

4.4 Emission Bandwidth Measurement

4.4.1 Limits Of Emission Bandwidth Measurement

-26dBc Bandwidth

According to FCC 27.53(m)(6) specified that 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 26dB below the transmitter power.

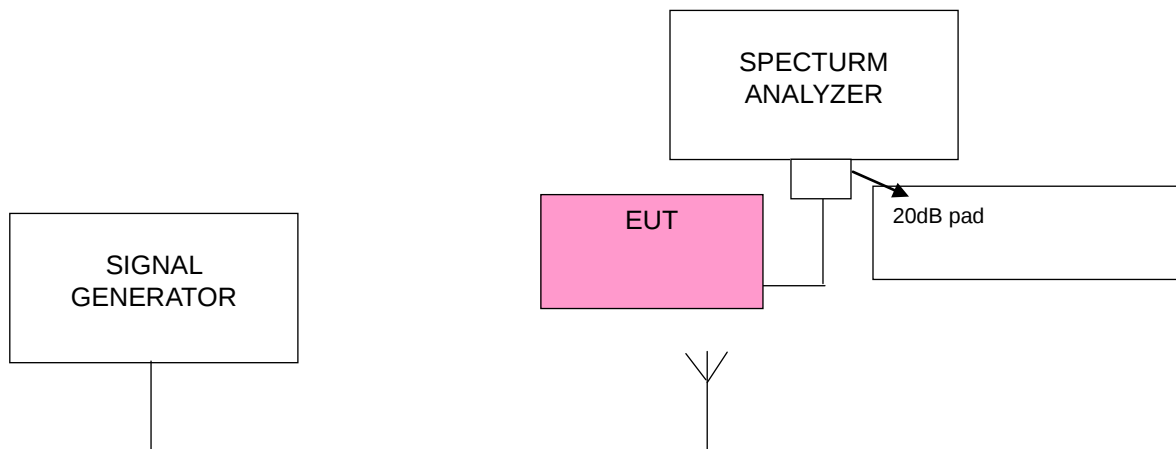
Occupied Bandwidth

The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

4.4.2 Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW = 200kHz and VBW = 620kHz (Channel Bandwidth: 10MHz and 15MHz), RBW = 430kHz and VBW = 1.2MHz (Channel Bandwidth: 20MHz). The 26dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 26dB.

4.4.3 Test Setup

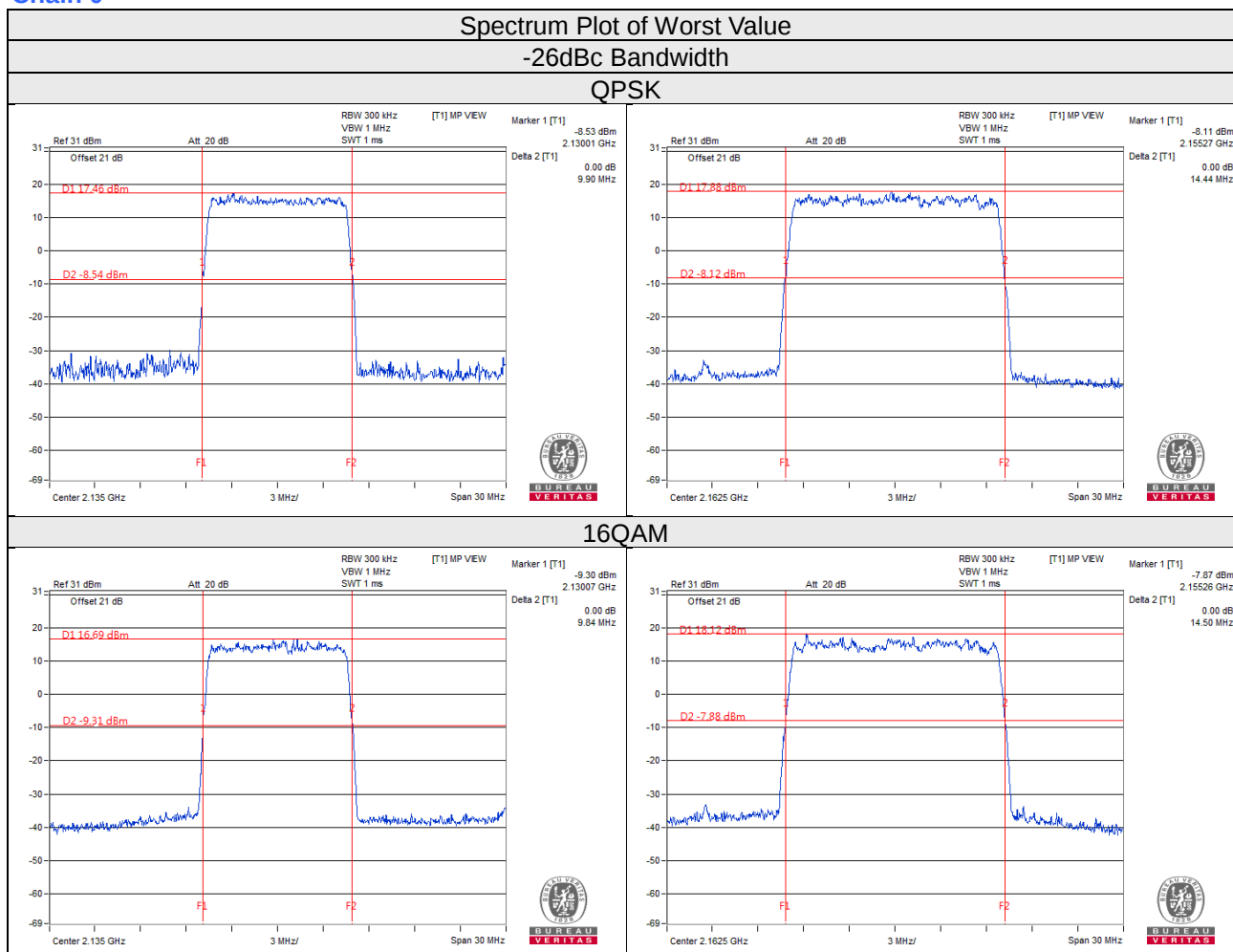


4.4.4 Test Results (-26dBc Bandwidth)

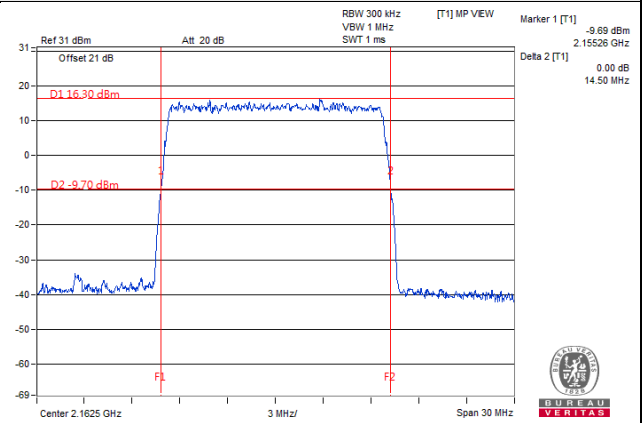
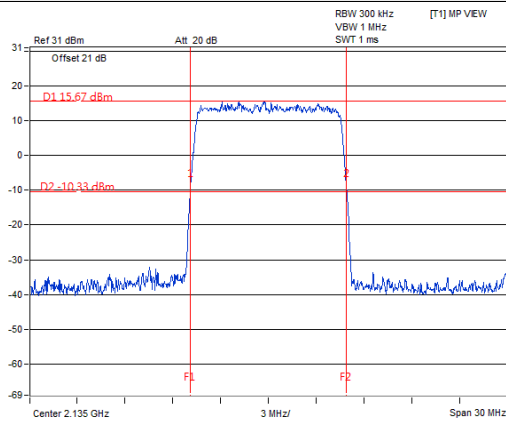
10MHz+15MHz Non-Contiguous GAP 15MHz

Channel Number	Freq. (MHz)	26dB Down Bandwidth (MHz)							
		Chain 0				Chain 1			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
66686+66961	2135+2162.5	24.34	24.34	24.36	24.49	24.33	24.27	24.37	24.45

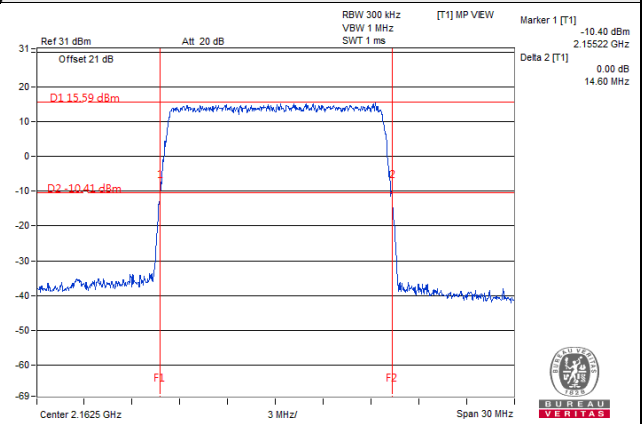
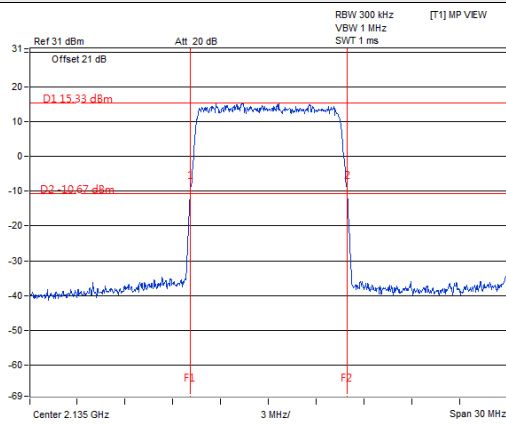
Chain 0



64QAM



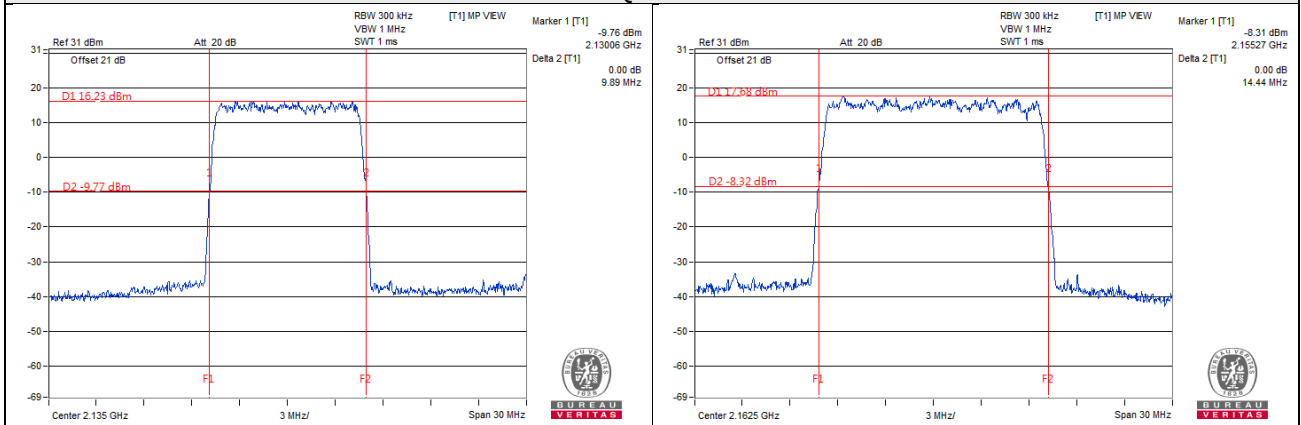
256QAM



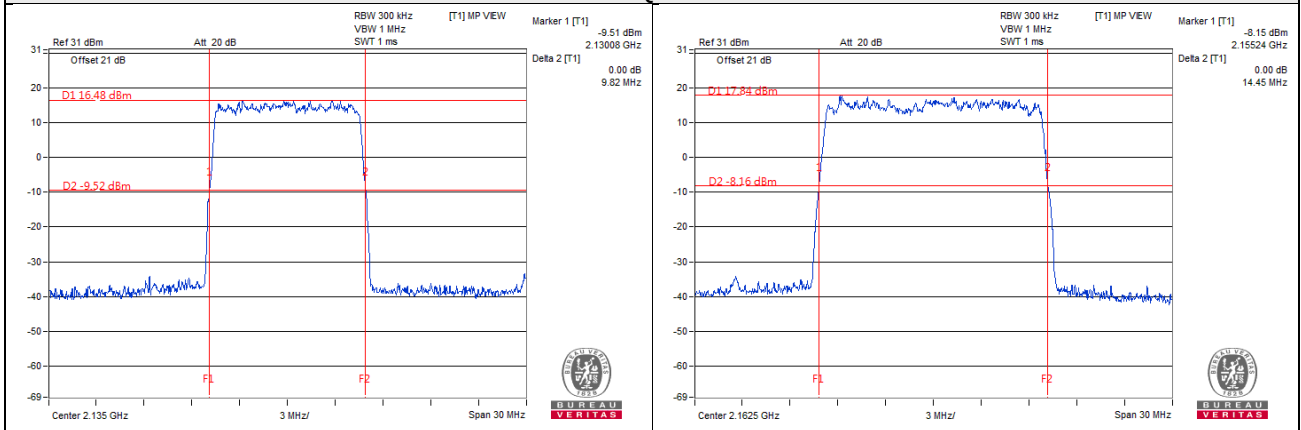
Chain 1

Spectrum Plot of Worst Value -26dBc Bandwidth

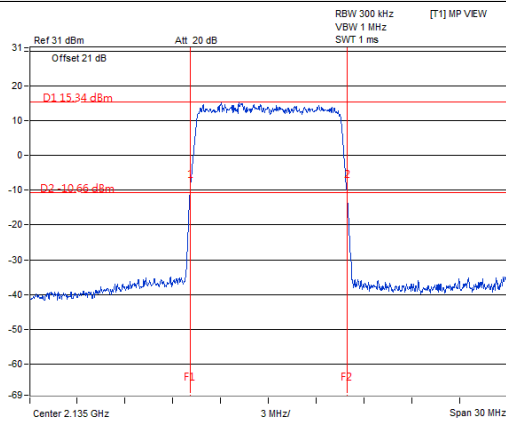
QPSK



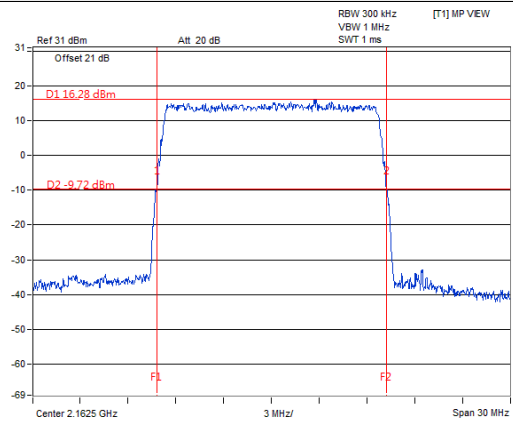
16QAM



64QAM



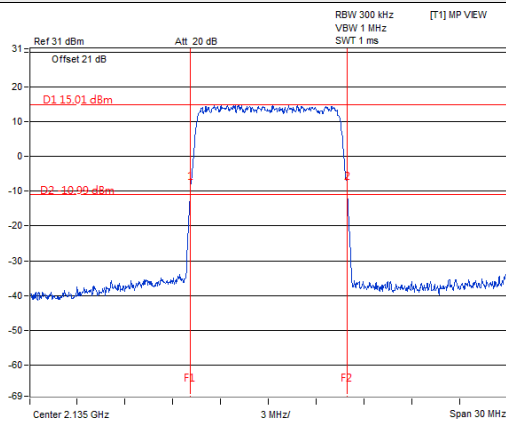
Marker 1 [T1]
-10.65 dBm
2.13004 GHz
Delta 2 [T1]
0.00 dB
9.88 MHz



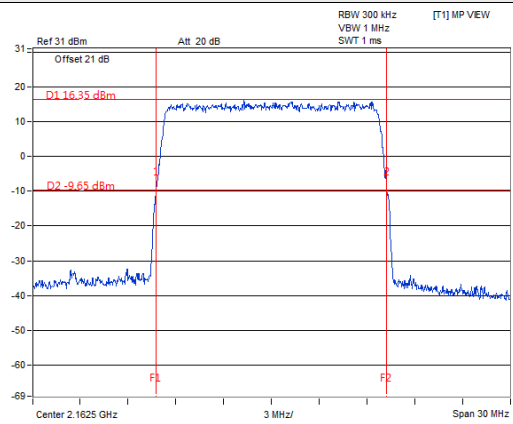
Marker 1 [T1]
-9.71 dBm
2.15526 GHz
Delta 2 [T1]
0.00 dB
14.49 MHz



256QAM



Marker 1 [T1]
-10.98 dBm
2.13005 GHz
Delta 2 [T1]
0.00 dB
9.90 MHz



Marker 1 [T1]
-9.64 dBm
2.15521 GHz
Delta 2 [T1]
0.00 dB
14.55 MHz

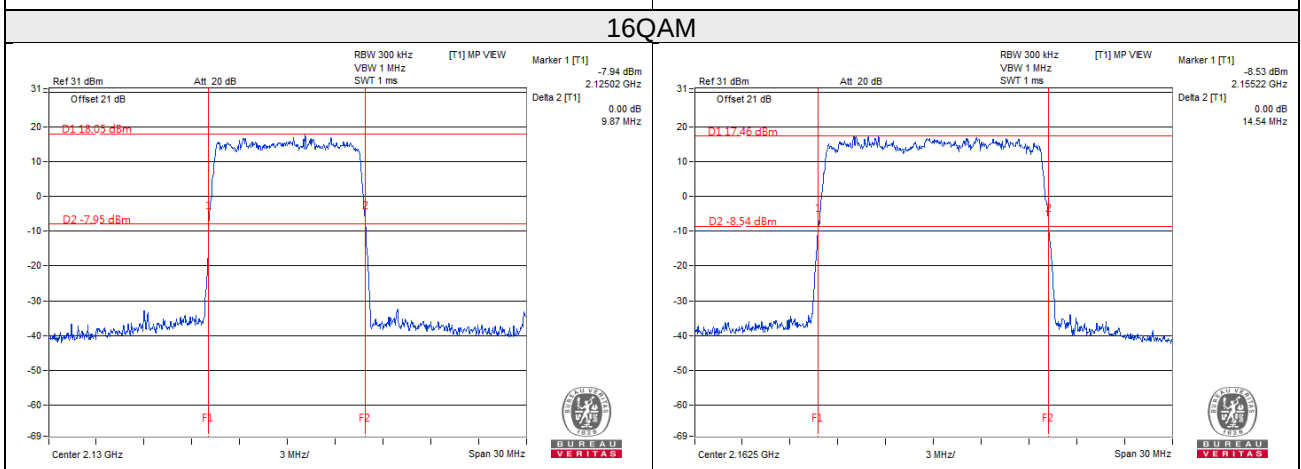
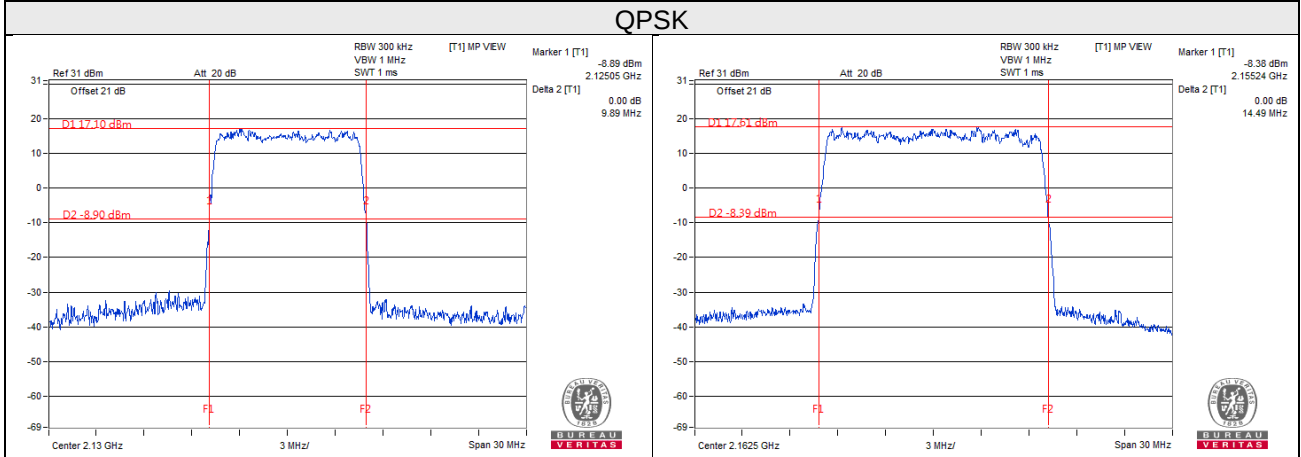


10MHz+15MHz Non-Contiguous GAP 20MHz

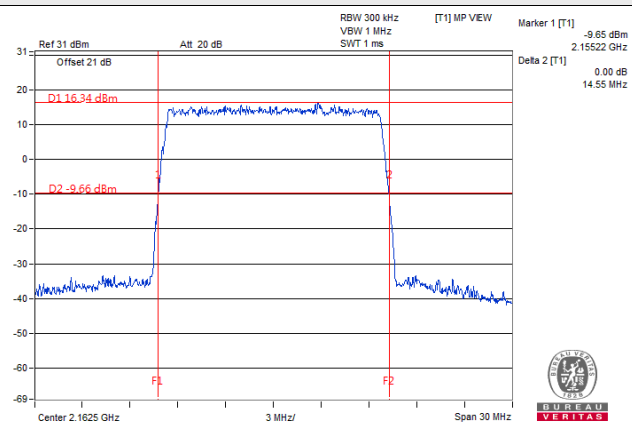
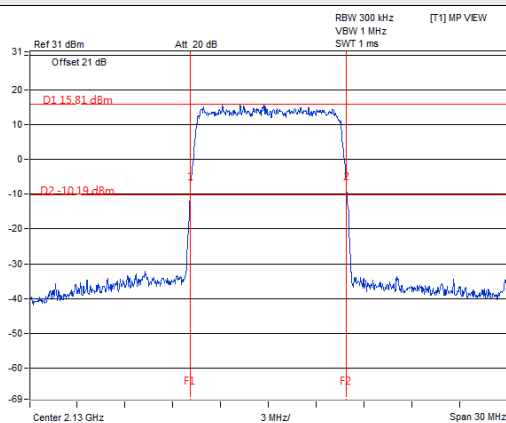
Channel Number	Freq. (MHz)	26dB Down Bandwidth (MHz)							
		Chain 0				Chain 1			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
66636+66961	2130+2162.5	24.38	24.41	24.42	23.44	24.38	24.33	24.45	24.46

Chain 0

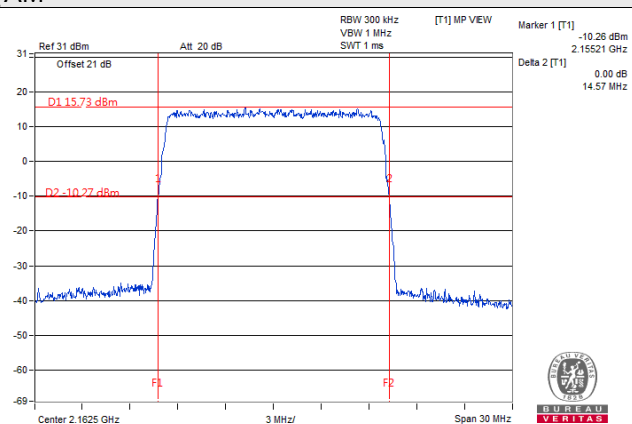
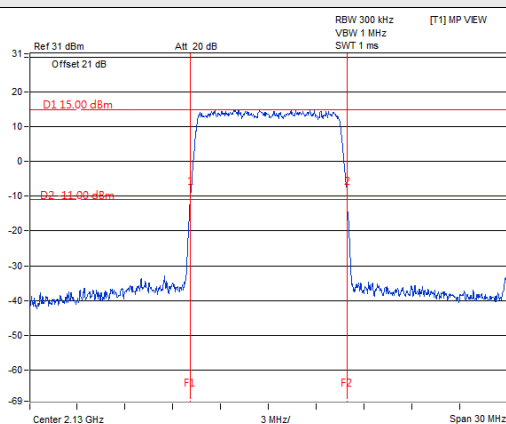
Spectrum Plot of Worst Value -26dBc Bandwidth



64QAM



256QAM

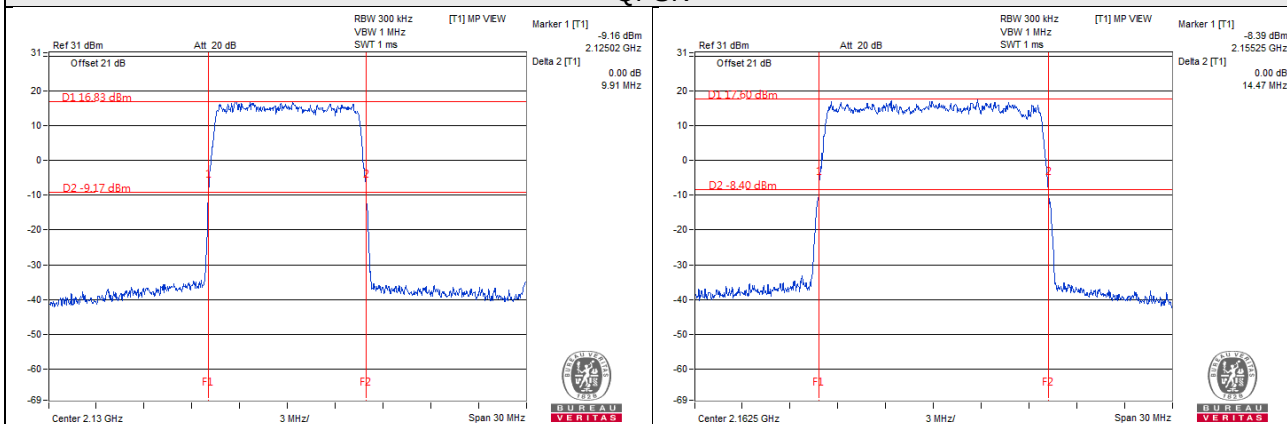


Chain 1

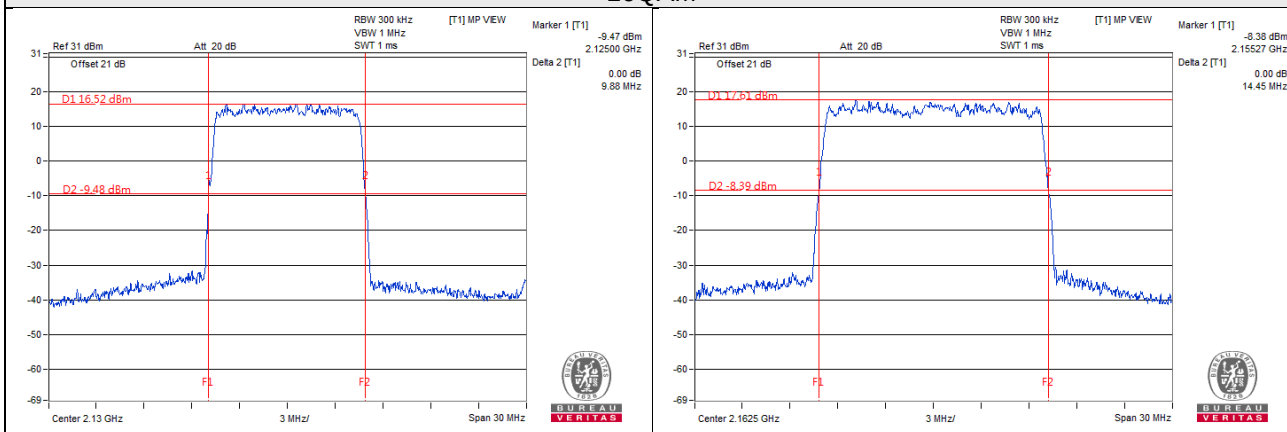
Spectrum Plot of Worst Value

-26dBc Bandwidth

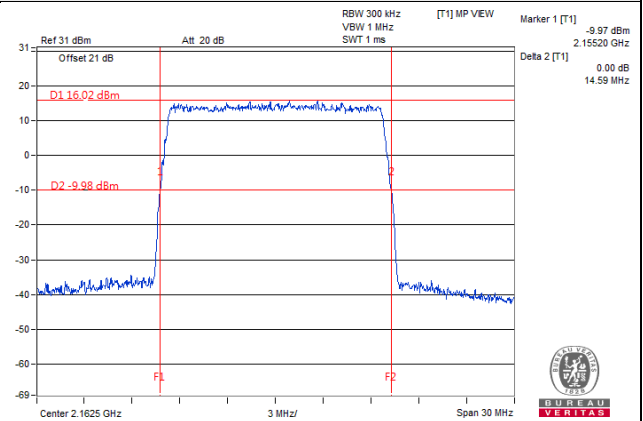
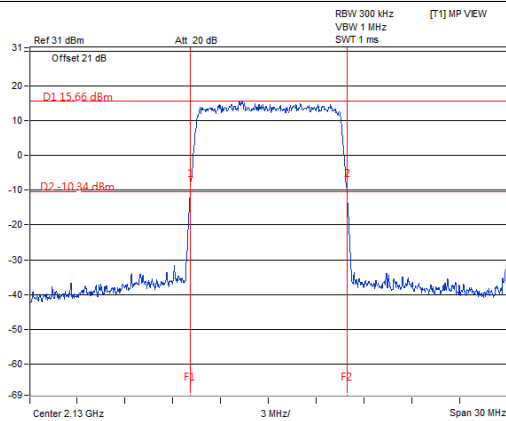
QPSK



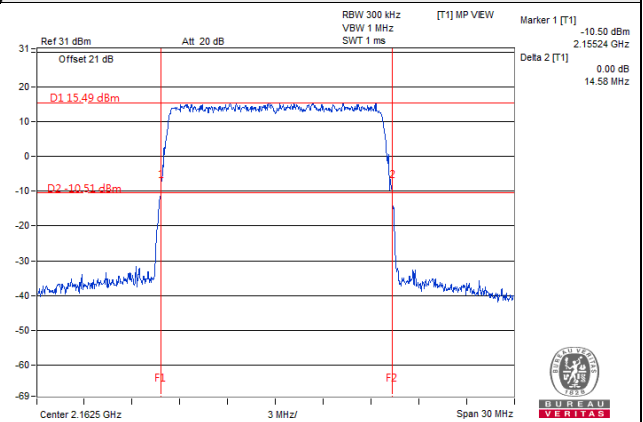
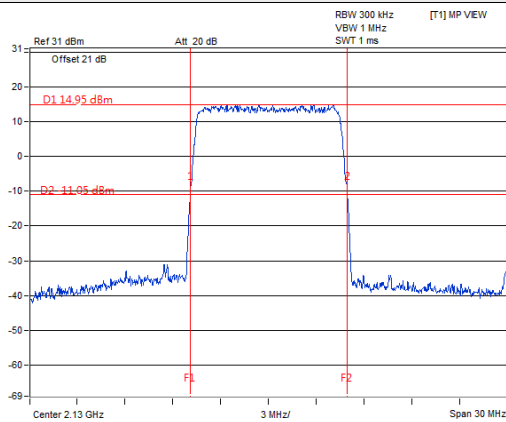
16QAM



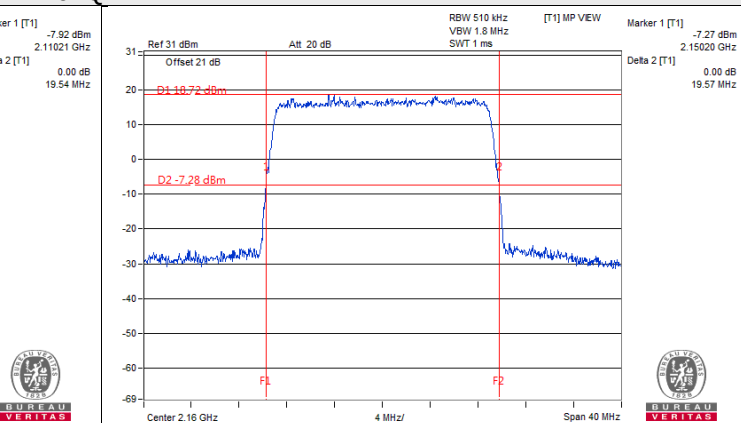
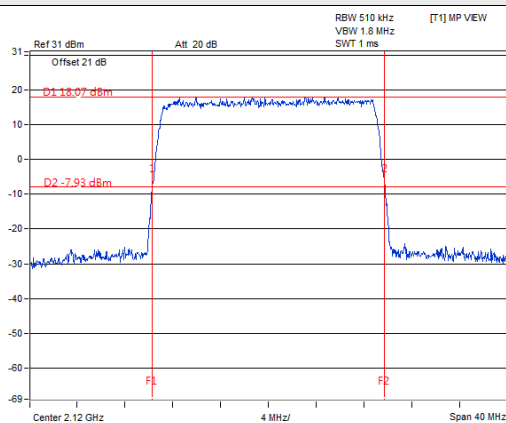
64QAM



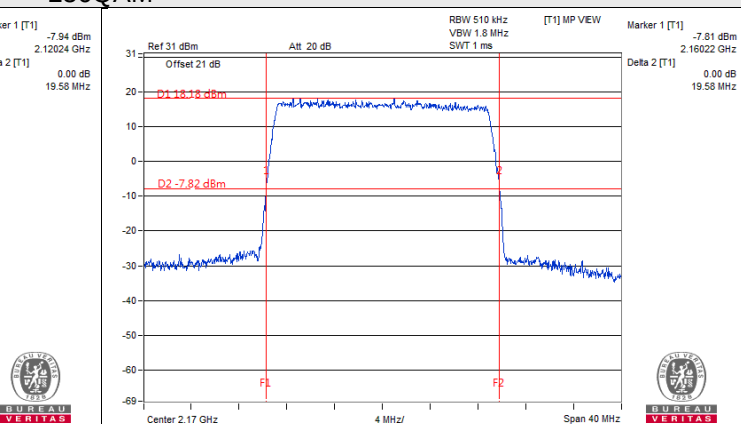
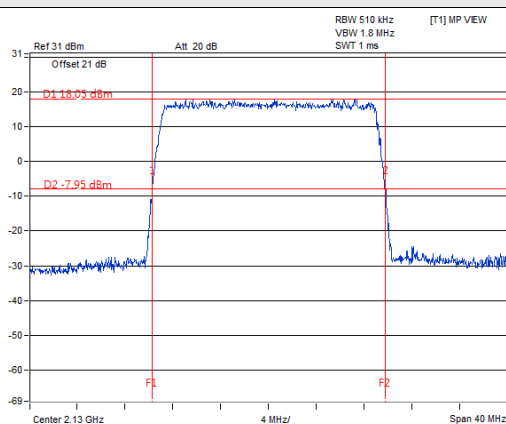
256QAM



64QAM



256QAM

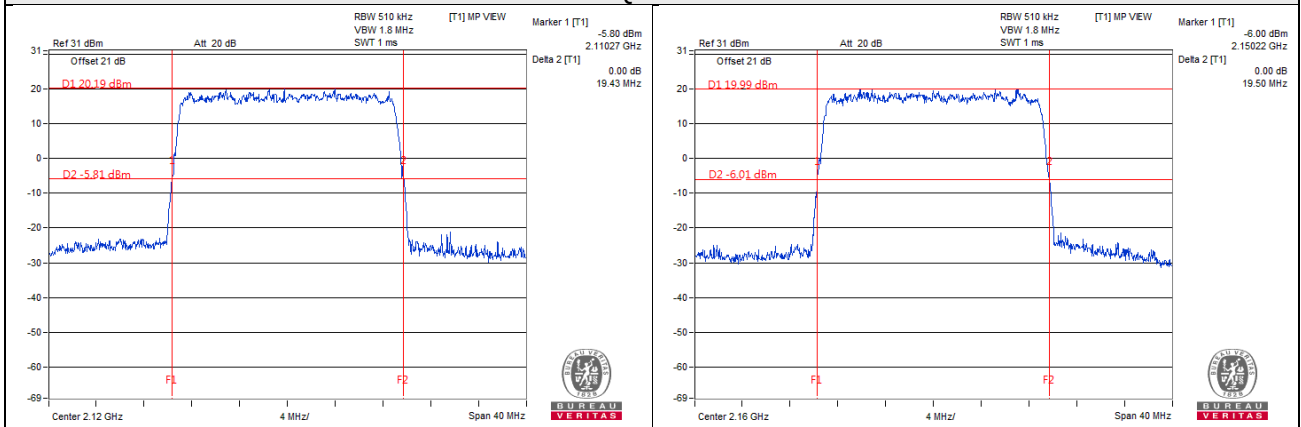


Chain 1

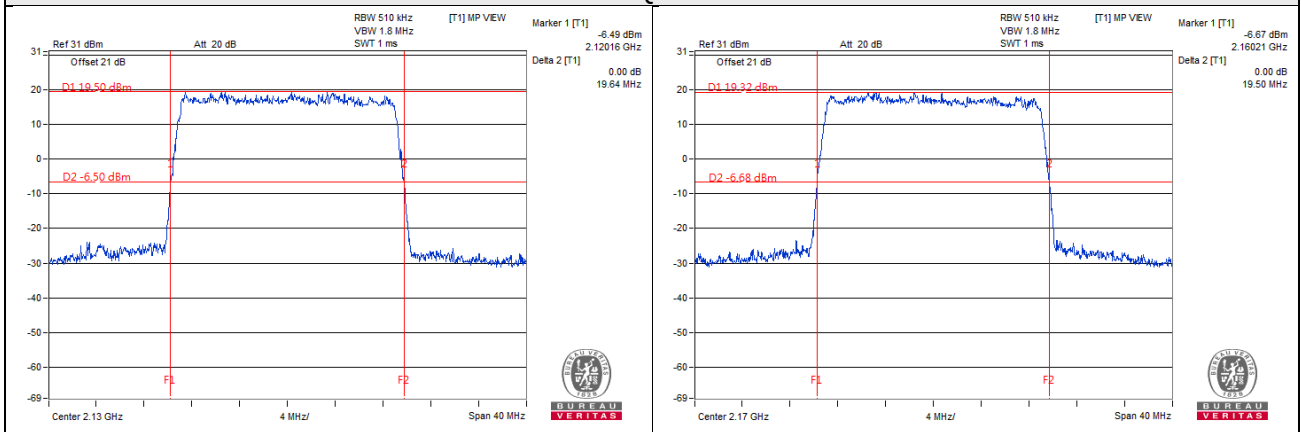
Spectrum Plot of Worst Value

-26dBc Bandwidth

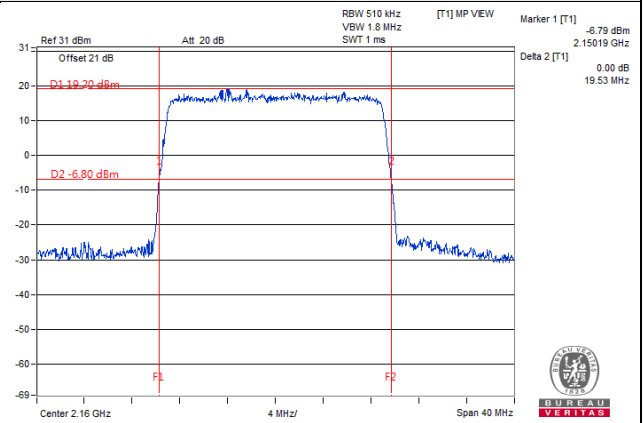
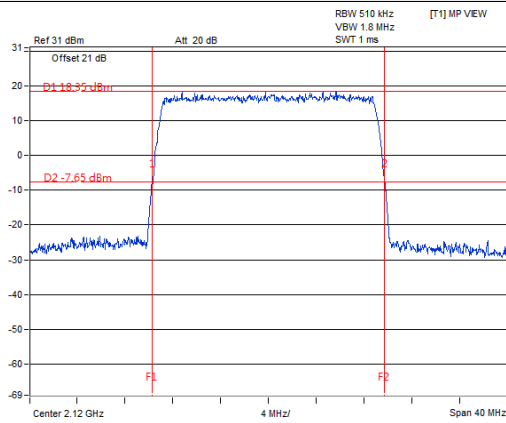
QPSK



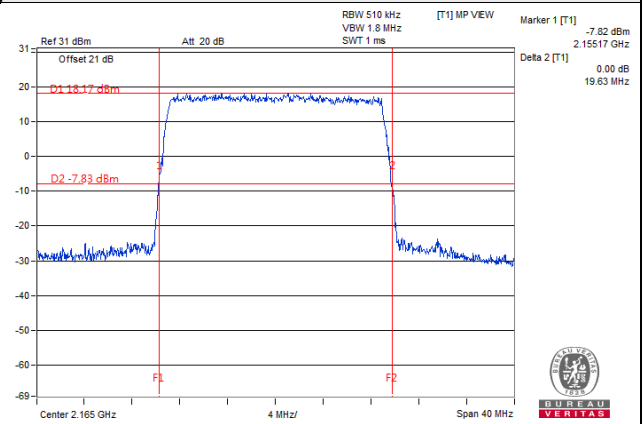
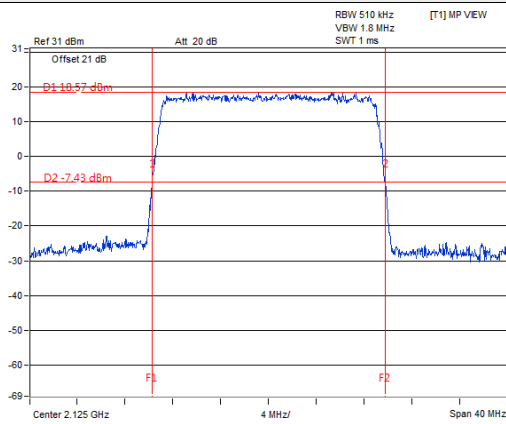
16QAM



64QAM



256QAM



20MHz+20MHz Contiguous

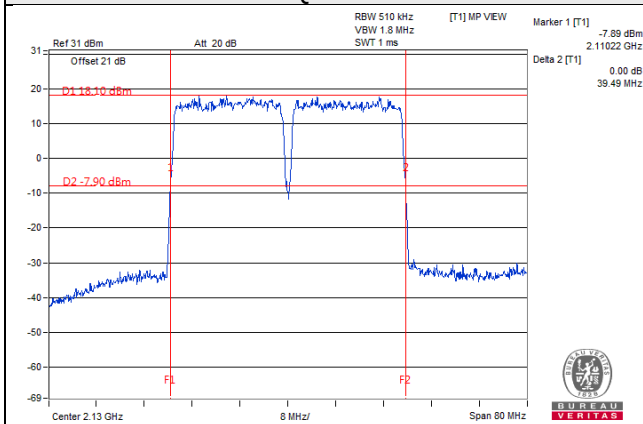
Channel Number	Freq. (MHz)	26dB Down Bandwidth (MHz)							
		Chain 0				Chain 1			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
66536+66736	2120+2140	39.49	39.38	39.52	39.57	39.43	39.41	39.56	39.56
66686+66886	2135+2155	39.47	39.50	39.59	39.61	39.40	39.50	39.52	39.64
66836+67036	2150+2170	39.39	39.50	39.42	39.64	39.43	39.58	39.54	39.53

Chain 0

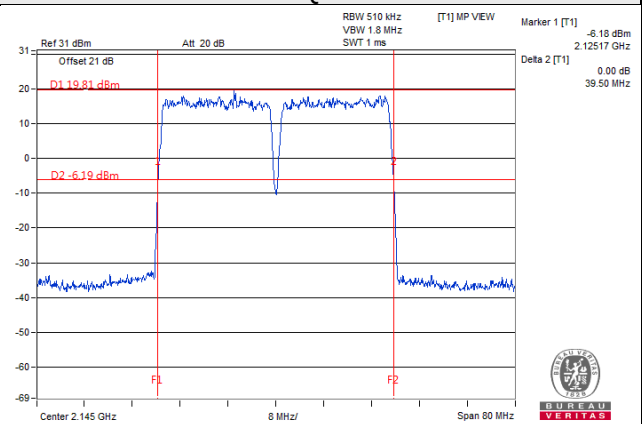
Spectrum Plot of Worst Value

-26dBc Bandwidth

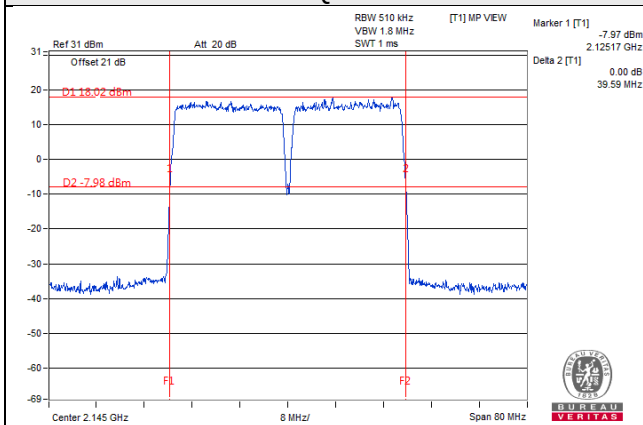
QPSK



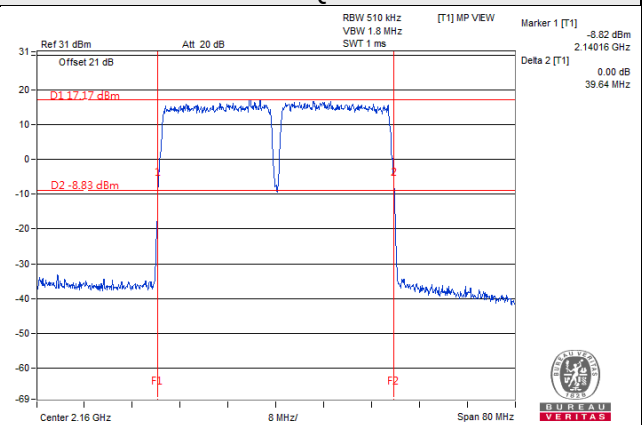
16QAM



64QAM



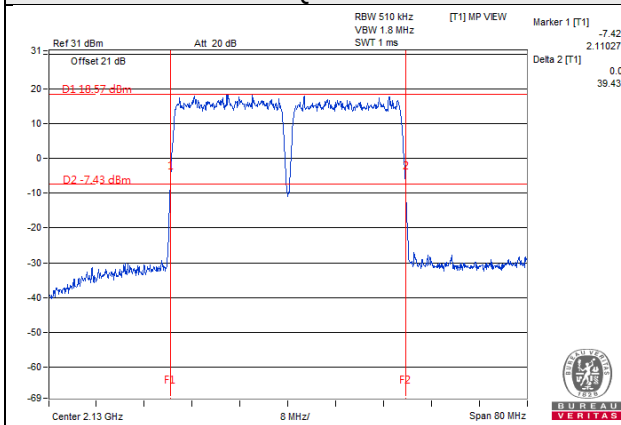
256QAM



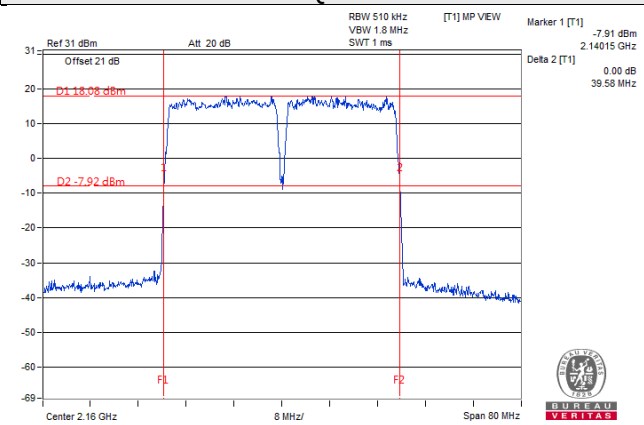
Chain 1

Spectrum Plot of Worst Value -26dBc Bandwidth

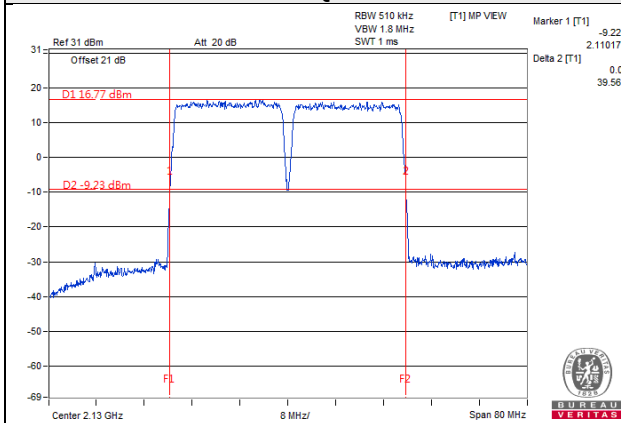
QPSK



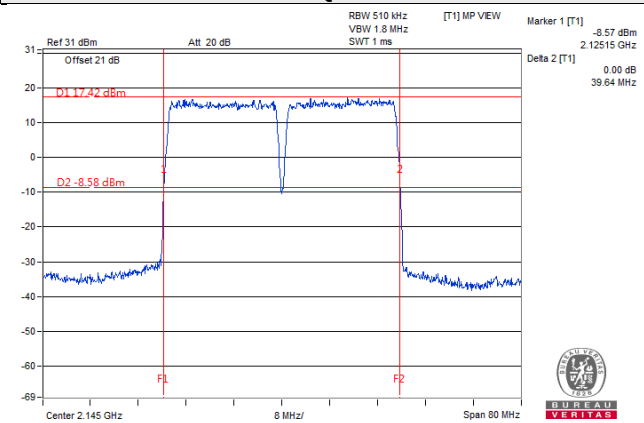
16QAM



64QAM



256QAM



4.4.5 Test Results (Occupied Bandwidth)

10MHz+15MHz Non-Contiguous GAP 15MHz

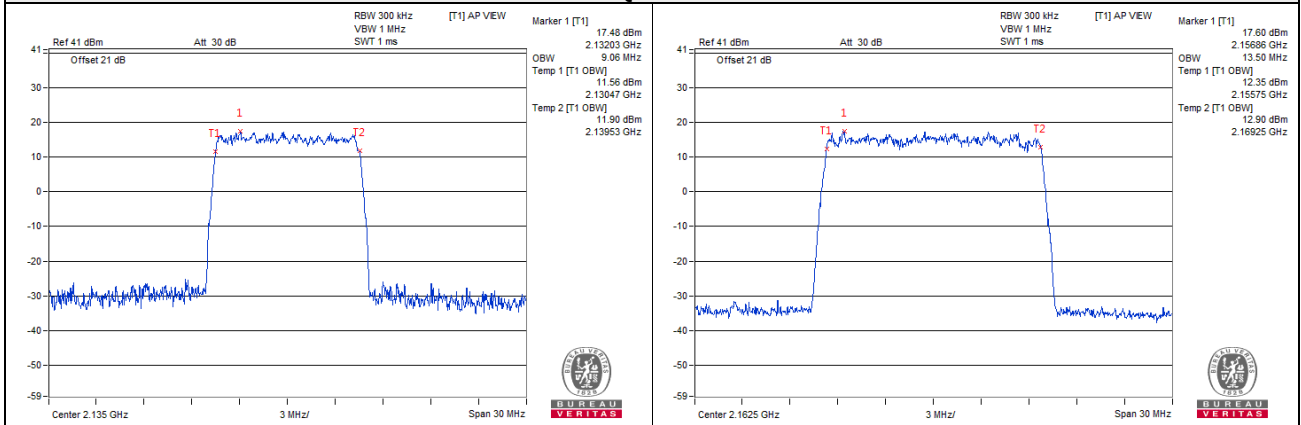
Channel Number	Freq. (MHz)	Occupied Bandwidth (MHz)							
		Chain 0				Chain 1			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
66686+66961	2135+2162.5	22.56	22.62	22.50	22.50	22.56	22.65	22.50	22.50

Chain 0

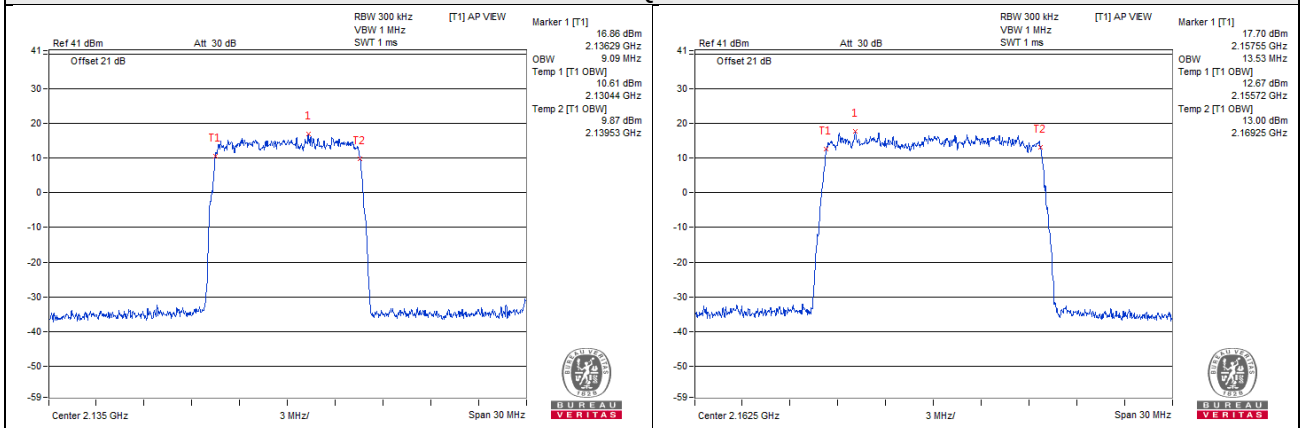
Spectrum Plot of Worst Value

Occupied Bandwidth

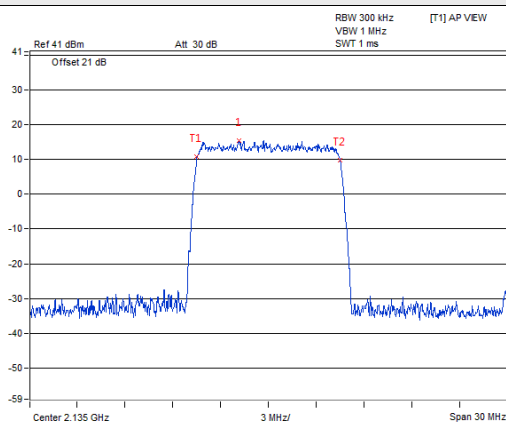
QPSK



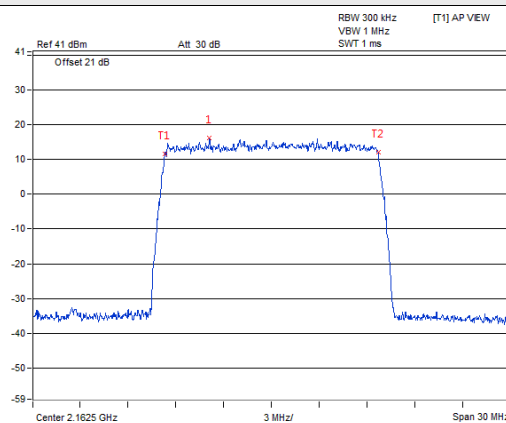
16QAM



64QAM



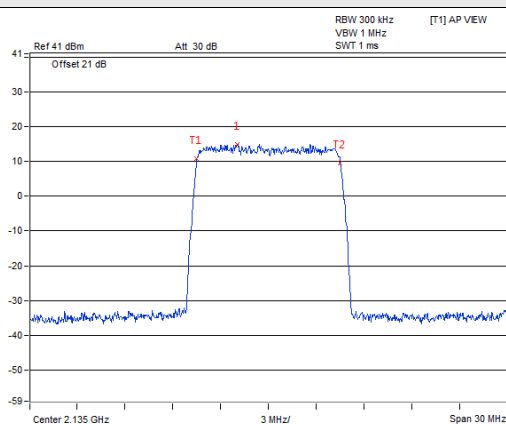
Marker 1 [T1]
15.59 dBm
2.13314 GHz
9.03 MHz
Temp 1 [T1] OBW
10.74 dBm
2.13047 GHz
Temp 2 [T1] OBW
9.92 dBm
2.13950 GHz



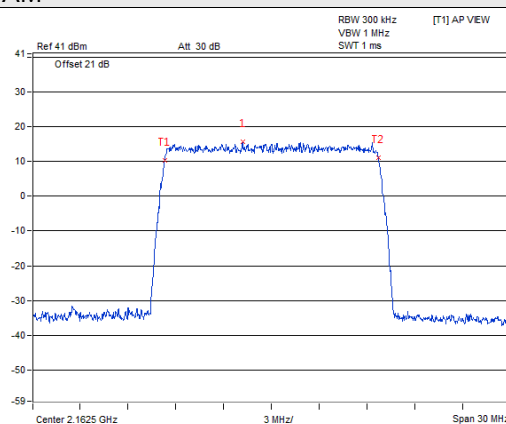
Marker 1 [T1]
16.17 dBm
2.15857 GHz
13.47 MHz
Temp 1 [T1] OBW
11.64 dBm
2.15575 GHz
Temp 2 [T1] OBW
12.13 dBm
2.16922 GHz



256QAM



Marker 1 [T1]
14.88 dBm
2.13302 GHz
9.03 MHz
Temp 1 [T1] OBW
10.76 dBm
2.13047 GHz
Temp 2 [T1] OBW
9.65 dBm
2.13950 GHz



Marker 1 [T1]
15.64 dBm
2.16067 GHz
13.47 MHz
Temp 1 [T1] OBW
10.27 dBm
2.15575 GHz
Temp 2 [T1] OBW
11.02 dBm
2.16922 GHz

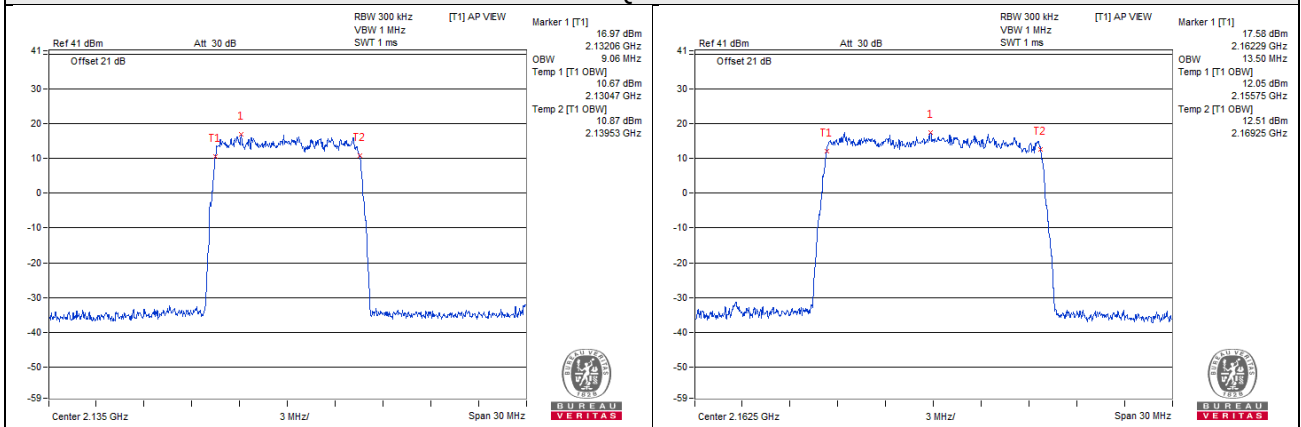


Chain 1

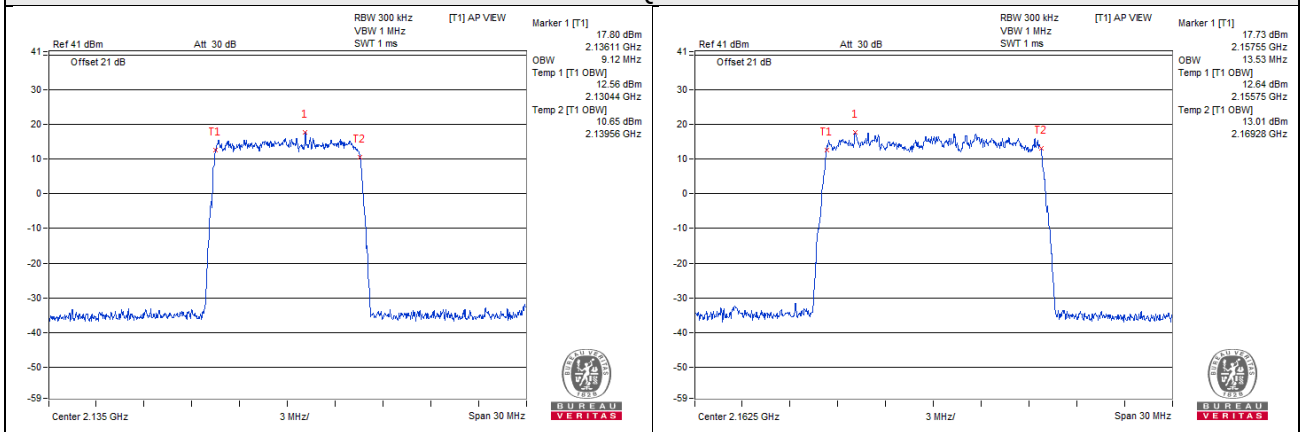
Spectrum Plot of Worst Value

-26dBc Bandwidth

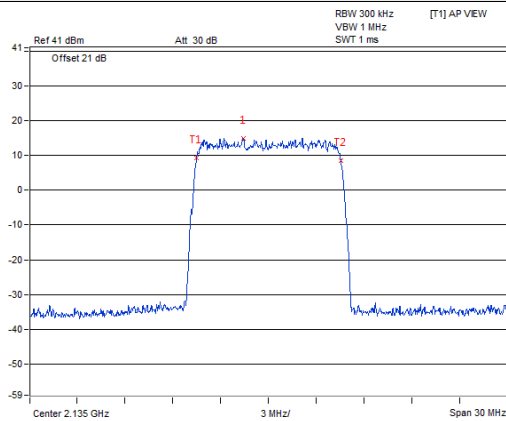
QPSK



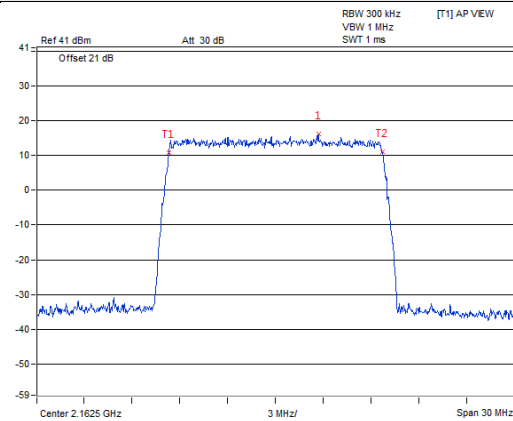
16QAM



64QAM



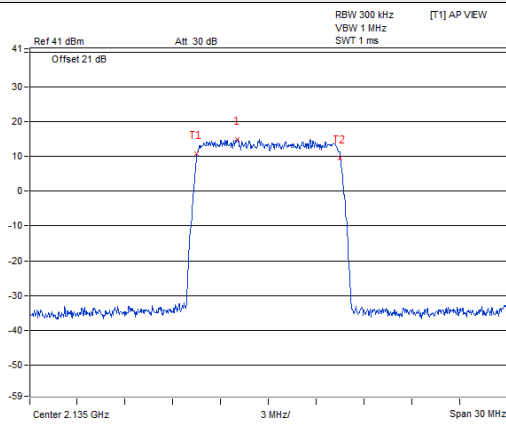
Marker 1 [T1]
15.04 dBm
2.13338 GHz
9.06 MHz
OBW
9.36 dBm
Temp 1 [T1] OBW
2.13047 GHz
Temp 2 [T1] OBW
8.46 dBm
2.13953 GHz



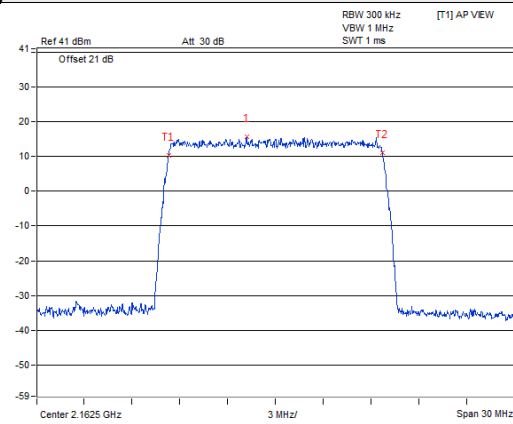
Marker 1 [T1]
16.29 dBm
2.16520 GHz
13.44 MHz
OBW
10.71 dBm
Temp 1 [T1] OBW
2.15578 GHz
Temp 2 [T1] OBW
11.16 dBm
2.16922 GHz



256QAM



Marker 1 [T1]
14.88 dBm
2.13302 GHz
9.03 MHz
OBW
10.76 dBm
Temp 1 [T1] OBW
2.13047 GHz
Temp 2 [T1] OBW
9.65 dBm
2.13950 GHz



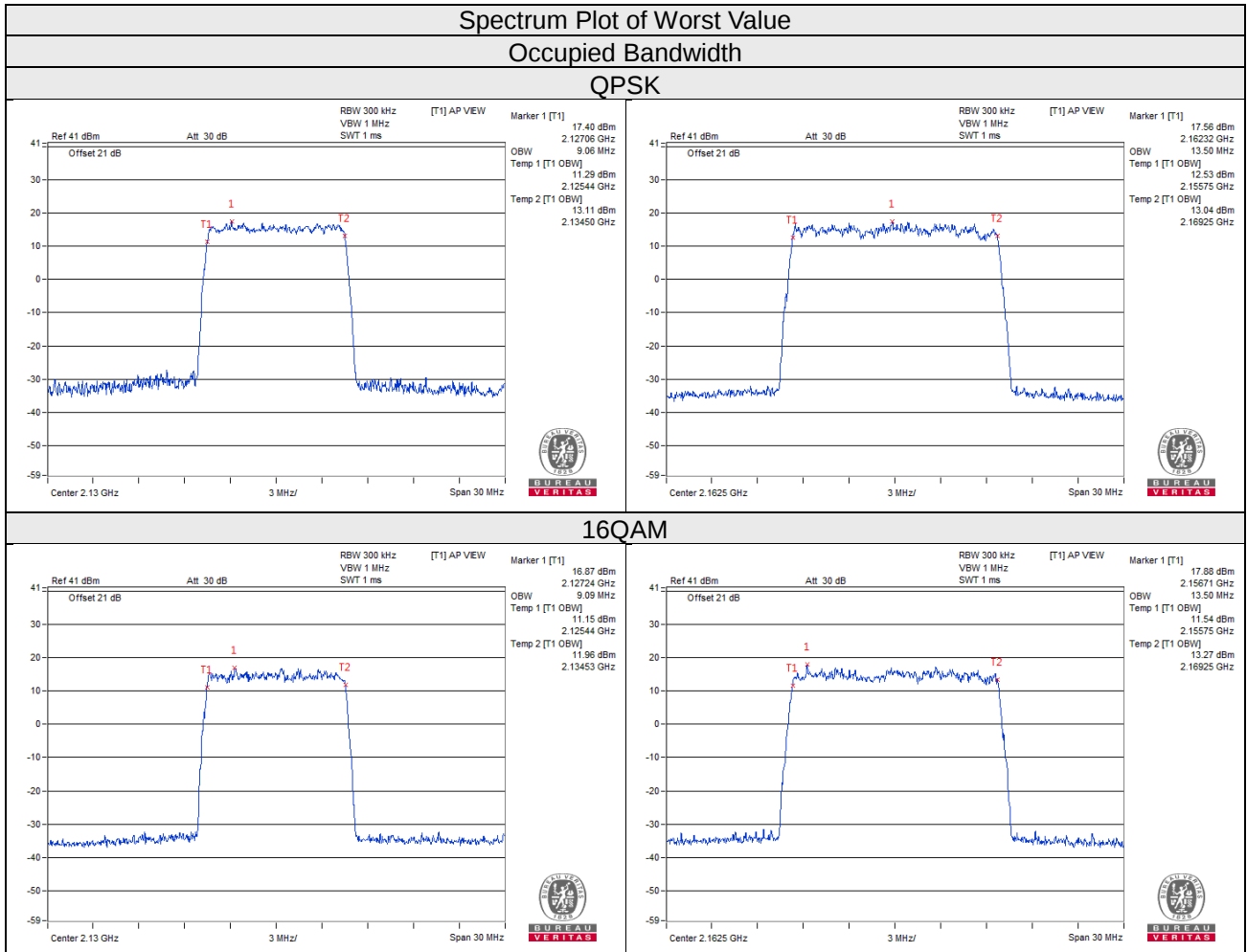
Marker 1 [T1]
15.64 dBm
2.16067 GHz
13.47 MHz
OBW
10.27 dBm
Temp 1 [T1] OBW
2.15575 GHz
Temp 2 [T1] OBW
11.02 dBm
2.16922 GHz



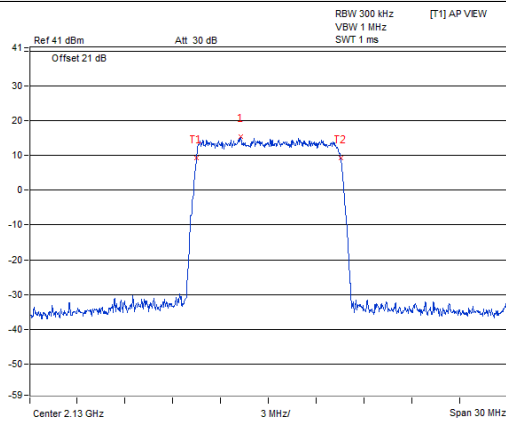
10MHz+15MHz Non-Contiguous GAP 20MHz

Channel Number	Freq. (MHz)	Occupied Bandwidth (MHz)							
		Chain 0				Chain 1			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
66636+66961	2130+2162.5	22.56	22.59	22.50	22.56	22.56	22.59	22.53	22.53

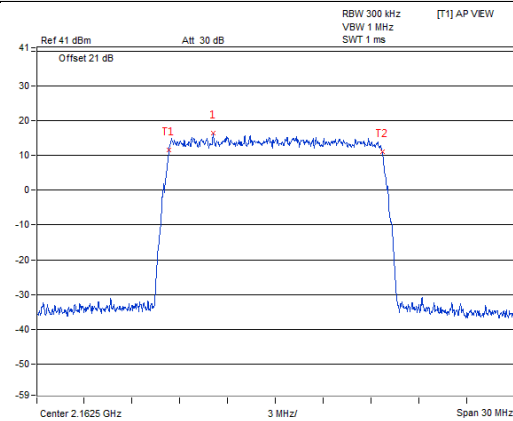
Chain 0



64QAM



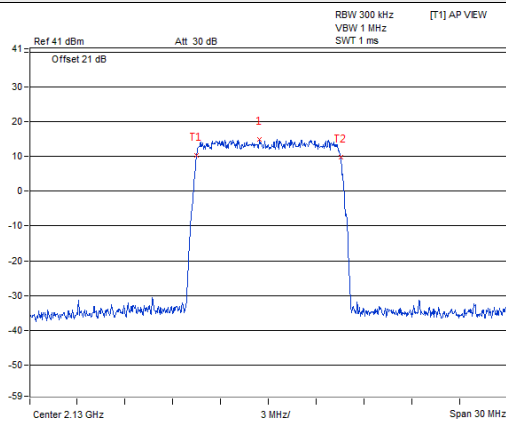
Marker 1 [T1]
15.49 dBm
2.12823 GHz
9.06 MHz
Temp 1 [T1] OBW
9.36 dBm
2.12547 GHz
Temp 2 [T1] OBW
9.34 dBm
2.13453 GHz



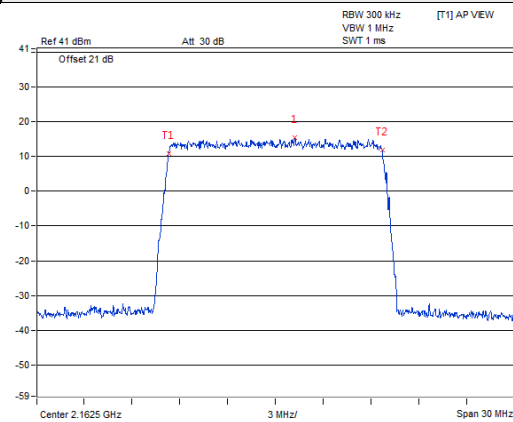
Marker 1 [T1]
16.48 dBm
2.15854 GHz
13.44 MHz
Temp 1 [T1] OBW
11.51 dBm
2.15578 GHz
Temp 2 [T1] OBW
10.99 dBm
2.16922 GHz



256QAM



Marker 1 [T1]
15.01 dBm
2.12943 GHz
9.09 MHz
Temp 1 [T1] OBW
10.43 dBm
2.12544 GHz
Temp 2 [T1] OBW
9.85 dBm
2.13453 GHz



Marker 1 [T1]
15.30 dBm
2.16370 GHz
13.47 MHz
Temp 1 [T1] OBW
10.85 dBm
2.15575 GHz
Temp 2 [T1] OBW
11.76 dBm
2.16922 GHz

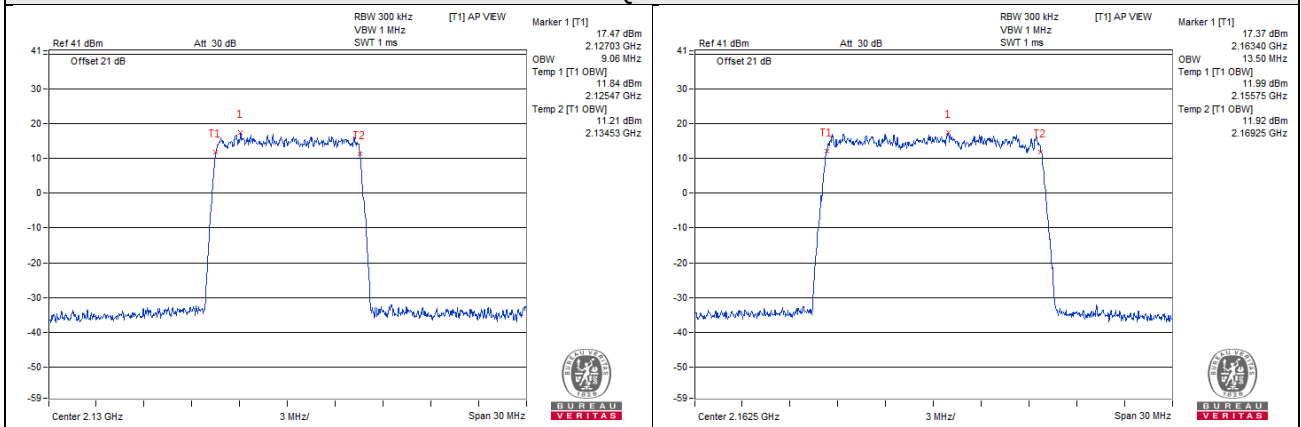


Chain 1

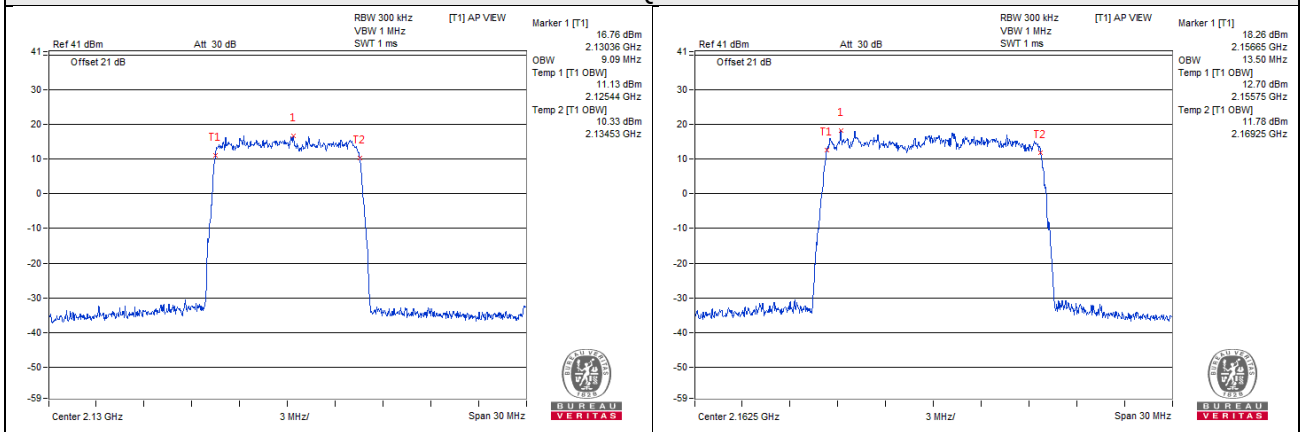
Spectrum Plot of Worst Value

Occupied Bandwidth

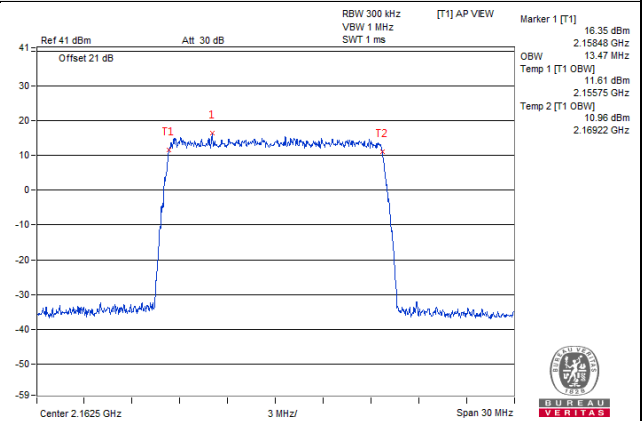
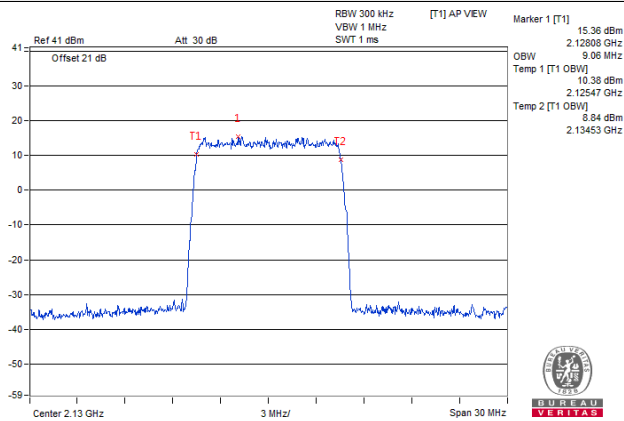
QPSK



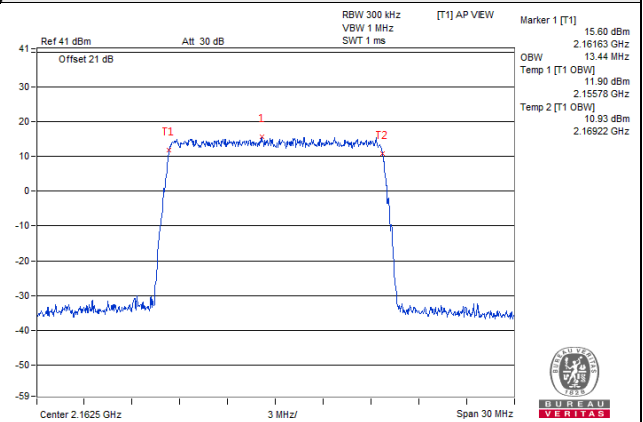
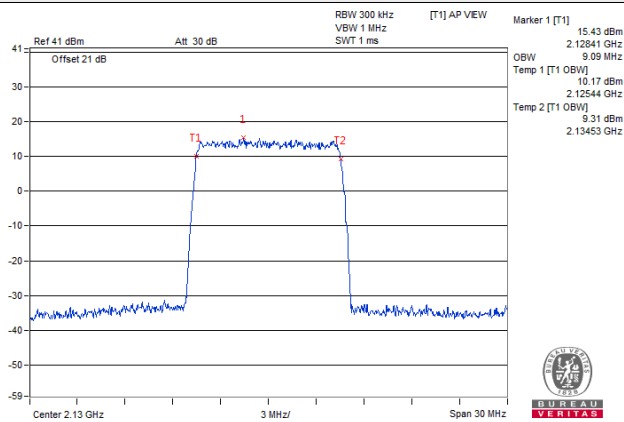
16QAM



64QAM



256QAM



20MHz+20MHz Non-Contiguous GAP 20MHz

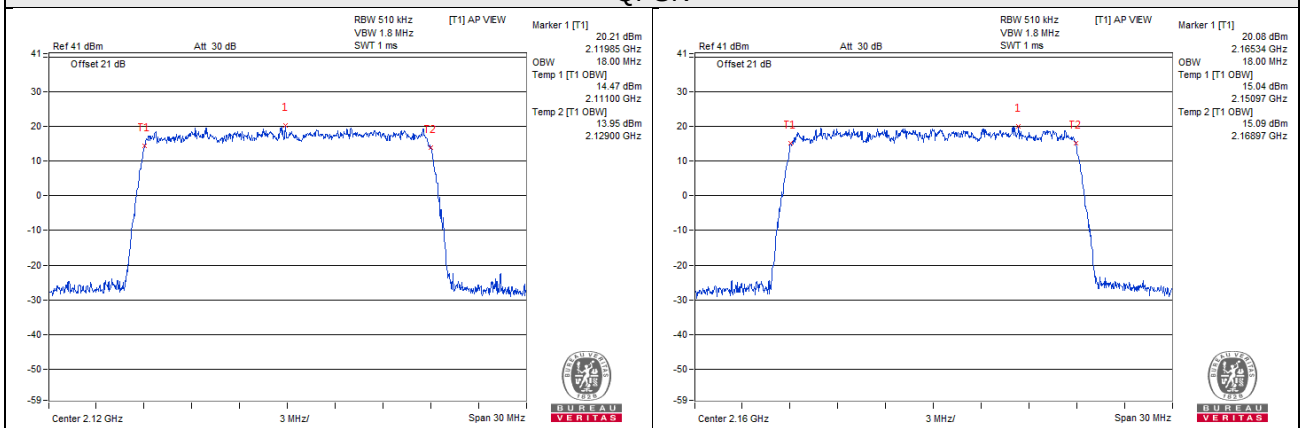
Channel Number	Freq. (MHz)	Occupied Bandwidth (MHz)							
		Chain 0				Chain 1			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
66536+66936	2120+2160	36.00	36.09	35.97	36.09	35.97	36.03	36.03	36.06
66586+66986	2125+2165	36.00	36.03	35.97	36.00	35.97	36.09	35.97	36.03
66636+67036	2130+2170	35.94	36.00	36.00	36.03	35.97	36.06	35.97	36.03

Chain 0

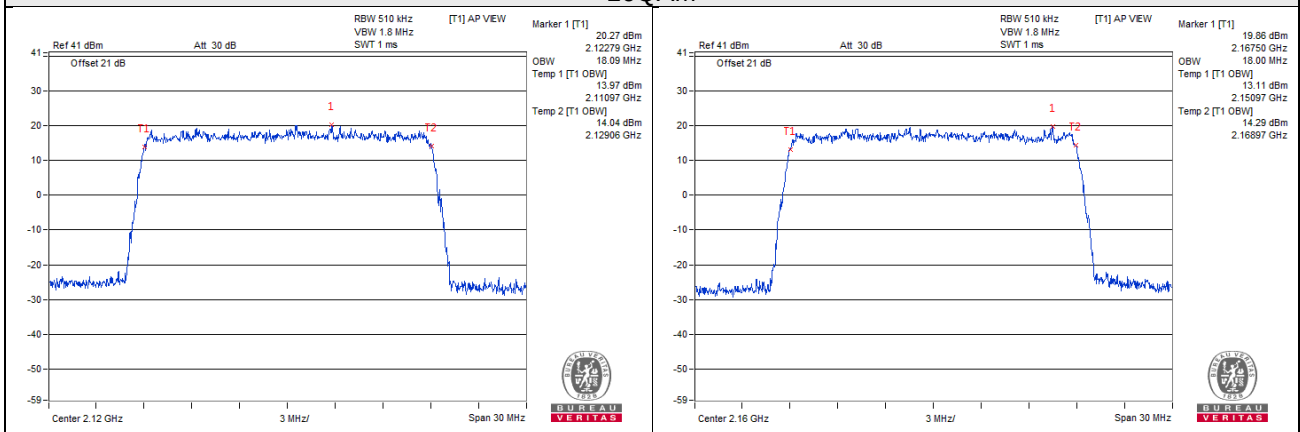
Spectrum Plot of Worst Value

Occupied Bandwidth

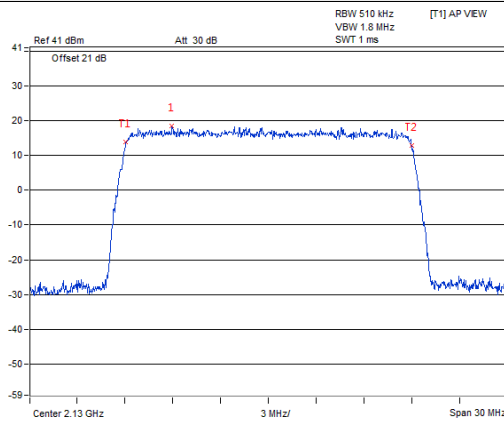
QPSK



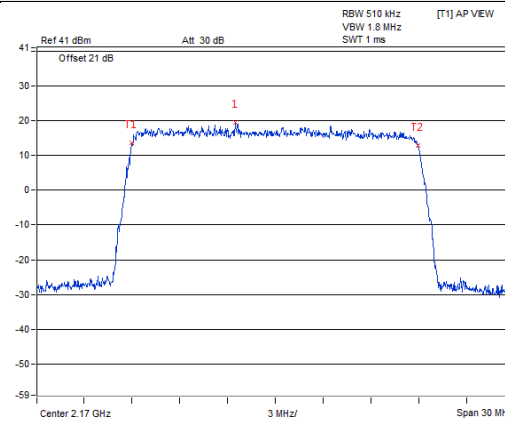
16QAM



64QAM

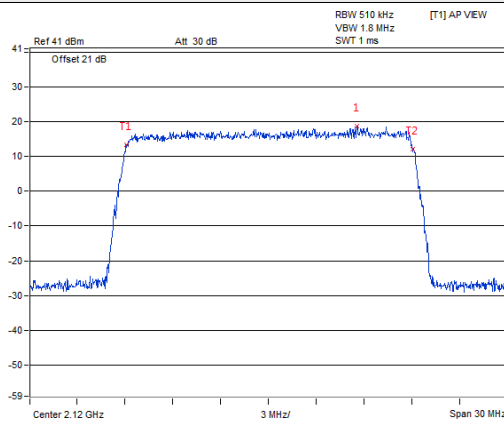


Marker 1 [T1]
18.39 dBm
2.12391 GHz
OBW 18.00 MHz
Temp 1 [T1] OBW 13.93 dBm
2.12100 GHz
Temp 2 [T1] OBW 12.92 dBm
2.13900 GHz

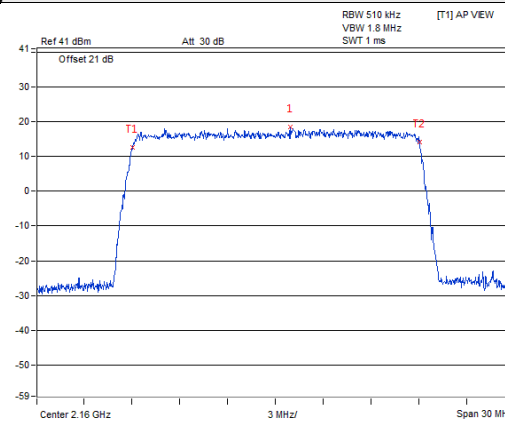


Marker 1 [T1]
19.52 dBm
2.16745 GHz
OBW 18.00 MHz
Temp 1 [T1] OBW 13.62 dBm
2.16094 GHz
Temp 2 [T1] OBW 12.91 dBm
2.17894 GHz

256QAM



Marker 1 [T1]
18.85 dBm
2.12555 GHz
OBW 18.03 MHz
Temp 1 [T1] OBW 13.43 dBm
2.11103 GHz
Temp 2 [T1] OBW 12.13 dBm
2.12906 GHz



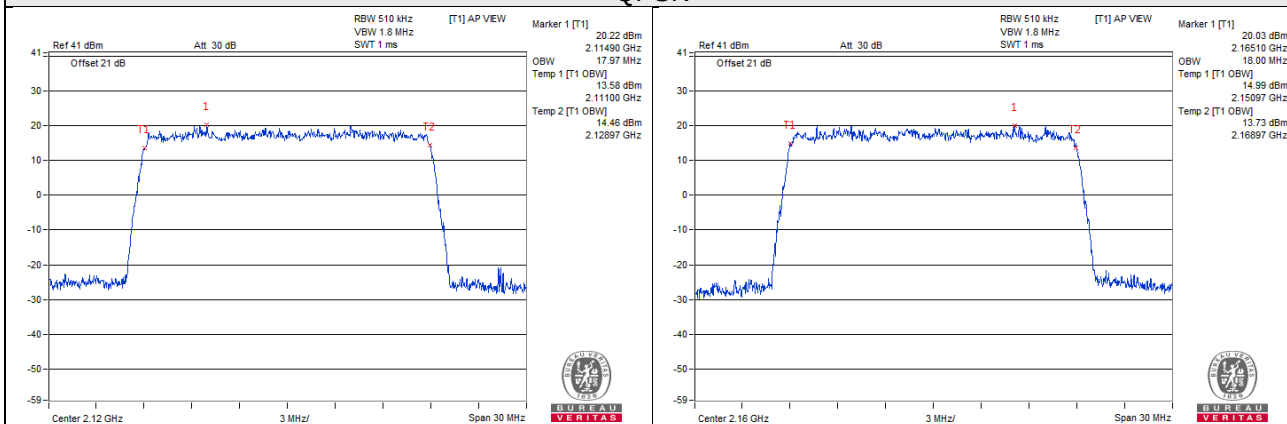
Marker 1 [T1]
18.58 dBm
2.16090 GHz
OBW 18.06 MHz
Temp 1 [T1] OBW 12.87 dBm
2.15100 GHz
Temp 2 [T1] OBW 14.15 dBm
2.16906 GHz

Chain 1

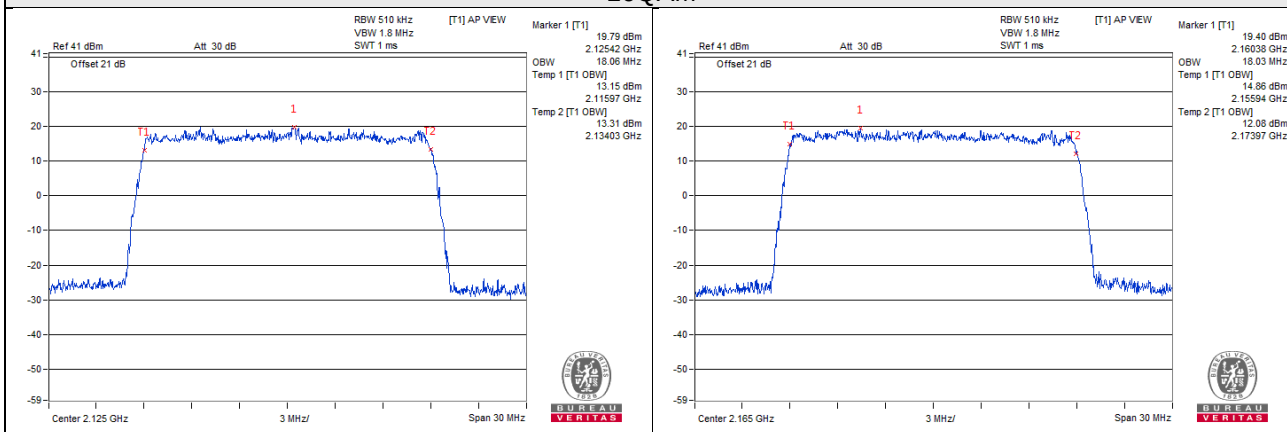
Spectrum Plot of Worst Value

Occupied Bandwidth

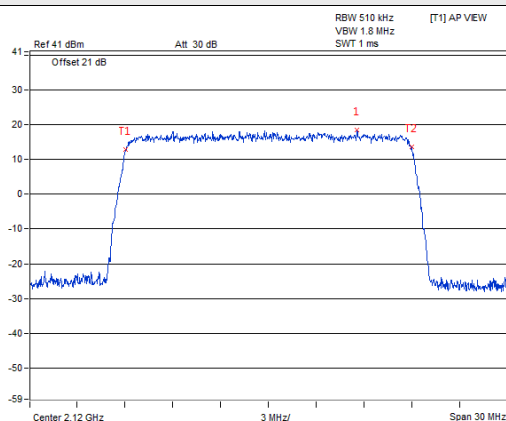
QPSK



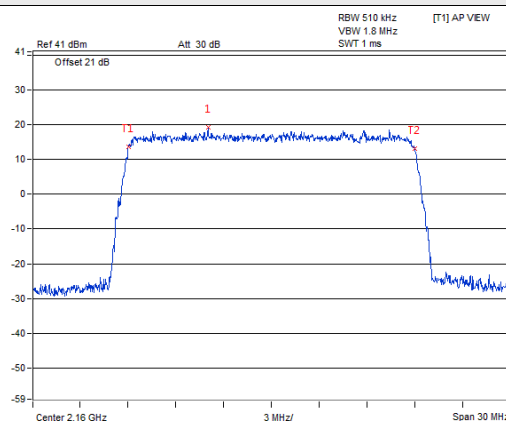
16QAM



64QAM



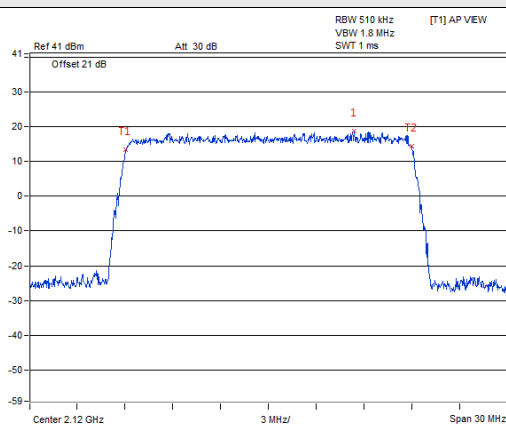
Marker 1 [T1]
18.47 dBm
2.12558 GHz
OBW 18.00 MHz
Temp 1 [T1] OBW 12.78 dBm
2.11100 GHz
Temp 2 [T1] OBW 13.60 dBm
2.12900 GHz



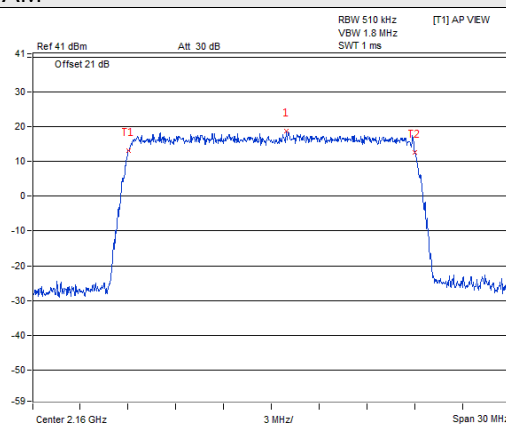
Marker 1 [T1]
19.32 dBm
2.15598 GHz
OBW 18.03 MHz
Temp 1 [T1] OBW 13.75 dBm
2.15097 GHz
Temp 2 [T1] OBW 13.22 dBm
2.16900 GHz



256QAM



Marker 1 [T1]
18.81 dBm
2.12537 GHz
OBW 18.03 MHz
Temp 1 [T1] OBW 13.44 dBm
2.11100 GHz
Temp 2 [T1] OBW 14.29 dBm
2.12903 GHz



Marker 1 [T1]
18.75 dBm
2.16090 GHz
OBW 18.03 MHz
Temp 1 [T1] OBW 13.00 dBm
2.15097 GHz
Temp 2 [T1] OBW 12.54 dBm
2.16900 GHz



20MHz+20MHz Contiguous

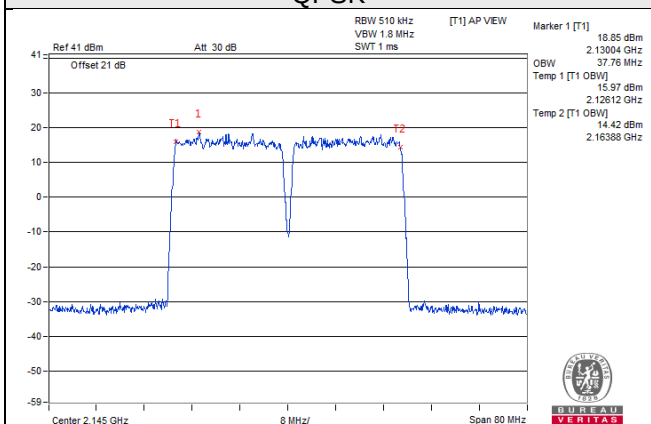
Channel Number	Freq. (MHz)	Occupied Bandwidth (MHz)							
		Chain 0				Chain 1			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
66536+66736	2120+2140	37.68	37.76	37.68	37.76	37.76	37.84	37.68	37.76
66686+66886	2135+2155	37.76	37.84	37.76	37.84	37.76	37.84	37.76	37.76
66836+67036	2150+2170	37.68	37.68	37.60	37.68	37.68	37.68	37.60	37.68

Chain 0

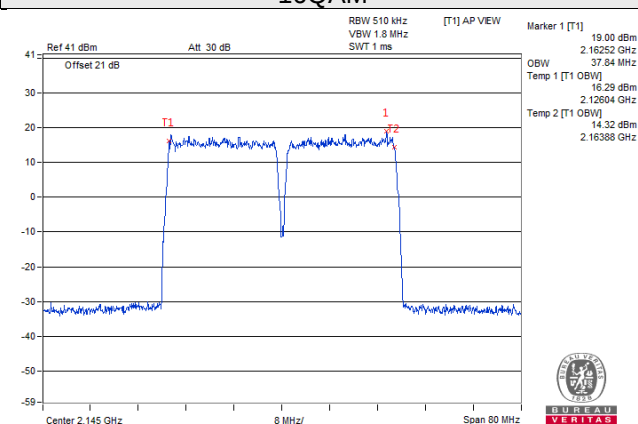
Spectrum Plot of Worst Value

Occupied Bandwidth

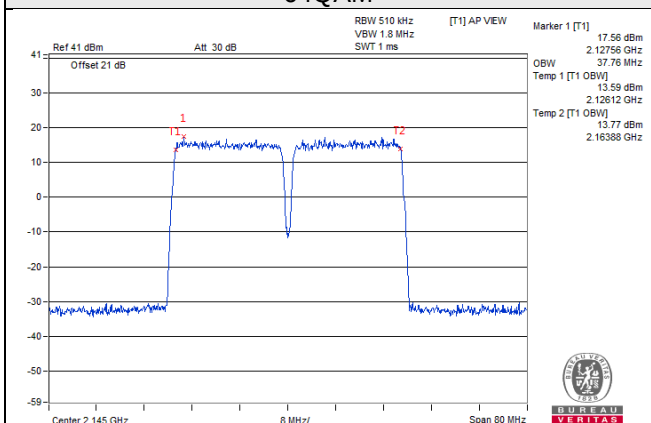
QPSK



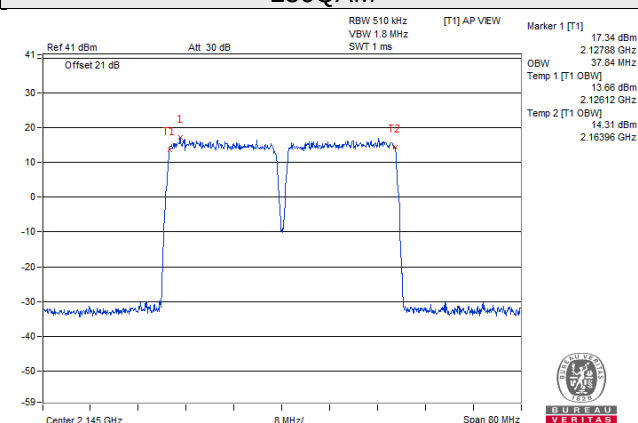
16QAM



64QAM



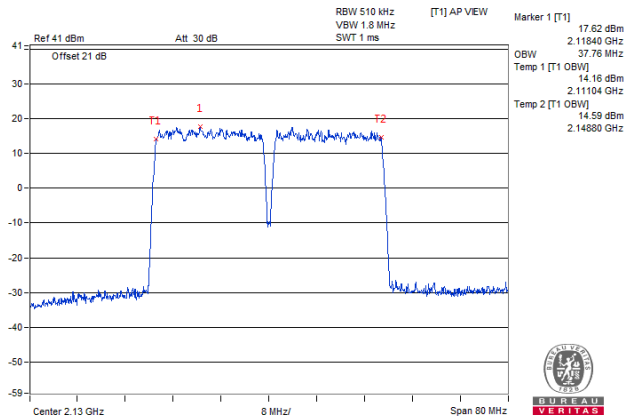
256QAM



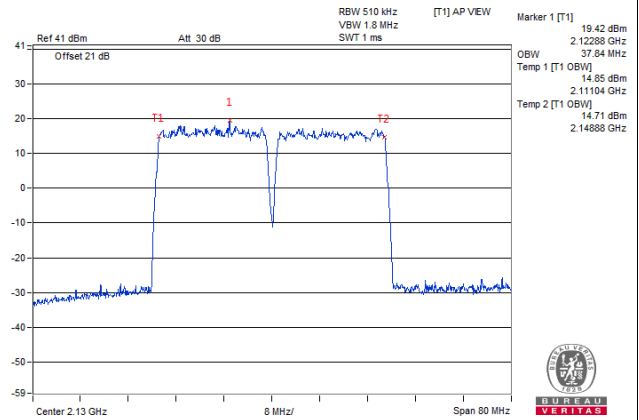
Chain 1

Spectrum Plot of Worst Value Occupied Bandwidth

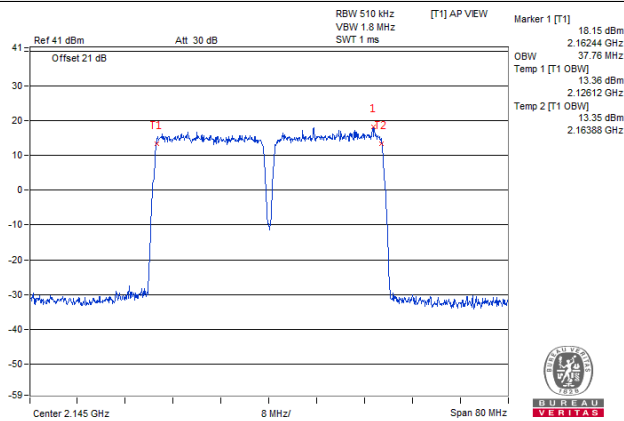
QPSK



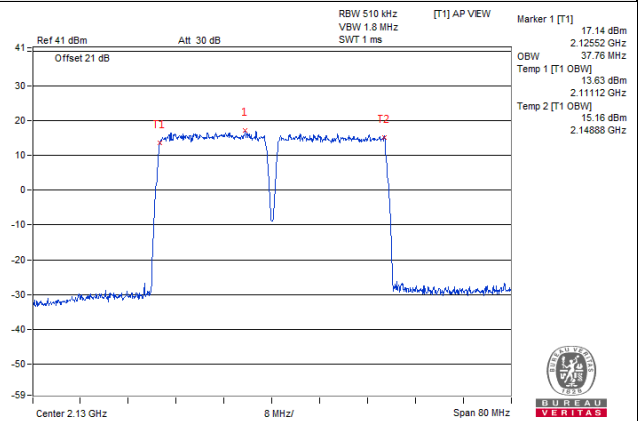
16QAM



64QAM



256QAM



4.5 Channel Edge Measurement

4.5.1 Limits of Band Edge Measurement

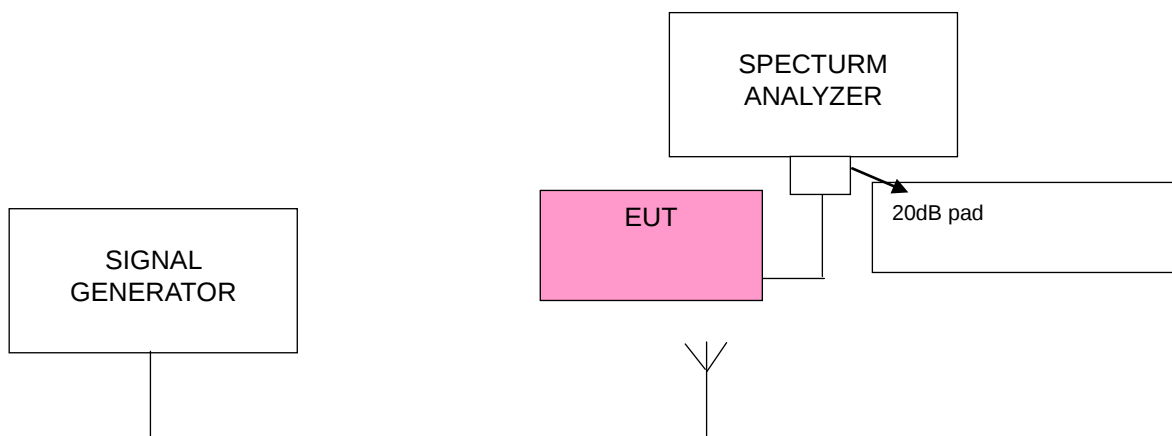
According to FCC 27.53(h) specified the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ dB. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

Note:

This device can be implelement MIMO function, so the limit of spurious emissions needs to be reduced by $10\log(\text{Numbers}_{\text{Ant}})$ according to FCC KDB 662911 D01 guidance.

{The limit is adjusted to $-13\text{dBm} - 10*\log(2) = -16.01\text{dBm}$.}

4.5.2 Test Setup



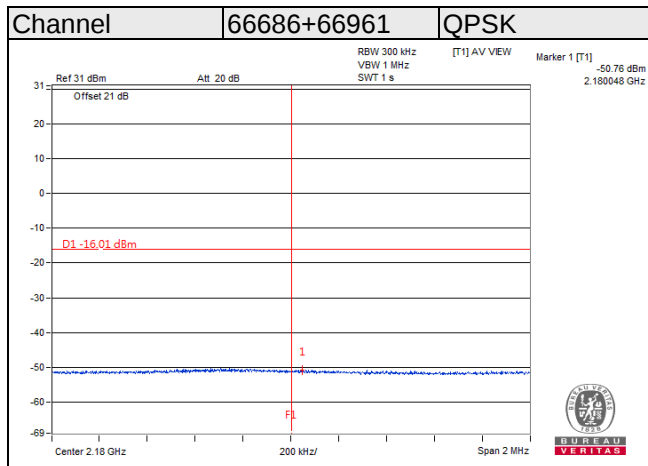
4.5.3 Test Procedures

- The EUT was set up for the rated peak power. The power was measured with Spectrum Analyzer. All measurements were done at 3 channels: low, middle and high operational frequency range.
- The center frequency of spectrum is the band edge frequency and span is 30MHz (Channel Bandwidth: 10MHz) / 40MHz (Channel Bandwidth: 15MHz) / 50MHz (Channel Bandwidth: 25MHz). RBW of the spectrum is 100kHz (Channel Bandwidth: 10MHz) / 100kHz (Channel Bandwidth: 10MHz) / 150kHz (Channel Bandwidth: 15MHz) / 200kHz (Channel Bandwidth: 20MHz).
- Record the max trace plot into the test report.

4.5.4 Test Results

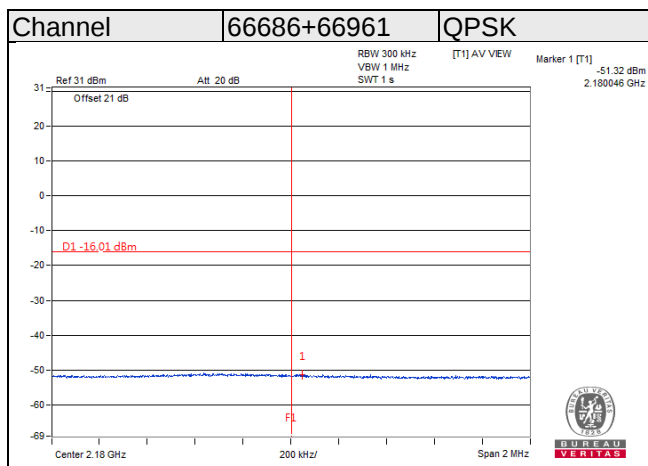
10MHz+15MHz Non-Contiguous GAP 15MHz Chain 0

Channel Number	Freq. (MHz)	QPSK					PASS /FAIL
		Bandedge (dBm)				Limit(dBm)	
		Low	Margin	High	Margin	Maximum	
66686+66961	2135+2162.5	-45.14	-29.13	-50.76	-34.75	-16.01	PASS



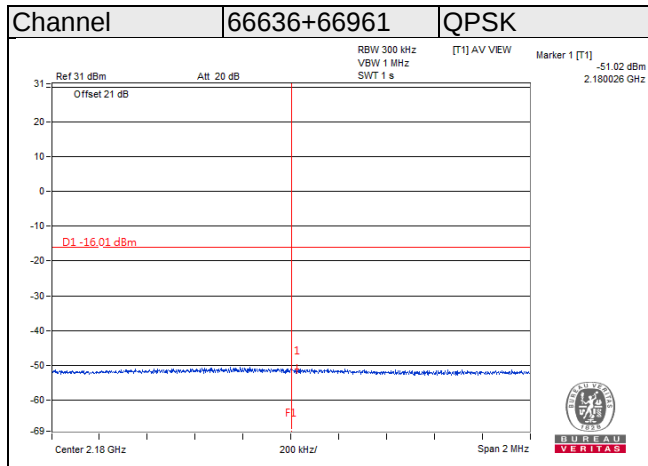
10MHz+15MHz Non-Contiguous GAP 15MHz Chain 1

Channel Number	Freq. (MHz)	QPSK					PASS /FAIL
		Bandedge (dBm)				Limit(dBm)	
		Low	Margin	High	Margin	Maximum	
66636+66961	2130+2162.5	-47.06	-31.05	-51.32	-35.31	-16.01	PASS



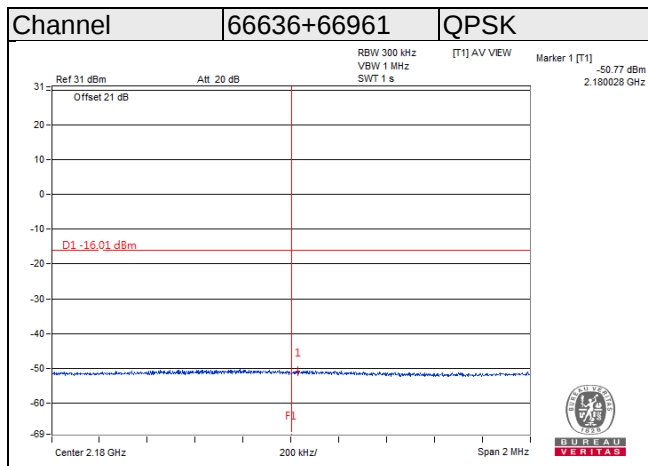
10MHz+15MHz Non-Contiguous GAP 20MHz Chain 0

Channel Number	Freq. (MHz)	QPSK					PASS /FAIL
		Bandedge (dBm)				Limit(dBm)	
		Low	Margin	High	Margin	Maximum	
66636+66961	2130+2162.5	-47.95	-31.94	-51.02	-35.01	-16.01	PASS



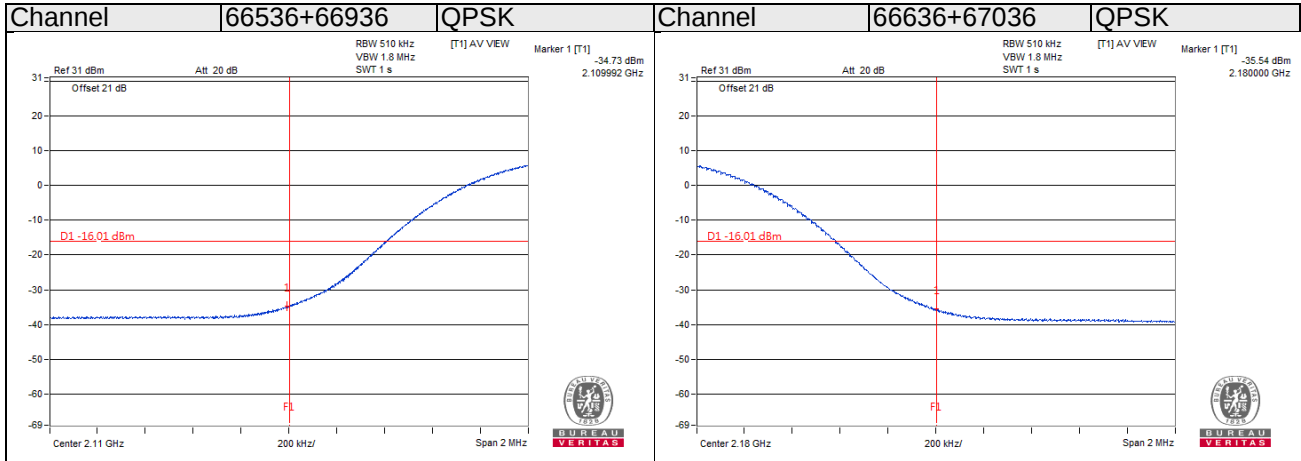
10MHz+15MHz Non-Contiguous GAP 20MHz Chain 1

Channel Number	Freq. (MHz)	QPSK					PASS /FAIL
		Bandedge (dBm)				Limit(dBm)	
		Low	Margin	High	Margin	Maximum	
66636+66961	2130+2162.5	-47.49	-31.48	-50.77	-34.76	-16.01	PASS



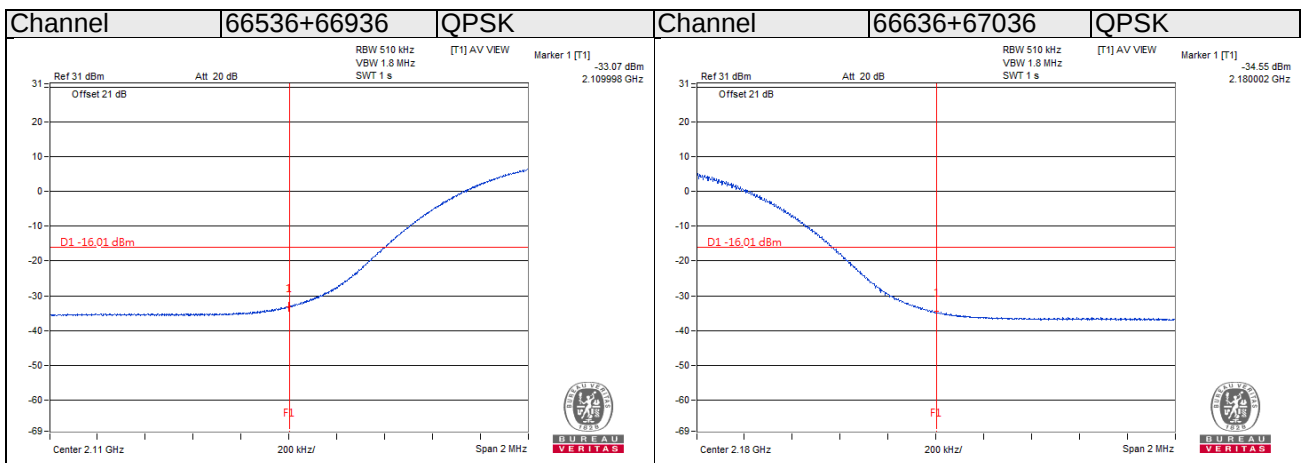
20MHz+20MHz Non-Contiguous GAP 20MHz Chain 0

Channel Number	Freq. (MHz)	QPSK					PASS /FAIL
		Bandedge (dBm)				Limit(dBm)	
		Low	Margin	High	Margin	Maximum	
66636+66961	2120+2160	-34.73	-18.72	NA	--	-16.01	PASS
66636+67036	2130+2170	NA	--	-35.54	-19.53	-16.01	PASS



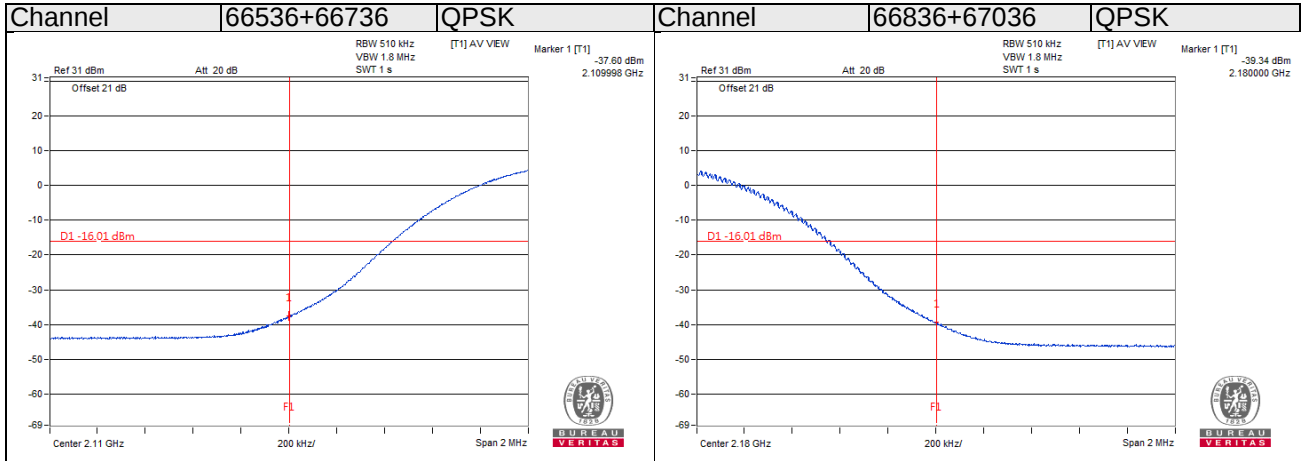
20MHz+20MHz Non-Contiguous GAP 20MHz Chain 1

Channel Number	Freq. (MHz)	QPSK					PASS /FAIL
		Bandedge (dBm)				Limit(dBm)	
		Low	Margin	High	Margin	Maximum	
66636+66961	2120+2160	-33.07	-17.06	NA	--	-16.01	PASS
66636+67036	2130+2170	NA	--	-34.55	-18.54	-16.01	PASS



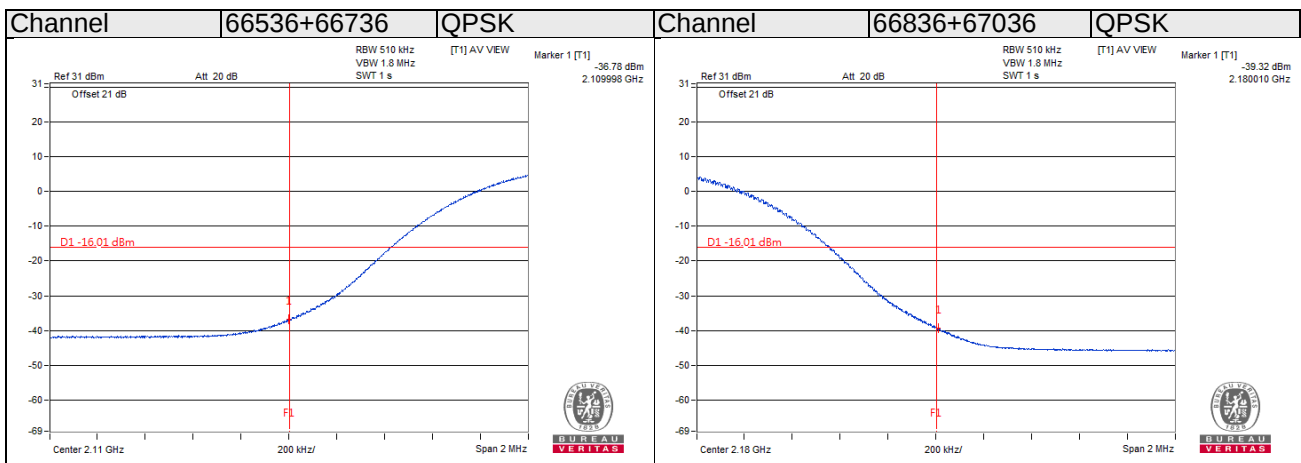
20MHz+20MHz Contiguous Chain 0

Channel Number	Freq. (MHz)	QPSK					PASS /FAIL
		Bandedge (dBm)				Limit(dBm)	
		Low	Margin	High	Margin	Maximum	
66536+66736	2120+2140	-37.6	-21.59	NA	--	-16.01	PASS
66836+67036	2150+2170	NA	--	-39.34	-23.33	-16.01	PASS



20MHz+20MHz Contiguous Chain 1

Channel Number	Freq. (MHz)	QPSK					PASS /FAIL
		Bandedge (dBm)				Limit(dBm)	
		Low	Margin	High	Margin	Maximum	
66536+66736	2120+2140	-36.78	-20.77	NA	--	-16.01	PASS
66836+67036	2150+2170	NA	--	-39.32	-23.31	-16.01	PASS

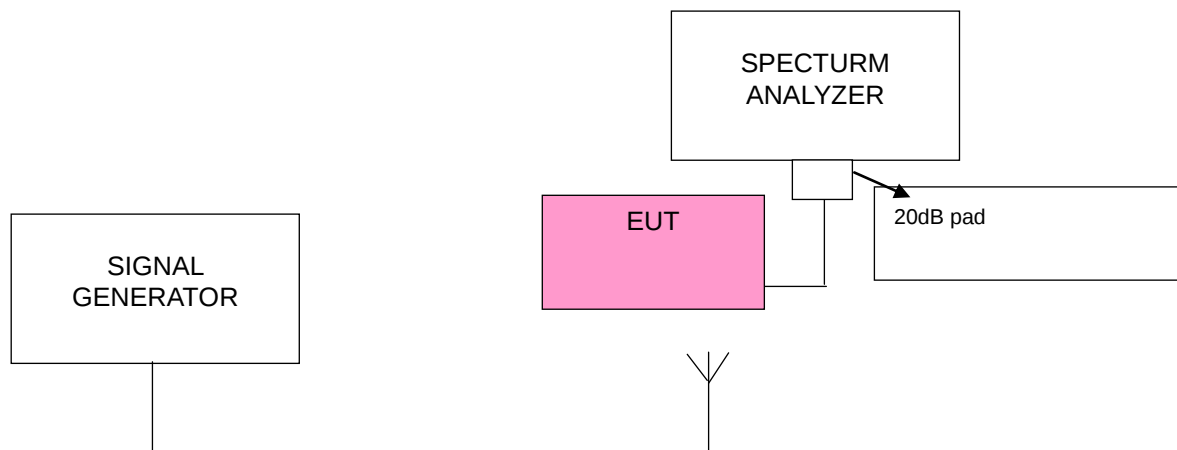


4.6 Peak to Average Ratio

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

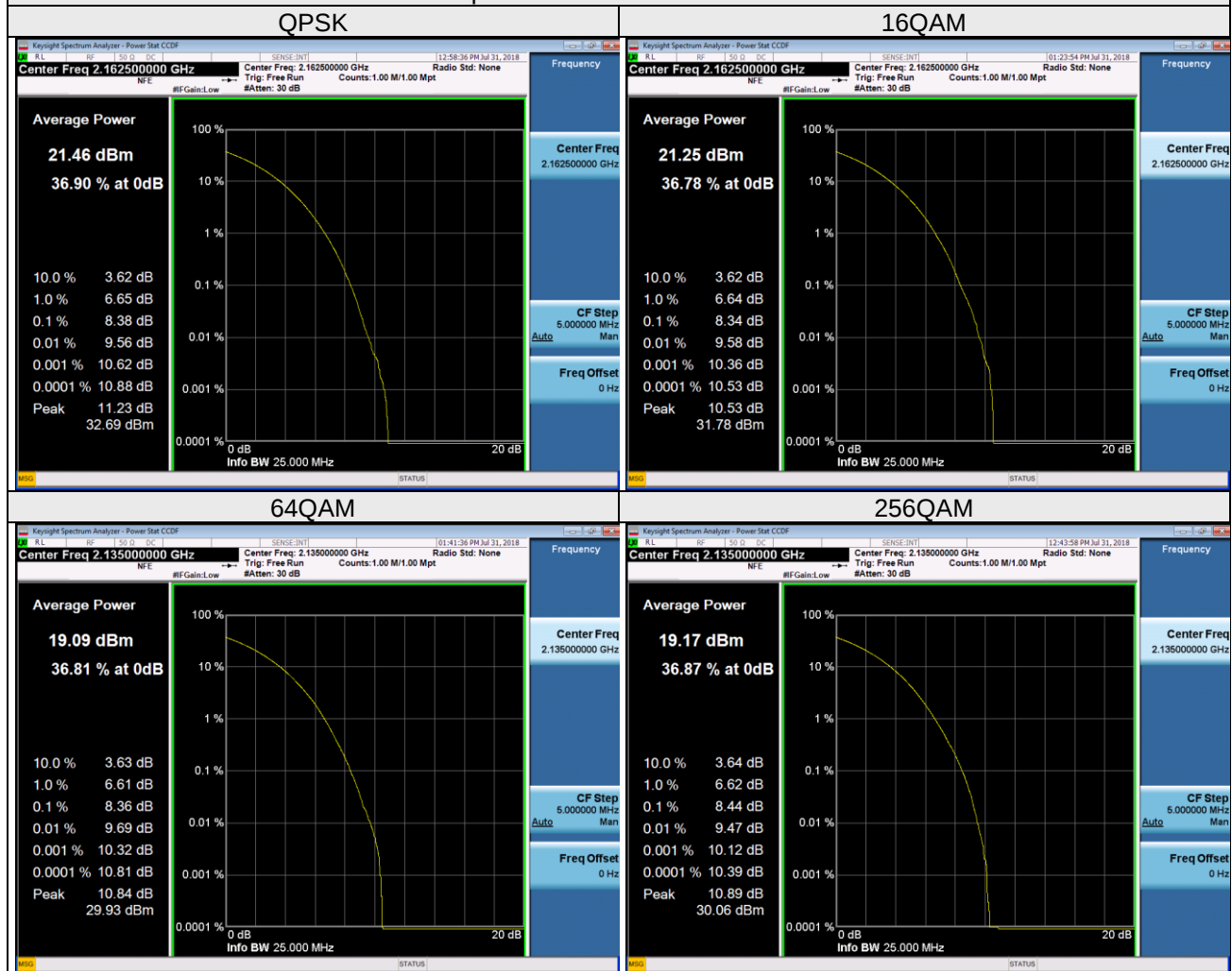
1. Set resolution/measurement bandwidth $\geq$ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1%.

4.6.4 Test Results

10MHz+15MHz Non-Contiguous GAP 15MHz Chain 0

Channel	Frequency (MHz)	Peak To Average Ratio (dB)							
		Low channel				High Channel			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
66686+66961	2135+2162.5	8.34	8.29	8.36	8.44	8.38	8.34	8.34	8.31

Spectrum Plot of Worst Value

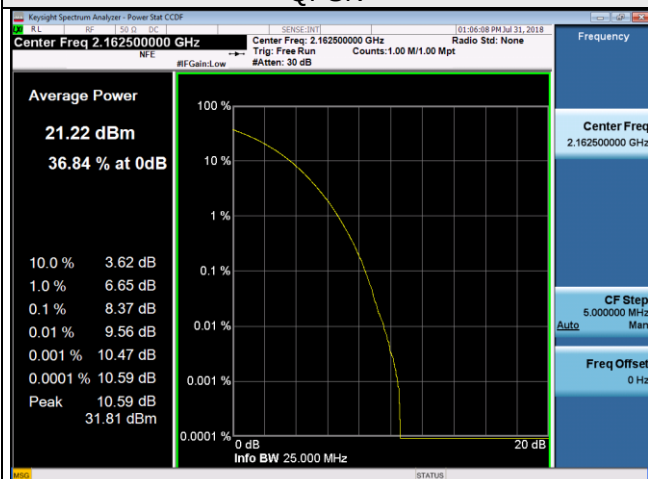


10MHz+15MHz Non-Contiguous GAP 15MHz Chain 1

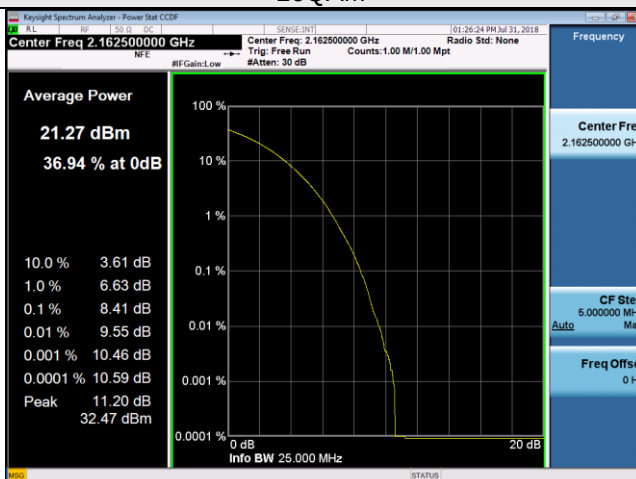
Channel	Frequency (MHz)	Peak To Average Ratio (dB)							
		Low channel				High Channel			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
66686+66961	2135+2162.5	8.32	8.31	8.42	8.47	8.37	8.41	8.38	8.39

Spectrum Plot of Worst Value

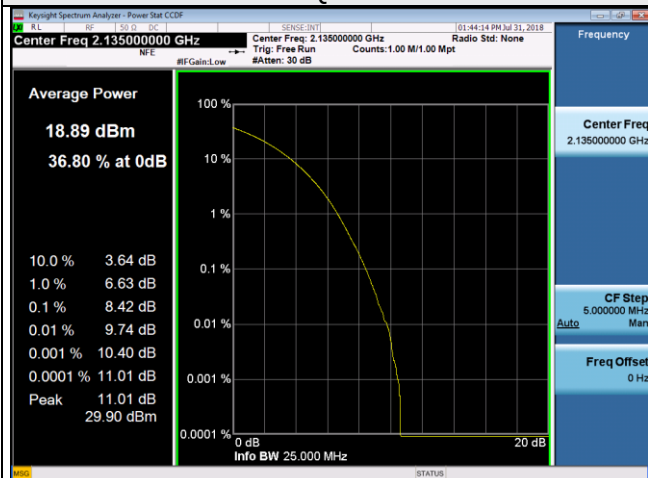
QPSK



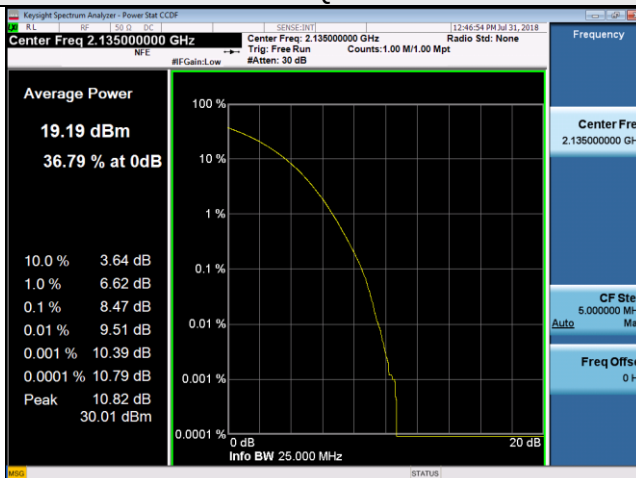
16QAM



64QAM



256QAM

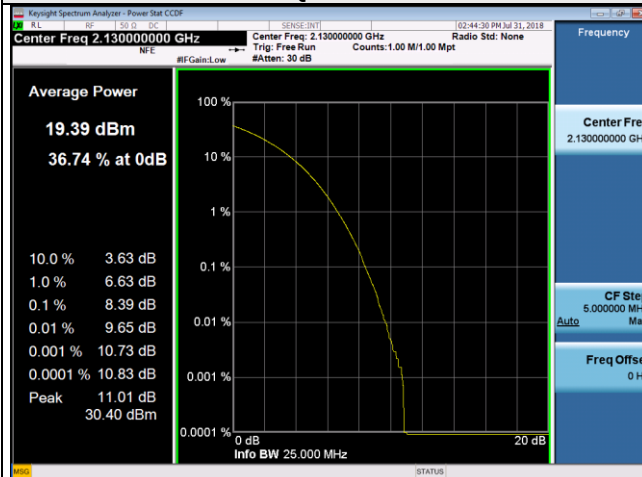


10MHz+15MHz Non-Contiguous GAP 20MHz Chain 0

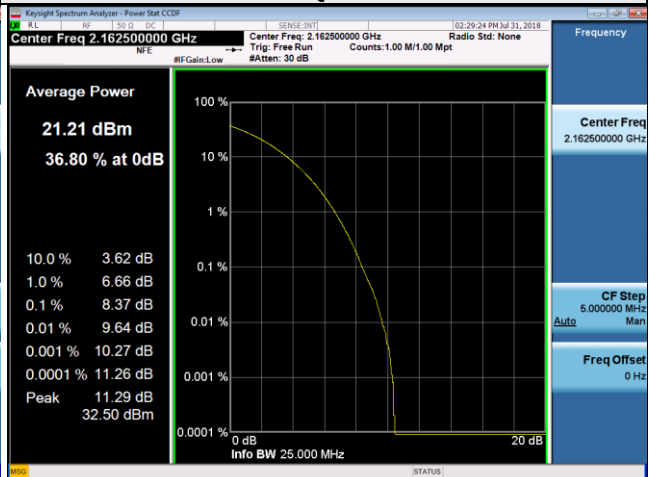
Channel	Frequency (MHz)	Peak To Average Ratio (dB)							
		Low channel				High Channel			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
66636+66961	2130+2162.5	8.39	8.31	8.43	8.46	8.37	8.37	8.38	8.39

Spectrum Plot of Worst Value

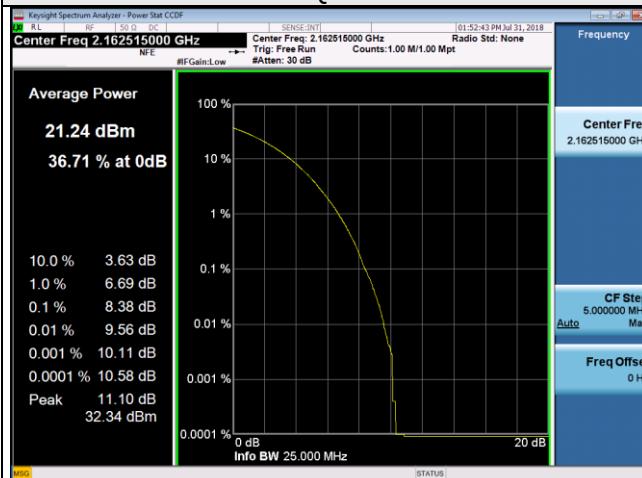
QPSK



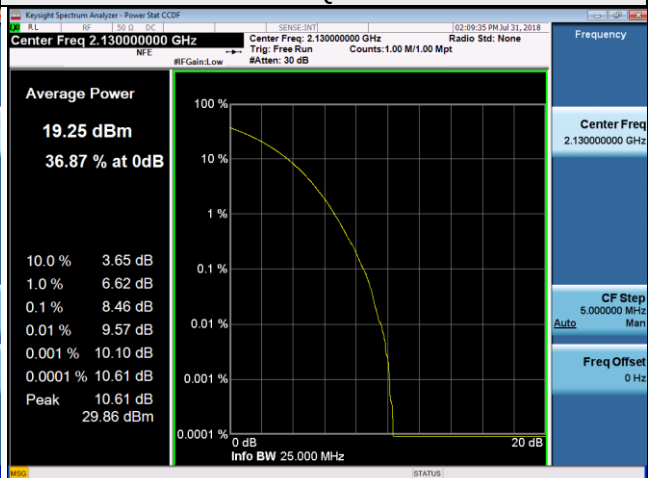
16QAM



64QAM



256QAM

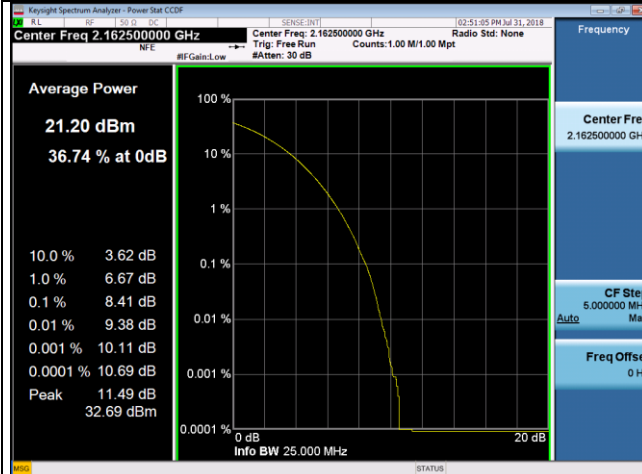


10MHz+15MHz Non-Contiguous GAP 20MHz Chain 1

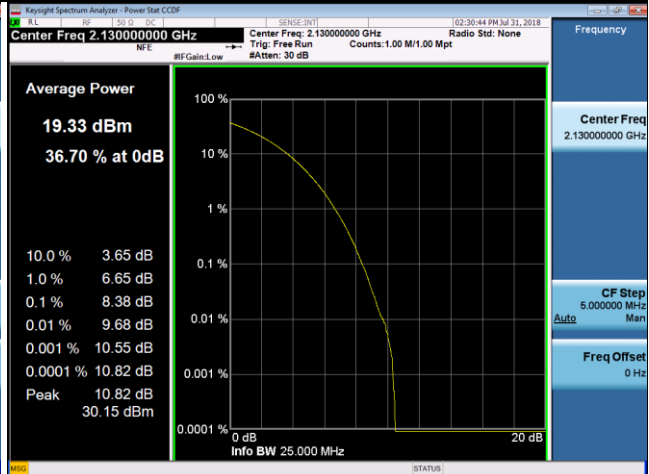
Channel	Frequency (MHz)	Peak To Average Ratio (dB)							
		Low channel				High Channel			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
66636+66961	2130+2162.5	8.35	8.38	8.40	8.46	8.41	8.38	8.34	8.43

Spectrum Plot of Worst Value

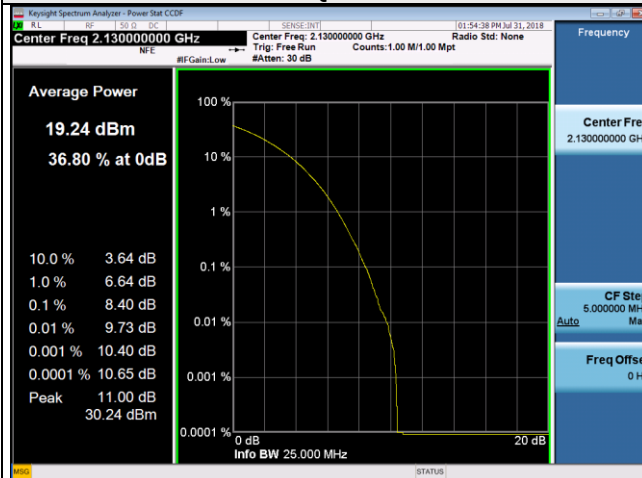
QPSK



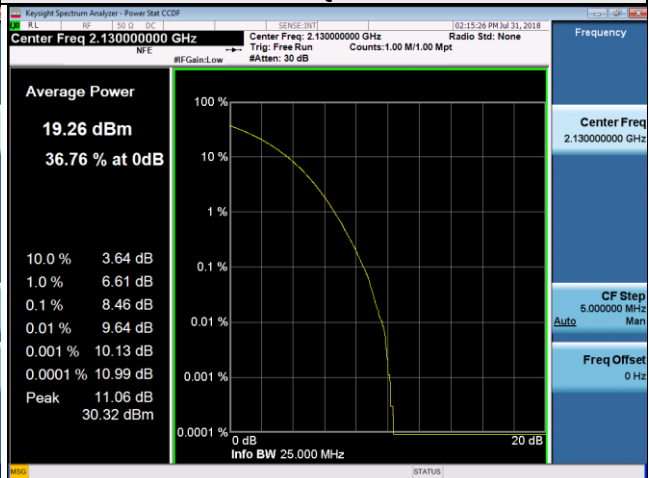
16QAM



64QAM



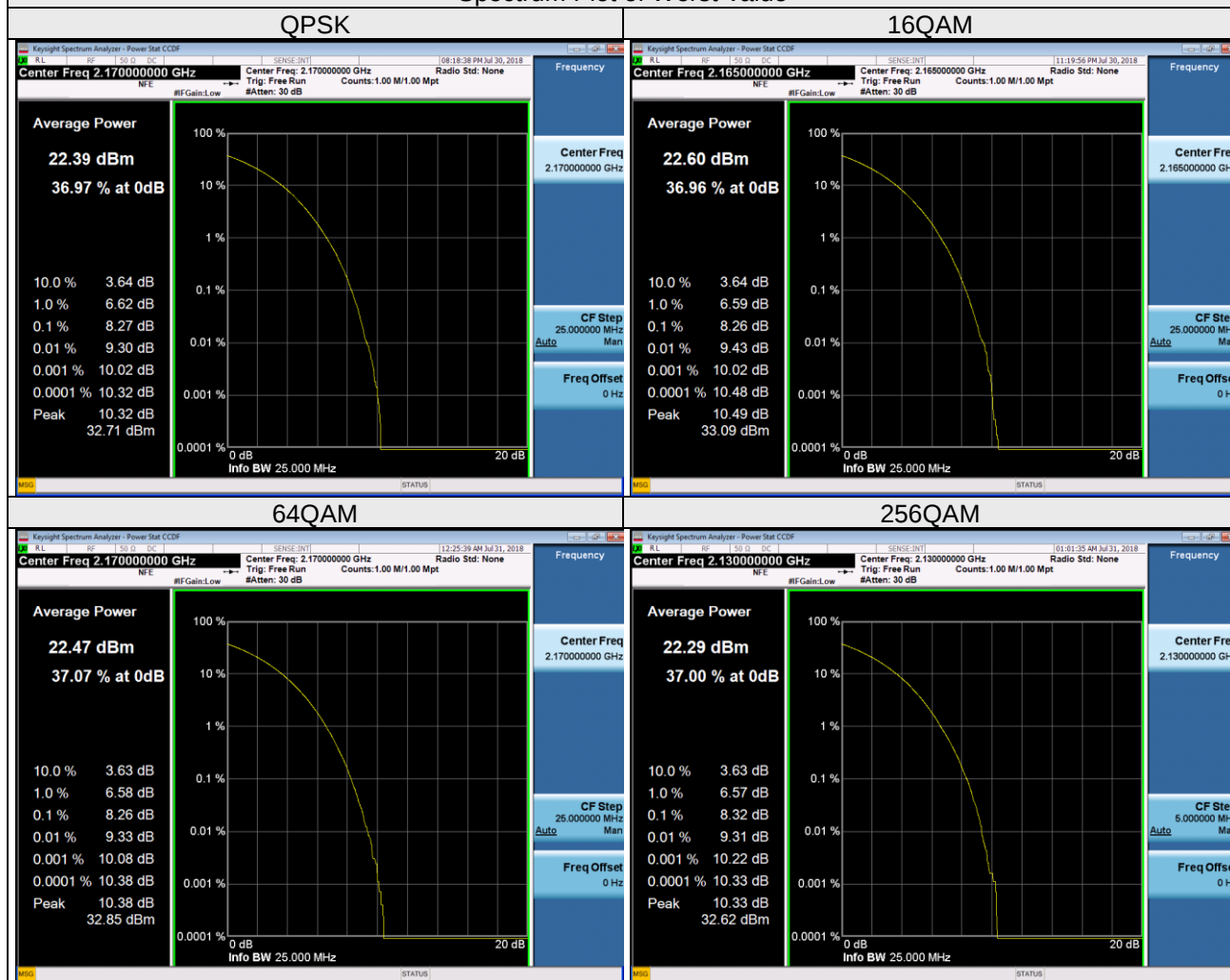
256QAM



20MHz+20MHz Non-Contiguous GAP 20MHz Chain 0

Channel	Frequency (MHz)	Peak To Average Ratio (dB)							
		Low channel				High Channel			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
66536+66936	2120+2160	8.23	8.24	8.19	8.21	8.25	8.22	8.19	8.21
66586+66986	2125+2165	8.25	8.22	8.20	8.20	8.23	8.26	8.20	8.23
66636+67036	2130+2170	8.24	8.22	8.19	8.32	8.27	8.23	8.26	8.26

Spectrum Plot of Worst Value



20MHz+20MHz Non-Contiguous GAP 20MHz Chain 1

Channel	Frequency (MHz)	Peak To Average Ratio (dB)							
		Low channel				High Channel			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
66536+66936	2120+2160	8.24	8.24	8.25	8.25	8.24	8.25	8.23	8.23
66586+66986	2125+2165	8.23	8.23	8.22	8.25	8.23	8.24	8.26	8.24
66636+67036	2130+2170	8.22	8.21	8.18	8.30	8.24	8.28	8.24	8.26

Spectrum Plot of Worst Value

