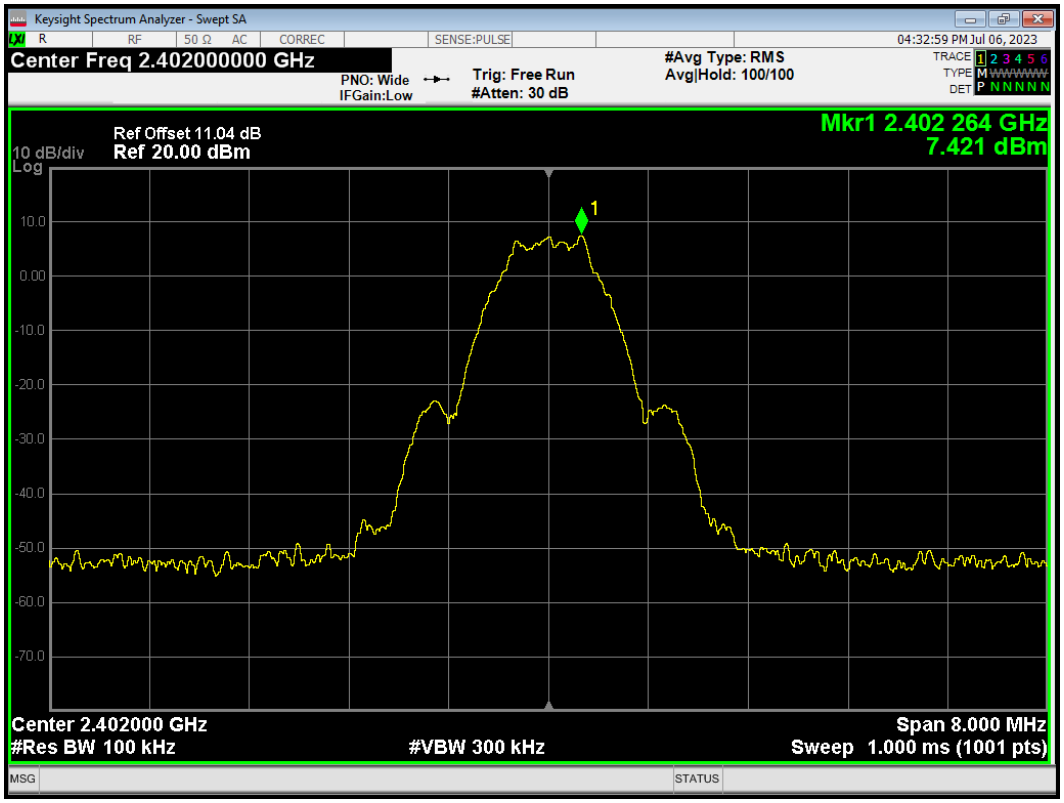
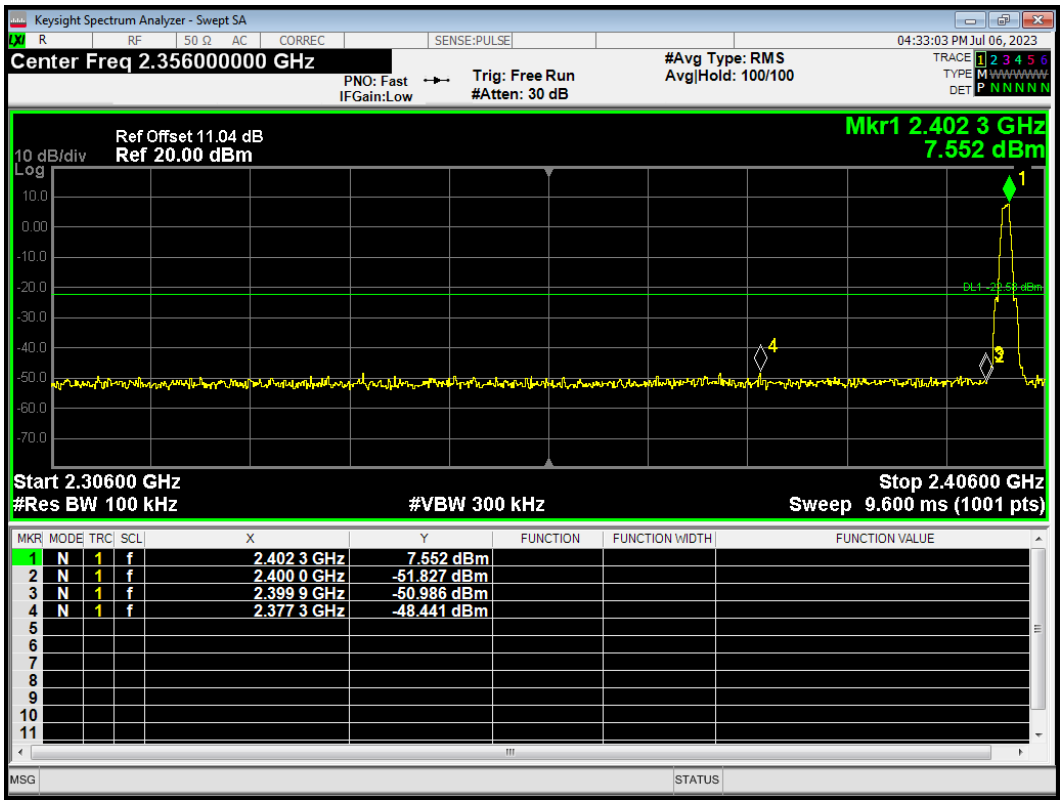
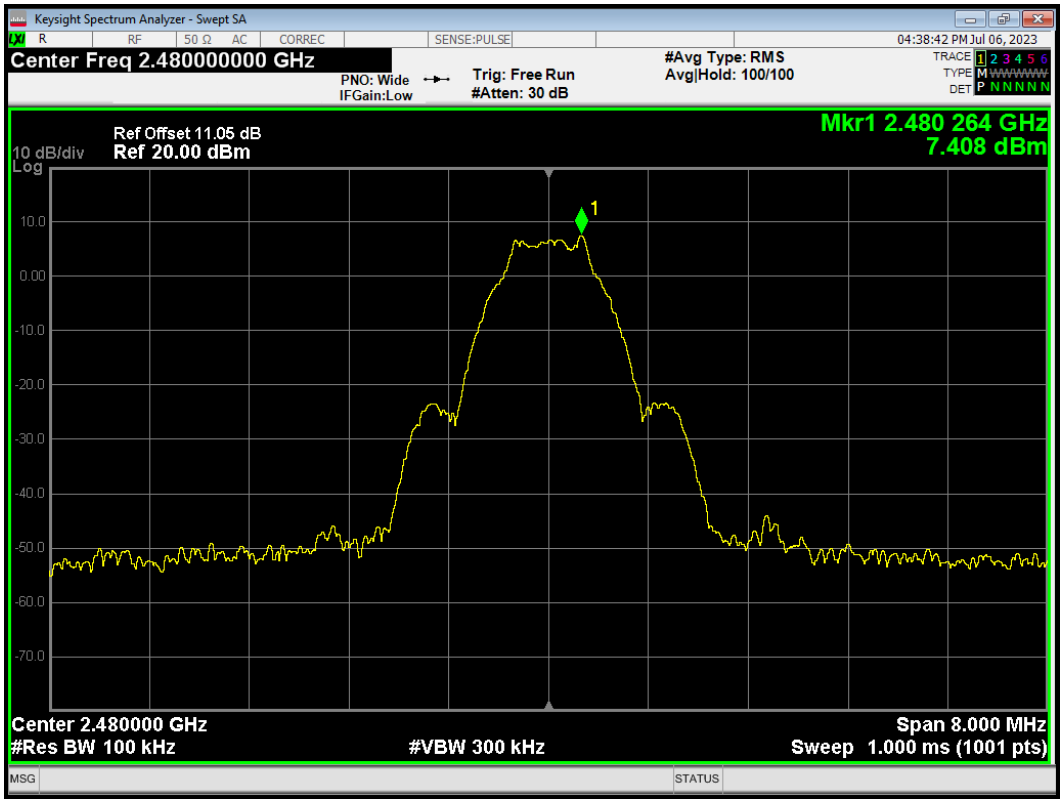
Band Edge BLE (S=8) 2402MHz Ref



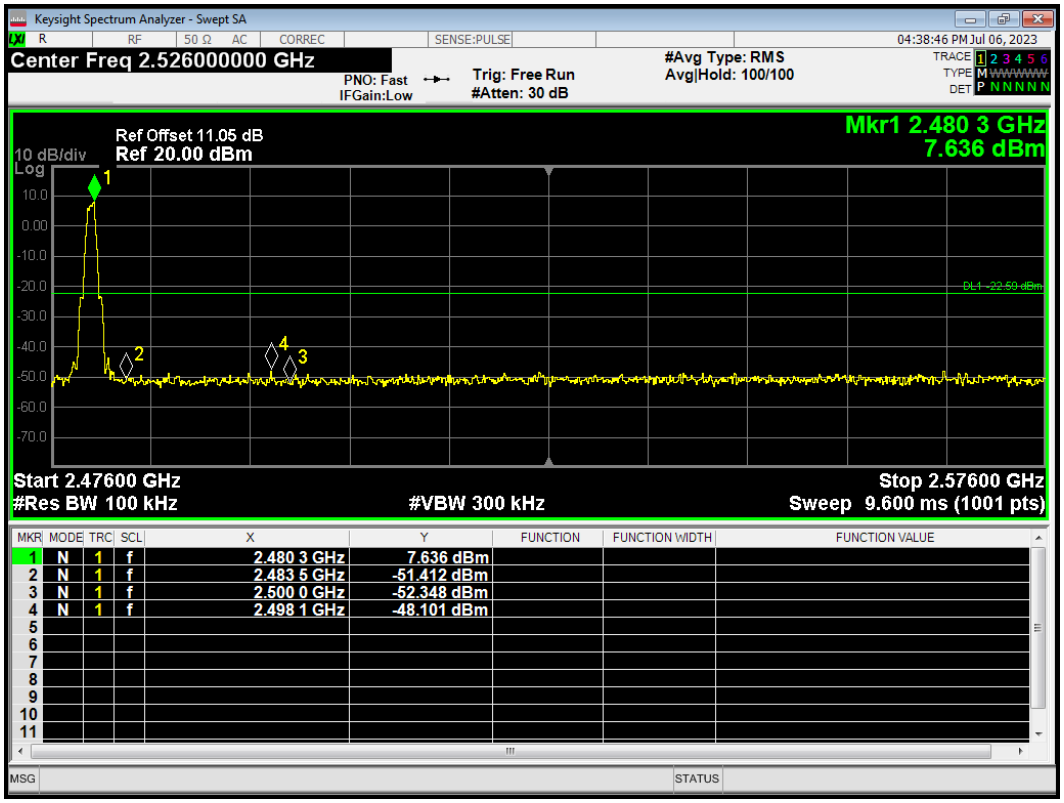
Band Edge BLE (S=8) 2402MHz Emission



Band Edge BLE (S=8) 2480MHz Ref



Band Edge BLE (S=8) 2480MHz Emission



5.4. Power Spectral Density

Ambient Condition

Temperature	Relative humidity
20°C ~ 25°C	45% ~ 50%

Method of Measurement

During the process of the testing, The EUT was connected to Spectrum Analyzer with a known loss. The EUT is max power transmission with proper modulation.

Method AVGPSD-1 was used for this test.

a) Set instrument center frequency to DTS channel center frequency

b) Set span to at least 1.5 times the OBW

c) Set RBW to:3kHz≤RBW≤100kHz

d) Set VBW≥[3x RBW]

e) Detector=power averaging (rms) or sample detector (when rms not available)

f) Ensure that the number of measurement points in the sweep ≥ [2 X span/RBW]

g) Sweep time auto couple

h) Employ trace averaging (rms) mode over a minimum of 100 traces

i) Use the peak marker function to determine the maximum amplitude level.

j) If the measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span to meet the minimum measurement point requirement as the RBW is reduced)

Method AVGPSD-2 was used for this test.

a) Measure the duty cycle (D)of the transmitter output signal as described in 11.6

b) Set instrument center frequency to DTS channel center frequency

c) Set span to at least 1.5 times the OBW

d) Set RBW to:3kHz≤RBW≤100kHz

e) Set VBW≥[3x RBW]

f) Detector= power averaging (rms) or sample detector (when rms not available)

g) Ensure that the number of measurement points in the sweep ≥ [2 X span/RBW]

h) Sweep time =auto couple

i) Do not use sweep triggering; allow sweep to "free run”

j) Employ trace averaging (rms) mode over a minimum of 100 traces

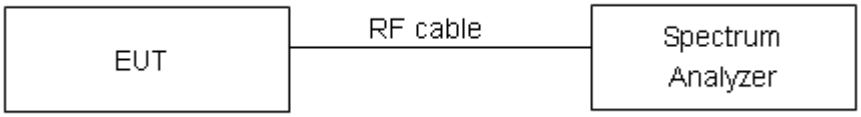
k) Use the peak marker function to determine the maximum amplitude level

l) Add [10 log(1/ D)], where D is the duty cycle measured in step a), to the measured PSD to compute the average PSD during the actual transmission time

m) If measured value exceeds requirement specified by regulatory agency then reduce RBW (but no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span to meet the minimum measurement point requirement as the RBW is reduced)

The conducted Power is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically.

Test setup



Limits

Rule Part 15.247(e) specifies that" For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. ''

Limits	≤ 8 dBm / 3kHz

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 0.75dB.

Test Results:

SISO Antenna 1

Test Mode	Carrier frequency (MHz))/ Channel	Read Value (dBm / 30kHz)	Power Spectral Density (dBm / 3kHz)	Limit (dBm / 3kHz)	Conclusion
802.11b	2412/CH 1	-5.95	-15.76	8	PASS
	2437/CH 6	-5.78	-15.59	8	PASS
	2462/CH11	-5.76	-15.57	8	PASS
802.11g	2412/CH 1	-8.76	-17.72	8	PASS
	2437/CH 6	-8.51	-17.47	8	PASS
	2462/CH11	-8.77	-17.73	8	PASS
802.11n HT20	2412/CH 1	-8.61	-17.50	8	PASS
	2437/CH 6	-8.71	-17.60	8	PASS
	2462/CH11	-8.99	-17.88	8	PASS
802.11n HT40	2422/CH3	-12.28	-17.79	8	PASS
	2437/CH6	-12.11	-17.62	8	PASS
	2452/CH9	-11.98	-17.49	8	PASS
802.11ax HE20	2412/CH 1	-11.51	-18.17	8	PASS
	2437/CH 6	-10.76	-17.42	8	PASS
	2462/CH11	-11.06	-17.72	8	PASS
802.11ax HE40	2422/CH3	-13.11	-19.79	8	PASS
	2437/CH6	-13.11	-19.79	8	PASS
	2452/CH9	-13.10	-19.78	8	PASS
Note: Power Spectral Density (dBm/3kHz) =Read Value+Duty cycle correction factor + 10*log10(3/30)					

SISO Antenna 2

Test Mode	Carrier frequency (MHz))/ Channel	Read Value (dBm / 30kHz)	Power Spectral Density (dBm / 3kHz)	Limit (dBm / 3kHz)	Conclusion
802.11b	2412/CH 1	-5.76	-15.57	8	PASS
	2437/CH 6	-5.57	-15.38	8	PASS
	2462/CH11	-5.70	-15.51	8	PASS
802.11g	2412/CH 1	-8.63	-17.59	8	PASS
	2437/CH 6	-8.33	-17.29	8	PASS
	2462/CH11	-8.79	-17.75	8	PASS
802.11n HT20	2412/CH 1	-9.01	-17.90	8	PASS
	2437/CH 6	-8.99	-17.88	8	PASS
	2462/CH11	-8.67	-17.56	8	PASS
802.11n HT40	2422/CH3	-11.09	-16.60	8	PASS
	2437/CH6	-12.93	-18.44	8	PASS
	2452/CH9	-12.29	-17.80	8	PASS
802.11ax HE20	2412/CH 1	-10.62	-17.28	8	PASS
	2437/CH 6	-10.40	-17.06	8	PASS
	2462/CH11	-10.03	-16.69	8	PASS
802.11ax HE40	2422/CH3	-12.51	-19.19	8	PASS
	2437/CH6	-13.03	-19.71	8	PASS
	2452/CH9	-13.36	-20.04	8	PASS
Note: Power Spectral Density (dBm/3kHz) =Read Value+Duty cycle correction factor + 10*log10(3/30)					

MIMO

Test Mode	Carrier frequency (MHz))/ Channel	Power Spectral Density				Total PSD	Limit (dBm / 3kHz)	Conclusion
		Antenna 1		Antenna 2				
		Read Value (dBm / 30kHz)	Power Spectral Density (dBm / 3kHz)	Read Value (dBm / 30kHz)	Power Spectral Density (dBm / 3kHz)	(dBm / 3kHz)		
802.11b	2412/CH 1	-6.39	-16.20	-6.44	-16.25	-13.21	8.00	PASS
	2437/CH 6	-5.98	-15.79	-6.21	-16.02	-12.89	8.00	PASS
	2462/CH11	-6.15	-15.96	-6.33	-16.14	-13.04	8.00	PASS
802.11g	2412/CH 1	-8.99	-17.95	-8.76	-17.72	-14.82	8.00	PASS
	2437/CH 6	-8.67	-17.63	-8.97	-17.93	-14.77	8.00	PASS
	2462/CH11	-9.10	-18.06	-8.66	-17.62	-14.82	8.00	PASS
802.11n HT20	2412/CH 1	-9.03	-17.92	-9.14	-18.03	-14.96	8.00	PASS
	2437/CH 6	-9.47	-18.36	-9.27	-18.16	-15.25	8.00	PASS
	2462/CH11	-9.58	-18.47	-9.49	-18.38	-15.41	8.00	PASS
802.11n HT40	2422/CH3	-12.61	-18.12	-12.22	-17.73	-14.91	8.00	PASS
	2437/CH6	-11.18	-16.69	-12.10	-17.61	-14.12	8.00	PASS
	2452/CH9	-13.21	-18.72	-12.02	-17.53	-15.07	8.00	PASS
802.11ax HE20	2412/CH 1	-10.61	-17.27	-11.53	-18.19	-14.70	8.00	PASS
	2437/CH 6	-10.89	-17.55	-10.29	-16.95	-14.23	8.00	PASS
	2462/CH11	-10.02	-16.68	-11.02	-17.68	-14.14	8.00	PASS
802.11ax HE40	2422/CH3	-12.96	-19.64	-13.81	-20.49	-17.03	8.00	PASS
	2437/CH6	-13.51	-20.19	-12.85	-19.53	-16.84	8.00	PASS
	2452/CH9	-13.70	-20.38	-13.75	-20.43	-17.39	8.00	PASS

Note: 1.Power Spectral Density (dBm/3kHz) =Read Value+Duty cycle correction factor + 10*LOG10(3 / 30)

2. For Total PSD, according to KDB 662911 D01 Multiple Transmitter Output v02r01 2)a),the power spectral density=$10\log(10^{(\text{PSD antenna1 in dBm/10})}+10^{(\text{PSD antenna2 in dBm/10})})$

3. According to KDB 662911 D01 Multiple Transmitter Output v02r01 F)2)f)(ii): If antenna gains are not equal, the user may use either of the following methods to calculate directional gain, provided that each transmit antenna is driven by only one spatial stream: Directional gain may be calculated by using the formulas applicable to equal gain antennas with G_{ANT} set equal to the gain of the antenna having the highest gain.

Directional gain = $G_{ANT\ MAX}$ + Array Gain. For PSD measurements on all devices, Array Gain=10log(Nant/Nss)dB, so directional gain=$G_{ANT\ MAX}$+ Array Gain=-0.2+10*log(2/1)= 2.81 <6dBi. So the PSD limit is 8.

TB Mode

SISO Antenna 1

Test Mode	Carrier frequency (MHz)/ Channel	RU Index	Read Value (dBm / 30kHz)	Power Spectral Density (dBm / 3kHz)	Limit (dBm / 3kHz)	Conclusion
802.11ax HE20 26-Tone	2412/CH 1	0	-3.36	-12.47	8	PASS
	2437/CH 6	4	-2.55	-11.72	8	PASS
	2462/CH11	8	-2.62	-10.67	8	PASS
802.11ax HE20 52-Tone	2412/CH 1	37	-6.33	-14.03	8	PASS
	2437/CH 6	38	-5.42	-13.07	8	PASS
	2462/CH11	40	-5.74	-13.39	8	PASS
802.11ax HE20 106-Tone	2412/CH 1	53	-8.93	-16.48	8	PASS
	2437/CH 6	53	-8.66	-16.21	8	PASS
	2462/CH11	54	-8.83	-16.23	8	PASS
Note: Power Spectral Density (dBm/3kHz) =Read Value+Duty cycle correction factor + 10*log10(3/30)						

SISO Antenna 2

Test Mode	Carrier frequency (MHz)/ Channel	RU Index	Read Value (dBm / 30kHz)	Power Spectral Density (dBm / 3kHz)	Limit (dBm / 3kHz)	Conclusion
802.11ax HE20 26-Tone	2412/CH 1	0	-3.83	-12.94	8	PASS
	2437/CH 6	4	-2.29	-11.46	8	PASS
	2462/CH11	8	-2.21	-10.26	8	PASS
802.11ax HE20 52-Tone	2412/CH 1	37	-5.67	-13.37	8	PASS
	2437/CH 6	38	-5.18	-12.83	8	PASS
	2462/CH11	40	-4.72	-12.37	8	PASS
802.11ax HE20 106-Tone	2412/CH 1	53	-8.80	-16.35	8	PASS
	2437/CH 6	53	-8.90	-16.45	8	PASS
	2462/CH11	54	-8.59	-15.99	8	PASS
Note: Power Spectral Density (dBm/3kHz) =Read Value+Duty cycle correction factor + 10*log10(3/30)						

MIMO

Test Mode	Carrier frequency (MHz))/ Channel	RU Index	Power Spectral Density				Total PSD	Limit (dBm / 3kHz)	Conclusion
			Antenna 1		Antenna 2				
			Read Value (dBm / 30kHz)	Power Spectral Density (dBm / 3kHz)	Read Value (dBm / 30kHz)	Power Spectral Density (dBm / 3kHz)	(dBm / 3kHz)		
802.11ax HE20 26-Tone	2412/CH 1	0	-3.07	-12.18	-2.40	-11.51	-8.82	8.00	PASS
	2437/CH 6	4	-2.30	-11.47	-2.34	-11.51	-8.48	8.00	PASS
	2462/CH11	8	-2.34	-10.39	-2.88	-10.93	-7.64	8.00	PASS
802.11ax HE20 52-Tone	2412/CH 1	37	-5.71	-13.41	-5.14	-12.84	-10.11	8.00	PASS
	2437/CH 6	38	-6.08	-13.73	-5.21	-12.86	-10.26	8.00	PASS
	2462/CH11	40	-5.20	-12.85	-5.82	-13.47	-10.14	8.00	PASS
802.11ax HE20 106-Tone	2412/CH 1	53	-8.64	-16.19	-8.27	-15.82	-12.99	8.00	PASS
	2437/CH 6	53	-8.55	-16.10	-8.30	-15.85	-12.96	8.00	PASS
	2462/CH11	54	-7.92	-15.32	-8.45	-15.85	-12.57	8.00	PASS

Note: 1.Power Spectral Density (dBm/3kHz) =Read Value+Duty cycle correction factor + 10*LOG10(3 / 30)

2. For Total PSD, according to KDB 662911 D01 Multiple Transmitter Output v02r01 2)a),the power spectral density=$10\log(10^{(\text{PSD antenna1 in dBm/10})}+10^{(\text{PSD antenna2 in dBm/10})})$

3. According to KDB 662911 D01 Multiple Transmitter Output v02r01 F)2)f)(ii): If antenna gains are not equal, the user may use either of the following methods to calculate directional gain, provided that each transmit antenna is driven by only one spatial stream: Directional gain may be calculated by using the formulas applicable to equal gain antennas with G_{ANT} set equal to the gain of the antenna having the highest gain.

Directional gain = $G_{ANT\ MAX}$ + Array Gain. For PSD measurements on all devices, Array Gain=10log(Nant/Nss)dB, so directional gain=$G_{ANT\ MAX}$+ Array Gain=-0.2+10*log(2/1)= 2.81 <6dBi. So the PSD limit is 8.

Internal Antenna

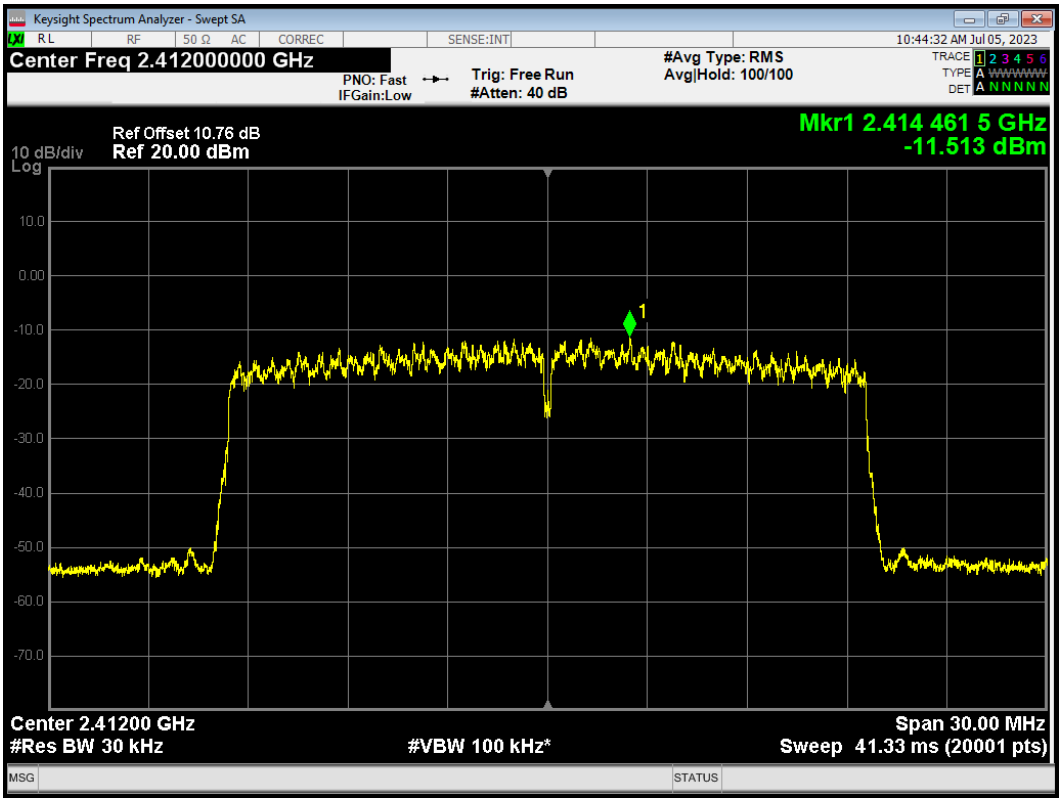
Test Mode	Carrier frequency (MHz))/ Channel	Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)	Limit (dBm / 3kHz)	Conclusion
Bluetooth (Low Energy) (1M)	2402/CH0	-12.20	-10.08	8	PASS
	2440/CH19	-12.35	-10.23	8	PASS
	2480/CH39	-12.30	-10.18	8	PASS
Bluetooth (Low Energy) (2M)	2402/CH0	-18.81	-16.38	8	PASS
	2440/CH19	-18.49	-16.06	8	PASS
	2480/CH39	-18.48	-16.05	8	PASS
Bluetooth (Low Energy) (S=2)	2402/CH0	-9.33	-8.92	8	PASS
	2440/CH19	-12.38	-11.97	8	PASS
	2480/CH39	-9.88	-9.47	8	PASS
Bluetooth (Low Energy) (S=8)	2402/CH0	0.09	0.20	8	PASS
	2440/CH19	0.22	0.33	8	PASS
	2480/CH39	0.11	0.22	8	PASS
Note: Power Spectral Density =Read Value+Duty cycle correction factor					

External Antenna

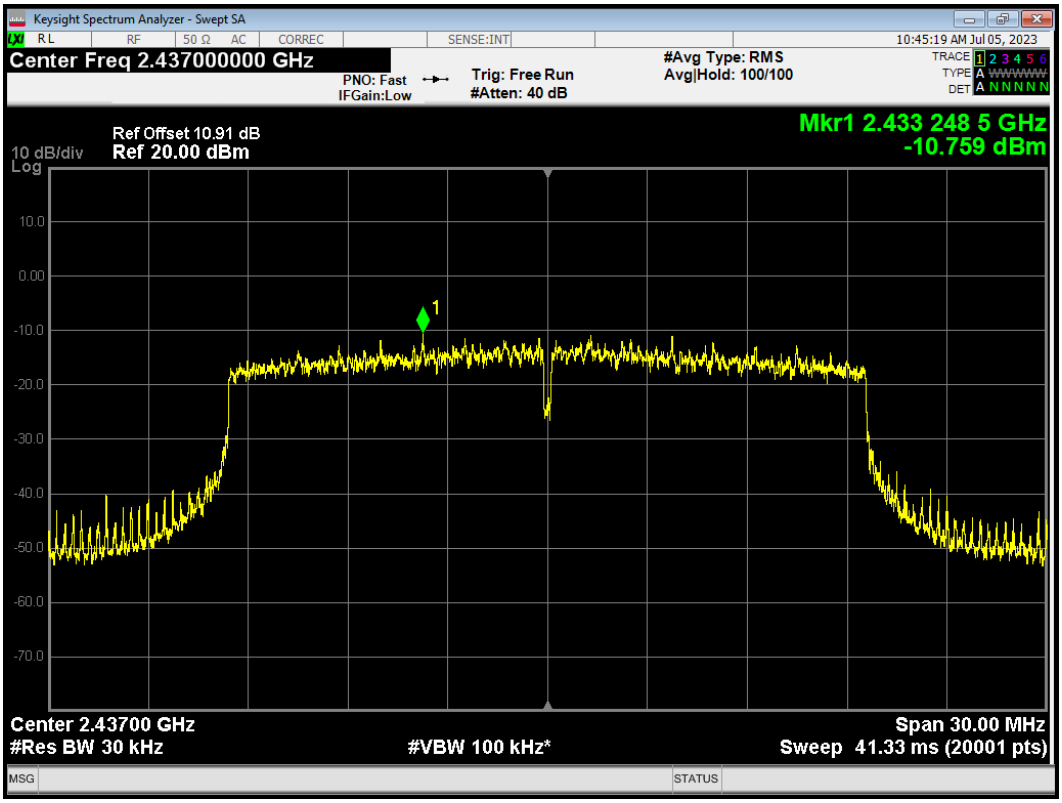
Test Mode	Carrier frequency (MHz))/ Channel	Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)	Limit (dBm / 3kHz)	Conclusion
Bluetooth (Low Energy) (1M)	2402/CH0	-11.46	-9.34	8	PASS
	2440/CH19	-12.17	-10.05	8	PASS
	2480/CH39	-12.06	-9.94	8	PASS
Bluetooth (Low Energy) (2M)	2402/CH0	-18.60	-16.17	8	PASS
	2440/CH19	-18.13	-15.70	8	PASS
	2480/CH39	-18.75	-16.32	8	PASS
Bluetooth (Low Energy) (S=2)	2402/CH0	-14.56	-13.86	8	PASS
	2440/CH19	-14.63	-13.93	8	PASS
	2480/CH39	-14.65	-13.95	8	PASS
Bluetooth (Low Energy) (S=8)	2402/CH0	-14.43	-13.73	8	PASS
	2440/CH19	-14.56	-13.86	8	PASS
	2480/CH39	-14.58	-13.88	8	PASS
Note: Power Spectral Density =Read Value+ Duty cycle correction factor					

SISO Antenna 1

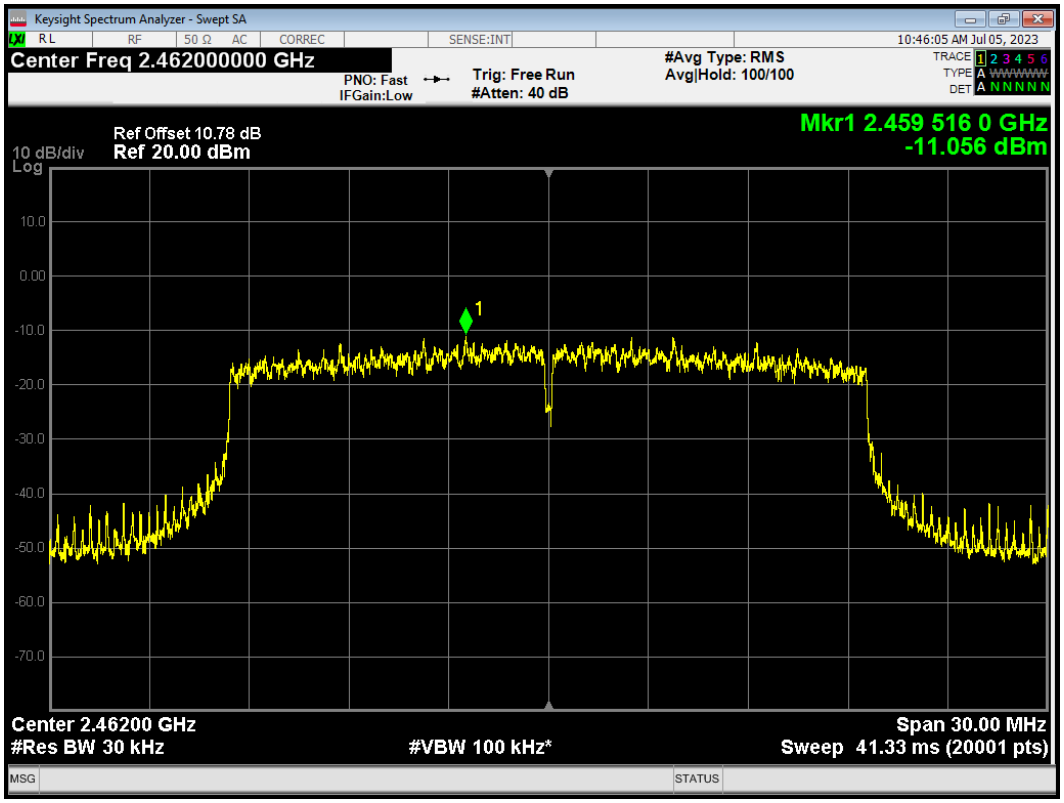
PSD 802.11ax(HE20) 2412MHz



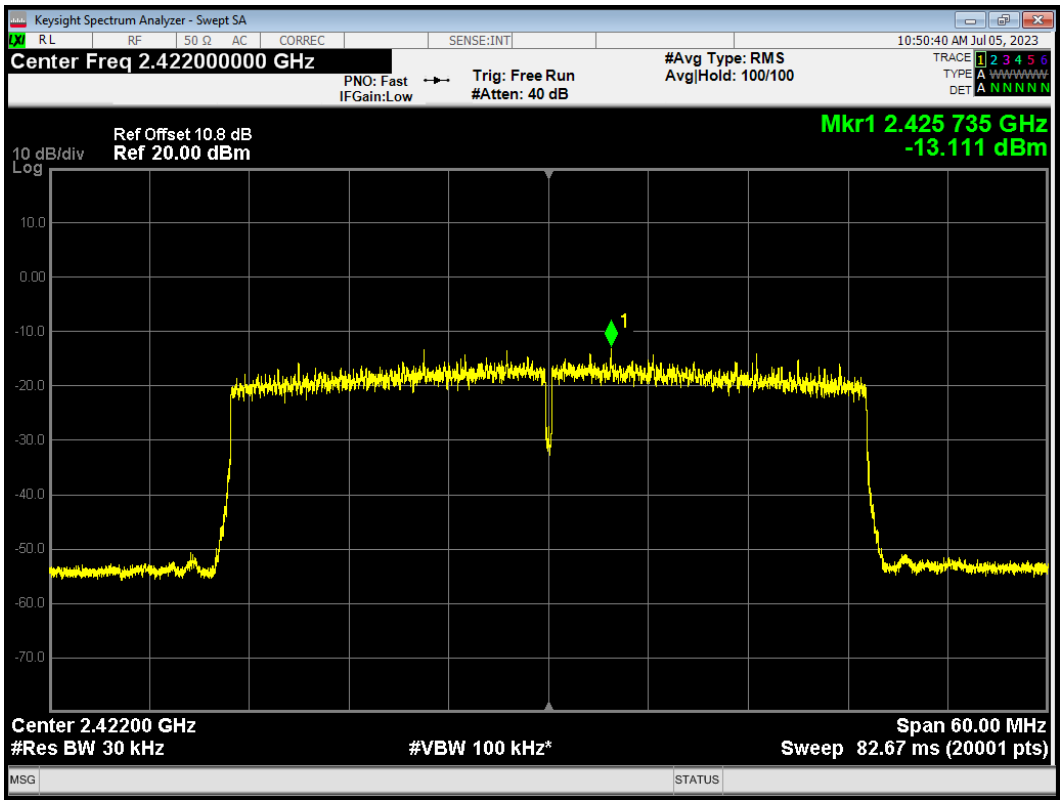
PSD 802.11ax(HE20) 2437MHz



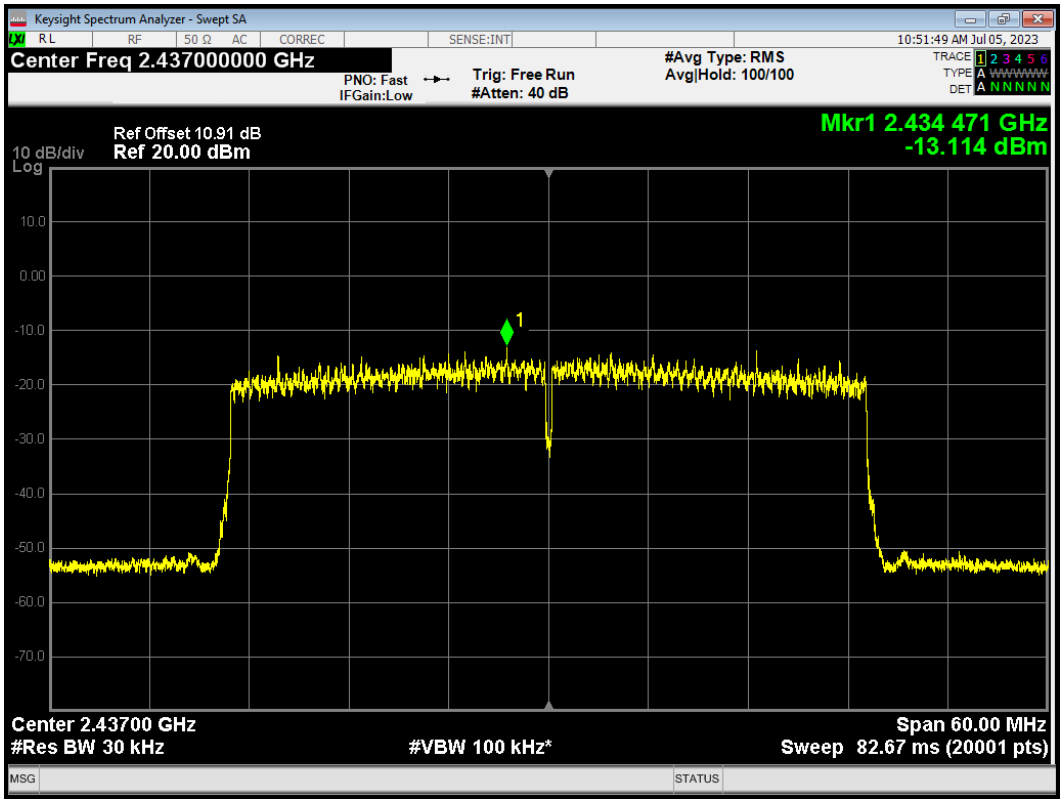
PSD 802.11ax(HE20) 2462MHz



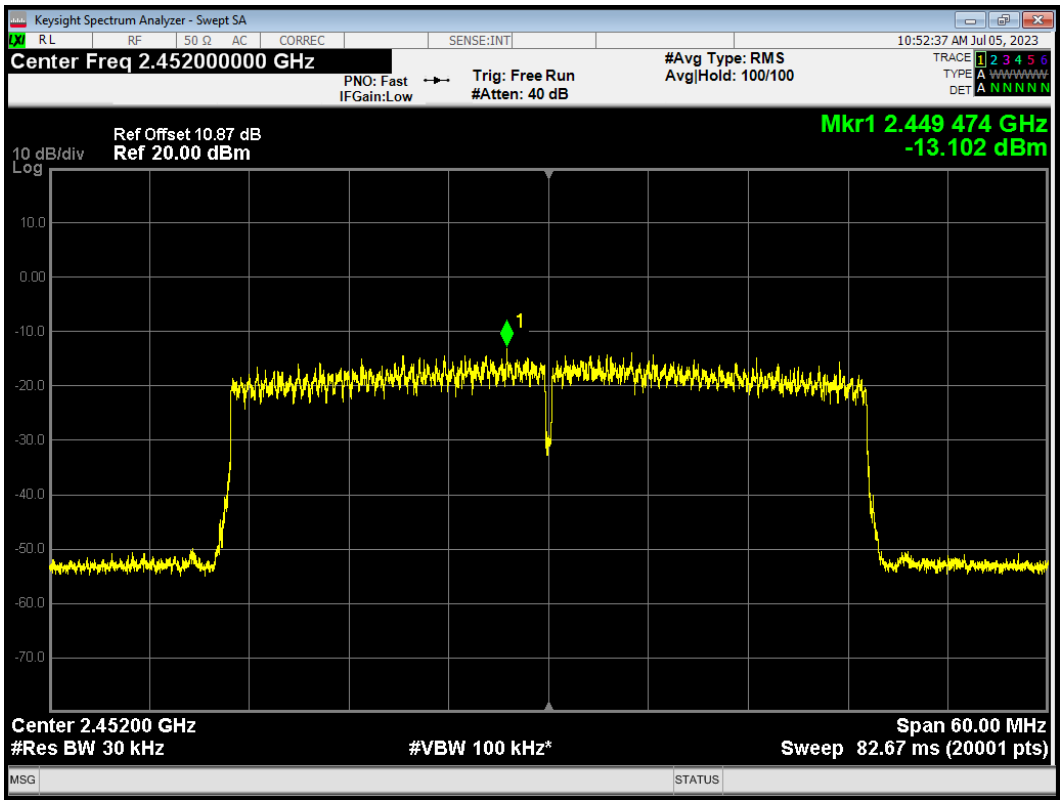
PSD 802.11ax(HE40) 2422MHz



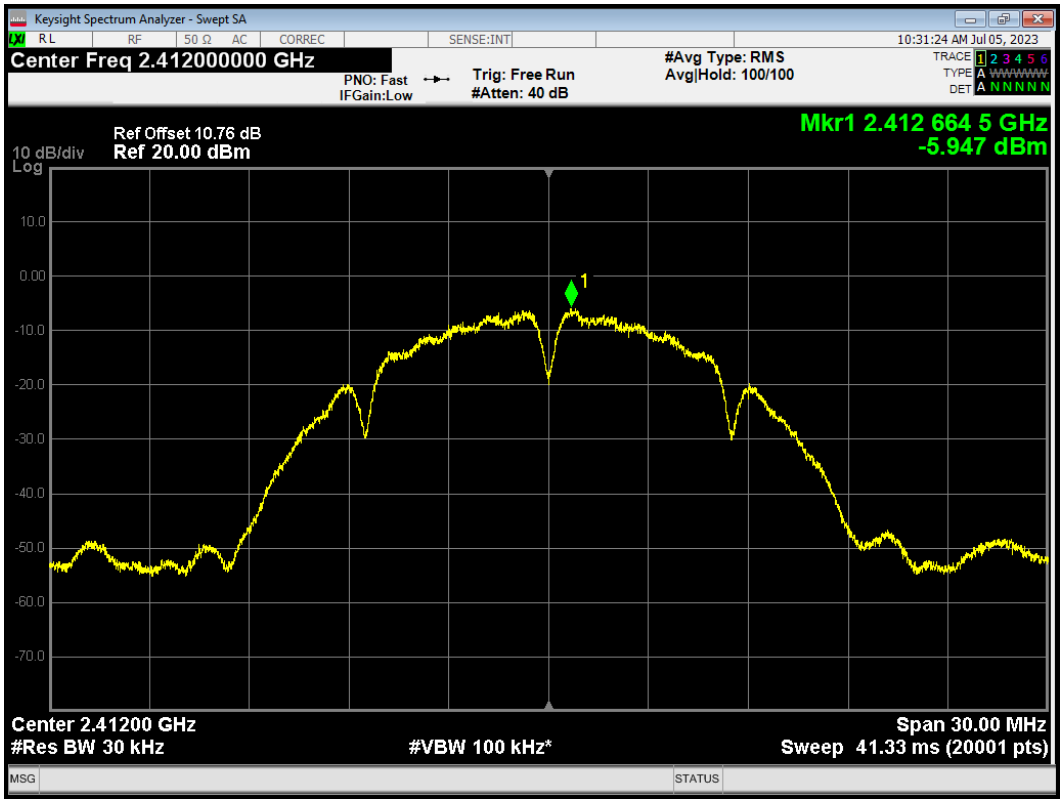
PSD 802.11ax(HE40) 2437MHz



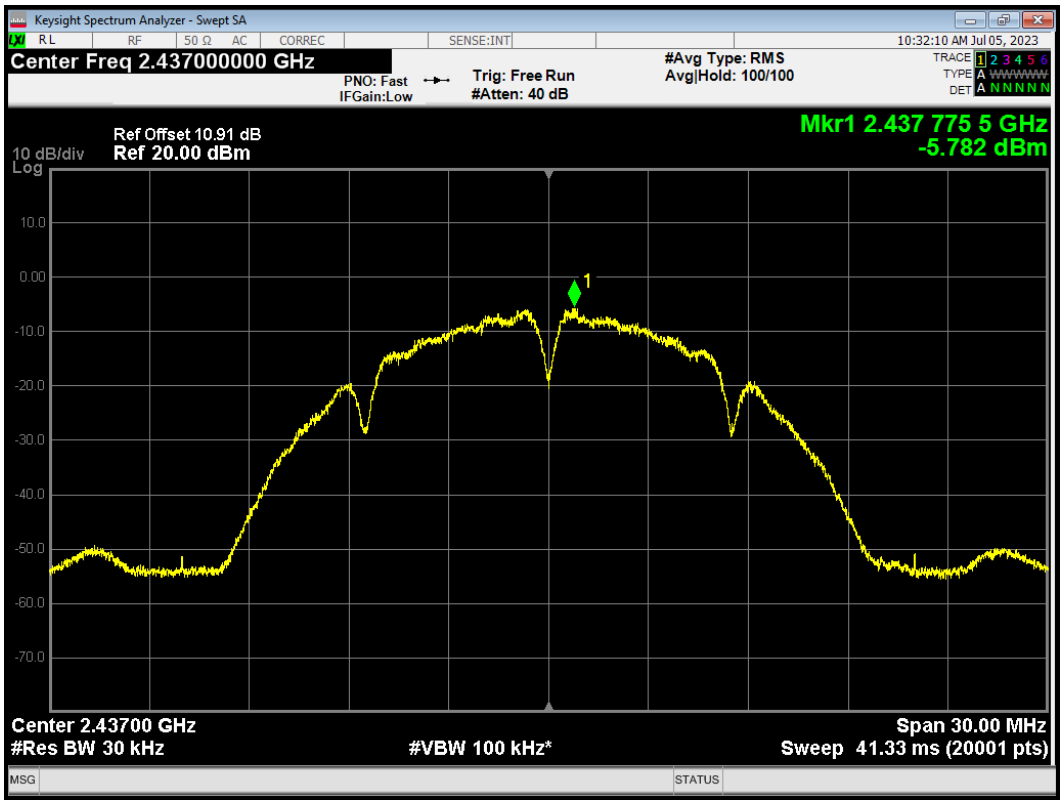
PSD 802.11ax(HE40) 2452MHz



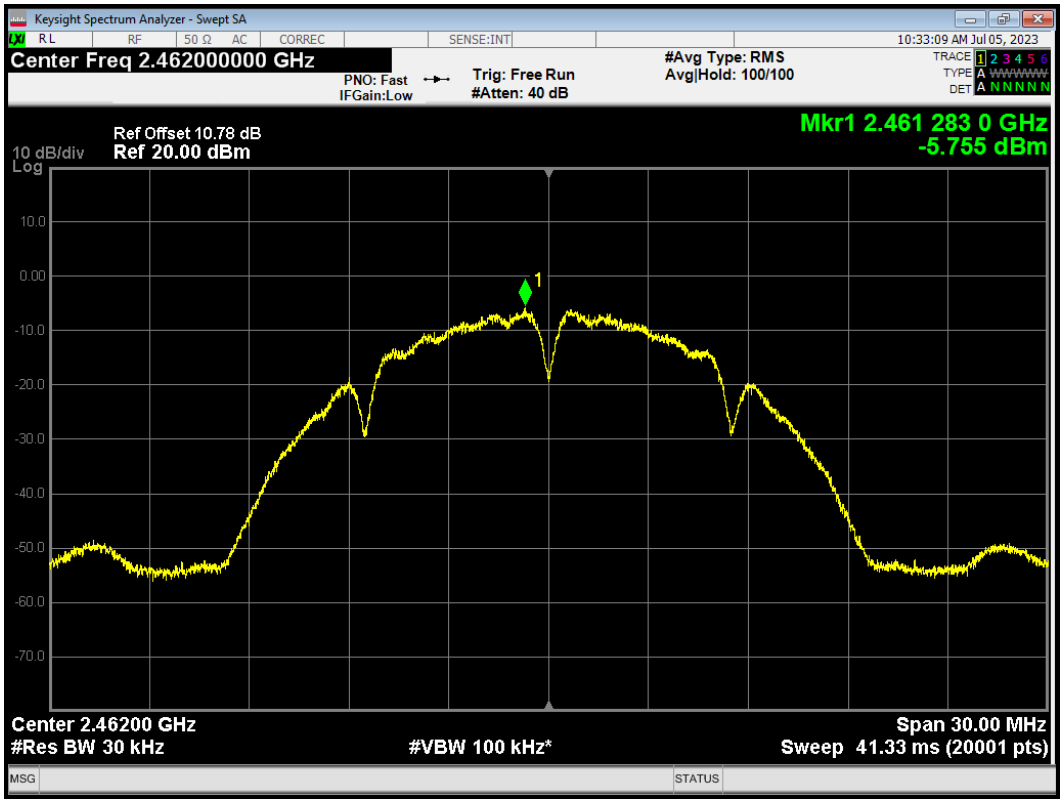
PSD 802.11b 2412MHz



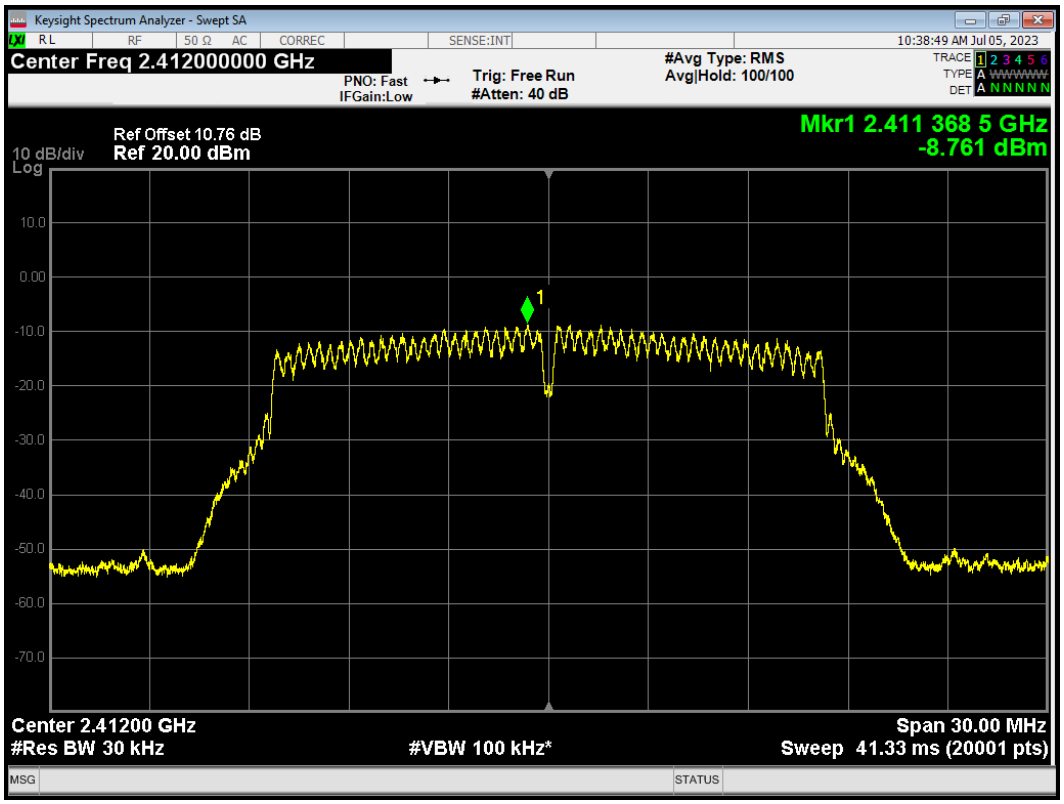
PSD 802.11b 2437MHz



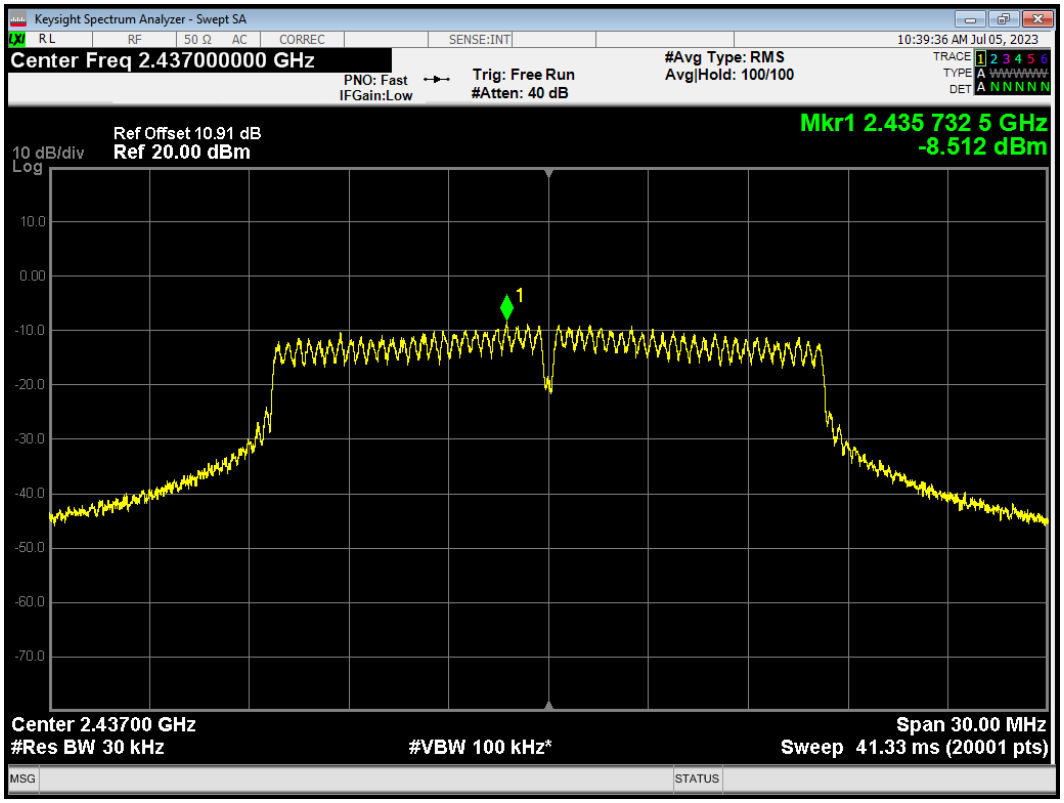
PSD 802.11b 2462MHz



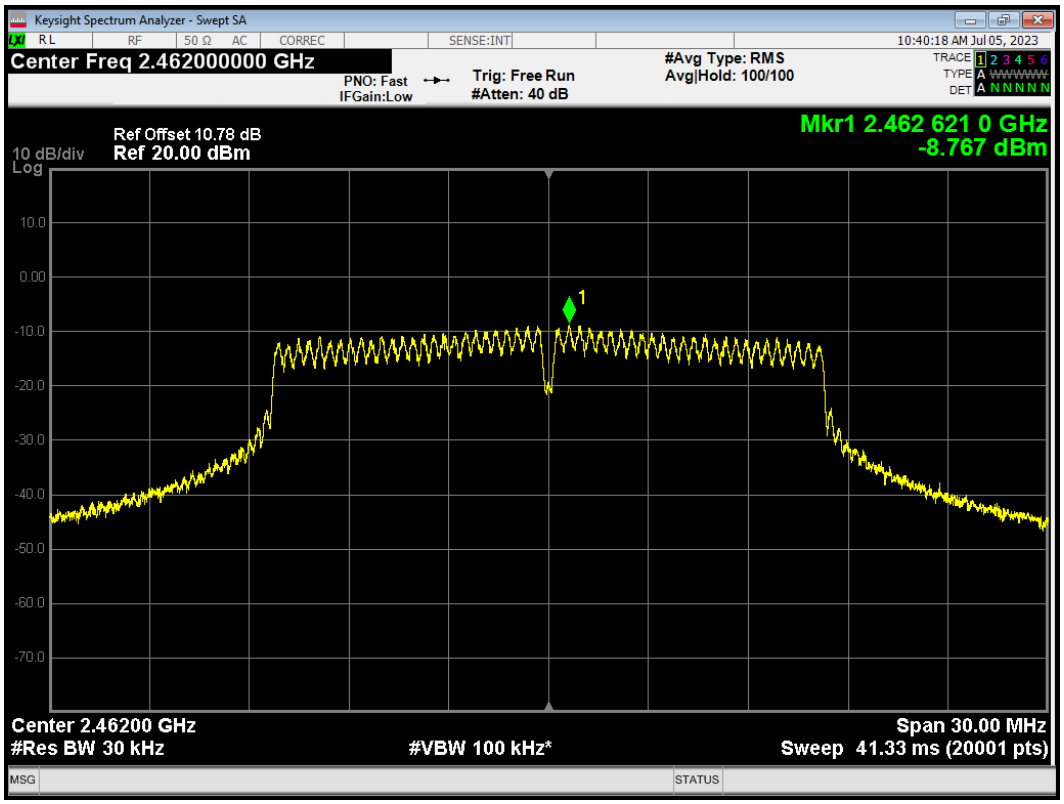
PSD 802.11g 2412MHz



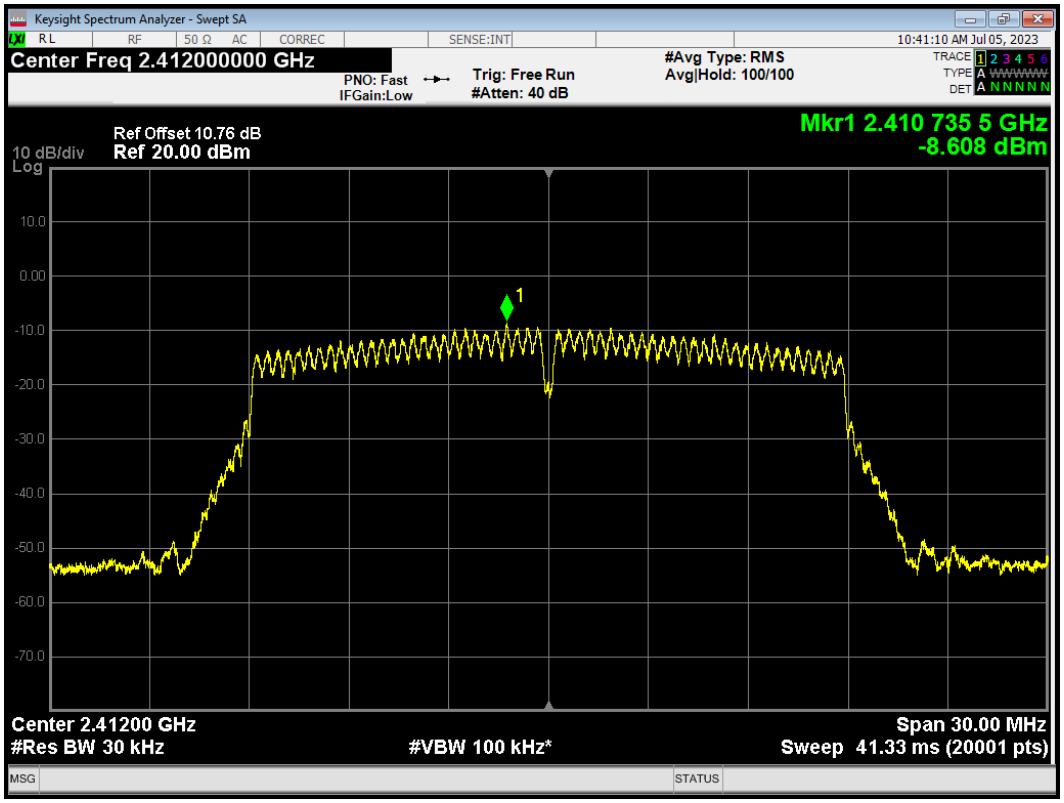
PSD 802.11g 2437MHz



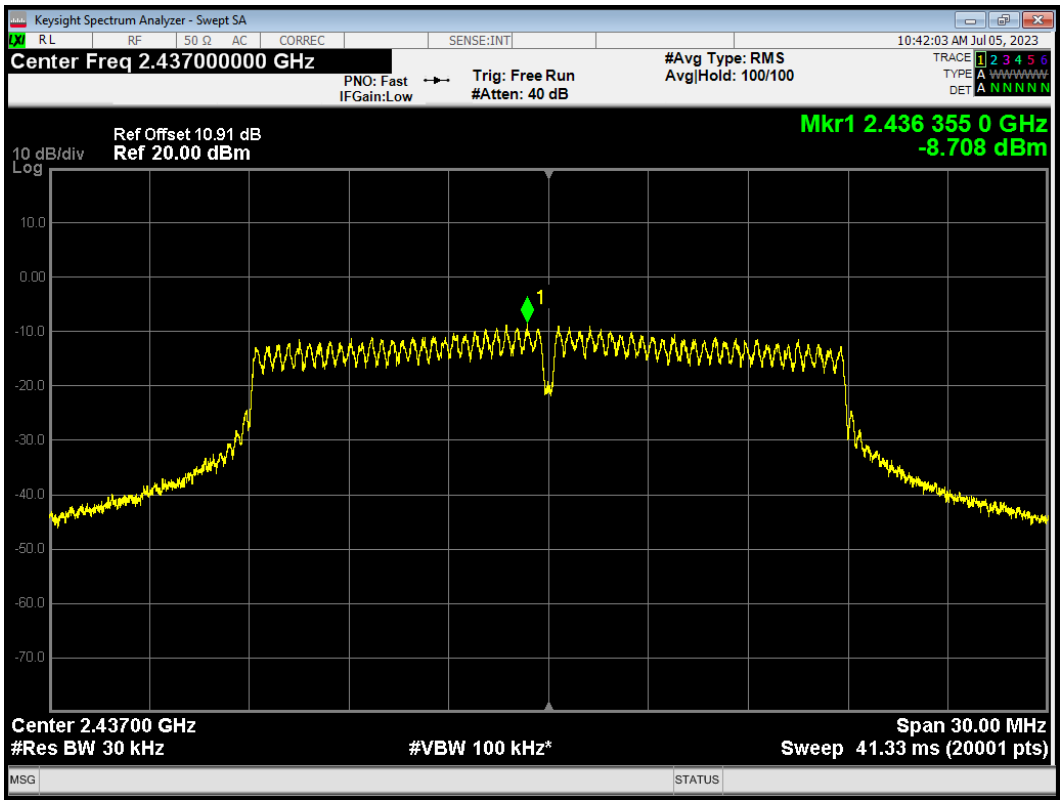
PSD 802.11g 2462MHz



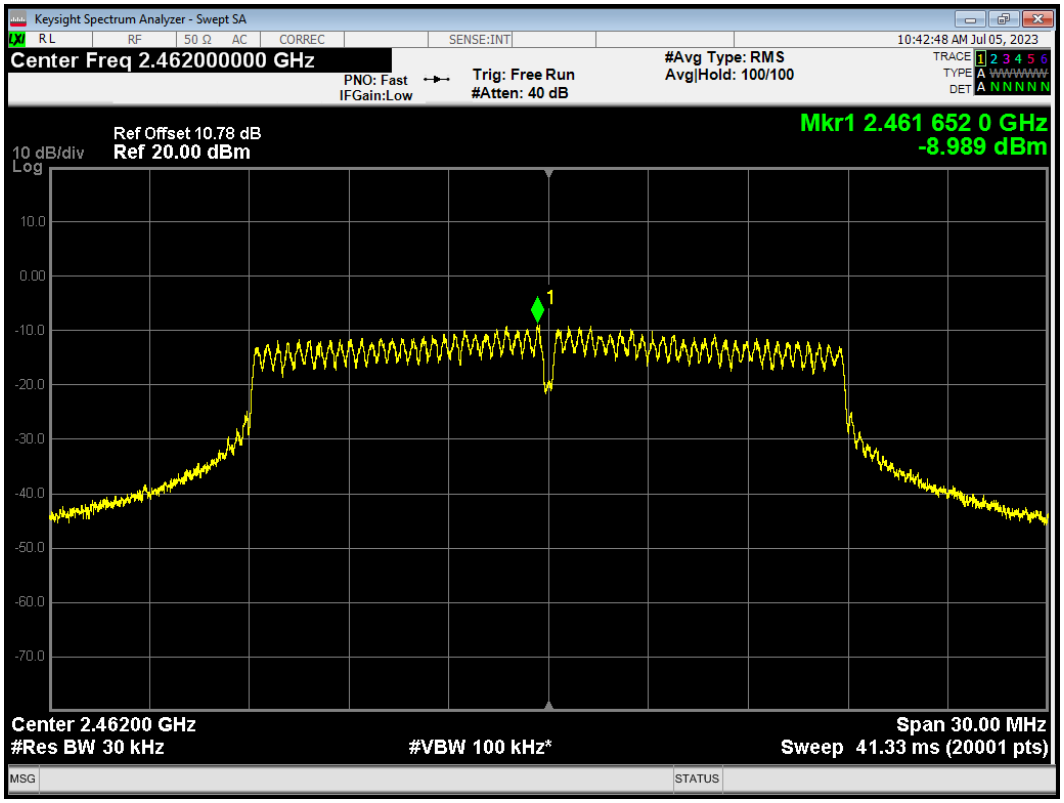
PSD 802.11n(HT20) 2412MHz



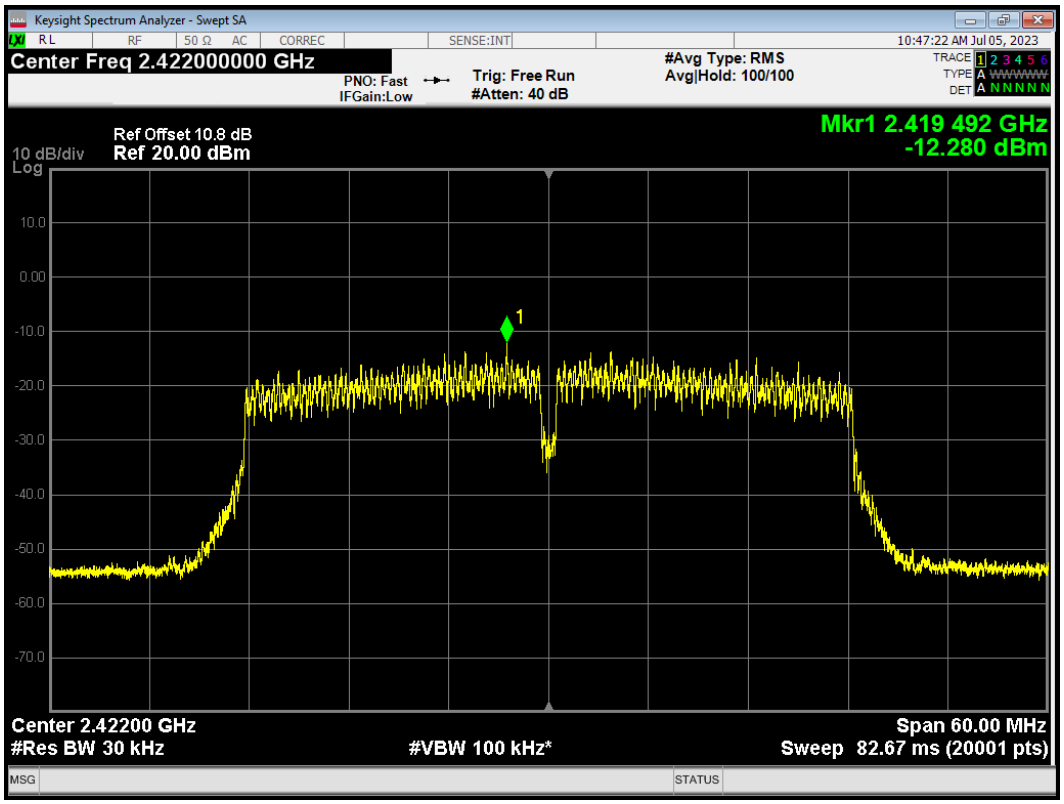
PSD 802.11n(HT20) 2437MHz



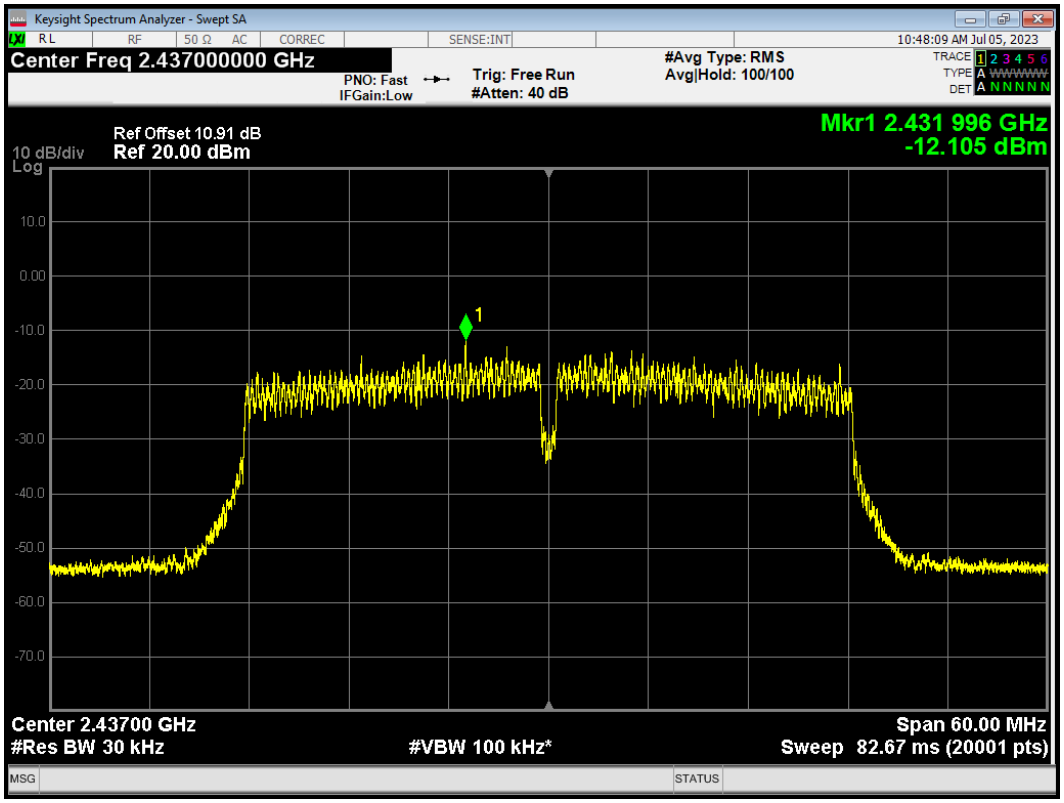
PSD 802.11n(HT20) 2462MHz



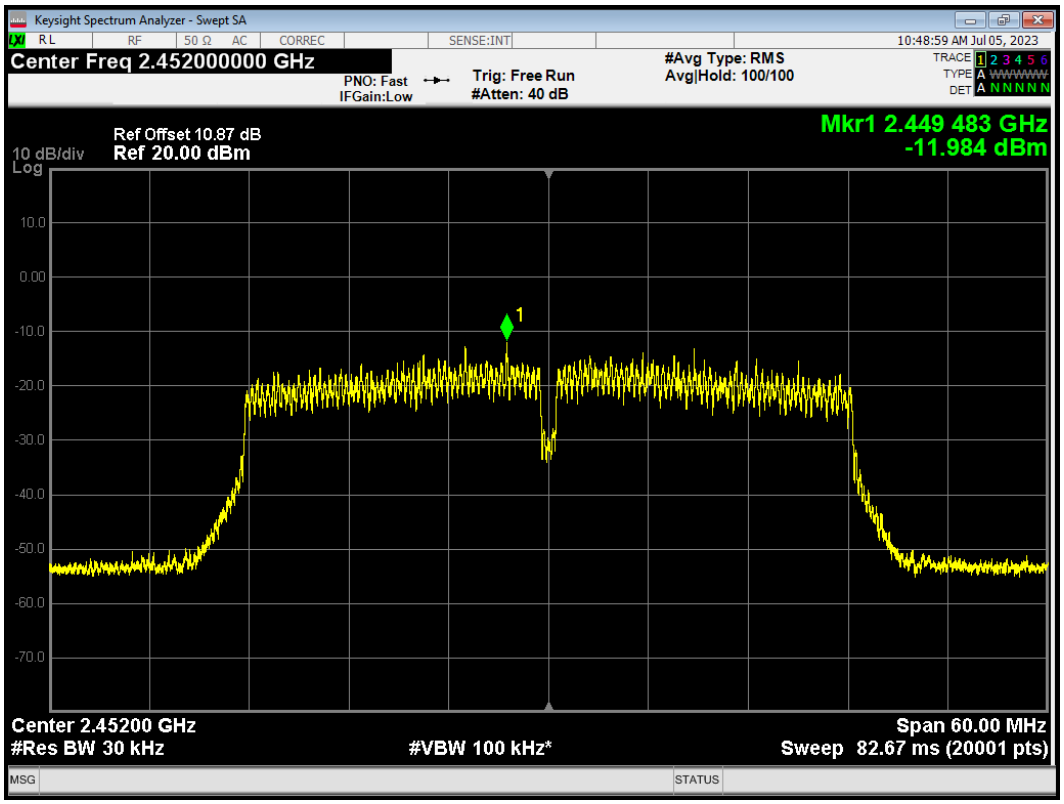
PSD 802.11n(HT40) 2422MHz



PSD 802.11n(HT40) 2437MHz

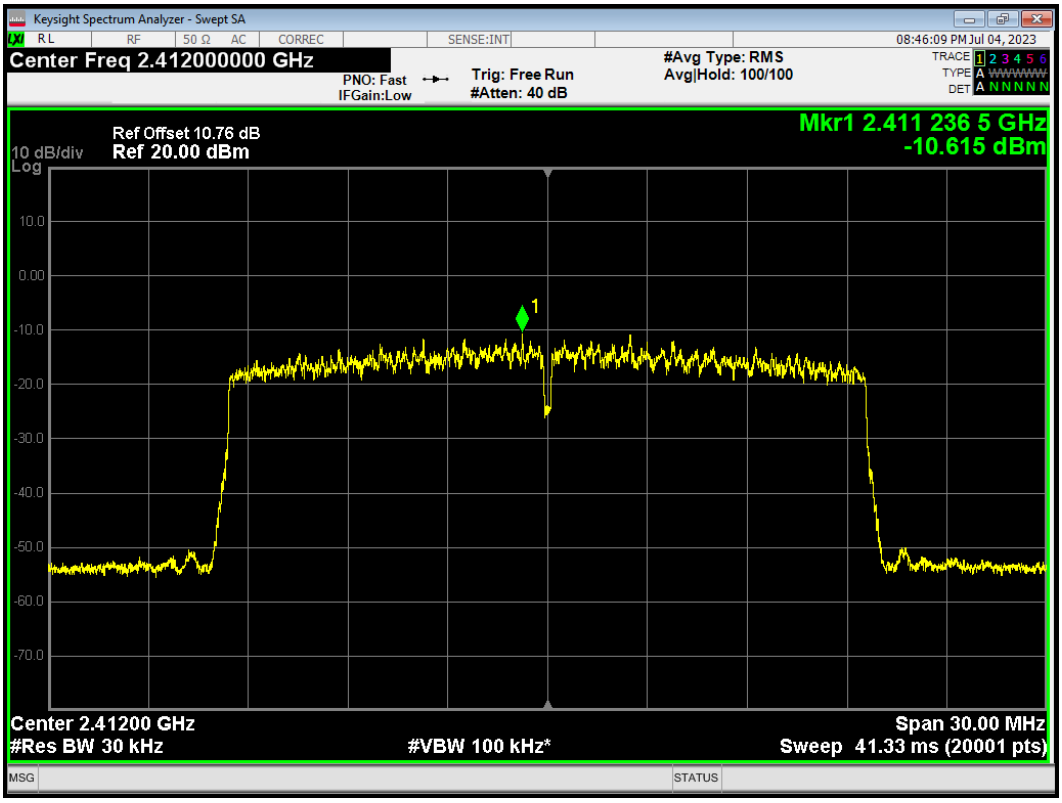


PSD 802.11n(HT40) 2452MHz

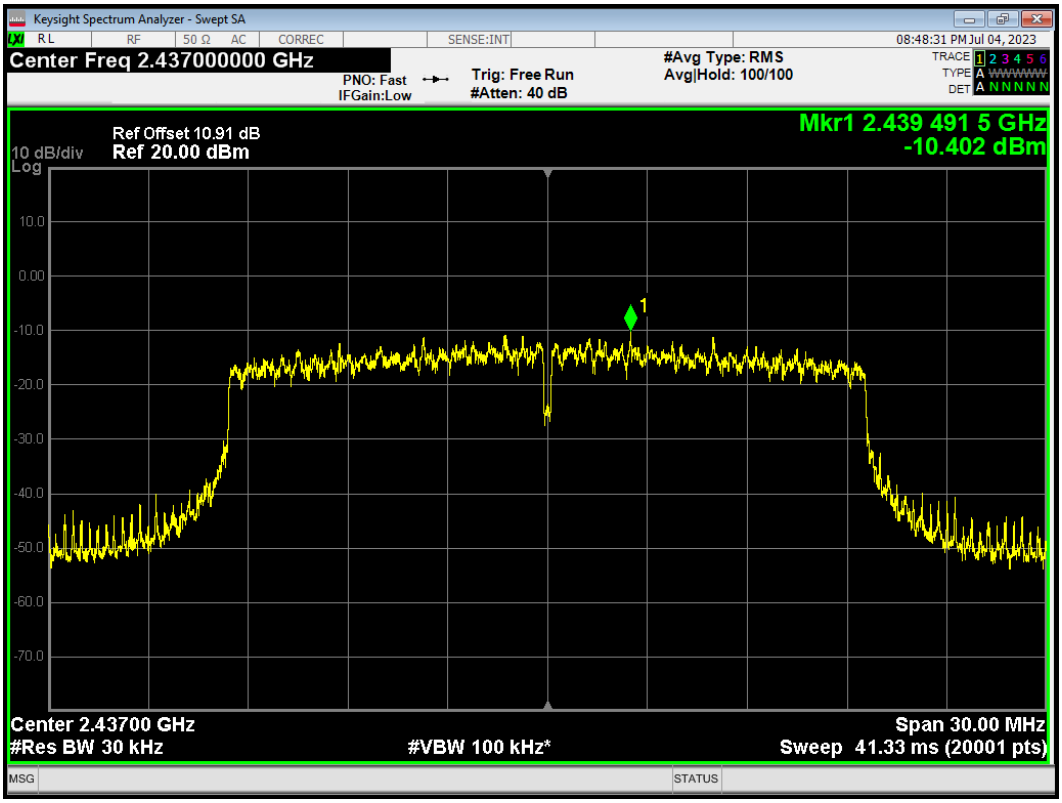


SISO Antenna 2

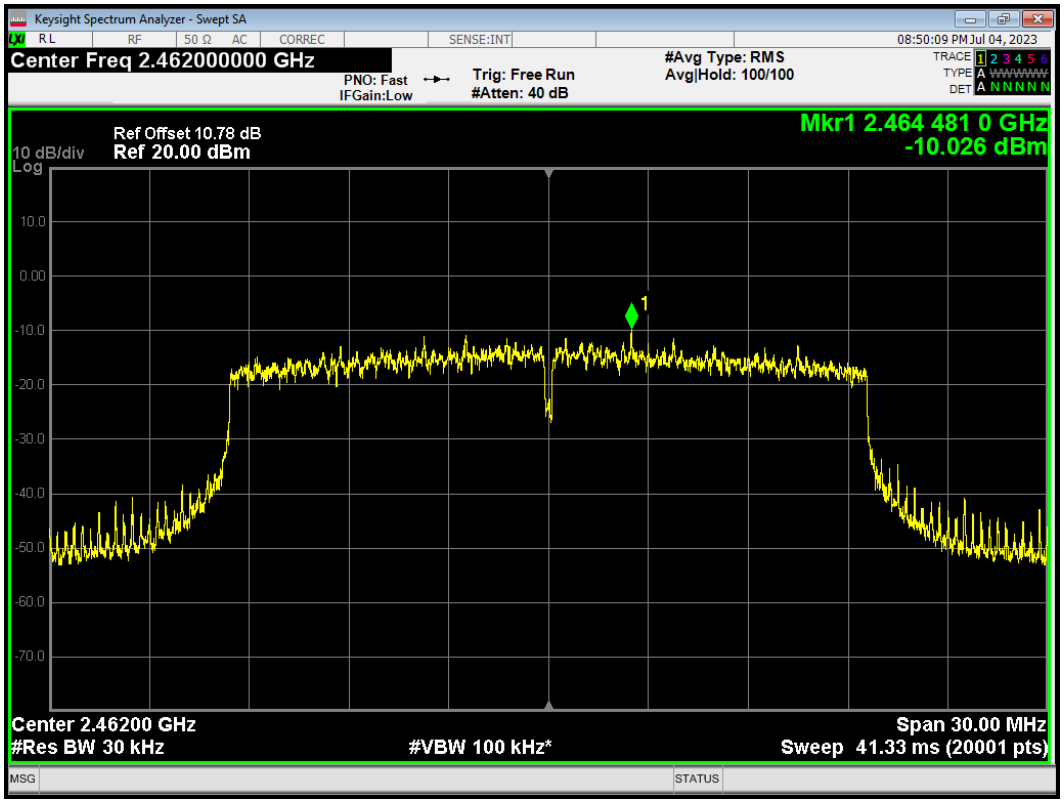
PSD 802.11ax(HE20) 2412MHz



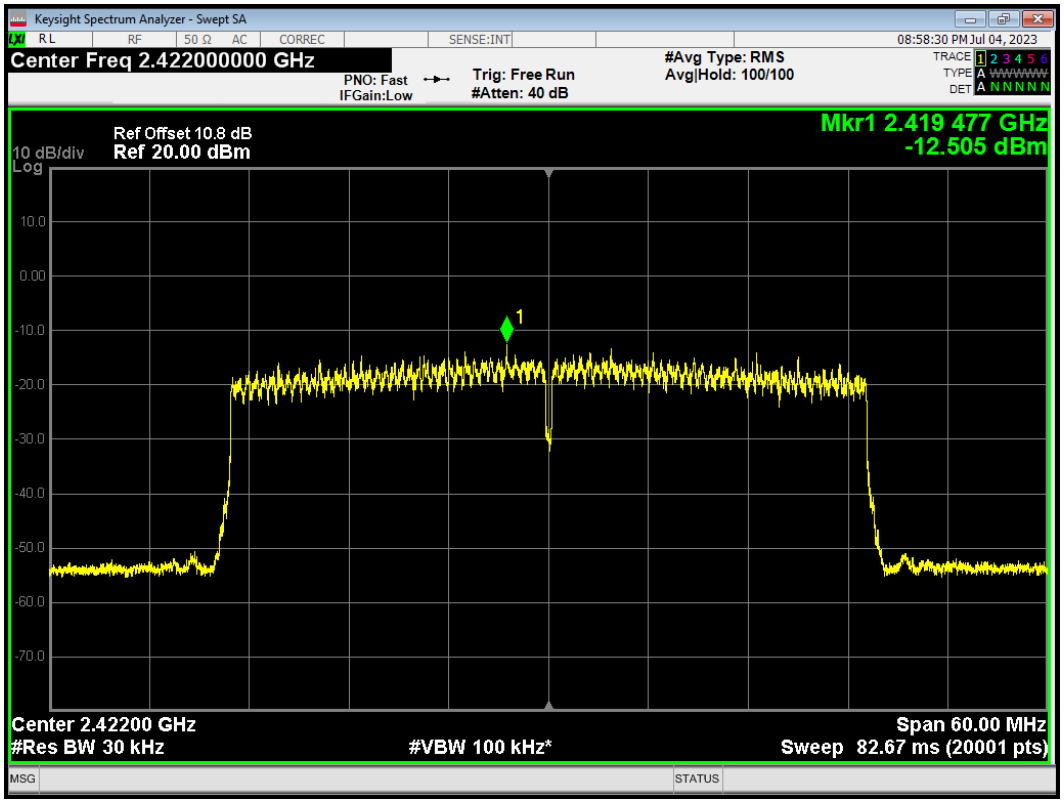
PSD 802.11ax(HE20) 2437MHz



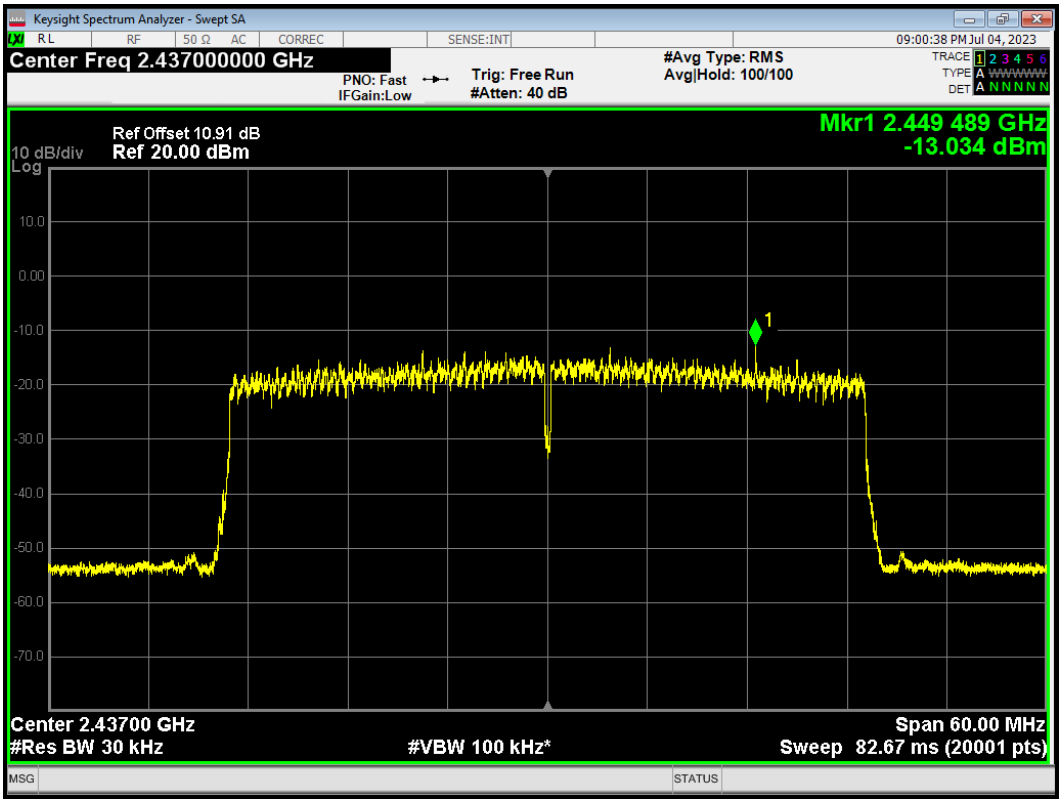
PSD 802.11ax(HE20) 2462MHz



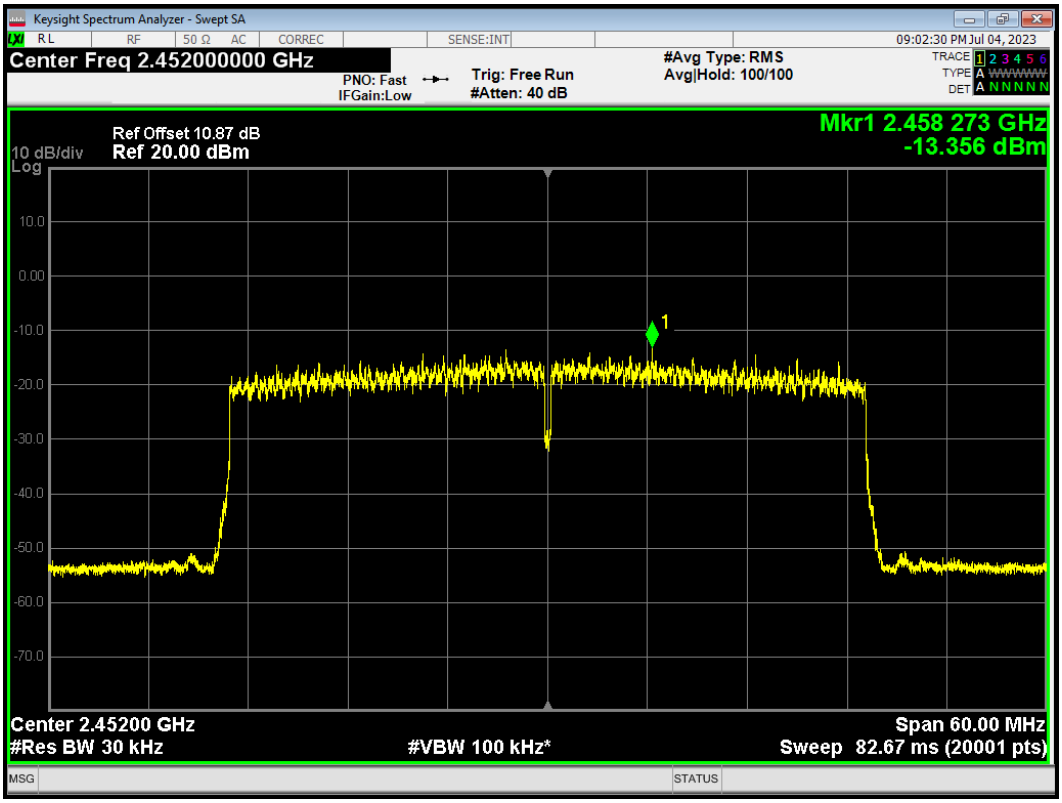
PSD 802.11ax(HE40) 2422MHz



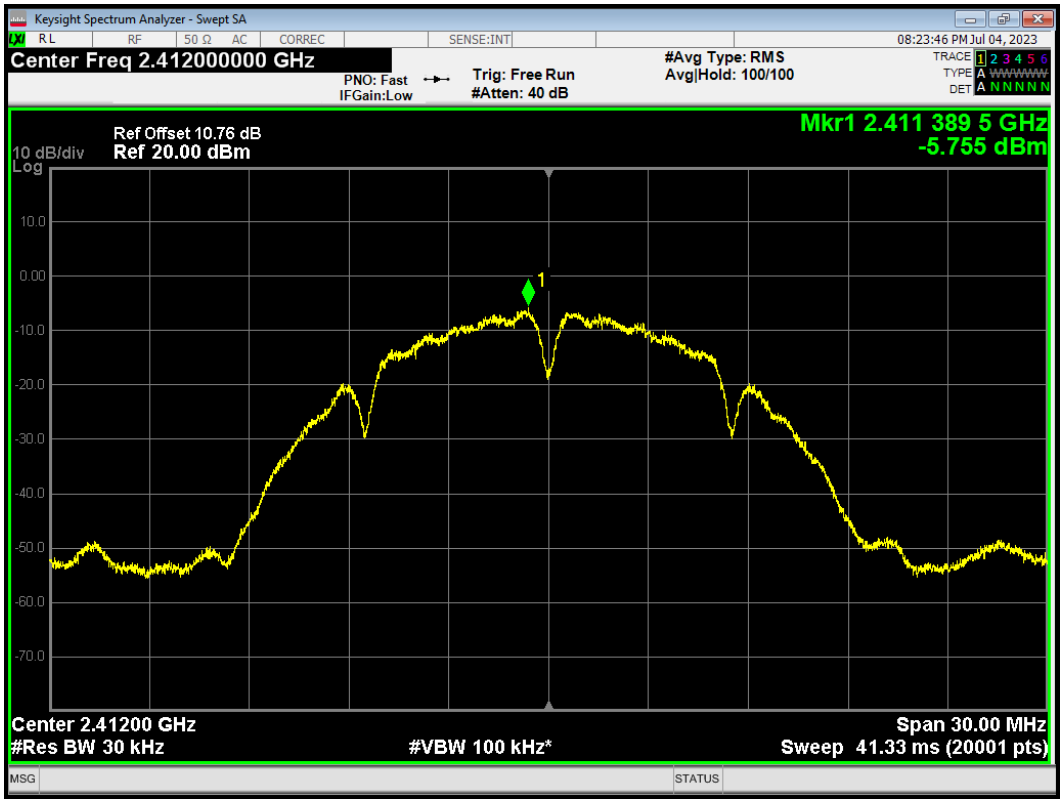
PSD 802.11ax(HE40) 2437MHz



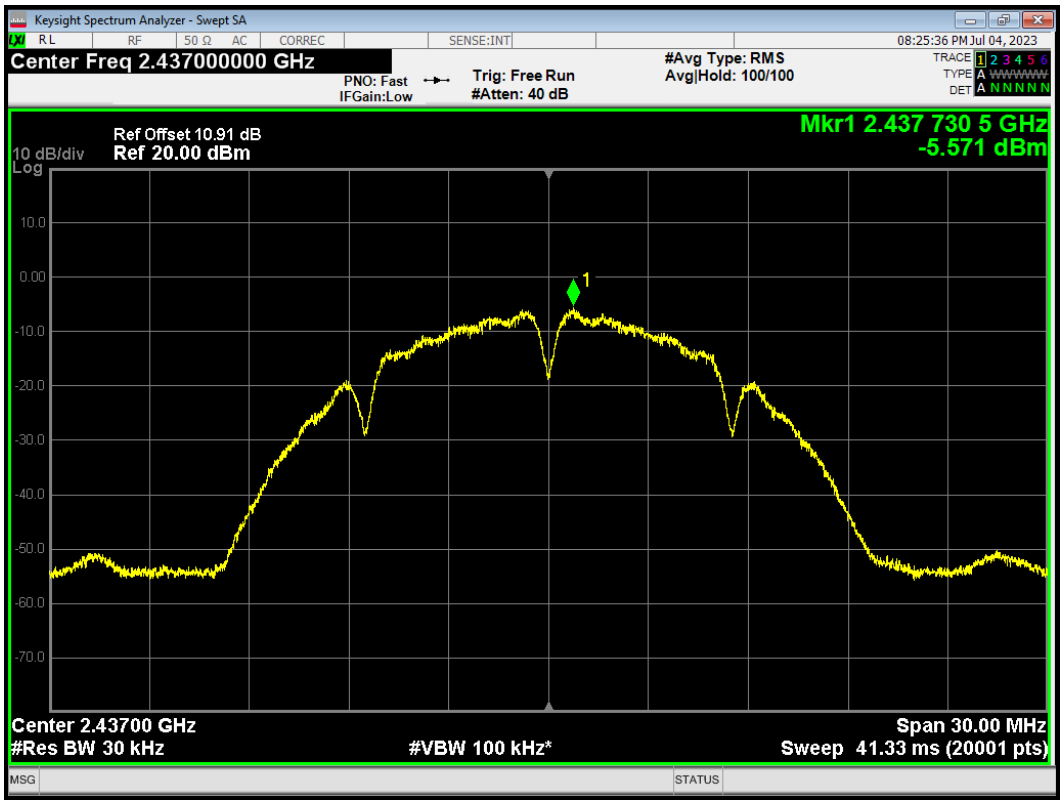
PSD 802.11ax(HE40) 2452MHz



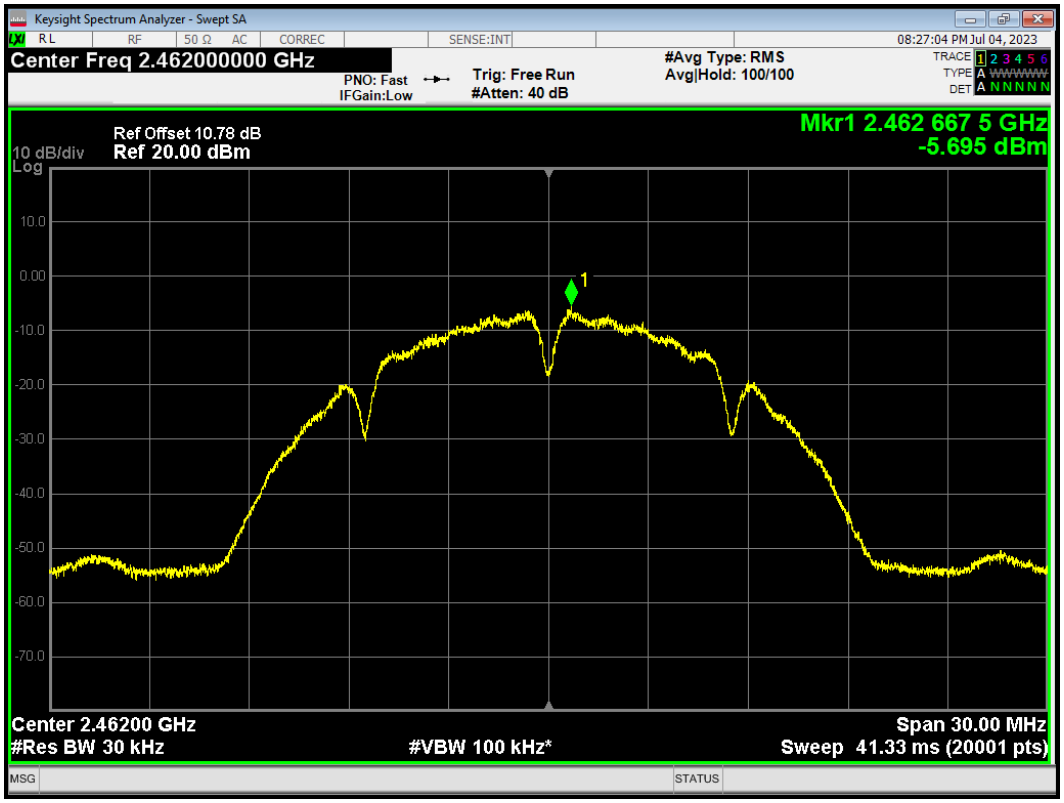
PSD 802.11b 2412MHz



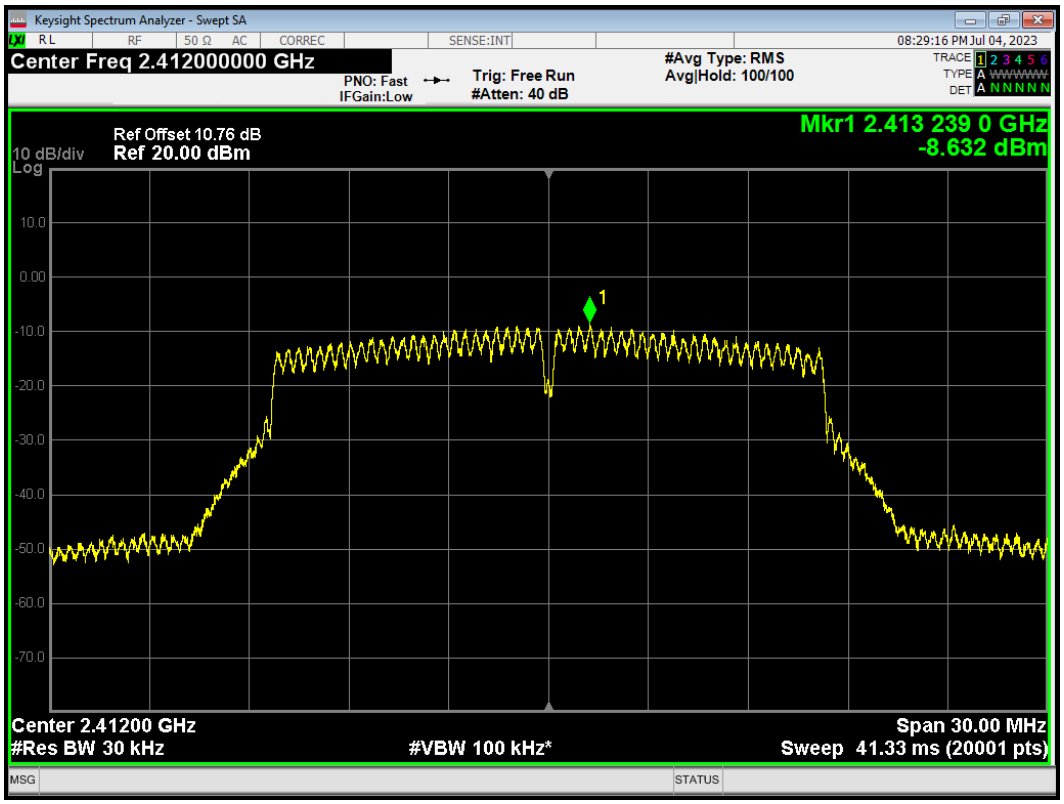
PSD 802.11b 2437MHz



PSD 802.11b 2462MHz



PSD 802.11g 2412MHz



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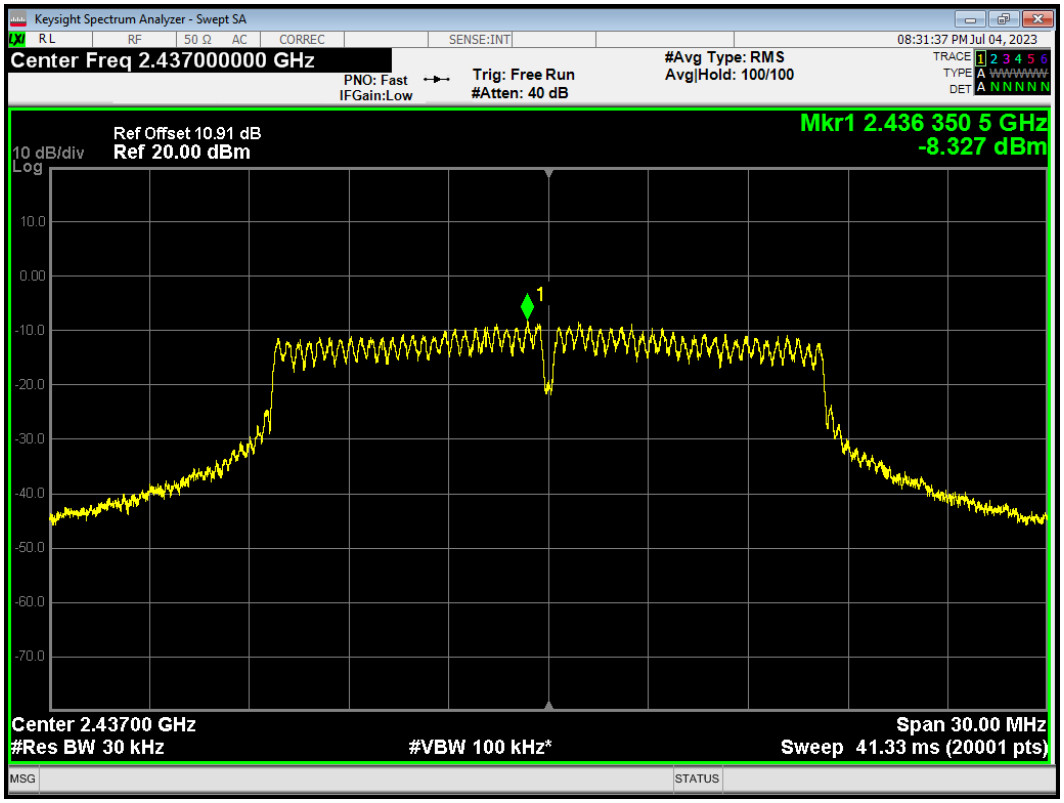
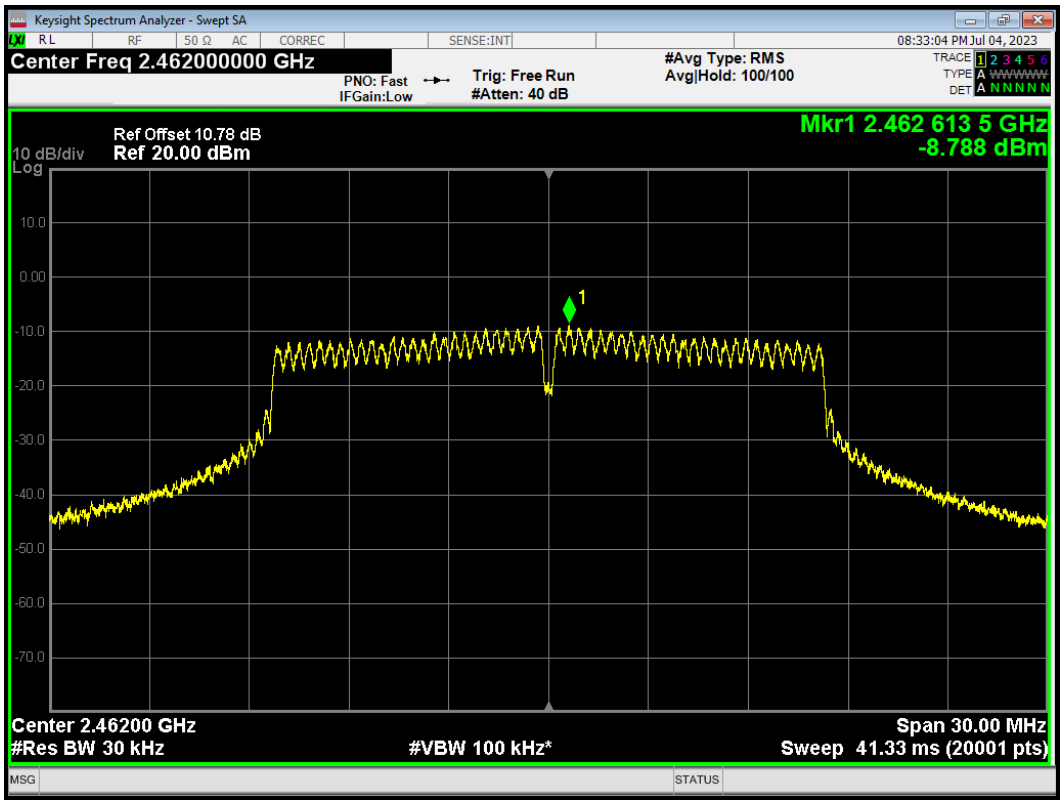
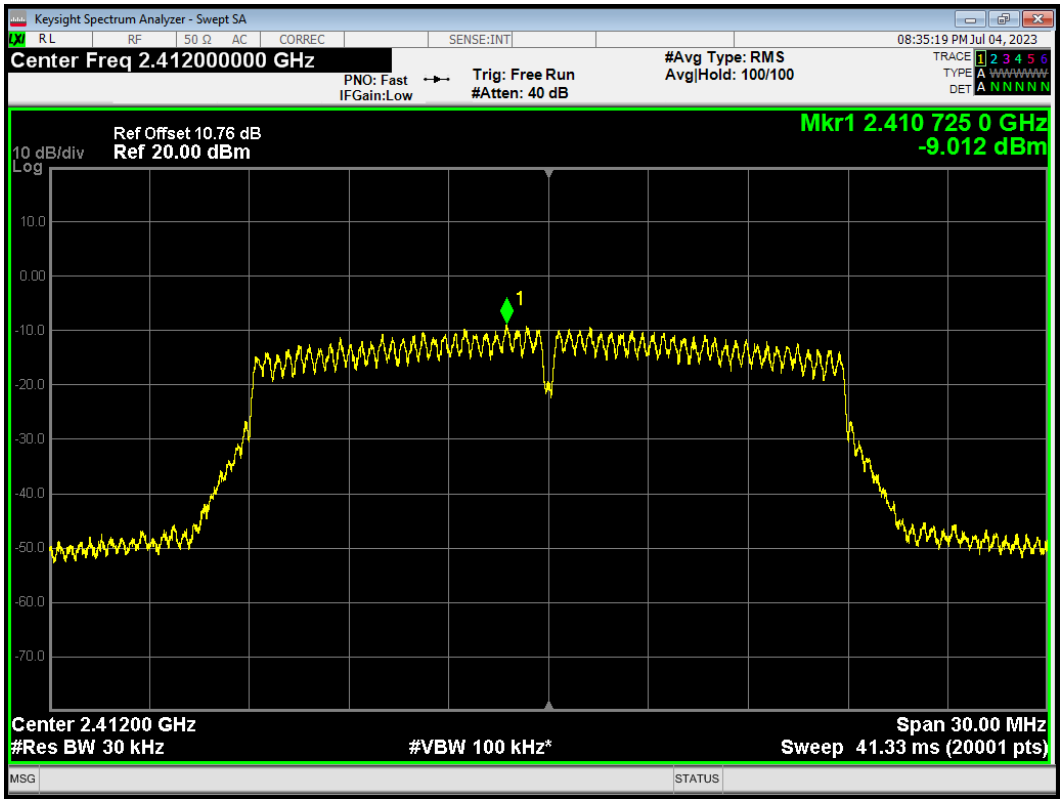


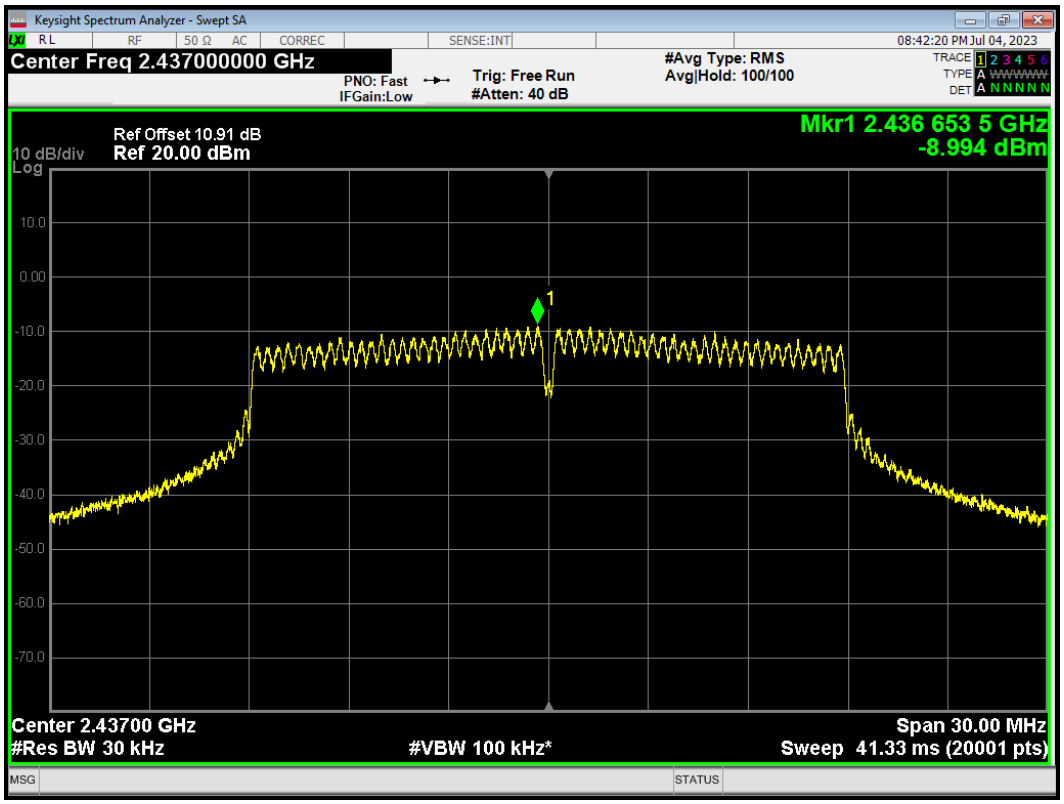
PSD 802.11g 2462MHz



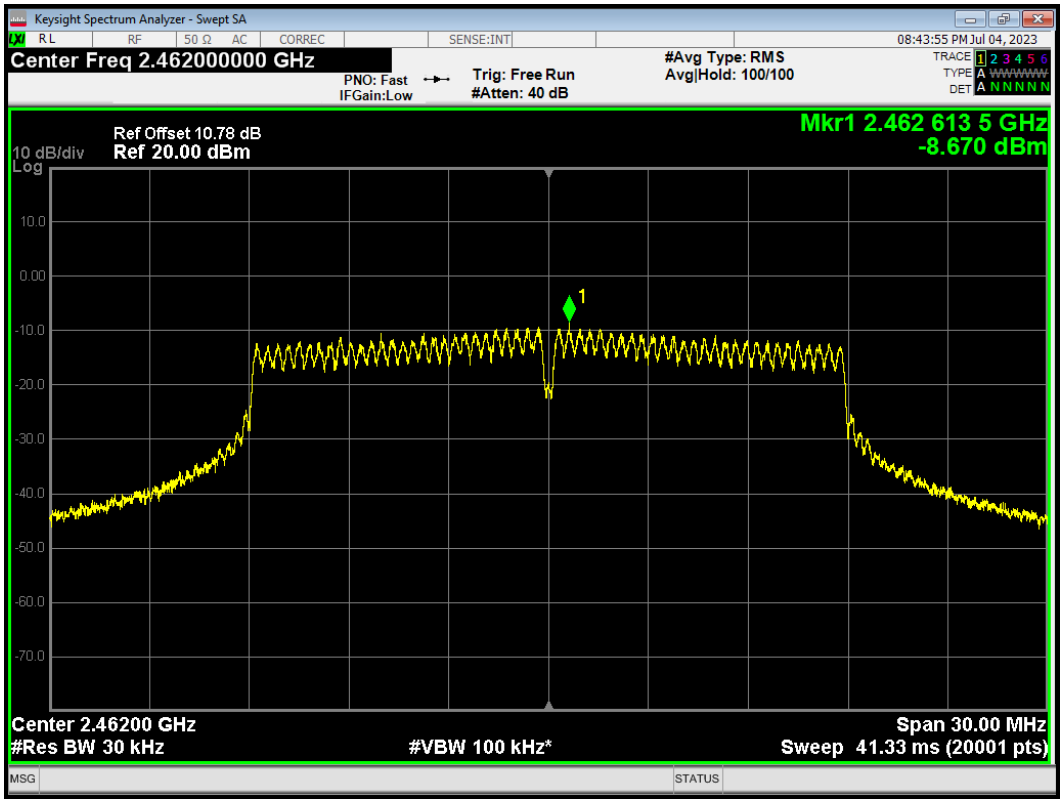
PSD 802.11n(HT20) 2412MHz



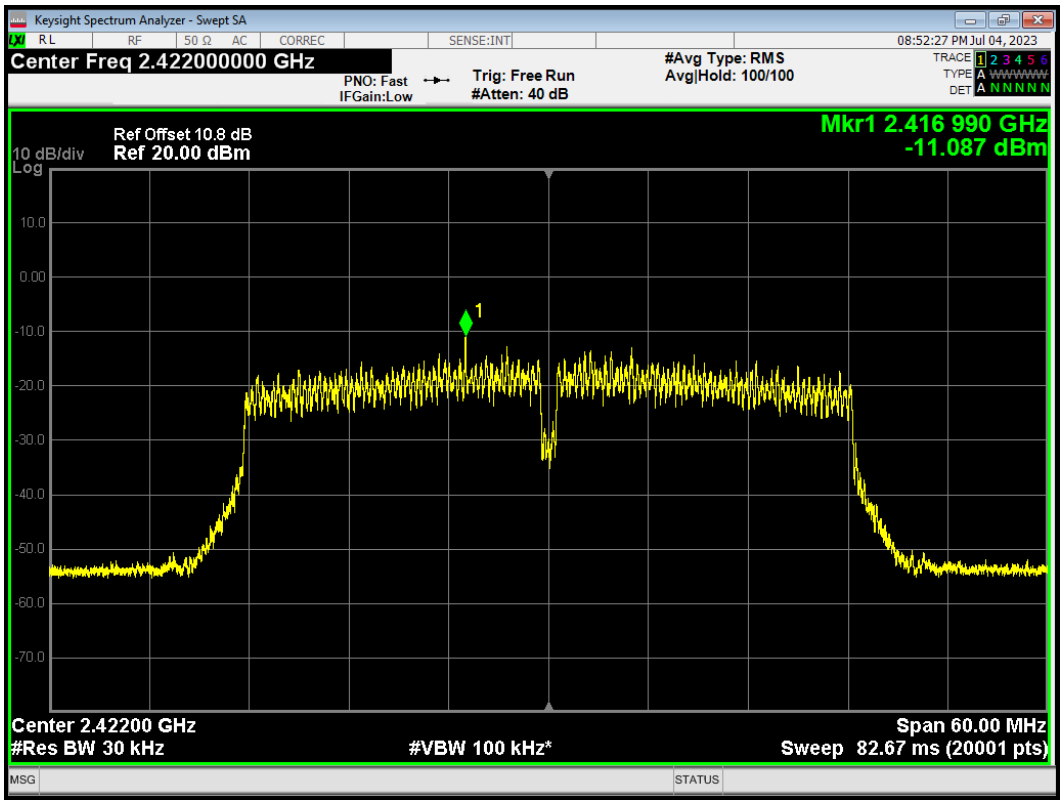
PSD 802.11n(HT20) 2437MHz



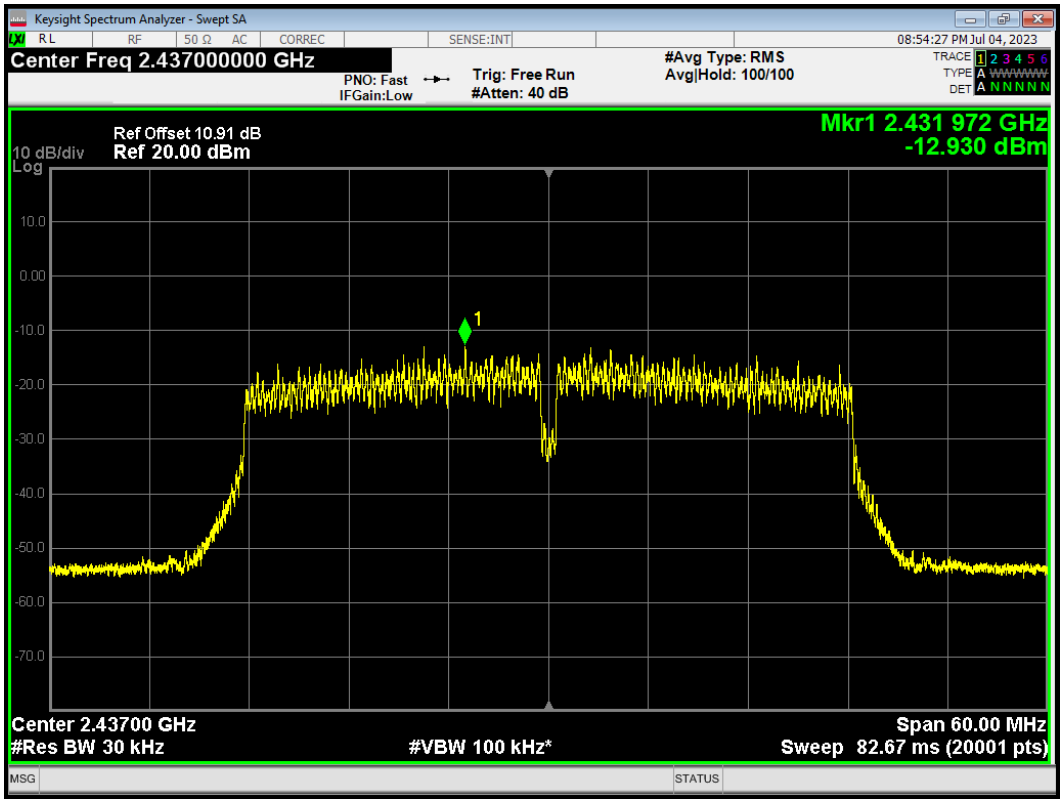
PSD 802.11n(HT20) 2462MHz



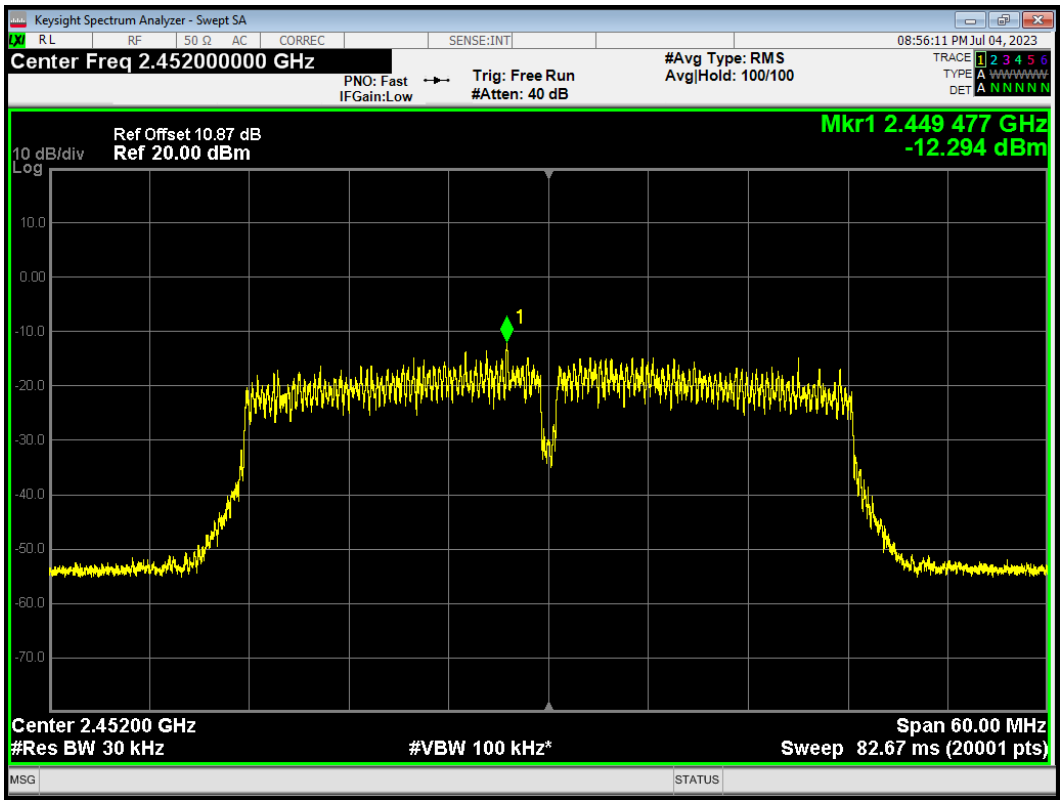
PSD 802.11n(HT40) 2422MHz



PSD 802.11n(HT40) 2437MHz

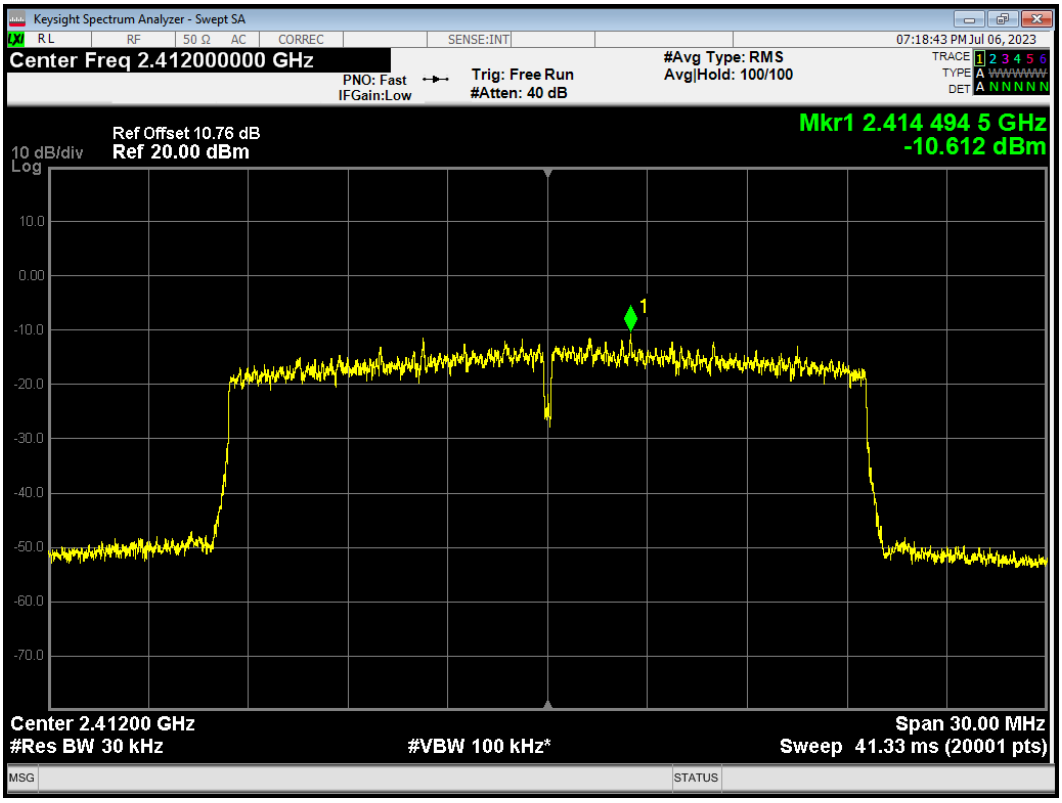


PSD 802.11n(HT40) 2452MHz

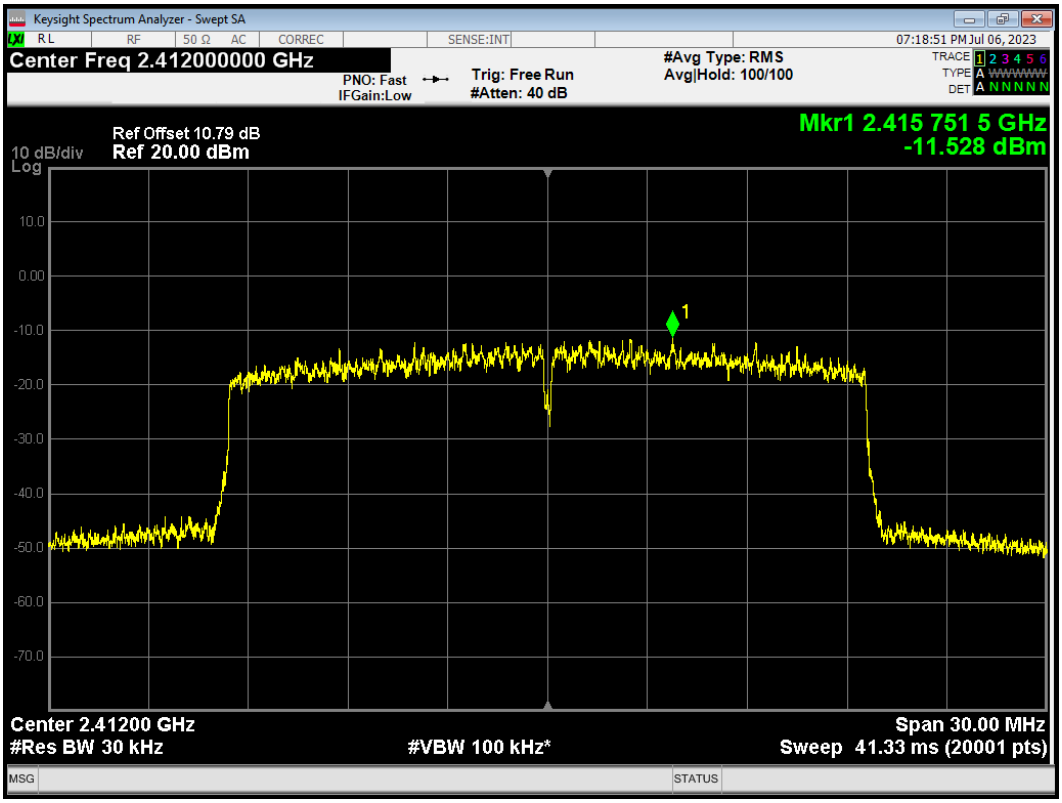


MIMO

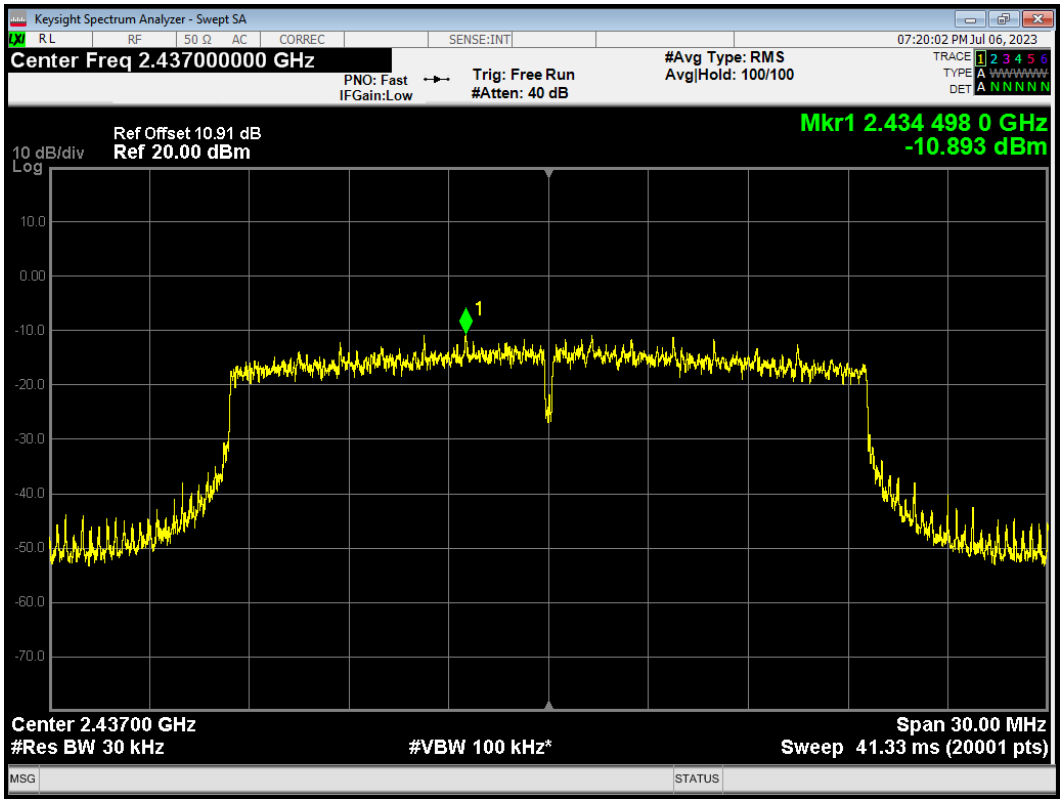
PSD 802.11ax(HE20) 2412MHz Ant1



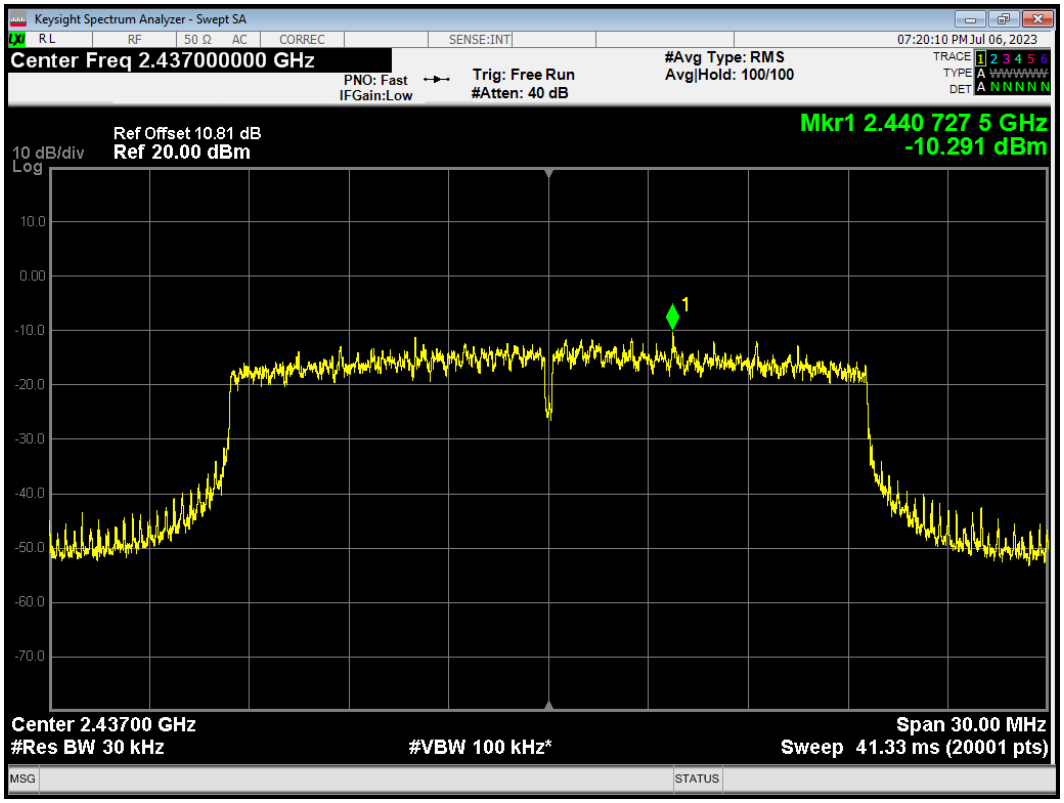
PSD 802.11ax(HE20) 2412MHz Ant2



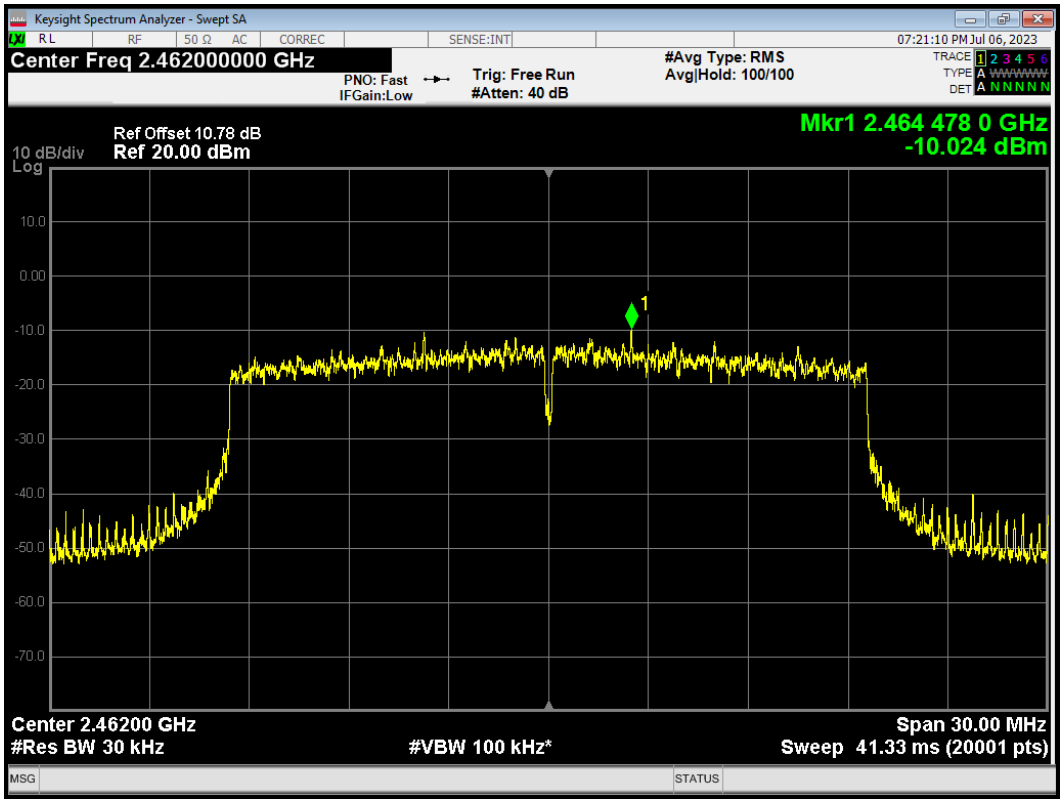
PSD 802.11ax(HE20) 2437MHz Ant1



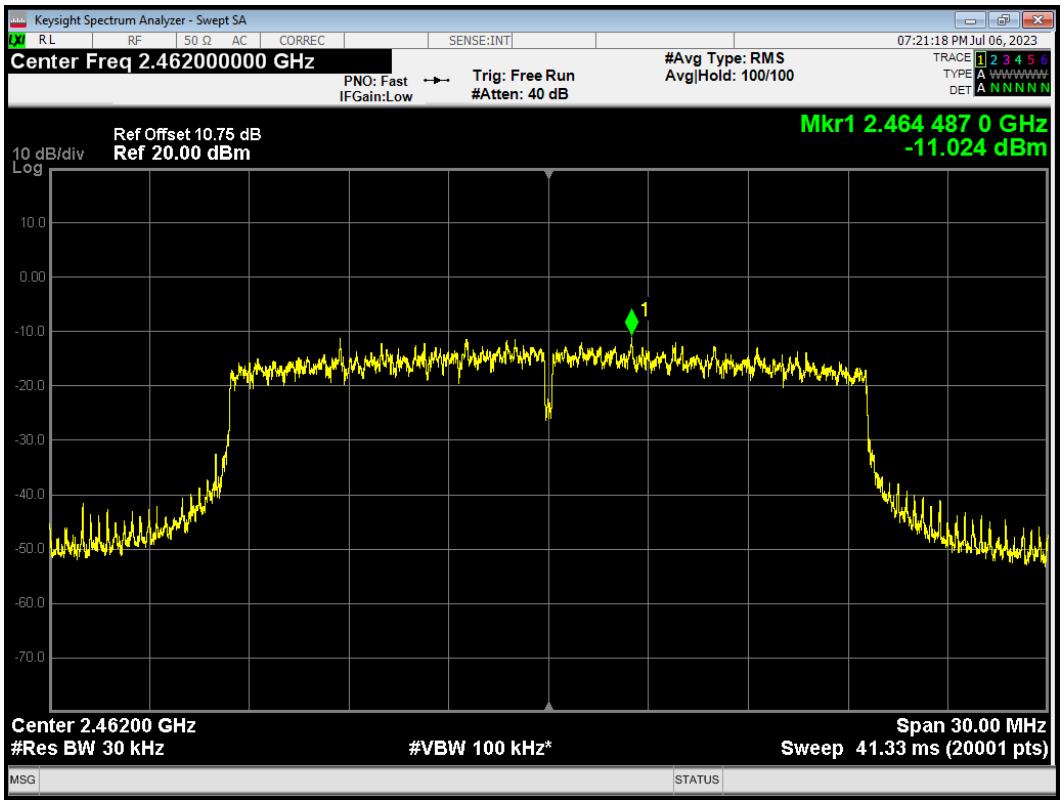
PSD 802.11ax(HE20) 2437MHz Ant2



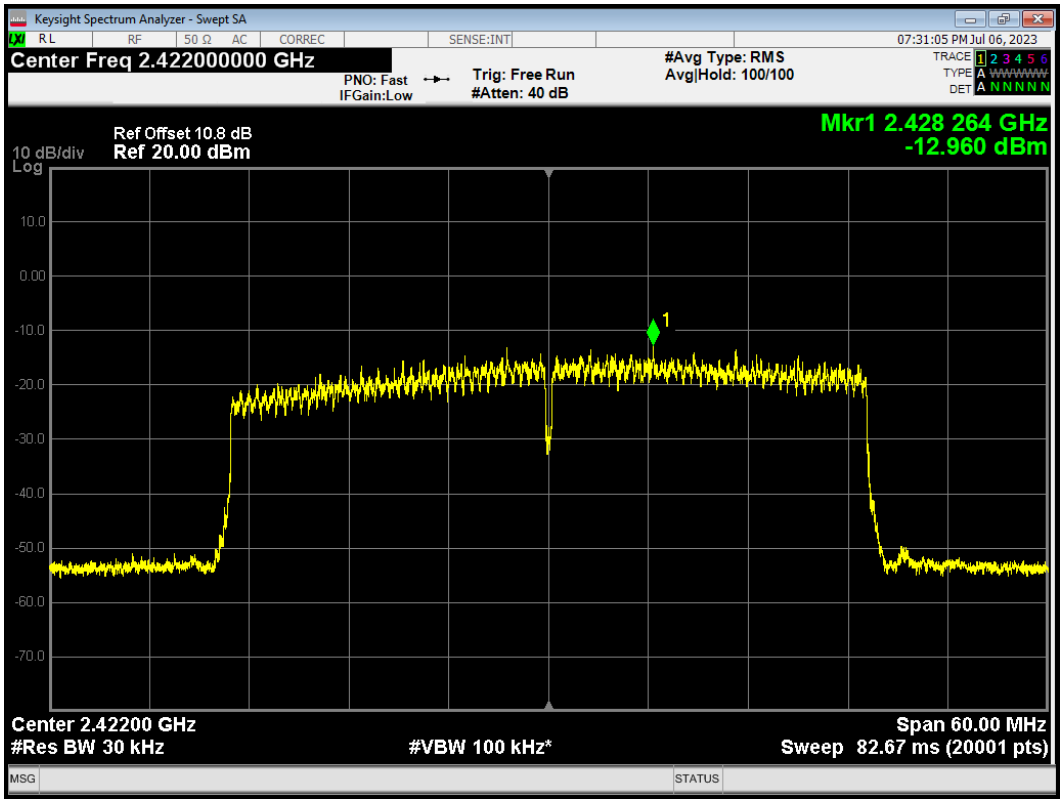
PSD 802.11ax(HE20) 2462MHz Ant1



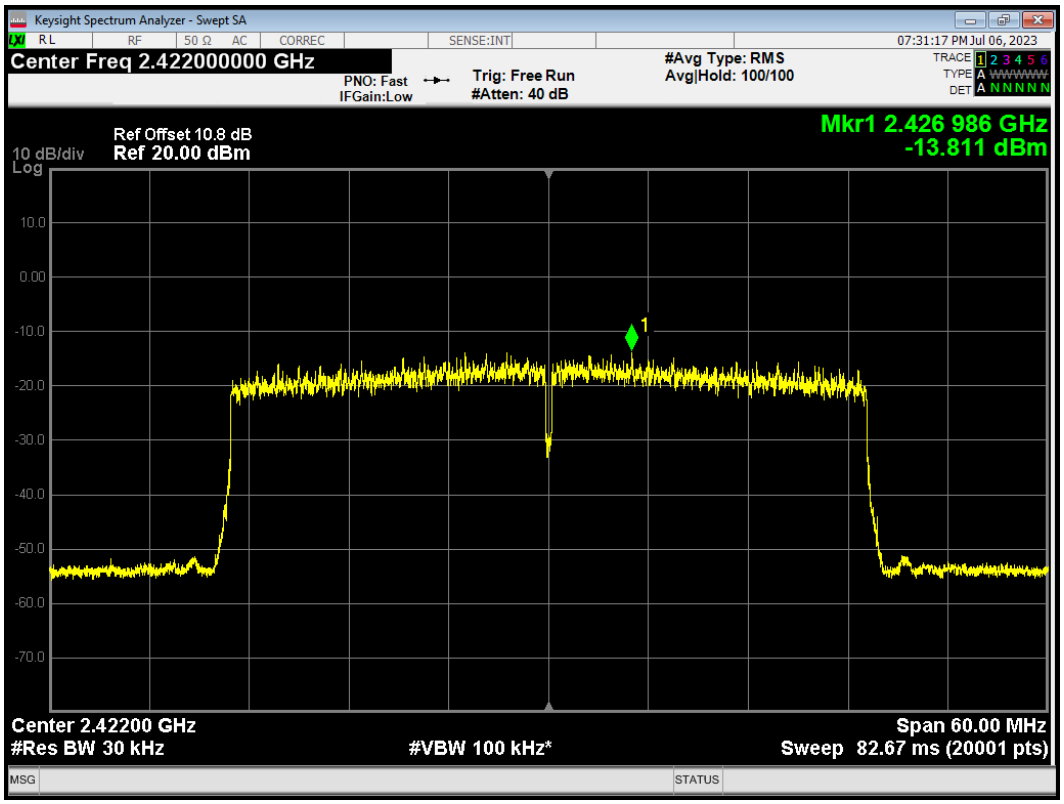
PSD 802.11ax(HE20) 2462MHz Ant2



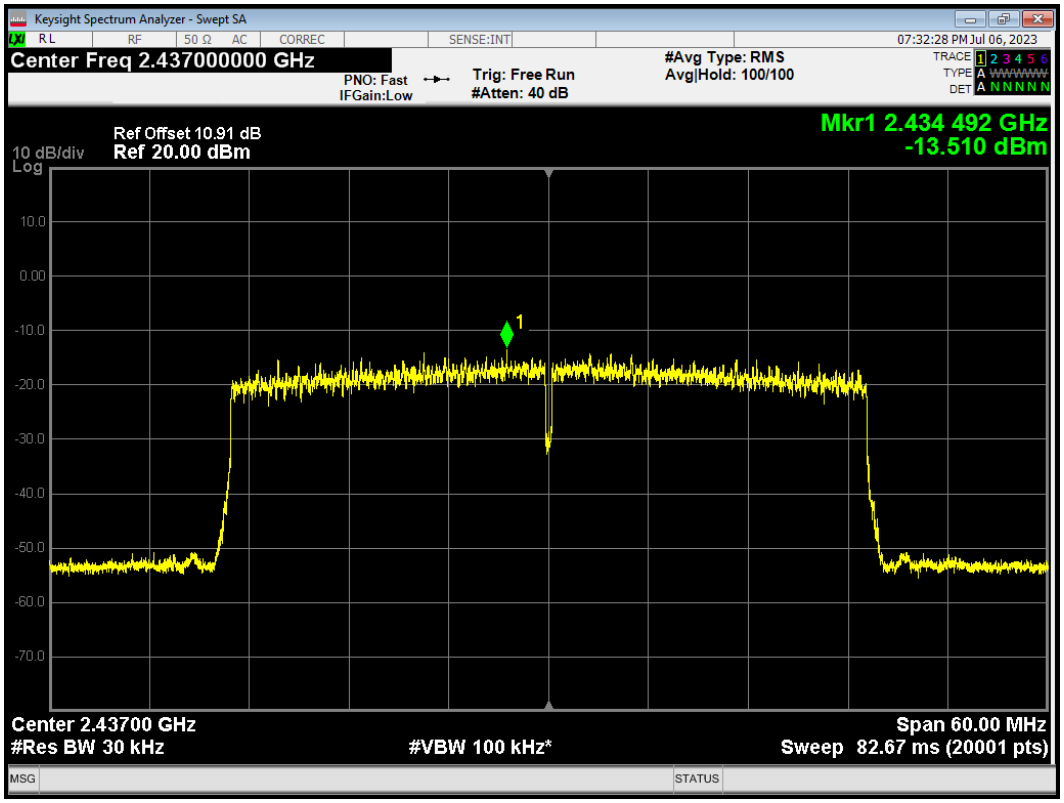
PSD 802.11ax(HE40) 2422MHz Ant1



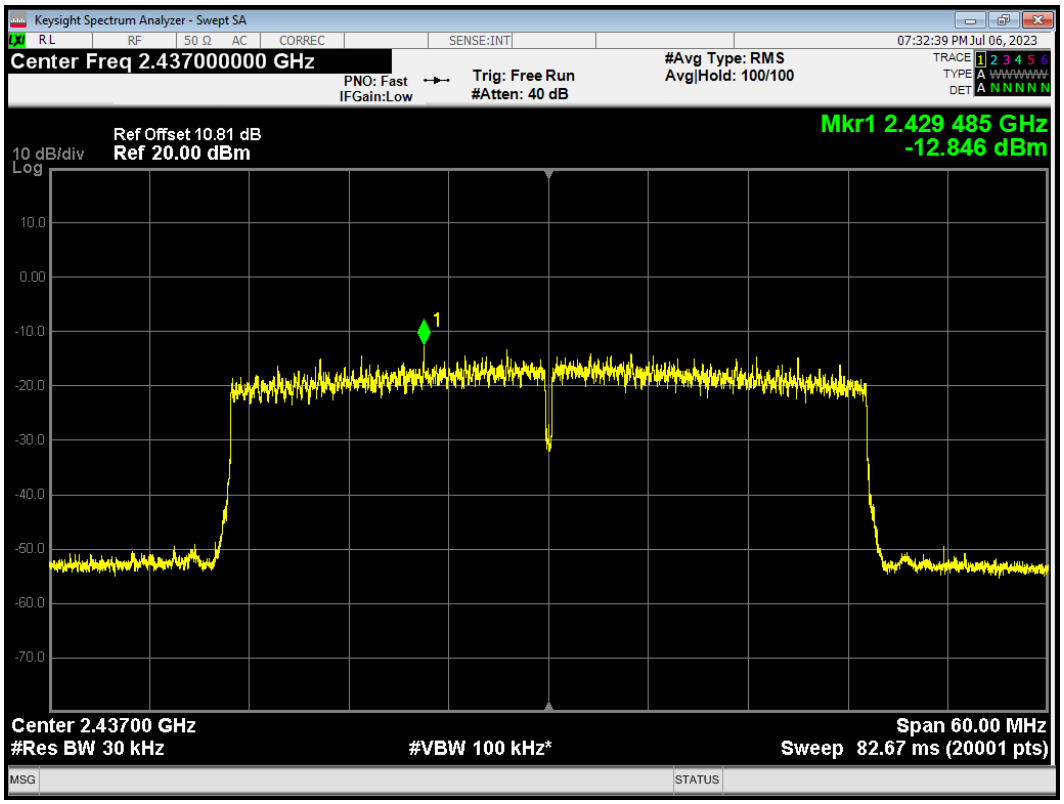
PSD 802.11ax(HE40) 2422MHz Ant2



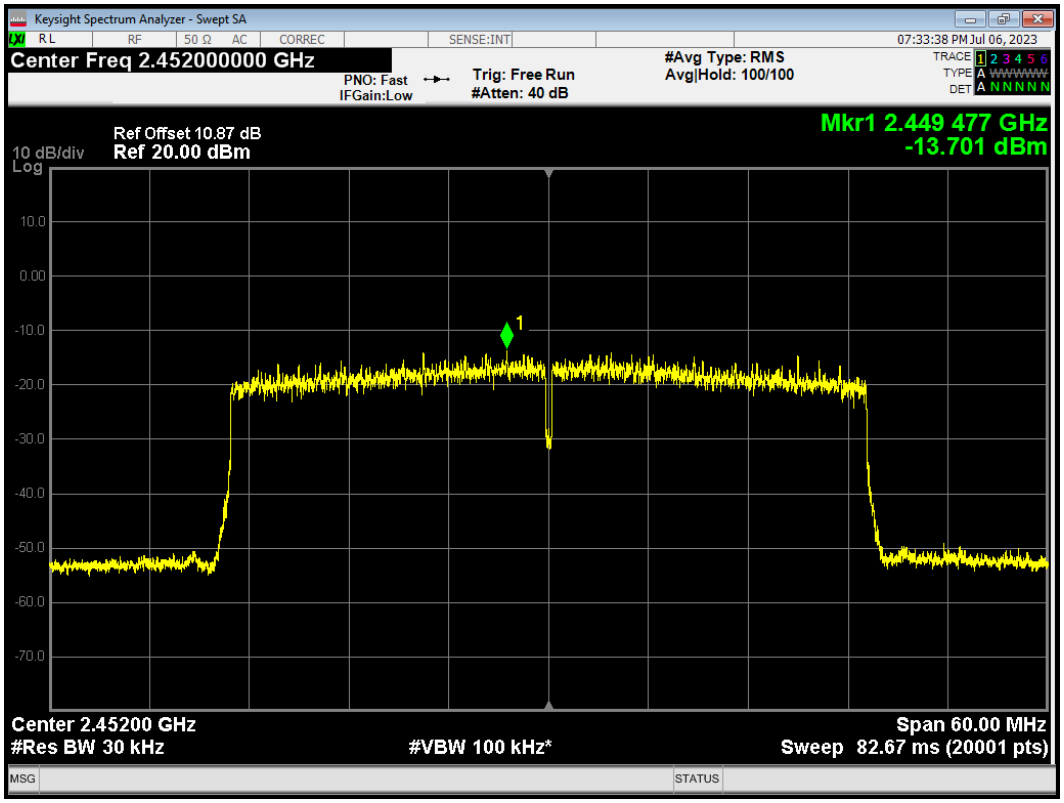
PSD 802.11ax(HE40) 2437MHz Ant1



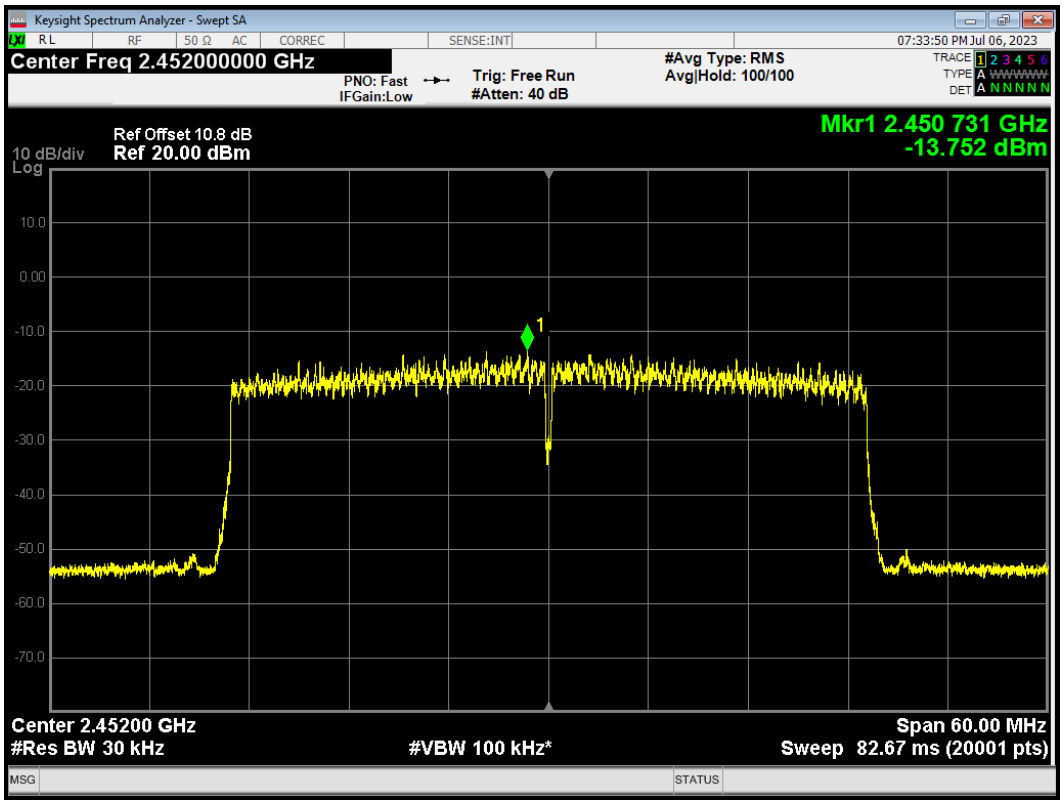
PSD 802.11ax(HE40) 2437MHz Ant2



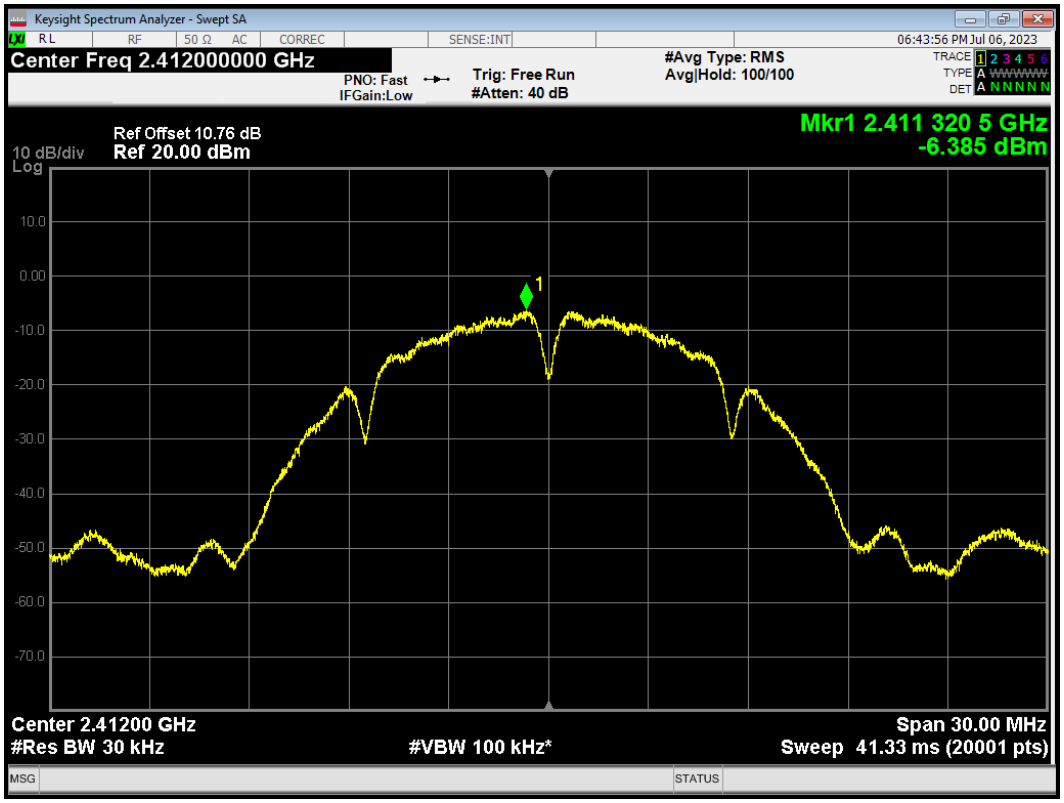
PSD 802.11ax(HE40) 2452MHz Ant1



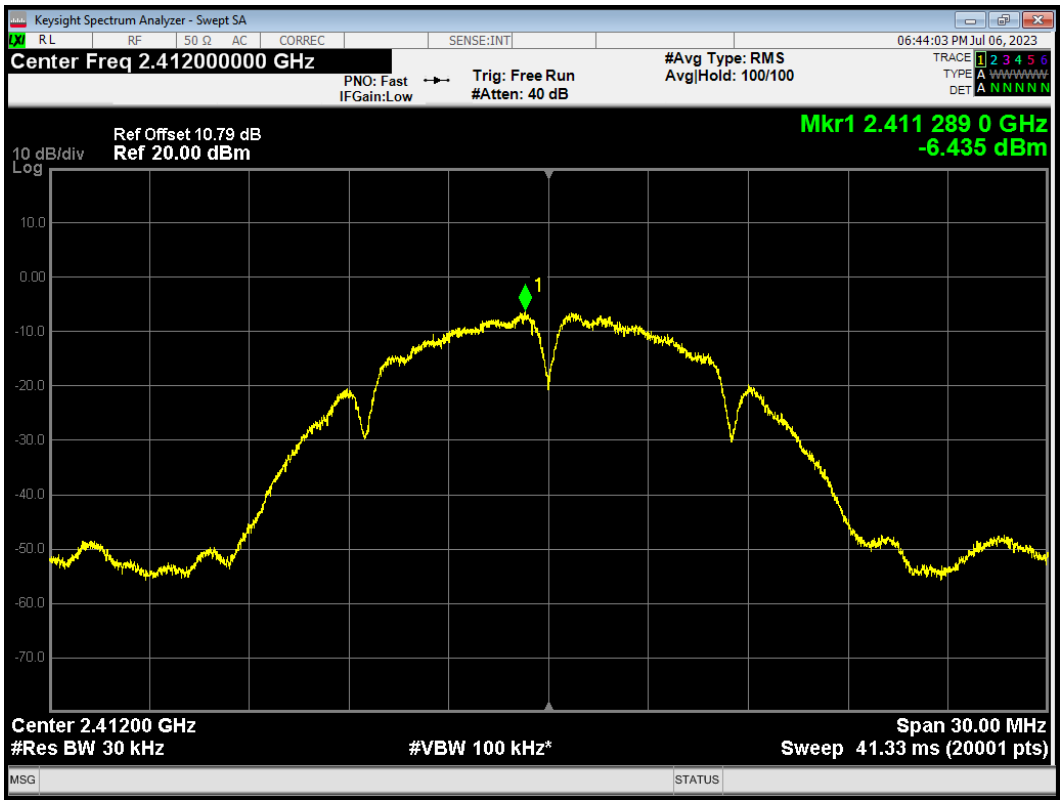
PSD 802.11ax(HE40) 2452MHz Ant2



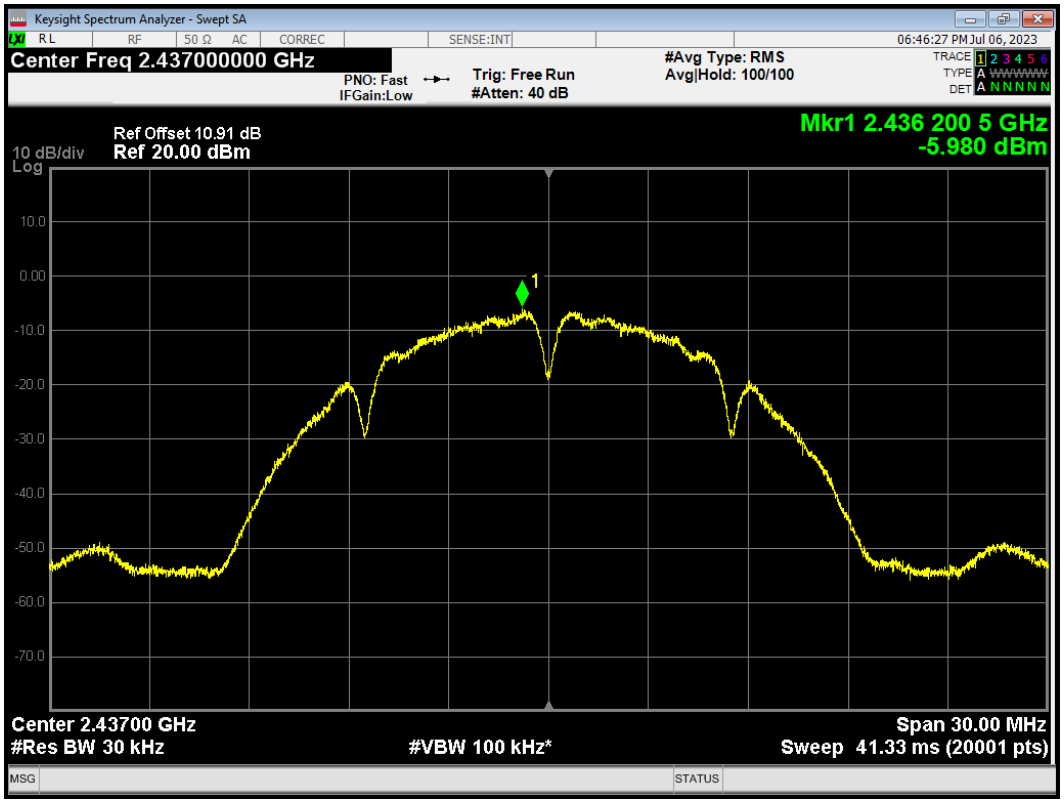
PSD 802.11b 2412MHz Ant1



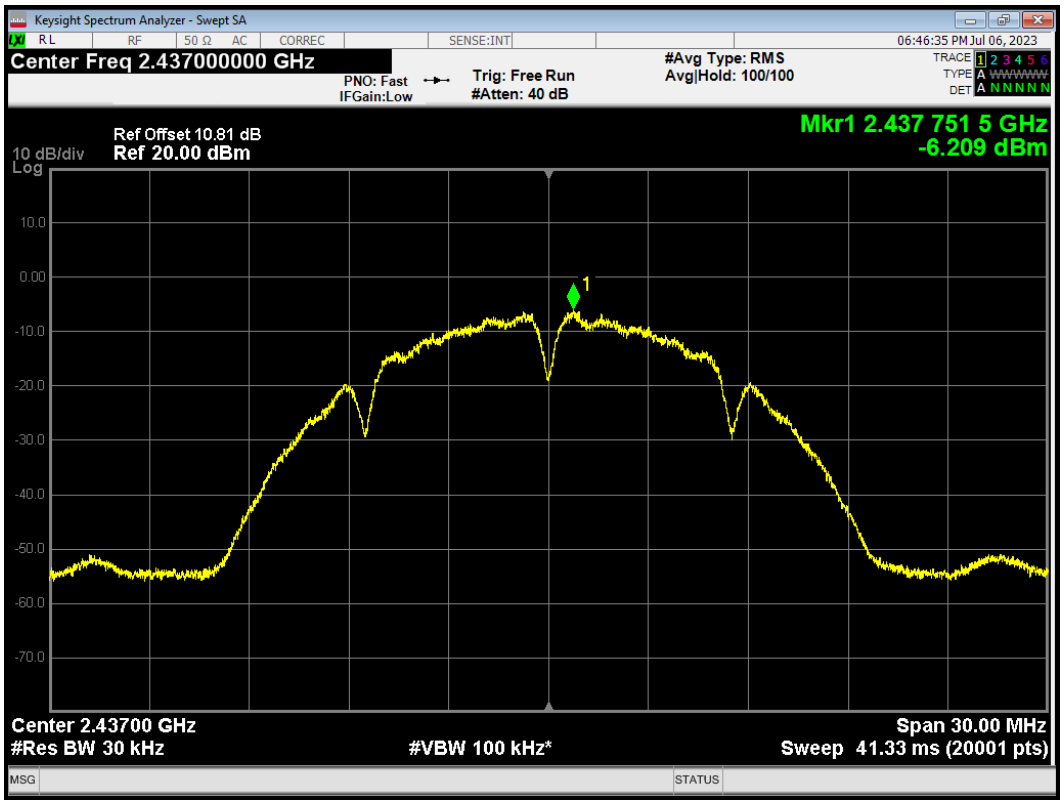
PSD 802.11b 2412MHz Ant2



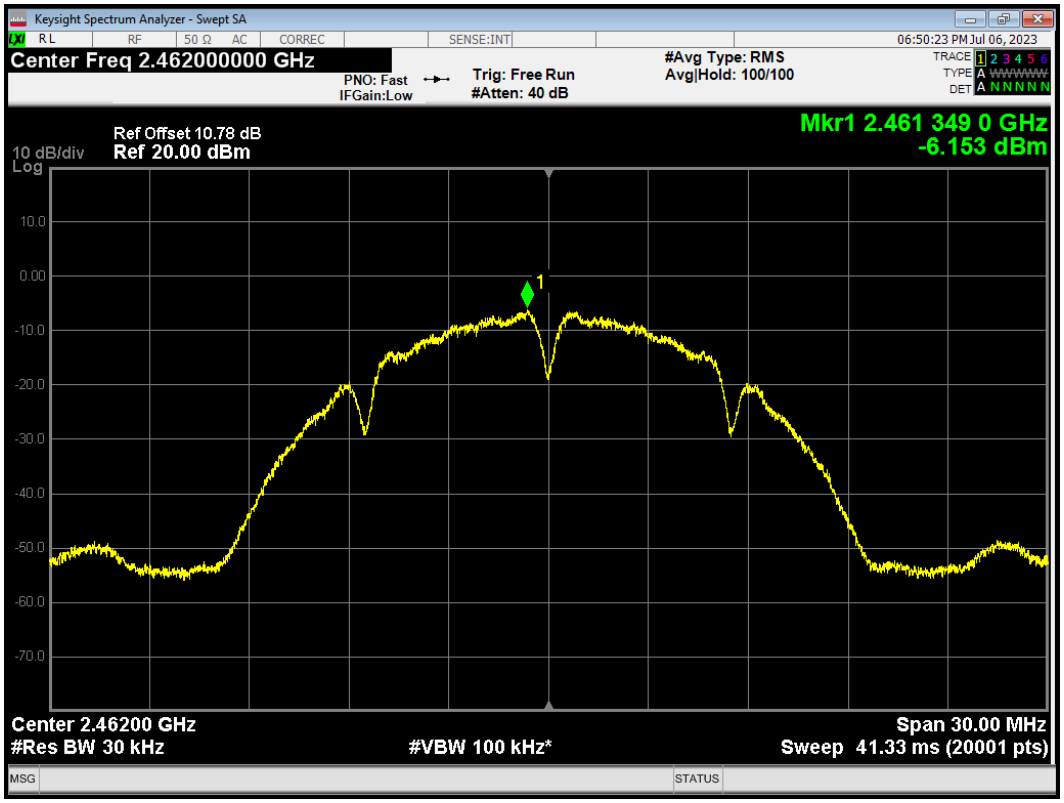
PSD 802.11b 2437MHz Ant1



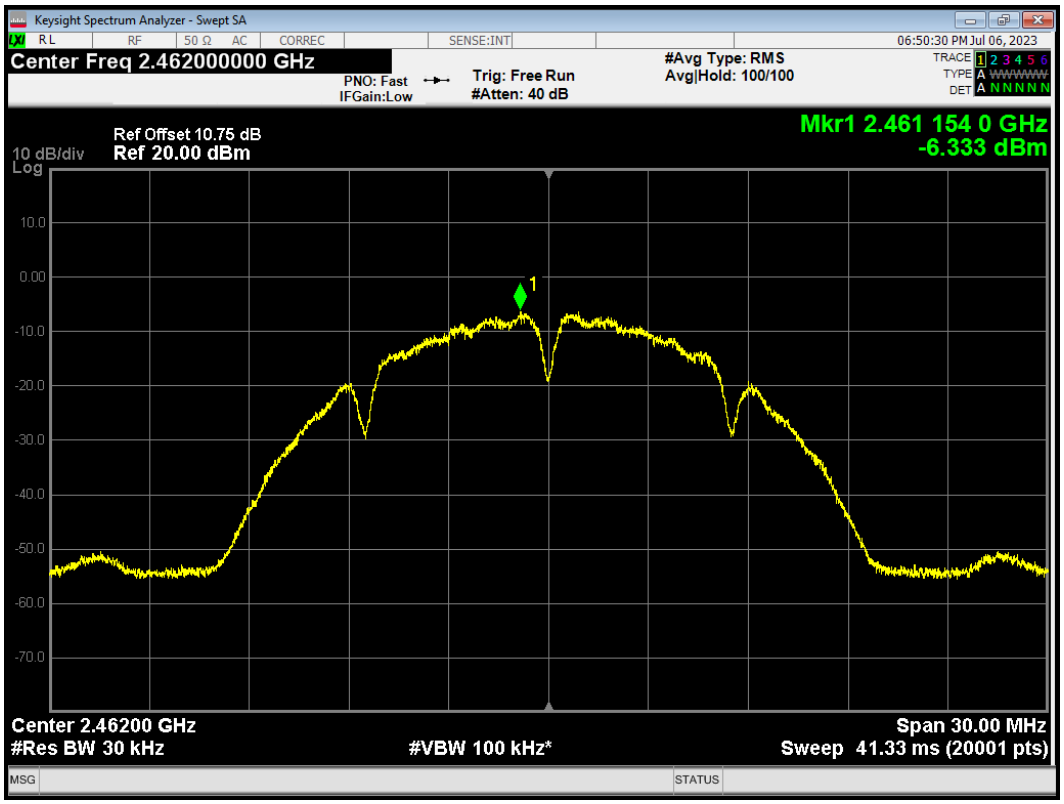
PSD 802.11b 2437MHz Ant2



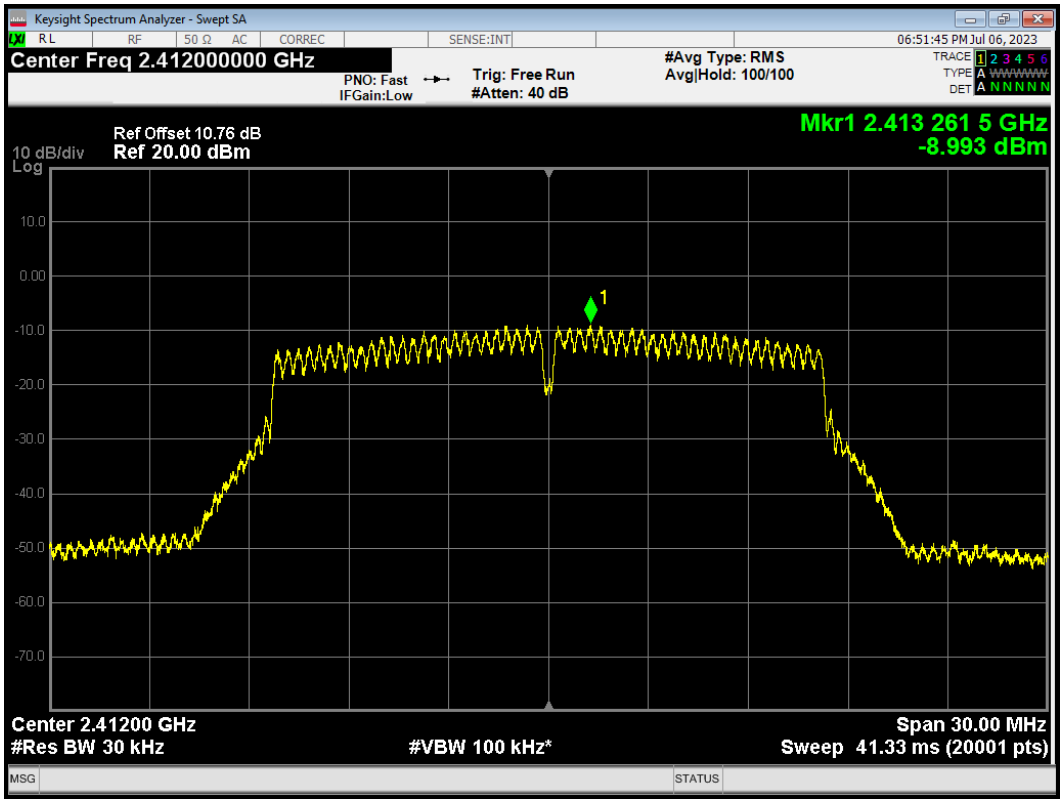
PSD 802.11b 2462MHz Ant1



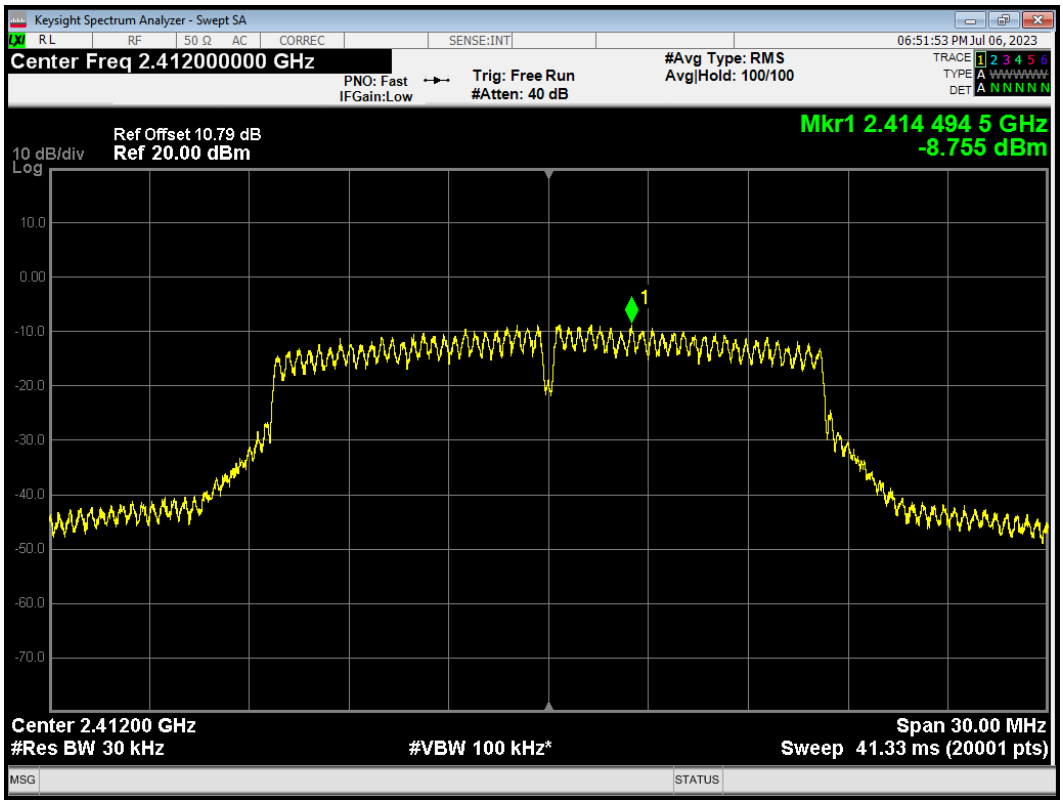
PSD 802.11b 2462MHz Ant2



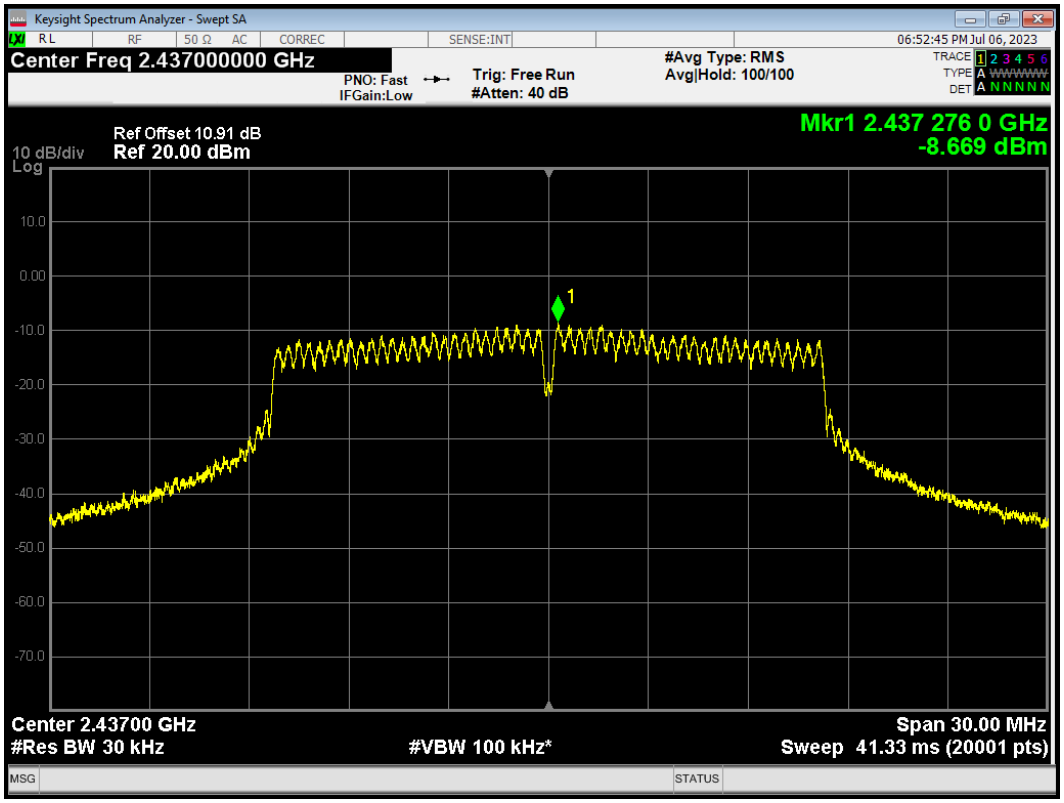
PSD 802.11g 2412MHz Ant1



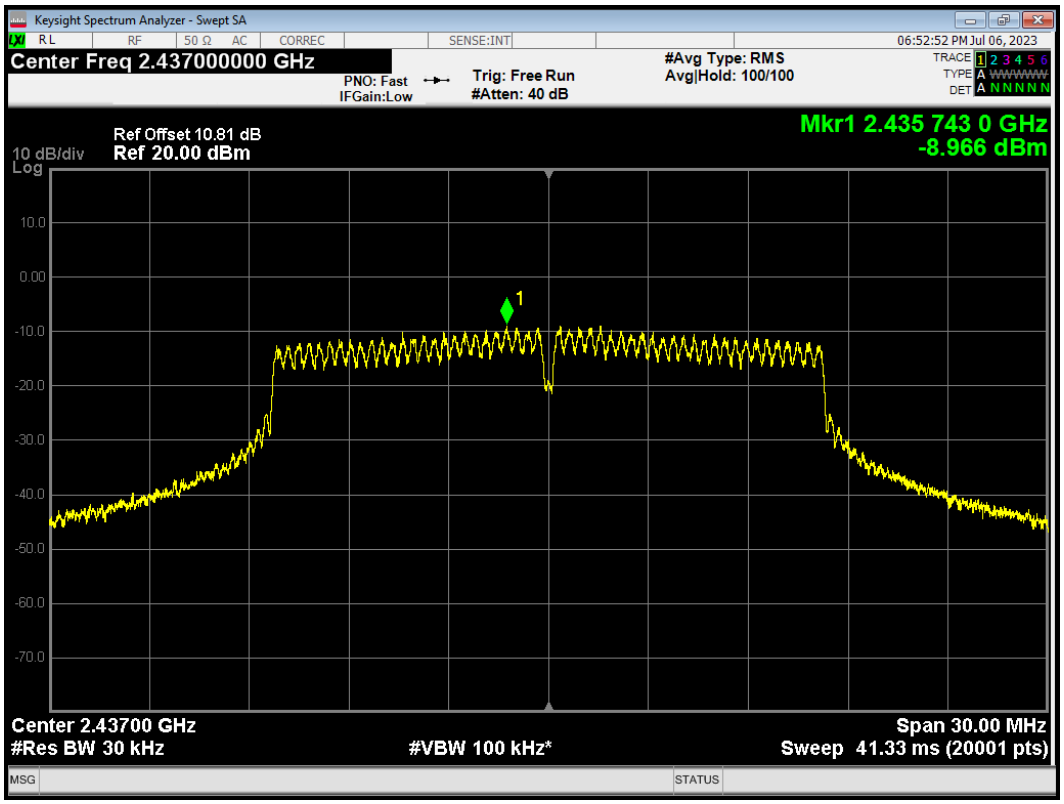
PSD 802.11g 2412MHz Ant2



PSD 802.11g 2437MHz Ant1



PSD 802.11g 2437MHz Ant2



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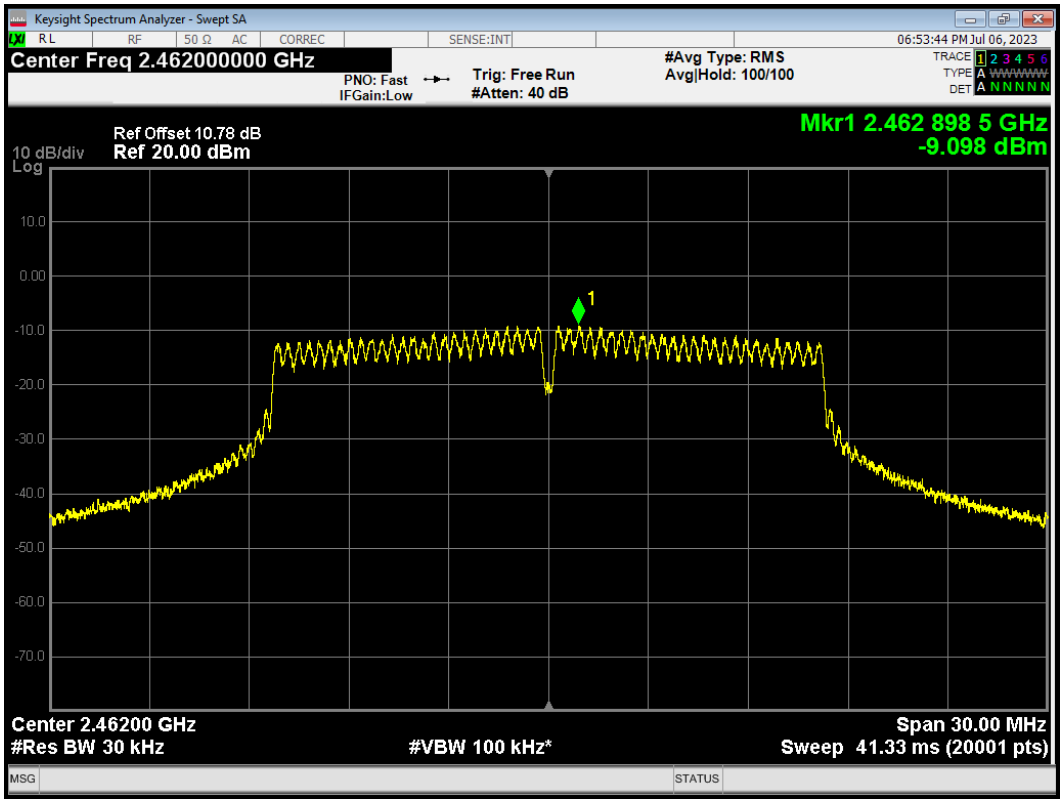
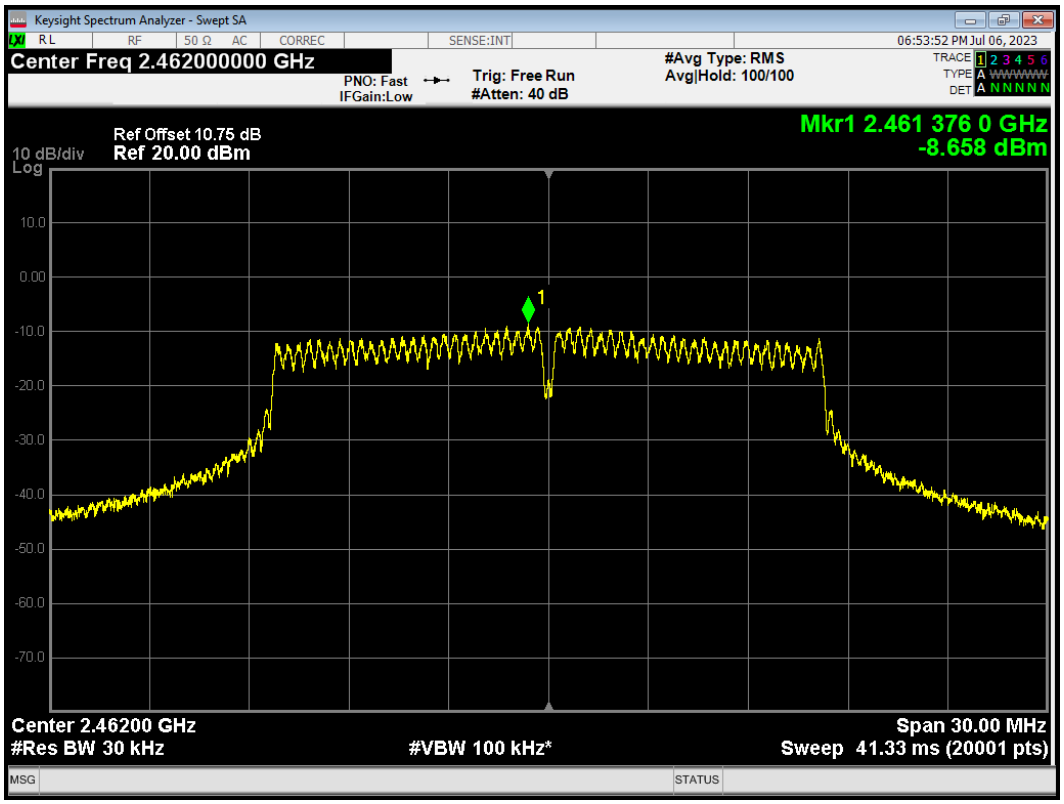
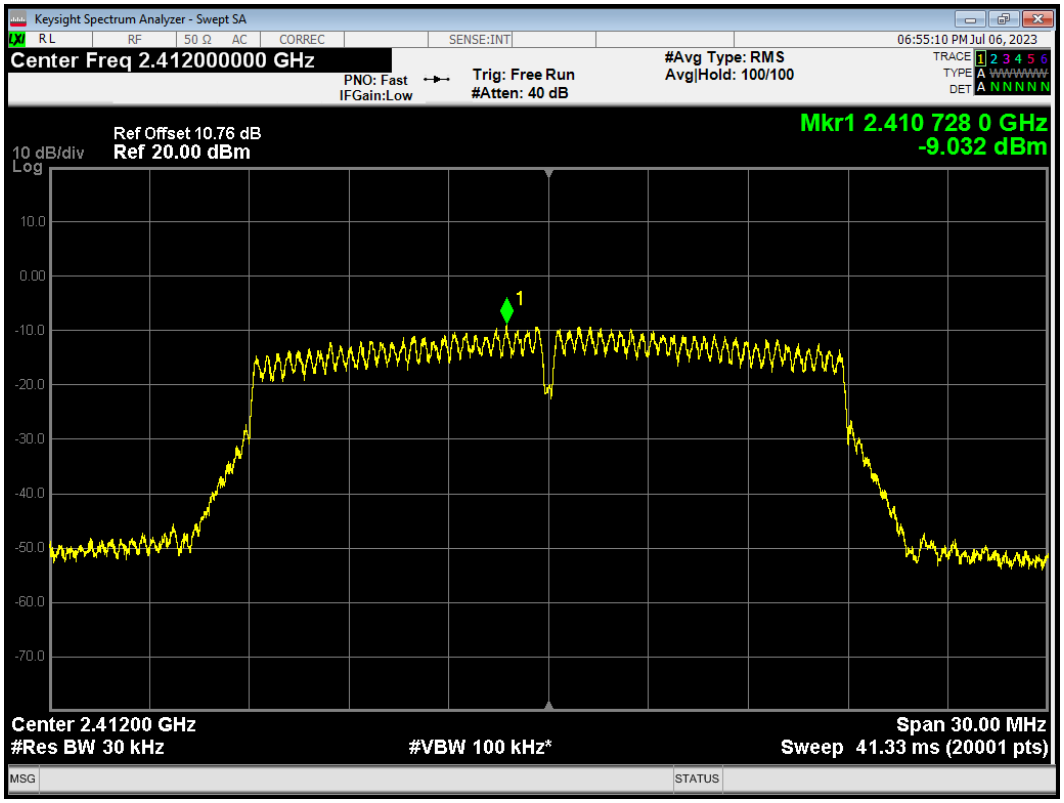


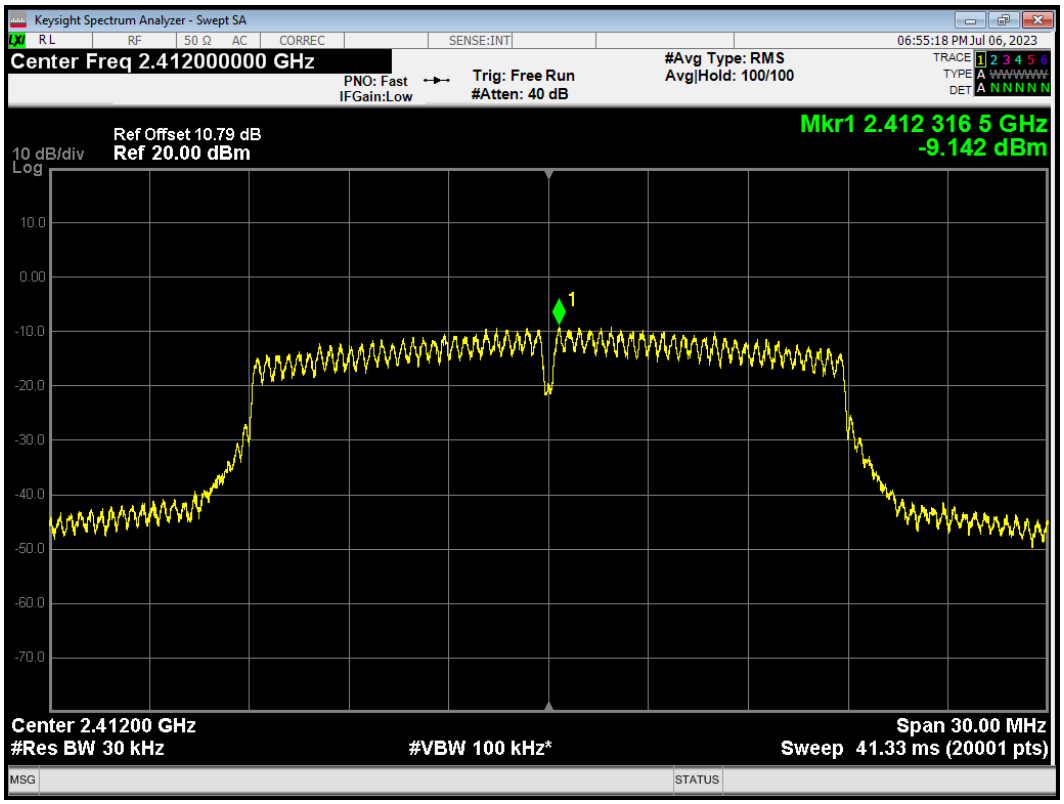
PSD 802.11g 2462MHz Ant2



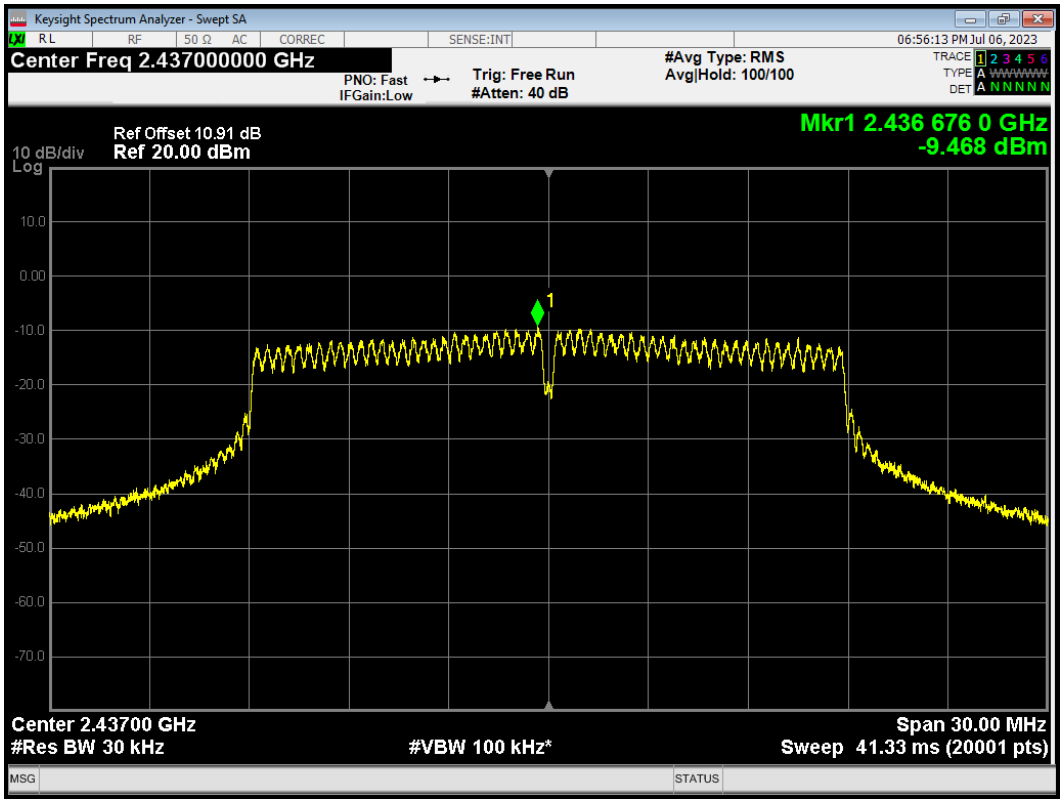
PSD 802.11n(HT20) 2412MHz Ant1



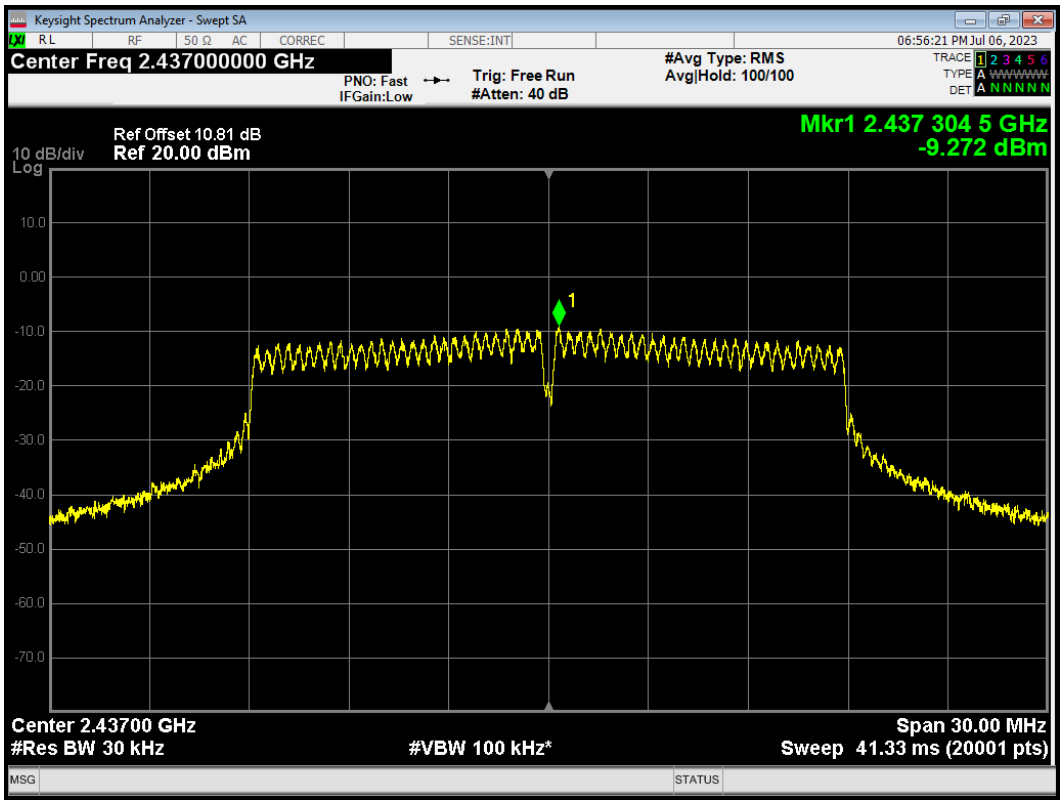
PSD 802.11n(HT20) 2412MHz Ant2



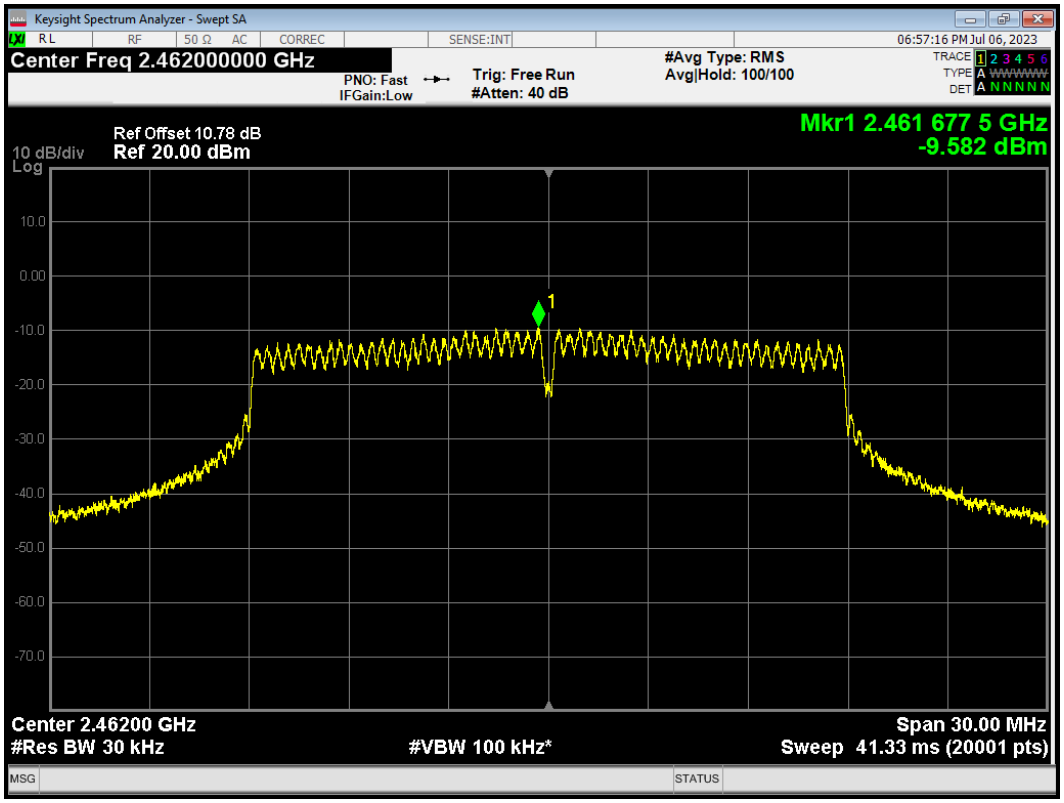
PSD 802.11n(HT20) 2437MHz Ant1



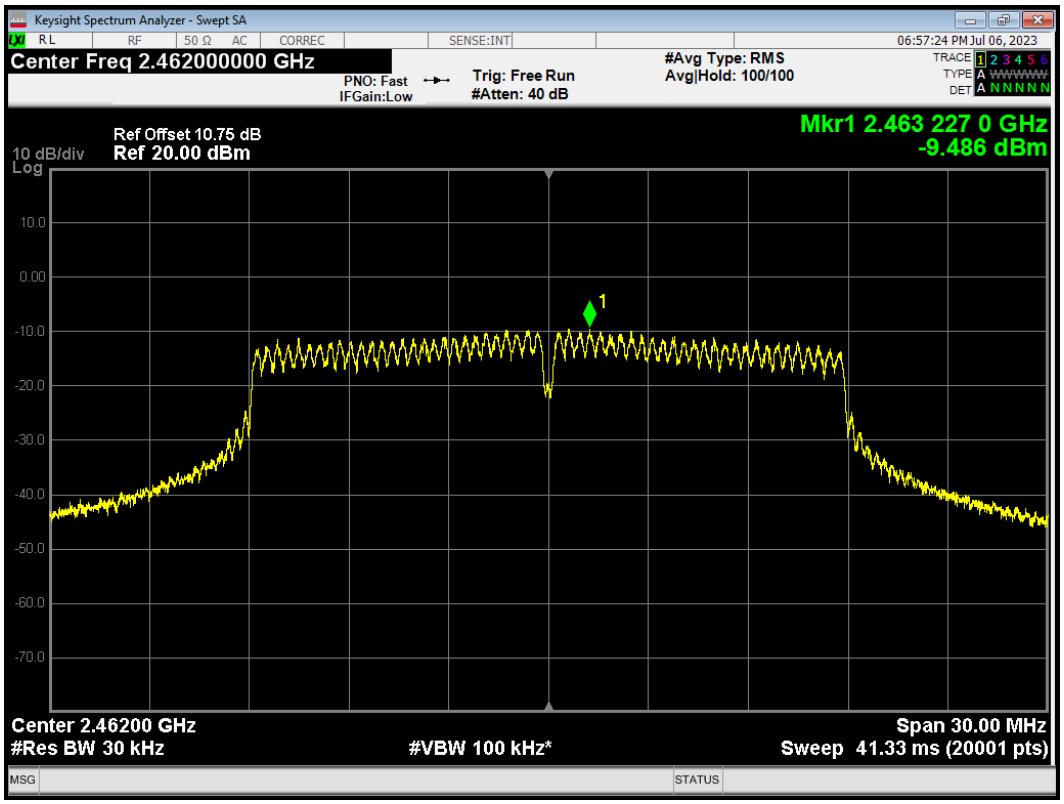
PSD 802.11n(HT20) 2437MHz Ant2



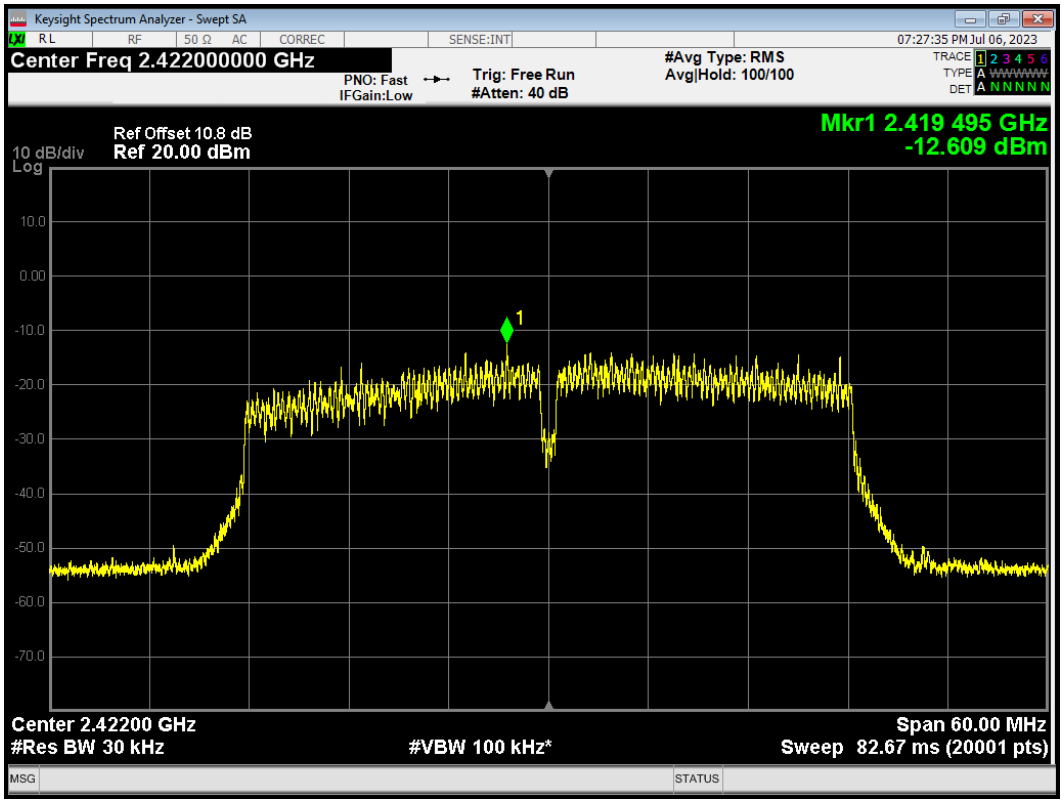
PSD 802.11n(HT20) 2462MHz Ant1



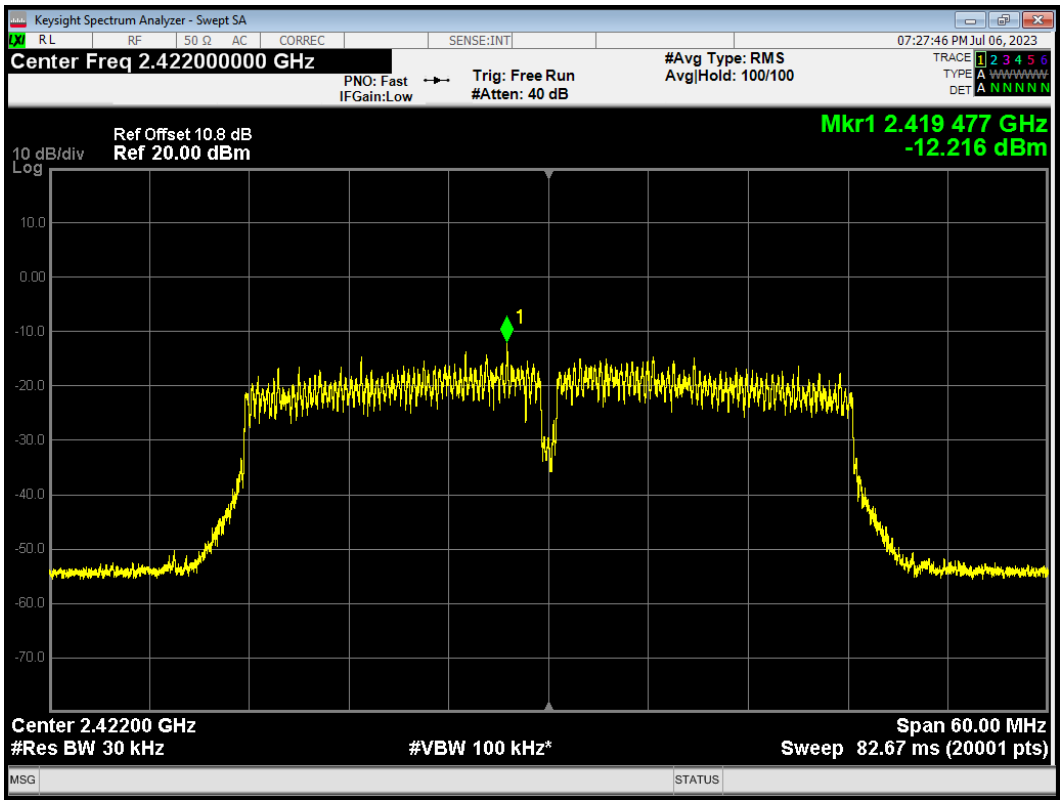
PSD 802.11n(HT20) 2462MHz Ant2



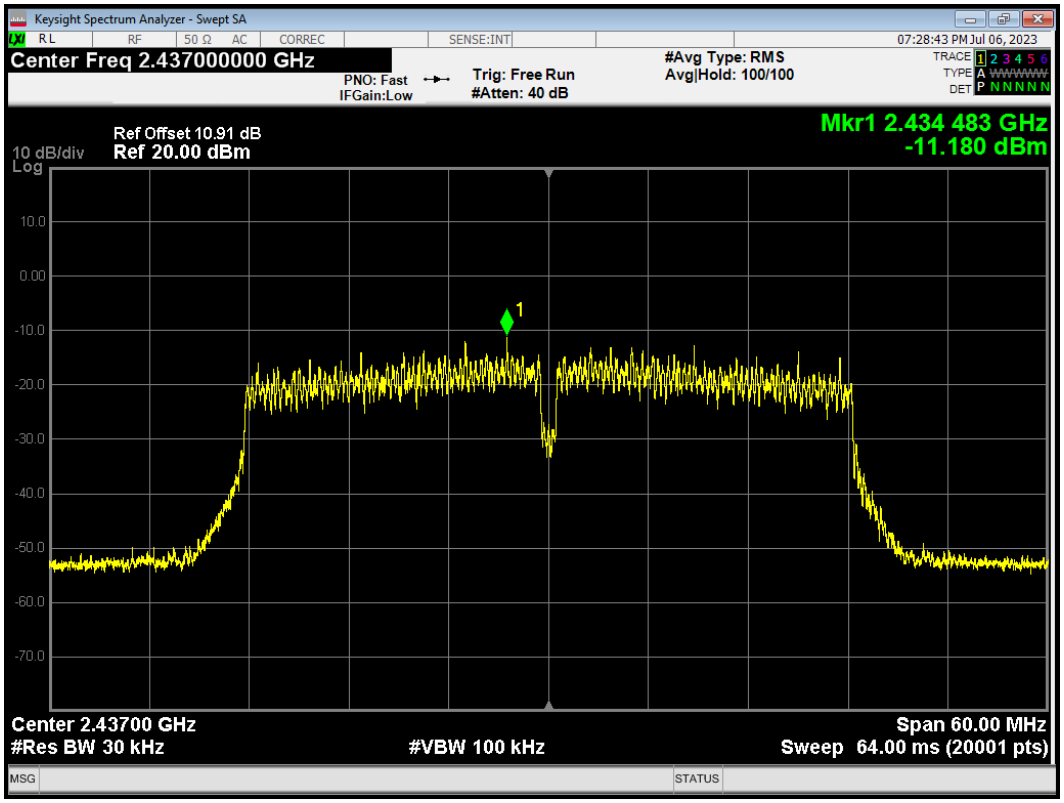
PSD 802.11n(HT40) 2422MHz Ant1



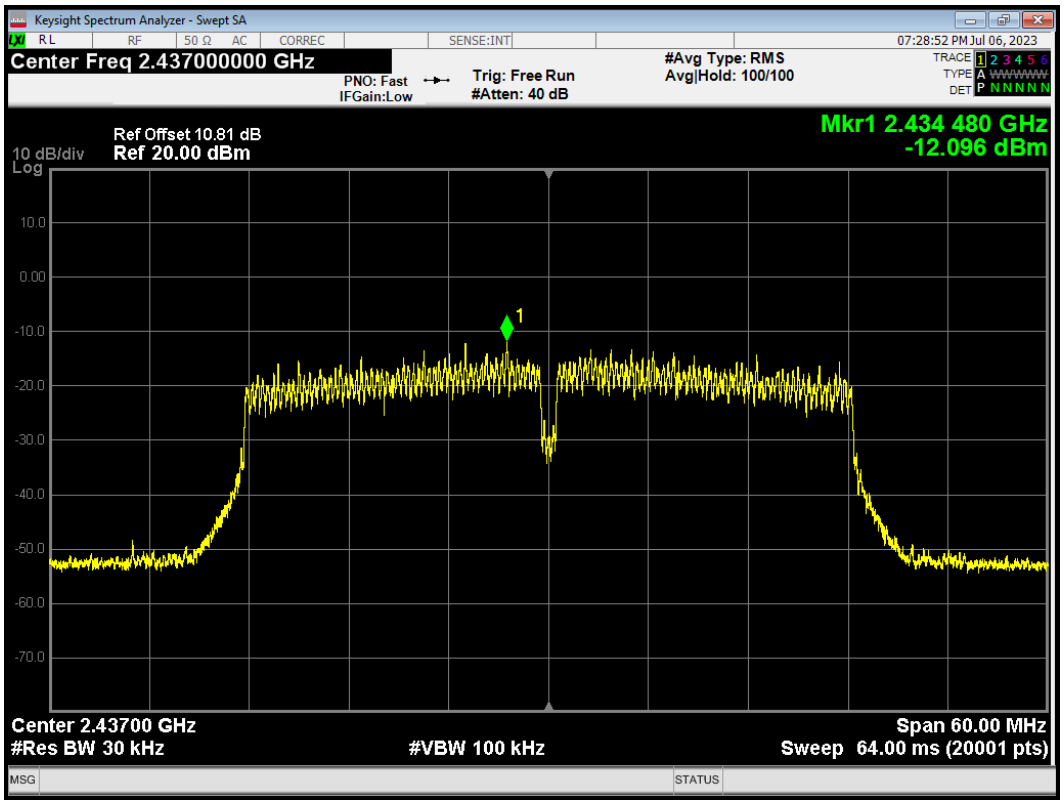
PSD 802.11n(HT40) 2422MHz Ant2



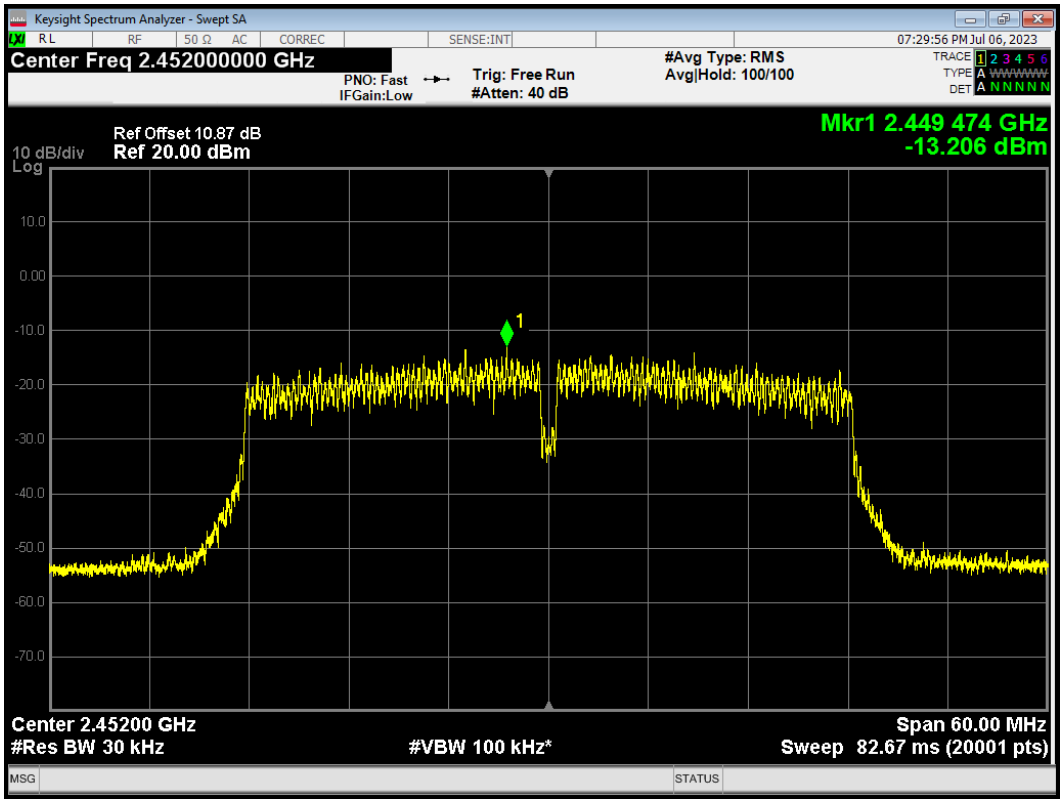
PSD 802.11n(HT40) 2437MHz Ant1



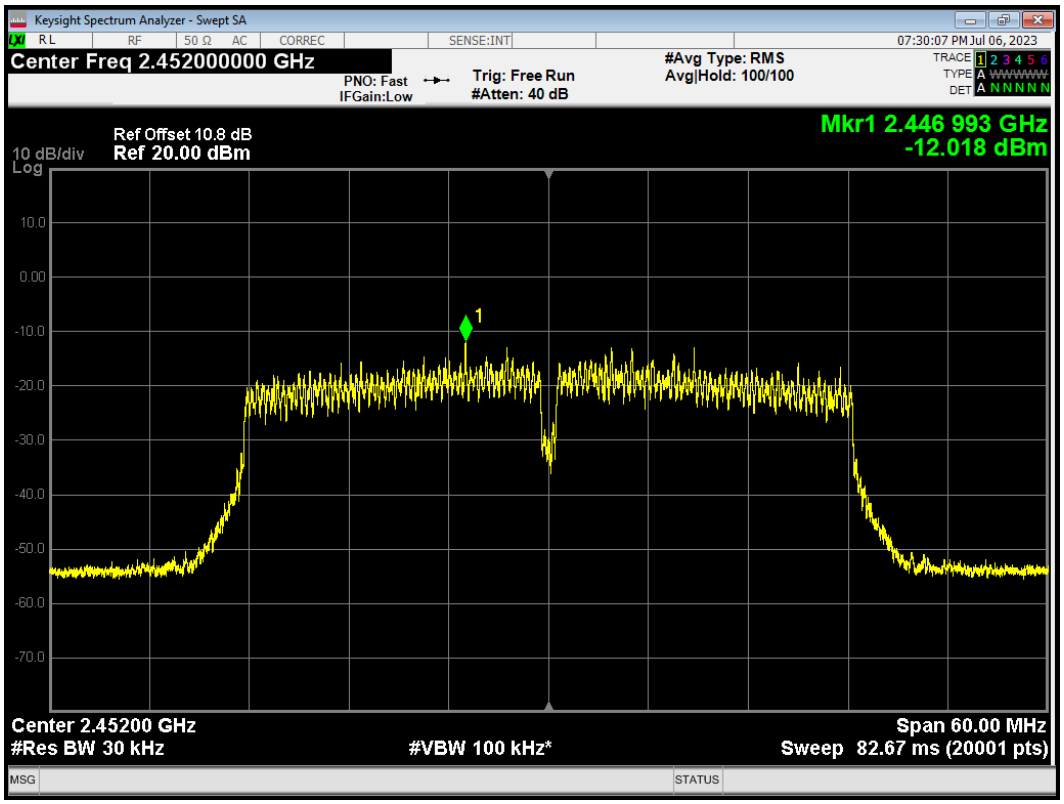
PSD 802.11n(HT40) 2437MHz Ant2



PSD 802.11n(HT40) 2452MHz Ant1



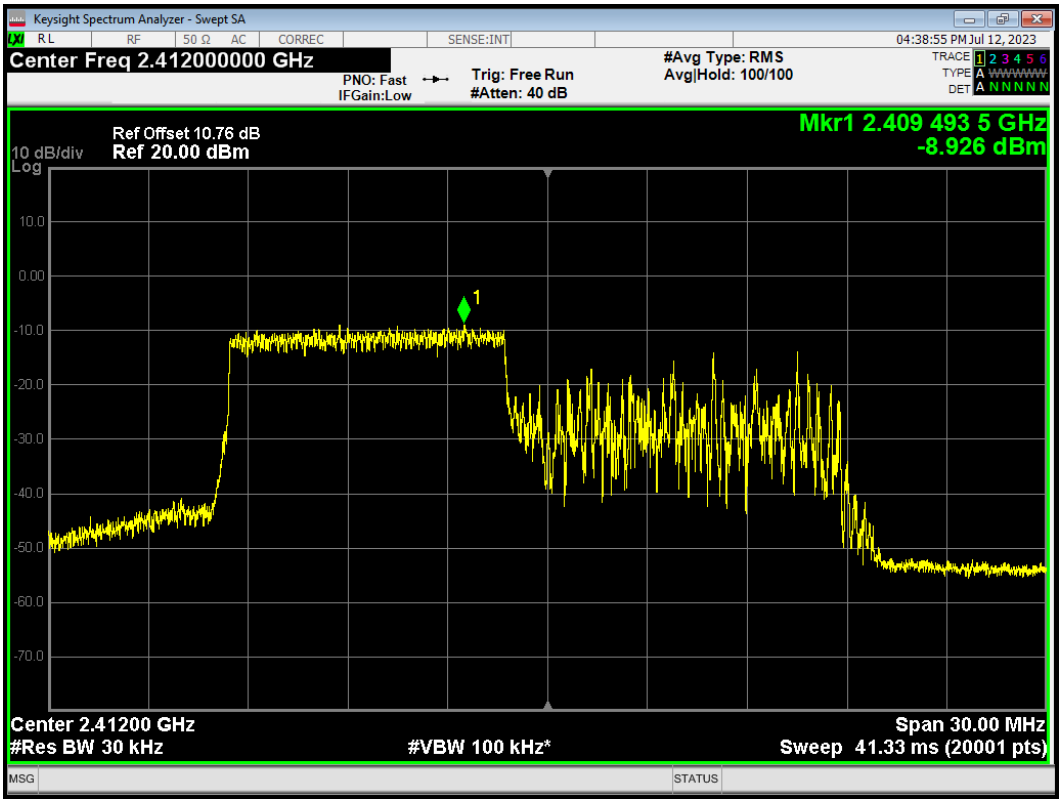
PSD 802.11n(HT40) 2452MHz Ant2



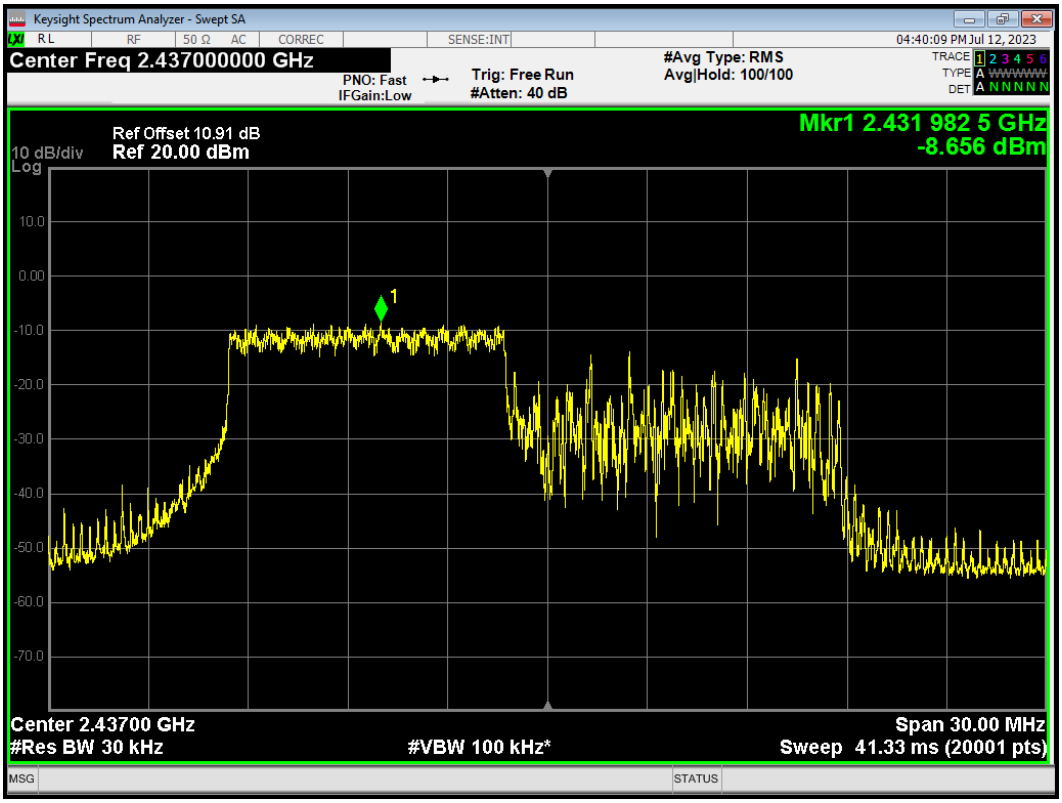
TB Mode

SISO Antenna 1

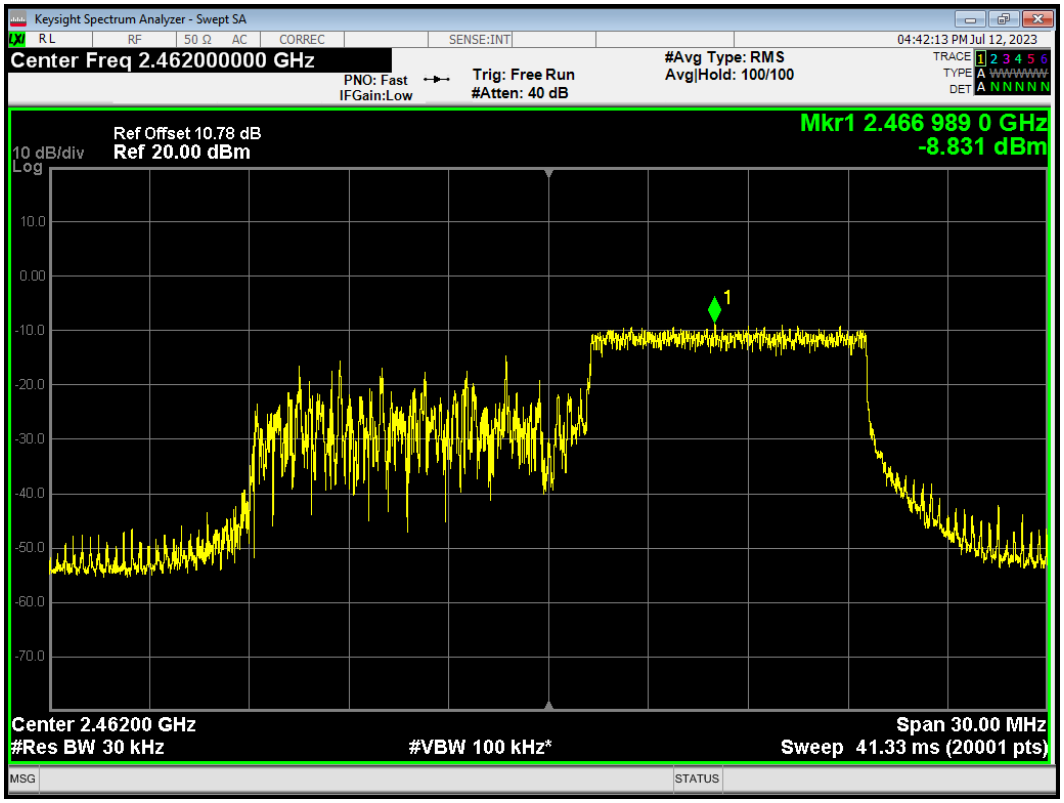
PSD 802.11ax (20M) RU106 IDX53 2412MHz



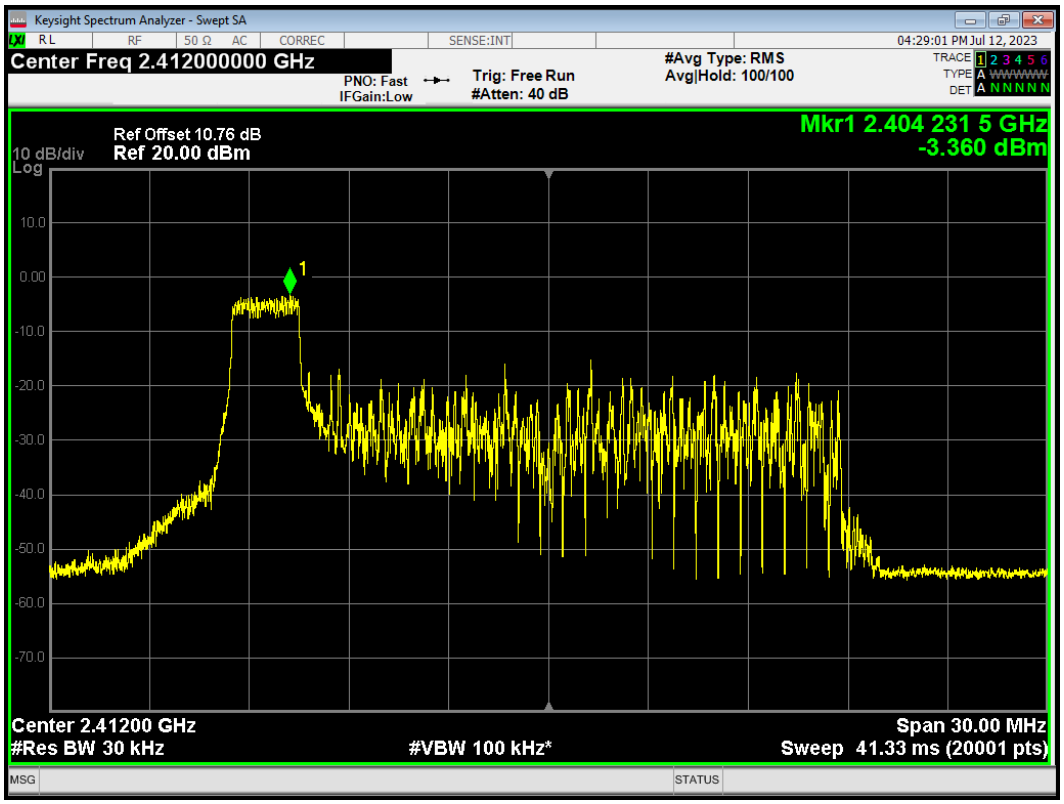
PSD 802.11ax (20M) RU106 IDX53 2437MHz



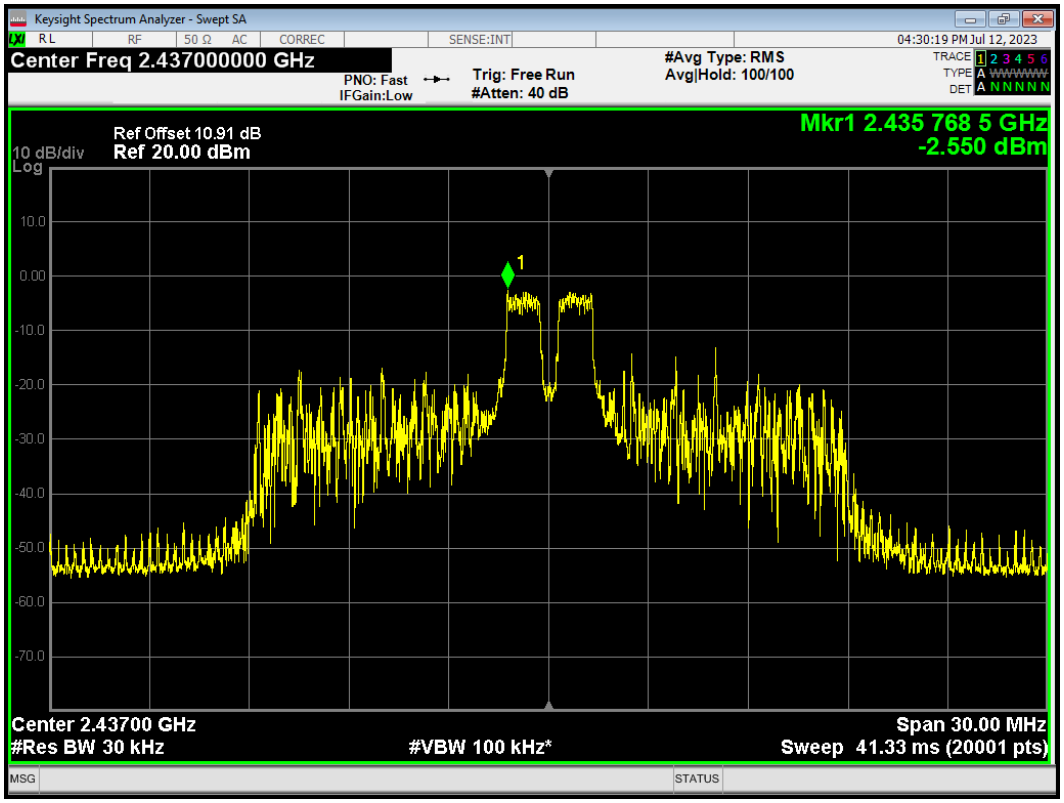
PSD 802.11ax (20M) RU106 IDX54 2462MHz



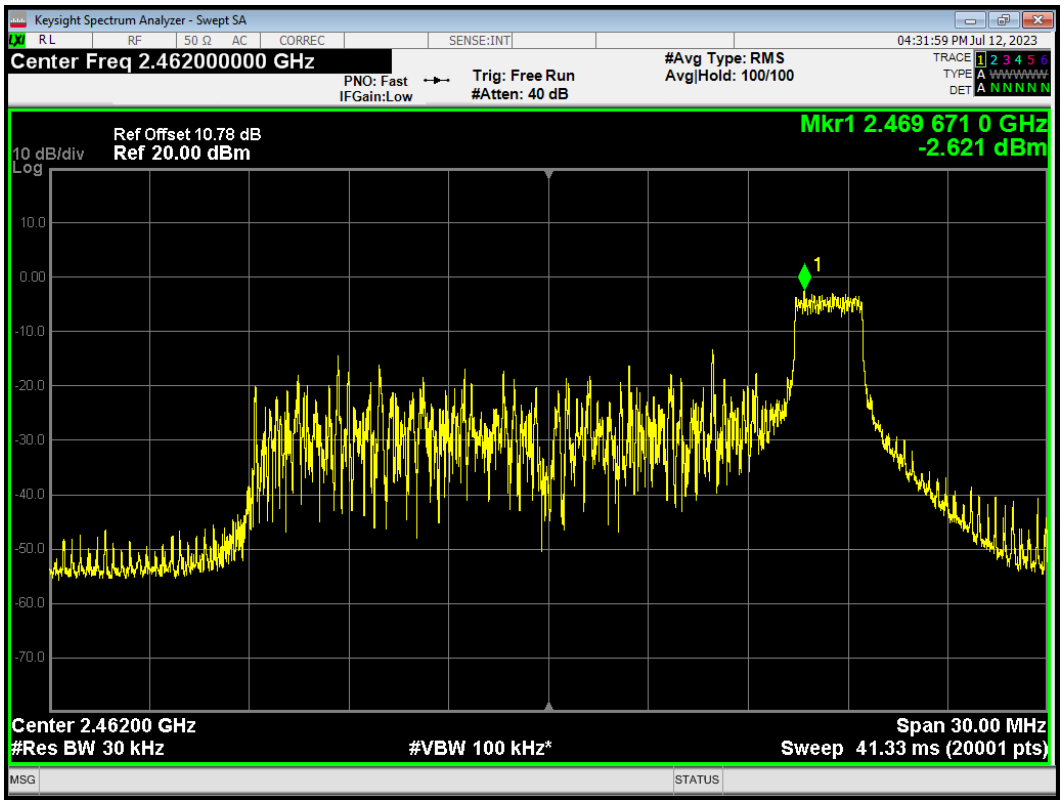
PSD 802.11ax (20M) RU26 IDX0 2412MHz



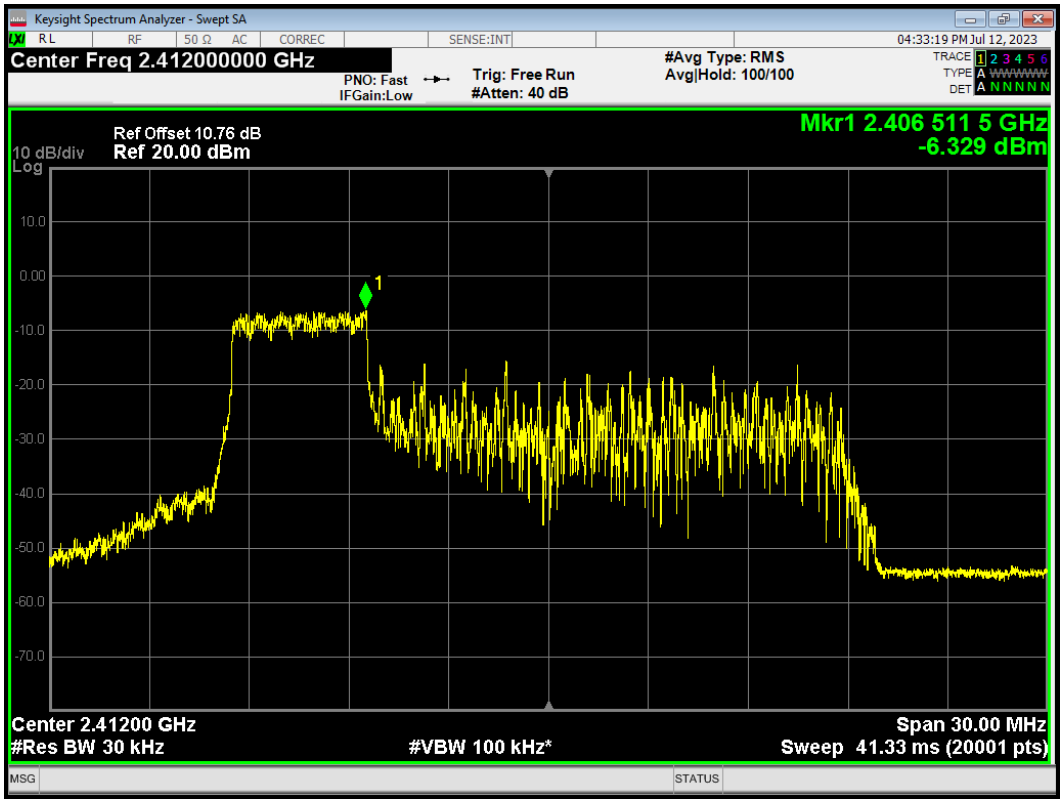
PSD 802.11ax (20M) RU26 IDX4 2437MHz



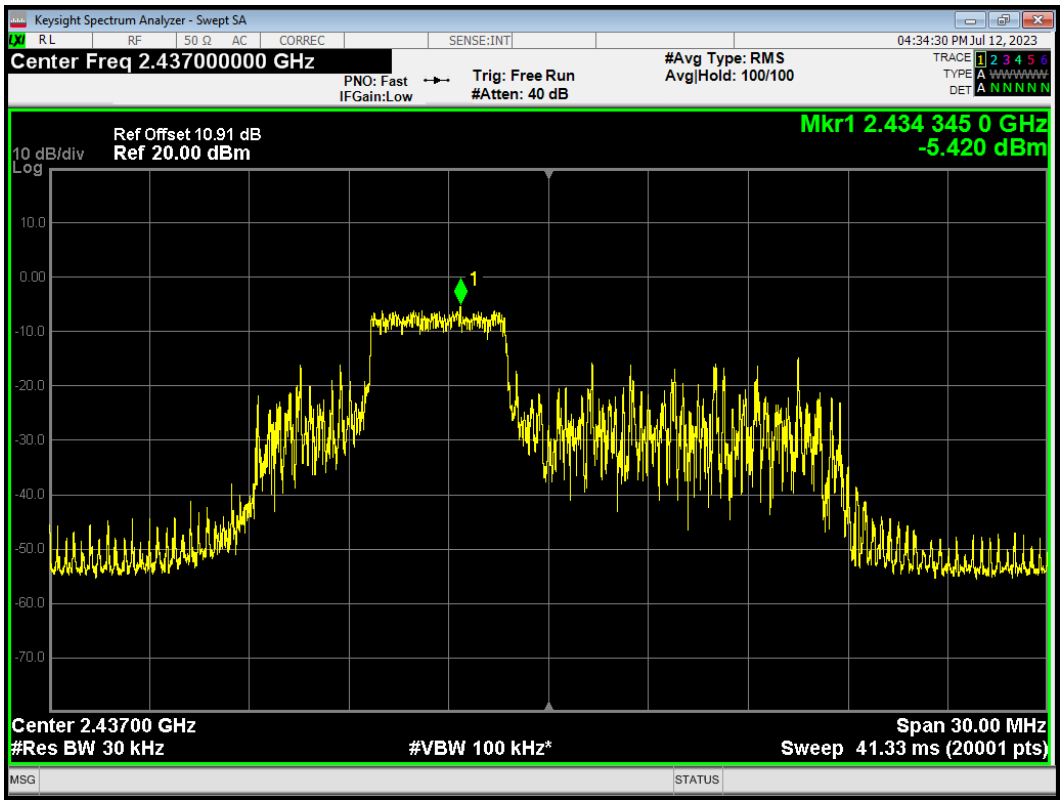
PSD 802.11ax (20M) RU26 IDX8 2462MHz



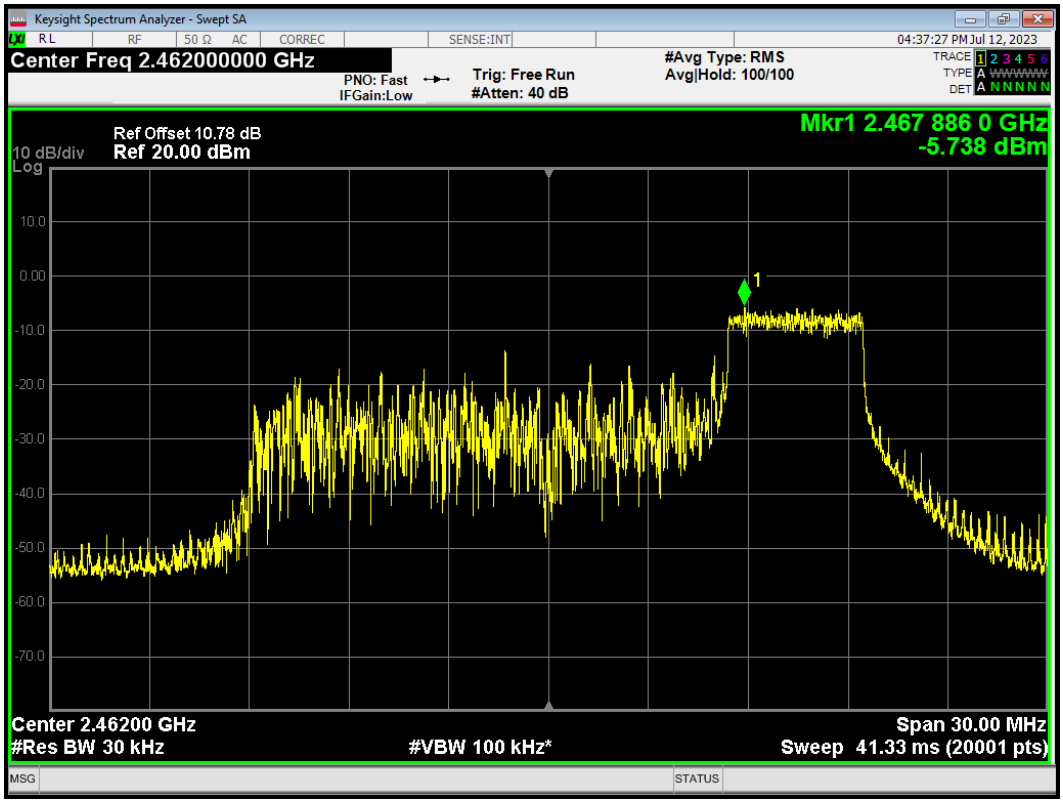
PSD 802.11ax (20M) RU52 IDX37 2412MHz



PSD 802.11ax (20M) RU52 IDX38 2437MHz

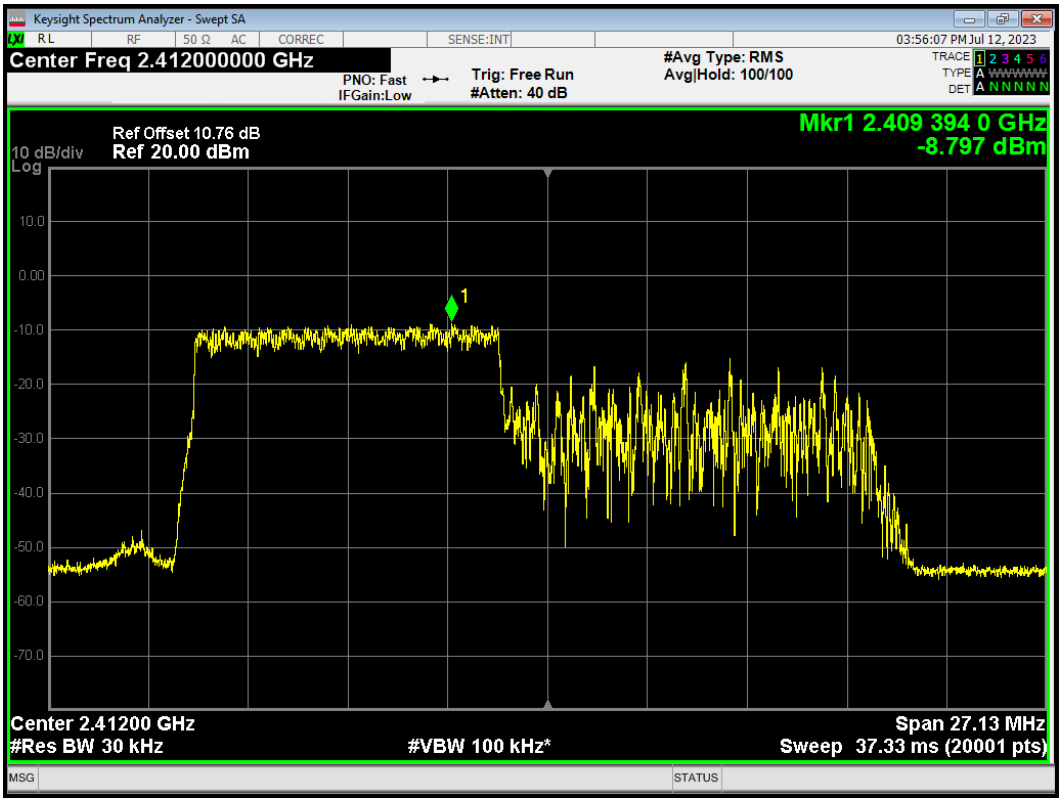


PSD 802.11ax (20M) RU52 IDX40 2462MHz

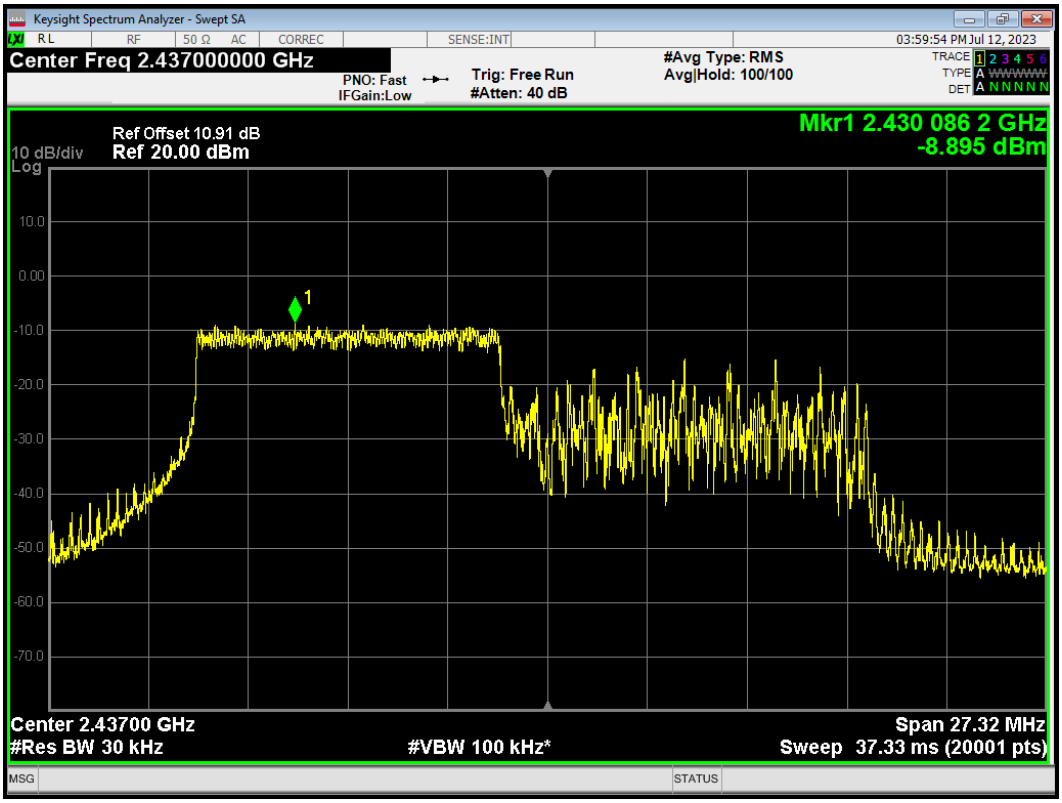


SISO Antenna 2

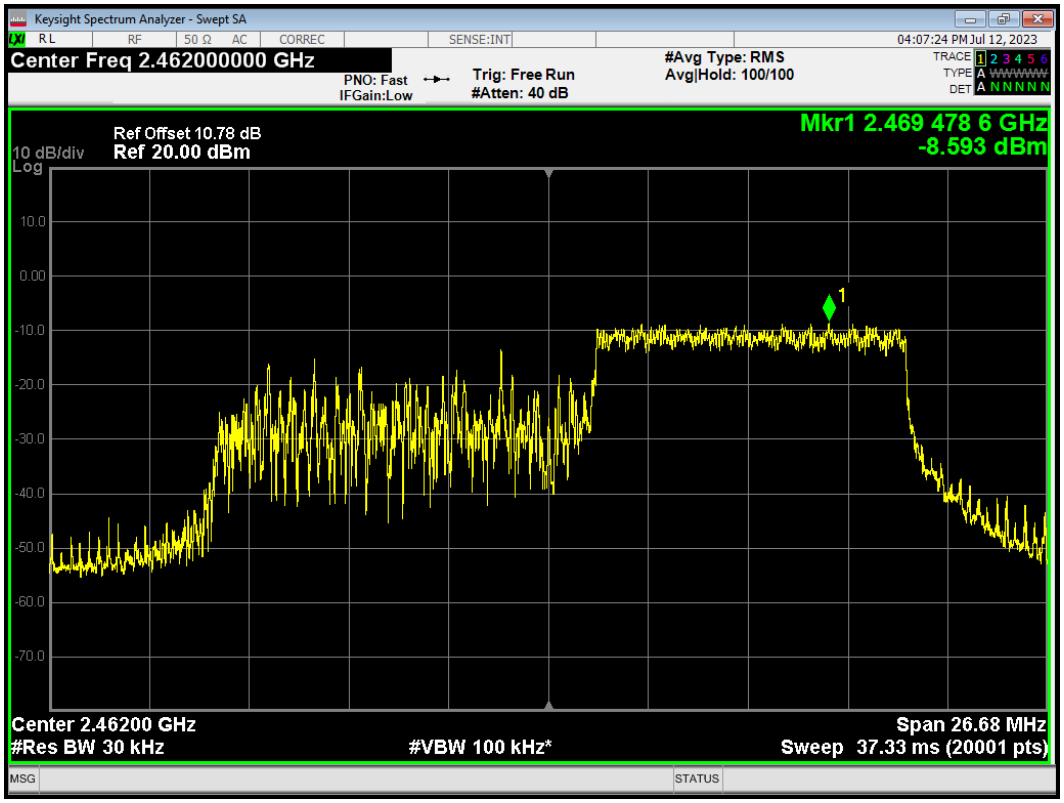
PSD 802.11ax (20M) RU106 IDX53 2412MHz



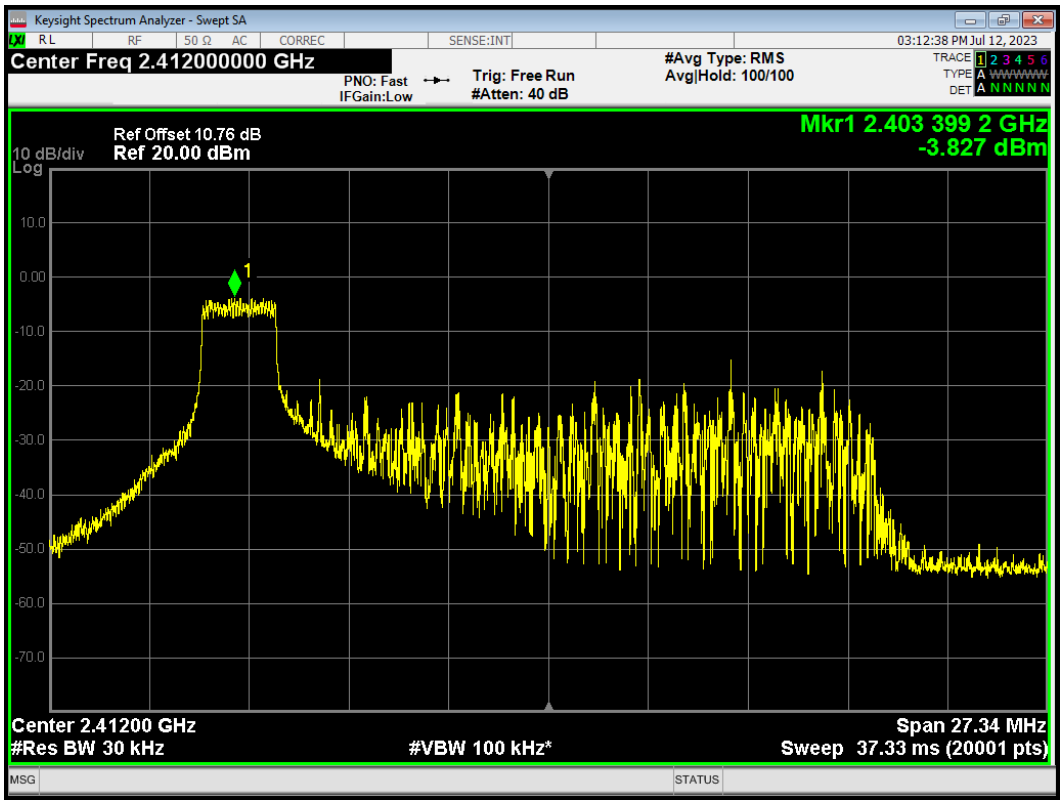
PSD 802.11ax (20M) RU106 IDX53 2437MHz



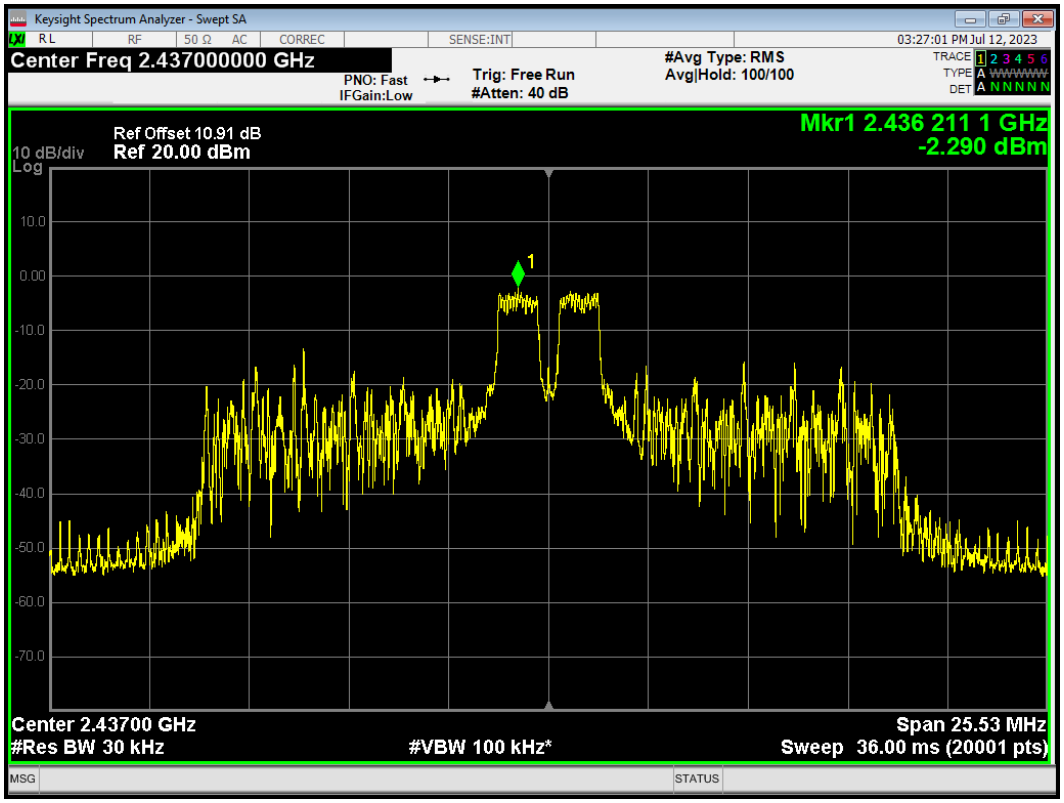
PSD 802.11ax (20M) RU106 IDX54 2462MHz



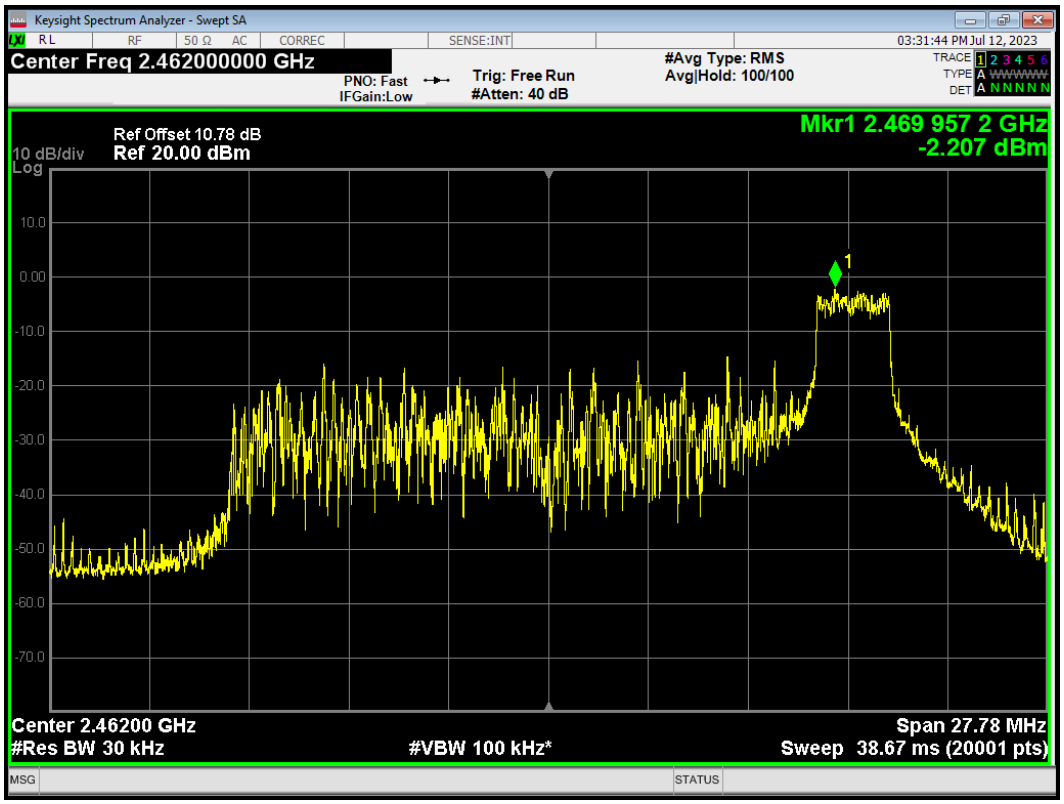
PSD 802.11ax (20M) RU26 IDX0 2412MHz



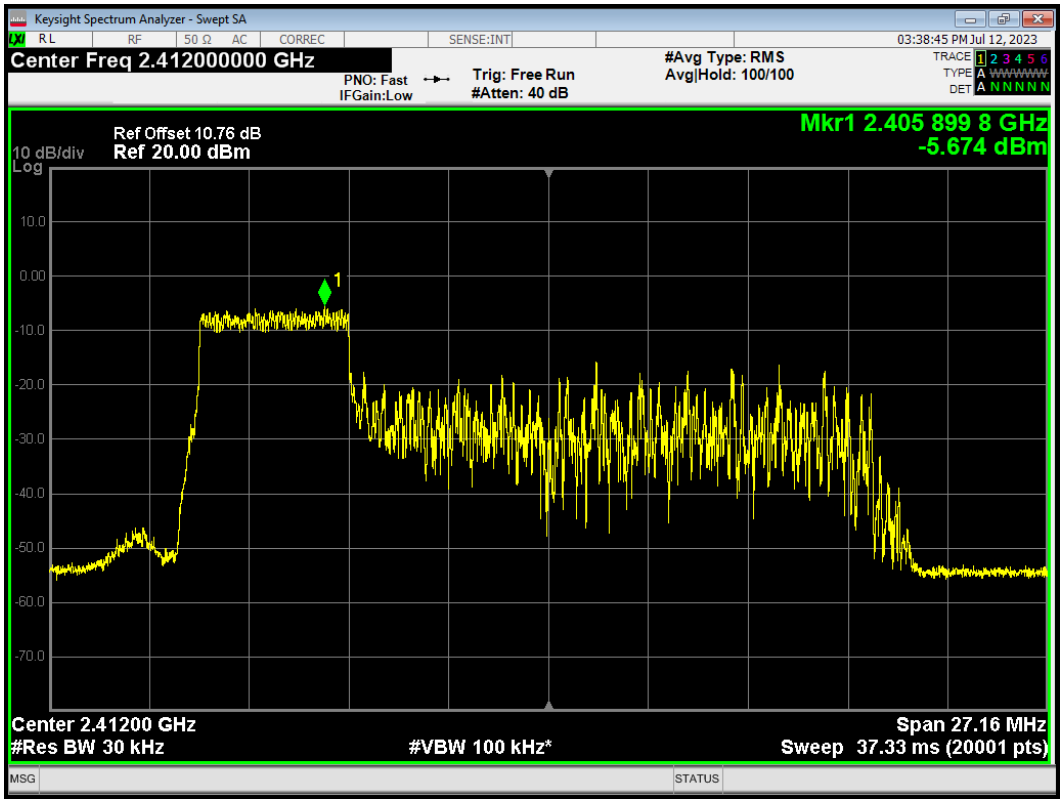
PSD 802.11ax (20M) RU26 IDX4 2437MHz



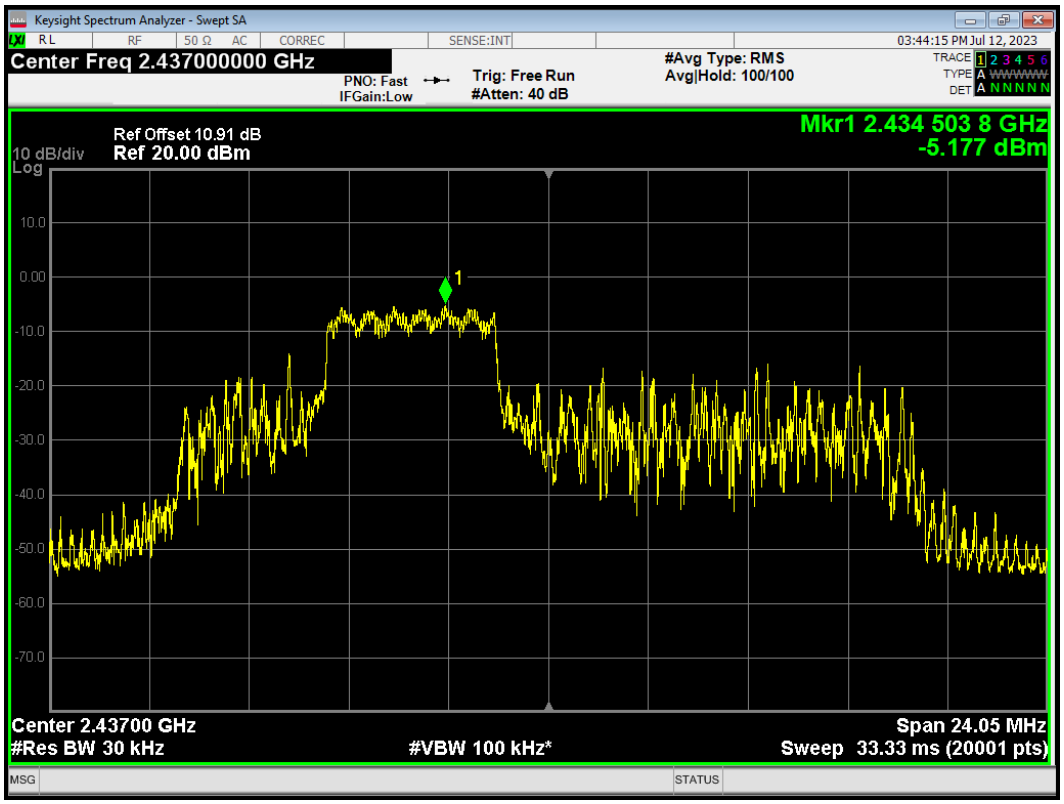
PSD 802.11ax (20M) RU26 IDX8 2462MHz



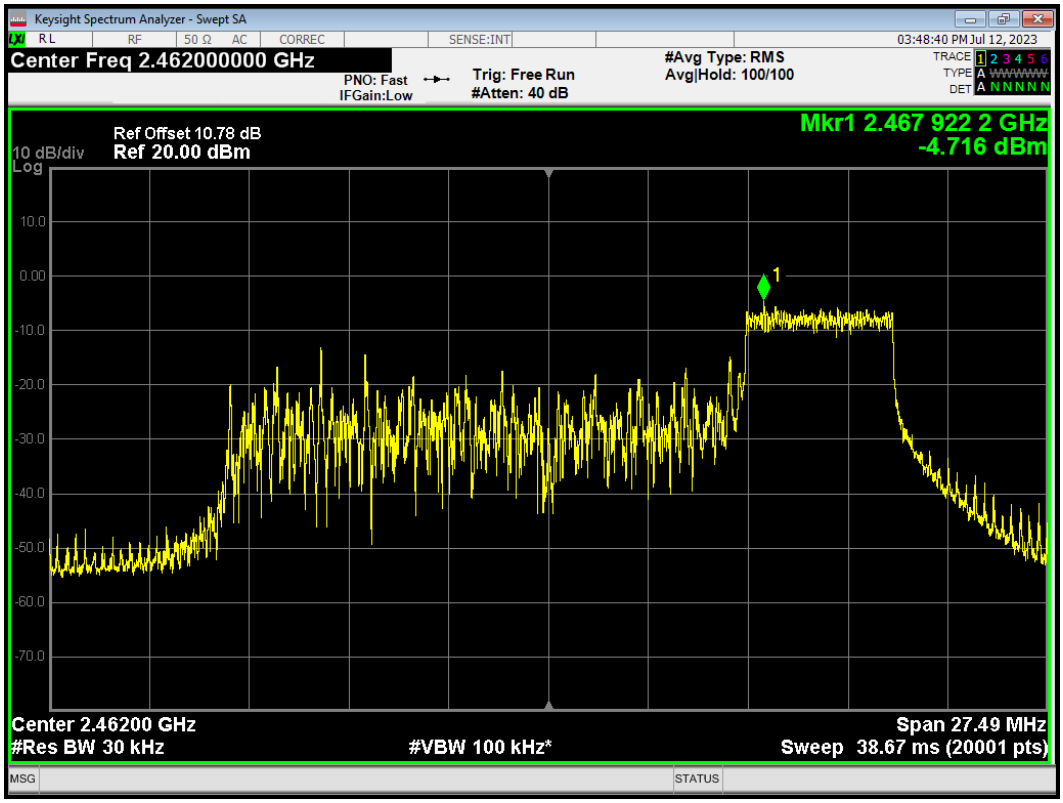
PSD 802.11ax (20M) RU52 IDX37 2412MHz



PSD 802.11ax (20M) RU52 IDX38 2437MHz

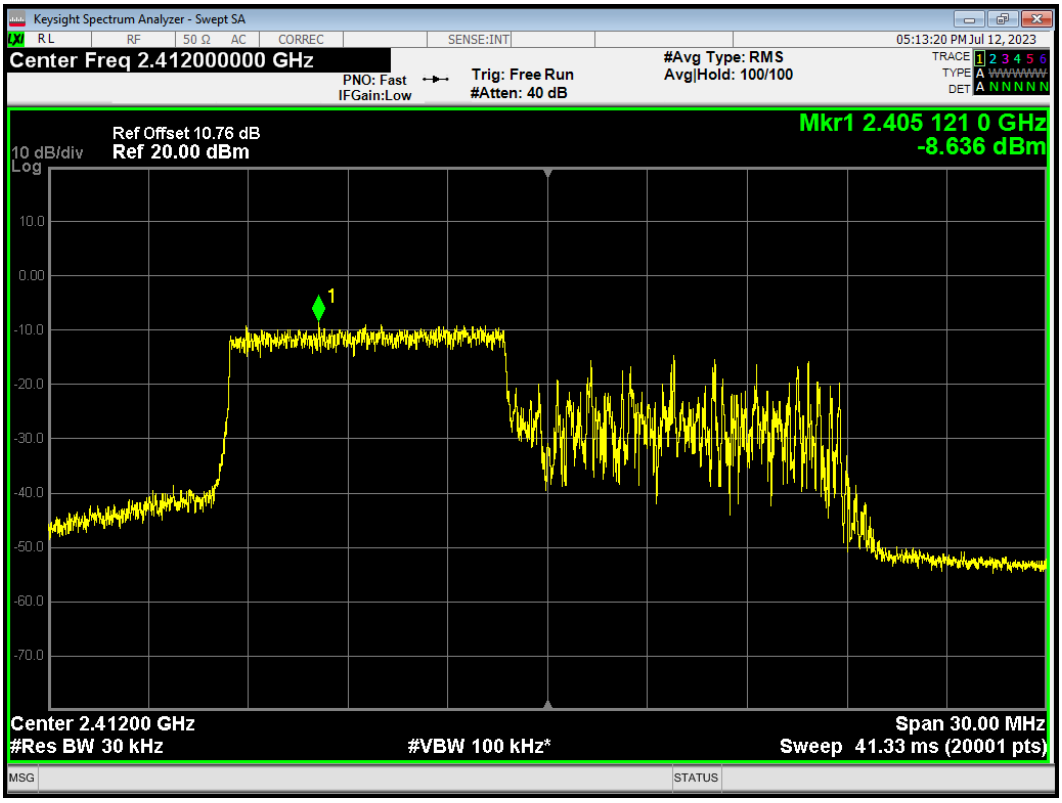


PSD 802.11ax (20M) RU52 IDX40 2462MHz

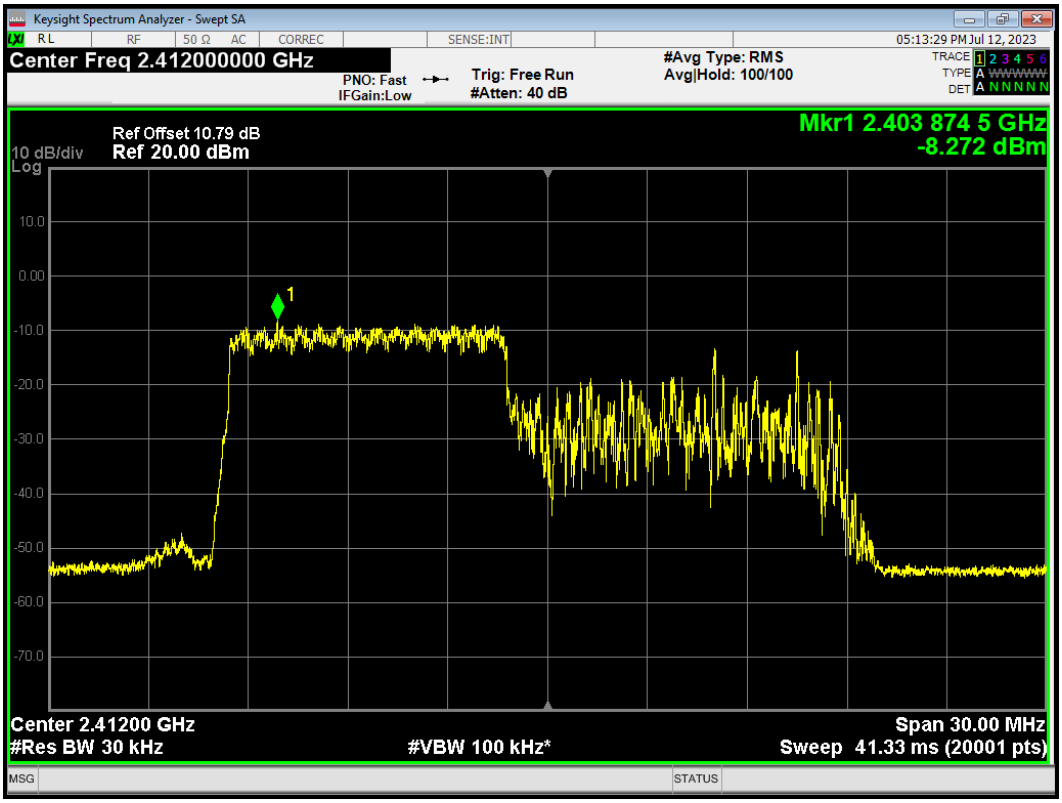


MIMO

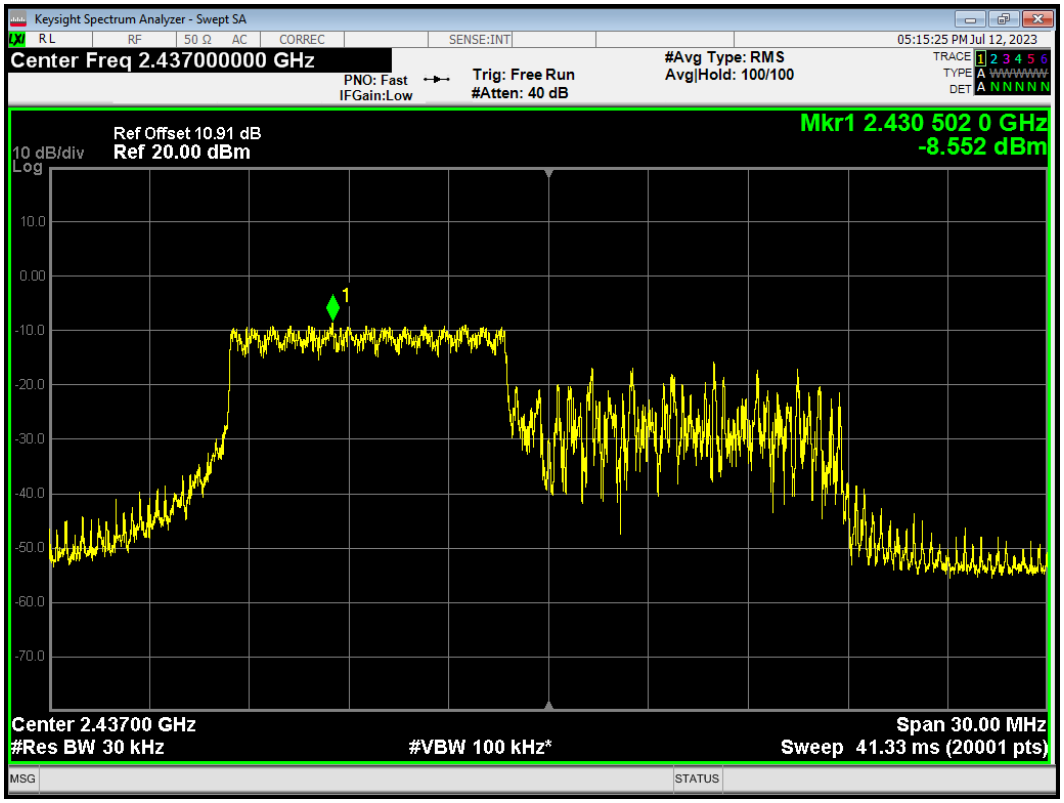
PSD 802.11ax (20M) RU106 IDX53 2412MHz Ant1



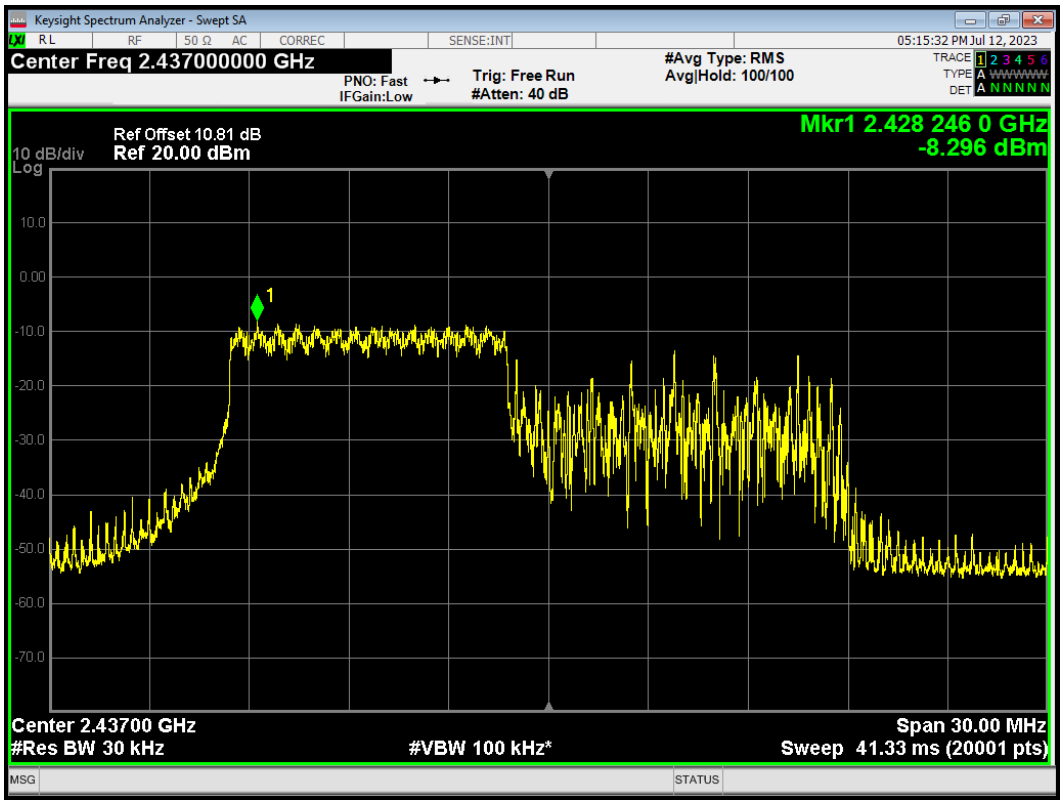
PSD 802.11ax (20M) RU106 IDX53 2412MHz Ant2



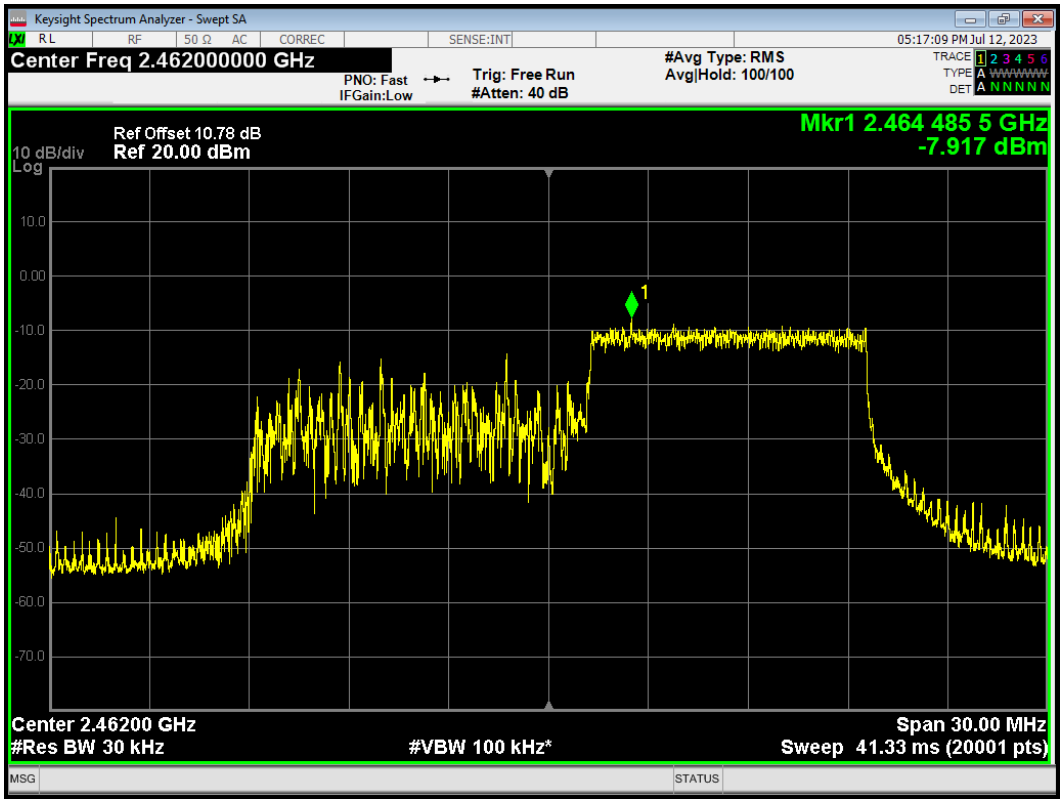
PSD 802.11ax (20M) RU106 IDX53 2437MHz Ant1



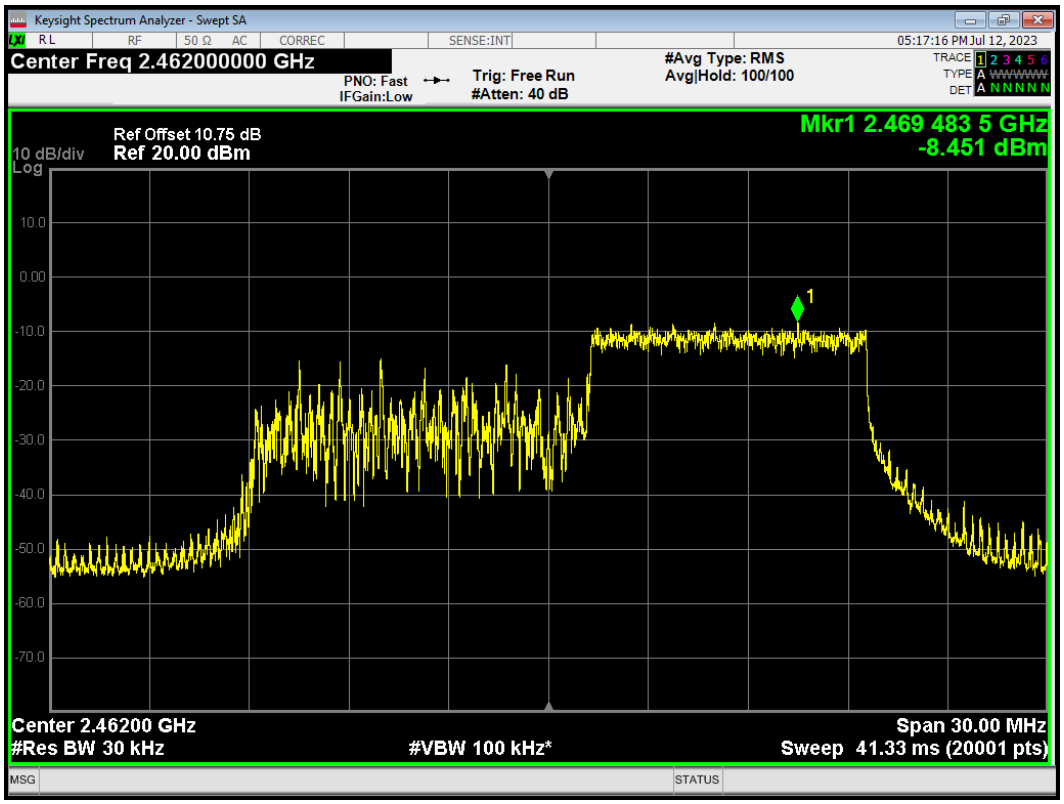
PSD 802.11ax (20M) RU106 IDX53 2437MHz Ant2



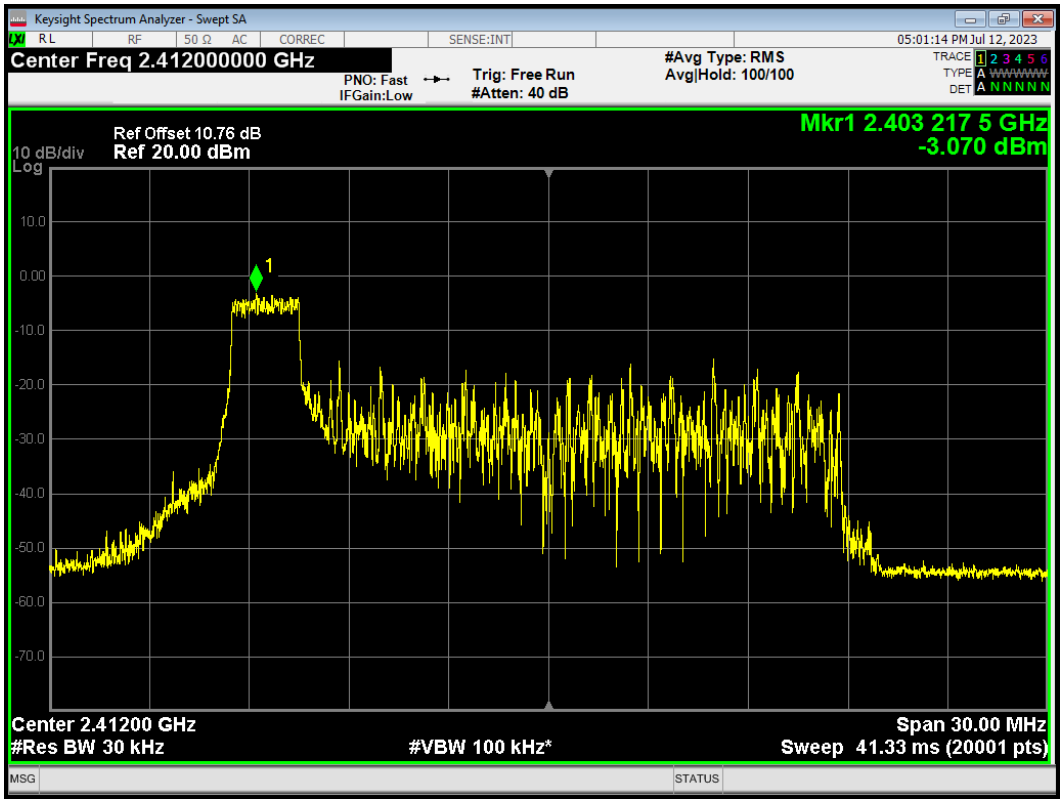
PSD 802.11ax (20M) RU106 IDX54 2462MHz Ant1



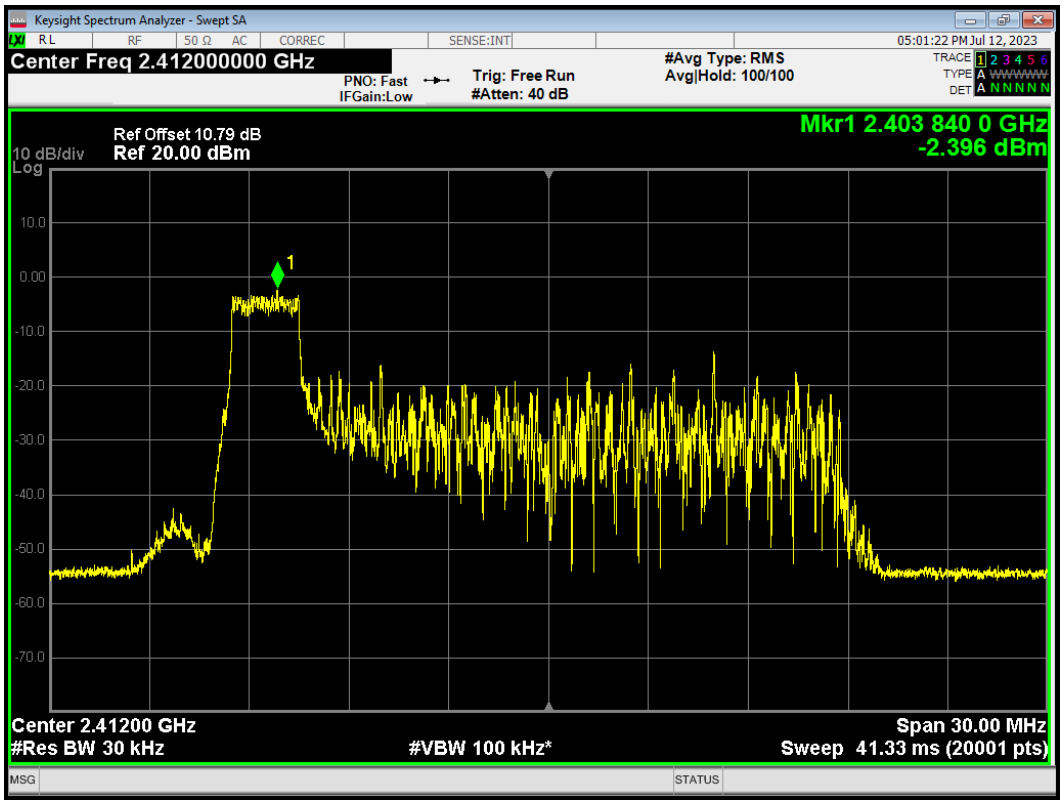
PSD 802.11ax (20M) RU106 IDX54 2462MHz Ant2



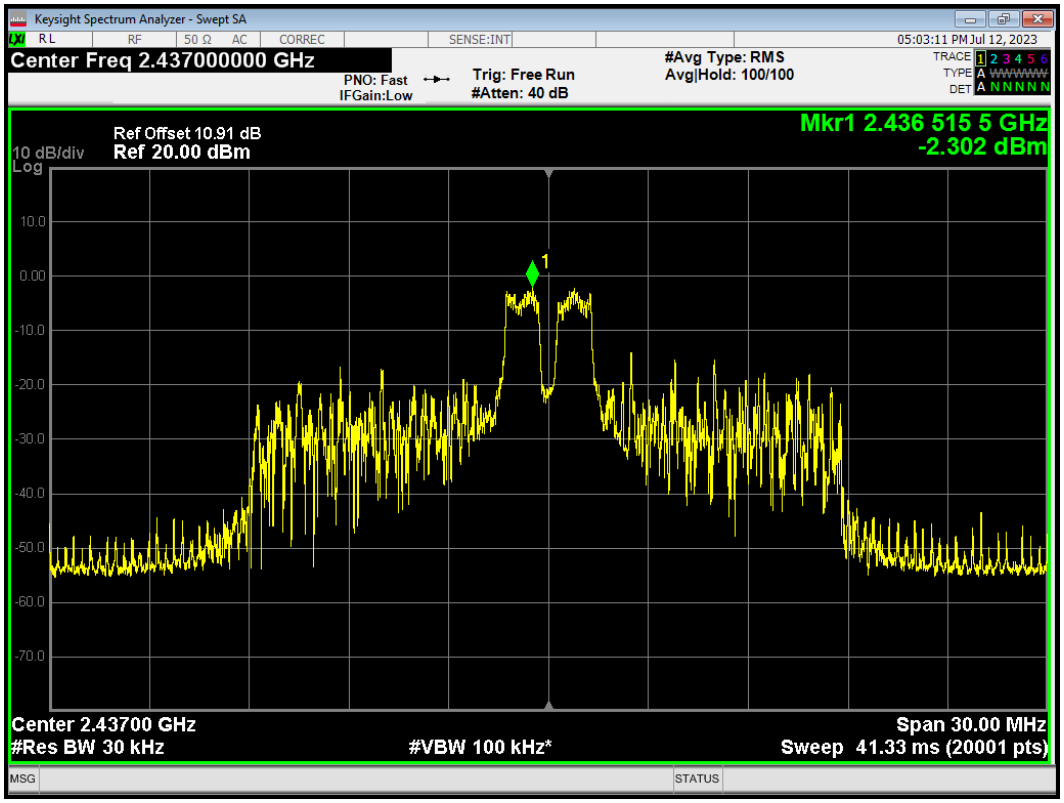
PSD 802.11ax (20M) RU26 IDX0 2412MHz Ant1



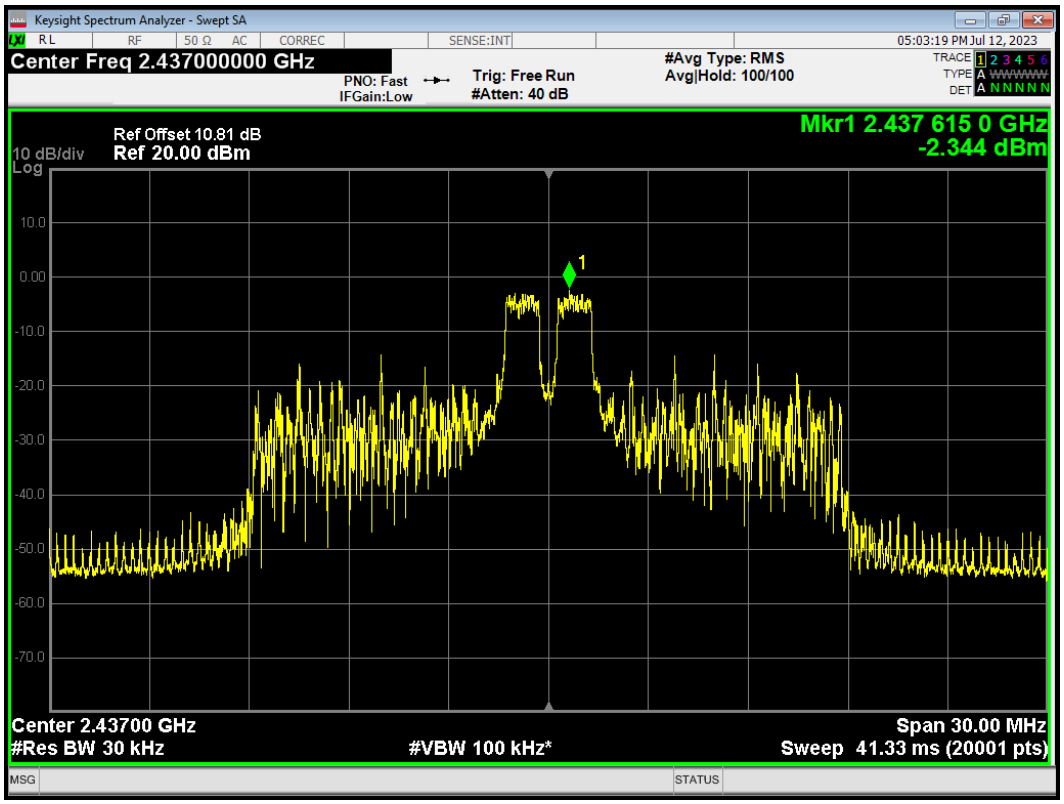
PSD 802.11ax (20M) RU26 IDX0 2412MHz Ant2



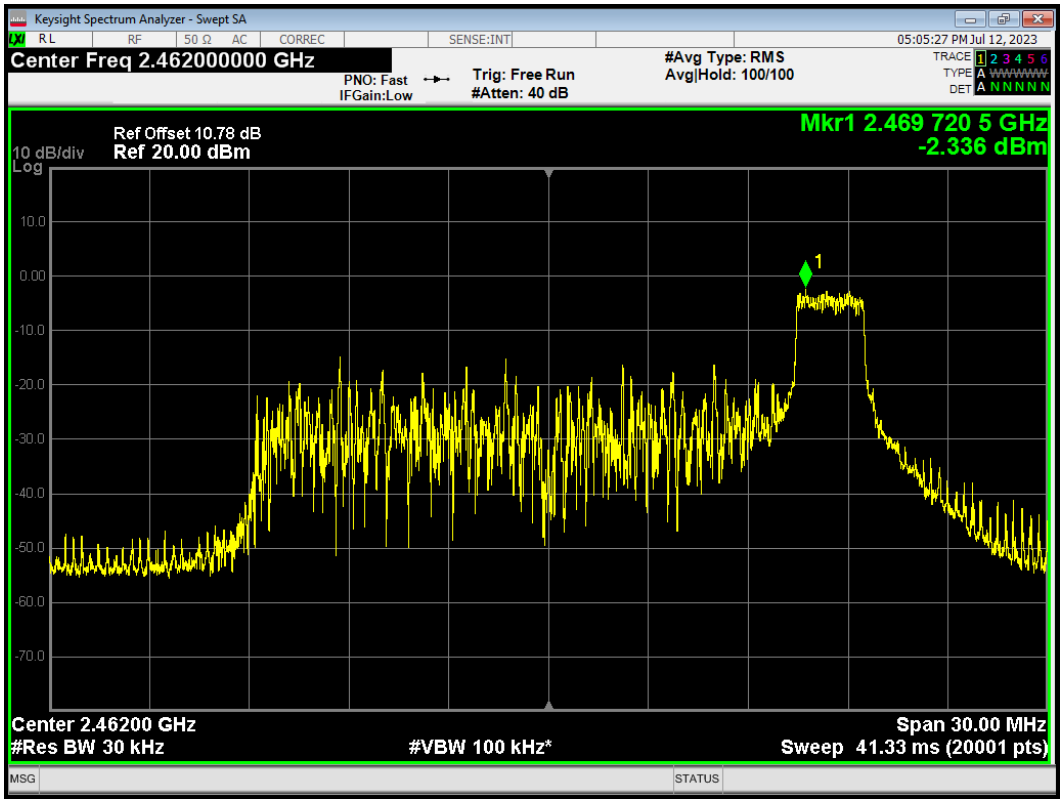
PSD 802.11ax (20M) RU26 IDX4 2437MHz Ant1



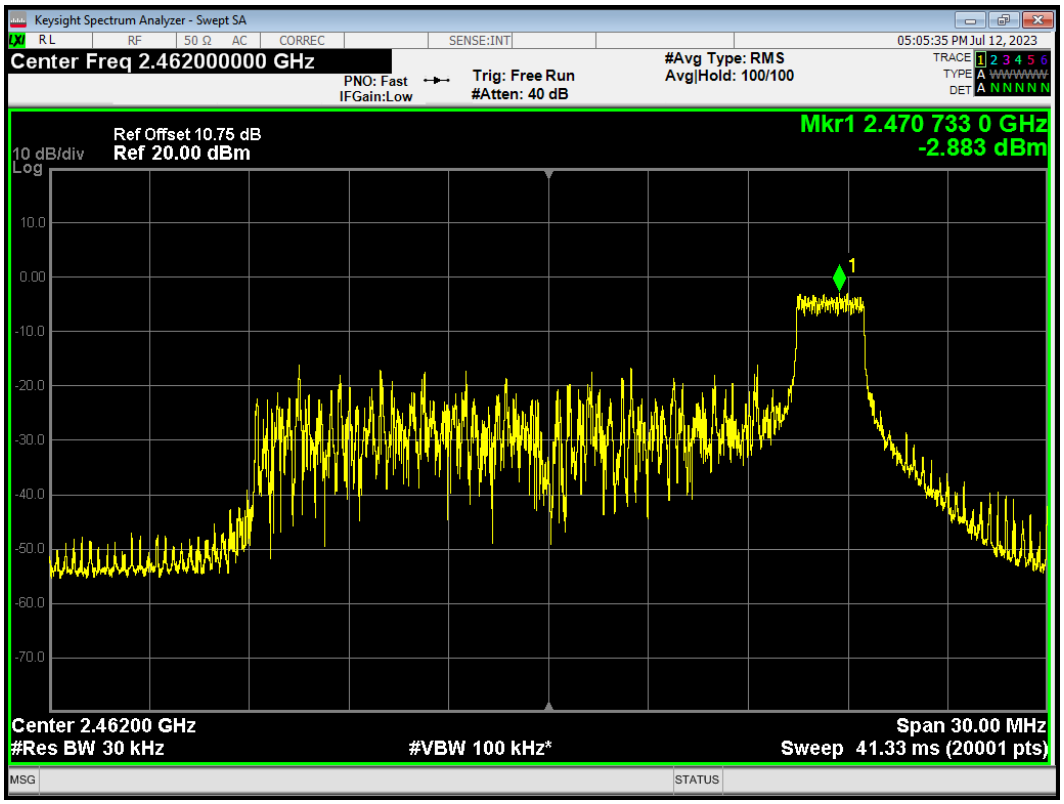
PSD 802.11ax (20M) RU26 IDX4 2437MHz Ant2



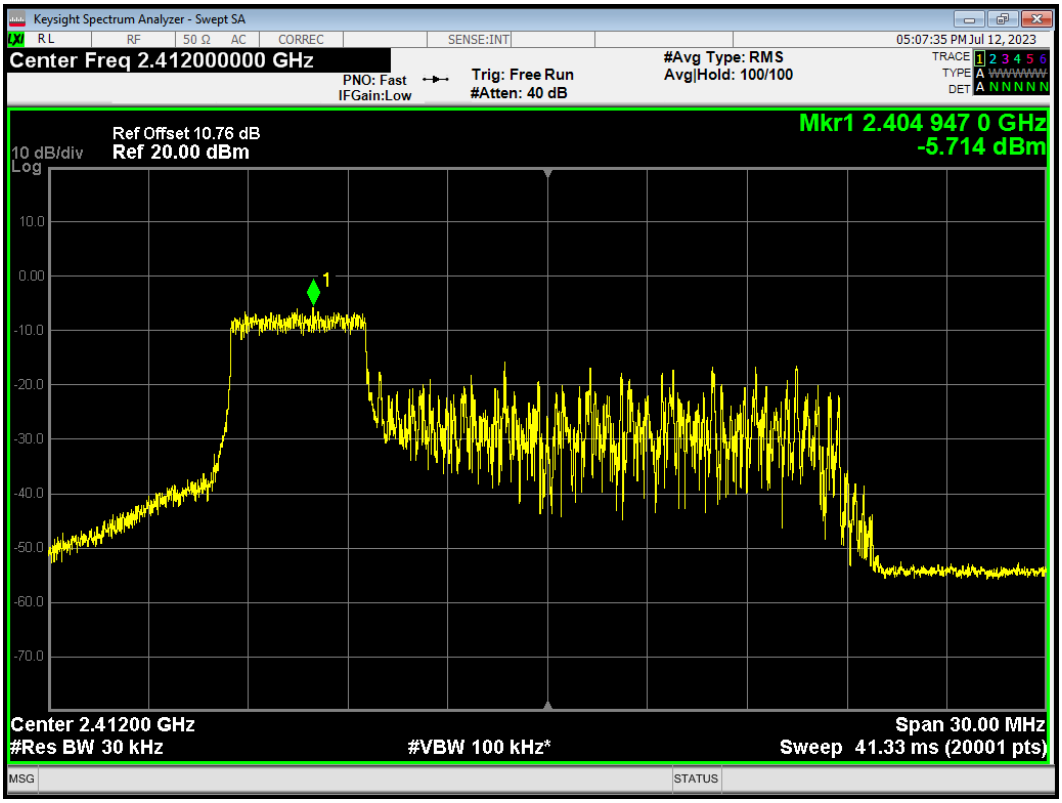
PSD 802.11ax (20M) RU26 IDX8 2462MHz Ant1



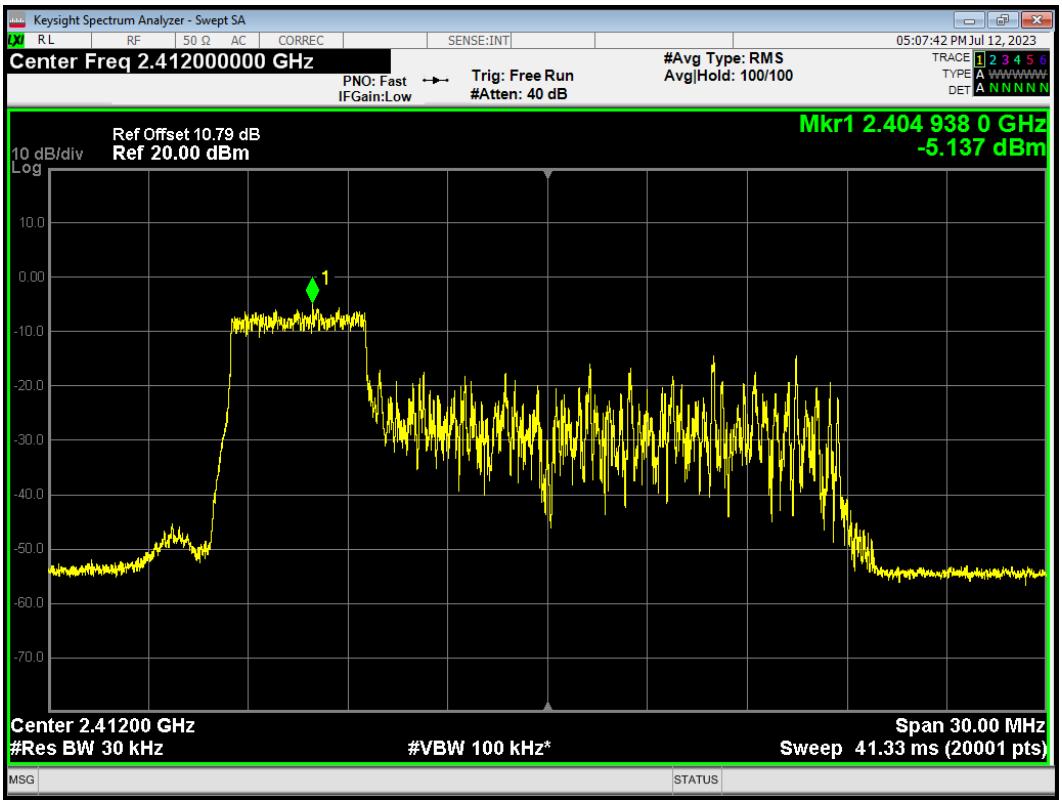
PSD 802.11ax (20M) RU26 IDX8 2462MHz Ant2



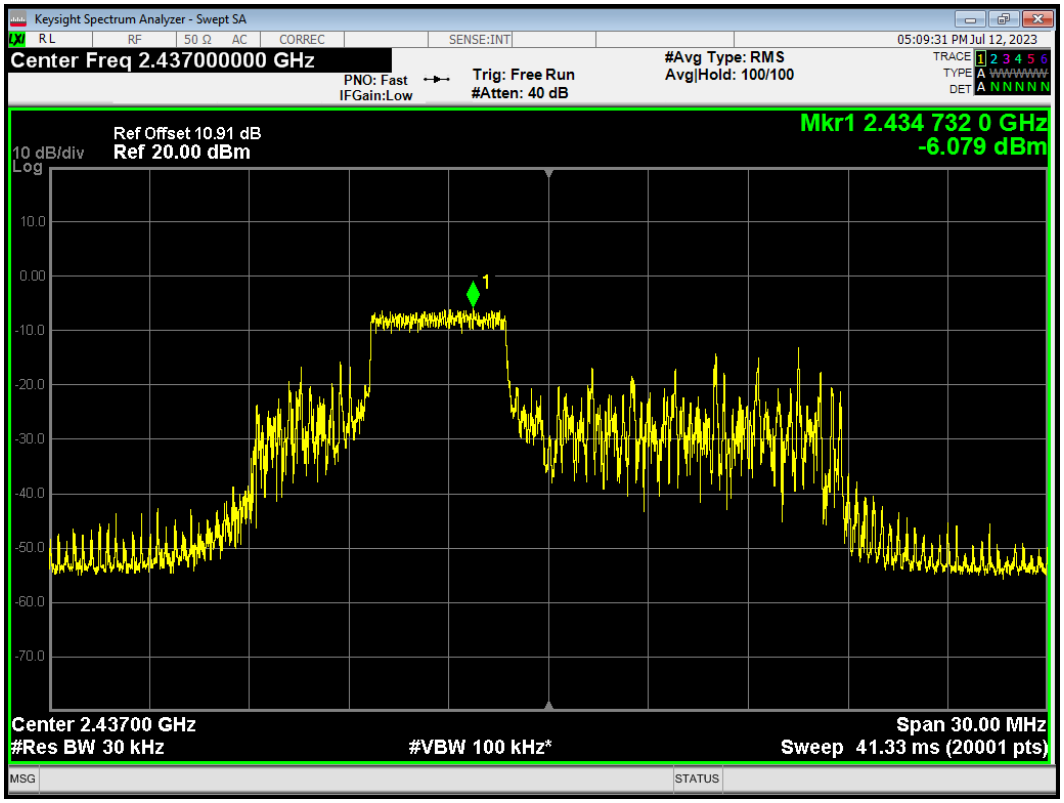
PSD 802.11ax (20M) RU52 IDX37 2412MHz Ant1



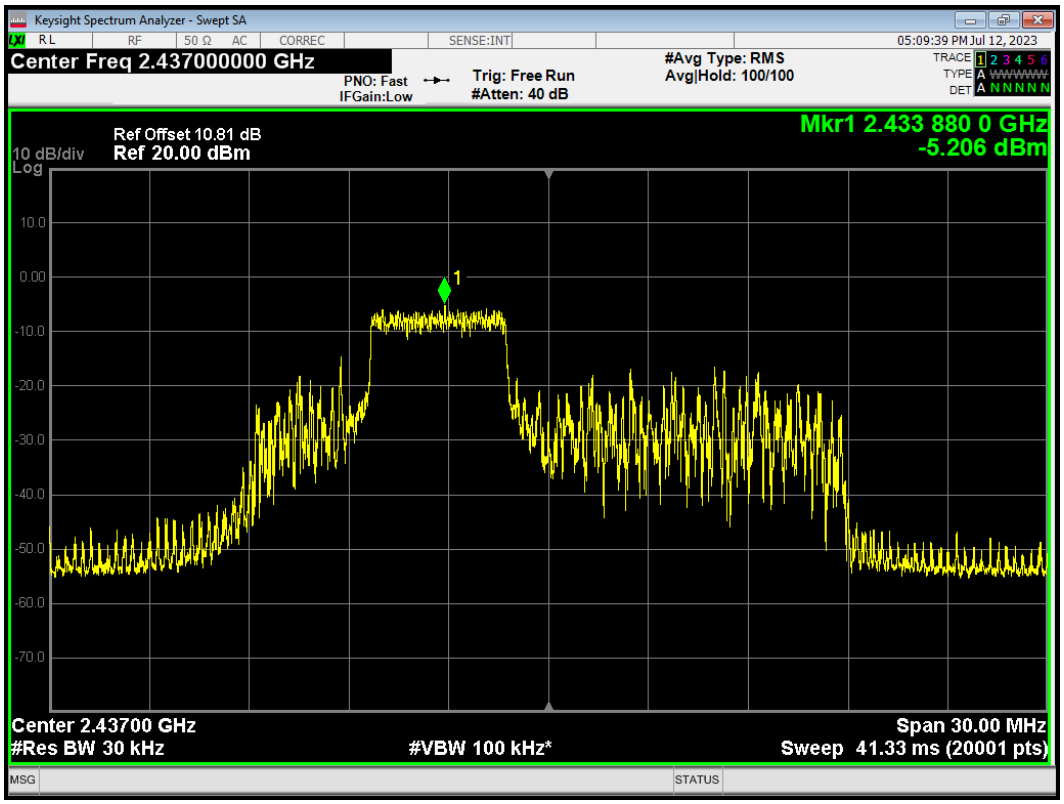
PSD 802.11ax (20M) RU52 IDX37 2412MHz Ant2



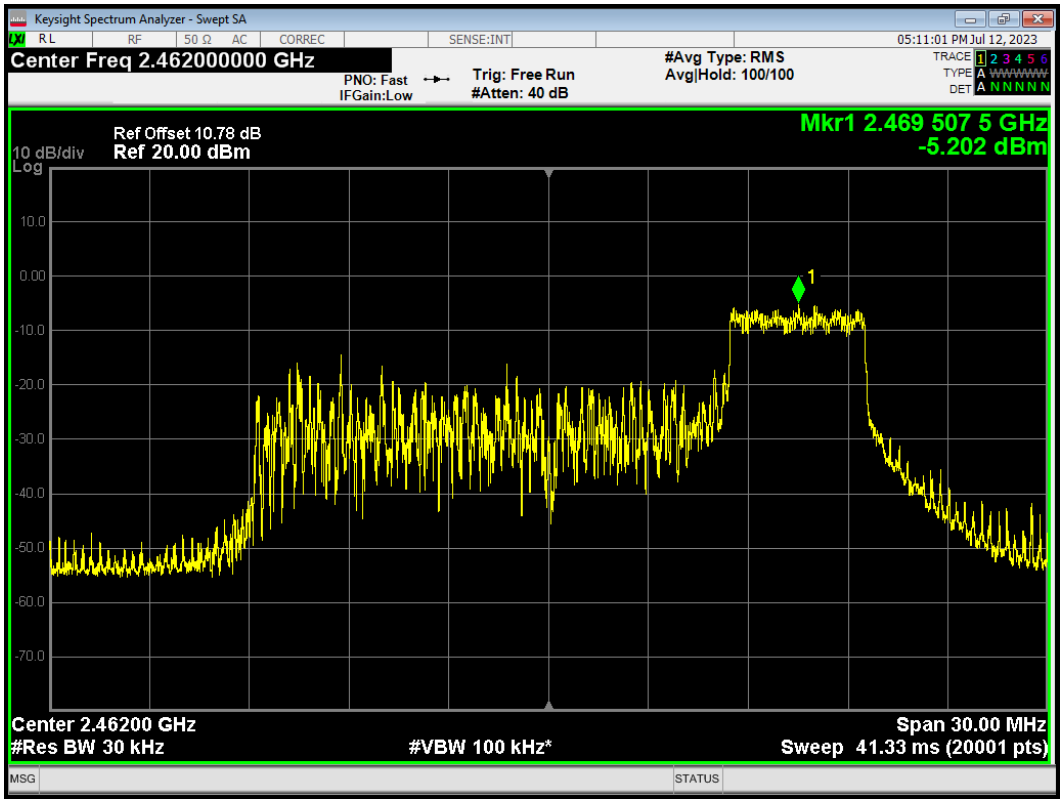
PSD 802.11ax (20M) RU52 IDX38 2437MHz Ant1



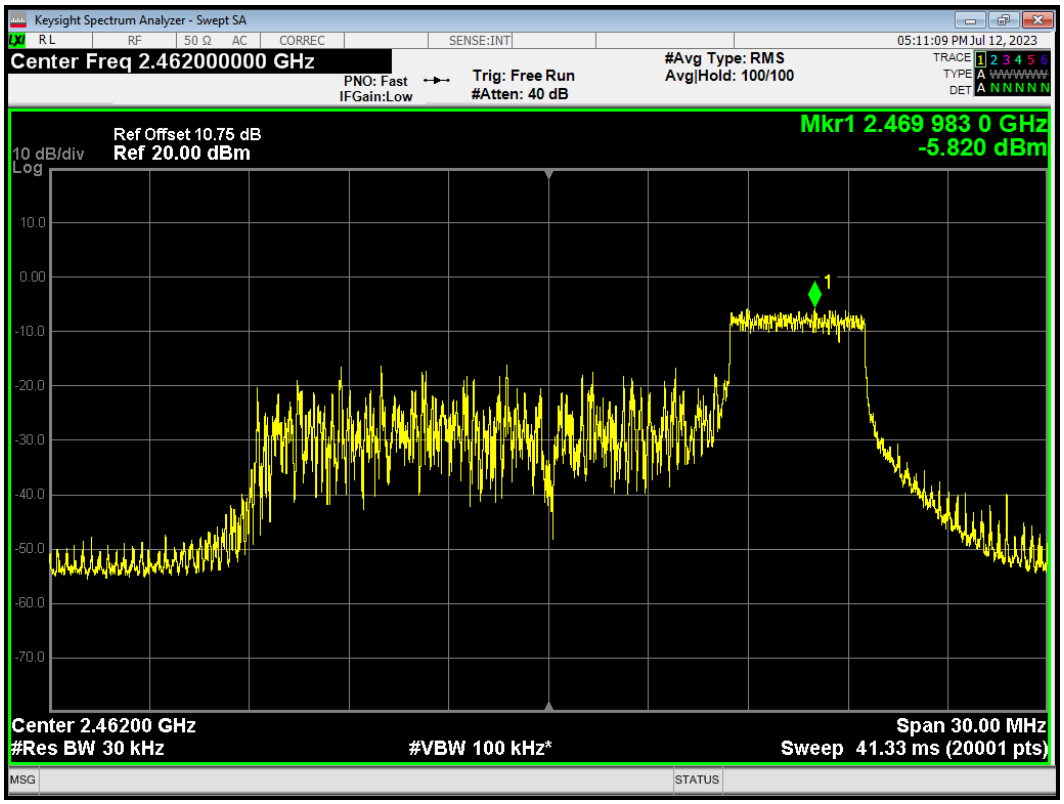
PSD 802.11ax (20M) RU52 IDX38 2437MHz Ant2



PSD 802.11ax (20M) RU52 IDX40 2462MHz Ant1

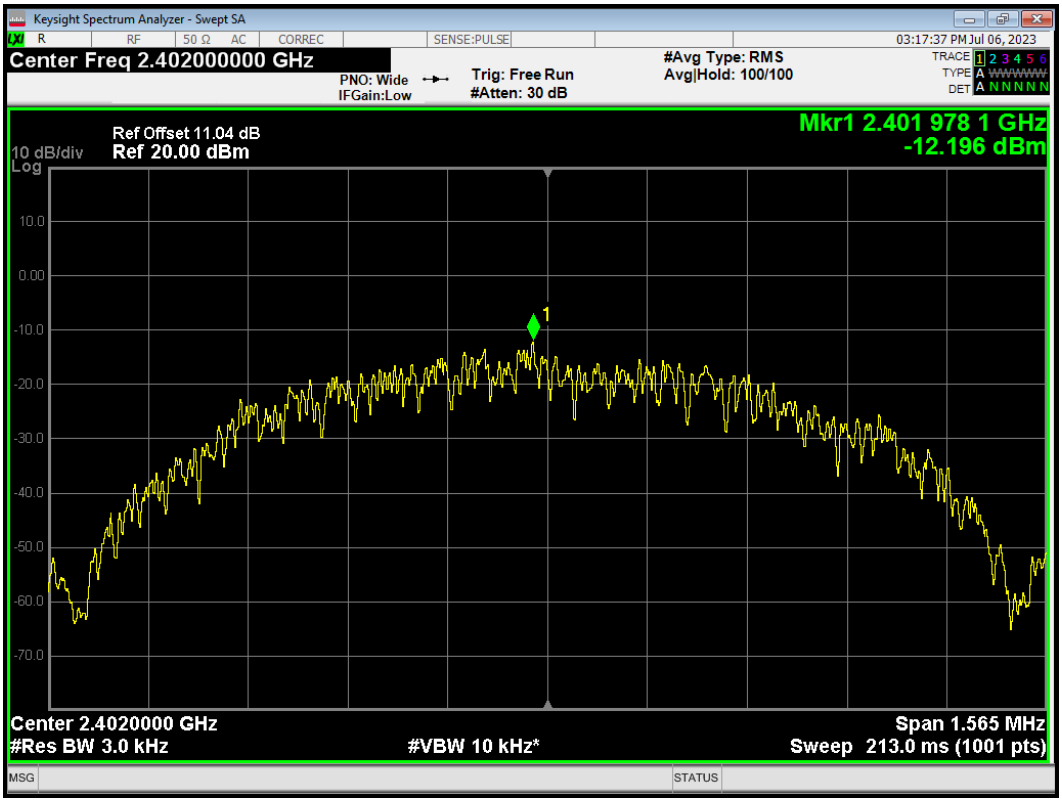


PSD 802.11ax (20M) RU52 IDX40 2462MHz Ant2

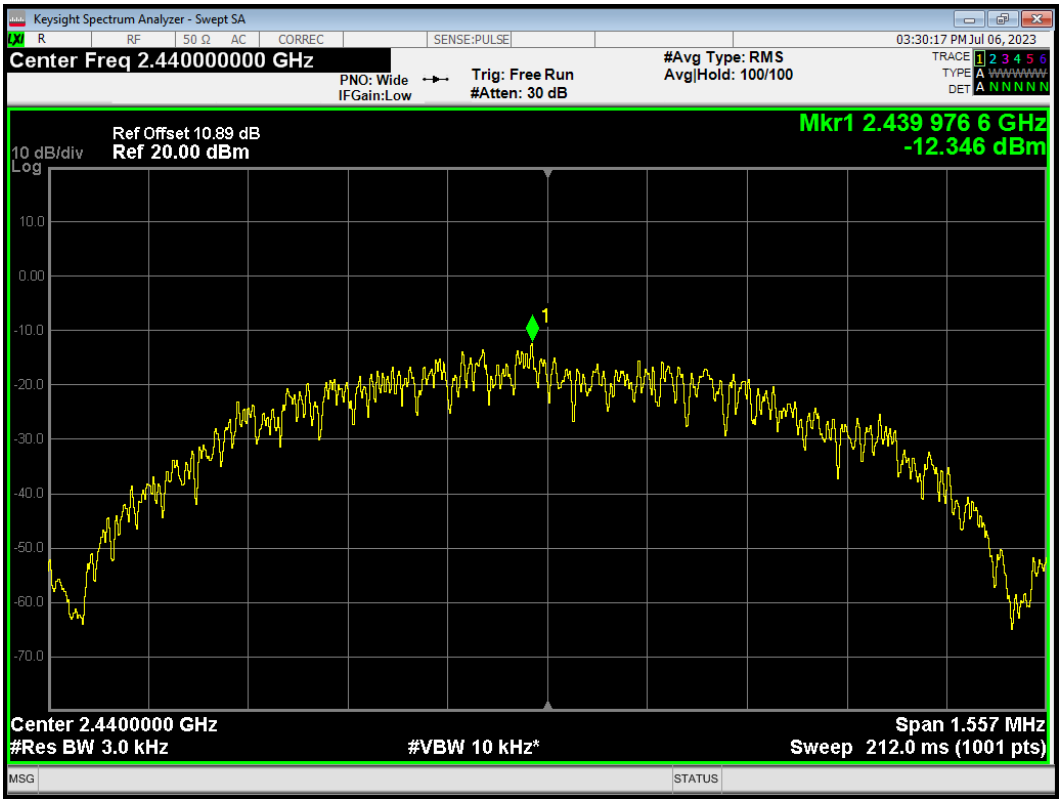


Internal Antenna

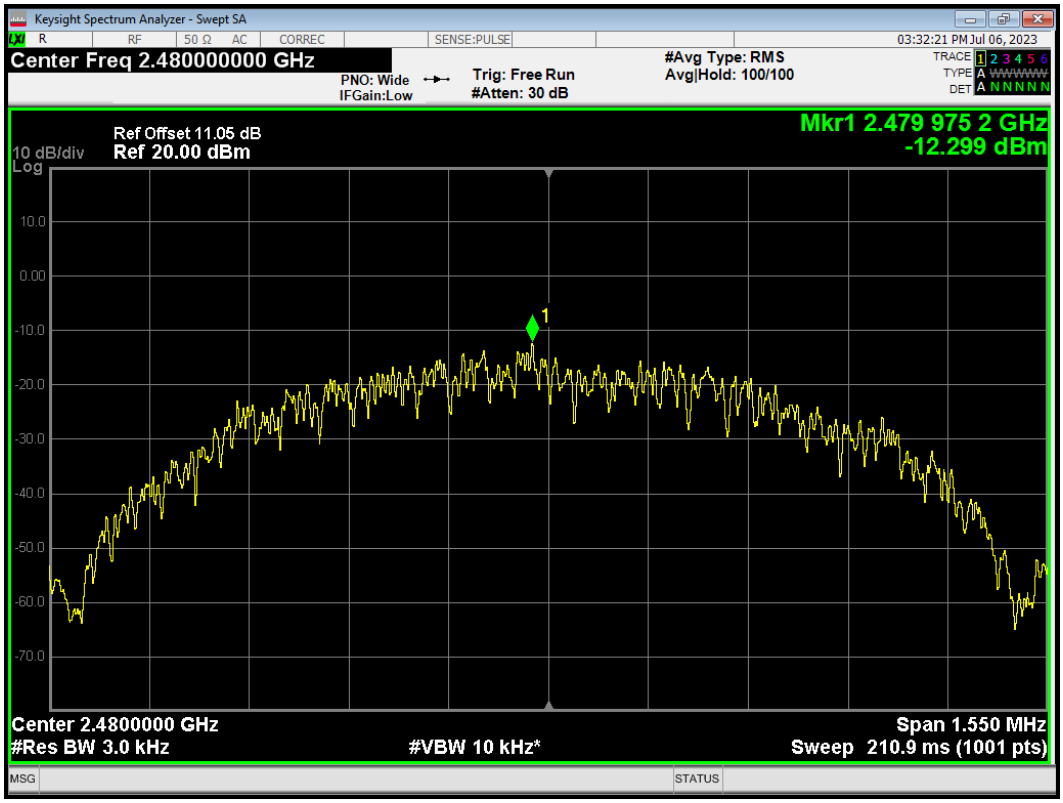
PSD BLE (1M) 2402MHz



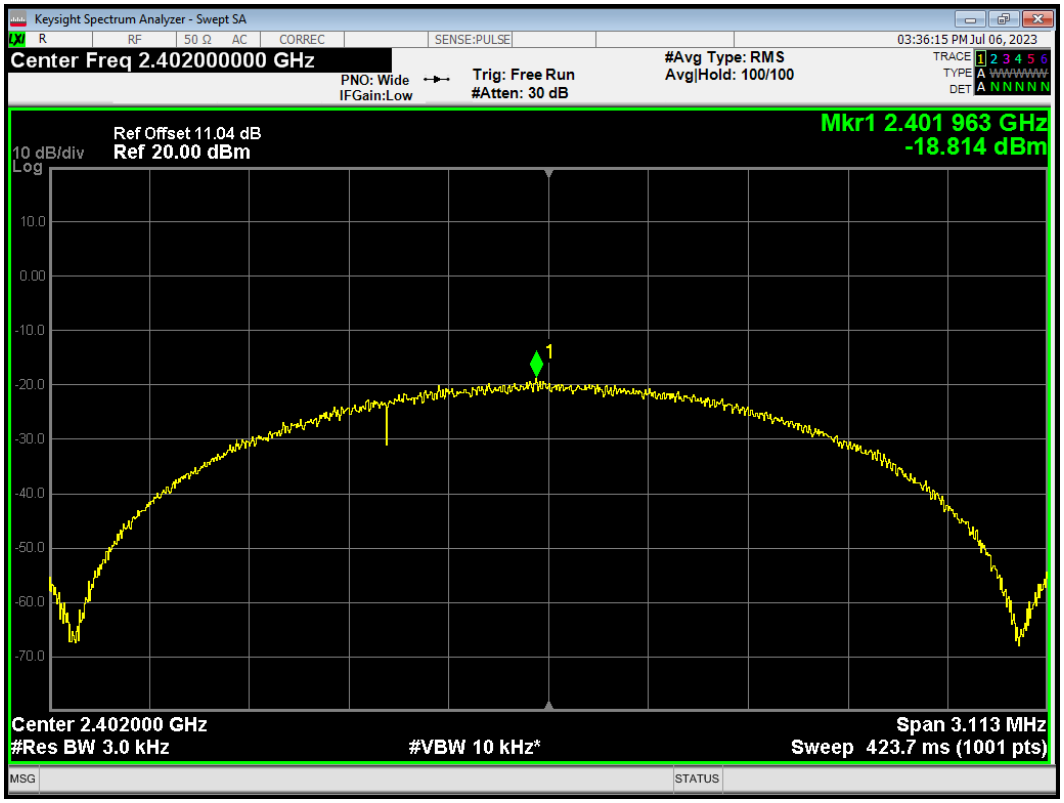
PSD BLE (1M) 2440MHz



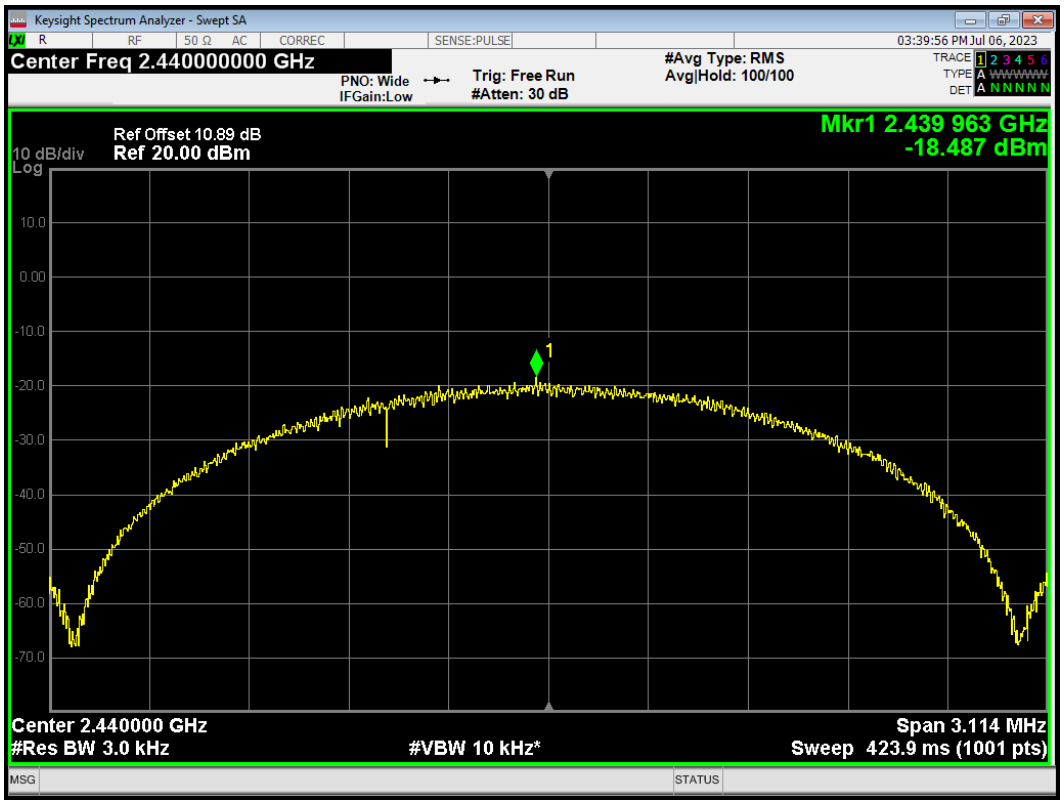
PSD BLE (1M) 2480MHz



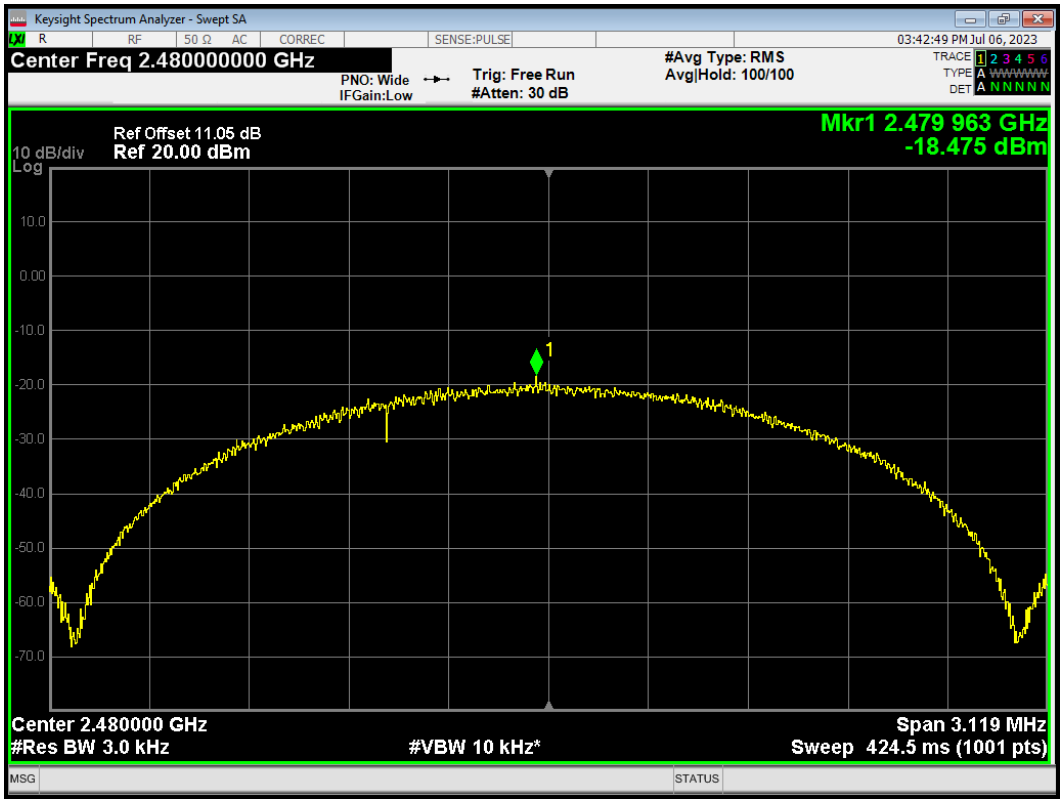
PSD BLE (2M) 2402MHz



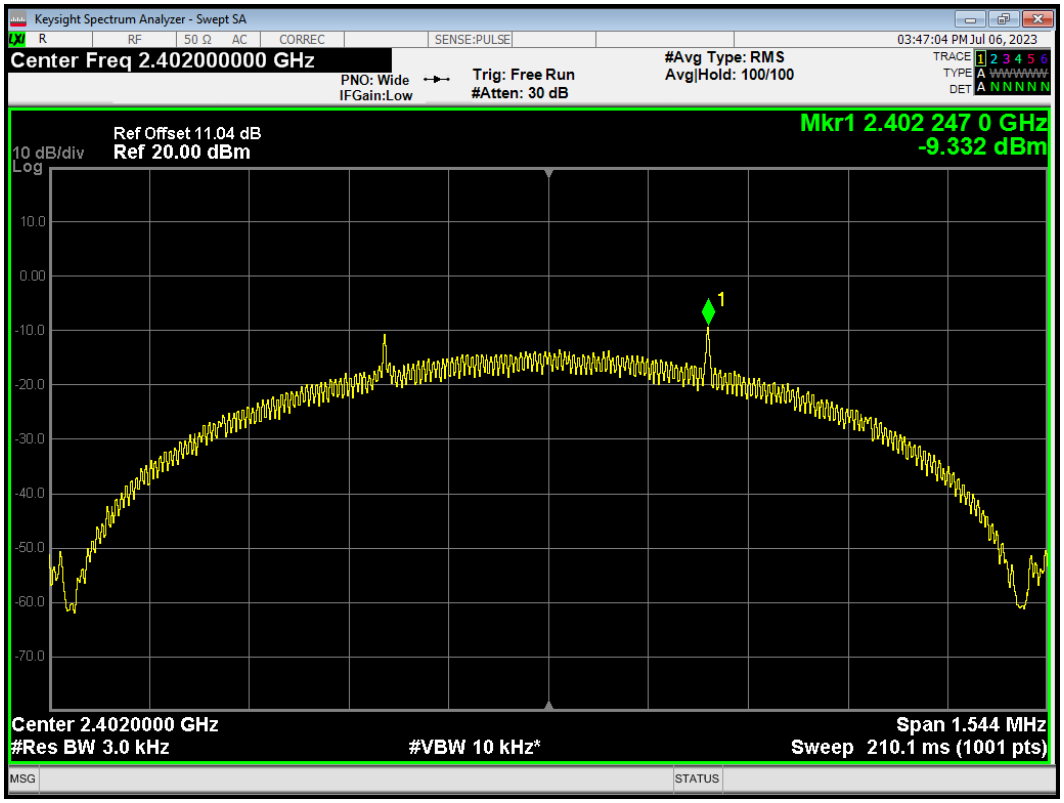
PSD BLE (2M) 2440MHz



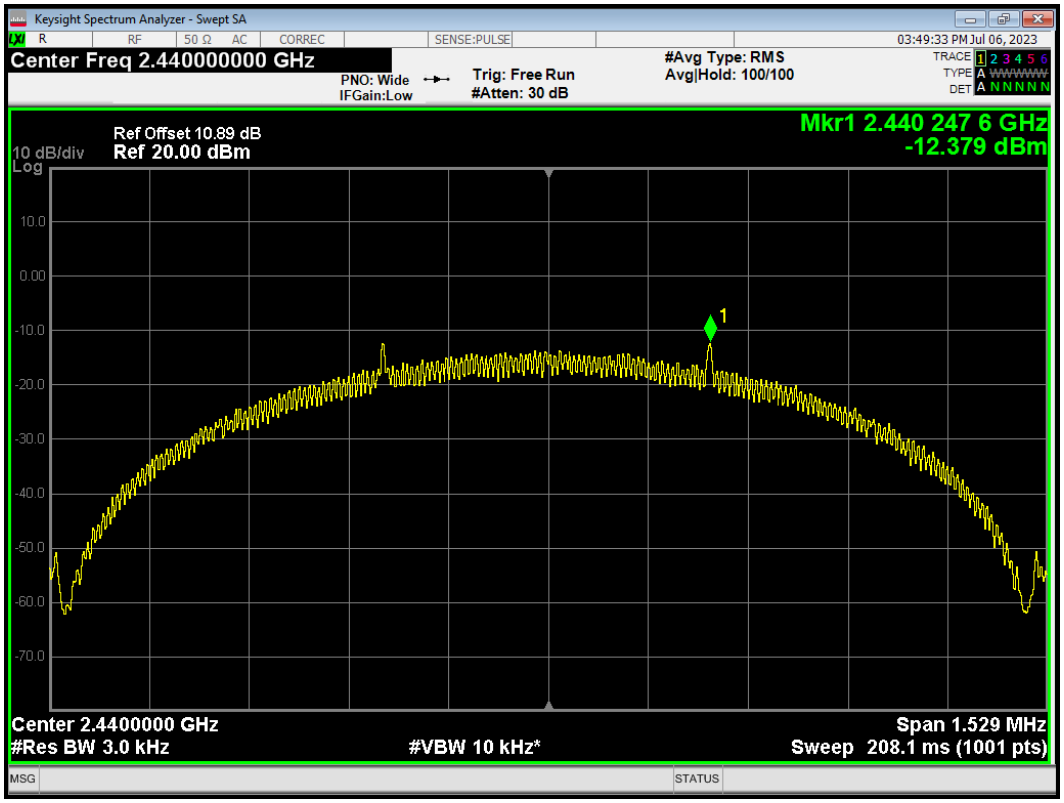
PSD BLE (2M) 2480MHz



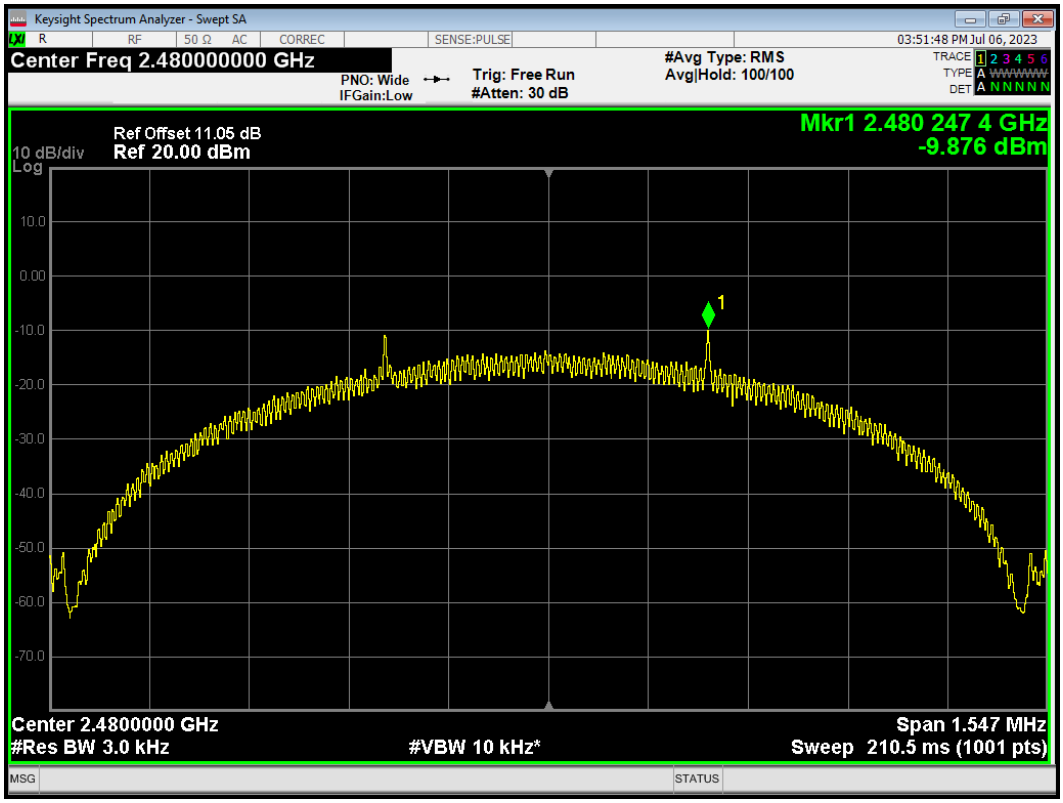
PSD BLE (S=2) 2402MHz



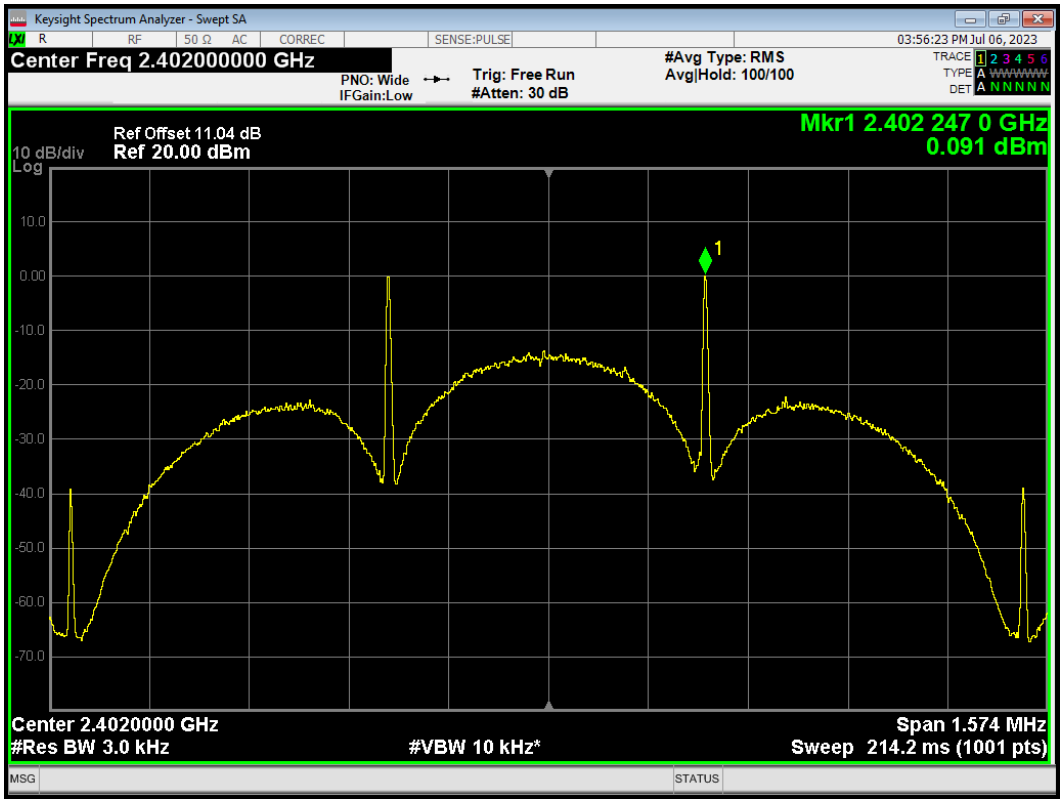
PSD BLE (S=2) 2440MHz



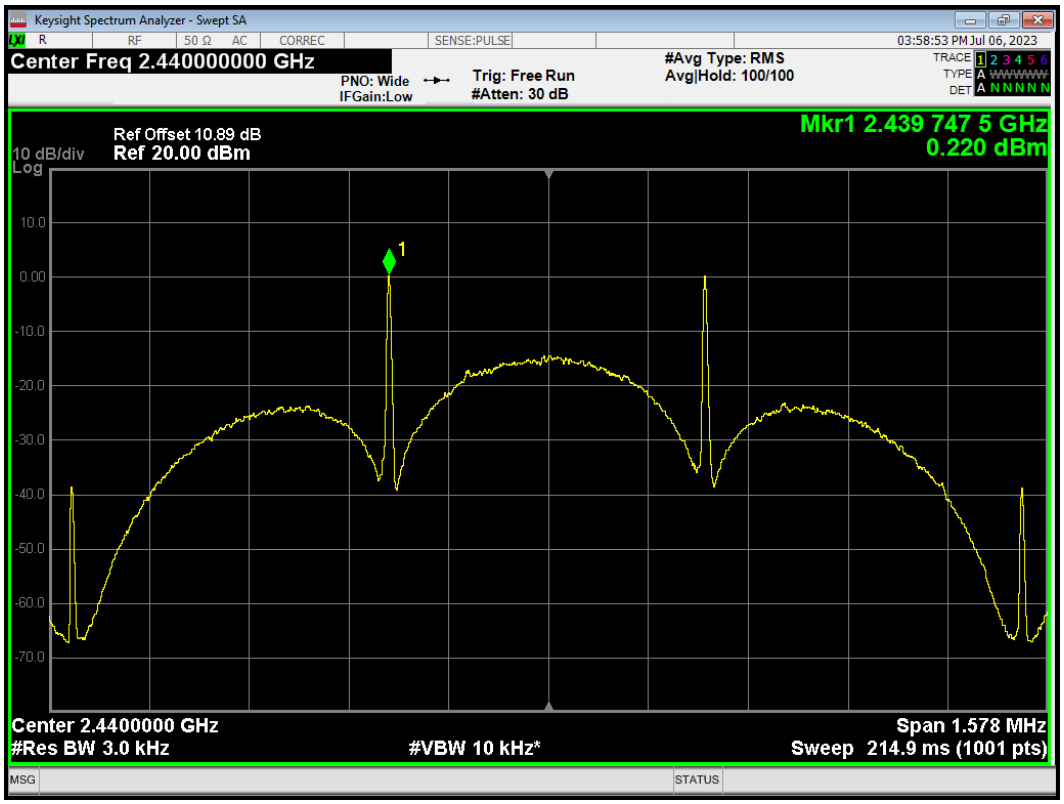
PSD BLE (S=2) 2480MHz



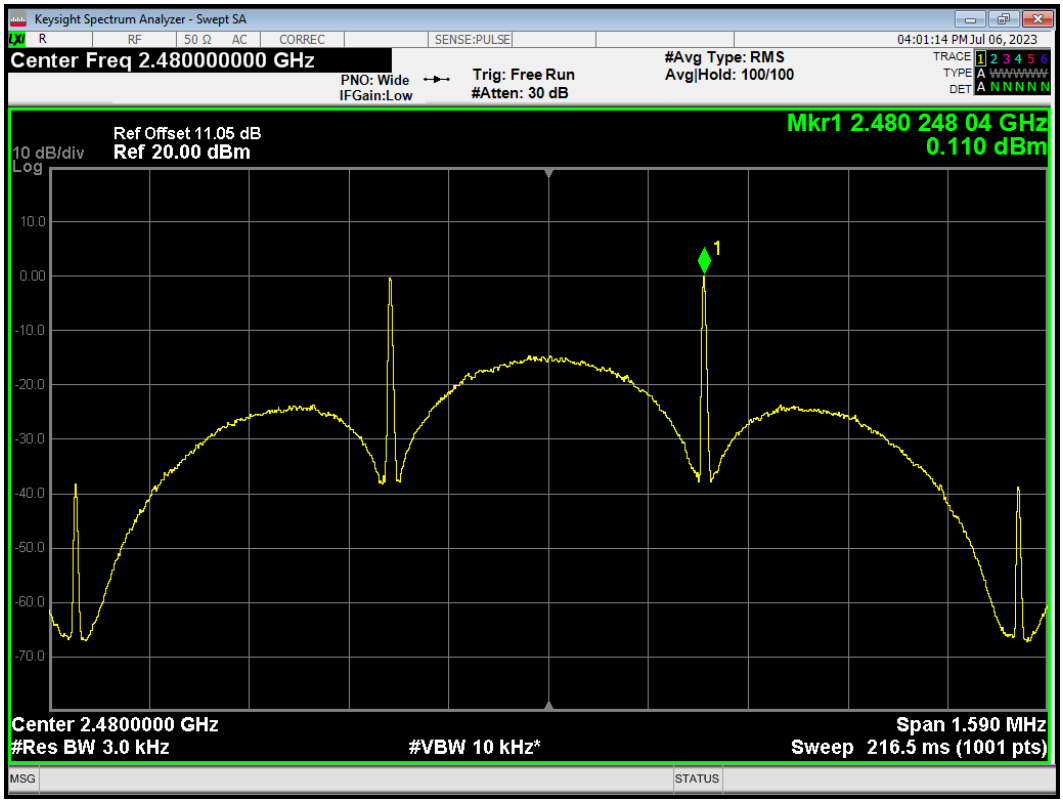
PSD BLE (S=8) 2402MHz



PSD BLE (S=8) 2440MHz

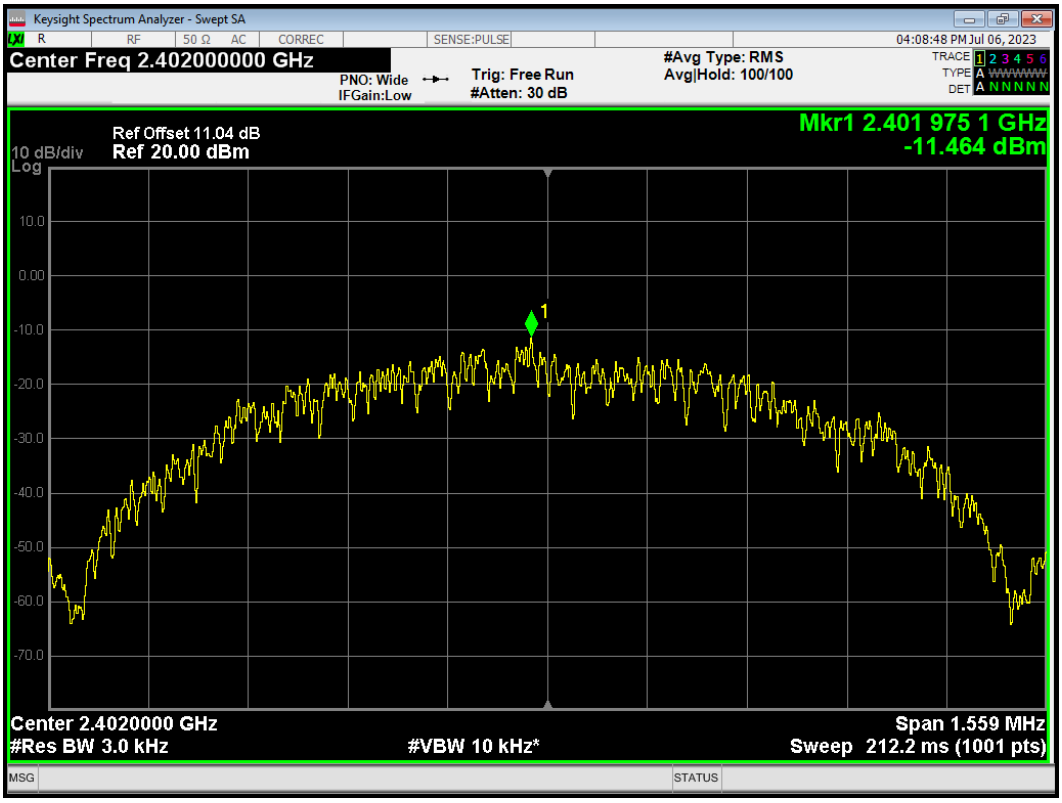


PSD BLE (S=8) 2480MHz

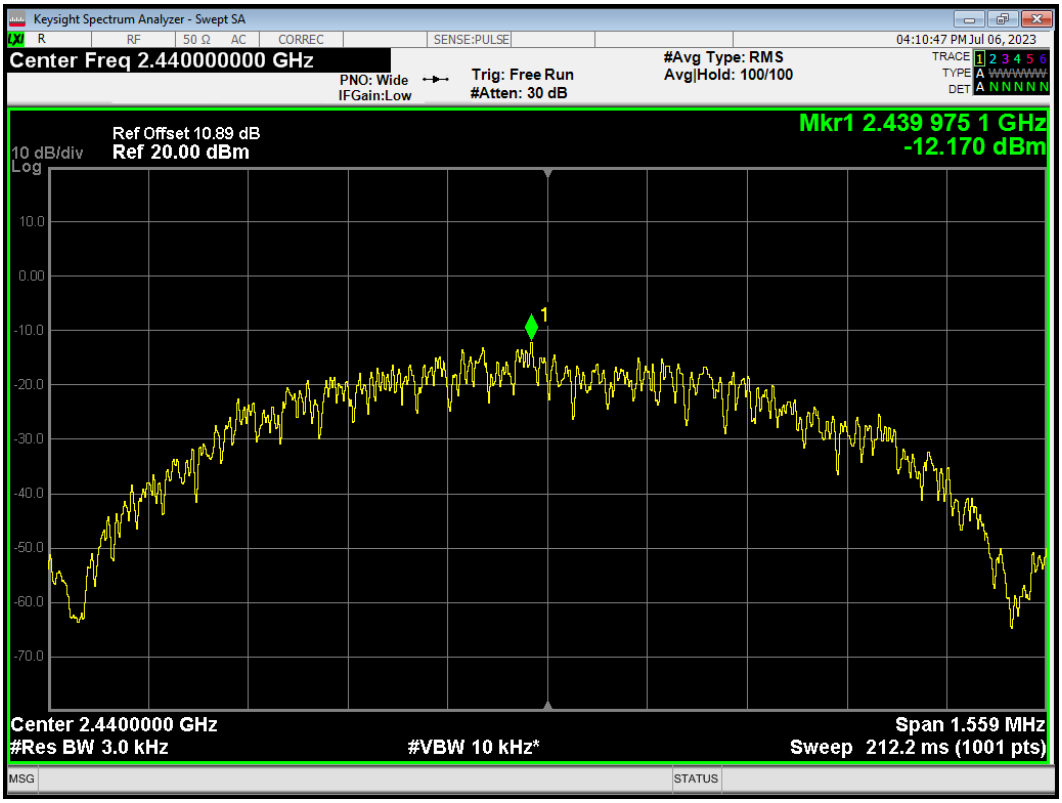


External Antenna

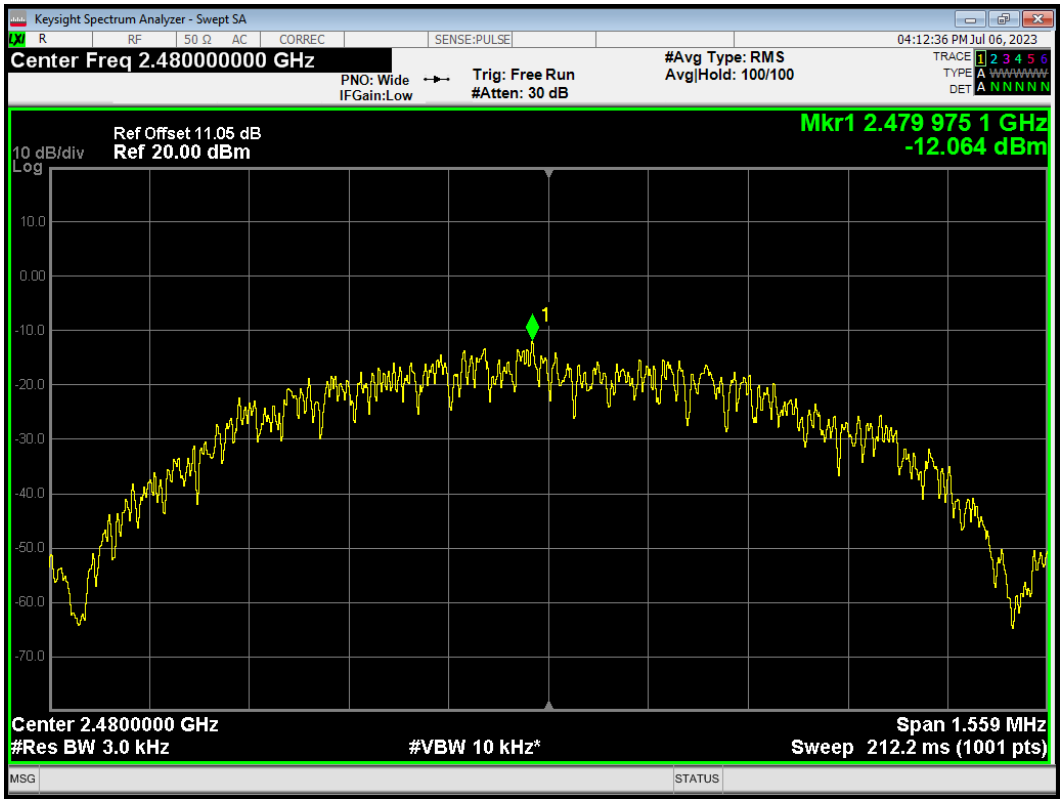
PSD BLE (1M) 2402MHz



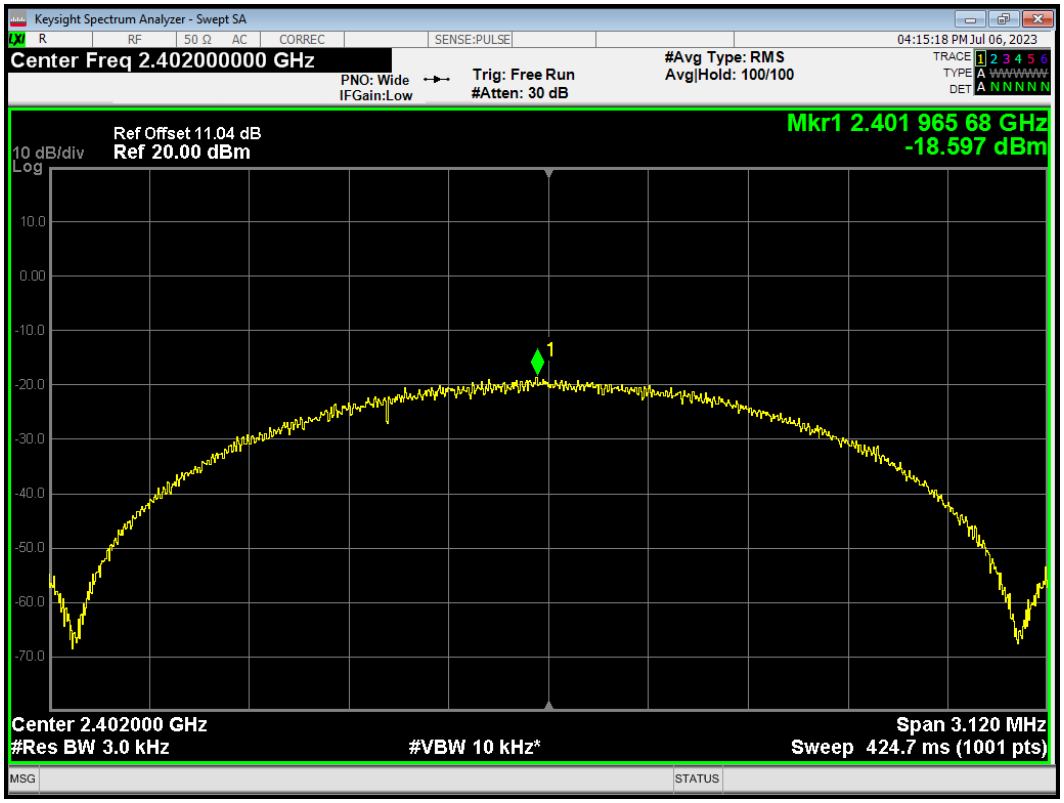
PSD BLE (1M) 2440MHz



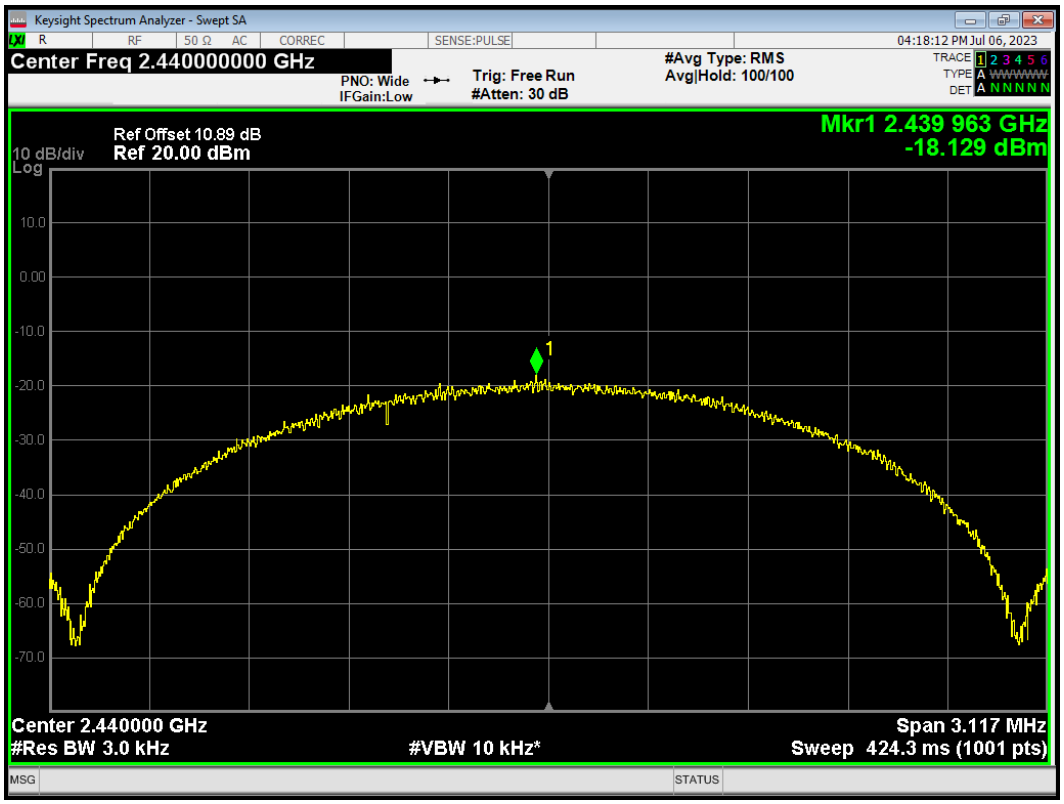
PSD BLE (1M) 2480MHz



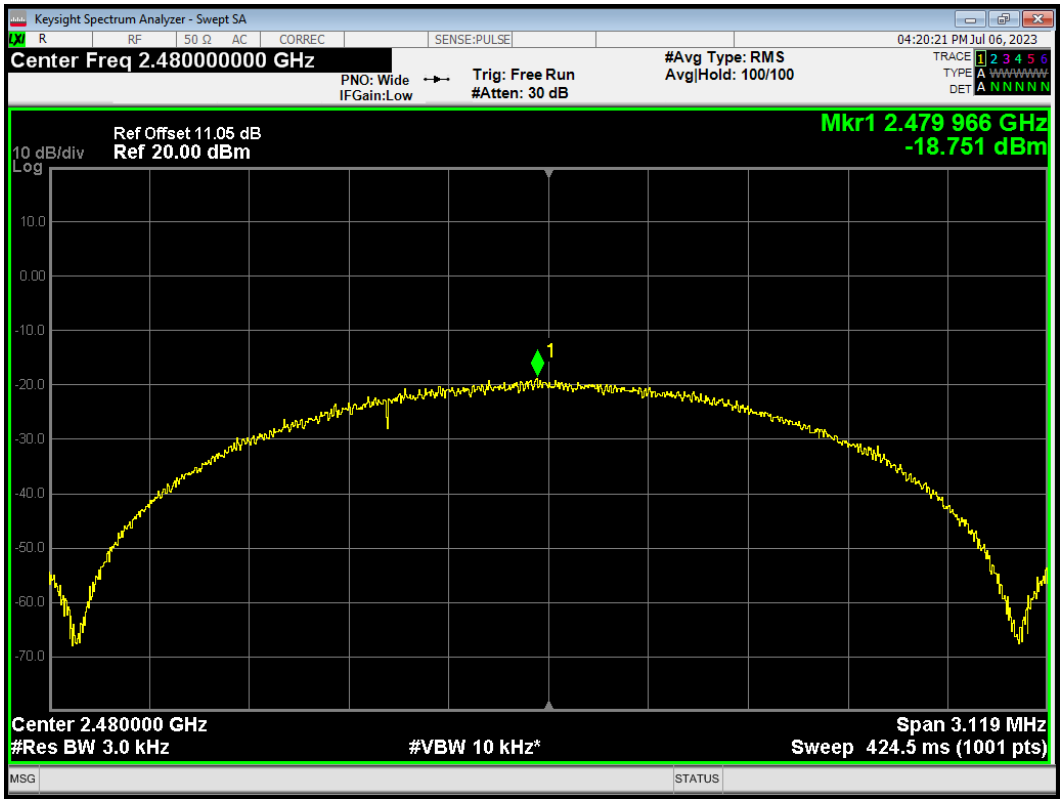
PSD BLE (2M) 2402MHz



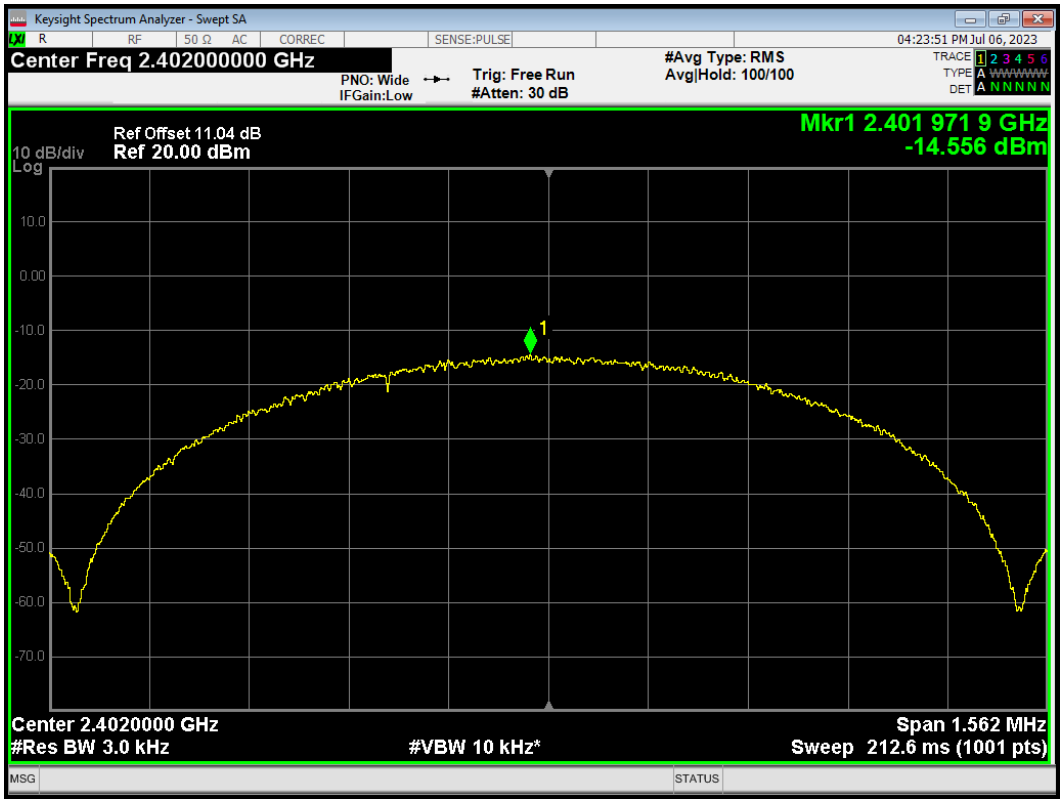
PSD BLE (2M) 2440MHz



PSD BLE (2M) 2480MHz



PSD BLE (S=2) 2402MHz



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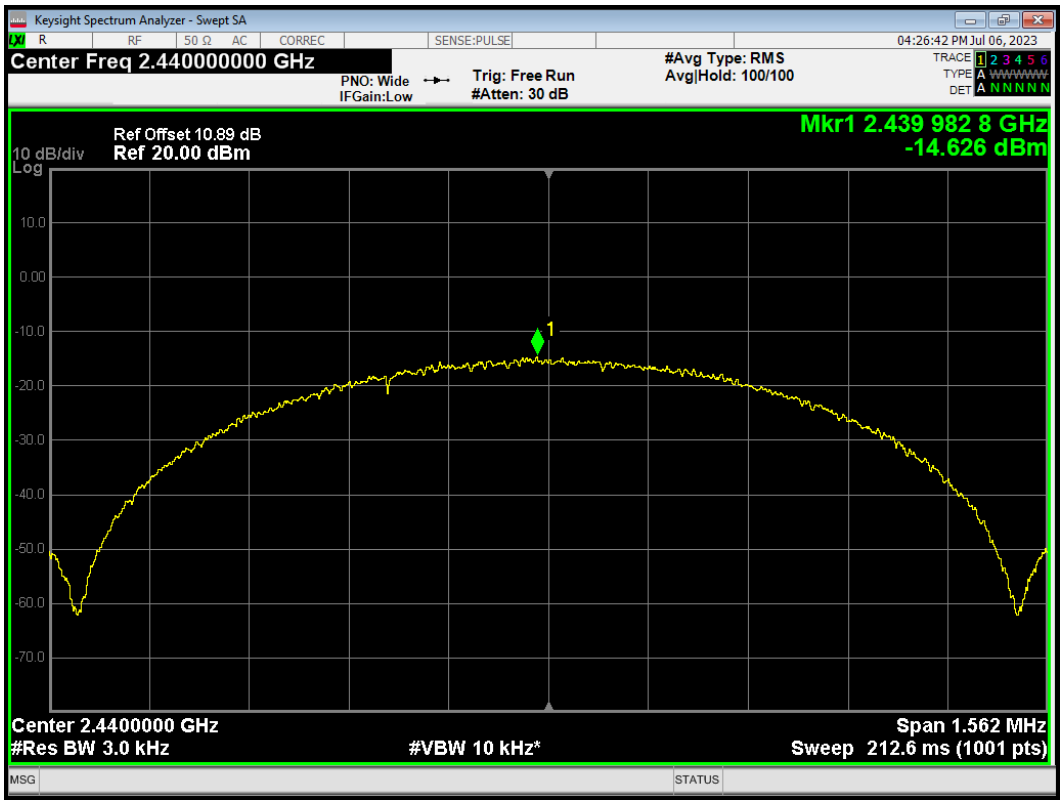
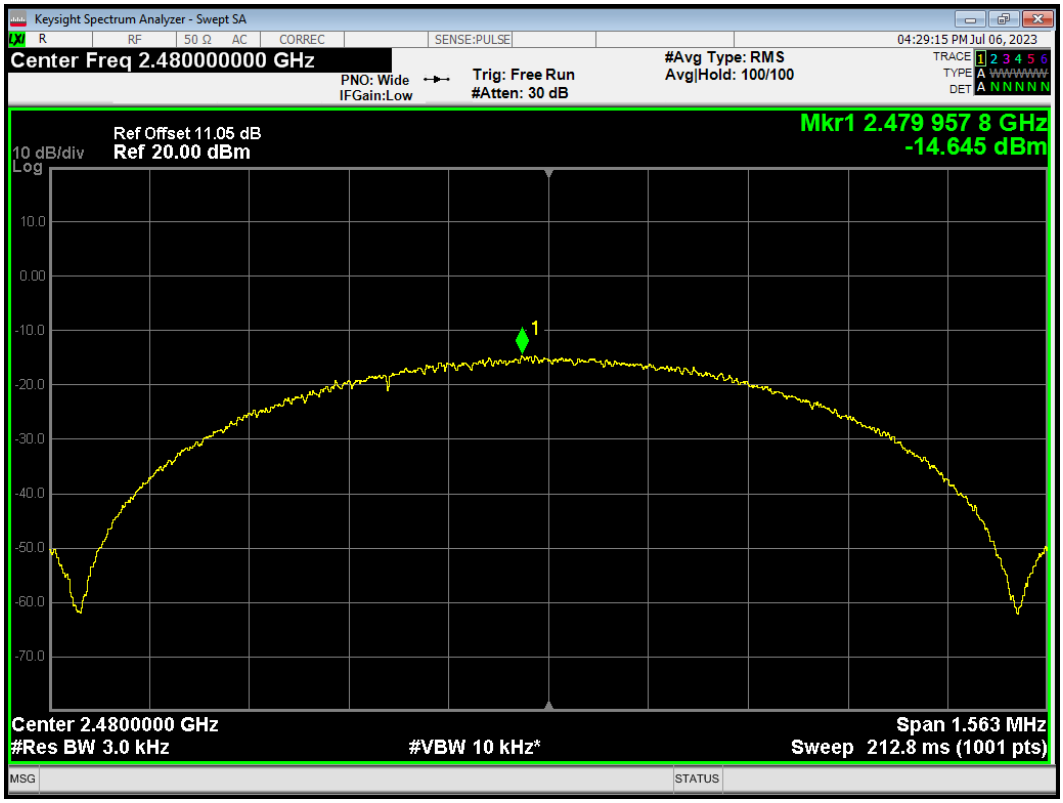
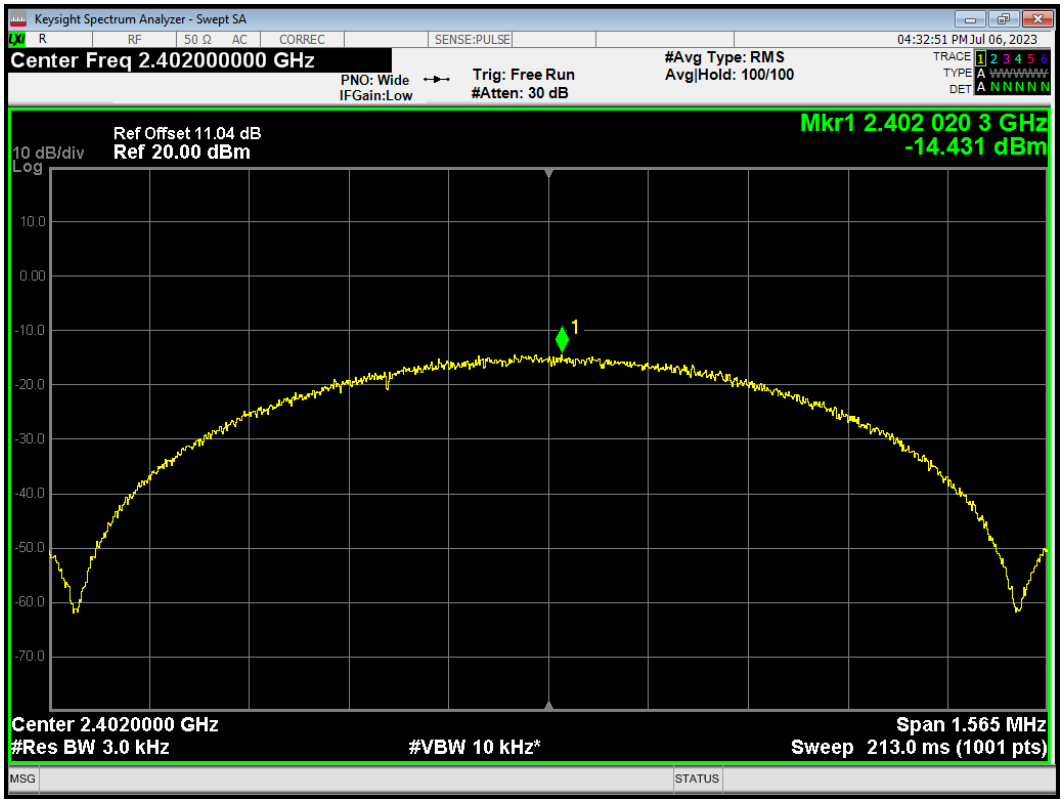


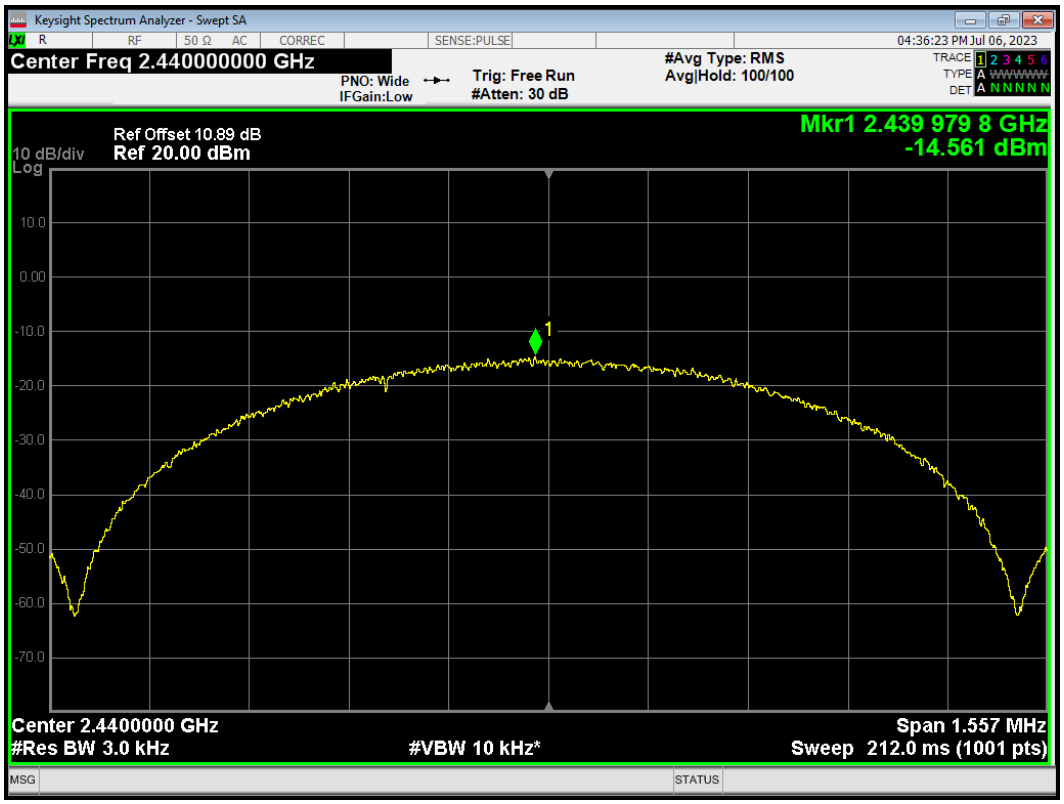
PSD BLE (S=2) 2480MHz



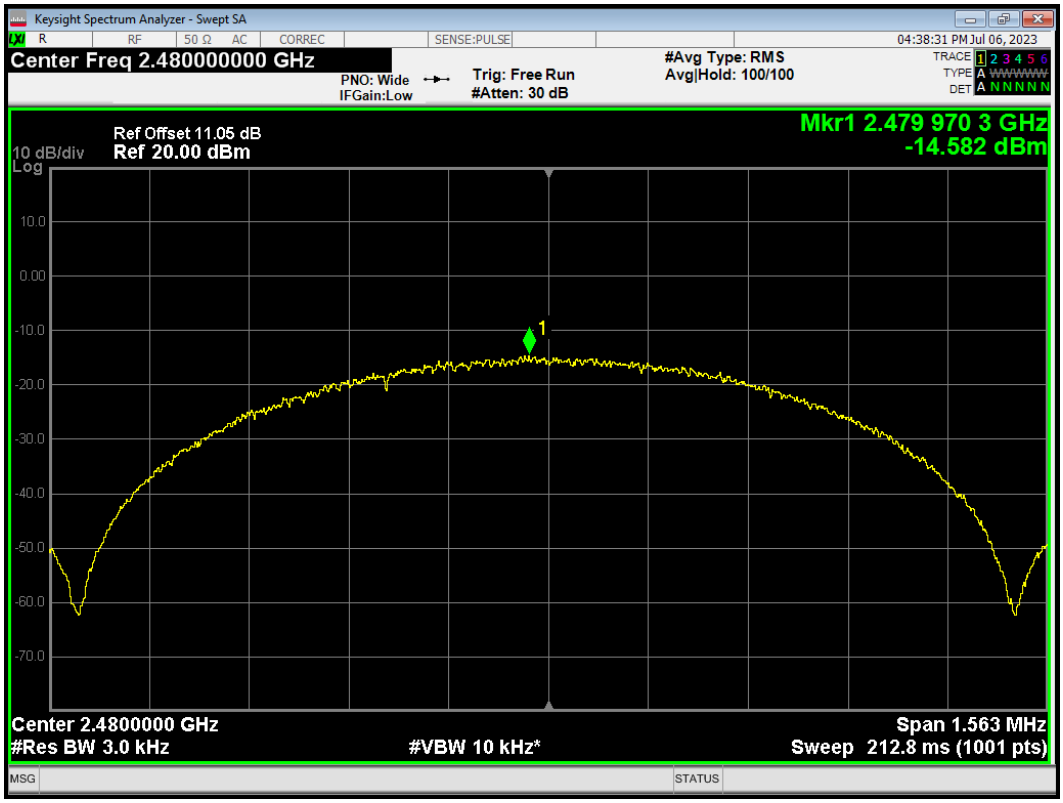
PSD BLE (S=8) 2402MHz



PSD BLE (S=8) 2440MHz



PSD BLE (S=8) 2480MHz



5.5. Spurious RF Conducted Emissions

Ambient Condition

Temperature	Relative humidity
20°C ~ 25°C	45% ~ 50%

Method of Measurement

The EUT was connected to the spectrum analyzer with a known loss. The spectrum analyzer scans from 30MHz to the 10th harmonic of the carrier. The peak detector is used. Set RBW to 100 kHz and VBW to 300 kHz, Sweep is set to ATUO.
The test is in transmitting mode.

Test Setup

Limits

Rule Part 15.247(d) pacifies that “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. ”

Test Mode	Carrier frequency (MHz)	Reference value (dBm)	Limit
802.11b	2412	7.28	-22.72
	2437	7.11	-22.89
	2462	6.91	-23.09
802.11g	2412	3.49	-26.51
	2437	4.54	-25.46
	2462	3.98	-26.02
802.11n HT20	2412	5.29	-24.71
	2437	4.31	-25.69
	2462	4.57	-25.43
802.11n HT40	2422	2.58	-27.42
	2437	2.66	-27.34
	2452	2.22	-27.78
802.11ax	2412	3.81	-26.19

HE20	2437	5.27	-24.73
	2462	4.93	-25.07
802.11ax HE40	2422	1.93	-28.07
	2437	1.78	-28.22
	2452	1.53	-28.47

TB Mode

Test Mode	Carrier frequency (MHz)	RU Index	Reference value (dBm)	Limit
802.11ax HE20 26-Tone	2412	0	8.70	-21.30
	2437	4	10.67	-19.33
	2462	8	10.13	-19.87
802.11ax HE20 52-Tone	2412	37	7.83	-22.17
	2437	38	7.37	-22.63
	2462	40	7.39	-22.61
802.11ax HE20 106-Tone	2412	53	5.40	-24.60
	2437	53	5.01	-24.99
	2462	54	4.79	-25.21

Internal Antenna

Test Mode	Carrier frequency (MHz)	Reference value (dBm)	Limit
Bluetooth (Low Energy) (1M)	2402	6.62	-23.38
	2440	6.48	-23.52
	2480	6.37	-23.63
Bluetooth (Low Energy) (2M)	2402	6.58	-23.42
	2440	5.89	-24.11
	2480	4.64	-25.36
Bluetooth (Low Energy) (S=2)	2402	6.83	-23.17
	2440	6.66	-23.34
	2480	6.62	-23.38
Bluetooth (Low Energy) (S=8)	2402	4.27	-25.73
	2440	3.95	-26.05
	2480	3.85	-26.15

External Antenna

Test Mode	Carrier frequency (MHz)	Reference value (dBm)	Limit
Bluetooth (Low Energy) (1M)	2402	7.13	-22.87
	2440	6.84	-23.16
	2480	6.97	-23.03
Bluetooth (Low Energy)	2402	4.81	-25.19
	2440	6.57	-23.43

(2M)	2480	6.97	-23.03
Bluetooth (Low Energy) (S=2)	2402	7.97	-22.03
	2440	7.27	-22.73
	2480	6.85	-23.15
Bluetooth (Low Energy) (S=8)	2402	7.81	-22.19
	2440	7.61	-22.39
	2480	7.32	-22.68

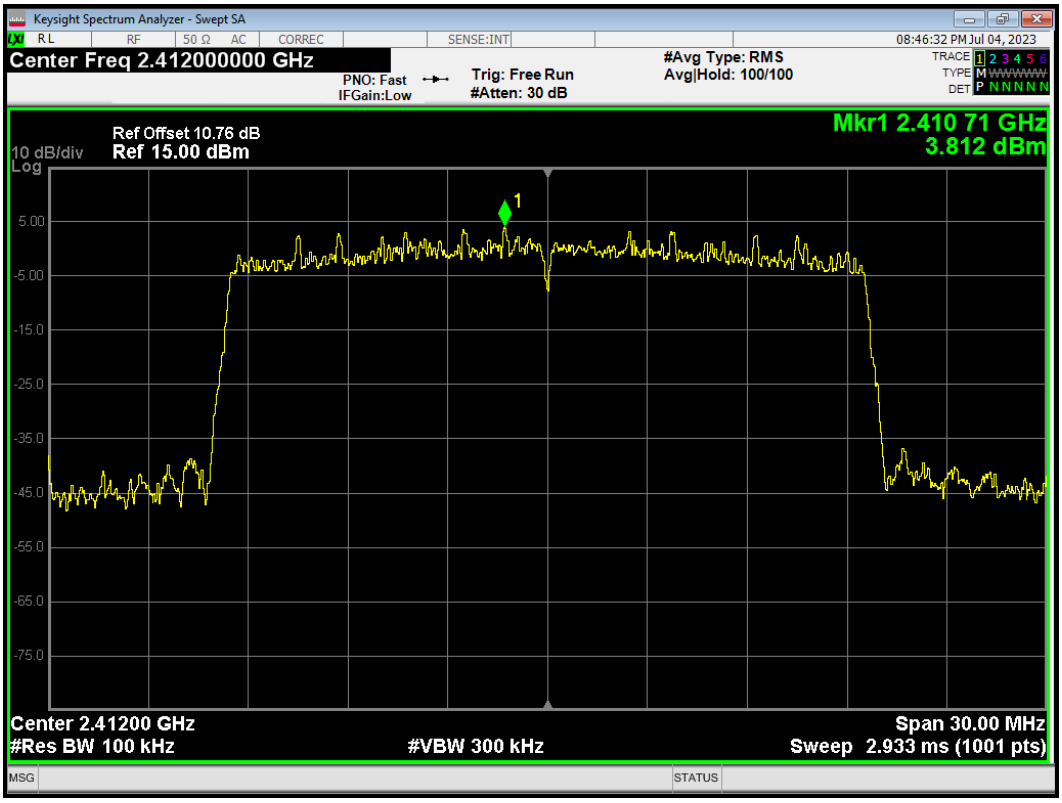
Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor *k* = 1.96.

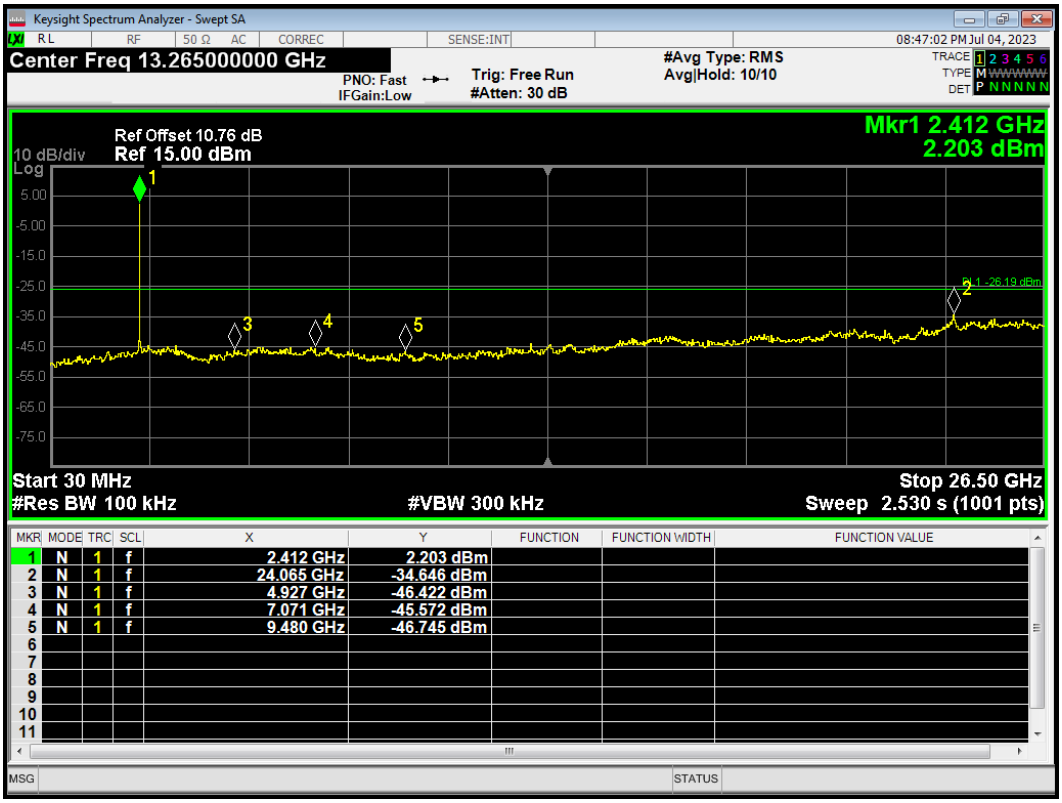
Frequency	Uncertainty
100kHz-2GHz	0.684 dB
2GHz-26GHz	1.407 dB

Test Results:

Tx. Spurious 802.11ax(HE20) 2412MHz Ref

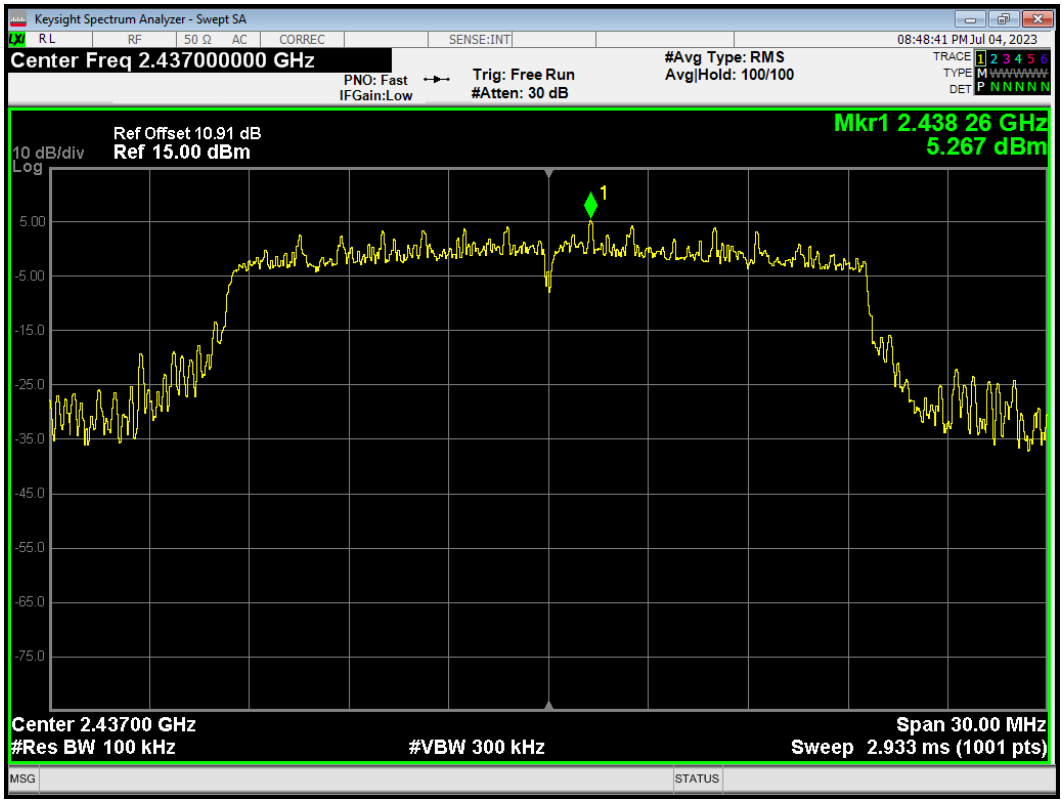


Tx. Spurious 802.11ax(HE20) 2412MHz Emission

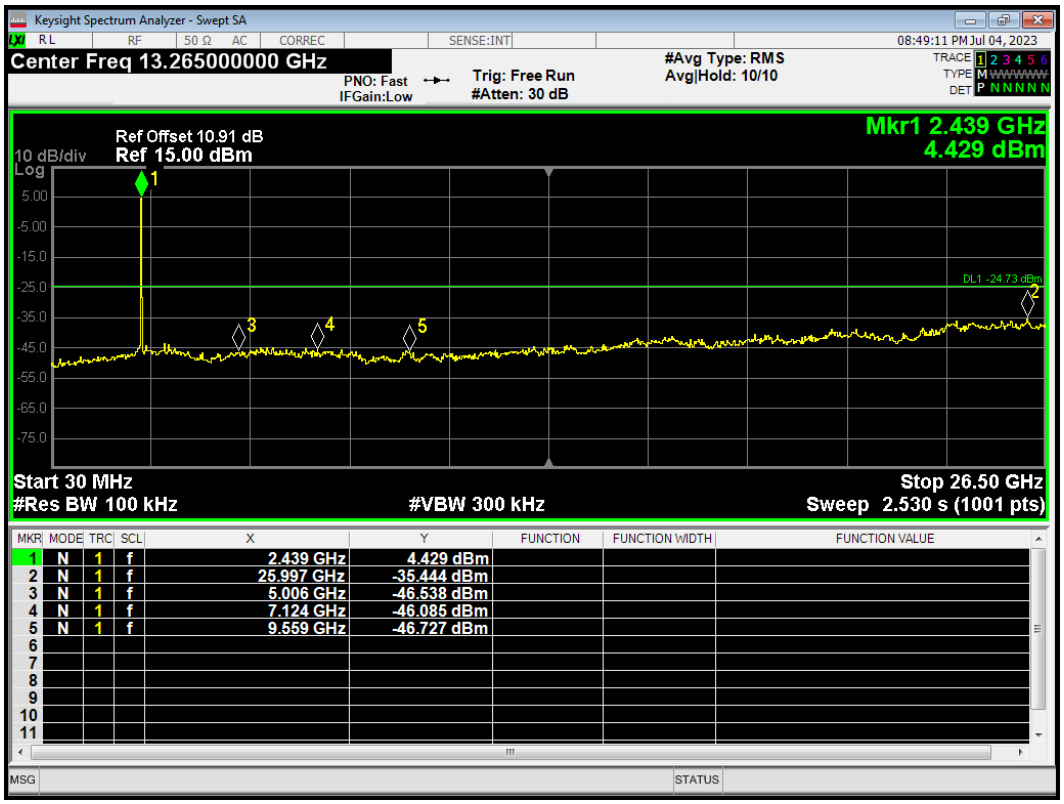


MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.412 GHz	2.203 dBm			
2	N	1	f	24.065 GHz	-34.646 dBm			
3	N	1	f	4.927 GHz	-46.422 dBm			
4	N	1	f	7.071 GHz	-45.572 dBm			
5	N	1	f	9.480 GHz	-46.745 dBm			

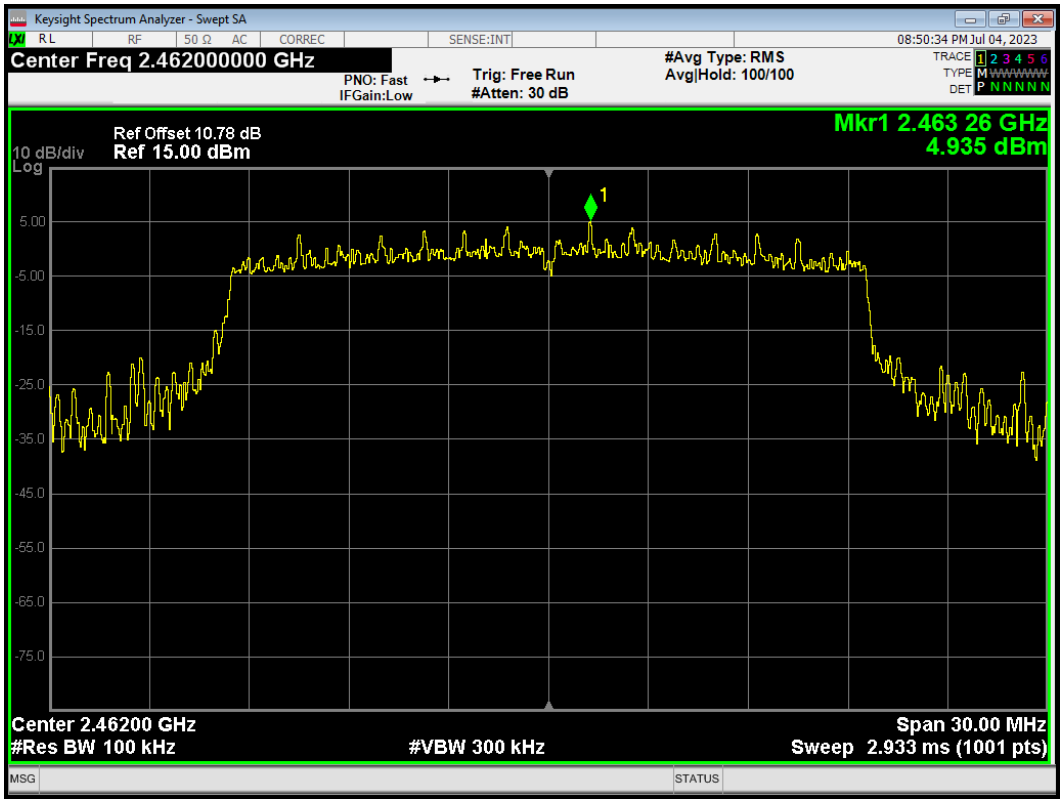
Tx. Spurious 802.11ax(HE20) 2437MHz Ref



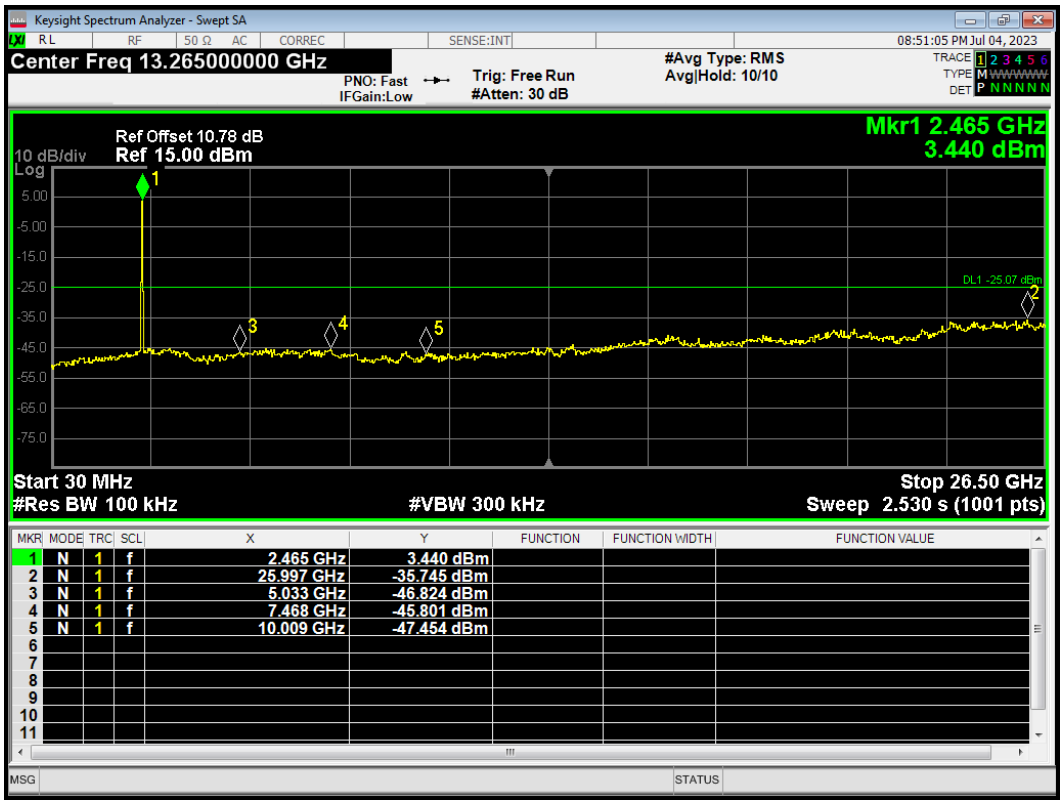
Tx. Spurious 802.11ax(HE20) 2437MHz Emission



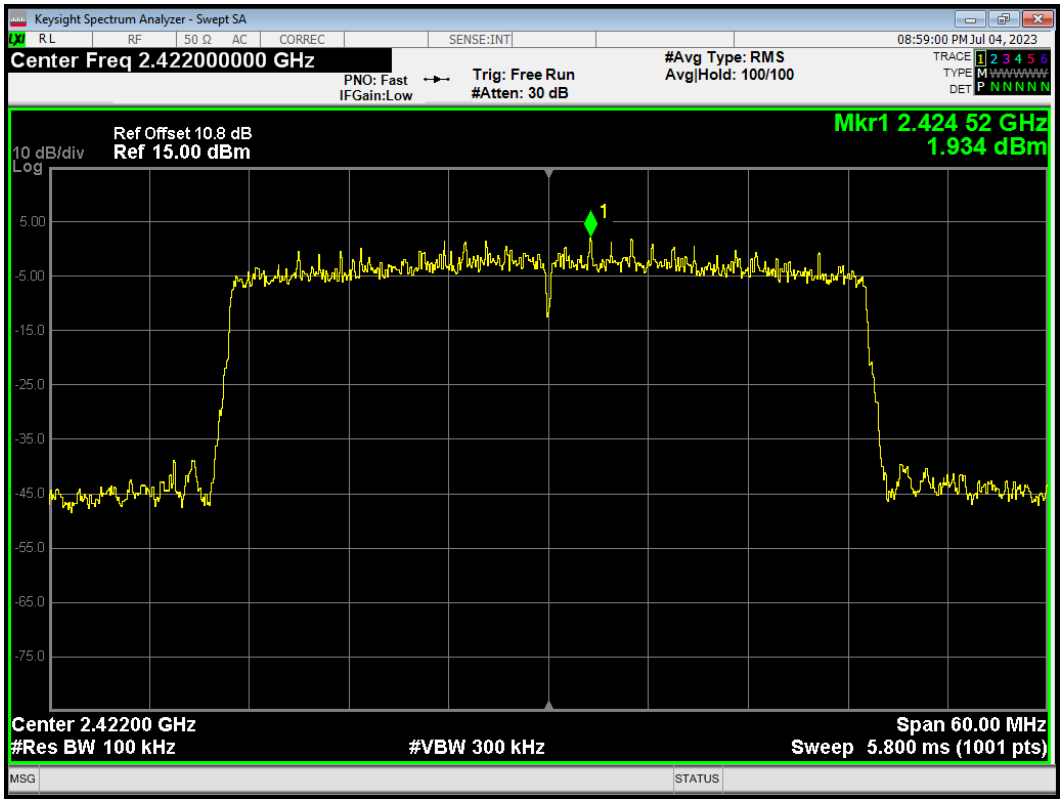
Tx. Spurious 802.11ax(HE20) 2462MHz Ref



Tx. Spurious 802.11ax(HE20) 2462MHz Emission



Tx. Spurious 802.11ax(HE40) 2422MHz Ref



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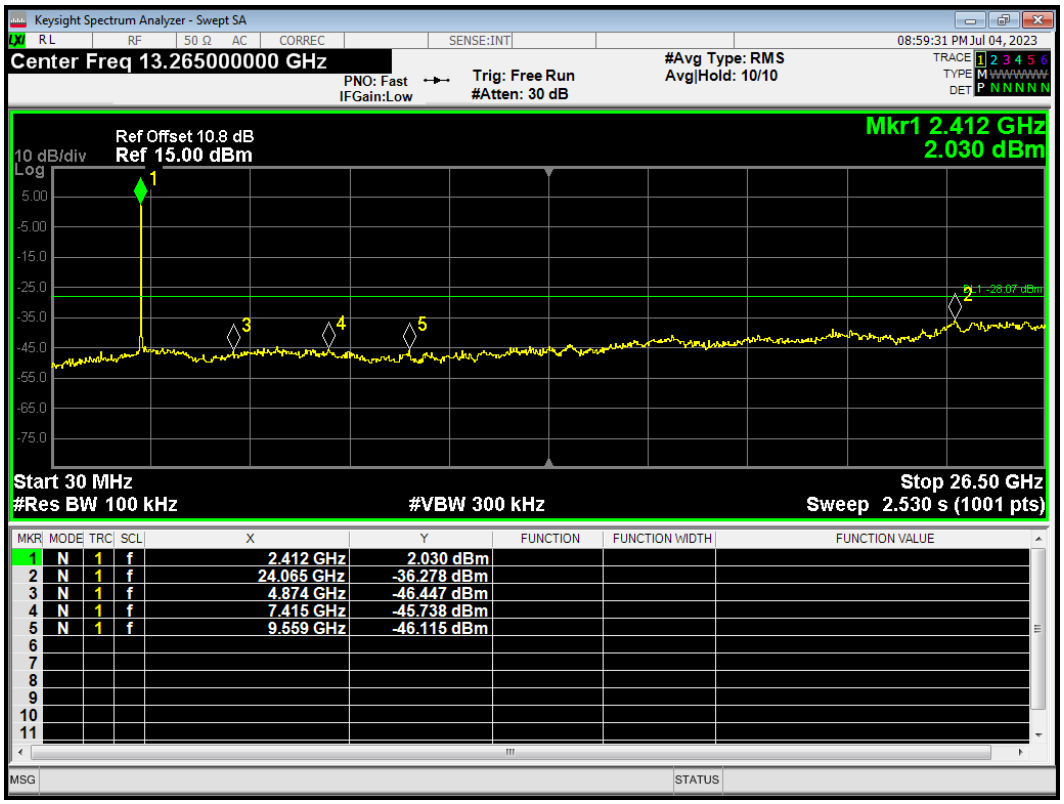

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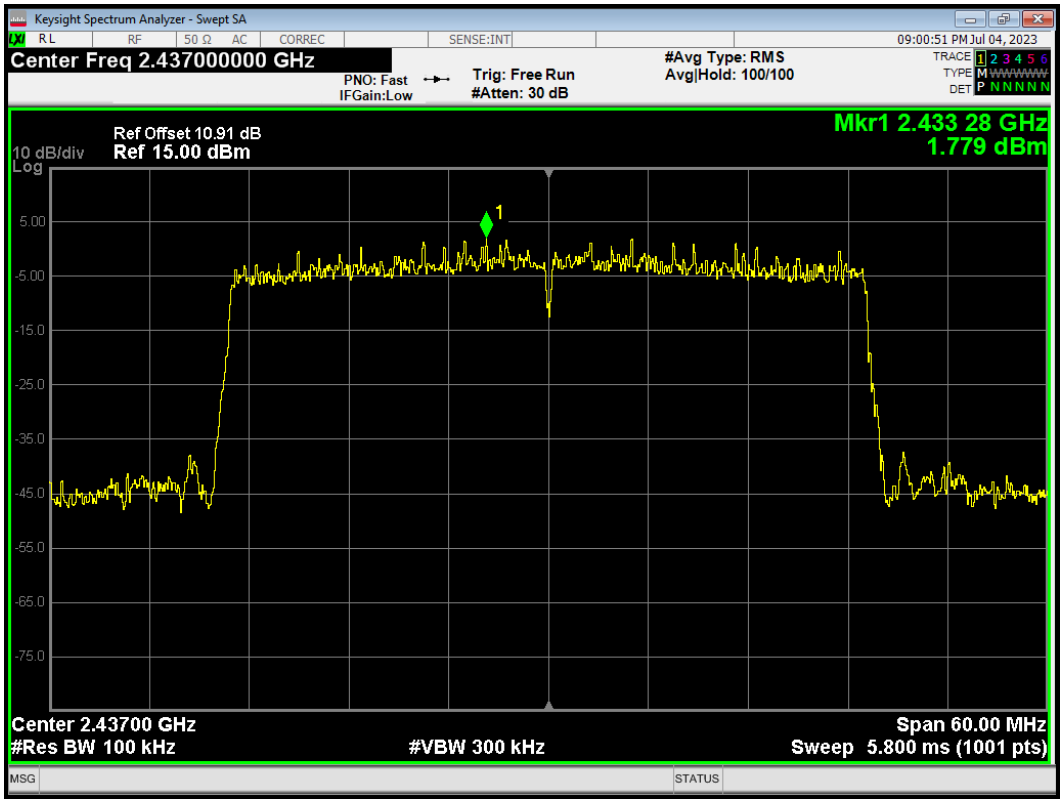

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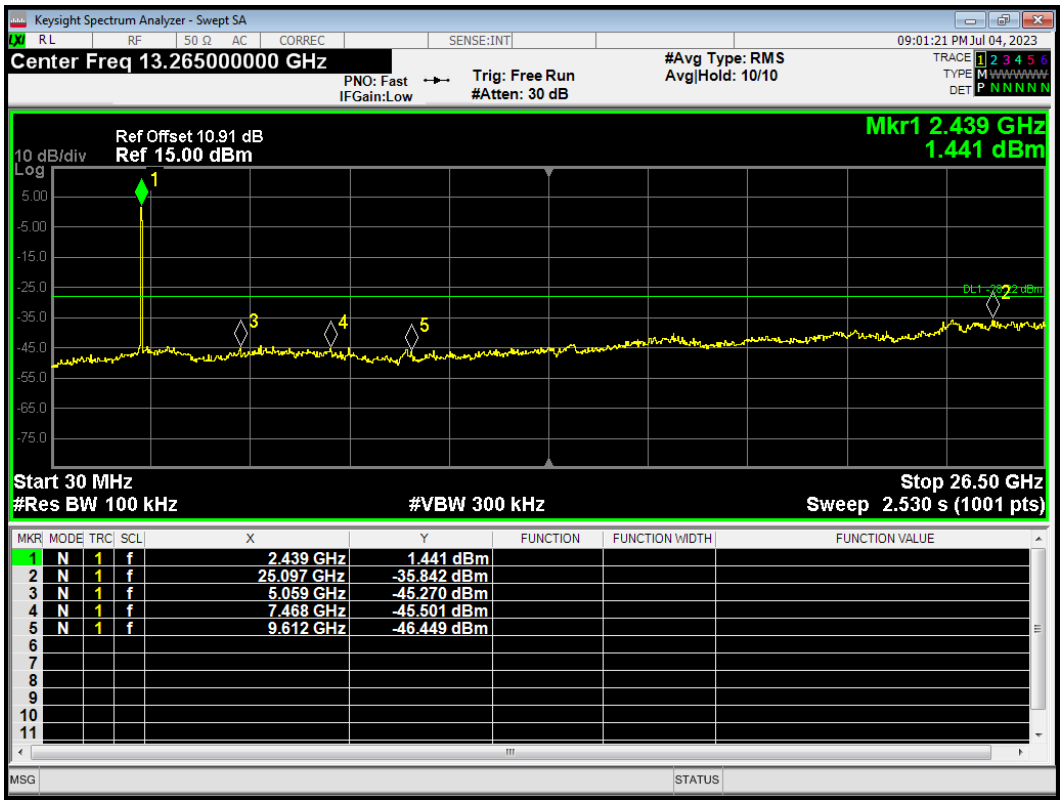
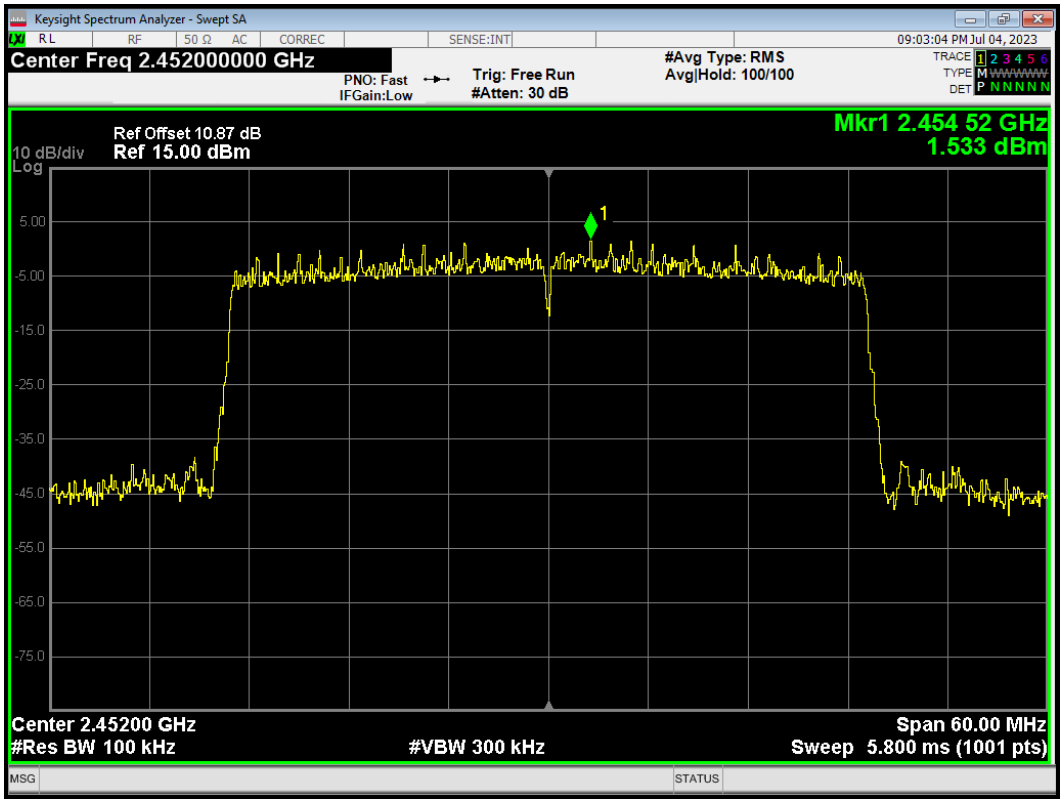


Tx. Spurious 802.11ax(HE40) 2452MHz Ref



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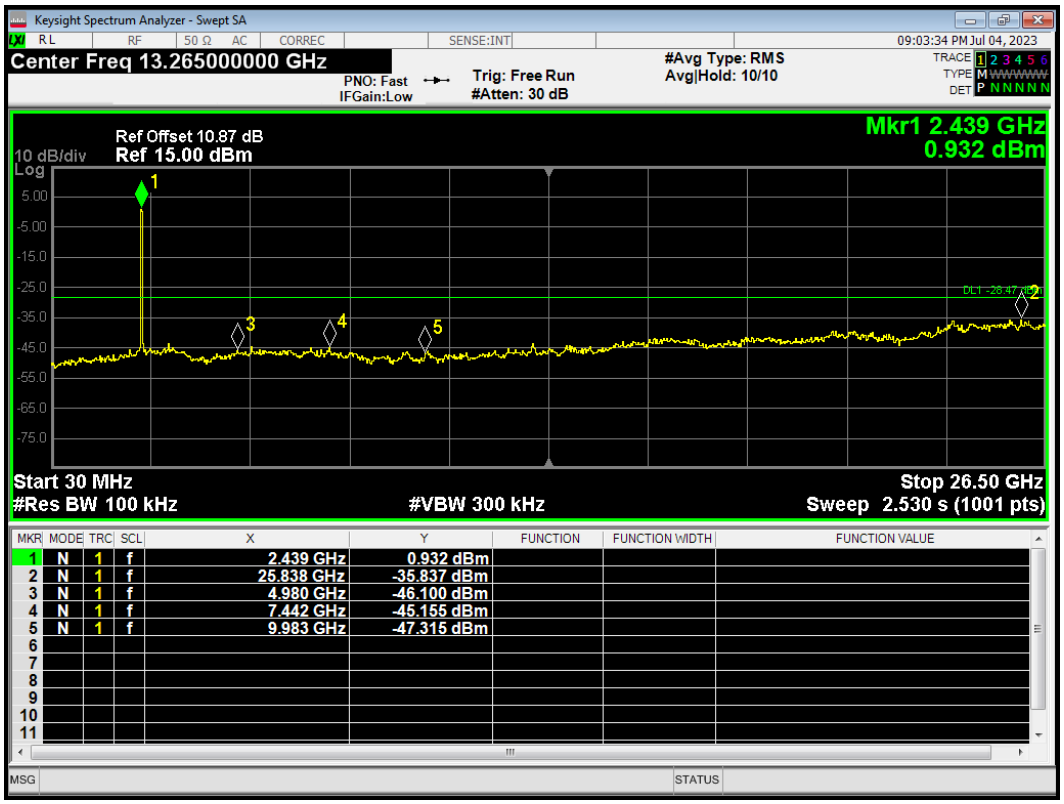
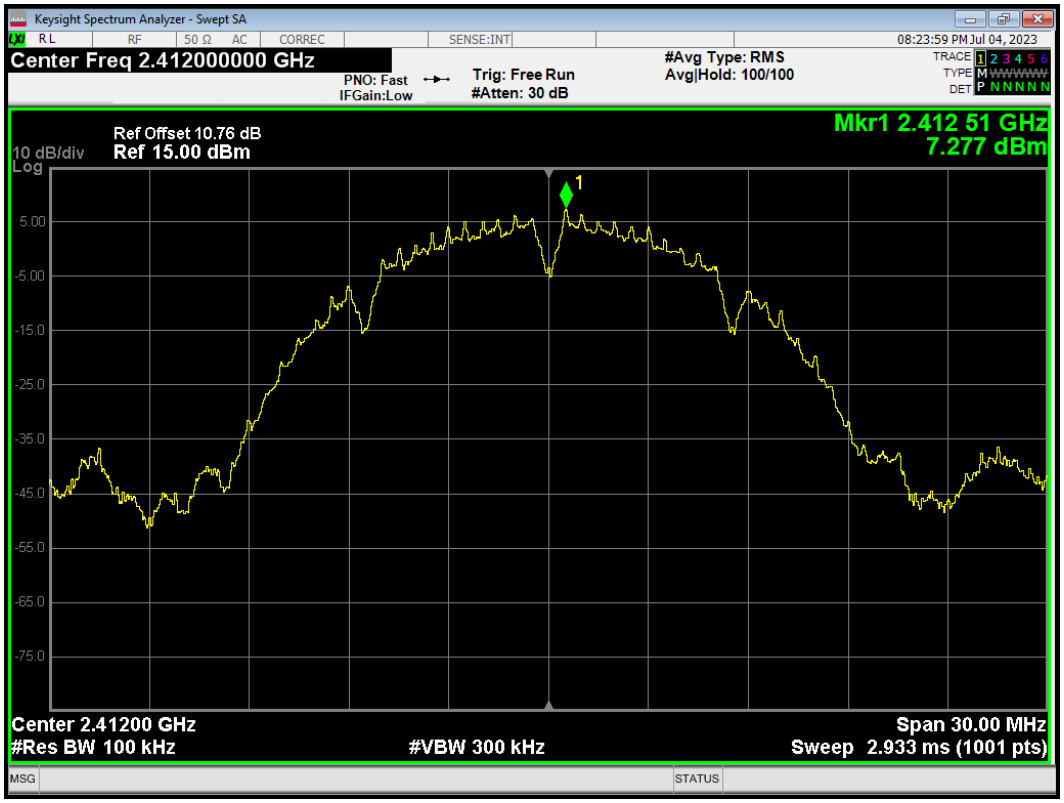
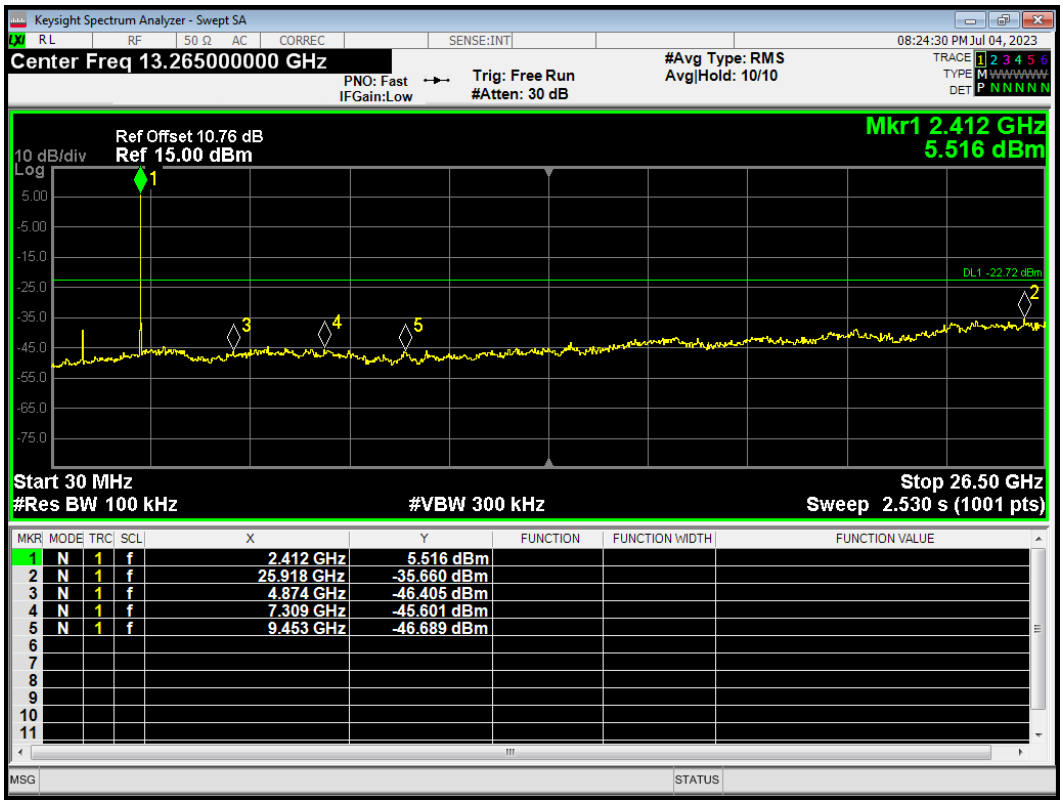


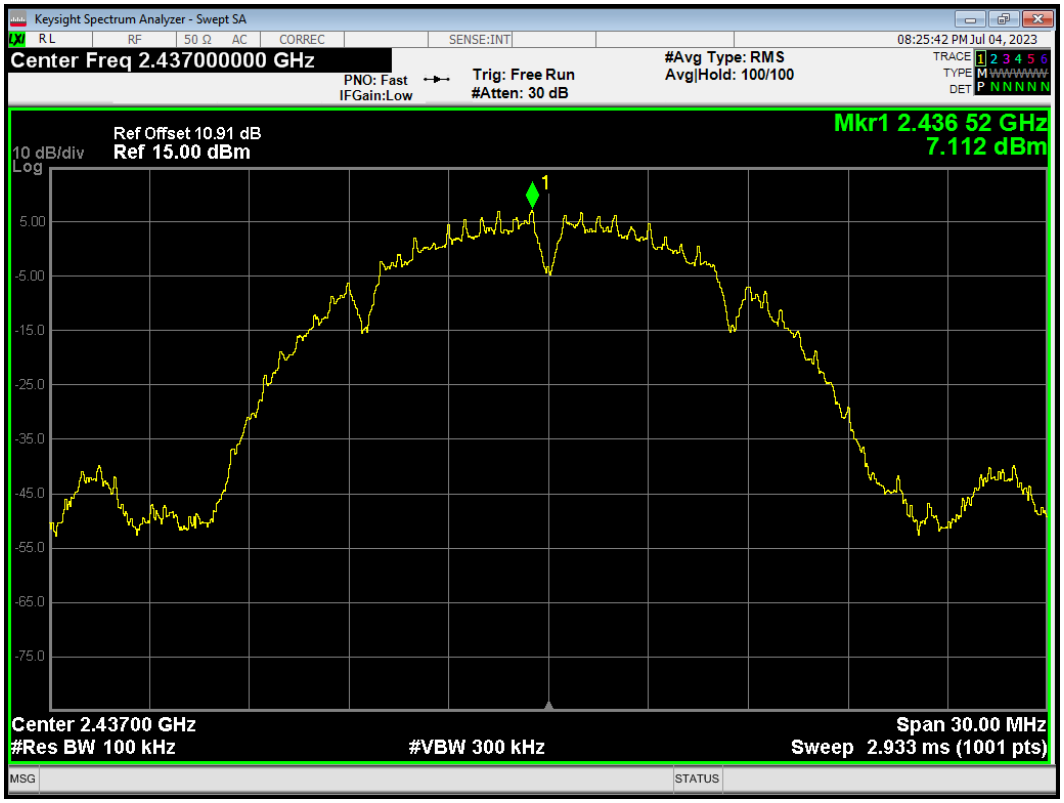
Tx. Spurious 802.11b 2412MHz Ref



Tx. Spurious 802.11b 2412MHz Emission



Tx. Spurious 802.11b 2437MHz Ref



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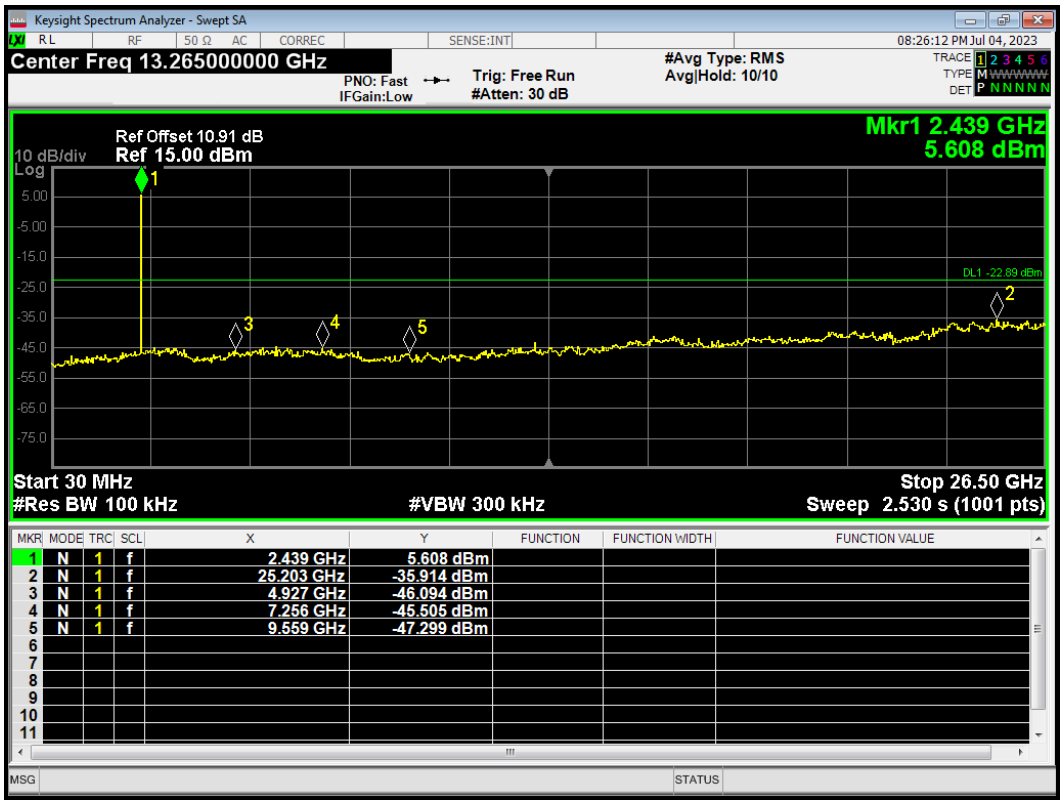

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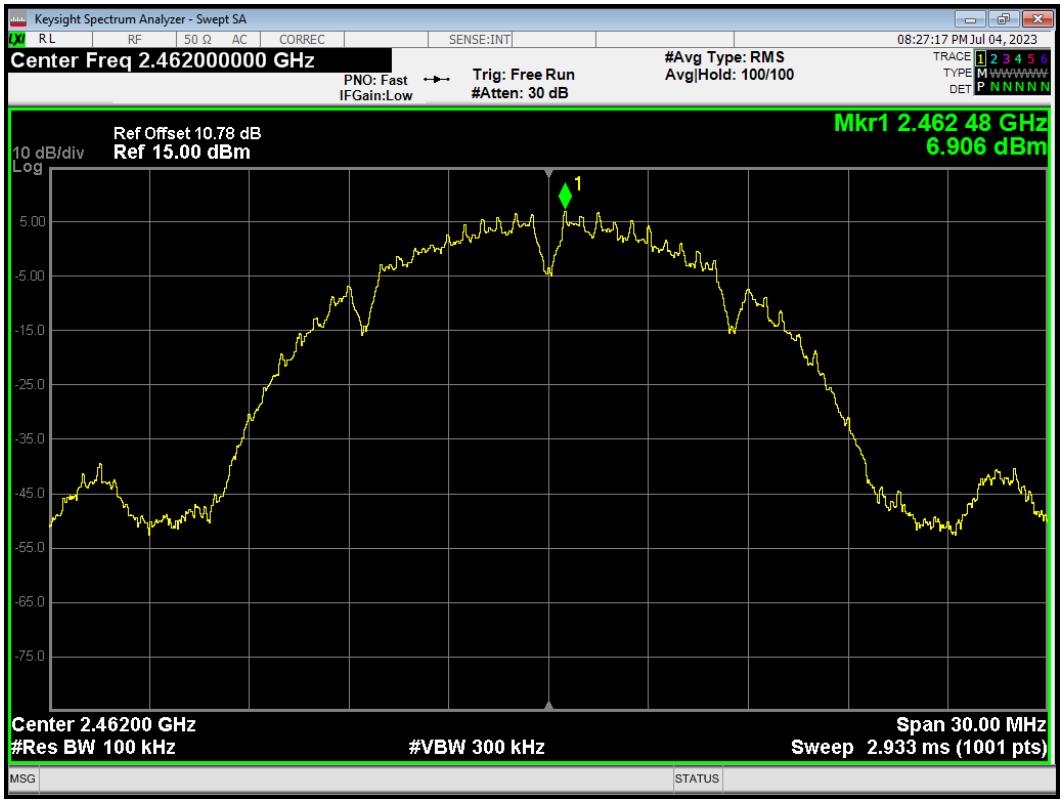

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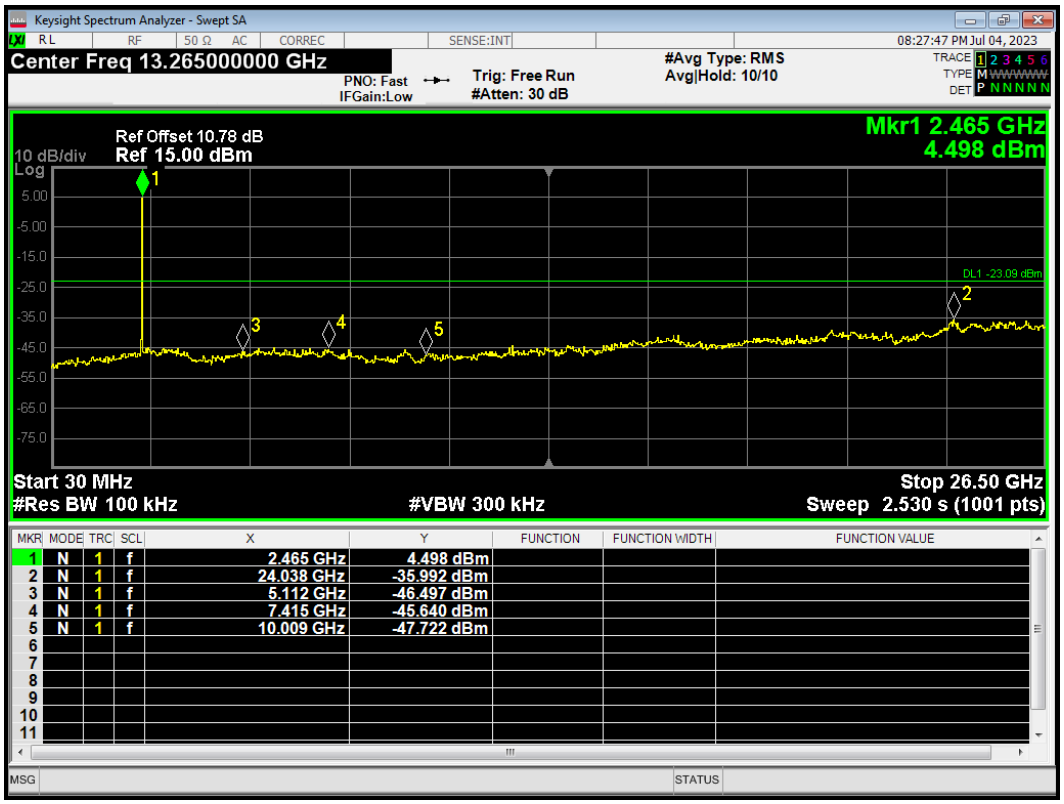

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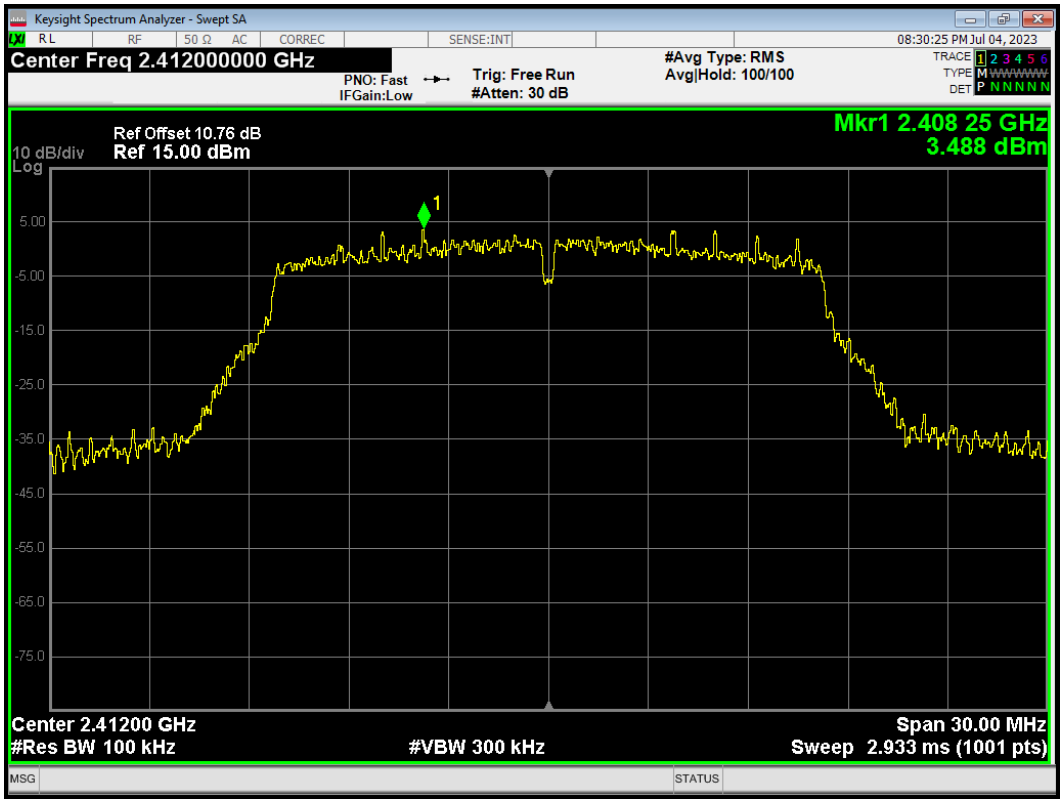

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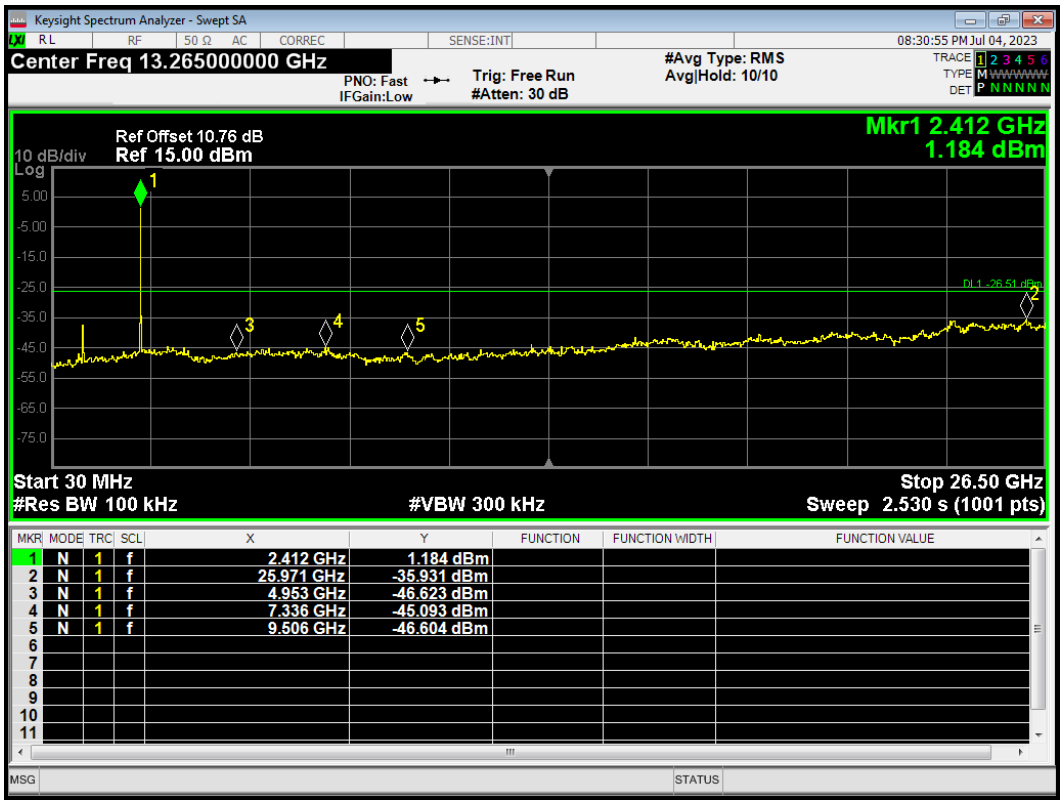

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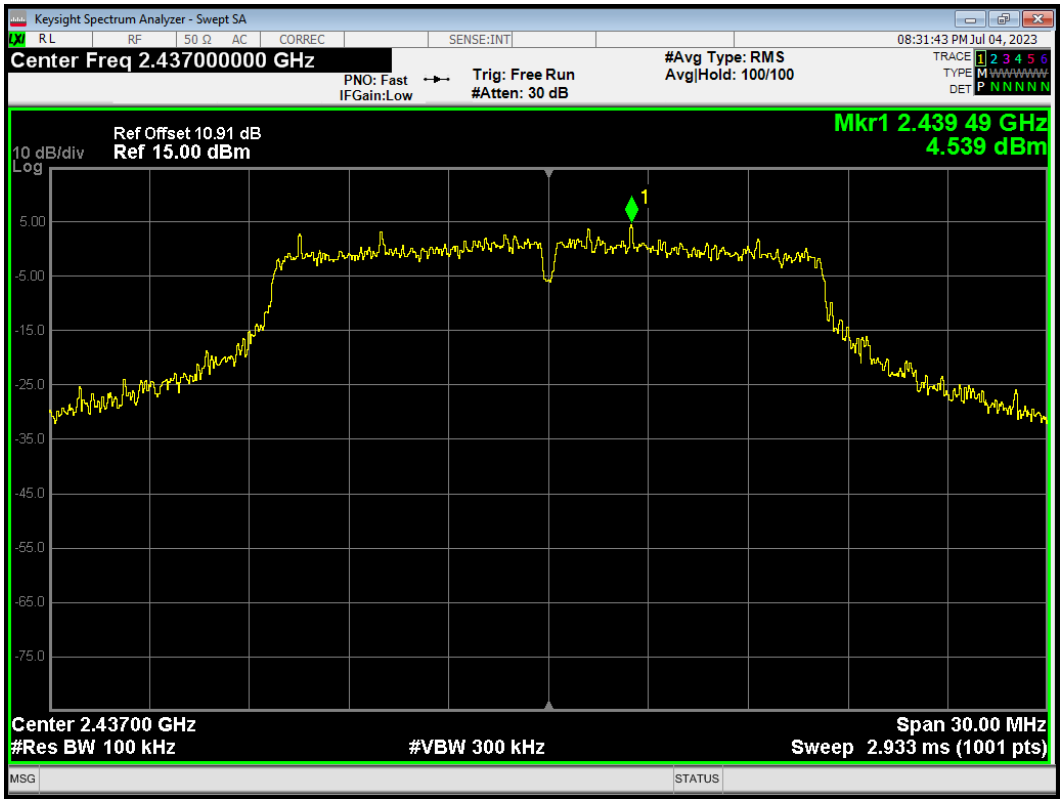

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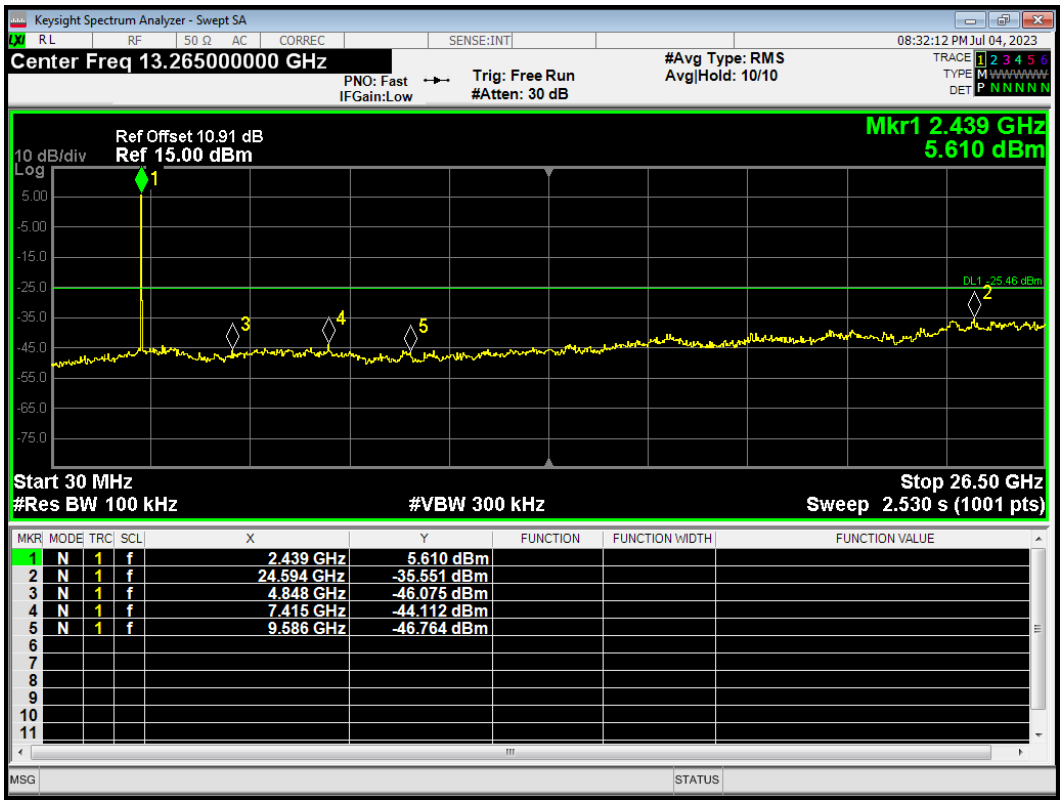

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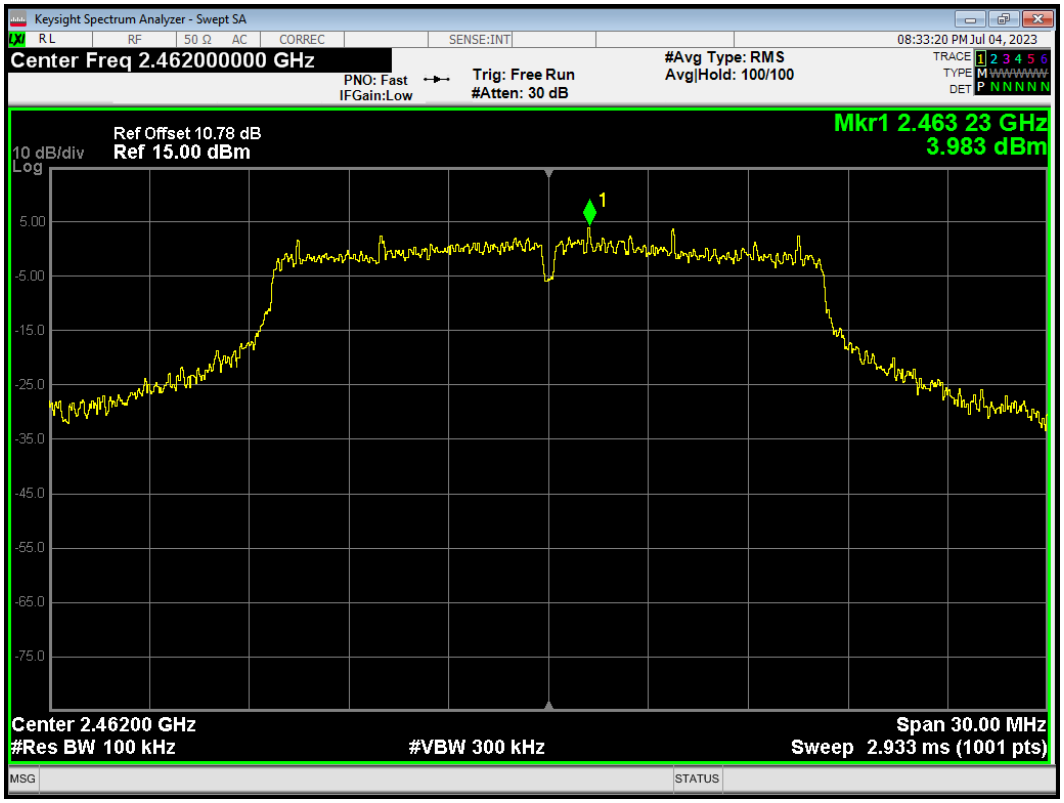

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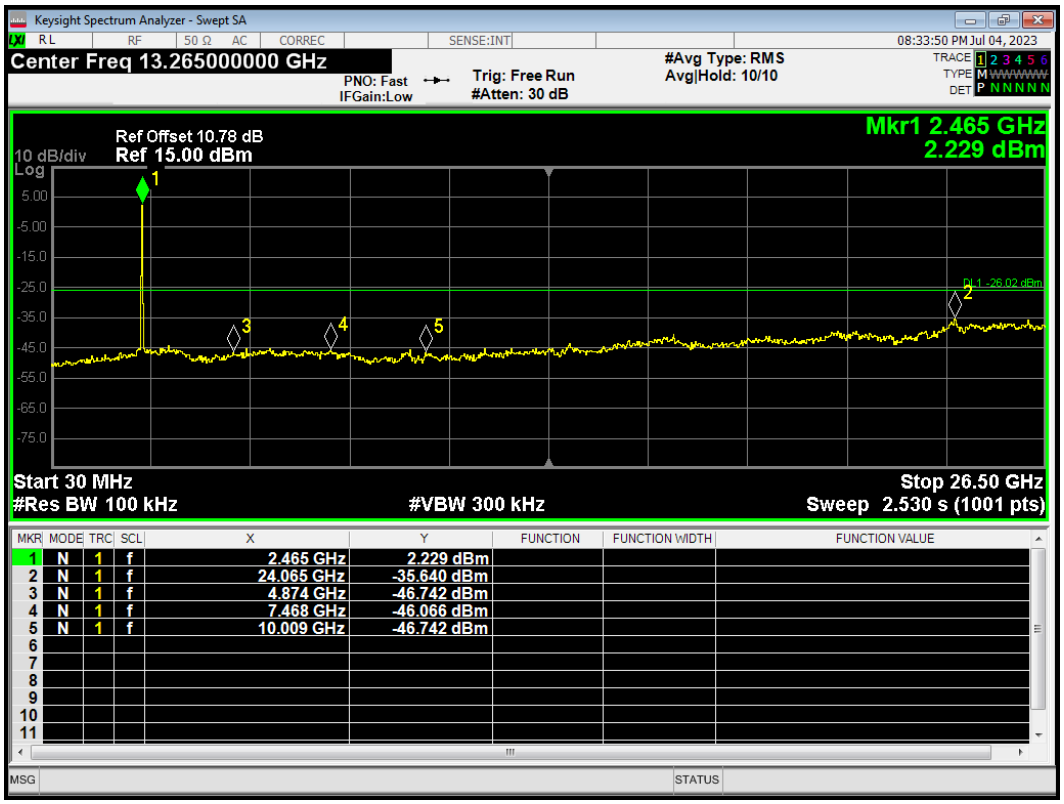
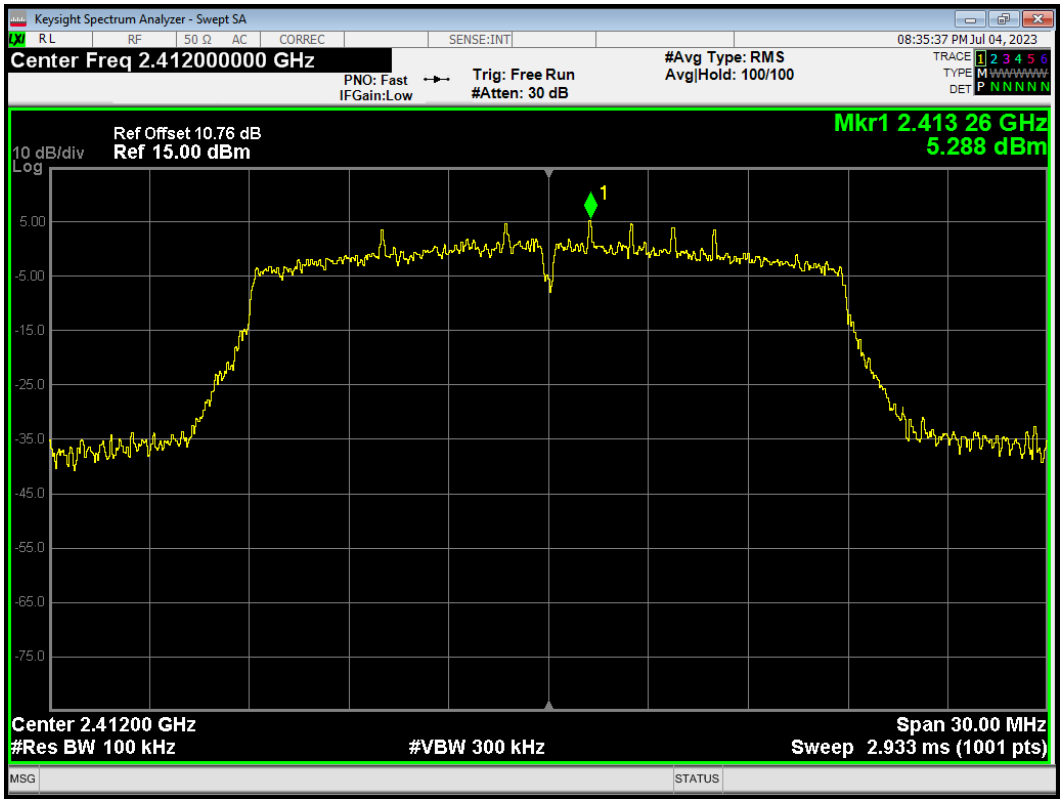


Tx. Spurious 802.11n(HT20) 2412MHz Ref



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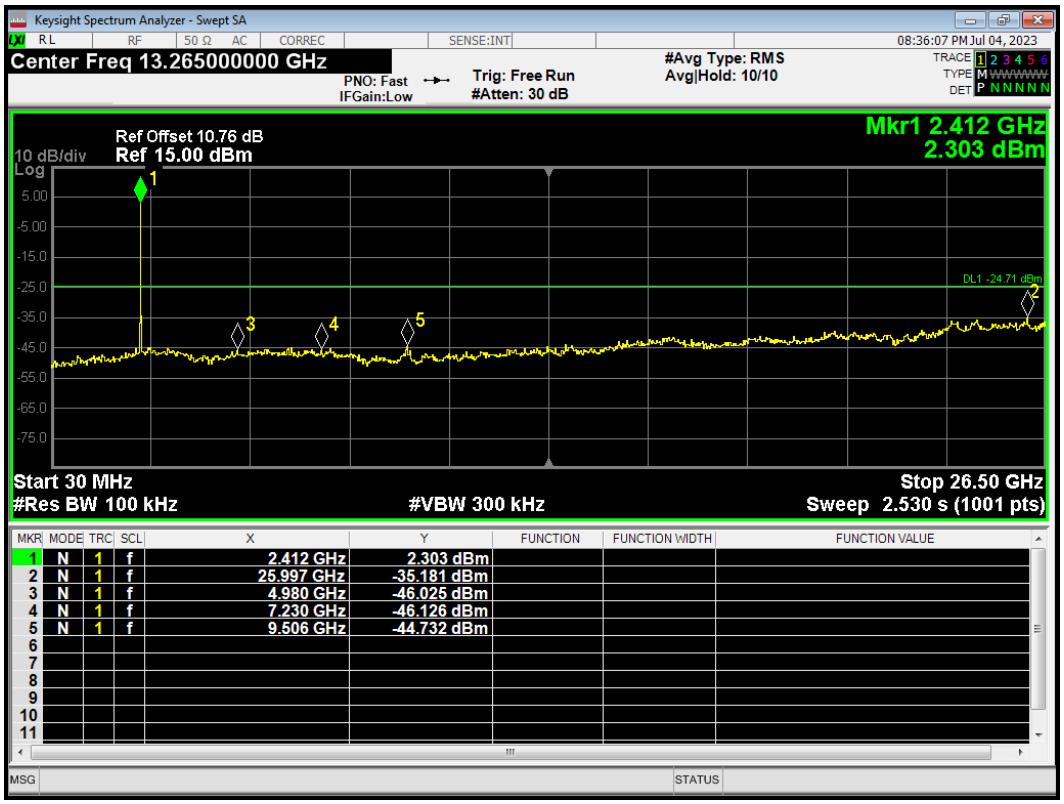

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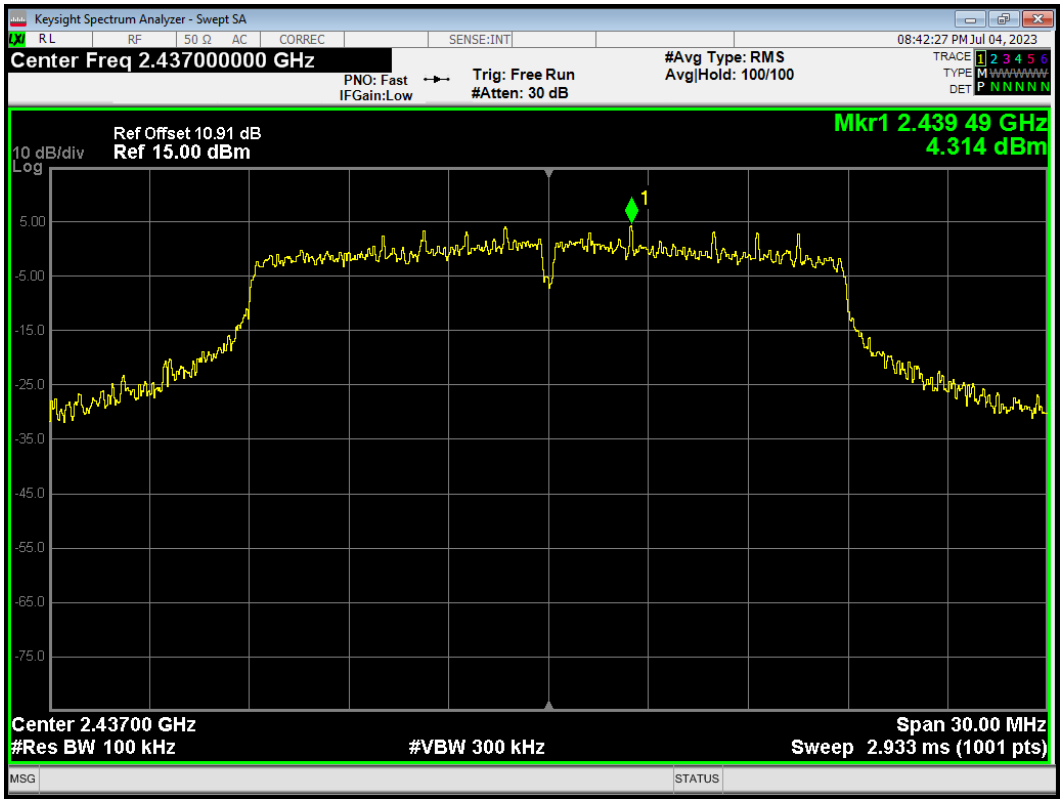

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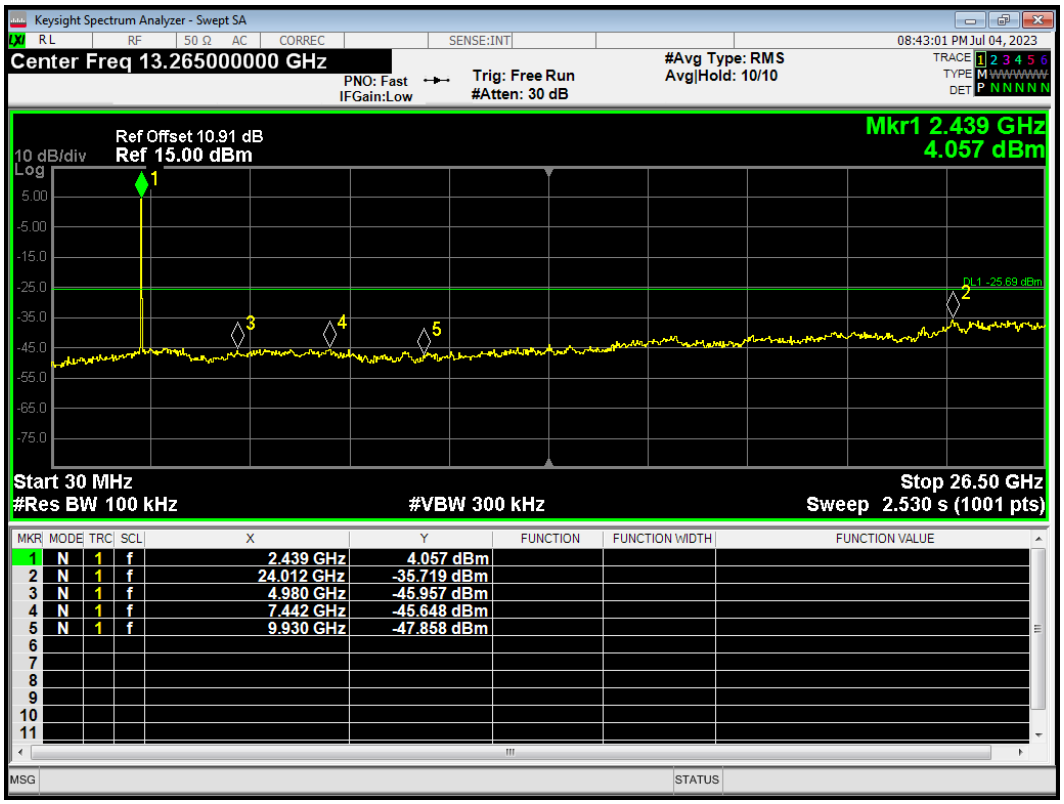

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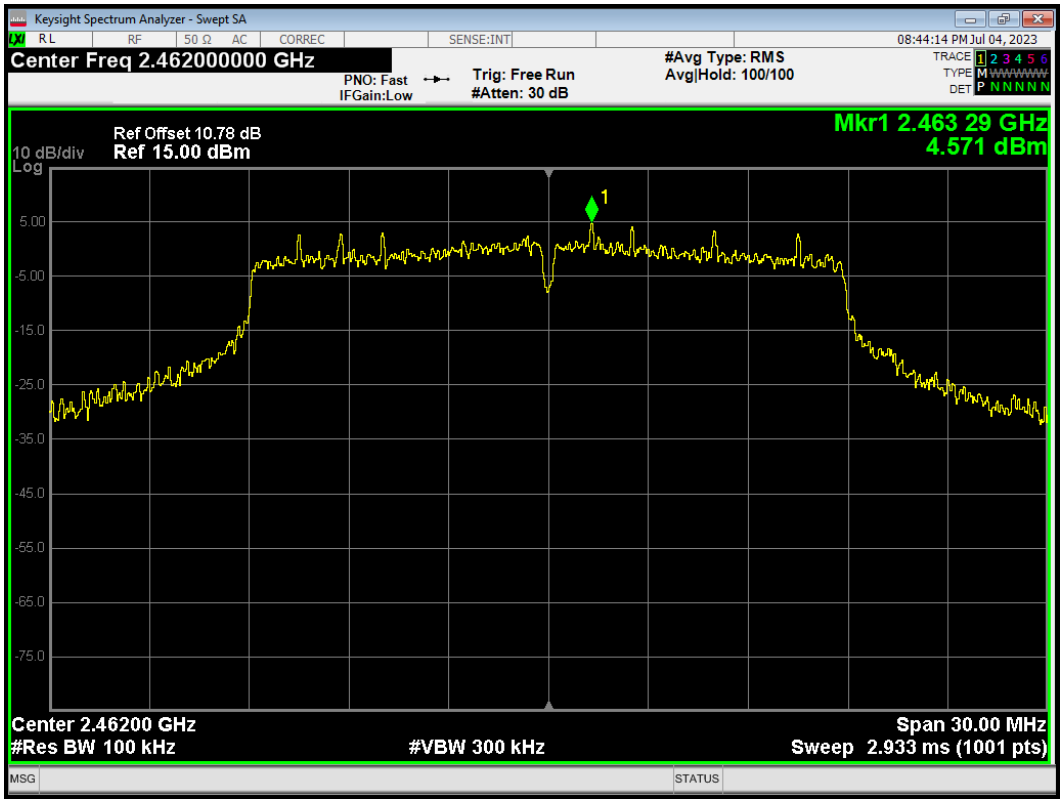

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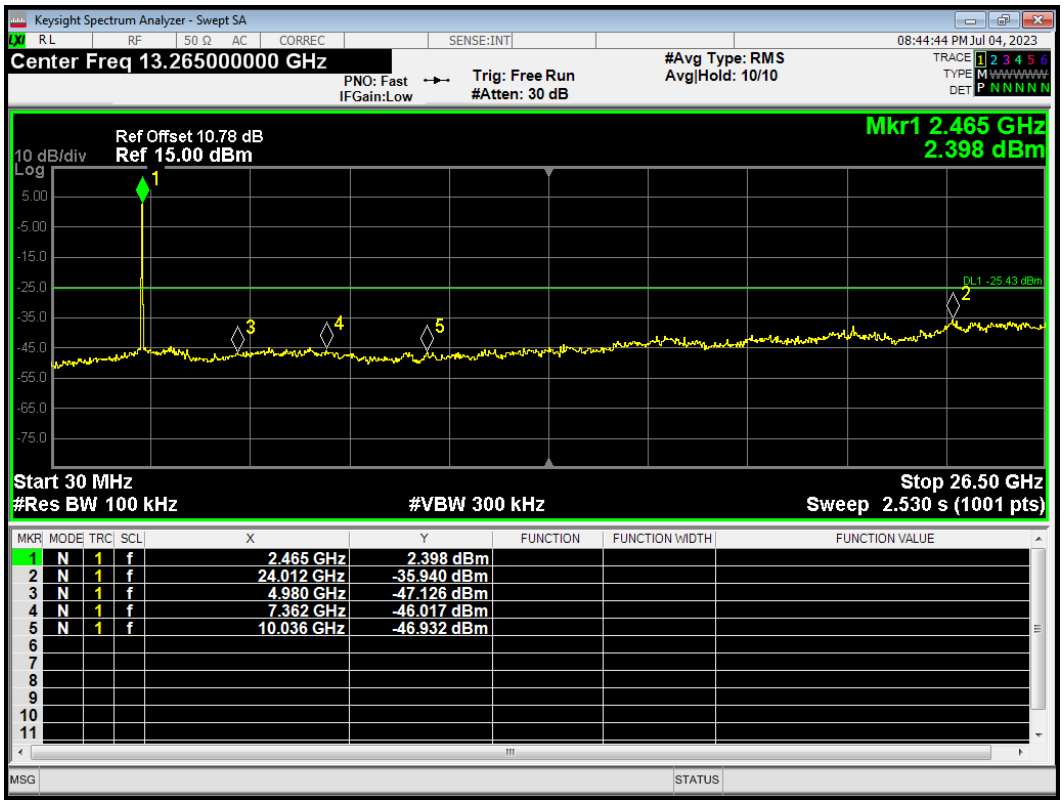
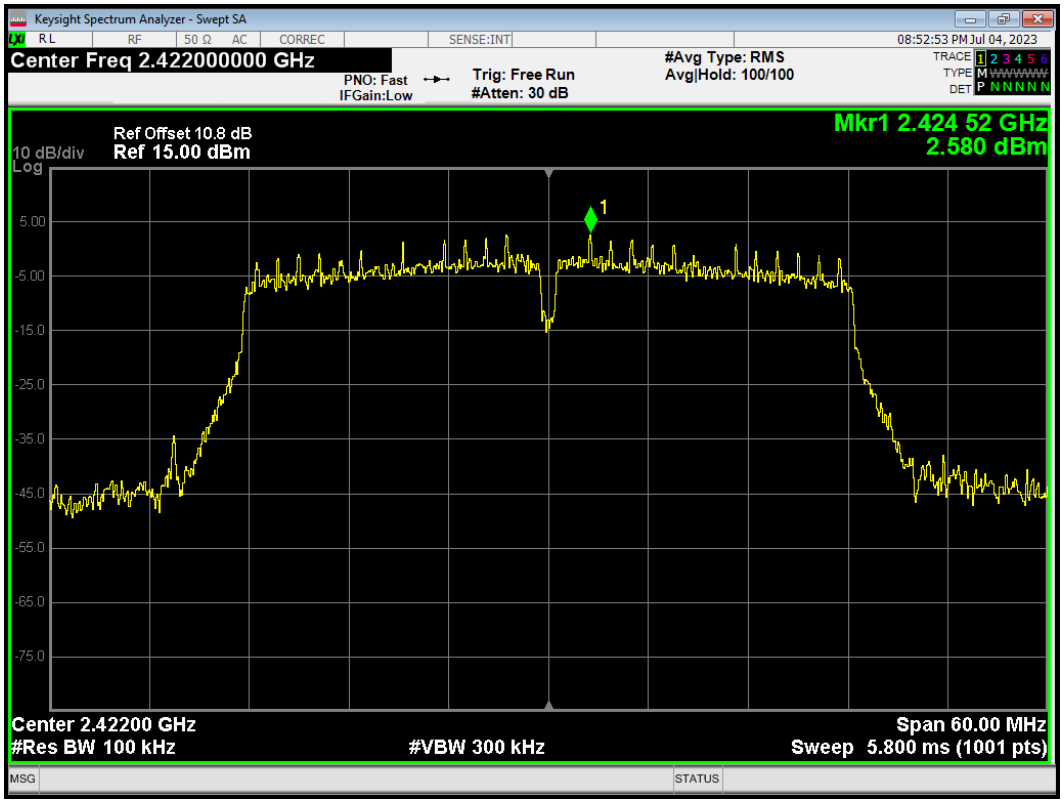
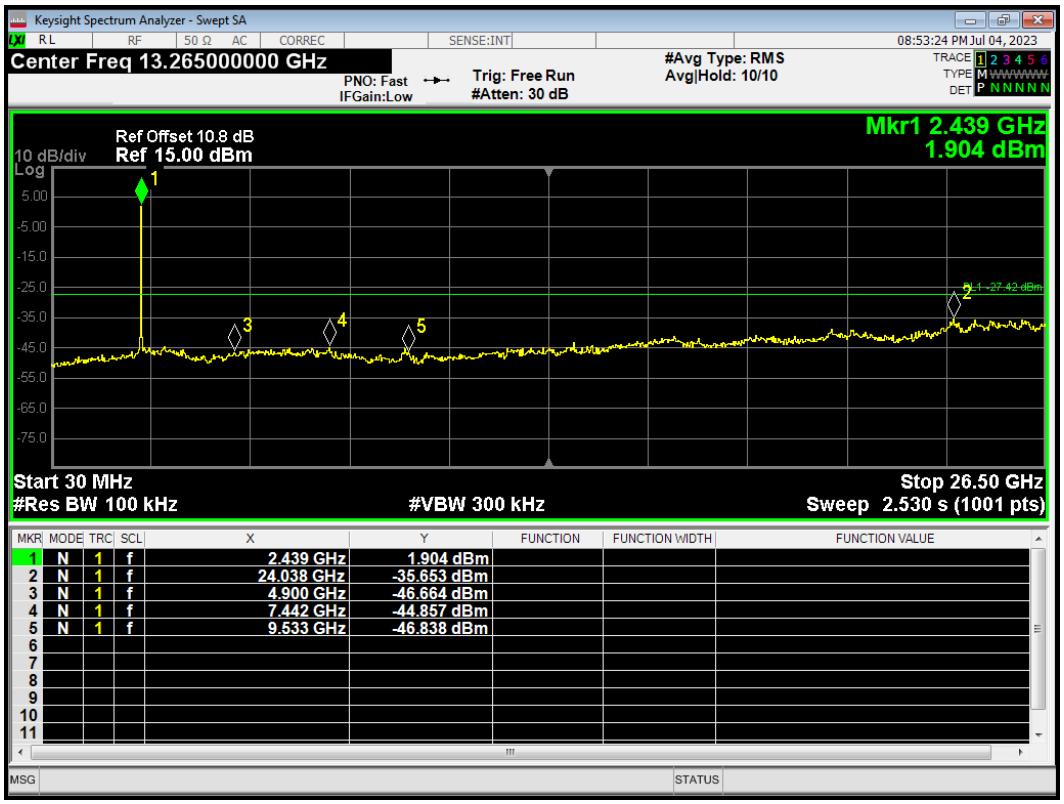


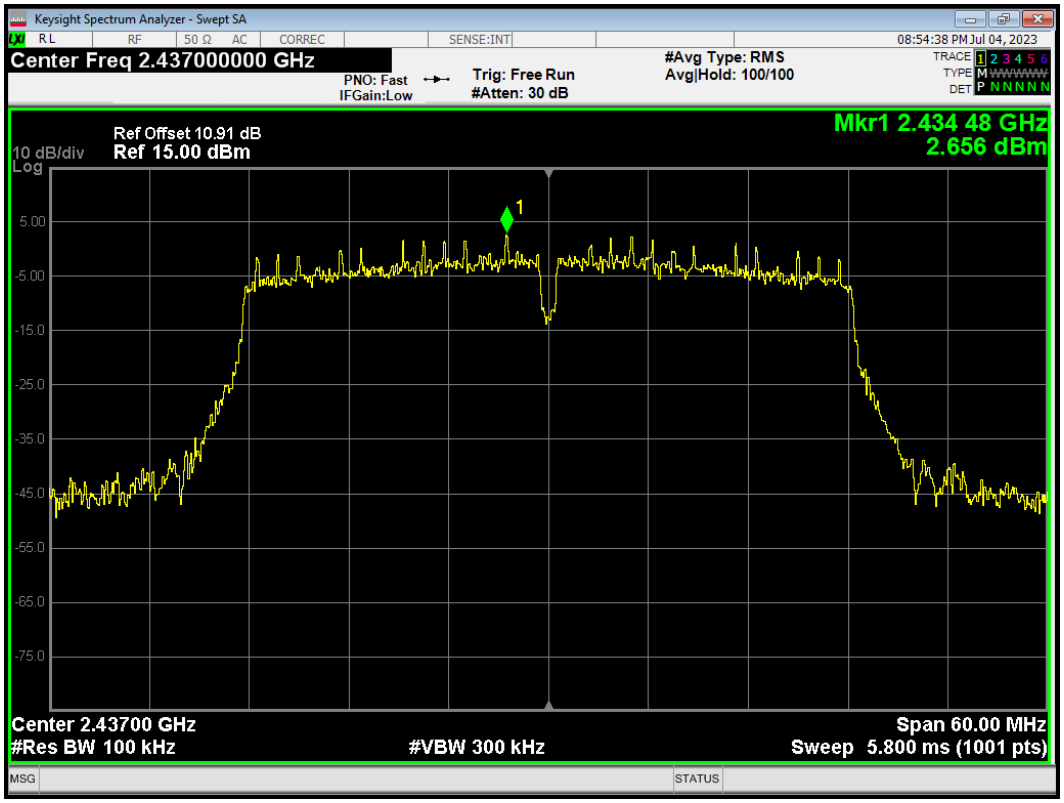
Tx. Spurious 802.11n(HT40) 2422MHz Ref



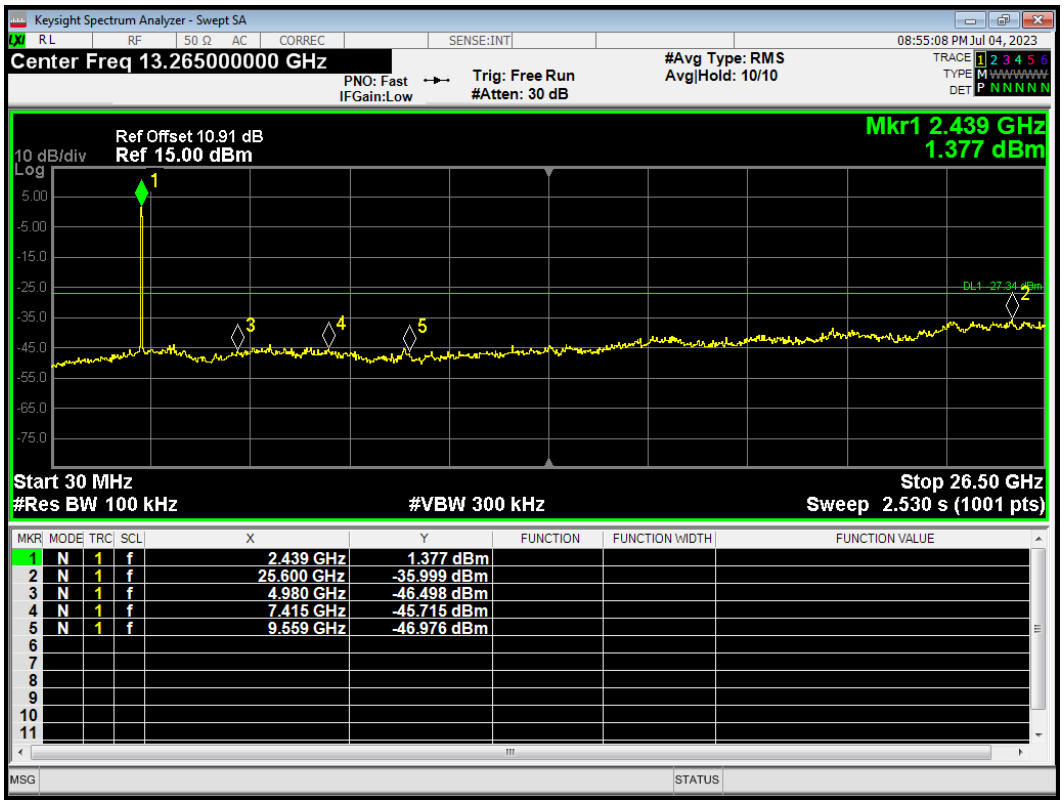
Tx. Spurious 802.11n(HT40) 2422MHz Emission



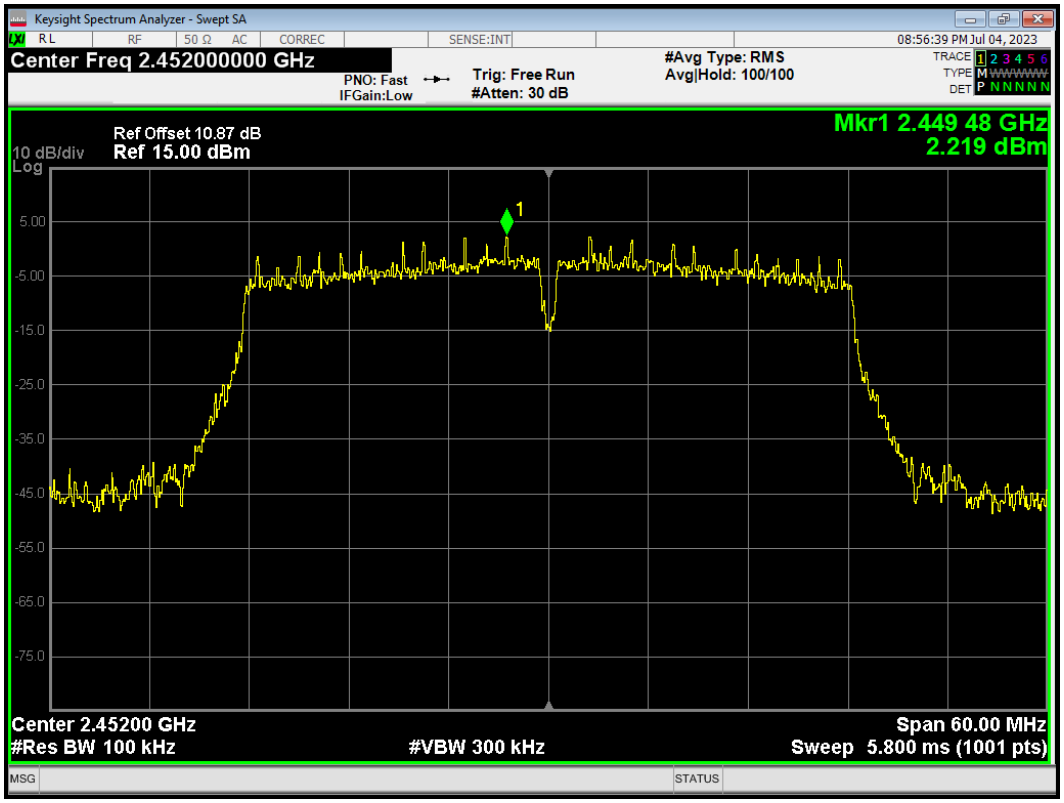
Tx. Spurious 802.11n(HT40) 2437MHz Ref



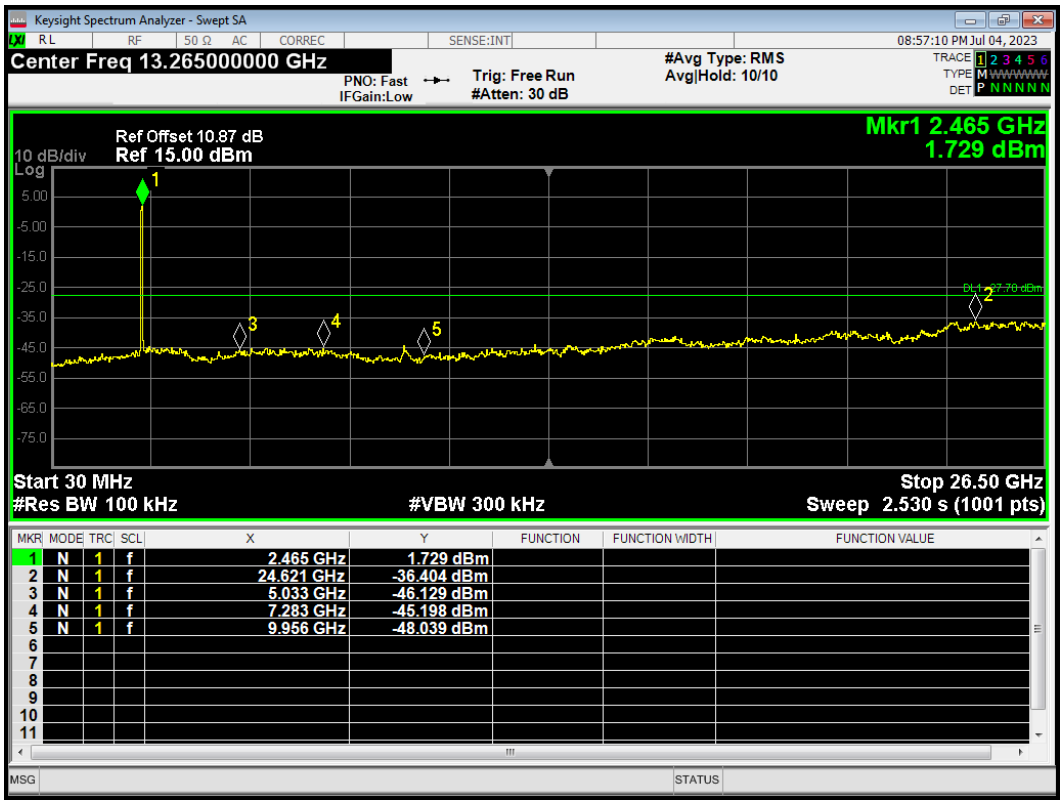
Tx. Spurious 802.11n(HT40) 2437MHz Emission



Tx. Spurious 802.11n(HT40) 2452MHz Ref

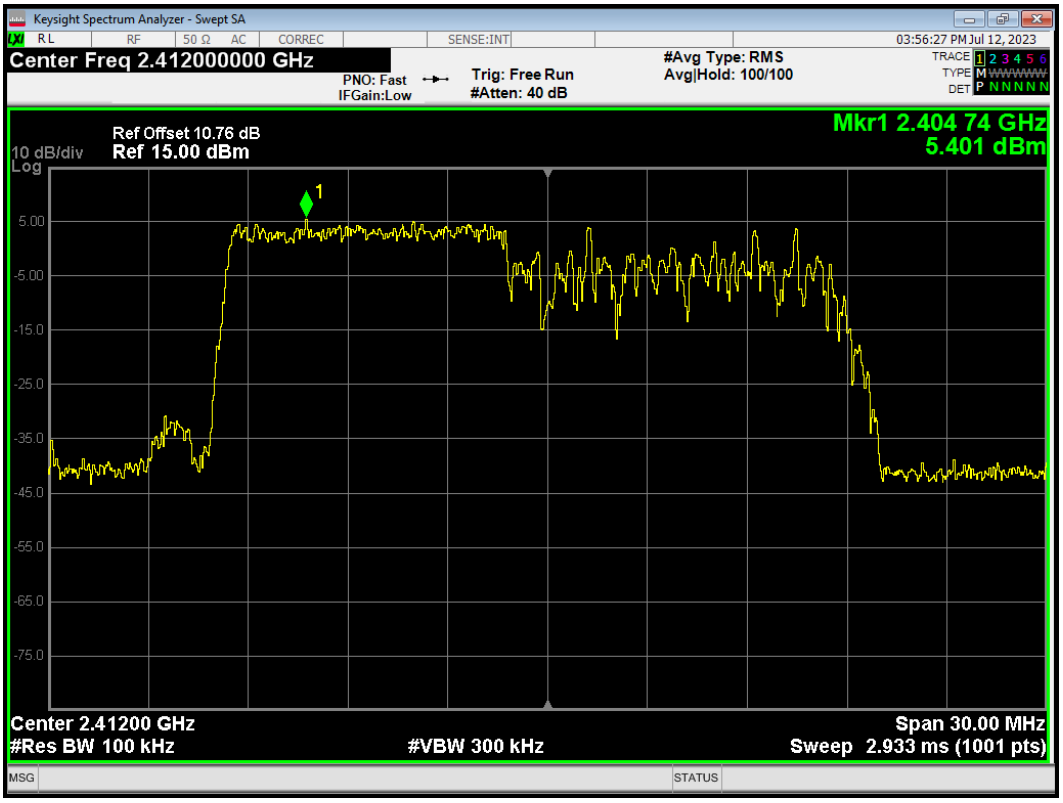


Tx. Spurious 802.11n(HT40) 2452MHz Emission

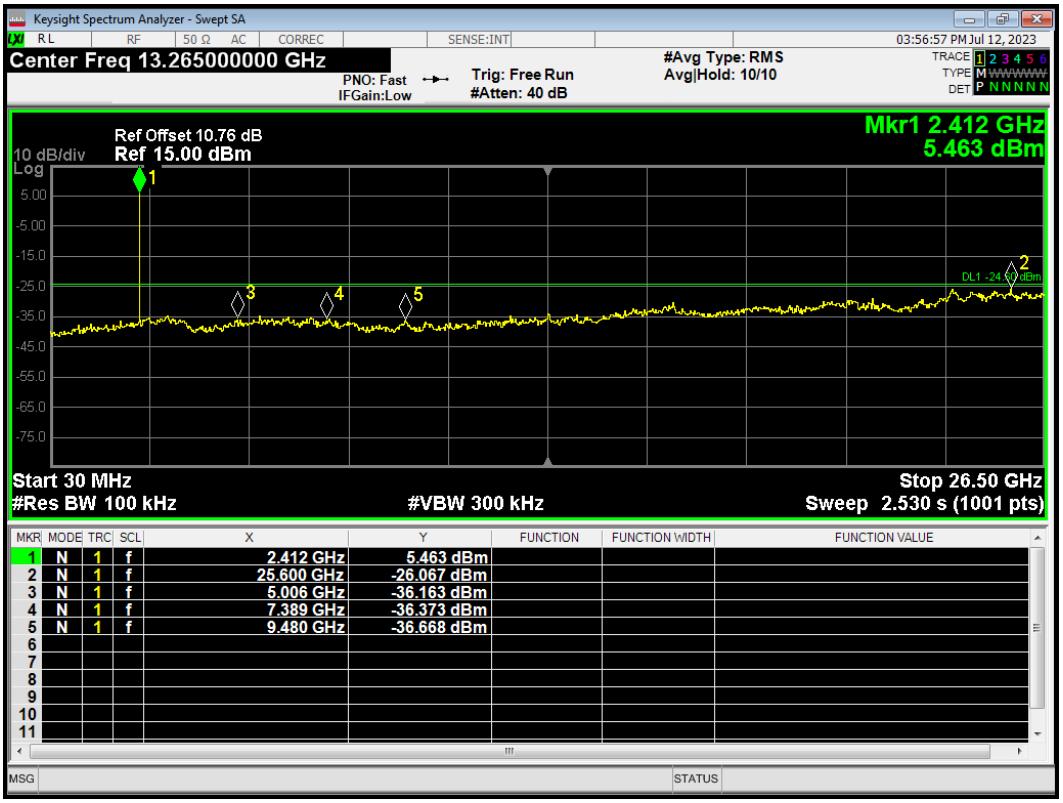


TB Mode

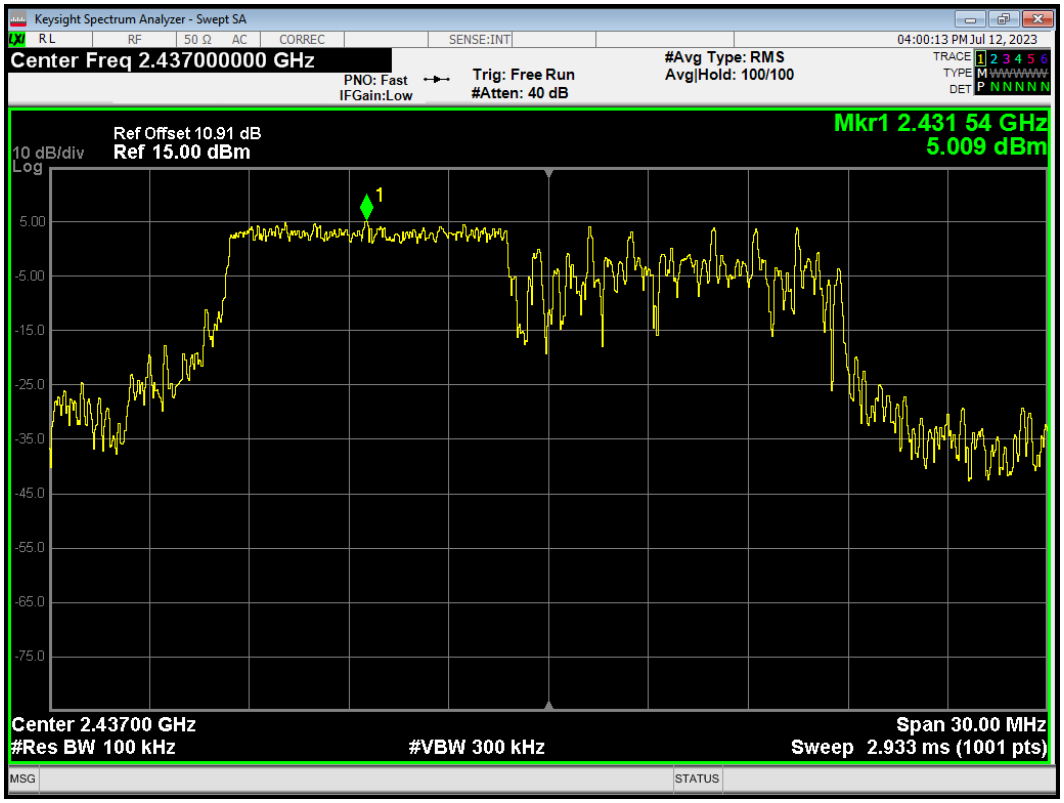
Tx. Spurious 802.11ax (20M) RU106 IDX53 2412MHz Ref



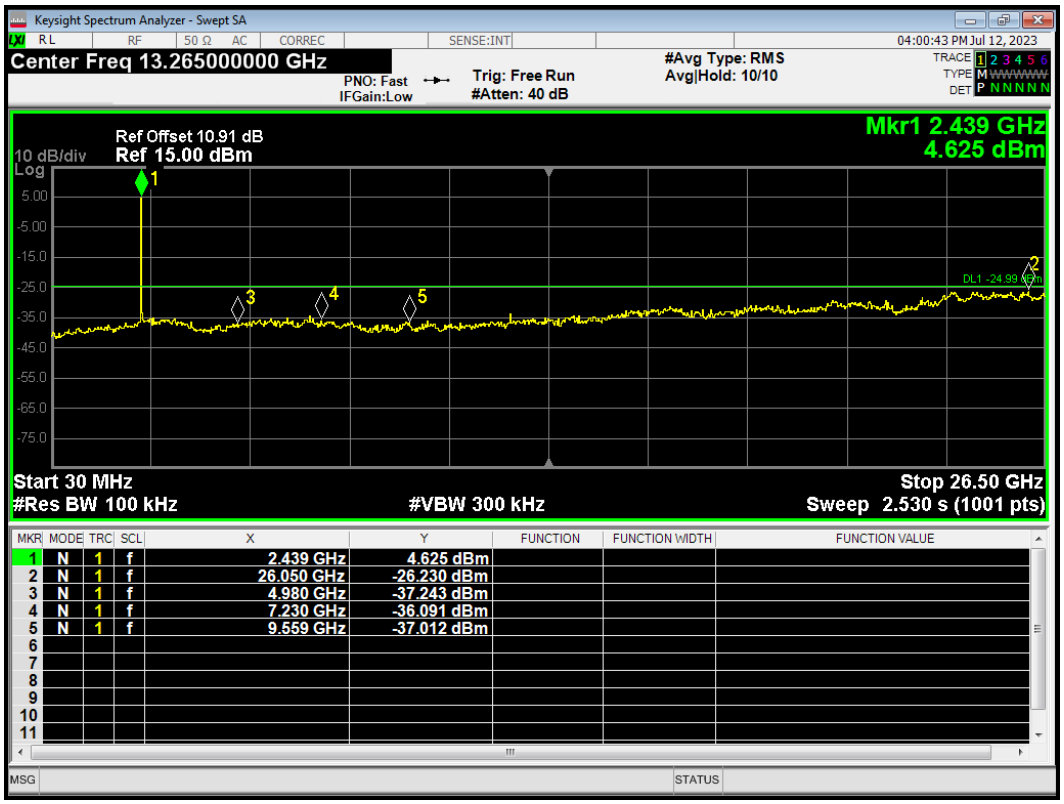
Tx. Spurious 802.11ax (20M) RU106 IDX53 2412MHz Emission



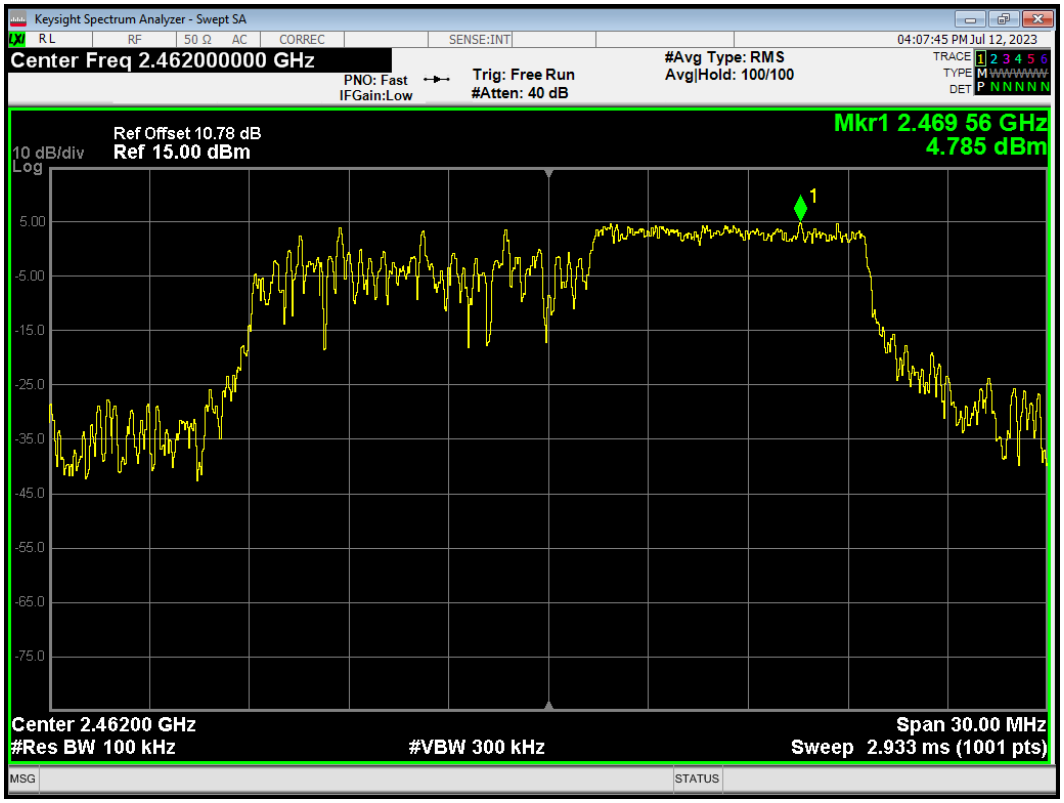
Tx. Spurious 802.11ax (20M) RU106 IDX53 2437MHz Ref



Tx. Spurious 802.11ax (20M) RU106 IDX53 2437MHz Emission



Tx. Spurious 802.11ax (20M) RU106 IDX54 2462MHz Ref



Tx. Spurious 802.11ax (20M) RU106 IDX54 2462MHz Emission