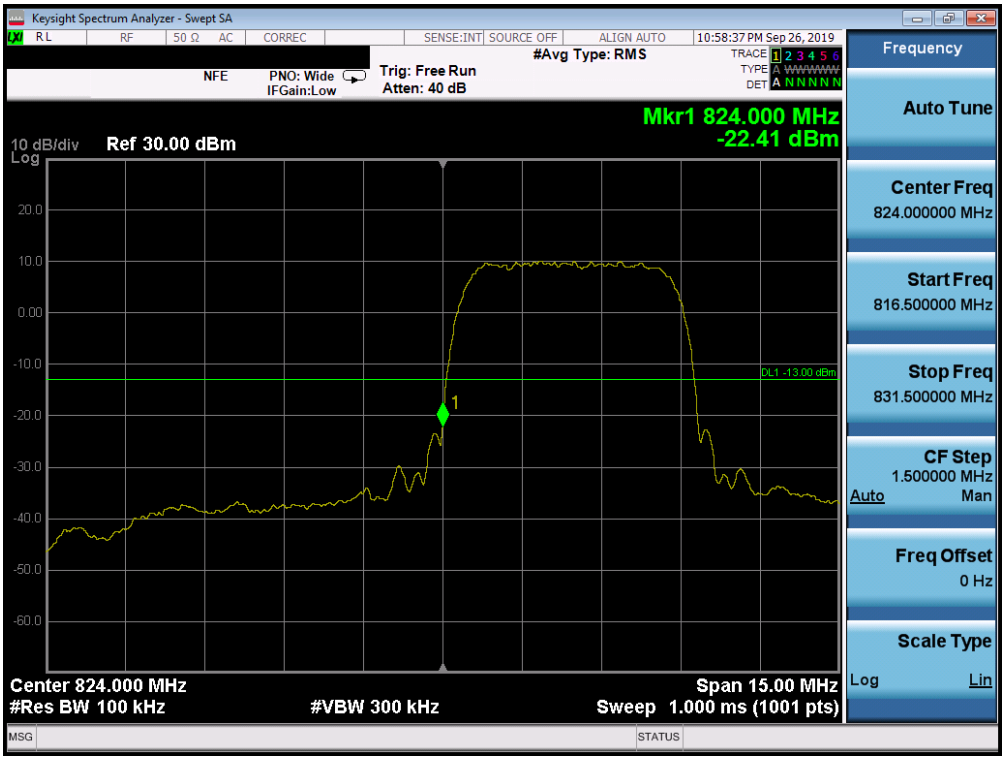
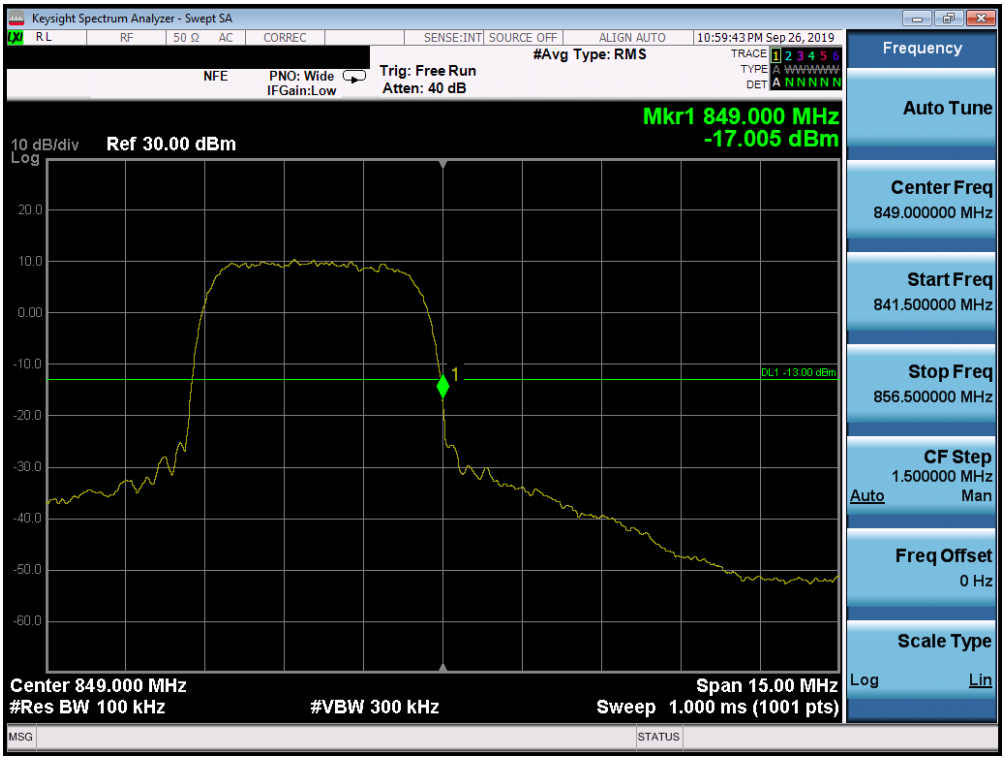
Cellular WCDMA Mode



Plot 7-87. Band Edge Plot (Cellular WCDMA Mode - Low Channel)



Plot 7-88. Band Edge Plot (Cellular WCDMA Mode - High Channel)

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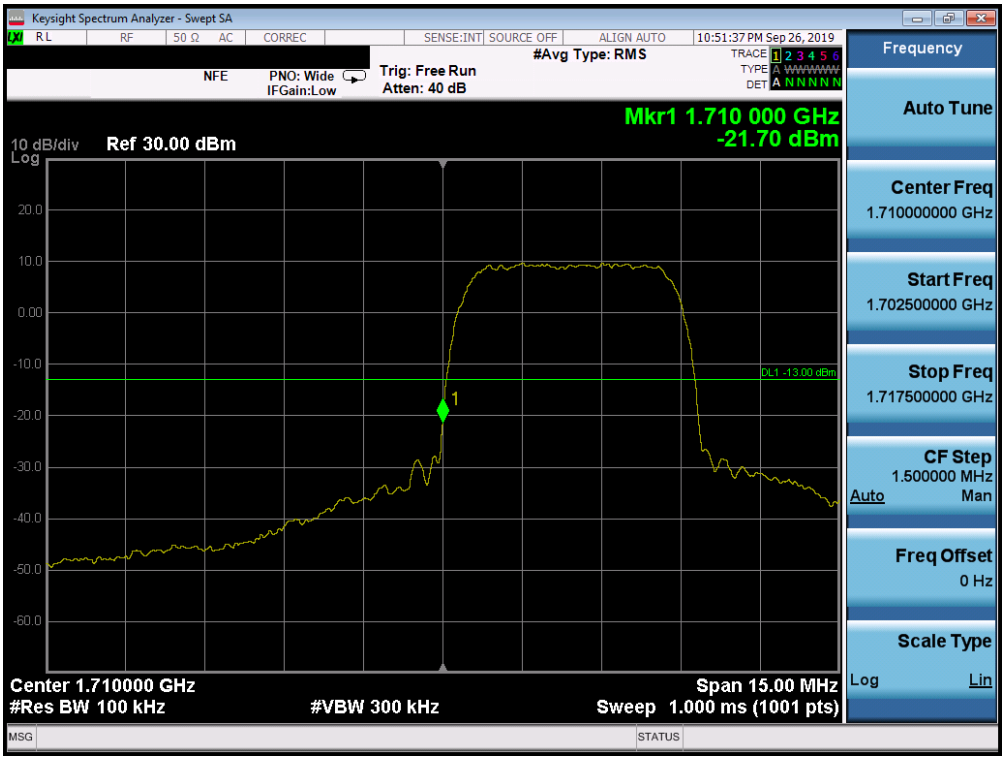
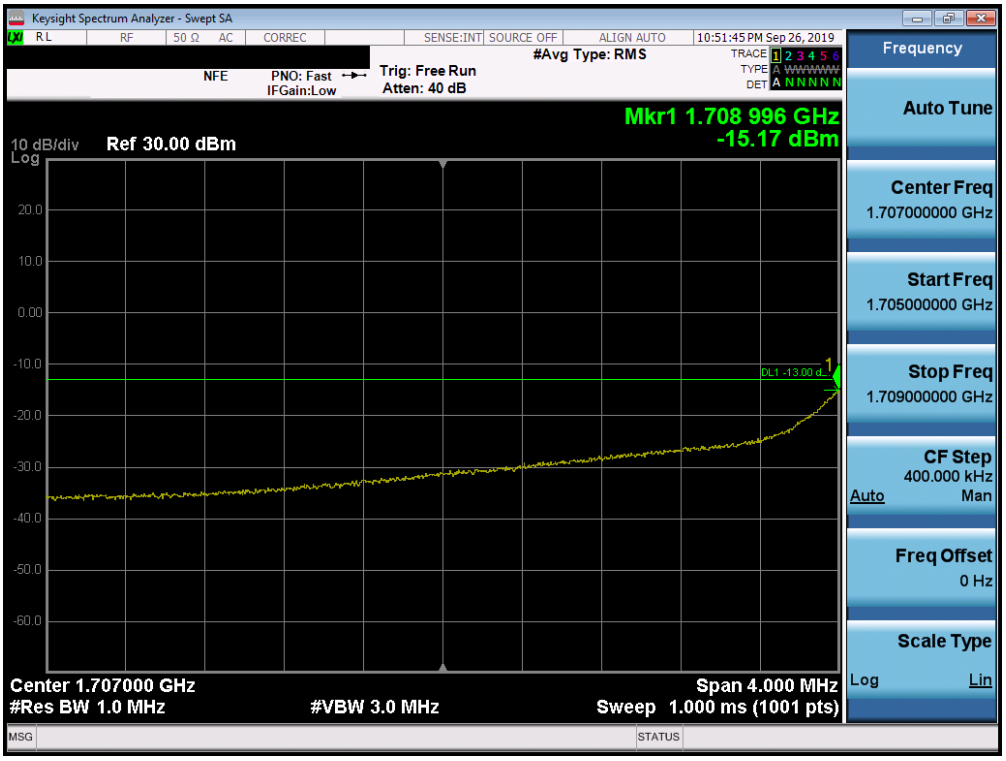
AWS WCDMA Mode



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



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

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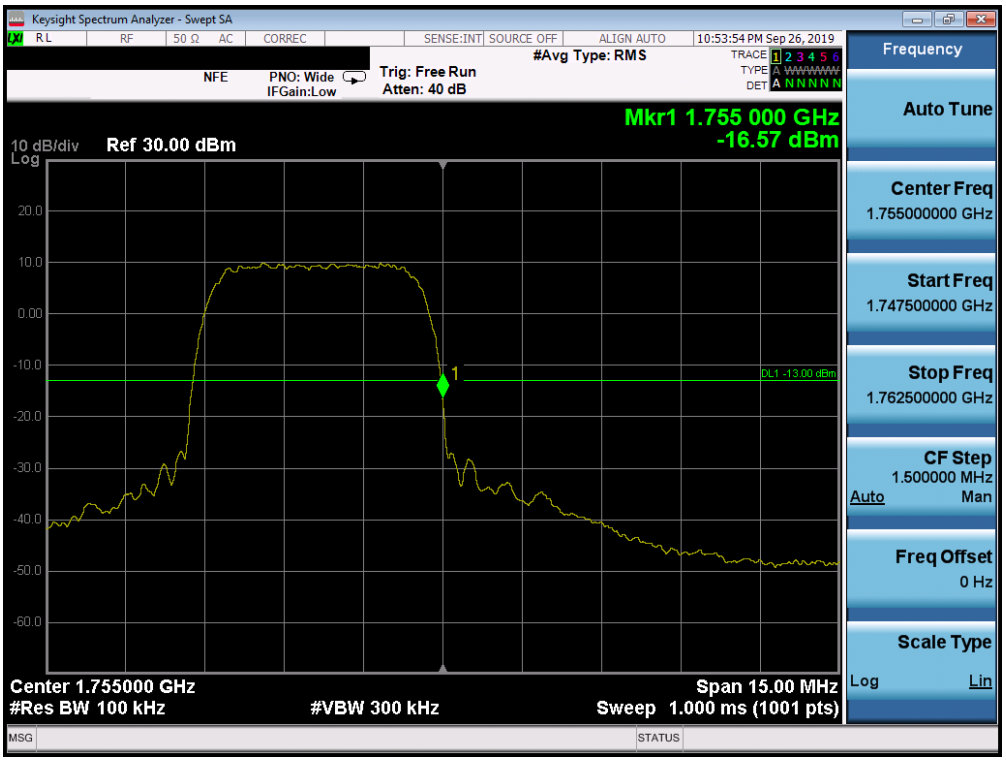
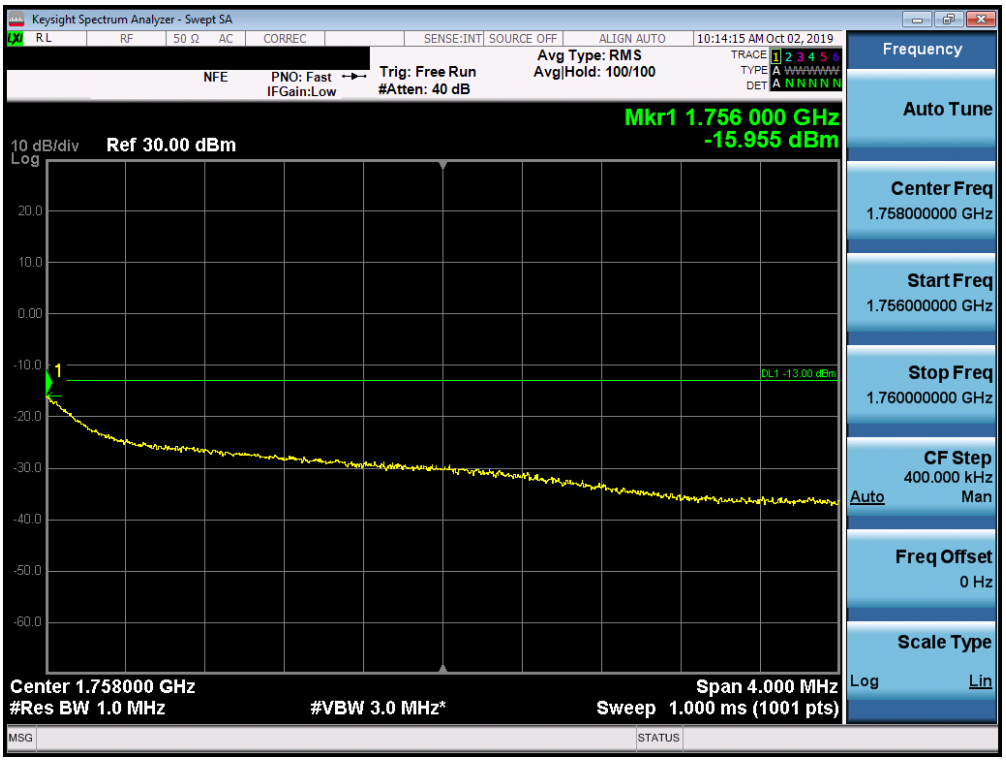


Plot 7-91. Band Edge Plot (AWS WCDMA Mode - High Channel)



Plot 7-92. 4MHz Span Plot (AWS WCDMA Mode - High Channel)

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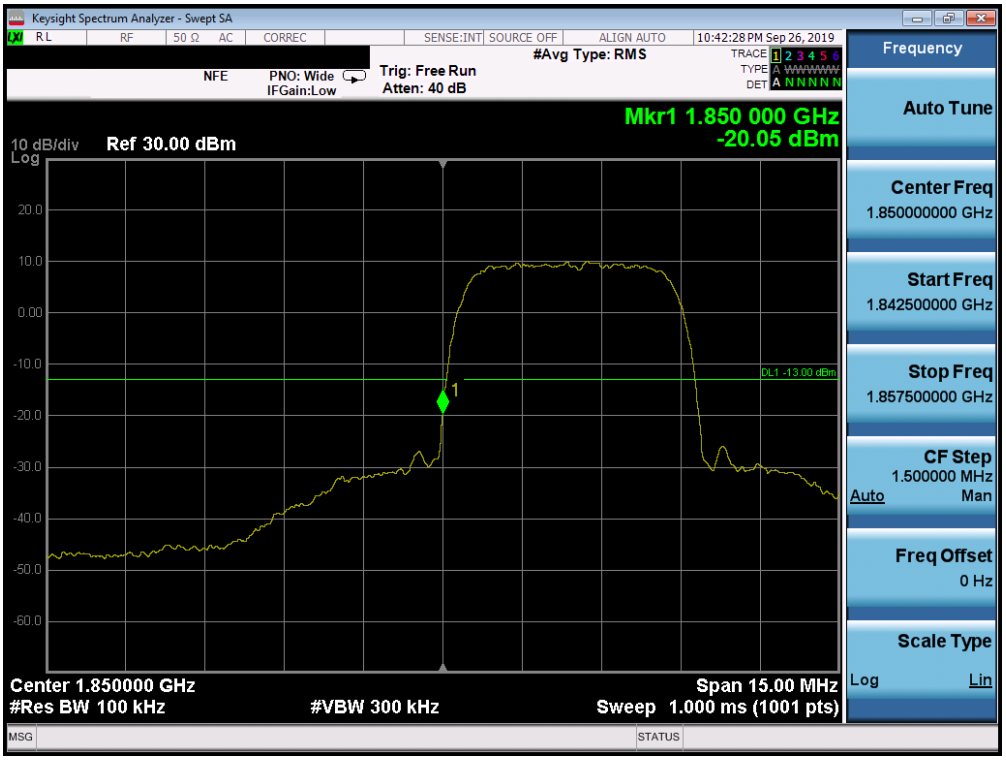
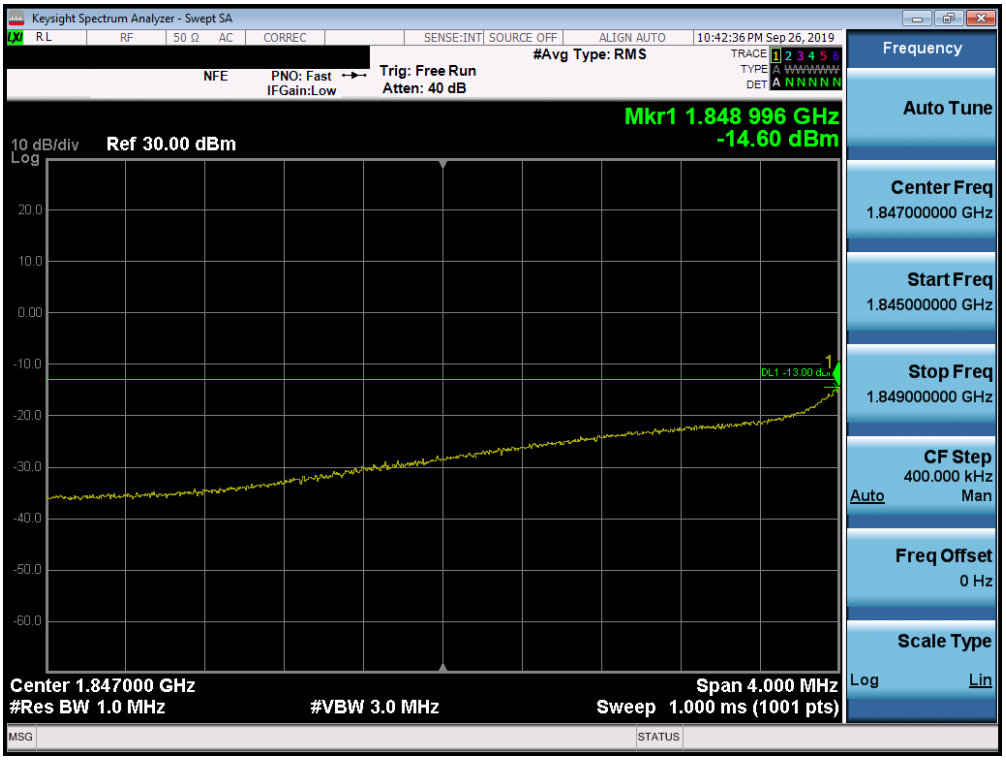
PCS WCDMA Mode



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



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

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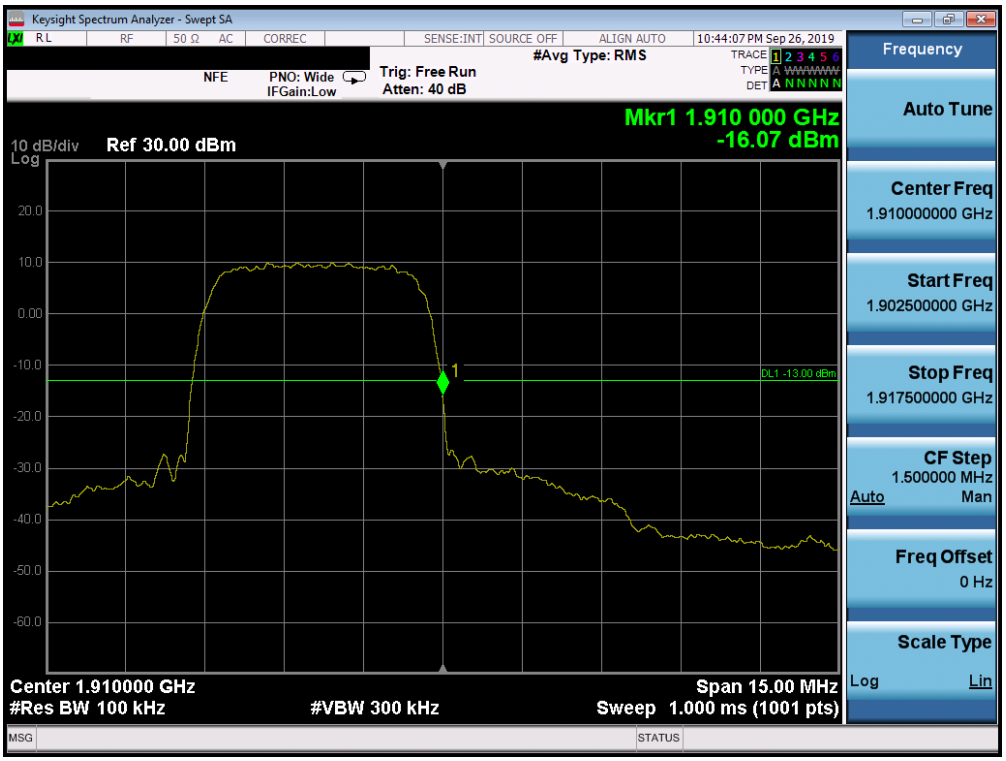
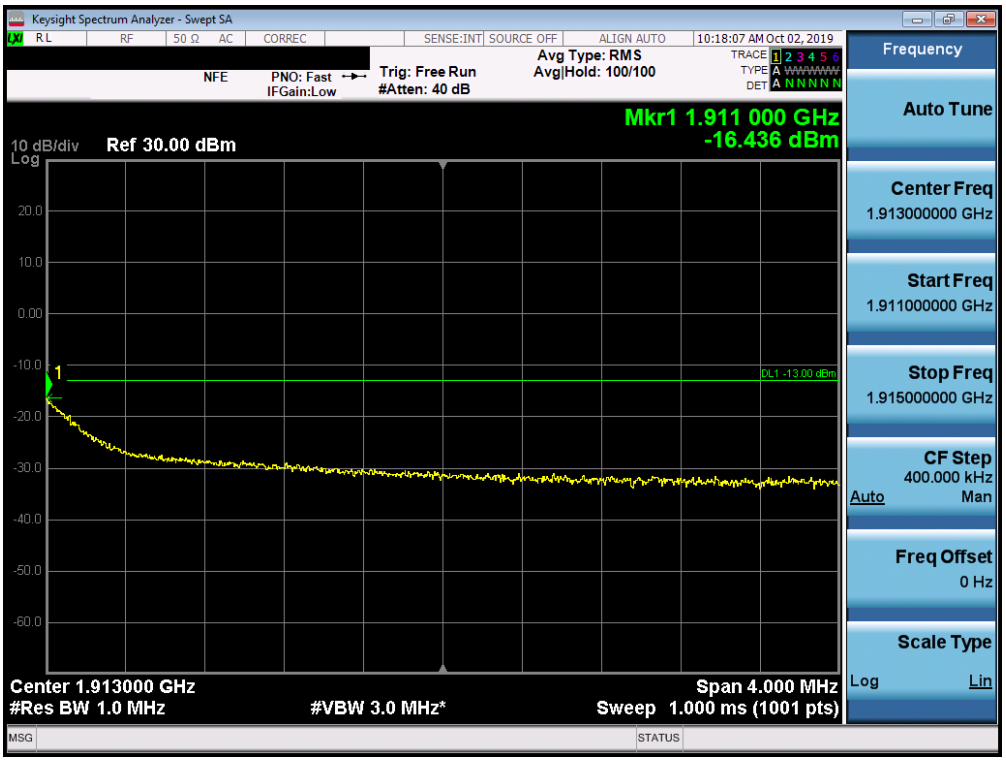


Plot 7-95. Band Edge Plot (PCS WCDMA Mode - High Channel)



Plot 7-96. 4MHz Span Plot (PCS WCDMA Mode - High Channel)

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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.

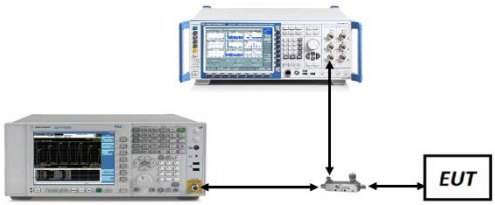

Figure 7-4. Test Instrument & Measurement Setup

Test Notes

None

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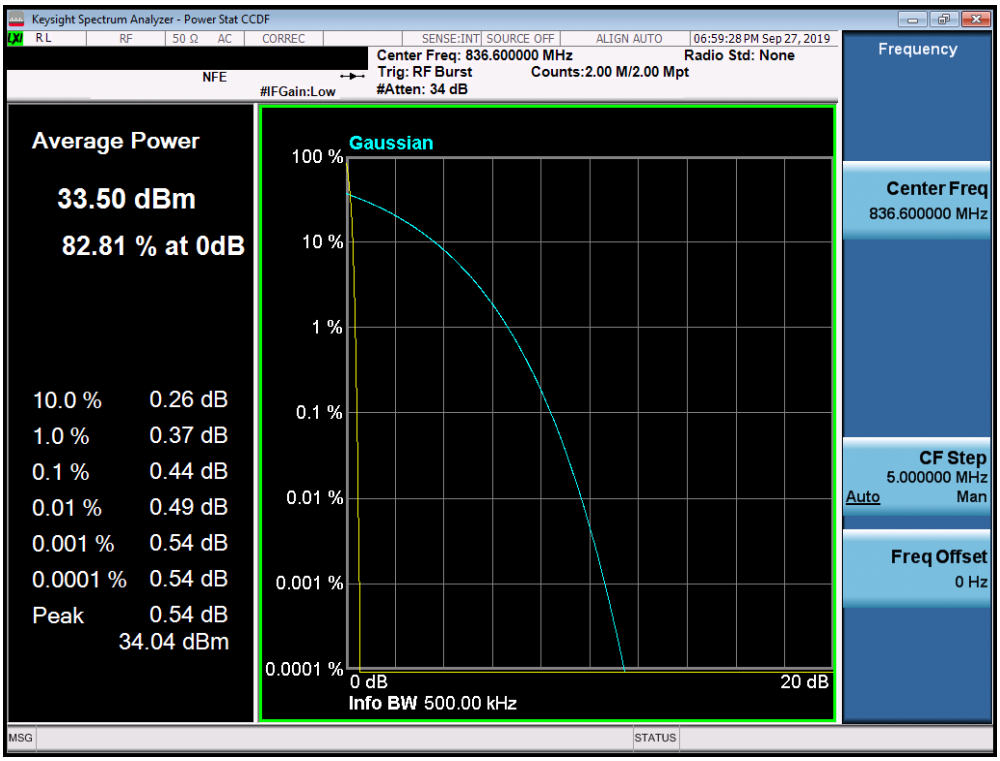
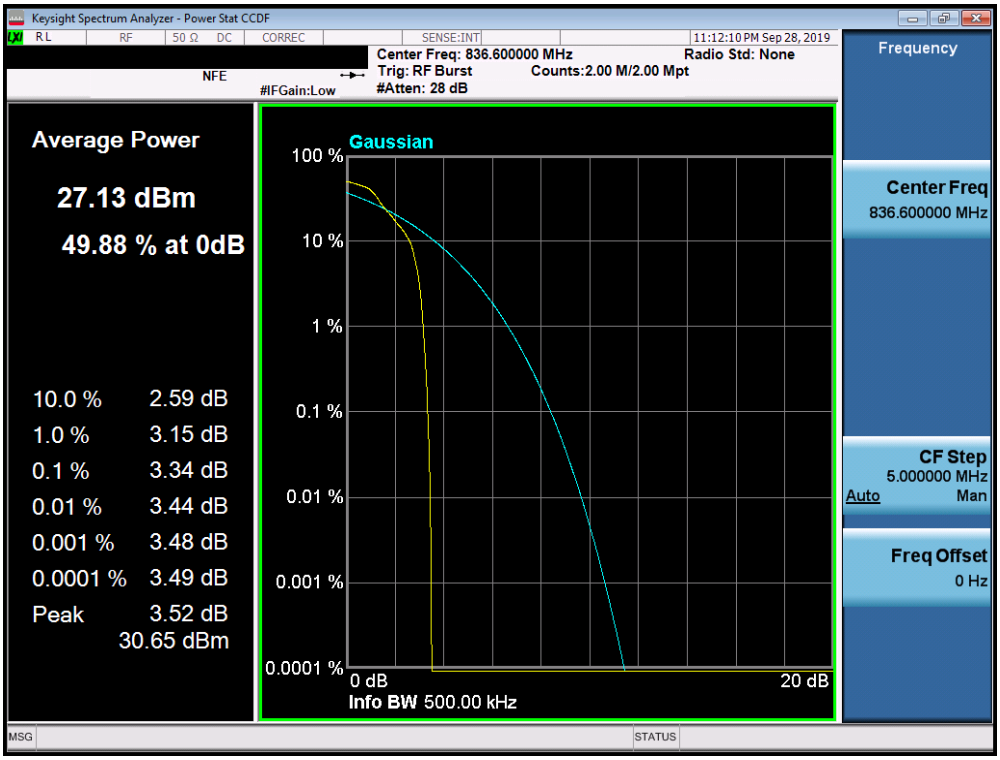


Plot 7-97. Peak-Average Ratio Plot (Cellular GPRS Mode)



Plot 7-98. Peak-Average Ratio Plot (Cellular EDGE Mode)

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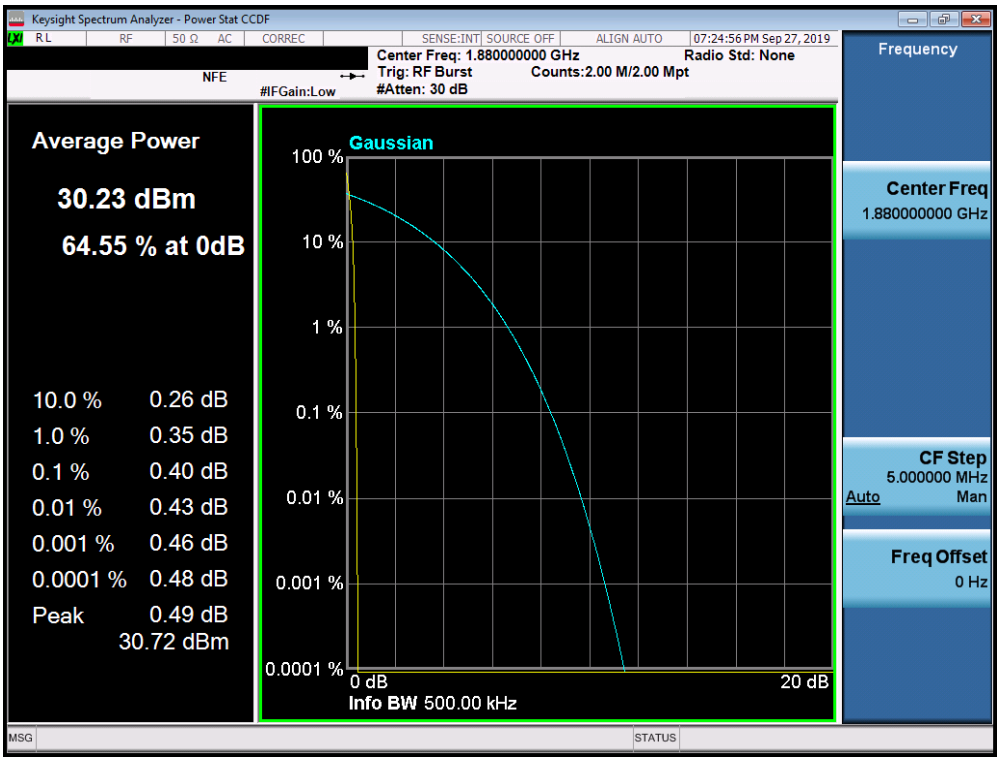
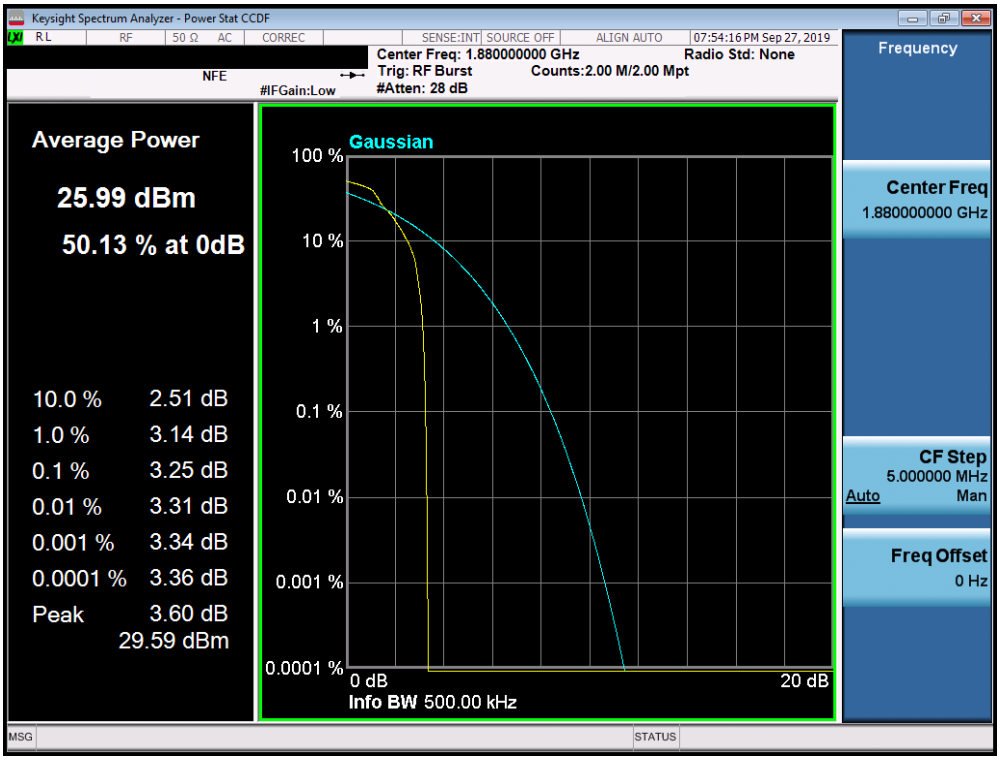


Plot 7-99. Peak-Average Ratio Plot (PCS GPRS Mode)



Plot 7-100. Peak-Average Ratio Plot (PCS EDGE Mode)

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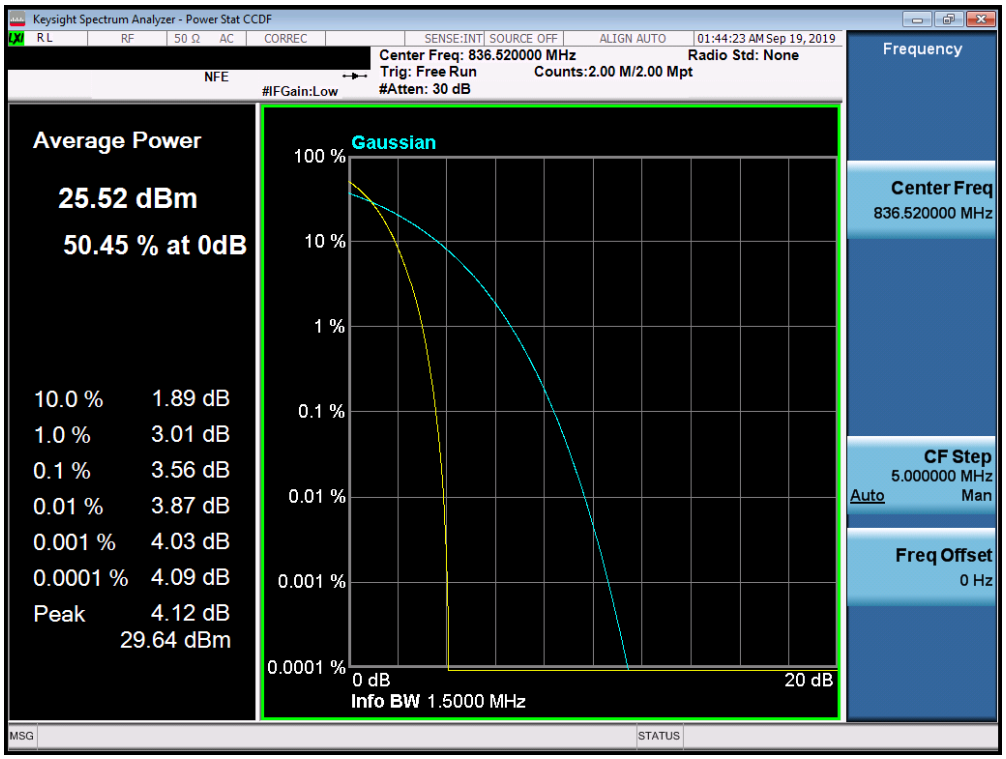
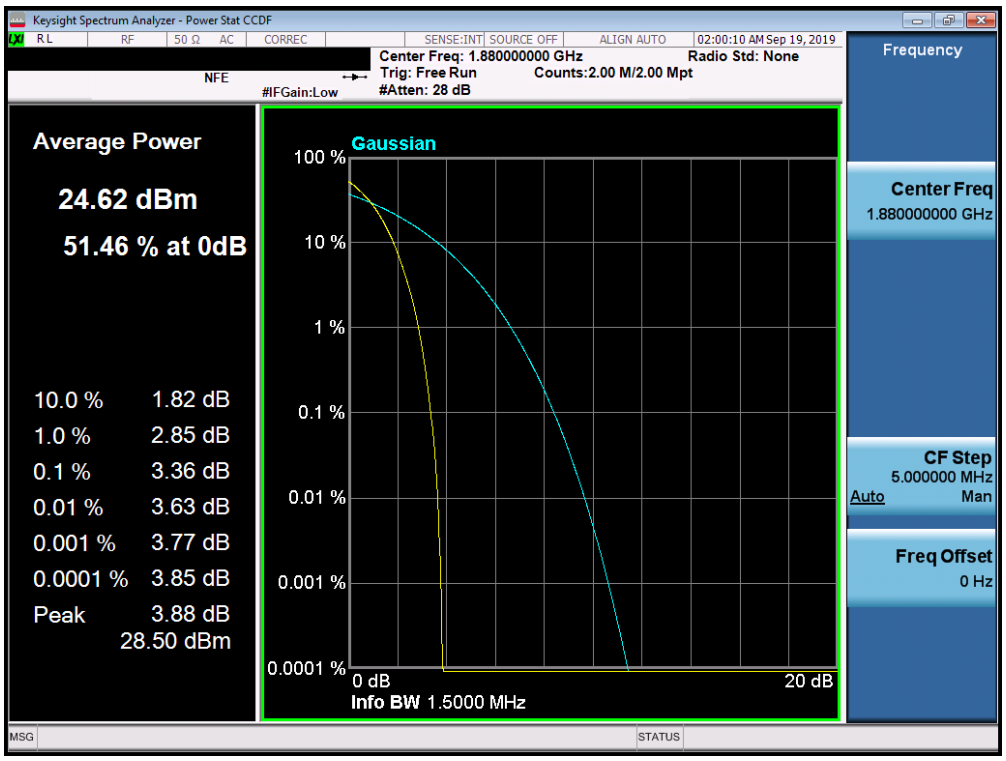


Plot 7-101. Peak-Average Ratio Plot (Cellular CDMA Mode)



Plot 7-102. Peak-Average Ratio Plot (PCS CDMA Mode)

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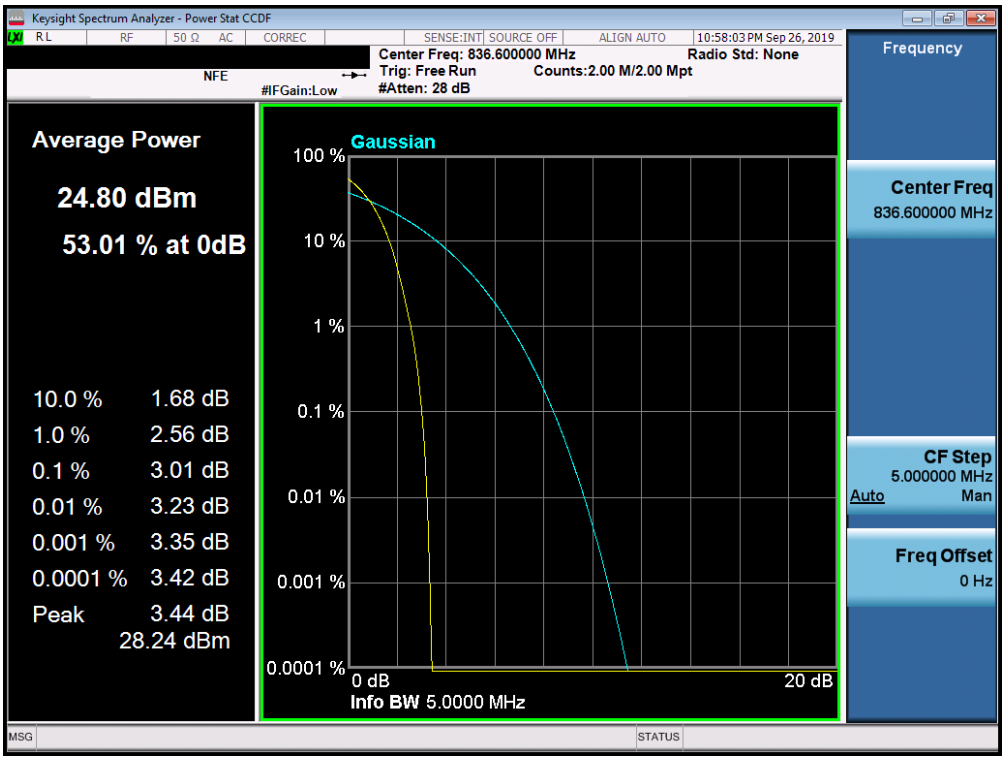
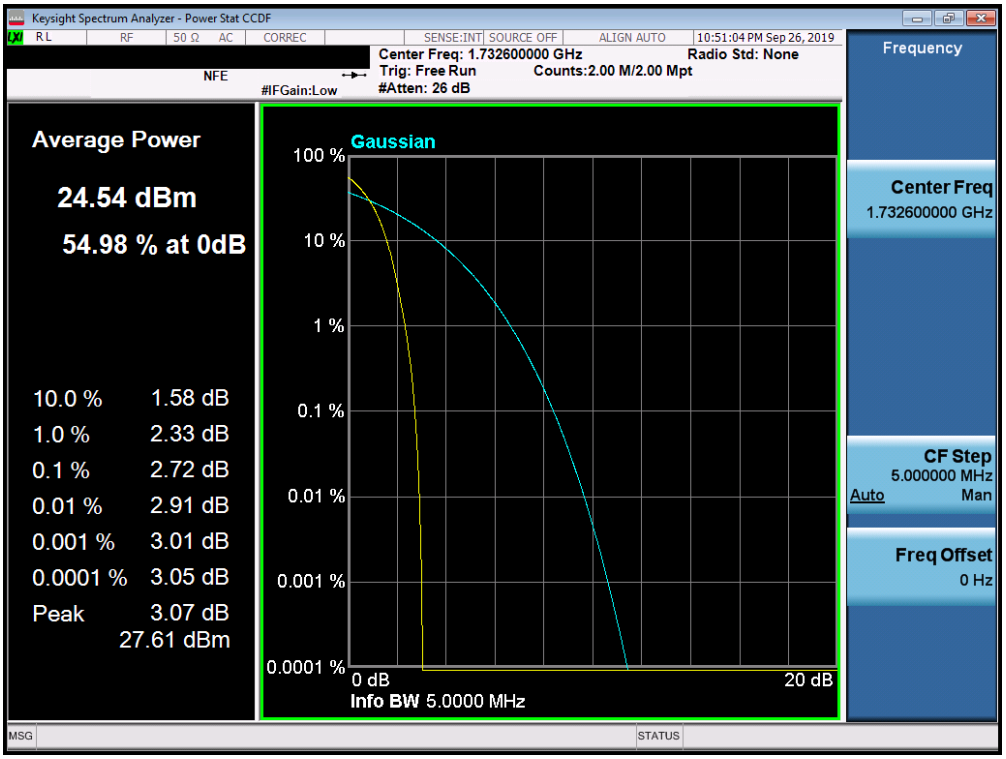


Plot 7-103. Peak-Average Ratio Plot (Cellular WCDMA Mode)



Plot 7-104. Peak-Average Ratio Plot (AWS WCDMA Mode)

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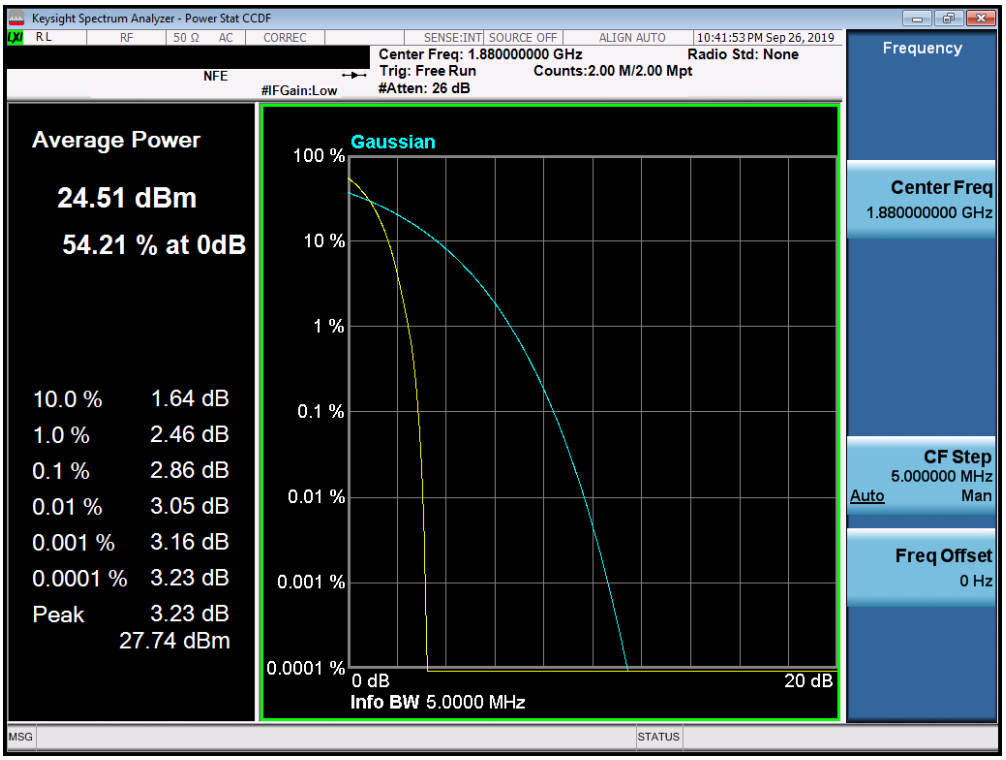

Plot 7-105. Peak-Average Ratio Plot (PCS WCDMA Mode)

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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

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Test Setup

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

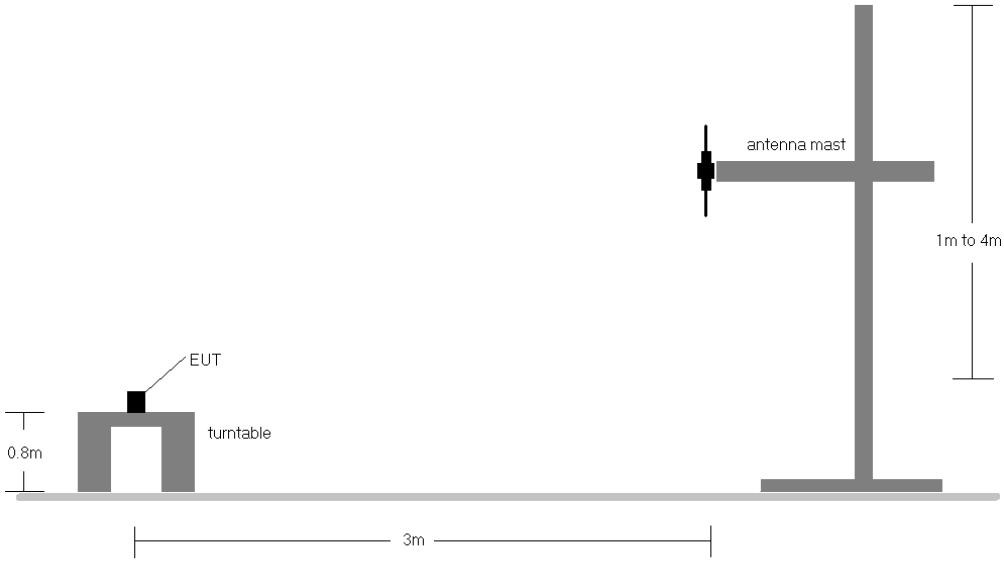

Figure 7-5. Radiated Test Setup <1GHz

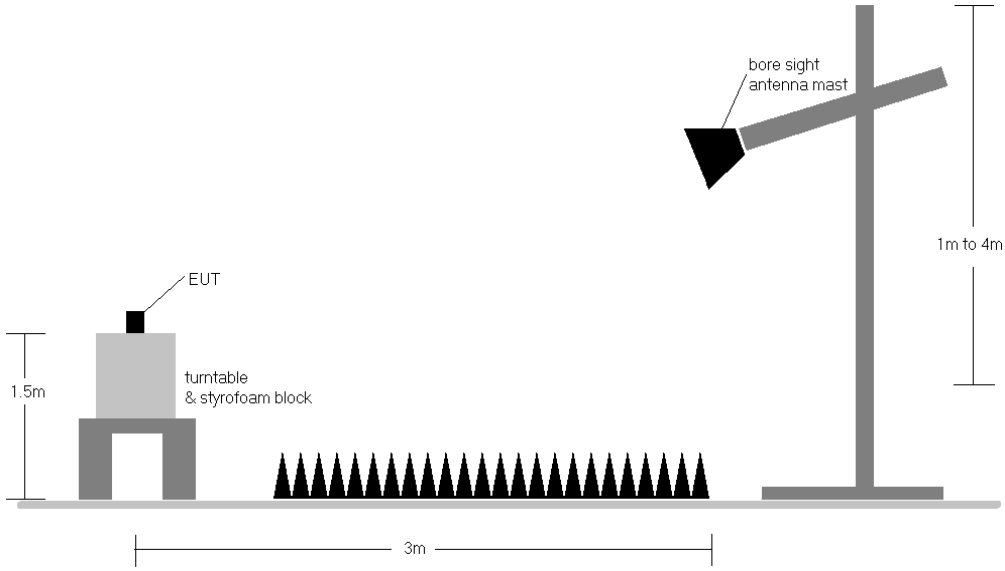

Figure 7-6. Radiated Test Setup >1GHz

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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) This 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 Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP Limit [dBm]	Margin [dB]
824.20	GPRS850	V	145	124	22.19	6.30	26.34	38.45	-12.11	28.49	40.61	-12.12
836.60	GPRS850	V	144	123	22.85	6.40	**27.10**	38.45	-11.35	**29.25**	40.61	-11.36
848.80	GPRS850	V	143	125	21.84	6.50	26.19	38.45	-12.26	28.34	40.61	-12.27
836.60	GPRS850	H	226	91	21.63	6.70	26.18	38.45	-12.27	28.33	40.61	-12.28
836.60	EDGE850	V	144	123	17.53	6.40	**21.78**	38.45	-16.67	**23.93**	40.61	-16.68

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

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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	145	110	13.15	6.30	17.30	38.45	-21.15	19.45	40.61	-21.16
836.52	CDMA850	V	144	105	13.75	6.40	**18.00**	38.45	-20.45	**20.15**	40.61	-20.46
848.31	CDMA850	V	143	109	13.11	6.50	17.46	38.45	-20.99	19.61	40.61	-21.00
836.52	CDMA850	H	220	89	12.09	6.70	16.64	38.45	-21.81	18.79	40.61	-21.82

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	149	105	13.49	6.30	17.64	38.45	-20.81	19.79	40.61	-20.82
836.60	WCDMA850	V	142	94	13.63	6.40	**17.88**	38.45	-20.57	**20.03**	40.61	-20.58
846.60	WCDMA850	V	147	80	13.14	6.50	17.49	38.45	-20.96	19.64	40.61	-20.97
836.60	WCDMA850	H	222	92	12.39	6.70	16.94	38.45	-21.51	19.09	40.61	-21.52

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	115	6	12.12	9.43	21.55	30.00	-8.45
1732.60	WCDMA1700	H	100	5	12.68	9.31	**21.99**	30.00	-8.01
1752.60	WCDMA1700	H	102	3	11.60	9.21	20.81	30.00	-9.19
1732.60	WCDMA1700	V	133	15	11.53	9.19	20.72	30.00	-9.28

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 Limit [dBm]	Margin [dB]
1850.20	GPRS1900	H	106	349	18.10	9.48	27.58	33.01	-5.43
1880.00	GPRS1900	H	119	348	18.82	9.90	28.72	33.01	-4.29
1909.80	GPRS1900	H	110	348	20.00	10.26	**30.26**	33.01	-2.75
1909.80	GPRS1900	V	166	349	18.67	10.31	28.98	33.01	-4.03
1909.80	EDGE1900	H	110	348	15.97	10.26	**26.23**	33.01	-6.78

Table 7-6. EIRP (PCS GPRS)

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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]
1851.25	CDMA1900	H	104	349	12.71	9.49	22.20	33.01	-10.81
1880.00	CDMA1900	H	119	349	12.76	9.90	22.66	33.01	-10.35
1908.75	CDMA1900	H	108	348	12.77	10.25	**23.02**	33.01	-9.99
1908.75	CDMA1900	V	165	349	11.23	10.31	21.54	33.01	-11.47

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 Limit [dBm]	Margin [dB]
1852.40	WCDMA1900	H	123	353	11.20	9.51	20.71	33.01	-12.30
1880.00	WCDMA1900	H	117	352	12.31	9.90	22.21	33.01	-10.80
1907.60	WCDMA1900	H	110	352	12.30	10.24	**22.54**	33.01	-10.47
1907.60	WCDMA1900	V	130	354	10.76	10.30	21.06	33.01	-11.95

Table 7-8. EIRP (PCS WCDMA)

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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

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Test Setup

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

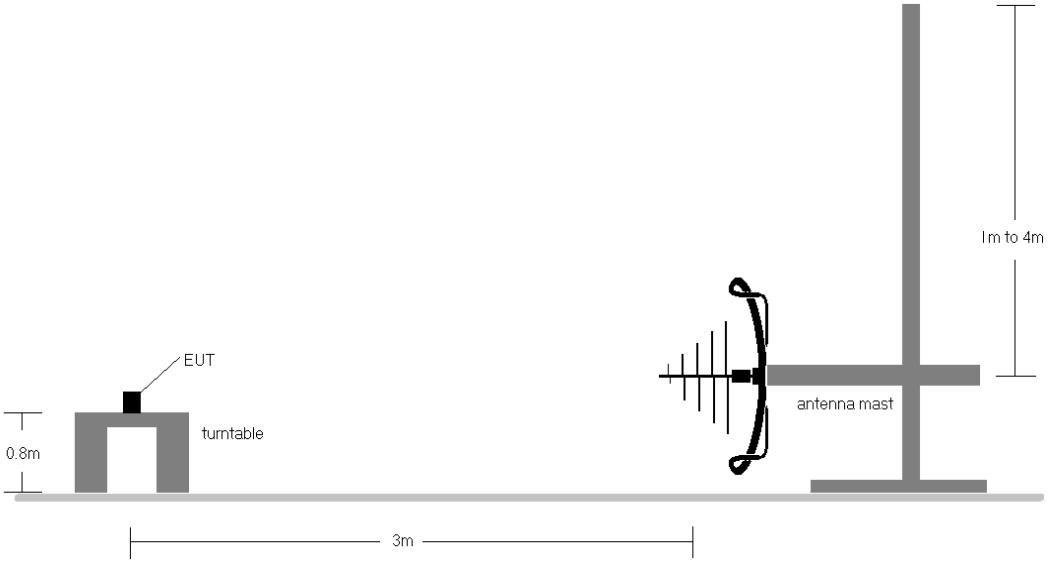

Figure 7-7. Test Instrument & Measurement Setup < 1GHz

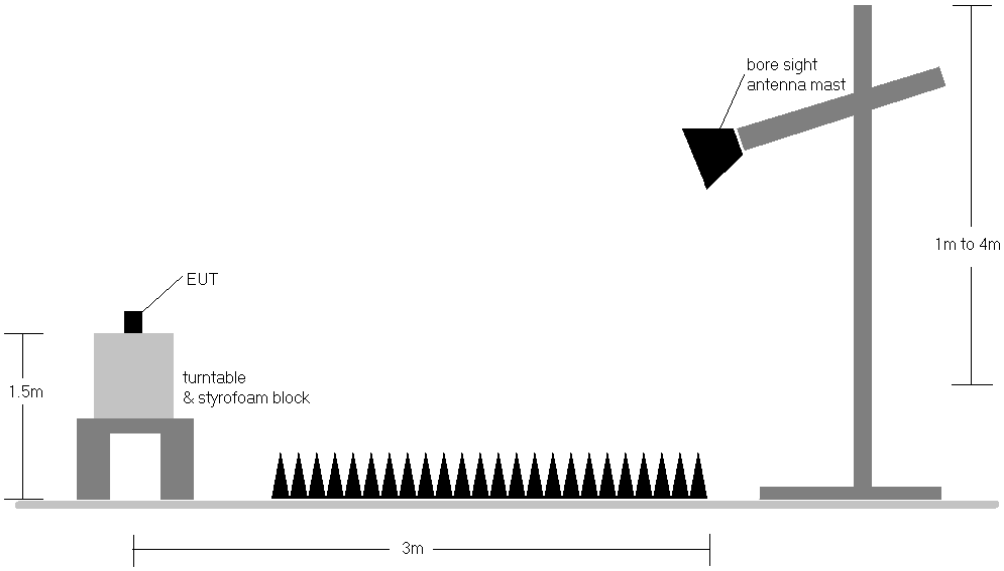

Figure 7-8. Test Instrument & Measurement Setup >1 GHz

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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) This 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.

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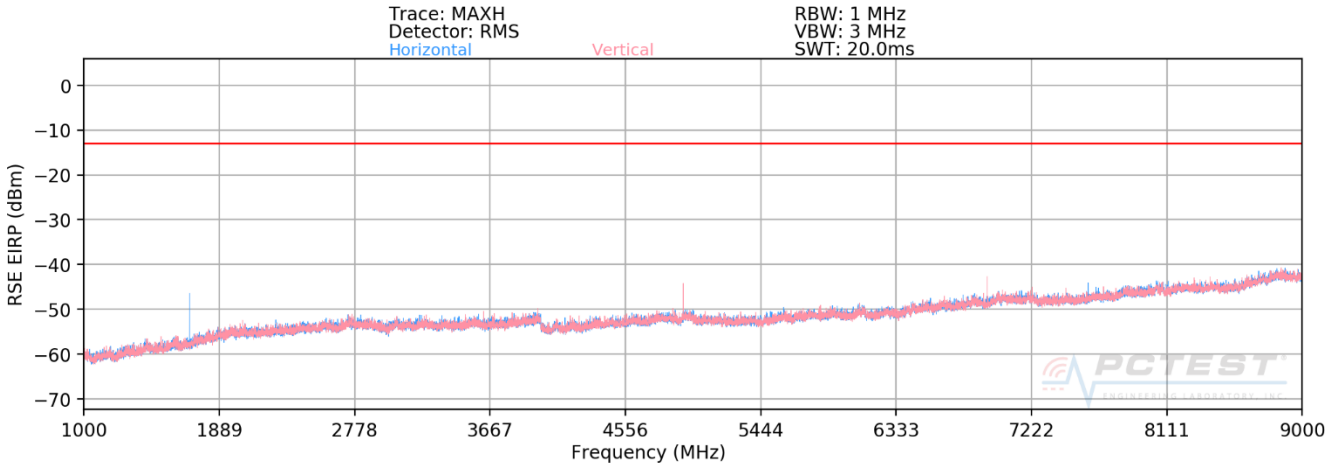
Cellular GPRS Mode



Plot 7-106. 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	H	112	195	-63.56	8.94	-54.62	-41.6
2472.60	H	142	333	-52.06	9.64	-42.41	-29.4
3296.80	H	400	192	-67.88	9.57	-58.31	-45.3
4121.00	H	116	316	-69.92	10.17	-59.75	-46.7
4945.20	H	-	-	-73.06	10.90	-62.16	-49.2
5769.40	H	-	-	-72.91	11.47	-61.45	-48.4

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

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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	H	140	330	-67.27	8.95	-58.32	-45.3
2509.80	H	173	333	-48.48	9.75	-38.73	-25.7
3346.40	H	392	189	-67.20	9.60	-57.60	-44.6
4183.00	H	130	311	-70.53	10.35	-60.19	-47.2
5019.60	H	-	-	-72.93	10.88	-62.05	-49.0
5856.20	H	-	-	-72.44	11.52	-60.92	-47.9

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	H	196	126	-68.42	8.95	-59.47	-46.5
2546.40	H	111	332	-48.05	9.74	-38.30	-25.3
3395.20	H	303	224	-69.31	9.78	-59.53	-46.5
4244.00	H	125	337	-69.68	10.58	-59.11	-46.1
5092.80	H	-	-	-72.81	10.69	-62.12	-49.1
5941.60	H	-	-	-72.50	11.45	-61.04	-48.0

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

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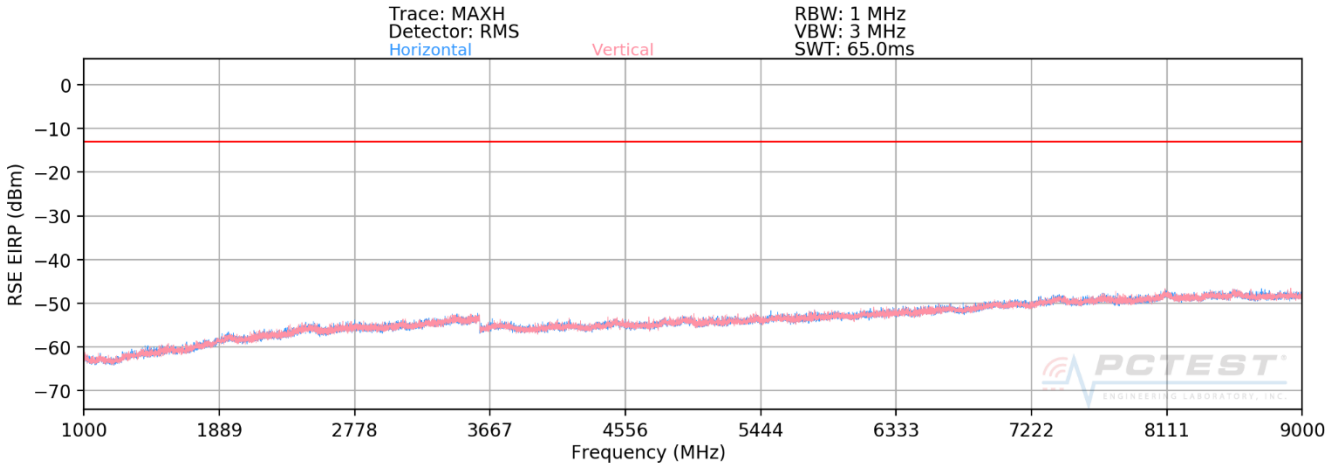
Cellular CDMA Mode



Plot 7-107. 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	H	108	149	-66.81	3.61	-63.20	-50.2
2474.10	H	-	-	-65.80	4.22	-61.58	-48.6

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	H	108	168	-65.86	3.62	-62.24	-49.2
2509.56	H	-	-	-65.59	4.33	-61.26	-48.3

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

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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	H	108	179	-65.61	3.63	-61.98	-49.0
2544.93	H	-	-	-65.24	4.55	-60.69	-47.7

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

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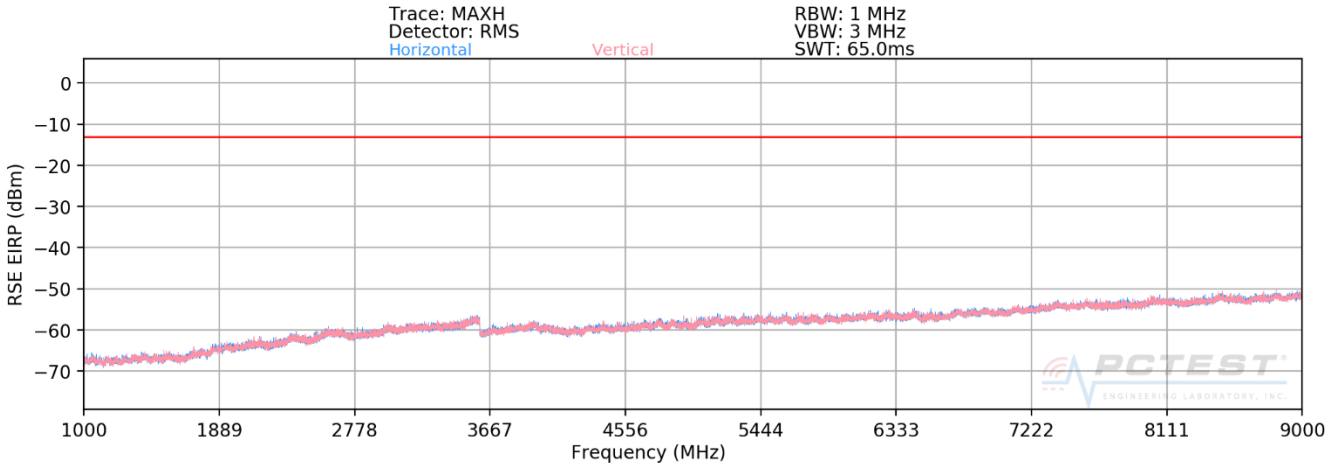
Cellular WCDMA Mode



Plot 7-108. 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	-	-	-80.64	8.95	-71.70	-58.7
2479.20	V	-	-	-78.15	9.67	-68.48	-55.5

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

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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	-	-	-80.47	8.95	-71.52	-58.5
2509.80	V	-	-	-78.01	9.75	-68.26	-55.3

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	-	-	-80.03	8.95	-71.08	-58.1
2539.80	V	-	-	-77.37	9.74	-67.63	-54.6

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

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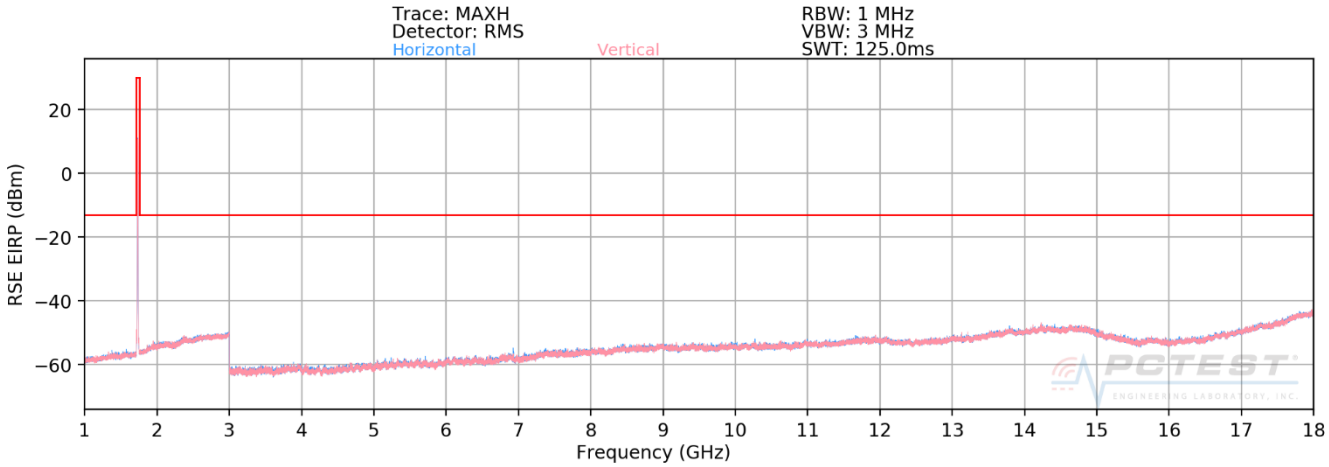
AWS WCDMA Mode



Plot 7-109. 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	V	167	364	-72.27	9.83	-62.45	-49.4
5137.20	V	-	-	-74.44	10.69	-63.75	-50.7
6849.60	V	149	189	-70.70	11.64	-59.06	-46.1
8562.00	V	-	-	-70.18	11.14	-59.04	-46.0
10274.40	V	-	-	-70.20	12.21	-57.99	-45.0

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

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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	V	400	359	-73.43	9.88	-63.55	-50.6
5197.80	V	-	-	-74.30	10.76	-63.54	-50.5
6930.40	V	398	339	-73.26	11.74	-61.52	-48.5
8663.00	V	-	-	-70.33	11.02	-59.31	-46.3
10395.60	V	-	-	-70.61	12.44	-58.17	-45.2

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	V	377	363	-72.86	9.92	-62.94	-49.9
5257.80	V	-	-	-73.37	10.72	-62.66	-49.7
7010.40	V	400	47	-72.25	11.86	-60.39	-47.4
8763.00	V	-	-	-69.39	10.98	-58.41	-45.4
10515.60	V	-	-	-70.62	12.60	-58.02	-45.0

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

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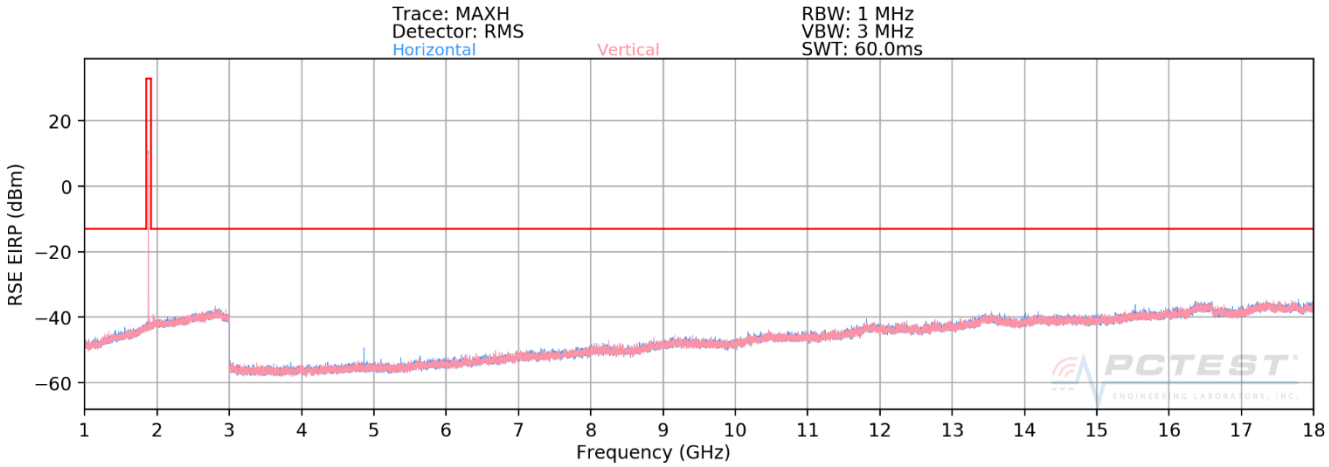
PCS GPRS Mode



Plot 7-110. 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	V	175	363	-56.96	9.58	-47.37	-34.4
5550.60	V	341	315	-52.93	10.94	-41.99	-29.0
7400.80	V	-	-	-67.22	10.96	-56.26	-43.3

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

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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	V	165	341	-56.01	9.37	-46.64	-33.6
5640.00	V	400	10	-52.54	11.17	-41.38	-28.4
7520.00	V	383	358	-66.56	11.11	-55.44	-42.4
9400.00	V	211	17	-63.68	11.57	-52.10	-39.1
11280.00	V	176	362	-63.06	12.72	-50.34	-37.3
13160.00	V	-	-	-64.71	13.15	-51.56	-38.6

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	V	163	343	-57.50	9.30	-48.19	-35.2
5729.40	V	381	16	-52.68	11.39	-41.29	-28.3
7639.20	V	283	44	-66.34	11.33	-55.01	-42.0
9549.00	V	158	17	-62.37	11.79	-50.58	-37.6
11458.80	V	-	-	-65.94	12.82	-53.12	-40.1

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

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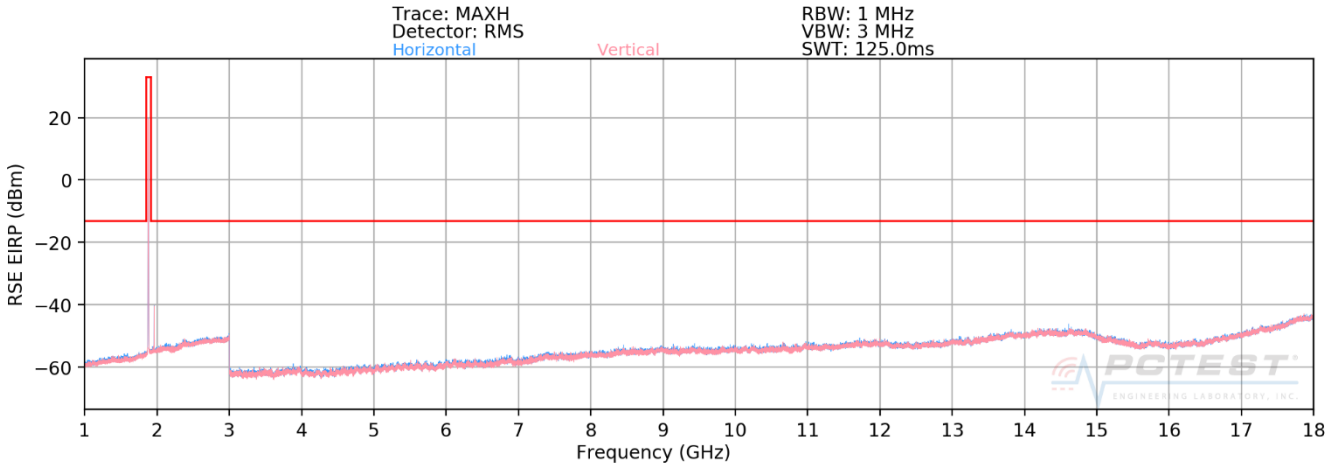
PCS CDMA Mode



Plot 7-111. 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	V	397	313	-72.65	9.58	-63.07	-50.1
5553.75	V	400	320	-72.19	10.95	-61.24	-48.2
7405.00	V	124	9	-67.44	10.96	-56.48	-43.5
9256.25	V	-	-	-67.74	11.63	-56.11	-43.1
11107.50	V	-	-	-67.03	12.74	-54.29	-41.3

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

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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	V	398	325	-72.44	9.37	-63.07	-50.1
5640.00	V	121	35	-71.04	11.17	-59.88	-46.9
7520.00	V	-	-	-69.28	11.11	-58.16	-45.2

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	V	400	9	-71.97	9.30	-62.67	-49.7
5726.25	V	400	28	-71.93	11.38	-60.56	-47.6
7635.00	V	293	8	-67.38	11.32	-56.06	-43.1
9543.75	V	-	-	-67.53	11.78	-55.75	-42.8

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

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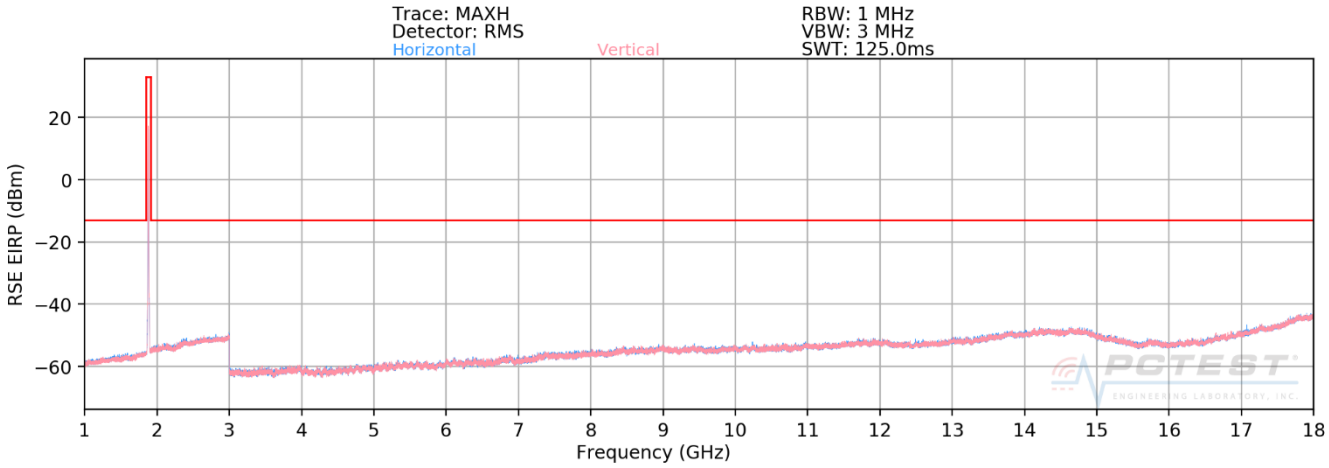
PCS WCDMA Mode



Plot 7-112. 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	V	-	-	-73.85	9.57	-64.28	-51.3
5557.20	V	-	-	-73.84	10.95	-62.89	-49.9

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

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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	V	-	-	-73.64	9.37	-64.27	-51.3
5640.00	V	-	-	-73.72	11.17	-62.56	-49.6

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	V	-	-	-73.14	9.30	-63.84	-50.8
5722.80	V	-	-	-73.67	11.37	-62.30	-49.3

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

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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

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Frequency Stability / Temperature Variation

OPERATING FREQUENCY:	836,600,000	Hz
CHANNEL:	190	
REFERENCE VOLTAGE:	4.33	VDC
DEVIATION LIMIT:	± 0.00025 % or 2.5 ppm	

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.33	- 30	836,599,589	-411	-0.0000491
100 %		- 20	836,599,599	-401	-0.0000479
100 %		- 10	836,600,215	215	0.0000257
100 %		0	836,600,024	24	0.0000029
100 %		+ 10	836,600,294	294	0.0000351
100 %		+ 20	836,600,077	77	0.0000092
100 %		+ 30	836,599,788	-212	-0.0000253
100 %		+ 40	836,600,129	129	0.0000154
100 %		+ 50	836,599,752	-248	-0.0000296
BATT. ENDPOINT	2.93	+ 20	836,599,915	-85	-0.0000102

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

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Frequency Stability / Temperature Variation

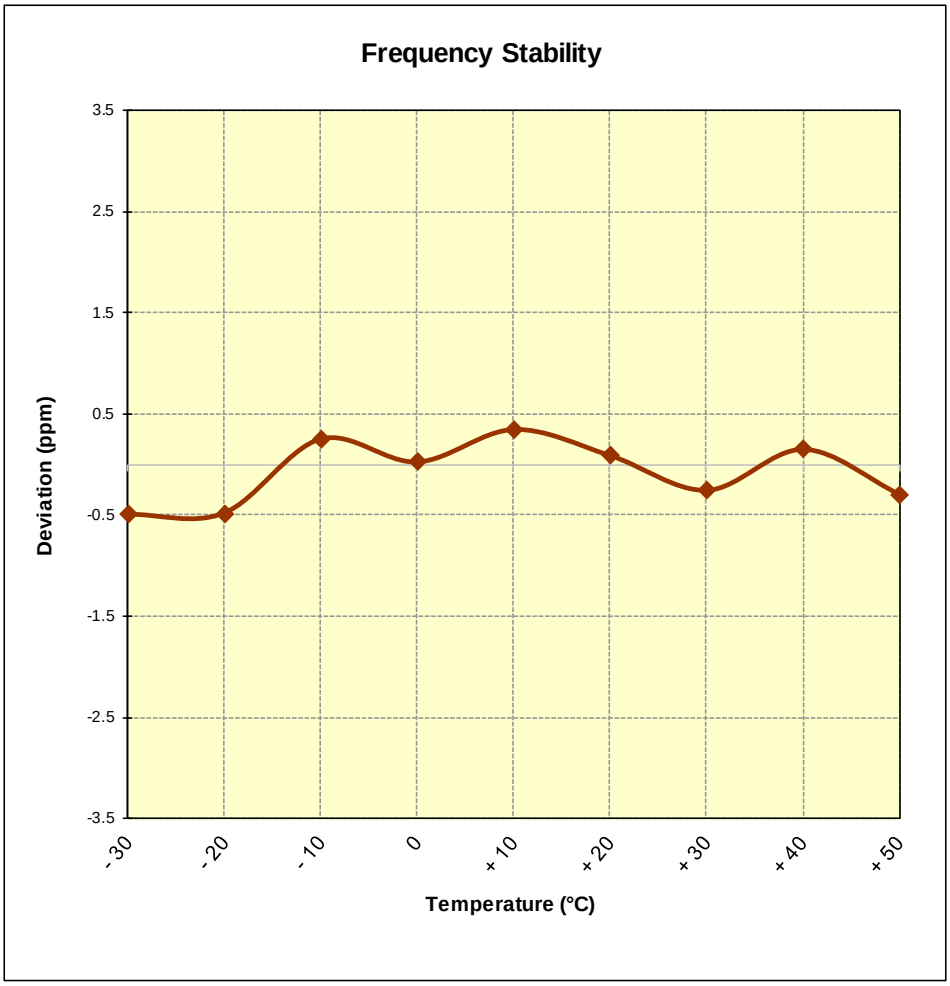

Figure 7-9. Frequency Stability Graph (Cellular GPRS Mode – Ch. 190)

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Frequency Stability / Temperature Variation

OPERATING FREQUENCY:	836,520,000	Hz
CHANNEL:	384	
REFERENCE VOLTAGE:	4.33	VDC
DEVIATION LIMIT:	± 0.00025 % or 2.5 ppm	

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.33	- 30	836,520,007	7	0.0000008
100 %		- 20	836,520,303	303	0.0000362
100 %		- 10	836,519,849	-151	-0.0000181
100 %		0	836,520,070	70	0.0000084
100 %		+ 10	836,520,019	19	0.0000023
100 %		+ 20	836,520,410	410	0.0000490
100 %		+ 30	836,520,130	130	0.0000155
100 %		+ 40	836,520,225	225	0.0000269
100 %		+ 50	836,519,844	-156	-0.0000186
BATT. ENDPOINT	2.93	+ 20	836,519,680	-320	-0.0000383

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

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Frequency Stability / Temperature Variation

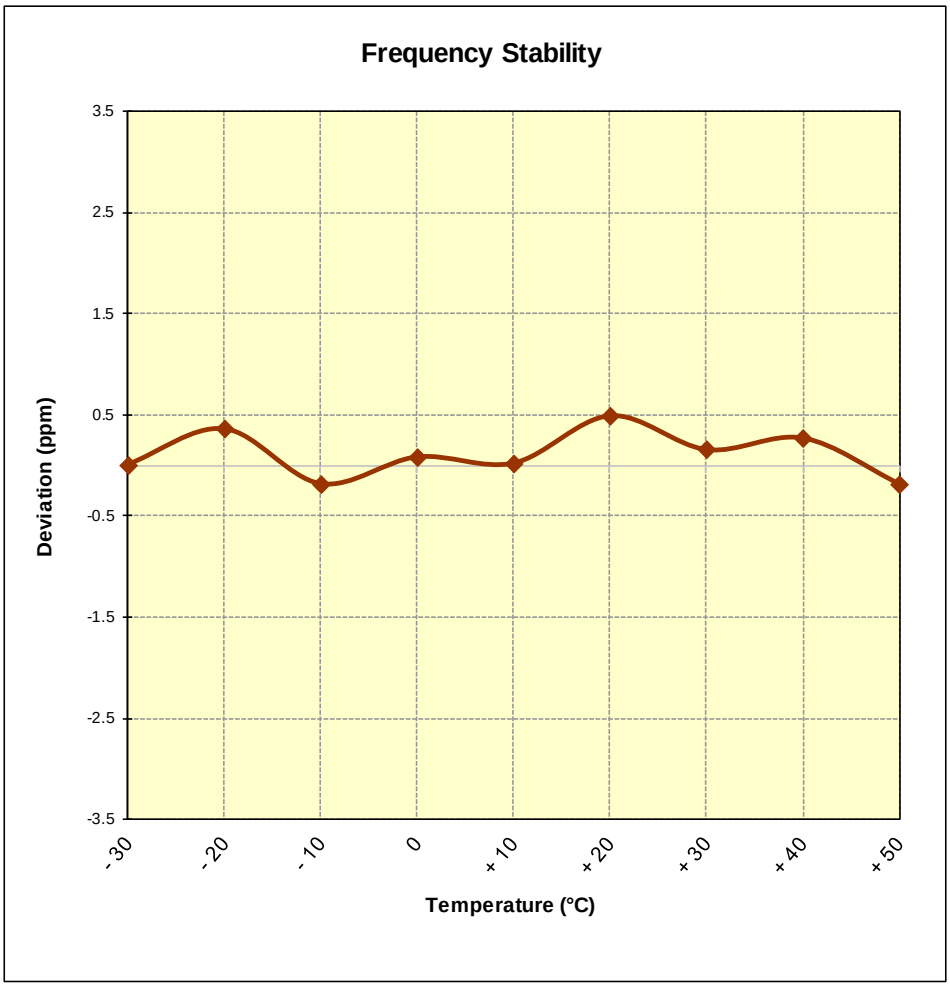

Figure 7-10. Frequency Stability Graph (Cellular CDMA Mode – Ch. 384)

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Frequency Stability / Temperature Variation

OPERATING FREQUENCY:	836,600,000	Hz
CHANNEL:	4183	
REFERENCE VOLTAGE:	4.33	VDC
DEVIATION LIMIT:	± 0.00025 % or 2.5 ppm	

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.33	- 30	836,599,952	-48	-0.0000057
100 %		- 20	836,599,622	-378	-0.0000452
100 %		- 10	836,600,026	26	0.0000031
100 %		0	836,600,217	217	0.0000259
100 %		+ 10	836,600,067	67	0.0000080
100 %		+ 20	836,600,029	29	0.0000035
100 %		+ 30	836,600,109	109	0.0000130
100 %		+ 40	836,600,221	221	0.0000264
100 %		+ 50	836,599,909	-91	-0.0000109
BATT. ENDPOINT	2.93	+ 20	836,599,997	-3	-0.0000004

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

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Frequency Stability / Temperature Variation

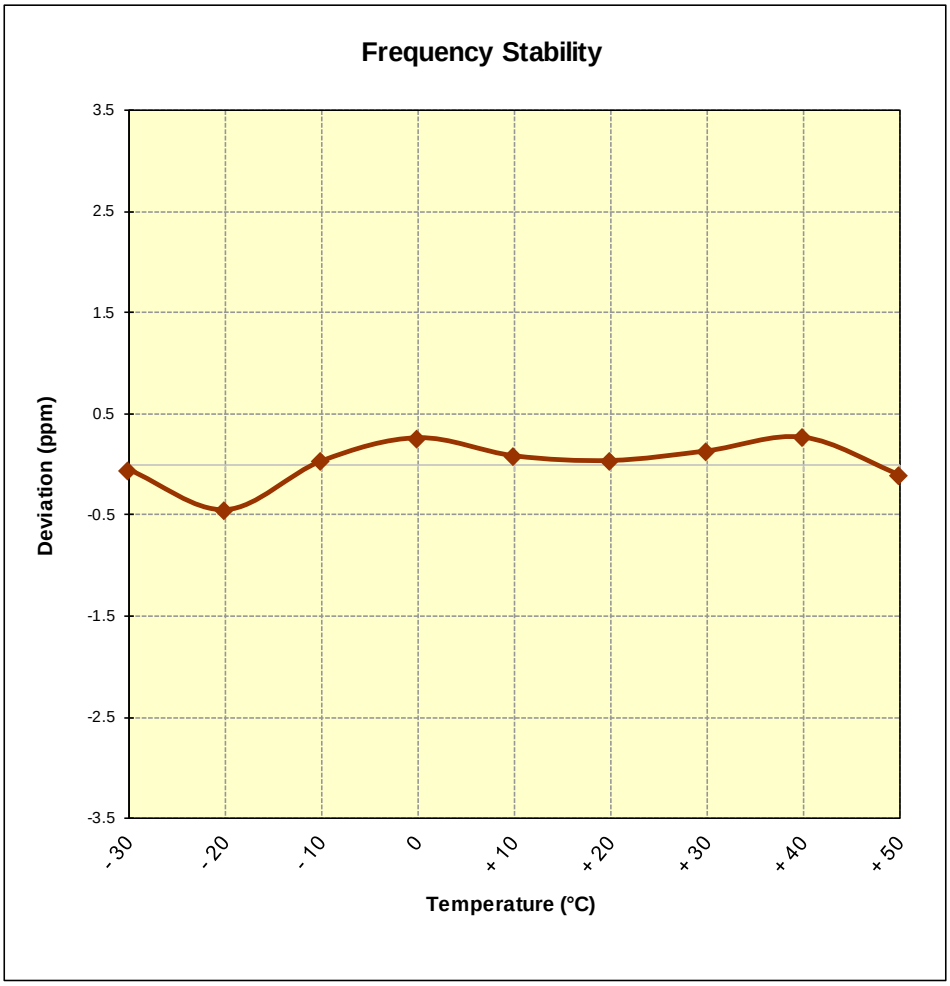

Figure 7-11. Frequency Stability Graph (Cellular WCDMA Mode – Ch. 4183)

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Frequency Stability / Temperature Variation

OPERATING FREQUENCY:	1,732,600,000	Hz
CHANNEL:	1413	
REFERENCE VOLTAGE:	4.33	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.33	- 30	1,732,600,037	37	0.0000021
100 %		- 20	1,732,599,974	-26	-0.0000015
100 %		- 10	1,732,599,658	-342	-0.0000197
100 %		0	1,732,599,923	-77	-0.0000044
100 %		+ 10	1,732,600,015	15	0.0000009
100 %		+ 20	1,732,599,949	-51	-0.0000029
100 %		+ 30	1,732,599,885	-115	-0.0000066
100 %		+ 40	1,732,600,109	109	0.0000063
100 %		+ 50	1,732,599,998	-2	-0.0000001
BATT. ENDPOINT	2.93	+ 20	1,732,599,668	-332	-0.0000192

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.

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Frequency Stability / Temperature Variation

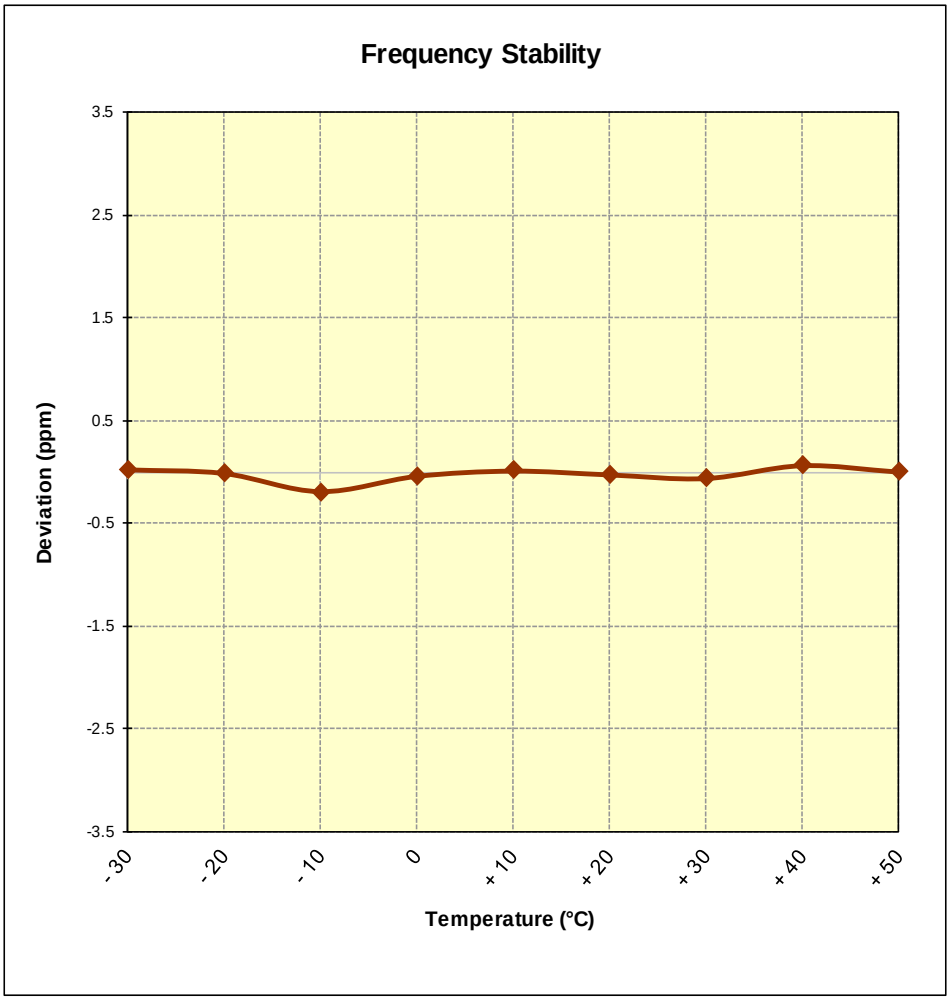

Figure 7-12. Frequency Stability Graph (AWS WCDMA Mode – Ch. 1413)

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Frequency Stability / Temperature Variation

OPERATING FREQUENCY:	1,880,000,000	Hz
CHANNEL:	661	
REFERENCE VOLTAGE:	4.33	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.33	- 30	1,880,000,124	124	0.0000066
100 %		- 20	1,880,000,148	148	0.0000079
100 %		- 10	1,880,000,017	17	0.0000009
100 %		0	1,879,999,762	-238	-0.0000127
100 %		+ 10	1,880,000,075	75	0.0000040
100 %		+ 20	1,879,999,932	-68	-0.0000036
100 %		+ 30	1,879,999,844	-156	-0.0000083
100 %		+ 40	1,879,999,976	-24	-0.0000013
100 %		+ 50	1,879,999,782	-218	-0.0000116
BATT. ENDPOINT	2.93	+ 20	1,880,000,033	33	0.0000018

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

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.

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Frequency Stability / Temperature Variation

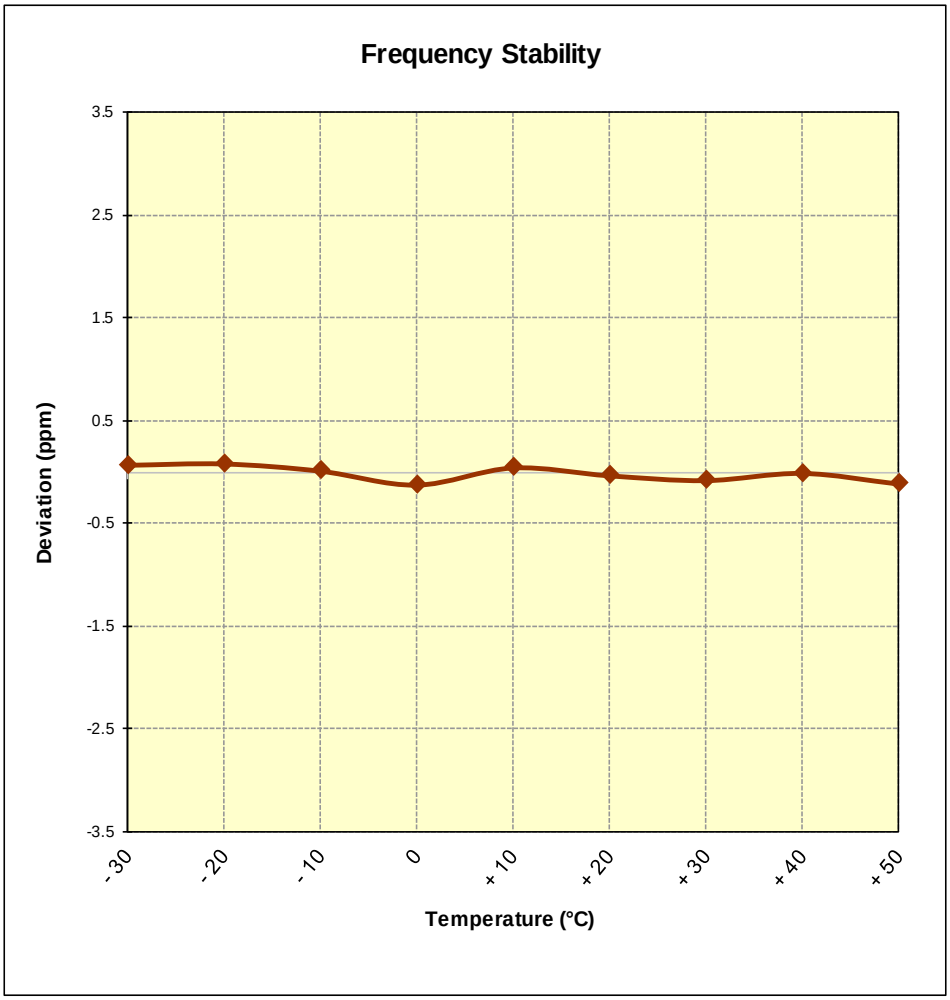

Figure 7-13. Frequency Stability Graph (PCS GPRS Mode – Ch. 661)

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Frequency Stability / Temperature Variation

OPERATING FREQUENCY:	1,880,000,000	Hz
CHANNEL:	600	
REFERENCE VOLTAGE:	4.33	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.33	- 30	1,880,000,154	154	0.0000082
100 %		- 20	1,879,999,983	-17	-0.0000009
100 %		- 10	1,880,000,138	138	0.0000073
100 %		0	1,880,000,044	44	0.0000023
100 %		+ 10	1,879,999,743	-257	-0.0000137
100 %		+ 20	1,880,000,005	5	0.0000003
100 %		+ 30	1,880,000,201	201	0.0000107
100 %		+ 40	1,880,000,189	189	0.0000101
100 %		+ 50	1,880,000,202	202	0.0000107
BATT. ENDPOINT	2.93	+ 20	1,880,000,015	15	0.0000008

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

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.

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Frequency Stability / Temperature Variation

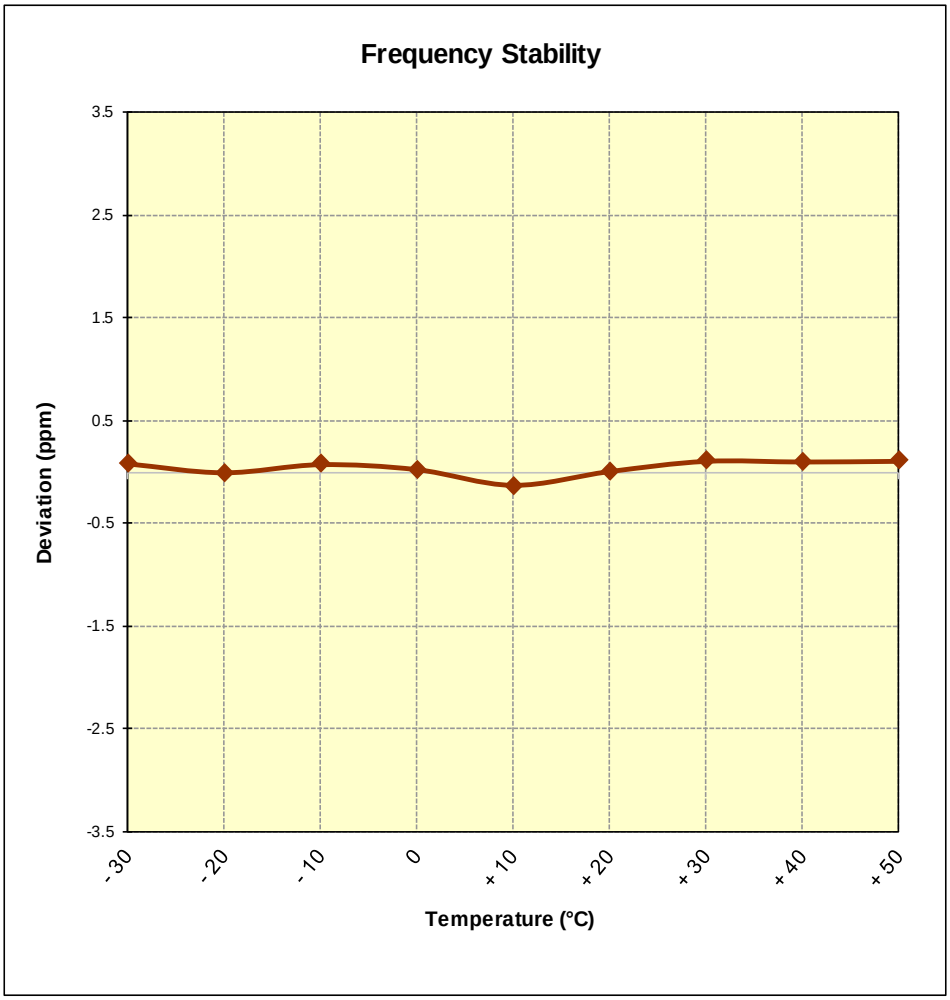

Figure 7-14. Frequency Stability Graph (PCS CDMA Mode – Ch. 600)

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Frequency Stability / Temperature Variation

OPERATING FREQUENCY:	1,880,000,000	Hz
CHANNEL:	9400	
REFERENCE VOLTAGE:	4.33	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.33	- 30	1,880,000,283	283	0.0000151
100 %		- 20	1,880,000,094	94	0.0000050
100 %		- 10	1,879,999,893	-107	-0.0000057
100 %		0	1,879,999,888	-112	-0.0000060
100 %		+ 10	1,880,000,242	242	0.0000129
100 %		+ 20	1,880,000,201	201	0.0000107
100 %		+ 30	1,880,000,025	25	0.0000013
100 %		+ 40	1,879,999,552	-448	-0.0000238
100 %		+ 50	1,880,000,436	436	0.0000232
BATT. ENDPOINT	2.93	+ 20	1,879,999,709	-291	-0.0000155

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

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.

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Frequency Stability / Temperature Variation

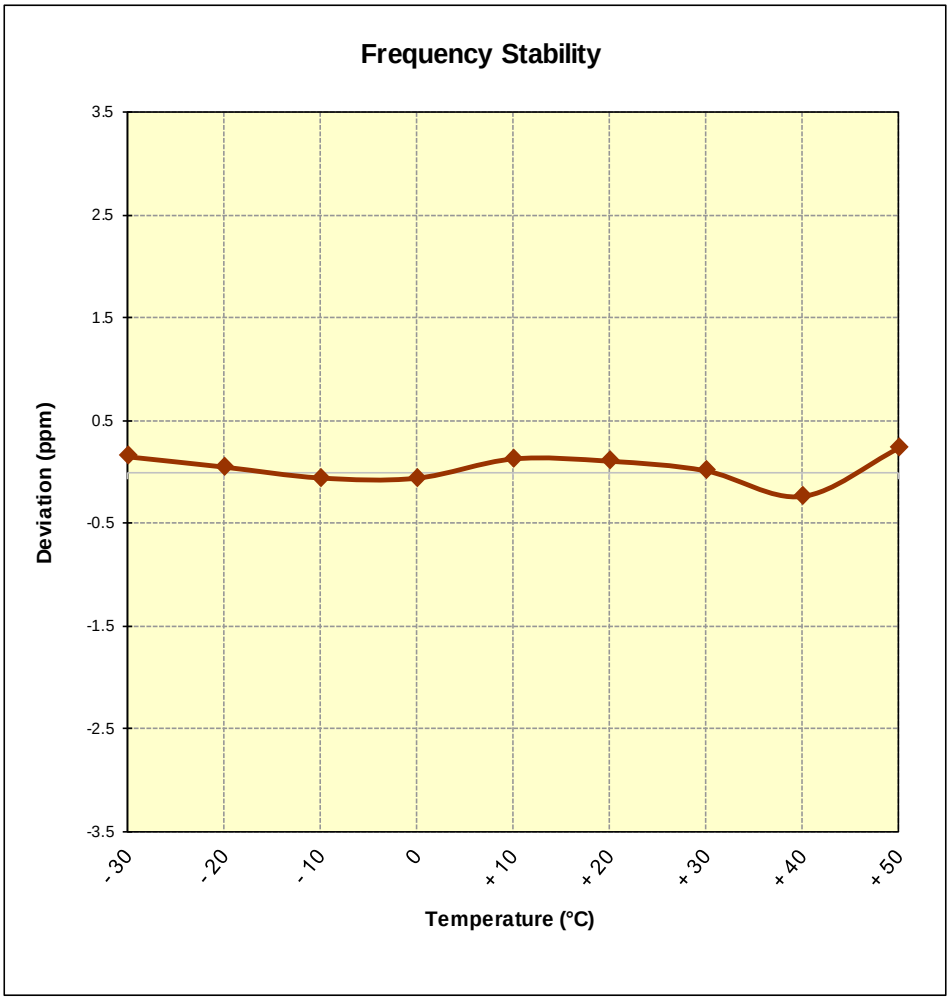

Figure 7-15. Frequency Stability Graph (PCS WCDMA Mode – Ch. 9400)

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8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **LG Portable Handset FCC ID: ZNFQ620WA** complies with all the requirements of Part 22, 24, & 27 of the FCC Rules.

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