7.5 Spurious and Harmonic Emissions at Antenna Terminal

§2.1051, §24.238(a), §27.53(h)

Test Overview

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

The minimum permissible attenuation level of any spurious emission is 43 + $log_{10}(P_{[Watts]})$, where P is the transmitter power in Watts.

Test Procedure Used

KDB 971168 D01 v02r02 – Section 6.0
KDB 662911 D01 v02r01 – Section E)3)a)iii)

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to at least 10 * the fundamental frequency (separated into at least two plots per channel)
2. Detector = RMS
3. Trace mode = trace average for continuous emissions
4. Sweep time = auto couple
5. The trace was allowed to stabilize
6. Please see test notes below for RBW and VBW settings

Test Setup

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

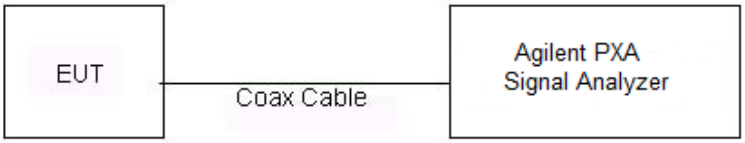


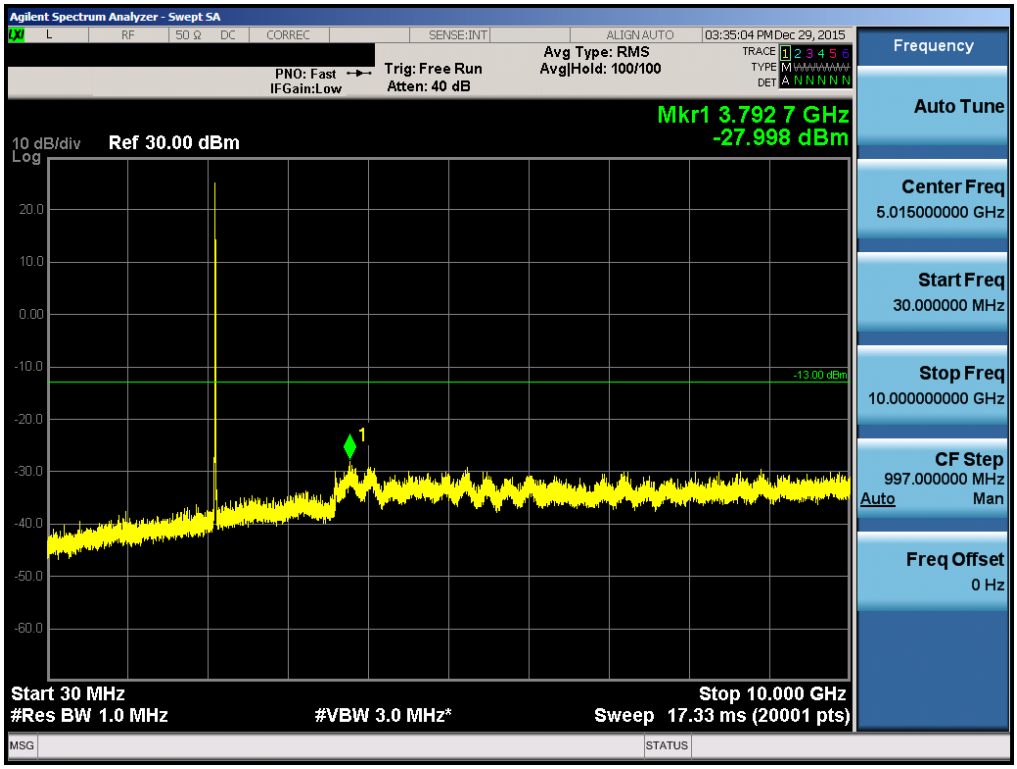
Figure 7-4. Test Instrument & Measurement Setup

Test Notes

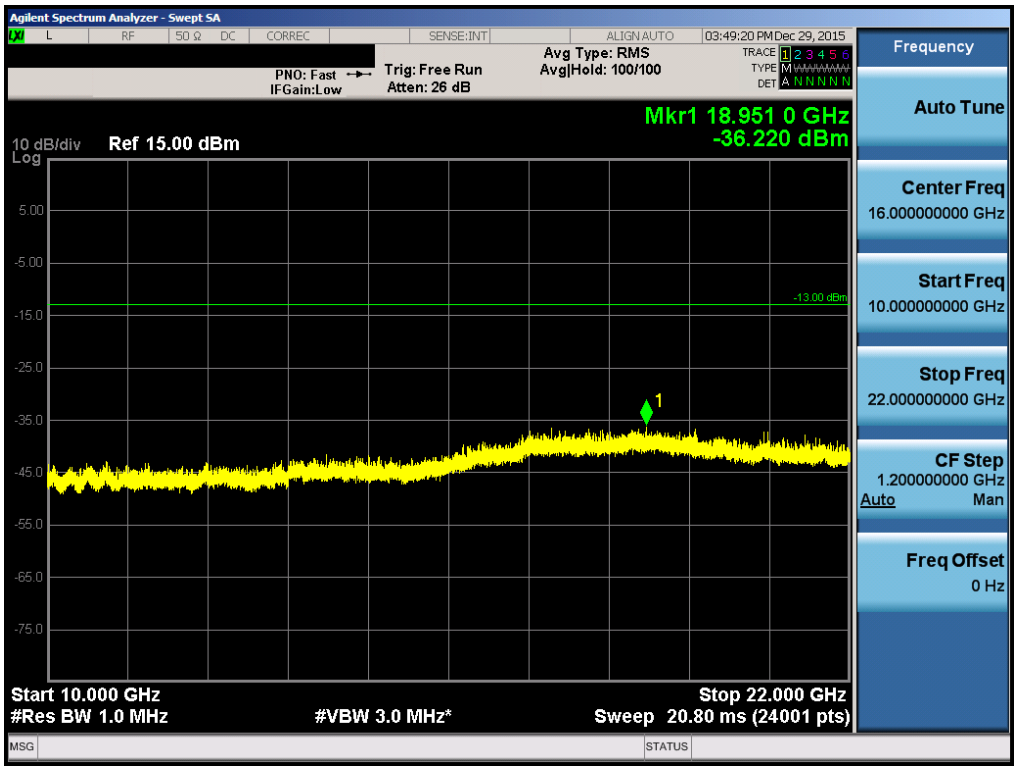
1. Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and 1 MHz or greater for frequencies greater than 1 GHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

2. Per 24.238(a) and 27.53(h), the spurious emission limit is -13dBm. Since this device transmits from two antennas simultaneously, applying the "Measure and add 10 log(N_{ant}) dB", where N_{ant} = 2, guidance from KDB 662911 D01 v02r01 yields an additional correction to the limit of -3dB. The correct out of band conducted emission limit is -13dBm + (-3dB) = **-16dBm**.

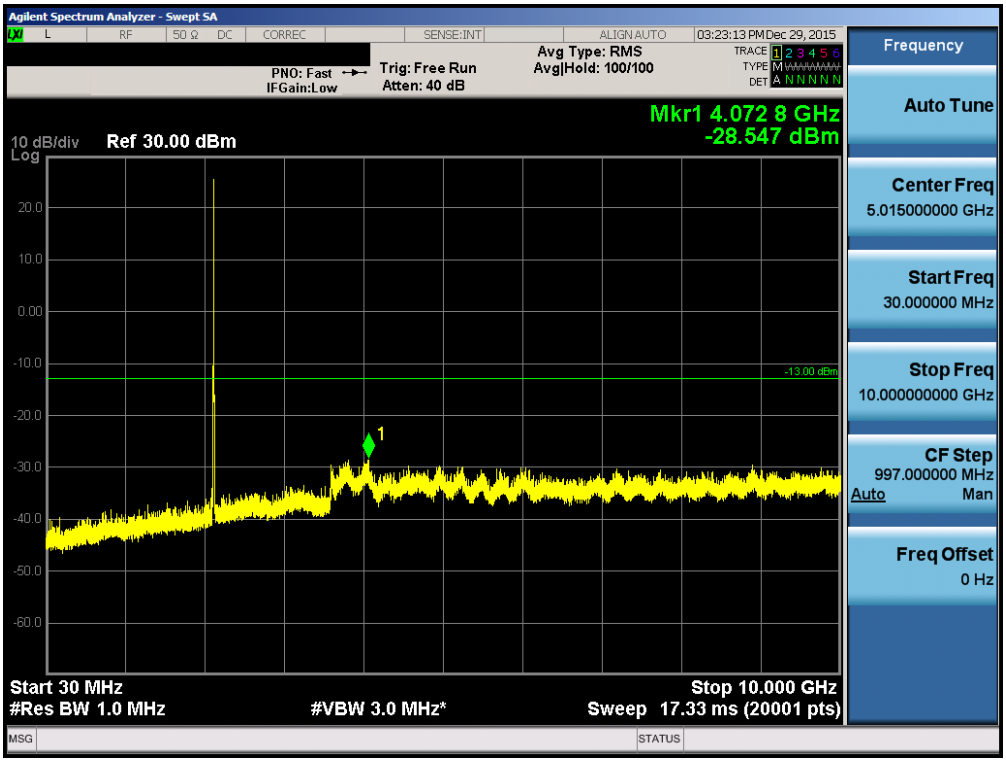
Chain0



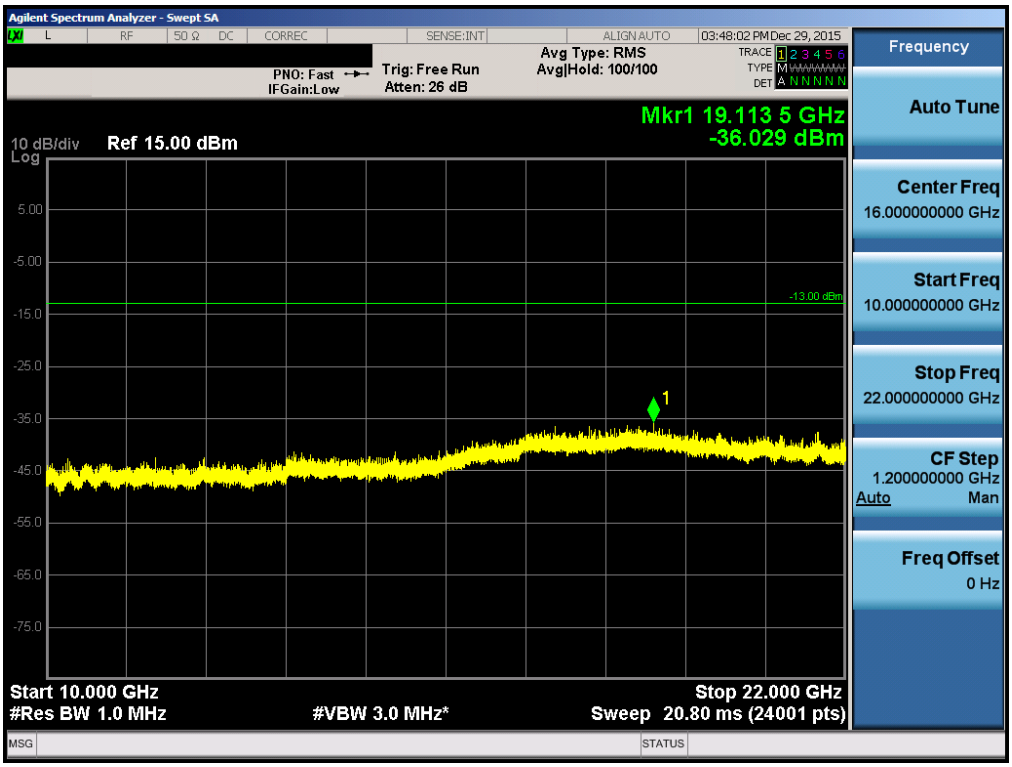
Plot 7-90. Conducted Spurious Plot (Band 4 – 5.0MHz QPSK – RB Size 6, Low Channel)



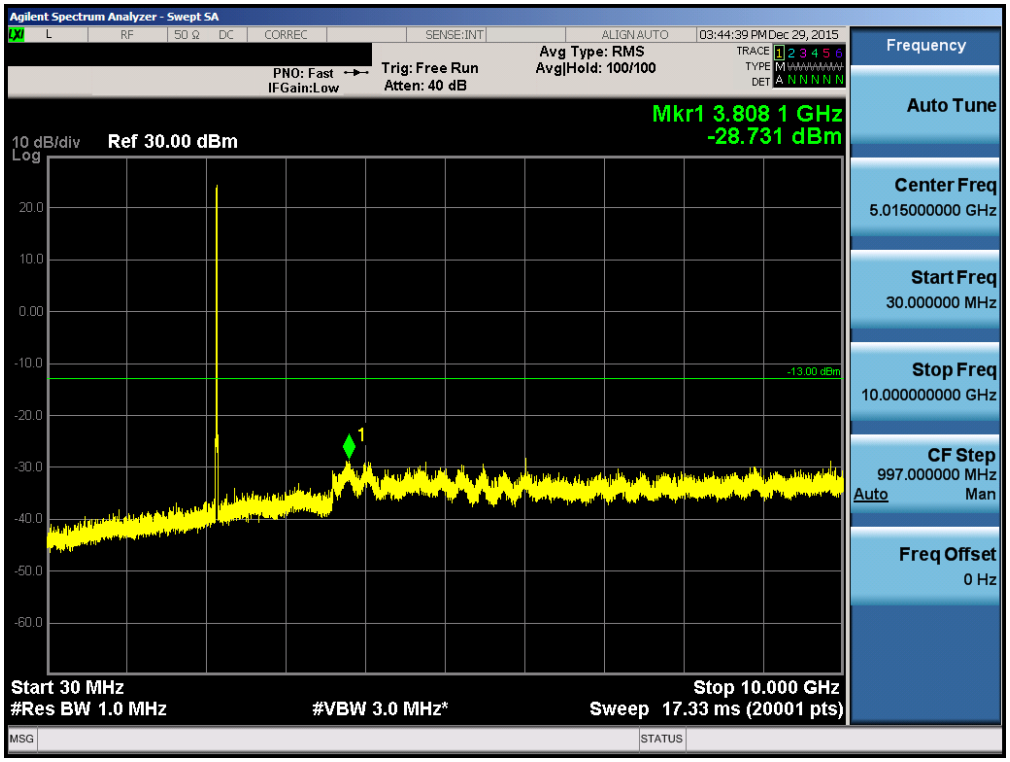
Plot 7-91. Conducted Spurious Plot (Band 4 – 5.0MHz QPSK – RB Size 6, Low Channel)



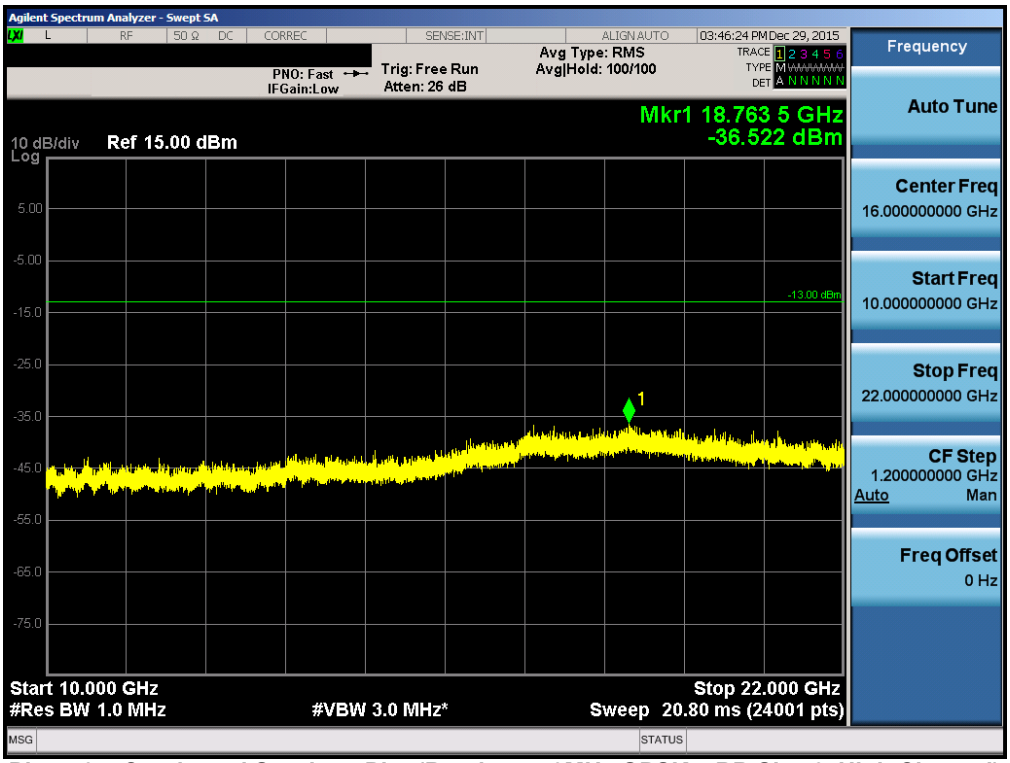
Plot 7-92. Conducted Spurious Plot (Band 4 – 5.0MHz QPSK – RB Size 6, Mid Channel)



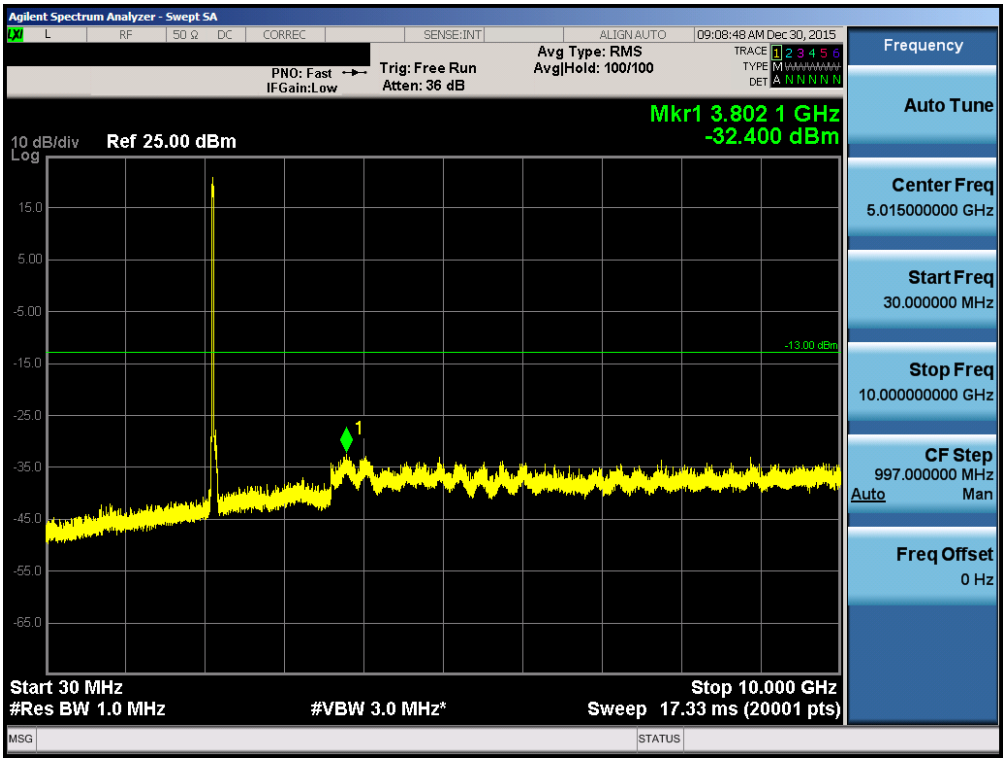
Plot 7-93. Conducted Spurious Plot (Band 4 – 5.0MHz QPSK – RB Size 6, Mid Channel)



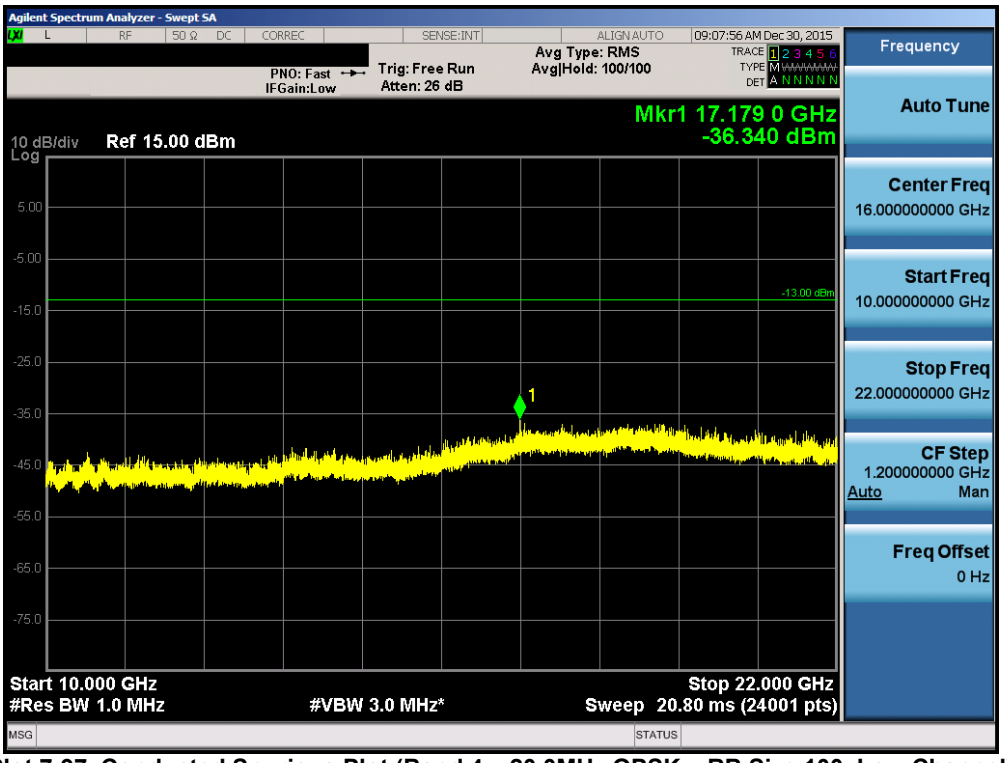
Plot 7-94. Conducted Spurious Plot (Band 4 – 5.0MHz QPSK – RB Size 6, High Channel)



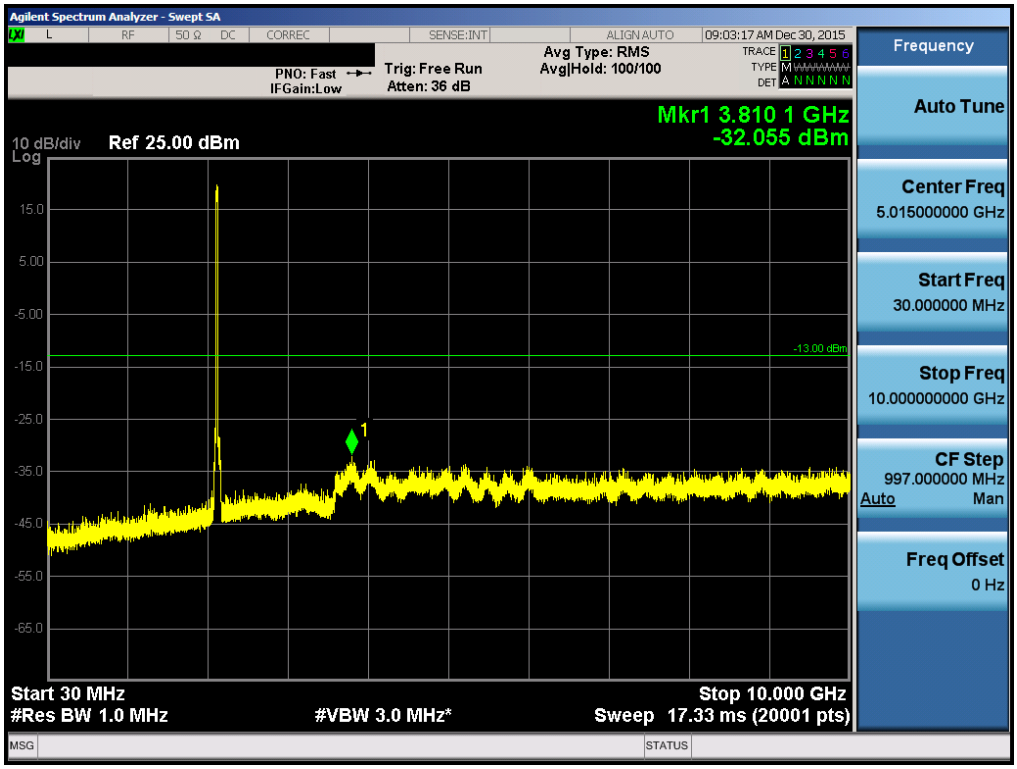
Plot 7-95. Conducted Spurious Plot (Band 4 – 5.0MHz QPSK – RB Size 6, High Channel)



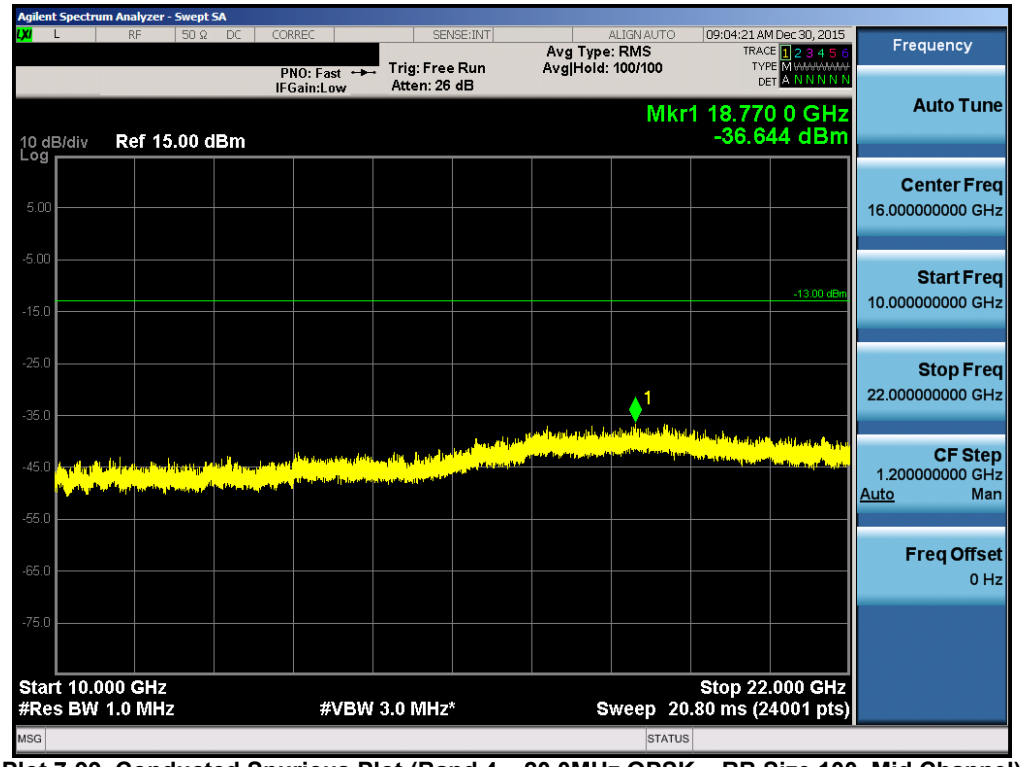
Plot 7-96. Conducted Spurious Plot (Band 4 – 20.0MHz QPSK – RB Size 100, Low Channel)



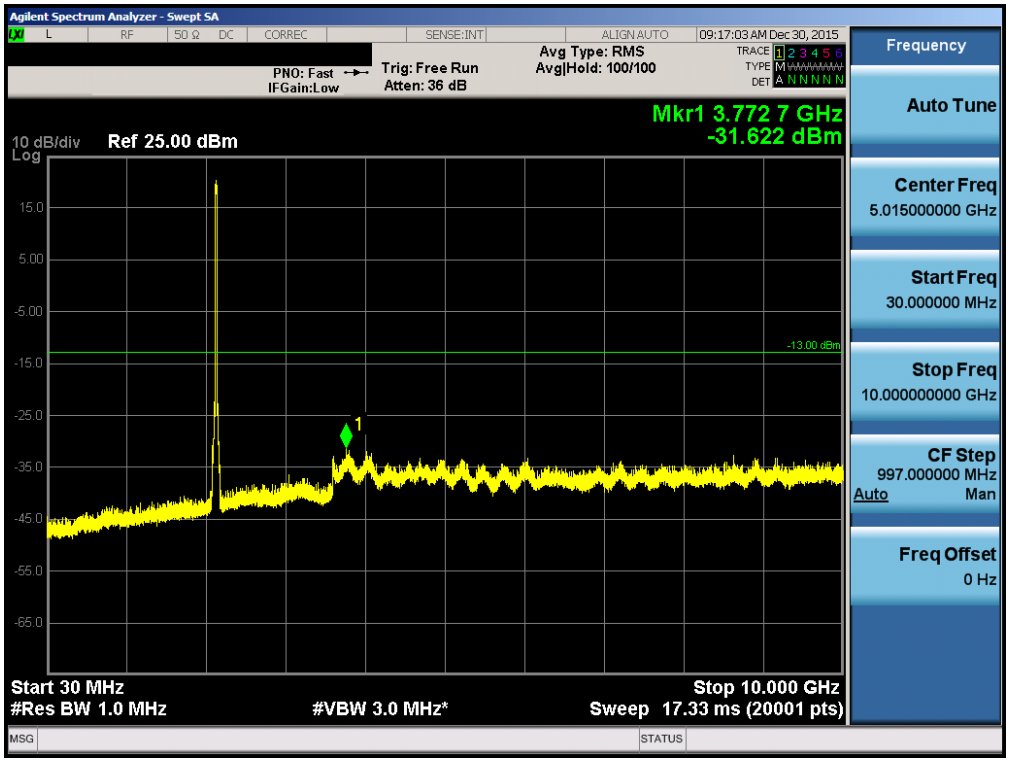
Plot 7-97. Conducted Spurious Plot (Band 4 – 20.0MHz QPSK – RB Size 100, Low Channel)



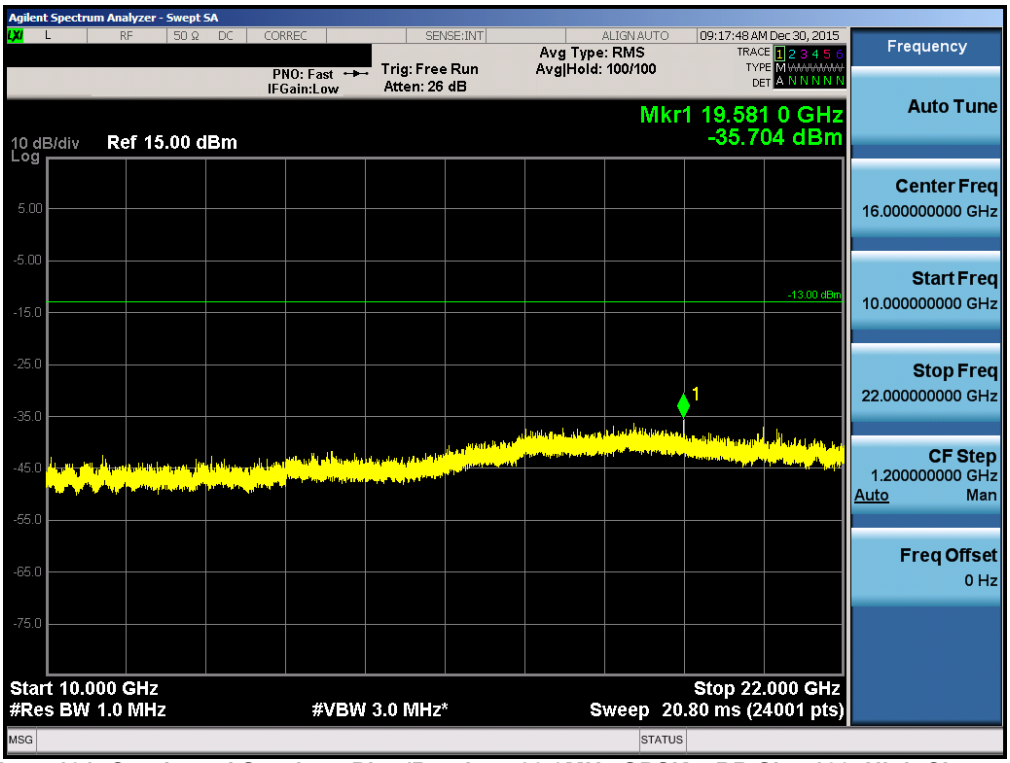
Plot 7-98. Conducted Spurious Plot (Band 4 – 20.0MHz QPSK – RB Size 100, Mid Channel)



Plot 7-99. Conducted Spurious Plot (Band 4 – 20.0MHz QPSK – RB Size 100, Mid Channel)

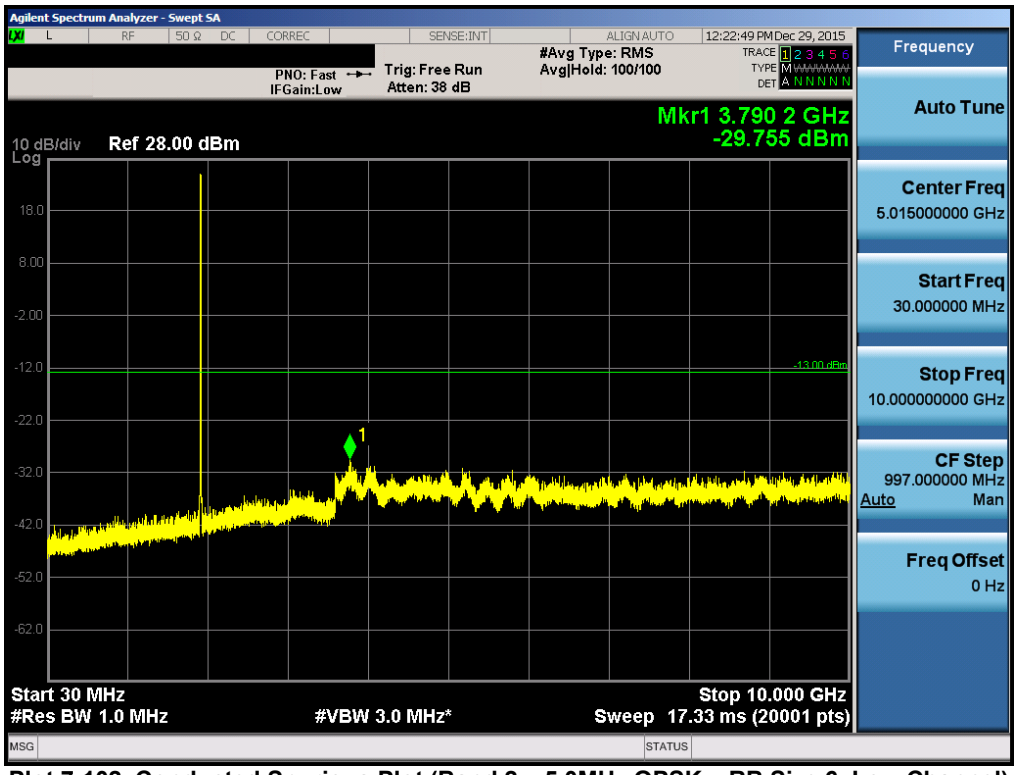


Plot 7-100. Conducted Spurious Plot (Band 4 – 20.0MHz QPSK – RB Size 100, High Channel)

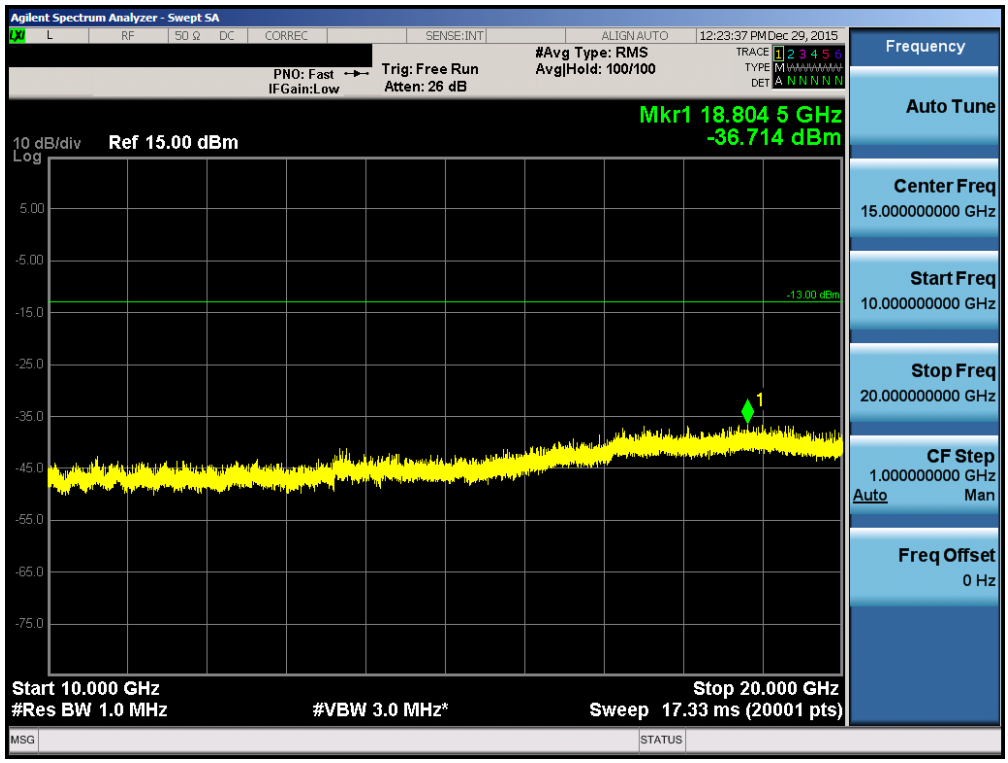


Plot 7-101. Conducted Spurious Plot (Band 4 – 20.0MHz QPSK – RB Size 100, High Channel)

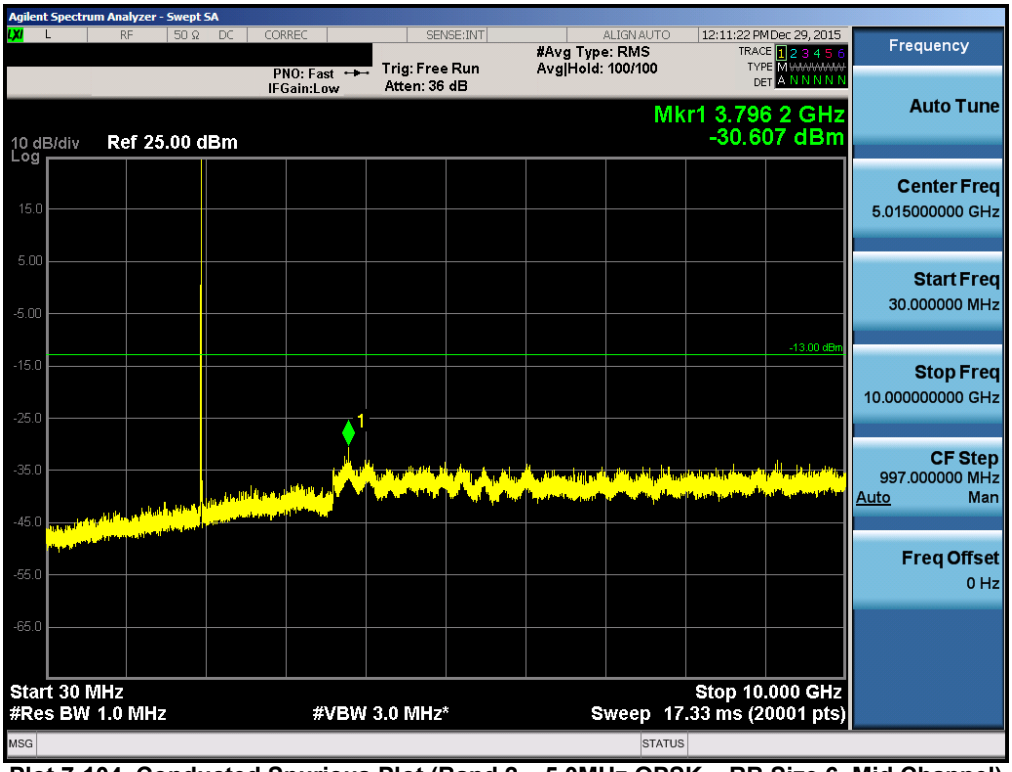
Chain1



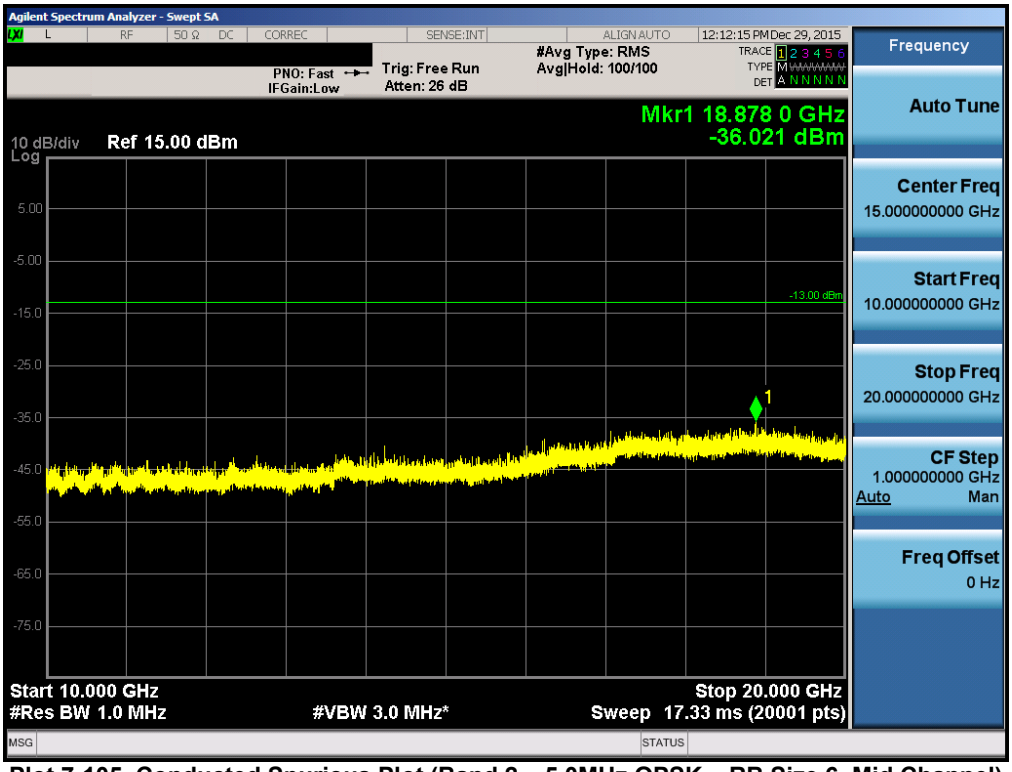
Plot 7-102. Conducted Spurious Plot (Band 2 – 5.0MHz QPSK – RB Size 6, Low Channel)



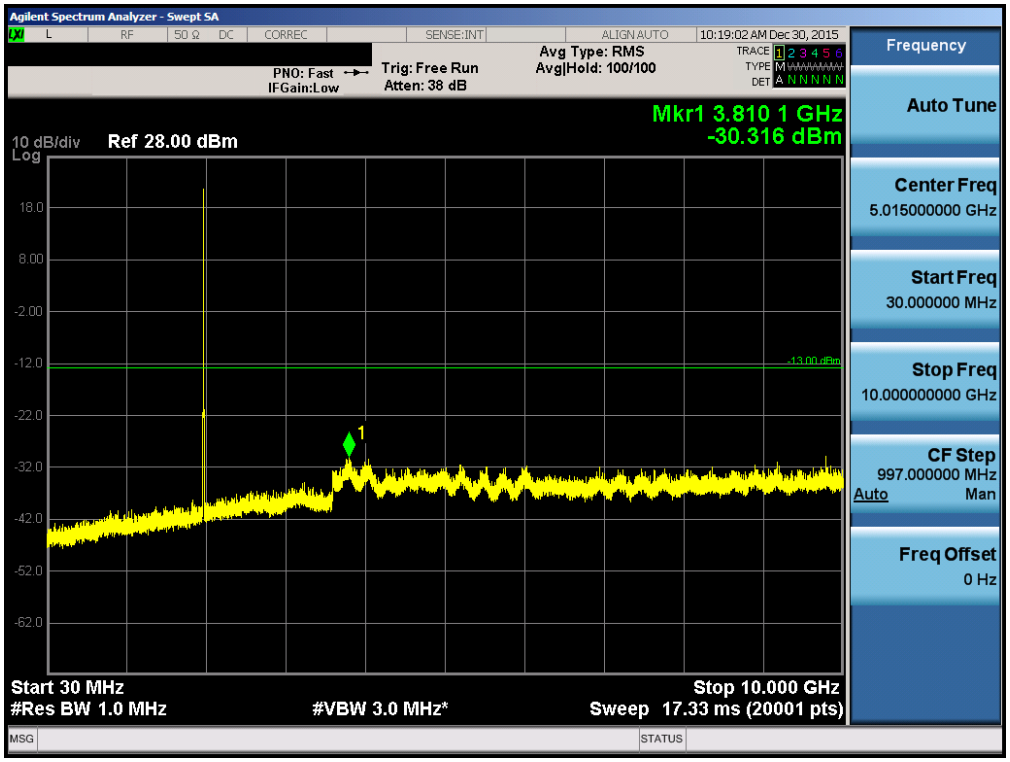
Plot 7-103. Conducted Spurious Plot (Band 2 – 5.0MHz QPSK – RB Size 6, Low Channel)



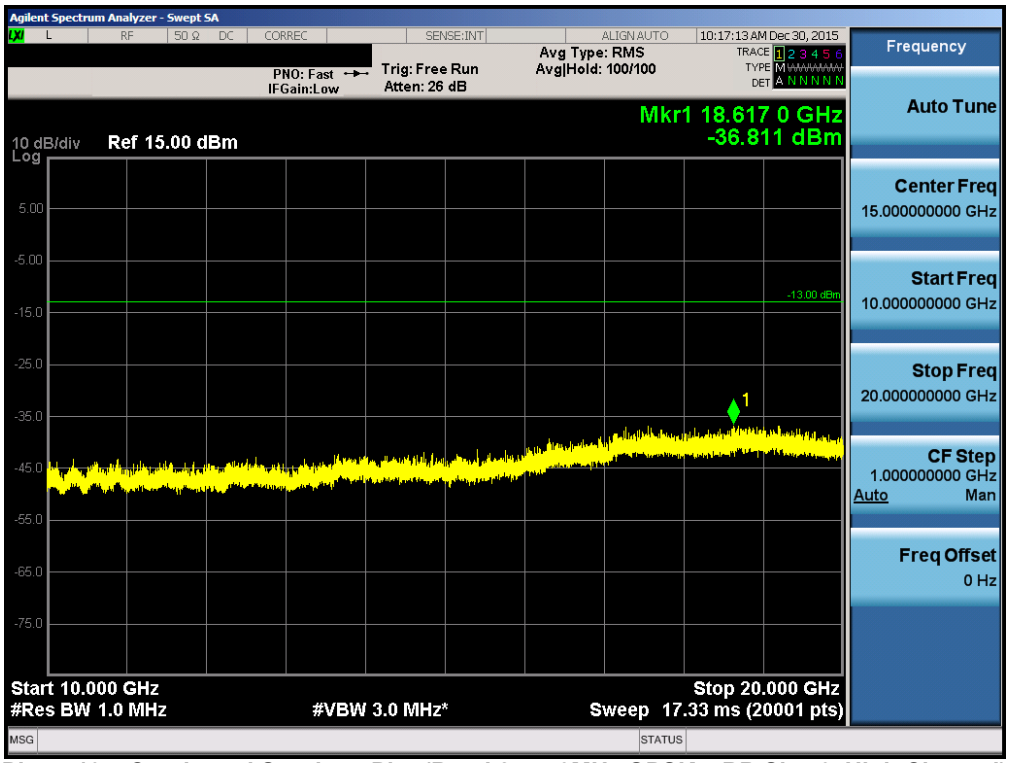
Plot 7-104. Conducted Spurious Plot (Band 2 – 5.0MHz QPSK – RB Size 6, Mid Channel)



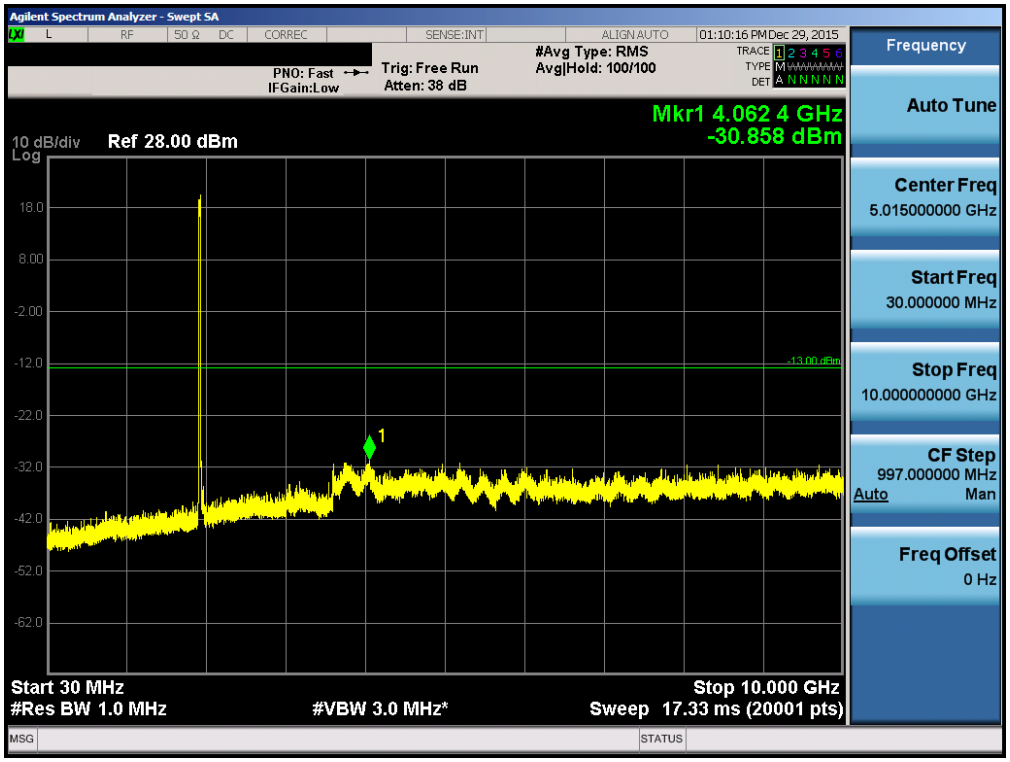
Plot 7-105. Conducted Spurious Plot (Band 2 – 5.0MHz QPSK – RB Size 6, Mid Channel)



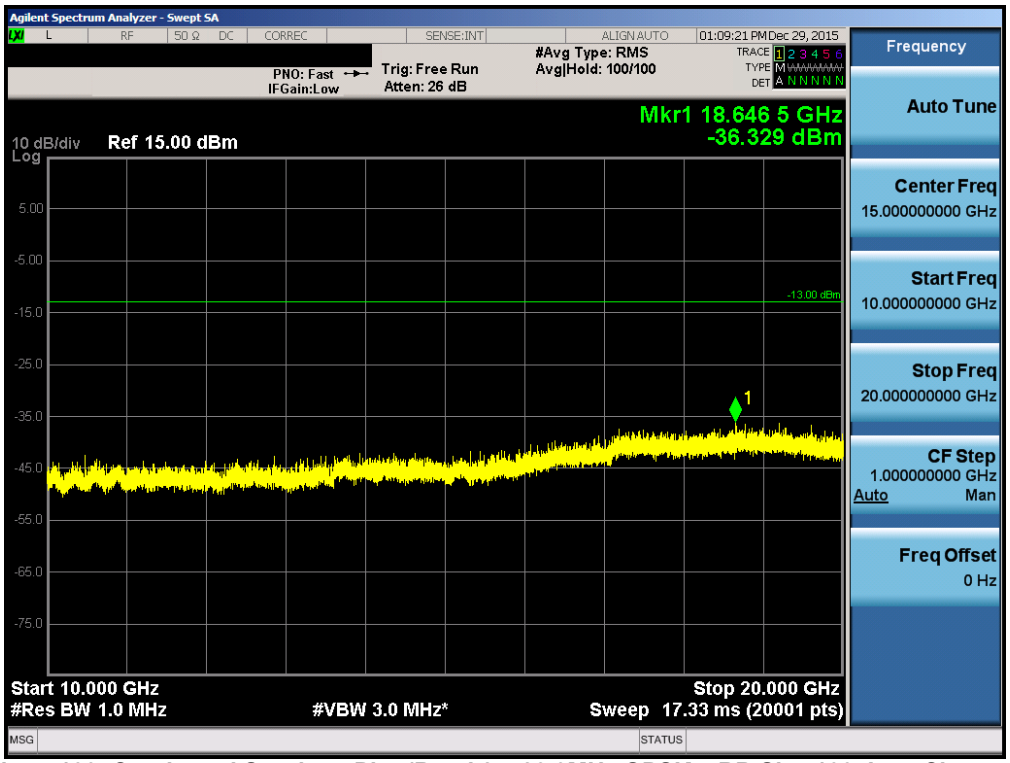
Plot 7-106. Conducted Spurious Plot (Band 2 – 5.0MHz QPSK – RB Size 6, High Channel)



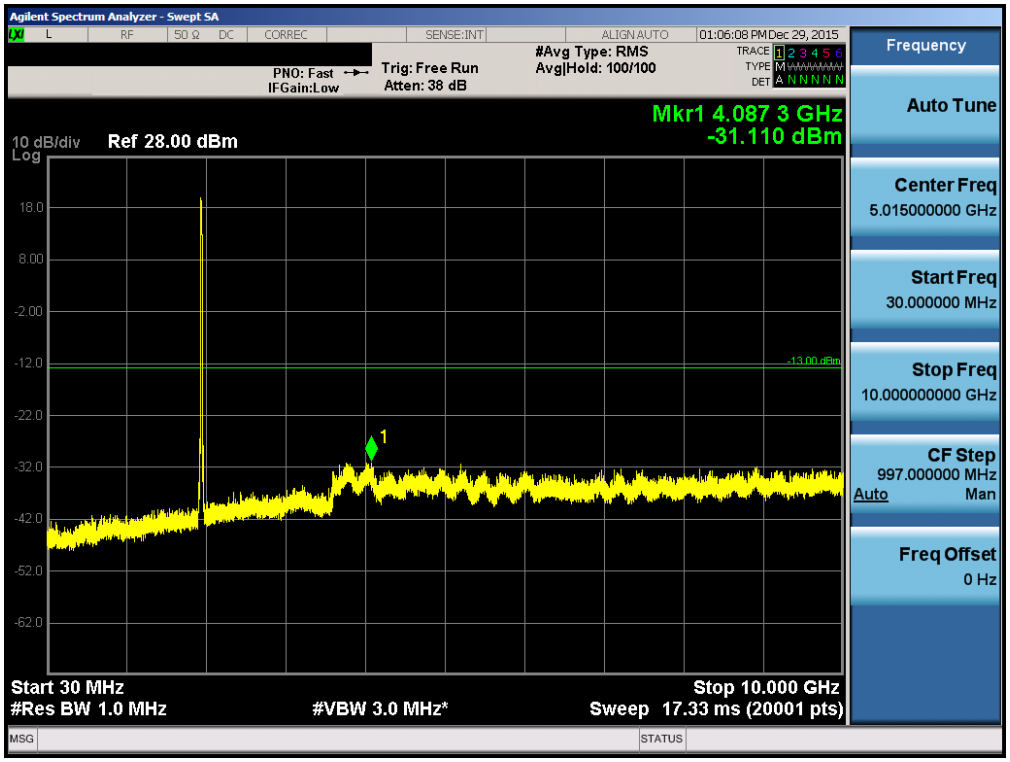
Plot 7-107. Conducted Spurious Plot (Band 2 – 5.0MHz QPSK – RB Size 6, High Channel)



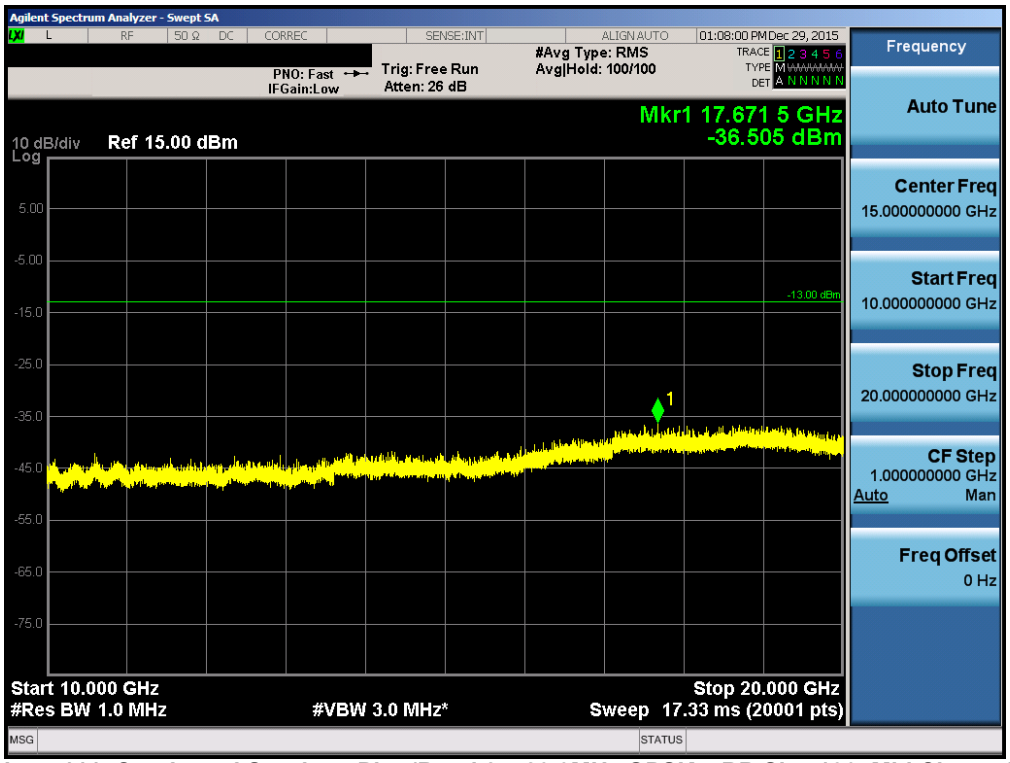
Plot 7-108. Conducted Spurious Plot (Band 2 – 20.0MHz QPSK – RB Size 100, Low Channel)



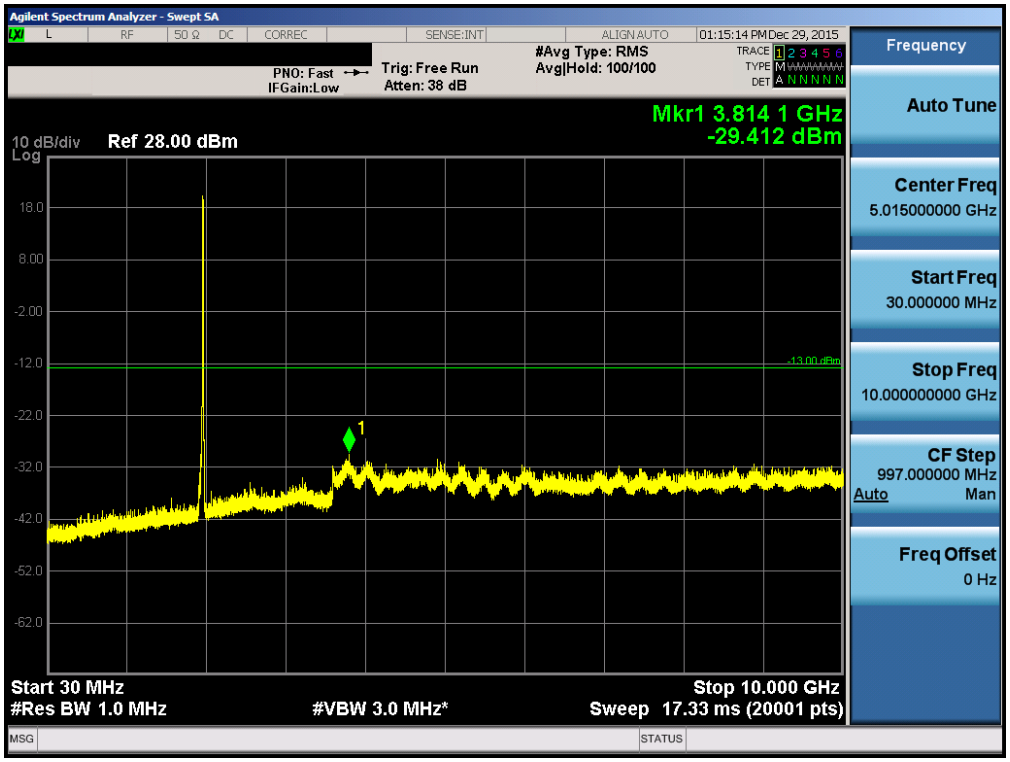
Plot 7-109. Conducted Spurious Plot (Band 2 – 20.0MHz QPSK – RB Size 100, Low Channel)



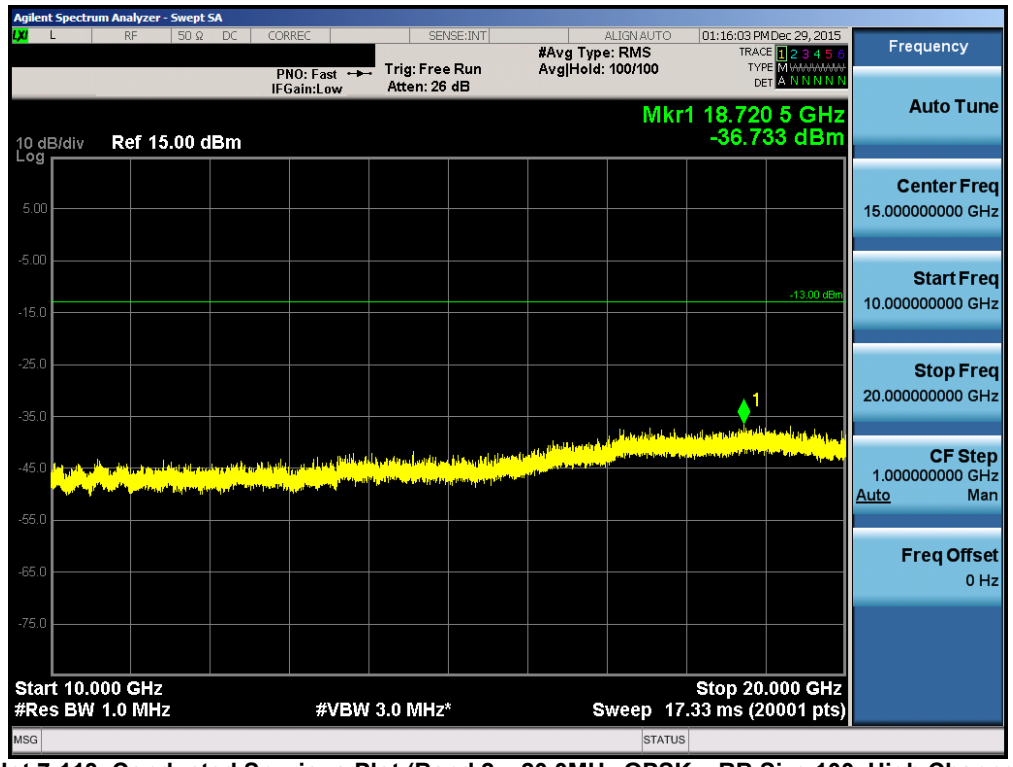
Plot 7-110. Conducted Spurious Plot (Band 2 – 20.0MHz QPSK – RB Size 100, Mid Channel)



Plot 7-111. Conducted Spurious Plot (Band 2 – 20.0MHz QPSK – RB Size 100, Mid Channel)



Plot 7-112. Conducted Spurious Plot (Band 2 – 20.0MHz QPSK – RB Size 100, High Channel)



Plot 7-113. Conducted Spurious Plot (Band 2 – 20.0MHz QPSK – RB Size 100, High Channel)

7.6 Peak-Average Ratio

§24.232(d), §27.50(d)

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 v02r02 – 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.

Test Setup

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

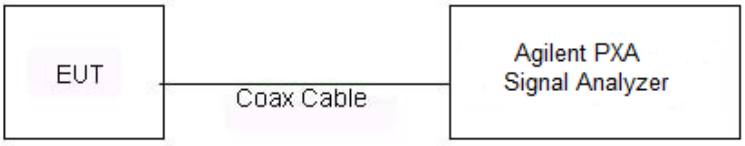
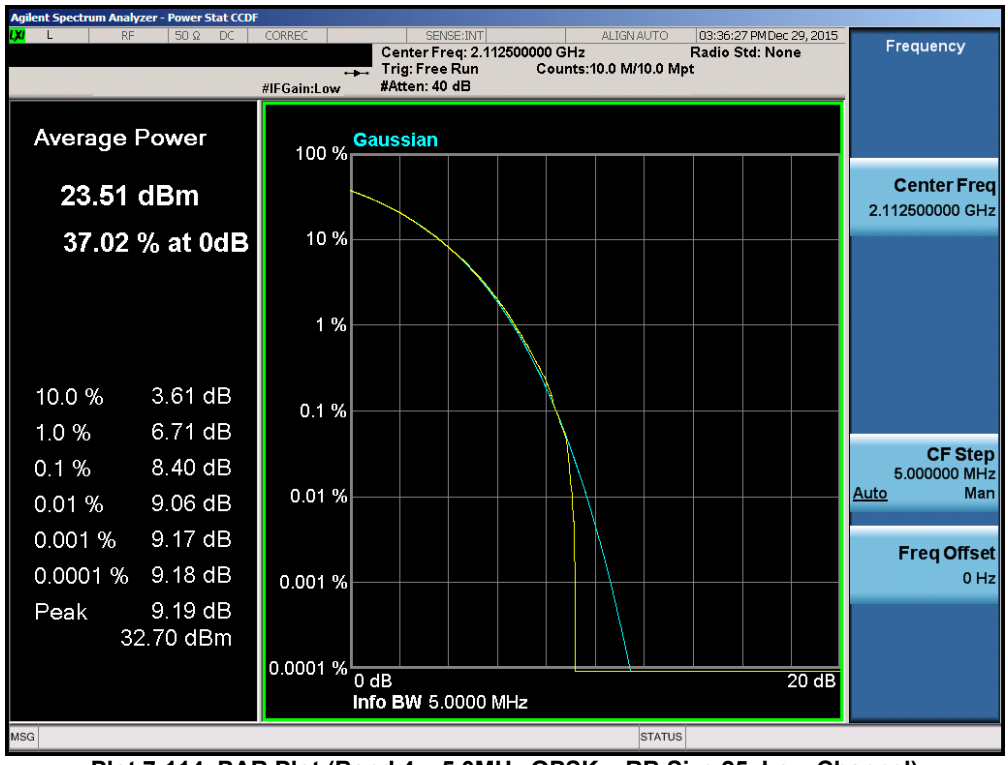


Figure 7-5. Test Instrument & Measurement Setup

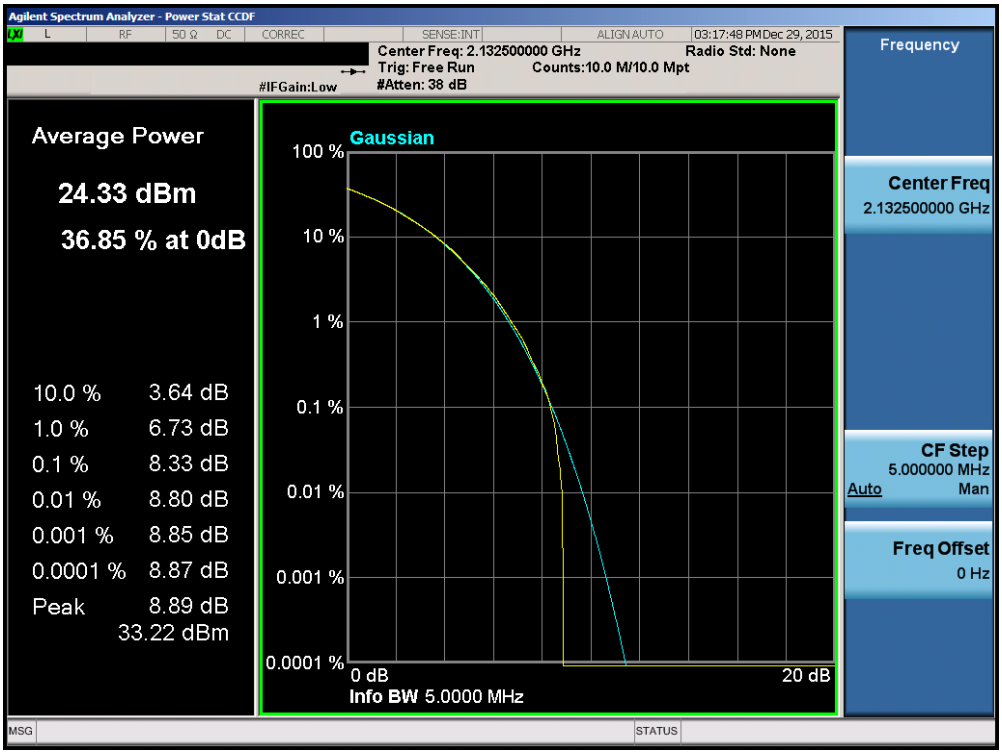
Test Notes

None

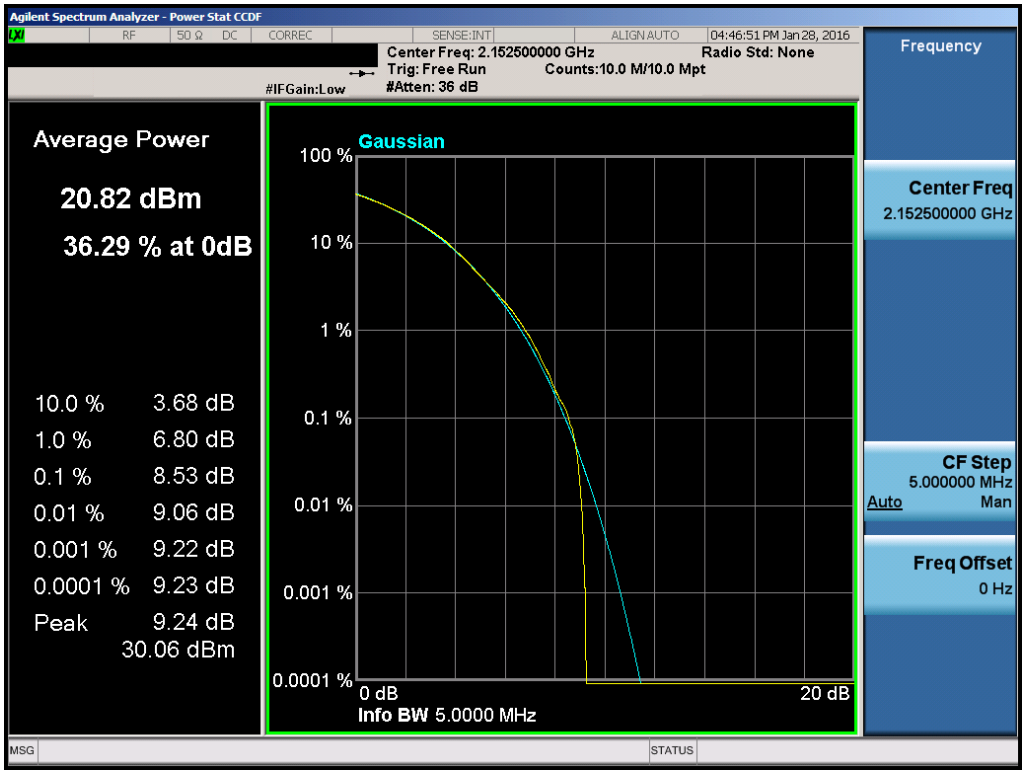
Chain0



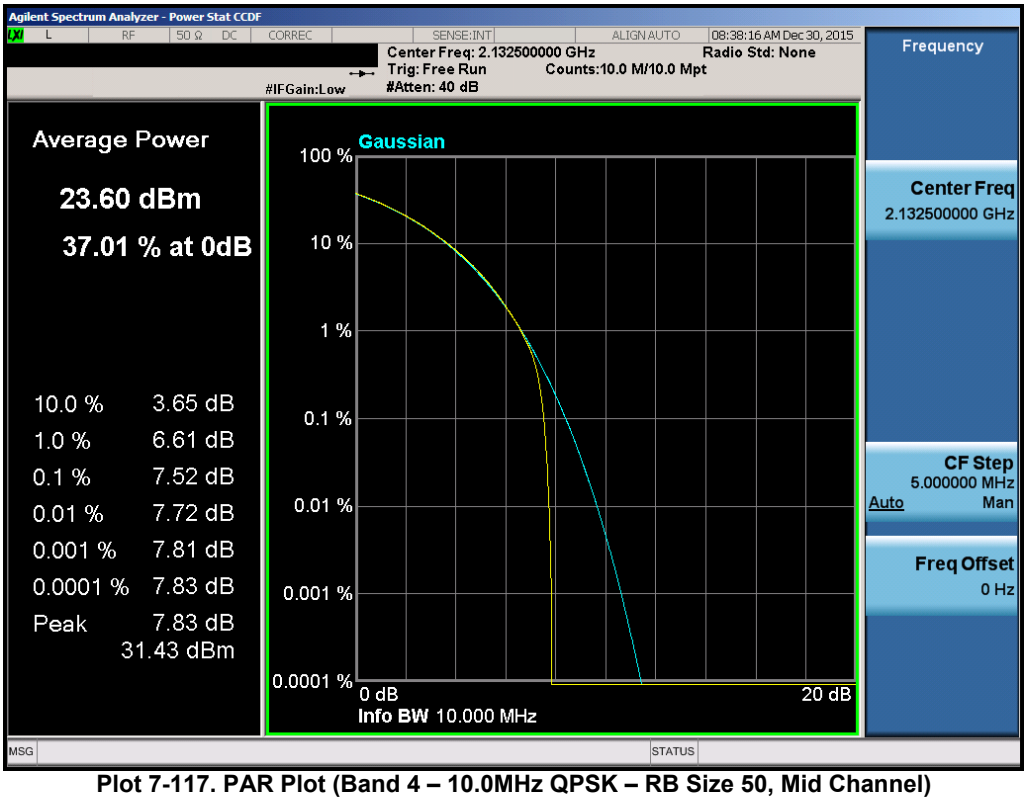
Plot 7-114. PAR Plot (Band 4 – 5.0MHz QPSK – RB Size 25, Low Channel)



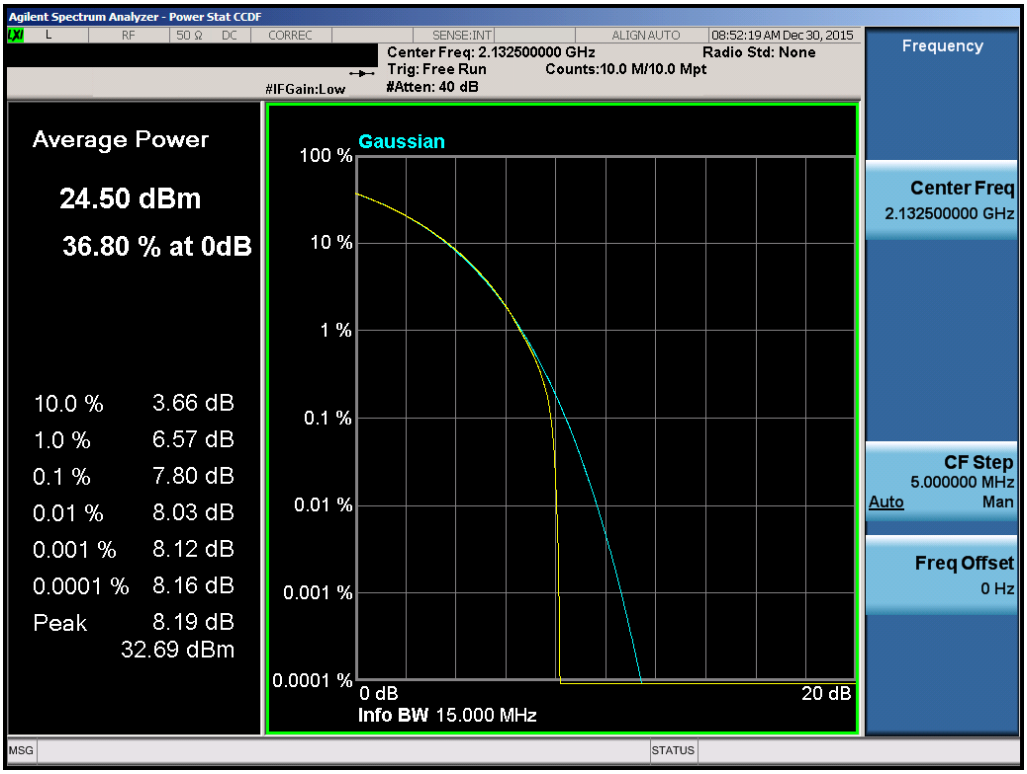
Plot 7-115. PAR Plot (Band 4 – 5.0MHz QPSK – RB Size 25, Mid Channel)



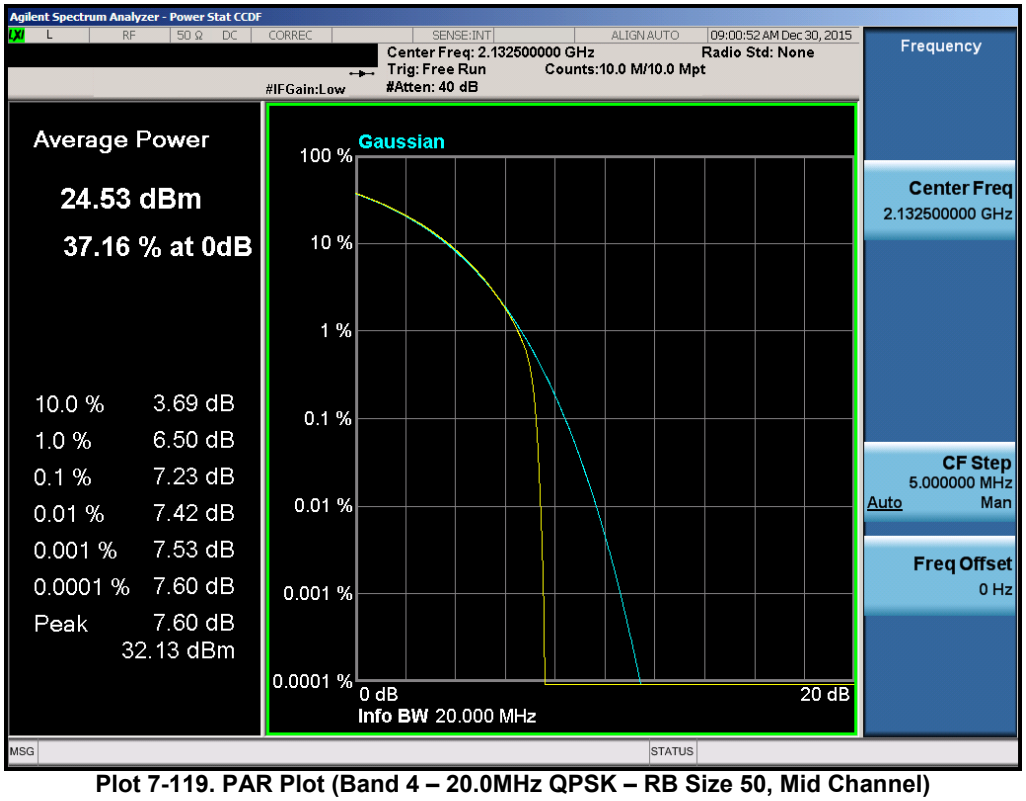
Plot 7-116. PAR Plot (Band 4 –5.0MHz QPSK – RB Size 25, High Channel)



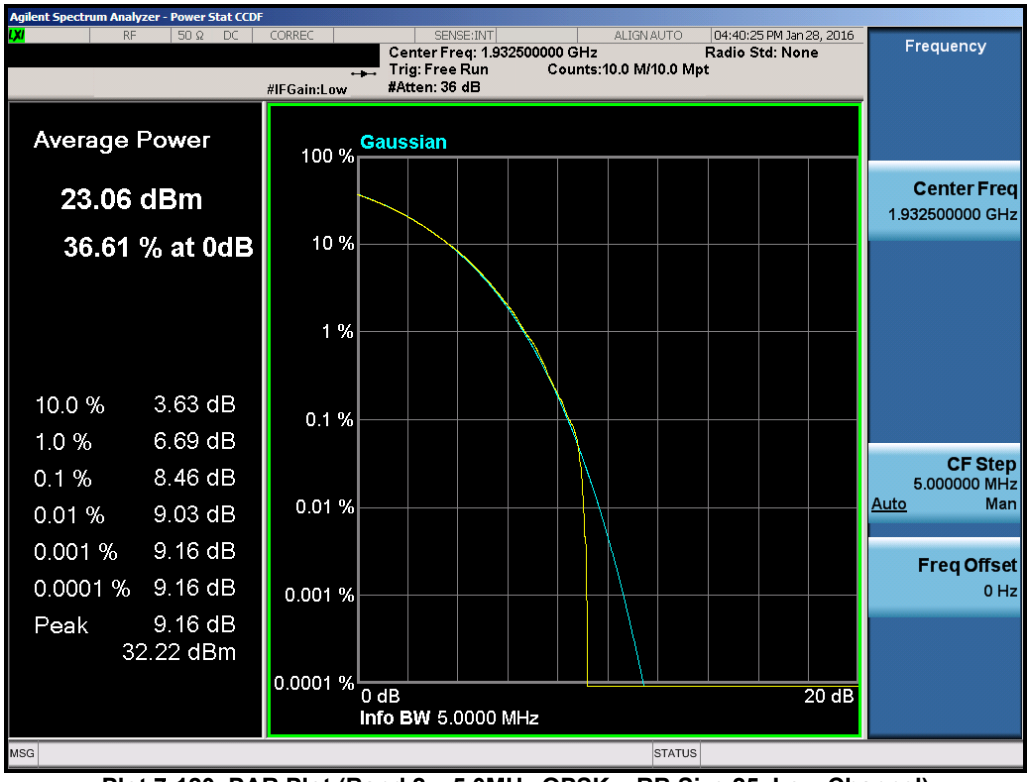
Plot 7-117. PAR Plot (Band 4 – 10.0MHz QPSK – RB Size 50, Mid Channel)



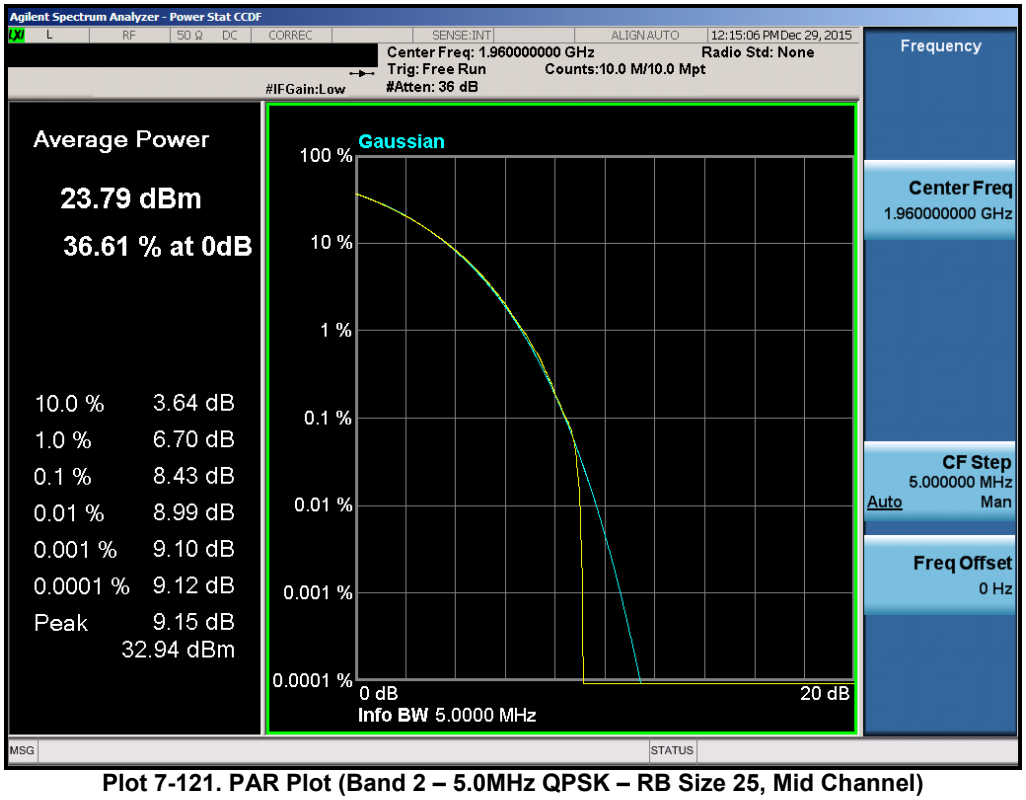
Plot 7-118. PAR Plot (Band 4 – 15.0MHz QPSK – RB Size 75, Mid Channel)



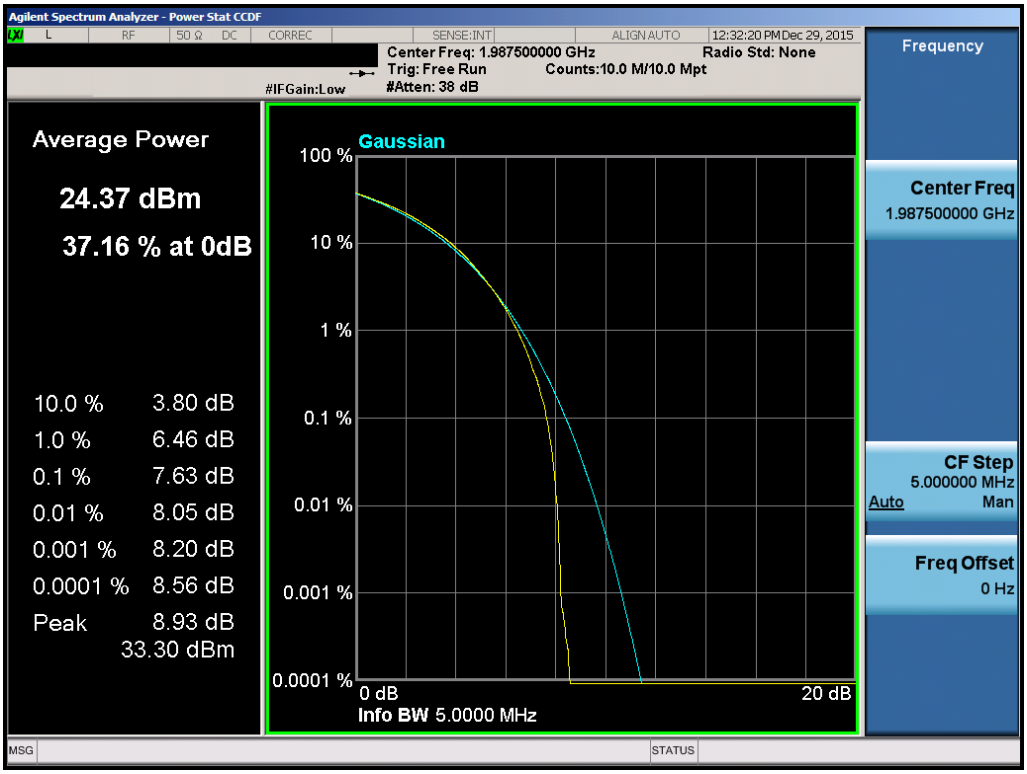
Plot 7-119. PAR Plot (Band 4 – 20.0MHz QPSK – RB Size 50, Mid Channel)



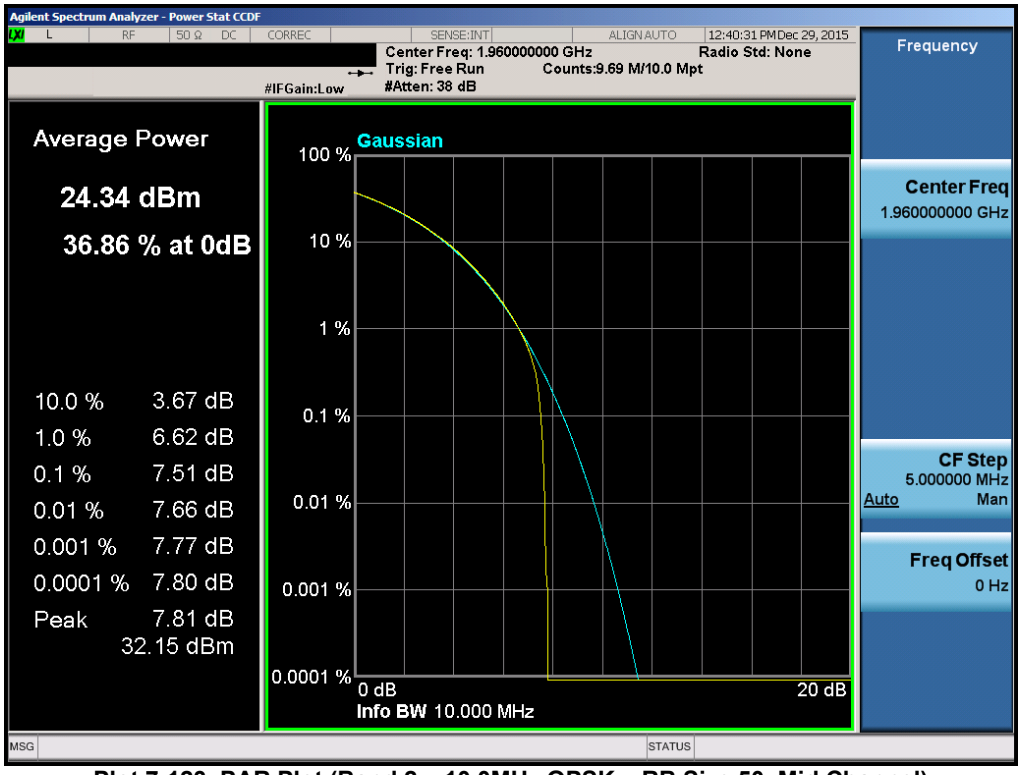
Plot 7-120. PAR Plot (Band 2 – 5.0MHz QPSK – RB Size 25, Low Channel)



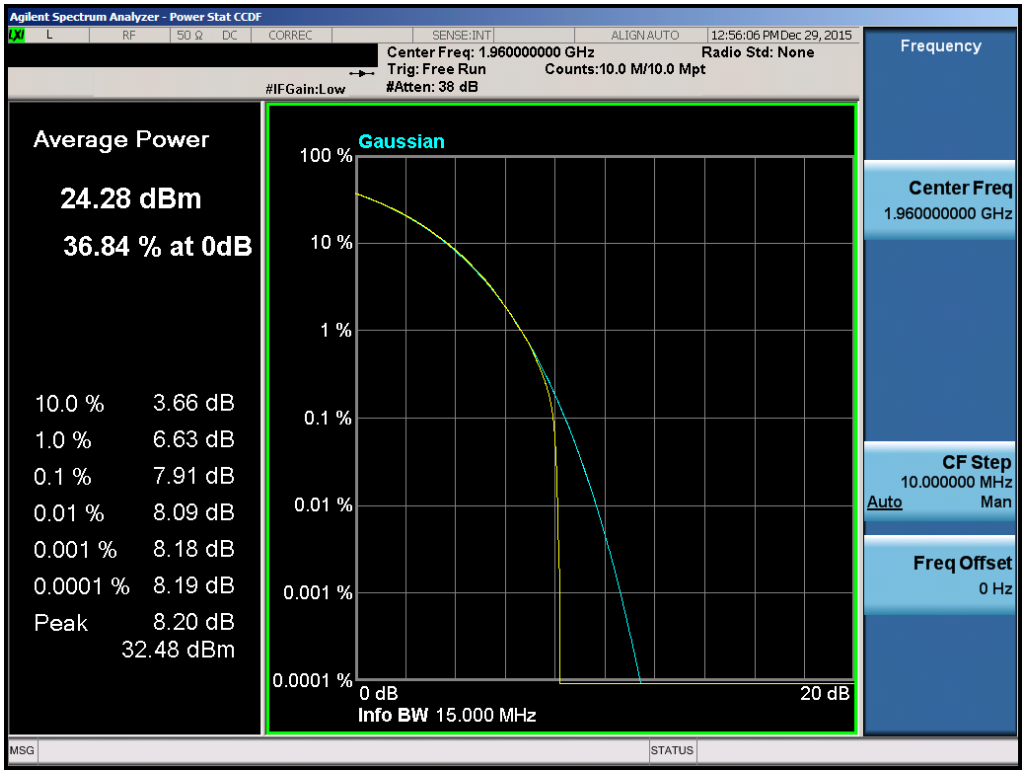
Plot 7-121. PAR Plot (Band 2 – 5.0MHz QPSK – RB Size 25, Mid Channel)



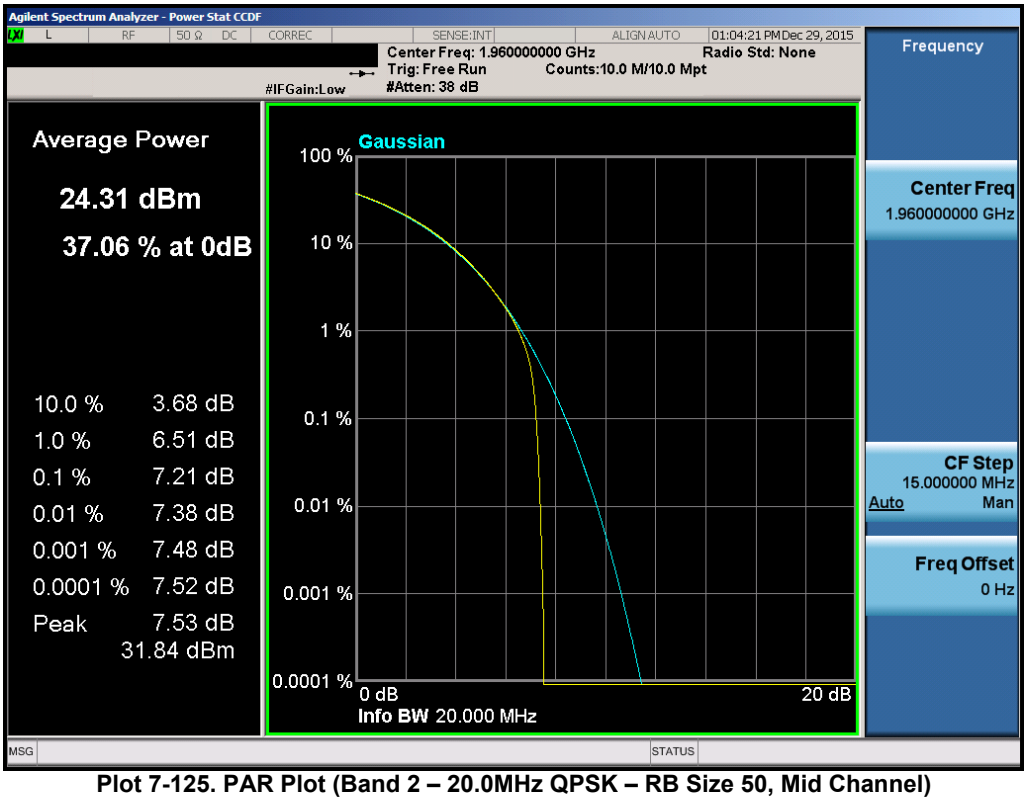
Plot 7-122. PAR Plot (Band 2 –5.0MHz QPSK – RB Size 25, High Channel)



Plot 7-123. PAR Plot (Band 2 – 10.0MHz QPSK – RB Size 50, Mid Channel)

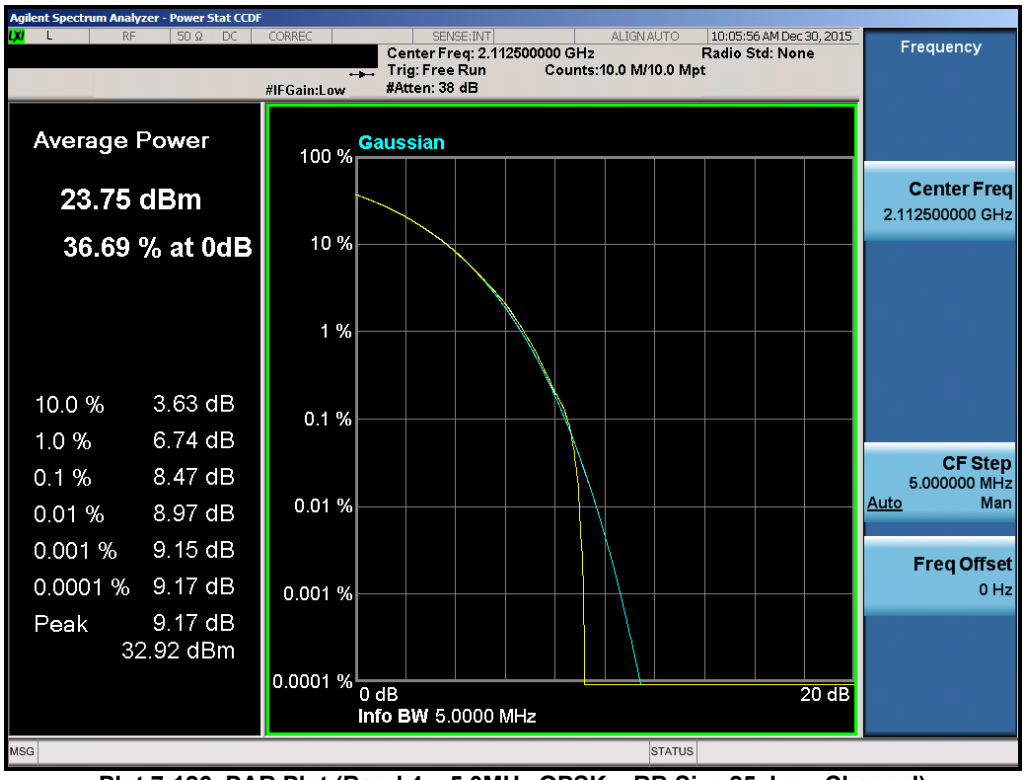


Plot 7-124. PAR Plot (Band 2 – 15.0MHz QPSK – RB Size 75, Mid Channel)

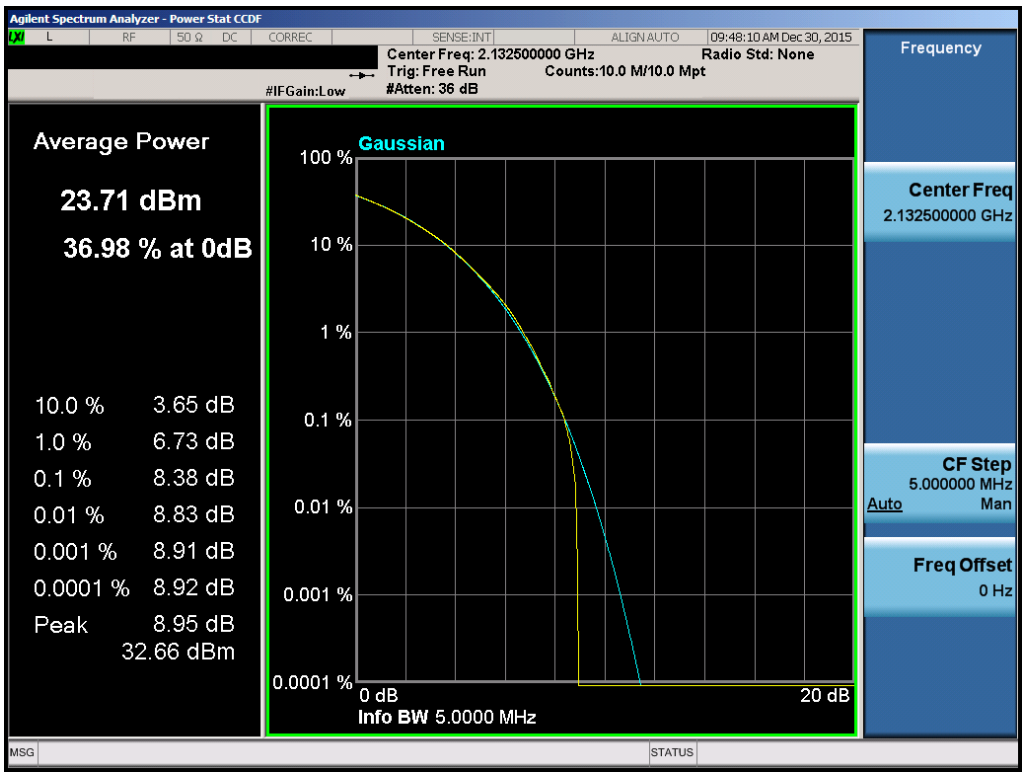


Plot 7-125. PAR Plot (Band 2 – 20.0MHz QPSK – RB Size 50, Mid Channel)

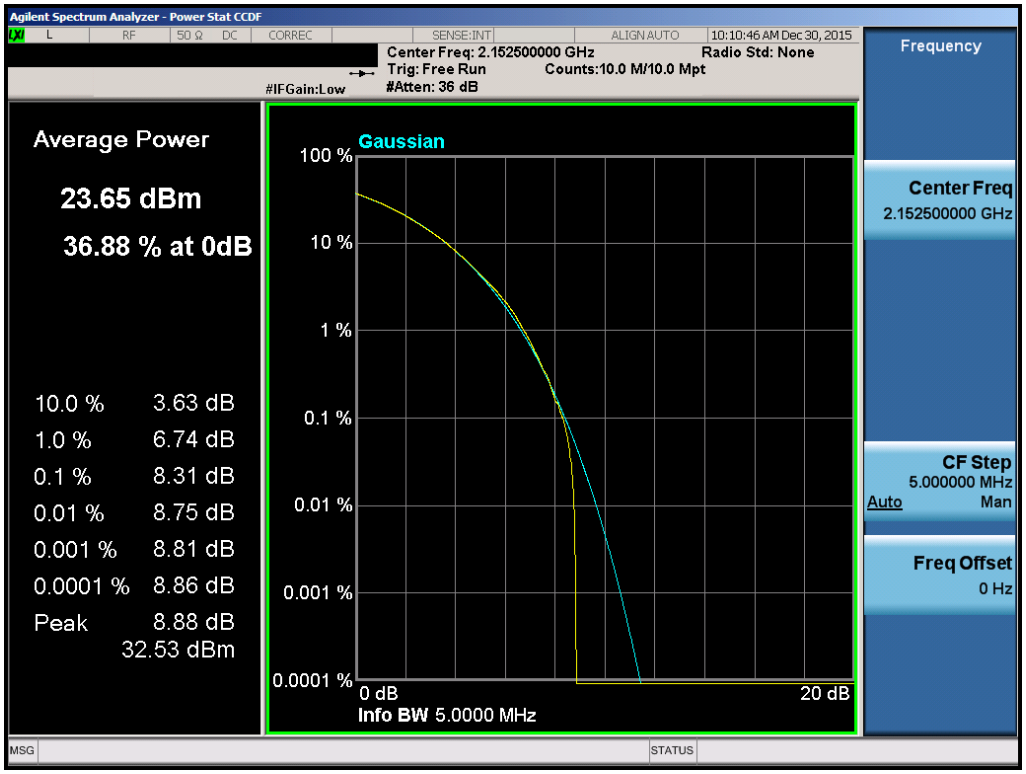
Chain1



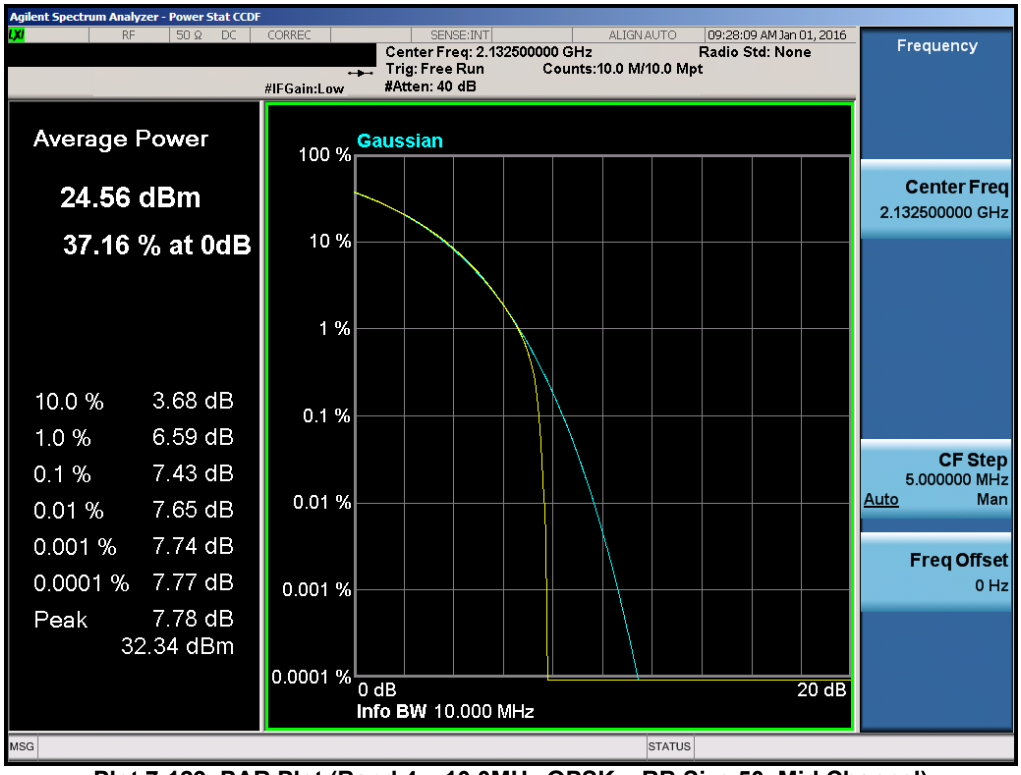
Plot 7-126. PAR Plot (Band 4 – 5.0MHz QPSK – RB Size 25, Low Channel)



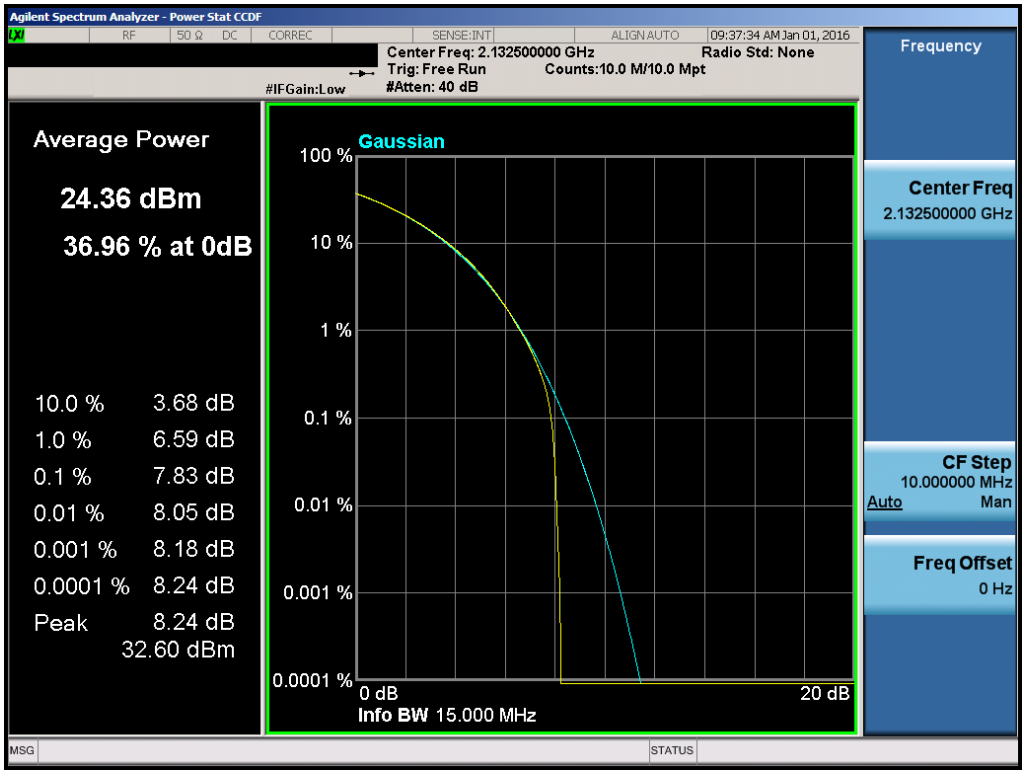
Plot 7-127. PAR Plot (Band 4 – 5.0MHz QPSK – RB Size 25, Mid Channel)



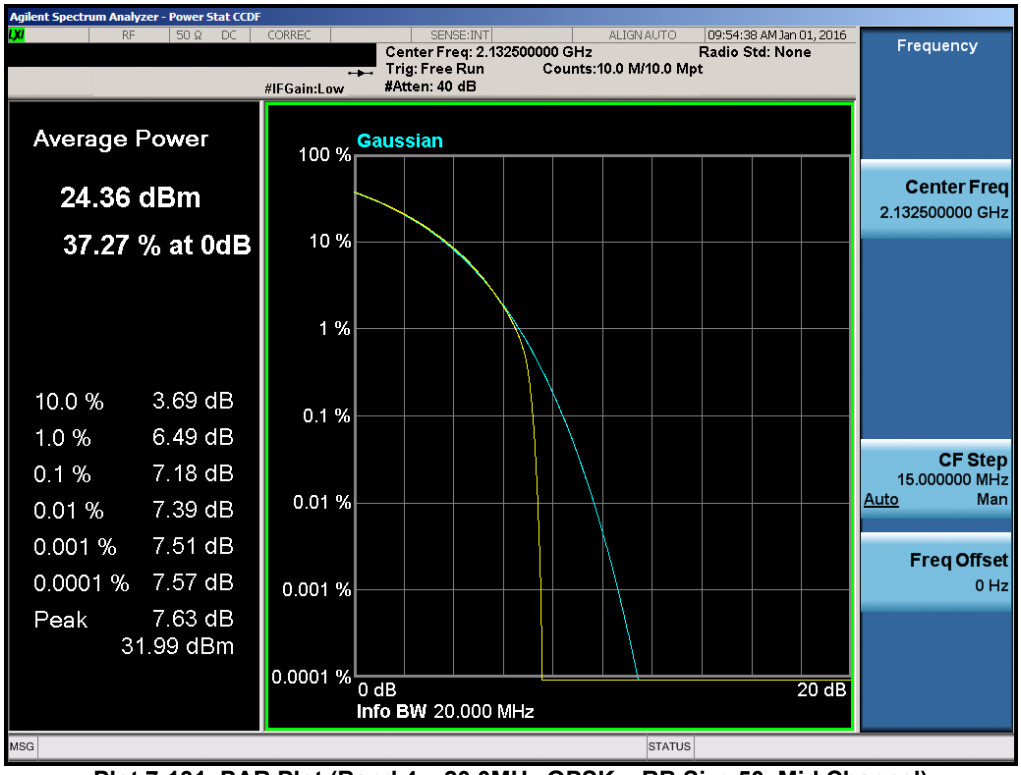
Plot 7-128. PAR Plot (Band 4 –5.0MHz QPSK – RB Size 25, High Channel)



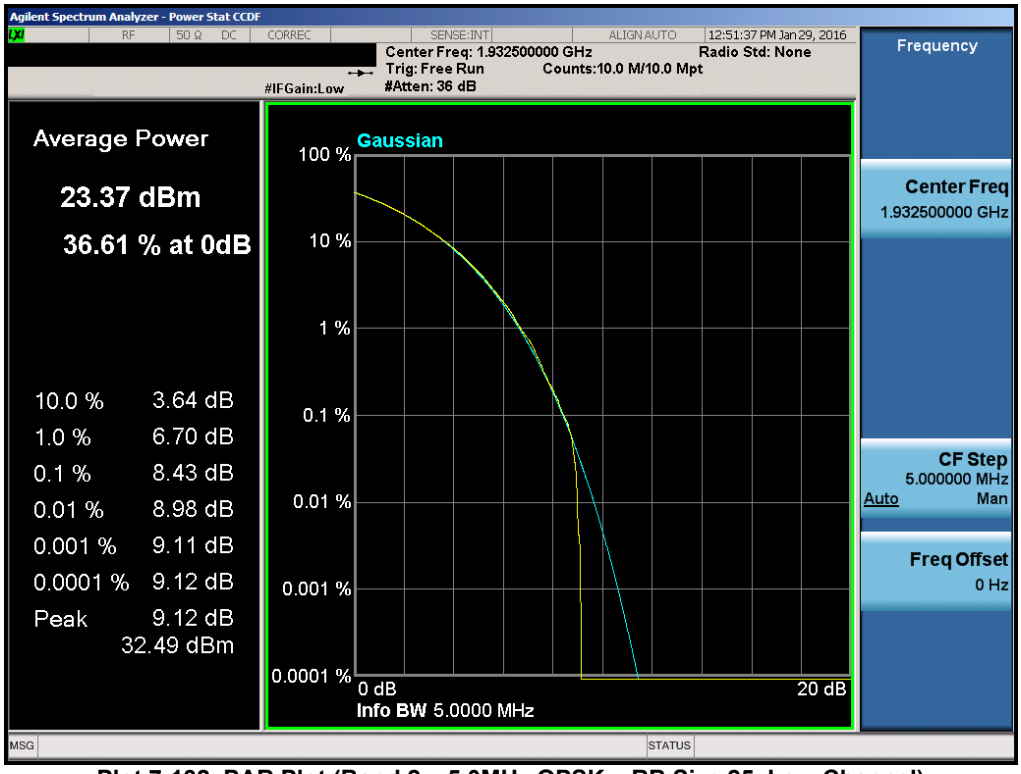
Plot 7-129. PAR Plot (Band 4 – 10.0MHz QPSK – RB Size 50, Mid Channel)



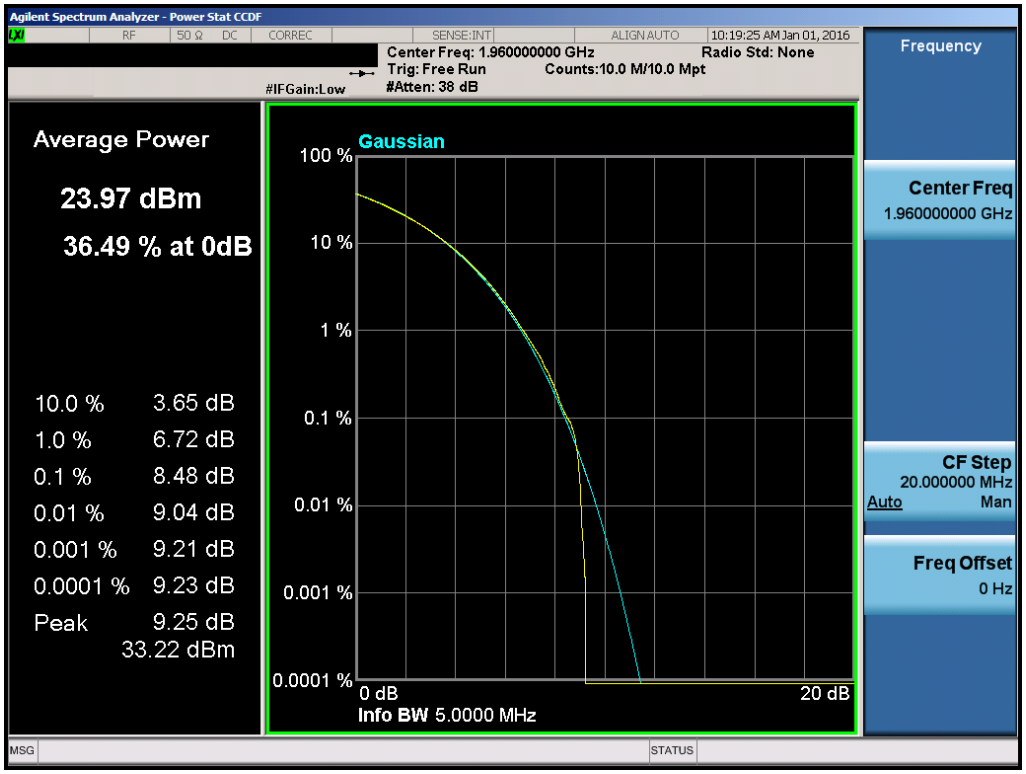
Plot 7-130. PAR Plot (Band 4 – 15.0MHz QPSK – RB Size 75, Mid Channel)



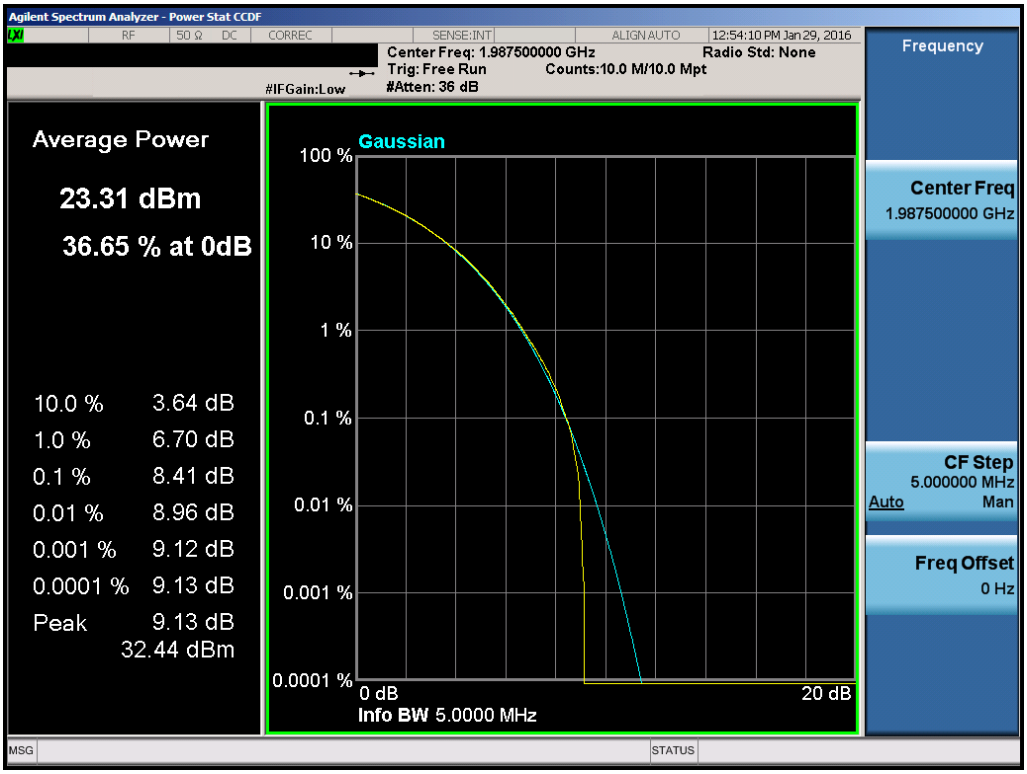
Plot 7-131. PAR Plot (Band 4 – 20.0MHz QPSK – RB Size 50, Mid Channel)



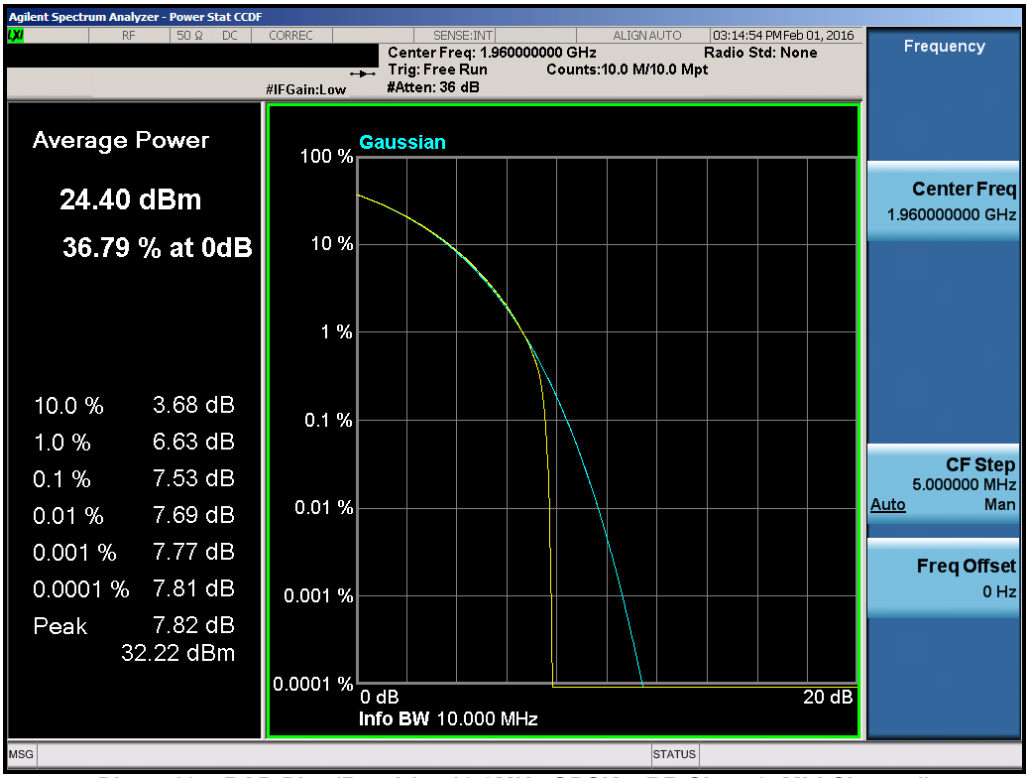
Plot 7-132. PAR Plot (Band 2 – 5.0MHz QPSK – RB Size 25, Low Channel)



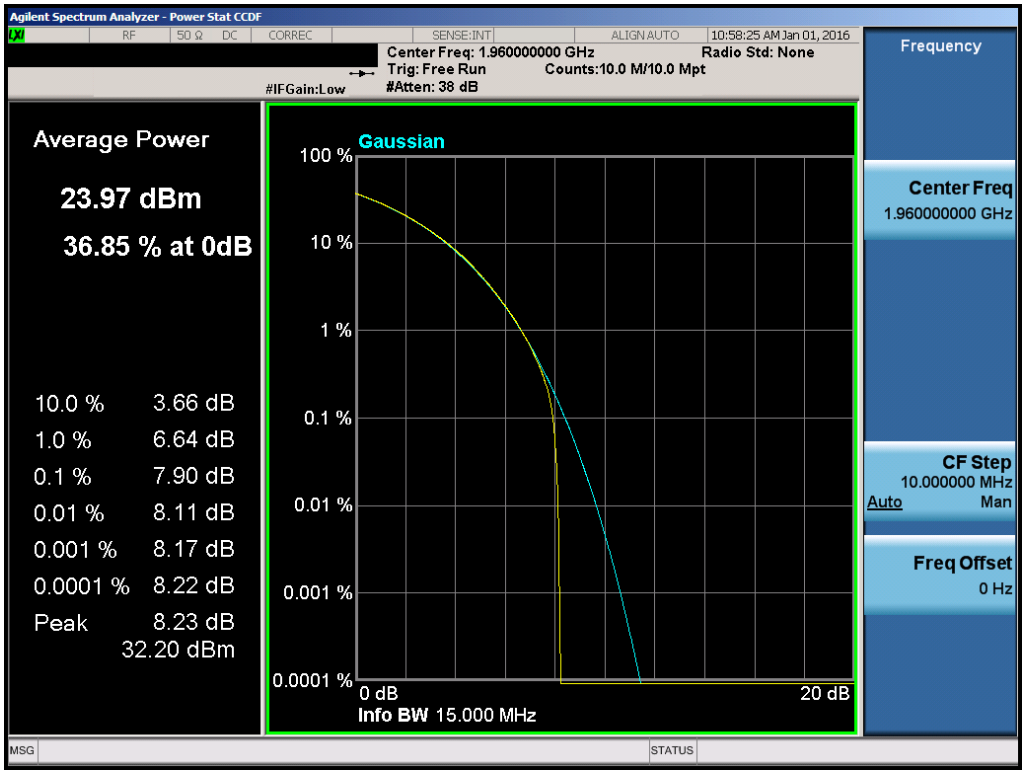
Plot 7-133. PAR Plot (Band 2 – 5.0MHz QPSK – RB Size 25, Mid Channel)



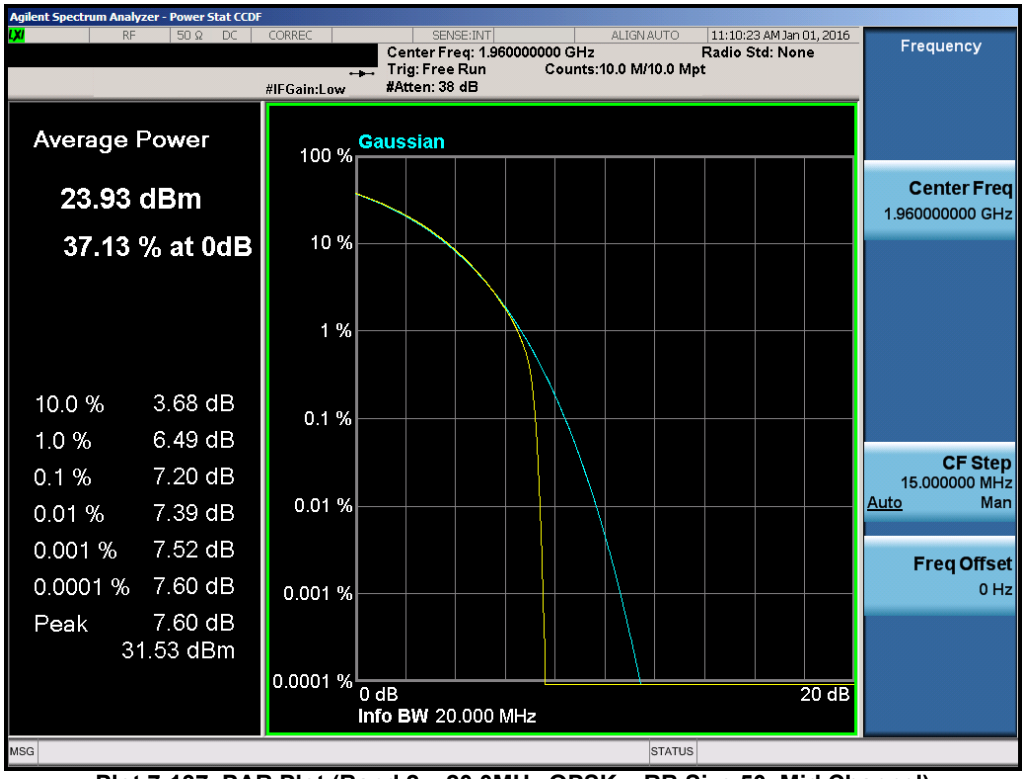
Plot 7-134. PAR Plot (Band 2 –5.0MHz QPSK – RB Size 25, High Channel)



Plot 7-135. PAR Plot (Band 2 – 10.0MHz QPSK – RB Size 50, Mid Channel)



Plot 7-136. PAR Plot (Band 2 – 15.0MHz QPSK – RB Size 75, Mid Channel)



Plot 7-137. PAR Plot (Band 2 – 20.0MHz QPSK – RB Size 50, Mid Channel)

7.7 Frequency Stability / Temperature Variation

§2.1055, §24.235, §27.54

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-D-2010. 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 24 and Part 27, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Procedure Used

ANSI/TIA-603-D-2010

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

Band 4 Frequency Stability Measurements

§2.1055, §27.54

OPERATING FREQUENCY: 2,132,500,000 Hz

REFERENCE VOLTAGE: 120.00 VAC

VOLTAGE (%)	POWER (VAC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	120.00	+ 20 (Ref)	2,132,504,745	4,745	0.0002225
100 %		- 30	2,132,503,750	3,750	0.0001758
100 %		- 20	2,132,504,375	4,375	0.0002052
100 %		- 10	2,132,501,875	1,875	0.0000879
100 %		0	2,132,503,750	3,750	0.0001758
100 %		+ 10	2,132,502,500	2,500	0.0001172
100 %		+ 20	2,132,504,745	4,745	0.0002225
100 %		+ 30	2,132,501,875	1,875	0.0000879
100 %		+ 40	2,132,503,125	3,125	0.0001465
100 %		+ 50	2,132,503,750	3,750	0.0001758
85 %	102.00	+ 20	2,132,503,950	3,950	0.0001852
115 %	138.00	+ 20	2,132,503,575	3,575	0.0001676

Table 7-2. Frequency Stability Data (Band 4)

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.

Band 2 Frequency Stability Measurements

§2.1055, §24.235

OPERATING FREQUENCY: 1,960,000,000 Hz

REFERENCE VOLTAGE: 120.00 VAC

VOLTAGE (%)	POWER (VAC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	120.00	+ 20 (Ref)	1,960,001,775	1,775	0.0000906
100 %		- 30	1,960,004,850	4,850	0.0002474
100 %		- 20	1,960,004,550	4,550	0.0002321
100 %		- 10	1,960,004,225	4,225	0.0002156
100 %		0	1,960,002,475	2,475	0.0001263
100 %		+ 10	1,960,001,550	1,550	0.0000791
100 %		+ 20	1,960,002,025	2,025	0.0001033
100 %		+ 30	1,960,001,745	1,745	0.0000890
100 %		+ 40	1,960,004,550	4,550	0.0002321
100 %		+ 50	1,960,003,675	3,675	0.0001875
85 %	102.00	+ 20	1,960,003,125	3,125	0.0001594
115 %	138.00	+ 20	1,960,003,625	3,625	0.0001849

Table 7-3. Frequency Stability Data (Band 2)

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.

7.8 Cabinet Radiated Spurious Emissions Measurements

§2.1053, §24.238(a), §27.53(h)

Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-D-2010 with the outputs of the EUT terminated in 50Ω. 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 peak measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 v02r02 – Section 5.8
ANSI/TIA-603-D-2010 – 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 = Peak
6. Trace mode = max hold
7. The trace was allowed to stabilize

Test Setup

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

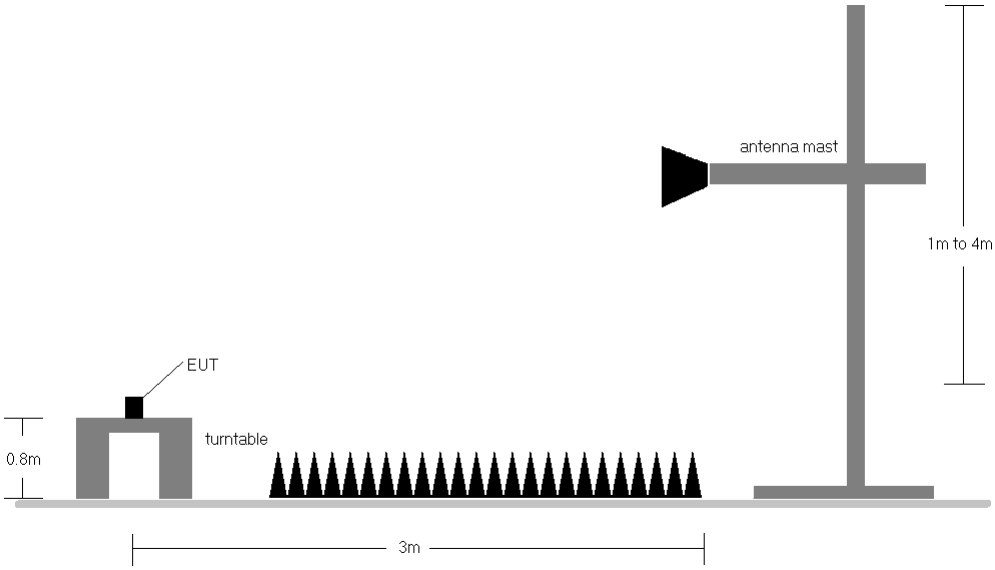


Figure 7-6. Test Instrument & Measurement Setup

Test Notes

1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning.

2) This unit was tested while powered by an AC power source.

3) The EUT was evaluated for cabinet radiated spurious emissions with the antenna ports terminated in 50Ω.

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

5) 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.

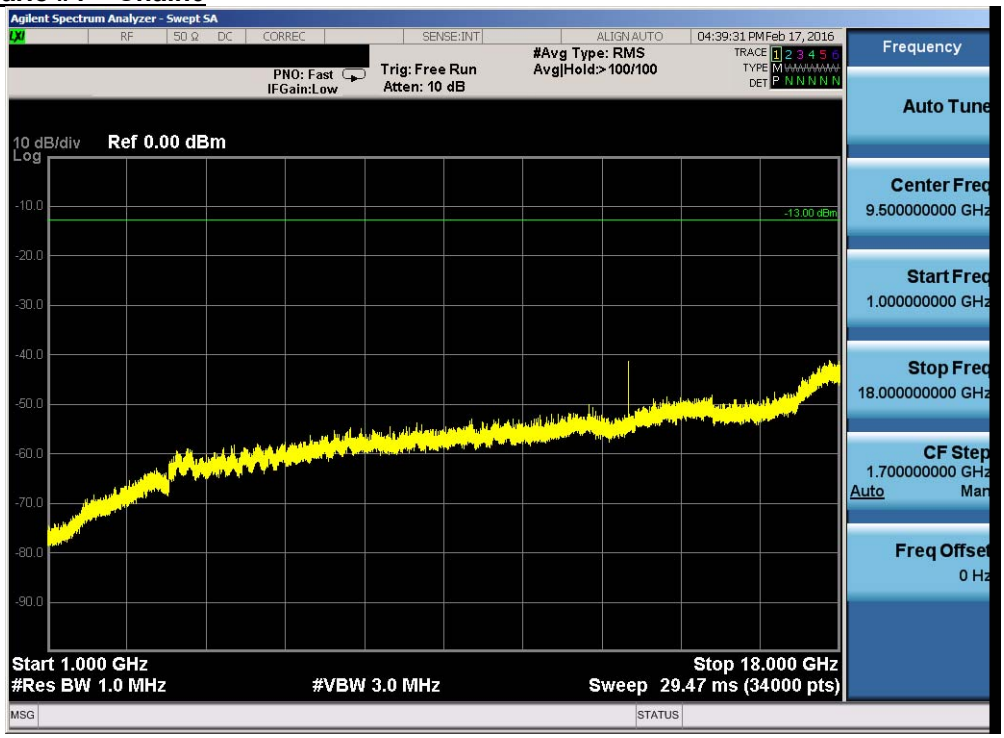
6) The wide spectrum spurious emissions plots shown on the following pages were measured at a 1m distance and are used only for the purpose of emission identification. There were no emissions detected in the 30MHz – 1GHz frequency range or above 18GHz, as shown in the subsequent plots.

7) The "-" shown in the "Antenna Height" and "Turntable Azimuth" columns of the following RSE tables are used to denote a noise floor measurement.

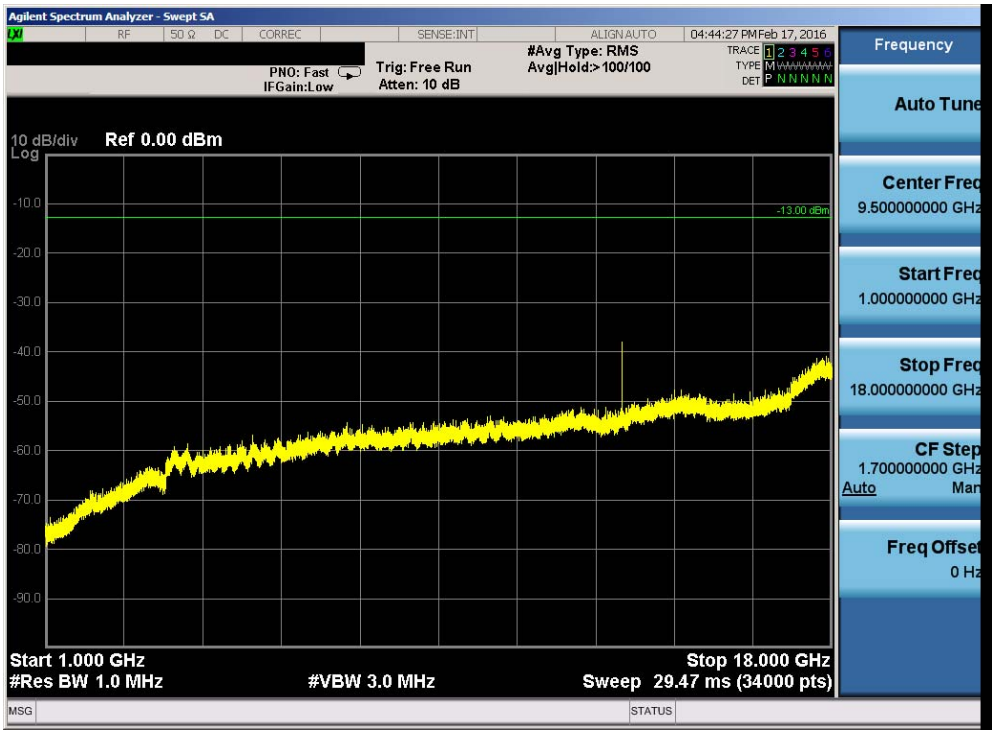
8) Cabinet radiated emissions were performed for two different test scenarios. In Test Scenario #1, Chain0 was active. In Test Scenario #2, Chain1 was active. Both scenarios were used to measure cabinet radiated emissions with the antenna ports terminated in 50 Ω. The test scenarios are labeled throughout this section.

Cabinet Radiated Spurious Emissions Measurements (Cont'd)

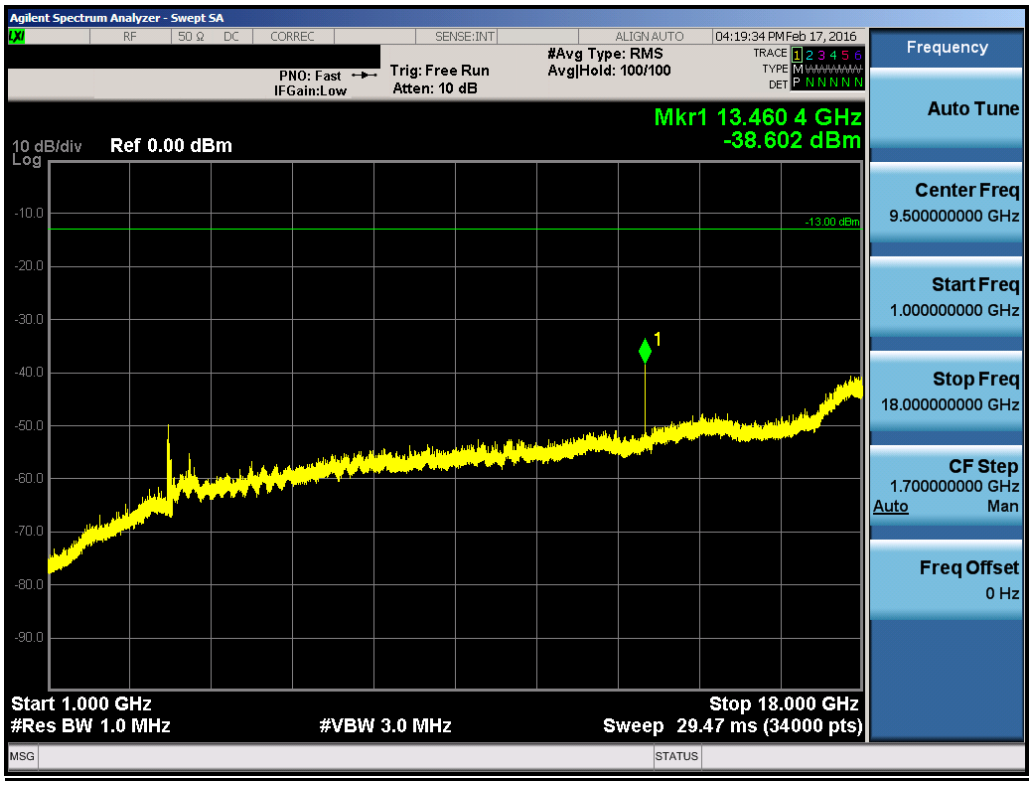
Test Scenario #1 – Chain0



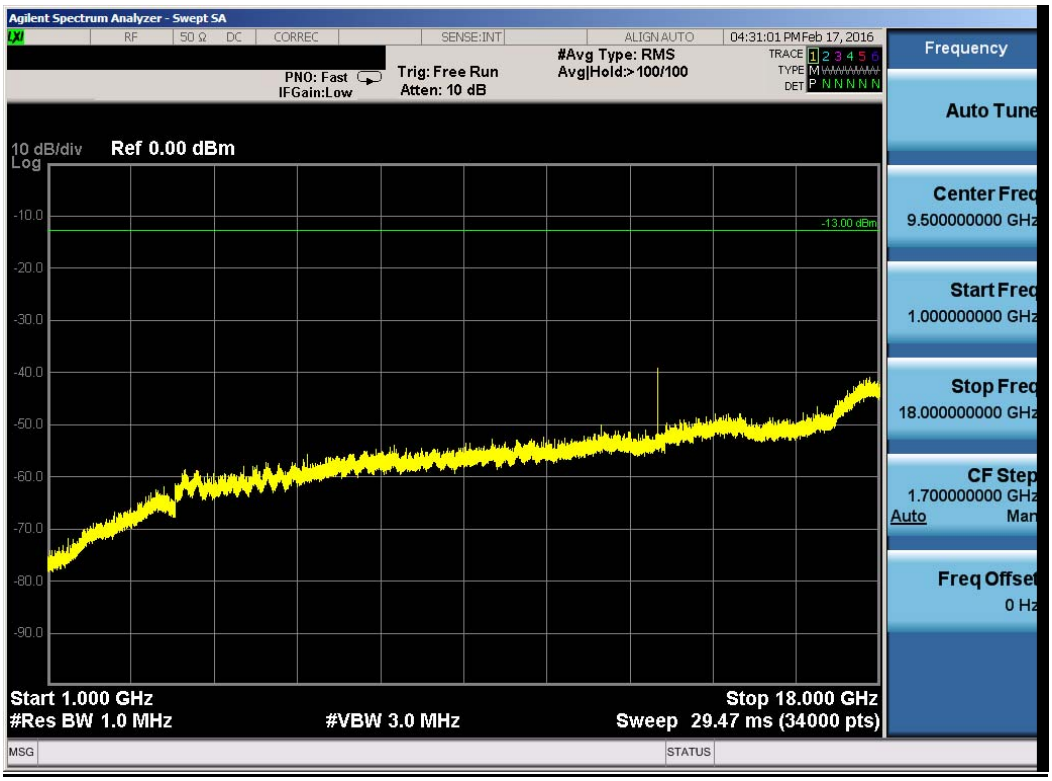
Plot 7-138. Radiated Spurious Plot above 1GHz (LTE Band 4, 5MHz BW, Ch. 2175)



Plot 7-139. Radiated Spurious Plot above 1GHz (LTE Band 4, 20MHz BW, Ch. 2175)

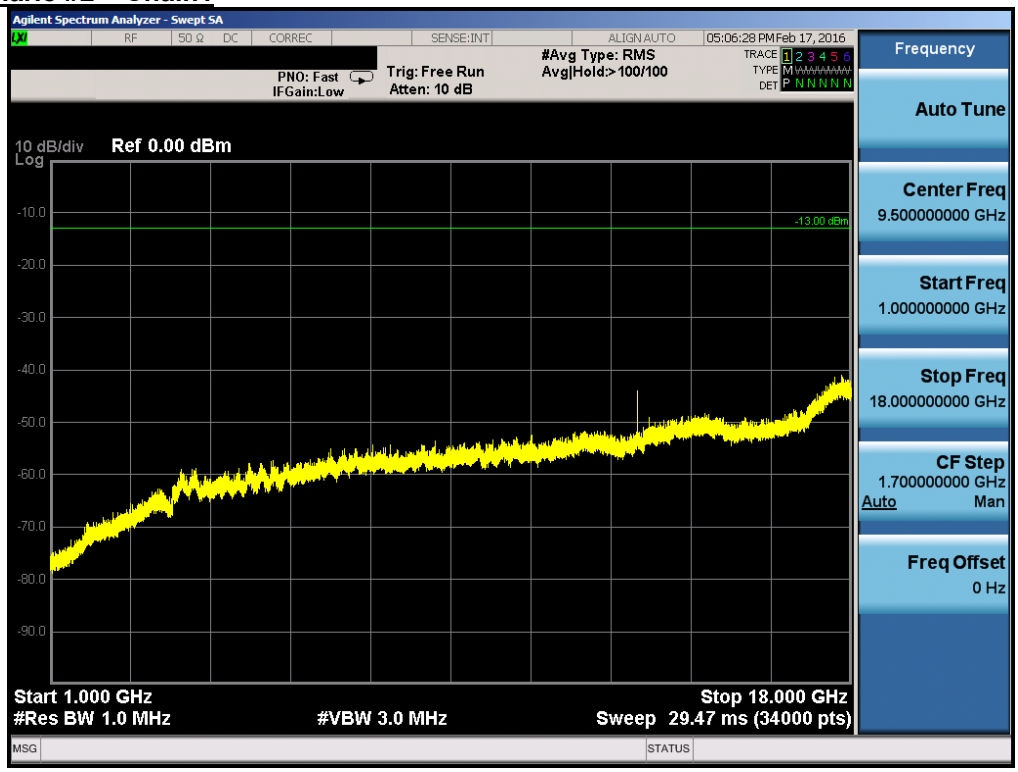


Plot 7-140. Radiated Spurious Plot above 1GHz (LTE Band 2, 5MHz BW, Ch. 900)

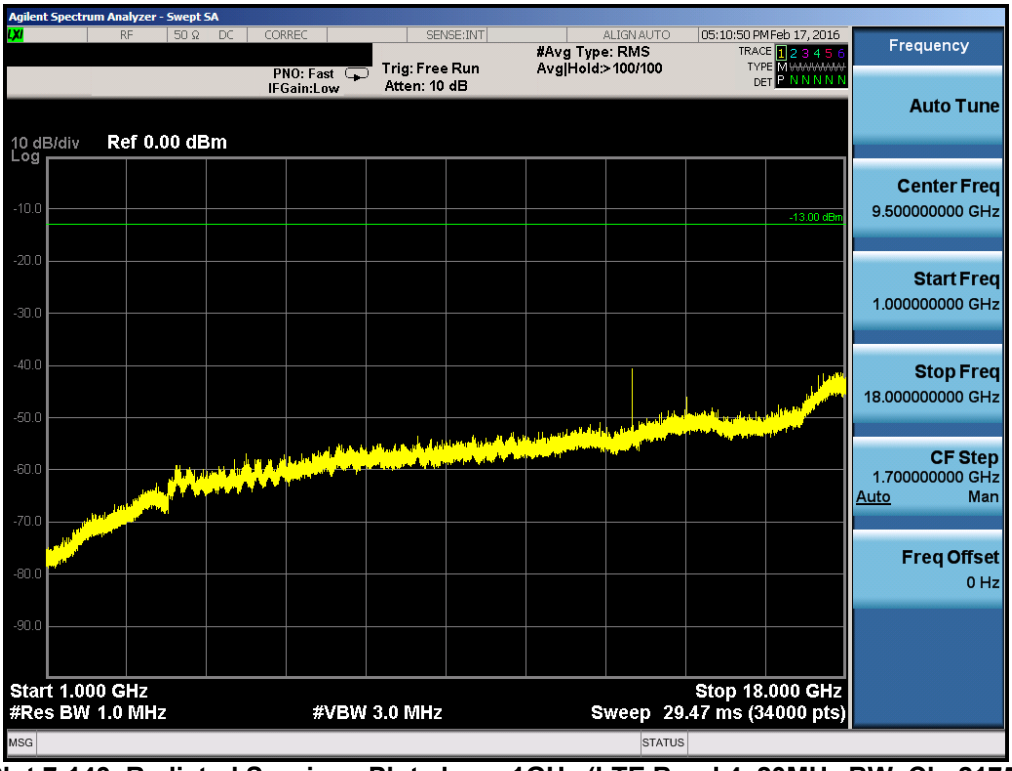


Plot 7-141. Radiated Spurious Plot above 1GHz (LTE Band 2, 20MHz BW, Ch. 900)

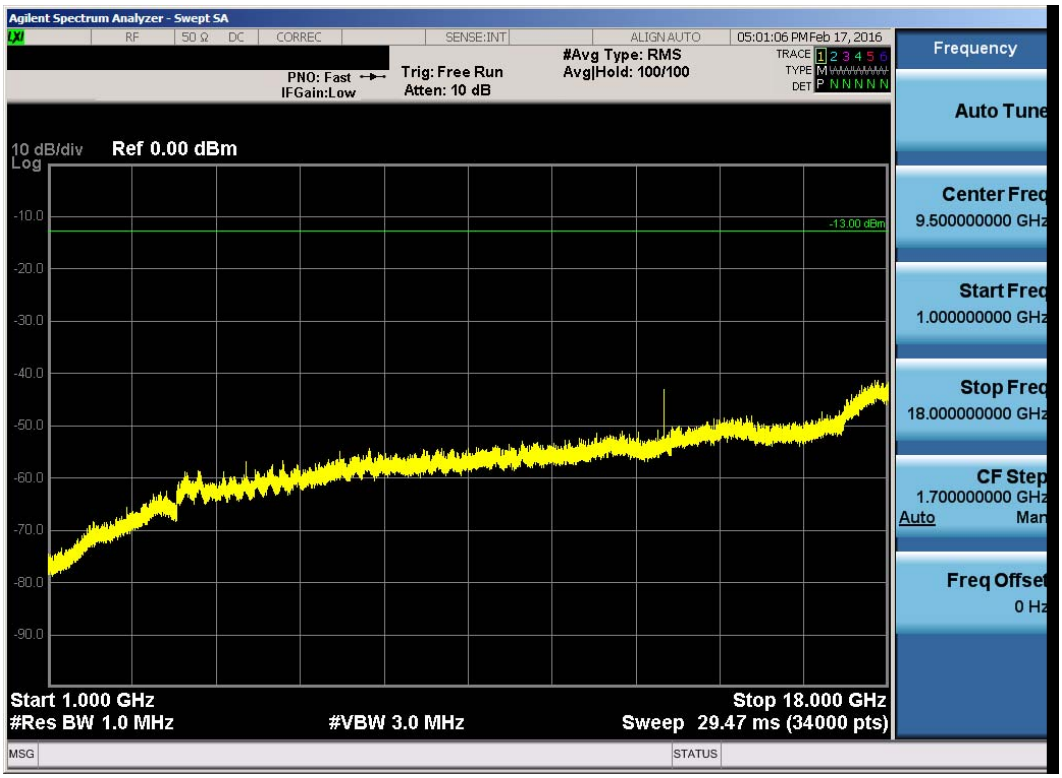
Test Scenario #2 – Chain1



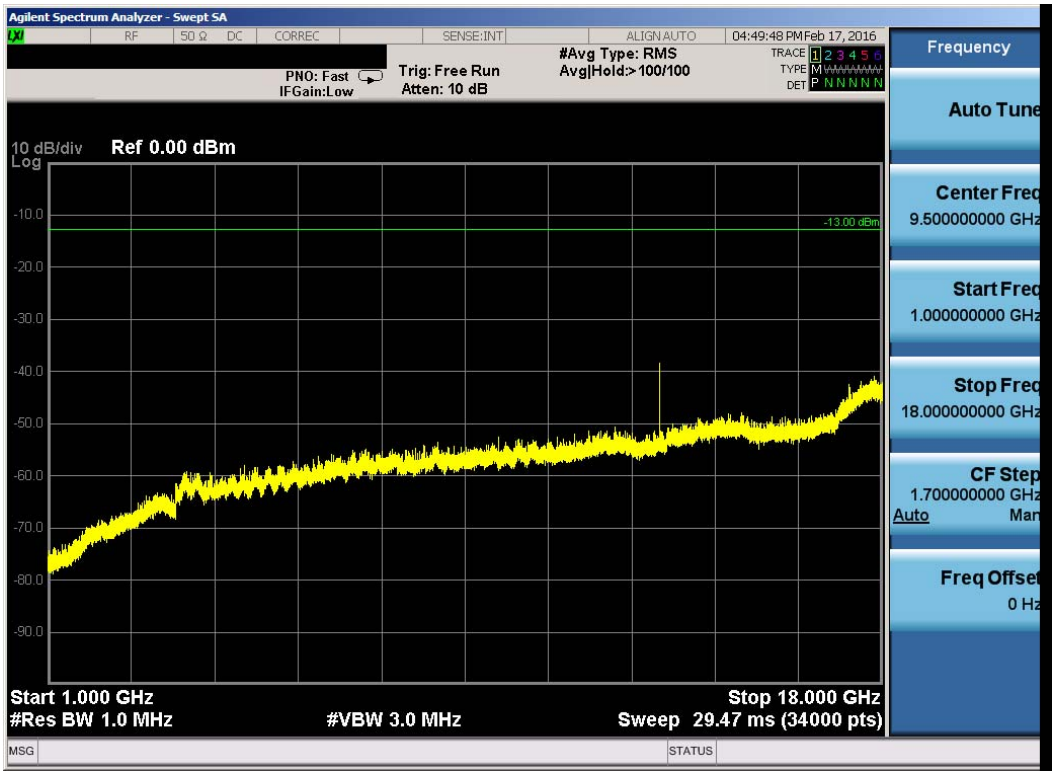
Plot 7-142. Radiated Spurious Plot above 1GHz (LTE Band 4, 5MHz BW, Ch. 2175)



Plot 7-143. Radiated Spurious Plot above 1GHz (LTE Band 4, 20MHz BW, Ch. 2175)



Plot 7-144. Radiated Spurious Plot above 1GHz (LTE Band 2, 5MHz BW, Ch. 900)



Plot 7-145. Radiated Spurious Plot above 1GHz (LTE Band 2, 20MHz BW, Ch. 900)

Cabinet Radiated Spurious Emissions Measurements (Cont'd)

Test Scenario #1 – Chain0

OPERATING FREQUENCY:	2112.50	MHz
BANDWIDTH:	5.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1100.00	H	-	-	-54.44	6.36	-48.09	-35.1
8673.00	H	-	-	-50.44	11.07	-39.37	-26.4

Table 7-4. Radiated Spurious Data (Band 4 – Low Channel, 5MHz BW)

OPERATING FREQUENCY:	2132.50	MHz
BANDWIDTH:	5.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3068.00	H	-	-	-51.15	9.44	-41.72	-28.7
13446.00	H	-	-	-49.02	12.38	-36.64	-23.6

Table 7-5. Radiated Spurious Data (Band 4 – Mid Channel, 5MHz BW)

OPERATING FREQUENCY:	2152.50	MHz
BANDWIDTH:	5.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
2903.00	H	-	-	-53.08	9.84	-43.24	-30.2
6654.00	H	-	-	-44.86	11.89	-32.97	-20.0

Table 7-6. Radiated Spurious Data (Band 4 – High Channel, 5MHz BW)

Cabinet Radiated Spurious Emissions Measurements (Cont'd)

OPERATING FREQUENCY:	1932.50	MHz
BANDWIDTH:	5.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1339.00	H	1.25	257	-55.55	7.38	-48.17	-35.2
3865.00	H	1.64	68	-35.10	9.22	-25.88	-12.9
13442.00	H	-	-	-48.70	12.38	-36.32	-23.3

Table 7-7. Radiated Spurious Data (Band 2 – Low Channel, 5MHz BW)

OPERATING FREQUENCY:	1960.00	MHz
BANDWIDTH:	5.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1280.00	H	1.11	302	-52.76	7.01	-45.76	-32.8
3240.00	H	1.03	188	-50.55	9.49	-41.06	-28.1
3920.00	H	1.15	117	-34.30	9.33	-24.97	-12.0
6650.00	H	-	-	-46.16	11.90	-34.26	-21.3

Table 7-8. Radiated Spurious Data (Band 2 – Mid Channel, 5MHz BW)

OPERATING FREQUENCY:	1987.50	MHz
BANDWIDTH:	5.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1221.00	H	2.54	27	-56.32	6.70	-49.62	-36.6
3975.00	H	2.50	304	-36.43	9.57	-26.86	-13.9
13442.00	H	-	-	-48.75	12.38	-36.37	-23.4

Table 7-9. Radiated Spurious Data (Band 2 – High Channel, 5MHz BW)

Cabinet Radiated Spurious Emissions Measurements (Cont'd)

OPERATING FREQUENCY: 2120.00 MHz
BANDWIDTH: 20.0 MHz
DISTANCE: 3 meters
LIMIT: -13 dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
2740.00	H	-	-	-53.88	9.87	-44.02	-31.0
7346.00	H	-	-	-51.94	10.76	-41.18	-28.2

Table 7-10. Radiated Spurious Data (Band 4 – Low Channel, 20MHz BW)

OPERATING FREQUENCY: 2132.50 MHz
BANDWIDTH: 20.0 MHz
DISTANCE: 3 meters
LIMIT: -13 dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1280.00	H	-	-	-55.45	7.01	-48.45	-35.4
3240.00	H	-	-	-51.22	9.49	-41.73	-28.7
13446.00	H	-	-	-47.92	12.38	-35.54	-22.5

Table 7-11. Radiated Spurious Data (Band 4 – Mid Channel, 20MHz BW)

OPERATING FREQUENCY: 2145.00 MHz
BANDWIDTH: 20.0 MHz
DISTANCE: 3 meters
LIMIT: -13 dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1326.00	H	-	-	-58.24	7.29	-50.95	-38.0
7788.00	H	-	-	-52.03	11.22	-40.81	-27.8

Table 7-12. Radiated Spurious Data (Band 4 – High Channel, 20MHz BW)

Cabinet Radiated Spurious Emissions Measurements (Cont'd)

OPERATING FREQUENCY:	1940.00	MHz
BANDWIDTH:	20.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1320.00	H	1.98	245	-53.95	7.25	-46.70	-33.7
3880.00	H	1.70	228	-37.27	9.23	-28.04	-15.0
7519.00	H	-	-	-53.68	10.97	-42.71	-29.7

Table 7-13. Radiated Spurious Data (Band 2 – Low Channel, 20MHz BW)

OPERATING FREQUENCY:	1960.00	MHz
BANDWIDTH:	20.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1280.00	H	1.00	234	-42.14	7.01	-35.14	-22.1
3240.00	H	-	-	-51.71	9.49	-42.22	-29.2
3920.00	H	2.09	302	-40.73	9.33	-31.40	-18.4
13442.00	H	1.18	360	-44.98	12.38	-32.60	-19.6

Table 7-14. Radiated Spurious Data (Band 2 – Mid Channel, 20MHz BW)

OPERATING FREQUENCY:	1980.00	MHz
BANDWIDTH:	20.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1221.00	H	1.04	256	-49.62	6.70	-42.92	-29.9
3960.00	H	1.86	305	-37.26	9.51	-27.75	-14.8
6653.00	H	-	-	-47.43	11.89	-35.54	-22.5

Table 7-15. Radiated Spurious Data (Band 2 – High Channel, 20MHz BW)

Cabinet Radiated Spurious Emissions Measurements (Cont'd)

Test Scenario #2 – Chain1

OPERATING FREQUENCY:	2112.50	MHz
BANDWIDTH:	5.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1100.00	H	-	-	-55.60	6.36	-49.25	-36.2
8673.00	H	-	-	-50.62	11.07	-39.55	-26.6

Table 7-16. Radiated Spurious Data (Band 4 – Low Channel, 5MHz BW)

OPERATING FREQUENCY:	2132.50	MHz
BANDWIDTH:	5.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3068.00	H	-	-	-51.61	9.44	-42.18	-29.2
4265.00	H	-	-	-48.44	10.62	-37.82	-24.8

Table 7-17. Radiated Spurious Data (Band 4 – Mid Channel, 5MHz BW)

OPERATING FREQUENCY:	2152.50	MHz
BANDWIDTH:	5.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
2903.00	H	-	-	-52.91	9.84	-43.07	-30.1
6654.00	H	-	-	-45.53	11.89	-33.64	-20.6

Table 7-18. Radiated Spurious Data (Band 4 – High Channel, 5MHz BW)

Cabinet Radiated Spurious Emissions Measurements (Cont'd)

OPERATING FREQUENCY:	1932.50	MHz
BANDWIDTH:	5.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1339.00	H	-	-	-55.35	7.38	-47.97	-35.0
3865.00	H	1.00	32	-36.85	9.22	-27.63	-14.6
7230.00	H	-	-	-48.26	12.38	-35.88	-22.9

Table 7-19. Radiated Spurious Data (Band 2 – Low Channel, 5MHz BW)

OPERATING FREQUENCY:	1960.00	MHz
BANDWIDTH:	5.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1843.00	H	-	-	-55.51	7.01	-48.51	-35.5
3240.00	H	-	-	-46.00	9.49	-36.51	-23.5
3920.00	H	-	-	-46.72	9.33	-37.39	-24.4
10446.00	H	-	-	-47.14	11.90	-35.24	-22.2

Table 7-20. Radiated Spurious Data (Band 2 – Mid Channel, 5MHz BW)

OPERATING FREQUENCY:	1987.50	MHz
BANDWIDTH:	5.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1221.00	H	-	-	-55.90	6.70	-49.20	-36.2
3975.00	H	-	-	-46.95	9.57	-37.38	-24.4
13442.00	H	-	-	-48.86	12.38	-36.48	-23.5

Table 7-21. Radiated Spurious Data (Band 2 – High Channel, 5MHz BW)

Cabinet Radiated Spurious Emissions Measurements (Cont'd)

OPERATING FREQUENCY:	2120.00	MHz
BANDWIDTH:	20.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
2740.00	H	-	-	-53.58	9.87	-43.72	-30.7
7346.00	H	-	-	-50.90	10.76	-40.14	-27.1

Table 7-22. Radiated Spurious Data (Band 4 – Low Channel, 20MHz BW)

OPERATING FREQUENCY:	2132.50	MHz
BANDWIDTH:	20.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1280.00	H	-	-	-56.78	7.01	-49.78	-36.8
3240.00	H	-	-	-50.61	9.49	-41.12	-28.1

Table 7-23. Radiated Spurious Data (Band 4 – Mid Channel, 20MHz BW)

OPERATING FREQUENCY:	2145.00	MHz
BANDWIDTH:	20.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1326.00	H	-	-	-55.93	7.29	-48.64	-35.6
7788.00	H	-	-	-51.88	11.22	-40.66	-27.7

Table 7-24. Radiated Spurious Data (Band 4 – High Channel, 20MHz BW)

Cabinet Radiated Spurious Emissions Measurements (Cont'd)

OPERATING FREQUENCY:	1940.00	MHz
BANDWIDTH:	20.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1320.00	H	-	-	-55.56	7.25	-48.31	-35.3
3880.00	H	2.14	121	-31.63	9.23	-22.40	-9.4
6650.00	H	-	-	-51.43	10.97	-40.46	-27.5

Table 7-25. Radiated Spurious Data (Band 2 – Low Channel, 20MHz BW)

OPERATING FREQUENCY:	1960.00	MHz
BANDWIDTH:	20.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1280.00	H	1.00	241	-55.98	7.01	-48.98	-36.0
3240.00	H	-	-	-49.90	9.49	-40.41	-27.4
3920.00	H	1.01	21	-38.83	9.33	-29.50	-16.5
13442.00	H	-	-	-49.63	12.38	-37.25	-24.3

Table 7-26. Radiated Spurious Data (Band 2 – Mid Channel, 20MHz BW)

OPERATING FREQUENCY:	1980.00	MHz
BANDWIDTH:	20.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1221.00	H	-	-	-56.46	6.70	-49.76	-36.8
3960.00	H	-	-	-48.64	9.51	-39.13	-26.1
6653.00	H	-	-	-46.38	11.89	-34.49	-21.5

Table 7-27. Radiated Spurious Data (Band 2 – High Channel, 20MHz BW)

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Qualcomm LAA Release 13 Small Cell FCC ID: J9CMTP9900LAA** complies with all the requirements for LTE operation under Parts 24 & 27 of the FCC rules.