

FCC RADIO TEST REPORT

FCC ID: 2AIMKMTBEACON

Product:	MTBeacon
Trade Name:	N/A
Model Number:	MTBeacon
Report No.:	POCE15072237NRR

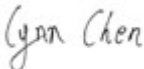
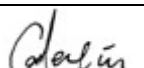
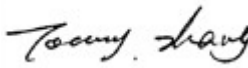
Prepared for

Hunan Forzone Culture Science And Technology Development Co., LTD
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Prepared by

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TEST RESULT CERTIFICATION	
Applicant's name	Hunan Forzone Culture Science And Technology Development Co., LTD
Address	Room 2501, Jiasheng International Plaza, No.289, Laodong West Road, Changsha City, Hunan, China
Manufacture's Name	Shenzhen Mantou Technology Co.,LTD
Address	Floor 2, Buliding H2, Hongfa-Tech Park, Tangtou Road, Shiyan Town, Bao'an District, Shenzhen, China
Product description	
Product name.....	MTBeacon
Model and/or type reference	MTBeacon
Ratings	DC 3.0V from battery
Standards	FCC Part15.247
Test procedure.....	ANSI C63.10-2013
This device described above has been tested by POCE, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.	
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Date of Test	
Date (s) of performance of tests	Apr. 07, 2016 ~ Apr. 10, 2016
Date of Issue.....	Apr. 10, 2016
Test Result	Pass

Testing Engineer	:	
		(Lynn Chen)
Technical Manager	:	
		(Carlen Liu)
Authorized Signatory	:	
		(Tommy zhang)

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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1. TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz.

ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices

KDB Publication No. 558074 D01 v03r03 Guidance on Measurements for Digital Transmission Systems

2. SUMMARY

2.1. Equipment Under Test

Power supply system utilised

Power supply voltage	:	<input type="radio"/> 120V / 60 Hz	<input type="radio"/> 115V / 60Hz
		<input type="radio"/> 12 V DC	<input type="radio"/> 24 V DC
		<input checked="" type="radio"/> Other (specified in blank below)	

DC 3.0V from battery

2.2. Short description of the Equipment under Test (EUT)

MTBeacon with Bluetooth 4.0LE function.

For more details, refer to the user's manual of the EUT.

Serial number: Prototyp

2.3. EUT operation mode

The EUT has been tested under typical operating condition. The Applicant provides communication tools software to control the EUT for staying in continuous transmitting and receiving mode for testing. There are 40 channels of EUT, and the test carried out at the lowest channel, middle channel and highest channel .

Frequency Range:	2400-2483.5MHz
Channel number:	40 channels
Modulation type:	GFSK
Antenna:	internal

Test Channel	Test Frequency
Low Channel	2402 MHz
Middle Channel	2440 MHz
High Channel	2480 MHz

2.4. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

☐ - supplied by the manufacturer

☒ - supplied by the lab

2.5. Configuration of Tested System

Fig. 2-1 Configuration of Tested System



2.6. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: 2AHXVMTBEACON** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.7. Modifications

No modifications were implemented to meet testing criteria.

2.8. NOTE

1. The EUT have Bluetooth 4.0 functions, The functions of the EUT listed as below:

	Test Standards	Reference Report
Radio	FCC Part 15 Subpart C (Section15.247)	POCE15072237NRR

2. The frequency bands used in this EUT are listed as follows:

Frequency Band(MHz)	2400-2483.5	5150-5350	5470-5725	5725-5850
Bluetooth 4.0LE	√	—	—	—

3. The EUT provides one completed transmitter and receiver.

Modulation Mode	TX Function
GFSK	1TX

2.9. Channel list

Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	20	2442
01	2404	21	2444
02	2406	22	2446
03	2408	23	2448
04	2410	24	2450
05	2412	25	2452
06	2414	26	2454
07	2416	27	2456
08	2418	28	2458
09	2420	29	2460
10	2422	30	2462
11	2424	31	2464
12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2472
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
19	2440	39	2480

2.10. Mode of Operation

1. The EUT has been tested under normal operating condition.
2. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.
- Channel low (2402MHz), mid (2440MHz) and high (2480MHz) with highest data rate are chosen for full testing.
3. Test Mode:

Test Mode(TM)	Description
TM1	Transmitter-2402MHz
TM2	Transmitter-2440MHz
TM3	Transmitter-2480MHz
TM4	Transmitter-Link mode

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Shenzhen POCE Technology Co.,Ltd.

Room 502, Bldg. 1, Xinghua Garden, Baoan Road Xixiang, Baoan District, Shenzhen, China

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.10 and CISPR 22/EN 55022 requirements

3.2. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.: 222278

Shenzhen POCE Technology Co.,Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 222278.

3.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	<u>15-35 ° C</u>
Humidity:	<u>30-60 %</u>
Atmospheric pressure:	<u>950-1050mbar</u>

3.4. Statement of the measurement uncertainty

The reported uncertainty of measurement $y \pm U$, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately **95 %**.

No.	Item	Uncertainty
1	Conducted Emission Test	$\pm 1.38\text{dB}$
2	RF power,conducted	$\pm 0.16\text{dB}$
3	Spurious emissions,conducted	$\pm 0.21\text{dB}$
4	All emissions,radiated(<1G)	$\pm 4.68\text{dB}$
5	All emissions,radiated(>1G)	$\pm 4.89\text{dB}$
6	Temperature	$\pm 0.5^{\circ}\text{C}$
7	Humidity	$\pm 2\%$

3.5. Test Description

FCC PART 15		
FCC Part 15.207	AC Power Conducted Emission	N/A
FCC Part 2.1049/Part 15.247(a)(2)	6dB Bandwidth	PASS
FCC Part 2.1051/Part 15.247(d)	Spurious RF Conducted Emission	PASS
FCC Part 2.1046/Part 15.247(b)	Maximum Peak Output Power	PASS
FCC Part 15.247(e)	Power Spectral Density	PASS
FCC Part 2.1053/Part 15.109/ 15.205/ 15.209	Radiated Emissions	PASS
FCC Part 15.247(d)	Band Edge Compliance of RF Emission	PASS
FCC Part 15.203/15.247 (b)	Antenna Requirement	PASS

Remark: The measurement uncertainty is not included in the test result.

3.6. Equipments Used during the Test

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibration Date
1	Spectrum Analyzer	Agilent	E4407B	160400005	Jul. 12. 2015
2	Test Receiver	R&S	ESPI	101318	Jul. 12. 2015
3	Bilog Antenna	TESEQ	CBL6111D	31216	Oct. 16. 2015
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264416	Jul. 06. 2015
5	Spectrum Analyzer	ADVANTEST	R3132	150900201	Jul. 06. 2015
6	Horn Antenna	EM	EM-AH-10180	2011071402	Oct. 16. 2015
7	Horn Ant	Schwarzbeck	BBHA 9170	9170-181	Oct. 16. 2015
8	Amplifier	EM	EM-30180	060538	Jul. 12. 2015
9	Loop Antenna	ARA	PLA-1030/B	1029	Oct. 16. 2015
10	Power Meter	R&S	NRVS	100696	Jul. 06. 2015
11	Test Receiver	R&S	ESCI	101160	Jul. 12. 2015
12	LISN	R&S	ENV216	101313	Jul. 06. 2015
13	LISN	EMCO	3816/2	00042990	Jul. 06. 2015
14	50Ω Coaxial Switch	Anritsu	MP59B	6200264417	Jul. 06. 2015
15	Passive Voltage Probe	R&S	ESH2-Z3	100196	Jul. 06. 2015
16	Absorbing clamp	R&S	MOS-21	100423	Jul. 06. 2015
17	The temporary antenna connector	MMCX - SMA	1547	23657478	Jul. 06. 2015
18	RF Cable(1-25GHz)	HUBER+SUHNER	RG214	N/A	Jul. 06. 2015
19	RF Cable(0-1GHz)	HUBER+SUHNER	RG174	N/A	Jul. 06. 2015

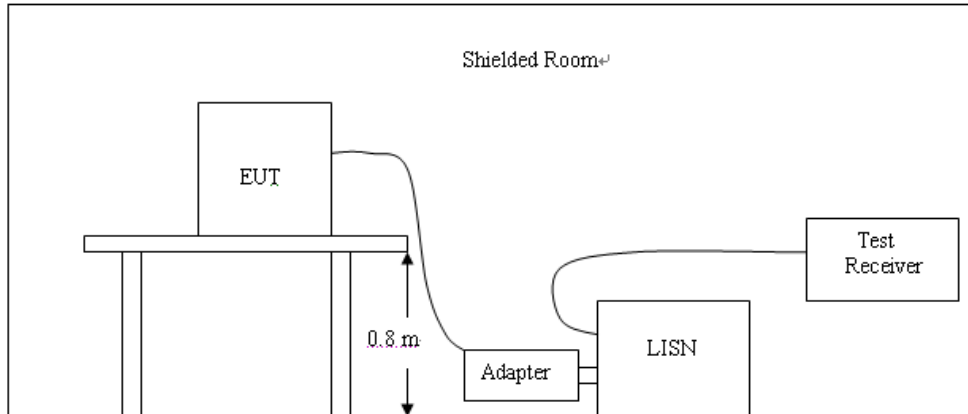
Note: 1. The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

2. The Cal. Due is 1 year.

4. TEST CONDITIONS AND RESULTS

4.1. AC Power Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

- 1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2013.
- 2 Support equipment, if needed, was placed as per ANSI C63.10-2013
- 3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2013
- 4 The EUT received DC5V power from the adapter, the adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5 All support equipments received AC power from a second LISN, if any.
- 6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
- 8 During the above scans, the emissions were maximized by cable manipulation.
Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

AC Power Conducted Emission Limit

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following :

Frequency (MHz)	Maximum RF Line Voltage (dBμV)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

* Decreasing linearly with the logarithm of the frequency

TEST RESULTS

Not applicable to this device.

FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

RADIATION LIMIT

For unintentional device, according to § 15.209(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency (MHz)	Distance (Meters)	Radiated (dBµV/m)	Radiated (µV/m)
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8m above ground plane below 1GHz and 1.5m above ground plane above 1GHz .
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. For the radiated emission test above 1GHz: Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. Repeat above procedures until the measurements for all frequencies are complete.
8. Based on the Frequency Generator in the device include 16MHz. The test frequency range from 9KHz to 25GHz per FCC PART 15.33(a).

Note:

Three axes are chosen for pretest, the X axis is the worst mode for final test.

For battery operated equipment, the equipment tests shall be performed using a fully-charged battery.

TEST RESULTS

All the test modes (TM1, TM2, TM3 and TM4) completed for test. The worst case of Radiated Emission is TM1; the test data of this mode was reported.

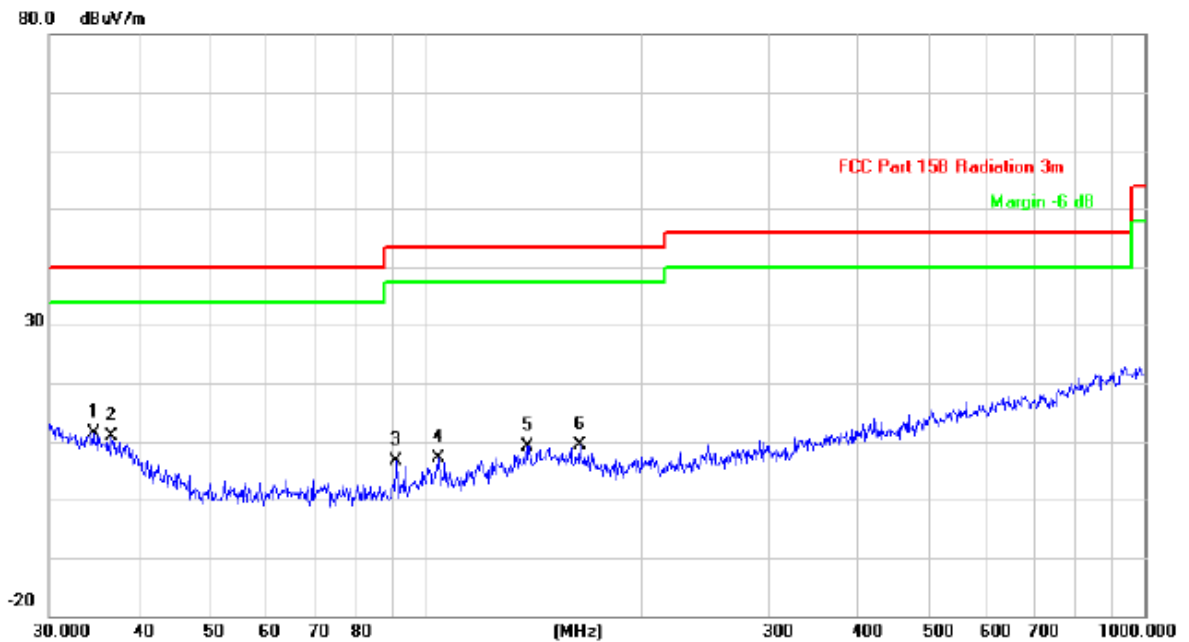
9KHz-30MHz:

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
-	-	-	-	See Note

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

Distance extrapolation factor= 40 log (specific distance/ test distance) (dB);

Limit line= specific limits (dBuV) + distance extrapolation factor.

30-1000MHz:

Site Chamber #1

Limit: FCC Part 15B Radiation 3m

EUT:

M/N:

Mode:

Note:

Polarization: **Vertical**

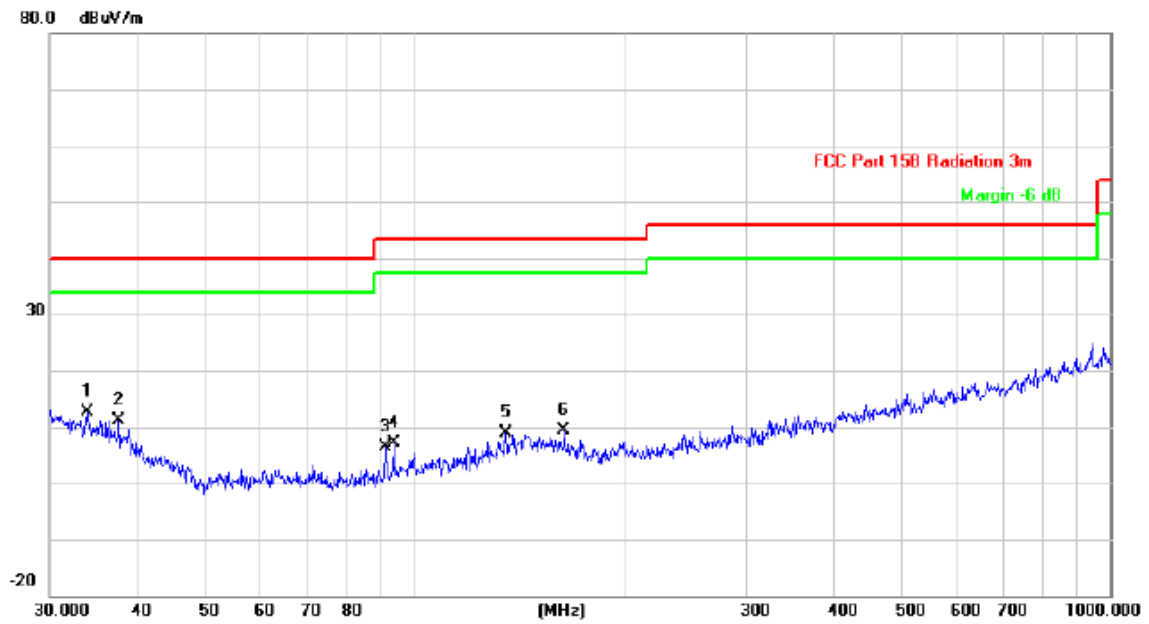
Power:

Distance: 3m

Temperature:

Humidity: %

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB/m	Measure-ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree	Comment
1	*	34.5173	21.39	-10.10	11.29	40.00	-28.71	QP		
2		36.6375	22.39	-11.58	10.81	40.00	-29.19	QP		
3		91.1746	27.50	-20.77	6.73	43.50	-36.77	QP		
4		104.1701	25.26	-18.04	7.22	43.50	-36.28	QP		
5		138.3873	23.48	-14.23	9.25	43.50	-34.25	QP		
6		163.7550	23.95	-14.55	9.40	43.50	-34.10	QP		



Site Chamber #1

Polarization: *Horizontal*

Temperature:

Limit: FCC Part 15B Radiation 3m

Power:

Humidity: %

EUT:

Distance: 3m

M/N:

Mode:

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	cm	degree	Comment
1	*	33.9174	22.23	-9.67	12.56	40.00	-27.44	QP		
2		37.6798	23.42	-12.26	11.16	40.00	-28.84	QP		
3		90.8554	27.19	-20.81	6.38	43.50	-37.12	QP		
4		93.4402	27.58	-20.44	7.14	43.50	-36.36	QP		
5		135.5062	23.27	-14.45	8.82	43.50	-34.68	QP		
6		164.3301	23.86	-14.59	9.27	43.50	-34.23	QP		

Above 1 GHz Test Results:

CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
0	V	2402	56.3	30.8	87.1	Fundamental	/	PK
	V	3200	14.8	31.1	45.9	54(note3)	8.1	PK
	V	2390	34.9	32.2	67.1	74	6.9	PK
	V	2390	15.0	32.2	47.2	54	6.8	AV
	V	2400	37.6	32.1	69.7	74	4.3	PK
	V	2400	16.2	32.1	48.3	54	5.7	AV
	V	4804	5.0	42.6	47.6	54(note3)	6.4	PK
	V	7206	19.3	46.5	65.8	74	8.2	PK
	V	7206	0.7	46.5	47.2	54	6.8	AV
19	V	2440	55.2	31.2	86.4	Fundamental	/	PK
	V	3200	11.6	31.1	42.7	54(note3)	11.3	PK
	V	4880	13.3	32.8	46.1	54(note3)	7.9	PK
	V	7320	22.2	46.8	69.0	74	5.0	PK
	V	7320	1.2	46.1	47.3	54	6.7	AV
39	V	2480	56.9	30.9	87.8	Fundamental	/	PK
	V	3200	12.0	31.1	43.1	54(note3)	10.9	PK
	V	2483.5	35.7	30.2	65.9	74	8.1	PK
	V	2483.5	17.1	30.2	47.3	54	6.7	AV
	V	4960	14.3	32.5	46.8	54(note3)	7.2	PK
	V	7440	21.9	46.3	68.2	74	5.8	PK
	V	7440	0.2	46.3	46.5	54	7.5	AV

Note: 1. Measure Level = Reading Level + Factor.

2. The test results which are attenuated more than 20 dB below the permissible value limit (the test frequency range: 9kHz~30MHz, 18GHz~25GHz), therefore no data appear in the report.

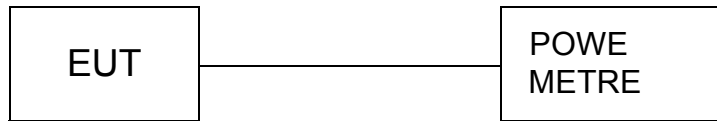
3. This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.

4. above 8GHz up to 25GHz was verified, and no any emission was found except system noise floor.

Remark: RBW 1MHz VBW 3MHz peak detector for PK value, RMS detector for AV value

4.3. Maximum Peak Output Power

TEST CONFIGURATION



TEST PROCEDURE

According to C63.10 -2013 and KDB 558074 D01 v03r03, The EUT was directly connected to the power meter / spectrum analyzer and antenna output port as show in the block diagram as TEST CONFIGURATION shows.

Use the wideband power meter to test peak power and record the result.

LIMIT

The Maximum Peak Output Power Measurement limit is 30dBm.

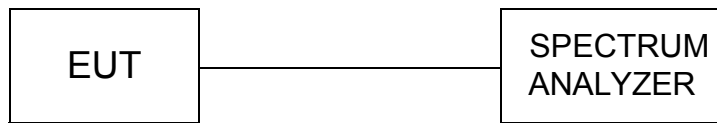
TEST RESULTS

Channel Frequency (MHz)	Peak Power Output (dBm)	Peak Power Limit (dBm)	Pass / Fail
2402	-7.03	30	PASS
2440	-7.38	30	PASS
2480	-7.29	30	PASS

Note: The test results including the cable lose.

4.4. 6dB Bandwidth

TEST CONFIGURATION



TEST PROCEDURE

1. The testing follows FCC KDB Publication No. 558074 D01 v03r03 (Measurement Guidelines of DTS).
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
3. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW. The 6 dB bandwidth must be greater than 500 kHz.
4. The marker-delta reading at this point is the 6 dB bandwidth of the emission.

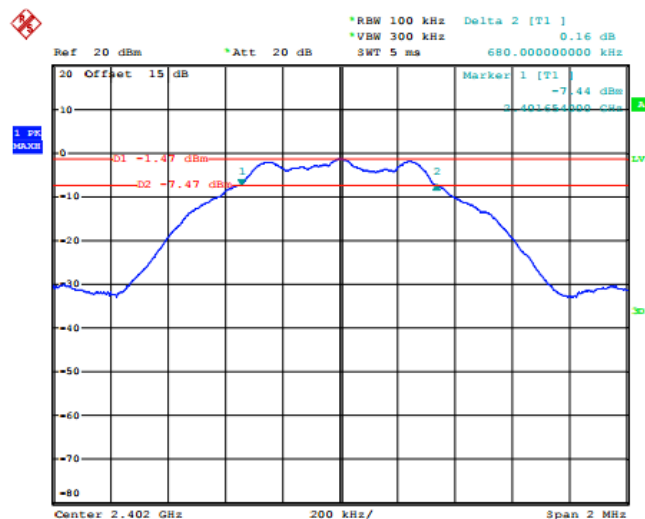
LIMIT

For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

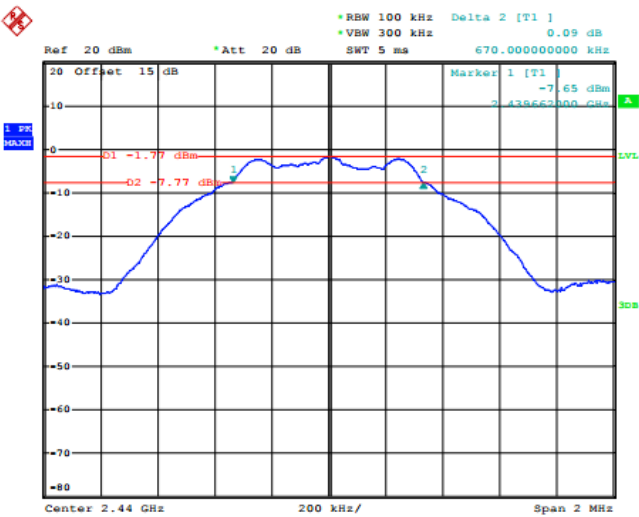
TEST RESULTS

CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (KHz)	LIMIT (KHz)	PASS/FAIL
2402	680	500	PASS
2440	670	500	PASS
2480	688	500	PASS

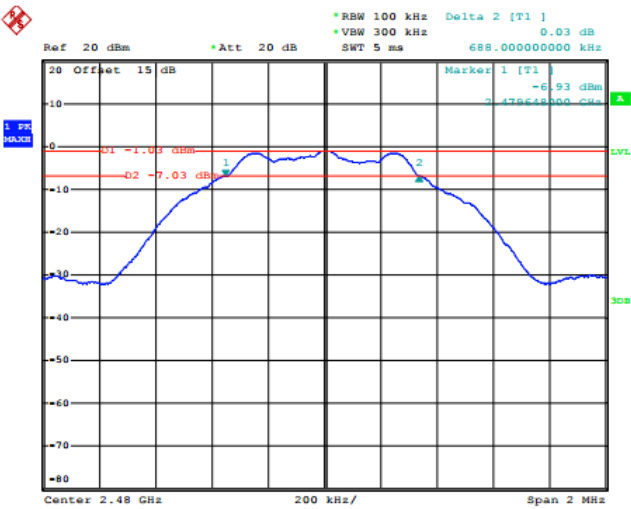
Low Channel



Middle Channel

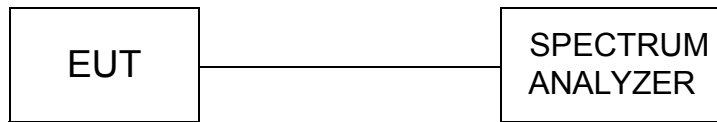


High Channel



4.5. Power Spectral Density Measurement

TEST CONFIGURATION



TEST PROCEDURE

The EUT was tested according to KDB 558074 D01 v03r03 for compliance to FCC 47CFR 15.247 requirements.

Set RBW= 3 kHz, VBW \geq 10KHz, SPAN to 1.5 times greater than the EBW,.

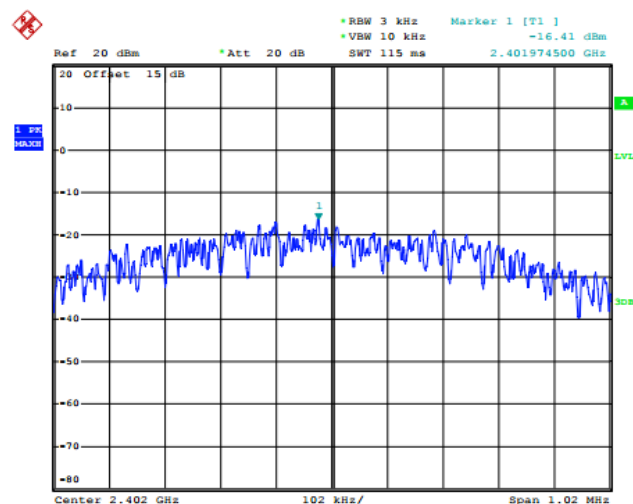
LIMIT

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

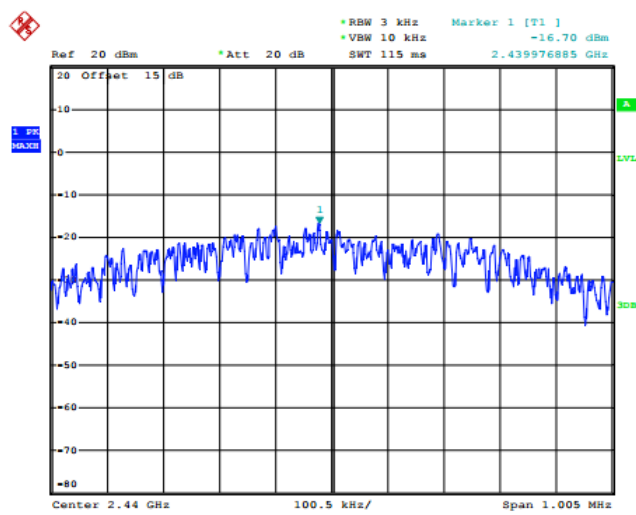
TEST RESULTS

Modulation Mode	Channel	Channel Frequency (MHz)	PSD (dBm/3KHz)	Maximum limit (dBm/3KHz)	PASS / FAIL
GFSK	0	2402	-16.41	8	PASS
	19	2440	-16.70	8	PASS
	39	2480	-15.93	8	PASS

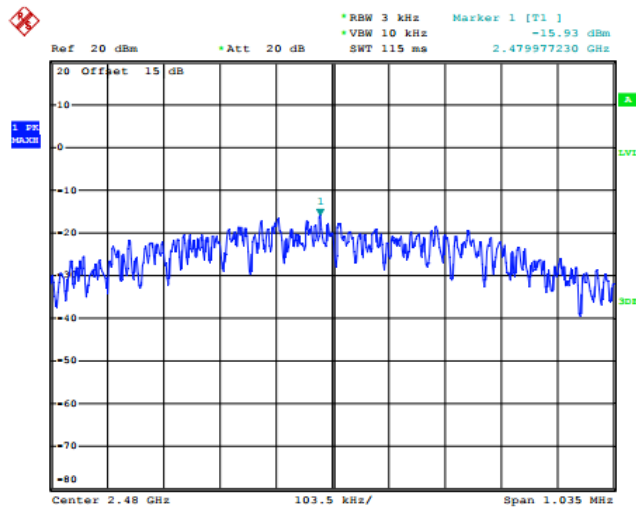
Low channel



Middle channel

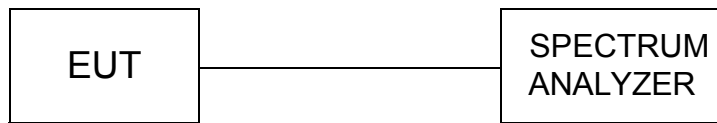


High channel



4.6. Spurious RF Conducted Emission and Bandedge

TEST CONFIGURATION



TEST PROCEDURE

The EUT was tested according to KDB 558074 D01 v03r03 for compliance to FCC 47CFR 15.247 requirements.

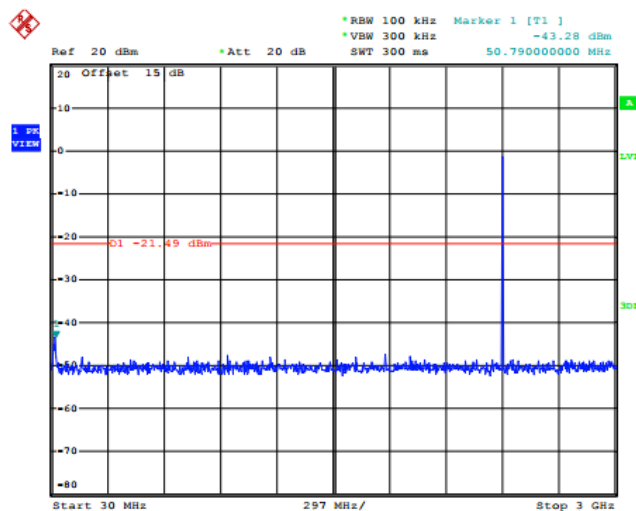
The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2013 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW=100kHz and VBM= 300kHz to measure the peak field strength, and measure frequency range from 30MHz to 26.5GHz.

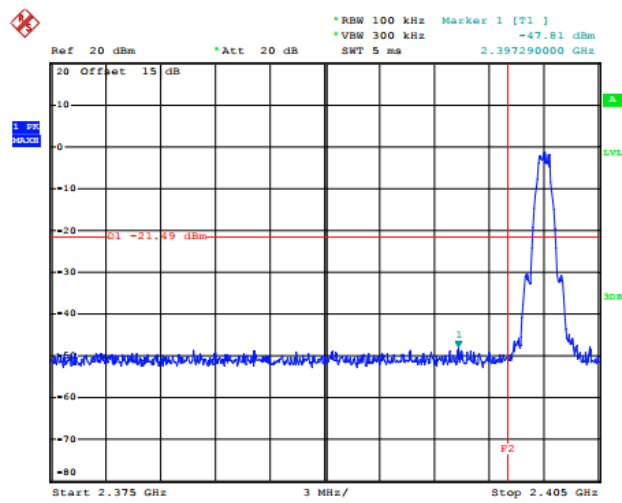
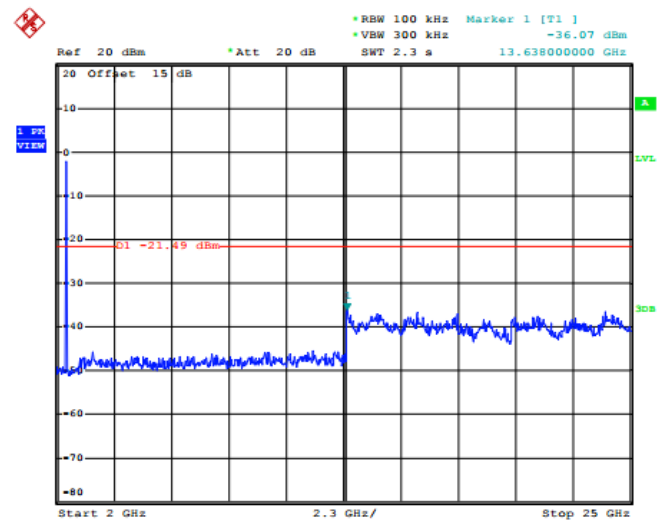
LIMIT

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

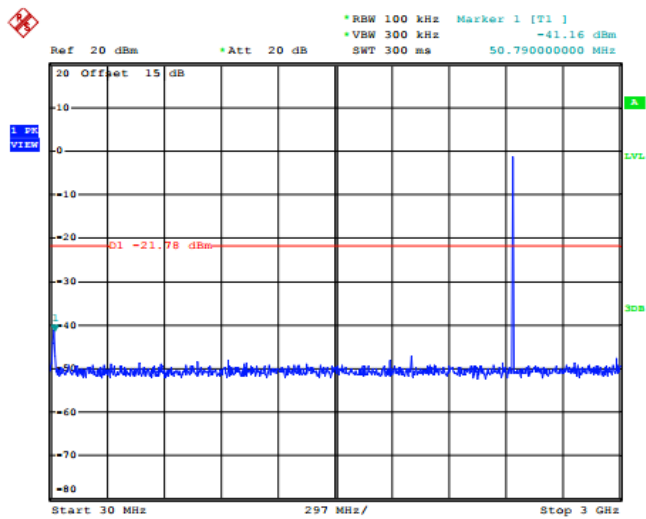
TEST RESULTS

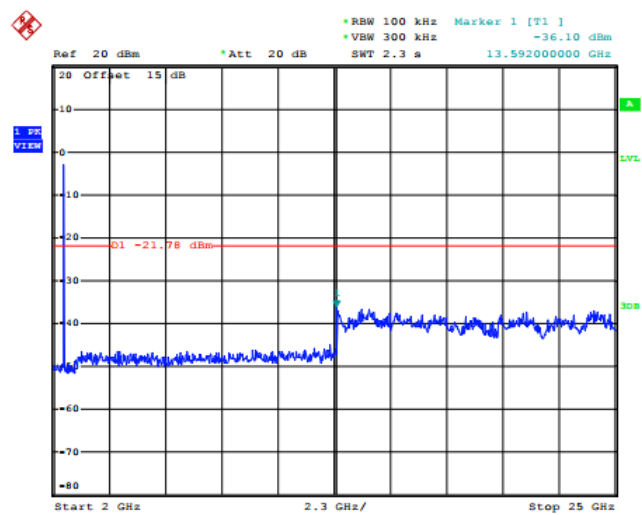
Low channel



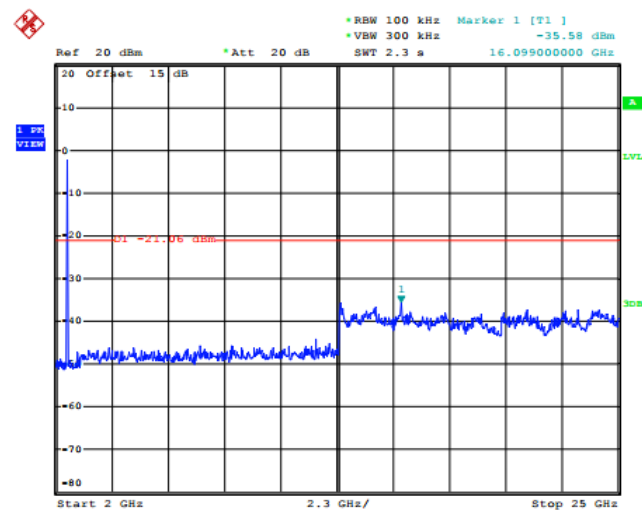
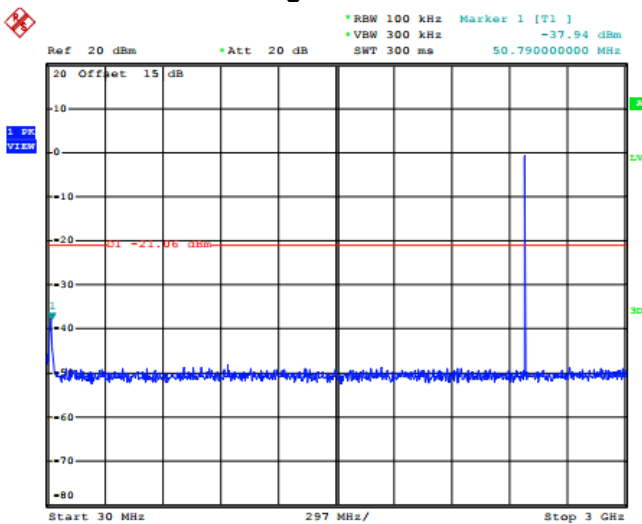


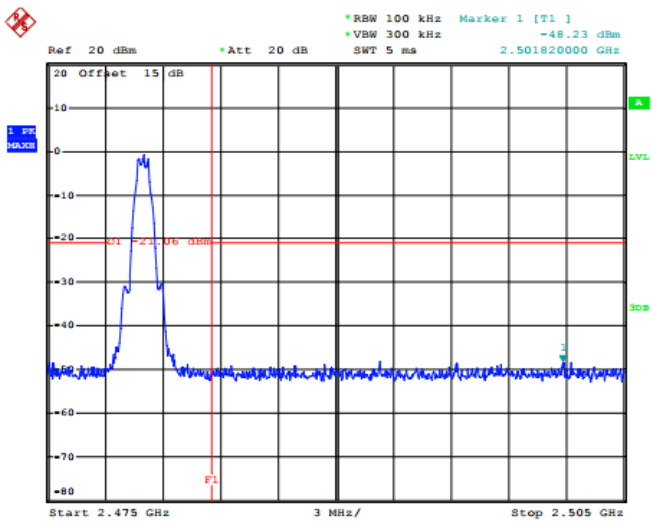
Middle channel





High channel





4.7. Antenna Requirement

Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Refer to statement below for compliance.

The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

Antenna Connected Construction

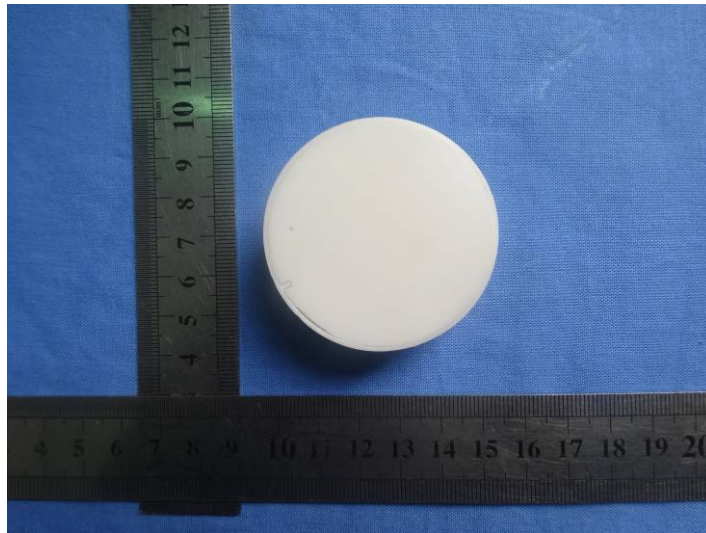
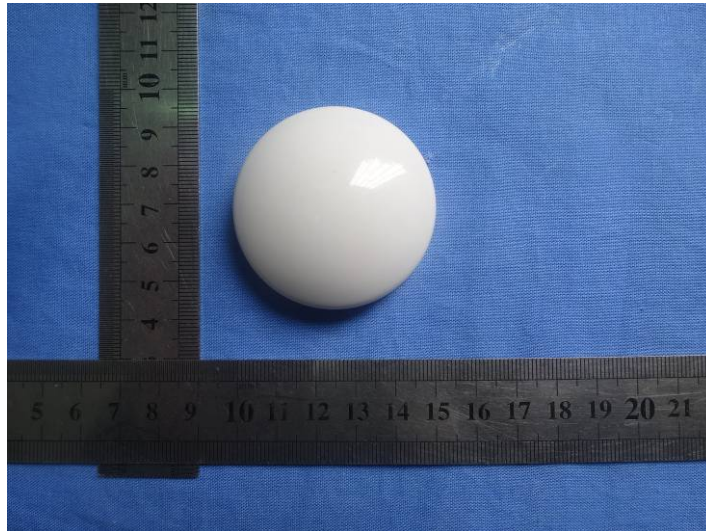
The antenna used in this product is a PCB Antenna, The directional gains of antenna used for transmitting is 0dBi.

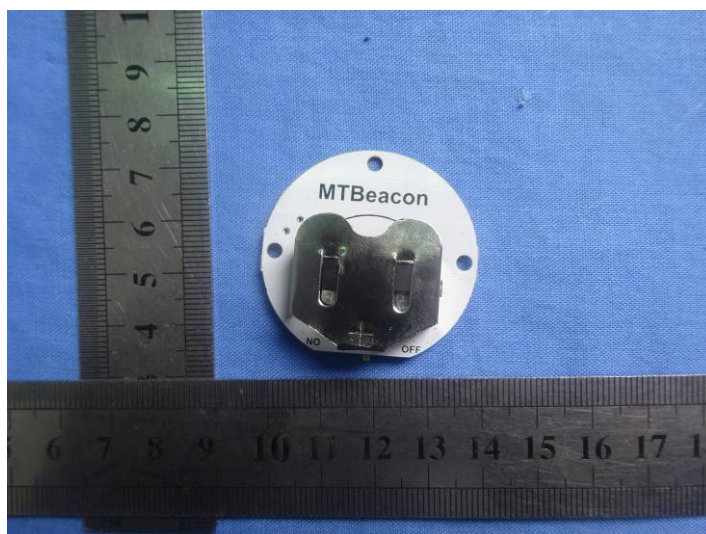
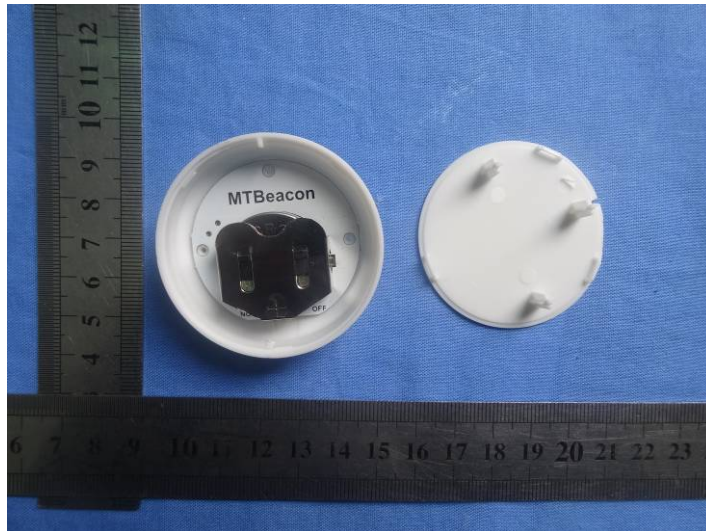
5. Test Setup Photos of the EUT

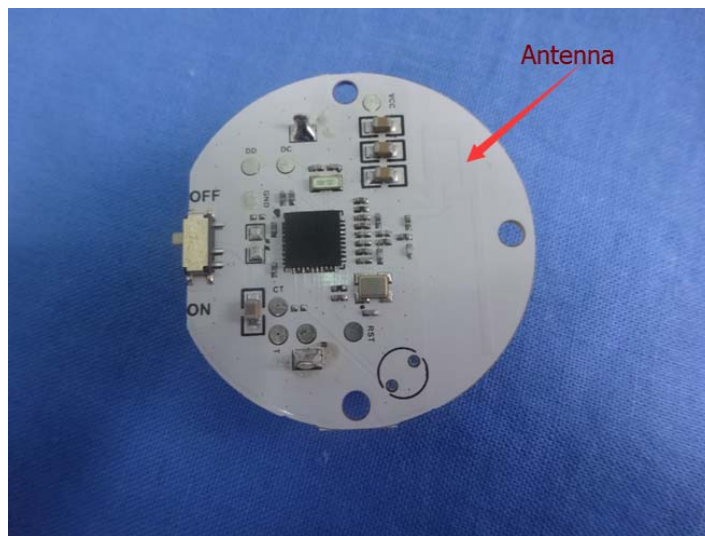


6. External and Internal Photos of the EUT

External Photos of EUT



Internal Photos of EUT



.....End of Report.....