



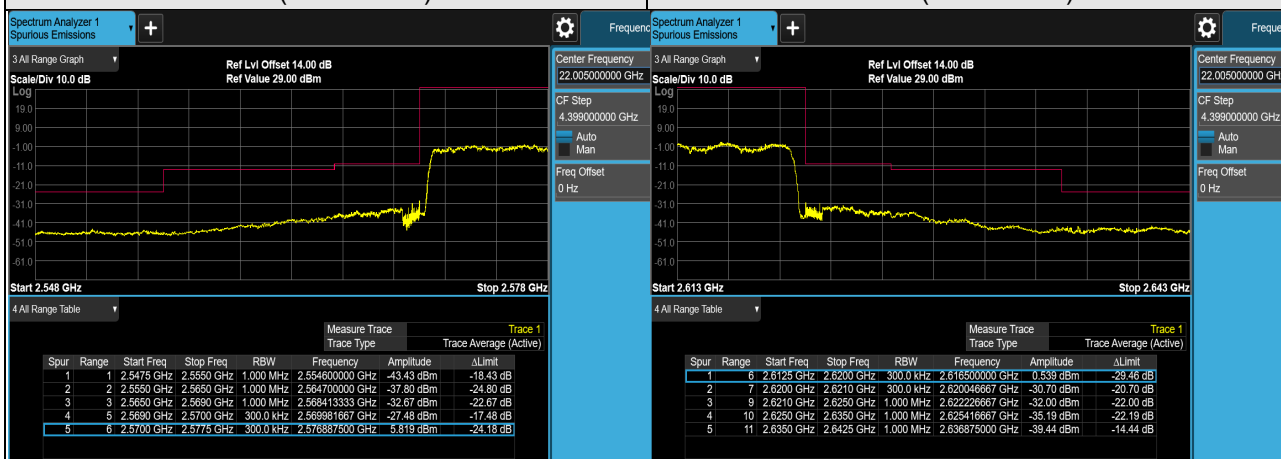
BUREAU VERITAS

### LTE Band 38 (Channel Bandwidth 15MHz)



1RB (2577.5MHz)

1RB (2612.5MHz)



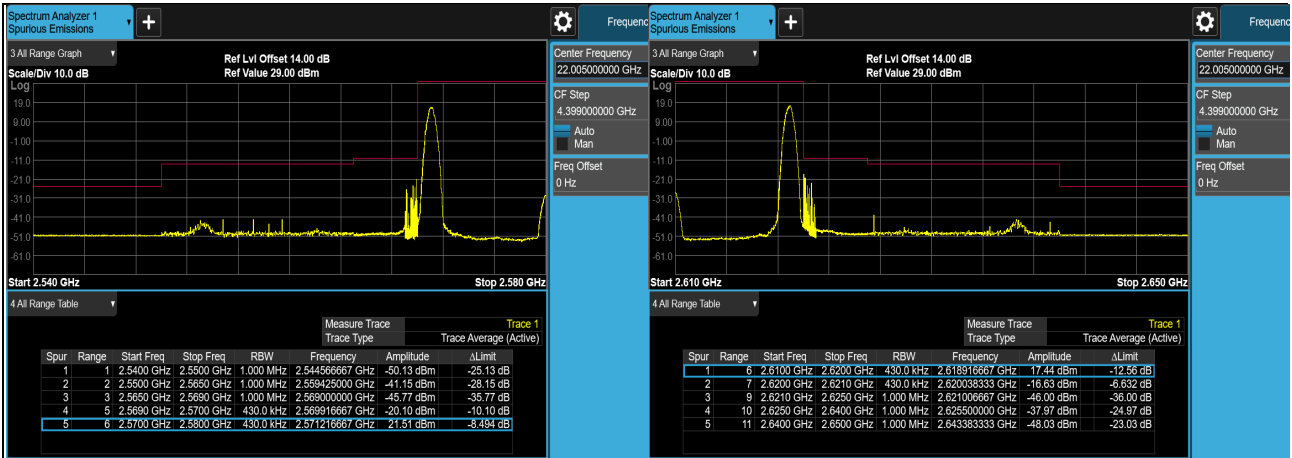
FULL (2577.5MHz)

FULL (2612.5MHz)



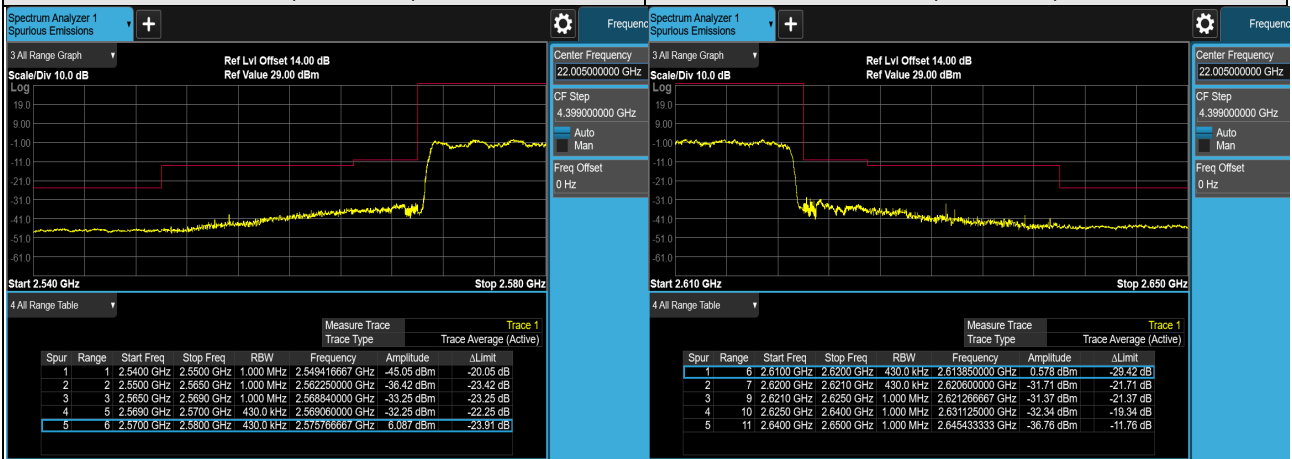
BUREAU VERITAS

### LTE Band 38 (Channel Bandwidth 20MHz)



1RB (2580MHz)

1RB (2610MHz)



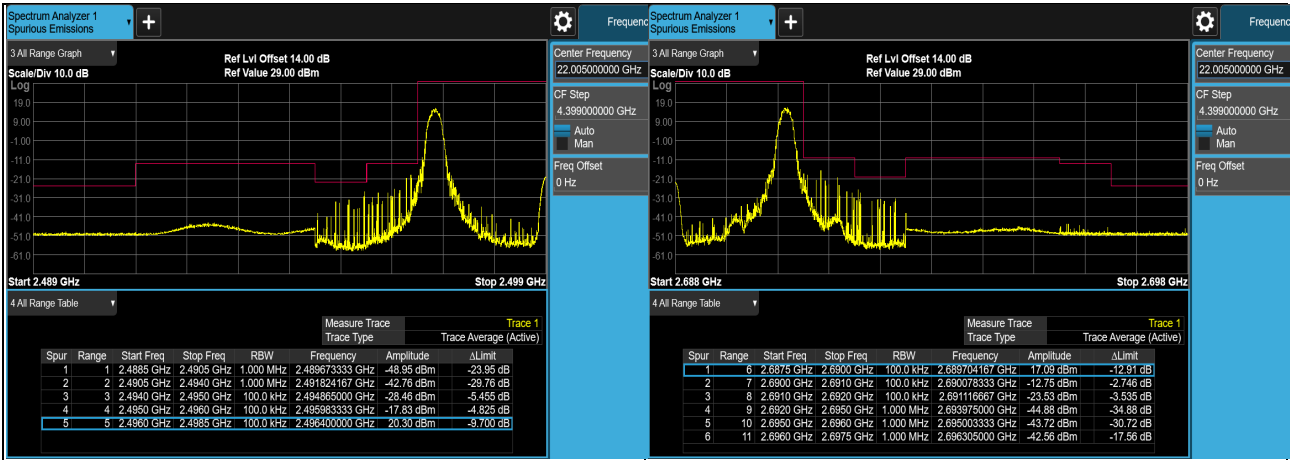
FULL (2580MHz)

FULL (2610MHz)



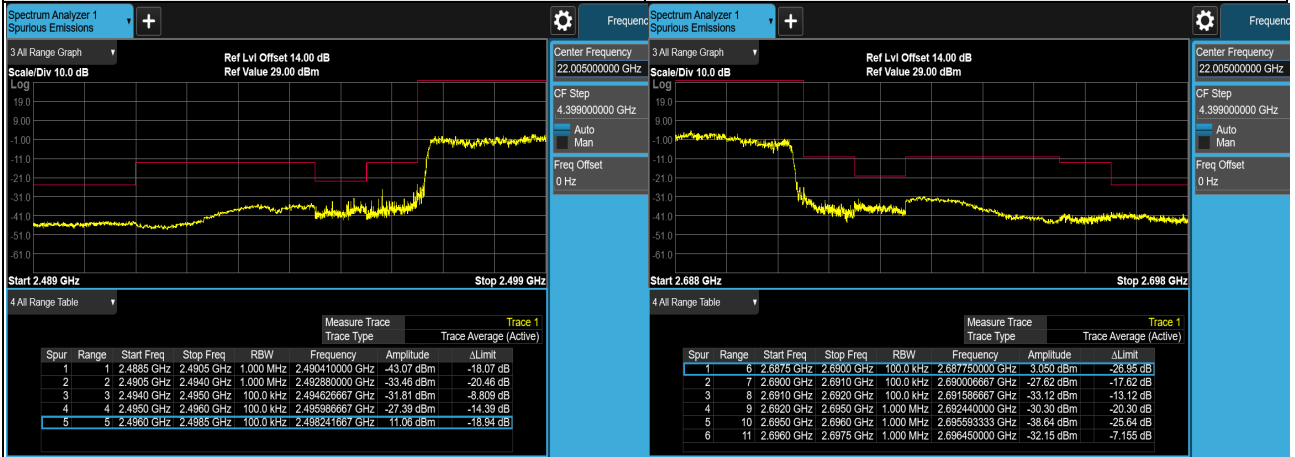
BUREAU VERITAS

### LTE Band 41 (Channel Bandwidth 5MHz)



1RB (2498.5MHz)

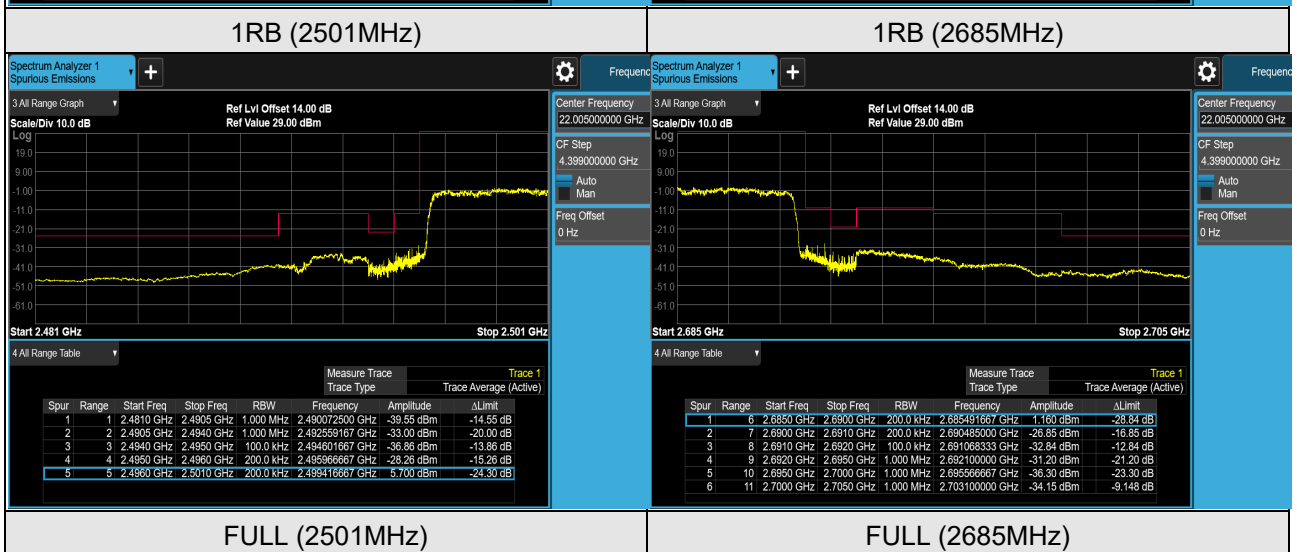
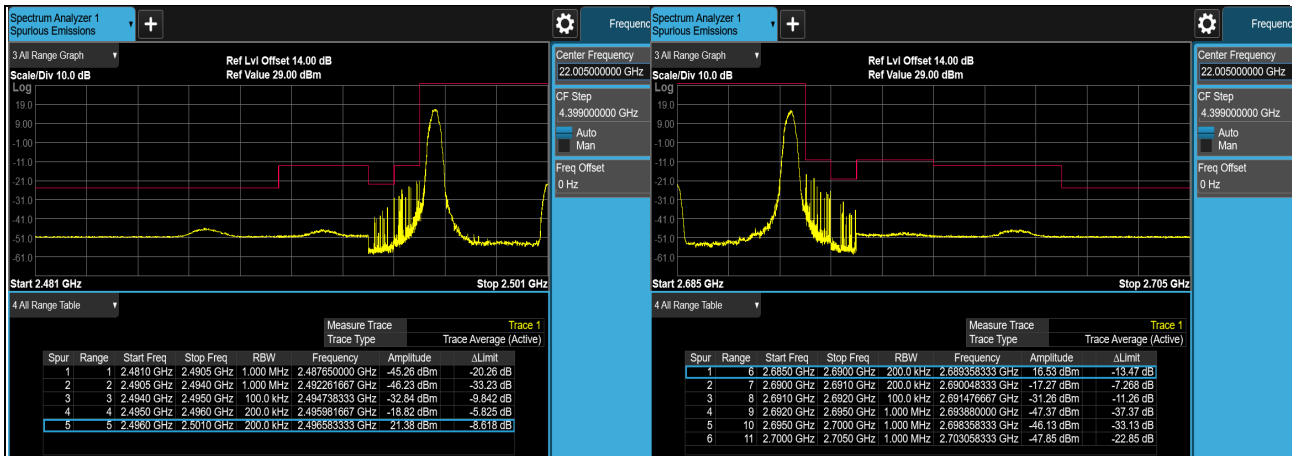
1RB (2687.5MHz)



FULL (2498.5MHz)

FULL (2687.5MHz)

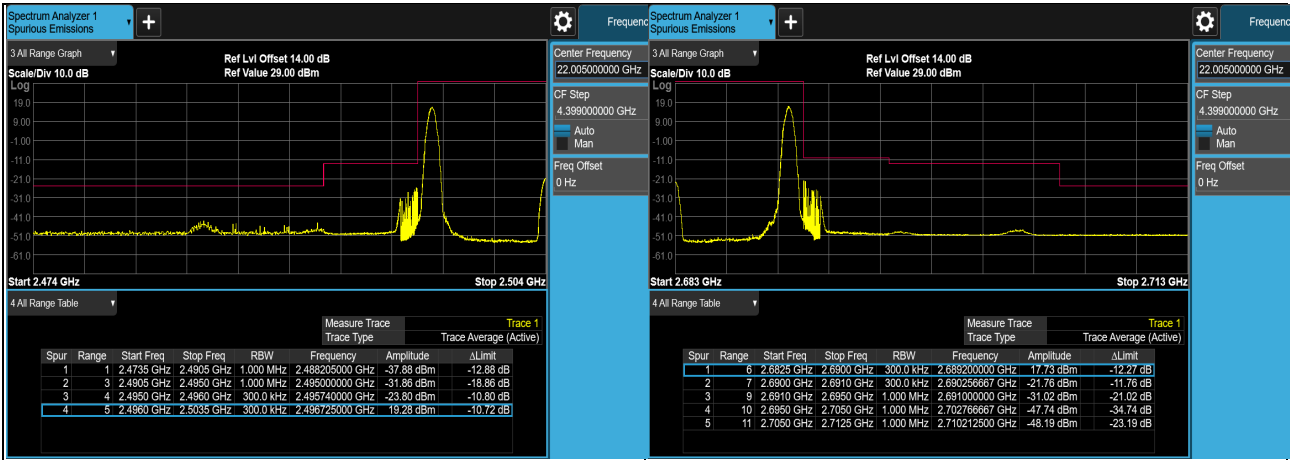
## LTE Band 41 (Channel Bandwidth 10MHz)





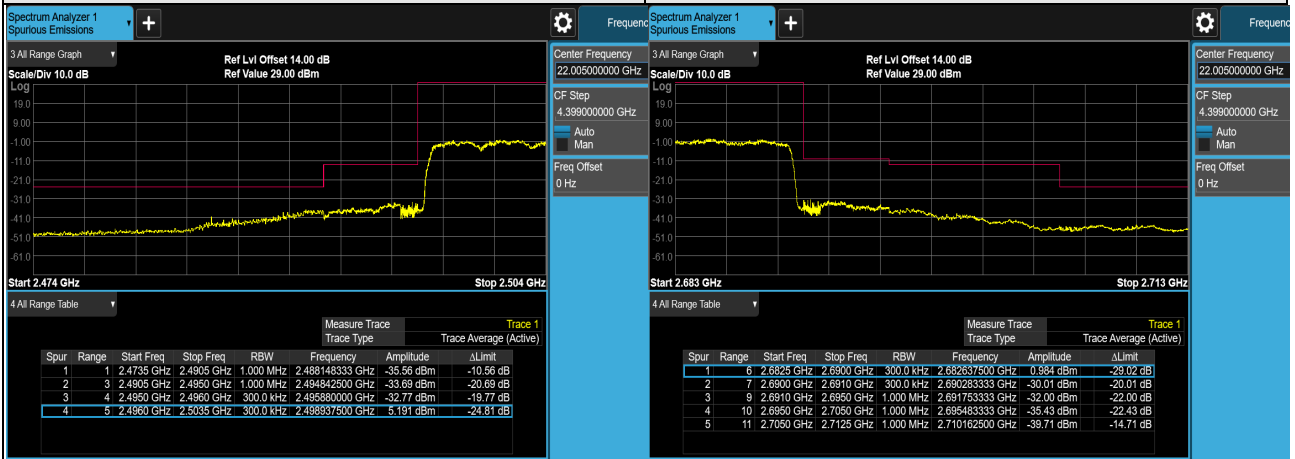
BUREAU VERITAS

### LTE Band 41 (Channel Bandwidth 15MHz)



1RB (2503.5MHz)

1RB (2682.5MHz)



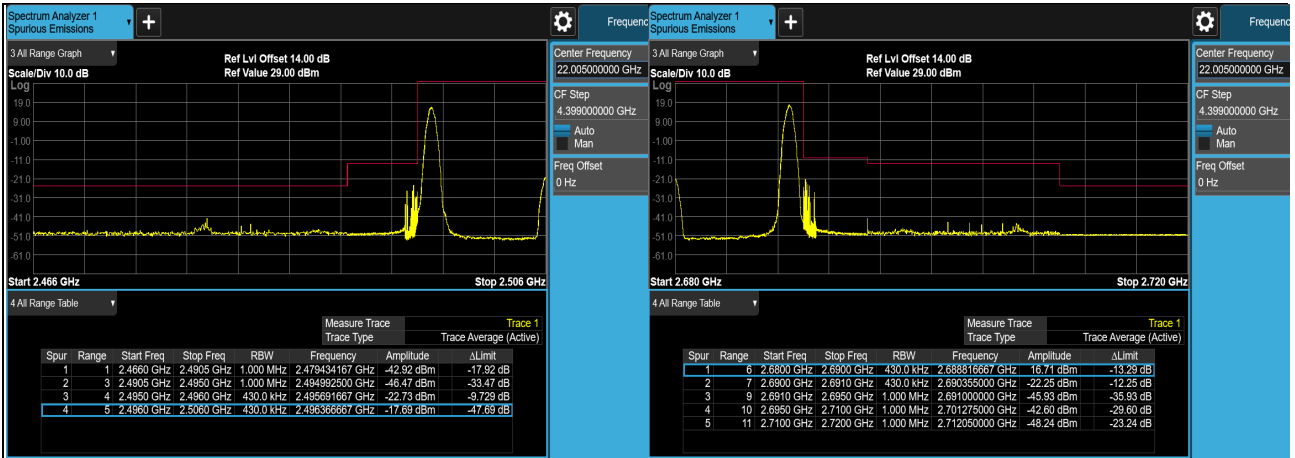
FULL (2503.5MHz)

FULL (2682.5MHz)



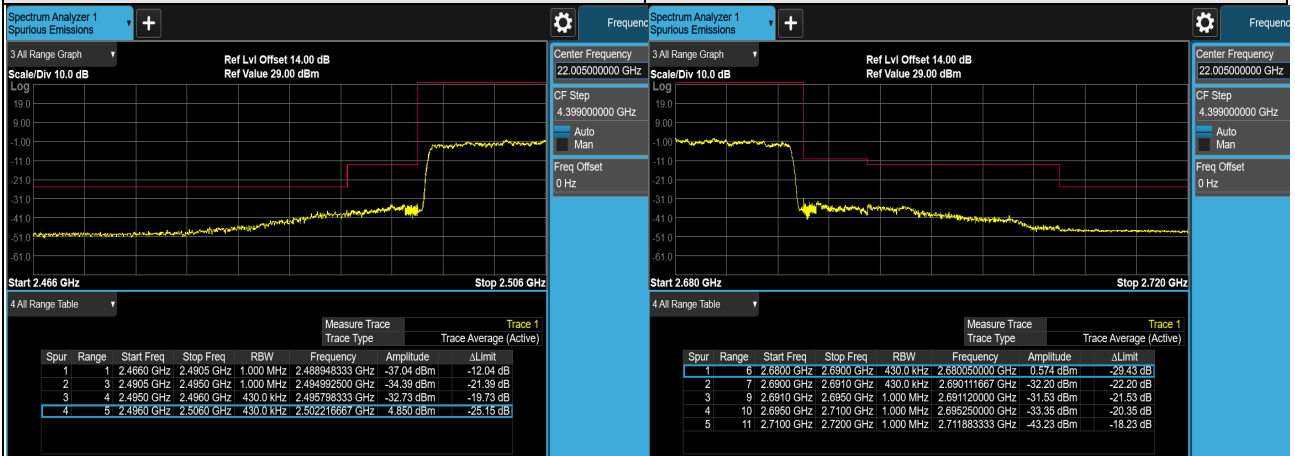
BUREAU VERITAS

### LTE Band 41 (Channel Bandwidth 20MHz)



1RB (2506MHz)

1RB (2680MHz)



FULL (2506MHz)

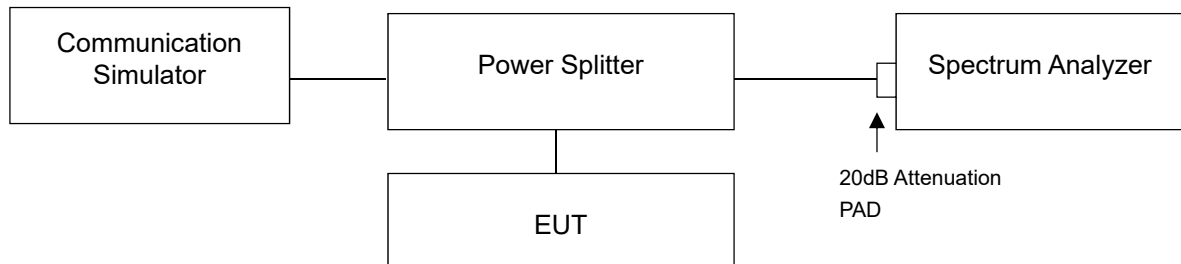
FULL (2680MHz)

## 4.6 Peak to Average Ratio

### 4.6.1 Limits of Peak to Average Ratio Measurement

In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB

### 4.6.2 Test Setup



### 4.6.3 Test Procedures

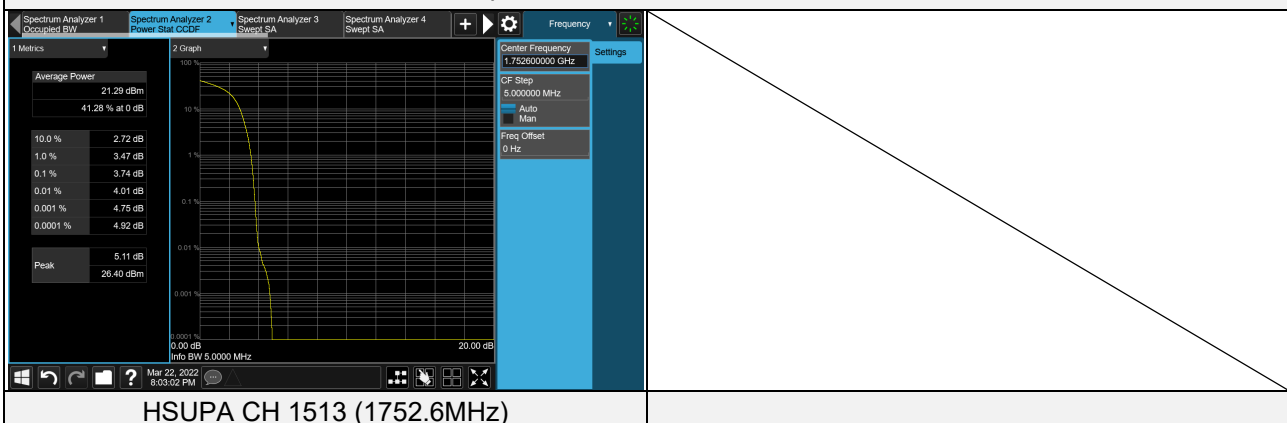
- Set resolution/measurement bandwidth  $\geq$  signal's occupied bandwidth;
- Set the number of counts to a value that stabilizes the measured CCDF curve;
- Record the maximum PAPR level associated with a probability of 0.1%.

#### 4.6.4 Test Results

##### WCDMA Band 4

Test Condition	Channel	Frequency (MHz)	Measure. Value (dB)	Limit (dB)	Result
WCDMA	1312	1712.4	3.17	13	Pass
WCDMA	1413	1732.6	3.10	13	Pass
WCDMA	1513	1752.6	3.16	13	Pass
HSDPA	1312	1712.4	3.73	13	Pass
HSDPA	1413	1732.6	3.69	13	Pass
HSDPA	1513	1752.6	3.72	13	Pass
HSUPA	1312	1712.4	3.74	13	Pass
HSUPA	1413	1732.6	3.65	13	Pass
HSUPA	1513	1752.6	3.74	13	Pass

Spectrum Plot of Worst Value

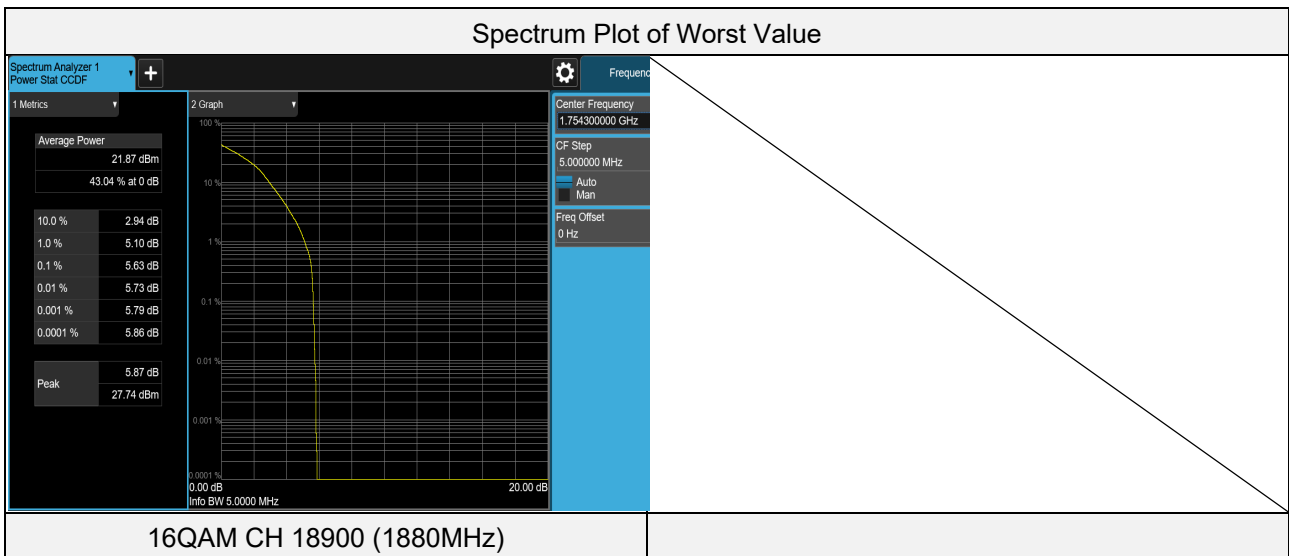




LTE Band 4 (Channel Bandwidth 1.4MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit (dB)	Result
QPSK	19957	1710.7	4.38	13	Pass
QPSK	20175	1732.5	4.59	13	Pass
QPSK	20393	1754.3	4.61	13	Pass
16QAM	19957	1710.7	5.27	13	Pass
16QAM	20175	1732.5	5.50	13	Pass
16QAM	20393	1754.3	5.63	13	Pass

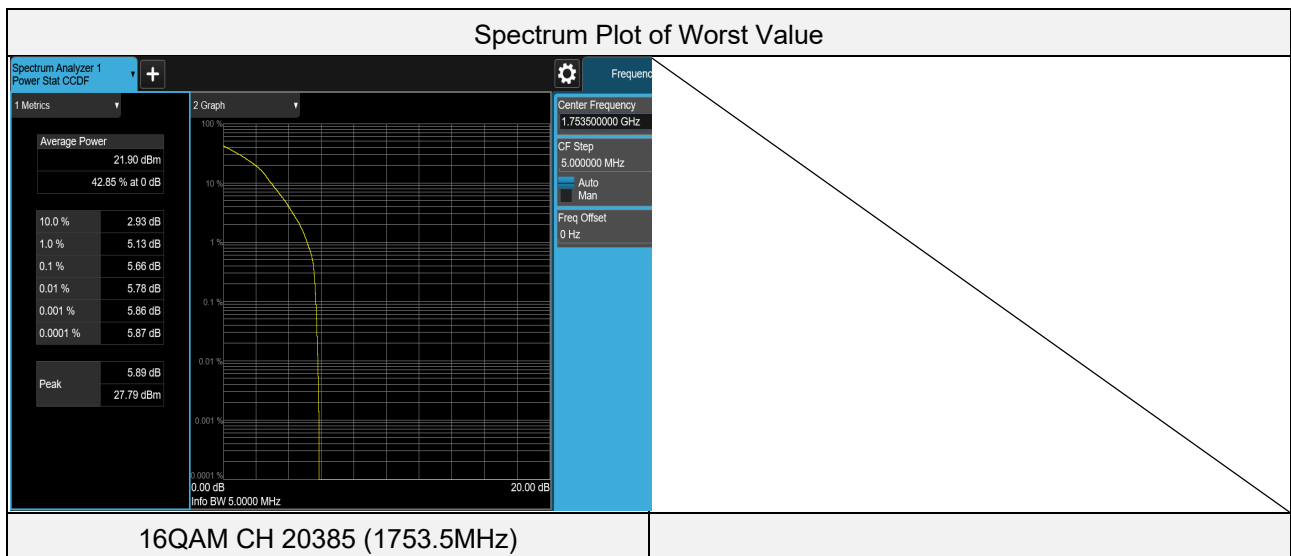
Spectrum Plot of Worst Value



LTE Band 4 (Channel Bandwidth 3MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit (dB)	Result
QPSK	19965	1711.5	4.42	13	Pass
QPSK	20175	1732.5	4.62	13	Pass
QPSK	20385	1753.5	4.69	13	Pass
16QAM	19965	1711.5	5.32	13	Pass
16QAM	20175	1732.5	5.63	13	Pass
16QAM	20385	1753.5	5.66	13	Pass

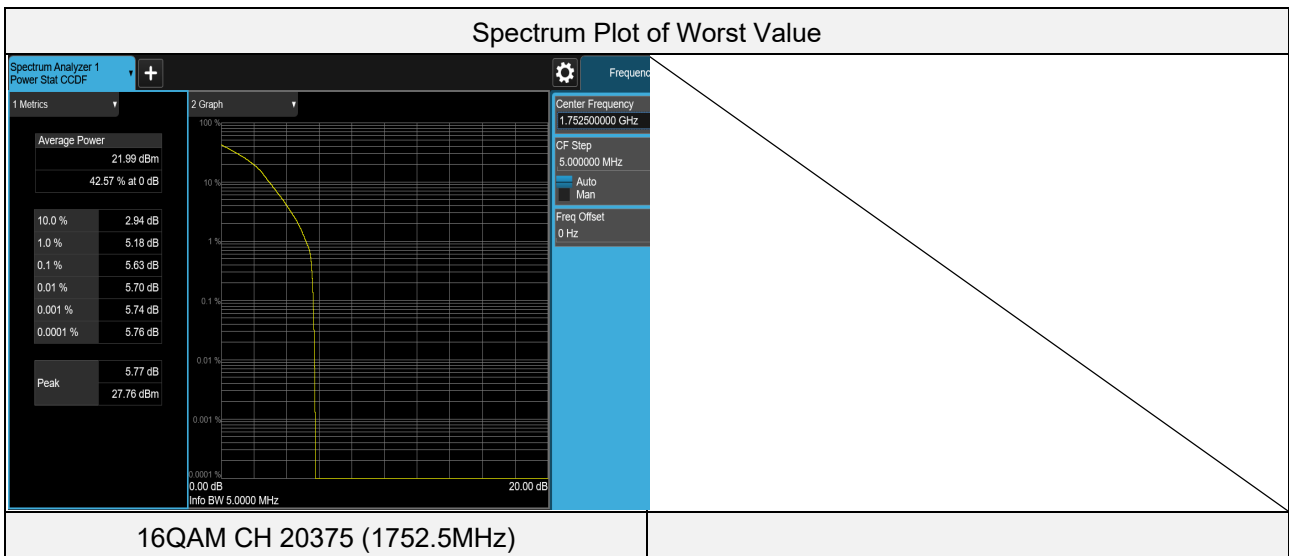
Spectrum Plot of Worst Value



LTE Band 4 (Channel Bandwidth 5MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit (dB)	Result
QPSK	19975	1712.5	4.42	13	Pass
QPSK	20175	1732.5	4.62	13	Pass
QPSK	20375	1752.5	4.66	13	Pass
16QAM	19975	1712.5	5.32	13	Pass
16QAM	20175	1732.5	5.52	13	Pass
16QAM	20375	1752.5	5.63	13	Pass

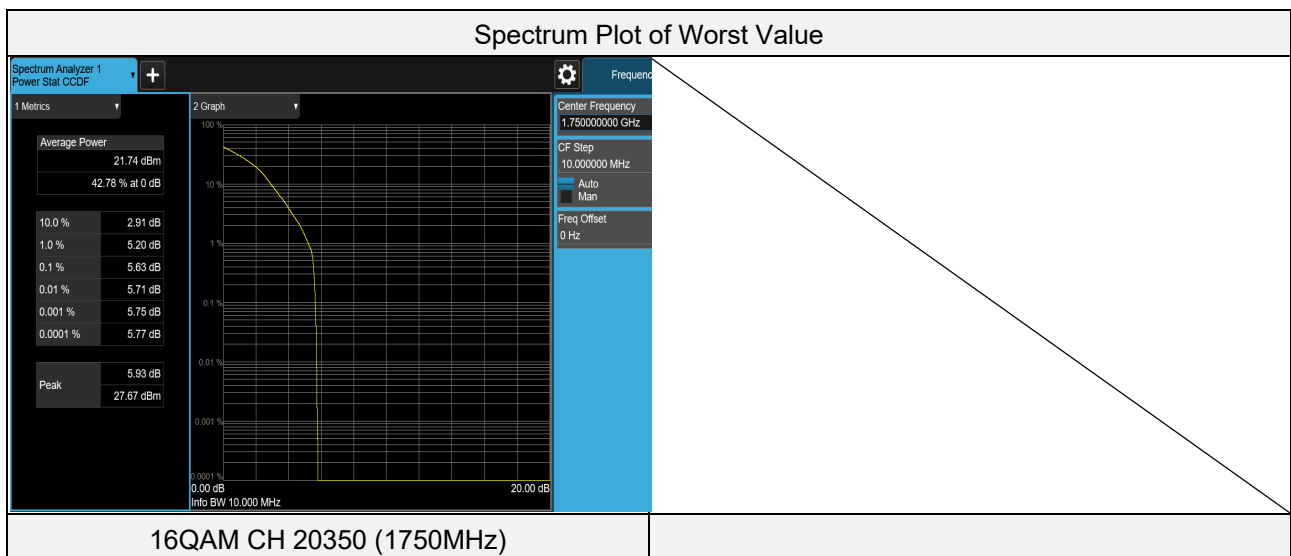
Spectrum Plot of Worst Value



LTE Band 4 (Channel Bandwidth 10MHz)

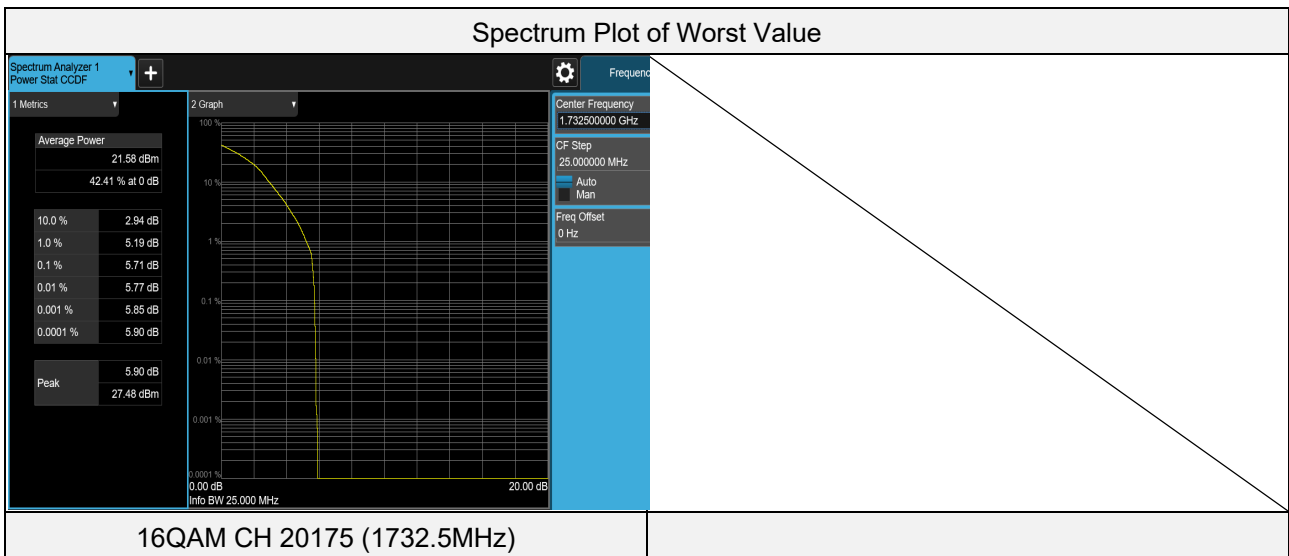
Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit (dB)	Result
QPSK	20000	1715	4.66	13	Pass
QPSK	20175	1732.5	4.74	13	Pass
QPSK	20350	1750	4.71	13	Pass
16QAM	20000	1715	5.59	13	Pass
16QAM	20175	1732.5	5.62	13	Pass
16QAM	20350	1750	5.63	13	Pass

Spectrum Plot of Worst Value



LTE Band 4 (Channel Bandwidth 15MHz)

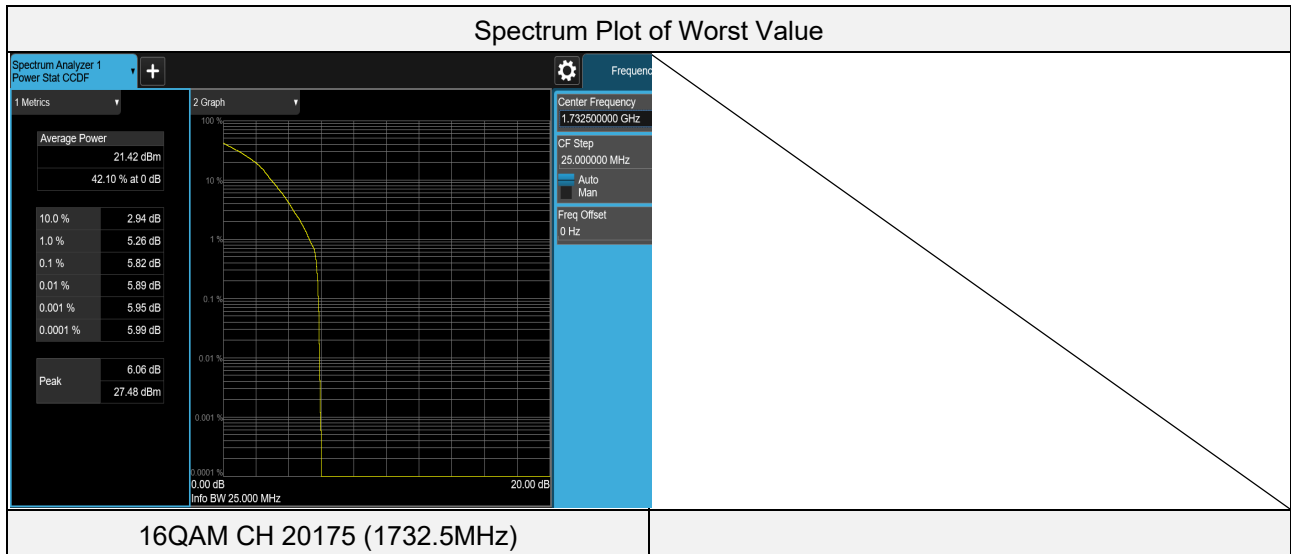
Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit (dB)	Result
QPSK	20025	1717.5	4.67	13	Pass
QPSK	20175	1732.5	4.79	13	Pass
QPSK	20325	1747.5	4.60	13	Pass
16QAM	20025	1717.5	5.59	13	Pass
16QAM	20175	1732.5	5.71	13	Pass
16QAM	20325	1747.5	5.50	13	Pass



LTE Band 4 (Channel Bandwidth 20MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit (dB)	Result
QPSK	20050	1720	4.63	13	Pass
QPSK	20175	1732.5	4.87	13	Pass
QPSK	20300	1745	4.56	13	Pass
16QAM	20050	1720	5.53	13	Pass
16QAM	20175	1732.5	5.82	13	Pass
16QAM	20300	1745	5.63	13	Pass

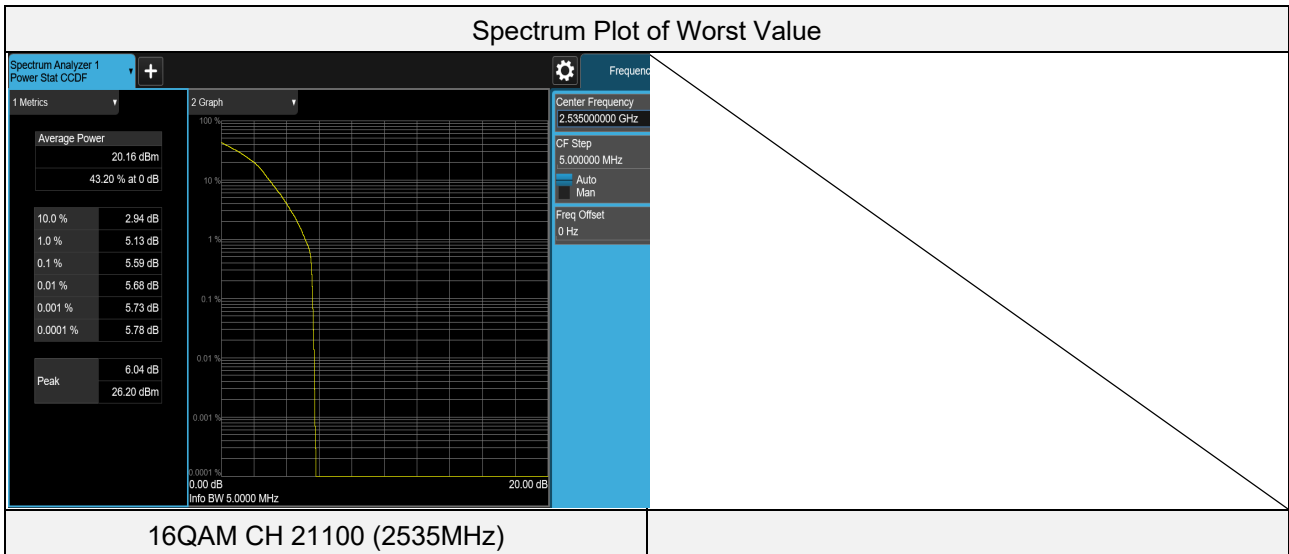
Spectrum Plot of Worst Value



LTE Band 7 (Channel Bandwidth 5MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit (dB)	Result
QPSK	20775	2502.5	4.63	13	Pass
QPSK	21100	2535	4.61	13	Pass
QPSK	21425	2567.5	4.33	13	Pass
16QAM	20775	2502.5	5.56	13	Pass
16QAM	21100	2535	5.59	13	Pass
16QAM	21425	2567.5	5.38	13	Pass

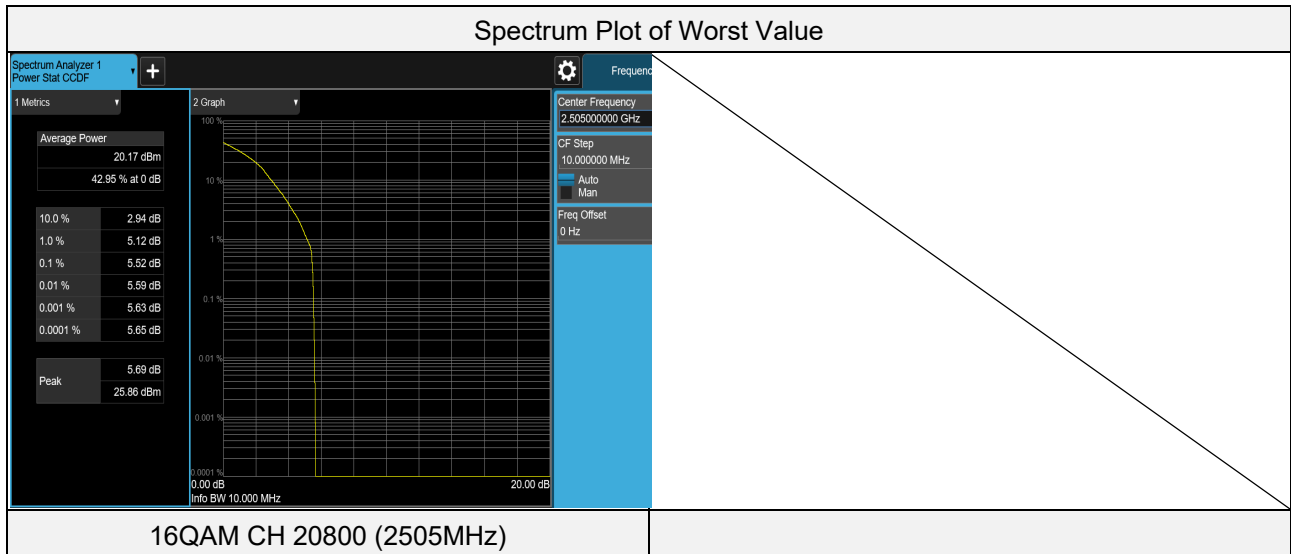
Spectrum Plot of Worst Value



LTE Band 7 (Channel Bandwidth 10MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit (dB)	Result
QPSK	20800	2505	4.59	13	Pass
QPSK	21100	2535	4.52	13	Pass
QPSK	21400	2565	4.37	13	Pass
16QAM	20800	2505	5.52	13	Pass
16QAM	21100	2535	5.49	13	Pass
16QAM	21400	2565	5.32	13	Pass

Spectrum Plot of Worst Value

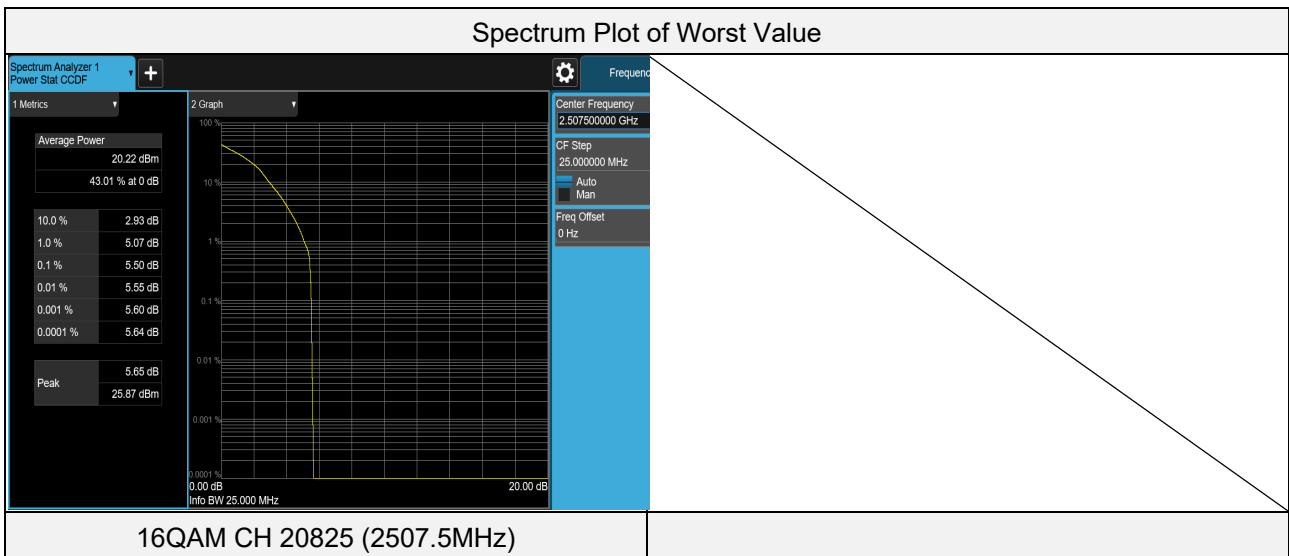




LTE Band 7 (Channel Bandwidth 15MHz)

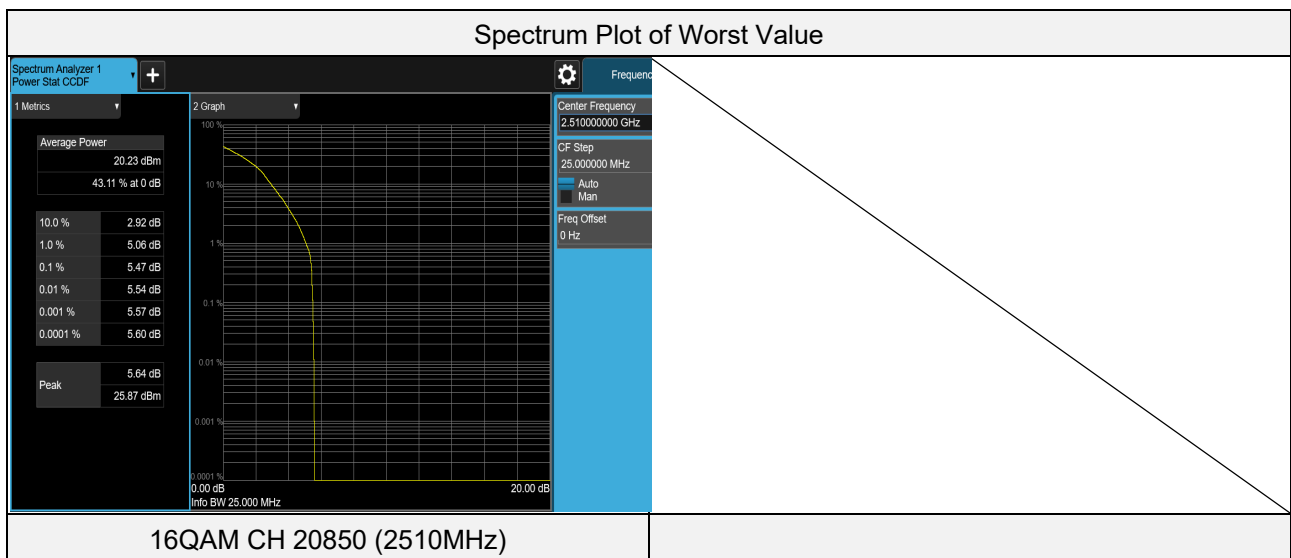
Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit (dB)	Result
QPSK	20825	2507.5	4.48	13	Pass
QPSK	21100	2535	4.46	13	Pass
QPSK	21375	2562.5	4.30	13	Pass
16QAM	20825	2507.5	5.50	13	Pass
16QAM	21100	2535	5.42	13	Pass
16QAM	21375	2562.5	5.30	13	Pass

Spectrum Plot of Worst Value



LTE Band 7 (Channel Bandwidth 20MHz)

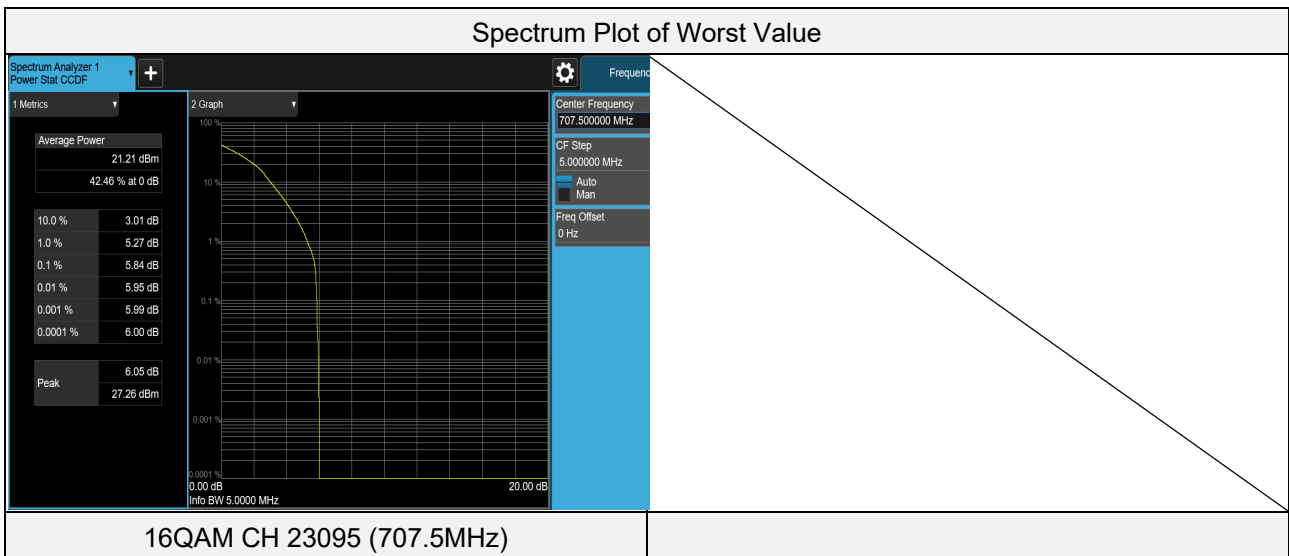
Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit (dB)	Result
QPSK	20850	2510	4.52	13	Pass
QPSK	21100	2535	4.41	13	Pass
QPSK	21350	2560	4.35	13	Pass
16QAM	20850	2510	5.47	13	Pass
16QAM	21100	2535	5.36	13	Pass
16QAM	21350	2560	5.23	13	Pass



LTE Band 12 (Channel Bandwidth 1.4MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit (dB)	Result
QPSK	23017	699.7	4.79	13	Pass
QPSK	23095	707.5	4.86	13	Pass
QPSK	23173	715.3	4.62	13	Pass
16QAM	23017	699.7	5.71	13	Pass
16QAM	23095	707.5	5.84	13	Pass
16QAM	23173	715.3	5.63	13	Pass

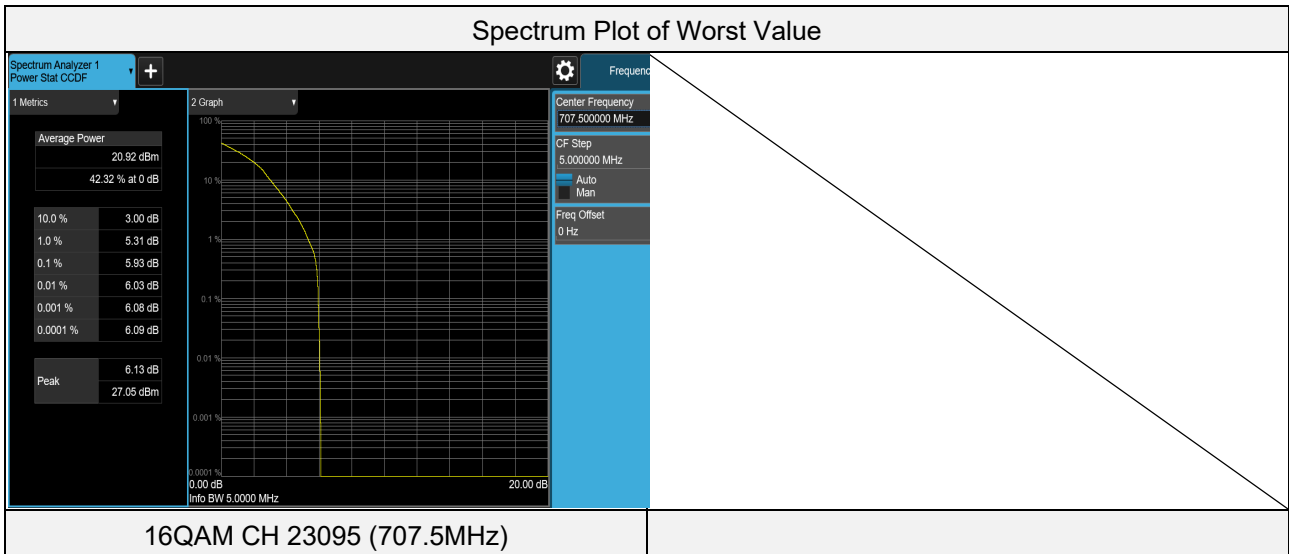
Spectrum Plot of Worst Value



LTE Band 12 (Channel Bandwidth 3MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit (dB)	Result
QPSK	23025	700.5	4.88	13	Pass
QPSK	23095	707.5	4.93	13	Pass
QPSK	23165	714.5	4.80	13	Pass
16QAM	23025	700.5	5.83	13	Pass
16QAM	23095	707.5	5.93	13	Pass
16QAM	23165	714.5	5.77	13	Pass

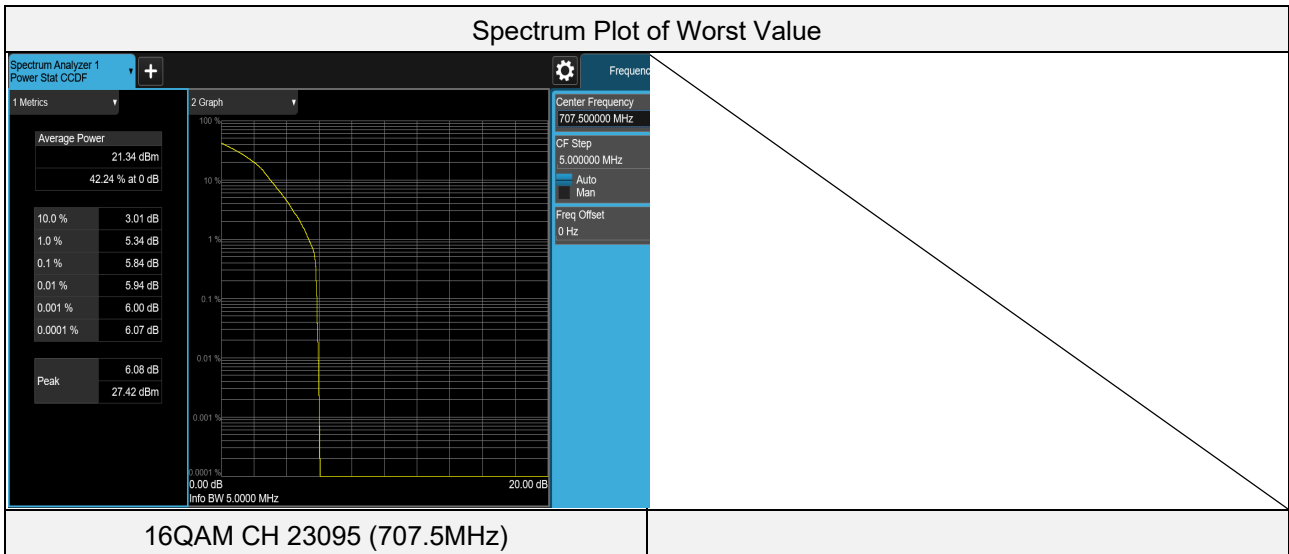
Spectrum Plot of Worst Value



LTE Band 12 (Channel Bandwidth 5MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit (dB)	Result
QPSK	23035	701.5	4.78	13	Pass
QPSK	23095	707.5	4.83	13	Pass
QPSK	23155	713.5	4.74	13	Pass
16QAM	23035	701.5	5.74	13	Pass
16QAM	23095	707.5	5.84	13	Pass
16QAM	23155	713.5	5.68	13	Pass

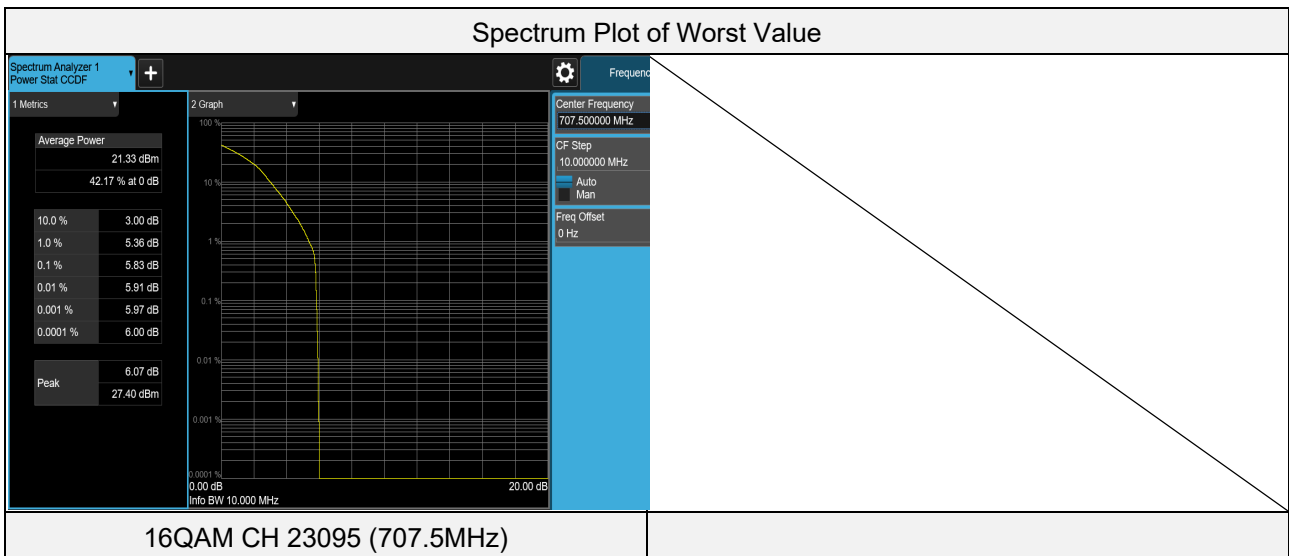
Spectrum Plot of Worst Value



LTE Band 12 (Channel Bandwidth 10MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit (dB)	Result
QPSK	23060	704	4.78	13	Pass
QPSK	23095	707.5	4.87	13	Pass
QPSK	23130	711	4.84	13	Pass
16QAM	23060	704	5.78	13	Pass
16QAM	23095	707.5	5.83	13	Pass
16QAM	23130	711	5.79	13	Pass

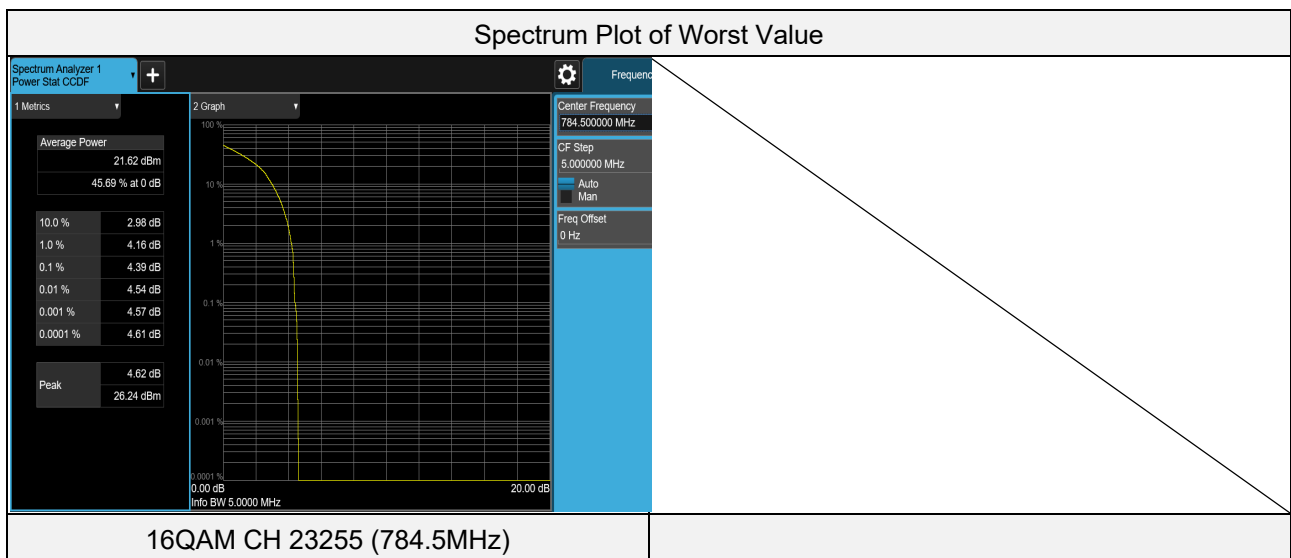
Spectrum Plot of Worst Value



LTE Band 13 (Channel Bandwidth 5MHz)

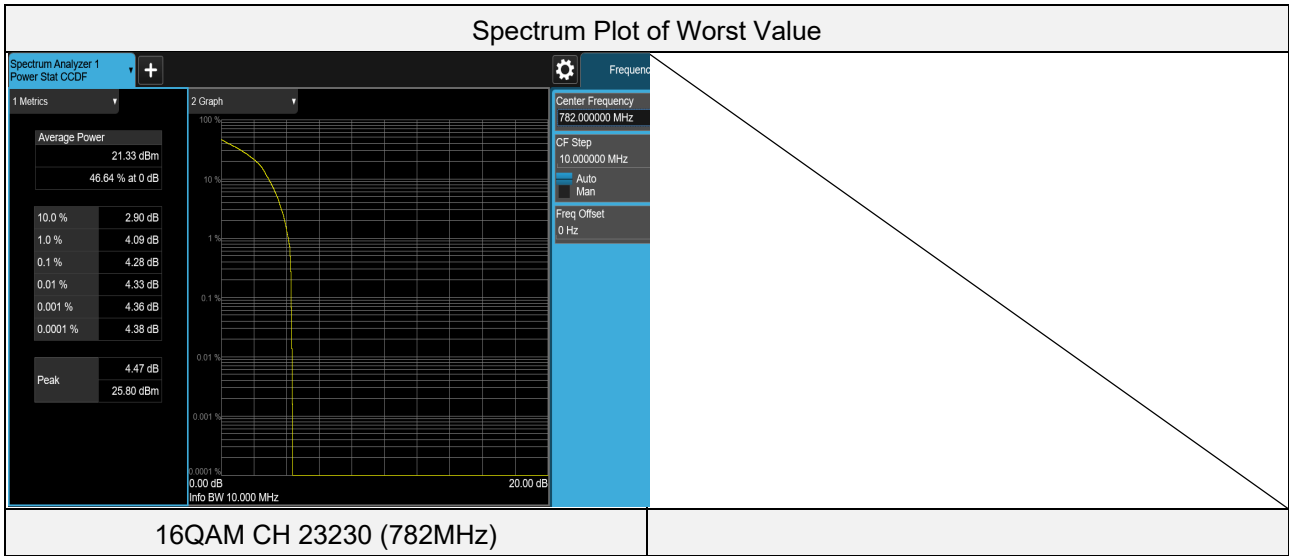
Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit (dB)	Result
QPSK	23205	779.5	3.06	13	Pass
QPSK	23230	782	3.01	13	Pass
QPSK	23255	784.5	3.29	13	Pass
16QAM	23205	779.5	4.13	13	Pass
16QAM	23230	782	3.92	13	Pass
16QAM	23255	784.5	4.39	13	Pass

Spectrum Plot of Worst Value



LTE Band 13 (Channel Bandwidth 10MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit (dB)	Result
QPSK	23230	782	2.84	13	Pass
16QAM	23230	782	4.28	13	Pass

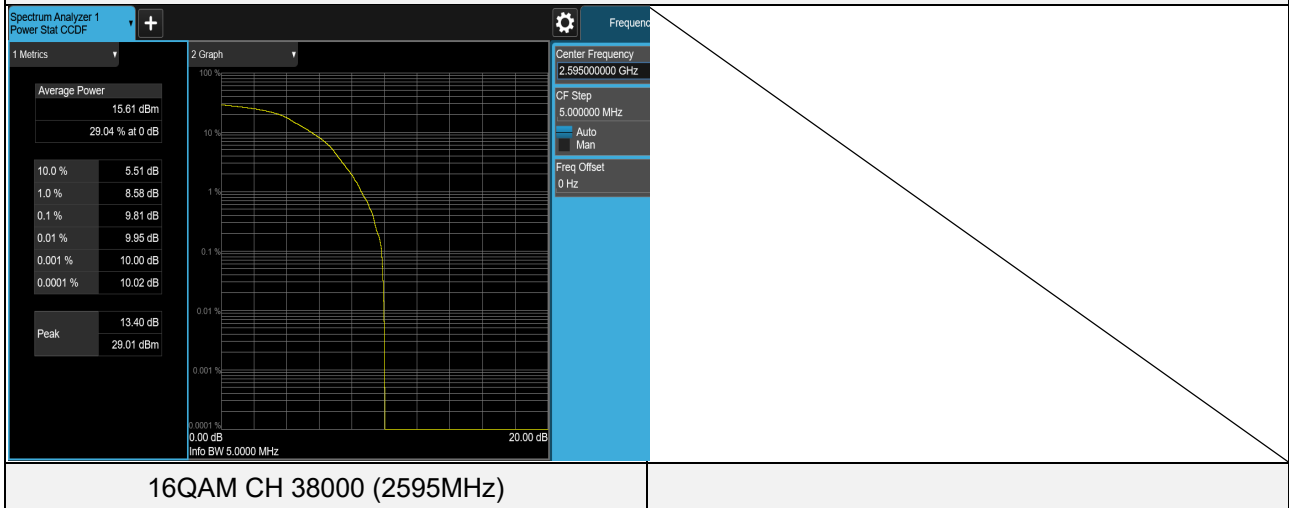




LTE Band 38 (Channel Bandwidth 5MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit (dB)	Result
QPSK	37775	2572.5	8.47	13	Pass
QPSK	38000	2595	8.52	13	Pass
QPSK	38225	2617.5	8.49	13	Pass
16QAM	37775	2572.5	9.45	13	Pass
16QAM	38000	2595	9.81	13	Pass
16QAM	38225	2617.5	9.37	13	Pass

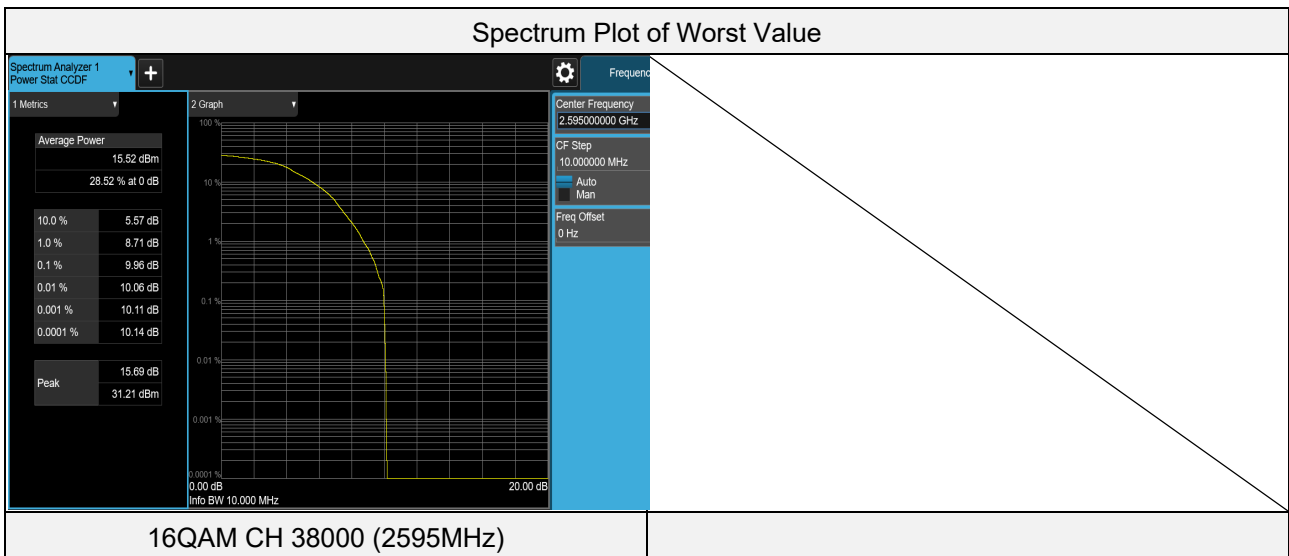
Spectrum Plot of Worst Value



LTE Band 38 (Channel Bandwidth 10MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit (dB)	Result
QPSK	37800	2575	8.13	13	Pass
QPSK	38000	2595	8.46	13	Pass
QPSK	38200	2615	8.08	13	Pass
16QAM	37800	2575	9.73	13	Pass
16QAM	38000	2595	9.96	13	Pass
16QAM	38200	2615	9.95	13	Pass

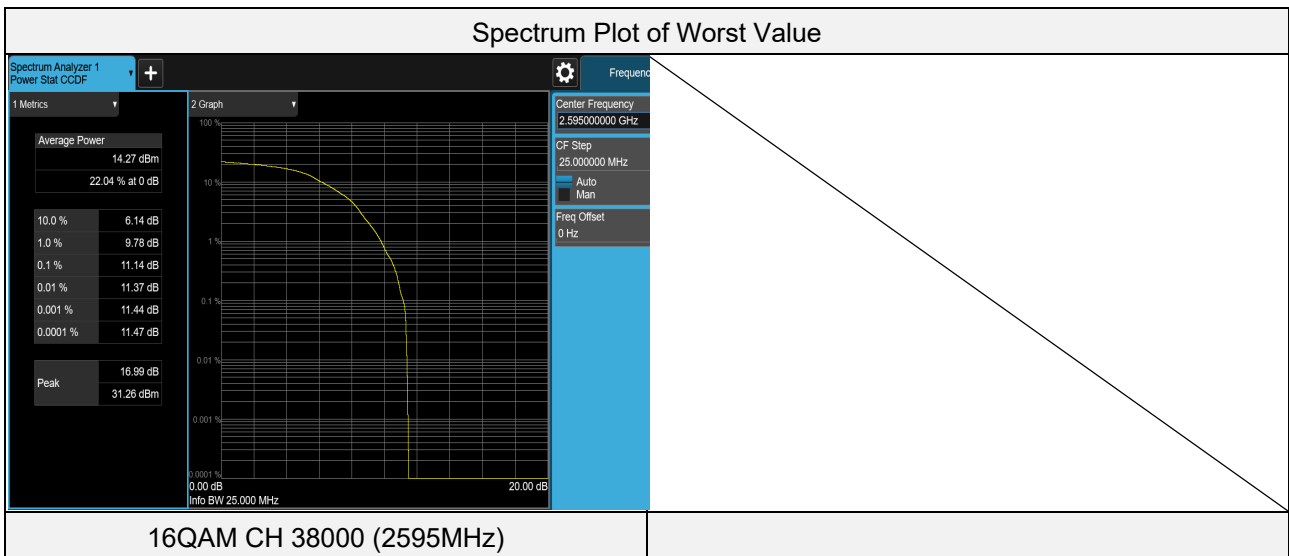
Spectrum Plot of Worst Value



LTE Band 38 (Channel Bandwidth 15MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit (dB)	Result
QPSK	37825	2577.5	7.32	13	Pass
QPSK	38000	2595	7.24	13	Pass
QPSK	38175	2612.5	8.92	13	Pass
16QAM	37825	2577.5	9.31	13	Pass
16QAM	38000	2595	11.14	13	Pass
16QAM	38175	2612.5	9.53	13	Pass

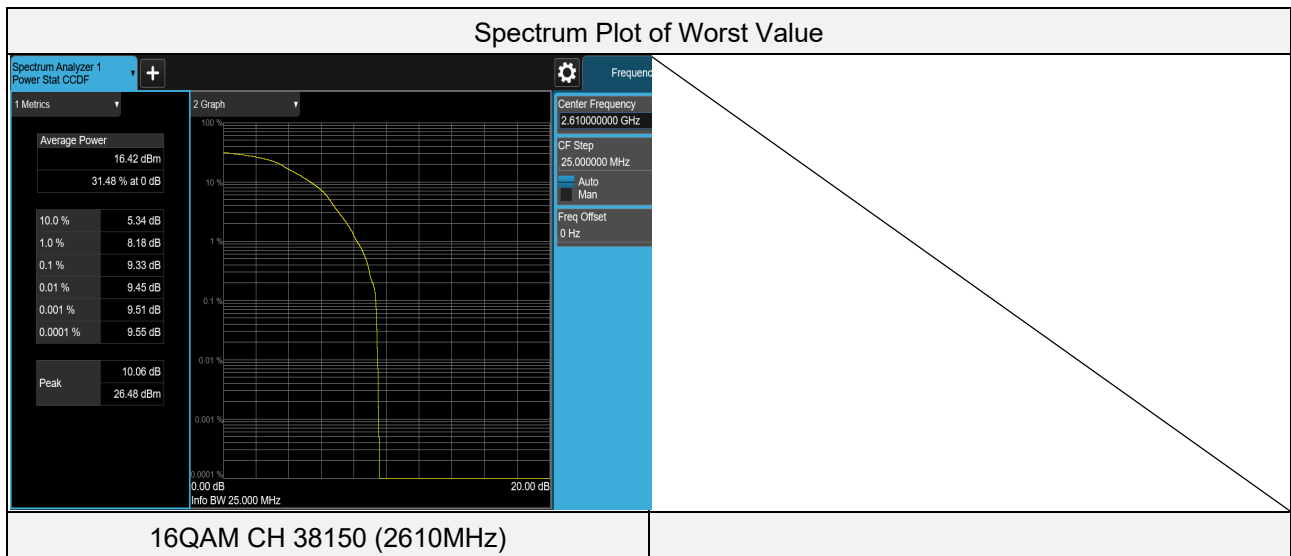
Spectrum Plot of Worst Value



LTE Band 38 (Channel Bandwidth 20MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit (dB)	Result
QPSK	37850	2580	8.97	13	Pass
QPSK	38000	2595	8.62	13	Pass
QPSK	38150	2610	9.02	13	Pass
16QAM	37850	2580	9.21	13	Pass
16QAM	38000	2595	9.09	13	Pass
16QAM	38150	2610	9.33	13	Pass

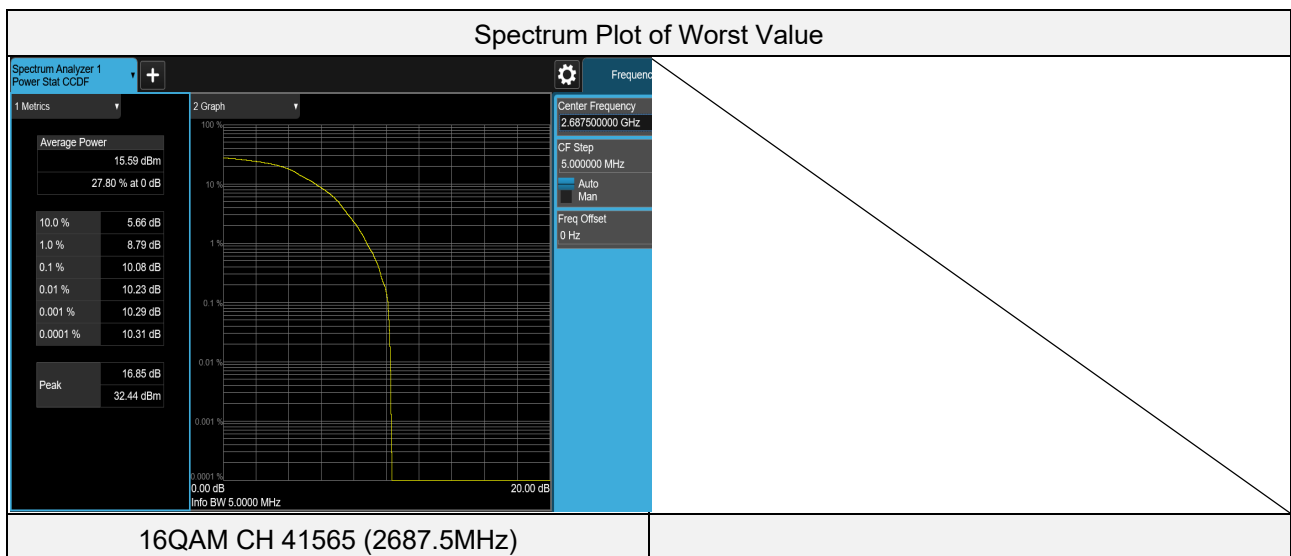
Spectrum Plot of Worst Value



LTE Band 41 (Channel Bandwidth 5MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit (dB)	Result
QPSK	39675	2498.5	8.48	13	Pass
QPSK	40620	2593	8.24	13	Pass
QPSK	41565	2687.5	8.46	13	Pass
16QAM	39675	2498.5	8.99	13	Pass
16QAM	40620	2593	9.55	13	Pass
16QAM	41565	2687.5	10.08	13	Pass

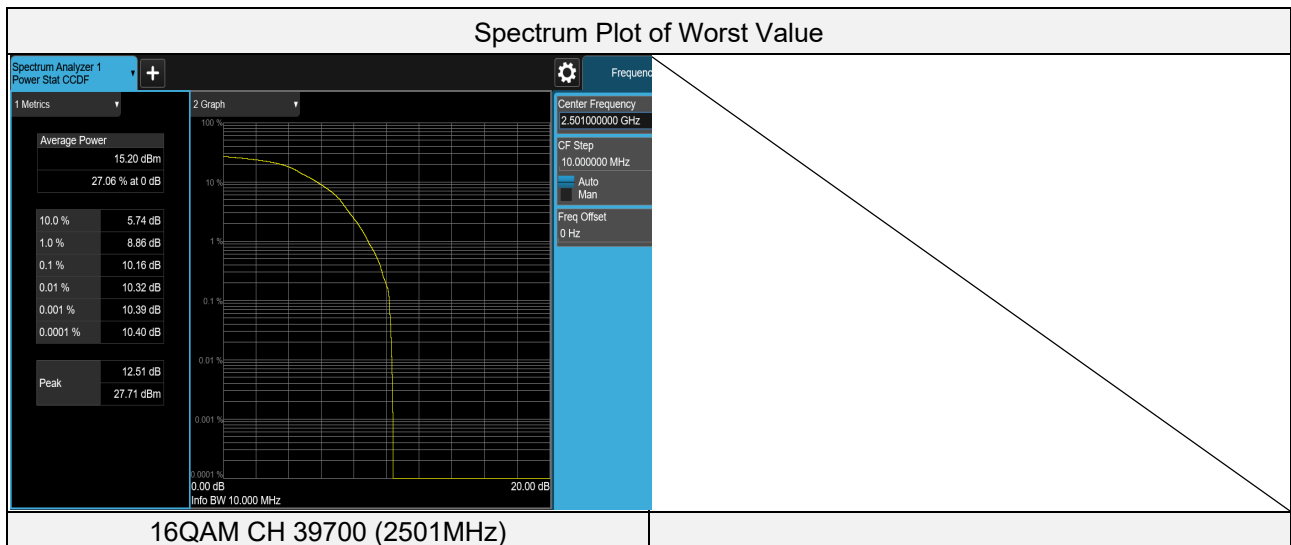
Spectrum Plot of Worst Value



LTE Band 41 (Channel Bandwidth 10MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit (dB)	Result
QPSK	39700	2501	8.19	13	Pass
QPSK	40620	2593	8.10	13	Pass
QPSK	41540	2685	7.98	13	Pass
16QAM	39700	2501	10.16	13	Pass
16QAM	40620	2593	9.81	13	Pass
16QAM	41540	2685	9.20	13	Pass

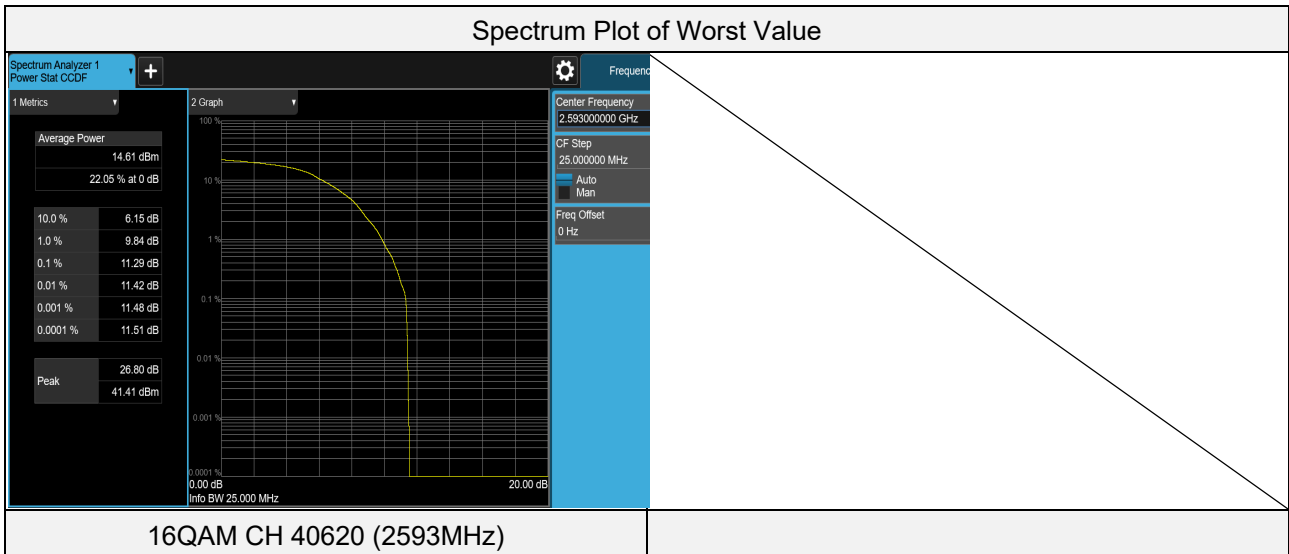
Spectrum Plot of Worst Value



LTE Band 41 (Channel Bandwidth 15MHz)

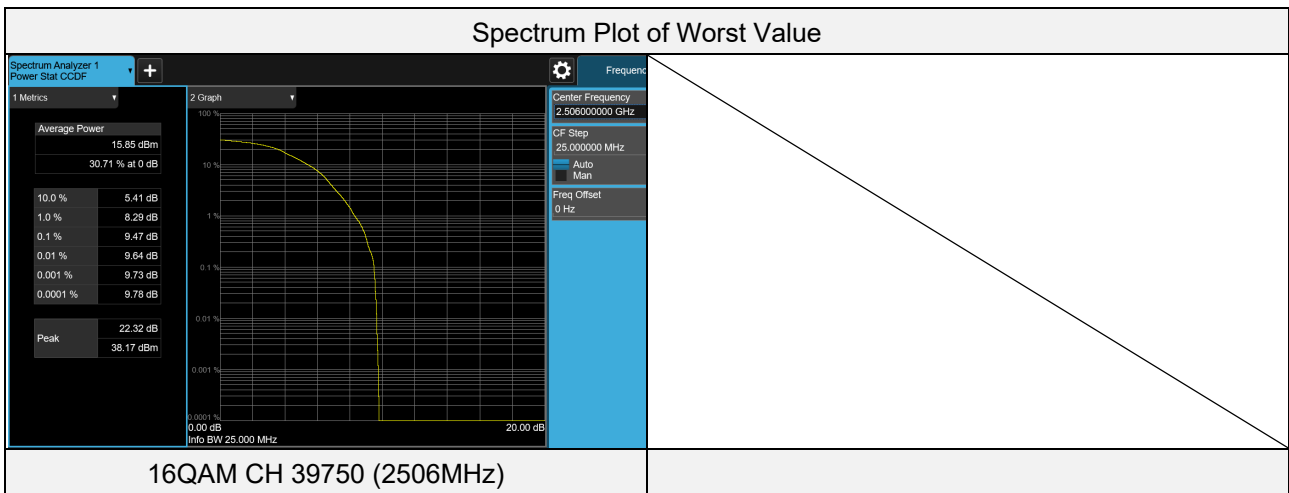
Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit (dB)	Result
QPSK	39725	2503.5	9.10	13	Pass
QPSK	40620	2593	7.22	13	Pass
QPSK	41515	2682.5	7.25	13	Pass
16QAM	39725	2503.5	9.53	13	Pass
16QAM	40620	2593	11.29	13	Pass
16QAM	41515	2682.5	11.21	13	Pass

Spectrum Plot of Worst Value



LTE Band 41 (Channel Bandwidth 20MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit (dB)	Result
QPSK	39750	2506	8.35	13	Pass
QPSK	40620	2593	7.26	13	Pass
QPSK	41490	2680	8.91	13	Pass
16QAM	39750	2506	9.47	13	Pass
16QAM	40620	2593	9.40	13	Pass
16QAM	41490	2680	8.13	13	Pass





## 4.7 Conducted Spurious Emissions

### 4.7.1 Limits of Conducted Spurious Emissions Measurement

For WCDMA Band 4, LTE Band 4:

In the FCC 27.53(h), On any frequency outside a licensee's frequency block, The power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB. The emission limit equal to  $-13\text{dBm}$ .

For LTE Band 7, LTE Band 38, LTE Band 41:

In the FCC 27.53(m)(4), On any frequency outside a licensee's frequency block, The power of any emission shall be attenuated below the transmitter power (P) by at least  $55 + 10 \log (P)$  dB. The emission limit equal to  $-25\text{dBm}$ .

For LTE Band 13:

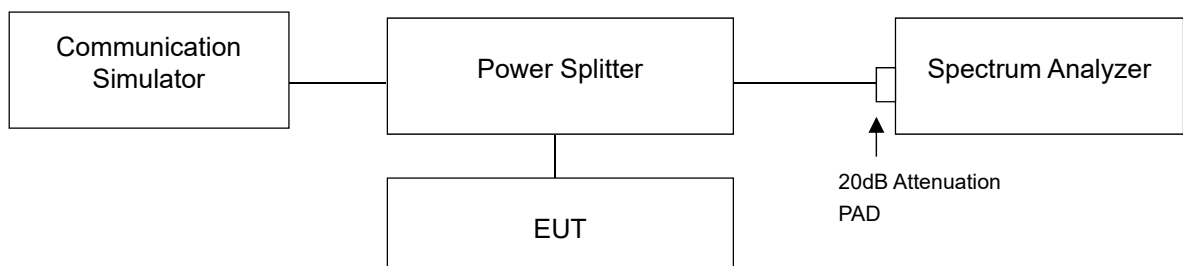
According to FCC 27.53(c)(2) for on any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB.

According to FCC 27.53(f) for operations in the 775-788 MHz, emissions in the band 1559-1610MHz shall be limited to  $-70$  dBW/MHz. The limit of emissions is equal to  $-40$  dBm

For LTE Band 12:

According to FCC 27.53(g) for operations in the 600 MHz band and 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. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater.

### 4.7.2 Test Setup

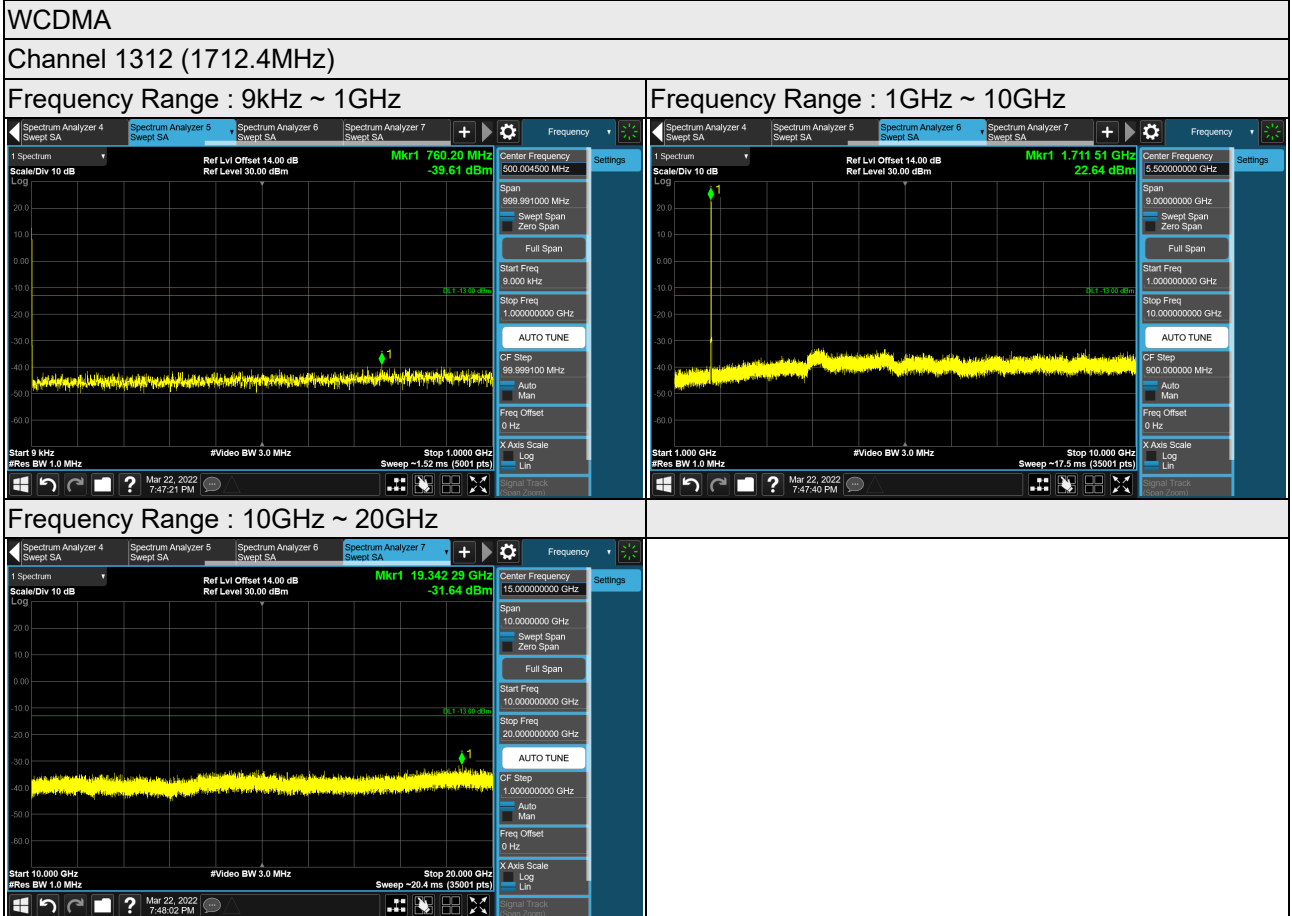


### 4.7.3 Test Procedure

- All measurements were done at low and high channels operational frequency range.
- Measuring frequency range is from 9kHz to 1GHz. 20dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz are for conducted emission measurement.
- Measuring frequency range is from 1GHz to 8GHz / 9GHz / 18GHz / 20GHz / 26GHz / 27GHz. 20dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz are used for conducted emission measurement.

## 4.7.4 Test Results

### WCDMA Band 4

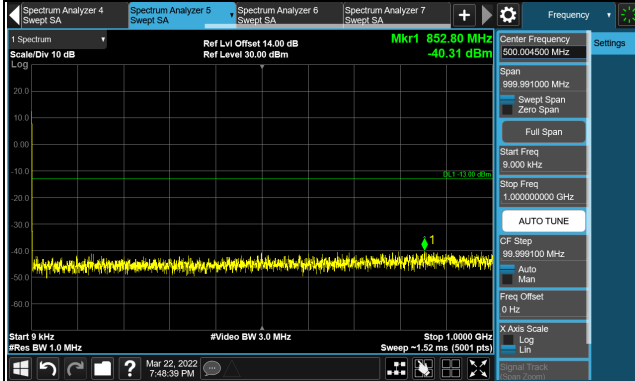


\*The 9kHz signal over the limit is from Spectrum.

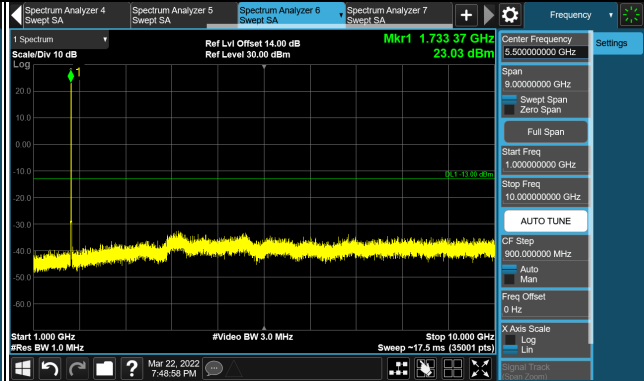
WCDMA

Channel 1413 (1732.6MHz)

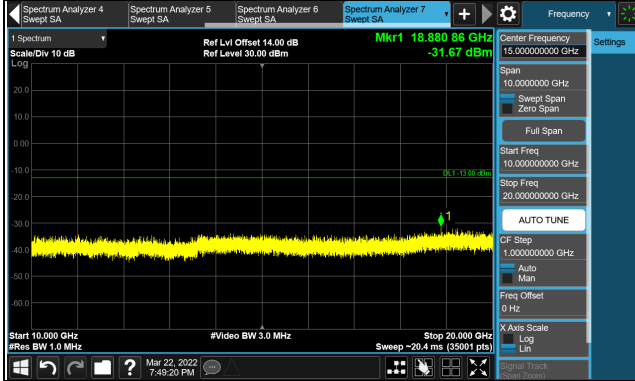
Frequency Range : 9kHz ~ 1GHz



Frequency Range : 1GHz ~ 10GHz



Frequency Range : 10GHz ~ 20GHz

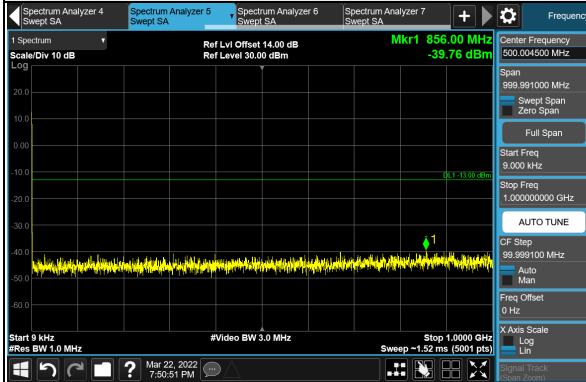


\*The 9kHz signal over the limit is from Spectrum.

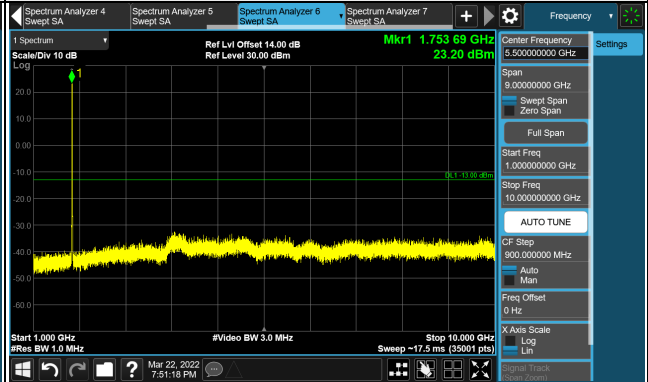
WCDMA

Channel 1513 (1752.6MHz)

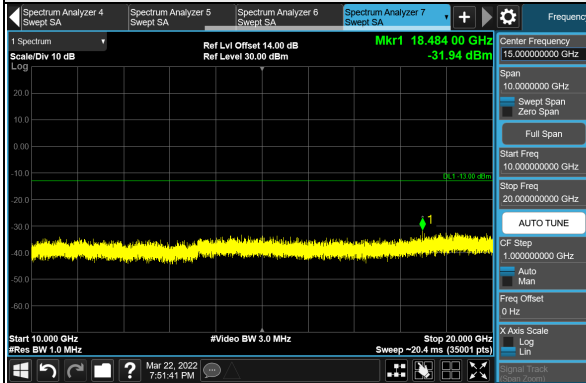
Frequency Range : 9kHz ~ 1GHz



Frequency Range : 1GHz ~ 10GHz



Frequency Range : 10GHz ~ 20GHz

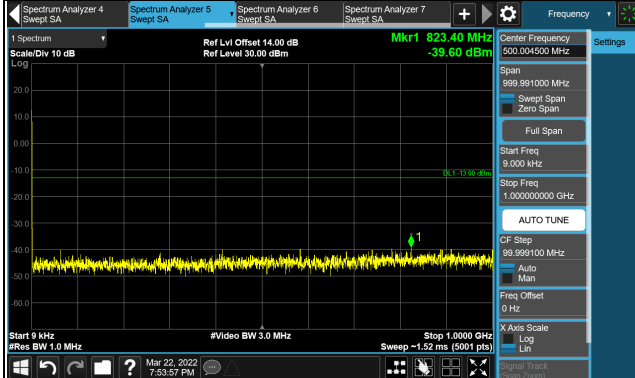


\*The 9kHz signal over the limit is from Spectrum.

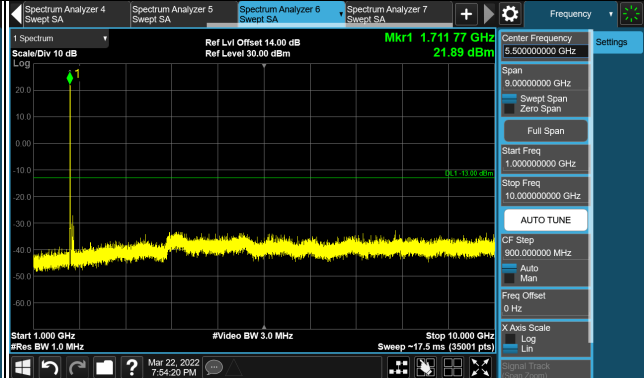
# HSDPA

## Channel 1312 (1712.4MHz)

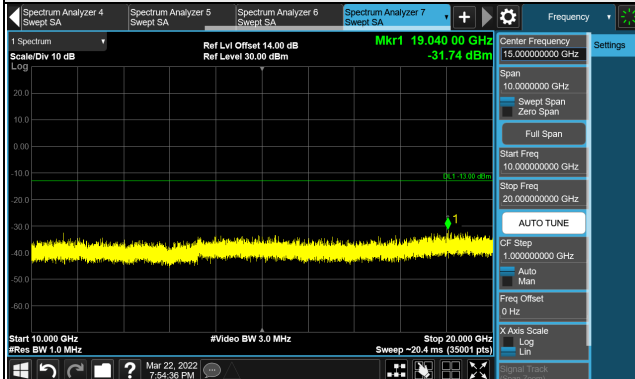
### Frequency Range : 9kHz ~ 1GHz



### Frequency Range : 1GHz ~ 10GHz



### Frequency Range : 10GHz ~ 20GHz

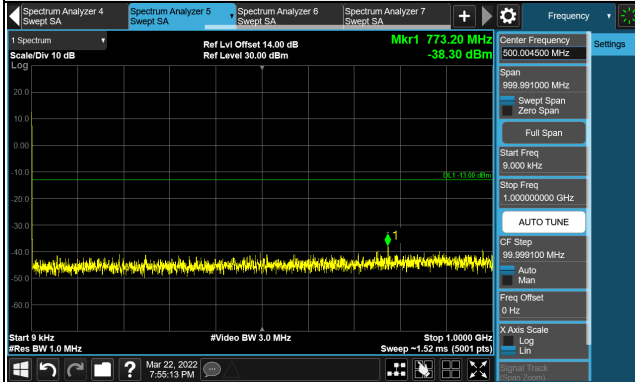


\*The 9kHz signal over the limit is from Spectrum.

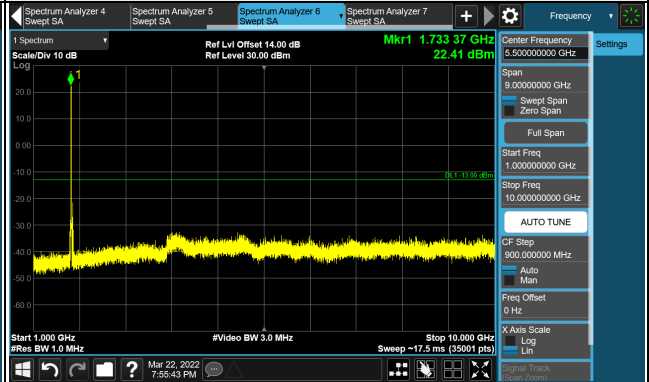
# HSDPA

## Channel 1413 (1732.6MHz)

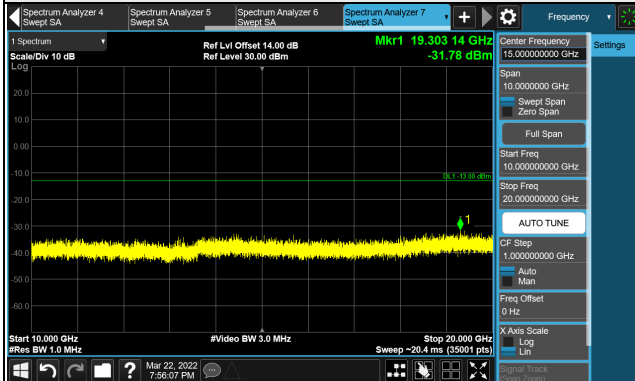
### Frequency Range : 9kHz ~ 1GHz



### Frequency Range : 1GHz ~ 10GHz



### Frequency Range : 10GHz ~ 20GHz

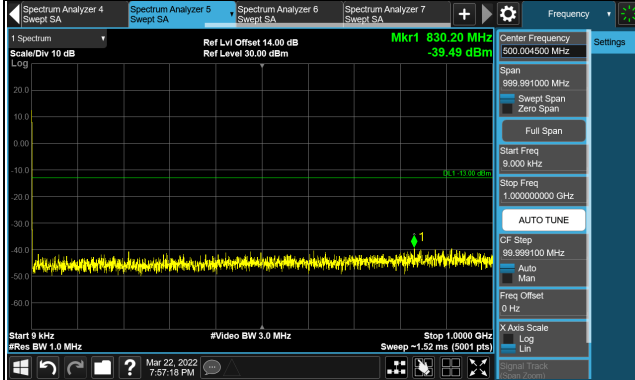


\*The 9kHz signal over the limit is from Spectrum.

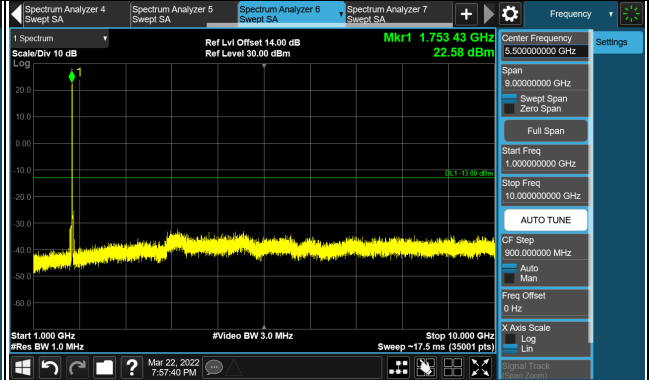
# HSDPA

## Channel 1513 (1752.6MHz)

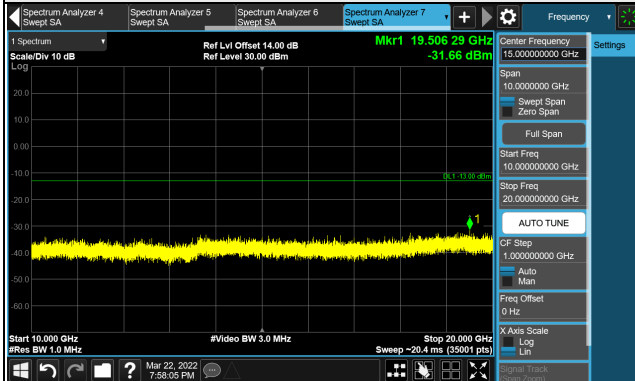
### Frequency Range : 9kHz ~ 1GHz



### Frequency Range : 1GHz ~ 10GHz



### Frequency Range : 10GHz ~ 20GHz

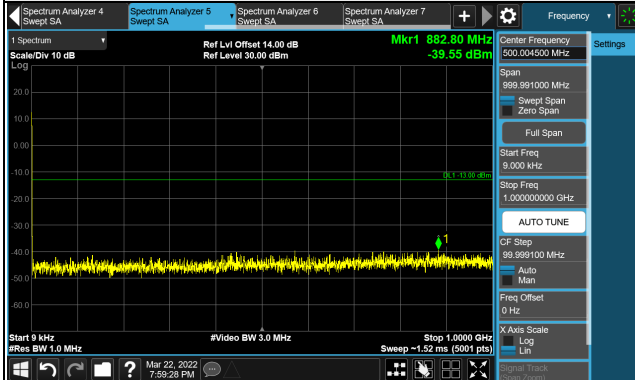


\*The 9kHz signal over the limit is from Spectrum.

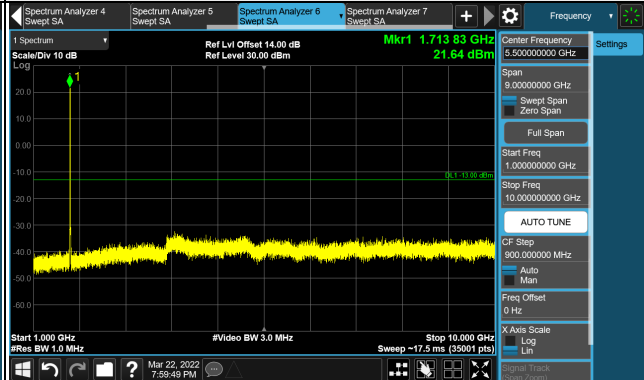
HSUPA

Channel 1312 (1712.4MHz)

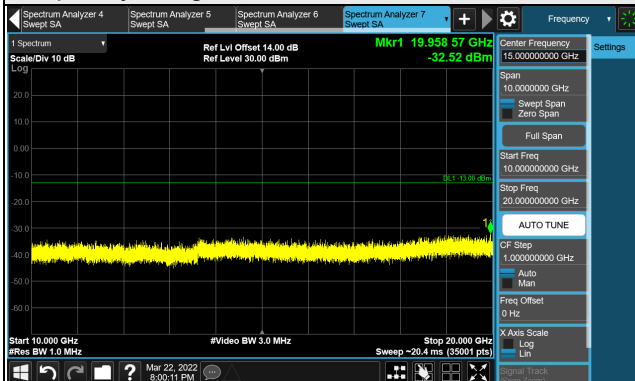
Frequency Range : 9kHz ~ 1GHz



Frequency Range : 1GHz ~ 10GHz



Frequency Range : 10GHz ~ 20GHz



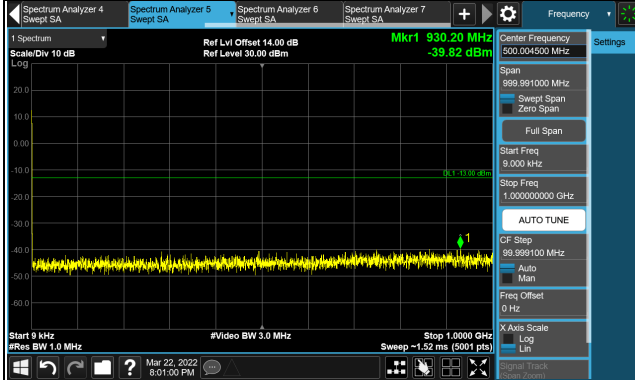
\*The 9kHz signal over the limit is from Spectrum.



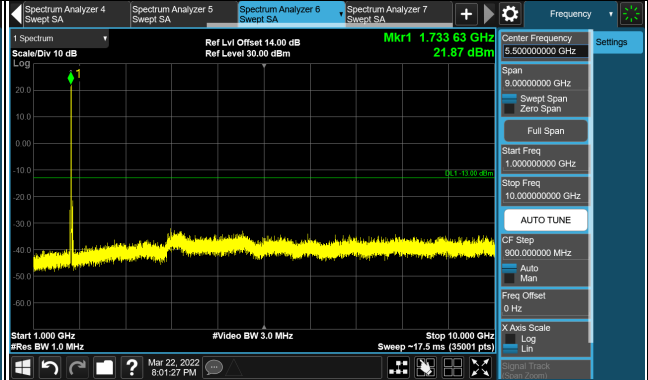
HSUPA

Channel 1413 (1732.6MHz)

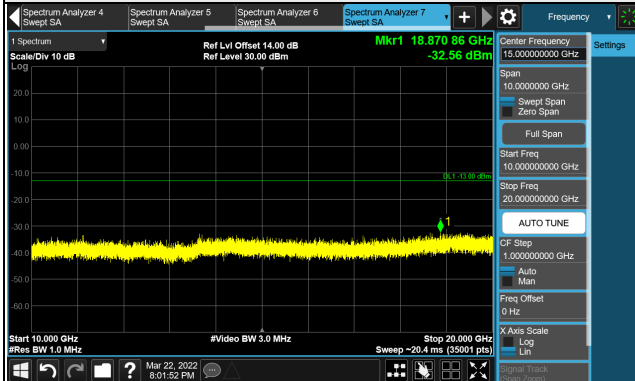
Frequency Range : 9kHz ~ 1GHz



Frequency Range : 1GHz ~ 10GHz



Frequency Range : 10GHz ~ 20GHz

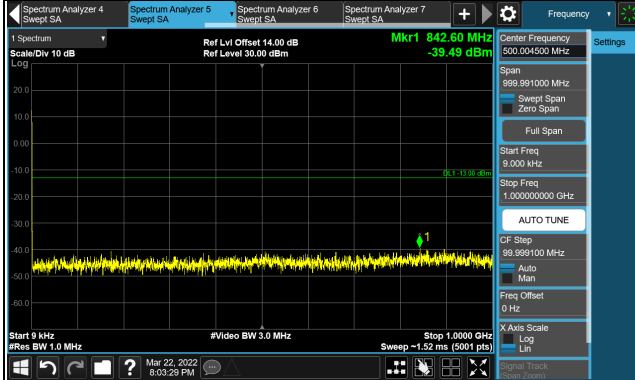


\*The 9kHz signal over the limit is from Spectrum.

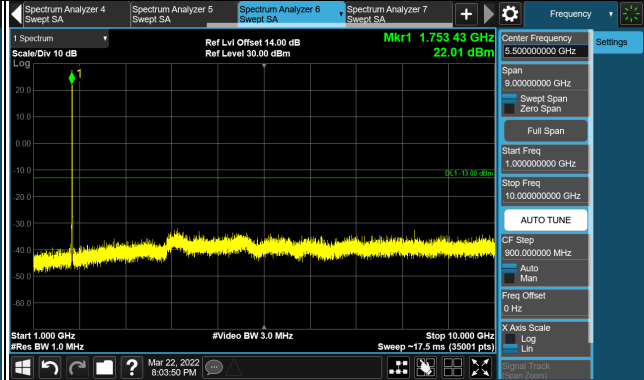
# HSUPA

## Channel 1513 (1752.6MHz)

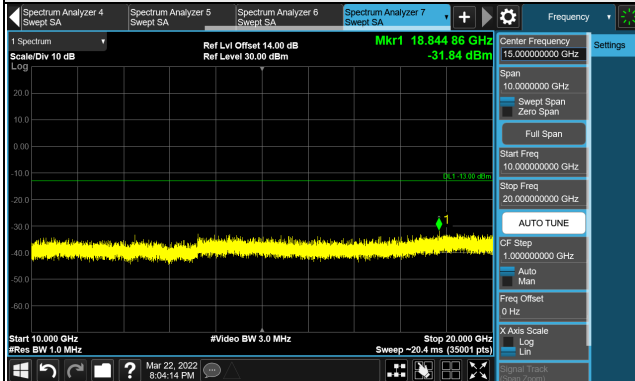
### Frequency Range : 9kHz ~ 1GHz



### Frequency Range : 1GHz ~ 10GHz



### Frequency Range : 10GHz ~ 20GHz



\*The 9kHz signal over the limit is from Spectrum.