Radiated Power (ERP) for Band 5										
Mode	RB/ RB SIZE	Frequency	Result							Conclusion
			SG Level (dBm)	Cable Loss (dBm)	Antenna Gain (dB)	Correction (dB)	Max. EIRP Average (dBm)	Max. EIRP Average (mW)	Polarization Of Max. ERP	
1.4MHz Band QPSK	6/0	824.7	6.33	2.01	19.68	2.15	21.85	153.109	Horizontal	Pass
		836.5	6.36	2.01	19.77	2.15	21.97	157.398	Horizontal	Pass
		848.3	6.21	2.02	19.82	2.15	21.86	153.462	Horizontal	Pass
1.4MHz Band 16 QAM	6/0	824.7	5.66	2.01	19.68	2.15	21.18	131.220	Horizontal	Pass
		836.5	5.61	2.01	19.77	2.15	21.22	132.434	Horizontal	Pass
		848.3	5.54	2.02	19.82	2.15	21.19	131.522	Horizontal	Pass
3.0MHz Band QPSK	15/0	825.5	6.34	2.01	19.70	2.15	21.88	154.170	Horizontal	Pass
		836.5	6.30	2.01	19.77	2.15	21.91	155.239	Horizontal	Pass
		847.5	6.25	2.02	19.81	2.15	21.89	154.525	Horizontal	Pass
3.0MHz Band 16 QAM	15/0	825.5	5.70	2.01	19.70	2.15	21.24	133.045	Horizontal	Pass
		836.5	5.57	2.01	19.77	2.15	21.18	131.220	Horizontal	Pass
		847.5	5.59	2.02	19.81	2.15	21.23	132.739	Horizontal	Pass
5.0MHz Band QPSK	25/0	826.5	6.24	2.01	19.71	2.15	21.79	151.008	Horizontal	Pass
		836.5	6.30	2.01	19.77	2.15	21.91	155.239	Horizontal	Pass
		846.5	6.22	2.02	19.79	2.15	21.84	152.757	Horizontal	Pass
5.0MHz Band 16 QAM	25/0	826.5	5.61	2.01	19.71	2.15	21.16	130.617	Horizontal	Pass
		836.5	5.53	2.01	19.77	2.15	21.14	130.017	Horizontal	Pass
		846.5	5.58	2.02	19.79	2.15	21.20	131.826	Horizontal	Pass
10.0MHz Band QPSK	50/0	829	6.35	2.01	19.73	2.15	21.92	155.597	Horizontal	Pass
		836.5	6.29	2.01	19.77	2.15	21.90	154.882	Horizontal	Pass
		844	6.26	2.02	19.78	2.15	21.87	153.815	Horizontal	Pass
10.0MHz Band 16 QAM	50/0	829	5.56	2.01	19.73	2.15	21.13	129.718	Horizontal	Pass
		836.5	5.65	2.01	19.77	2.15	21.26	133.660	Horizontal	Pass
		844	5.60	2.02	19.78	2.15	21.21	132.130	Horizontal	Pass

Note:
SG Level= Signal generator output
Max. EIRP Average (dBm)= Antenna Gain(dB)+ SG Level (dBm)- Cable Loss(dBm)

8.5 LTE BAND 7

Radiated Power (EIRP) for Band 7									
Mode	RB/ RB SIZE	Frequency	Result						Conclusion
			SG Level (dBm)	Cable Loss (dBm)	Antenna Gain (dB)	Max. EIRP Average (dBm)	Max. EIRP Average (mW)	Polarization Of Max. ERP	
5.0MHz Band QPSK	25/0	2502.5	-2.70	4.54	27.75	20.51	112.460	Vertical	Pass
		2535	-2.84	4.69	27.72	20.19	104.472	Vertical	Pass
		2567.5	-2.57	4.71	27.71	20.43	110.408	Vertical	Pass
5.0MHz Band 16 QAM	25/0	2502.5	-3.23	4.54	27.75	19.98	99.541	Vertical	Pass
		2535	-3.26	4.69	27.72	19.77	94.842	Vertical	Pass
		2567.5	-3.15	4.71	27.71	19.85	96.605	Vertical	Pass
10.0MHz Band QPSK	50/0	2505	-2.58	4.55	27.76	20.63	115.611	Vertical	Pass
		2535	-2.51	4.69	27.72	20.52	112.720	Vertical	Pass
		2565	-2.52	4.72	27.70	20.46	111.173	Vertical	Pass
10.0MHz Band 16 QAM	50/0	2505	-3.40	4.55	27.76	19.81	95.719	Vertical	Pass
		2535	-3.17	4.69	27.72	19.86	96.828	Vertical	Pass
		2565	-3.25	4.72	27.70	19.73	93.972	Vertical	Pass
15.0MHz Band QPSK	75/0	2507.5	-2.78	4.55	27.77	20.44	110.662	Vertical	Pass
		2535	-2.54	4.69	27.72	20.49	111.944	Vertical	Pass
		2562.5	-2.44	4.72	27.69	20.53	112.980	Vertical	Pass
15.0MHz Band 16 QAM	75/0	2507.5	-3.31	4.55	27.77	19.91	97.949	Vertical	Pass
		2535	-3.19	4.69	27.72	19.84	96.383	Vertical	Pass
		2562.5	-3.09	4.72	27.69	19.88	97.275	Vertical	Pass
20.0MHz Band QPSK	100/0	2510	-2.77	4.57	27.78	20.44	110.662	Vertical	Pass
		2535	-2.52	4.73	27.72	20.47	111.429	Vertical	Pass
		2560	-2.50	4.75	27.68	20.43	110.408	Vertical	Pass
20.0MHz Band 16 QAM	100/0	2510	-3.36	4.57	27.78	19.85	96.605	Vertical	Pass
		2535	-3.16	4.73	27.72	19.83	96.161	Vertical	Pass
		2560	-3.14	4.75	27.68	19.79	95.280	Vertical	Pass

Note:

SG Level= Signal generator output

Max. EIRP Average (dBm)= Antenna Gain(dB)+ SG Level (dBm)- Cable Loss(dBm)

Radiated Power (EIRP) for Band 7									
Mode	RB/ RB SIZE	Frequency	Result						Conclusion
			SG Level (dBm)	Cable Loss (dBm)	Antenna Gain (dB)	Max. EIRP Average (dBm)	Max. EIRP Average (mW)	Polarization Of Max. ERP	
5.0MHz Band QPSK	25/0	2502.5	-2.97	4.54	27.75	20.24	105.682	Horizontal	Pass
		2535	-2.84	4.69	27.72	20.19	104.472	Horizontal	Pass
		2567.5	-2.79	4.71	27.71	20.21	104.954	Horizontal	Pass
5.0MHz Band 16 QAM	25/0	2502.5	-3.47	4.54	27.75	19.74	94.189	Horizontal	Pass
		2535	-3.38	4.69	27.72	19.65	92.257	Horizontal	Pass
		2567.5	-3.48	4.71	27.71	19.52	89.536	Horizontal	Pass
10.0MHz Band QPSK	50/0	2505	-3.10	4.55	27.76	20.11	102.565	Horizontal	Pass
		2535	-2.79	4.69	27.72	20.24	105.682	Horizontal	Pass
		2565	-2.79	4.72	27.70	20.19	104.472	Horizontal	Pass
10.0MHz Band 16 QAM	50/0	2505	-3.67	4.55	27.76	19.54	89.950	Horizontal	Pass
		2535	-3.47	4.69	27.72	19.56	90.365	Horizontal	Pass
		2565	-3.40	4.72	27.70	19.58	90.782	Horizontal	Pass
15.0MHz Band QPSK	75/0	2507.5	-2.98	4.55	27.77	20.24	105.682	Horizontal	Pass
		2535	-2.77	4.69	27.72	20.26	106.170	Horizontal	Pass
		2562.5	-2.66	4.72	27.69	20.31	107.399	Horizontal	Pass
15.0MHz Band 16 QAM	75/0	2507.5	-3.93	4.55	27.77	19.29	84.918	Horizontal	Pass
		2535	-3.77	4.69	27.72	19.26	84.333	Horizontal	Pass
		2562.5	-3.70	4.72	27.69	19.27	84.528	Horizontal	Pass
20.0MHz Band QPSK	100/0	2510	-2.93	4.57	27.78	20.28	106.660	Horizontal	Pass
		2535	-2.80	4.73	27.72	20.19	104.472	Horizontal	Pass
		2560	-2.71	4.75	27.68	20.22	105.196	Horizontal	Pass
20.0MHz Band 16 QAM	100/0	2510	-3.87	4.57	27.78	19.34	85.901	Horizontal	Pass
		2535	-3.75	4.73	27.72	19.24	83.946	Horizontal	Pass
		2560	-3.64	4.75	27.68	19.29	84.918	Horizontal	Pass

Note:
SG Level= Signal generator output
Max. EIRP Average (dBm)= Antenna Gain(dB)+ SG Level (dBm)- Cable Loss(dBm)

8.6 LTE BAND 12

Radiated Power (ERP) for Band 12										
Mode	RB/ RB SIZE	Frequency	Result							Conclusion
			SG Level (dBm)	Cable Loss (dBm)	Antenna Gain (dB)	Correction (dB)	Max. EIRP Average (dBm)	Max. EIRP Average (mW)	Polarization Of Max. ERP	
1.4MHz Band QPSK	6/0	699.7	6.73	1.91	19.21	2.15	21.88	154.170	Vertical	Pass
		707.5	6.69	1.91	19.26	2.15	21.89	154.525	Vertical	Pass
		715.3	6.66	1.93	19.34	2.15	21.92	155.597	Vertical	Pass
1.4MHz Band 16 QAM	6/0	699.7	6.09	1.91	19.21	2.15	21.24	133.045	Vertical	Pass
		707.5	5.97	1.91	19.26	2.15	21.17	130.918	Vertical	Pass
		715.3	6.00	1.93	19.34	2.15	21.26	133.660	Vertical	Pass
3.0MHz Band QPSK	15/0	700.5	6.76	1.91	19.21	2.15	21.91	155.239	Vertical	Pass
		707.5	6.66	1.91	19.26	2.15	21.86	153.462	Vertical	Pass
		714.5	6.55	1.93	19.34	2.15	21.81	151.705	Vertical	Pass
3.0MHz Band 16 QAM	15/0	700.5	6.17	1.91	19.21	2.15	21.32	135.519	Vertical	Pass
		707.5	6.06	1.91	19.26	2.15	21.26	133.660	Vertical	Pass
		714.5	5.98	1.93	19.34	2.15	21.24	133.045	Vertical	Pass
5.0MHz Band QPSK	25/0	701.5	6.69	1.91	19.23	2.15	21.86	153.462	Vertical	Pass
		707.5	6.70	1.91	19.26	2.15	21.90	154.882	Vertical	Pass
		713.5	6.62	1.92	19.33	2.15	21.88	154.170	Vertical	Pass
5.0MHz Band 16 QAM	25/0	701.5	6.05	1.91	19.23	2.15	21.22	132.434	Vertical	Pass
		707.5	6.03	1.91	19.26	2.15	21.23	132.739	Vertical	Pass
		713.5	5.93	1.92	19.33	2.15	21.19	131.522	Vertical	Pass
10.0MHz Band QPSK	50/0	704	6.72	1.91	19.25	2.15	21.91	155.239	Vertical	Pass
		707.5	6.62	1.91	19.26	2.15	21.82	152.055	Vertical	Pass
		711	6.60	1.92	19.32	2.15	21.85	153.109	Vertical	Pass
10.0MHz Band 16 QAM	50/0	704	6.04	1.91	19.25	2.15	21.23	132.739	Vertical	Pass
		707.5	6.07	1.91	19.26	2.15	21.27	133.968	Vertical	Pass
		711	5.86	1.92	19.32	2.15	21.11	129.122	Vertical	Pass

Radiated Power (EIRP) for Band 12										
Mode	RB/ RB SIZE	Frequency	Result							Conclusion
			SG Level (dBm)	Cable Loss (dBm)	Antenna Gain (dB)	Correction (dB)	Max. EIRP Average (dBm)	Max. EIRP Average (mW)	Polarization Of Max. ERP	
1.4MHz Band QPSK	6/0	699.7	6.42	1.91	19.21	2.15	21.57	143.549	Horizontal	Pass
		707.5	6.29	1.91	19.26	2.15	21.49	140.929	Horizontal	Pass
		715.3	6.18	1.93	19.34	2.15	21.44	139.316	Horizontal	Pass
1.4MHz Band 16 QAM	6/0	699.7	5.52	1.91	19.21	2.15	20.67	116.681	Horizontal	Pass
		707.5	5.75	1.91	19.26	2.15	20.95	124.451	Horizontal	Pass
		715.3	5.58	1.93	19.34	2.15	20.84	121.339	Horizontal	Pass
3.0MHz Band QPSK	15/0	700.5	6.32	1.91	19.21	2.15	21.47	140.281	Horizontal	Pass
		707.5	6.36	1.91	19.26	2.15	21.56	143.219	Horizontal	Pass
		714.5	6.26	1.93	19.34	2.15	21.52	141.906	Horizontal	Pass
3.0MHz Band 16 QAM	15/0	700.5	5.78	1.91	19.21	2.15	20.93	123.880	Horizontal	Pass
		707.5	5.66	1.91	19.26	2.15	20.86	121.899	Horizontal	Pass
		714.5	5.51	1.93	19.34	2.15	20.77	119.399	Horizontal	Pass
5.0MHz Band QPSK	25/0	701.5	6.27	1.91	19.23	2.15	21.44	139.316	Horizontal	Pass
		707.5	6.29	1.91	19.26	2.15	21.49	140.929	Horizontal	Pass
		713.5	6.20	1.92	19.33	2.15	21.46	139.959	Horizontal	Pass
5.0MHz Band 16 QAM	25/0	701.5	5.68	1.91	19.23	2.15	20.85	121.619	Horizontal	Pass
		707.5	5.47	1.91	19.26	2.15	20.67	116.681	Horizontal	Pass
		713.5	5.60	1.92	19.33	2.15	20.86	121.899	Horizontal	Pass
10.0MHz Band QPSK	50/0	704	6.36	1.91	19.25	2.15	21.55	142.889	Horizontal	Pass
		707.5	6.31	1.91	19.26	2.15	21.51	141.579	Horizontal	Pass
		711	6.24	1.92	19.32	2.15	21.49	140.929	Horizontal	Pass
10.0MHz Band 16 QAM	50/0	704	5.60	1.91	19.25	2.15	20.79	119.950	Horizontal	Pass
		707.5	5.61	1.91	19.26	2.15	20.81	120.504	Horizontal	Pass
		711	5.57	1.92	19.32	2.15	20.82	120.781	Horizontal	Pass

Note:
SG Level= Signal generator output
Max. EIRP Average (dBm)= Antenna Gain(dB)+ SG Level (dBm)- Cable Loss(dBm)

8.7 LTE BAND 17

Radiated Power (ERP) for Band 17										
Mode	RB/ RB SIZE	Frequency	Result							Conclusion
			SG Level (dBm)	Cable Loss (dBm)	Antenna Gain (dB)	Correction (dB)	Max. EIRP Average (dBm)	Max. EIRP Average (mW)	Polarization Of Max. ERP	
5.0MHz Band QPSK	25/0	706.5	6.87	1.91	19.23	2.15	22.04	159.956	Vertical	Pass
		710	6.91	1.91	19.26	2.15	22.11	162.555	Vertical	Pass
		713.5	6.69	1.92	19.33	2.15	21.95	156.675	Vertical	Pass
5.0MHz Band 16 QAM	25/0	706.5	6.25	1.91	19.23	2.15	21.42	138.676	Vertical	Pass
		710	6.19	1.91	19.26	2.15	21.39	137.721	Vertical	Pass
		713.5	6.18	1.92	19.33	2.15	21.44	139.316	Vertical	Pass
10.0MHz Band QPSK	50/0	709	6.77	1.91	19.25	2.15	21.96	157.036	Vertical	Pass
		710	6.81	1.91	19.26	2.15	22.01	158.855	Vertical	Pass
		711	6.68	1.92	19.32	2.15	21.93	155.955	Vertical	Pass
10.0MHz Band 16 QAM	50/0	709	6.10	1.91	19.25	2.15	21.29	134.586	Vertical	Pass
		710	6.11	1.91	19.26	2.15	21.31	135.207	Vertical	Pass
		711	6.07	1.92	19.32	2.15	21.32	135.519	Vertical	Pass

Radiated Power (ERP) for Band 17										
Mode	RB/ RB SIZE	Frequency	Result							Conclusion
			SG Level (dBm)	Cable Loss (dBm)	Antenna Gain (dB)	Correction (dB)	Max. EIRP Average (dBm)	Max. EIRP Average (mW)	Polarization Of Max. ERP	
5.0MHz Band QPSK	25/0	706.5	6.32	1.91	19.23	2.15	21.49	140.929	Horizontal	Pass
		710	6.31	1.91	19.26	2.15	21.51	141.579	Horizontal	Pass
		713.5	6.27	1.92	19.33	2.15	21.53	142.233	Horizontal	Pass
5.0MHz Band 16 QAM	25/0	706.5	5.84	1.91	19.23	2.15	21.01	126.183	Horizontal	Pass
		710	5.92	1.91	19.26	2.15	21.12	129.420	Horizontal	Pass
		713.5	5.83	1.92	19.33	2.15	21.09	128.529	Horizontal	Pass
10.0MHz Band QPSK	50/0	709	6.33	1.91	19.25	2.15	21.52	141.906	Horizontal	Pass
		710	6.33	1.91	19.26	2.15	21.53	142.233	Horizontal	Pass
		711	6.23	1.92	19.32	2.15	21.48	140.605	Horizontal	Pass
10.0MHz Band 16 QAM	50/0	709	5.84	1.91	19.25	2.15	21.03	126.765	Horizontal	Pass
		710	5.83	1.91	19.26	2.15	21.03	126.765	Horizontal	Pass
		711	5.80	1.92	19.32	2.15	21.05	127.350	Horizontal	Pass

Note:
SG Level= Signal generator output
Max. EIRP Average (dBm)= Antenna Gain(dB)+ SG Level (dBm)- Cable Loss(dBm)

9. FIELD STRENGTH OF SPURIOUS RADIATION

RULE PART(S)

FCC: §2.1053, §22.917, §24.238 and §27.53

LIMIT

§22.917 (e) and §24.238 (a): Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

§27.53 (g) For operations in the 698–746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB.

§27.53 (h) For operations in the 1710–1755 MHz and 2110–2155 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least 43 + 10 log10(P) dB.

TEST PROCEDURE

For Cellular equipment - Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. 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. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 100 kHz or 1 percent of emission bandwidth, as specified). 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 emissions are attenuated at least 26 dB below the transmitter power.

For PCS equipment - Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. 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. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). 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 emissions are attenuated at least 26 dB below the transmitter power.

The unwanted emission power shall be measured with a resolution bandwidth of at least 1% of the occupied bandwidth in the 1 MHz band immediately outside and adjacent to the channel edge of the equipment. Beyond the 1 MHz band immediately outside the channel edge of the equipment, a resolution bandwidth of 1 MHz shall be employed. A narrower resolution bandwidth is allowed to be used provided that the measured power is integrated over the full required measurement bandwidth of 1 MHz or 1% of the occupied bandwidth as applicable.

The power of any unwanted emissions measured from the channel edge of the equipment shall be attenuated below the transmitter power, P (dBW), as follows:
a. for base station and subscriber equipment, other than mobile subscriber equipment, the attenuation shall not be less than 43 + 10 Log10 (p), dB; and
b. for mobile subscriber equipment, the attenuation shall not be less than 43 + 10 Log10 (p), dB at the channel edges and 55 + 10 Log10 (p) at 5.5 MHz away and beyond the channel edges where p in (a) and (b) is the transmitter power measured in watts.

MODES TESTED

- ☐ LTE Band 2
- LTE Band 4
- ☐ LTE Band 5
- LTE Band 7
- LTE Band 12
- LTE Band 17

RESULTS

PASS

9.1 LTE BAND 2

QPSK EIRP POWER FOR LTE BAND 2 (1.4MHZ BANDWIDTH)

Test Results for Low Channel 1850.7MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Gain(dB)	Absolute Level(dBm)	Limit （dBm）	Margin(dBm)	Polarity
3701.4	-53.21	4.04	33.51	-23.74	-13	-10.74	Horizontal
3701.4	-55.69	4.04	33.51	-26.22	-13	-13.22	Vertical
5552.1	-57.41	5.24	35.84	-26.81	-13	-13.81	Vertical
5552.1	-59.85	5.24	35.84	-29.25	-13	-16.25	Horizontal
Test Results for Mid Channel 1880MHz							
3760	-59.63	4.04	33.56	-30.11	-13	-17.11	Horizontal
3760	-55.41	4.04	33.56	-25.89	-13	-12.89	Vertical
5640	-56.85	5.24	35.91	-26.18	-13	-13.18	Vertical
5640	-57.84	5.24	35.91	-27.17	-13	-14.17	Horizontal
Test Results for High Channel 1909.3MHz							
3818.6	-54.29	4.04	34.00	-24.33	-13	-11.33	Horizontal
3818.6	-56.85	4.04	34.00	-26.89	-13	-13.89	Vertical
5727.9	-58.51	5.24	36.04	-27.71	-13	-14.71	Vertical
5727.9	-57.63	5.24	36.04	-26.83	-13	-13.83	Horizontal

QPSK EIRP POWER FOR LTE BAND 2 (20.0MHZ BANDWIDTH)

Test Results for Low Channel 1860MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Gain(dB)	Absolute Level(dBm)	Limit （dBm）	Margin(dBm)	Polarity
3720	-57.41	4.07	33.54	-27.94	-13	-14.94	Horizontal
3720	-53.62	4.07	33.54	-24.15	-13	-11.15	Vertical
5580	-59.41	5.28	35.86	-28.83	-13	-15.83	Vertical
5580	-60.85	5.28	35.86	-30.27	-13	-17.27	Horizontal
Test Results for Mid Channel 1880MHz							
3760	-57.36	4.04	33.56	-27.84	-13	-14.84	Horizontal
3760	-54.11	4.04	33.56	-24.59	-13	-11.59	Vertical
5640	-58.65	5.24	35.91	-27.98	-13	-14.98	Vertical
5640	-59.63	5.24	35.91	-28.96	-13	-15.96	Horizontal
Test Results for High Channel 1900MHz							
3800	-55.74	4.04	34.00	-25.78	-13	-12.78	Horizontal
3800	-56.96	4.04	34.00	-27.00	-13	-14.00	Vertical
5700	-57.41	5.24	36.04	-26.61	-13	-13.61	Vertical
5700	-56.63	5.24	36.04	-25.83	-13	-12.83	Horizontal

Note: PMea(dBm)= Power(dBm)+ ARpl (dBm)

. Over Limit= : PMea(dBm)-Limit(dBm)

. We test both H direction and V direction, recorded worst case direction.

9.2 LTE BAND 4

QPSK EIRP POWER FOR LTE BAND 4 (1.4MHZ BANDWIDTH)

Test Results for Low Channel 1710.7MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Gain(dB)	Absolute Level(dBm)	Limit （dBm）	Margin(dBm)	Polarity
3421.4	-58.67	4.02	29.80	-32.89	-13	-19.89	Horizontal
3421.4	-56.94	4.02	29.80	-31.16	-13	-18.16	Vertical
5132.1	-59.41	5.24	35.84	-28.81	-13	-15.81	Vertical
5132.1	-58.63	5.24	35.84	-28.03	-13	-15.03	Horizontal
Test Results for Mid Channel 1732.5MHz							
3465	-57.76	4.03	30.00	-31.79	-13	-18.79	Horizontal
3465	-55.28	4.03	30.00	-29.31	-13	-16.31	Vertical
5197.5	-59.98	5.25	35.86	-29.37	-13	-16.37	Vertical
5197.5	-57.12	5.25	35.86	-26.51	-13	-13.51	Horizontal
Test Results for High Channel 1754.3MHz							
3508.6	-52.36	4.05	30.01	-26.40	-13	-13.40	Horizontal
3508.6	-58.41	4.05	30.01	-32.45	-13	-19.45	Vertical
5262.9	-58.92	5.26	35.86	-28.32	-13	-15.32	Vertical
5262.9	-56.32	5.26	35.86	-25.72	-13	-12.72	Horizontal

QPSK EIRP POWER FOR LTE BAND 4 (20.0MHZ BANDWIDTH)

Test Results for Low Channel 1720MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Gain(dB)	Absolute Level(dBm)	Limit （dBm）	Margin(dBm)	Polarity
3440	-57.44	4.02	29.80	-31.66	-13	-18.66	Horizontal
3440	-58.42	4.02	29.80	-32.64	-13	-19.64	Vertical
5160	-52.85	5.24	35.84	-22.25	-13	-9.25	Vertical
5160	-60.59	5.24	35.84	-29.99	-13	-16.99	Horizontal
Test Results for Mid Channel 1732.5MHz							
3465	-52.11	4.03	30.00	-26.14	-13	-13.14	Horizontal
3465	-55.54	4.03	30.00	-29.57	-13	-16.57	Vertical
5197.5	-62.84	5.25	35.86	-32.23	-13	-19.23	Vertical
5197.5	-59.94	5.25	35.86	-29.33	-13	-16.33	Horizontal
Test Results for High Channel 1745MHz							
2490	-54.42	2.91	27.68	-29.65	-13	-16.65	Horizontal
3490	-56.39	2.91	27.68	-31.62	-13	-18.62	Vertical
5235	-59.74	5.26	35.86	-29.14	-13	-16.14	Vertical
5235	-58.81	5.26	35.86	-28.21	-13	-15.21	Horizontal

Note: PMea(dBm)= Power(dBm)+ ARpl (dBm)

. Over Limit= : PMea(dBm)-Limit(dBm)

. We test both H direction and V direction, recorded worst case direction.

9.3 LTE BAND 5

QPSK EIRP POWER FOR LTE BAND 5 (1.4MHZ BANDWIDTH)

Test Results for Low Channel 824.7MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Gain(dB)	Absolute Level(dBm)	Limit （dBm）	Margin(dBm)	Polarity
1649.4	-54.26	2.78	27.50	-29.54	-13	-16.54	Horizontal
1649.4	-55.28	2.78	27.50	-30.56	-13	-17.56	Vertical
2474.1	-56.93	2.90	27.80	-32.03	-13	-19.03	Vertical
2474.1	-55.41	2.90	27.80	-30.51	-13	-17.51	Horizontal
Test Results For Mid Channel 836.5MHz							
1673	-52.94	2.78	27.48	-28.24	-13	-15.24	Horizontal
1673	-54.97	2.78	27.48	-30.27	-13	-17.27	Vertical
2509.5	-53.62	2.91	27.70	-28.83	-13	-15.83	Vertical
2509.5	-56.21	2.91	27.70	-31.42	-13	-18.42	Horizontal
Test Results for High Channel 848.3MHz							
1696.6	-53.64	2.78	27.43	-28.99	-13	-15.99	Horizontal
1696.6	-55.22	2.78	27.43	-30.57	-13	-17.57	Vertical
2544.9	-52.98	2.92	27.74	-28.16	-13	-15.16	Vertical
2544.9	-56.64	2.92	27.74	-31.82	-13	-18.82	Horizontal

QPSK EIRP POWER FOR LTE BAND 5 (10MHZ BANDWIDTH)

Test Results for Low Channel 829MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Gain(dB)	Absolute Level(dBm)	Limit （dBm）	Margin(dBm)	Polarity
1658	-54.41	2.78	27.50	-29.69	-13	-16.69	Horizontal
1658	-52.98	2.78	27.50	-28.26	-13	-15.26	Vertical
2487	-56.69	2.90	27.80	-31.79	-13	-18.79	Vertical
2487	-53.95	2.90	27.80	-29.05	-13	-16.05	Horizontal
Test Results For Mid Channel 836.5MHz							
1673	-53.42	2.78	27.48	-28.72	-13	-15.72	Horizontal
1673	-53.62	2.78	27.48	-28.92	-13	-15.92	Vertical
2509.5	-55.54	2.91	27.70	-30.75	-13	-17.75	Vertical
2509.5	-53.92	2.91	27.70	-29.13	-13	-16.13	Horizontal
Test Results for High Channel 844MHz							
1688	-56.61	2.78	27.43	-31.96	-13	-18.96	Horizontal
1688	-54.41	2.78	27.43	-29.76	-13	-16.76	Vertical
2532	-53.62	2.92	27.74	-28.80	-13	-15.80	Vertical
2532	-53.92	2.92	27.74	-29.10	-13	-16.10	Horizontal

Note: PMea(dBm)= Power(dBm)+ ARpl (dBm)

. Over Limit= : PMea(dBm)-Limit(dBm)

. We test both H direction and V direction, recorded worst case direction.

9.4 LTE BAND 7

QPSK EIRP POWER FOR LTE BAND 7 (5.0MHZ BANDWIDTH)

Test Results for Low Channel 2502.5MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Gain(dB)	Absolute Level(dBm)	Limit （dBm）	Margin(dBm)	Polarity
5005	-57.18	5.23	35.81	-26.60	-13	-13.60	Horizontal
5005	-55.49	5.23	35.81	-24.91	-13	-11.91	Vertical
7507.5	-58.95	5.67	36.85	-27.77	-13	-14.77	Vertical
7507.5	-55.68	5.67	36.85	-24.50	-13	-11.50	Horizontal
Test Results for Mid Channel 2535MHz							
5070	-54.23	5.23	35.82	-23.64	-13	-10.64	Horizontal
5070	-56.92	5.23	35.82	-26.33	-13	-13.33	Vertical
7605	-57.12	5.67	36.85	-25.94	-13	-12.94	Vertical
7605	-58.67	5.67	36.85	-27.49	-13	-14.49	Horizontal
Test Results for High Channel 2567.5MHz							
5135	-56.96	5.24	35.83	-26.37	-13	-13.37	Horizontal
5135	-55.28	5.24	35.83	-24.69	-13	-11.69	Vertical
7702.5	-57.91	5.68	36.87	-26.72	-13	-13.72	Vertical
7702.5	-58.36	5.68	36.87	-27.17	-13	-14.17	Horizontal

QPSK EIRP POWER FOR LTE BAND 7 (20.0MHZ BANDWIDTH)

Test Results for Low Channel 2510MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Gain(dB)	Absolute Level(dBm)	Limit （dBm）	Margin(dBm)	Polarity
5020	-57.41	5.23	35.82	-26.82	-13	-13.82	Horizontal
5020	-56.96	5.23	35.82	-26.37	-13	-13.37	Vertical
7530	-58.94	5.67	36.86	-27.75	-13	-14.75	Vertical
7530	-54.41	5.67	36.86	-23.22	-13	-10.22	Horizontal
Test Results for Mid Channel 2535MHz							
5070	-55.28	5.23	35.82	-24.69	-13	-11.69	Horizontal
5070	-54.36	5.23	35.82	-23.77	-13	-10.77	Vertical
7605	-57.85	5.67	36.85	-26.67	-13	-13.67	Vertical
7605	-58.92	5.67	36.85	-27.74	-13	-14.74	Horizontal
Test Results for High Channel 2560MHz							
5120	-54.12	5.24	35.83	-23.53	-13	-10.53	Horizontal
5120	-56.96	5.24	35.83	-26.37	-13	-13.37	Vertical
7680	-58.92	5.7	36.88	-27.74	-13	-14.74	Vertical
7680	-58.23	5.7	36.88	-27.05	-13	-14.05	Horizontal

Note: PMea(dBm)= Power(dBm)+ ARpl (dBm)

. Over Limit= : PMea(dBm)-Limit(dBm)

. We test both H direction and V direction, recorded worst case direction.

9.5 LTE BAND 12

QPSK EIRP POWER FOR LTE BAND 12 (1.4MHZ BANDWIDTH)

Test Results for Low Channel 699.7MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Gain(dB)	Absolute Level(dBm)	Limit （dBm）	Margin(dBm)	Polarity
1399.4	-51.41	2.60	27.20	-26.81	-13	-13.81	Horizontal
1399.4	-52.85	2.60	27.20	-28.25	-13	-15.25	Vertical
2099.1	-56.69	2.85	27.54	-32.00	-13	-19.00	Vertical
2099.1	-54.74	2.85	27.54	-30.05	-13	-17.05	Horizontal
Test Results For Mid Channel 707.5MHz							
1415	-53.62	2.61	27.28	-28.95	-13	-15.95	Horizontal
1415	-52.84	2.61	27.28	-28.17	-13	-15.17	Vertical
2122.5	-50.92	2.87	27.59	-26.20	-13	-13.20	Vertical
2122.5	-53.62	2.87	27.59	-28.90	-13	-15.90	Horizontal
Test Results for High Channel 715.3MHz							
1430.6	-53.74	2.63	27.28	-29.09	-13	-16.09	Horizontal
1430.6	-57.62	2.63	27.28	-32.97	-13	-19.97	Vertical
2145.9	-54.16	2.88	27.60	-29.44	-13	-16.44	Vertical
2145.9	-52.95	2.88	27.60	-28.23	-13	-15.23	Horizontal

QPSK EIRP POWER FOR LTE BAND 12 (10MHZ BANDWIDTH)

Test Results for Low Channel 704MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Gain(dB)	Absolute Level(dBm)	Limit （dBm）	Margin(dBm)	Polarity
1408	-56.95	2.61	27.26	-32.30	-13	-19.30	Horizontal
1408	-54.41	2.61	27.26	-29.76	-13	-16.76	Vertical
2112	-53.62	2.87	27.58	-28.91	-13	-15.91	Vertical
2112	-53.94	2.87	27.58	-29.23	-13	-16.23	Horizontal
Test Results for Mid Channel 707.5MHz							
1415	-52.85	2.61	27.28	-28.18	-13	-15.18	Horizontal
1415	-56.96	2.61	27.28	-32.29	-13	-19.29	Vertical
2122.5	-54.17	2.87	27.59	-29.45	-13	-16.45	Vertical
2122.5	-53.62	2.87	27.59	-28.90	-13	-15.90	Horizontal
Test Results for High Channel 711MHz							
1422	-55.58	2.62	27.28	-30.92	-13	-17.92	Horizontal
1422	-52.17	2.62	27.28	-27.51	-13	-14.51	Vertical
2133	-54.63	2.87	27.60	-29.90	-13	-16.90	Vertical
2133	-53.92	2.87	27.60	-29.19	-13	-16.19	Horizontal

Note: PMea(dBm)= Power(dBm)+ ARpl (dBm)

. Over Limit= : PMea(dBm)-Limit(dBm)

. We test both H direction and V direction, recorded worst case direction.

9.6 LTE BAND 17

QPSK EIRP POWER FOR LTE BAND 17 (5MHZ BANDWIDTH)

Test Results for Low Channel 706.5MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Gain(dB)	Absolute Level(dBm)	Limit （dBm）	Margin(dBm)	Polarity
1413	-54.11	2.61	27.28	-29.44	-13	-16.44	Horizontal
1413	-52.63	2.61	27.28	-27.96	-13	-14.96	Vertical
2119.5	-53.92	2.87	27.59	-29.20	-13	-16.20	Vertical
2119.5	-54.46	2.87	27.59	-29.74	-13	-16.74	Horizontal
Test Results For Mid Channel 710MHz							
1420	-50.82	2.62	27.30	-26.14	-13	-13.14	Horizontal
1420	-54.44	2.62	27.30	-29.76	-13	-16.76	Vertical
2130	-53.62	2.87	27.62	-28.87	-13	-15.87	Vertical
2130	-56.97	2.87	27.62	-32.22	-13	-19.22	Horizontal
Test Results for High Channel 713.5MHz							
1427	-54.52	2.66	27.28	-29.90	-13	-16.90	Horizontal
1427	-55.28	2.66	27.28	-30.66	-13	-17.66	Vertical
2140.5	-53.62	2.88	27.60	-28.90	-13	-15.90	Vertical
2140.5	-56.64	2.88	27.60	-31.92	-13	-18.92	Horizontal

QPSK EIRP POWER FOR LTE BAND 17 (10MHZ BANDWIDTH)

Test Results for Low Channel 709MHz							
Frequency(MHz)	SG Level(dBm)	Cable Loss(dB)	Antenna Gain(dB)	Absolute Level(dBm)	Limit （dBm）	Margin(dBm)	Polarity
1418	-56.69	2.62	27.30	-32.01	-13	-19.01	Horizontal
1418	-54.48	2.62	27.30	-29.80	-13	-16.80	Vertical
2127	-53.64	2.87	27.62	-28.89	-13	-15.89	Vertical
2127	-57.84	2.87	27.62	-33.09	-13	-20.09	Horizontal
Test Results for Mid Channel 710MHz							
1420	-53.62	2.62	27.30	-28.94	-13	-15.94	Horizontal
1420	-52.90	2.62	27.30	-28.22	-13	-15.22	Vertical
2130	-54.41	2.87	27.62	-29.66	-13	-16.66	Vertical
2130	-52.98	2.87	27.62	-28.23	-13	-15.23	Horizontal
Test Results for High Channel 711MHz							
1422	-56.96	2.62	27.30	-32.28	-13	-19.28	Horizontal
1422	-54.41	2.62	27.30	-29.73	-13	-16.73	Vertical
2133	-56.95	2.87	27.62	-32.20	-13	-19.20	Vertical
2133	-54.74	2.87	27.62	-29.99	-13	-16.99	Horizontal

Note: PMea(dBm)= Power(dBm)+ ARpl (dBm)

. Over Limit= PMea(dBm)-Limit(dBm)

. We test both H direction and V direction, recorded worst case direction.

10. FREQUENCY STABILITY

RULE PART(S)

FCC: §2.1055, §22.355, §24.235, §27.54

LIMITS

§22.355 - The carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm for mobile stations.

§24.235 - The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

TEST PROCEDURE

Use CMW 500 with Frequency Error measurement capability.

- Temp. = −30° to +50°C
- Voltage =low voltage,DC 3.2V, Normal, DC 3.8V and High voltage, DC DC 4.2V.

Frequency Stability vs Temperature:

The EUT is place inside a temperature chamber. The temperature is set to -30ºC and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured. The temperature is increased by 10 degrees, allowed to stabilize and soak, and then the measurement is repeated. This is repeated until +50ºC is reached.

Frequency Stability vs Voltage:

The peak frequency error is recorded (worst-case).

MODES TESTED

- LTE Band 2
- LTE Band 4
- LTE Band5
- LTE Band 7
- LTE Band 12
- LTE Band 17

RESULTS

See the following pages.

10.1 LTE BAND 2

QPSK, (20MHz BANDWIDTH)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 2 QPSK, (CH 18900 RB size 100 RB Offset 0 20MHz BANDWIDTH)				
3.2	1880	-12.4	-0.006596	2.5
3.8	1880	-14.2	-0.007553	2.5
4.2	1880	-10.5	-0.005585	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 2 QPSK, (CH 18900 RB size 100 RB Offset 0 20MHz BANDWIDTH)				
Normal (25C)	1880	9.8	0.005213	2.5
Extreme (50C)	1880	11.4	0.006064	2.5
Extreme (40C)	1880	16.4	0.008723	2.5
Extreme (30C)	1880	-15.2	-0.008085	2.5
Extreme (10C)	1880	-11.7	-0.006223	2.5
Extreme (0C)	1880	-9.3	-0.004947	2.5
Extreme (-10C)	1880	-8.5	-0.004521	2.5
Extreme (-20C)	1880	-8.7	-0.004628	2.5
Extreme (-30C)	1880	-9.6	-0.005106	2.5

16QAM, (20MHz BANDWIDTH)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 2 16QAM, (CH 18900 RB size 100 RB Offset 0 20MHz BANDWIDTH)				
3.2	1880	-13.6	-0.007234	2.5
3.8	1880	-16.1	-0.008564	2.5
4.2	1880	-10.7	-0.005691	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 2 16QAM, (CH 18900 RB size 100 RB Offset 0 20MHz BANDWIDTH)				
Normal (25C)	1880	-11.8	-0.006277	2.5
Extreme (50C)	1880	-12.9	-0.006862	2.5
Extreme (40C)	1880	-15.7	-0.008351	2.5
Extreme (30C)	1880	-9.8	-0.005213	2.5
Extreme (10C)	1880	-10.6	-0.005638	2.5
Extreme (0C)	1880	-13.4	-0.007128	2.5
Extreme (-10C)	1880	-5.2	-0.002766	2.5
Extreme (-20C)	1880	-8.6	-0.004574	2.5
Extreme (-30C)	1880	-9.3	-0.004947	2.5

***Note:** Frequency error measurements were made by using the build-in capability of the Wireless Communication Test Set.

10.2 LTE BAND 4

QPSK, (10MHz BANDWIDTH)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 4 QPSK, (CH 20175 RB size 100 RB Offset 0 20MHz BANDWIDTH)				
3.2	1732.5	-8.7	-0.005022	2.5
3.8	1732.5	-12.9	-0.007446	2.5
4.2	1732.5	-9	-0.005195	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 4 QPSK, (CH 20175 RB size 100 RB Offset 0 20MHz BANDWIDTH)				
Normal (25C)	1732.5	7.4	0.004271	2.5
Extreme (50C)	1732.5	-6.9	-0.003983	2.5
Extreme (40C)	1732.5	-11.3	-0.006522	2.5
Extreme (30C)	1732.5	-8.5	-0.004906	2.5
Extreme (10C)	1732.5	-9.2	-0.005310	2.5
Extreme (0C)	1732.5	-10.1	-0.005830	2.5
Extreme (-10C)	1732.5	-12.3	-0.007100	2.5
Extreme (-20C)	1732.5	-6.8	-0.003925	2.5
Extreme (-30C)	1732.5	-7.8	-0.004502	2.5

16QAM, (20MHz BANDWIDTH)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 4 16QAM, (CH 20175 RB size 100 RB Offset 0 20MHz BANDWIDTH)				
3.2	1732.5	-13.2	-0.007619	2.5
3.8	1732.5	-11.9	-0.006869	2.5
4.2	1732.5	-10.8	-0.006234	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 4 16QAM, (CH 20175 RB size 100 RB Offset 0 20MHz BANDWIDTH)				
Normal (25C)	1732.5	-15.4	-0.008889	2.5
Extreme (50C)	1732.5	-12.4	-0.007157	2.5
Extreme (40C)	1732.5	-10.6	-0.006118	2.5
Extreme (30C)	1732.5	-8.5	-0.004906	2.5
Extreme (10C)	1732.5	-7.9	-0.004560	2.5
Extreme (0C)	1732.5	-13.6	-0.007850	2.5
Extreme (-10C)	1732.5	-11.2	-0.006465	2.5
Extreme (-20C)	1732.5	-10.4	-0.006003	2.5
Extreme (-30C)	1732.5	-8.9	-0.005137	2.5

***Note:** Frequency error measurements were made by using the build-in capability of the Wireless Communication Test Set.

10.3 LTE BAND 5

QPSK, (10MHz BANDWIDTH)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 5 QPSK, (CH 20525 RB size 50 RB Offset 0 10MHz BANDWIDTH)				
3.2	836.5	-11.4	-0.013628	2.5
3.8	836.5	-10.2	-0.012194	2.5
4.2	836.5	-8.9	-0.010640	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 5 QPSK, (CH 20525 RB size 50 RB Offset 0 10MHz BANDWIDTH)				
Normal (25C)	836.5	-7.4	-0.008846	2.5
Extreme (50C)	836.5	-13.2	-0.015780	2.5
Extreme (40C)	836.5	-10.5	-0.012552	2.5
Extreme (30C)	836.5	-8.6	-0.010281	2.5
Extreme (10C)	836.5	-9.9	-0.011835	2.5
Extreme (0C)	836.5	-10.1	-0.012074	2.5
Extreme (-10C)	836.5	-11.4	-0.013628	2.5
Extreme (-20C)	836.5	-13.4	-0.016019	2.5
Extreme (-30C)	836.5	-10.1	-0.012074	2.5

16QAM, (10MHz BANDWIDTH)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 5 16QAM, (CH 20525 RB size 50 RB Offset 0 10MHz BANDWIDTH)				
3.2	836.5	-8.8	-0.010520	2.5
3.8	836.5	7.6	0.009085	2.5
4.2	836.5	10.4	0.012433	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 5 16QAM, (CH 20525 RB size 50 RB Offset 0 10MHz BANDWIDTH)				
Normal (25C)	836.5	-10.2	-0.012194	2.5
Extreme (50C)	836.5	-11.4	-0.013628	2.5
Extreme (40C)	836.5	-13.5	-0.016139	2.5
Extreme (30C)	836.5	-14.8	-0.017693	2.5
Extreme (10C)	836.5	-15.4	-0.018410	2.5
Extreme (0C)	836.5	-16.2	-0.019366	2.5
Extreme (-10C)	836.5	-10.8	-0.012911	2.5
Extreme (-20C)	836.5	-10.9	-0.013030	2.5
Extreme (-30C)	836.5	-11.4	-0.013628	2.5

***Note:** Frequency error measurements were made by using the build-in capability of the Wireless Communication Test Set.

10.4 LTE BAND 7

QPSK, (20MHz BANDWIDTH)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 7 QPSK, (CH 21100 RB size 100 RB Offset 0 20MHz BANDWIDTH)				
3.2	2535	-9.5	-0.003748	2.5
3.8	2535	-14.2	-0.005602	2.5
4.2	2535	-10.1	-0.003984	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 7 QPSK, (CH 21100 RB size 100 RB Offset 0 20MHz BANDWIDTH)				
Normal (25C)	2535	-9.6	-0.003787	2.5
Extreme (50C)	2535	-11.5	-0.004536	2.5
Extreme (40C)	2535	-10.3	-0.004063	2.5
Extreme (30C)	2535	-7.8	-0.003077	2.5
Extreme (10C)	2535	-10.6	-0.004181	2.5
Extreme (0C)	2535	-8	-0.003156	2.5
Extreme (-10C)	2535	9.6	0.003787	2.5
Extreme (-20C)	2535	-10.7	-0.004221	2.5
Extreme (-30C)	2535	14.3	0.005641	2.5

16QAM, (20MHz BANDWIDTH)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 7 16QAM, (CH 21100 RB size 100 RB Offset 0 20MHz BANDWIDTH)				
3.2	2535	-7.9	-0.003116	2.5
3.8	2535	-8.2	-0.003235	2.5
4.2	2535	-9.9	-0.003905	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 7 16QAM, (CH 21100 RB size 100 RB Offset 0 20MHz BANDWIDTH)				
Normal (25C)	2535	-10.1	-0.003984	2.5
Extreme (50C)	2535	-11.4	-0.004497	2.5
Extreme (40C)	2535	-10.5	-0.004142	2.5
Extreme (30C)	2535	-8.6	-0.003393	2.5
Extreme (10C)	2535	-7.3	-0.002880	2.5
Extreme (0C)	2535	-7	-0.002761	2.5
Extreme (-10C)	2535	-8	-0.003156	2.5
Extreme (-20C)	2535	-16.2	-0.006391	2.5
Extreme (-30C)	2535	-12.3	-0.004852	2.5

***Note:** Frequency error measurements were made by using the build-in capability of the Wireless Communication Test Set.

10.5 LTE BAND 12

QPSK, (10MHz BANDWIDTH)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 12 QPSK, (CH 23095 RB size 50 RB Offset 0 10MHz BANDWIDTH)				
3.2	707.5	-10.2	-0.014417	2.5
3.8	707.5	-10.4	-0.014700	2.5
4.2	707.5	-8.7	-0.012297	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 12 QPSK, (CH 23095 RB size 50 RB Offset 0 10MHz BANDWIDTH)				
Normal (25C)	707.5	-8.5	-0.012014	2.5
Extreme (50C)	707.5	-9.6	-0.013569	2.5
Extreme (40C)	707.5	-10.2	-0.014417	2.5
Extreme (30C)	707.5	10	0.014134	2.5
Extreme (10C)	707.5	11	0.015548	2.5
Extreme (0C)	707.5	-13.4	-0.018940	2.5
Extreme (-10C)	707.5	-12.4	-0.017527	2.5
Extreme (-20C)	707.5	-13.6	-0.019223	2.5
Extreme (-30C)	707.5	-11.7	-0.016537	2.5

16QAM, (10MHz BANDWIDTH)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 12 16QAM, (CH 23095 RB size 50 RB Offset 0 10MHz BANDWIDTH)				
3.2	707.5	-5.6	-0.007915	2.5
3.8	707.5	-9.8	-0.013852	2.5
4.2	707.5	-10.1	-0.014276	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 12 QPSK, (CH 23095 RB size 50 RB Offset 0 10MHz BANDWIDTH)				
Normal (25C)	707.5	-11.7	-0.016537	2.5
Extreme (50C)	707.5	-12.4	-0.017527	2.5
Extreme (40C)	707.5	-14.5	-0.020495	2.5
Extreme (30C)	707.5	-13.1	-0.018516	2.5
Extreme (10C)	707.5	-11	-0.015548	2.5
Extreme (0C)	707.5	-12.8	-0.018092	2.5
Extreme (-10C)	707.5	-11.5	-0.016254	2.5
Extreme (-20C)	707.5	-13.6	-0.019223	2.5
Extreme (-30C)	707.5	-14.5	-0.020495	2.5

***Note:** Frequency error measurements were made by using the build-in capability of the Wireless Communication Test Set.

10.6 LTE BAND 17

QPSK, (10MHz BANDWIDTH)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 17 QPSK, (CH 23790 RB size 50 RB Offset 0 10MHz BANDWIDTH)				
3.2	710.0	-9.5	-0.013380	2.5
3.8	710.0	-14.3	-0.020141	2.5
4.2	710.0	-10.7	-0.015070	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 17 QPSK, (CH 23790 RB size 50 RB Offset 0 10MHz BANDWIDTH)				
Normal (25C)	710.0	-13.2	-0.018592	2.5
Extreme (50C)	710.0	-16.8	-0.023662	2.5
Extreme (40C)	710.0	-10.5	-0.014789	2.5
Extreme (30C)	710.0	-11.8	-0.016620	2.5
Extreme (10C)	710.0	-7.7	-0.010845	2.5
Extreme (0C)	710.0	10.2	0.014366	2.5
Extreme (-10C)	710.0	-11.6	-0.016338	2.5
Extreme (-20C)	710.0	-10.9	-0.015352	2.5
Extreme (-30C)	710.0	-15.2	-0.021408	2.5

16QAM, (10MHz BANDWIDTH)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 17 16QAM, (CH 23790 RB size 50 RB Offset 0 10MHz BANDWIDTH)				
3.2	710.0	-6.8	-0.009577	2.5
3.8	710.0	-7.4	-0.010423	2.5
4.2	710.0	-11.2	-0.015775	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
BAND 17 QPSK, (CH 23790 RB size 50 RB Offset 0 10MHz BANDWIDTH)				
Normal (25C)	710.0	-12.3	-0.017324	2.5
Extreme (50C)	710.0	-14.6	-0.020563	2.5
Extreme (40C)	710.0	-10.9	-0.015352	2.5
Extreme (30C)	710.0	-11.5	-0.016197	2.5
Extreme (10C)	710.0	-8.9	-0.012535	2.5
Extreme (0C)	710.0	-8.1	-0.011408	2.5
Extreme (-10C)	710.0	-11.1	-0.015634	2.5
Extreme (-20C)	710.0	-13.4	-0.018873	2.5
Extreme (-30C)	710.0	-12.6	-0.017746	2.5

***Note:** Frequency error measurements were made by using the build-in capability of the Wireless Communication Test Set.

11. Peak-to-Average Ratio

11.1 Description of the PAR Measurement

The peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

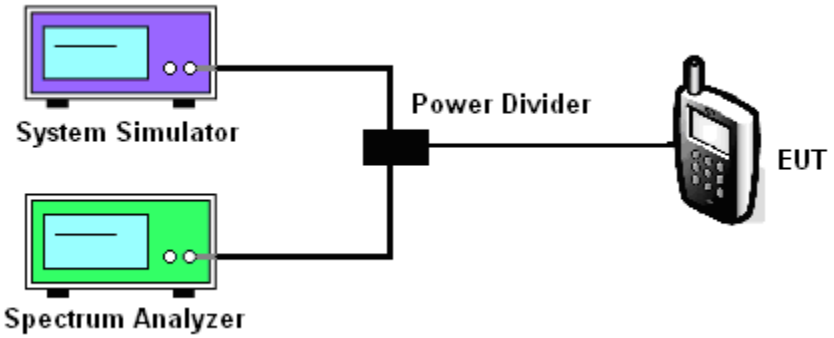
11.2 Measuring Instruments

See list of measuring instruments of this test report.

11.3 Test Procedures

1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. For GSM/EGPRS operating modes:
   a. Set the RBW = 1MHz, VBW = 1MHz, Peak detector in spectrum analyzer.
   b. Set EUT in maximum power output, and triggered the burst signal.
   c. Measured respectively the Peak level and Mean level, and the deviation was recorded as Peak to Average Ratio.
4. For UMTS operating modes:
   a. Set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer.
   b. The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1 %.

11.4 Test Setup



MODES TESTED

- ☐ LTE Band2
- LTE Band 4
- ☐ LTE Band5
- ☐ LTE Band 7
- LTE Band 12
- LTE Band 17

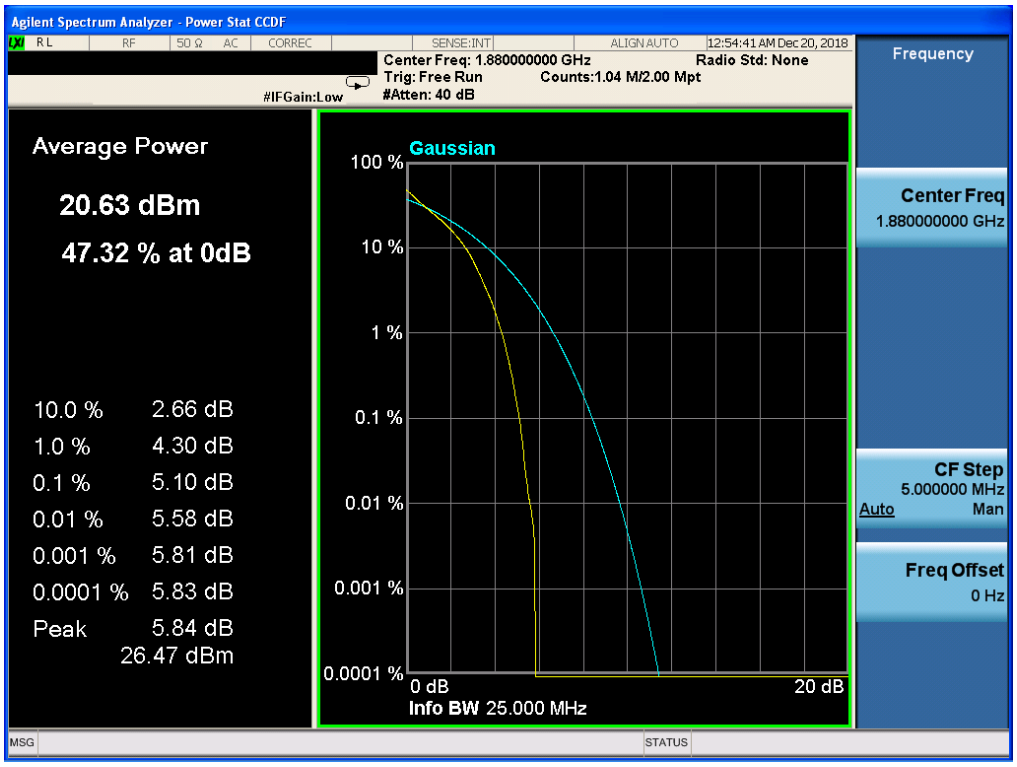
BAND	CHANNEL	Frequency [MHz]	BANDWIDTH	NO. RB	RB POS.	MODULATION	PAR [dB]
2	18900	1880.0	1.4	1	Low	QPSK	5.10
2	18900	1880.0	1.4	1	Low	16-QAM	5.87
2	18900	1880.0	3.0	1	Low	QPSK	5.16
2	18900	1880.0	3.0	1	Low	16-QAM	6.04
2	18900	1880.0	5.0	1	Low	QPSK	5.14
2	18900	1880.0	5.0	1	Low	16-QAM	5.88
2	18900	1880.0	10.0	1	Low	QPSK	4.90
2	18900	1880.0	10.0	1	Low	16-QAM	5.84
2	18900	1880.0	15.0	1	Low	QPSK	5.31
2	18900	1880.0	15.0	1	Low	16-QAM	5.95
2	18900	1880.0	20.0	1	Low	QPSK	5.24
2	18900	1880.0	20.0	1	Low	16-QAM	6.00
4	20175	1732.5	1.4	1	Low	QPSK	5.18
4	20175	1732.5	1.4	1	Low	16-QAM	5.78
4	20175	1732.5	3.0	1	Low	QPSK	5.41
4	20175	1732.5	3.0	1	Low	16-QAM	6.05
4	20175	1732.5	5.0	1	Low	QPSK	5.21
4	20175	1732.5	5.0	1	Low	16-QAM	5.96
4	20175	1732.5	10.0	1	Low	QPSK	5.15
4	20175	1732.5	10.0	1	Low	16-QAM	5.97

4	20175	1732.5	15.0	1	Low	QPSK	5.50
4	20175	1732.5	15.0	1	Low	16-QAM	6.11
4	20175	1732.5	20.0	1	Low	QPSK	5.40
4	20175	1732.5	20.0	1	Low	16-QAM	6.22
5	20525	836.5	1.4	1	Low	QPSK	4.91
5	20525	836.5	1.4	1	Low	16-QAM	5.68
5	20525	836.5	3.0	1	Low	QPSK	4.97
5	20525	836.5	3.0	1	Low	16-QAM	5.86
5	20525	836.5	5.0	1	Low	QPSK	5.06
5	20525	836.5	5.0	1	Low	16-QAM	5.71
5	20525	836.5	10.0	1	Low	QPSK	5.23
5	20525	836.5	10.0	1	Low	16-QAM	5.82
7	21100	2535.0	5.0	1	Low	QPSK	4.84
7	21100	2535.0	5.0	1	Low	16-QAM	5.65
7	21100	2535.0	10.0	1	Low	QPSK	4.80
7	21100	2535.0	10.0	1	Low	16-QAM	5.66
7	21100	2535.0	15.0	1	Low	QPSK	5.13
7	21100	2535.0	15.0	1	Low	16-QAM	5.84
7	21100	2535.0	20.0	1	Low	QPSK	5.12
7	21100	2535.0	20.0	1	Low	16-QAM	5.90
12	23095	707.5	1.4	1	Low	QPSK	5.43
12	23095	707.5	1.4	1	Low	16-QAM	6.21

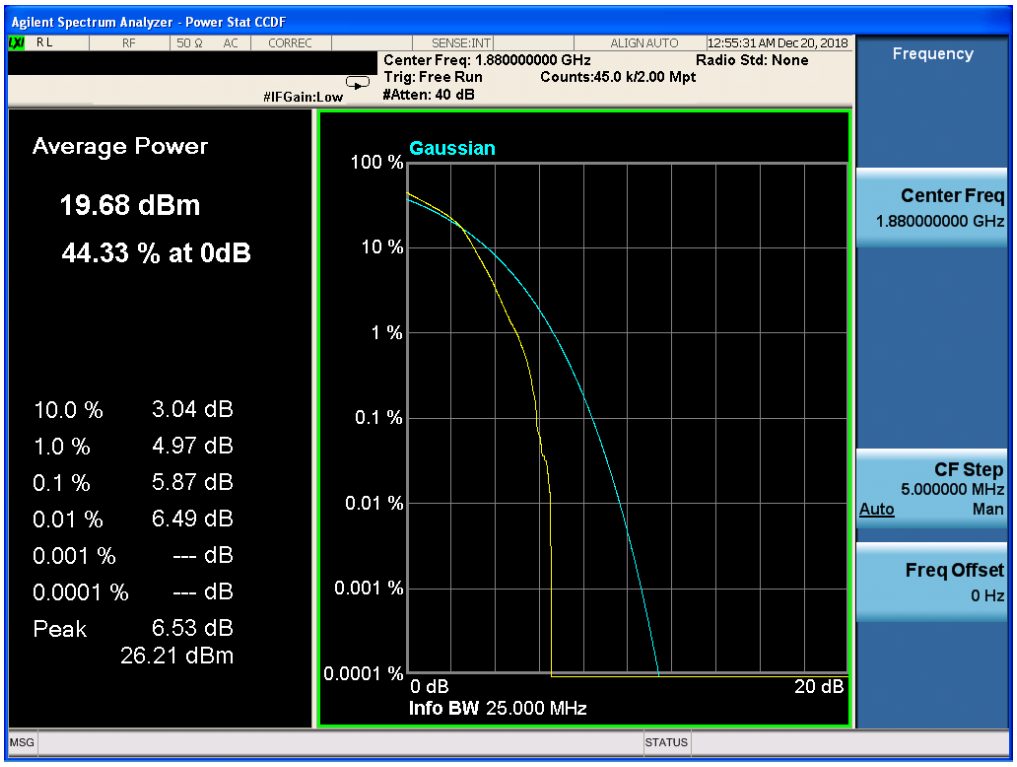
12	23095	707.5	3.0	1	Low	QPSK	5.46
12	23095	707.5	3.0	1	Low	16-QAM	6.40
12	23095	707.5	5.0	1	Low	QPSK	5.36
12	23095	707.5	5.0	1	Low	16-QAM	6.34
12	23095	707.5	10.0	1	Low	QPSK	5.31
12	23095	707.5	10.0	1	Low	16-QAM	6.17
17	23790	710.0	5.0	1	Low	QPSK	5.23
17	23790	710.0	5.0	1	Low	16-QAM	6.03
17	23790	710.0	10.0	1	Low	QPSK	5.23
17	23790	710.0	10.0	1	Low	16-QAM	6.04

11.5 LTE BAND 2

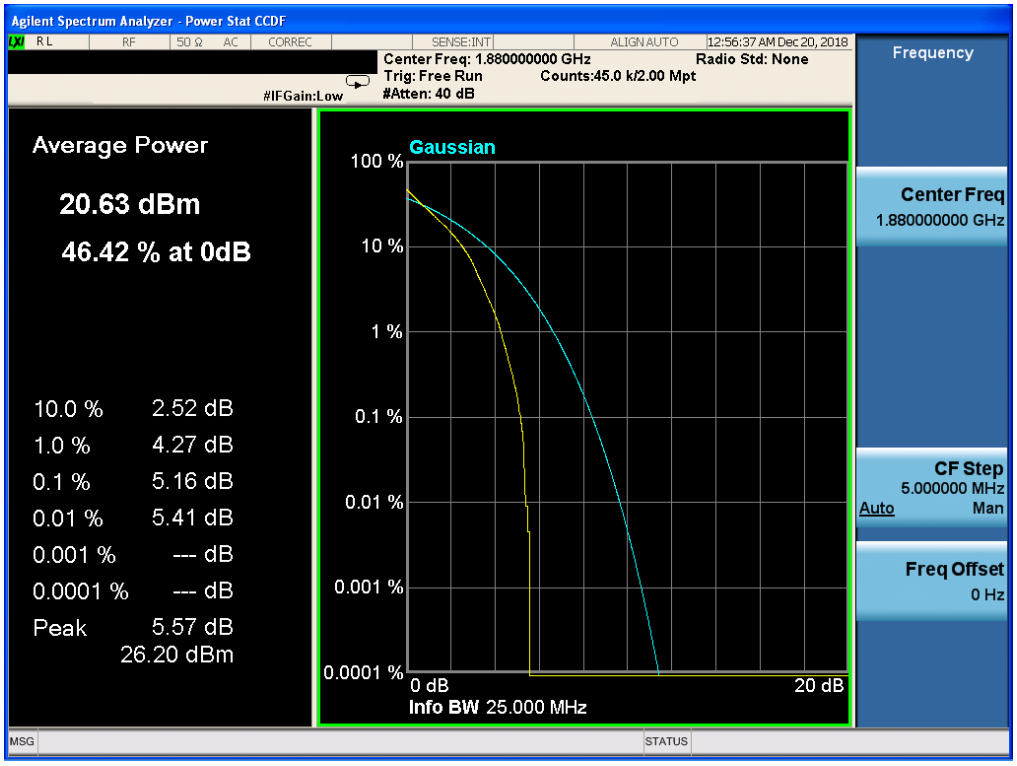
Band 2,UL Channel 18900,UL Frequency 1880.0,BW 1.4,NO. RB 1,RB POS. Low,QPSK



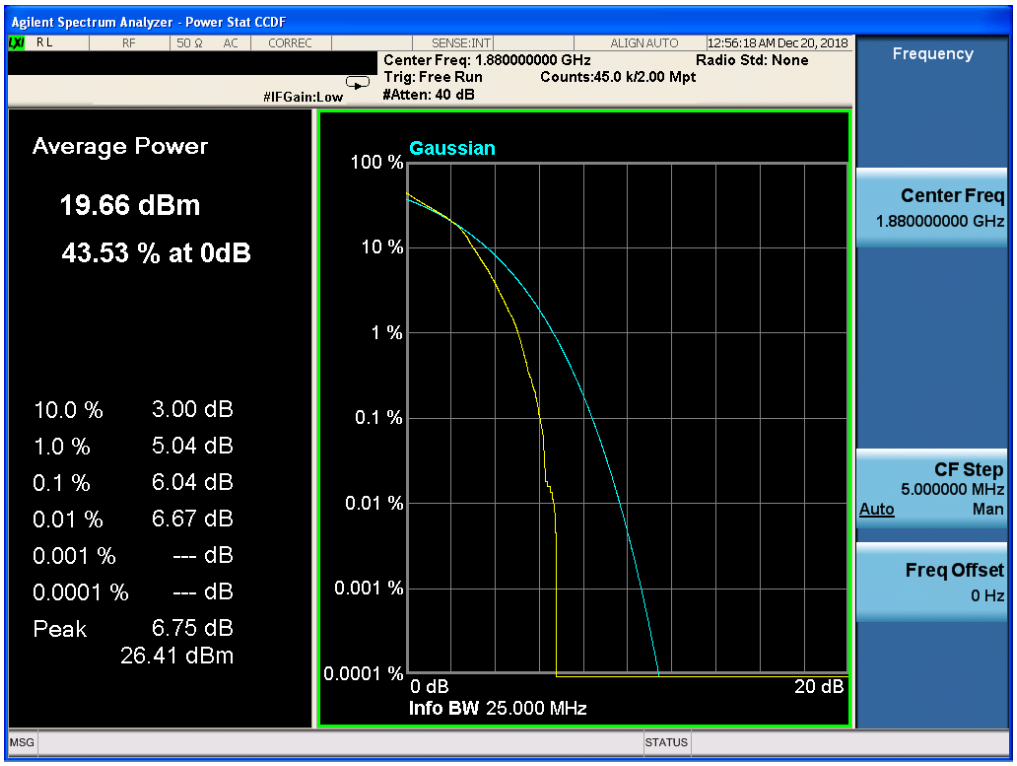
Band 2,UL Channel 18900,UL Frequency 1880.0,BW 1.4,NO. RB 1,RB POS. Low,16-QAM



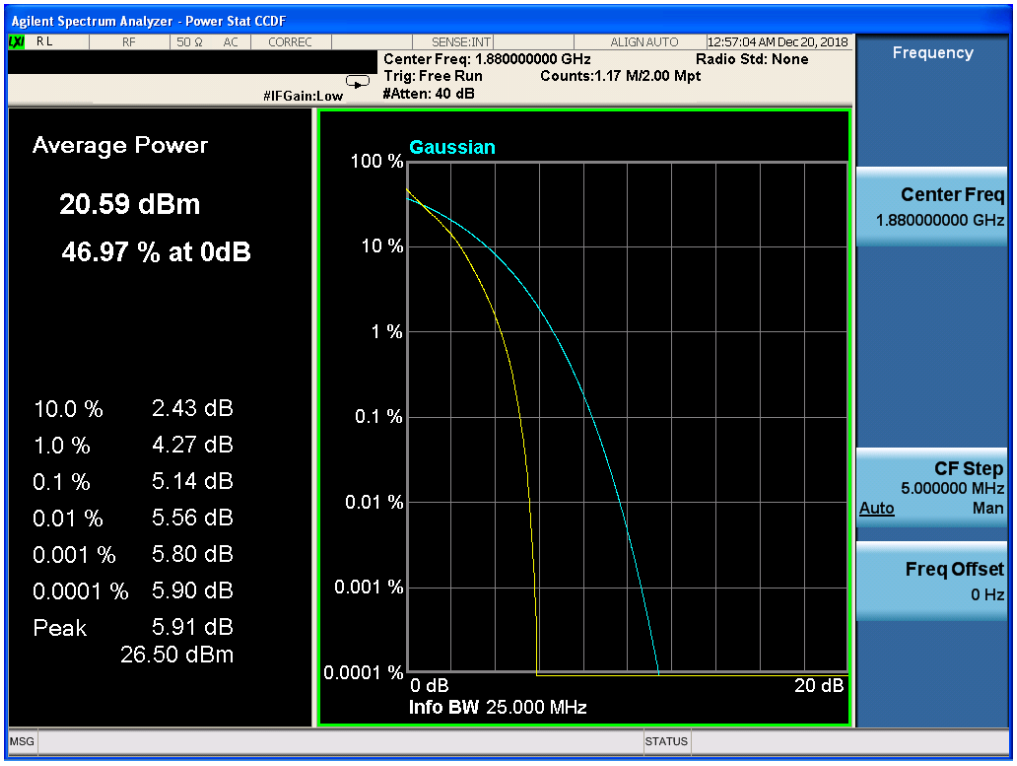
Band 2,UL Channel 18900,UL Frequency 1880.0,BW 3.0,NO. RB 1,RB POS. Low,QPSK



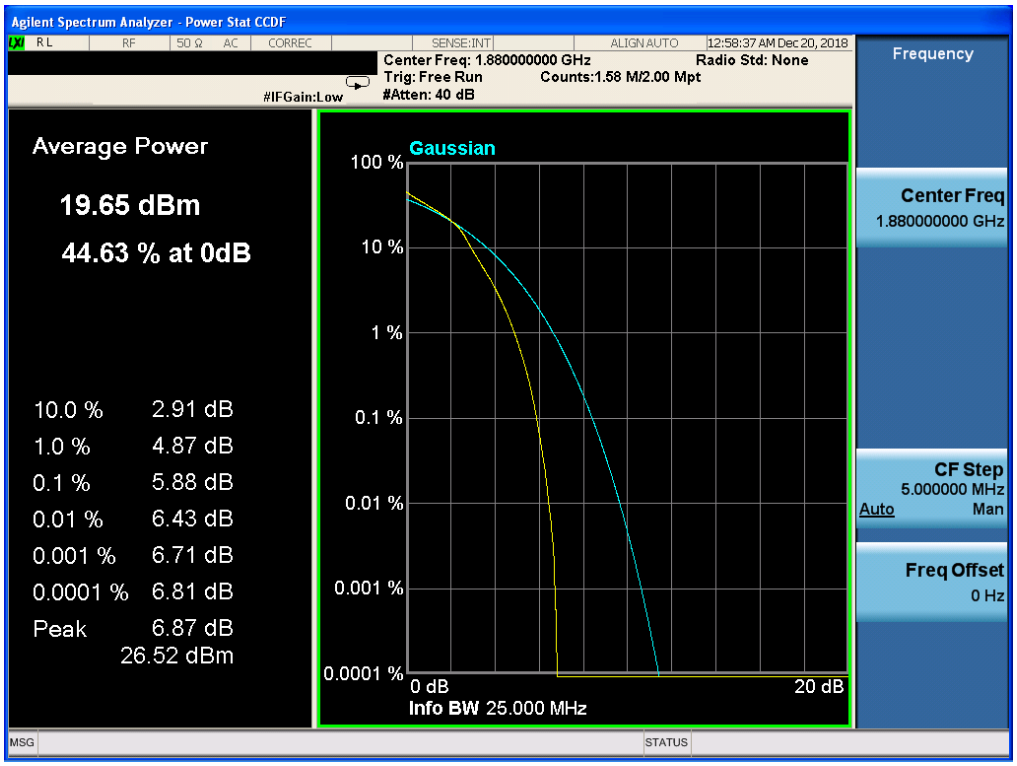
Band 2,UL Channel 18900,UL Frequency 1880.0,BW 3.0,NO. RB 1,RB POS. Low,16-QAM



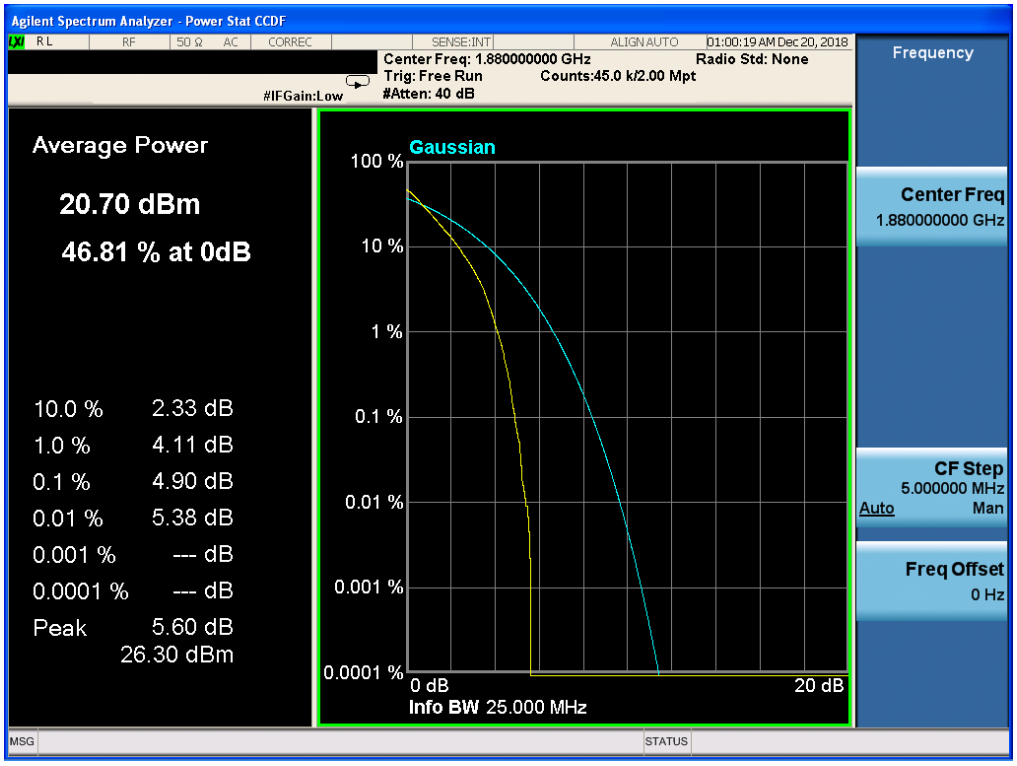
Band 2,UL Channel 18900,UL Frequency 1880.0,BW 5.0,NO. RB 1,RB POS. Low,QPSK



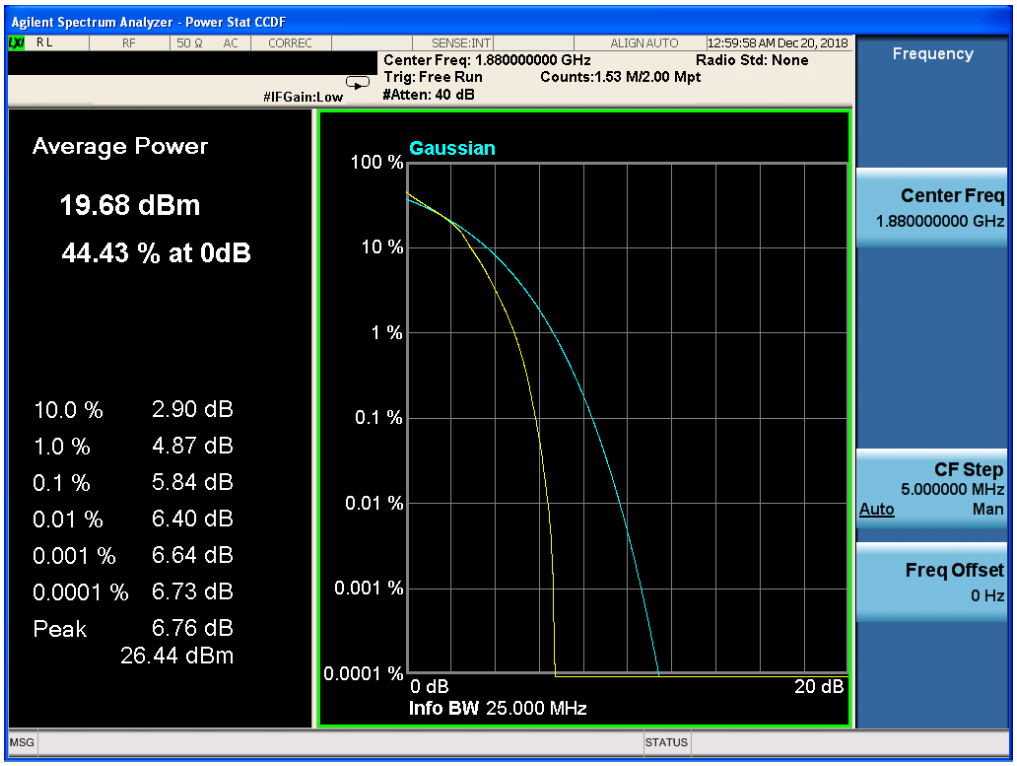
Band 2,UL Channel 18900,UL Frequency 1880.0,BW 5.0,NO. RB 1,RB POS. Low,16-QAM



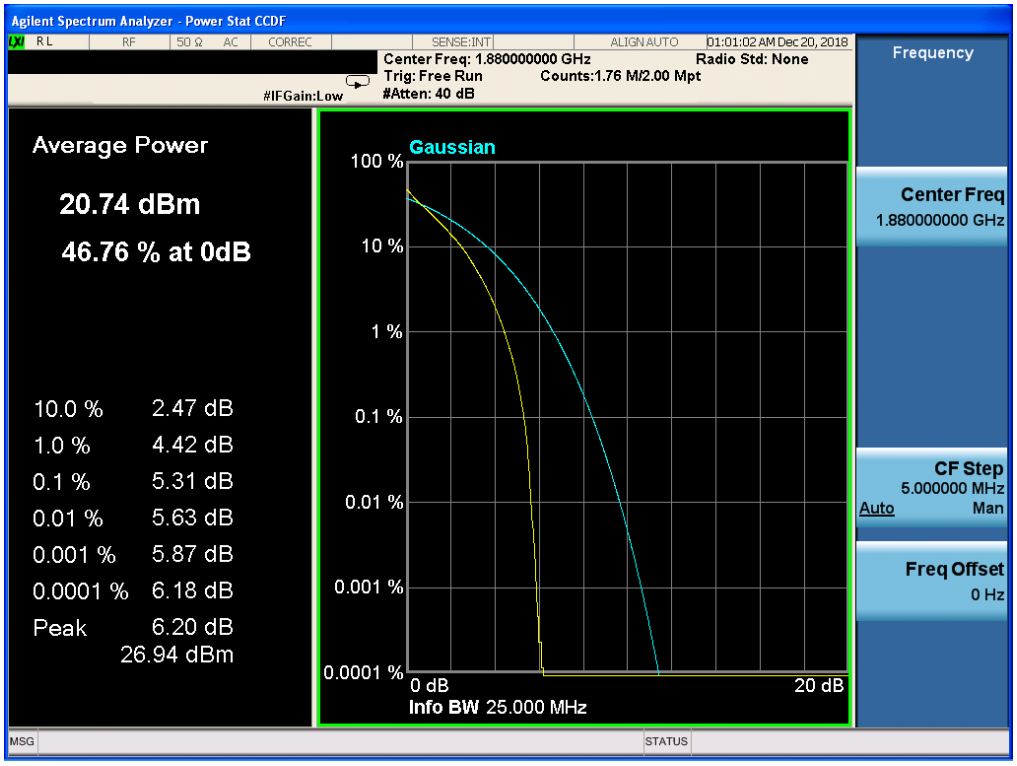
Band 2,UL Channel 18900,UL Frequency 1880.0,BW 10.0,NO. RB 1,RB POS. Low,QPSK



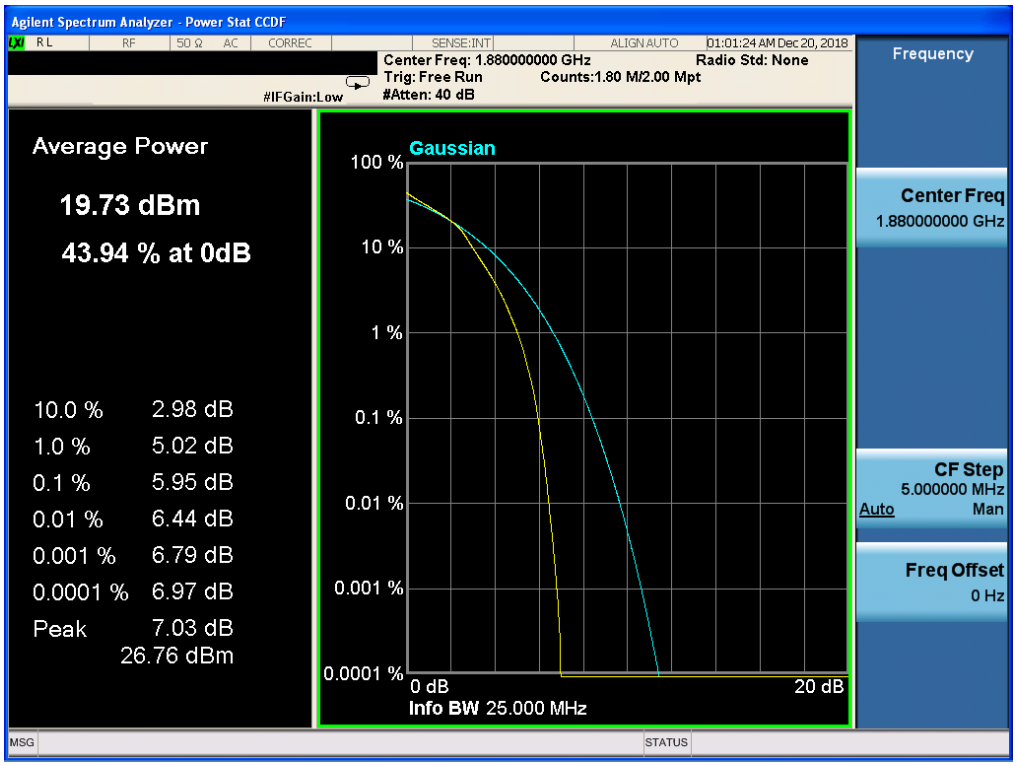
Band 2,UL Channel 18900,UL Frequency 1880.0,BW 10.0,NO. RB 1,RB POS. Low,16-QAM



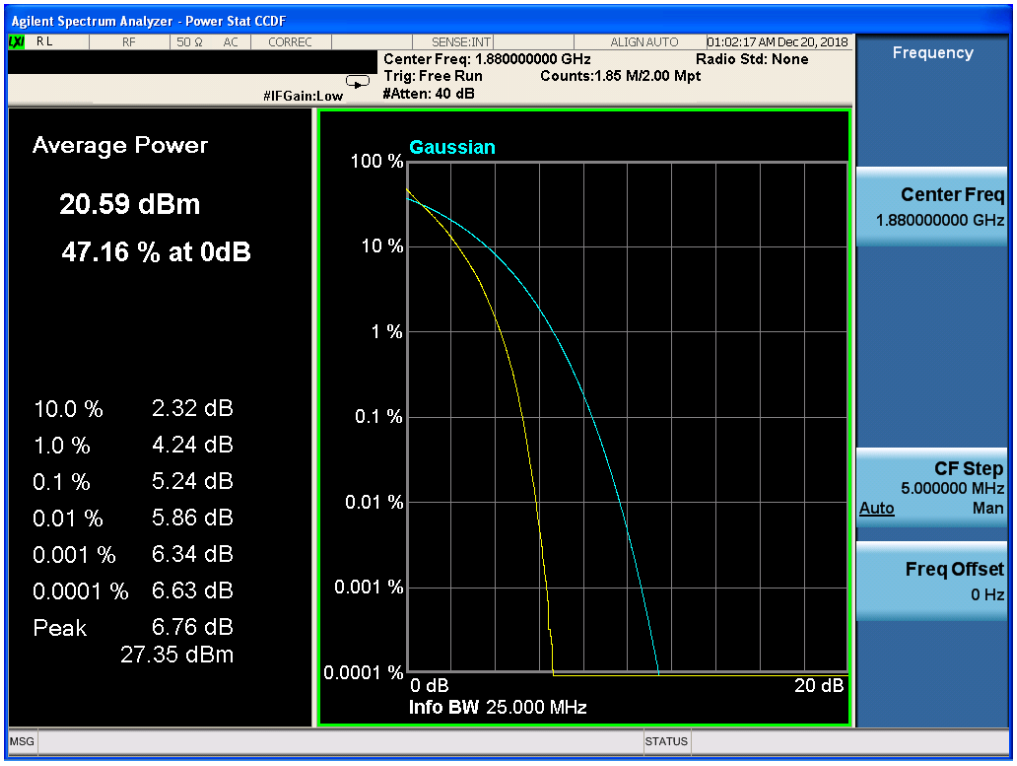
Band 2,UL Channel 18900,UL Frequency 1880.0,BW 15.0,NO. RB 1,RB POS. Low,QPSK



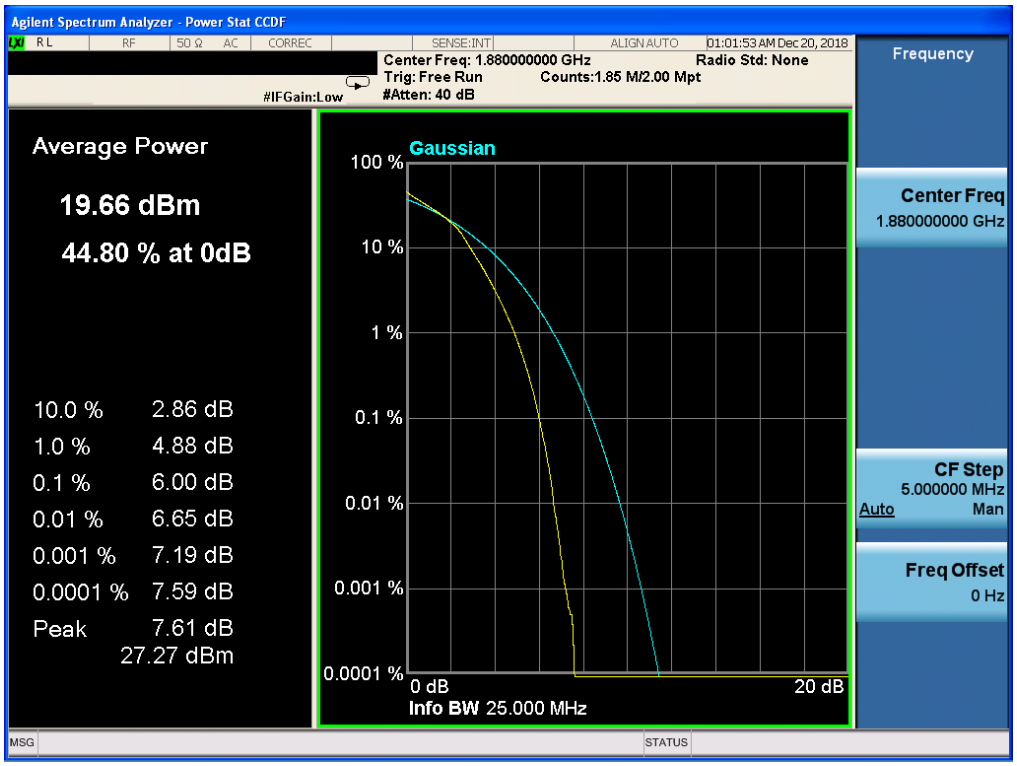
Band 2,UL Channel 18900,UL Frequency 1880.0,BW 15.0,NO. RB 1,RB POS. Low,16-QAM



Band 2,UL Channel 18900,UL Frequency 1880.0,BW 20.0,NO. RB 1,RB POS. Low,QPSK

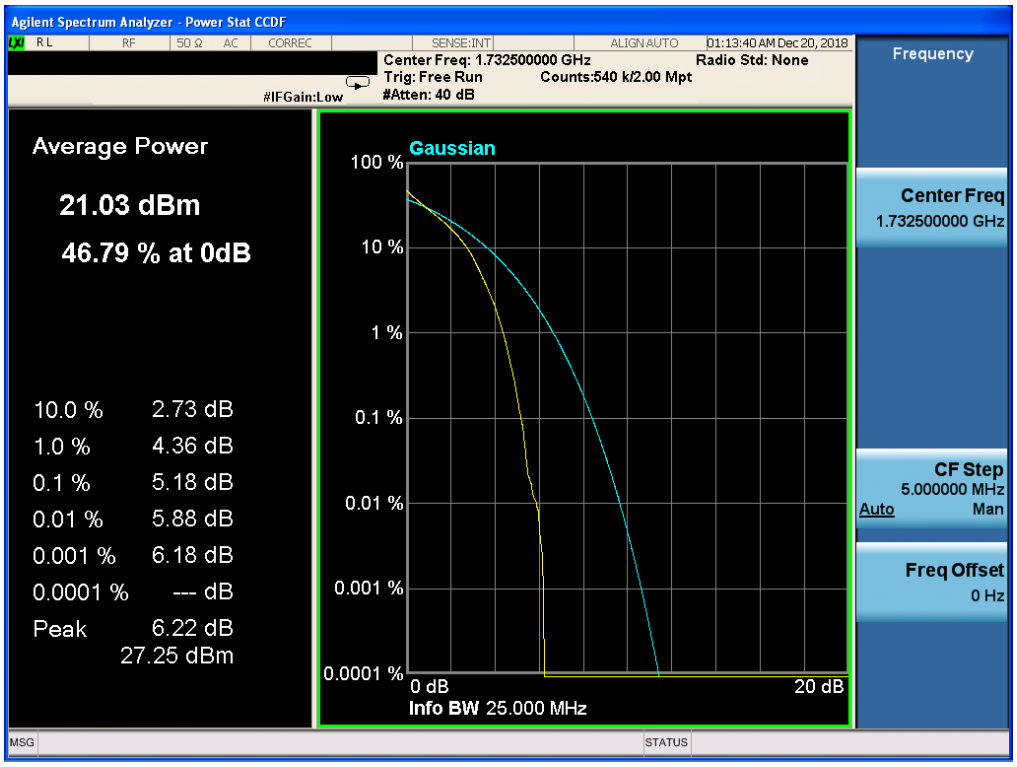


Band 2,UL Channel 18900,UL Frequency 1880.0,BW 20.0,NO. RB 1,RB POS. Low,16-QAM

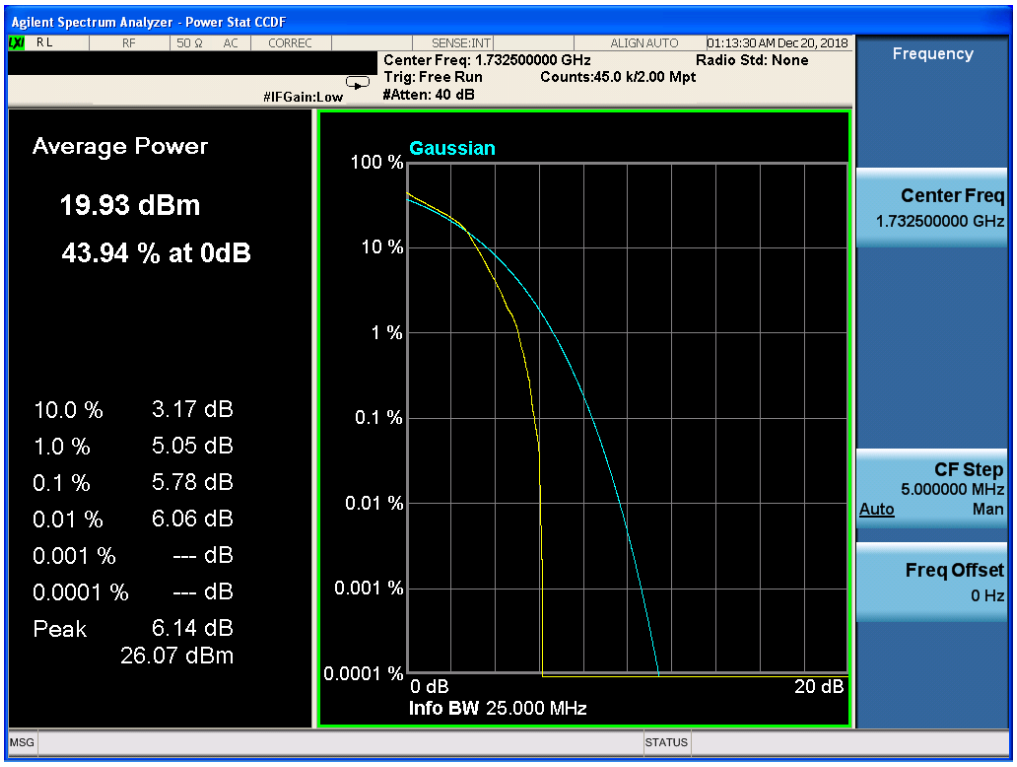


11.6 LTE BAND 4

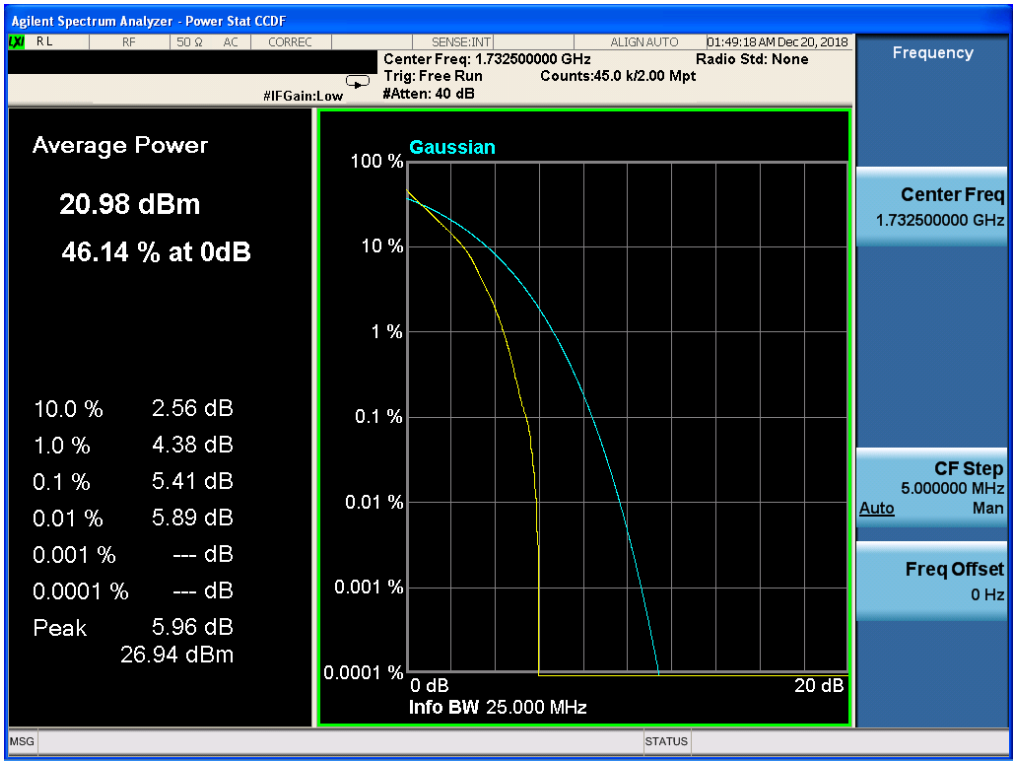
Band 4,UL Channel 20175,UL Frequency 1732.5,BW 1.4,NO. RB 1,RB POS. Low,QPSK



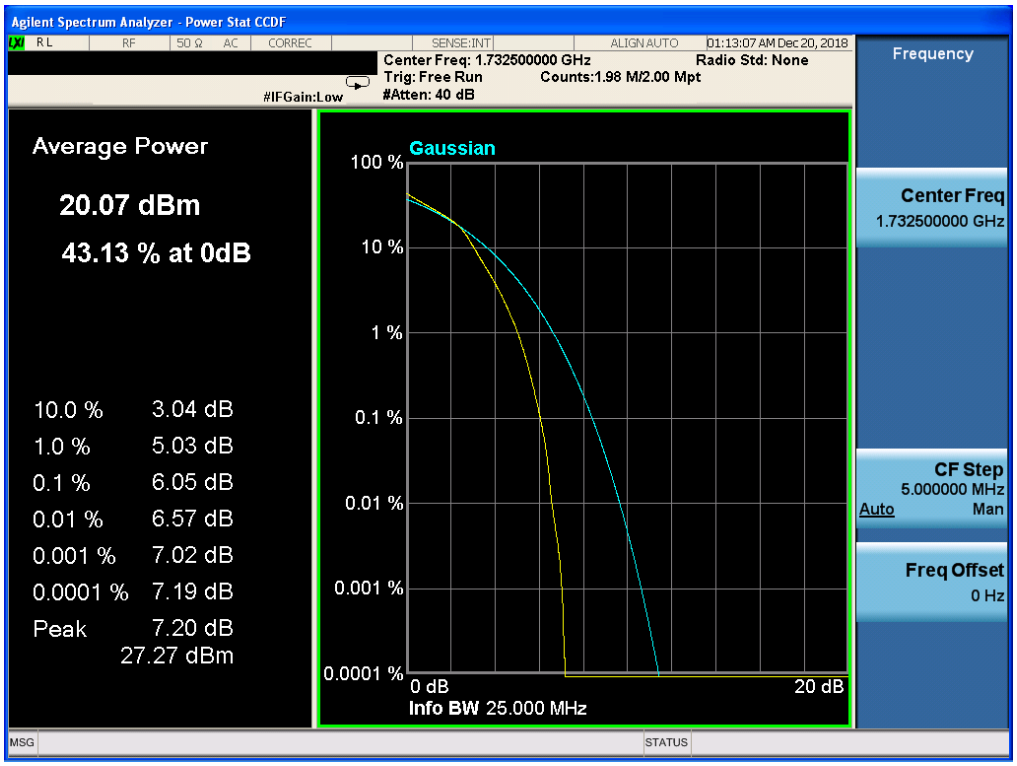
Band 4,UL Channel 20175,UL Frequency 1732.5,BW 1.4,NO. RB 1,RB POS. Low,16-QAM



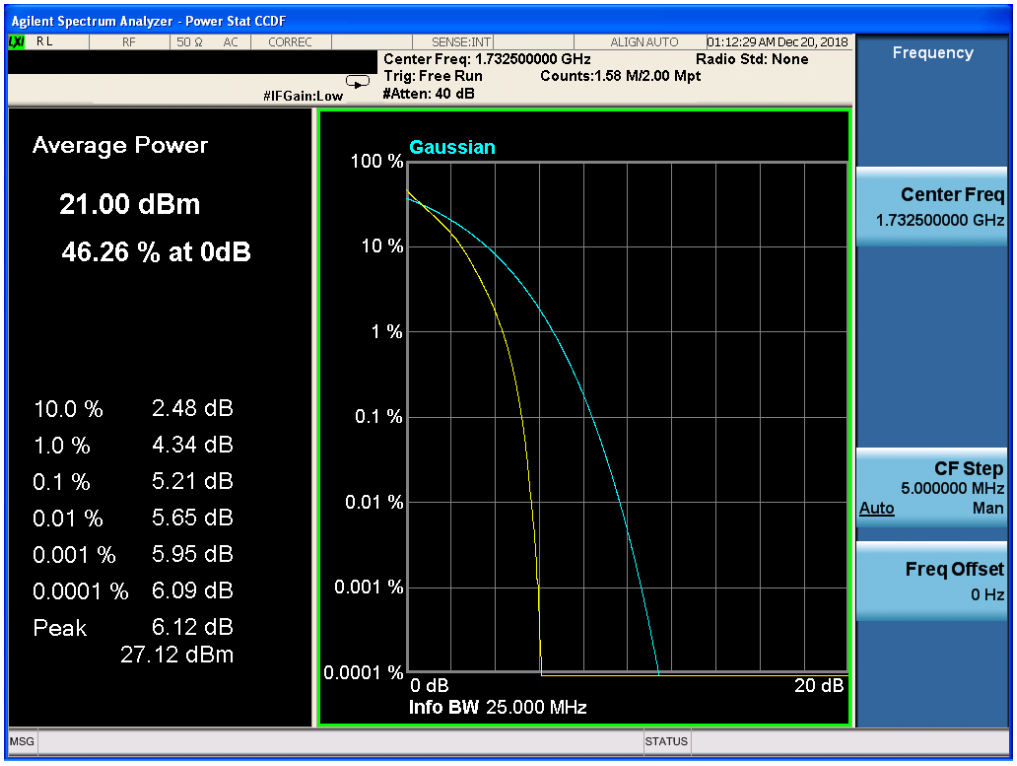
Band 4,UL Channel 20175,UL Frequency 1732.5,BW 3.0,NO. RB 1,RB POS. Low,QPSK



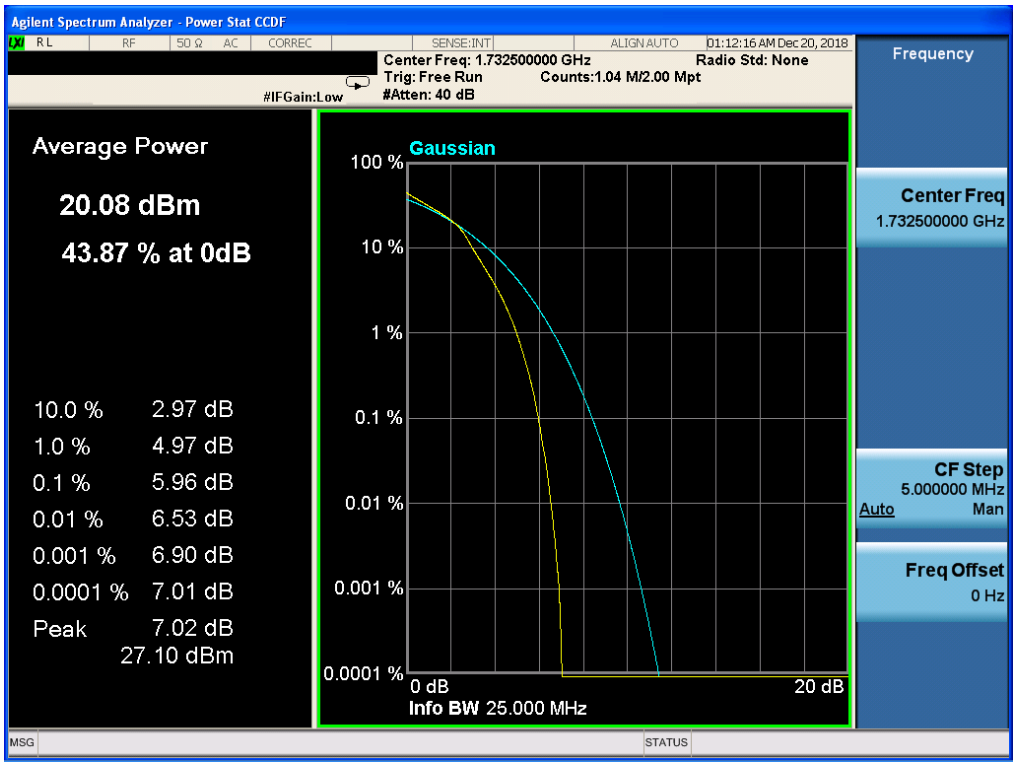
Band 4,UL Channel 20175,UL Frequency 1732.5,BW 3.0,NO. RB 1,RB POS. Low,16-QAM



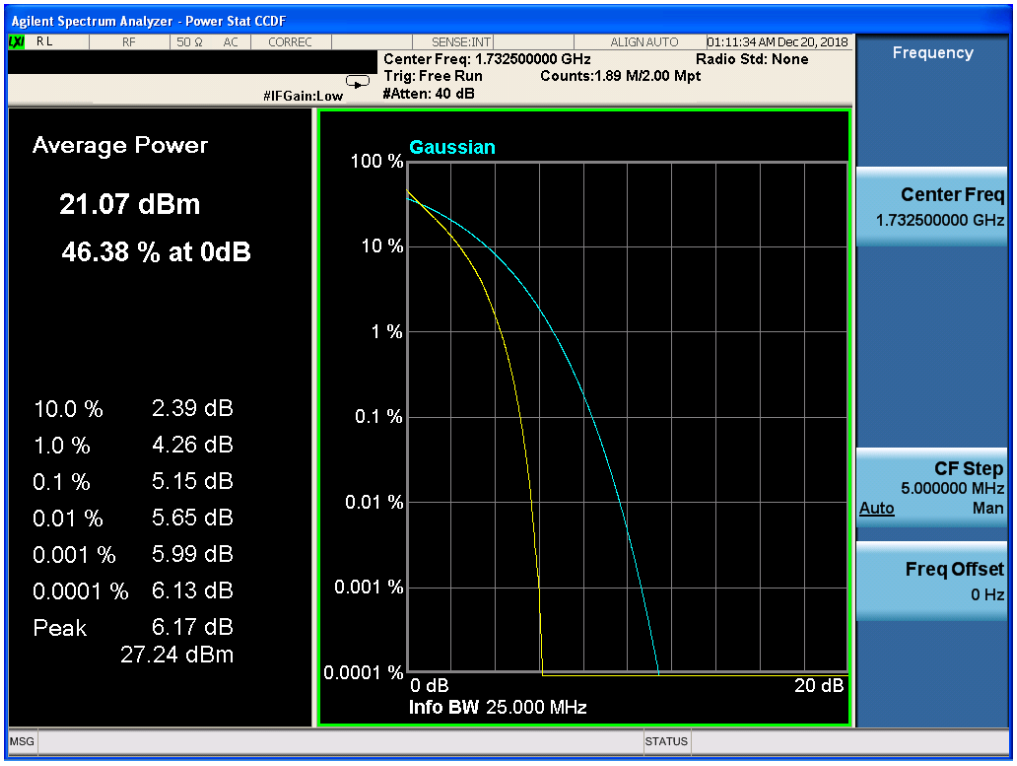
Band 4,UL Channel 20175,UL Frequency 1732.5,BW 5.0,NO. RB 1,RB POS. Low,QPSK



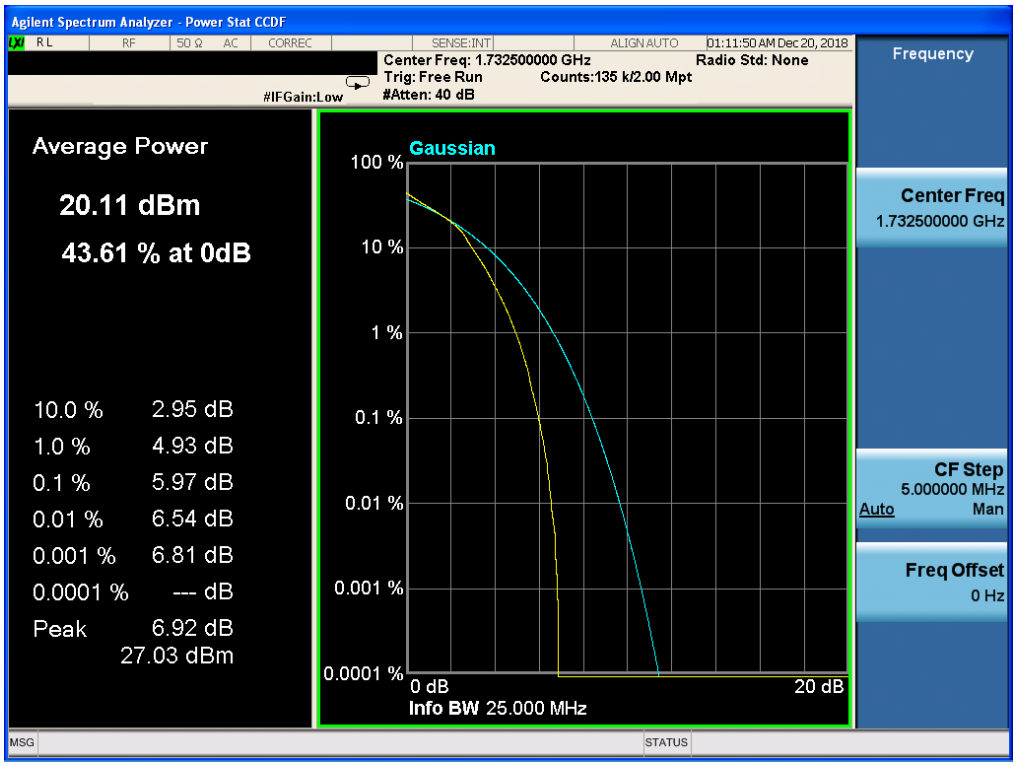
Band 4,UL Channel 20175,UL Frequency 1732.5,BW 5.0,NO. RB 1,RB POS. Low,16-QAM



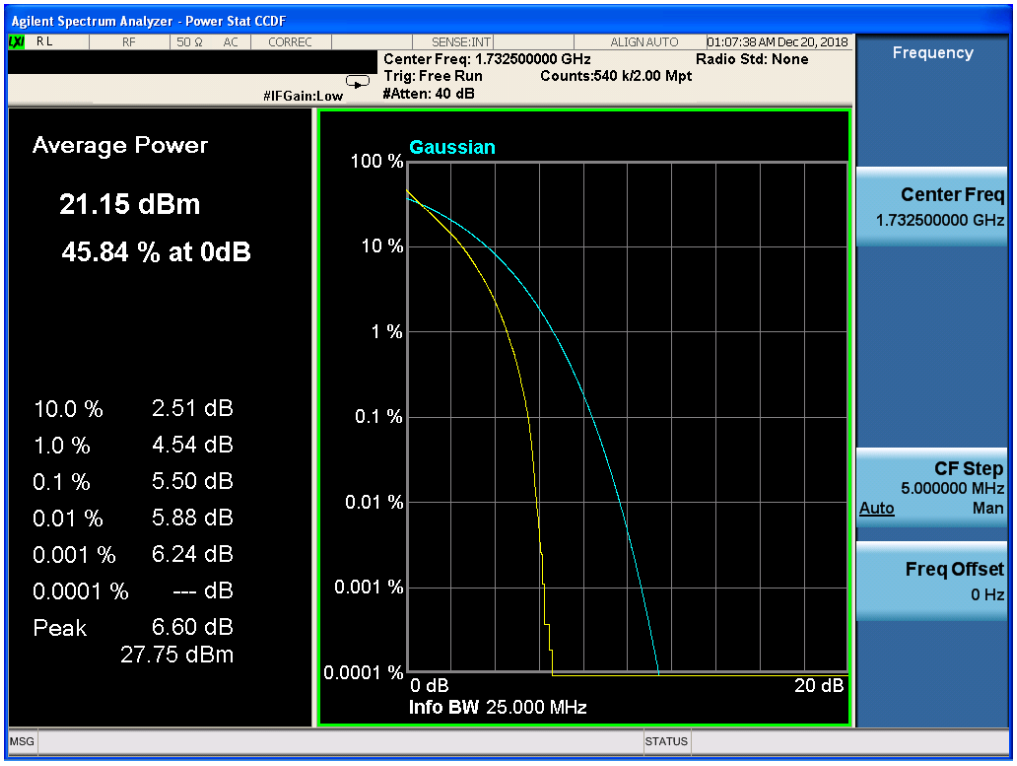
Band 4,UL Channel 20175,UL Frequency 1732.5,BW 10.0,NO. RB 1,RB POS. Low,QPSK



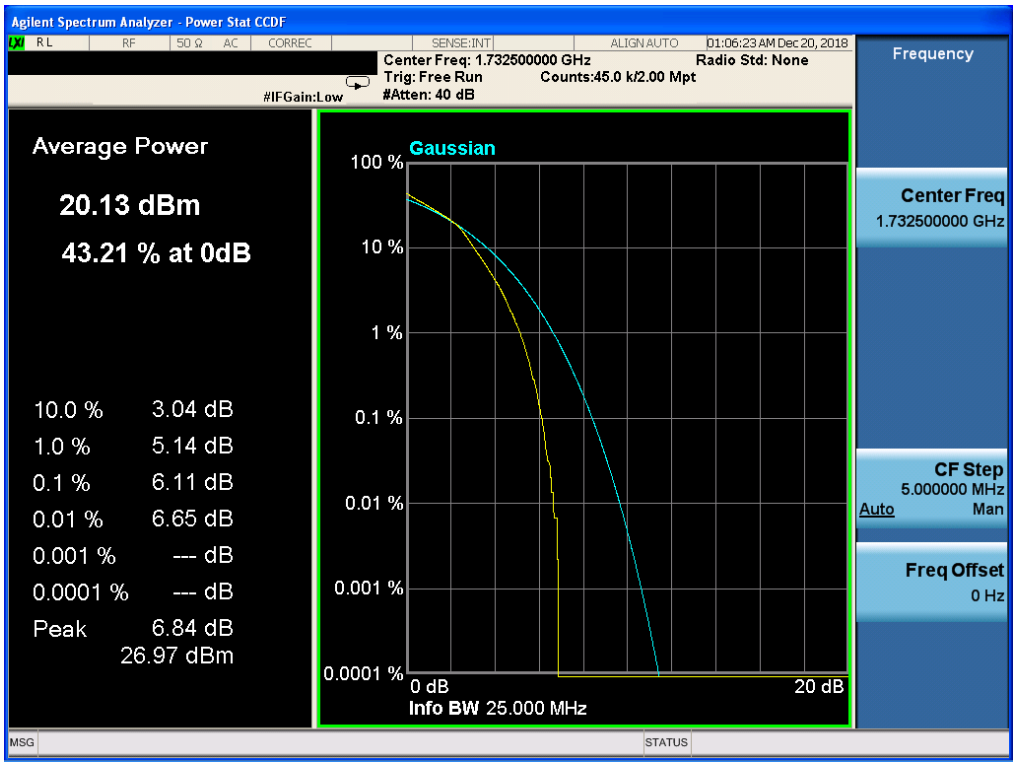
Band 4,UL Channel 20175,UL Frequency 1732.5,BW 10.0,NO. RB 1,RB POS. Low,16-QAM



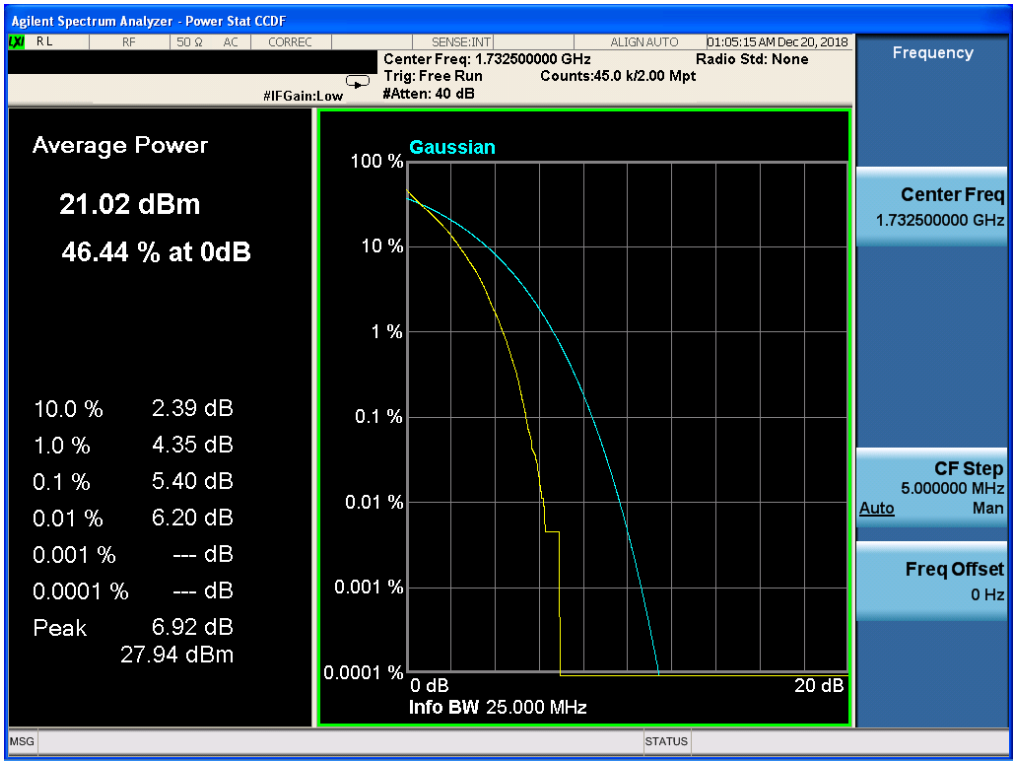
Band 4,UL Channel 20175,UL Frequency 1732.5,BW 15.0,NO. RB 1,RB POS. Low,QPSK



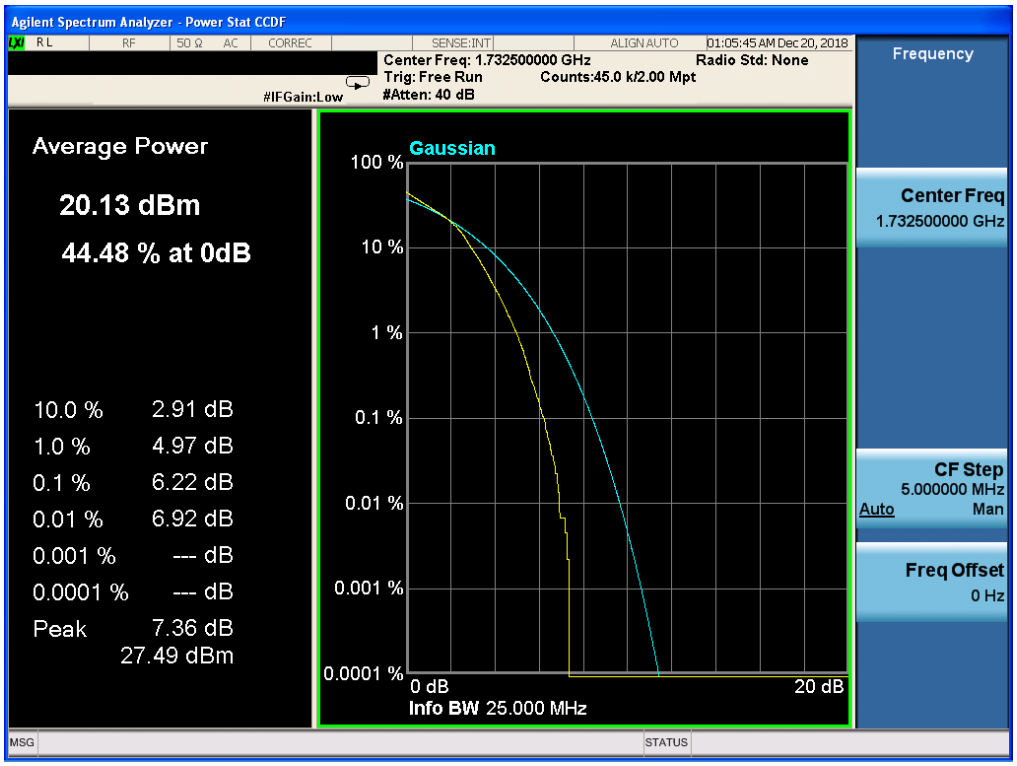
Band 4,UL Channel 20175,UL Frequency 1732.5,BW 15.0,NO. RB 1,RB POS. Low,16-QAM



Band 4,UL Channel 20175,UL Frequency 1732.5,BW 20.0,NO. RB 1,RB POS. Low,QPSK

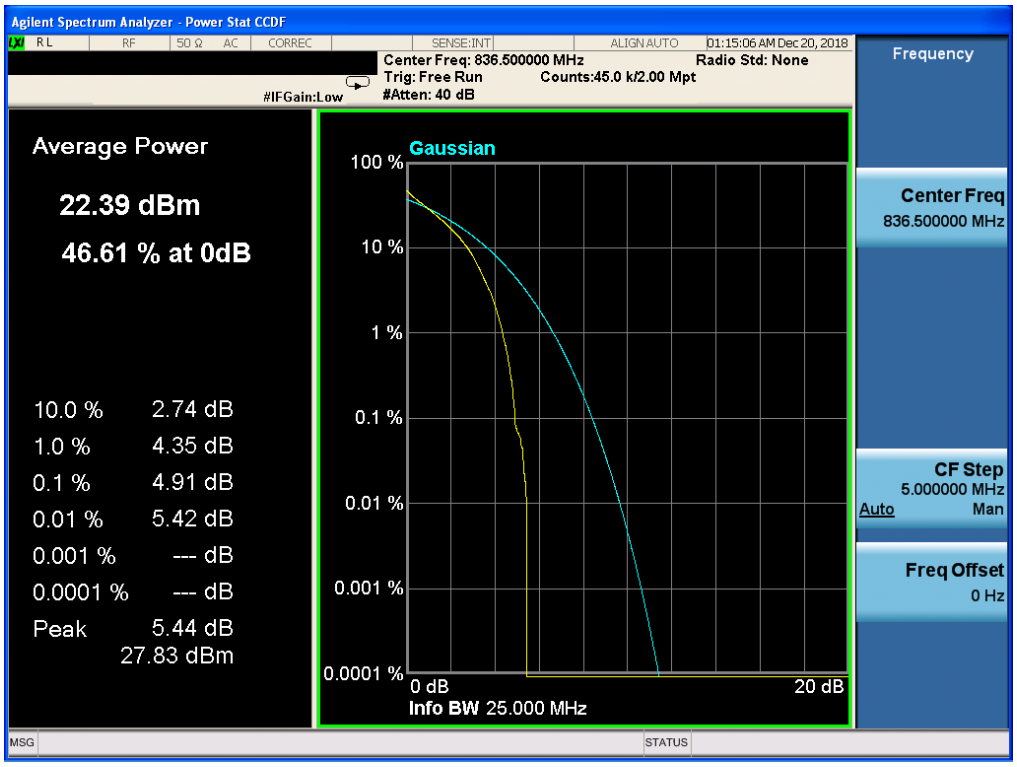


Band 4,UL Channel 20175,UL Frequency 1732.5,BW 20.0,NO. RB 1,RB POS. Low,16-QAM

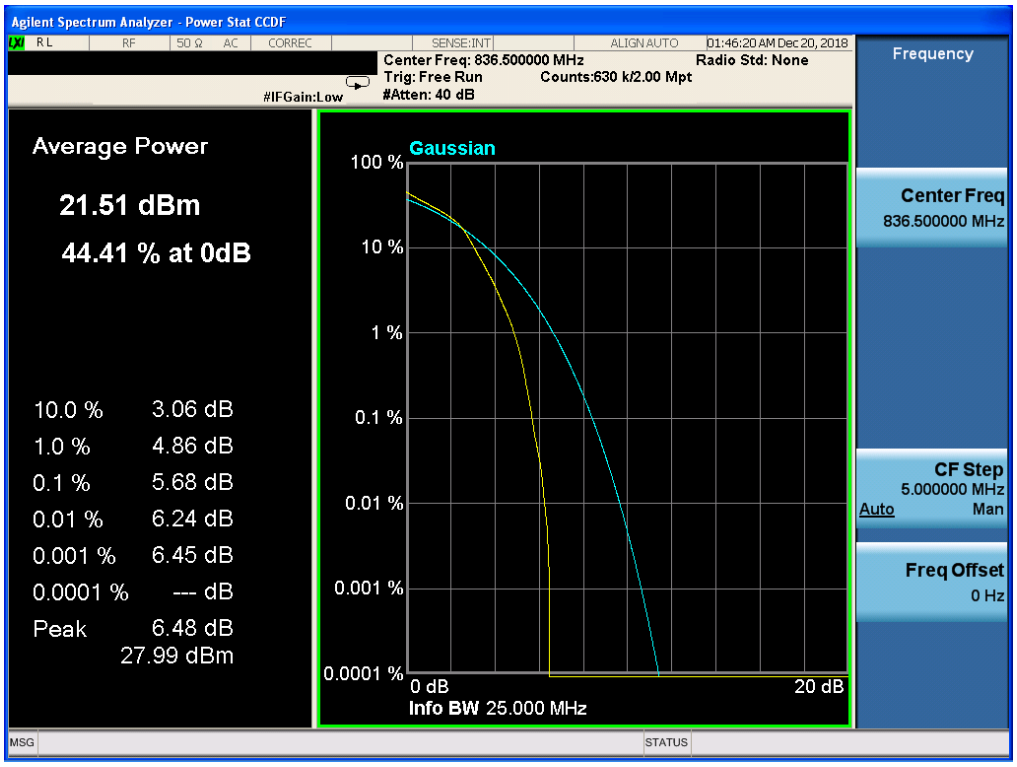


11.7 LTE BAND 5

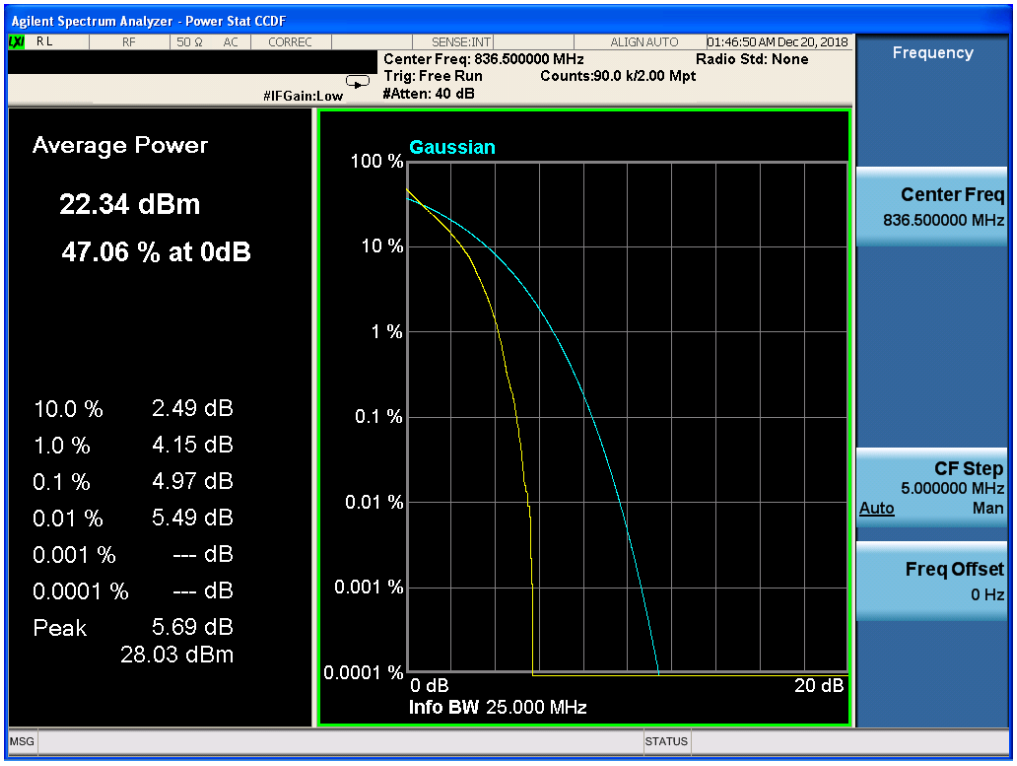
Band 5,UL Channel 20525,UL Frequency 836.5,BW 1.4,NO. RB 1,RB POS. Low,QPSK



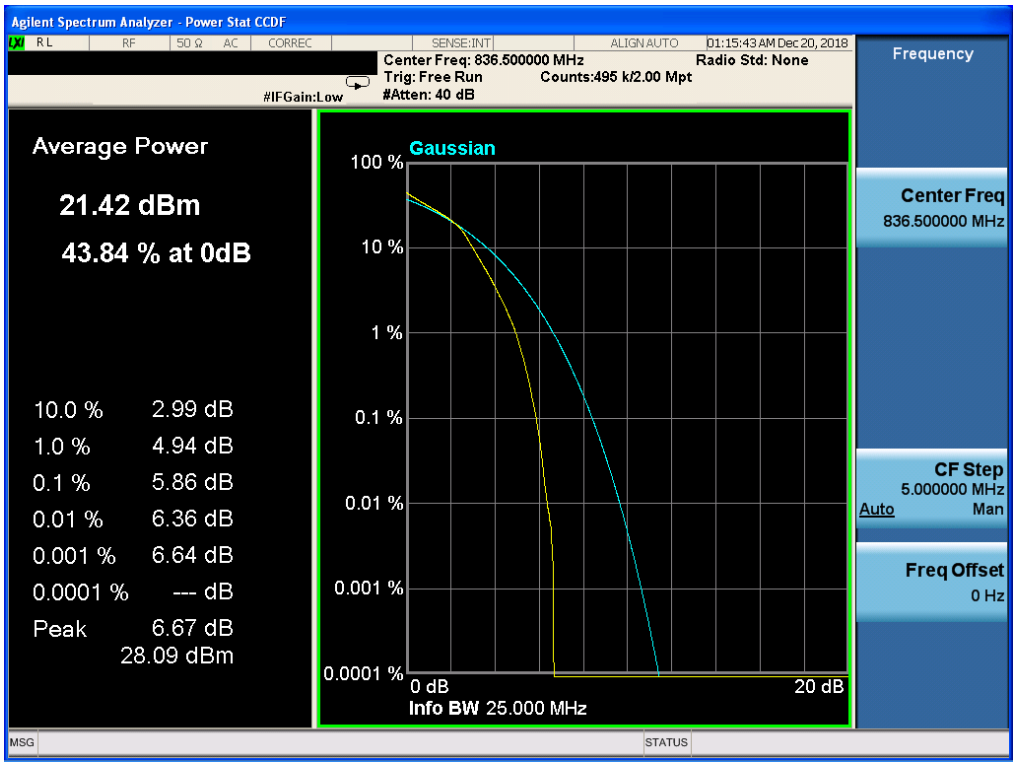
Band 5,UL Channel 20525,UL Frequency 836.5,BW 1.4,NO. RB 1,RB POS. Low,16-QAM



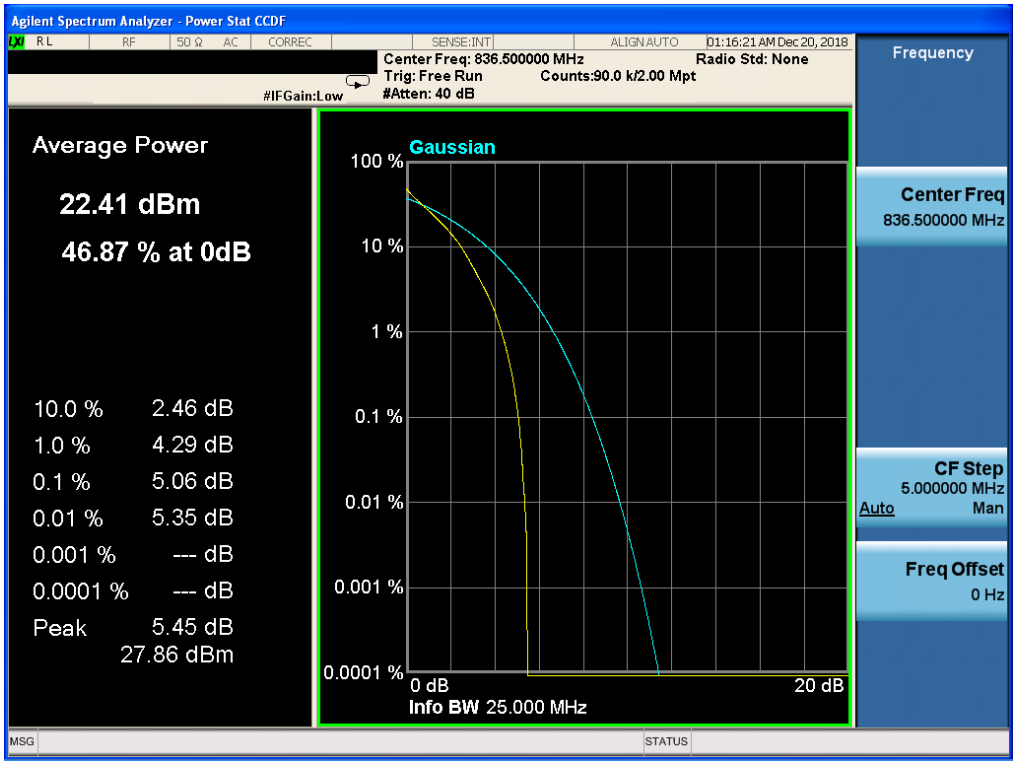
Band 5,UL Channel 20525,UL Frequency 836.5,BW 3.0,NO. RB 1,RB POS. Low,QPSK



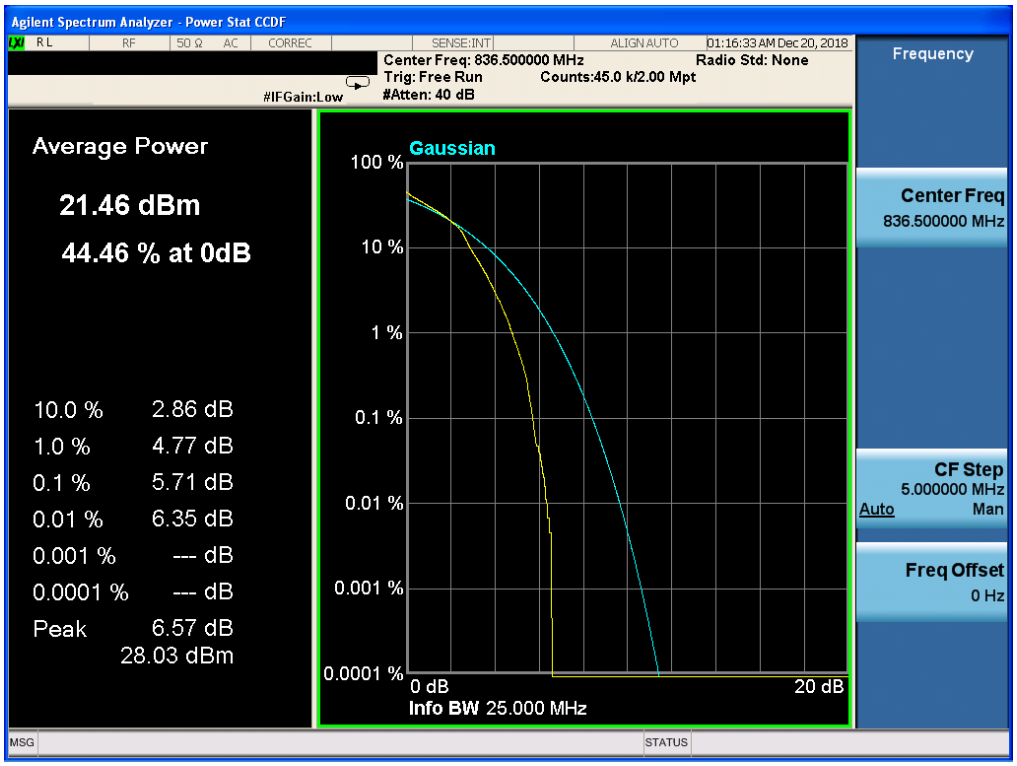
Band 5,UL Channel 20525,UL Frequency 836.5,BW 3.0,NO. RB 1,RB POS. Low,16-QAM



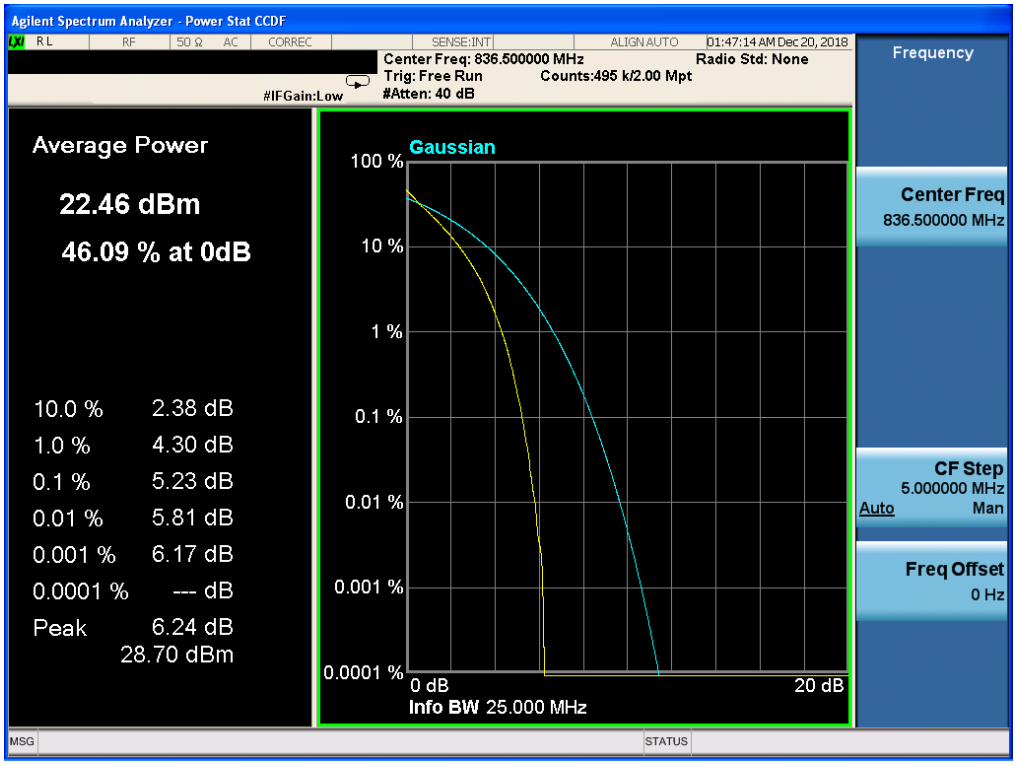
Band 5,UL Channel 20525,UL Frequency 836.5,BW 5.0,NO. RB 1,RB POS. Low,QPSK



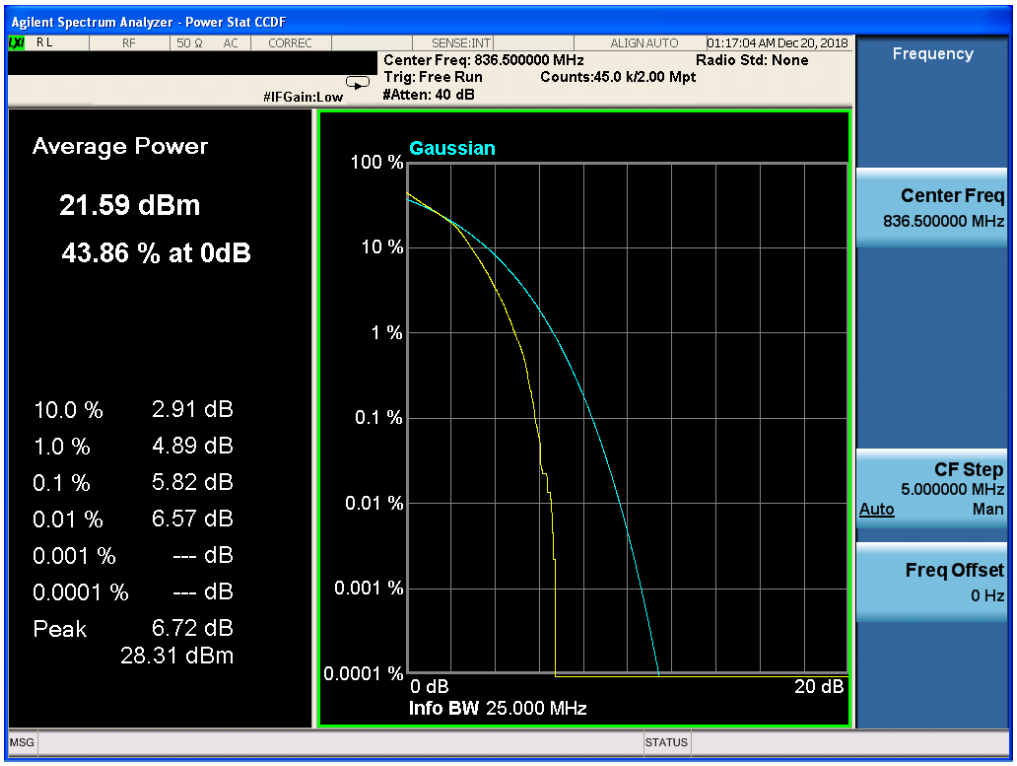
Band 5,UL Channel 20525,UL Frequency 836.5,BW 5.0,NO. RB 1,RB POS. Low,16-QAM



Band 5,UL Channel 20525,UL Frequency 836.5,BW 10.0,NO. RB 1,RB POS. Low,QPSK

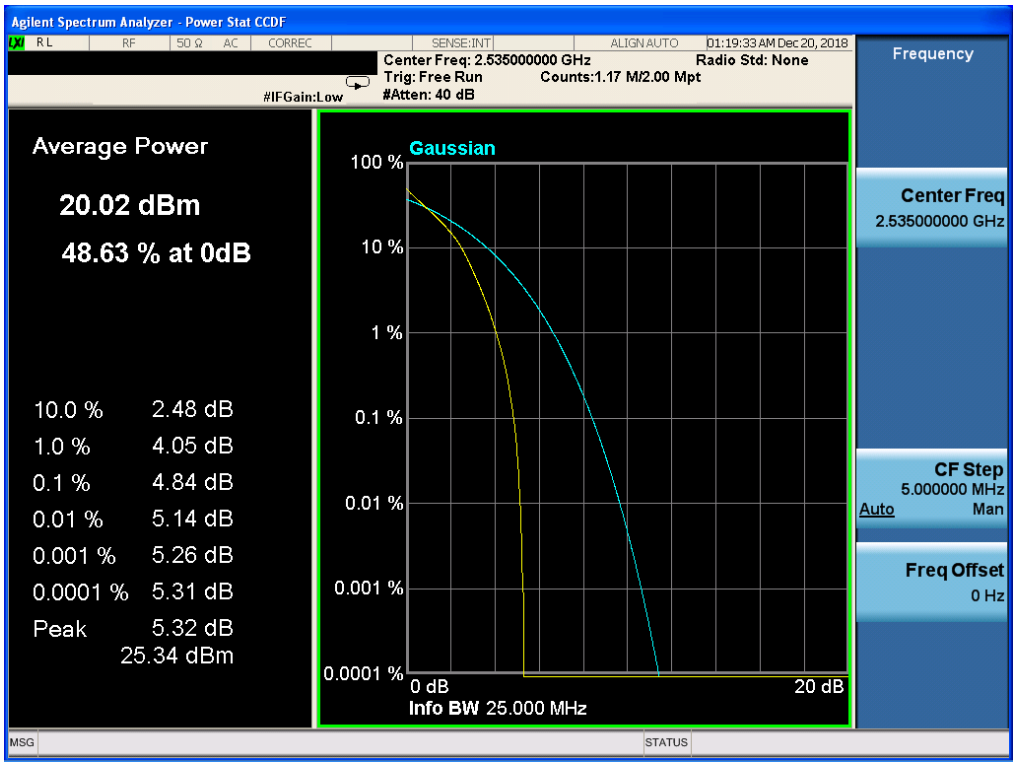


Band 5,UL Channel 20525,UL Frequency 836.5,BW 10.0,NO. RB 1,RB POS. Low,16-QAM

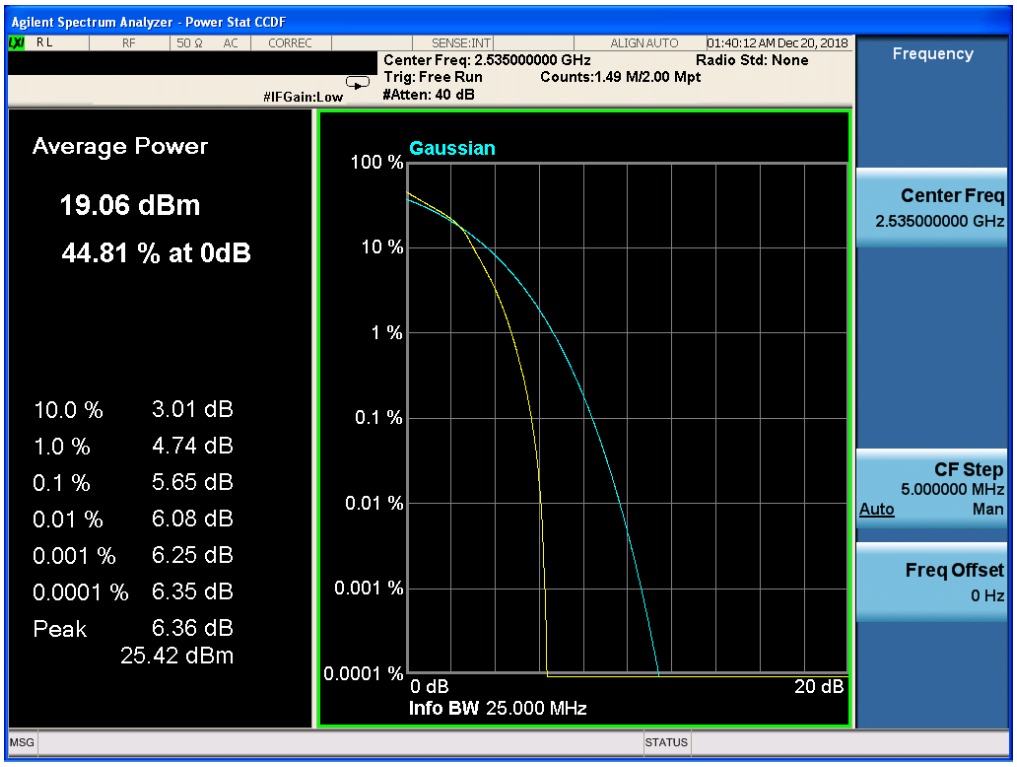


11.8 LTE BAND 7

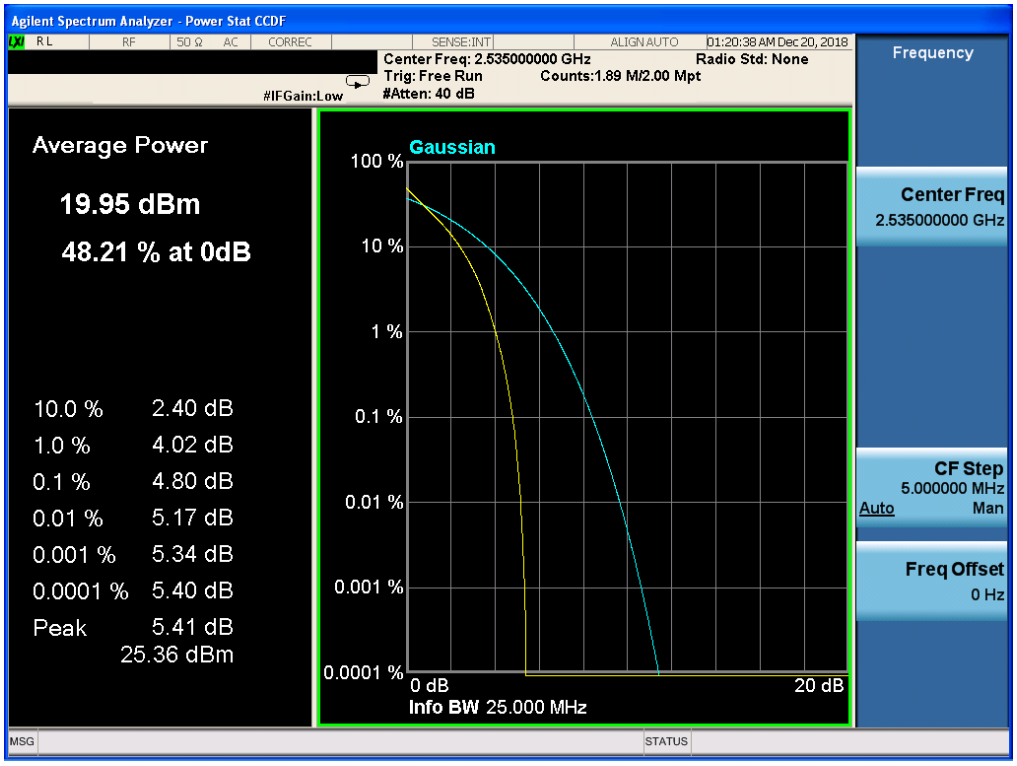
Band 7,UL Channel 21100,UL Frequency 2535.0,BW 5.0,NO. RB 25,RB POS. Low,QPSK



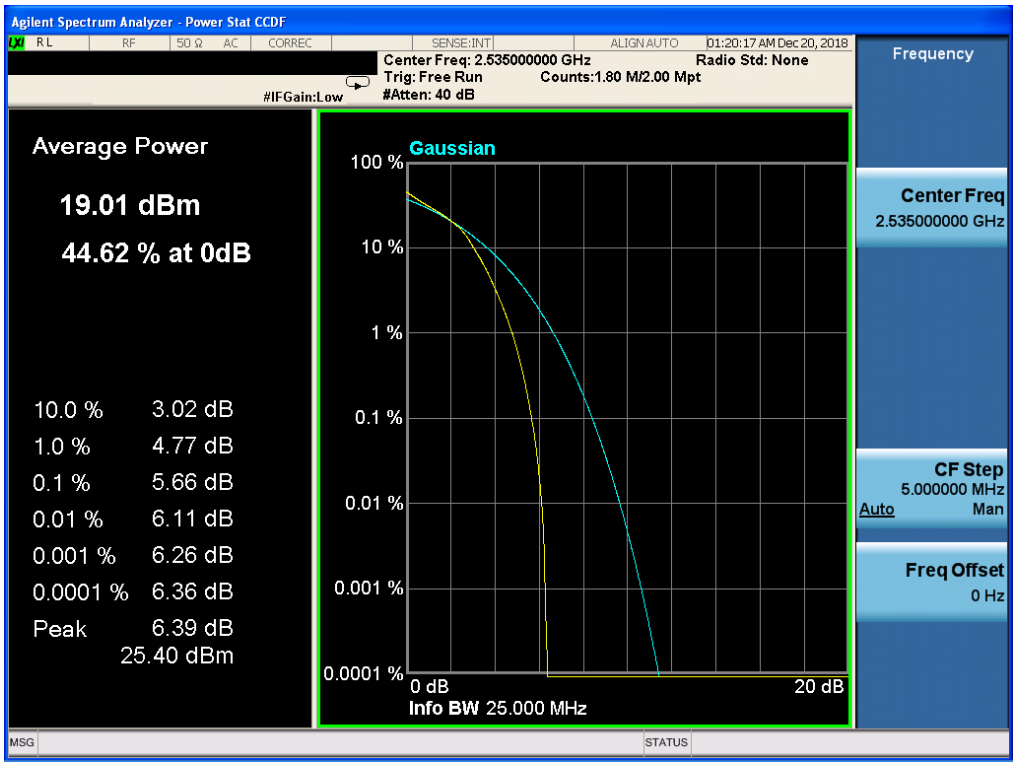
Band 7,UL Channel 21100,UL Frequency 2535.0,BW 5.0,NO. RB 25,RB POS. Low,16-QAM



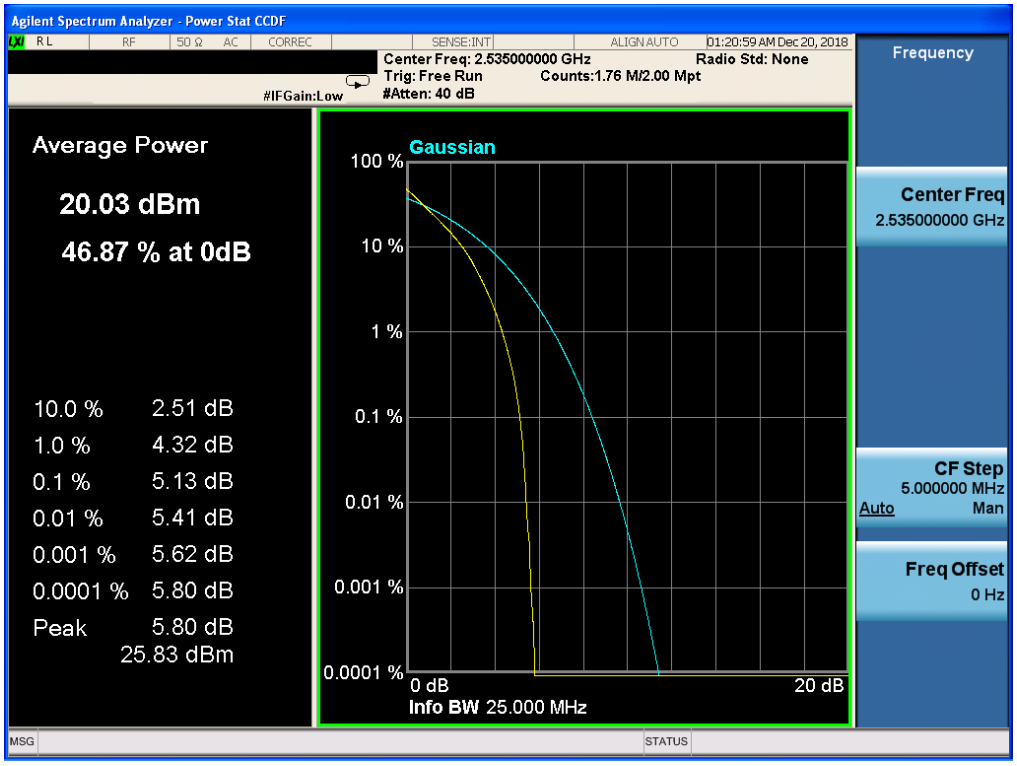
Band 7,UL Channel 21100,UL Frequency 2535.0,BW 10.0,NO. RB 50,RB POS. Low,QPSK



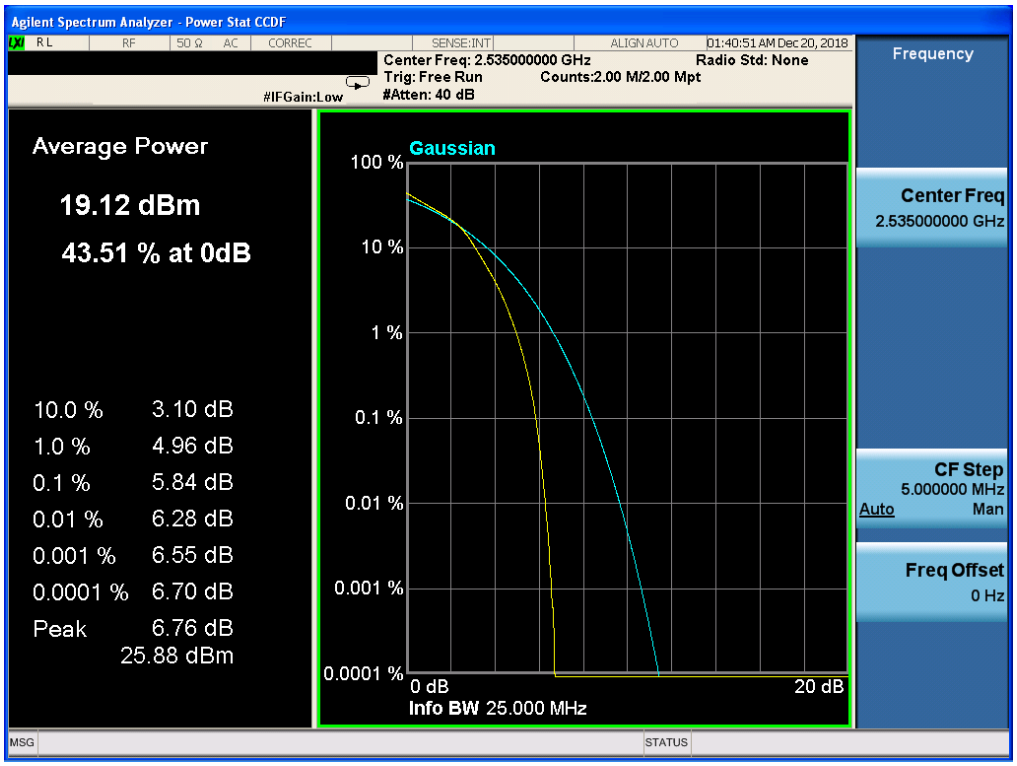
Band 7,UL Channel 21100,UL Frequency 2535.0,BW 10.0,NO. RB 1,RB POS. Low,16-QAM



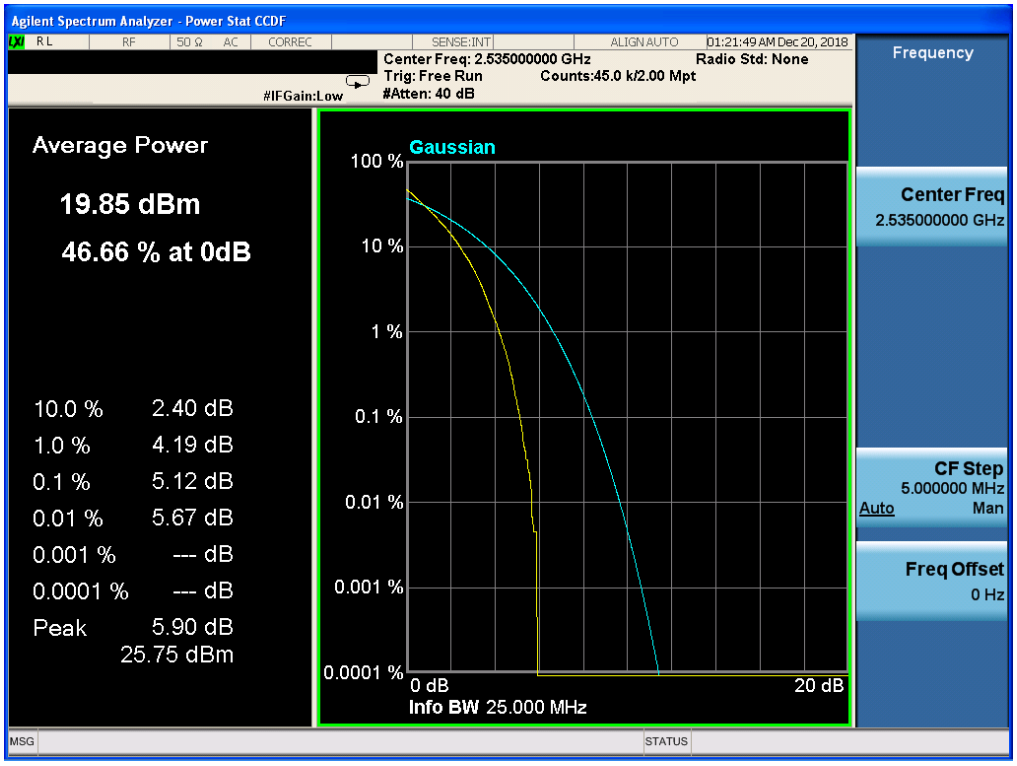
Band 7,UL Channel 21100,UL Frequency 2535.0,BW 15.0,NO. RB 1,RB POS. Low,QPSK



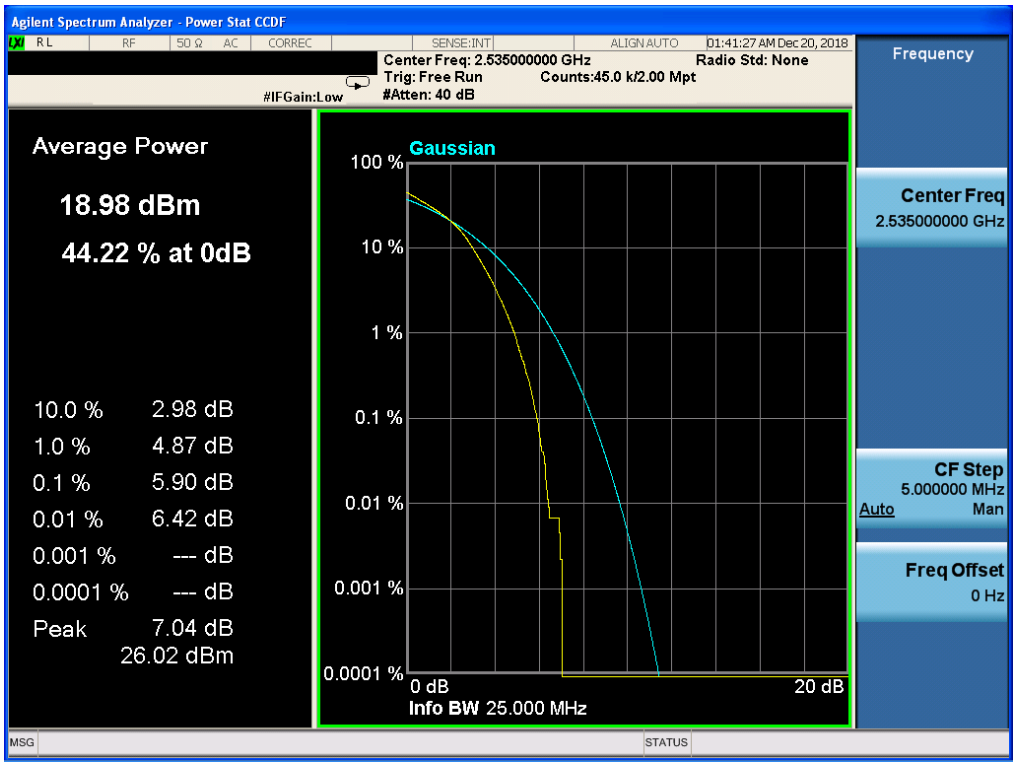
Band 7,UL Channel 21100,UL Frequency 2535.0,BW 15.0,NO. RB 1,RB POS. Low,16-QAM



Band 7,UL Channel 21100,UL Frequency 2535.0,BW 20.0,NO. RB 1,RB POS. Low,QPSK

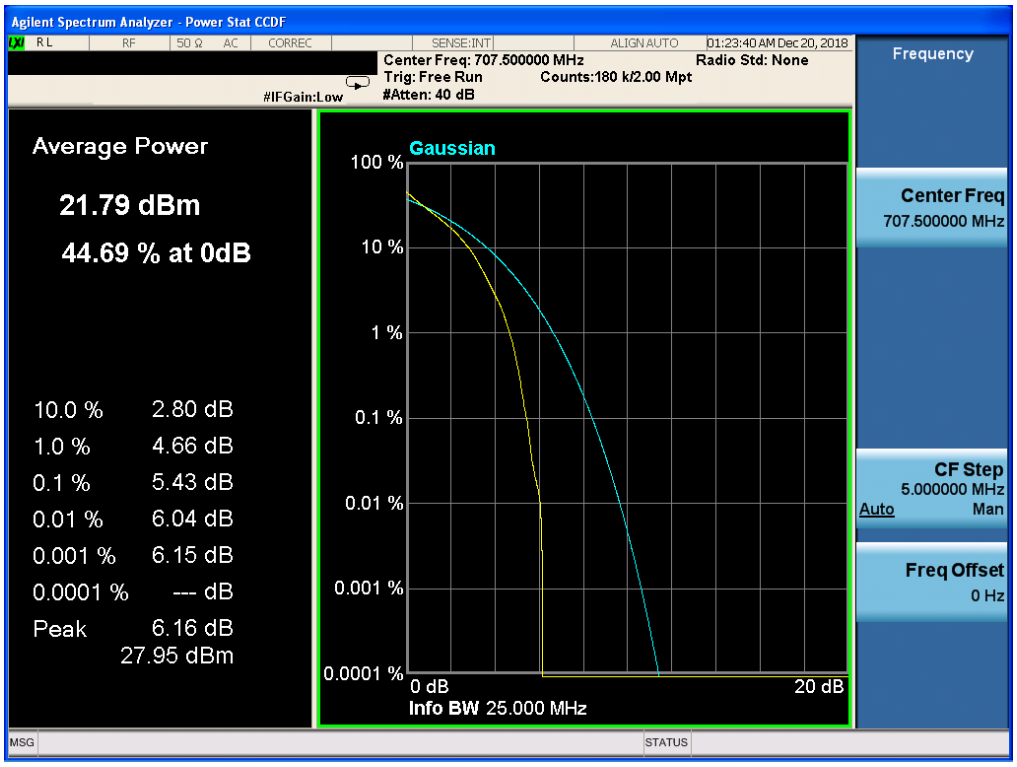


Band 7,UL Channel 21100,UL Frequency 2535.0,BW 20.0,NO. RB 1,RB POS. Low,16-QAM

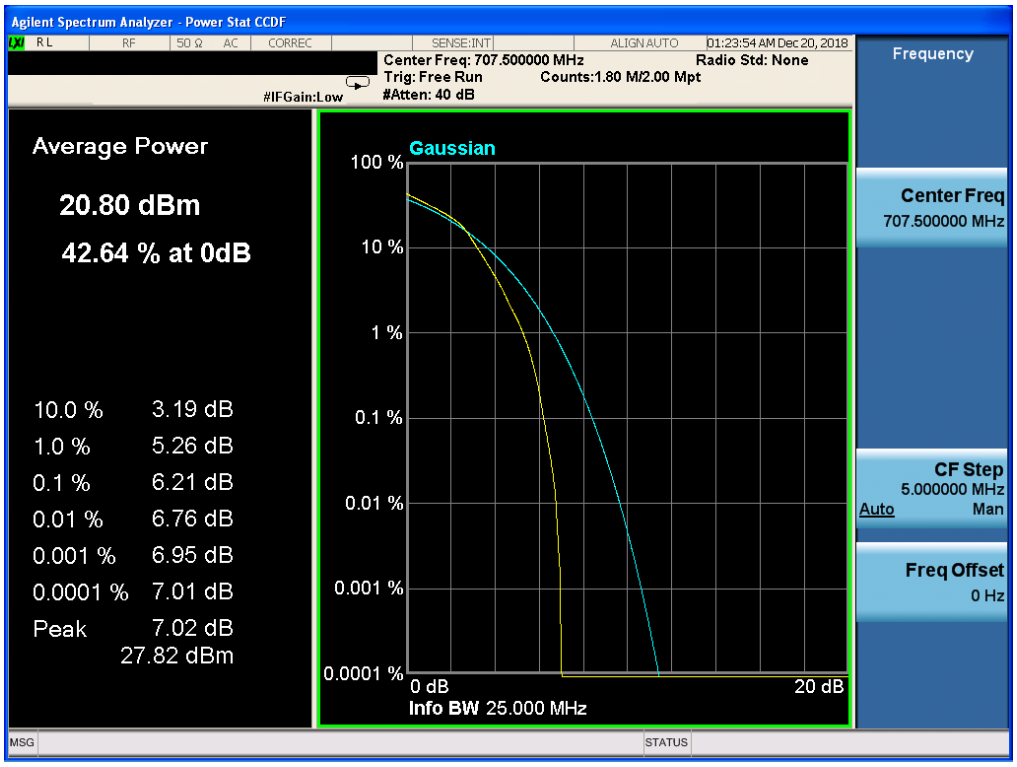


11.9 LTE BAND 12

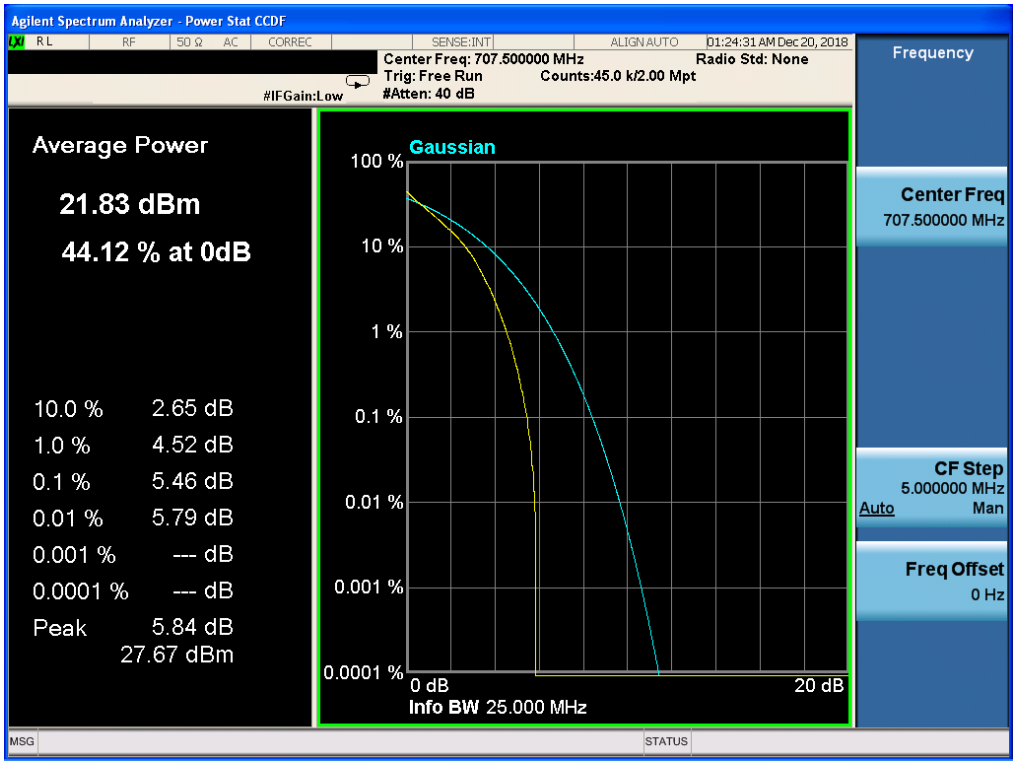
Band 12,UL Channel 23095,UL Frequency 707.5,BW 1.4,NO. RB 1,RB POS. Low,QPSK



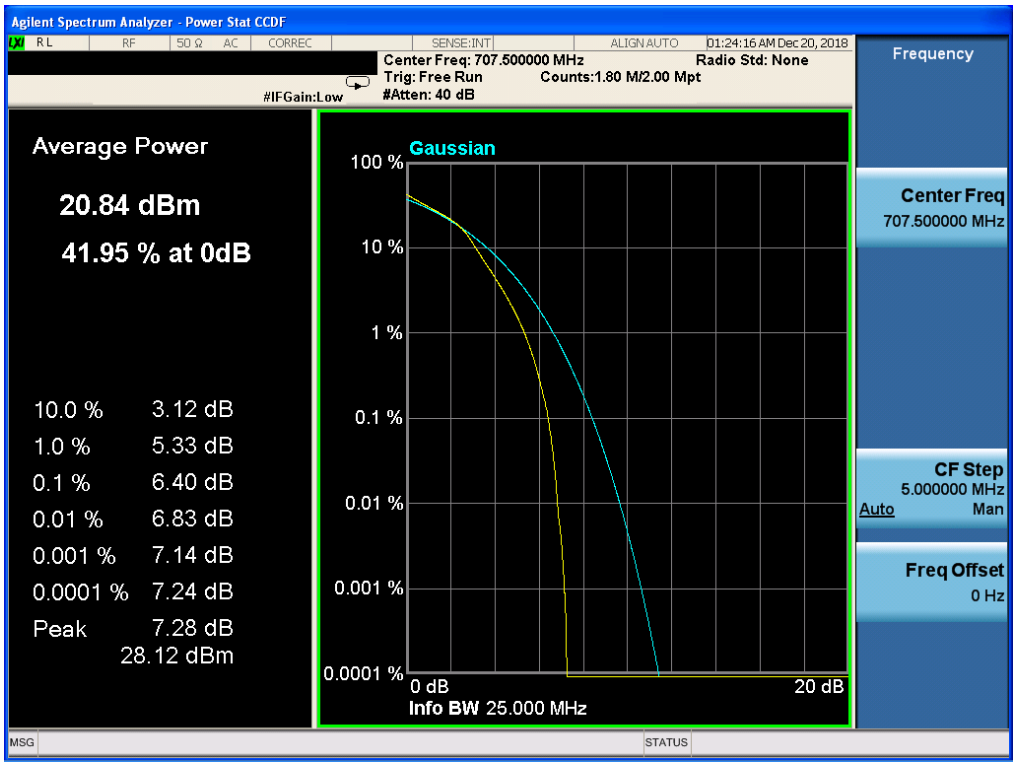
Band 12,UL Channel 23095,UL Frequency 707.5,BW 1.4,NO. RB 1,RB POS. Low,16-QAM



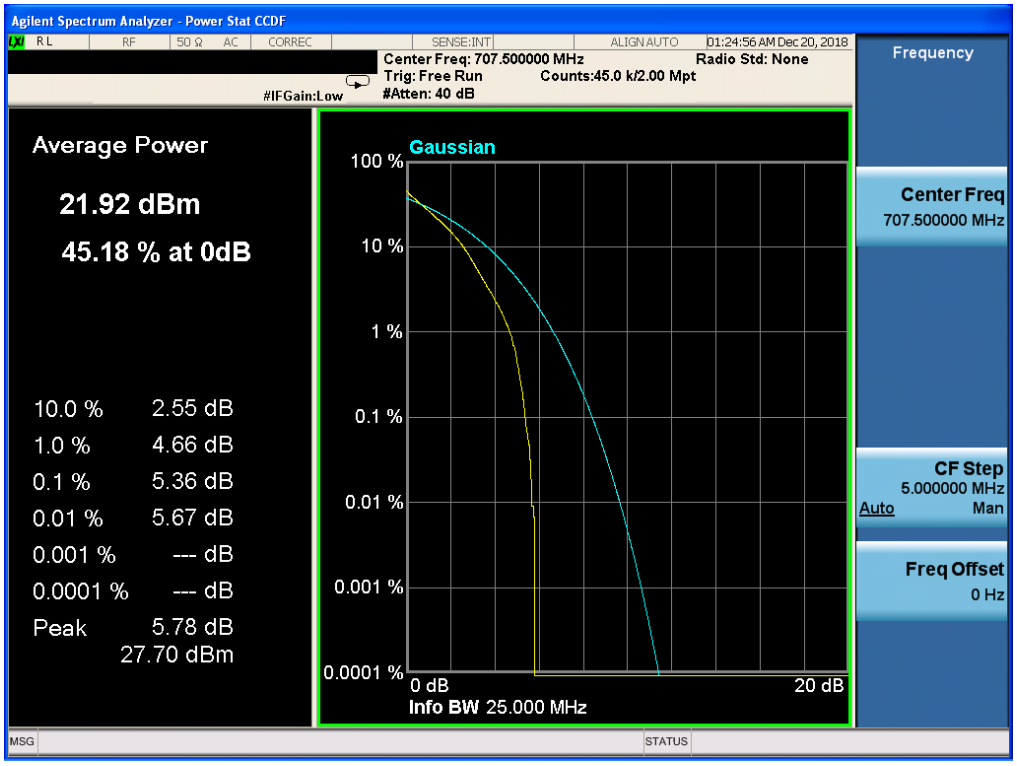
Band 12,UL Channel 23095,UL Frequency 707.5,BW 3.0,NO. RB 1,RB POS. Low,QPSK



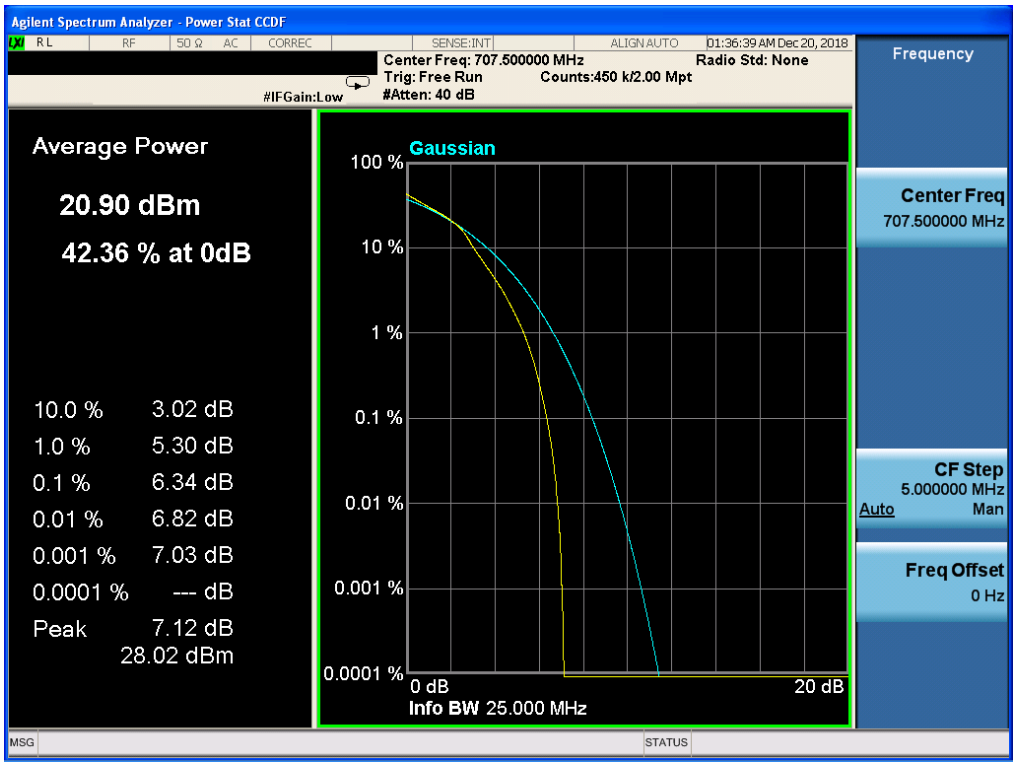
Band 12,UL Channel 23095,UL Frequency 707.5,BW 3.0,NO. RB 1,RB POS. Low,16-QAM



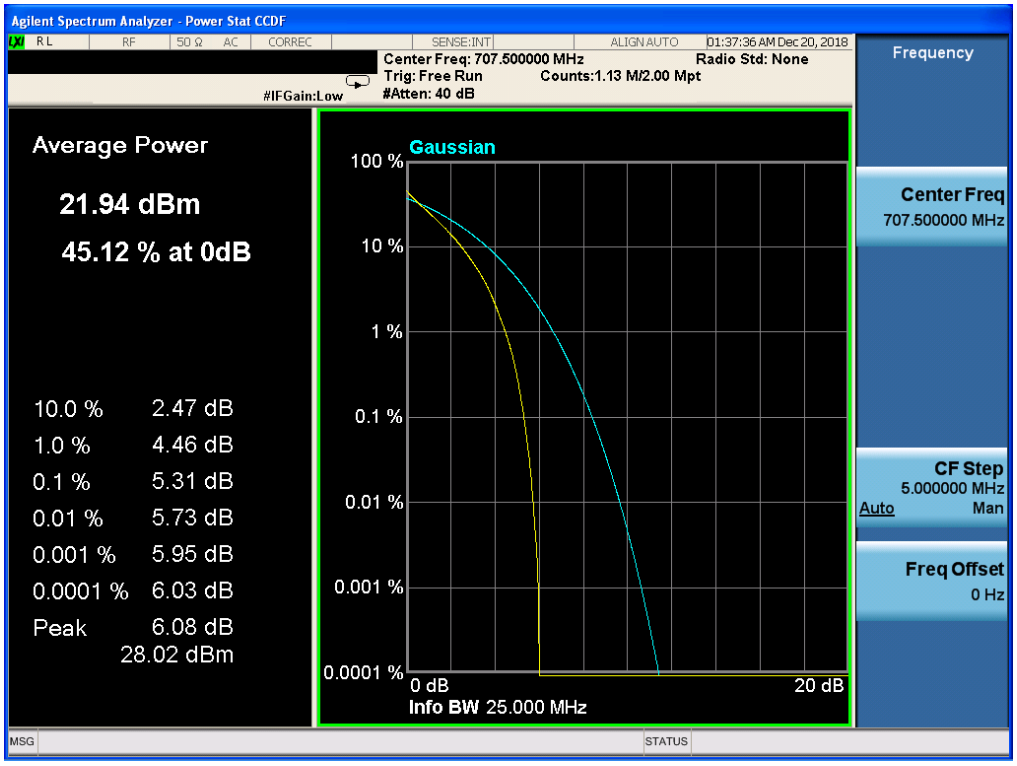
Band 12,UL Channel 23095,UL Frequency 707.5,BW 5.0,NO. RB 1,RB POS. Low,QPSK



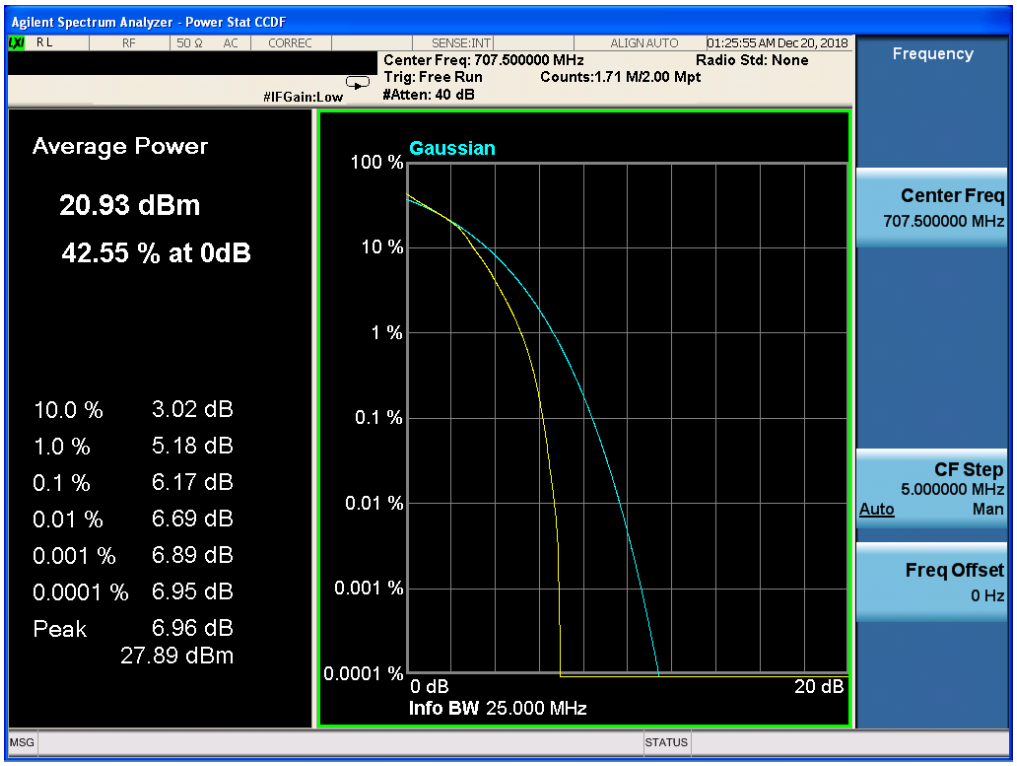
Band 12,UL Channel 23095,UL Frequency 707.5,BW 5.0,NO. RB 1,RB POS. Low,16-QAM



Band 12,UL Channel 23095,UL Frequency 707.5,BW 10.0,NO. RB 1,RB POS. Low,QPSK

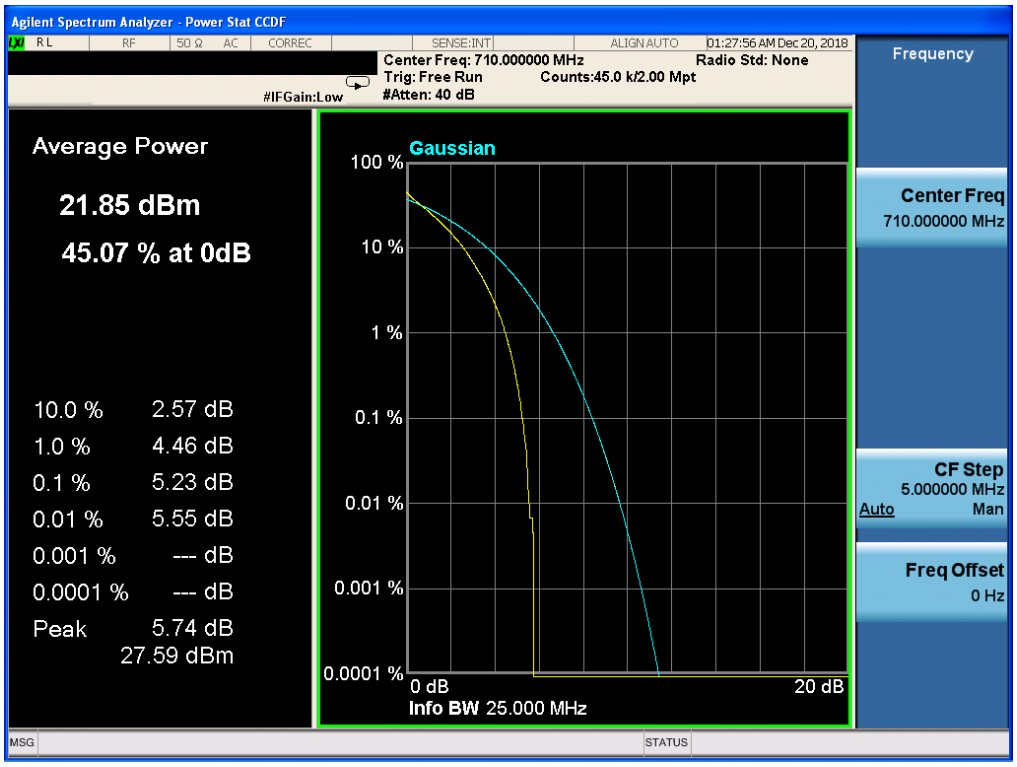


Band 12,UL Channel 23095,UL Frequency 707.5,BW 10.0,NO. RB 1,RB POS. Low,16-QAM

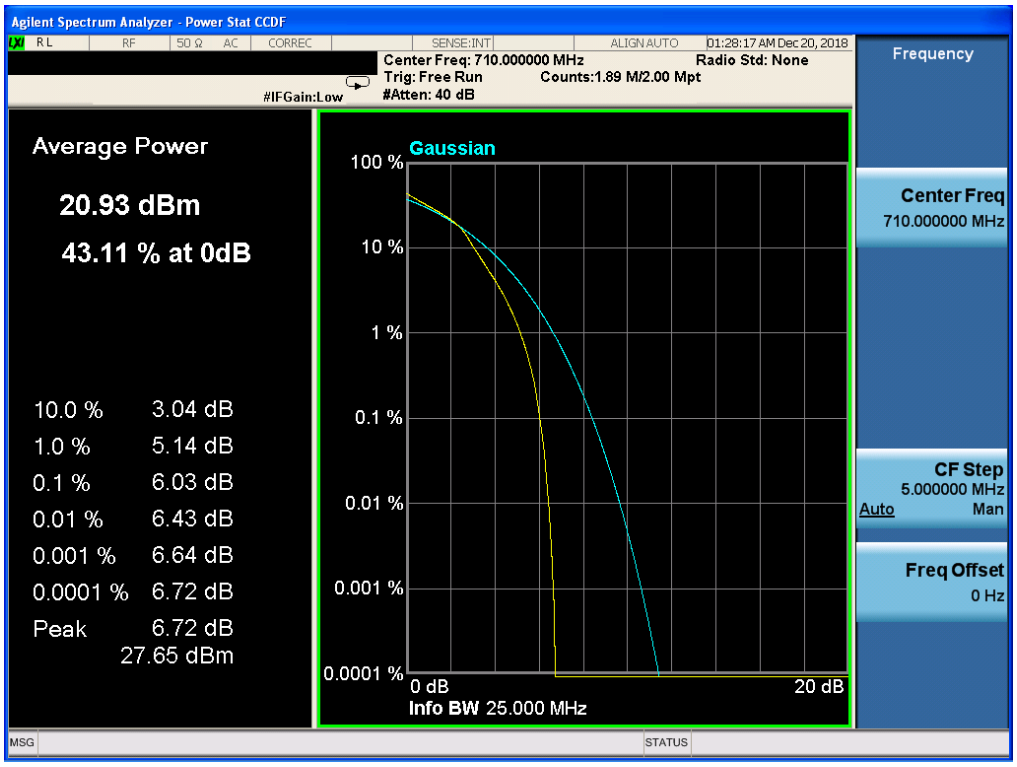


11.10 LTE BAND 17

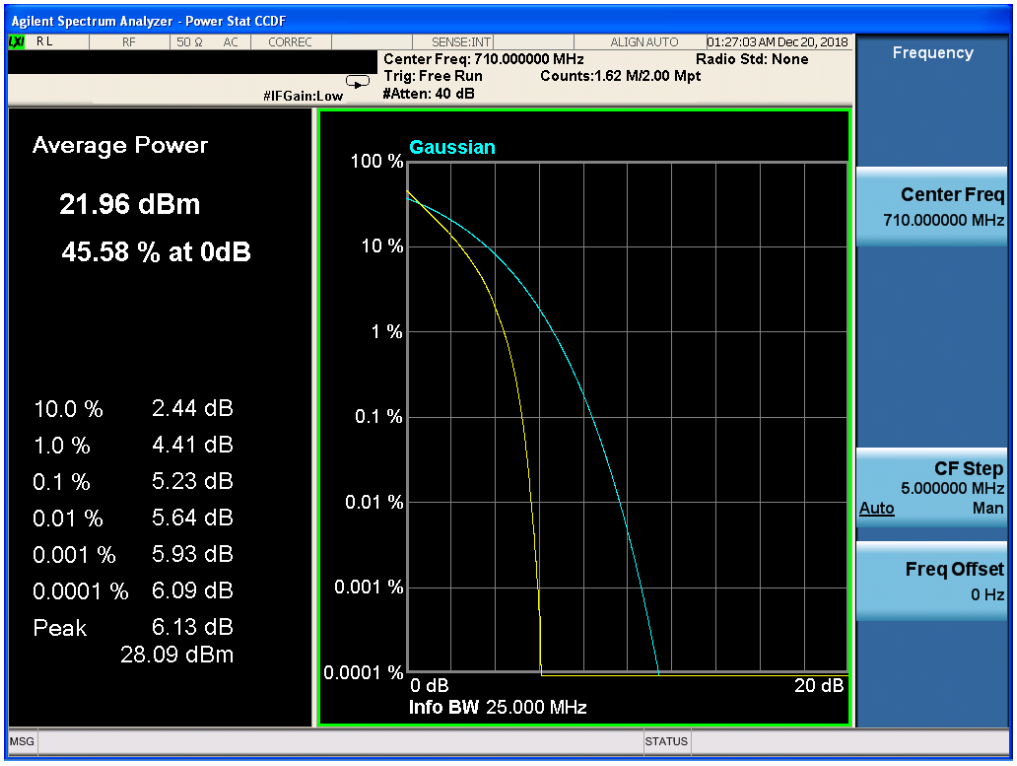
Band 17,UL Channel 23790,UL Frequency 710.0,BW 5.0,NO. RB 25,RB POS. Low,QPSK



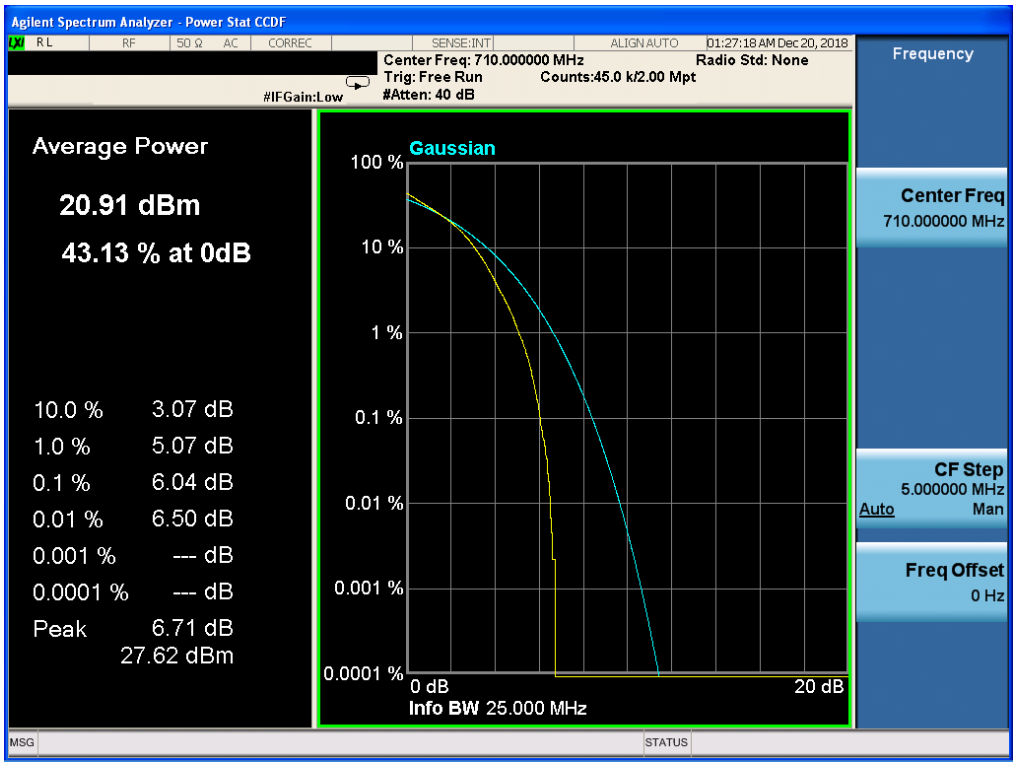
Band 17,UL Channel 23790,UL Frequency 710.0,BW 5.0,NO. RB 25,RB POS. Low,16-QAM



Band 17,UL Channel 23790,UL Frequency 710.0,BW 10.0,NO. RB 50,RB POS. Low,QPSK



Band 17,UL Channel 23790,UL Frequency 710.0,BW 10.0,NO. RB 50,RB POS. Low,16-QAM



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