7.8 CONDUCTED BAND EDGE MEASUREMENT

7.8.1 Applicable Standard

According to FCC Part 15.247(d) and ANSI C63.10-2013

7.8.2 Conformance Limit

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. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

7.8.3 Measuring Instruments

The Measuring equipment is listed in the section 6.3 of this test report.

7.8.4 Test Setup

Please refer to Section 6.1 of this test report.

7.8.5 Test Procedure

The testing follows ANSI C63.10-2013 clause 7.8.6.
The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.
The path loss was compensated to the results for each measurement.
Set to the maximum power setting and enable the EUT transmit continuously.
The EUT must have its hopping function enabled.
Use the following spectrum analyzer settings:
Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel
RBW = 100KHz
VBW = 300KHz
Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100kHz RBW. The attenuation shall be 30 dB instead of 20 dB when RMS conducted output power procedure is used.
Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
Repeat above procedures until all measured frequencies were complete.

7.8.6 Test Results

EUT:	Mobile Phone	Model No.:	GQ3097
Temperature:	20 ℃	Relative Humidity:	48%
Test Mode:	Mode2 /Mode4/ Mode 5	Test By:	Mary Hu

Test data reference attachment.

7.9 SPURIOUS RF CONDUCTED EMISSION

7.9.1 Applicable Standard

According to FCC Part 15.247(d) and ANSI C63.10-2013.

7.9.2 Conformance Limit

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. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

7.9.3 Measuring Instruments

The Measuring equipment is listed in the section 6.3 of this test report.

7.9.4 Test Setup

Please refer to Section 6.1 of this test report.

7.9.5 Test Procedure

Establish an emission level by using the following procedure:
a) Set the center frequency and span to encompass frequency range to be measured.
b) Set the RBW = 100 kHz.
c) Set the VBW ≥ [3 × RBW].
d) Detector = peak.
e) Sweep time = auto couple.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use the peak marker function to determine the maximum amplitude level.
Then the limit shall be attenuated by at least 20 dB relative to the maximum amplitude level in 100 kHz.

7.9.6 Test Results

Remark: The measurement frequency range is from 30MHzHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and bandege measurement data.

Test data reference attachment.

7.10 **ANTENNA APPLICATION**

7.10.1 Antenna Requirement

15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

7.10.2 Result

The EUT antenna is permanent attached PIFA antenna (Gain: 1.8dBi). It comply with the standard requirement.

7.11 FREQUENCY HOPPING SYSTEM (FHSS) EQUIPMENT REQUIREMENTS

7.11.1 Standard Applicable

According to FCC Part 15.247(a)(1), The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals. (g) Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section. (h) The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

7.11.2 Frequency Hopping System

This transmitter device is frequency hopping device, and complies with FCC part 15.247 rule. This device uses Bluetooth radio which operates in 2400-2483.5 MHz band. Bluetooth uses a radio technology called frequency-hopping spread spectrum, which chops up the data being sent and transmits chunks of it on up to 79 bands (1 MHz each; centred from 2402 to 2480 MHz) in the range 2,400-2,483.5 MHz. The transmitter switches hop frequencies 1,600 times per second to assure a high degree of data security. All Bluetooth devices participating in a given piconet are synchronized to the frequency-hopping channel for the piconet. The frequency hopping sequence is determined by the master's device address and the phase of the hopping sequence (the frequency to hop at a specific time) is determined by the master's internal clock. Therefore, all slaves in a piconet must know the master's device address and must synchronize their clocks with the master's clock. Adaptive Frequency Hopping (AFH) was introduced in the Bluetooth specification to provide an effective way for a Bluetooth radio to counteract normal interference. AFH identifies "bad" channels, where either other wireless devices are interfering with the Bluetooth signal or the Bluetooth signal is interfering with another device. The AFH-enabled Bluetooth device will then communicate with other devices within its piconet to share details of any identified bad channels. The devices will then switch to alternative available "good" channels, away from the areas of interference, thus having no impact on the bandwidth used.
This device was tested with an bluetooth system receiver to check that the device maintained hopping synchronization, and the device complied with these requirements for FCC Part 15.247 rule.

7.11.3 EUT Pseudorandom Frequency Hopping Sequence

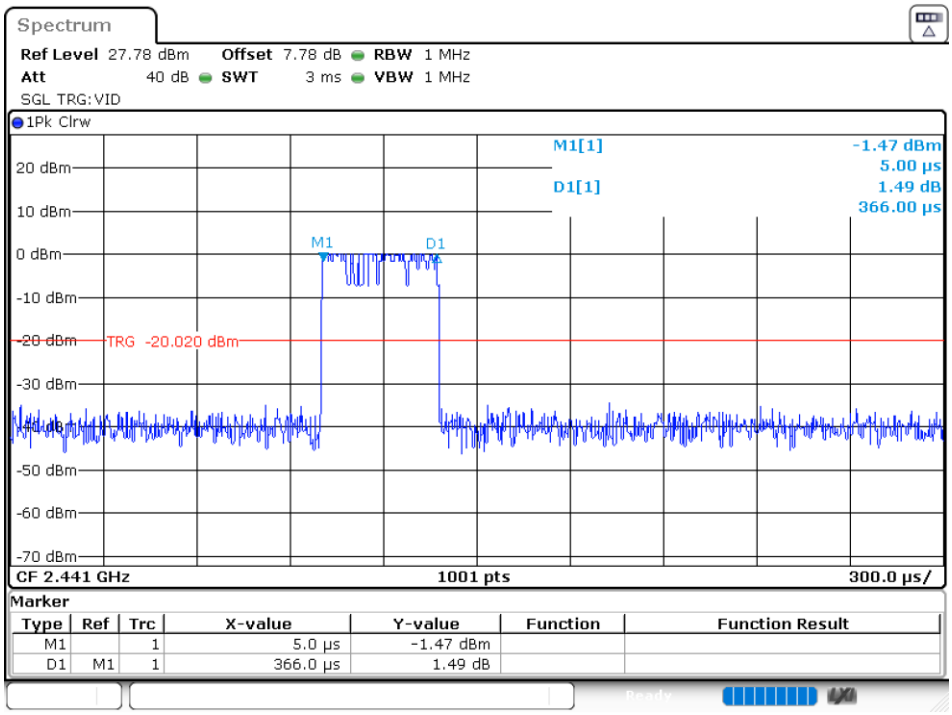
Pseudorandom Frequency Hopping Sequence Table as below: Channel: 08, 24, 40, 56, 40, 56, 72, 09, 01, 09, 33, 41, 33, 41, 65, 73, 53, 69, 06, 22, 04, 20, 36, 52, 38, 46, 70, 78, 68, 76, 21, 29, 10, 26, 42, 58, 44, 60, 76, 13, 03, 11, 35, 43, 37, 45, 69, 77, 55, 71, 08, 24, 08, 24, 40, 56, 40, 48, 72, 01, 72, 01, 25, 33, 12, 28, 44, 60, 42, 58, 74, 11, 05, 13, 37, 45 etc.
The system receiver have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

8 TEST RESULTS

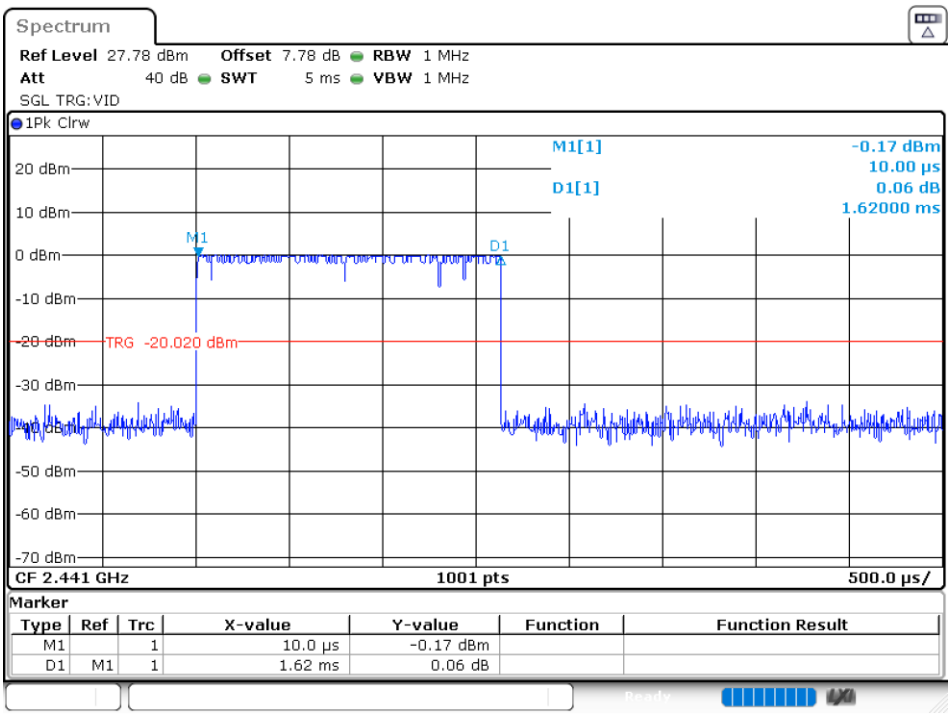
8.1 DWELL TIME

Condition	Mode	Frequency (MHz)	Pulse Time (ms)	Total Dwell Time (ms)	Period Time (ms)	Limit (ms)	Verdict
NVNT	1-DH1	2441	0.366	117.12	31600	400	Pass
NVNT	1-DH3	2441	1.62	259.2	31600	400	Pass
NVNT	1-DH5	2441	2.872	306.347	31600	400	Pass
NVNT	2-DH1	2441	0.381	121.92	31600	400	Pass
NVNT	2-DH3	2441	1.63	260.8	31600	400	Pass
NVNT	2-DH5	2441	2.872	306.347	31600	400	Pass
NVNT	3-DH1	2441	0.375	120	31600	400	Pass
NVNT	3-DH3	2441	1.62	259.2	31600	400	Pass
NVNT	3-DH5	2441	2.872	306.347	31600	400	Pass

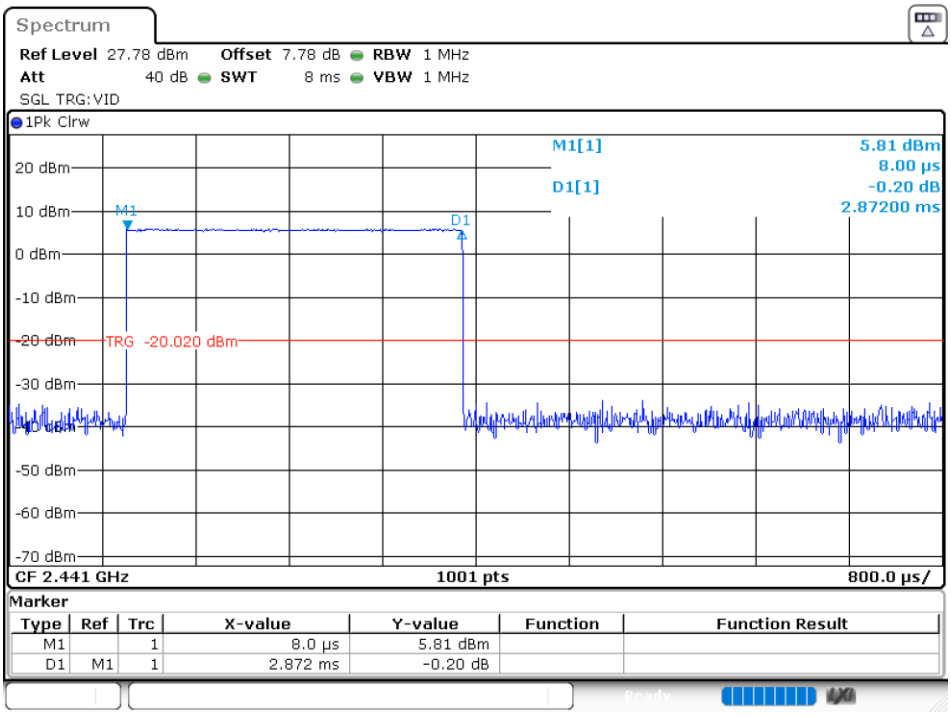
Dwell NVNT 1-DH1 2441MHz



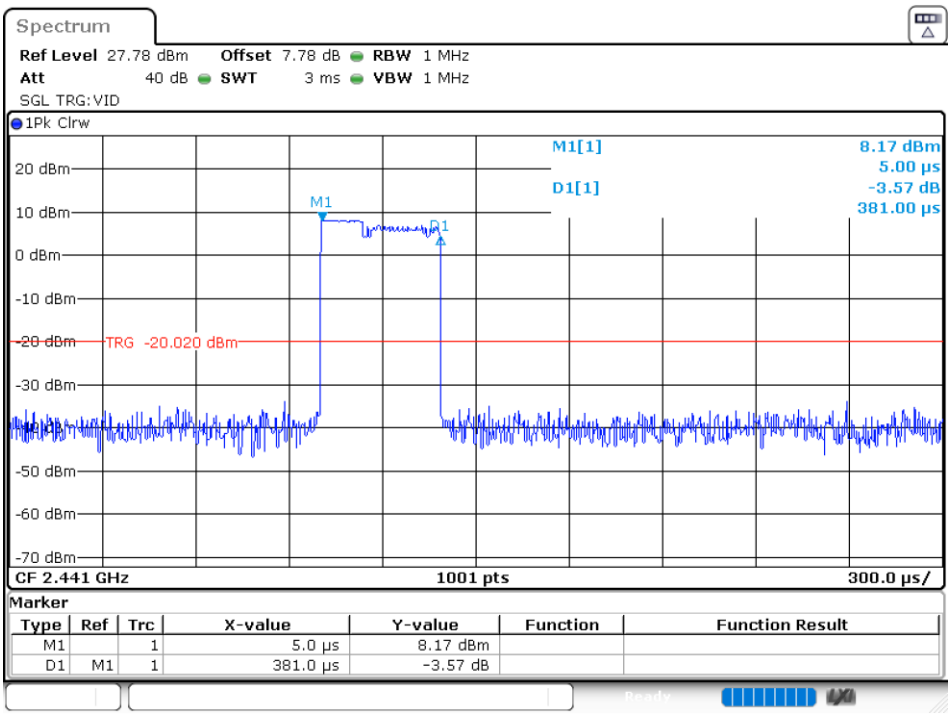
Dwell NVNT 1-DH3 2441MHz



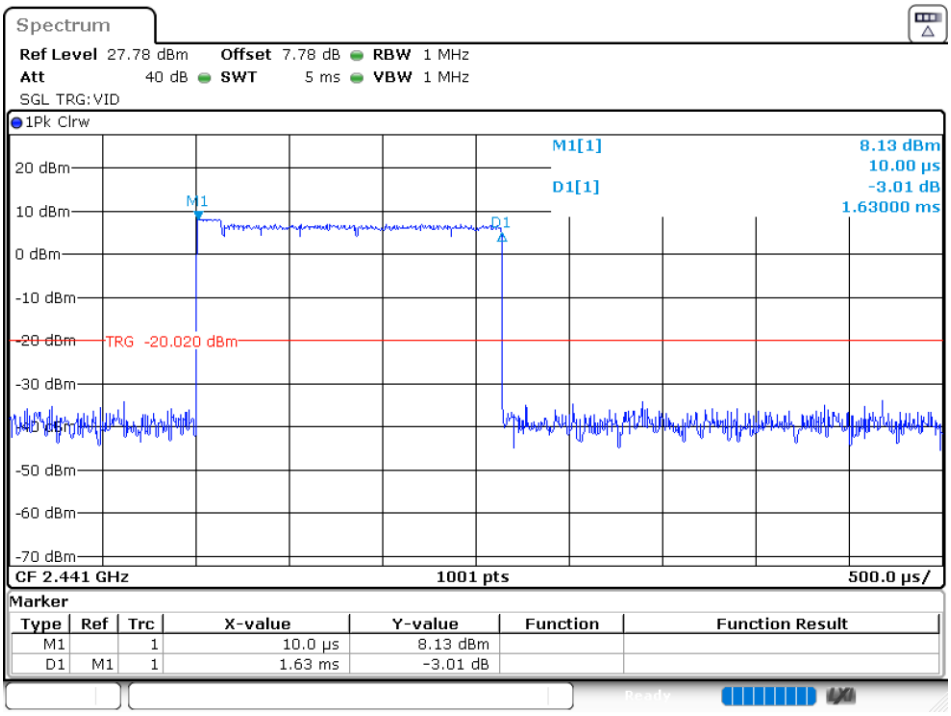
Dwell NVNT 1-DH5 2441MHz



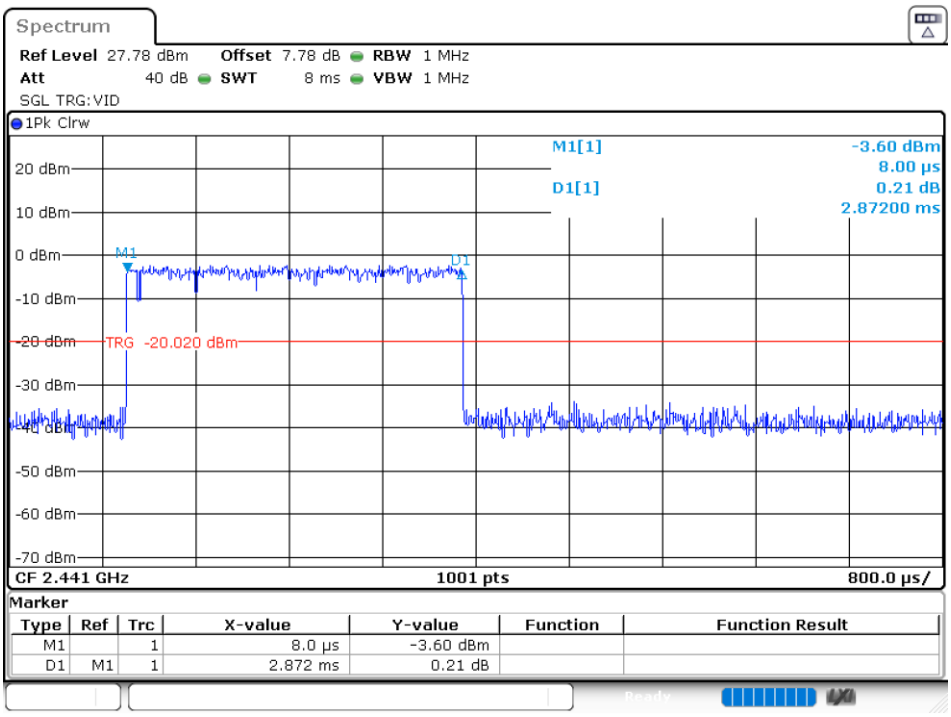
Dwell NVNT 2-DH1 2441MHz



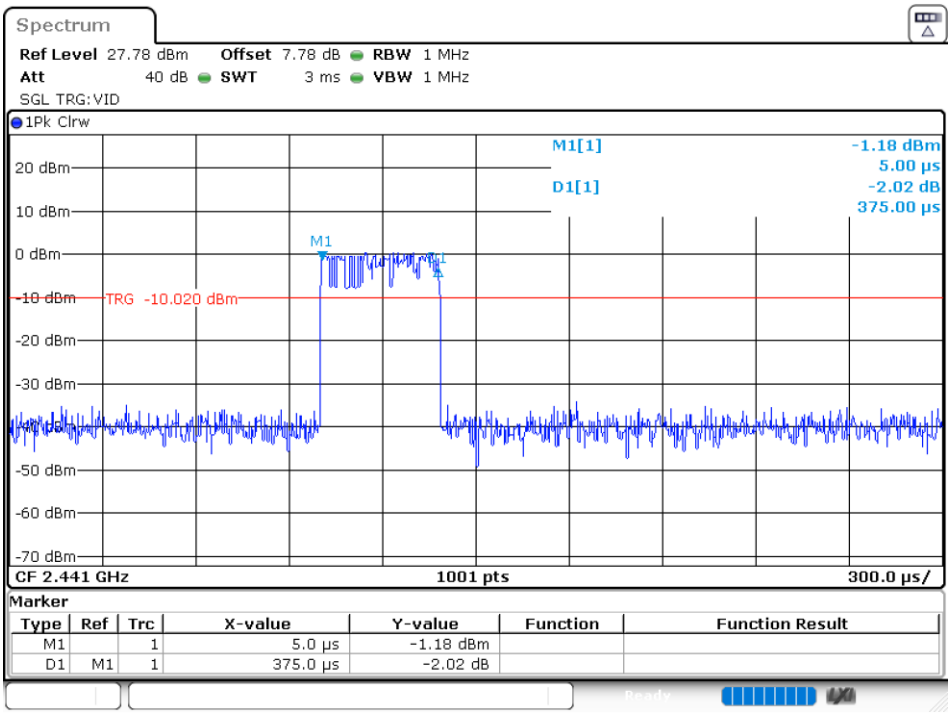
Dwell NVNT 2-DH3 2441MHz



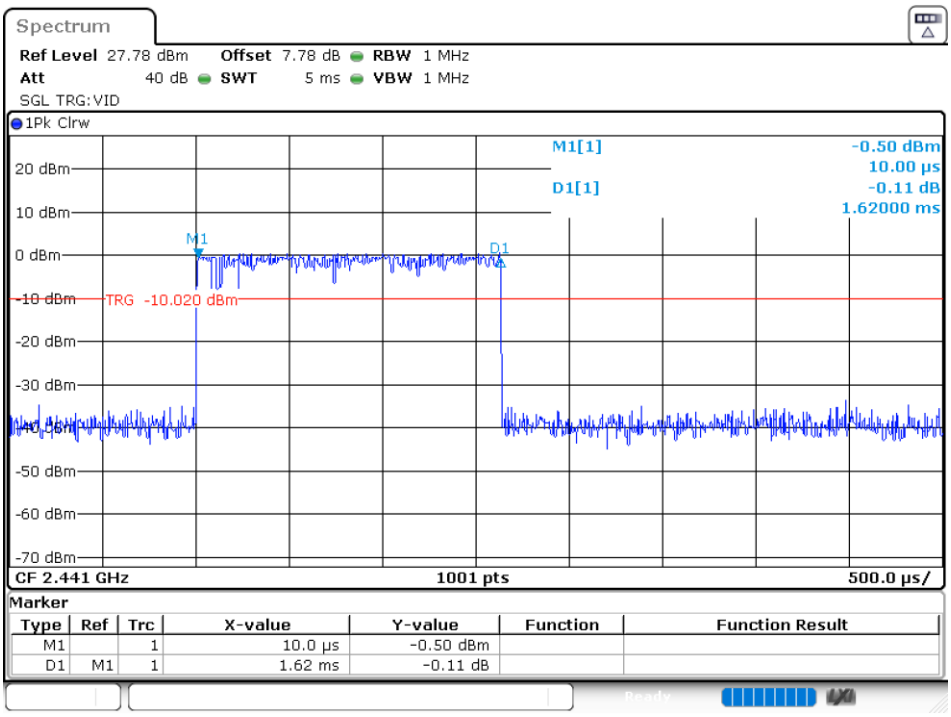
Dwell NVNT 2-DH5 2441MHz



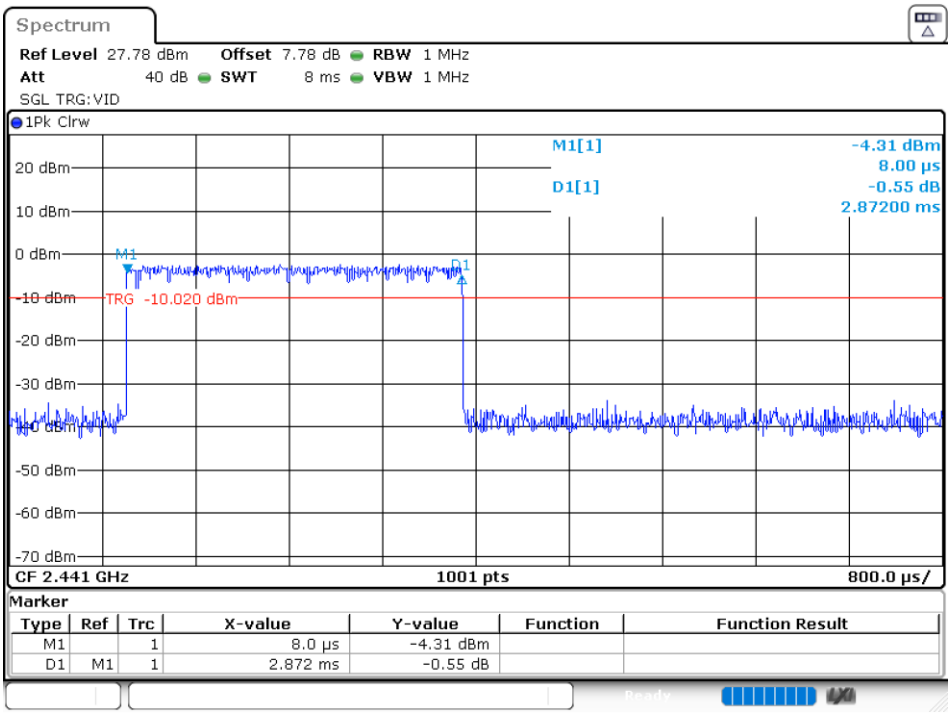
Dwell NVNT 3-DH1 2441MHz



Dwell NVNT 3-DH3 2441MHz



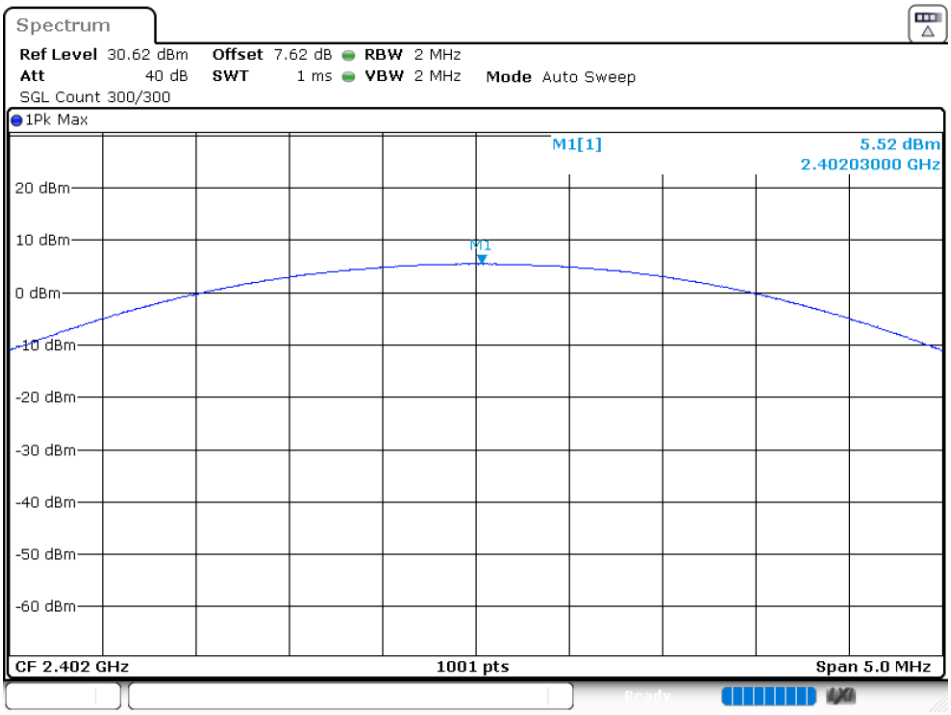
Dwell NVNT 3-DH5 2441MHz



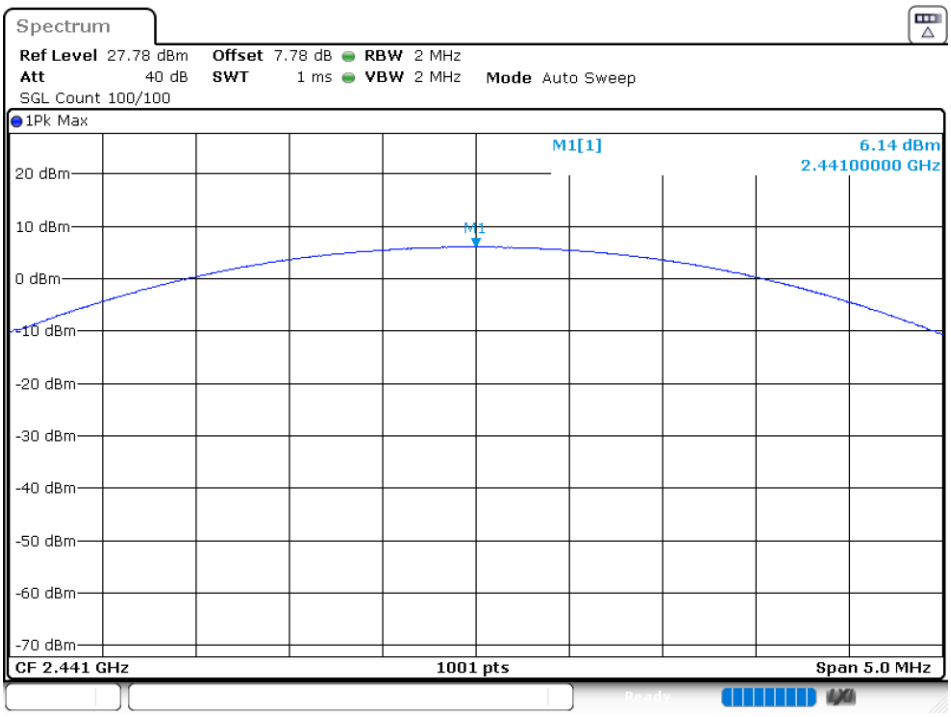
8.2 MAXIMUM CONDUCTED OUTPUT POWER

Condition	Mode	Frequency (MHz)	Antenna	Power (dBm)	Limit (dBm)	Verdict
NVNT	1-DH5	2402	Ant 1	5.52	30	Pass
NVNT	1-DH5	2441	Ant 1	6.14	30	Pass
NVNT	1-DH5	2480	Ant 1	7.34	30	Pass
NVNT	2-DH5	2402	Ant 1	4.68	20.97	Pass
NVNT	2-DH5	2441	Ant 1	5.33	20.97	Pass
NVNT	2-DH5	2480	Ant 1	6.42	20.97	Pass
NVNT	3-DH5	2402	Ant 1	4.58	20.97	Pass
NVNT	3-DH5	2441	Ant 1	4.90	20.97	Pass
NVNT	3-DH5	2480	Ant 1	6.41	20.97	Pass

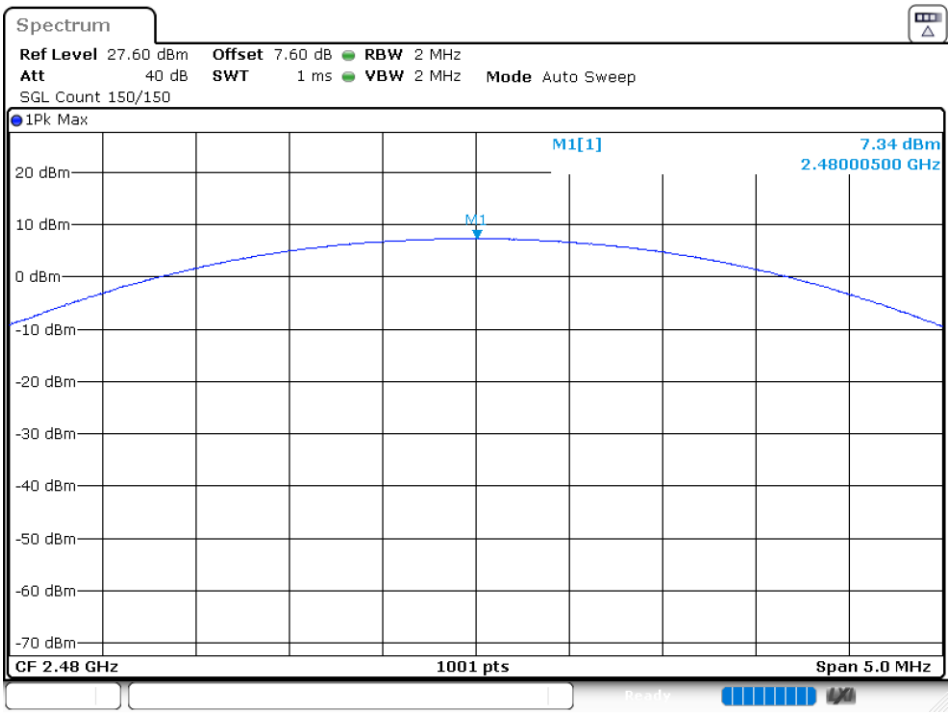
Power NVNT 1-DH5 2402MHz Ant1



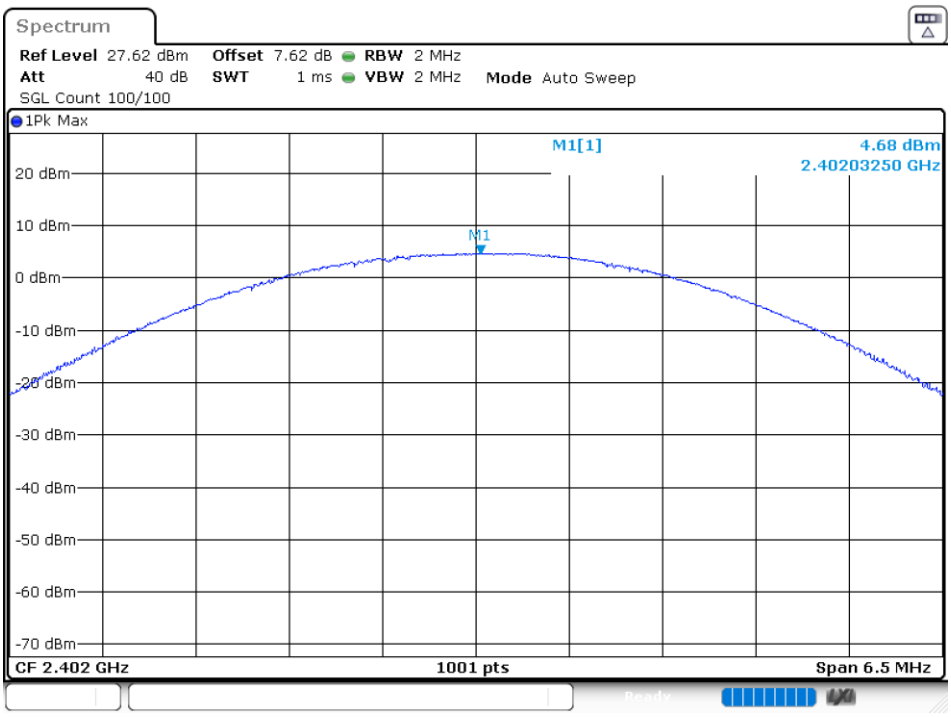
Power NVNT 1-DH5 2441MHz Ant1



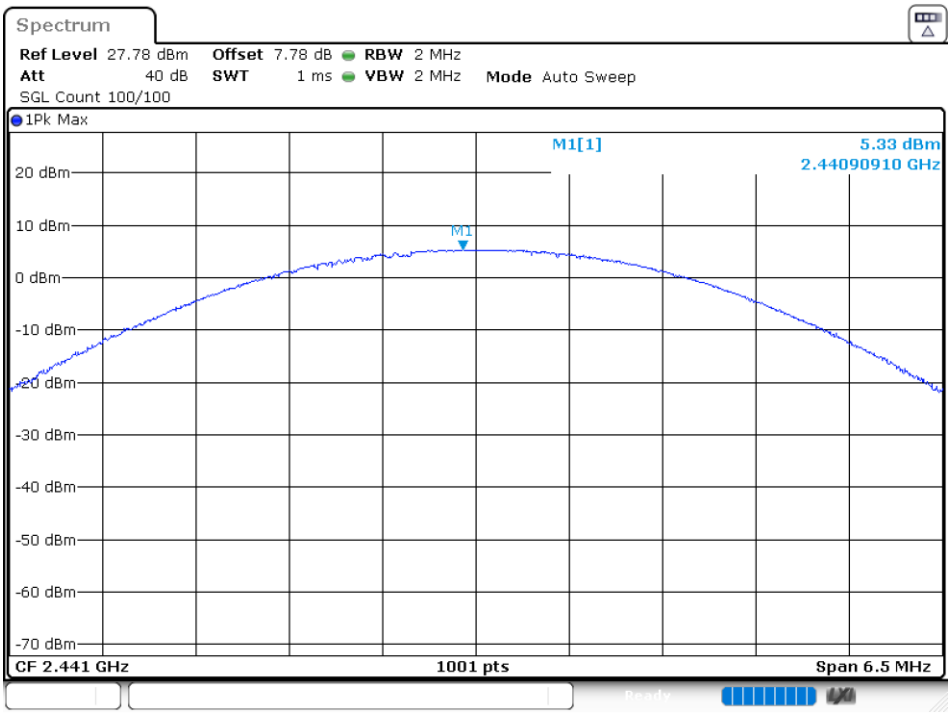
Power NVNT 1-DH5 2480MHz Ant1



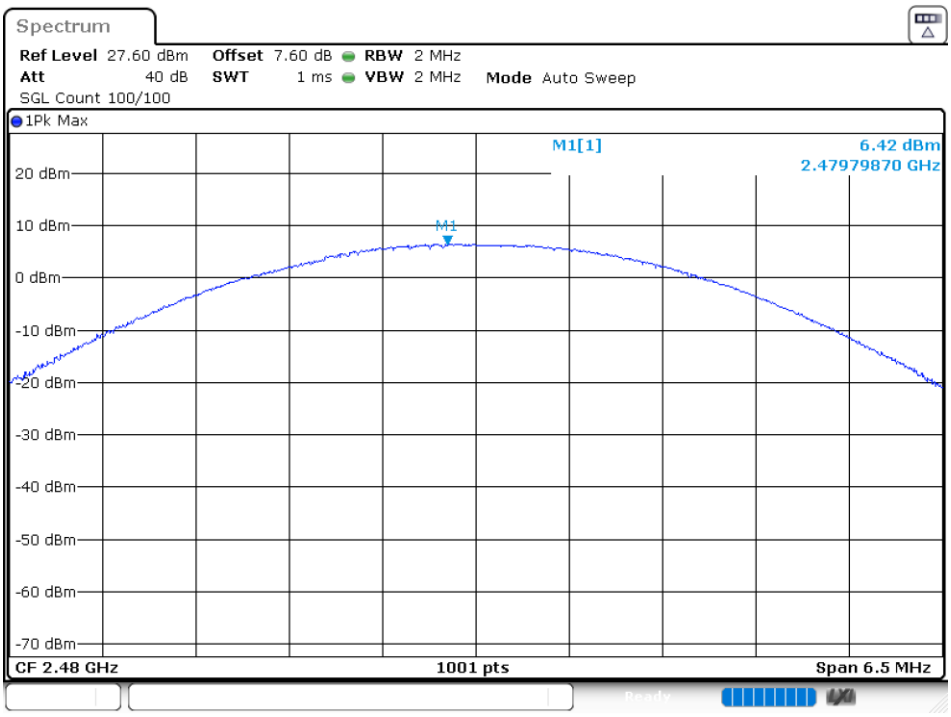
Power NVNT 2-DH5 2402MHz Ant1



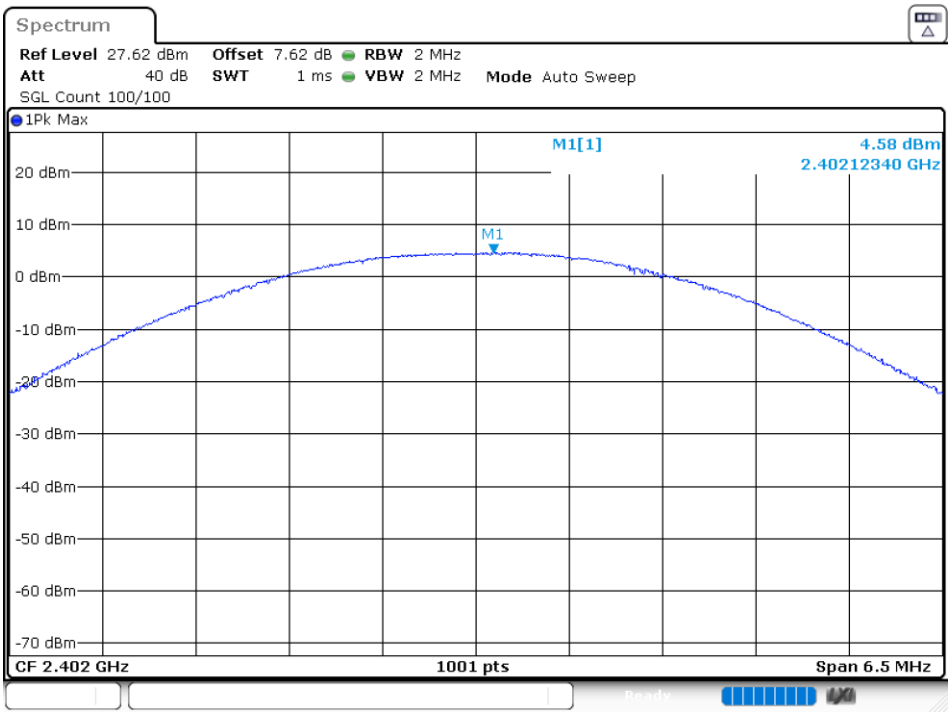
Power NVNT 2-DH5 2441MHz Ant1



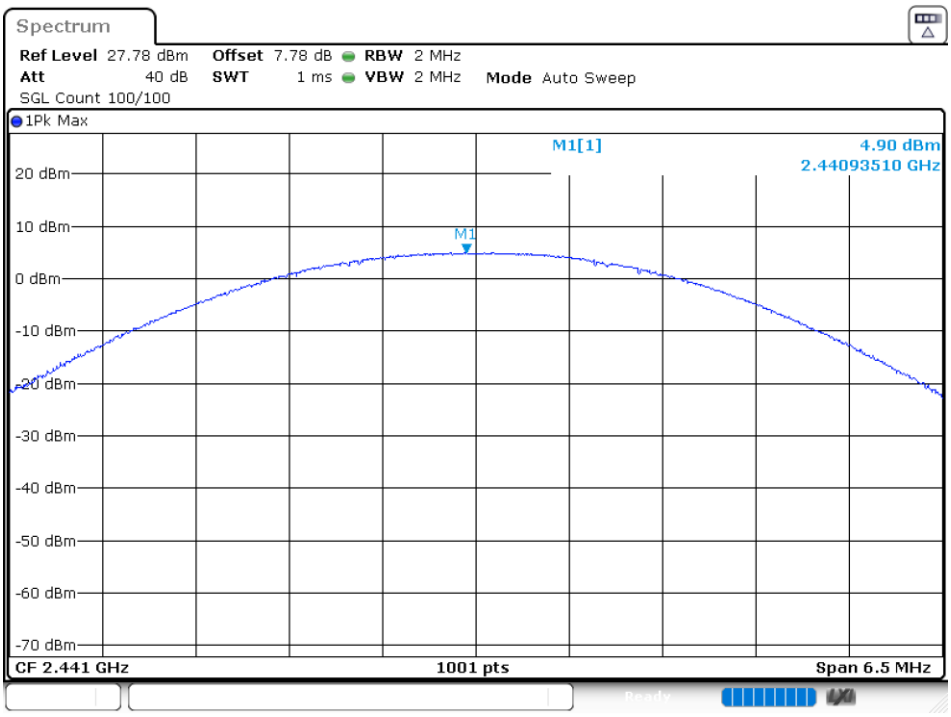
Power NVNT 2-DH5 2480MHz Ant1



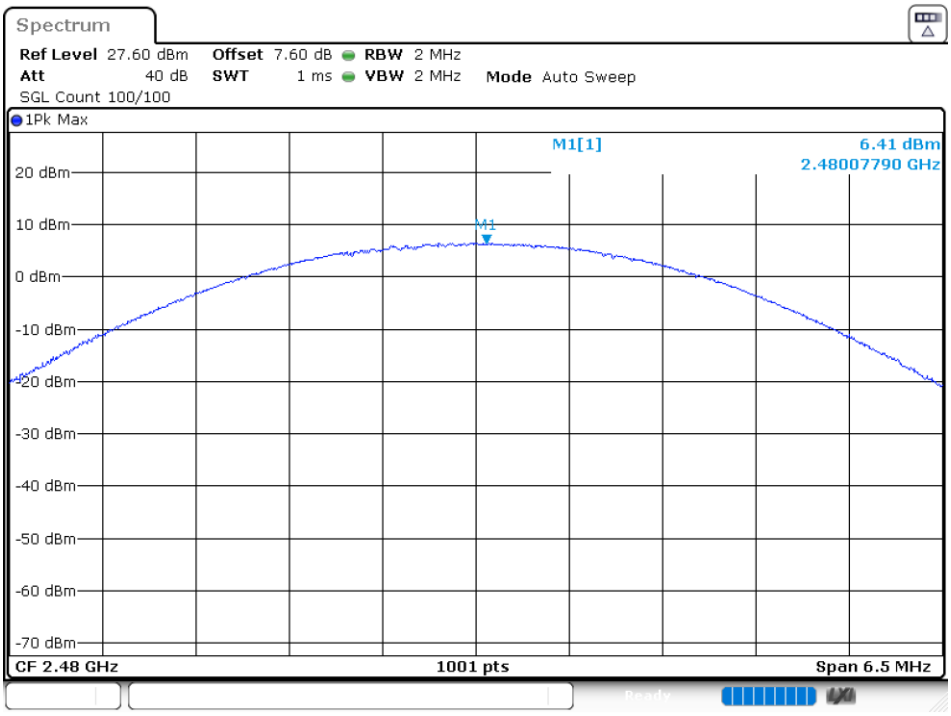
Power NVNT 3-DH5 2402MHz Ant1



Power NVNT 3-DH5 2441MHz Ant1



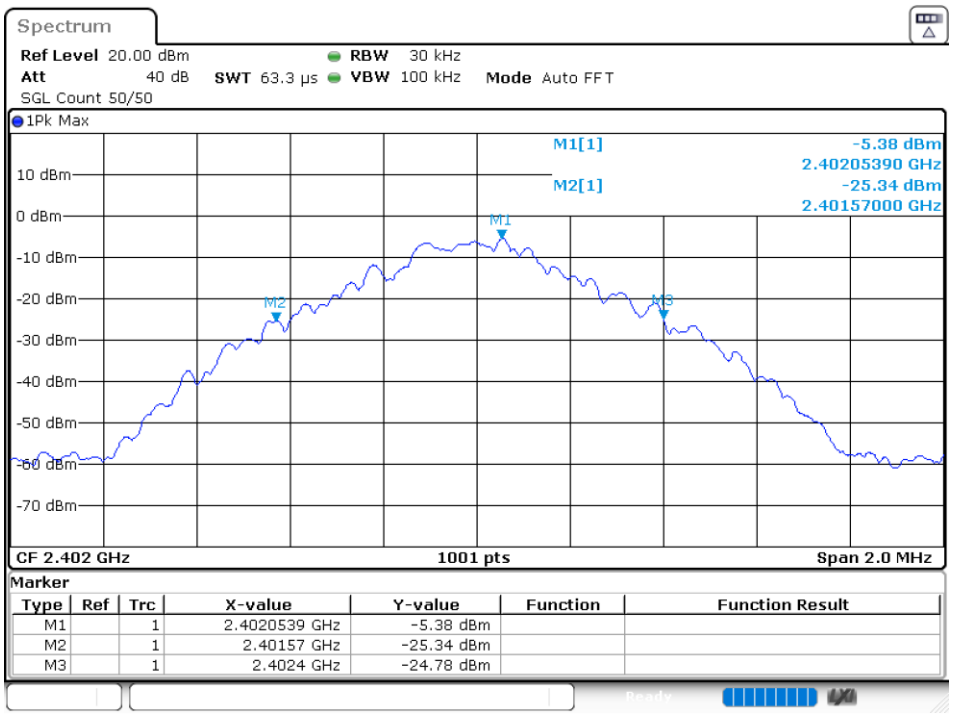
Power NVNT 3-DH5 2480MHz Ant1



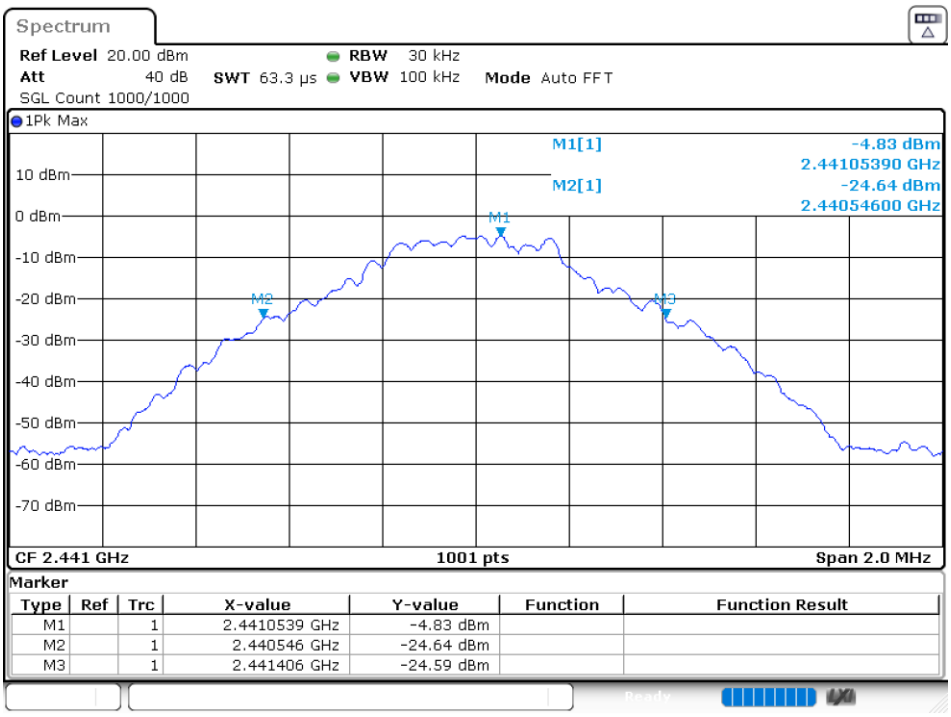
8.3 OCCUPIED CHANNEL BANDWIDTH

Condition	Mode	Frequency (MHz)	Antenna	-20 dB Bandwidth (MHz)
NVNT	1-DH5	2402	Ant 1	0.83
NVNT	1-DH5	2441	Ant 1	0.86
NVNT	1-DH5	2480	Ant 1	0.808
NVNT	2-DH5	2402	Ant 1	1.274
NVNT	2-DH5	2441	Ant 1	1.25
NVNT	2-DH5	2480	Ant 1	1.254
NVNT	3-DH5	2402	Ant 1	1.256
NVNT	3-DH5	2441	Ant 1	1.294
NVNT	3-DH5	2480	Ant 1	1.25

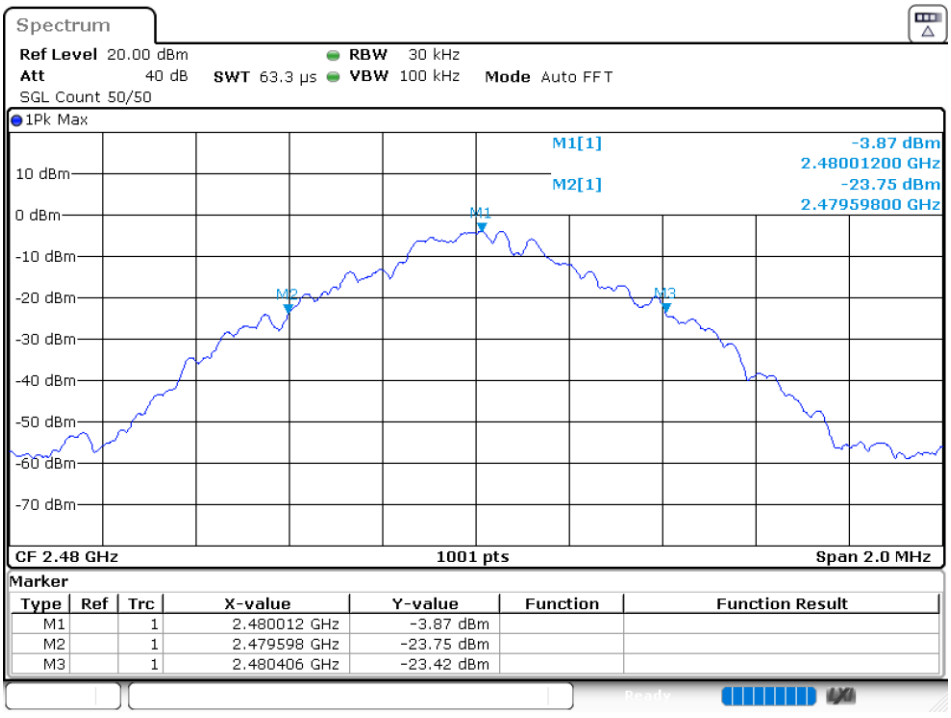
-20 dB BW NVNT 1-DH5 2402MHz Ant1



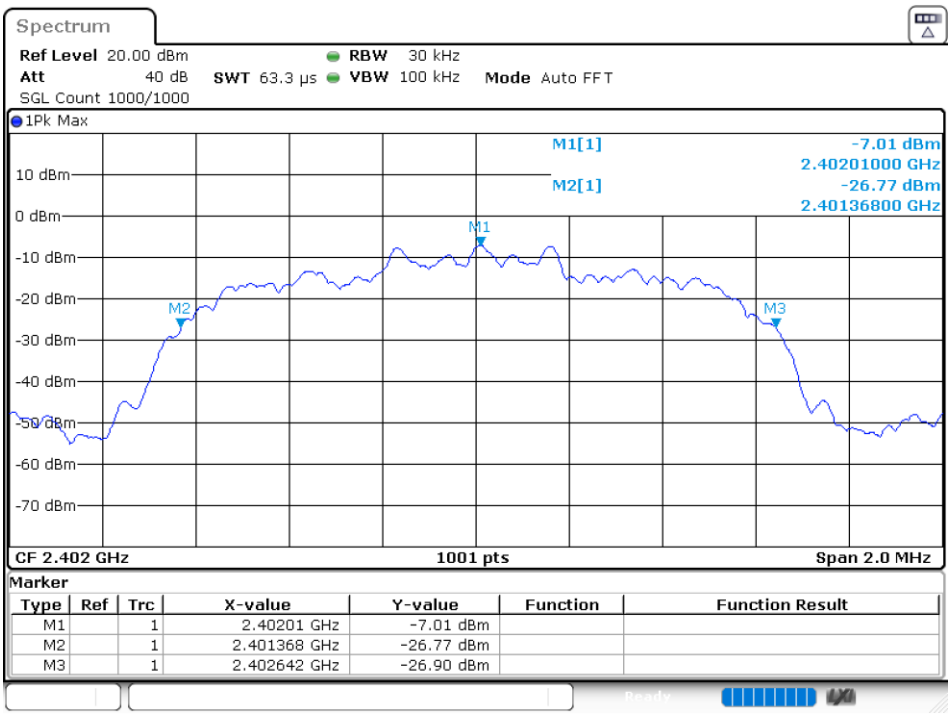
-20 dB BW NVNT 1-DH5 2441MHz Ant1



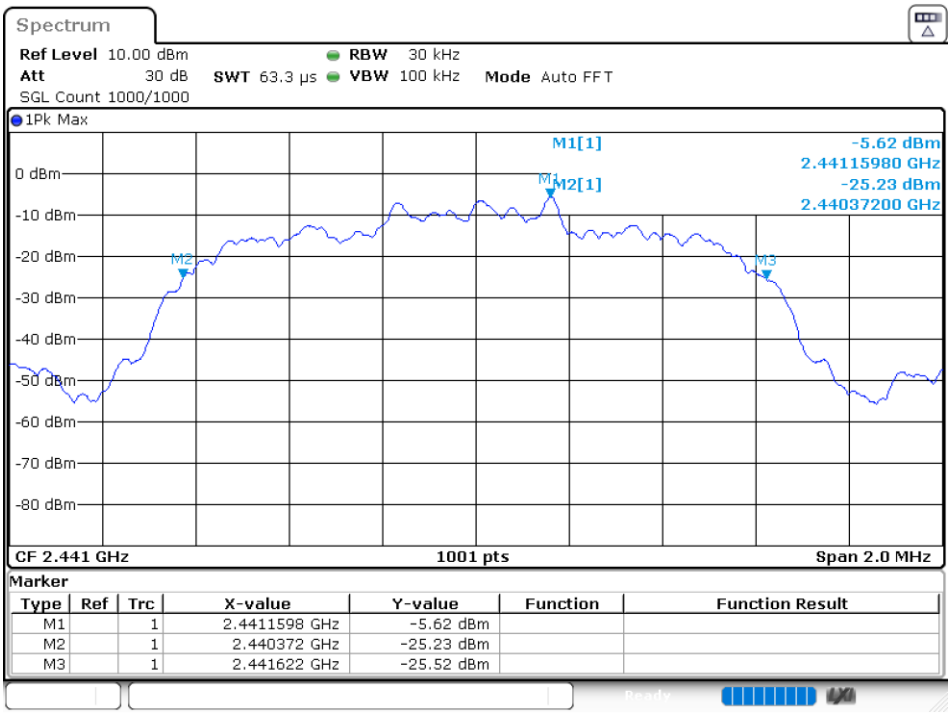
-20 dB BW NVNT 1-DH5 2480MHz Ant1



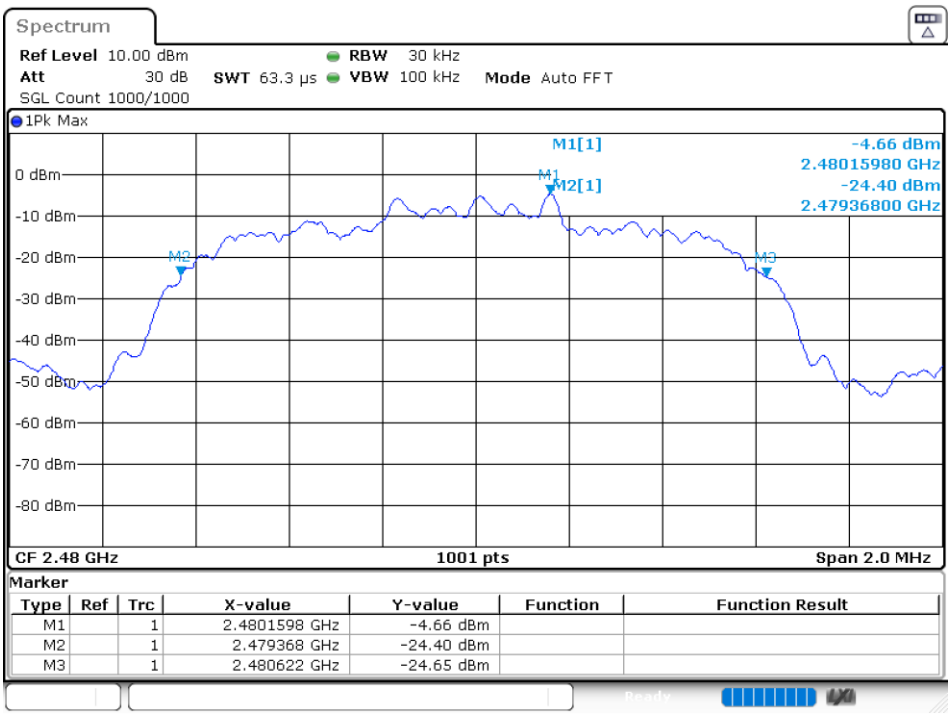
-20 dB BW NVNT 2-DH5 2402MHz Ant1



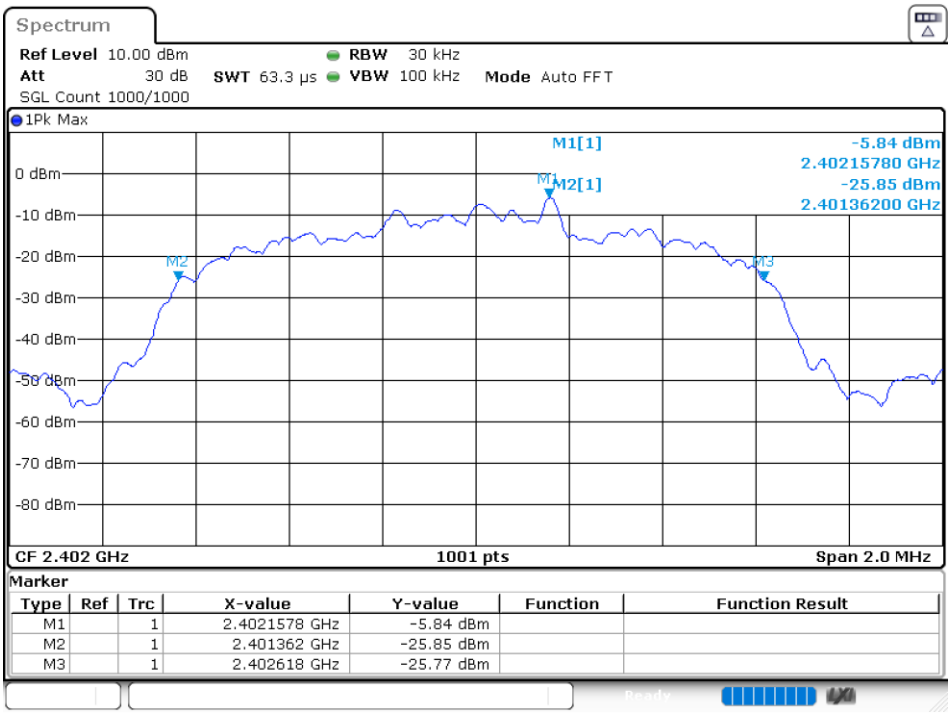
-20 dB BW NVNT 2-DH5 2441MHz Ant1



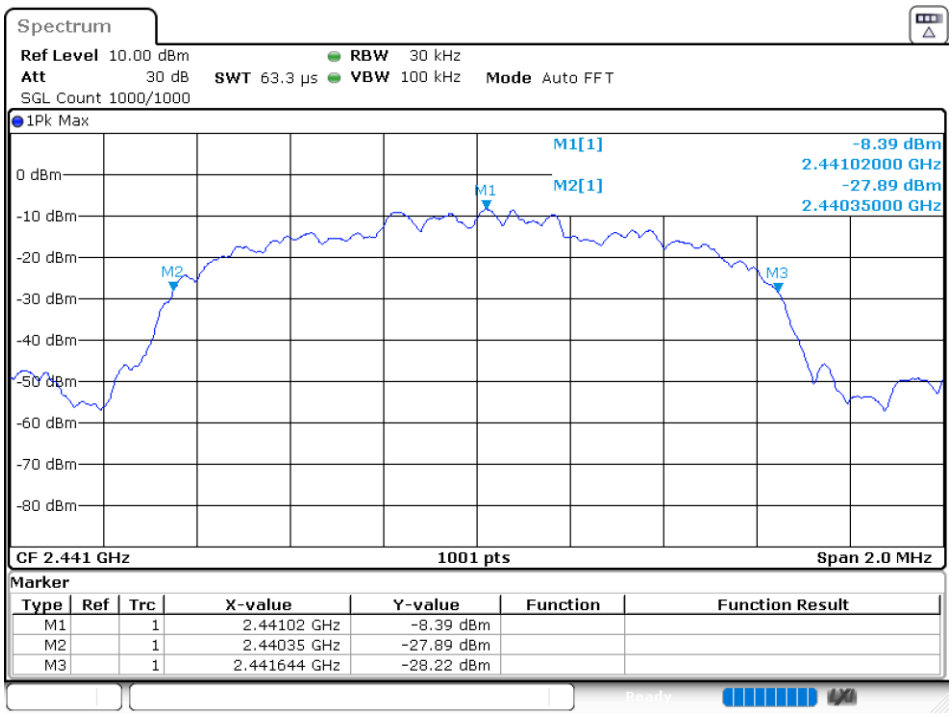
-20 dB BW NVNT 2-DH5 2480MHz Ant1



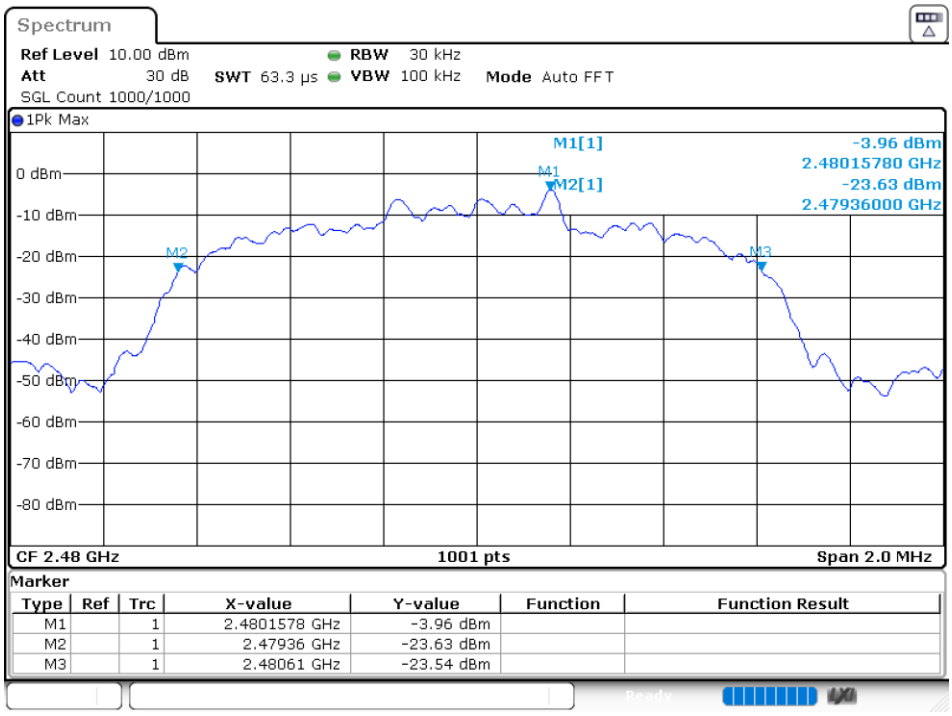
-20 dB BW NVNT 3-DH5 2402MHz Ant1



-20 dB BW NVNT 3-DH5 2441MHz Ant1



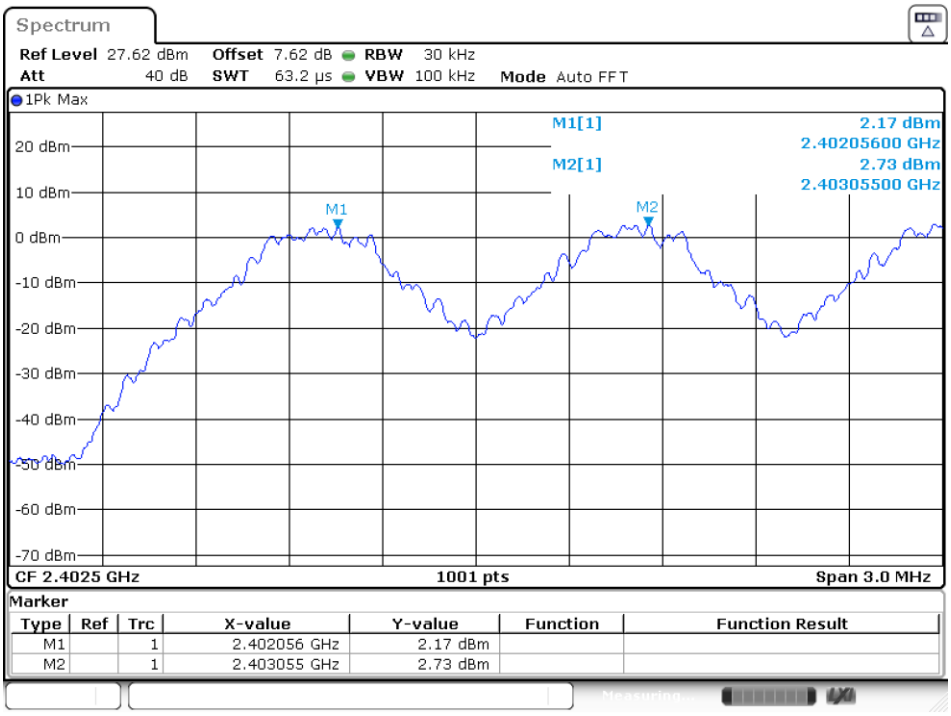
-20 dB BW NVNT 3-DH5 2480MHz Ant1



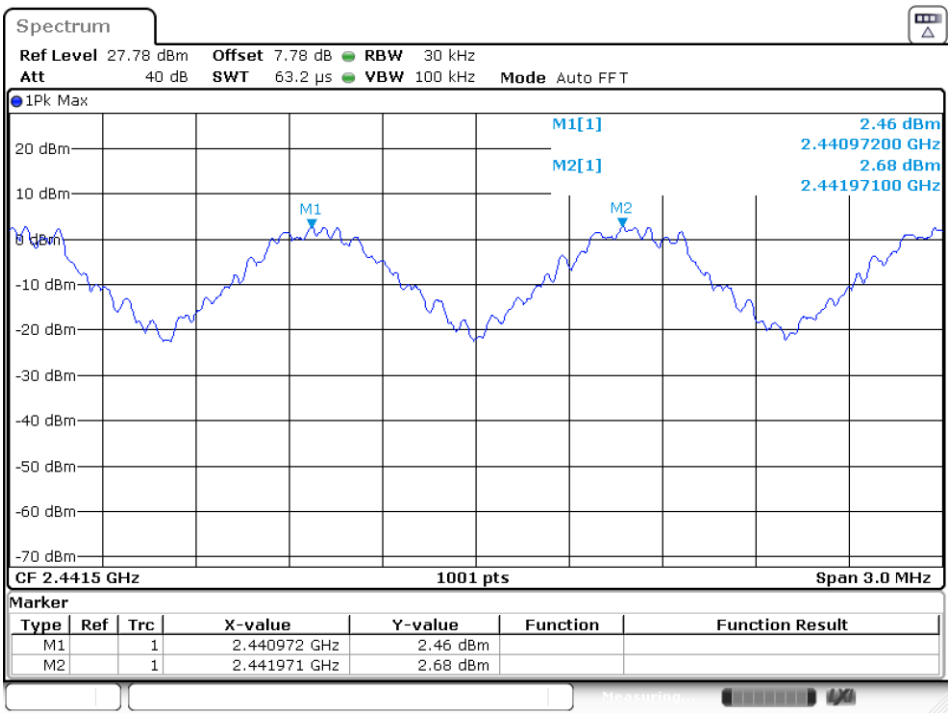
8.4 CARRIER FREQUENCIES SEPARATION

Condition	Mode	Hopping Freq1 (MHz)	Hopping Freq2 (MHz)	HFS (MHz)	Limit (MHz)	Verdict
NVNT	1-DH5	2402.056	2403.055	0.999	0.83	Pass
NVNT	1-DH5	2440.972	2441.971	0.999	0.86	Pass
NVNT	1-DH5	2479.053	2479.974	0.921	0.808	Pass
NVNT	2-DH5	2402.158	2403.16	1.002	0.849	Pass
NVNT	2-DH5	2441.158	2442.16	1.002	0.833	Pass
NVNT	2-DH5	2479.158	2480.16	1.002	0.836	Pass
NVNT	3-DH5	2402.158	2403.01	0.852	0.837	Pass
NVNT	3-DH5	2441.158	2442.16	1.002	0.863	Pass
NVNT	3-DH5	2479.158	2480.16	1.002	0.833	Pass

CFS NVNT 1-DH5 2402MHz



CFS NVNT 1-DH5 2441MHz



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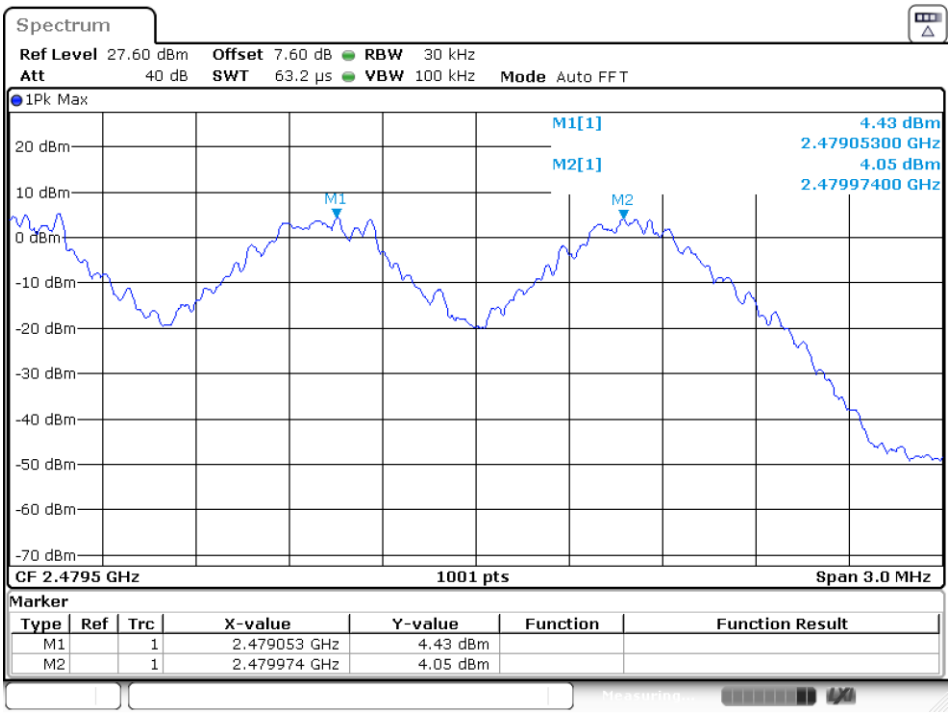

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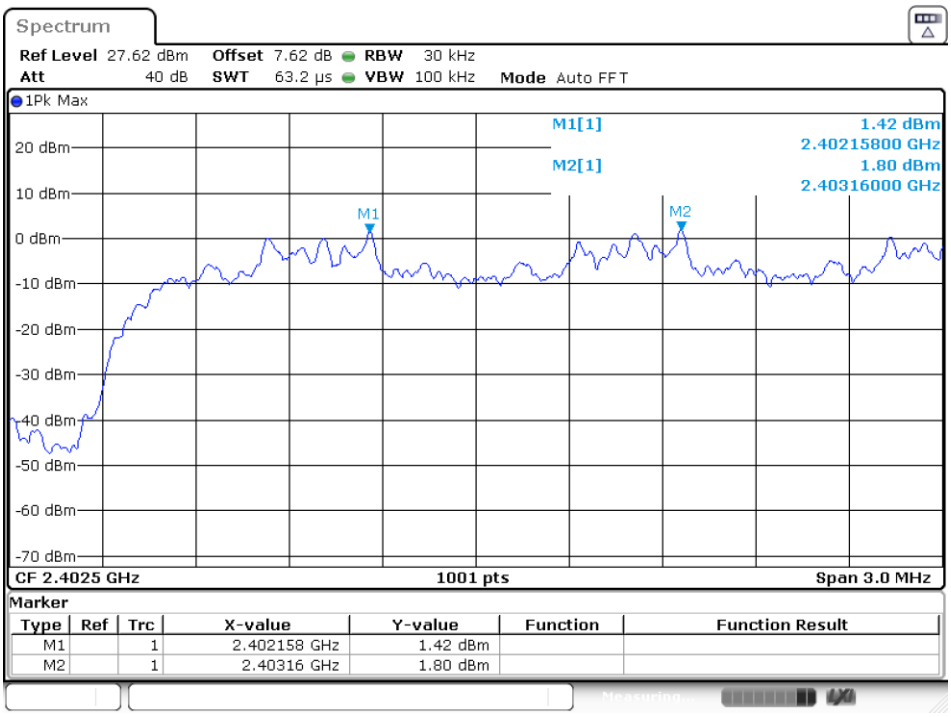
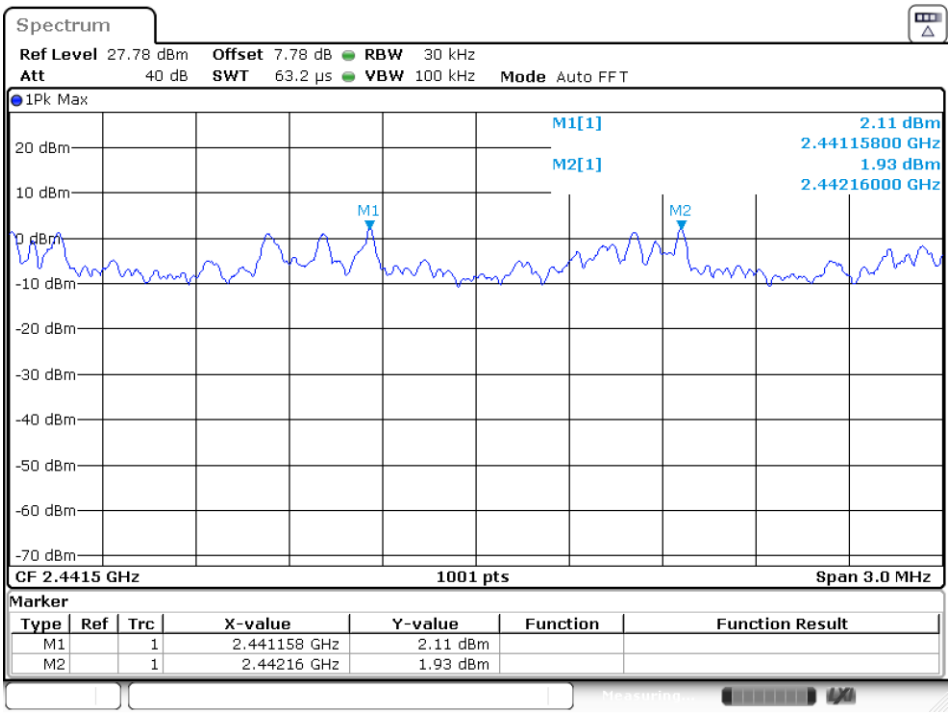
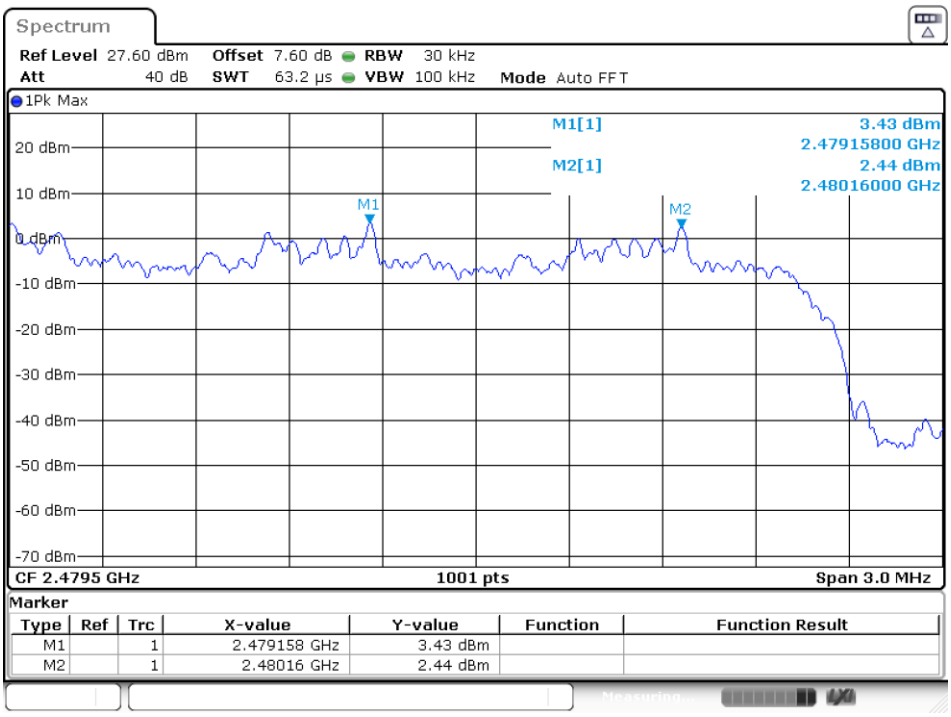


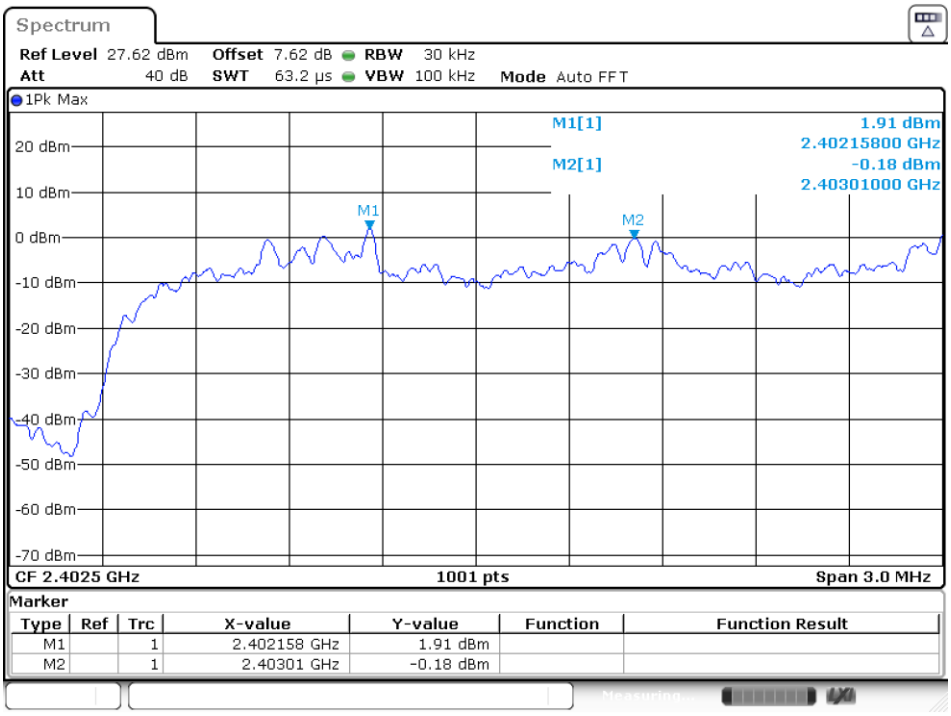
CFS NVNT 2-DH5 2441MHz



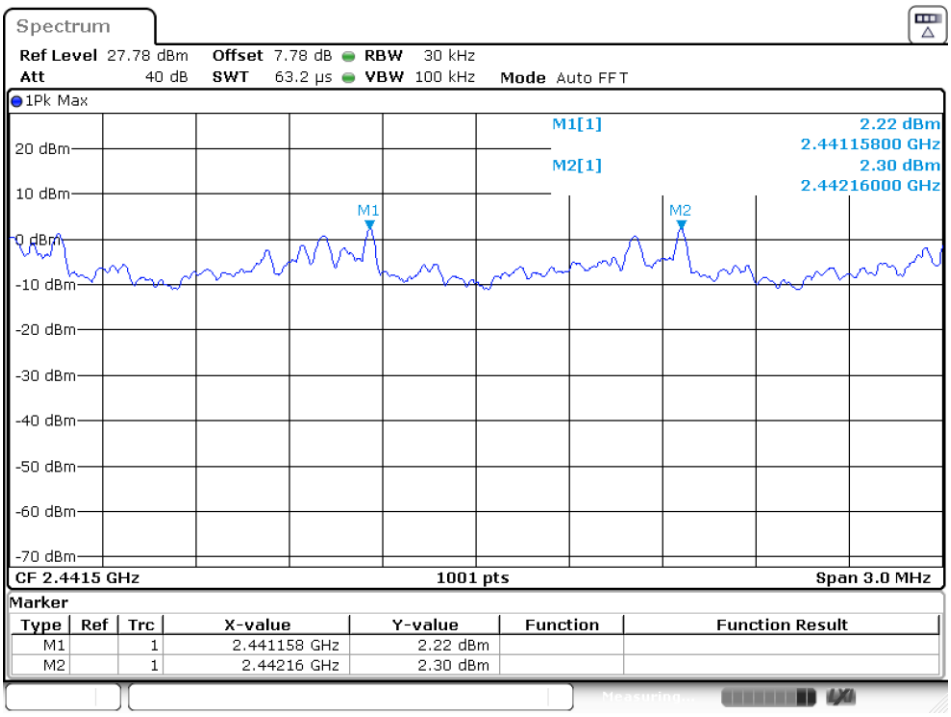
CFS NVNT 2-DH5 2480MHz



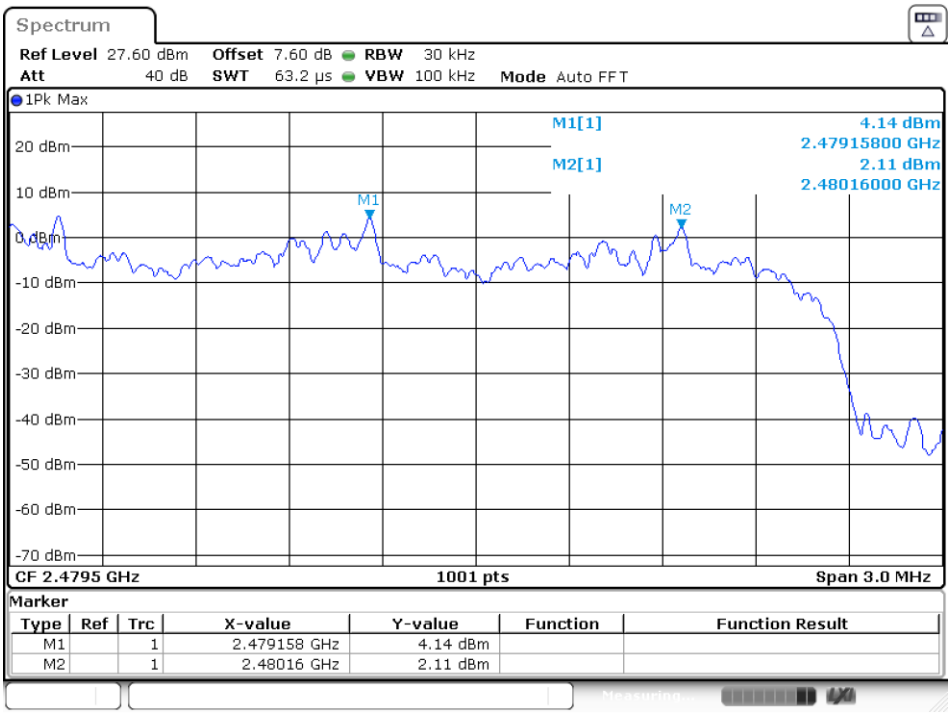
CFS NVNT 3-DH5 2402MHz



CFS NVNT 3-DH5 2441MHz



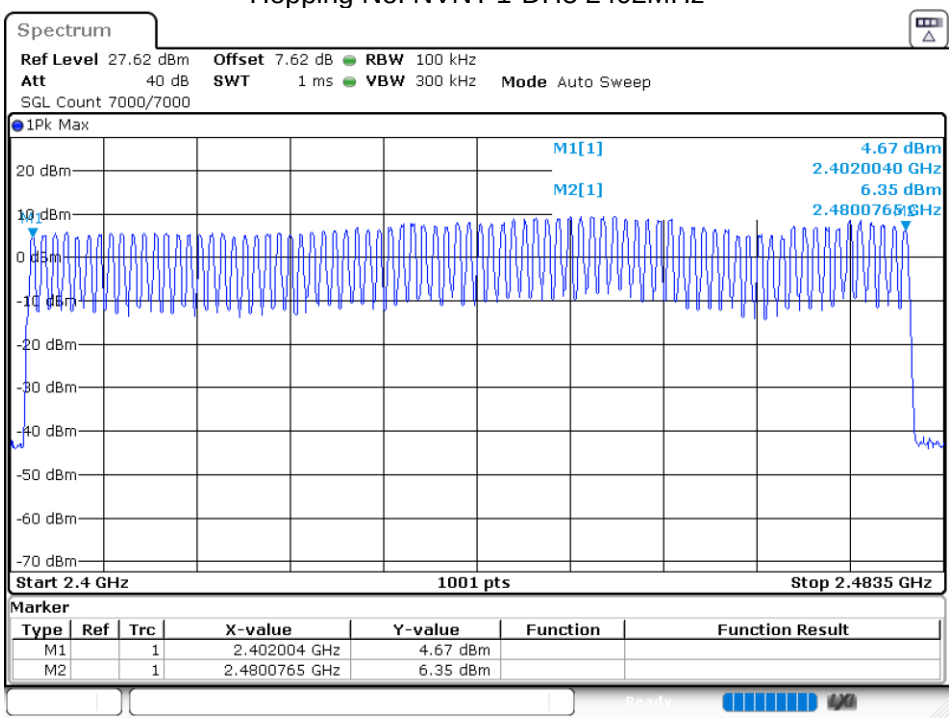
CFS NVNT 3-DH5 2480MHz



8.5 NUMBER OF HOPPING CHANNEL

Condition	Mode	Hopping Number	Limit	Verdict
NVNT	1-DH5	79	15	Pass

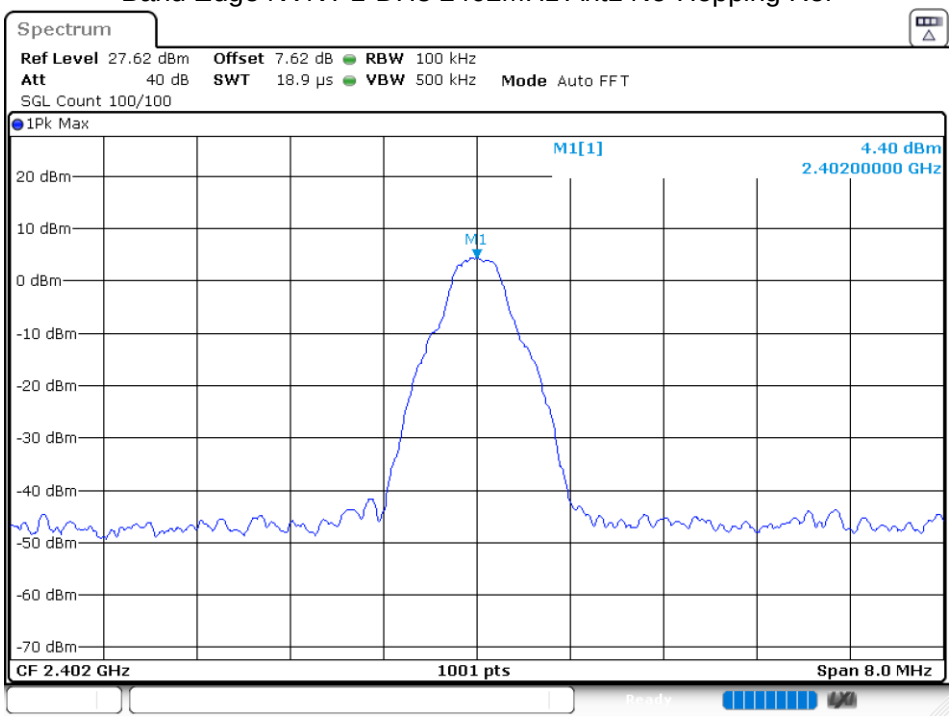
Hopping No. NVNT 1-DH5 2402MHz



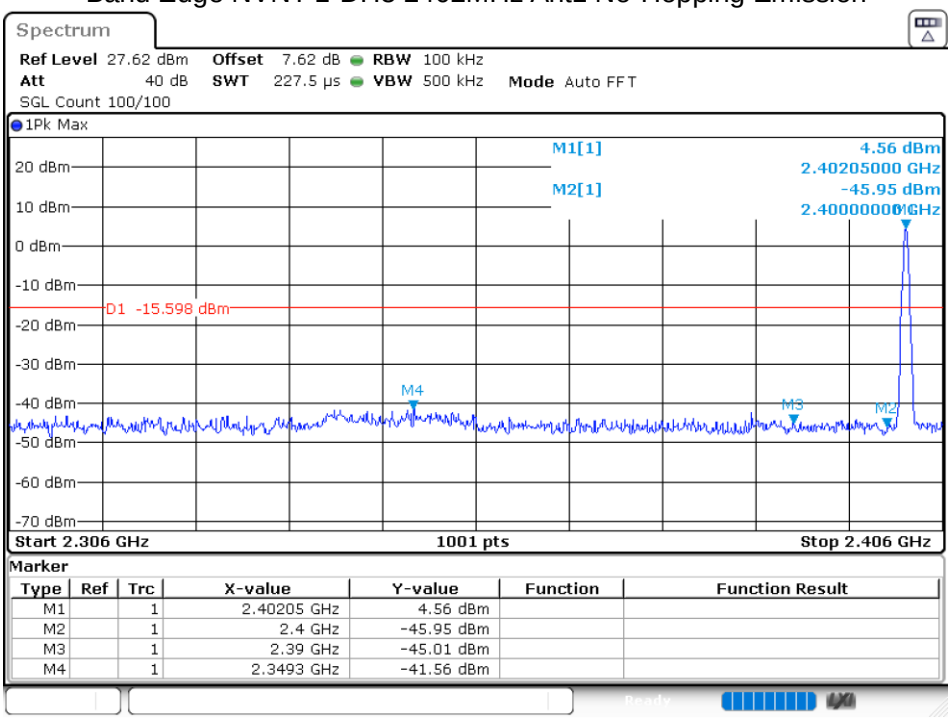
8.6 **BAND EDGE**

Condition	Mode	Frequency (MHz)	Antenna	Hopping Mode	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH5	2402	Ant 1	No-Hopping	-45.96	-20	Pass
NVNT	1-DH5	2402	Ant 1	Hopping	-46.18	-20	Pass
NVNT	1-DH5	2480	Ant 1	No-Hopping	-49.19	-20	Pass
NVNT	1-DH5	2480	Ant 1	Hopping	-50.14	-20	Pass
NVNT	2-DH5	2402	Ant 1	No-Hopping	-43.79	-20	Pass
NVNT	2-DH5	2402	Ant 1	Hopping	-45.14	-20	Pass
NVNT	2-DH5	2480	Ant 1	No-Hopping	-46.1	-20	Pass
NVNT	2-DH5	2480	Ant 1	Hopping	-47.18	-20	Pass
NVNT	3-DH5	2402	Ant 1	No-Hopping	-45.48	-20	Pass
NVNT	3-DH5	2402	Ant 1	Hopping	-45.81	-20	Pass
NVNT	3-DH5	2480	Ant 1	No-Hopping	-47.46	-20	Pass
NVNT	3-DH5	2480	Ant 1	Hopping	-50	-20	Pass

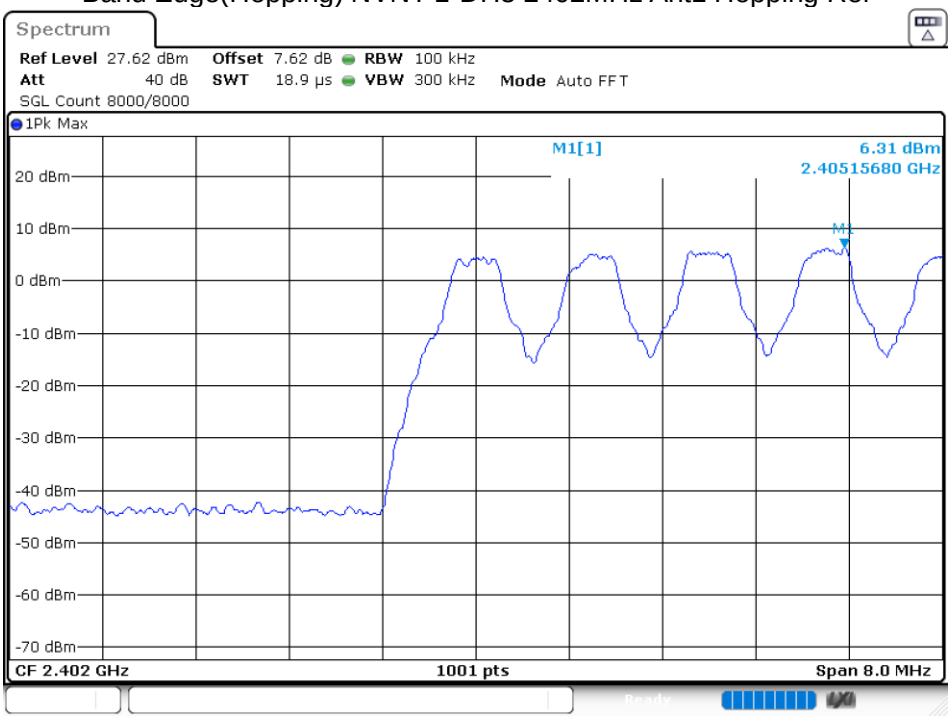
Band Edge NVNT 1-DH5 2402MHz Ant1 No-Hopping Ref



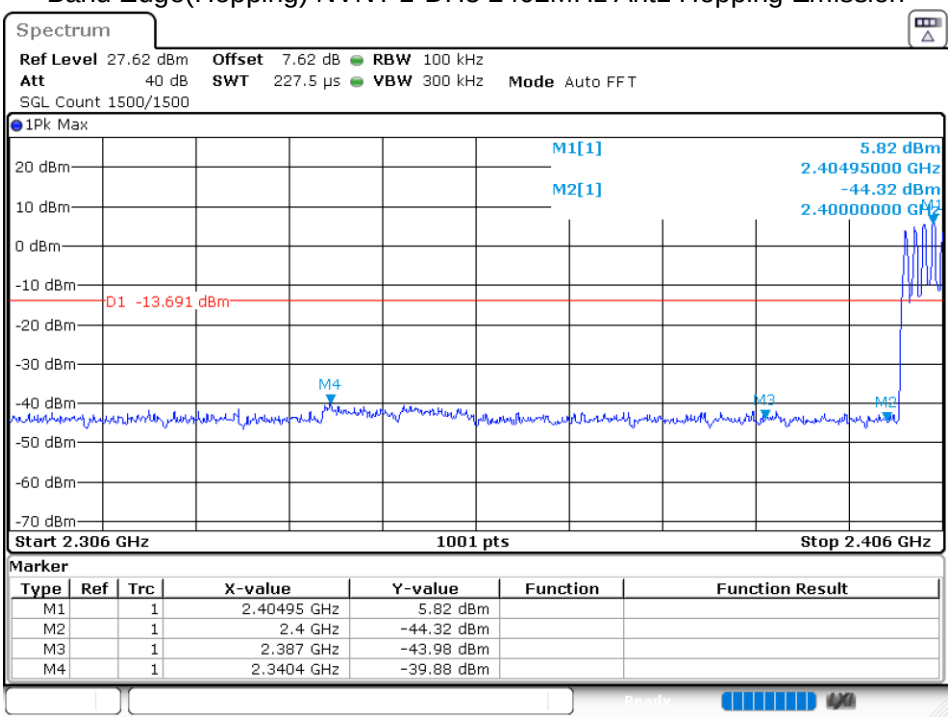
Band Edge NVNT 1-DH5 2402MHz Ant1 No-Hopping Emission



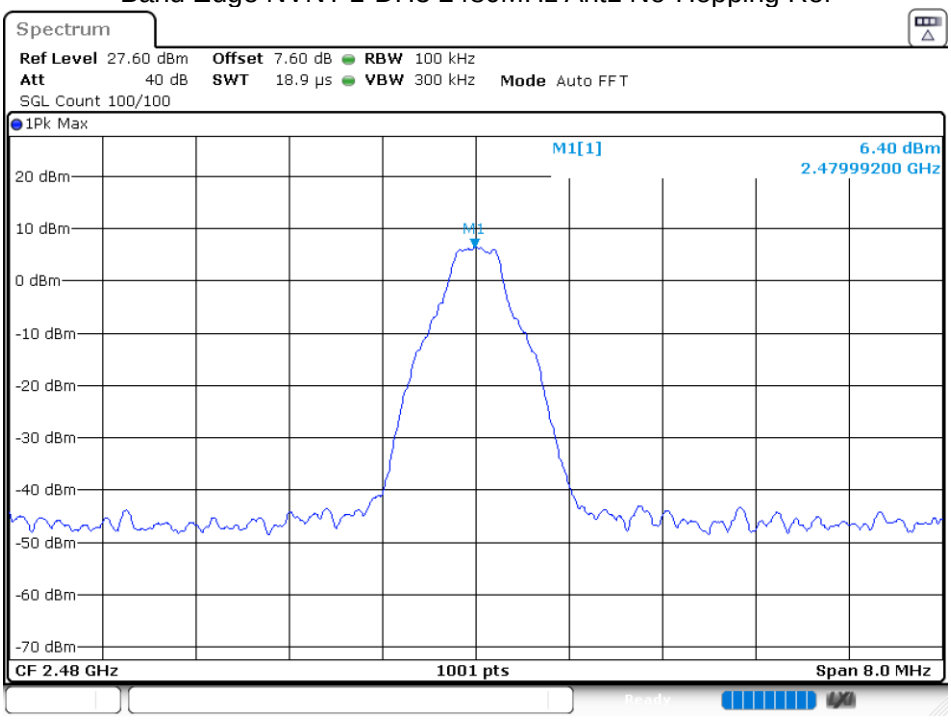
Band Edge(Hopping) NVNT 1-DH5 2402MHz Ant1 Hopping Ref



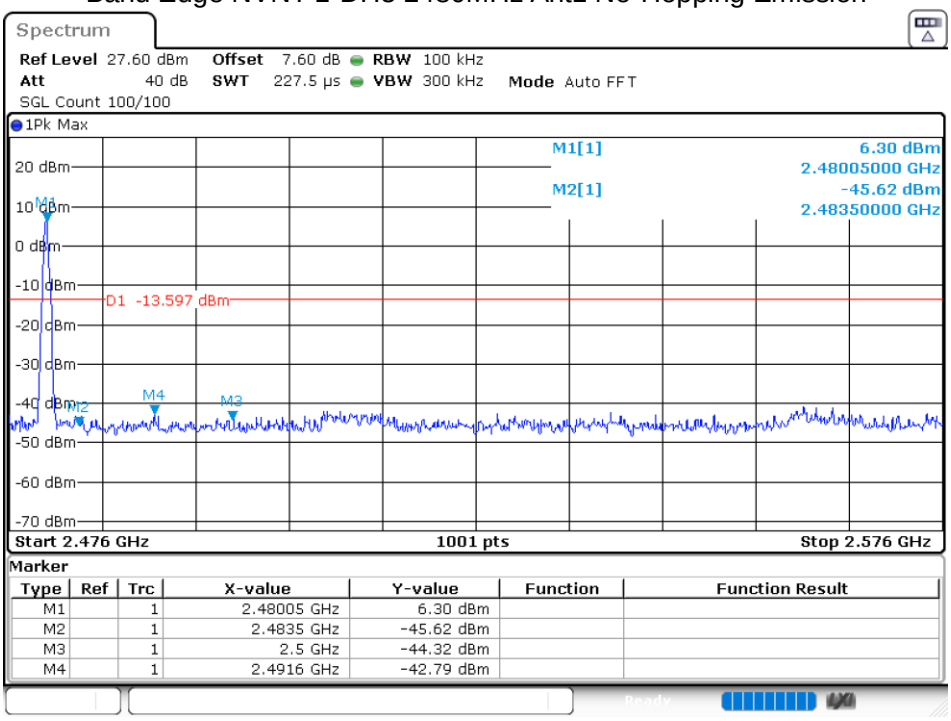
Band Edge(Hopping) NVNT 1-DH5 2402MHz Ant1 Hopping Emission



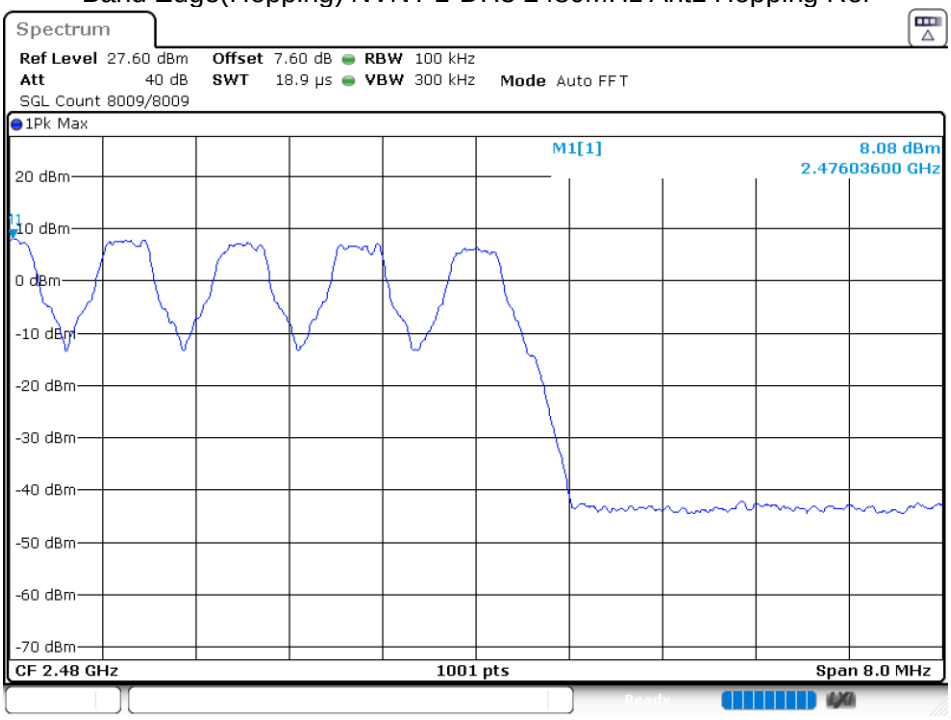
Band Edge NVNT 1-DH5 2480MHz Ant1 No-Hopping Ref



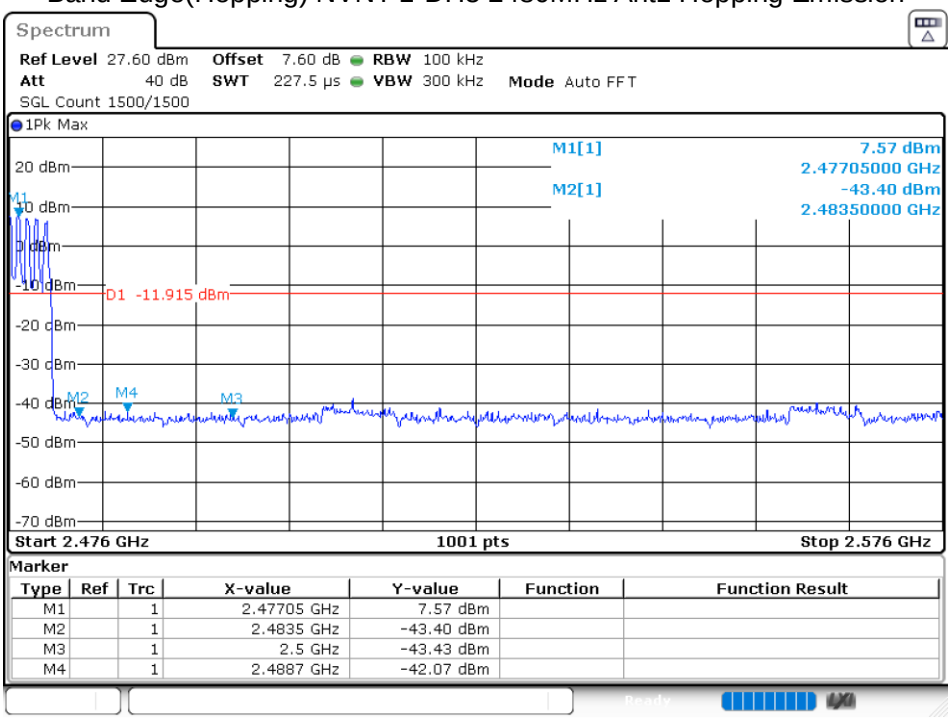
Band Edge NVNT 1-DH5 2480MHz Ant1 No-Hopping Emission



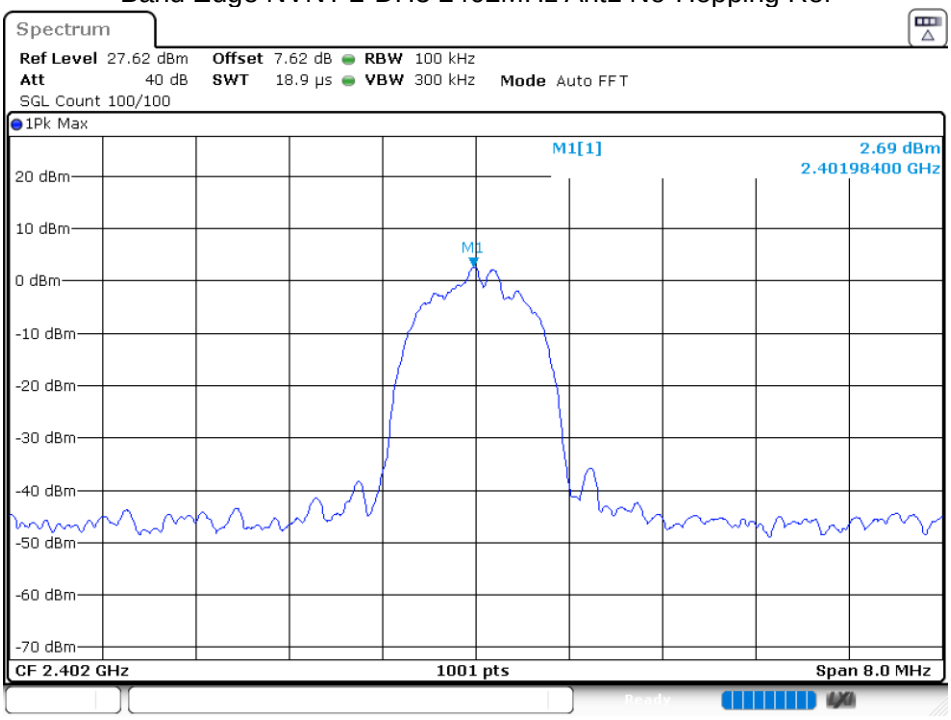
Band Edge(Hopping) NVNT 1-DH5 2480MHz Ant1 Hopping Ref



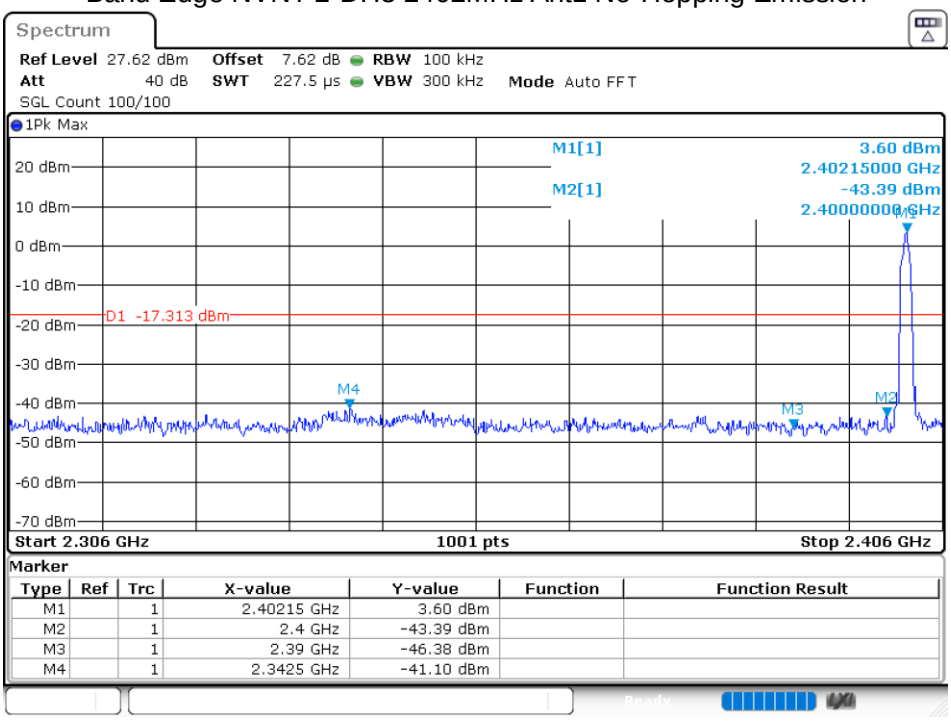
Band Edge(Hopping) NVNT 1-DH5 2480MHz Ant1 Hopping Emission



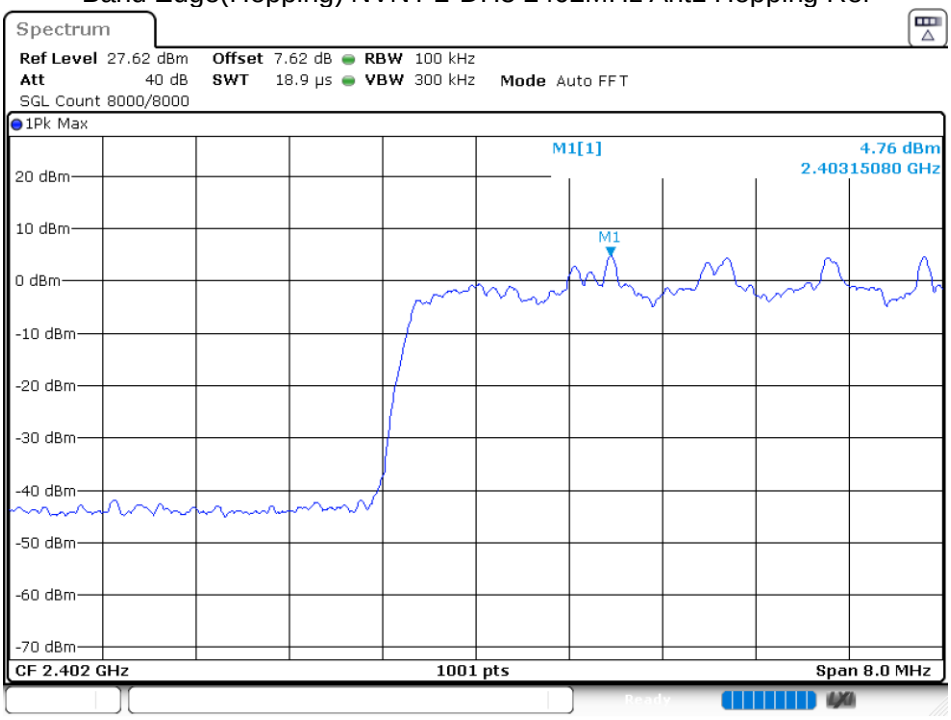
Band Edge NVNT 2-DH5 2402MHz Ant1 No-Hopping Ref



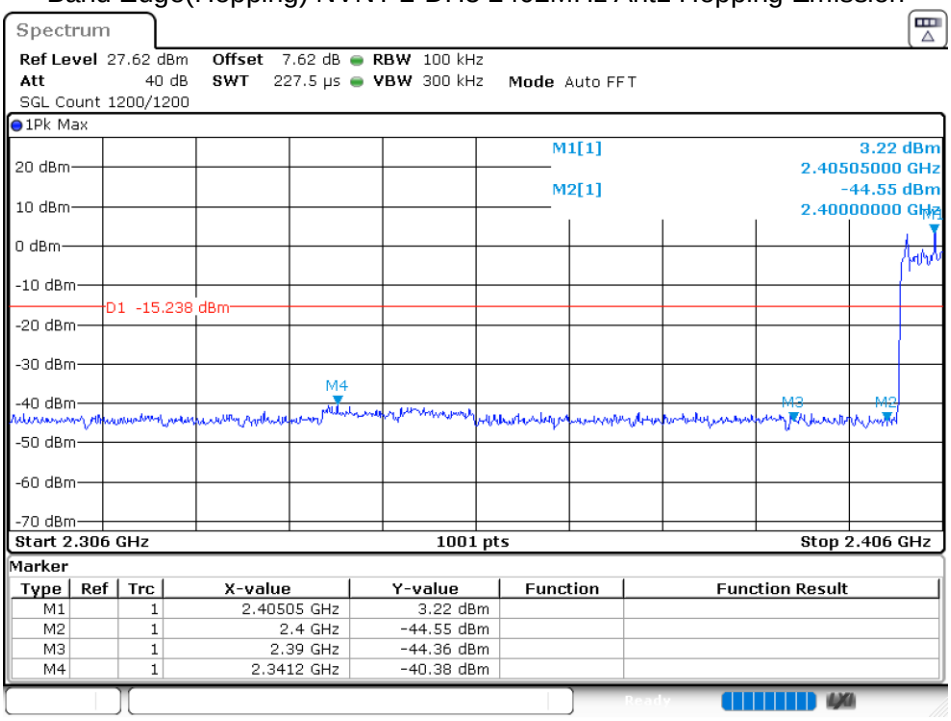
Band Edge NVNT 2-DH5 2402MHz Ant1 No-Hopping Emission



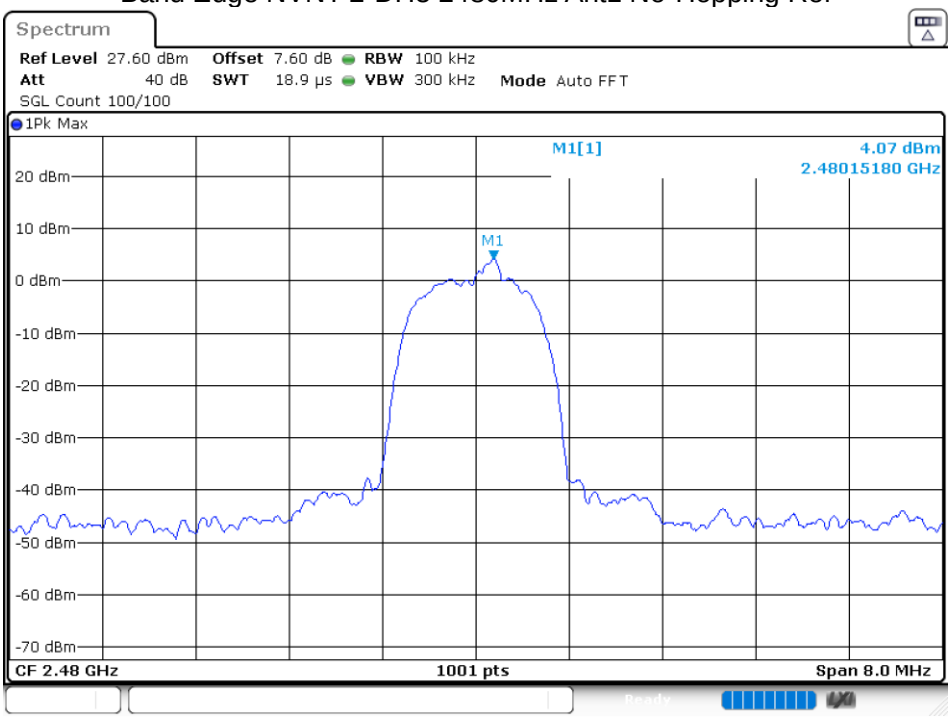
Band Edge(Hopping) NVNT 2-DH5 2402MHz Ant1 Hopping Ref



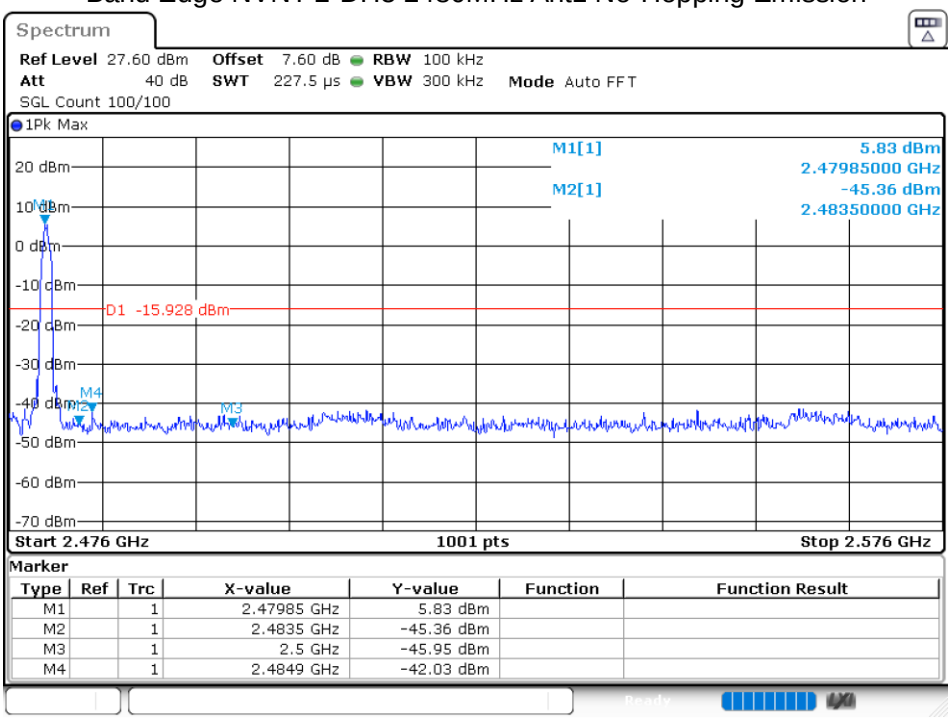
Band Edge(Hopping) NVNT 2-DH5 2402MHz Ant1 Hopping Emission



Band Edge NVNT 2-DH5 2480MHz Ant1 No-Hopping Ref



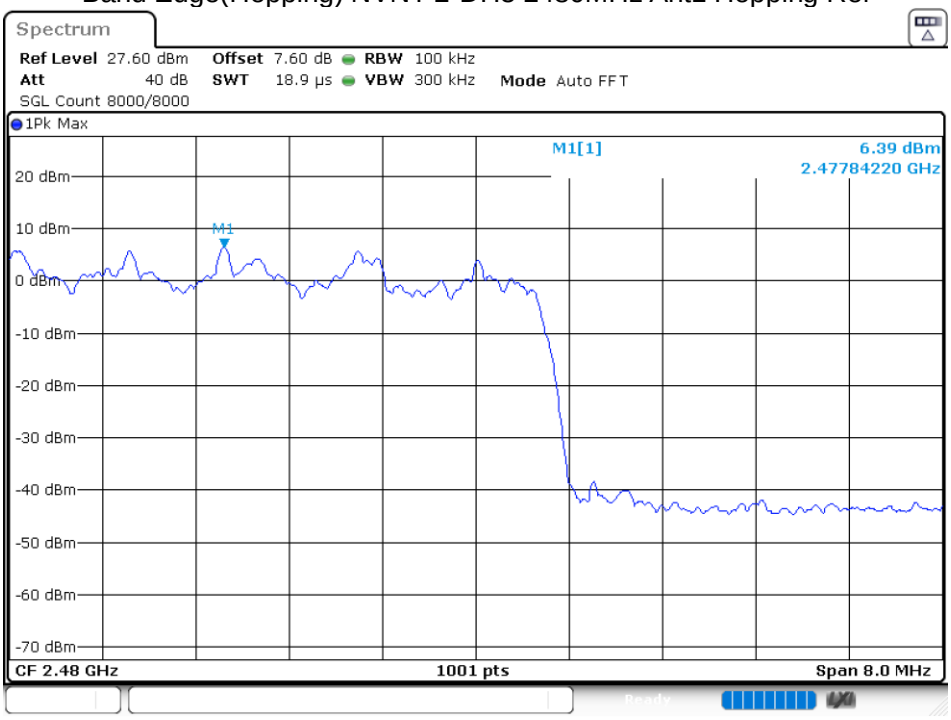
Band Edge NVNT 2-DH5 2480MHz Ant1 No-Hopping Emission



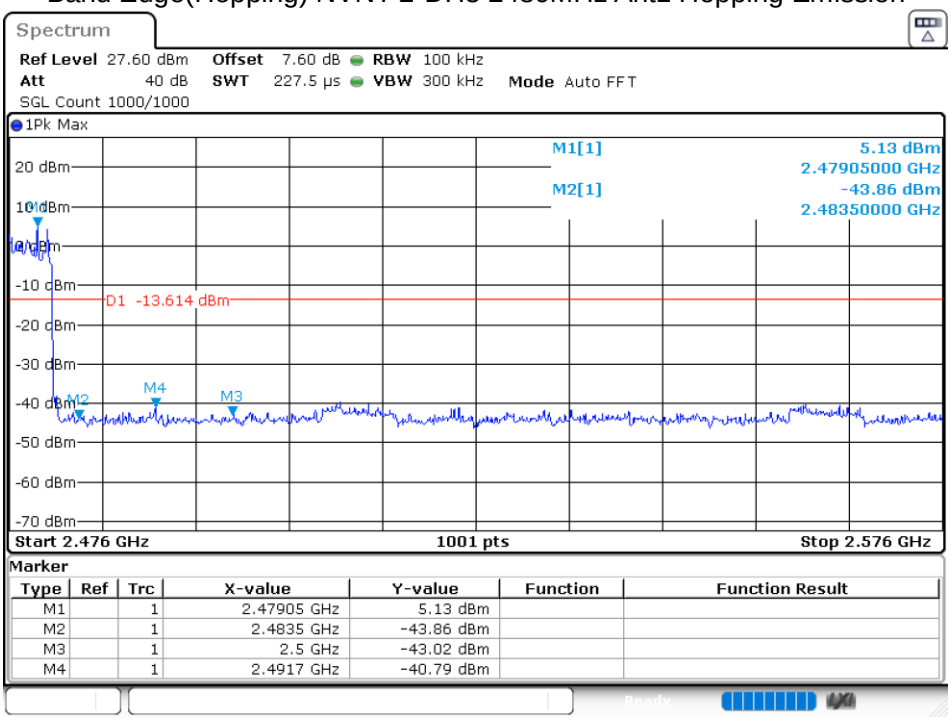
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47985 GHz	5.83 dBm		
M2		1	2.4835 GHz	-45.36 dBm		
M3		1	2.5 GHz	-45.95 dBm		
M4		1	2.4849 GHz	-42.03 dBm		

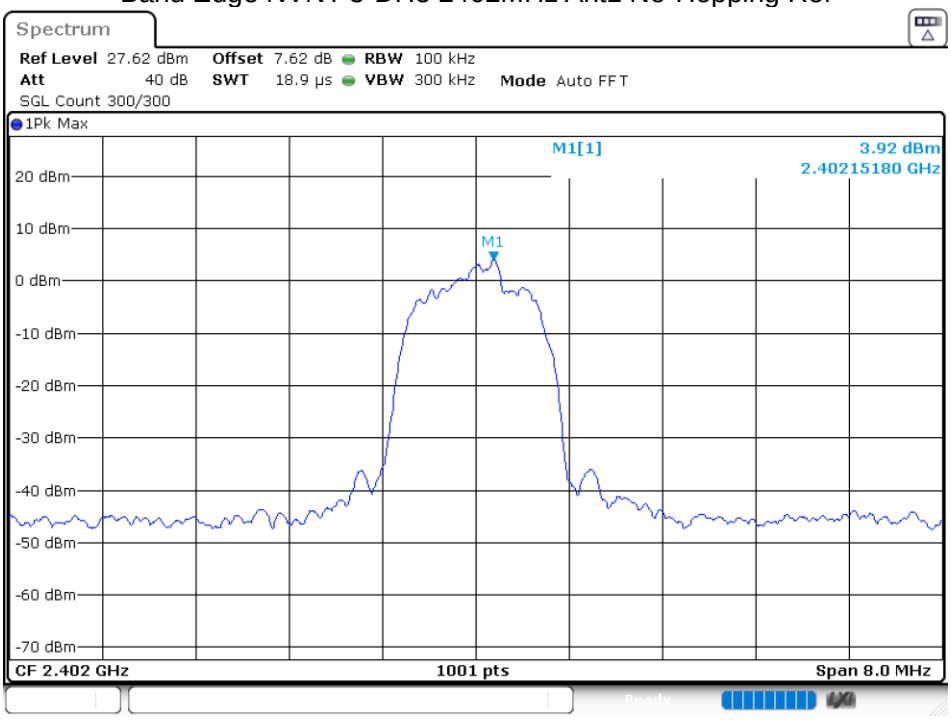
Band Edge(Hopping) NVNT 2-DH5 2480MHz Ant1 Hopping Ref



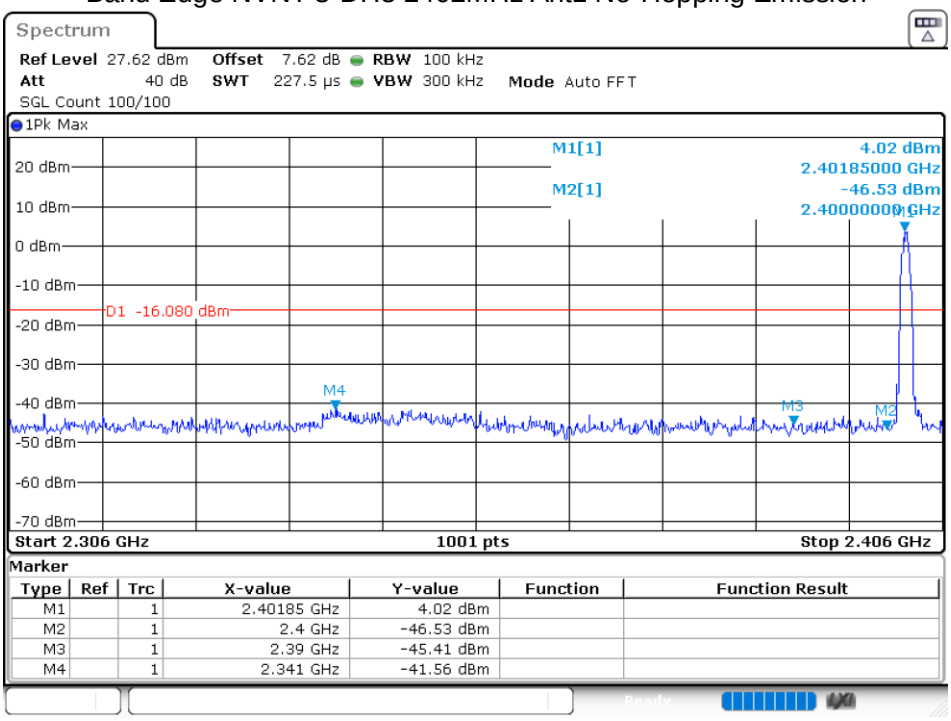
Band Edge(Hopping) NVNT 2-DH5 2480MHz Ant1 Hopping Emission



Band Edge NVNT 3-DH5 2402MHz Ant1 No-Hopping Ref



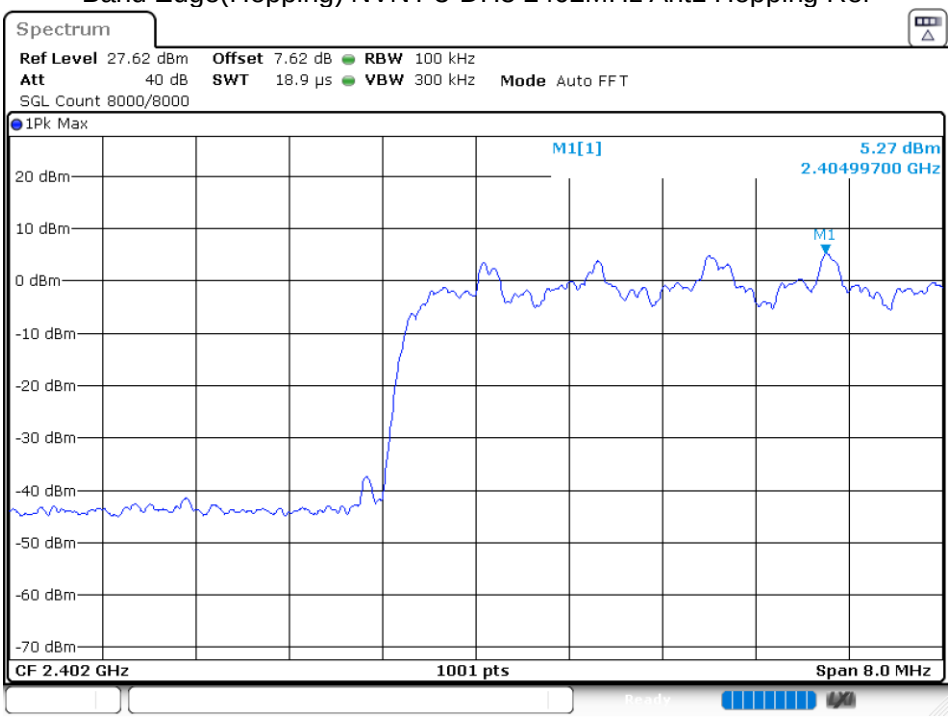
Band Edge NVNT 3-DH5 2402MHz Ant1 No-Hopping Emission



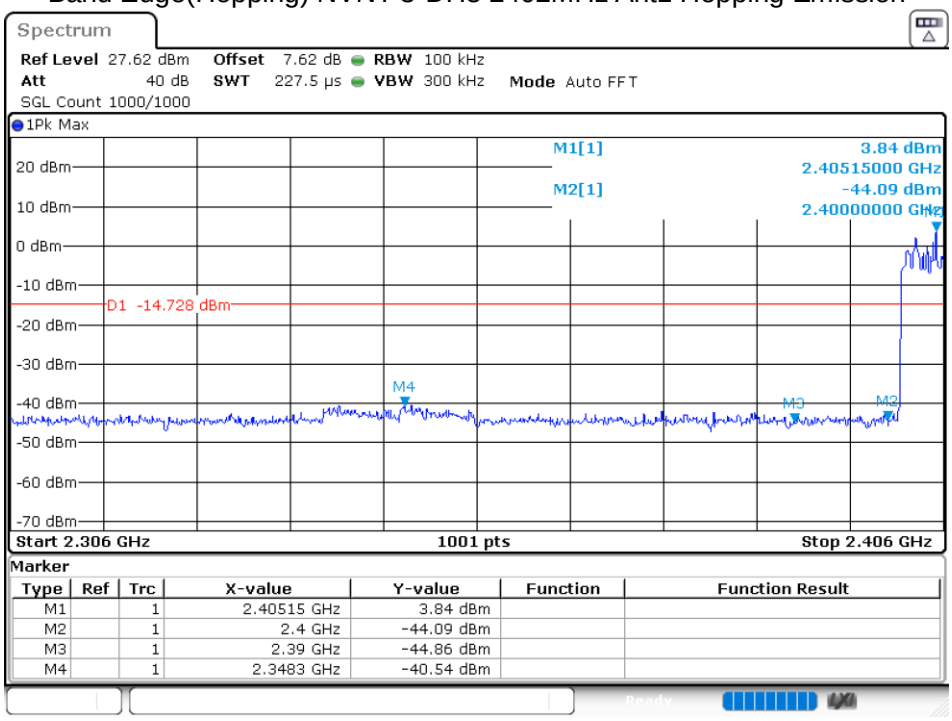
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40185 GHz	4.02 dBm		
M2		1	2.4 GHz	-46.53 dBm		
M3		1	2.39 GHz	-45.41 dBm		
M4		1	2.341 GHz	-41.56 dBm		

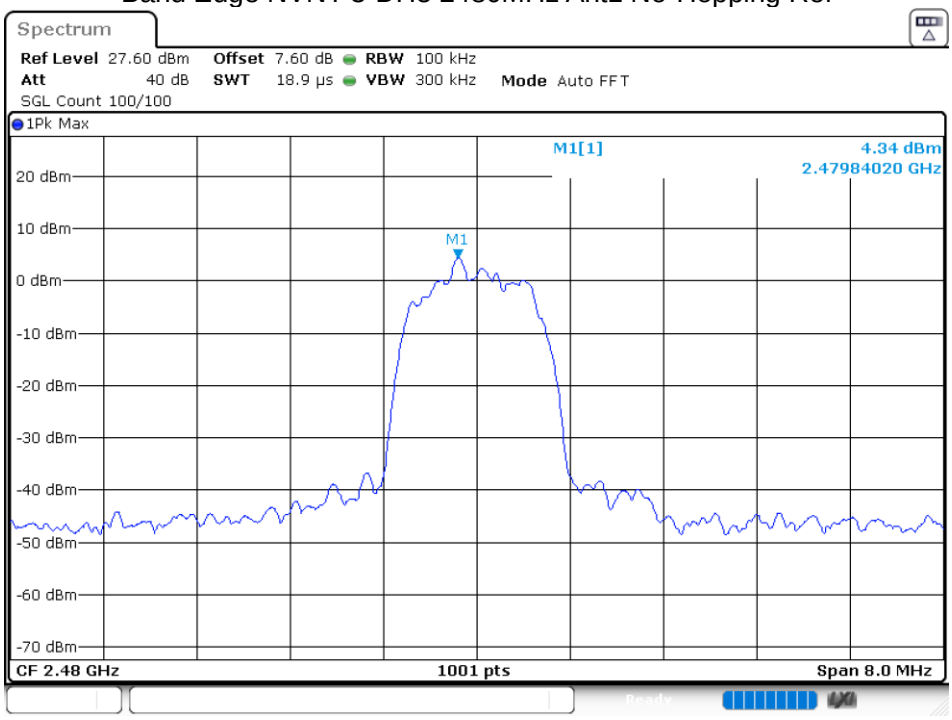
Band Edge(Hopping) NVNT 3-DH5 2402MHz Ant1 Hopping Ref



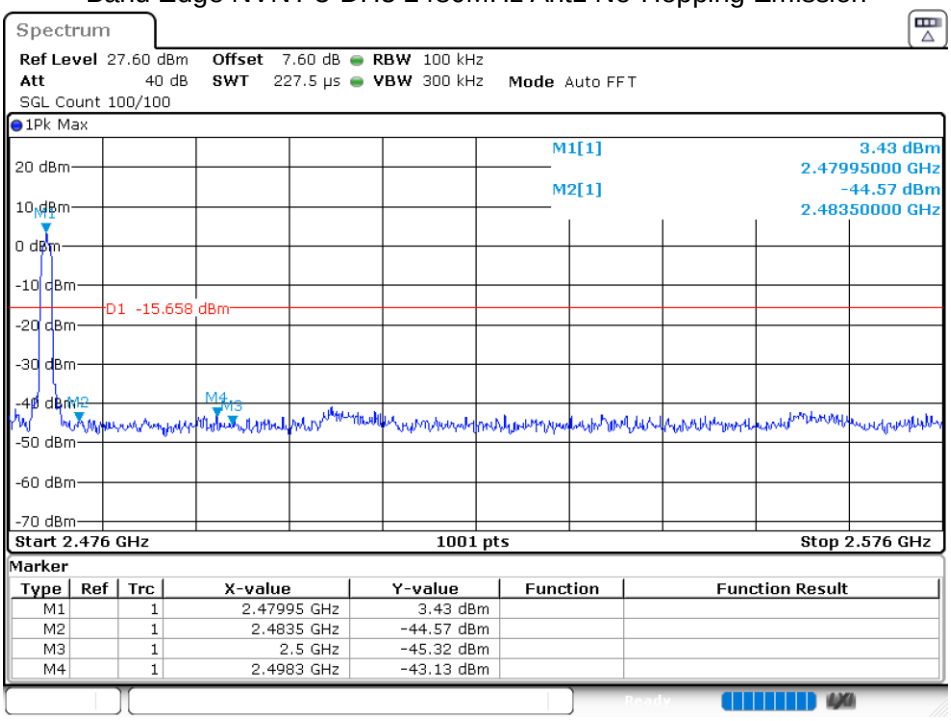
Band Edge(Hopping) NVNT 3-DH5 2402MHz Ant1 Hopping Emission



Band Edge NVNT 3-DH5 2480MHz Ant1 No-Hopping Ref



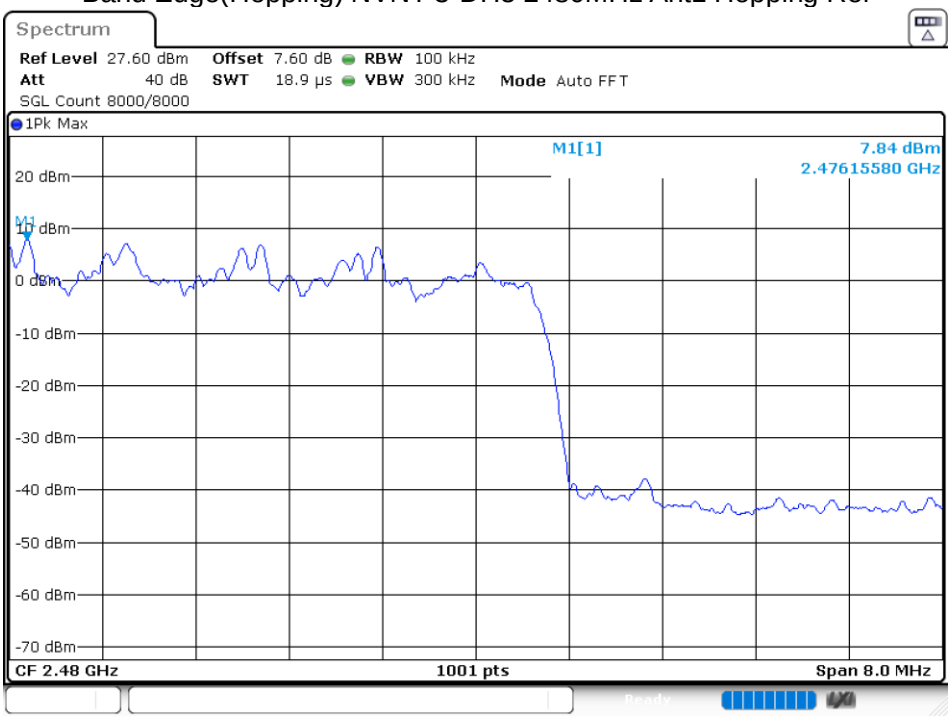
Band Edge NVNT 3-DH5 2480MHz Ant1 No-Hopping Emission



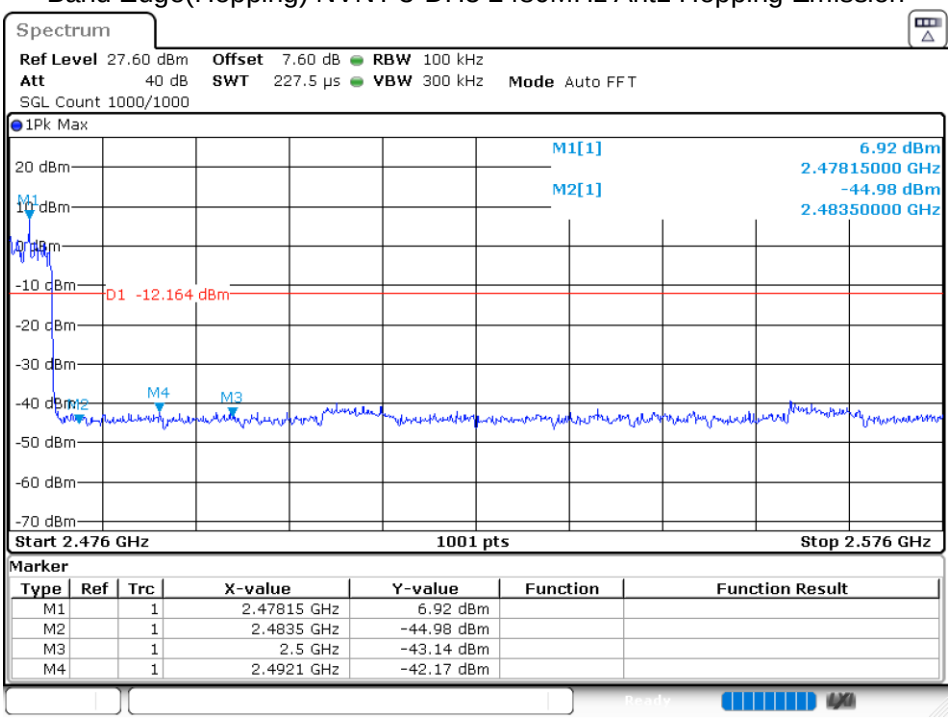
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47995 GHz	3.43 dBm		
M2		1	2.4835 GHz	-44.57 dBm		
M3		1	2.5 GHz	-45.32 dBm		
M4		1	2.4983 GHz	-43.13 dBm		

Band Edge(Hopping) NVNT 3-DH5 2480MHz Ant1 Hopping Ref



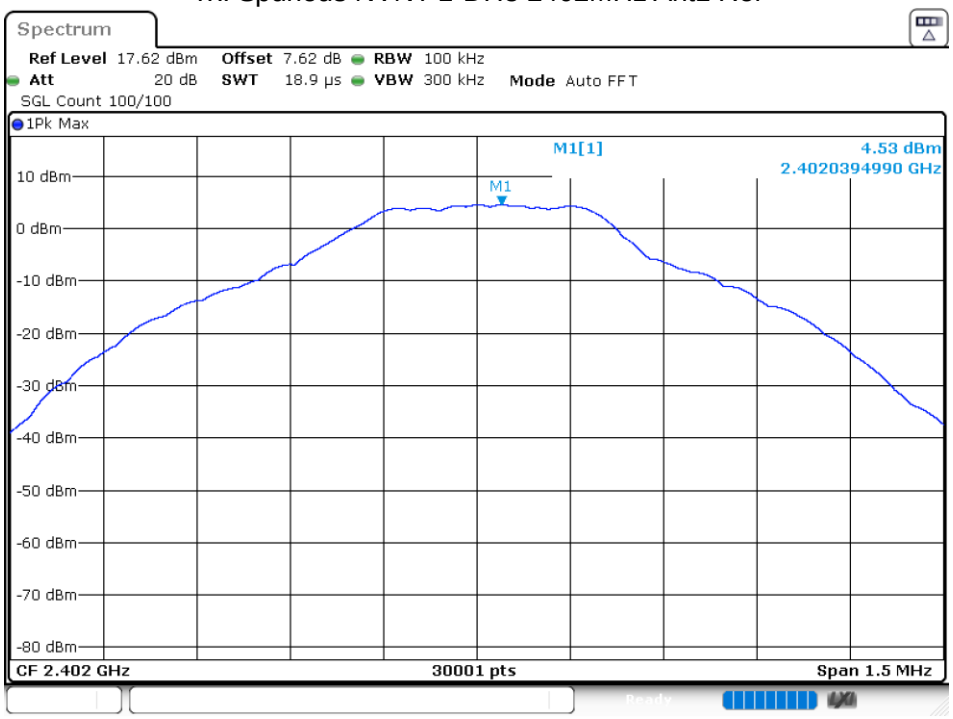
Band Edge(Hopping) NVNT 3-DH5 2480MHz Ant1 Hopping Emission



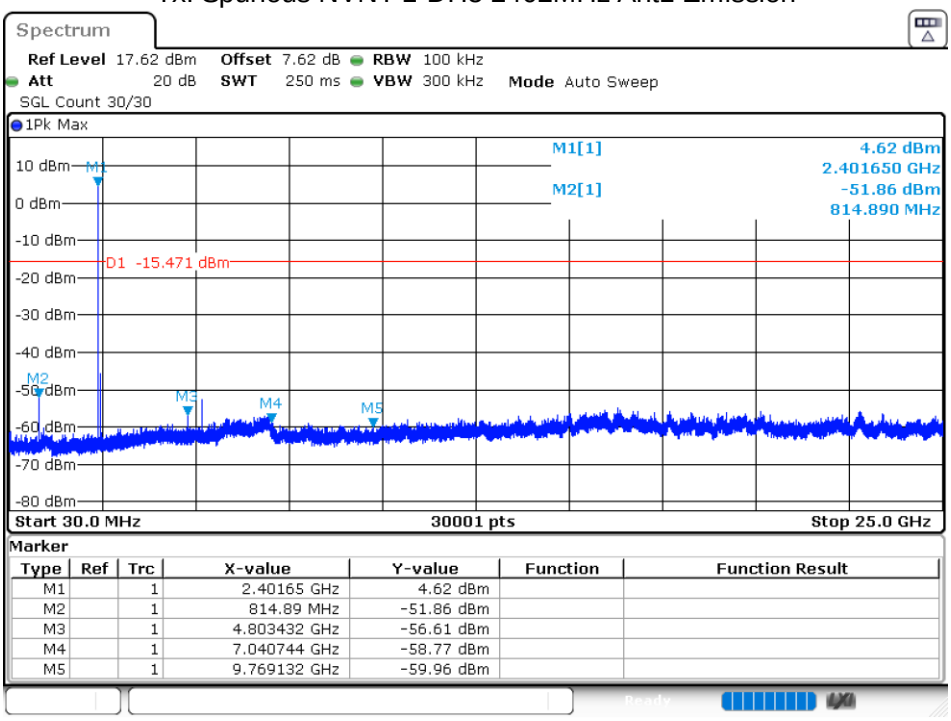
8.7 CONDUCTED RF SPURIOUS EMISSION

Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH5	2402	Ant 1	-56.39	-20	Pass
NVNT	1-DH5	2441	Ant 1	-54.71	-20	Pass
NVNT	1-DH5	2480	Ant 1	-60.12	-20	Pass
NVNT	2-DH5	2402	Ant 1	-52.03	-20	Pass
NVNT	2-DH5	2441	Ant 1	-45.25	-20	Pass
NVNT	2-DH5	2480	Ant 1	-57.69	-20	Pass
NVNT	3-DH5	2402	Ant 1	-44.6	-20	Pass
NVNT	3-DH5	2441	Ant 1	-43.35	-20	Pass
NVNT	3-DH5	2480	Ant 1	-43.75	-20	Pass

Tx. Spurious NVNT 1-DH5 2402MHz Ant1 Ref



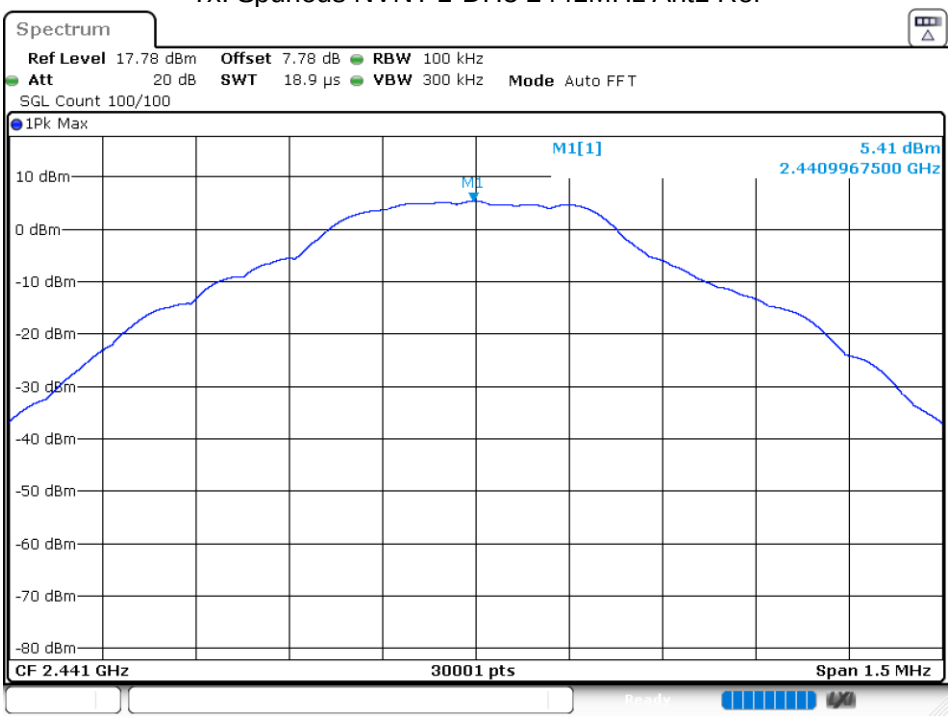
Tx. Spurious NVNT 1-DH5 2402MHz Ant1 Emission



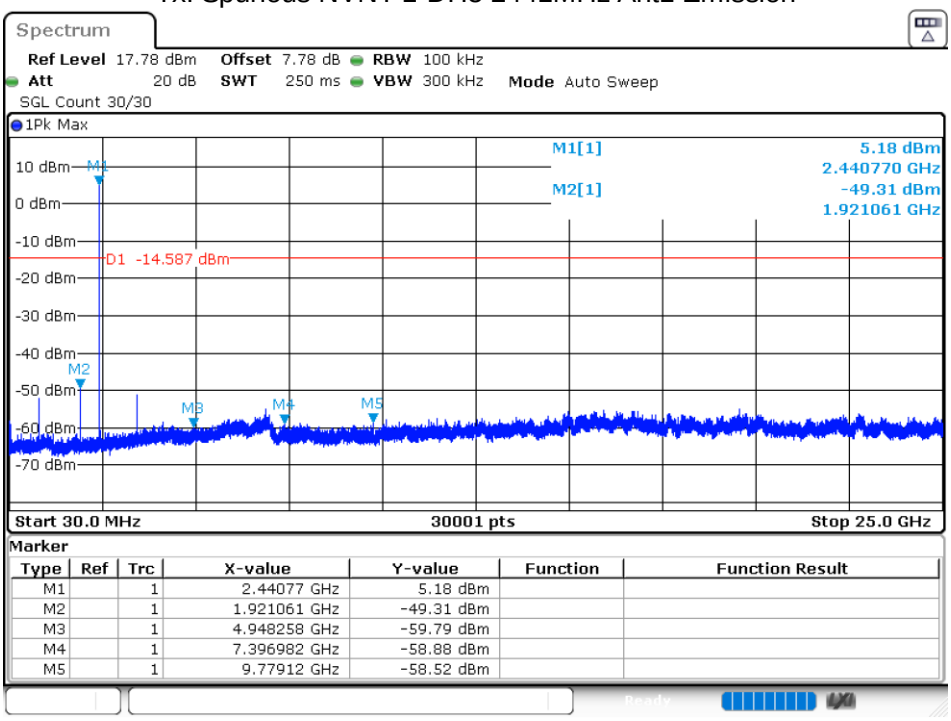
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40165 GHz	4.62 dBm		
M2		1	814.89 MHz	-51.86 dBm		
M3		1	4.803432 GHz	-56.61 dBm		
M4		1	7.040744 GHz	-58.77 dBm		
M5		1	9.769132 GHz	-59.96 dBm		

Tx. Spurious NVNT 1-DH5 2441MHz Ant1 Ref



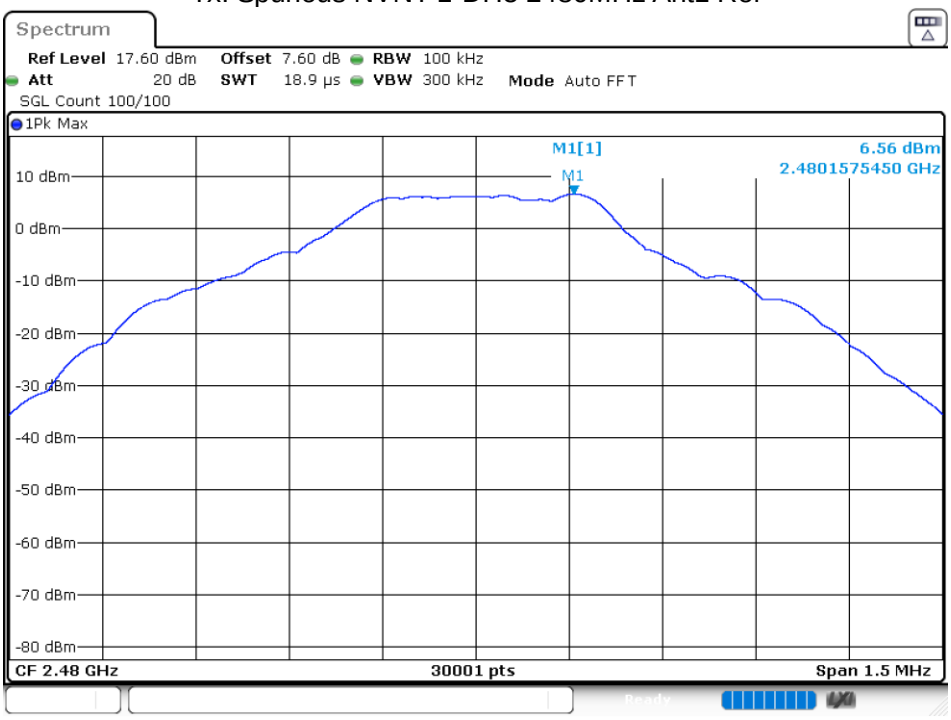
Tx. Spurious NVNT 1-DH5 2441MHz Ant1 Emission



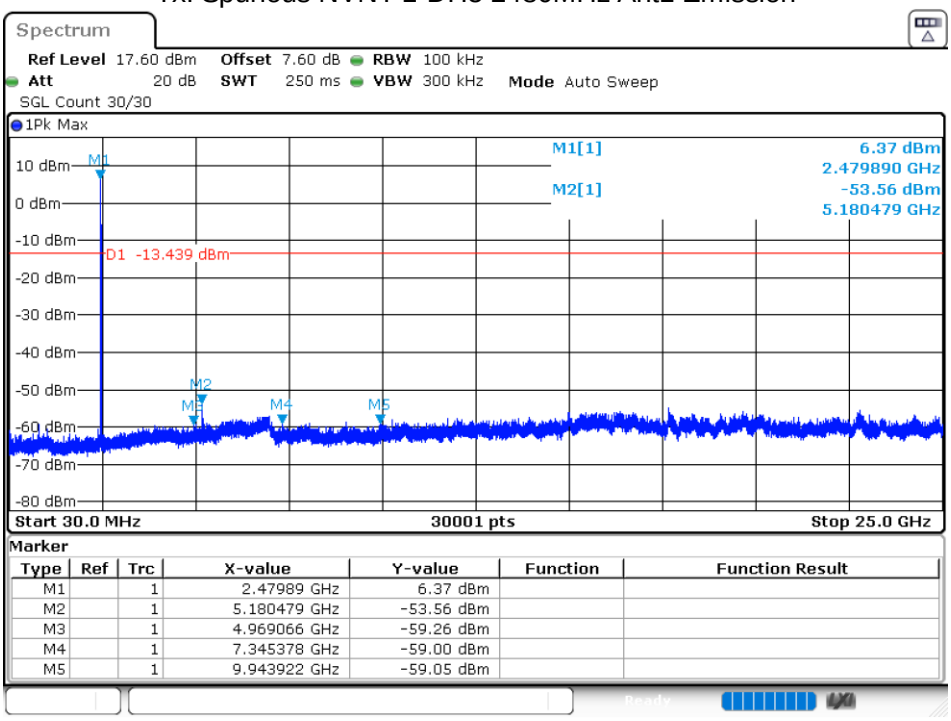
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.44077 GHz	5.18 dBm		
M2		1	1.921061 GHz	-49.31 dBm		
M3		1	4.948258 GHz	-59.79 dBm		
M4		1	7.396982 GHz	-58.88 dBm		
M5		1	9.77912 GHz	-58.52 dBm		

Tx. Spurious NVNT 1-DH5 2480MHz Ant1 Ref



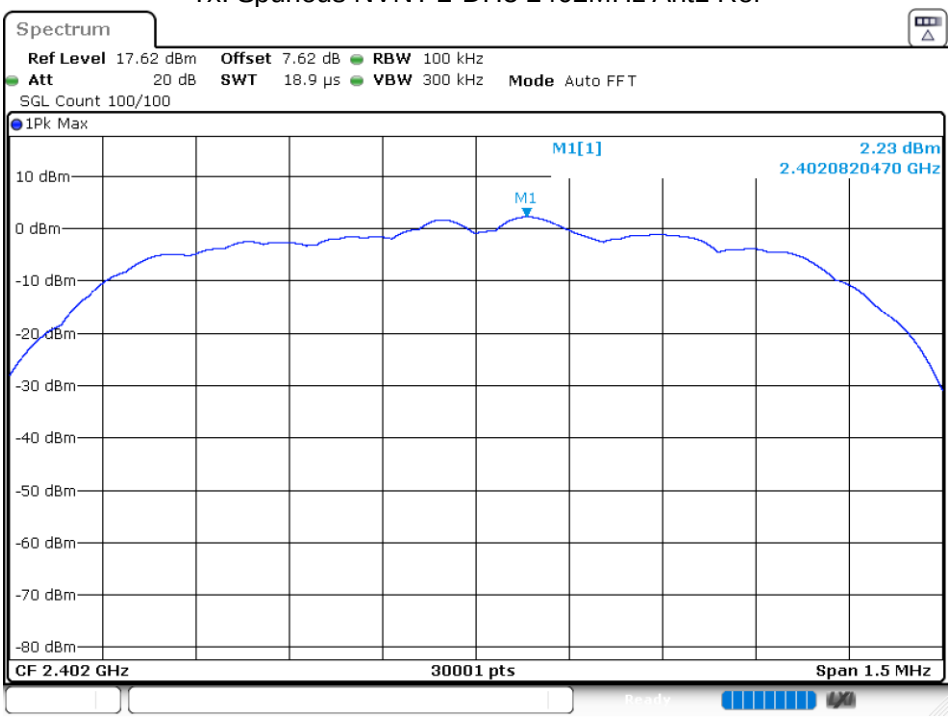
Tx. Spurious NVNT 1-DH5 2480MHz Ant1 Emission



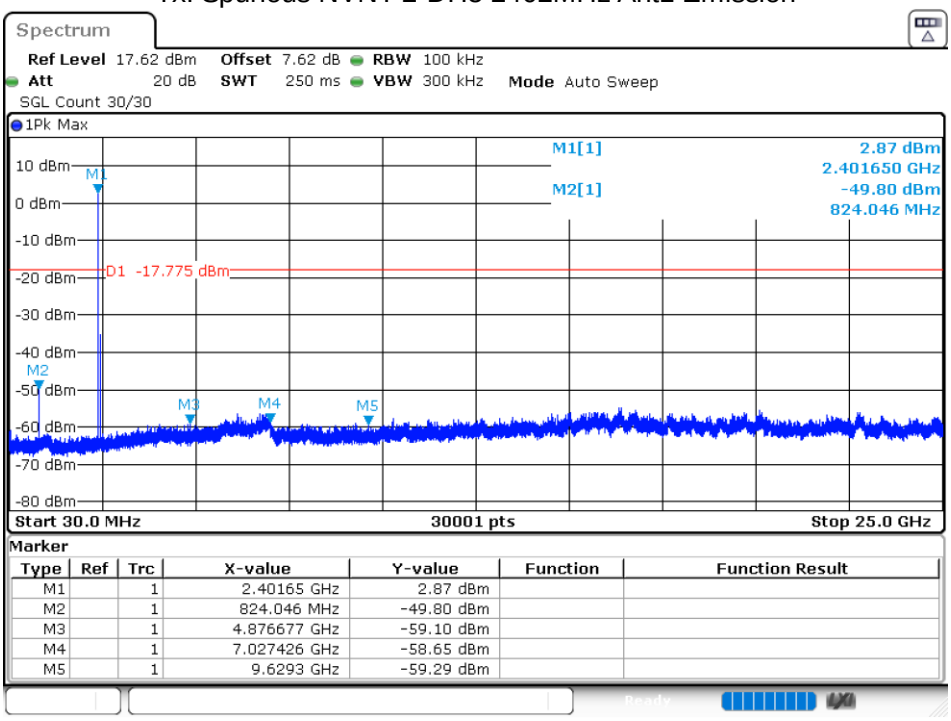
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47989 GHz	6.37 dBm		
M2		1	5.180479 GHz	-53.56 dBm		
M3		1	4.969066 GHz	-59.26 dBm		
M4		1	7.345378 GHz	-59.00 dBm		
M5		1	9.943922 GHz	-59.05 dBm		

Tx. Spurious NVNT 2-DH5 2402MHz Ant1 Ref



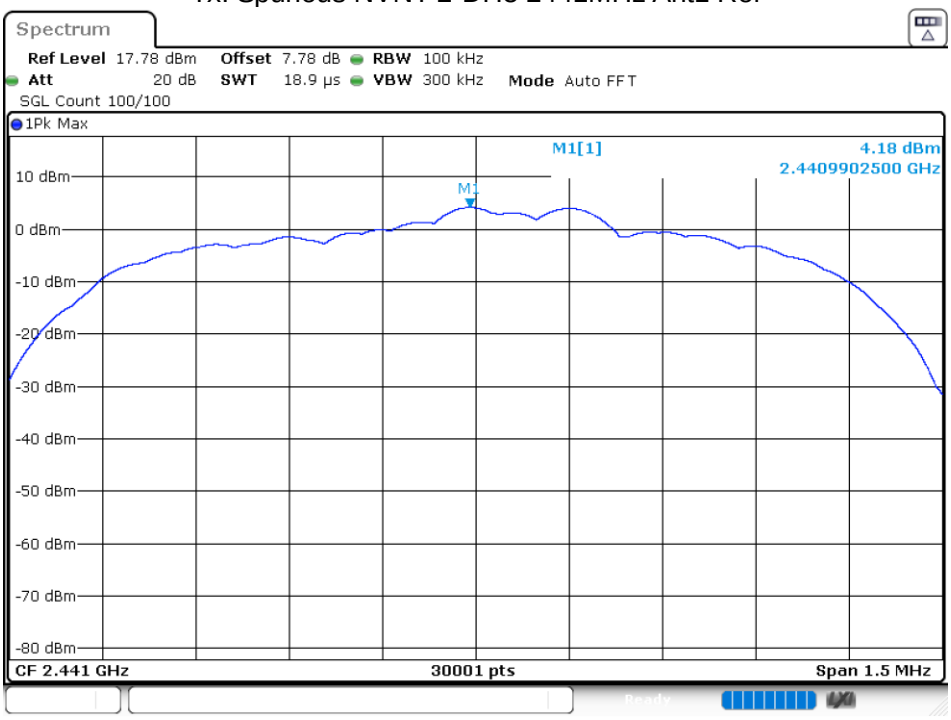
Tx. Spurious NVNT 2-DH5 2402MHz Ant1 Emission



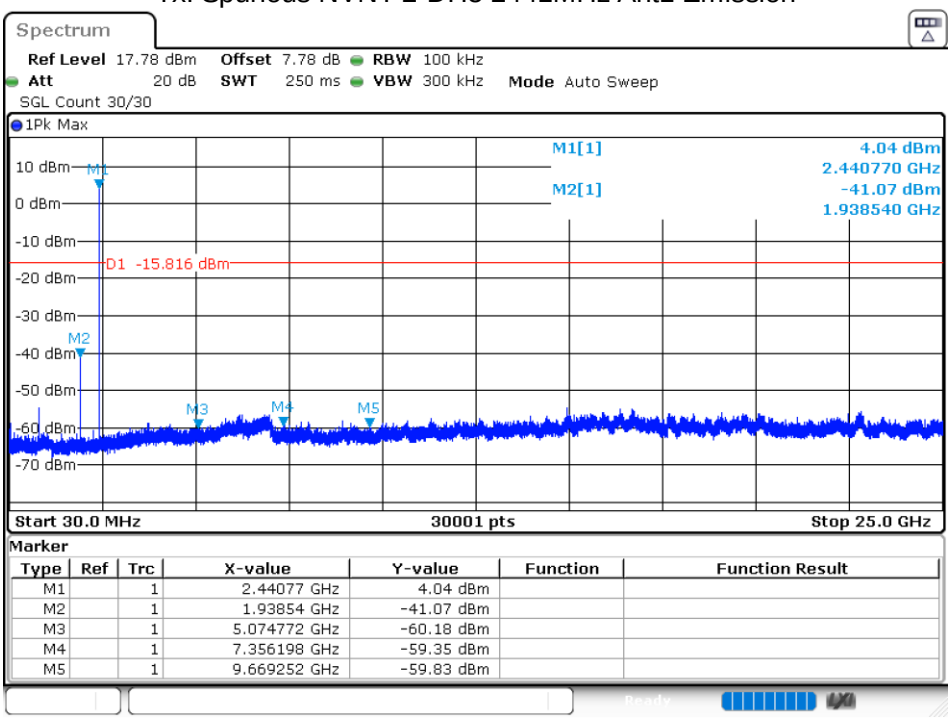
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40165 GHz	2.87 dBm		
M2		1	824.046 MHz	-49.80 dBm		
M3		1	4.876677 GHz	-59.10 dBm		
M4		1	7.027426 GHz	-58.65 dBm		
M5		1	9.6293 GHz	-59.29 dBm		

Tx. Spurious NVNT 2-DH5 2441MHz Ant1 Ref



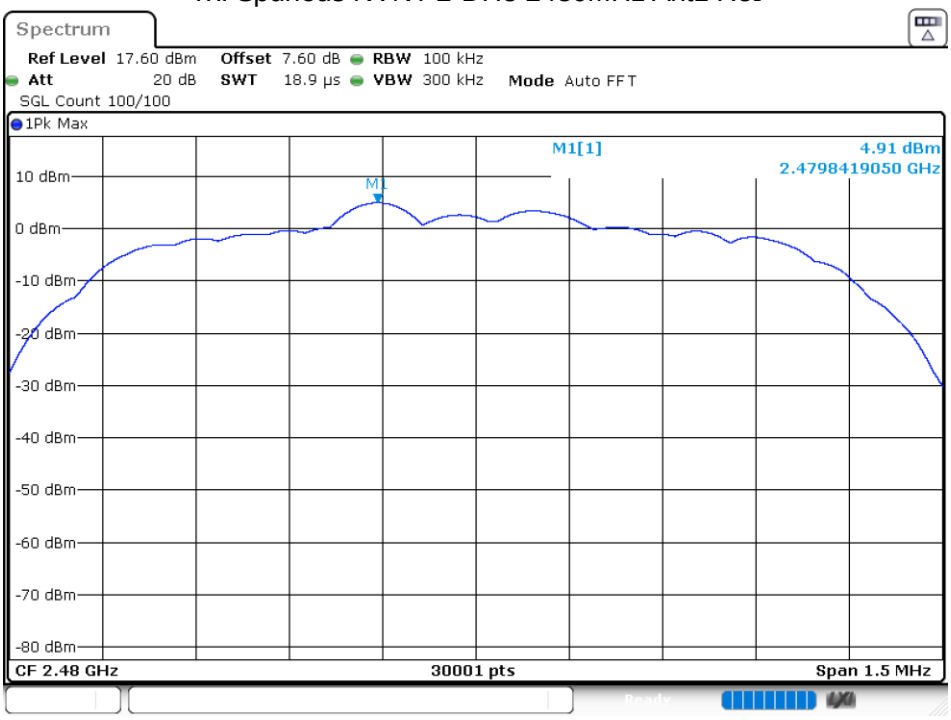
Tx. Spurious NVNT 2-DH5 2441MHz Ant1 Emission



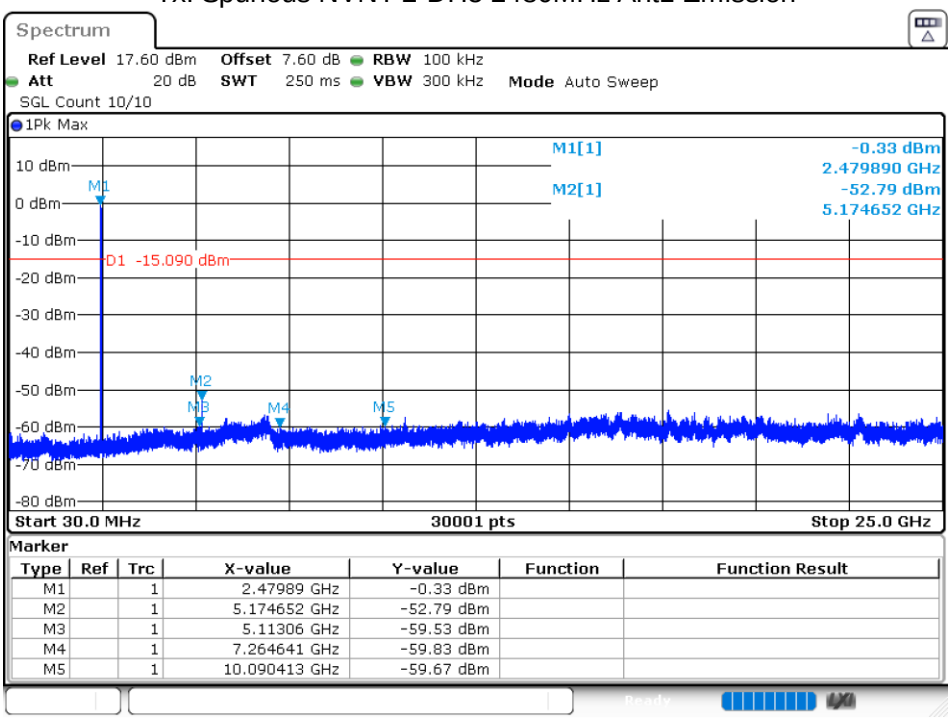
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.44077 GHz	4.04 dBm		
M2		1	1.93854 GHz	-41.07 dBm		
M3		1	5.074772 GHz	-60.18 dBm		
M4		1	7.356198 GHz	-59.35 dBm		
M5		1	9.669252 GHz	-59.83 dBm		

Tx. Spurious NVNT 2-DH5 2480MHz Ant1 Ref



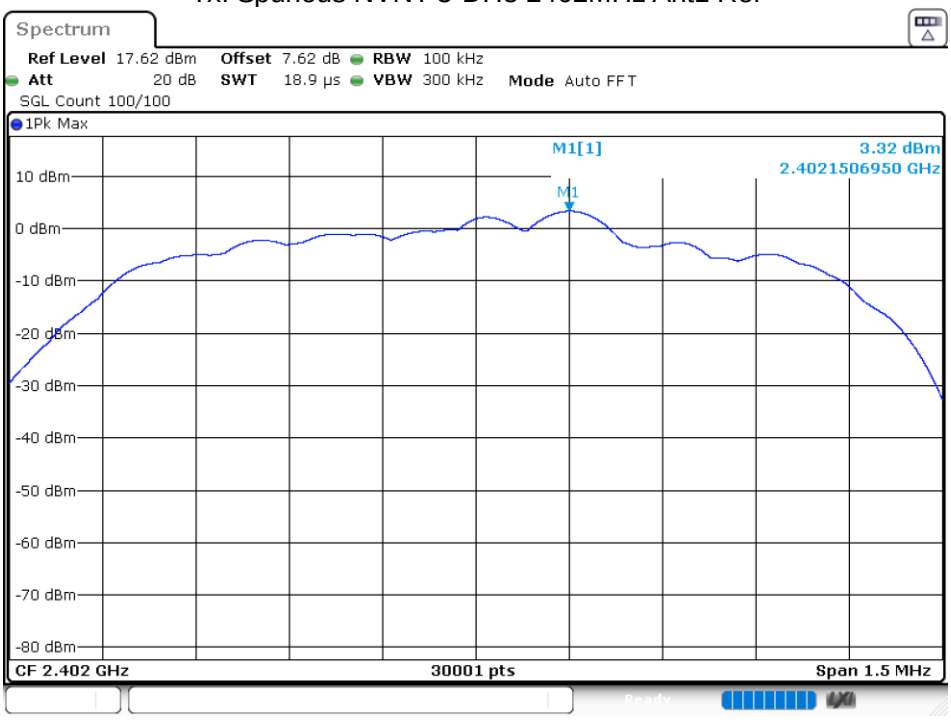
Tx. Spurious NVNT 2-DH5 2480MHz Ant1 Emission



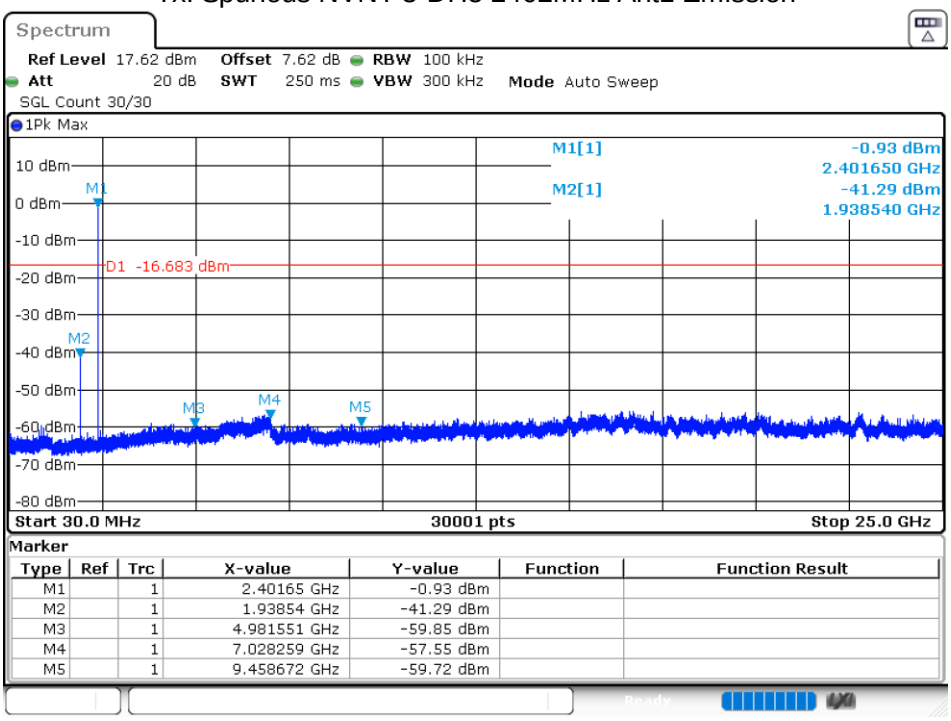
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47989 GHz	-0.33 dBm		
M2		1	5.174652 GHz	-52.79 dBm		
M3		1	5.11306 GHz	-59.53 dBm		
M4		1	7.264641 GHz	-59.83 dBm		
M5		1	10.090413 GHz	-59.67 dBm		

Tx. Spurious NVNT 3-DH5 2402MHz Ant1 Ref



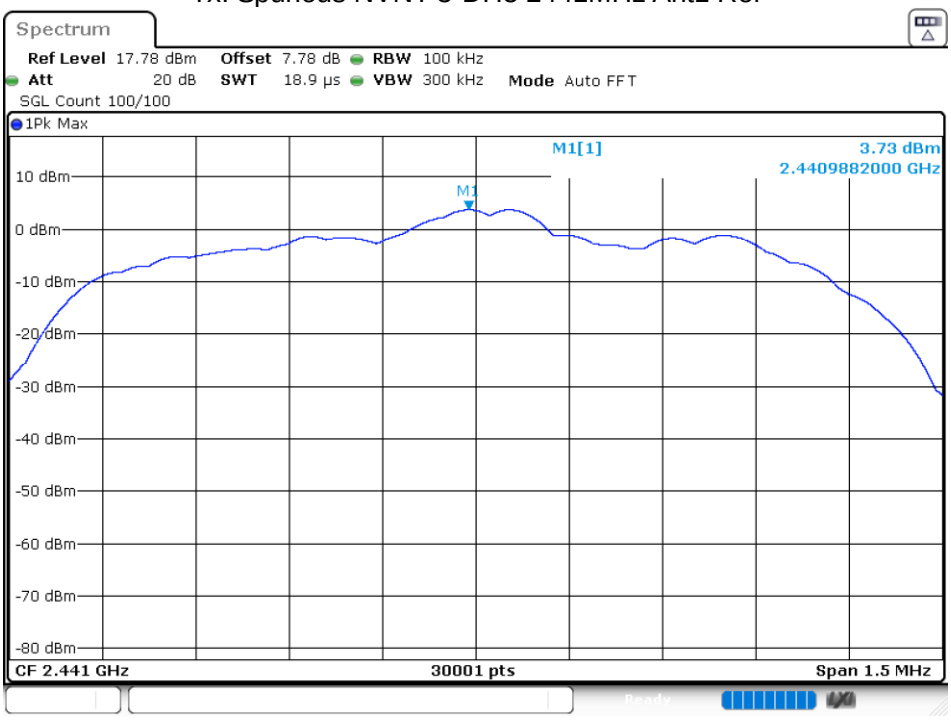
Tx. Spurious NVNT 3-DH5 2402MHz Ant1 Emission



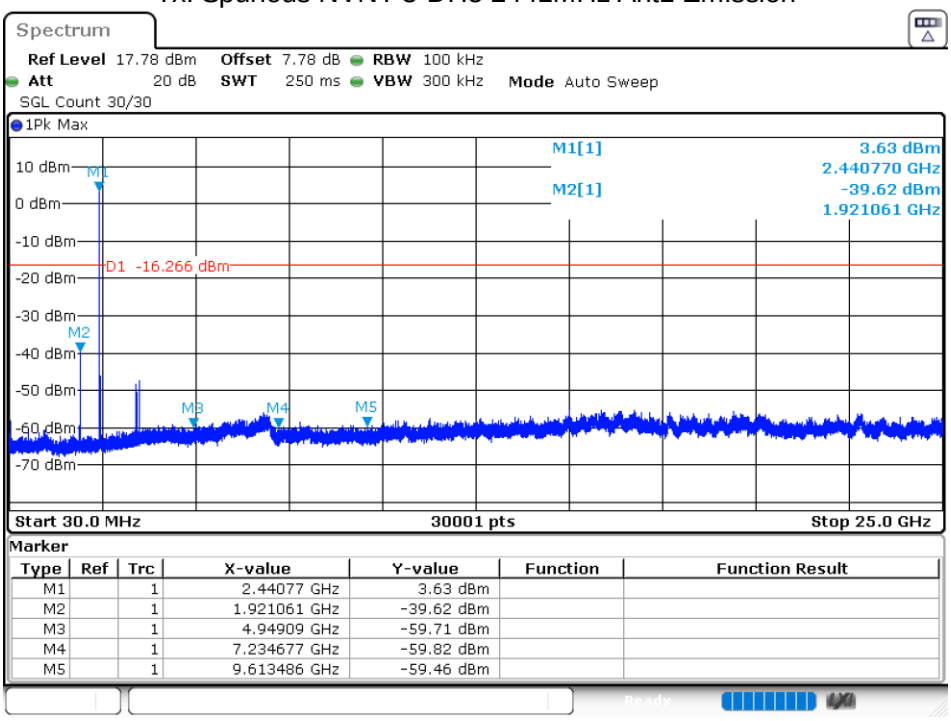
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40165 GHz	-0.93 dBm		
M2		1	1.93854 GHz	-41.29 dBm		
M3		1	4.981551 GHz	-59.85 dBm		
M4		1	7.028259 GHz	-57.55 dBm		
M5		1	9.458672 GHz	-59.72 dBm		

Tx. Spurious NVNT 3-DH5 2441MHz Ant1 Ref



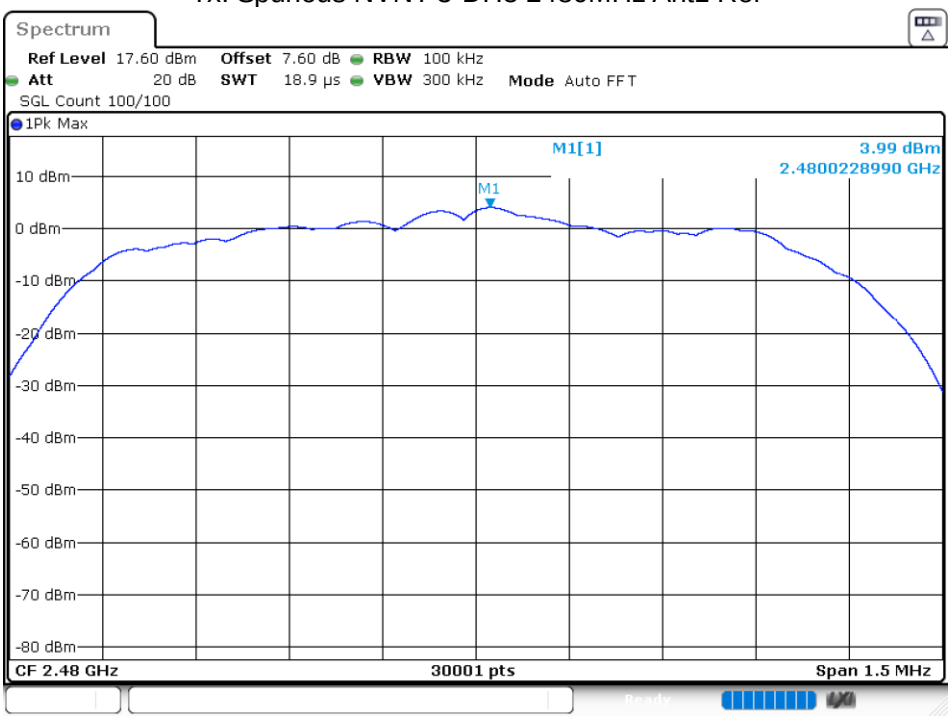
Tx. Spurious NVNT 3-DH5 2441MHz Ant1 Emission



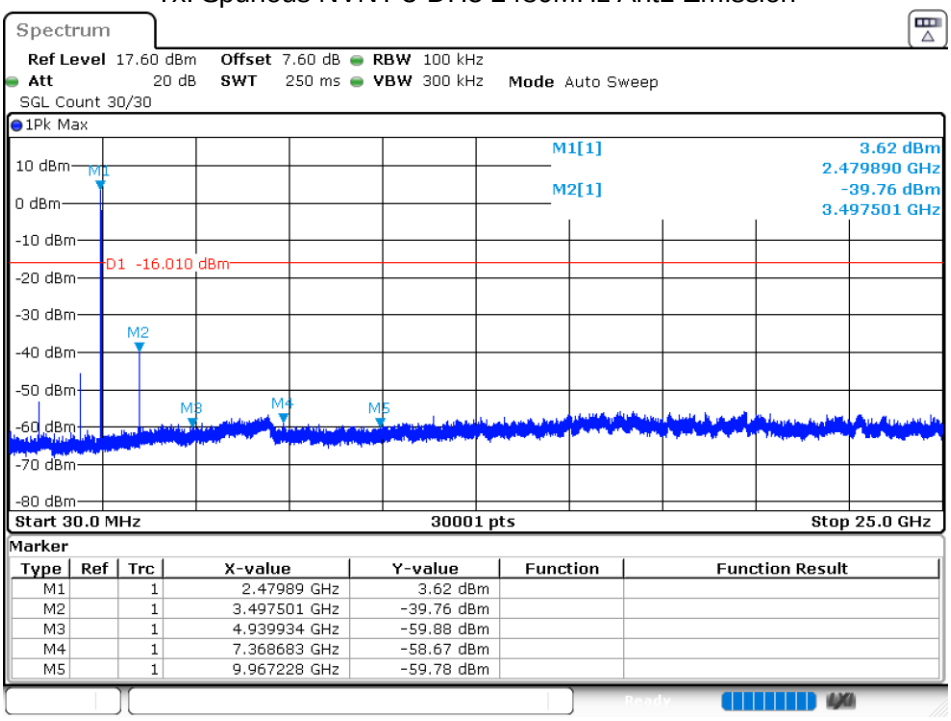
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.44077 GHz	3.63 dBm		
M2		1	1.921061 GHz	-39.62 dBm		
M3		1	4.94909 GHz	-59.71 dBm		
M4		1	7.234677 GHz	-59.82 dBm		
M5		1	9.613486 GHz	-59.46 dBm		

Tx. Spurious NVNT 3-DH5 2480MHz Ant1 Ref



Tx. Spurious NVNT 3-DH5 2480MHz Ant1 Emission



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47989 GHz	3.62 dBm		
M2		1	3.497501 GHz	-39.76 dBm		
M3		1	4.939934 GHz	-59.88 dBm		
M4		1	7.368683 GHz	-58.67 dBm		
M5		1	9.967228 GHz	-59.78 dBm		

END OF REPORT