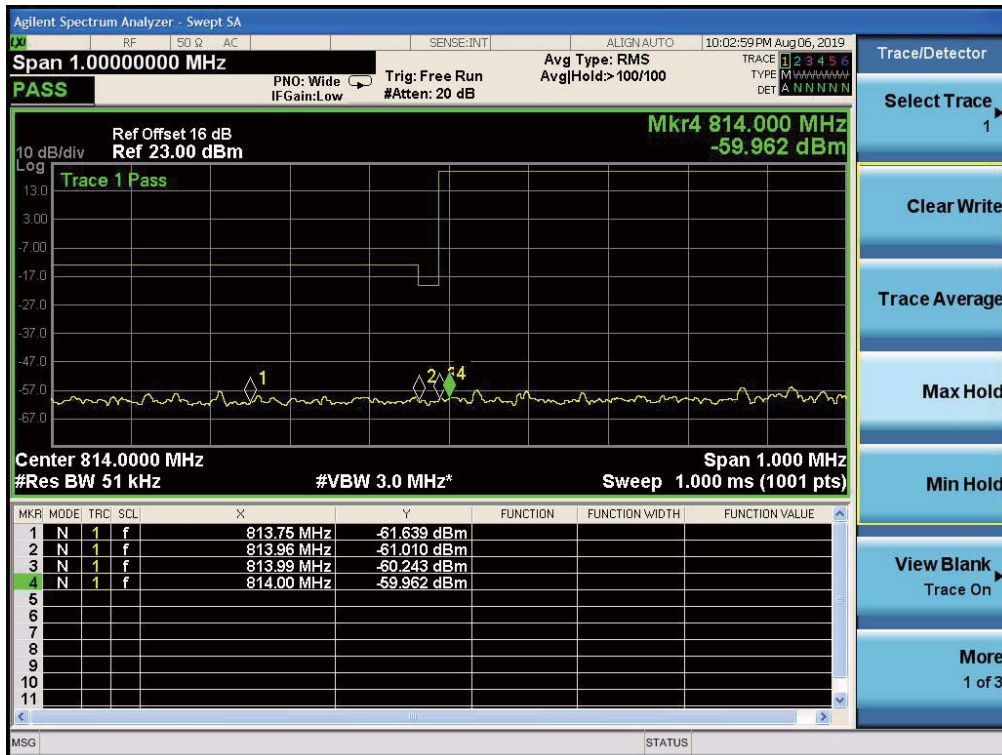
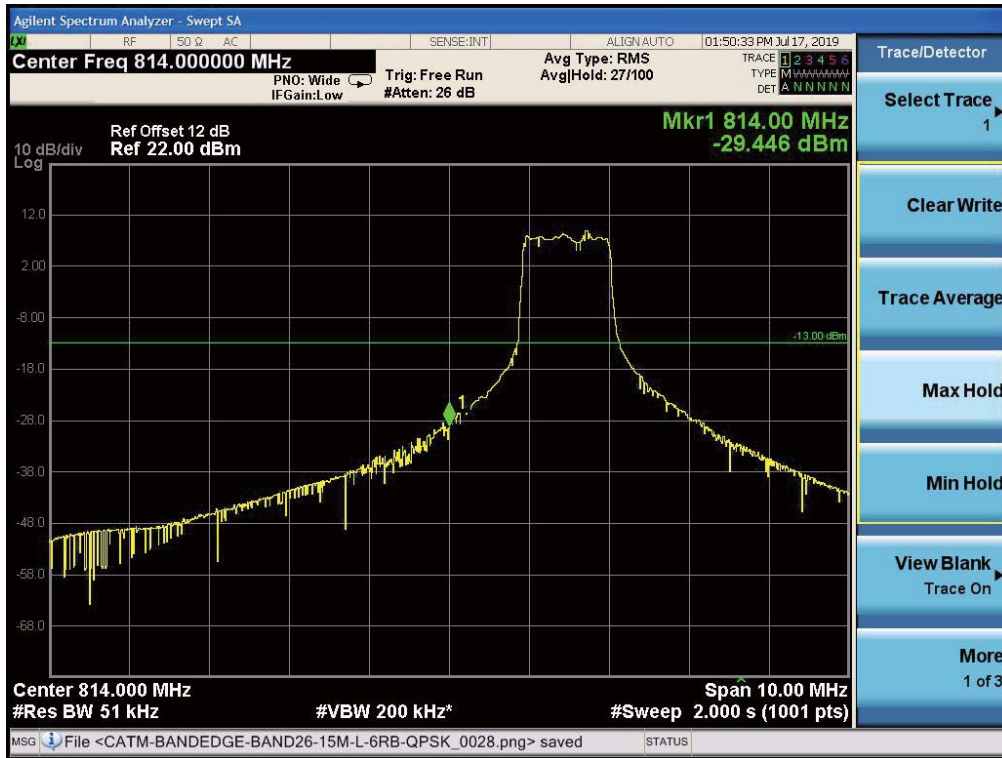


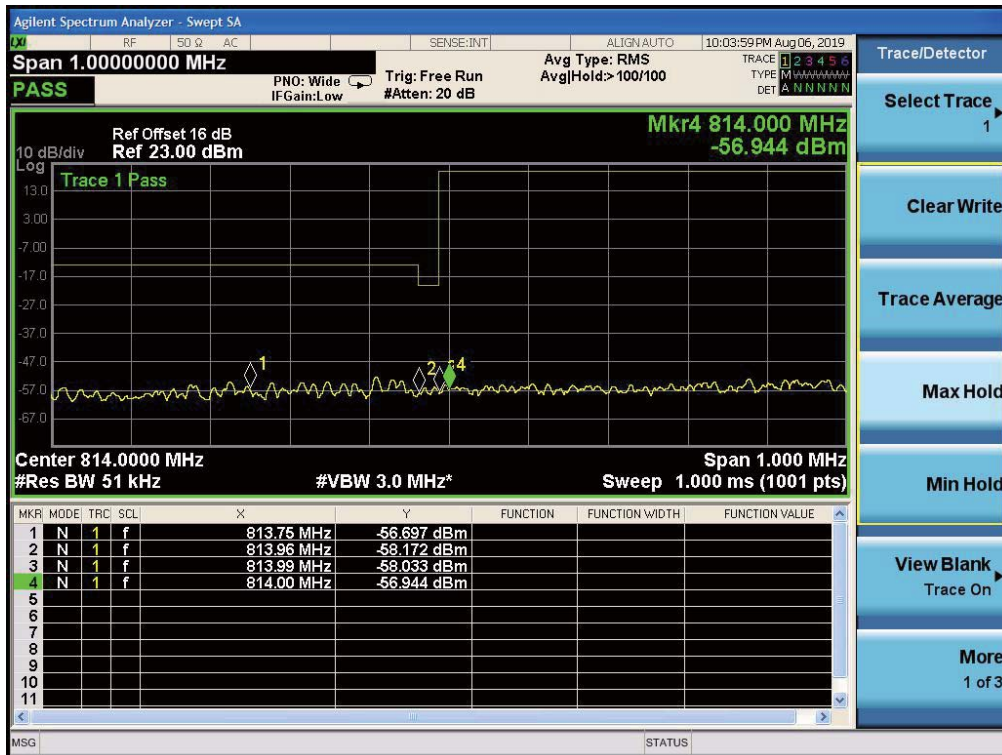
Band26-Low Channel-15MHz Bandwidth-1RB-QPSK



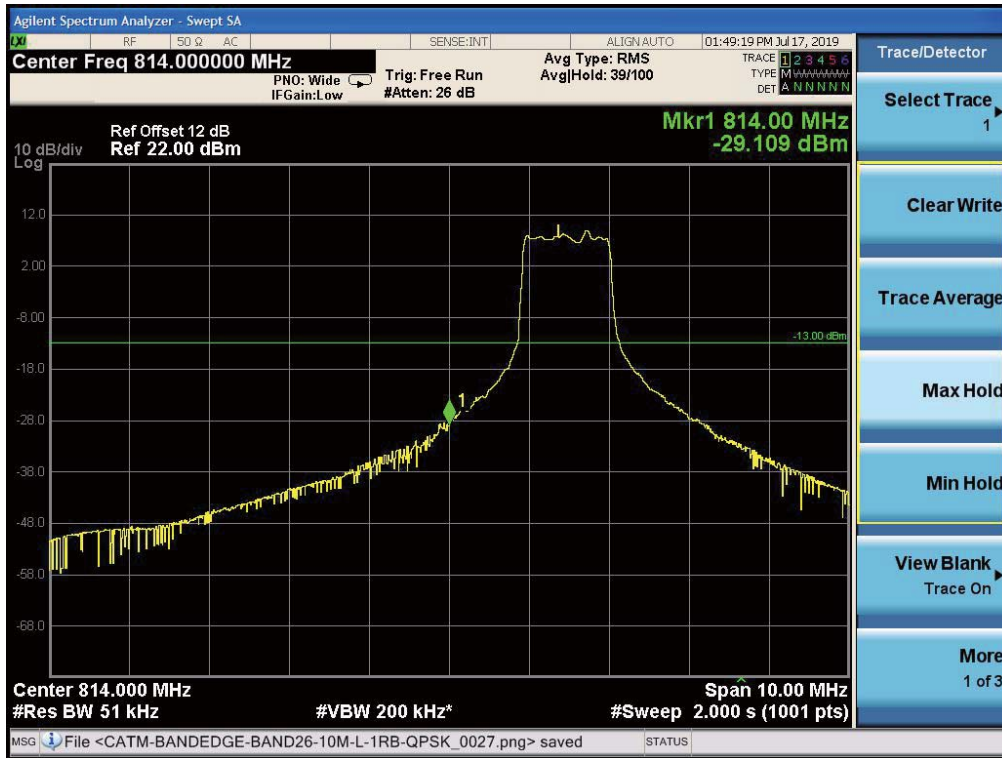
Band26-Low Channel-15MHz Bandwidth-1RB-QPSK



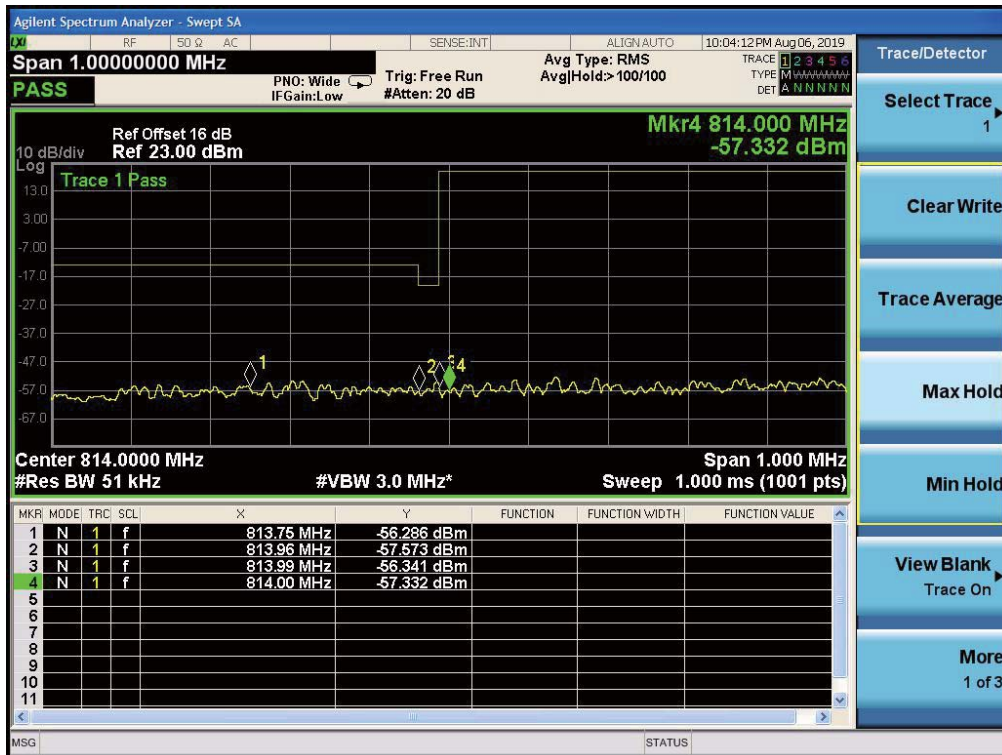
Band26-Low Channel-15MHz Bandwidth-6RB-16QAM



Band26-Low Channel-15MHz Bandwidth-6RB-16QAM



Band26-Low Channel-15MHz Bandwidth-6RB-QPSK



Band26-Low Channel-15MHz Bandwidth-6RB-QPSK

5.6 Frequency Stability over Temperature Variation

<b>Specifications:</b>	FCC Part 2.1055, 22.355, 24.235, 27.54, 90.213
<b>DUT Serial Number:</b>	353081090297923
<b>Test conditions:</b>	Ambient Temperature:15°C-35°C Relative Humidity:30%-60% Air pressure: 86-106kPa
<b>Test Results:</b>	Pass

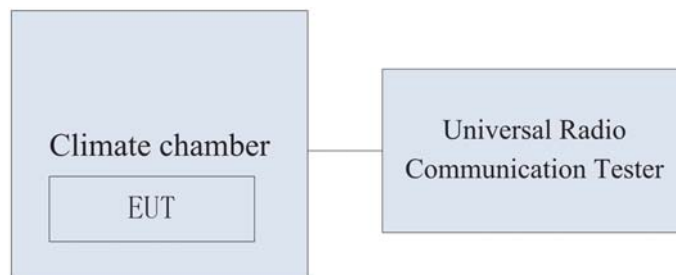
Limit	
Frequency deviation [ppm]	±2.5

Measurement Uncertainty:

Item	Uncertainty
Expanded Uncertainty	15 Hz (k=2)

Test Setup

The EUT was placed in a temperature chamber, demonstrated as figure T. The Wireless Telecommunications Test Set was used to set the Tx channel and power level, modulate the TX signal with different bit patterns and measure the frequency of Tx.



Test Method

- 1、 The EUT was turned off and placed in the temperature chamber.
- 2、 The temperature of the chamber was set to -30°C and allowed to stabilize.
- 3、 The EUT temperature was allowed to stabilize for 45 minutes.
- 4、 The EUT was turned on and set to transmit with Wireless Telecommunications Test Set.
- 5、 The maximum transmit frequency deviation during one minute period was measured by Wireless Communications Test Set.
- 6、 The steps 3-5 were repeated for -30°C,-20°C, -10°C, 0°C, 10°C, 20°C, 30°C, 40°C and 50°C.

**Note:** Only worst case result is given below.

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## 5.6.1 GSM Band Frequency Stability over Temperature Variation Results

Band	Offset	Temperature[°C]								
		-30	-20	-10	0	10	20	30	40	50
GSM850 GMSK	Hz	17.61	-18.11	5.83	10.01	-2.12	3.01	-4.11	-3.08	8.78
	ppm	0.021	-0.022	0.007	0.012	-0.003	0.004	-0.005	-0.004	0.010
GSM850 8PSK	Hz	-13.55	-14.20	4.08	-6.55	7.14	2.08	4.44	6.17	-7.02
	ppm	-0.016	-0.017	0.005	-0.008	0.009	0.002	0.005	0.007	-0.008
PCS1900 GMSK	Hz	11.51	-10.98	5.71	4.30	-5.00	3.89	-1.42	-4.57	5.11
	ppm	0.006	-0.006	0.003	0.002	-0.003	0.002	-0.001	-0.002	0.003
PCS1900 8PSK	Hz	-10.00	-9.71	6.87	3.32	-5.61	-2.10	1.11	-5.10	-3.26
	ppm	-0.005	-0.005	0.004	0.002	-0.003	-0.001	0.001	-0.003	-0.002

## 5.6.2 NB-IoT Band Frequency Stability over Temperature Variation Results

Band	Offset	Temperature[°C]								
		-30	-20	-10	0	10	20	30	40	50
2	Hz	11.36	-15.27	8.02	-7.05	5.98	15.21	8.91	-6.57	10.60
	ppm	0.006	-0.008	0.004	-0.004	0.003	0.008	0.005	-0.003	0.006
4	Hz	-4.95	3.55	10.58	7.81	-19.3	6.25	-8.05	15.07	7.71
	ppm	-0.003	0.002	0.006	0.004	-0.011	0.004	-0.005	0.009	0.004
12	Hz	-1.76	-0.12	0.47	-4.94	1.66	1.47	0.16	-1.55	0.37
	ppm	-0.002	-0.0001	0.0006	-0.007	0.002	0.002	0.0002	-0.002	0.0005
13	Hz	-0.94	1.40	-2.39	-5.59	0.47	1.88	0.40	-1.47	0.15
	ppm	-0.001	0.002	-0.003	-0.007	0.0006	0.002	0.0005	-0.0018	-0.0001
26	Hz	20.98	-12.84	10.75	-13.37	-7.89	15.35	9.68	7.31	-13.66
	ppm	0.025	-0.015	0.013	-0.016	-0.009	0.018	0.0116	0.009	-0.016

## 5.6.3 CAT-M Band Frequency Stability over Temperature Variation Results

Band	Offset	Temperature[°C]								
		-30	-20	-10	0	10	20	30	40	50

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2	Hz	9.15	7.06	-8.09	13.27	-16.05	-7.07	12.14	-10.92	7.82
	ppm	0.005	0.004	-0.004	0.007	-0.008	-0.004	0.006	-0.006	0.004
4	Hz	13.39	-20.07	10.09	-12.37	9.28	7.52	-16.67	7.89	11.52
	ppm	0.008	-0.011	0.006	-0.007	0.005	0.004	-0.010	0.004	0.007
12	Hz	2.71	3.48	0.34	0.59	1.94	0.09	0.59	1.85	0.21
	ppm	0.0038	0.0048	0.0005	0.0008	0.0027	0.0001	0.0008	0.0026	0.0003
13	Hz	2.27	-0.36	0.02	3.04	-0.70	-0.07	2.00	0.12	-0.2
	ppm	0.0024	-0.0005	0.00003	0.0039	-0.0009	-0.0001	0.0026	0.0001	-0.0003
26	Hz	6.96	17.89	7.39	-5.27	15.34	9.22	-11.05	-6.97	15.09
	ppm	0.008	0.021	0.009	-0.006	0.018	0.011	-0.013	-0.008	0.018

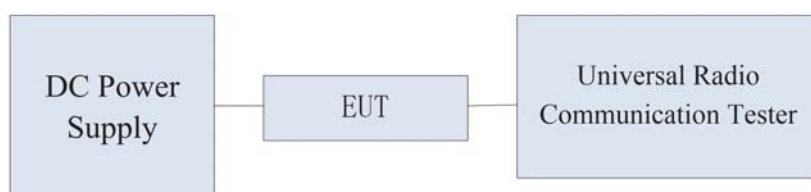
### 5.7 Frequency Stability over Voltage Variation

<b>Specifications:</b>	FCC Part 2.1055, 22.355, 24.235, 27.54, 90.213
<b>DUT Serial Number:</b>	353081090297923
<b>Test conditions:</b>	Ambient Temperature:15°C-35°C Relative Humidity:30%-60% Air pressure: 86-106kPa
<b>Test Results:</b>	Pass

Limit	
Frequency deviation [ppm]	±2.5

### Test Setup

The EUT was placed in a shielding chamber and powered by an adjustable power supply, demonstrated as figure V. A Wireless Telecommunications Test Set was used to set the TX channel and power level, modulate the TX signal with different bit patterns and measure the frequency of TX.



### Measurement Uncertainty:

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Item	Uncertainty
Expanded Uncertainty	15 Hz (k=2)

## Test Method

The EUT was powered by the adjustable power supply. The frequency stability is measured by the Wireless Telecommunications Test Set.

**Note:** Only worst case result is given below.

**5.7.1 GSM Band Frequency Stability over Voltage Variation Results**

Test data:

Band	Offset	Voltage (V)		
		3.4	3.8	4.2
GSM850 GMSK	Hz	3.61	-1.01	3.41
	ppm	0.004	-0.001	0.004
GSM850 8PSK	Hz	-5.60	-0.78	2.30
	ppm	-0.007	-0.001	0.003
PCS1900 GMSK	Hz	1.09	1.77	-1.56
	ppm	0.001	0.001	-0.001
PCS1900 8PSK	Hz	2.11	-0.11	-4.01
	ppm	0.001	-0.001	-0.002

**5.7.2 NB-IoT Band Frequency Stability over Voltage Variation Results**

Test data:

Band	Offset	Voltage (V)		
		3.4	3.8	4.2
2	Hz	9.39	-7.61	5.41
	ppm	0.005	-0.004	0.003
4	Hz	10.91	8.19	5.06
	ppm	0.006	0.005	0.003
12	Hz	0.99	1.02	0.54
	ppm	0.0014	0.0014	0.0007
13	Hz	1.38	1.25	-1.96
	ppm	0.0017	0.0015	-0.0025
26	Hz	13.18	7.72	-5.93
	ppm	0.016	0.009	-0.007

**5.7.3 CAT-M Band Frequency Stability over Voltage Variation Results**

Test data:



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Band	Offset	Voltage (V)		
		3.4	3.8	4.2
2	Hz	14.91	10.36	-8.92
	ppm	0.008	0.005	-0.005
4	Hz	6.15	8.30	-10.73
	ppm	0.003	0.005	-0.006
12	Hz	3.97	1.10	2.85
	ppm	0.0056	0.0016	0.004
13	Hz	0.16	2.84	0.47
	ppm	0.0002	0.0036	0.0006
26	Hz	-11.05	7.53	-8.21
	ppm	-0.013	0.009	-0.010

## 5.8 Peak to Average Ratio

<b>Specifications:</b>	FCC Part 24.232, 27.50
<b>DUT Serial Number:</b>	353081090297923
<b>Test conditions:</b>	Ambient Temperature:15°C-35°C Relative Humidity:30%-60% Air pressure: 86-106kPa
<b>Test Results:</b>	Pass

### Limit

The EUT meets the requirement of having a peak to average ratio of less than 13dB.

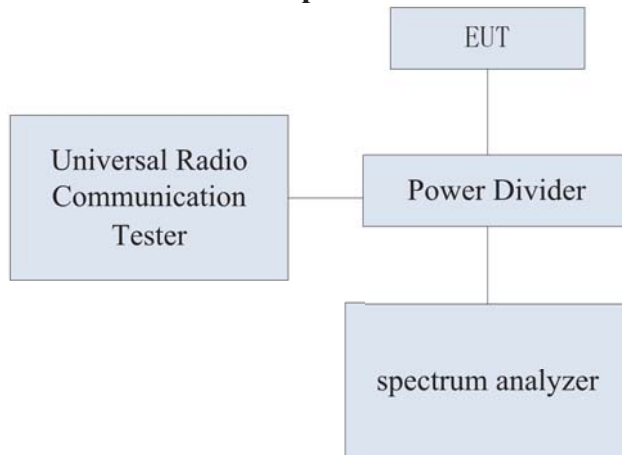
### Measurement Uncertainty:

Item	Uncertainty
Expanded Uncertainty	0.52 dB (k=2)

### Test Setup

During the test, the EUT was controlled via the Wireless Communications Test Set to ensure max power transmission and proper modulation and measured by spectrum analyzer.

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**Test Method**

The transmitter output was connected to a CMW500 through a coaxial RF cable and directional coupler, and configured to operate at maximum power. The peak to average ratio was measured at the required operating frequencies in each Band on the Spectrum Analyzer.

**Note:** Only worst case result is given below.

**5.8.1 GSM850 Peak to Average Ratio Results**

Frequency (MHz)	Channel	Modulation	PAPR(dB)
836.6	190	GMSK	12.70
		8PSK	12.83

**5.8.2 PCS1900 Peak to Average Ratio Results**

Frequency (MHz)	Channel	Modulation	PAPR(dB)
1880	661	GMSK	10.96
		8PSK	12.25

**5.8.3 NB-IoT Peak to Average Ratio Results**

Mode	Channel	Frequency (MHz)	PAPR(dB)	PAPR(dB)
			QPSK	BPSK
Band2	18900	1880	9.45	10.49
Band4	20175	1732.5	8.26	9.23
Band12	23095	707.5	9.96	9.56
Band13	23230	782.0	12.09	9.40
Band26	26865	831.5	6.96	8.47

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## 5.8.4 CAT-M Peak to Average Ratio Results

Mode	Bandwidth	Modulation	Channel/Frequency (MHz)	PAPR (dB)
Band2	1.4MHz	QPSK	18900/1880	11.63
		16QAM	18900/1880	10.18
	3MHz	QPSK	18900/1880	11.00
		16QAM	18900/1880	11.76
	5MHz	QPSK	18900/1880	10.95
		16QAM	18900/1880	8.58
	10MHz	QPSK	18900/1880	9.92
		16QAM	18900/1880	11.29
	15MHz	QPSK	18900/1880	10.52
		16QAM	18900/1880	10.13
	20MHz	QPSK	18900/1880	8.33
		16QAM	18900/1880	9.92

Mode	Bandwidth	Modulation	Channel/Frequency (MHz)	PAPR (dB)
Band4	1.4MHz	QPSK	20175/1732.5	10.99
		16QAM	20175/1732.5	8.60
	3MHz	QPSK	20175/1732.5	10.76
		16QAM	20175/1732.5	9.71
	5MHz	QPSK	20175/1732.5	10.83
		16QAM	20175/1732.5	10.00
	10MHz	QPSK	20175/1732.5	10.37
		16QAM	20175/1732.5	8.96
	15MHz	QPSK	20175/1732.5	10.01
		16QAM	20175/1732.5	8.52
	20MHz	QPSK	20175/1732.5	9.36
		16QAM	20175/1732.5	10.17

Mode	Bandwidth	Modulation	Channel/Frequency (MHz)	PAPR (dB)
Band12	1.4MHz	QPSK	23095/707.5	10.86
		16QAM	23095/707.5	12.00
	3MHz	QPSK	23095/707.5	10.59
		16QAM	23095/707.5	11.89
	5MHz	QPSK	23095/707.5	11.95
		16QAM	23095/707.5	11.77

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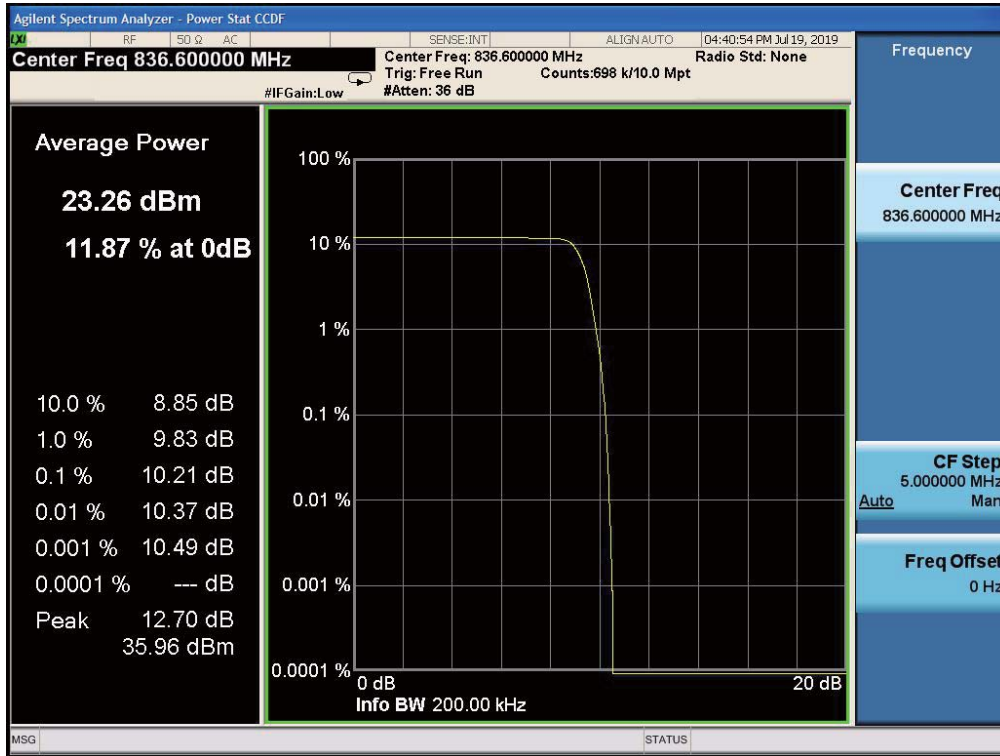
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	10MHz	QPSK	23095/707.5	11.80
		16QAM	23095/707.5	11.85

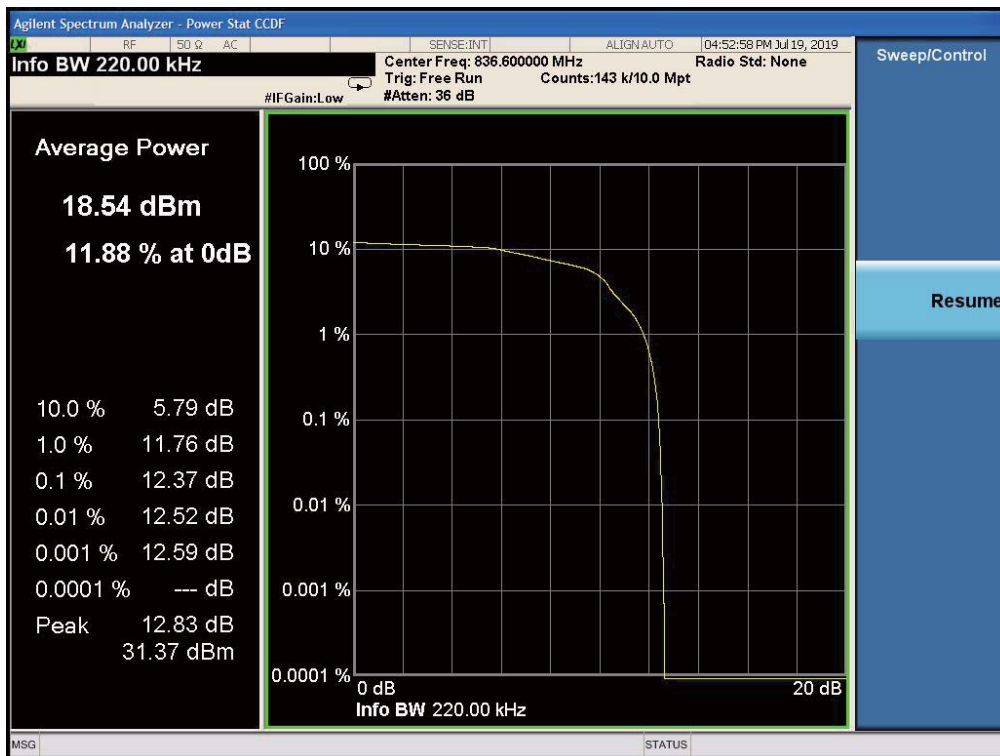
Mode	Bandwidth	Modulation	Channel/Frequency (MHz)	PAPR (dB)
Band13	5MHz	QPSK	23230/782.0	11.39
		16QAM	23230/782.0	11.34
	10MHz	QPSK	23230/782.0	11.28
		16QAM	23230/782.0	11.26

Mode	Bandwidth	Modulation	Channel/Frequency (MHz)	PAPR (dB)
Band26	1.4MHz	QPSK	26865/831.5	10.76
		16QAM	26865/831.5	9.87
	3MHz	QPSK	26865/831.5	11.69
		16QAM	26865/831.5	11.36
	5MHz	QPSK	26865/831.5	11.05
		16QAM	26865/831.5	9.18
	10MHz	QPSK	26865/831.5	10.85
		16QAM	26865/831.5	11.63
15MHz	QPSK	26865/831.5	9.45	
	16QAM	26865/831.5	10.00	

Graphical for Peak to Average Ratio Results for GSM850:

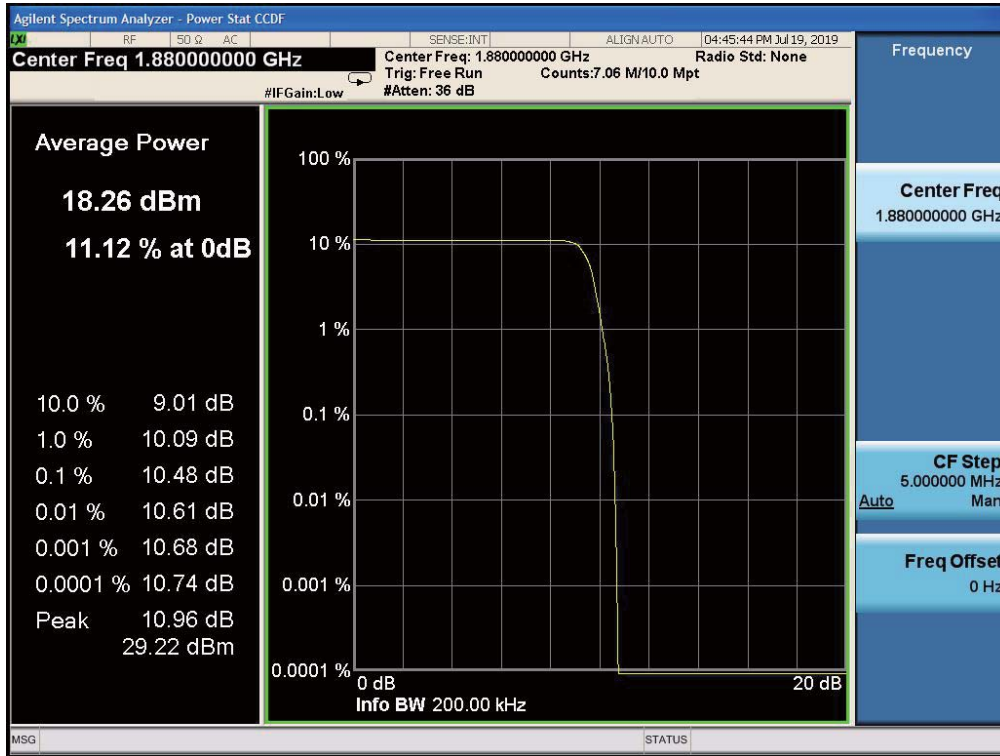


836.6MHz-CH190-GMSK

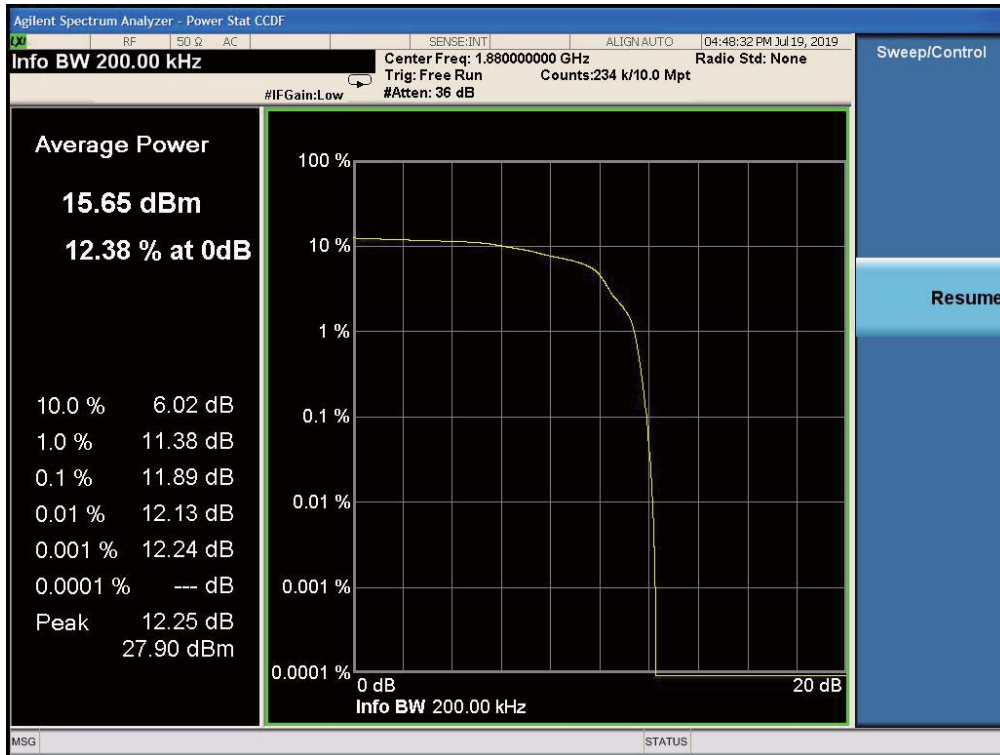


836.6MHz-CH190-8PSK

Graphical for Peak to Average Ratio Results for PCS1900:

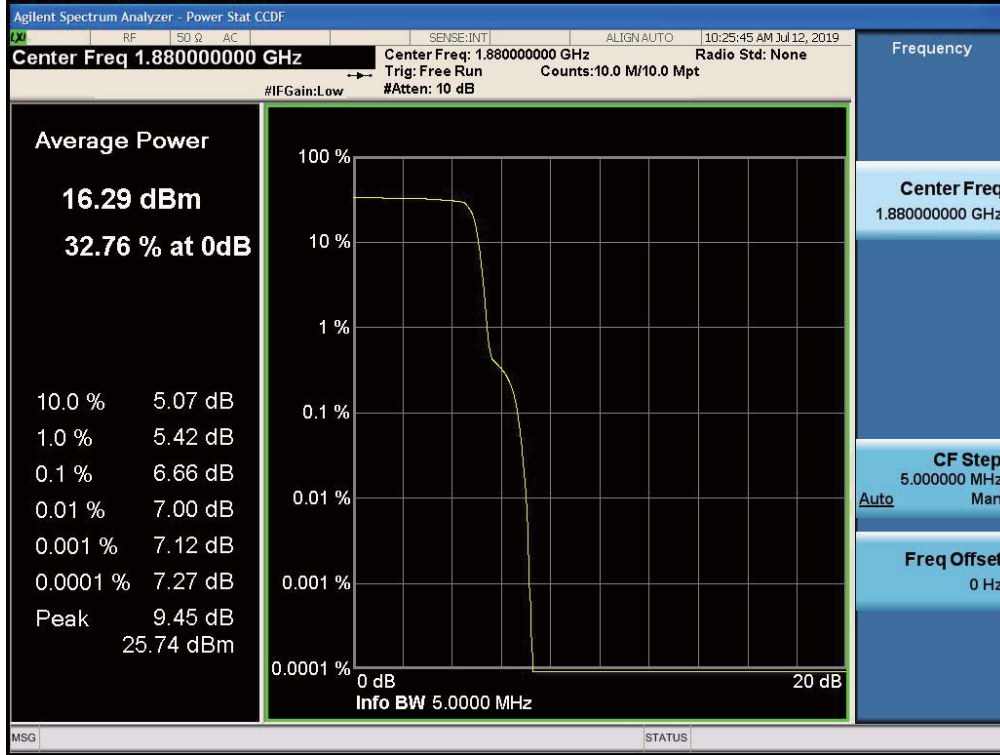


1880MHz-CH661-GMSK

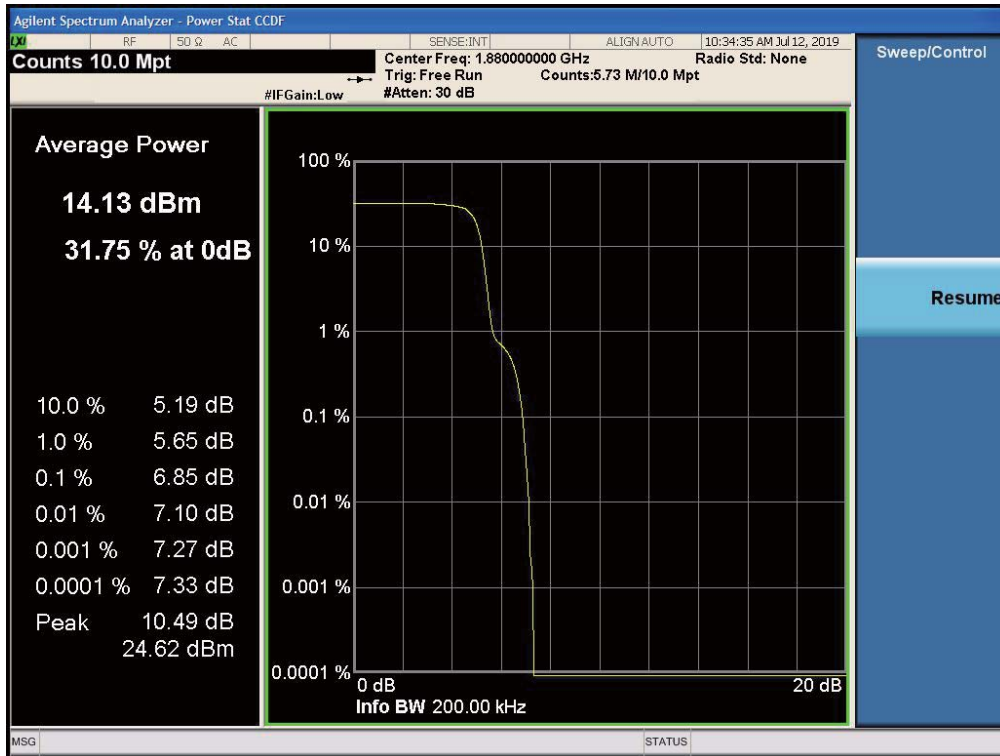


1880MHz-CH661-8PSK

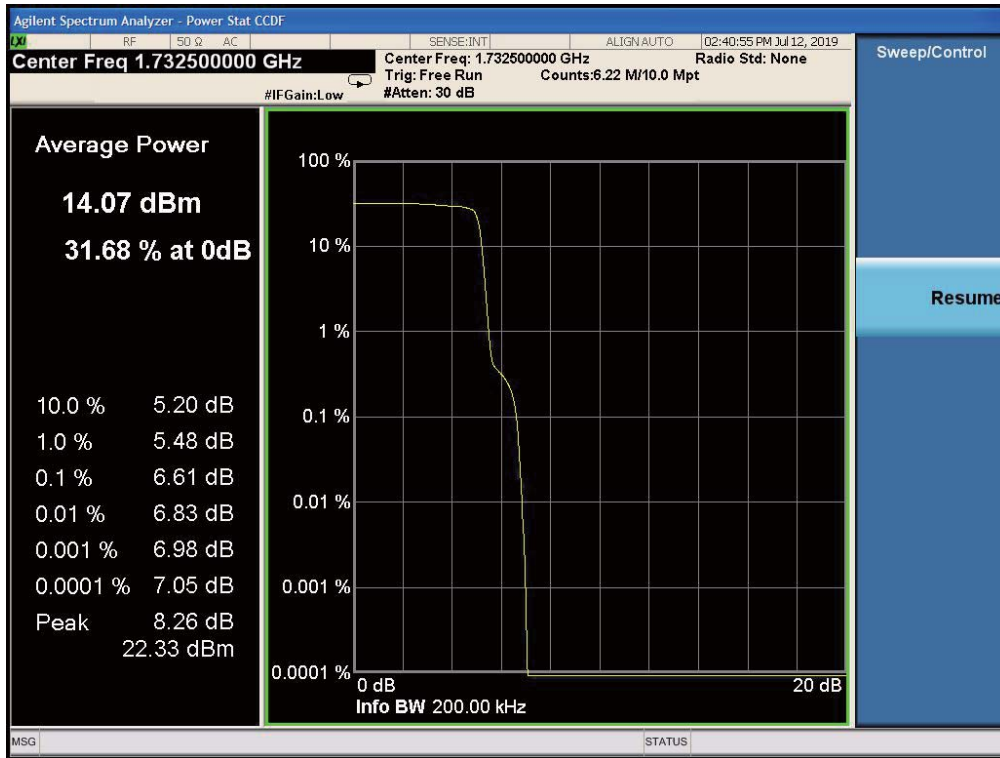
Graphical for Peak to Average Ratio Results for NB-IoT:



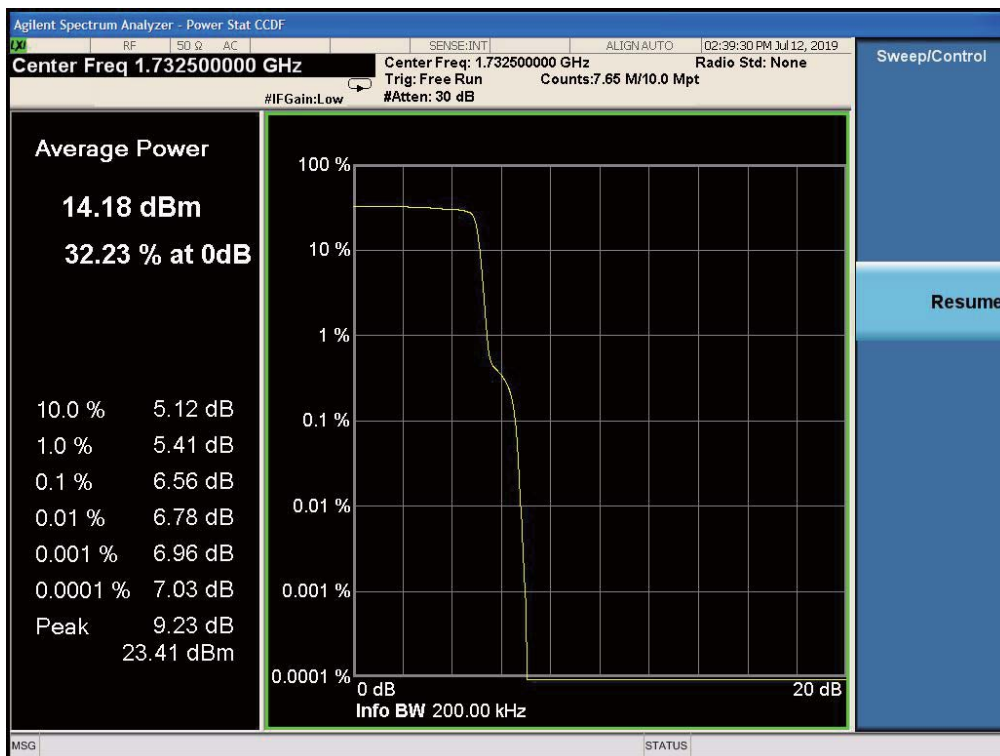
Band2-CH18900-1880MHz-QPSK



Band2-CH18900-1880MHz-BPSK

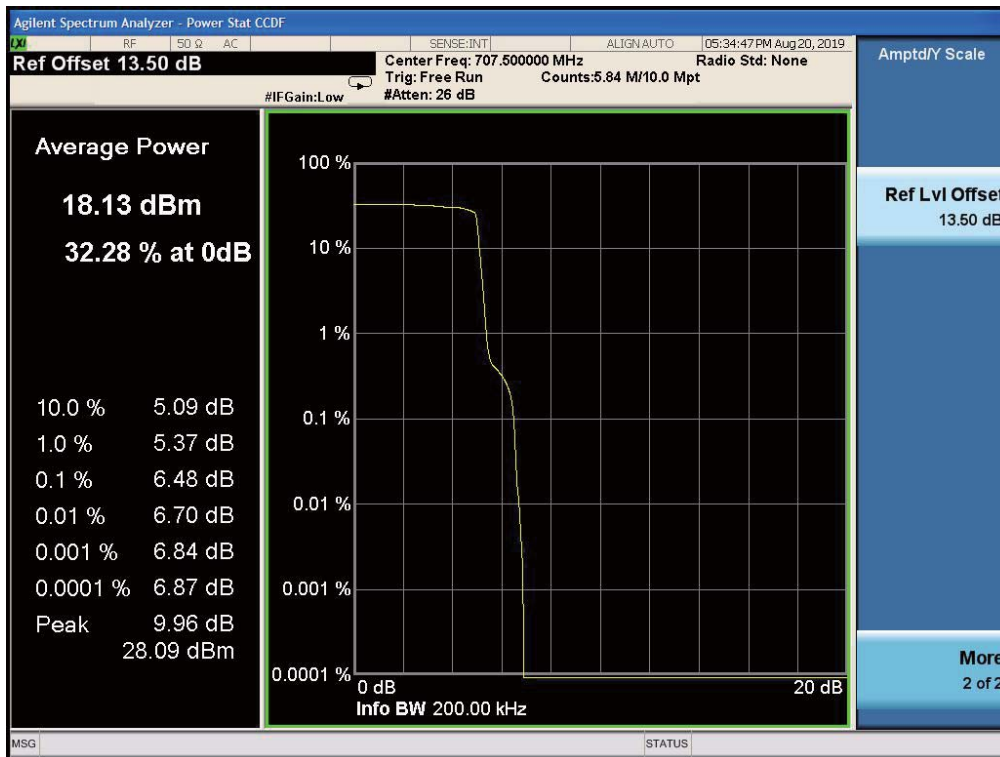


Band4-CH20175-1732.5MHz-QPSK

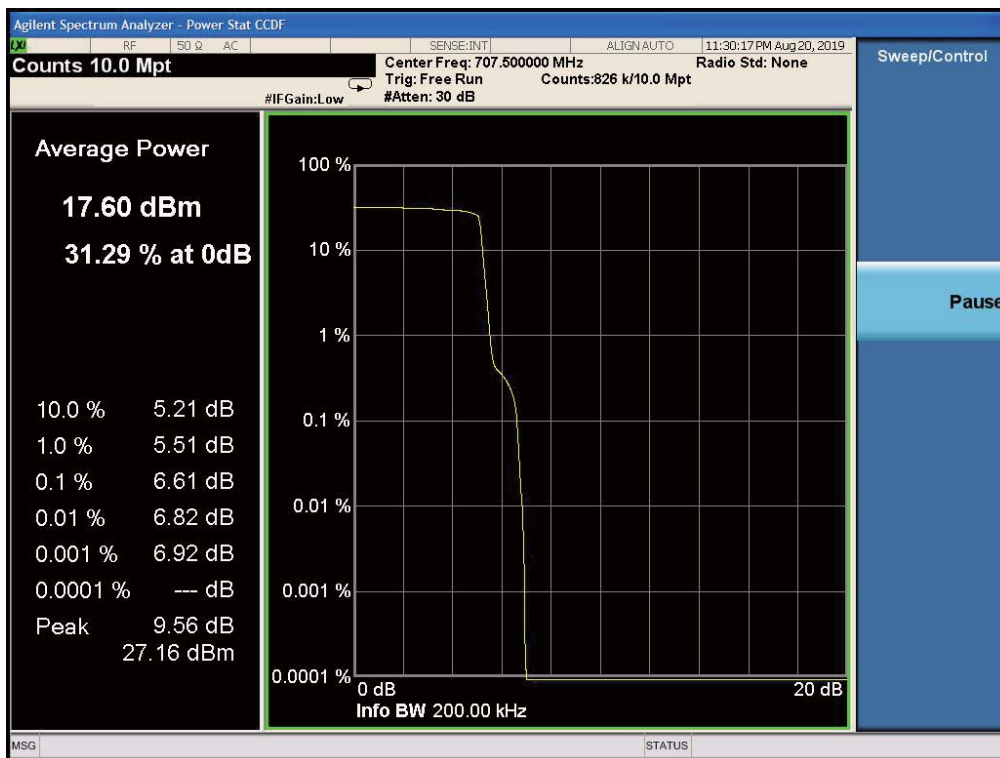


Band4- CH20175-1732.5MHz -BPSK

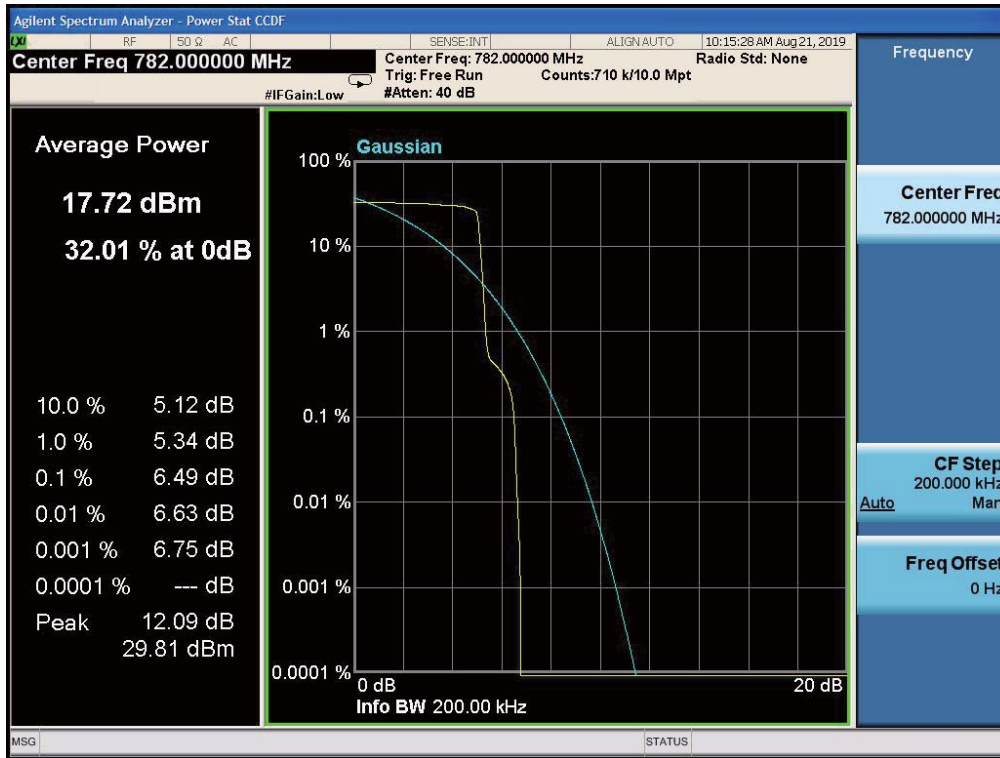




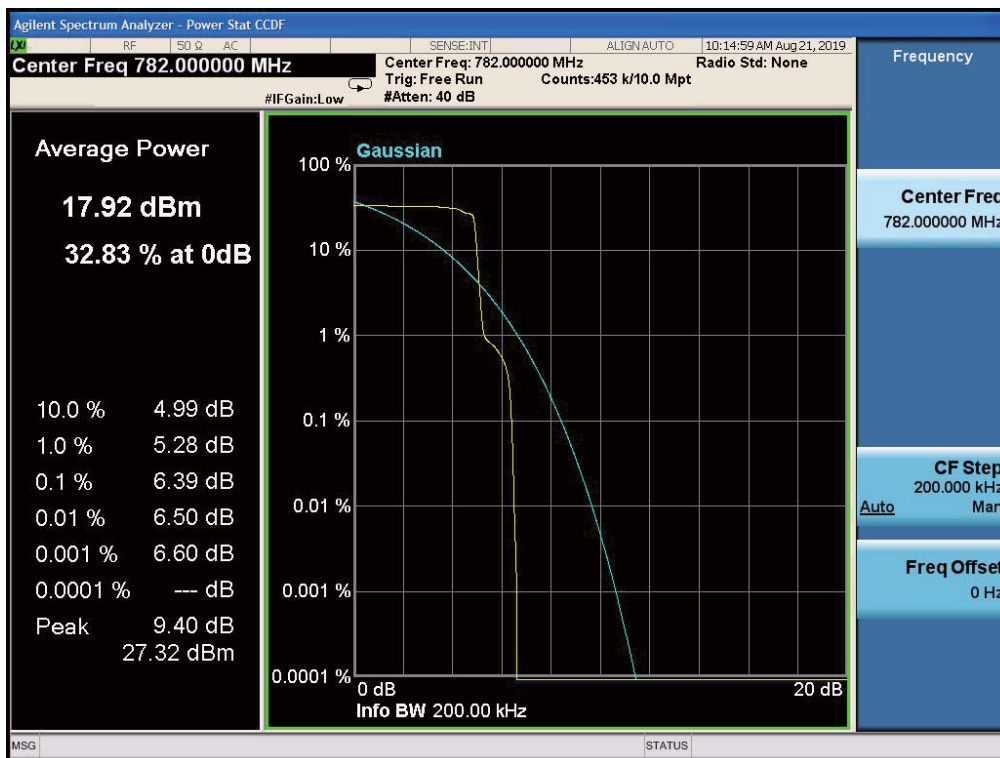
Band12-CH23095-707.5MHz-QPSK



Band12- CH23095-707.5MHz -BPSK



Band13-CH23230-782MHz-QPSK



Band13- CH23230-782MHz -BPSK