



7. 20DB&99% BANDWIDTH

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10-2020+Cor 1-2023

7.1 Test Setup



7.2 Limit

N/A

7.3 Test procedure

1. Set RBW = 30 kHz.
2. Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

7.4 DEVIATION FROM STANDARD

No deviation.

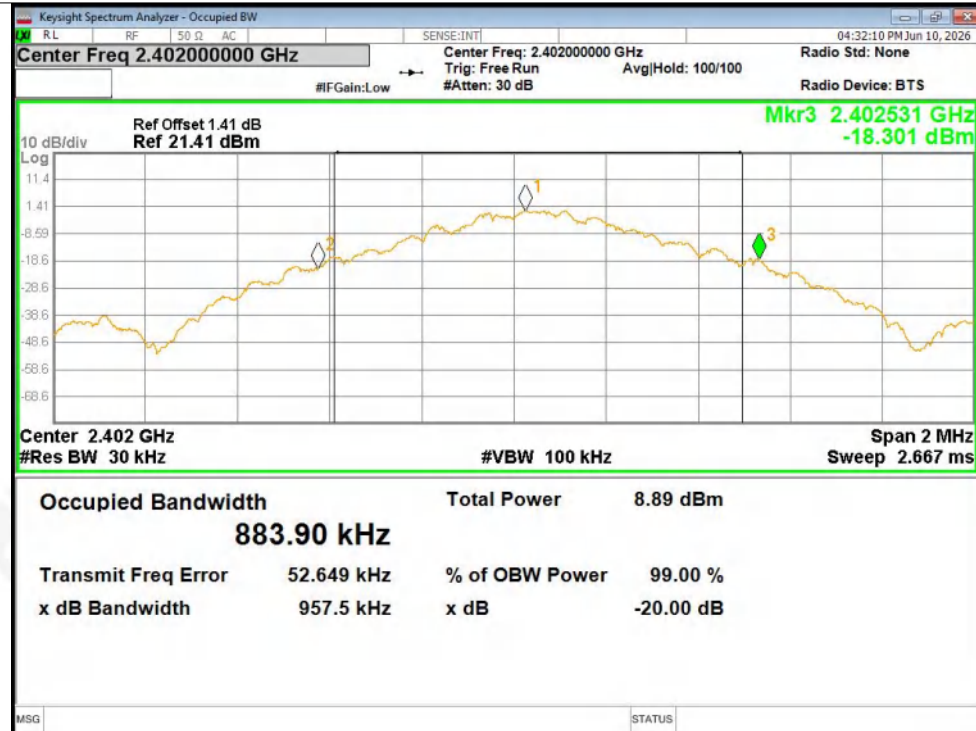
7.5 Test Result

Mode	Test channel	20dB Emission Bandwidth (MHz)	Result
GFSK	Lowest	0.957	Pass
	Middle	0.956	
	Highest	0.950	
$\pi/4$ -DQPSK	Lowest	1.364	Pass
	Middle	1.356	
	Highest	1.363	
8-DPSK	Lowest	1.346	Pass
	Middle	1.346	
	Highest	1.344	

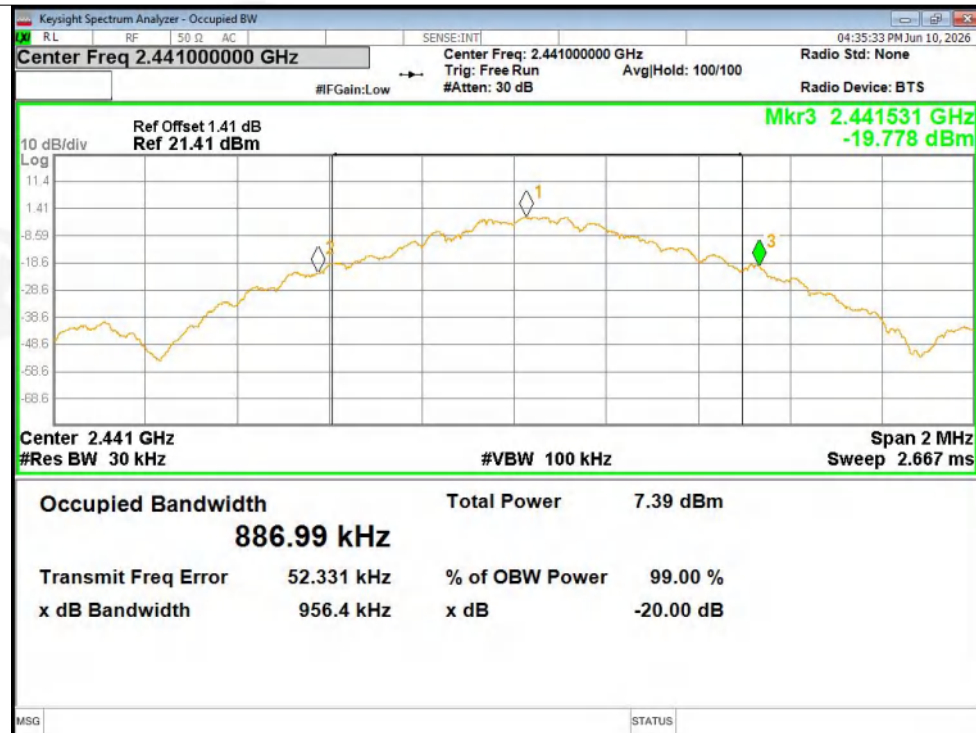


Test Graphs

-20dB Bandwidth NVNT 1-DH5 2402MHz Ant1

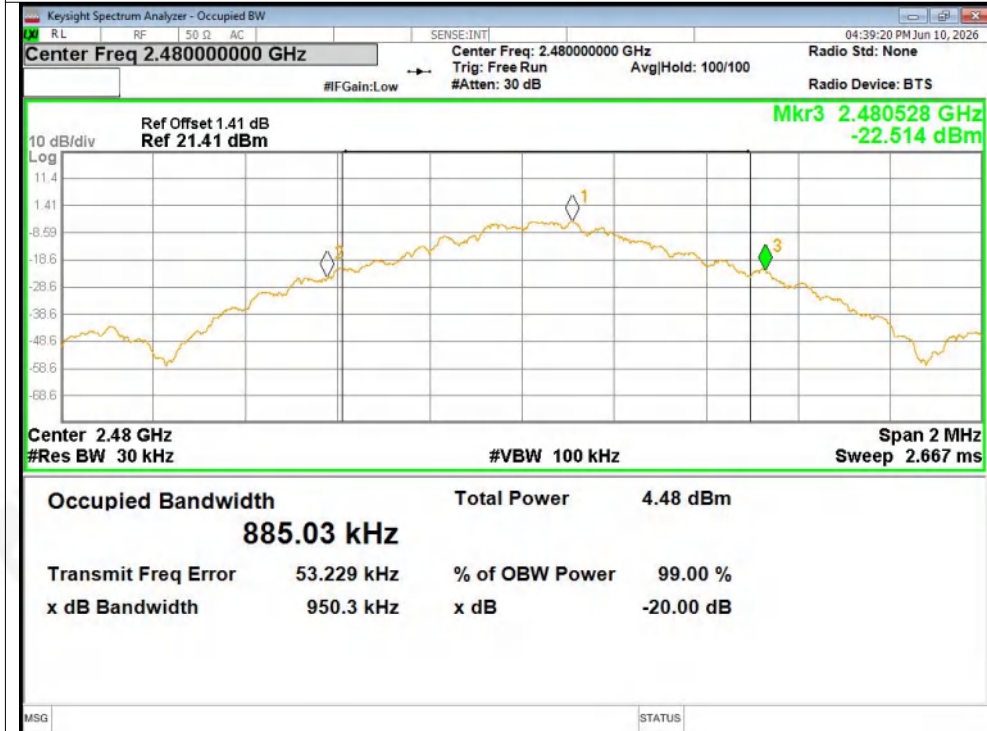


-20dB Bandwidth NVNT 1-DH5 2441MHz Ant1

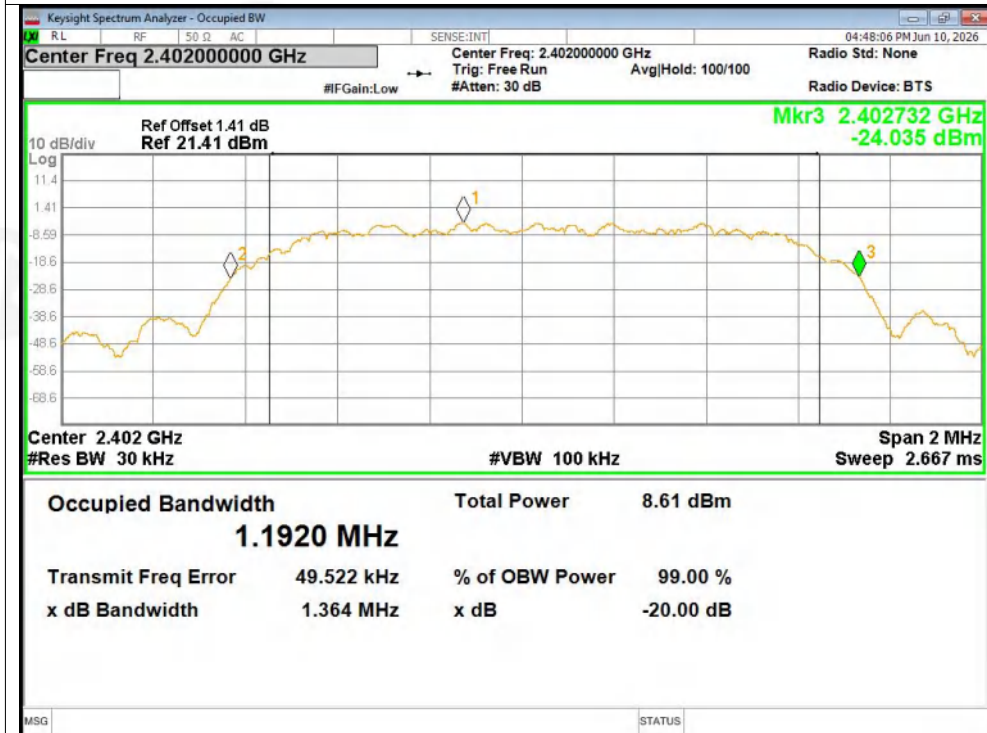




-20dB Bandwidth NVNT 1-DH5 2480MHz Ant1

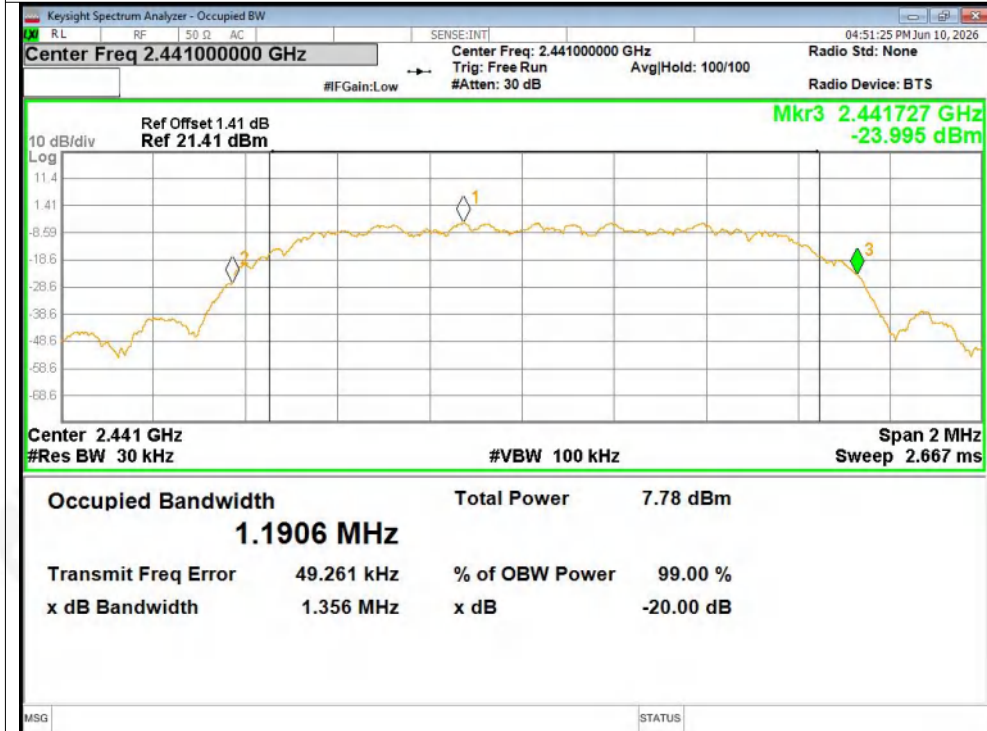


-20dB Bandwidth NVNT 2-DH5 2402MHz Ant1

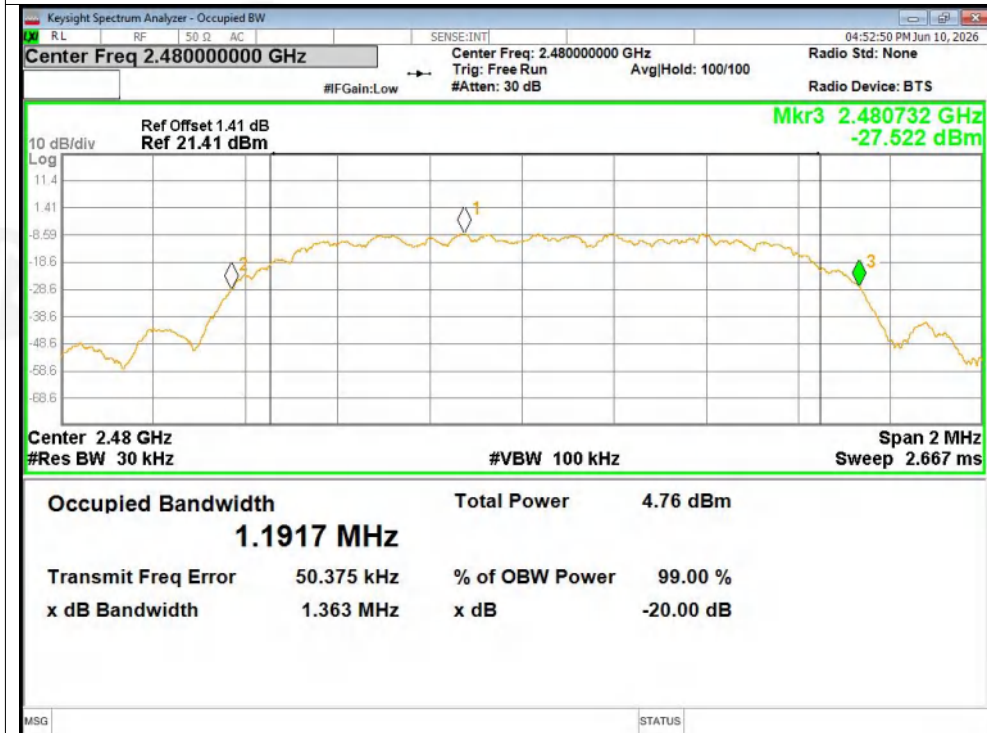




-20dB Bandwidth NVNT 2-DH5 2441MHz Ant1

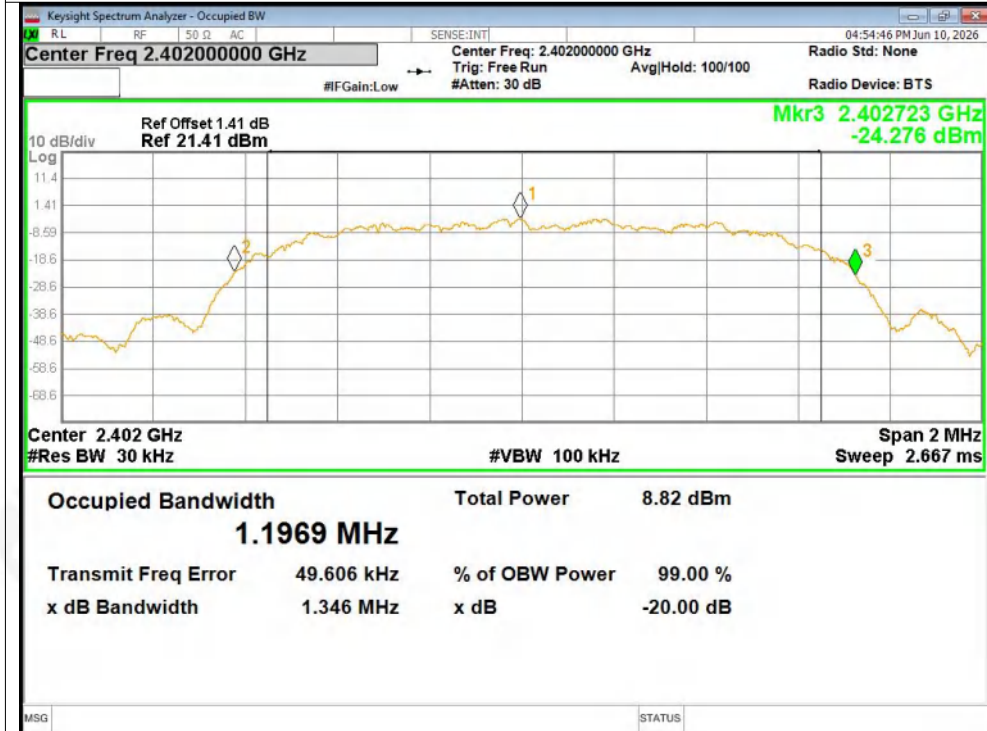


-20dB Bandwidth NVNT 2-DH5 2480MHz Ant1

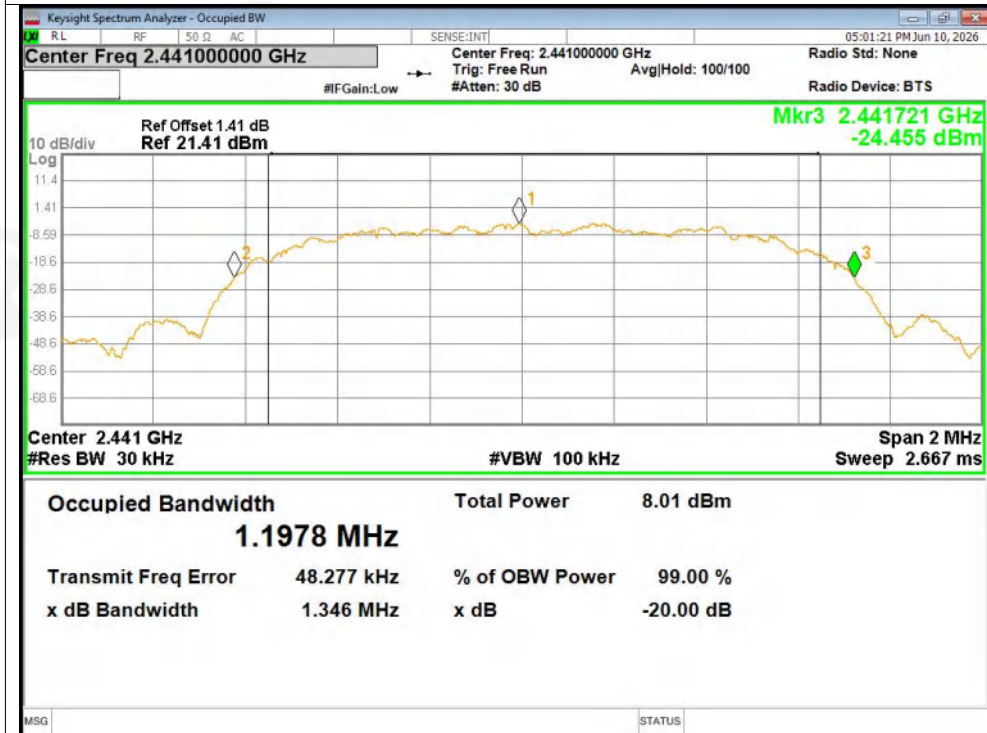


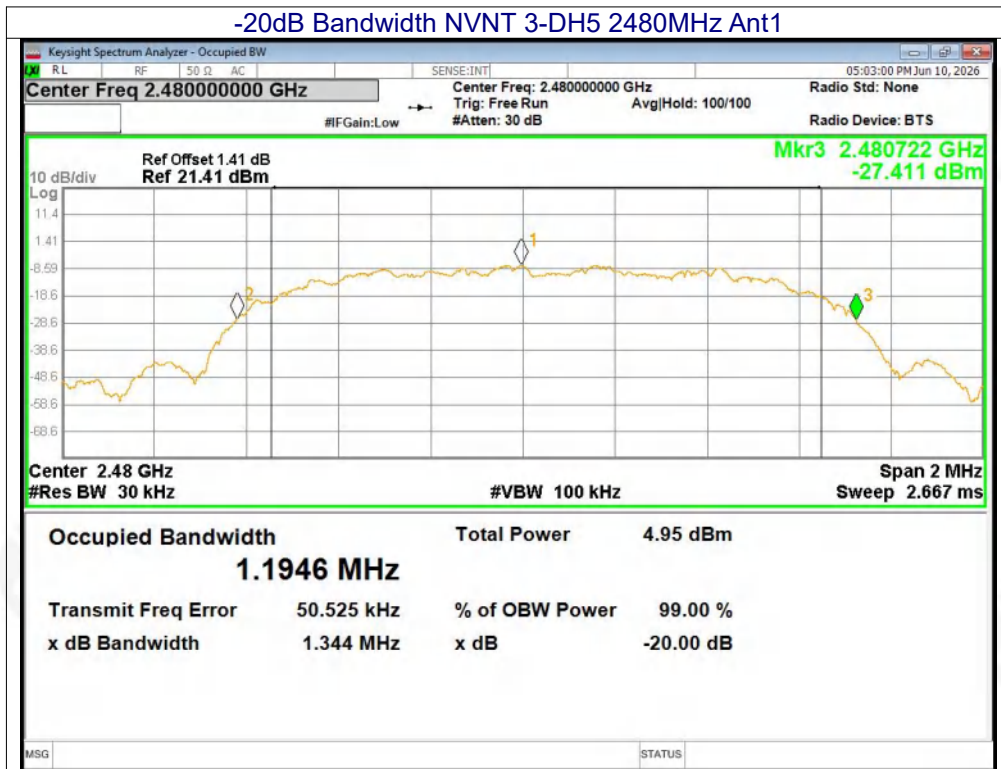


-20dB Bandwidth NVNT 3-DH5 2402MHz Ant1



-20dB Bandwidth NVNT 3-DH5 2441MHz Ant1







8. Maximum Peak Output Power

Test Requirement:	FCC Part15 C Section 15.247 (b)(1)
Test Method:	ANSI C63.10-2020+Cor 1-2023
Limit:	GFSK:30 dBm $\pi/4$ -DQPSK & 8-DPSK:20.97 dBm

8.1 Block Diagram Of Test Setup



8.2 Limit

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

For FHSs operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W if the hopset uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W if the hopset uses less than 75 hopping channels. The e.i.r.p. shall not exceed 4 W.

8.3 Test procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 2MHz. VBW =6MHz. Sweep = auto; Detector Function = Peak.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

8.4 DEVIATION FROM STANDARD

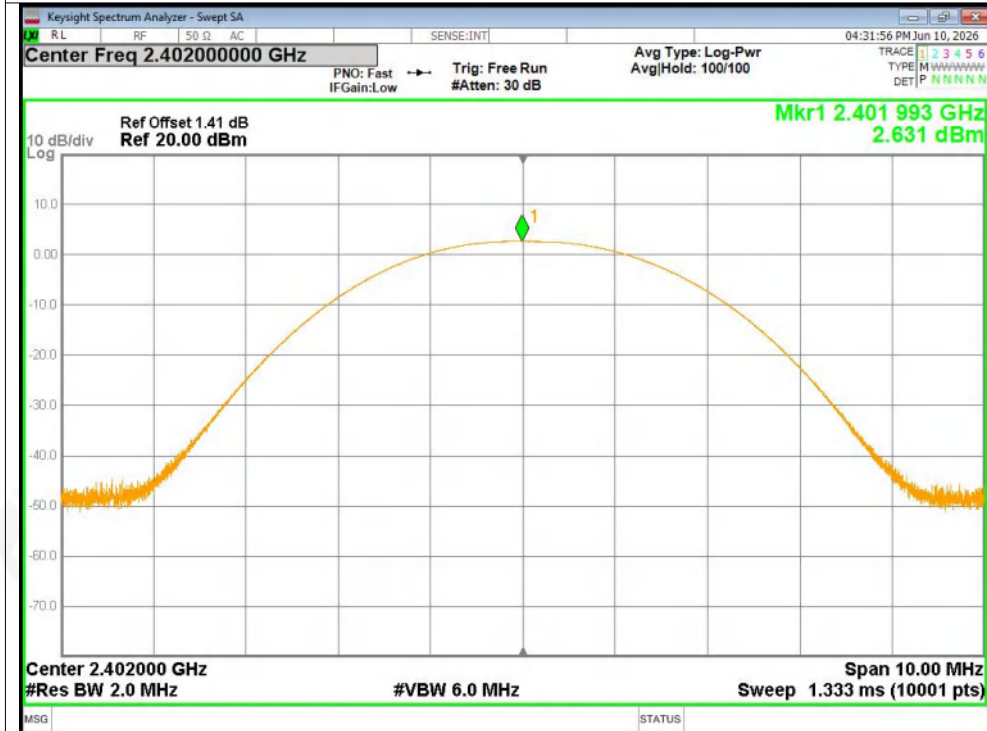
No deviation.

8.5 Test Result

Mode	Test channel	Peak Output Power (dBm)	FCC Limit (dBm)	Result
GFSK	Lowest	2.63	30.00	Pass
	Middle	1.17		
	Highest	-1.71		
$\pi/4$ -DQPSK	Lowest	4.93	21.00	Pass
	Middle	4.12		
	Highest	1.02		
8-DPSK	Lowest	5.49	21.00	Pass
	Middle	4.66		
	Highest	1.57		



Test Graphs Peak Power NVNT 1-DH5 2402MHz Ant1

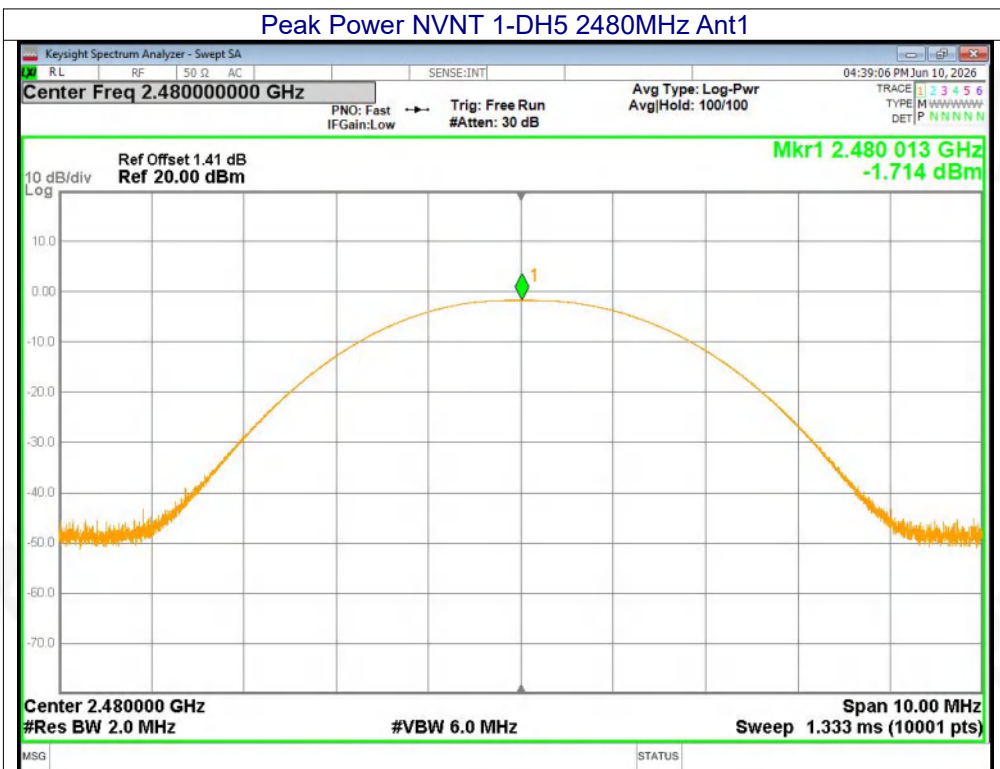


Peak Power NVNT 1-DH5 2441MHz Ant1

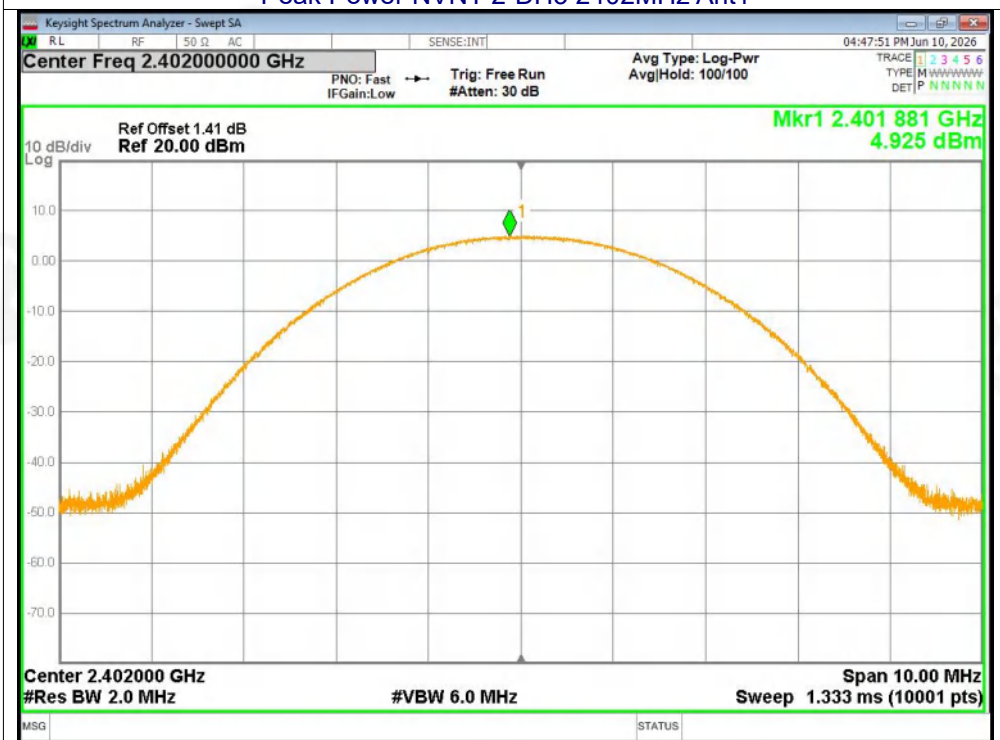




Peak Power NVNT 1-DH5 2480MHz Ant1

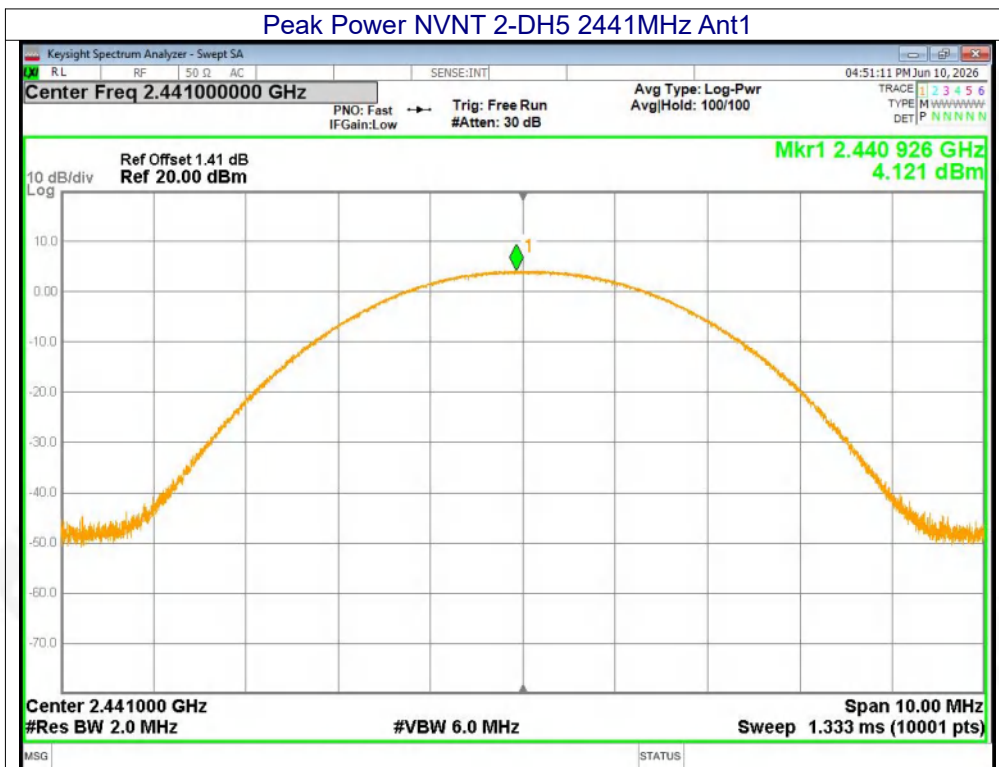


Peak Power NVNT 2-DH5 2402MHz Ant1

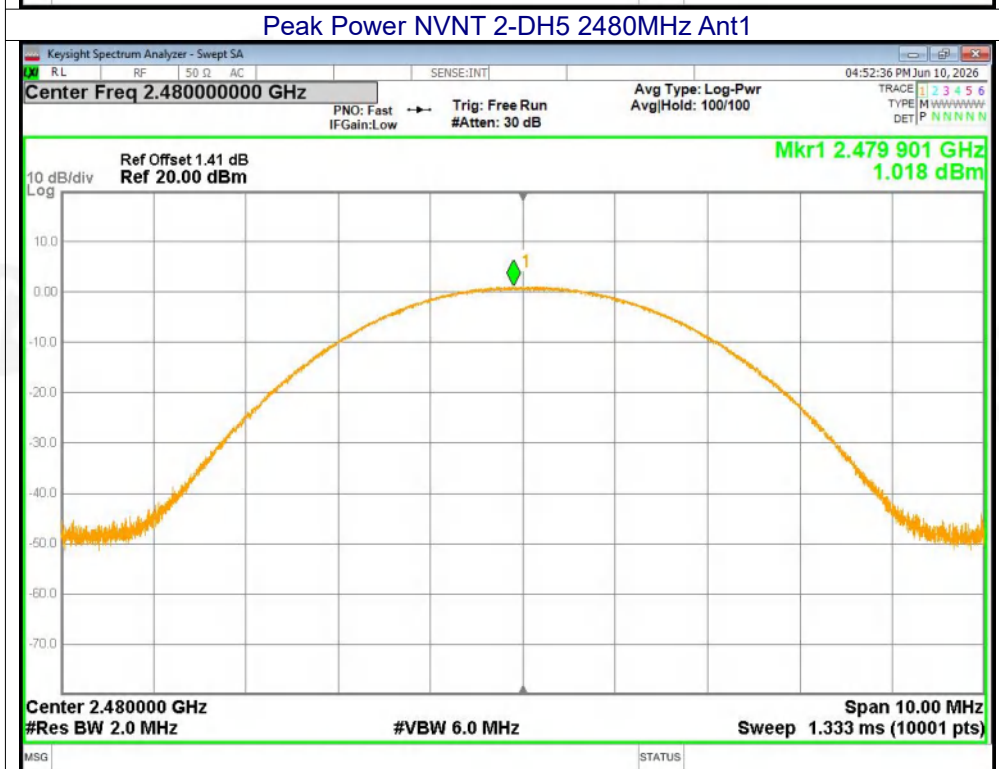




Peak Power NVNT 2-DH5 2441MHz Ant1

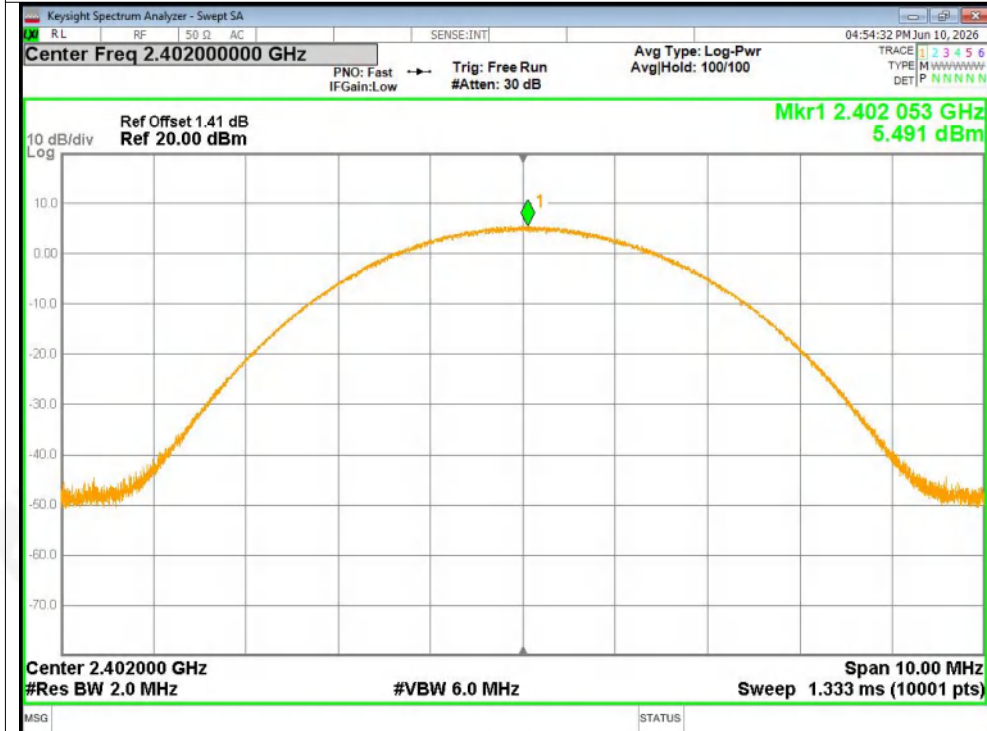


Peak Power NVNT 2-DH5 2480MHz Ant1

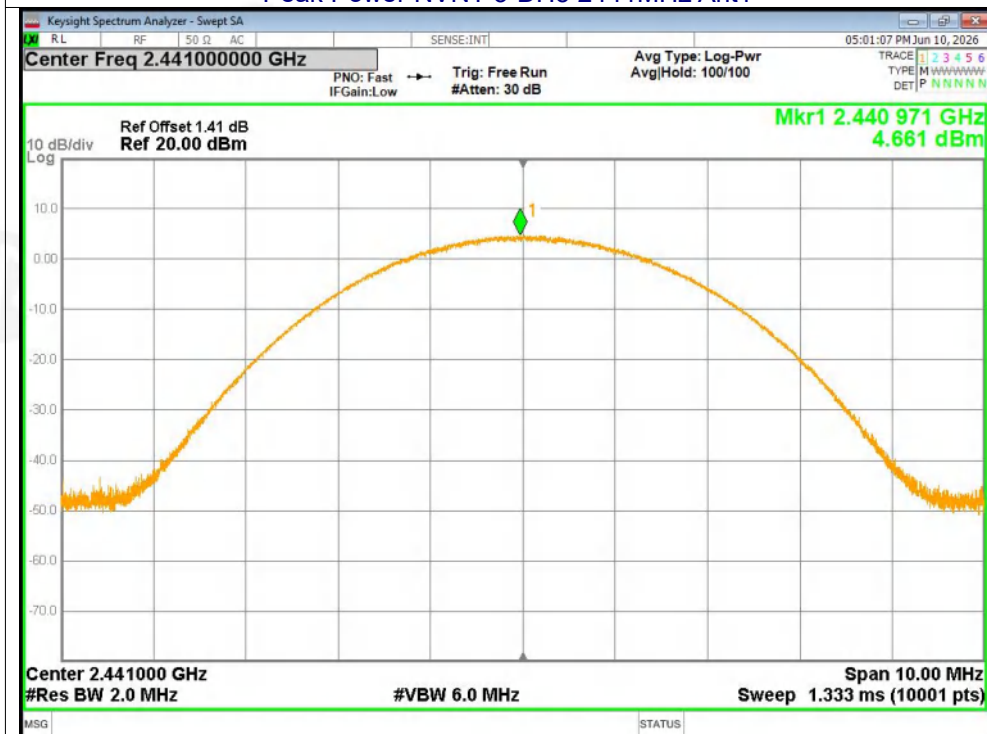


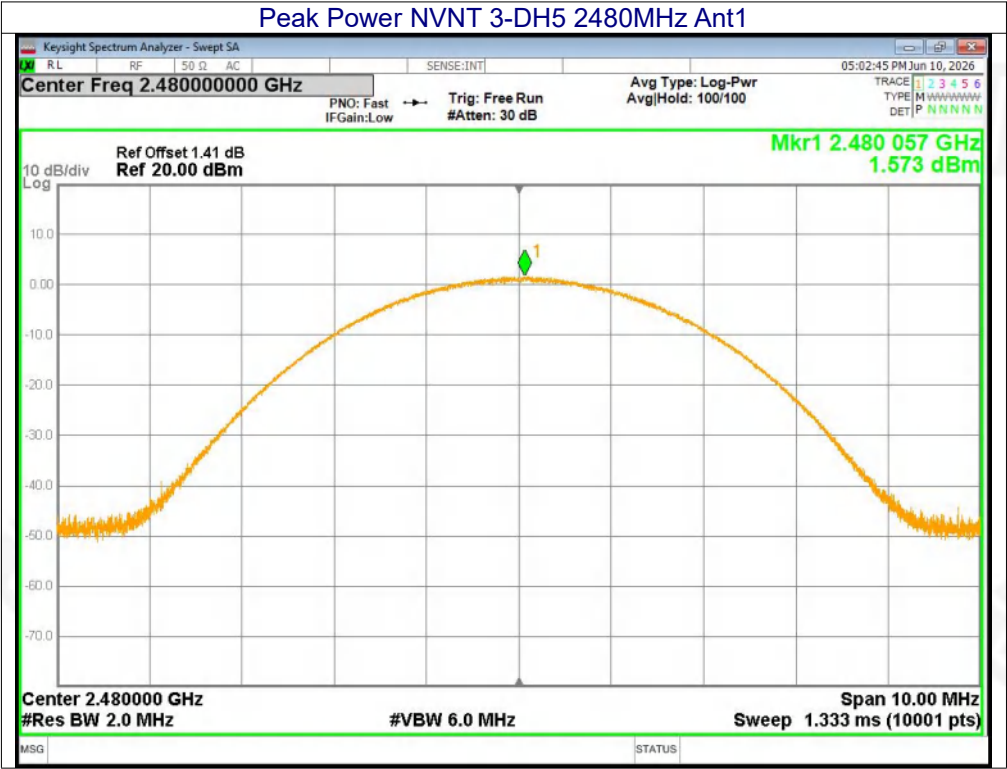


Peak Power NVNT 3-DH5 2402MHz Ant1



Peak Power NVNT 3-DH5 2441MHz Ant1







9. HOPPING CHANNEL SEPARATION

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10-2020+Cor 1-2023
Receiver setup:	RBW = 300kHz. VBW = 300kHz , Span = 2.0MHz for GFSK, RBW = 100kHz. VBW = 100kHz , Span = 2.6MHz for $\pi/4$ -DQPSK and 8-DPSK, detector=Peak
Limit:	GFSK: 20dB bandwidth $\pi/4$ -DQPSK & 8DSK: 0.025MHz or 2/3 of the 20dB bandwidth (whichever is greater)

9.1 Test Setup



9.2 Test procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 300kHz. VBW = 300kHz , Span = 2.0MHz for GFSK, RBW = 100kHz. VBW = 100kHz , Span = 2.6MHz for $\pi/4$ -DQPSK and 8-DPSK. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

9.3 DEVIATION FROM STANDARD

No deviation.

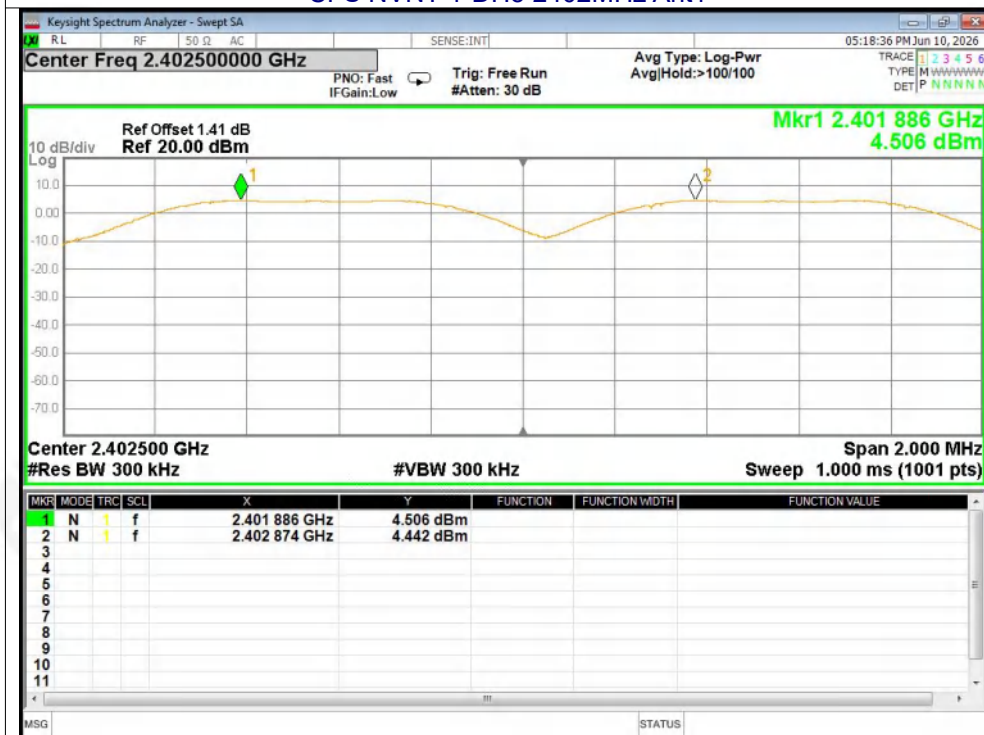


9.4 Test Result

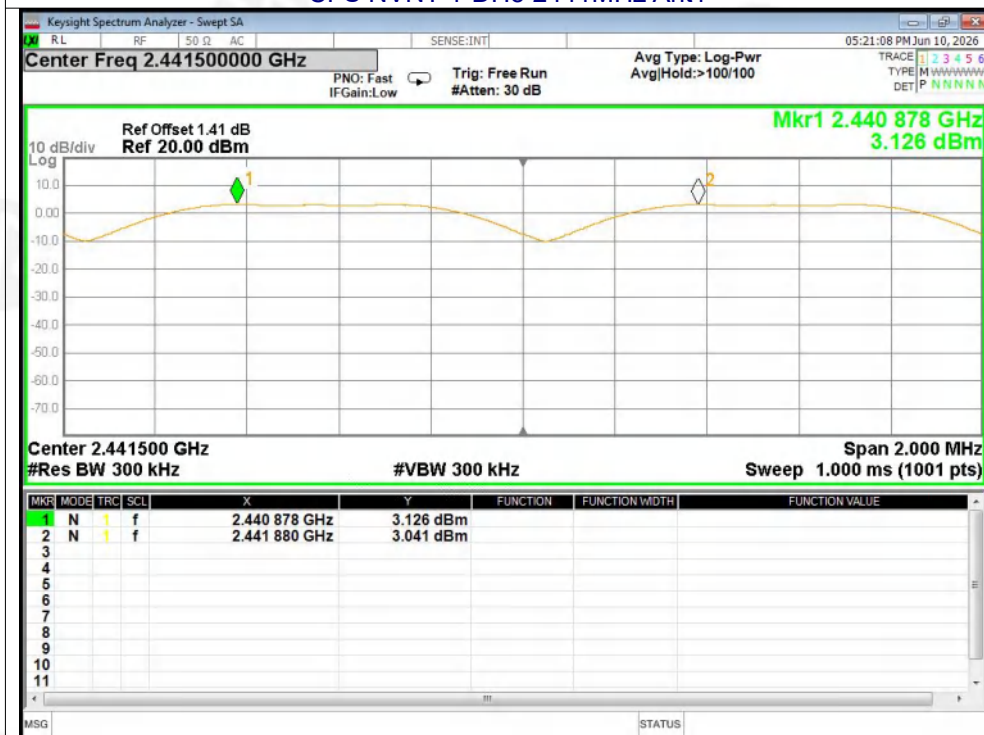
Modulation	Test Channel	Separation (MHz)	Limit(MHz)	Result
GFSK	Low	0.9880	0.957	PASS
GFSK	Middle	1.0020	0.956	PASS
GFSK	High	1.0100	0.950	PASS
$\pi/4$ -DQPSK	Low	1.0374	0.909	PASS
$\pi/4$ -DQPSK	Middle	1.2194	0.904	PASS
$\pi/4$ -DQPSK	High	1.1466	0.909	PASS
8-DPSK	Low	1.0114	0.897	PASS
8-DPSK	Middle	1.2012	0.897	PASS
8-DPSK	High	1.0192	0.896	PASS



Test Graphs CFS NVNT 1-DH5 2402MHz Ant1

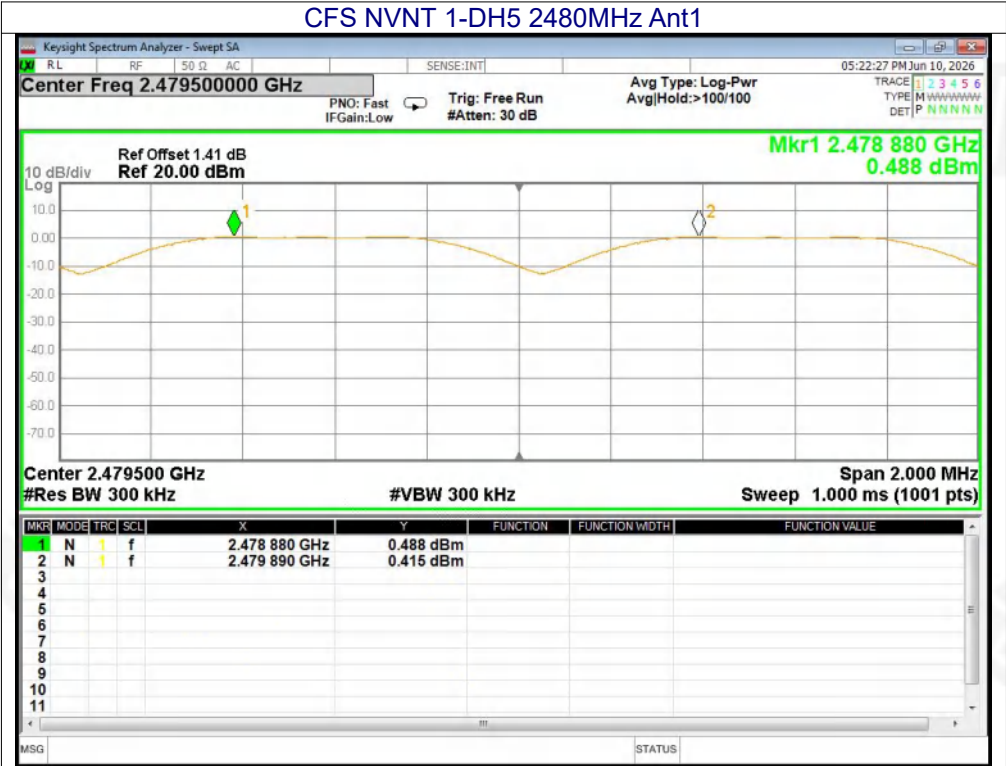


CFS NVNT 1-DH5 2441MHz Ant1





CFS NVNT 1-DH5 2480MHz Ant1

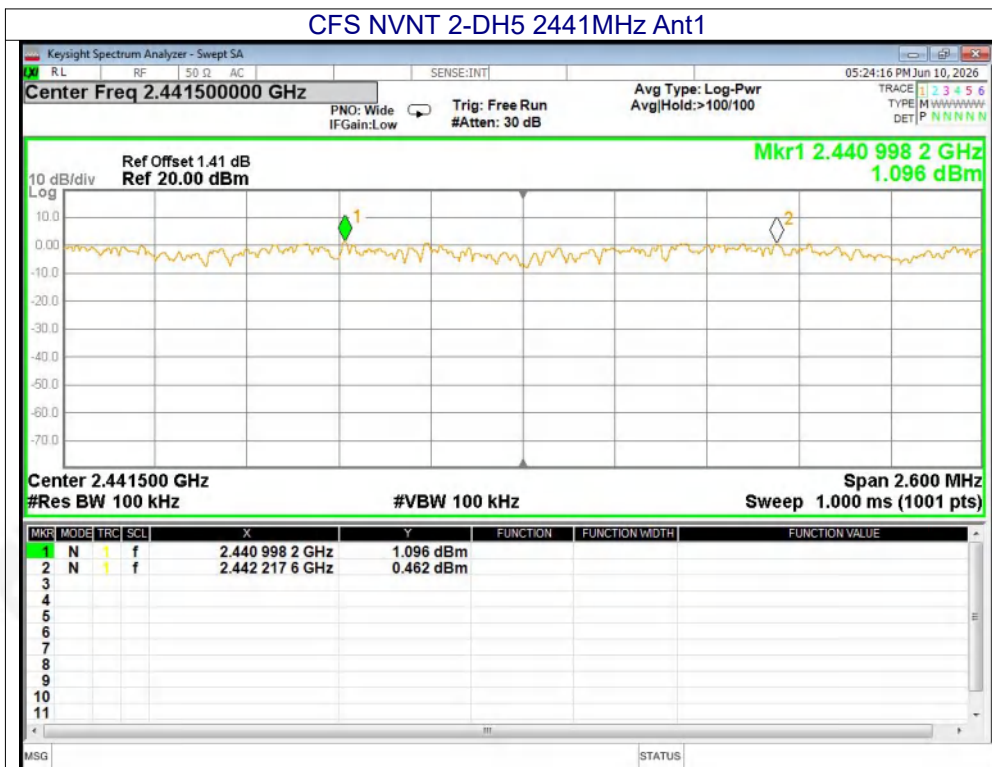


CFS NVNT 2-DH5 2402MHz Ant1

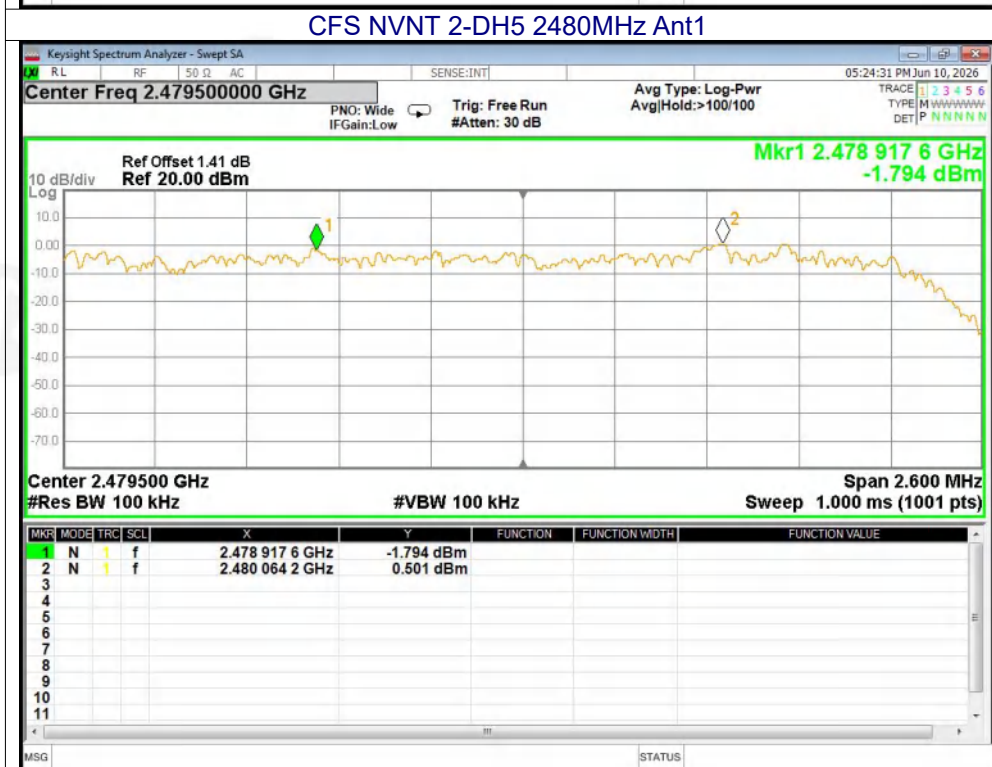




CFS NVNT 2-DH5 2441MHz Ant1

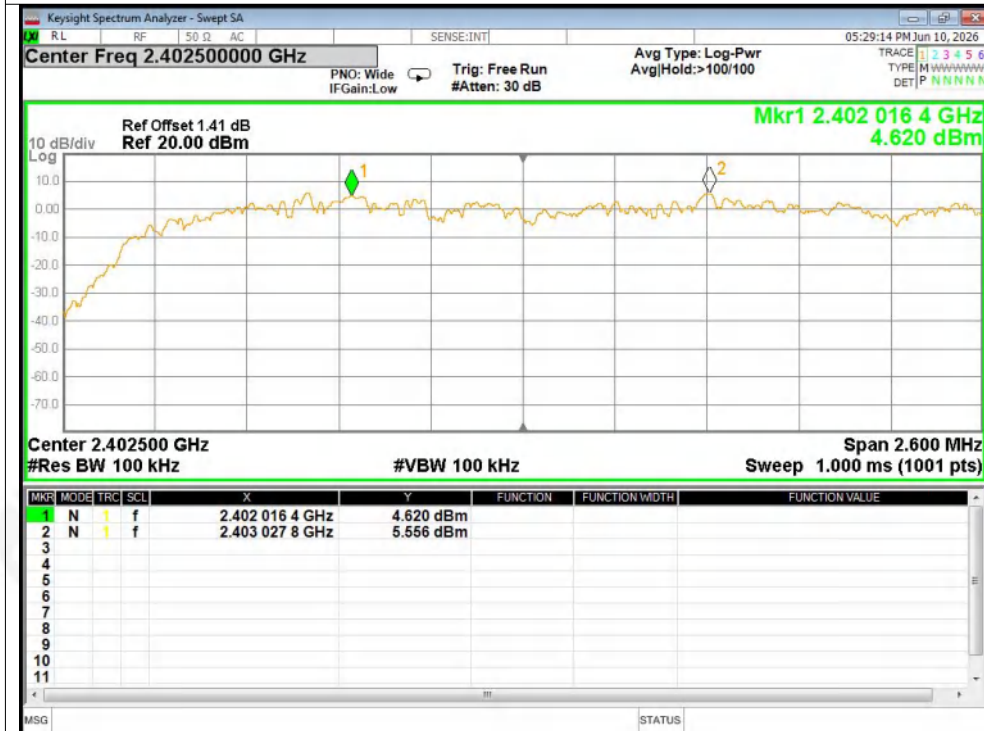


CFS NVNT 2-DH5 2480MHz Ant1

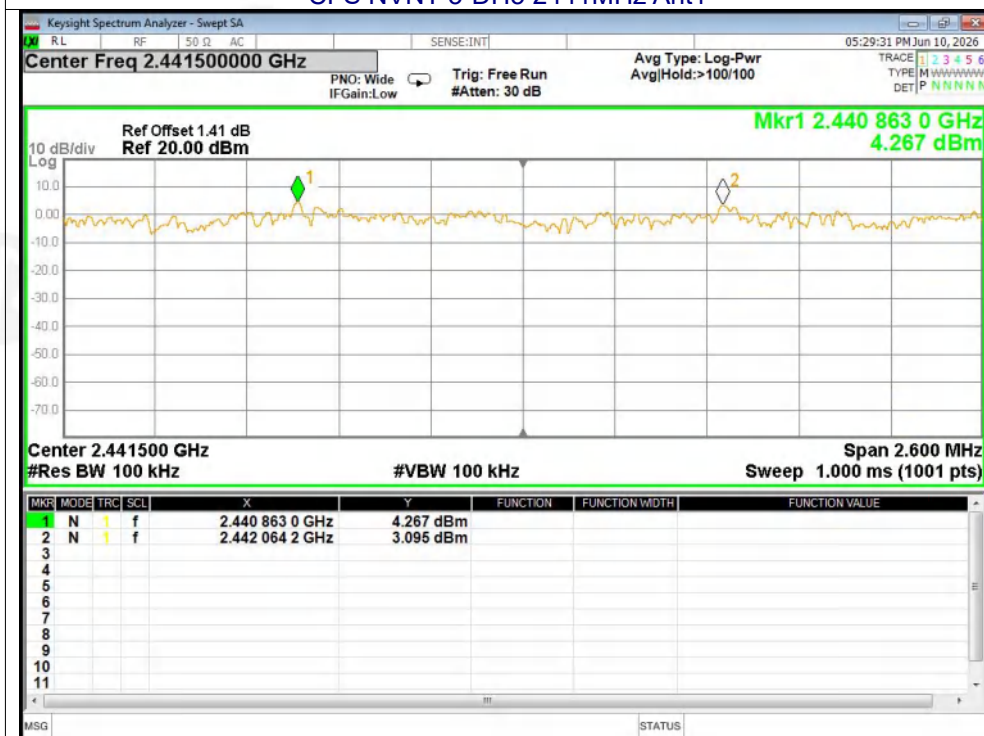


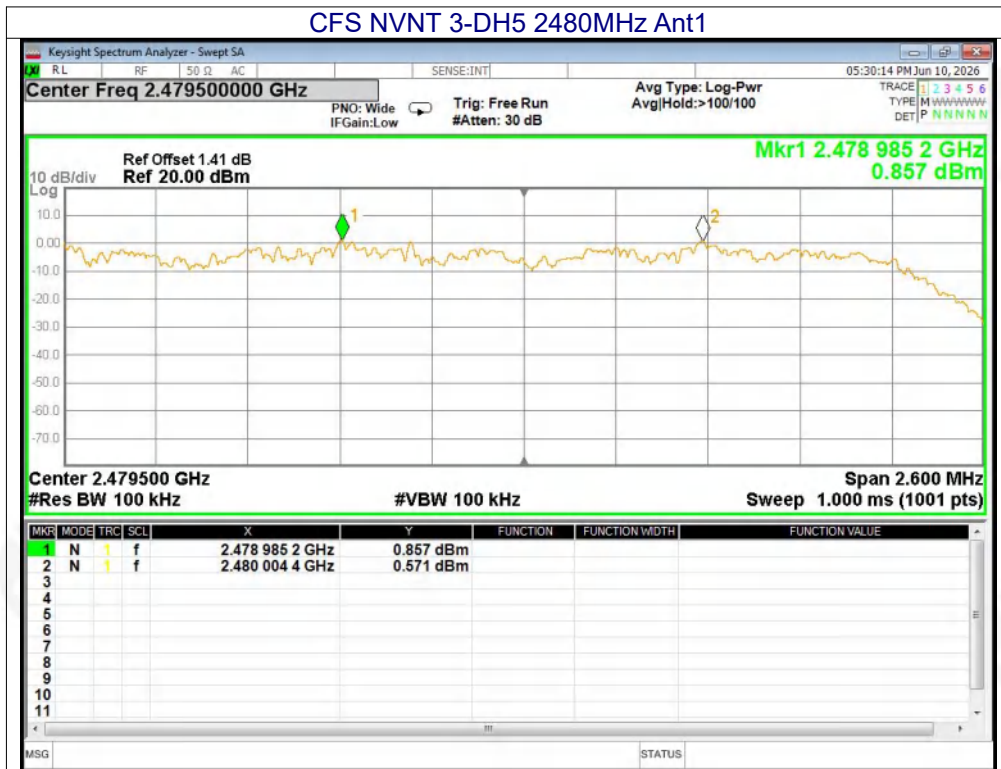


CFS NVNT 3-DH5 2402MHz Ant1



CFS NVNT 3-DH5 2441MHz Ant1



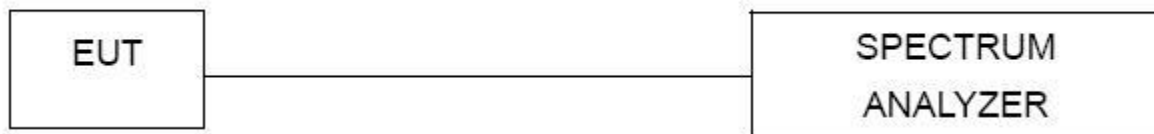




10. NUMBER OF HOPPING FREQUENCY

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)(iii)
Test Method:	ANSI C63.10-2020+Cor 1-2023
Receiver setup:	RBW=100kHz, VBW=300kHz, Frequency range=2400MHz-2483.5MHz, Detector=Peak
Limit:	15 channels

10.1 Test Setup



10.2 Test procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 100kHz. VBW = 300kHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. It may prove necessary to break the span up to sections. in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section.
4. Set the spectrum analyzer: Start Frequency = 2.4GHz, Stop Frequency = 2.4835GHz. Sweep=auto;

10.3 DEVIATION FROM STANDARD

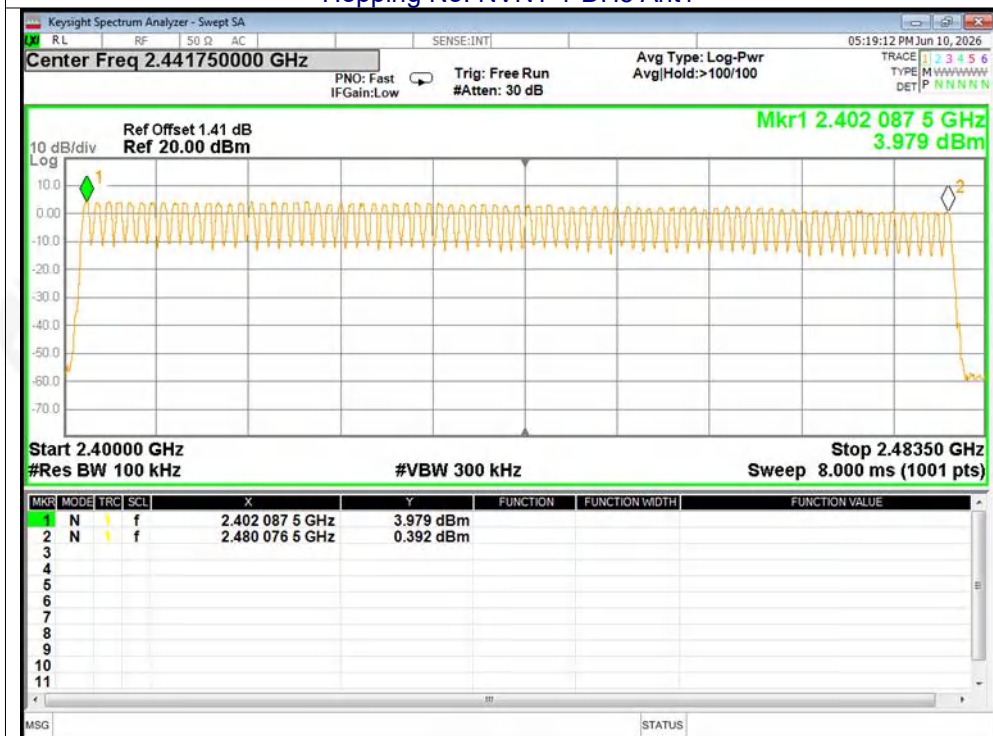
No deviation.



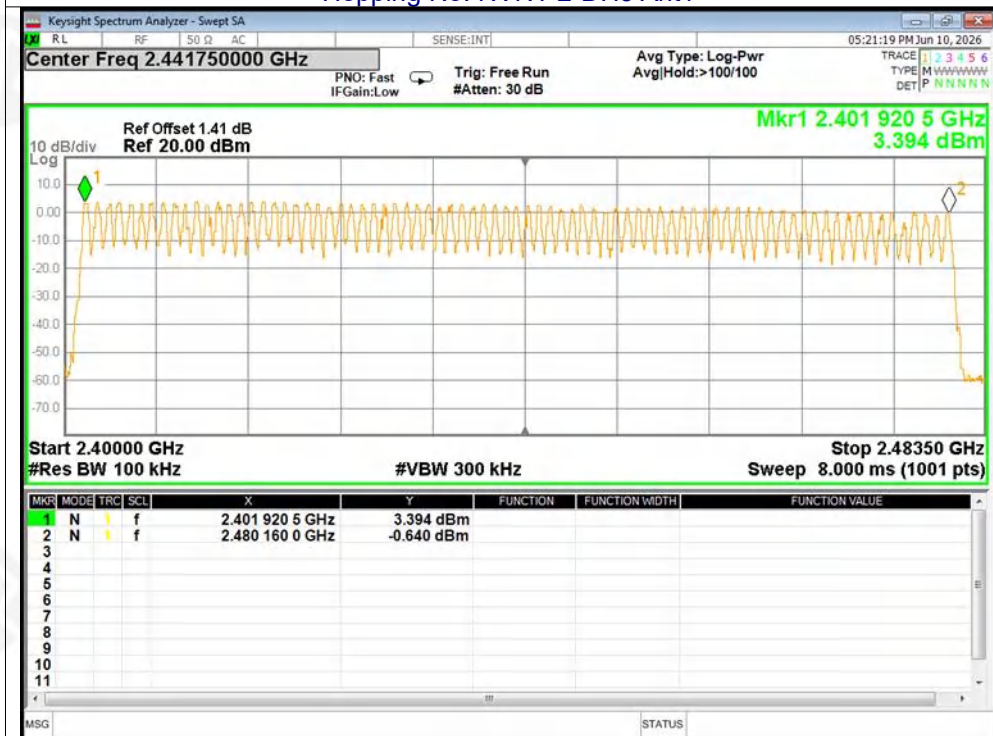
10.4 Test Result

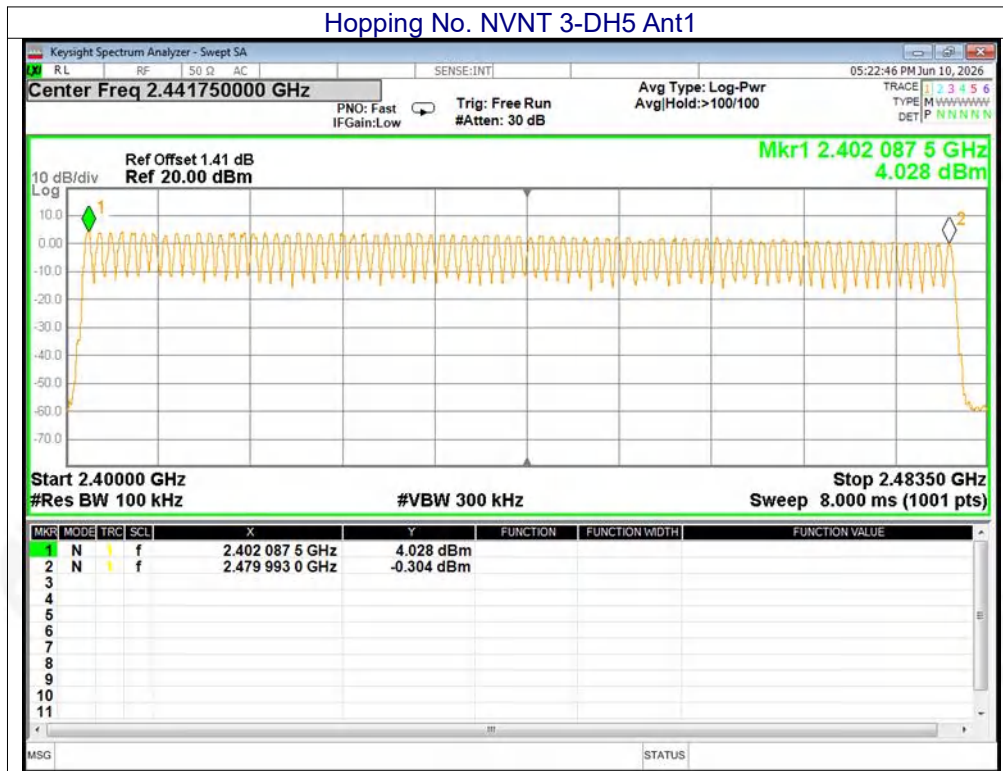
Condition	Mode	Antenna	Hopping Number	Limit	Verdict
NVNT	1-DH5	Ant1	79	15	Pass
NVNT	2-DH5	Ant1	79	15	Pass
NVNT	3-DH5	Ant1	79	15	Pass

Test Graphs
Hopping No. NVNT 1-DH5 Ant1



Hopping No. NVNT 2-DH5 Ant1







11. DWELL TIME

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)(iii)
Test Method:	ANSI C63.10-2020+Cor 1-2023
Receiver setup:	RBW=1MHz, VBW=3MHz, Span=0Hz, Detector=Peak
Limit:	0.4 Second

11.1 Test Setup



11.2 Test procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set spectrum analyzer span = 0Hz;
3. Set RBW = 1MHz and VBW = 3MHz.Sweep = as necessary to capture the entire dwell time per hopping channel. Set the EUT for DH5, DH3 and DH1 packet transmitting.
4. Use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g.. data rate. modulation format. etc.). repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

11.3 DEVIATION FROM STANDARD

No deviation.



11.4 Test Result

Condition	Mode	Frequency (MHz)	Antenna	Pulse Time (ms)	Total Dwell Time (ms)	Burst Count	Period Time (ms)	Limit (ms)	Verdict
NVNT	1-DH1	2441	Ant1	0.383	122.56	320	31600	400	Pass
NVNT	1-DH3	2441	Ant1	1.639	242.572	148	31600	400	Pass
NVNT	1-DH5	2441	Ant1	2.887	320.457	111	31600	400	Pass
NVNT	2-DH1	2441	Ant1	0.391	122.383	313	31600	400	Pass
NVNT	2-DH3	2441	Ant1	1.643	267.809	163	31600	400	Pass
NVNT	2-DH5	2441	Ant1	2.892	309.444	107	31600	400	Pass
NVNT	3-DH1	2441	Ant1	0.391	122.774	314	31600	400	Pass
NVNT	3-DH3	2441	Ant1	1.642	252.868	154	31600	400	Pass
NVNT	3-DH5	2441	Ant1	2.894	306.764	106	31600	400	Pass

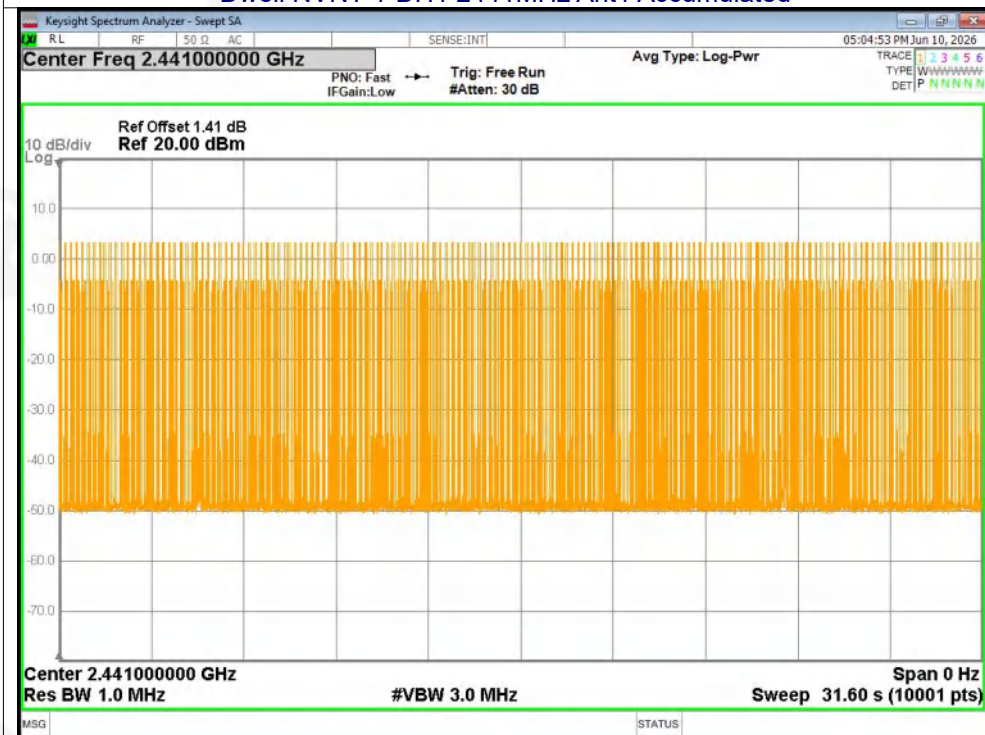


Test Graphs

Dwell NVNT 1-DH1 2441MHz Ant1 One Burst

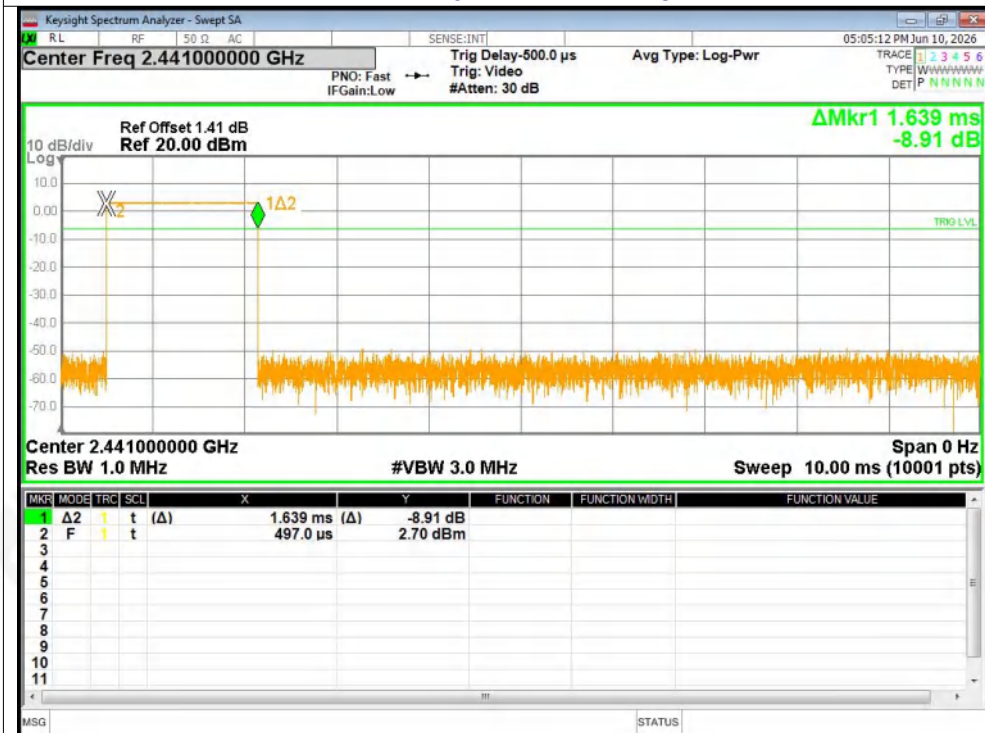


Dwell NVNT 1-DH1 2441MHz Ant1 Accumulated

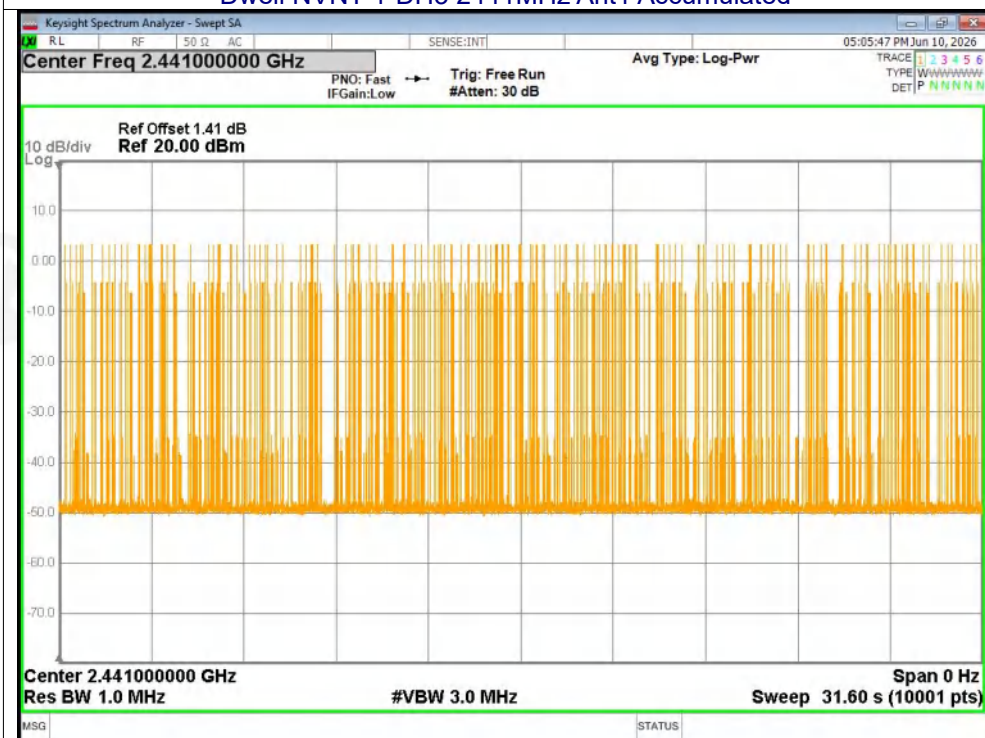




Dwell NVNT 1-DH3 2441MHz Ant1 One Burst

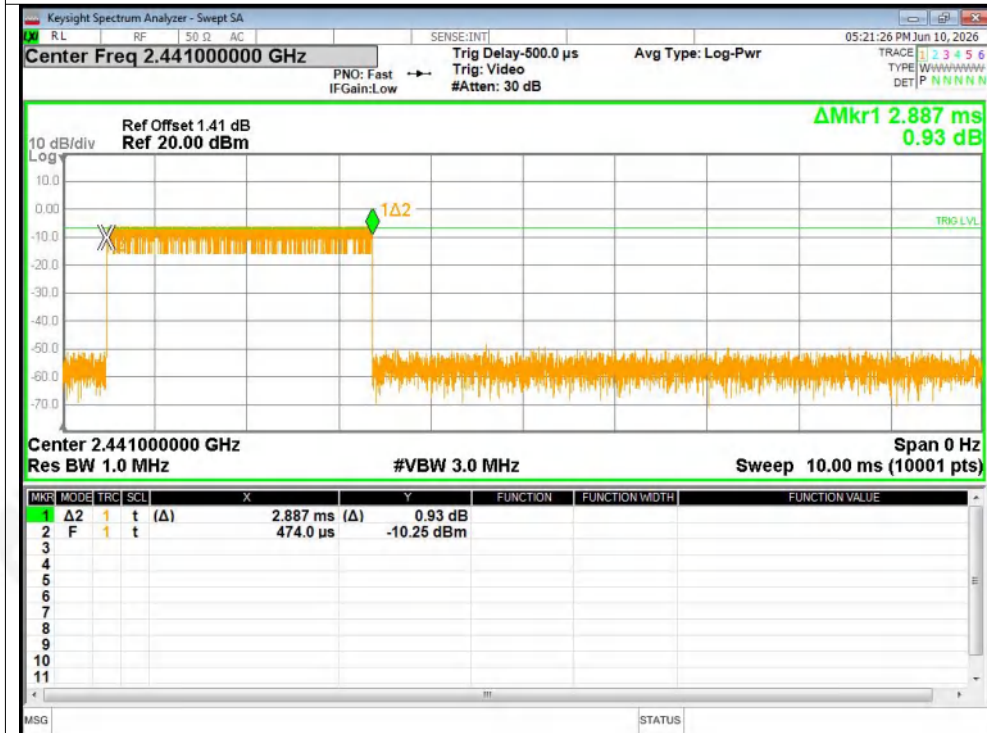


Dwell NVNT 1-DH3 2441MHz Ant1 Accumulated

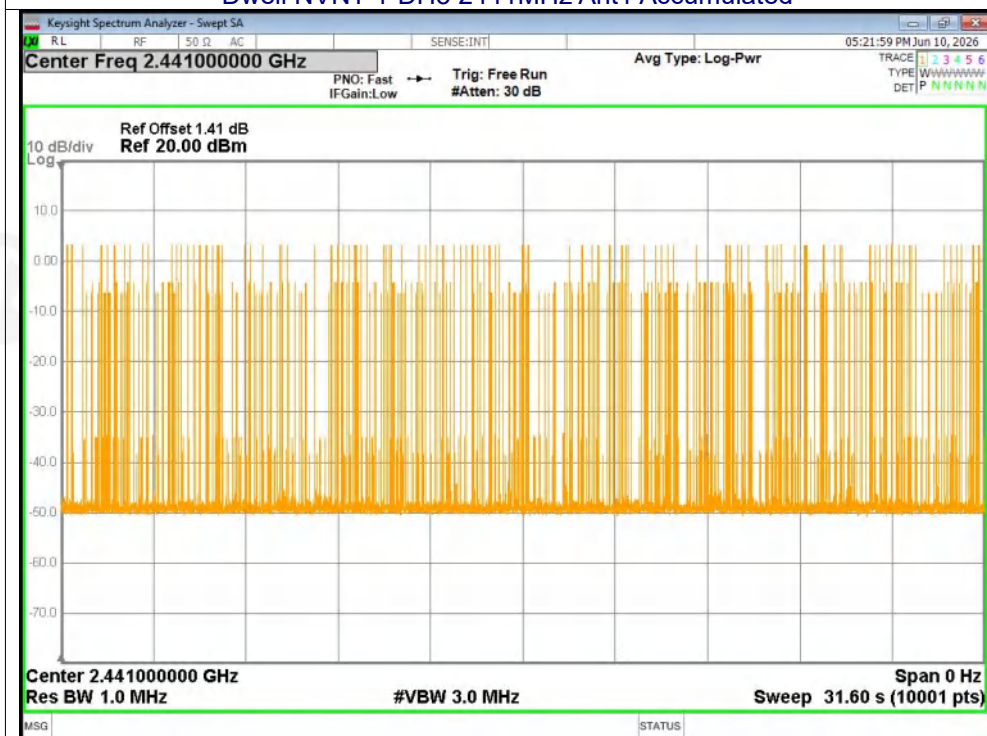




Dwell NVNT 1-DH5 2441MHz Ant1 One Burst

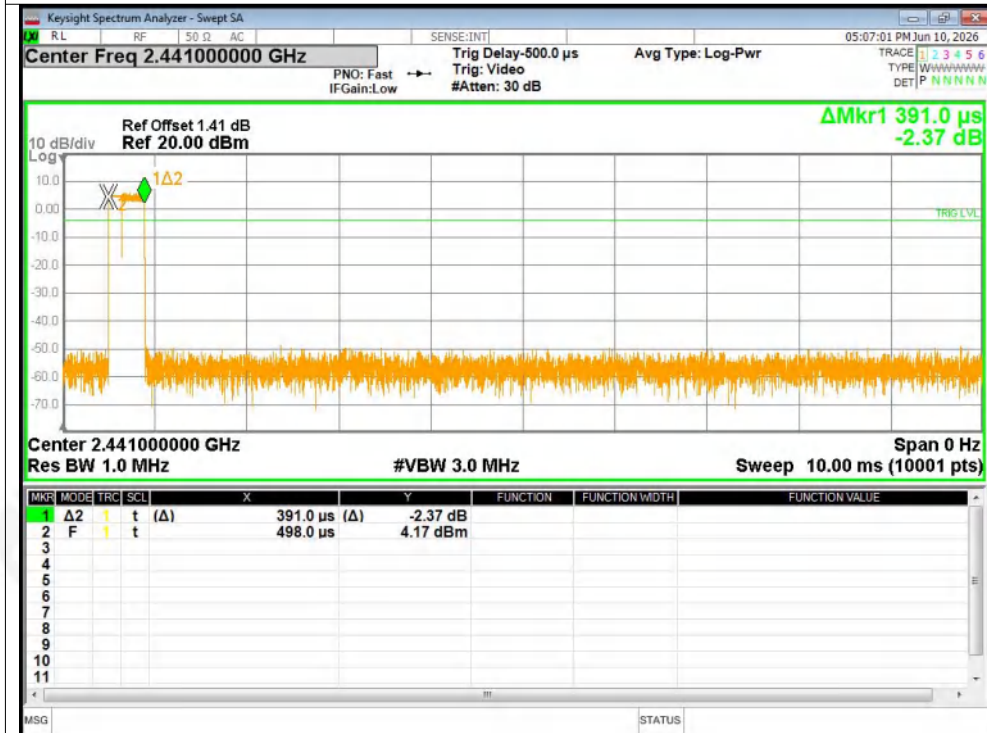


Dwell NVNT 1-DH5 2441MHz Ant1 Accumulated





Dwell NVNT 2-DH1 2441MHz Ant1 One Burst

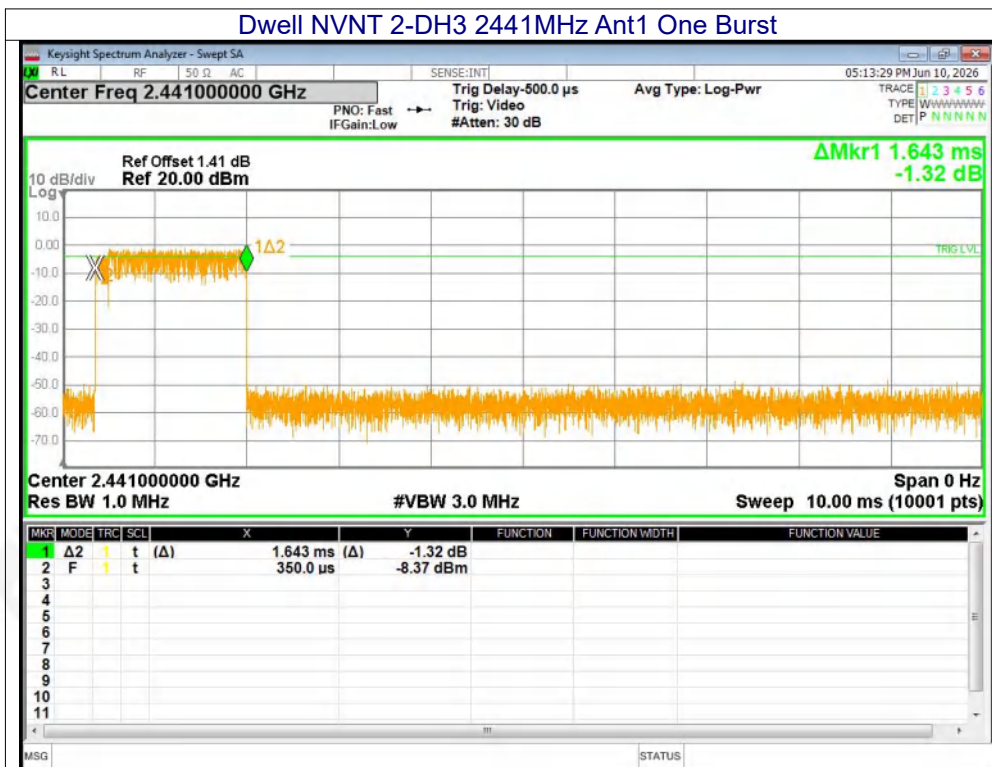


Dwell NVNT 2-DH1 2441MHz Ant1 Accumulated





Dwell NVNT 2-DH3 2441MHz Ant1 One Burst



Dwell NVNT 2-DH3 2441MHz Ant1 Accumulated





Dwell NVNT 2-DH5 2441MHz Ant1 One Burst

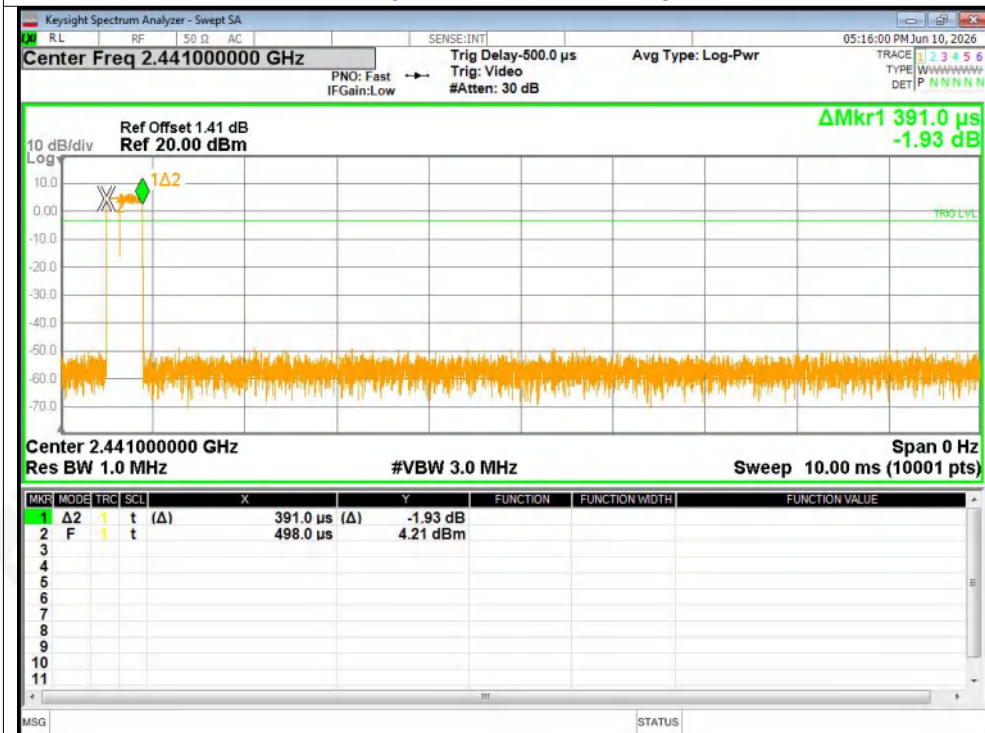


Dwell NVNT 2-DH5 2441MHz Ant1 Accumulated





Dwell NVNT 3-DH1 2441MHz Ant1 One Burst



Dwell NVNT 3-DH1 2441MHz Ant1 Accumulated





Dwell NVNT 3-DH3 2441MHz Ant1 One Burst



Dwell NVNT 3-DH3 2441MHz Ant1 Accumulated





Dwell NVNT 3-DH5 2441MHz Ant1 One Burst



Dwell NVNT 3-DH5 2441MHz Ant1 Accumulated





12. Antenna Requirement

Standard requirement:	FCC Part15 C Section 15.203 /247(c)
15.203 requirement: 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 15.247(c) (1)(i) requirement: (i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.	
EUT Antenna:	
The antenna is Chip antenna, the best case gain of the antennas is 4.29dBi, reference to the appendix II for details	



13. Test Setup Photo

Reference to the appendix I for details.

14. EUT Constructional Details

Reference to the appendix II for details.

***** END OF REPORT *****