

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.

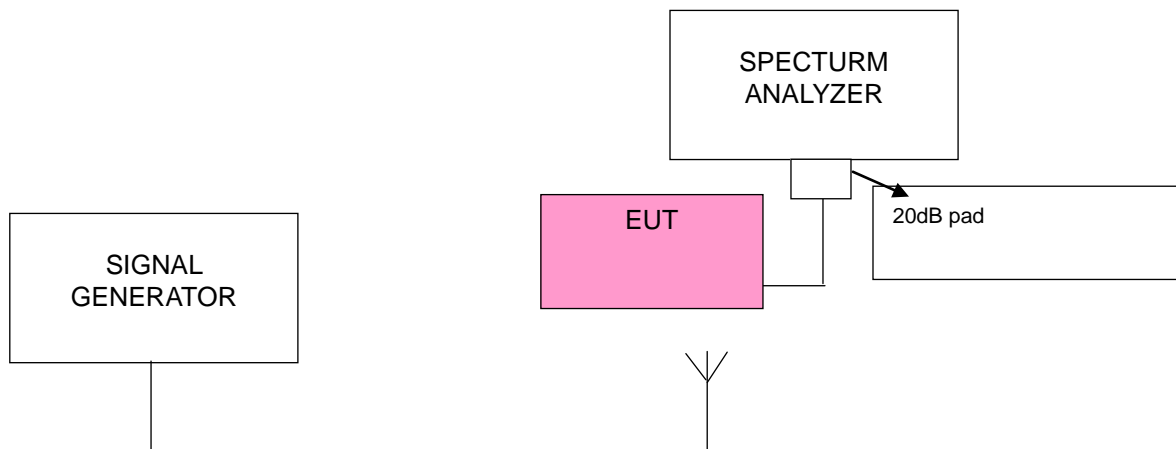
Occupied Bandwidth

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

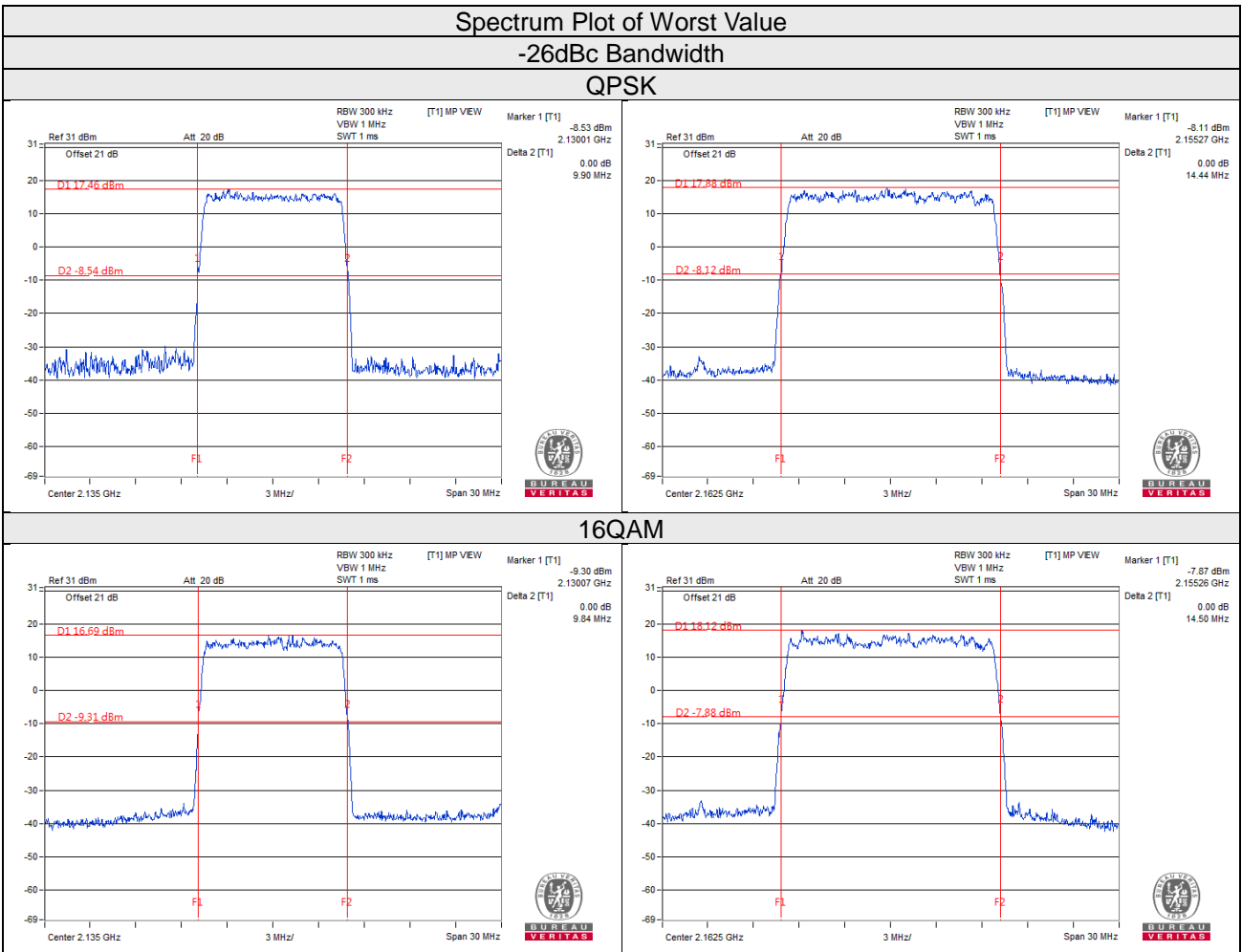


4.4.4 Test Results (-26dBc Bandwidth)

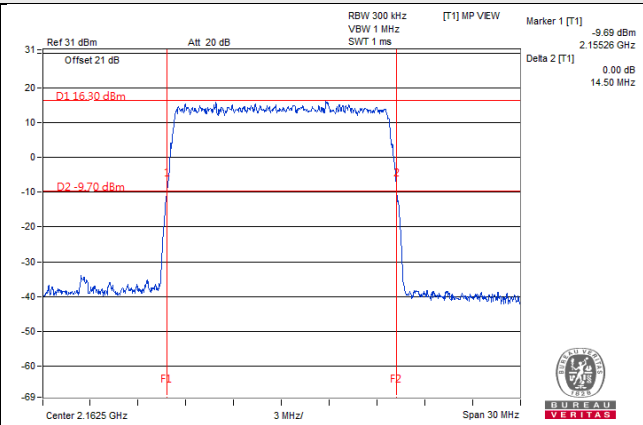
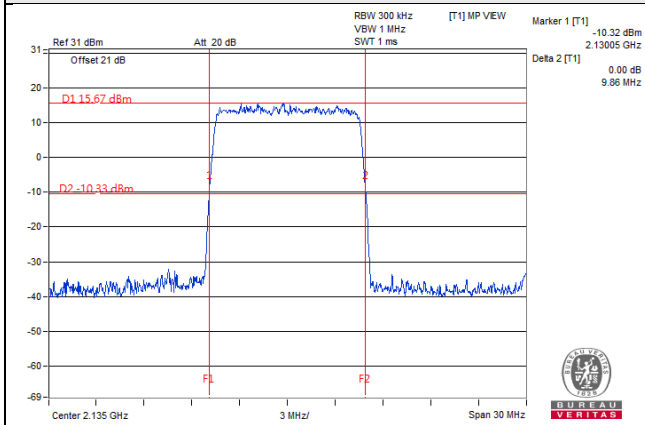
10MHz+15MHz Non-Contiguous GAP 15MHz

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

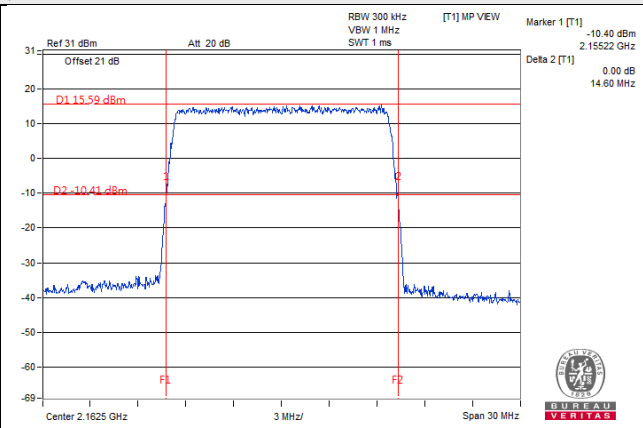
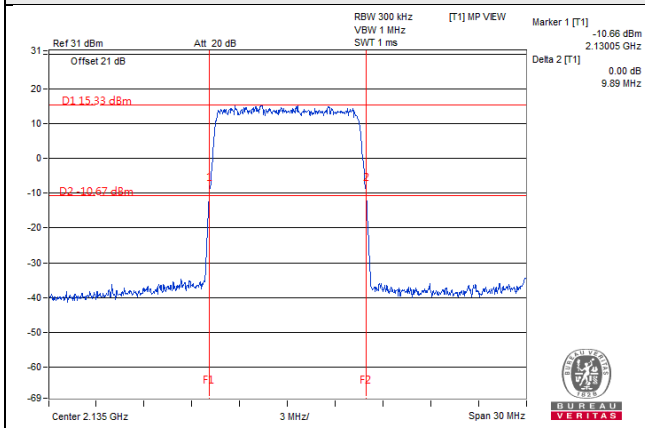
Chain 0



64QAM



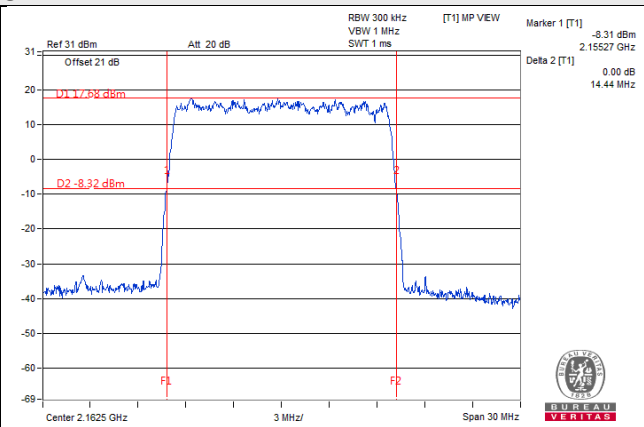
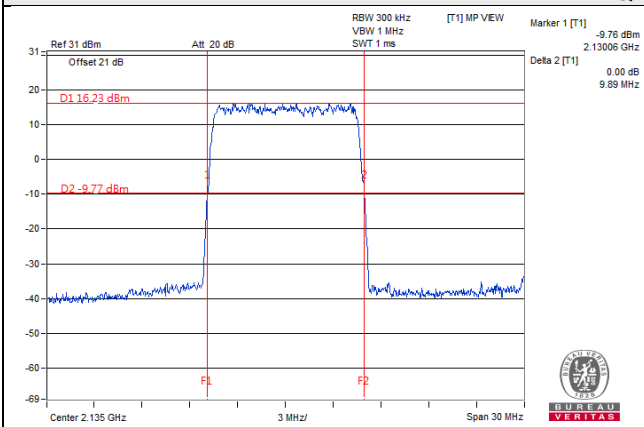
256QAM



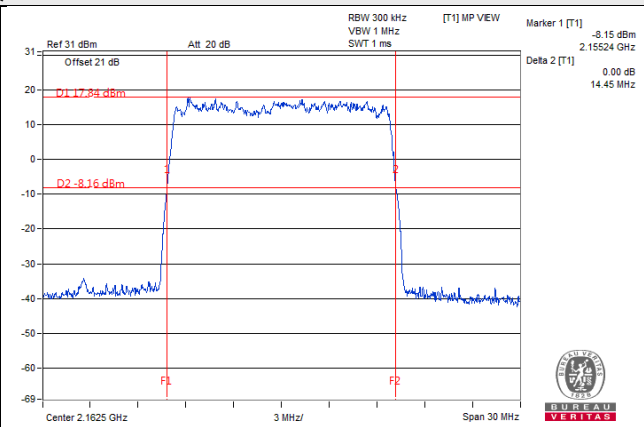
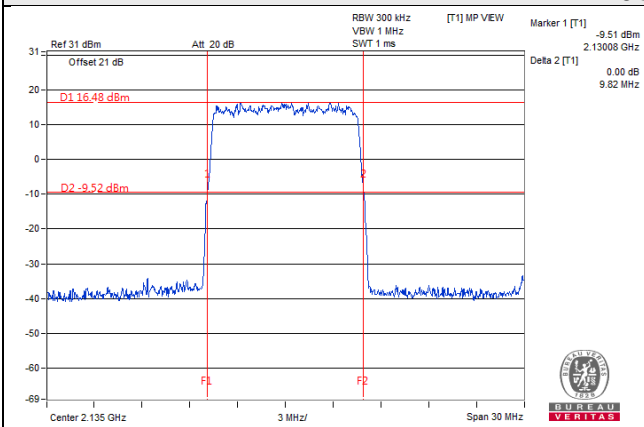
Chain 1

Spectrum Plot of Worst Value
-26dBc Bandwidth

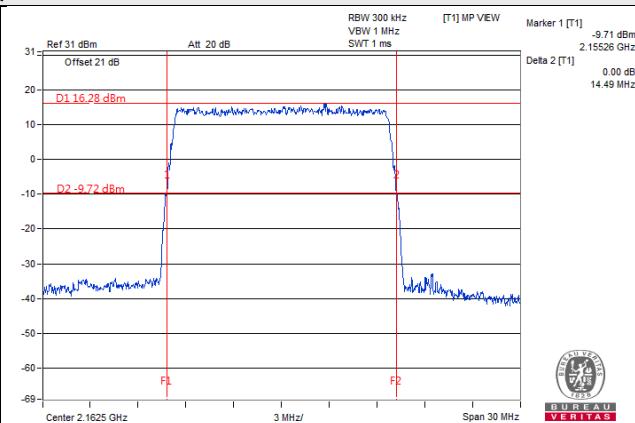
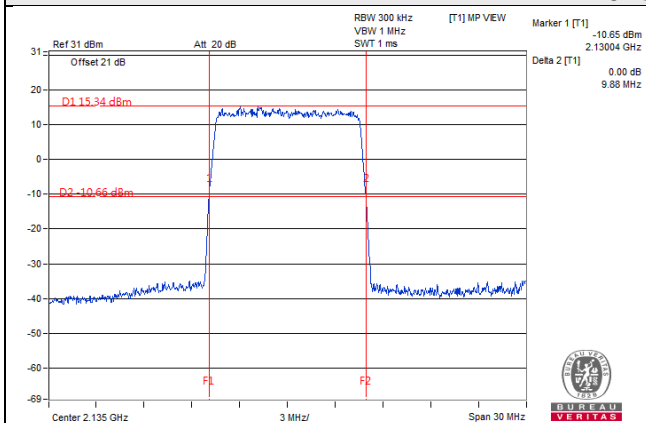
QPSK



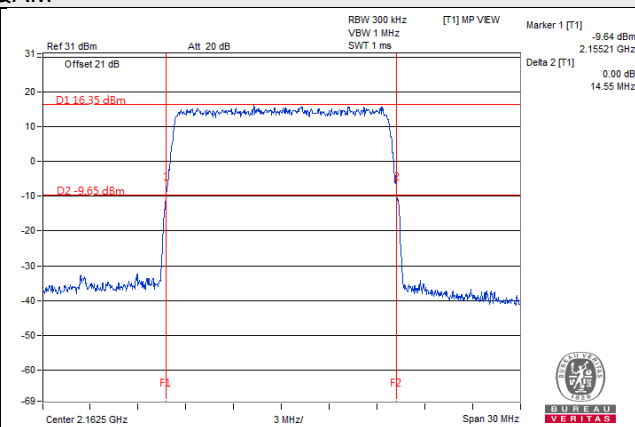
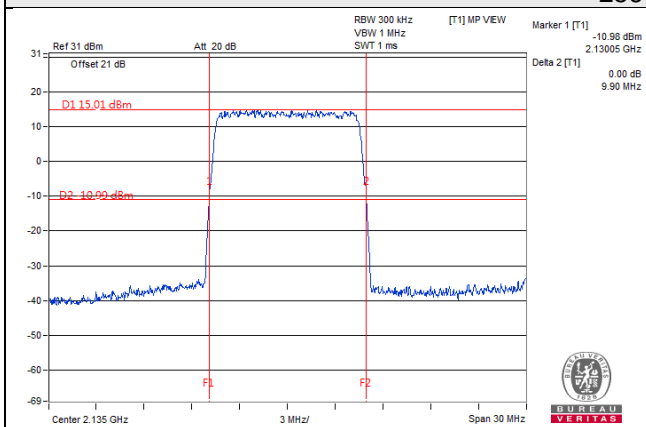
16QAM



64QAM



256QAM



10MHz+15MHz Non-Contiguous GAP 20MHz

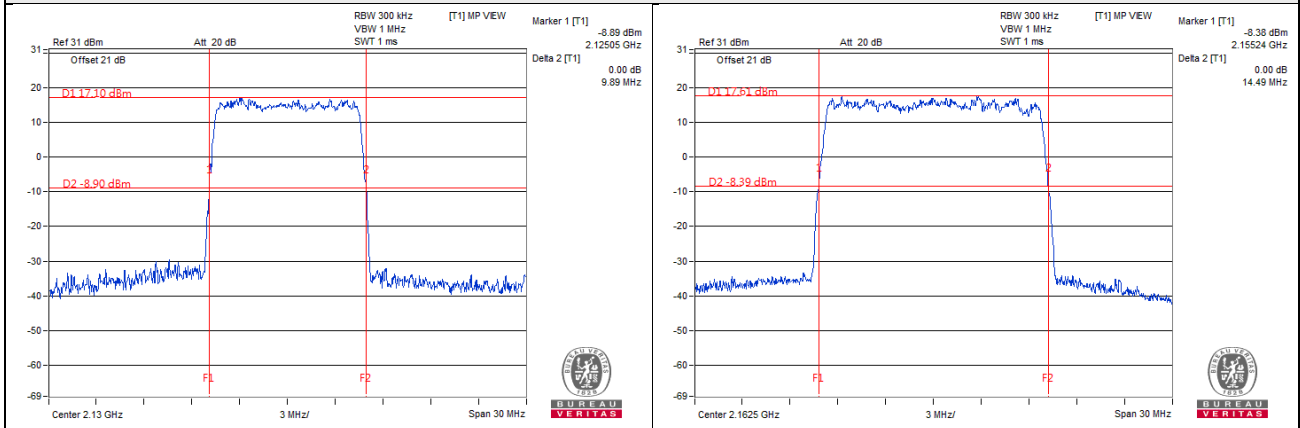
Channel Number	Freq. (MHz)	26dB Down Bandwidth (MHz)							
		Chain 0				Chain 1			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
66636+66961	2130+2162.5	24.38	24.41	24.42	23.44	24.38	24.33	24.45	24.46

Chain 0

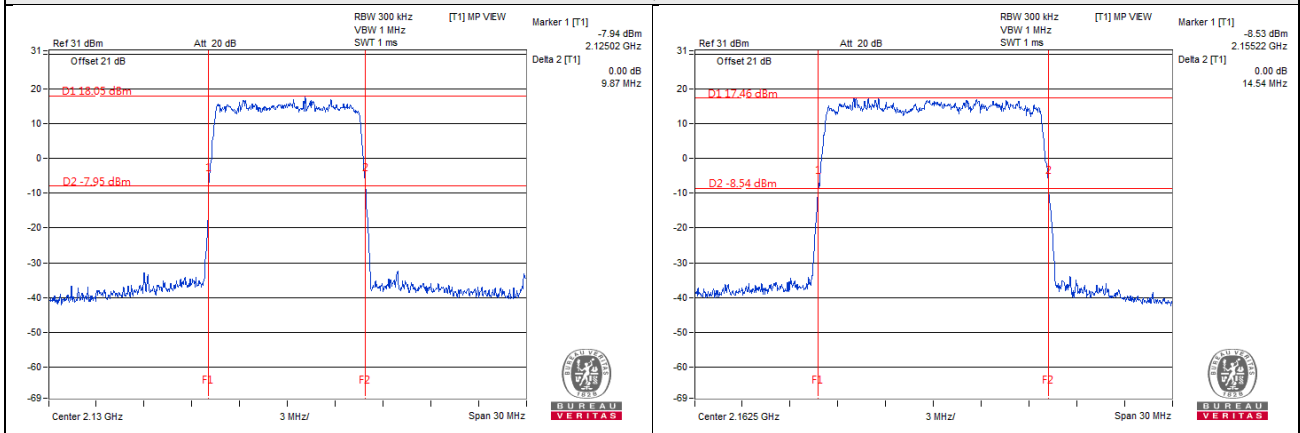
Spectrum Plot of Worst Value

-26dBc Bandwidth

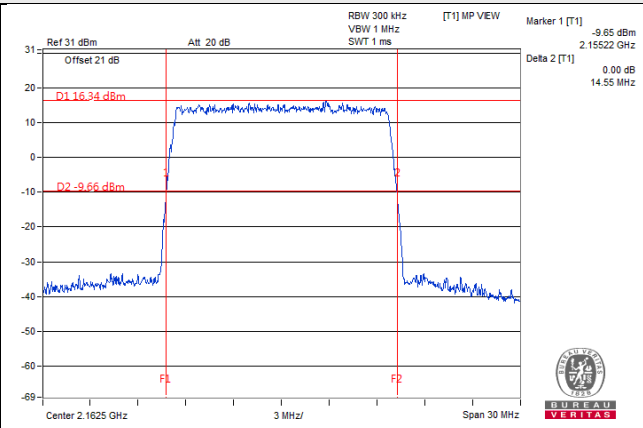
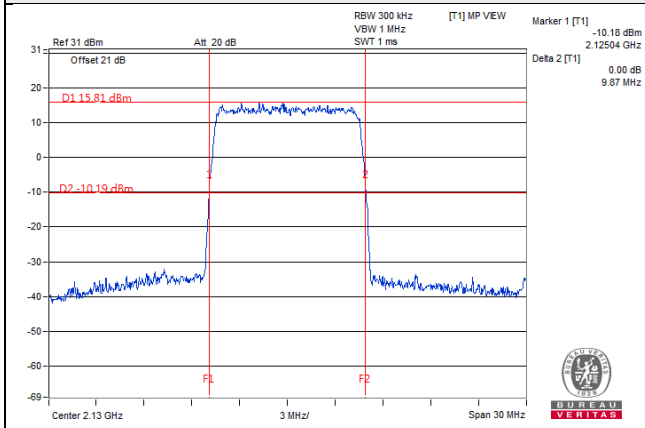
QPSK



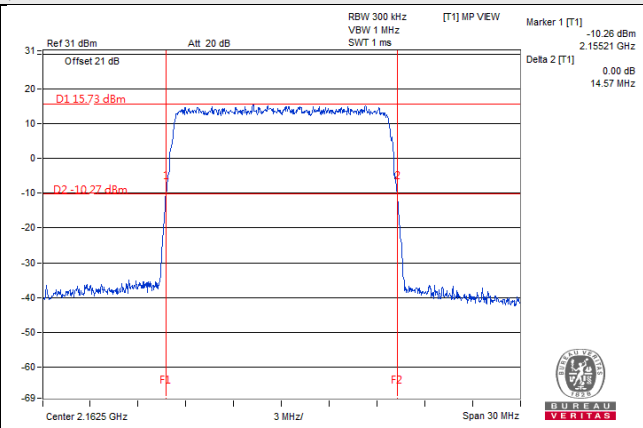
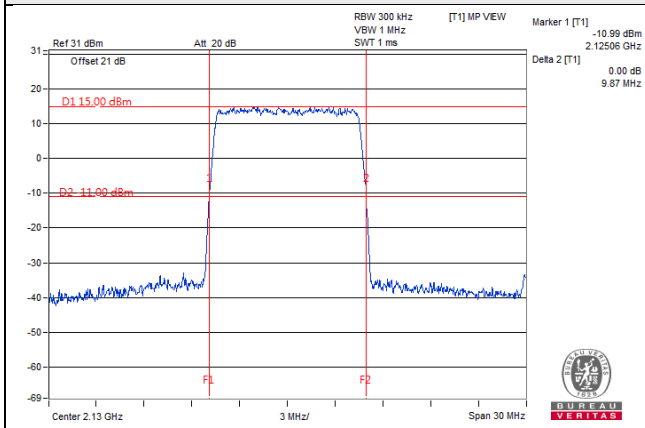
16QAM



64QAM



256QAM

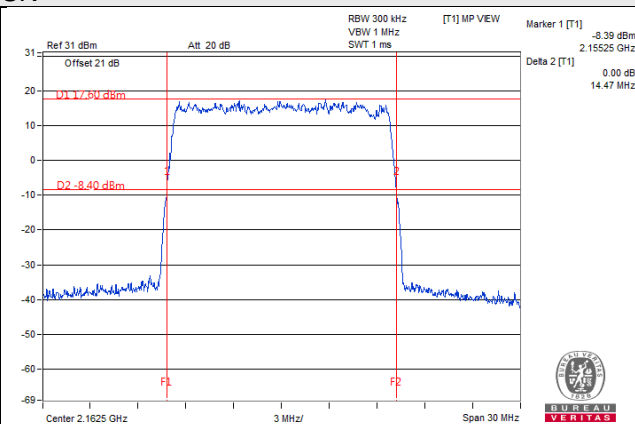
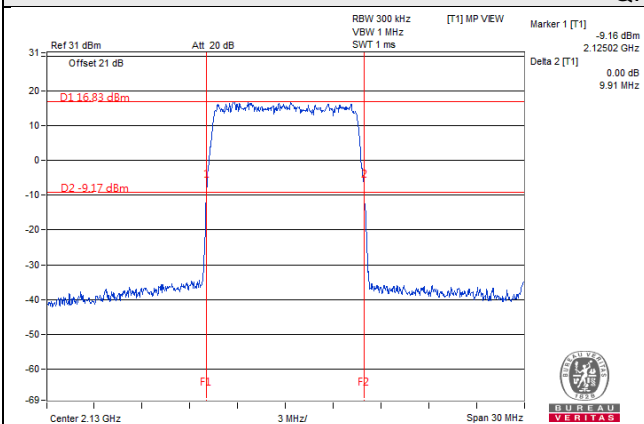


Chain 1

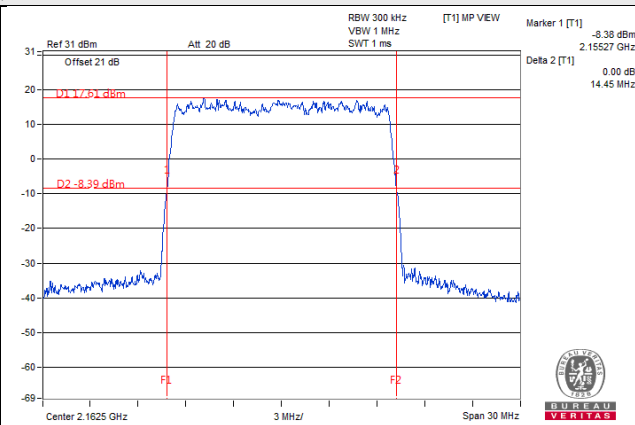
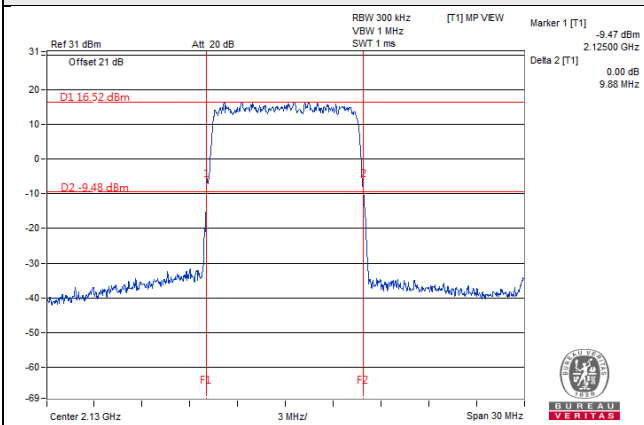
Spectrum Plot of Worst Value

-26dBc Bandwidth

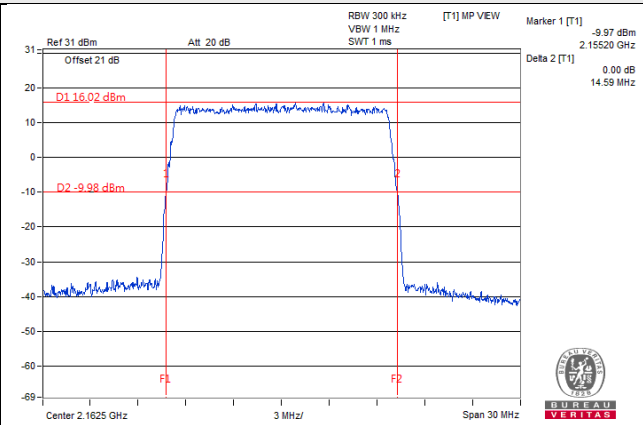
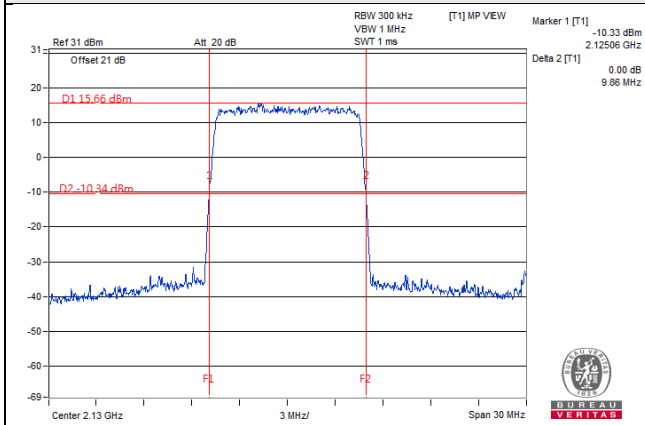
QPSK



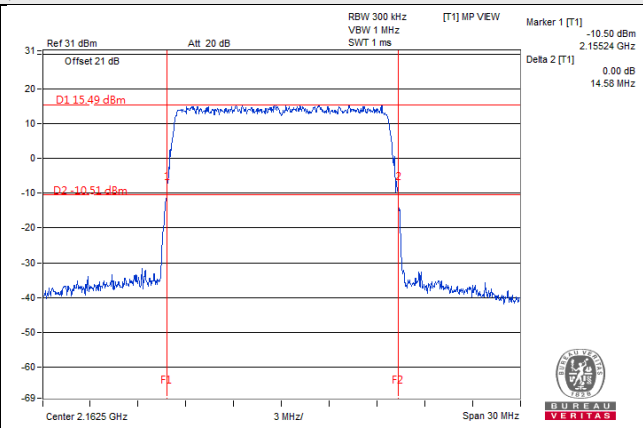
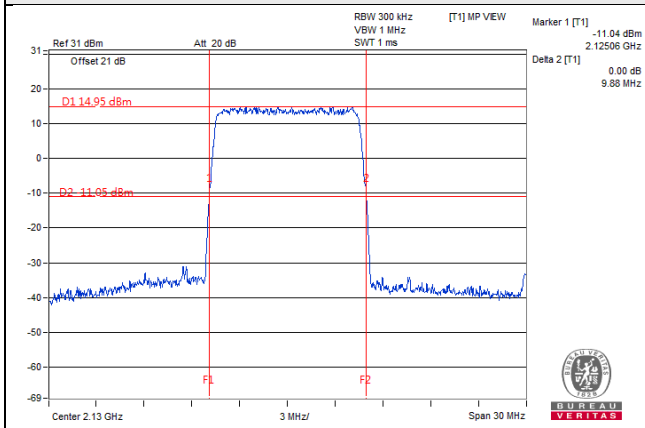
16QAM



64QAM



256QAM



20MHz+20MHz Non-Contiguous GAP 20MHz

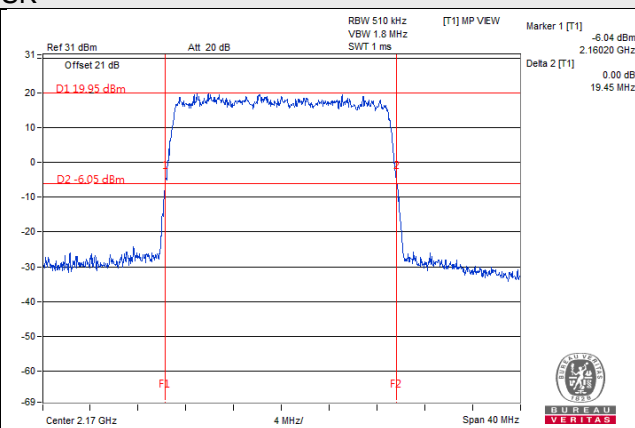
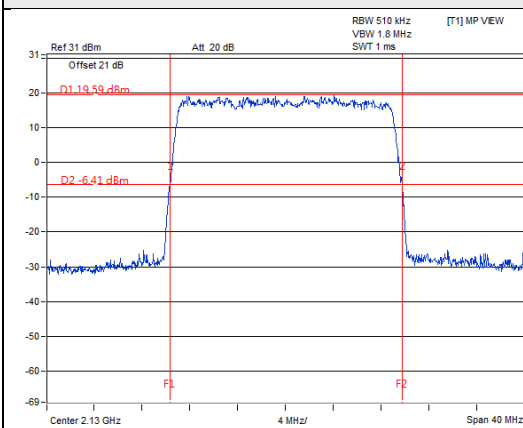
Channel Number	Freq. (MHz)	26dB Down Bandwidth (MHz)							
		Chain 0				Chain 1			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
66536+66936	2120+2160	38.86	39.01	39.11	39.07	38.93	39.10	39.08	39.02
66586+66986	2125+2165	38.81	39.05	39.07	39.09	38.86	38.94	38.93	39.20
66636+67036	2130+2170	38.92	38.86	38.97	39.16	38.86	39.14	39.04	39.18

Chain 0

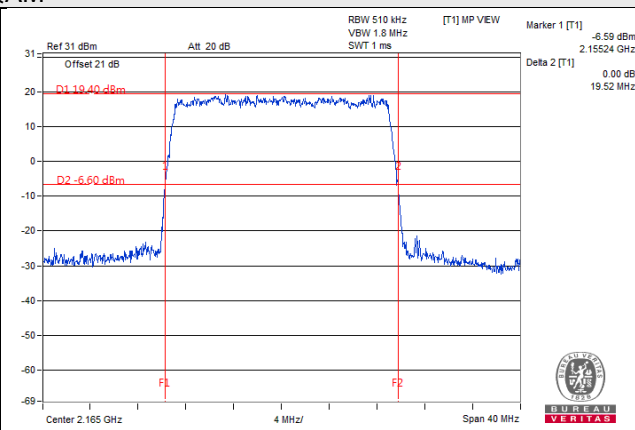
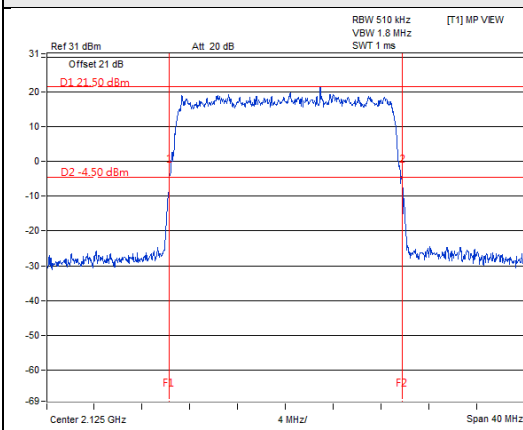
Spectrum Plot of Worst Value

-26dBc Bandwidth

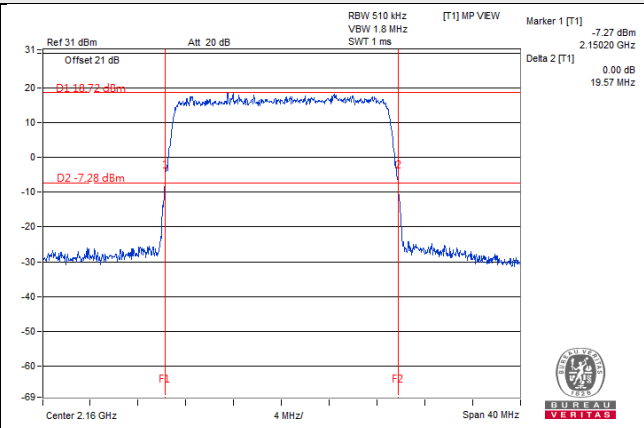
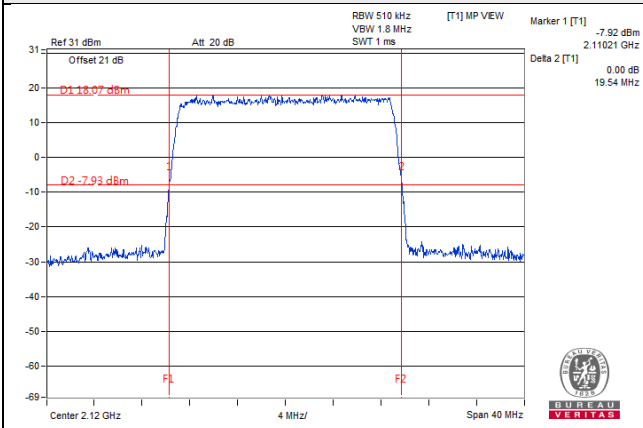
QPSK



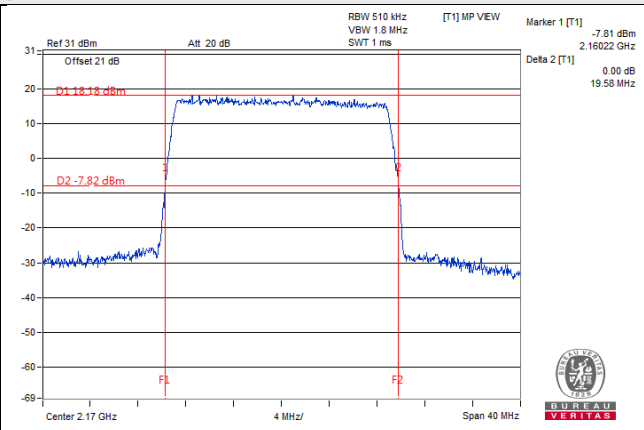
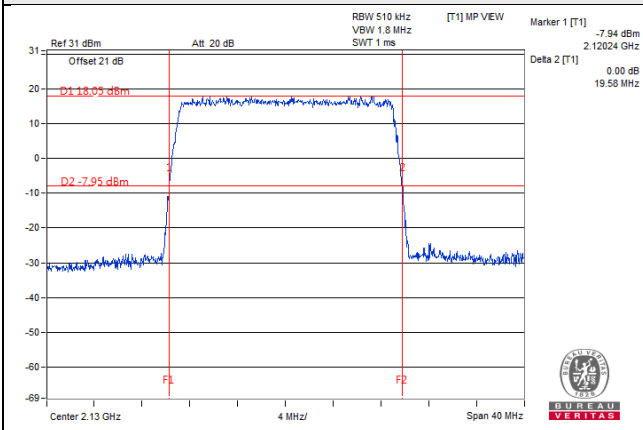
16QAM



64QAM



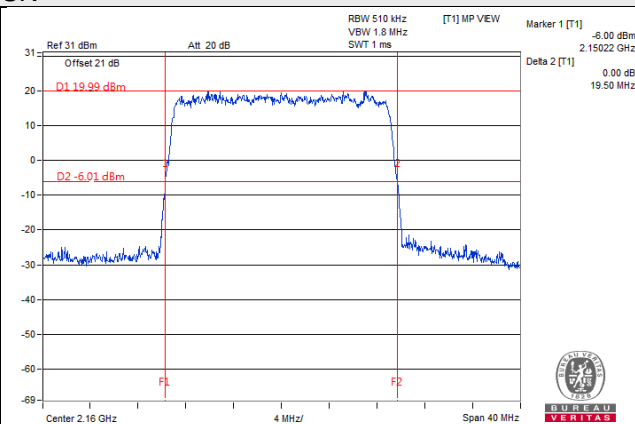
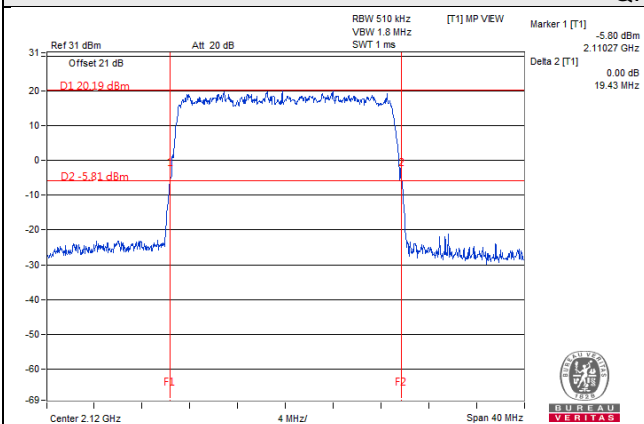
256QAM



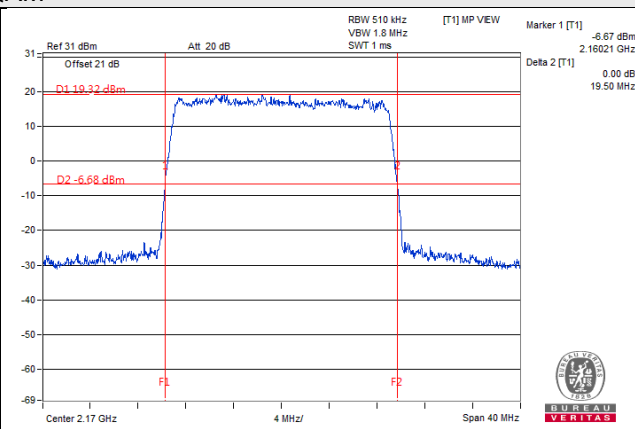
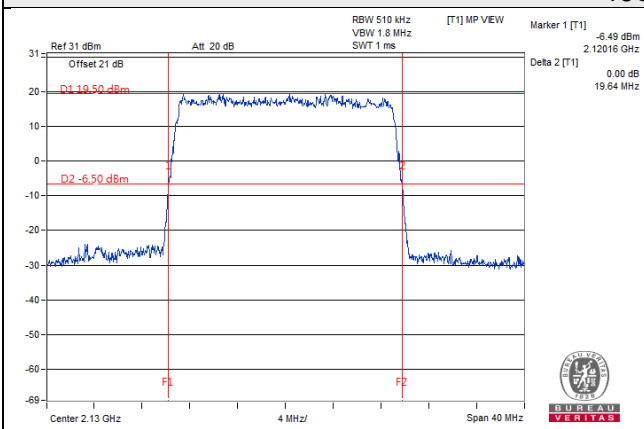
Chain 1

Spectrum Plot of Worst Value
-26dBc Bandwidth

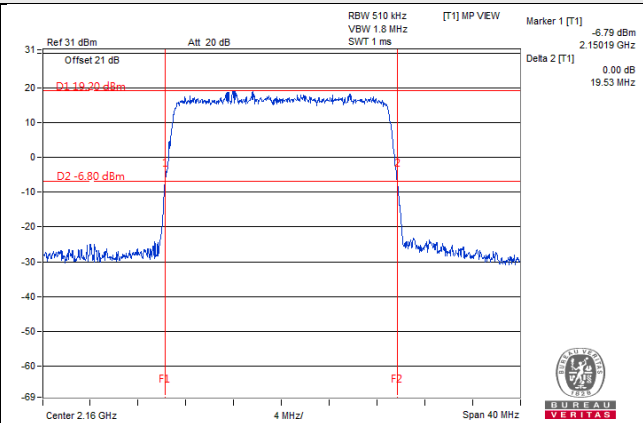
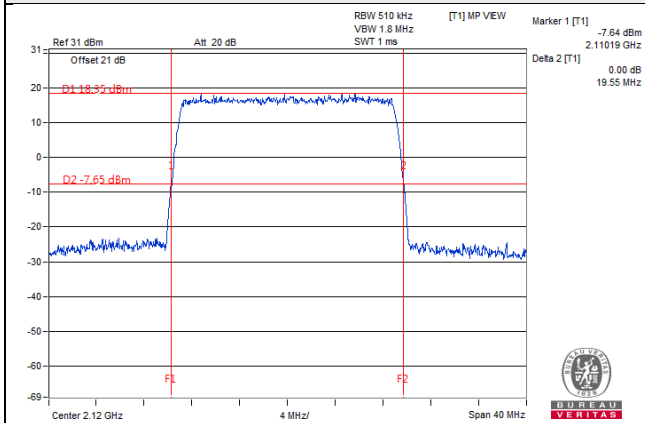
QPSK



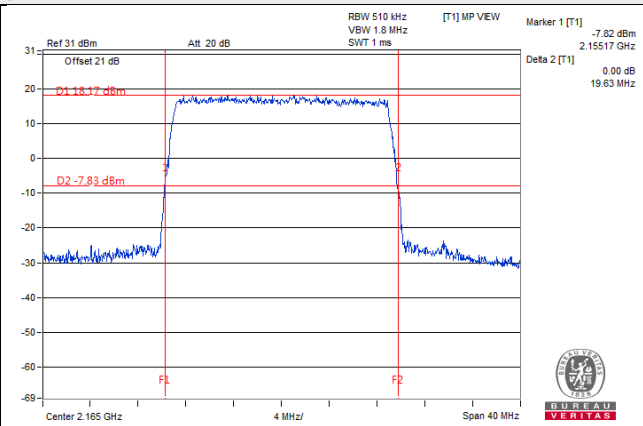
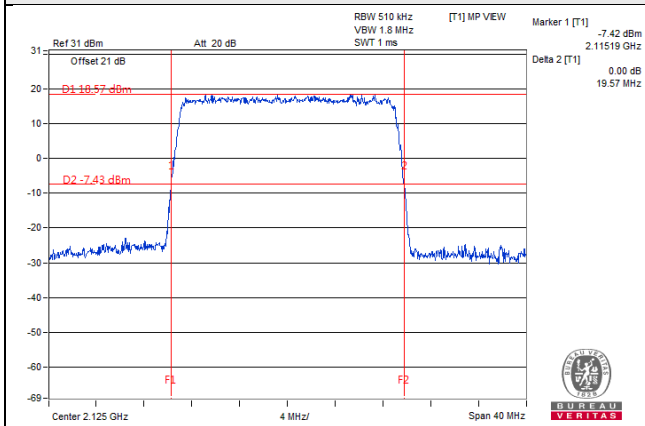
16QAM



64QAM



256QAM

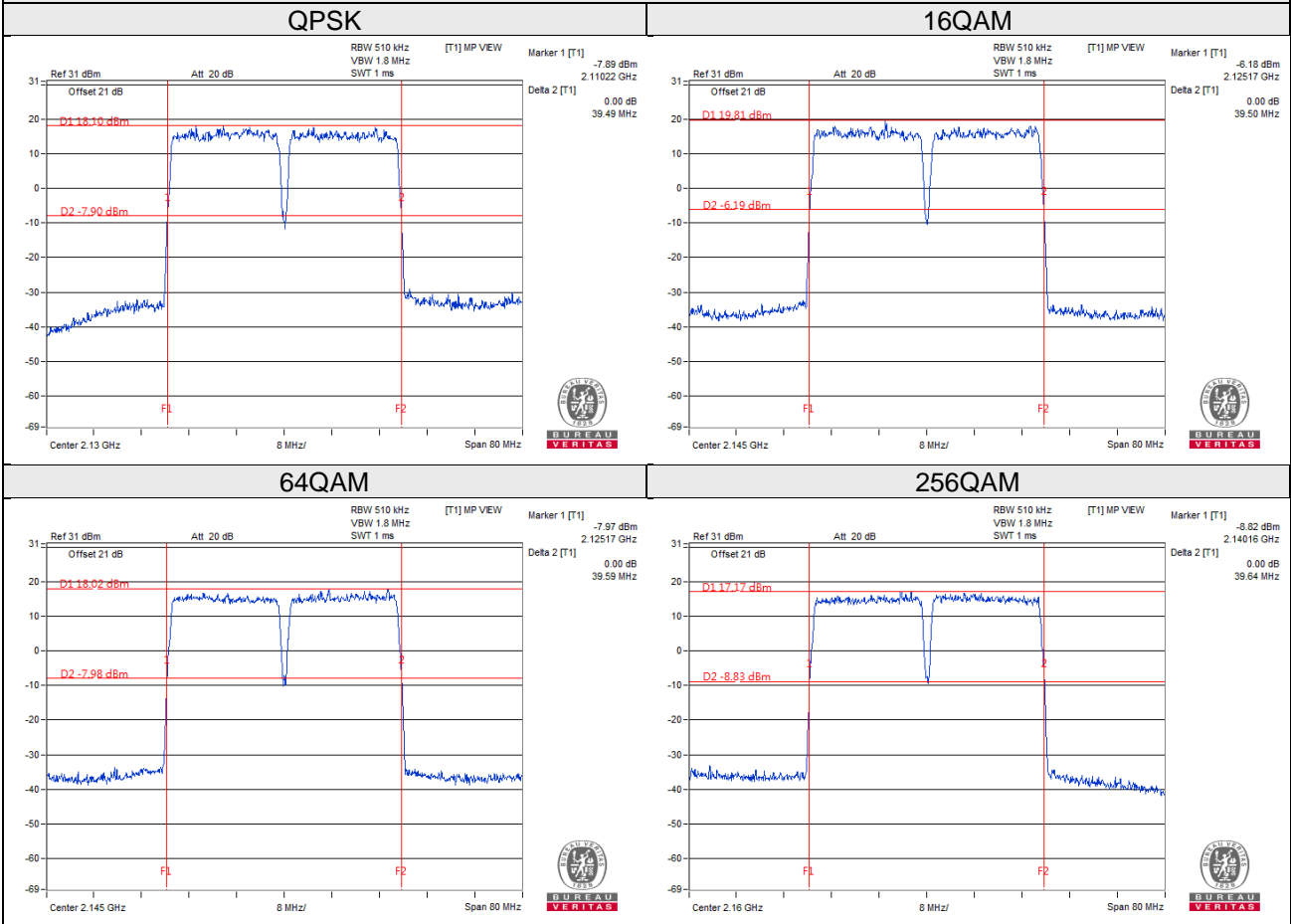


20MHz+20MHz Contiguous

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

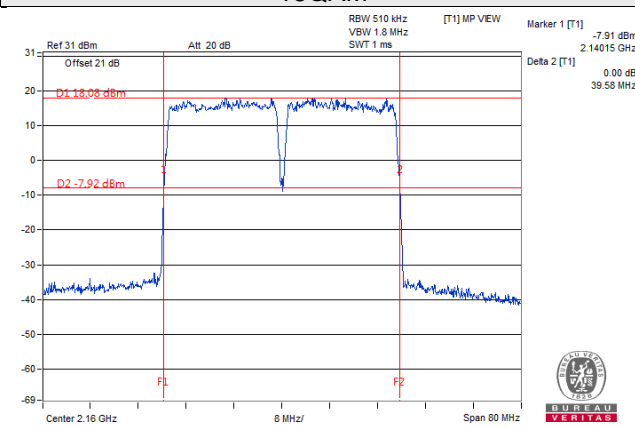
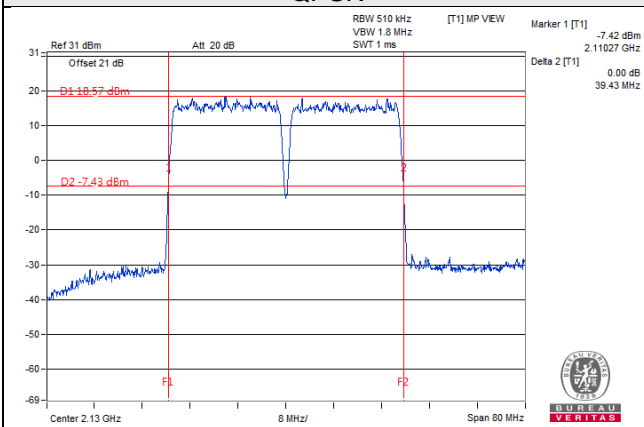


Chain 1

Spectrum Plot of Worst Value
-26dBc Bandwidth

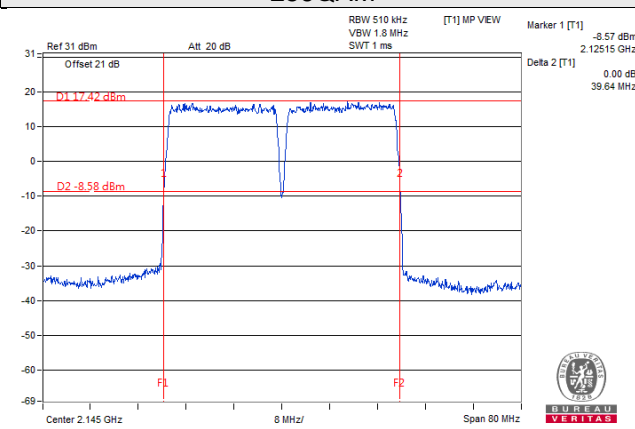
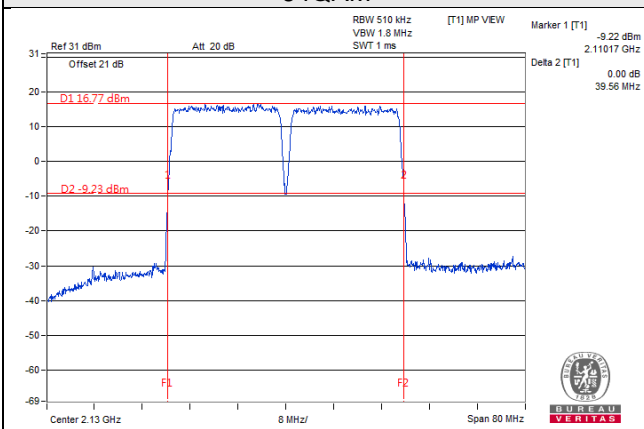
QPSK

16QAM



64QAM

256QAM



4.4.5 Test Results (Occupied Bandwidth)

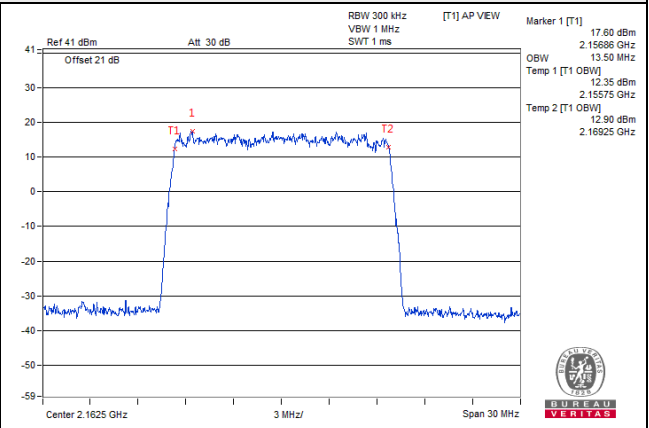
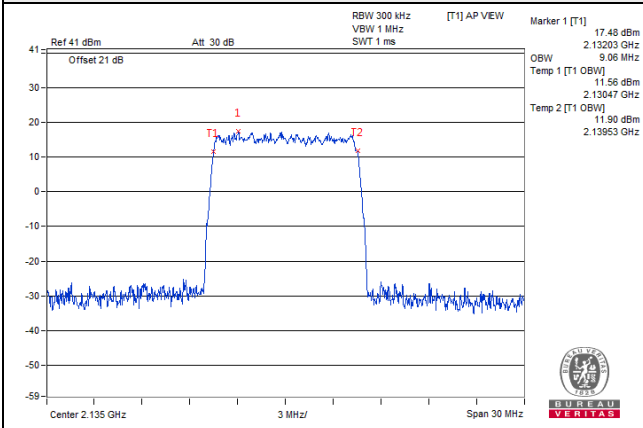
10MHz+15MHz Non-Contiguous GAP 15MHz

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

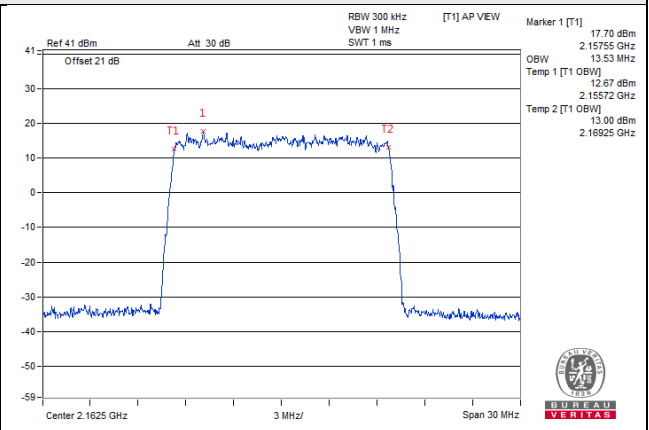
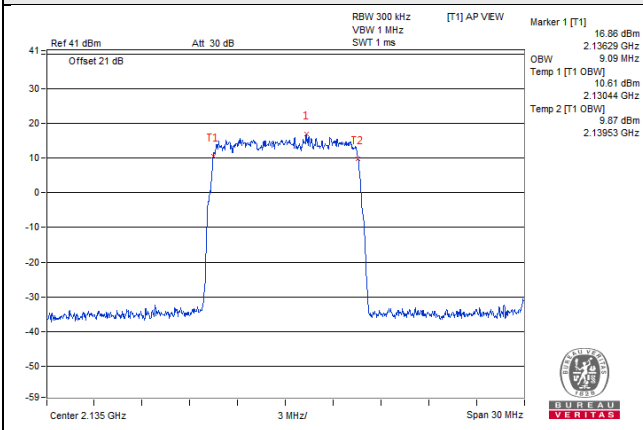
Chain 0

Spectrum Plot of Worst Value Occupied Bandwidth

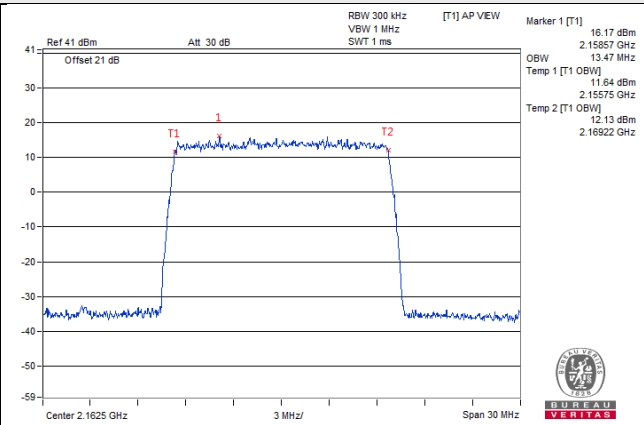
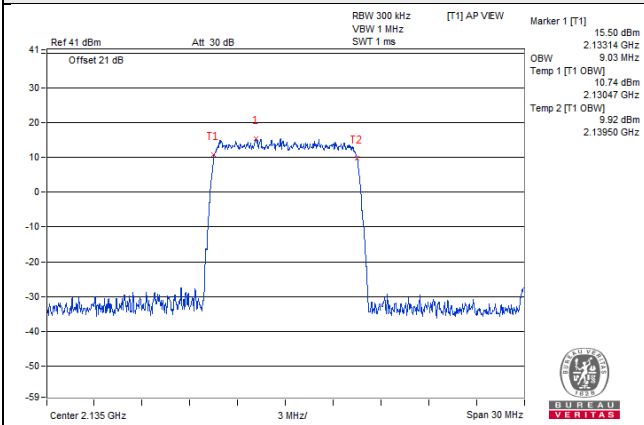
QPSK



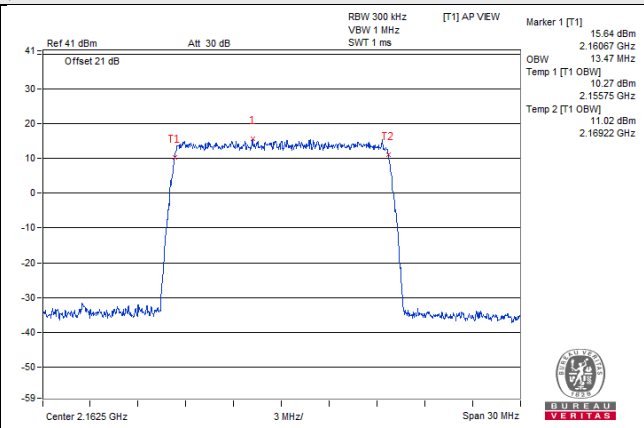
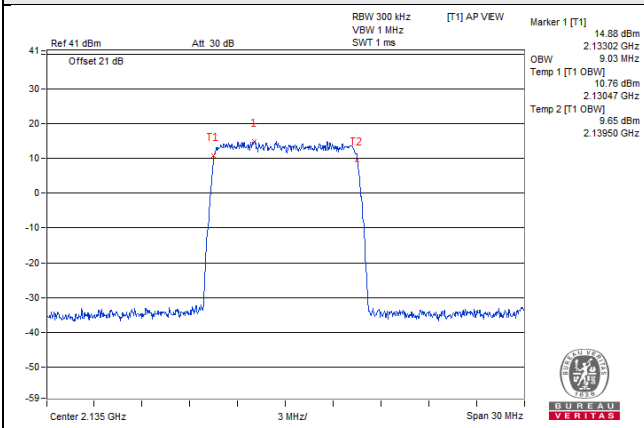
16QAM



64QAM



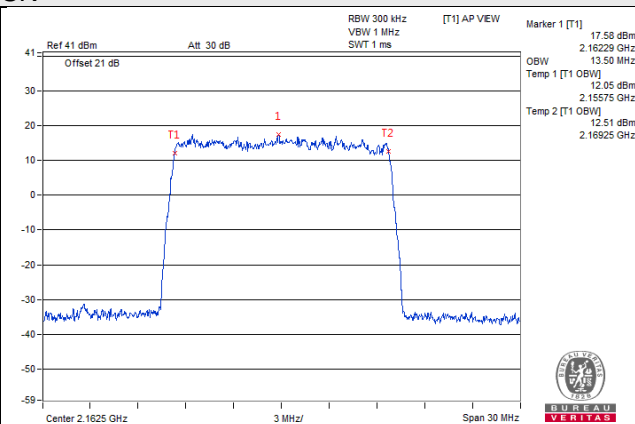
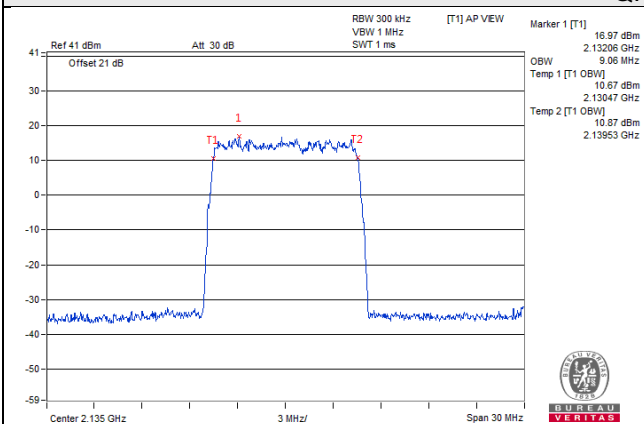
256QAM



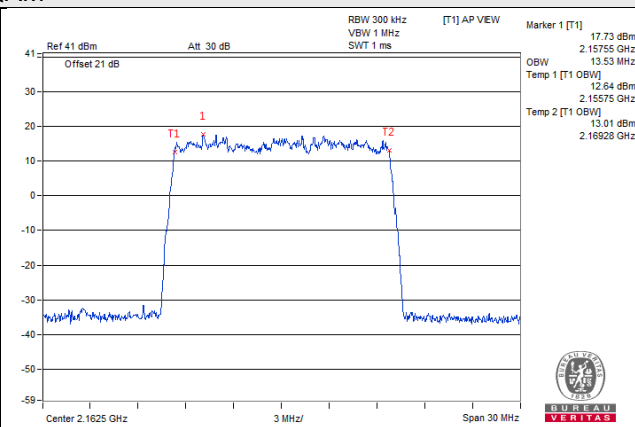
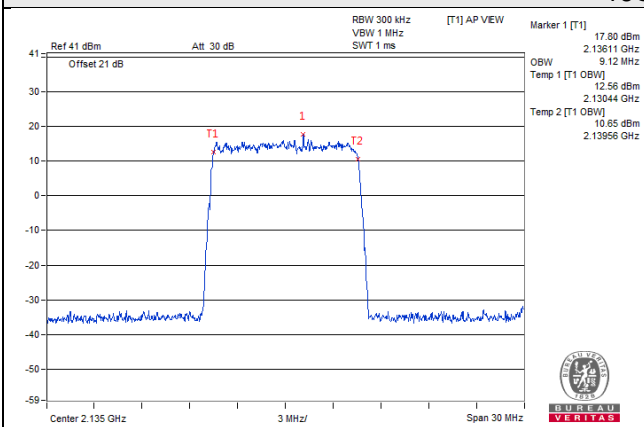
Chain 1

Spectrum Plot of Worst Value
-26dBc Bandwidth

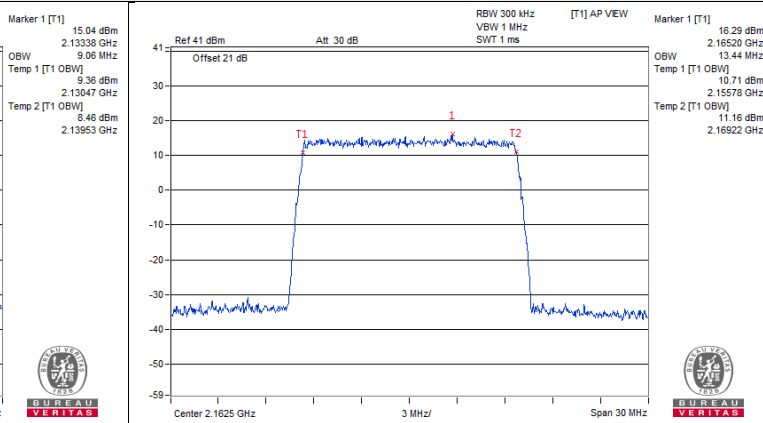
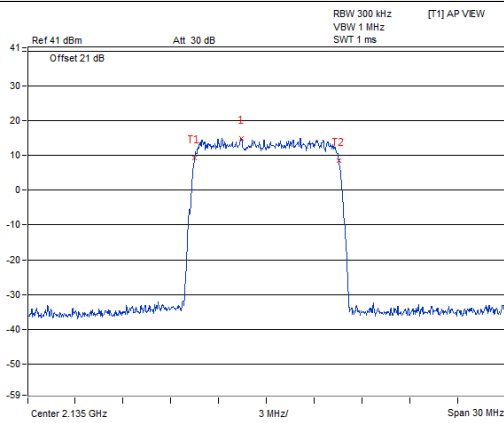
QPSK



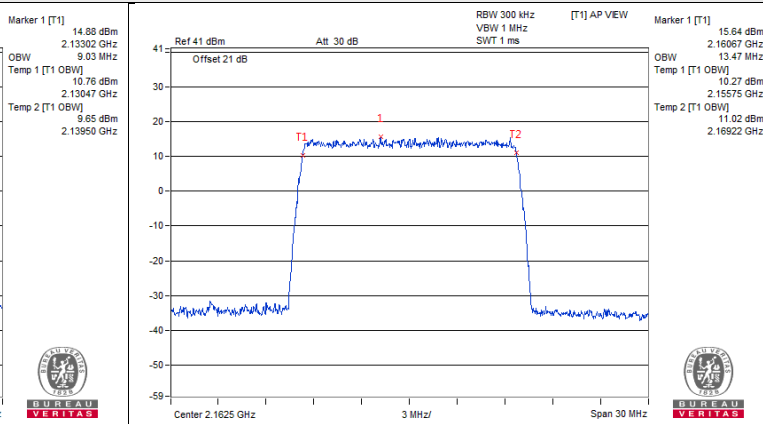
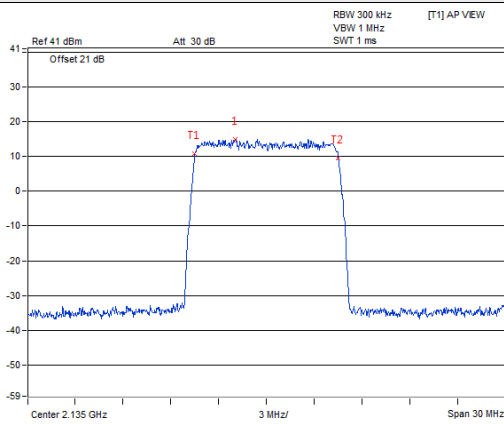
16QAM



64QAM



256QAM



10MHz+15MHz Non-Contiguous GAP 20MHz

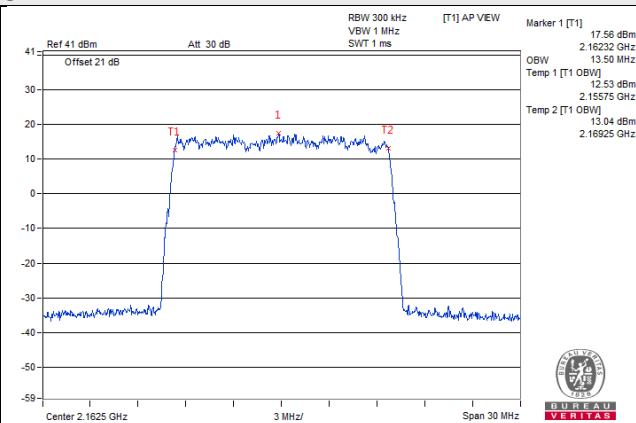
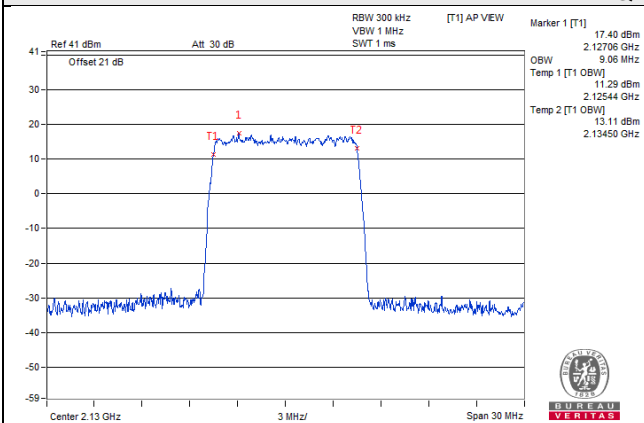
Channel Number	Freq. (MHz)	Occupied Bandwidth (MHz)							
		Chain 0				Chain 1			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
66636+66961	2130+2162.5	22.56	22.59	22.50	22.56	22.56	22.59	22.53	22.53

Chain 0

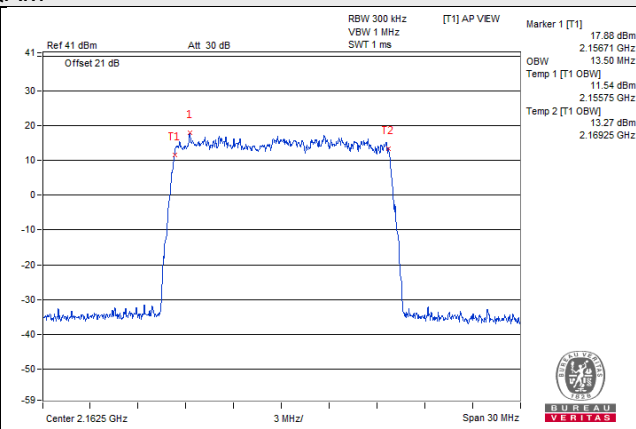
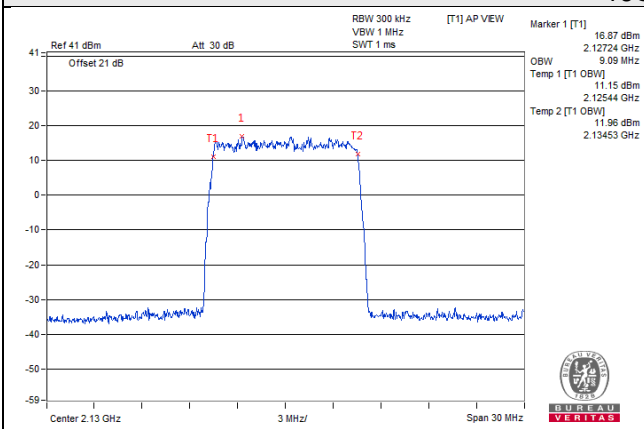
Spectrum Plot of Worst Value

Occupied Bandwidth

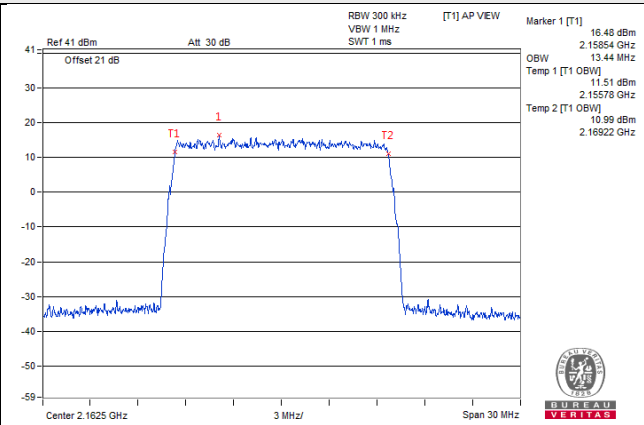
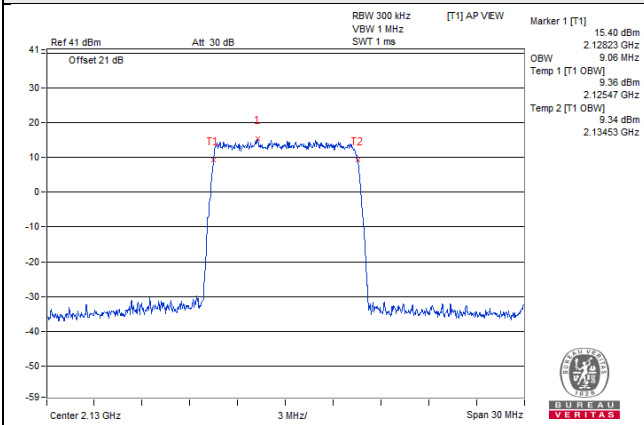
QPSK



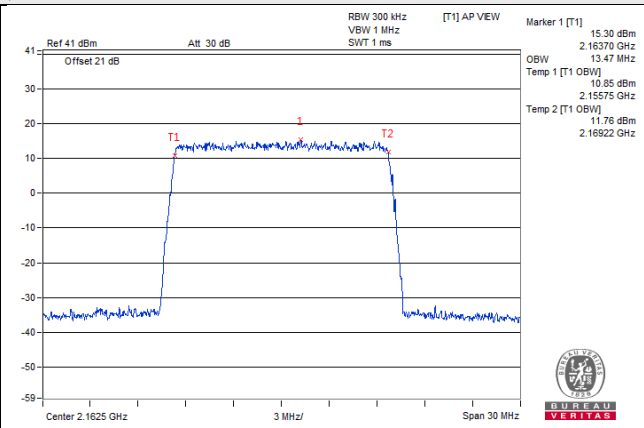
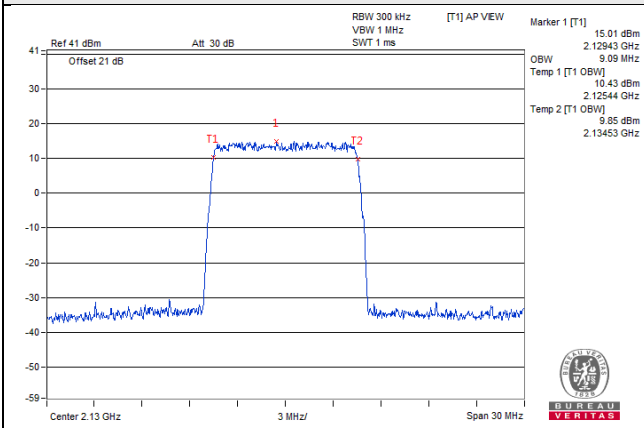
16QAM



64QAM



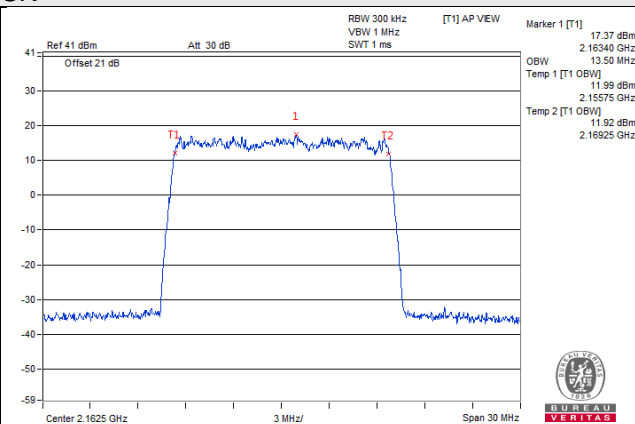
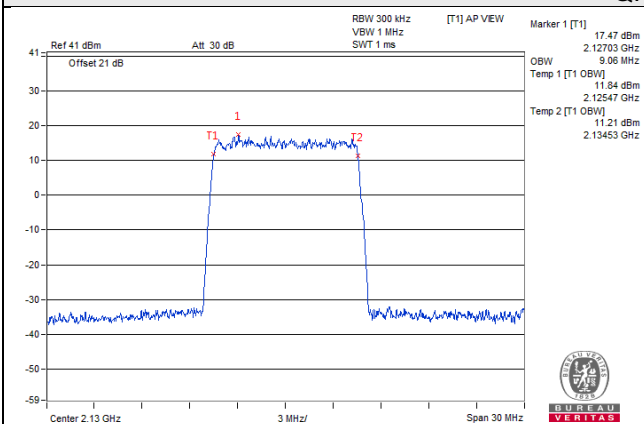
256QAM



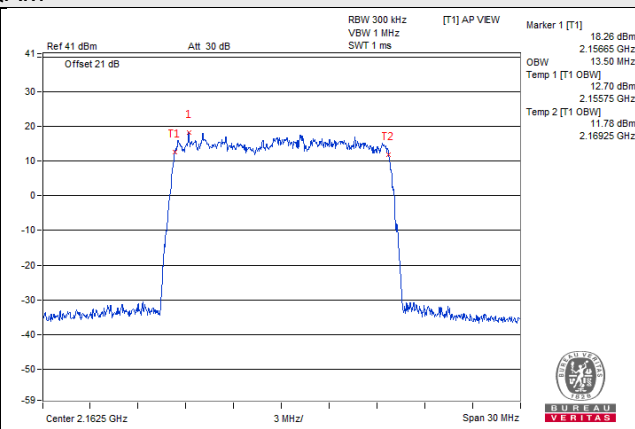
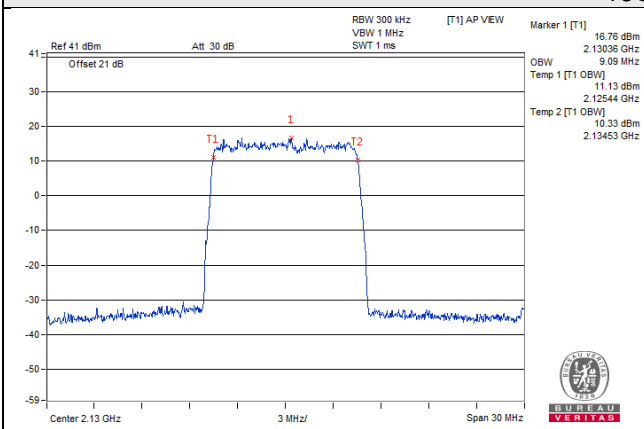
Chain 1

Spectrum Plot of Worst Value
Occupied Bandwidth

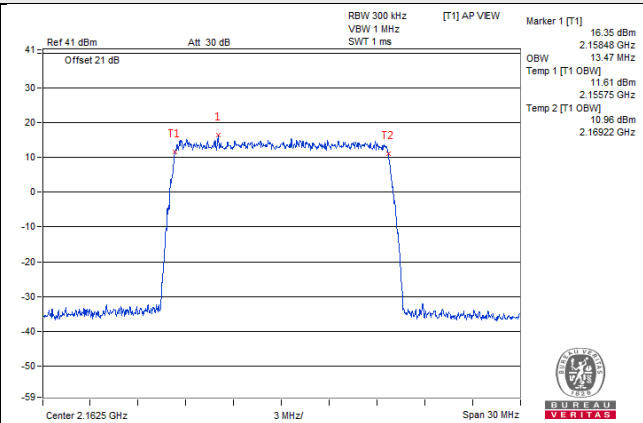
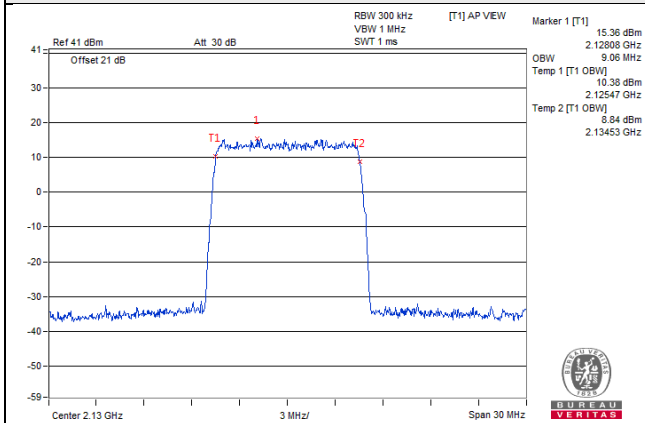
QPSK



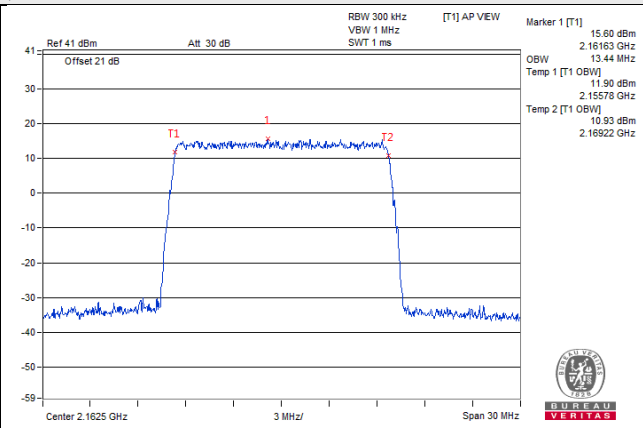
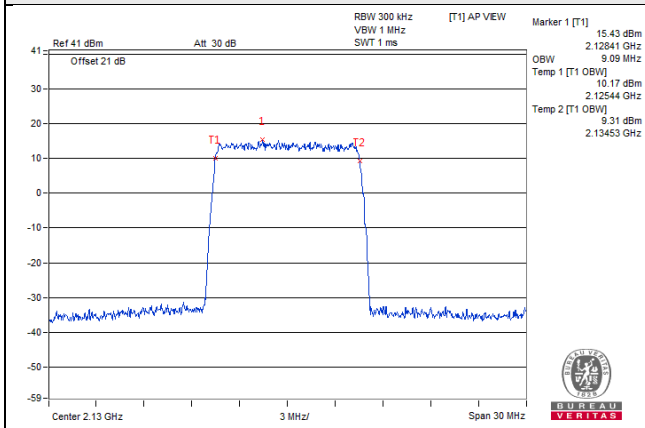
16QAM



64QAM



256QAM



20MHz+20MHz Non-Contiguous GAP 20MHz

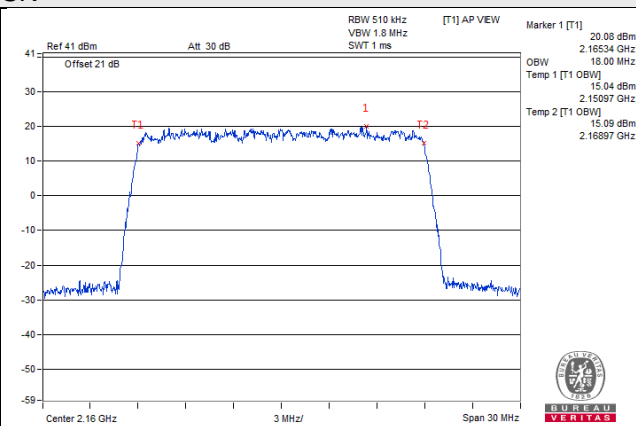
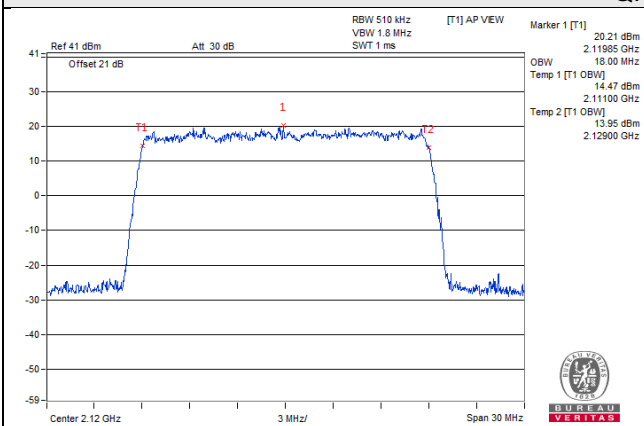
Channel Number	Freq. (MHz)	Occupied Bandwidth (MHz)							
		Chain 0				Chain 1			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
66536+66936	2120+2160	36.00	36.09	35.97	36.09	35.97	36.03	36.03	36.06
66586+66986	2125+2165	36.00	36.03	35.97	36.00	35.97	36.09	35.97	36.03
66636+67036	2130+2170	35.94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

Chain 0

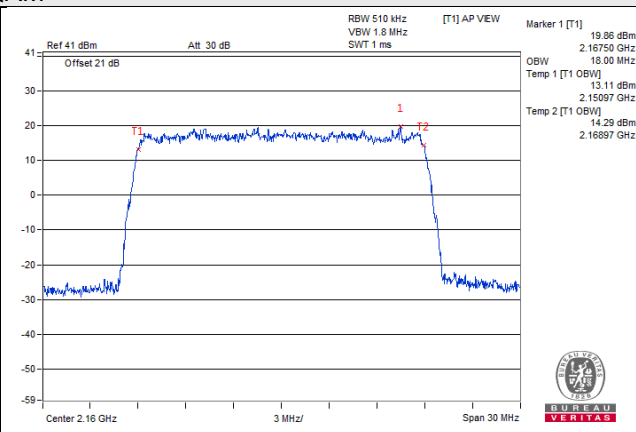
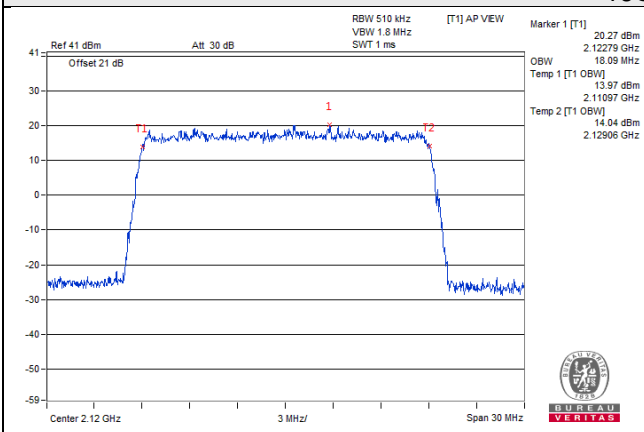
Spectrum Plot of Worst Value

Occupied Bandwidth

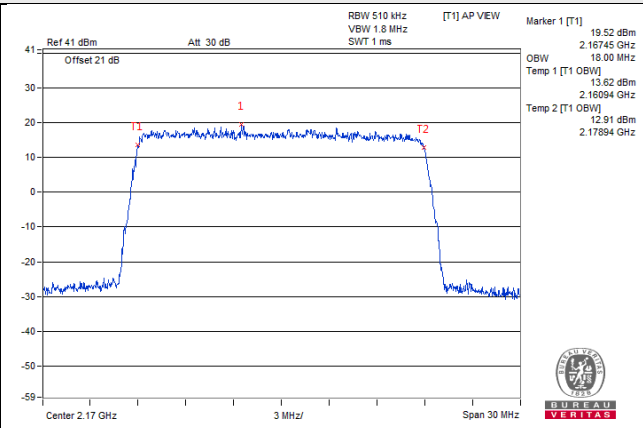
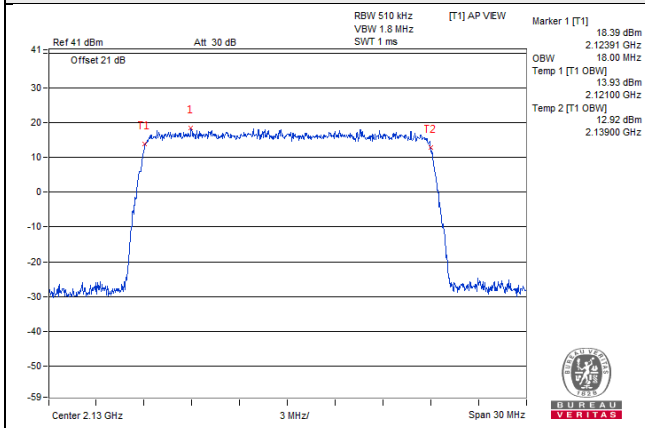
QPSK



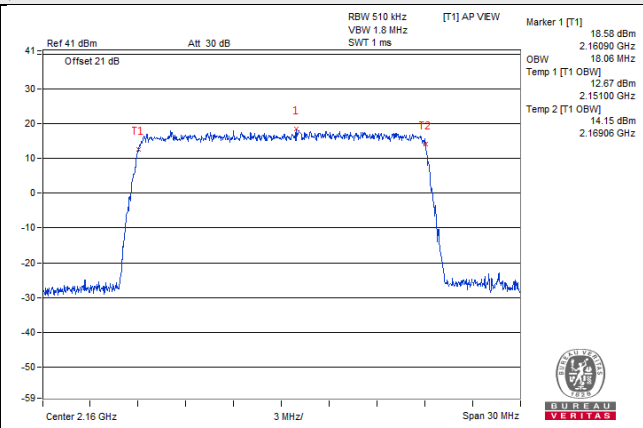
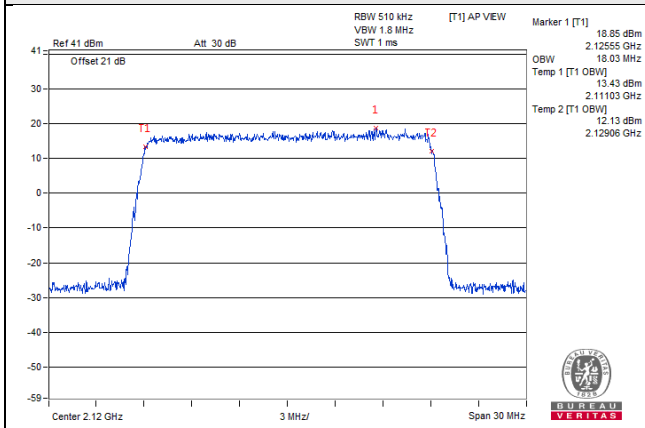
16QAM



64QAM



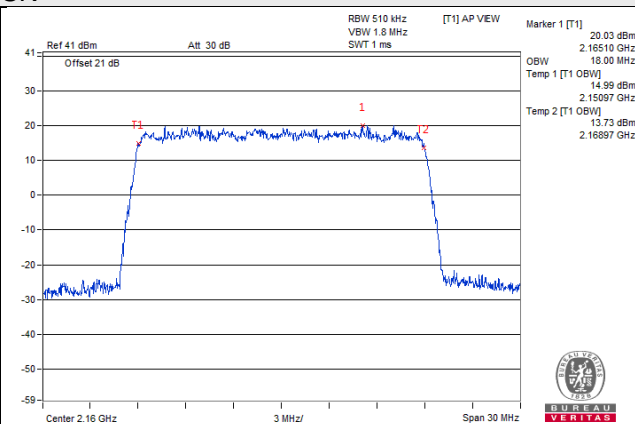
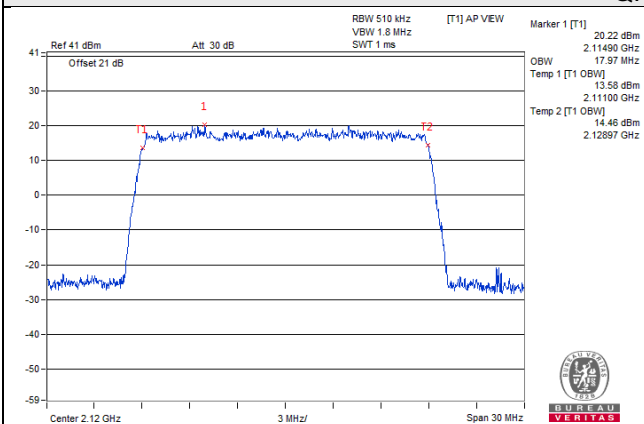
256QAM



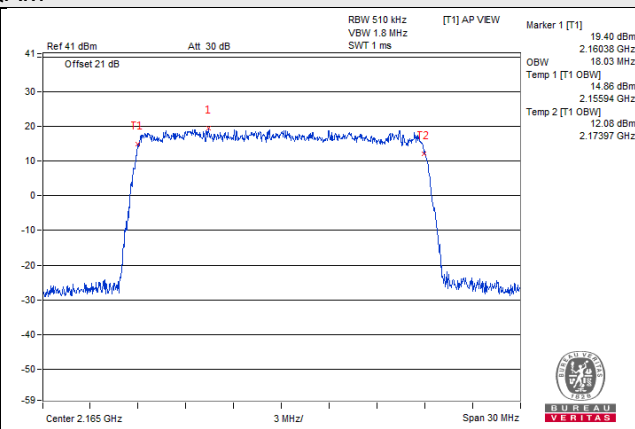
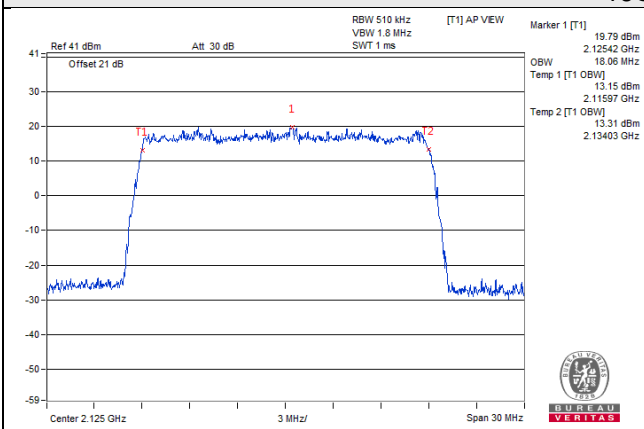
Chain 1

Spectrum Plot of Worst Value
Occupied Bandwidth

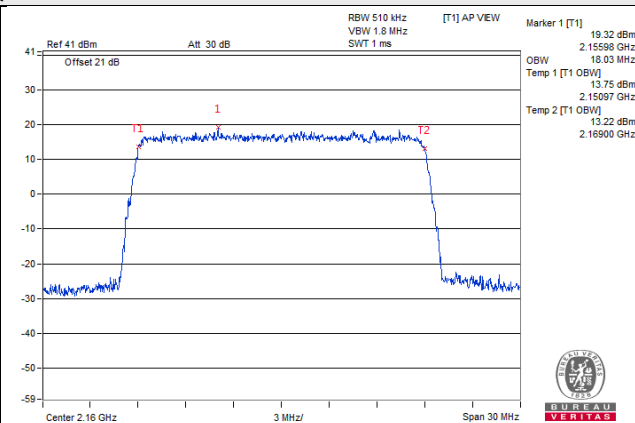
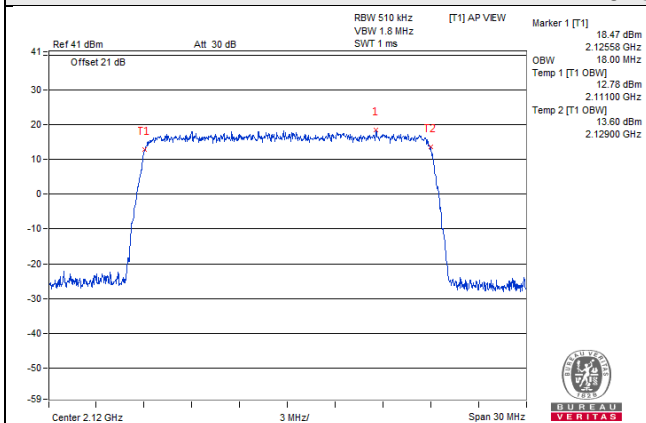
QPSK



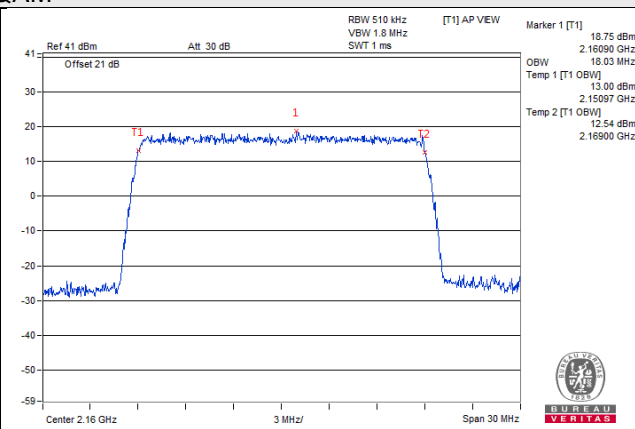
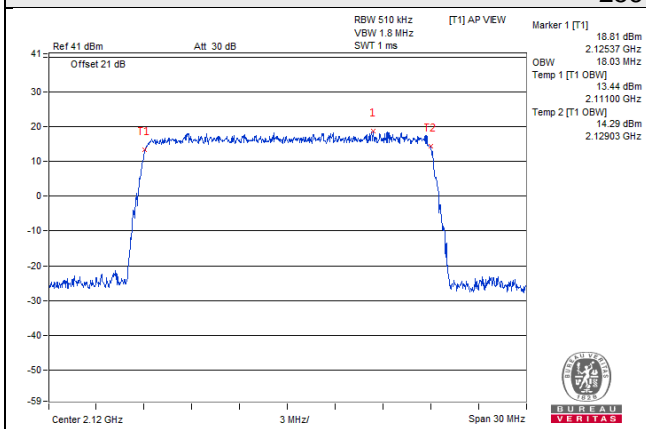
16QAM



64QAM



256QAM



20MHz+20MHz Contiguous

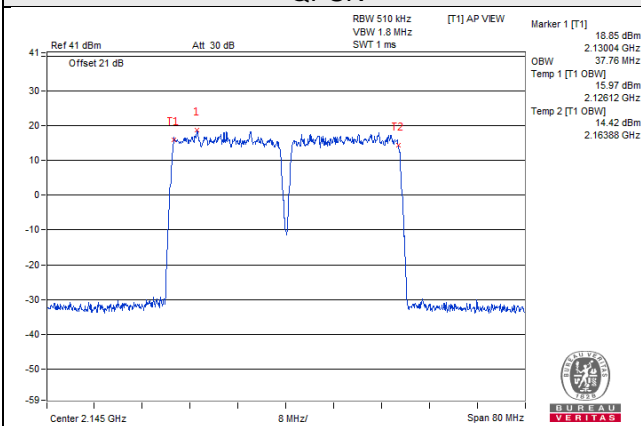
Channel Number	Freq. (MHz)	Occupied Bandwidth (MHz)							
		Chain 0				Chain 1			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
66536+66736	2120+2140	37.68	37.76	37.68	37.76	37.76	37.84	37.68	37.76
66686+66886	2135+2155	37.76	37.84	37.76	37.84	37.76	37.84	37.76	37.76
66836+67036	2150+2170	37.68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

Chain 0

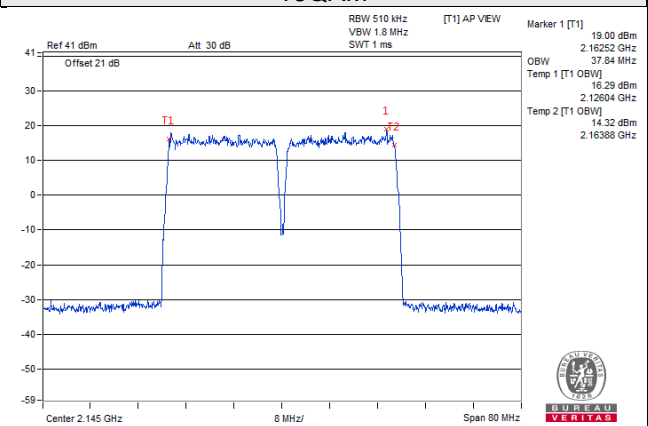
Spectrum Plot of Worst Value

Occupied Bandwidth

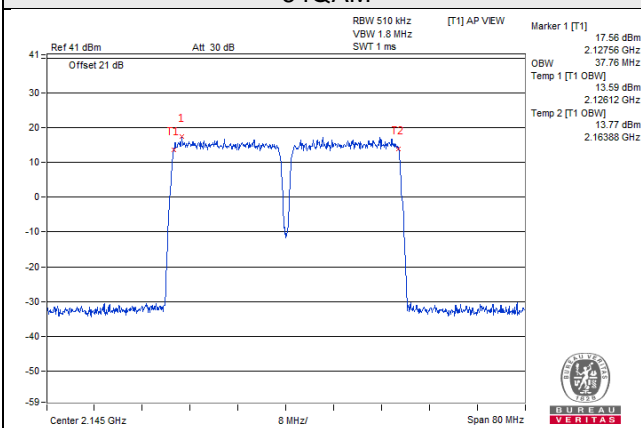
QPSK



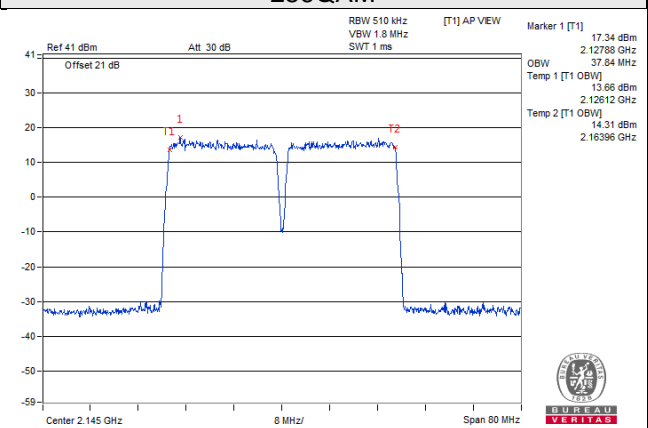
16QAM



64QAM



256QAM

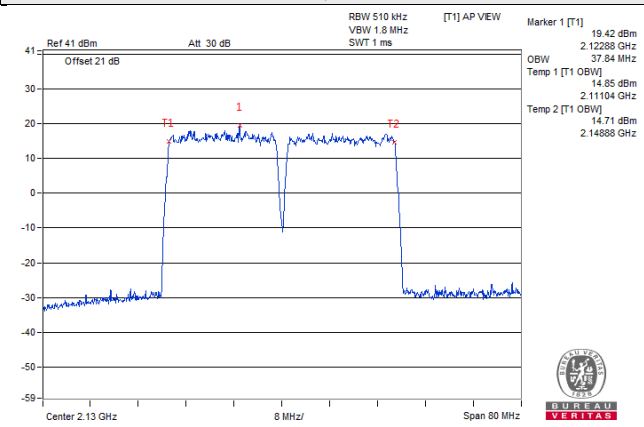
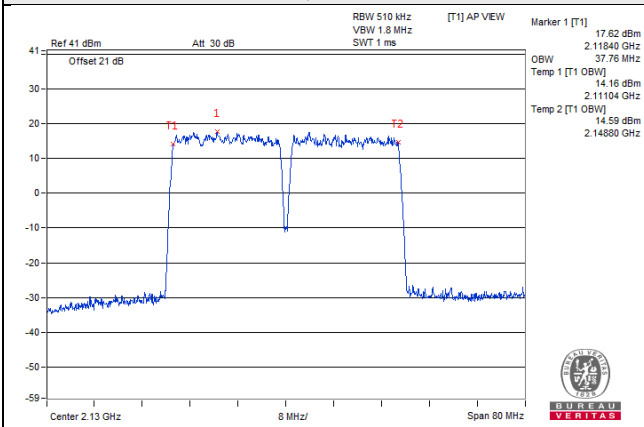


Chain 1

Spectrum Plot of Worst Value
Occupied Bandwidth

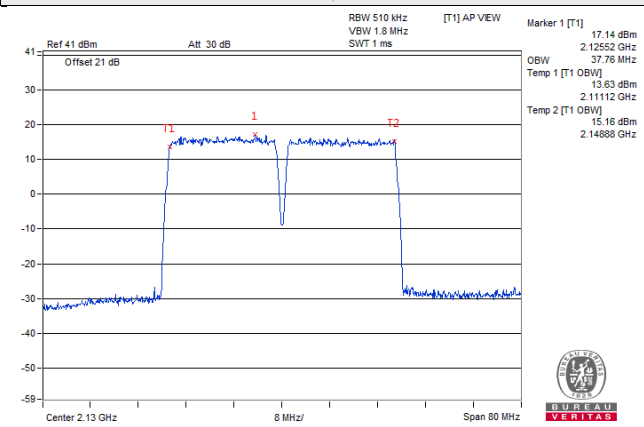
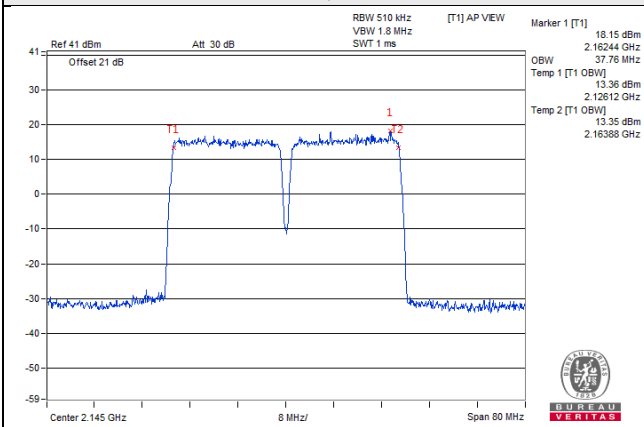
QPSK

16QAM



64QAM

256QAM



4.5 Channel Edge Measurement

4.5.1 Limits of Band Edge Measurement

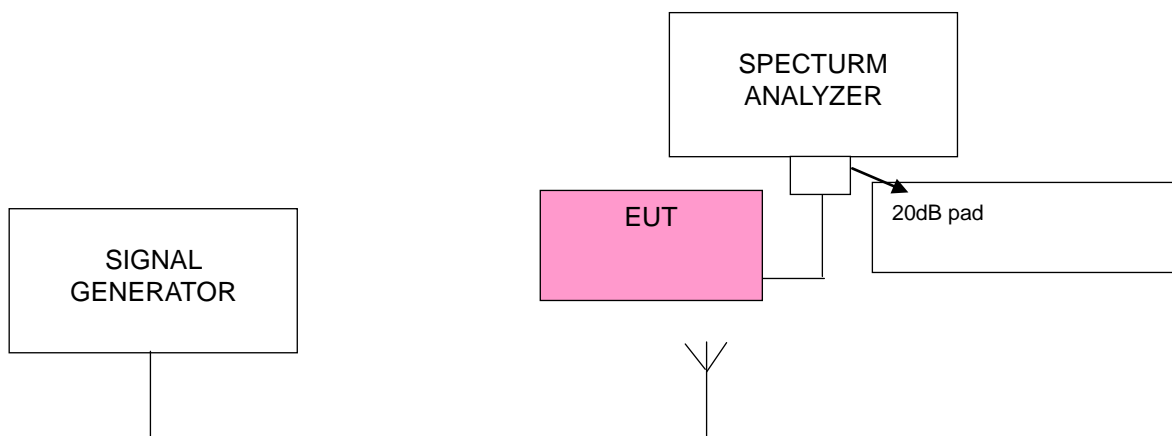
According to FCC 27.53(h) specified the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ dB. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at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



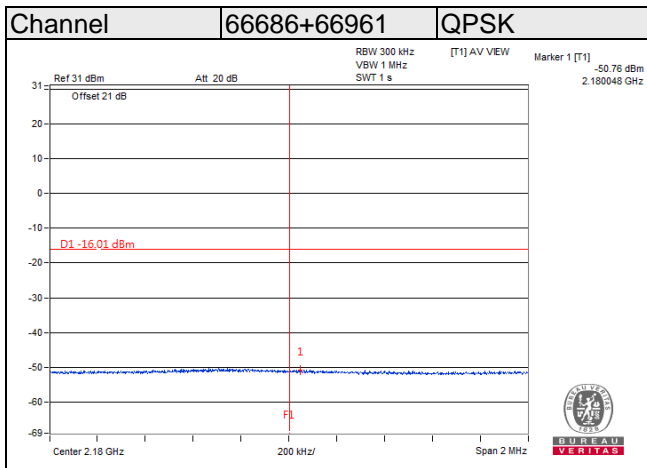
4.5.3 Test Procedures

- 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

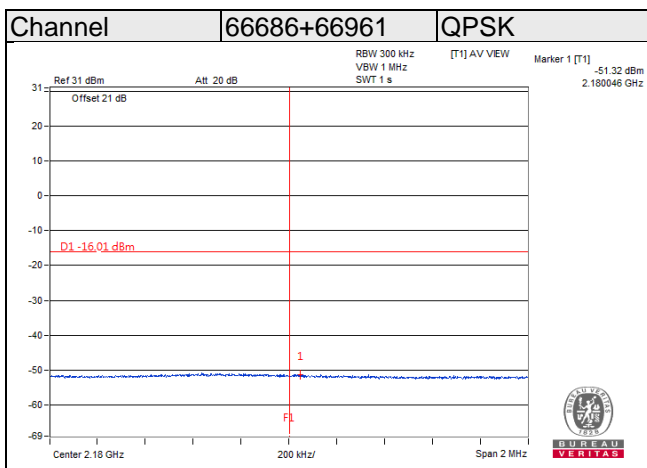
10MHz+15MHz Non-Contiguous GAP 15MHz Chain 0

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



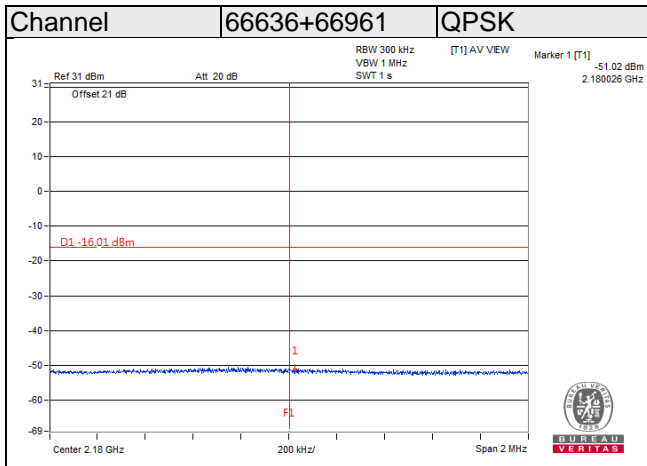
10MHz+15MHz Non-Contiguous GAP 15MHz Chain 1

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



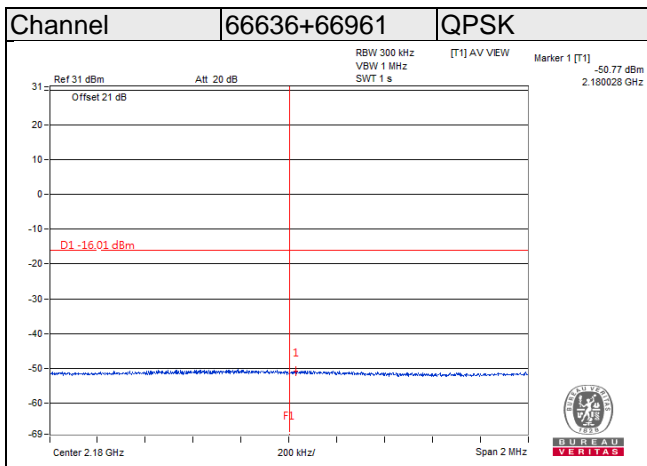
10MHz+15MHz Non-Contiguous GAP 20MHz Chain 0

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



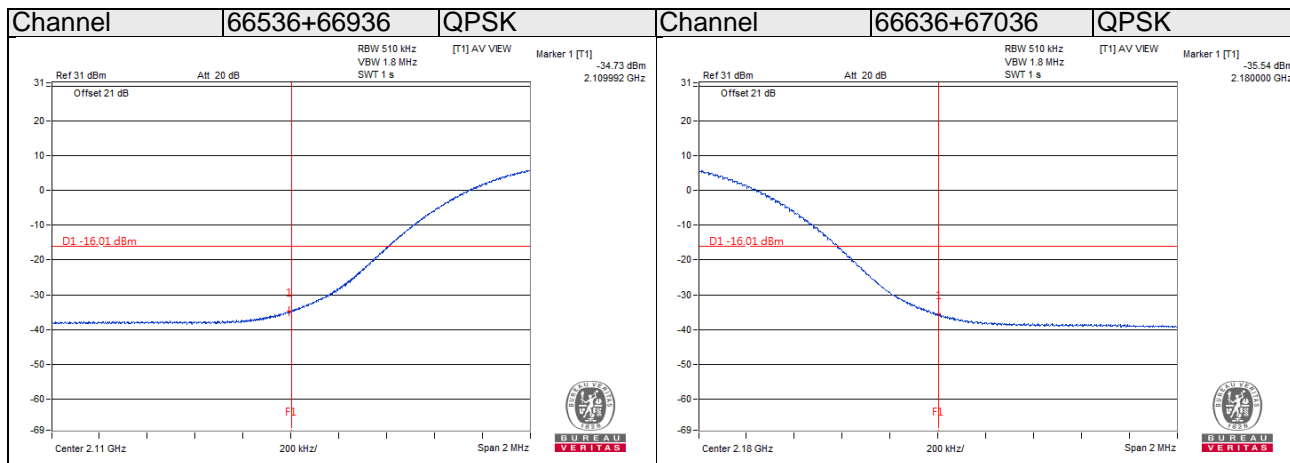
10MHz+15MHz Non-Contiguous GAP 20MHz Chain 1

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



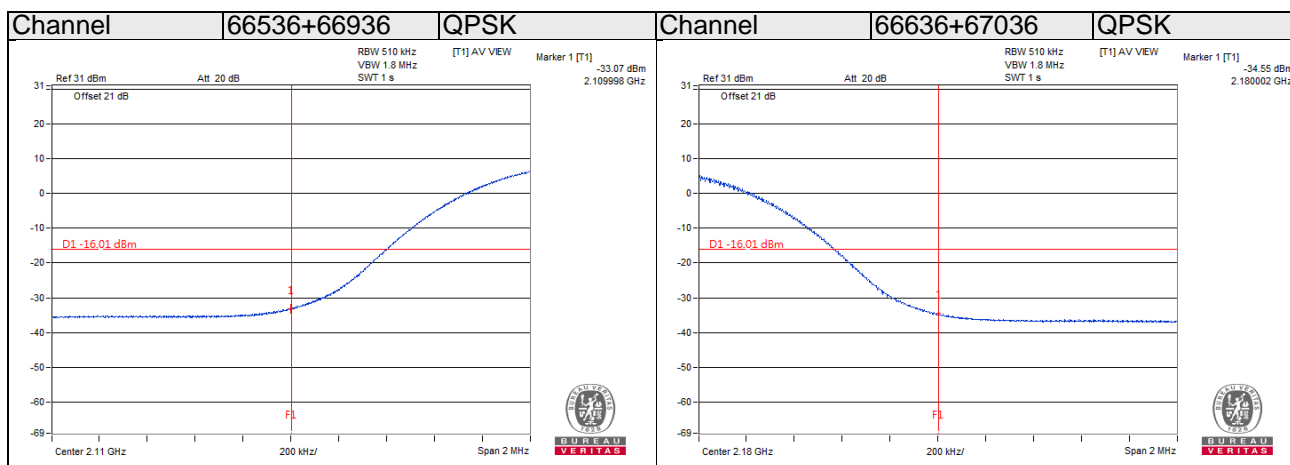
20MHz+20MHz Non-Contiguous GAP 20MHz Chain 0

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



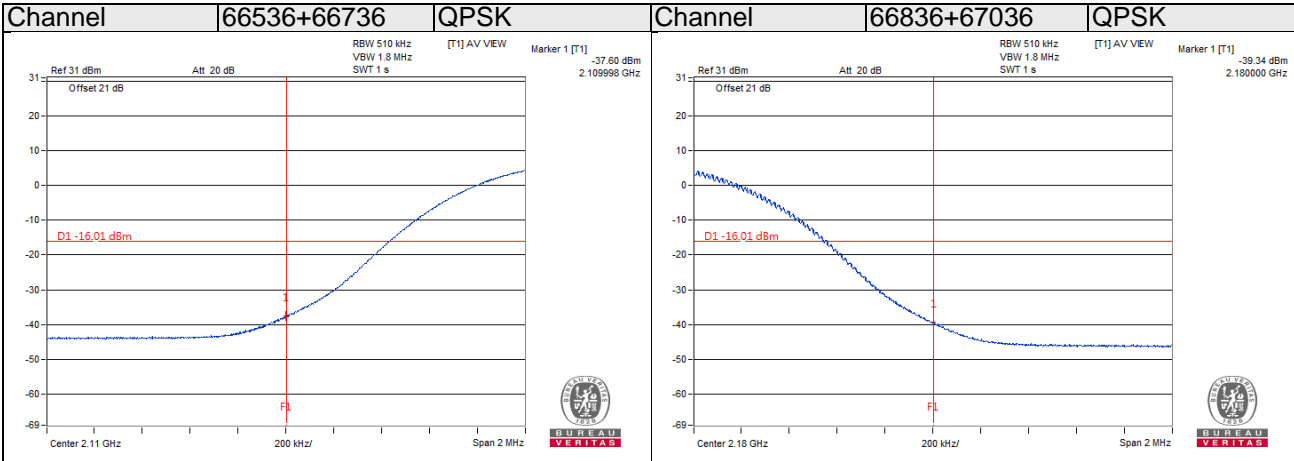
20MHz+20MHz Non-Contiguous GAP 20MHz Chain 1

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



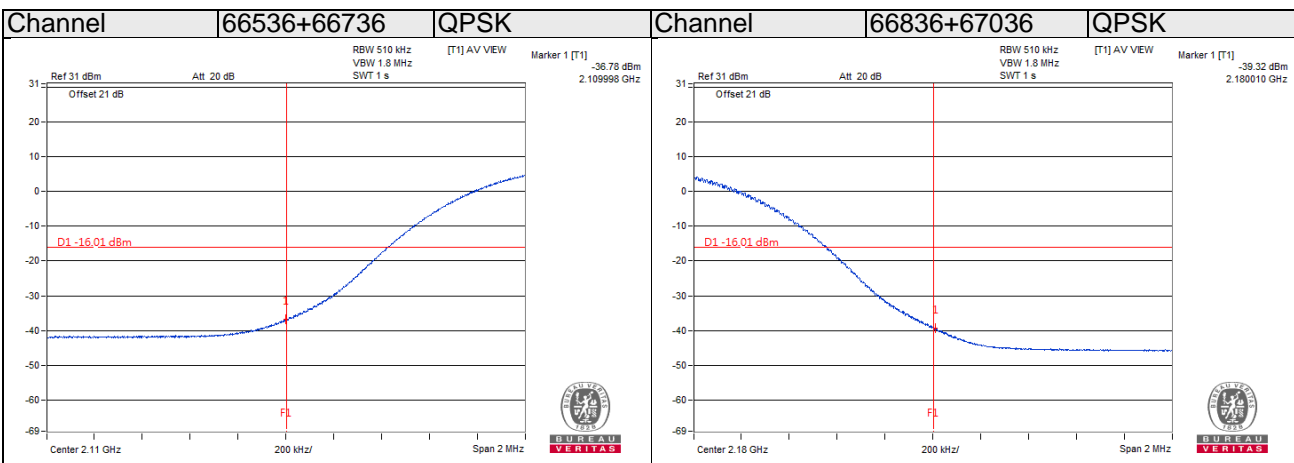
20MHz+20MHz Contiguous Chain 0

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

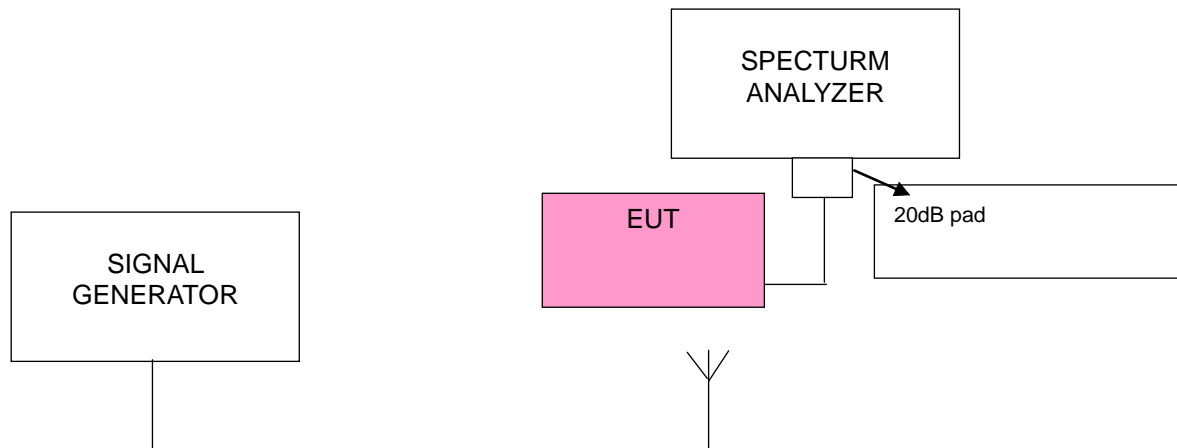


4.6 Peak to Average Ratio

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

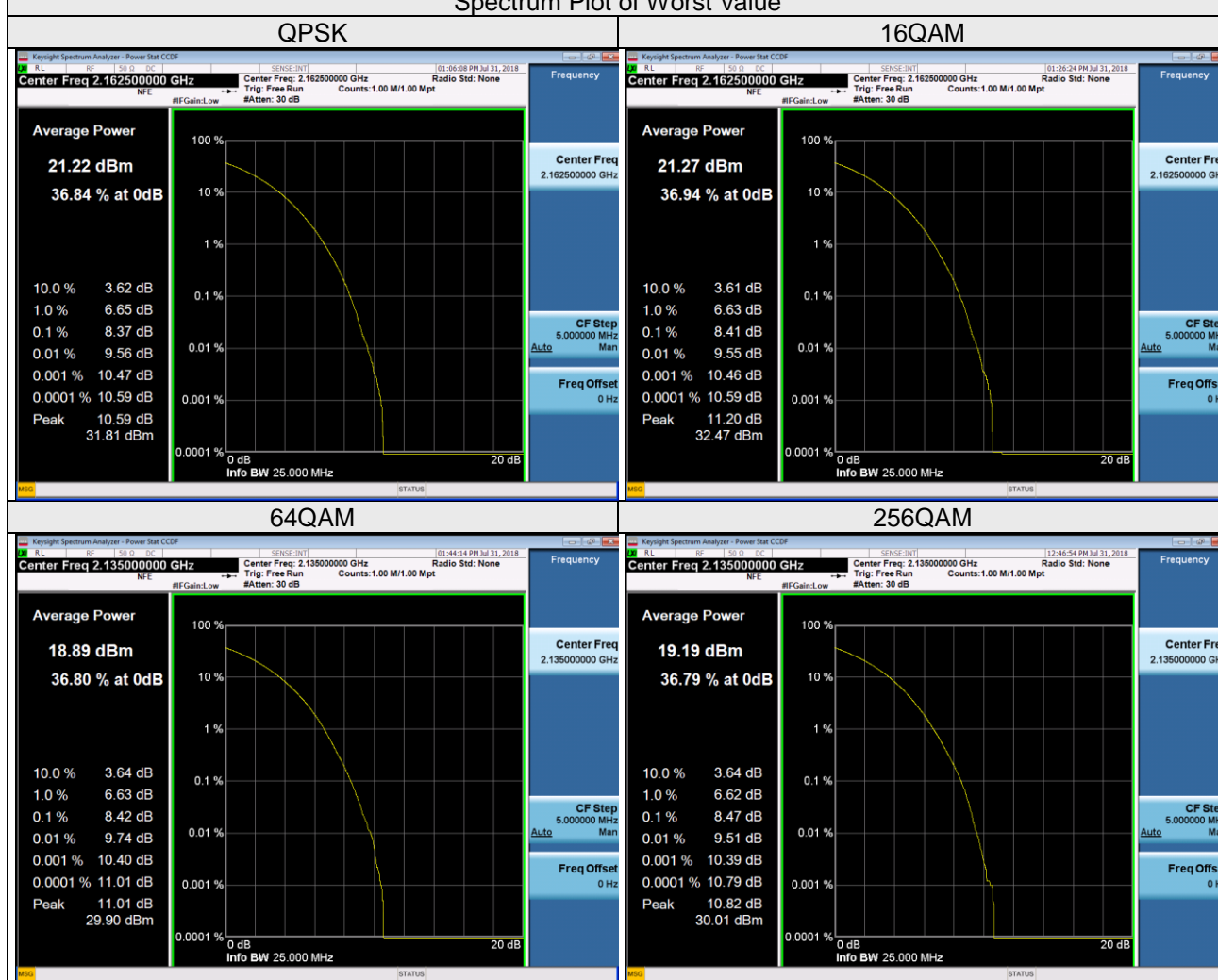
Spectrum Plot of Worst Value



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

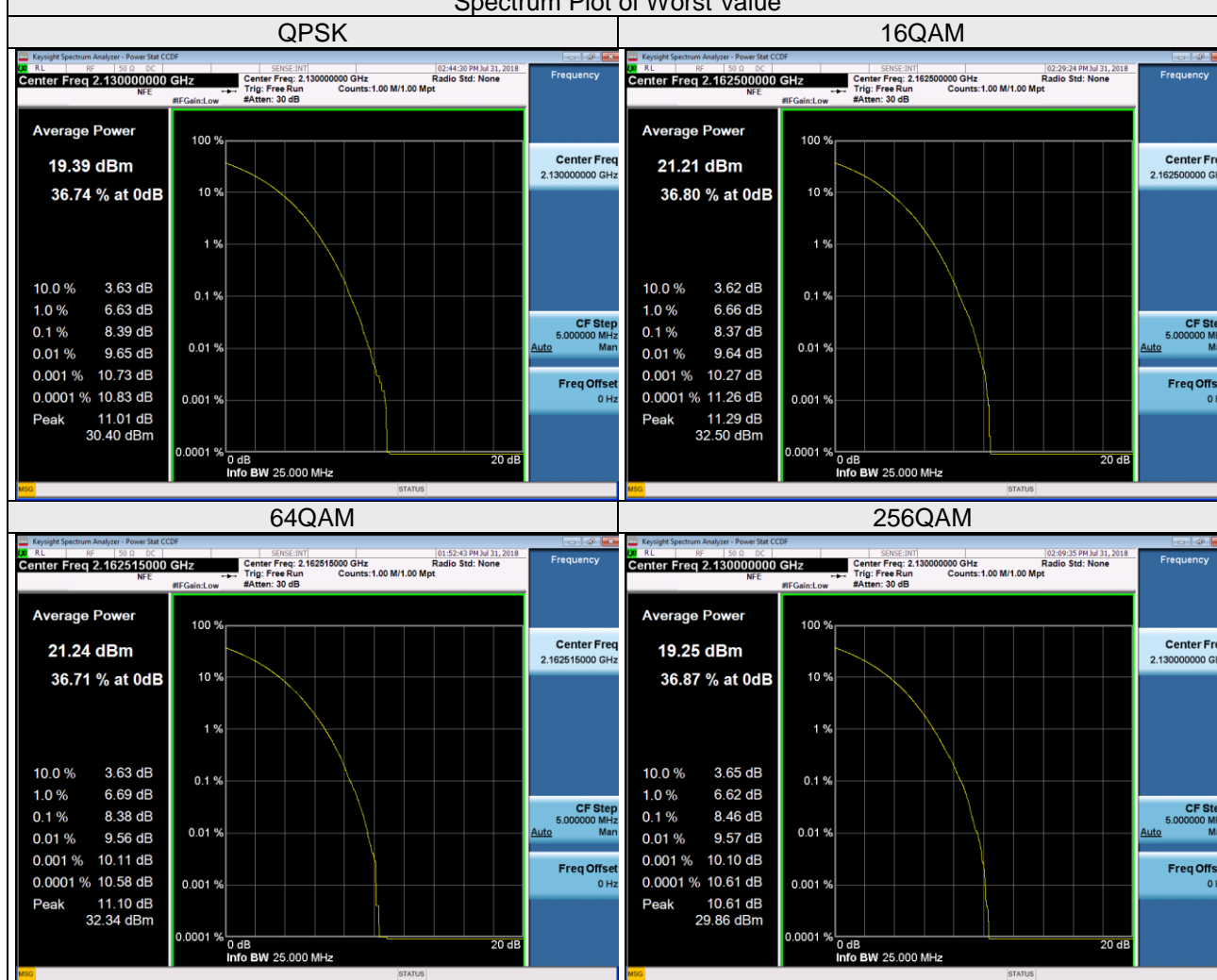
Spectrum Plot of Worst Value



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



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

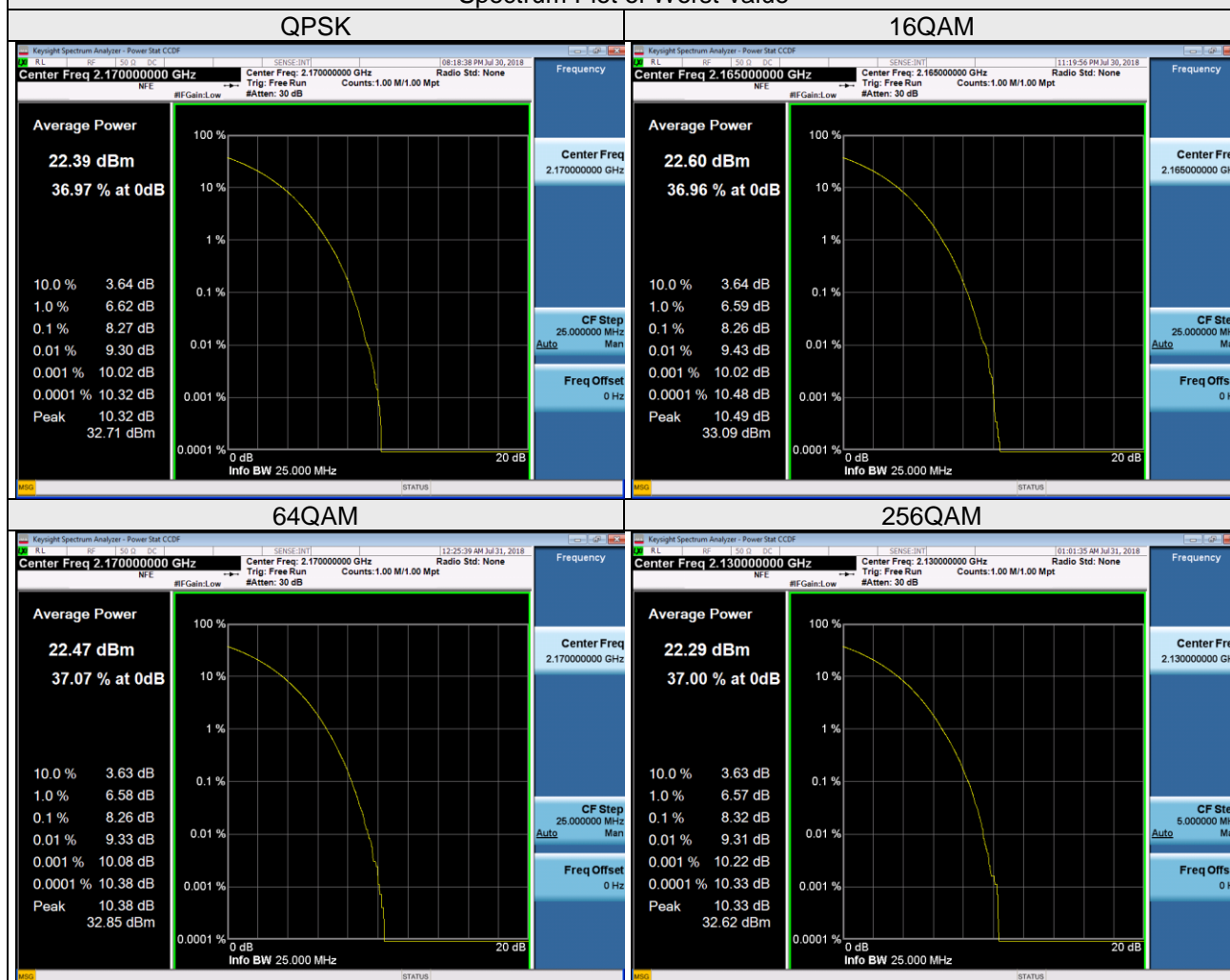
Spectrum Plot of Worst Value



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

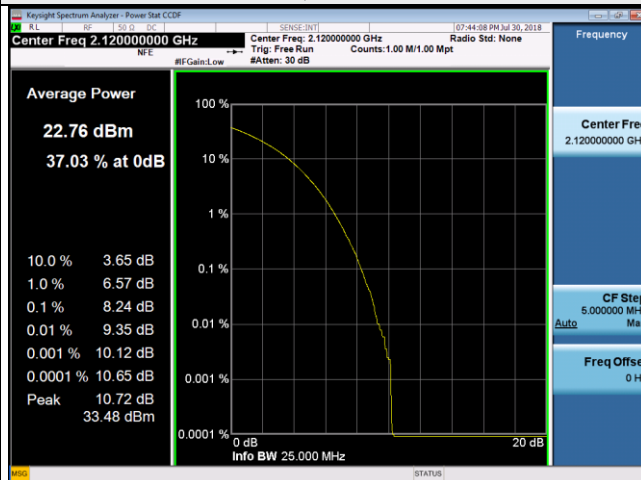


20MHz+20MHz Non-Contiguous GAP 20MHz Chain 1

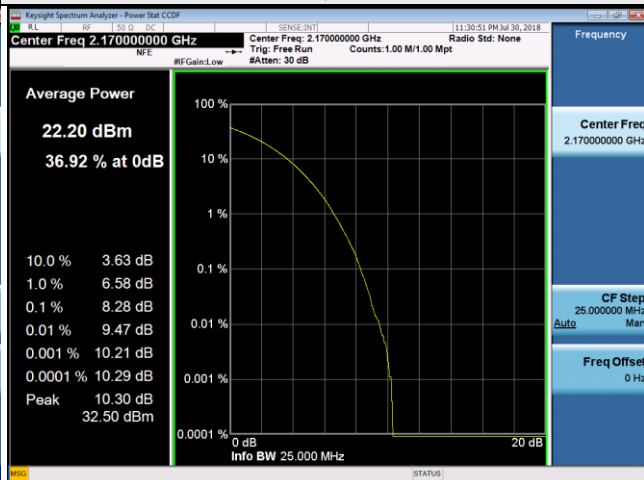
Channel	Frequency (MHz)	Peak To Average Ratio (dB)							
		Low channel				High Channel			
		QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
66536+66936	2120+2160	8.24	8.24	8.25	8.25	8.24	8.25	8.23	8.23
66586+66986	2125+2165	8.23	8.23	8.22	8.25	8.23	8.24	8.26	8.24
66636+67036	2130+2170	8.22	8.21	8.18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

Spectrum Plot of Worst Value

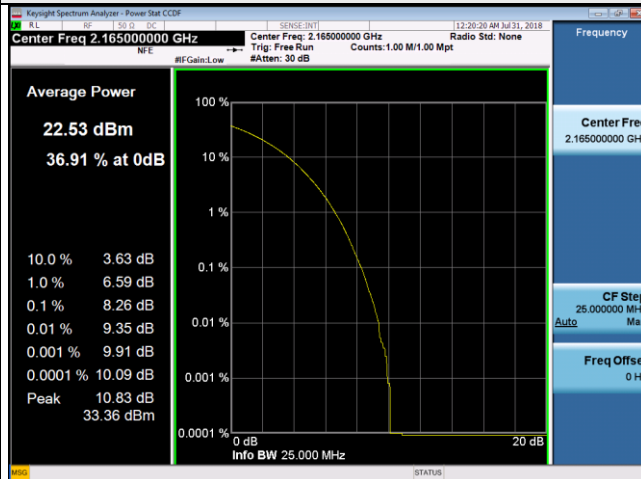
QPSK



16QAM



64QAM



256QAM

