



FCC TEST REPORT

FCC ID: 2AQ4H-ZT004

On Behalf of

Zhortech

ZT4 Module

Model No.: ZTPS004-FPT10

Prepared for : Zhortech
Address : 7, Place Stanislas, 54000, Nancy, France

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 : A2103295-C01-R01
Date of Receipt : April 12, 2021
Date of Test : April 12, 2021- May 21, 2021
Date of Report : May 21, 2021
Version Number : V0

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TEST REPORT DECLARATION

Applicant : Zhortech
Address : 7, Place Stanislas, 54000, Nancy, France
Manufacturer : Zhortech
Address : 7, Place Stanislas, 54000, Nancy, France
EUT Description : ZT4 Module
(A) Model No. : ZTPS004-FPT10
(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

A handwritten signature in black ink, appearing to read 'Lucas Pang', is written over a horizontal dashed line.

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

A handwritten signature in black ink, appearing to read 'Simple Guan', is written over a horizontal dashed line.

Date of issue.....: May 21, 2021

Revision History

Revision	Issue Date	Revisions	Revised By
V0	May 21, 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	Test Requirement	Standards Paragraph	Result
Conducted Emission	FCC PART 15:2017	15.207	P
6dB Bandwidth	FCC PART 15:2017	15.247 (a)(2)	P
Output Power	FCC PART 15:2017	15.247 (b)(3)	P
Radiated Spurious Emission	FCC PART 15:2017	15.247 (c)	P
Conducted Spurious & Band Edge Emission	FCC PART 15:2017	15.247 (d)	P
Power Spectral Density	FCC PART 15:2017	15.247 (e)	P
Radiated Band Edge Emission	FCC PART 15:2017	15.205	P
Antenna Requirement	FCC PART 15:2017	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 Description : ZT4 Module

Trademark :



Model No. : ZTPS004-FPT10

DIFF. : N/A

Test Voltage : DC 3.7V by battery, DC 5V from USB

BT

Radio Technology : Bluetooth(BLE)

Operation frequency : 2402-2480MHz

Channel No. : 40 Channels

Channel Separation : 2MHz

Data Rate : 1Mbps, 2Mbps

Modulation : GFSK

Antenna Type : PCB Antenna, max gain 5.3dBi

Software version : V1.0

Hardware version : V1.0

Intend use : Residential, commercial and light industrial environment
environment

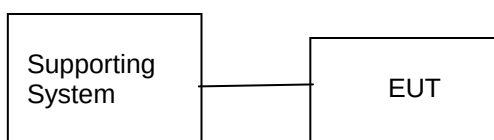
2.2. Accessories of Device (EUT)

Accessories1 : /
 Manufacturer : /
 Model : /
 Ratings : /

2.3. Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number	Certification
1.	Adapter	--	HW-059200CHQ	--	--

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: CH20	2440
	High: CH40	2480

2.6. Test Conditions

Items	Required	Actual
Temperature range:	15-35℃	24℃
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

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	2020.09.02	1Year
Spectrum analyzer	ROHDE&SCHWARZ	FSU	1166.1660.26	2020.09.02	1Year
Spectrum analyzer	Agilent	N9020A	MY499100060	2020.09.02	1Year
Receiver	ROHDE&SCHWARZ	ESR	1316.3003K03-102082-Wa	2020.09.02	1Year
Receiver	R&S	ESCI	101165	2020.09.02	1Year
Bilog Antenna	Schwarzbeck	VULB 9168	VULB9168-438	2019.09.07	2Year
Horn Antenna	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D(1201)	2020.04.12	2Year
Loop Antenna	SCHWARZBECK	FMZB 1519B	00059	2019.09.07	2Year
Cable	Resenberger	N/A	No.1	2020.09.02	1Year
Cable	SCHWARZBECK	N/A	No.2	2020.09.02	1Year
Cable	SCHWARZBECK	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
Temperature controller	Terchy	MHQ	120	2020.09.02	1Year
L.I.S.N.#1	Schwarzbeck	NSLK8126	8126-466	2020.09.02	1Year
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	101043	2020.09.02	1 Year
20db Attenuator	ICPROBING	IATS1	82347	2020.09.02	1 Year
Power meter	Agilent	E4419B	GB40202122	2020.09.02	1 Year

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

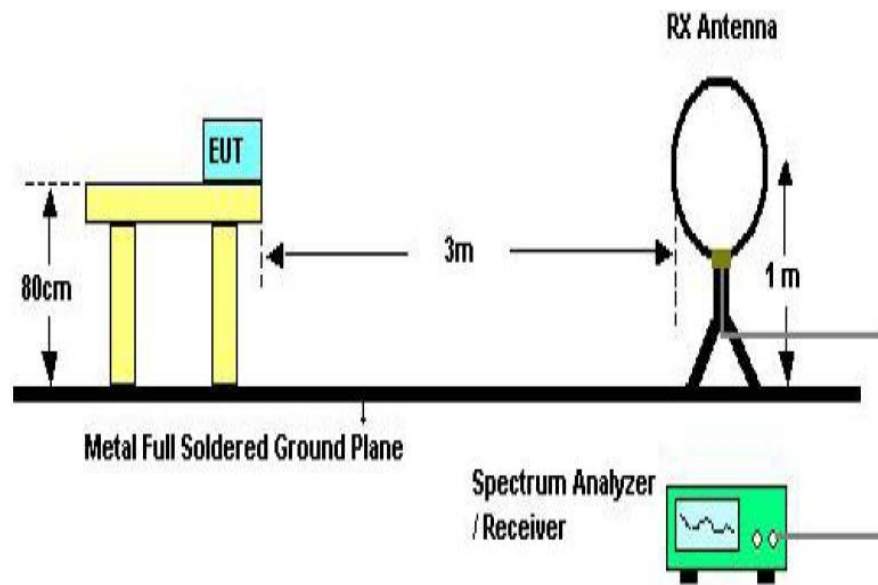
The measuring distance of 3m shall be used for measurements at frequency up to 1GH and above 1GHz, The EUT was placed on a rotating 0.8 m high above ground for below 1GHz and 1.5m high for above1GHz testing, The table was rotated 360 degrees to determine the position of the highest radiation The Test 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

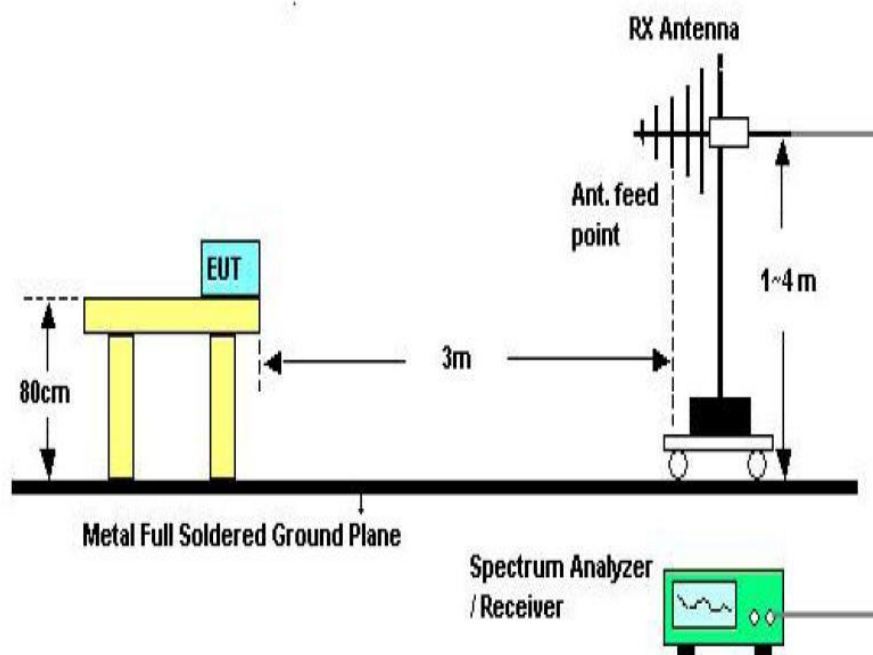
If Peak value comply with QP limit Below 1GHz.The EUT deemed to comply with QP limit. But the Peak value and average value both need to comply with applicable limit above 1GHz.

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

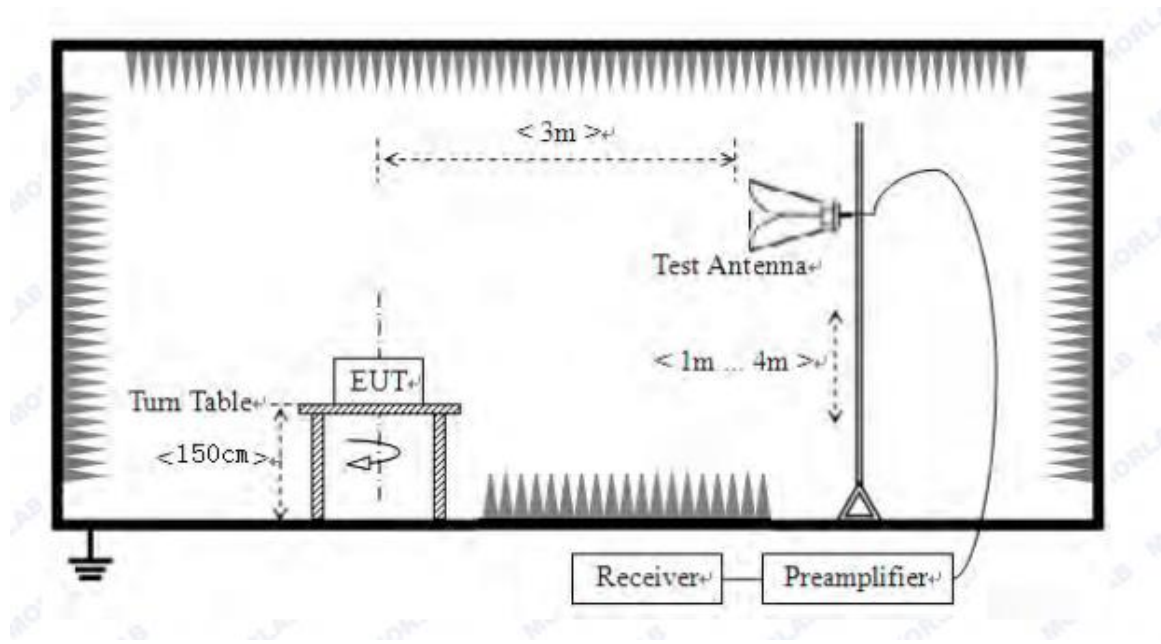
3.3. Test Setup



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.

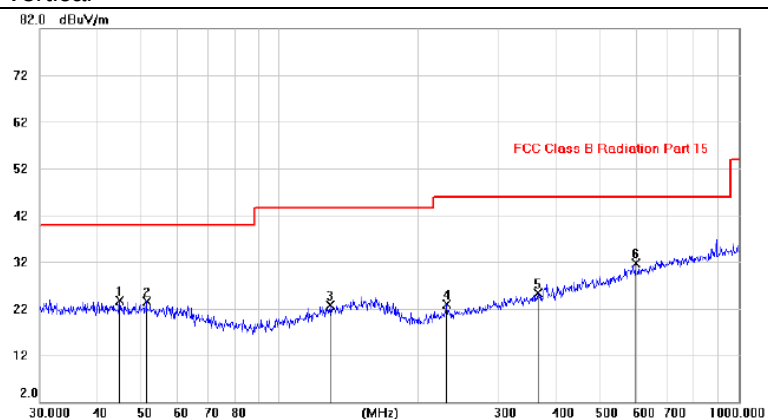
2.Only show the test data of the worst Channel in this report.

From 30MHz to 1000MHz: Conclusion: PASS

1Mbps

Pol

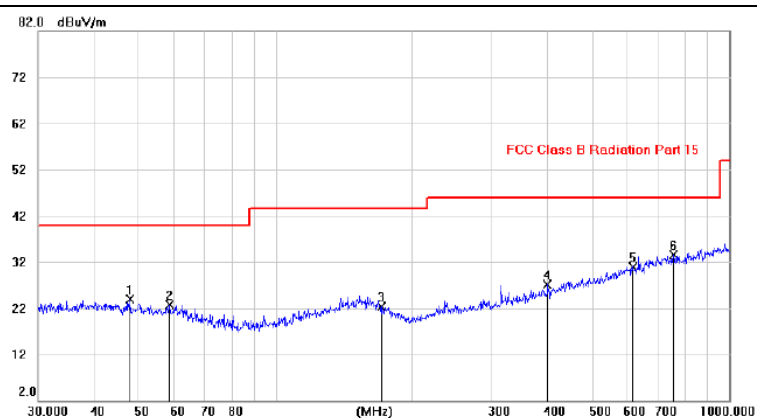
Vertical



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	44.7591	9.59	14.13	23.72	40.00	-16.28	peak	
2	51.2346	9.70	13.88	23.58	40.00	-16.42	peak	
3	128.8488	9.16	13.53	22.69	43.50	-20.81	peak	
4	230.9878	10.49	12.33	22.82	46.00	-23.18	peak	
5	365.1121	9.73	15.54	25.27	46.00	-20.73	peak	
6 *	595.8289	11.54	20.14	31.68	46.00	-14.32	peak	

Pol

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
1	47.7478	9.77	14.08	23.85	40.00	-16.15	peak	
2	58.5921	9.33	13.32	22.65	40.00	-17.35	peak	
3	171.6131	8.38	13.86	22.24	43.50	-21.26	peak	
4	398.7971	10.96	16.22	27.18	46.00	-18.82	peak	
5	614.0706	10.52	20.48	31.00	46.00	-15.00	peak	
6 *	754.2404	11.06	22.52	33.58	46.00	-12.42	peak	

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

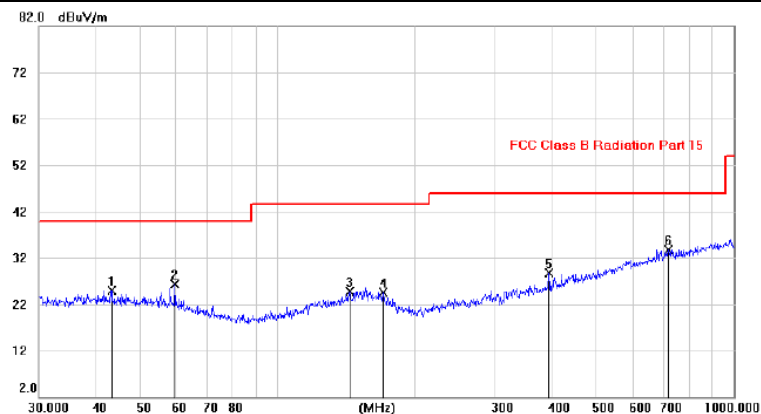
Note: Measurement=Reading Level+Correc Factor. Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

From 30MHz to 1000MHz: Conclusion: PASS

2Mbps

Pol

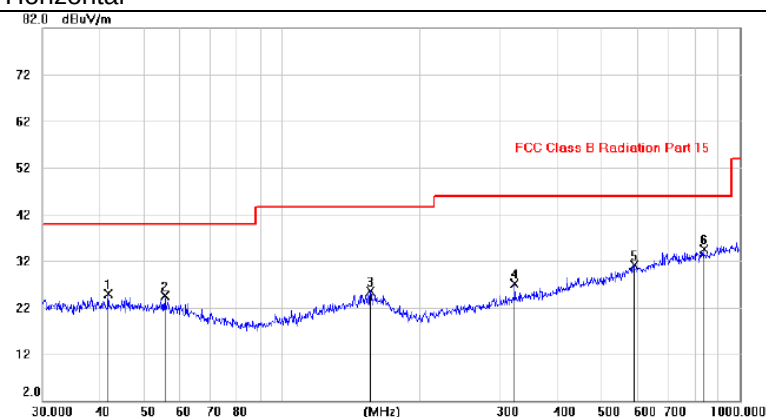
Vertical



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	43.2066	10.70	14.22	24.92	40.00	-15.08	peak		
2	59.4614	12.96	13.25	26.21	40.00	-13.79	peak		
3	144.3348	10.04	14.63	24.67	43.50	-18.83	peak		
4	170.4137	10.53	14.02	24.55	43.50	-18.95	peak		
5	394.3472	12.58	16.15	28.73	46.00	-17.27	peak		
6 *	721.4728	11.76	22.04	33.80	46.00	-12.20	peak		

Pol

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	41.8156	10.49	14.35	24.84	40.00	-15.16	peak		
2	55.4795	10.89	13.57	24.46	40.00	-15.54	peak		
3	156.4212	10.50	15.05	25.55	43.50	-17.95	peak		
4	322.3769	12.50	14.68	27.18	46.00	-18.82	peak		
5	587.5987	11.16	19.97	31.13	46.00	-14.87	peak		
6 *	834.8770	11.25	23.23	34.48	46.00	-11.52	peak		

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

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 Charging was listed in this report.

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	45.92	V	33.95	10.18	34.26	55.79	74	18.21	PK
4804	35.80	V	33.95	10.18	34.26	45.67	54	8.33	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
4804	44.33	H	33.95	10.18	34.26	54.20	74	19.80	PK
4804	37.26	H	33.95	10.18	34.26	47.13	54	6.87	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
Test Mode: TX Mid									
4880	42.38	V	33.93	10.2	34.29	52.22	74	21.78	PK
4880	34.08	V	33.93	10.2	34.29	43.92	54	10.08	AV
7320	/	/	/	/	/	/	/	/	/
9760	/	/	/	/	/	/	/	/	/
4880	44.90	H	33.93	10.2	34.29	54.74	74	19.26	PK
4880	34.97	H	33.93	10.2	34.29	44.81	54	9.19	AV
7320	/	/	/	/	/	/	/	/	/
9760	/	/	/	/	/	/	/	/	/
Test Mode: TX High									
4960	46.26	V	33.98	10.22	34.25	56.21	74	17.79	PK
4960	36.02	V	33.98	10.22	34.25	45.97	54	8.03	AV
7440	/	/	/	/	/	/	/	/	/
9920	/	/	/	/	/	/	/	/	/
4960	44.51	H	33.98	10.22	34.25	54.46	74	19.54	PK
4960	32.67	H	33.98	10.22	34.25	42.62	54	11.38	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: 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	45.21	V	33.95	10.18	34.26	55.08	74	18.92	PK
4804	38.31	V	33.95	10.18	34.26	48.18	54	5.82	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
4804	45.62	H	33.95	10.18	34.26	55.49	74	18.51	PK
4804	37.72	H	33.95	10.18	34.26	47.59	54	6.41	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
Test Mode: TX Mid									
4880	43.79	V	33.93	10.2	34.29	53.63	74	20.37	PK
4880	36.93	V	33.93	10.2	34.29	46.77	54	7.23	AV
7320	/	/	/	/	/	/	/	/	/
9760	/	/	/	/	/	/	/	/	/
4880	43.39	H	33.93	10.2	34.29	53.23	74	20.77	PK
4880	33.77	H	33.93	10.2	34.29	43.61	54	10.39	AV
7320	/	/	/	/	/	/	/	/	/
9760	/	/	/	/	/	/	/	/	/
Test Mode: TX High									
4960	43.62	V	33.98	10.22	34.25	53.57	74	20.43	PK
4960	33.72	V	33.98	10.22	34.25	43.67	54	10.33	AV
7440	/	/	/	/	/	/	/	/	/
9920	/	/	/	/	/	/	/	/	/
4960	42.75	H	33.98	10.22	34.25	52.70	74	21.30	PK
4960	32.09	H	33.98	10.22	34.25	42.04	54	11.96	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.

Conducted method
1Mbps:

EUT Description	ZT4 Module	Model No.	ZTPS004-FPT10
Temperature	24°C	Humidity	56%
Test mode	GFSK(2402MHz)	Test mode	GFSK(2440MHz)

Spectrum

Ref Level 11.62 dBm

Offset 11.62 dB

RBW 100 kHz

Att 30 dB

SWT 250 ms

VBW 300 kHz

Mode Auto Sweep

SGL Count 30/30

1Pk Max

0 dBm

-10 dBm

-20 dBm

-30 dBm

-40 dBm

-50 dBm

-60 dBm

-70 dBm

-80 dBm

M1[1]

M2[1]

M3

M4

M5

M2

-7.57 dBm

2.4120 GHz

-40.18 dBm

16.9597 GHz

D1 -25.594 dBm

Start 30.0 MHz

1001 pts

Stop 25.0 GHz

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1	1		2.412 GHz	-7.57 dBm		
M2	1		16.9597 GHz	-40.18 dBm		
M3	1		4.6994 GHz	-46.10 dBm		
M4	1		7.0715 GHz	-44.79 dBm		
M5	1		9.7933 GHz	-44.96 dBm		

Date: 16.APR.2021 11:45:50

Spectrum

Ref Level 11.78 dBm

Offset 11.78 dB

RBW 100 kHz

Att 30 dB

SWT 250 ms

VBW 300 kHz

Mode Auto Sweep

SGL Count 30/30

1Pk Max

0 dBm

-10 dBm

-20 dBm

-30 dBm

-40 dBm

-50 dBm

-60 dBm

-70 dBm

-80 dBm

M1[1]

M2[1]

M3

M4

M5

M2

-8.27 dBm

2.4370 GHz

-40.04 dBm

18.2831 GHz

D1 -27.042 dBm

Start 30.0 MHz

1001 pts

Stop 25.0 GHz

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1	1		2.437 GHz	-8.27 dBm		
M2	1		18.2831 GHz	-40.04 dBm		
M3	1		5.024 GHz	-45.48 dBm		
M4	1		7.2214 GHz	-45.15 dBm		
M5	1		9.6185 GHz	-44.27 dBm		

Date: 16.APR.2021 11:48:04

Test mode	GFSK(2480MHz)
-----------	---------------

Spectrum

Ref Level 11.60 dBm

Offset 11.60 dB

RBW 100 kHz

Att 30 dB

SWT 250 ms

VBW 300 kHz

Mode Auto Sweep

SGL Count 30/30

1Pk Max

0 dBm

-10 dBm

-20 dBm

-30 dBm

-40 dBm

-50 dBm

-60 dBm

-70 dBm

-80 dBm

M1[1]

M2[1]

M3

M4

M5

M2

-9.30 dBm

2.4870 GHz

-40.13 dBm

18.2831 GHz

D1 -28.048 dBm

Start 30.0 MHz

1001 pts

Stop 25.0 GHz

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1	1		2.487 GHz	-9.30 dBm		
M2	1		18.2831 GHz	-40.13 dBm		
M3	1		4.999 GHz	-45.98 dBm		
M4	1		7.546 GHz	-45.27 dBm		
M5	1		10.1179 GHz	-44.14 dBm		

Date: 16.APR.2021 11:54:46

2Mbps;

EUT Description	ZT4 Module	Model No.	ZTPS004-FPT10
Temperature	24°C	Humidity	56%
Test mode	GFSK(2402MHz)	Test mode	GFSK(2440MHz)

Spectrum

Ref Level 11.62 dBm

Offset 11.62 dB

RBW 100 kHz

Att 30 dB

SWT 250 ms

VBW 300 kHz

Mode Auto Sweep

SGL Count 30/30

1Pk Max

0 dBm

-10 dBm

-20 dBm

-30 dBm

-40 dBm

-50 dBm

-60 dBm

-70 dBm

-80 dBm

M1[1]

M2[1]

M3

M4

M5

M2

-9.83 dBm

2.4120 GHz

-40.41 dBm

18.3080 GHz

D1 -25.997 dBm

Start 30.0 MHz

1001 pts

Stop 25.0 GHz

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1	1		2.412 GHz	-9.83 dBm		
M2	1		18.308 GHz	-40.41 dBm		
M3	1		4.6494 GHz	-45.02 dBm		
M4	1		7.1215 GHz	-44.35 dBm		
M5	1		9.7433 GHz	-44.76 dBm		

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Spectrum

Ref Level 11.78 dBm

Offset 11.78 dB

RBW 100 kHz

Att 30 dB

SWT 250 ms

VBW 300 kHz

Mode Auto Sweep

SGL Count 30/30

1Pk Max

0 dBm

-10 dBm

-20 dBm

-30 dBm

-40 dBm

-50 dBm

-60 dBm

-70 dBm

-80 dBm

M1[1]

M2[1]

M3

M4

M5

M2

-7.23 dBm

2.4370 GHz

-39.76 dBm

18.3330 GHz

D1 -26.727 dBm

Start 30.0 MHz

1001 pts

Stop 25.0 GHz

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1	1		2.437 GHz	-7.23 dBm		
M2	1		18.333 GHz	-39.76 dBm		
M3	1		4.999 GHz	-44.88 dBm		
M4	1		7.4461 GHz	-45.50 dBm		
M5	1		9.8682 GHz	-44.22 dBm		

Date: 16.APR.2021 11:35:53

Test mode	GFSK(2480MHz)
-----------	---------------

Spectrum

Ref Level 11.60 dBm

Offset 11.60 dB

RBW 100 kHz

Att 30 dB

SWT 250 ms

VBW 300 kHz

Mode Auto Sweep

SGL Count 30/30

1Pk Max

0 dBm

-10 dBm

-20 dBm

-30 dBm

-40 dBm

-50 dBm

-60 dBm

-70 dBm

-80 dBm

M1[1]

M2[1]

M3

M4

M5

M2

-13.70 dBm

2.4870 GHz

-40.15 dBm

18.3080 GHz

D1 -26.767 dBm

Start 30.0 MHz

1001 pts

Stop 25.0 GHz

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1	1		2.487 GHz	-13.70 dBm		
M2	1		18.308 GHz	-40.15 dBm		
M3	1		4.9241 GHz	-45.35 dBm		
M4	1		7.3712 GHz	-45.49 dBm		
M5	1		9.8682 GHz	-44.70 dBm		

Date: 16.APR.2021 11:38:29

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.

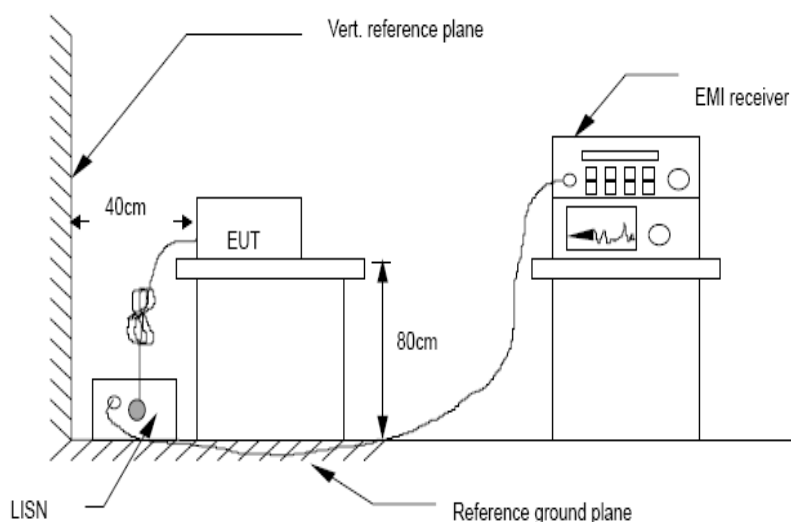
3. The limit decreases in line with the logarithm of the frequency in rang of 0.15 to 0.50 MHz.

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.

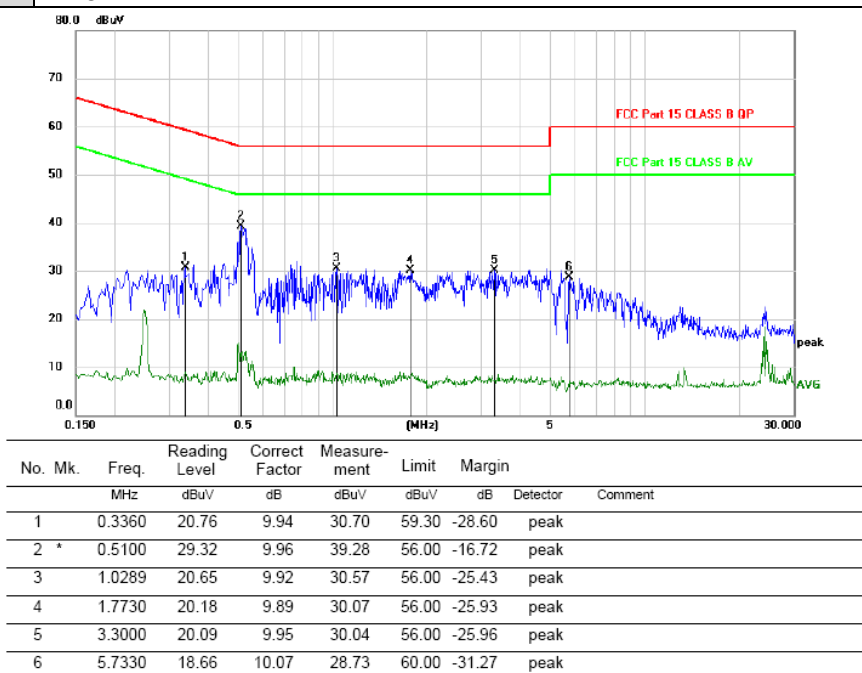
4.3. Test Setup



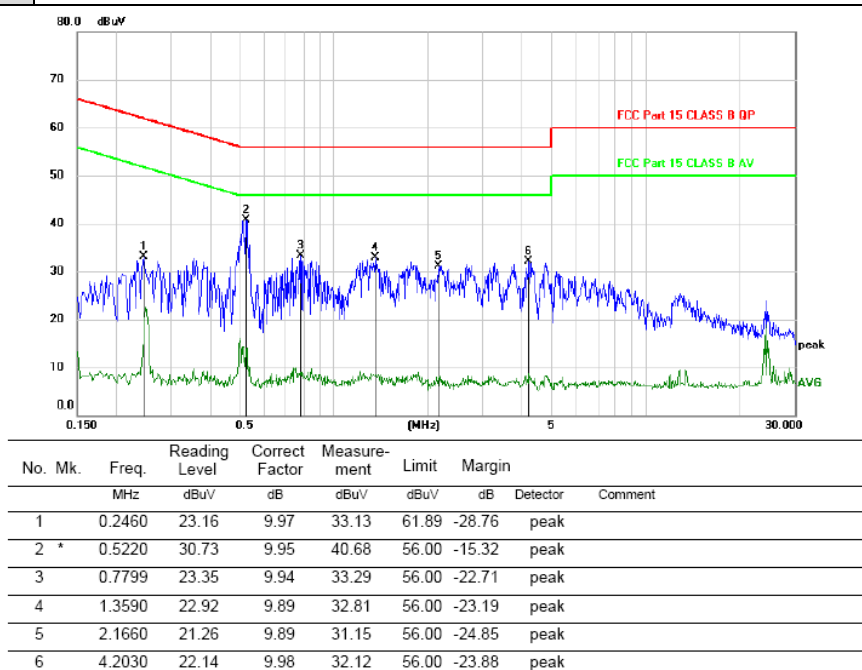
4.4. Test Results

The EUT is supplied by battery, so this item does not applicable.

Pol	Line
-----	------



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



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 Charging 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

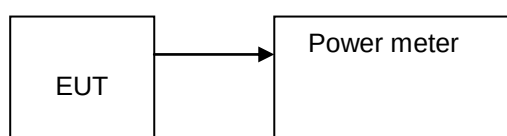
Details see the KDB558074 D01 Meas Guidance V05

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

1Mbps			
Channel	Frequency (MHz)	Peak Output Power (dBm)	Limit (dBm)
CH1	2402	-5.447	30
CH20	2440	-6.525	30
CH40	2480	-6.517	30
Conclusion: PASS			

2Mbps			
Channel	Frequency (MHz)	Peak Output Power (dBm)	Limit (dBm)
CH1	2402	-5.468	30
CH20	2440	-6.565	30
CH40	2480	-6.62	30
Conclusion: PASS			

6. 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 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 V05

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

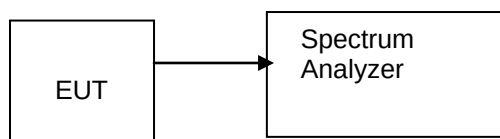
6.2.2 Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

6.2.3 Detector = RMS. 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 $\text{VBW} \geq 3 \times \text{RBW}$), span=1.5×DTS bandwidth., detail see the test plot.

6.2.4 Record the max reading.

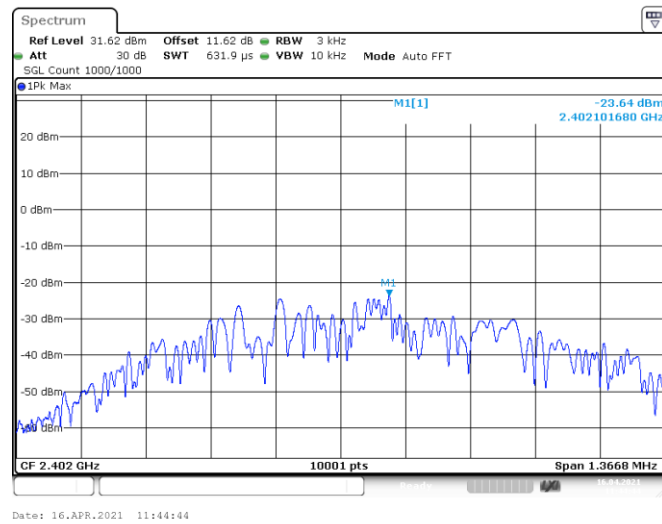
6.2.5 Repeat the above procedure until the measurements for all frequencies are completed.

6.3. Test Setup

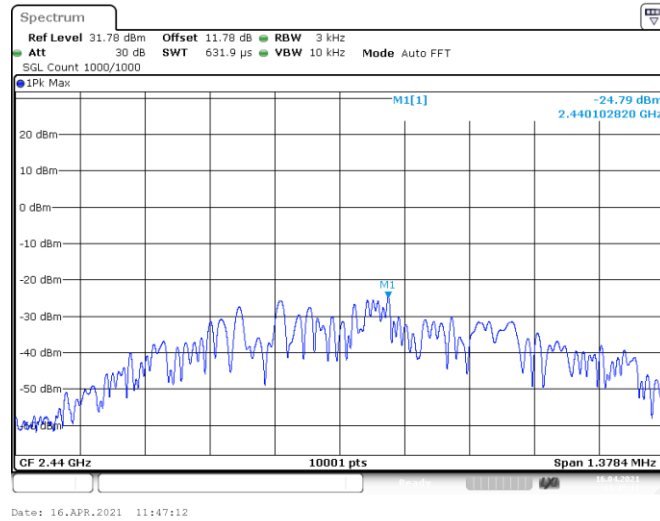


6.4. Test Results

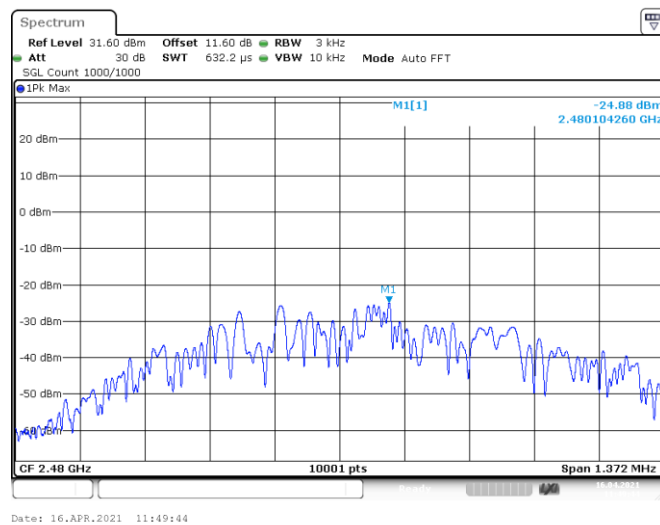
1Mbps				
Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limit (dBm)	Result
CH1	2402	-23.637	8	PASS
CH20	2440	-24.79	8	PASS
CH40	2480	-24.883	8	PASS
Conclusion: PASS				



Lowest channel

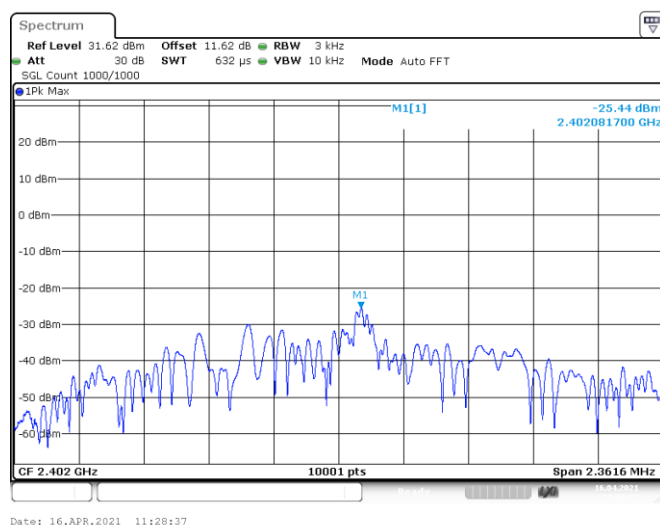


Middle channel

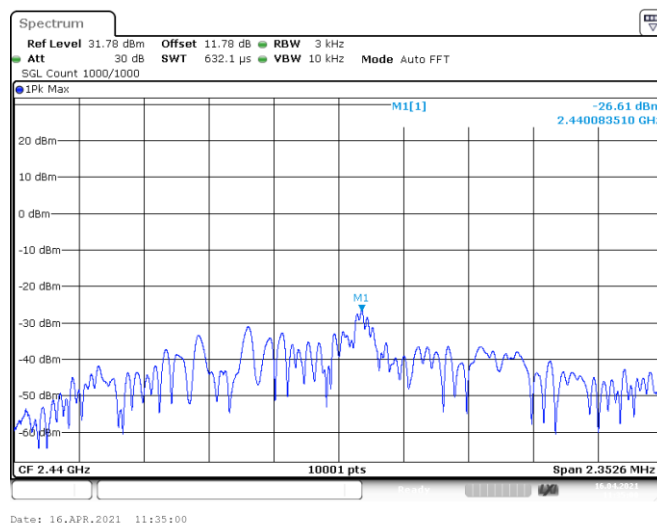


Highest channel

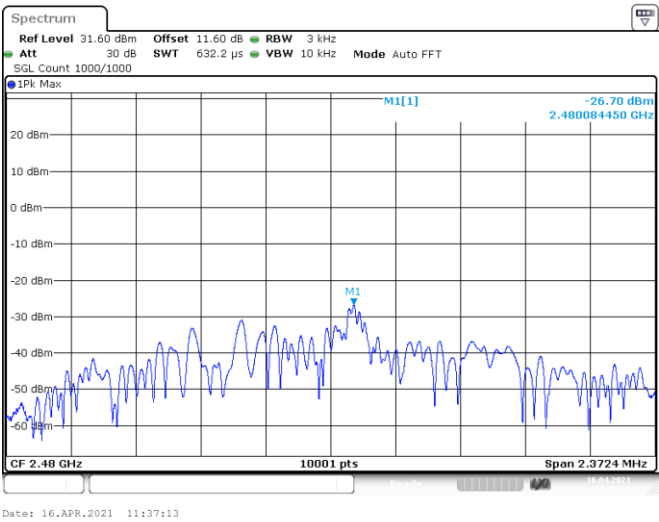
2Mbps				
Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limit (dBm)	Result
CH1	2402	-25.441	8	PASS
CH20	2440	-26.609	8	PASS
CH40	2480	-26.705	8	PASS
Conclusion: PASS				



Lowest channel



Middle channel



Highest channel

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.

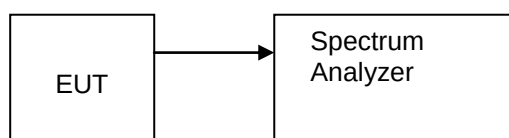
7.2. Test Procedure

Details see the KDB558074 D01 Meas Guidance V05

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

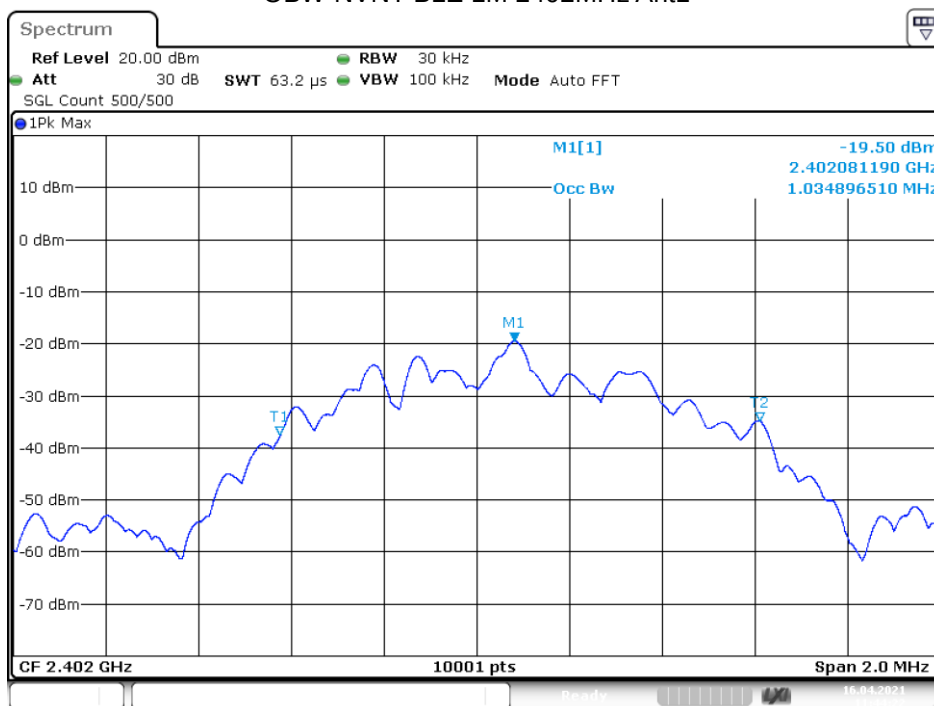
7.3. Test Setup



7.4. Test Results

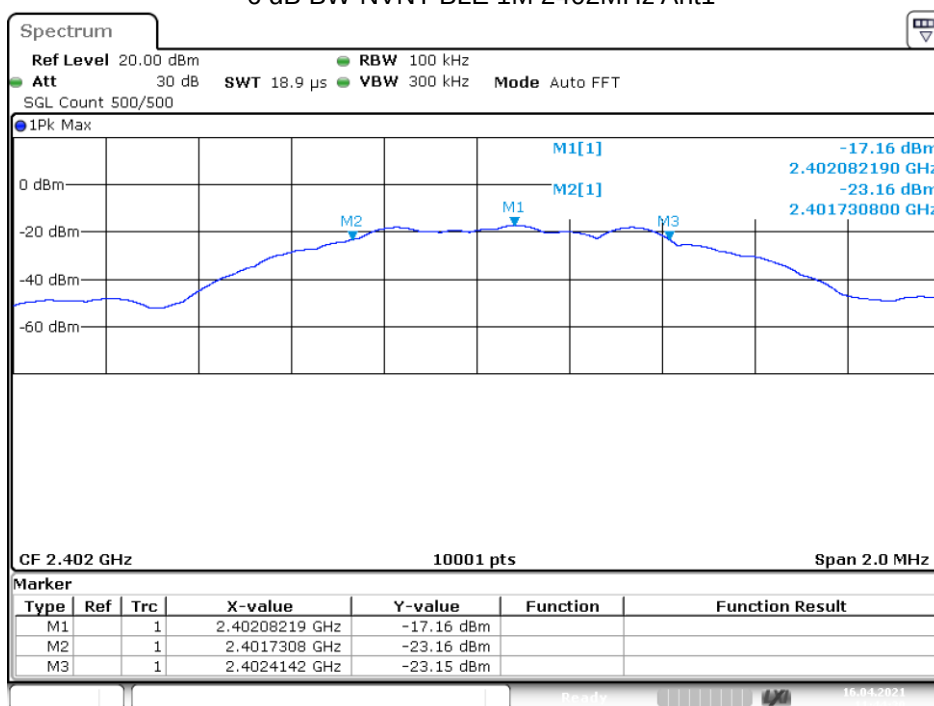
1Mbps							
Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	BLE	2402	Ant 1	1.0349	0.6834	0.5	Pass
NVNT	BLE	2440	Ant 1	1.0369	0.6892	0.5	Pass
NVNT	BLE	2480	Ant 1	1.0373	0.686	0.5	Pass

OBW NVNT BLE 1M 2402MHz Ant1



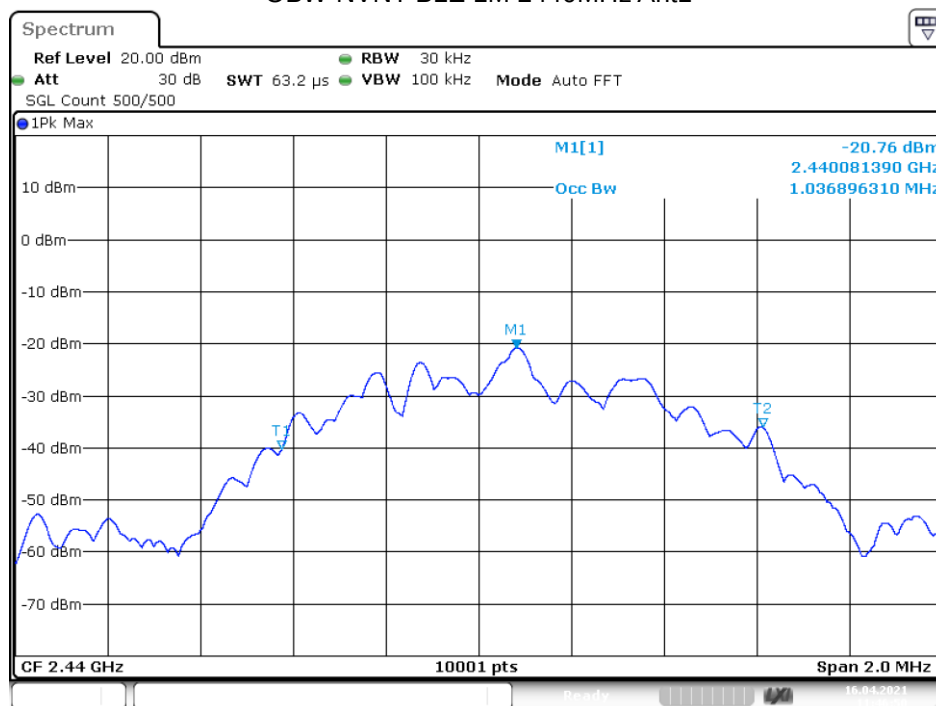
Date: 16.APR.2021 11:44:22

-6 dB BW NVNT BLE 1M 2402MHz Ant1



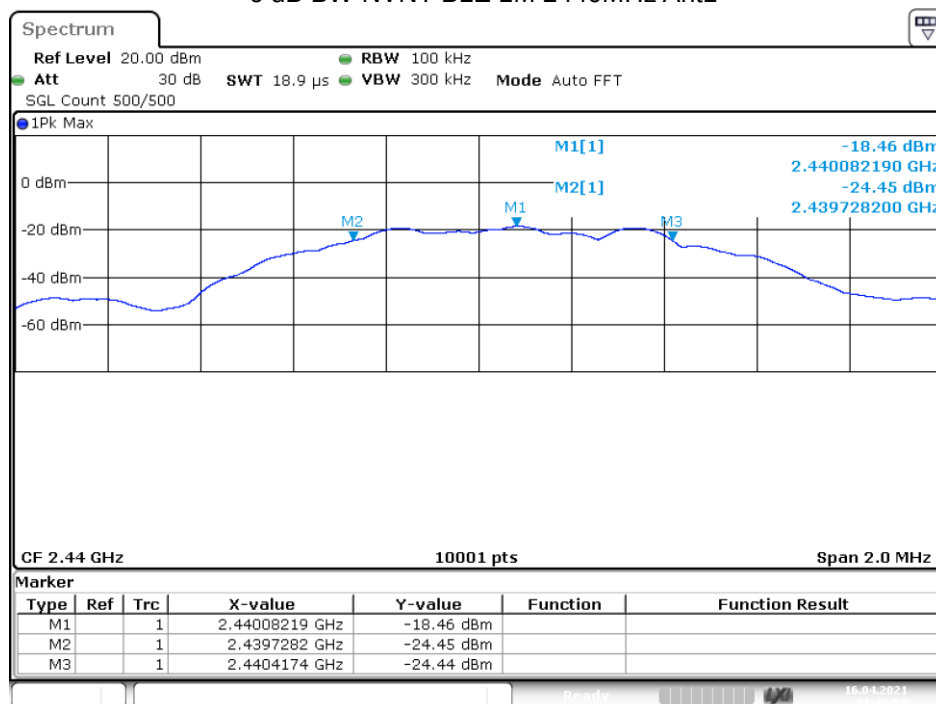
Date: 16.APR.2021 11:44:30

OBW NVNT BLE 1M 2440MHz Ant1



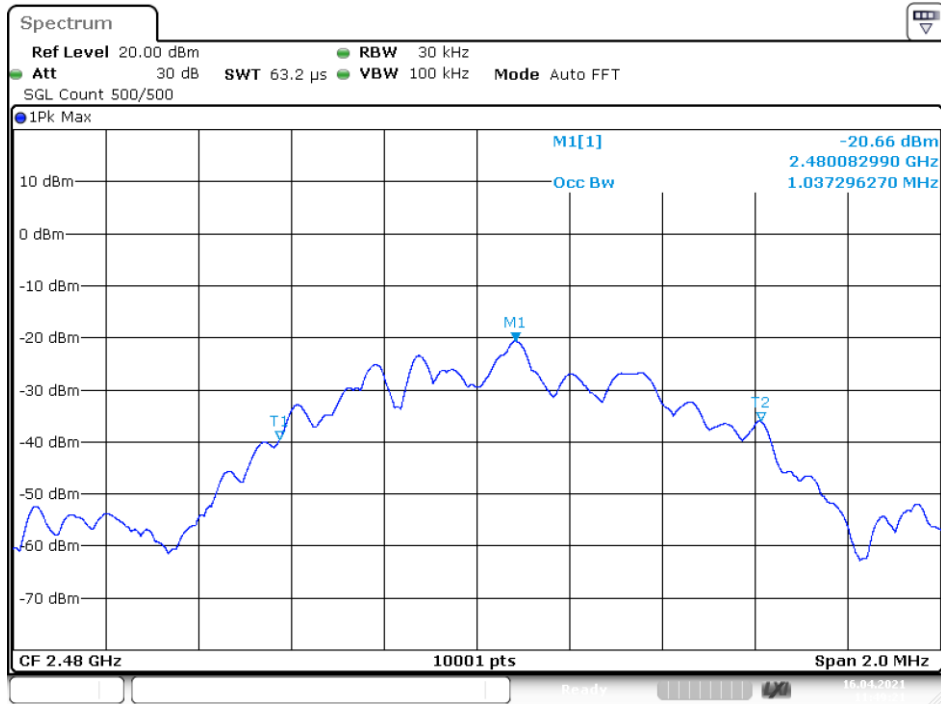
Date: 16.APR.2021 11:46:50

-6 dB BW NVNT BLE 1M 2440MHz Ant1



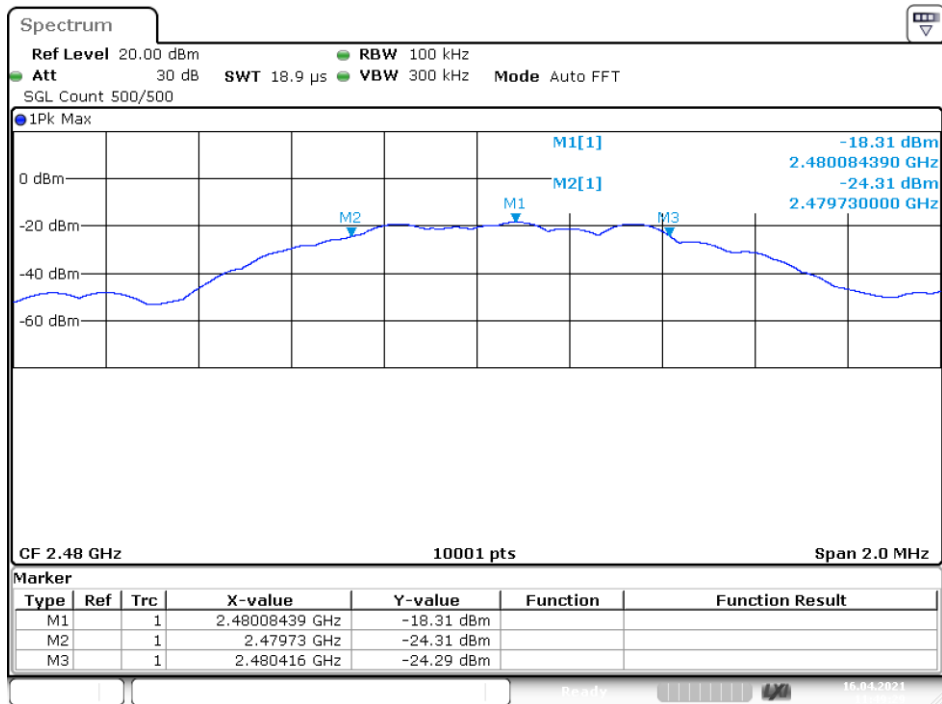
Date: 16.APR.2021 11:46:57

OBW NVNT BLE 1M 2480MHz Ant1



Date: 16.APR.2021 11:49:21

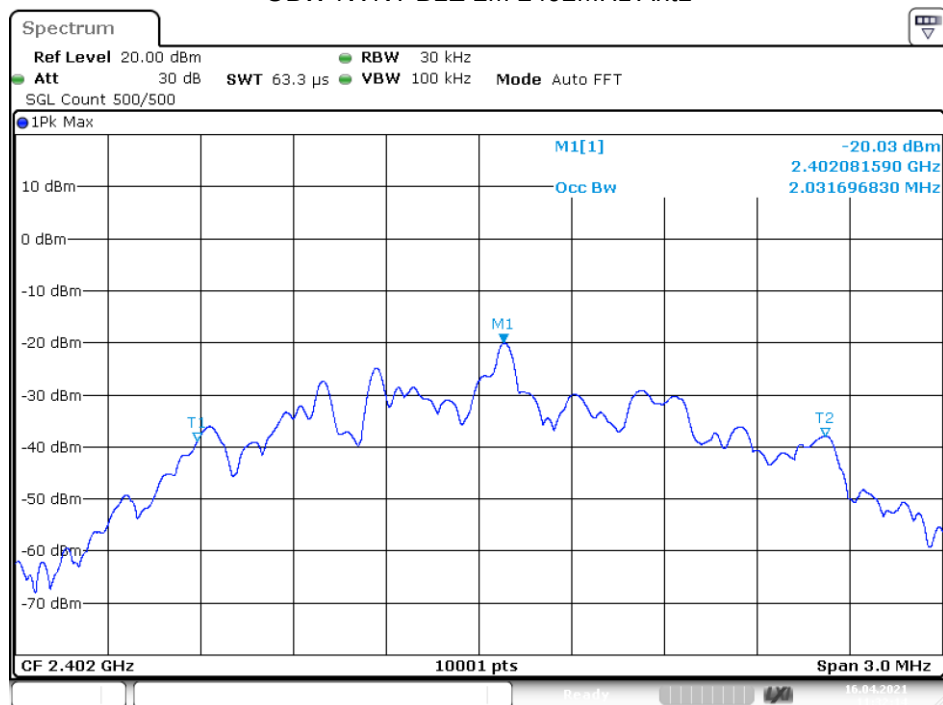
-6 dB BW NVNT BLE 1M 2480MHz Ant1



Date: 16.APR.2021 11:49:29

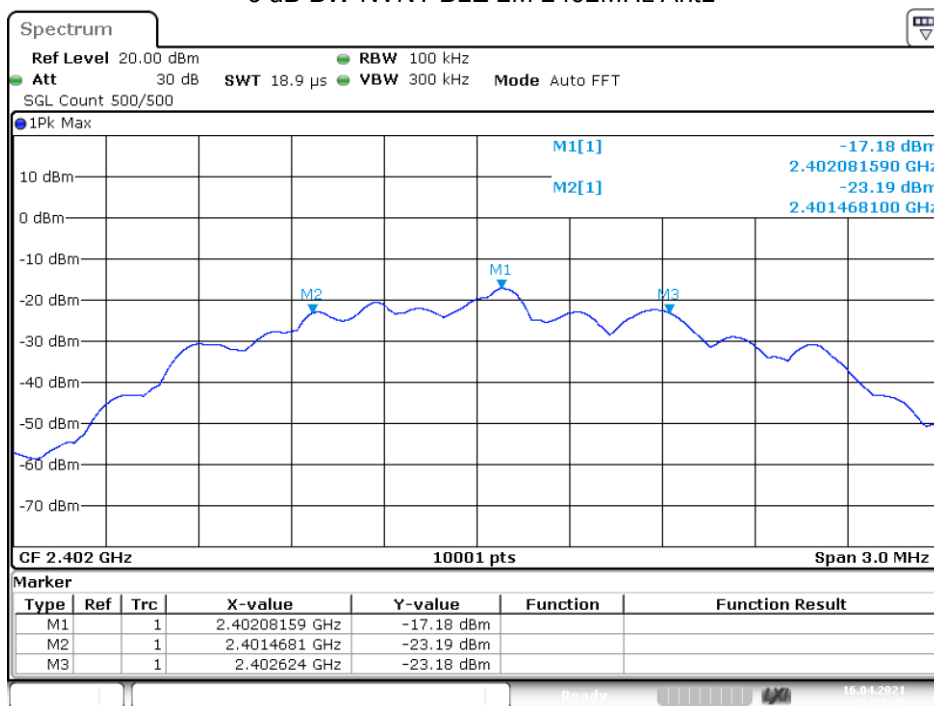
2Mbps							
Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	BLE 2M	2402	Ant 1	2.0317	1.1559	0.5	Pass
NVNT	BLE 2M	2440	Ant 1	2.0374	1.1763	0.5	Pass
NVNT	BLE 2M	2480	Ant 1	2.0419	1.1862	0.5	Pass

OBW NVNT BLE 2M 2402MHz Ant1

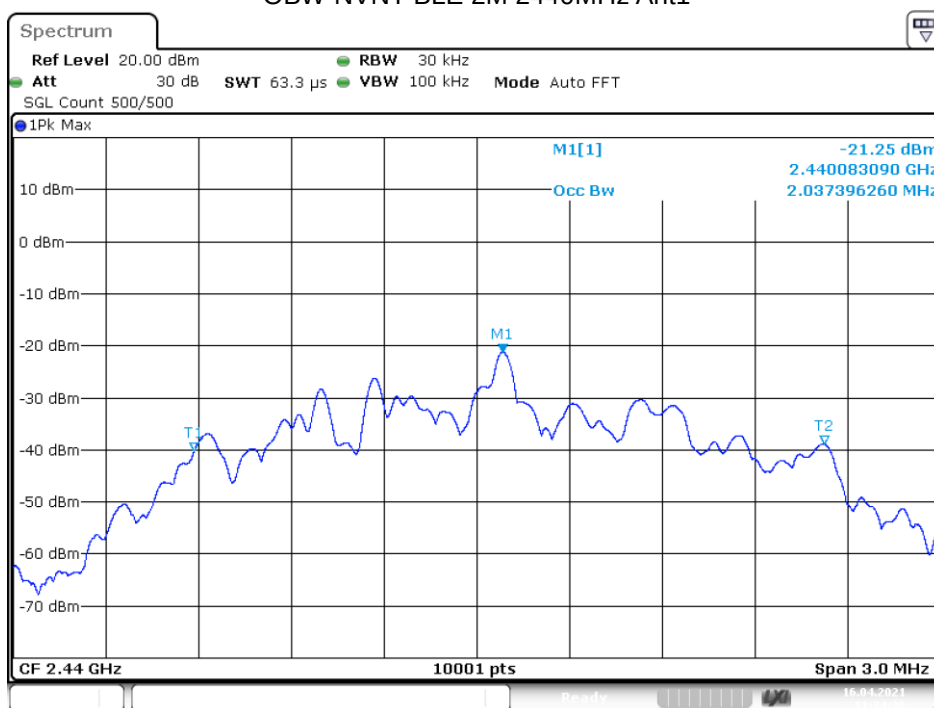


Date: 16.APR.2021 11:32:14

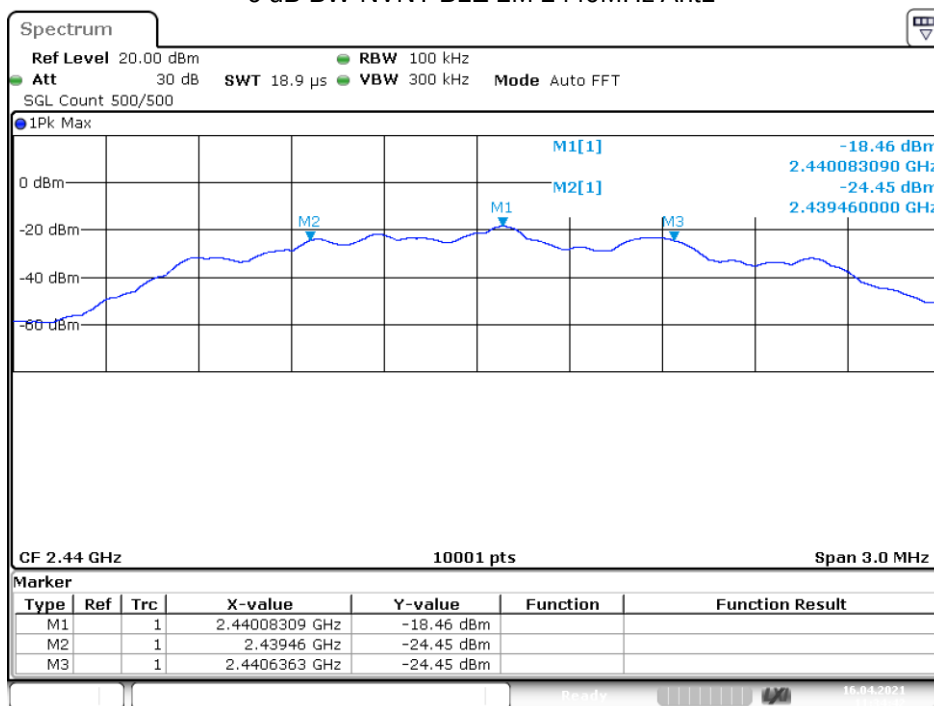
-6 dB BW NVNT BLE 2M 2402MHz Ant1



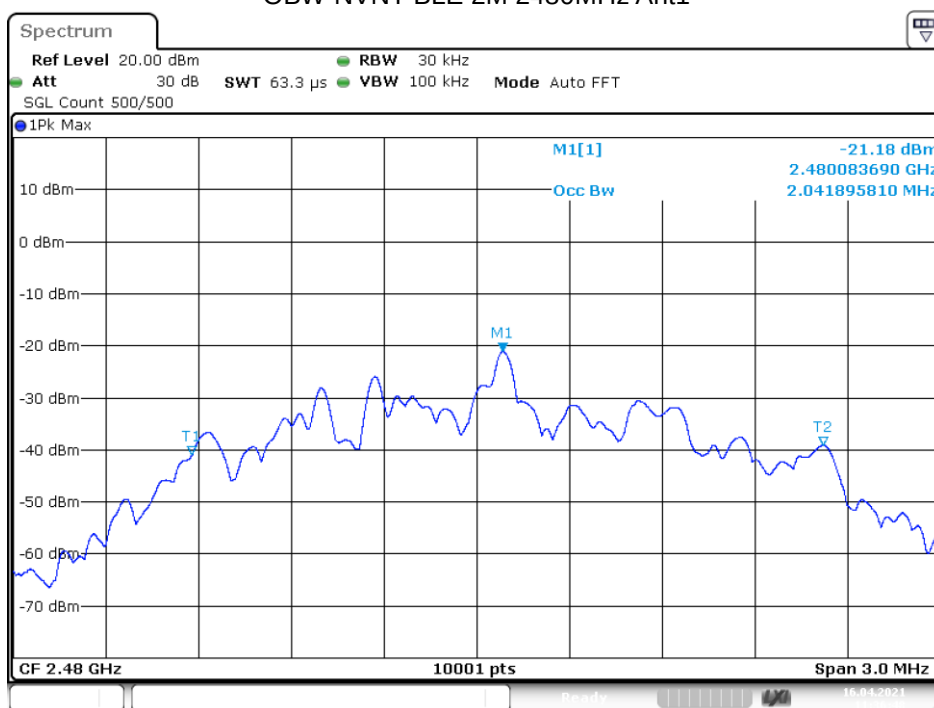
OBW NVNT BLE 2M 2440MHz Ant1



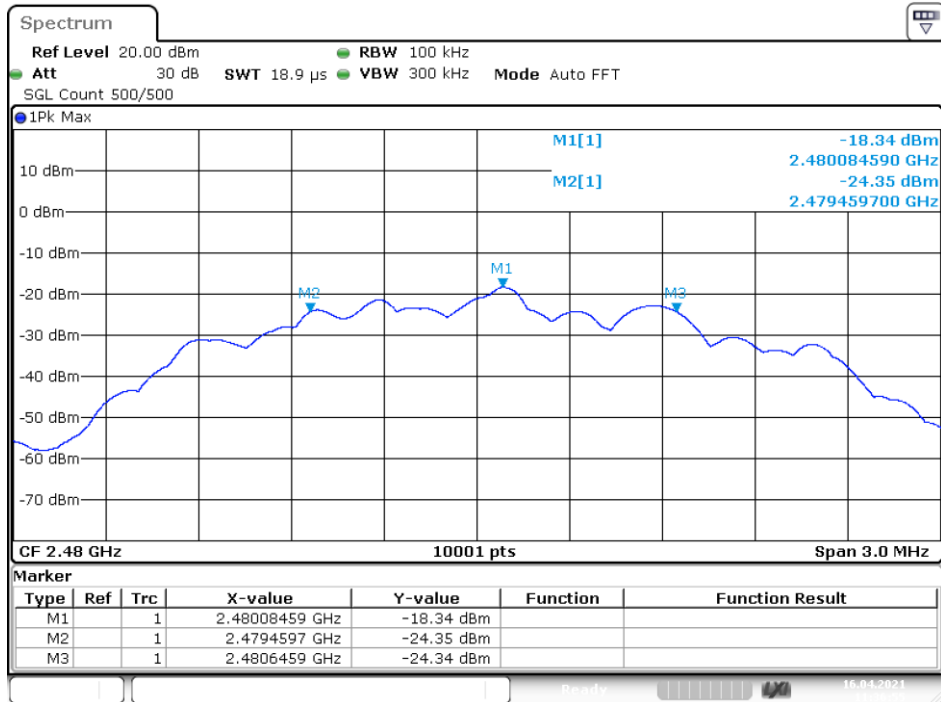
-6 dB BW NVNT BLE 2M 2440MHz Ant1



OBW NVNT BLE 2M 2480MHz Ant1



-6 dB BW NVNT BLE 2M 2480MHz Ant1



Date: 16.APR.2021 11:36:55

8. Band Edge Check

8.1. Test limits

Please refer section RSS-GEN&15.247.

8.2. Test Procedure

Details see the KDB558074 D01 Meas Guidance V05

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.

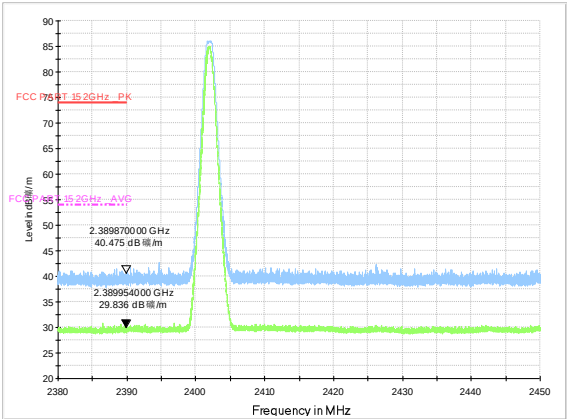
8.3. Test Setup

Same as 5.2.2.

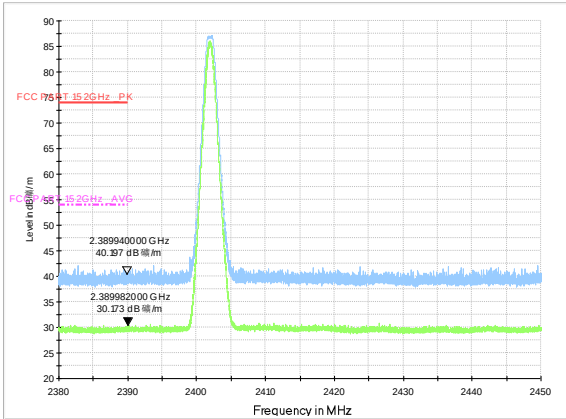
8.4. Test Results

Radiated Method:
Test Mode: Low

1Mbps

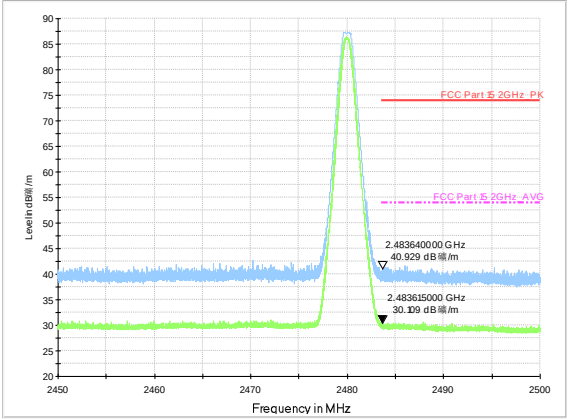


2Mbps

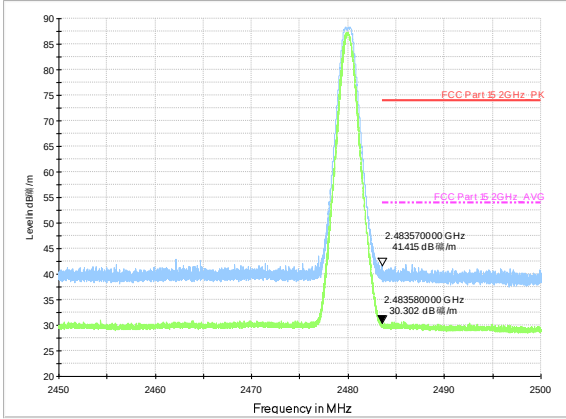


Test Mode: High

1Mbps

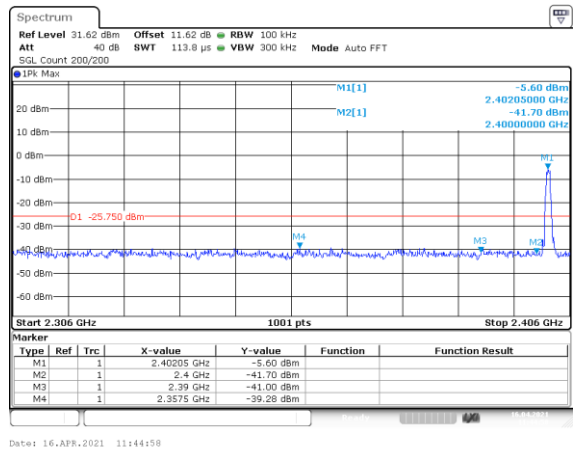


2Mbps

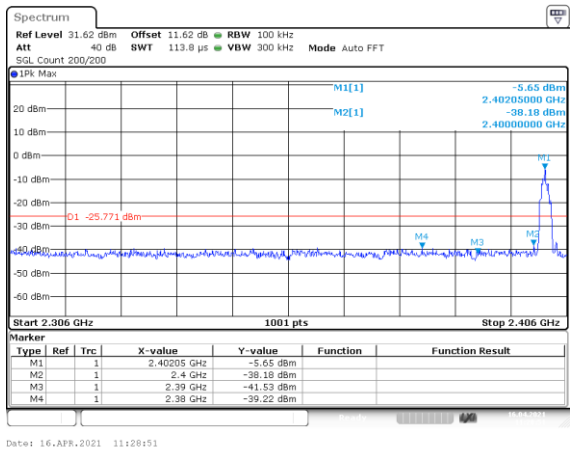


Conducted Method:

1Mbps

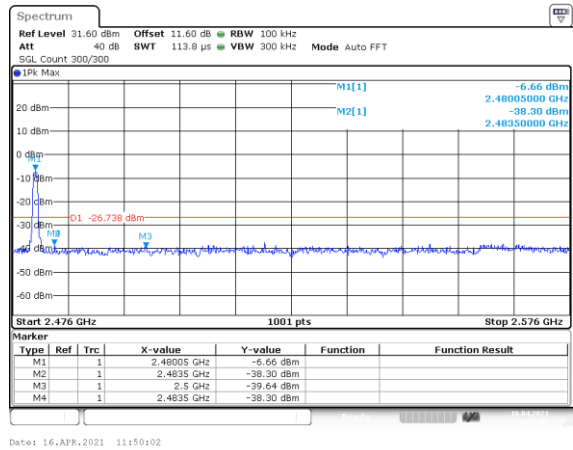


2Mbps

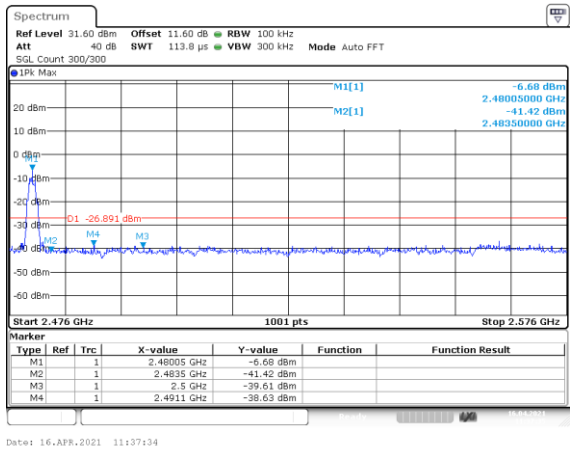


Lowest channel

1Mbps



2Mbps



Highest channel

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

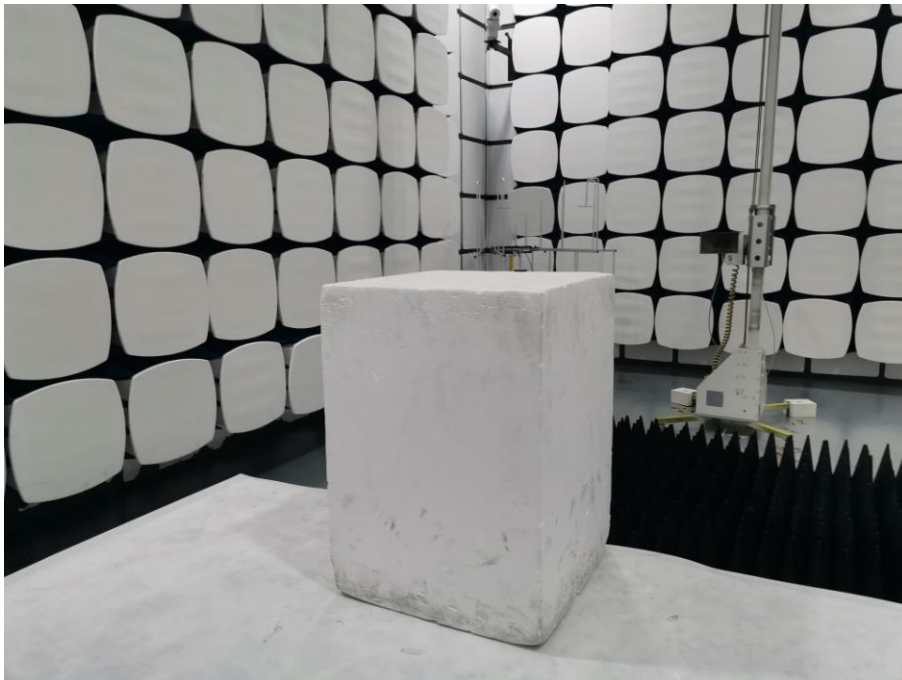
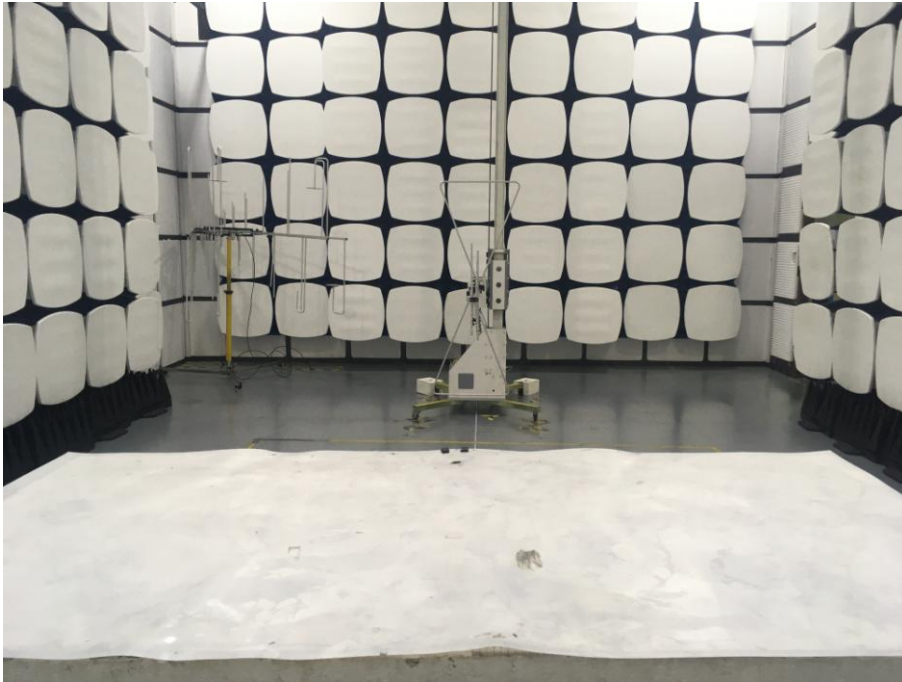
The antenna is PCB antenna and no consideration of replacement. Please see EUT photo for details.

9.3. Results

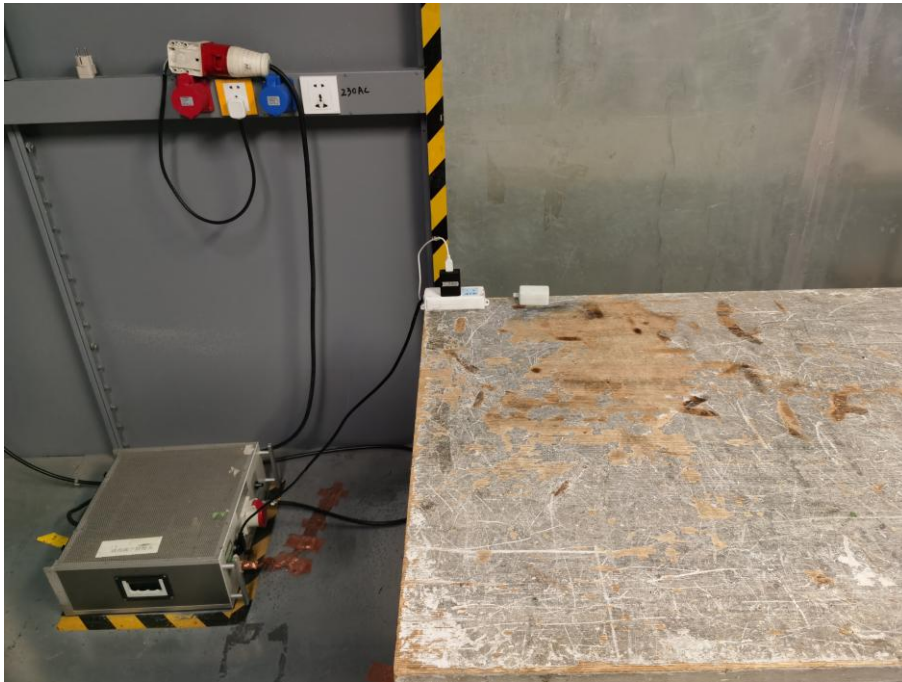
The EUT antenna 1 is PCB Antenna. It complies with the standard requirement.

10. Test Setup Photo

10.1. Photos of Radiated emission

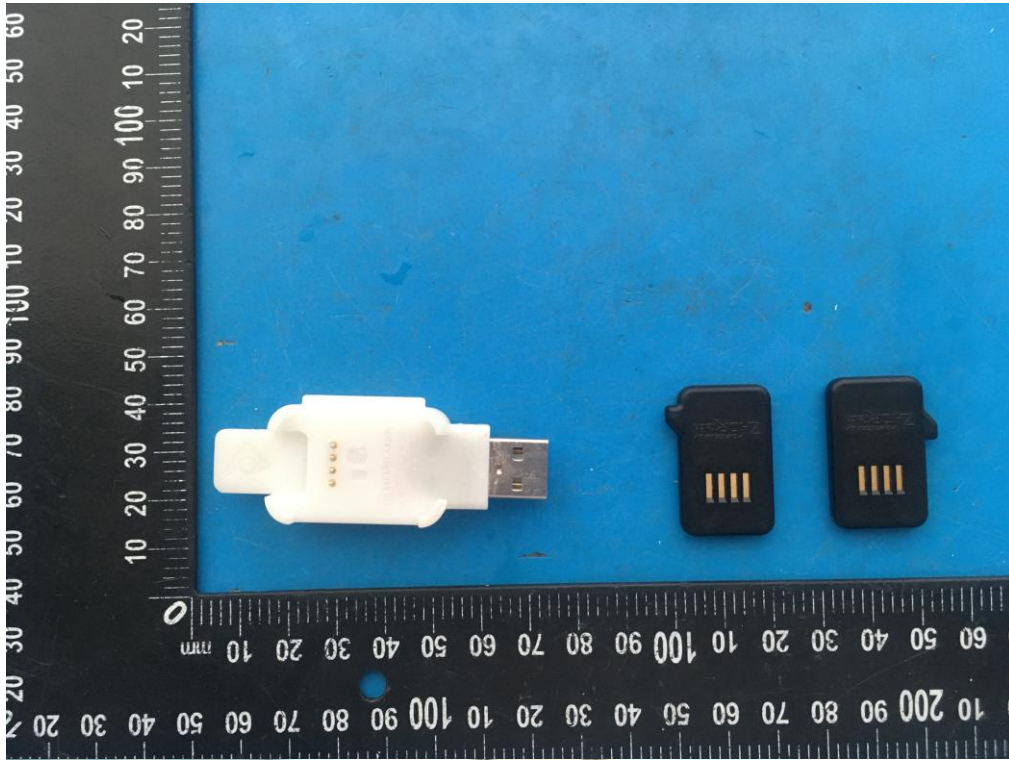


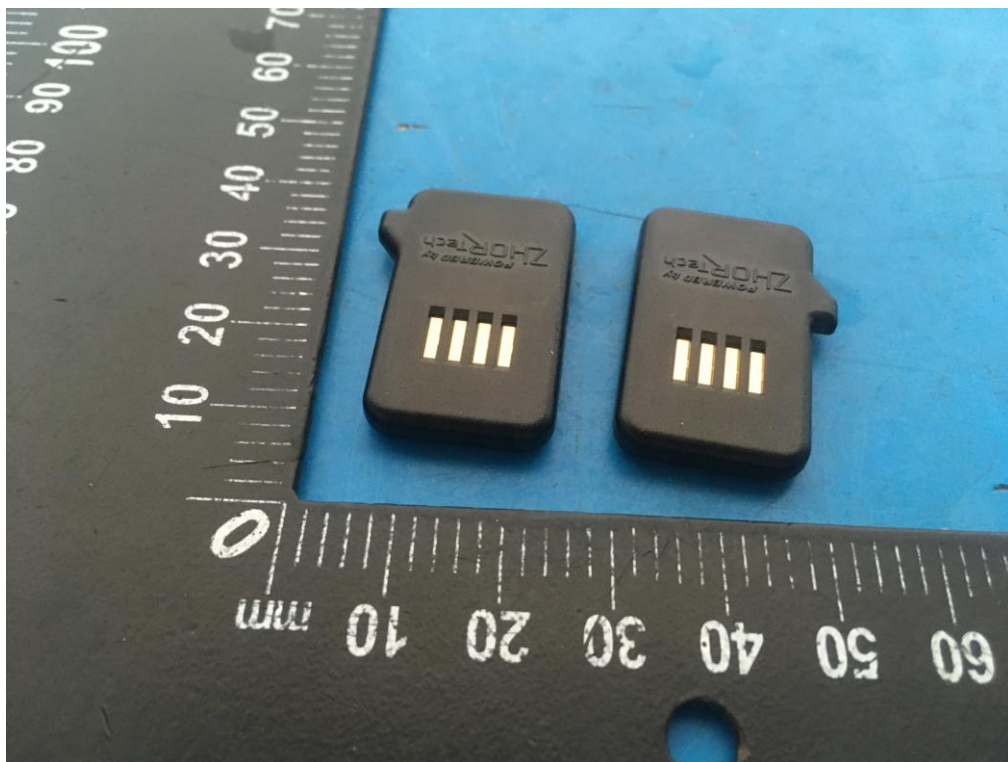
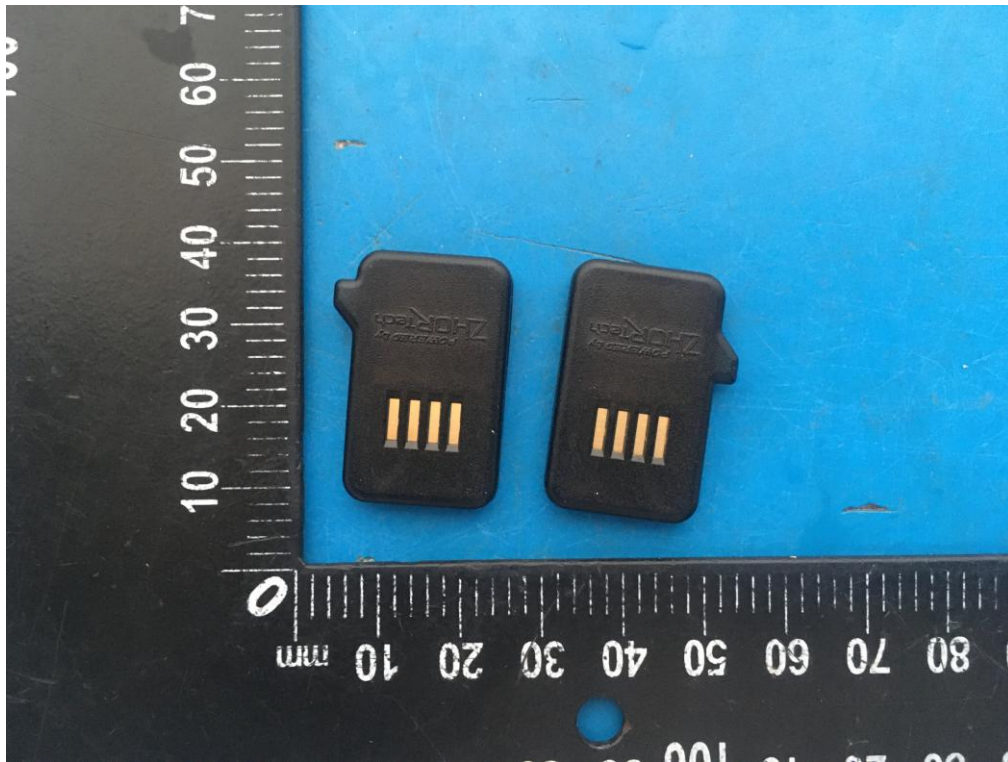
10.2.Photos of Power Line Conducted Emission Test

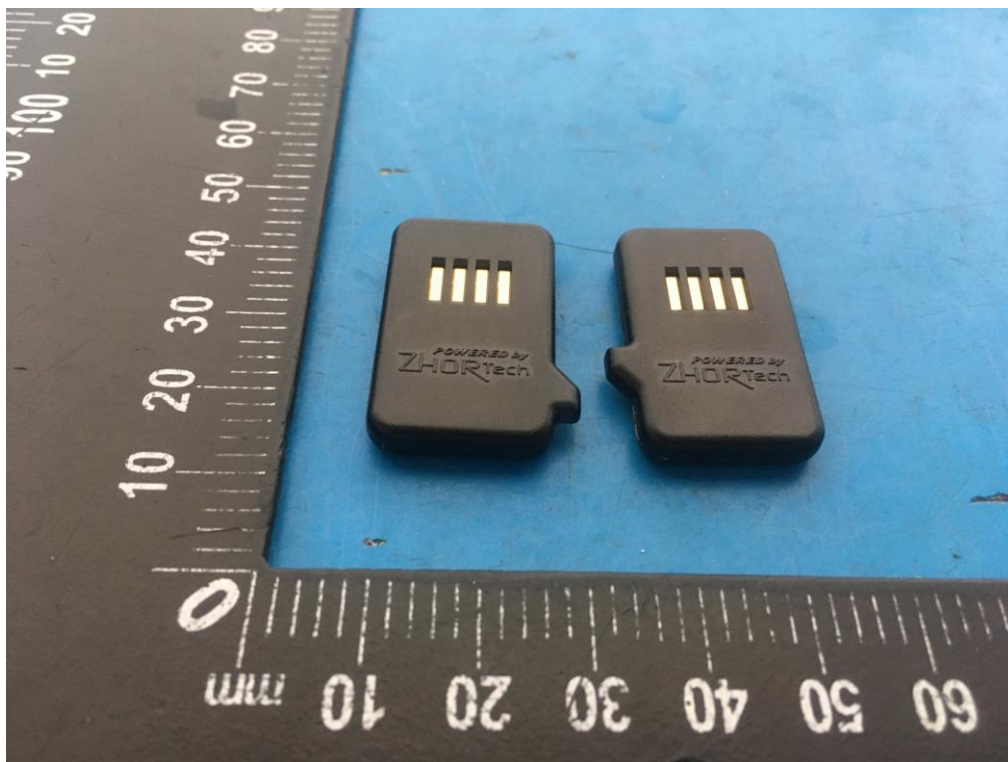


11. EUT Photo

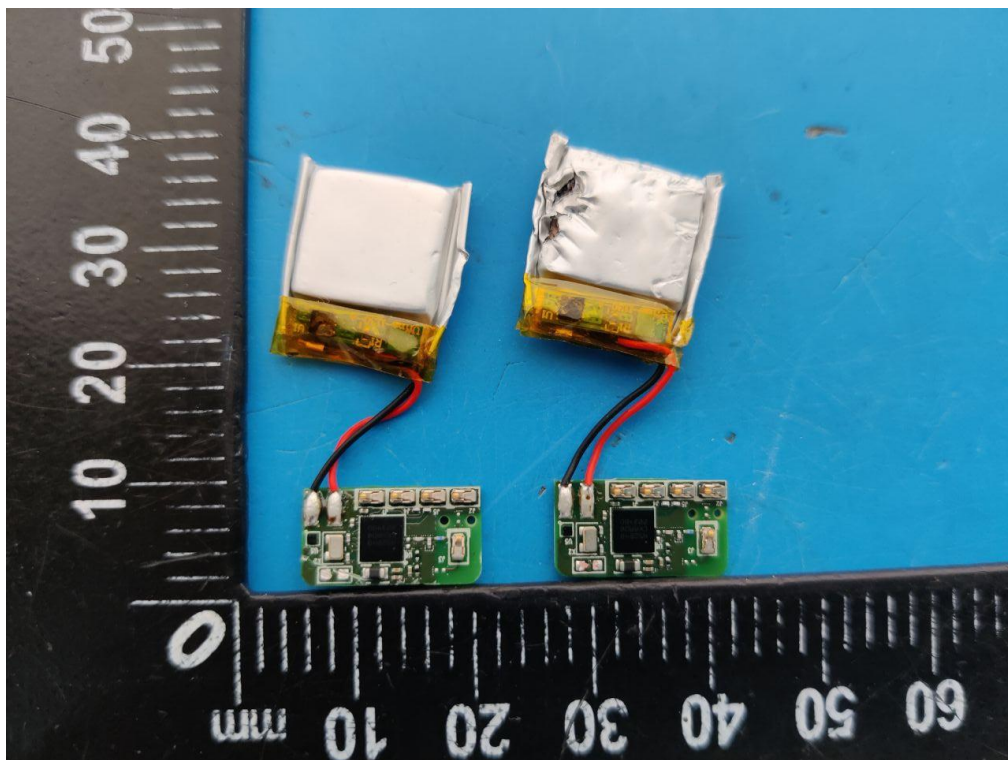
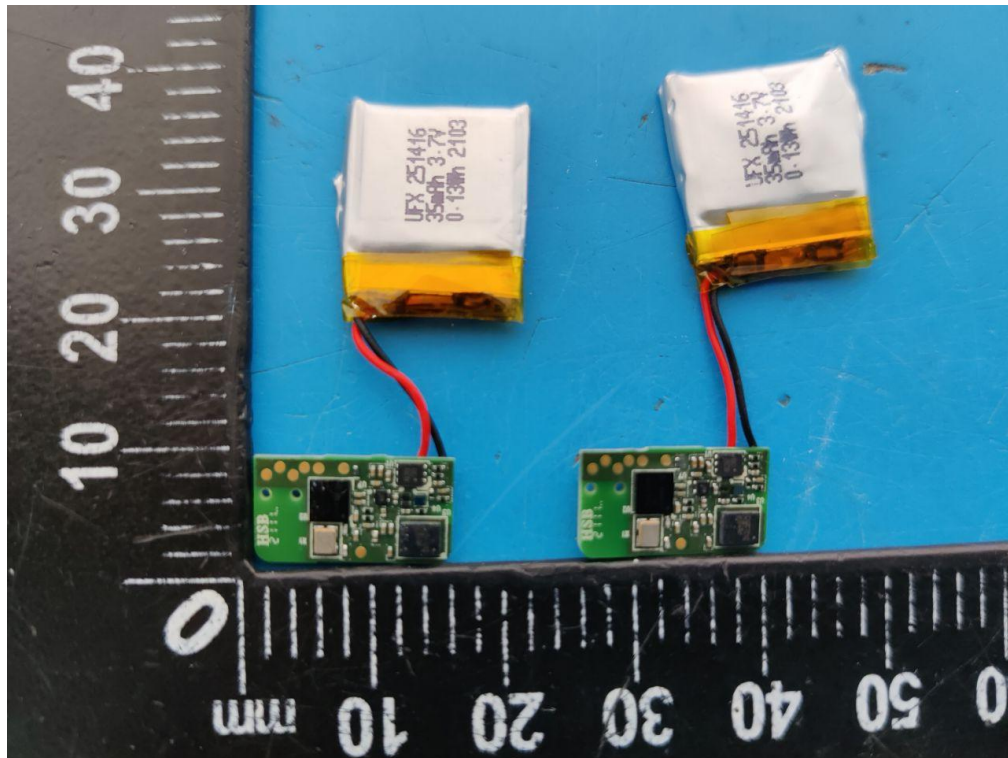


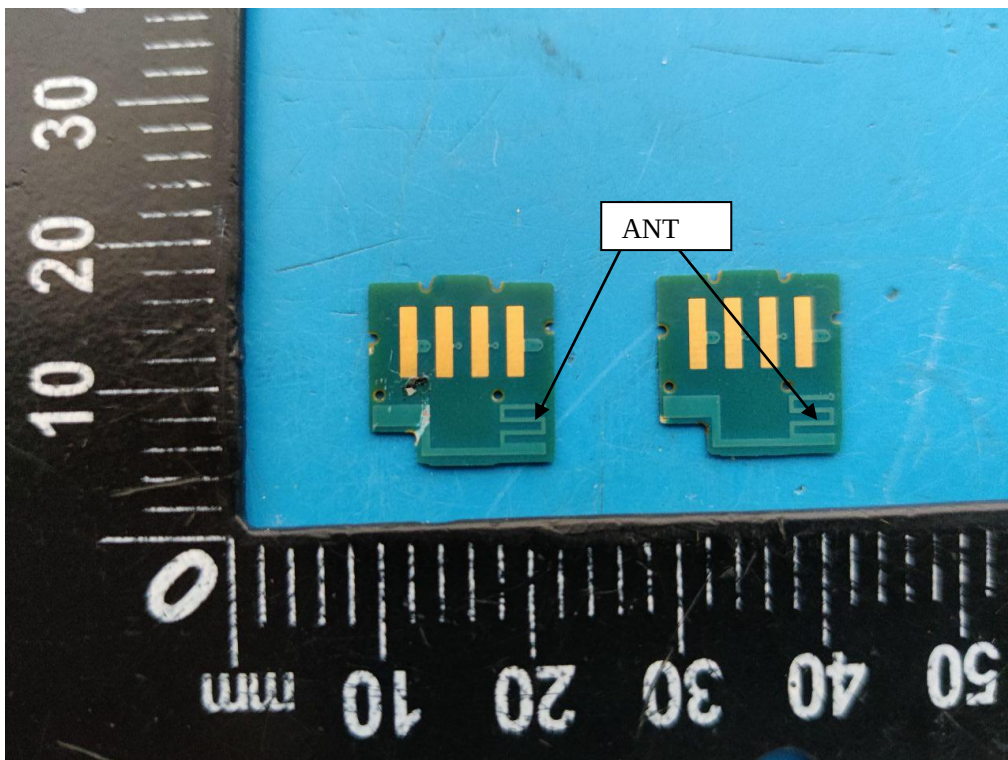
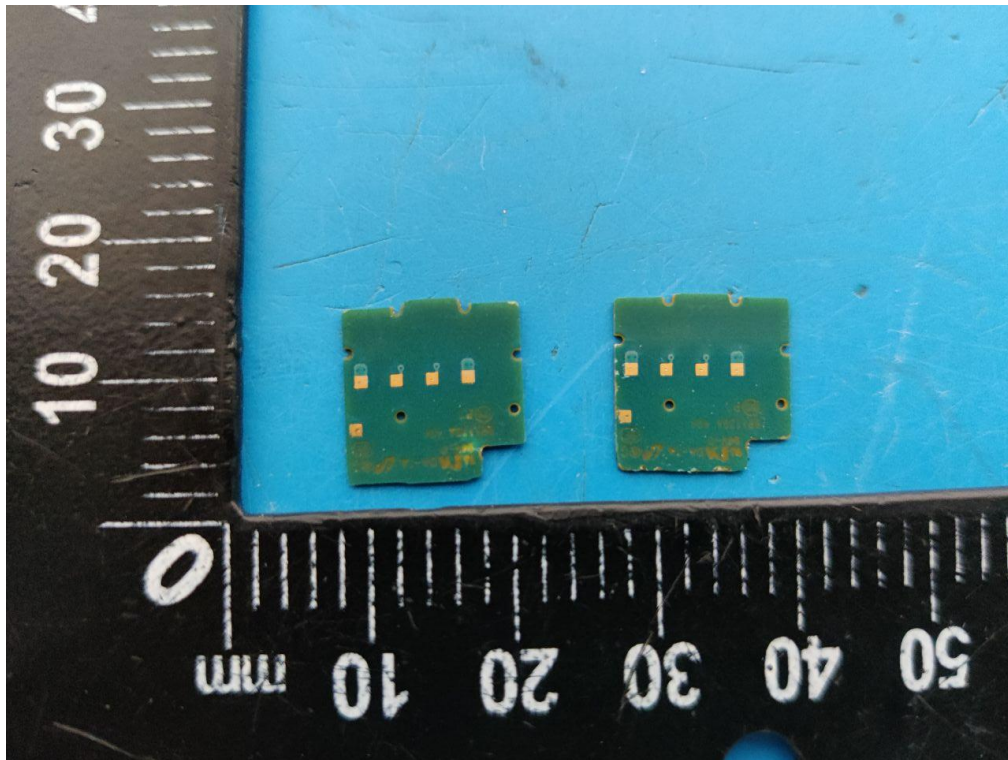












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