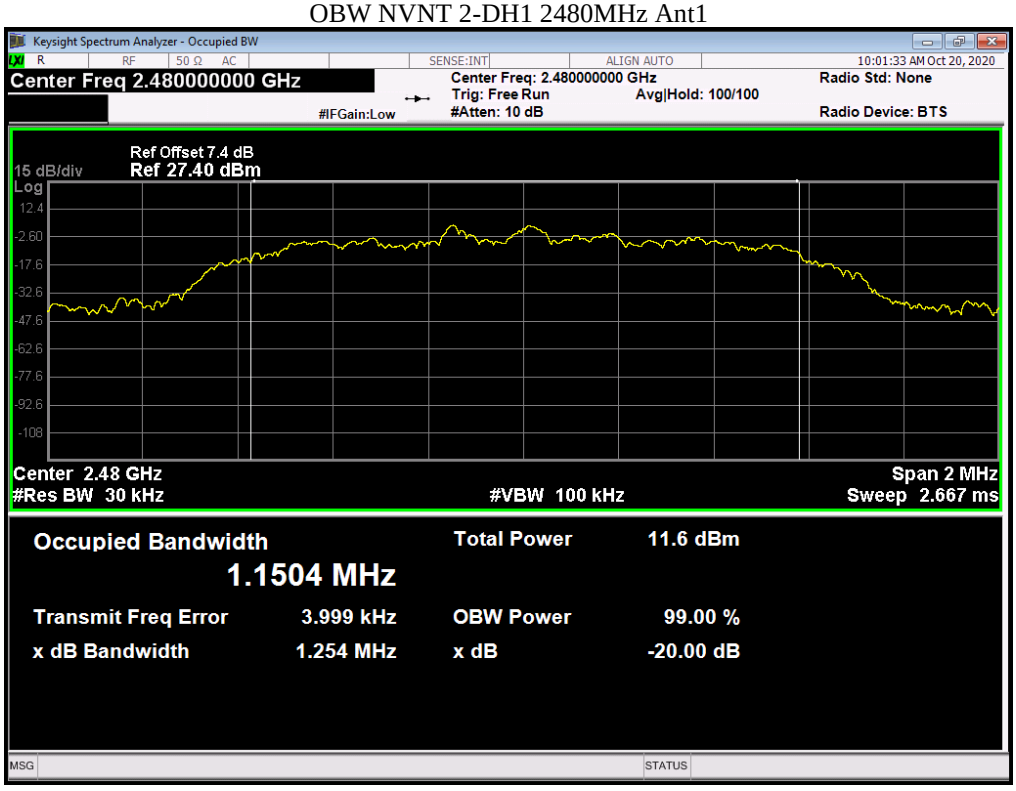
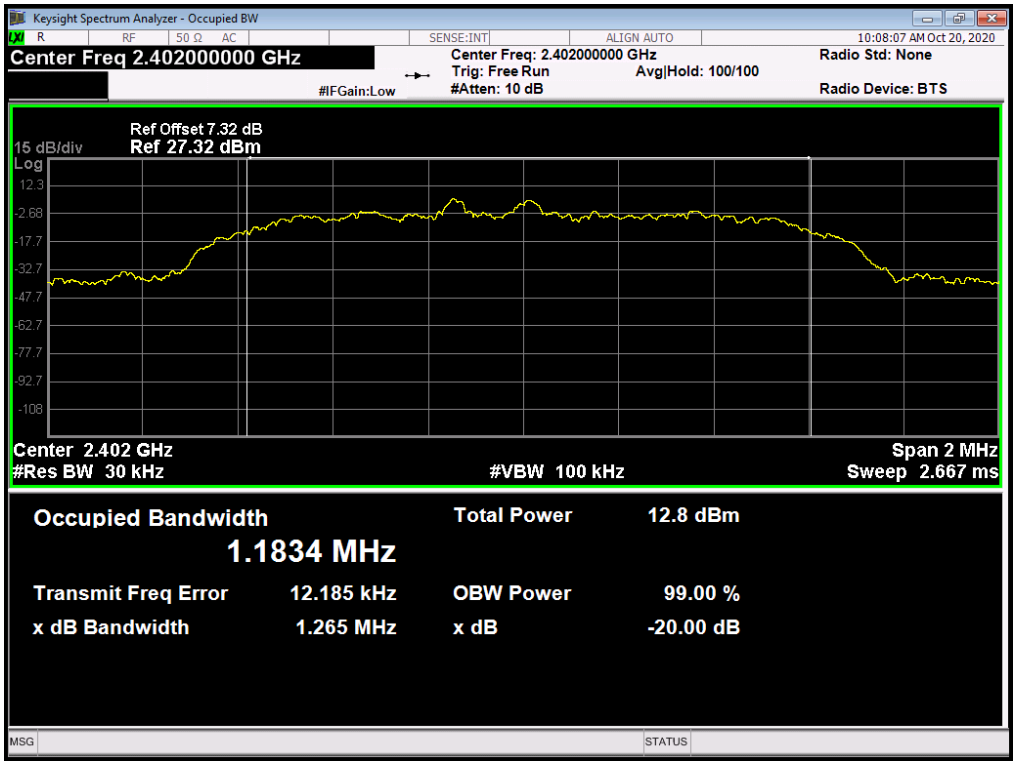
OBW NVNT 2-DH1 2480MHz Ant1

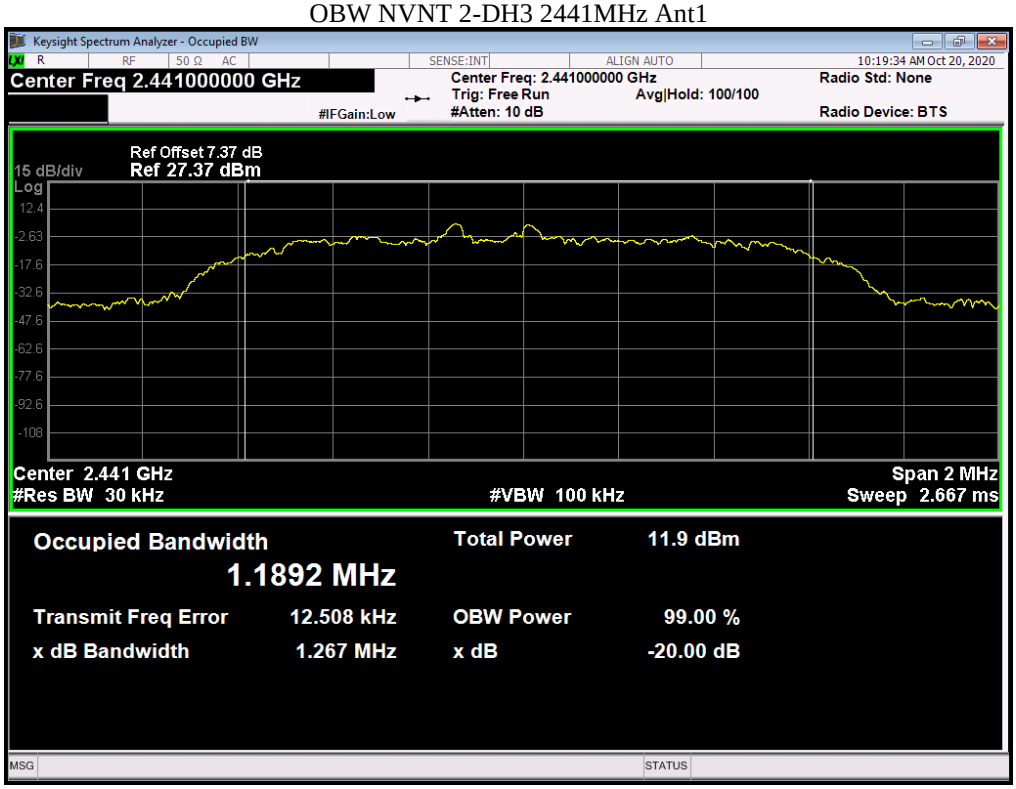


Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)	-20 dB Bandwidth (MHz)	Limit -20 dB Bandwidth (MHz)	Verdict
NVNT	2-DH3	2402	Ant 1	1.1834	1.2647	0	Pass
NVNT	2-DH3	2441	Ant 1	1.1892	1.2668	0	Pass
NVNT	2-DH3	2480	Ant 1	1.191	1.3191	0	Pass

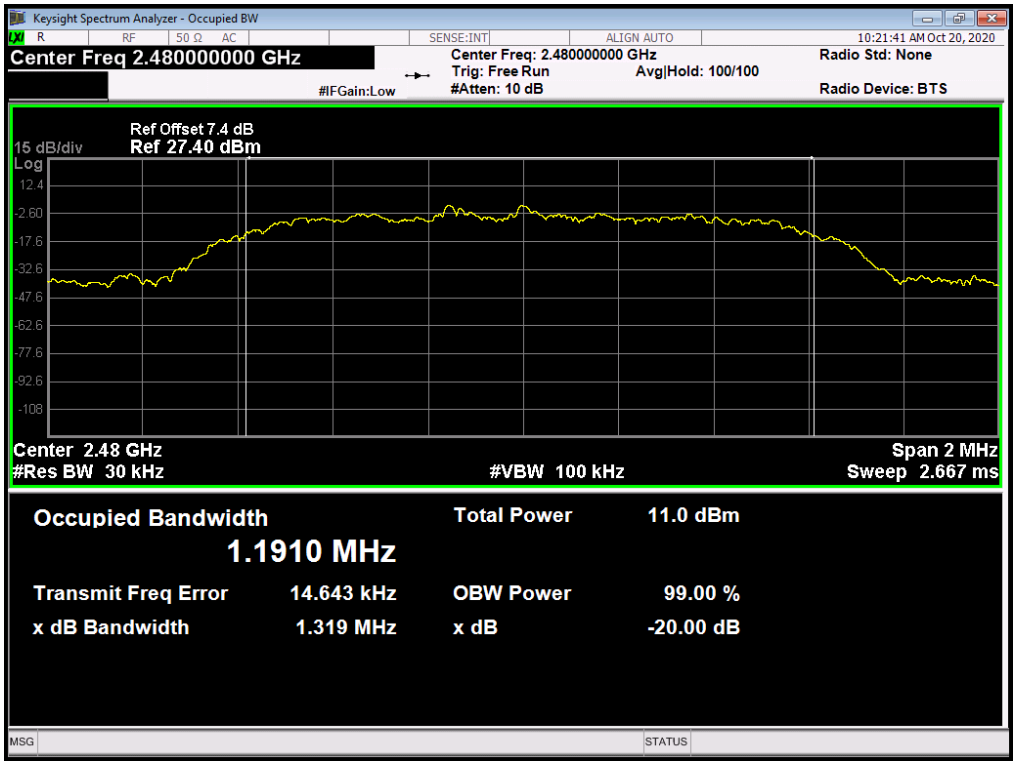
OBW NVNT 2-DH3 2402MHz Ant1



OBW NVNT 2-DH3 2441MHz Ant1

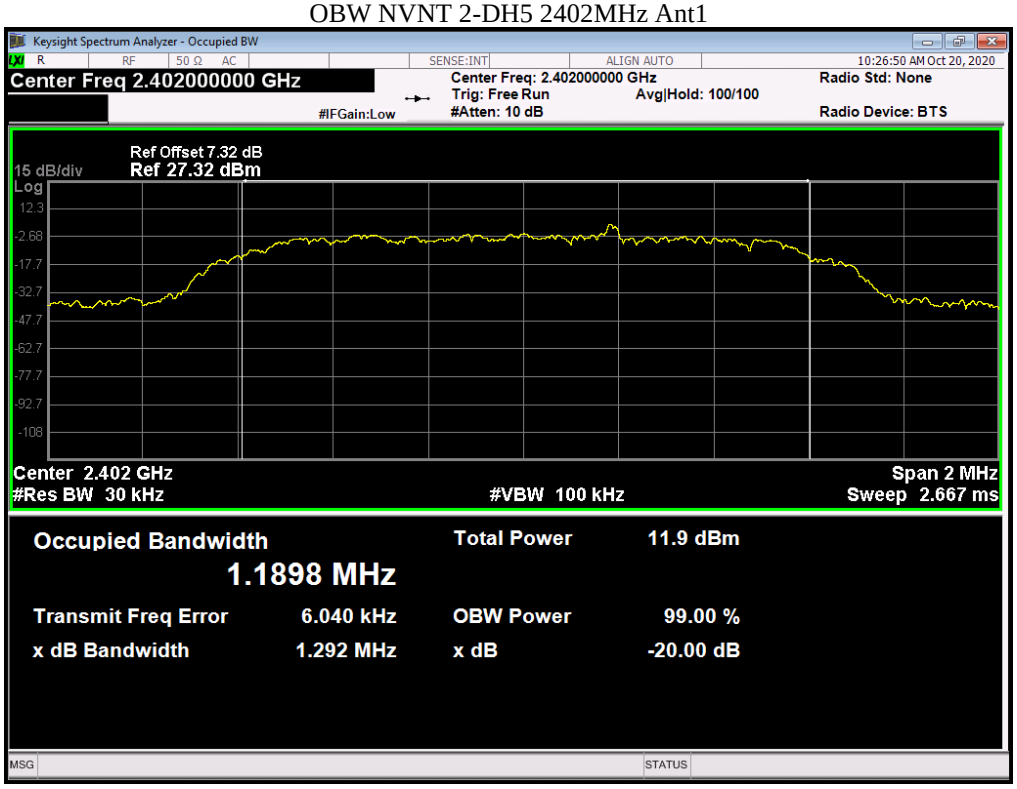


OBW NVNT 2-DH3 2480MHz Ant1

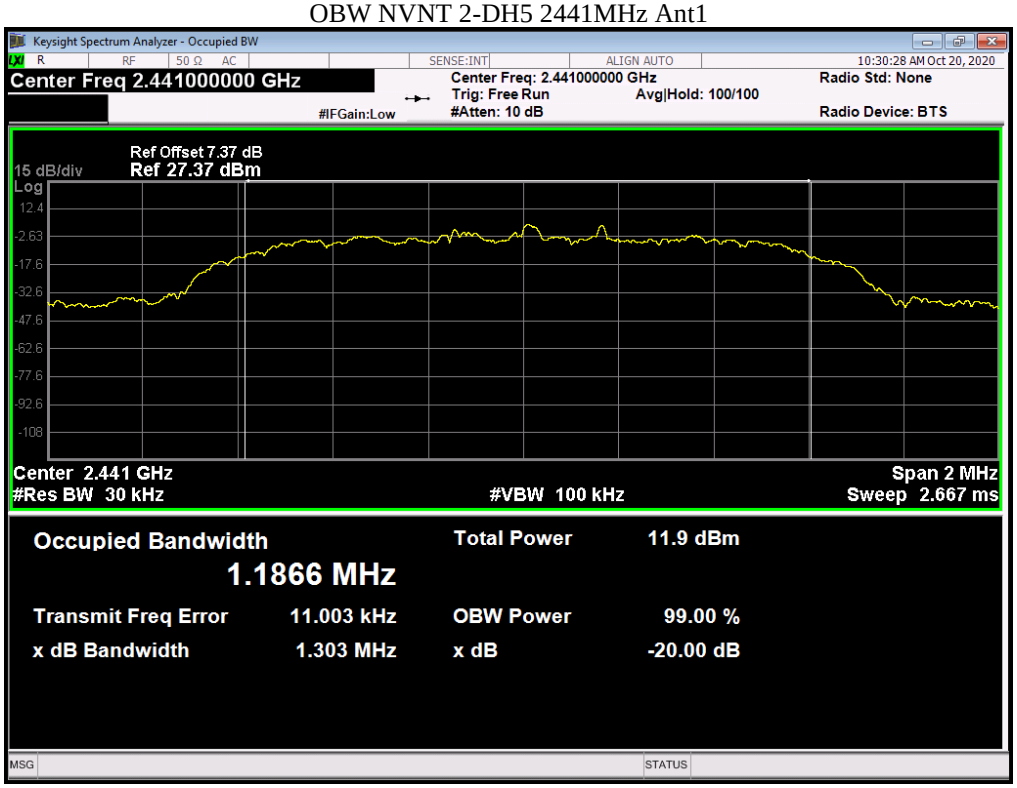


Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)	-20 dB Bandwidth (MHz)	Limit -20 dB Bandwidth (MHz)	Verdict
NVNT	2-DH5	2402	Ant 1	1.1898	1.2922	0	Pass
NVNT	2-DH5	2441	Ant 1	1.1866	1.303	0	Pass
NVNT	2-DH5	2480	Ant 1	1.1985	1.3456	0	Pass

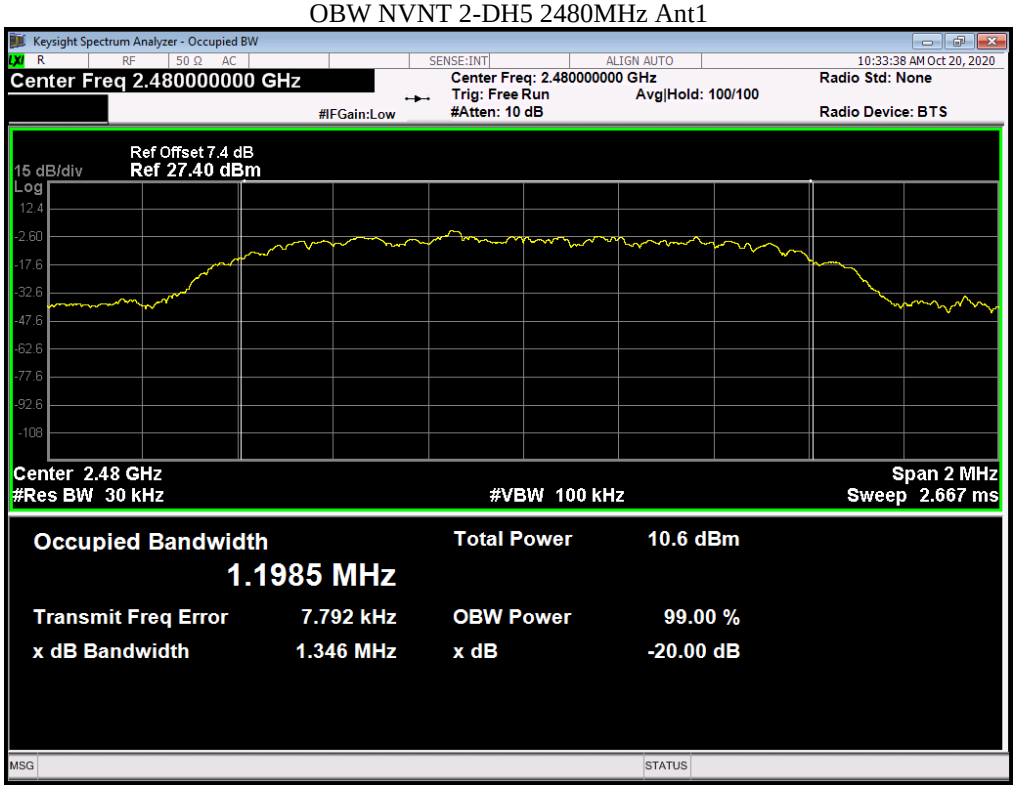
OBW NVNT 2-DH5 2402MHz Ant1



OBW NVNT 2-DH5 2441MHz Ant1



OBW NVNT 2-DH5 2480MHz Ant1



7. Carrier Frequencies Separated

7.1. Applied procedures / Limit

15.247(a) (1) 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 125 mW.

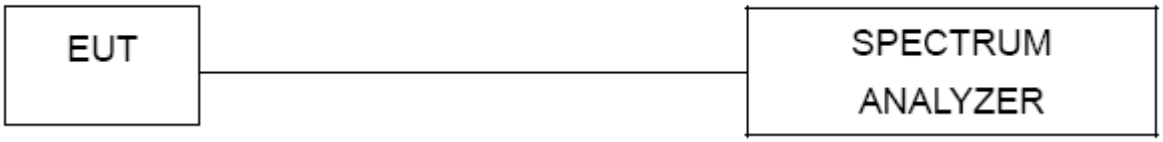
7.2. Test procedure

(1) Connected the antenna port to the Spectrum Analyzer, set the Spectrum Analyzer as Span = wide enough to capture the peaks of two adjacent channels, Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span, Video (or Average) Bandwidth (VBW) ≥ RBW Sweep = auto, Detector function = peak, Trace = max hold
(2) The EUT should be transmitting at its maximum data rate. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.
(3) The above procedure shall be repeated at the lowest, the middle, and the highest frequency of the stated frequency range with modulated mode. also shall be performed at different modes of operation.

7.3. Deviation from standard

No deviation.

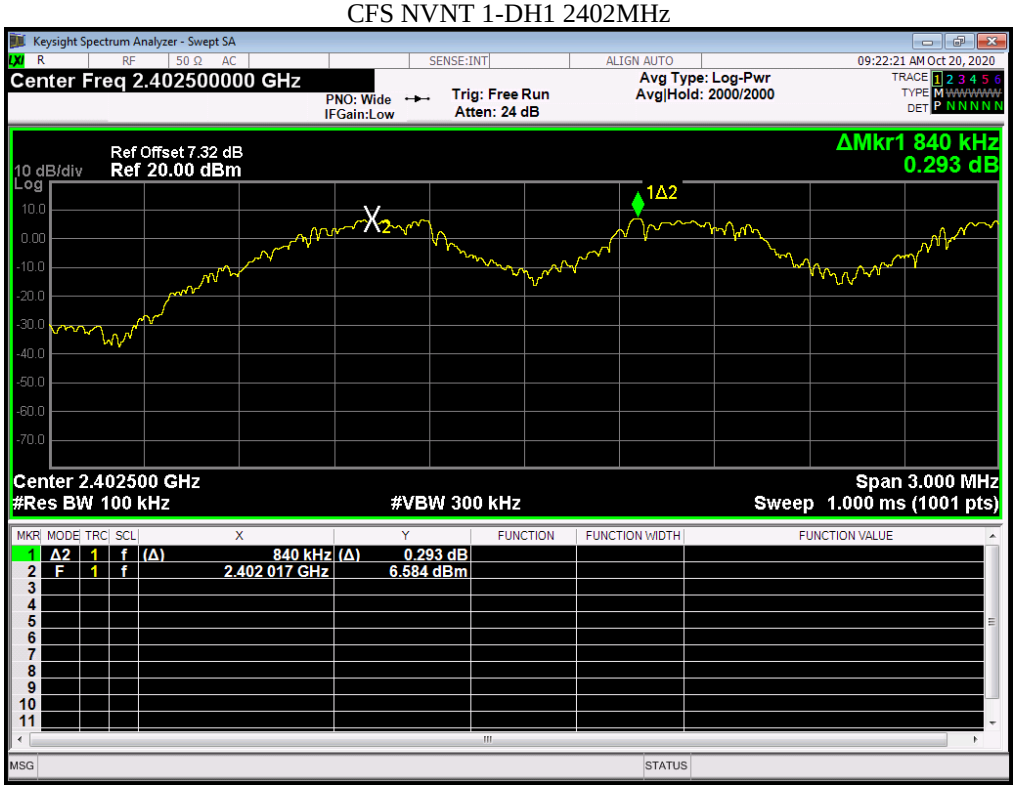
7.4. Test setup



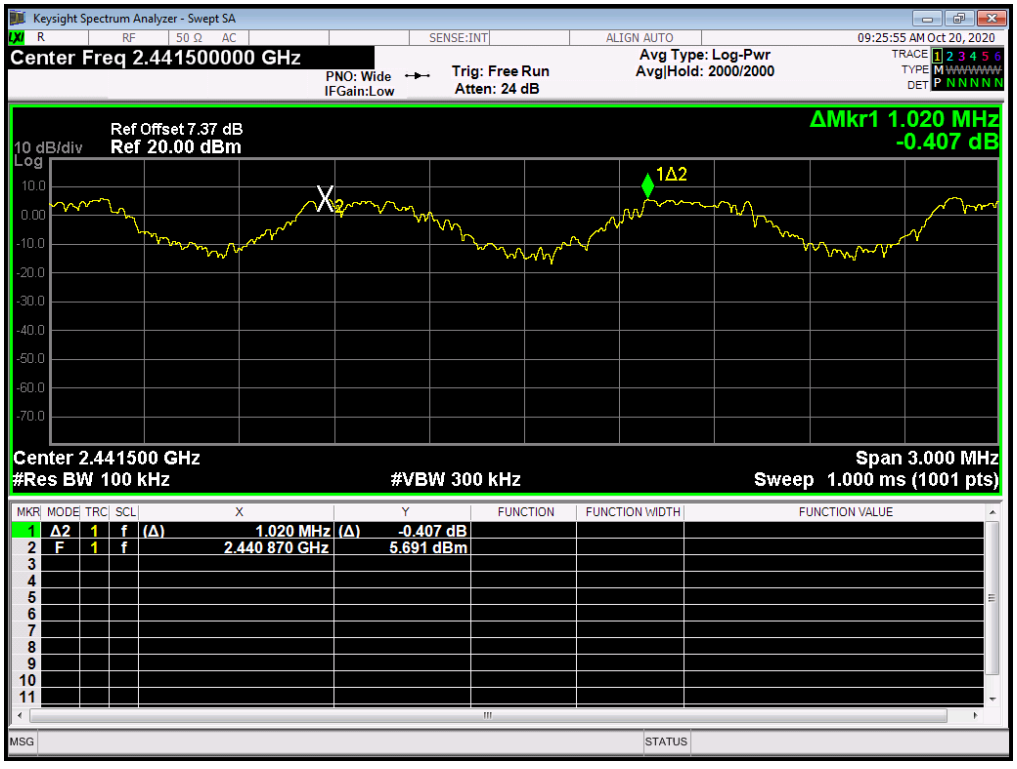
7.5. Test results

Condition	Mode	Hopping Freq1 (MHz)	Hopping Freq2 (MHz)	HFS (MHz)	Limit (MHz)	Verdict
NVNT	1-DH1	2402.017	2402.857	0.84	0.579	Pass
NVNT	1-DH1	2440.87	2441.89	1.02	0.565	Pass
NVNT	1-DH1	2478.855	2479.863	1.008	0.572	Pass

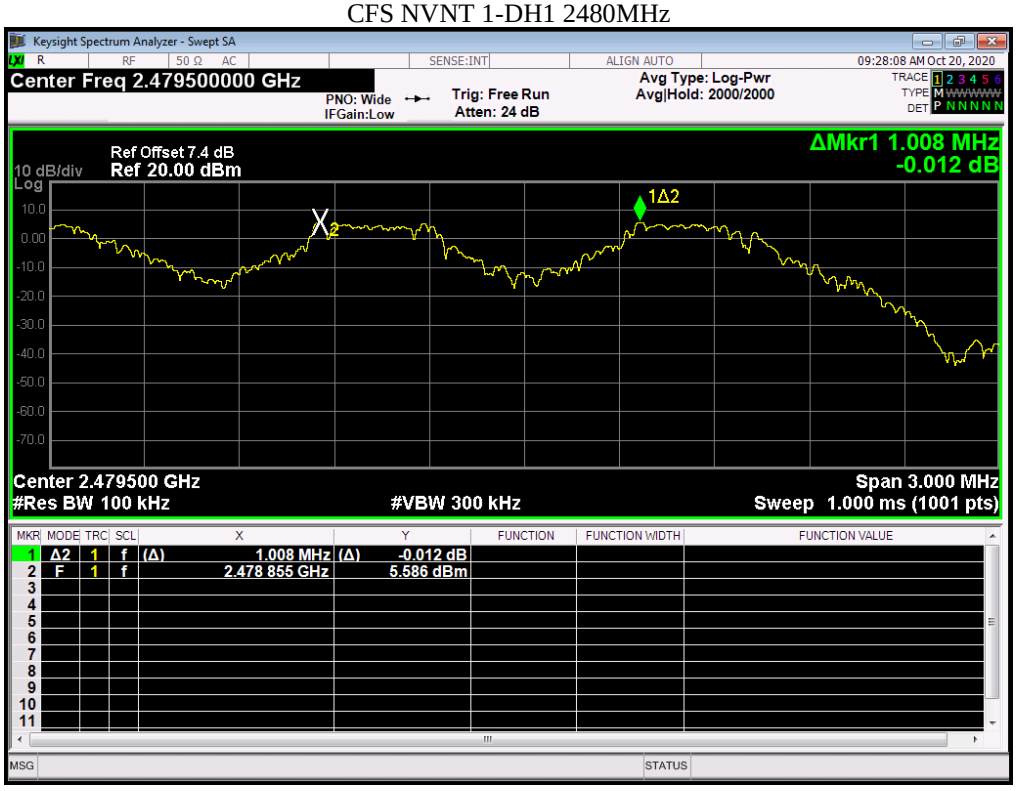
CFS NVNT 1-DH1 2402MHz



CFS NVNT 1-DH1 2441MHz

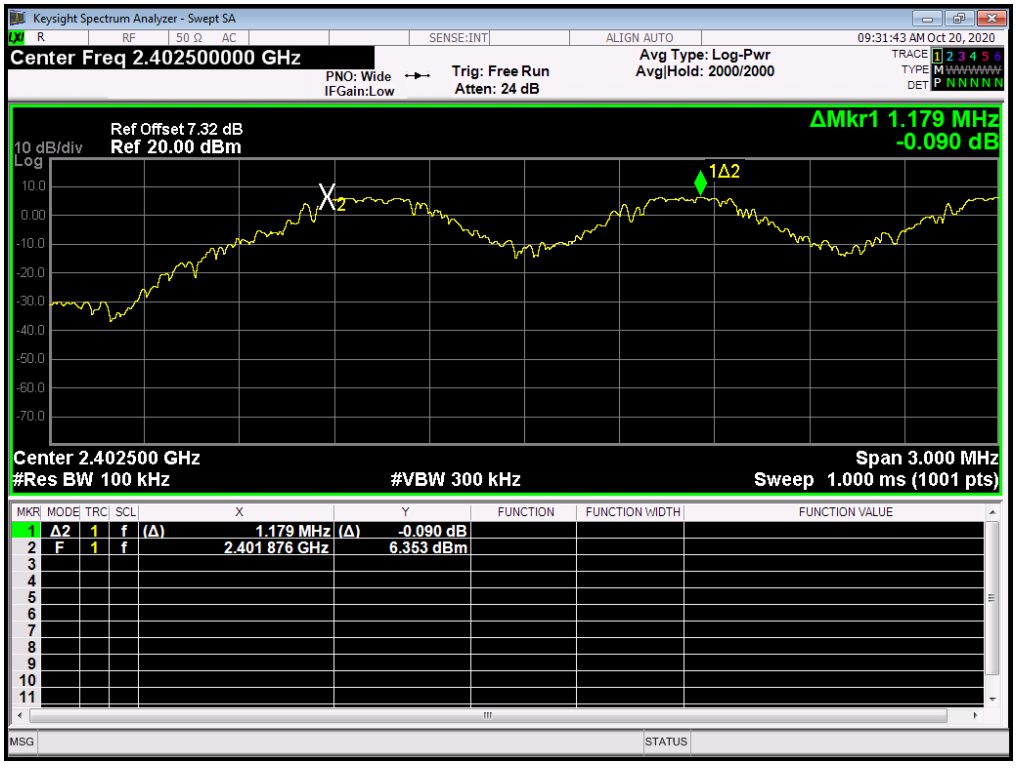


CFS NVNT 1-DH1 2480MHz

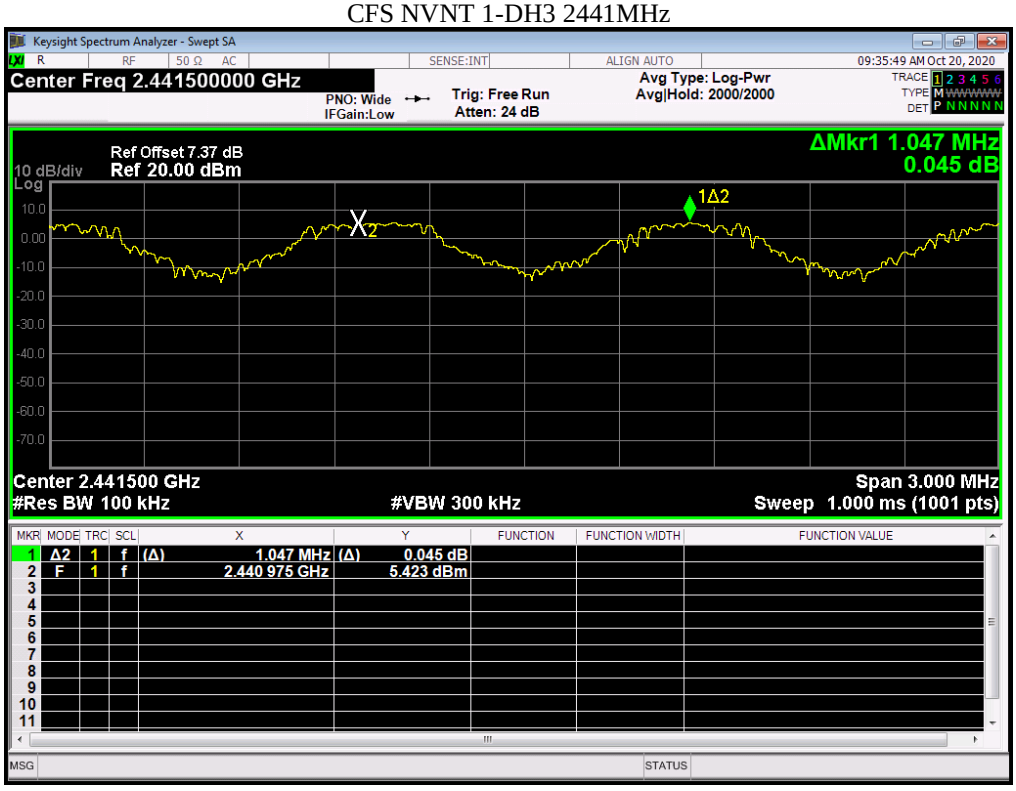


Condition	Mode	Hopping Freq1 (MHz)	Hopping Freq2 (MHz)	HFS (MHz)	Limit (MHz)	Verdict
NVNT	1-DH3	2401.876	2403.055	1.179	0.626	Pass
NVNT	1-DH3	2440.975	2442.022	1.047	0.634	Pass
NVNT	1-DH3	2478.852	2479.95	1.098	0.63	Pass

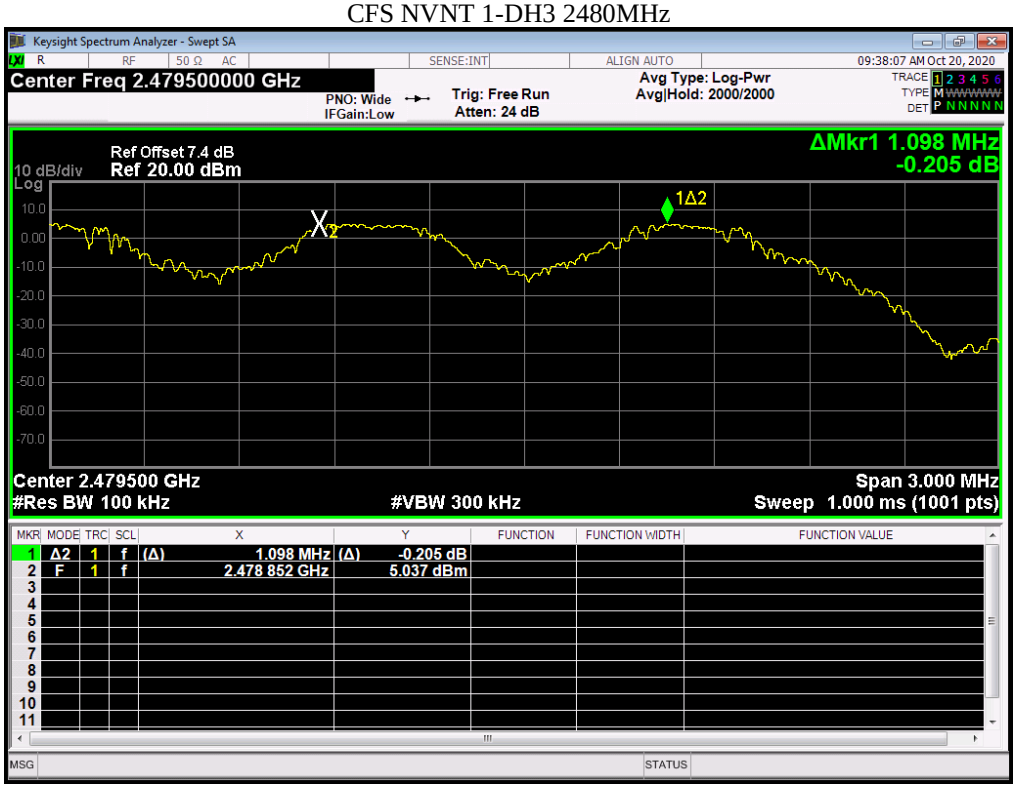
CFS NVNT 1-DH3 2402MHz



CFS NVNT 1-DH3 2441MHz

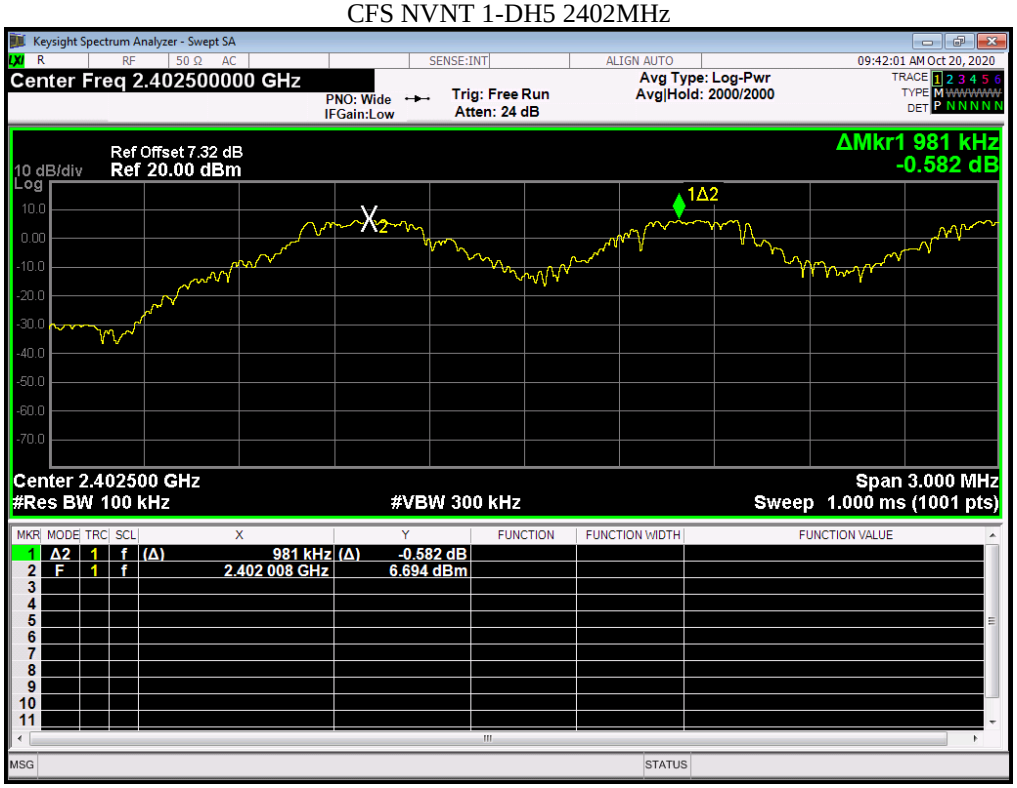


CFS NVNT 1-DH3 2480MHz

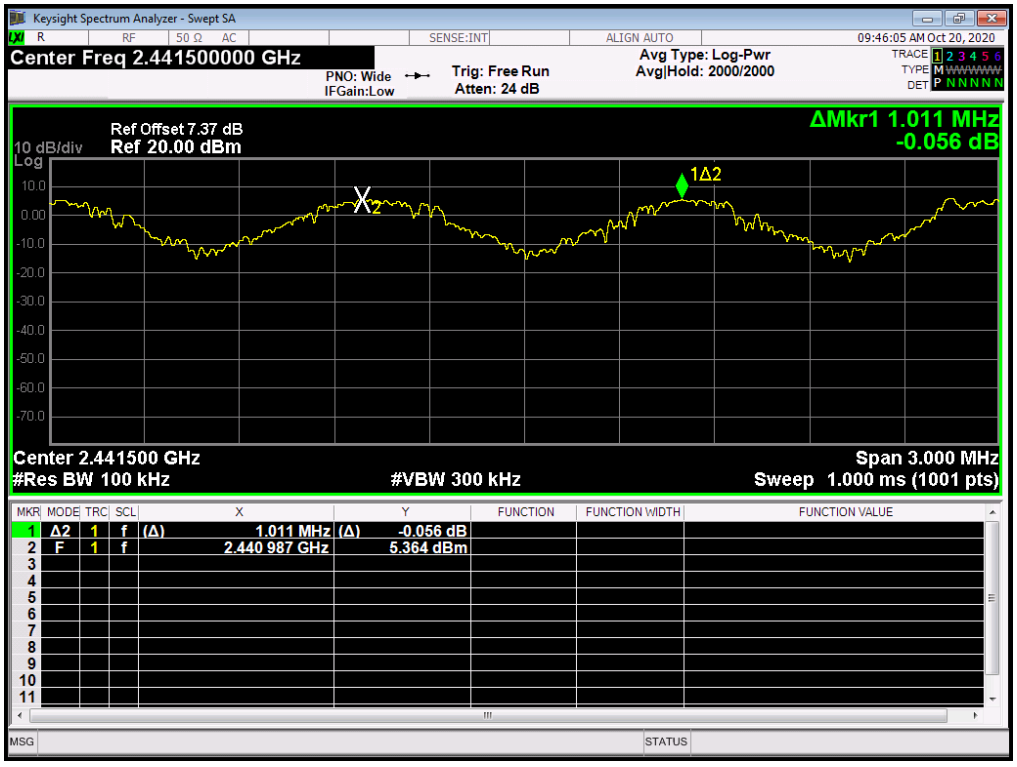


Condition	Mode	Hopping Freq1 (MHz)	Hopping Freq2 (MHz)	HFS (MHz)	Limit (MHz)	Verdict
NVNT	1-DH5	2402.008	2402.989	0.981	0.63	Pass
NVNT	1-DH5	2440.987	2441.998	1.011	0.627	Pass
NVNT	1-DH5	2478.96	2480.052	1.092	0.62	Pass

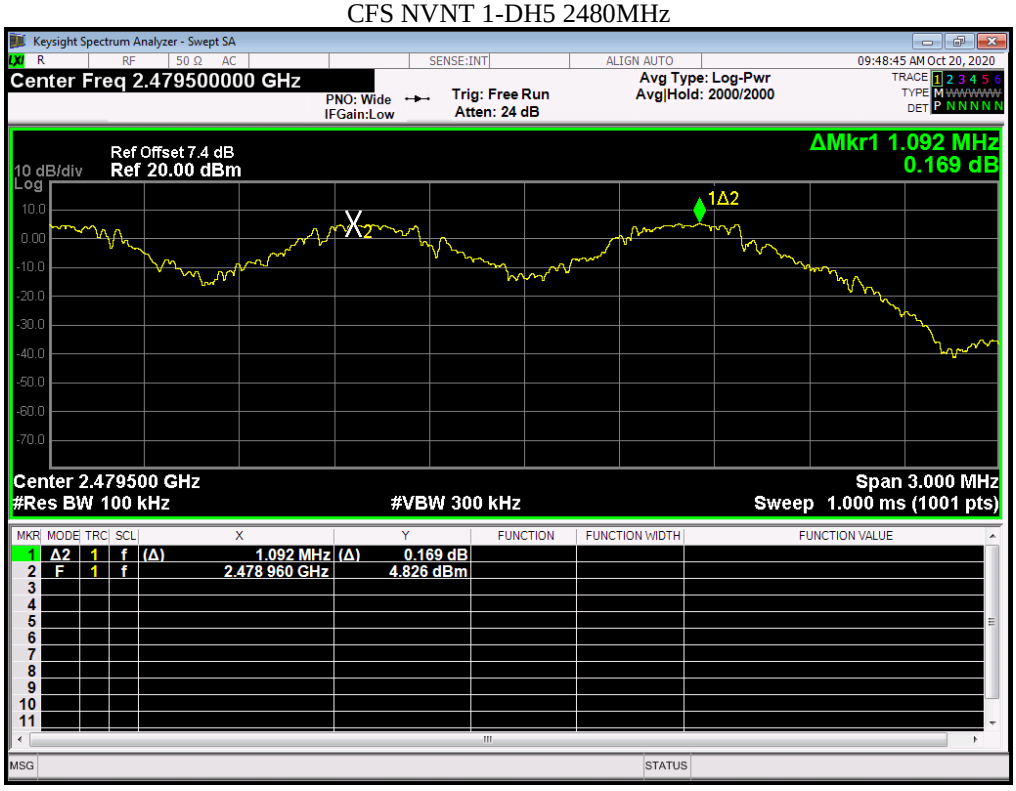
CFS NVNT 1-DH5 2402MHz



CFS NVNT 1-DH5 2441MHz

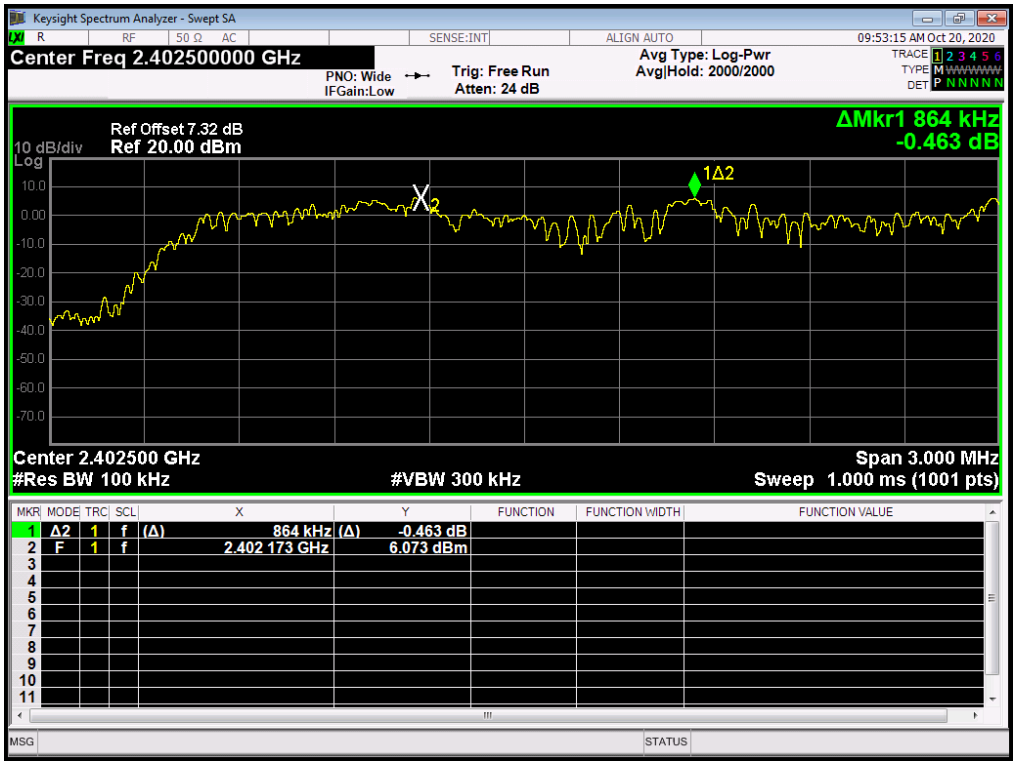


CFS NVNT 1-DH5 2480MHz

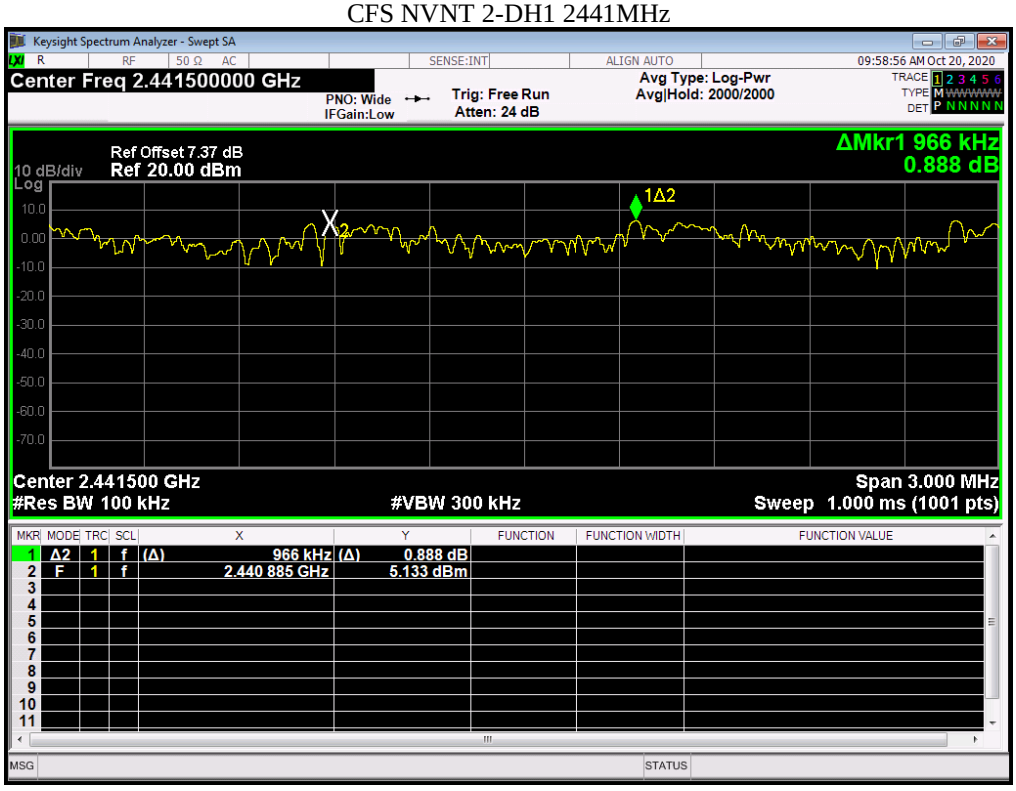


Condition	Mode	Hopping Freq1 (MHz)	Hopping Freq2 (MHz)	HFS (MHz)	Limit (MHz)	Verdict
NVNT	2-DH1	2402.173	2403.037	0.864	0.817	Pass
NVNT	2-DH1	2440.885	2441.851	0.966	0.859	Pass
NVNT	2-DH1	2478.855	2479.875	1.02	0.836	Pass

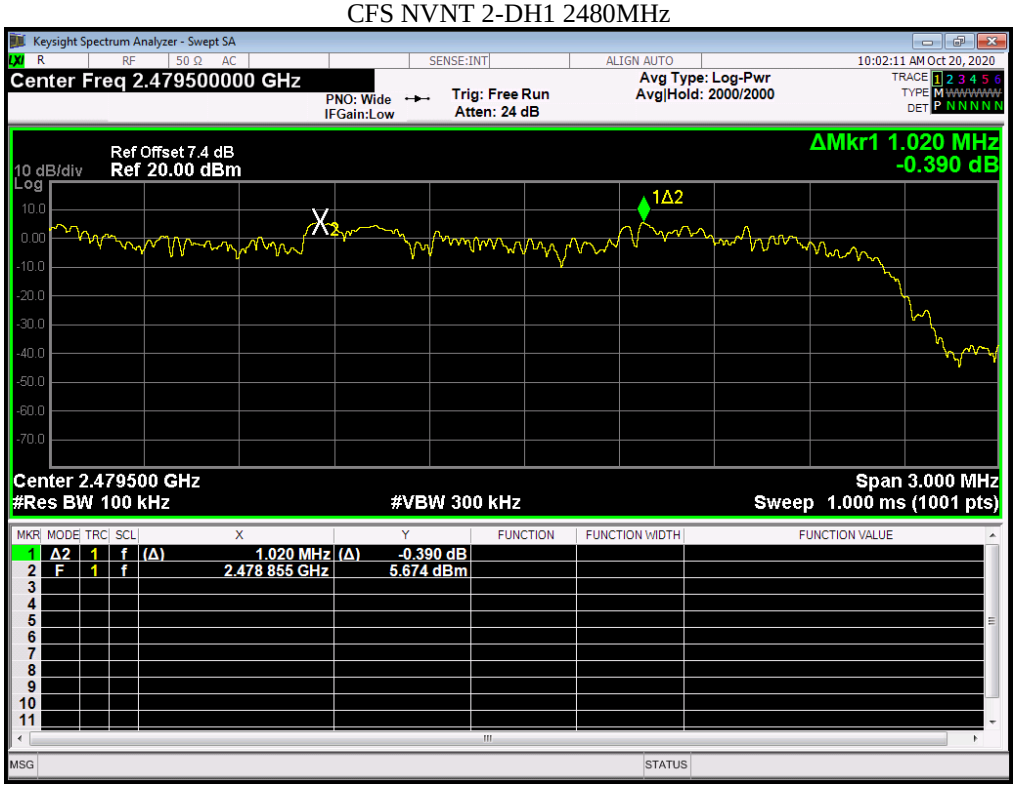
CFS NVNT 2-DH1 2402MHz



CFS NVNT 2-DH1 2441MHz

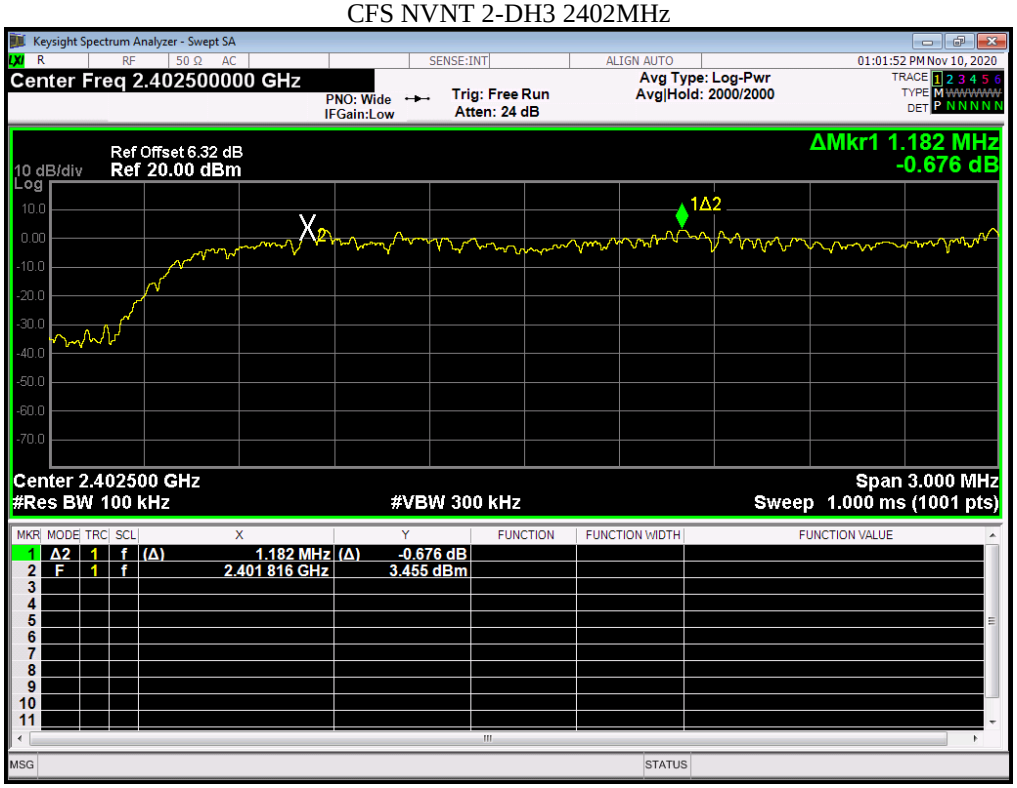


CFS NVNT 2-DH1 2480MHz

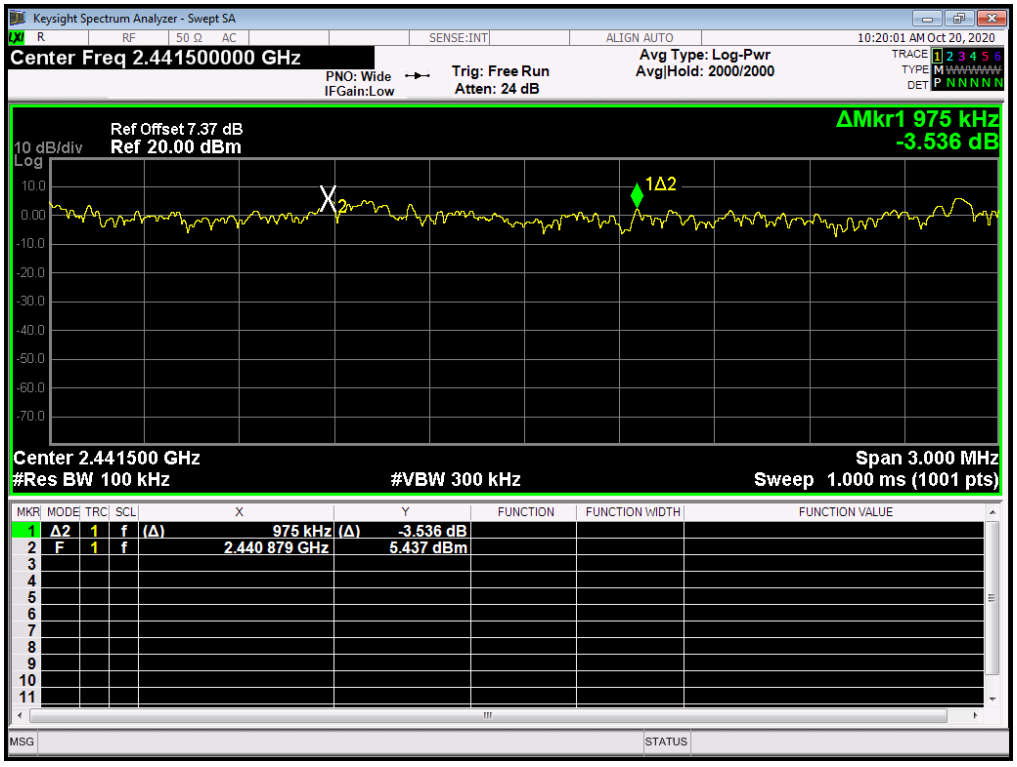


Condition	Mode	Hopping Freq1 (MHz)	Hopping Freq2 (MHz)	HFS (MHz)	Limit (MHz)	Verdict
NVNT	2-DH3	2401.816	2402.998	1.182	0.843	Fail
NVNT	2-DH3	2440.879	2441.854	0.975	0.845	Pass
NVNT	2-DH3	2478.864	2480.025	1.161	0.879	Pass

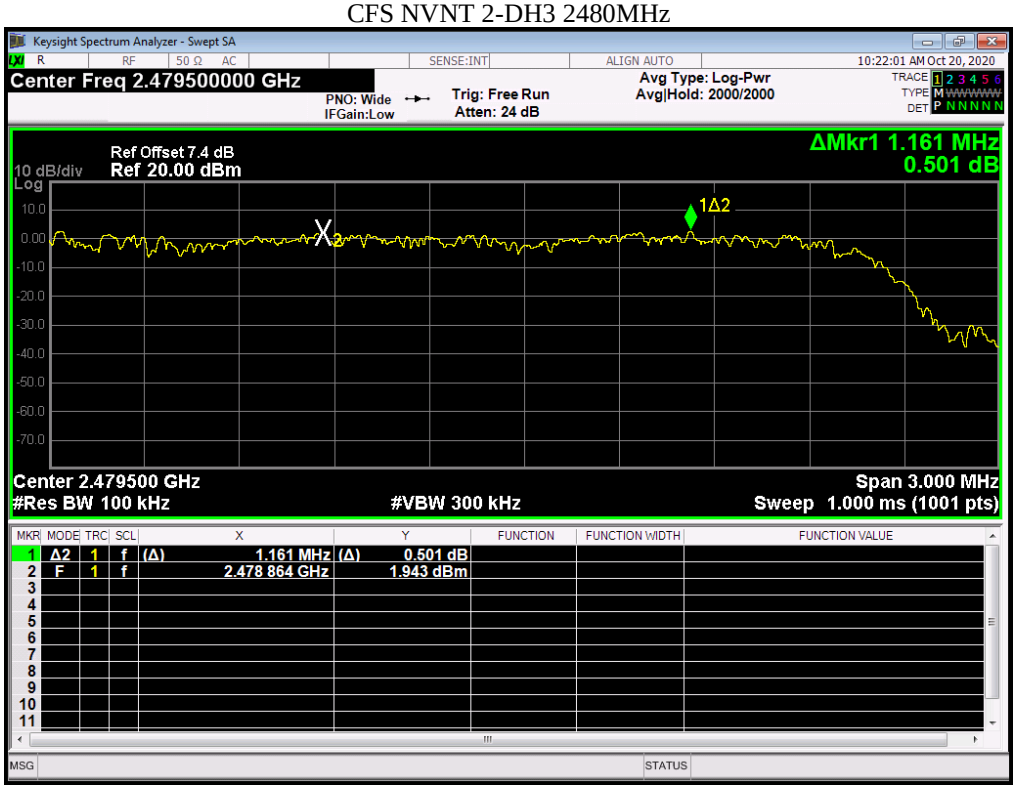
CFS NVNT 2-DH3 2402MHz



CFS NVNT 2-DH3 2441MHz

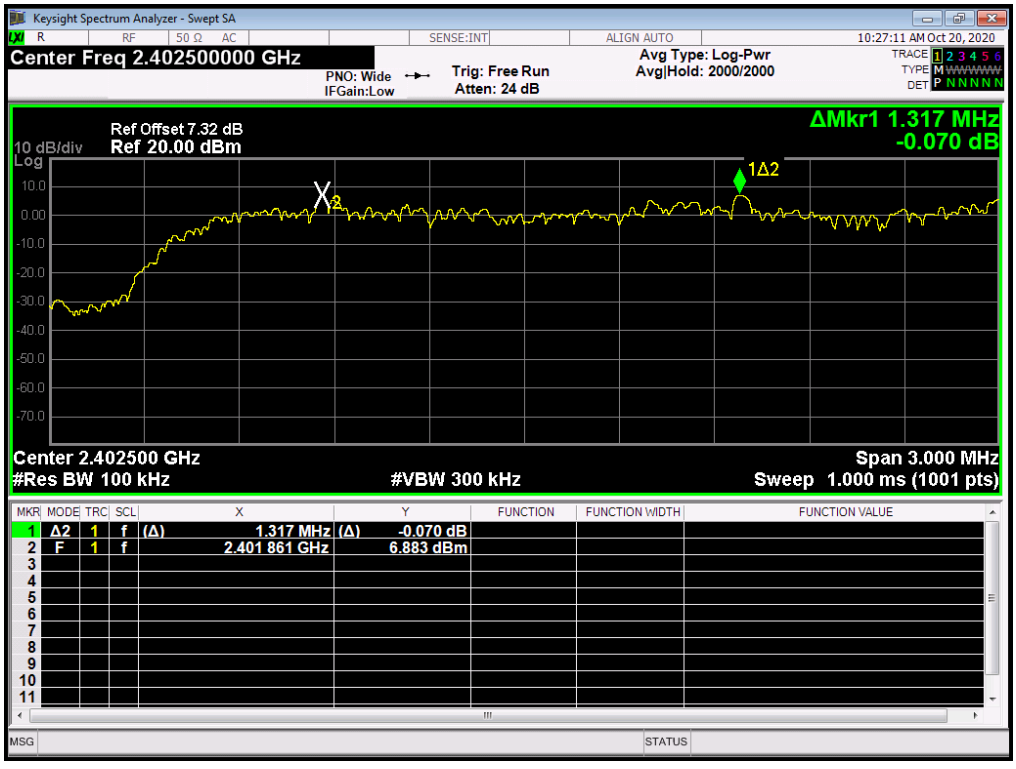


CFS NVNT 2-DH3 2480MHz

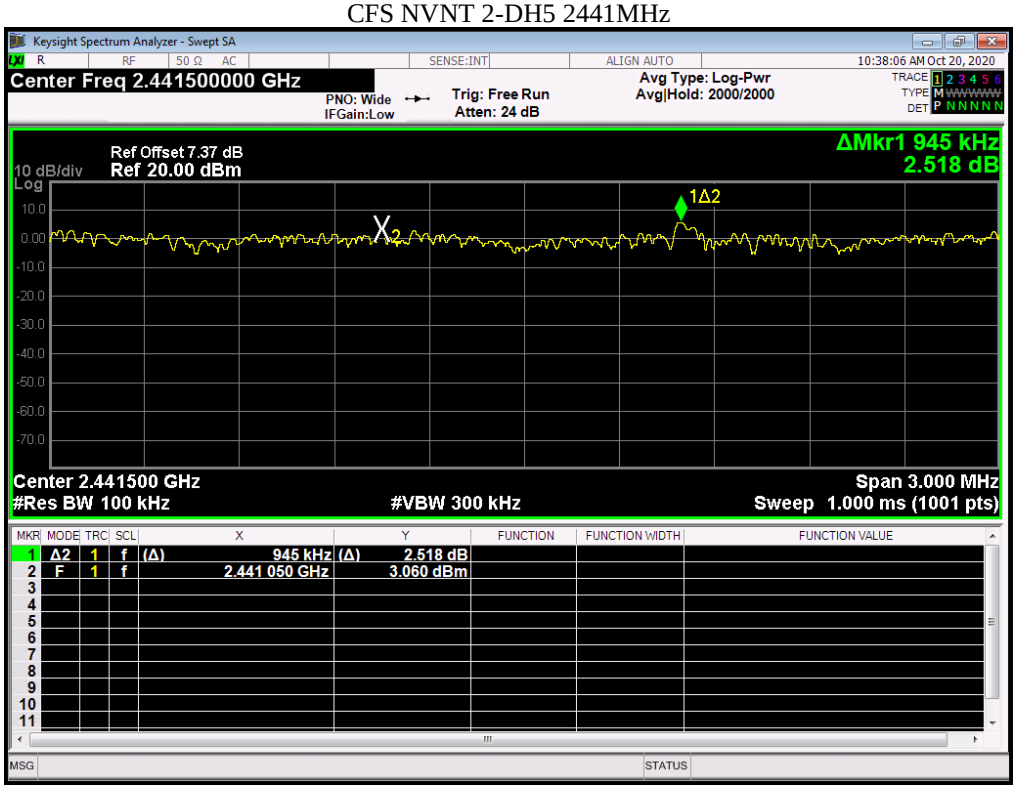


Condition	Mode	Hopping Freq1 (MHz)	Hopping Freq2 (MHz)	HFS (MHz)	Limit (MHz)	Verdict
NVNT	2-DH5	2401.861	2403.178	1.317	0.861	Pass
NVNT	2-DH5	2441.05	2441.995	0.945	0.897	Pass
NVNT	2-DH5	2478.882	2480.199	1.317	0.897	Pass

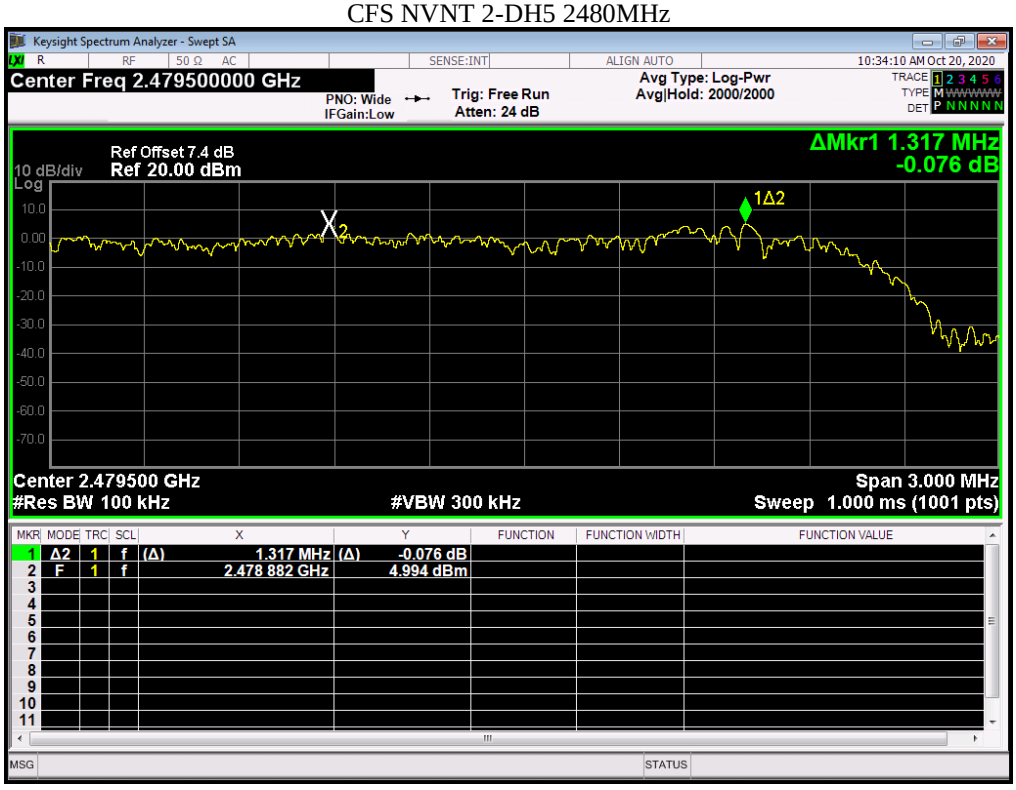
CFS NVNT 2-DH5 2402MHz



CFS NVNT 2-DH5 2441MHz



CFS NVNT 2-DH5 2480MHz



8. Hopping Channel Number

8.1. Applied procedures / Limit

15.247(a) (1) (iii) 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.

8.2. Test procedure

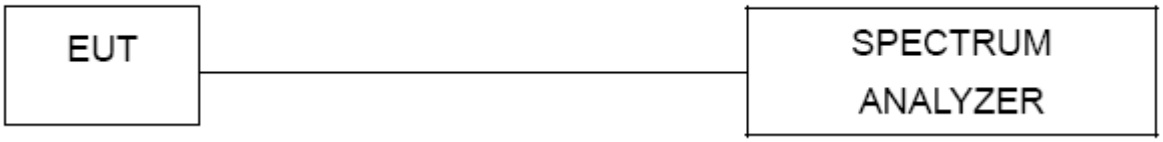
(1) Connected the antenna port to the Spectrum Analyzer , set the Spectrum Analyzer as Span = the frequency band of operation, RBW ≥ 1% of the span, VBW ≥ RBW Sweep = auto Detector function = peak, Trace = max hold

(2) The EUT should be have its hopping function enabled. Maxhold and record hopping channels It may prove necessary to break the span up to sections, in order to clearly show all of the hopping frequencies.

8.3. Deviation from standard

No deviation.

8.4. Test setup



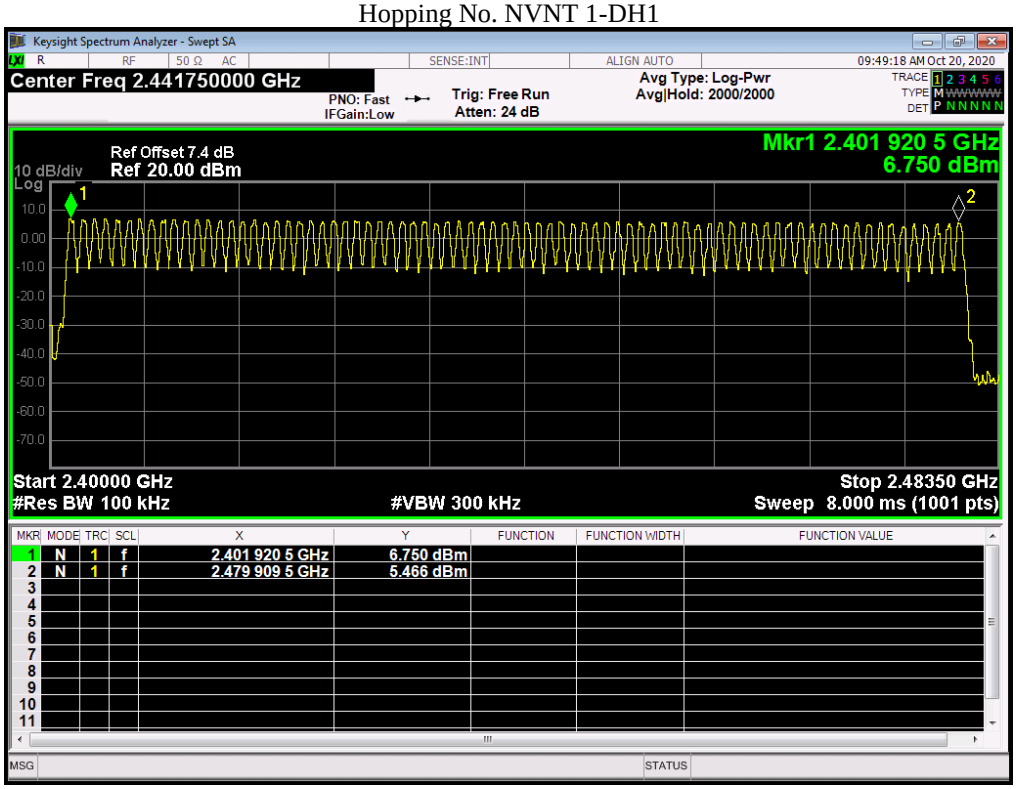
8.5. Test result

Number of Hopping Channel

Description of Channel:					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	27	2429	54	2456
01	2403	28	2430	55	2457
02	2404	29	2431	56	2458
03	2405	30	2432	57	2459
04	2406	31	2433	58	2460
05	2407	32	2434	59	2461
06	2408	33	2435	60	2462
07	2409	34	2436	61	2463
08	2410	35	2437	62	2464
09	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	2441	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470
15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	78	2480
25	2427	52	2454		
26	2428	53	2455		

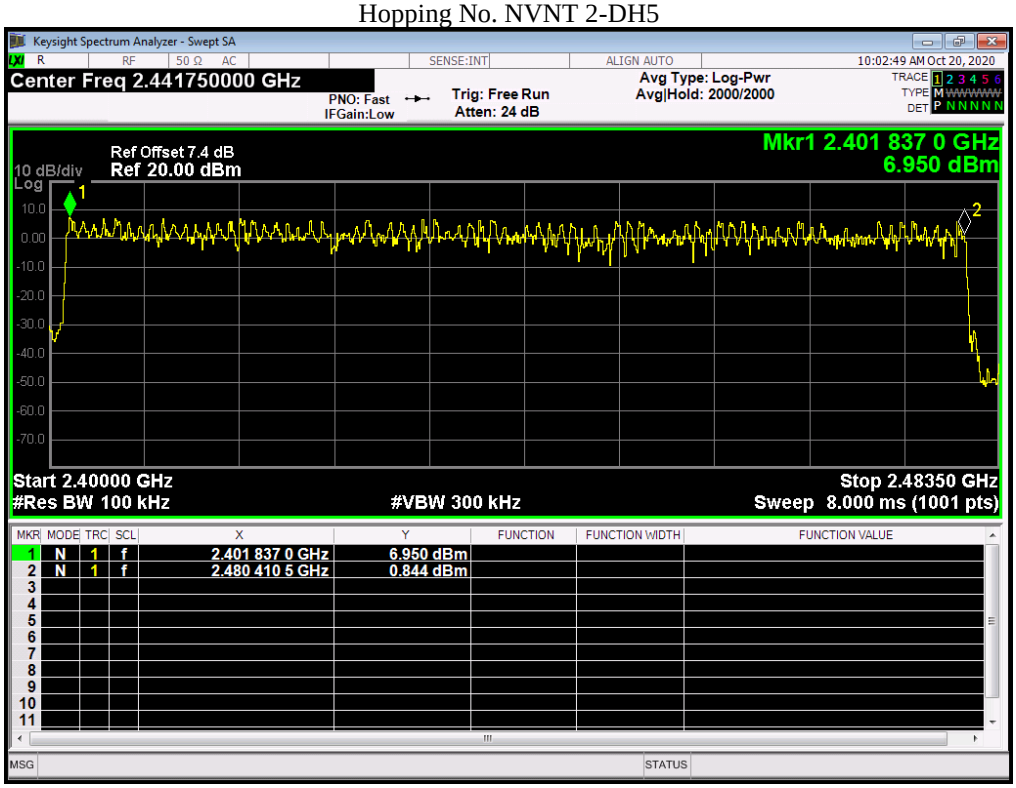
Condition	Mode	Hopping Number	Limit	Verdict
NVNT	1-DH1	79	15	Pass

Hopping No. NVNT 1-DH1



Condition	Mode	Hopping Number	Limit	Verdict
NVNT	2-DH5	79	15	Pass

Hopping No. NVNT 2-DH5



9. Dwell time

9.1. Applied procedures / Limit

15.247(a) (1) (iii) 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.

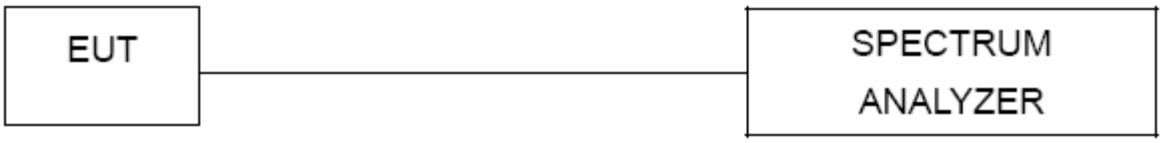
9.2. Test procedure

(1) Place the EUT on the table in the chamber or connect the antenna port of the EUT to spectrum analyzer and set it in transmitting mode.
(2) Set RBW of spectrum analyzer to 1MHz, VBW ≥ RBW
(3) Use a video trigger with the trigger level set to enable triggering only on full pulses.
(4) Sweep Time is more than once pulse time.
(5) Set the center frequency on any frequency would be measure and set the frequency span to zero span.
(6) Measure the maximum time duration of one single pulse.
(7) Set the EUT for DH5, DH3 and DH1 packet transmitting.
(8) Measure the maximum time duration of one single pulse.
(9) A Period Time = 79*0.4=31.6 S
DH1 Time Slot: Reading * (1600/2)*31.6/79
DH3 Time Slot: Reading * (1600/4)*31.6/79
DH5 Time Slot: Reading * (1600/6)*31.6/79

9.3. Deviation from standard

No deviation.

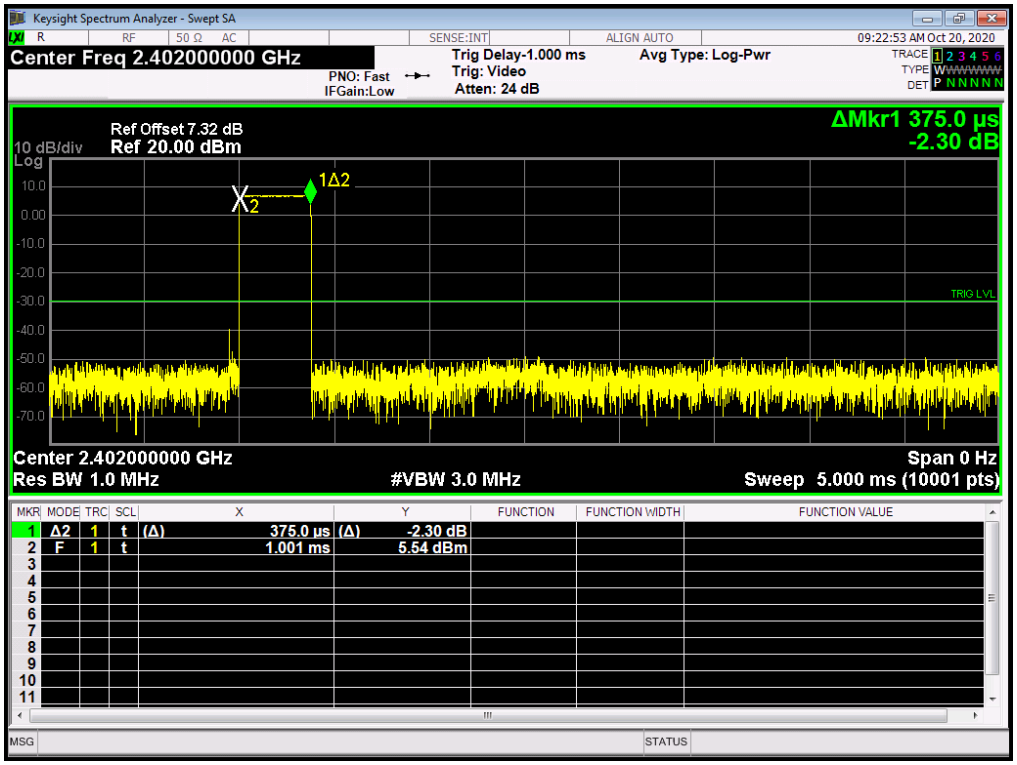
9.4. Test setup



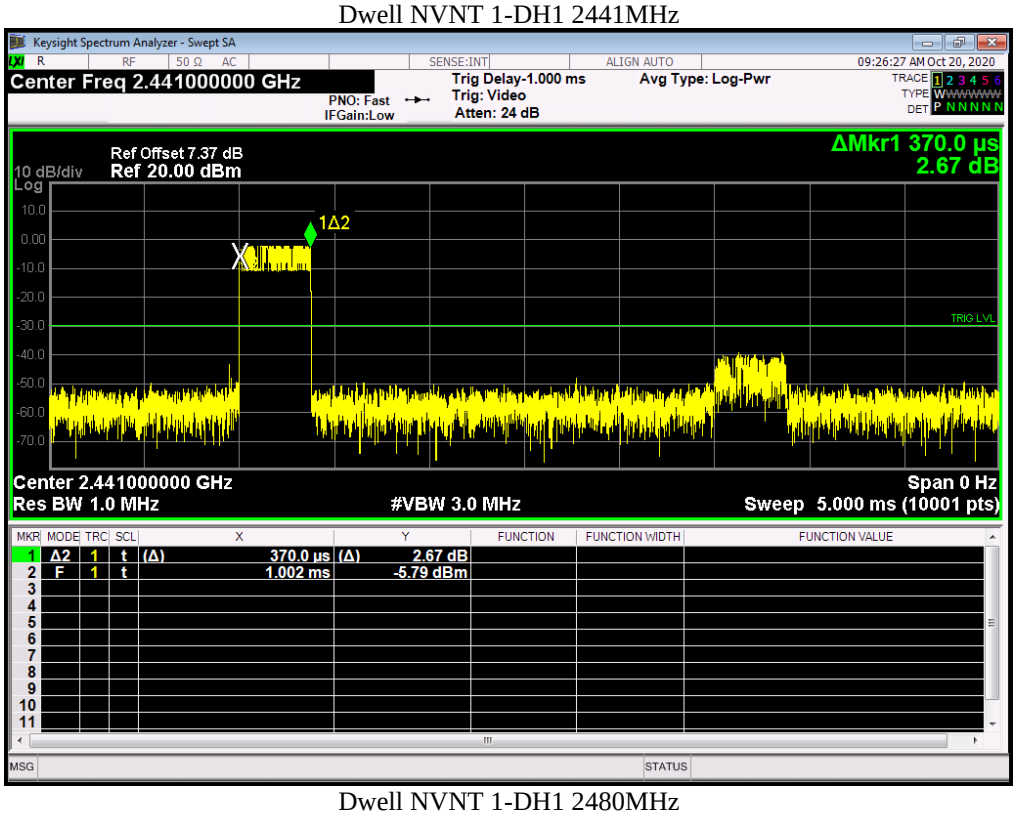
9.5. Test result

Condition	Mode	Frequency (MHz)	Pulse Time (ms)	Total Dwell Time (ms)	Period Time (ms)	Limit (ms)	Verdict
NVNT	1-DH1	2402	0.375	120	31600	400	Pass
NVNT	1-DH1	2441	0.37	118.4	31600	400	Pass
NVNT	1-DH1	2480	0.375	120	31600	400	Pass

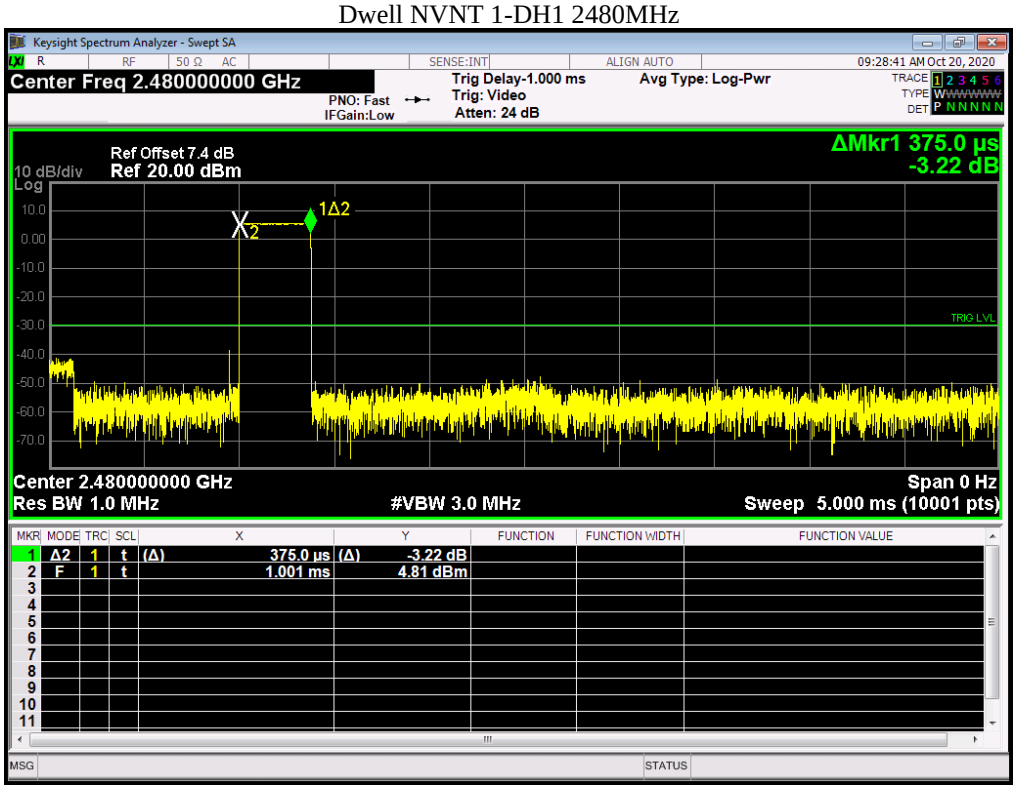
Dwell NVNT 1-DH1 2402MHz



Dwell NVNT 1-DH1 2441MHz

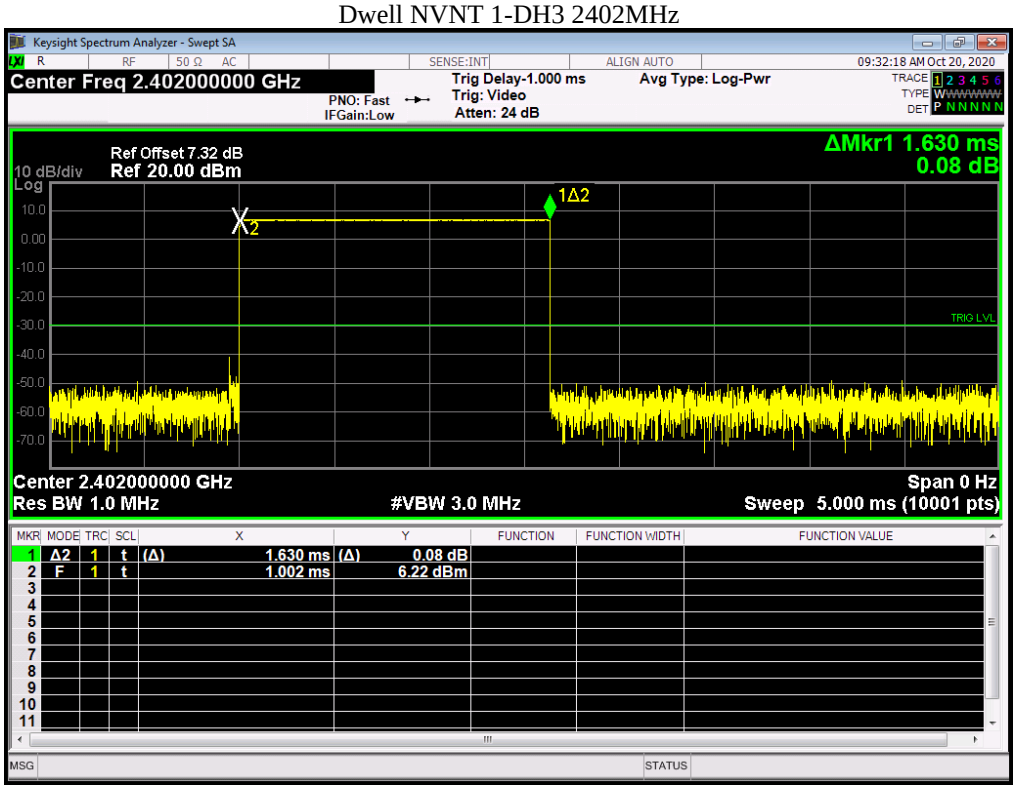


Dwell NVNT 1-DH1 2480MHz

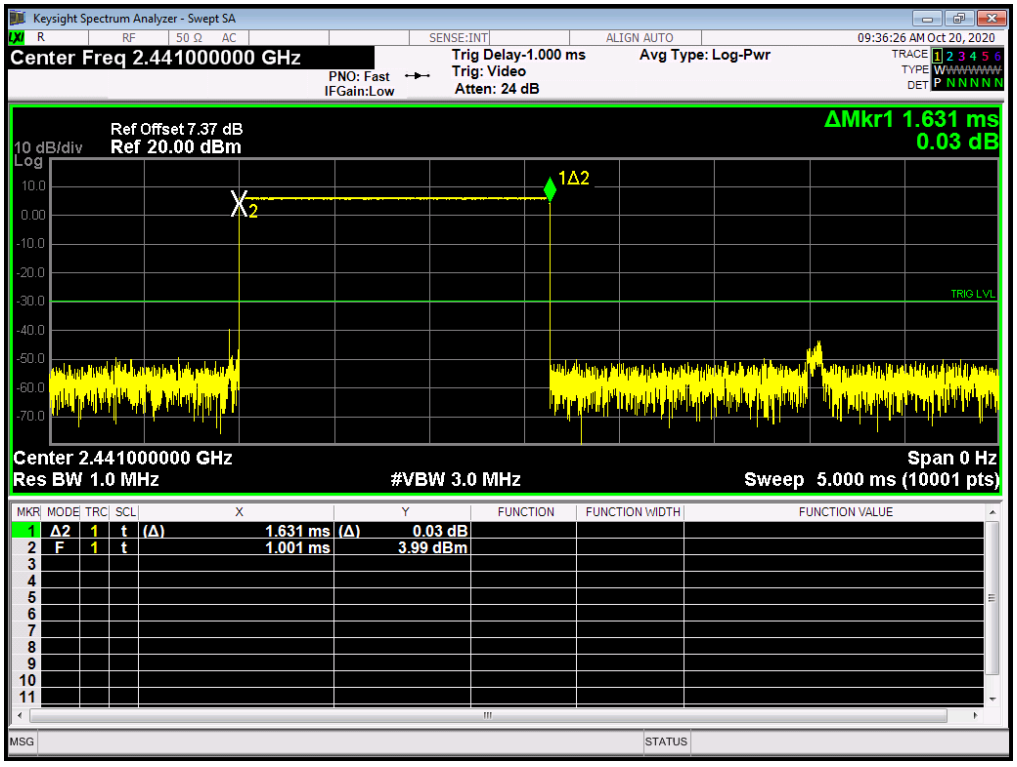


Condition	Mode	Frequency (MHz)	Pulse Time (ms)	Total Dwell Time (ms)	Period Time (ms)	Limit (ms)	Verdict
NVNT	1-DH3	2402	1.63	260.8	31600	400	Pass
NVNT	1-DH3	2441	1.631	260.96	31600	400	Pass
NVNT	1-DH3	2480	1.627	260.32	31600	400	Pass

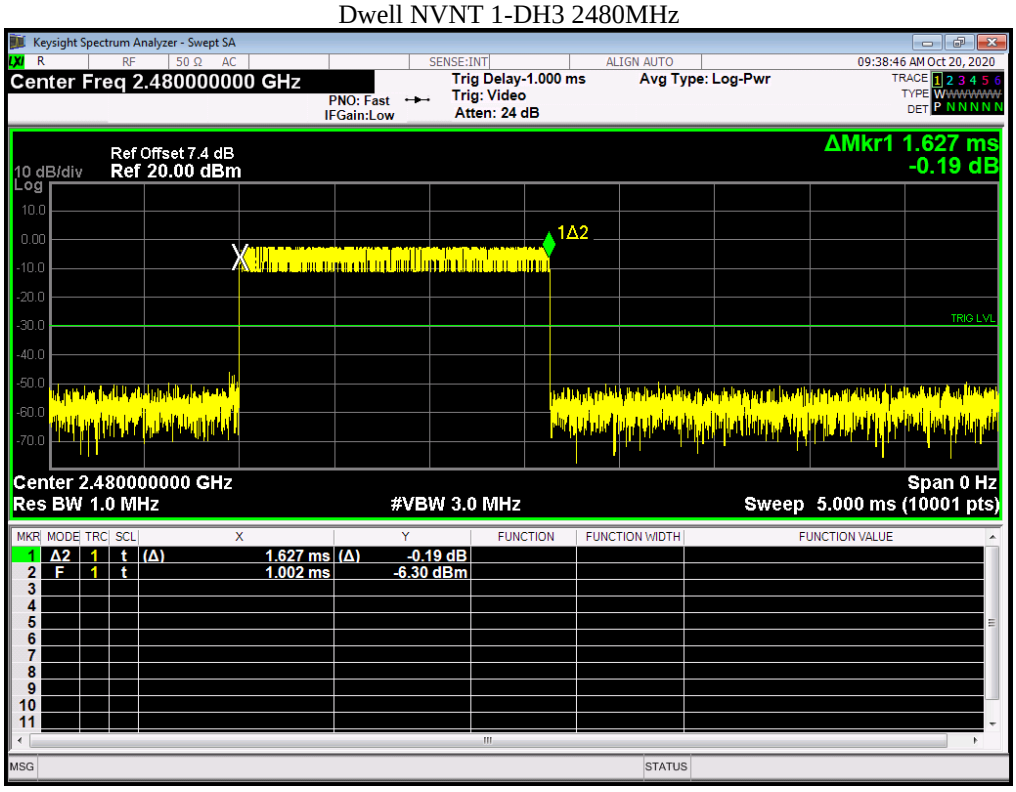
Dwell NVNT 1-DH3 2402MHz



Dwell NVNT 1-DH3 2441MHz

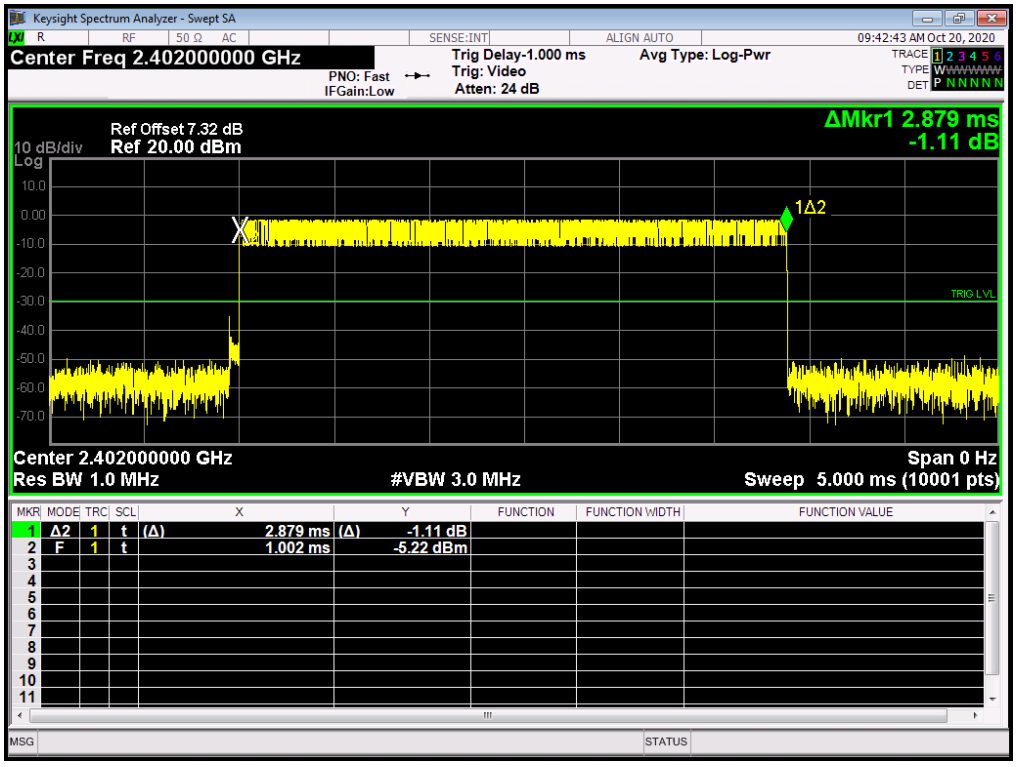


Dwell NVNT 1-DH3 2480MHz

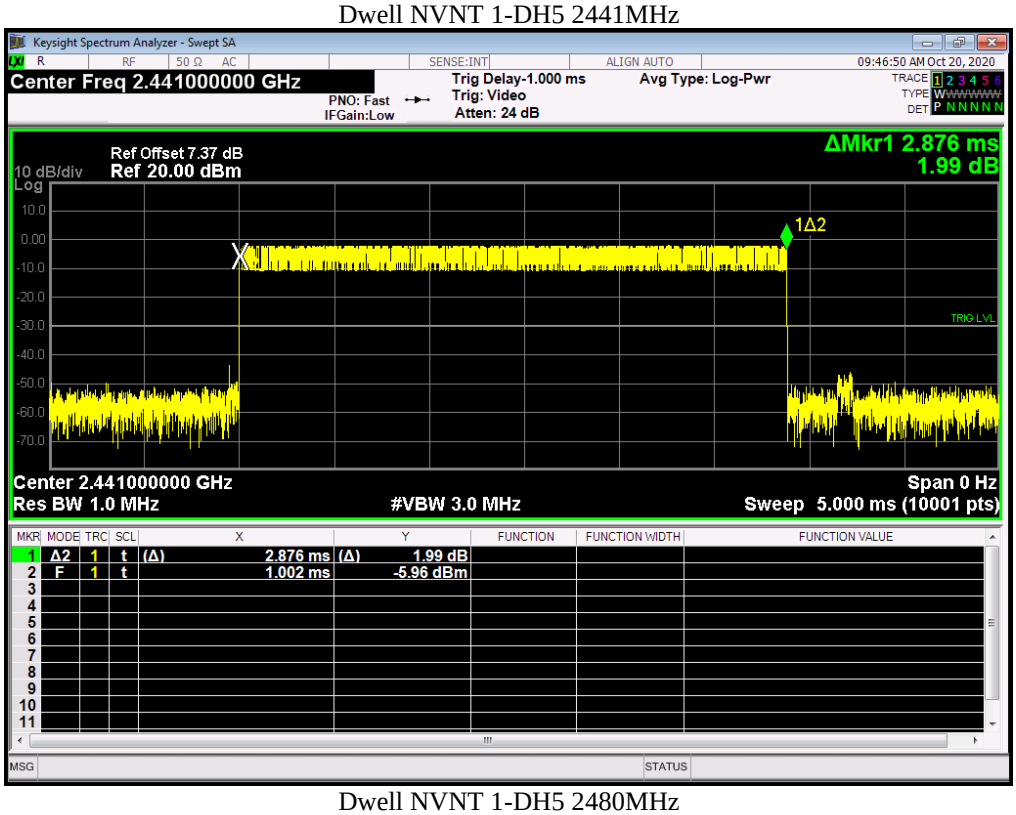


Condition	Mode	Frequency (MHz)	Pulse Time (ms)	Total Dwell Time (ms)	Period Time (ms)	Limit (ms)	Verdict
NVNT	1-DH5	2402	2.879	307.093	31600	400	Pass
NVNT	1-DH5	2441	2.876	306.773	31600	400	Pass
NVNT	1-DH5	2480	2.88	307.2	31600	400	Pass

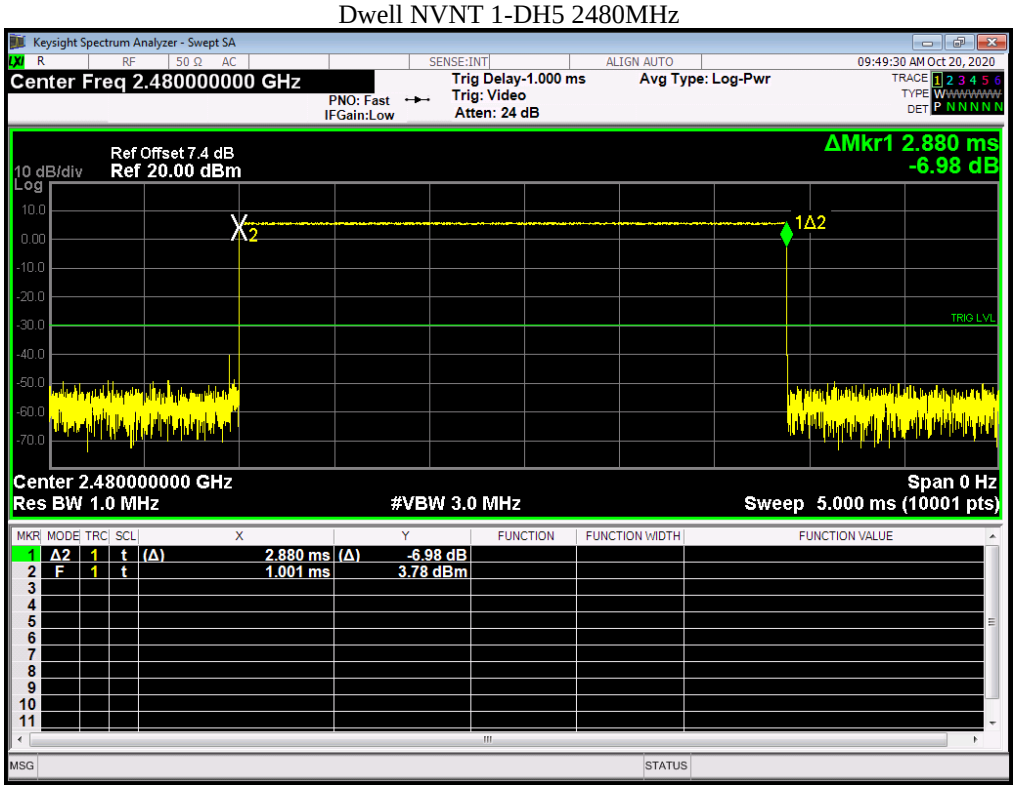
Dwell NVNT 1-DH5 2402MHz



Dwell NVNT 1-DH5 2441MHz

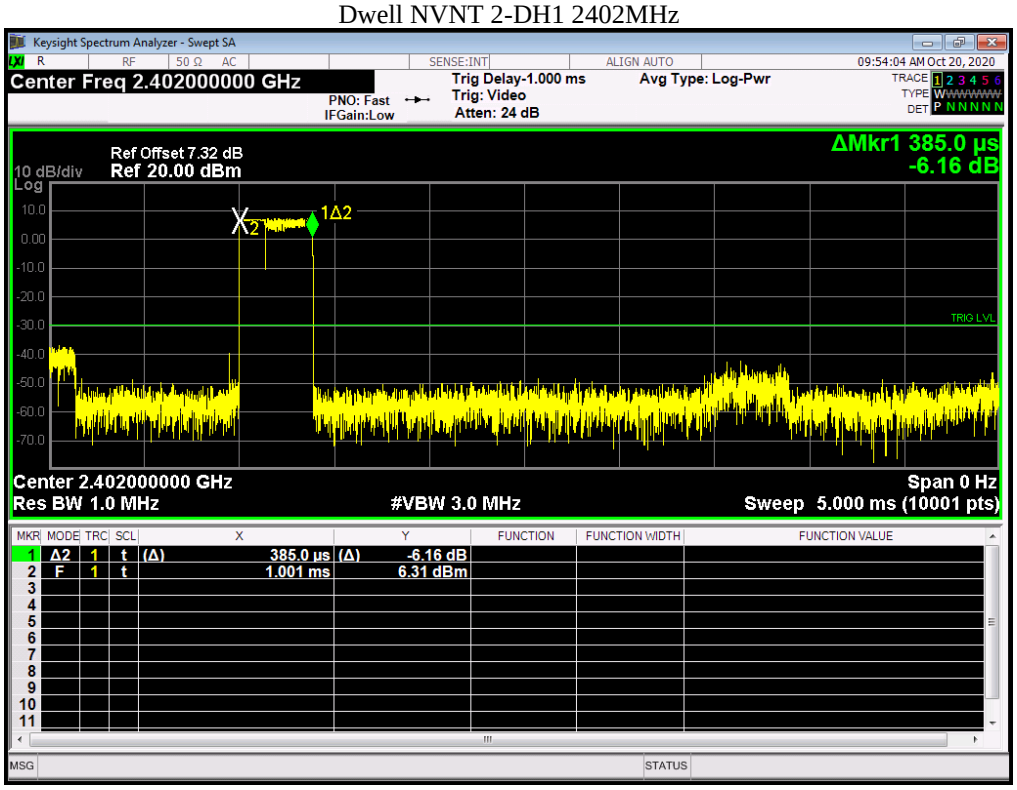


Dwell NVNT 1-DH5 2480MHz

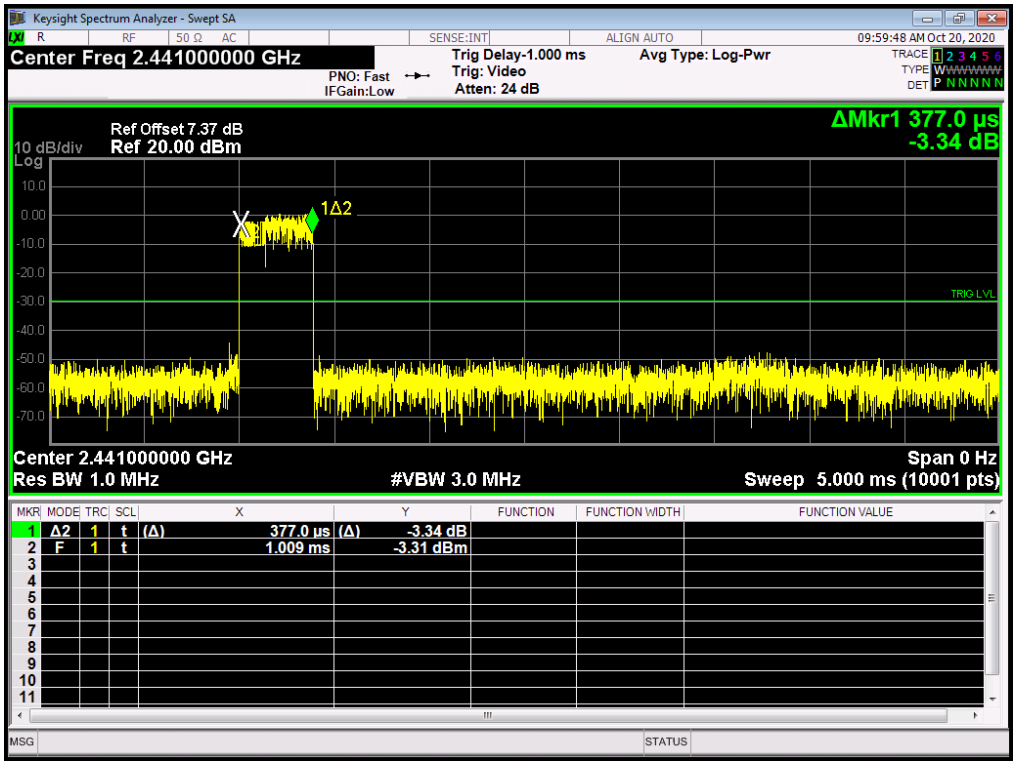


Condition	Mode	Frequency (MHz)	Pulse Time (ms)	Total Dwell Time (ms)	Period Time (ms)	Limit (ms)	Verdict
NVNT	2-DH1	2402	0.385	123.2	31600	400	Pass
NVNT	2-DH1	2441	0.377	120.64	31600	400	Pass
NVNT	2-DH1	2480	0.385	123.2	31600	400	Pass

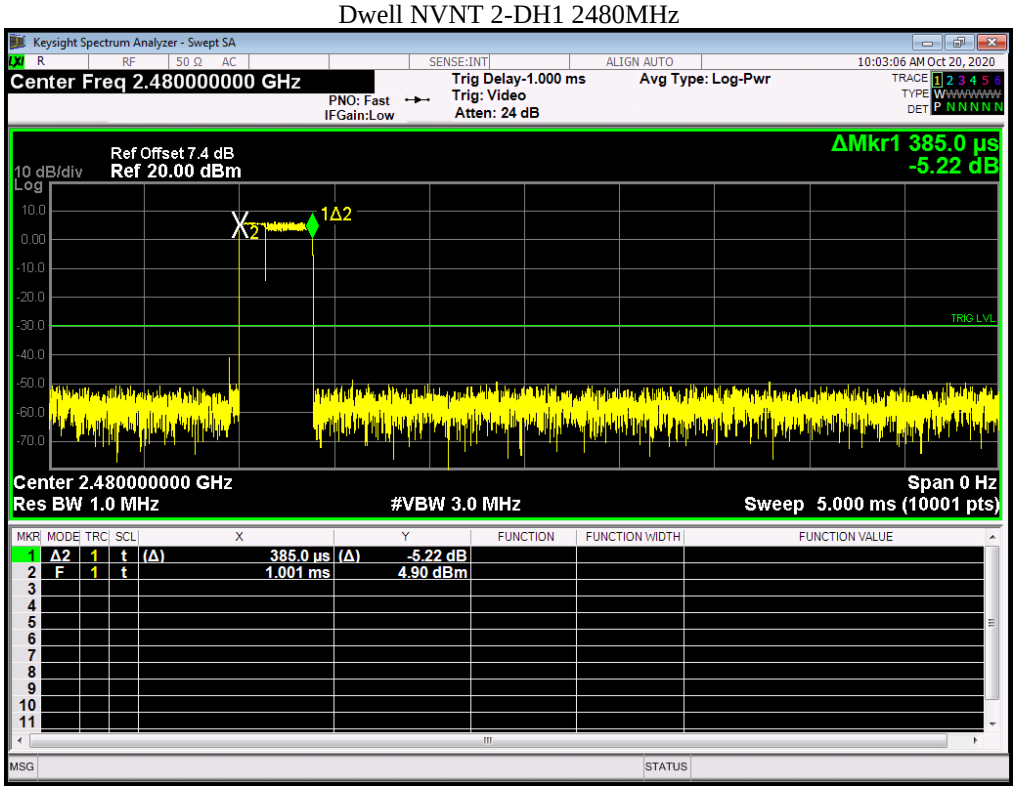
Dwell NVNT 2-DH1 2402MHz



Dwell NVNT 2-DH1 2441MHz

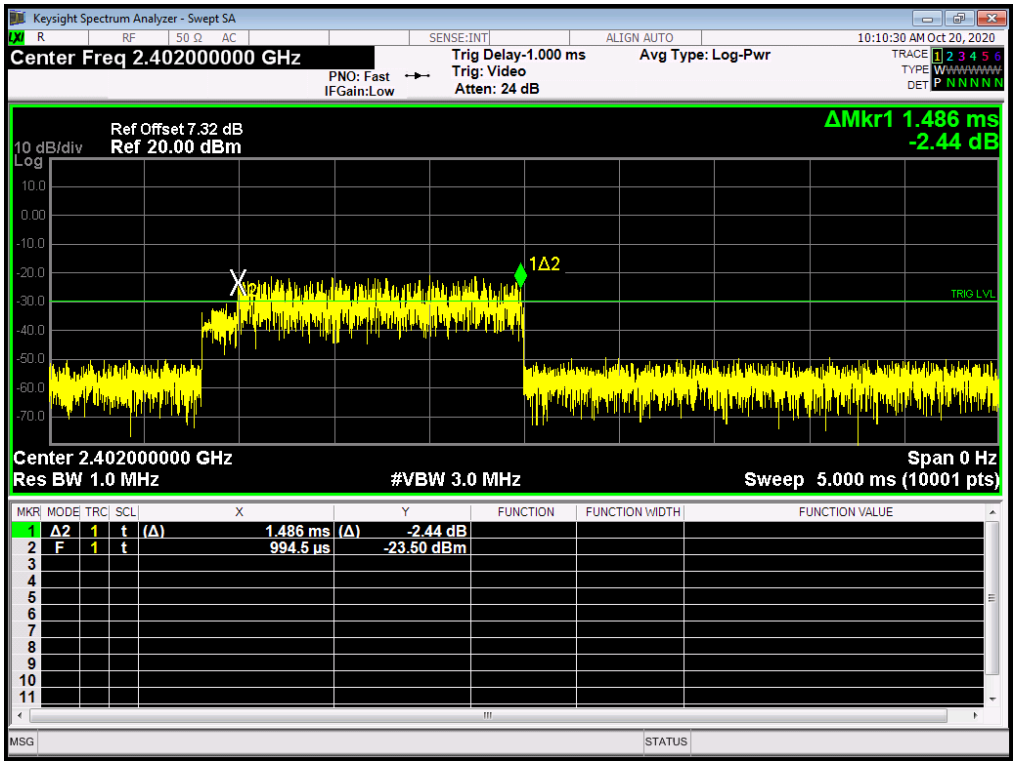


Dwell NVNT 2-DH1 2480MHz

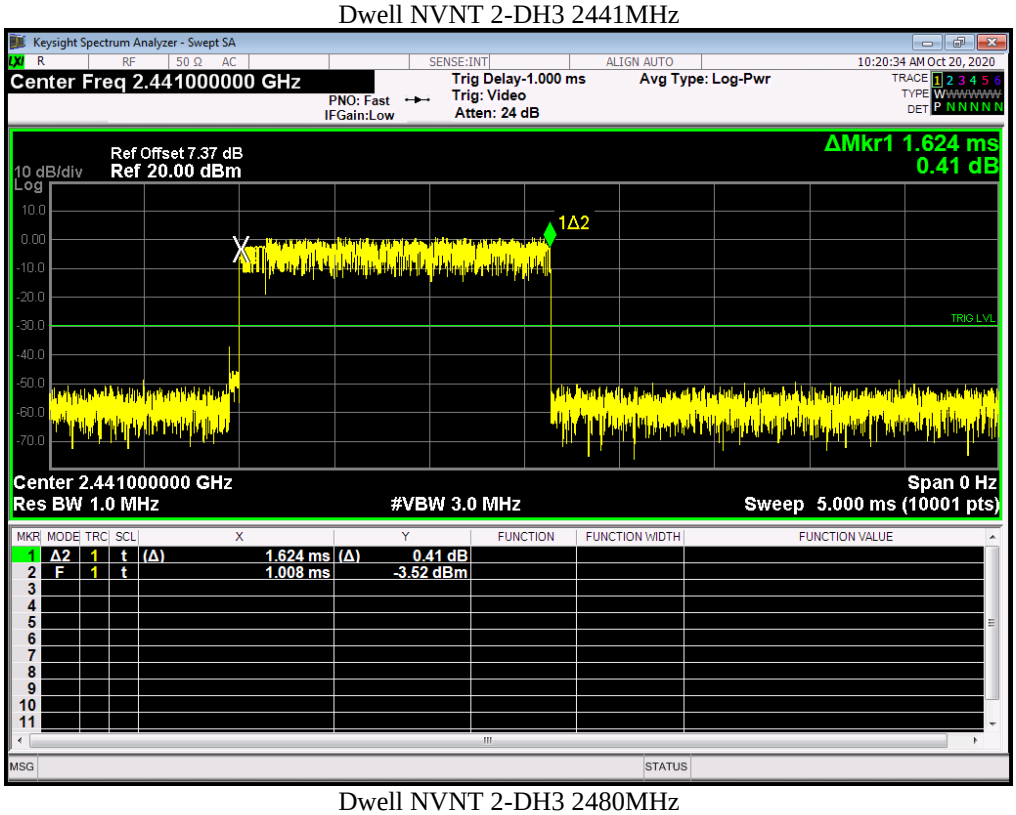


Condition	Mode	Frequency (MHz)	Pulse Time (ms)	Total Dwell Time (ms)	Period Time (ms)	Limit (ms)	Verdict
NVNT	2-DH3	2402	1.486	237.76	31600	400	Pass
NVNT	2-DH3	2441	1.624	259.84	31600	400	Pass
NVNT	2-DH3	2480	1.628	260.48	31600	400	Pass

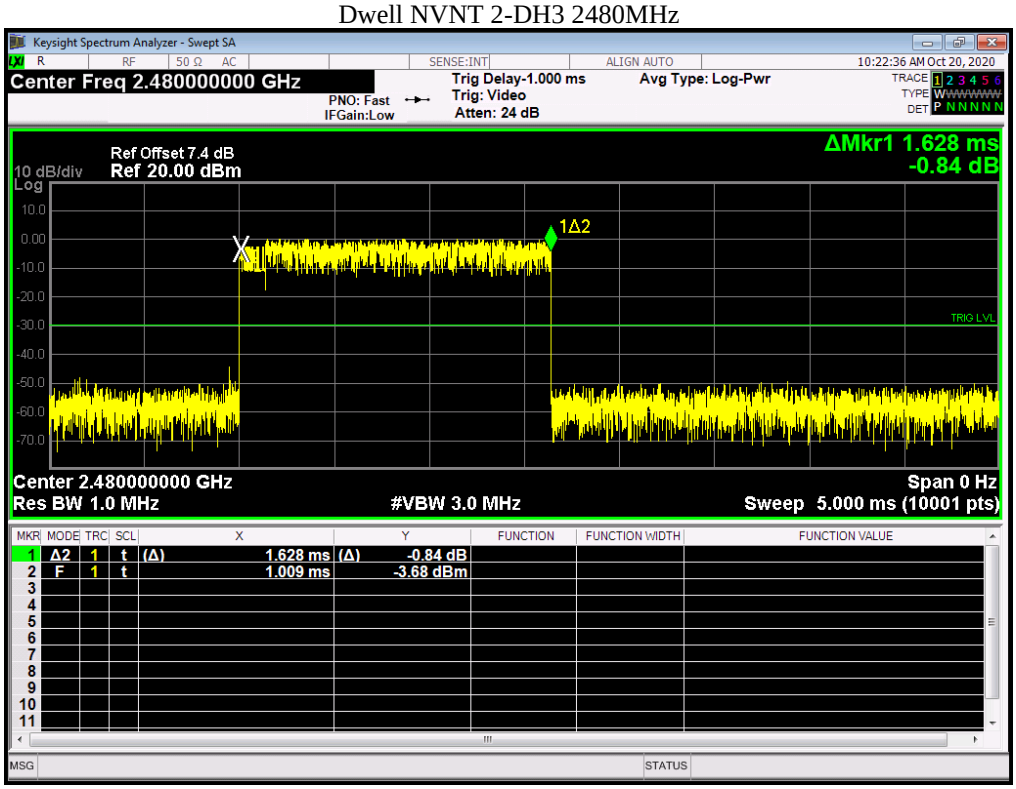
Dwell NVNT 2-DH3 2402MHz



Dwell NVNT 2-DH3 2441MHz

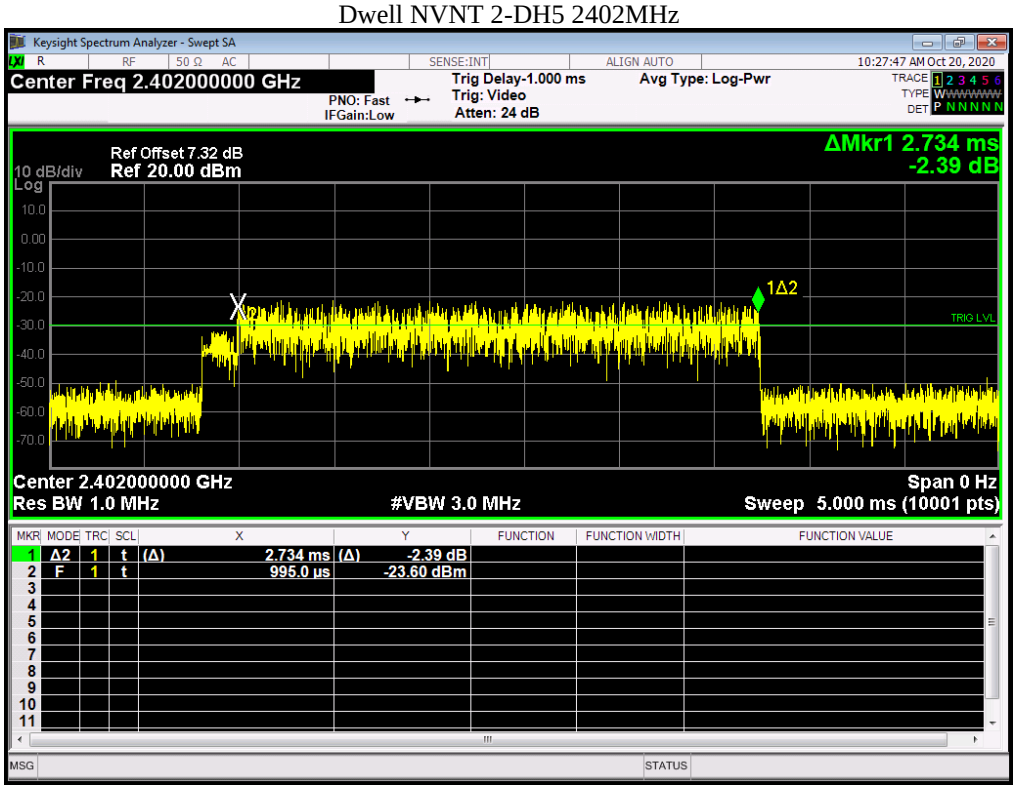


Dwell NVNT 2-DH3 2480MHz

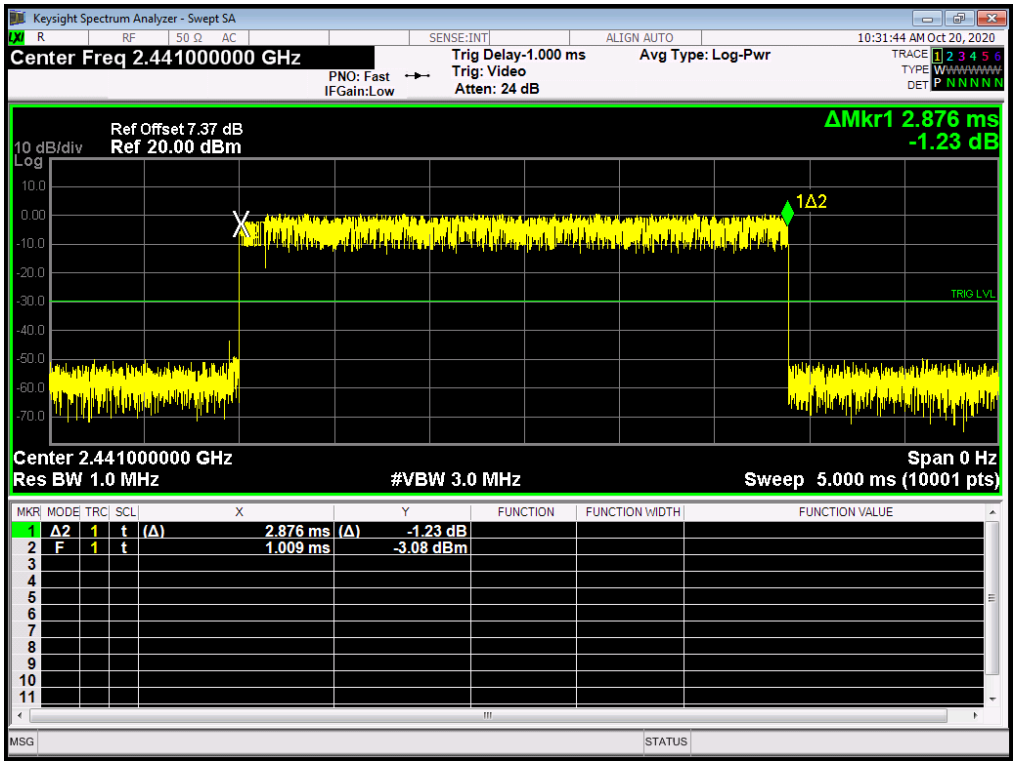


Condition	Mode	Frequency (MHz)	Pulse Time (ms)	Total Dwell Time (ms)	Period Time (ms)	Limit (ms)	Verdict
NVNT	2-DH5	2402	2.734	291.627	31600	400	Pass
NVNT	2-DH5	2441	2.876	306.773	31600	400	Pass
NVNT	2-DH5	2480	2.885	307.733	31600	400	Pass

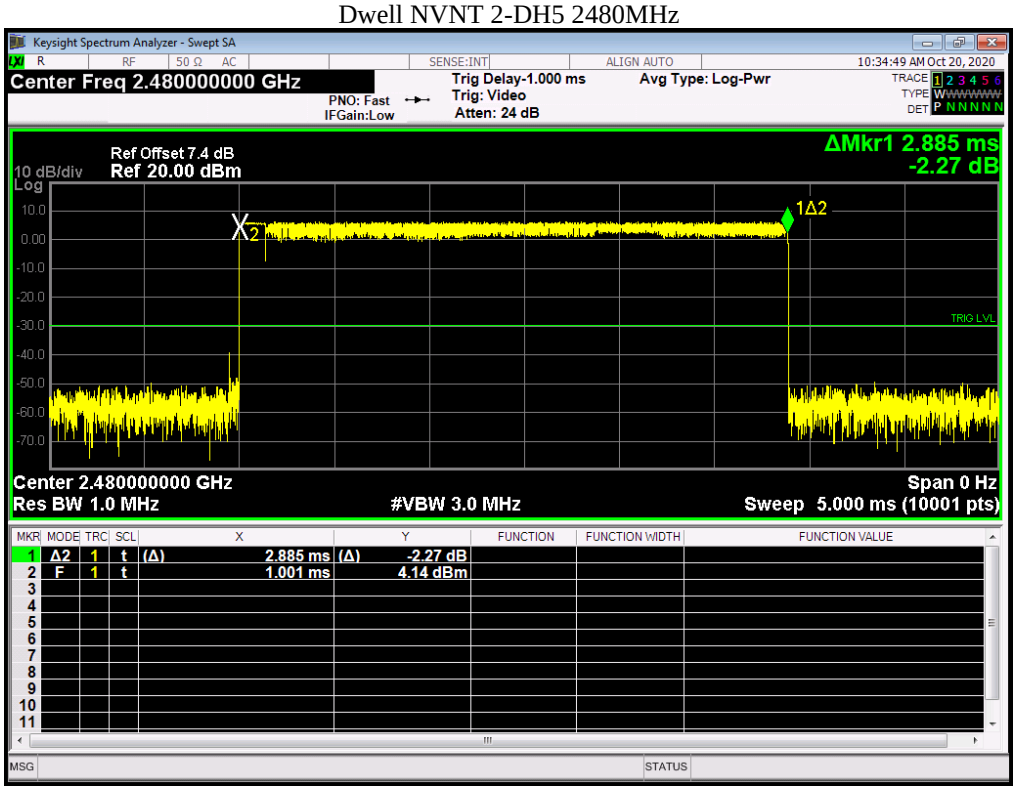
Dwell NVNT 2-DH5 2402MHz



Dwell NVNT 2-DH5 2441MHz



Dwell NVNT 2-DH5 2480MHz



10. Band edge

10.1. Applied procedures / Limit

15.247(d) 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 Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

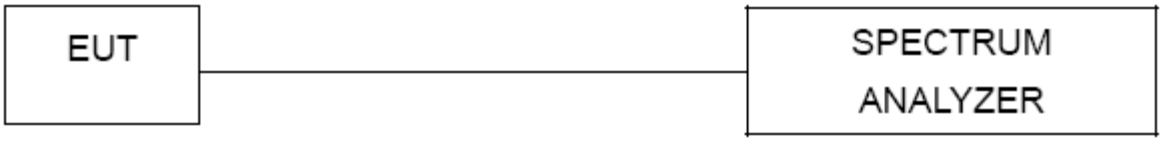
10.2. Test procedure

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
b. Span = wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation, RBW ≥ 1% of the span, VBW ≥ RBW, Sweep = auto,
Detector function = peak, Trace = max hold

10.3. Deviation from standard

No deviation.

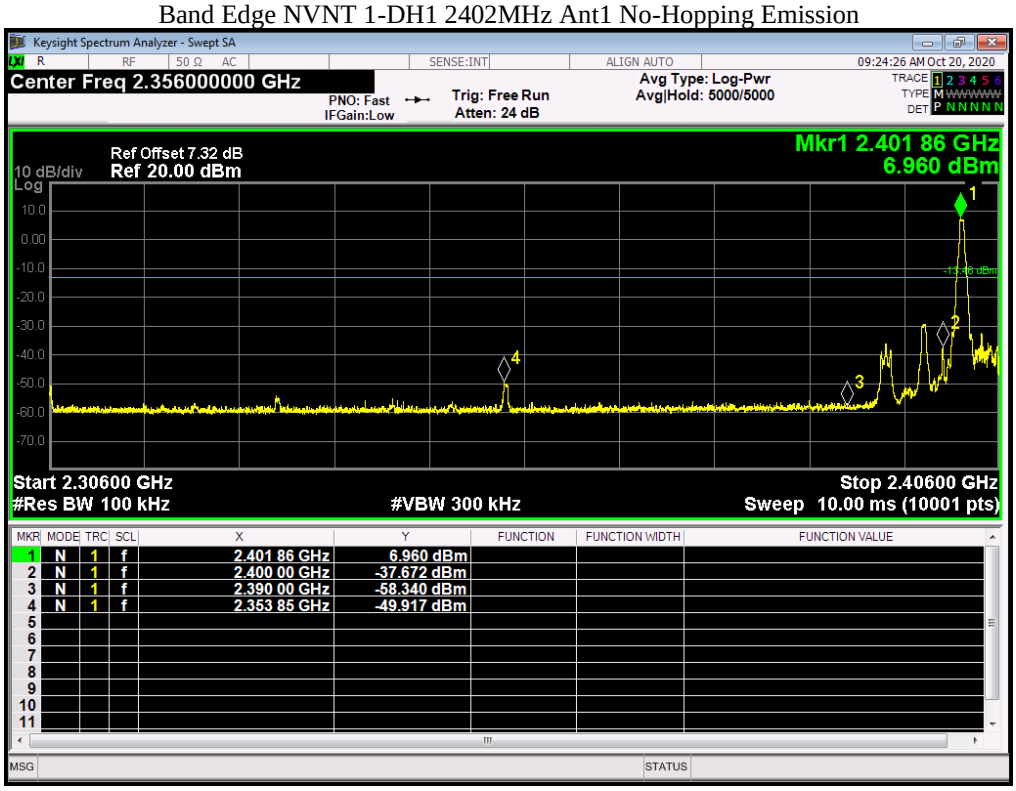
10.4. Test setup



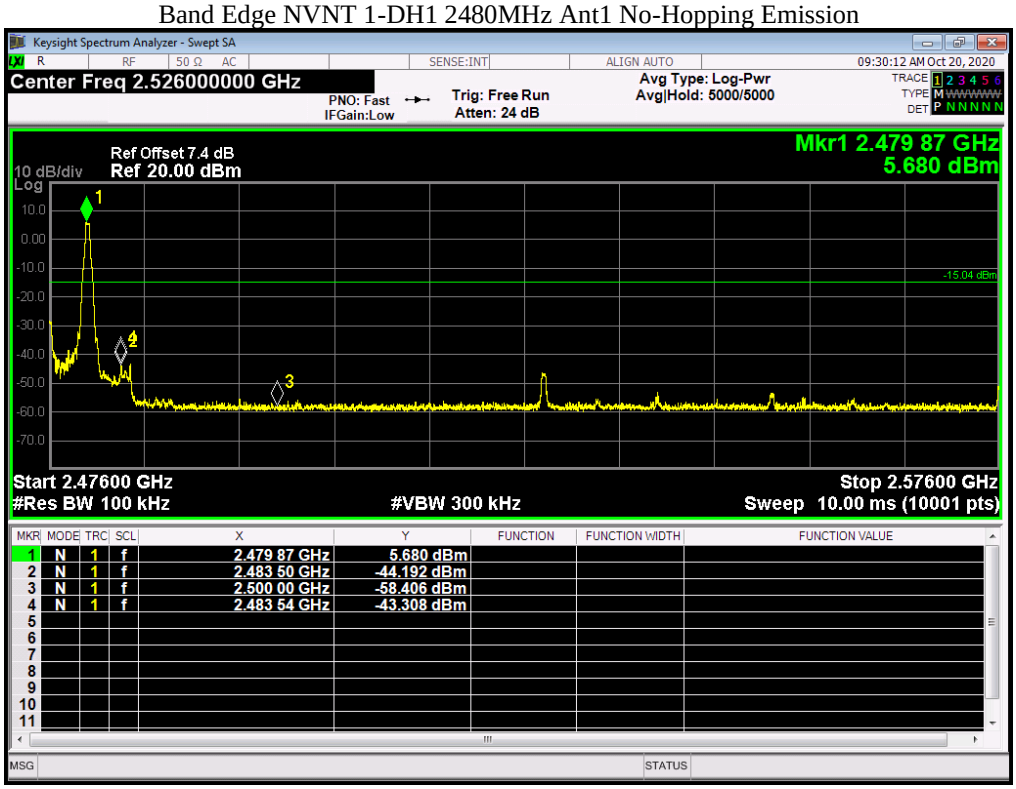
10.5. Test results

Condition	Mode	Frequency (MHz)	Antenna	Hopping Mode	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH1	2402	Ant 1	No-Hopping	-56.45	-20	Pass
NVNT	1-DH1	2480	Ant 1	No-Hopping	-48.265	-20	Pass

Band Edge NVNT 1-DH1 2402MHz Ant1 No-Hopping Emission

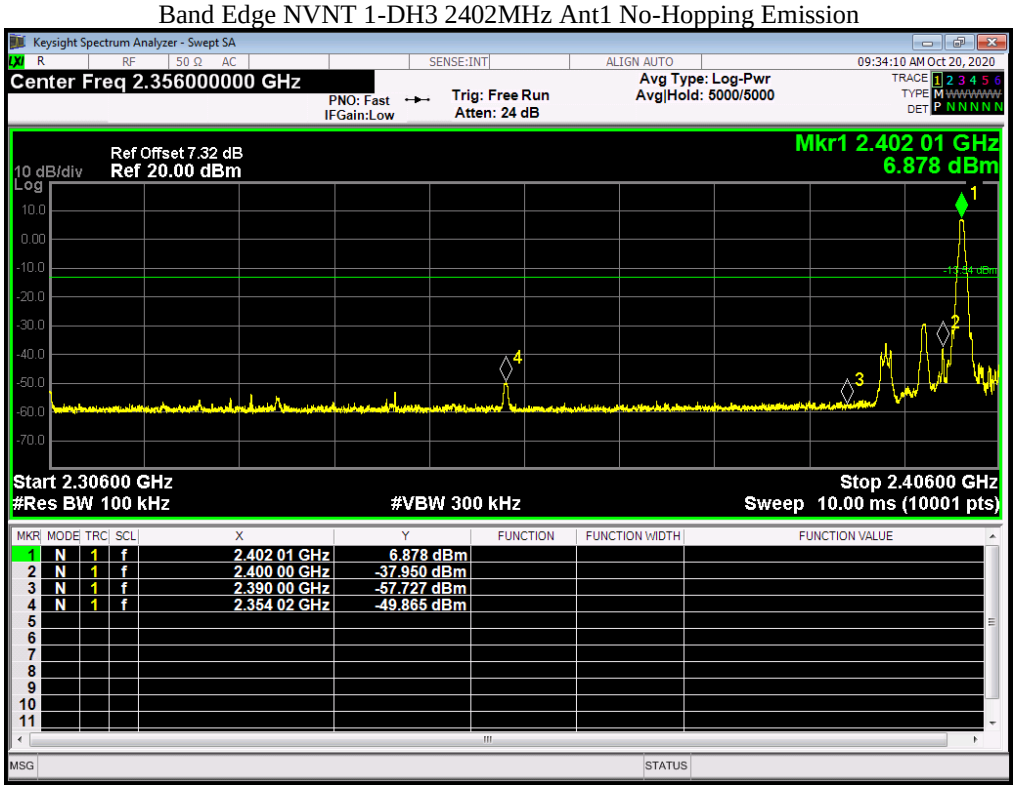


Band Edge NVNT 1-DH1 2480MHz Ant1 No-Hopping Emission

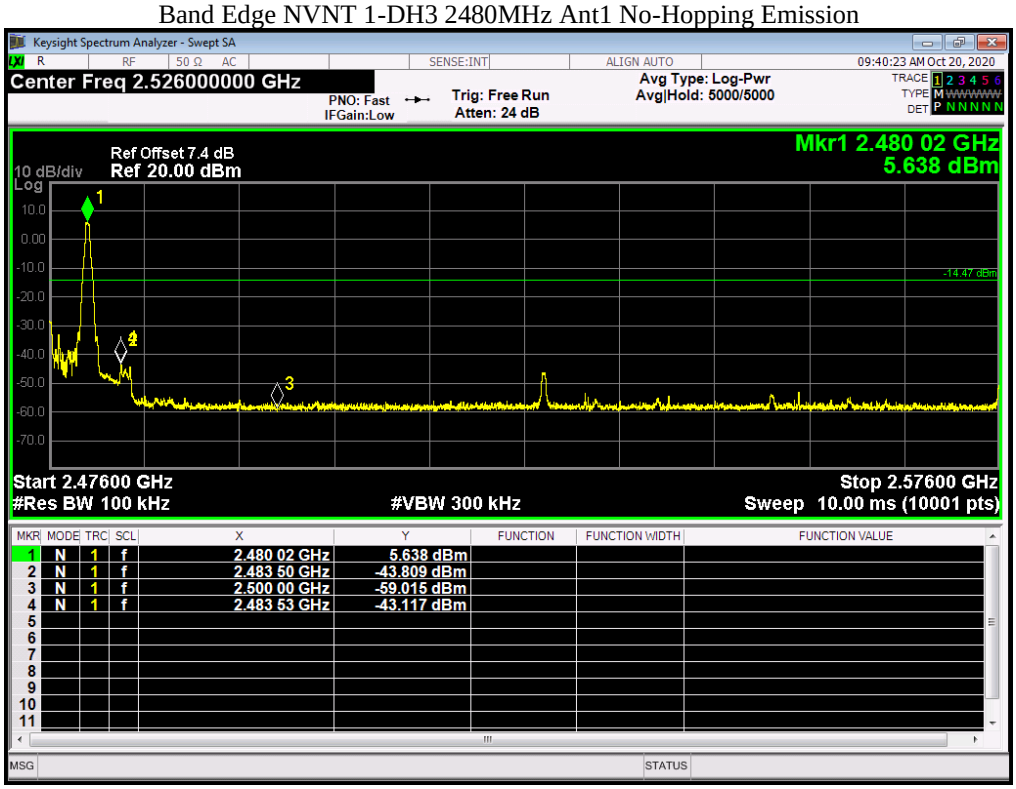


Condition	Mode	Frequency (MHz)	Antenna	Hopping Mode	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH3	2402	Ant 1	No-Hopping	-56.321	-20	Pass
NVNT	1-DH3	2480	Ant 1	No-Hopping	-48.64	-20	Pass

Band Edge NVNT 1-DH3 2402MHz Ant1 No-Hopping Emission

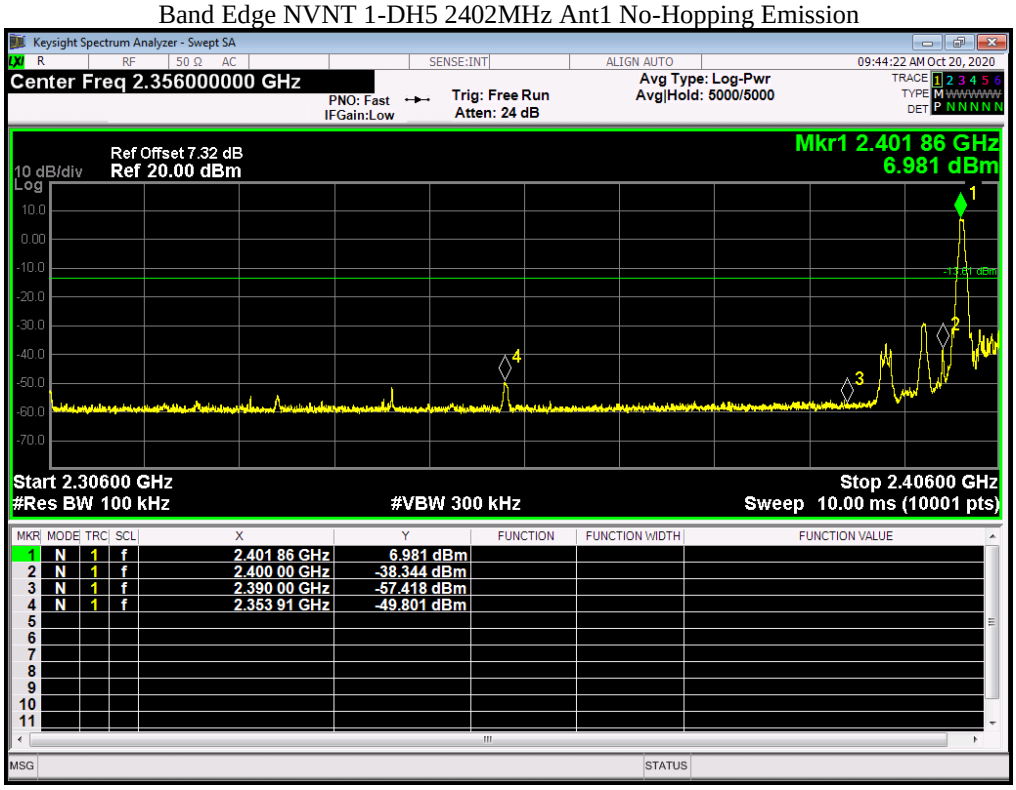


Band Edge NVNT 1-DH3 2480MHz Ant1 No-Hopping Emission

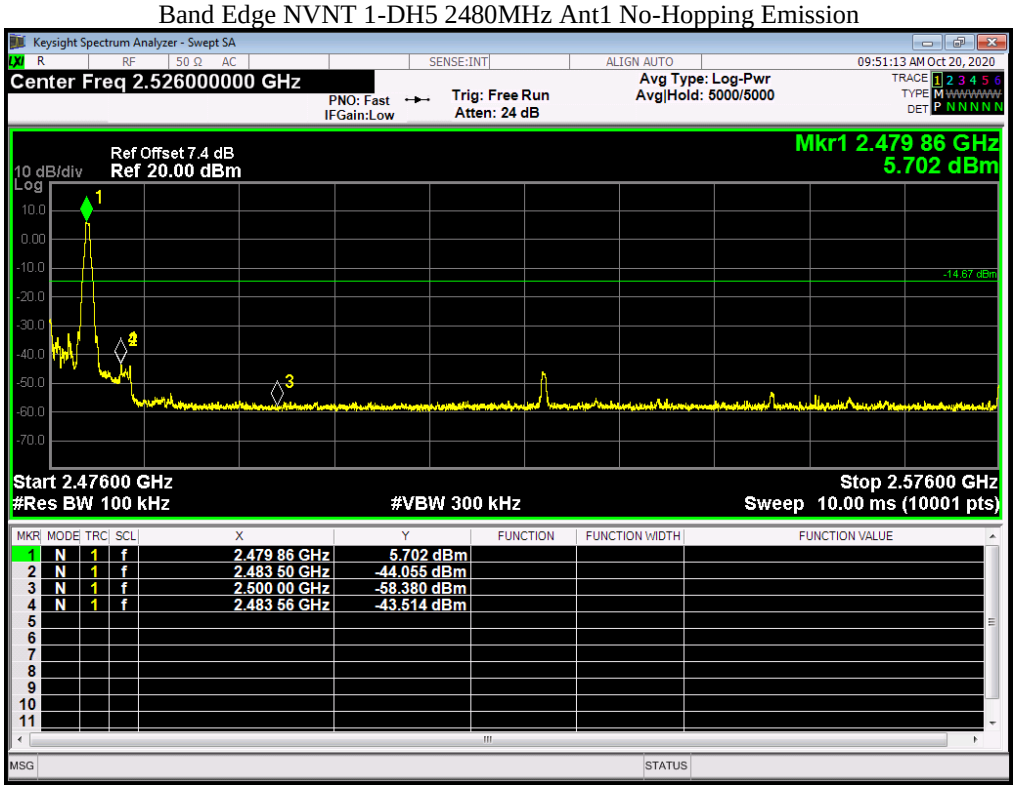


Condition	Mode	Frequency (MHz)	Antenna	Hopping Mode	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH5	2402	Ant 1	No-Hopping	-56.186	-20	Pass
NVNT	1-DH5	2480	Ant 1	No-Hopping	-48.837	-20	Pass

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

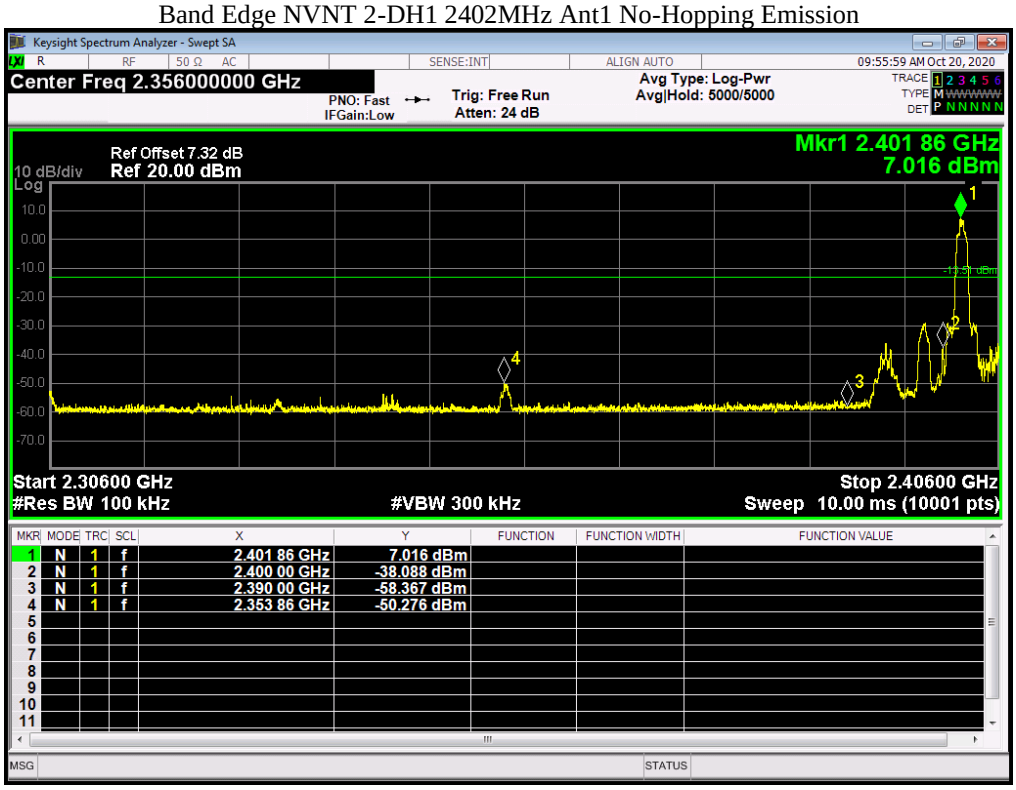


Band Edge NVNT 1-DH5 2480MHz Ant1 No-Hopping Emission

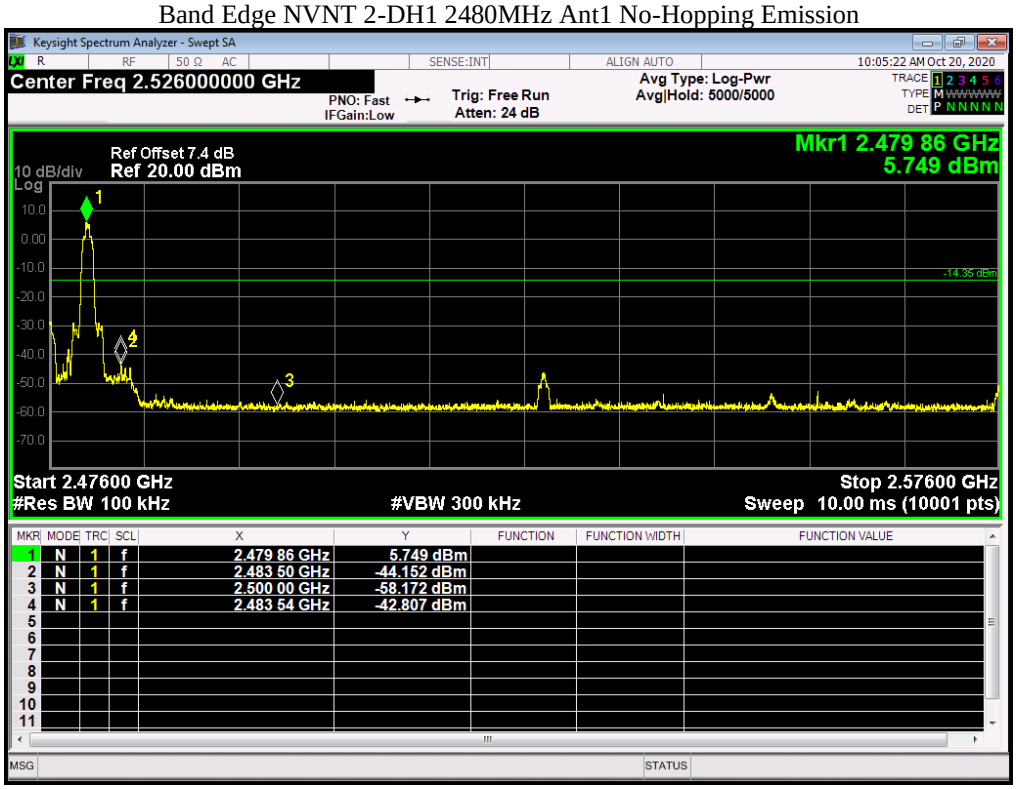


Condition	Mode	Frequency (MHz)	Antenna	Hopping Mode	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	2-DH1	2402	Ant 1	No-Hopping	-56.758	-20	Pass
NVNT	2-DH1	2480	Ant 1	No-Hopping	-48.455	-20	Pass

Band Edge NVNT 2-DH1 2402MHz Ant1 No-Hopping Emission

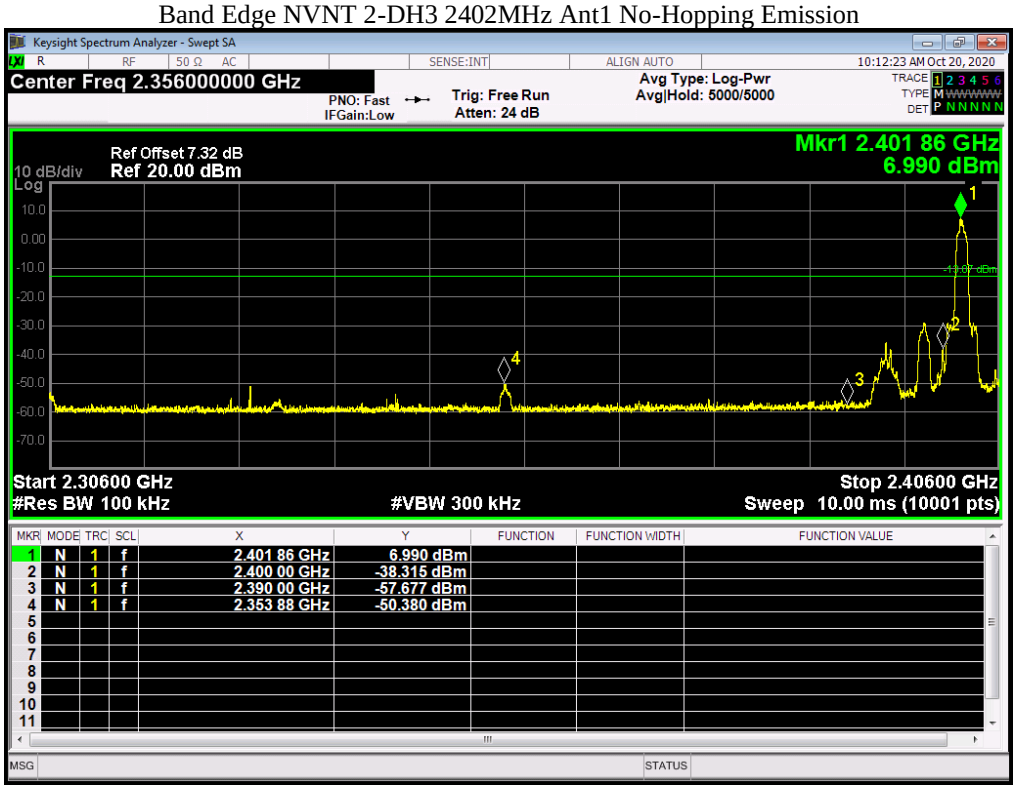


Band Edge NVNT 2-DH1 2480MHz Ant1 No-Hopping Emission

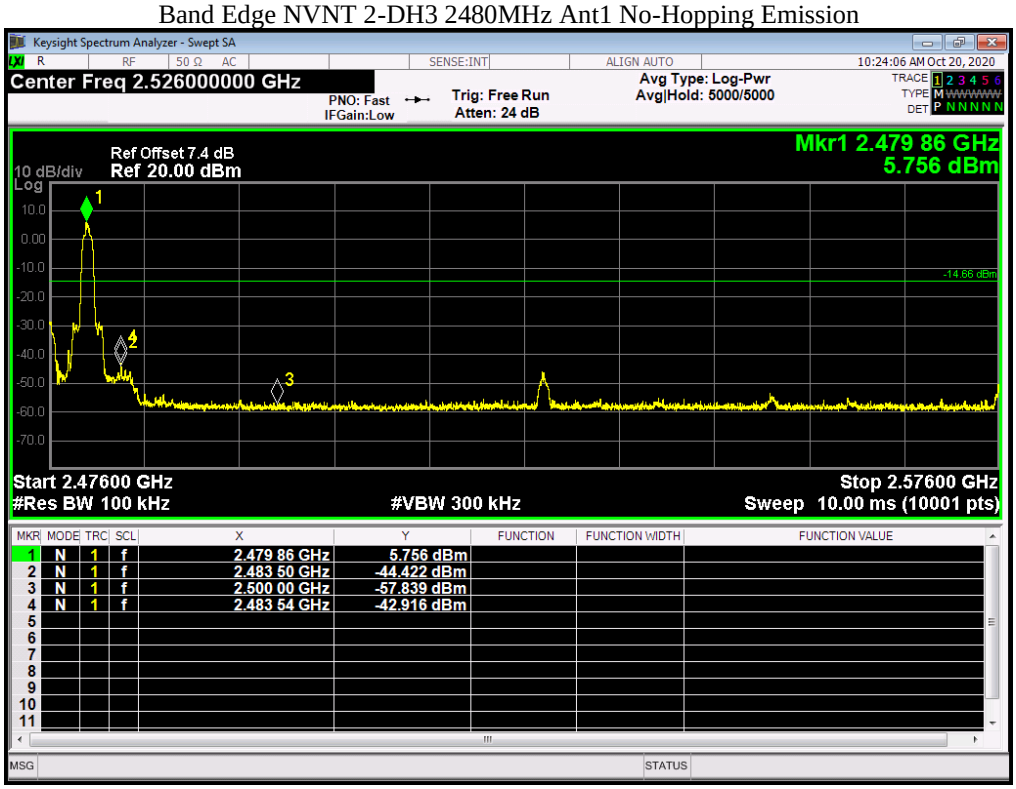


Condition	Mode	Frequency (MHz)	Antenna	Hopping Mode	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	2-DH3	2402	Ant 1	No-Hopping	-57.299	-20	Pass
NVNT	2-DH3	2480	Ant 1	No-Hopping	-48.248	-20	Pass

Band Edge NVNT 2-DH3 2402MHz Ant1 No-Hopping Emission

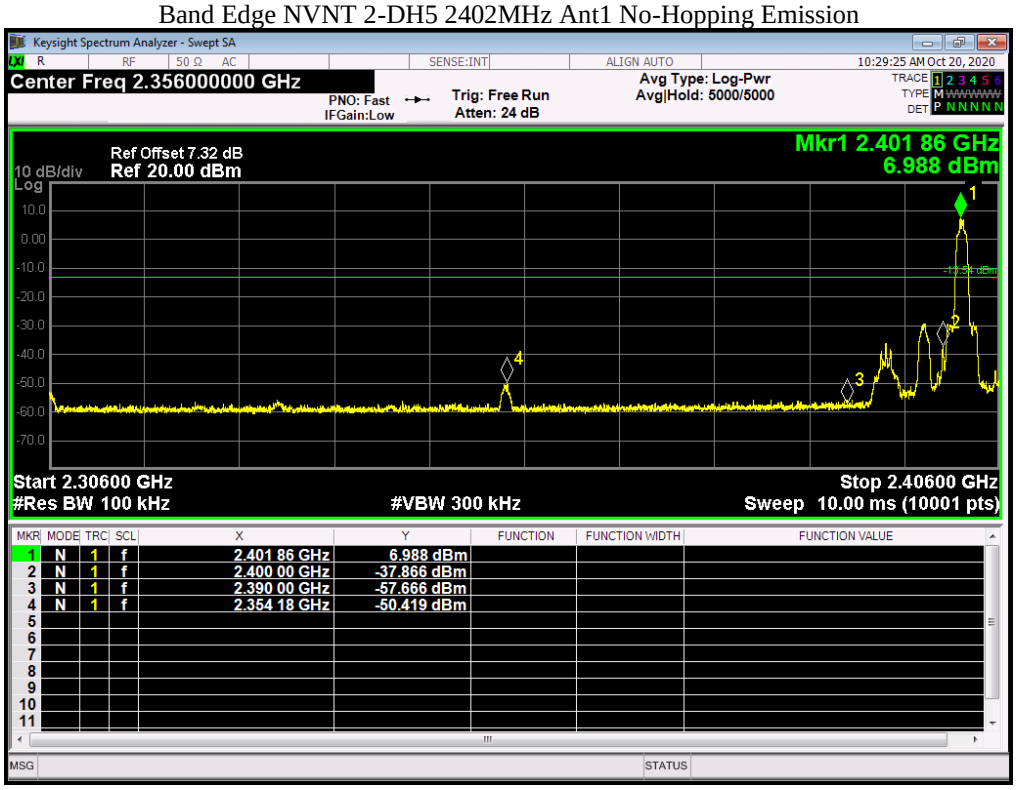


Band Edge NVNT 2-DH3 2480MHz Ant1 No-Hopping Emission

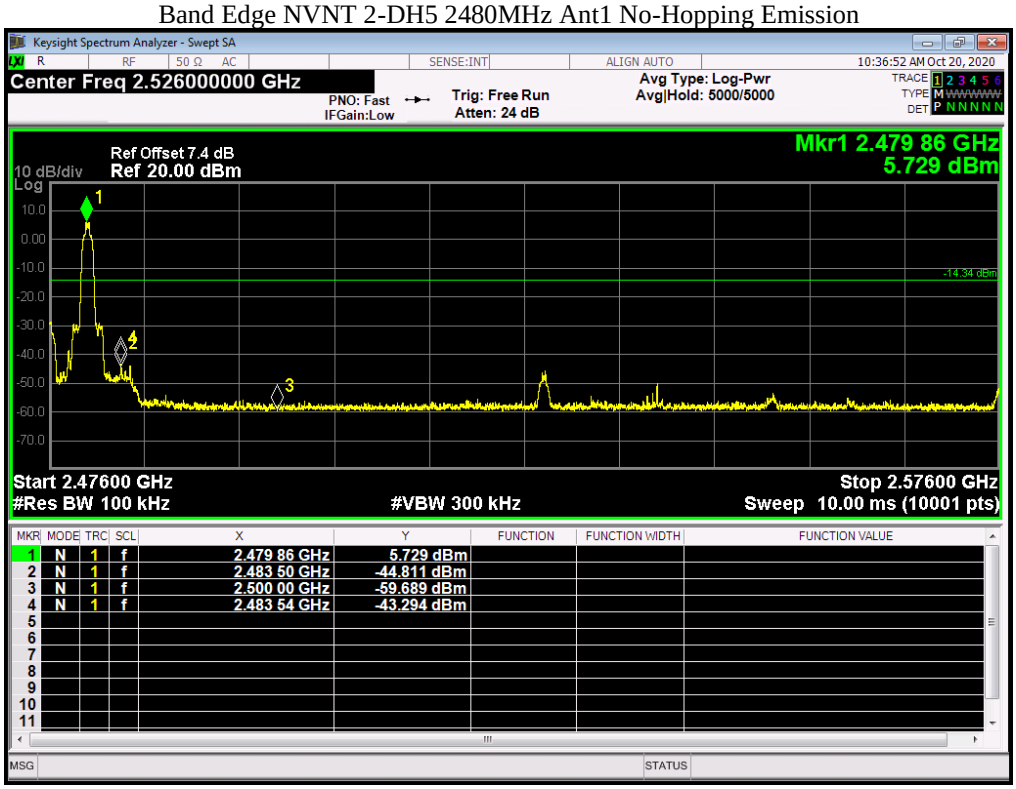


Condition	Mode	Frequency (MHz)	Antenna	Hopping Mode	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	2-DH5	2402	Ant 1	No-Hopping	-56.868	-20	Pass
NVNT	2-DH5	2480	Ant 1	No-Hopping	-48.954	-20	Pass

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

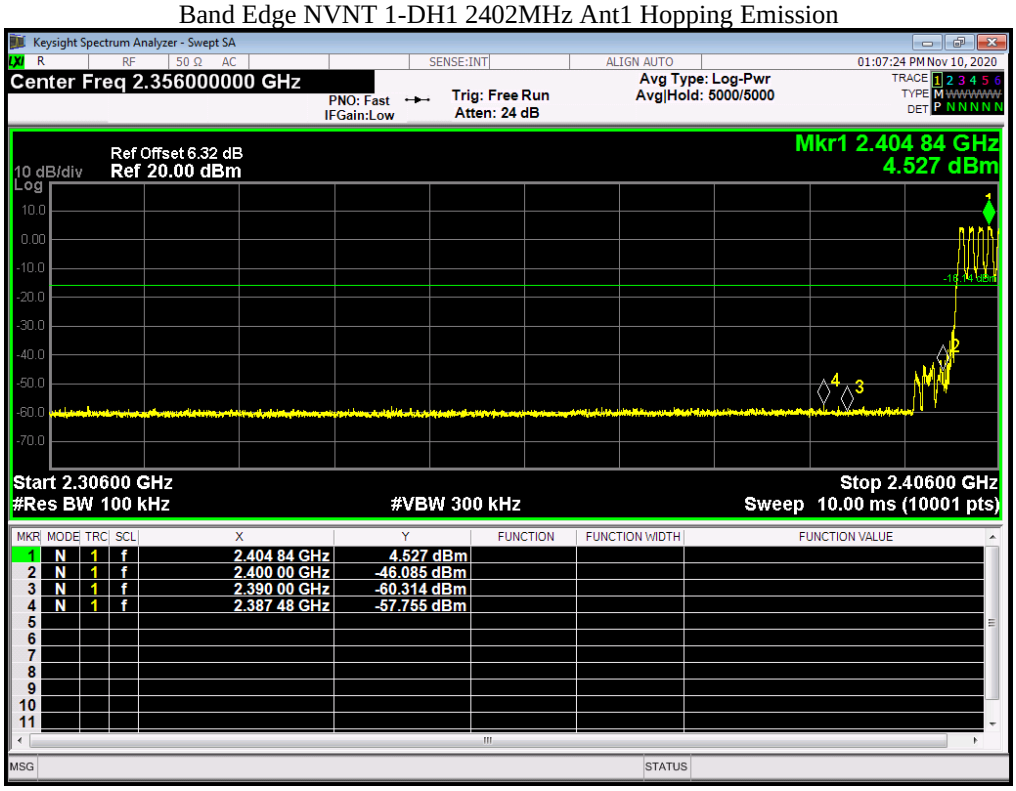


Band Edge NVNT 2-DH5 2480MHz Ant1 No-Hopping Emission

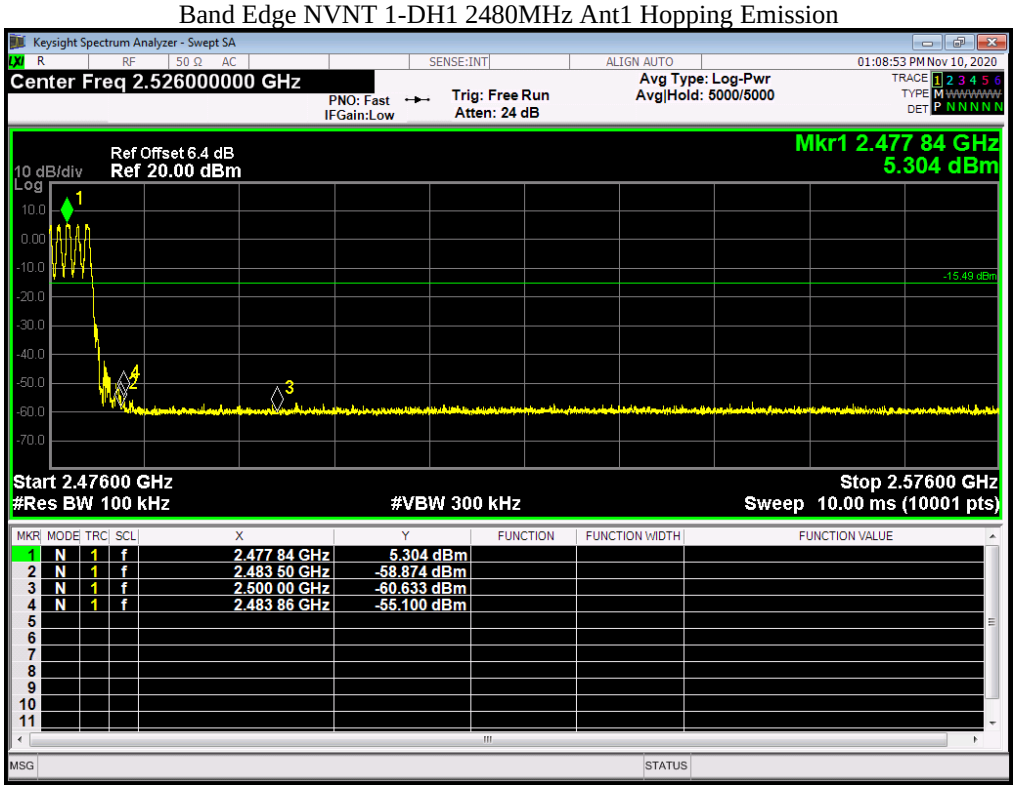


Condition	Mode	Frequency (MHz)	Antenna	Hopping Mode	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH1	2402	Ant 1	No-Hopping	-61.608	-20	Pass
NVNT	1-DH1	2480	Ant 1	No-Hopping	-59.602	-20	Pass

Band Edge NVNT 1-DH1 2402MHz Ant1 Hopping Emission

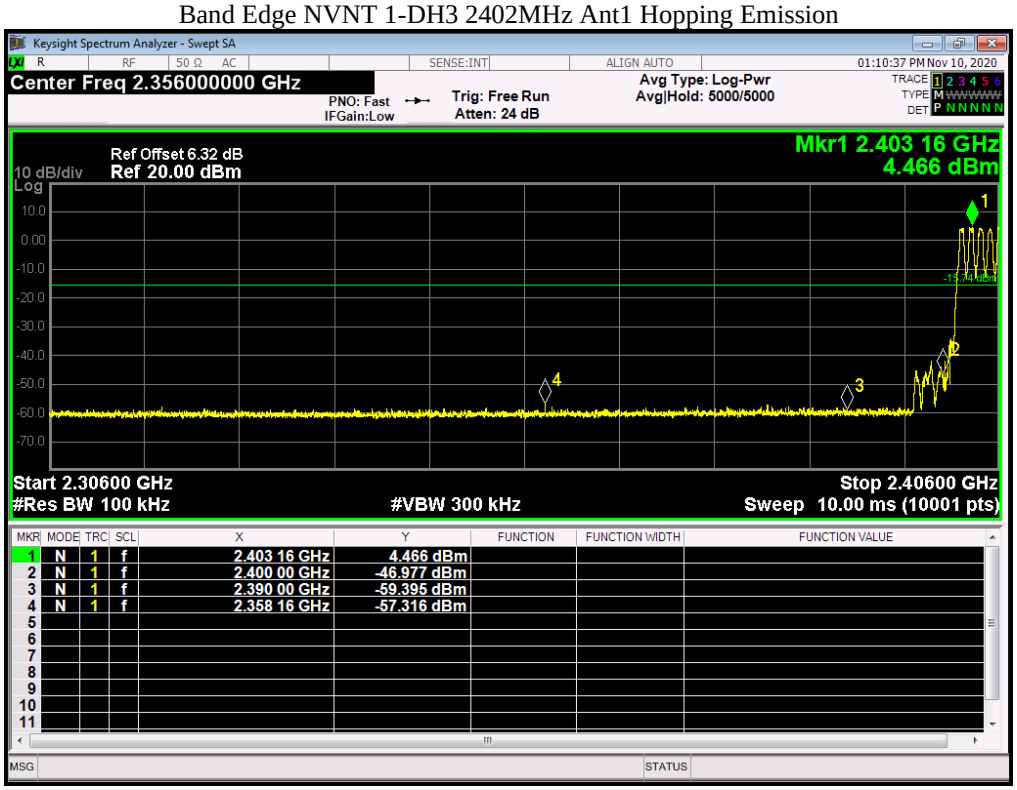


Band Edge NVNT 1-DH1 2480MHz Ant1 Hopping Emission

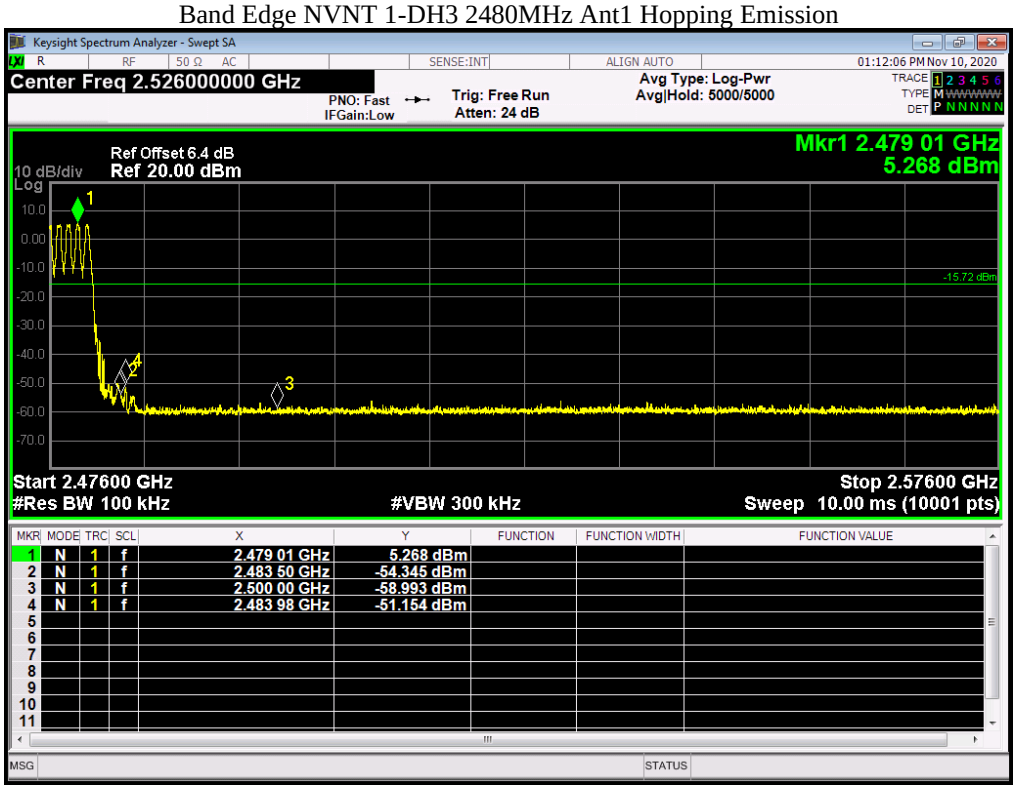


Condition	Mode	Frequency (MHz)	Antenna	Hopping Mode	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH3	2402	Ant 1	No-Hopping	-61.573	-20	Pass
NVNT	1-DH3	2480	Ant 1	No-Hopping	-55.433	-20	Pass

Band Edge NVNT 1-DH3 2402MHz Ant1 Hopping Emission

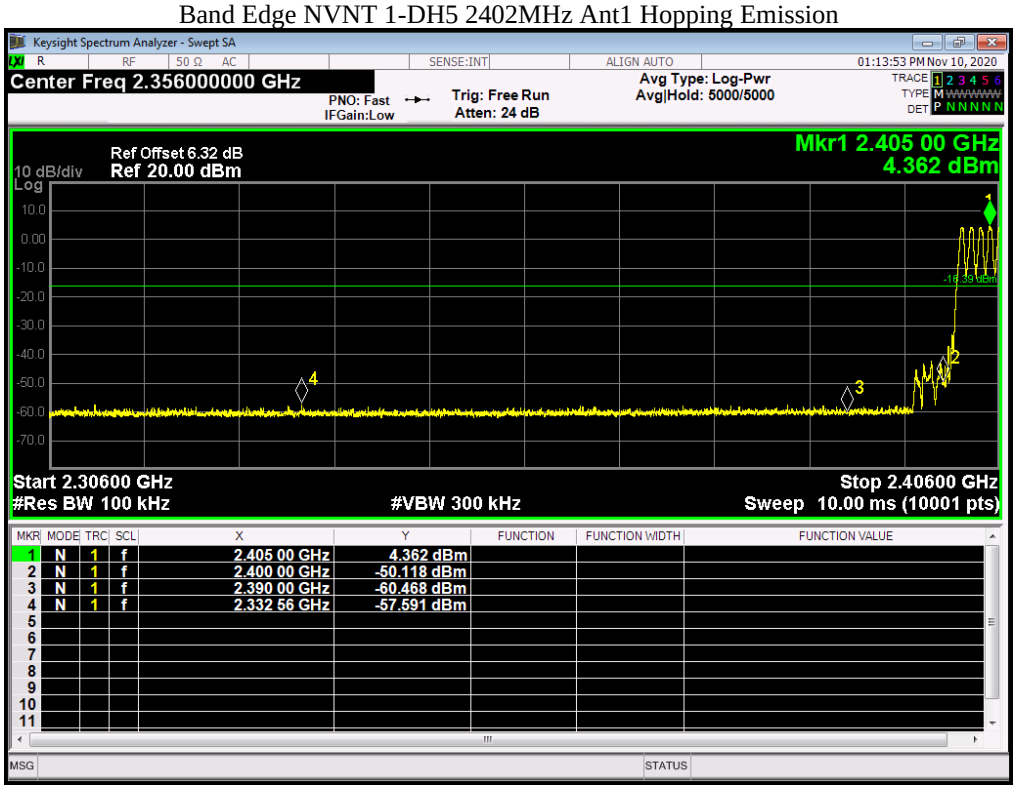


Band Edge NVNT 1-DH3 2480MHz Ant1 Hopping Emission

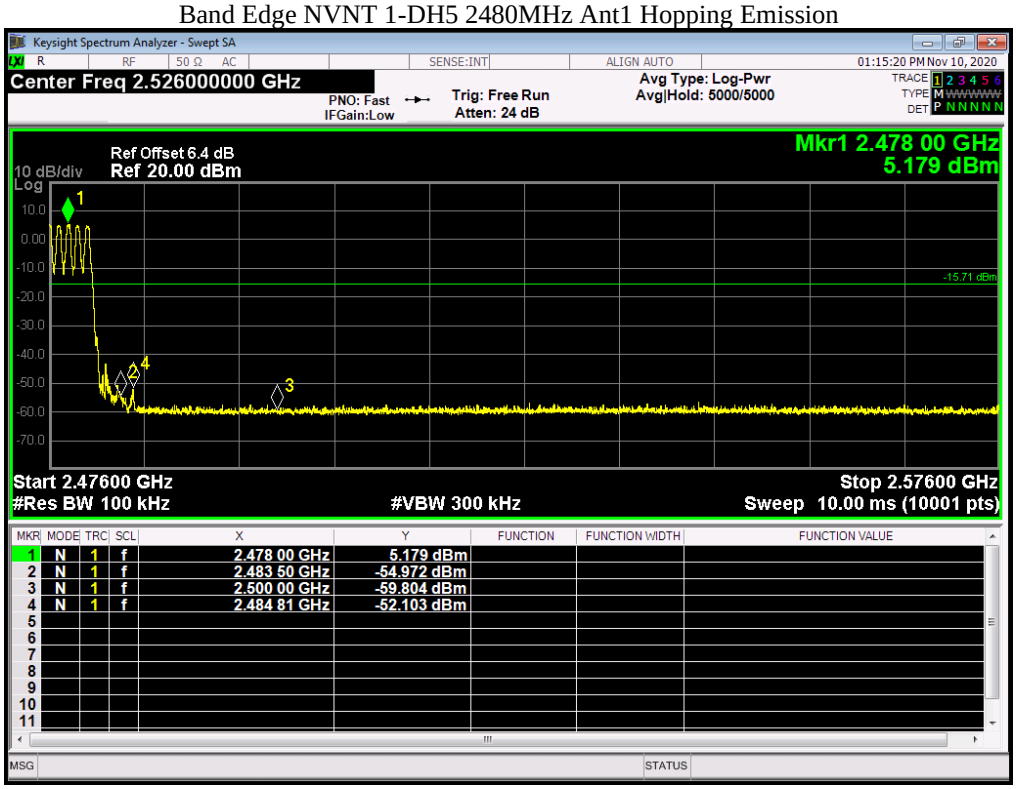


Condition	Mode	Frequency (MHz)	Antenna	Hopping Mode	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH5	2402	Ant 1	No-Hopping	-61.205	-20	Pass
NVNT	1-DH5	2480	Ant 1	No-Hopping	-56.391	-20	Pass

Band Edge NVNT 1-DH5 2402MHz Ant1 Hopping Emission

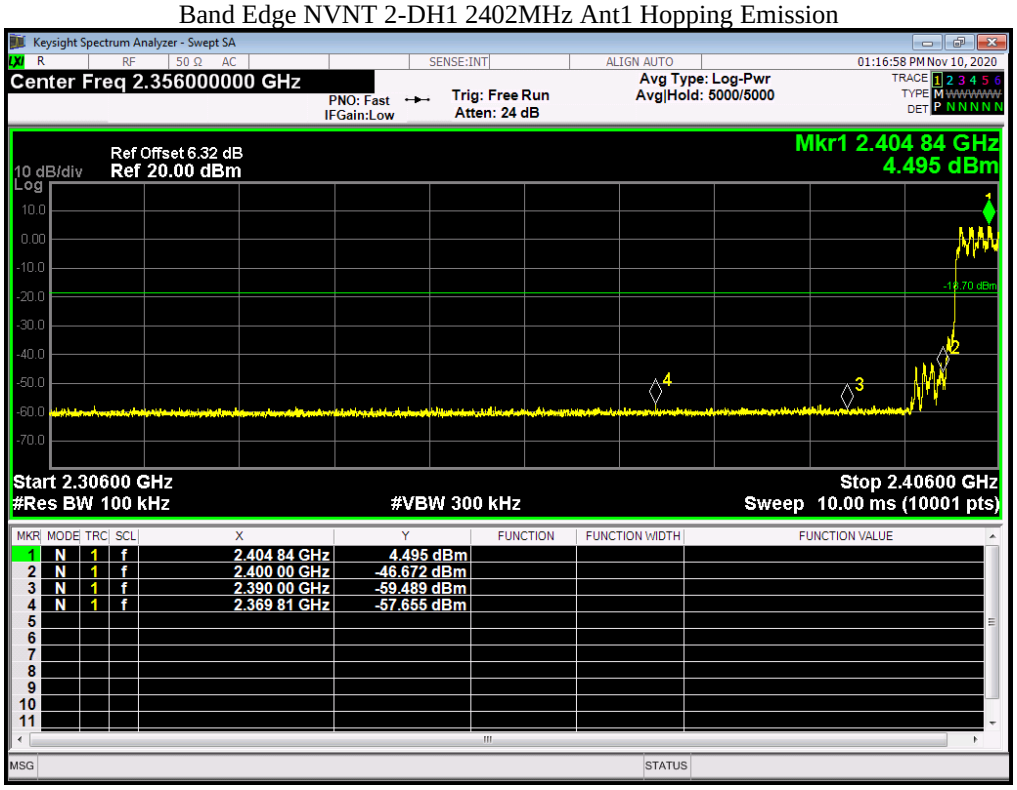


Band Edge NVNT 1-DH5 2480MHz Ant1 Hopping Emission



Condition	Mode	Frequency (MHz)	Antenna	Hopping Mode	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	2-DH1	2402	Ant 1	No-Hopping	-58.947	-20	Pass
NVNT	2-DH1	2480	Ant 1	No-Hopping	-55.124	-20	Pass

Band Edge NVNT 2-DH1 2402MHz Ant1 Hopping Emission



Band Edge NVNT 2-DH1 2480MHz Ant1 Hopping Emission