



FCC TEST REPORT

FCC ID: SY4-B01014

On Behalf of

Shanghai Huace Navigation Technology LTD.

Handheld GNSS Data Collector

Model No.: LT700H

Prepared for : Shanghai Huace Navigation Technology LTD.
Address : 599 Gaojing Road, Building D, Shanghai 201702, China

Prepared By : Shenzhen Alpha Product Testing Co., Ltd.
Address : Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103,
Shenzhen, Guangdong, China


Report Number : A2102055-C01-R02
Date of Receipt : February 27, 2021
Date of Test : February 27-March 25, 2021
Date of Report : April 6, 2021
Version Number : V0

TABLE OF CONTENTS

Description	Page
1. Summary of Standards And Results	6
1.1. Description of Standards and Results	6
2. General Information	7
2.1. Description of Device (EUT).....	7
2.2. Accessories of Device (EUT)	8
2.3. Tested Supporting System Details	8
2.4. Block Diagram of connection between EUT and simulators	8
2.5. Test Mode Description.....	8
2.6. Test Conditions	9
2.7. Test Facility	9
2.8. Measurement Uncertainty.....	9
2.9. Test Equipment List.....	10
3. Maximum Peak Output power	12
3.1. Limit	12
3.2. Test Procedure	12
3.3. Test Setup.....	12
3.4. Test Result	12
4. Bandwidth.....	13
4.1. Limit	13
4.2. Test Procedure	13
4.3. Test Result	13
5. Number Of Hopping Channel.....	23
5.1. Limit	23
5.2. Test Procedure	23
5.3. Test Result	23
6. Dwell Time.....	25
6.1. Test limit	25
6.2. Test Procedure	25
6.3. Test Result	25
7. Radiated emissions.....	29
7.1. Limit	29
7.2. Block Diagram of Test setup	30
7.3. Test Procedure	31
7.4. Test Result	31
8. Band Edge Compliance	47
8.1. Block Diagram of Test Setup.....	47
8.2. Limit	47
8.3. Test Procedure	47
8.4. Test Result	47

9. Power Line Conducted Emissions	57
9.1. Block Diagram of Test Setup	57
9.2. Limit	57
9.3. Test Procedure	57
9.4. Test Result	57
10. Antenna Requirements	60
10.1. Limit	60
10.2. Result	60
11. Test setup photo	61
11.1. Photos of Radiated emission.....	61
11.2. Photos of Conducted Emission test	62

TEST REPORT DECLARATION

Applicant : Shanghai Huace Navigation Technology LTD.
 Address : 599 Gaojing Road, Building D, Shanghai 201702, China
 Manufacturer : Shanghai Huace Navigation Technology LTD.
 Address : 599 Gaojing Road, Building D, Shanghai 201702, China
 EUT Description : Handheld GNSS Data Collector
 (A) Model No. : LT700H
 (B) Trademark : 

Measurement Standard Used:

FCC Rules and Regulations Part 15 Subpart C Section 15.247
ANSI C63.10:2013

The device described above is tested by Shenzhen Alpha Product Testing Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C limits both conducted and radiated emissions. The test results are contained in this test report and Shenzhen Alpha Product Testing Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

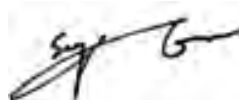
After the test, our opinion is that EUT compliance with the requirement of the above standards.

This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Shenzhen Alpha Product Testing Co., Ltd.

Tested by (name + signature).....: Lucas Pang
Project Engineer



Approved by (name + signature).....: Simple Guan
Project Manager



Date of issue..... : April 6, 2021

Revision History

Revision	Issue Date	Revisions	Revised By
V0	April 6, 2021	Initial released Issue	Lucas Pang

1. SUMMARY OF STANDARDS AND RESULTS

1.1. Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below:

Test Item	Standards Paragraph	Result
Maximum Peak Output Power	FCC Part 15: 15.247(b)(1) ANSI C63.10 :2013	P
Bandwidth	FCC Part 15: 15.215 ANSI C63.10 :2013	P
Carrier Frequency Separation	FCC Part 15: 15.247(a)(1) ANSI C63.10 :2013	P
Number Of Hopping Channel	FCC Part 15: 15.247(a)(1)(iii) ANSI C63.10 :2013	P
Dwell Time	FCC Part 15: 15.247(a)(1)(iii) ANSI C63.10 :2013	P
Radiated Emission	FCC Part 15: 15.209 FCC Part 15: 15.247(d) ANSI C63.10 :2013	P
Band Edge Compliance	FCC Part 15: 15.247(d) ANSI C63.10 :2013	P
Power Line Conducted Emissions	FCC Part 15: 15.207 ANSI C63.10 :2013	P
Antenna requirement	FCC Part 15: 15.203	P
Note:	1. P is an abbreviation for Pass. 2. F is an abbreviation for Fail. 3. N/A is an abbreviation for Not Applicable.	

2. GENERAL INFORMATION

2.1. Description of Device (EUT)

Description : Handheld GNSS Data Collector

Model Number : LT700H

Diff : N/A

Trademark : 

Power supply : DC 3.8V from battery, DC 5V for adapter

Radio Technology : Bluetooth V4.1 EDR

Operation frequency : 2402-2480MHz

Channel No. : 79 Channels

Channel spacing : 1MHz

Modulation type : GFSK, $\pi/4$ DQPSK, 8DPSK

Antenna Type : Internal antenna, Maximum Gain is 1.49dBi. (This value is supplied by applicant)

Software version : V1.0

Hardware version : V1.0

Connector cable loss : N/A

Intend use environment : Residential, commercial and light industrial environment

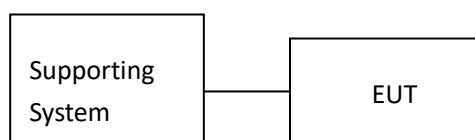
2.2. Accessories of Device (EUT)

Accessories1 : AC/DC ADAPTER
 Manufacturer : Shenzhen Jiuzhou Power Technology Co., LTD
 Model : JZB110-050200WU
 Input : AC 100-240V, 50/60Hz, 0.35A
 Output : DC 5V/2A Max., 10W

2.3. Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number	Certification or SDOC
1.	--	--	--	--	--

2.4. Block Diagram of connection between EUT and simulators



2.5. Test Mode Description

Tested mode, channel information		
Mode	Channel	Frequency (MHz)
GFSK	Low :CH1	2402
	Middle: CH40	2441
	High: CH79	2480
$\pi/4$ DQPSK	Low :CH1	2402
	Middle: CH40	2441
	High: CH79	2480
8DPSK	Low :CH1	2402
	Middle: CH40	2441
	High: CH79	2480
Charging		

2.6. Test Conditions

Items	Required	Actual
Temperature range:	15-35°C	24°C
Humidity range:	25-75%	56%
Pressure range:	86-106kPa	980kPa

2.7. Test Facility

Shenzhen Alpha Product Testing Co., Ltd
 Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103,
 Shenzhen, Guangdong, China

June 21, 2018 File on Federal Communication Commission
 Registration Number: 293961

September 15, 2019 Certificated by IC
 Registration Number: CN0085

2.8. Measurement Uncertainty

(95% confidence levels, k=2)

Item	Uncertainty
Uncertainty for Power point Conducted Emissions Test	2.74dB
Uncertainty for Radiation Emission test in 3m chamber (below 30MHz)	2.13 dB(Polarize: V)
	2.57dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	3.77dB(Polarize: V)
	3.80dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz)	4.13dB(Polarize: H)
	4.16dB(Polarize: V)
Uncertainty for radio frequency	5.4×10^{-8}
Uncertainty for conducted RF Power	0.37dB
Uncertainty for temperature	0.2°C
Uncertainty for humidity	1%
Uncertainty for DC and low frequency voltages	0.06%

2.9. Test Equipment List

Equipment	Manufacture	Model No.	Serial No.	Last cal.	Cal Interval
9*6*6 anechoic chamber	CHENYU	9*6*6	N/A	2019.09.06	3Year
Spectrum analyzer	ROHDE&SCHWARZ	FSV40-N	102137	2020.09.02	1Year
Spectrum analyzer	Agilent	N9020A	MY499100060	2020.09.02	1Year
Receiver	ROHDE&SCHWARZ	ESR	1316.3003K03-10208 2-Wa	2020.09.02	1Year
Receiver	R&S	ESCI	101165	2020.09.02	1Year
Bilog Antenna	Schwarzbeck	VULB 9168	VULB9168-438	2020.04.12	2Year
Horn Antenna	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D(1201)	2020.04.12	2Year
Active Loop Antenna	SCHWARZBECK	FMZB 1519B	00059	2019.09.07	2Year
Cable	Resenberger	N/A	No.1	2020.09.02	1Year
Cable	Resenberger	N/A	No.2	2020.09.02	1Year
Cable	Resenberger	N/A	No.3	2020.09.02	1Year
Pre-amplifier	HP	HP8347A	2834A00455	2020.09.02	1Year
Pre-amplifier	Agilent	8449B	3008A02664	2020.09.02	1Year
L.I.S.N.#1	Schwarzbeck	NSLK8126	8126466	2020.09.02	1Year
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	101043	2020.09.02	1Year
20db Attenuator	ICPROBING	IATS1	82347	2020.09.02	1Year
Horn Antenna	SCHWARZBECK	BBHA9170	00946	2019.09.07	2Year
Preamplifier	SKET	LNPA_1840-50	SK2018101801	2020.09.02	1Year
Power Meter	Agilent	E9300A	MY41496625	2020.09.02	1Year
Temp. & Humid. Chamber	Weihuang	WHTH-1000-40-8 80	100631	2020.09.02	1Year
Switching Mode Power Supply	JUNKE	JK12010S	20140927-6	2020.09.02	1Year

Software Information			
Test Item	Software Name	Manufacturer	Version
RE	EZ-EMC	EZ	Alpha-3A1
CE	EZ-EMC	EZ	Alpha-3A1
RF-CE	MTS 8310	MW	V2.0.0.0

3. MAXIMUM PEAK OUTPUT POWER

3.1.Limit

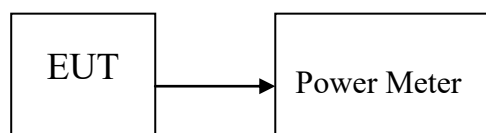
Please refer section15.247.

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts, the e.i.r.p shall not exceed 4W

3.2.Test Procedure

The transmitter output is connected to the RF Power Meter. The RF Power Meter is set to the peak power detection.

3.3.Test Setup



3.4.Test Result

Mode	Freq (MHz)	PK Output Power (dBm)	PK Output Power (mW)	Limit (dBm)	Result
GFSK	2402	-2.200	0.603	21	Pass
	2441	-1.546	0.700	21	Pass
	2480	-2.857	0.518	21	Pass
$\pi/4$ DQPSK	2402	-2.964	0.505	21	Pass
	2441	-2.615	0.548	21	Pass
	2480	-2.599	0.550	21	Pass
8DPSK	2402	-2.224	0.599	21	Pass
	2441	-2.037	0.626	21	Pass
	2480	-2.769	0.529	21	Pass

4. BANDWIDTH

4.1.Limit

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in § 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

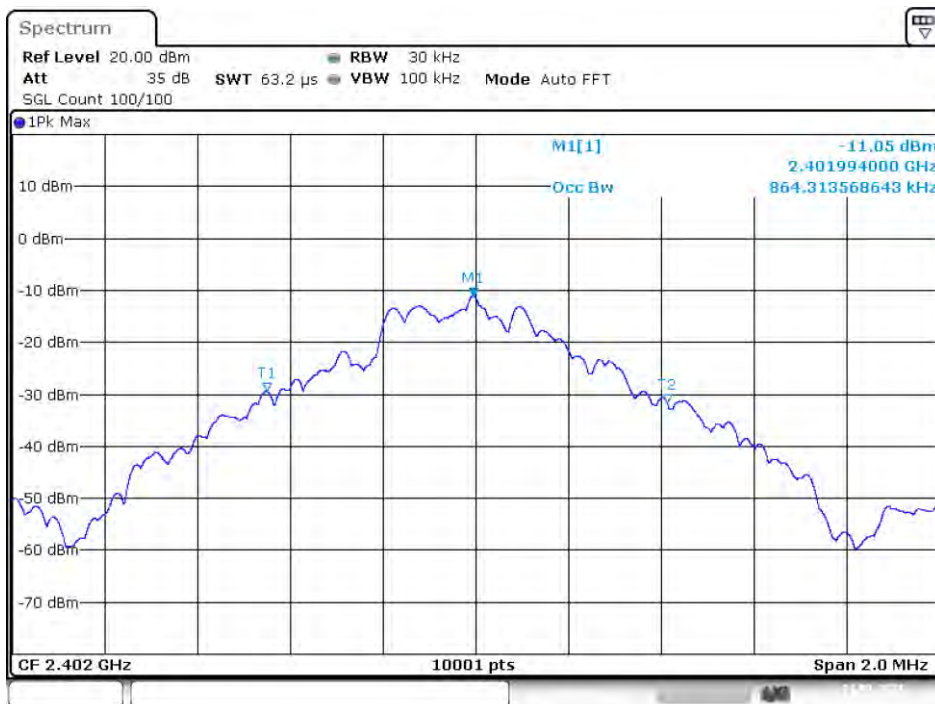
4.2.Test Procedure

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30kHz RBW and 100kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

4.3.Test Result

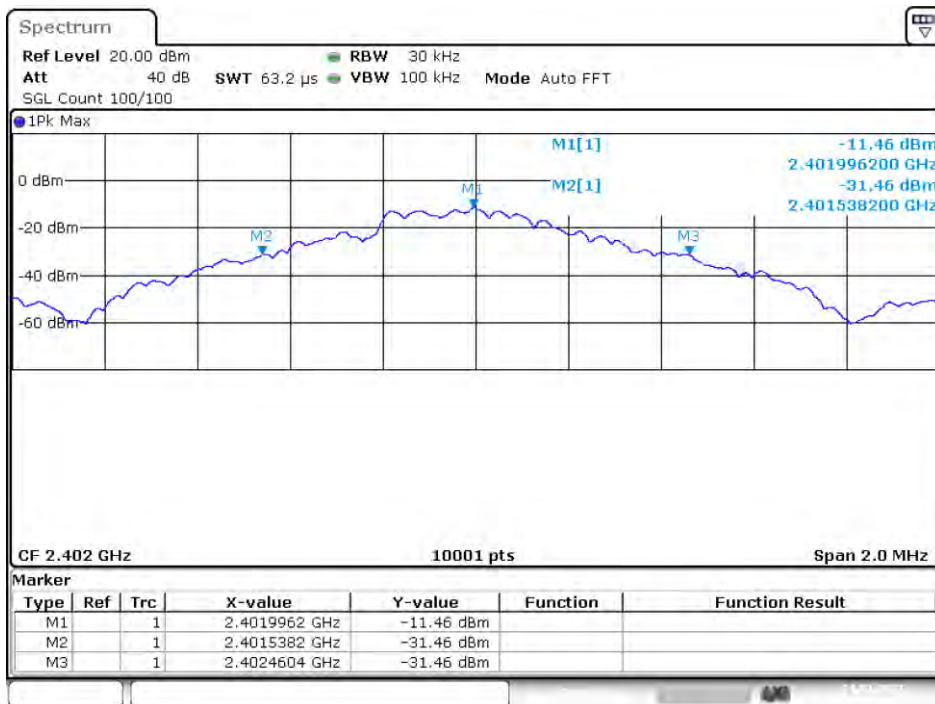
Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)	-20 dB Bandwidth (MHz)	Limit -20 dB Bandwidth (MHz)	Verdict
NVNT	1-DH1	2402	Ant 1	0.8643	0.9222	N/A	Pass
NVNT	1-DH1	2441	Ant 1	0.8559	0.8978	N/A	Pass
NVNT	1-DH1	2480	Ant 1	0.8577	0.8928	N/A	Pass
NVNT	2-DH1	2402	Ant 1	1.1591	1.2526	N/A	Pass
NVNT	2-DH1	2441	Ant 1	1.1649	1.2284	N/A	Pass
NVNT	2-DH1	2480	Ant 1	1.1499	1.2586	N/A	Pass
NVNT	3-DH1	2402	Ant 1	1.1399	1.216	N/A	Pass
NVNT	3-DH1	2441	Ant 1	1.1385	1.2134	N/A	Pass
NVNT	3-DH1	2480	Ant 1	1.1451	1.2148	N/A	Pass

OBW NVNT 1-DH1 2402MHz Ant1



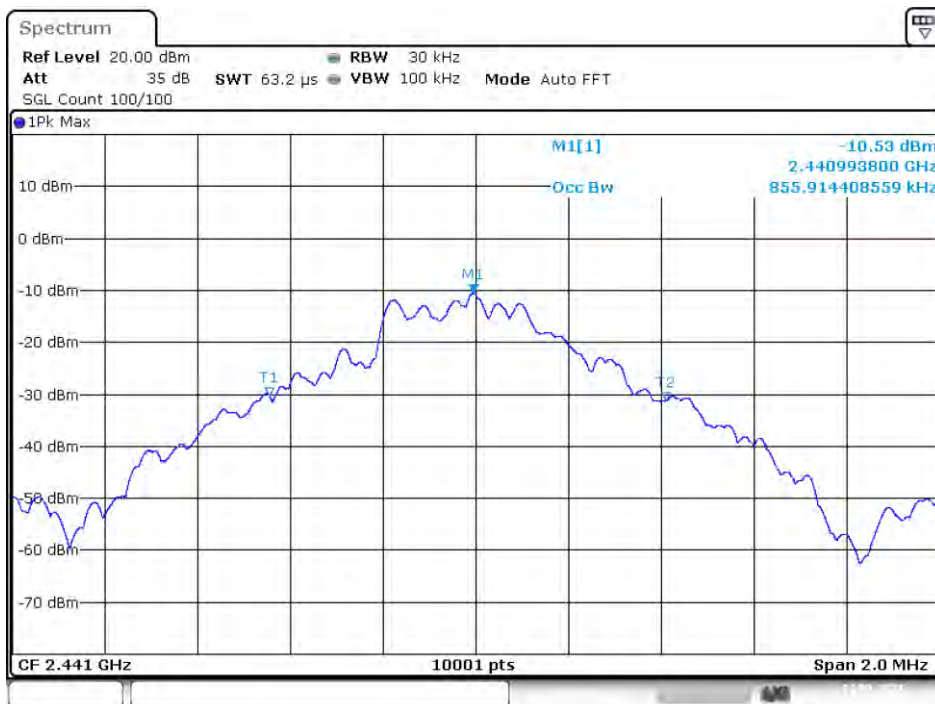
Date: 11.MAR.2021 03:23:23

-20 dB BW NVNT 1-DH1 2402MHz Ant1



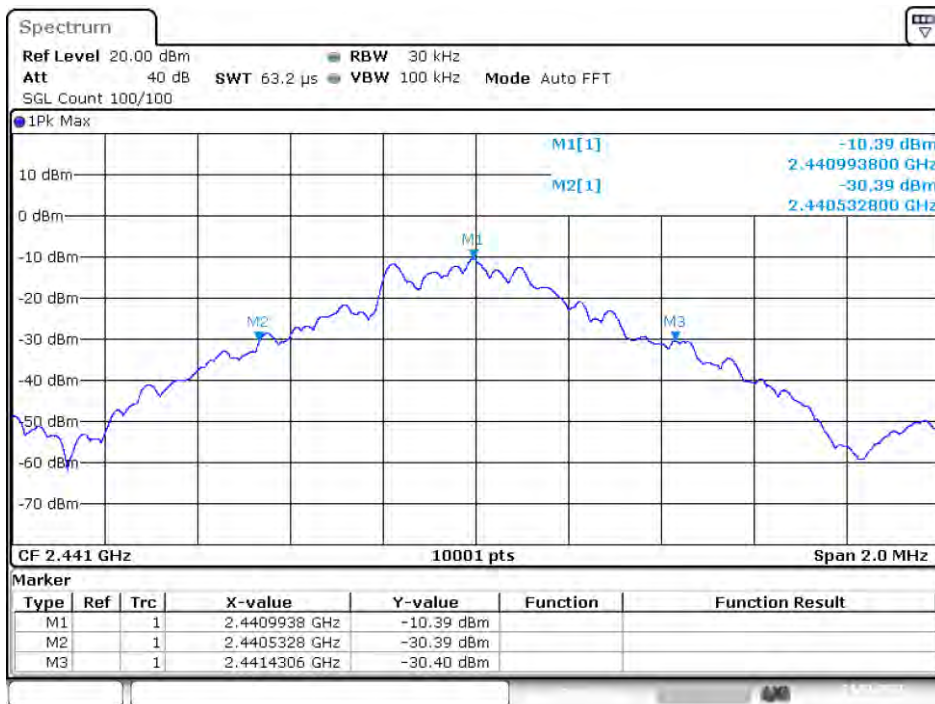
Date: 11.MAR.2021 03:23:26

OBW NVNT 1-DH1 2441MHz Ant1



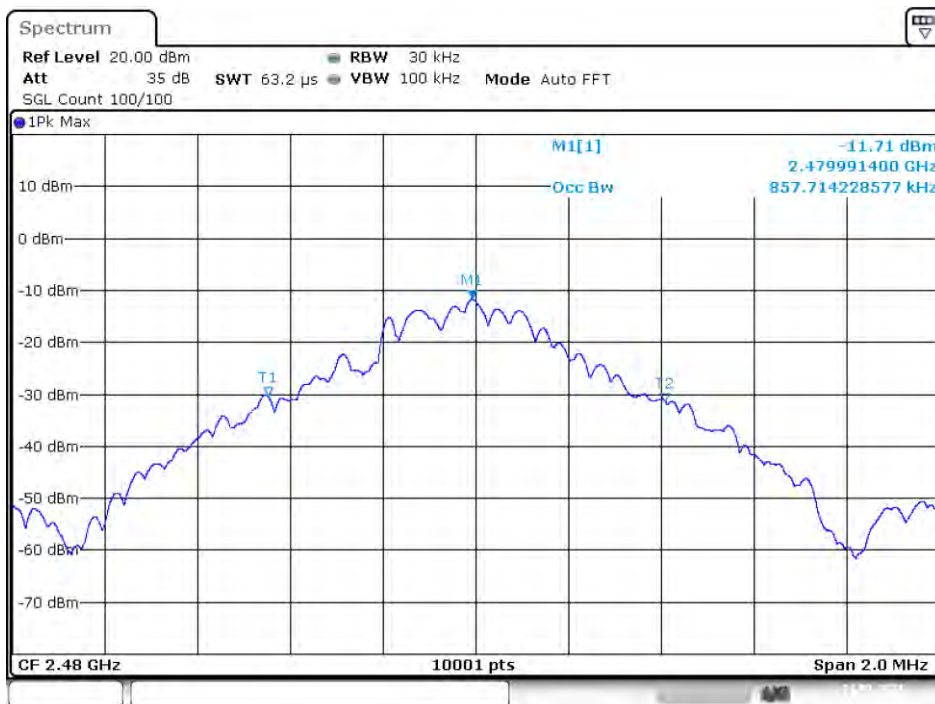
Date: 11.MAR.2021 03:16:17

-20 dB BW NVNT 1-DH1 2441MHz Ant1



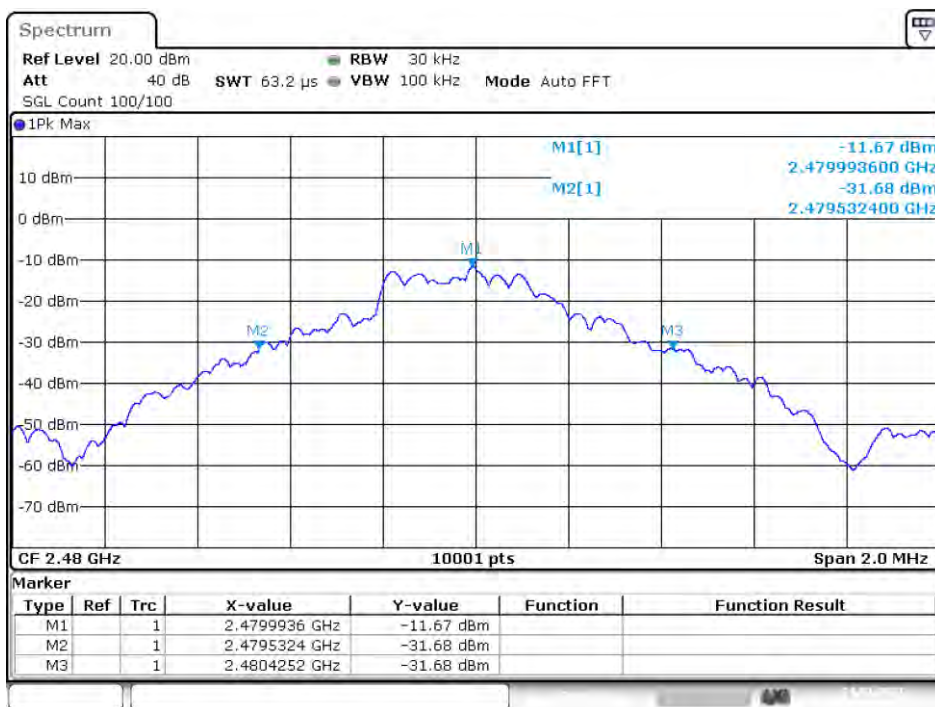
Date: 11.MAR.2021 03:16:20

OBW NVNT 1-DH1 2480MHz Ant1



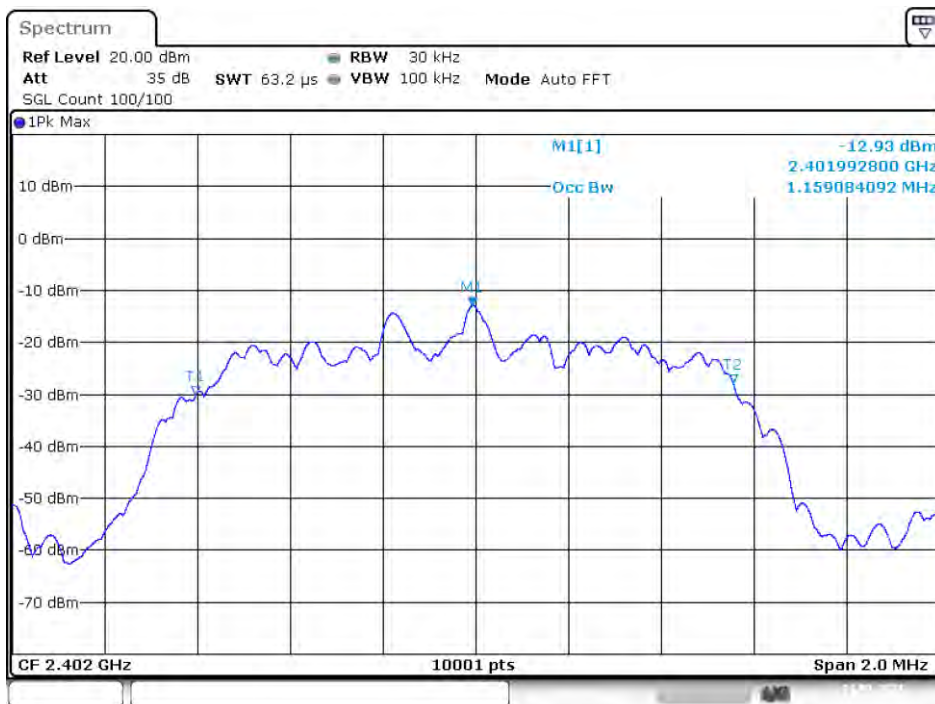
Date: 11.MAR.2021 03:28:02

-20 dB BW NVNT 1-DH1 2480MHz Ant1



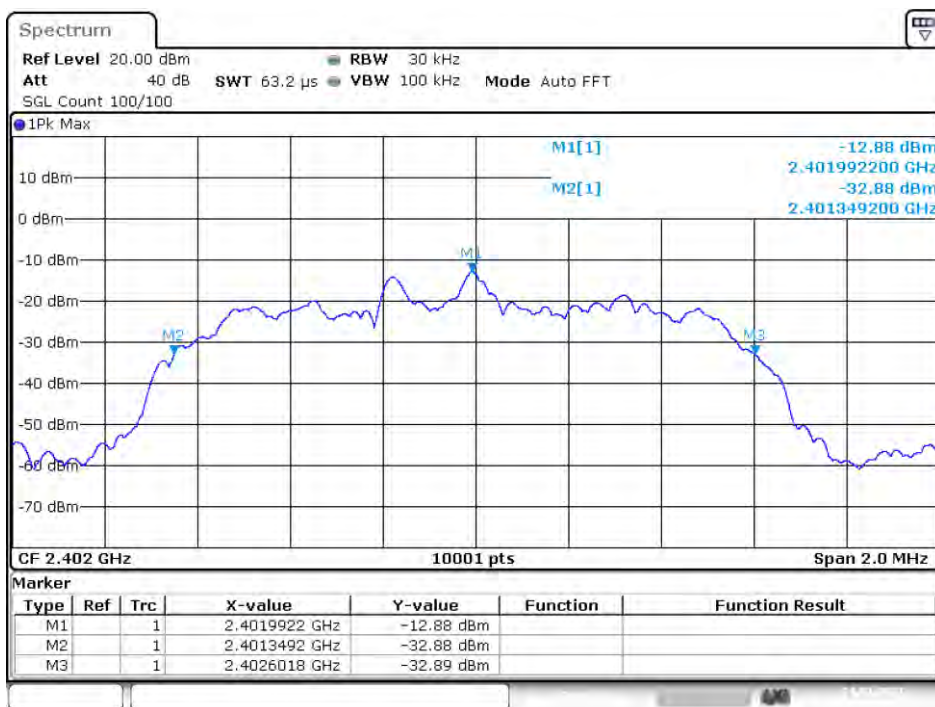
Date: 11.MAR.2021 03:28:05

OBW NVNT 2-DH1 2402MHz Ant1



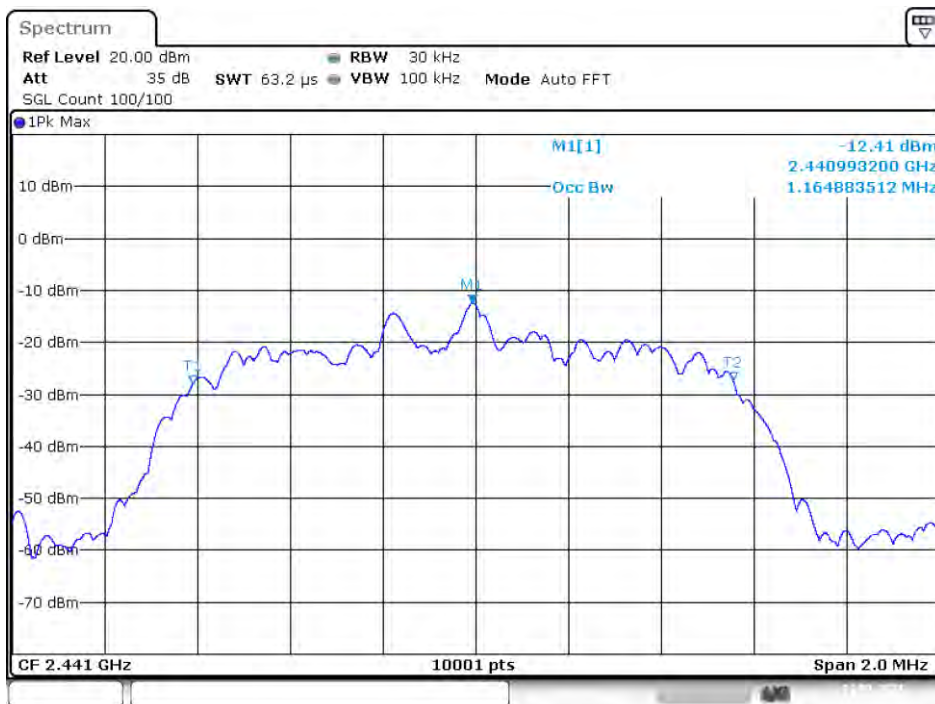
Date: 11.MAR.2021 03:24:52

-20 dB BW NVNT 2-DH1 2402MHz Ant1



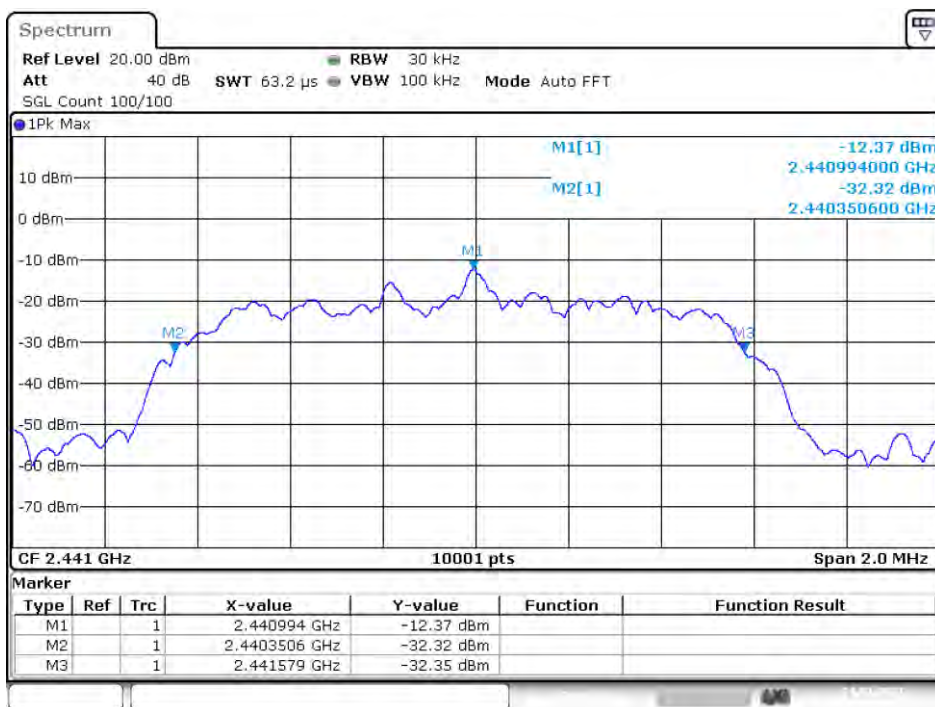
Date: 11.MAR.2021 03:24:55

OBW NVNT 2-DH1 2441MHz Ant1



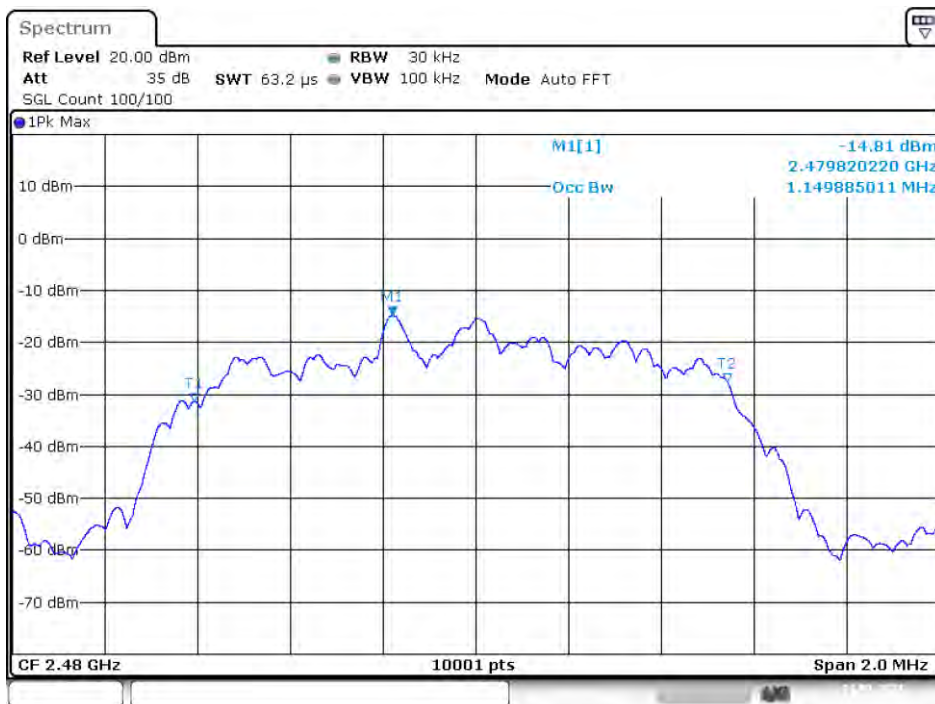
Date: 11.MAR.2021 03:18:38

-20 dB BW NVNT 2-DH1 2441MHz Ant1



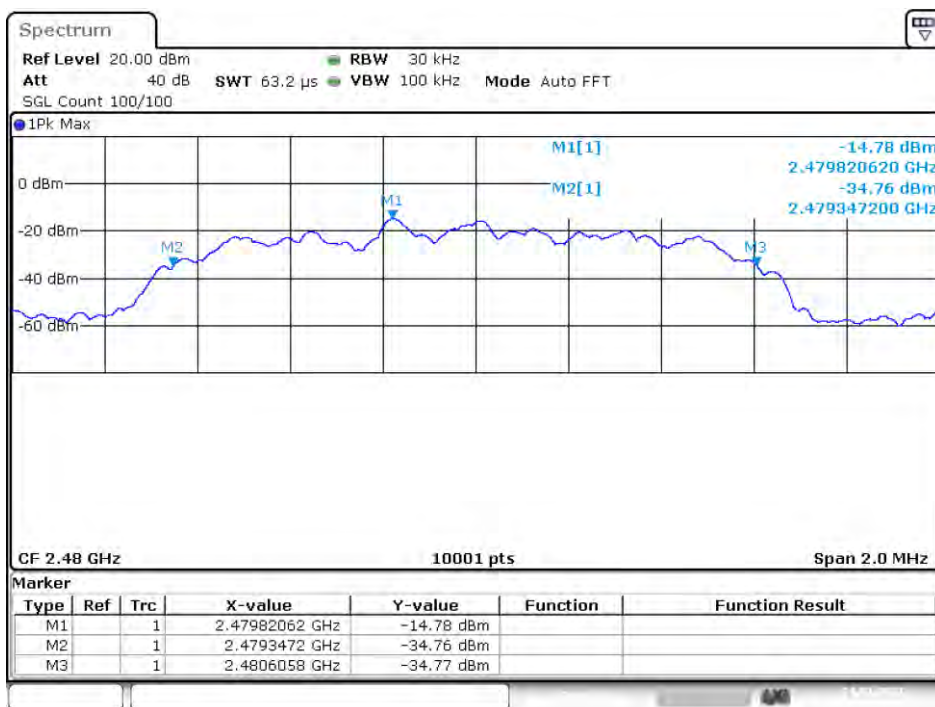
Date: 11.MAR.2021 03:18:41

OBW NVNT 2-DH1 2480MHz Ant1



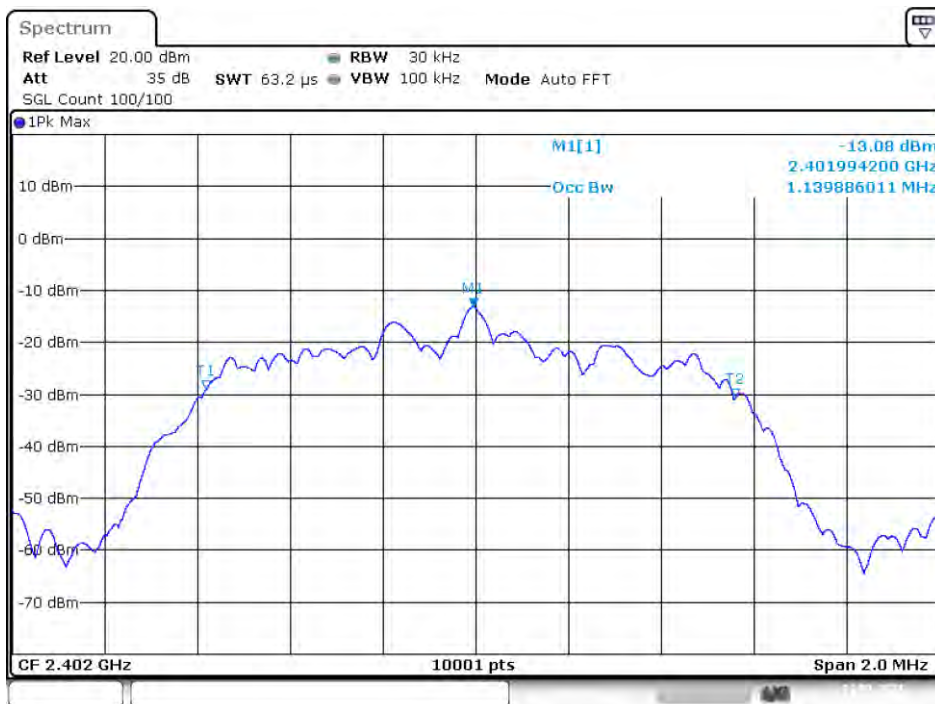
Date: 11.MAR.2021 03:29:44

-20 dB BW NVNT 2-DH1 2480MHz Ant1



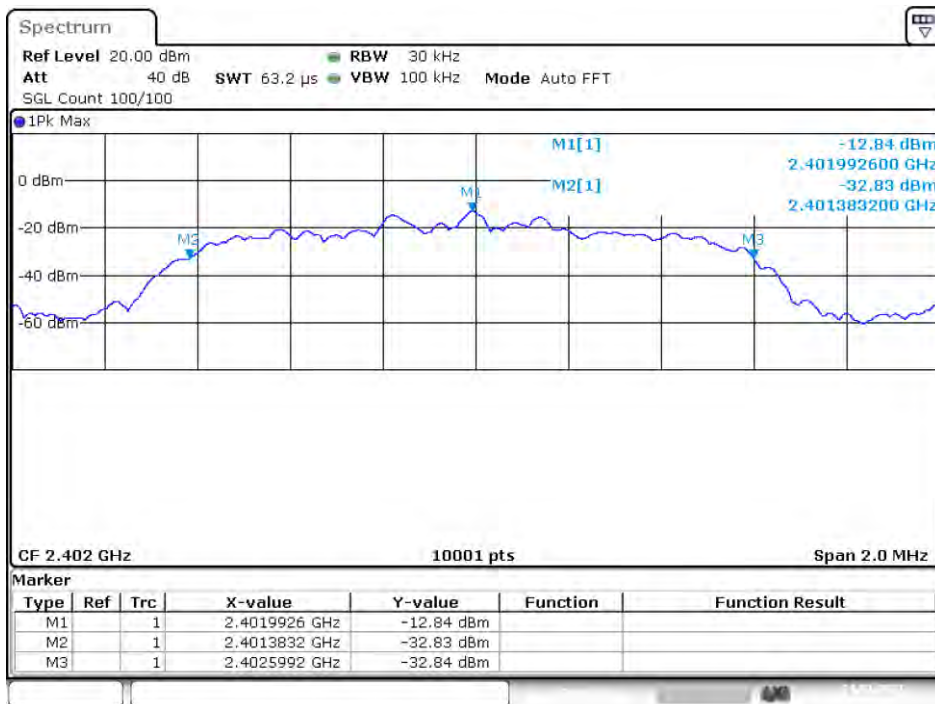
Date: 11.MAR.2021 03:29:47

OBW NVNT 3-DH1 2402MHz Ant1



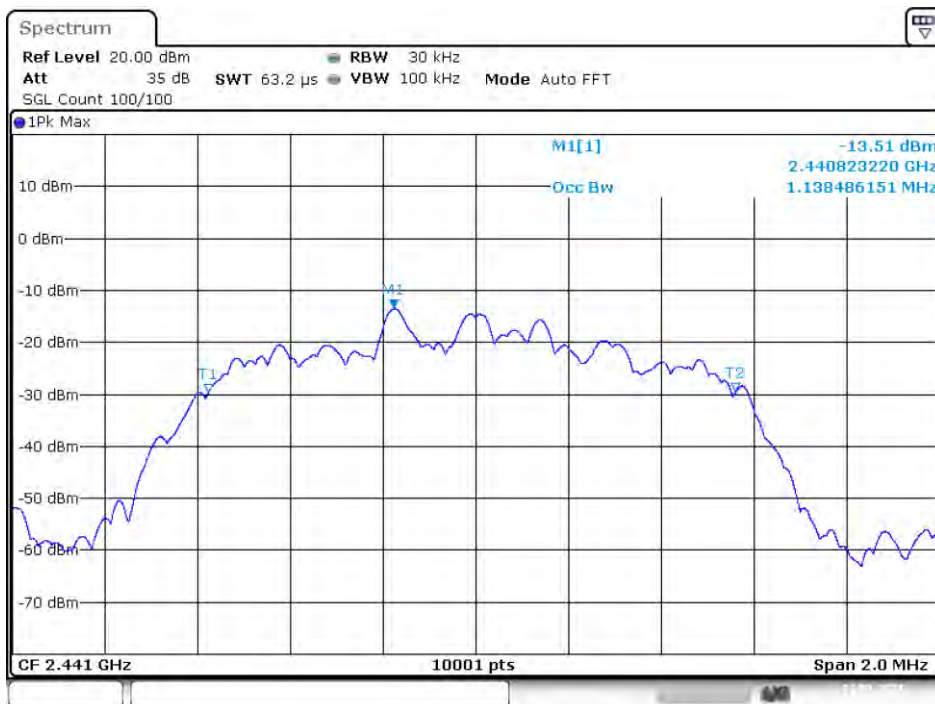
Date: 11.MAR.2021 03:26:29

-20 dB BW NVNT 3-DH1 2402MHz Ant1



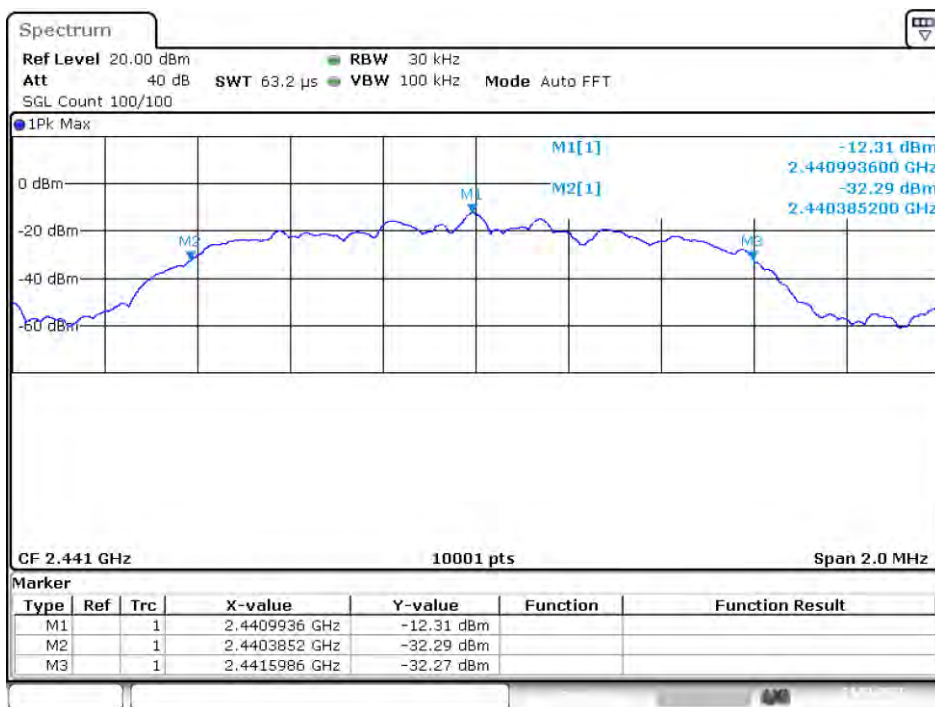
Date: 11.MAR.2021 03:26:33

OBW NVNT 3-DH1 2441MHz Ant1



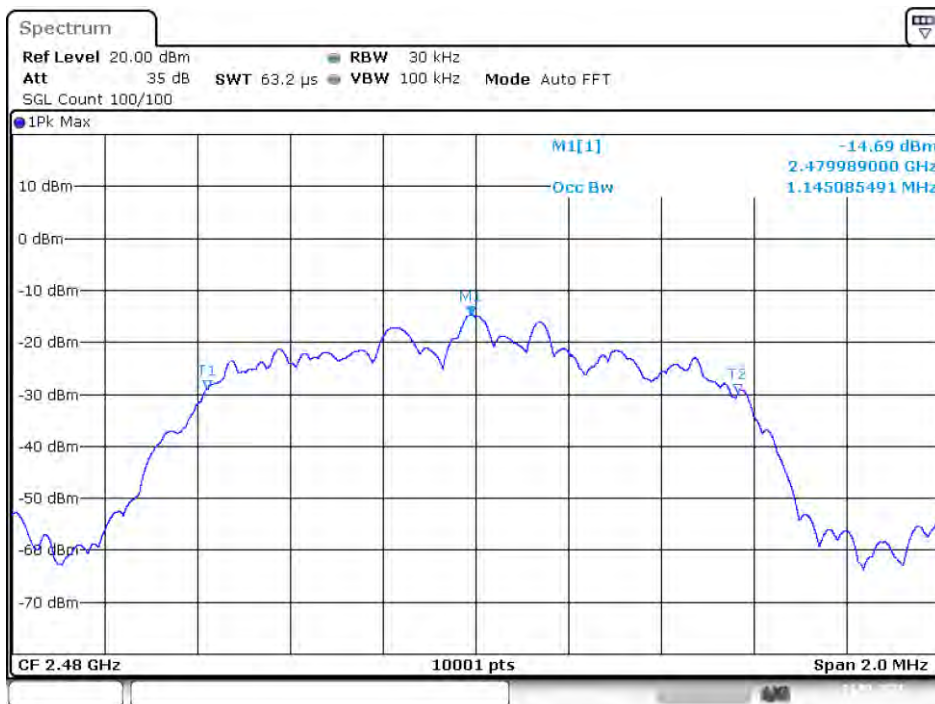
Date: 11.MAR.2021 03:20:22

-20 dB BW NVNT 3-DH1 2441MHz Ant1



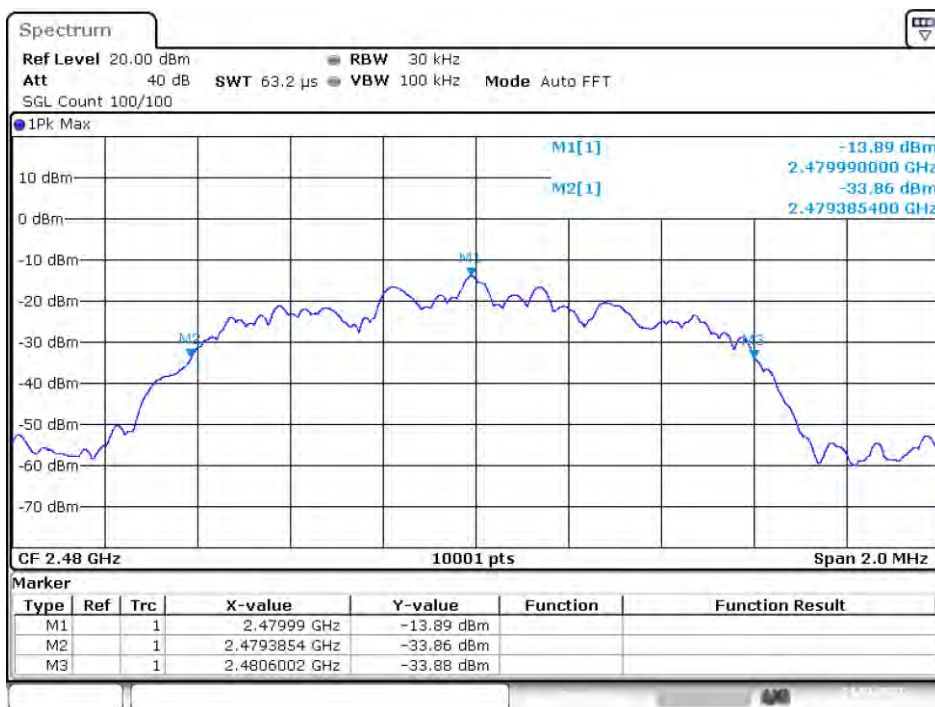
Date: 11.MAR.2021 03:20:25

OBW NVNT 3-DH1 2480MHz Ant1



Date: 11.MAR.2021 03:31:14

-20 dB BW NVNT 3-DH1 2480MHz Ant1



Date: 11.MAR.2021 03:31:17

5. NUMBER OF HOPPING CHANNEL

5.1.Limit

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

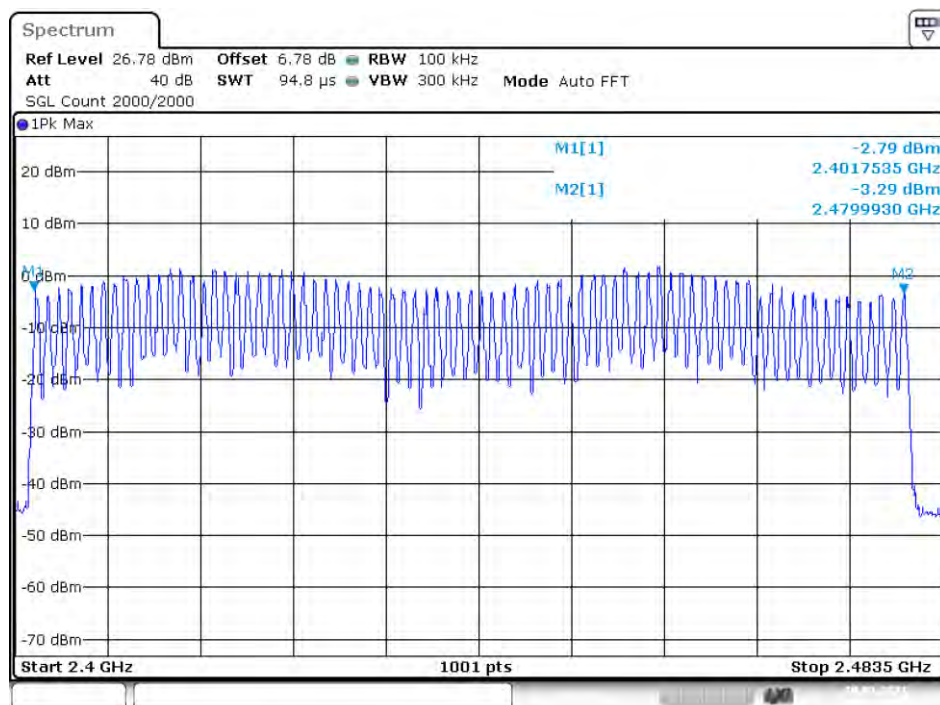
5.2.Test Procedure

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The number of hopping channel was measured by spectrum analyzer with 100kHz RBW and 300KHz VBW.

5.3.Test Result

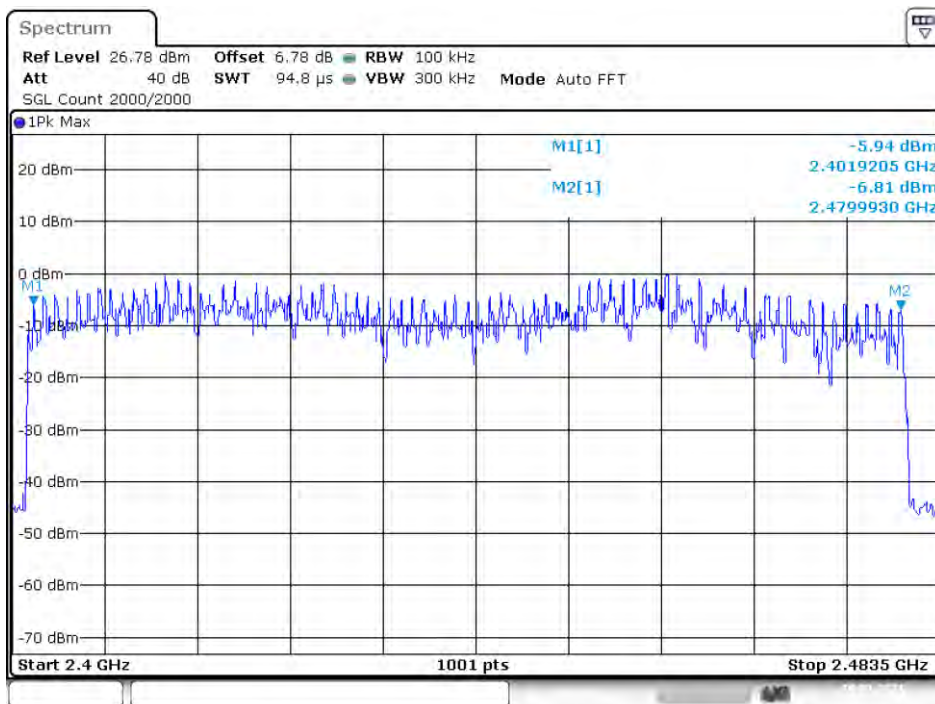
Condition	Mode	Hopping Number	Limit	Verdict
NVNT	1-DH1	79	15	Pass
NVNT	2-DH1	79	15	Pass
NVNT	3-DH1	79	15	Pass

Hopping No. NVNT 1-DH1 2441MHz



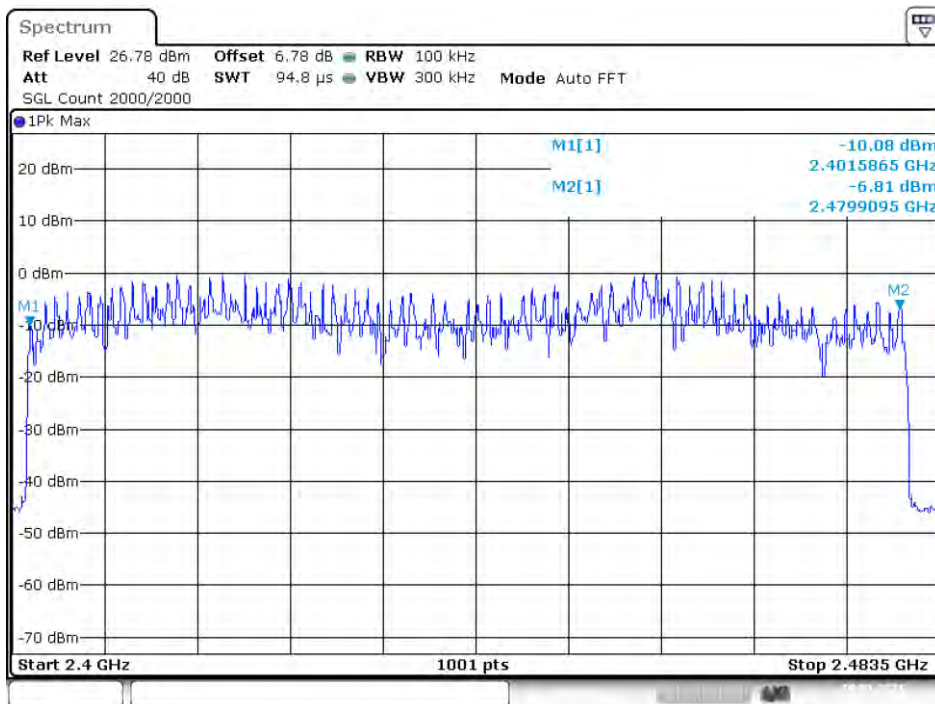
Date: 10.MAR.2021 15:33:55

Hopping No. NVNT 2-DH1 2441MHz



Date: 10.MAR.2021 15:40:45

Hopping No. NVNT 3-DH1 2441MHz



Date: 10.MAR.2021 15:53:05

6. DWELL TIME

6.1. Test limit

Please refer section 15.247

According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz. The average time of occupancy on any frequency shall not be greater than 0.4 s within period of 0.4 seconds multiplied by the number of hopping channels employed.

6.2. Test Procedure

- 7.2.1. Place the EUT on the table and set it in transmitting mode.
- 7.2.2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 7.2.3. Set center frequency of spectrum analyzer = operating frequency.
- 7.2.4. Set the spectrum analyzer as RBW=1MHz, VBW=1MHz, Span = 0Hz, Sweep = auto.
- 7.2.5. Repeat above procedures until all frequency measured were complete.

6.3. Test Result

PASS.

Detailed information please see the following page.

Mode	Data Packet	Frequency (MHz)	Pulse Duration (ms)	Dwell Time (s)	Limit (s)	Conclusion
GFSK	DH1	2441	0.381	0.122	<0.4	PASS
	DH3	2441	1.637	0.262		PASS
	DH5	2441	2.885	0.308		PASS
$\pi/4$ DQPSK	DH1	2441	0.386	0.124	<0.4	PASS
	DH3	2441	1.639	0.262		PASS
	DH5	2441	2.872	0.306		PASS
8DPSK	DH1	2441	0.386	0.124	<0.4	PASS
	DH3	2441	1.637	0.262		PASS
	DH5	2441	2.889	0.308		PASS

Note: 1 A period time = 0.4 (s) * 79 = 31.6(s)

2 DH1 time slot = Pulse Duration * (1600/(2*79)) * A period time/1000

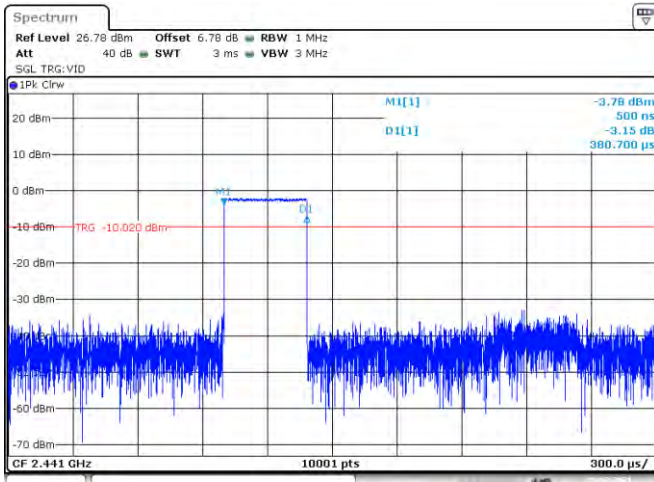
DH3 time slot = Pulse Duration * (1600/(4*79)) * A period time/1000

DH5 time slot = Pulse Duration * (1600/(6*79)) * A period time/1000

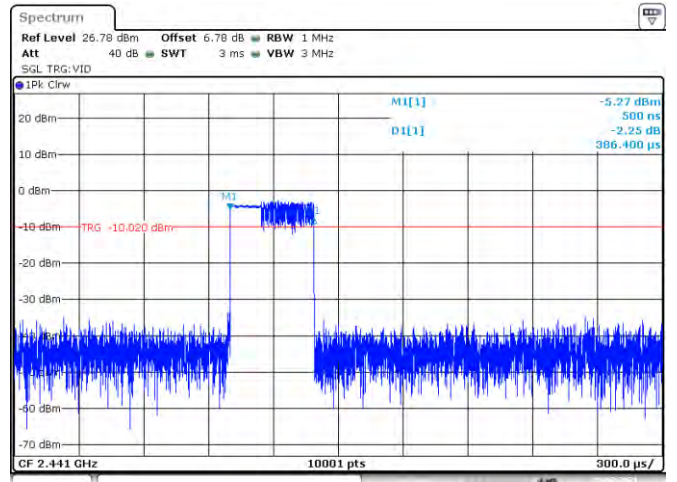
Dwell time

GFSK

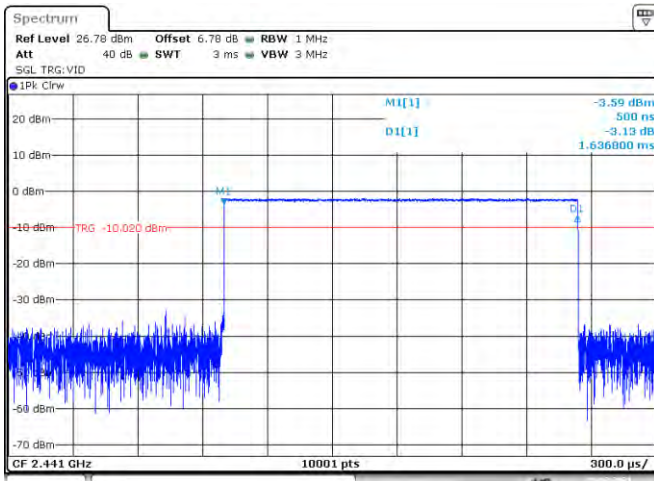
$\pi/4$ -DQPSK



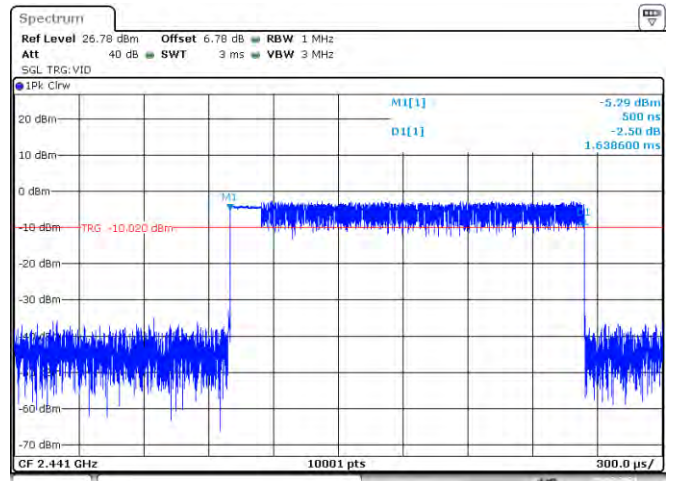
Channel 39 / 2441 MHz - DH1



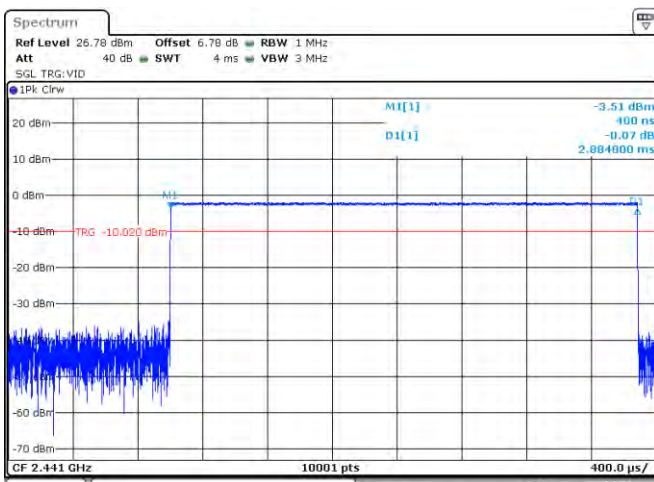
Channel 39 / 2441 MHz - 2DH1



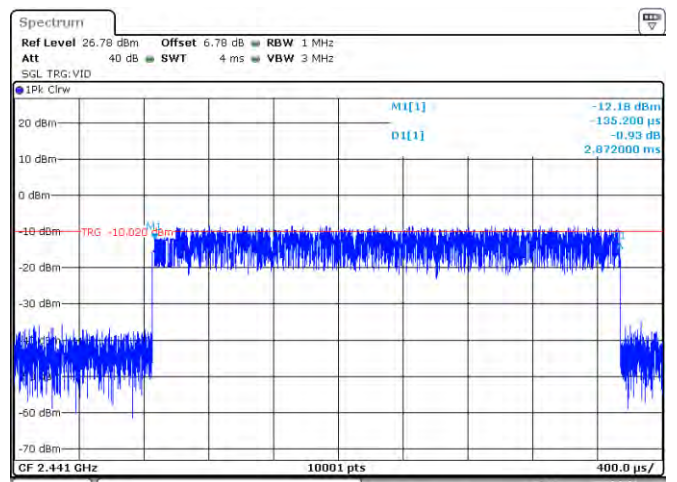
Channel 39 / 2441 MHz - DH3



Channel 39 / 2441 MHz - 2DH3



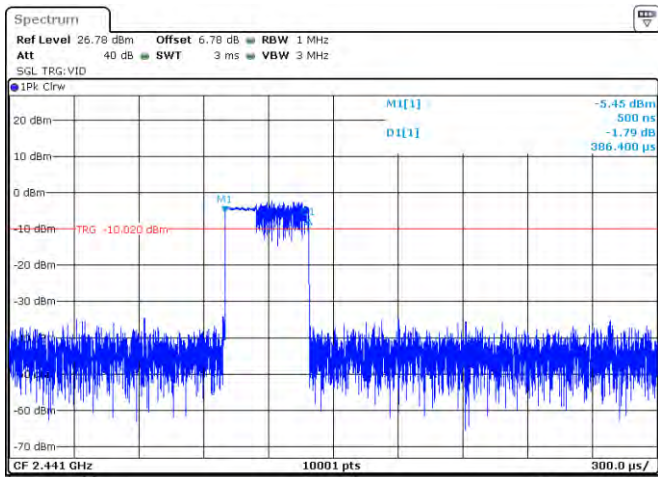
Channel 39 / 2441 MHz - DH5



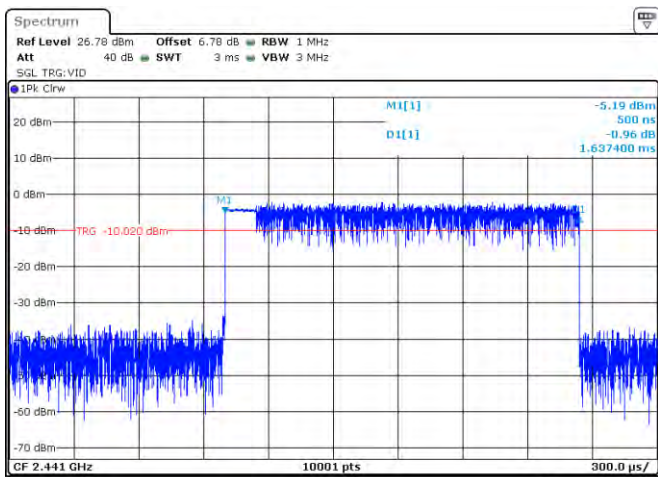
Channel 39 / 2441 MHz - 2DH5

Dwell time

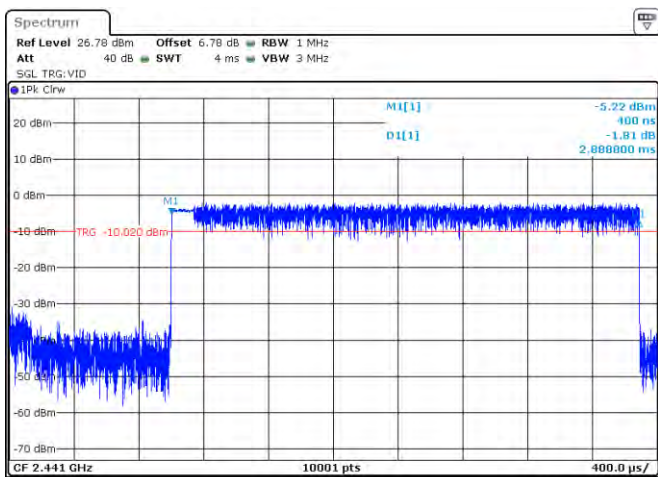
8DPSK



Channel 39 / 2441 MHz - 3DH1



Channel 39 / 2441 MHz - 3DH3



Channel 39 / 2441 MHz - 3DH5

7. RADIATED EMISSIONS

7.1.Limit

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

15.205 Restricted frequency band

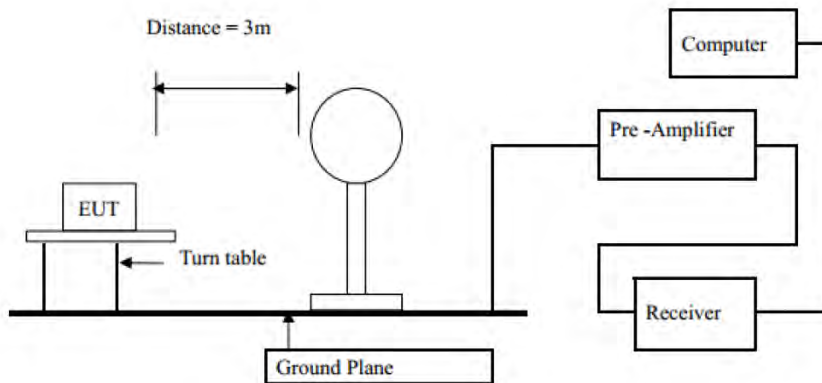
MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	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	(²)

15.209 Limit

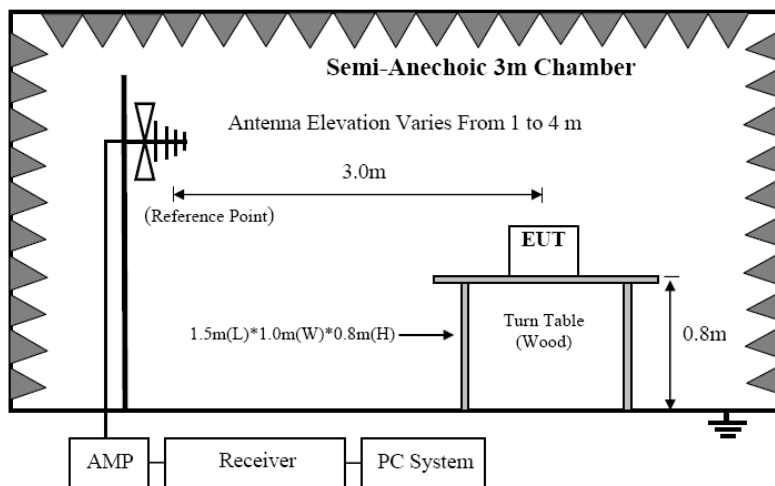
FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		$\mu\text{V}/\text{m}$	$\text{dB}(\mu\text{V})/\text{m}$
0.009-0.490	300	2400/F(KHz)	/
0.490-1.705	30	24000/F(KHz)	/
1.705-30	30	30	29.5
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	

7.2. Block Diagram of Test setup

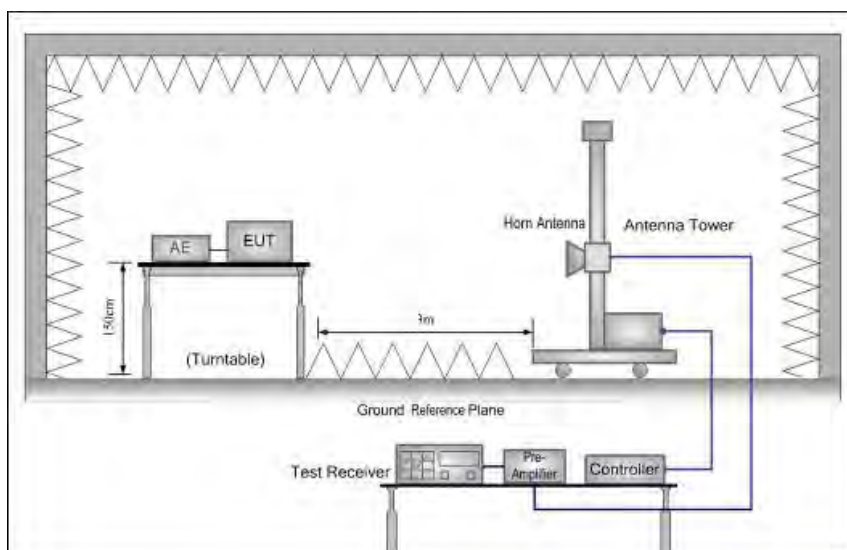
8.2.1 In 3m Anechoic Chamber Test Setup Diagram for below 30MHz



8.2.1 In 3m Anechoic Chamber Test Setup Diagram for below 1GHz



8.2.2 In 3m Anechoic Chamber Test Setup Diagram for frequency above 1GHz



Note: For harmonic emissions test a appropriate high pass filter was inserted in the input port of AMP.

7.3. Test Procedure

- (1) EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber.
- (2) Setup EUT and simulator as shown in section 1.4 and 6.1
- (3) Test antenna was located 3m from the EUT on an adjustable mast. Below pre-scan procedure was first performed in order to find prominent radiated emissions.
 - (a) Change work frequency or channel of device if practicable.
 - (b) Change modulation type of device if practicable.
 - (c) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions
- (4) Spectrum frequency from 9KHz to 25GHz (tenth harmonic of fundamental frequency) was investigated
- (5) For final emissions measurements at each frequency of interest, the EUT were rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10:2013on Radiated Emission test.
- (6) For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1MHz, VBW is set at 3MHz for Peak measure; RBW is set at 1MHz, VBW is set at 10Hz for Average measure.

7.4. Test Result

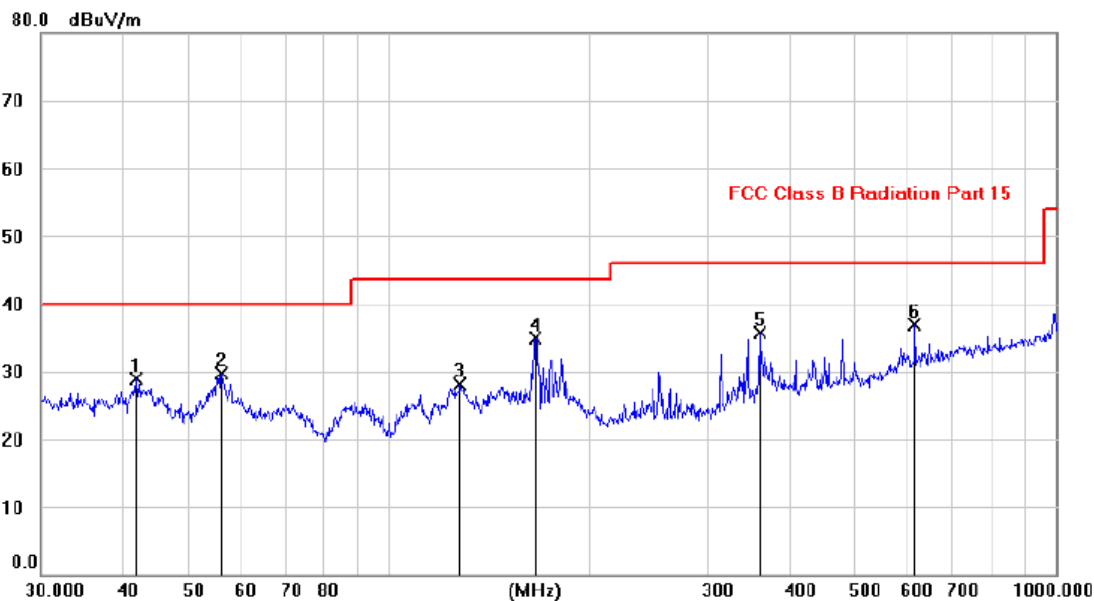
We have scanned the 10th harmonic from 9KHz to the EUT's highest frequency. Detailed information please see the following page.

From 9KHz to 30MHz: Conclusion: PASS

Note: The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

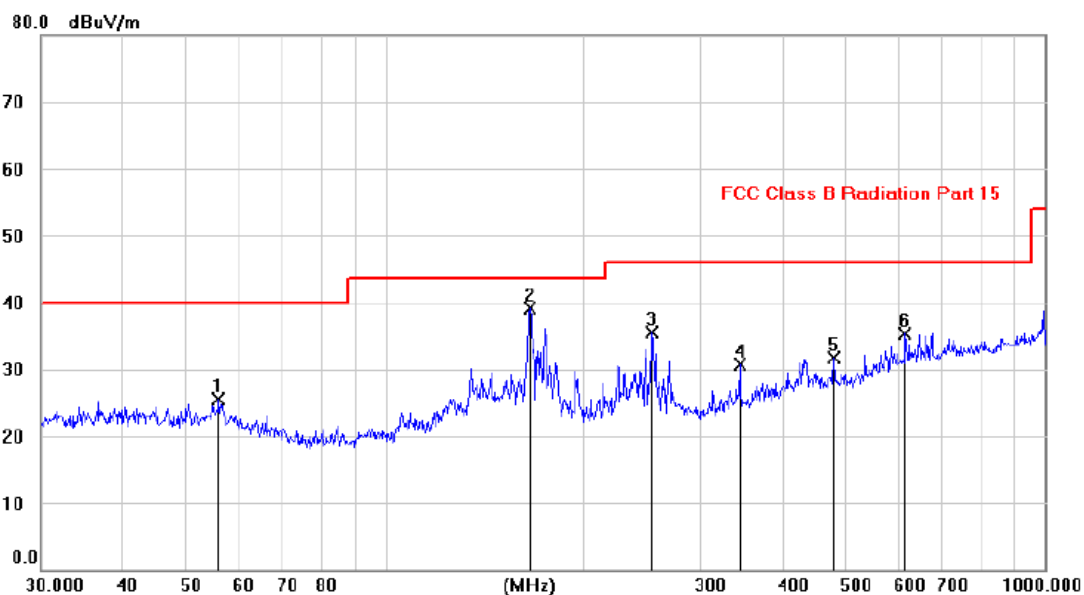
From 30MHz to 1000MHz: Conclusion: PASS

Vertical:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		41.7228	14.56	14.35	28.91	40.00	-11.09			peak
2		56.1449	16.06	13.55	29.61	40.00	-10.39			peak
3		128.0830	14.71	13.48	28.19	43.50	-15.31			peak
4	*	165.7965	20.44	14.48	34.92	43.50	-8.58			peak
5		359.9846	20.19	15.43	35.62	46.00	-10.38			peak
6		615.2920	16.36	20.50	36.86	46.00	-9.14			peak

Horizontal:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		55.9288	11.90	13.57	25.47	40.00	-14.53			peak
2	*	165.7965	24.54	14.48	39.02	43.50	-4.48			peak
3		254.2524	22.61	12.86	35.47	46.00	-10.53			peak
4		344.8689	15.47	15.15	30.62	46.00	-15.38			peak
5		480.0224	13.76	17.95	31.71	46.00	-14.29			peak
6		614.7888	14.73	20.49	35.22	46.00	-10.78			peak

Remark: All modes have been tested, and only worst data of GFSK mode, Channel 2402MHz was listed in this report.

From 1G-25GHz

Test Mode: GFSK TX Low									
Freq (MHz)	Read Level (dBuV/m)	Polar (H/V)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4804	42.51	H	33.93	10.2	34.29	52.35	74	21.65	PK
4804	33.06	H	33.93	10.2	34.29	42.90	54	11.10	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
4804	42.33	H	33.93	10.2	34.29	52.17	74	21.83	PK
4804	33.09	H	33.93	10.2	34.29	42.93	54	11.07	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
Test Mode: GFSK TX Mid									
4882	46.24	V	33.98	10.22	34.25	56.19	74	17.81	PK
4882	36.02	V	33.98	10.22	34.25	45.97	54	8.03	AV
7323	/	/	/	/	/	/	/	/	/
9764	/	/	/	/	/	/	/	/	/
4882	46.03	H	33.98	10.22	34.25	55.98	74	18.02	PK
4882	35.24	H	33.98	10.22	34.25	45.19	54	8.81	AV
7323	/	/	/	/	/	/	/	/	/
9764	/	/	/	/	/	/	/	/	/
Test Mode: GFSK TX High									
4960	46.37	V	33.98	10.22	34.25	56.32	74	17.68	PK
4960	36.09	V	33.98	10.22	34.25	46.04	54	7.96	AV
7440	/	/	/	/	/	/	/	/	/
9920	/	/	/	/	/	/	/	/	/
4960	46.19	H	33.98	10.22	34.25	56.14	74	17.86	PK
4960	34.72	H	33.98	10.22	34.25	44.67	54	9.33	AV
7440	/	/	/	/	/	/	/	/	/
9920	/	/	/	/	/	/	/	/	/
Note:									
1, Result = Read level + Antenna factor + cable loss-Amp factor									
2, All the other emissions not reported were too low to read and deemed to comply with FCC limit.									

From 1G-25GHz

Test Mode: $\pi/4$ DQPSK TX Low									
Freq (MHz)	Read Level (dBuV/m)	Polar (H/V)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4804	41.98	H	33.93	10.2	34.29	51.82	74	22.18	PK
4804	33.29	H	33.93	10.2	34.29	43.13	54	10.87	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
4804	46.04	V	33.98	10.22	34.25	55.99	74	18.01	PK
4804	35.77	V	33.98	10.22	34.25	45.72	54	8.28	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
Test Mode: $\pi/4$ DQPSK TX Mid									
4882	42.09	H	33.93	10.2	34.29	51.93	74	22.07	PK
4882	33.16	H	33.93	10.2	34.29	43.00	54	11.00	AV
7323	/	/	/	/	/	/	/	/	/
9764	/	/	/	/	/	/	/	/	/
4882	45.66	V	33.98	10.22	34.25	55.61	74	18.39	PK
4882	35.61	V	33.98	10.22	34.25	45.56	54	8.44	AV
7323	/	/	/	/	/	/	/	/	/
9764	/	/	/	/	/	/	/	/	/
Test Mode: $\pi/4$ DQPSK TX High									
4960	46.35	H	33.98	10.22	34.25	56.30	74	17.70	PK
4960	34.61	H	33.98	10.22	34.25	44.56	54	9.44	AV
7440	/	/	/	/	/	/	/	/	/
9920	/	/	/	/	/	/	/	/	/
4960	46.57	V	33.98	10.22	34.25	56.52	74	17.48	PK
4960	36.11	V	33.98	10.22	34.25	46.06	54	7.94	AV
7440	/	/	/	/	/	/	/	/	/
9920	/	/	/	/	/	/	/	/	/

Note:

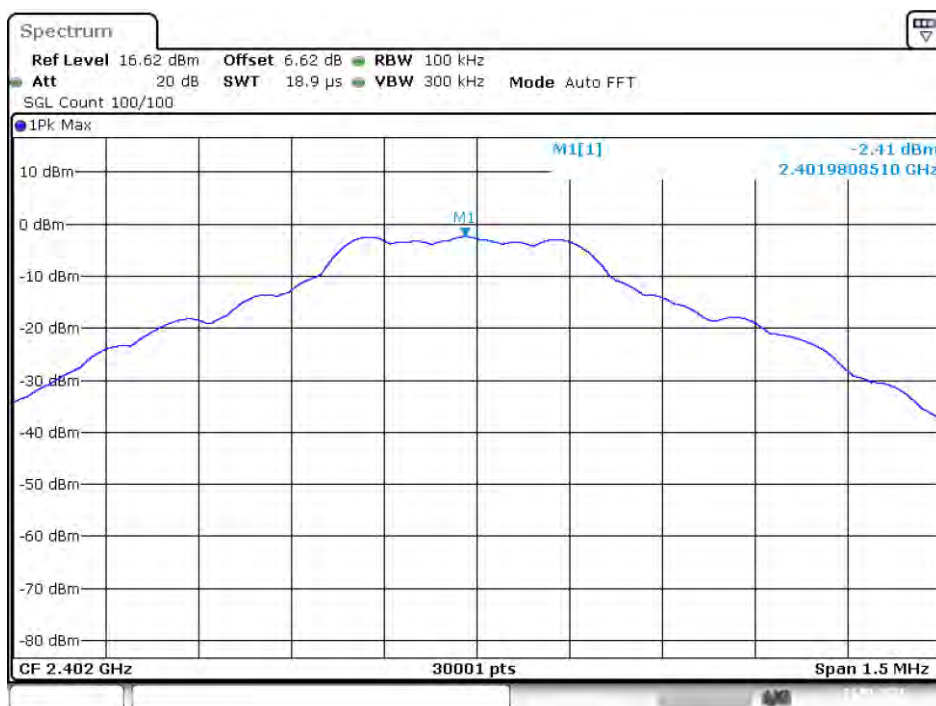
- 1, Result = Read level + Antenna factor + cable loss-Amp factor
- 2, All the other emissions not reported were too low to read and deemed to comply with FCC limit.

Test Mode: 8DPSK TX Low									
Freq (MHz)	Read Level (dBuV/m)	Polar (H/V)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4804	42.87	H	33.93	10.2	34.29	52.71	74	21.29	PK
4804	33.08	H	33.93	10.2	34.29	42.92	54	11.08	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
4804	46.45	V	33.98	10.22	34.25	56.40	74	17.60	PK
4804	35.44	V	33.98	10.22	34.25	45.39	54	8.61	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
Test Mode: 8DPSK TX Mid									
4882	42.30	H	33.93	10.2	34.29	52.14	74	21.86	PK
4882	33.40	H	33.93	10.2	34.29	43.24	54	10.76	AV
7323	/	/	/	/	/	/	/	/	/
9764	/	/	/	/	/	/	/	/	/
4882	46.48	V	33.98	10.22	34.25	56.43	74	17.57	PK
4882	35.52	V	33.98	10.22	34.25	45.47	54	8.53	AV
7323	/	/	/	/	/	/	/	/	/
9764	/	/	/	/	/	/	/	/	/
Test Mode: 8DPSK TX High									
4960	45.99	H	33.98	10.22	34.25	55.94	74	18.06	PK
4960	34.97	H	33.98	10.22	34.25	44.92	54	9.08	AV
7440	/	/	/	/	/	/	/	/	/
9920	/	/	/	/	/	/	/	/	/
4960	46.43	V	33.98	10.22	34.25	56.38	74	17.62	46.43
4960	35.82	V	33.98	10.22	34.25	45.77	54	8.23	35.82
7440	/	/	/	/	/	/	/	/	/
9920	/	/	/	/	/	/	/	/	/
Note:									
1, Result = Read level + Antenna factor + cable loss-Amp factor									
2, All the other emissions not reported were too low to read and deemed to comply with FCC limit.									

Conducted RF Spurious Emission

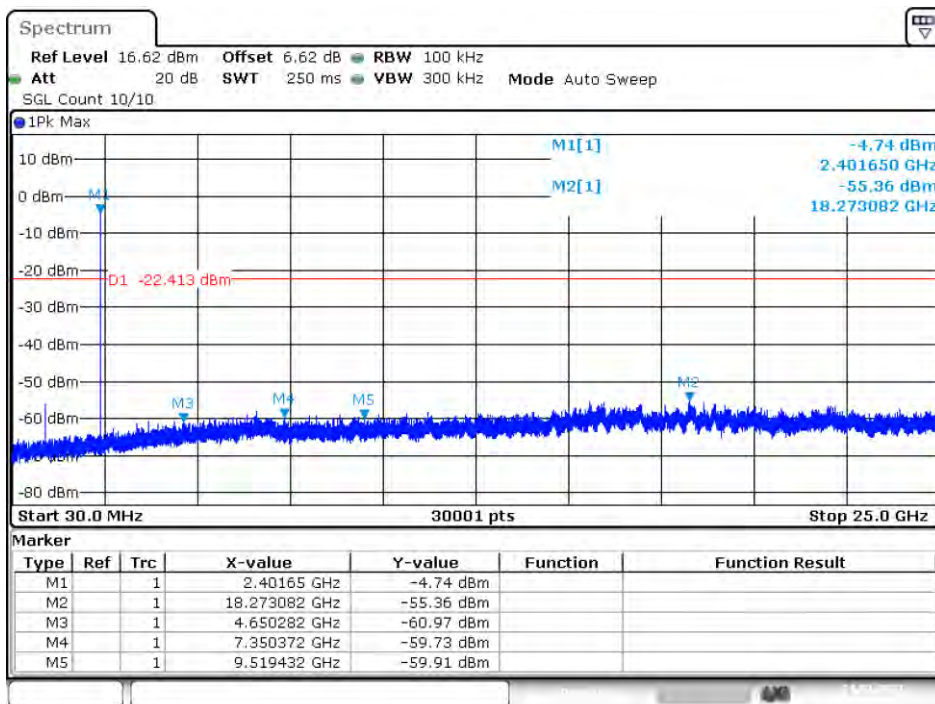
Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH1	2402	Ant 1	-52.94740329742	-20	Pass
NVNT	1-DH1	2441	Ant 1	-53.70252491951	-20	Pass
NVNT	1-DH1	2480	Ant 1	-52.029454813	-20	Pass
NVNT	2-DH1	2402	Ant 1	-51.03645746231	-20	Pass
NVNT	2-DH1	2441	Ant 1	-51.86842088699	-20	Pass
NVNT	2-DH1	2480	Ant 1	-49.91826145172	-20	Pass
NVNT	3-DH1	2402	Ant 1	-51.2650069046	-20	Pass
NVNT	3-DH1	2441	Ant 1	-51.21452181816	-20	Pass
NVNT	3-DH1	2480	Ant 1	-50.56422327042	-20	Pass

Tx. Spurious NVNT 1-DH1 2402MHz Ant1 Ref



Date: 11.MAR.2021 03:23:50

Tx. Spurious NVNT 1-DH1 2402MHz Ant1 Emission



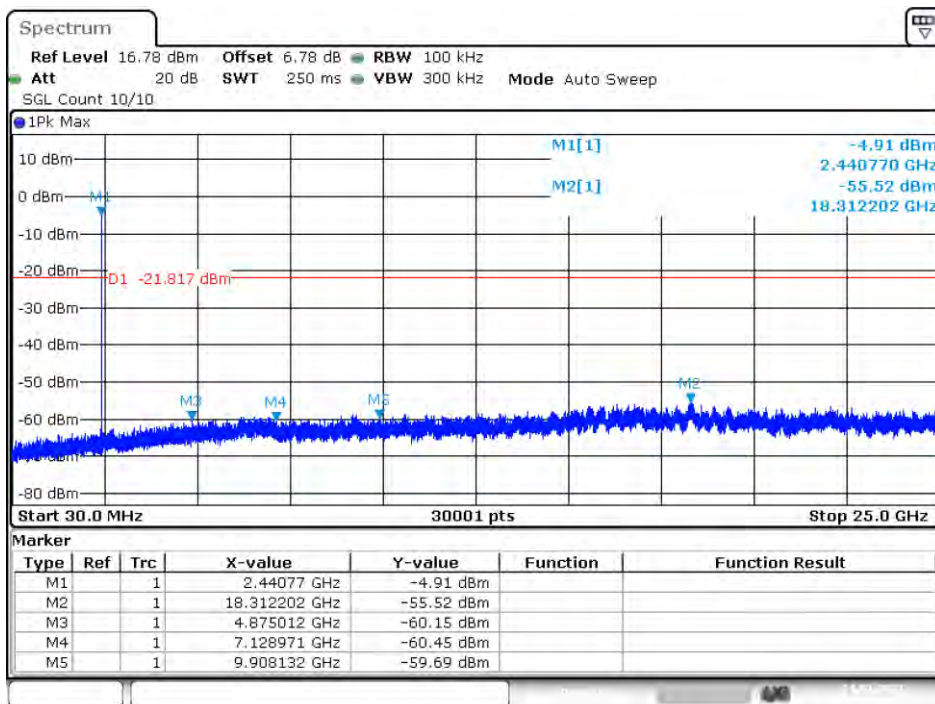
Date: 11.MAR.2021 03:24:03

Tx. Spurious NVNT 1-DH1 2441MHz Ant1 Ref



Date: 11.MAR.2021 03:16:29

Tx. Spurious NVNT 1-DH1 2441MHz Ant1 Emission



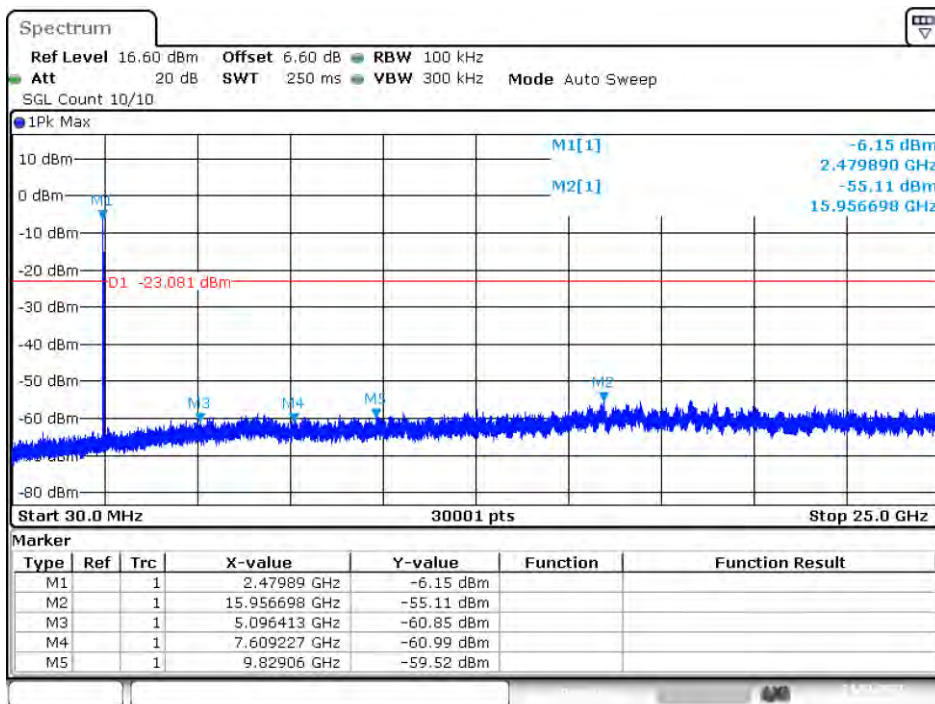
Date: 11.MAR.2021 03:16:42

Tx. Spurious NVNT 1-DH1 2480MHz Ant1 Ref



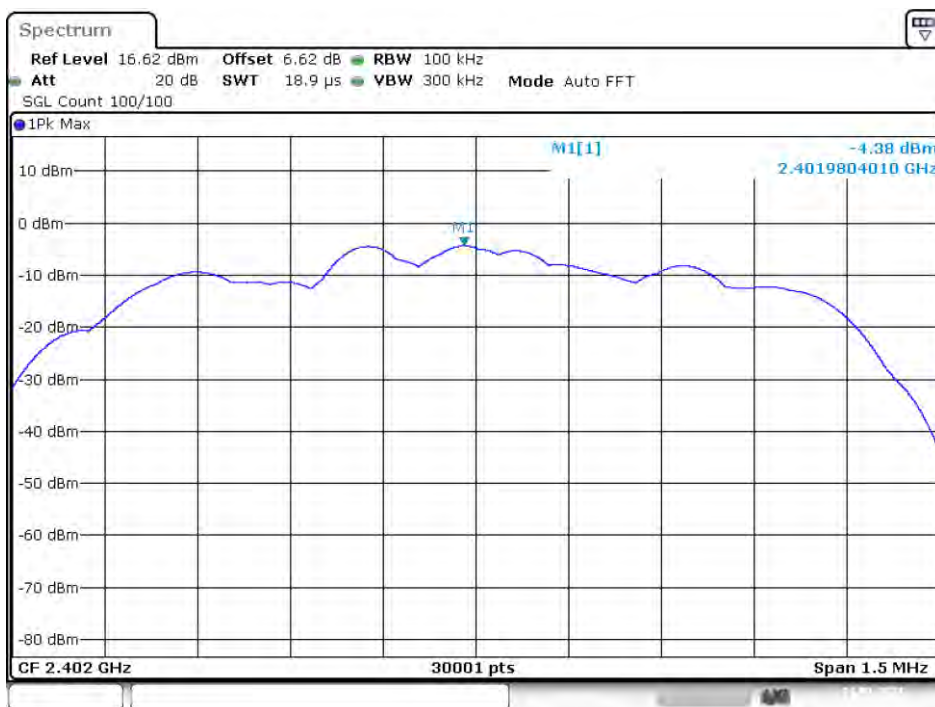
Date: 11.MAR.2021 03:28:31

Tx. Spurious NVNT 1-DH1 2480MHz Ant1 Emission



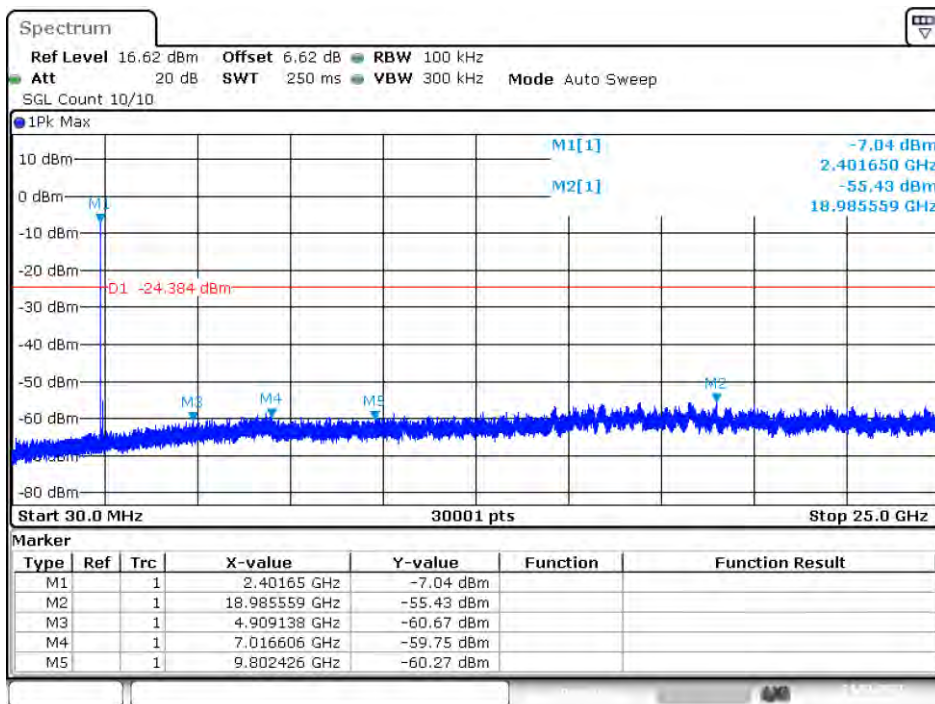
Date: 11.MAR.2021 03:28:44

Tx. Spurious NVNT 2-DH1 2402MHz Ant1 Ref



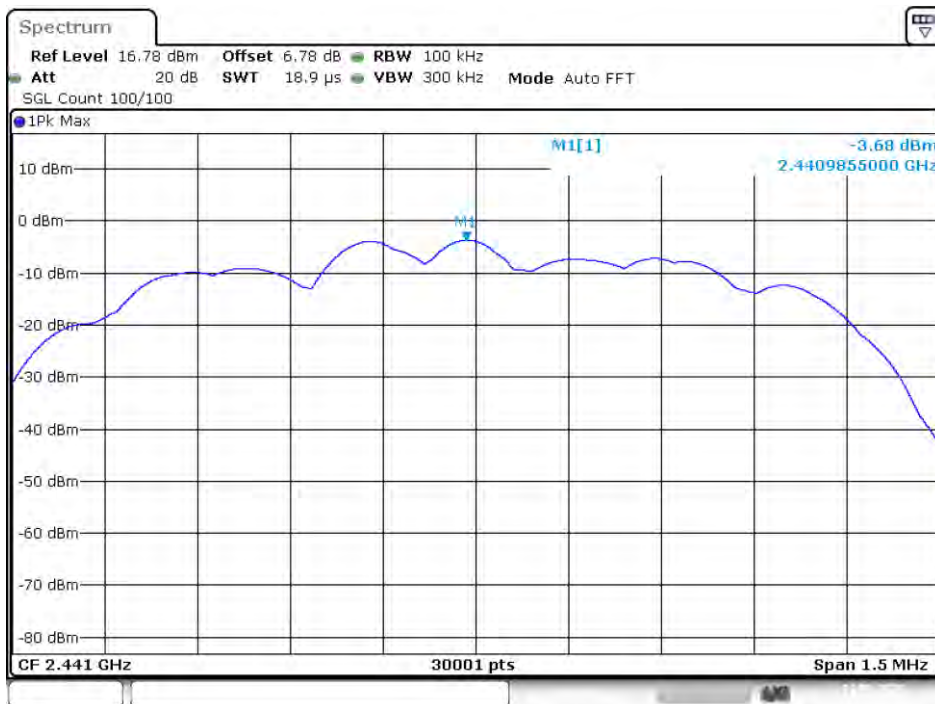
Date: 11.MAR.2021 03:25:20

Tx. Spurious NVNT 2-DH1 2402MHz Ant1 Emission



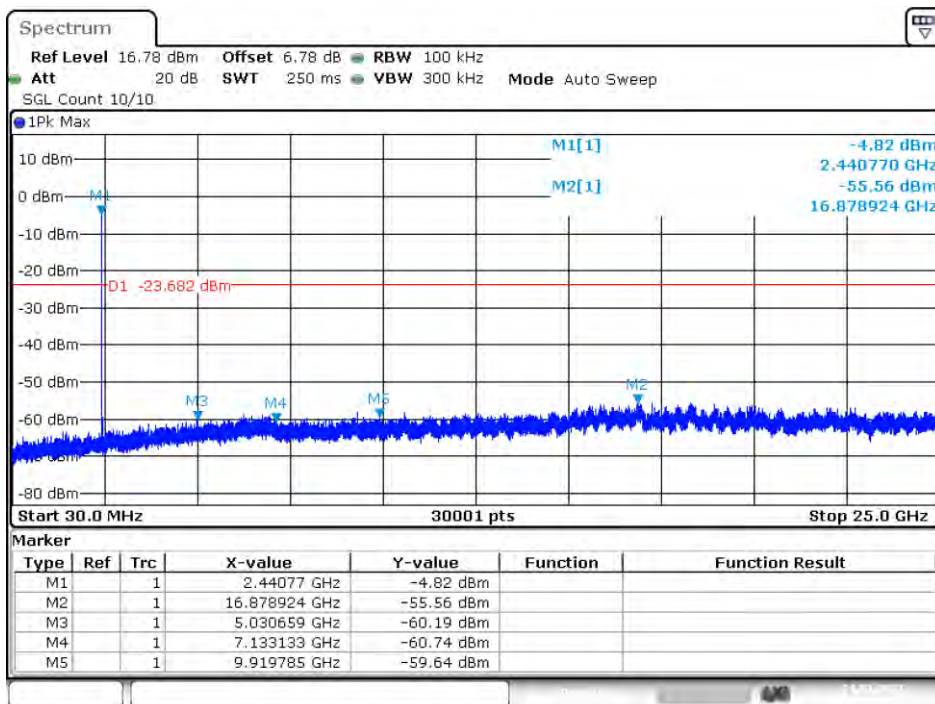
Date: 11.MAR.2021 03:25:33

Tx. Spurious NVNT 2-DH1 2441MHz Ant1 Ref

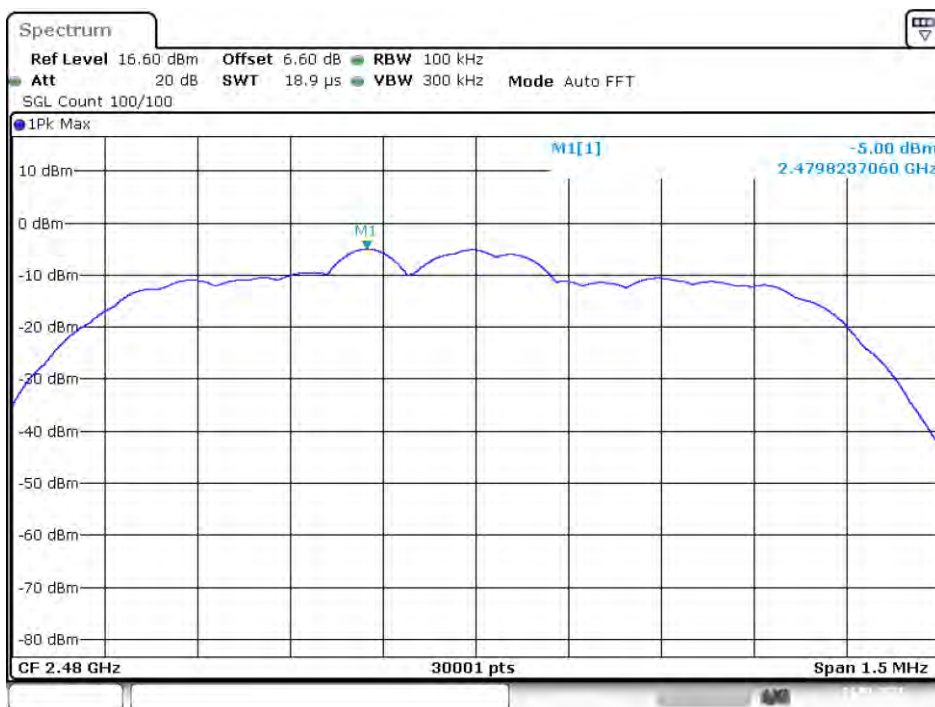


Date: 11.MAR.2021 03:18:51

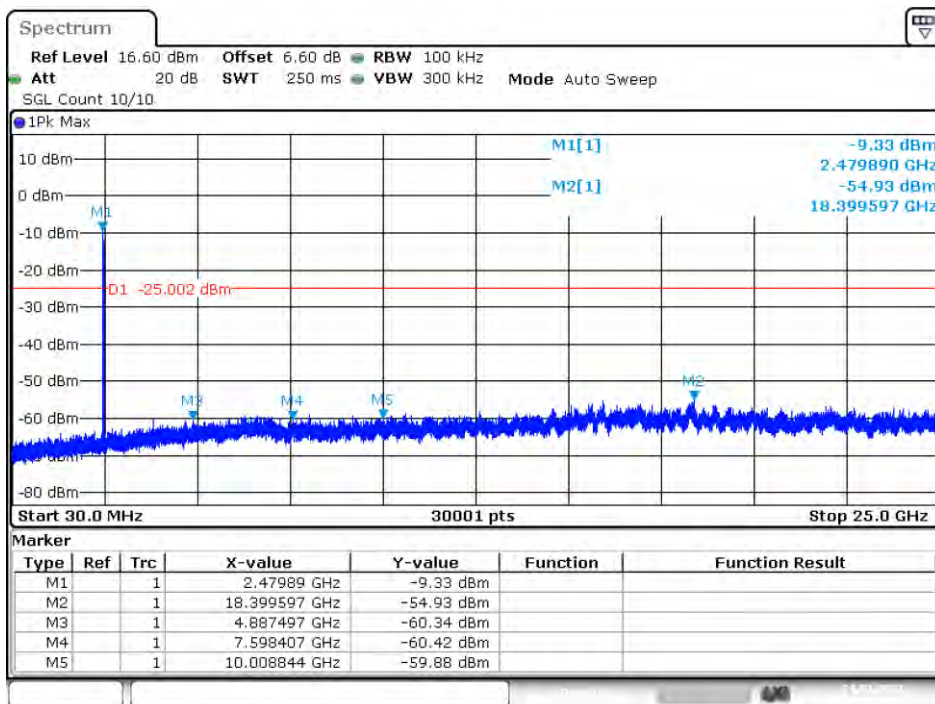
Tx. Spurious NVNT 2-DH1 2441MHz Ant1 Emission



Tx. Spurious NVNT 2-DH1 2480MHz Ant1 Ref



Tx. Spurious NVNT 2-DH1 2480MHz Ant1 Emission



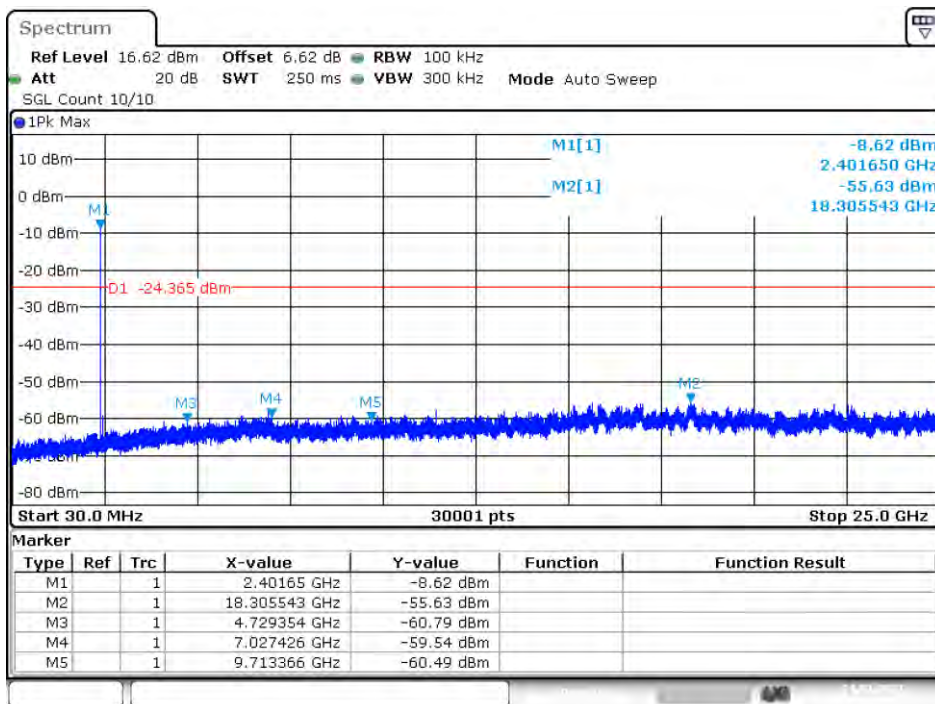
Date: 11.MAR.2021 03:30:27

Tx. Spurious NVNT 3-DH1 2402MHz Ant1 Ref



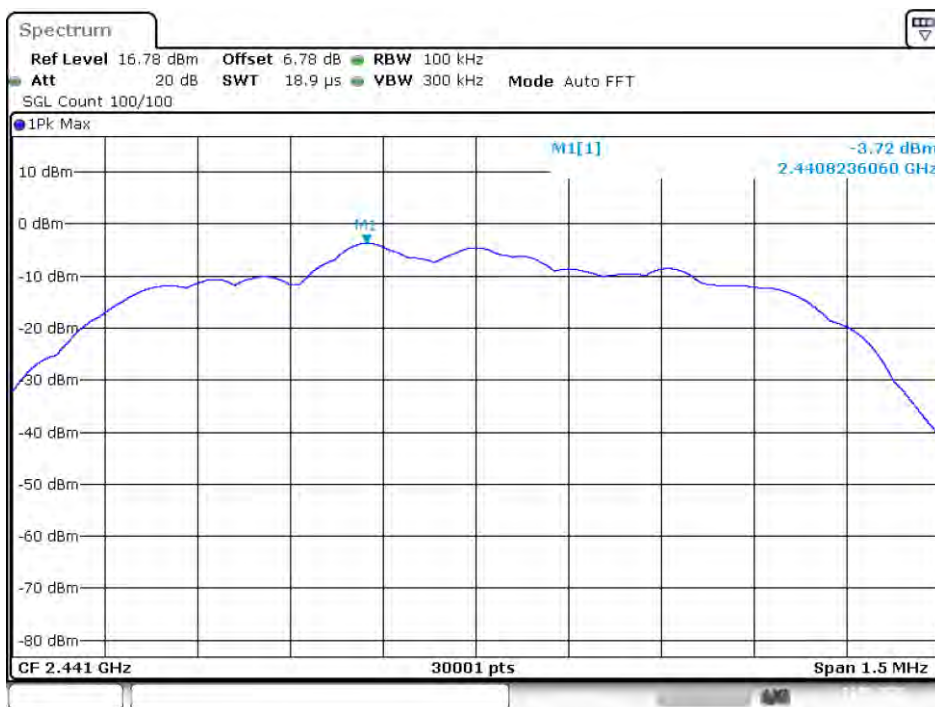
Date: 11.MAR.2021 03:26:58

Tx. Spurious NVNT 3-DH1 2402MHz Ant1 Emission



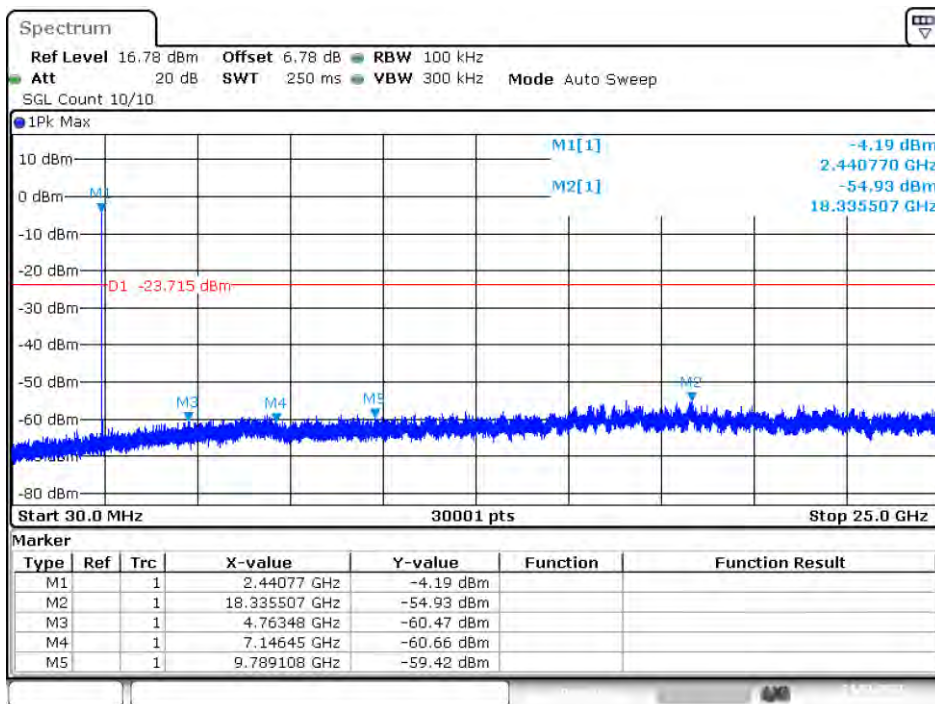
Date: 11.MAR.2021 03:27:11

Tx. Spurious NVNT 3-DH1 2441MHz Ant1 Ref



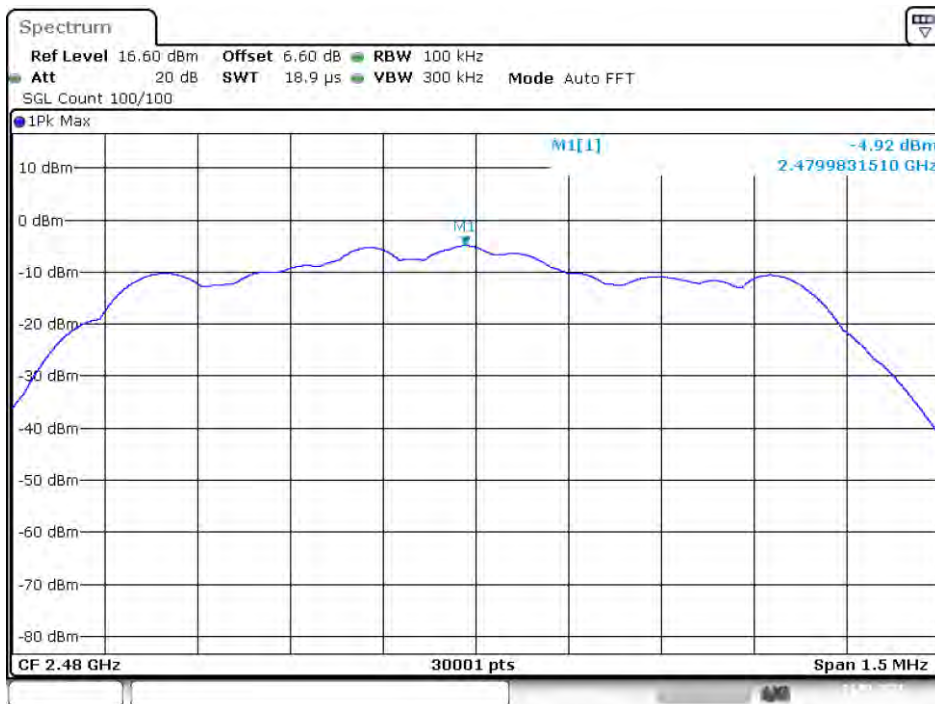
Date: 11.MAR.2021 03:20:35

Tx. Spurious NVNT 3-DH1 2441MHz Ant1 Emission



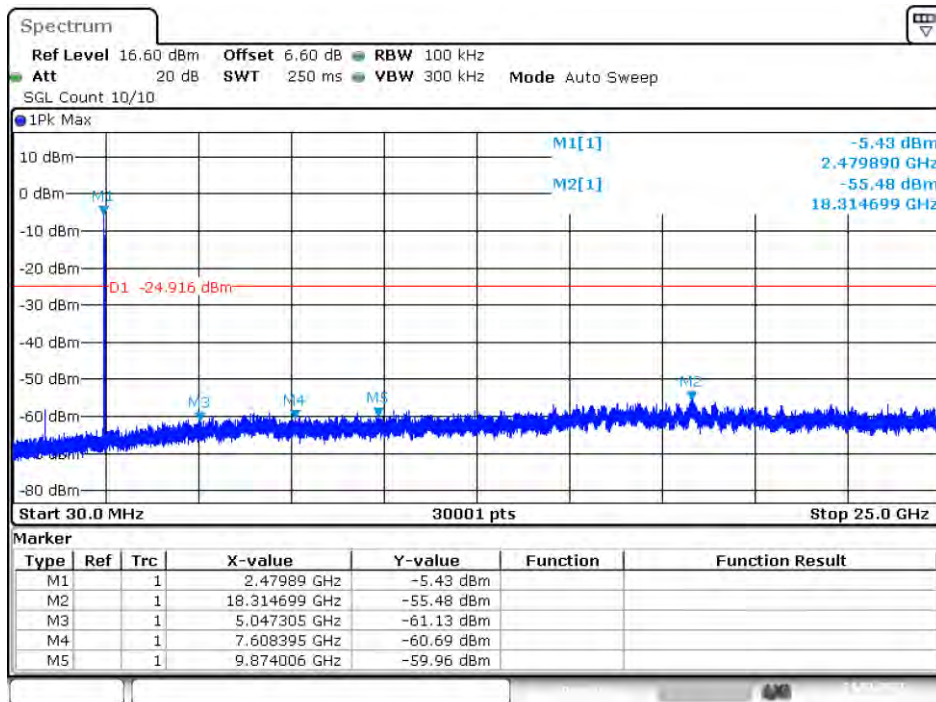
Date: 11.MAR.2021 03:20:46

Tx. Spurious NVNT 3-DH1 2480MHz Ant1 Ref



Date: 11.MAR.2021 03:31:45

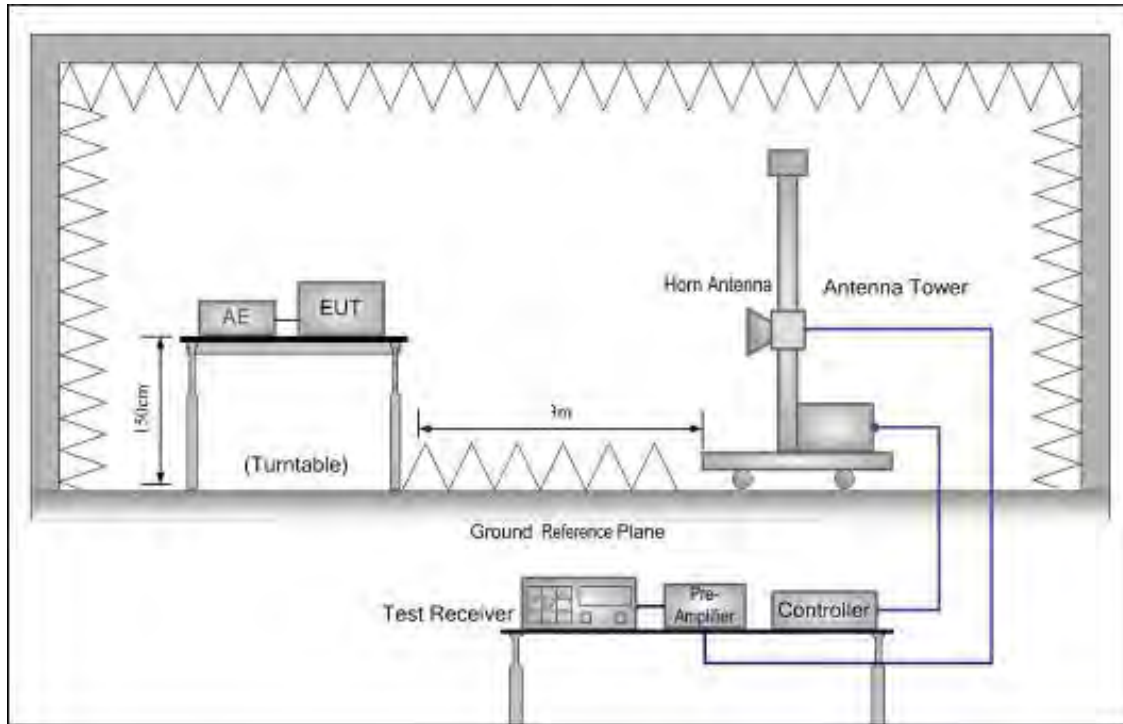
Tx. Spurious NVNT 3-DH1 2480MHz Ant1 Emission



Date: 11.MAR.2021 03:31:58

8. BAND EDGE COMPLIANCE

8.1. Block Diagram of Test Setup



8.2. Limit

All the lower and upper band-edges emissions appearing within restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

8.3. Test Procedure

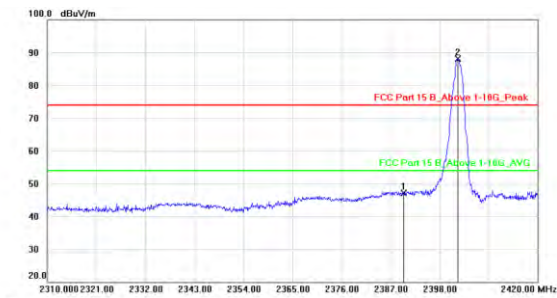
All restriction band and non- restriction band have been tested , only worse case is reported.

8.4. Test Result

PASS. (See below detailed test data)

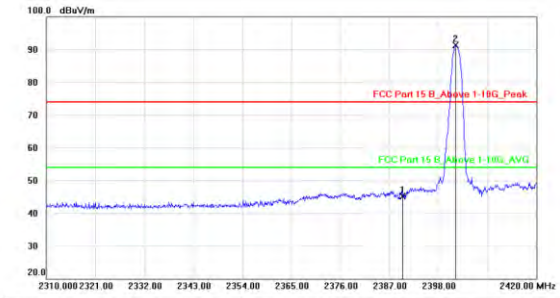
Test Mode: GFSK-Low Hopping-off

Polarization: Vertical



No.	Mk	Freq	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	
1		2390.000	50.51	-3.40	47.11	74.00	-26.89	peak		
2	*	2402.180	91.51	-3.41	88.10	74.00	14.10	peak		

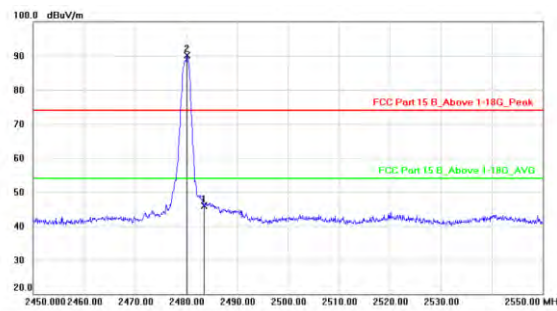
Polarization: Horizontal



No.	Mk	Freq	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	
1		2390.000	48.45	-3.40	45.05	74.00	-28.95	peak		
2	*	2401.850	94.79	-3.41	91.38	74.00	17.38	peak		

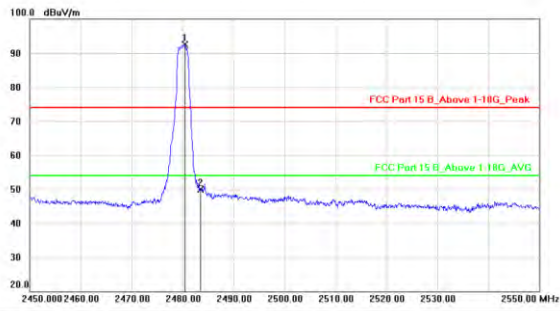
Test Mode: GFSK-High Hopping-off

Polarization: Vertical



No.	Mk	Freq	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	
1		2483.500	49.36	-3.38	45.98	74.00	-28.02	peak		
2	*	2480.200	93.40	-3.38	90.02	74.00	16.02	peak		

Polarization: Horizontal



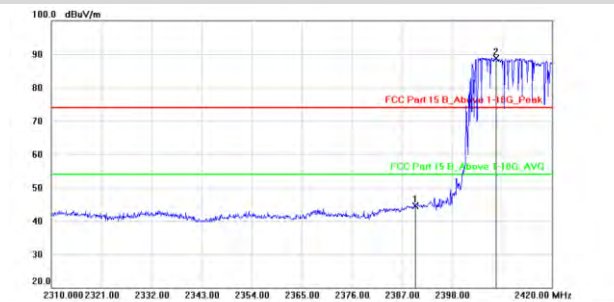
No.	Mk	Freq	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	
1	*	2480.400	95.94	-3.38	92.56	74.00	18.56	peak		
2		2483.500	53.32	-3.38	49.94	74.00	-24.06	peak		

Note: 1. *:Maximum data; x:Over limit; !:over margin.

2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

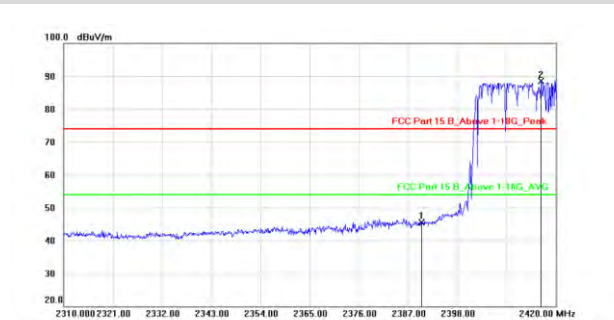
Test Mode: GFSK-Low Hopping-on

Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree
1		2390.000	47.97	-3.40	44.57	74.00	-29.43	peak		
2	*	2407.680	92.17	-3.40	88.77	74.00	14.77	peak		

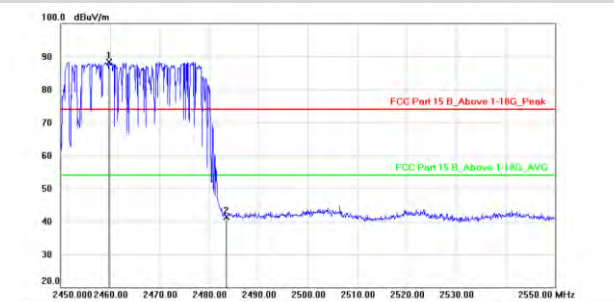
Polarization: Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree
1		2390.000	48.96	-3.40	45.56	74.00	-28.44	peak		
2	*	2416.700	92.00	-3.41	88.59	74.00	14.59	peak		

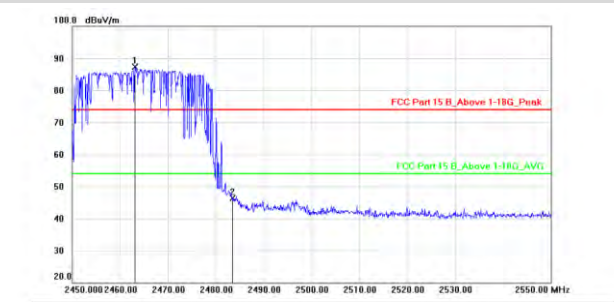
Test Mode: GFSK-High Hopping-on

Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree
1	*	2459.800	91.68	-3.39	88.29	74.00	14.29	peak		
2		2483.500	44.76	-3.38	41.38	74.00	-32.62	peak		

Polarization: Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree
1	*	2463.100	90.67	-3.40	87.27	74.00	13.27	peak		
2		2483.500	49.67	-3.38	46.29	74.00	-27.71	peak		

Note: 1. *:Maximum data; x:Over limit; !:over margin.

2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

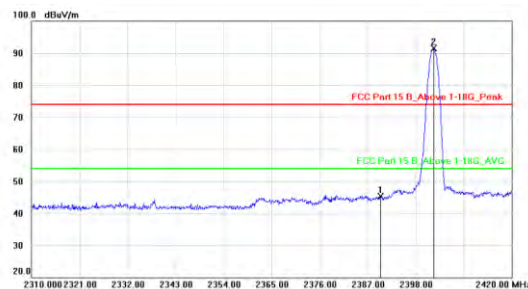
Test Mode: $\pi/4$ DQPSK-Low Hopping-off

Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	
1	*	2390.000	46.61	-3.40	43.21	74.00	-30.79	peak		
2	*	2402.290	88.48	-3.41	85.07	74.00	11.07	peak		

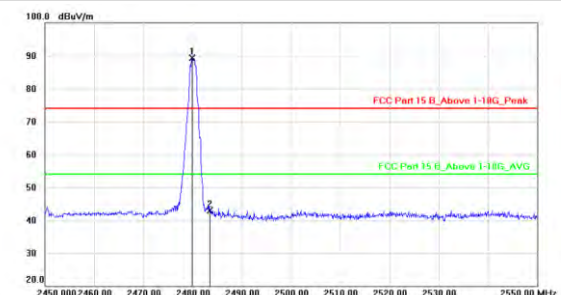
Polarization: Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	
1	*	2390.000	48.68	-3.40	45.28	74.00	-28.72	peak		
2	*	2402.180	94.92	-3.41	91.51	74.00	17.51	peak		

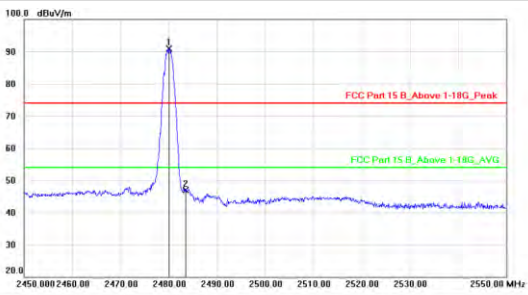
Test Mode: $\pi/4$ DQPSK-High Hopping-off

Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	
1	*	2479.900	92.69	-3.38	89.31	74.00	15.31	peak		
2	*	2483.500	46.21	-3.38	42.83	74.00	-31.17	peak		

Polarization: Horizontal



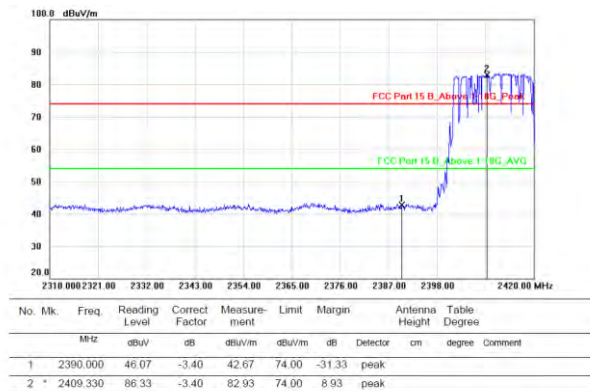
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	
1	*	2480.000	94.32	-3.38	90.94	74.00	16.94	peak		
2	*	2483.500	50.36	-3.38	46.98	74.00	-27.02	peak		

Note: 1. *:Maximum data; x:Over limit; !:over margin.

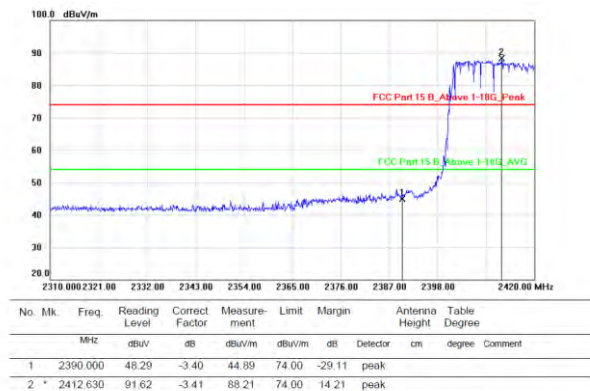
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Test Mode: $\pi/4$ DQPSK-Low Hopping-on

Polarization: Vertical



Polarization: Horizontal



Test Mode: $\pi/4$ DQPSK-High Hopping-on

Polarization: Vertical



Polarization: Horizontal

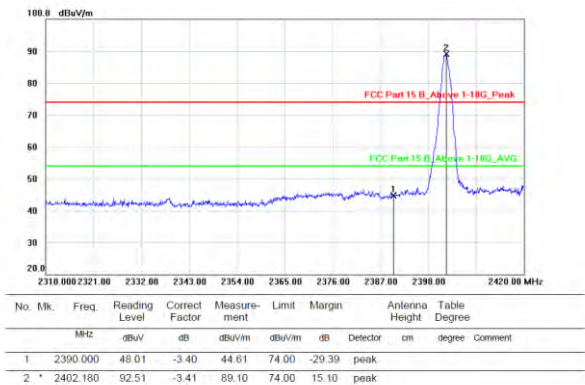


Note: 1. *:Maximum data; x:Over limit; !:over margin.

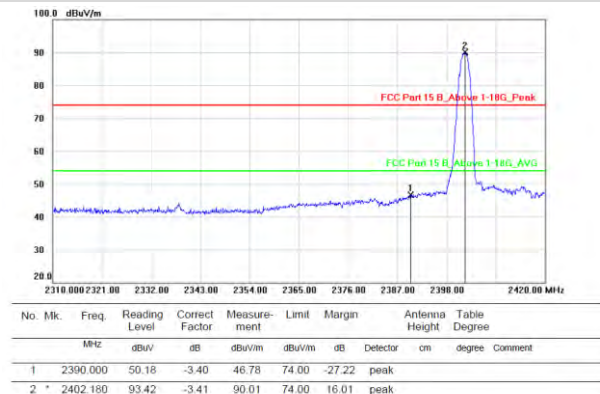
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Test Mode: 8DPSK-Low Hopping-off

Polarization: Vertical

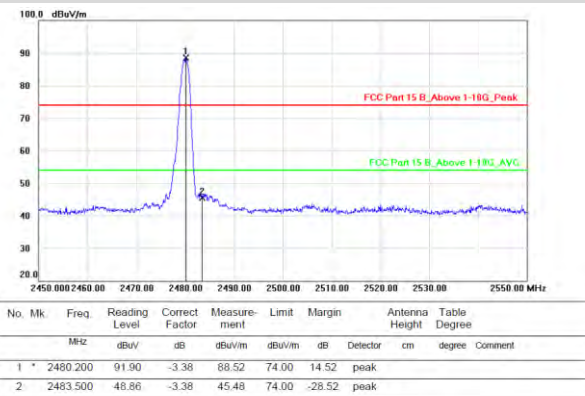


Polarization: Horizontal

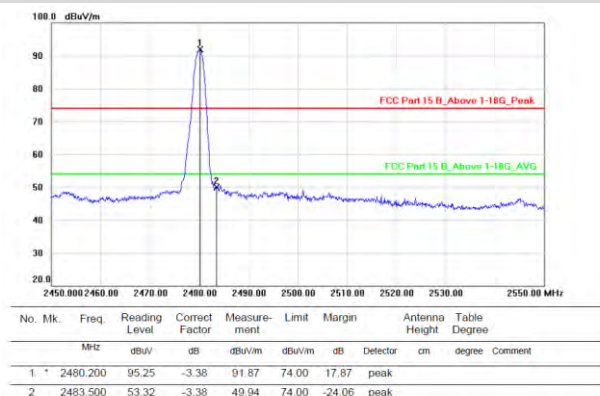


Test Mode: 8DPSK-High Hopping-off

Polarization: Vertical



Polarization: Horizontal

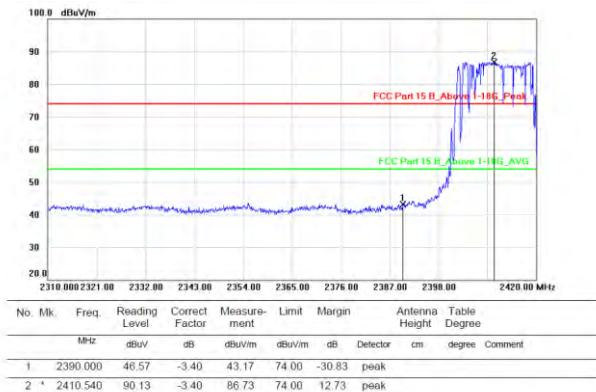


Note: 1. *:Maximum data; x:Over limit; !:over margin.

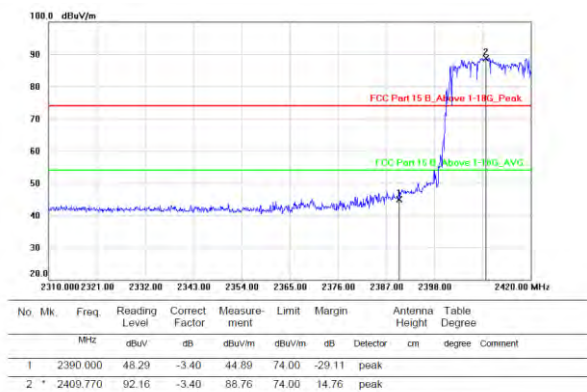
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Test Mode: 8DPSK-Low Hopping-on

Polarization: Vertical

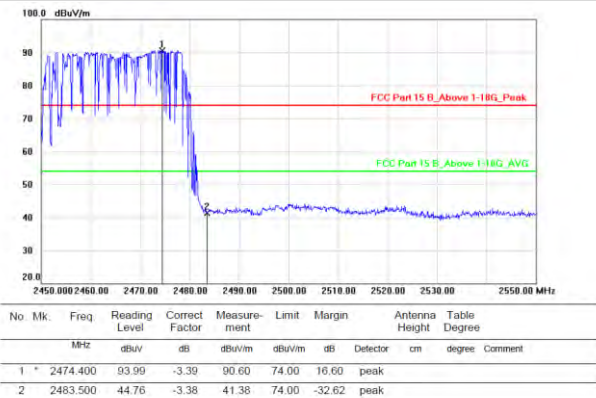


Polarization: Horizontal



Test Mode: 8DPSK-High Hopping-on

Polarization: Vertical



Polarization: Horizontal



Note: 1. *:Maximum data; x:Over limit; !:over margin.

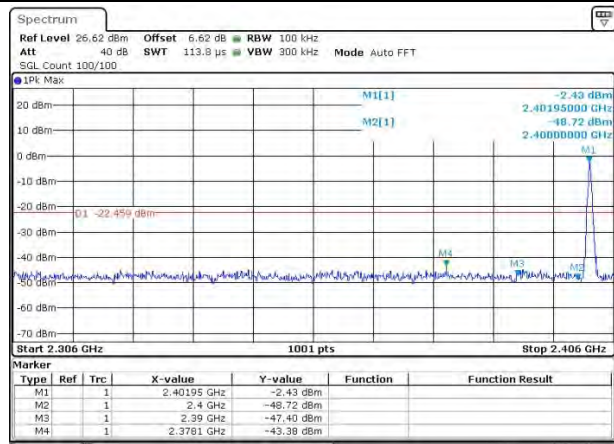
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Conducted Method

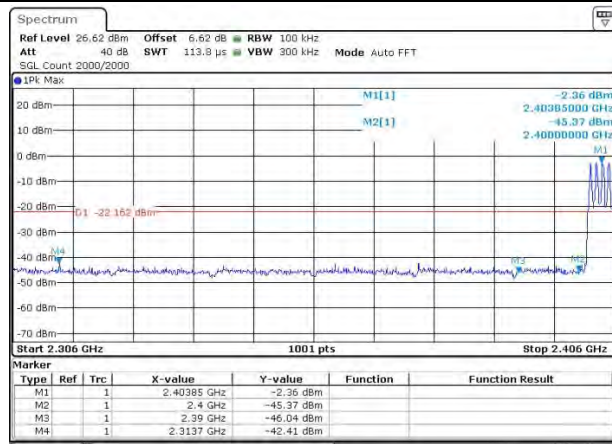
GFSK Mode:

Test channel:

Lowest channel



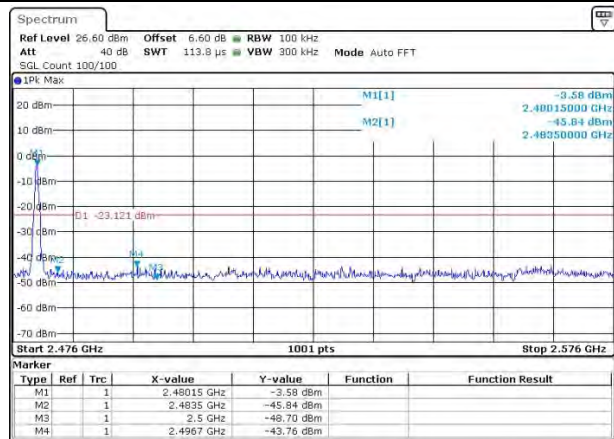
No-hopping mode



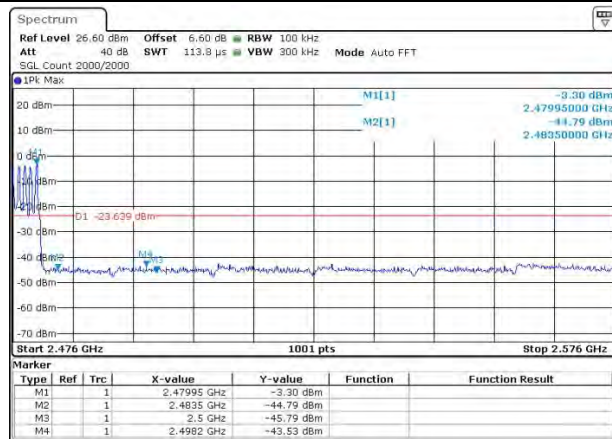
Hopping mode

Test channel:

Highest channel



No-hopping mode

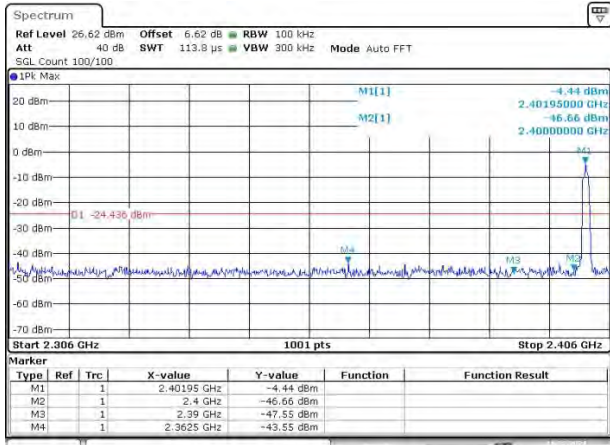


Hopping mode

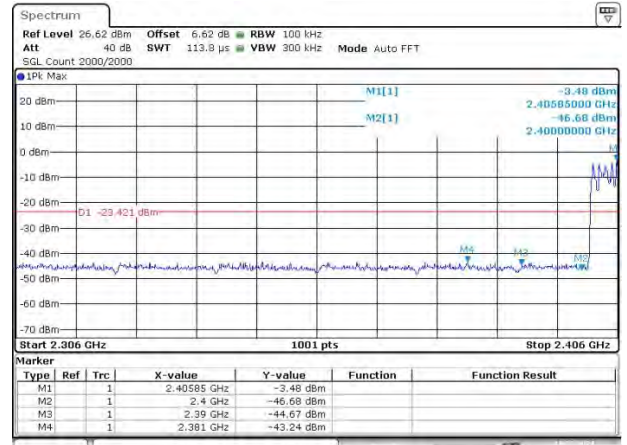
$\pi/4$ DQPSK Mode:

Test channel:

Lowest channel



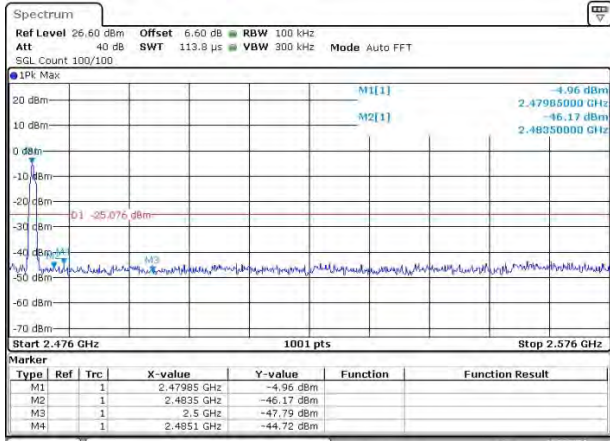
No-hopping mode



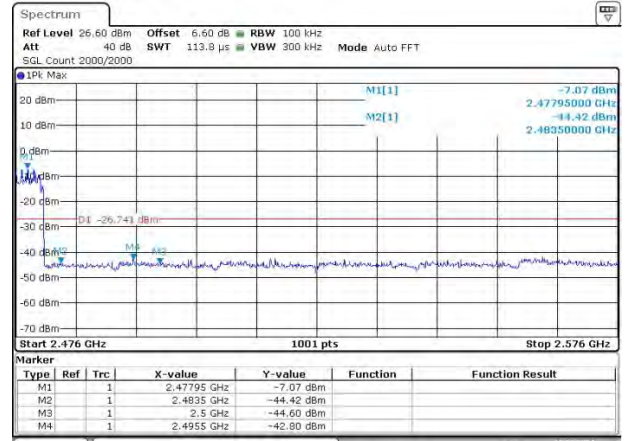
Hopping mode

Test channel:

Highest channel



No-hopping mode

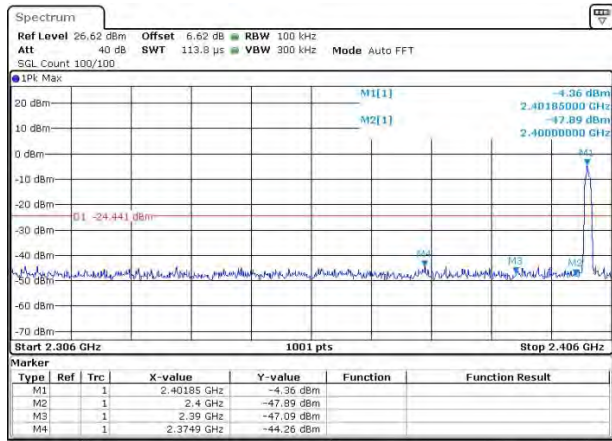


Hopping mode

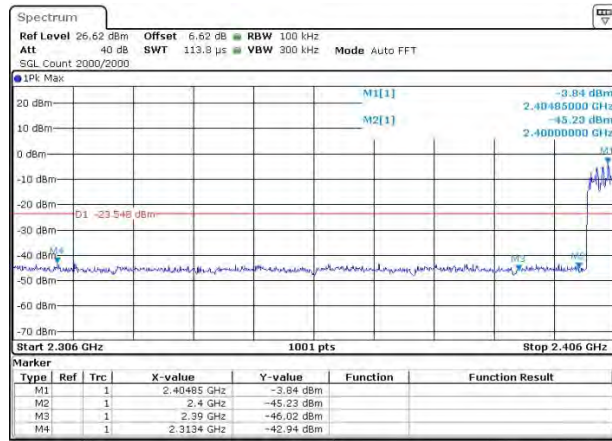
8DPSK Mode:

Test channel:

Lowest channel



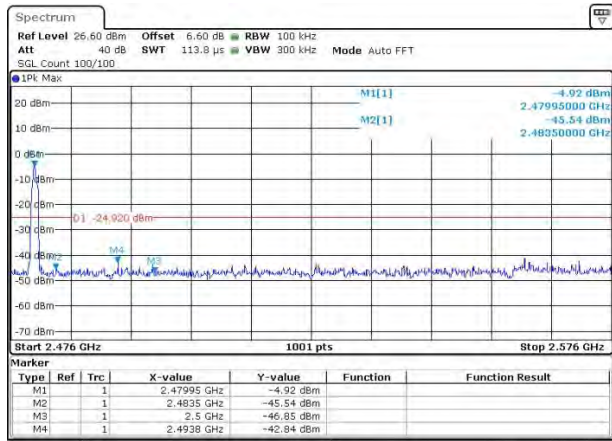
No-hopping mode



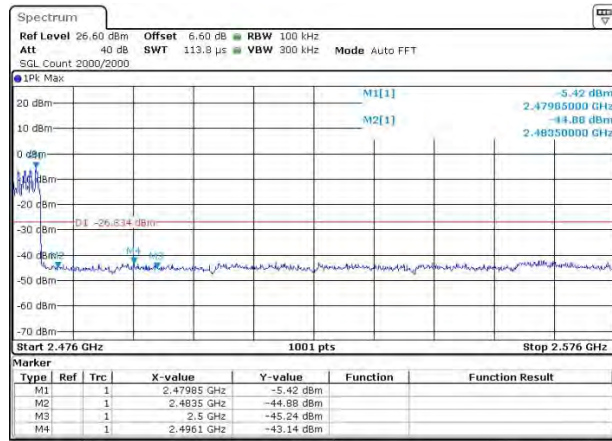
Hopping mode

Test channel:

Highest channel



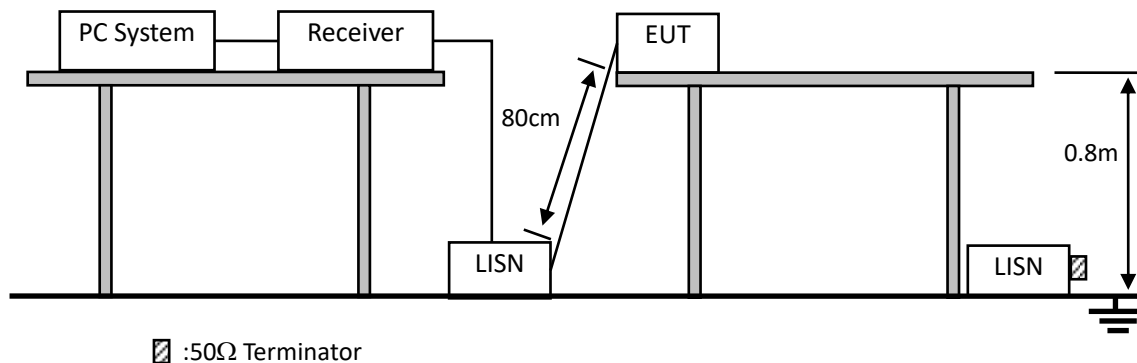
No-hopping mode



Hopping mode

9. POWER LINE CONDUCTED EMISSIONS

9.1. Block Diagram of Test Setup



9.2. Limit

Frequency	Maximum RF Line Voltage	
	Quasi-Peak Level dB(μ V)	Average Level dB(μ V)
150kHz ~ 500kHz	66 ~ 56*	56 ~ 46*
500kHz ~ 5MHz	56	46
5MHz ~ 30MHz	60	50

Notes: 1. * Decreasing linearly with logarithm of frequency.

2. The lower limit shall apply at the transition frequencies.

9.3. Test Procedure

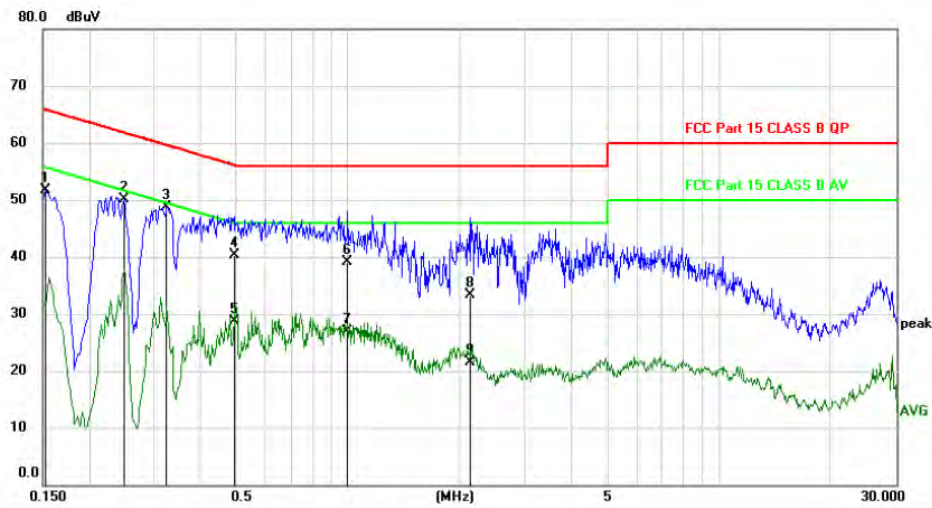
- (1) The EUT was placed on a non-metallic table, 80cm above the ground plane.
- (2) Setup the EUT and simulator as shown in 10.1
- (3) The EUT Power connected to the power mains through a power adapter and a line impedance stabilization network (L.I.S.N1). The other peripheral devices power cord connected to the power mains through a line impedance stabilization network (L.I.S.N2), this provided a 50-ohm coupling impedance for the EUT (Please refer to the block diagram of the test setup and photographs). Both sides of power line were checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10 :2013on conducted Emission test.
- (4) The bandwidth of test receiver is set at 10KHz.
- (5) The frequency range from 150 KHz to 30MHz is checked.

9.4. Test Result

PASS. (See below detailed test data)

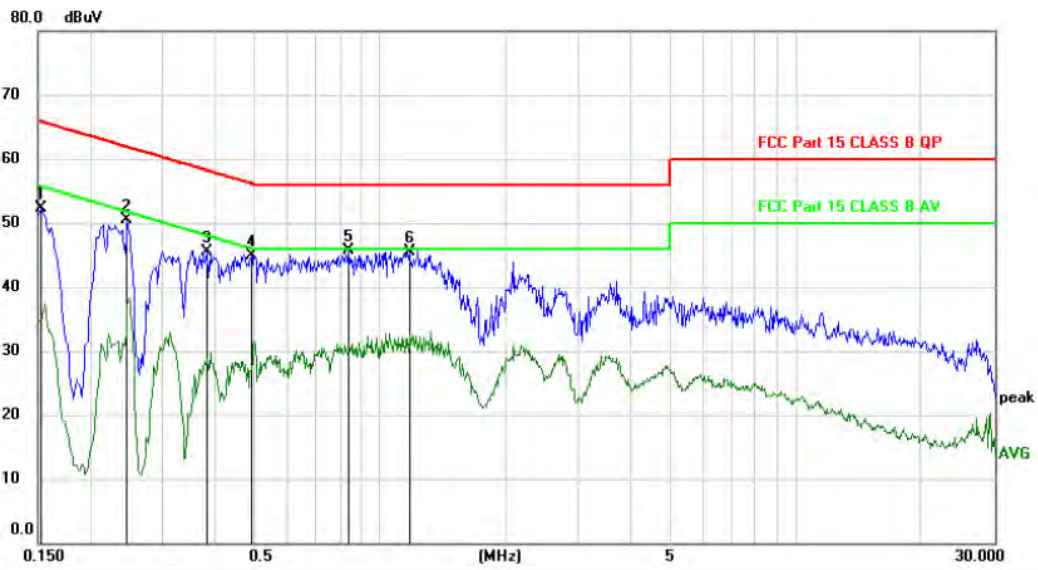
Note: If peak Result comply with AV limit, QP and AV Result is deemed to comply with AV limit

Line:



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1		0.1530	41.69	9.94	51.63	65.84	-14.21	peak	
2		0.2490	40.18	9.97	50.15	61.79	-11.64	peak	
3	*	0.3240	38.78	9.93	48.71	59.60	-10.89	peak	
4		0.4920	30.38	9.96	40.34	56.13	-15.79	QP	
5		0.4920	18.72	9.96	28.68	46.13	-17.45	AVG	
6		0.9960	29.14	9.92	39.06	56.00	-16.94	QP	
7		0.9960	17.06	9.92	26.98	46.00	-19.02	AVG	
8		2.1270	23.46	9.88	33.34	56.00	-22.66	QP	
9		2.1270	11.67	9.88	21.55	46.00	-24.45	AVG	

Neutral:



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1		0.1530	42.40	9.94	52.34	65.84	-13.50	peak	
2		0.2460	40.47	9.97	50.44	61.89	-11.45	peak	
3		0.3840	35.51	9.94	45.45	58.19	-12.74	peak	
4		0.4890	34.88	9.96	44.84	56.18	-11.34	peak	
5	*	0.8430	35.79	9.95	45.74	56.00	-10.26	peak	
6		1.1730	35.53	9.89	45.42	56.00	-10.58	peak	

Note: All modes and channels have been tested and only the Charging mode with the worst data is listed.

10. ANTENNA REQUIREMENTS

10.1. Limit

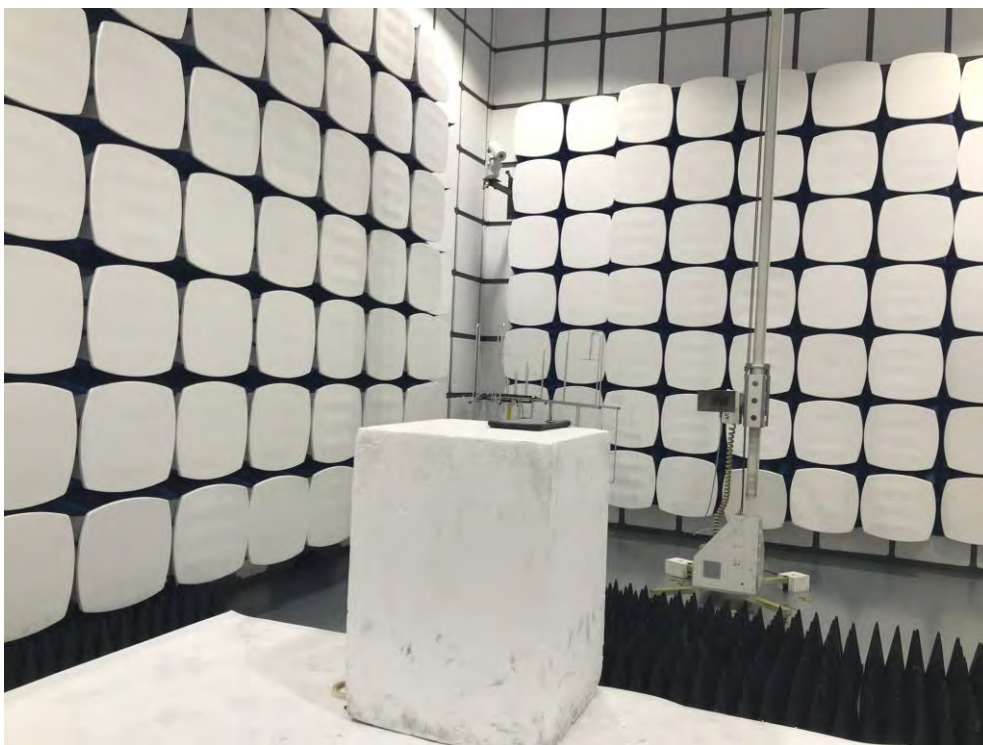
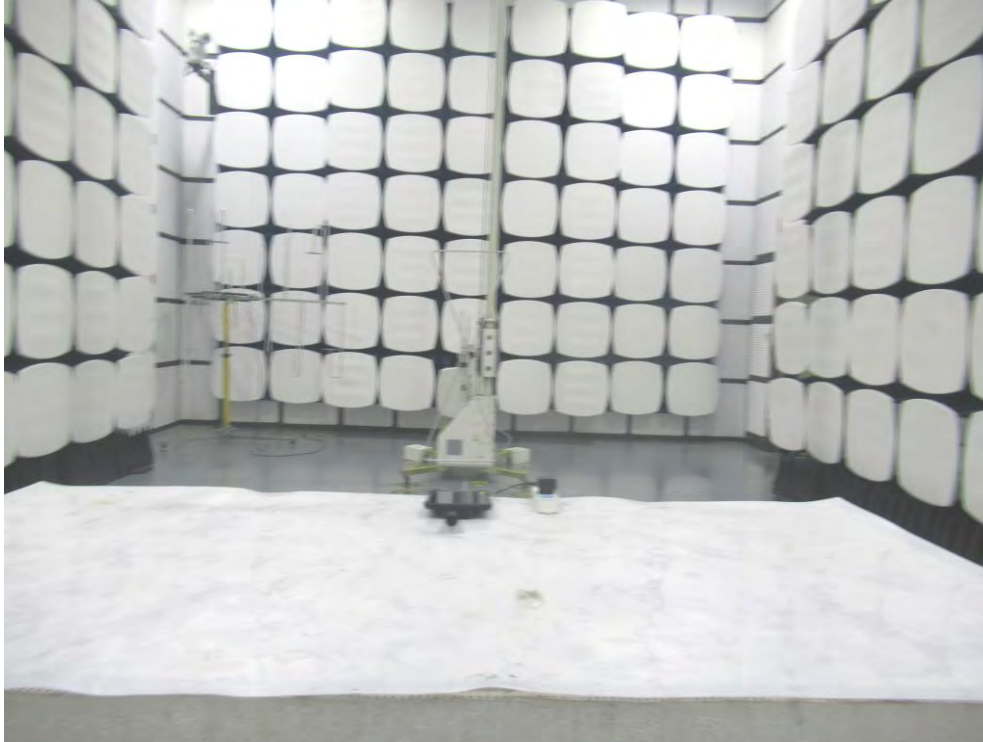
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

10.2. Result

The EUT antenna is Internal Antenna. It complies with the standard requirement.

11. TEST SETUP PHOTO

11.1. Photos of Radiated emission



11.2.Photos of Conducted Emission test



-----THE END OF REPORT-----