FCC PART 15 SUBPART CTEST REPORT

FCC PART 15.236

Report Reference No.....:	**CTA21120200401**
FCC ID.....:	**BEKNUSW1KUB**
Compiled by (position+printed name+signature)..:	File administrators Kevin Liu
Supervised by (position+printed name+signature)..:	Project Engineer Kevin Liu
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Date of issue.....:	Dec. 02, 2021
Representative Laboratory Name .:	**Shenzhen CTA Testing Technology Co., Ltd.**
Address.....:	Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street, Bao’an District, Shenzhen, China
Applicant’s name.....:	**Promark International, Inc.**
Address .....:	1268 Humbracht Circle Bartlett, IL 60103-1631 USA
Test specification .....:	
Standard .....:	**FCC Part 15.236**

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Test item description .....:	**Bodypack microphone**
Trade Mark .....:	N/A
Manufacturer .....:	ENPING SHANG FANG(VOTEX) AUDIO EQUIPMENT FACTORY
Model/Type reference.....:	BT-1KU
Listed Models .....:	N/A
Modulation Type .....:	FM
Operation Frequency.....:	520-544.975MHz
Rating .....:	DC 3V (1.5AA*2) by battery
Result.....:	**PASS**

TEST REPORT

Equipment under Test	:	Bodypack microphone
Model /Type	:	BT-1KU
Listed Models	:	N/A
Applicant	:	**Promark International, Inc.**
Address	:	1268 Humbracht Circle Bartlett, IL 60103-1631 USA
Manufacturer	:	**ENPING SHANG FANG(VOTEX) AUDIO EQUIPMENT FACTORY**
Address	:	2F-3F XIN PING NORTH ROAD,ENPING CITY, GUANGDONG,CHINA.

Test Result:	**PASS**

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 15.236: Operation of wireless Bodypack microphones in the bands 54-72 MHz, 76-88 MHz, 174-216 MHz, 470-608 MHz and 614-698 MHz.
ANSI C63.10-2013:AmericanNationalStandardforTestingUnlicensedWirelessDevices

2 SUMMARY

2.1 General Remarks

Date of receipt of test sample	:	Nov. 16, 2021
Testing commenced on	:	Nov. 16, 2021
Testing concluded on	:	Dec. 02, 2021

2.2 Product Description

Product Name:	Bodypack microphone
Model/Type reference:	BT-1KU
Power supply:	DC 3V (1.5AA*2) by battery
Hardware version:	V1.0
Software version:	V1.0
Testing sample ID:	CTA211202004-1# (Engineer sample) CTA211202004-2# (Normal sample)
Bodypack microphone	
Frequency:	520-544.975MHz
Nominal channel bandwidth	25KHz
Modulation Type:	FM
Antenna type:	External Antenna
Antenna gain:	0dBi

Note: For more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2.3 Equipment Under Test

Power supply system utilised

Power supply voltage	:	○	230V/ 50 Hz	○	120V/60Hz
		○	12 V DC	○	24 V DC
		●	Other (specified in blank below)		

DC 3V From Battery

2.4 Short description of the Equipment under Test (EUT)

This is a Bodypack microphone.

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

2.5 EUT operation mode

The EUT has been tested under typical operating condition. The EUT will staying in continuous transmitting when switch to the specific test frequency.

Operation Frequency:

(MHz) Groups →

Channels	00	01	02	03	04	05	06	07	08	09
00	520.000	522.500	525.000	527.500	530.000	532.500	535.000	537.500	540.000	542.500
01	520.025	522.525	525.025	527.525	530.025	532.525	535.025	537.525	540.025	542.525
02	520.050	522.550	525.050	527.550	530.050	532.550	535.050	537.550	540.050	542.550
03	520.075	522.575	525.075	527.575	530.075	532.575	535.075	537.575	540.075	542.575
04	520.100	522.600	525.100	527.600	530.100	532.600	535.100	537.600	540.100	542.600
05	520.125	522.625	525.125	527.625	530.125	532.625	535.125	537.625	540.125	542.625
06	520.150	522.650	525.150	527.650	530.150	532.650	535.150	537.650	540.150	542.650
07	520.175	522.675	525.175	527.675	530.175	532.675	535.175	537.675	540.175	542.675
08	520.200	522.700	525.200	527.700	530.200	532.700	535.200	537.700	540.200	542.700
09	520.225	522.725	525.225	527.725	530.225	532.725	535.225	537.725	540.225	542.725
10	520.250	522.750	525.250	527.750	530.250	532.750	535.250	537.750	540.250	542.750
11	520.275	522.775	525.275	527.775	530.275	532.775	535.275	537.775	540.275	542.775
12	520.300	522.800	525.300	527.800	530.300	532.800	535.300	537.800	540.300	542.800
13	520.325	522.825	525.325	527.825	530.325	532.825	535.325	537.825	540.325	542.825
14	520.350	522.850	525.350	527.850	530.350	532.850	535.350	537.850	540.350	542.850
15	520.375	522.875	525.375	527.875	530.375	532.875	535.375	537.875	540.375	542.875
16	520.400	522.900	525.400	527.900	530.400	532.900	535.400	537.900	540.400	542.900
17	520.425	522.925	525.425	527.925	530.425	532.925	535.425	537.925	540.425	542.925
18	520.450	522.950	525.450	527.950	530.450	532.950	535.450	537.950	540.450	542.950
19	520.475	522.975	525.475	527.975	530.475	532.975	535.475	537.975	540.475	542.975
20	520.500	523.000	525.500	528.000	530.500	533.000	535.500	538.000	540.500	543.000
21	520.525	523.025	525.525	528.025	530.525	533.025	535.525	538.025	540.525	543.025
22	520.550	523.050	525.550	528.050	530.550	533.050	535.550	538.050	540.550	543.050
23	520.575	523.075	525.575	528.075	530.575	533.075	535.575	538.075	540.575	543.075
24	520.600	523.100	525.600	528.100	530.600	533.100	535.600	538.100	540.600	543.100
25	520.625	523.125	525.625	528.125	530.625	533.125	535.625	538.125	540.625	543.125
26	520.650	523.150	525.650	528.150	530.650	533.150	535.650	538.150	540.650	543.150
27	520.675	523.175	525.675	528.175	530.675	533.175	535.675	538.175	540.675	543.175
28	520.700	523.200	525.700	528.200	530.700	533.200	535.700	538.200	540.700	543.200
29	520.725	523.225	525.725	528.225	530.725	533.225	535.725	538.225	540.725	543.225
30	520.750	523.250	525.750	528.250	530.750	533.250	535.750	538.250	540.750	543.250
31	520.775	523.275	525.775	528.275	530.775	533.275	535.775	538.275	540.775	543.275
32	520.800	523.300	525.800	528.300	530.800	533.300	535.800	538.300	540.800	543.300
33	520.825	523.325	525.825	528.325	530.825	533.325	535.825	538.325	540.825	543.325
34	520.850	523.350	525.850	528.350	530.850	533.350	535.850	538.350	540.850	543.350
35	520.875	523.375	525.875	528.375	530.875	533.375	535.875	538.375	540.875	543.375
36	520.900	523.400	525.900	528.400	530.900	533.400	535.900	538.400	540.900	543.400
37	520.925	523.425	525.925	528.425	530.925	533.425	535.925	538.425	540.925	543.425
38	520.950	523.450	525.950	528.450	530.950	533.450	535.950	538.450	540.950	543.450
39	520.975	523.475	525.975	528.475	530.975	533.475	535.975	538.475	540.975	543.475
40	521.000	523.500	526.000	528.500	531.000	533.500	536.000	538.500	541.000	543.500
41	521.025	523.525	526.025	528.525	531.025	533.525	536.025	538.525	541.025	543.525
42	521.050	523.550	526.050	528.550	531.050	533.550	536.050	538.550	541.050	543.550
43	521.075	523.575	526.075	528.575	531.075	533.575	536.075	538.575	541.075	543.575
44	521.100	523.600	526.100	528.600	531.100	533.600	536.100	538.600	541.100	543.600
45	521.125	523.625	526.125	528.625	531.125	533.625	536.125	538.625	541.125	543.625
46	521.150	523.650	526.150	528.650	531.150	533.650	536.150	538.650	541.150	543.650
47	521.175	523.675	526.175	528.675	531.175	533.675	536.175	538.675	541.175	543.675

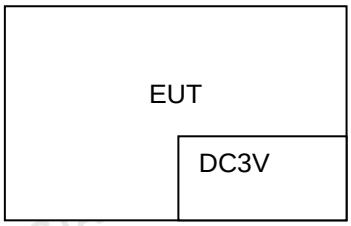
(MHz) Groups →

Channels	00	01	02	03	04	05	06	07	08	09
48	521.200	523.700	526.200	528.700	531.200	533.700	536.200	538.700	541.200	543.700
49	521.225	523.725	526.225	528.725	531.225	533.725	536.225	538.725	541.225	543.725
50	521.250	523.750	526.250	528.750	531.250	533.750	536.250	538.750	541.250	543.750
51	521.275	523.775	526.275	528.775	531.275	533.775	536.275	538.775	541.275	543.775
52	521.300	523.800	526.300	528.800	531.300	533.800	536.300	538.800	541.300	543.800
53	521.325	523.825	526.325	528.825	531.325	533.825	536.325	538.825	541.325	543.825
54	521.350	523.850	526.350	528.850	531.350	533.850	536.350	538.850	541.350	543.850
55	521.375	523.875	526.375	528.875	531.375	533.875	536.375	538.875	541.375	543.875
56	521.400	523.900	526.400	528.900	531.400	533.900	536.400	538.900	541.400	543.900
57	521.425	523.925	526.425	528.925	531.425	533.925	536.425	538.925	541.425	543.925
58	521.450	523.950	526.450	528.950	531.450	533.950	536.450	538.950	541.450	543.950
59	521.475	523.975	526.475	528.975	531.475	533.975	536.475	538.975	541.475	543.975
60	521.500	524.000	526.500	529.000	531.500	534.000	536.500	539.000	541.500	544.000
61	521.525	524.025	526.525	529.025	531.525	534.025	536.525	539.025	541.525	544.025
62	521.550	524.050	526.550	529.050	531.550	534.050	536.550	539.050	541.550	544.050
63	521.575	524.075	526.575	529.075	531.575	534.075	536.575	539.075	541.575	544.075
64	521.600	524.100	526.600	529.100	531.600	534.100	536.600	539.100	541.600	544.100
65	521.625	524.125	526.625	529.125	531.625	534.125	536.625	539.125	541.625	544.125
66	521.650	524.150	526.650	529.150	531.650	534.150	536.650	539.150	541.650	544.150
67	521.675	524.175	526.675	529.175	531.675	534.175	536.675	539.175	541.675	544.175
68	521.700	524.200	526.700	529.200	531.700	534.200	536.700	539.200	541.700	544.200
69	521.725	524.225	526.725	529.225	531.725	534.225	536.725	539.225	541.725	544.225
70	521.750	524.250	526.750	529.250	531.750	534.250	536.750	539.250	541.750	544.250
71	521.775	524.275	526.775	529.275	531.775	534.275	536.775	539.275	541.775	544.275
72	521.800	524.300	526.800	529.300	531.800	534.300	536.800	539.300	541.800	544.300
73	521.825	524.325	526.825	529.325	531.825	534.325	536.825	539.325	541.825	544.325
74	521.850	524.350	526.850	529.350	531.850	534.350	536.850	539.350	541.850	544.350
75	521.875	524.375	526.875	529.375	531.875	534.375	536.875	539.375	541.875	544.375
76	521.900	524.400	526.900	529.400	531.900	534.400	536.900	539.400	541.900	544.400
77	521.925	524.425	526.925	529.425	531.925	534.425	536.925	539.425	541.925	544.425
78	521.950	524.450	526.950	529.450	531.950	534.450	536.950	539.450	541.950	544.450
79	521.975	524.475	526.975	529.475	531.975	534.475	536.975	539.475	541.975	544.475
80	522.000	524.500	527.000	529.500	532.000	534.500	537.000	539.500	542.000	544.500
81	522.025	524.525	527.025	529.525	532.025	534.525	537.025	539.525	542.025	544.525
82	522.050	524.550	527.050	529.550	532.050	534.550	537.050	539.550	542.050	544.550
83	522.075	524.575	527.075	529.575	532.075	534.575	537.075	539.575	542.075	544.575
84	522.100	524.600	527.100	529.600	532.100	534.600	537.100	539.600	542.100	544.600
85	522.125	524.625	527.125	529.625	532.125	534.625	537.125	539.625	542.125	544.625
86	522.150	524.650	527.150	529.650	532.150	534.650	537.150	539.650	542.150	544.650
87	522.175	524.675	527.175	529.675	532.175	534.675	537.175	539.675	542.175	544.675
88	522.200	524.700	527.200	529.700	532.200	534.700	537.200	539.700	542.200	544.700
89	522.225	524.725	527.225	529.725	532.225	534.725	537.225	539.725	542.225	544.725
90	522.250	524.750	527.250	529.750	532.250	534.750	537.250	539.750	542.250	544.750
91	522.275	524.775	527.275	529.775	532.275	534.775	537.275	539.775	542.275	544.775
92	522.300	524.800	527.300	529.800	532.300	534.800	537.300	539.800	542.300	544.800
93	522.325	524.825	527.325	529.825	532.325	534.825	537.325	539.825	542.325	544.825
94	522.350	524.850	527.350	529.850	532.350	534.850	537.350	539.850	542.350	544.850
95	522.375	524.875	527.375	529.875	532.375	534.875	537.375	539.875	542.375	544.875
96	522.400	524.900	527.400	529.900	532.400	534.900	537.400	539.900	542.400	544.900
97	522.425	524.925	527.425	529.925	532.425	534.925	537.425	539.925	542.425	544.925
98	522.450	524.950	527.450	529.950	532.450	534.950	537.450	539.950	542.450	544.950
99	522.475	524.975	527.475	529.975	532.475	534.975	537.475	539.975	542.475	544.975

Operation Frequency:

Channel	Frequency (MHz)
Low	520.0
Middle	532.5
High	544.975

2.6 Block Diagram of Test Setup



2.7 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended forthe devicefiling to comply with Section 15.236 of the FCC Part 15, Subpart C Rules.

2.8 Modifications

No modifications were implemented to meet testing criteria.

3 TEST ENVIRONMENT

3.1 Address of the test laboratory

Shenzhen CTA Testing Technology Co., Ltd.
Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community,Fuhai Street, Bao'an District, Shenzhen, China

3.2 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:
FCC-Registration No.: 517856 Designation Number: CN1318

Shenzhen CTA Testing Technology Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

A2LA-Lab Cert. No.: 6534.01

Shenzhen CTA Testing Technology Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10 and CISPR 16-1-4:2010.

3.3 Environmental conditions

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

Temperature:	24 ° C
Humidity:	45 %
Atmospheric pressure:	950-1050mbar

Conducted testing:

Temperature:	25 ° C
Humidity:	44 %
Atmospheric pressure:	950-1050mbar

3.4 Summary of measurement results

Test Specification clause	Test case	Test result
§15.236(d)	RF Power Output	Compliant
§15.236(f)(2)	Occupied Bandwidth	Compliant
§15.236(g)	Necessary Bandwidth	Compliant
§15.236(g)	Spurious emissions	Compliant
§15.236(f)(3)	Frequency Stability	Compliant
§15.207	Conducted Emissions	N/A

Remark:
1. The measurement uncertainty is not included in the test result.
2. We tested all test mode and recorded worst case in report

3.5 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen CTA Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen CTA laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.06 dB	(1)
Radiated Emission	1~18GHz	5.14 dB	(1)
Radiated Emission	18-40GHz	5.38 dB	(1)
Conducted Disturbance	0.15~30MHz	2.14 dB	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3.6 Equipments Used during the Test

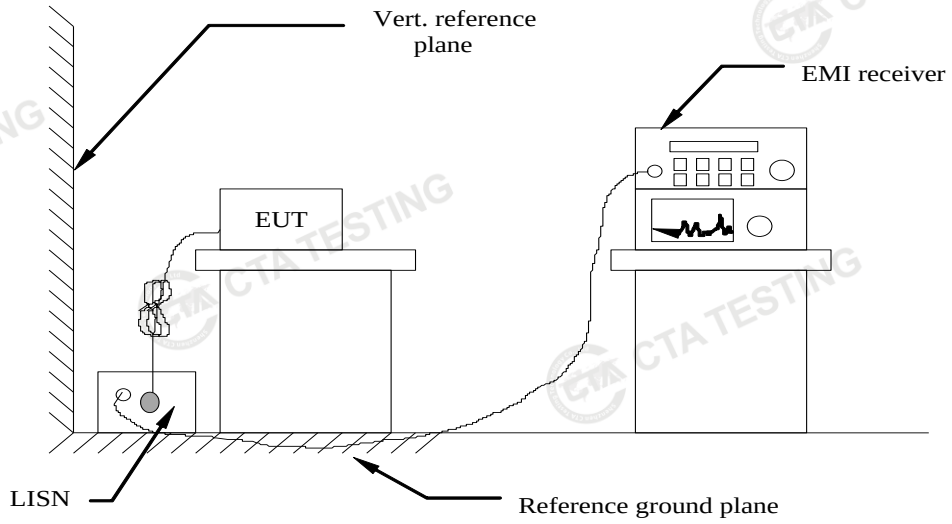
Test Equipment	Manufacturer	Model No.	Equipment No.	Calibration Date	Calibration Due Date
LISN	R&S	ENV216	CTA-308	2021/08/06	2022/08/05
LISN	R&S	ENV216	CTA-314	2021/08/06	2022/08/05
EMI Test Receiver	R&S	ESPI	CTA-307	2021/08/06	2022/08/05
EMI Test Receiver	R&S	ESCI	CTA-306	2021/08/06	2022/08/05
Spectrum Analyzer	Agilent	N9020A	CTA-301	2021/08/06	2022/08/05
Spectrum Analyzer	R&S	FSP	CTA-337	2021/08/06	2022/08/05
Vector Signal generator	Agilent	N5182A	CTA-305	2021/08/06	2022/08/05
Analog Signal Generator	R&S	SML03	CTA-304	2021/08/06	2022/08/05
Universal Radio Communication	CMW500	R&S	CTA-302	2021/08/06	2022/08/05
Temperature and humidity meter	Chigo	ZG-7020	CTA-326	2021/08/06	2022/08/05
Ultra-Broadband Antenna	Schwarzbeck	VULB9163	CTA-310	2021/08/07	2022/08/06
Horn Antenna	Schwarzbeck	BBHA 9120D	CTA-309	2021/08/07	2022/08/06
Loop Antenna	Zhinan	ZN30900C	CTA-311	2021/08/07	2022/08/06
Horn Antenna	Beijing Hangwei Dayang	OBH100400	CTA-336	2021/08/06	2022/08/05
Amplifier	Schwarzbeck	BBV 9745	CTA-312	2021/08/06	2022/08/05
Amplifier	Taiwan chengyi	EMC051845B	CTA-313	2021/08/06	2022/08/05
Directional coupler	NARDA	4226-10	CTA-303	2021/08/06	2022/08/05
High-Pass Filter	XingBo	XBLBQ-GTA18	CTA-402	2021/08/06	2022/08/05
High-Pass Filter	XingBo	XBLBQ-GTA27	CTA-403	2021/08/06	2022/08/05
Automated filter bank	Tonscend	JS0806-F	CTA-404	2021/08/06	2022/08/05
Power Sensor	Agilent	U2021XA	CTA-405	2021/08/06	2022/08/05
Amplifier	Schwarzbeck	BBV9719	CTA-406	2021/08/06	2022/08/05

Note: The Cal.Interval was one 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 DC12V power from adapter, the adapter received AC120V/60Hzand AC 240V/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.

AC Power Conducted Emission Limit

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

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
* Decreases with the logarithm of the frequency.		

TEST RESULTS

The EUT is powered by Battery, So this test item is not applicabel.

4.2 Maximum Output Power

Limit

The maximum radiated power shall not exceed the following values:

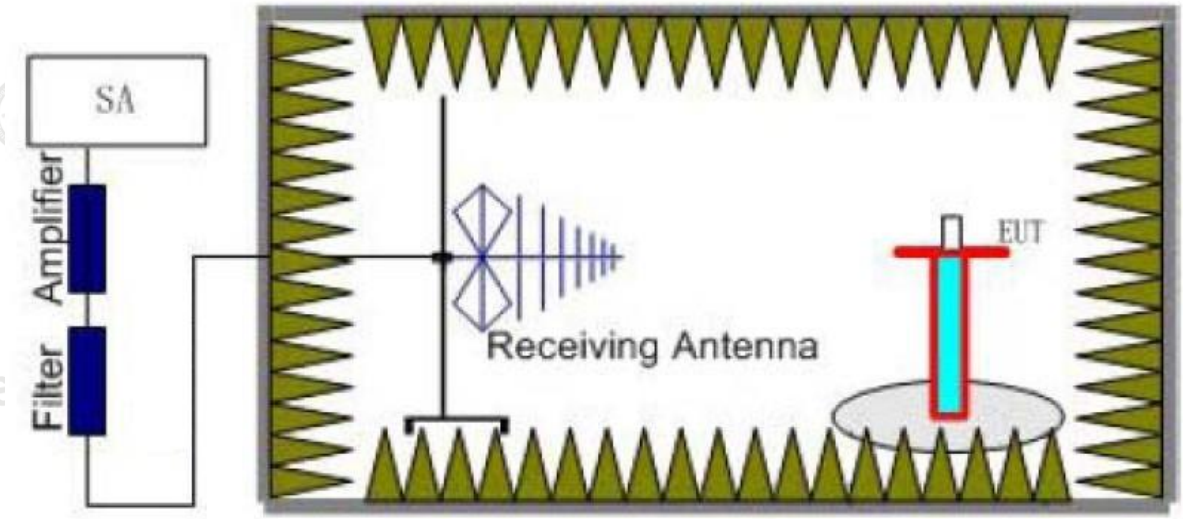
(1) In the bands allocated and assigned for broadcast television and in the 600 MHz service band: 50 mW EIRP

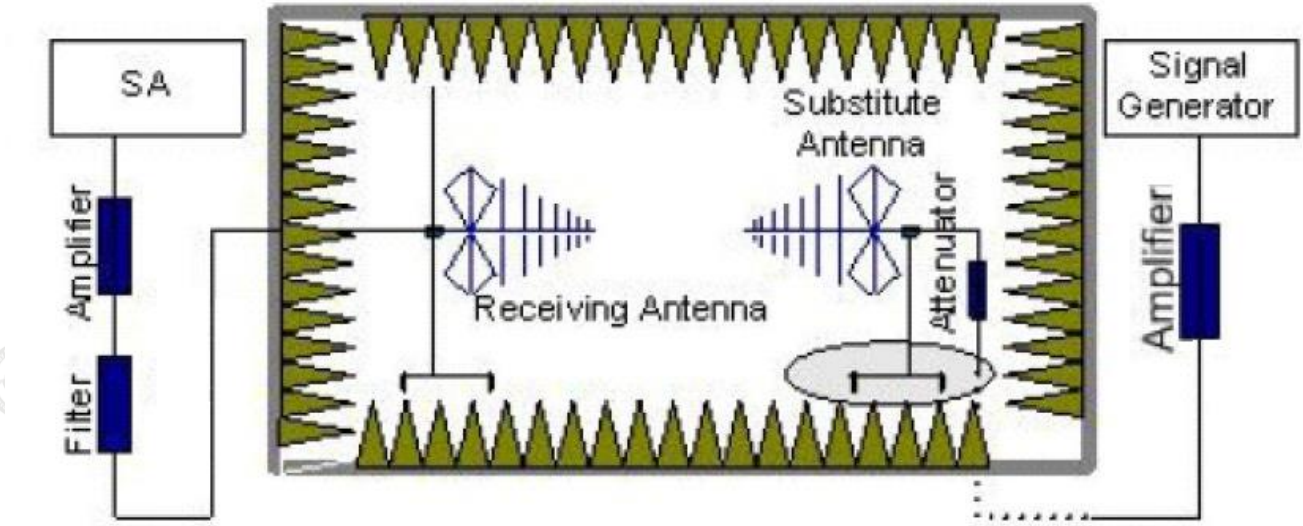
(2) In the 600 MHz guard band and the 600 MHz duplex gap: 20 mW EIRP.

Test Procedure

1. EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all test transmit frequencies were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test.Set Test Receiver or Spectrum RBW=1MHz,VBW=3MHz, And the maximum value of the receiver should be recorded as (P_r).
4. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
5. An amplifier may be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (P_{cl}) ,the Substitution Antenna Gain (G_a) and the Amplifier Gain (P_{Ag}) should be recorded after test.
   The measurement results are obtained as described below:
   Power(EIRP)=$P_{Mea+}P_{Ag} - P_{cl} + G_a$
6. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
7. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP-2.15dBi.

Test Configuration





Test Results

Remark;
The field strength of radiation emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The data show in this report only with the worst case setup. After exploratory measurement the worst case of Z axis and receiver antenna at vertical polarization was reported.

Test Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dBi)	P_{Ag} (dB)	EIRP (dBm)	EIRP (mW)	FCC Limit (mW)	Polarization
520	-21.04	1.95	8.71	26.97	12.69	18.58	50	V
532.5	-22.19	1.95	8.71	26.97	11.54	14.26	50	V
544.975	-21.68	1.95	8.71	26.97	12.05	16.03	50	V

Remark: EIRP=P_{Mea}(dBm) +P_{Ag}(dB) -P_{cl}(dB) +G_a(dBi)

4.3 Occupied Bandwidth

Limit

One or more adjacent 25 kHz segments within the assignable frequencies may be combined to form a channel whose maximum bandwidth shall not exceed 200 kHz. The operating bandwidth shall not exceed 200 kHz.

Test Procedure

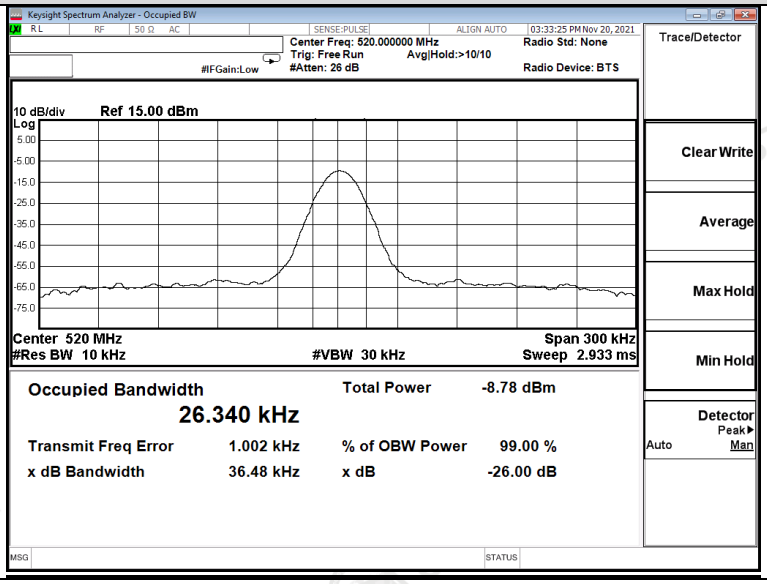
The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 3 KHz RBW and 10 KHz VBW.

Test Configuration

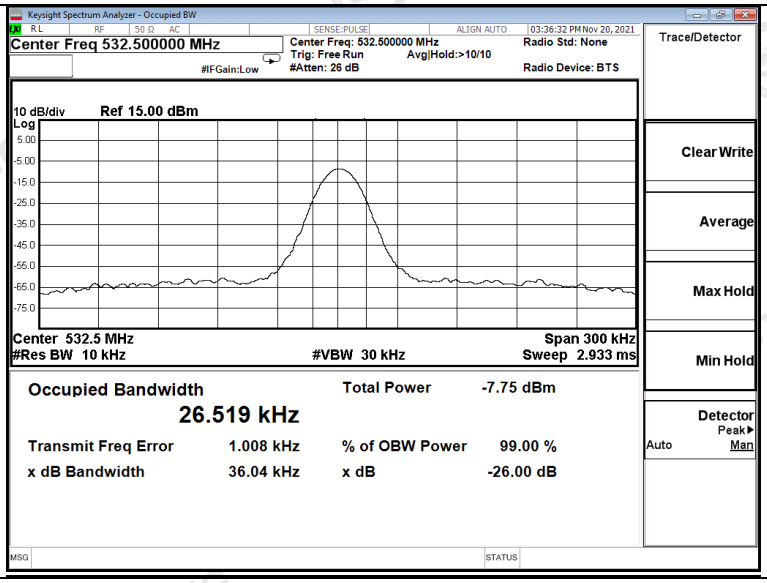
Test Results

Modulation	Frequency (MHz)	99% OBW (KHz)	Limit (KHz)	Result
FM	520.000	26.340	200	Pass
FM	532.500	26.519	200	Pass
FM	544.975	26.353	200	Pass

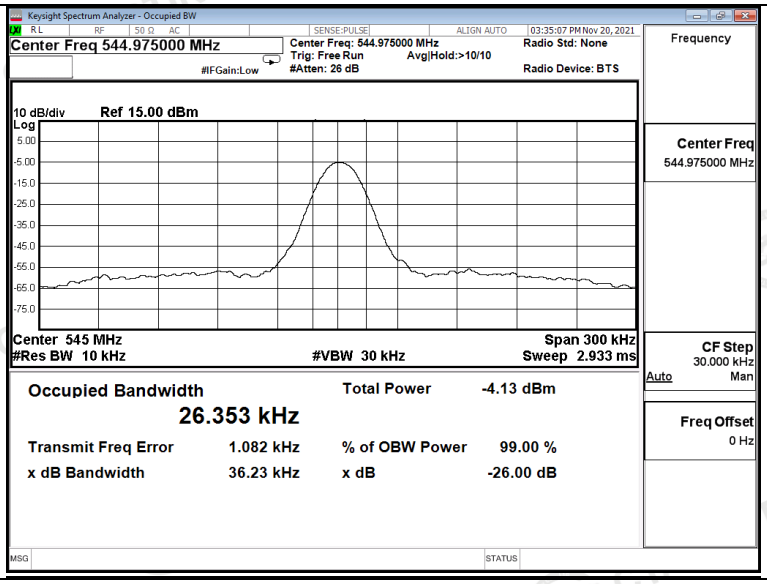
Plots of Occupied Bandwidth



520MHz



532.5MHz



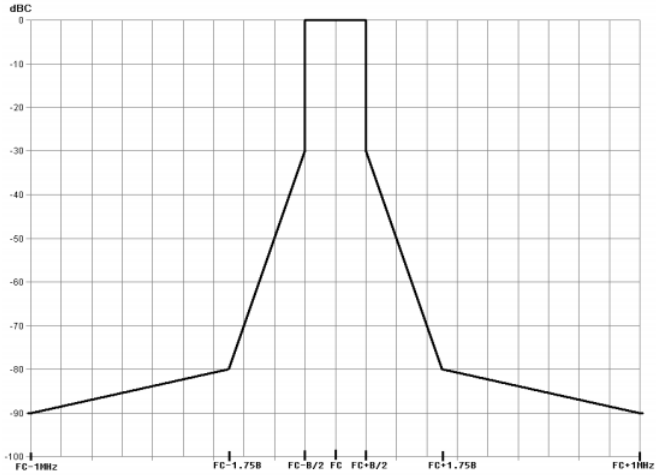
544.975MHz

4.4 Necessary Bandwidth

LIMIT

Emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in §8.3 of ETSI EN 300 422-1 V1.4.2 (2011-08) as below:

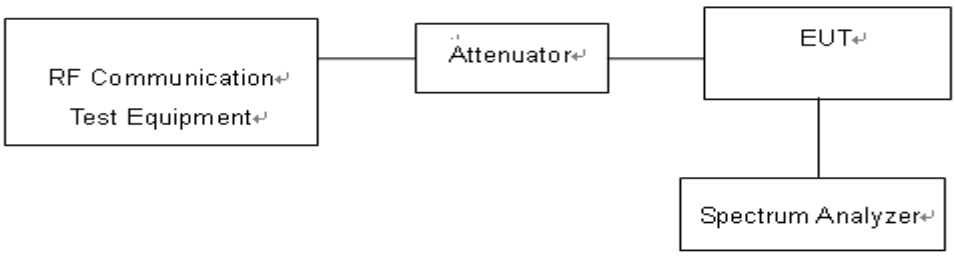
The transmitter output spectrum shall be within the mask defined in figure below where B is the declared channel bandwidth



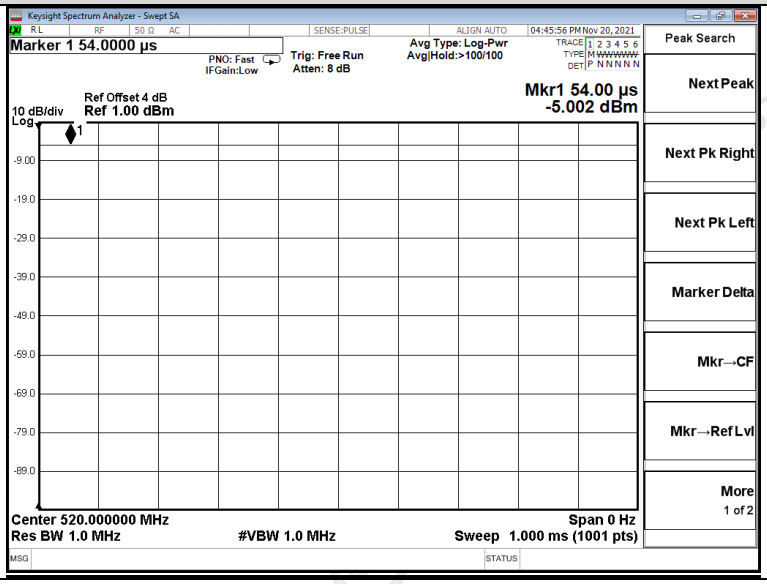
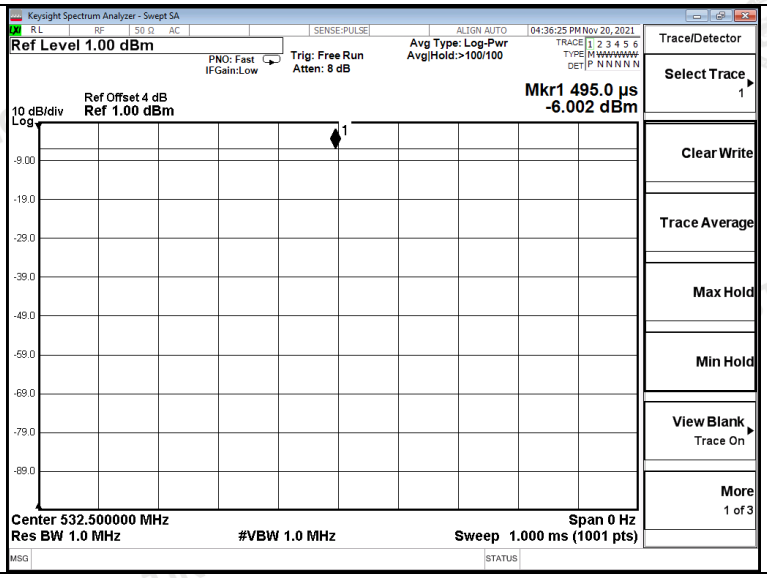
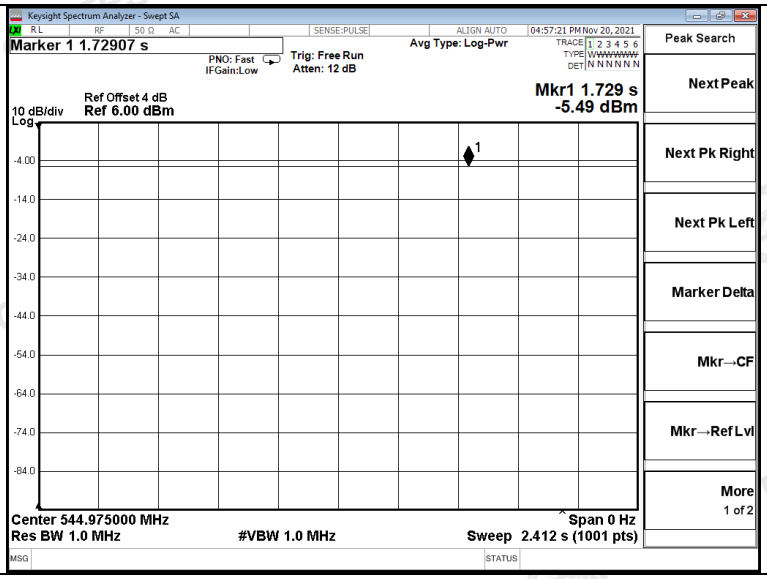
TEST PROCEDURE

1. With the Low Frequency (LF) audio signal generator set to 500 Hz, the audio input level to the EUT shall be Adjusted to 8 dB below the limiting threshold (-8dB limit) as declared by the manufacturer.
2. The corresponding audio output level from the demodulator shall be measured and recorded.
3. The input impedance of the noise meter shall be sufficiently high to avoid more than 0.1 dB changes in input level when the meter is switched between input and output.
4. The audio input level shall be increased by 20 dB, i.e. to 12 dB (lim), and the corresponding change in output level shall be measured.
5. It shall be checked that the audio output level has increased by ≤10 dB.
6. If the step 5 is not met, the initial audio input level shall be increased from -8 dB (lim) in 1 dB steps until the above condition is fulfilled, and the input level recorded in the test report. This level replaces the value derived from the manufacturer's declaration and is defined as -8dB (lim).
7. Measure the input level at the transmitter required to give +12 dB (lim) and record the EUT output level test plots by the spectrum analyzer.
8. The transmitter RF output spectrum shall be measured, using a spectrum analyser with the following settings:
   - centre frequency: fc: Transmitter (Tx) nominal frequency;
   - dispersion (Span): fc - 1 MHz to fc + 1 MHz;
   - Resolution BandWidth (RBW): 1 kHz;
   - Video BandWidth (VBW): 1 kHz;
   - detector: Peak hold.

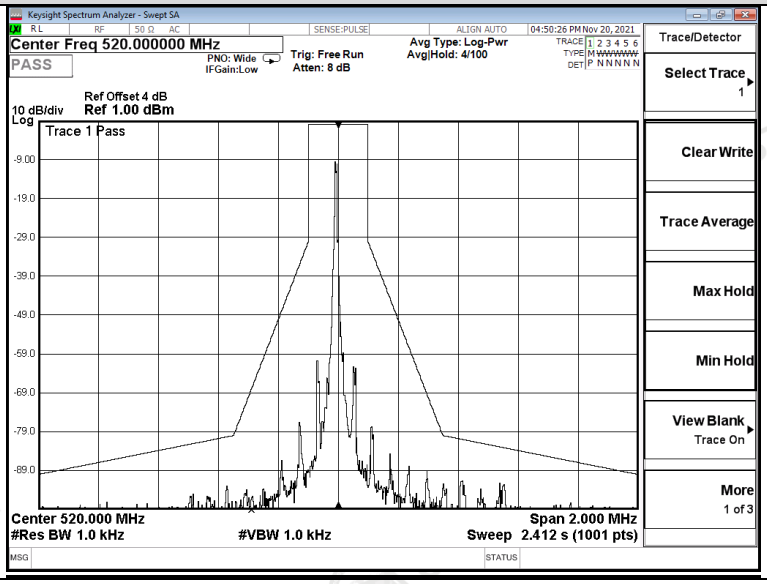
TEST CONFIGURATION



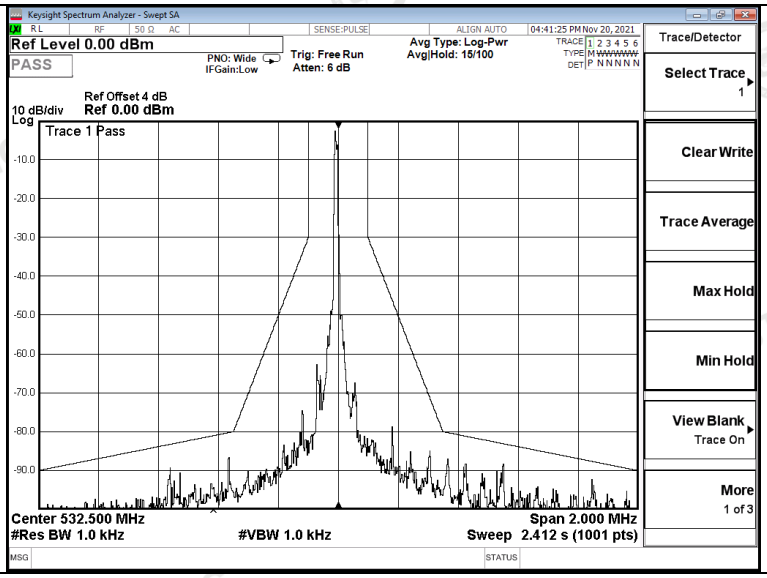
TEST RESULTS

Reference power

520MHz

532.5MHz

544.975MHz

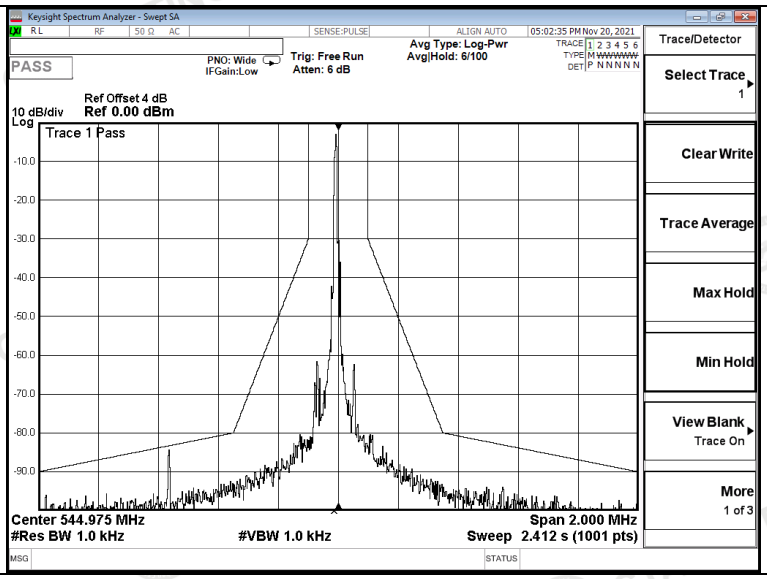
Plots of Necessary Bandwidth



520MHz



532.5MHz



544.975MHz

4.5 Transmitter spurious emissions

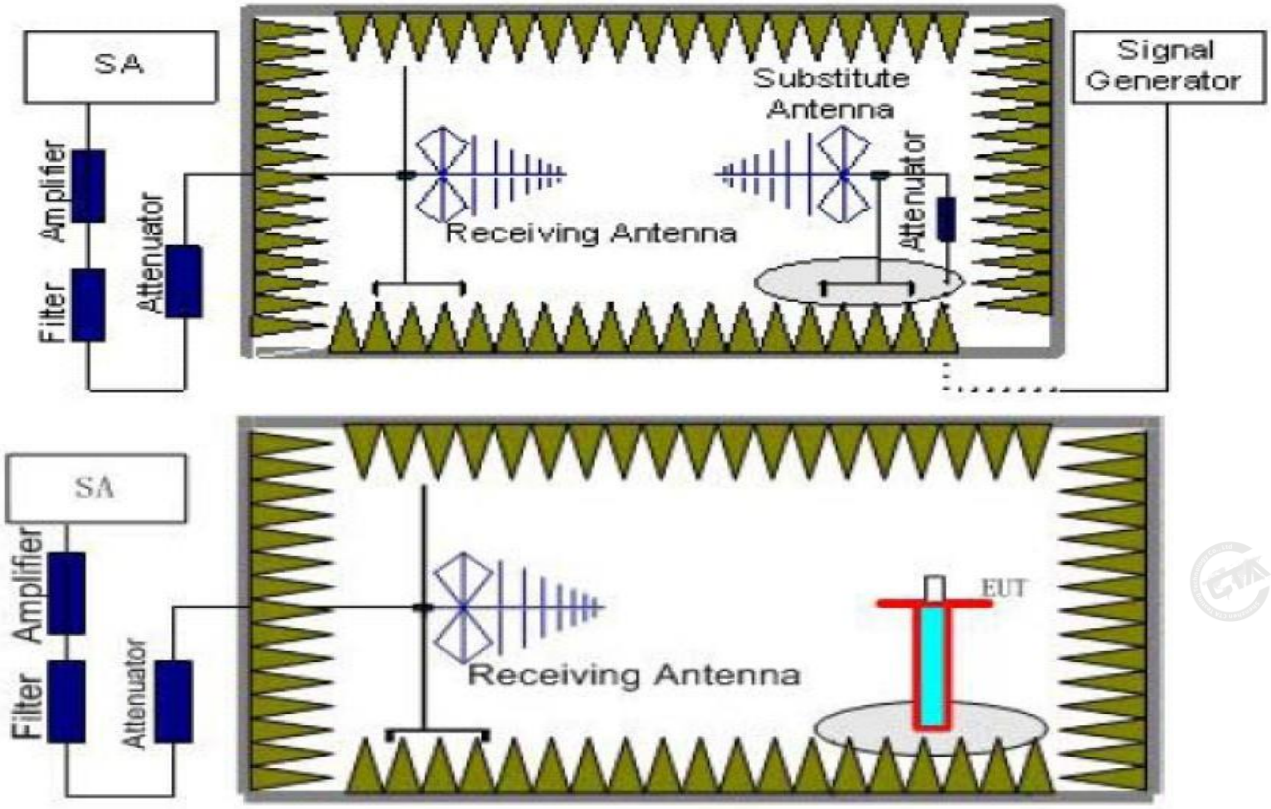
Limit

Spurious emissions are emissions outside the frequency range(s) of the equipment. The power of the spurious emissions shall not exceed the limits of table as below:

State	Frequency		
	47 MHz to 74 MHz 87,5 MHz to 137 MHz 174 MHz to 230 MHz 470 MHz to 862 MHz	Other Frequencies below 1 000 MHz	Frequencies above 1 000 MHz
Operation	4 nW	250 nW	1 µW
Standby	2 nW	2 nW	20 nW

Test Configuration

Effective Radiated Power measurement (30 MHz to 12.75 GHz)



TEST PROCEDURE

1. The EUT was placed on a turntable with 1.5m height.
2. The test distance between the receiving antenna and the EUT is 3 meter, while the receiving (test) antenna is kept at 1.5 meter height.
3. Set EUT in continuous transmitting with maximum output power at test frequency.
4. The table was rotated from 0 to 360 degree to search the highest radiated emission.
5. Repeat step 3 to 4 for each polarization and test channel to find the worst emission level.
6. The results obtained are compared to the limits in order to prove compliance with the requirement.

TEST RESULTS

The test frequency range from 25MHz to 4GHz and recorded worst at below:

Test mode: Tx (520MHz)					
Frequency (MHz)	**Pol./Ant**	**Measurement EIRP (dBm)**	**Limit (dBm)**	**Margin (dB)**	**Result**
1040	V	-46.77	-30	16.77	PASS
1560	V	-42.84	-30	12.84	
2080	V	-40.74	-30	10.74	
2600	V	-36.67	-30	6.67	
3120	V	-35.29	-30	5.29	
--	V	--	--	--	
1040	H	-47.44	-30	17.44	
1560	H	-45.82	-30	15.82	
2080	H	-44.88	-30	14.88	
2600	H	-41.33	-30	11.33	
3120	H	-38.45	-30	8.45	
--	H	--	--	--	

Test mode: Tx (532.5MHz)					
Frequency (MHz)	**Pol./Ant**	**Measurement EIRP (dBm)**	**Limit (dBm)**	**Margin (dB)**	**Result**
1065	V	-45.70	-30	15.7	PASS
1597.5	V	-46.57	-30	16.57	
2130	V	-42.68	-30	12.68	
2662.5	V	-41.00	-30	11.0	
3195	V	-42.10	-30	12.1	
--	V	--	--	--	
1065	H	-49.84	-30	19.84	
1597.5	H	-47.34	-30	17.34	
2130	H	-44.75	-30	14.75	
2662.5	H	-41.80	-30	11.8	
3195	H	-42.68	-30	12.68	
--	H	--	--	--	

Test mode: Tx (544.975MHz)					
Frequency (MHz)	**Pol./Ant**	**Measurement EIRP (dBm)**	**Limit (dBm)**	**Margin (dB)**	**Result**
1089.95	V	-46.44	-30	16.44	PASS
1634.93	V	-44.40	-30	14.4	
2179.9	V	-43.24	-30	13.24	
2724.88	V	-42.96	-30	12.96	
3269.85	V	-41.26	-30	11.26	
--	V	--	--	--	
1089.95	H	-48.79	-30	18.79	
1634.93	H	-46.84	-30	16.84	
2179.9	H	-43.19	-30	13.19	
2724.88	H	-42.43	-30	12.43	
3269.85	H	-42.58	-30	12.58	
--	H	--	--	--	

Remark:

1. *The test frequency range from 25MHz to 4GHz, RBW/VBW: 100 KHz/300KHz below 1GHz, RBW/VBW: 1000 KHz/3000KHz above 1GHz.*
2. *"--"Other emission levels were very low against the limit and not reported.*

4.6 Frequency Stability

Limit

The frequency tolerance of the carrier signal shall be maintained within ±0.005% of the operating frequency over a temperature variation of −20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. Battery operated equipment shall be tested using a new battery.

Test Procedure

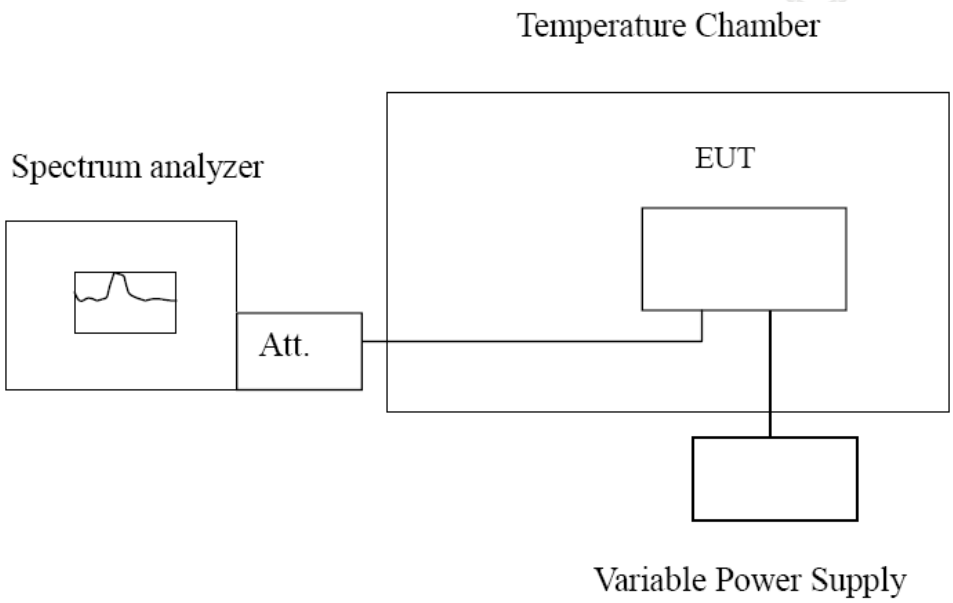
a) Frequency stability versus environmental temperature

1. Setup asTest Configuration for frequencies measured at ambient temperature if it is within 15℃to 25℃. Otherwise, an environmental chamber set for a temperature of 20℃shall be used.
2. Turn on EUT and set SA center frequency to the right frequency needs to be measured. Then set SA RBW to 3 kHz, VBW to 10kHz and frequency span to 500 kHz. Record this frequency to be a reference.
3. Set the temperature of chamber to 50℃. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize. While maintaining a constant temperature inside the chamber, turn the EUT on and measure the EUT operating frequency.
4. Repeat step 2 with a 10℃decreased per stage until the lowest temperature -20℃is measured, record all measurement frequencies.

b) Frequency stability versus input voltage

1. Setup asTest Configuration for frequencies measured at ambient temperature if it is within 15℃to 25℃. Otherwise, an environmental chamber set for a temperature of 20℃shall be used. Install new batteries in the EUT.
2. Set SA center frequency to the right frequency needs to be measured. Then set SA RBW to 3kHz, VBW to 10kHz and frequency span to 500 kHz. Record this frequency to be a reference.
3. For non hand carried, operated device, supply the EUT primary voltage with 85 and 115 percent of the nominal value and record the frequency.

Test Configuration



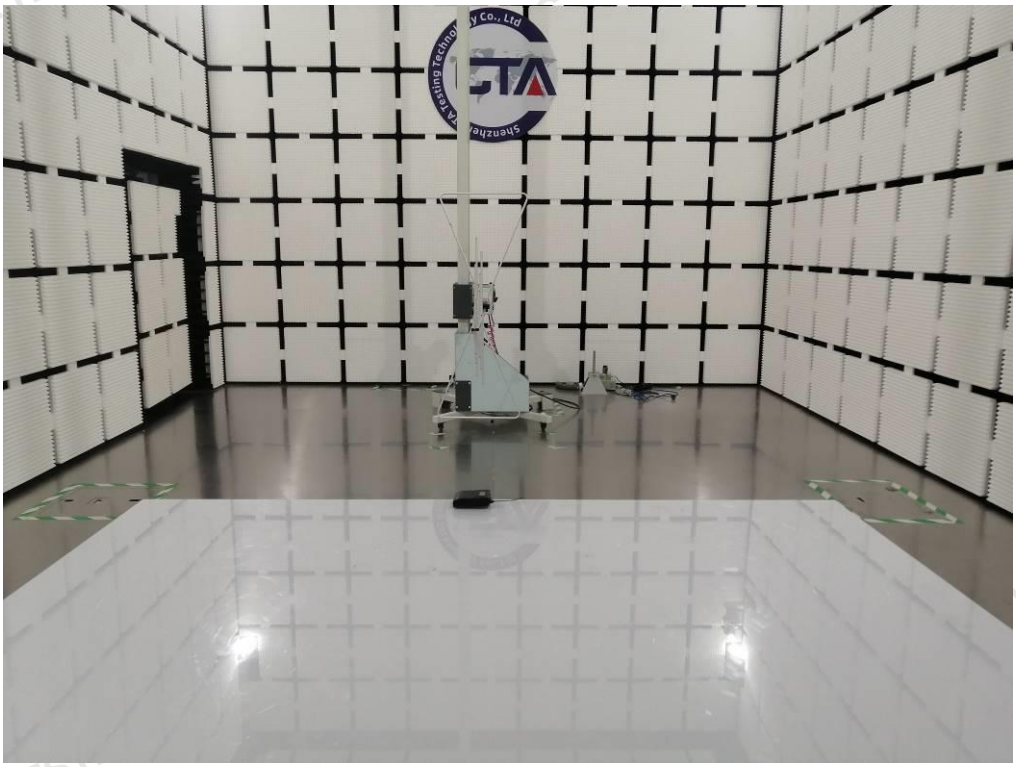
Test Results

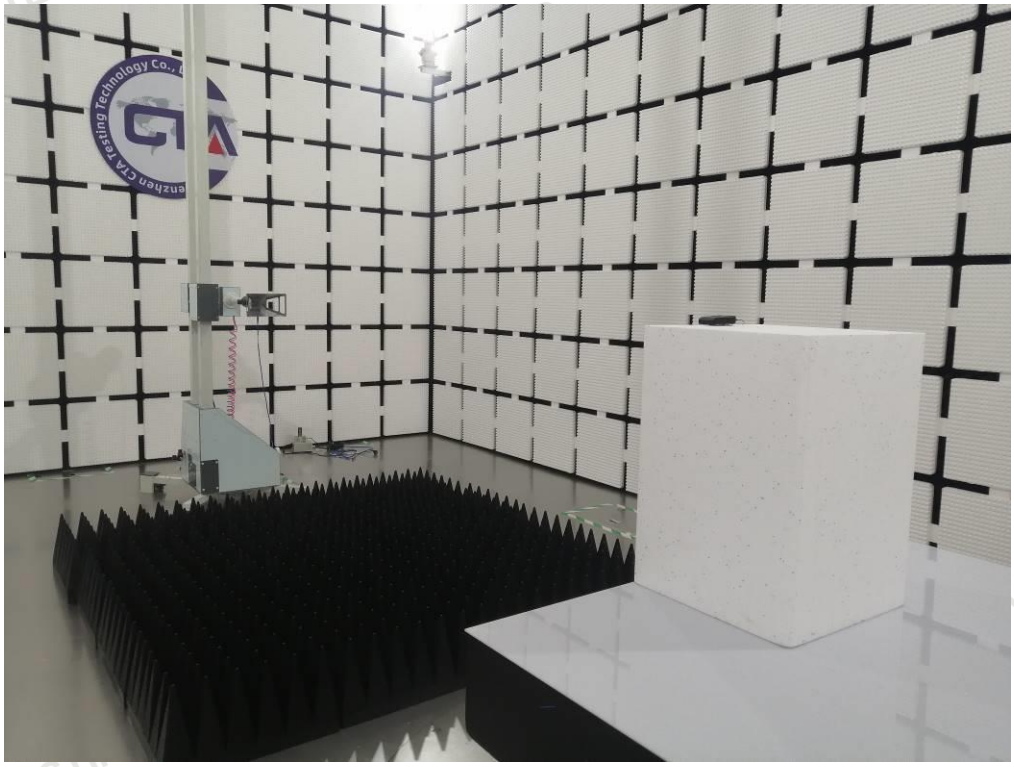
Reference Frequency: 520MHz					
Voltage (V)	Temperature (℃)	Frequency error (MHz)	Frequency Tolerance (%)	Limit (%)	Result
3.0V	-20	0.00087	0.00017%	±0.005	PASS
	-10	0.00079	0.00015%		
	0	0.00068	0.00013%		
	10	0.00076	0.00015%		
	20	0.00074	0.00014%		
	30	0.00073	0.00014%		
	40	0.00068	0.00013%		
	50	0.00062	0.00012%		
2.7 V	20	0.00059	0.00011%		

Reference Frequency: 532.5MHz					
Voltage (V)	Temperature (℃)	Frequency error (MHz)	Frequency Tolerance (%)	Limit (%)	Result
3.0V	-20	0.00089	0.00017%	±0.005	PASS
	-10	0.00084	0.00016%		
	0	0.000676	0.00013%		
	10	0.00075	0.00014%		
	20	0.00069	0.00013%		
	30	0.00071	0.00013%		
	40	0.00091	0.00017%		
	50	0.00069	0.00013%		
2.7 V	20	0.00067	0.00013%		

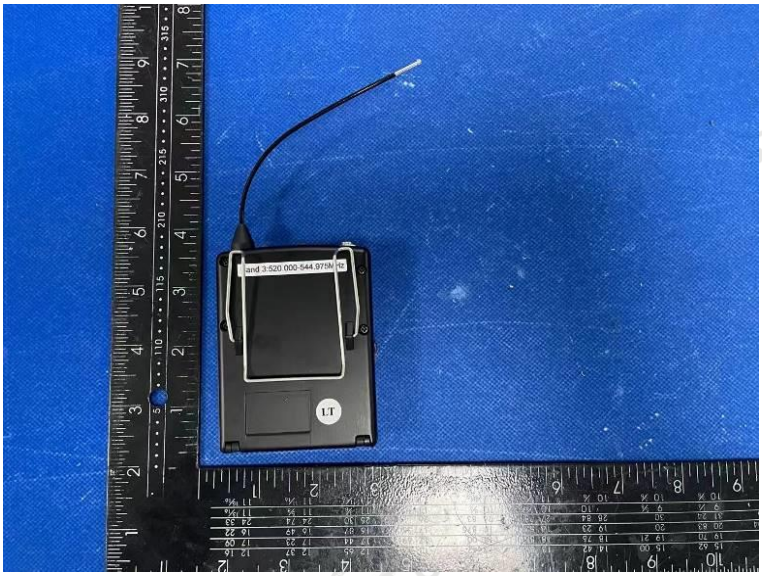
Reference Frequency: 544.975MHz					
Voltage (V)	Temperature (℃)	Frequency error (MHz)	Frequency Tolerance (%)	Limit (%)	Result
3.0V	-20	0.00086	0.00016%	±0.005	PASS
	-10	0.00083	0.00015%		
	0	0.00067	0.00012%		
	10	0.00074	0.00014%		
	20	0.00069	0.00013%		
	30	0.00071	0.00013%		
	40	0.00082	0.00015%		
	50	0.00073	0.00013%		
2.7 V	20	0.00069	0.00013%		

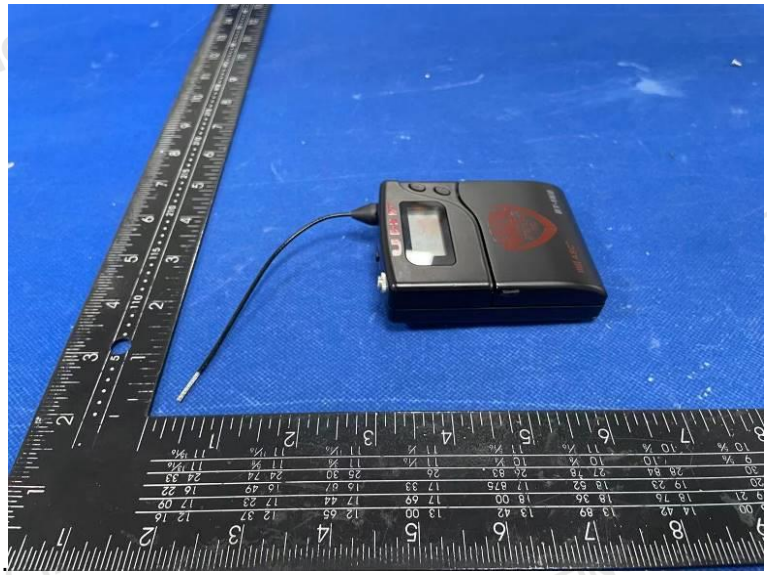
5 Test Setup Photos of the EUT





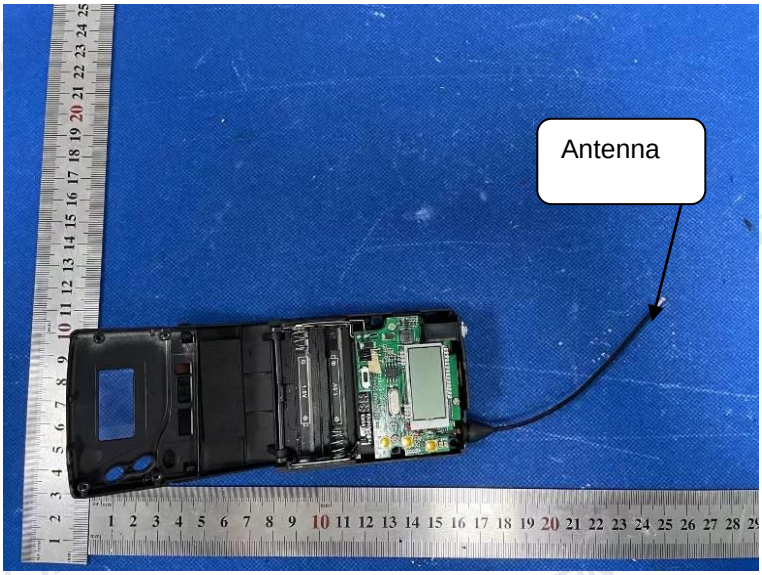
6 Photos of the EUT

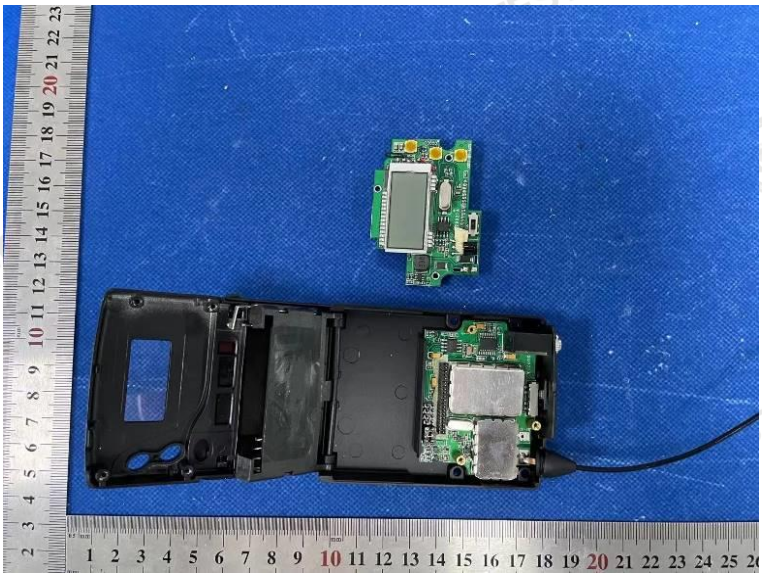


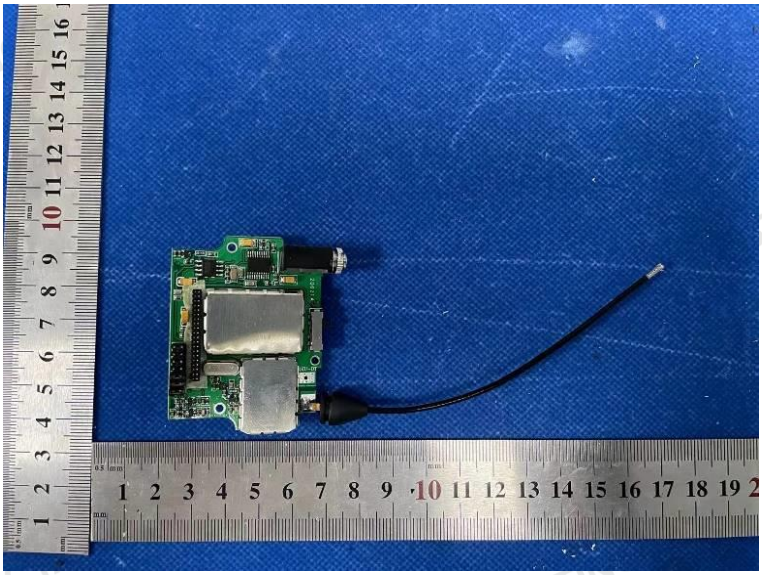


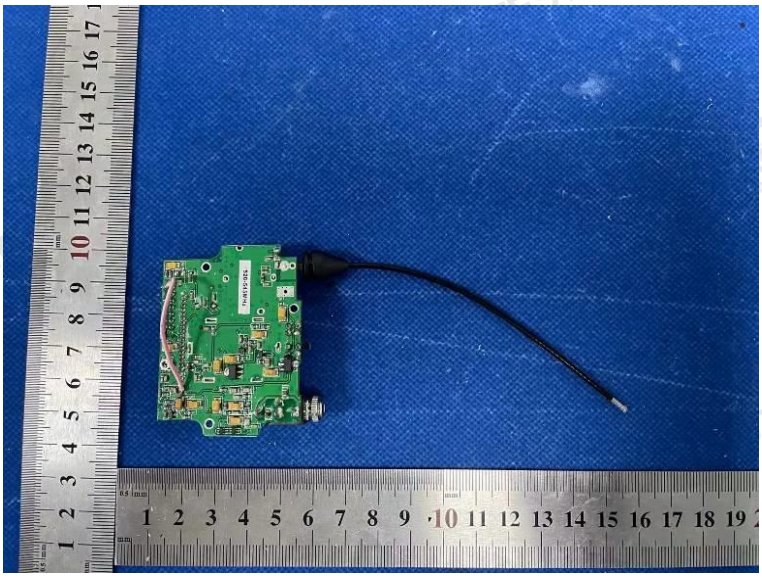
MUTE
ON
OFF

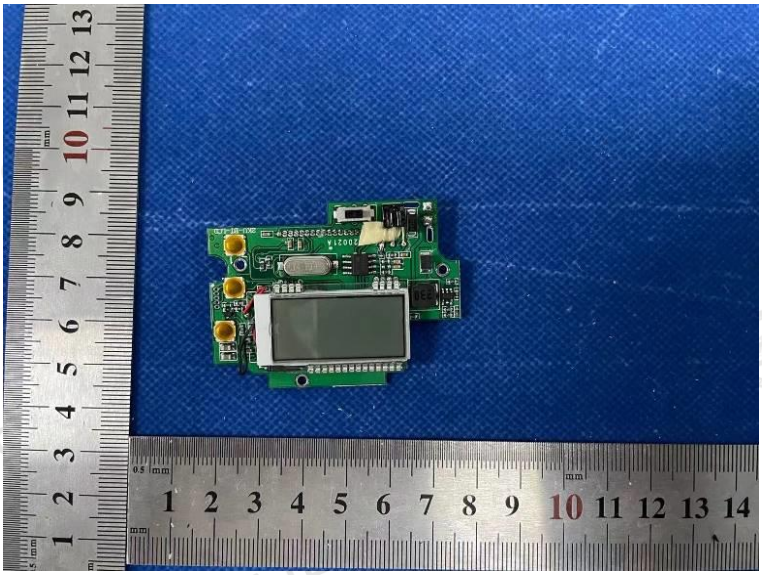
NADY
SYSTEMS

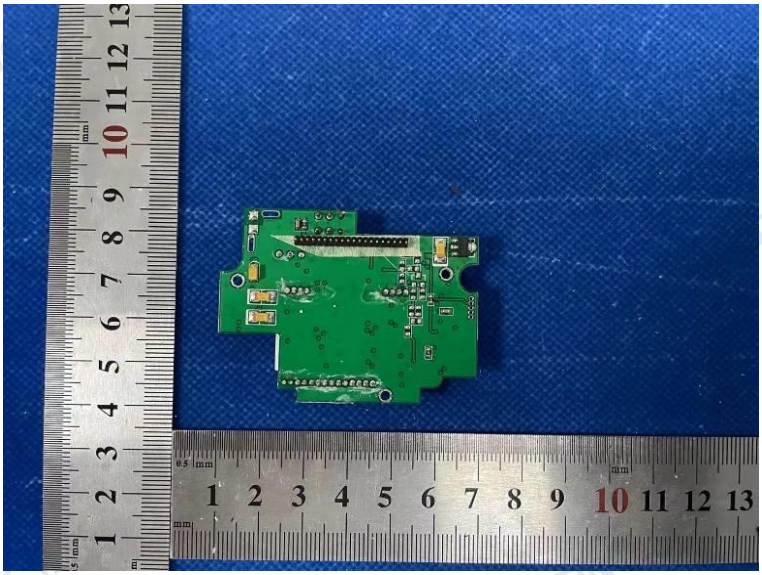

Antenna

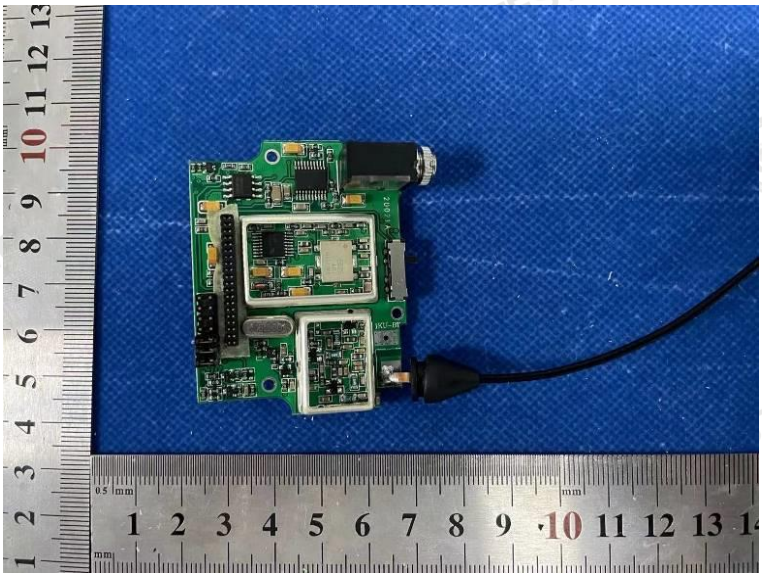












********** End of Report **********