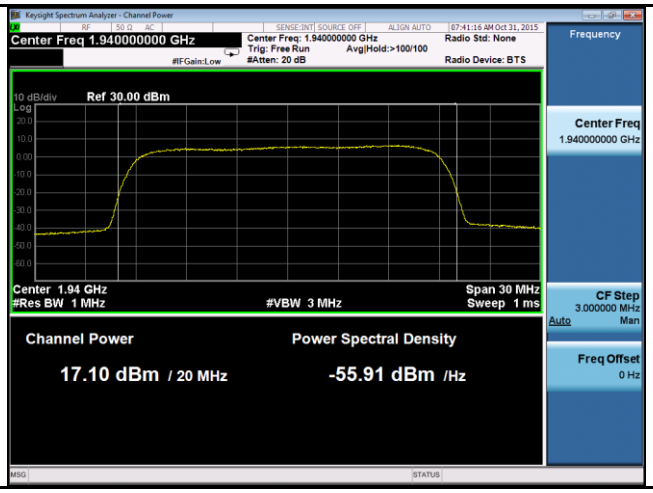
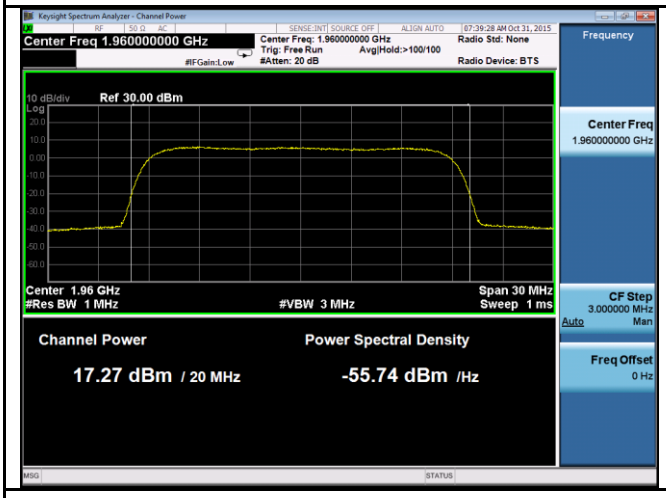
Test Plots for Band 2-QPSK-20MHz

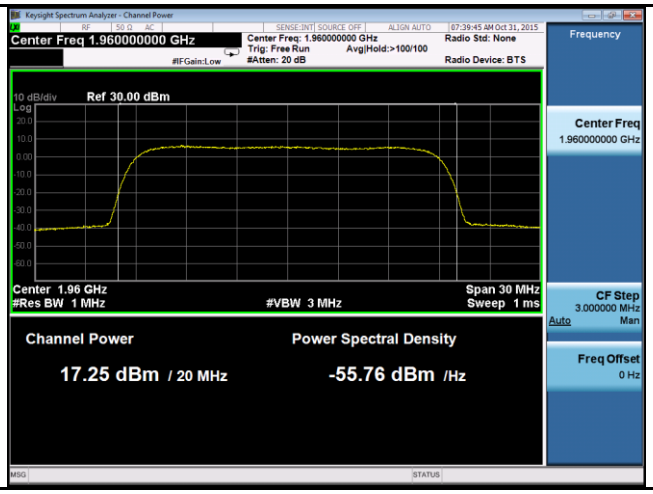
PWR-Band2-QPSK-20M BW-Low CH-Port1



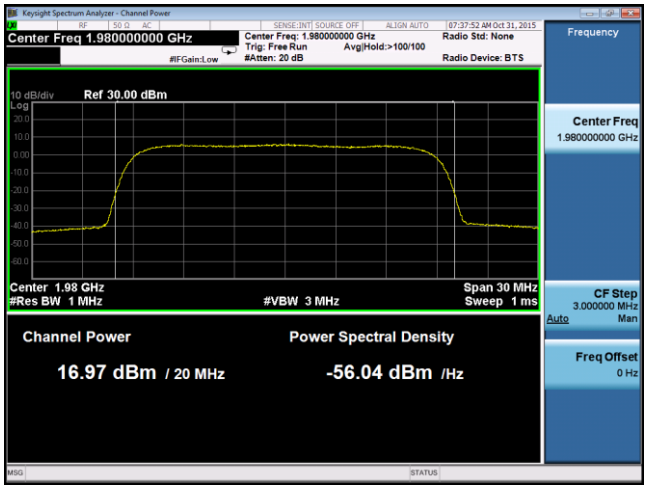
PWR-Band2-QPSK-20M BW-Low CH-Port2



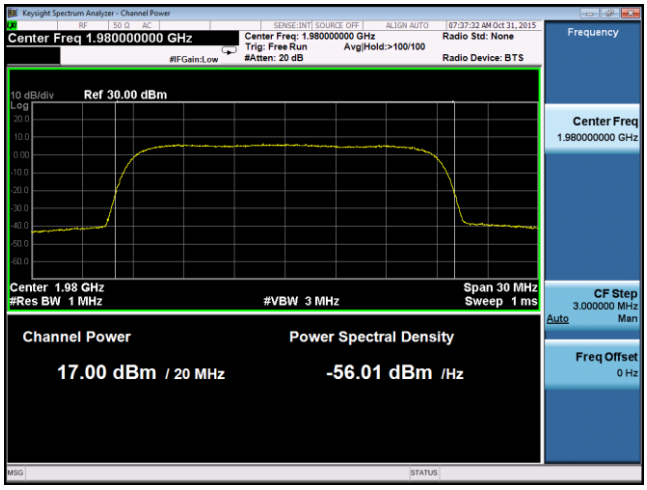
PWR-Band2-QPSK-20M BW-Mid CH-Port1



PWR-Band2-QPSK-20M BW-Mid CH-Port2



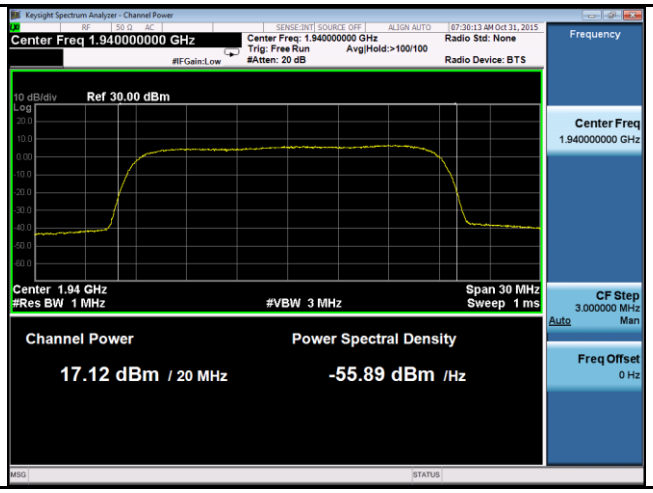
PWR-Band2-QPSK-20M BW-High CH-Port1



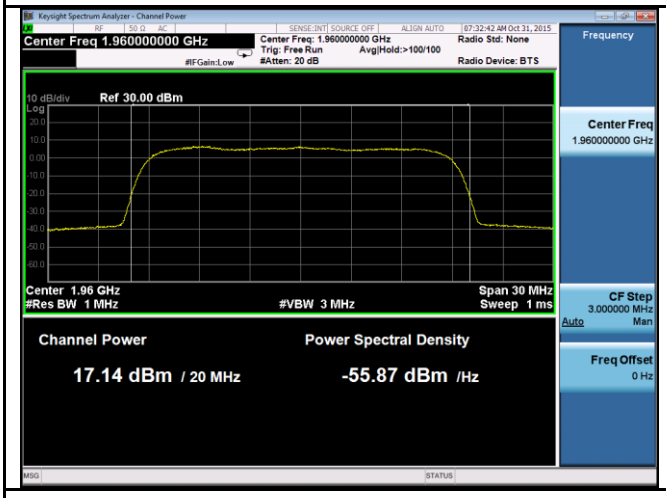
PWR-Band2-QPSK-20M BW-High CH-Port2

Test Plots for Band 2-64QAM-20MHz

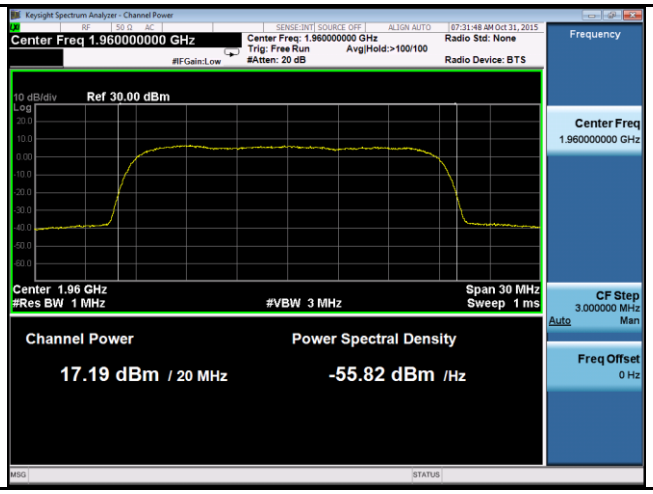
PWR-Band2-64QAM-20M BW-Low CH-Port1



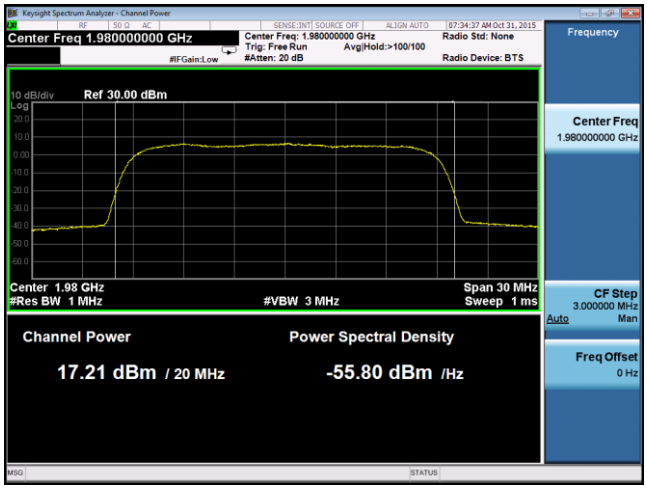
PWR-Band2-64QAM-20M BW-Low CH-Port2



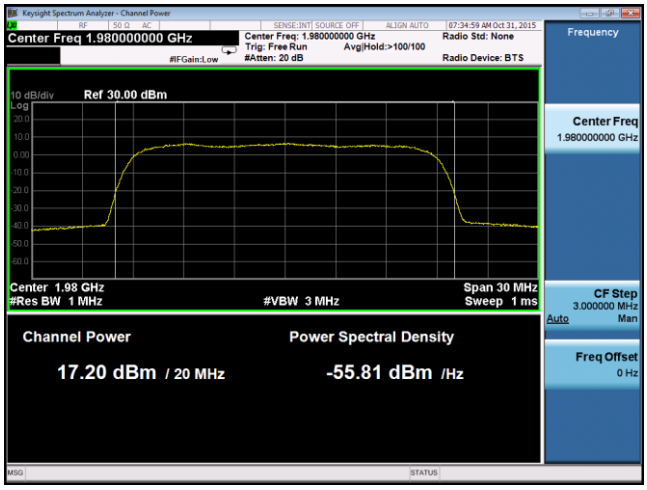
PWR-Band2-64QAM-20M BW-Mid CH-Port1



PWR-Band2-64QAM-20M BW-Mid CH-Port2



PWR-Band2-64QAM-20M BW-High CH-Port1

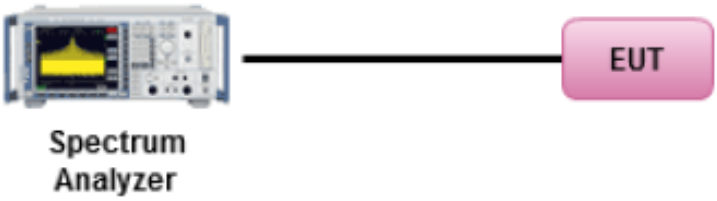


PWR-Band2-64QAM-20M BW-High CH-Port2

10.2 Peak-Average Ratio

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR27.50	(b)	The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB. The PAPR measurements should be made using either an instrument with complementary cumulative distribution function (CCDF) capabilities to determine that PAPR will not exceed 13 dB for more than 0.1 percent of the time or other Commission approved procedure. The measurement must be performed using a signal corresponding to the highest PAPR expected during periods of continuous transmission.	☒
47CFR24.232	(d)	Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.	☒

Test Setup				
Test Procedure	- EUT was set for low, mid, high channel with modulated mode and highest RF output power. - The spectrum analyzer was connected to the antenna terminal.			
Test Date	04/30/2015 – 05/03/2015 10/26/2015 – 11/02/2015	Environmental condition	Temperature Relative Humidity Atmospheric Pressure	23°C 48% 1008mbar
Remark	NONE			
Result	☒ Pass ☐ Fail			

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

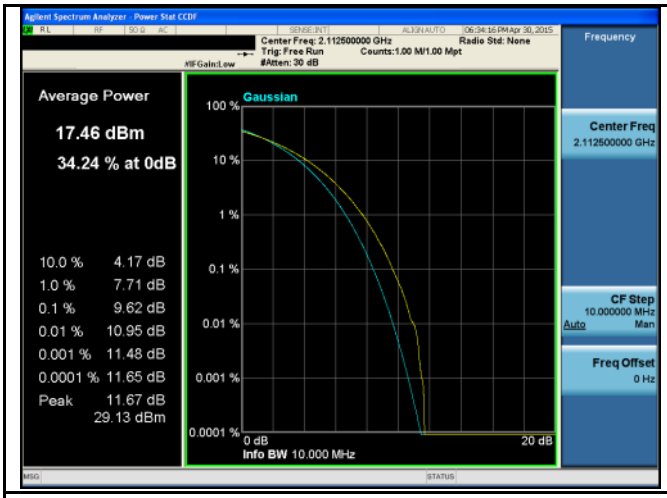
Test Data for LTE band 4:

Type	Channel	Frequency (MHz)	Peak-Average Ratio (dB)	Peak-Average Ratio (dB)
5MHz BW, QPSK	Low	2112.5	9.62	13
	Mid	2132.5	9.53	13
	High	2152.5	9.53	13
5MHz BW, 16QAM	Low	2112.5	9.54	13
	Mid	2132.5	9.95	13
	High	2152.5	9.51	13
5MHz BW, 64QAM	Low	2112.5	9.65	13
	Mid	2132.5	9.52	13
	High	2152.5	9.49	13
10MHz BW, QPSK	Low	2115.0	8.94	13
	Mid	2132.5	8.93	13
	High	2150.0	8.87	13
10MHz BW, 16QAM	Low	2115.0	8.98	13
	Mid	2132.5	8.93	13
	High	2150.0	8.93	13
10MHz BW, 64QAM	Low	2115.0	8.94	13
	Mid	2132.5	8.94	13
	High	2150.0	8.91	13
15MHz BW, QPSK	Low	2117.5	9.11	13
	Mid	2132.5	9.01	13
	High	2147.5	9.01	13
15MHz BW, 16QAM	Low	2117.5	8.94	13
	Mid	2132.5	8.82	13
	High	2147.5	8.88	13
15MHz BW, 64QAM	Low	2117.5	9.09	13
	Mid	2132.5	9.02	13
	High	2147.5	9.00	13
20MHz BW, QPSK	Low	2120.0	8.98	13
	Mid	2132.5	8.90	13
	High	2145.0	8.87	13
20MHz BW, 16QAM	Low	2120.0	8.95	13
	Mid	2132.5	8.91	13
	High	2145.0	8.88	13
20MHz BW, 64QAM	Low	2120.0	8.95	13
	Mid	2132.5	8.88	13
	High	2145.0	8.85	13

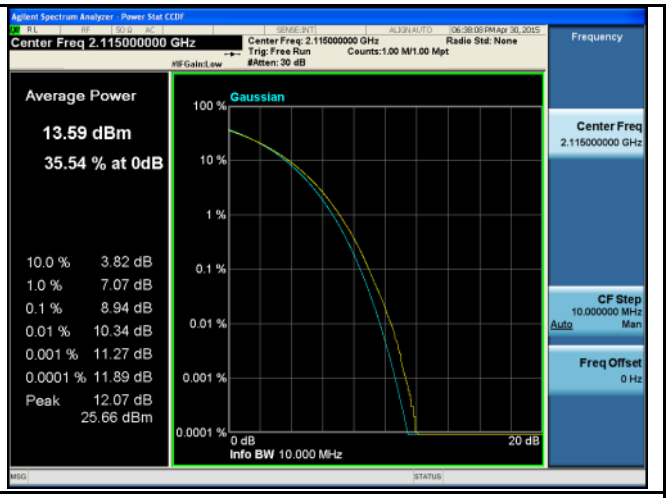
Test Data for LTE band 2 (QPSK is the worst case)

Type	Channel	Frequency (MHz)	Peak-Average Ratio (dB)	Peak-Average Ratio (dB)
5MHz BW, QPSK	Low	1932.5	9.79	13
	Mid	1960.0	9.79	13
	High	1987.5	9.83	13
10MHz BW, QPSK	Low	1935.0	10.06	13
	Mid	1960.0	10.06	13
	High	1985.0	10.05	13
15MHz BW, QPSK	Low	1937.5	9.90	13
	Mid	1960.0	9.93	13
	High	1982.5	9.92	13
20MHz BW, QPSK	Low	1940.0	9.90	13
	Mid	1960.0	9.89	13
	High	1980.0	9.84	13

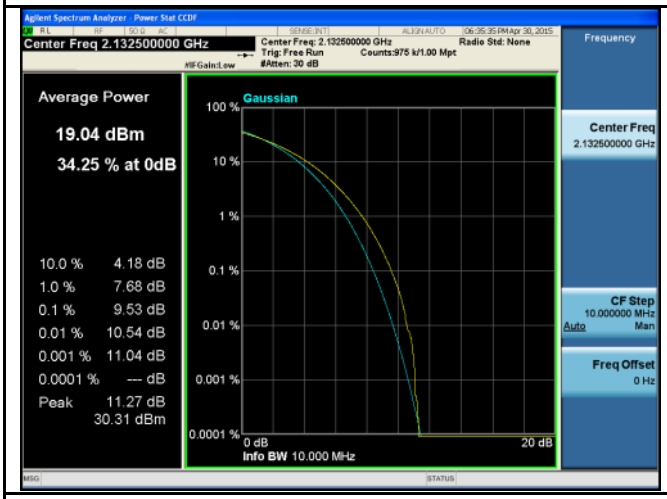
Test Plots for LTE band 4:



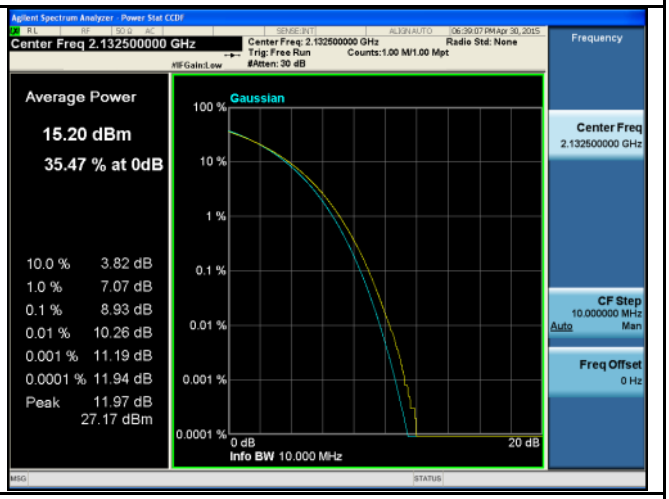
PK-AV-Ratio-Band4-QPSK-5M BW-Low



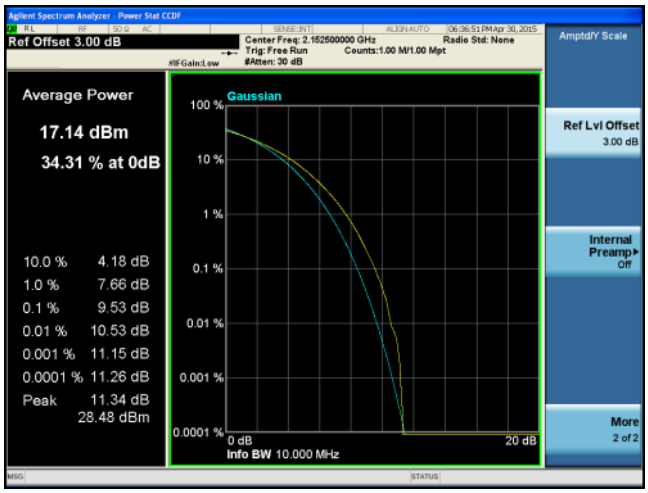
PK-AV-Ratio-Band4-QPSK-10M BW-Low



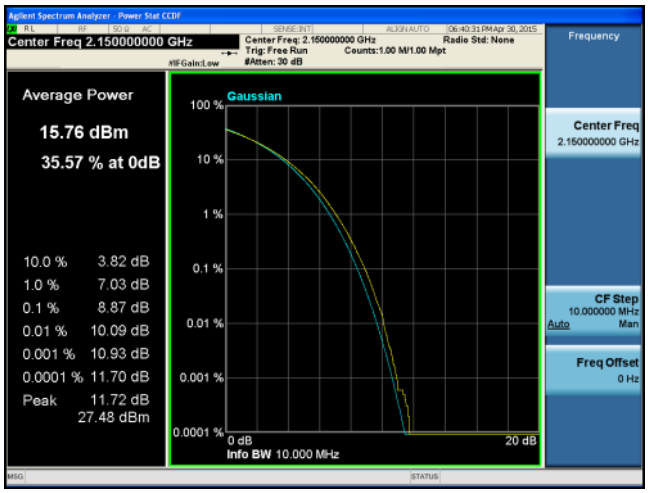
PK-AV-Ratio-Band4-QPSK-5M BW-Mid



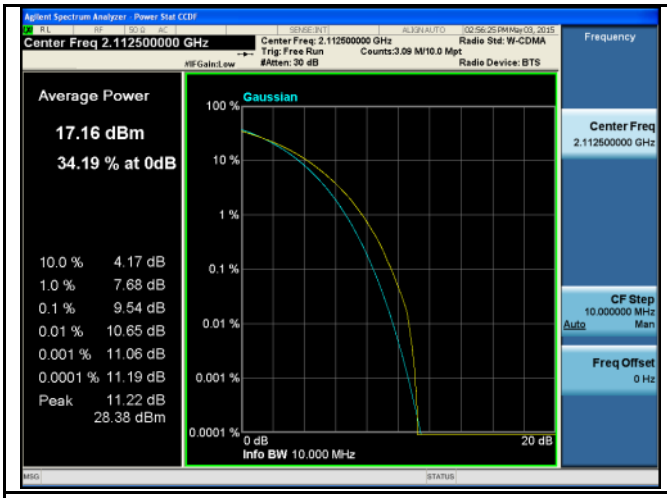
PK-AV-Ratio-Band4-QPSK-10M BW-Mid



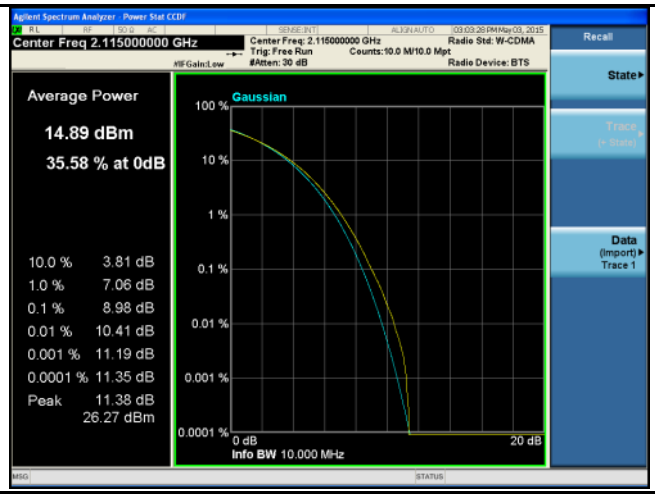
PK-AV-Ratio-Band4-QPSK-5M BW-High



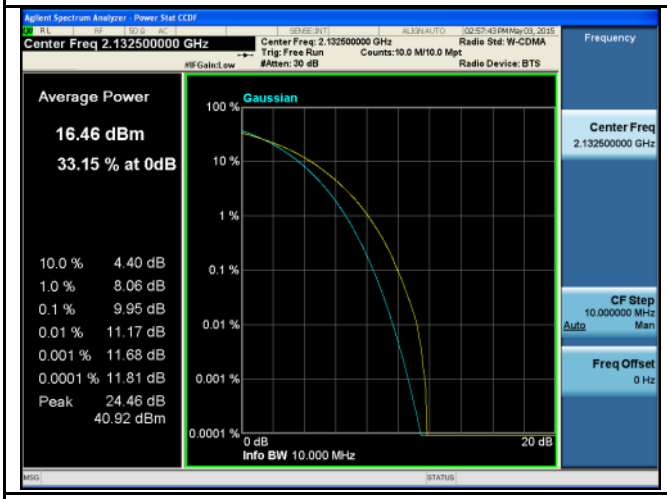
PK-AV-Ratio-Band4-QPSK-10M BW-High



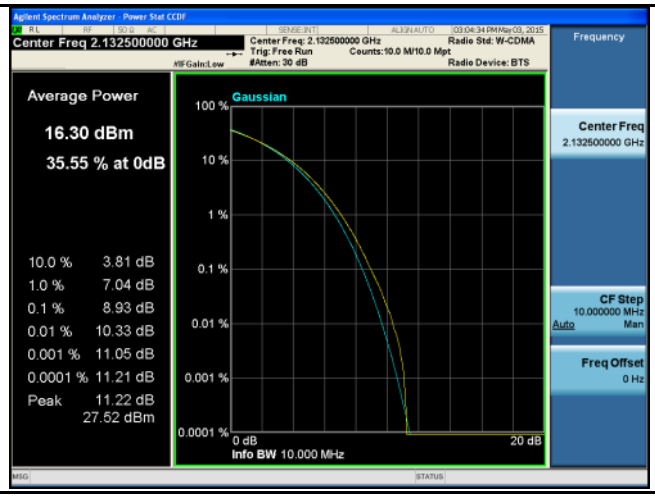
PK-AV-Ratio-Band4-16QAM-5M BW-Low



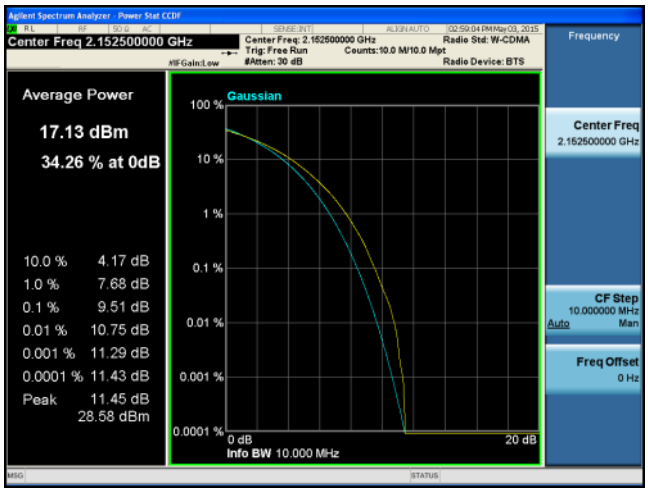
PK-AV-Ratio-Band4-16QAM-10M BW-Low



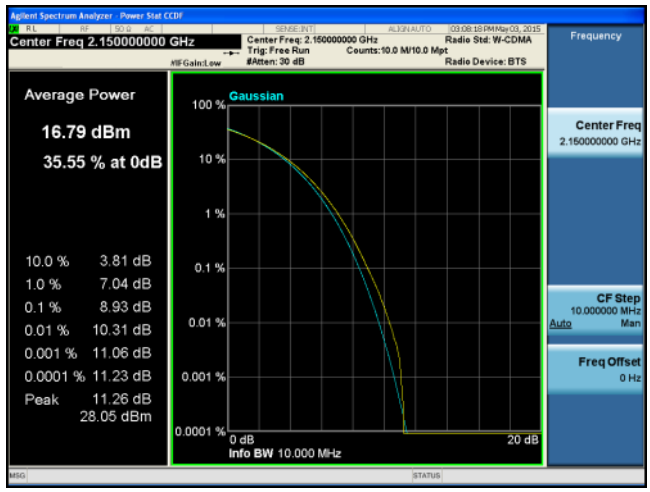
PK-AV-Ratio-Band4-16QAM-5M BW-Mid



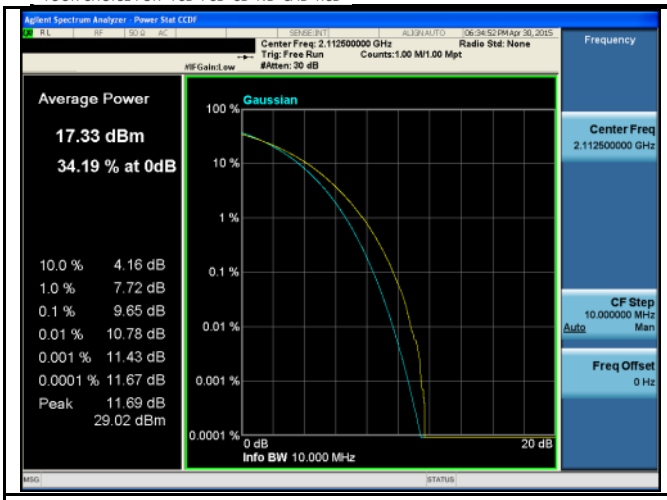
PK-AV-Ratio-Band4-16QAM-10M BW-Mid



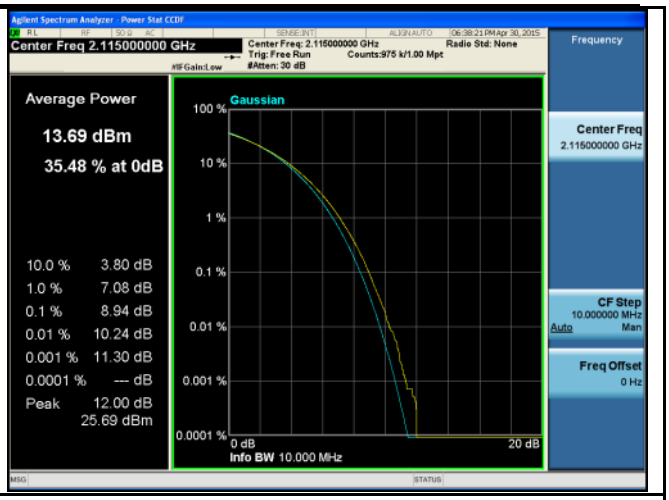
PK-AV-Ratio-Band4-16QAM-5M BW-High



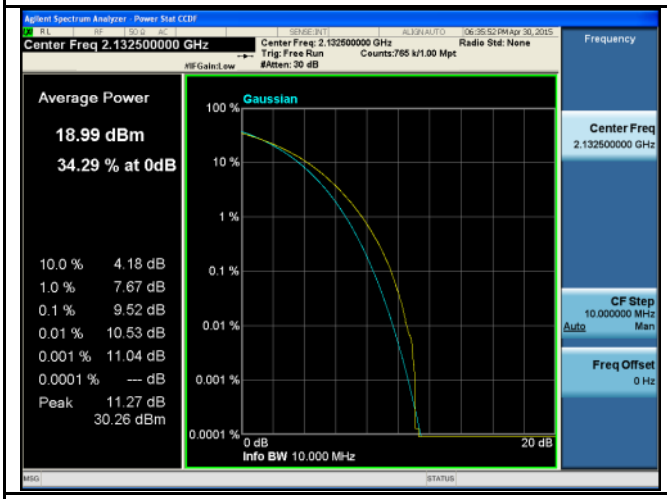
PK-AV-Ratio-Band4-16QAM-10M BW-High



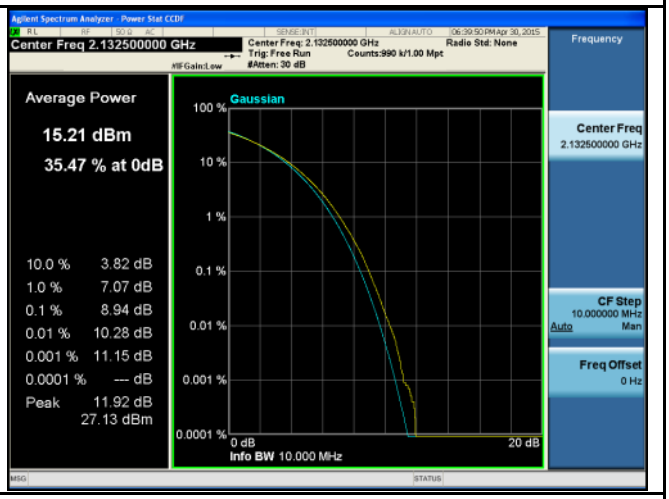
PK-AV-Ratio-Band4-64QAM-5M BW-Low



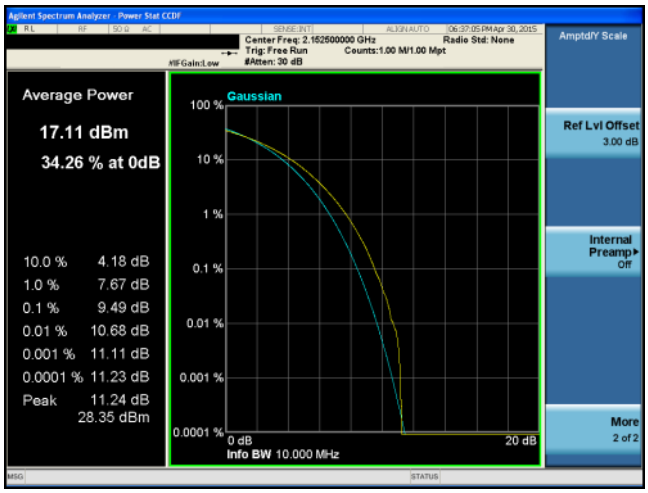
PK-AV-Ratio-Band4-64QAM-10M BW-Low



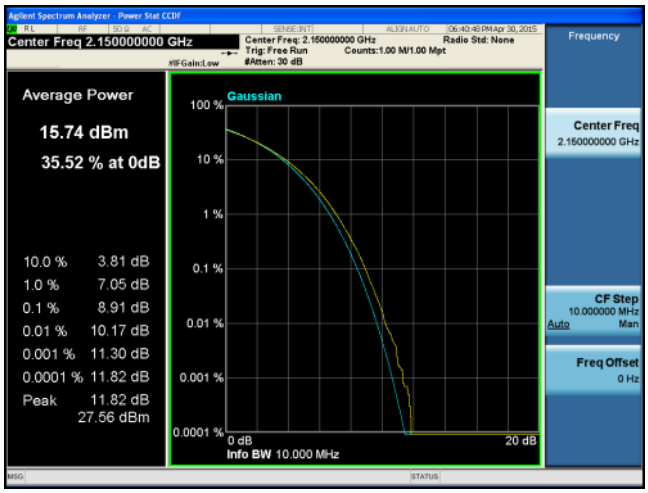
PK-AV-Ratio-Band4-64QAM-5M BW-Mid



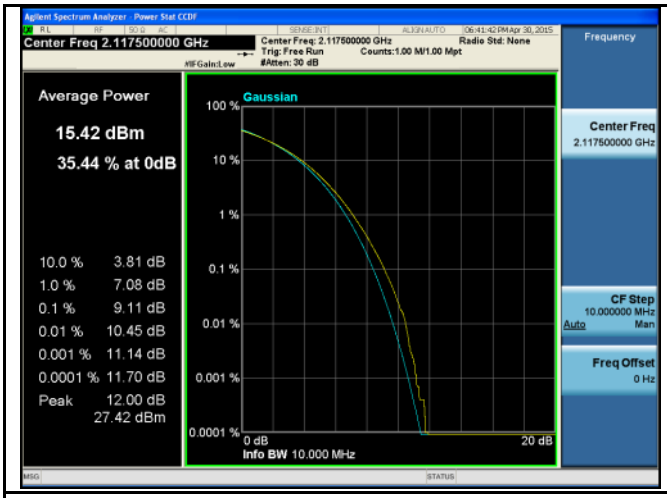
PK-AV-Ratio-Band4-64QAM-10M BW-Mid



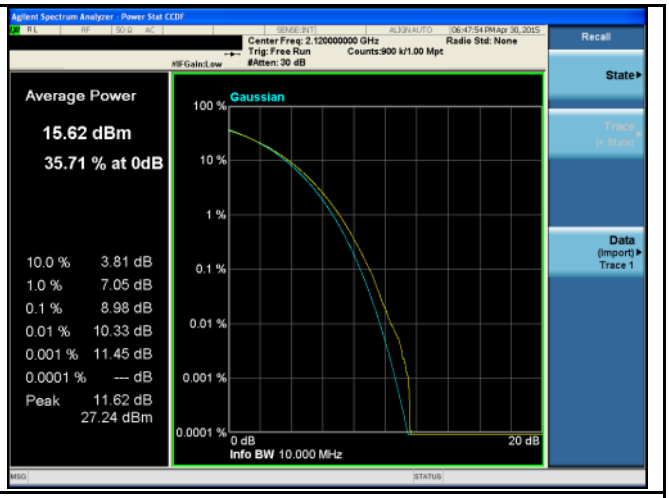
PK-AV-Ratio-Band4-64QAM-5M BW-High



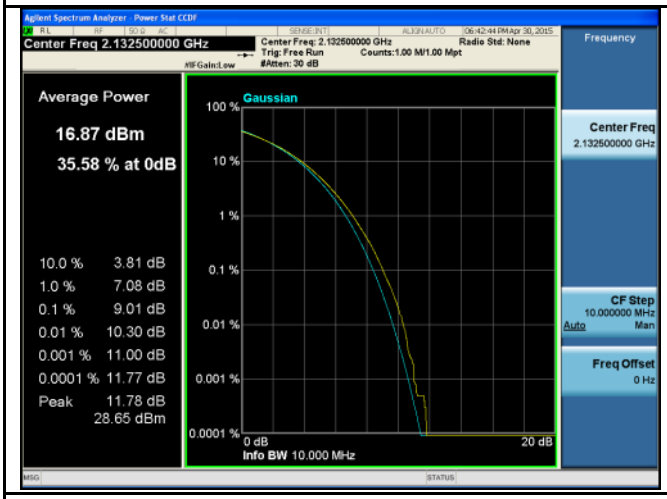
PK-AV-Ratio-Band4-64QAM-10M BW-High



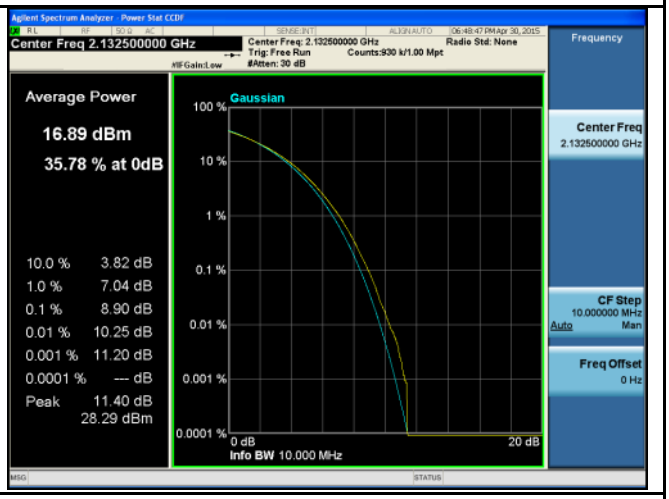
PK-AV-Ratio-Band4-QPSK-15M BW-Low



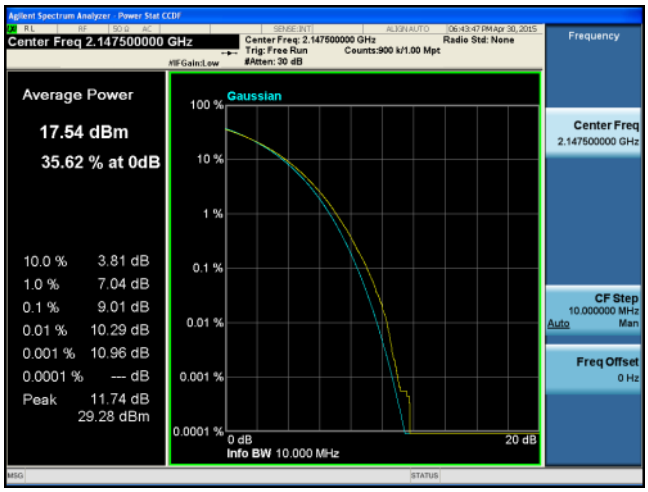
PK-AV-Ratio-Band4-QPSK-20M BW-Low



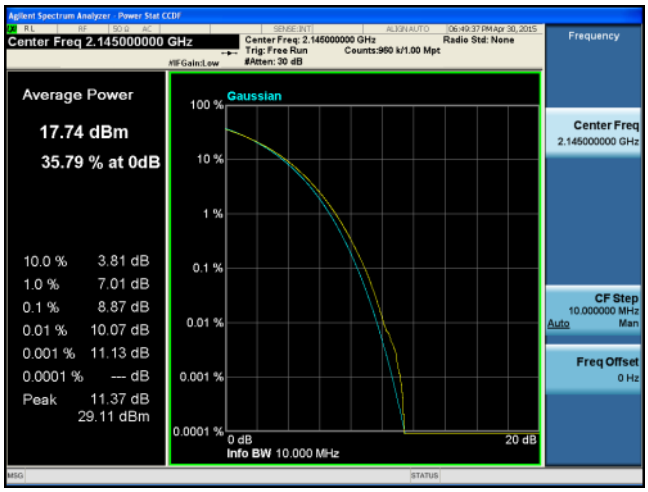
PK-AV-Ratio-Band4-QPSK-15M BW-Mid



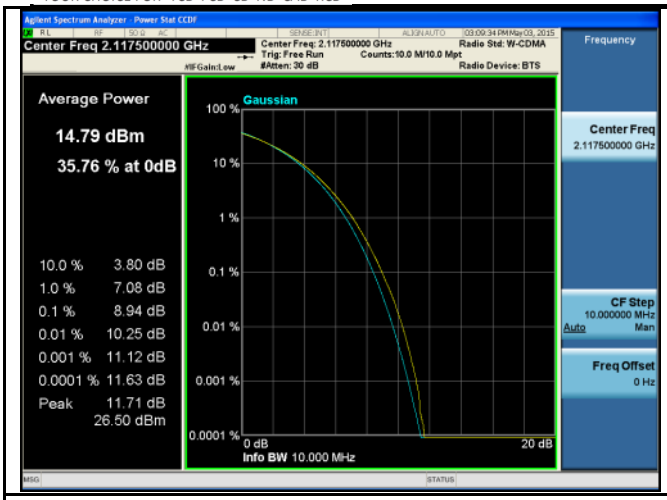
PK-AV-Ratio-Band4-QPSK-20M BW-Mid



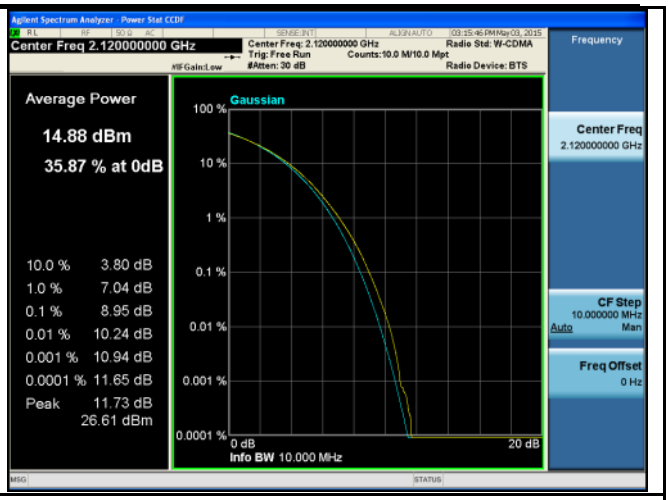
PK-AV-Ratio-Band4-QPSK-15M BW-High



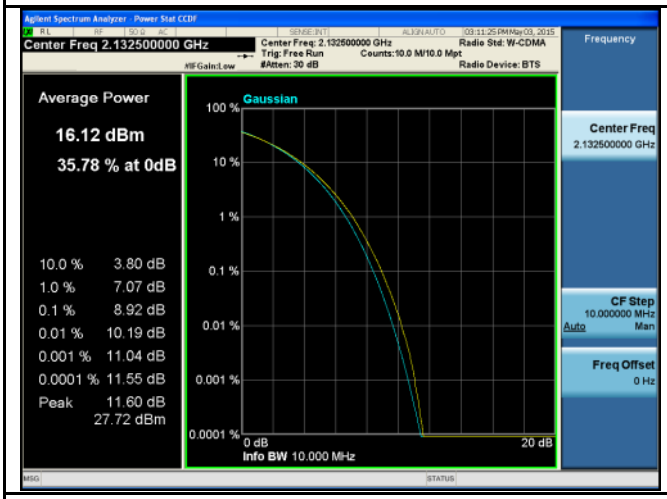
PK-AV-Ratio-Band4-QPSK-20M BW-High



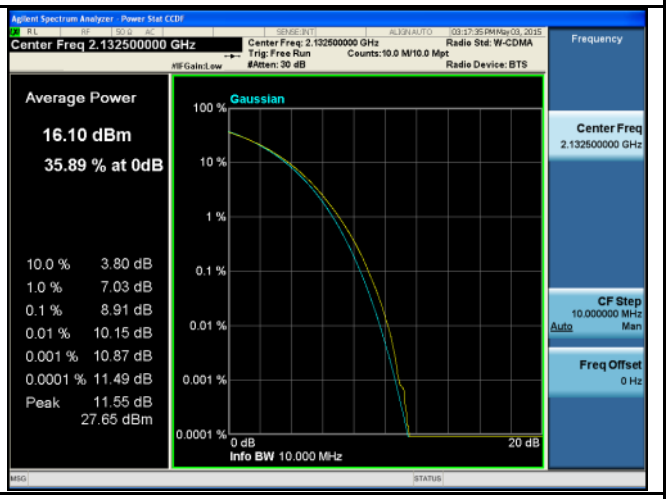
PK-AV-Ratio-Band4-16QAM-15M BW-Low



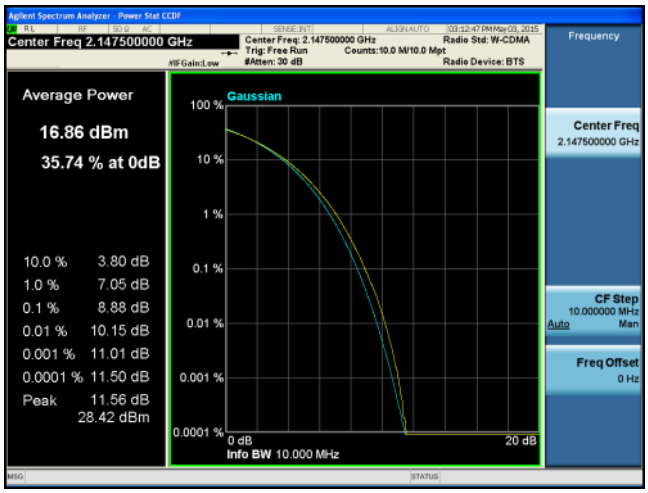
PK-AV-Ratio-Band4-16QAM-20M BW-Low



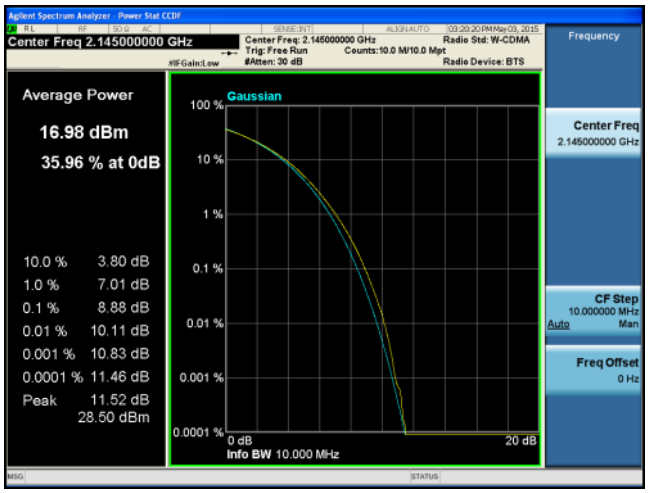
PK-AV-Ratio-Band4-16QAM-15M BW-Mid



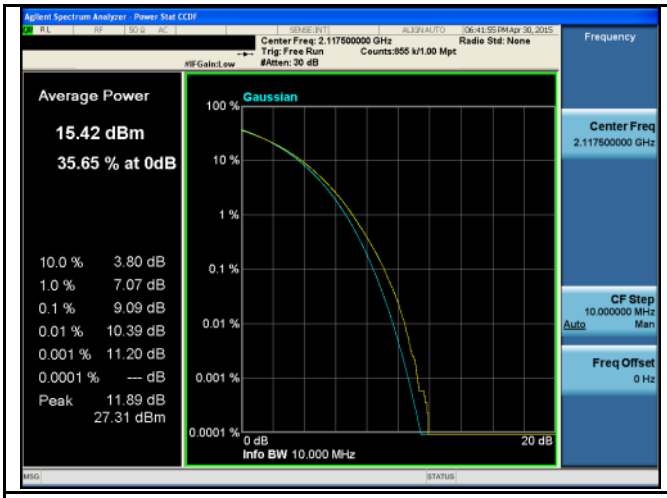
PK-AV-Ratio-Band4-16QAM-20M BW-Mid



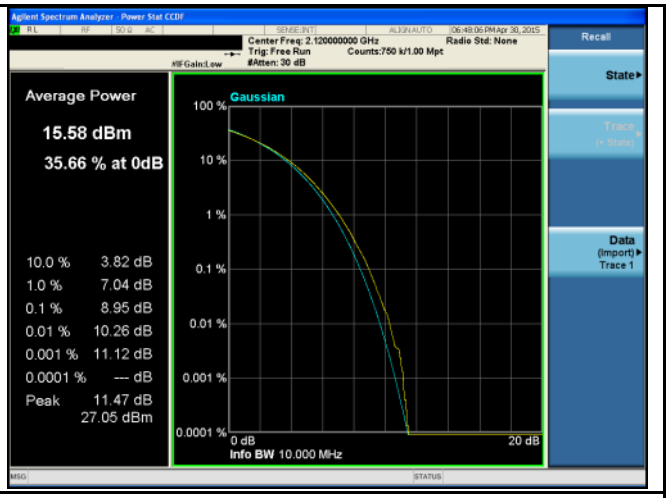
PK-AV-Ratio-Band4-16QAM-15M BW-High



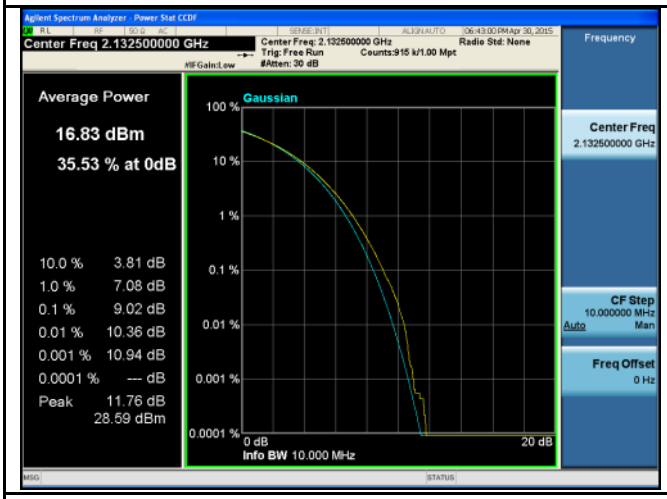
PK-AV-Ratio-Band4-16QAM-20M BW-High



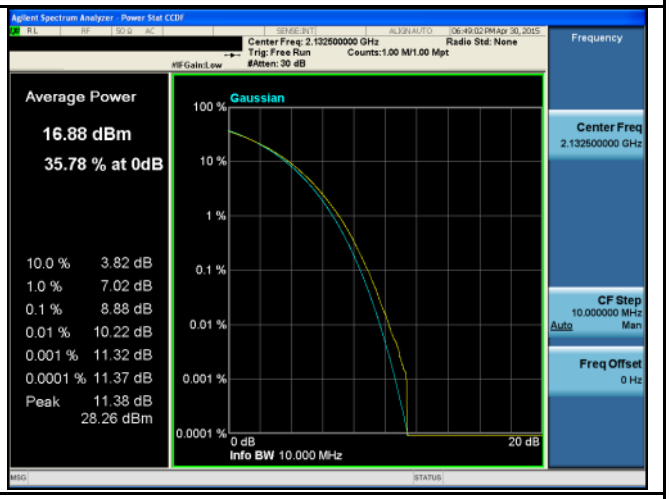
PK-AV-Ratio-Band4-64QAM-15M BW-Low



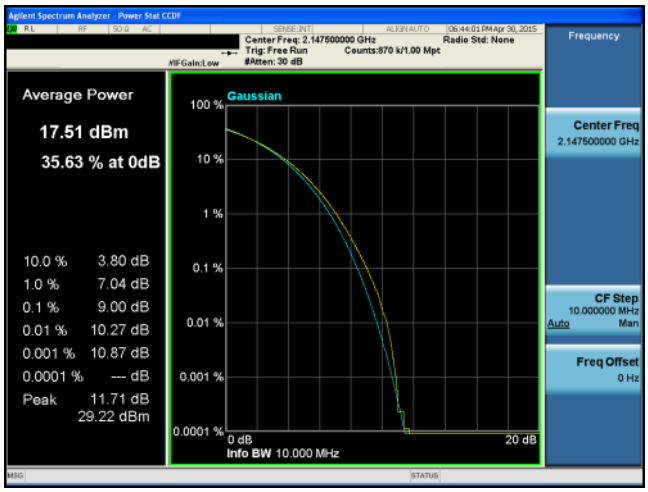
PK-AV-Ratio-Band4-64QAM-20M BW-Low



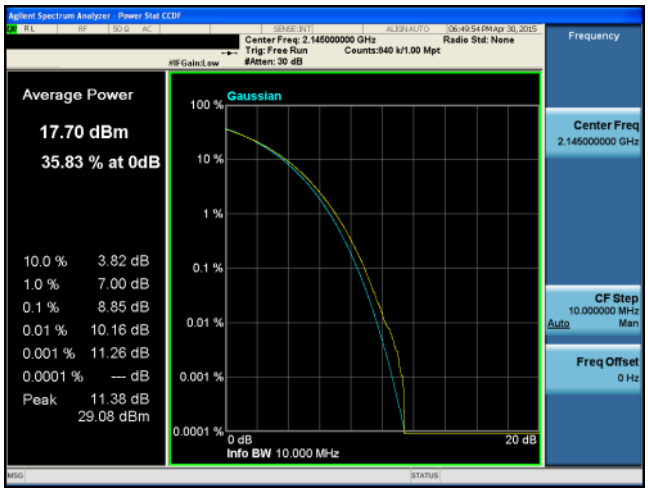
PK-AV-Ratio-Band4-64QAM-15M BW-Mid



PK-AV-Ratio-Band4-64QAM-20M BW-Mid

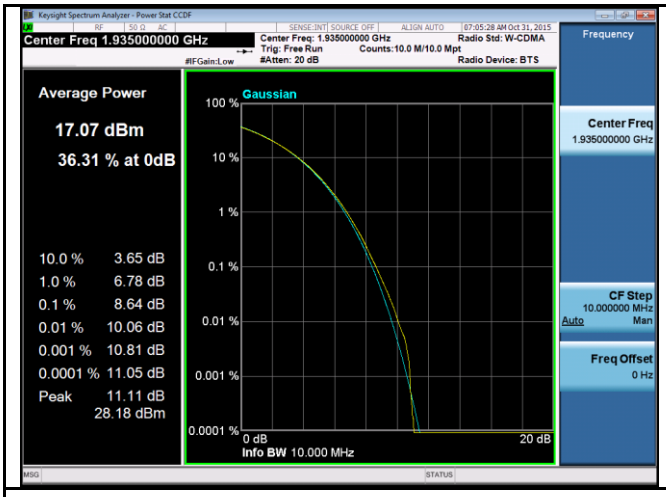


PK-AV-Ratio-Band4-64QAM-15M BW-High

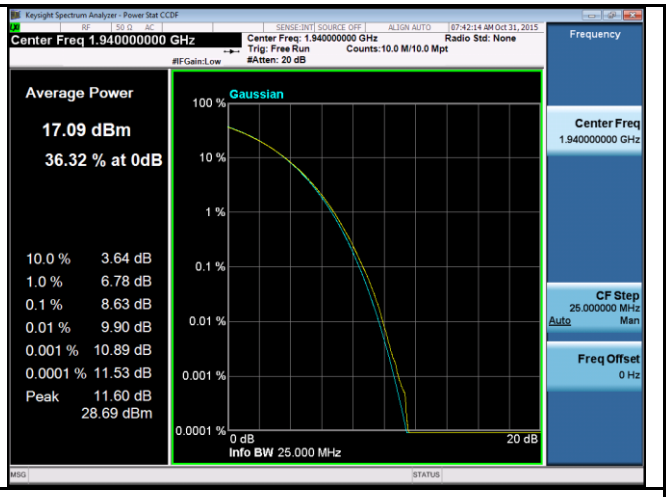


PK-AV-Ratio-Band4-64QAM-20M BW-High

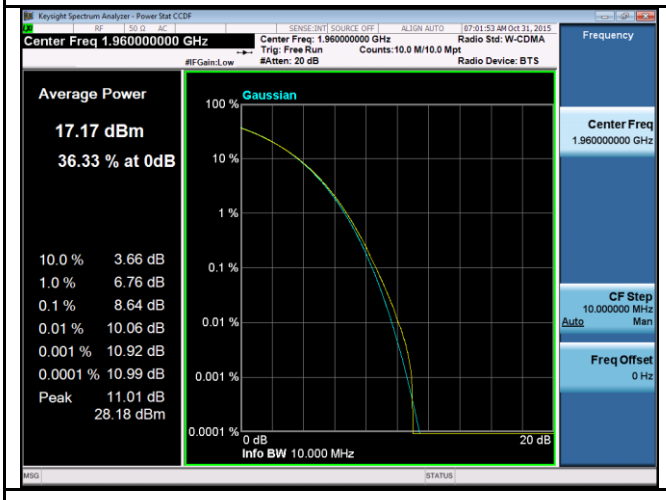
Test Plots for Band 2:



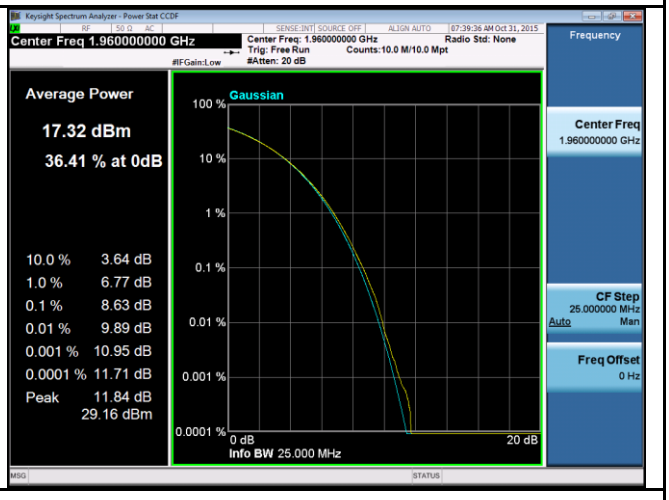
PK-AV-Ratio-Band2-QPSK-10M BW-Low



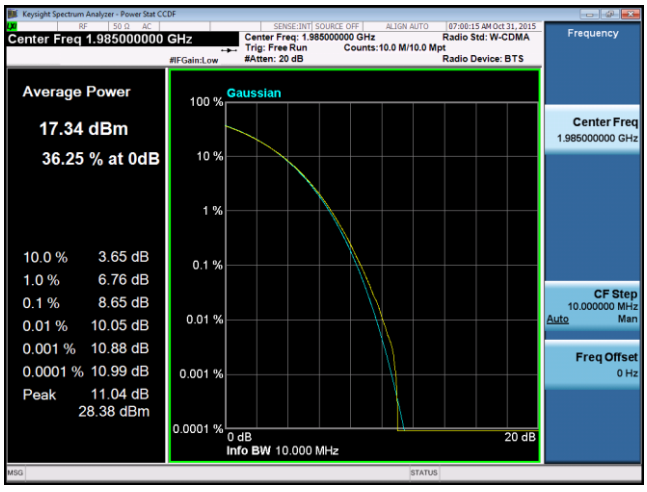
PK-AV-Ratio- Band2-QPSK-20M BW-Low



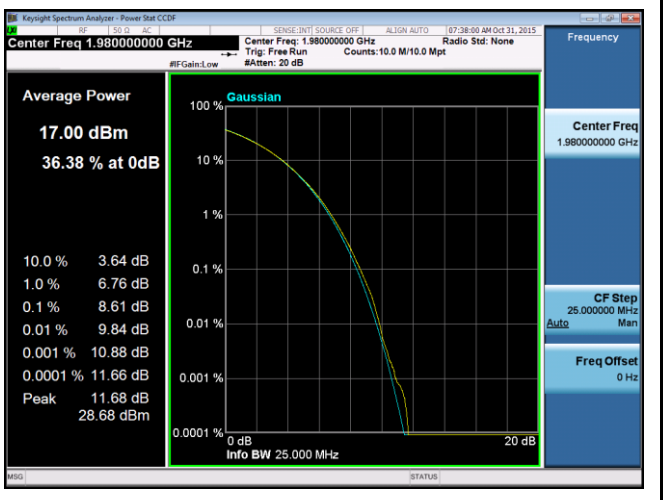
PK-AV-Ratio- Band2-QPSK-10M BW-Mid



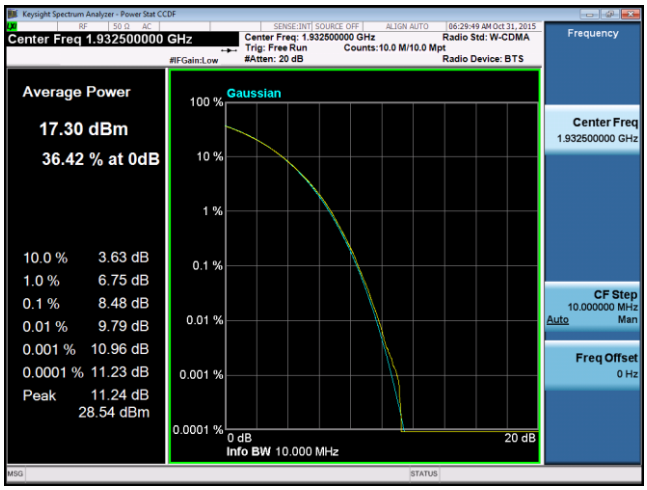
PK-AV-Ratio- Band2-QPSK-20M BW-Mid



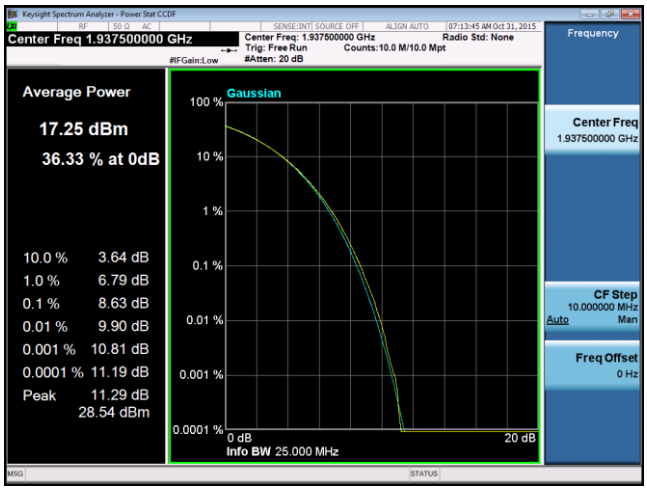
PK-AV-Ratio- Band2-QPSK-10M BW-High



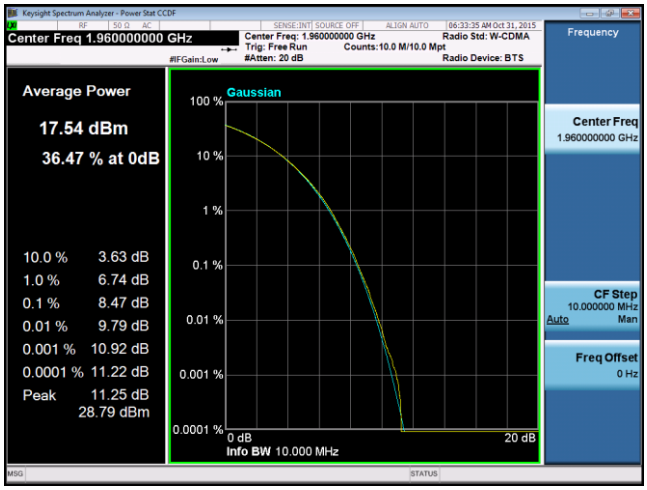
PK-AV-Ratio- Band2-QPSK-20M BW-High



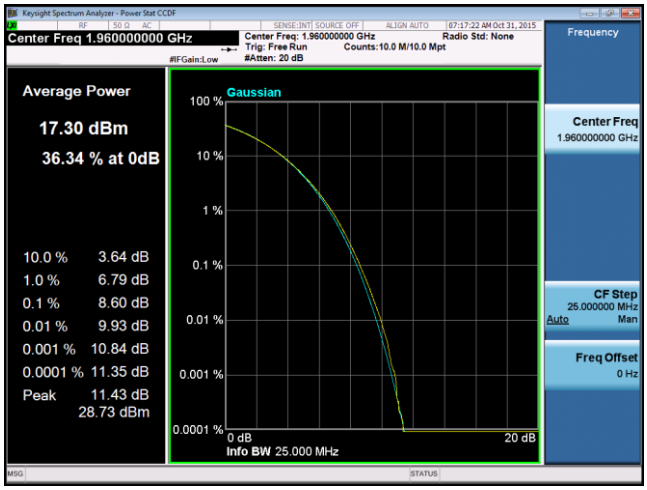
PK-AV-Ratio- Band2-QPSK-5M BW-Low



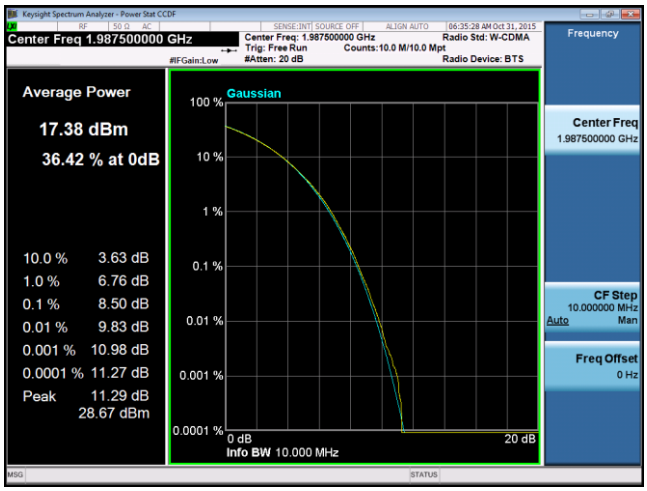
PK-AV-Ratio- Band2-QPSK-15M BW-Low



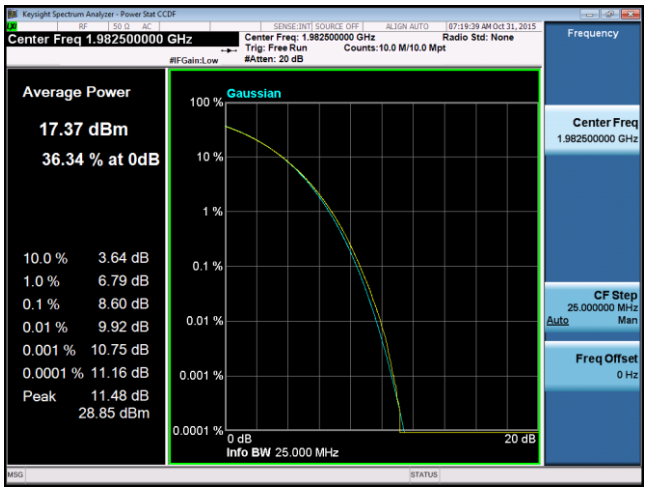
PK-AV-Ratio- Band2-QPSK-5M BW-Mid



PK-AV-Ratio- Band2-QPSK-15M BW-Mid



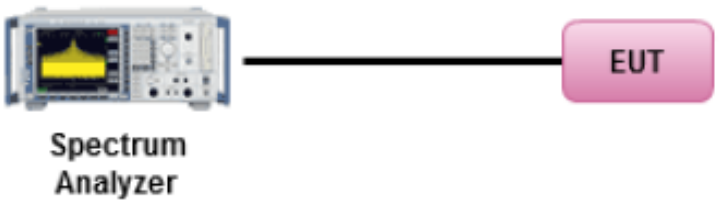
PK-AV-Ratio- Band2-QPSK-5M BW-High



PK-AV-Ratio- Band2-QPSK-15M BW-High

10.3 Occupied Bandwidth

Requirement(s):

Spec	Requirement	Applicable
47 CFR §2.1049	The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions of § 2.1049 (a) through (i)	☒
Test Setup		
Procedure	99% Occupied bandwidth measurement procedure - Allow the trace to stabilize. - Use the spectrum analyzer built-in measurement function to determine the 26 dB bandwidth 99% OBW. o Set RBW = 1% -5% of Emission Bandwidth o Set VBW = approximately 3 x RBW o Detector = Peak o Trace mode = max hold o Sweep = auto couple - Capture the plot. Repeat above steps for different test channel and other modulation type.	

Test Date	04/30/2015 – 05/03/2015 10/26/2015 – 11/02/2015	Environmental condition	Temperature 23°C Relative Humidity 48% Atmospheric Pressure 1008mbar
Remark	NONE		
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test Data

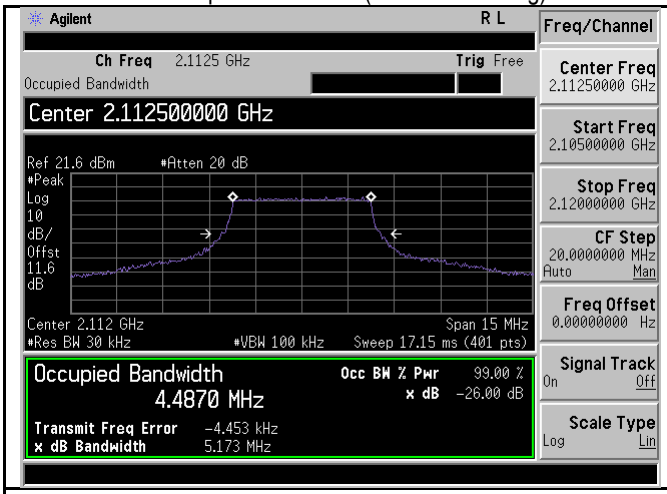
99% Bandwidth measurement result for LTE band 4:

Type	Channel	Channel Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Occupied Bandwidth (MHz)
5MHz BW, QPSK	Low	2112.5	4.487	5.173
	Mid	2132.5	4.481	5.228
	High	2152.5	4.497	5.137
5MHz BW, 64QAM	Low	2112.5	4.479	5.107
	Mid	2132.5	4.488	5.044
	High	2152.5	4.479	5.011
10MHz BW, QPSK	Low	2115.0	8.931	9.609
	Mid	2132.5	8.916	9.756
	High	2150.0	8.933	9.789
10MHz BW, 64QAM	Low	2115.0	8.936	9.751
	Mid	2132.5	8.913	9.648
	High	2150.0	8.931	9.725
15MHz BW, QPSK	Low	2117.5	13.402	14.309
	Mid	2132.5	13.379	14.431
	High	2147.5	13.361	14.332
15MHz BW, 64QAM	Low	2117.5	13.401	14.430
	Mid	2132.5	13.399	14.315
	High	2147.5	13.370	14.045
20MHz BW, QPSK	Low	2120.0	17.808	18.828
	Mid	2132.5	17.782	18.623
	High	2145.0	17.992	18.756
20MHz BW, 64QAM	Low	2120.0	17.819	18.685
	Mid	2132.5	17.808	18.712
	High	2145.0	17.805	18.607

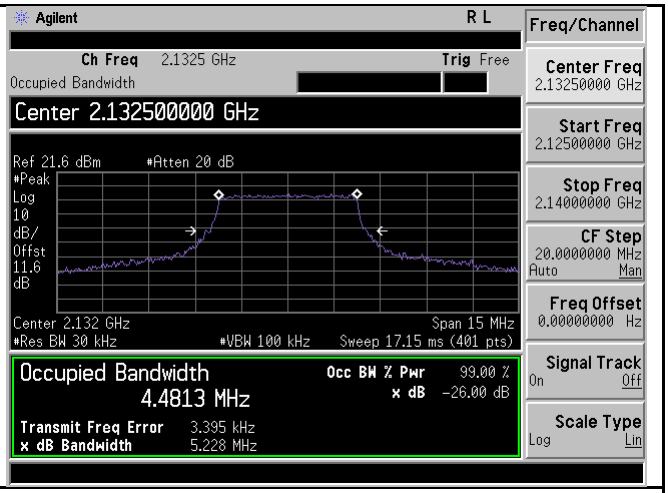
99% Bandwidth measurement result for LTE band 2:

Type	Channel	Channel Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Occupied Bandwidth (MHz)
5MHz BW, QPSK	Low	1932.5	4.41	4.63
	Mid	1960.0	4.42	4.67
	High	1987.5	4.43	4.67
5MHz BW, 64QAM	Low	1932.5	4.41	4.63
	Mid	1960.0	4.40	4.63
	High	1987.5	4.40	4.64
10MHz BW, QPSK	Low	1935.0	8.88	9.22
	Mid	1960.0	8.85	9.24
	High	1985.0	8.85	9.22
10MHz BW, 64QAM	Low	1935.0	8.88	9.22
	Mid	1960.0	8.86	9.18
	High	1985.0	8.86	9.21
15MHz BW, QPSK	Low	1937.5	13.27	13.77
	Mid	1960.0	13.27	13.88
	High	1982.5	13.26	13.70
15MHz BW, 64QAM	Low	1937.5	13.26	13.82
	Mid	1960.0	13.27	13.72
	High	1982.5	13.28	13.88
20MHz BW, QPSK	Low	1940.0	17.54	18.19
	Mid	1960.0	17.59	18.19
	High	1980.0	17.57	18.18
20MHz BW, 64QAM	Low	1940.0	17.59	18.14
	Mid	1960.0	17.49	18.14
	High	1980.0	17.46	18.15

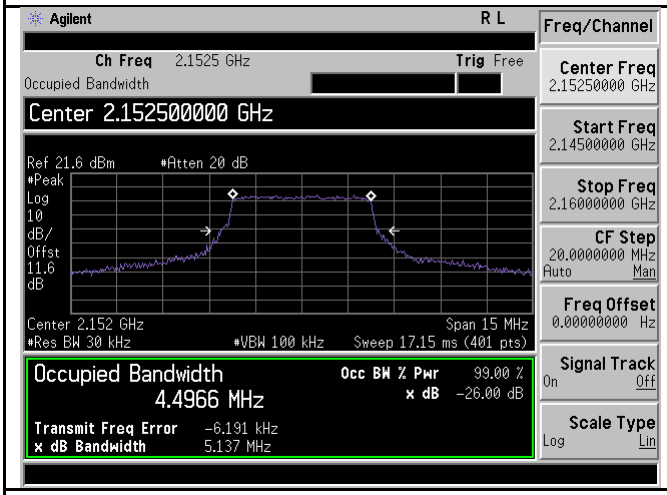
Test Plot for Occupied Bandwidth (5MHz BW setting)



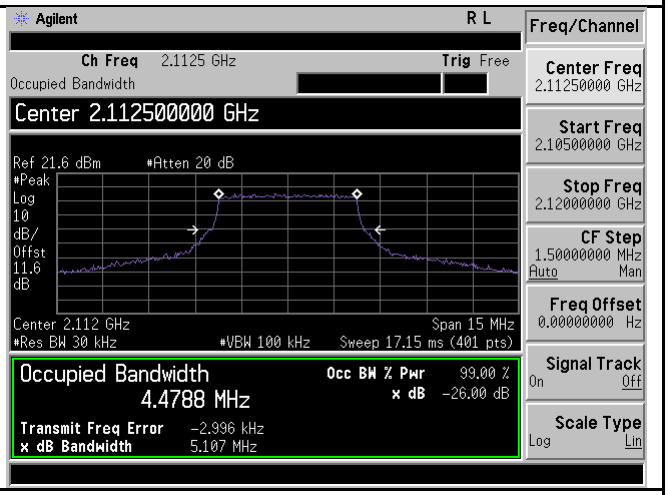
OBW-Band4-5M BW-Low- QPSK



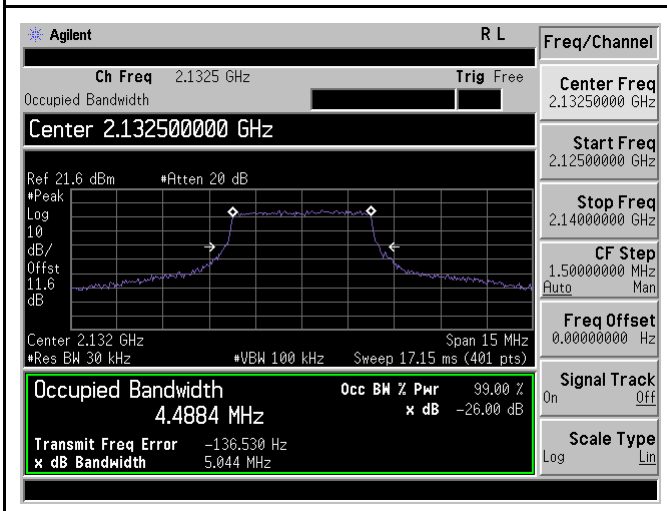
OBW-Band4-5M BW-Mid- QPSK



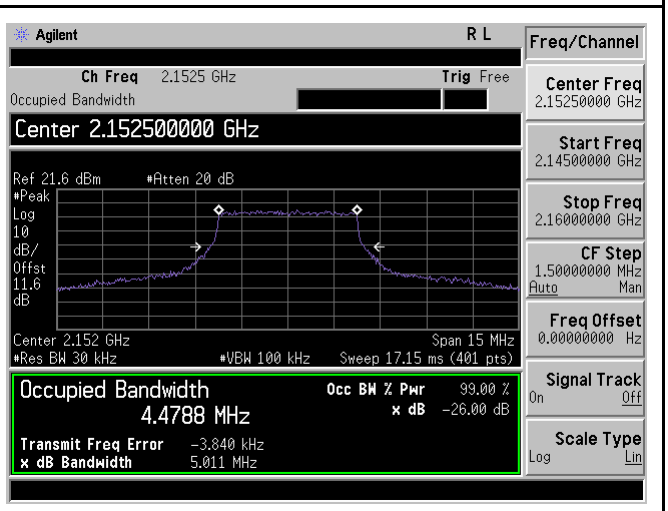
OBW-Band4-5M BW-High- QPSK



OBW-Band4-5M BW-Low- 64QAM

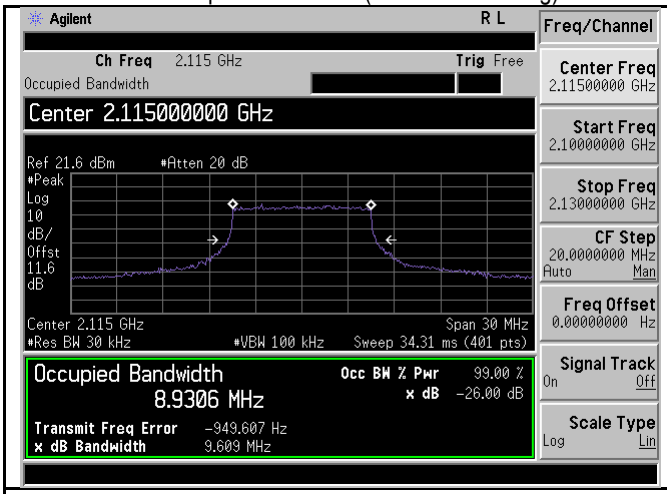


OBW-Band4-5M BW-Mid- 64QAM

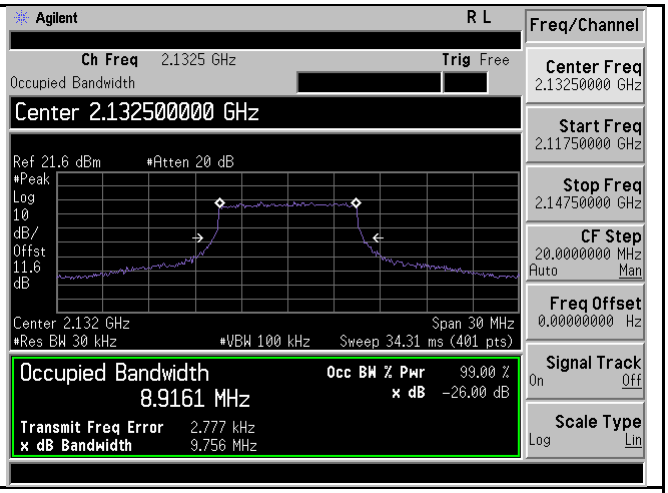


OBW-Band4-5M BW-High- 64QAM

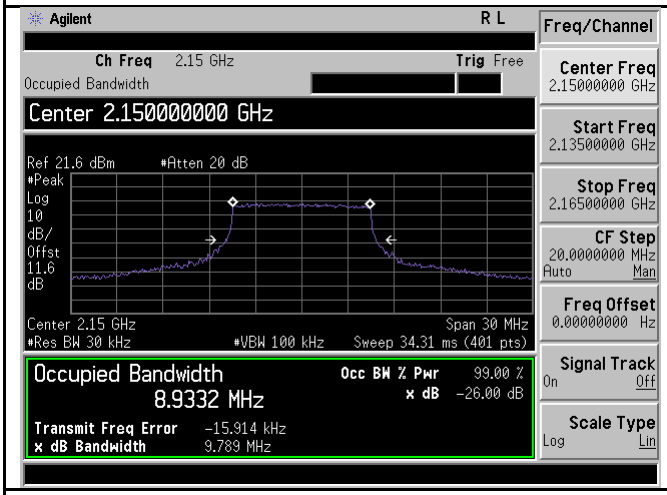
Test Plot for Occupied Bandwidth (10MHz BW setting)



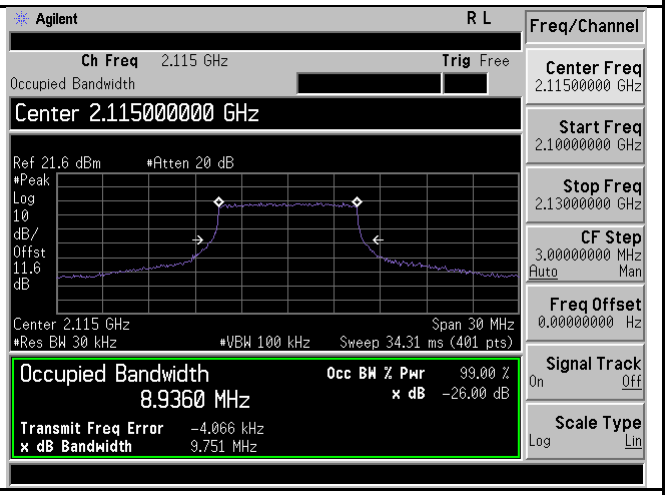
OBW-Band4-10M BW-Low- QPSK



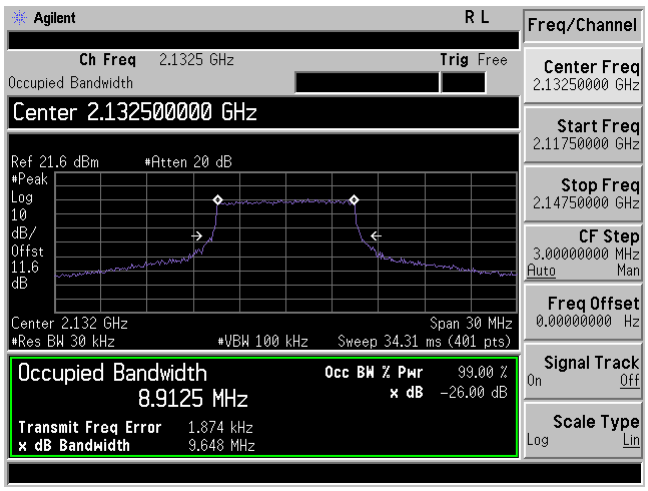
OBW-Band4-10M BW-Mid- QPSK



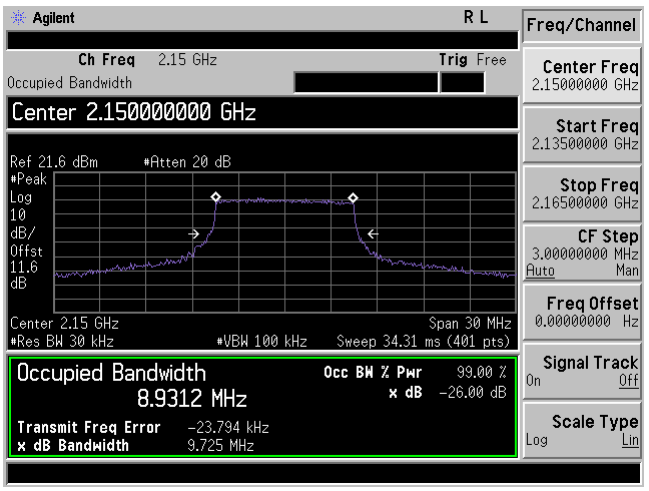
OBW-Band4-10M BW-High- QPSK



OBW-Band4-10M BW-Low- 64QAM

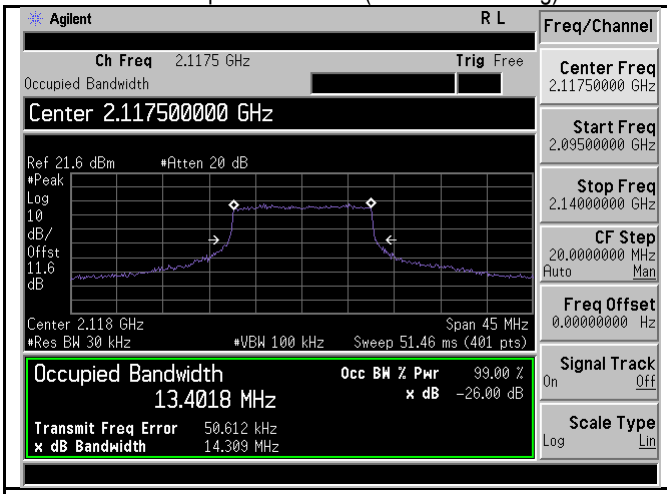


OBW-Band4-10M BW-Mid- 64QAM

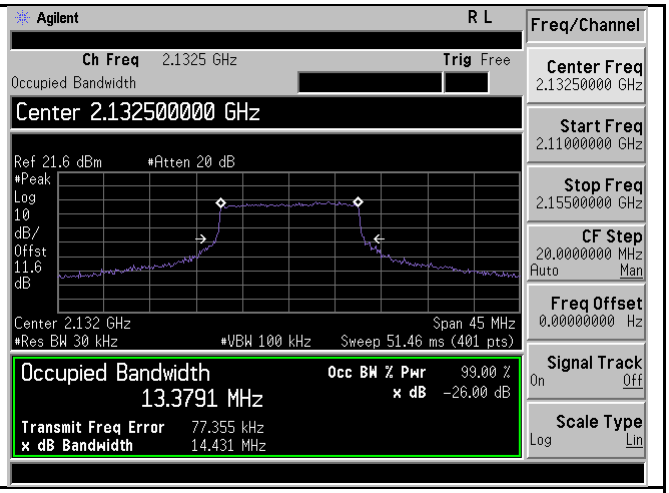


OBW-Band4-10M BW-High- 64QAM

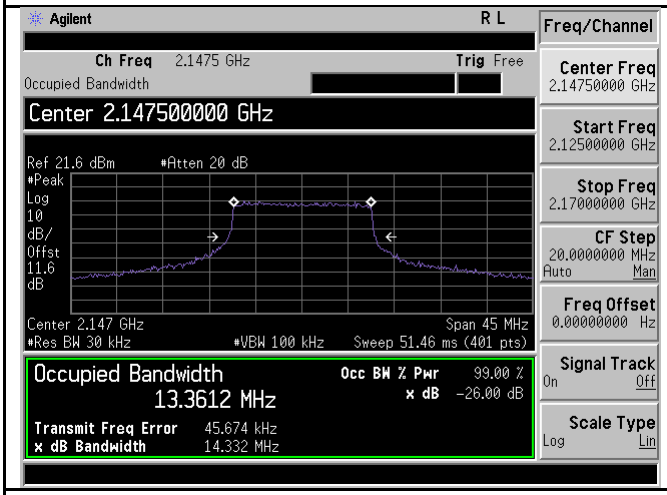
Test Plot for Occupied Bandwidth (15MHz BW setting)



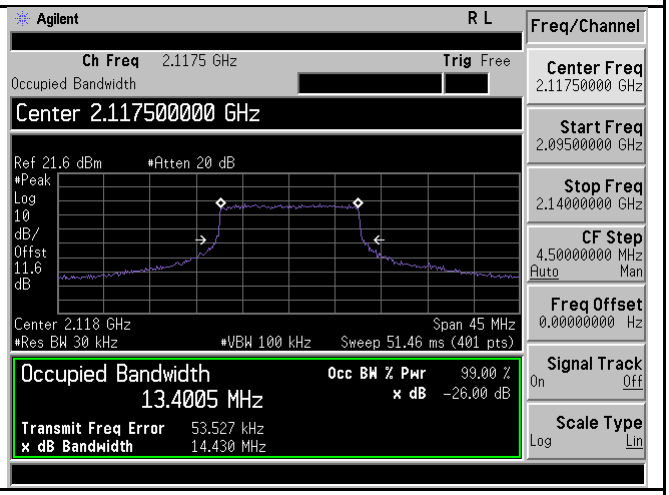
OBW-Band4-15M BW-Low- QPSK



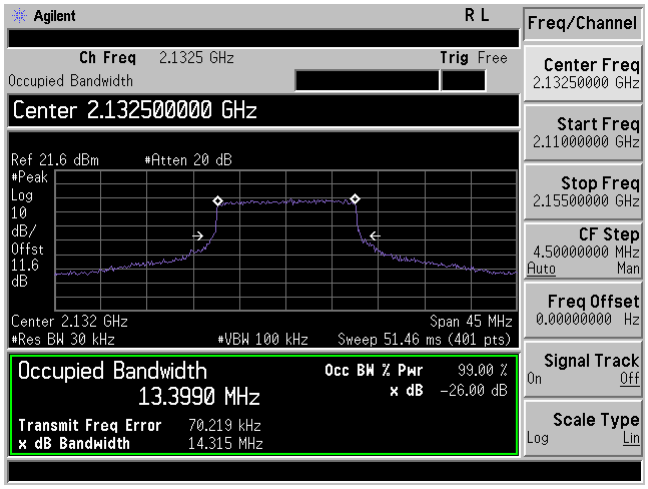
OBW-Band4-15M BW-Mid- QPSK



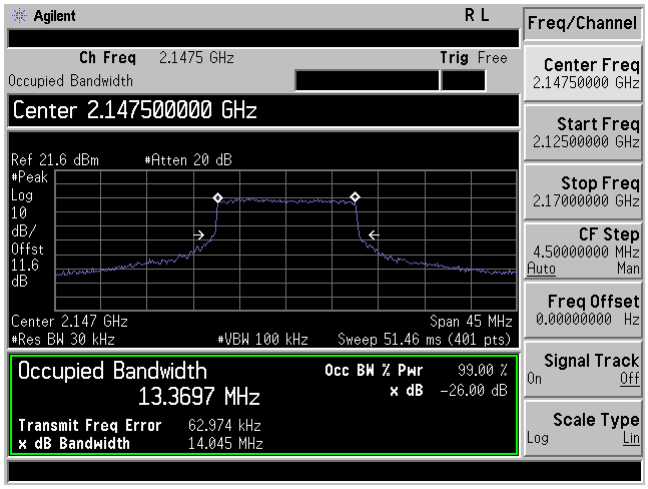
OBW-Band4-15M BW-High- QPSK



OBW-Band4-15M BW-Low- 64QAM

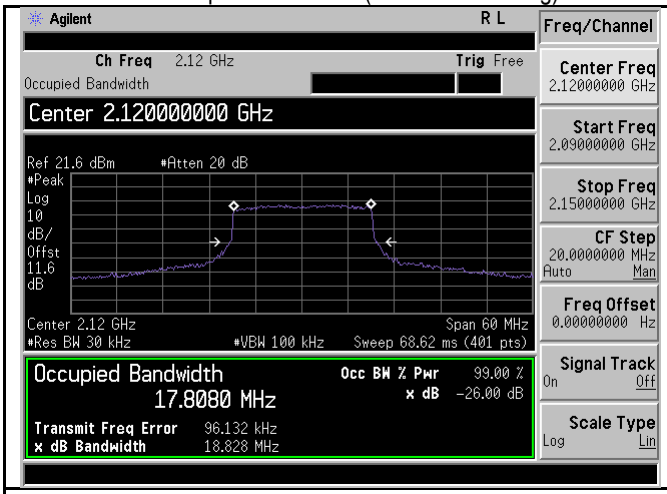


OBW-Band4-15M BW-Mid- 64QAM

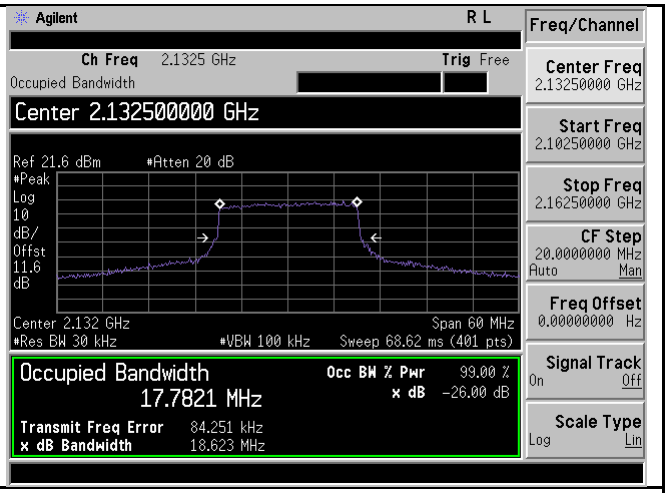


OBW-Band4-15M BW-High- 64QAM

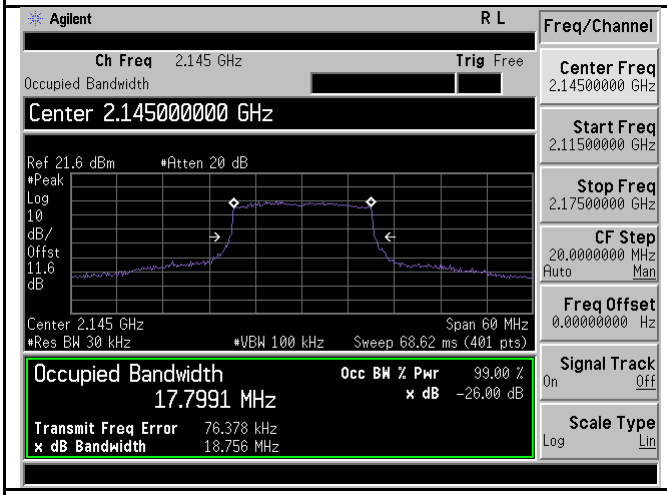
Test Plot for Occupied Bandwidth (20MHz BW setting)



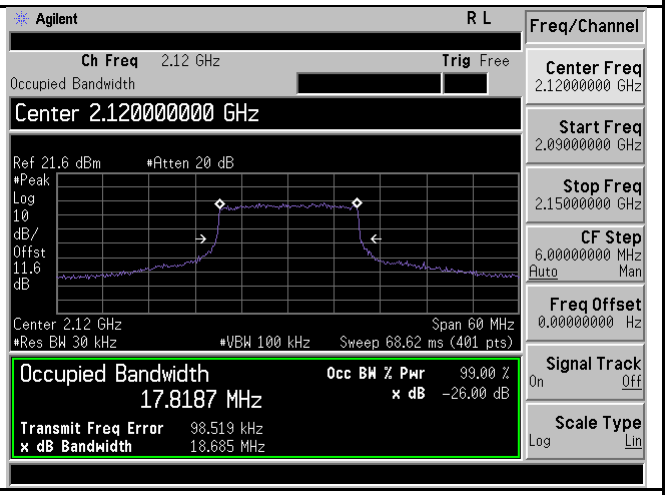
OBW-Band4-20M BW-Low- QPSK



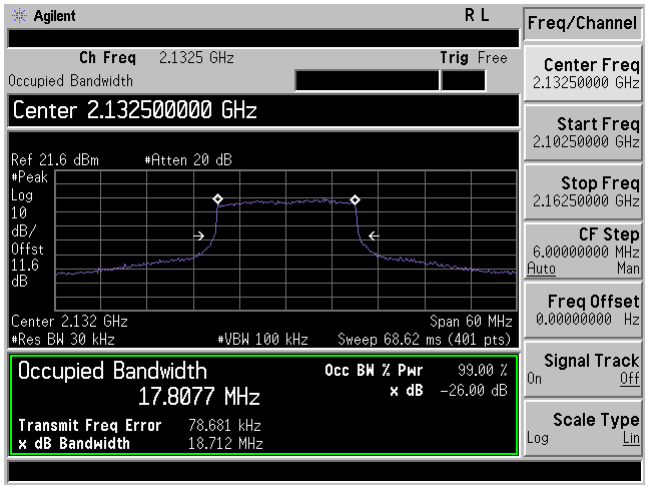
OBW-Band4-20M BW-Mid- QPSK



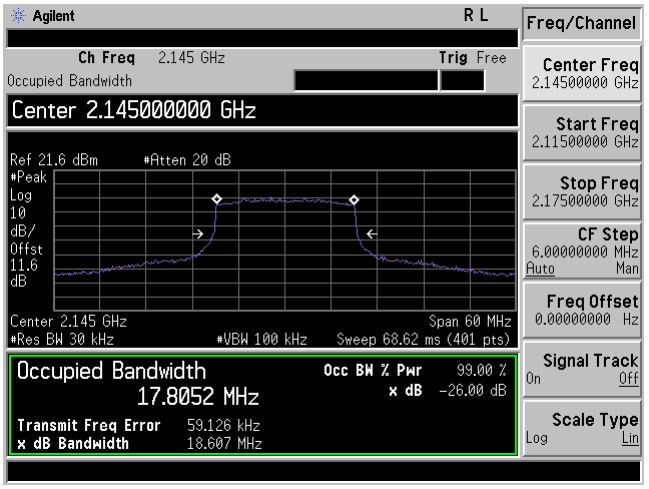
OBW-Band4-20M BW-High- QPSK



OBW-Band4-20M BW-Low- 64QAM



OBW-Band4-20M BW-Mid- 64QAM



OBW-Band4-20M BW-High- 64QAM