

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.

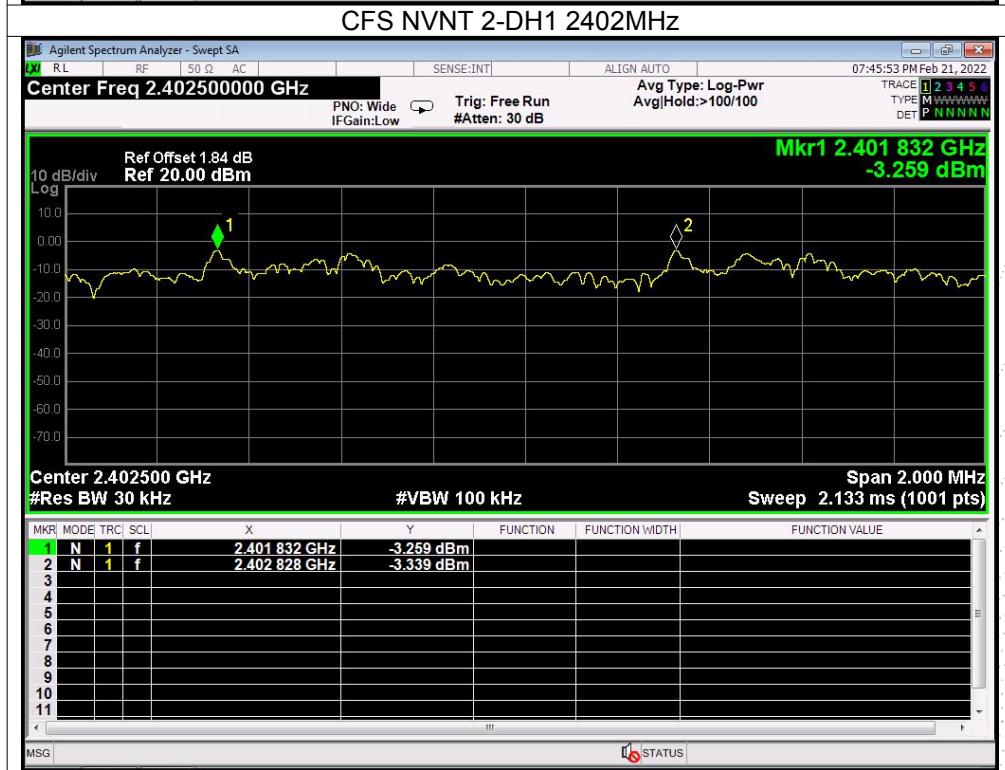
12.3 Test procedure

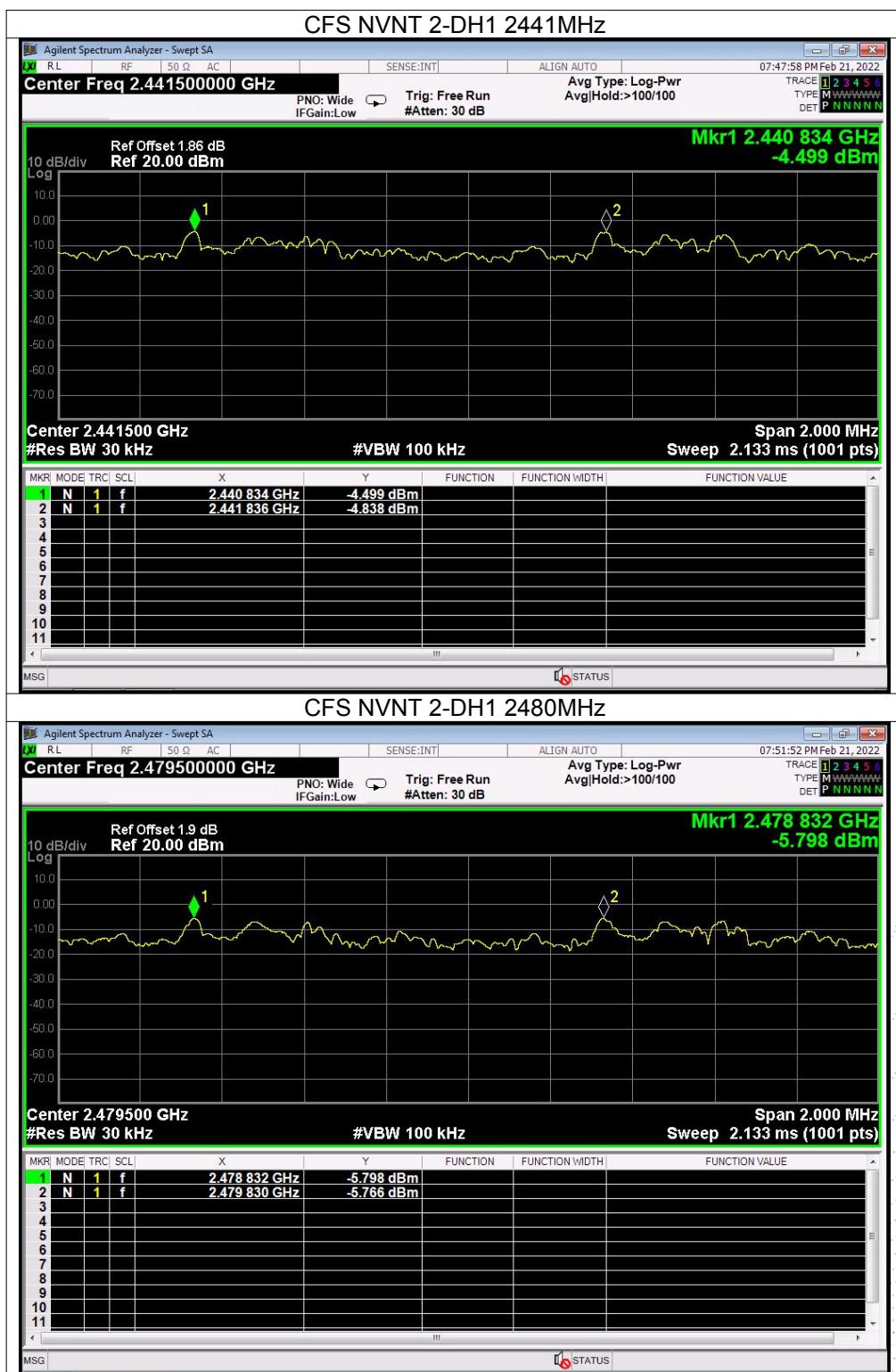
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 30kHz. VBW = 100kHz , Span = 2.0MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to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

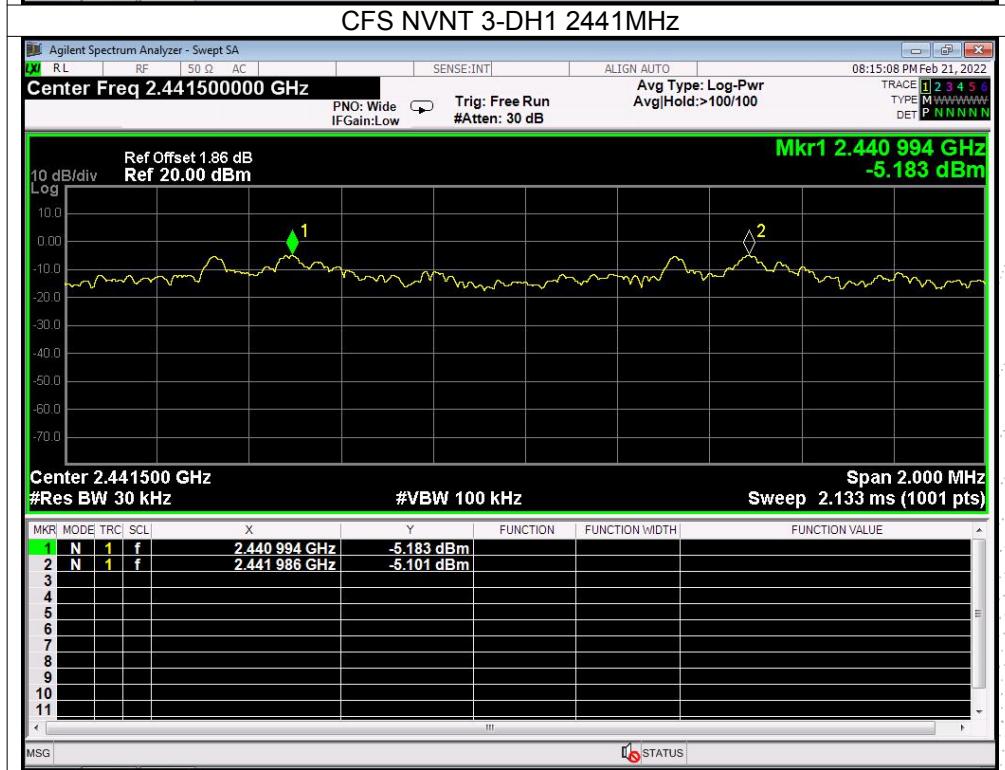
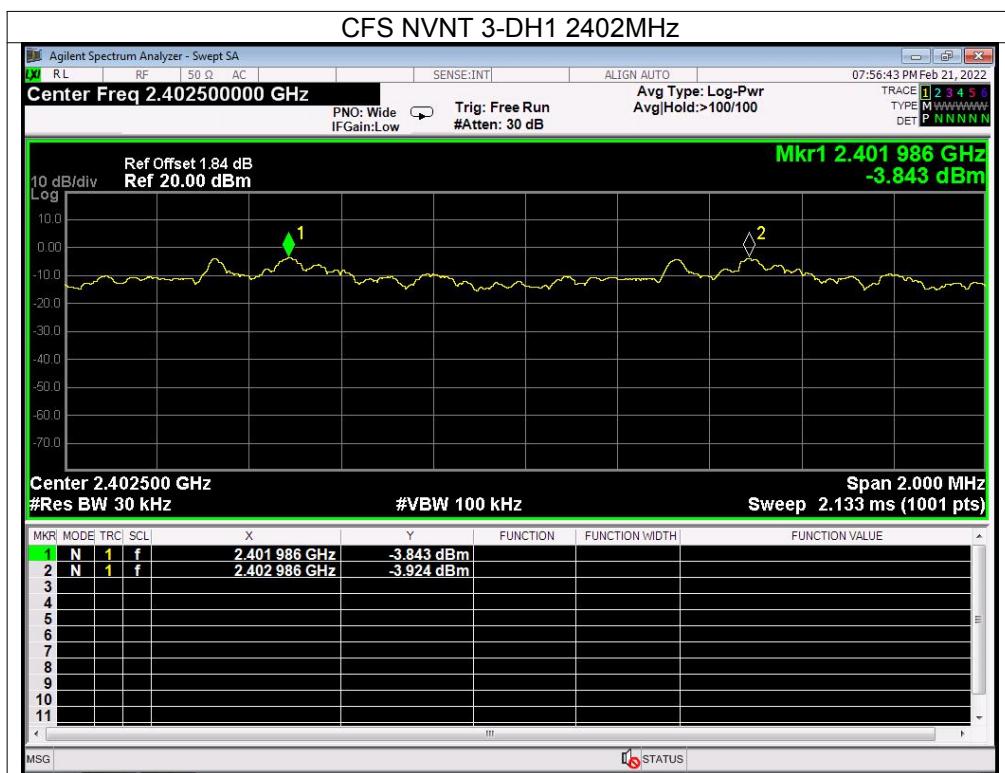
12.4 Test Result

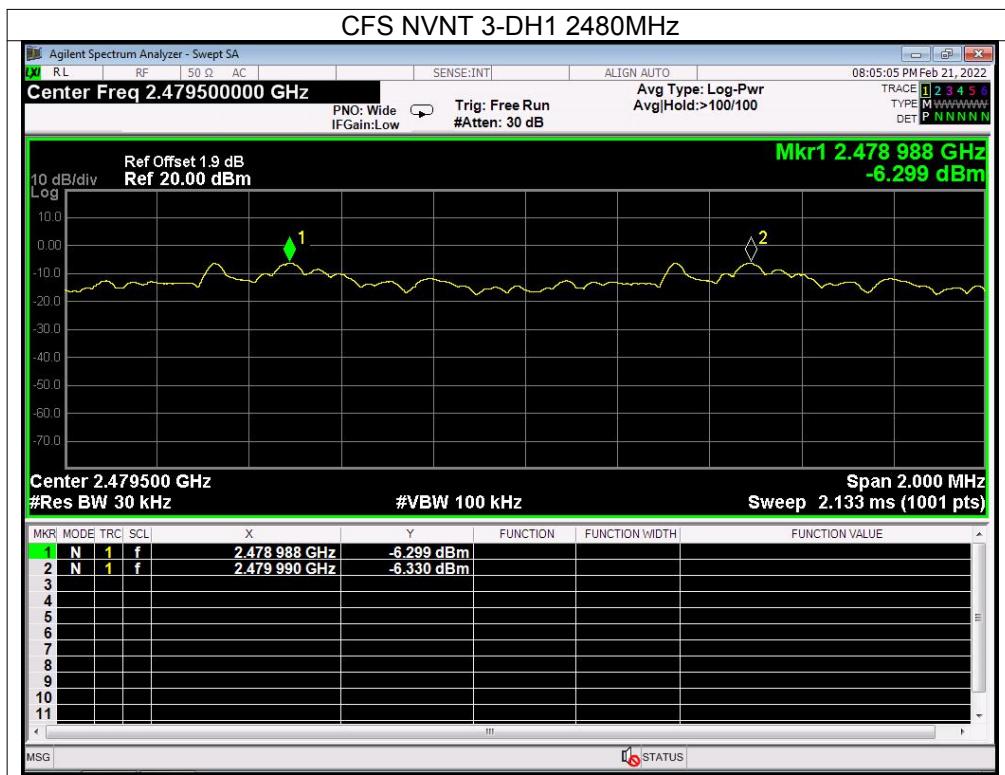
| Condition | Mode | Hopping Freq1 (MHz) | Hopping Freq2 (MHz) | HFS (MHz) | Limit (MHz) | Verdict |
|-----------|-------|---------------------|---------------------|-----------|-------------|---------|
| NVNT | 1-DH1 | 2401.824 | 2402.832 | 1.008 | 0.582 | Pass |
| NVNT | 1-DH1 | 2440.828 | 2441.830 | 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

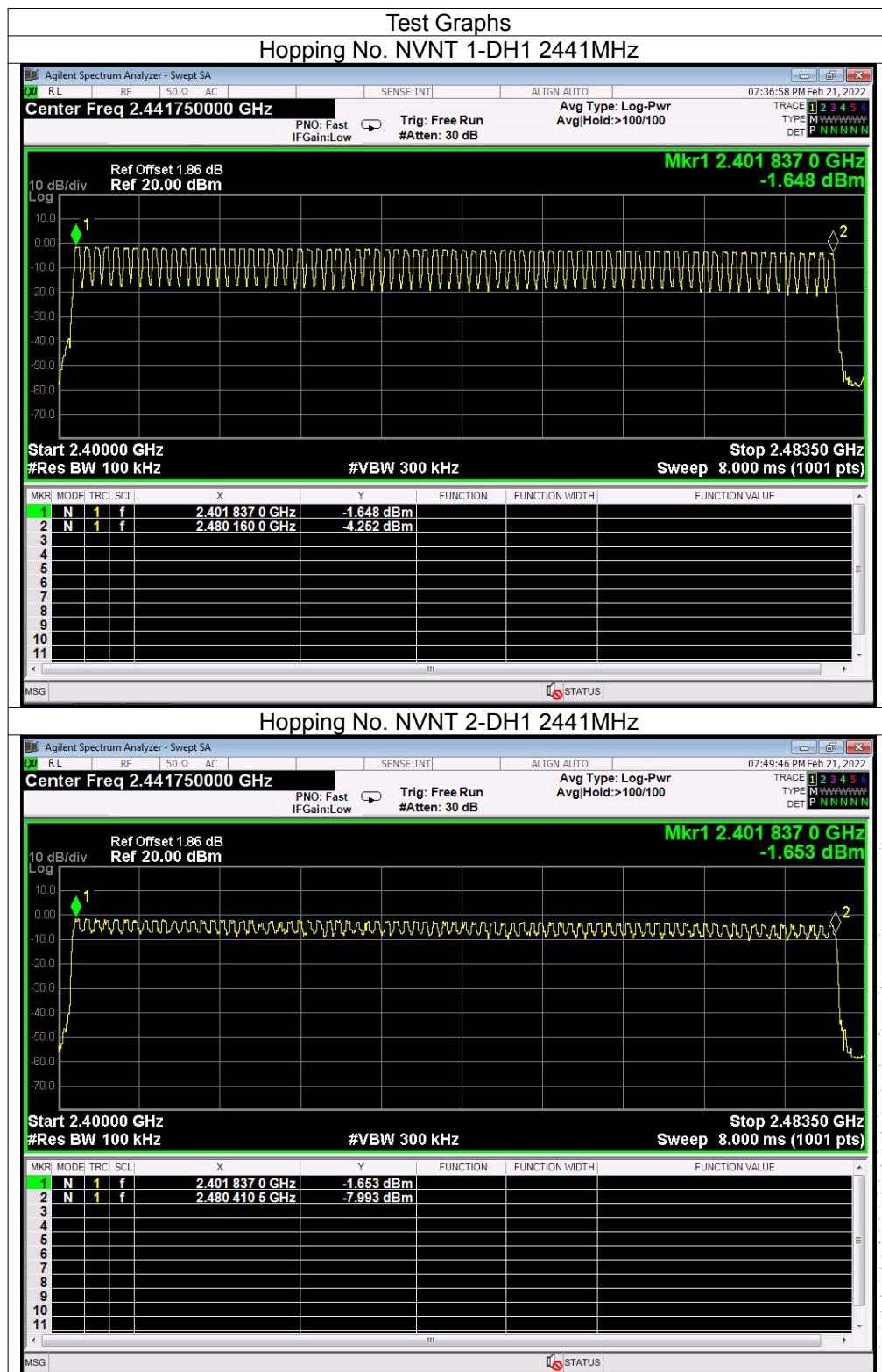
Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

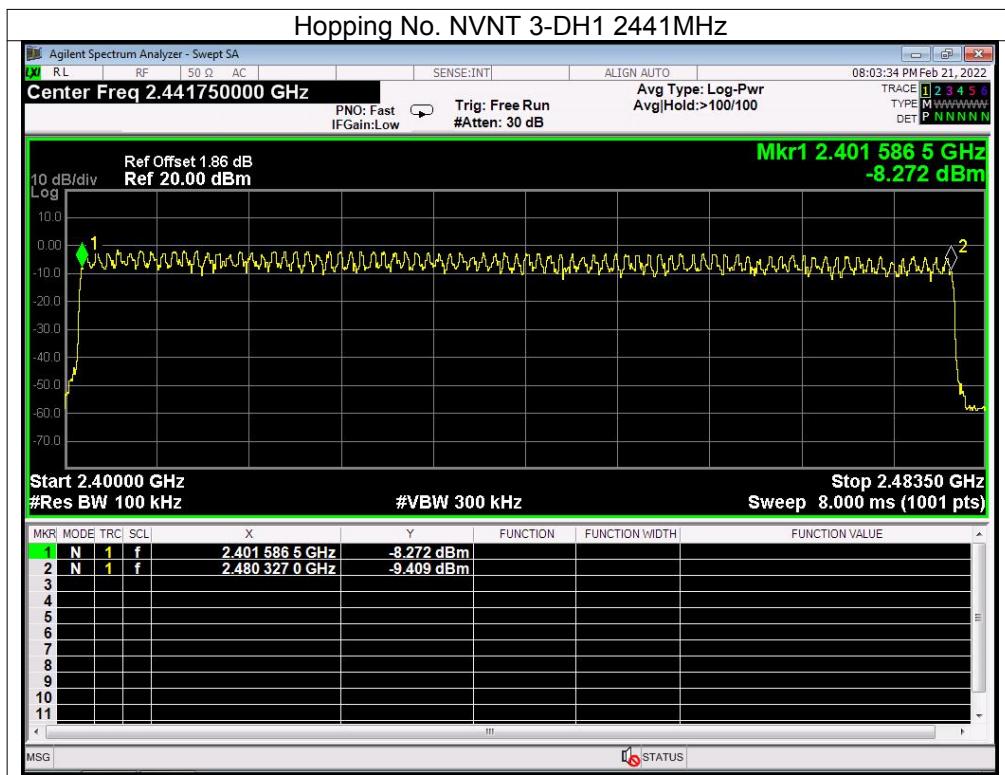
13.3 Test procedure

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:

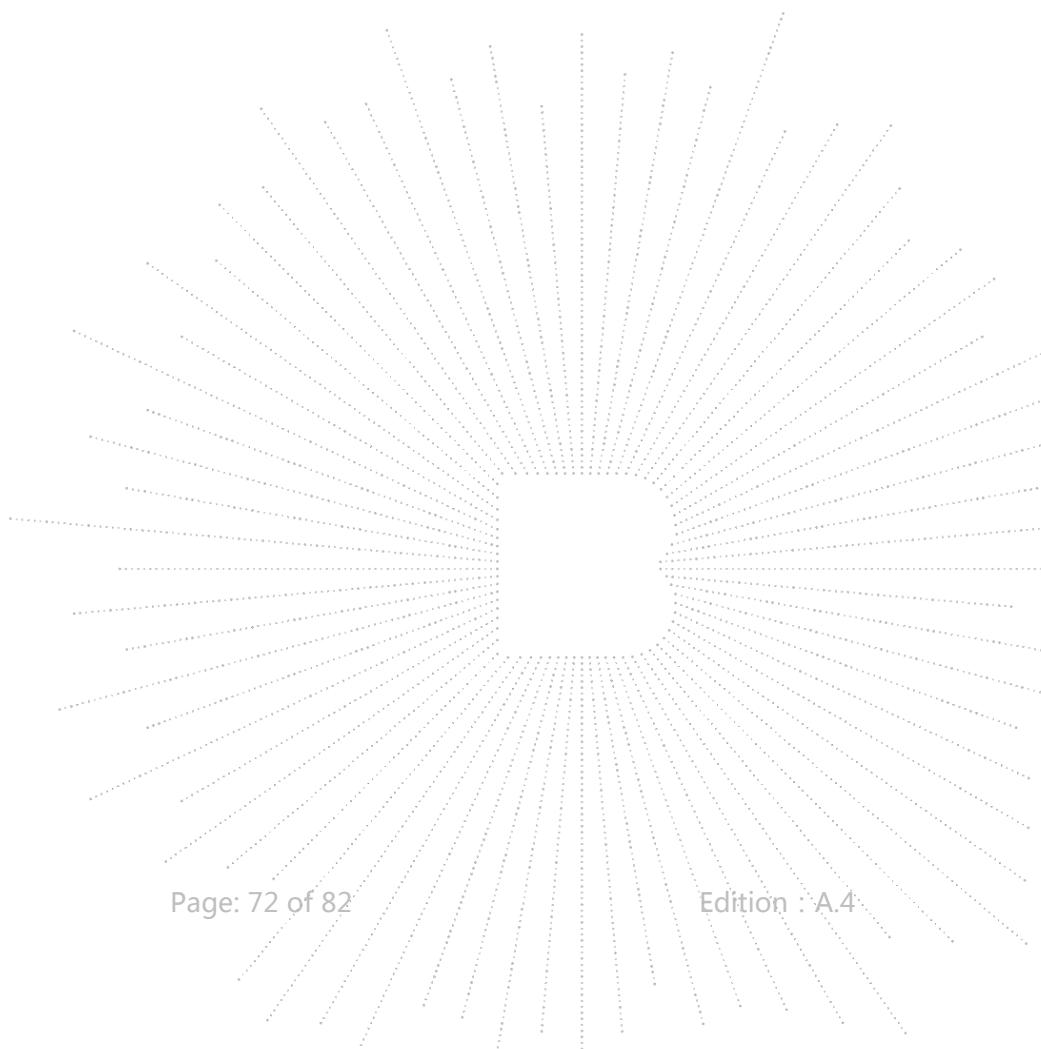
DH5:1600/79/6*0.4*79*(MkrDelta)/1000

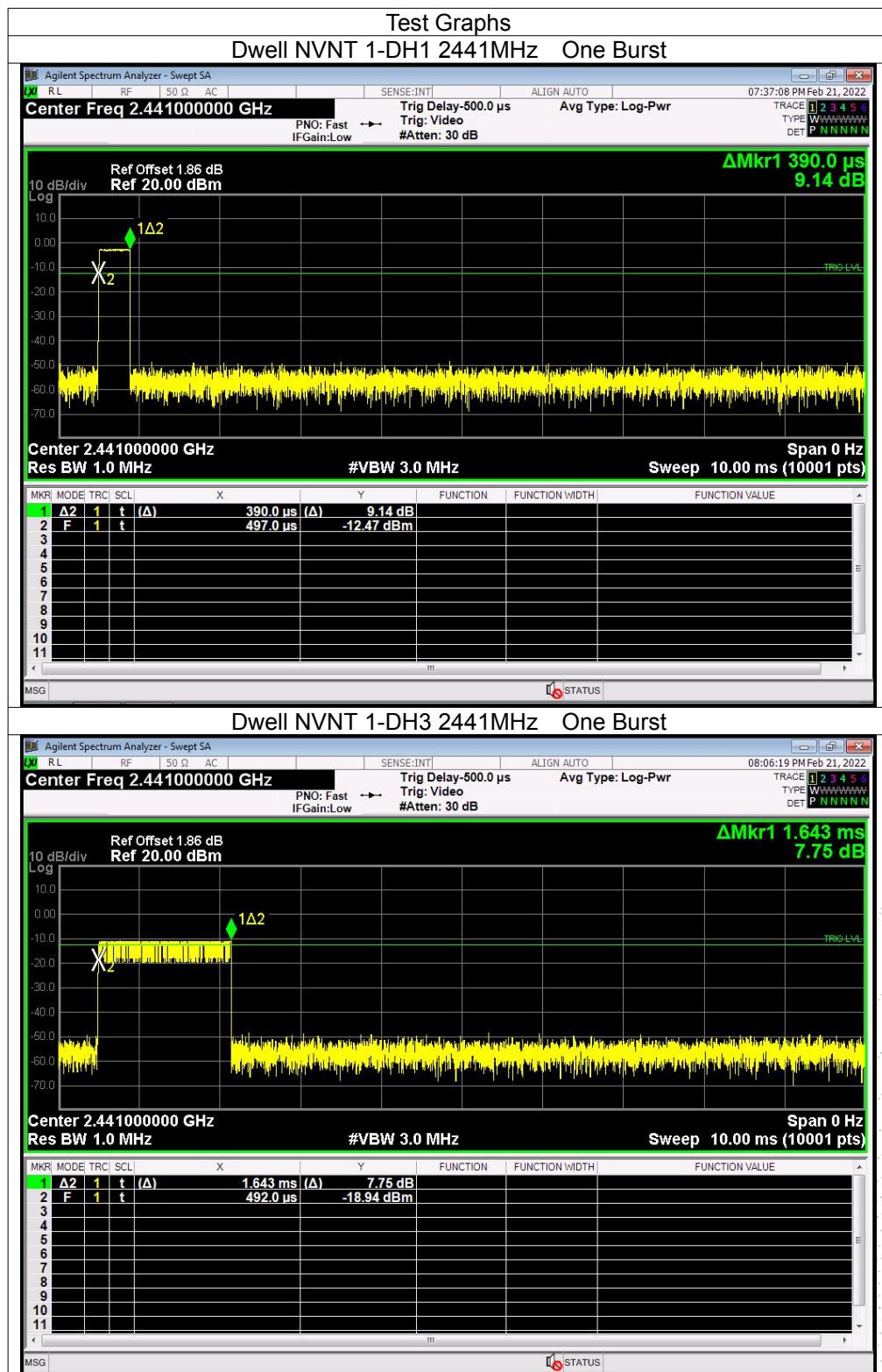
DH3:1600/79/4*0.4*79*(MkrDelta)/1000

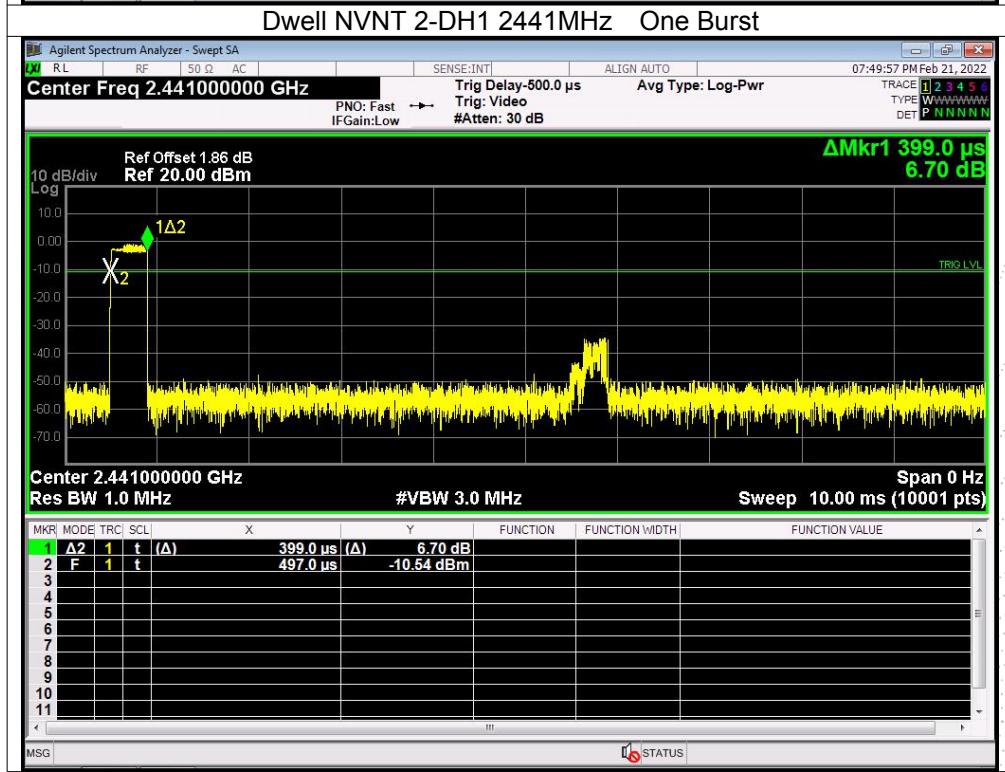
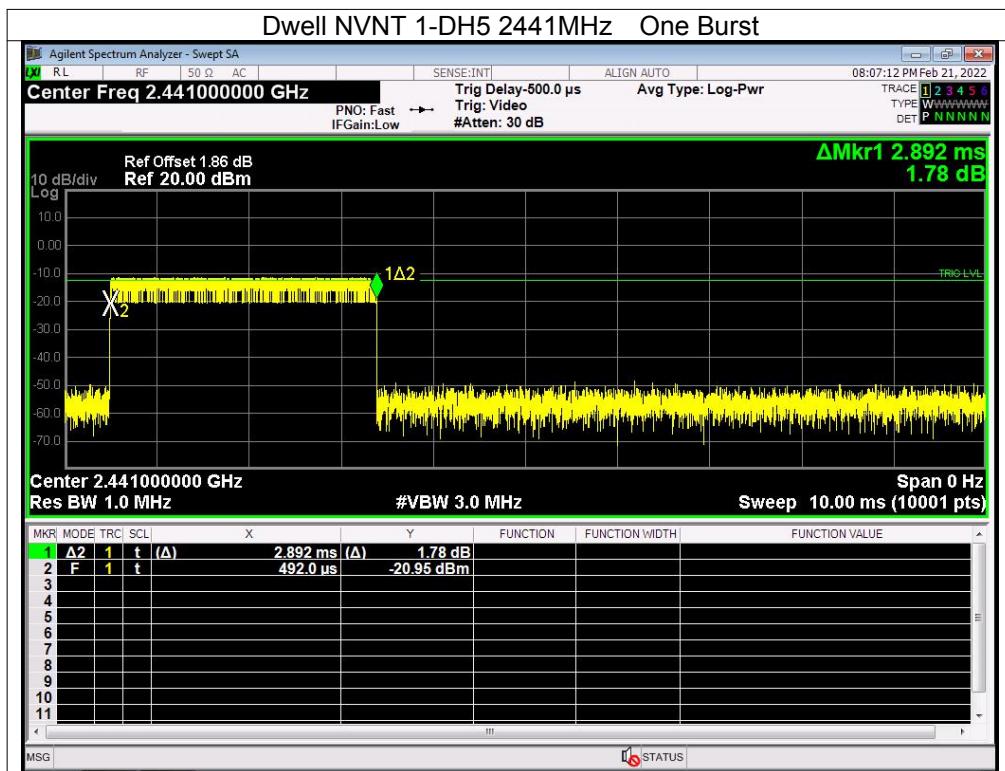
DH1:1600/79/2*0.4*79*(MkrDelta)/1000

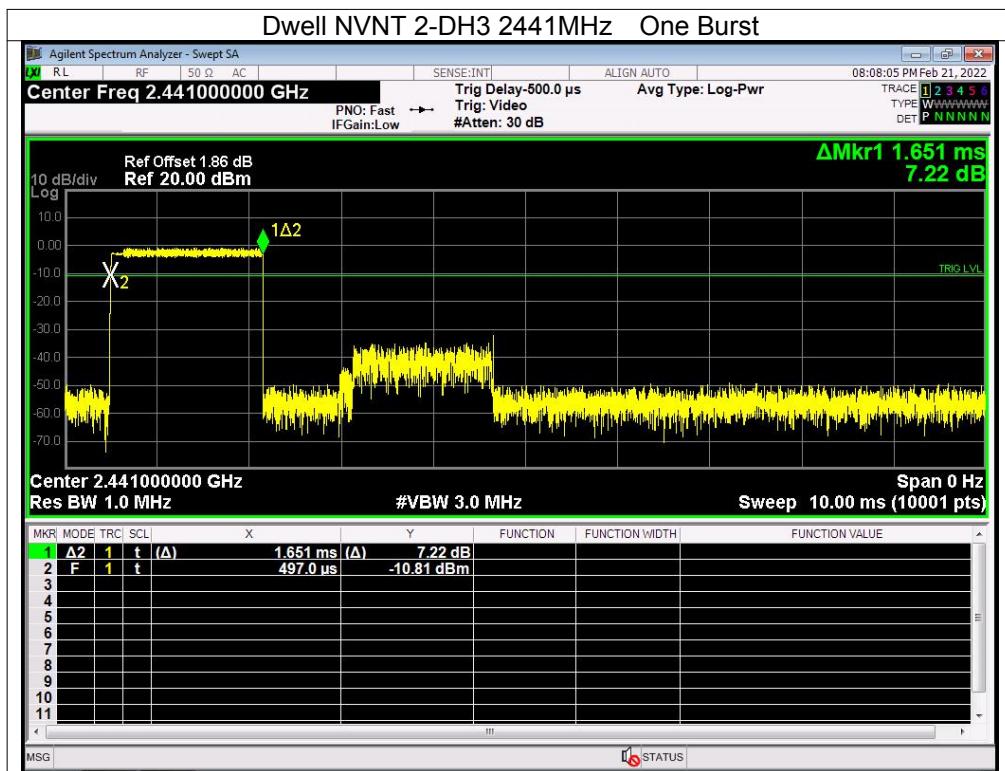
Remark: Mkr Delta is once pulse time.

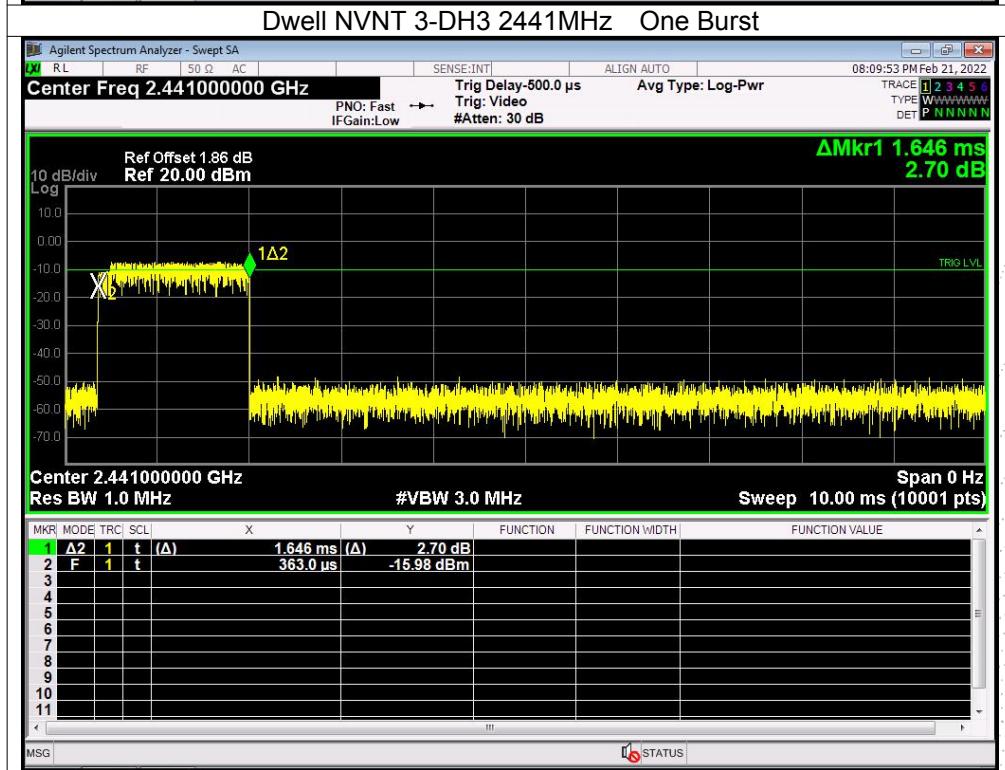
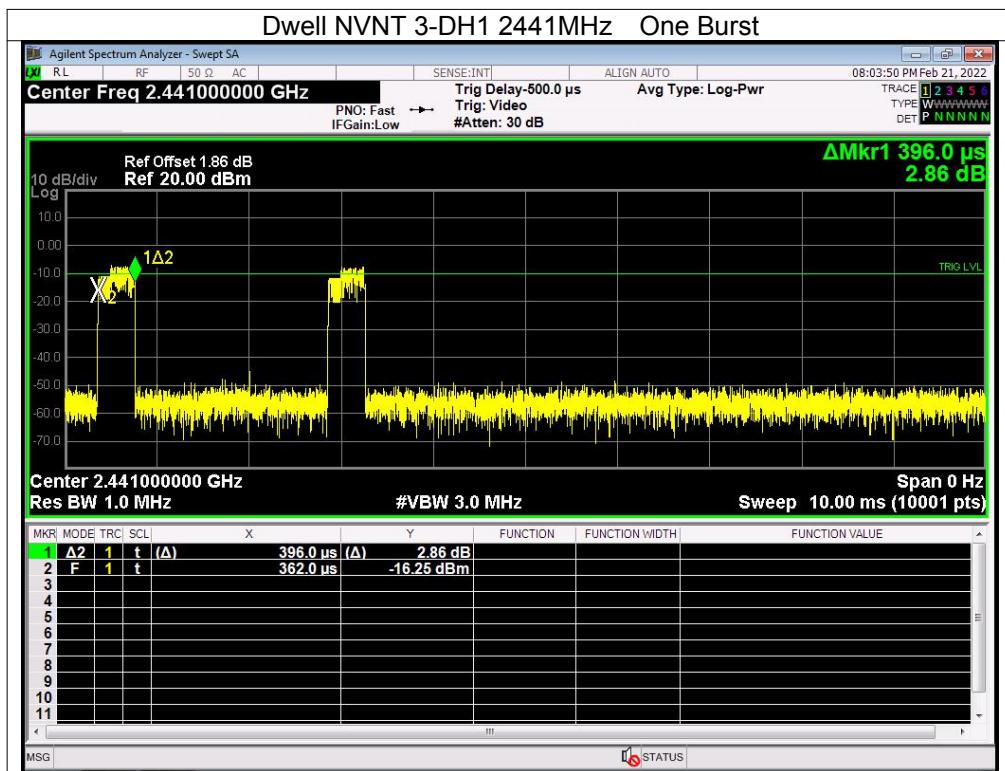
| Modulation | Channel Data | Packet | pulse time(ms) | Dwell Time(ms) | Limits(ms) |
|---------------|--------------|--------|----------------|----------------|------------|
| GFSK | Middle | DH1 | 0.390 | 124.80 | 400 |
| | | DH3 | 1.643 | 262.88 | 400 |
| | | DH5 | 2.892 | 308.48 | 400 |
| $\pi/4$ 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 |

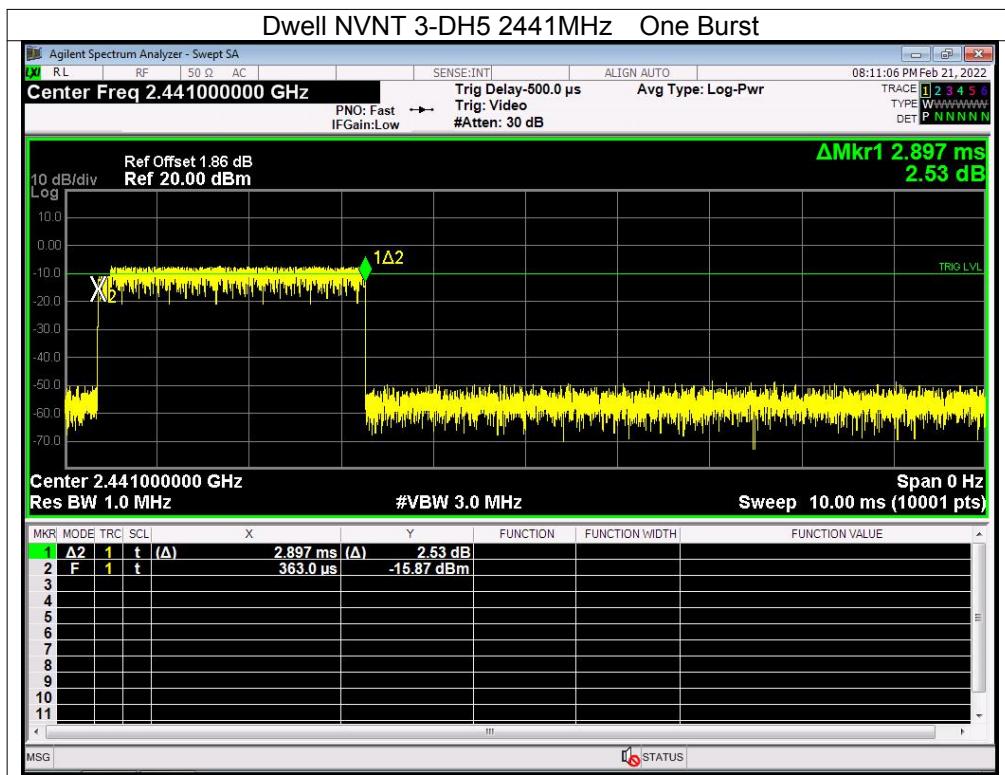












15. Antenna Requirement

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.

