



FCC TEST REPORT

FCC ID: PADWF140

On Behalf of

Wahoo Fitness L.L.C

ELEMNT RIVAL

Model No.: WF140

Prepared for : Wahoo Fitness L.L.C
Address : 90 W Wieuca Road #110 Atlanta, GA 30342, United States

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 : A2002059-C03-R08
Date of Receipt : July 2, 2020
Date of Test : July 2-8, 2020
Date of Report : July 8, 2020
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	8
2.7. Test Facility	9
2.8. Measurement Uncertainty	9
2.9. Test Equipment List	10
3. Spurious Emission	11
3.1. Test Limits	11
3.2. Test Procedure	11
3.3. Test Setup	12
3.4. Test Results	13
4. Power Line Conducted Emission	16
4.1. Test Limits	16
4.2. Test Procedure	16
4.3. Test Setup	16
4.4. Test Results	17
5. Conducted Maximum Output Power	18
5.1. Test limits	18
5.2. Test Procedure	18
5.3. Test Setup	18
5.4. Test Results	18
6. Peak Power Spectral Density	19
6.1. Test limits	19
6.2. Test Procedure	19
6.3. Test Setup	19
6.4. Test Results	19
7. Bandwidth	21
7.1. Test limits	21
7.2. Test Procedure	21
7.3. Test Setup	21
7.4. Test Results	21
8. Band Edge Check	25
8.1. Test limits	25
8.2. Test Procedure	25
8.3. Test Setup	25
8.4. Test Results	25
9. Antenna Requirement	28
9.1. Standard Requirement	28
9.2. Antenna Connected Construction	28

9.3. Results	28
10. Test Setup Photo	29
11. EUT photo	30

TEST REPORT DECLARATION

Applicant : Wahoo Fitness L.L.C
Address : 90 W Wieuca Road #110 Atlanta, GA 30342, United States
Manufacturer : USI Electronics (ShenZhen) Co., Ltd.
Address : USI Electronics Park, 9028 BeiHuan Boulevard, North of High-Tech Industrial Park,
Xili, Nanshan District, ShenZhen City, GuangDong Province, P.R. China
EUT Description : ELEMNT RIVAL
(A) Model No. : WF140
(B) Trademark : N/A

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.....

July 8, 2020

Revision History

Revision	Issue Date	Revisions	Revised By
V0	July 8, 2020	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	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.		

2. General Information

2.1. Description of Device (EUT)

EUT : ELEMNT RIVAL

Trade Name : N/A

Model No. WF140

DIFF : N/A

Power supply : DC 3.8V by battery, DC 5V from USB

Bluetooth

Radio Technology : Bluetooth V4.0 LE

Operation frequency : 2402MHz -2480MHz

Modulation : GFSK

Antenna Type : Internal Antenna, max gain -0.52dBi

2.2.Accessories of Device (EUT)

Accessories1 : /
 Manufacturer : /
 Model : /
 Remark : /

2.3.Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number	Certification or SDOC
1	Notebook	ACER	ZQT	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 :CH0	2402
	Middle: CH19	2440
	High: CH39	2480

2.6.Test Conditions

Items	Required	Actual
Temperature range:	15-35℃	24℃
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 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	2019.09.05	1Year
Spectrum analyzer	Agilent	N9020A	MY499100060	2019.09.05	1Year
Receiver	ROHDE&SCHWARZ	ESR	1316.3003K03-10208 2-Wa	2019.09.06	1Year
Receiver	R&S	ESCI	101165	2019.09.05	1Year
Bilog Antenna	Schwarzbeck	VULB 9168	VULB9168-438	2019.09.07	2Year
Horn Antenna	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D(1201)	2019.04.12	2Year
Active Loop Antenna	SCHWARZBECK	FMZB 1519B	00059	2019.09.07	2Year
Cable	Resenberger	N/A	No.1	2019.09.05	1Year
Cable	Resenberger	N/A	No.2	2019.09.05	1Year
Cable	Resenberger	N/A	No.3	2019.09.05	1Year
Pre-amplifier	HP	HP8347A	2834A00455	2019.09.05	1Year
Pre-amplifier	Agilent	8449B	3008A02664	2019.09.05	1Year
L.I.S.N.#1	Schwarzbeck	NSLK8126	8126466	2019.09.05	1Year
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	101043	2019.09.05	1 Year
20db Attenuator	ICPROBING	IATS1	82347	2019.08.26	1 Year
Horn Antenna	SCHWARZBECK	BBHA9170	00946	2019.09.07	2 Year
Preamplifier	SKET	LNPA_1840-50	SK2018101801	2019.09.06	1 Year
Power Meter	Agilent	E9300A	MY41496625	2019.09.06	1 Year
Temp. & Humid. Chamber	Wei Huang	WHTH-1000-40-8 80	100631	2019.09.06	1 Year
Switching Mode Power Supply	JUNKE	JK12010S	20140927-6	2019.09.05	1 Year

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) $\text{Emission Level(dB uV/m)} = 20 \log \text{Emission Level(uv/m)}$

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 above 1GHz testing, The table was rotated 360 degrees to determine the position of the highest radiation

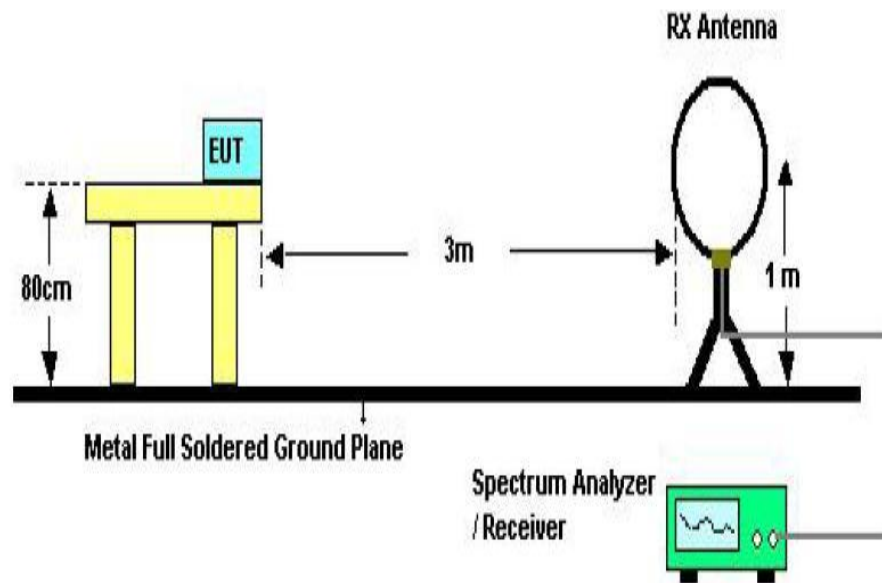
The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set of make measurement.

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

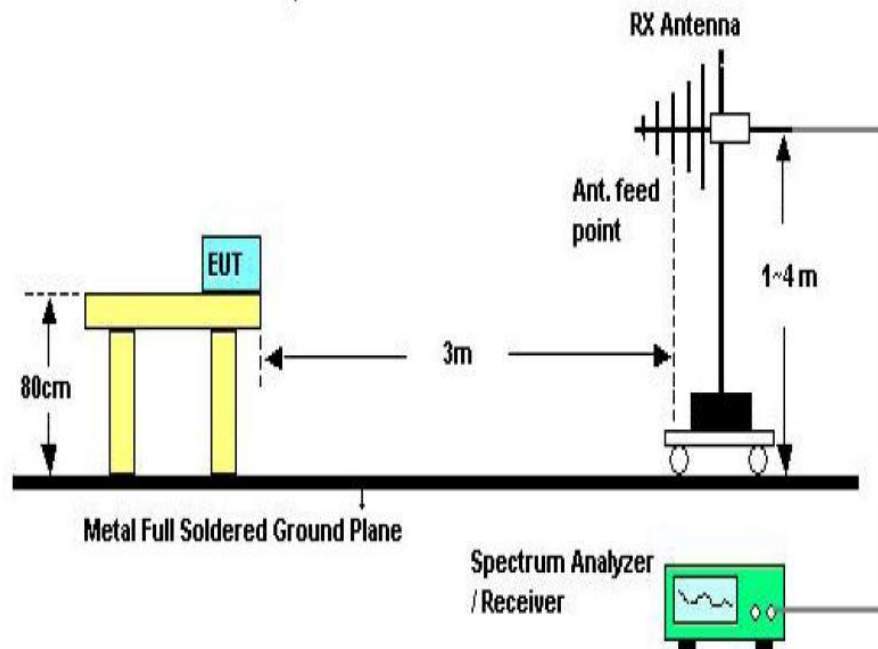
If Peak value comply with QP limit Below 1GHz. The EUT deemed to comply with QP limit. But the Peak value and average value both need to comply with applicable limit above 1GHz.

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

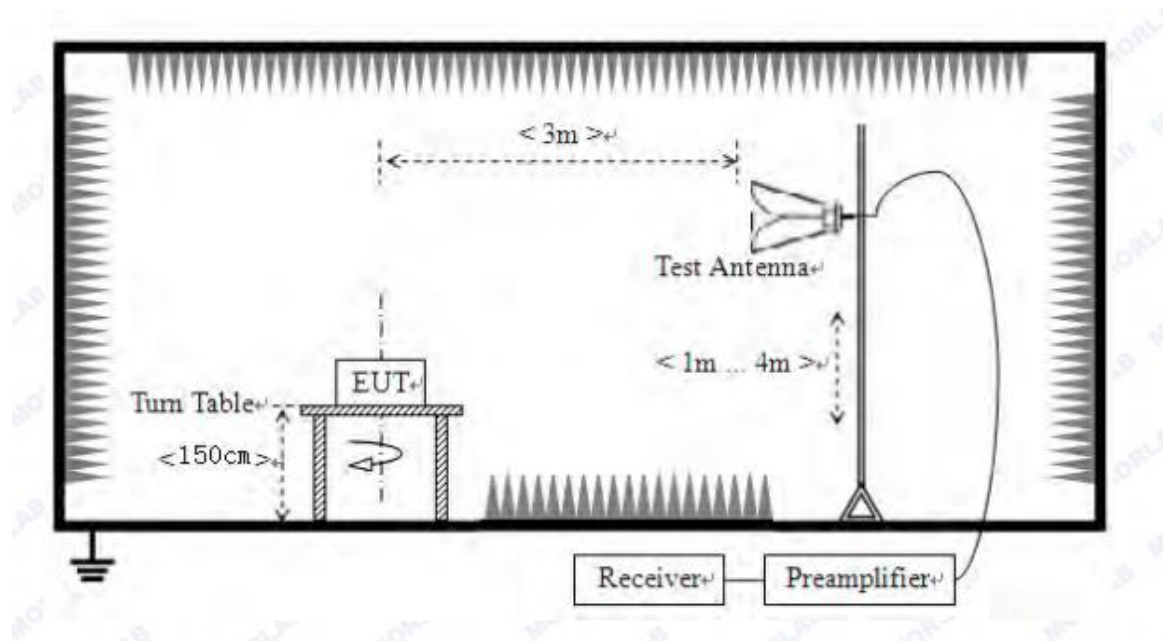
3.3. Test Setup



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.

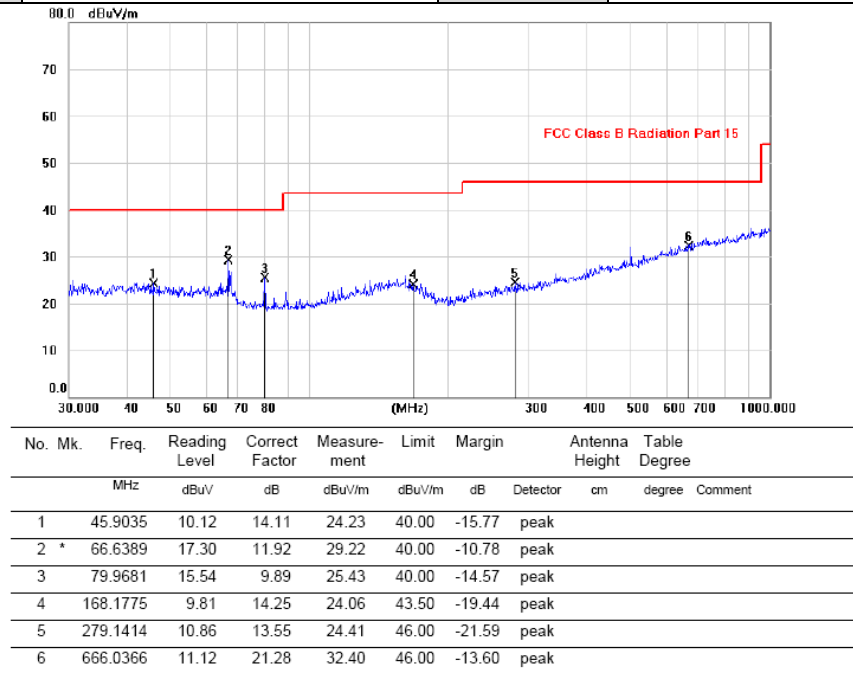
Detailed information please see the following page.

From 9KHz to 30MHz: Conclusion: PASS

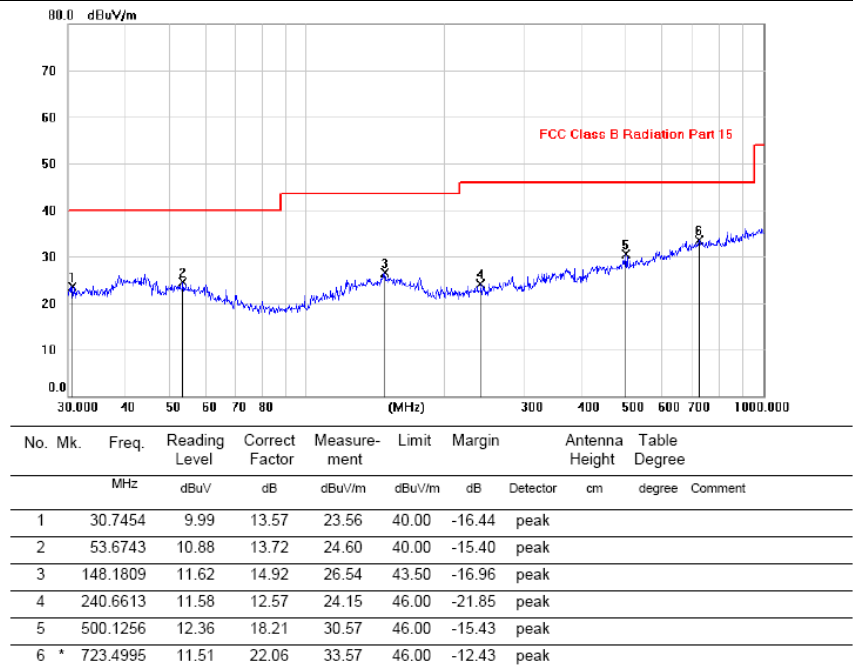
Note: 1. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

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

Temperature	24°C	Humidity	56%
Pol	Vertical	Test mode	BLE 2402MHz
Test Voltage	DC 3.8V		



Pol	Horizontal
------------	------------



Notes: Above is below 1GHz test data. This report only show the worst case mode for TX 2402MHz

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	41.85	V	33.98	10.22	34.25	51.80	74	22.20	PK
4804	32.62	V	33.98	10.22	34.25	42.57	54	11.43	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
4804	42.24	H	33.98	10.22	34.25	52.19	74	21.81	PK
4804	31.86	H	33.98	10.22	34.25	41.81	54	12.19	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
Test Mode: TX Mid									
4880	41.75	V	33.98	10.22	34.25	51.70	74	22.30	PK
4880	32.59	V	33.98	10.22	34.25	42.54	54	11.46	AV
7320	/	/	/	/	/	/	/	/	/
9760	/	/	/	/	/	/	/	/	/
4880	42.79	H	33.98	10.22	34.25	52.74	74	21.26	PK
4880	31.50	H	33.98	10.22	34.25	41.45	54	12.55	AV
7320	/	/	/	/	/	/	/	/	/
9760	/	/	/	/	/	/	/	/	/
Test Mode: TX High									
4960	42.22	V	33.98	10.22	34.25	52.17	74	21.83	PK
4960	32.77	V	33.98	10.22	34.25	42.72	54	11.28	AV
7440	/	/	/	/	/	/	/	/	/
9920	/	/	/	/	/	/	/	/	/
4960	42.64	H	33.98	10.22	34.25	52.59	74	21.41	PK
4960	31.63	H	33.98	10.22	34.25	41.58	54	12.42	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.

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

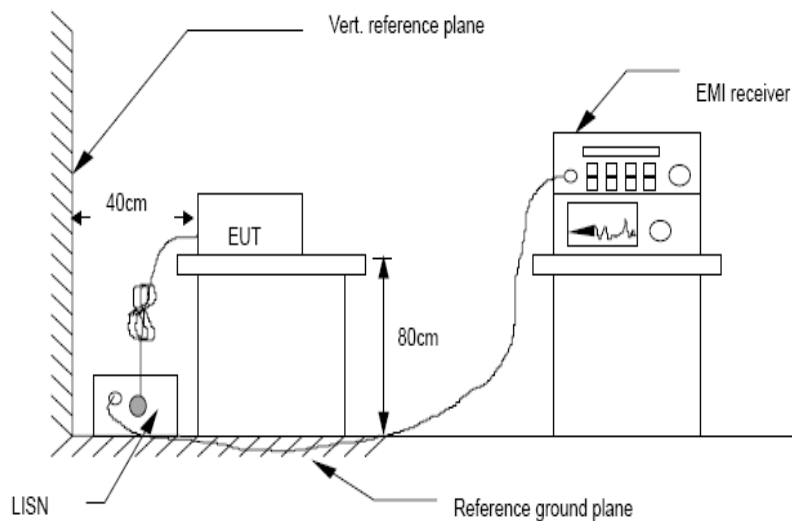
Notes: 1. *Decreasing linearly with logarithm of frequency.
 2. The lower limit shall apply at the transition frequencies.
 3. The limit decreases in line with the logarithm of the frequency in rang of 0.15 to 0.50 MHz.

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.

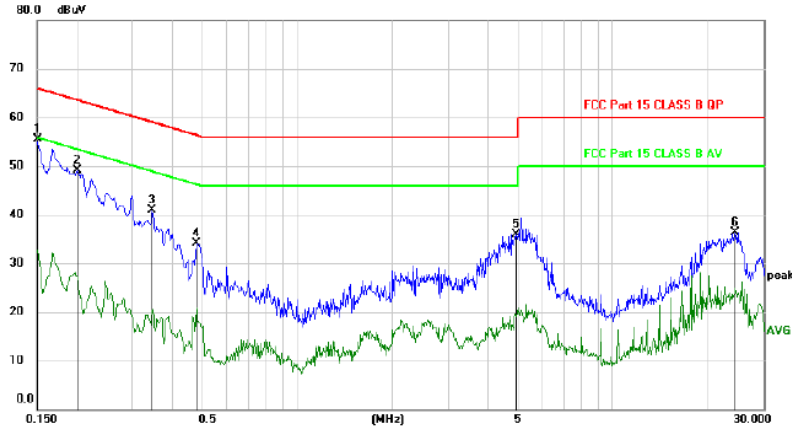
The bandwidth of test receiver is set at 9 kHz.

4.3. Test Setup



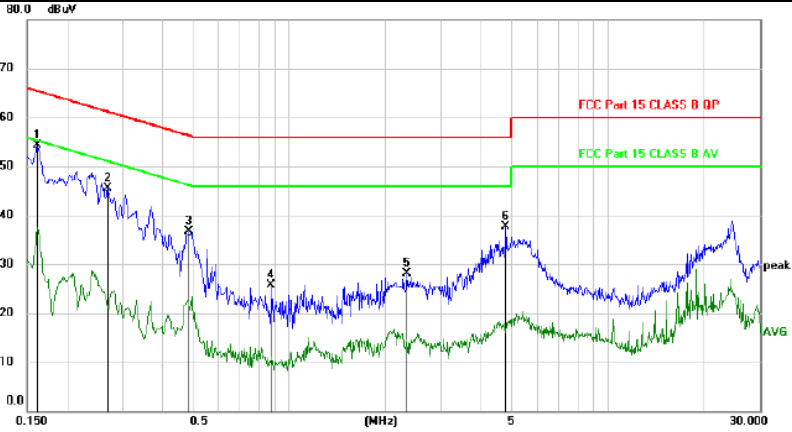
4.4.Test Results

Temperature	24°C	Humidity	56%
Pol	Line	Test mode	BLE 2402M
Test Voltage	DC 5V		



No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1 *	0.1500	45.49	10.07	55.56	66.00	-10.44	peak	
2	0.2006	38.98	10.09	49.07	63.59	-14.52	peak	
3	0.3477	30.76	10.15	40.91	59.02	-18.11	peak	
4	0.4800	23.91	10.24	34.15	56.34	-22.19	peak	
5	4.9439	25.34	10.64	35.98	56.00	-20.02	peak	
6	24.3537	25.32	11.00	36.32	60.00	-23.68	peak	

Pol	Neutral
-----	---------



No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1 *	0.1620	44.25	10.06	54.31	65.36	-11.05	peak	
2	0.2700	35.28	10.13	45.41	61.12	-15.71	peak	
3	0.4858	26.38	10.25	36.63	56.24	-19.61	peak	
4	0.8760	15.42	10.38	25.80	56.00	-30.20	peak	
5	2.3338	17.61	10.44	28.05	56.00	-27.95	peak	
6	4.7819	27.16	10.62	37.78	56.00	-18.22	peak	

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

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

5. Conducted Maximum Output Power

5.1. Test limits

Please refer section RSS-247 & 15.247.

5.2. Test Procedure

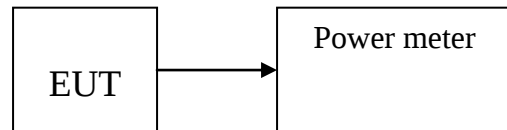
Details see the KDB 558074 D01 15.247 Meas Guidance v05r02

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

GFSK(1M)

Channel	Frequency (MHz)	PK Output Power (dBm)	PK Output Power (mW)	Limit (dBm)	Result
CH0	2402	-11.663	0.068	30	Pass
CH19	2440	-8.305	0.148	30	Pass
CH39	2480	-8.586	0.138	30	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 KDB 558074 D01 15.247 Meas Guidance v05r02

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

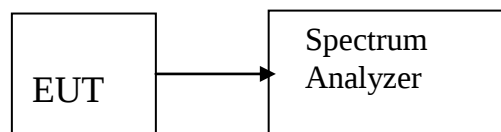
6.2.2 Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

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

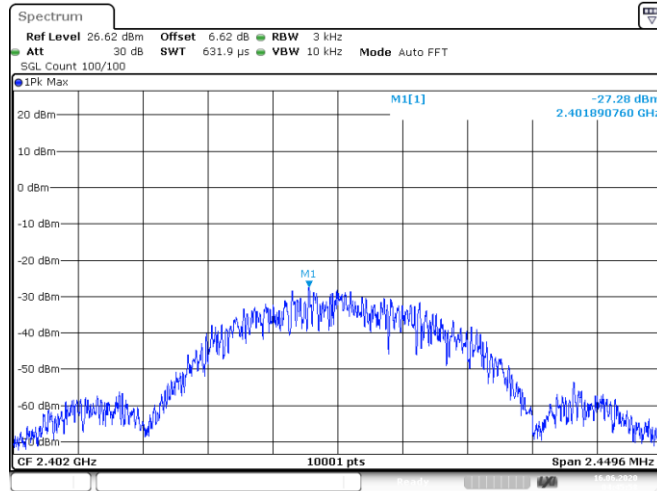
6.3. Test Setup



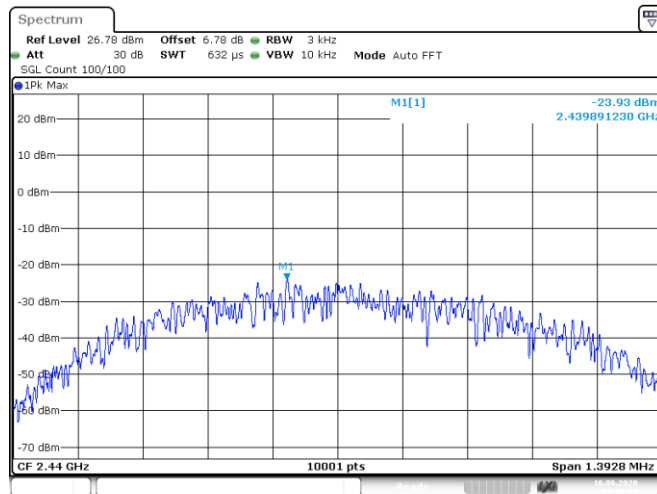
6.4. Test Results

Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limit (dBm)	Result
CH0	2402	-27.278	8	PASS
CH19	2440	-23.934	8	PASS
CH39	2480	-24.034	8	PASS
Conclusion: PASS				

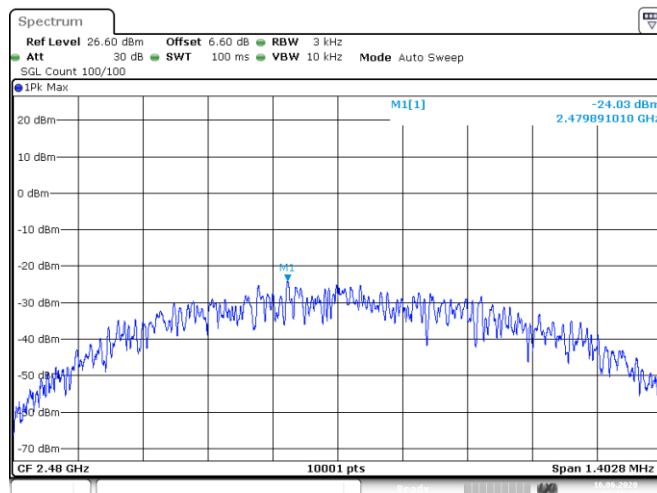
PSD NVNT BLE 2402MHz Ant1



PSD NVNT BLE 2440MHz Ant1



PSD NVNT BLE 2480MHz Ant1



7. Bandwidth

7.1. Test limits

Please refer section RSS-247 & 15.247

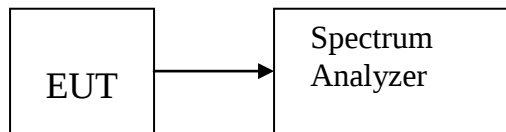
For direct sequence systems, the minimum 6dB bandwidth shall be at least 500 kHz.

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 $\geq 3 \times \text{RBW} = 300\text{kHz}$, Sweep time set auto, detail see the test plot.

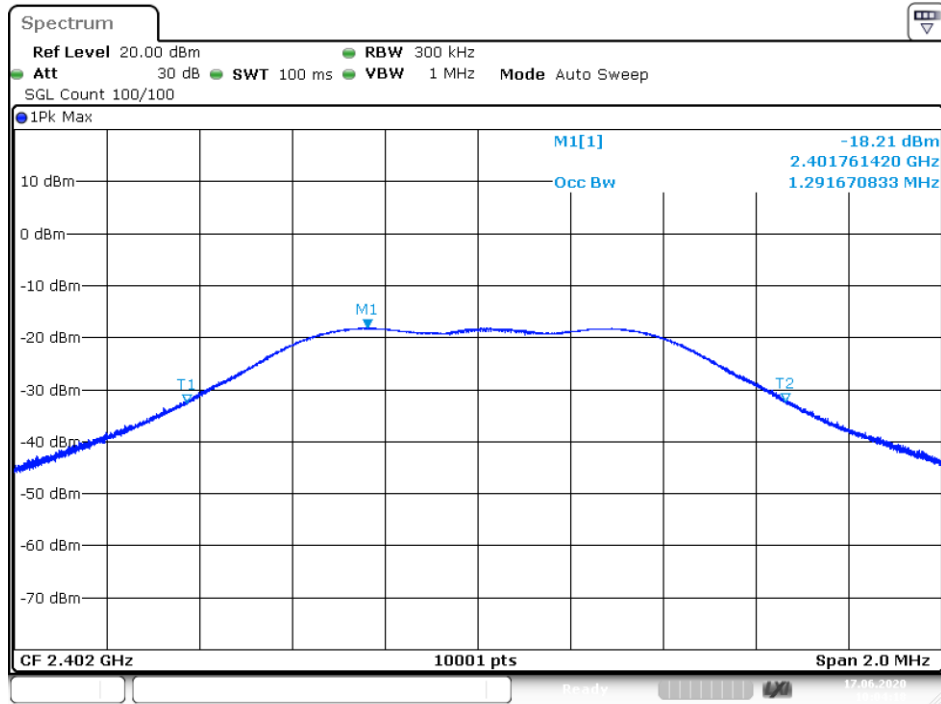
7.3. Test Setup



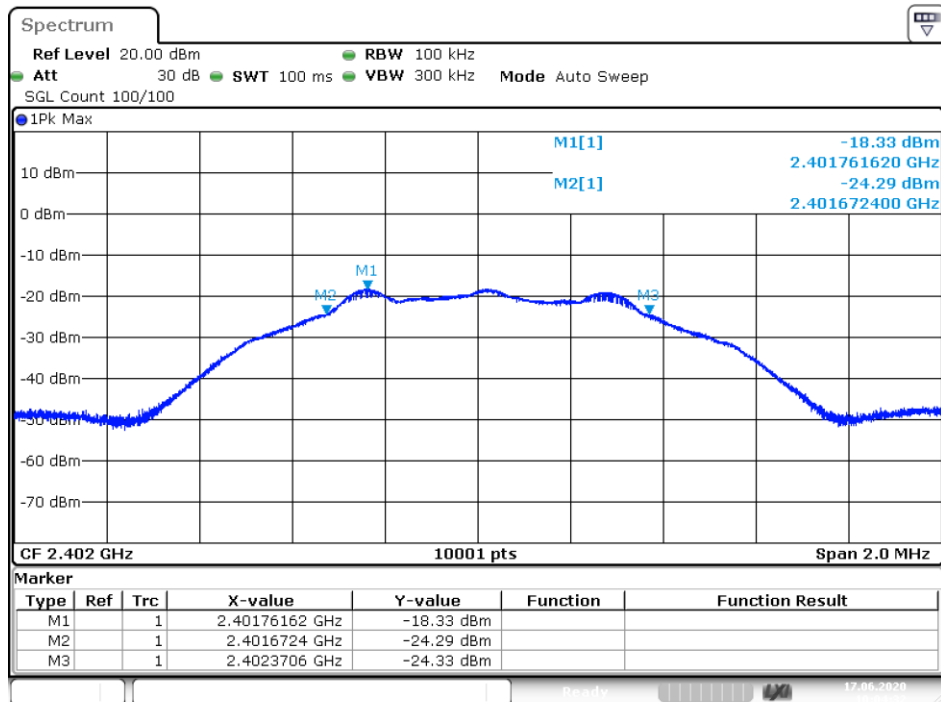
7.4. Test Results

Frequency (MHz)	Antenna	99% OBW (MHz)	-6 dB Bandwidth(MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
2402	Ant 1	1.2917	0.6982	0.5	Pass
2440	Ant 1	1.2895	0.7006	0.5	Pass
2480	Ant 1	1.2973	0.698	0.5	Pass

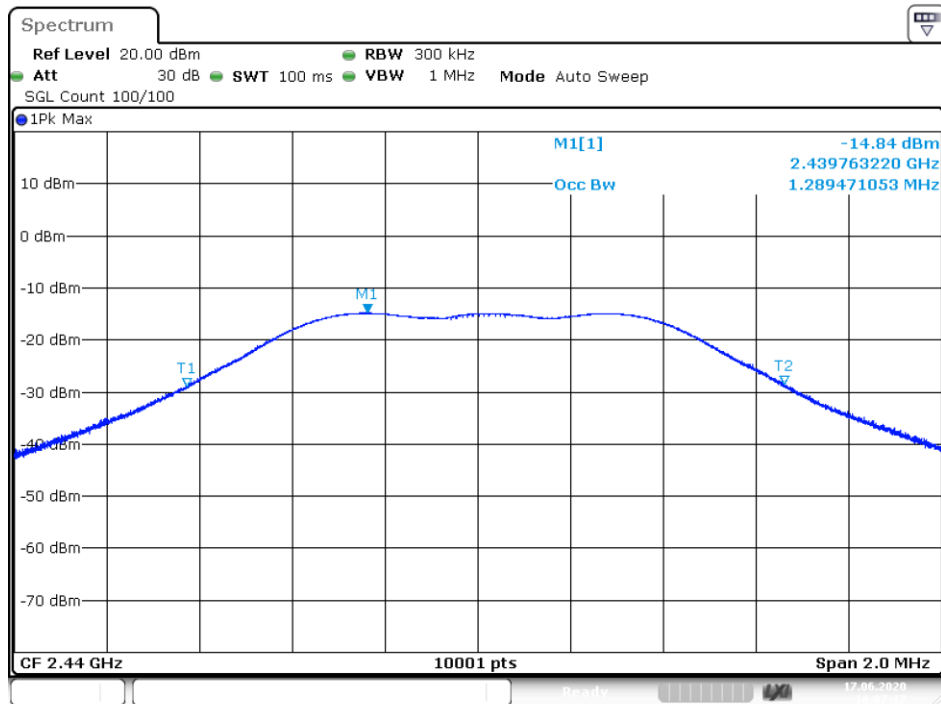
OBW NVNT BLE 2402MHz Ant1



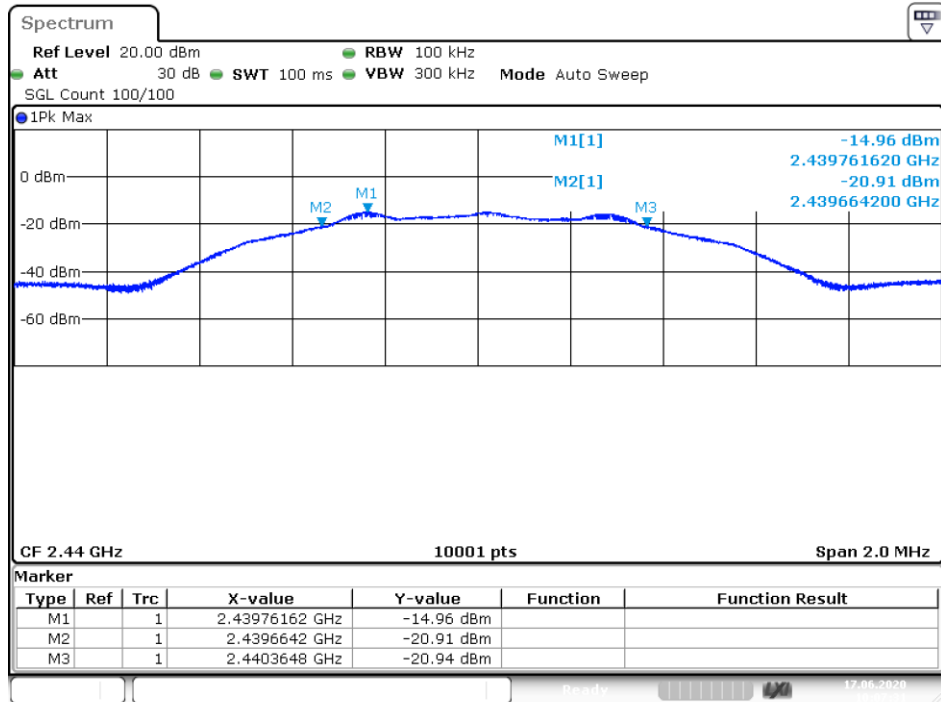
-6 dB BW NVNT BLE 2402MHz Ant1



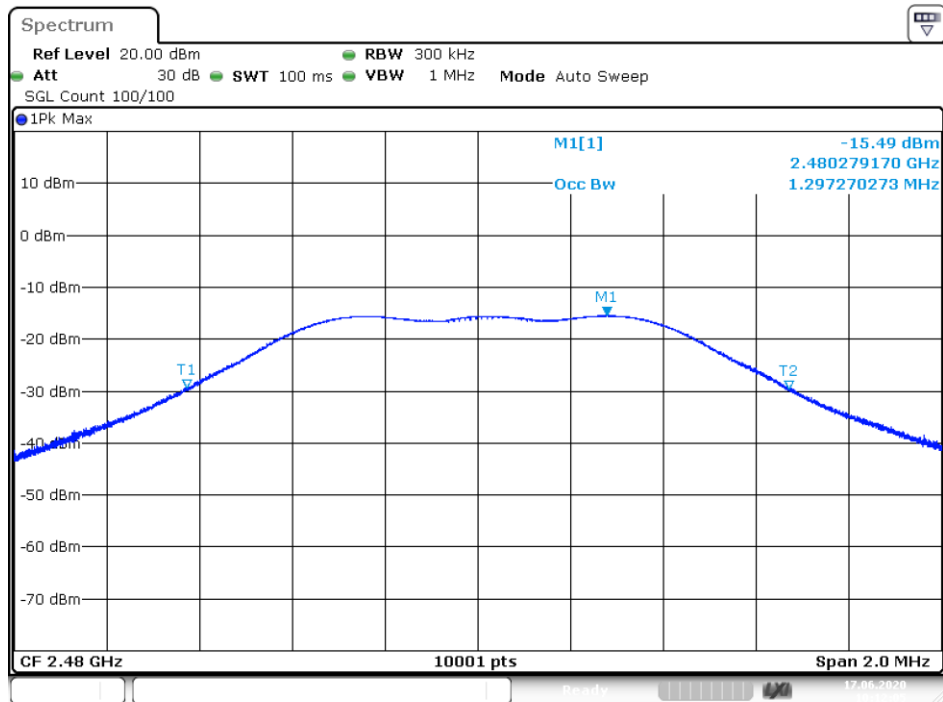
OBW NVNT BLE 2440MHz Ant1



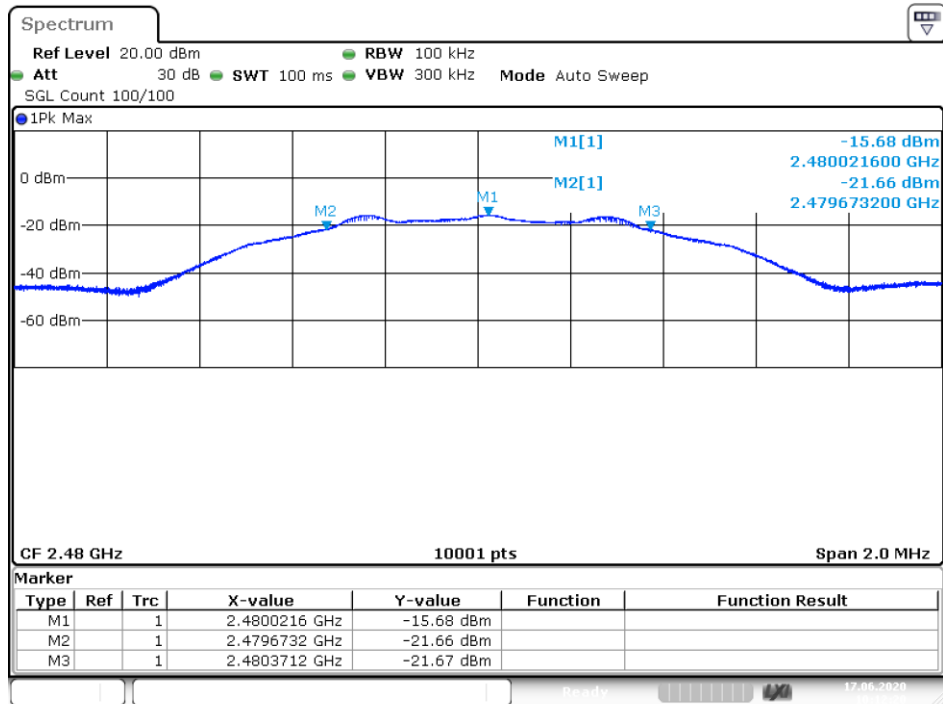
-6 dB BW NVNT BLE 2440MHz Ant1



OBW NVNT BLE 2480MHz Ant1



-6 dB BW NVNT BLE 2480MHz Ant1



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.

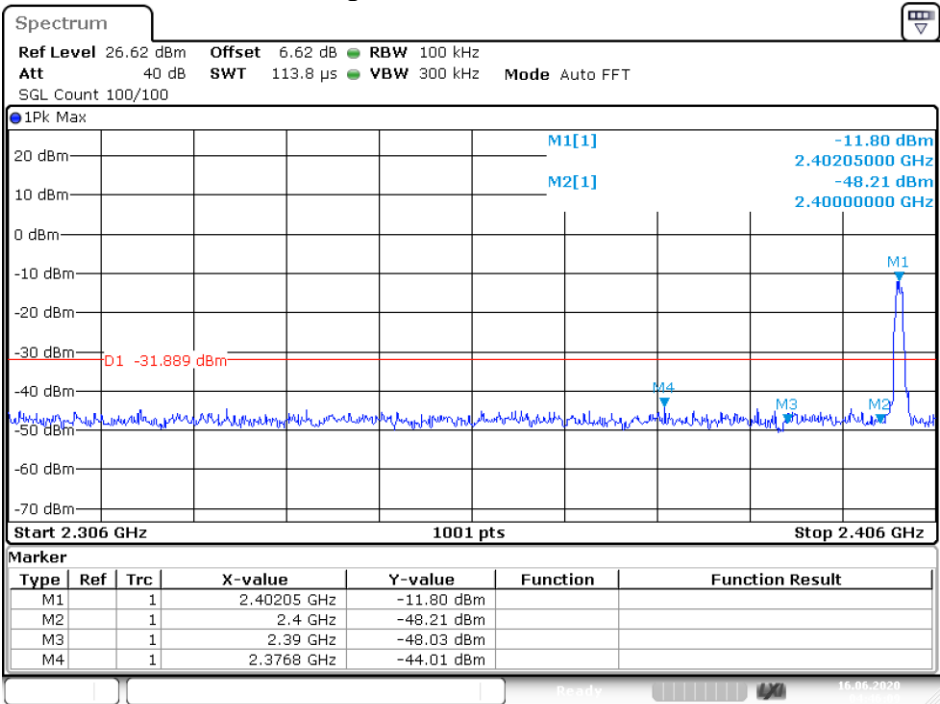
8.4. Test Results

Pass

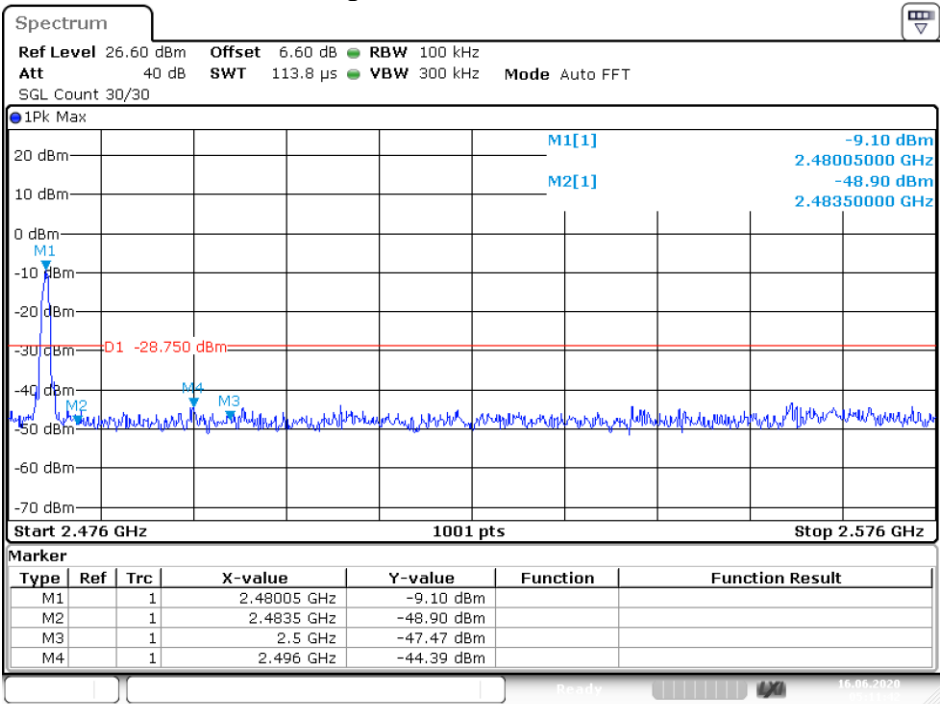
The results are shown on the next page.

GFSK

Band Edge NVLT BLE 2402MHz Ant1



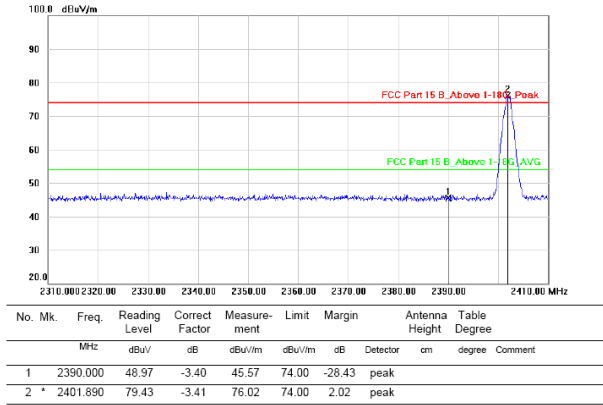
Band Edge NVLT BLE 2480MHz Ant1



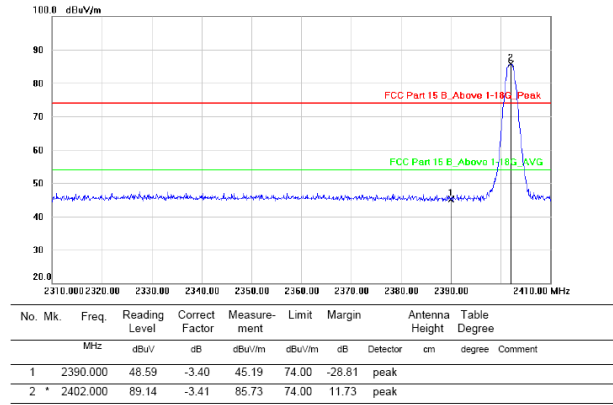
Radiated Method: GFSK

Test Mode: Low

Polarization: Vertical

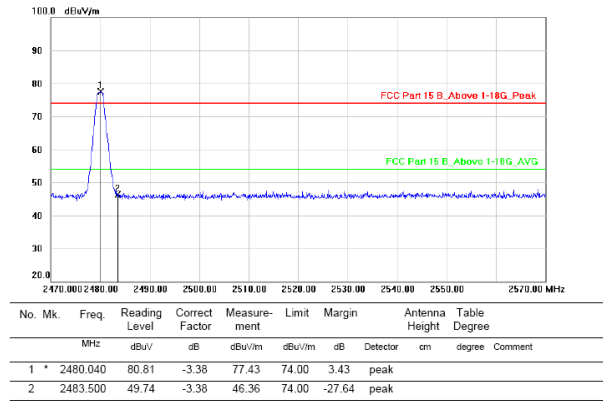


Polarization: Horizontal

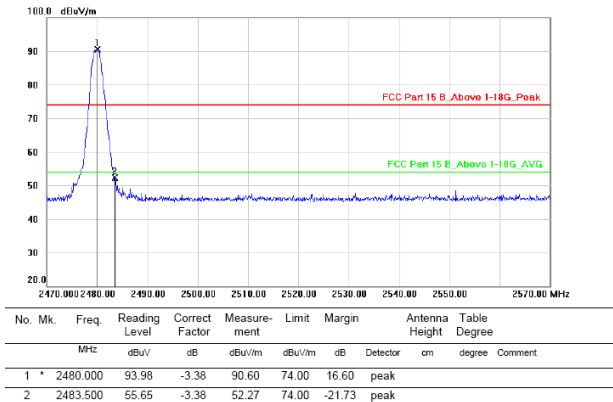


Test Mode: High

Polarization: Vertical



Polarization: Horizontal



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

Please refer to: Test Setup Photographs.

11.EUT PHOTO

Please refer to: External Photographs and Internal Photographs.

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