V | 400 | 313 | -60.84 | 3.61 | -57.24 | -44.2 |
| 2474.10 | V | 182 | 172 | -54.67 | 4.22 | -50.45 | -37.4 |
| 3298.80 | V | - | - | -57.79 | 5.78 | -52.01 | -39.0 |
| 4123.50 | V | - | - | -63.44 | 7.60 | -55.84 | -42.8 |

**Table 7-12. Radiated Spurious Data (Cellular CDMA Mode – Ch. 1013)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 836.52 | MHz |
| MODULATION SIGNAL: | CDMA | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 1673.04 | V | 177 | 122 | -61.00 | 3.62 | -57.38 | -44.4 |
| 2509.56 | V | 158 | 188 | -57.02 | 4.33 | -52.69 | -39.7 |
| 3346.08 | V | - | - | -58.64 | 5.92 | -52.72 | -39.7 |
| 4182.60 | V | - | - | -62.54 | 7.69 | -54.85 | -41.8 |

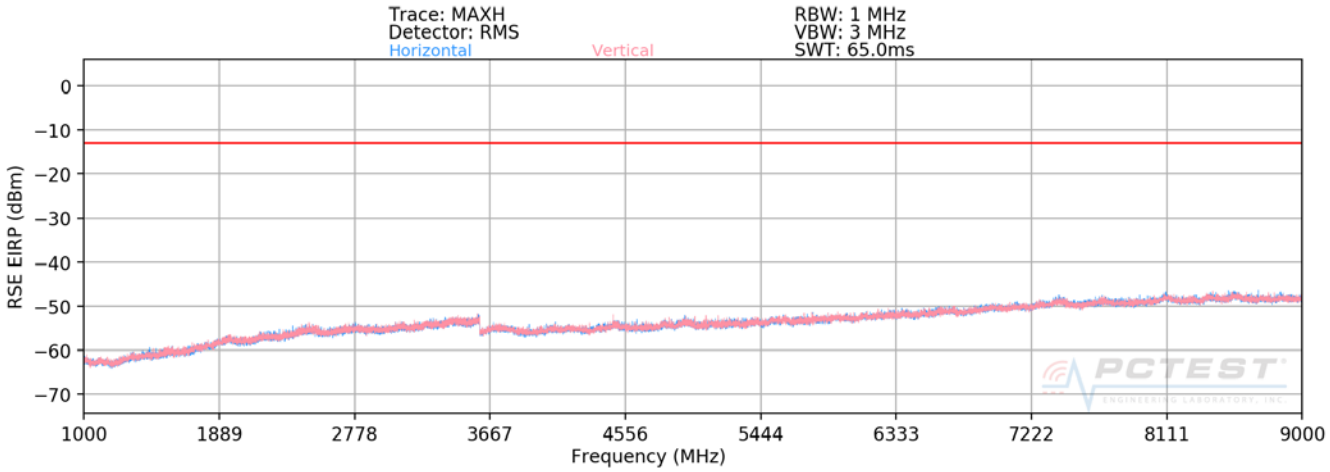
**Table 7-13. Radiated Spurious Data (Cellular CDMA Mode – Ch. 384)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 848.31 | MHz |
| MODULATION SIGNAL: | CDMA | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 1696.62 | V | 381 | 139 | -62.10 | 3.63 | -58.47 | -45.5 |
| 2544.93 | V | 190 | 330 | -57.16 | 4.55 | -52.61 | -39.6 |
| 3393.24 | V | - | - | -62.60 | 6.13 | -56.48 | -43.5 |
| 4241.55 | V | - | - | -63.64 | 7.79 | -55.85 | -42.9 |

**Table 7-14. Radiated Spurious Data (Cellular CDMA Mode – Ch. 777)**

## Cellular WCDMA Mode




**Plot 7-101. Radiated Spurious Plot above 1GHz (Cellular WCDMA Mode)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 826.40 | MHz |
| MODULATION SIGNAL: | WCDMA | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 1652.80 | V | - | - | -79.66 | 8.95 | -70.71 | -57.7 |
| 2479.20 | V | - | - | -76.91 | 9.67 | -67.24 | -54.2 |

**Table 7-15. Radiated Spurious Data (Cellular WCDMA Mode – Ch. 4132)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 836.60 | MHz |
| MODULATION SIGNAL: | WCDMA | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 1673.20 | V | 400 | 244 | -79.16 | 8.95 | -70.21 | -57.2 |
| 2509.80 | V | - | - | -76.95 | 9.75 | -67.20 | -54.2 |

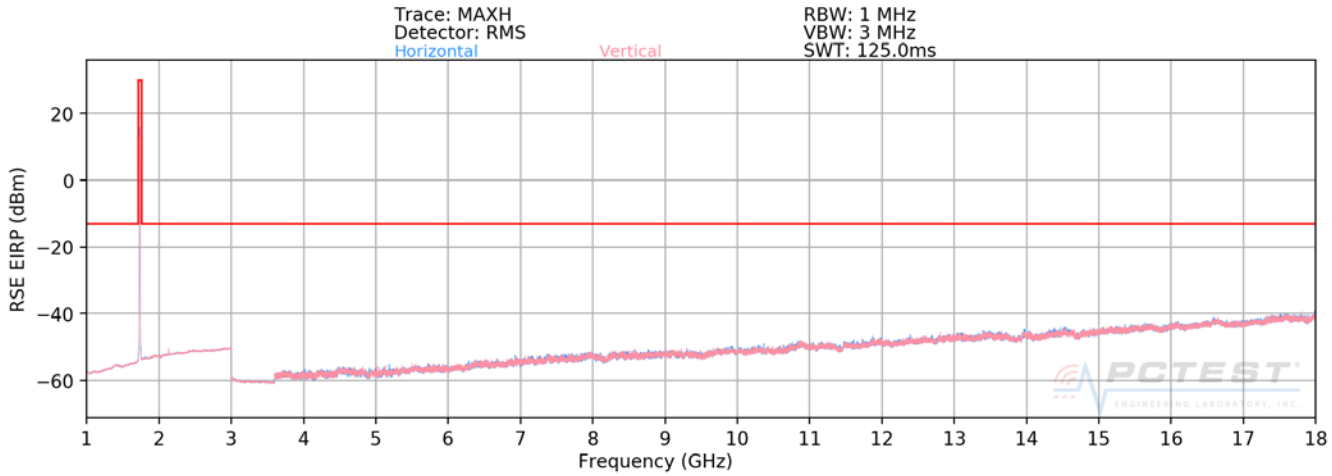
**Table 7-16. Radiated Spurious Data (Cellular WCDMA Mode – Ch. 4183)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 846.60 | MHz |
| MODULATION SIGNAL: | WCDMA | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 1693.20 | V | - | - | -79.17 | 8.95 | -70.21 | -57.2 |
| 2539.80 | V | - | - | -76.27 | 9.74 | -66.52 | -53.5 |

**Table 7-17. Radiated Spurious Data (Cellular WCDMA Mode – Ch. 4233)**

## AWS WCDMA Mode




**Plot 7-102. Radiated Spurious Plot above 1GHz (AWS WCDMA Mode)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 1712.40 | MHz |
| MODULATION SIGNAL: | WCDMA | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 3424.80 | H | - | - | -73.56 | 9.83 | -63.73 | -50.7 |
| 5137.20 | H | - | - | -73.43 | 10.69 | -62.74 | -49.7 |

**Table 7-18. Radiated Spurious Data (AWS WCDMA Mode – Ch. 1312)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 1732.60 | MHz |
| MODULATION SIGNAL: | WCDMA | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 3465.20 | H | 120 | 12 | -73.88 | 9.88 | -64.00 | -51.0 |
| 5197.80 | H | - | - | -74.03 | 10.76 | -63.27 | -50.3 |

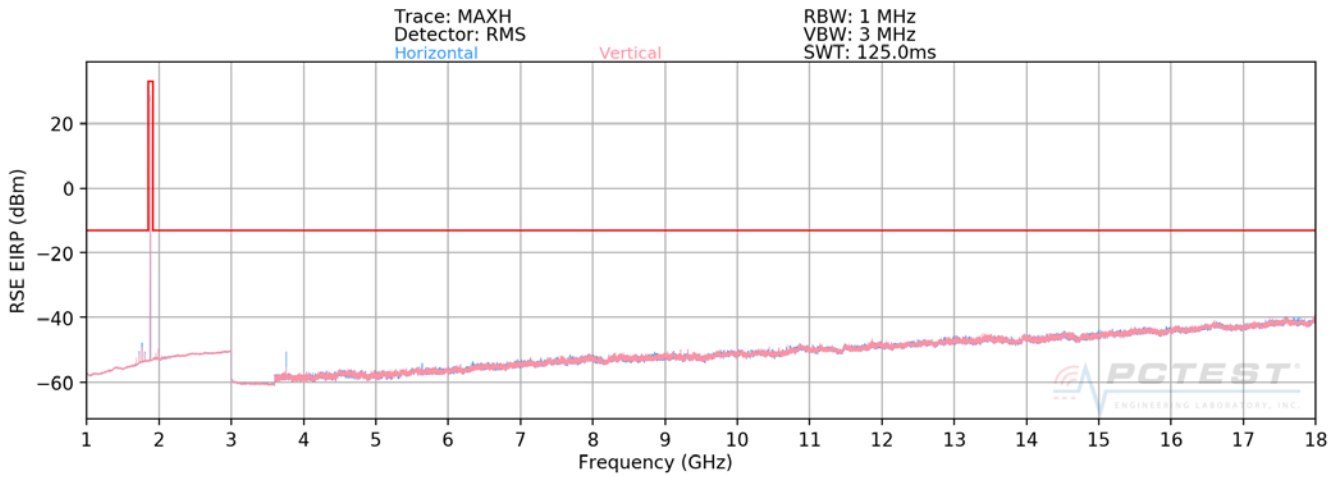
**Table 7-19. Radiated Spurious Data (AWS WCDMA Mode – Ch. 1413)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 1752.60 | MHz |
| MODULATION SIGNAL: | WCDMA | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 3505.20 | H | 131 | 11 | -72.62 | 9.92 | -62.70 | -49.7 |
| 5257.80 | H | - | - | -73.61 | 10.72 | -62.89 | -49.9 |

**Table 7-20. Radiated Spurious Data (AWS WCDMA Mode – Ch. 1513)**

## PCS GPRS Mode




**Plot 7-103. Radiated Spurious Plot above 1GHz (PCS GPRS Mode)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 1850.20 | MHz |
| MODULATION SIGNAL: | GPRS (GMSK) | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 3700.40 | H | 121 | 162 | -56.10 | 9.58 | -46.52 | -33.5 |
| 5550.60 | H | 125 | 180 | -68.36 | 10.94 | -57.42 | -44.4 |
| 7400.80 | H | - | - | -68.89 | 10.96 | -57.94 | -44.9 |

**Table 7-21. Radiated Spurious Data (PCS GPRS Mode – Ch. 512)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 1880.00 | MHz |
| MODULATION SIGNAL: | GPRS (GMSK) | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 3760.00 | H | 134 | 2 | -55.57 | 9.37 | -46.20 | -33.2 |
| 5640.00 | H | 146 | 12 | -67.01 | 11.17 | -55.84 | -42.8 |
| 7520.00 | H | - | - | -69.03 | 11.11 | -57.91 | -44.9 |

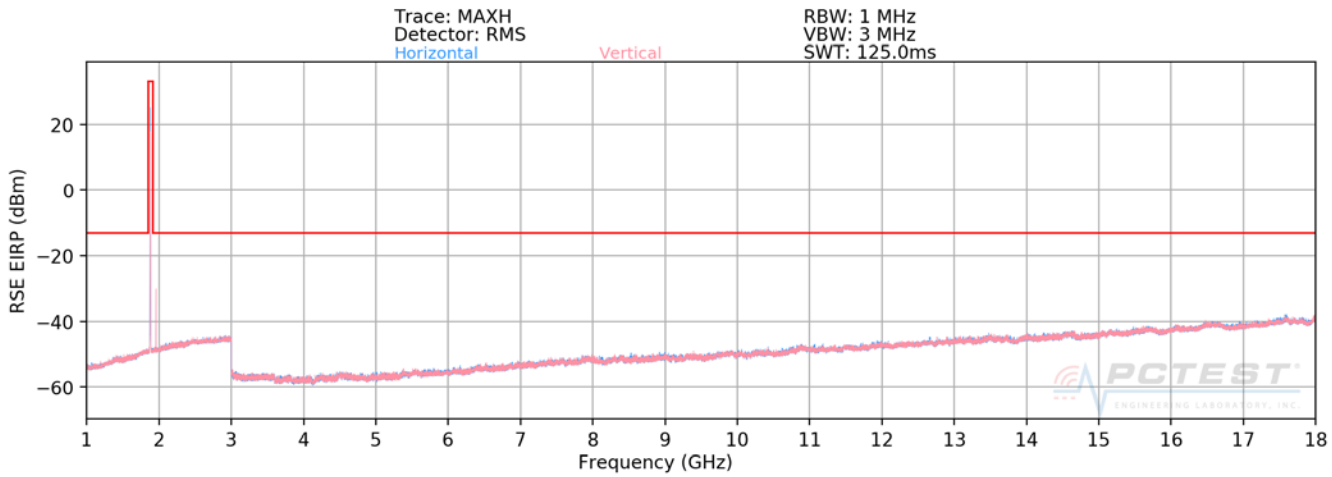
**Table 7-22. Radiated Spurious Data (PCS GPRS Mode – Ch. 661)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 1909.80 | MHz |
| MODULATION SIGNAL: | GPRS (GMSK) | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 3819.60 | H | 125 | 4 | -53.01 | 9.30 | -43.71 | -30.7 |
| 5729.40 | H | 127 | 12 | -67.75 | 11.39 | -56.36 | -43.4 |
| 7639.20 | H | 140 | 25 | -68.52 | 11.33 | -57.19 | -44.2 |
| 9549.00 | H | - | - | -67.91 | 11.79 | -56.12 | -43.1 |

**Table 7-23. Radiated Spurious Data (PCS GPRS Mode – Ch. 810)**

## PCS CDMA Mode




**Plot 7-104. Radiated Spurious Plot above 1GHz (PCS CDMA Mode)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 1851.25 | MHz |
| MODULATION SIGNAL: | CDMA | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 3702.50 | H | 192 | 188 | -62.21 | 6.56 | -55.64 | -42.6 |
| 5553.75 | H | - | - | -61.68 | 8.72 | -52.96 | -40.0 |
| 7405.00 | H | - | - | -57.79 | 8.41 | -49.38 | -36.4 |

**Table 7-24. Radiated Spurious Data (PCS CDMA Mode – Ch. 25)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 1880.00 | MHz |
| MODULATION SIGNAL: | CDMA | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 3760.00 | H | - | - | -62.01 | 6.67 | -55.34 | -42.3 |
| 5640.00 | H | - | - | -62.66 | 8.81 | -53.85 | -40.8 |

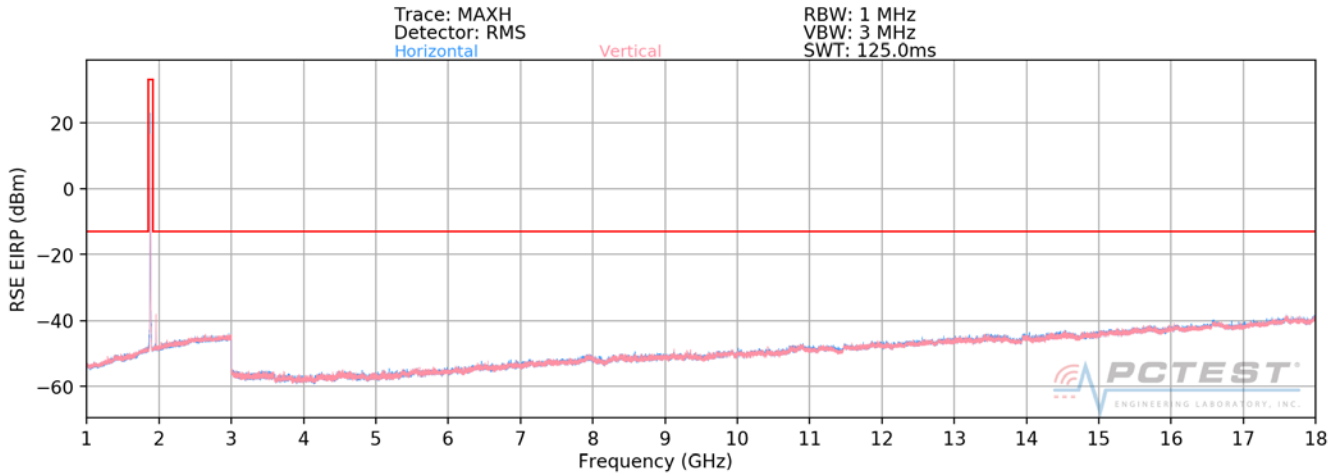
**Table 7-25. Radiated Spurious Data (PCS CDMA Mode – Ch. 600)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 1908.75 | MHz |
| MODULATION SIGNAL: | CDMA | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 3817.50 | H | 114 | 186 | -59.80 | 6.98 | -52.81 | -39.8 |
| 5726.25 | H | 395 | 97 | -62.32 | 8.77 | -53.55 | -40.5 |
| 7635.00 | H | - | - | -58.43 | 8.53 | -49.90 | -36.9 |
| 9543.75 | H | - | - | -57.08 | 9.42 | -47.65 | -34.7 |

**Table 7-26. Radiated Spurious Data (PCS CDMA Mode – Ch. 1175)**

## PCS WCDMA Mode




**Plot 7-105. Radiated Spurious Plot above 1GHz (PCS WCDMA Mode)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 1852.40 | MHz |
| MODULATION SIGNAL: | WCDMA | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 3704.80 | H | 400 | 43 | -73.26 | 9.57 | -63.69 | -50.7 |
| 5557.20 | H | - | - | -73.05 | 10.95 | -62.10 | -49.1 |

**Table 7-27. Radiated Spurious Data (PCS WCDMA Mode – Ch. 9262)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 1880.00 | MHz |
| MODULATION SIGNAL: | WCDMA | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 3760.00 | H | 400 | 344 | -73.11 | 9.37 | -63.74 | -50.7 |
| 5640.00 | H | - | - | -73.16 | 11.17 | -61.99 | -49.0 |

**Table 7-28. Radiated Spurious Data (PCS WCDMA Mode – Ch. 9400)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 1907.60 | MHz |
| MODULATION SIGNAL: | WCDMA | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 3815.20 | H | 111 | 357 | -72.29 | 9.30 | -62.99 | -50.0 |
| 5722.80 | H | - | - | -73.98 | 11.37 | -62.61 | -49.6 |

**Table 7-29. Radiated Spurious Data (PCS WCDMA Mode – Ch. 9538)**

## 7.8 Frequency Stability / Temperature Variation

**Test Overview and Limit**

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-E-2016. The frequency stability of the transmitter is measured by:

a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.

b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

***For Part 22, RSS-132, and RSS-133, the frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5 ppm) of the center frequency. For Part 24, Part 27, and RSS-139, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.***

**Test Procedure Used**

ANSI/TIA-603-E-2016

**Test Settings**

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a "standby" condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

**Test Setup**

The EUT was connected via an RF cable to a spectrum analyzer with the EUT placed inside an environmental chamber.

**Test Notes**

None

## Frequency Stability / Temperature Variation

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 836,600,000 | Hz |
| CHANNEL: | 190 | |
| REFERENCE VOLTAGE: | 3.85 | VDC |
| DEVIATION LIMIT: | ± 0.00025 % or 2.5 ppm | |

| VOLTAGE (%) | POWER (VDC) | TEMP (°C) | FREQUENCY (Hz) | Freq. Dev. (Hz) | Deviation (%) |
|---|---|---|---|---|---|
| 100 % | 3.85 | - 30 | 836,599,970 | -30 | -0.0000036 |
| 100 % | | - 20 | 836,599,918 | -82 | -0.0000098 |
| 100 % | | - 10 | 836,599,996 | -4 | -0.0000005 |
| 100 % | | 0 | 836,599,787 | -213 | -0.0000255 |
| 100 % | | + 10 | 836,600,018 | 18 | 0.0000022 |
| 100 % | | + 20 | 836,600,141 | 141 | 0.0000169 |
| 100 % | | + 30 | 836,600,280 | 280 | 0.0000335 |
| 100 % | | + 40 | 836,600,234 | 234 | 0.0000280 |
| 100 % | | + 50 | 836,600,166 | 166 | 0.0000198 |
| BATT. ENDPOINT | 3.40 | + 20 | 836,599,958 | -42 | -0.0000050 |

**Table 7-30. Frequency Stability Data (Cellular GPRS Mode – Ch. 190)**

## Frequency Stability / Temperature Variation

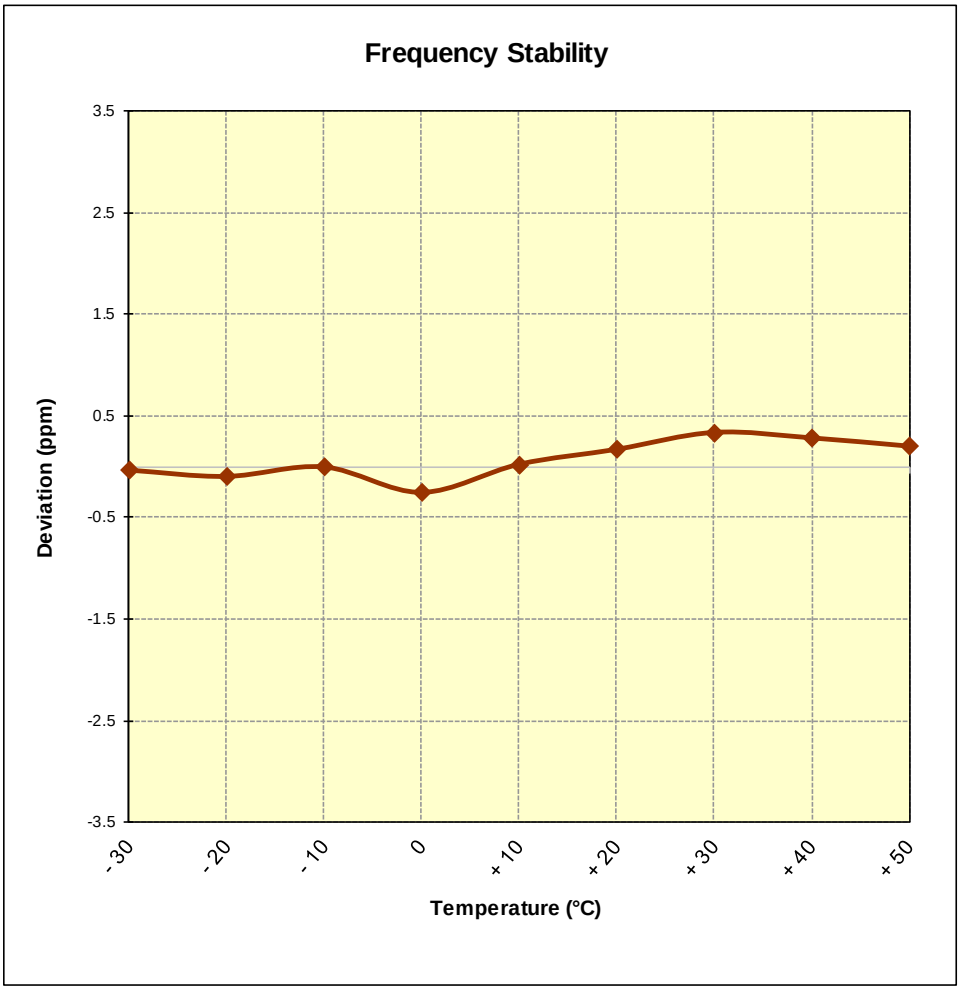



**Figure 7-9. Frequency Stability Graph (Cellular GPRS Mode – Ch. 190)**

## Frequency Stability / Temperature Variation

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 836,520,000 | Hz |
| CHANNEL: | 384 | |
| REFERENCE VOLTAGE: | 3.85 | VDC |
| DEVIATION LIMIT: | ± 0.00025 % or 2.5 ppm | |

| VOLTAGE (%) | POWER (VDC) | TEMP (°C) | FREQUENCY (Hz) | Freq. Dev. (Hz) | Deviation (%) |
|---|---|---|---|---|---|
| 100 % | 3.85 | - 30 | 836,519,764 | -236 | -0.0000282 |
| 100 % | | - 20 | 836,520,024 | 24 | 0.0000029 |
| 100 % | | - 10 | 836,519,673 | -327 | -0.0000391 |
| 100 % | | 0 | 836,519,934 | -66 | -0.0000079 |
| 100 % | | + 10 | 836,520,011 | 11 | 0.0000013 |
| 100 % | | + 20 | 836,519,964 | -36 | -0.0000043 |
| 100 % | | + 30 | 836,519,997 | -3 | -0.0000004 |
| 100 % | | + 40 | 836,520,020 | 20 | 0.0000024 |
| 100 % | | + 50 | 836,520,118 | 118 | 0.0000141 |
| BATT. ENDPOINT | 3.40 | + 20 | 836,520,102 | 102 | 0.0000122 |

**Table 7-31. Frequency Stability Data (Cellular CDMA Mode – Ch. 384)**

## Frequency Stability / Temperature Variation

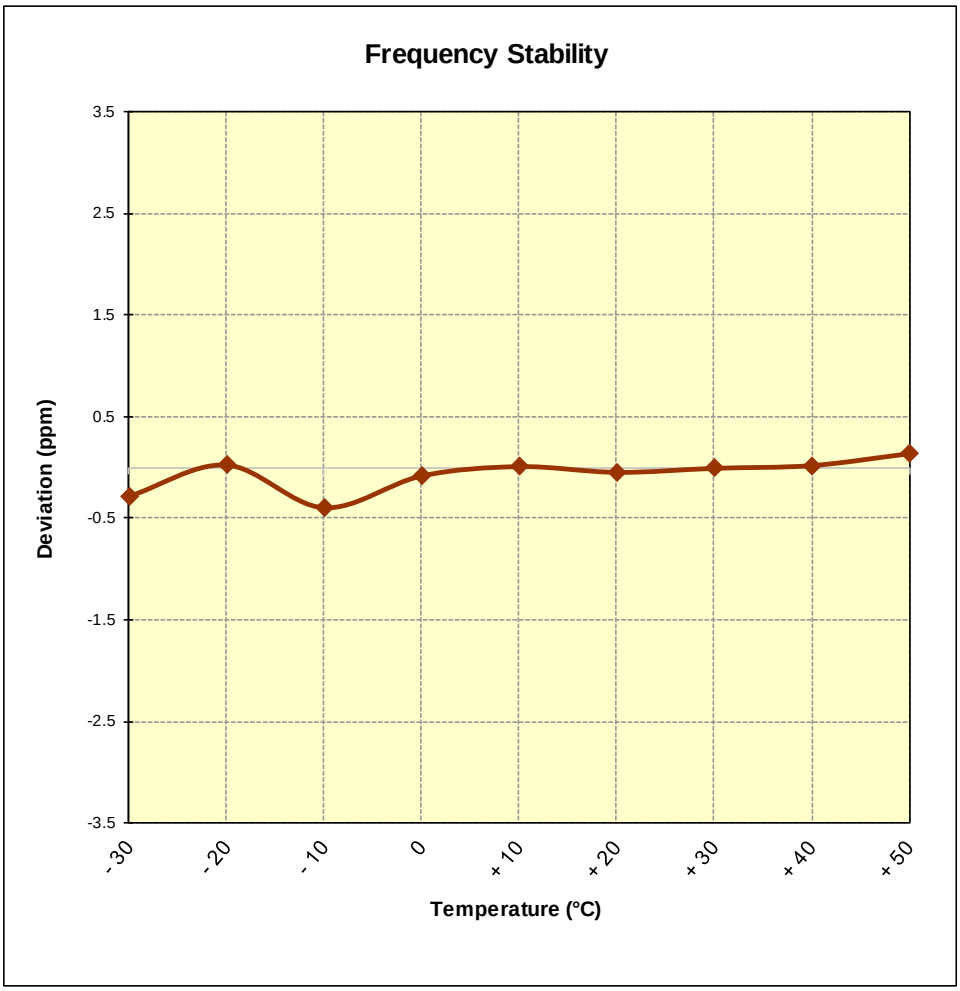



**Figure 7-10. Frequency Stability Graph (Cellular CDMA Mode – Ch. 384)**

## Frequency Stability / Temperature Variation

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 836,600,000 | Hz |
| CHANNEL: | 4183 | |
| REFERENCE VOLTAGE: | 3.85 | VDC |
| DEVIATION LIMIT: | ± 0.00025 % or 2.5 ppm | |

| VOLTAGE (%) | POWER (VDC) | TEMP (°C) | FREQUENCY (Hz) | Freq. Dev. (Hz) | Deviation (%) |
|---|---|---|---|---|---|
| 100 % | 3.85 | - 30 | 836,599,753 | -247 | -0.0000295 |
| 100 % | | - 20 | 836,600,402 | 402 | 0.0000481 |
| 100 % | | - 10 | 836,600,105 | 105 | 0.0000126 |
| 100 % | | 0 | 836,599,980 | -20 | -0.0000024 |
| 100 % | | + 10 | 836,600,150 | 150 | 0.0000179 |
| 100 % | | + 20 | 836,599,922 | -78 | -0.0000093 |
| 100 % | | + 30 | 836,600,177 | 177 | 0.0000212 |
| 100 % | | + 40 | 836,599,876 | -124 | -0.0000148 |
| 100 % | | + 50 | 836,600,093 | 93 | 0.0000111 |
| BATT. ENDPOINT | 3.40 | + 20 | 836,600,232 | 232 | 0.0000277 |

**Table 7-32. Frequency Stability Data (Cellular WCDMA Mode – Ch. 4183)**

## Frequency Stability / Temperature Variation

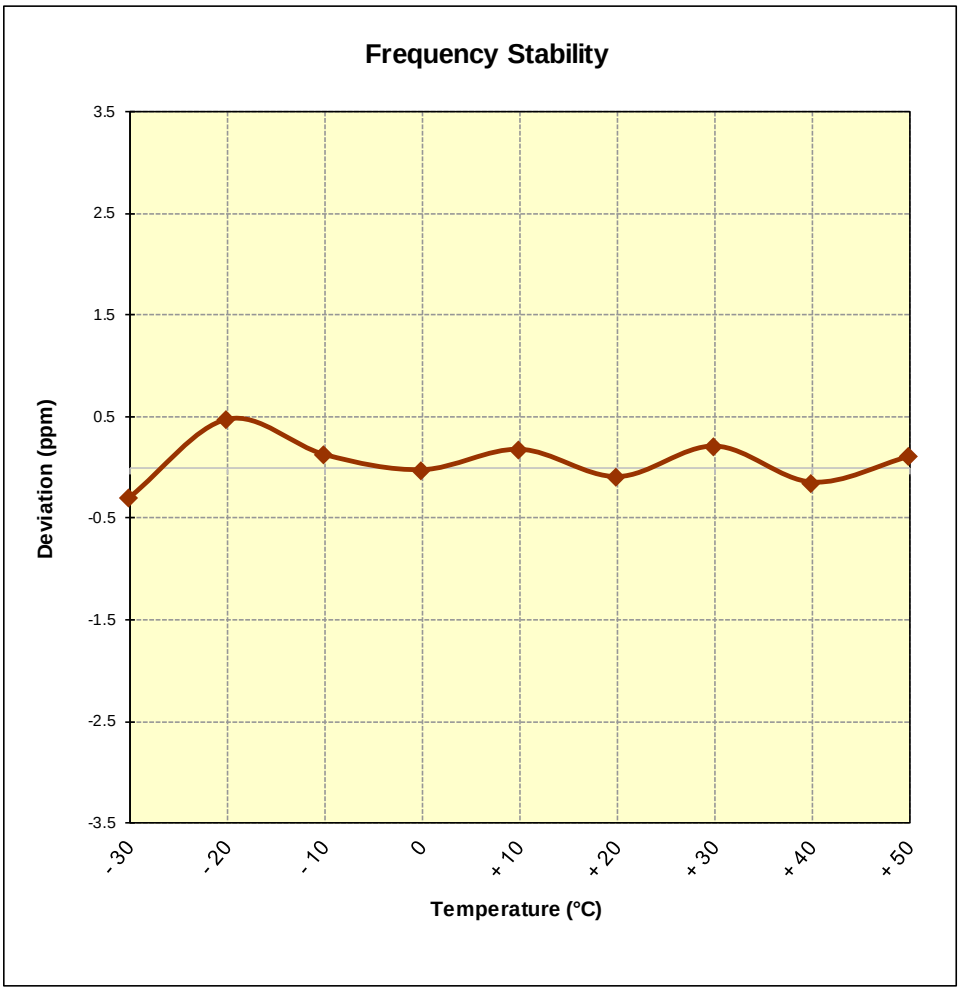



**Figure 7-11. Frequency Stability Graph (Cellular WCDMA Mode – Ch. 4183)**

## Frequency Stability / Temperature Variation

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 1,732,600,000 | Hz |
| CHANNEL: | 1413 | |
| REFERENCE VOLTAGE: | 3.85 | VDC |

| VOLTAGE (%) | POWER (VDC) | TEMP (°C) | FREQUENCY (Hz) | Freq. Dev. (Hz) | Deviation (%) |
|---|---|---|---|---|---|
| 100 % | 3.85 | - 30 | 1,732,599,776 | -224 | -0.0000129 |
| 100 % | | - 20 | 1,732,599,780 | -220 | -0.0000127 |
| 100 % | | - 10 | 1,732,599,922 | -78 | -0.0000045 |
| 100 % | | 0 | 1,732,600,369 | 369 | 0.0000213 |
| 100 % | | + 10 | 1,732,599,689 | -311 | -0.0000179 |
| 100 % | | + 20 | 1,732,600,138 | 138 | 0.0000080 |
| 100 % | | + 30 | 1,732,600,020 | 20 | 0.0000012 |
| 100 % | | + 40 | 1,732,600,208 | 208 | 0.0000120 |
| 100 % | | + 50 | 1,732,599,975 | -25 | -0.0000014 |
| BATT. ENDPOINT | 3.40 | + 20 | 1,732,600,109 | 109 | 0.0000063 |

**Table 7-33. Frequency Stability Data (AWS WCDMA Mode – Ch. 1413)**

**Note:**

Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

## Frequency Stability / Temperature Variation

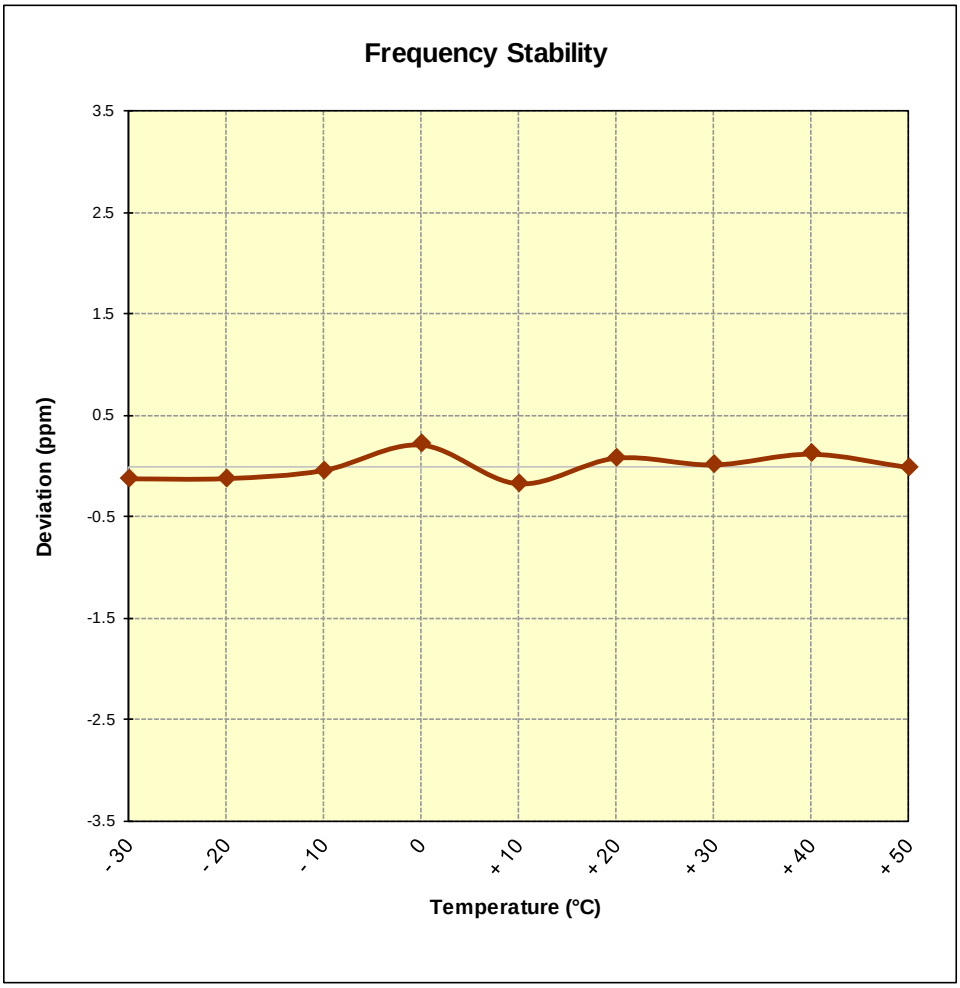



**Figure 7-12. Frequency Stability Graph (AWS WCDMA Mode – Ch. 1413)**

## Frequency Stability / Temperature Variation

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 1,880,000,000 | Hz |
| CHANNEL: | 661 | |
| REFERENCE VOLTAGE: | 3.85 | VDC |
| DEVIATION LIMIT: | ± 0.00025 % or 2.5 ppm | |

| VOLTAGE (%) | POWER (VDC) | TEMP (°C) | FREQUENCY (Hz) | Freq. Dev. (Hz) | Deviation (%) |
|---|---|---|---|---|---|
| 100 % | 3.85 | - 30 | 1,880,000,079 | 79 | 0.0000042 |
| 100 % | | - 20 | 1,880,000,034 | 34 | 0.0000018 |
| 100 % | | - 10 | 1,880,000,233 | 233 | 0.0000124 |
| 100 % | | 0 | 1,879,999,909 | -91 | -0.0000048 |
| 100 % | | + 10 | 1,880,000,264 | 264 | 0.0000140 |
| 100 % | | + 20 | 1,880,000,185 | 185 | 0.0000098 |
| 100 % | | + 30 | 1,880,000,020 | 20 | 0.0000011 |
| 100 % | | + 40 | 1,879,999,715 | -285 | -0.0000152 |
| 100 % | | + 50 | 1,880,000,171 | 171 | 0.0000091 |
| BATT. ENDPOINT | 3.40 | + 20 | 1,879,999,982 | -18 | -0.0000010 |

**Table 7-34. Frequency Stability Data (PCS GPRS Mode – Ch. 661)**

## Frequency Stability / Temperature Variation

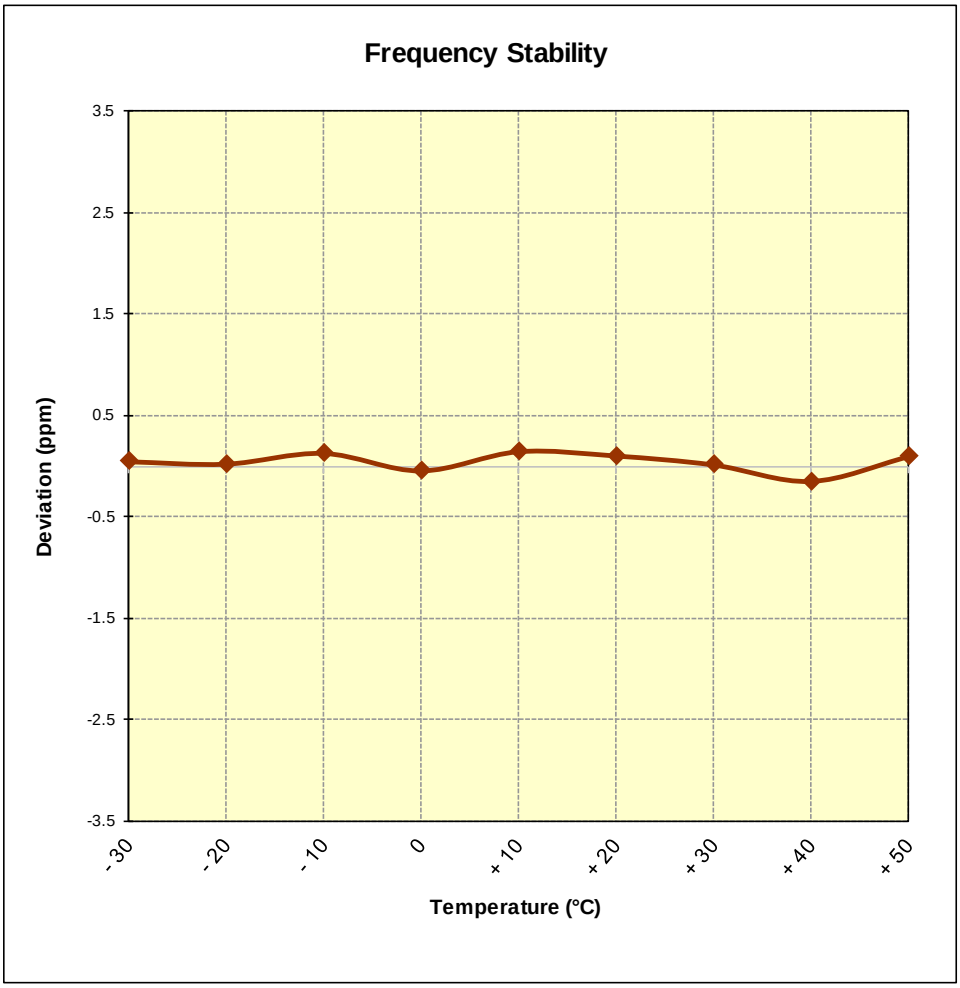



**Figure 7-13. Frequency Stability Graph (PCS GPRS Mode – Ch. 661)**

## Frequency Stability / Temperature Variation

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 1,880,000,000 | Hz |
| CHANNEL: | 600 | |
| REFERENCE VOLTAGE: | 3.85 | VDC |
| DEVIATION LIMIT: | ± 0.00025 % or 2.5 ppm | |

| VOLTAGE (%) | POWER (VDC) | TEMP (°C) | FREQUENCY (Hz) | Freq. Dev. (Hz) | Deviation (%) |
|---|---|---|---|---|---|
| 100 % | 3.85 | - 30 | 1,880,000,235 | 235 | 0.0000125 |
| 100 % | | - 20 | 1,879,999,869 | -131 | -0.0000070 |
| 100 % | | - 10 | 1,880,000,265 | 265 | 0.0000141 |
| 100 % | | 0 | 1,880,000,391 | 391 | 0.0000208 |
| 100 % | | + 10 | 1,879,999,781 | -219 | -0.0000116 |
| 100 % | | + 20 | 1,879,999,862 | -138 | -0.0000073 |
| 100 % | | + 30 | 1,880,000,123 | 123 | 0.0000065 |
| 100 % | | + 40 | 1,879,999,824 | -176 | -0.0000094 |
| 100 % | | + 50 | 1,880,000,372 | 372 | 0.0000198 |
| BATT. ENDPOINT | 3.40 | + 20 | 1,879,999,911 | -89 | -0.0000047 |

**Table 7-35. Frequency Stability Data (PCS CDMA Mode – Ch. 600)**

## Frequency Stability / Temperature Variation

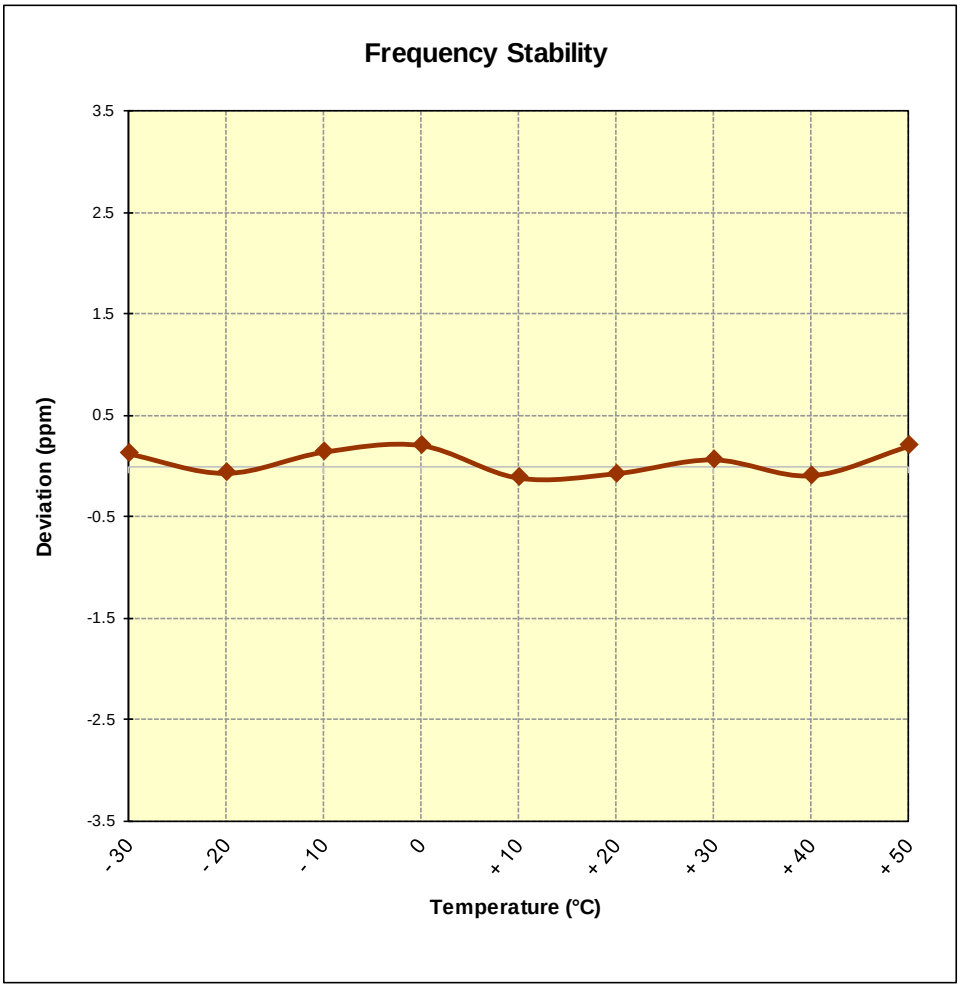



**Figure 7-14. Frequency Stability Graph (PCS CDMA Mode – Ch. 600)**

## Frequency Stability / Temperature Variation

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 1,880,000,000 | Hz |
| CHANNEL: | 9400 | |
| REFERENCE VOLTAGE: | 3.85 | VDC |
| DEVIATION LIMIT: | ± 0.00025 % or 2.5 ppm | |

| VOLTAGE (%) | POWER (VDC) | TEMP (°C) | FREQUENCY (Hz) | Freq. Dev. (Hz) | Deviation (%) |
|---|---|---|---|---|---|
| 100 % | 3.85 | - 30 | 1,879,999,897 | -103 | -0.0000055 |
| 100 % | | - 20 | 1,879,999,925 | -75 | -0.0000040 |
| 100 % | | - 10 | 1,879,999,929 | -71 | -0.0000038 |
| 100 % | | 0 | 1,880,000,277 | 277 | 0.0000147 |
| 100 % | | + 10 | 1,880,000,439 | 439 | 0.0000234 |
| 100 % | | + 20 | 1,879,999,573 | -427 | -0.0000227 |
| 100 % | | + 30 | 1,879,999,618 | -382 | -0.0000203 |
| 100 % | | + 40 | 1,880,000,284 | 284 | 0.0000151 |
| 100 % | | + 50 | 1,879,999,934 | -66 | -0.0000035 |
| BATT. ENDPOINT | 3.40 | + 20 | 1,880,000,113 | 113 | 0.0000060 |

**Table 7-36. Frequency Stability Data (PCS WCDMA Mode – Ch. 9400)**

## Frequency Stability / Temperature Variation

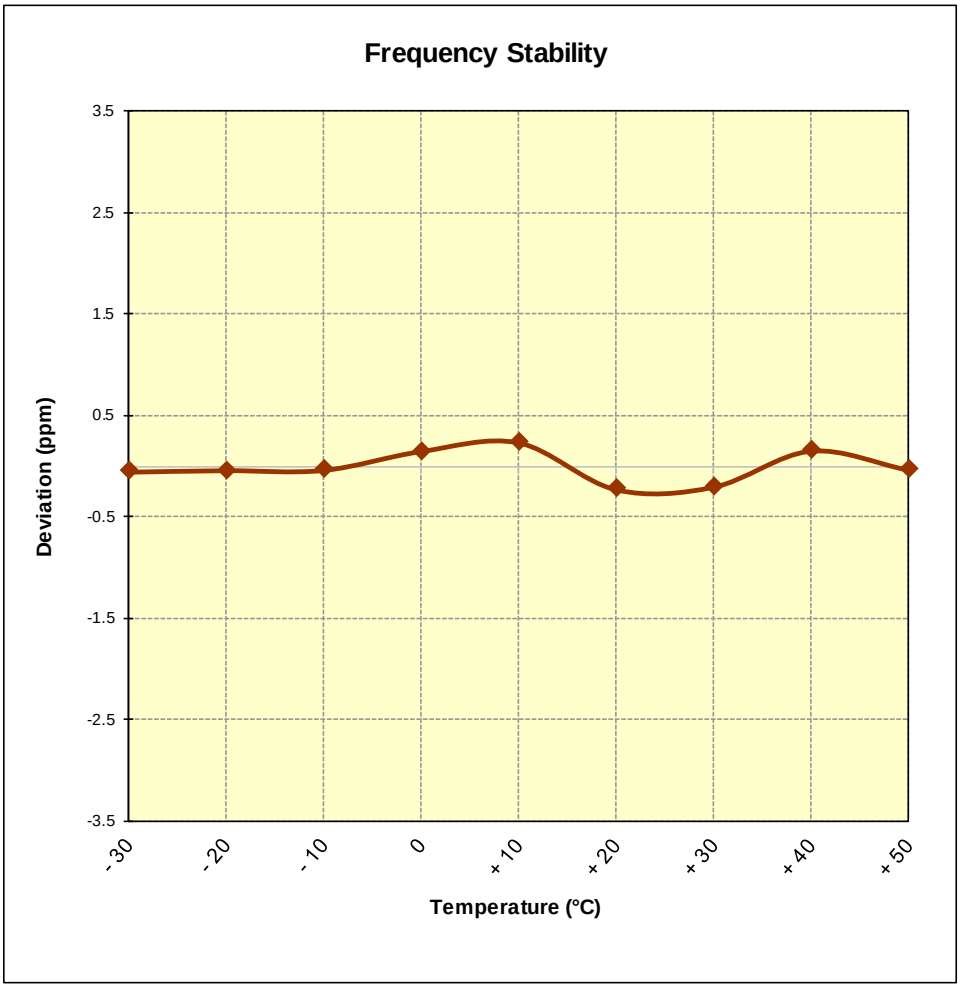



**Figure 7-15. Frequency Stability Graph (PCS WCDMA Mode – Ch. 9400)**

# 8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **LG Portable Handset FCC ID: ZNFX420TM** complies with all the requirements of Part 22, 24, & 27 of the FCC Rules.