



FCC TEST REPORT

FCC ID: 2AYMH-HSC09978

**On Behalf of
HANSHOW TECHNOLOGY CO.,LTD.**

ESL Controller

Model No.: HS_C09978

Prepared for : HANSHOW TECHNOLOGY CO.,LTD.
Building 1 (1F podium building and 4F) and Building 5 (7F) in Jiaxing
Address : Photovoltaic High-tech Park, No. 1288 Kanghe Rd., Xiuzhou District,
Jiaxing, Zhejiang

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

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TEST REPORT DECLARATION

Applicant : HANSHOW TECHNOLOGY CO.,LTD.
 Address : Building 1 (1F podium building and 4F) and Building 5 (7F) in Jiaxing Photovoltaic High-tech Park, No. 1288 Kanghe Rd., Xiuzhou District, Jiaxing, Zhejiang
 Manufacturer : HANSHOW TECHNOLOGY CO.,LTD.
 Address : Building 1 (1F podium building and 4F) and Building 5 (7F) in Jiaxing Photovoltaic High-tech Park, No. 1288 Kanghe Rd., Xiuzhou District, Jiaxing, Zhejiang
 EUT Description : ESL Controller
 (A) Model No. : HS_C09978
 (B) Trademark : 

Measurement Standard Used:


FCC Rules and Regulations Part 15 Subpart C Section 15.247

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).....: Yannis Wen
Project Engineer



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



Date of issue..... : June 8, 2022

Revision History

Revision	Issue Date	Revisions	Revised By
V0	June 8, 2022	Initial released Issue	Yannis Wen

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
Conducted Emission	FCC Part 15: 15.207	P
6dB Bandwidth	FCC PART 15:15.247(a)(2)	P
Output Power	FCC Part 15: 15.247(b)(3)	P
Radiated Spurious Emission	FCC Part 15: 15.209 FCC Part 15: 15.247(d)	P
Conducted Spurious & Band Edge Emission	FCC Part 15: 15.247(d)	P
Power Spectral Density	FCC PART 15:15.247(e)	P
Radiated Band Edge Emission	FCC Part 15: 15.247(d)	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. 4. The conclusion of this test report is judged by actual test data without considering measurement uncertainty.	

2. General Information

2.1. Description of Device (EUT)

Description/PMN : ESL Controller

Model
Number/HVIN(s) : HS_C09978
Diff. : /

Trademark : 

Test Voltage : DC 5V powered by USB

Radio Technology : 2.4g Technology

Operation
frequency : 2402-2480MHz

Channel No. : 157 channels

Channel Separation : 0.5MHz

Modulation : GFSK

Antenna Type : Internal antenna, Maximum Gain is 0.5dBi. (Antenna information is provided by applicant.)

Software Version : V1.0

Hardware
version/FVIN : V1.0

Remark:

1. The worst-case simultaneous transmission configuration was evaluated with no non-compliance found. Results in this report are only for 2.4g Technology function, and there is no other transmitter involved.

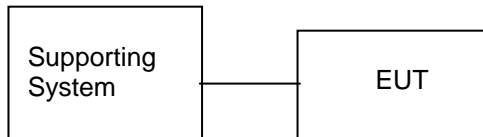
2.2. Accessories of Device (EUT)

Accessories1 : /
 Manufacturer : /
 Model : /
 INPUT : /
 OUTPUT : /

2.3. Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number	Certification or SDOC
1.	GPON Terminal	HUAWEI	HG8M8245W5-8 T-V2G01	48575443ADC299A7	N/A

2.4. Block Diagram of connection between EUT and simulators



2.5. Test Mode Description

Tested mode, channel, and data rate information		
Mode	Channel	Frequency (MHz)
GFSK	Low : CH1	2402
	Middle: CH79	2441
	High: CH157	2480

The test software “QRCT” was used to control EUT work in Continuous TX mode, and select test channel, wireless mode.

For All Channels:

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2402.0MHz	39	2421.0	79	2441.0	119	2461.0
2	2402.5MHz	40	2421.5	80	2441.5	120	2461.5
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
37	2420.0	77	2440.0	117	2460.0	156	2479.5
38	2420.5	78	2440.5	118	2460.5	157	2480.0

2.6. Test Conditions

Items	Required	Actual
Temperature range:	15-35°C	27°C
Humidity range:	25-75%	56%
Pressure range:	86-106kPa	98kPa

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
 Designation Number: CN1236

July 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	1.63dB
Uncertainty for Radiation Emission test in 3m chamber (below 30MHz)	3.5dB
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	3.74dB(Polarize: V)
	3.76dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz)	3.77dB(Polarize: V)
	3.80dB(Polarize: H)
Uncertainty for radio frequency	5.06×10^{-8} GHz
Uncertainty for conducted RF Power	0.40dB
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	2020.09.02	3Year
Spectrum analyzer	ROHDE&SCHWARZ	FSV40-N	102137	2021.08.25	1Year
Spectrum analyzer	Agilent	N9020A	MY499100060	2021.08.25	1Year
Receiver	ROHDE&SCHWARZ	ESR	1316.3003K03-10208 2-Wa	2021.08.25	1Year
Receiver	R&S	ESCI	101165	2021.08.25	1Year
Bilog Antenna	Schwarzbeck	VULB 9168	VULB 9168#627	2021.08.30	2Year
Horn Antenna	SCHWARZBECK	BBHA 9120 D	2106	2021.08.30	2Year
Active Loop Antenna	SCHWARZBECK	FMZB 1519B	00059	2021.08.30	2Year
RF Cable	Resenberger	Cable 1	RE1	2021.08.25	1Year
RF Cable	Resenberger	Cable 2	RE2	2021.08.25	1Year
RF Cable	Resenberger	Cable 3	CE1	2021.08.25	1Year
Pre-amplifier	HP	HP8347A	2834A00455	2021.08.25	1Year
Pre-amplifier	Agilent	8449B	3008A02664	2021.08.25	1Year
L.I.S.N.#1	Schwarzbeck	NSLK8126	8126-466	2021.08.25	1Year
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	101043	2021.08.25	1 Year
Horn Antenna	SCHWARZBECK	BBHA9170	00946	2021.08.30	2 Year
Preamplifier	SKET	LNPA_1840 -50	SK2018101801	2021.08.25	1 Year
Power Meter	Agilent	E9300A	MY41496628	2021.08.25	1 Year
Power Sensor	DARE	RPR3006W	15100041SNO91	2021.08.25	1 Year
Temp. & Humid. Chamber	Weihuang	WHTH-1000 -40-880	100631	2022.04.22	1 Year
Switching Mode Power Supply	JUNKE	JK12010S	20140927-6	2021.08.25	1 Year
Adjustable attenuator	MWRFtest	N/A	N/A	N/A	N/A
10dB Attenuator	Mini-Circuits	DC-6G	N/A	N/A	N/A

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. Spurious Emission

3.1. Test Limits

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
¹ 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)	

Note 1: The peak limit is 20 dB higher than the average limit

Note 2: Peak limit applies (AVG limit + 20 dB) as well as RSS-247 Section 5.5

Harmonic emissions limits comply with below 54 dB $\mu\text{V}/\text{m}$ at 3m. Other emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 15.209(a) limit in the table below has to be followed.

3.2. Test Procedure

The measuring distance of 3m shall be used for measurements at frequency up to 1GHz and above 1GHz.

The EUT was placed on a rotating 0.8 m high above ground for below 1GHz and 1.5m high for above1GHz testing, The table was rotated 360 degrees to determine the position of the highest radiation.

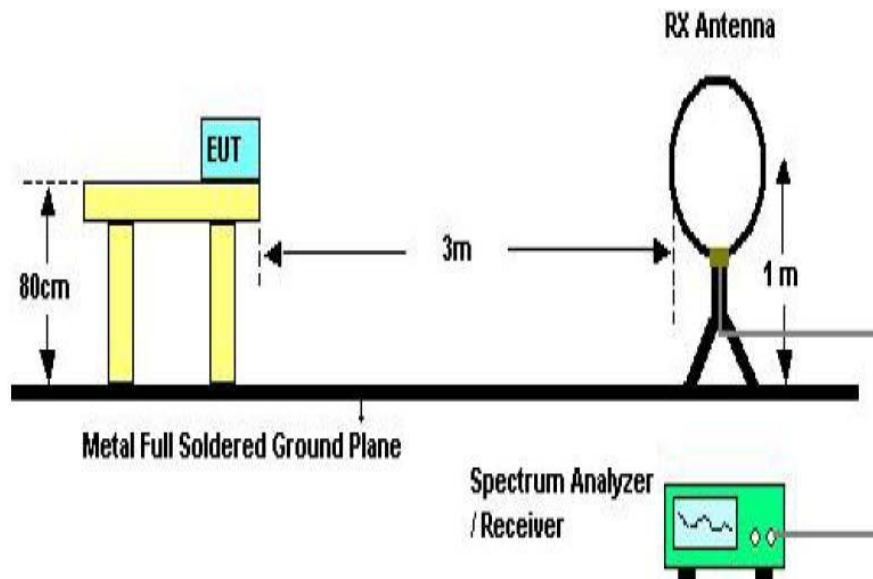
The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set of make measurement.

The initial step in collecting radiated emission data is a spectrum analyzer Peak detector mode pre-scanning the measurement frequency range. Significant Peaks are then marked. and then Quasi Peak Detector mode premeasured.

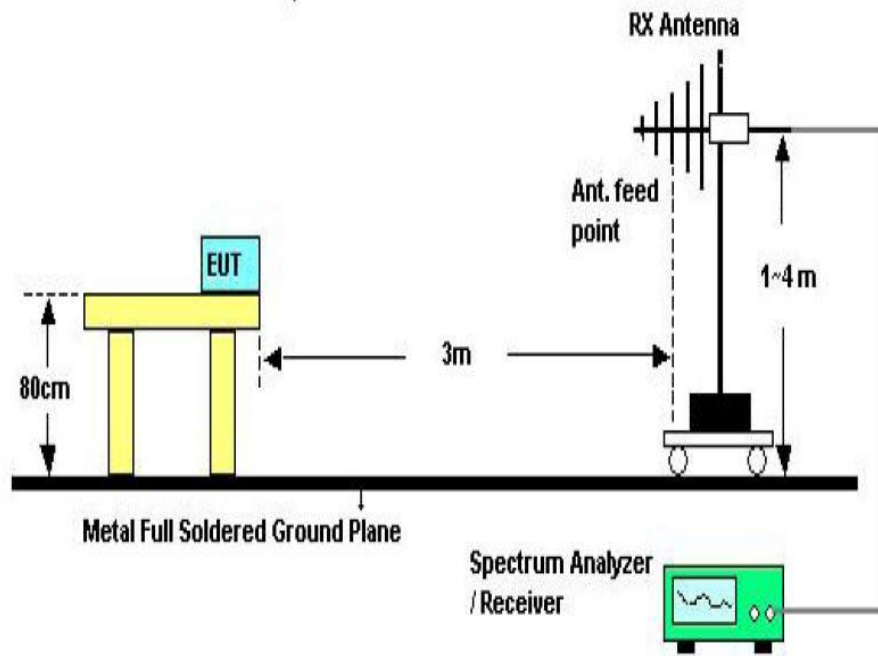
If Peak value comply with QP limit Below 1GHz, the EUT deemed to comply with QP limit. But the Peak value and average value both need to comply with applicable limit above 1GHz.

For the actual test configuration, please see the test setup photo.

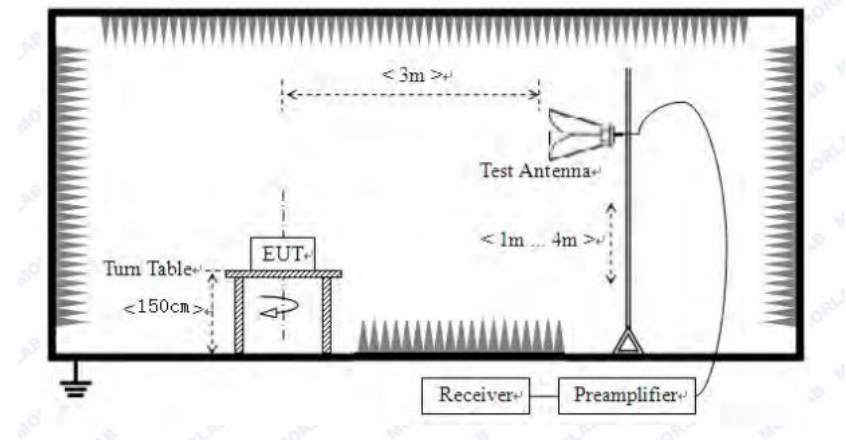
3.3. Test Setup



Below 30MHz Test Setup



Above 30MHz Test Setup



Above 1GHz Test Setup

3.4. Test Results

Test Condition

Continual Transmitting in maximum power.

9KHz~150KHz	RBW200Hz	VBW1KHz
150KHz~30MHz	RBW9KHz	VBW 30KHz
30MHz~1GHz	RBW120KHz	VBW 300KHz
Above1GHz	RBW1MHz	VBW 3MHz

We have scanned from 9 kHz to the 10th harmonic of the EUT.

Detailed information please see the following page.

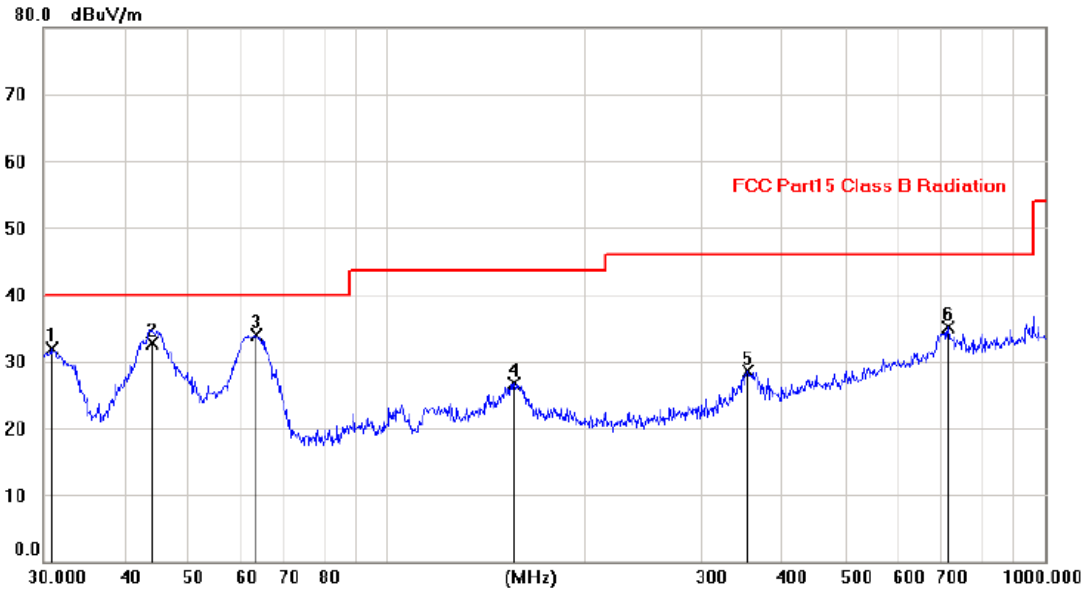
From 9KHz to 30MHz: Conclusion: PASS

Note: 1.The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

2.Only show the test data of the worst Channel in this report.

From 30MHz to 1000MHz: Conclusion: PASS

Vertical:

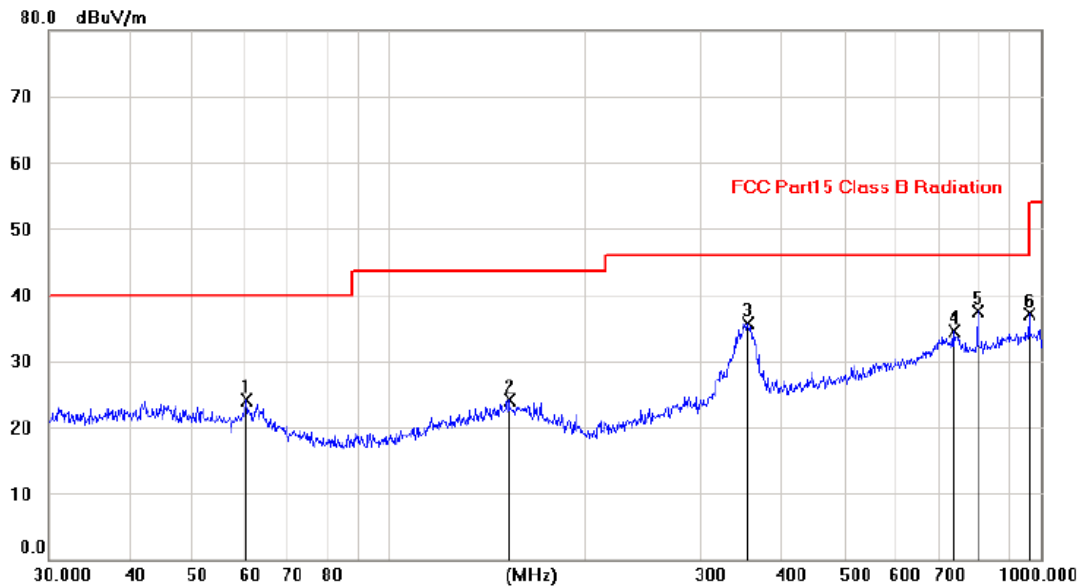


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree
1		30.9619	18.33	13.59	31.92	40.00	-8.08	peak	
2		43.8425	18.56	14.23	32.79	40.00	-7.21	QP	
3	*	63.1285	21.41	12.51	33.92	40.00	-6.08	peak	
4		156.1472	11.71	15.05	26.76	43.50	-16.74	peak	
5		352.9846	13.24	15.29	28.53	46.00	-17.47	peak	
6		713.9230	13.16	21.93	35.09	46.00	-10.91	peak	

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

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

Horizontal:



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Antenna Height cm	Table Degree degree	Comment
1		60.4283	11.01	13.08	24.09	40.00	-15.91			peak
2		152.8069	9.08	15.05	24.13	43.50	-19.37			peak
3		355.0121	20.44	15.33	35.77	46.00	-10.23			peak
4		737.0714	12.30	22.22	34.52	46.00	-11.48			peak
5	*	800.1012	14.65	22.90	37.55	46.00	-8.45			peak
6		960.0279	12.48	24.67	37.15	54.00	-16.85			peak

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

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

Remark: All modes have been tested, and only worst data of GFSK(ANT1) mode, Channel 2402MHz was listed in this report.

From 1G-25GHz

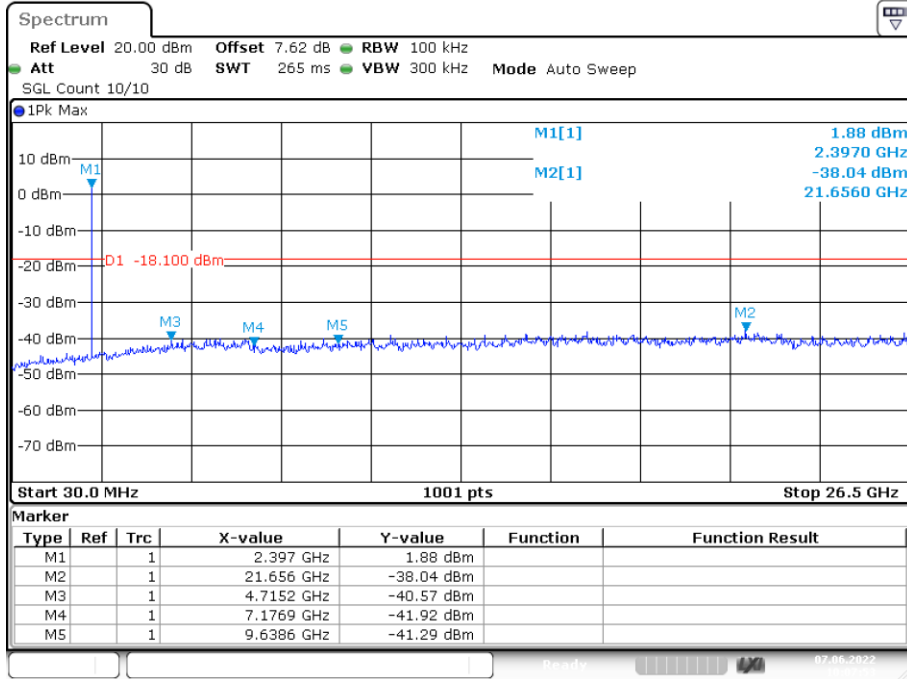
Test Mode: TX Low									
Freq (MHz)	Read Level (dBuV/m)	Polar (H/V)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4804	47.87	V	33.95	10.18	34.26	57.74	74	-16.26	PK
4804	36.12	V	33.95	10.18	34.26	45.99	54	-8.01	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
4804	46.10	H	33.95	10.18	34.26	55.97	74	-18.03	PK
4804	35.66	H	33.95	10.18	34.26	45.53	54	-8.47	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
Test Mode: TX Mid									
4880	45.04	V	33.93	10.2	34.29	54.88	74	-19.12	PK
4880	36.41	V	33.93	10.2	34.29	46.25	54	-7.75	AV
7320	/	/	/	/	/	/	/	/	/
9760	/	/	/	/	/	/	/	/	/
4880	43.63	H	33.93	10.2	34.29	53.47	74	-20.53	PK
4880	34.40	H	33.93	10.2	34.29	44.24	54	-9.76	AV
7320	/	/	/	/	/	/	/	/	/
9760	/	/	/	/	/	/	/	/	/
Test Mode: TX High									
4960	43.60	V	33.98	10.22	34.25	53.55	74	-20.45	PK
4960	33.49	V	33.98	10.22	34.25	43.44	54	-10.56	AV
7440	/	/	/	/	/	/	/	/	/
9920	/	/	/	/	/	/	/	/	/
4960	43.25	H	33.98	10.22	34.25	53.20	74	-20.80	PK
4960	33.06	H	33.98	10.22	34.25	43.01	54	-10.99	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.									

This report only shall the worst case mode for ANT1.

Conducted RF Spurious Emission

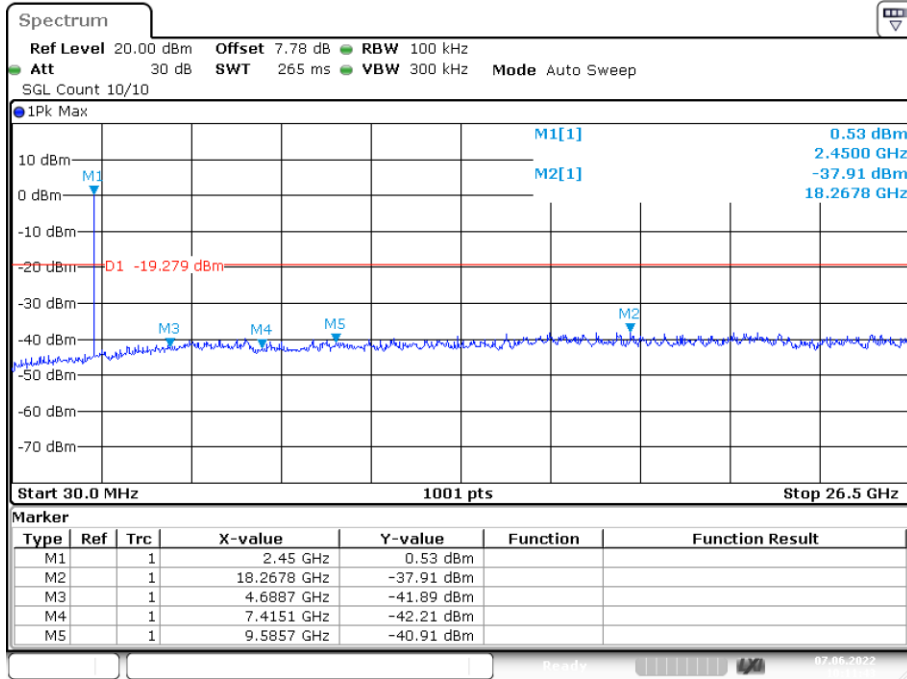
For ANT 1						
Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	user	2402	Ant 1	-39.93	-20	Pass
NVNT	user	2441	Ant 1	-38.63	-20	Pass
NVNT	user	2480	Ant 1	-38.13	-20	Pass

Tx. Spurious NVNT user 2402MHz Ant1 Emission



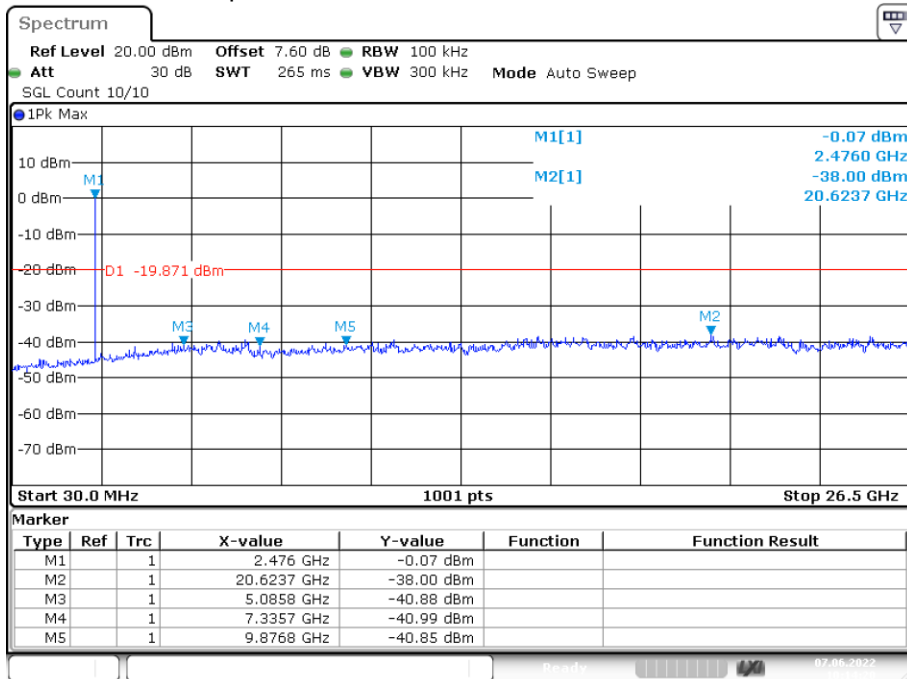
Date: 7.JUN.2022 10:07:53

Tx. Spurious NVNT user 2441MHz Ant1 Emission



Date: 7.JUN.2022 10:11:43

Tx. Spurious NVNT user 2480MHz Ant1 Emission

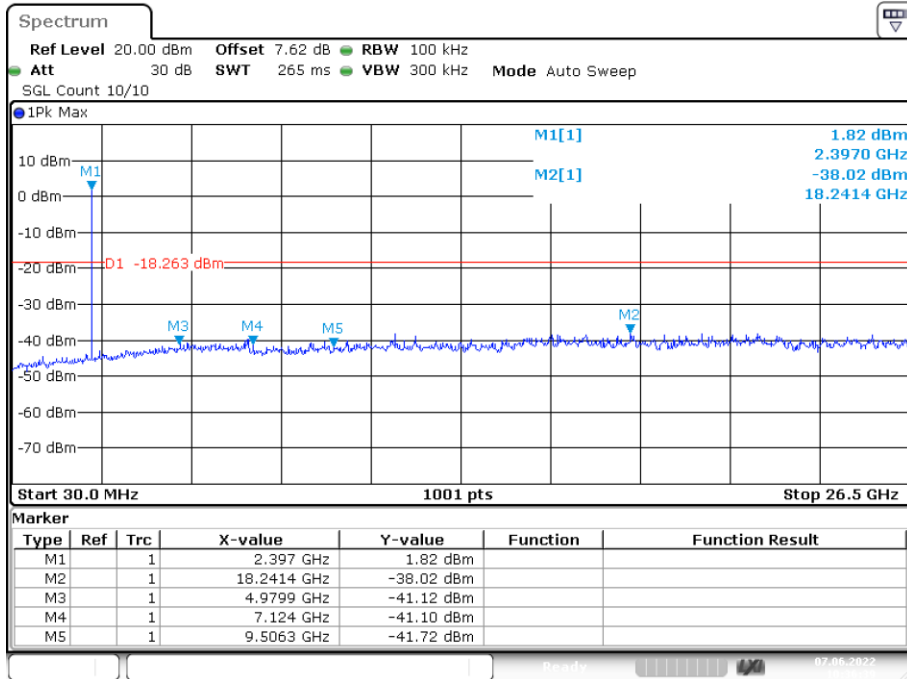


Date: 7.JUN.2022 10:14:20

Conducted RF Spurious Emission

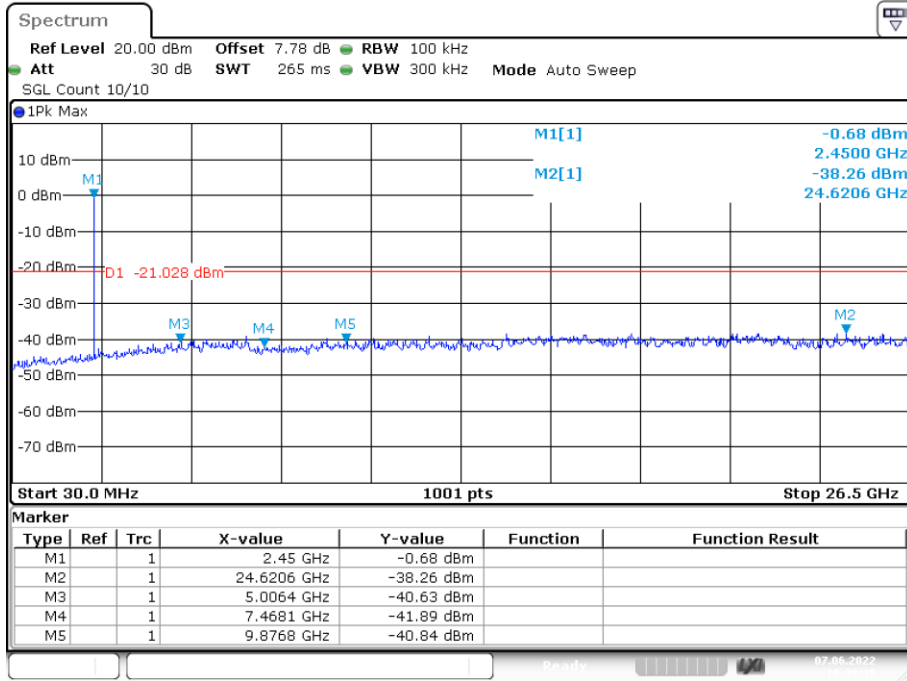
For ANT 2						
Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	user	2402	Ant 2	-39.75	-20	Pass
NVNT	user	2441	Ant 2	-37.22	-20	Pass
NVNT	user	2480	Ant 2	-36.32	-20	Pass

Tx. Spurious NVNT user 2402MHz Ant2 Emission



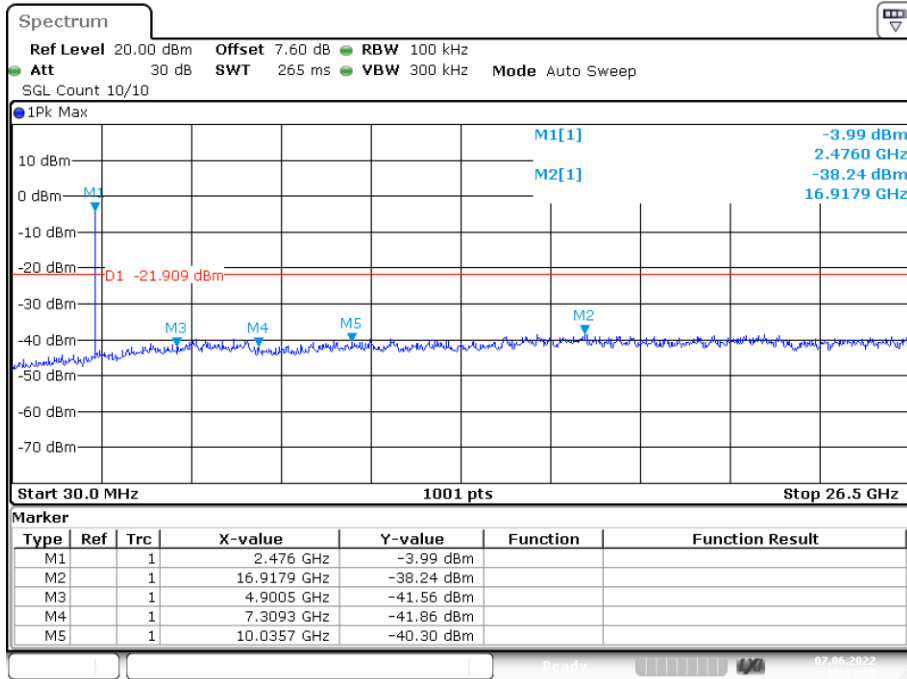
Date: 7.JUN.2022 10:36:39

Tx. Spurious NVNT user 2441MHz Ant2 Emission



Date: 7.JUN.2022 10:39:35

Tx. Spurious NVNT user 2480MHz Ant2 Emission



Date: 7.JUN.2022 10:43:04

4. Power Line Conducted Emission

4.1. Test Limits

Frequency MHz	Limits dB(μ V)	
	Quasi-peak Level	Average Level
0.15 -0.50	66 -56*	56 - 46*
0.50 -5.00	56	46
5.00 -30.00	60	50

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

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

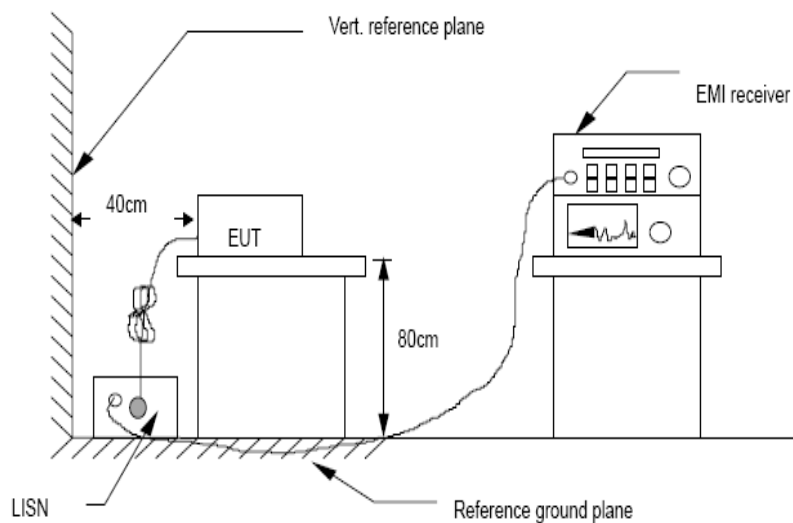
3. The limit decreases in line with the logarithm of the frequency in rang of 0.15 to 0.50 MHz.

4.2. Test Procedure

The EUT is put on the plane 0.8m high above the ground by insulating support and is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC lines are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.10:2013 on Conducted Emission Measurement.

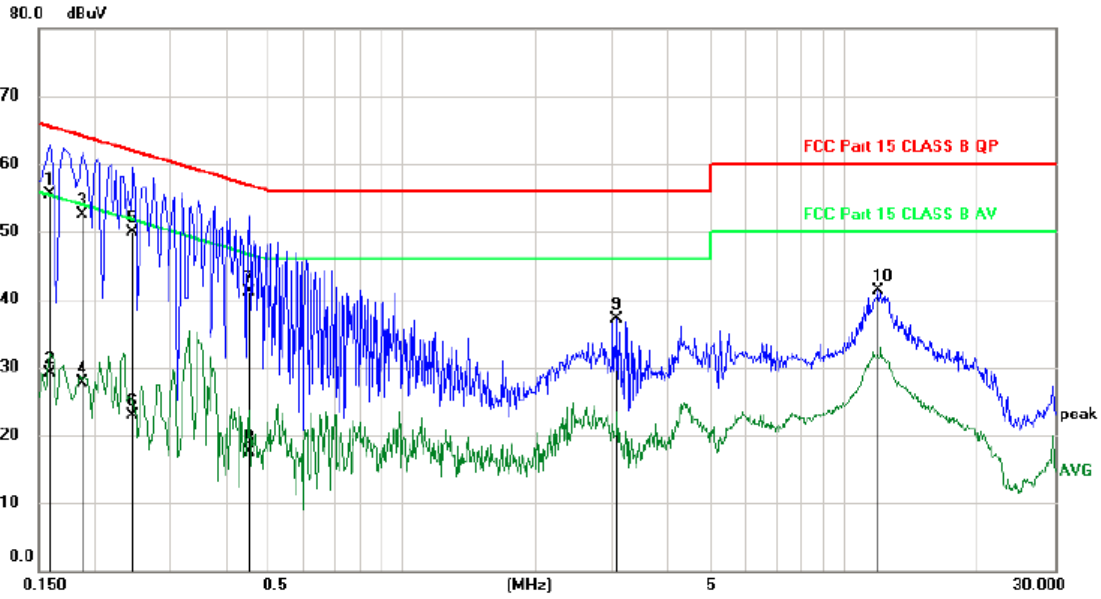
The bandwidth of test receiver is set at 9 kHz.

4.3. Test Setup



4.4. Test Results

Line:



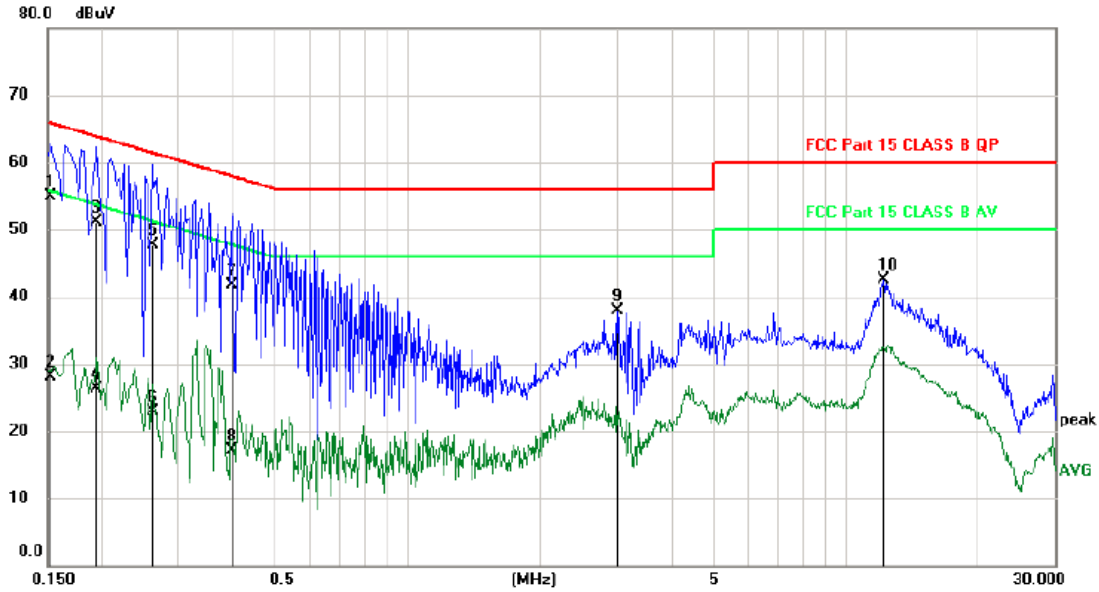
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1	*	0.1590	35.82	19.60	55.42	65.52	-10.10	QP	
2		0.1590	9.52	19.60	29.12	55.52	-26.40	AVG	
3		0.1890	32.86	19.60	52.46	64.08	-11.62	QP	
4		0.1890	8.01	19.60	27.61	54.08	-26.47	AVG	
5		0.2460	30.27	19.60	49.87	61.89	-12.02	QP	
6		0.2460	3.40	19.60	23.00	51.89	-28.89	AVG	
7		0.4500	21.45	19.60	41.05	56.88	-15.83	QP	
8		0.4500	-2.05	19.60	17.55	46.88	-29.33	AVG	
9		3.0630	17.59	19.48	37.07	56.00	-18.93	peak	
10		11.9760	21.66	19.60	41.26	60.00	-18.74	peak	

*:Maximum data x:Over limit !:over margin

(Reference Only)

Note: Measurement=Reading Level+Correc Factor. Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

Neutral:



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1	*	0.1530	35.33	19.60	54.93	65.84	-10.91	QP	
2		0.1530	8.51	19.60	28.11	55.84	-27.73	AVG	
3		0.1949	31.56	19.60	51.16	63.83	-12.67	QP	
4		0.1949	6.61	19.60	26.21	53.83	-27.62	AVG	
5		0.2610	28.18	19.60	47.78	61.40	-13.62	QP	
6		0.2610	3.36	19.60	22.96	51.40	-28.44	AVG	
7		0.3960	22.17	19.60	41.77	57.94	-16.17	QP	
8		0.3960	-2.43	19.60	17.17	47.94	-30.77	AVG	
9		3.0120	18.52	19.46	37.98	56.00	-18.02	peak	
10		12.2340	22.92	19.60	42.52	60.00	-17.48	peak	

*:Maximum data x:Over limit !:over margin <Reference Only

Note: Measurement=Reading Level+Correc Factor. Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

Remark: All modes have been tested, and only worst data of GFSK(ANT1) mode, Channel 2402MHz was listed in this report.

5. Conducted Maximum Output Power

5.1. Test limits

Please refer section RSS-247 & 15.247.

5.2. Test Procedure

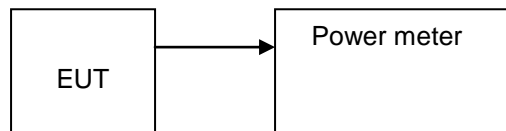
Details see the KDB558074 D01 Meas Guidance v05r02

5.2.1 Place the EUT on the table and set it in transmitting mode.

5.2.2 Measure out each mode and each bands peak output power of EUT.

Note: The cable loss and attenuator loss were offset into measure device as amplitude offset.

5.3. Test Setup



5.4. Test Results

For ANT 1			
Channel	Frequency (MHz)	peak Output Power (dBm)	Limit (dBm)
CH0	2402	1.773	30
CH79	2441	0.788	30
CH157	2480	0.04	30
Conclusion: PASS			

For ANT 2			
Channel	Frequency (MHz)	peak Output Power (dBm)	Limit (dBm)
CH0	2402	1.559	30
CH79	2441	-0.566	30
CH157	2480	-1.823	30
Conclusion: PASS			

6. Peak Power Spectral Density

6.1. Test limits

6.1.1 Please refer section RSS-247 & 15.247.

6.1.2 For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

6.1.3 The direct sequence operating of the hybrid system, with the frequency hopping operation turned off, shall comply with the power density requirements of paragraph (d) of this section.

6.2. Test Procedure

Details see the KDB558074 D01 Meas Guidance v05r02

6.2.1 Place the EUT on the table and set it in transmitting mode.

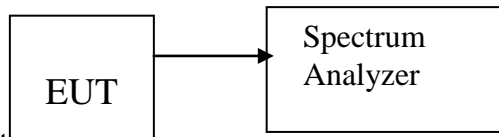
6.2.2 Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

6.2.3 Set the spectrum analyzer as RBW = 100kHz(Set the RBW to: $3\text{ kHz} \leq \text{RBW} \leq 100\text{ kHz}$.), VBW = 300kHz(Set the $\text{VBW} \geq 3 \times \text{RBW}$), span $\geq 1.5 \times \text{DTS bandwidth}$., detail see the test plot.

6.2.4 Record the max reading.

6.2.5 Repeat the above procedure until the measurements for all frequencies are completed.

6.3. Test Setup

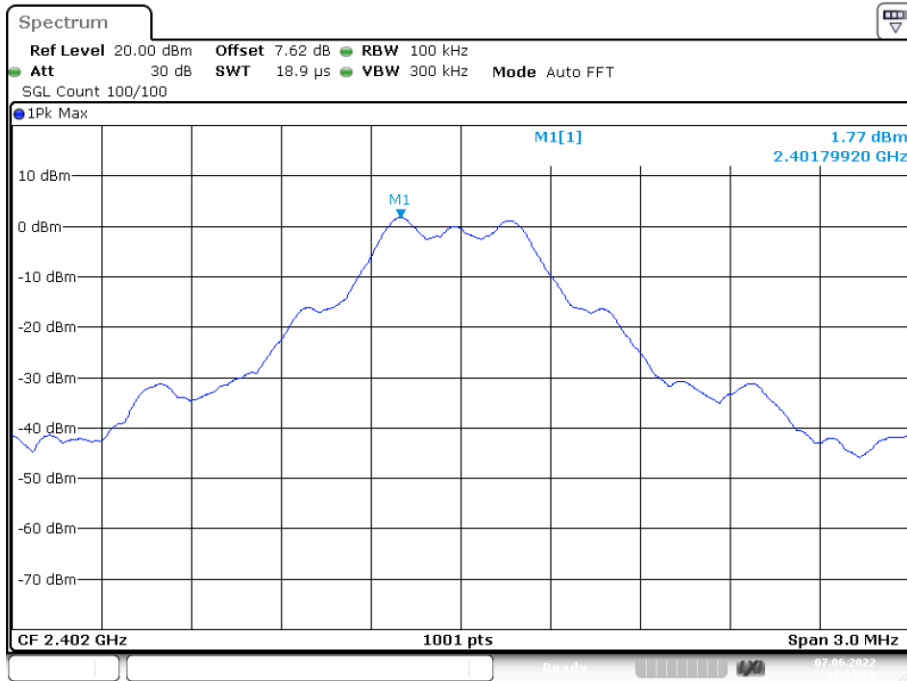


6.4. Test Results

For ANT 1							
Condition	Mode	Frequency (MHz)	Antenna	Max PSD (dBm/100kHz)	Max PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
NVNT	user	2402	Ant 1	1.773	-13.456	8	Pass
NVNT	user	2441	Ant 1	0.759	-14.470	8	Pass
NVNT	user	2480	Ant 1	-0.052	-15.281	8	Pass

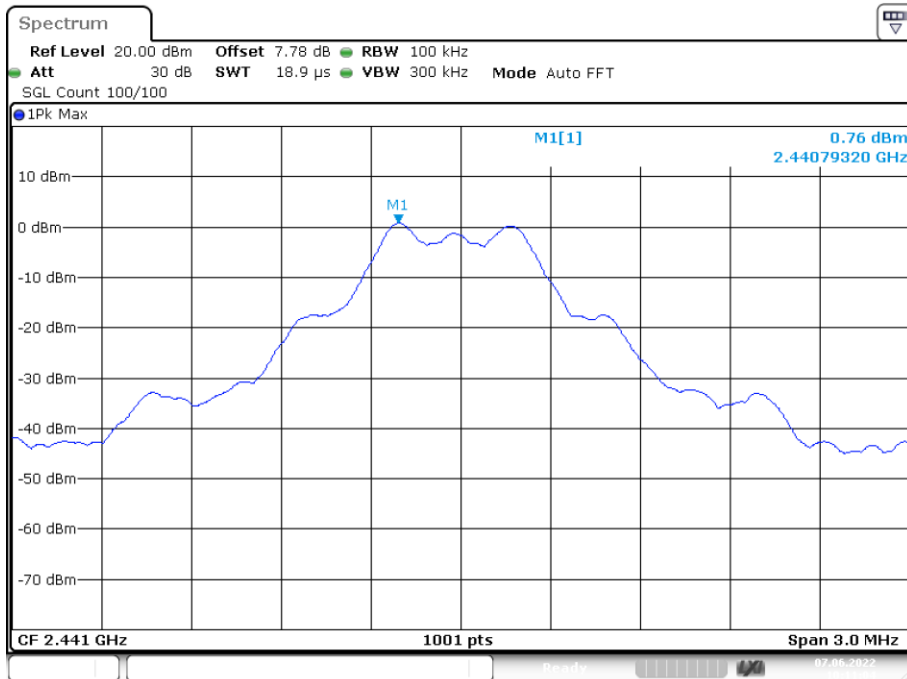
Note: Max PSD (dBm/3K) = Max PSD (dBm/100K) - $\text{Log}(100/3) \times 10$

PSD NVNT user 2402MHz Ant1



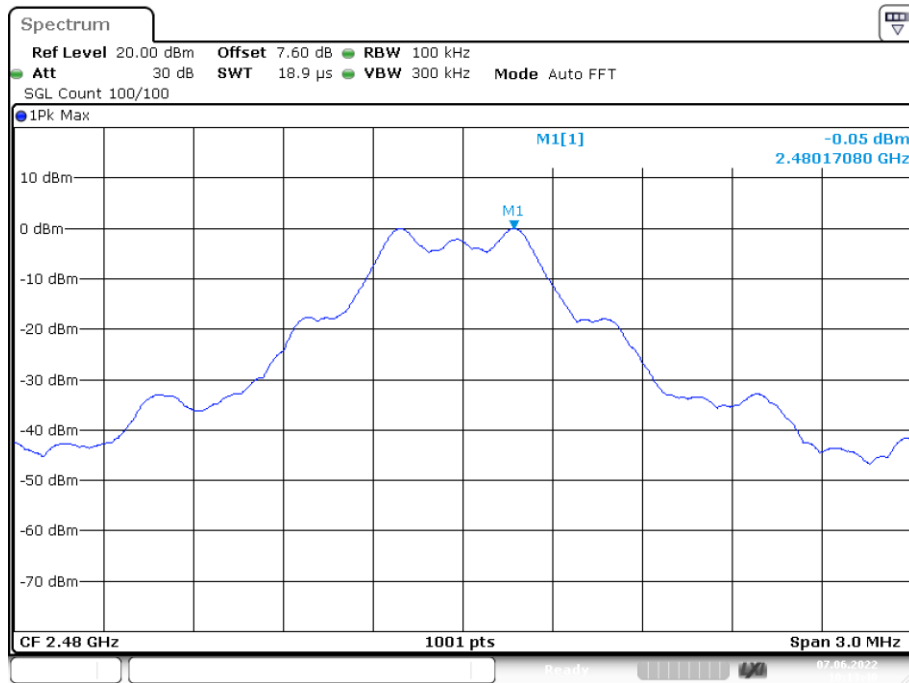
Date: 7.JUN.2022 10:07:16

PSD NVNT user 2441MHz Ant1



Date: 7.JUN.2022 10:11:03

PSD NVNT user 2480MHz Ant1

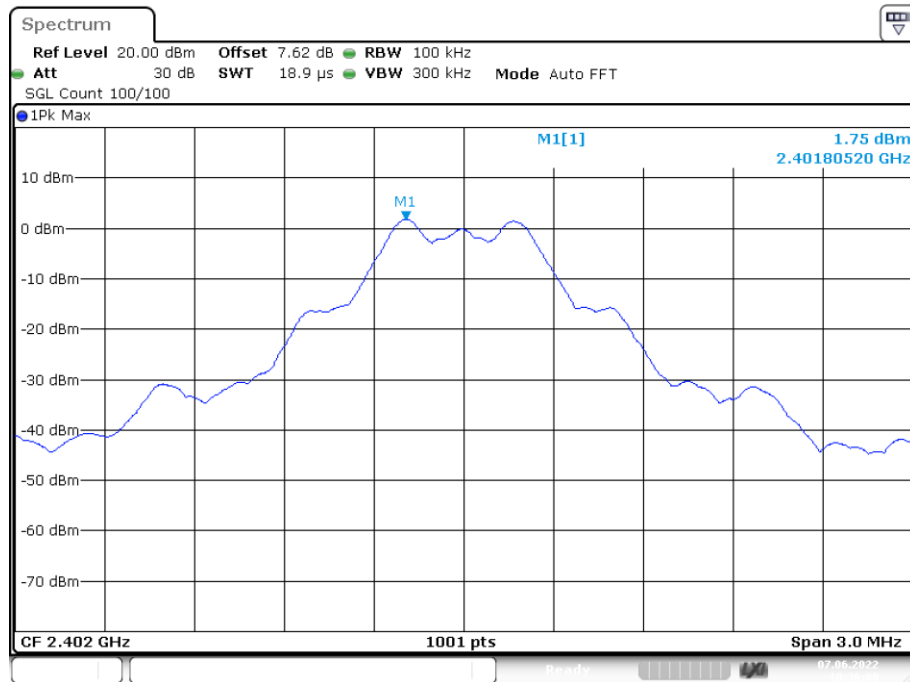


Date: 7.JUN.2022 10:13:41

For ANT 2							
Condition	Mode	Frequency (MHz)	Antenna	Max PSD (dBm/100kHz)	Max PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
NVNT	user	2402	Ant 1	1.747	-13.482	8	Pass
NVNT	user	2441	Ant 1	-0.623	-15.852	8	Pass
NVNT	user	2480	Ant 1	-2.046	-17.275	8	Pass

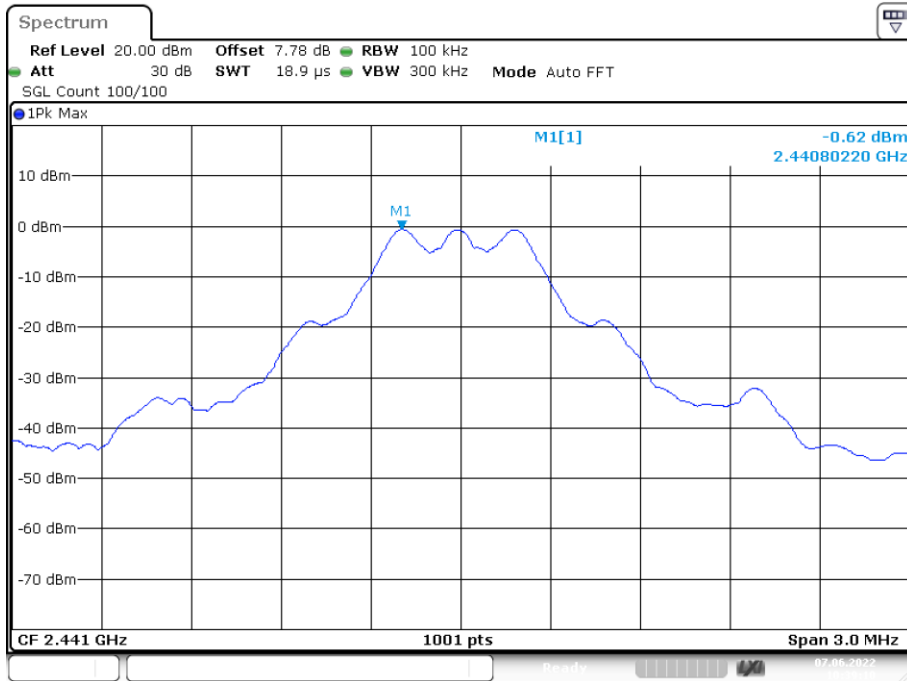
Note: Max PSD (dBm/3K)= Max PSD (dBm/100K)-Log(100/3)*10

PSD NVNT user 2402MHz Ant2



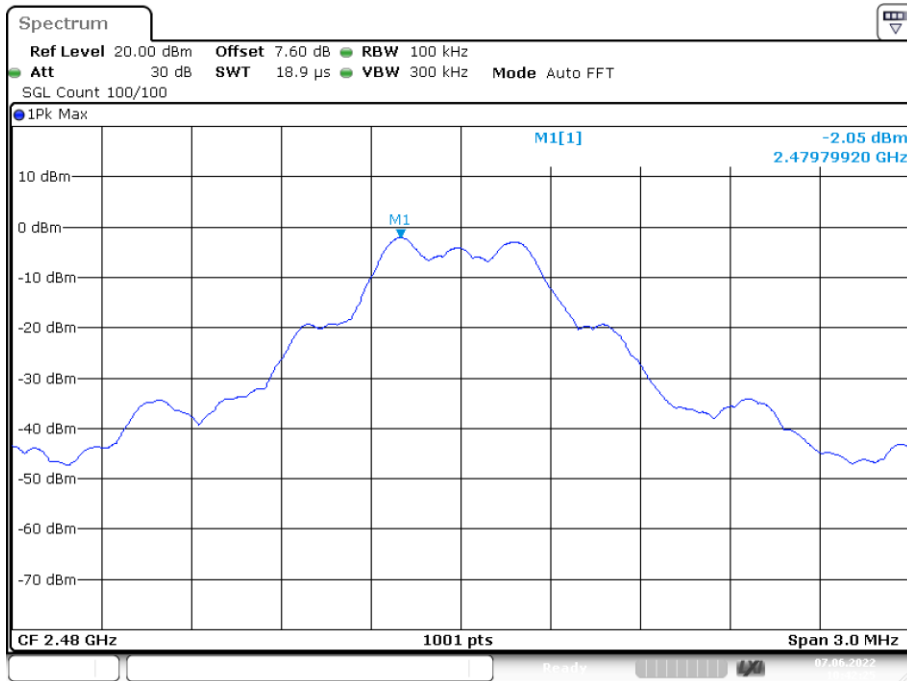
Date: 7.JUN.2022 10:36:00

PSD NVNT user 2441MHz Ant2



Date: 7.JUN.2022 10:39:10

PSD NVNT user 2480MHz Ant2



Date: 7.JUN.2022 10:42:25

7. Bandwidth

7.1. Test limits

Please refer section RSS-247 & 15.247

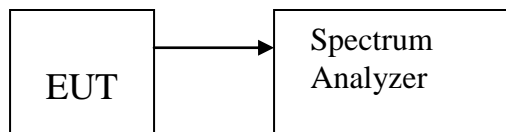
For direct sequence systems, the minimum 6dB bandwidth shall be at least 500 kHz.

7.2. Test Procedure

Details see the KDB558074 D01 Meas Guidance v05r02

- a) The bandwidth is measured at an amplitude level reduced 6dB from the reference level. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.
- b) The test receiver set $RBW = 1-5\%BW$, $VBW \geq 3*RBW$, Sweep time set auto, detail see the test plot for 99% Bandwidth.
- c) The test receiver set $RBW = 100kHz$, $VBW \geq 3*RBW = 300kHz$, Sweep time set auto, detail see the test plot for 6dB Bandwidth.

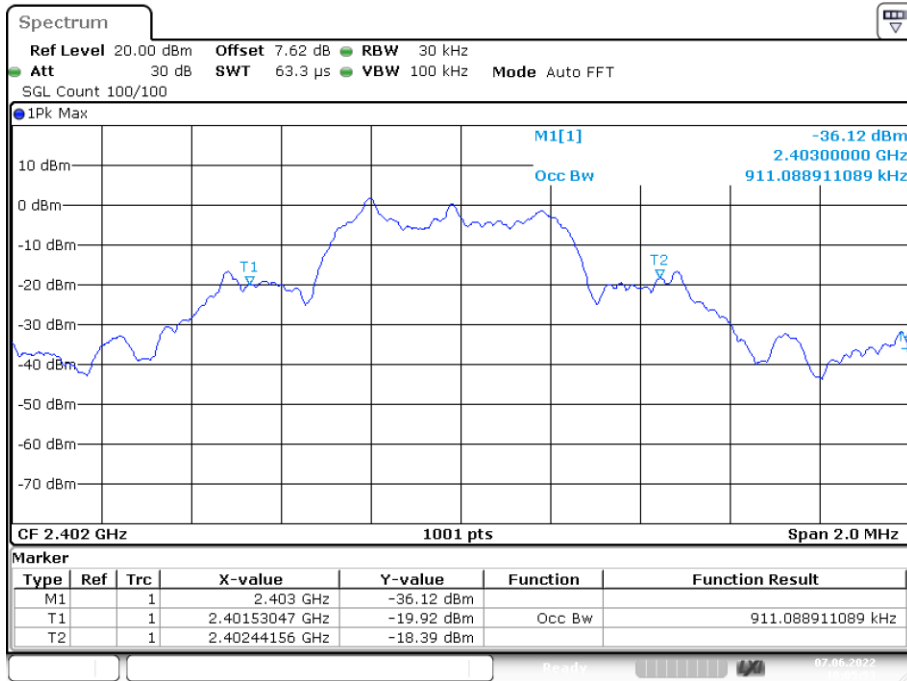
7.3. Test Setup



7.4. Test Results

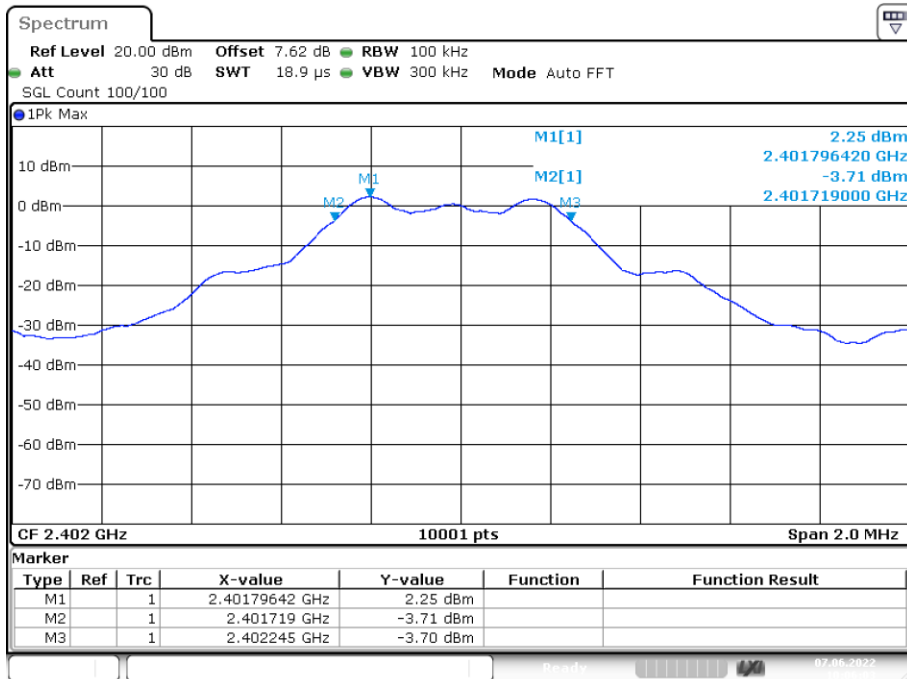
For ANT 1							
Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	user	2402	Ant 1	0.911	0.527	0.5	Pass
NVNT	user	2441	Ant 1	0.939	0.532	0.5	Pass
NVNT	user	2480	Ant 1	0.955	0.539	0.5	Pass

OBW NVNT user 2402MHz Ant1



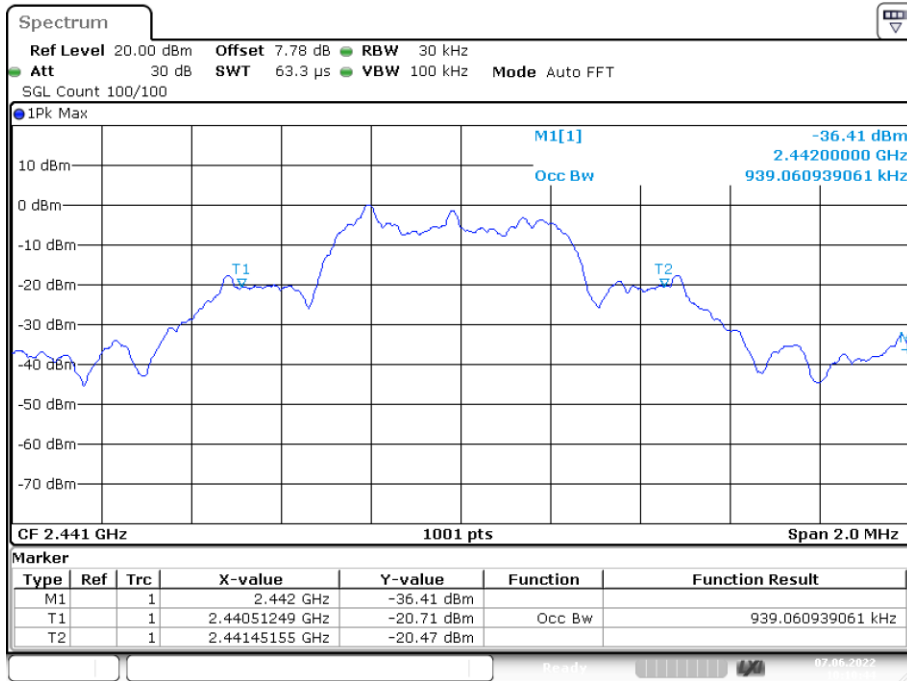
Date: 7.JUN.2022 10:05:53

-6dB Bandwidth NVNT user 2402MHz Ant1

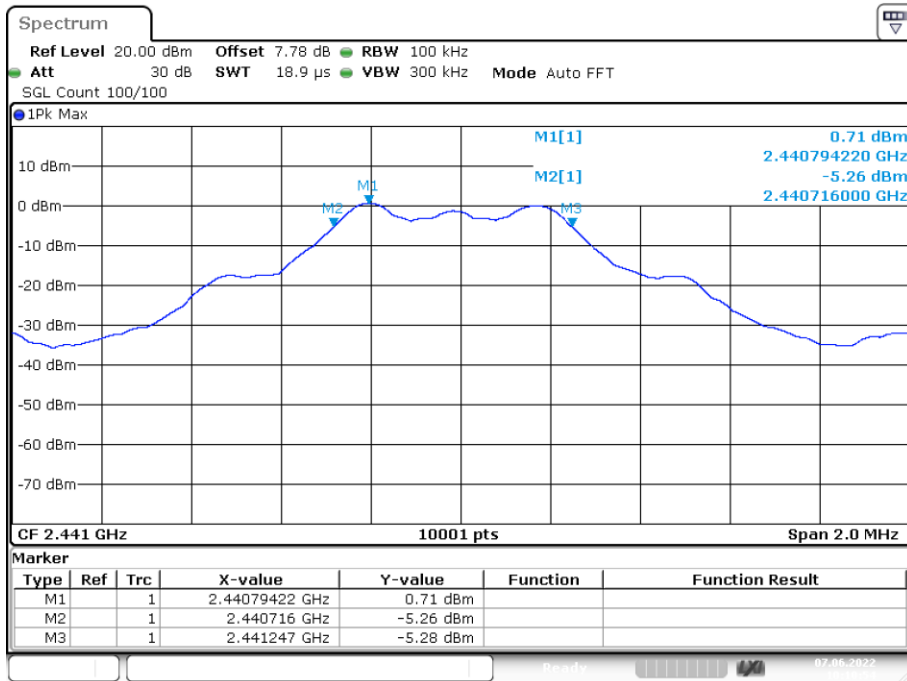


Date: 7.JUN.2022 10:06:02

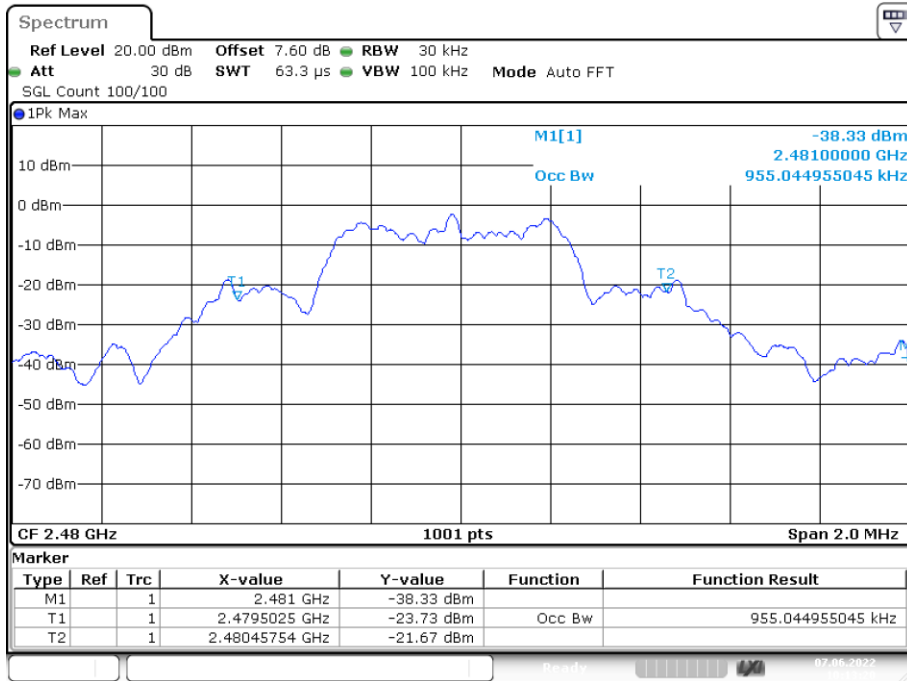
OBW NVNT user 2441MHz Ant1



-6dB Bandwidth NVNT user 2441MHz Ant1

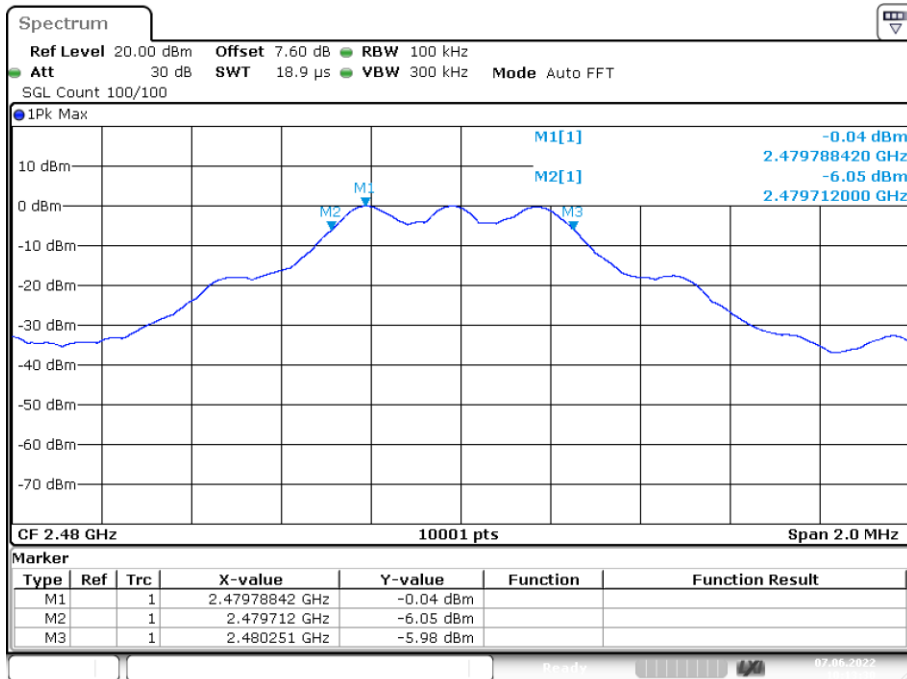


OBW NVNT user 2480MHz Ant1



Date: 7.JUN.2022 10:13:20

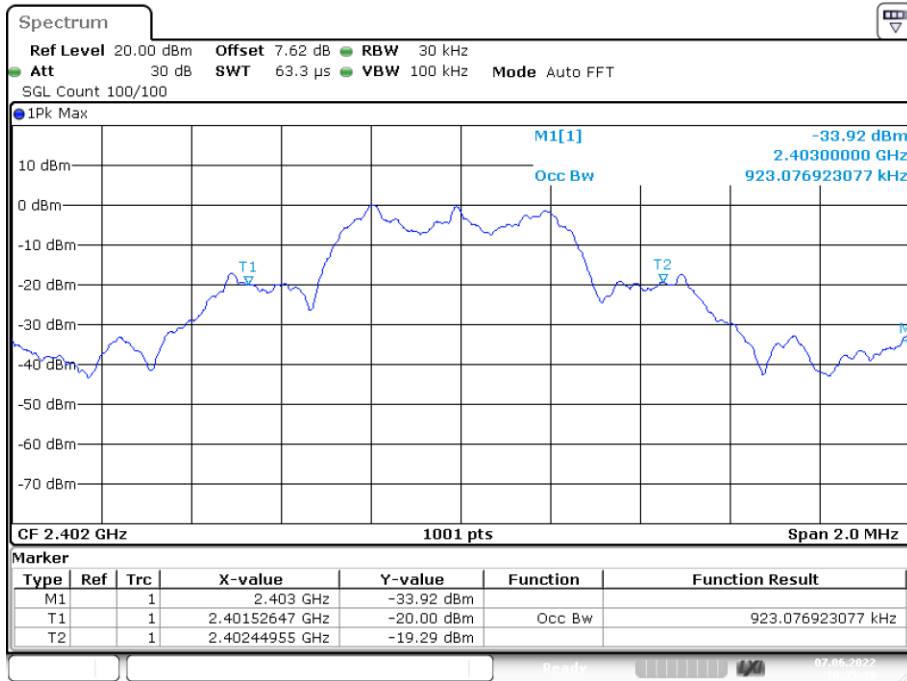
-6dB Bandwidth NVNT user 2480MHz Ant1



Date: 7.JUN.2022 10:13:30

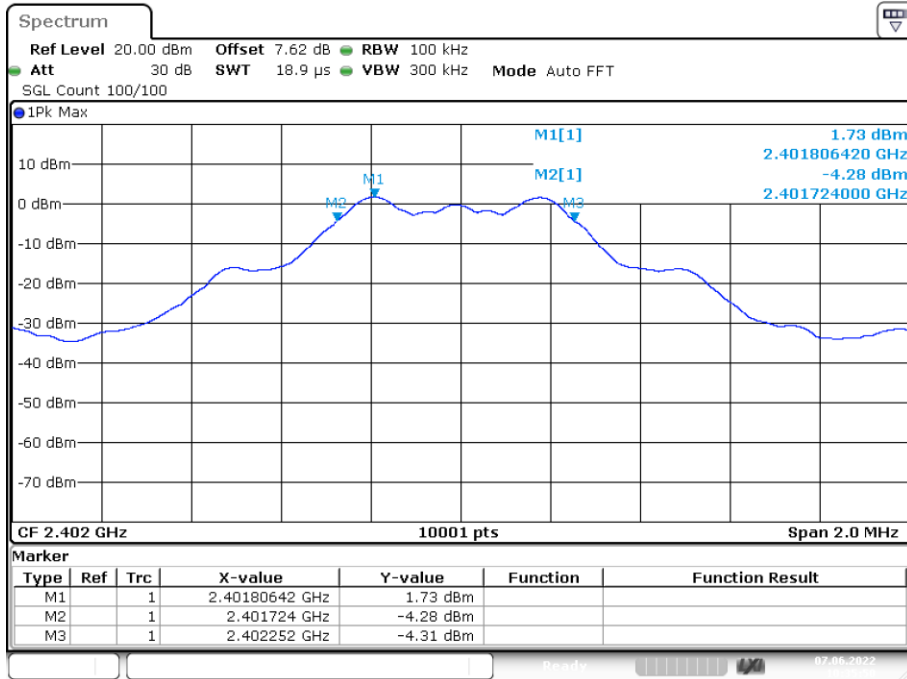
For ANT 2							
Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	user	2402	Ant 2	0.923	0.528	0.5	Pass
NVNT	user	2441	Ant 2	0.883	0.526	0.5	Pass
NVNT	user	2480	Ant 2	0.951	0.537	0.5	Pass

OBW NVNT user 2402MHz Ant1



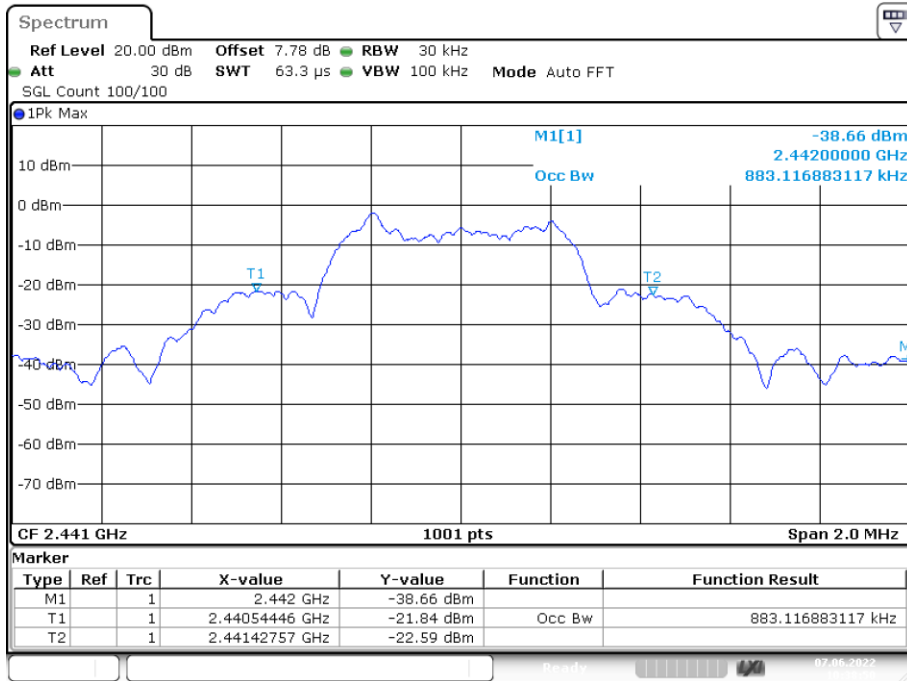
Date: 7.JUN.2022 10:35:39

-6dB Bandwidth NVNT user 2402MHz Ant1

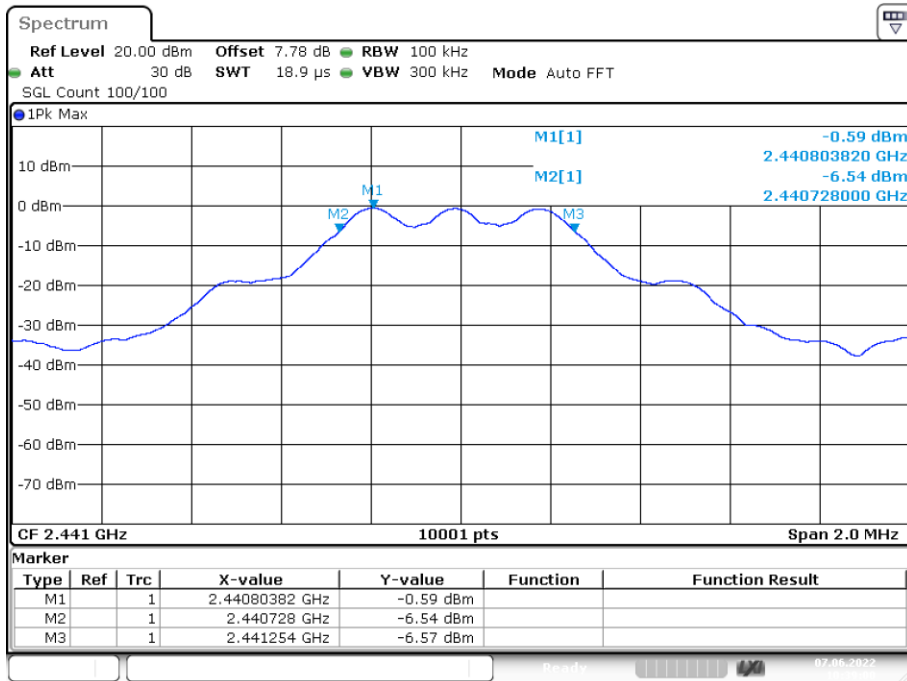


Date: 7.JUN.2022 10:35:50

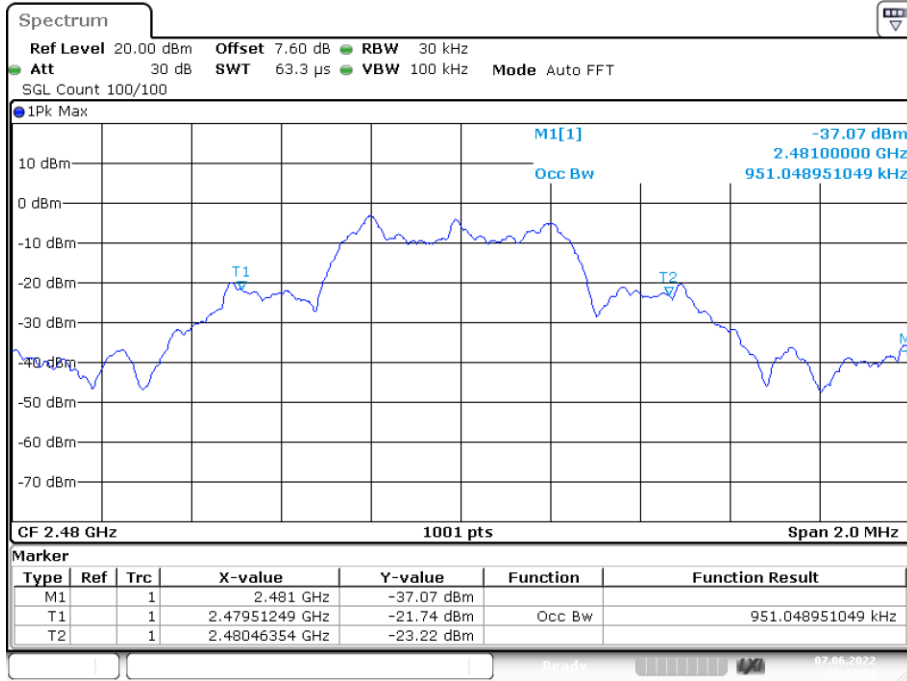
OBW NVNT user 2441MHz Ant1



-6dB Bandwidth NVNT user 2441MHz Ant1

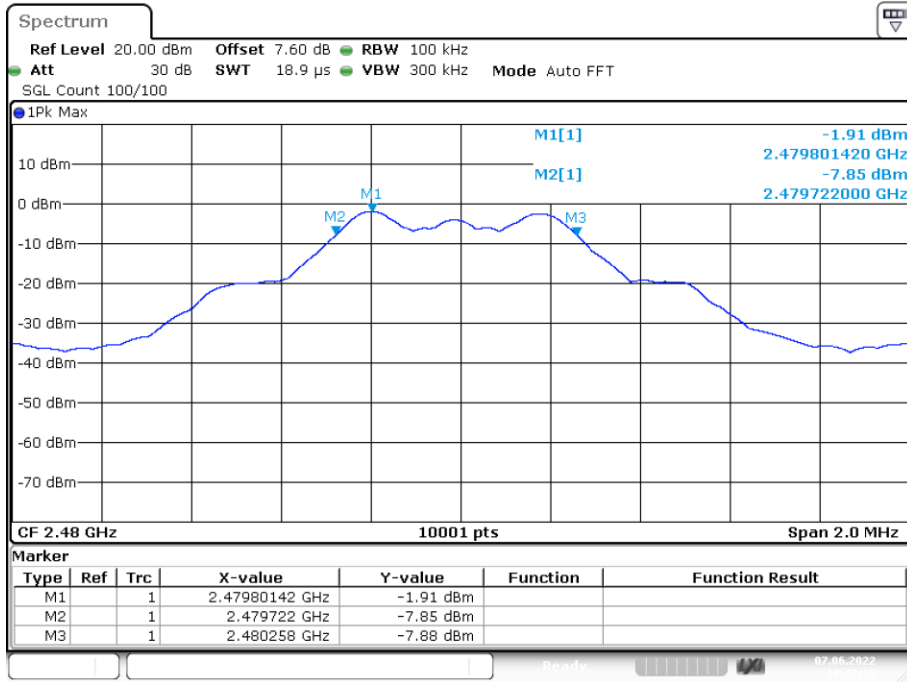


OBW NVNT user 2480MHz Ant1



Date: 7.JUN.2022 10:42:04

-6dB Bandwidth NVNT user 2480MHz Ant1



Date: 7.JUN.2022 10:42:14