10MHz/QPSK/Low CH

10MHz/16QAM/Low CH

10MHz/QPSK/Mid CH

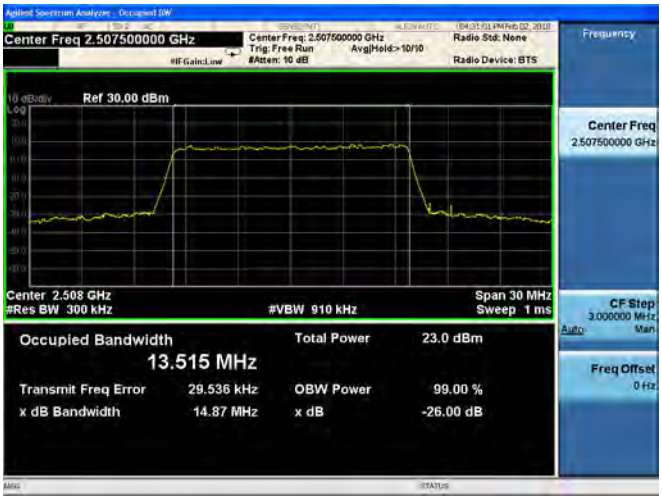
10MHz/16QAM/Mid CH

10MHz/QPSK/High CH

10MHz/16QAM/High CH

15MHz/QPSK/Low CH

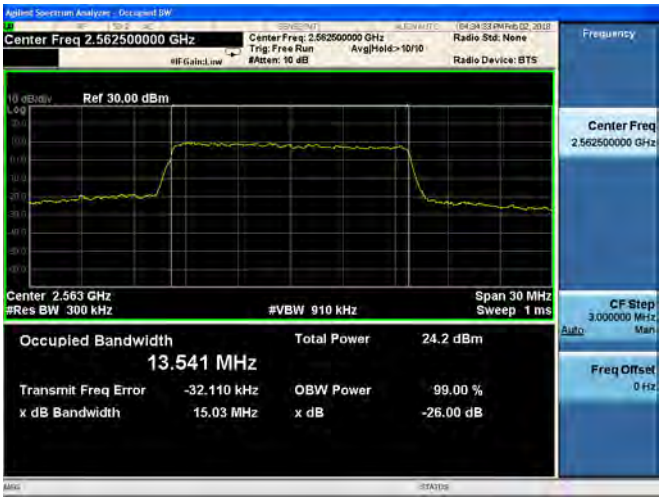
15MHz/16QAM/Low CH



15MHz/QPSK/Mid CH

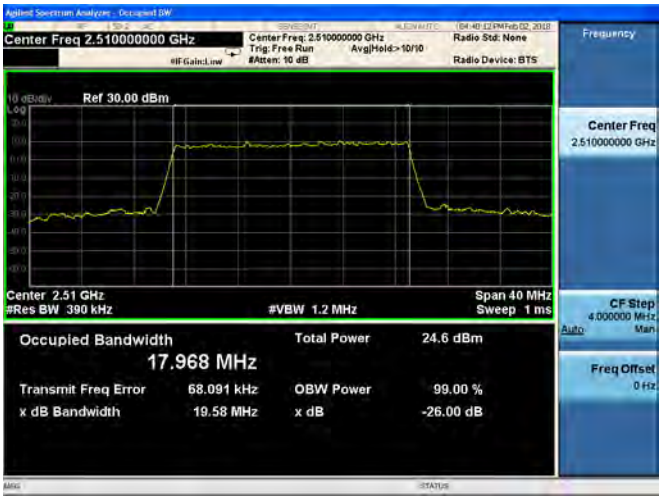
15MHz/16QAM/Mid CH

15MHz/QPSK/High CH



15MHz/16QAM/High CH

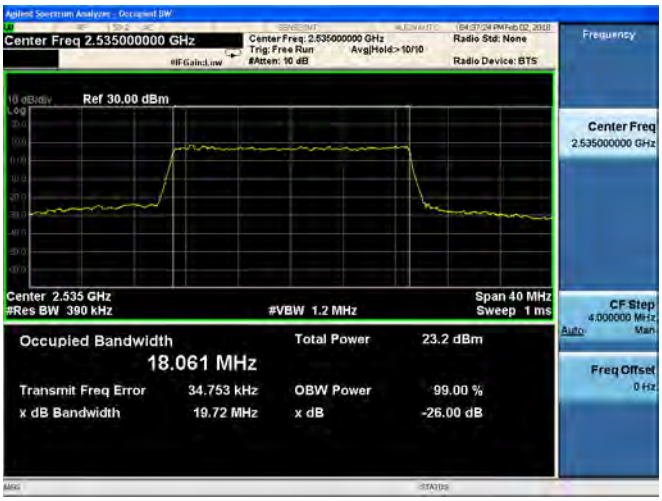
20MHz/QPSK/Low CH



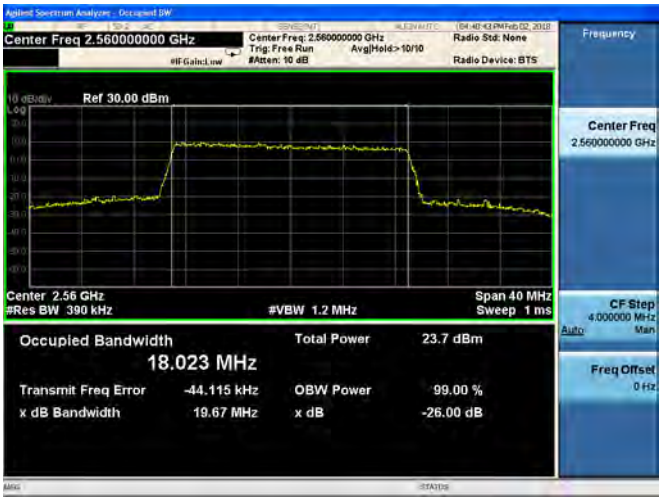
20MHz/16QAM/Low CH

20MHz/QPSK/Mid CH

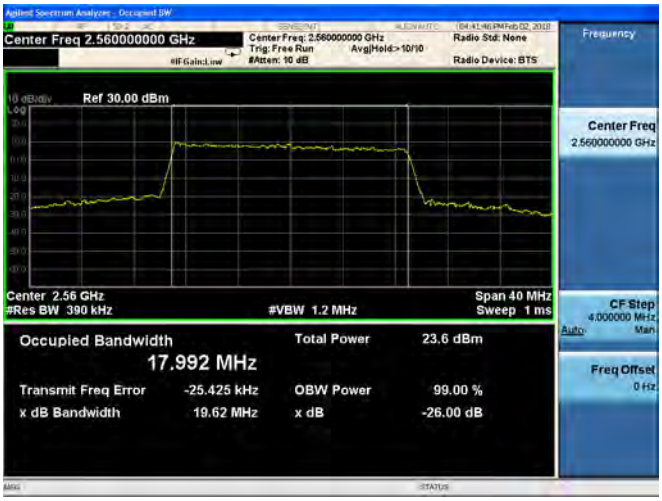
20MHz/16QAM/Mid CH



20MHz/QPSK/High CH



20MHz/16QAM/High CH



LTE Band 12, BW: 1.4MHz					
Channel	Frequency (MHz)	QPSK		16QAM	
		99% Bandwidth (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)	26dB Bandwidth (MHz)
23017	699.7	1.0976	1.275	1.1051	1.286
23095	707.5	1.0994	1.280	1.0971	1.259
23173	715.3	1.0983	1.267	1.1034	1.285
LTE Band 12, BW: 3MHz					
Channel	Frequency (MHz)	QPSK		16QAM	
		99% Bandwidth (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)	26dB Bandwidth (MHz)
23025	700.5	2.7163	2.972	2.7054	2.990
23095	707.5	2.7079	2.987	2.7147	2.996
23165	714.5	2.7110	2.976	2.7031	2.985
LTE Band 12, BW: 5MHz					
Channel	Frequency (MHz)	QPSK		16QAM	
		99% Bandwidth (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)	26dB Bandwidth (MHz)
23035	701.5	4.5296	5.118	4.5267	5.014
23095	707.5	4.5412	5.045	4.5350	5.080
23165	714.5	4.5184	5.037	4.5344	5.077
LTE Band 12, BW: 10MHz					
Channel	Frequency (MHz)	QPSK		16QAM	
		99% Bandwidth (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)	26dB Bandwidth (MHz)
23060	704.0	8.9582	9.883	8.9737	9.955
23095	707.5	9.0414	10.06	9.0311	9.912
23130	711.0	9.0128	10.03	9.0076	10.04

LTE Band 12 99%&26dB Bandwidth

1.4MHz/QPSK/Low CH

1.4MHz/16QAM/Low CH

1.4MHz/QPSK/Mid CH

1.4MHz/16QAM/Mid CH

1.4MHz/QPSK/High CH	1.4MHz/16QAM/High CH

3MHz/QPSK/Low CH

3MHz/16QAM/Low CH

3MHz/QPSK/Mid CH

3MHz/16QAM/Mid CH

3MHz/QPSK/High CH

3MHz/16QAM/High CH

5MHz/QPSK/Low CH

5MHz/16QAM/Low CH

5MHz/QPSK/Mid CH

5MHz/16QAM/Mid CH

5MHz/QPSK/High CH

5MHz/16QAM/High CH

10MHz/QPSK/Low CH

10MHz/16QAM/Low CH

10MHz/QPSK/Mid CH

10MHz/16QAM/Mid CH

10MHz/QPSK/High CH

10MHz/16QAM/High CH

LTE Band 17, BW: 5MHz					
Channel	Frequency (MHz)	QPSK		16QAM	
		99% Bandwidth (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)	26dB Bandwidth (MHz)
23755	706.5	4.5368	5.087	4.5337	5.069
23790	710.0	4.5374	5.055	4.5423	5.101
23825	713.5	4.5210	5.044	4.5363	5.079
LTE Band 17, BW: 10MHz					
Channel	Frequency (MHz)	QPSK		16QAM	
		99% Bandwidth (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)	26dB Bandwidth (MHz)
23780	709.0	9.0177	10.01	9.0362	9.945
23790	710.0	9.0337	10.02	9.0298	9.985
23800	711.0	9.0136	10.00	9.0079	10.02

LTE Band 17 99%&26dB Bandwidth	
5MHz/QPSK/Low CH	**5MHz/16QAM/Low CH**

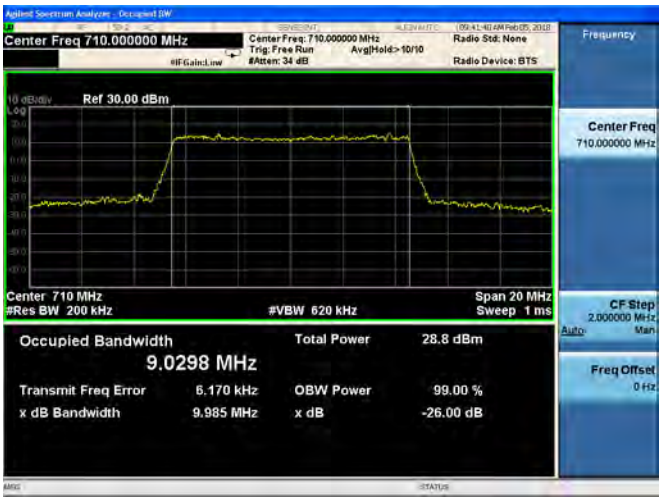
5MHz/QPSK/Mid CH	5MHz/16QAM/Mid CH
5MHz/QPSK/High CH	**5MHz/16QAM/High CH**

10MHz/QPSK/Low CH

10MHz/16QAM/Low CH

10MHz/QPSK/Mid CH

10MHz/16QAM/Mid CH



10MHz/QPSK/High CH

10MHz/16QAM/High CH

2.3. Frequency Stability

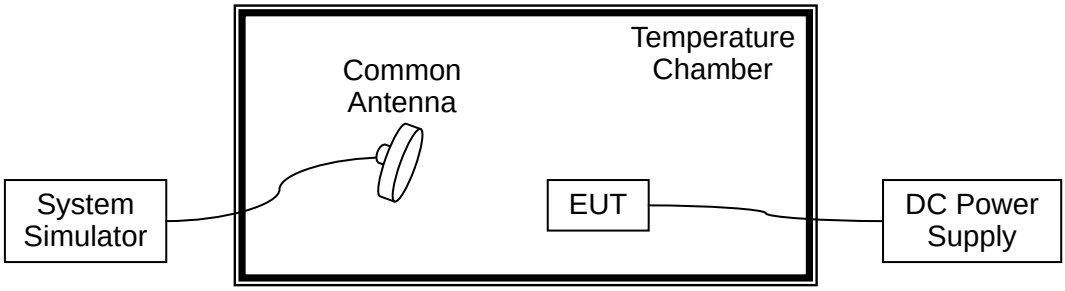
2.3.1. Requirement

According to FCC section 2.1055 & 27.54&24.235, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. According to FCC section 2.1055, the test conditions are:

(a) The temperature is varied from -30°C to +50°C at intervals of not more than 10°C.

(b) For hand carried battery powered equipment, the primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacture. The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided.

2.3.2. Test Description



The EUT which is powered by the DC Power Supply directly, is located in the Temperature Chamber. The EUT is commanded by the System Simulator (SS) to operate at the maximum output power. A call is established between the EUT and the SS via a Common Antenna.

2.3.3. Test procedure

KDB 971168 D01v03 Section 9.0 and ANSI/TIA-603-E-2016.

2.3.4. Test Result

The nominal, highest and lowest extreme voltages are separately 3.8VDC, 4.35VDC and 3.6VDC, which are specified by the applicant; the normal temperature here used is 20°C. The frequency deviation limit is ±2.5ppm.

The testing was performed using one RB and Bandwidth setting for each band.

LTE Band 2 – QPSK - Channel 18900 – Frequency 1880.0MHz – RB 6/0 Limit: 1880.0MHz*1ppm=1880.0Hz				
Voltage (%)	**Power (VDC)**	**Temp (°C)**	**Fre. Dev. (Hz)**	**Result**
100	3.8V	-30	8.55	PASS
100		-20	-13.67	
100		-10	5.82	
100		0	7.73	
100		+10	6.55	
100		+20	5.47	
100		+30	-14.9	
100		+40	6.82	
100		+50	5.77	
115	4.35V	+20	-13.75	
85	3.6V	+20	8.9	

LTE Band 4 – QPSK - Channel 20175 – Frequency 1732.5MHz – RB 6/0 Limit: 1732.5MHz*2.5ppm=4331.25Hz				
Voltage (%)	**Power (VDC)**	**Temp (°C)**	**Fre. Dev. (Hz)**	**Result**
100	3.8V	-30	12.6	PASS
100		-20	-9.62	
100		-10	9.87	
100		0	11.78	
100		+10	10.6	
100		+20	9.52	
100		+30	-10.85	
100		+40	10.87	
100		+50	9.82	
115	4.35V	+20	-9.7	
85	3.6V	+20	12.95	

LTE Band 7 – QPSK - Channel 21100 – Frequency 2535MHz – RB 25/0 Limit: 2535MHz*2.5ppm=6337.5Hz				
Voltage (%)	**Power (VDC)**	**Temp (°C)**	**Fre. Dev. (Hz)**	**Result**
100	3.8V	-30	10.94	PASS
100		-20	-11.28	
100		-10	8.21	
100		0	10.12	
100		+10	8.94	
100		+20	7.86	
100		+30	-12.51	
100		+40	9.21	
100		+50	8.16	
115	4.35V	+20	-11.36	
85	3.6V	+20	11.29	

LTE Band 12 – QPSK - Channel 23095 – Frequency 707.5MHz – RB 6/0 Limit: 707.5 MHz*2.5ppm=1768.75Hz				
Voltage (%)	**Power (VDC)**	**Temp (°C)**	**Fre. Dev. (Hz)**	**Result**
100	3.8V	-30	11.89	PASS
100		-20	-10.33	
100		-10	9.16	
100		0	11.07	
100		+10	9.89	
100		+20	8.81	
100		+30	-11.56	
100		+40	10.16	
100		+50	9.11	
115	4.35V	+20	-10.41	
85	3.6V	+20	12.24	

LTE Band 17 – QPSK - Channel 23790 – Frequency 710MHz – RB 25/0 Limit: 710MHz*2.5ppm=1775Hz				
Voltage (%)	**Power (VDC)**	**Temp (°C)**	**Fre. Dev. (Hz)**	**Result**
100	3.8V	-30	10.34	PASS
100		-20	-11.88	
100		-10	7.61	
100		0	9.52	
100		+10	8.34	
100		+20	7.26	
100		+30	-13.11	
100		+40	8.61	
100		+50	7.56	
115	4.35V	+20	-11.96	
85	3.6V	+20	10.69	

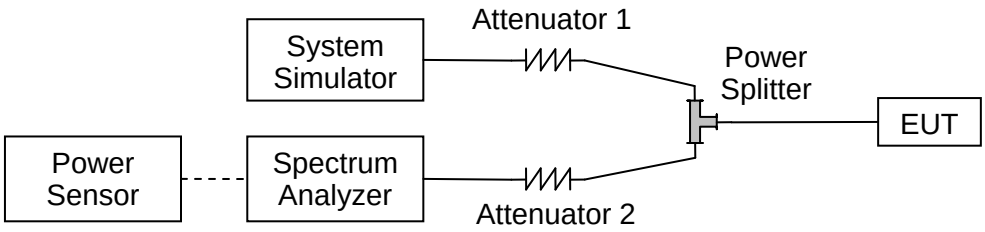
2.4. Peak to Average Radio

2.4.1. Requirement

According to FCC section 24.232(d), the peak to average ratio (PAR) of the transmission may not exceed 13dB.

2.4.2. Test Description

A. Test Set:



The EUT is coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum output power. A call is established between the EUT and the SS.

2.4.3. Test procedure

KDB 971168 D01v03 Section 5.7 and ANSI/TIA-603-E-2016.

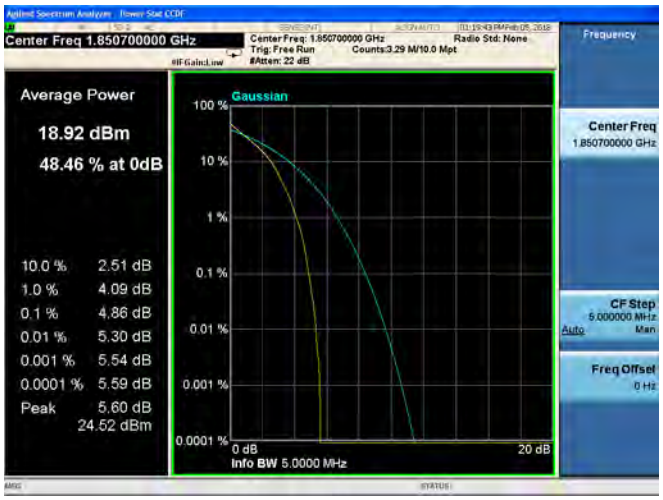
2.4.4. Test Result

Record the maximum PAPR level associated with a probability of 0.1%.

LTE Band 2, BW: 1.4MHz			
Channel	Frequency (MHz)	Peak to Average Radio(dB)	
		QPSK	16QAM
18607	1850.7	4.86	5.66
18900	1880.0	4.93	5.67
19192	1909.2	4.63	5.48
LTE Band 2, BW: 3MHz			
Channel	Frequency (MHz)	Peak to Average Radio(dB)	
		QPSK	16QAM
18615	1851.5	4.95	5.75
18900	1880.0	5.06	5.81
19184	1908.4	4.82	5.64
LTE Band 2, BW: 5MHz			
Channel	Frequency (MHz)	Peak to Average Radio(dB)	
		QPSK	16QAM
18625	1852.5	5.28	5.92
18900	1880.0	5.35	6.04
19175	1907.5	5.18	5.90
LTE Band 2, BW: 10MHz			
Channel	Frequency (MHz)	Peak to Average Radio(dB)	
		QPSK	16QAM
18650	1855.0	4.64	5.92
18900	1880.0	4.64	6.01
19150	1905.0	4.64	6.05
LTE Band 2, BW: 15MHz			
Channel	Frequency (MHz)	Peak to Average Radio(dB)	
		QPSK	16QAM
18675	1857.5	5.75	6.71
18900	1880.0	5.75	6.66
19125	1902.5	5.76	6.81
LTE Band 2, BW: 20MHz			
Channel	Frequency (MHz)	Peak to Average Radio(dB)	
		QPSK	16QAM
18700	1860.0	6.47	7.10
18900	1880.0	6.48	7.13
19100	1900.0	6.46	7.11

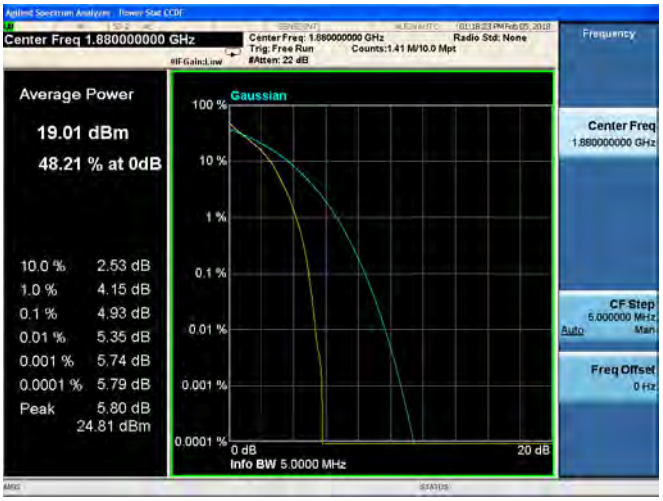
LTE Band 2 Peak to Average Radio

1.4MHz/QPSK/Low CH

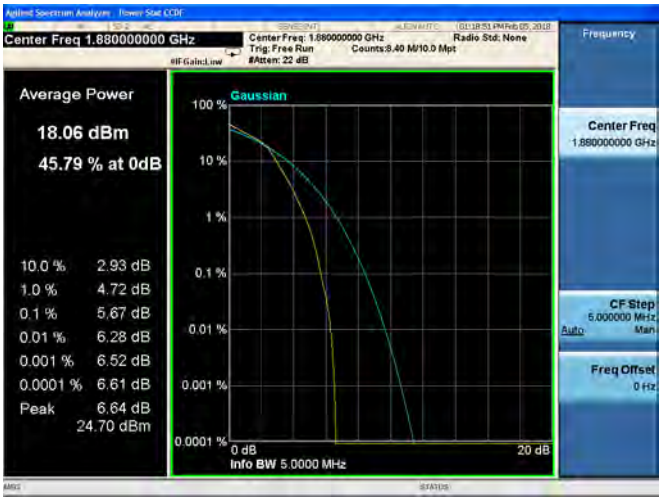


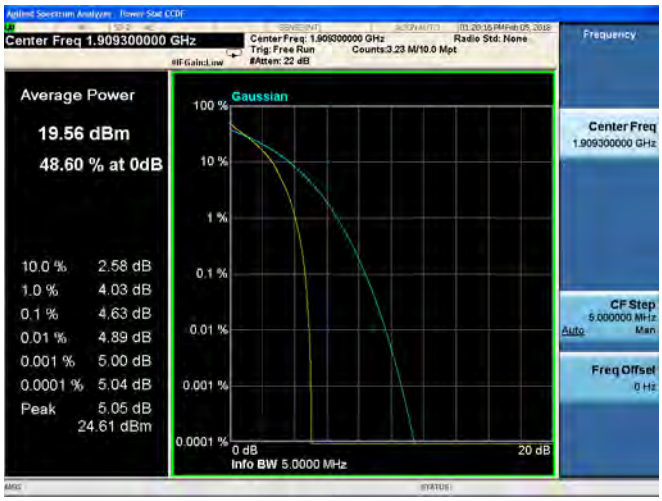
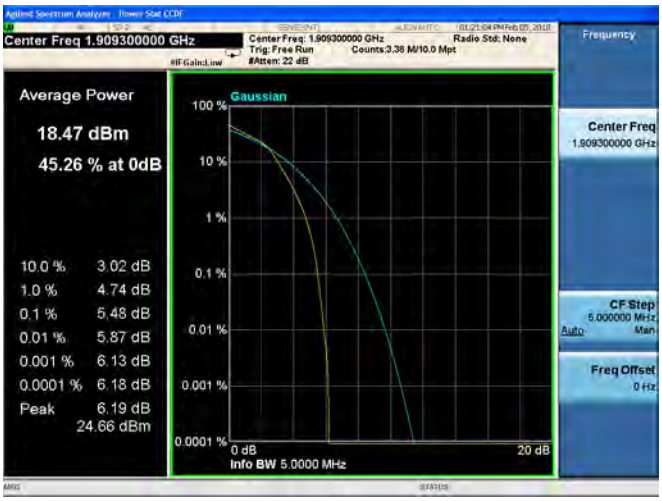
1.4MHz/16QAM/Low CH

1.4MHz/QPSK/Mid CH



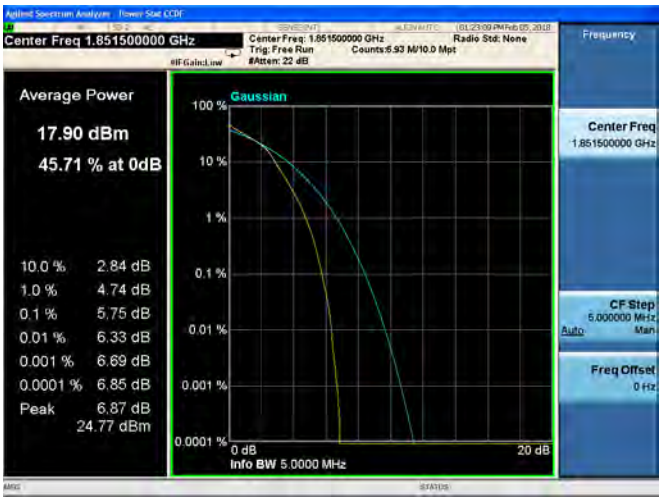
1.4MHz/16QAM/Mid CH



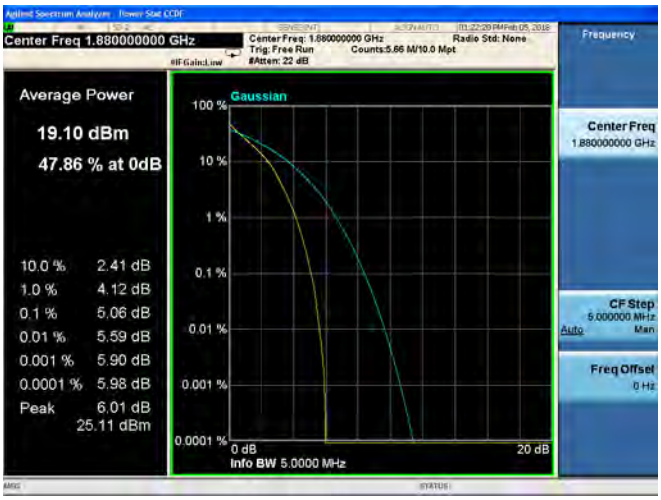
1.4MHz/QPSK/High CH	1.4MHz/16QAM/High CH
	

3MHz/QPSK/Low CH

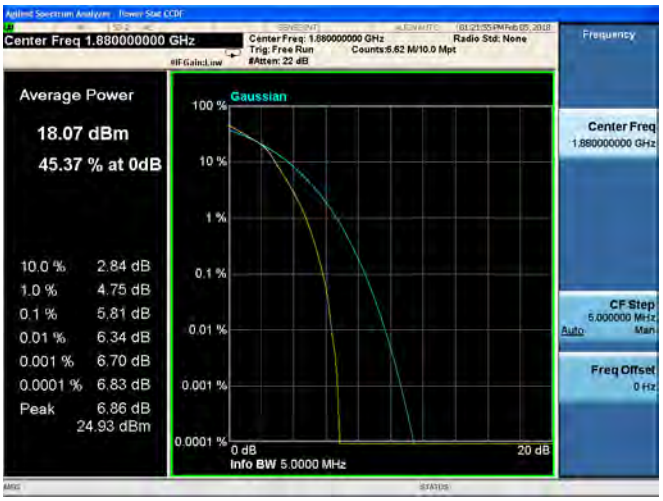
3MHz/16QAM/Low CH



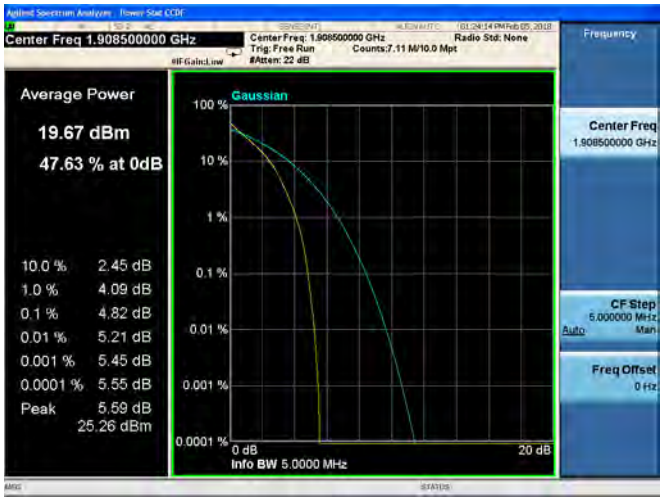
3MHz/QPSK/Mid CH



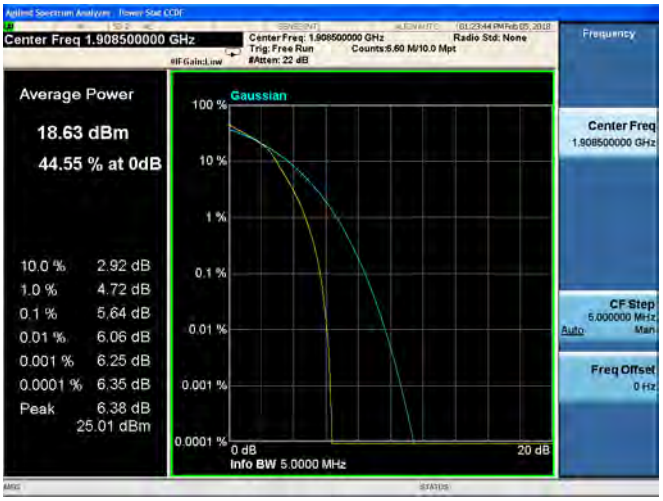
3MHz/16QAM/Mid CH



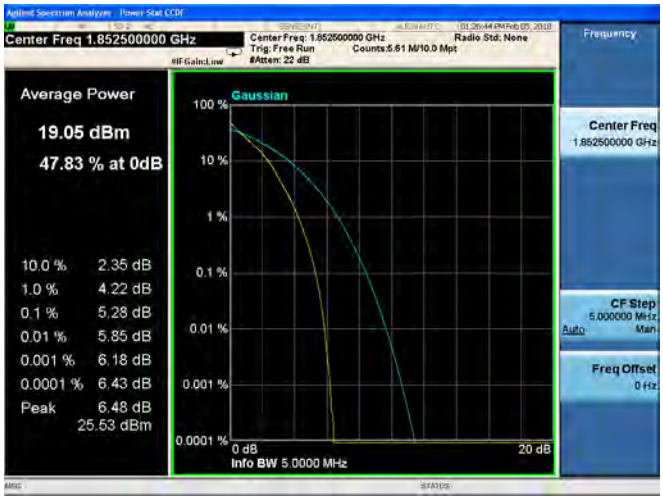
3MHz/QPSK/High CH



3MHz/16QAM/High CH

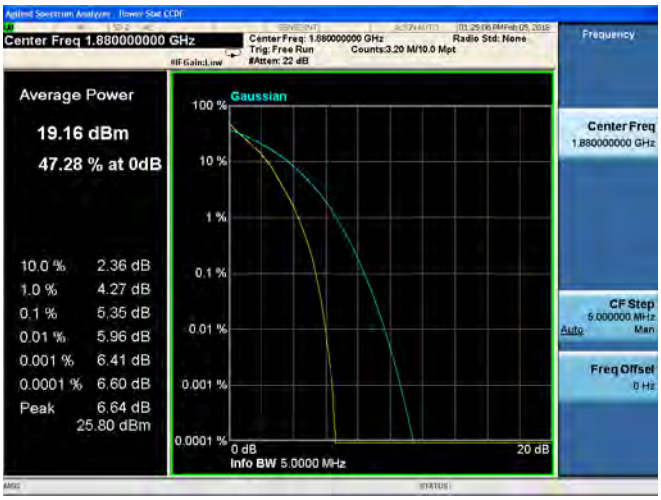


5MHz/QPSK/Low CH

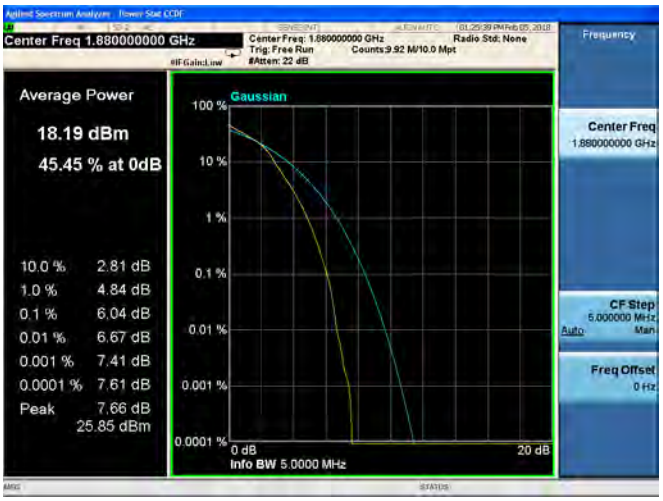


5MHz/16QAM/Low CH

5MHz/QPSK/Mid CH

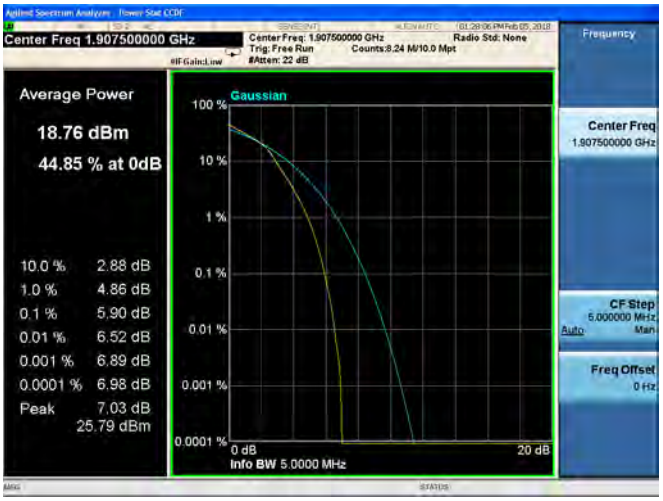


5MHz/16QAM/Mid CH

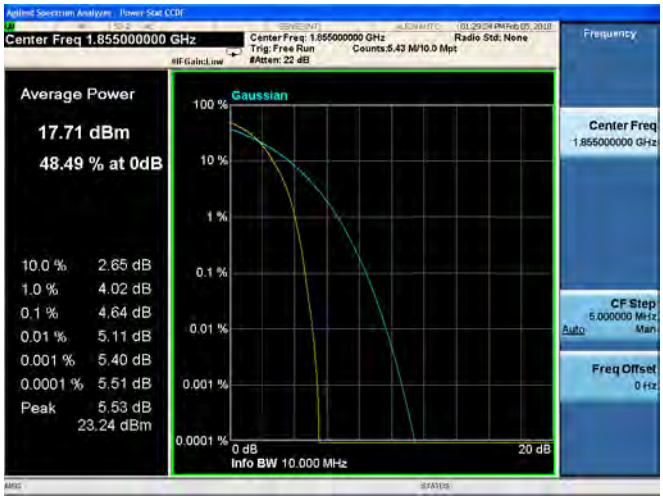


5MHz/QPSK/High CH

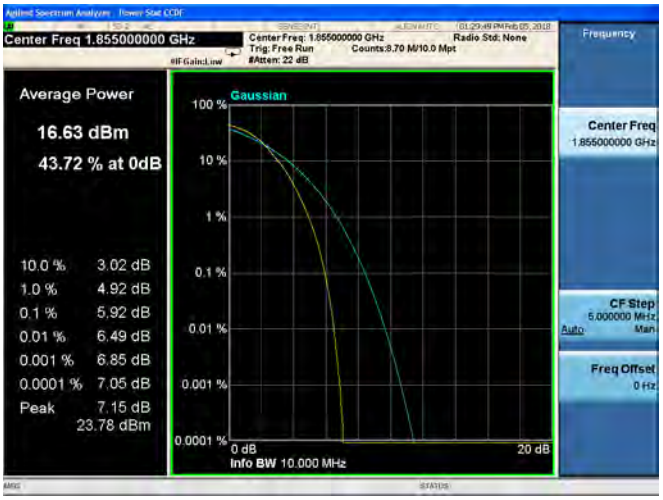
5MHz/16QAM/High CH



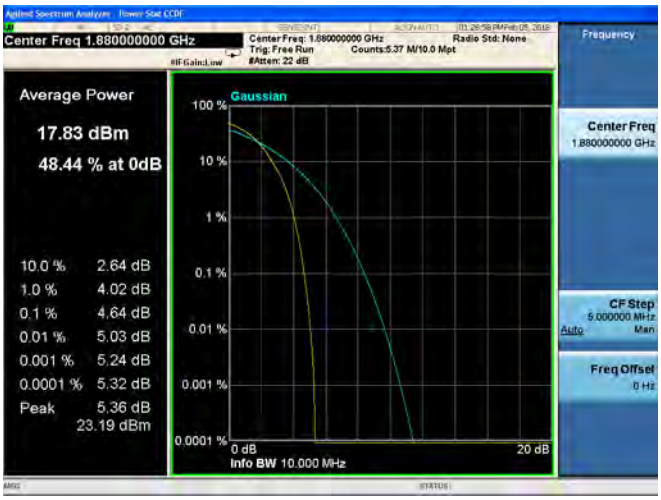
10MHz/QPSK/Low CH



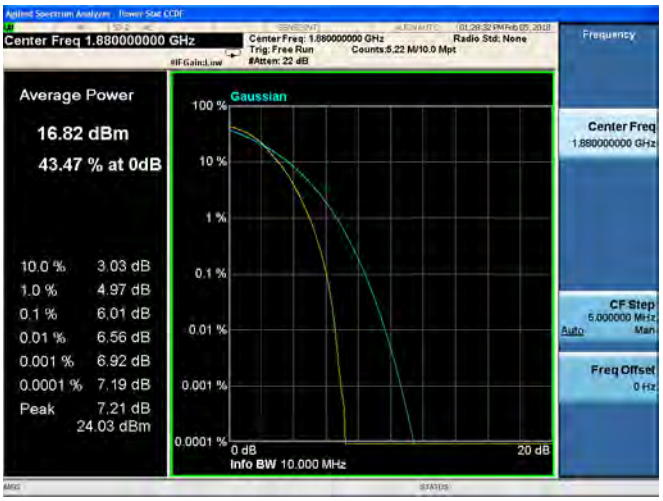
10MHz/16QAM/Low CH



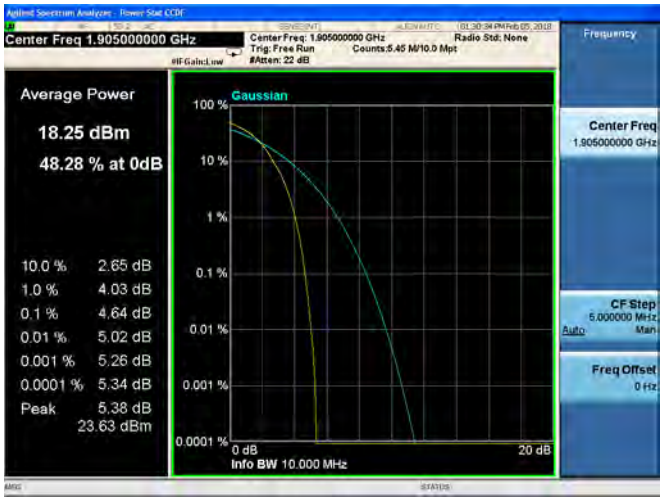
10MHz/QPSK/Mid CH



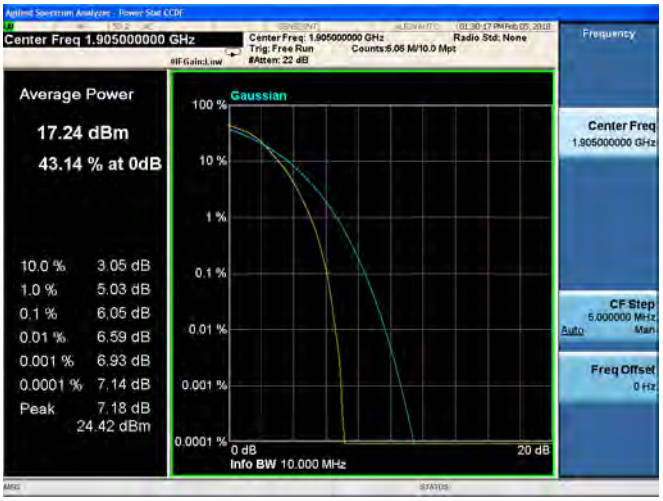
10MHz/16QAM/Mid CH



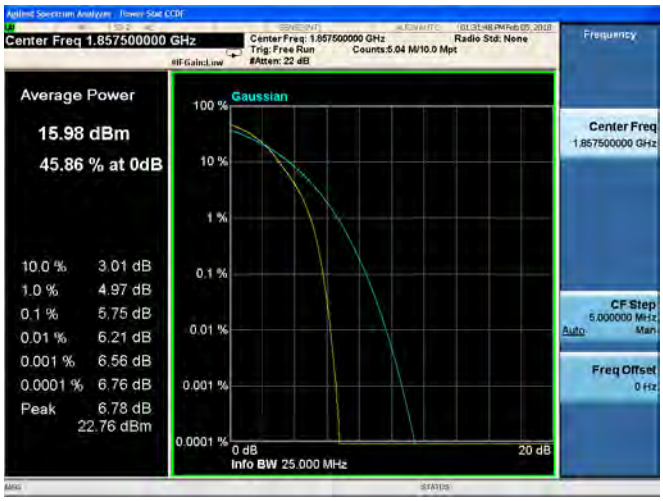
10MHz/QPSK/High CH



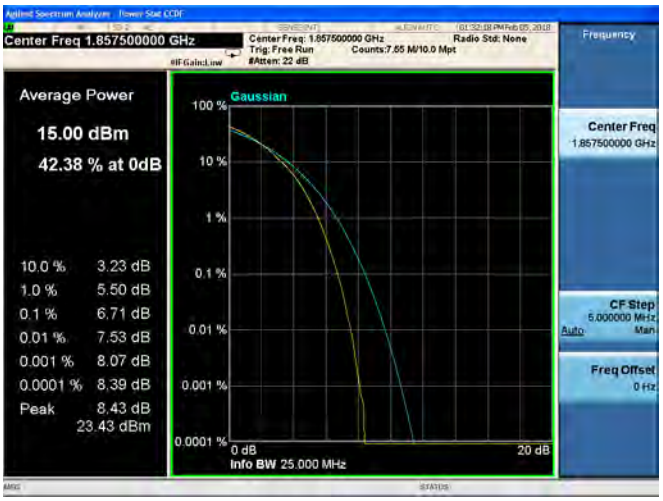
10MHz/16QAM/High CH



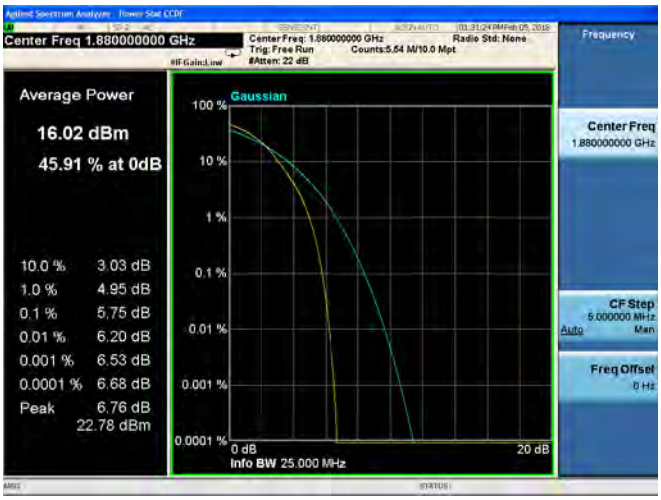
15MHz/QPSK/Low CH



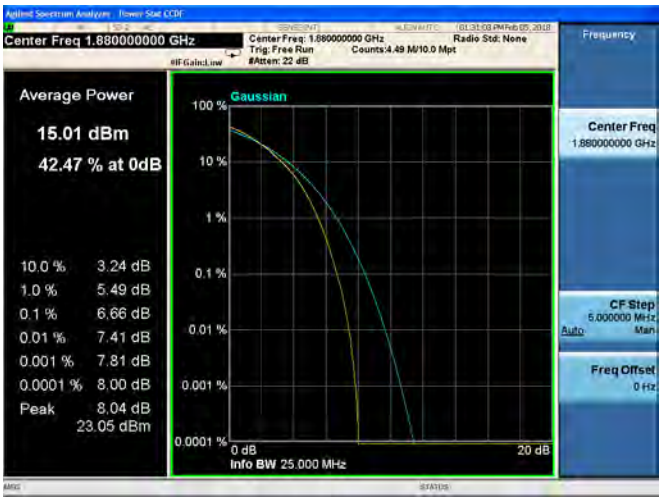
15MHz/16QAM/Low CH



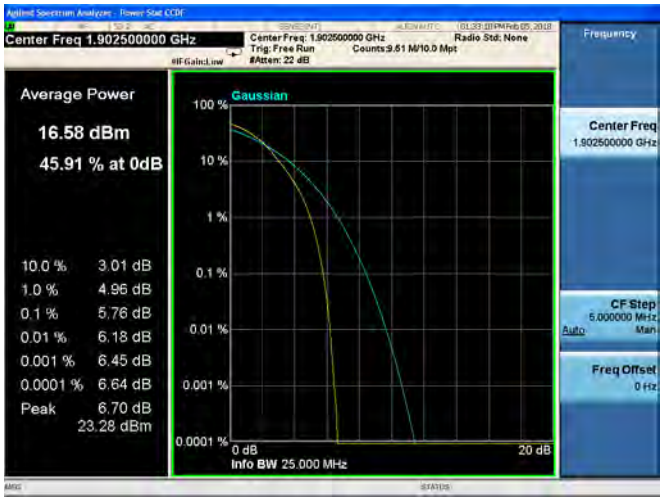
15MHz/QPSK/Mid CH



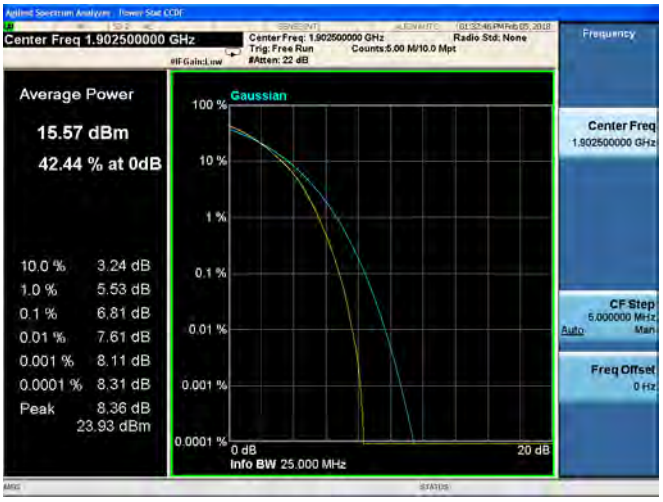
15MHz/16QAM/Mid CH



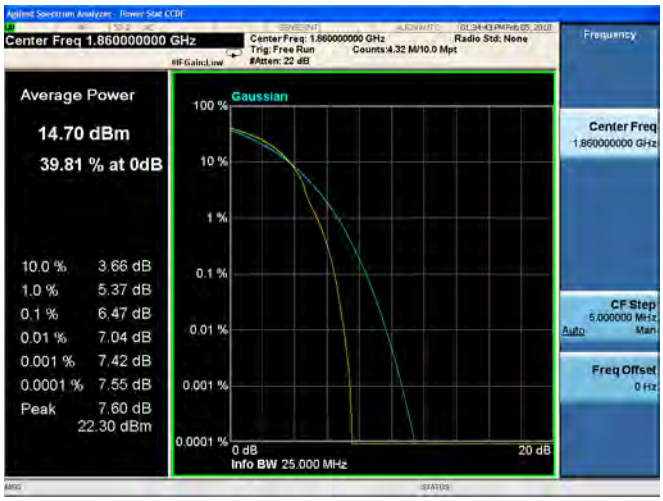
15MHz/QPSK/High CH



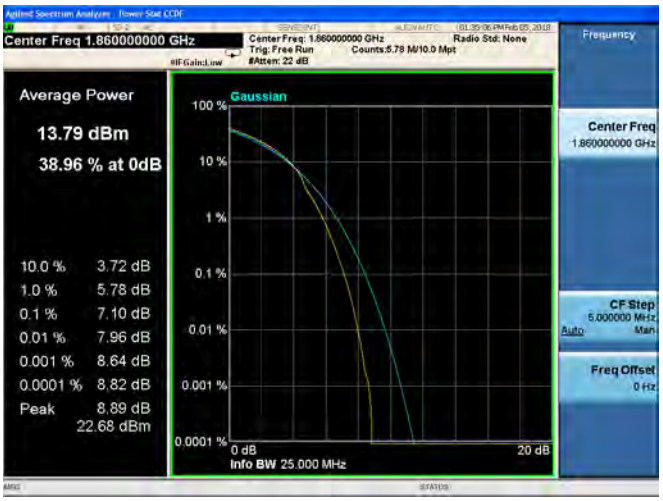
15MHz/16QAM/High CH



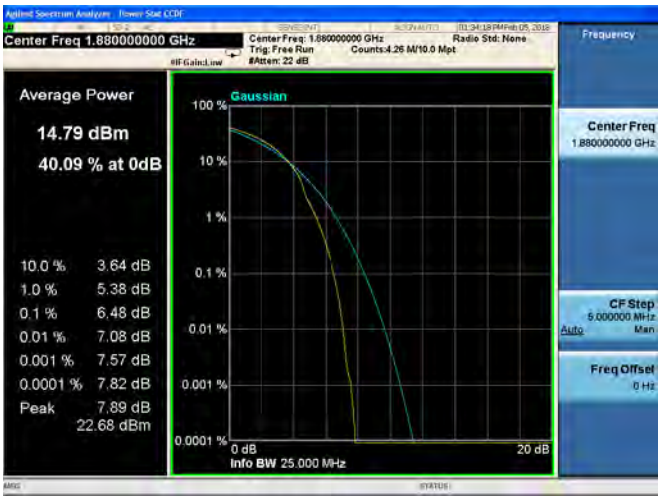
20MHz/QPSK/Low CH



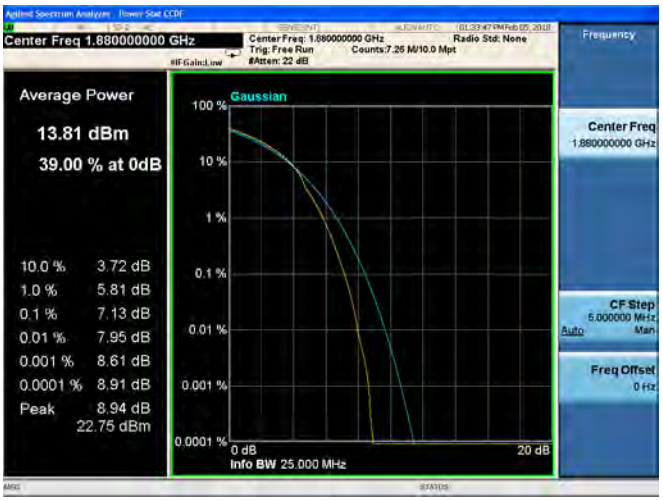
20MHz/16QAM/Low CH



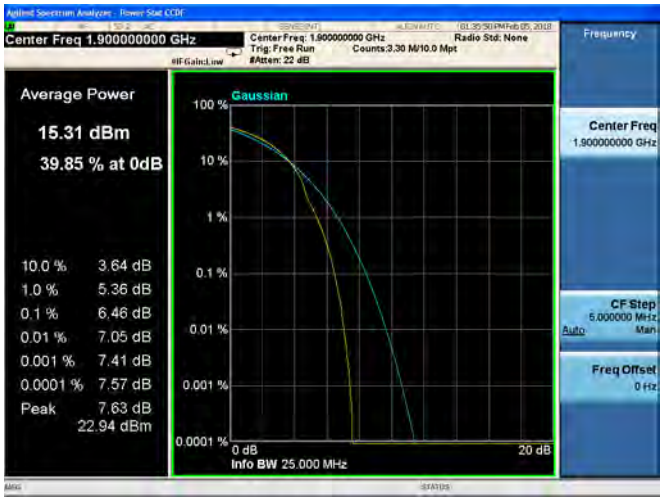
20MHz/QPSK/Mid CH



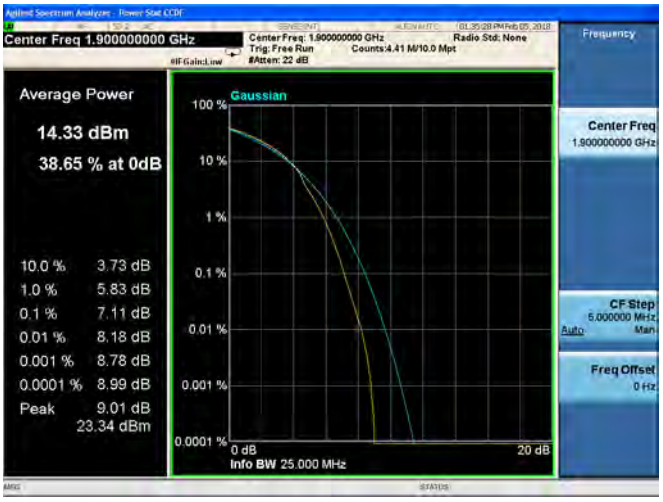
20MHz/16QAM/Mid CH



20MHz/QPSK/High CH



20MHz/16QAM/High CH



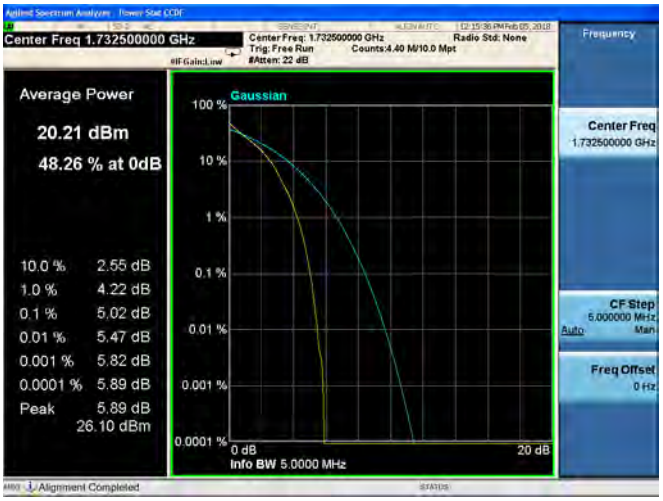
LTE Band 4, BW: 1.4MHz			
Channel	Frequency (MHz)	Peak to Average Radio(dB)	
		QPSK	16QAM
18607	1850.7	4.78	5.59
18900	1880.0	5.02	5.71
19192	1909.2	3.91	4.83
LTE Band 4, BW: 3MHz			
Channel	Frequency (MHz)	Peak to Average Radio(dB)	
		QPSK	16QAM
18615	1851.5	4.90	5.72
18900	1880.0	5.20	5.90
19184	1908.4	4.18	5.05
LTE Band 4, BW: 5MHz			
Channel	Frequency (MHz)	Peak to Average Radio(dB)	
		QPSK	16QAM
18625	1852.5	5.20	5.88
18900	1880.0	5.39	6.08
19175	1907.5	4.74	5.48
LTE Band 4, BW: 10MHz			
Channel	Frequency (MHz)	Peak to Average Radio(dB)	
		QPSK	16QAM
18650	1855.0	4.66	5.92
18900	1880.0	4.64	6.02
19150	1905.0	4.58	5.92
LTE Band 4, BW: 15MHz			
Channel	Frequency (MHz)	Peak to Average Radio(dB)	
		QPSK	16QAM
18675	1857.5	5.79	6.74
18900	1880.0	5.76	6.68
19125	1902.5	5.94	6.73
LTE Band 4, BW: 20MHz			
Channel	Frequency (MHz)	Peak to Average Radio(dB)	
		QPSK	16QAM
18700	1860.0	6.47	7.13
18900	1880.0	6.49	7.13
19100	1900.0	6.47	7.09

LTE Band 4 Peak to Average Radio

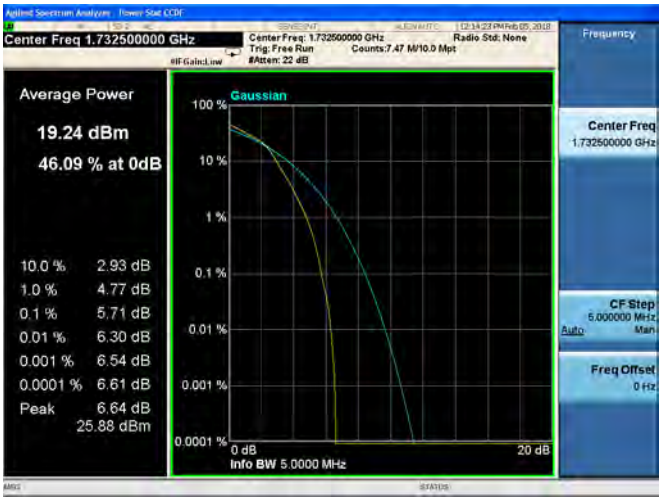
1.4MHz/QPSK/Low CH

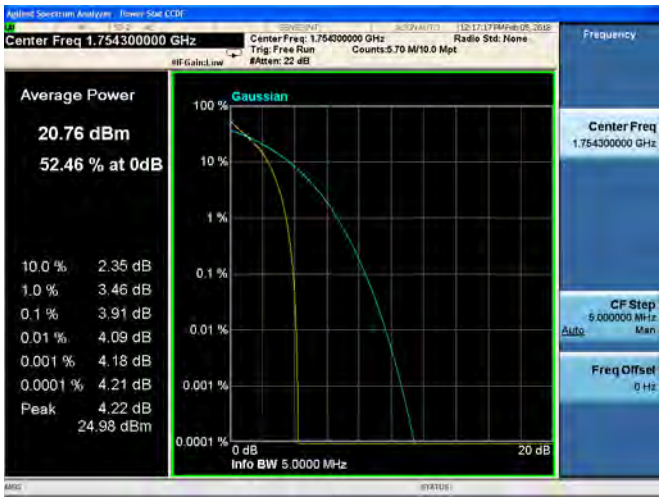
1.4MHz/16QAM/Low CH

1.4MHz/QPSK/Mid CH



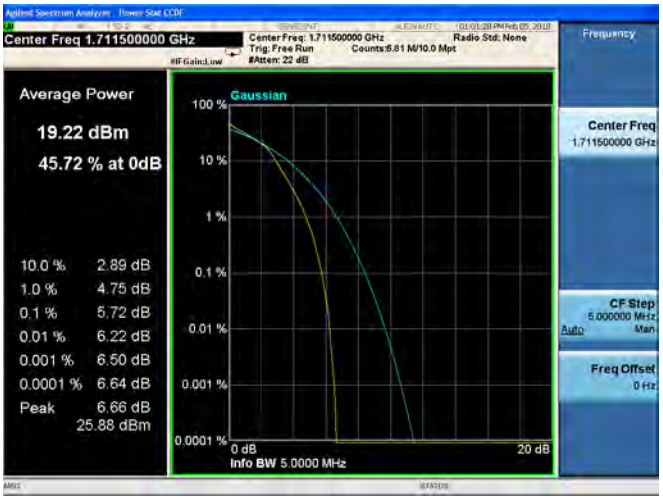
1.4MHz/16QAM/Mid CH



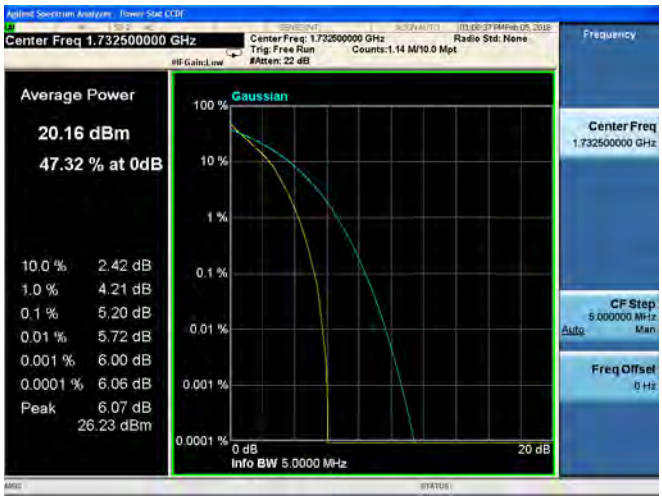
1.4MHz/QPSK/High CH	1.4MHz/16QAM/High CH
	

3MHz/QPSK/Low CH

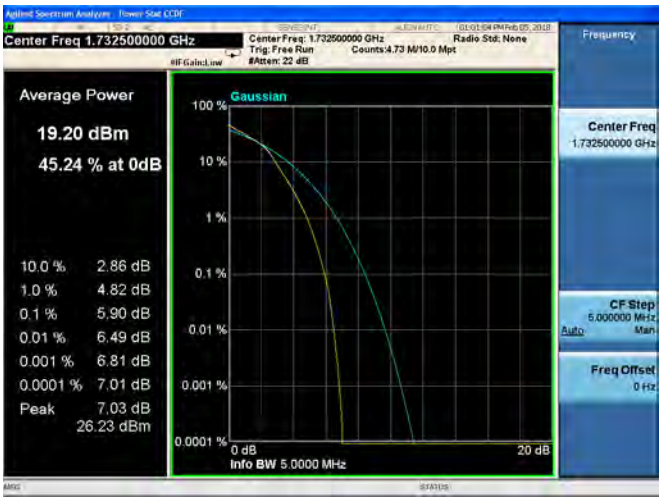
3MHz/16QAM/Low CH



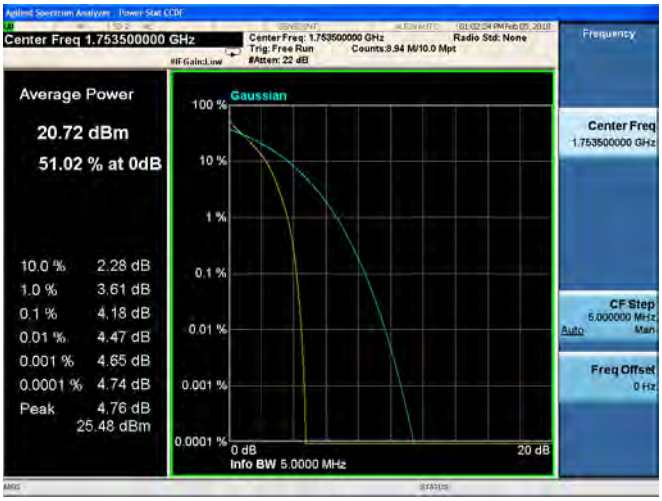
3MHz/QPSK/Mid CH



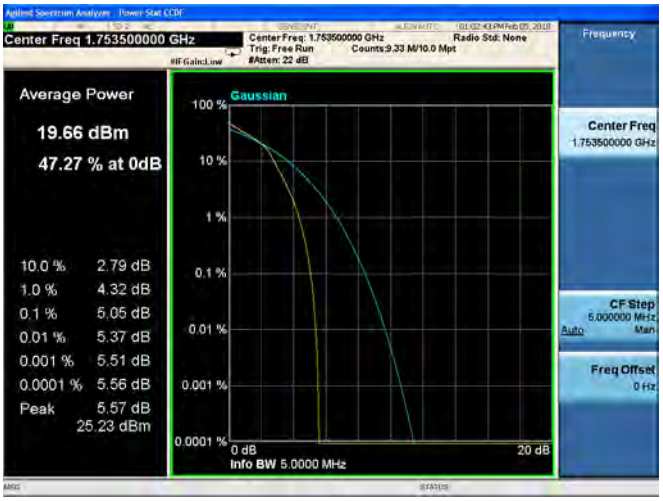
3MHz/16QAM/Mid CH



3MHz/QPSK/High CH

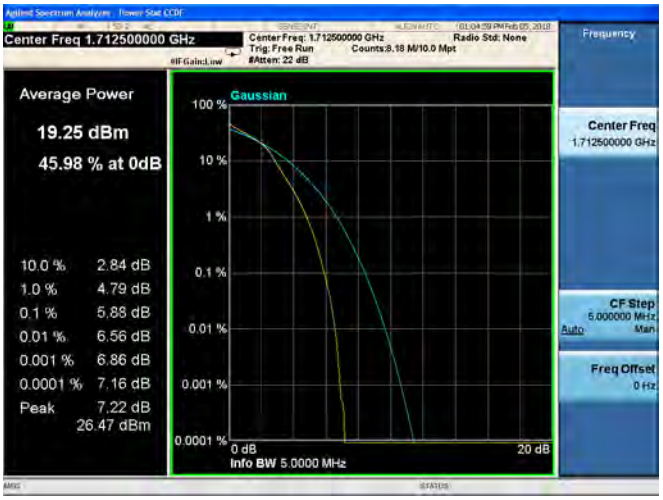


3MHz/16QAM/High CH

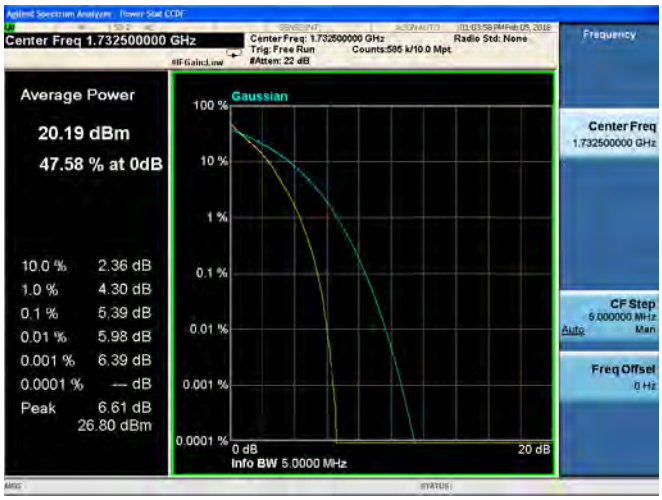


5MHz/QPSK/Low CH

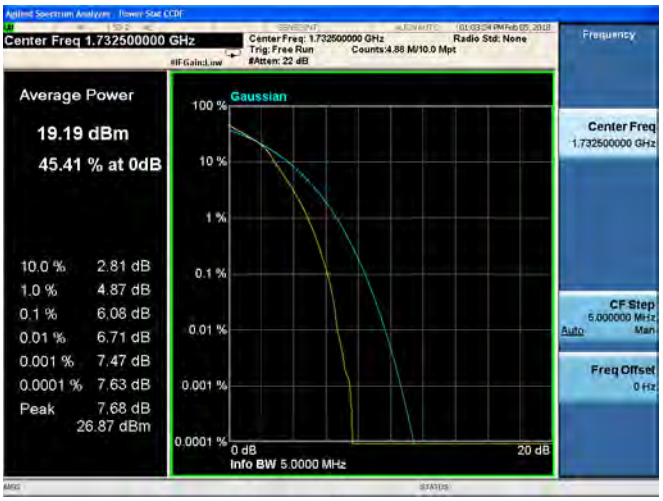
5MHz/16QAM/Low CH



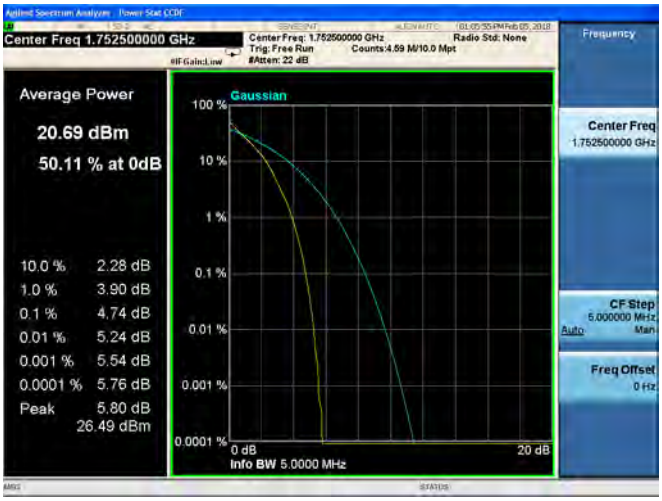
5MHz/QPSK/Mid CH



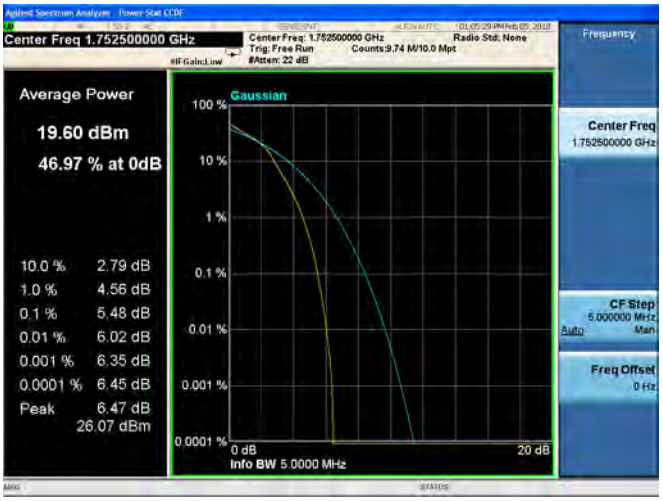
5MHz/16QAM/Mid CH



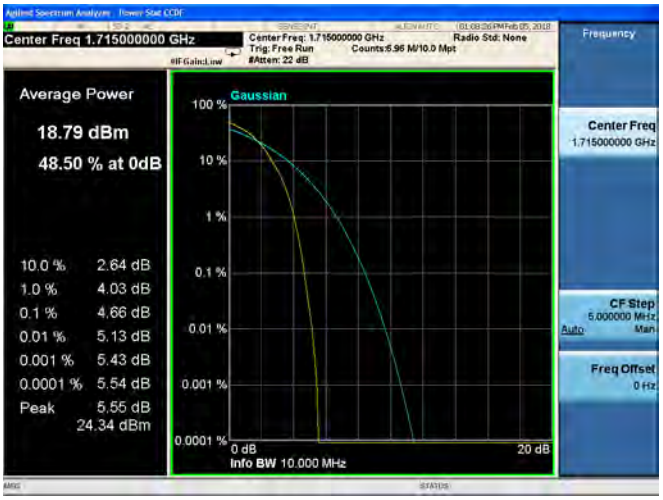
5MHz/QPSK/High CH



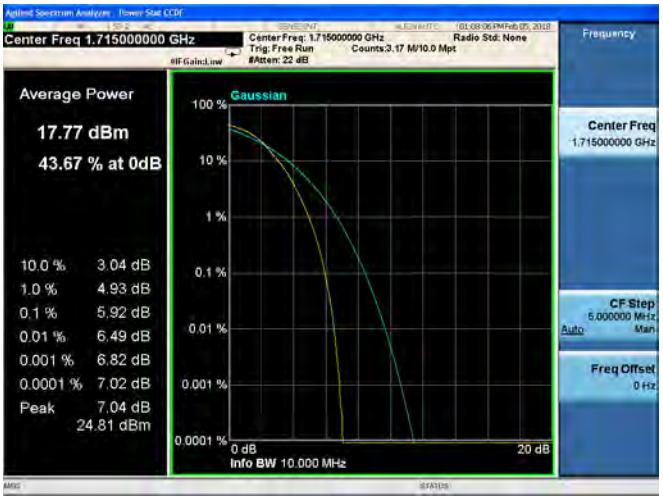
5MHz/16QAM/High CH



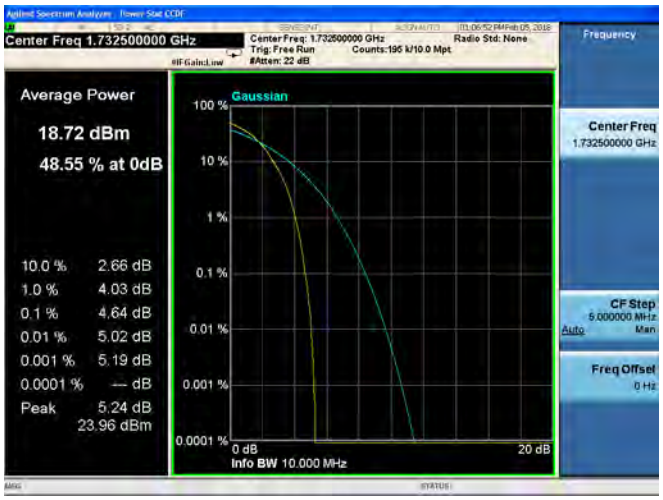
10MHz/QPSK/Low CH



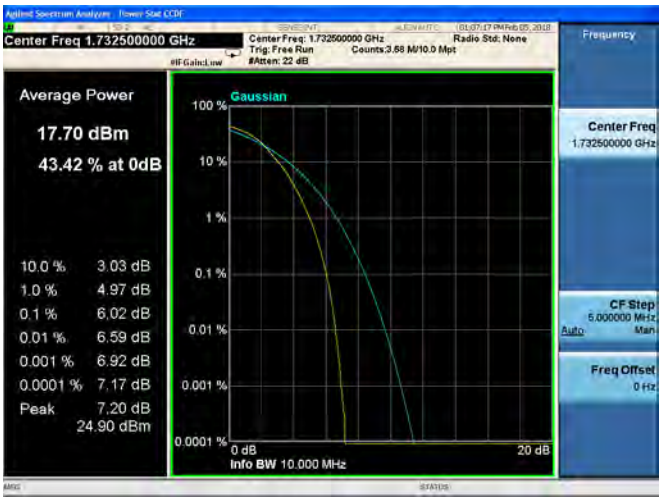
10MHz/16QAM/Low CH



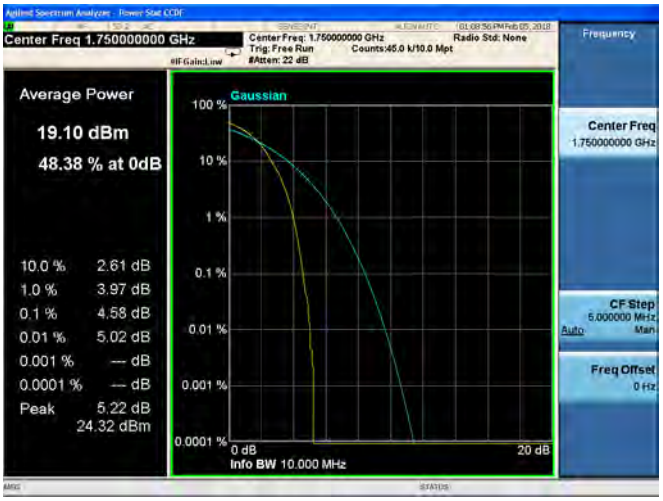
10MHz/QPSK/Mid CH



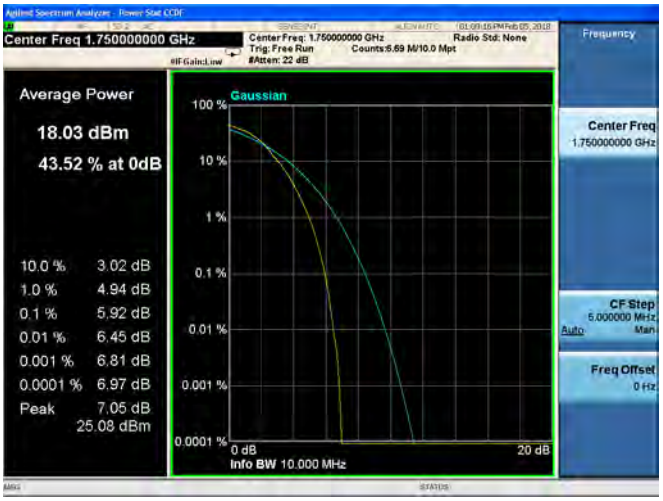
10MHz/16QAM/Mid CH



10MHz/QPSK/High CH

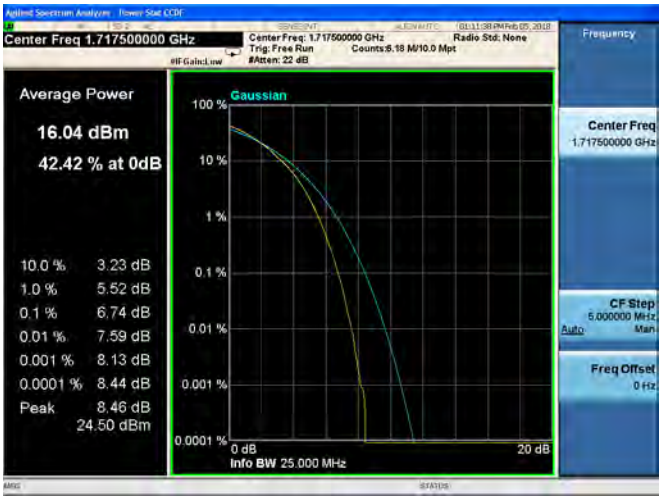


10MHz/16QAM/High CH

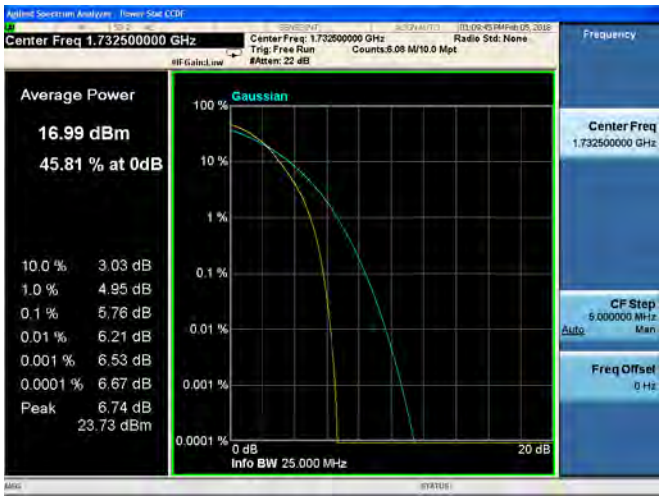


15MHz/QPSK/Low CH

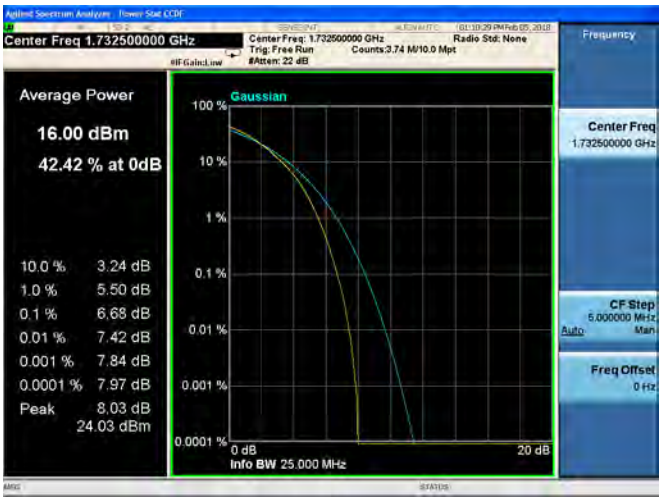
15MHz/16QAM/Low CH



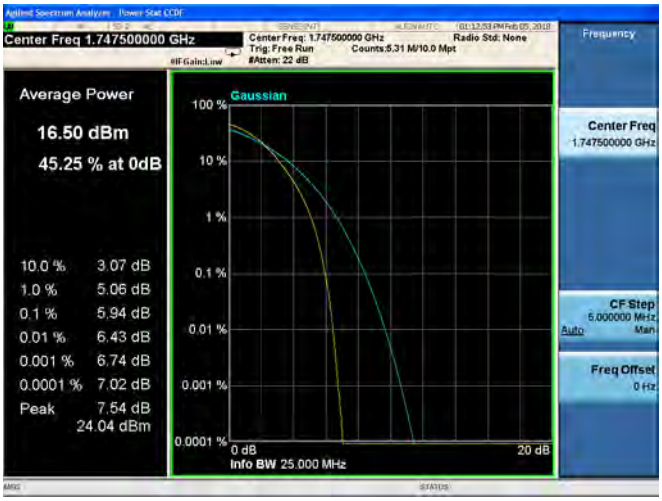
15MHz/QPSK/Mid CH



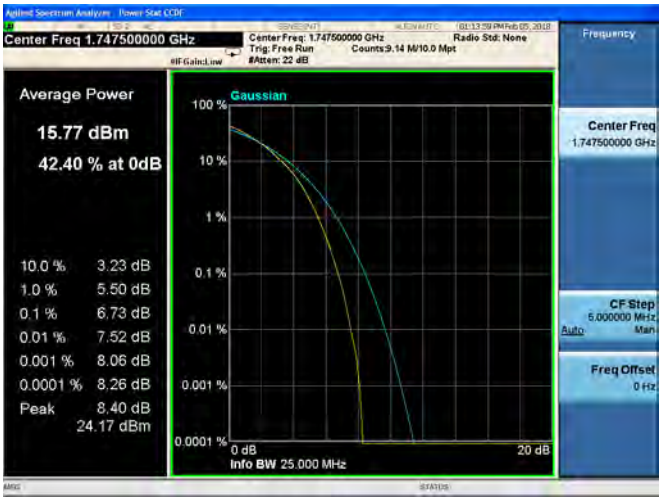
15MHz/16QAM/Mid CH



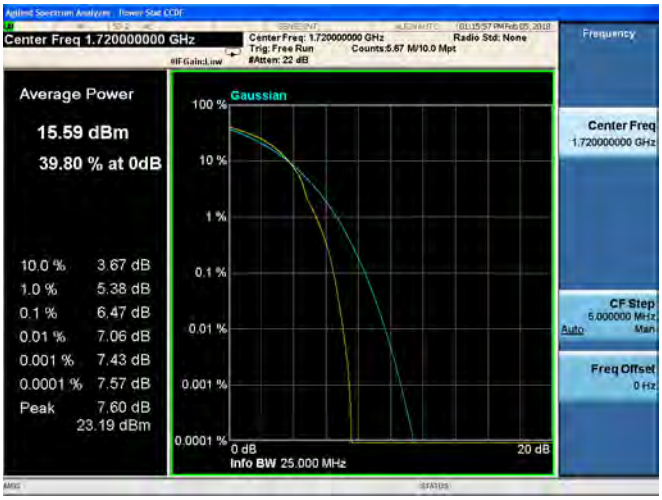
15MHz/QPSK/High CH



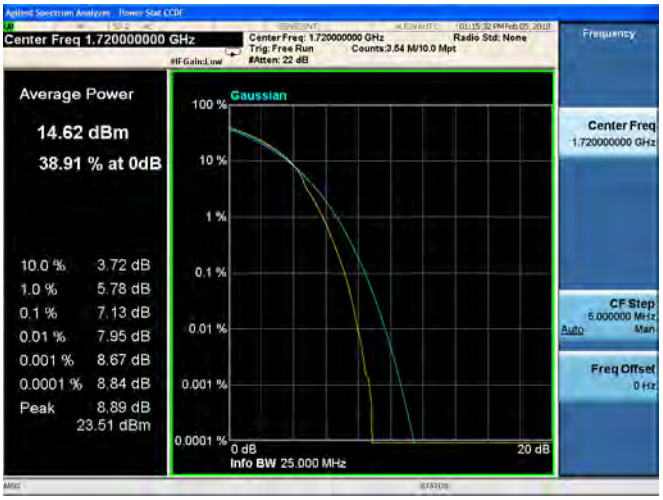
15MHz/16QAM/High CH



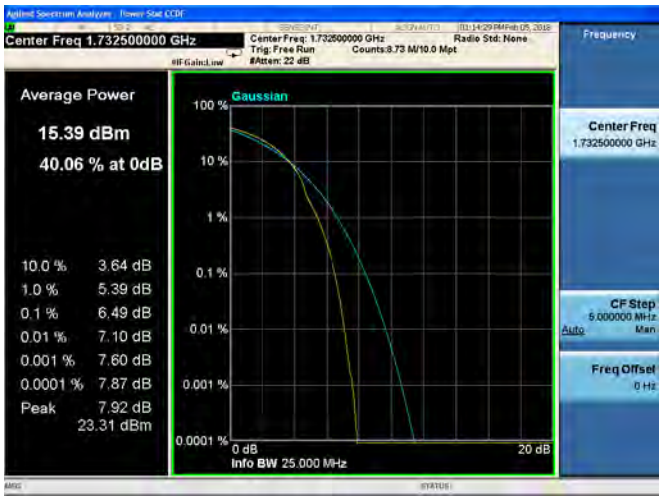
20MHz/QPSK/Low CH



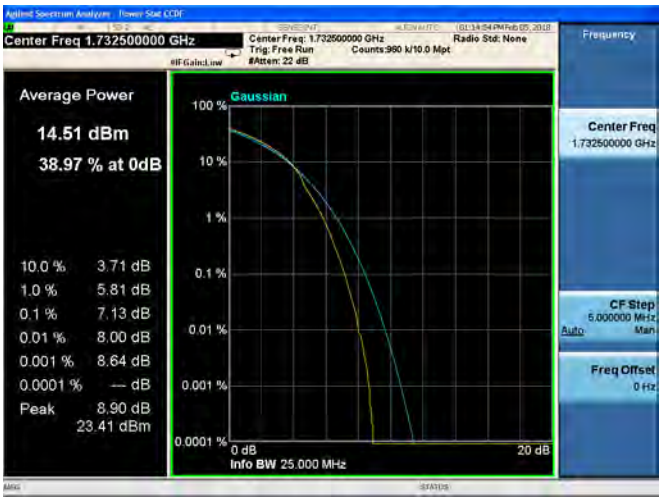
20MHz/16QAM/Low CH



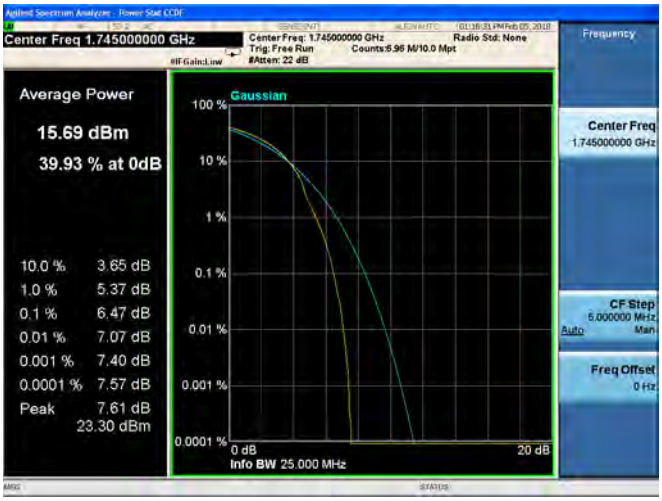
20MHz/QPSK/Mid CH



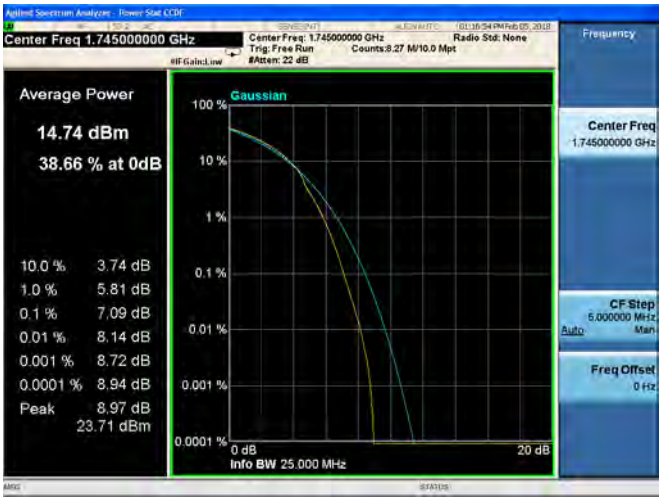
20MHz/16QAM/Mid CH



20MHz/QPSK/High CH



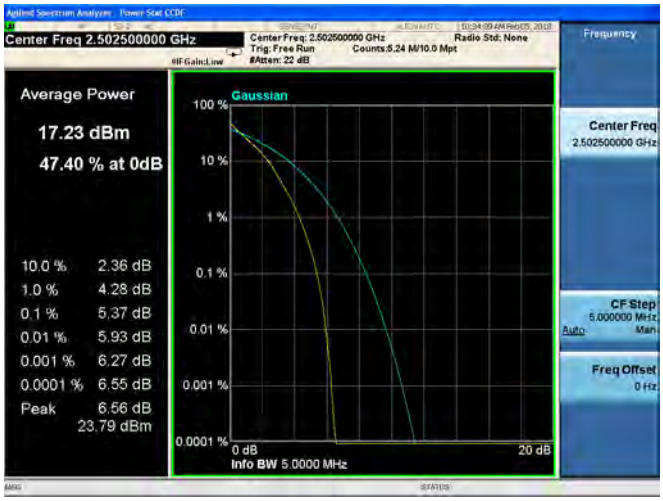
20MHz/16QAM/High CH



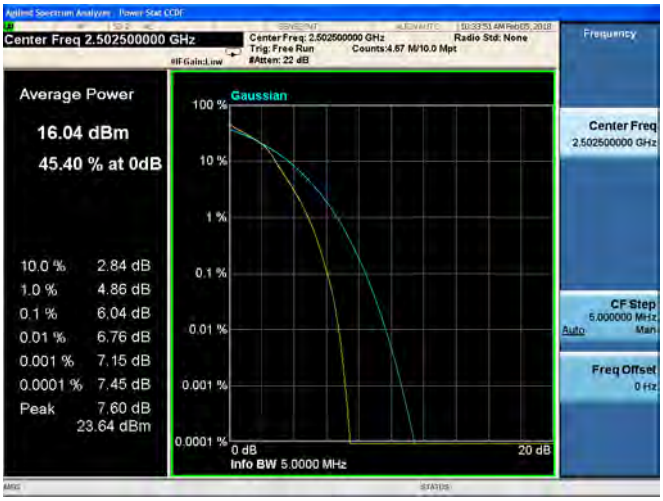
LTE Band 7, BW: 5MHz			
Channel	Frequency (MHz)	Peak to Average Radio(dB)	
		QPSK	16QAM
20775	2502.5	5.37	6.04
21100	2535.0	5.41	6.07
21425	2567.5	5.00	5.73
LTE Band 7, BW: 10MHz			
Channel	Frequency (MHz)	Peak to Average Radio(dB)	
		QPSK	16QAM
20800	2505.0	4.69	6.03
21100	2535.0	4.68	6.06
21400	2565.0	4.63	5.92
LTE Band 7, BW: 15MHz			
Channel	Frequency (MHz)	Peak to Average Radio(dB)	
		QPSK	16QAM
20825	2507.5	5.78	6.79
21100	2535.0	5.77	6.71
21375	2562.5	5.80	6.70
LTE Band 7, BW: 20MHz			
Channel	Frequency (MHz)	Peak to Average Radio(dB)	
		QPSK	16QAM
20850	2510.0	6.47	7.13
21100	2535.0	6.49	7.17
21350	2560.0	6.48	7.05

LTE Band 7 Peak to Average Radio

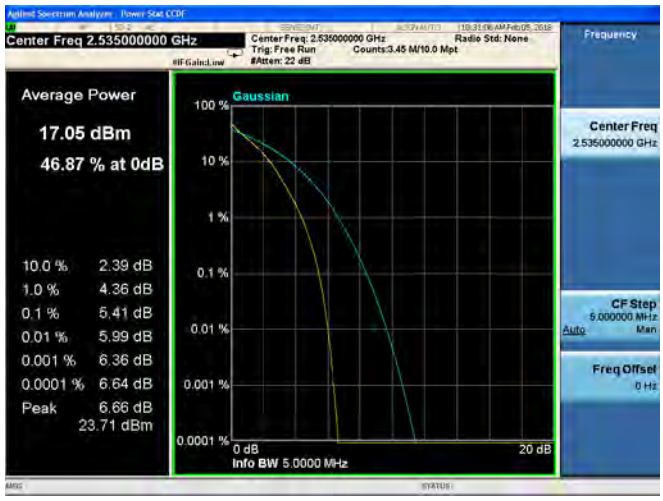
5MHz/QPSK/Low CH



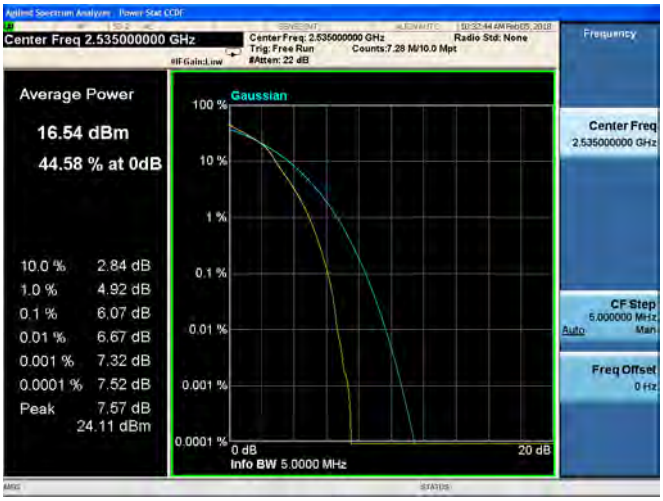
5MHz/16QAM/Low CH

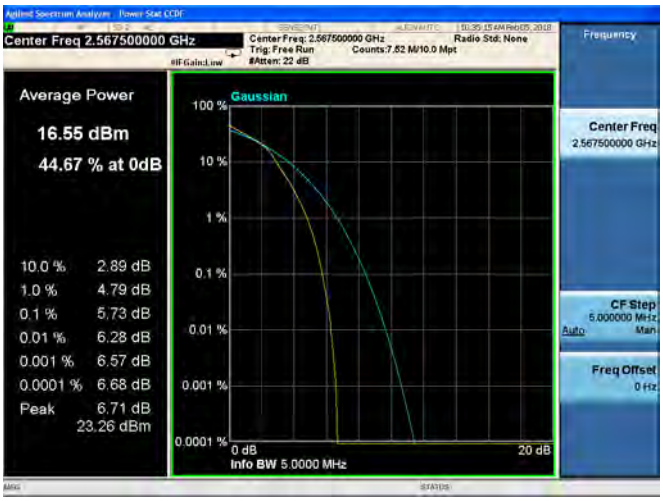


5MHz/QPSK/Mid CH

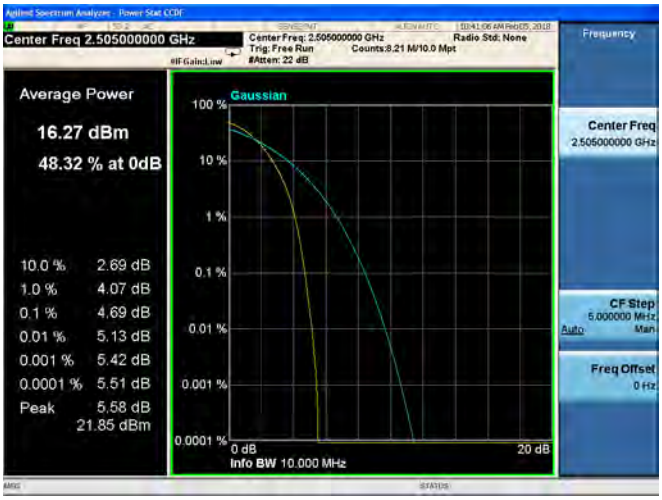


5MHz/16QAM/Mid CH

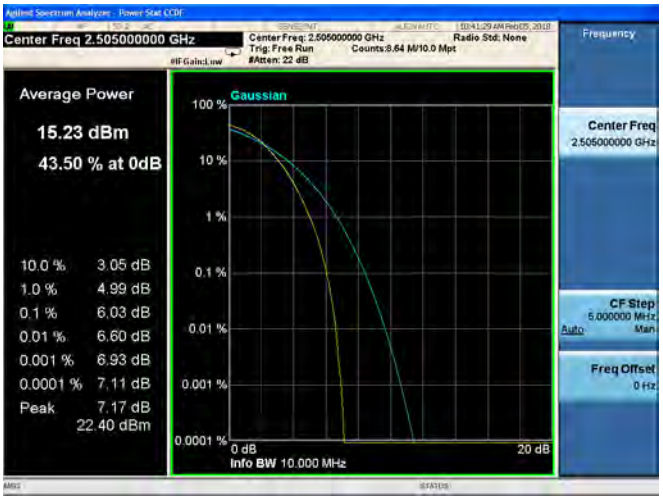


5MHz/QPSK/High CH	5MHz/16QAM/High CH
	

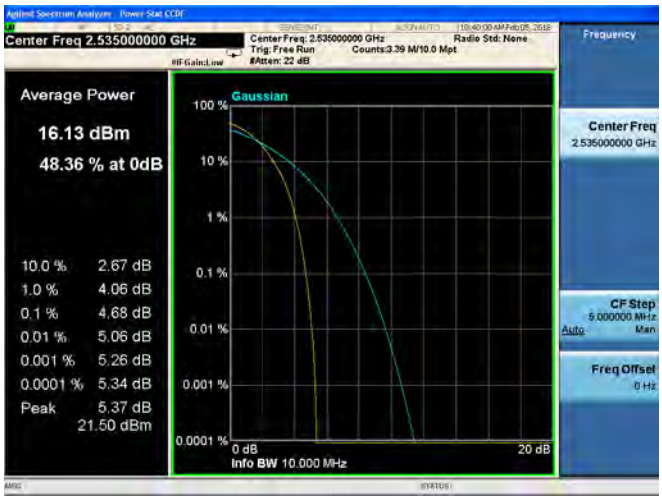
10MHz/QPSK/Low CH



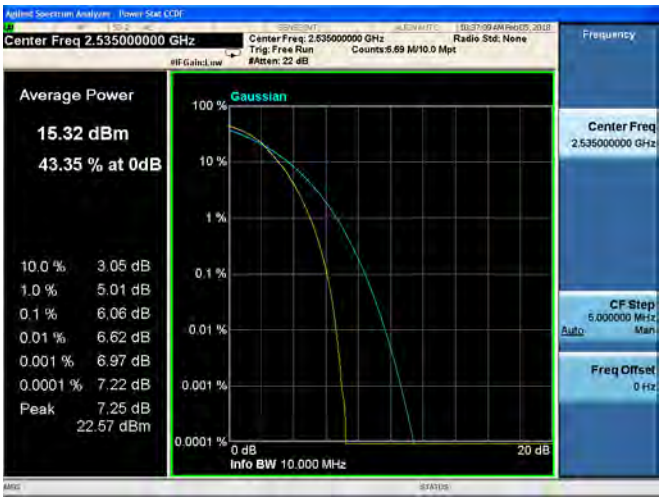
10MHz/16QAM/Low CH



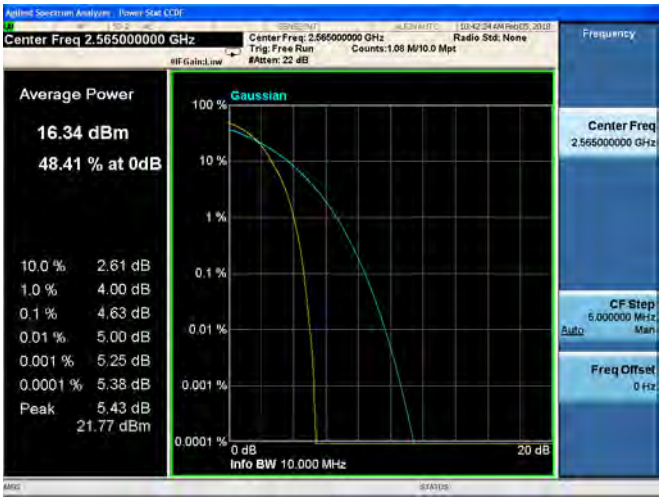
10MHz/QPSK/Mid CH



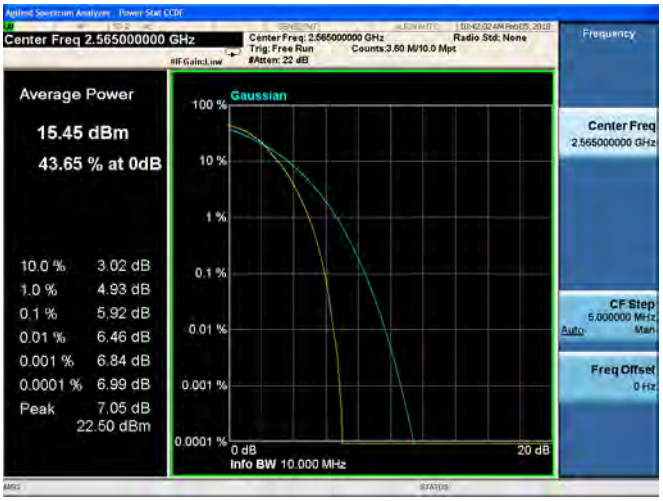
10MHz/16QAM/Mid CH



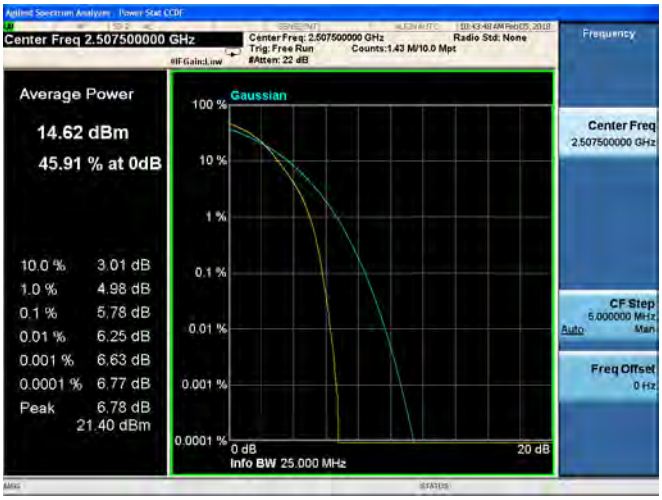
10MHz/QPSK/High CH



10MHz/16QAM/High CH

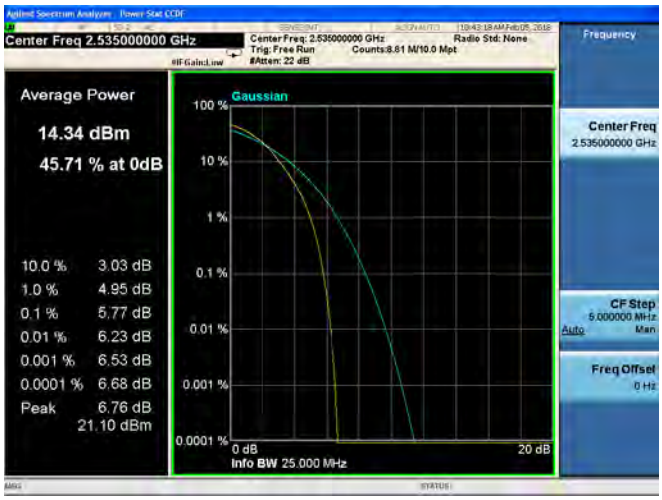


15MHz/QPSK/Low CH

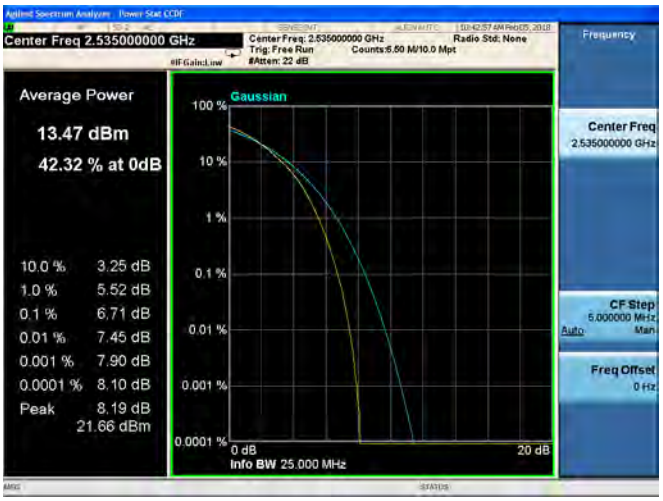


15MHz/16QAM/Low CH

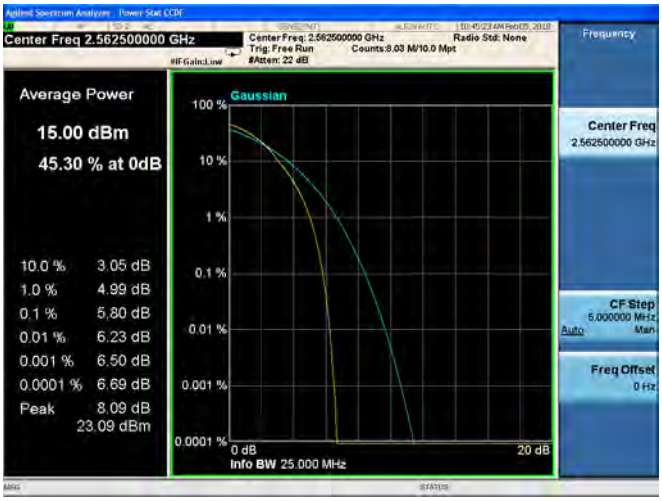
15MHz/QPSK/Mid CH



15MHz/16QAM/Mid CH

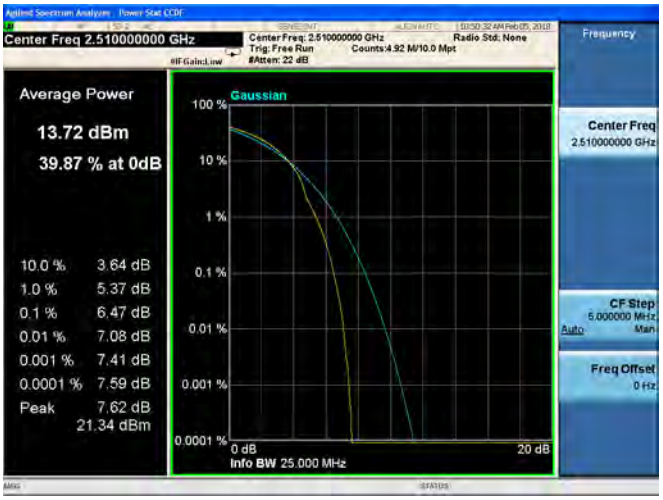


15MHz/QPSK/High CH

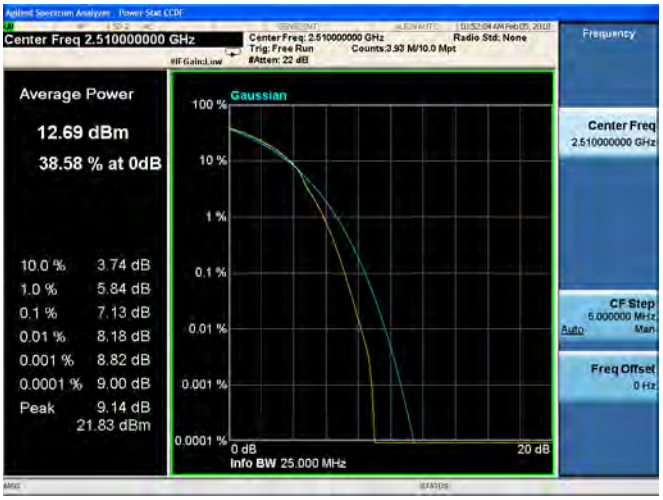


15MHz/16QAM/High CH

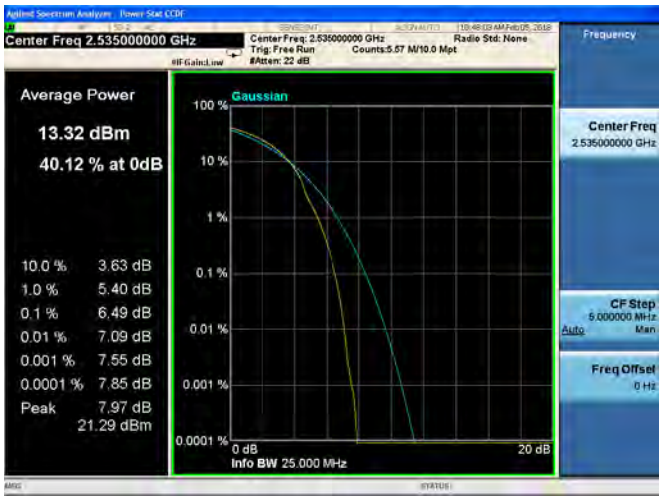
20MHz/QPSK/Low CH



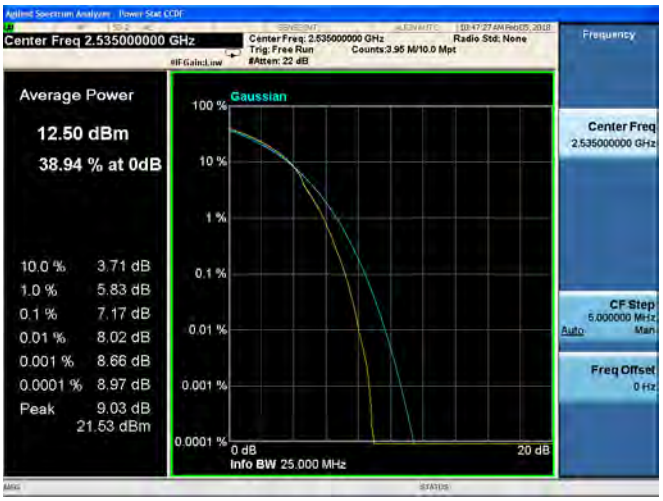
20MHz/16QAM/Low CH



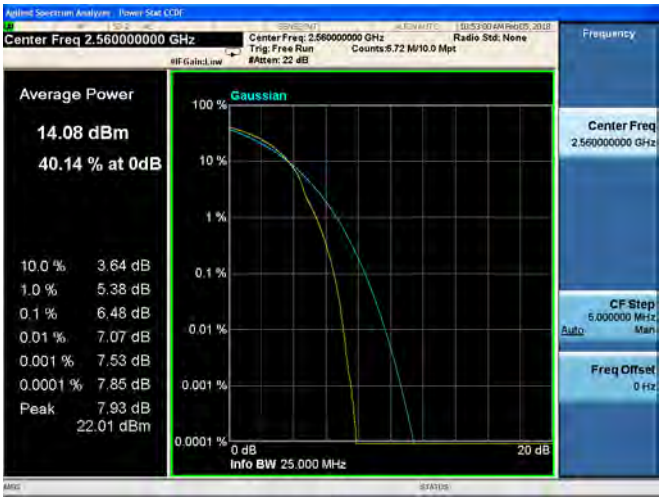
20MHz/QPSK/Mid CH



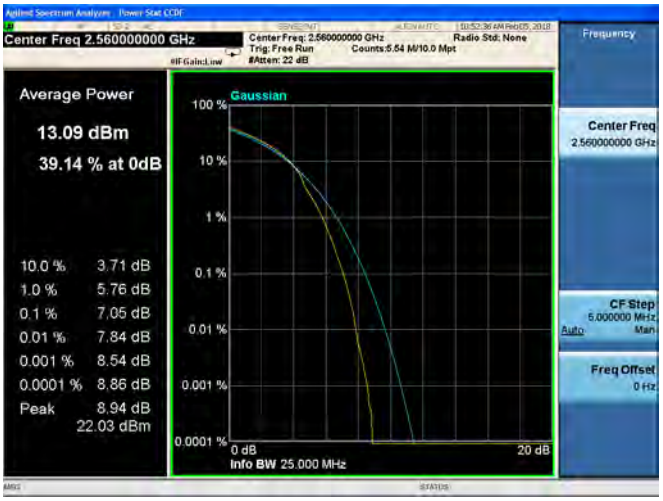
20MHz/16QAM/Mid CH



20MHz/QPSK/High CH



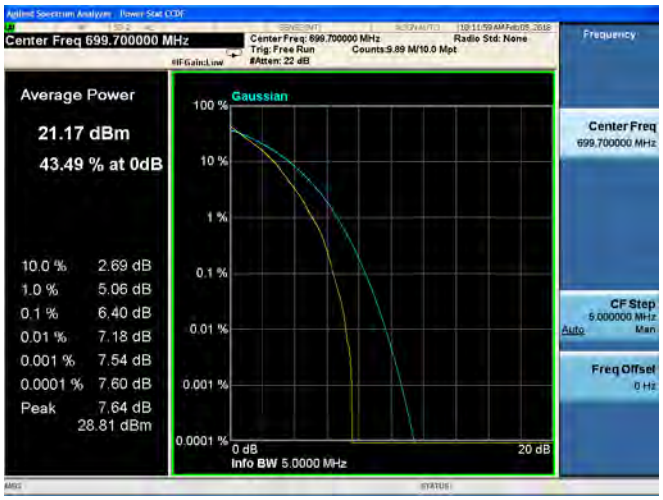
20MHz/16QAM/High CH



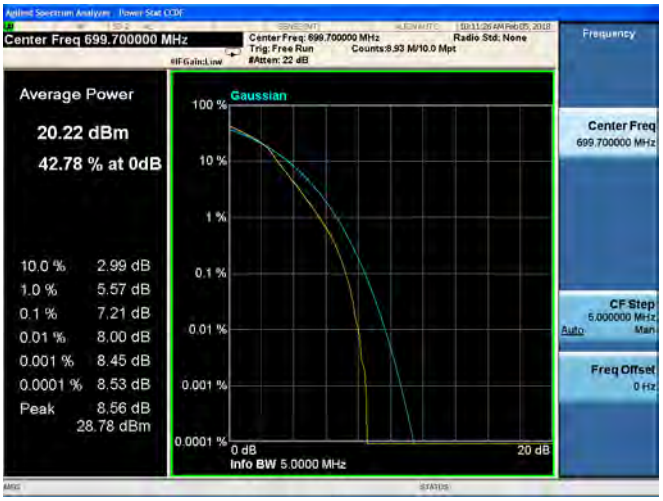
LTE Band 12, BW: 1.4MHz			
Channel	Frequency (MHz)	Peak to Average Radio(dB)	
		QPSK	16QAM
23017	699.7	6.40	7.21
23095	707.5	5.25	5.97
23173	715.3	4.68	5.48
LTE Band 12, BW: 3MHz			
Channel	Frequency (MHz)	Peak to Average Radio(dB)	
		QPSK	16QAM
23025	700.5	6.12	6.98
23095	707.5	5.30	6.08
23165	714.5	5.02	5.81
LTE Band 12, BW: 5MHz			
Channel	Frequency (MHz)	Peak to Average Radio(dB)	
		QPSK	16QAM
23035	701.5	5.79	6.52
23095	707.5	5.54	6.26
23165	714.5	5.55	6.30
LTE Band 12, BW: 10MHz			
Channel	Frequency (MHz)	Peak to Average Radio(dB)	
		QPSK	16QAM
23060	704.0	4.59	5.99
23095	707.5	4.70	6.05
23130	711.0	4.74	6.29

LTE Band 12 Peak to Average Radio

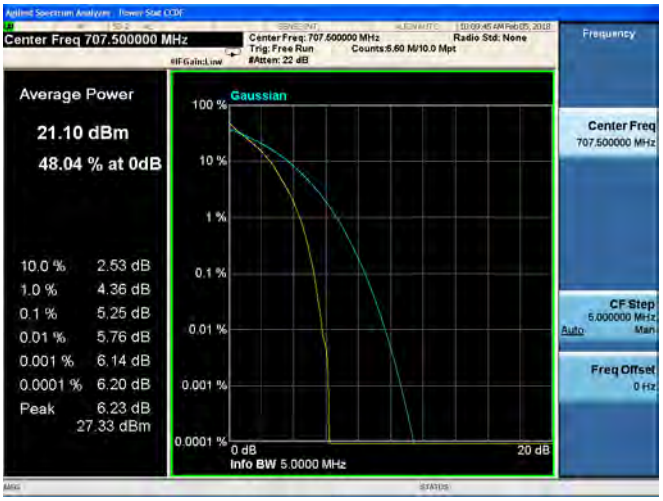
1.4MHz/QPSK/Low CH



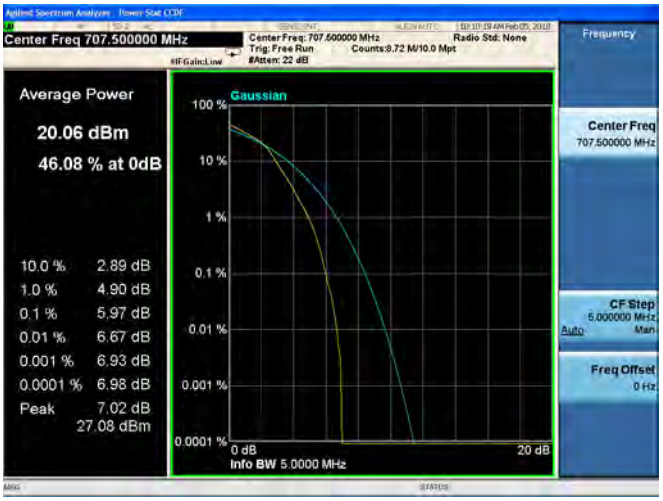
1.4MHz/16QAM/Low CH

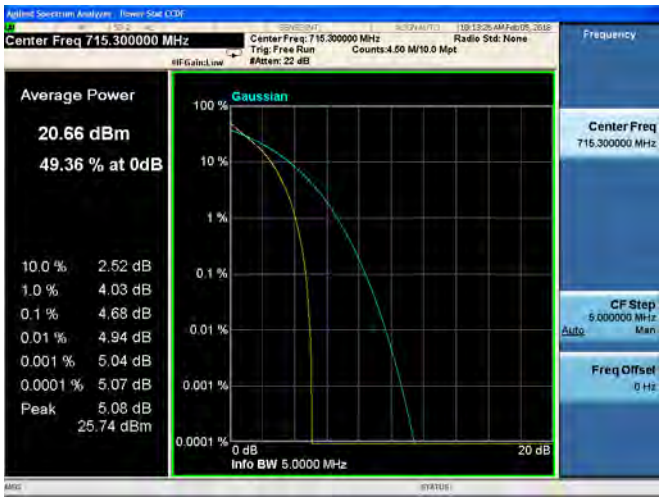
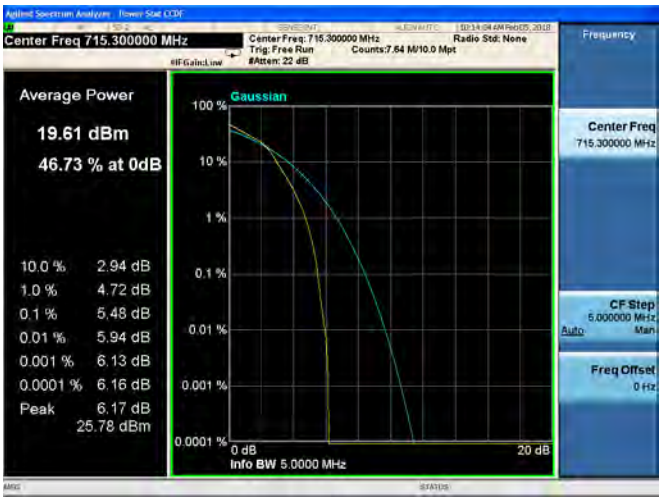


1.4MHz/QPSK/Mid CH

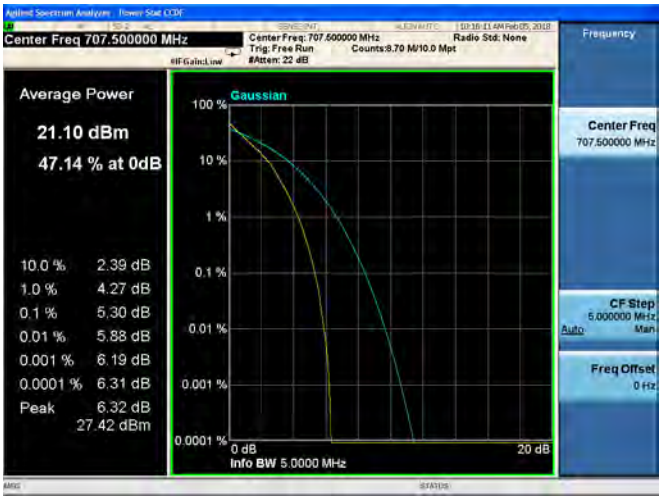


1.4MHz/16QAM/Mid CH

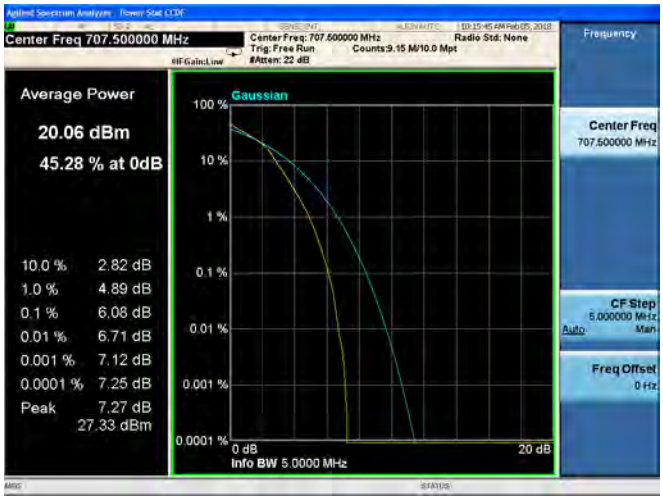


1.4MHz/QPSK/High CH	1.4MHz/16QAM/High CH
	

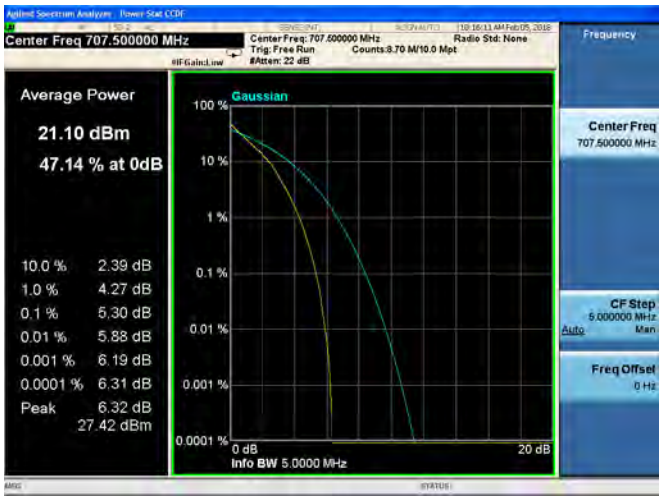
3MHz/QPSK/Low CH



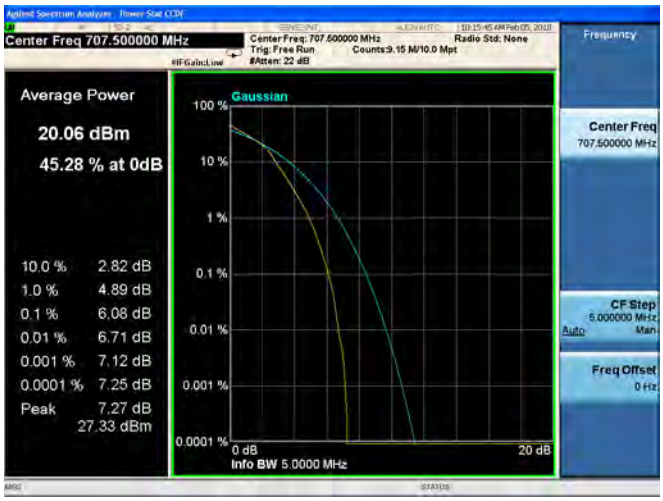
3MHz/16QAM/Low CH



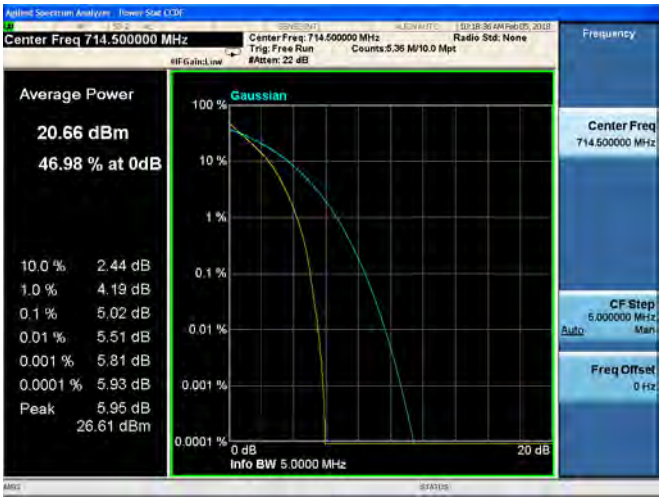
3MHz/QPSK/Mid CH



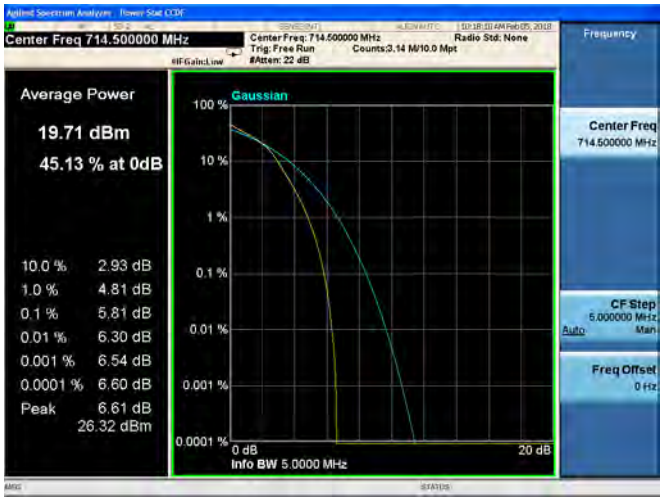
3MHz/16QAM/Mid CH



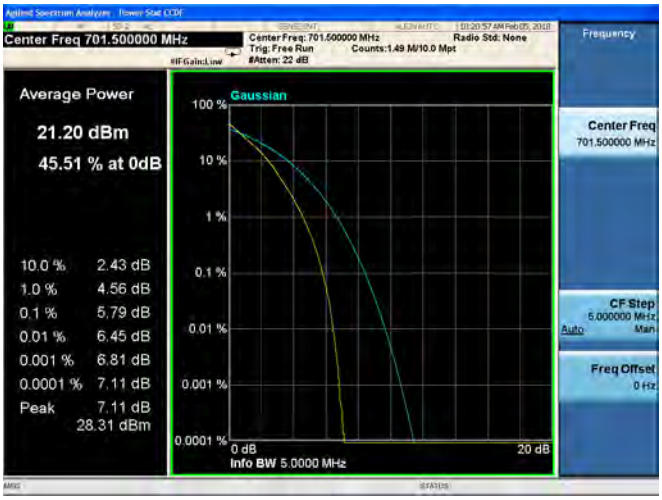
3MHz/QPSK/High CH



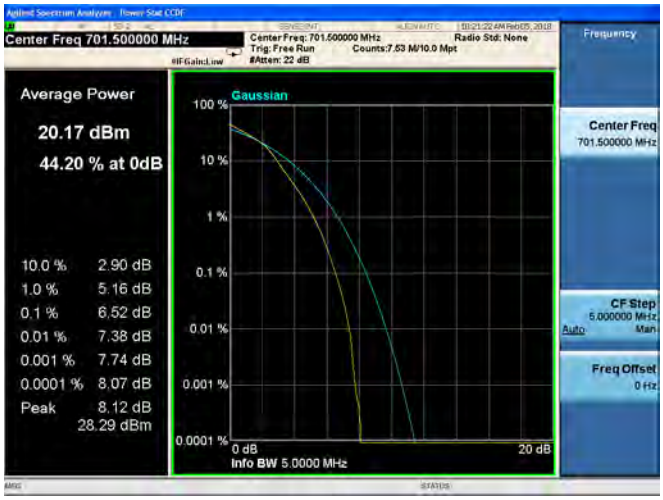
3MHz/16QAM/High CH



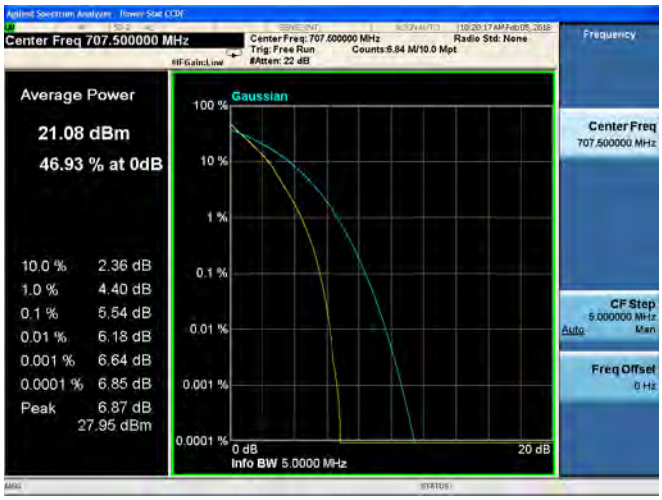
5MHz/QPSK/Low CH



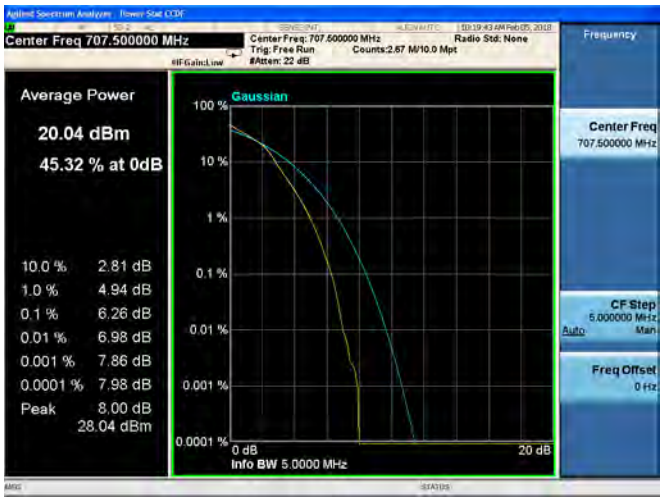
5MHz/16QAM/Low CH



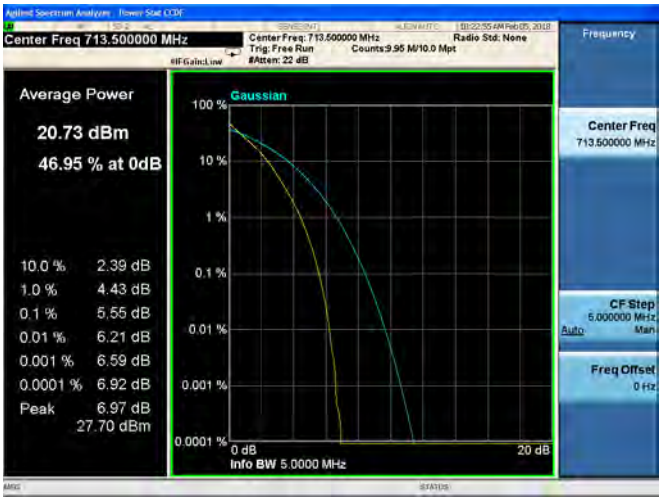
5MHz/QPSK/Mid CH



5MHz/16QAM/Mid CH

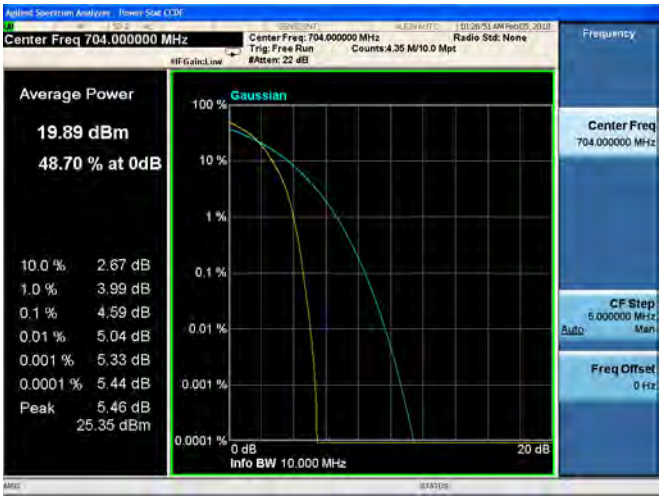


5MHz/QPSK/High CH

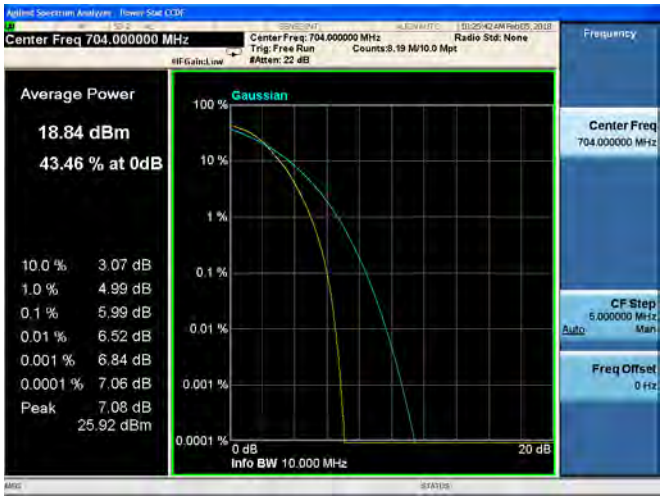


5MHz/16QAM/High CH

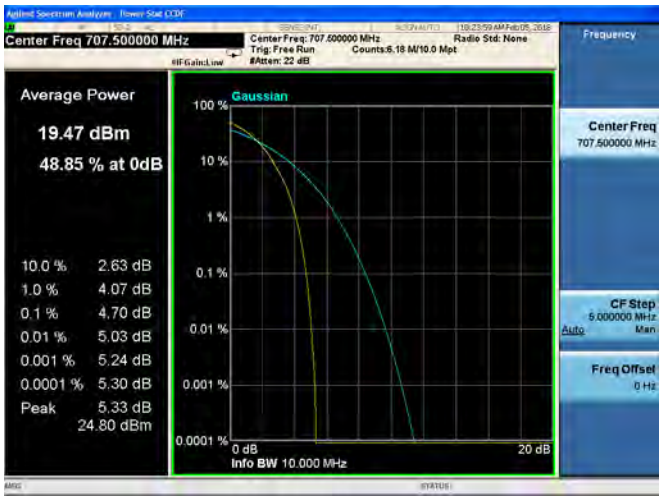
10MHz/QPSK/Low CH



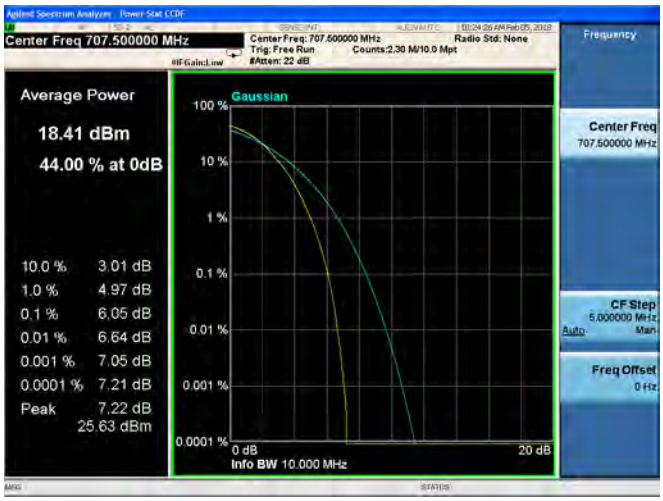
10MHz/16QAM/Low CH



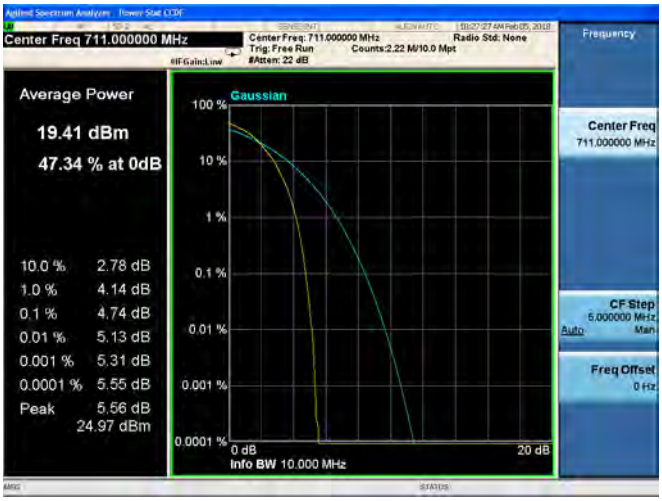
10MHz/QPSK/Mid CH



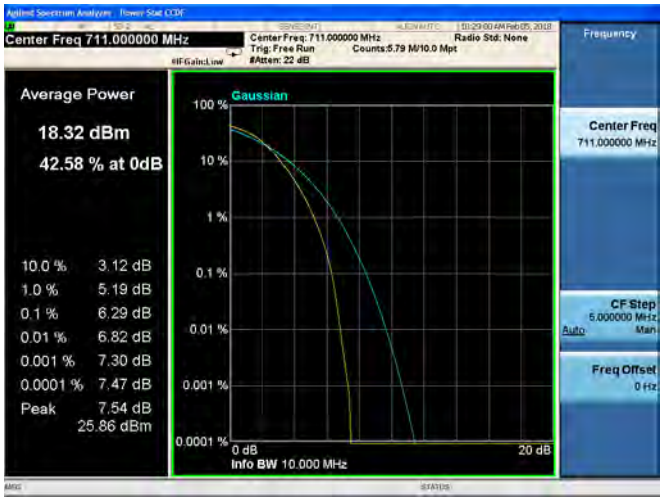
10MHz/16QAM/Mid CH



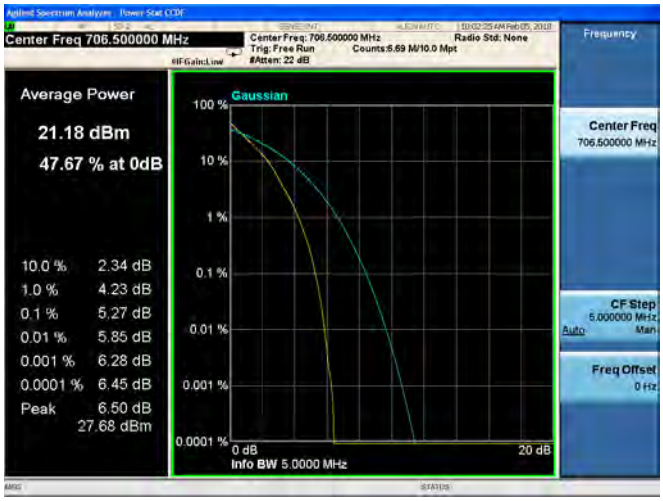
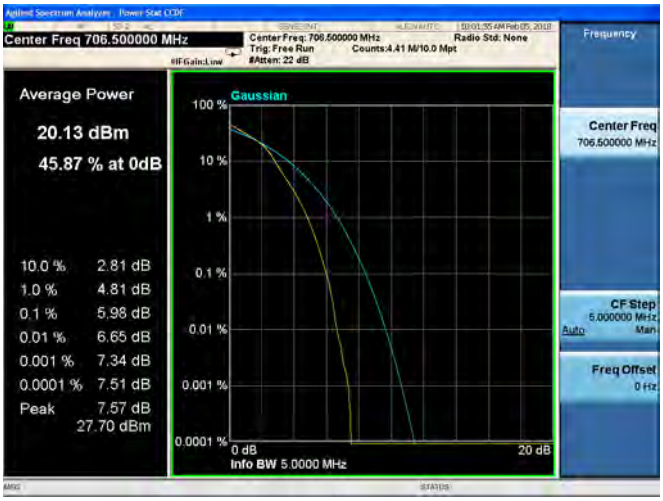
10MHz/QPSK/High CH

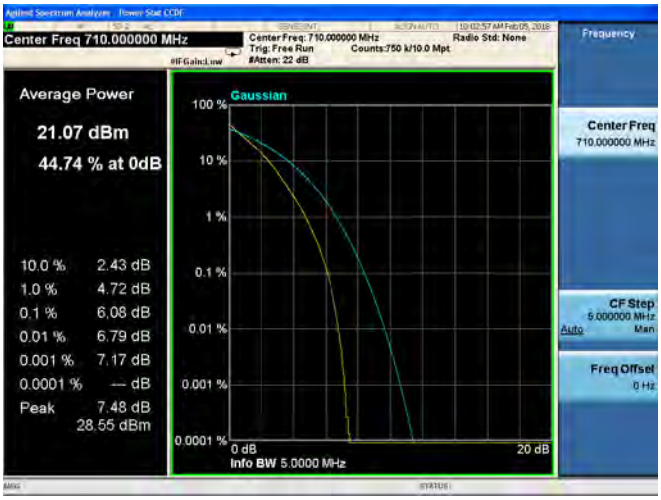
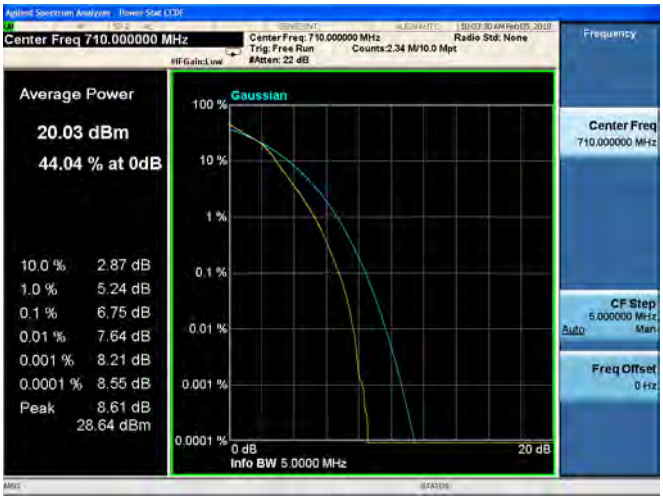
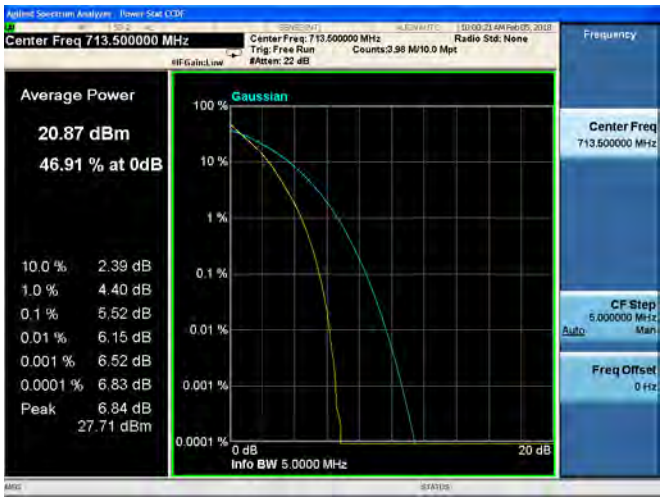
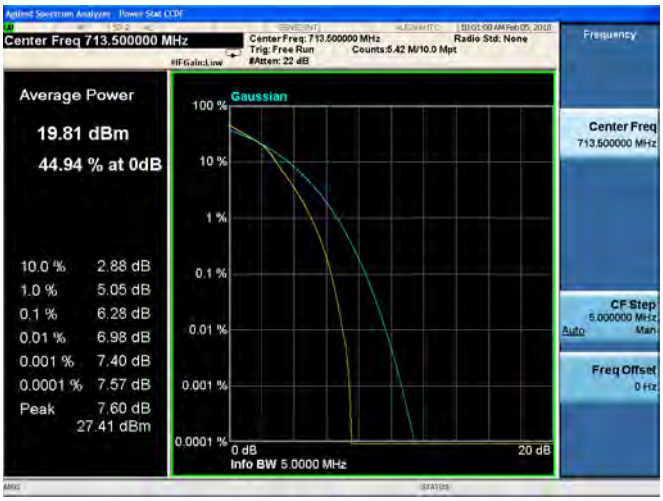


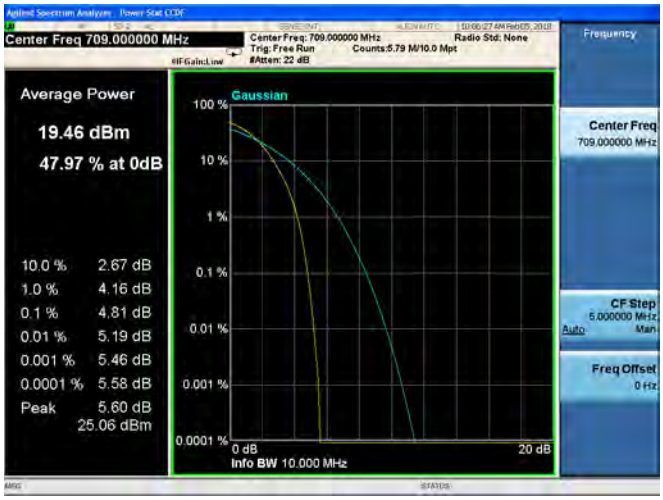
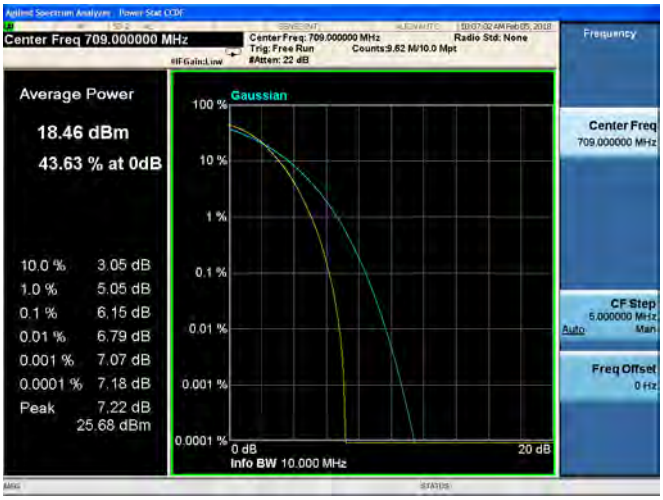
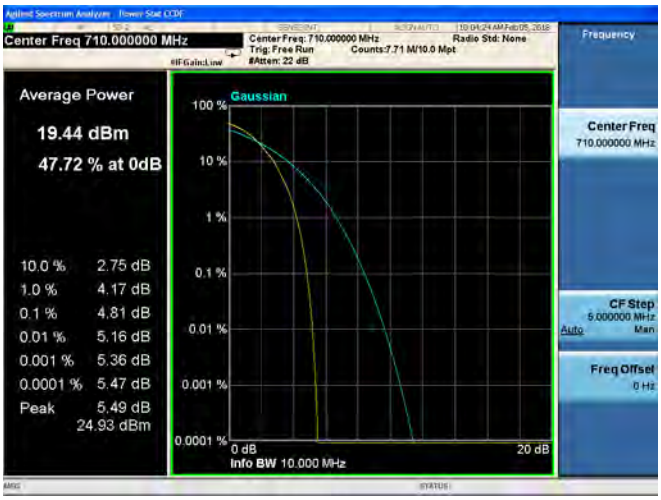
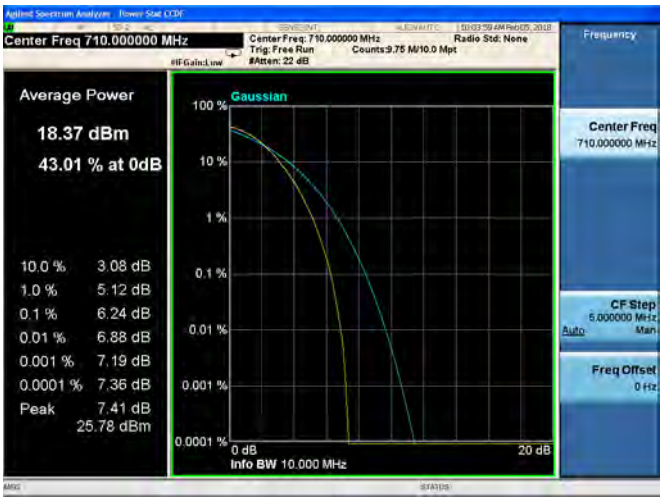
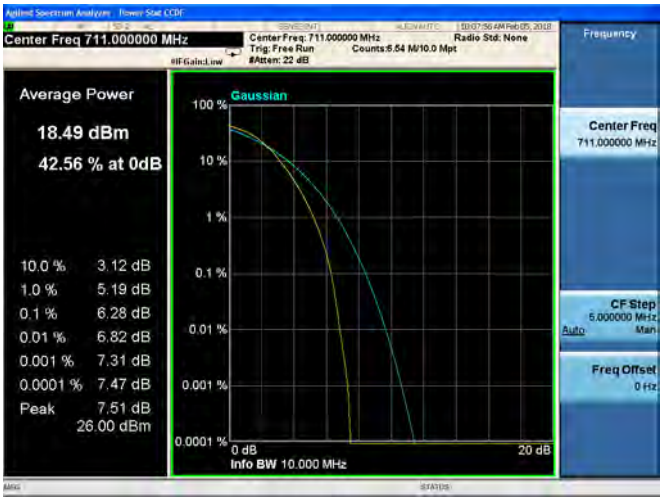
10MHz/16QAM/High CH



LTE Band 17, BW: 5MHz			
Channel	Frequency (MHz)	Peak to Average Radio(dB)	
		QPSK	16QAM
23755	706.5	5.27	5.98
23790	710.0	6.08	6.75
23825	713.5	5.52	6.28
LTE Band 1, BW: 10MHz			
Channel	Frequency (MHz)	Peak to Average Radio(dB)	
		QPSK	16QAM
23780	709.0	4.81	6.15
23790	710.0	4.81	6.24
23800	711.0	4.74	6.28

LTE Band 17 Peak to Average Radio	
5MHz/QPSK/Low CH	**5MHz/16QAM/Low CH**
	

5MHz/QPSK/Mid CH	5MHz/16QAM/Mid CH
	
5MHz/QPSK/High CH	**5MHz/16QAM/High CH**
	

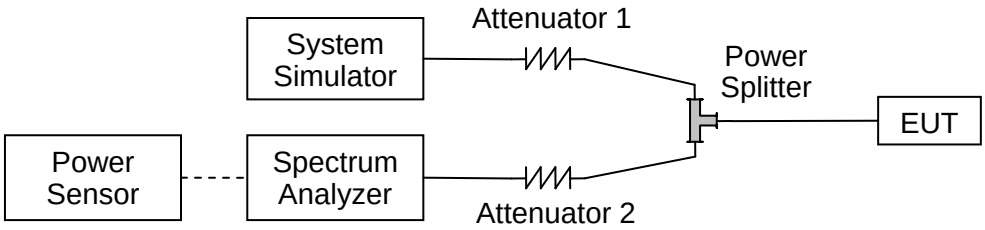
10MHz/QPSK/Low CH	10MHz/16QAM/Low CH
	
10MHz/QPSK/Mid CH	**10MHz/16QAM/Mid CH**
	
10MHz/QPSK/High CH	**10MHz/16QAM/High CH**
	

2.5. Conducted Spurious Emissions

2.5.1. Requirement

According to FCC section 2.1051, 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. This calculated to be -13dBm.

2.5.2. Test Description



The EUT is coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum output power. A call is established between the EUT and the SS.

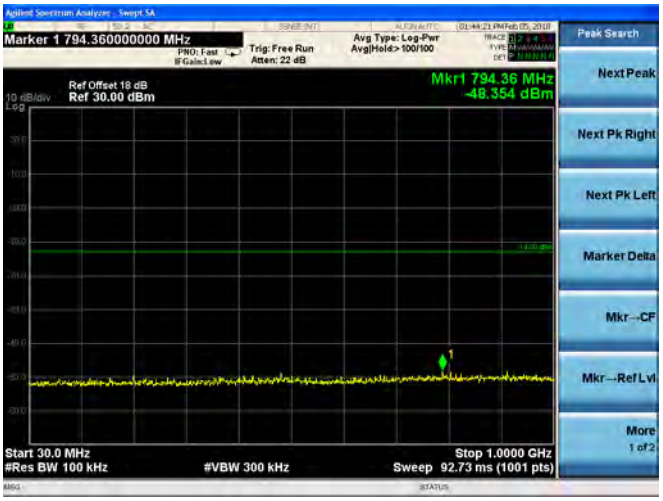
2.5.3. Test procedure

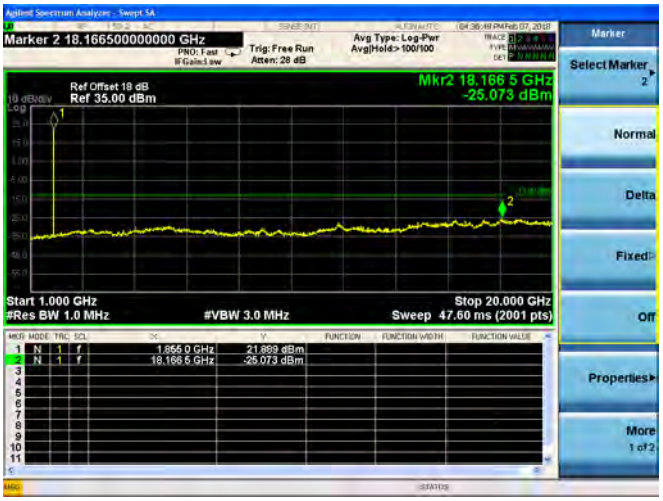
KDB 971168 D01v03 Section 6.0 and ANSI/TIA-603-E-2016.

2.5.4. Test Result

LTE Band 2 1.4MHz BW Low Channel

QPSK





16QAM