



REPORT No.: SZ25100001W03

TEST REPORT

APPLICANT : Grace Digital Inc.

PRODUCT NAME : DEFENDER TITAN

MODEL NAME : GDI-EXDFNRXL01

BRAND NAME : ECOXGEAR

FCC ID : 2AAUI-GDIEXDFNRXL

STANDARD(S) : 47 CFR Part 15 Subpart C

RECEIPT DATE : 2025-10-10

TEST DATE : 2025-10-13 to 2025-12-26

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Change History		
Version	Date	Reason for change
1.0	2026-01-14	First edition



1. Summary of Test Result

No.	Section	Description	Test Date	Test Engineer	Result	Remark
1	15.203	Antenna Requirement	N/A	N/A	PASS	/
2	15.247(a) 15.247(h)	Hopping Mechanism	N/A	N/A	PASS	/
3	15.247(a)	Number of Hopping Frequency	Oct. 21, 2025	Li Xinpeng	PASS	/
4	ANSI C63.10	Duty Cycle	Oct. 21, 2025	Li Xinpeng	PASS	/
5	15.247(b)	Maximum Peak Conducted Output Power	Oct. 21, 2025	Li Xinpeng	PASS	/
6	15.247(b)	Maximum Average Conducted Output Power	Oct. 21, 2025	Li Xinpeng	PASS	/
7	15.247(a)	20dB Bandwidth	Oct. 21, 2025	Li Xinpeng	PASS	/
8	15.247(a)	Carrier Frequency Separation	Oct. 21, 2025	Li Xinpeng	PASS	/
9	15.247(a)	Time of Occupancy (Dwell time)	Oct. 21, 2025	Li Xinpeng	PASS	/
10	15.247(d)	Conducted Spurious Emission and Band Edge	Oct. 21, 2025	Li Xinpeng	PASS	/
11	15.207	Conducted Emission	Oct. 20&21, 2025	Wang Yapeng	N/A	/
12	15.247(d)	Restricted Frequency Bands	Oct. 13, 2025 to Dec. 24, 2025	Gao Jianrou	PASS	/
13	15.209, 15.247(d)	Radiated Emission	Oct. 13, 2025 to Dec. 26, 2025	Gao Jianrou	PASS	/



Note 1: The tests were performed according to the method of measurements prescribed in ANSI C63.10-2020 and KDB 558074 D01 v05r02.

Note 2: Any additions, deviation, or exclusions from the method shall be noted in the "Remark".

1.1. Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR Part 15 Subpart C Radio Frequency Devices



1.2. Test Equipment List

1.2.1 Conducted Test Equipment

Equipment	Serial No.	Type	Manufacturer	Cal. Date	Due Date
EXA Signal Analyzer	MY53470836	N9010A	Agilent	2025.01.15	2026.01.14
RF Cable (30MHz-26GHz)	CB01	RF01	Morlab	N/A	N/A
SMA Connector	CN01	RF03	HUBER-SUHNER	N/A	N/A

1.2.2 Conducted Emission Test Equipment

Equipment	Serial No.	Type	Manufacturer	Cal. Date	Due Date
Receiver	101052	ESPI	R&S	2025.05.15	2026.05.14
LISN	103131	ENV 216	R&S	2025.03.20	2026.03.19
Pulse Limiter (10dB)	VTSD 9561 F-B #206	VTSD 9561-F	R&S	2025.05.13	2026.05.12
RF Coaxial Cable (DC-100MHz)	EMC-CE-00514	N/A	N/A	2025.05.06	2026.05.05

1.2.3 List of Software Used

Description	Manufacturer	Software Version
Test System	MaiWei	2.0.0.0
JS32-RE	Tonscend	5.0.0
TS+ -[JS32-CE]	Tonscend	2.5.0.0

**1.2.4 Radiated Test Equipment**

Equipment	Serial No.	Type	Manufacturer	Cal. Date	Due Date
Signal Analyzer	MY56060145	N9020A	Agilent	2025.05.13	2026.05.12
Test Antenna - Bi-Log	9163-274	VULB 9163	Schwarzbeck	2025.06.28	2026.06.27
Test Antenna - Loop	00131	FMZB1519B	Schwarzbeck	2025.09.08	2026.09.07
Test Antenna – Horn	9120D-963	BBHA 9120D	Schwarzbeck	2025.05.16	2026.05.15
Test Antenna – Horn	BBHA9170 #773	BBHA9170	Schwarzbeck	2025.06.20	2026.06.19
Preamplifier (10MHz-6GHz)	46732	S10M100L38 02	LUCIX CORP.	2025.05.13	2026.05.12
Preamplifier (2GHz-18GHz)	61171/61172	S020180L32 03	LUCIX CORP.	2025.05.13	2026.05.12
Preamplifier (18GHz-40GHz)	DS77209	DCLNA0118-40C-S	Decentest	2025.05.13	2026.05.12
RF Coaxial Cable (DC-18GHz)	MRE001	PE330	Pasternack	2025.05.13	2026.05.12
RF Coaxial Cable (DC-18GHz)	MRE002	CLU18	Pasternack	2025.05.13	2026.05.12
RF Coaxial Cable (DC-18GHz)	MRE003	CLU18	Pasternack	2025.05.13	2026.05.12
RF Coaxial Cable (DC-40GHz)	22290045	QA360-40-KK-0.5	Qualwave	2025.09.03	2026.09.02
RF Coaxial Cable (DC-40GHz)	22290046	QA360-40-KKF-2	Qualwave	2025.09.03	2026.09.02
RF Coaxial Cable (DC-18GHz)	22120181	QA500-18-NN-5	Qualwave	2025.09.03	2026.09.02
Notch Filter	N/A	WRCG-2400-2483.5-60SS	Wainwright	N/A	N/A
Anechoic Chamber	N/A	9m*6m*6m	CRT	2025.06.21	2028.06.20
Anechoic Chamber	N/A	9m*6m*6m	CRT	2025.04.09	2028.04.08



1.3. Measurement Uncertainty

Test Items	Uncertainty	Remark
Number of Hopping Frequency	±5%	Confidence levels of 95%
Peak Output Power	±2.22dB	Confidence levels of 95%
Bandwidth	±5%	Confidence levels of 95%
Carrier Frequency Separation	±5%	Confidence levels of 95%
Time of Occupancy (Dwell time)	±5%	Confidence levels of 95%
Conducted Spurious Emission	±2.77dB	Confidence levels of 95%
Restricted Frequency Bands	±5%	Confidence levels of 95%
Radiated Emission	±2.95dB	Confidence levels of 95%
Conducted Emission	±2.44dB	Confidence levels of 95%

1.4. Testing Laboratory

Laboratory Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Laboratory Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
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FCC Designation Number:	CN1192
FCC Test Firm Registration Number:	226174



2. General Description

2.1. Information of Applicant and Manufacturer

Applicant:	Grace Digital Inc.
Applicant Address:	10531 4S Commons Drive#166 Suite#430, San Diego, CA 92127, USA
Manufacturer:	Xingtel Xiamen Group Co., Ltd.
Manufacturer Address:	Xingtel Building,Chuangxin Road, Torch Hi-Tech Industrial District,Xiamen 3 61006, PR China

2.2. Information of EUT

Product Name:	DEFENDER TITAN	
Sample No.:	1#, 2#, 3#, 7#	
Hardware Version:	BT387-M-V2.5	
Software Version:	BT387_M031SD2AE_FCF8	
Module Type:	☐ F-9398; ☒ JS-BTM331 (The product includes two modules.)	
Equipment Type:	Bluetooth classic	
Bluetooth Version:	5.1	
Modulation Type:	FHSS (GFSK(1Mbps), $\pi/4$ -DQPSK(EDR 2Mbps), 8-DPSK(EDR 3Mbps))	
Operating Frequency Range:	2402MHz-2480MHz	
Antenna Type:	PCB Antenna	
Antenna Gain:	2.5dBi	
Accessory Information:	Battery	
	Brand Name:	GREAT POWER
	Model No.:	ICR18650 7800mAh 22.2V 173.16Wh
	Serial No.:	N/A
	Capacity:	7800mAh
	Rated Voltage:	22.2V
	Charge Limit:	25.2V
	Manufacturer:	Henan Great Power Energy Co.,Ltd



Accessory Information:	AC Adapter	
	Brand Name:	Shenzhen Keyu Power Supply Technology Co., Ltd.
	Model No.:	KA30E-US
	Serial No.:	N/A
	Rated Output:	5V $\approx$ 3A; 9V $\approx$ 3A; 12V $\approx$ 2.5A; 15V $\approx$ 2A; 20V $\approx$ 1.5A PPS: 3.3-11V $\approx$ 3A or 3.3-16V $\approx$ 2A
	Rated Input:	100-240V $\sim$ 50/60Hz, 0.8A
	Manufacturer:	Something High Electric (Xiamen) Company Inc.

Note 1: The EUT description presented in the report are provided by applicant and/or manufacturer, and the test laboratory is not responsible for the accuracy of the information. For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.



2.3.Channel List of EUT

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		

Note 1: The black bold channels were selected for test.

2.4. Test Configuration of EUT

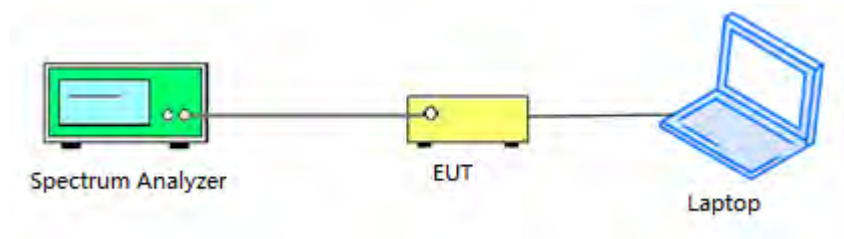
Test mode is used to control the EUT under the maximum power level during test.

2.5. Test Conditions

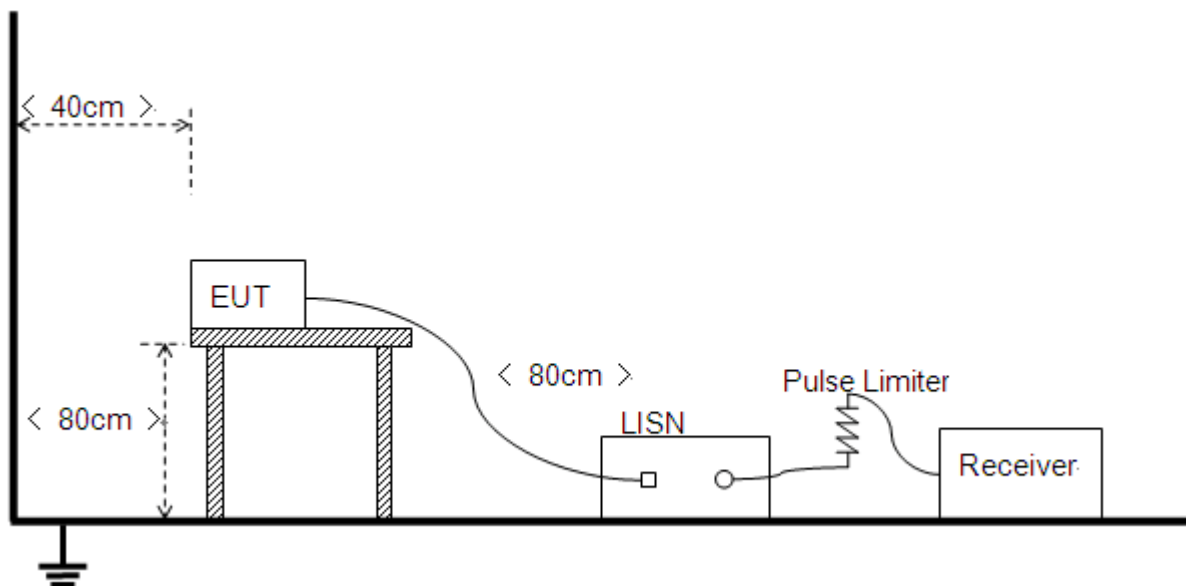
Temperature (°C):	15-35
Relative Humidity (%):	30-60
Atmospheric Pressure (kPa):	86-106

2.6. Test Setup Layout Diagram

2.6.1. Conducted Measurement

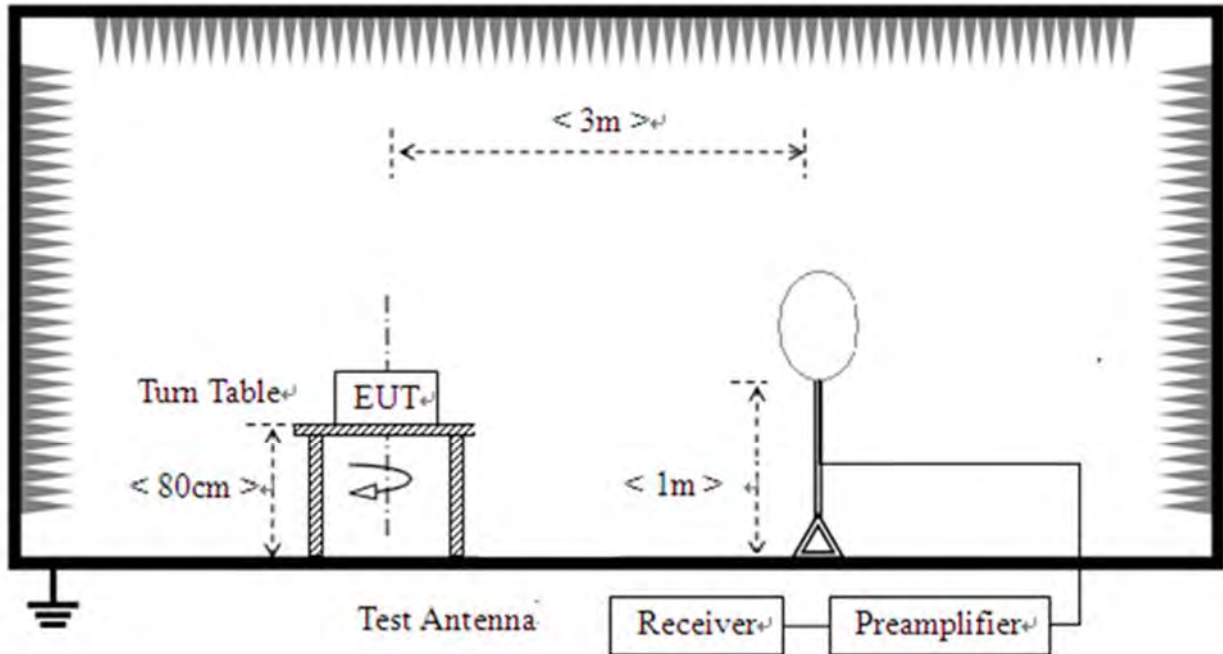


2.6.2. Conducted Emission Measurement

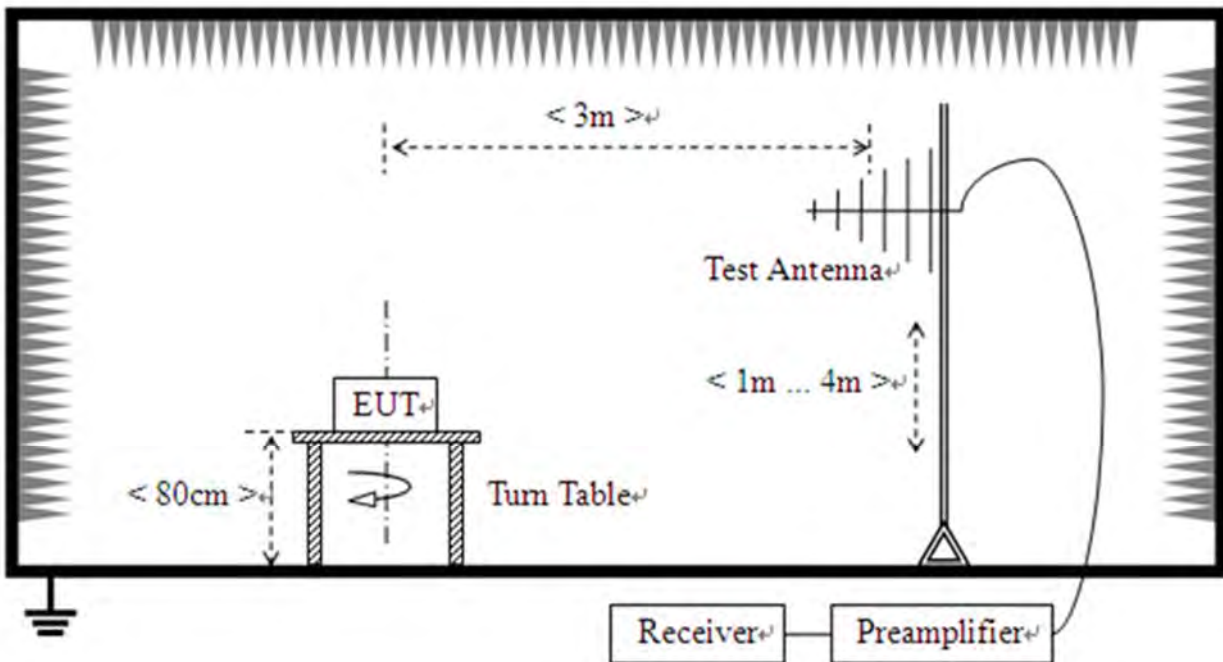


2.6.3.Radiation Measurement

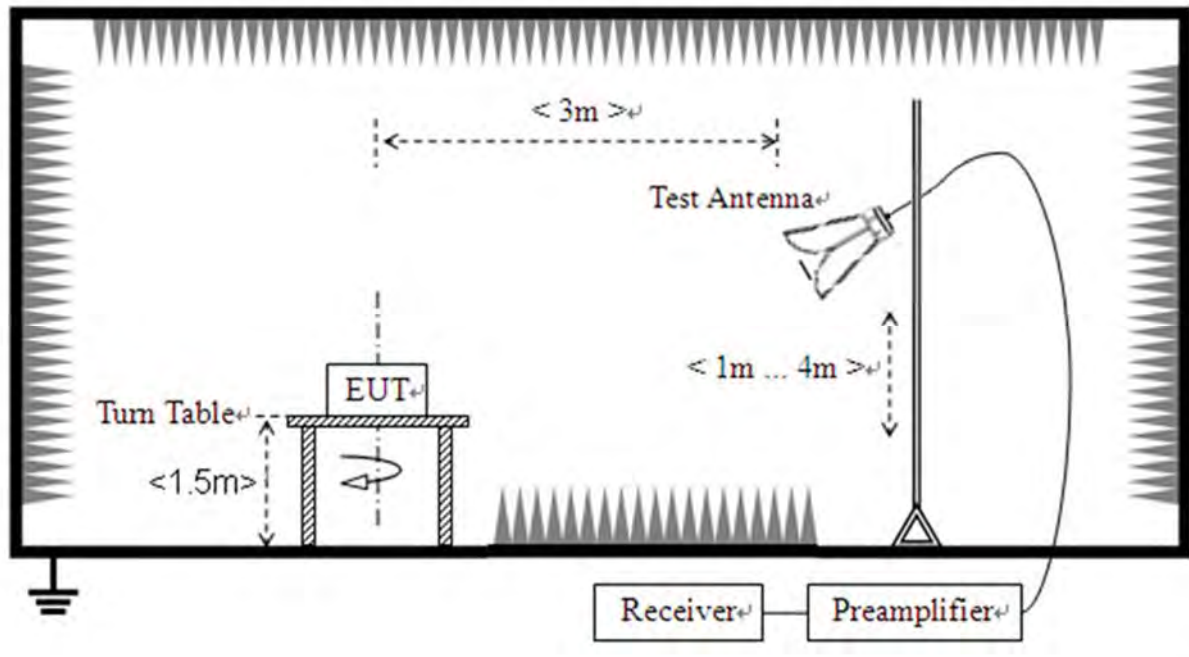
1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to 1GHz



3) For radiated emissions above 1GHz





3. Test Results

3.1. Antenna Requirement

3.1.1. Requirement

According to FCC 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

3.1.2. Test Result

Antenna location	Antenna Type	Coupling Method
☒ Internal ☐ External	☐ FPC Antenna ☐ Spring Antenna ☐ Ceramic Antenna ☐ Integrated Antenna ☐ Dipole Antenna ☒ PCB Antenna ☐ PIFA Antenna ☐ Monopole Antenna	☐ I-PEX Connector ☐ SMA Connector ☐ RP-SMA Connector ☐ Metal Shrapnel ☒ Layout



3.2. Hopping Mechanism

3.2.1. Requirement

According to FCC section 15.247(a)(1), a frequency hopping spread spectrum 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.

According to FCC section 15.247(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 hop sets 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.

3.2.2. Test Result

The hopping mechanism of the EUT is in compliance with the document "**Bluetooth core specification v5.1**".



3.3. Number of Hopping Frequency

3.3.1. Requirement

According to FCC section 15.247(a)(1)(iii), frequency hopping systems operating in the 2400MHz to 2483.5MHz bands shall use at least 15 hopping frequencies.

3.3.2. Test Procedures

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = the frequency band of operation

RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize

3.3.3. Test Setup Layout

Refer to chapter 2.6.1 in this report.

3.3.4. Test Result

Refer to Annex A.1 in this report.



3.4. Duty Cycle of Test Signal

3.4.1. Requirement

Preferably, all measurements of maximum conducted (average) output power will be performed with the EUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%). When continuous operation cannot be realized, then the use of sweep triggering/signal gating techniques can be used to ensure that measurements are made only during transmissions at the maximum power control level. Such sweep triggering/signal gating techniques will require knowledge of the minimum transmission duration (T) over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation. Sweep triggering/signal gating techniques can then be used if the measurement/sweep time of the analyzer can be set such that it does not exceed T at any time that data are being acquired (i.e., no transmitter OFF-time is to be considered).

When continuous transmission cannot be achieved and sweep triggering/signal gating cannot be implemented, alternative procedures are provided that can be used to measure the average power; however, they will require an additional measurement of the transmitter duty cycle (D). Within this sub clause, the duty cycle refers to the fraction of time over which the transmitter is ON and is transmitting at its maximum power control level. The duty cycle is considered to be constant if variations are less than $\pm 2\%$; otherwise, the duty cycle is considered to be non constant.

3.4.2. Test Result

Refer to Annex A.2 in this report.



3.5. Maximum Peak Conducted Output Power

3.5.1. Requirement

According to FCC section 15.247(b)(1), for frequency hopping systems that operates in the 2400MHz to 2483.5MHz band employing at least 75 hopping channels, the maximum peak output power of the intentional radiator shall not exceed 1Watt. For all other frequency hopping systems in the 2400MHz to 2483.5MHz band, it is 0.125Watts.

3.5.2. Test Procedures

KDB 558074 Section 8.3.1 was used in order to prove compliance.

3.5.3. Test Setup Layout

Refer to chapter 2.6.1 in this report.

3.5.4. Test Result

Refer to Annex A.3 in this report.



3.6. Maximum Average Conducted Output Power

3.6.1. Requirement

According to FCC section 15.247(b)(1), for frequency hopping systems that operates in the 2400MHz to 2483.5MHz band employing at least 75 hopping channels, the maximum peak output power of the intentional radiator shall not exceed 1Watt. For all other frequency hopping systems in the 2400MHz to 2483.5MHz band, it is 0.125Watts.

3.6.2. Test Procedures

KDB 558074 Section 8.3.2 was used in order to prove compliance.

3.6.3. Test Setup Layout

Refer to chapter 2.6.1 in this report.

3.6.4. Test Result

Refer to Annex A.4 in this report.



3.7.20 dB Bandwidth

3.7.1.Requirement

According to FCC section 15.247(a)(1), the 20 dB bandwidth is known as the 99% emission bandwidth, or 20 dB bandwidth ($10 \cdot \log 1\% = 20 \text{ dB}$) taking the total RF output power.

3.7.1.Test Procedures

Use the following spectrum analyzer settings:

Span = between 2 to 5 times the OBW, centered on the test channel

RBW= 1% to 5% of the OBW

VBW $\geq 3 \times$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

3.7.2.Test Setup Layout

Refer to chapter 2.6.1 in this report.

3.7.3.Test Result

Refer to Annex A.5 in this report.



3.8. Carried Frequency Separation

3.8.1. Requirement

According to FCC section 15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater.

3.8.2. Test Procedures

The EUT must have its hopping function enabled. According to DA 00-705, use the following spectrum analyzer settings:

Span = wide enough to capture the peaks of two adjacent channels

Resolution (or IF) Bandwidth (RBW) $\geq 1\%$ of the span

Video (or Average) Bandwidth (VBW) $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

3.8.3. Test Setup Layout

Refer to chapter 2.6.1 in this report.

3.8.4. Test Result

Refer to Annex A.6 in this report.



3.9. Time of Occupancy (Dwell time)

3.9.1. Requirement

According to FCC section 15.247(a) (1) (iii), frequency hopping systems in the 2400 - 2483.5MHz band shall use at least 15 non-overlapping 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.

3.9.2. Test Procedures

Normal Mode:

DH1: Dwell time equal to Pulse time (ms) $\times (1600 / 2 / 79) \times 31.6$ Millisecond
DH3: Dwell time equal to Pulse time (ms) $\times (1600 / 4 / 79) \times 31.6$ Millisecond
DH5: Dwell time equal to Pulse Time (ms) $\times (1600 / 6 / 79) \times 31.6$ Millisecond

AFH Mode:

DH1: Dwell time equal to Pulse time (ms) $\times (800 / 2 / 20) \times (0.4 \times 20)$ Millisecond
DH3: Dwell time equal to Pulse time (ms) $\times (800 / 4 / 20) \times (0.4 \times 20)$ Millisecond
DH5: Dwell time equal to Pulse Time (ms) $\times (800 / 6 / 20) \times (0.4 \times 20)$ Millisecond.

3.9.3. Test Setup Layout

Refer to chapter 2.6.1 in this report.

3.9.4. Test Result

Refer to Annex A.7 in this report.



3.10. Conducted Spurious Emissions and Band Edge

3.10.1.Requirement

According to FCC section 15.247(d), in any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

3.10.2.Test Procedures

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.

RBW = 100 kHz

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize.

3.10.3.Test Setup Layout

Refer to chapter 2.6.1 in this report.

3.10.4.Test Result

Refer to Annex A.8 and A.9 in this report.

3.11. Conducted Emission

3.11.1.Requirement

According to FCC section 15.207, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 Ω line impedance stabilization network (LISN).

Frequency Range (MHz)	Conducted Limit (dB μ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

Note:

- (a) The lower limit shall apply at the band edges.
- (b) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

3.11.2.Test Procedures

The Table-top EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.10.

3.11.3.Test Setup Layout

Refer to chapter 2.6.2 in this report.

3.11.4.Test Result

Refer to Annex A.10 in this report.



3.12. Restricted Frequency Bands

3.12.1.Requirement

According to FCC section 15.247(d), in any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, 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).

3.12.2.Test Procedures

The EUT is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading.

For the Test Antenna:

Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength.

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1\text{GHz}$, 100 kHz for $f < 1\text{GHz}$

VBW = 3 MHz

Sweep = auto

Detector function = peak/average

Trace = max hold

Allow the trace to stabilize

3.12.3.Test Setup Layout

Refer to chapter 2.6.3 in this report.

3.12.4.Test Result

Refer to Annex A.11 in this report.

3.13. Radiated Emission

3.13.1.Requirement

According to FCC section 15.247(d), radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength ($\mu\text{V/m}$)	Measurement Distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

Note1: For above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.

Note2:For above 1000MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK).In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table).



3.13.2.Test Procedures

The EUT is placed on a non-conducting table 80 cm above the ground plane for measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz. The antenna to EUT distance is 3meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 30MHz, the emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9kHz-90 kHz, 110kHz-490 kHz. Radiated emission limits in these two bands are based on measurements employing an average detector.

For measurements below 1GHz the resolution bandwidth is set to 100kHz for peak detection measurements or 120kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1GHz the resolution bandwidth is set to 1MHz, the video band width is set to 3MHz for peak measurements and as applicable for average measurements.

The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions. For measurements above 1 GHz, keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response.

3.13.3.Test Setup Layout

Refer to chapter 2.6.3 in this report.

3.13.4.Test Result

Refer to Annex A.12 in this report.



Annex A Test Data and Result

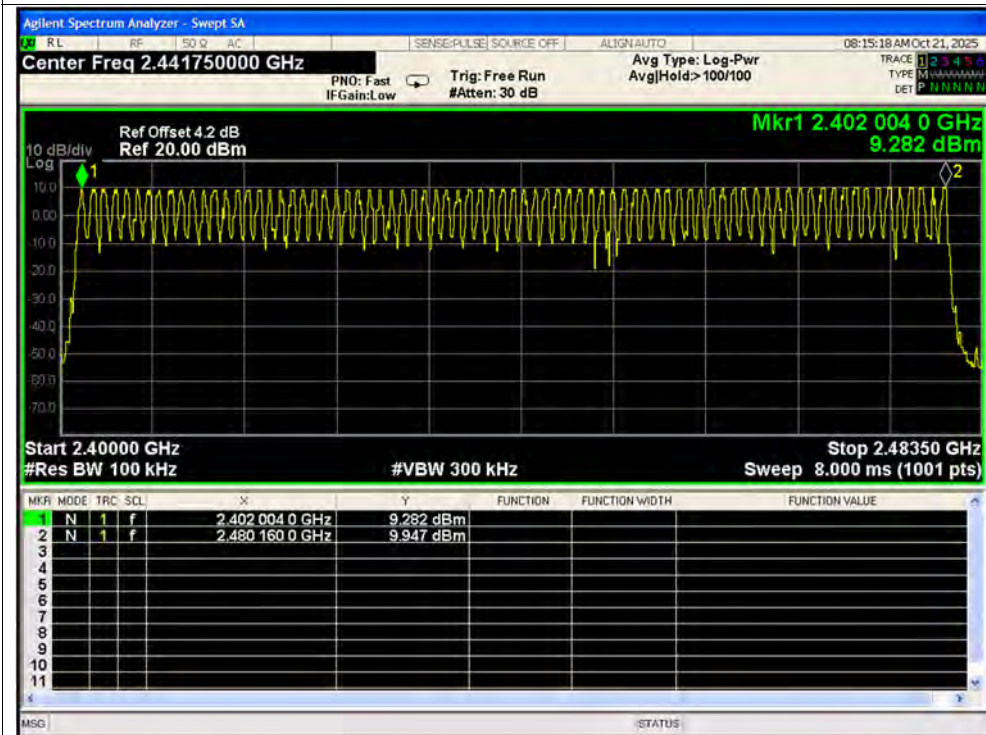
A.1. Number of Hopping Frequency

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

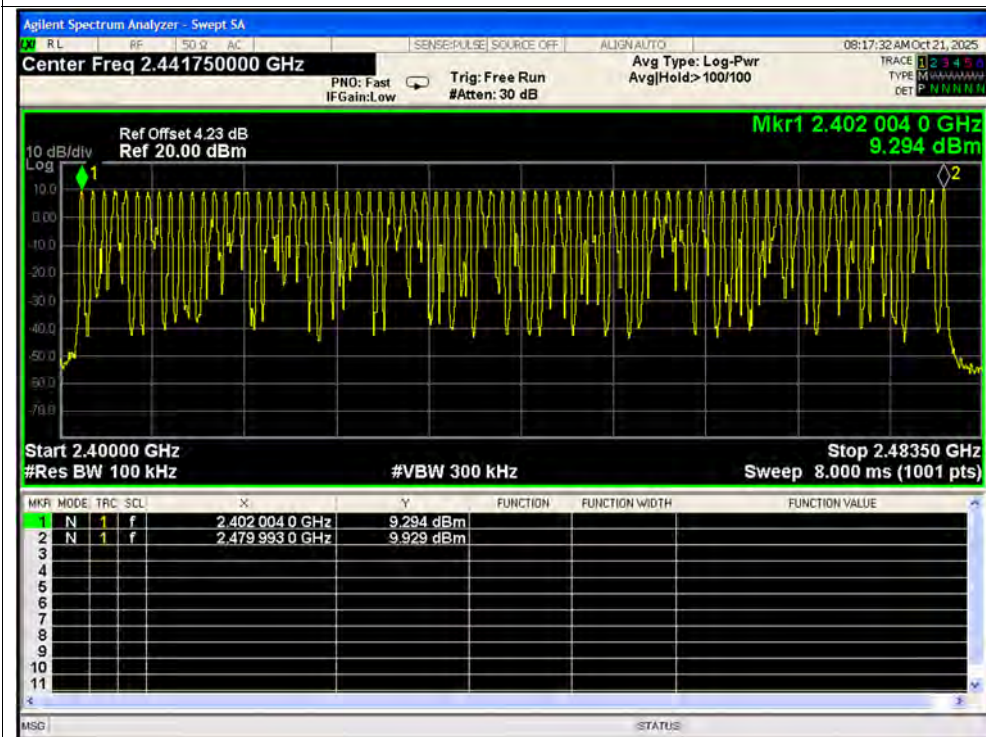


Test Graphs

Hopping No. NVNT 1-DH5 2402MHz Ant1

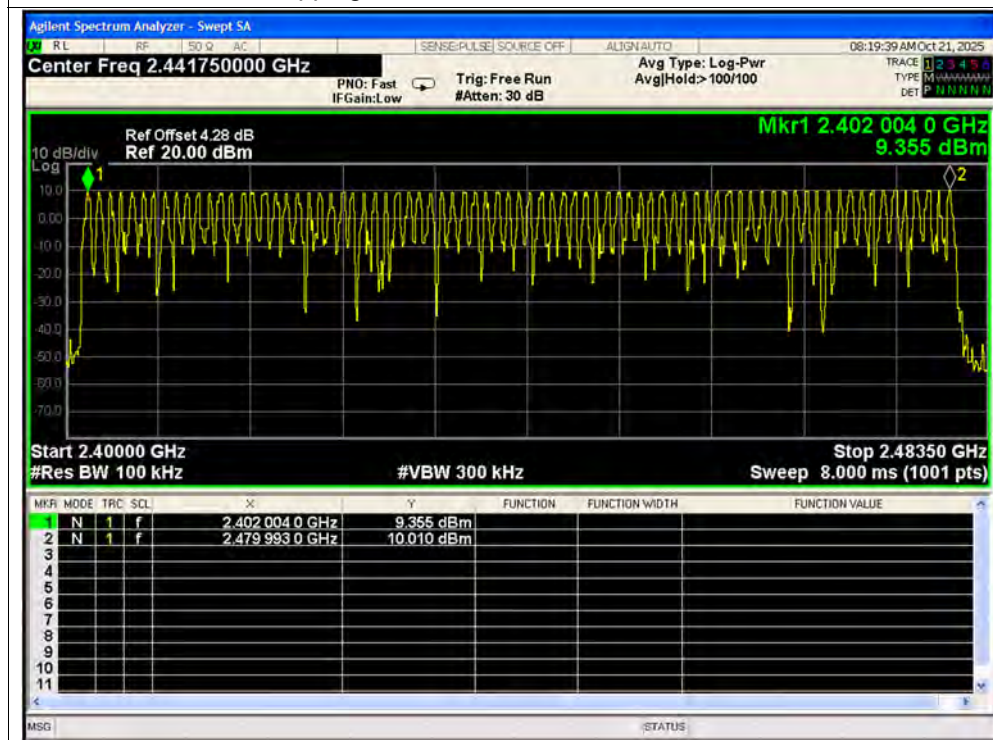


Hopping No. NVNT 1-DH5 2441MHz Ant1

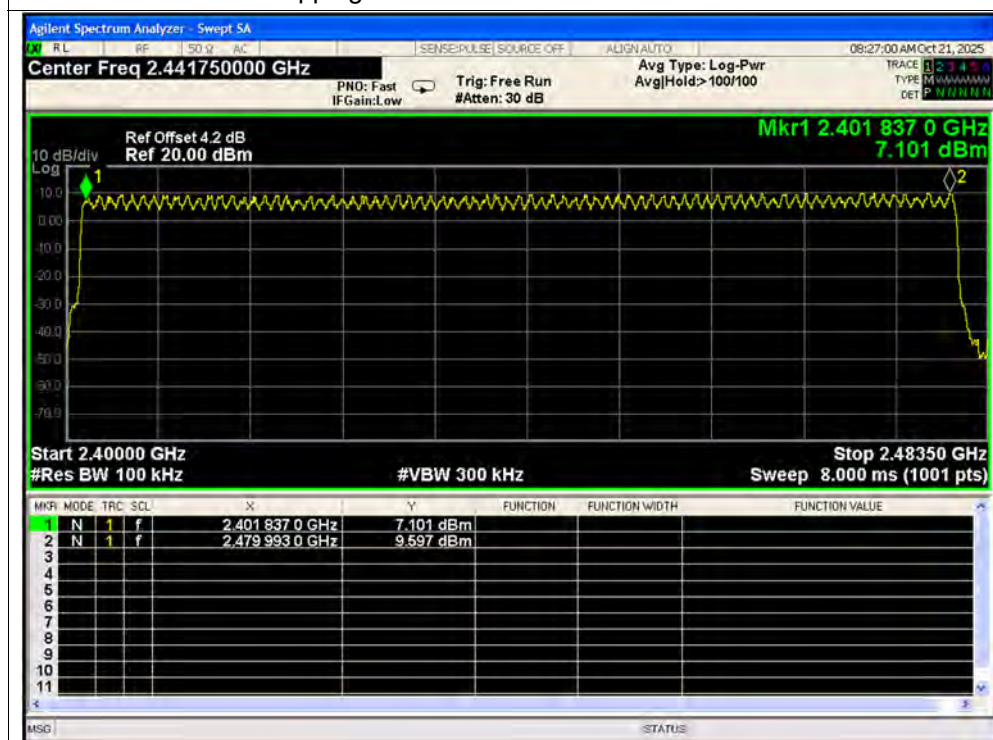




Hopping No. NVNT 1-DH5 2480MHz Ant1

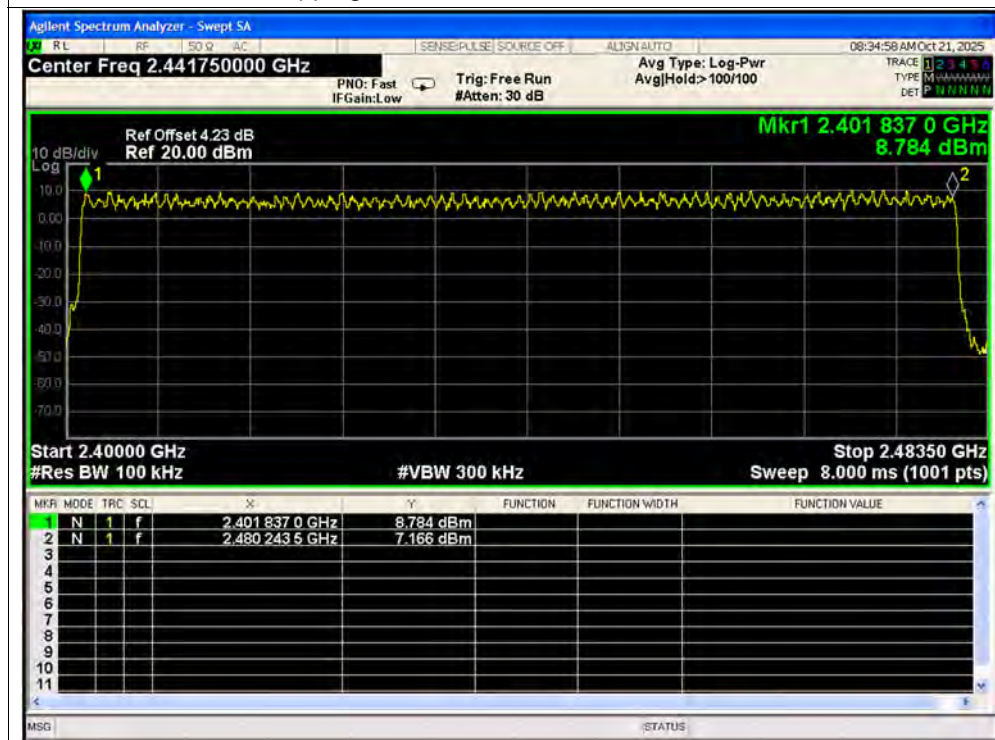


Hopping No. NVNT 2-DH5 2402MHz Ant1

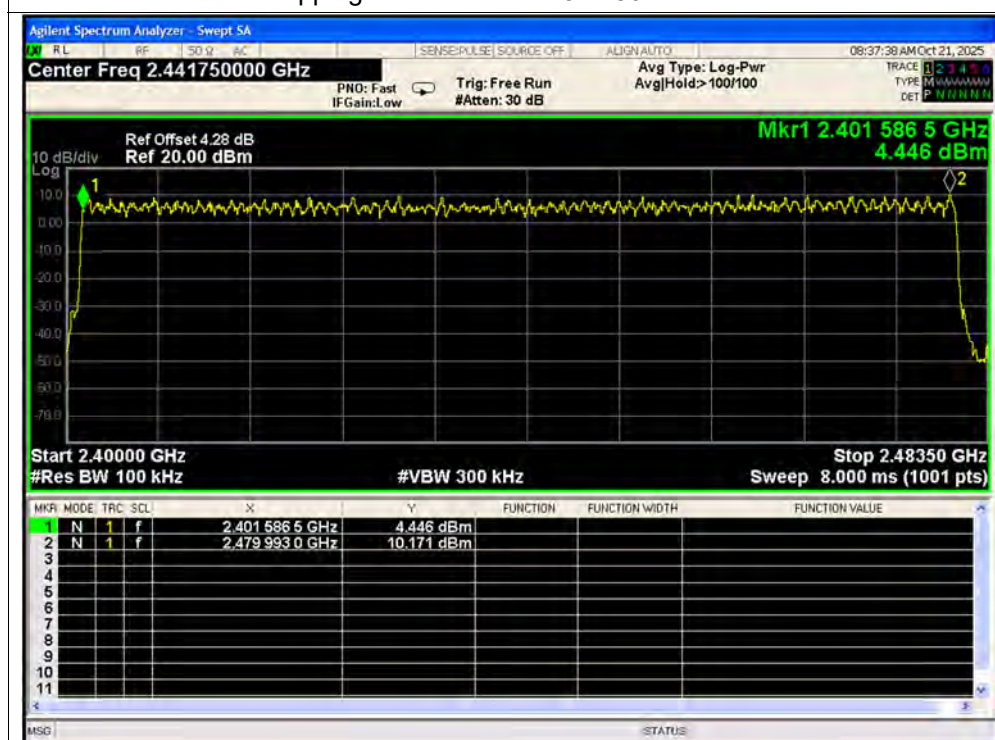




Hopping No. NVNT 2-DH5 2441MHz Ant1

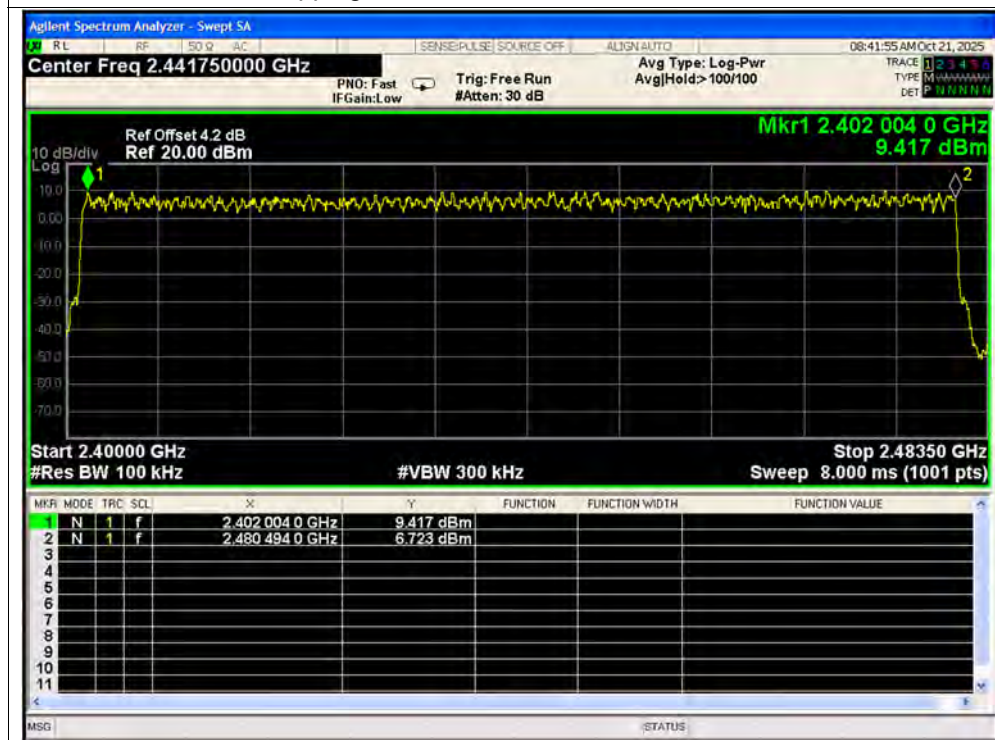


Hopping No. NVNT 2-DH5 2480MHz Ant1

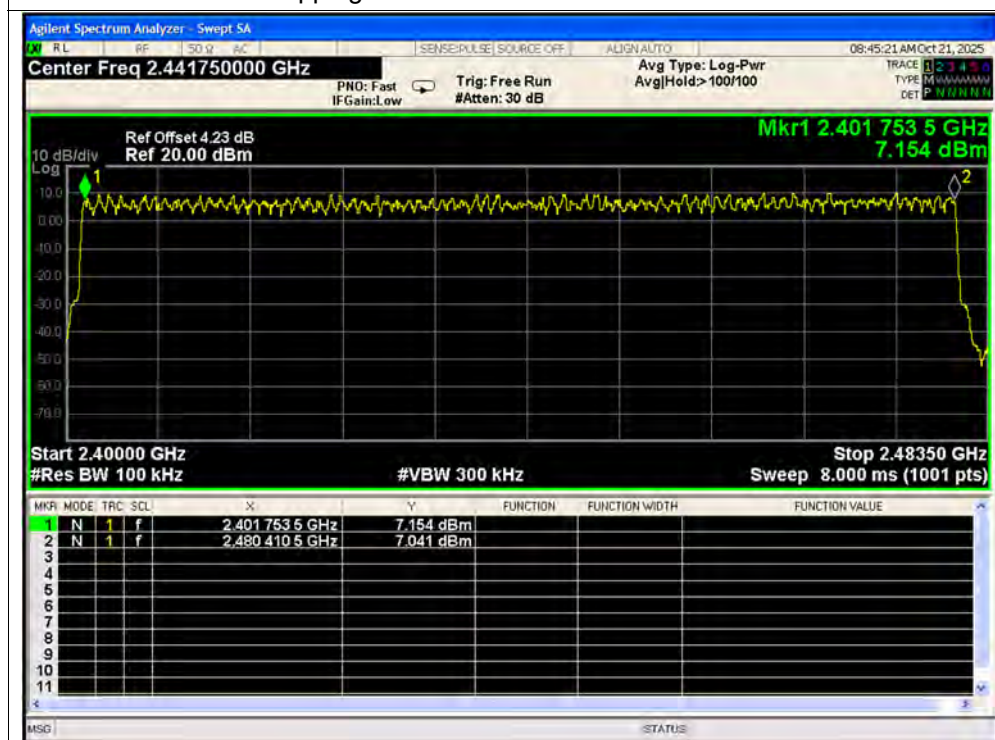




Hopping No. NVNT 3-DH5 2402MHz Ant1

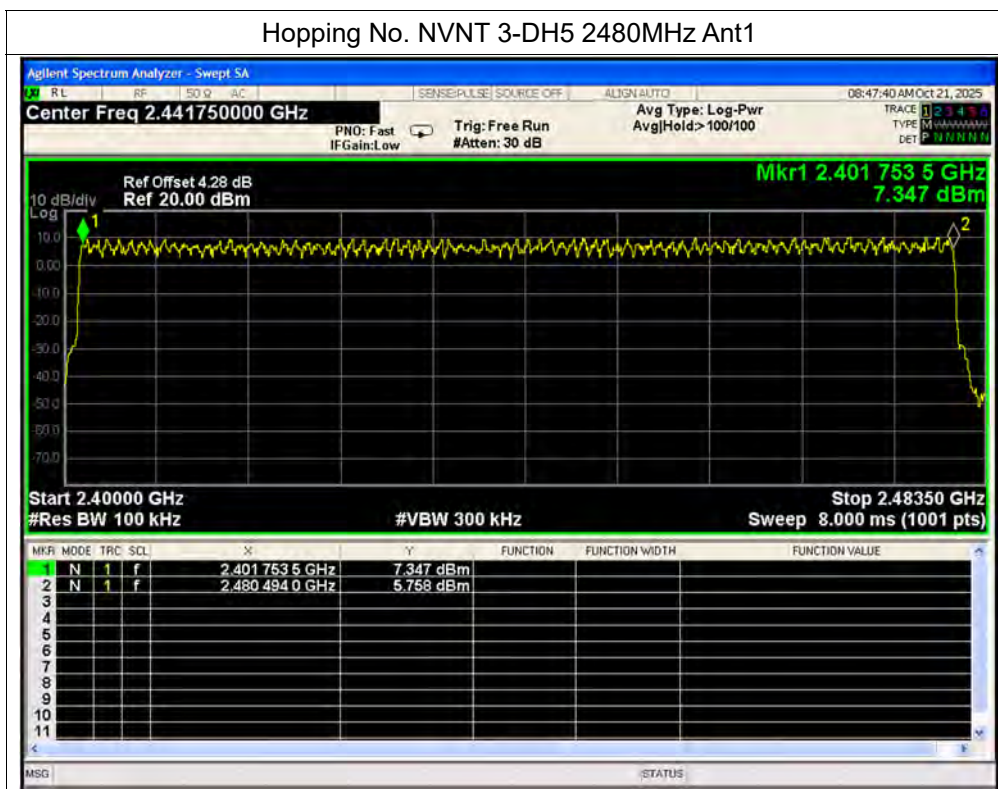


Hopping No. NVNT 3-DH5 2441MHz Ant1





Hopping No. NVNT 3-DH5 2480MHz Ant1

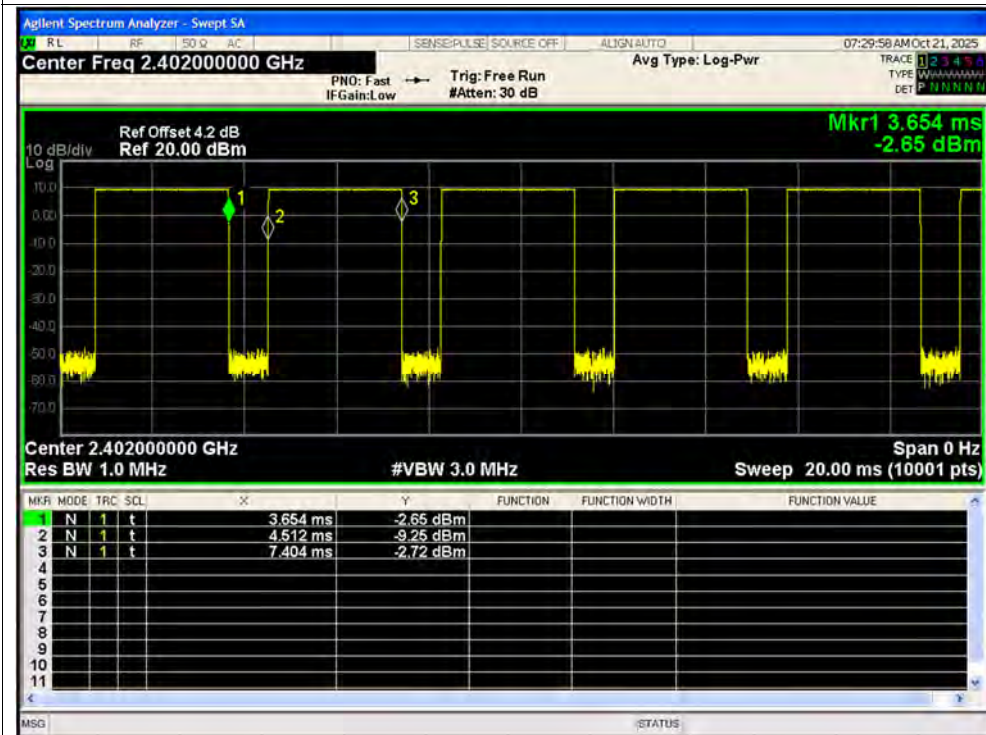


**A.2. Duty Cycle of Test Signal**

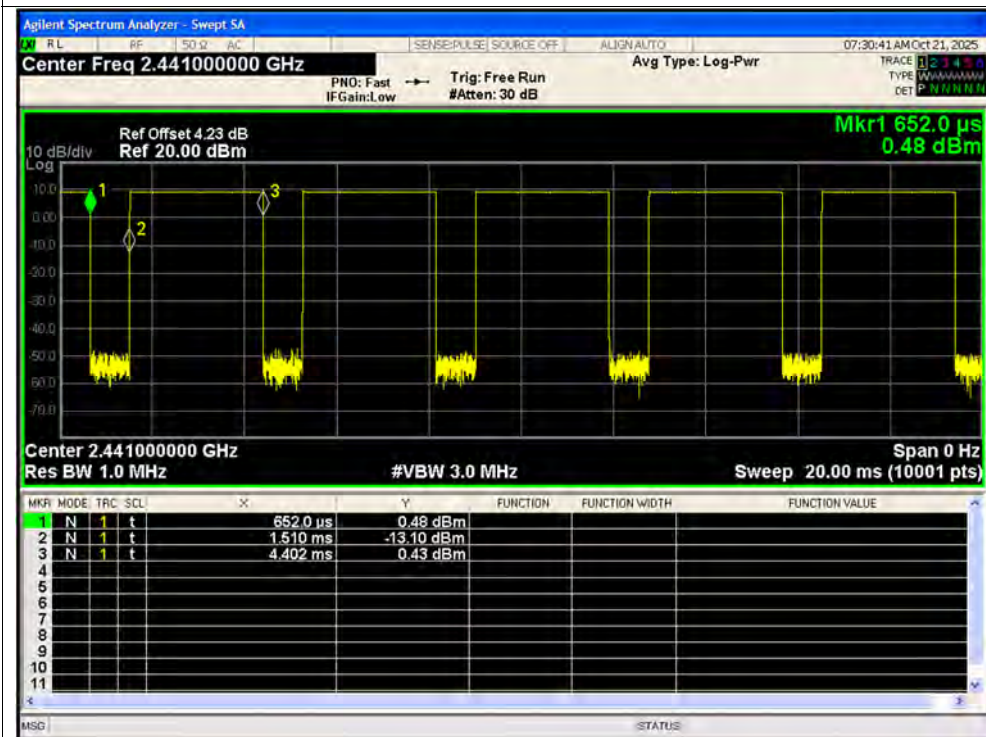
Condition	Mode	Frequency (MHz)	Antenna	Duty Cycle (%)	Correction Factor (dB)	1/T (kHz)
NVNT	1-DH5	2402	Ant1	77.12	1.13	0.35
NVNT	1-DH5	2441	Ant1	77.12	1.13	0.35
NVNT	1-DH5	2480	Ant1	77.12	1.13	0.35
NVNT	2-DH5	2402	Ant1	77.28	1.12	0.35
NVNT	2-DH5	2441	Ant1	77.33	1.12	0.34
NVNT	2-DH5	2480	Ant1	77.28	1.12	0.35
NVNT	3-DH5	2402	Ant1	77.33	1.12	0.34
NVNT	3-DH5	2441	Ant1	77.33	1.12	0.34
NVNT	3-DH5	2480	Ant1	77.33	1.12	0.34

Test Graphs

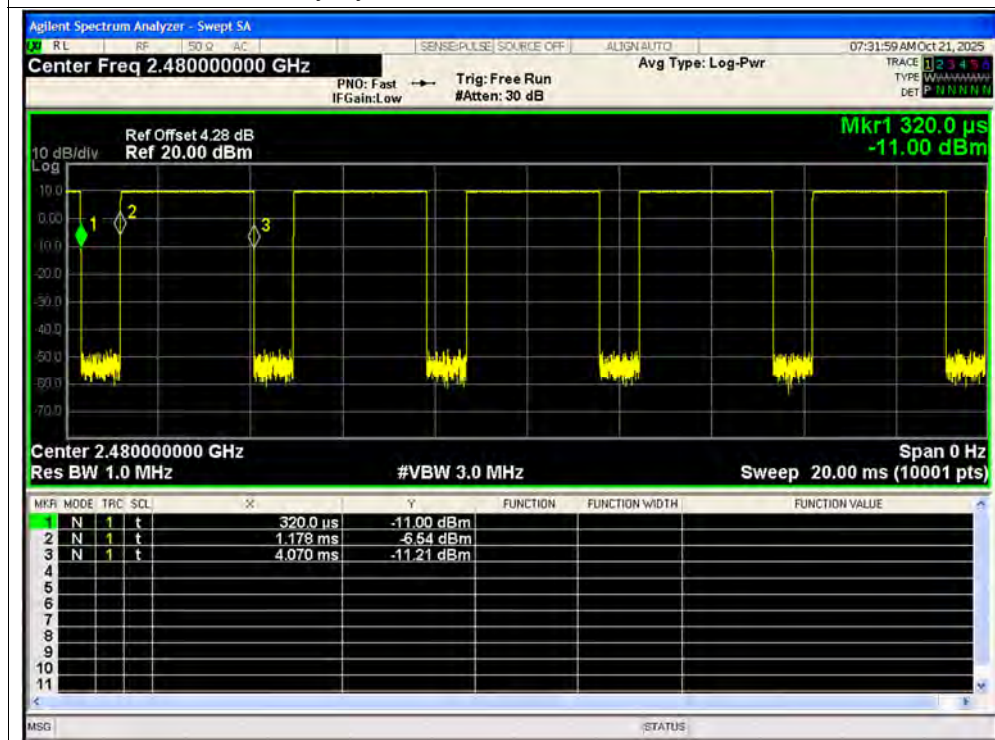
Duty Cycle NVNT 1-DH5 2402MHz Ant1



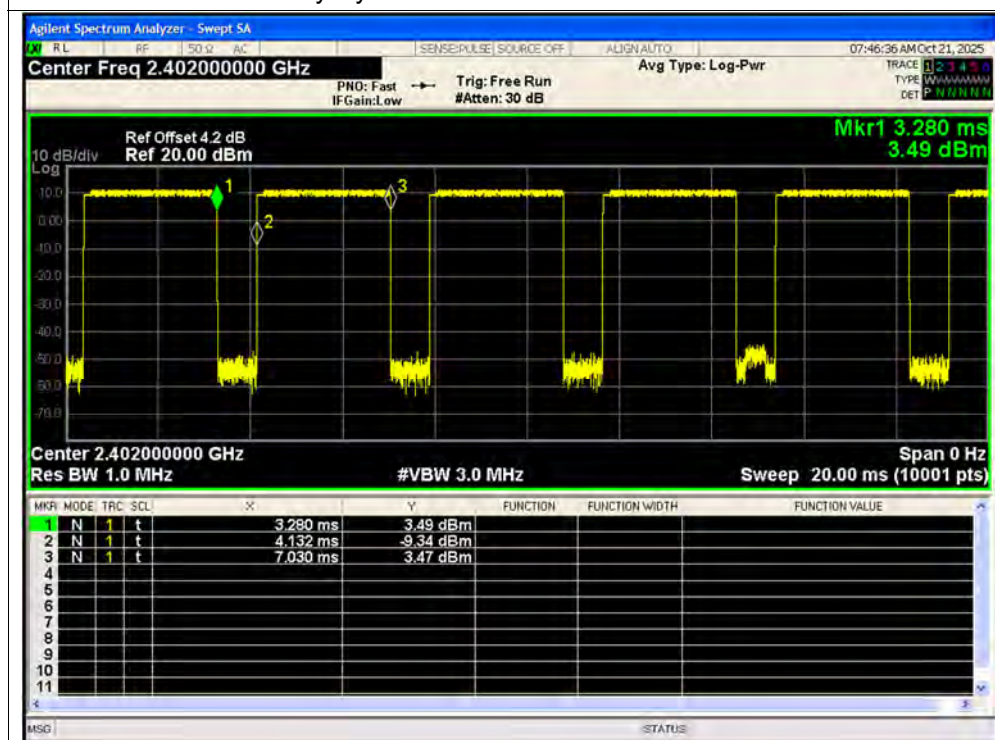
Duty Cycle NVNT 1-DH5 2441MHz Ant1



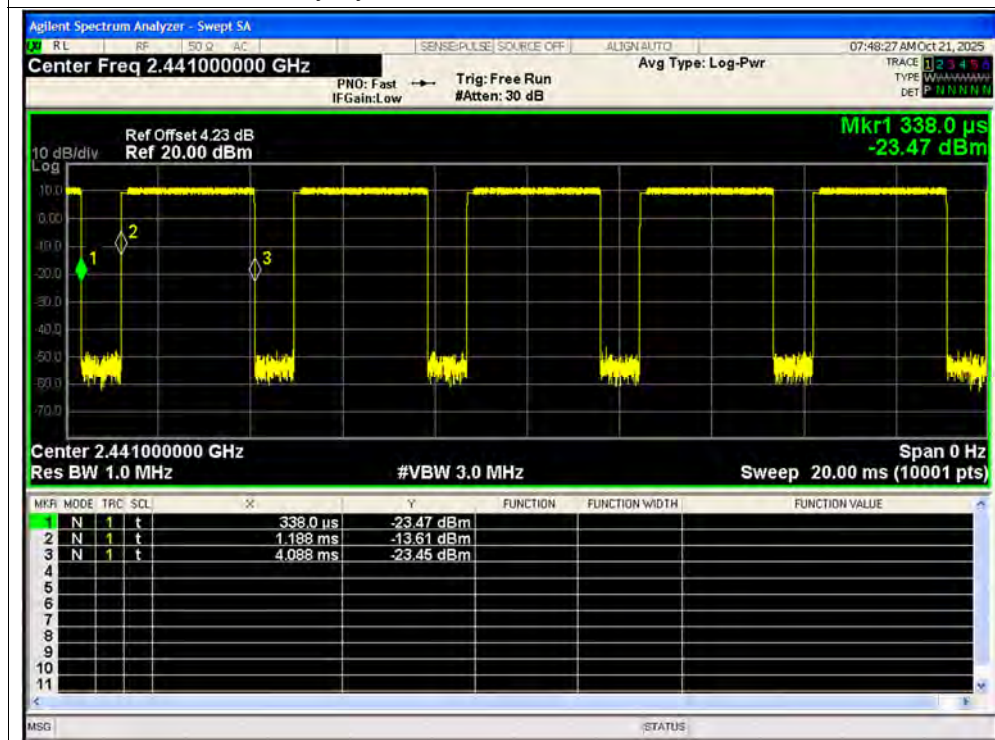
Duty Cycle NVNT 1-DH5 2480MHz Ant1



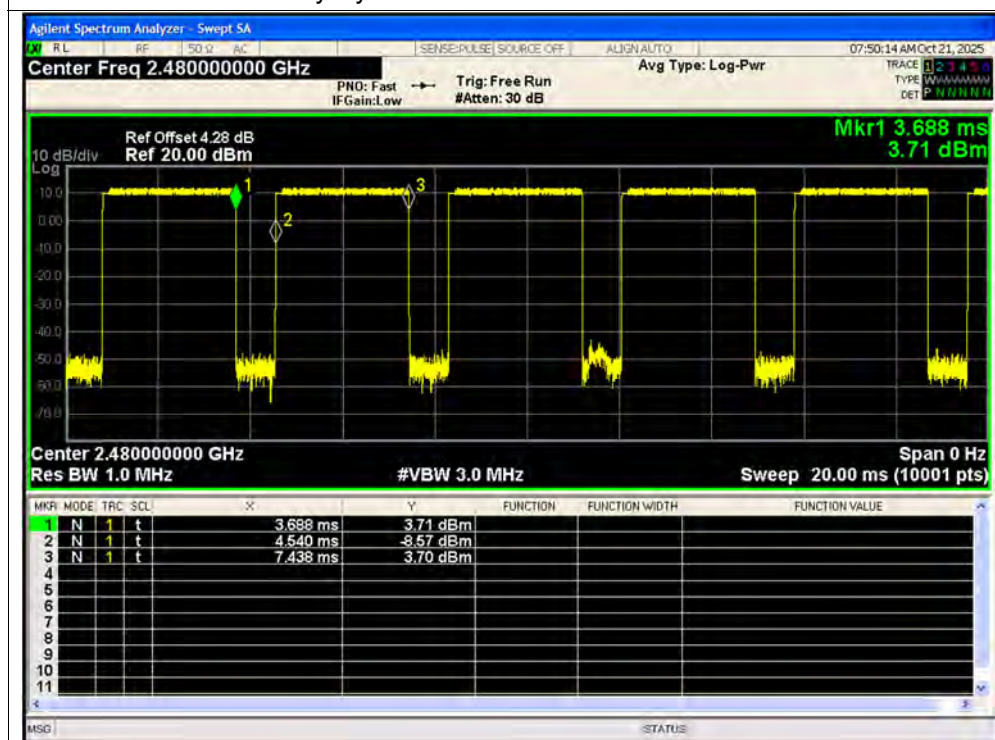
Duty Cycle NVNT 2-DH5 2402MHz Ant1



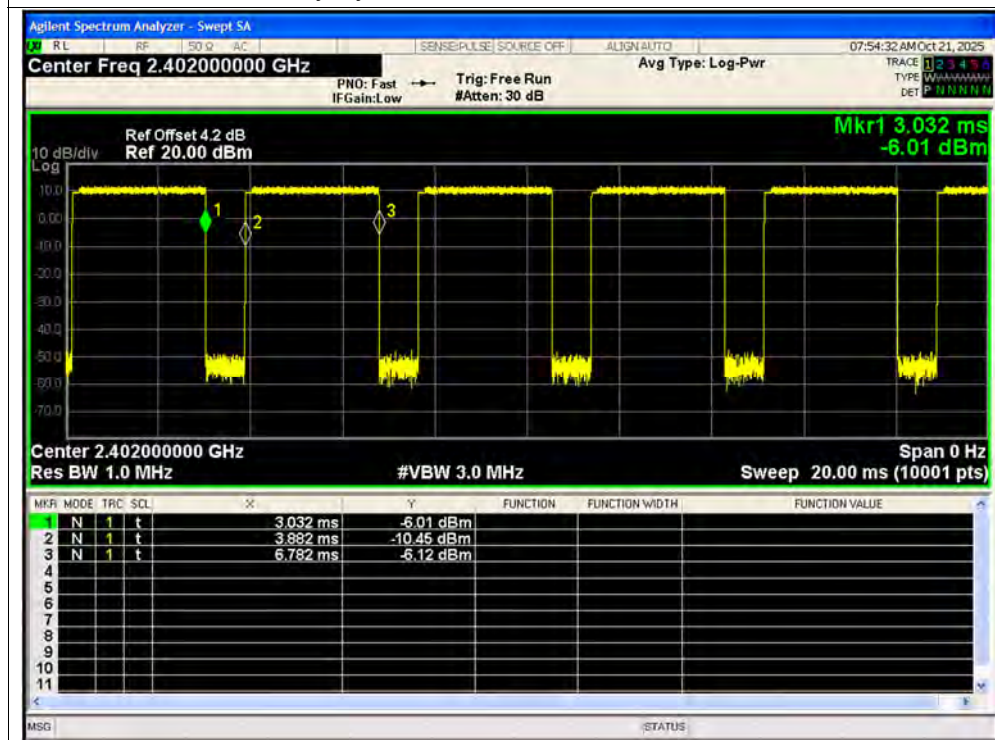
Duty Cycle NVNT 2-DH5 2441MHz Ant1



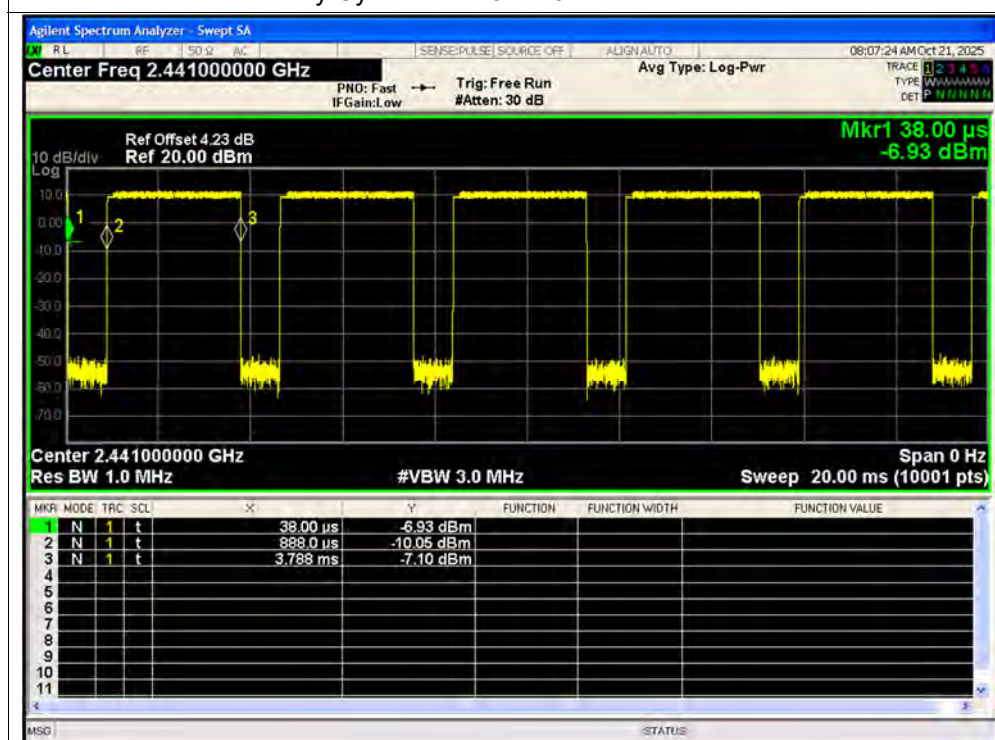
Duty Cycle NVNT 2-DH5 2480MHz Ant1



Duty Cycle NVNT 3-DH5 2402MHz Ant1

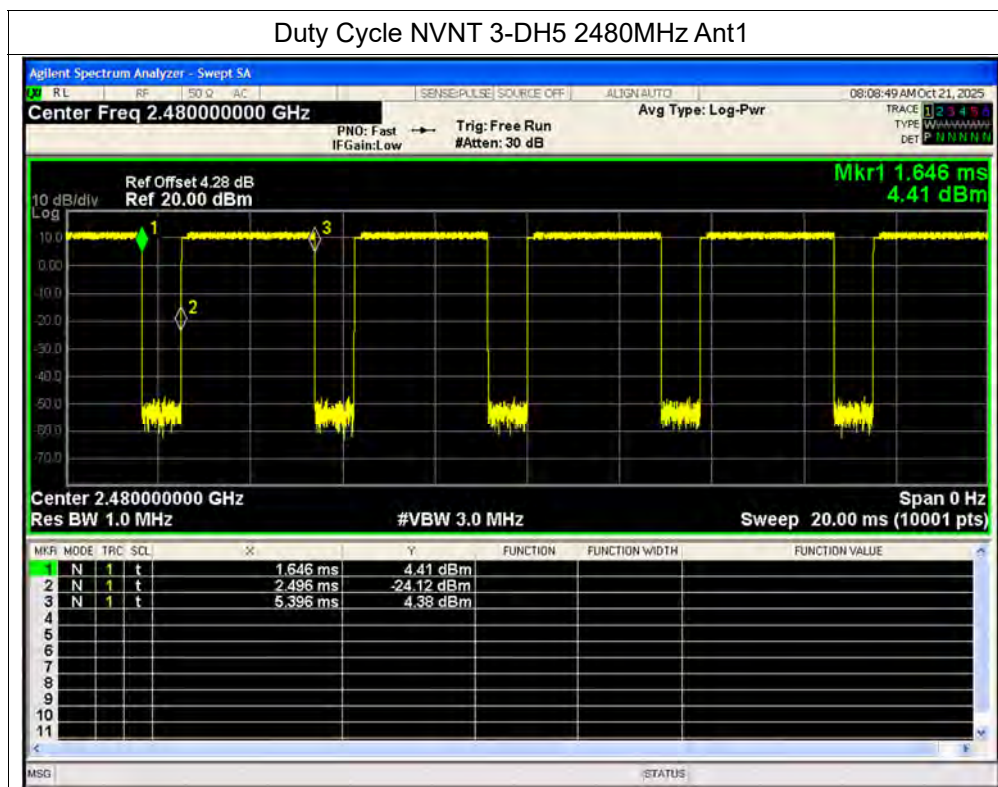


Duty Cycle NVNT 3-DH5 2441MHz Ant1





Duty Cycle NVNT 3-DH5 2480MHz Ant1



**A.3. Maximum Peak Conducted Output Power**

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Duty Factor (dB)	Total Conducted Power (dBm)	Total Conducted Power (W)	Limit Conducted (dBm)	Verdict
NVNT	1-DH5	2402	Ant1	9.35	0	9.35	0.00861	30	Pass
NVNT	1-DH5	2441	Ant1	8.98	0	8.98	0.00791	30	Pass
NVNT	1-DH5	2480	Ant1	9.88	0	9.88	0.00973	30	Pass
NVNT	2-DH5	2402	Ant1	11.64	0	11.64	0.01459	30	Pass
NVNT	2-DH5	2441	Ant1	11.61	0	11.61	0.01449	30	Pass
NVNT	2-DH5	2480	Ant1	12.19	0	12.19	0.01656	30	Pass
NVNT	3-DH5	2402	Ant1	11.67	0	11.67	0.01469	30	Pass
NVNT	3-DH5	2441	Ant1	11.66	0	11.66	0.01466	30	Pass
NVNT	3-DH5	2480	Ant1	12.28	0	12.28	0.0169	30	Pass

Test Graphs

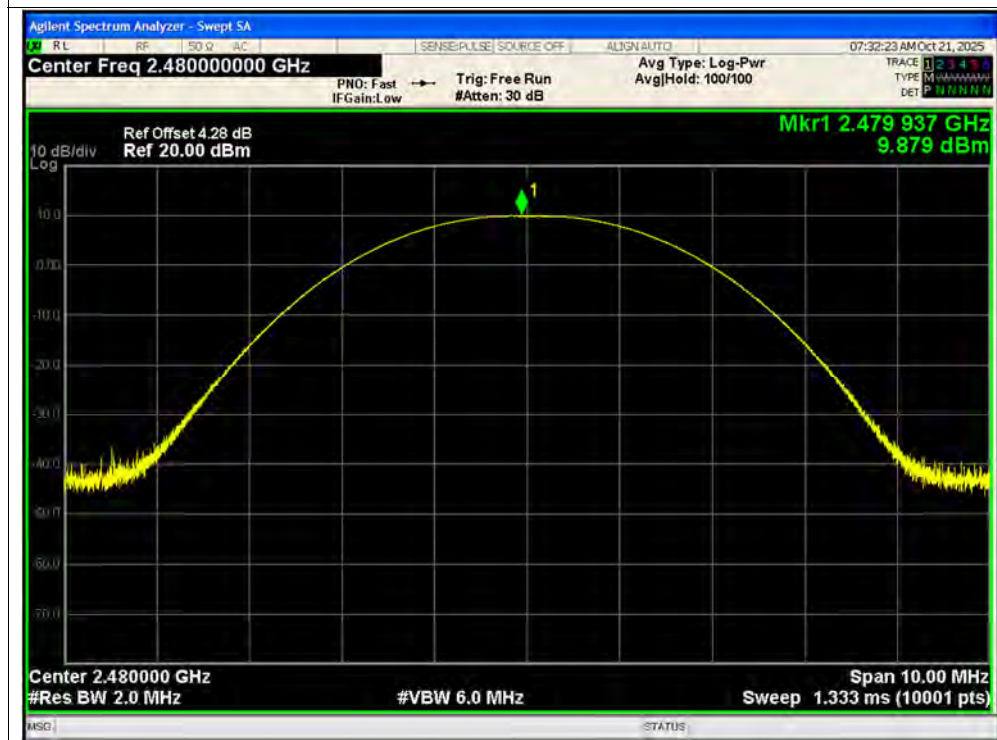
Peak Power NVNT 1-DH5 2402MHz Ant1



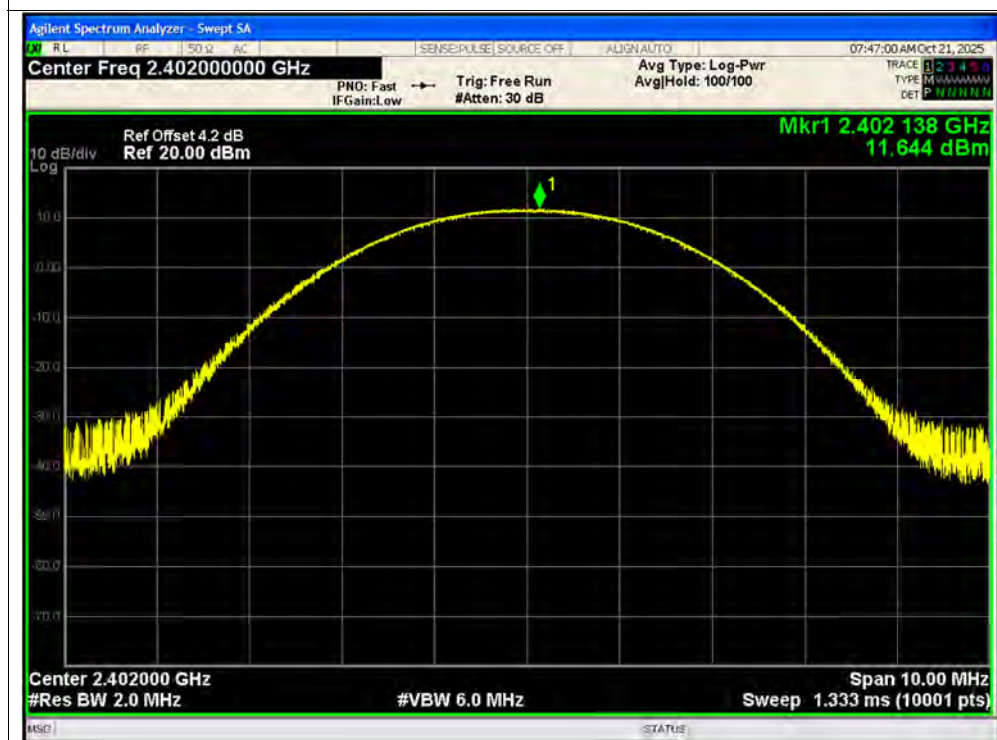
Peak Power NVNT 1-DH5 2441MHz Ant1



Peak Power NVNT 1-DH5 2480MHz Ant1



Peak Power NVNT 2-DH5 2402MHz Ant1



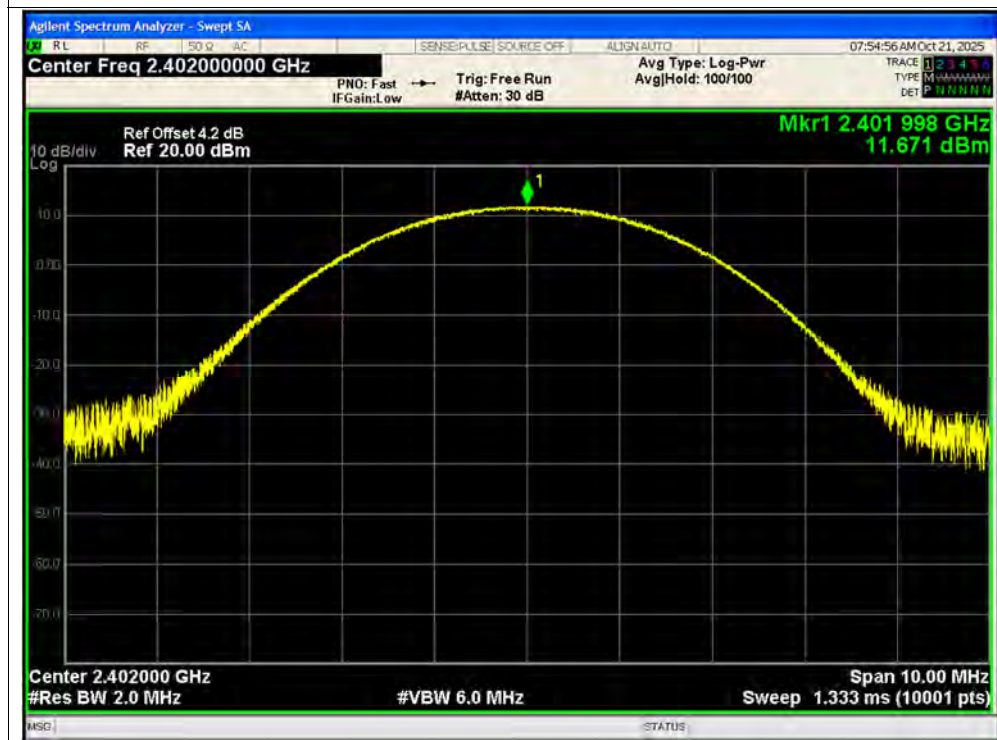
Peak Power NVNT 2-DH5 2441MHz Ant1



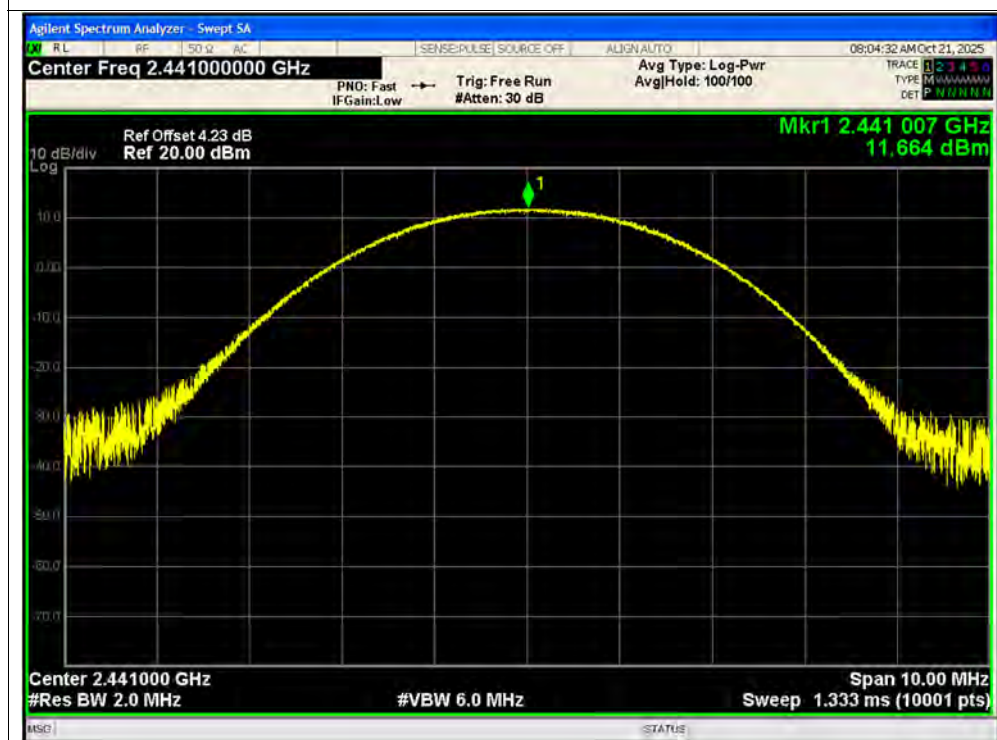
Peak Power NVNT 2-DH5 2480MHz Ant1



Peak Power NVNT 3-DH5 2402MHz Ant1

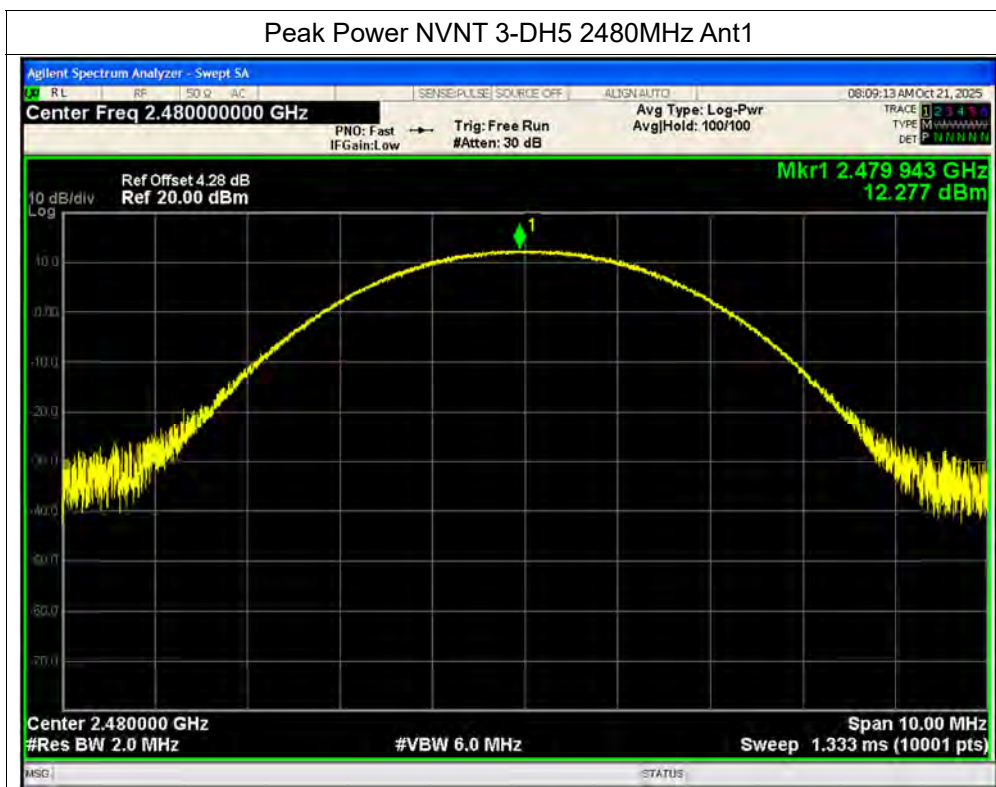


Peak Power NVNT 3-DH5 2441MHz Ant1





Peak Power NVNT 3-DH5 2480MHz Ant1



**A.4. Maximum Average Conducted Output Power**

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Duty Factor (dB)	Total Conducted Power (dBm)	Total Conducted Power (W)	Limit Conducted (dBm)	Verdict
NVNT	1-DH5	2402	Ant1	7.92	1.13	9.05	0.00804	30	Pass
NVNT	1-DH5	2441	Ant1	7.71	1.13	8.84	0.00766	30	Pass
NVNT	1-DH5	2480	Ant1	8.64	1.13	9.77	0.00948	30	Pass
NVNT	2-DH5	2402	Ant1	8.21	1.12	9.33	0.00857	30	Pass
NVNT	2-DH5	2441	Ant1	8.04	1.12	9.16	0.00824	30	Pass
NVNT	2-DH5	2480	Ant1	8.33	1.12	9.45	0.00881	30	Pass
NVNT	3-DH5	2402	Ant1	7.81	1.12	8.93	0.00782	30	Pass
NVNT	3-DH5	2441	Ant1	8.02	1.12	9.14	0.0082	30	Pass
NVNT	3-DH5	2480	Ant1	8.7	1.12	9.82	0.00959	30	Pass



Test Graphs

Average Power NVNT 1-DH5 2402MHz Ant1



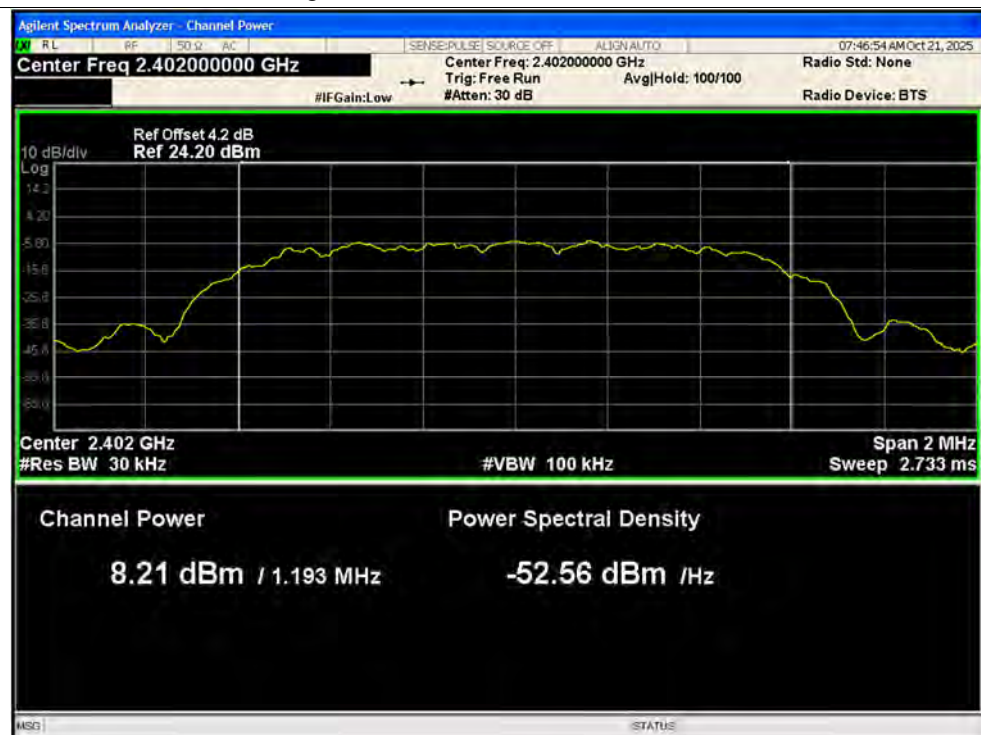
Average Power NVNT 1-DH5 2441MHz Ant1



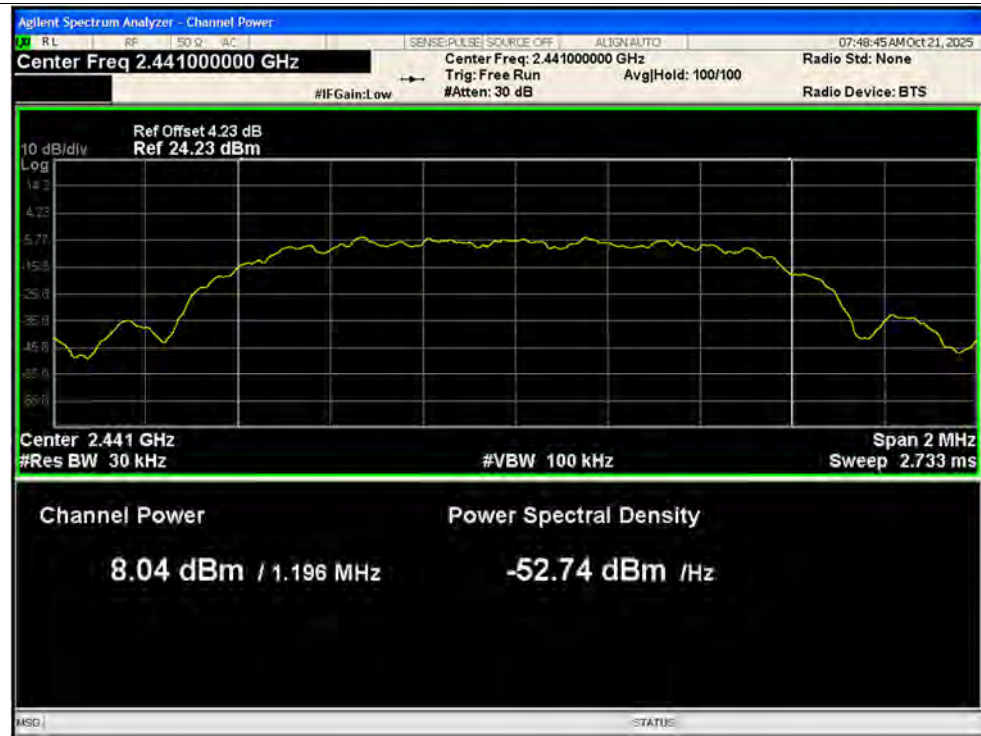
Average Power NVNT 1-DH5 2480MHz Ant1



Average Power NVNT 2-DH5 2402MHz Ant1



Average Power NVNT 2-DH5 2441MHz Ant1

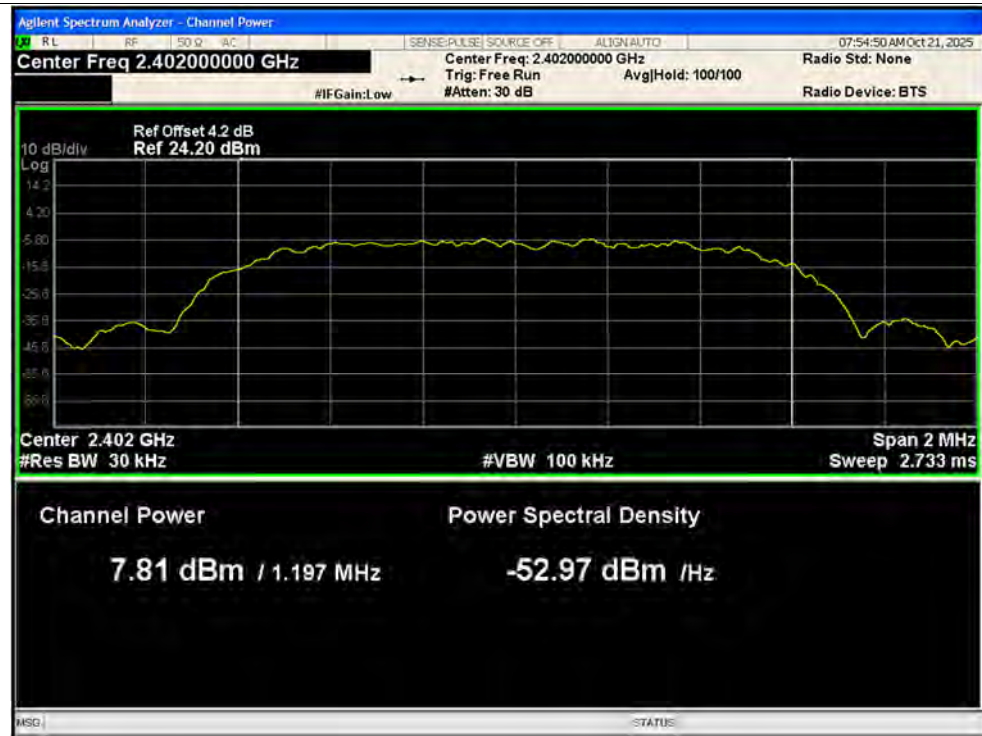


Average Power NVNT 2-DH5 2480MHz Ant1





Average Power NVNT 3-DH5 2402MHz Ant1

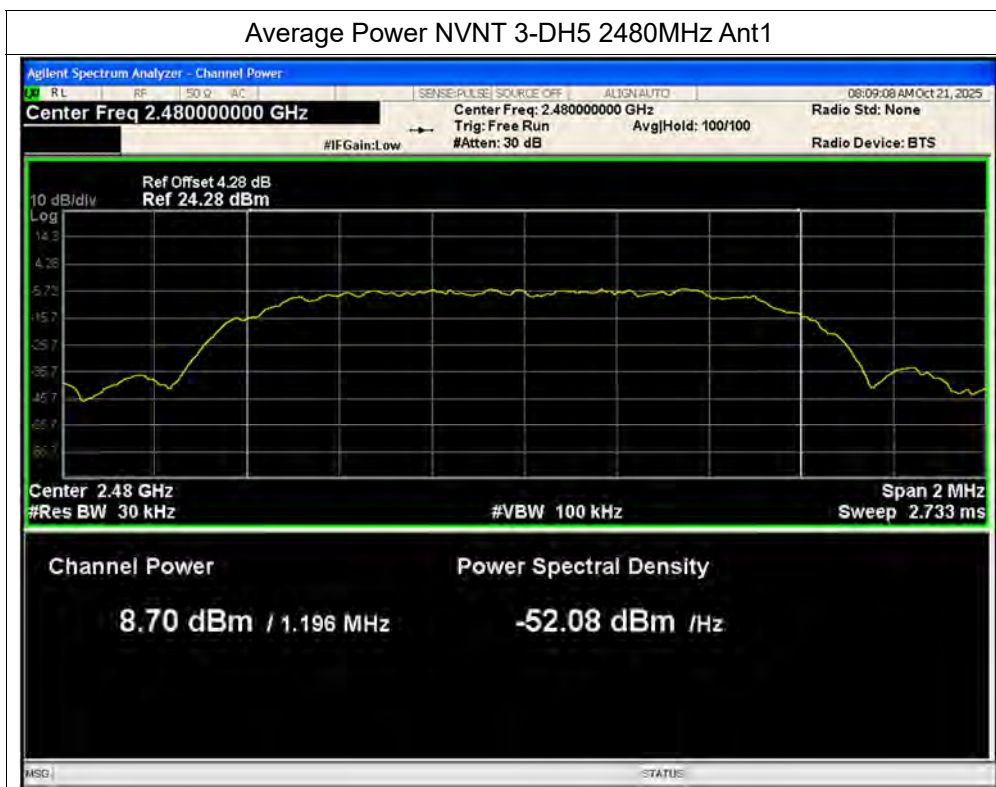


Average Power NVNT 3-DH5 2441MHz Ant1





Average Power NVNT 3-DH5 2480MHz Ant1



**A.5. 20 dB Bandwidth**

Condition	Mode	Frequency (MHz)	Antenna	-20 dB Bandwidth (MHz)
NVNT	1-DH5	2402	Ant1	0.945
NVNT	1-DH5	2441	Ant1	0.9578
NVNT	1-DH5	2480	Ant1	0.9525
NVNT	2-DH5	2402	Ant1	1.336
NVNT	2-DH5	2441	Ant1	1.333
NVNT	2-DH5	2480	Ant1	1.33
NVNT	3-DH5	2402	Ant1	1.308
NVNT	3-DH5	2441	Ant1	1.303
NVNT	3-DH5	2480	Ant1	1.326



Test Graphs

-20dB Bandwidth NVNT 1-DH5 2402MHz Ant1



-20dB Bandwidth NVNT 1-DH5 2441MHz Ant1

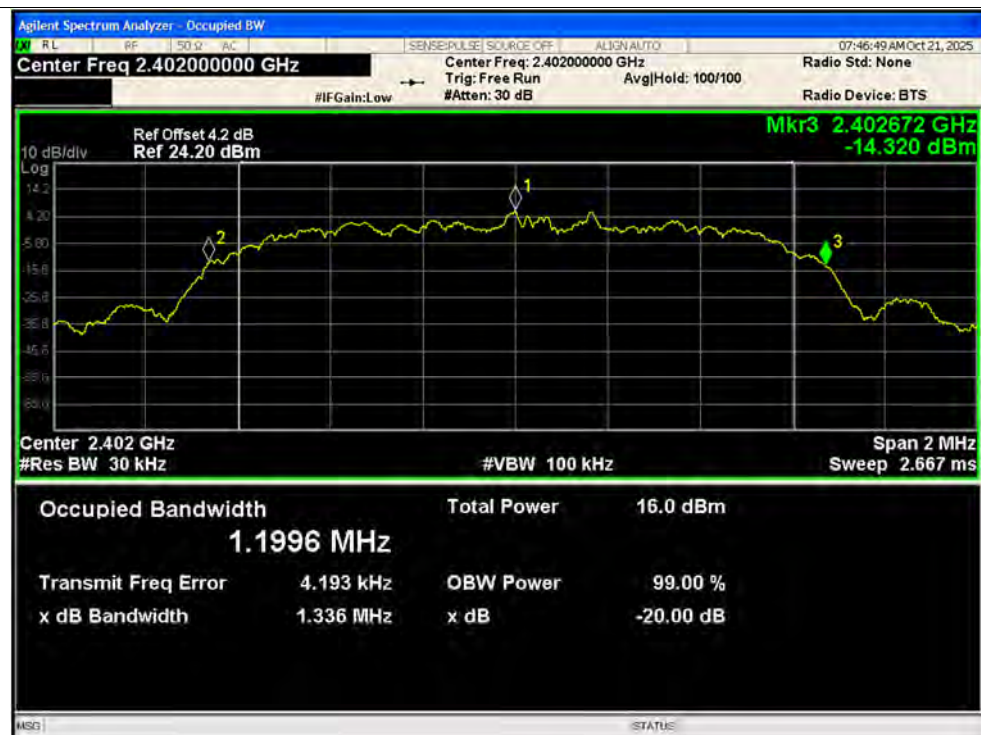




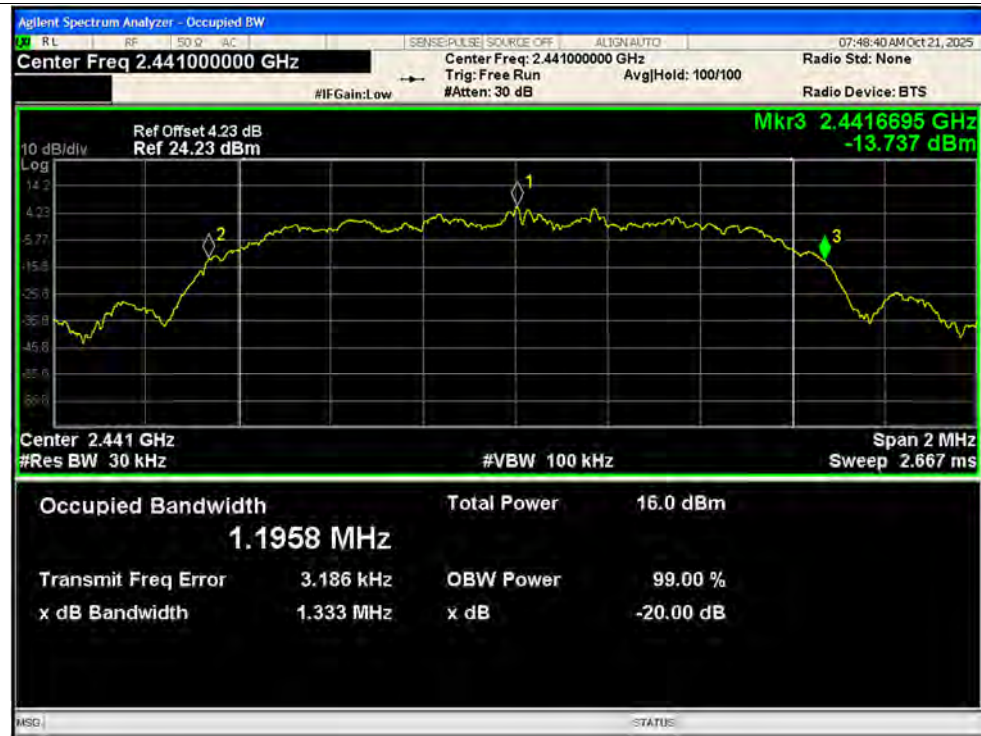
-20dB Bandwidth NVNT 1-DH5 2480MHz Ant1



-20dB Bandwidth NVNT 2-DH5 2402MHz Ant1



-20dB Bandwidth NVNT 2-DH5 2441MHz Ant1

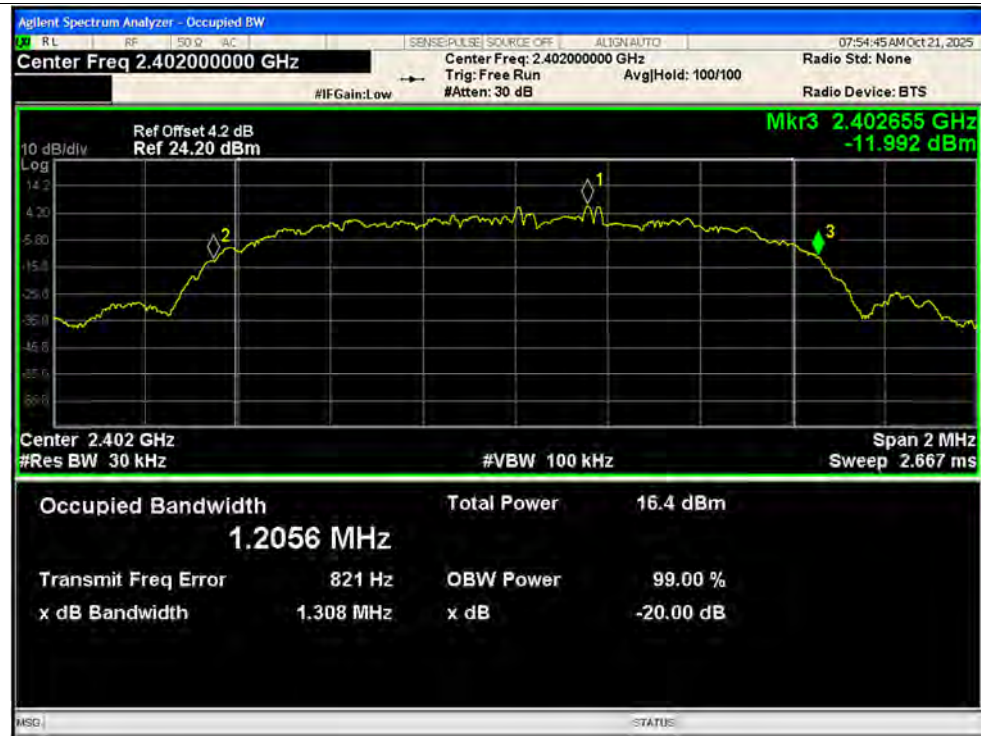


-20dB Bandwidth NVNT 2-DH5 2480MHz Ant1

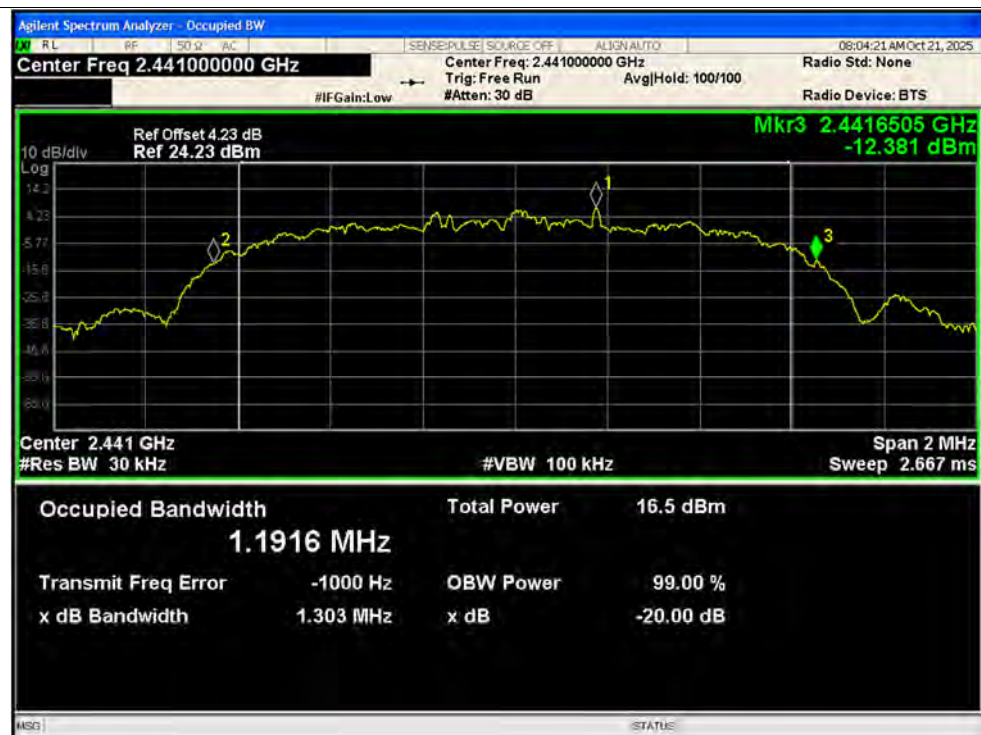




-20dB Bandwidth NVNT 3-DH5 2402MHz Ant1

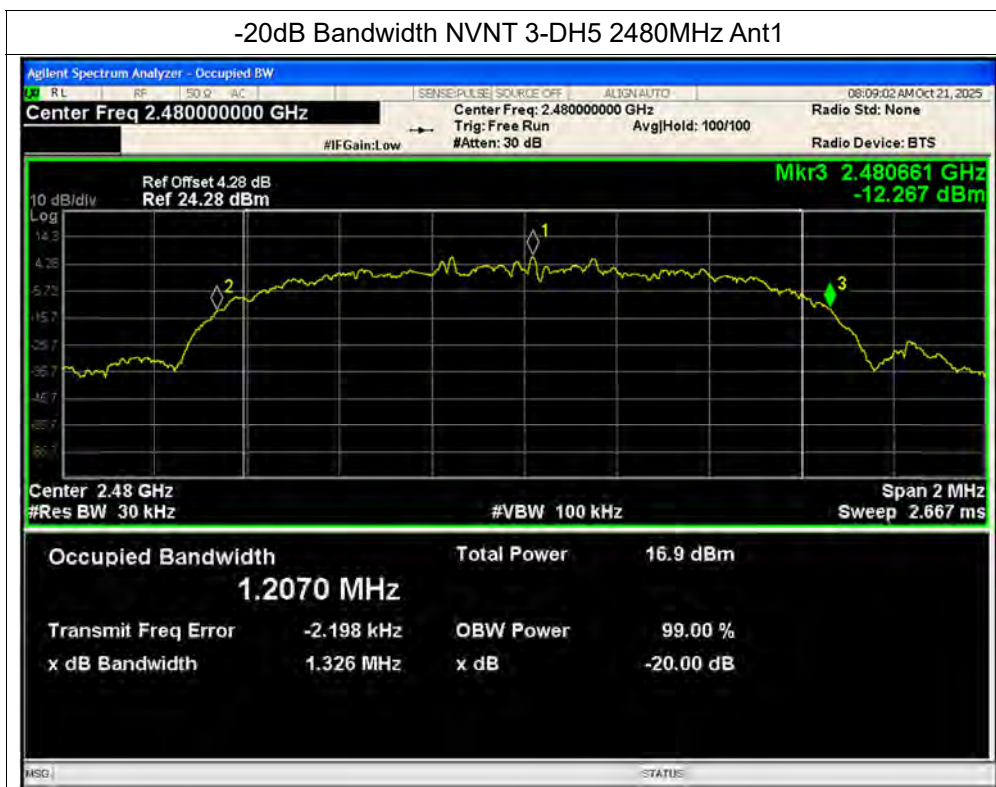


-20dB Bandwidth NVNT 3-DH5 2441MHz Ant1





-20dB Bandwidth NVNT 3-DH5 2480MHz Ant1



**A.6. Carried Frequency Separation**

Condition	Mode	Antenna	Hopping Freq1 (MHz)	Hopping Freq2 (MHz)	HFS (MHz)	Limit (MHz)	Verdict
NVNT	1-DH5	Ant1	2402.002	2403.004	1.002	0.63	Pass
NVNT	1-DH5	Ant1	2441.004	2442.004	1	0.639	Pass
NVNT	1-DH5	Ant1	2479.004	2480.004	1	0.635	Pass
NVNT	2-DH5	Ant1	2402.01	2403.008	0.998	0.891	Pass
NVNT	2-DH5	Ant1	2441.012	2442.014	1.002	0.889	Pass
NVNT	2-DH5	Ant1	2479.01	2480.018	1.008	0.887	Pass
NVNT	3-DH5	Ant1	2402.01	2403.016	1.006	0.872	Pass
NVNT	3-DH5	Ant1	2440.998	2442.172	1.174	0.869	Pass
NVNT	3-DH5	Ant1	2478.842	2480.188	1.346	0.884	Pass

Test Graphs

CFS NVNT 1-DH5 2402MHz Ant1



CFS NVNT 1-DH5 2441MHz Ant1

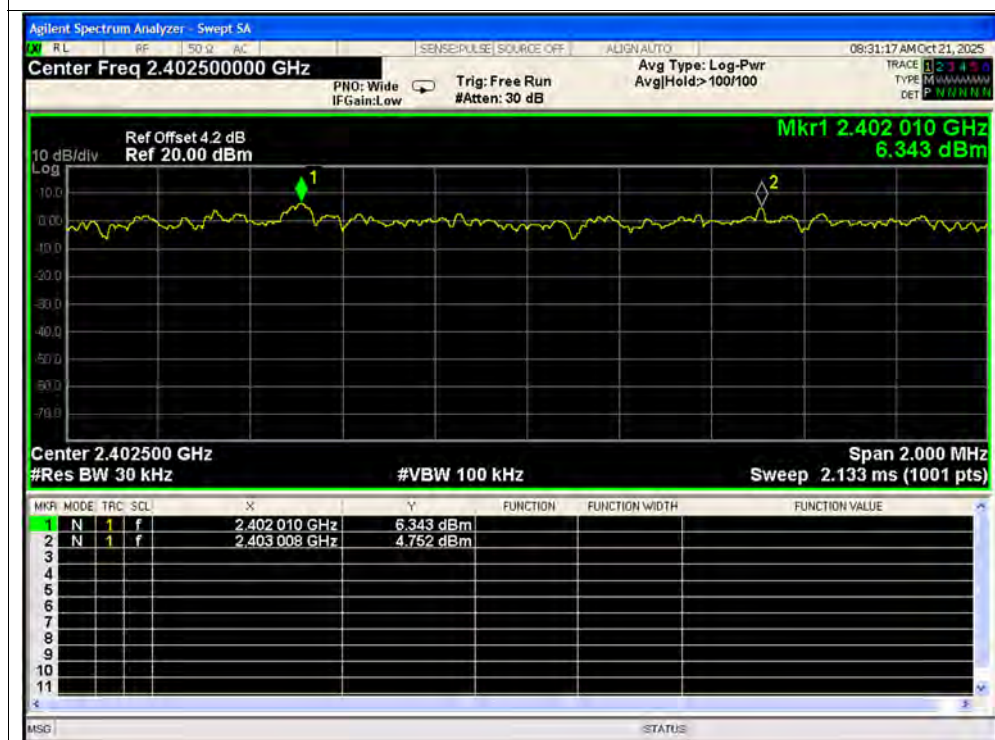




CFS NVNT 1-DH5 2480MHz Ant1

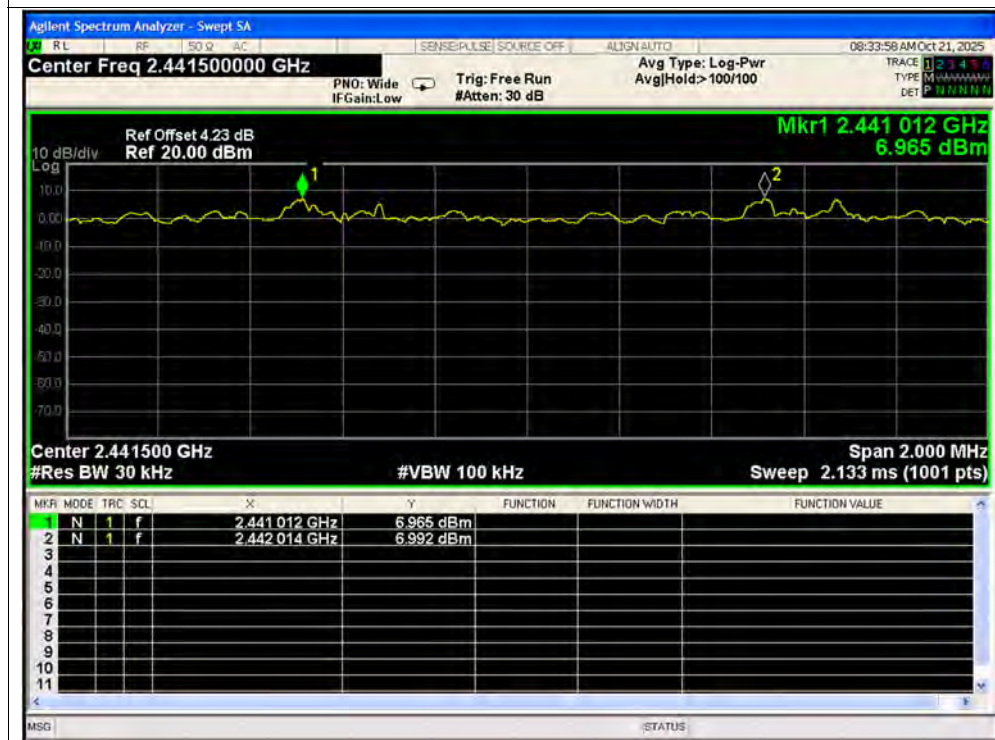


CFS NVNT 2-DH5 2402MHz Ant1

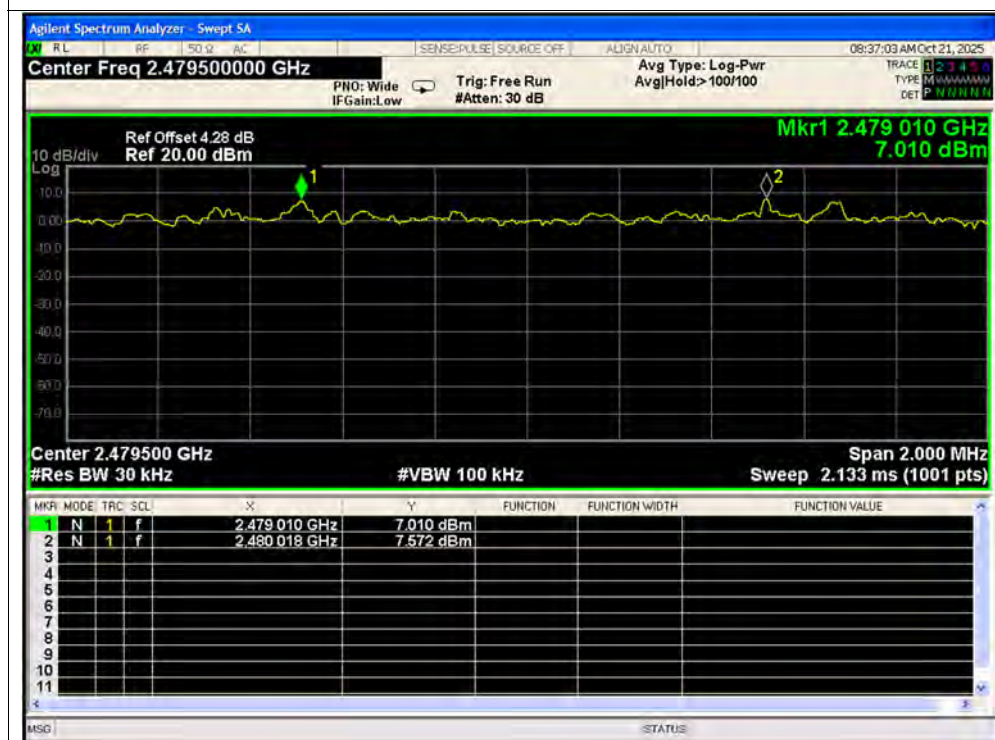




CFS NVNT 2-DH5 2441MHz Ant1

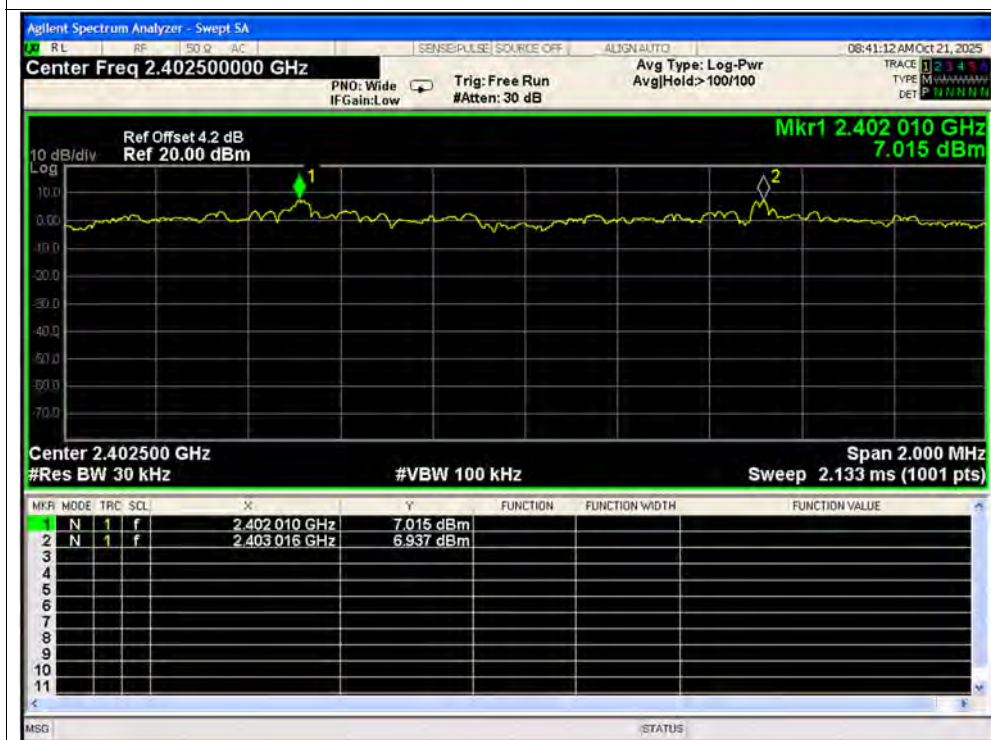


CFS NVNT 2-DH5 2480MHz Ant1

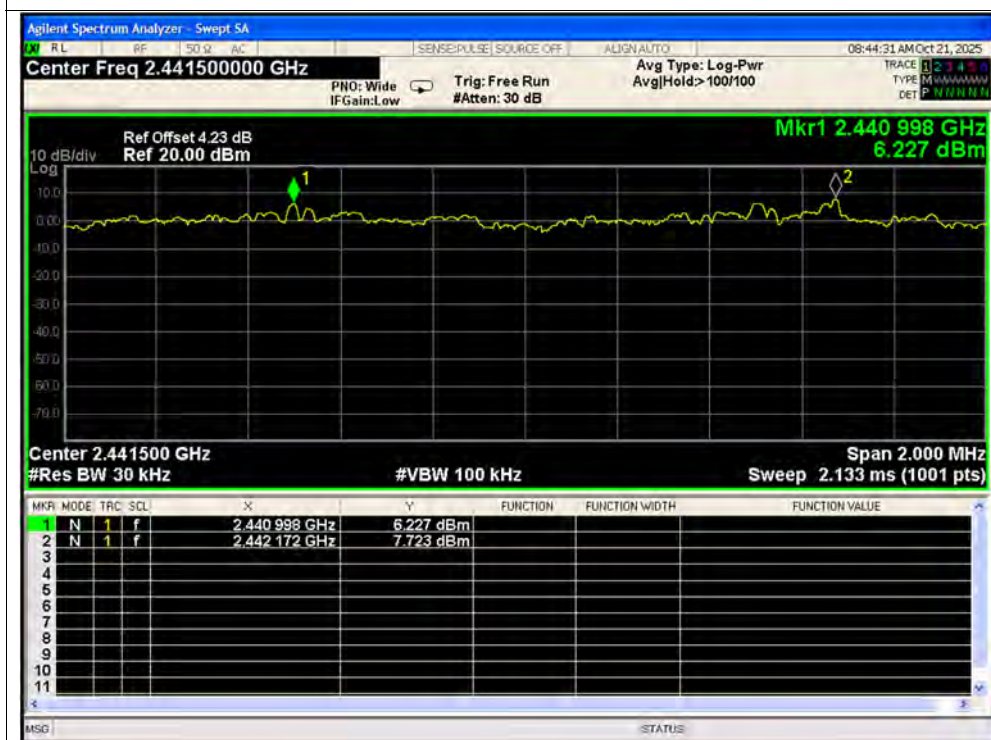




CFS NVNT 3-DH5 2402MHz Ant1

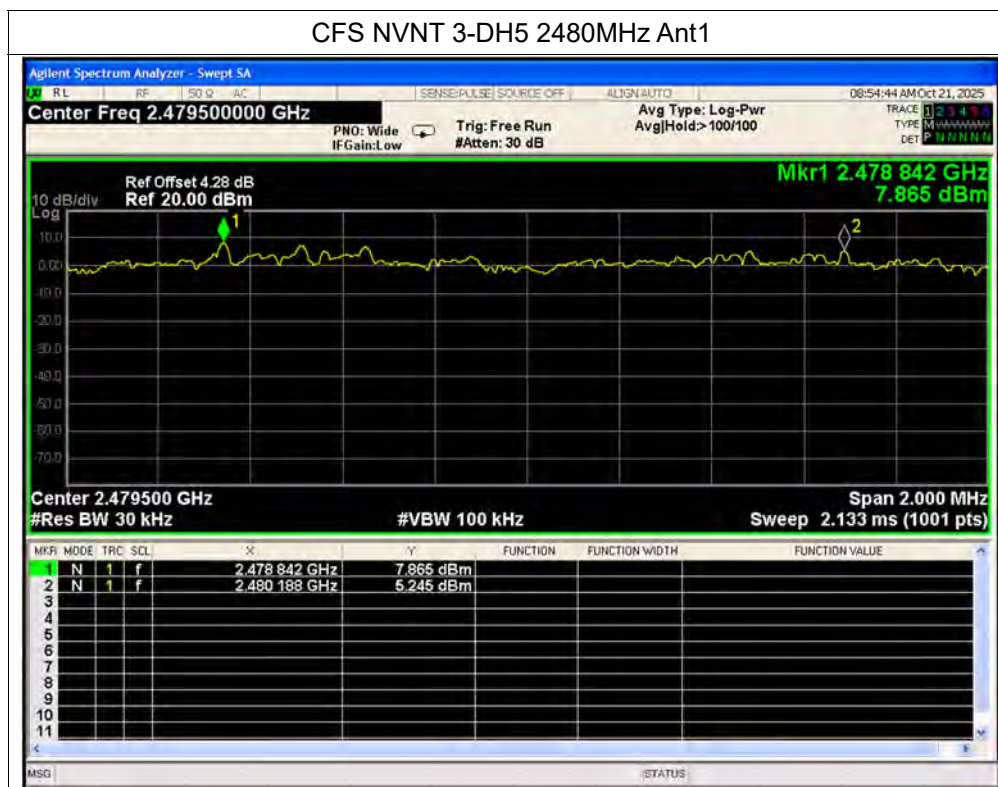


CFS NVNT 3-DH5 2441MHz Ant1





CFS NVNT 3-DH5 2480MHz Ant1



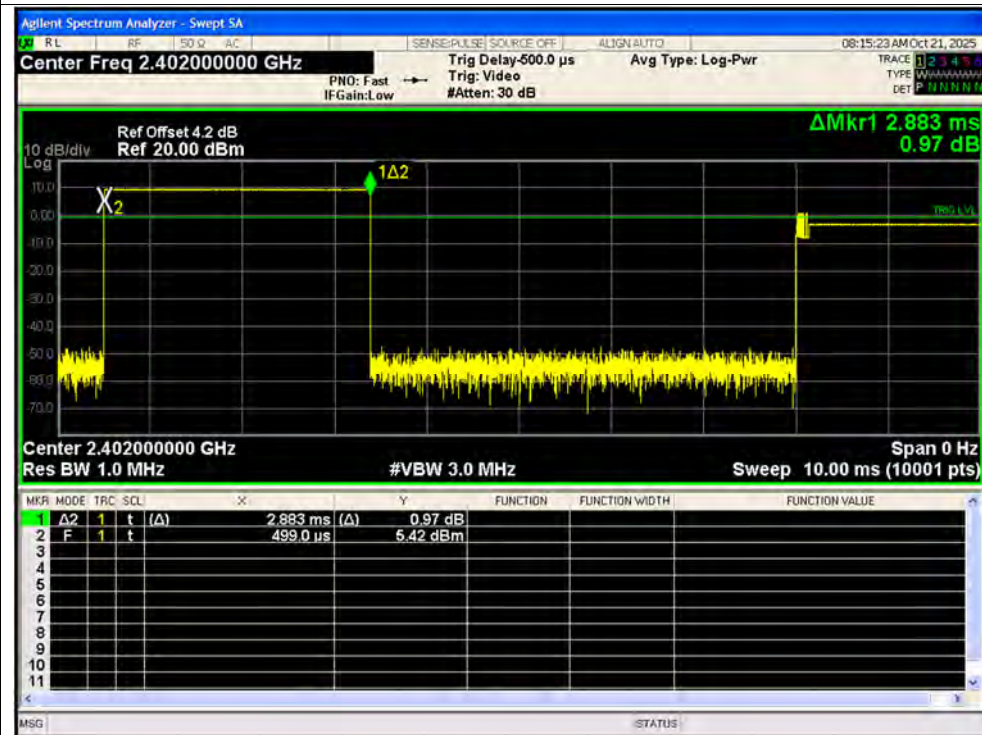
**A.7. Time of Occupancy (Dwell time)**

Condition	Mode	Frequency (MHz)	Antenna	Pulse Time (ms)	Total Dwell Time (ms)	Burst Count	Period Time (ms)	Limit (ms)	Verdict
NVNT	1-DH5	2402	Ant1	2.883	305.598	106	31600	400	Pass
NVNT	1-DH5	2441	Ant1	2.884	305.704	106	31600	400	Pass
NVNT	1-DH5	2480	Ant1	2.883	308.481	107	31600	400	Pass
NVNT	2-DH5	2402	Ant1	2.889	309.123	107	31600	400	Pass
NVNT	2-DH5	2441	Ant1	2.889	309.123	107	31600	400	Pass
NVNT	2-DH5	2480	Ant1	2.889	309.123	107	31600	400	Pass
NVNT	3-DH5	2402	Ant1	2.89	309.23	107	31600	400	Pass
NVNT	3-DH5	2441	Ant1	2.89	303.45	105	31600	400	Pass
NVNT	3-DH5	2480	Ant1	2.89	309.23	107	31600	400	Pass

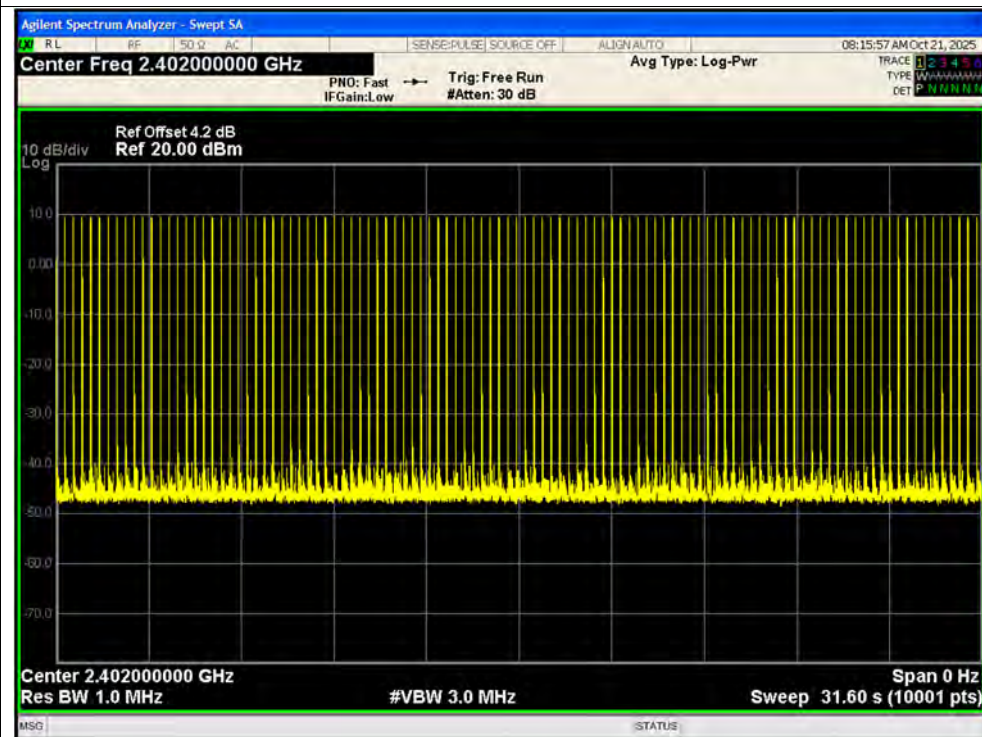


Test Graphs

Dwell NVNT 1-DH5 2402MHz Ant1 One Burst

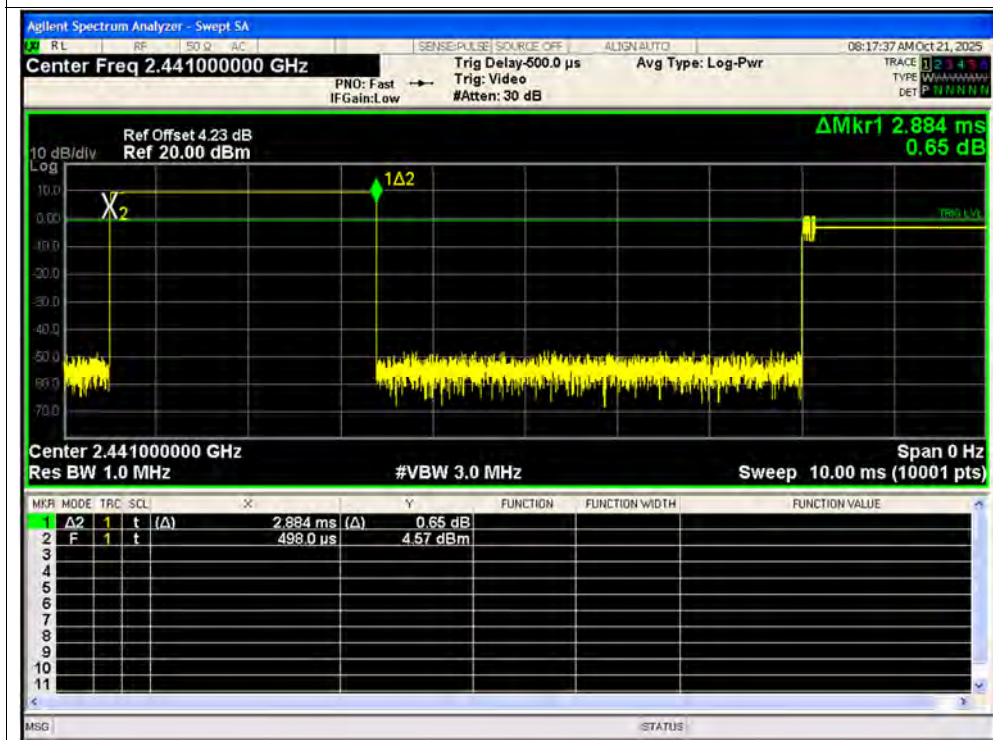


Dwell NVNT 1-DH5 2402MHz Ant1 Accumulated

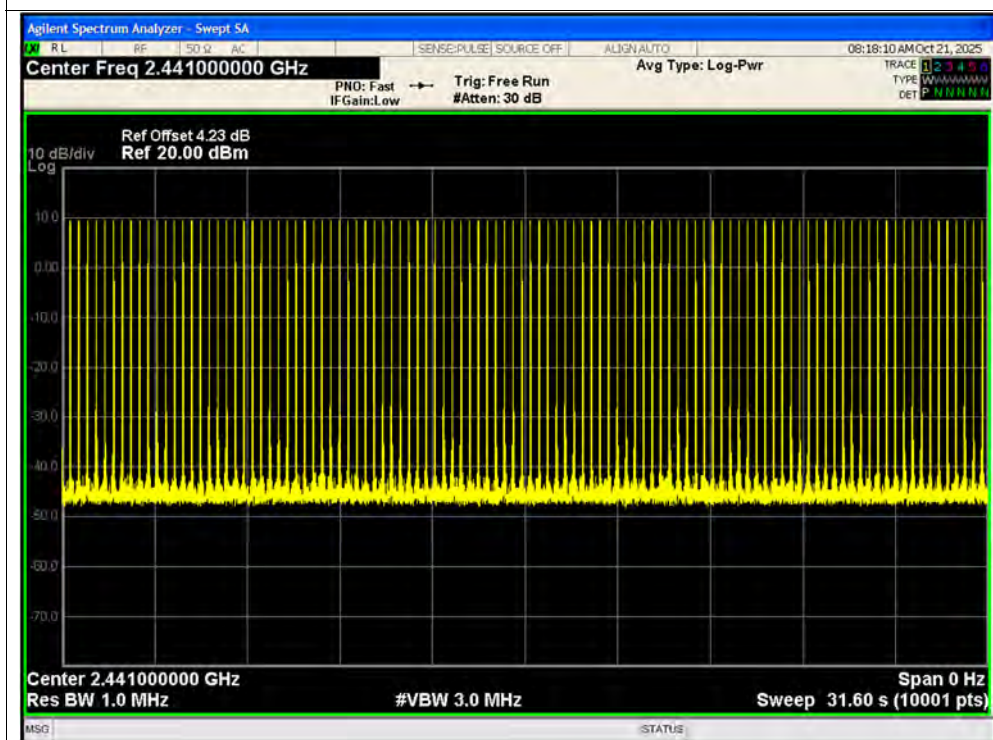




Dwell NVNT 1-DH5 2441MHz Ant1 One Burst

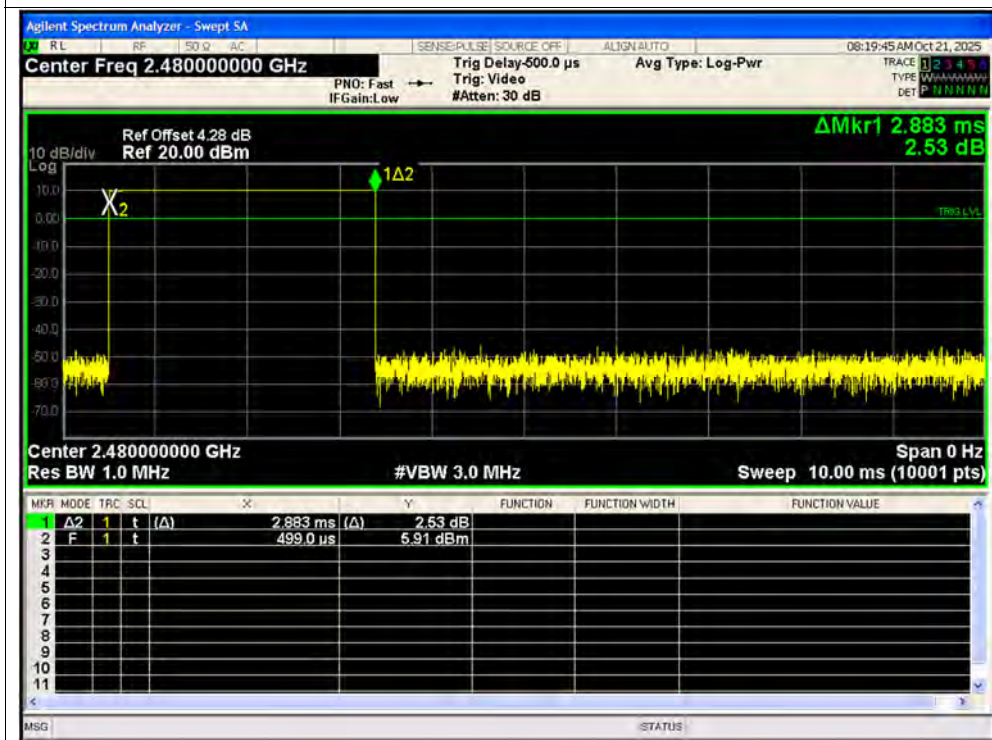


Dwell NVNT 1-DH5 2441MHz Ant1 Accumulated

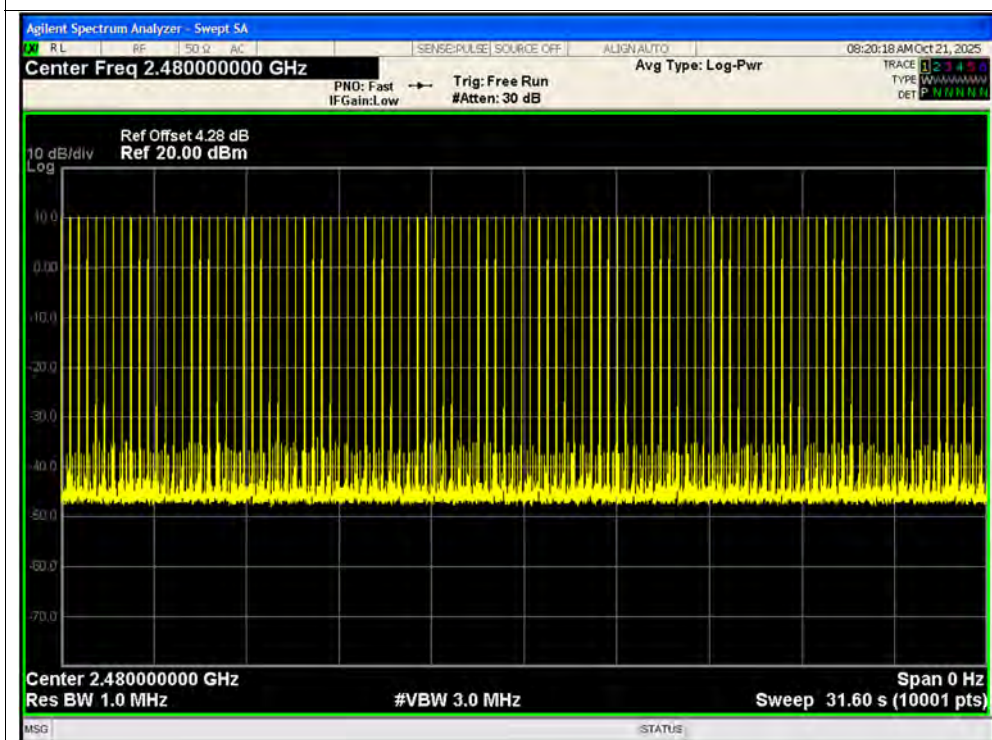




Dwell NVNT 1-DH5 2480MHz Ant1 One Burst

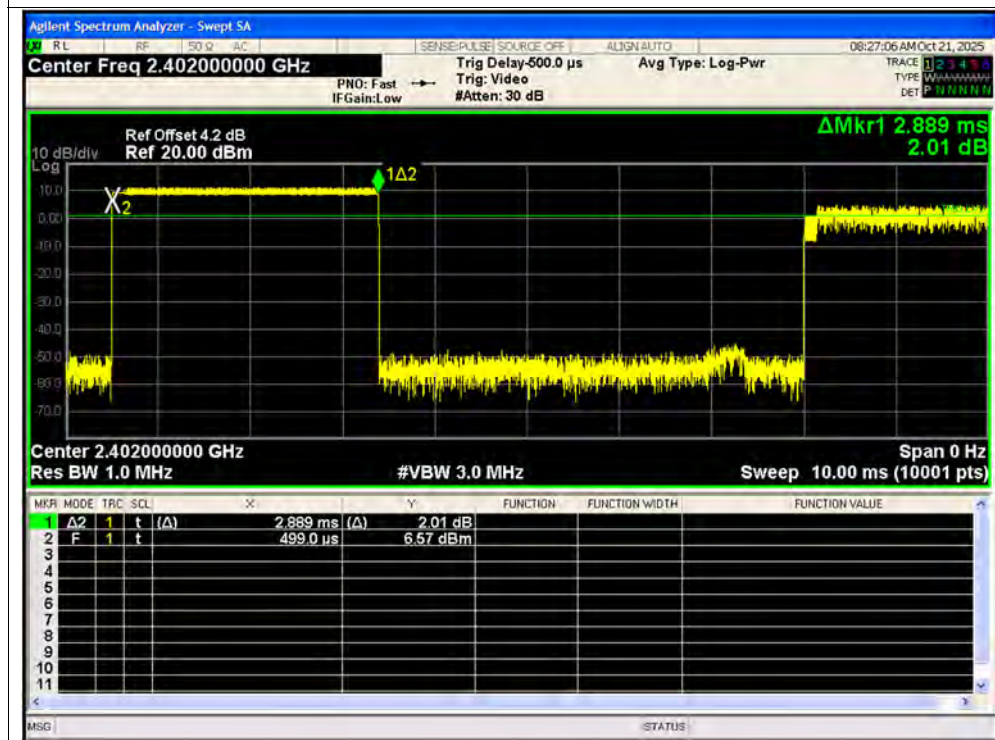


Dwell NVNT 1-DH5 2480MHz Ant1 Accumulated

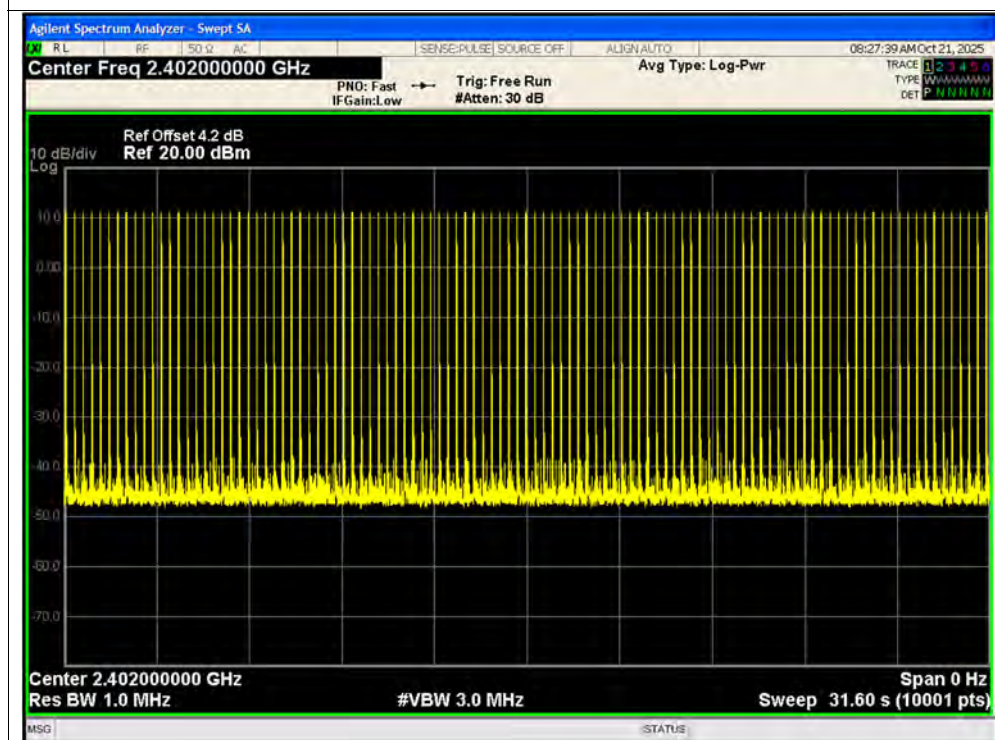




Dwell NVNT 2-DH5 2402MHz Ant1 One Burst

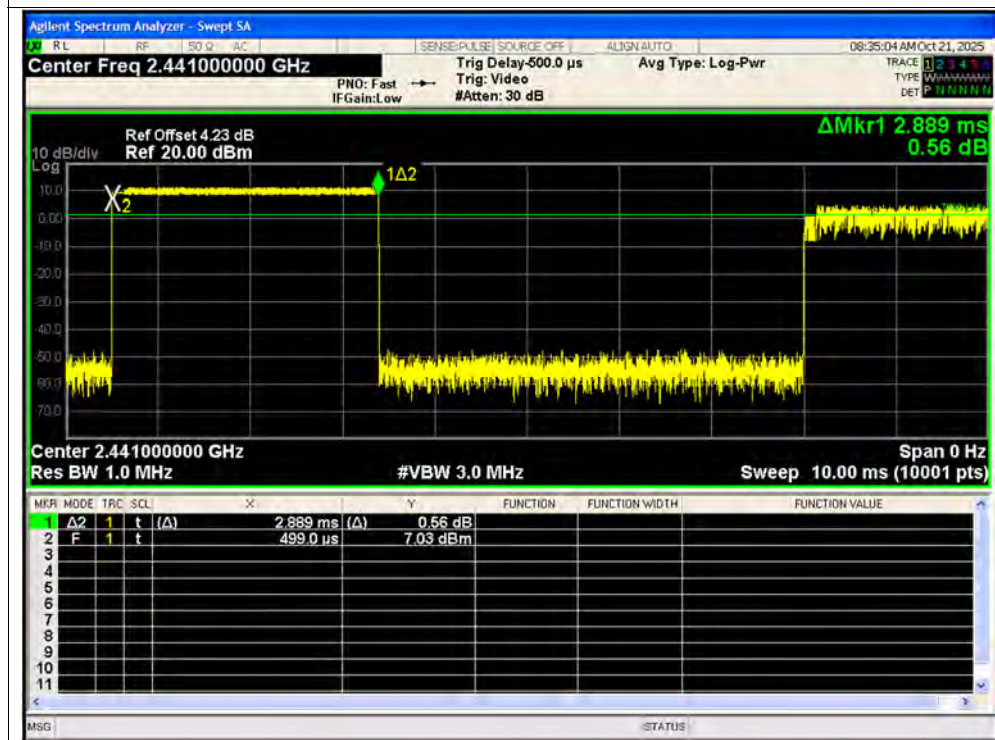


Dwell NVNT 2-DH5 2402MHz Ant1 Accumulated

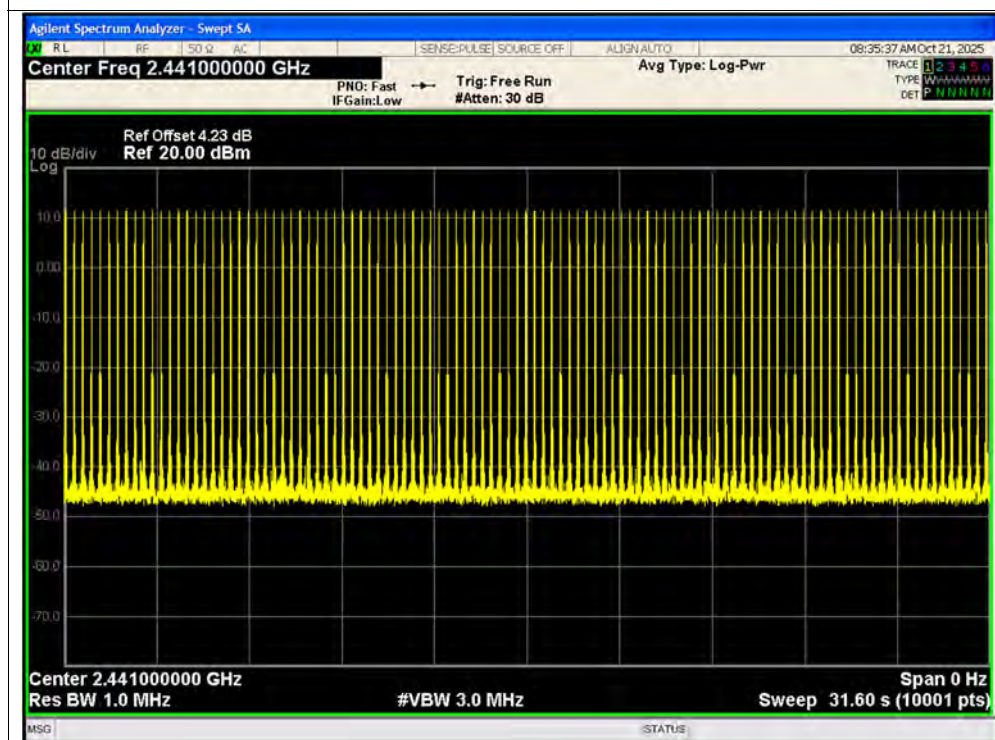




Dwell NVNT 2-DH5 2441MHz Ant1 One Burst

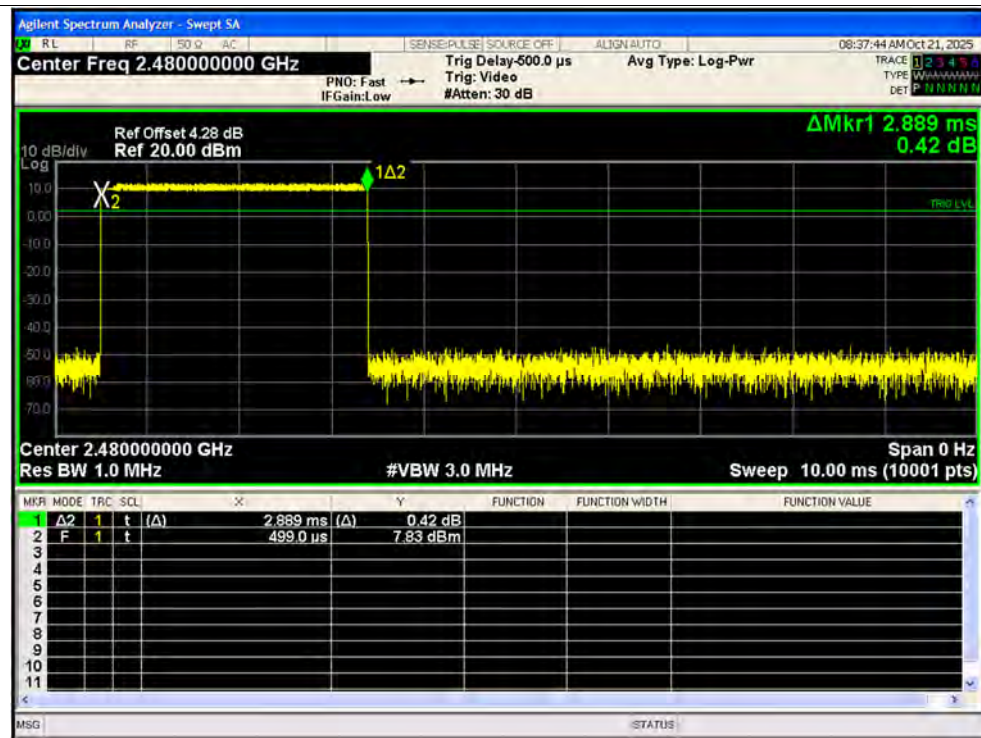


Dwell NVNT 2-DH5 2441MHz Ant1 Accumulated

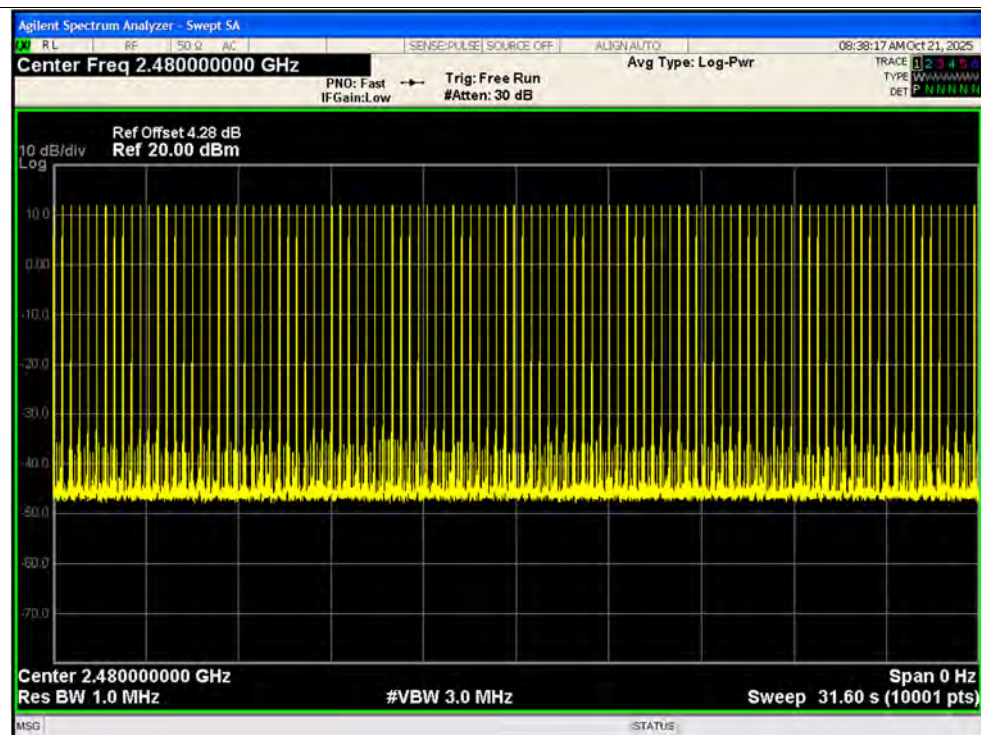




Dwell NVNT 2-DH5 2480MHz Ant1 One Burst

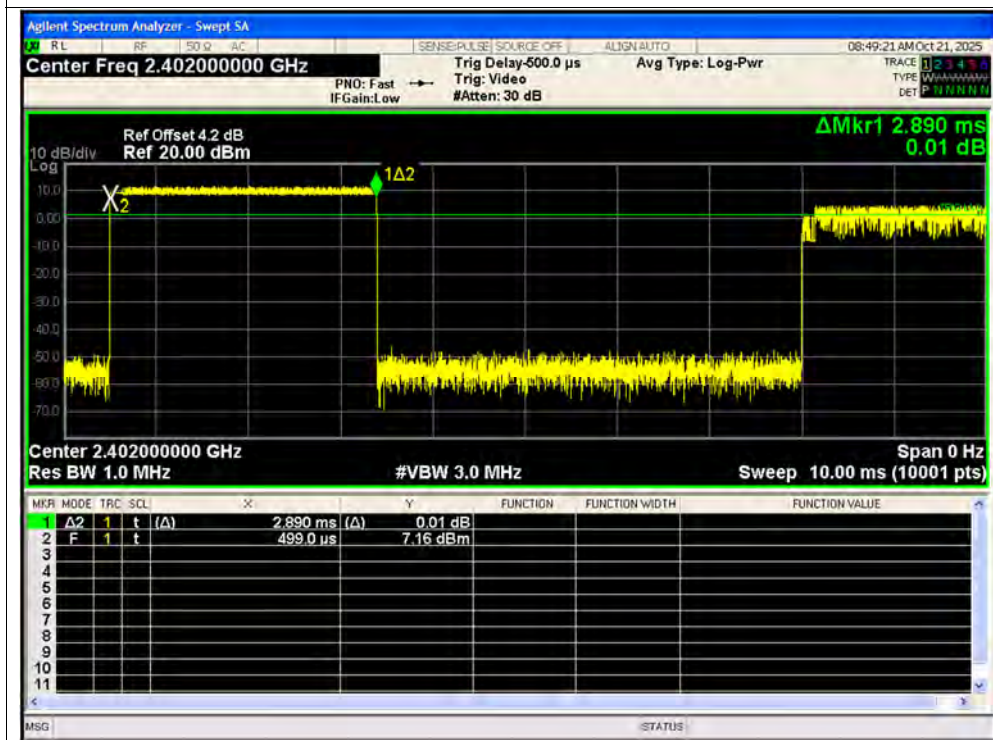


Dwell NVNT 2-DH5 2480MHz Ant1 Accumulated

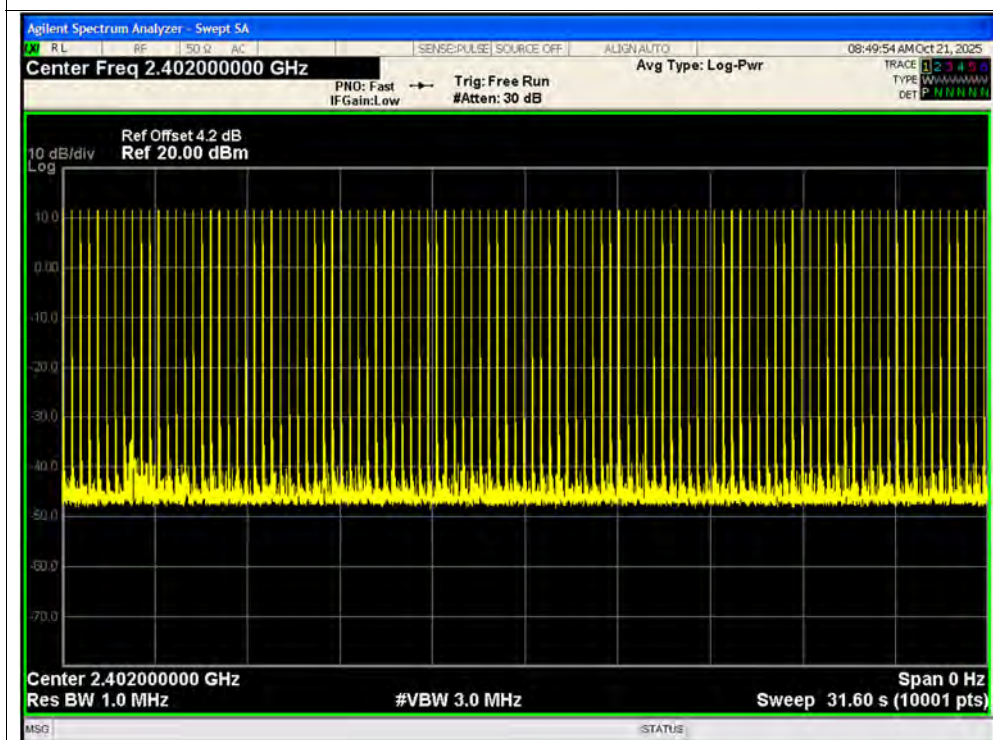




Dwell NVNT 3-DH5 2402MHz Ant1 One Burst

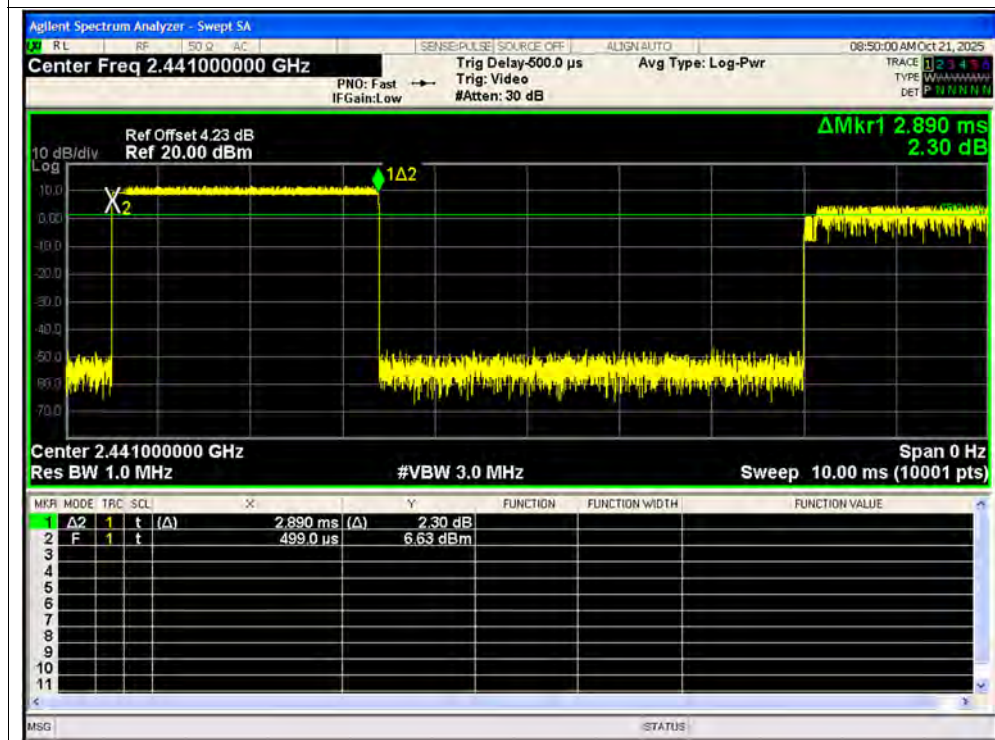


Dwell NVNT 3-DH5 2402MHz Ant1 Accumulated

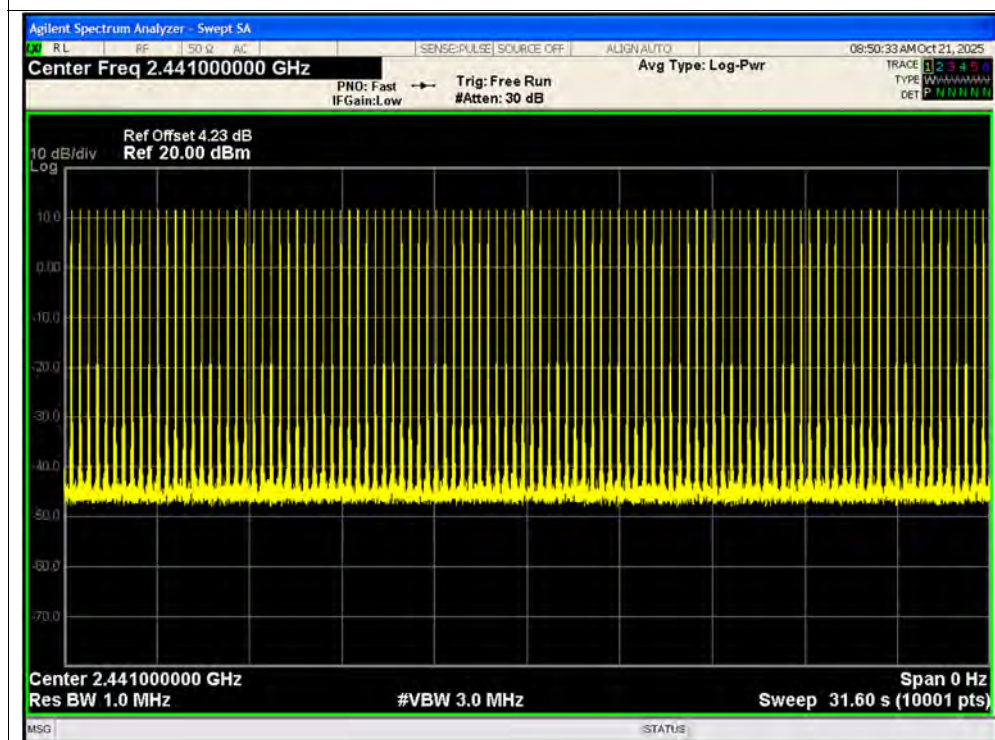




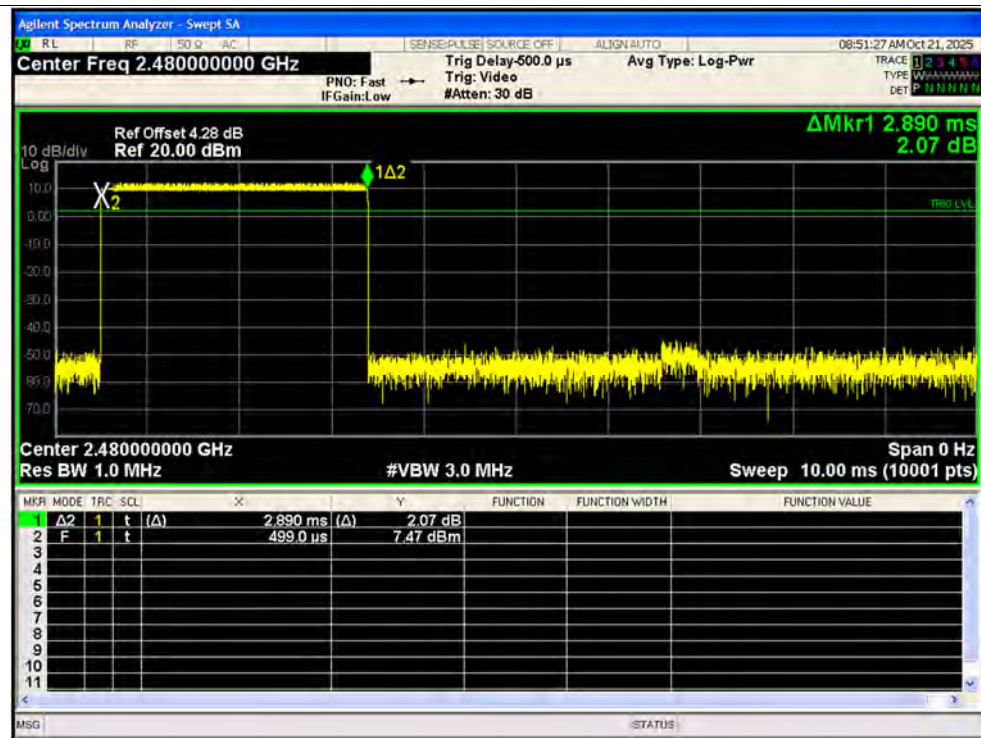
Dwell NVNT 3-DH5 2441MHz Ant1 One Burst



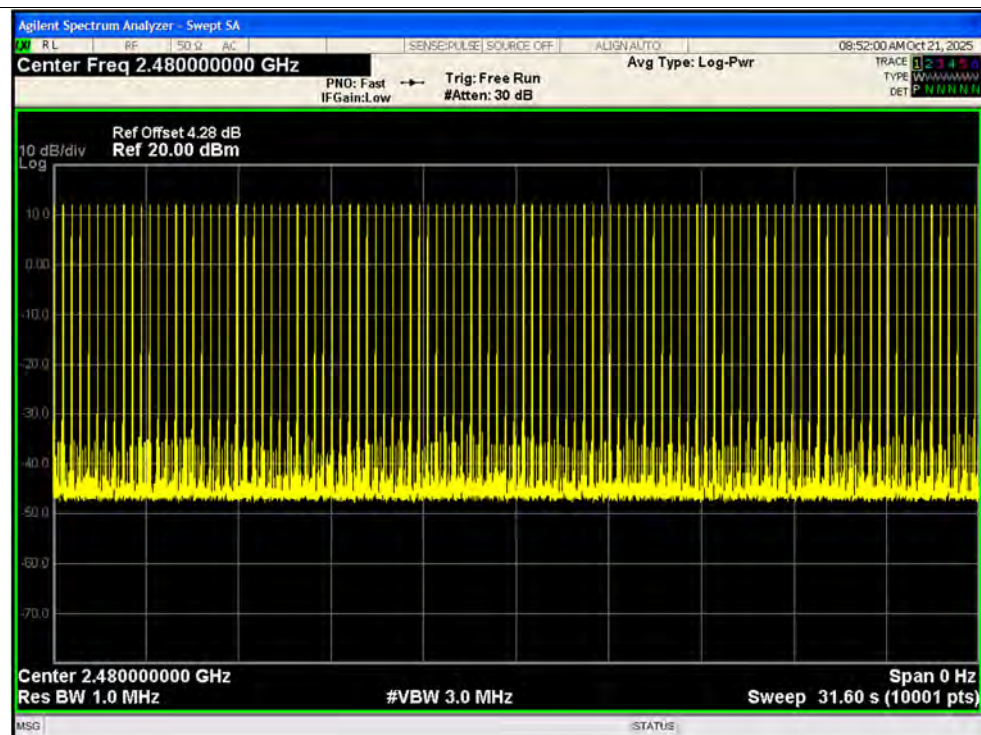
Dwell NVNT 3-DH5 2441MHz Ant1 Accumulated



Dwell NVNT 3-DH5 2480MHz Ant1 One Burst



Dwell NVNT 3-DH5 2480MHz Ant1 Accumulated



**A.8. Conducted Spurious Emissions**

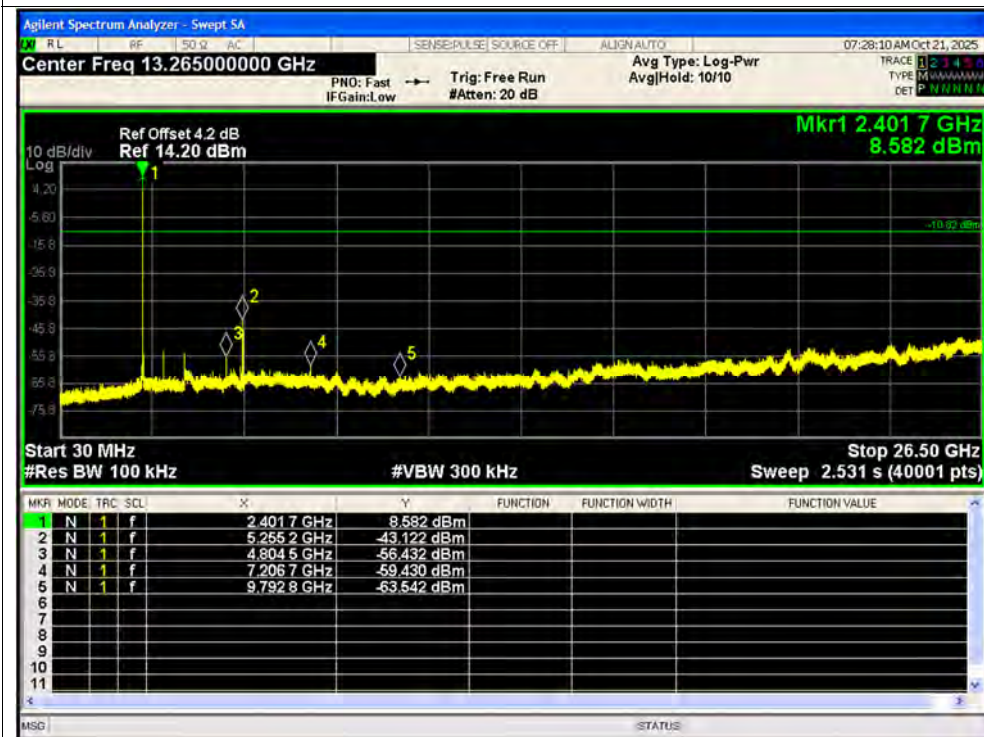
Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH5	2402	Ant1	-52.3	-20	Pass
NVNT	1-DH5	2441	Ant1	-56.83	-20	Pass
NVNT	1-DH5	2480	Ant1	-57.53	-20	Pass
NVNT	2-DH5	2402	Ant1	-57.26	-20	Pass
NVNT	2-DH5	2441	Ant1	-57.44	-20	Pass
NVNT	2-DH5	2480	Ant1	-57.91	-20	Pass
NVNT	3-DH5	2402	Ant1	-57.41	-20	Pass
NVNT	3-DH5	2441	Ant1	-57.47	-20	Pass
NVNT	3-DH5	2480	Ant1	-56.12	-20	Pass

Test Graphs

Tx. Spurious NVNT 1-DH5 2402MHz Ant1 Ref



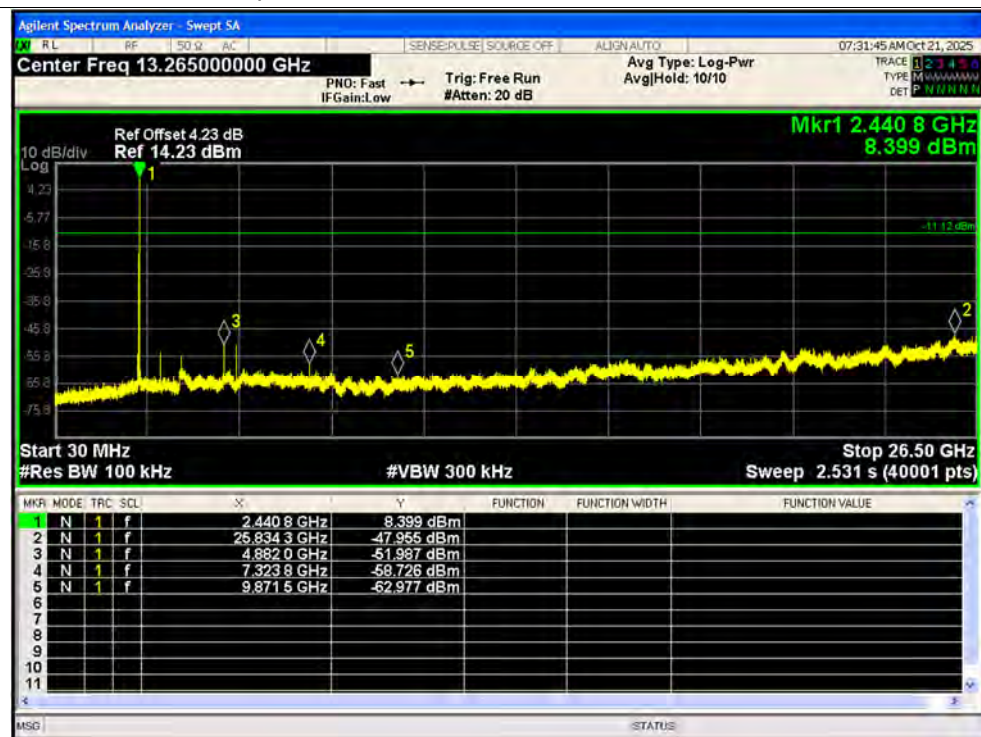
Tx. Spurious NVNT 1-DH5 2402MHz Ant1 Emission



Tx. Spurious NVNT 1-DH5 2441MHz Ant1 Ref



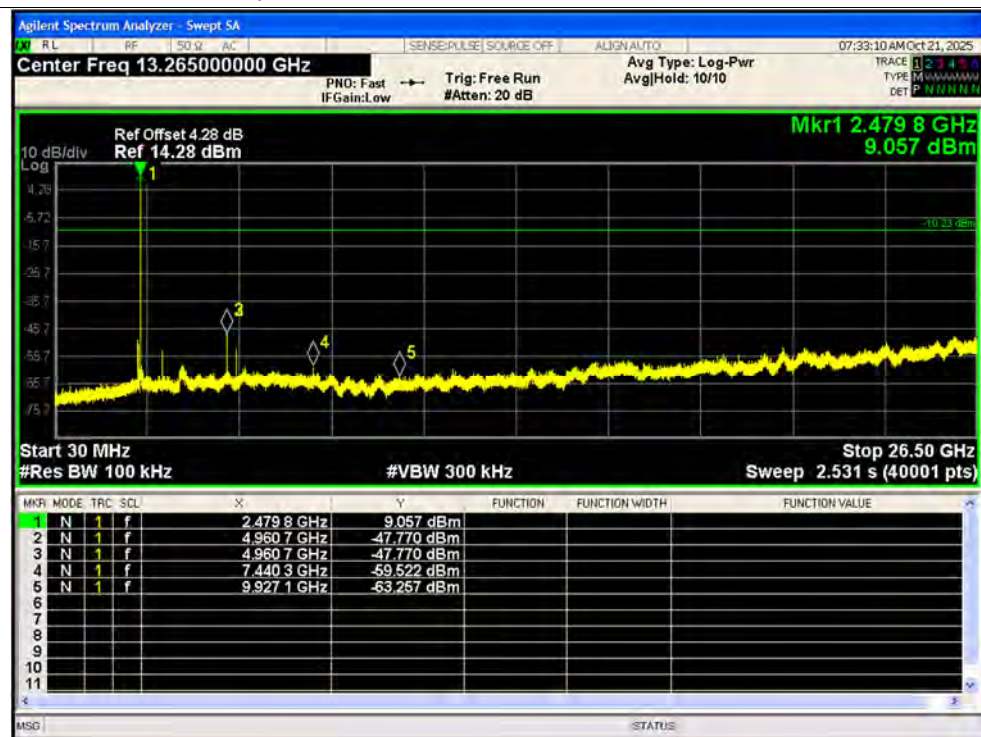
Tx. Spurious NVNT 1-DH5 2441MHz Ant1 Emission



Tx. Spurious NVNT 1-DH5 2480MHz Ant1 Ref



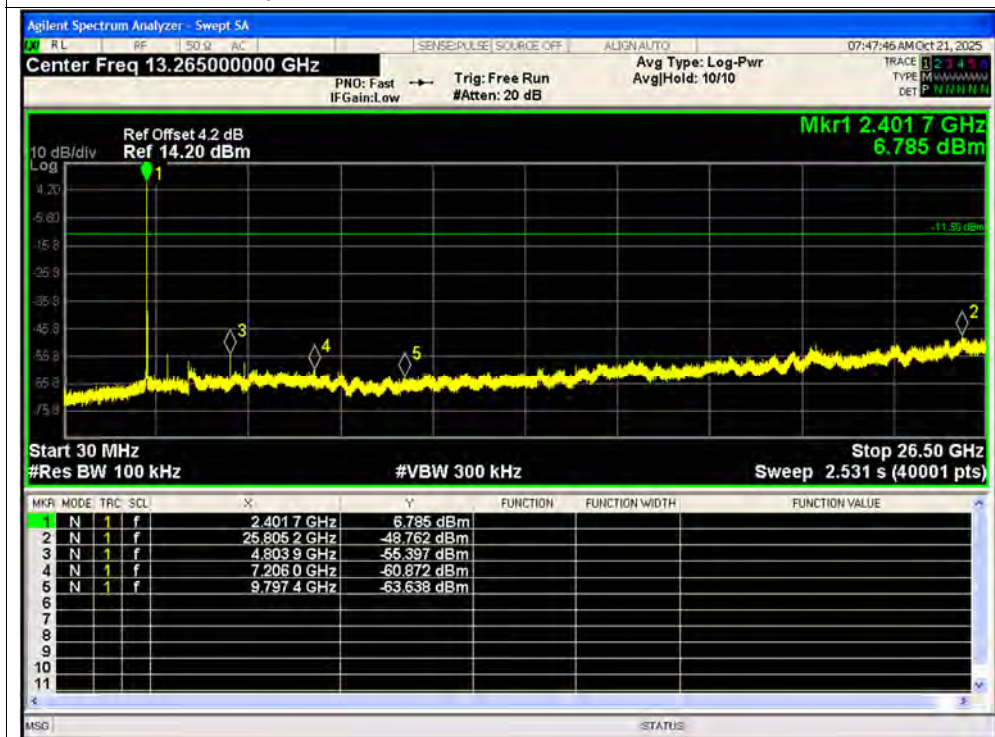
Tx. Spurious NVNT 1-DH5 2480MHz Ant1 Emission



Tx. Spurious NVNT 2-DH5 2402MHz Ant1 Ref



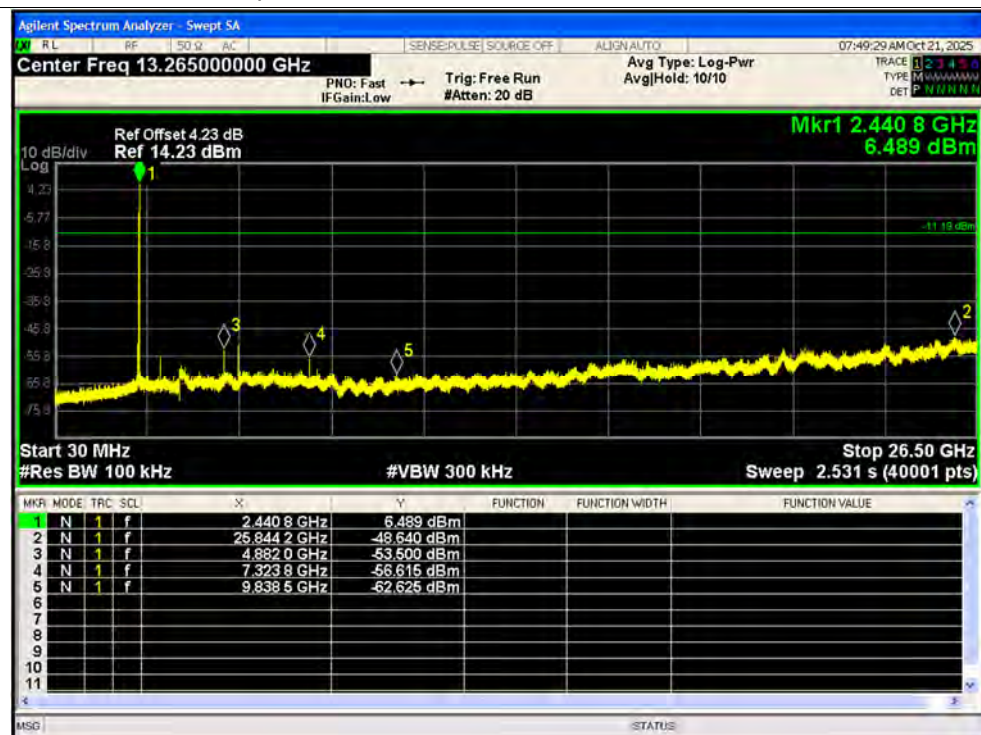
Tx. Spurious NVNT 2-DH5 2402MHz Ant1 Emission



Tx. Spurious NVNT 2-DH5 2441MHz Ant1 Ref



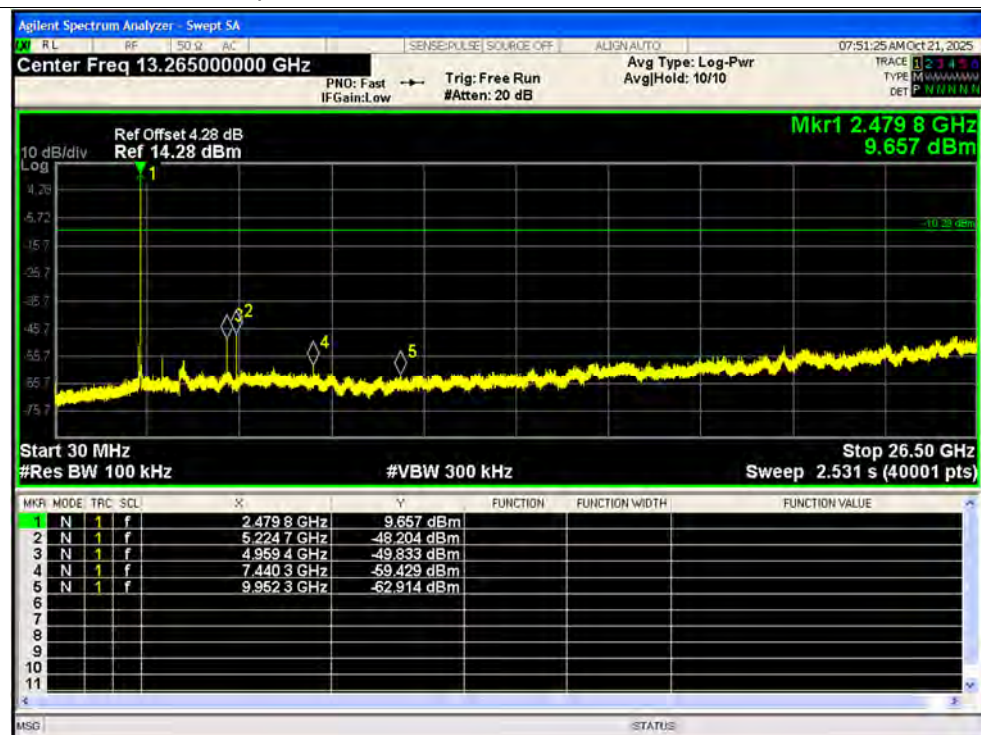
Tx. Spurious NVNT 2-DH5 2441MHz Ant1 Emission



Tx. Spurious NVNT 2-DH5 2480MHz Ant1 Ref



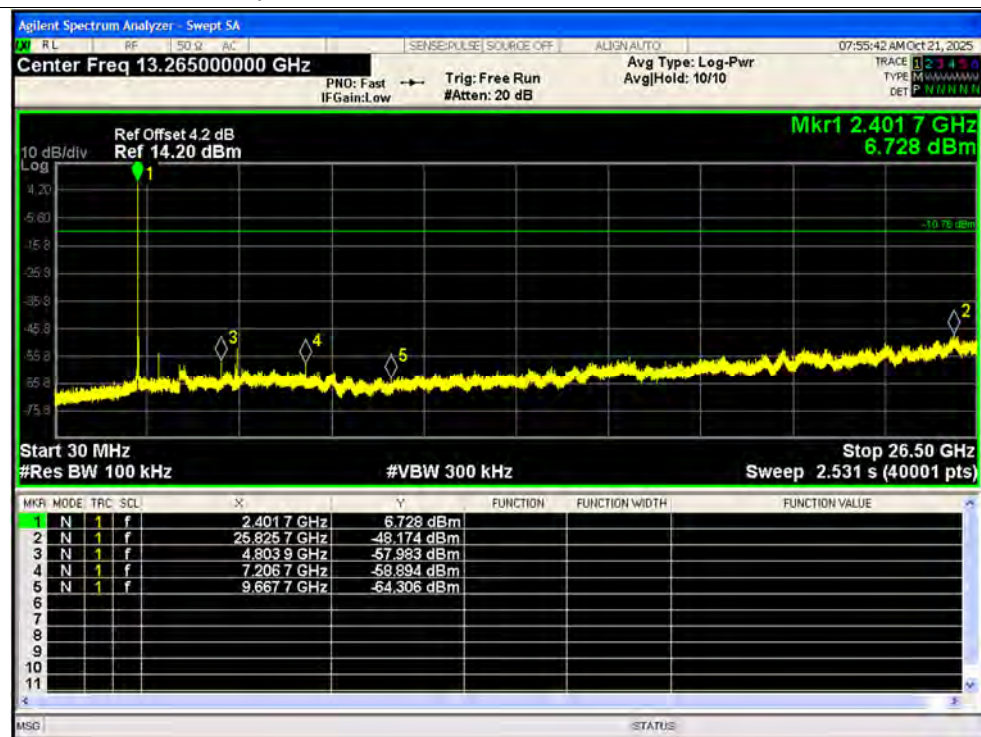
Tx. Spurious NVNT 2-DH5 2480MHz Ant1 Emission



Tx. Spurious NVNT 3-DH5 2402MHz Ant1 Ref



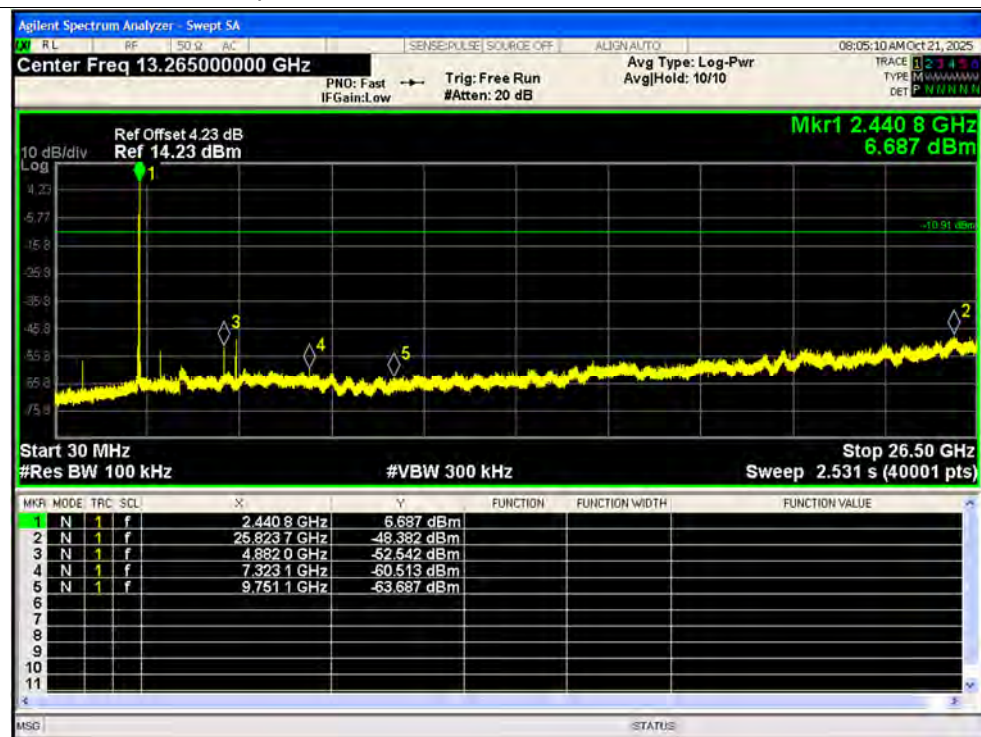
Tx. Spurious NVNT 3-DH5 2402MHz Ant1 Emission



Tx. Spurious NVNT 3-DH5 2441MHz Ant1 Ref



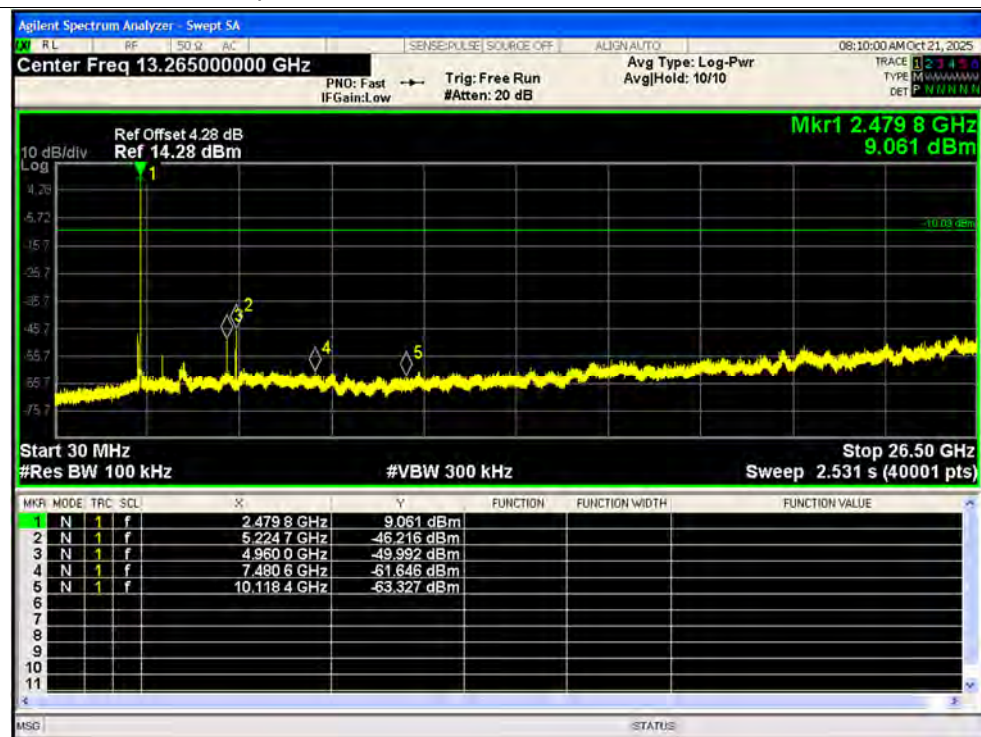
Tx. Spurious NVNT 3-DH5 2441MHz Ant1 Emission



Tx. Spurious NVNT 3-DH5 2480MHz Ant1 Ref



Tx. Spurious NVNT 3-DH5 2480MHz Ant1 Emission



**A.9. Band Edge**

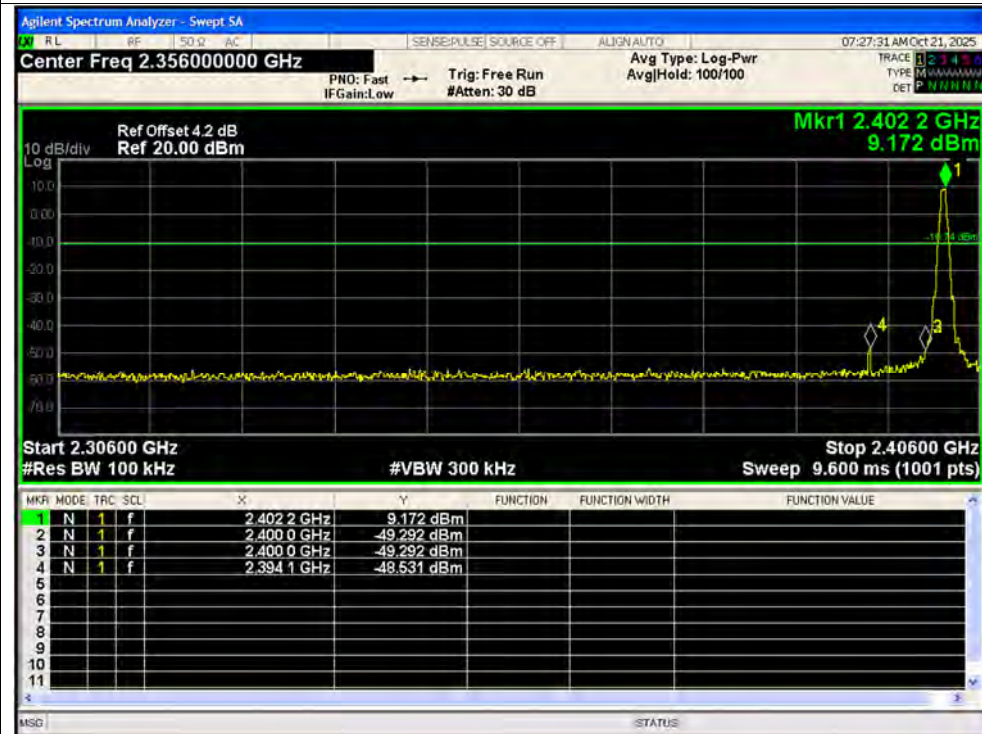
Condition	Mode	Frequency (MHz)	Antenna	Hopping Mode	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH5	2402	Ant1	No-Hopping	-57.79	-20	Pass
NVNT	1-DH5	2480	Ant1	No-Hopping	-56.28	-20	Pass
NVNT	2-DH5	2402	Ant1	No-Hopping	-47.72	-20	Pass
NVNT	2-DH5	2480	Ant1	No-Hopping	-55.42	-20	Pass
NVNT	3-DH5	2402	Ant1	No-Hopping	-50.59	-20	Pass
NVNT	3-DH5	2480	Ant1	No-Hopping	-54.28	-20	Pass
NVNT	1-DH5	2402	Ant1	Hopping	-62.67	-20	Pass
NVNT	1-DH5	2480	Ant1	Hopping	-62.98	-20	Pass
NVNT	2-DH5	2402	Ant1	Hopping	-63.21	-20	Pass
NVNT	2-DH5	2480	Ant1	Hopping	-51.99	-20	Pass
NVNT	3-DH5	2402	Ant1	Hopping	-60.48	-20	Pass
NVNT	3-DH5	2480	Ant1	Hopping	-56.15	-20	Pass

Test Graphs

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



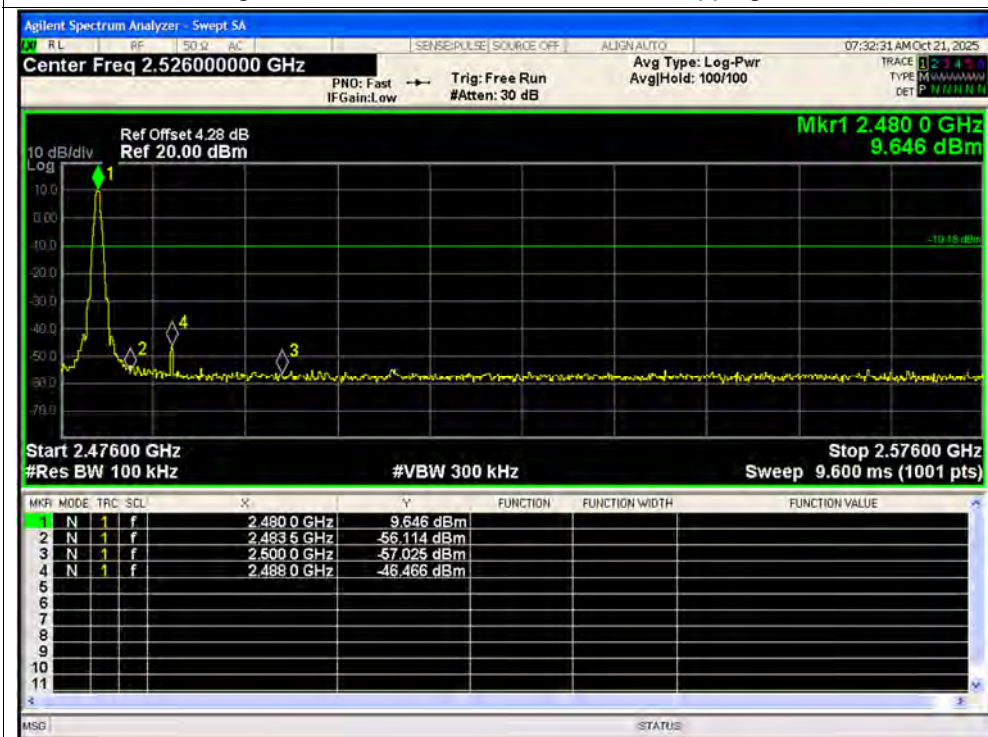
Band Edge NVNT 1-DH5 2402MHz Ant1 No-Hopping Emission



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



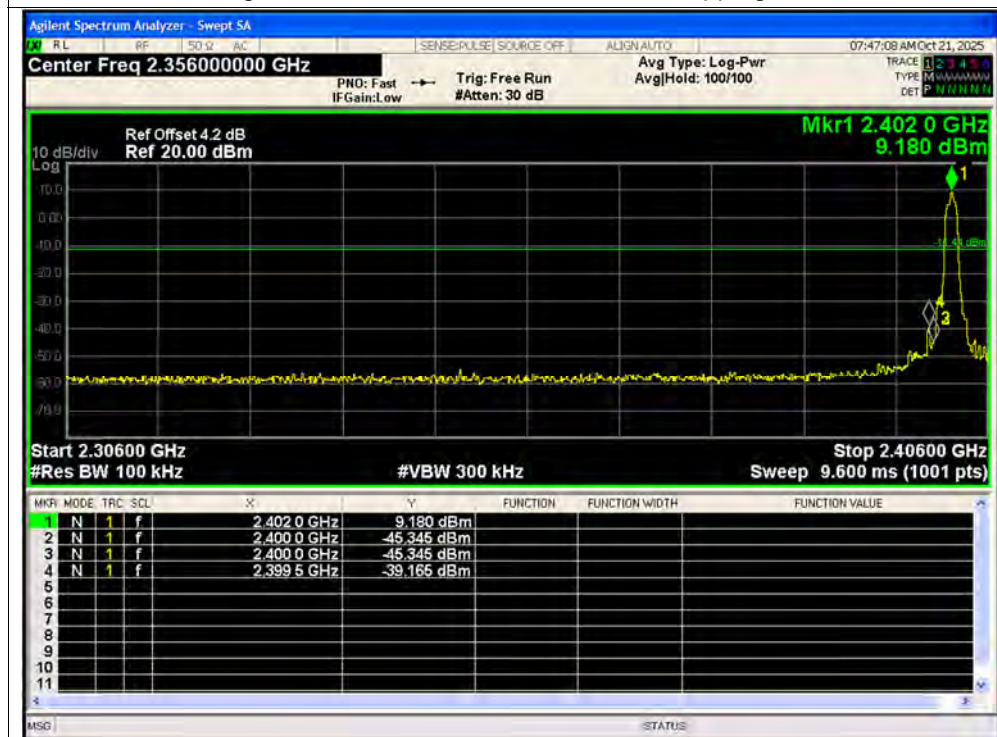
Band Edge NVNT 1-DH5 2480MHz Ant1 No-Hopping Emission



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



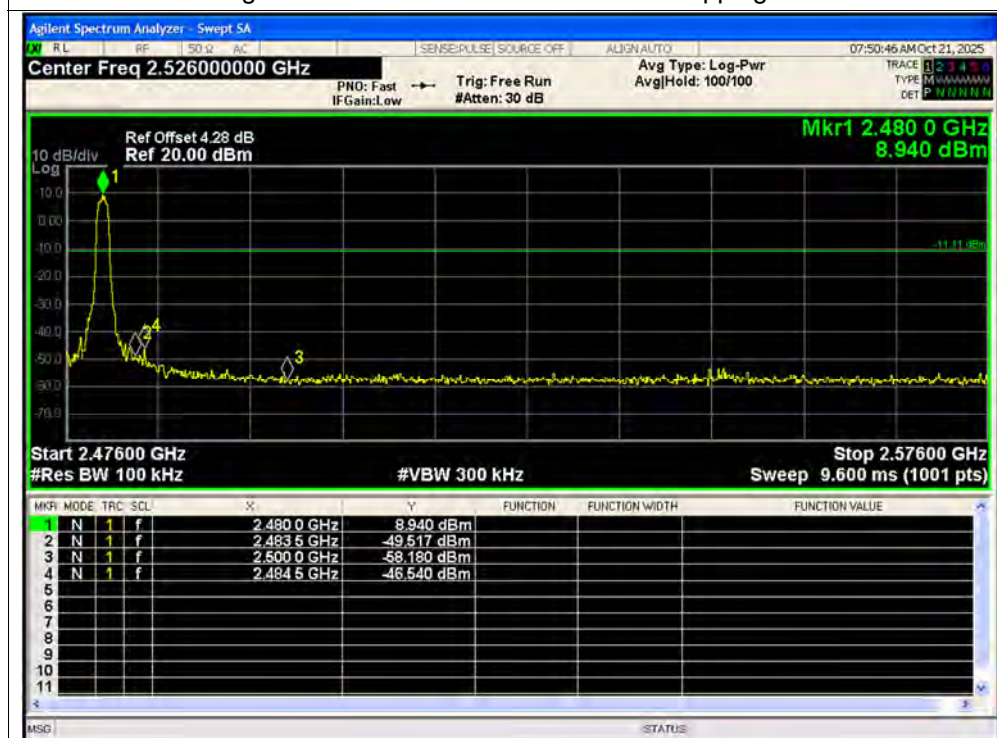
Band Edge NVNT 2-DH5 2402MHz Ant1 No-Hopping Emission



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



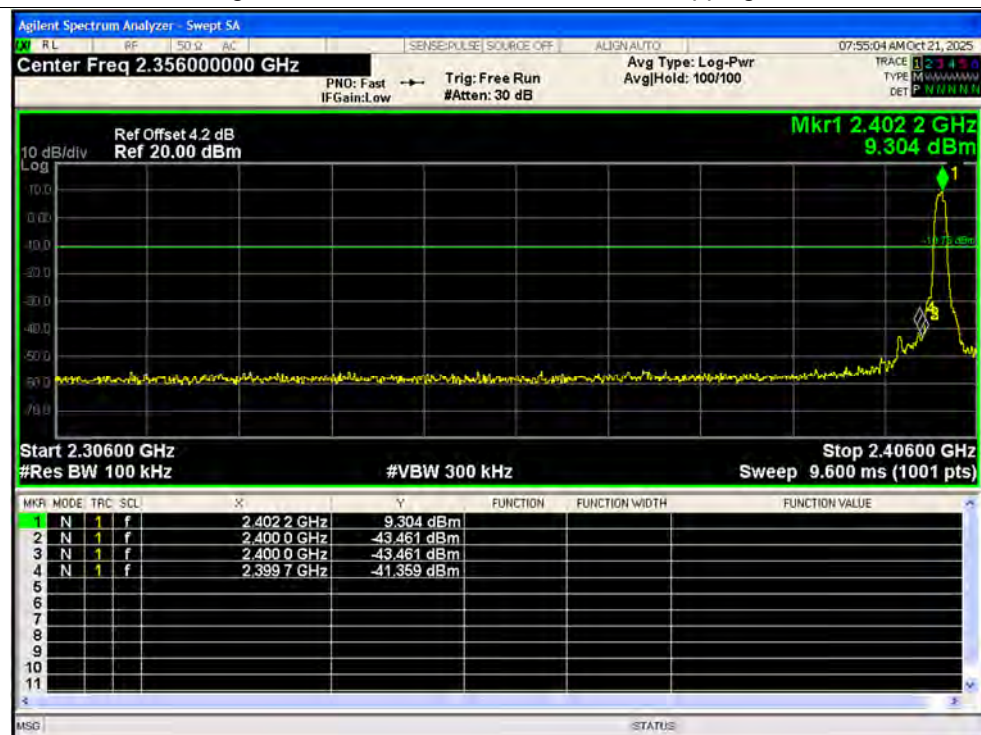
Band Edge NVNT 2-DH5 2480MHz Ant1 No-Hopping Emission



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



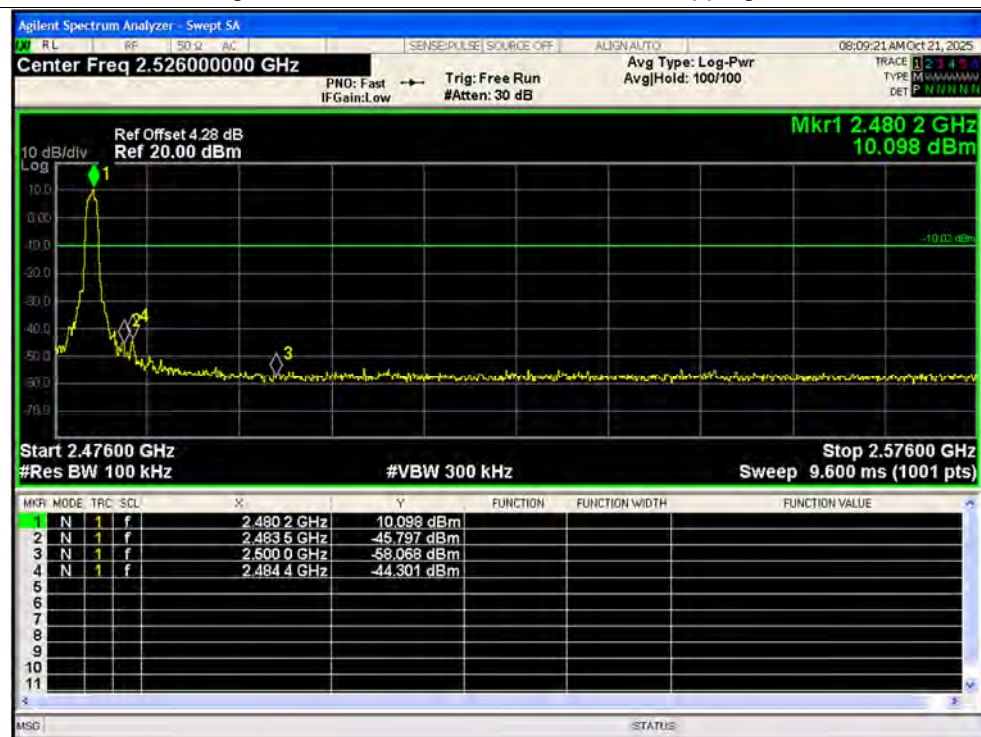
Band Edge NVNT 3-DH5 2402MHz Ant1 No-Hopping Emission



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



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



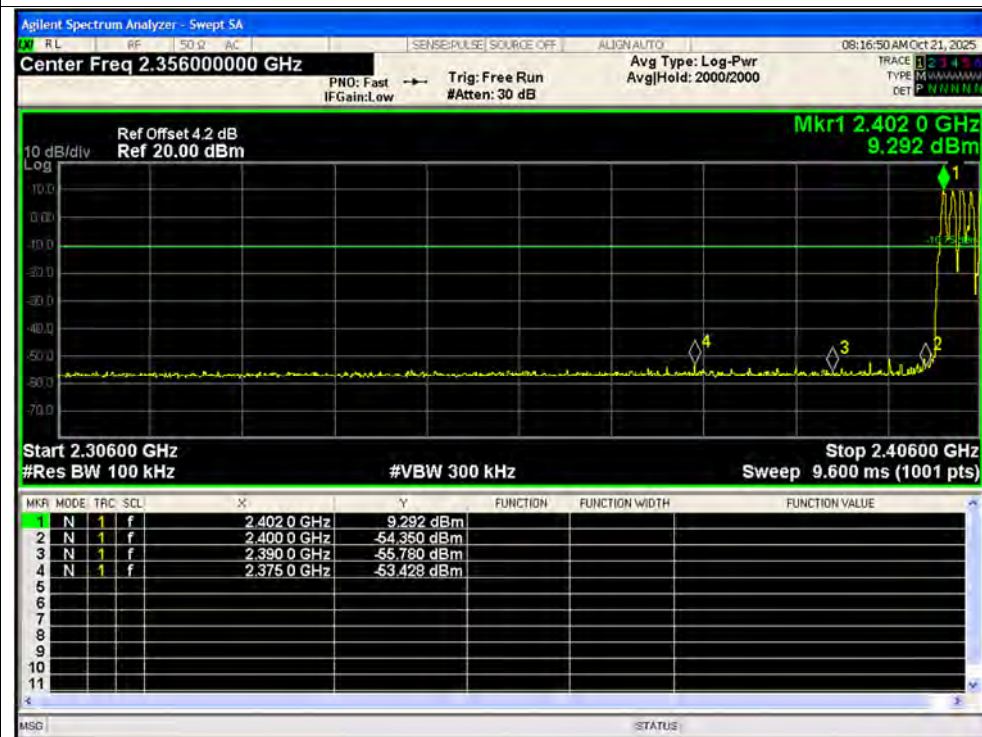


Test Graphs

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



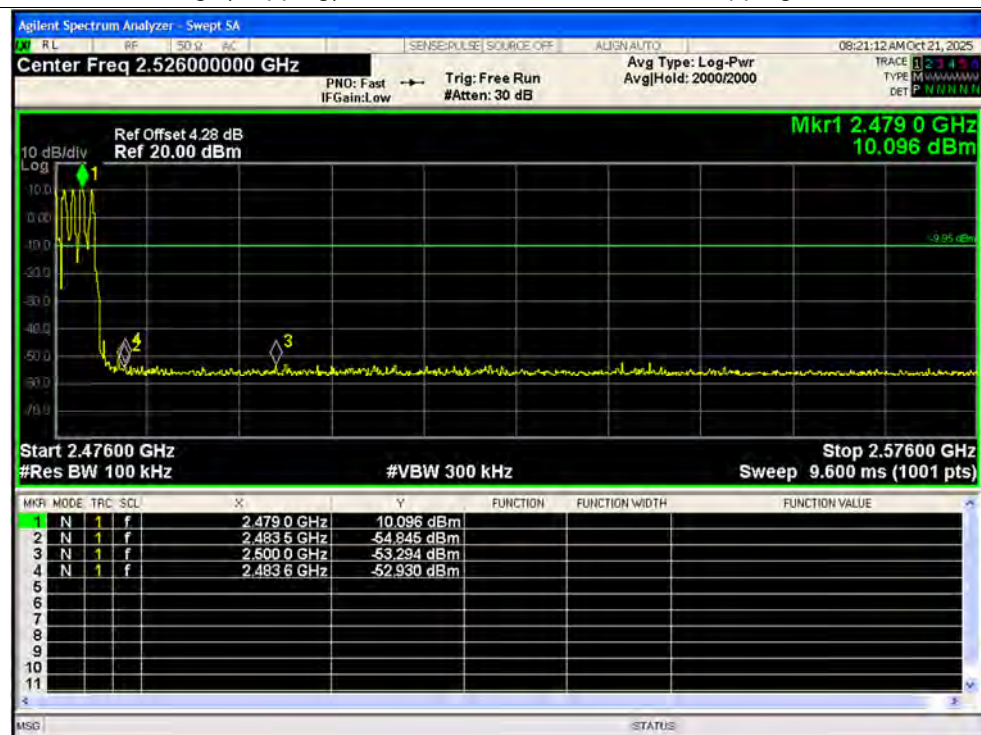
Band Edge(Hopping) NVNT 1-DH5 2402MHz Ant1 Hopping Emission



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



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

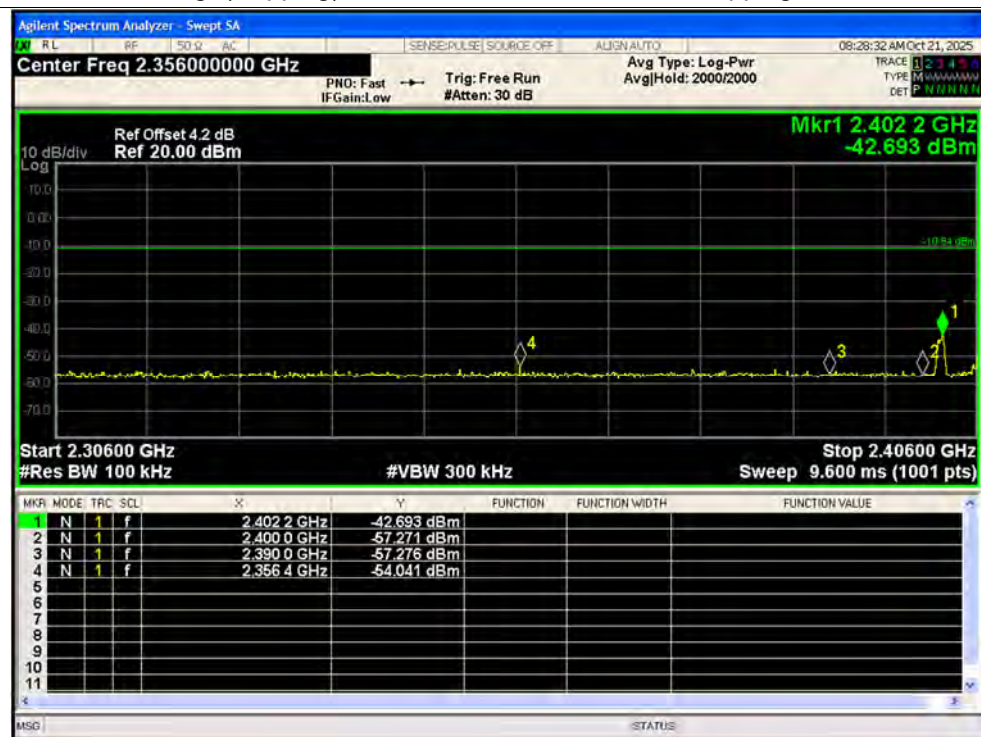




Band Edge(Hopping) NVNT 2-DH5 2402MHz Ant1 Hopping Ref



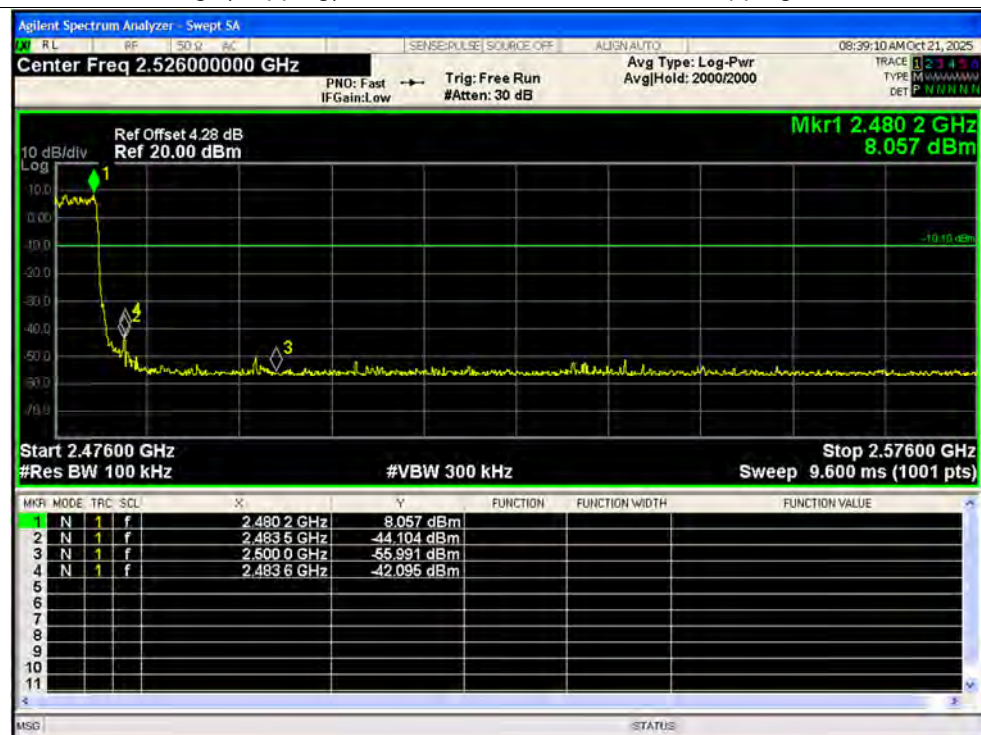
Band Edge(Hopping) NVNT 2-DH5 2402MHz Ant1 Hopping Emission



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



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

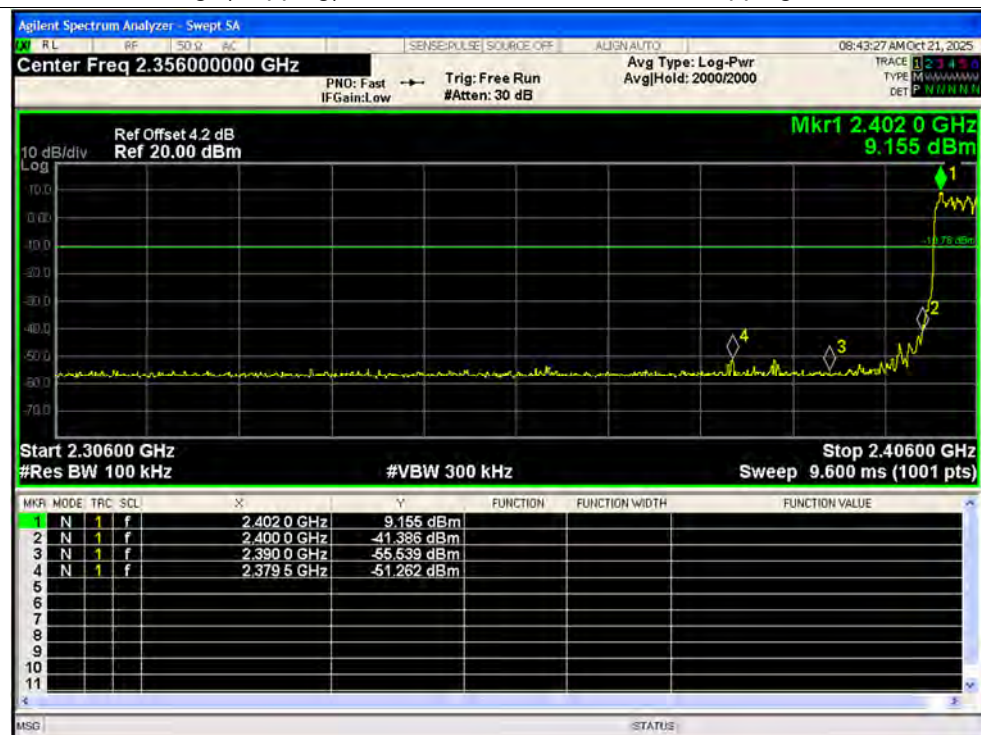




Band Edge(Hopping) NVNT 3-DH5 2402MHz Ant1 Hopping Ref



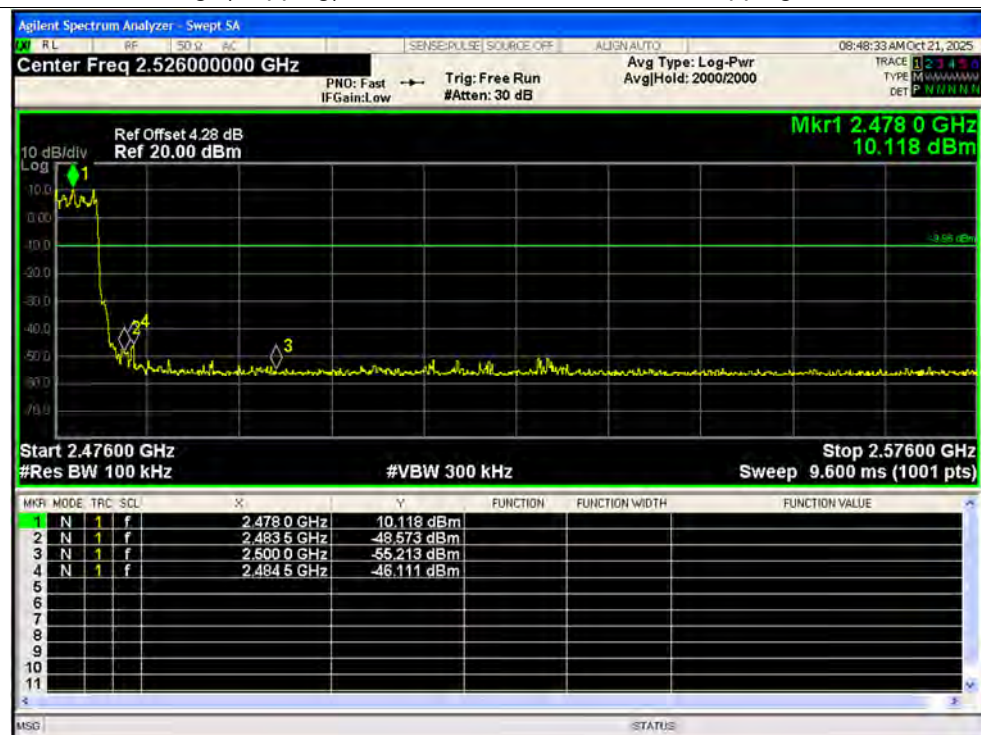
Band Edge(Hopping) NVNT 3-DH5 2402MHz Ant1 Hopping Emission



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



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





A.10. Conducted Emission

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Set RBW=9kHz, VBW=30kHz. Refer to recorded points and plots below.

Note: Both of the test voltage AC 120V/60Hz and AC 230V/50Hz were considered and tested respectively, only the results of the worst case AC 120V/60Hz were recorded in this report.

A. Test Setup:

Test Mode: EUT+Adapter+Data cable+PC+BR TX

Test voltage: AC 120V/60Hz

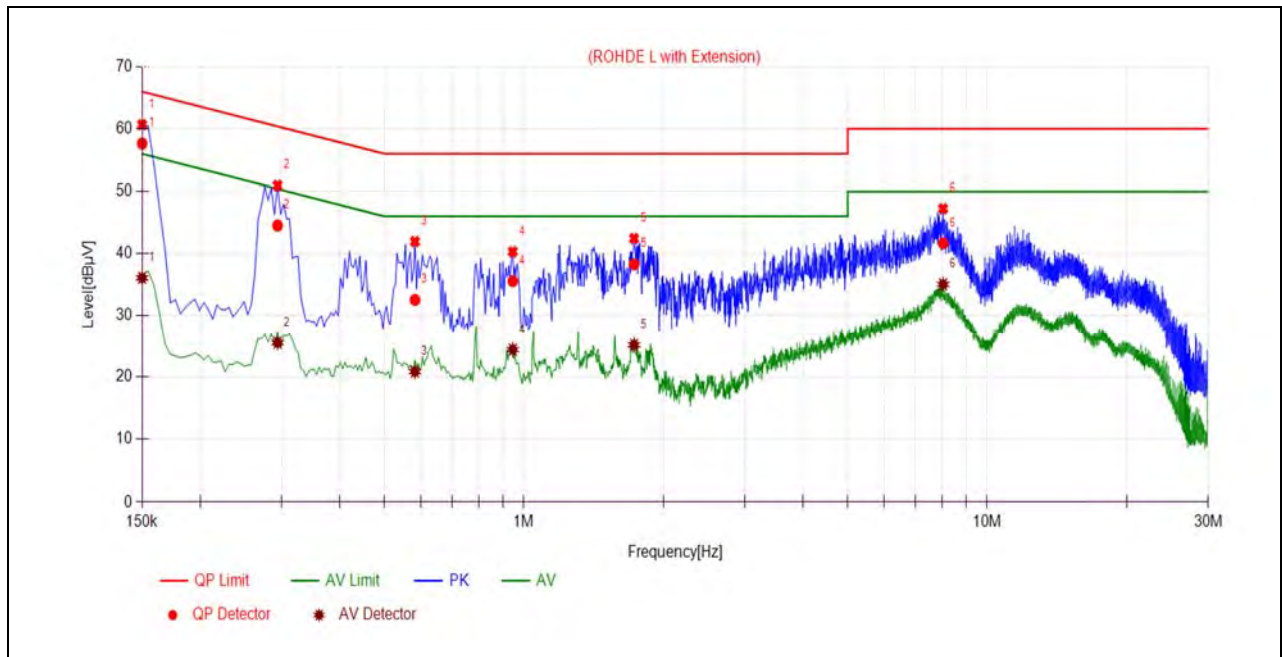
The measurement results are obtained as below:

$$E \text{ [dB}\mu\text{V]} = U_R + L_{\text{Cable loss}} \text{ [dB]} + A_{\text{Factor}}$$

U_R : Receiver Reading

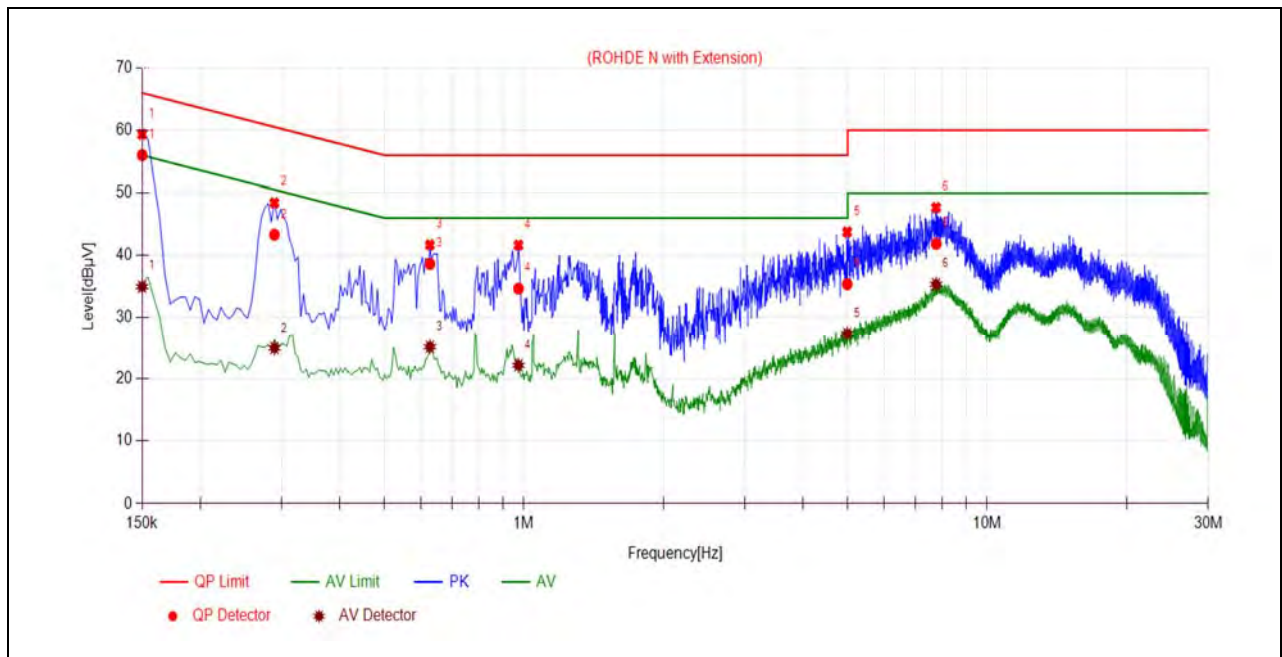
A_{Factor} : Voltage division factor of LISN

B. Test Plot:



(L Phase)

No.	Fre. (MHz)	Emission Level (dBμV)		Limit (dBμV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1500	57.65	36.10	66.00	56.00	Line	PASS
2	0.2940	44.55	25.52	60.41	50.41		PASS
3	0.5820	32.56	20.86	56.00	46.00		PASS
4	0.9466	35.59	24.41	56.00	46.00		PASS
5	1.7296	38.31	25.17	56.00	46.00		PASS
6	8.0344	41.67	35.06	60.00	50.00		PASS



(N Phase)

No.	Fre. (MHz)	Emission Level (dBμV)		Limit (dBμV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1500	56.02	35.00	66.00	56.00	Neutral	PASS
2	0.2895	43.33	24.98	60.54	50.54		PASS
3	0.6270	38.65	25.19	56.00	46.00		PASS
4	0.9735	34.69	22.20	56.00	46.00		PASS
5	4.9875	35.40	27.38	56.00	46.00		PASS
6	7.7591	41.86	35.37	60.00	50.00		PASS

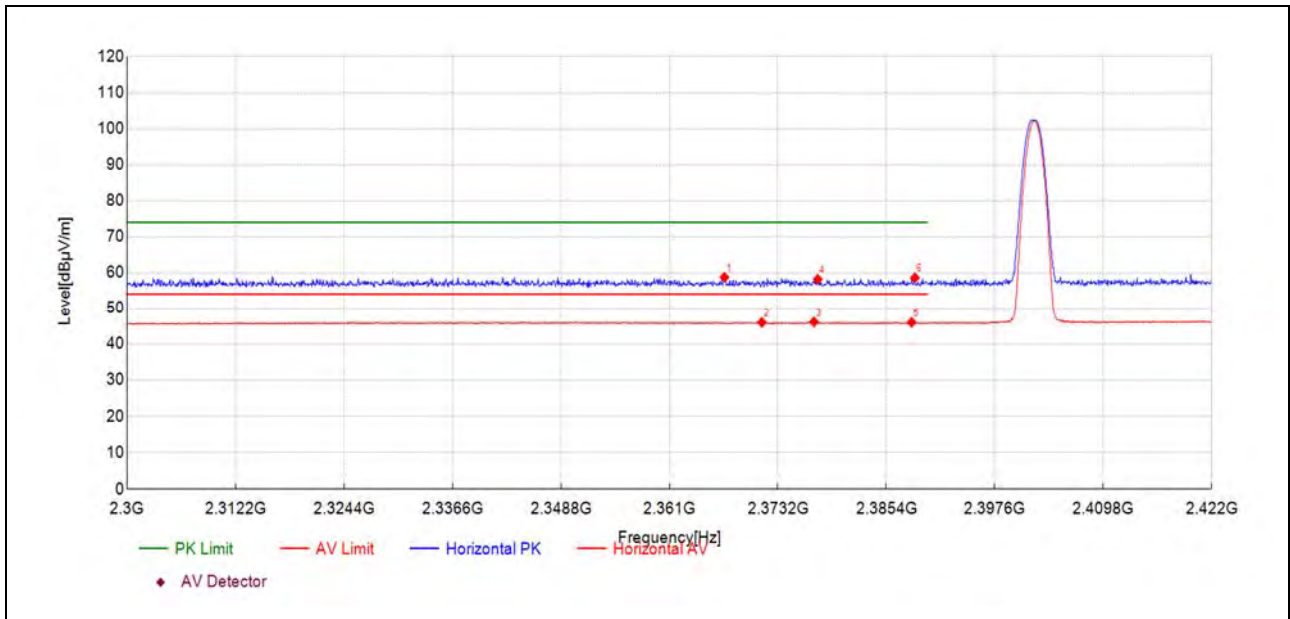
A.11. Restricted Frequency Bands

Note 1: Restricted Frequency Bands were performed when antenna was at vertical and horizontal polarity, and only the worse test condition (Horizontal) was recorded in this test report.

Note 2: All test modes were considered and evaluated respectively by performing full test, only the worst data were recorded.

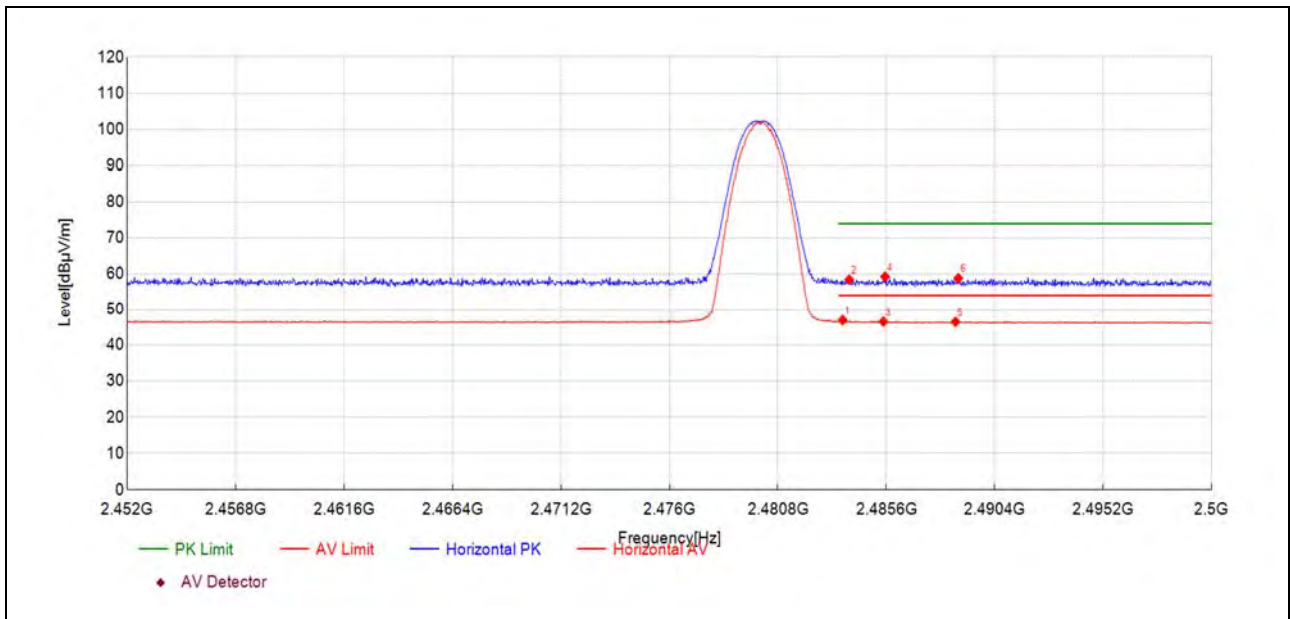
GFSK Mode

Plot for Channel 0



Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Angle [°]	Detector	Polarity	Verdict
2367.19	21.3	58.76	37.470	74.00	15.24	0	PK	Horizontal	PASS
2371.41	8.5	46.00	37.470	54.00	8.00	3	AV	Horizontal	PASS
2377.26	8.6	46.11	37.480	54.00	7.89	44	AV	Horizontal	PASS
2377.69	20.7	58.18	37.480	74.00	15.82	203	PK	Horizontal	PASS
2388.25	8.5	45.99	37.490	54.00	8.01	249	AV	Horizontal	PASS
2388.62	21.1	58.58	37.490	74.00	15.42	263	PK	Horizontal	PASS

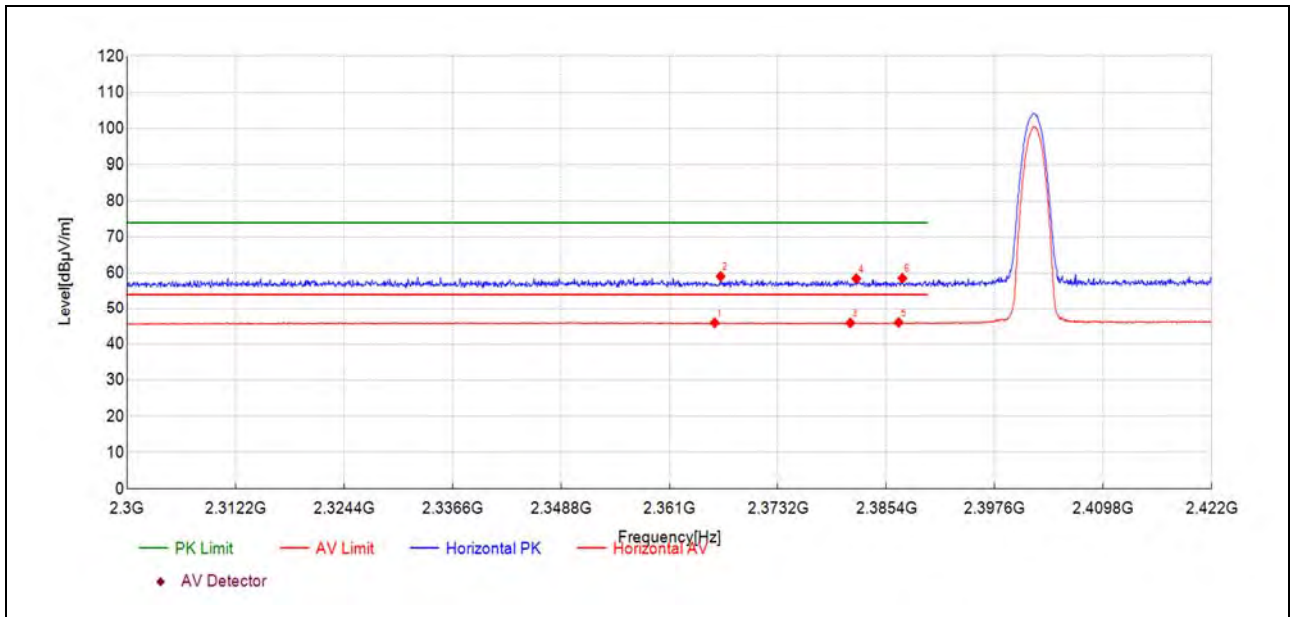
Plot for Channel 78



Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Angle [°]	Detector	Polarity	Verdict
2483.67	8.7	46.96	38.280	54.00	7.04	74	AV	Horizontal	PASS
2483.96	20.2	58.44	38.270	74.00	15.56	238	PK	Horizontal	PASS
2485.47	8.3	46.56	38.270	54.00	7.44	80	AV	Horizontal	PASS
2485.54	21.0	59.28	38.270	74.00	14.72	74	PK	Horizontal	PASS
2488.67	8.2	46.46	38.270	54.00	7.54	355	AV	Horizontal	PASS
2488.79	20.6	58.84	38.260	74.00	15.16	294	PK	Horizontal	PASS

**8-DPSK Mode**

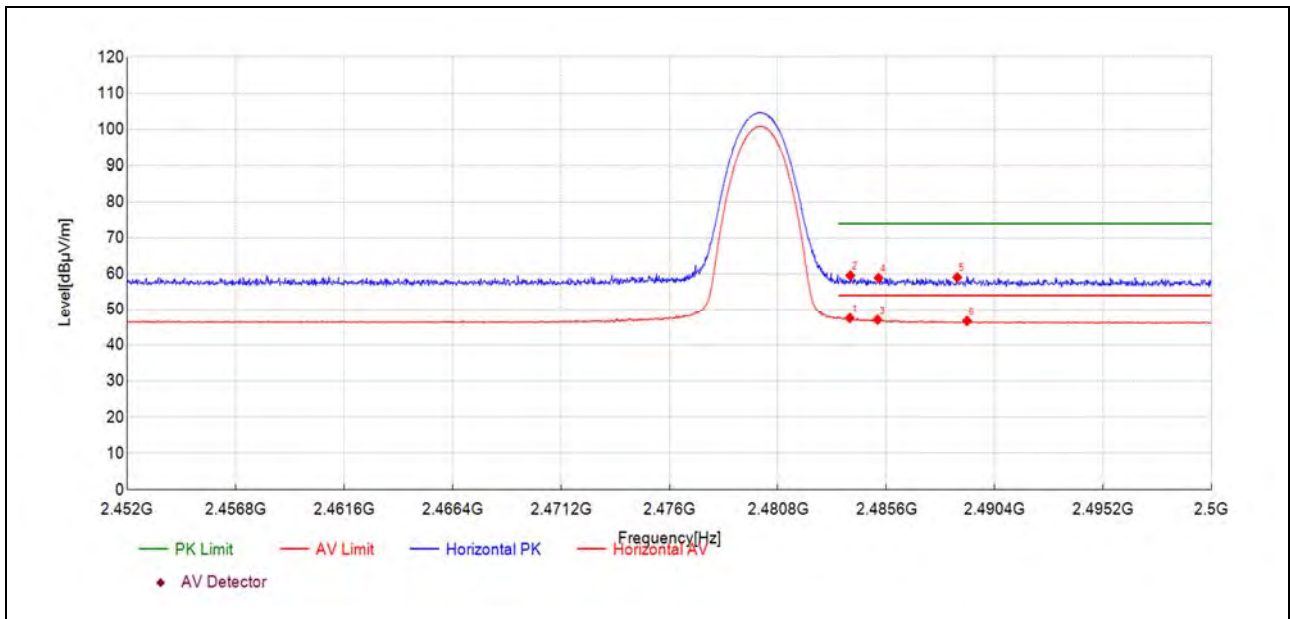
Plot for Channel 0



Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Angle [°]	Detector	Polarity	Verdict
2366.10	8.5	45.94	37.470	54.00	8.06	342	AV	Horizontal	PASS
2366.77	21.7	59.12	37.470	74.00	14.88	137	PK	Horizontal	PASS
2381.35	8.4	45.92	37.480	54.00	8.08	355	AV	Horizontal	PASS
2382.03	21.0	58.48	37.480	74.00	15.52	188	PK	Horizontal	PASS
2386.79	8.5	46.03	37.490	54.00	7.97	305	AV	Horizontal	PASS
2387.21	21.1	58.59	37.490	74.00	15.41	1	PK	Horizontal	PASS



Plot for Channel 78



Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Angle [°]	Detector	Polarity	Verdict
2483.98	9.3	47.56	38.270	54.00	6.44	42	AV	Horizontal	PASS
2484.01	21.3	59.58	38.270	74.00	14.42	42	PK	Horizontal	PASS
2485.21	8.8	47.09	38.270	54.00	6.91	75	AV	Horizontal	PASS
2485.26	20.7	58.92	38.270	74.00	15.08	80	PK	Horizontal	PASS
2488.74	20.8	59.06	38.270	74.00	14.94	305	PK	Horizontal	PASS
2489.17	8.5	46.74	38.260	54.00	7.26	80	AV	Horizontal	PASS



A.12. Radiated Emission

According to ANSI C63.10, because of peak detection will yield amplitudes equal to or greater than amplitudes measured with the quasi-peak (or average) detector, the measurement data from a spectrum analyzer peak detector will represent the worst-case results, if the peak measured value complies with the quasi-peak (or average) limit, it is unnecessary to perform an quasi-peak measurement (or average).

The measurement results are obtained as below:

$$E [\text{dB}\mu\text{V/m}] = U_R + A_T + A_{\text{Factor}} [\text{dB}]; A_T = L_{\text{Cable loss}} [\text{dB}] - G_{\text{preamp}} [\text{dB}]$$

A_T : Total correction Factor except Antenna

U_R : Receiver Reading

G_{preamp} : Preamplifier Gain

A_{Factor} : Antenna Factor at 3m

During the test, the total correction Factor A_T and A_{Factor} were built in test software.

Note1: All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Note2: For the frequency, which started from 9kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

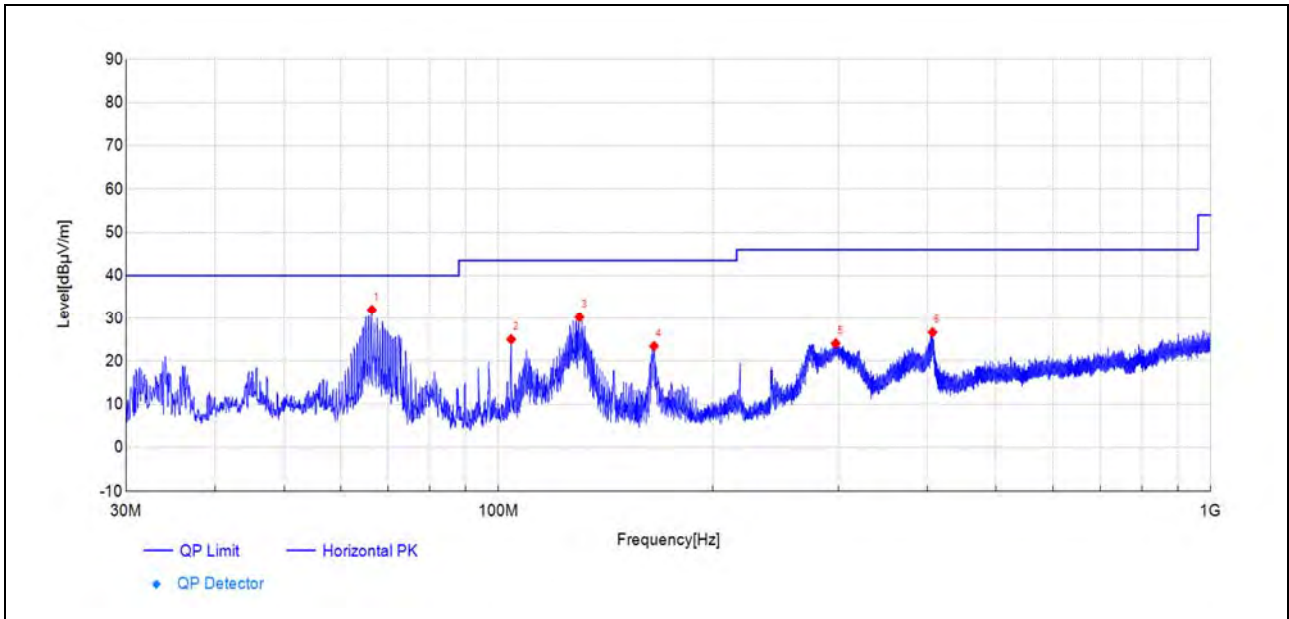
Note3: For the frequency, which started from 18GHz to 10th harmonic of the highest frequency, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

Note4: All test modes were considered and evaluated respectively by performing full test, only the worst data were recorded.



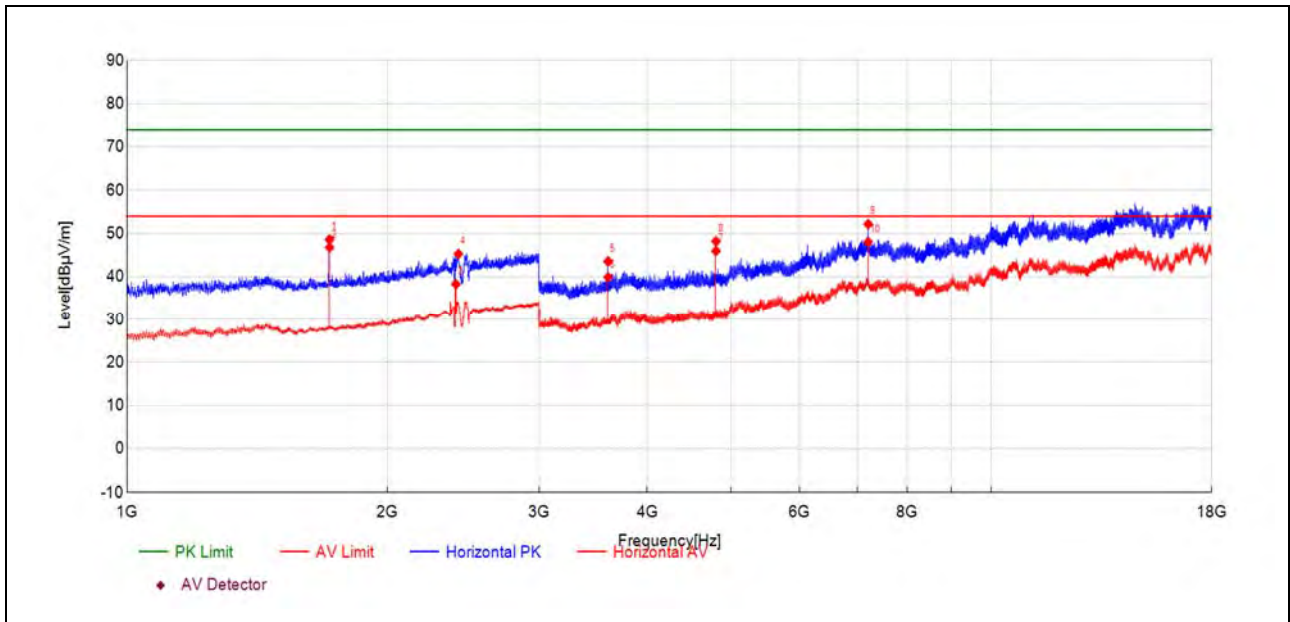
GFSK Mode

Plot for Channel 0



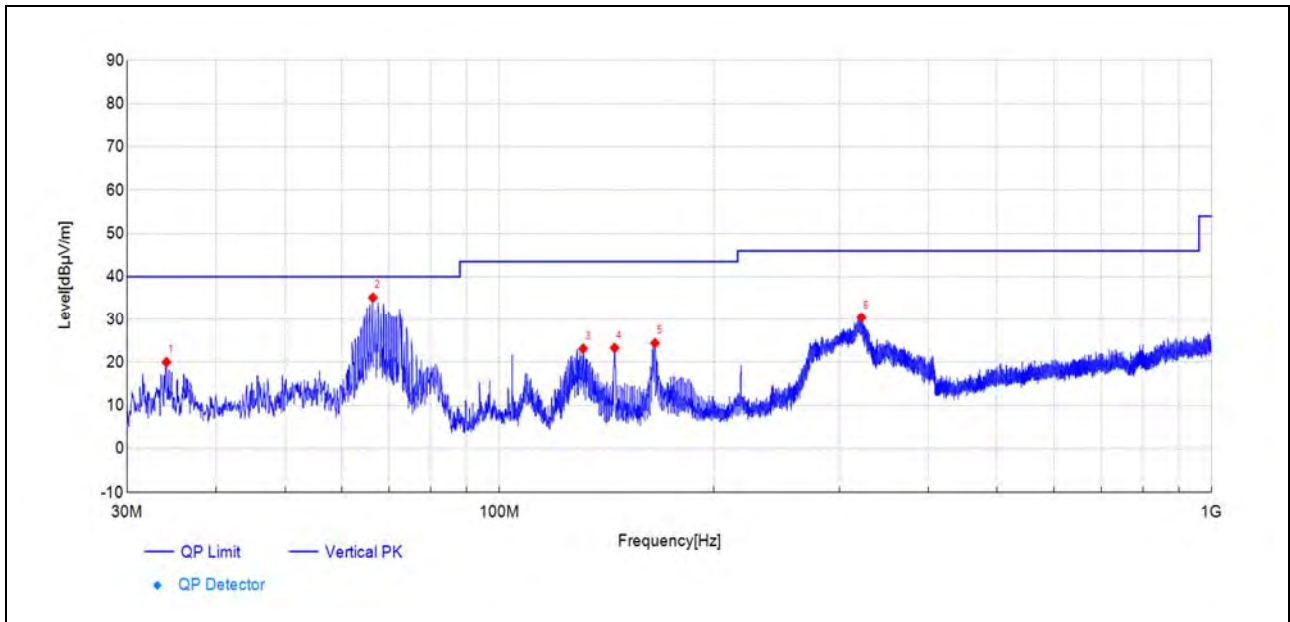
(Antenna Horizontal, 30MHz to 1GHz)

Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Angle [°]	Detector	Verdict
66.43	62.7	31.99	-30.720	40.00	8.01	360	PK	PASS
104.21	54.6	25.05	-29.570	43.50	18.45	9	PK	PASS
129.91	62.2	30.26	-31.920	43.50	13.24	189	PK	PASS
165.37	55.0	23.48	-31.480	43.50	20.02	239	PK	PASS
297.49	49.8	24.10	-25.700	46.00	21.90	169	PK	PASS
406.86	49.9	26.68	-23.250	46.00	19.32	260	PK	PASS



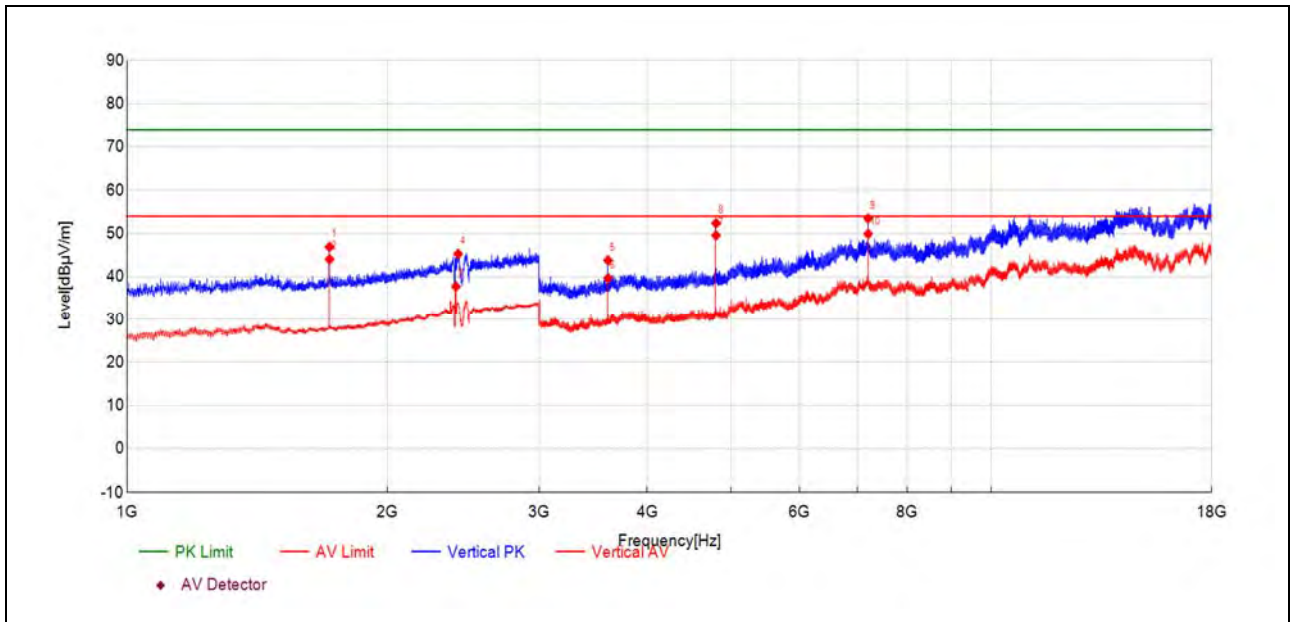
(Antenna Horizontal, 1GHz to 18GHz)

Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Angle [°]	Detector	Verdict
1715.34	48.3	48.62	0.370	74.00	25.38	45	PK	PASS
1715.74	46.4	46.78	0.370	54.00	7.22	56	AV	PASS
2402.28	33.0	38.27	5.250	-	-	34	AV	NA
2418.28	39.8	45.27	5.500	74.00	28.73	142	PK	PASS
3603.45	52.7	43.57	-9.080	74.00	30.43	130	PK	PASS
3603.87	49.0	39.87	-9.080	54.00	14.13	130	AV	PASS
4804.34	51.1	45.99	-5.140	54.00	8.01	308	AV	PASS
4804.34	53.4	48.21	-5.140	74.00	25.79	23	PK	PASS
7206.55	47.2	52.18	5.020	74.00	21.82	103	PK	PASS
7206.55	43.0	48.04	5.020	54.00	5.96	267	AV	PASS



(Antenna Vertical, 30MHz to 1GHz)

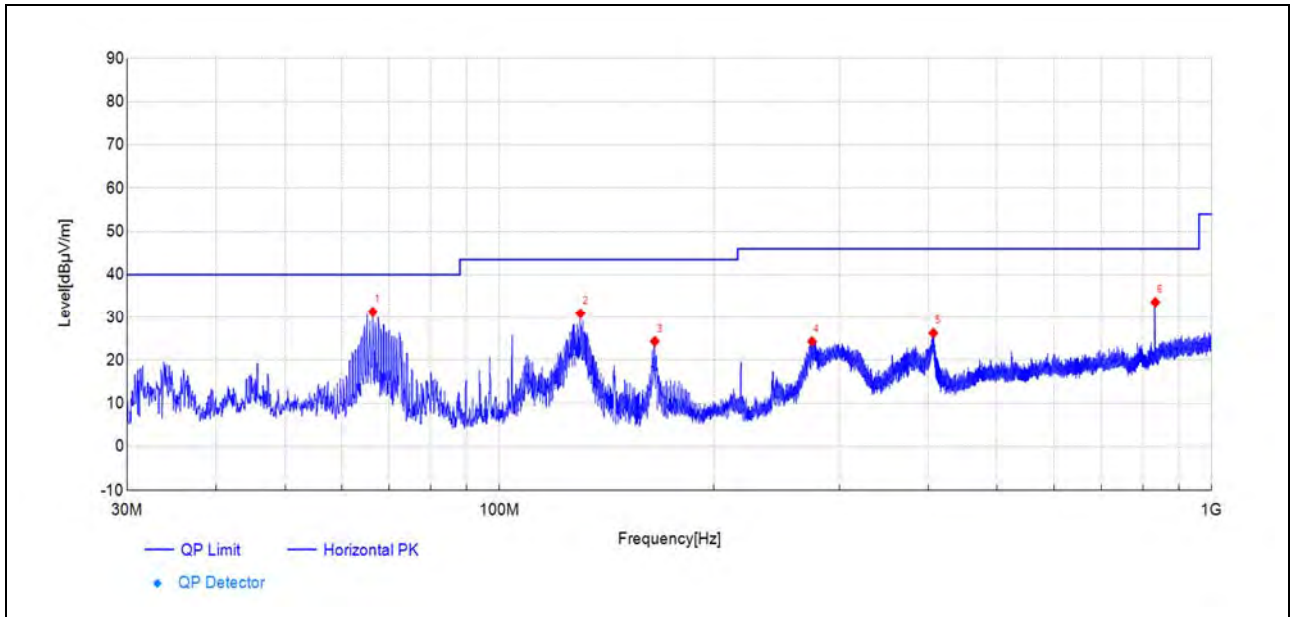
Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Angle [°]	Detector	Verdict
34.07	49.9	20.03	-29.850	40.00	19.97	351	PK	PASS
66.43	65.9	35.14	-30.720	40.00	4.86	82	PK	PASS
131.08	55.0	23.13	-31.820	43.50	20.37	235	PK	PASS
145.10	54.8	23.32	-31.480	43.50	20.18	10	PK	PASS
165.32	55.9	24.42	-31.470	43.50	19.08	0	PK	PASS
322.28	55.3	30.41	-24.840	46.00	15.59	75	PK	PASS



(Antenna Vertical, 1GHz to 18GHz)

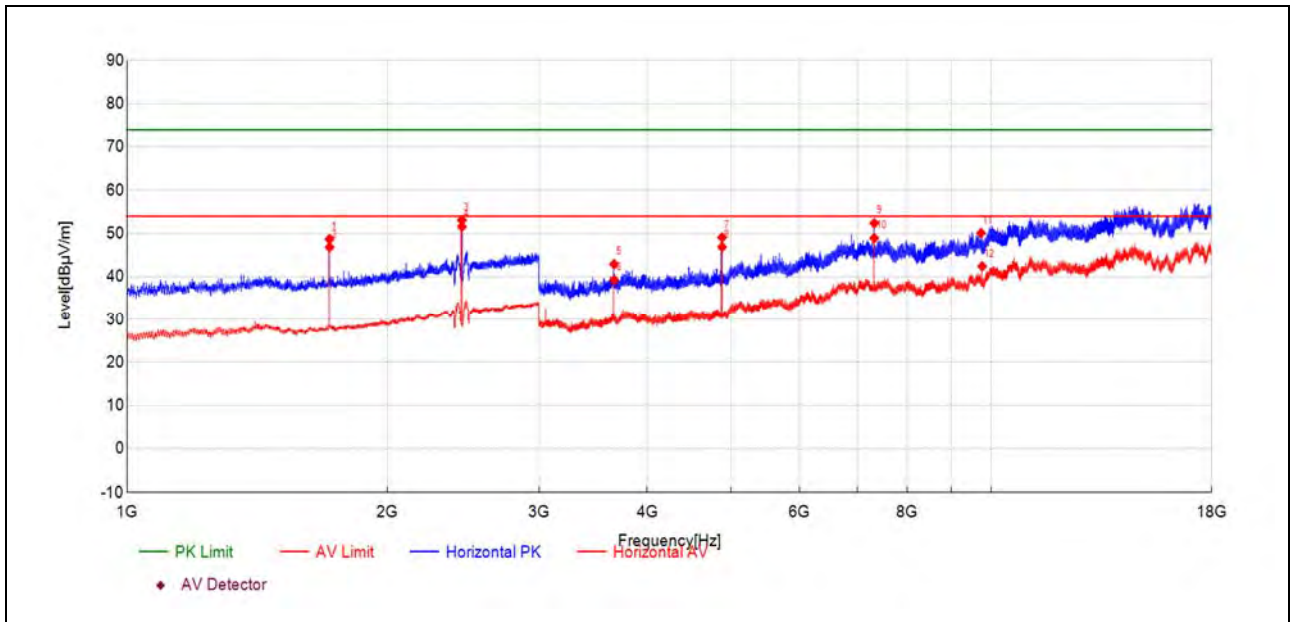
Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Angle [°]	Detector	Verdict
1715.34	46.5	46.90	0.370	74.00	27.10	29	PK	PASS
1715.74	43.7	44.06	0.370	54.00	9.94	29	AV	PASS
2402.28	32.5	37.74	5.250	-	-	39	AV	NA
2416.68	39.8	45.29	5.460	74.00	28.71	291	PK	PASS
3603.02	52.9	43.81	-9.080	74.00	30.19	105	PK	PASS
3603.45	48.7	39.66	-9.080	54.00	14.34	90	AV	PASS
4804.34	54.7	49.56	-5.140	54.00	4.44	77	AV	PASS
4804.34	57.5	52.38	-5.140	74.00	21.62	77	PK	PASS
7206.12	48.4	53.47	5.030	74.00	20.53	23	PK	PASS
7206.55	44.9	49.90	5.020	54.00	4.10	23	AV	PASS

Plot for Channel 39



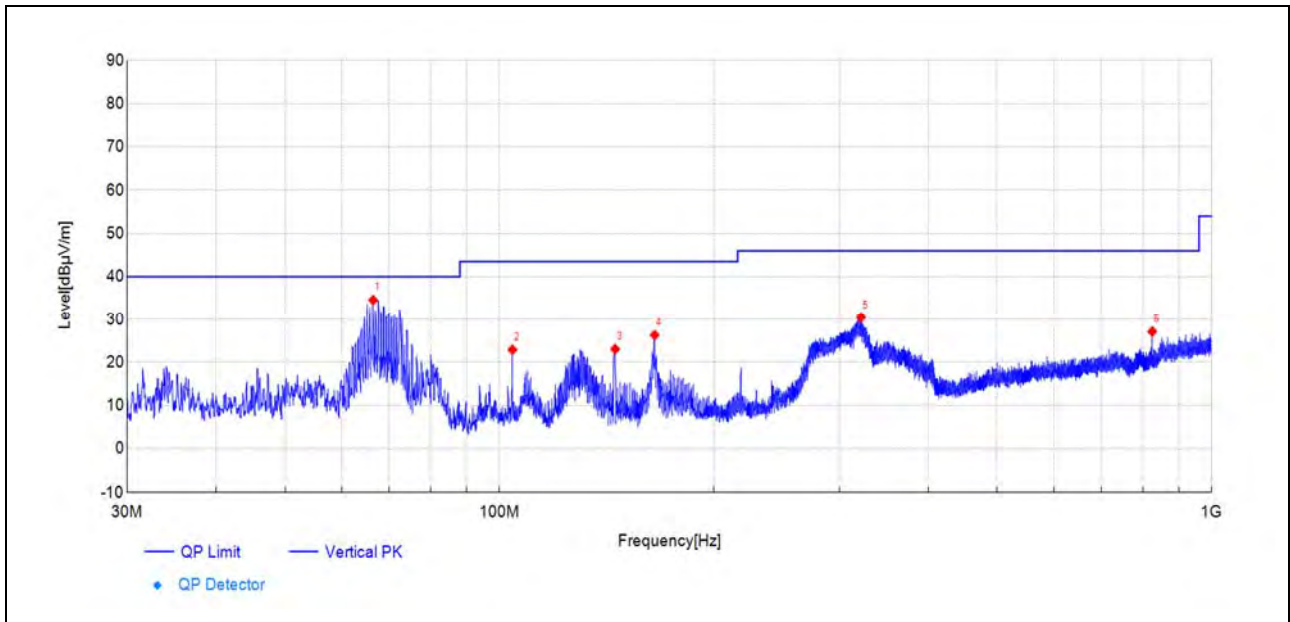
(Antenna Horizontal, 30MHz to 1GHz)

Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Angle [°]	Detector	Verdict
66.43	62.0	31.29	-30.720	40.00	8.71	9	PK	PASS
129.91	62.8	30.90	-31.920	43.50	12.60	181	PK	PASS
165.22	55.8	24.36	-31.450	43.50	19.14	271	PK	PASS
274.74	50.4	24.32	-26.110	46.00	21.68	92	PK	PASS
406.57	49.5	26.29	-23.240	46.00	19.71	264	PK	PASS
833.39	47.6	33.60	-14.000	46.00	12.40	9	PK	PASS



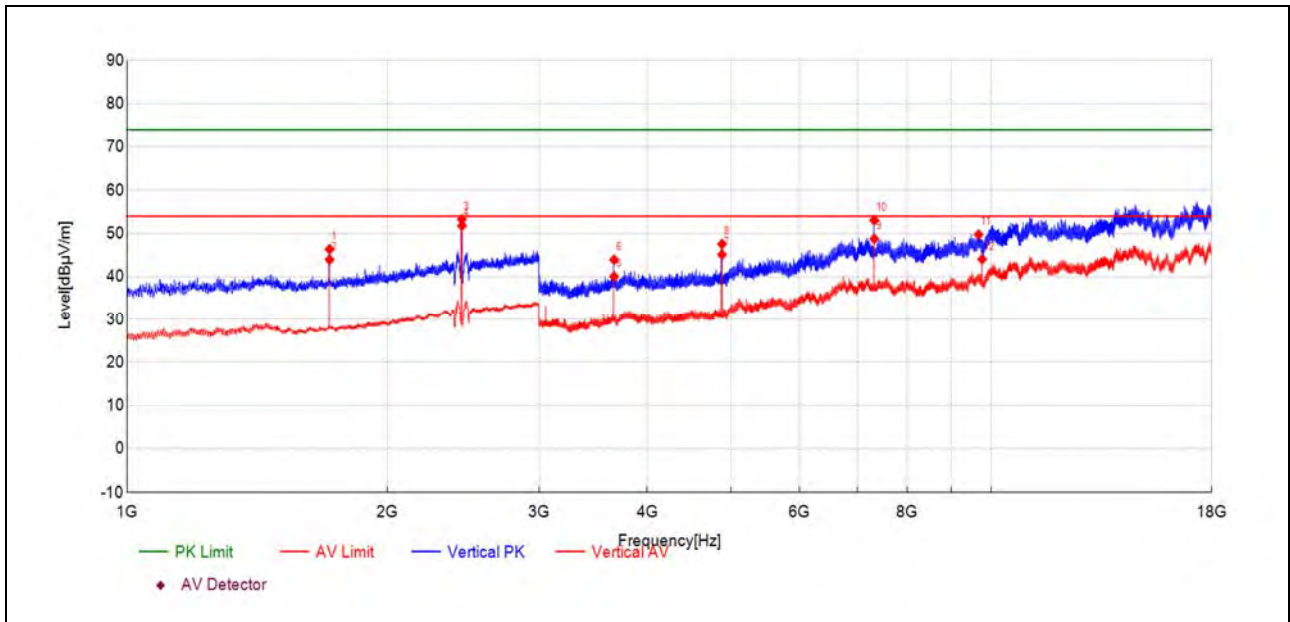
(Antenna Horizontal, 1GHz to 18GHz)

Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Angle [°]	Detector	Verdict
1715.34	48.3	48.68	0.370	74.00	25.32	47	PK	PASS
1715.74	46.5	46.85	0.370	54.00	7.15	58	AV	PASS
2441.09	47.3	53.11	5.840	-	-	41	PK	NA
2441.49	45.7	51.58	5.840	-	-	41	AV	NA
3661.30	51.8	42.91	-8.900	74.00	31.09	64	PK	PASS
3661.73	48.2	39.26	-8.910	54.00	14.74	64	AV	PASS
4882.34	54.1	49.09	-5.020	74.00	24.91	265	PK	PASS
4882.77	51.9	46.85	-5.020	54.00	7.15	251	AV	PASS
7323.12	48.1	52.38	4.300	74.00	21.62	278	PK	PASS
7323.55	44.6	48.93	4.300	54.00	5.07	278	AV	PASS
9734.34	41.1	50.11	9.060	74.00	23.89	360	PK	PASS
9764.76	33.4	42.41	9.000	54.00	11.59	170	AV	PASS



(Antenna Vertical, 30MHz to 1GHz)

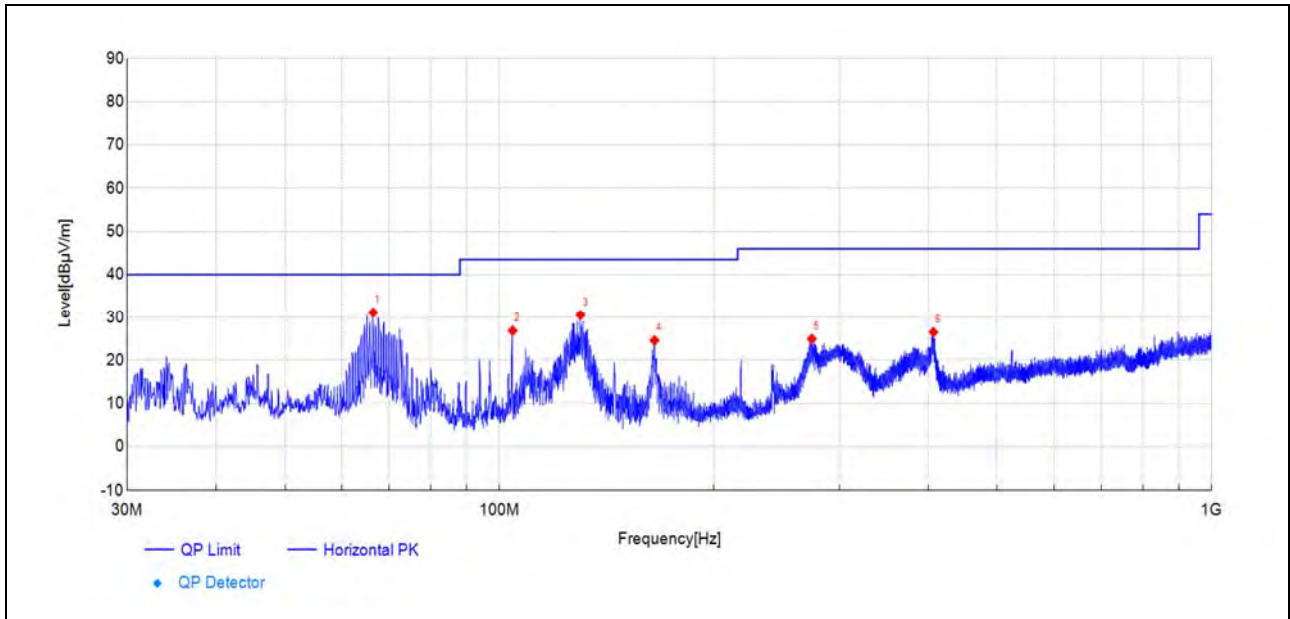
Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Angle [°]	Detector	Verdict
66.47	65.3	34.58	-30.750	40.00	5.42	81	PK	PASS
104.31	52.4	22.91	-29.520	43.50	20.59	351	PK	PASS
145.34	54.6	23.04	-31.580	43.50	20.46	351	PK	PASS
165.13	57.7	26.30	-31.440	43.50	17.20	0	PK	PASS
321.89	55.3	30.45	-24.880	46.00	15.55	81	PK	PASS
825.15	41.3	27.12	-14.200	46.00	18.88	330	PK	PASS



(Antenna Vertical, 1GHz to 18GHz)

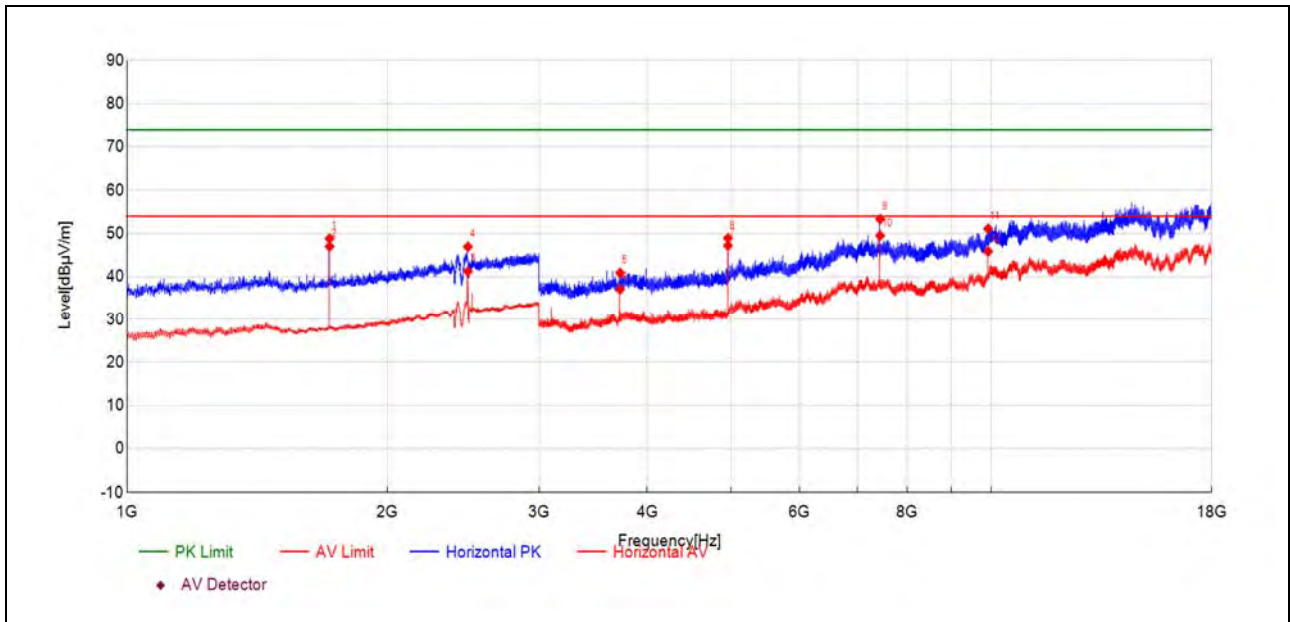
Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Angle [°]	Detector	Verdict
1715.34	46.0	46.36	0.370	74.00	27.64	29	PK	PASS
1715.74	43.6	43.96	0.370	54.00	10.04	29	AV	PASS
2440.69	47.5	53.30	5.830	-	-	29	PK	NA
2441.49	46.0	51.79	5.840	-	-	29	AV	NA
3661.73	49.0	40.06	-8.910	54.00	13.94	129	AV	PASS
3661.73	52.9	43.94	-8.910	74.00	30.06	103	PK	PASS
4882.34	50.1	45.12	-5.020	54.00	8.88	76	AV	PASS
4882.34	52.6	47.56	-5.020	74.00	26.44	89	PK	PASS
7323.12	44.5	48.76	4.300	54.00	5.24	277	AV	PASS
7323.55	48.8	53.07	4.300	74.00	20.93	277	PK	PASS
9671.76	40.5	49.75	9.290	74.00	24.25	236	PK	PASS
9763.91	35.0	44.04	9.000	54.00	9.96	169	AV	PASS

Plot for Channel 78



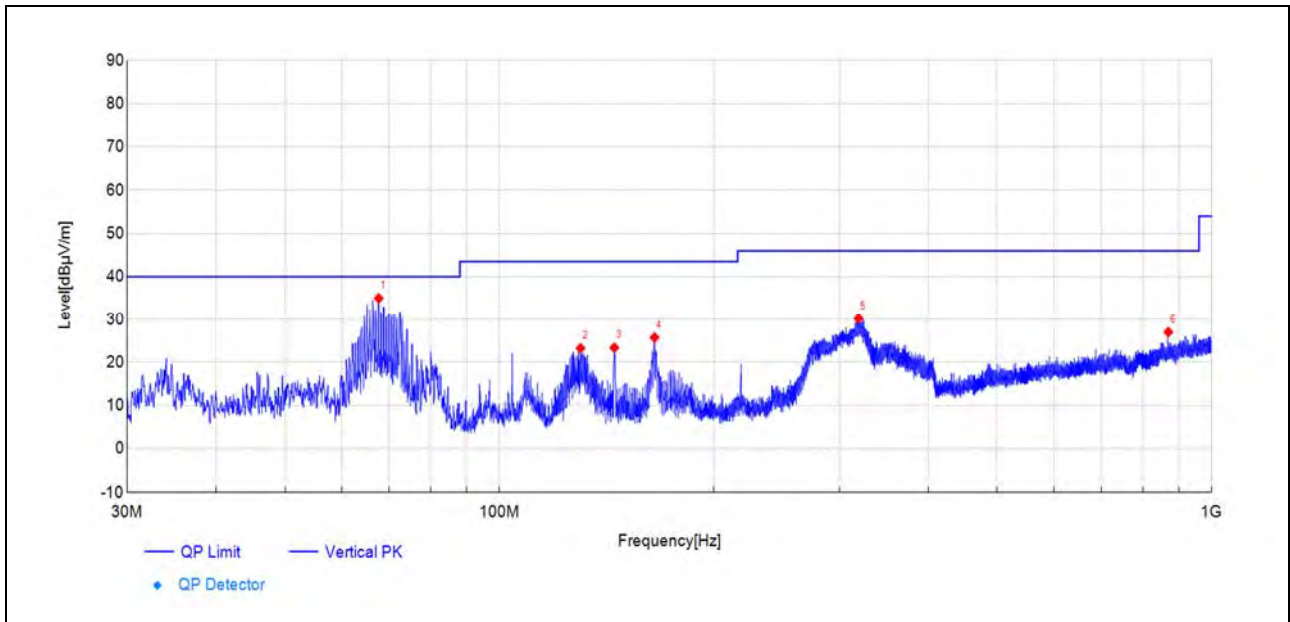
(Antenna Horizontal, 30MHz to 1GHz)

Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Angle [°]	Detector	Verdict
66.47	61.9	31.13	-30.750	40.00	8.87	350	PK	PASS
104.35	56.4	26.86	-29.490	43.50	16.64	323	PK	PASS
129.91	62.5	30.53	-31.920	43.50	12.97	163	PK	PASS
165.08	56.0	24.57	-31.440	43.50	18.93	261	PK	PASS
274.55	51.1	24.92	-26.150	46.00	21.08	108	PK	PASS
406.62	49.7	26.50	-23.240	46.00	19.50	261	PK	PASS



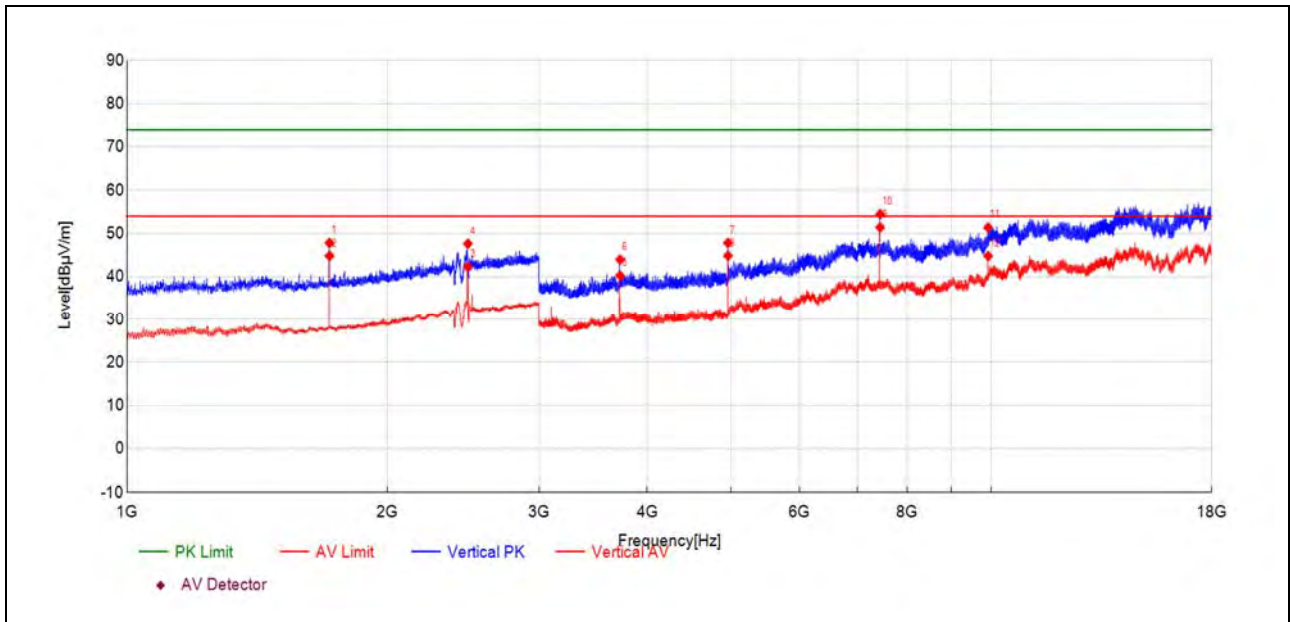
(Antenna Horizontal, 1GHz to 18GHz)

Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Angle [°]	Detector	Verdict
1715.34	48.4	48.81	0.370	74.00	25.19	41	PK	PASS
1715.74	46.6	47.00	0.370	54.00	7.00	41	AV	PASS
2480.30	35.4	41.24	5.890	-	-	74	AV	NA
2480.30	41.0	46.93	5.890	-	-	68	PK	NA
3720.02	49.9	40.88	-8.970	74.00	33.12	90	PK	PASS
3720.45	46.1	37.10	-8.960	54.00	16.90	64	AV	PASS
4960.34	51.8	47.18	-4.610	54.00	6.82	251	AV	PASS
4960.34	53.5	48.92	-4.610	74.00	25.08	278	PK	PASS
7439.27	48.7	53.32	4.630	74.00	20.68	170	PK	PASS
7440.56	44.9	49.52	4.630	54.00	4.48	170	AV	PASS
9920.34	41.8	51.12	9.370	74.00	22.88	251	PK	PASS
9920.77	36.5	45.87	9.370	54.00	8.13	90	AV	PASS



(Antenna Vertical, 30MHz to 1GHz)

Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Angle [°]	Detector	Verdict
67.69	66.1	35.00	-31.070	40.00	5.00	88	PK	PASS
129.96	55.1	23.23	-31.910	43.50	20.27	254	PK	PASS
145.00	54.8	23.38	-31.440	43.50	20.12	351	PK	PASS
165.08	57.2	25.75	-31.440	43.50	17.75	351	PK	PASS
319.22	55.3	30.17	-25.110	46.00	15.83	74	PK	PASS
869.09	39.4	27.00	-12.430	46.00	19.00	24	PK	PASS



(Antenna Vertical, 1GHz to 18GHz)

Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Angle [°]	Detector	Verdict
1714.94	47.5	47.83	0.370	74.00	26.17	22	PK	PASS
1715.74	44.5	44.83	0.370	54.00	9.17	33	AV	PASS
2480.30	36.4	42.30	5.890	-	-	33	AV	NA
2480.30	41.7	47.63	5.890	-	-	242	PK	NA
3720.45	49.2	40.26	-8.960	54.00	13.74	130	AV	PASS
3720.45	52.9	43.98	-8.960	74.00	30.02	145	PK	PASS
4959.91	52.4	47.82	-4.610	74.00	26.18	331	PK	PASS
4960.34	49.5	44.86	-4.610	54.00	9.14	331	AV	PASS
7440.56	46.8	51.42	4.630	54.00	2.58	278	AV	PASS
7440.56	49.9	54.48	4.630	74.00	19.52	278	PK	PASS
9920.34	42.0	51.39	9.370	74.00	22.61	170	PK	PASS
9920.77	35.4	44.81	9.370	54.00	9.19	64	AV	PASS

END OF REPORT