

12. Hopping Channel Separation

12.1 Block Diagram Of Test Setup



12.2 Limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 0.125W.

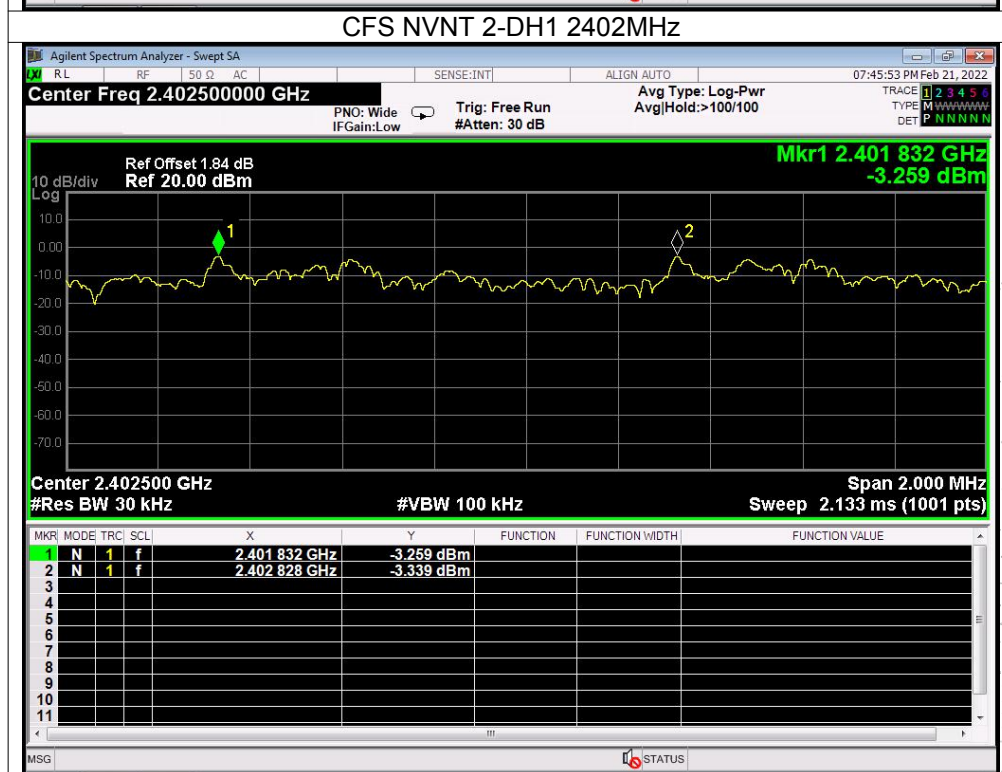
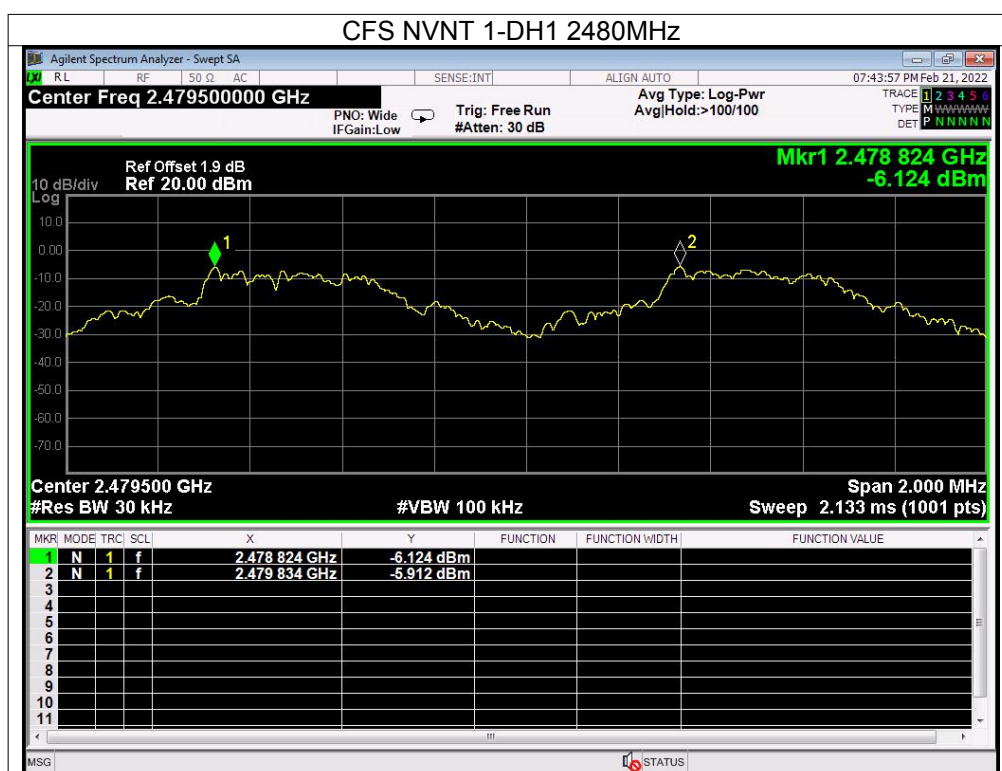
12.3 Test procedure

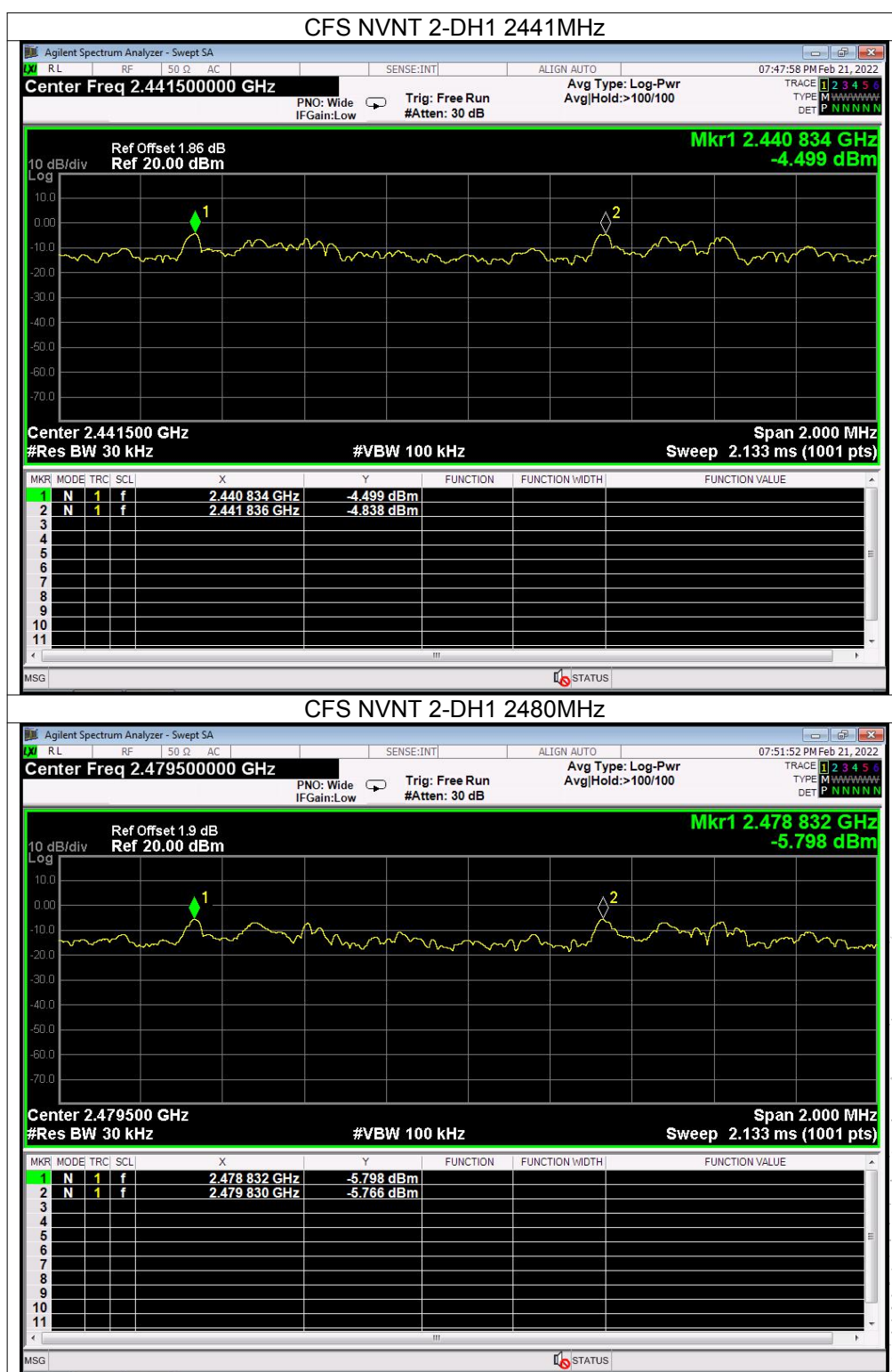
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 30kHz. VBW = 100kHz , Span = 2.0MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to 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.

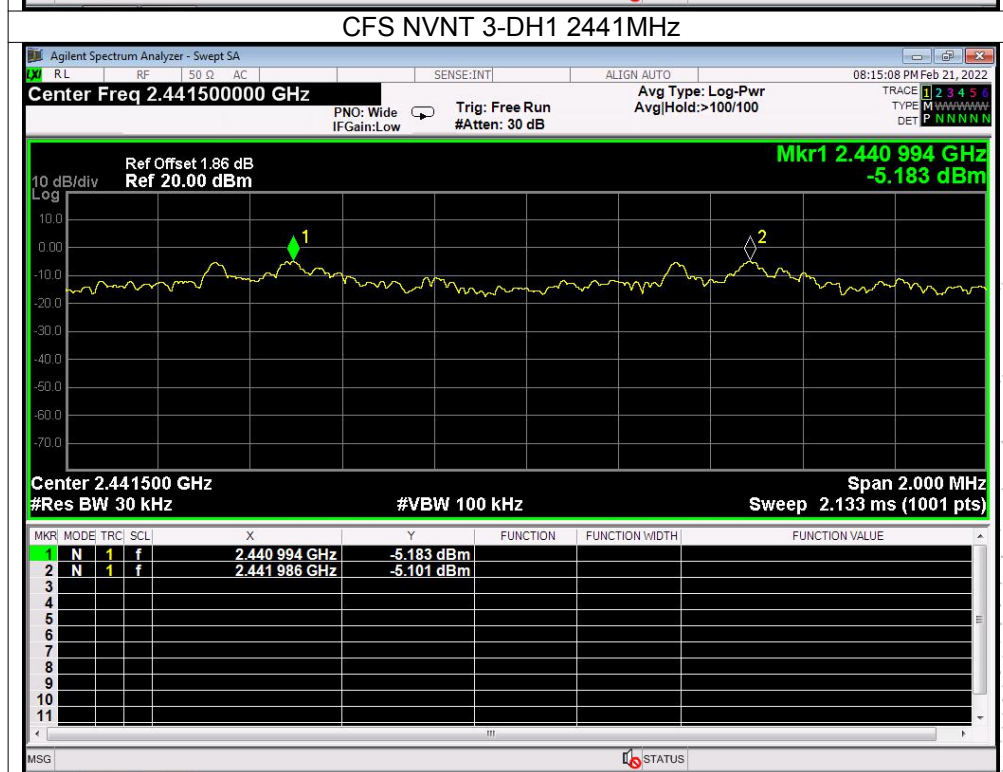
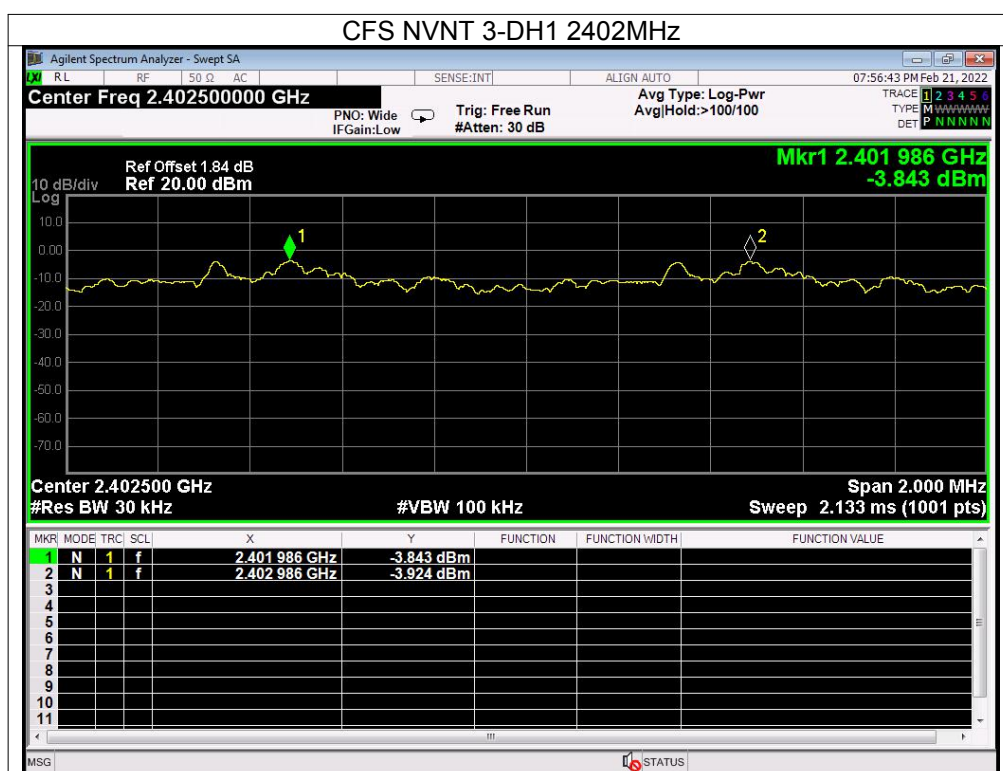
12.4 Test Result

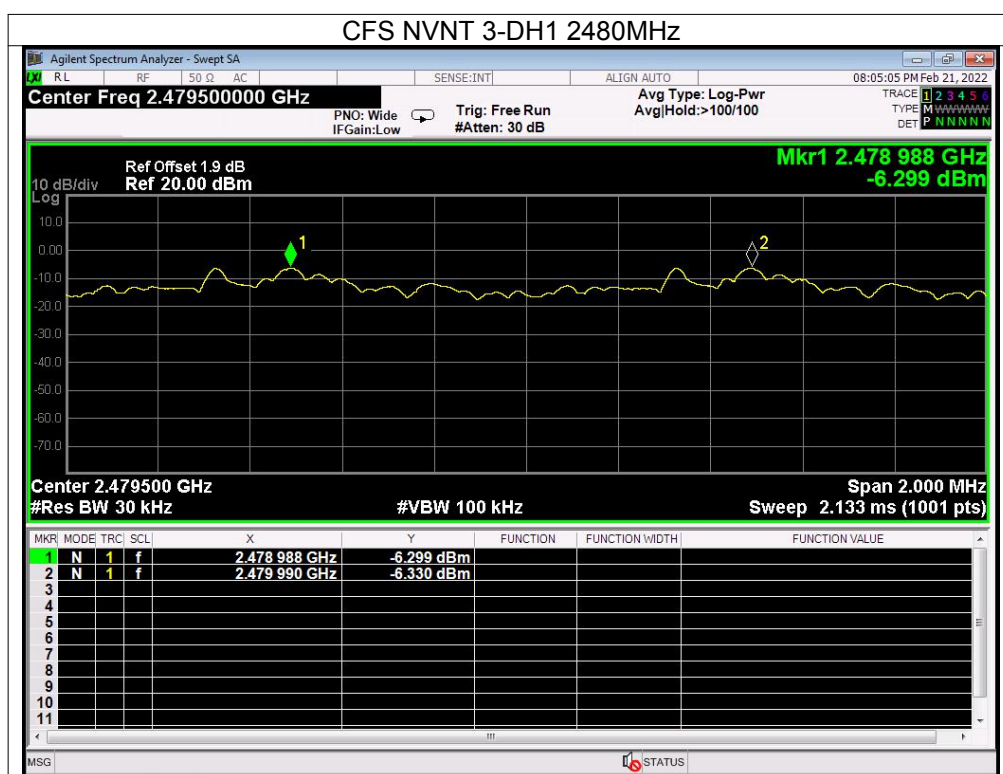
Condition	Mode	Hopping Freq1 (MHz)	Hopping Freq2 (MHz)	HFS (MHz)	Limit (MHz)	Verdict
NVNT	1-DH1	2401.824	2402.832	1.008	0.582	Pass
NVNT	1-DH1	2440.828	2441.830	1.002	0.596	Pass
NVNT	1-DH1	2478.824	2479.834	1.010	0.585	Pass
NVNT	2-DH1	2401.832	2402.828	0.996	0.869	Pass
NVNT	2-DH1	2440.834	2441.836	1.002	0.836	Pass
NVNT	2-DH1	2478.832	2479.830	0.998	0.843	Pass
NVNT	3-DH1	2401.986	2402.986	1.000	0.809	Pass
NVNT	3-DH1	2440.994	2441.986	0.992	0.832	Pass
NVNT	3-DH1	2478.988	2479.990	1.002	0.829	Pass











13. Number Of Hopping Frequency

13.1 Block Diagram Of Test Setup



13.2 Limit

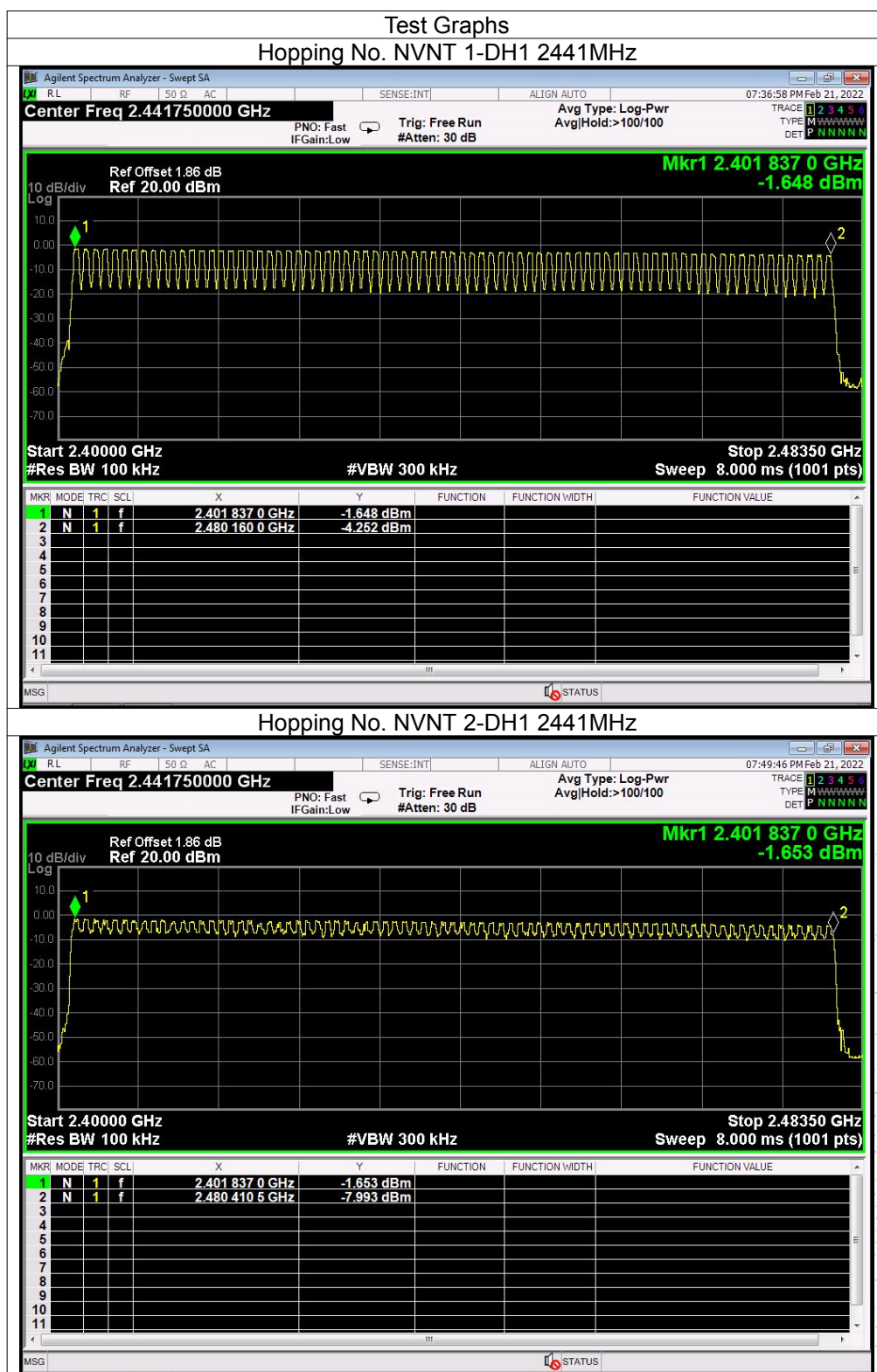
Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

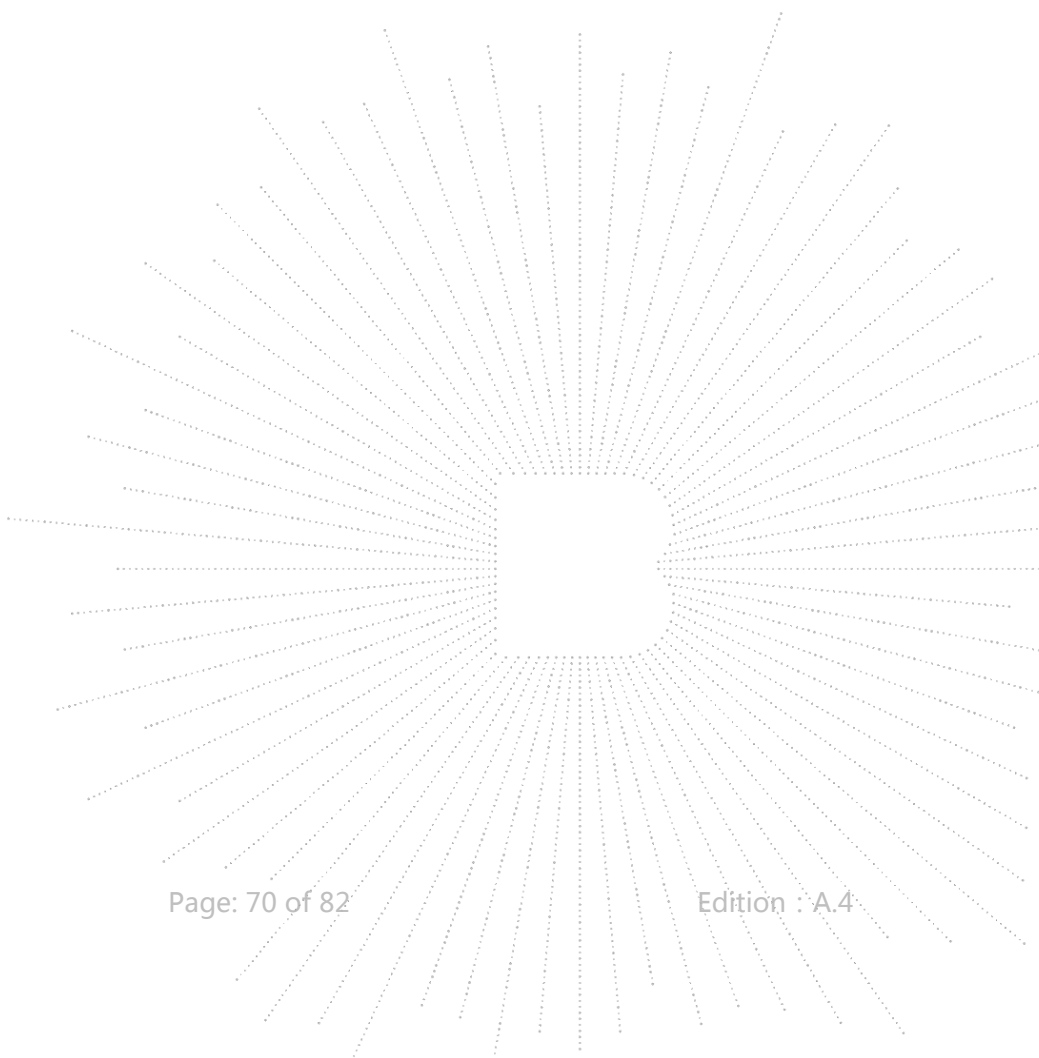
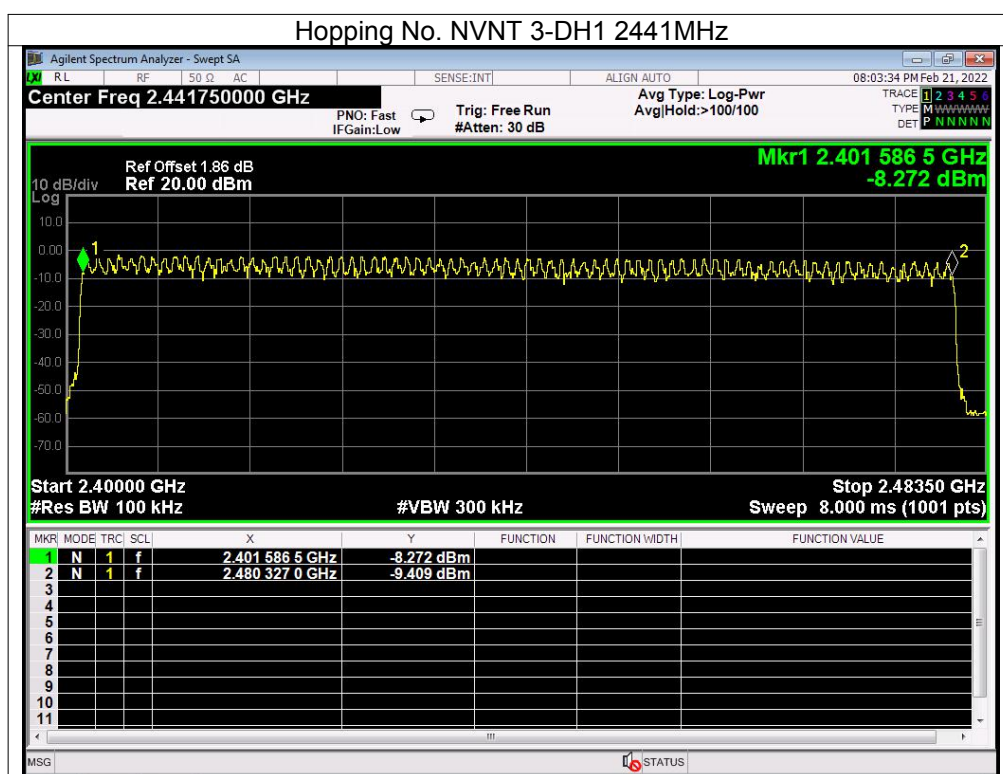
13.3 Test procedure

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 = 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;

13.4 Test Result

Condition	Mode	Hopping Number	Limit	Verdict
NVNT	1-DH1	79	15	Pass
NVNT	2-DH1	79	15	Pass
NVNT	3-DH1	79	15	Pass





14. Dwell Time

14.1 Block Diagram Of Test Setup



14.2 Limit

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

14.3 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 spectrum analyzer span = 0. Centred on a hopping channel;
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).

14.4 Test Result

DH5 Packet permit maximum $1600 / 79 / 6$ hops per second in each channel (5 time slots RX, 1 time slot TX).

DH3 Packet permit maximum $1600 / 79 / 4$ hops per second in each channel (3 time slots RX, 1 time slot TX).

DH1 Packet permit maximum $1600 / 79 / 2$ hops per second in each channel (1 time slot RX, 1 time slot TX). So, the Dwell Time can be calculated as follows:

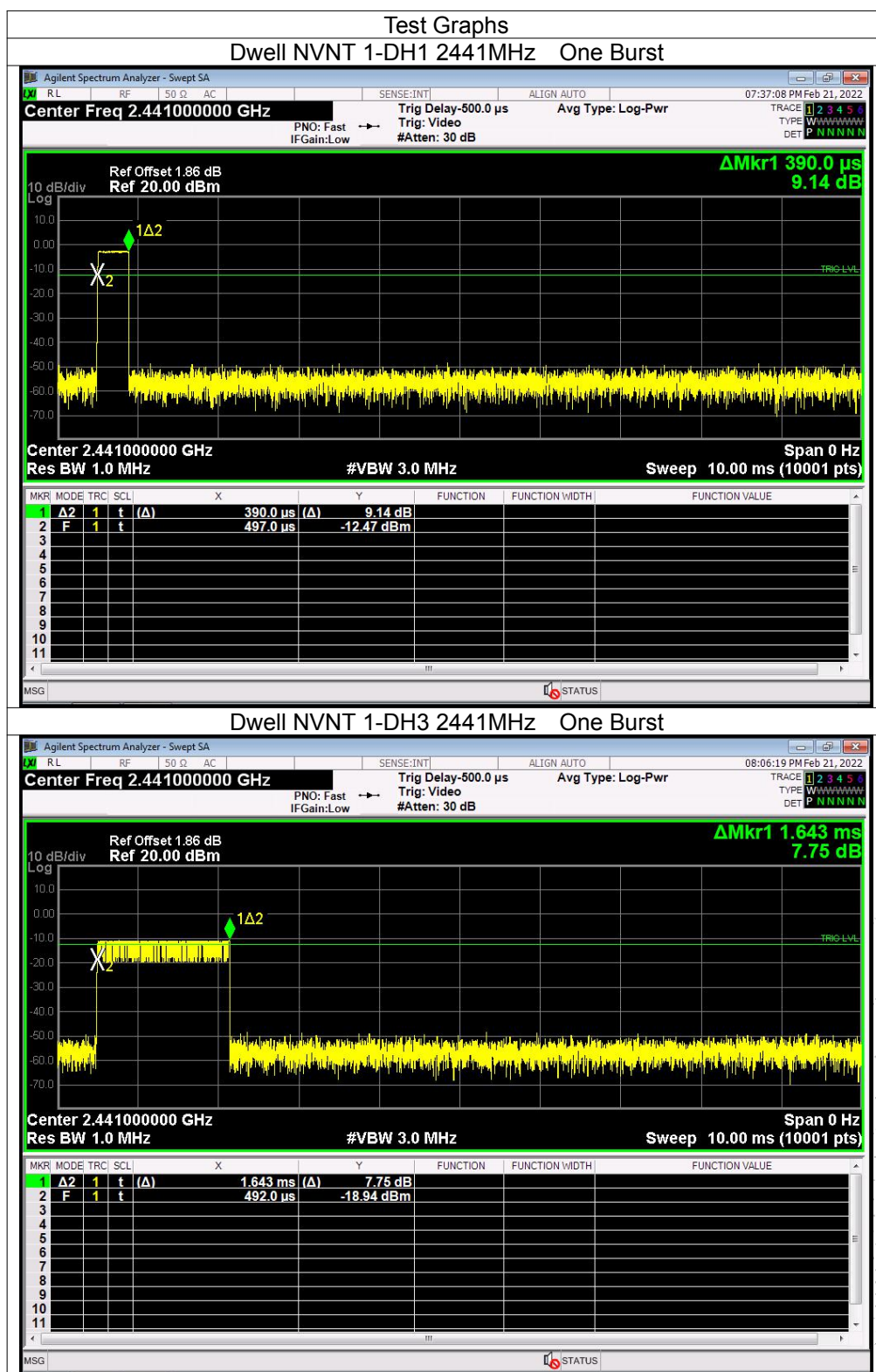
DH5: $1600/79/6*0.4*79*(MkrDelta)/1000$

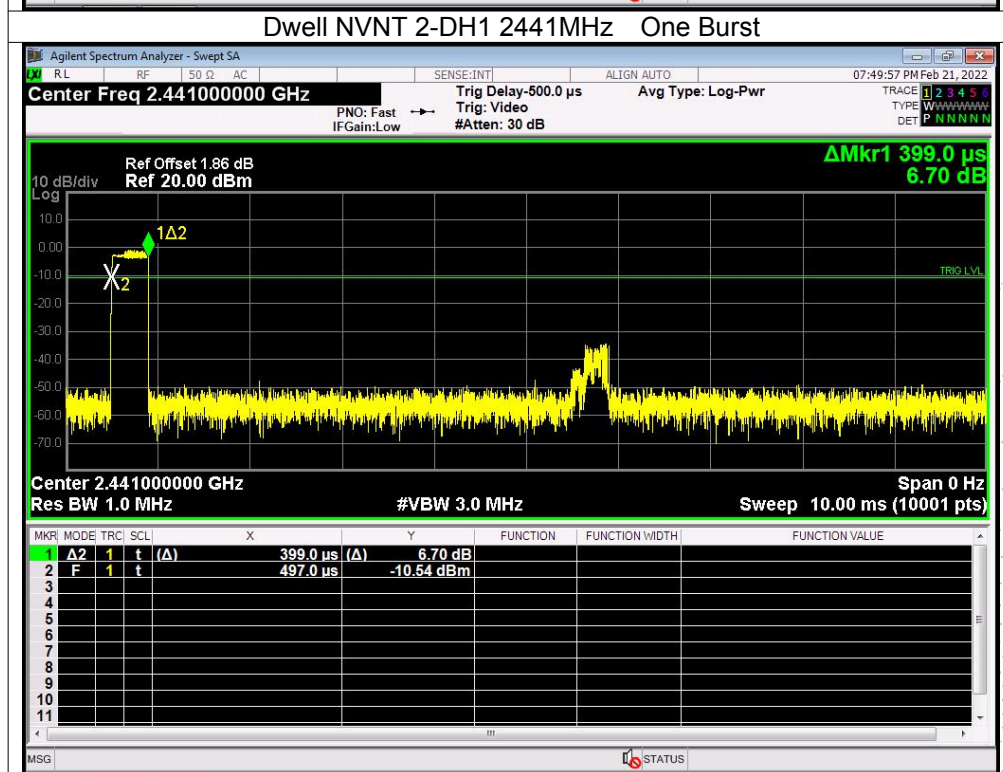
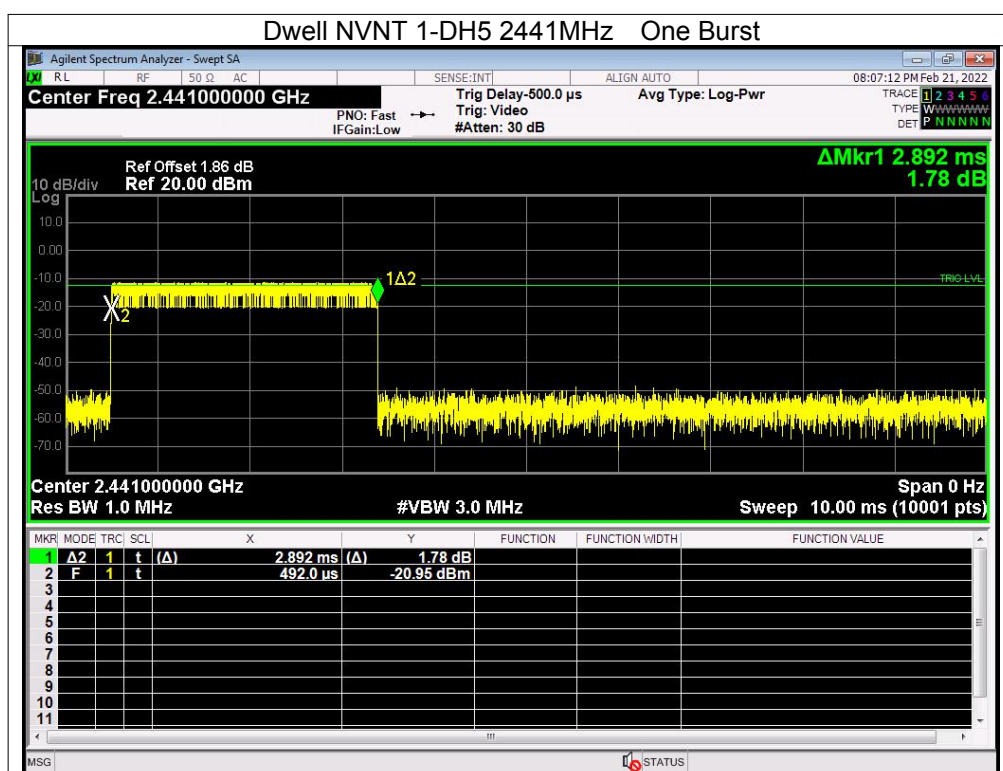
DH3: $1600/79/4*0.4*79*(MkrDelta)/1000$

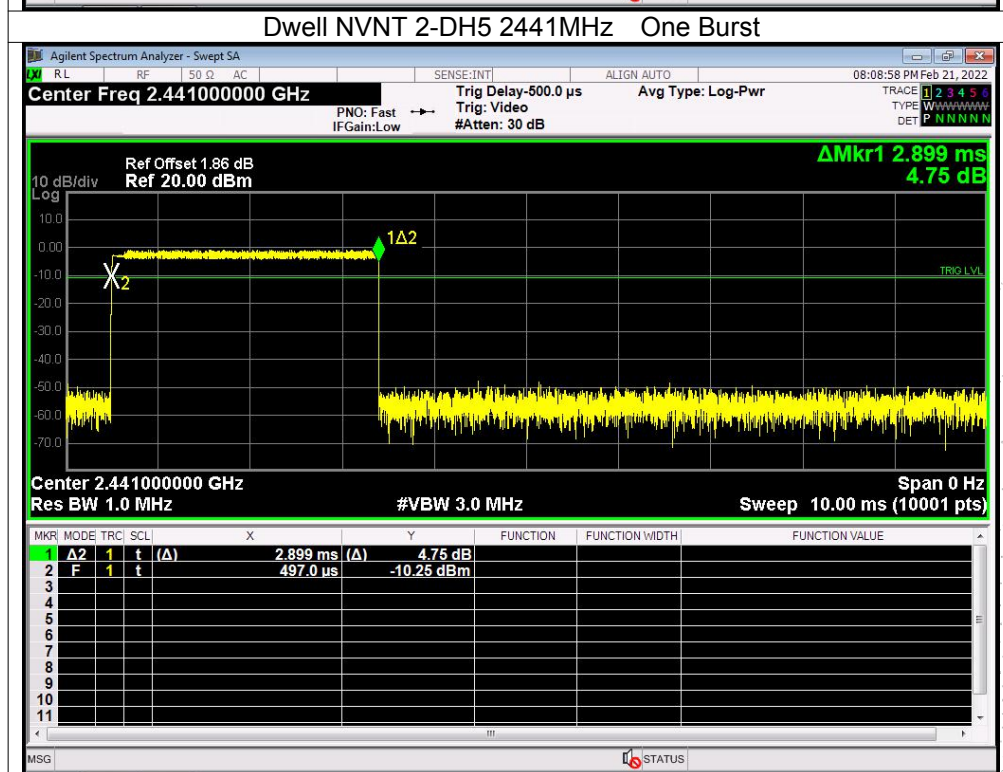
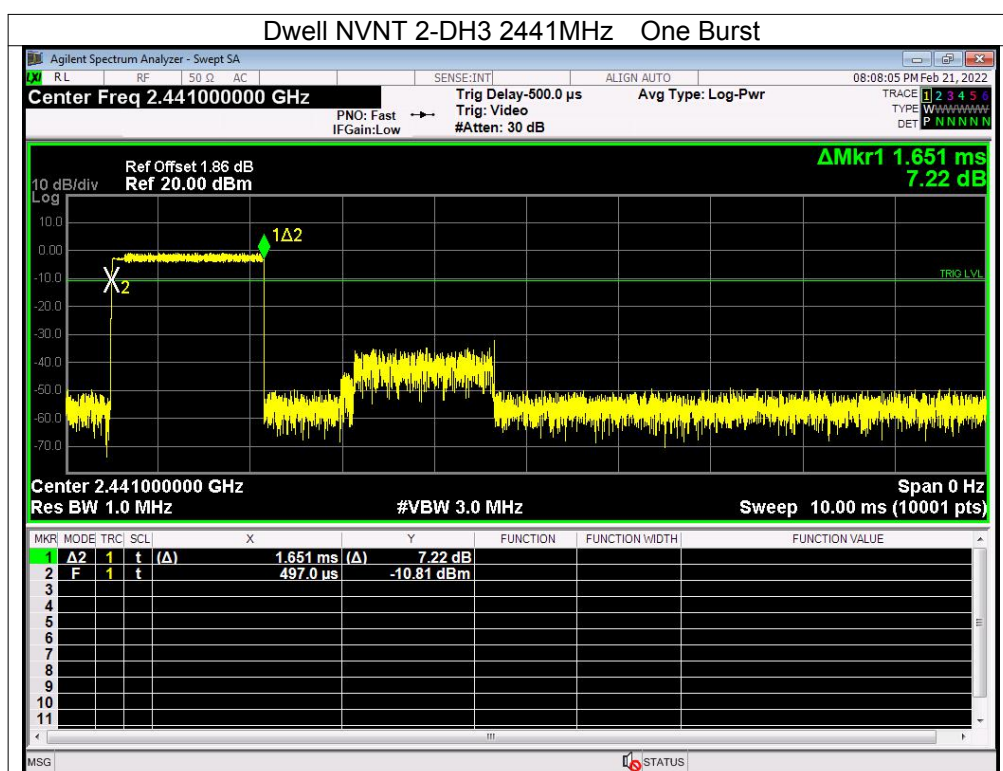
DH1: $1600/79/2*0.4*79*(MkrDelta)/1000$

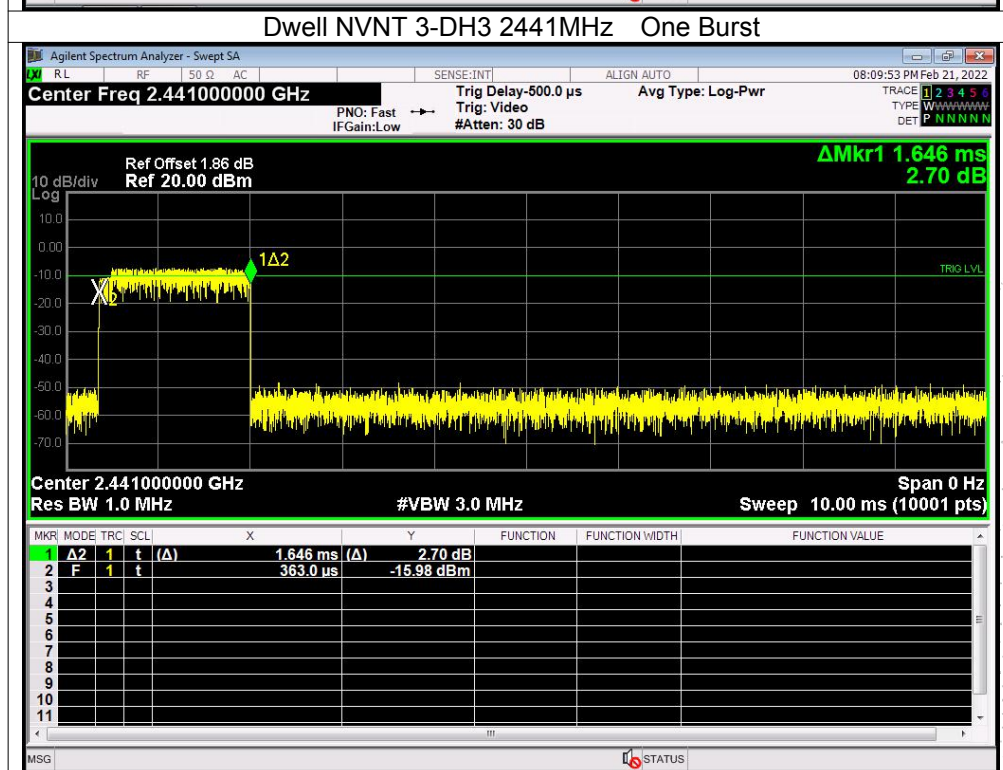
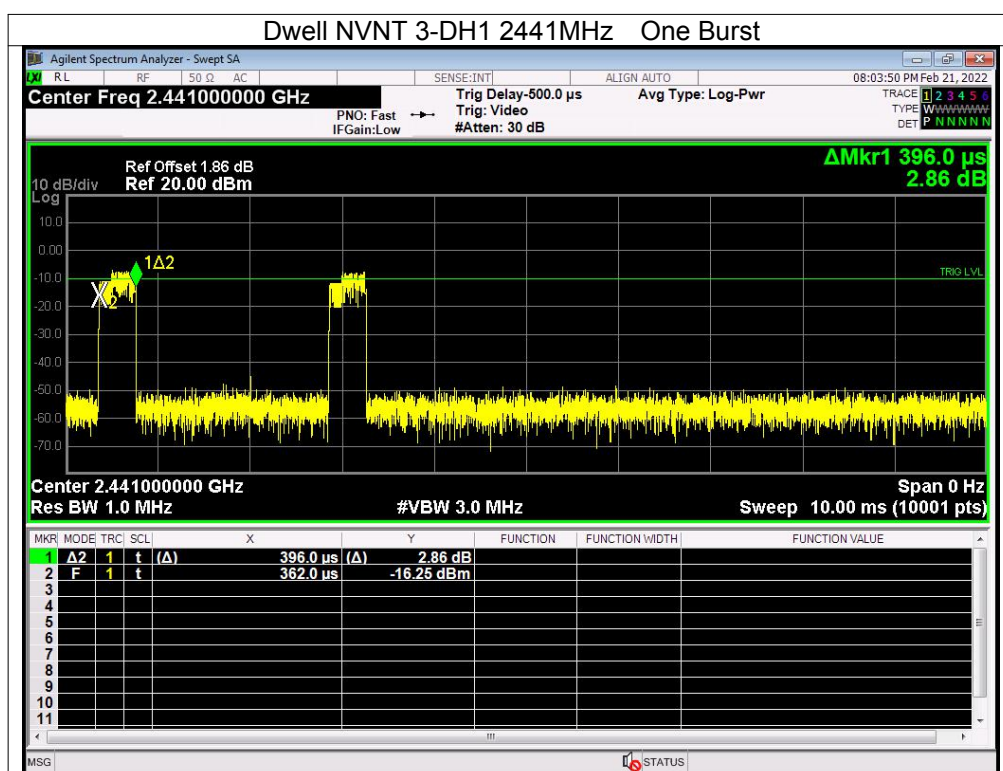
Remark: Mkr Delta is once pulse time.

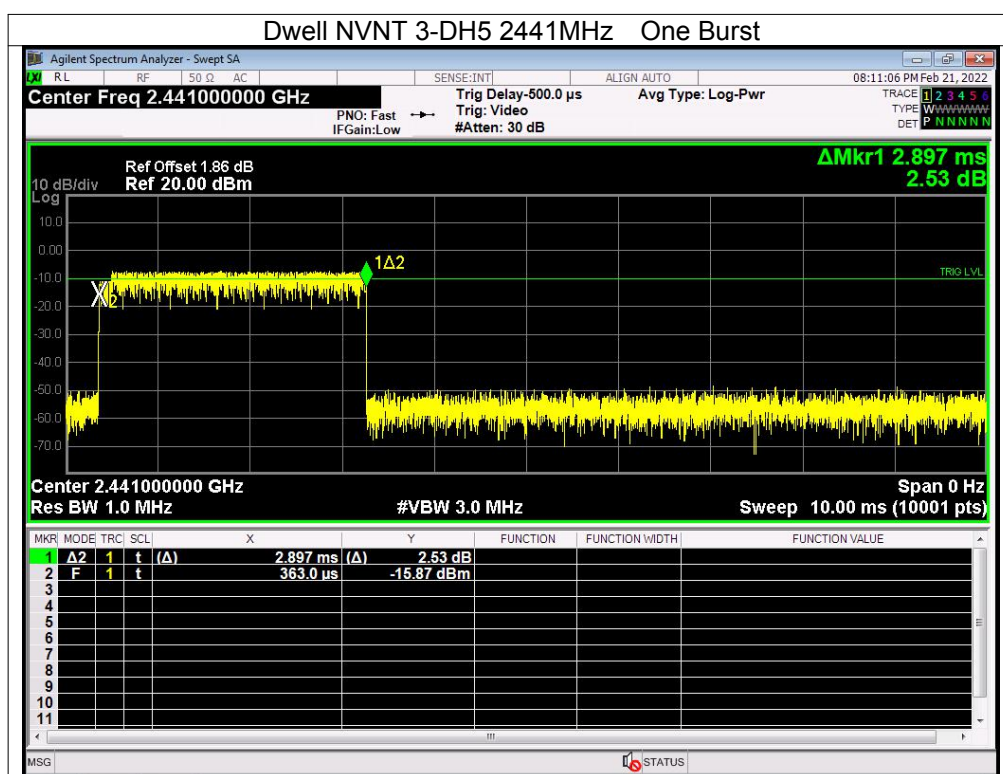
Modulation	Channel Data	Packet	pulse time(ms)	Dwell Time(ms)	Limits(ms)
GFSK	Middle	DH1	0.390	124.80	400
		DH3	1.643	262.88	400
		DH5	2.892	308.48	400
$\pi/4$ DQPSK	Middle	2DH1	0.399	127.68	400
		2DH3	1.651	264.16	400
		2DH5	2.899	309.23	400
8DPSK	Middle	3DH1	0.396	126.72	400
		3DH3	1.646	263.36	400
		3DH5	2.897	309.01	400











15. Antenna Requirement

15.1 Limit

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.

15.2 Test Result

The EUT antenna is Internal antenna, fulfill the requirement of this section.

