



## 10.3.2. OUTPUT POWER

### LIMITS

#### FCC §15.247 (b) (3)

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

§15.247 (c) (2) In addition to the provisions in paragraphs (b)(1), (b)(3), (b)(4) and (c)(1)(i) of this section, transmitters operating in the 2400-2483.5 MHz band that emit multiple directional beams, simultaneously or sequentially, for the purpose of directing signals to individual receivers or to groups of receivers provided the emissions comply with the following:

(i) Different information must be transmitted to each receiver.

(ii) If the transmitter employs an antenna system that emits multiple directional beams but does not do emit multiple directional beams simultaneously, the total output power conducted to the array or arrays that comprise the device, i.e., the sum of the power supplied to all antennas, antenna elements, staves, etc. and summed across all carriers or frequency channels, shall not exceed the limit specified in paragraph (b)(1) or (b)(3) of this section, as applicable. However, the total conducted output power shall be reduced by 1 dB below the specified limits for each 3 dB that the directional gain of the antenna/antenna array exceeds 6 dBi. The directional antenna gain shall be computed as follows:

(A) The directional gain shall be calculated as the sum of 10 log (number of array elements or staves) plus the directional gain of the element or stave having the highest gain.

(B) A lower value for the directional gain than that calculated in paragraph (c)(2)(ii)(A) of this section will be accepted if sufficient evidence is presented, e.g., due to shading of the array or coherence loss in the beamforming.

(iii) If a transmitter employs an antenna that operates simultaneously on multiple directional beams using the same or different frequency channels, the power supplied to each emission beam is subject to the power limit specified in paragraph (c)(2)(ii) of this section. If transmitted beams overlap, the power shall be reduced to ensure that their aggregate power does not exceed the limit specified in paragraph (c)(2)(ii) of this section. In addition, the aggregate power transmitted simultaneously on all beams shall not exceed the limit specified in paragraph (c)(2)(ii) of this section by more than 8 dB.

**RESULTS - QPSK**

**Limits**

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)
Low	2450.7	26.8	24.00
Mid	2460.7	26.8	24.00
High	2470.7	26.8	24.00

**Results**

Channel	Frequency (MHz)	Chain 1 Power (dB)	Chain 2 Power (dB)	Chain 3 Power (dB)	Chain 4 Power (dB)
Low	2450.7	11.2	13.2	14.64	16.01
Mid	2460.7	11.01	13.37	14.37	16.05
High	2470.7	10.81	13.22	13.92	15.6

Channel	Frequency (MHz)	Chain 5 Power (dB)	Chain 6 Power (dB)	Chain 7 Power (dB)	Chain 8 Power (dB)	Total Corrected Power (dBm)	Limit	Margin
Low	2450.7	17.05	15.24	13.29	11.39	23.47	24.00	-0.53
Mid	2460.7	16.7	15.05	13.21	11.13	23.32	24.00	-0.68
High	2470.7	16.74	14.86	13.01	11.27	23.12	24.00	-0.88

**RESULTS – 16-QAM**

**Limits**

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)
Low	2450.7	26.8	24.00
Mid	2460.7	26.8	24.00
High	2470.7	26.8	24.00

**Results**

Channel	Frequency (MHz)	Chain 1 Power (dB)	Chain 2 Power (dB)	Chain 3 Power (dB)	Chain 4 Power (dB)
Low	2450.7	11.16	13.38	14.09	16.12
Mid	2460.7	10.95	13.36	14.48	16.27
High	2470.7	10.86	13.02	14.38	15.78

Channel	Frequency (MHz)	Chain 5 Power (dB)	Chain 6 Power (dB)	Chain 7 Power (dB)	Chain 8 Power (dB)	Total Corrected Power (dBm)	Limit	Margin
Low	2450.7	17	15.21	13.42	11.14	23.42	24.00	-0.58
Mid	2460.7	16.79	14.98	13.29	11.16	23.39	24.00	-0.61
High	2470.7	16.71	14.92	12.92	10.79	23.16	24.00	-0.84

**RESULTS – 64-QAM**

**Limits**

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)
Low	2450.7	26.8	24.00
Mid	2460.7	26.8	24.00
High	2470.7	26.8	24.00

**Results**

Channel	Frequency (MHz)	Chain 1 Power (dB)	Chain 2 Power (dB)	Chain 3 Power (dB)	Chain 4 Power (dB)
Low	2450.7	11.14	13.46	14.11	16.02
Mid	2460.7	11.07	13.24	14.04	16.14
High	2470.7	11.3	13.26	14.46	16.08

Channel	Frequency (MHz)	Chain 5 Power (dB)	Chain 6 Power (dB)	Chain 7 Power (dB)	Chain 8 Power (dB)	Total Corrected Power (dBm)	Limit	Margin
Low	2450.7	16.79	15.15	13.37	11.02	23.34	24.00	-0.66
Mid	2460.7	16.69	14.97	13.35	11.4	23.30	24.00	-0.70
High	2470.7	16.87	14.7	13.04	11.21	23.32	24.00	-0.68

**10.3.3. POWER SPECTRAL DENSITY**

**LIMITS**

FCC §15.247 (e)

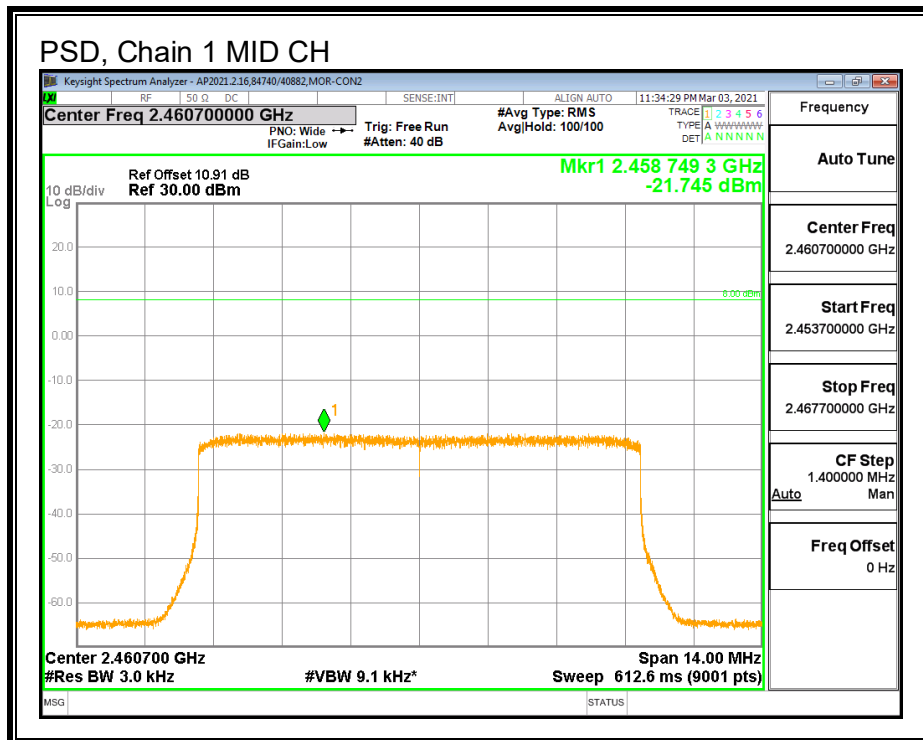
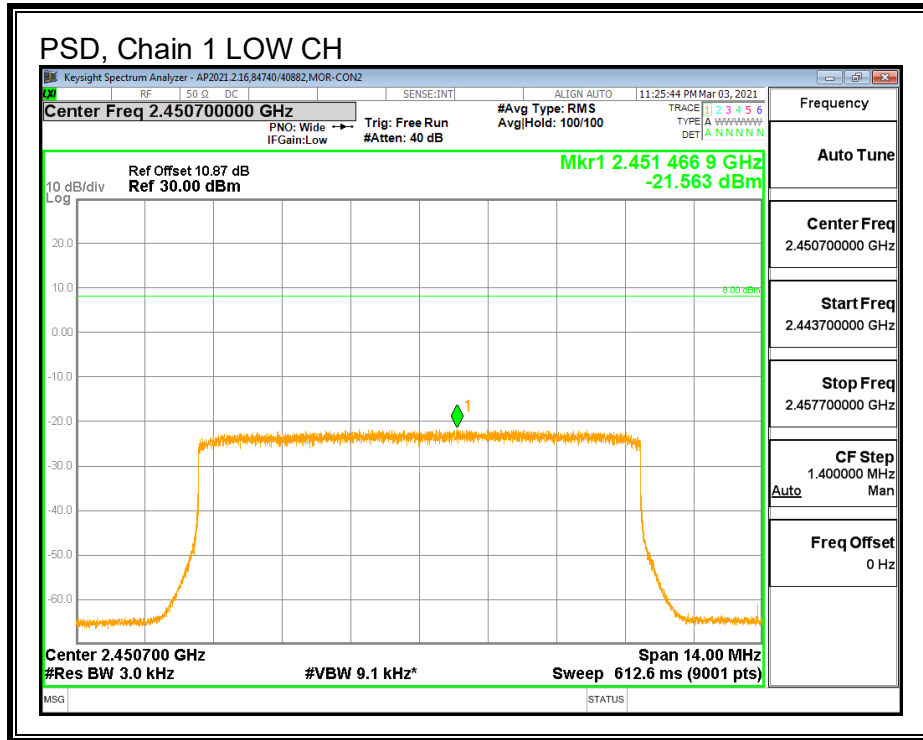
**RESULTS - QPSK**

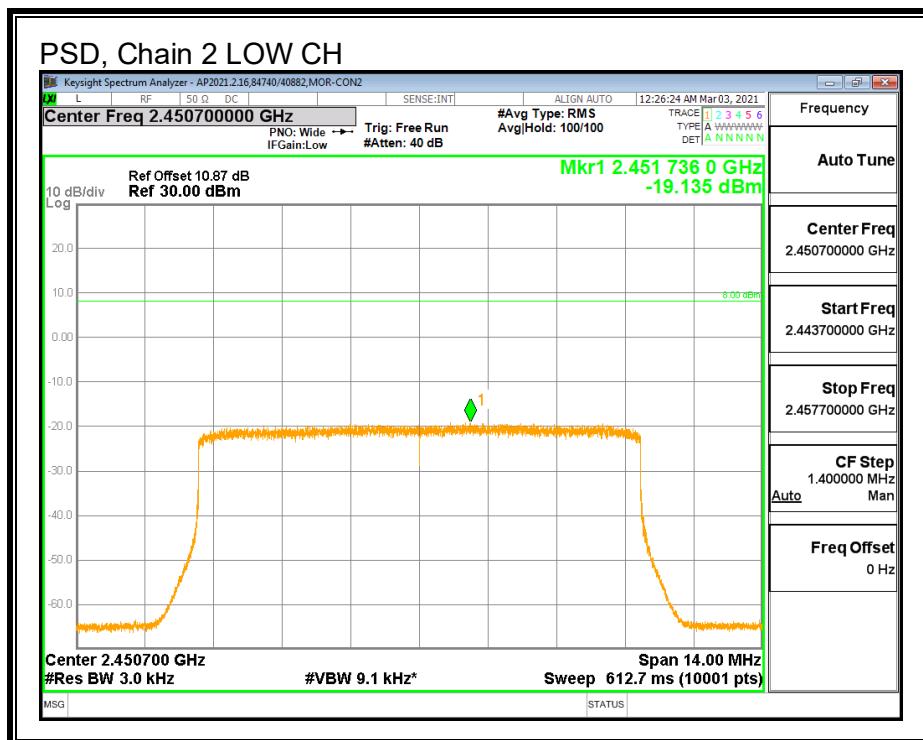
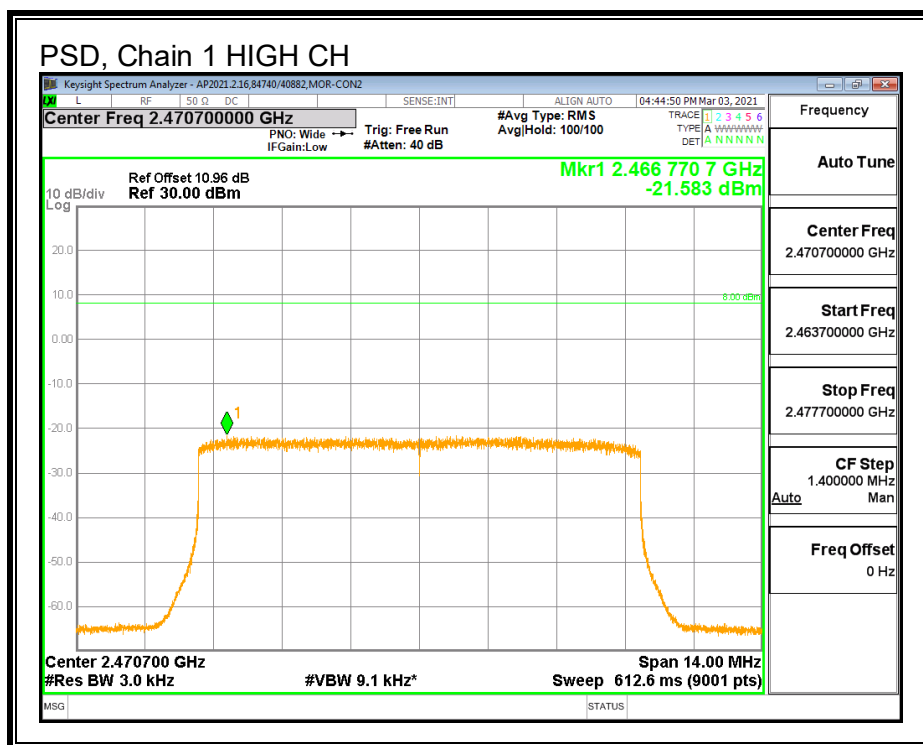
Duty Cycle CF (dB)	Included in Calculations of Corr'd PSD							
	Chain 1	Chain 2	Chain 3	Chain 4	Chain 5	Chain 6	Chain 7	Chain 8
	1.35	1.36	1.35	0	17.26	0	1.34	1.39

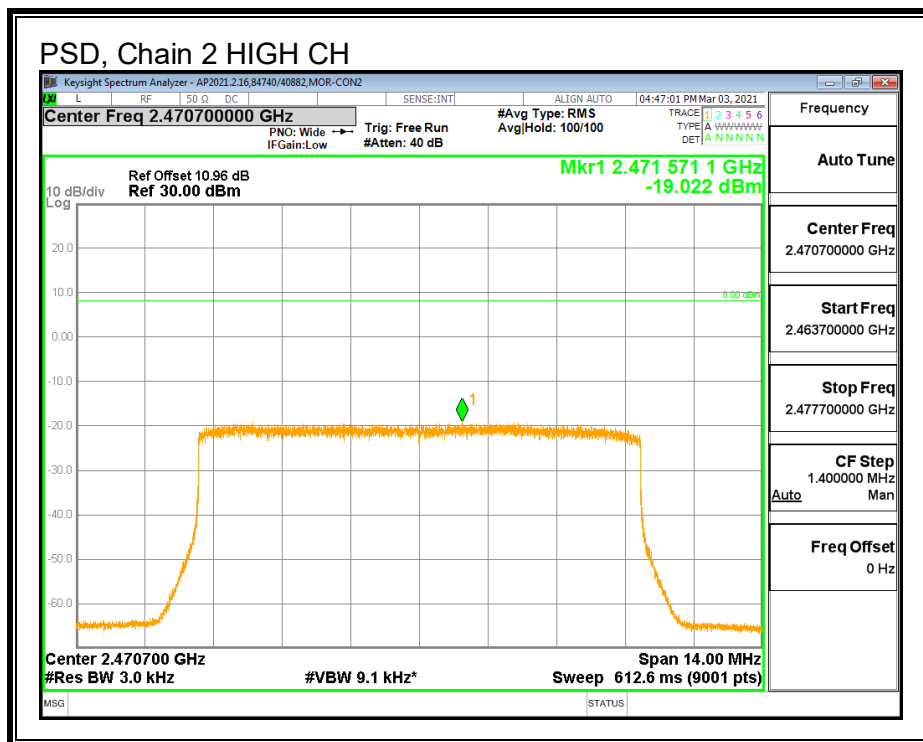
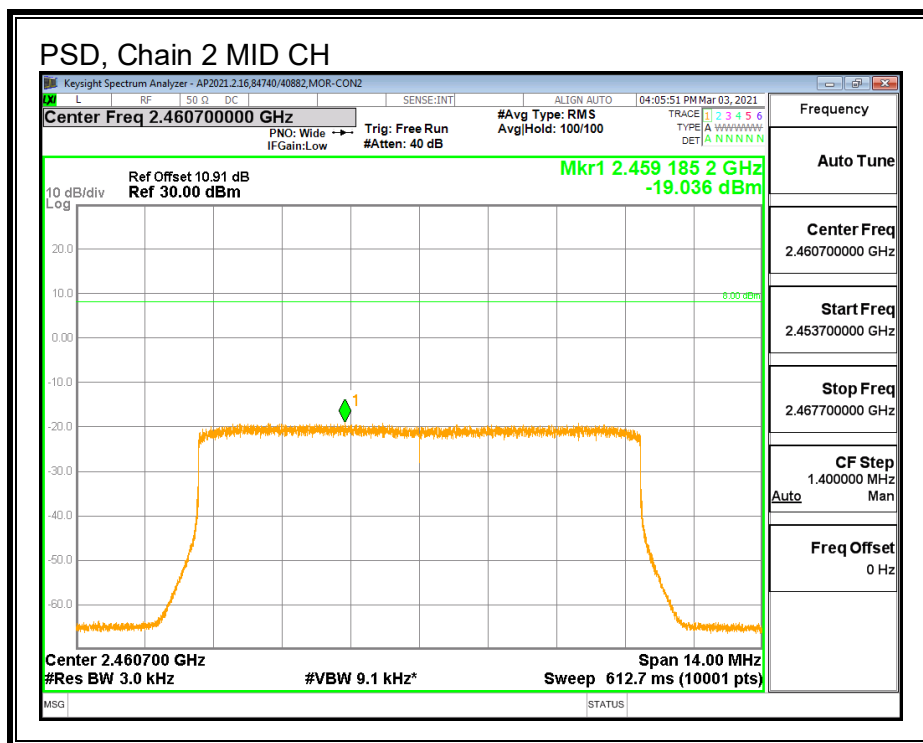
**PSD Results**

Channel	Frequency (MHz)	Chain 1 Meas (dBm)	Chain 2 Meas (dBm)	Chain 3 Meas (dBm)	Chain 4 Meas (dBm)
Low	2450.700	-21.56	-19.14	-17.72	-14.32
Mid	2460.700	-21.75	-19.04	-17.87	-16.22
High	2470.700	-21.58	-19.02	-18.24	-16.03

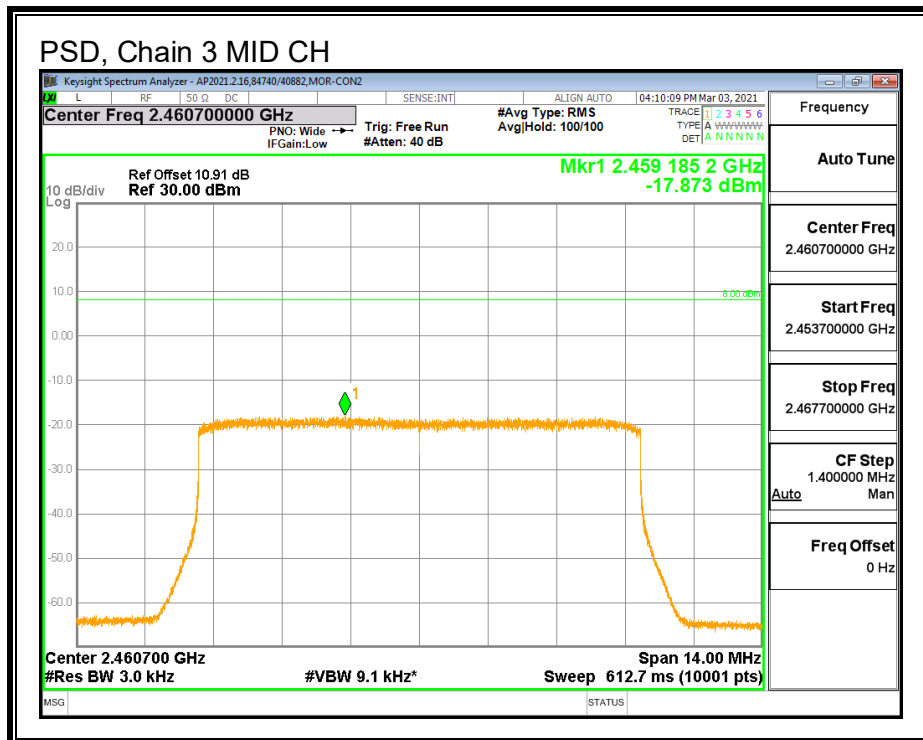
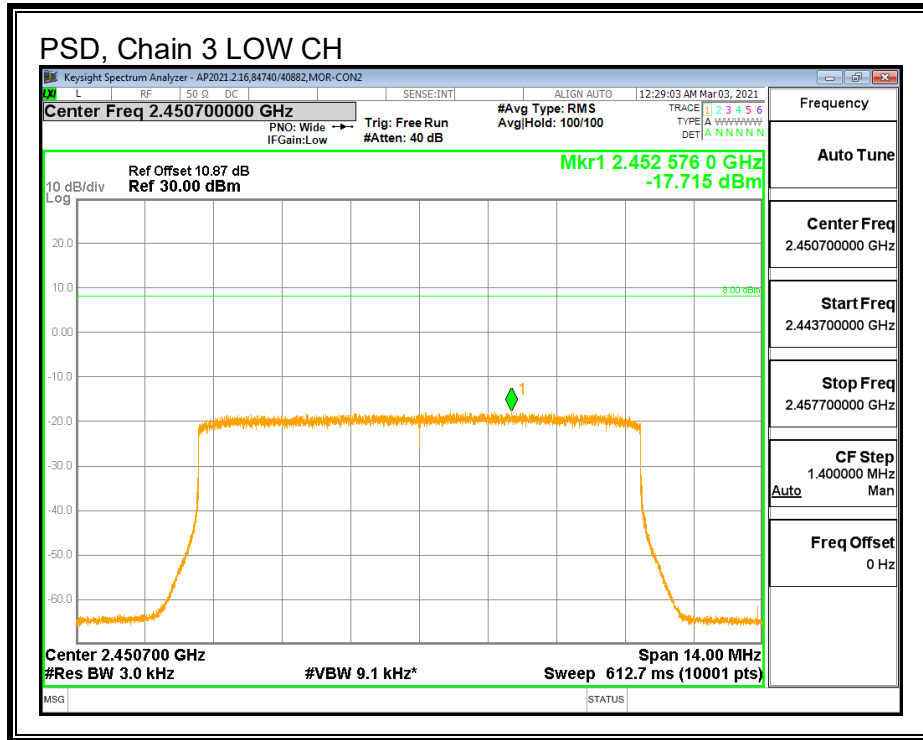
Channel	Frequency (MHz)	Chain 5 Meas (dBm)	Chain 6 Meas (dBm)	Chain 7 Meas (dBm)	Chain 8 Meas (dBm)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2450.700	-14.93	-16.74	-19.37	-20.61	2.66	8.0	-5.3
Mid	2460.700	-15.45	-17.03	-19.13	-20.68	2.15	8.0	-5.9
High	2470.700	-15.38	-16.97	-19.76	-21.23	2.20	8.0	-5.8

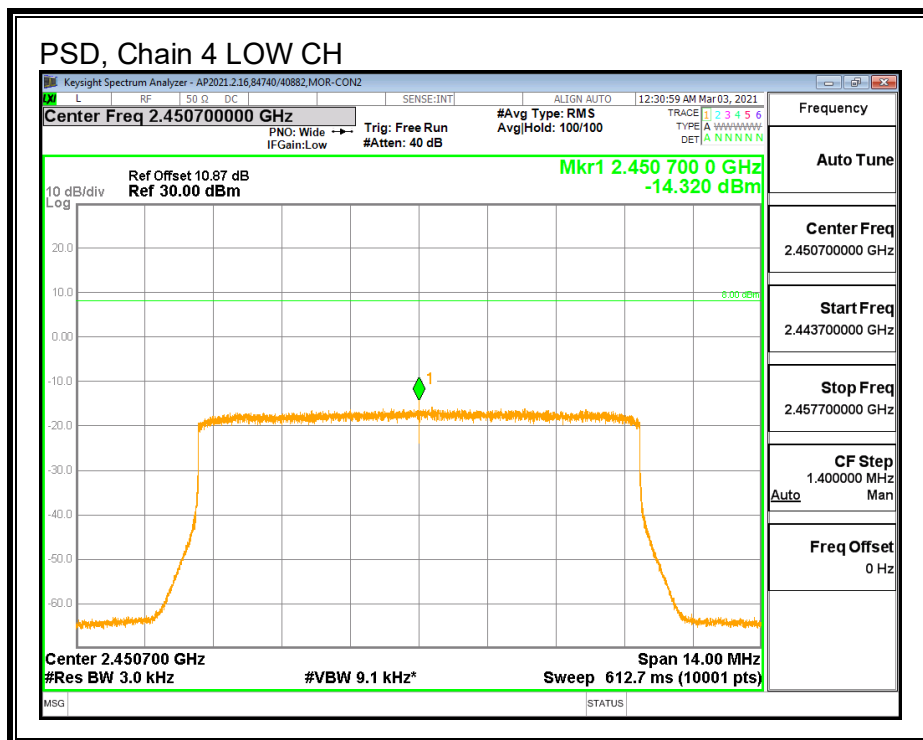
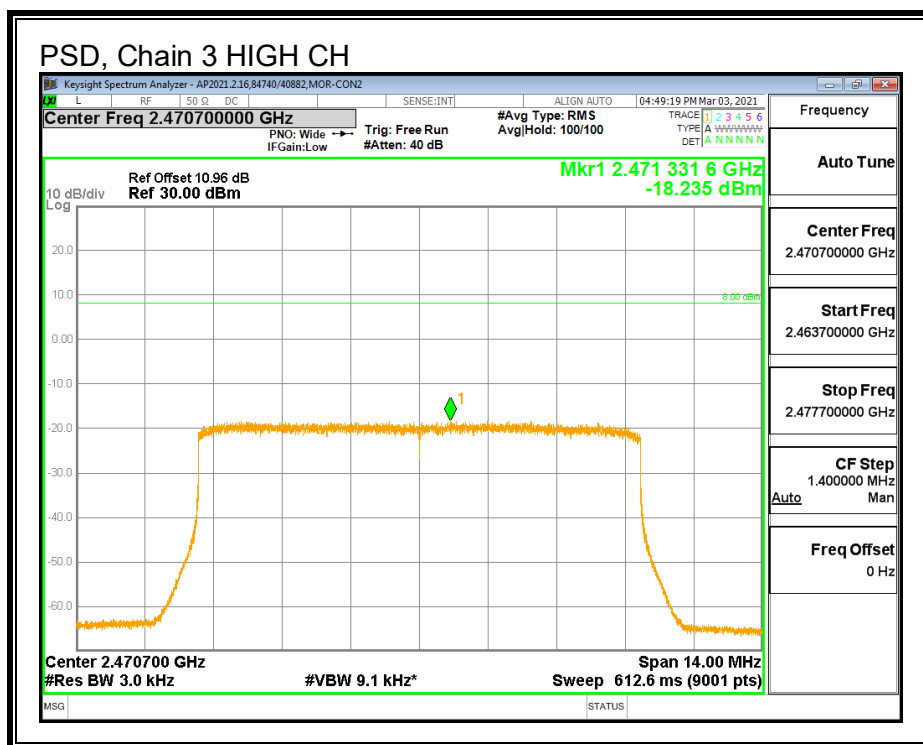


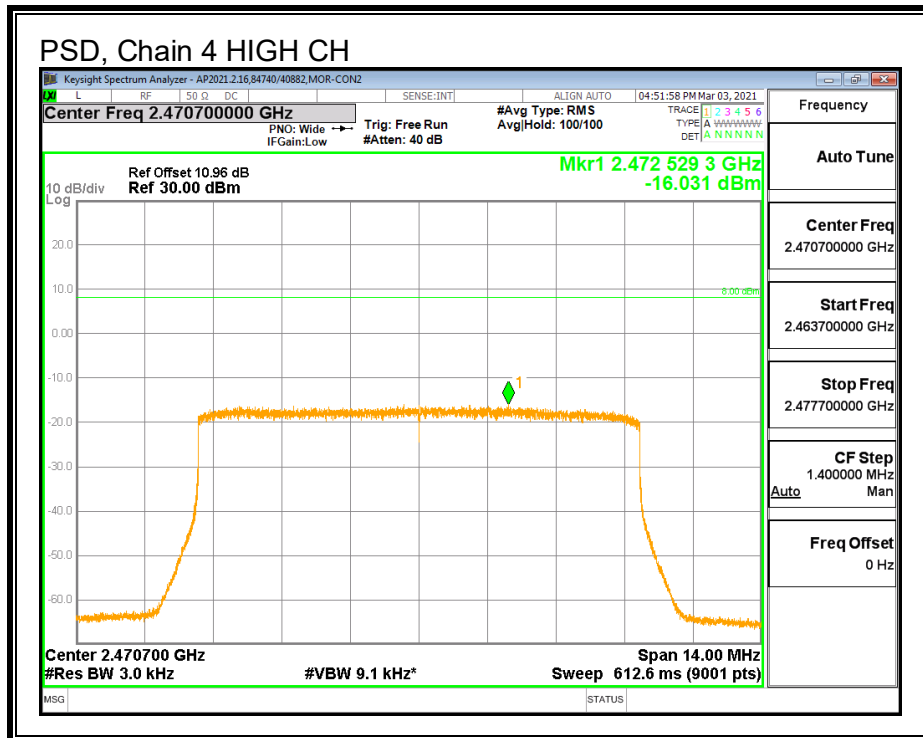
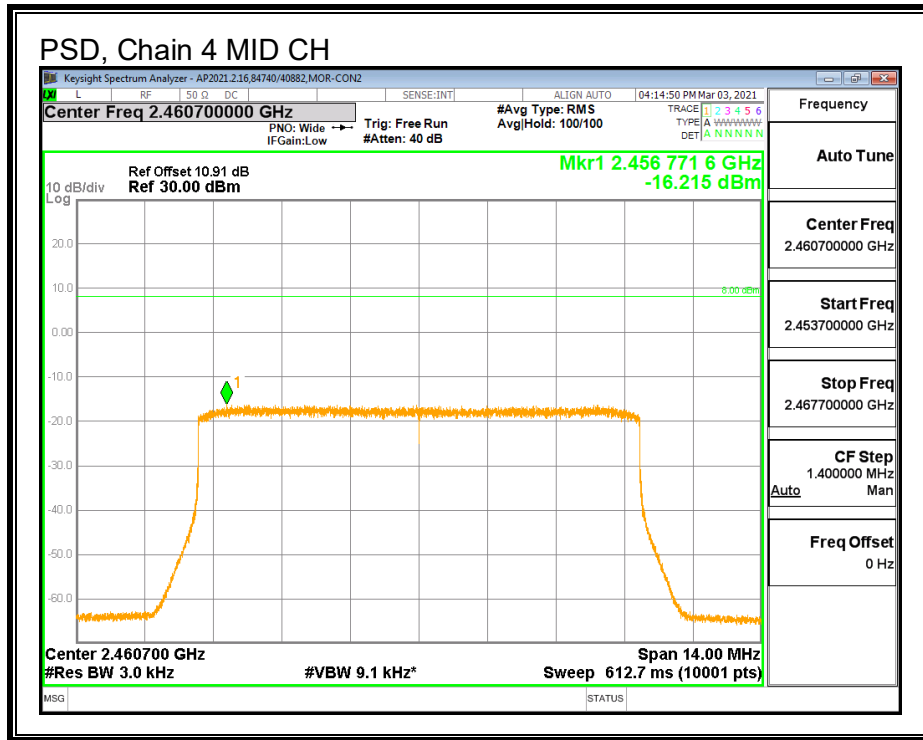


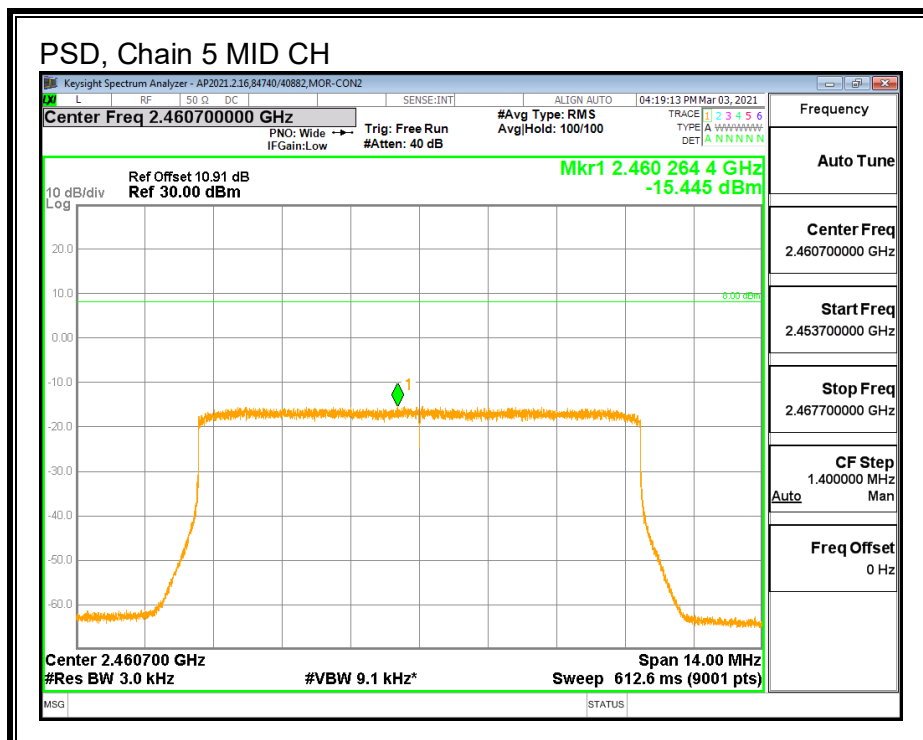
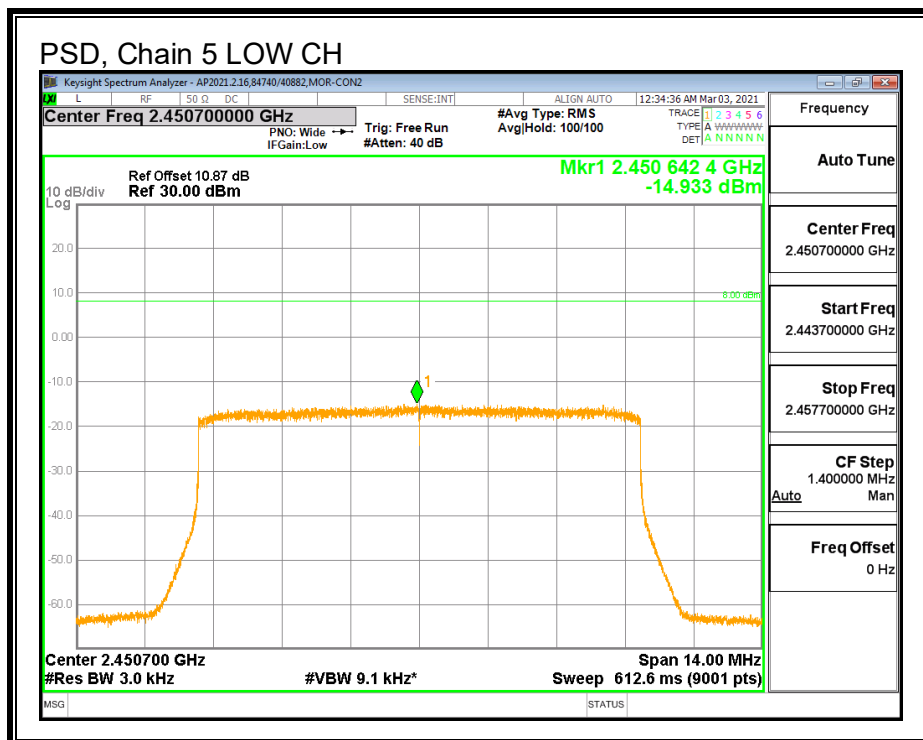


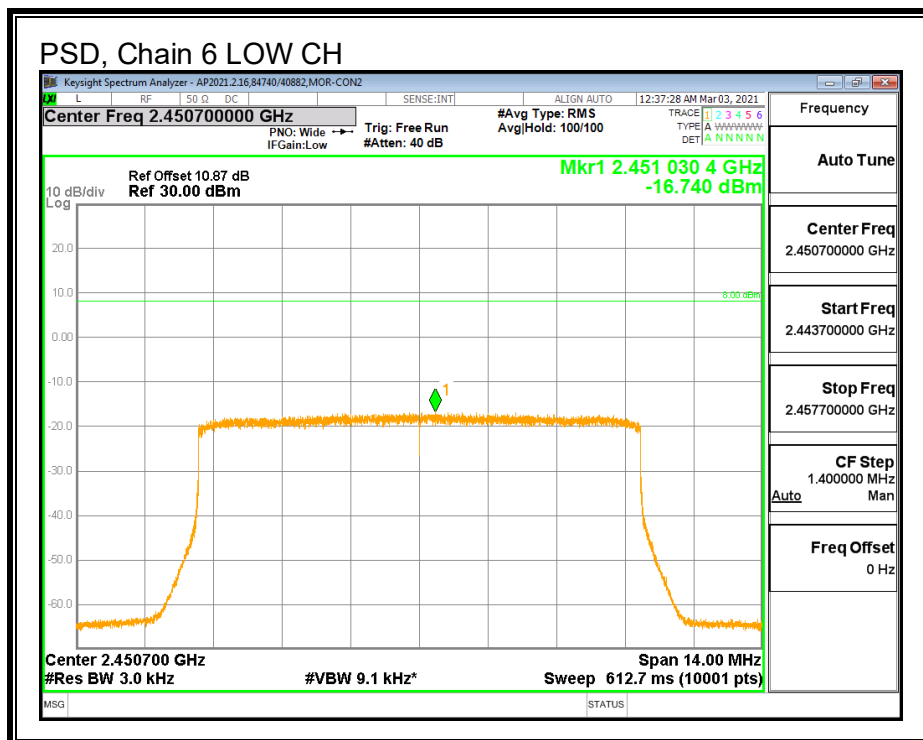
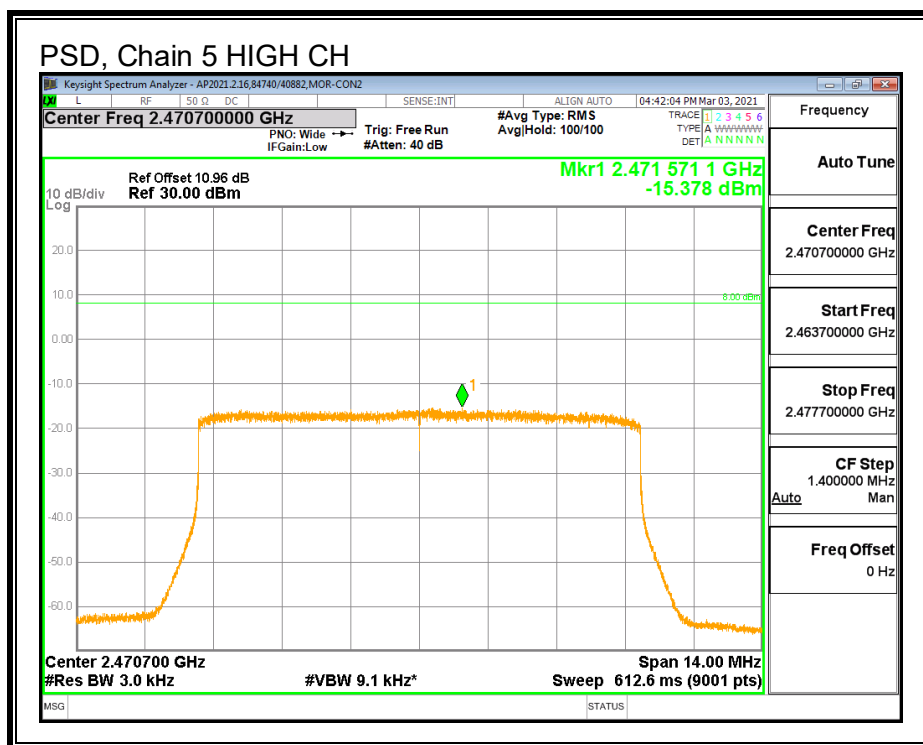


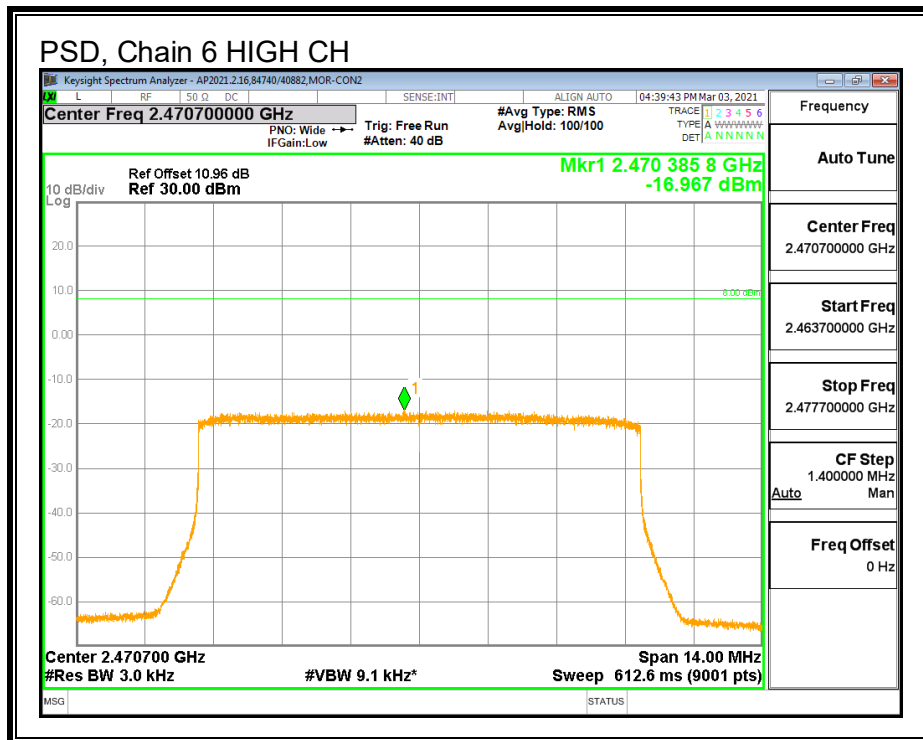
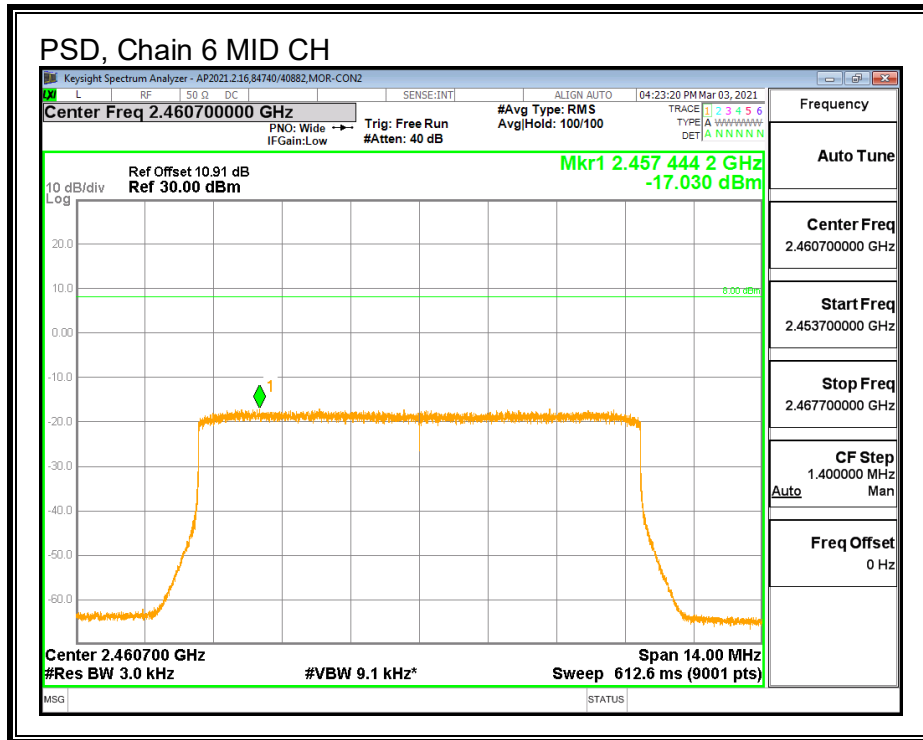


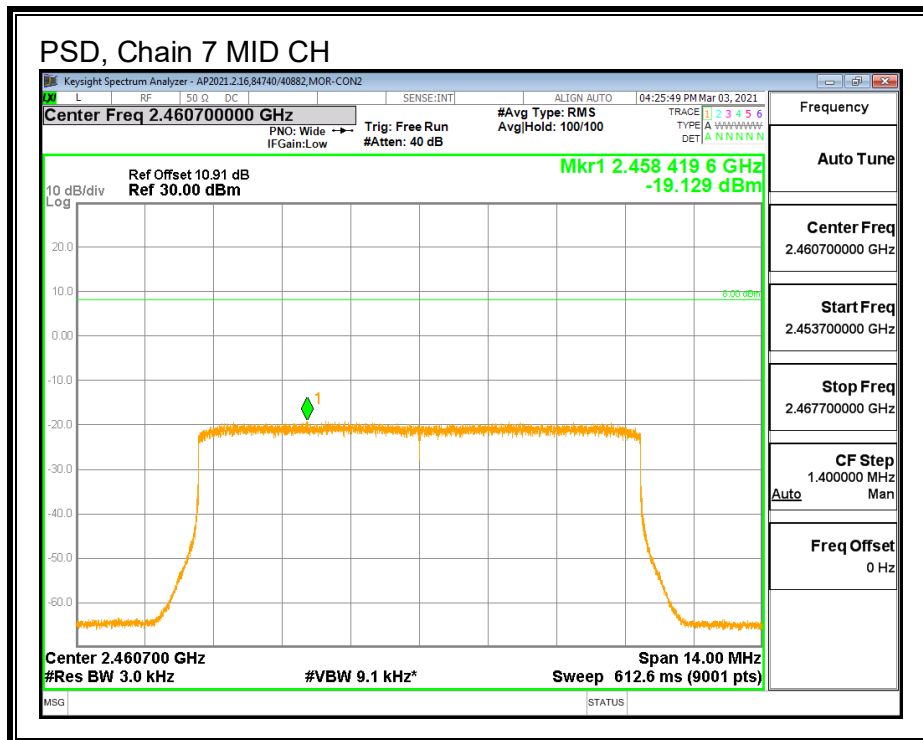
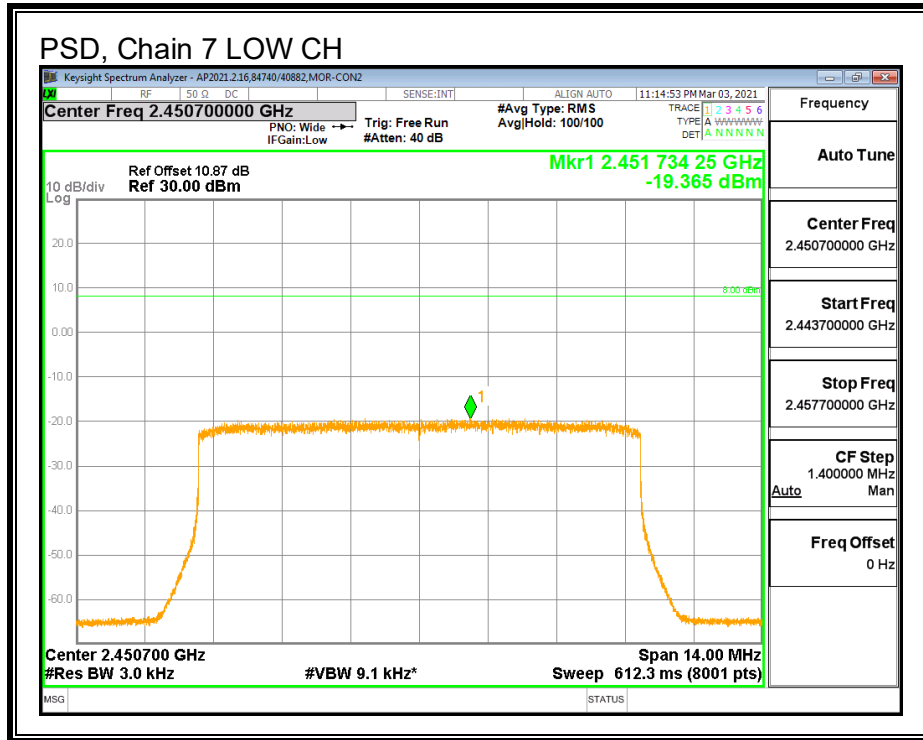


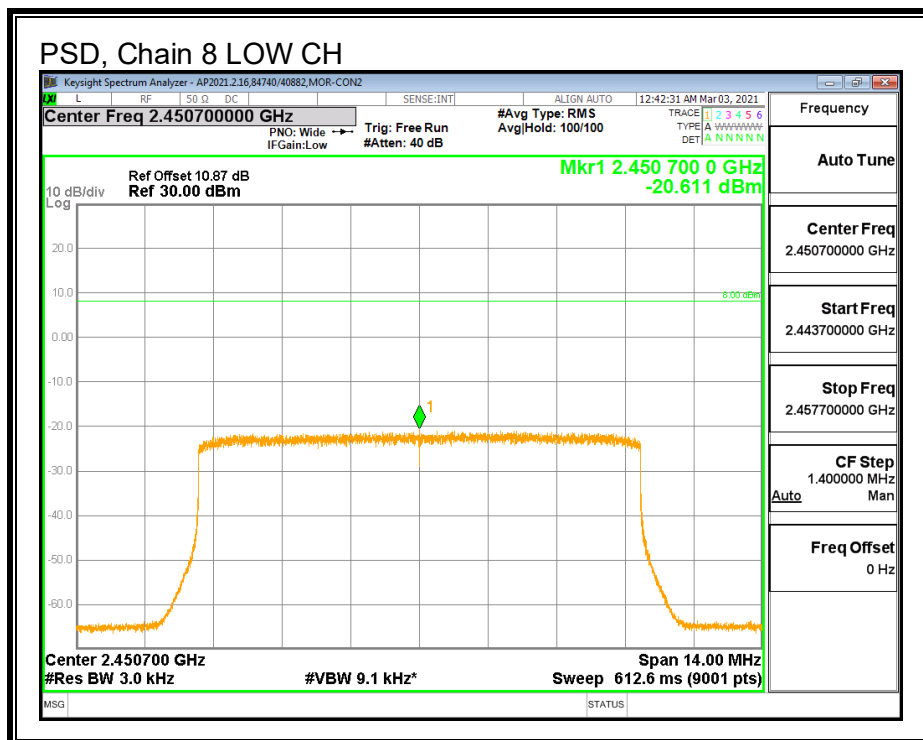
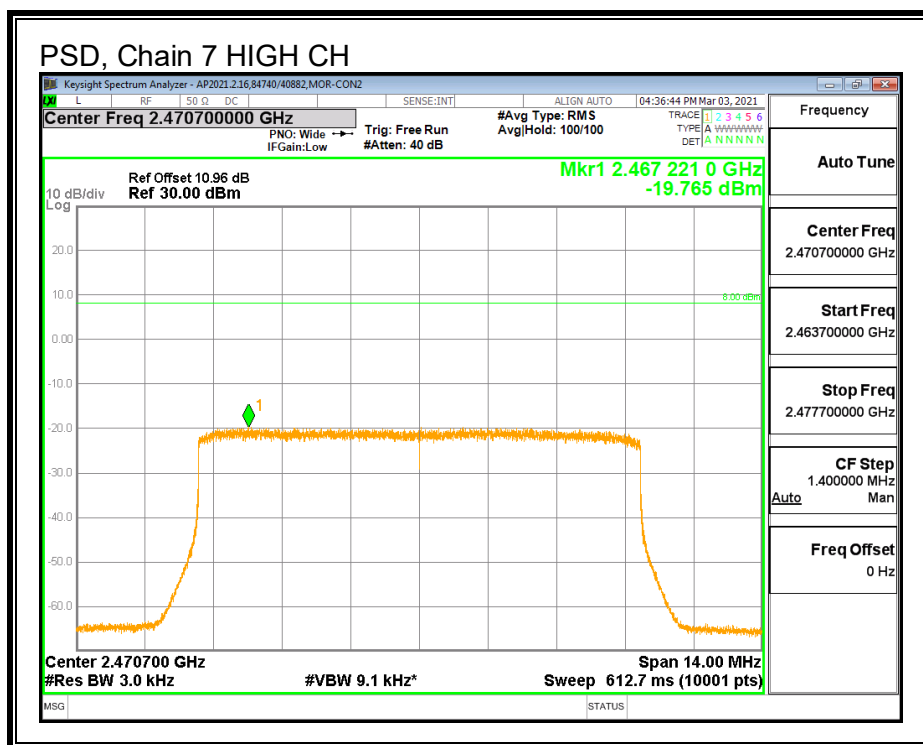




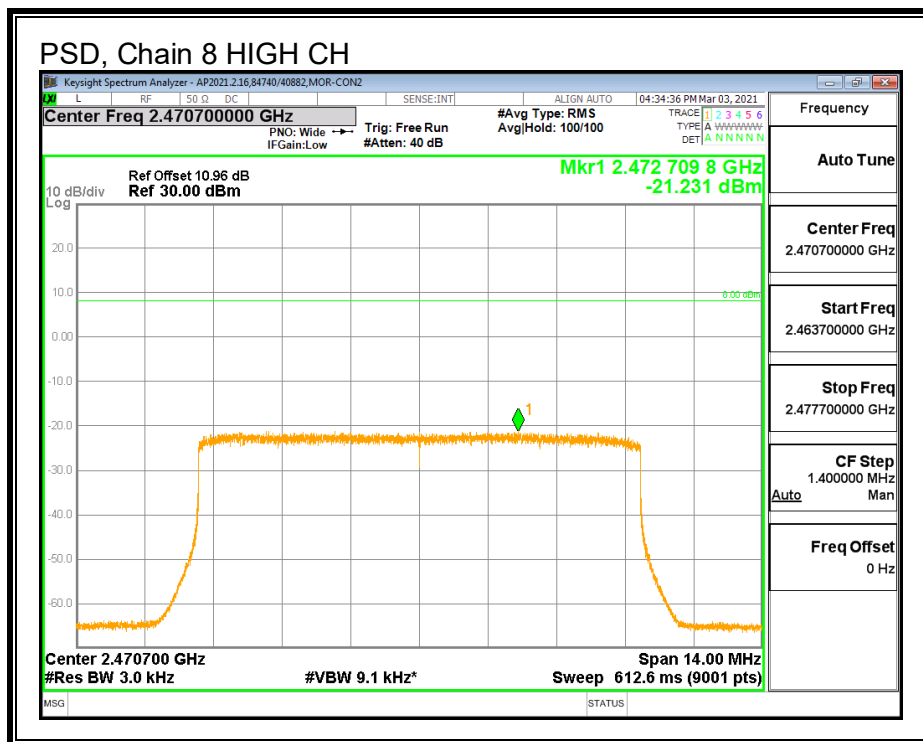
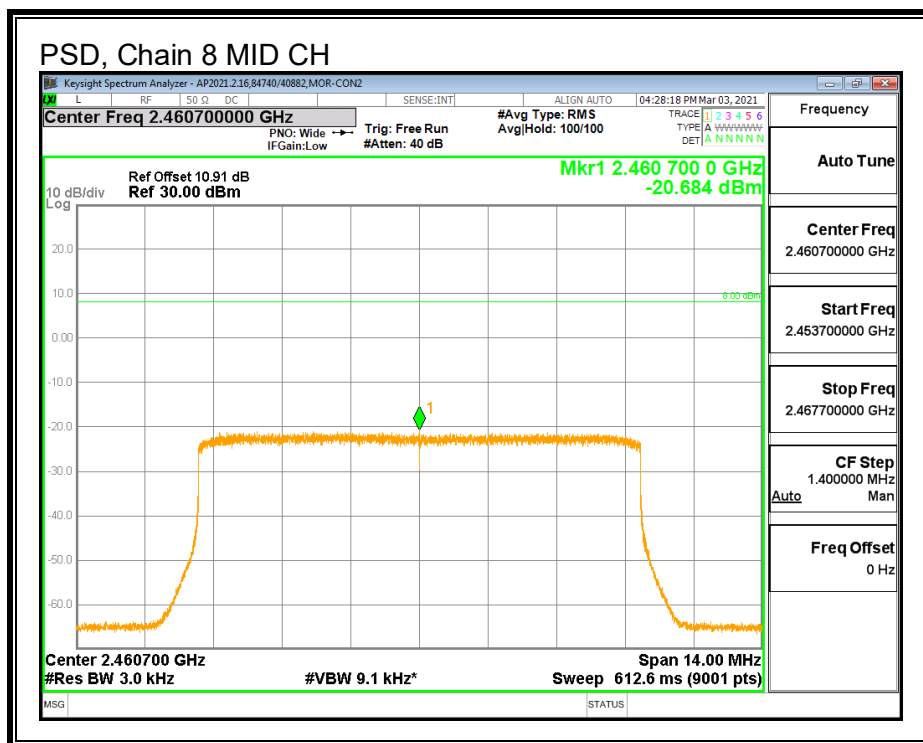












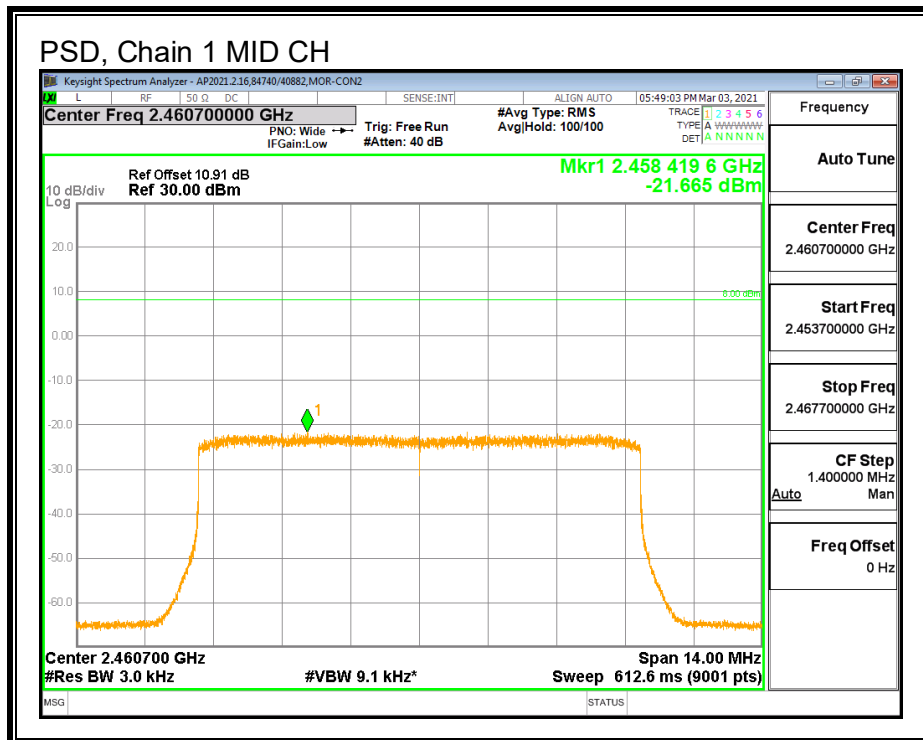
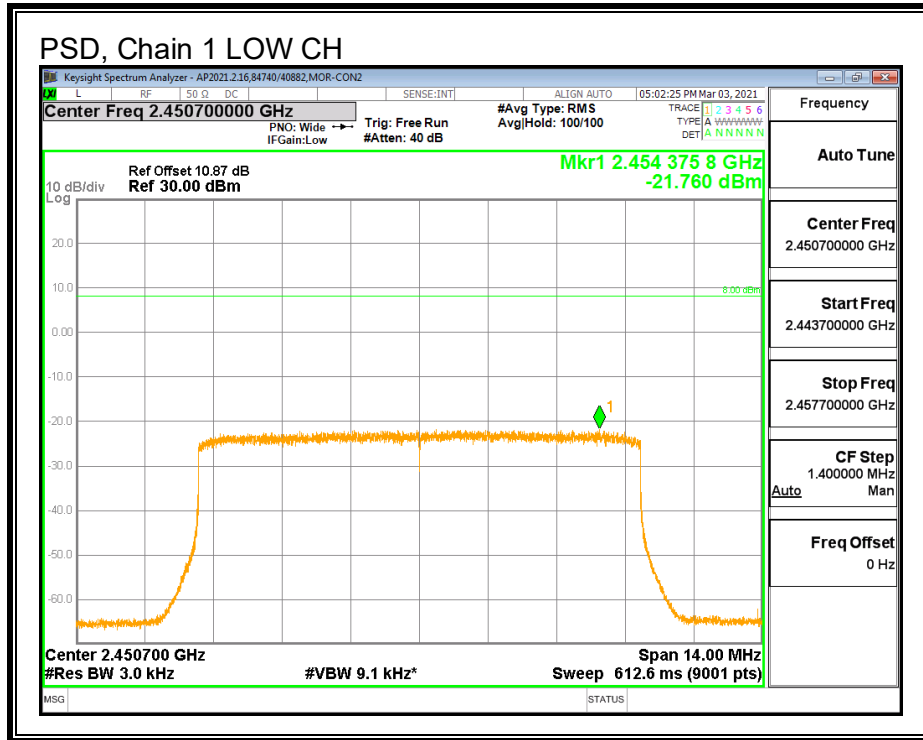
**RESULTS – 16-QAM**

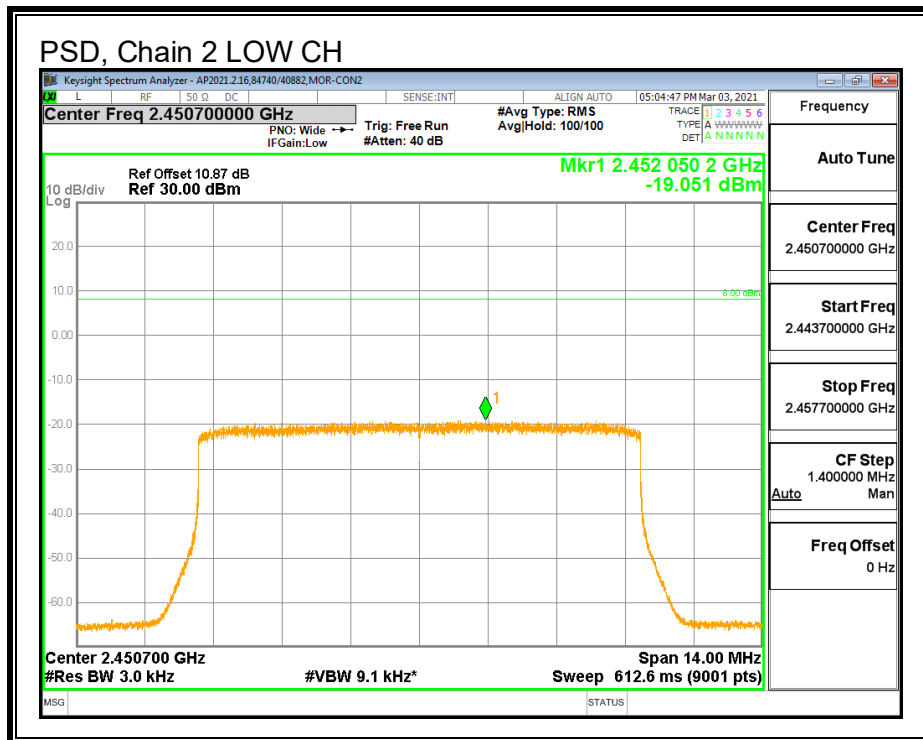
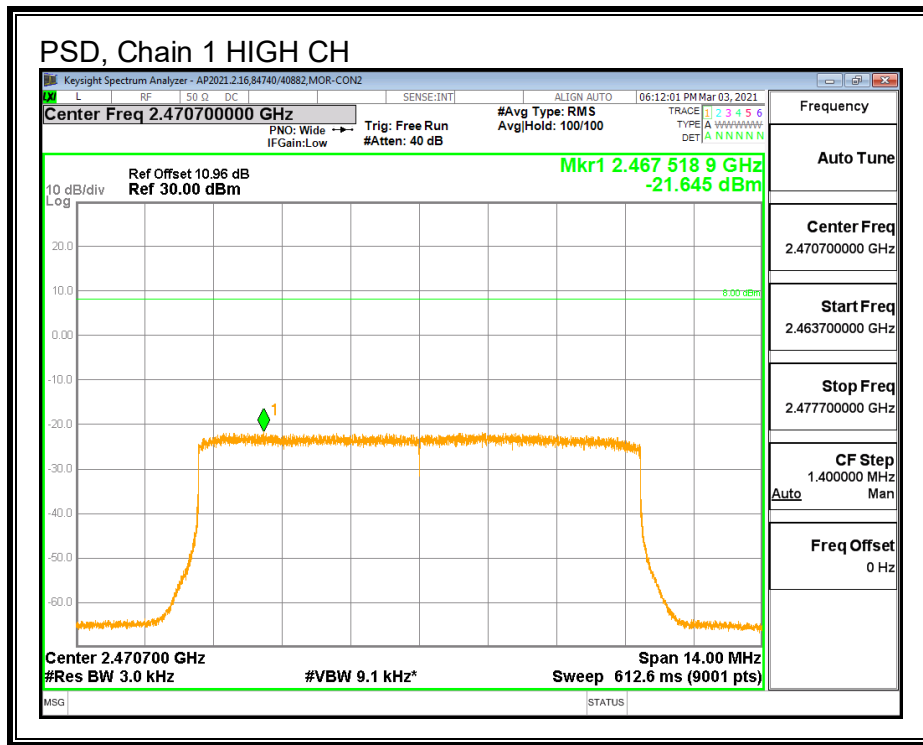
Duty Cycle CF (dB)	Included in Calculations of Corr'd PSD							
	Chain 1	Chain 2	Chain 3	Chain 4	Chain 5	Chain 6	Chain 7	Chain 8
	1.36	1.36	1.39	0	17.51	0	1.35	1.3

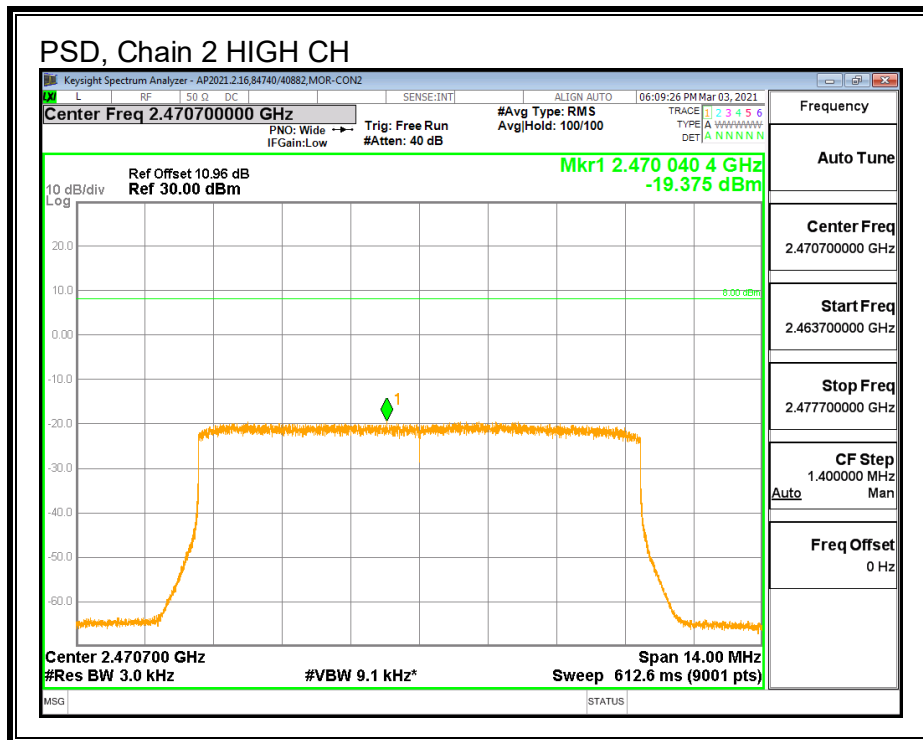
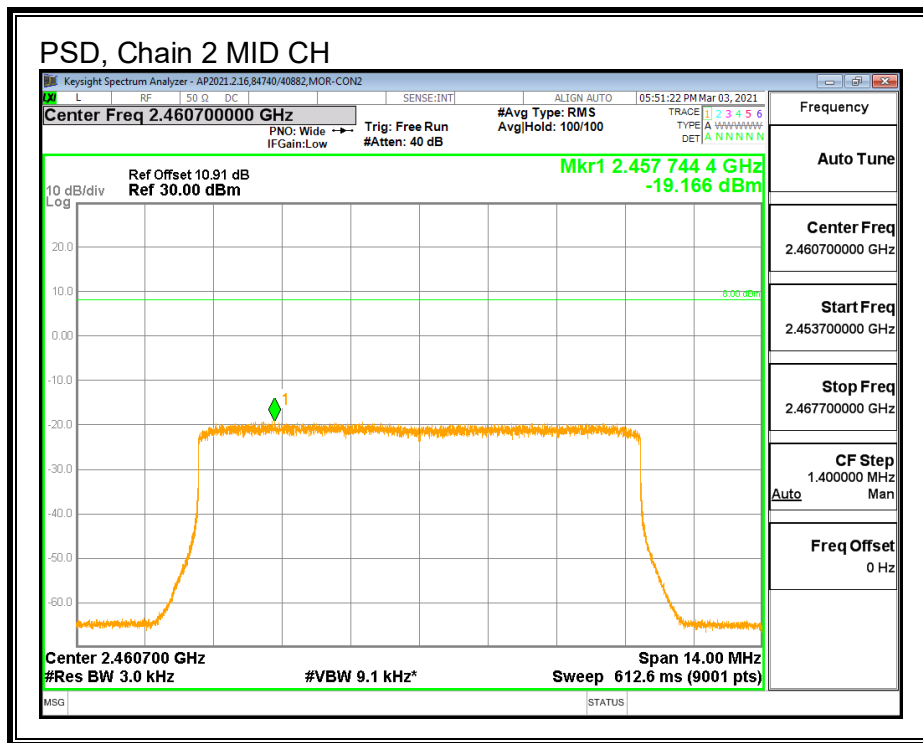
**PSD Results**

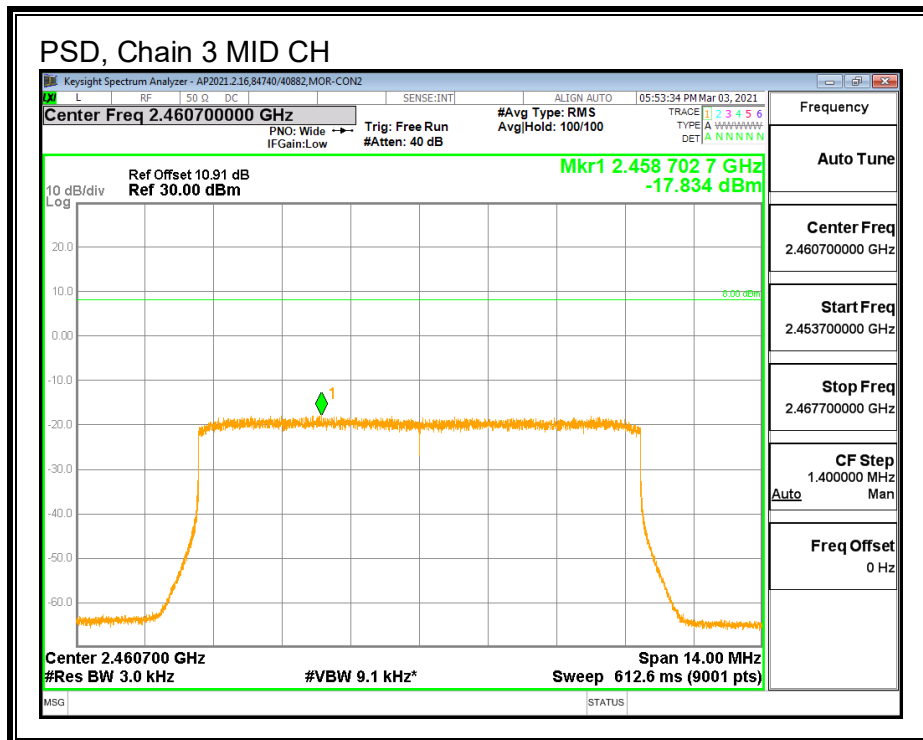
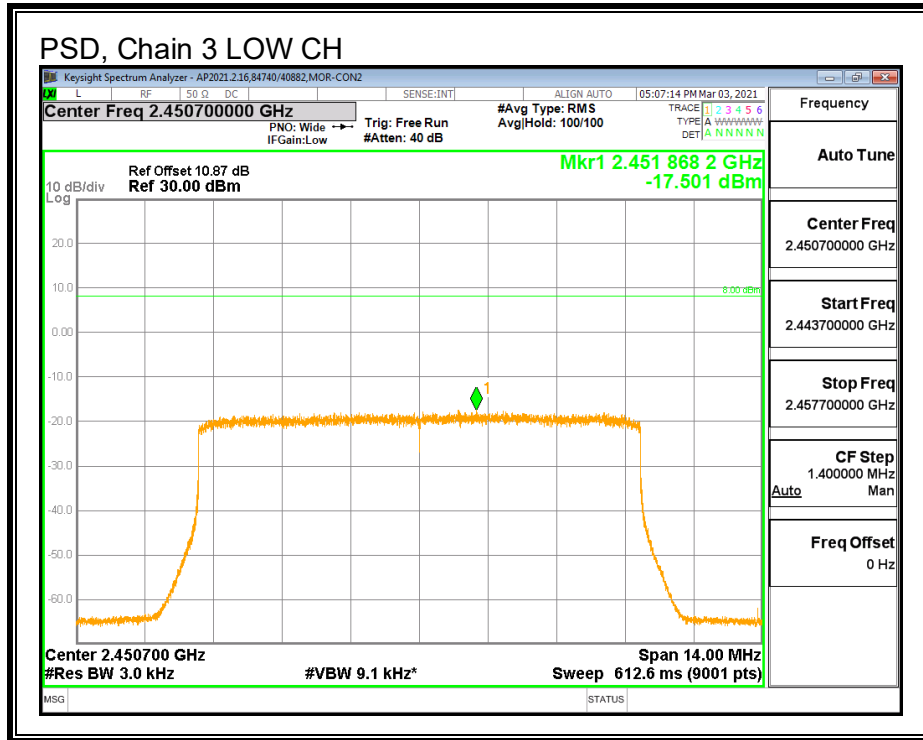
Channel	Frequency (MHz)	Chain 1 Meas (dBm)	Chain 2 Meas (dBm)	Chain 3 Meas (dBm)	Chain 4 Meas (dBm)
Low	2450.700	-21.76	-19.05	-17.50	-15.85
Mid	2460.700	-21.67	-19.17	-17.83	-15.56
High	2470.700	-21.65	-19.38	-18.15	-15.90

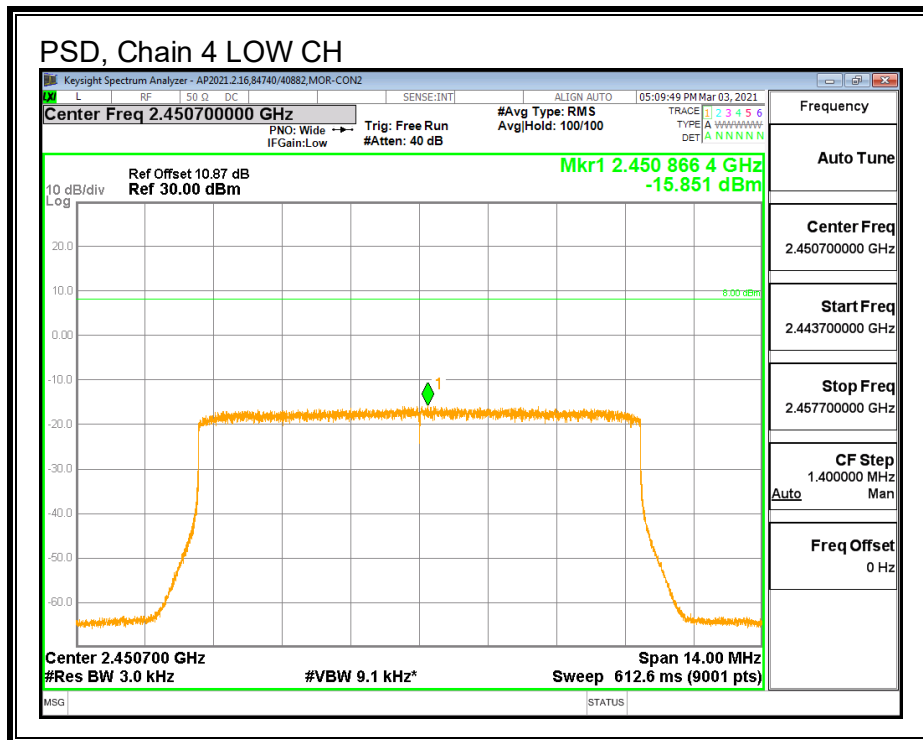
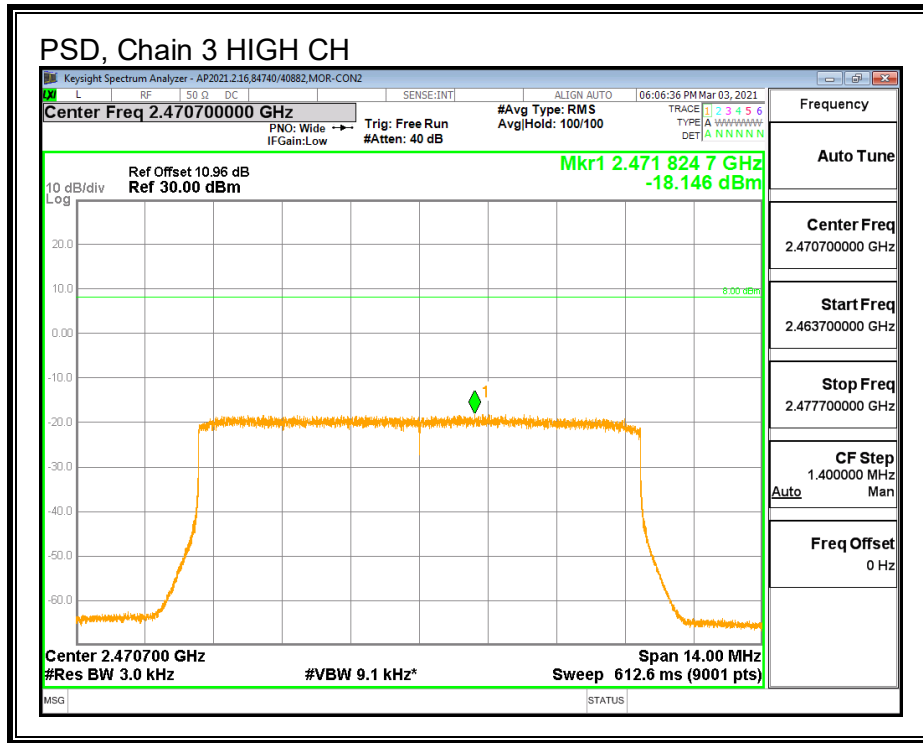
Channel	Frequency (MHz)	Chain 5 Meas (dBm)	Chain 6 Meas (dBm)	Chain 7 Meas (dBm)	Chain 8 Meas (dBm)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2450.700	-15.12	-16.81	-19.08	-20.94	2.69	8.0	-5.3
Mid	2460.700	-15.17	-17.24	-19.33	-20.34	2.65	8.0	-5.4
High	2470.700	-15.16	-16.94	-19.37	-20.67	2.65	8.0	-5.4

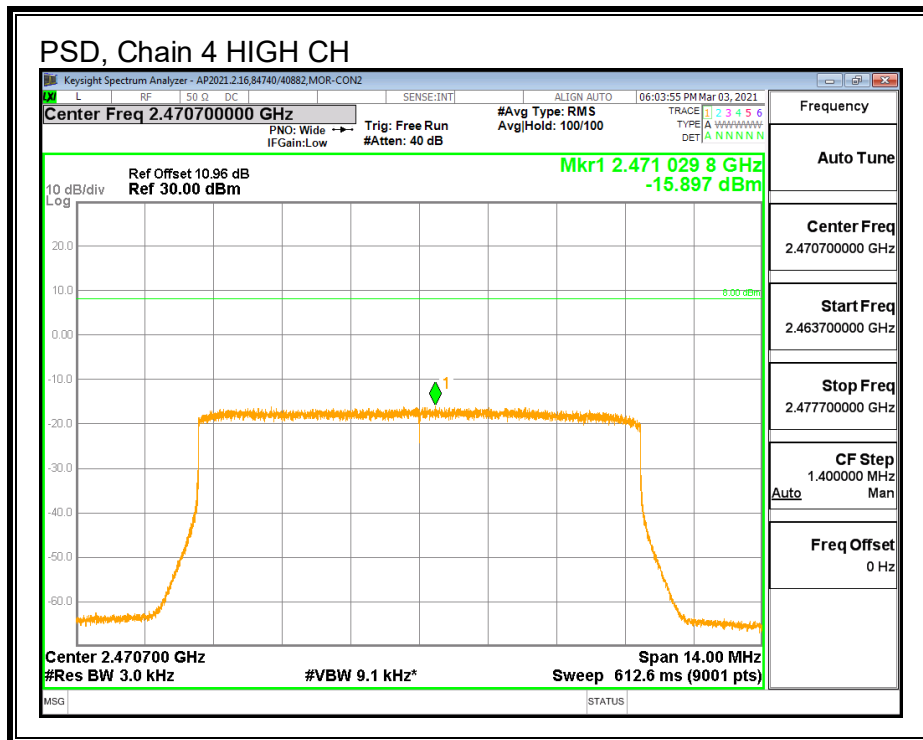
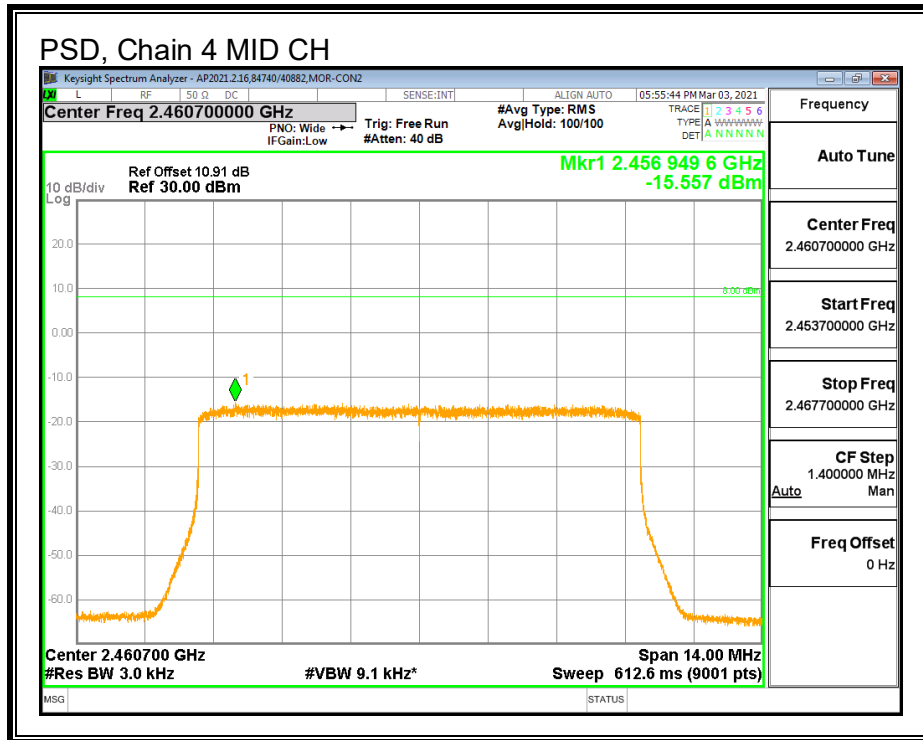




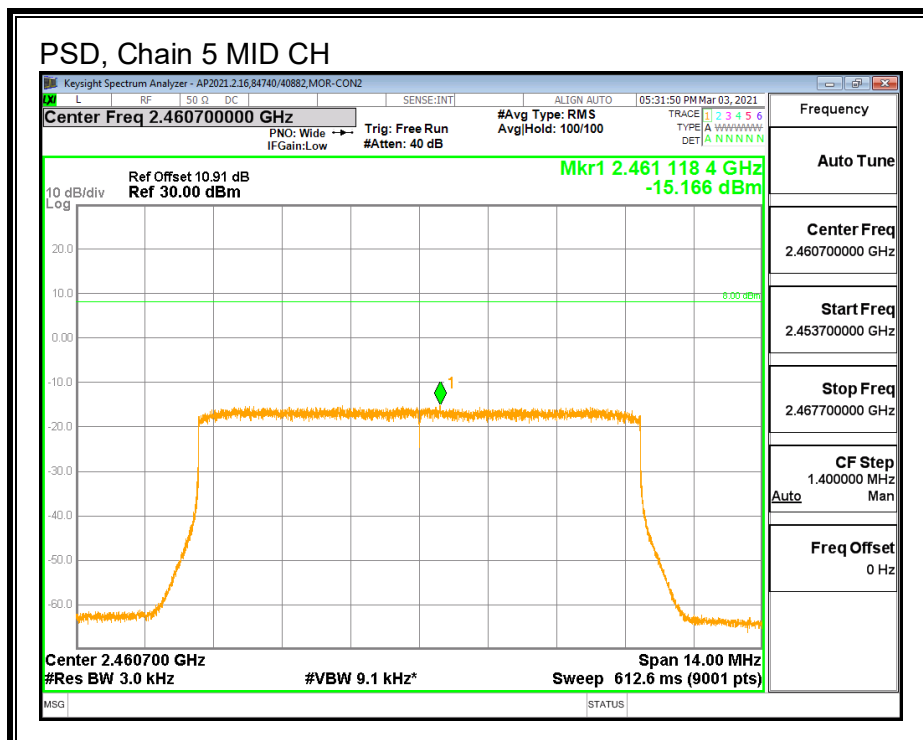
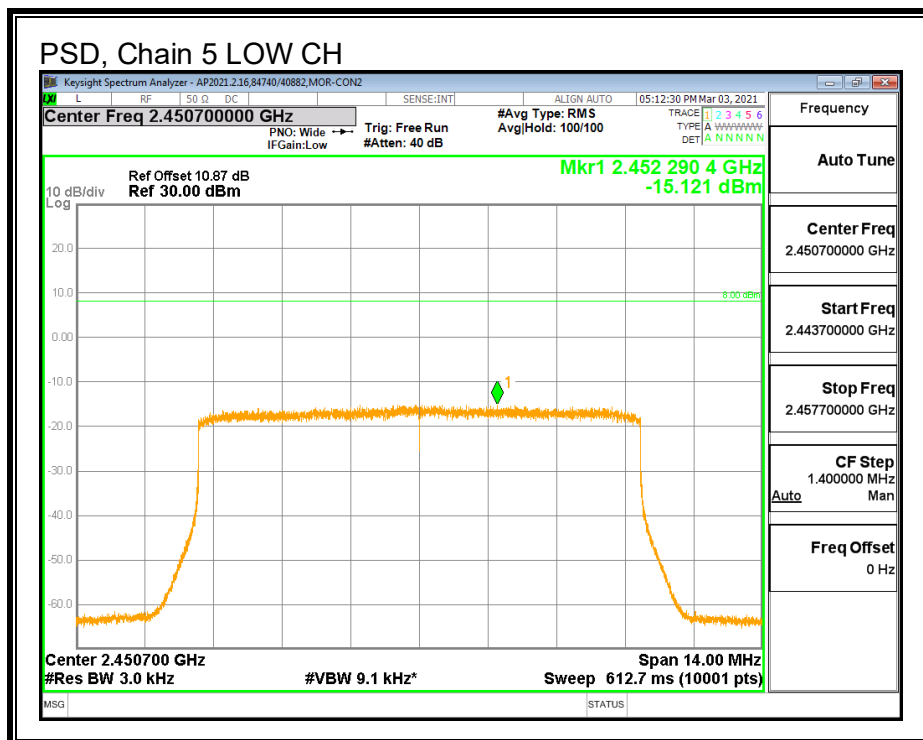


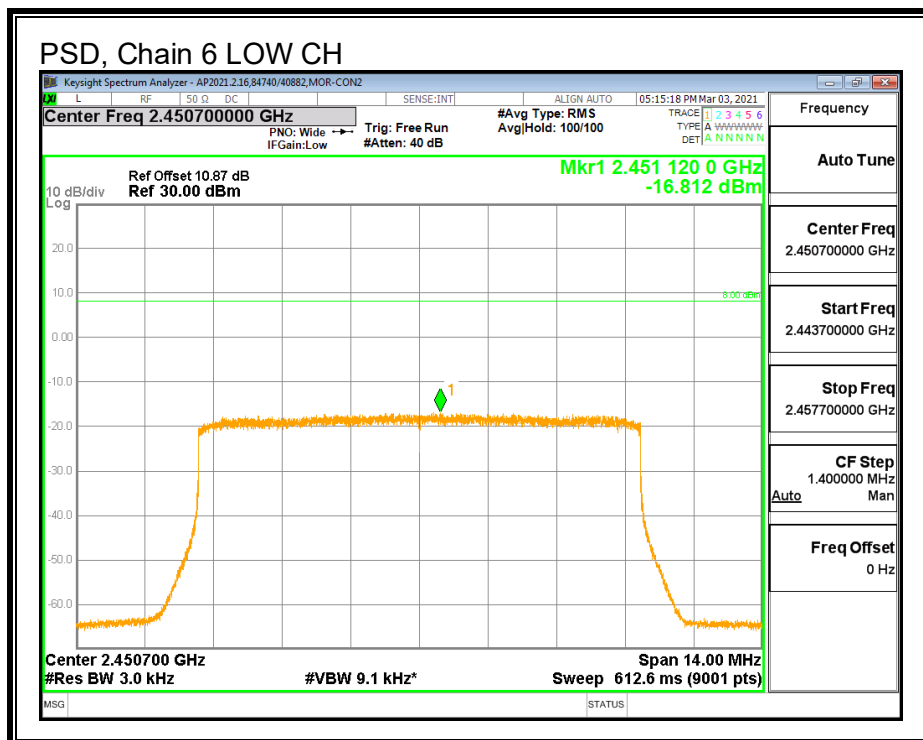
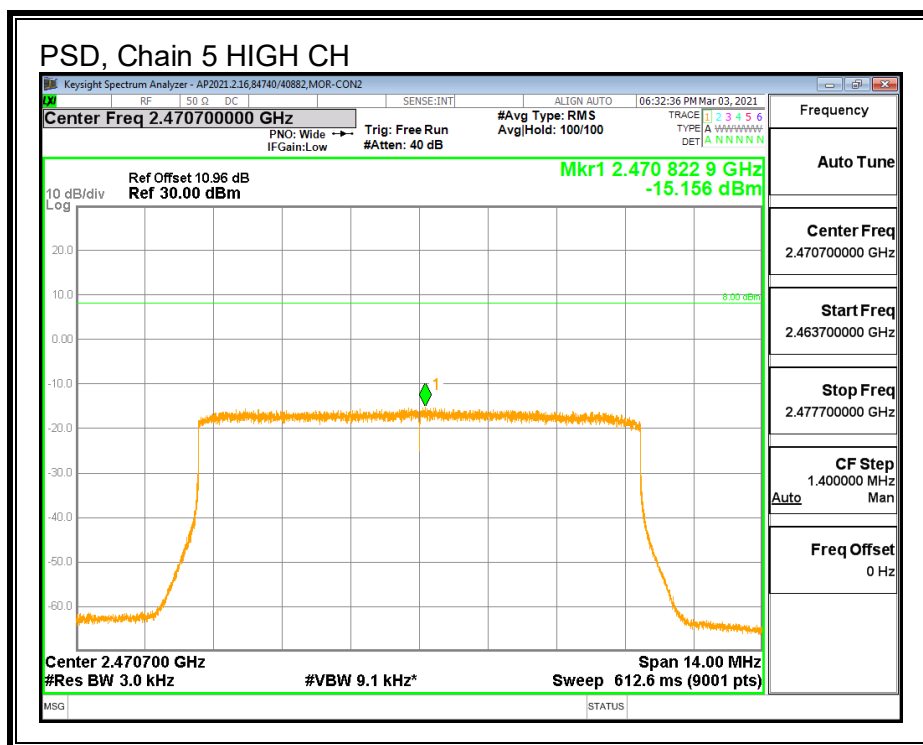


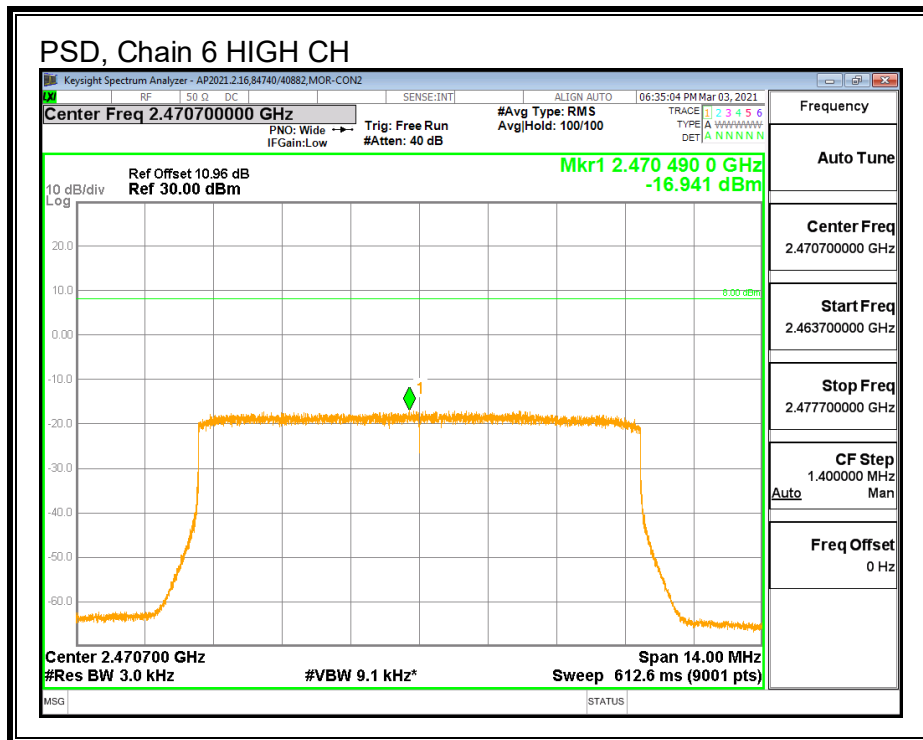
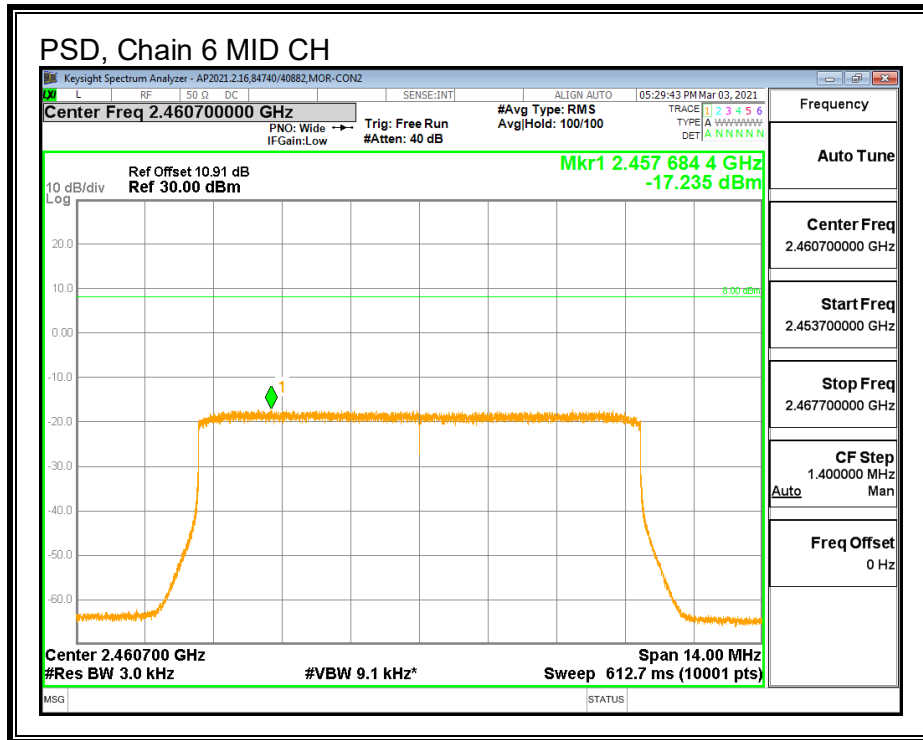


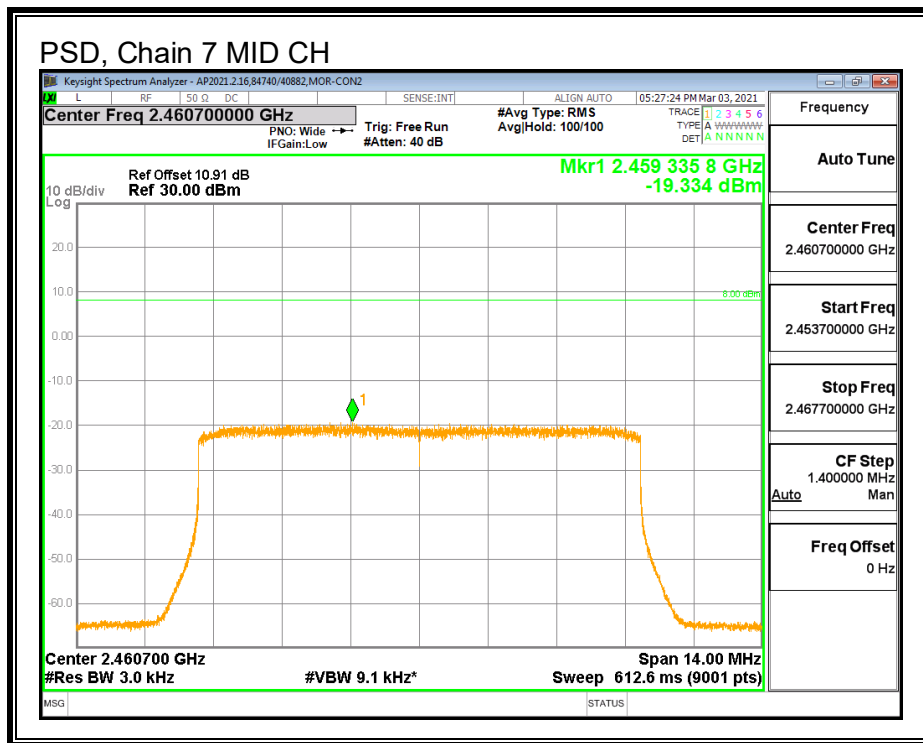
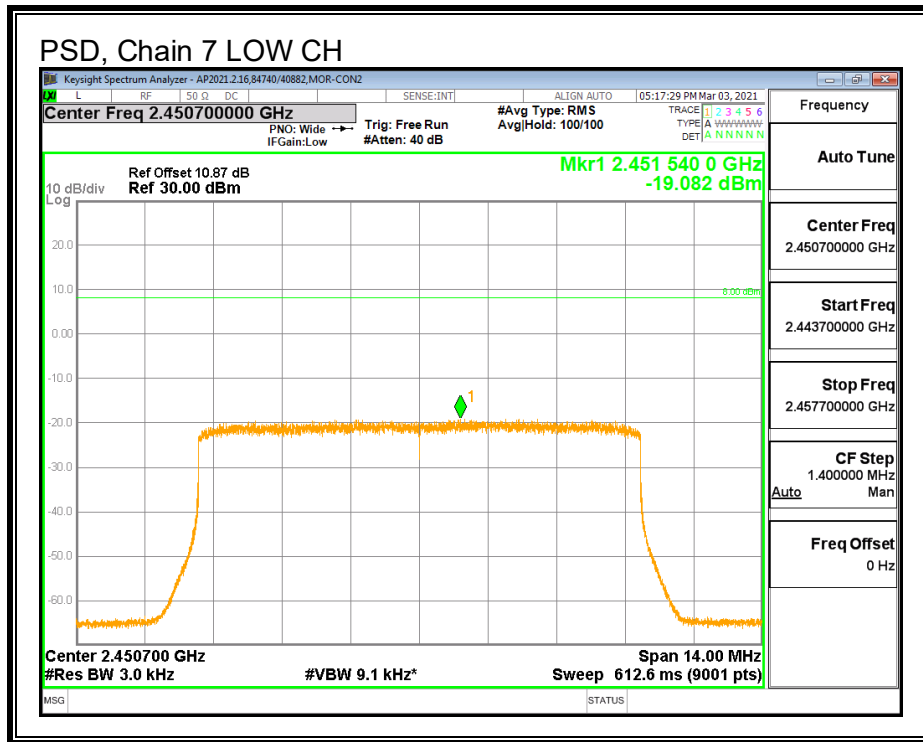


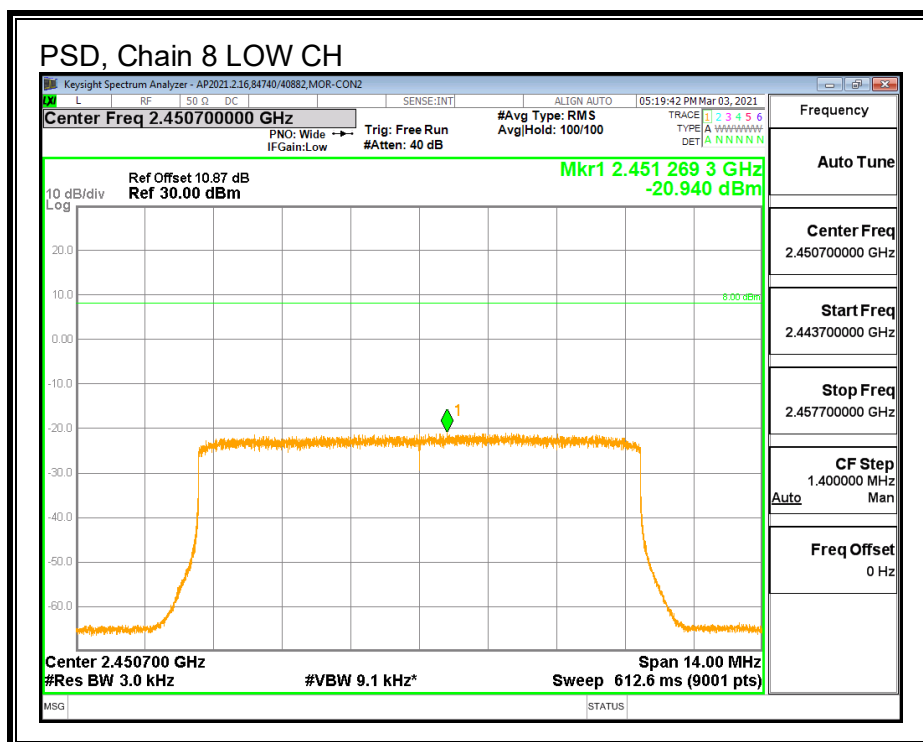
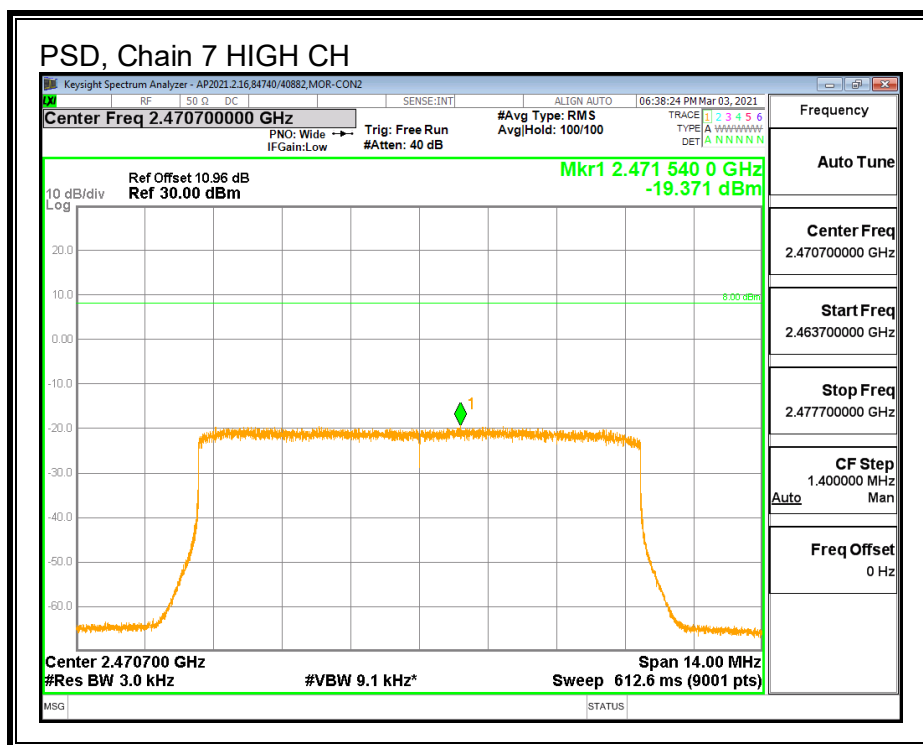


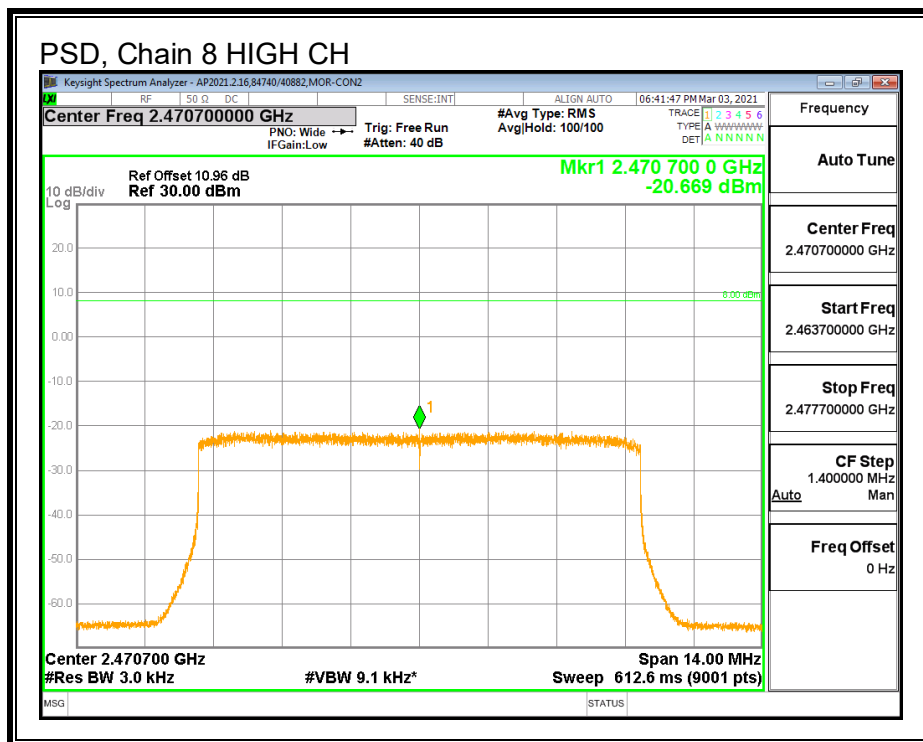
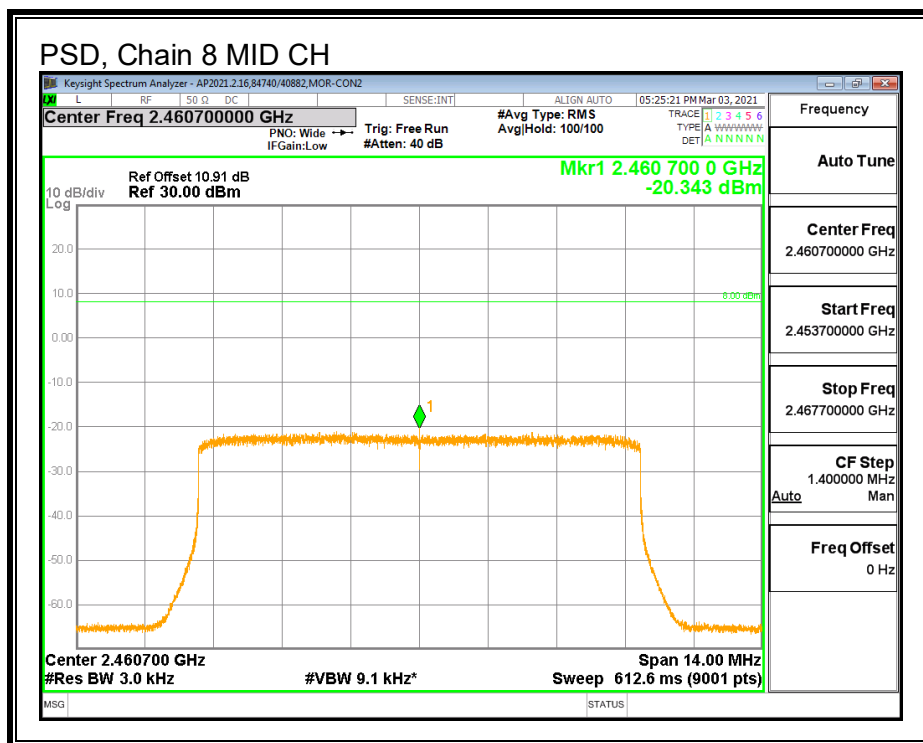












### 10.3.4. OUT-OF-BAND EMISSIONS

#### LIMITS

FCC §15.247 (d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

**RESULTS - QPSK**

