



FCC TEST REPORT

FCC ID: SY4-A02028

On Behalf of

Shanghai Huace Navigation Technology Ltd.

Unmanned Surface Vessel

Model No.: Apache 3, Apache 3 Pro, Apache 4

Prepared for : Shanghai Huace Navigation Technology Ltd.
Address : 577 Songying Road, Qingpu District, 201706 Shanghai, 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 : A2312264-C01-R03
Date of Receipt : April 2, 2024
Date of Test : April 2, 2024 - June 27, 2024
Date of Report : June 27, 2024
Version Number : V0
Result : Pass

TABLE OF CONTENTS

Description	Page
1. Summary of Standards And Results	5
1.1. Description of Standards and Results	5
2. General Information	6
2.1. Description of Device (EUT)	6
2.2. Accessories of Device (EUT)	7
2.3. Tested Supporting System Details	7
2.4. Block Diagram of connection between EUT and simulators	7
2.5. Test Mode Description	7
2.6. Test Conditions	8
2.7. Test Facility	8
2.8. Measurement Uncertainty	8
2.9. Test Equipment List	9
3. Spurious Emission	10
3.1. Test Limits	10
3.2. Test Procedure	10
3.3. Test Setup	11
3.4. Test Results	12
4. Power Line Conducted Emission	23
4.1. Test Limits	23
4.2. Test Procedure	23
4.3. Test Setup	23
4.4. Test Results	23
5. Conducted Maximum Output Power	24
5.1. Test limits	24
5.2. Test Procedure	24
5.3. Test Setup	24
5.4. Test Results	24
6. Peak Power Spectral Density	25
6.1. Test limits	25
6.2. Test Procedure	25
6.3. Test Setup	25
6.4. Test Results	25
7. Bandwidth	28
7.1. Test limits	28
7.2. Test Procedure	28
7.3. Test Setup	28
7.4. Test Results	28
8. Band Edge Check	33
8.1. Test limits	33
8.2. Test Procedure	33
8.3. Test Setup	33
8.4. Test Results	33
9. Antenna Requirement	37
9.1. Standard Requirement	37
9.2. Antenna Connected Construction	37
9.3. Results	37
10. Test setup photo	38
10.1. Photo of Radiated Emission test	38

TEST REPORT DECLARATION

Applicant : Shanghai Huace Navigation Technology Ltd.
Address : 577 Songying Road, Qingpu District, 201706 Shanghai, China
Manufacturer : Shanghai Huace Navigation Technology Ltd.
Address : 577 Songying Road, Qingpu District, 201706 Shanghai, China
EUT Description : Unmanned Surface Vessel
(A) Model No. Apache 3, Apache 3 Pro, Apache 4
(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).....: Yannis Wen
Project Engineer



Approved by (name + signature).....: Jack Xu
Project Manager



Date of issue.....: June 27, 2024

Revision History

Revision	Issue Date	Revisions	Revised By
V0	June 27, 2024	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	Test Requirement	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	15.247 (c)	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	15.205	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	: Unmanned Surface Vessel
Model Number	: Apache 3, Apache 3 Pro, Apache 4
Diff	: There is no difference except for the appearance and size. All tests are made with the Apache 3 model.
Power supply	: DC 32.4V from battery.
Radio Technology	: 2.4G
Operation frequency	: 2406.5-2476.5MHz
Channel No.	: 16 Channels
Modulation type	: GFSK
Antenna Type	: Rod antenna, Maximum Gain is 6.24dBi. (Antenna information is provided by applicant.)
Software version	: V1.0
Hardware version	: V1.0
Connector cable loss	: N/A
Intend use environment	: Residential, commercial and light industrial environment

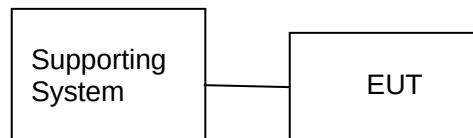
2.2. Accessories of Device (EUT)

Accessories : /
Manufacturer : /
Model : /
Ratings : /

2.3. Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number	Certification or SDoC
1	Notebook PC	Lenovo	ThinkPad E14	N/A	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	2406.5
	Middle: CH8	2439
	High: CH16	2476.5

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

July 25, 2017 Certificated by IC
 Registration Number: 12135A

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 Radiation Emission test in 3m chamber (18GHz to 40GHz)	4.31 dB(Polarize: V)
	4.30 dB(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.	Firmware version	Serial No.	Last cal.	Cal Interval
9*6*6 anechoic chamber	CHENYU	9*6*6	/	N/A	2022.05.17	3Year
Spectrum analyzer	ROHDE&SCHWARZ	FSV40-N	2.3	102137	2023.08.16	1Year
Spectrum analyzer	Agilent	N9020A	A.14.16	MY499100060	2023.08.16	1Year
Receiver	ROHDE&SCHWARZ	ESR	2.28 SP1	1316.3003K03-10 2082-Wa	2023.08.16	1Year
Receiver	R&S	ESCI	4.42 SP1	101165	2023.08.16	1Year
Bilog Antenna	Schwarzbeck	VULB 9168	/	VULB 9168#627	2023.08.28	1Year
Horn Antenna	SCHWARZBECK	BBHA 9120 D	/	2106	2023.08.19	1Year
Loop Antenna	SCHWARZBECK	FMZB 1519B	/	00128	2023.08.19	1Year
RF Cable	Resenberger	Cable 1	/	RE1	2023.08.16	1Year
RF Cable	Resenberger	Cable 2	/	RE2	2023.08.16	1Year
RF Cable	Resenberger	Cable 3	/	CE1	2023.08.16	1Year
Pre-amplifier	HP	HP8347A	/	2834A00455	2023.08.16	1Year
Pre-amplifier	Agilent	8449B	/	3008A02664	2023.08.16	1Year
L.I.S.N.#1	Schwarzbeck	NSLK8126	/	8126-466	2023.08.16	1Year
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	/	101043	2023.08.16	1Year
Horn Antenna	SCHWARZBECK	BBHA 9170	/	00946	2023.08.19	1Year
Preamplifier	SKET	LNPA_1840 -50	/	SK2018101801	2023.08.16	1 Year
Power Meter	Agilent	E9300A	/	MY41496628	2023.08.16	1 Year
Power Sensor	DARE	RPR3006W	/	15100041SNO91	2023.08.16	1 Year
Temp. & Humid. Chamber	Teelong	TL-HW408S	/	TL-20191205-01	2023.07.25	1 Year
Switching Mode Power Supply	JUNKE	JK12010S	/	20140927-6	2023.08.16	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

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

Harmonic emissions limits comply with below 54 dBuV/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.

NOTE:

- a) The tighter limit applies at the band edges.
- b) Emission Level(dB uV/m)=20log Emission Level(uv/m)

3.2. Test Procedure

The measuring distance of 3m shall be used for measurements at frequency up to 1GH 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

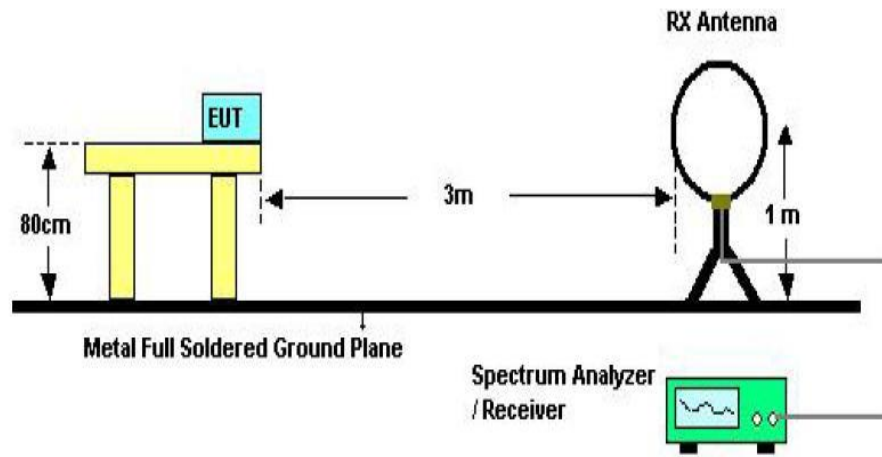
The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set of make measurement.

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

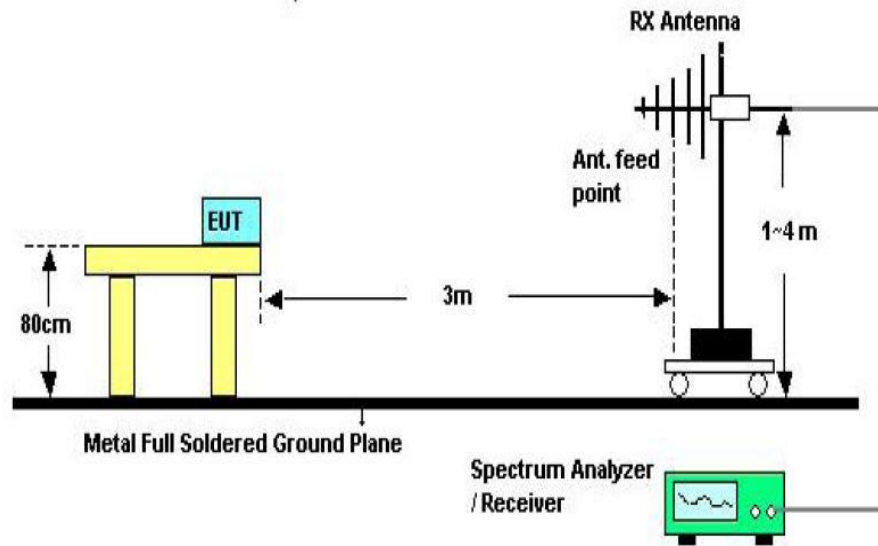
If Peak value comply with QP limit Below 1GHz.The EUT deemed to comply with QP limit. But the Peak value and average value both need to comply with applicable limit above 1GHz.

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

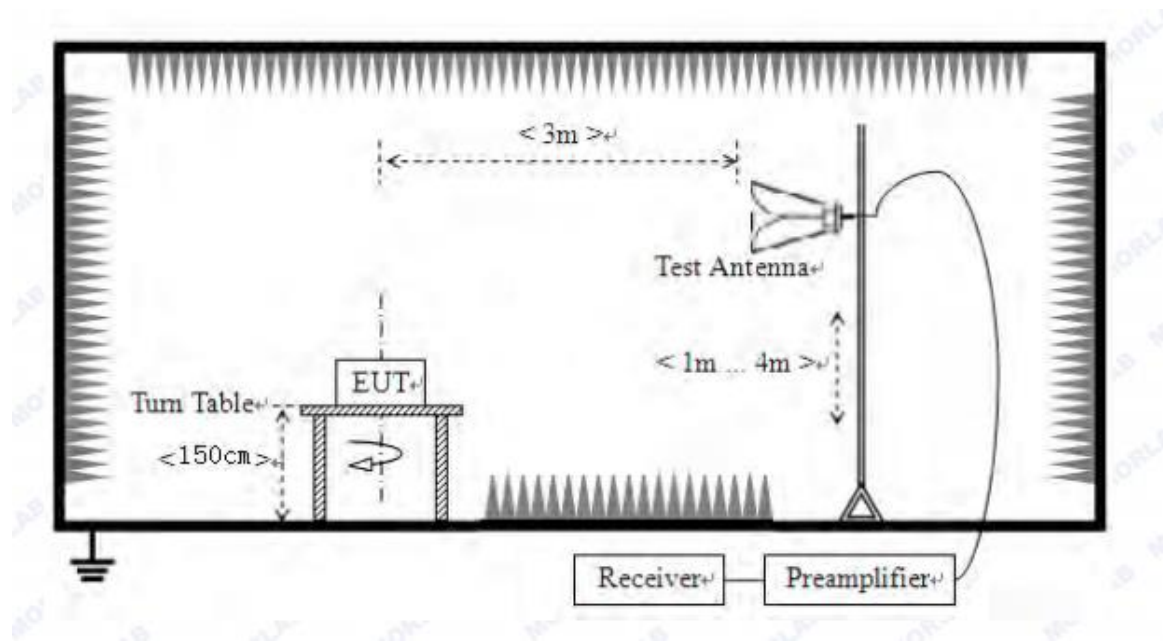
3.3. Test Setup



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 the 10th harmonic from 9 kHz to the EUT.

Detailed information please see the following page.

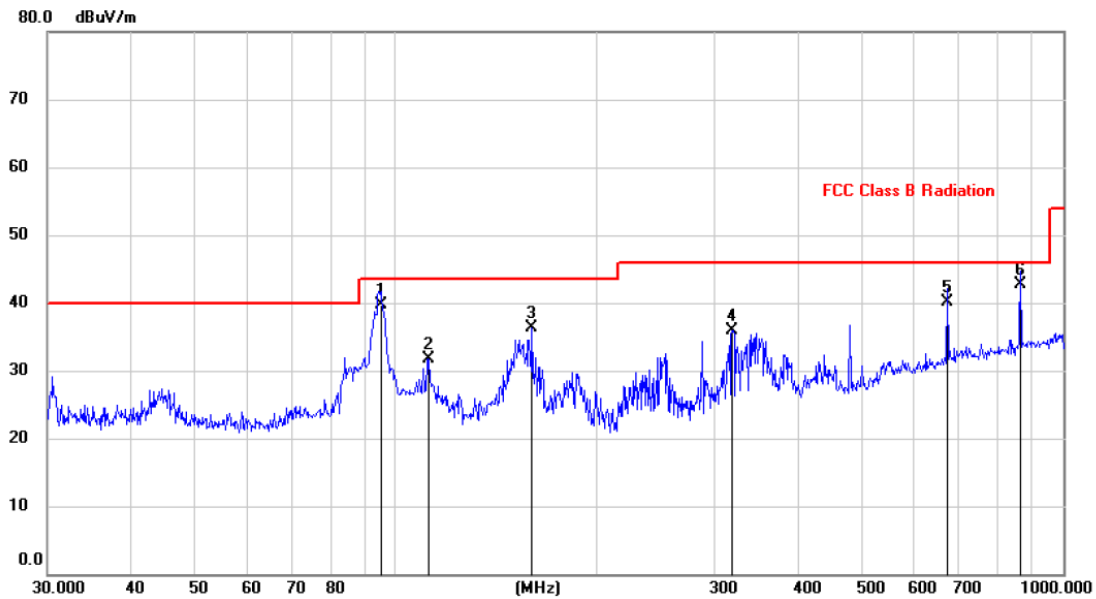
From 9KHz to 30MHz: Conclusion: PASS

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.

Model: Apache 3

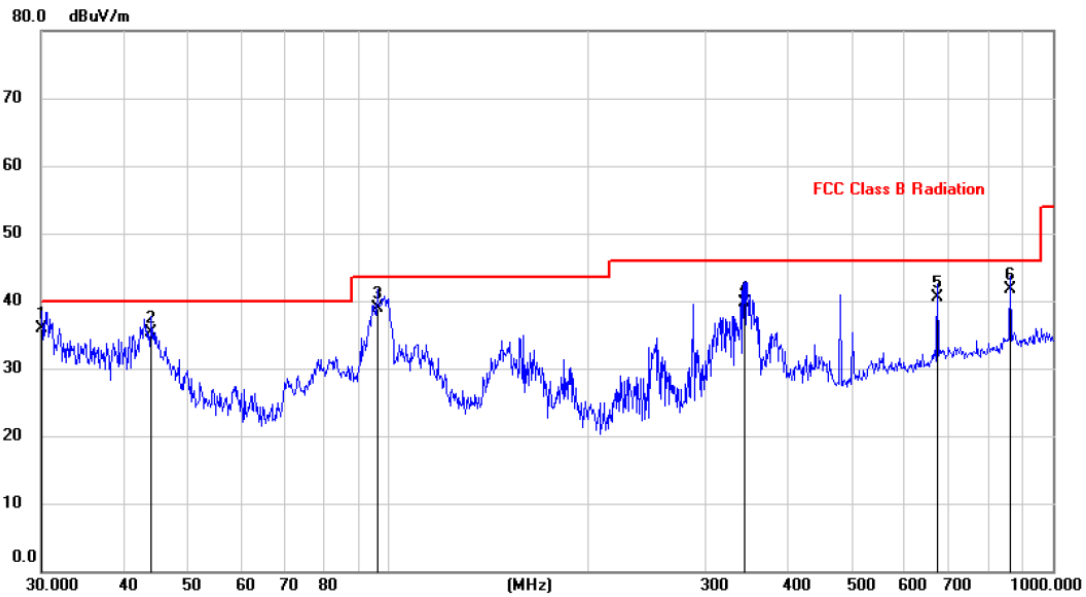
Antenna polarity: Horizontal



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	Antenna	Table	
		MHz	Level	Factor	ment			Height	Degree	
			dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree
1		95.0262	29.24	10.52	39.76	43.50	-3.74	QP		
2		111.7510	19.72	12.04	31.76	43.50	-11.74	peak		
3		159.9900	21.36	15.04	36.40	43.50	-7.10	peak		
4		319.9368	21.37	14.63	36.00	46.00	-10.00	peak		
5		672.0584	18.70	21.35	40.05	46.00	-5.95	QP		
6	*	864.0656	19.10	23.53	42.63	46.00	-3.37	QP		

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

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

Antenna polarity: Vertical

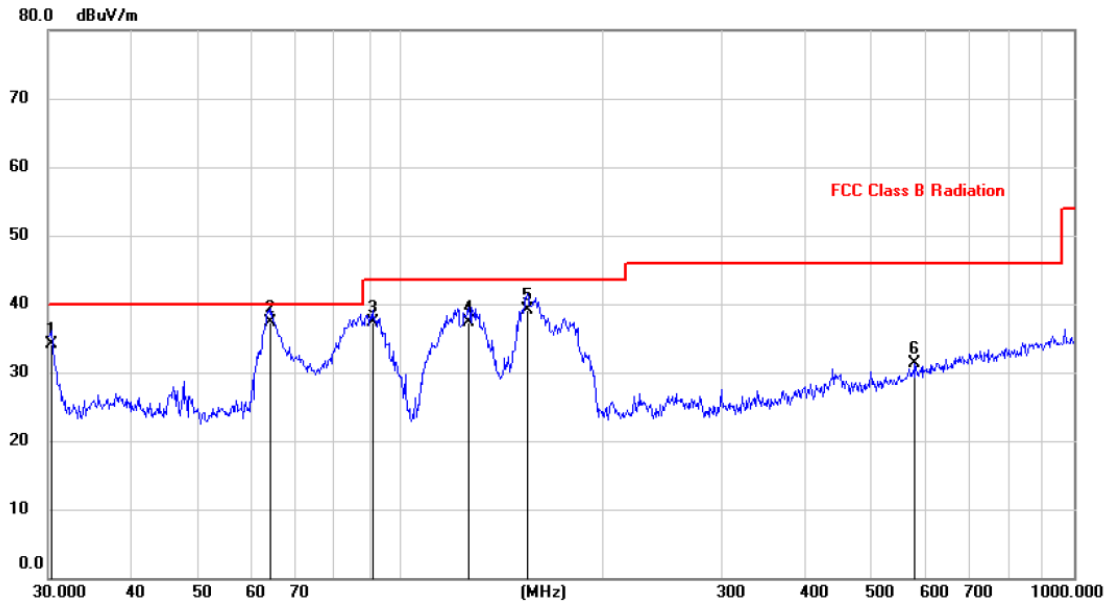
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1	*	30.1722	22.29	13.53	35.82	40.00	-4.18	QP		
2		44.0326	21.14	14.23	35.37	40.00	-4.63	QP		
3		96.1997	28.40	10.56	38.96	43.50	-4.54	QP		
4		344.0232	24.54	15.14	39.68	46.00	-6.32	QP		
5		672.0584	19.09	21.35	40.44	46.00	-5.56	QP		
6		864.0656	18.10	23.53	41.63	46.00	-4.37	QP		

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

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

Notes: Above is below 1GHz test data. This report only shall the worst case mode for TX 2406.5MHz.

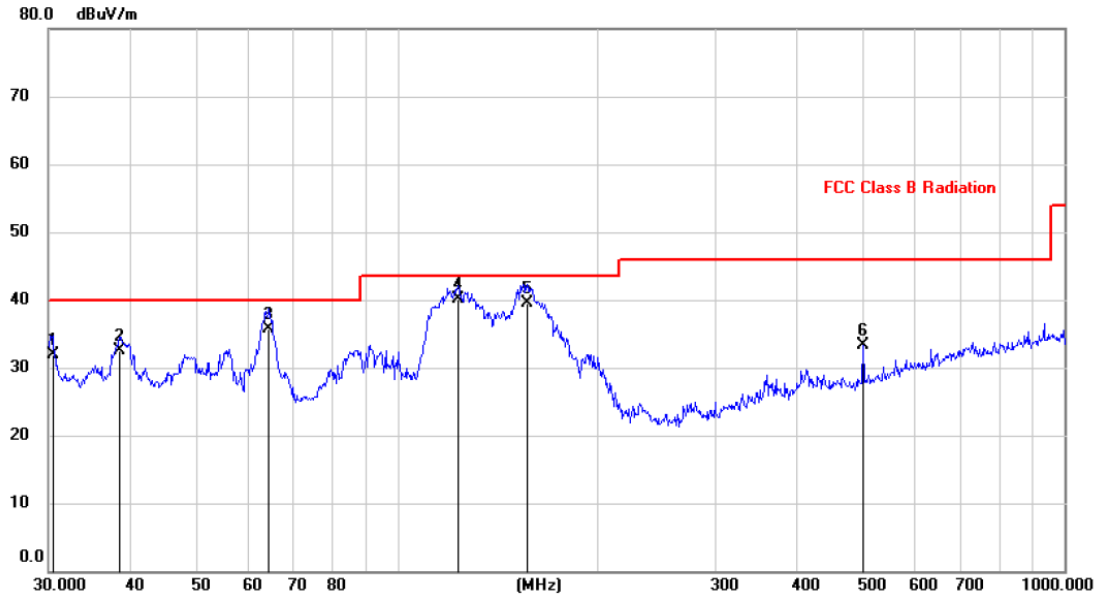
Model: Apache 3 Pro

Antenna polarity: 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		30.3597	20.52	13.54	34.06	40.00	-5.94	QP		
2	*	64.2600	24.81	12.42	37.23	40.00	-2.77	QP		
3		90.9298	27.10	10.18	37.28	43.50	-6.22	QP		
4		126.7278	23.90	13.41	37.31	43.50	-6.19	QP		
5		154.4046	24.14	15.05	39.19	43.50	-4.31	QP		
6		582.7423	11.36	19.88	31.24	46.00	-14.76	peak		

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

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

Antenna polarity: Vertical

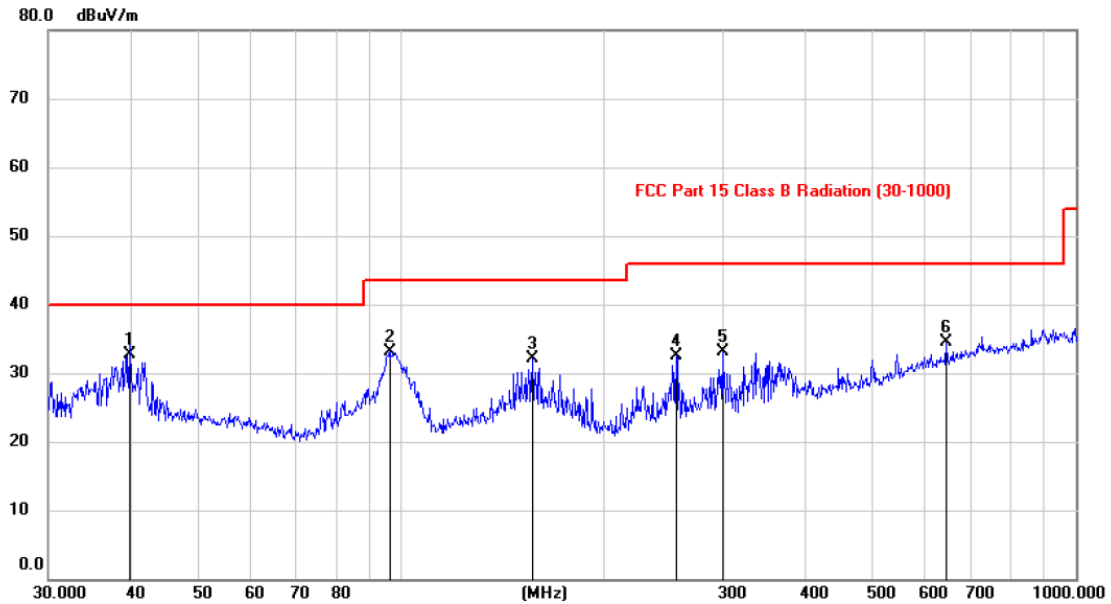
No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	Antenna	Table	
		MHz	Level	Factor	ment			Height	Degree	
			dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		30.4522	18.30	13.55	31.85	40.00	-8.15	QP		
2		38.4537	18.31	14.26	32.57	40.00	-7.43	QP		
3		64.4029	23.33	12.36	35.69	40.00	-4.31	QP		
4	*	123.6260	26.95	13.24	40.19	43.50	-3.31	QP		
5		156.7323	24.47	15.05	39.52	43.50	-3.98	QP		
6		500.0086	15.11	18.21	33.32	46.00	-12.68	peak		

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

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

Notes: Above is below 1GHz test data. This report only shall the worst case mode for TX 2406.5MHz.

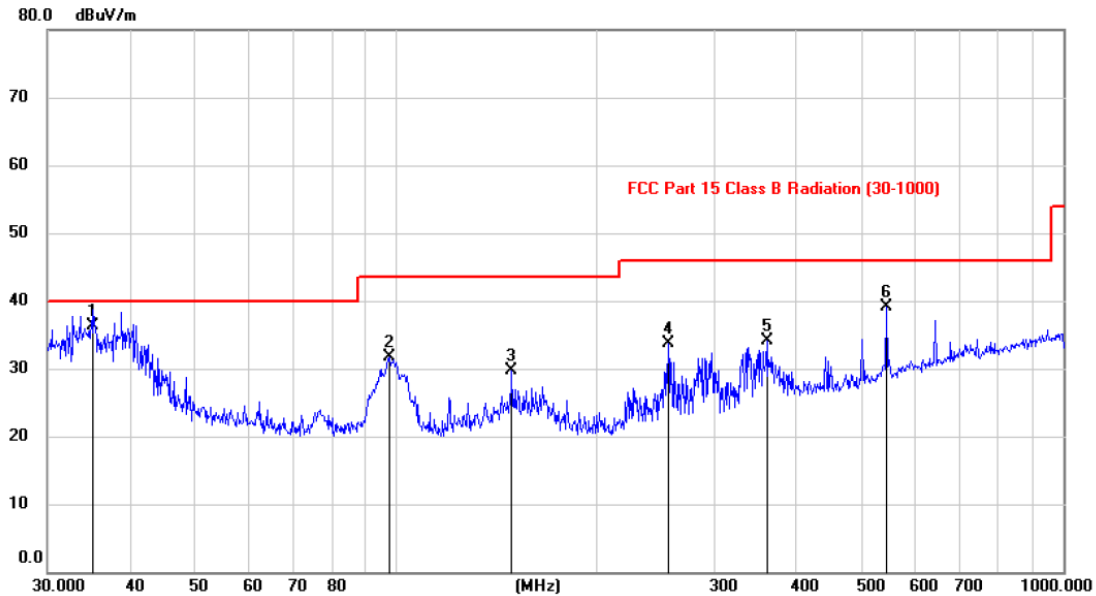
Model: Apache 4

Antenna polarity: Horizontal

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree
1	*	39.5803	18.32	14.47	32.79	40.00	-7.21	QP		
2		96.1209	22.65	10.55	33.20	43.50	-10.30	peak		
3		156.5491	16.97	15.05	32.02	43.50	-11.48	peak		
4		256.5210	19.61	12.90	32.51	46.00	-13.49	peak		
5		299.9812	18.92	14.10	33.02	46.00	-12.98	peak		
6		643.5379	13.47	21.01	34.48	46.00	-11.52	peak		

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

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

Antenna polarity: Vertical

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree
1	*	35.2346	22.55	13.74	36.29	40.00	-3.71	QP		
2		97.7980	20.95	10.69	31.64	43.50	-11.86	peak		
3		148.9970	14.74	14.98	29.72	43.50	-13.78	peak		
4		256.4909	20.87	12.90	33.77	46.00	-12.23	peak		
5		360.1949	18.68	15.43	34.11	46.00	-11.89	peak		
6		544.4818	20.05	19.10	39.15	46.00	-6.85	peak		

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

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

Notes: Above is below 1GHz test data. This report only shall the worst case mode for TX 2406.5MHz.

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
4813	45.38	V	33.95	10.18	34.26	55.25	74	-18.75	PK
4813	37.53	V	33.95	10.18	34.26	47.40	54	-6.60	AV
7220	/	/	/	/	/	/	/	/	/
9626	/	/	/	/	/	/	/	/	/
4813	47.18	H	33.95	10.18	34.26	57.05	74	-16.95	PK
4813	35.57	H	33.95	10.18	34.26	45.44	54	-8.56	AV
7220	/	/	/	/	/	/	/	/	/
9626	/	/	/	/	/	/	/	/	/
Test Mode: TX Mid									
4878	45.82	V	33.93	10.2	34.29	55.66	74	-18.34	PK
4878	32.57	V	33.93	10.2	34.29	42.41	54	-11.59	AV
7317	/	/	/	/	/	/	/	/	/
9756	/	/	/	/	/	/	/	/	/
4878	47.63	H	33.93	10.2	34.29	57.47	74	-16.53	PK
4878	33.42	H	33.93	10.2	34.29	43.26	54	-10.74	AV
7317	/	/	/	/	/	/	/	/	/
9756	/	/	/	/	/	/	/	/	/
Test Mode: TX High									
4953	45.62	V	33.98	10.22	34.25	55.57	74	-18.43	PK
4953	33.87	V	33.98	10.22	34.25	43.82	54	-10.18	AV
7430	/	/	/	/	/	/	/	/	/
9906	/	/	/	/	/	/	/	/	/
4953	48.07	H	33.98	10.22	34.25	58.02	74	-15.98	PK
4953	32.91	H	33.98	10.22	34.25	42.86	54	-11.14	AV
7430	/	/	/	/	/	/	/	/	/
9906	/	/	/	/	/	/	/	/	/

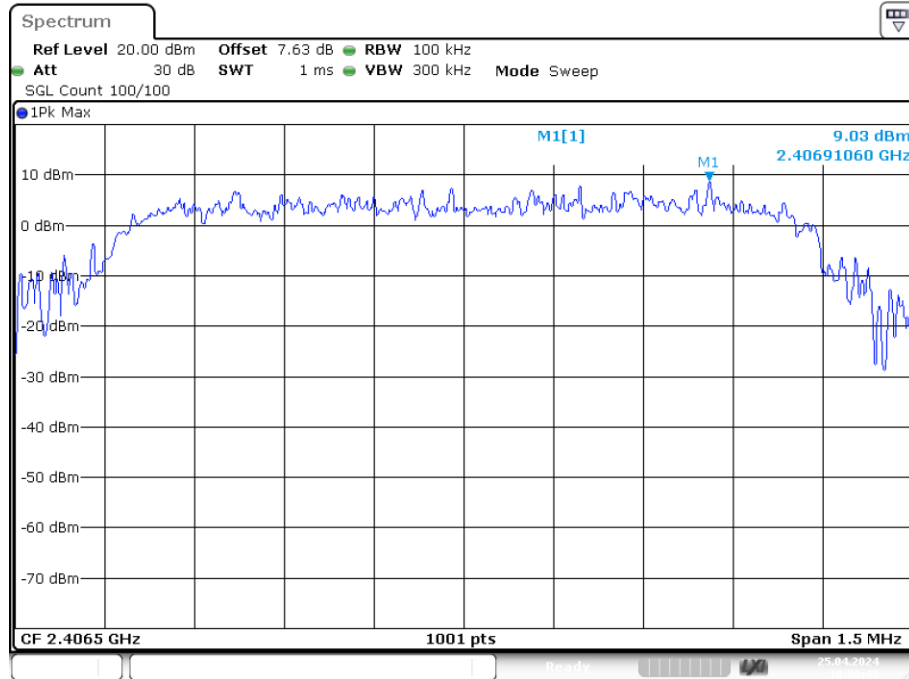
Note:

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.

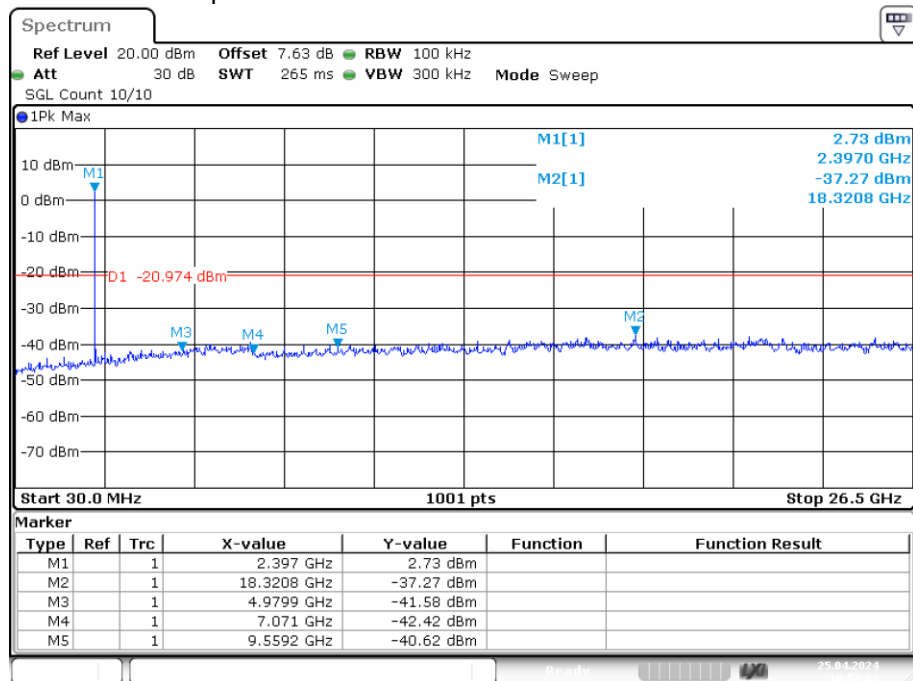
Conducted RF Spurious Emission

Tx. Spurious NVNT GFSK 2406.5MHz Ant1 Ref



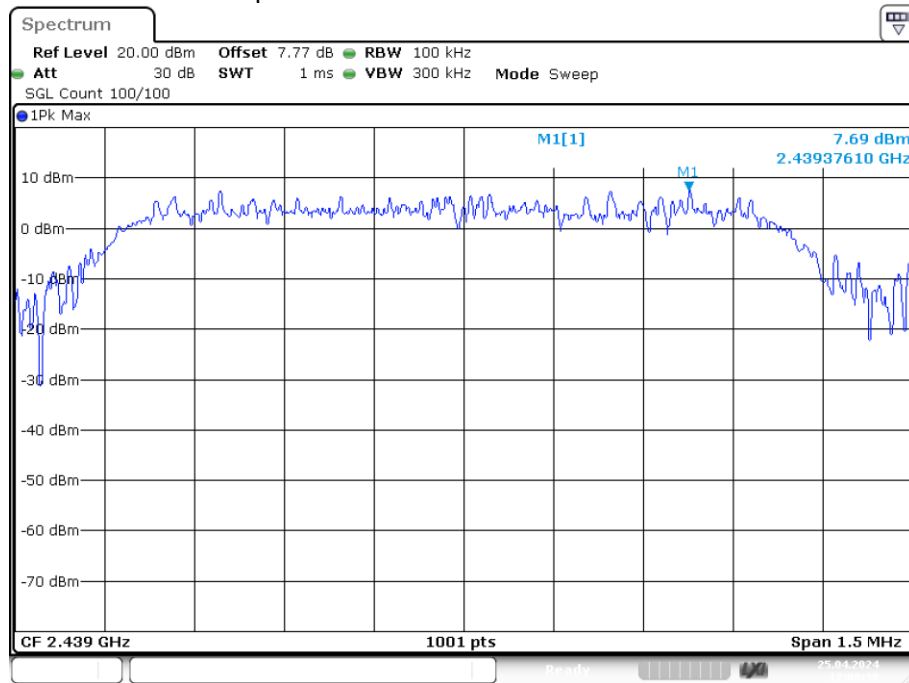
Date: 25.APR.2024 10:56:46

Tx. Spurious NVNT GFSK 2406.5MHz Ant1 Emission



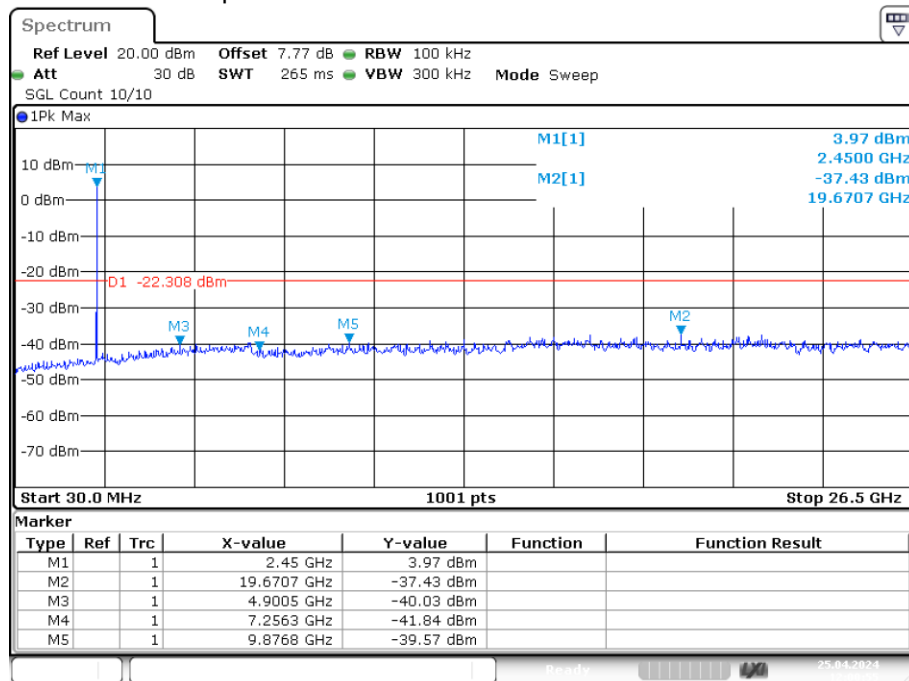
Date: 25.APR.2024 10:57:04

Tx. Spurious NVNT GFSK 2439MHz Ant1 Ref



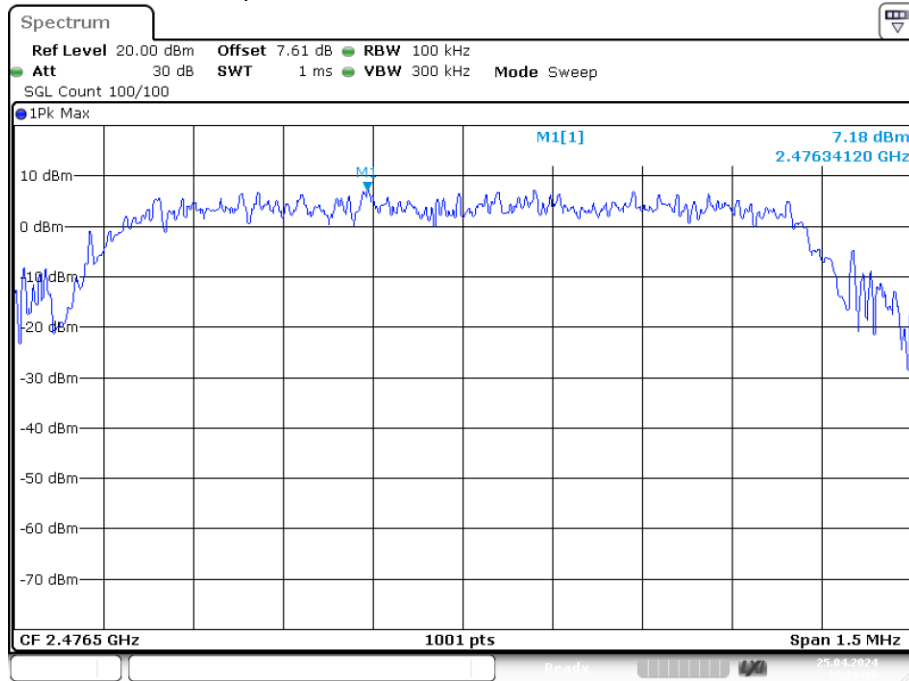
Date: 25.APR.2024 12:00:37

Tx. Spurious NVNT GFSK 2439MHz Ant1 Emission



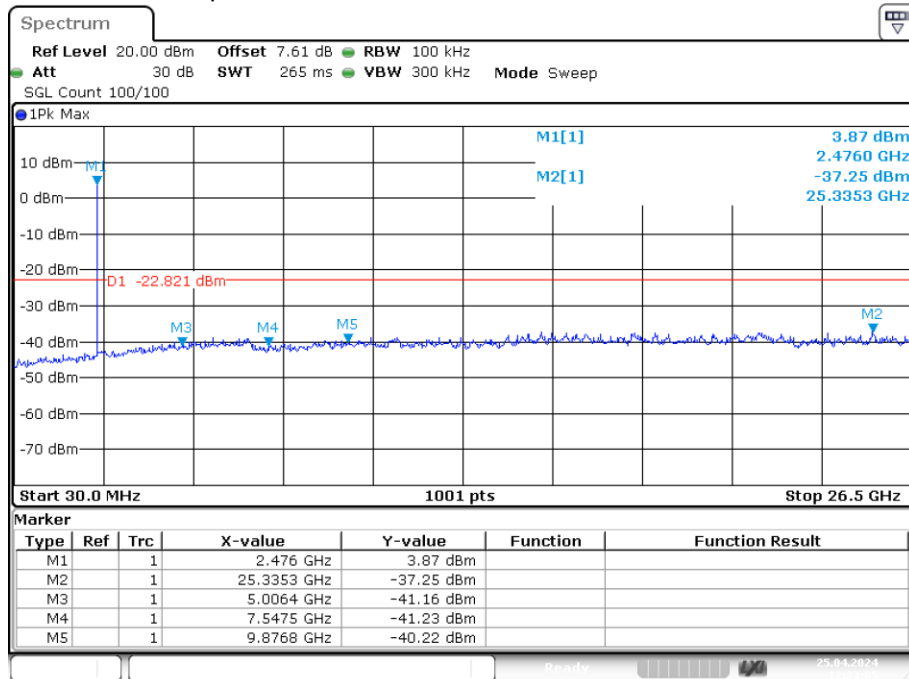
Date: 25.APR.2024 12:00:55

Tx. Spurious NVNT GFSK 2476.5MHz Ant1 Ref



Date: 25.APR.2024 12:20:26

Tx. Spurious NVNT GFSK 2476.5MHz Ant1 Emission



Date: 25.APR.2024 12:23:05

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.

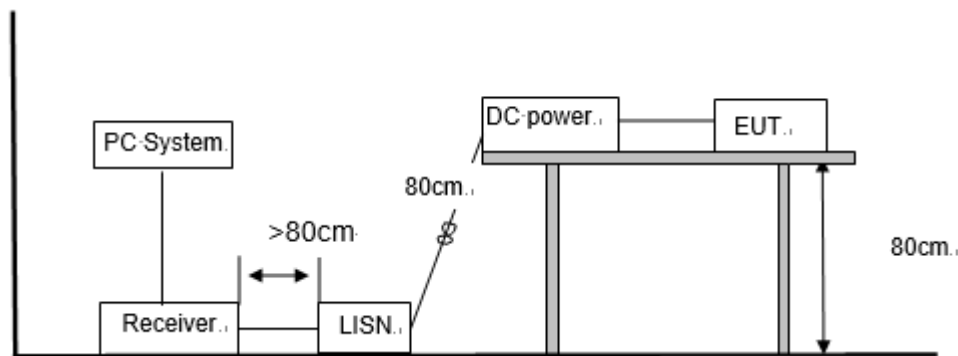
3. The limit decreases in line with the logarithm of the frequency in rang of 0.15 to 0.50 MHz.

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

Not applicable for equipment operated with battery.

5. CONDUCTED MAXIMUM OUTPUT POWER

5.1. Test limits

Please refer section RSS-247 & 15.247.

5.2. Test Procedure

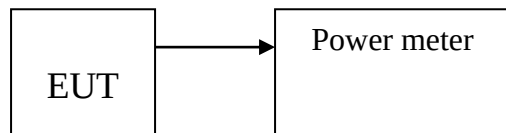
Details see the KDB 558074 D01 15.247 Meas Guidance v05r02

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

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	EIRP (dBm)	Limit (dBm)	Verdict
NVNT	GFSK	2406.5	Ant1	12.148	18.388	29.76	Pass
NVNT	GFSK	2439	Ant1	11.468	17.708	29.76	Pass
NVNT	GFSK	2476.5	Ant1	10.853	17.093	29.76	Pass

Note: 1. Directional gain=6.24dBi, so the Conducted Power Limit need to reduce 0.24.

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 KDB 558074 D01 15.247 Meas Guidance v05r02

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

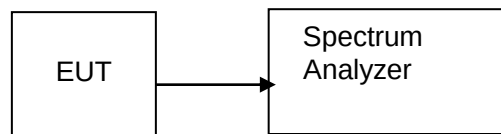
6.2.2 Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

6.2.3 Set the spectrum analyzer as $RBW = 3\text{kHz}$ (Set the RBW to: $3\text{ kHz} \leq RBW \leq 100\text{ kHz}$.), $VBW = 10\text{kHz}$ (Set the $VBW \geq 3 \times RBW$), $\text{span} = 1.5 \times \text{DTS bandwidth}$., 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



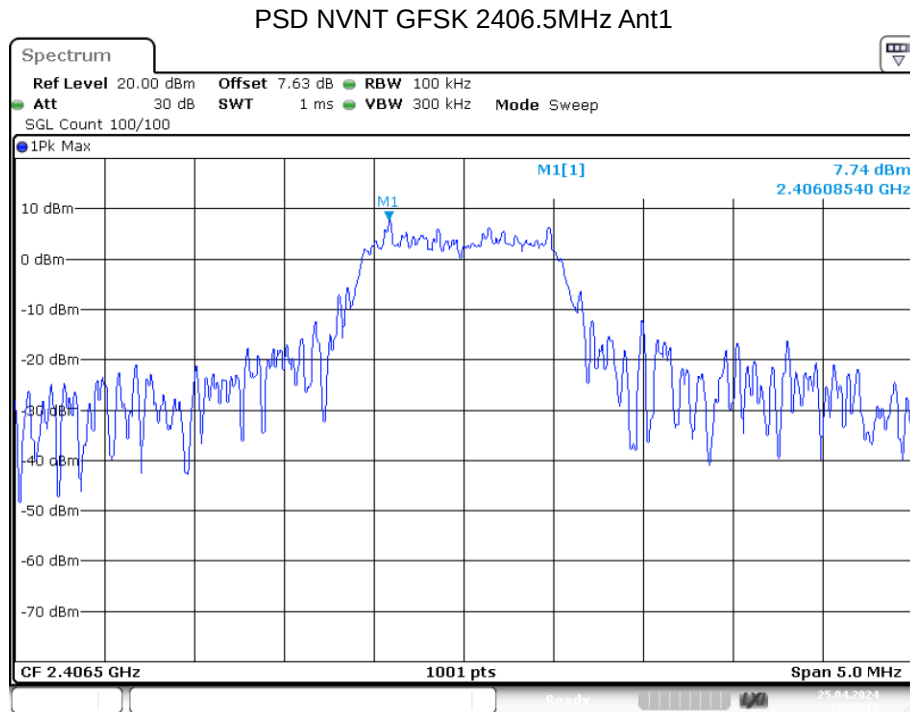
6.4. Test Results

Pass

The test results are listed in next pages.

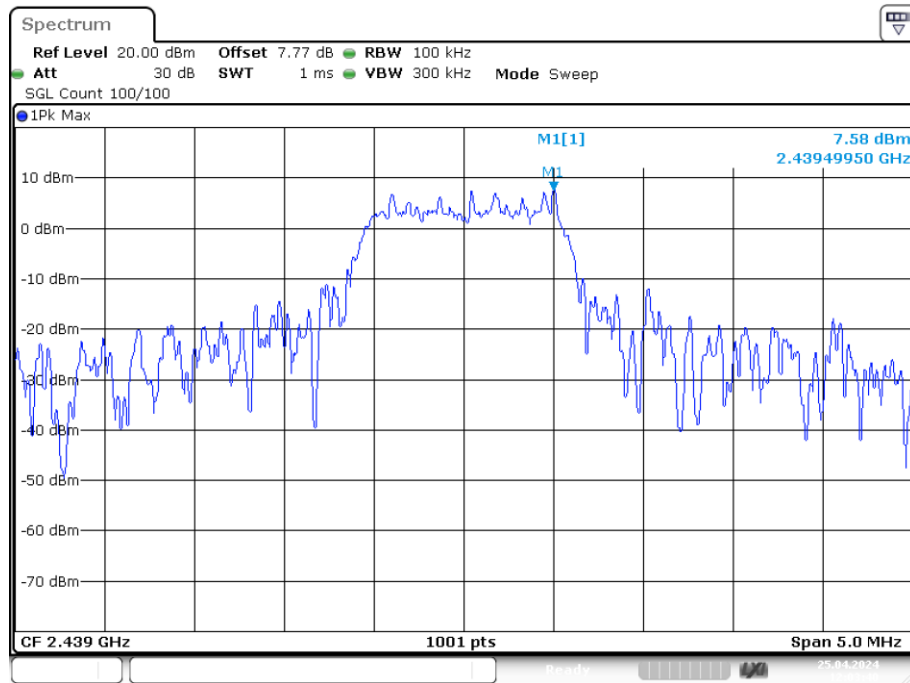
Condition	Mode	Frequency (MHz)	Antenna	Conducted PSD (dBm)	Limit (dBm)	Verdict
NVNT	GFSK	2406.5	Ant1	7.74	7.76	Pass
NVNT	GFSK	2439	Ant1	7.576	7.76	Pass
NVNT	GFSK	2476.5	Ant1	7.247	7.76	Pass

Note: 1. Directional gain=6.24dBi, so the Conducted Power Limit need to reduce 0.24.



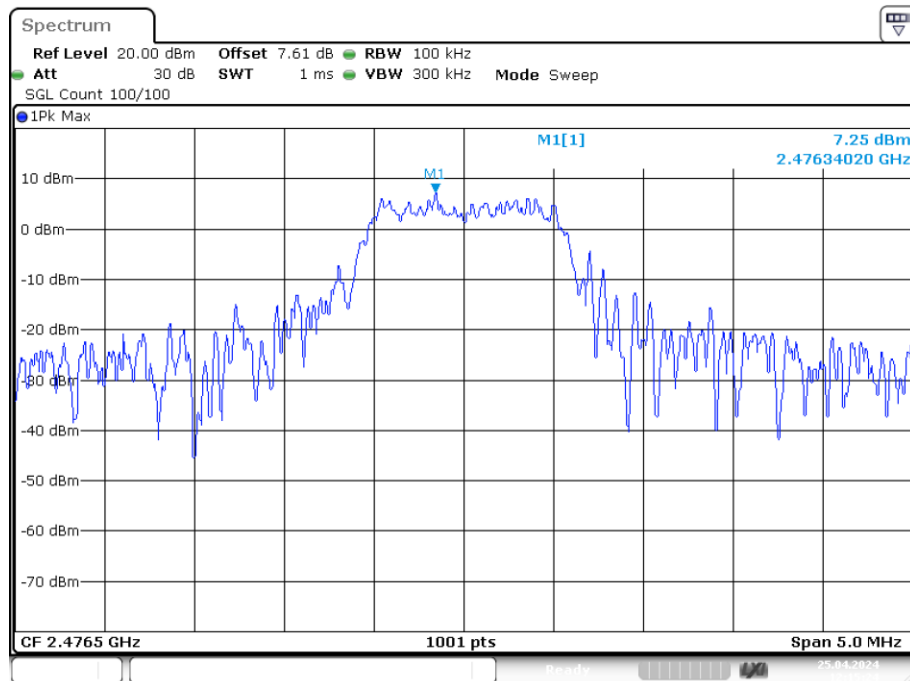
Date: 25.APR.2024 12:27:10

PSD NVNT GFSK 2439MHz Ant1



Date: 25.APR.2024 12:03:40

PSD NVNT GFSK 2476.5MHz Ant1



Date: 25.APR.2024 12:15:24

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.

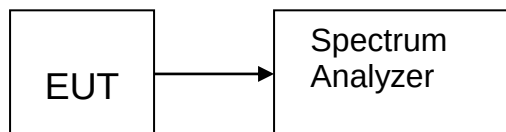
7.2. Test Procedure

Details see the KDB 558074 D01 15.247 Meas Guidance v05r02

a) The bandwidth is measured at an amplitude level reduced 20dB 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 = 100kHz, VBW $\geq$ 3*RBW =300kHz, sweep time set auto, detail see the test plot.

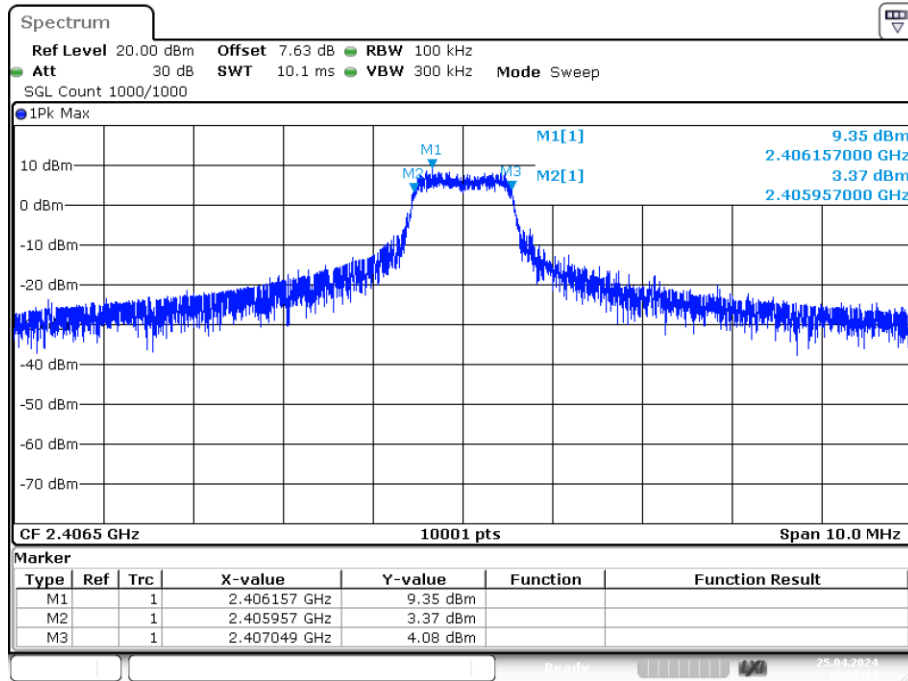
7.3. Test Setup



7.4. Test Results

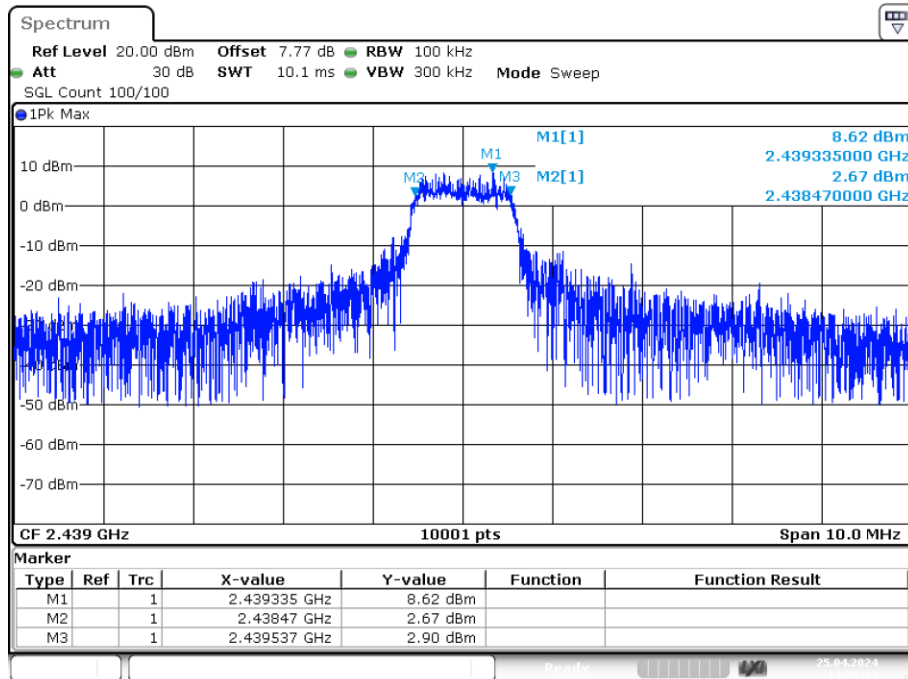
Condition	Mode	Frequency (MHz)	Antenna	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	GFSK	2406.5	Ant1	1.092	0.5	Pass
NVNT	GFSK	2439	Ant1	1.067	0.5	Pass
NVNT	GFSK	2476.5	Ant1	1.057	0.5	Pass

-6dB Bandwidth NVNT GFSK 2406.5MHz Ant1



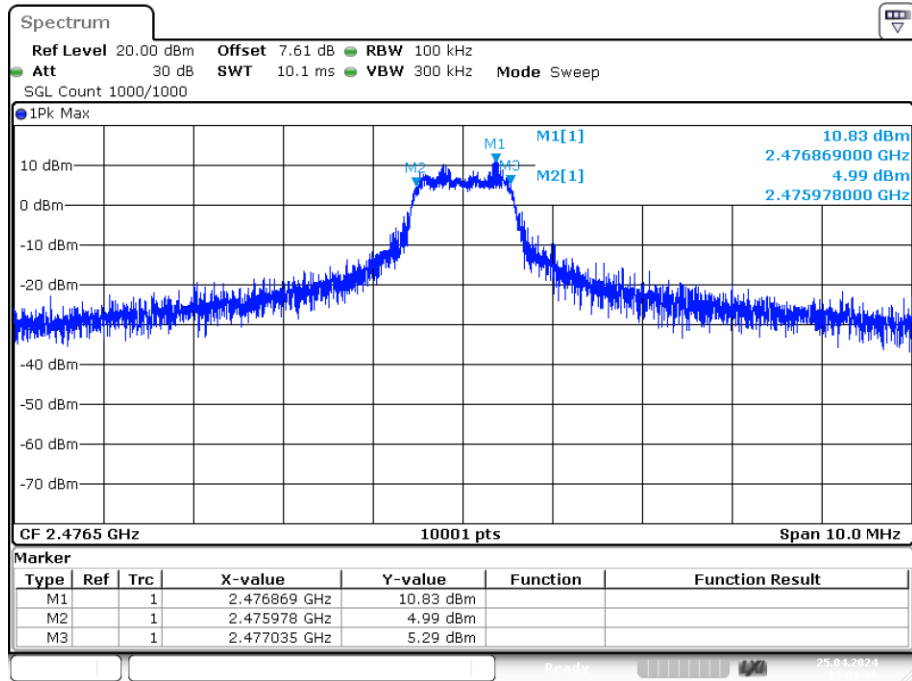
Date: 25.APR.2024 12:26:44

-6dB Bandwidth NVNT GFSK 2439MHz Ant1



Date: 25.APR.2024 11:59:23

-6dB Bandwidth NVNT GFSK 2476.5MHz Ant1

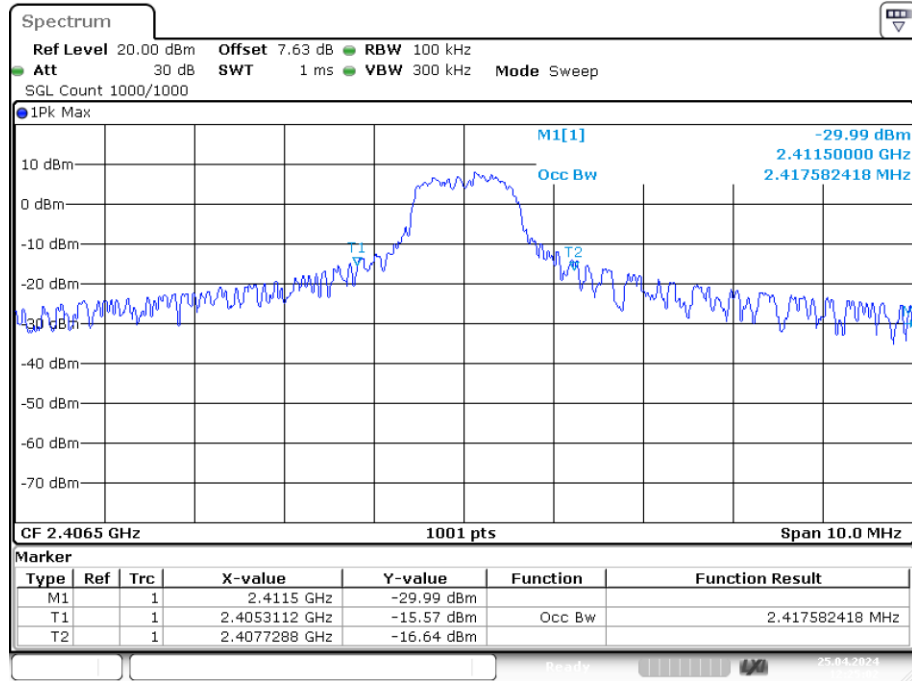


Date: 25.APR.2024 12:09:06

Occupied Channel Bandwidth

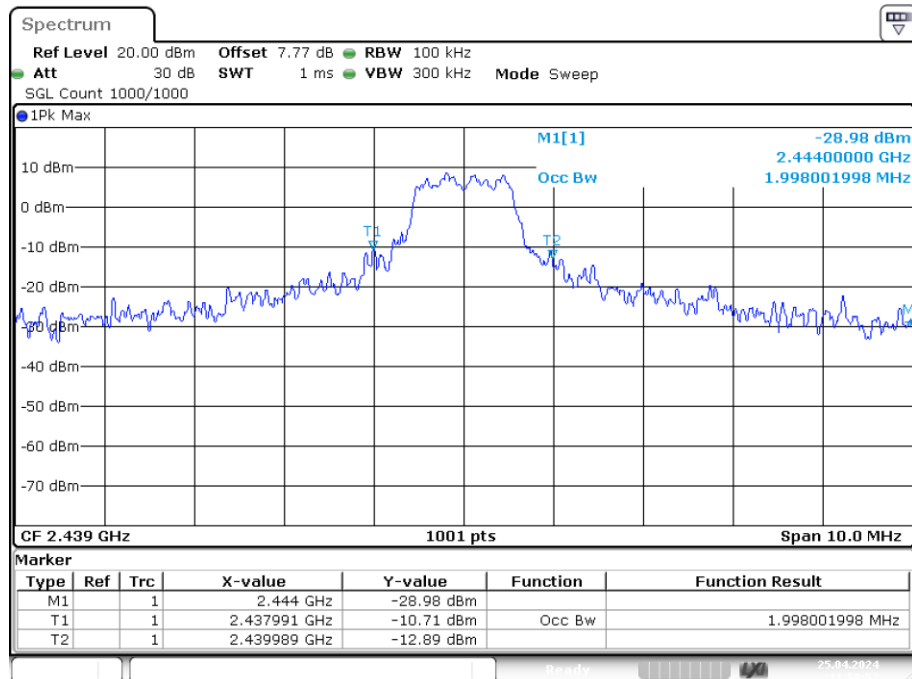
Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)
NVNT	GFSK	2406.5	Ant1	2.418
NVNT	GFSK	2439	Ant1	1.998
NVNT	GFSK	2476.5	Ant1	1.449

OBW NVNT GFSK 2406.5MHz Ant1



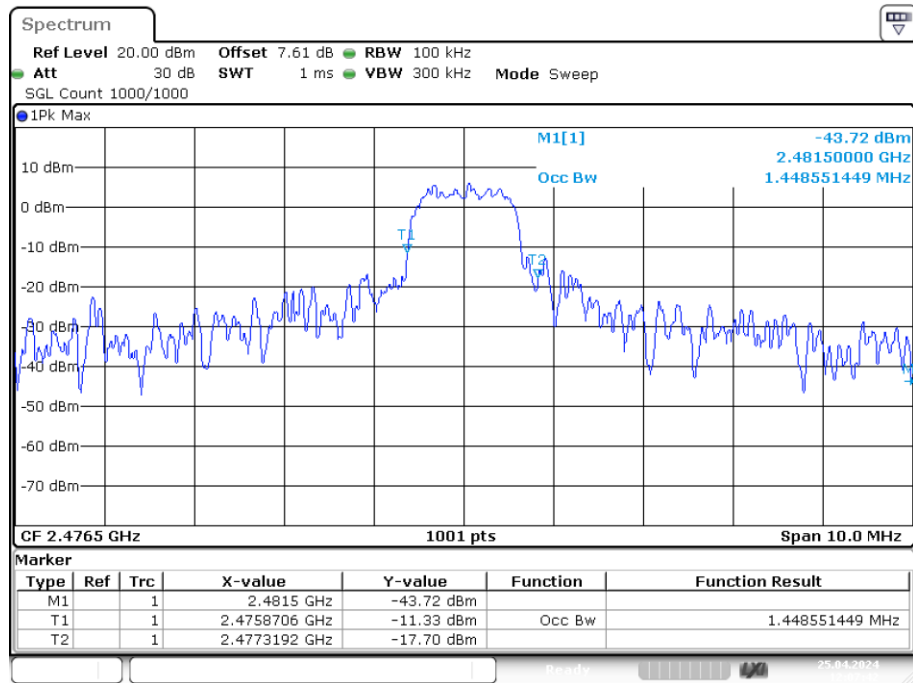
Date: 25.APR.2024 12:25:01

OBW NVNT GFSK 2439MHz Ant1



Date: 25.APR.2024 11:58:51

OBW NVNT GFSK 2476.5MHz Ant1



Date: 25.APR.2024 12:07:42

8. BAND EDGE CHECK

8.1. Test limits

Please refer section RSS-GEN&15.247.

8.2. Test Procedure

Details see the KDB 558074 D01 15.247 Meas Guidance v05r02

8.2.1 Put the EUT on a 0.8m high table, power on the EUT. Emissions were scanned and measured rotating the EUT to 360 degrees, Find the maximum Emission

8.2.2 Check the spurious emissions out of band.

8.2.3 RBW 1MHz, VBW 3MHz, peak detector for peak value, RBW 1MHz, VBW 3MHz, RMS detector for AV value.

8.3. Test Setup

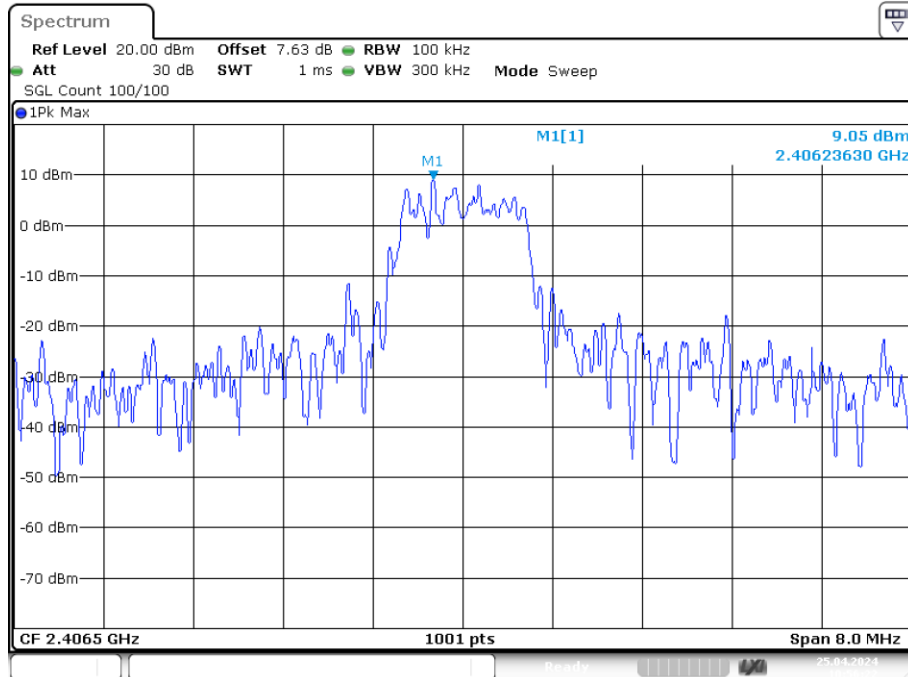
Same as 5.2.2.

8.4. Test Results

Pass

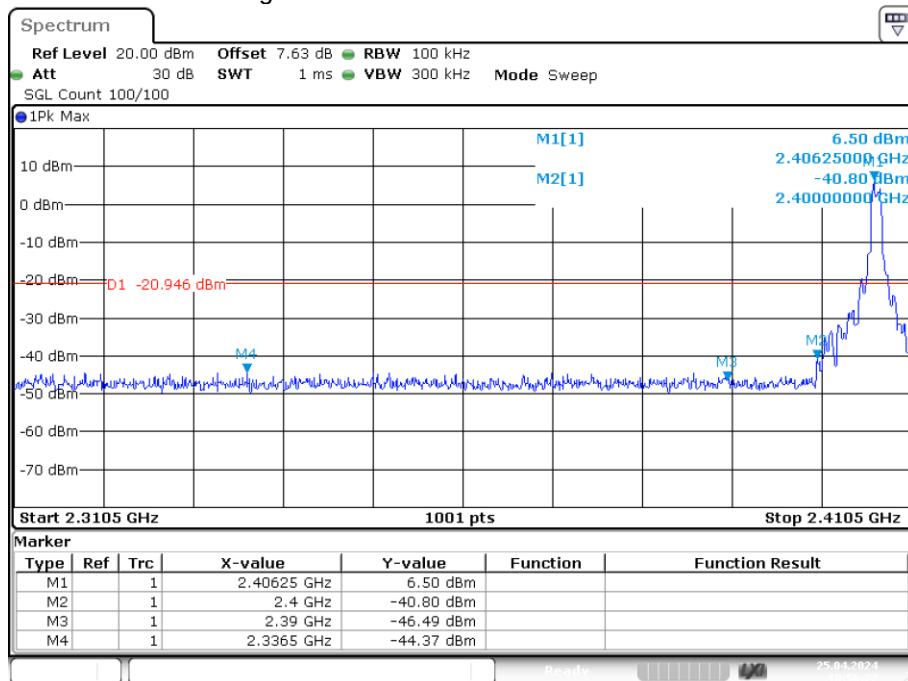
The test results are listed in next pages.

Band Edge NVNT GFSK 2406.5MHz Ant1 Ref



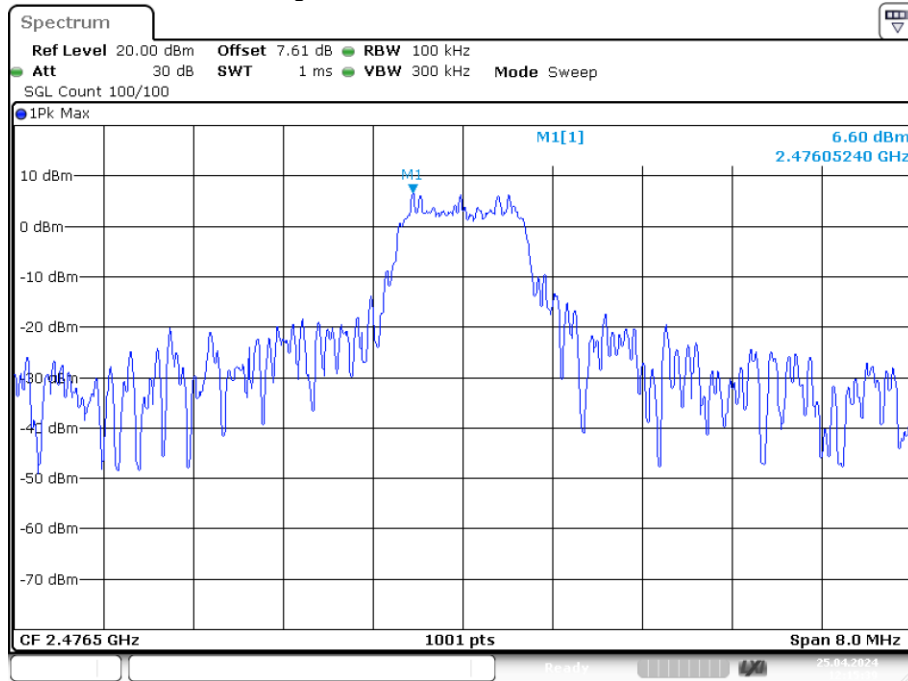
Date: 25.APR.2024 10:56:23

Band Edge NVNT GFSK 2406.5MHz Ant1 Emission



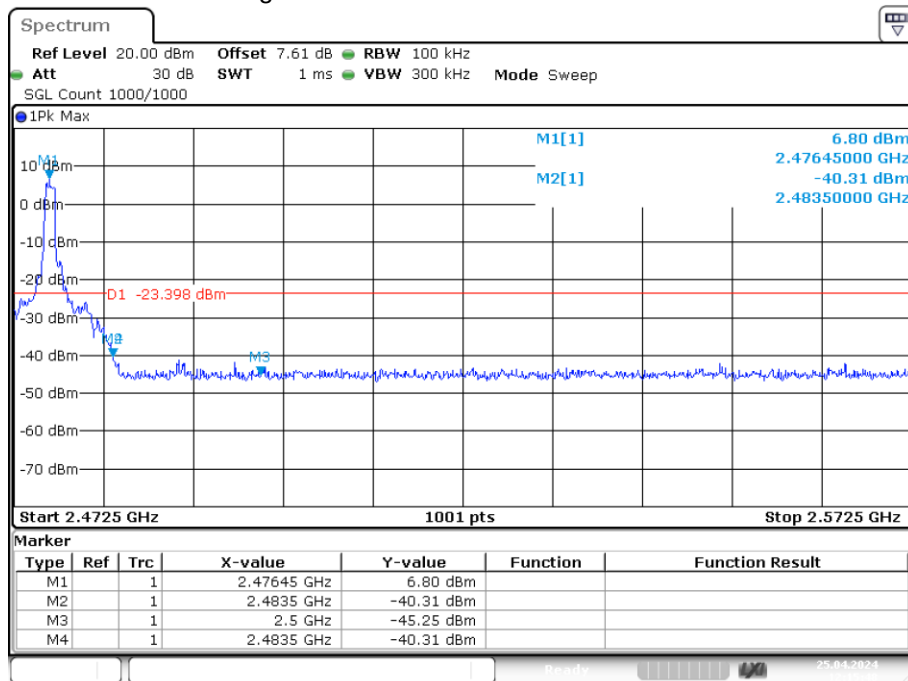
Date: 25.APR.2024 10:56:27

Band Edge NVNT GFSK 2476.5MHz Ant1 Ref



Date: 25.APR.2024 12:15:39

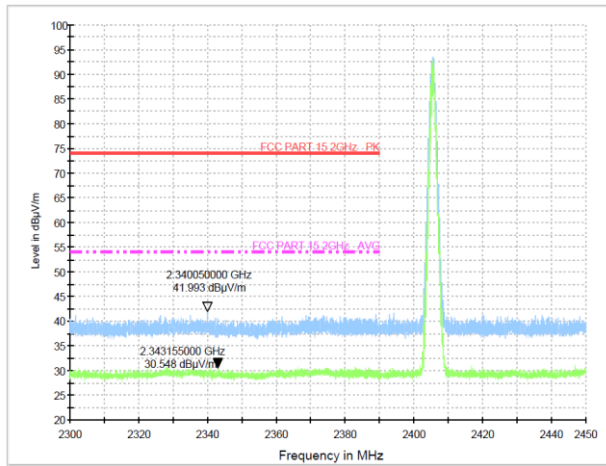
Band Edge NVNT GFSK 2476.5MHz Ant1 Emission



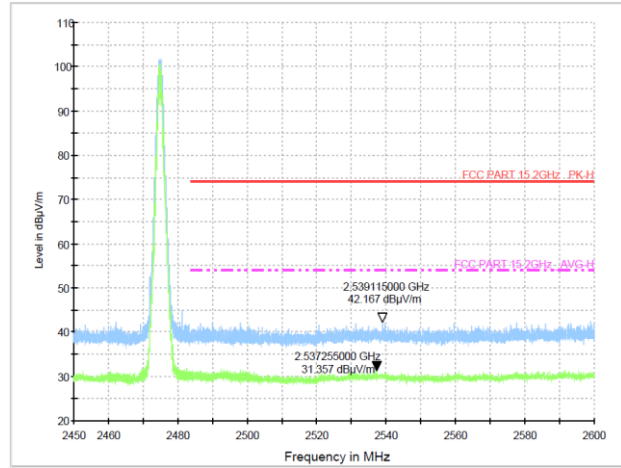
Date: 25.APR.2024 12:15:48

Radiated Method: GFSK

Test Mode: CH-L



Test Mode: CH-H



9. ANTENNA REQUIREMENT

9.1. Standard Requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

9.2. Antenna Connected Construction

The antenna is internal antenna and no consideration of replacement. Please see EUT photo for details.

9.3. Results

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

10. TEST SETUP PHOTO

10.1. Photo of Radiated Emission test

Model: Apache 3

Radiated Emission



Model: Apache 3 Pro
Radiated Emission



Model: Apache 4

Radiated Emission



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