RF TEST REPORT

Product Name: Wi-Fi Bluetooth dual mode 7-day programmable thermostat

Model Name: QD-HVAC10(W), QD-HVAC10WIFI, MD-HVAC10(W), Thermo-HVAC10, Thermo-HVAC10(W)

FCC ID: 2BBA7HVAC10W

Issued For : Dongguan Meiqi Intelligence Technology Co., Ltd.

No.1 Jiangzhong Second Street, Huangjiang New Village, Huangjiang Town, Dongguan City, Guangdong Province, China

Issued By : Shenzhen LGT Test Service Co., Ltd.

Room 205, Building 13, Zone B, Zhenxiong Industrial Park, No.177, Renmin West Road, Jinsha, Kengzi Street, Pingshan District, Shenzhen, Guangdong, China

Report Number:	LGT23E039RF02
Sample Received Date:	May 18, 2023
Date of Test:	May 18, 2023 ~ May 29, 2023
Date of Issue:	May 29, 2023

The test report is effective only with both signature and specialized stamp. This report shall not be reproduced except in full without the written approval of the Laboratory. The results in this report only apply to the tested sample.

TEST REPORT CERTIFICATION

Applicant:	Dongguan Meiqi Intelligence Technology Co., Ltd.
Address:	No.1 Jiangzhong Second Street, Huangjiang New Village, Huangjiang Town, Dongguan City, Guangdong Province, China
Manufacturer:	QUNDA Control Technology (Jiangsu) Co., Ltd
Address:	No.888 Longqiao Road, Wujiang Economy Development Zone, Suzhou, Jiangsu, China
Product Name:	Wi-Fi Bluetooth dual mode 7-day programmable thermostat
Trademark:	MechDoc
Model Name:	QD-HVAC10(W), QD-HVAC10WIFI, MD-HVAC10(W), Thermo-HVAC10, Thermo-HVAC10(W)
Sample Status:	Normal

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC Part 15.247, Subpart C ANSI C63.10-2013	PASS

Prepared by:

Zane Shan

Zane Shan
Engineer

Approved by:

Vita Li
Technical Director

SHENZHEN LGT TEST SERVICE CO., LTD.
LGT
领冠检测

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Revision History

Rev.	Issue Date	Contents
00	May 29, 2023	Initial Issue

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:
KDB 558074 D01 15.247 Meas Guidance v05r02.

FCC Part 15.247,Subpart C			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	PASS	--
15.247 (a)(2)	6dB Bandwidth	PASS	--
15.247 (b)(3)	Output Power	PASS	--
15.209	Radiated Spurious Emission	PASS	--
15.247 (d)	Conducted Spurious & Band Edge Emission	PASS	--
15.247 (e)	Power Spectral Density	PASS	--
15.205	Restricted Band Edge Emission	PASS	--
Part 15.247(d)/ Part 15.209(a)	Band Edge Emission	PASS	--
15.203	Antenna Requirement	PASS	--

NOTE:

(1) ‘N/A’ denotes test is not applicable in this Test Report.

(2) All tests are according to ANSI C63.10-2013.

1.1 TEST FACTORY

Company Name:	Shenzhen LGT Test Service Co., Ltd.
Address:	Room 205, Building 13, Zone B, Chen Hsong Industrial Park, No.177 Renmin West Road, Jinsha Community, Kengzi Street, Pingshan New District, Shenzhen, China
Accreditation Certificate	A2LA Certificate No.: 6727.01
	FCC Registration No.: 746540
	CAB ID: CN0136

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement **y ± U**, where expended uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k=2**, providing a level of confidence of approximately **95** %.

Parameter	Uncertainty
Occupied Channel Bandwidth	±3.2 %
RF Output Power, Conducted	±0.71dB
Power Spectral Density, Conducted	±1.57 dB
Unwanted Emission, Conducted	±0.63dB
Conducted emission	±2.80dB
All Emissions, Radiated (0.009-30MHz)	±2.16dB
All Emissions, Radiated (30MHz-1GHz)	±4.40dB
All Emissions, Radiated (1GHz-18GHz)	±5.49dB
Temperature	±0.5°C
Humidity	±2%
Duty Cycle	±2.3%

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF THE EUT

<table>
<tr><td>Product Name:</td><td>Wi-Fi Bluetooth dual mode 7-day programmable thermostat</td></tr>
<tr><td>Trademark:</td><td>MechDoc</td></tr>
<tr><td>Model Name:</td><td>QD-HVAC10(W)</td></tr>
<tr><td>Series Model:</td><td>QD-HVAC10WIFI, MD-HVAC10(W), Thermo-HVAC10, Thermo-HVAC10(W)</td></tr>
<tr><td>Model Difference:</td><td>Only different in model name</td></tr>
<tr><td>Product Description:</td><td>The EUT is a Wi-Fi Bluetooth dual mode 7-day programmable thermostat
<table>
<tr><td>Operation Frequency:</td><td>802.11b/g/n (20MHz): 2412~2462 MHz</td></tr>
<tr><td>Modulation Type:</td><td>802.11b(DSSS):CCK,DQPSK,DBPSK
802.11g(OFDM):BPSK,QPSK,16-QAM,64-QAM
802.11n(OFDM):BPSK,QPSK,16-QAM,64-QAM</td></tr>
<tr><td>Number of Channel:</td><td>802.11b/g/n (20MHz): 11CH</td></tr>
<tr><td>Antenna Designation:</td><td>PCB Antenna</td></tr>
<tr><td>Antenna Gain(dBi):</td><td>2.5</td></tr>
<tr><td>Duty Cycle:</td><td>>98%</td></tr>
</table></td></tr>
<tr><td>Channel List:</td><td>Please refer to the Note 2.</td></tr>
<tr><td>Input:</td><td>AC 24V</td></tr>
<tr><td>Battery:</td><td>N/A</td></tr>
<tr><td>Hardware Version:</td><td>N/A</td></tr>
<tr><td>Software Version:</td><td>N/A</td></tr>
<tr><td>Connecting I/O Port(s):</td><td>Please refer to the Note 1.</td></tr>
</table>

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User Manual.

2.

Operation Frequency of channel	
802.11b/g/n (20MHz)	
Channel	Frequency
01	2412
02	2417
03	2422
04	2427
05	2432
06	2437
07	2442
08	2447
09	2452
10	2457
11	2462

3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	MechDoc	QD-HVAC10(W)	PCB	N/A	2.5	2.4G WIFI

Note:
In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, themiddle frequency, and the highest frequency of channel were selected to perform the test, and the selectedchannel see below:
Carrier Frequency Channel

2.4GHz Test Frequency:

For 802.11b/g/n (20MHz)	
Channel	Freq.(MHz)
01	2412
06	2437
11	2462

Note: The antenna information refer the manufacturer provide report, applicable only to the tested sample identified in the report.

2.2 DESCRIPTION OF THE TEST MODES

Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Worst Mode	Description	Data Rate
Mode 1	TX IEEE 802.11b CH1	1 Mbps
Mode 2	TX IEEE 802.11b CH6	1 Mbps
Mode 3	TX IEEE 802.11 b CH11	1 Mbps
Mode 4	TX IEEE 802.11g CH1	6 Mbps
Mode 5	TX IEEE 802.11g CH6	6 Mbps
Mode 6	TX IEEE 802.11g CH11	6 Mbps
Mode 7	TX IEEE 802.11n HT20 CH1	MCS 0
Mode 8	TX IEEE 802.11n HT20 CH6	MCS 0
Mode 9	TX IEEE 802.11n HT20 CH11	MCS 0

Note:

(1) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported.

(2) We have be tested for all avaiable U.S. voltage and frequencies(For 120V,50/60Hz and 240V, 50/60Hz) for which the device is capable of operation, and the worst case of 120V /60Hz is shown in the report.

AC Conducted Emission

Test Case	
AC Conducted Emission	Mode10: WLAN Link

2.3 TEST SOFTWARE AND POWER LEVEL

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level.

Accessories Equipment

Description	Manufacturer	Model	S/N	Rating

Auxiliary Equipment

Description	Manufacturer	Model	S/N	Rating
Laptop	Lenovo	Thinkbook 14	N/A	N/A
control transformer	CHNT	NDK-300	N/A	AC 24V

2.4 TABLE OF PARAMETERS OF TEST SOFTWARE SETTING

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of FHSS.

Test software Version	Test program: 2.4G WIFI	
UI_mptool_1.0.0.1	Mode Or Modulation type	Power setting
	b	65
	g	65
	n20	65

2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

Conducted Emission					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date**	**Cal. Until**
EMI Test Receiver	R&S	ESU8	100372	2023.04.13	2024.04.12
LISN	COM-POWER	LI-115	02032	2023.04.07	2024.04.06
LISN	SCHWARZBECK	NNLK 8121	00847	2023.04.07	2024.04.06
LISN	SCHWARZBECK	NNLK 8122	00160	2023.04.07	2024.04.06
ISN	FCC	T4-02	91317	2022.06.08	2023.06.07
ISN	SCHWARZBECK	NTFM 8158	00303	2023.04.07	2024.04.06
Transient Limiter	CYBERTEK	EM5010A	E2250100049	2023.04.07	2024.04.06
Temperature & Humidity	KTJ	TA218B	N.A	2023.04.24	2024.04.23
Testing Software	EMC-I_V1.4.0.3_SKET				

Radiated Test equipment					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date**	**Cal. Until**
EMI Test Receiver	R&S	ESU8	100372	2023.04.13	2024.04.12
Active loop Antenna	ETS	6502	00049544	2022.06.02	2025.06.01
Spectrum Analyzer	Keysight	N9010B	MY60242508	2023.04.10	2024.04.09
Bilog Antenna	SCHAFFNER	CBL6112B	2705	2022.06.05	2025.06.04
Horn Antenna	SCHWARZBECK	3115	10SL0060	2022.06.02	2025.06.01
Pre-amplifier(9kHz-1GHz)	EMtrace	RP01A	02017	2023.04.07	2024.04.06
Pre-amplifier(1-26.5G)	Agilent	8449B	3008A4722	2023.04.07	2024.04.06
Wireless Communications Test Set	R&S	CMW 500	137737	2023.04.13	2024.04.12
Temperature & Humidity	KTJ	TA218B	N.A	2023.04.24	2024.04.23
Testing Software	EMC-I_V1.4.0.3_SKET				

Conducted Test equipment					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date**	**Cal. Until**
Signal Analyzer	Keysight	N9010B	MY60242508	2023.04.10	2024.04.09
Wireless Communications Test Set	R&S	CMW 500	137737	2023.04.13	2024.04.12
MXG Vector Signal Generator	Keysight	N5182B	MY59100717	2023.04.07	2024.04.06
RF Automatic Test system	MW	MW100-RFCB	MW220324LG-33	2023.04.13	2024.04.12
Temperature & Humidity	KTJ	TA218B	N.A	2023.04.24	2024.04.23
Temperature& Humidity test chamber	AISRY	LX-1000L	171200018	2022.05.10	2023.05.09
Attenuator	eastsheep	90db	N.A	2023.04.10	2024.04.09
Testing Software	MTS8200_ V2.0.0.0_MW				

3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION LIMITS

The radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table.

FREQUENCY (MHz)	Conducted Emissionlimit (dBuV)	
	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

Note:

(1) The tighter limit applies at the band edges.

(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

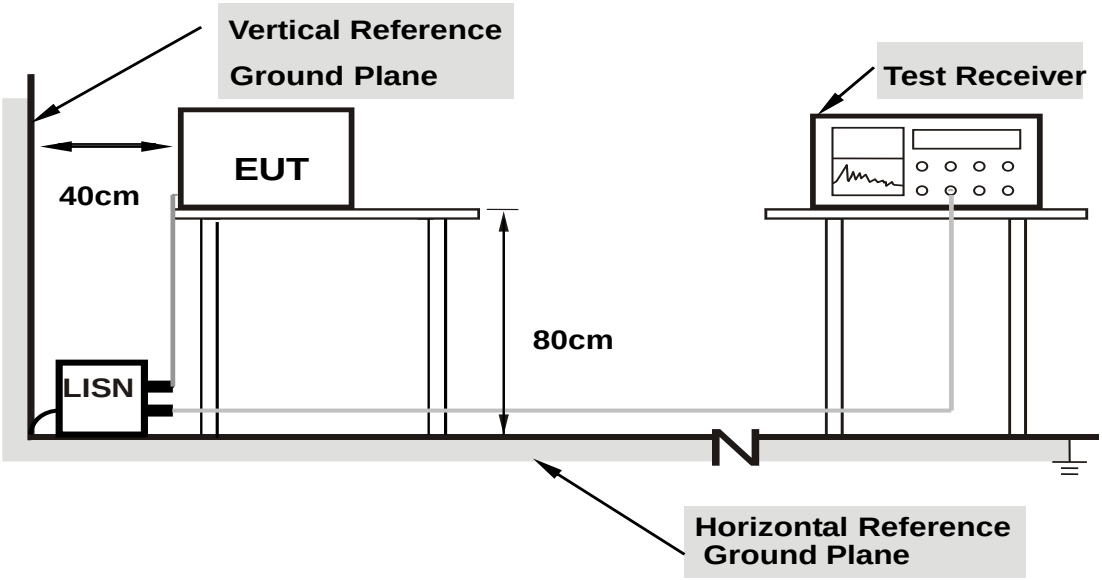
The following table is the setting of the receiver

Receiver Parameters	**Setting**
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

3.1.2 TEST PROCEDURE

a. The EUT is 0.8 m from the horizontal ground plane and 0.4 m from the vertical ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments are powered from additional LISN(s). The LISN provides 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
d. LISN is at least 80 cm from the nearest part of EUT chassis.
e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.3 TEST SETUP



Note: 1. Support units were connected to second LISN.

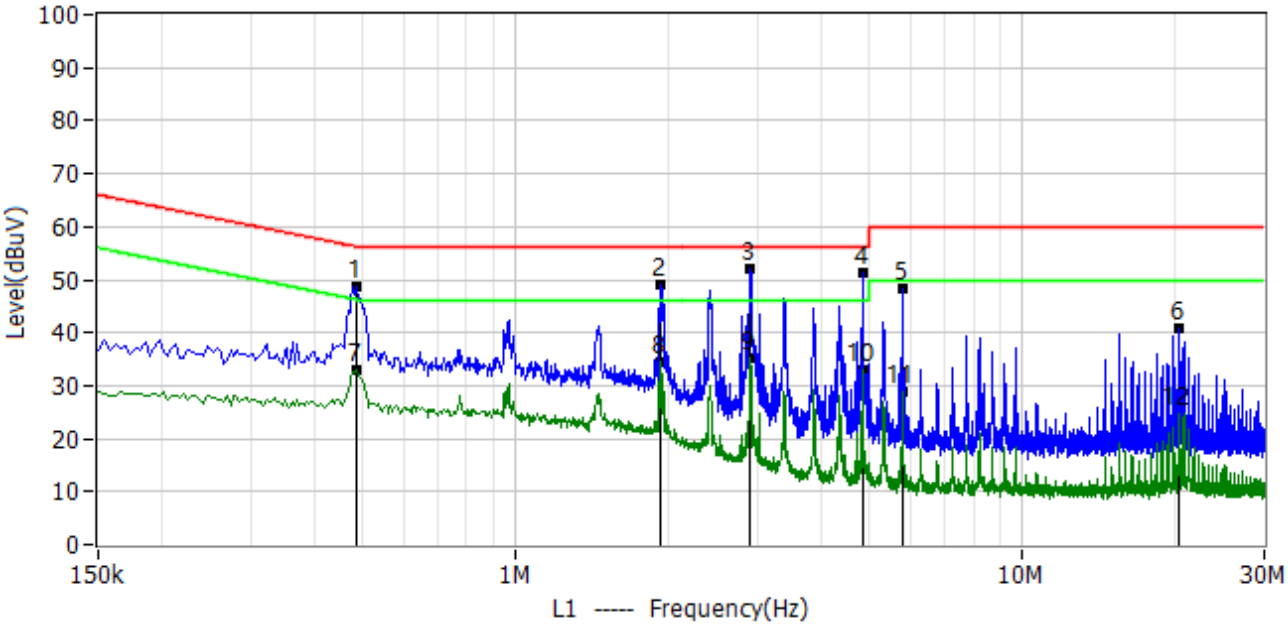
2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes support units.

3.1.4 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

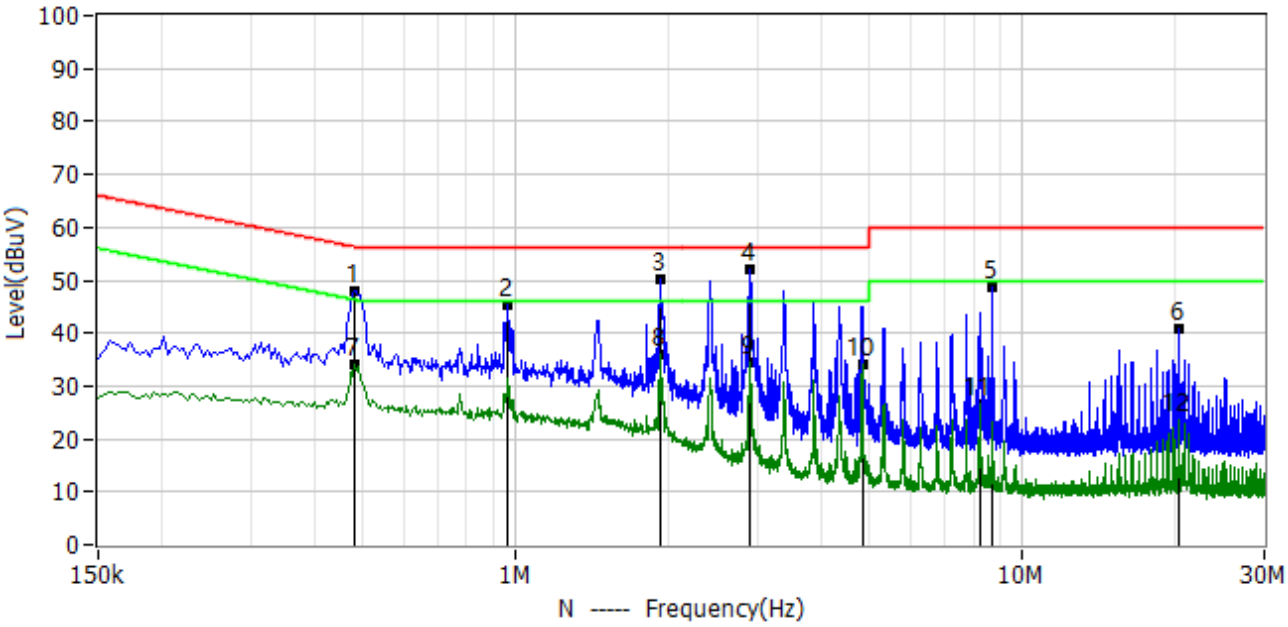
3.1.5 TEST RESULT

Project: LGT23E039	Test Engineer: Dylan.shi
EUT: Wi-Fi Bluetooth dual mode 7-day programmable thermostat	Temperature: 26.9℃
M/N: QD-HVAC10(W)	Humidity: 51%RH
Test Voltage: AC 24V/50Hz	Test Data: 2023-05-29
Test Mode: 2.4G Wi-Fi TX	
Note:	



No.	Frequency	Reading dBuV	Factor dB	Level dBuV	Limit dBuV	Margin dB	Detector	Polar
1*	486.000kHz	38.15	10.66	48.81	56.24	-7.42	QP	L1
2*	1.938MHz	38.24	10.99	49.23	56.00	-6.77	QP	L1
3*	2.906MHz	40.85	11.11	51.96	56.00	-4.04	QP	L1
4*	4.838MHz	40.13	11.34	51.47	56.00	-4.53	QP	L1
5*	5.786MHz	36.85	11.47	48.32	60.00	-11.68	QP	L1
6*	20.322MHz	28.44	12.33	40.77	60.00	-19.23	QP	L1
7*	486.000kHz	22.12	10.66	32.78	46.24	-13.45	AV	L1
8*	1.938MHz	23.44	10.99	34.43	46.00	-11.57	AV	L1
9*	2.906MHz	24.15	11.11	35.26	46.00	-10.74	AV	L1
10*	4.838MHz	21.58	11.34	32.92	46.00	-13.08	AV	L1
11*	5.786MHz	17.37	11.47	28.84	50.00	-21.16	AV	L1
12*	20.370MHz	12.46	12.33	24.79	50.00	-25.21	AV	L1

Project: LGT23E039	Test Engineer: Dylan.shi
EUT: Wi-Fi Bluetooth dual mode 7-day programmable thermostat	Temperature: 26.9℃
M/N: QD-HVAC10(W)	Humidity: 51%RH
Test Voltage: AC 24V/50Hz	Test Data: 2023-05-29
Test Mode: 2.4G Wi-Fi TX	
Note:	



No.	Frequency	Reading dBuV	Factor dB	Level dBuV	Limit dBuV	Margin dB	Detector	Polar
1*	482.000kHz	37.34	10.73	48.07	56.30	-8.24	QP	N
2*	962.000kHz	34.35	10.79	45.14	56.00	-10.86	QP	N
3*	1.934MHz	39.28	11.04	50.32	56.00	-5.68	QP	N
4*	2.894MHz	40.77	11.17	51.94	56.00	-4.06	QP	N
5*	8.726MHz	36.68	11.93	48.61	60.00	-11.39	QP	N
6*	20.282MHz	28.63	12.38	41.01	60.00	-18.99	QP	N
7*	482.000kHz	23.27	10.73	34.00	46.30	-12.31	AV	N
8*	1.934MHz	24.91	11.04	35.95	46.00	-10.05	AV	N
9*	2.902MHz	23.20	11.17	34.37	46.00	-11.63	AV	N
10*	4.826MHz	22.58	11.44	34.02	46.00	-11.98	AV	N
11*	8.222MHz	14.77	11.88	26.65	50.00	-23.35	AV	N
12*	20.362MHz	11.22	12.38	23.60	50.00	-26.40	AV	N

3.2 RADIATED EMISSION MEASUREMENT

3.2.1 RADIATED EMISSION LIMITS

In any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the Restricted band specified on Part15.205(a)&209(a) limit in the table and according to ANSI C63.10-2013 below has to be followed.

LIMITS OF RADIATED EMISSION MEASUREMENT (0.009MHz - 1000MHz)

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
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

LIMITS OF RADIATED EMISSION MEASUREMENT (1000MHz-25GHz)

FREQUENCY (MHz)	(dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

(1) The limit for radiated test was performed according to FCC PART 15C.

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

LIMITS OF RESTRICTED FREQUENCY BANDS

FREQUENCY (MHz)	FREQUENCY (MHz)	FREQUENCY (MHz)	FREQUENCY (GHz)
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

For Radiated Emission

Spectrum Parameter	Setting
Attenuation	Auto
Detector	Peak/QP/AV
Start Frequency	9 KHz/150KHz(Peak/QP/AV)
Stop Frequency	150KHz/30MHz(Peak/QP/AV)
RB / VB (emission in restricted band)	200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz); 200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz)

Spectrum Parameter	Setting
Attenuation	Auto
Detector	Peak/QP
Start Frequency	30 MHz(Peak/QP)
Stop Frequency	1000 MHz (Peak/QP)
RB / VB (emission in restricted band)	120 KHz / 300 KHz

Spectrum Parameter	Setting
Attenuation	Auto
Detector	Peak
Start Frequency	1000 MHz(Peak/AV)
Stop Frequency	10th carrier hamonic(Peak/AV)
RB / VB (emission in restricted band)	1 MHz / 3 MHz(Peak) 1 MHz/1/T MHz(AVG)

For Restricted band

Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	Lower Band Edge: 2310 to 2430 MHz Upper Band Edge: 2445 to 2500 MHz
RB / VB	1 MHz / 3 MHz(Peak) 1 MHz/1/T MHz(AVG)

Receiver Parameter	Setting
Start ~ Stop Frequency	9kHz~90kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	90kHz~110kHz / RB 200Hz for QP
Start ~ Stop Frequency	110kHz~490kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	490kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

3.2.2 TEST PROCEDURE

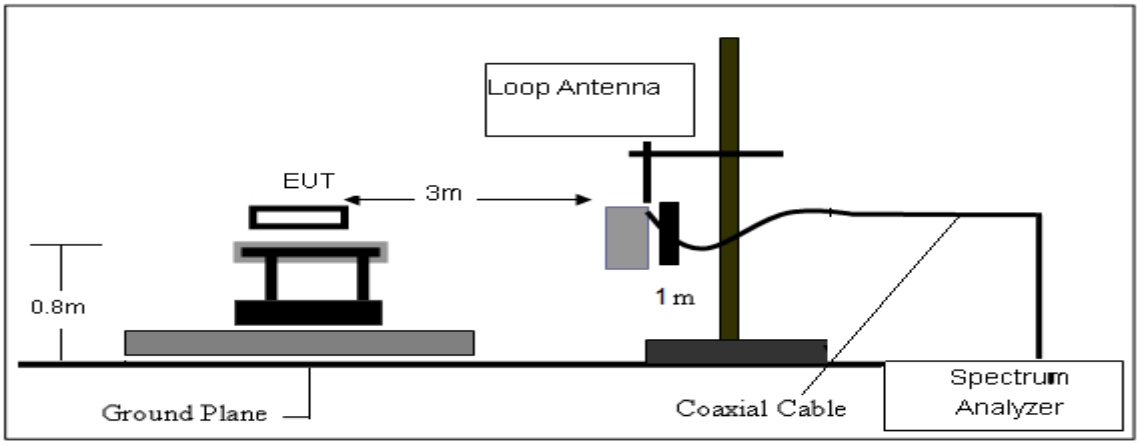
a. The measuring distance at 3 m shall be used for measurements at frequency 0.009MHz up to 1GHz, and above 1GHz.
b. The EUT was placed on the top of a rotating table 0.8 m (above 1GHz is 1.5 m) above the ground at a 3 m anechoic chamber test site. The table was rotated 360 degree to determine the position of the highest radiation.
c. The height of the equipment shall be 0.8 m (above 1GHz is 1.5 m); the height of the test antenna shall vary between 1 m to 4 m. Horizontal and vertical polarization of the antenna are set to make the measurement.
d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and QuasiPeak detector mode will be re-measured.
e. If the Peak Mode measured value is compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and no additional QP Mode measurement was performed.
f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

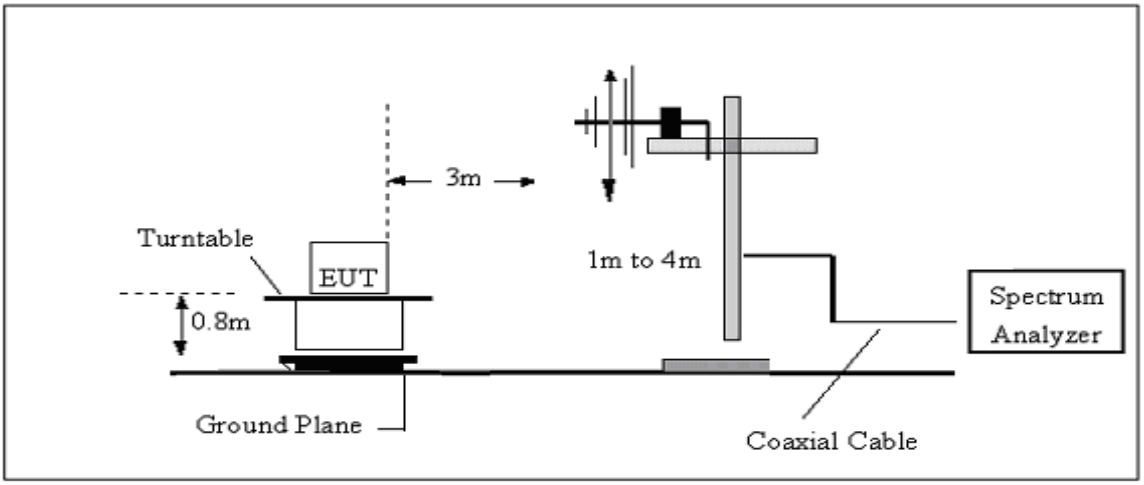
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported.

3.2.3 TEST SETUP

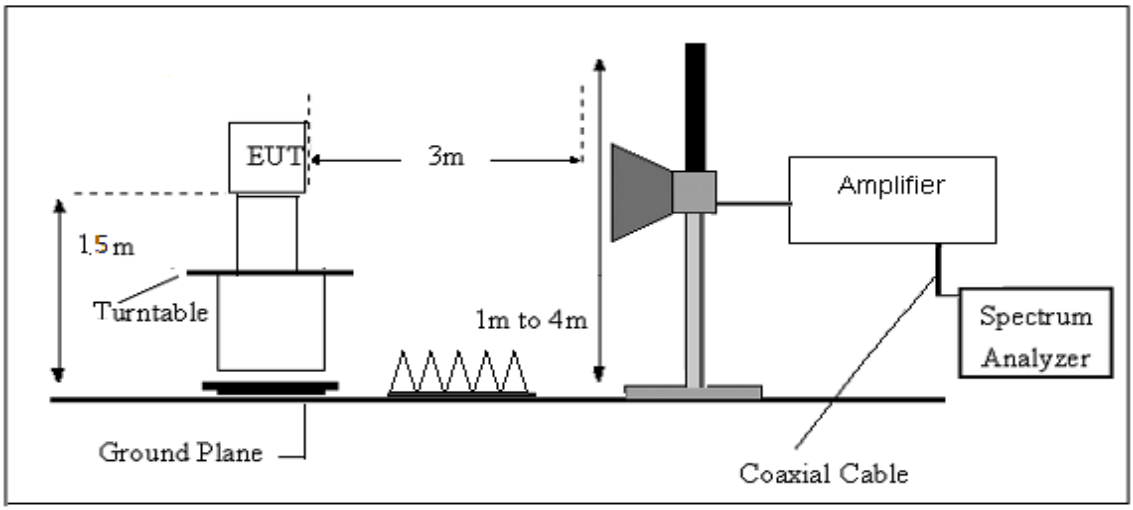
(A) Radiated Emission Test-Up Frequency Below 30MHz



(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



(C) Radiated Emission Test-Up Frequency Above 1GHz



3.2.4 EUT OPERATING CONDITIONS

Please refer to section 3.1.4 of this report.

3.2.5 FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting theAmplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where

FS = Field Strength

CL = Cable Attenuation Factor (Cable Loss)

RA = Reading Amplitude

AG = Amplifier Gain

AF = Antenna Factor

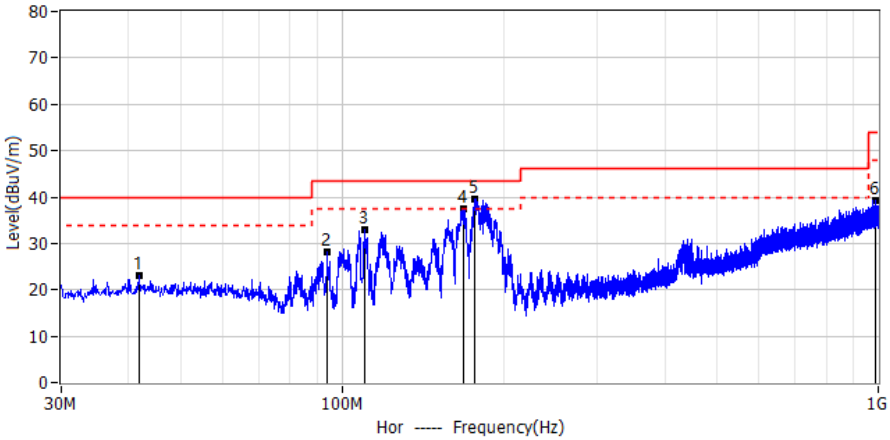
For example

Frequency	FS	RA	AF	CL	AG	Factor
(MHz)	(dBμV/m)	(dBμV/m)	(dB)	(dB)	(dB)	(dB)
300	40	58.1	12.2	1.6	31.9	-18.1

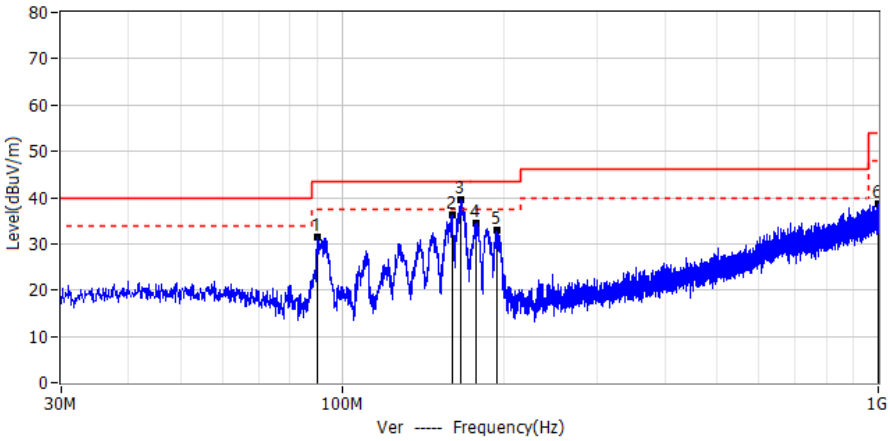
Factor=AF+CL-AG

3.2.6 TEST RESULT

Project: LGT23E039	Test Engineer: Dylan.shi
EUT: Wi-Fi Bluetooth dual mode 7-day programmable thermostat	Temperature: 26.5℃
M/N: QD-HVAC10(W)	Humidity: 54%RH
Test Voltage: AC 24V/50Hz	Test Data: 2023-05-29
Test Mode: 2.4G Wi-Fi TX	
Note:	

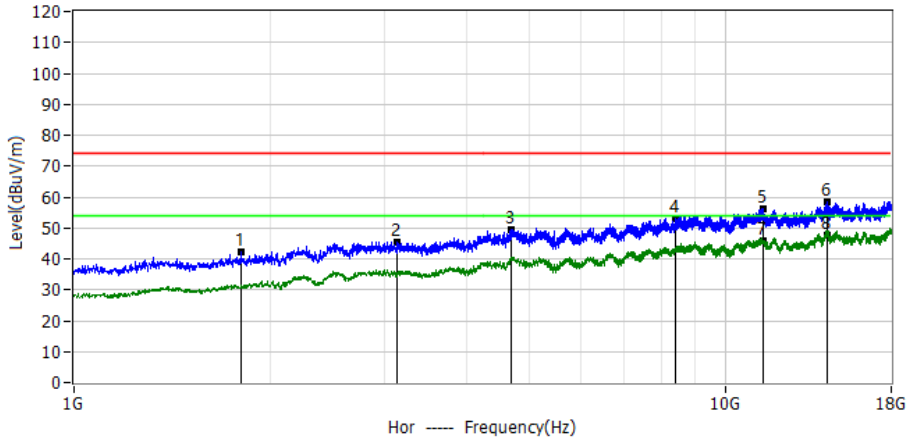


No.	Frequency	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Polar
1*	41.883MHz	3.83	19.32	23.15	40.00	-16.85	QP	Hor
2*	94.141MHz	12.85	15.29	28.14	43.50	-15.36	QP	Hor
3*	110.389MHz	16.17	16.81	32.98	43.50	-10.52	QP	Hor
4*	169.074MHz	17.72	19.79	37.51	43.50	-5.99	QP	Hor
5*	177.319MHz	20.44	19.09	39.53	43.50	-3.97	QP	Hor
6*	986.420MHz	4.79	34.51	39.30	54.00	-14.70	QP	Hor

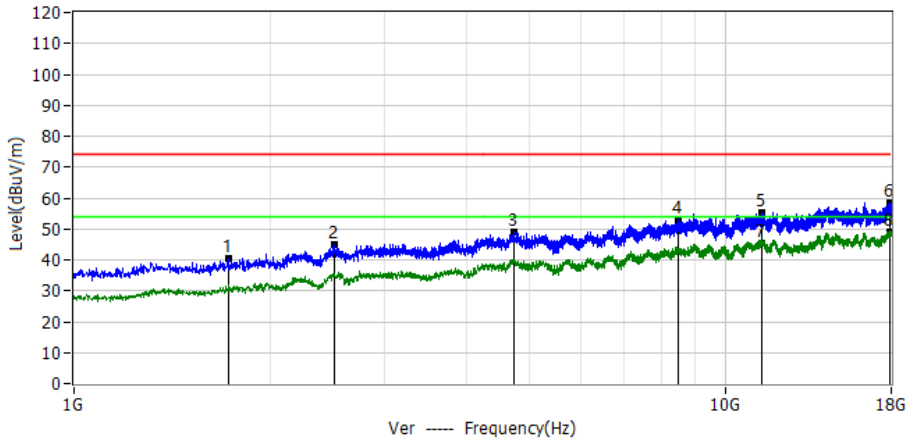


No.	Frequency	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Polar
1*	90.261MHz	16.53	15.07	31.60	43.50	-11.90	QP	Ver
2*	160.586MHz	16.47	19.83	36.30	43.50	-7.20	QP	Ver
3*	166.770MHz	19.73	19.80	39.53	43.50	-3.97	QP	Ver
4*	178.289MHz	15.56	18.99	34.55	43.50	-8.95	QP	Ver
5*	194.294MHz	15.37	17.44	32.81	43.50	-10.69	QP	Ver
6*	998.666MHz	4.07	34.56	38.63	54.00	-15.37	QP	Ver

Project: LGT23E039	Test Engineer: Dylan.shi
EUT: Wi-Fi Bluetooth dual mode 7-day programmable thermostat	Temperature: 26.7℃
M/N: QD-HVAC10(W)	Humidity: 59%RH
Test Voltage: AC 24V/50Hz	Test Data: 2023-05-24
Test Mode: 802.11b 2412	
Note:	

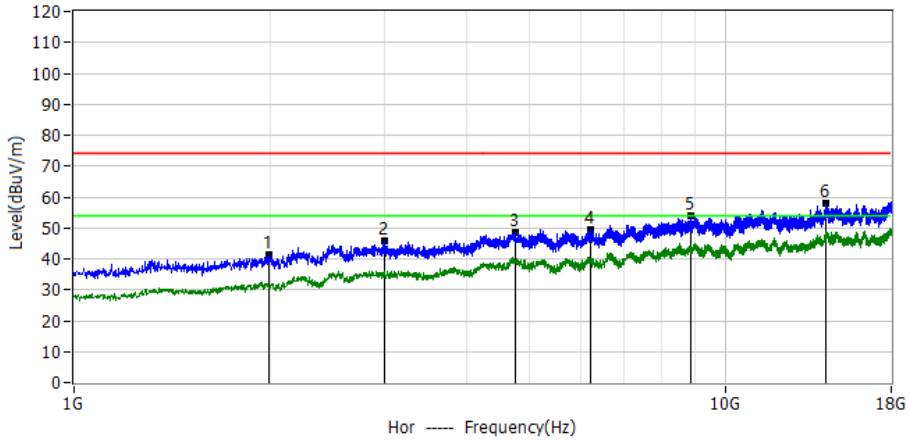


No.	Frequency	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Polar
1*	1.803GHz	60.31	-18.22	42.09	74.00	-31.90	PK	Hor
2*	3.136GHz	53.94	-8.38	45.56	74.00	-28.40	PK	Hor
3*	4.702GHz	55.32	-5.91	49.41	74.00	-24.60	PK	Hor
4*	8.404GHz	56.02	-2.86	53.16	74.00	-20.80	PK	Hor
5*	11.425GHz	54.45	1.88	56.33	74.00	-17.70	PK	Hor
6*	14.362GHz	52.62	5.90	58.52	74.00	-15.50	PK	Hor
7*	11.425GHz	43.82	1.88	45.70	54.00	-8.30	AV	Hor
8*	14.362GHz	41.90	5.90	47.80	54.00	-6.20	AV	Hor

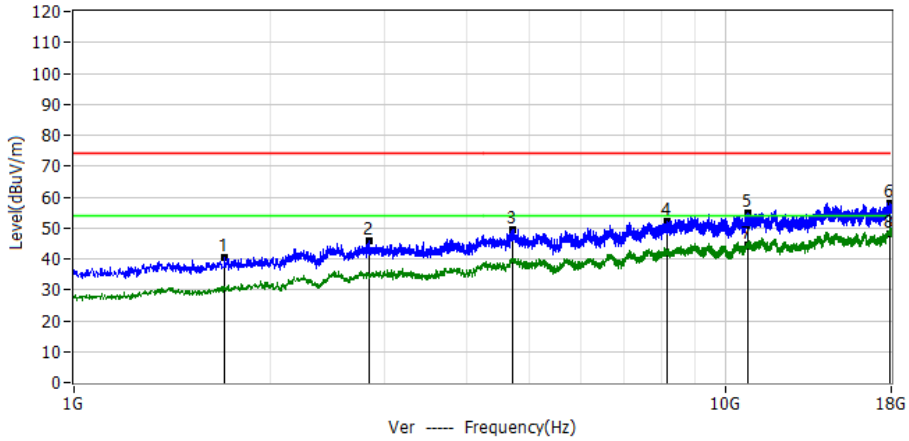


No.	Frequency	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Polar
1*	1.725GHz	59.46	-18.98	40.48	74.00	-33.50	PK	Ver
2*	2.507GHz	55.84	-10.95	44.89	74.00	-29.10	PK	Ver
3*	4.734GHz	54.85	-5.93	48.92	74.00	-25.10	PK	Ver
4*	8.482GHz	55.87	-2.64	53.23	74.00	-20.80	PK	Ver
5*	11.364GHz	53.47	1.84	55.31	74.00	-18.70	PK	Ver
6*	17.883GHz	50.05	8.44	58.49	74.00	-15.50	PK	Ver
7*	11.364GHz	43.36	1.84	45.20	54.00	-8.80	AV	Ver
8*	17.883GHz	40.36	8.44	48.80	54.00	-5.20	AV	Ver

Project: LGT23E039	Test Engineer: Dylan.shi
EUT: Wi-Fi Bluetooth dual mode 7-day programmable thermostat	Temperature: 26.7℃
M/N: QD-HVAC10(W)	Humidity: 59%RH
Test Voltage: AC 24V/50Hz	Test Data: 2023-05-24
Test Mode: 802.11b 2437	
Note:	

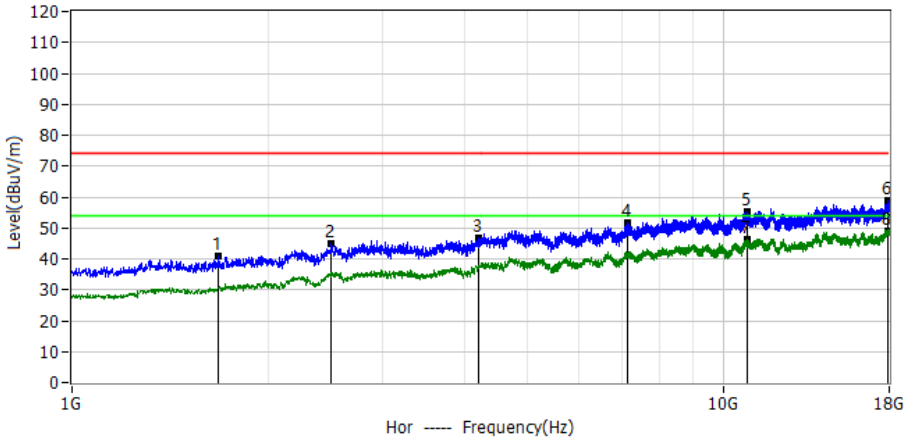


No.	Frequency	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Polar
1*	1.990GHz	57.70	-16.33	41.37	74.00	-32.60	PK	Hor
2*	2.991GHz	54.09	-8.39	45.70	74.00	-28.30	PK	Hor
3*	4.757GHz	54.44	-5.95	48.49	74.00	-25.50	PK	Hor
4*	6.228GHz	56.56	-7.10	49.46	74.00	-24.50	PK	Hor
5*	8.869GHz	55.61	-1.54	54.07	74.00	-19.90	PK	Hor
6*	14.315GHz	52.27	5.90	58.17	74.00	-15.80	PK	Hor

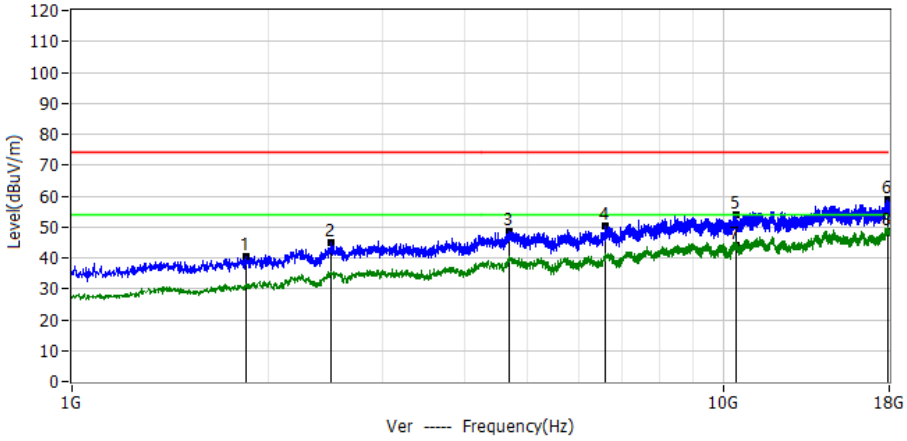


No.	Frequency	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Polar
1*	1.703GHz	59.84	-19.18	40.66	74.00	-33.30	PK	Ver
2*	2.847GHz	55.03	-9.15	45.88	74.00	-28.10	PK	Ver
3*	4.712GHz	55.24	-5.92	49.32	74.00	-24.70	PK	Ver
4*	8.129GHz	55.87	-3.63	52.24	74.00	-21.80	PK	Ver
5*	10.845GHz	53.55	1.19	54.74	74.00	-19.30	PK	Ver
6*	17.900GHz	49.61	8.45	58.06	74.00	-15.90	PK	Ver
7*	10.845GHz	43.51	1.19	44.70	54.00	-9.30	AV	Ver
8*	17.900GHz	39.55	8.45	48.00	54.00	-6.00	AV	Ver

Project: LGT23E039	Test Engineer: Dylan.shi
EUT: Wi-Fi Bluetooth dual mode 7-day programmable thermostat	Temperature: 26.7℃
M/N: QD-HVAC10(W)	Humidity: 59%RH
Test Voltage: AC 24V/50Hz	Test Data: 2023-05-24
Test Mode: 802.11b 2462	
Note:	



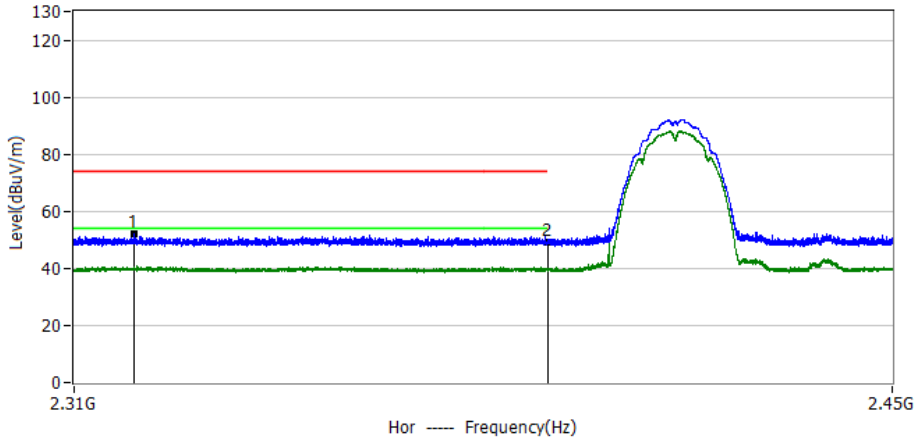
No.	Frequency	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Polar
1*	1.680GHz	60.36	-19.41	40.95	74.00	-33.00	PK	Hor
2*	2.505GHz	55.78	-10.96	44.82	74.00	-29.20	PK	Hor
3*	4.219GHz	53.56	-6.94	46.62	74.00	-27.40	PK	Hor
4*	7.143GHz	56.78	-5.29	51.49	74.00	-22.50	PK	Hor
5*	10.913GHz	53.78	1.39	55.17	74.00	-18.80	PK	Hor
6*	17.887GHz	50.23	8.44	58.67	74.00	-15.30	PK	Hor
7*	10.913GHz	45.01	1.39	46.40	54.00	-7.60	AV	Hor
8*	17.887GHz	40.36	8.44	48.80	54.00	-5.20	AV	Hor



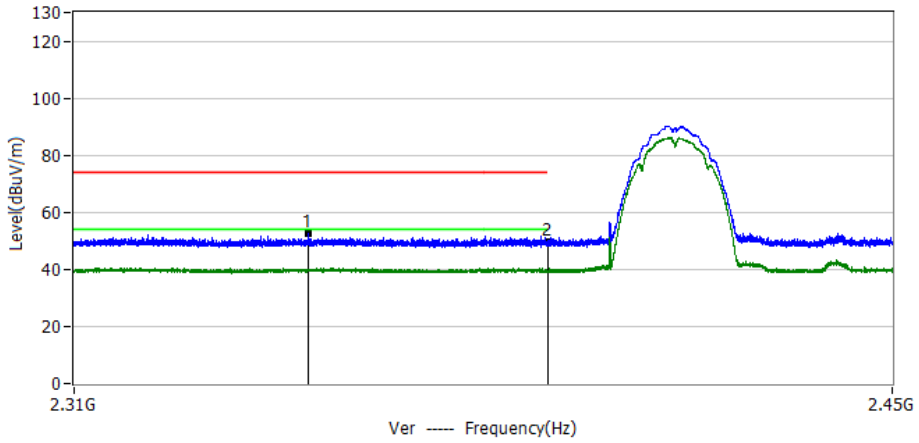
No.	Frequency	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Polar
1*	1.850GHz	58.10	-17.75	40.35	74.00	-33.60	PK	Ver
2*	2.498GHz	56.14	-11.00	45.14	74.00	-28.90	PK	Ver
3*	4.689GHz	54.35	-5.90	48.45	74.00	-25.50	PK	Ver
4*	6.606GHz	56.62	-6.38	50.24	74.00	-23.80	PK	Ver
5*	10.458GHz	54.04	0.11	54.15	74.00	-19.90	PK	Ver
6*	17.926GHz	50.62	8.47	59.09	74.00	-14.90	PK	Ver
7*	10.458GHz	44.09	0.11	44.20	54.00	-9.80	AV	Ver
8*	17.926GHz	39.93	8.47	48.40	54.00	-5.60	AV	Ver

3.2.7 RADIATED BAND EDGE

Project: LGT23E039	Test Engineer: Dylan.shi
EUT: Wi-Fi Bluetooth dual mode 7-day programmable thermostat	Temperature: 26.5℃
M/N: QD-HVAC10(W)	Humidity: 55%RH
Test Voltage: AC 24V/50Hz	Test Data: 2023-05-24
Test Mode: 802.11b 2412	
Note:	

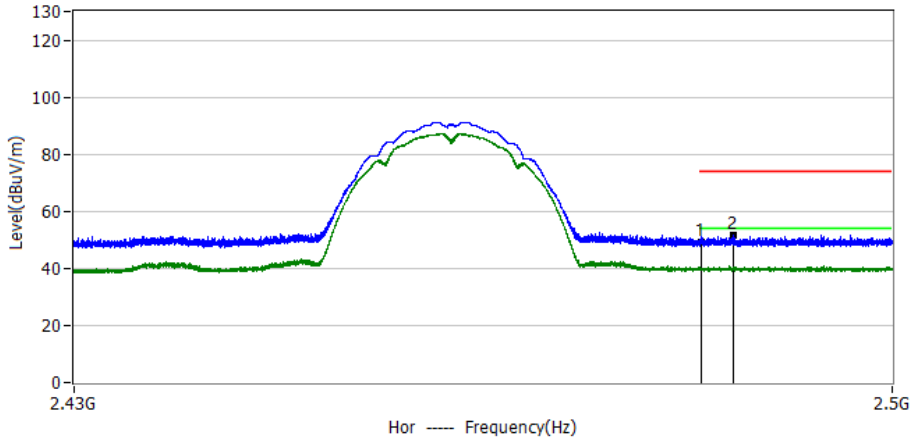


No.	Frequency	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Polar
1*	2.3200GHz	17.76	34.12	51.88	74.00	-22.12	PK	Hor
2*	2.3900GHz	15.05	33.95	49.00	74.00	-25.00	PK	Hor

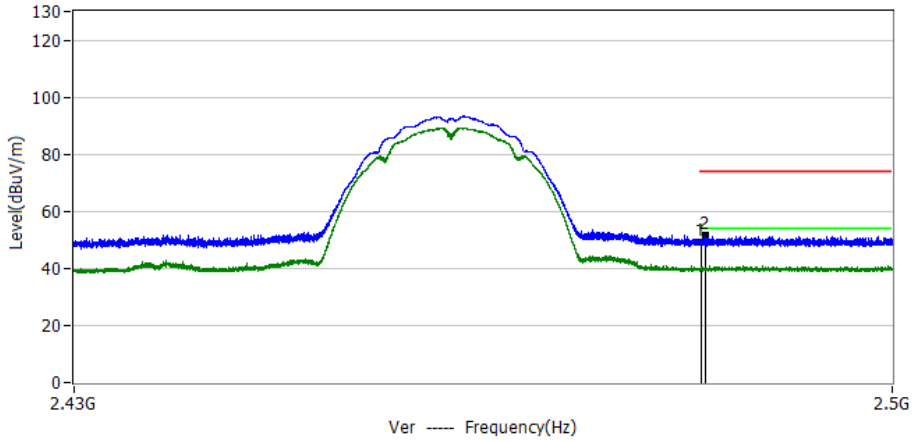


No.	Frequency	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Polar
1*	2.3493GHz	18.43	34.05	52.48	74.00	-21.52	PK	Ver
2*	2.3900GHz	15.95	33.95	49.90	74.00	-24.10	PK	Ver

Project: LGT23E039	Test Engineer: Dylan.shi
EUT: Wi-Fi Bluetooth dual mode 7-day programmable thermostat	Temperature: 26.5℃
M/N: QD-HVAC10(W)	Humidity: 55%RH
Test Voltage: AC 24V/50Hz	Test Data: 2023-05-24
Test Mode: 802.11b 2462	
Note:	



No.	Frequency	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Polar
1*	2.4835GHz	15.27	34.13	49.40	74.00	-24.60	PK	Hor
2*	2.4863GHz	17.39	34.13	51.52	74.00	-22.48	PK	Hor



No.	Frequency	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Polar
1*	2.4835GHz	15.17	34.13	49.30	74.00	-24.70	PK	Ver
2*	2.4838GHz	17.40	34.13	51.53	74.00	-22.47	PK	Ver

4. CONDUCTED SPURIOUS & BAND EDGE EMISSION

4.1 LIMIT

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.

4.2 TEST PROCEDURE

Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	30 MHz to 10th carrier harmonic
RB / VB (emission in restricted band)	100 KHz/300 KHz
Trace-Mode:	Max hold

For Band edge

Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	Lower Band Edge: 2300 to 2432 MHz Upper Band Edge: 2442 to 2500 MHz
RB / VB (emission in restricted band)	100 KHz/300 KHz
Trace-Mode:	Max hold

4.3 DEVIATION FROM STANDARD

No deviation.

4.4 TEST SETUP

The EUT which is powered by the ${ Power }, is connected to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW.

4.5 EUT OPERATION CONDITIONS

Please refer to section 3.1.4 of this report.

4.6 TEST RESULTS

For the measurement records，refer to the appendix I.

5. POWER SPECTRAL DENSITY TEST

5.1 LIMIT

FCC Part15.247 , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(e)	Power Spectral Density	≤8 dBm (RBW ≥3KHz)	2400-2483.5	PASS

5.2 TEST PROCEDURE

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS channel bandwidth.
3. Set the 100 kHz ≥ RBW ≥3 kHz.
4. Set the VBW ≥ 3 x RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

5.3 DEVIATION FROM STANDARD

No deviation.

5.4 TEST SETUP

5.5 EUT OPERATION CONDITIONS

Please refer to section 3.1.4 of this report.

5.6 TEST RESULTS

For the measurement records，refer to the appendix I.

6. BANDWIDTH TEST

6.1 LIMIT

FCC Part15.247,Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2)	Bandwidth	≥500KHz (6dB bandwidth)	2400-2483.5	PASS

6.2 TEST PROCEDURE

The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described above (i.e., RBW = 100 kHz, VBW≥3RBW, peak detector with maximum hold) is implemented by the instrumentation function. When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be≥6 dB.

6.3 DEVIATION FROM STANDARD

No deviation.

6.4 TEST SETUP

6.5 EUT OPERATION CONDITIONS

Please refer to section 3.1.4 of this report.

6.6 TEST RESULTS

For the measurement records，refer to the appendix I.

7. PEAK OUTPUT POWER TEST

7.1 LIMIT

FCC Part15.247,Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(3)	Output Power	1 watt or 30dBm	2400-2483.5	PASS

7.2 TEST PROCEDURE

One of the following procedures may be used to determine the maximum peak conducted output power of a DTS EUT.

RBW ≥ DTS bandwidth

The following procedure shall be used when an instrument with a resolution bandwidth that is greater than the DTS bandwidth is available to perform the measurement:

a) Set the RBW ≥ DTS bandwidth.
b) Set VBW ≥ [3 × RBW].
c) Set span ≥ [3 × RBW].
d) Sweep time = auto couple.
e) Detector = peak.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use peak marker function to determine the peak amplitude level.

Integrated band power method:

The following procedure can be used when the maximum available RBW of the instrument is less than the
DTS bandwidth:

a) Set the RBW = 1 MHz.
b) Set the VBW ≥ [3 × RBW].
c) Set the span ≥ [1.5 × DTS bandwidth].
d) Detector = peak.
e) Sweep time = auto couple.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges (for some instruments, this may require a manual override to select the peak detector). If the instrument does not have a band power function, then sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the DTS channel bandwidth.

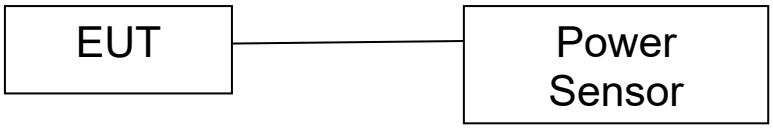
PKPM1 Peak power meter method:

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall use a fast-responding diode detector.

7.3 DEVIATION FROM STANDARD

No deviation.

7.4 TEST SETUP



7.5 EUT OPERATION CONDITIONS

Please refer to section 3.1.4 of this report.

7.6 TEST RESULTS

For the measurement records，refer to the appendix I.

8. ANTENNA REQUIREMENT

8.1 STANDARD REQUIREMENT

15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible partyshall be used with the device.

8.2 EUT ANTENNA

The EUT antenna is PCB Antenna. It comply with the standard requirement.

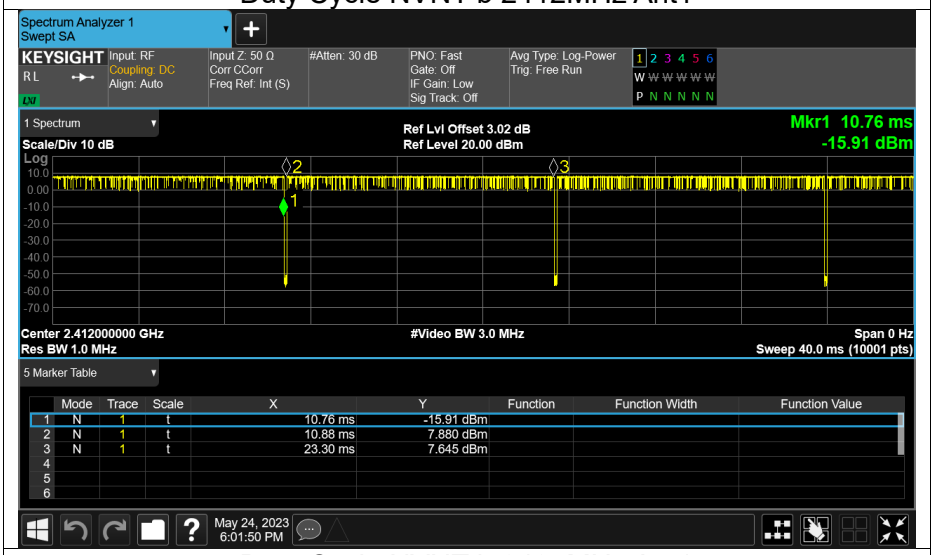
APPENDIX I - TEST RESULTS

DUTY CYCLE

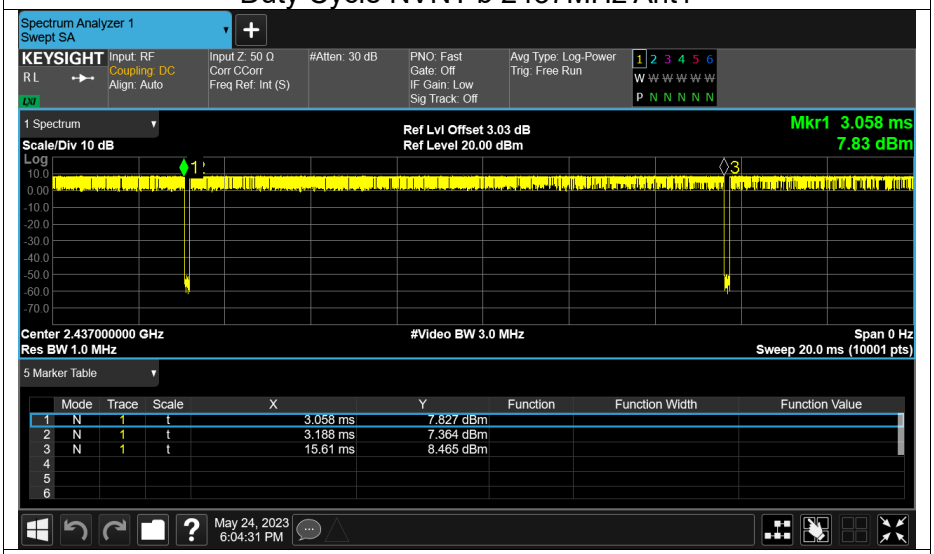
Condition	Mode	Frequency (MHz)	Antenna	Duty Cycle (%)	Correction Factor (dB)	1/T (kHz)
NVNT	b	2412	Ant1	98.98	0	0.08
NVNT	b	2437	Ant1	98.96	0	0.08
NVNT	b	2462	Ant1	98.98	0	0.08
NVNT	g	2412	Ant1	94.07	0.27	0.48
NVNT	g	2437	Ant1	94.07	0.27	0.48
NVNT	g	2462	Ant1	94.07	0.27	0.48
NVNT	n20	2412	Ant1	93.66	0.28	0.52
NVNT	n20	2437	Ant1	93.76	0.28	0.52
NVNT	n20	2462	Ant1	93.66	0.28	0.52

Test Graphs

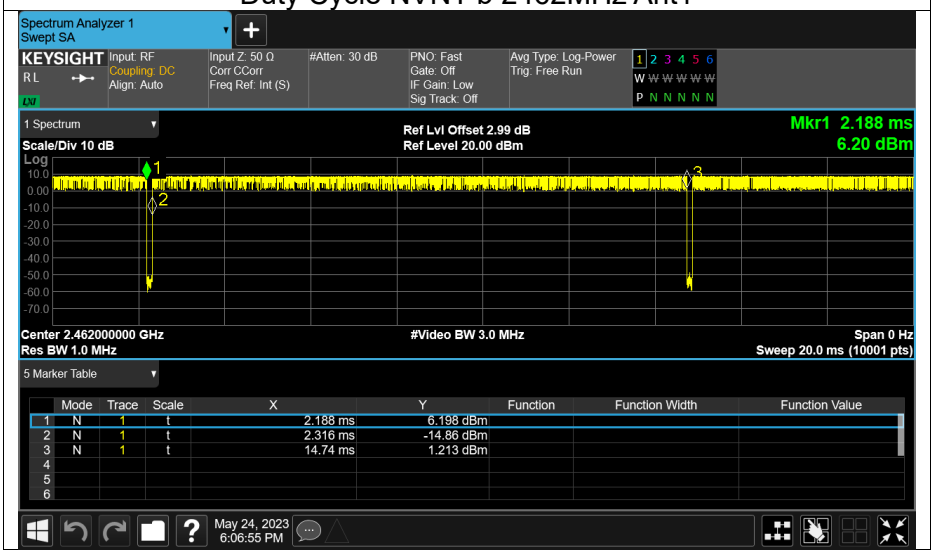
Duty Cycle NVNT b 2412MHz Ant1



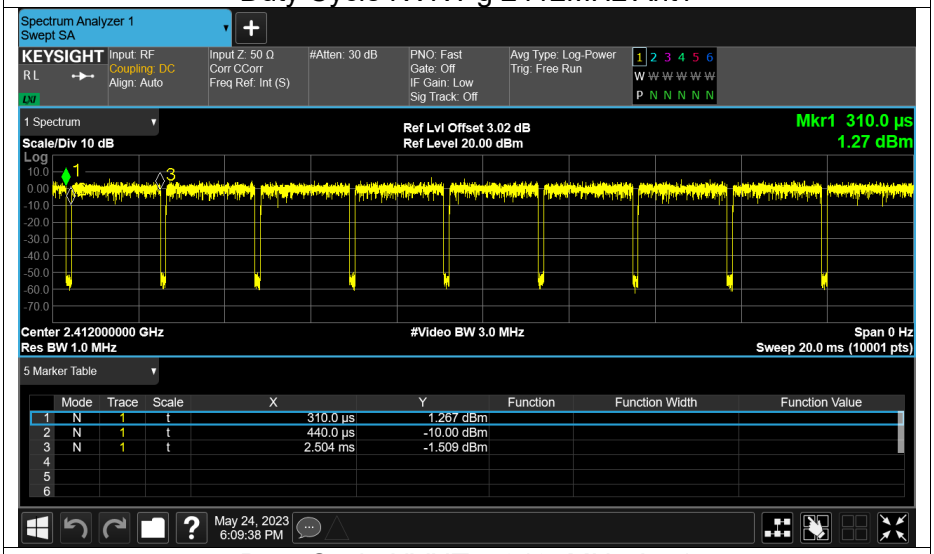
Duty Cycle NVNT b 2437MHz Ant1



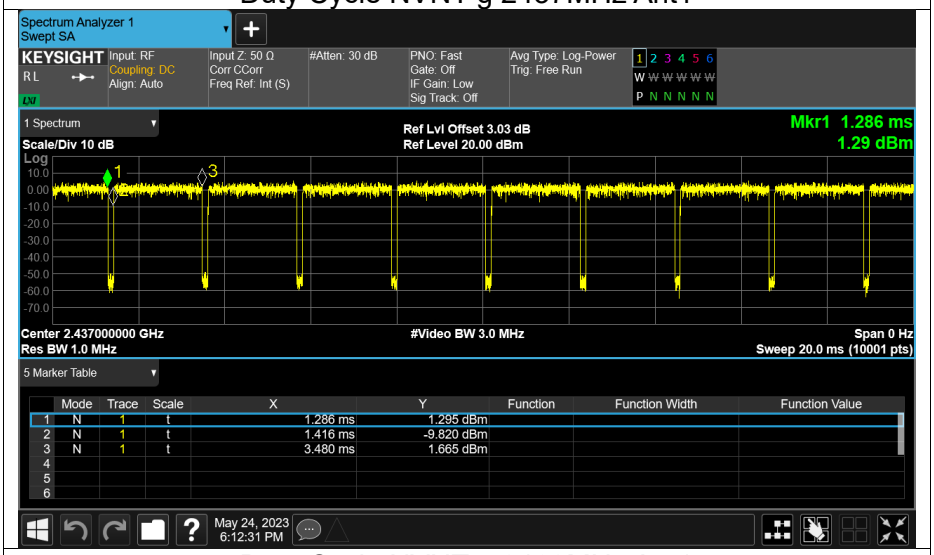
Duty Cycle NVNT b 2462MHz Ant1



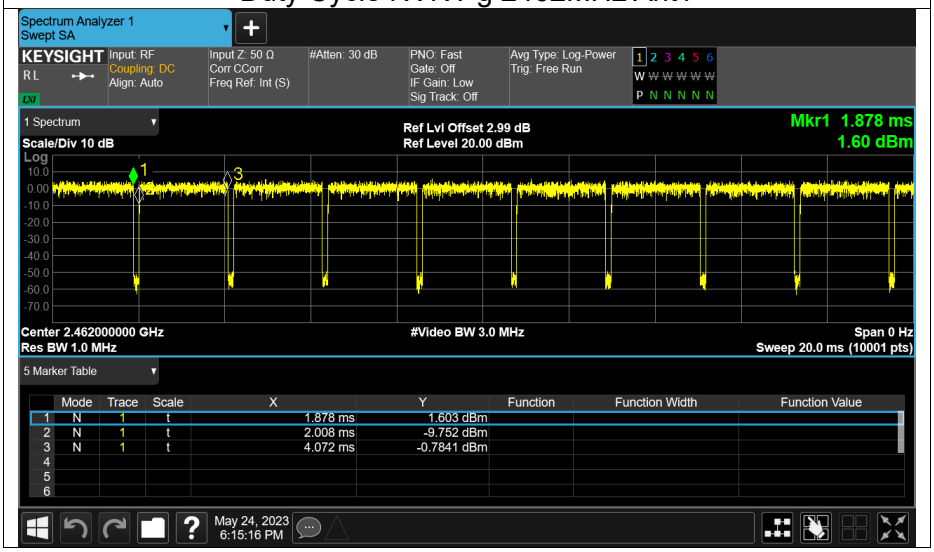
Duty Cycle NVNT g 2412MHz Ant1



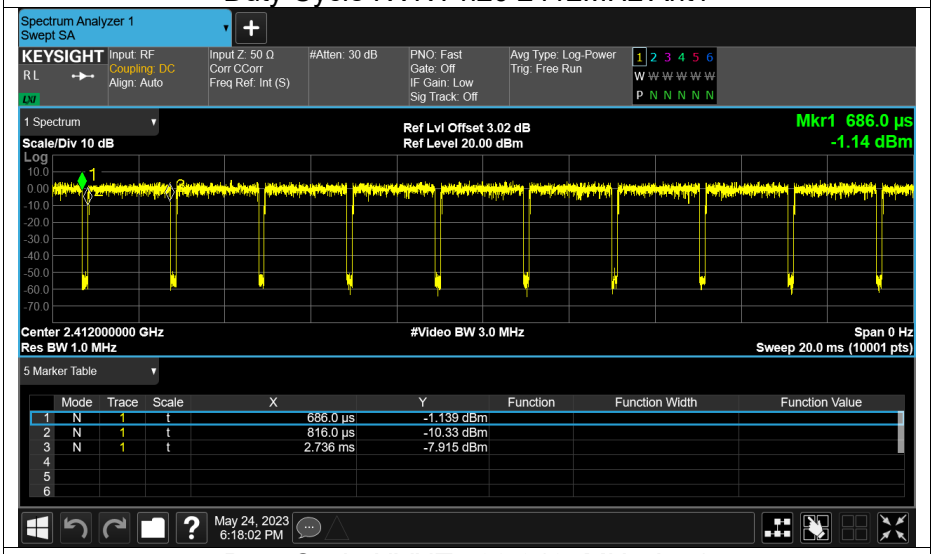
Duty Cycle NVNT g 2437MHz Ant1



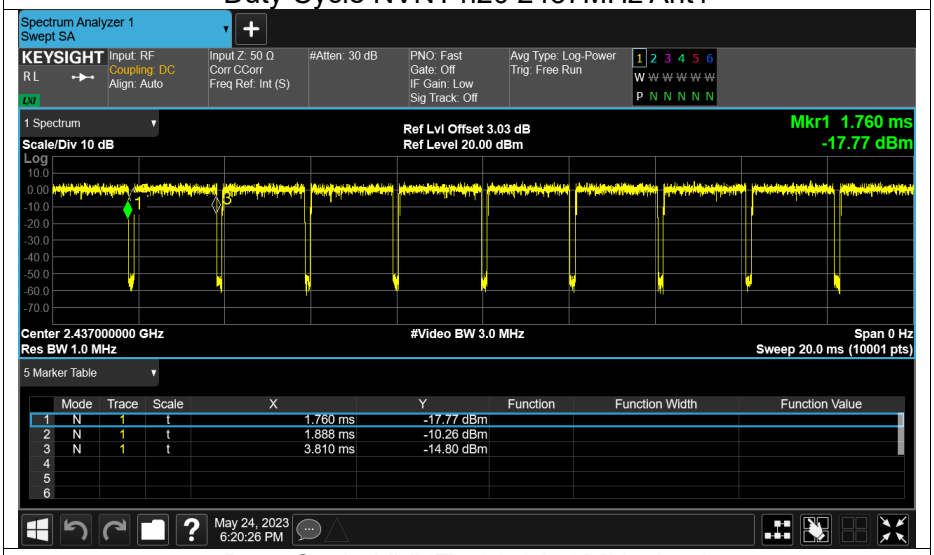
Duty Cycle NVNT g 2462MHz Ant1



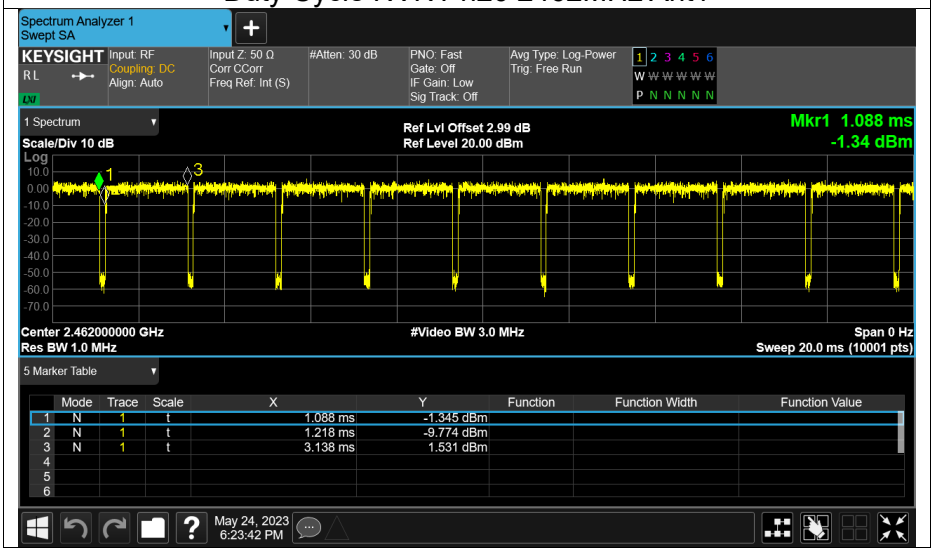
Duty Cycle NVNT n20 2412MHz Ant1



Duty Cycle NVNT n20 2437MHz Ant1



Duty Cycle NVNT n20 2462MHz Ant1



MAXIMUM PEAK CONDUCTED OUTPUT POWER

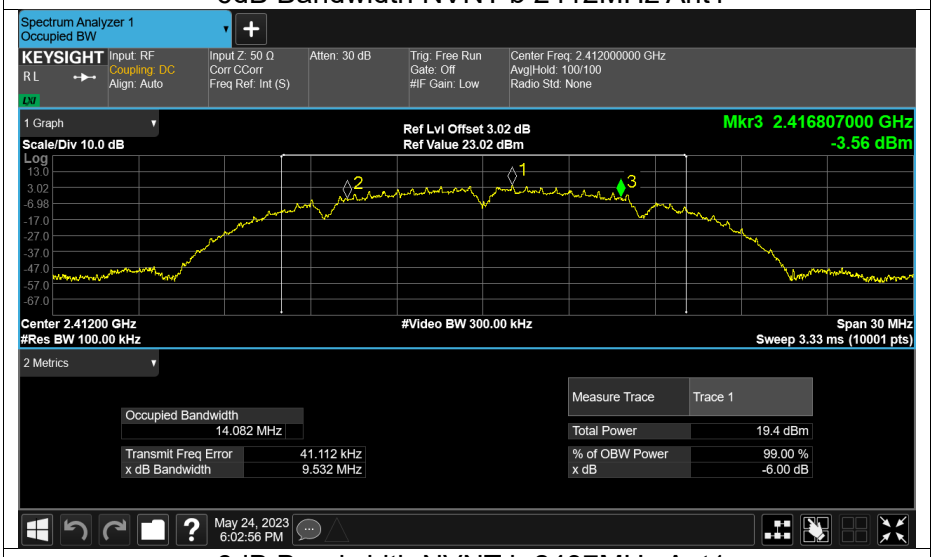
Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Limit (dBm)	Verdict
NVNT	b	2412	Ant1	14.37	30	Pass
NVNT	b	2437	Ant1	14.75	30	Pass
NVNT	b	2462	Ant1	14.86	30	Pass
NVNT	g	2412	Ant1	13.79	30	Pass
NVNT	g	2437	Ant1	14.17	30	Pass
NVNT	g	2462	Ant1	14.28	30	Pass
NVNT	n20	2412	Ant1	13.74	30	Pass
NVNT	n20	2437	Ant1	14.12	30	Pass
NVNT	n20	2462	Ant1	14.17	30	Pass

-6DB BANDWIDTH

Condition	Mode	Frequency (MHz)	Antenna	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	b	2412	Ant1	9.532	0.5	Pass
NVNT	b	2437	Ant1	9.031	0.5	Pass
NVNT	b	2462	Ant1	8.595	0.5	Pass
NVNT	g	2412	Ant1	16.354	0.5	Pass
NVNT	g	2437	Ant1	16.358	0.5	Pass
NVNT	g	2462	Ant1	16.346	0.5	Pass
NVNT	n20	2412	Ant1	17.578	0.5	Pass
NVNT	n20	2437	Ant1	17.578	0.5	Pass
NVNT	n20	2462	Ant1	17.298	0.5	Pass

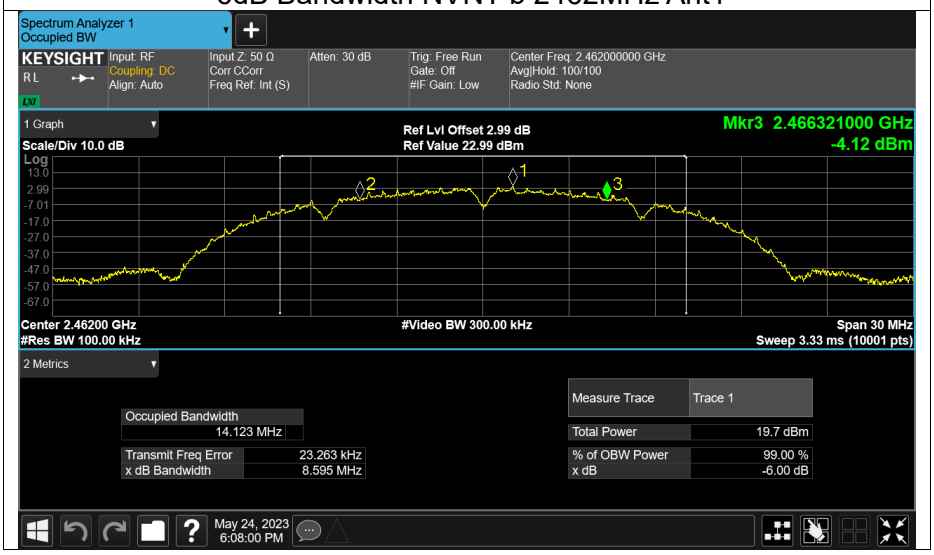
Test Graphs

-6dB Bandwidth NVNT b 2412MHz Ant1

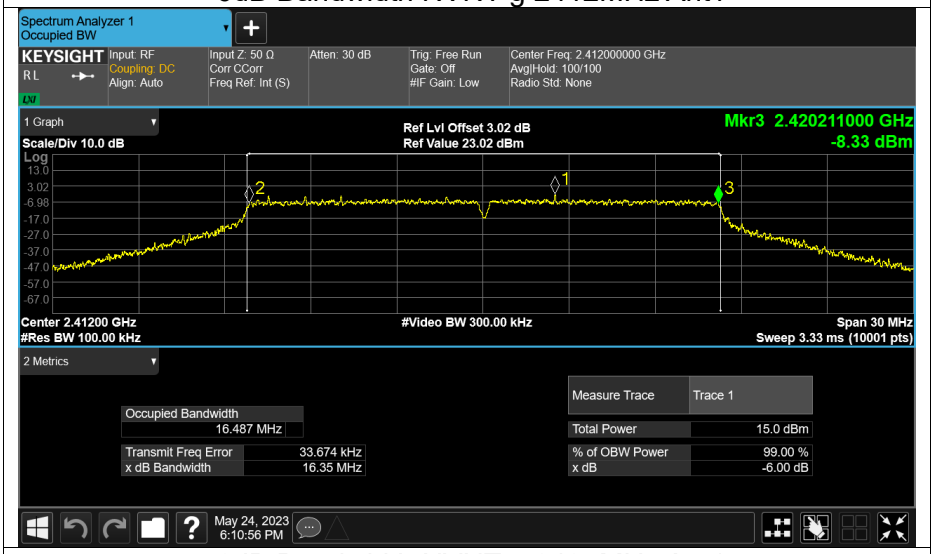


-6dB Bandwidth NVNT b 2437MHz Ant1

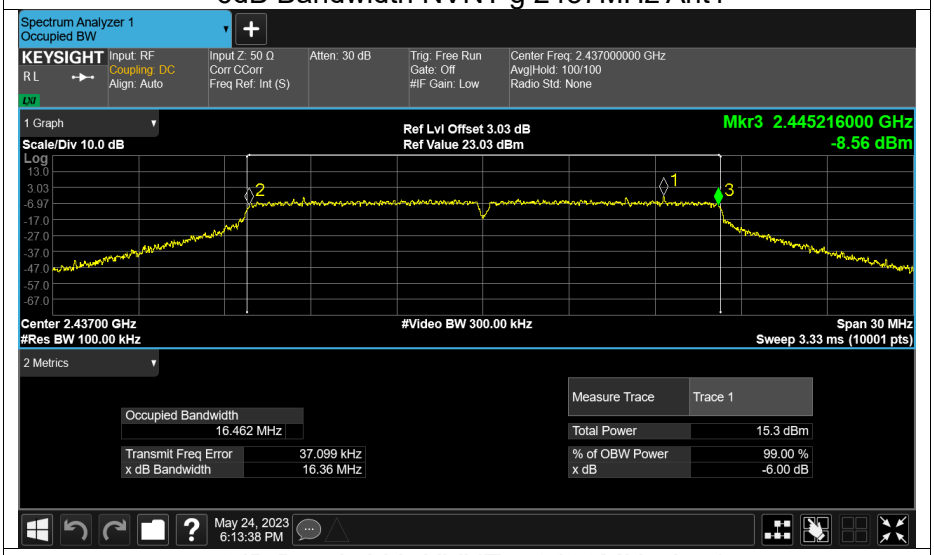
-6dB Bandwidth NVNT b 2462MHz Ant1



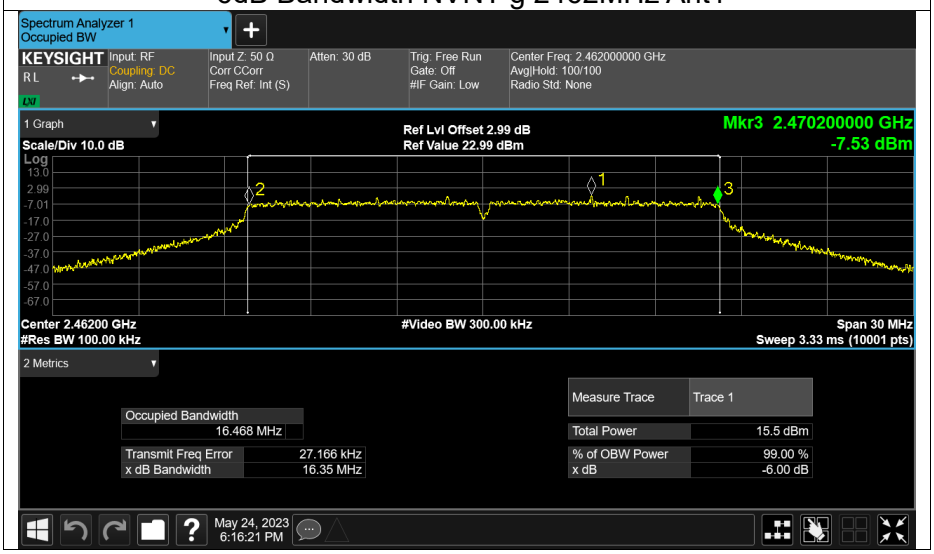
-6dB Bandwidth NVNT g 2412MHz Ant1



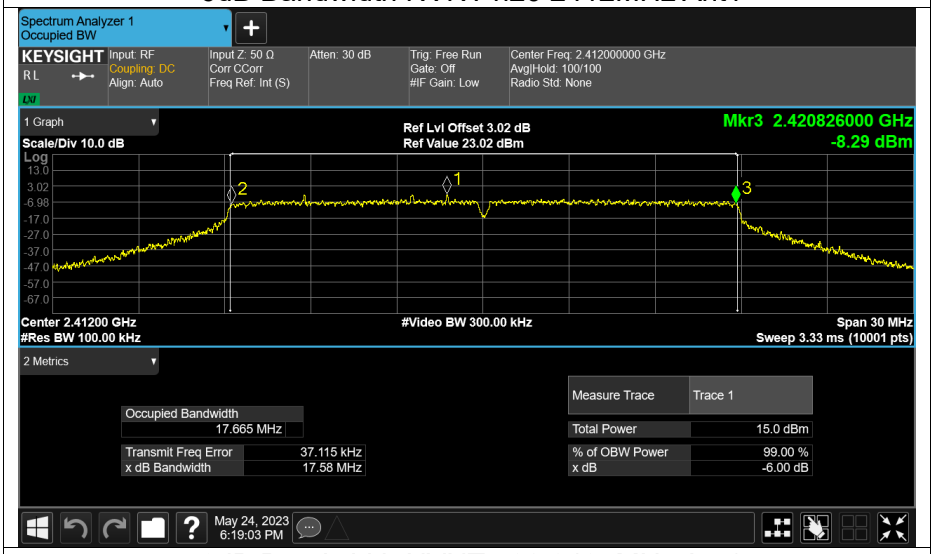
-6dB Bandwidth NVNT g 2437MHz Ant1



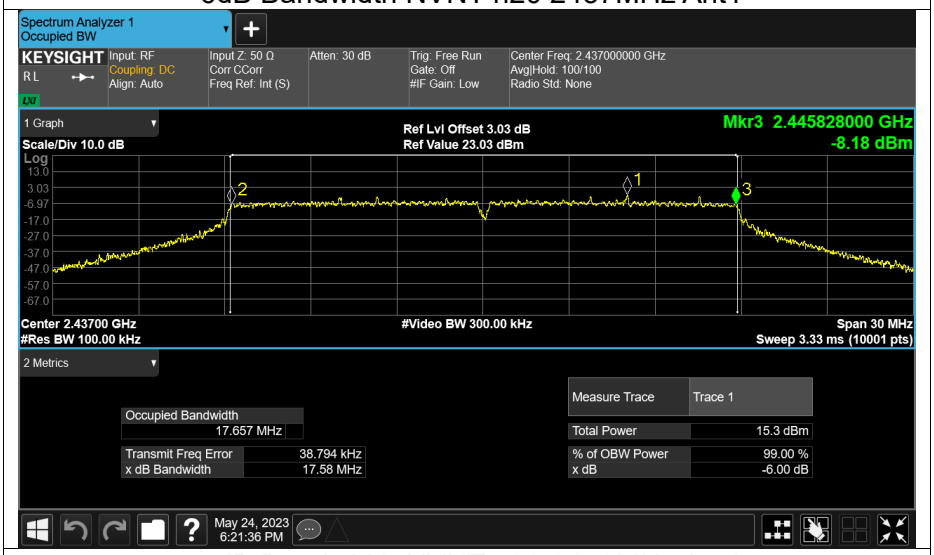
-6dB Bandwidth NVNT g 2462MHz Ant1



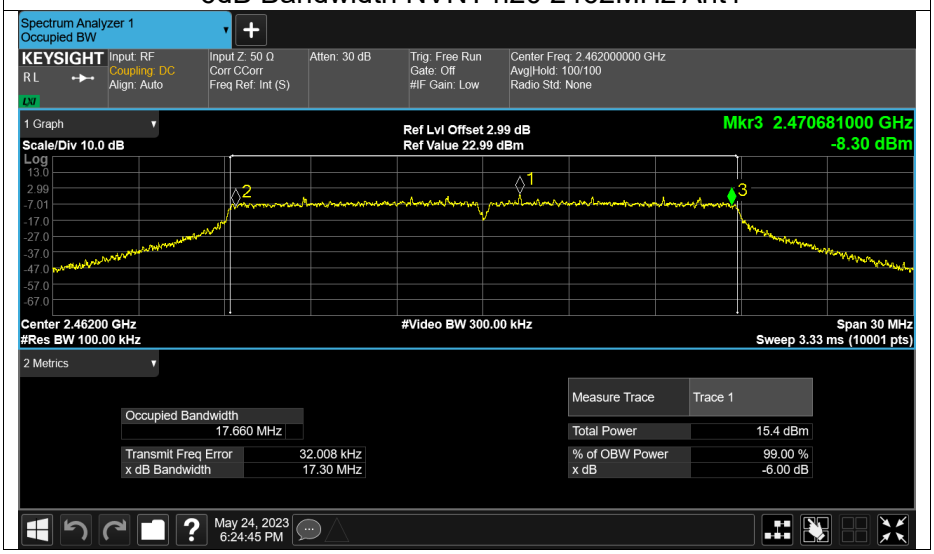
-6dB Bandwidth NVNT n20 2412MHz Ant1



-6dB Bandwidth NVNT n20 2437MHz Ant1



-6dB Bandwidth NVNT n20 2462MHz Ant1

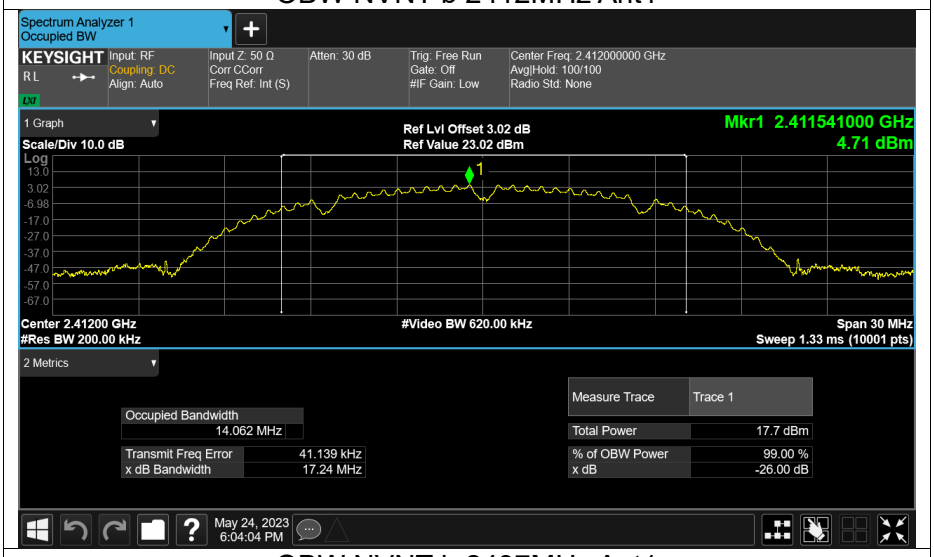


OCCUPIED CHANNEL BANDWIDTH

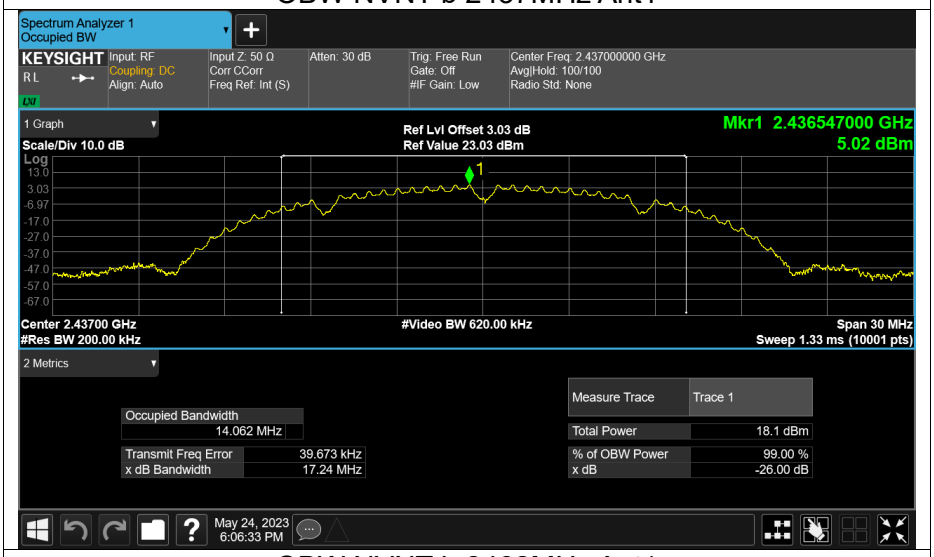
Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)
NVNT	b	2412	Ant1	14.062
NVNT	b	2437	Ant1	14.062
NVNT	b	2462	Ant1	14.057
NVNT	g	2412	Ant1	16.62
NVNT	g	2437	Ant1	16.61
NVNT	g	2462	Ant1	16.616
NVNT	n20	2412	Ant1	17.78
NVNT	n20	2437	Ant1	17.761
NVNT	n20	2462	Ant1	17.752

Test Graphs

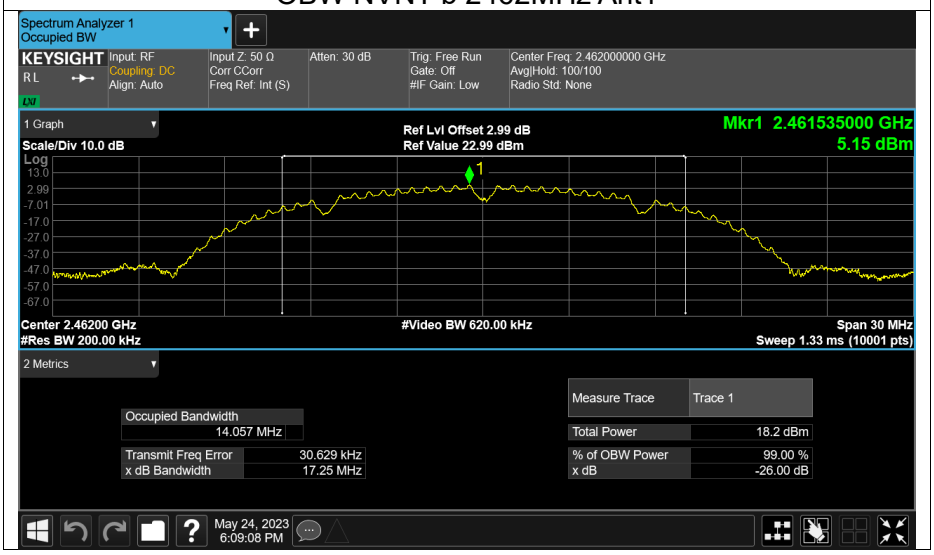
OBW NVNT b 2412MHz Ant1



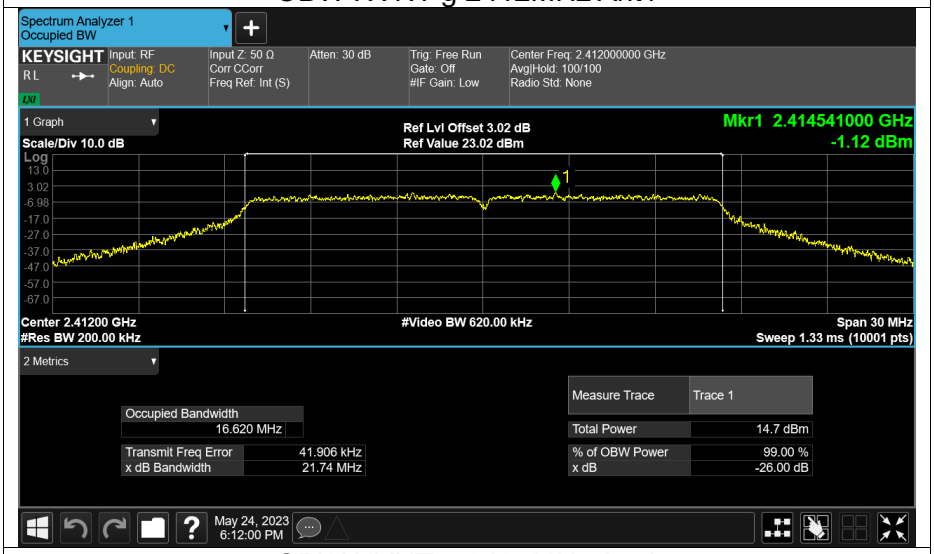
OBW NVNT b 2437MHz Ant1



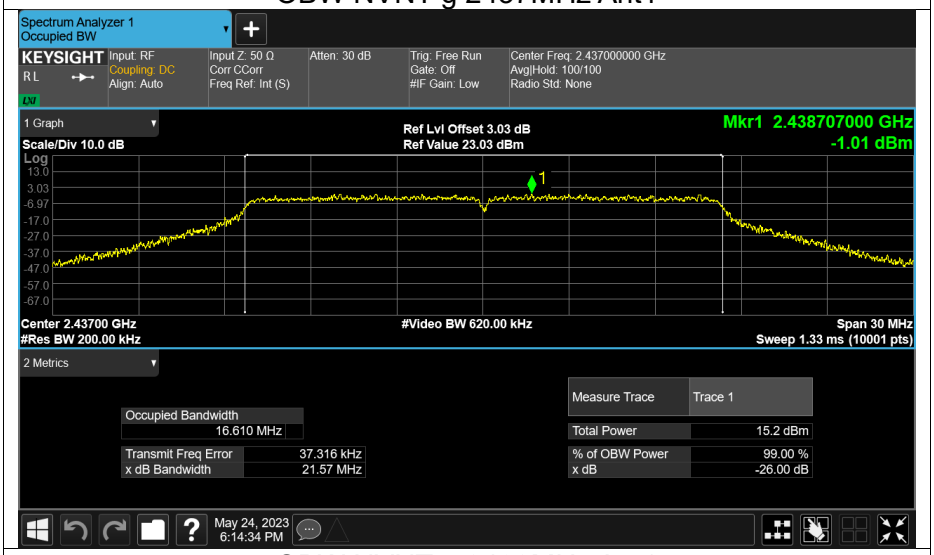
OBW NVNT b 2462MHz Ant1



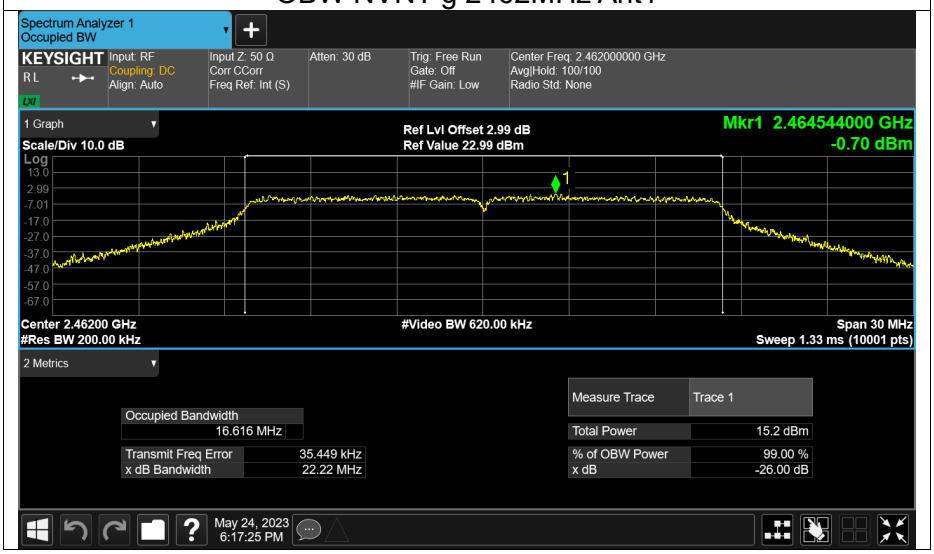
OBW NVNT g 2412MHz Ant1



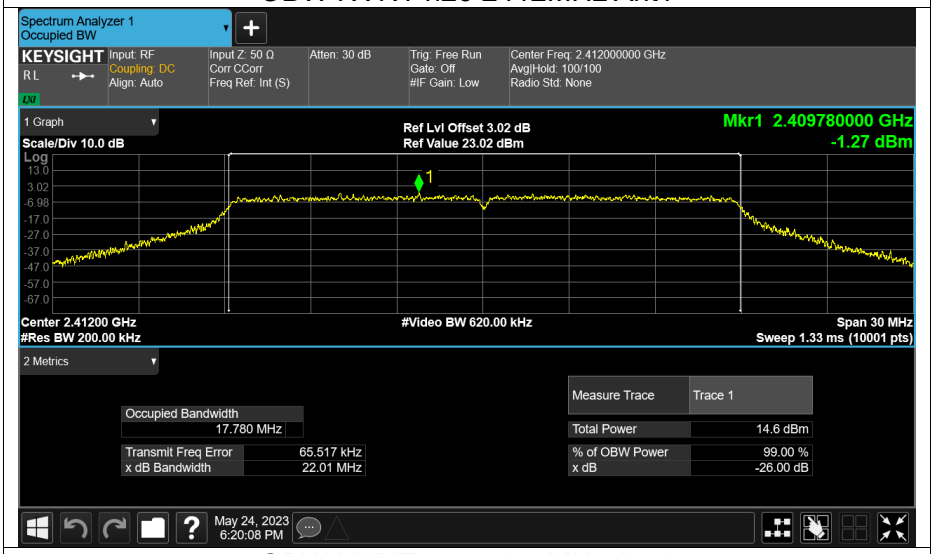
OBW NVNT g 2437MHz Ant1



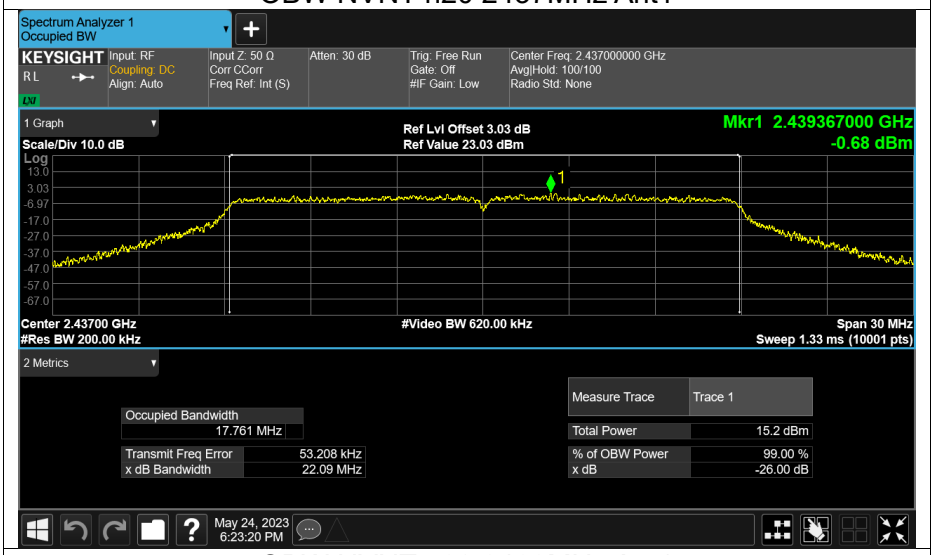
OBW NVNT g 2462MHz Ant1



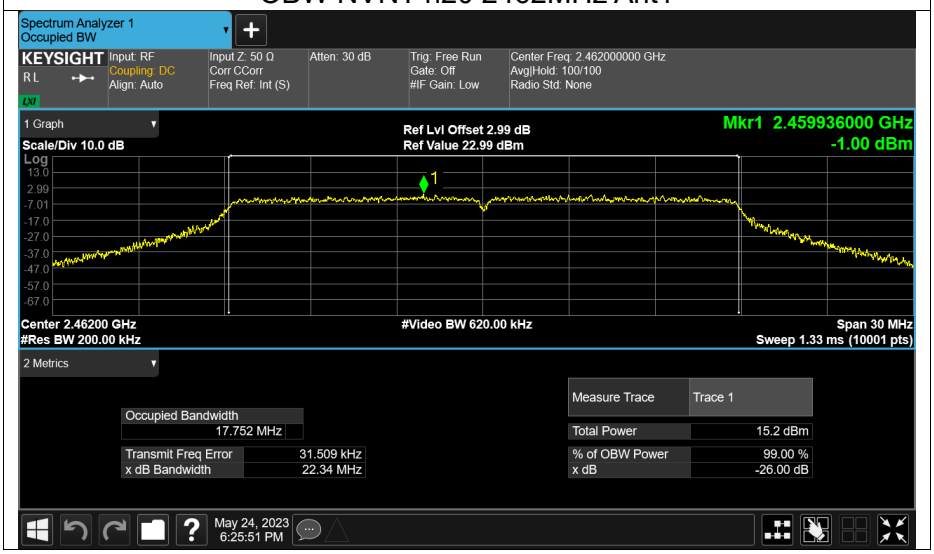
OBW NVNT n20 2412MHz Ant1



OBW NVNT n20 2437MHz Ant1



OBW NVNT n20 2462MHz Ant1

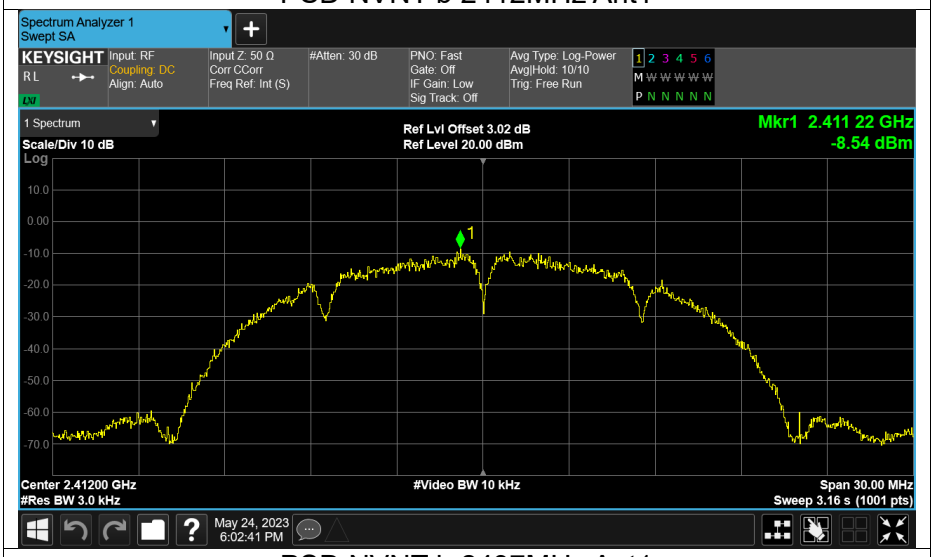


MAXIMUM POWER SPECTRAL DENSITY LEVEL

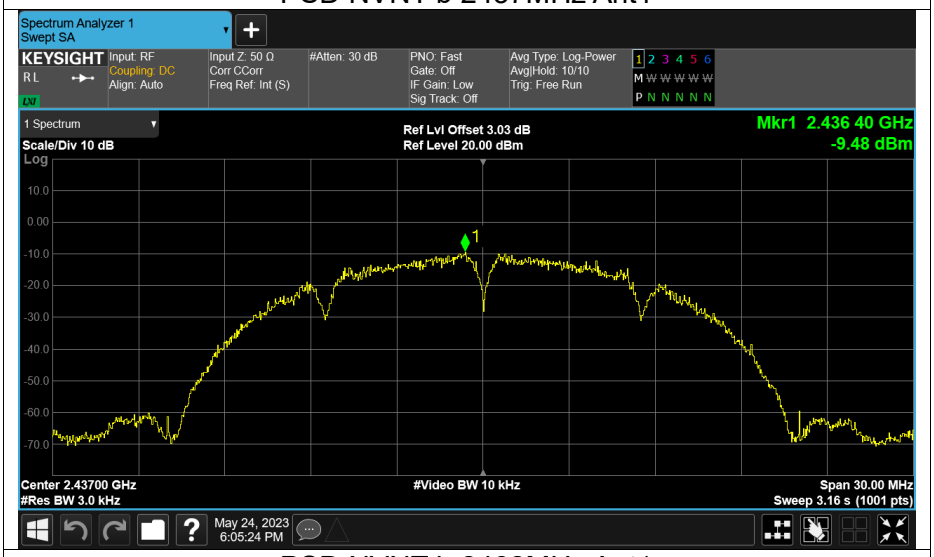
Condition	Mode	Frequency (MHz)	Antenna	Conducted PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
NVNT	b	2412	Ant1	-8.54	8	Pass
NVNT	b	2437	Ant1	-9.48	8	Pass
NVNT	b	2462	Ant1	-9.07	8	Pass
NVNT	g	2412	Ant1	-15.77	8	Pass
NVNT	g	2437	Ant1	-15.62	8	Pass
NVNT	g	2462	Ant1	-15.04	8	Pass
NVNT	n20	2412	Ant1	-15.36	8	Pass
NVNT	n20	2437	Ant1	-15	8	Pass
NVNT	n20	2462	Ant1	-15.39	8	Pass

Test Graphs

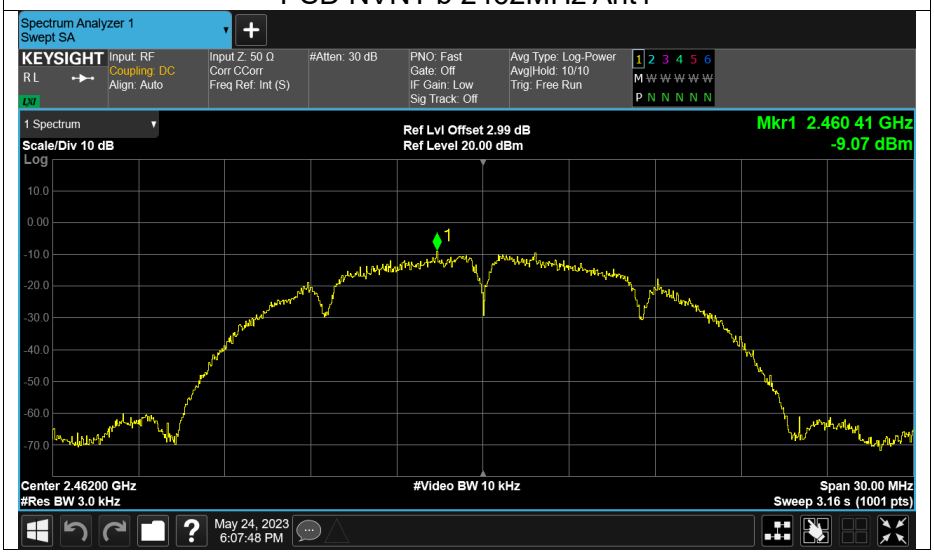
PSD NVNT b 2412MHz Ant1



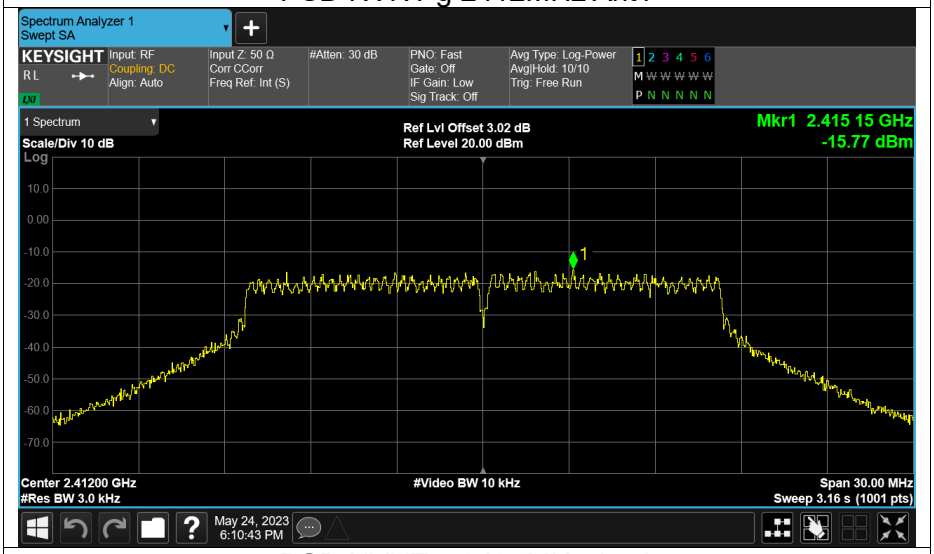
PSD NVNT b 2437MHz Ant1



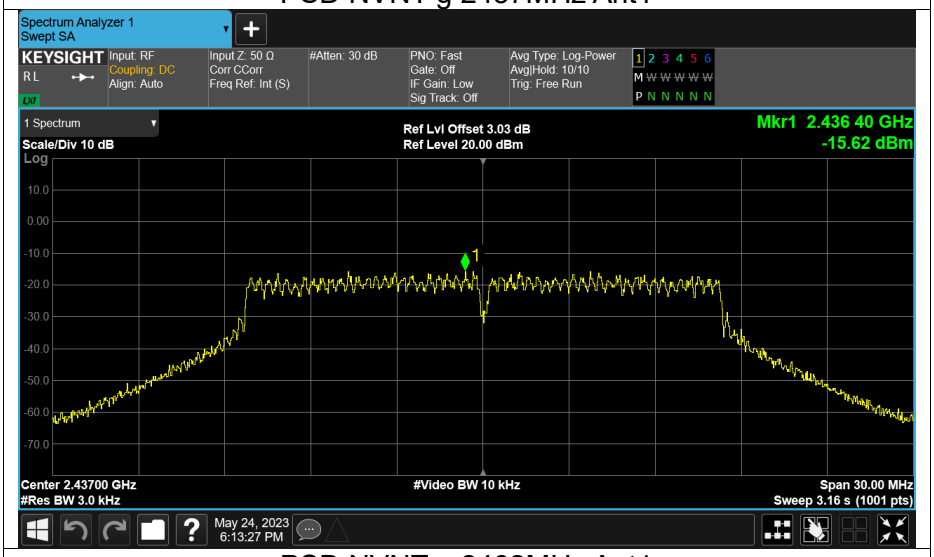
PSD NVNT b 2462MHz Ant1



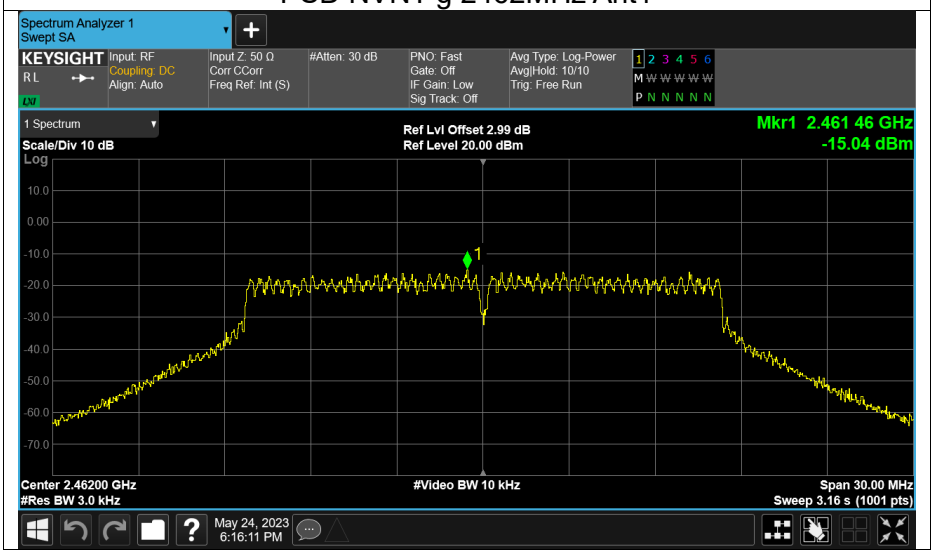
PSD NVNT g 2412MHz Ant1



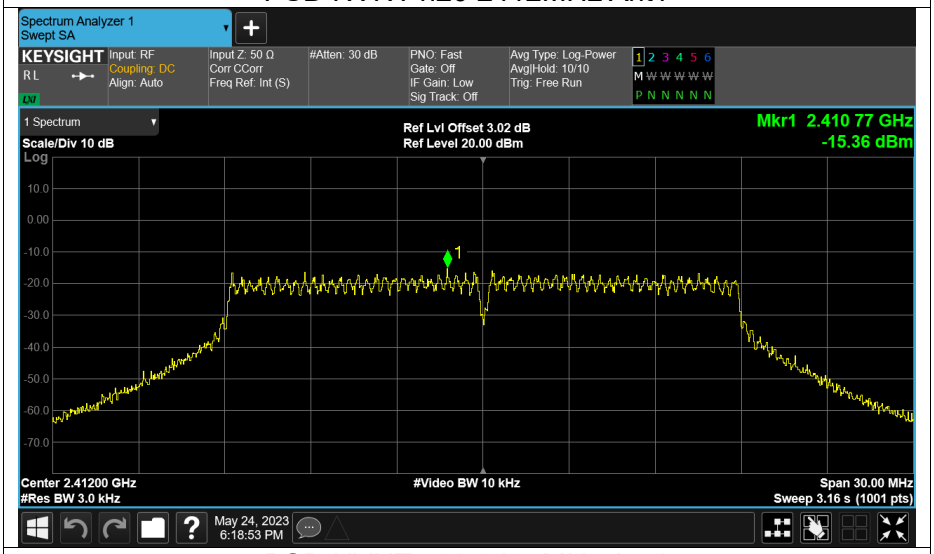
PSD NVNT g 2437MHz Ant1



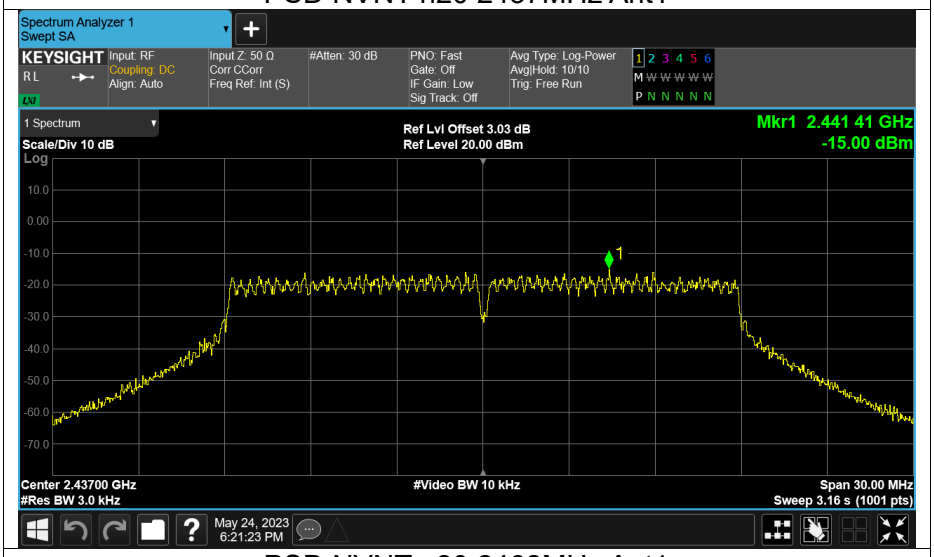
PSD NVNT g 2462MHz Ant1



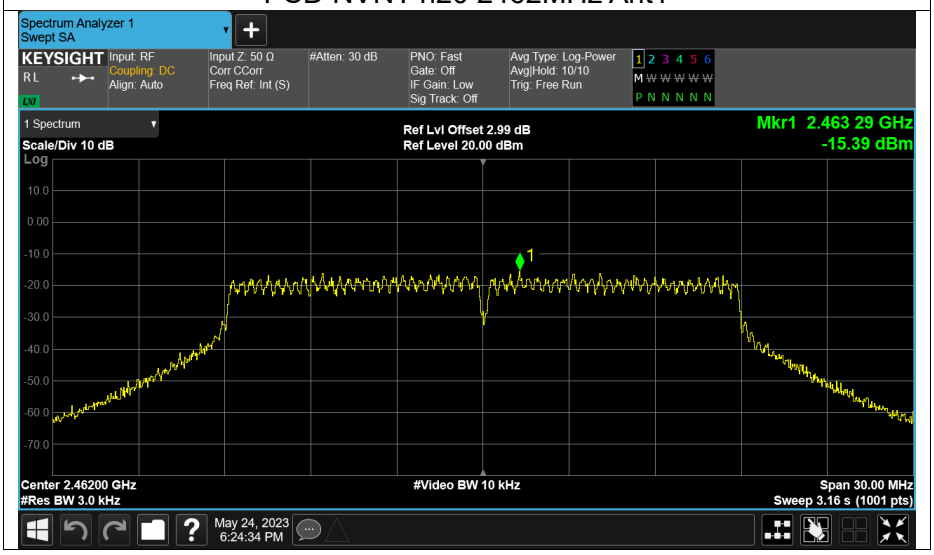
PSD NVNT n20 2412MHz Ant1



PSD NVNT n20 2437MHz Ant1



PSD NVNT n20 2462MHz Ant1

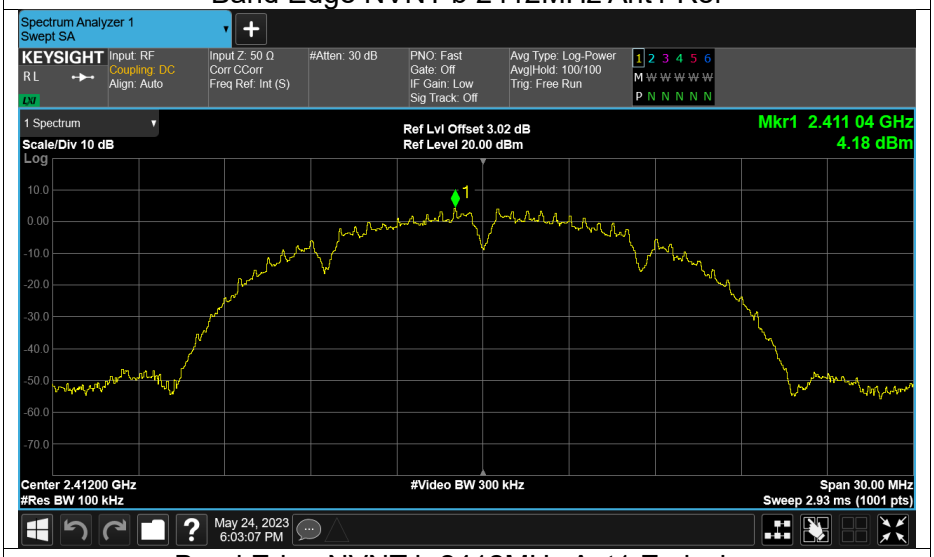


BAND EDGE

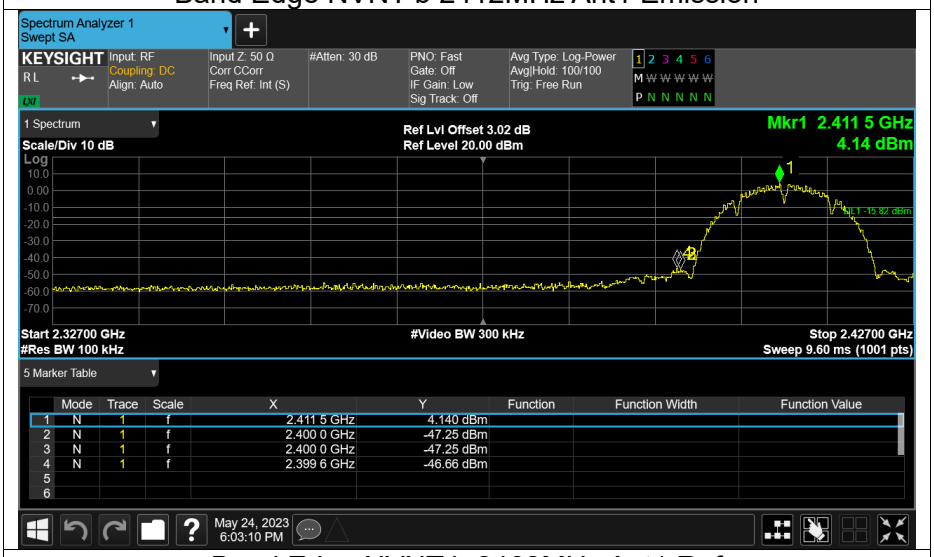
Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	b	2412	Ant1	-50.84	-20	Pass
NVNT	b	2462	Ant1	-58.4	-20	Pass
NVNT	g	2412	Ant1	-33.81	-20	Pass
NVNT	g	2462	Ant1	-52.38	-20	Pass
NVNT	n20	2412	Ant1	-32.51	-20	Pass
NVNT	n20	2462	Ant1	-50.85	-20	Pass

Test Graphs

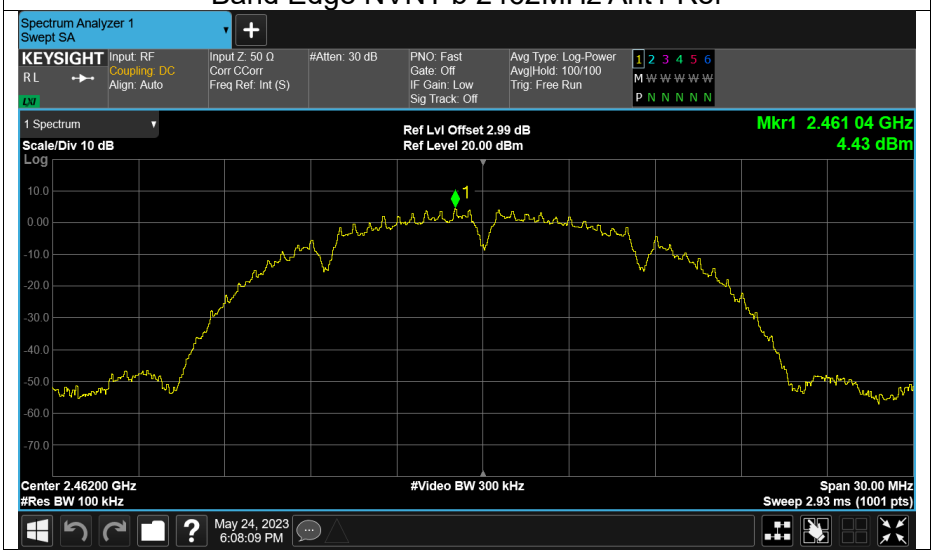
Band Edge NVNT b 2412MHz Ant1 Ref



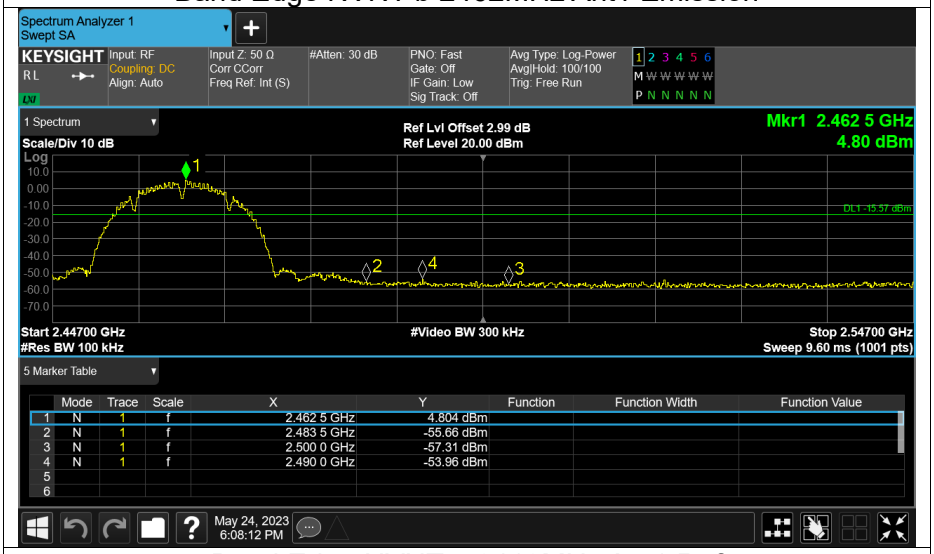
Band Edge NVNT b 2412MHz Ant1 Emission



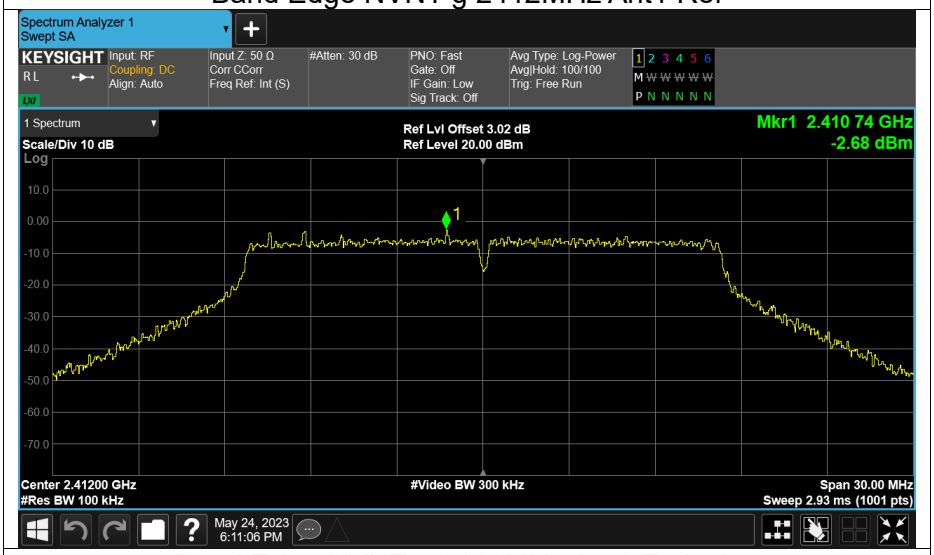
Band Edge NVNT b 2462MHz Ant1 Ref



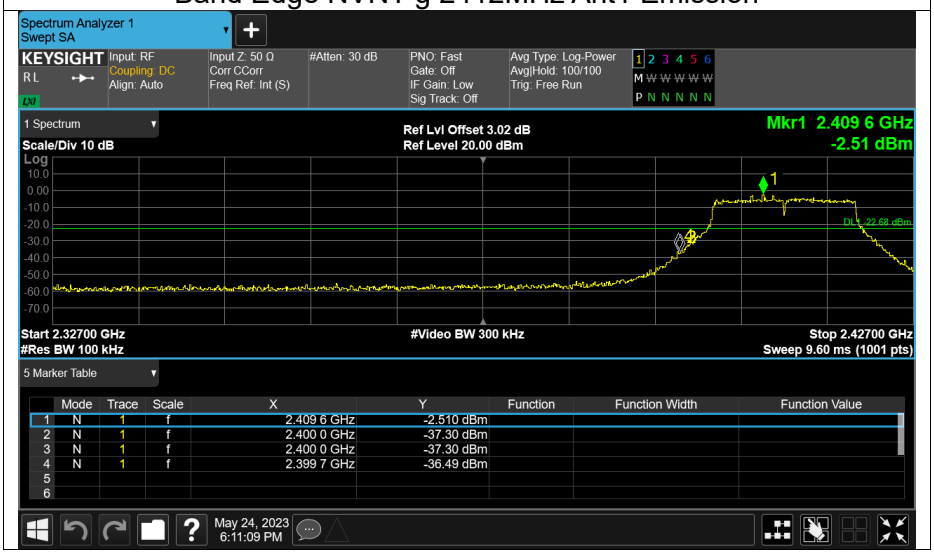
Band Edge NVNT b 2462MHz Ant1 Emission



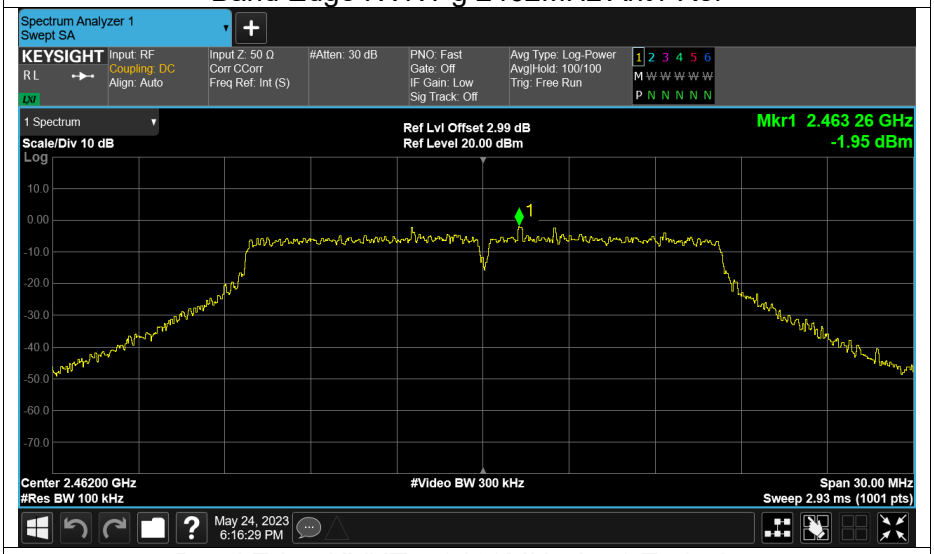
Band Edge NVNT g 2412MHz Ant1 Ref



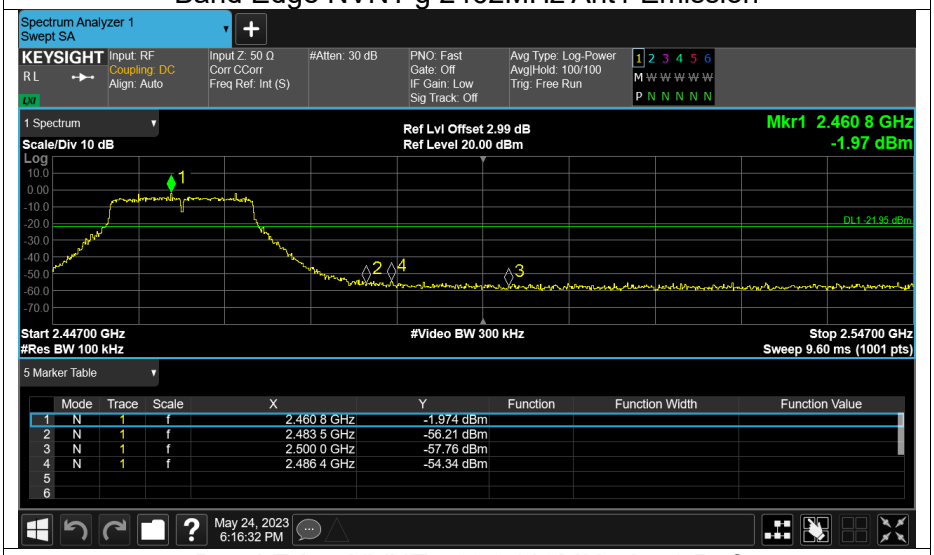
Band Edge NVNT g 2412MHz Ant1 Emission



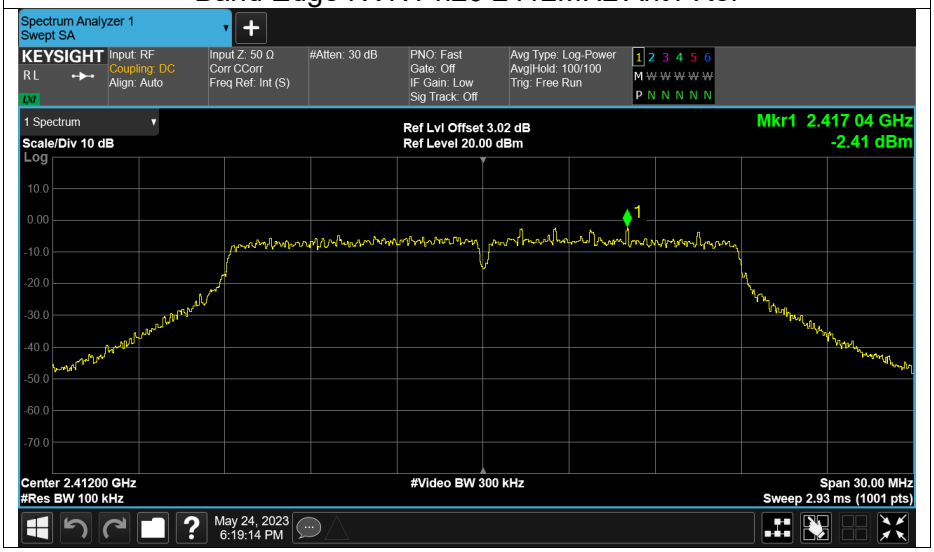
Band Edge NVNT g 2462MHz Ant1 Ref



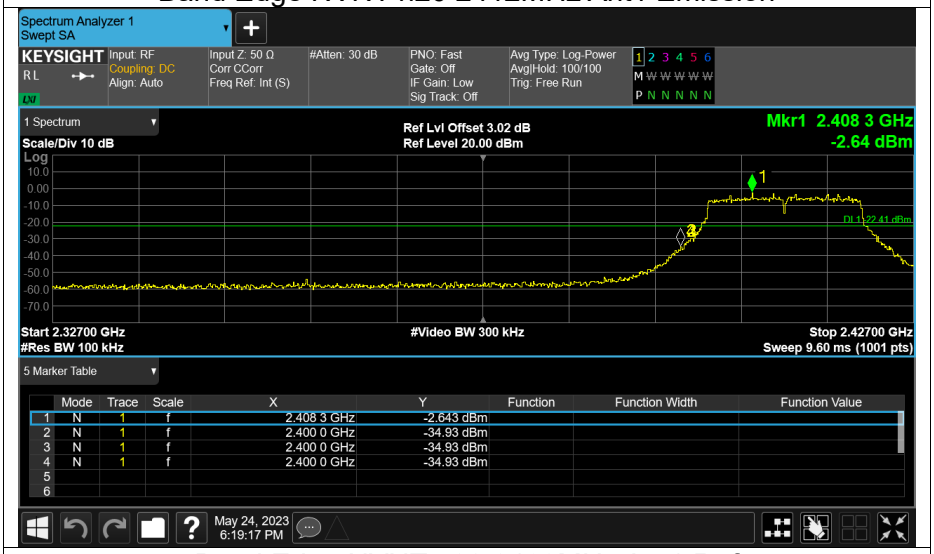
Band Edge NVNT g 2462MHz Ant1 Emission



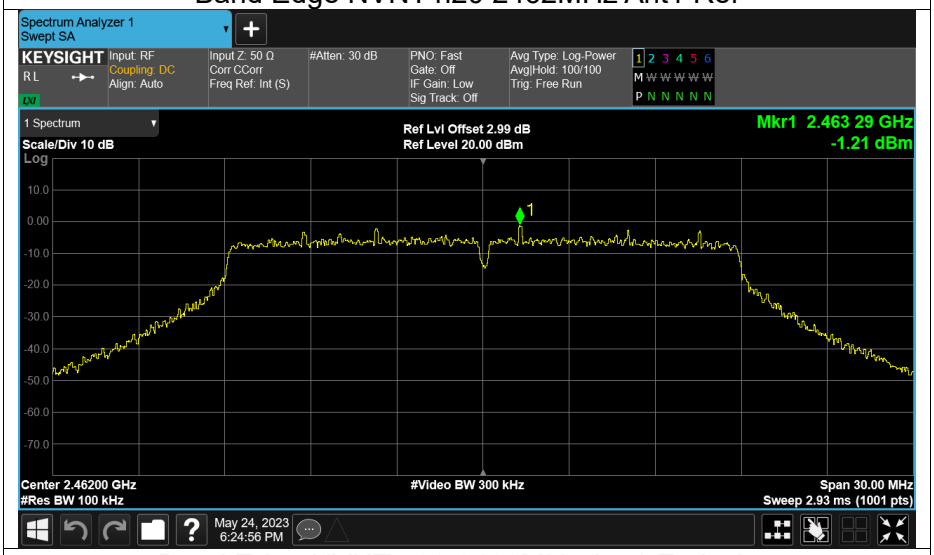
Band Edge NVNT n20 2412MHz Ant1 Ref



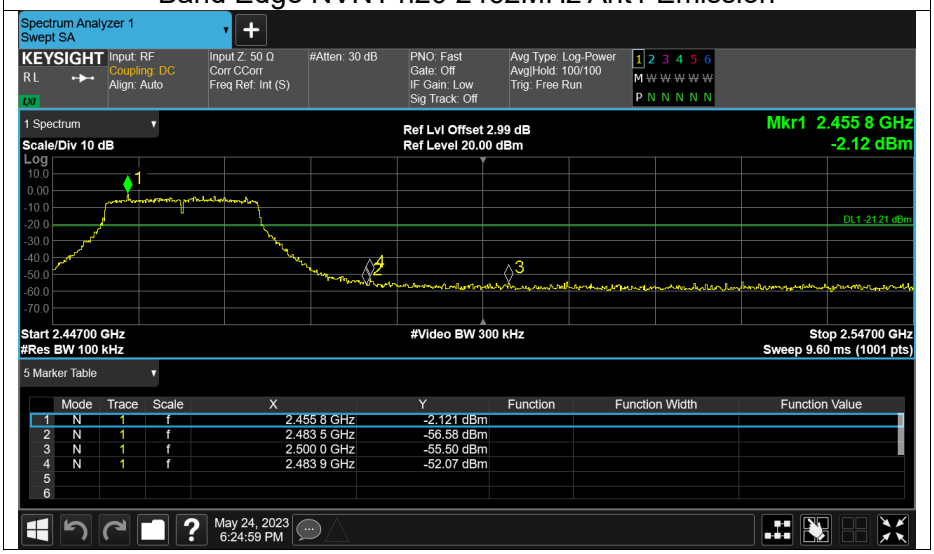
Band Edge NVNT n20 2412MHz Ant1 Emission



Band Edge NVNT n20 2462MHz Ant1 Ref



Band Edge NVNT n20 2462MHz Ant1 Emission

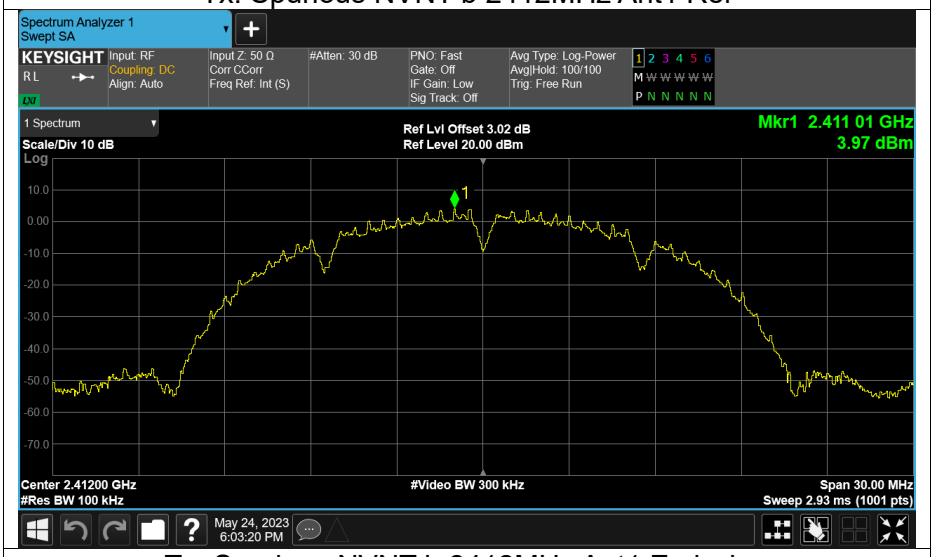


CONDUCTED RF SPURIOUS EMISSION

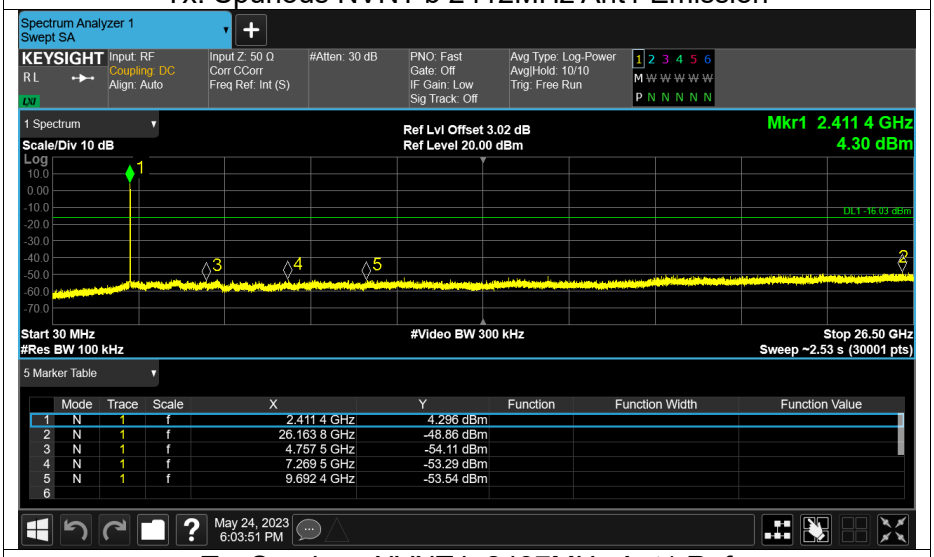
Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	b	2412	Ant1	-52.82	-20	Pass
NVNT	b	2437	Ant1	-53.38	-20	Pass
NVNT	b	2462	Ant1	-53.11	-20	Pass
NVNT	g	2412	Ant1	-46.17	-20	Pass
NVNT	g	2437	Ant1	-46.05	-20	Pass
NVNT	g	2462	Ant1	-46.36	-20	Pass
NVNT	n20	2412	Ant1	-47.3	-20	Pass
NVNT	n20	2437	Ant1	-47.55	-20	Pass
NVNT	n20	2462	Ant1	-47.07	-20	Pass

Test Graphs

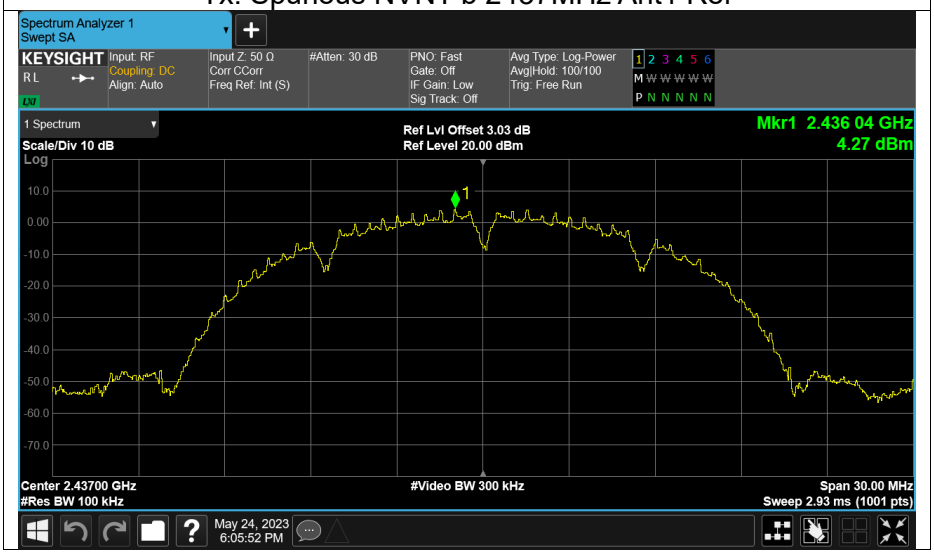
Tx. Spurious NVNT b 2412MHz Ant1 Ref



Tx. Spurious NVNT b 2412MHz Ant1 Emission



Tx. Spurious NVNT b 2437MHz Ant1 Ref



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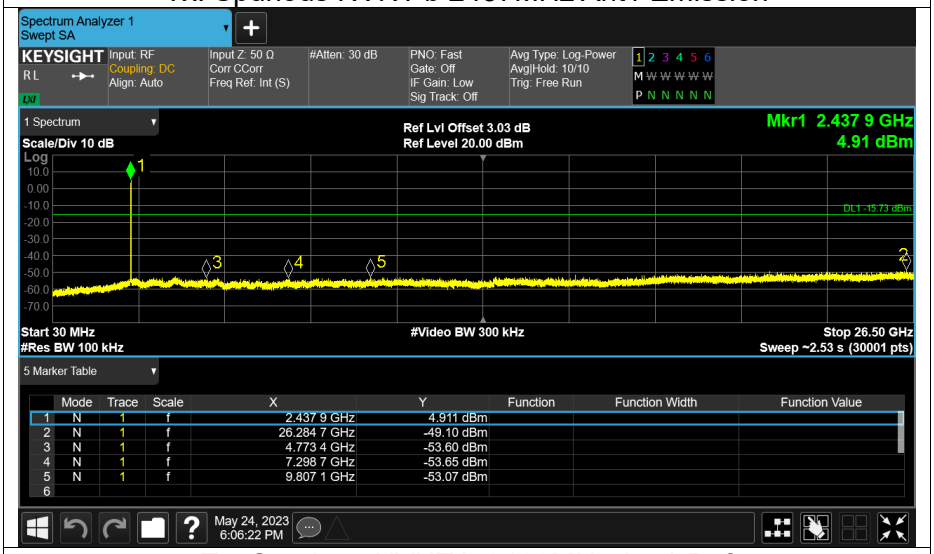

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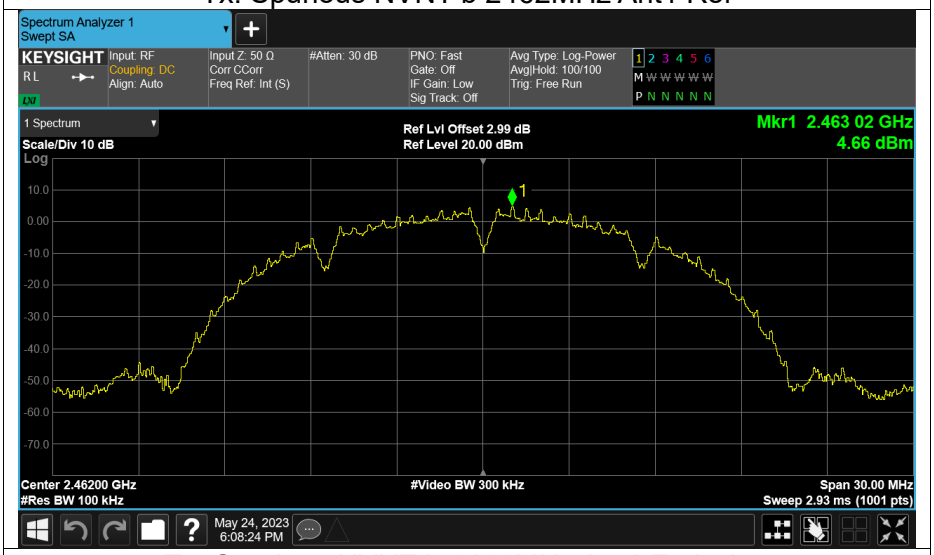

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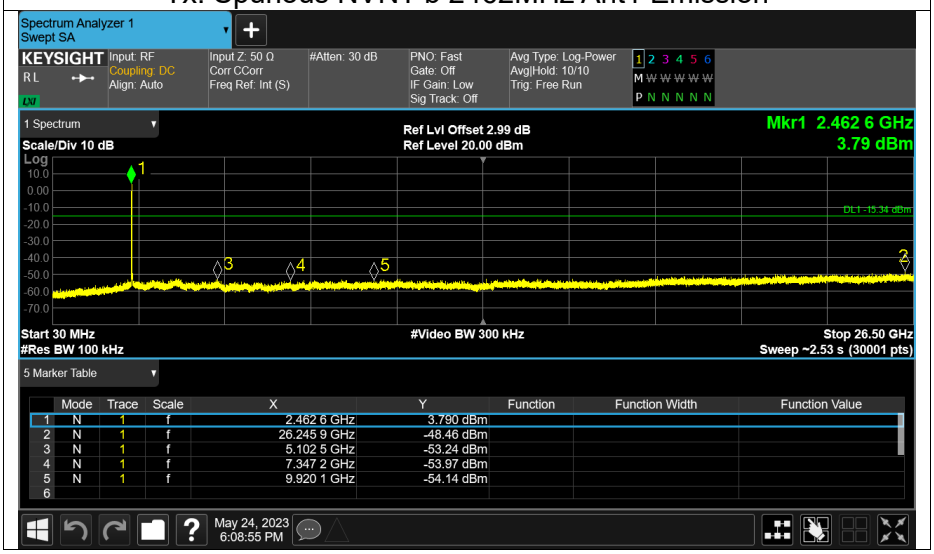

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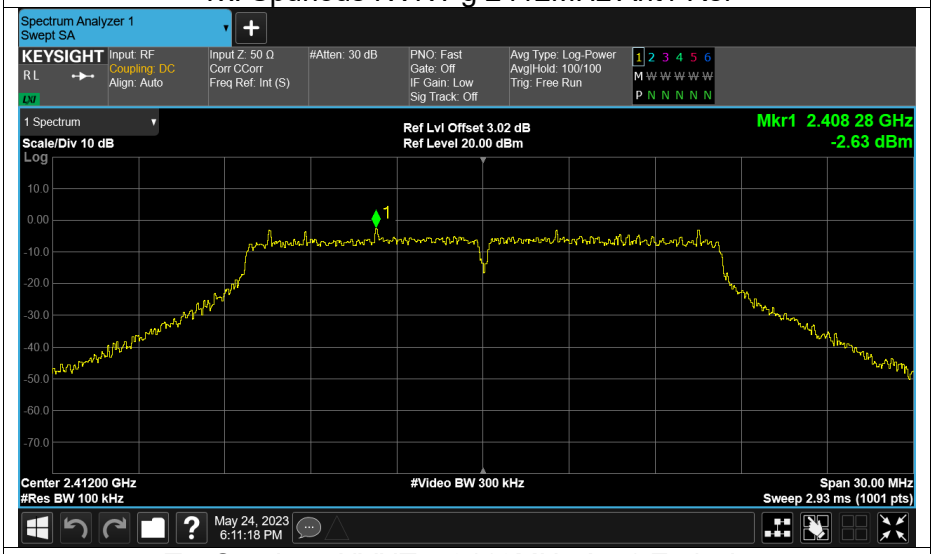
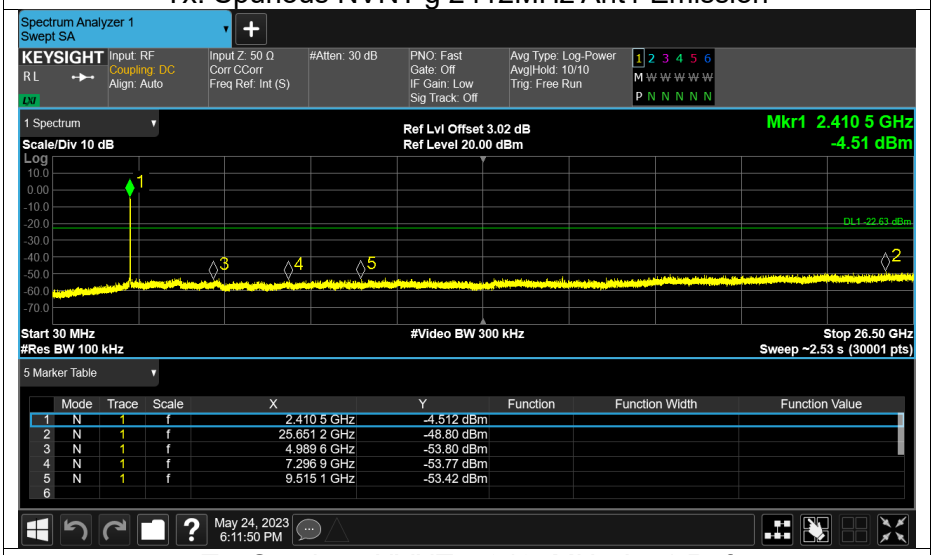
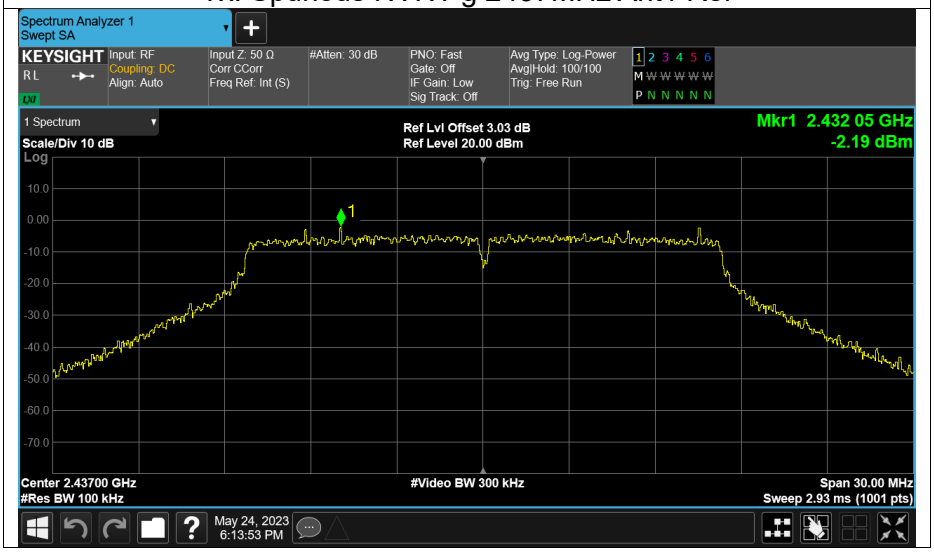


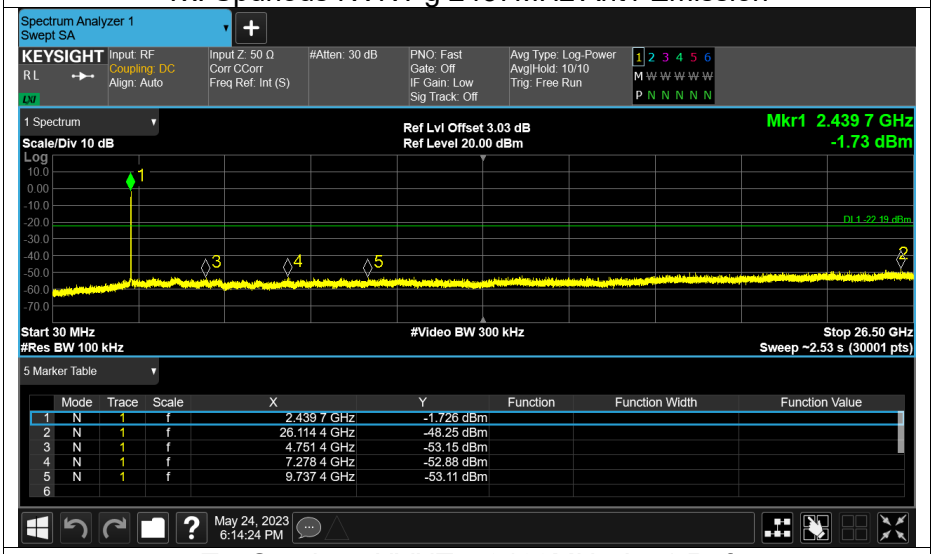
Tx. Spurious NVNT g 2412MHz Ant1 Emission



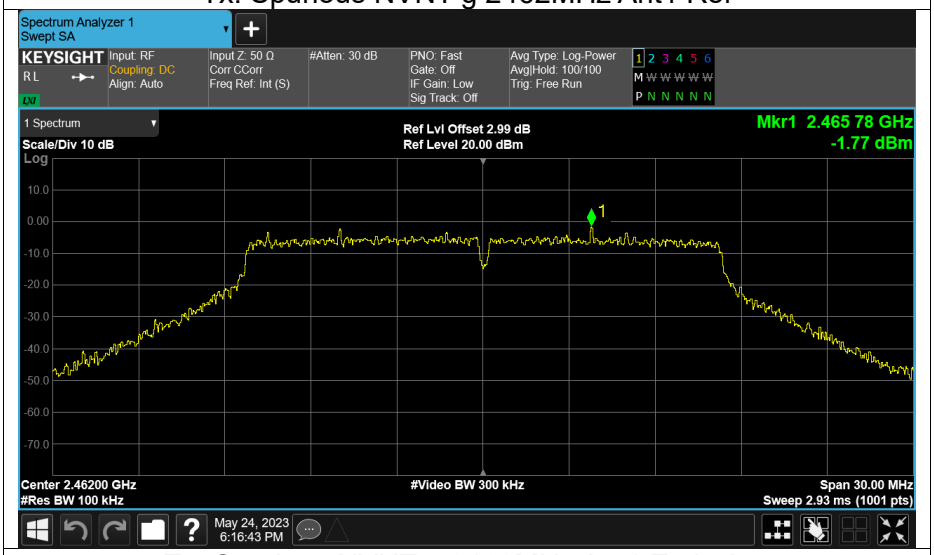
Tx. Spurious NVNT g 2437MHz Ant1 Ref



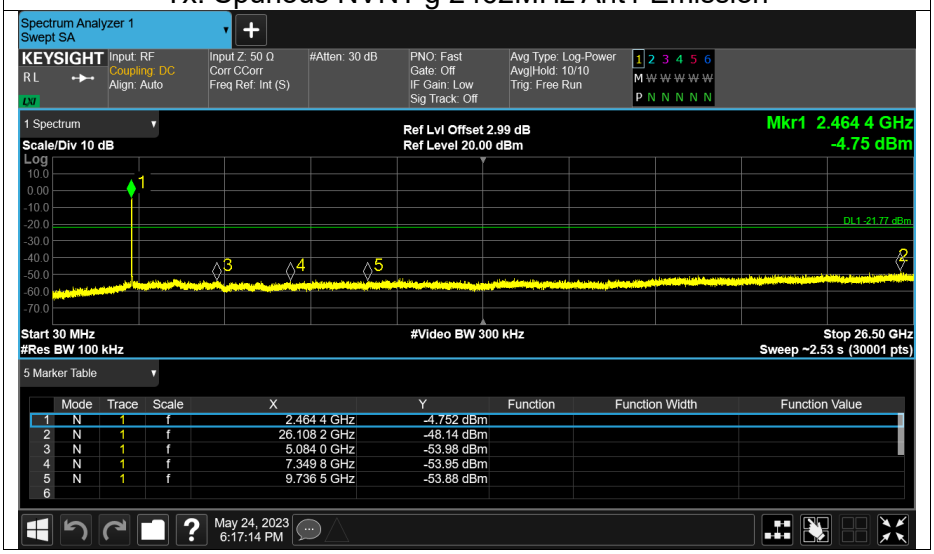
Tx. Spurious NVNT g 2437MHz Ant1 Emission



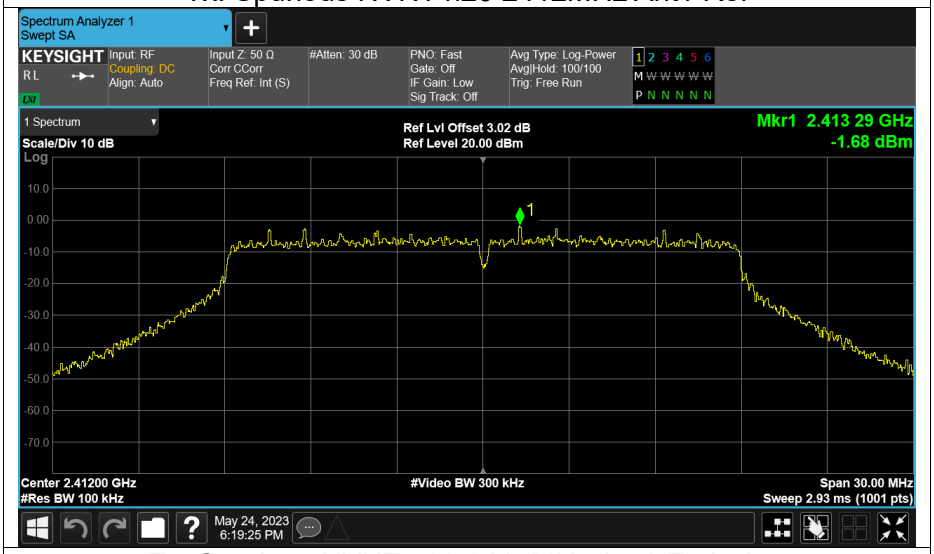
Tx. Spurious NVNT g 2462MHz Ant1 Ref



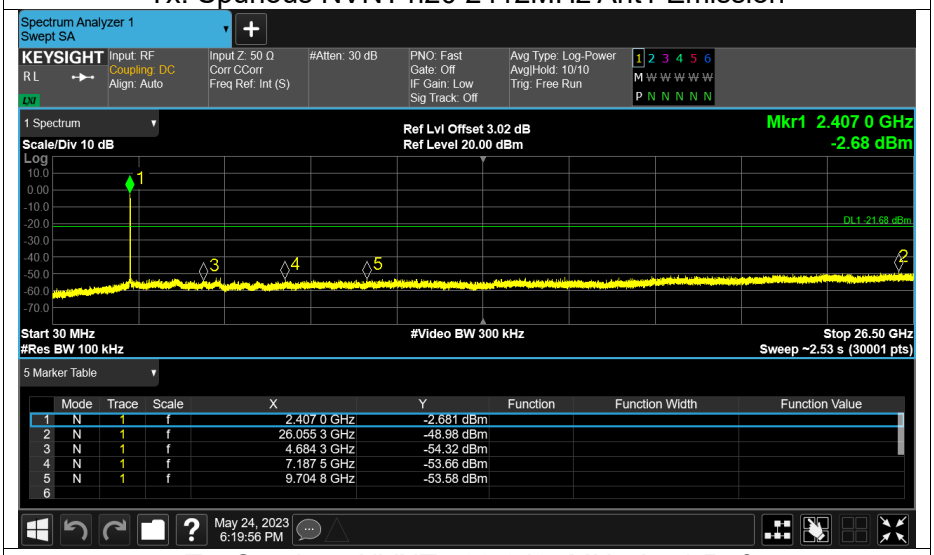
Tx. Spurious NVNT g 2462MHz Ant1 Emission



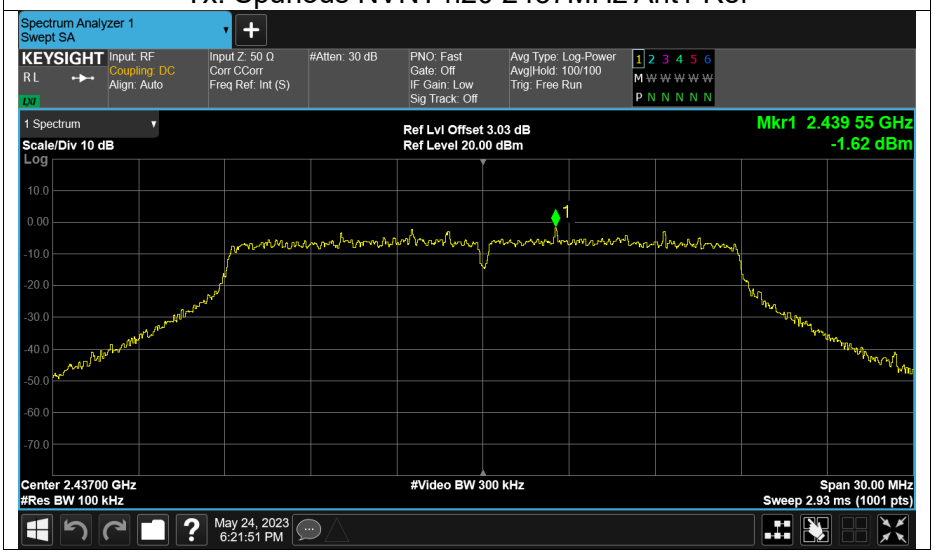
Tx. Spurious NVNT n20 2412MHz Ant1 Ref



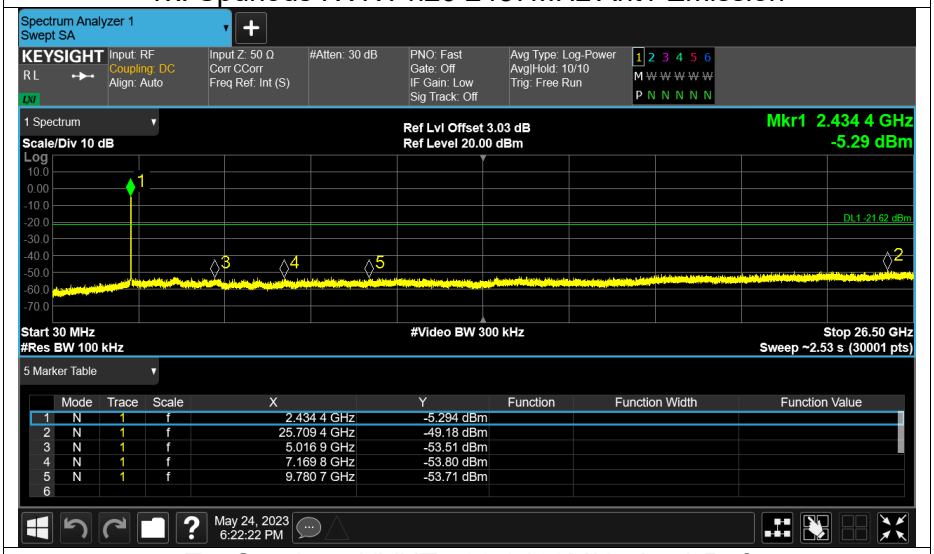
Tx. Spurious NVNT n20 2412MHz Ant1 Emission



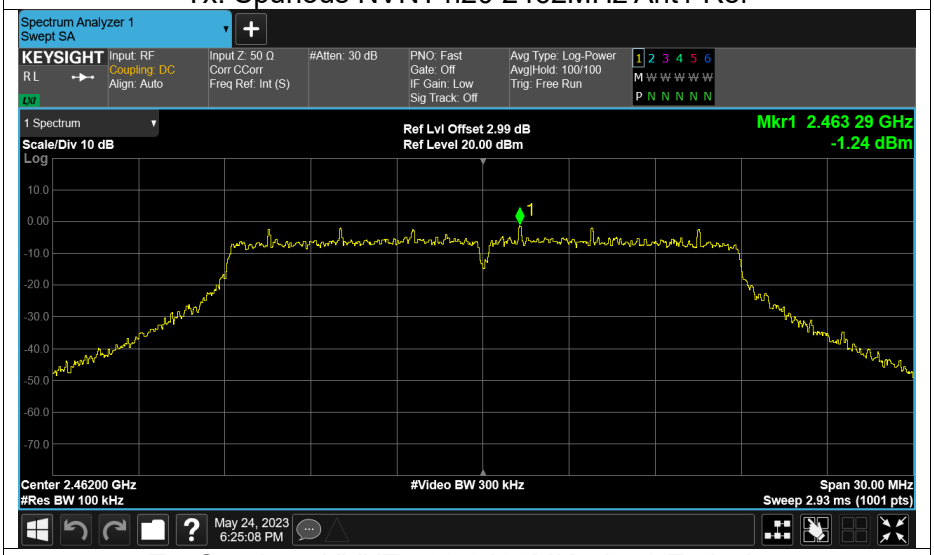
Tx. Spurious NVNT n20 2437MHz Ant1 Ref



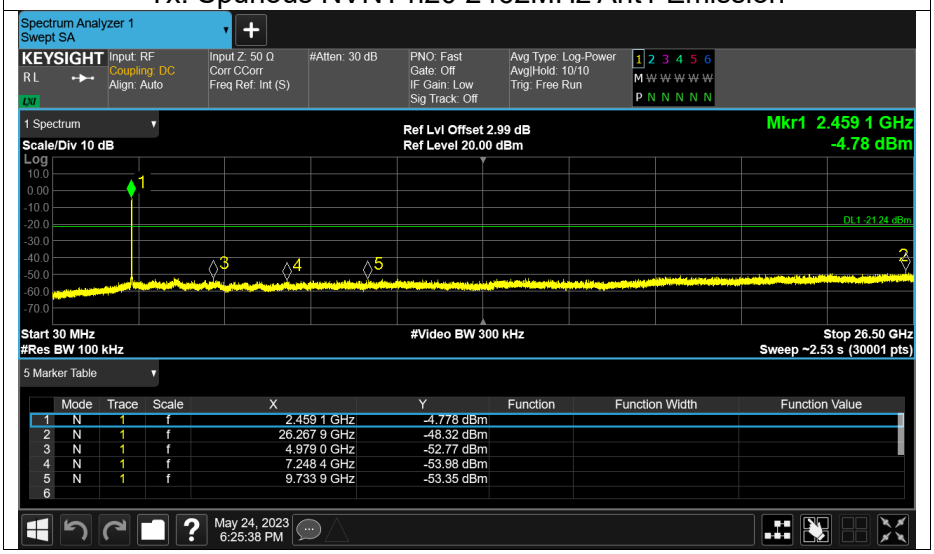
Tx. Spurious NVNT n20 2437MHz Ant1 Emission



Tx. Spurious NVNT n20 2462MHz Ant1 Ref

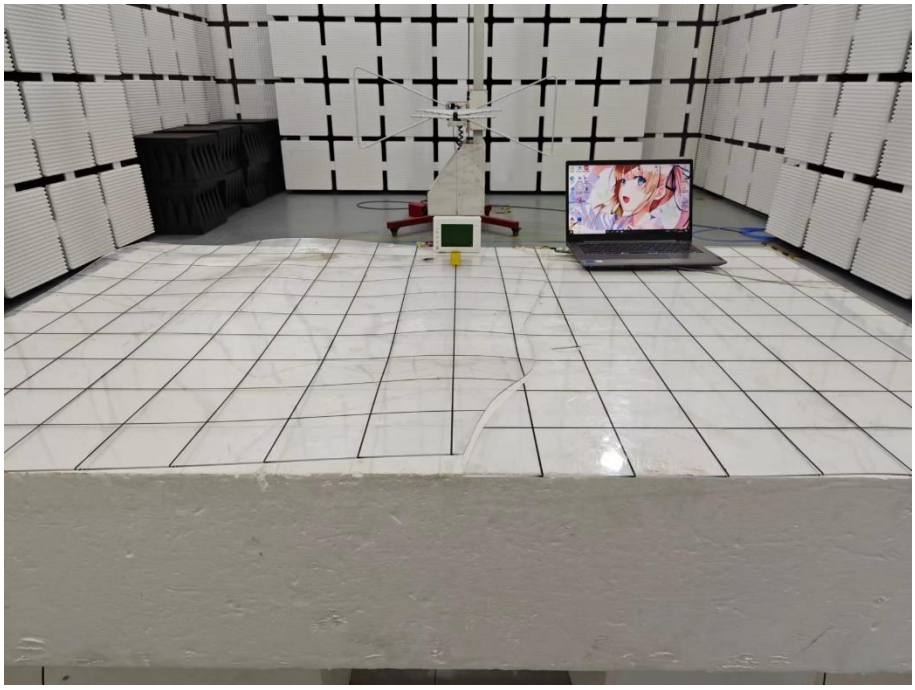


Tx. Spurious NVNT n20 2462MHz Ant1 Emission



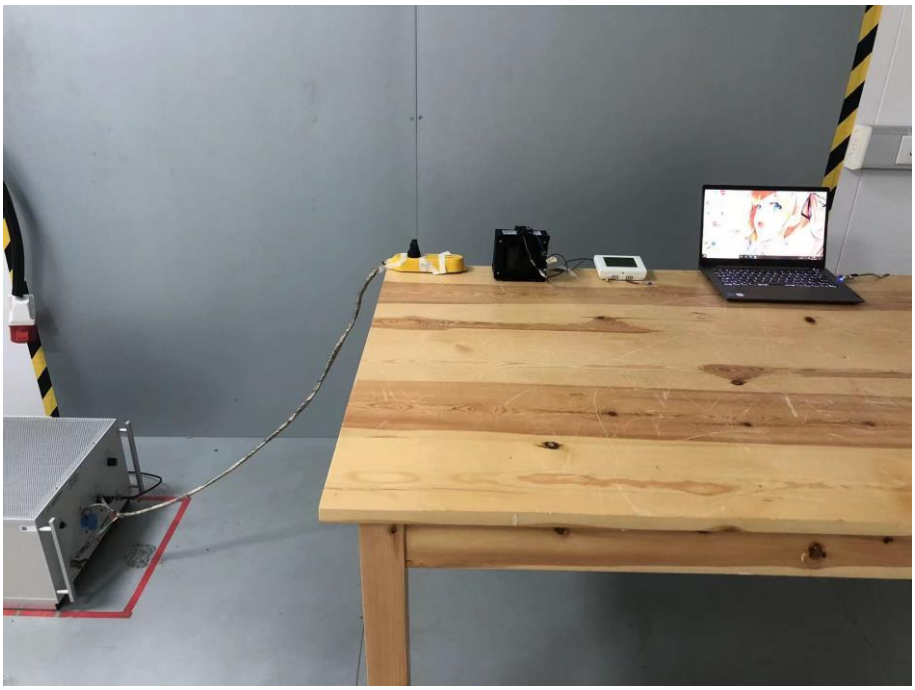
APPENDIX - TEST SETUP PHOTOS

Radiated Spurious Emission Test Setup Photo - Below 1GHz



Radiated Spurious Emission Test Setup Photo - Above 1GHz

Conducted Emission Test Setup Photo



※※※※※END OF THE REPORT※※※※※