



FCC TEST REPORT

FCC ID: 2AEEA-E-COPY

On Behalf of

SEA S.p.A.

Wireless remote control

Model No.: Coccinella E-Copy

Prepared for : SEA S.p.A.
Address : Zona Industriale S. Atto Teramo 64100 Italy Teramo, Italy

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 : A2406011-C01-R05-V1
Date of Receipt : June 7, 2024
Date of Test : June 7, 2024 - July 30, 2024
Date of Report : August 5, 2024
Version Number : V1
Test Result : Pass

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TEST REPORT DECLARATION

Applicant : SEA S.p.A.
Address : Zona Industriale S. Atto Teramo 64100 Italy Teramo, Italy
Manufacturer : SEA S.p.A.
Address : Zona Industriale S. Atto Teramo 64100 Italy Teramo, Italy
EUT Description : Wireless remote control
(A) Model No. : Coccinella E-Copy
(B) Trademark : N/A

Measurement Standard Used:

FCC Rules and Regulations Part 15 Subpart C Section 15.231

ANSI C63.10-2013

The device described above is tested by Shenzhen Alpha Product Testing Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C limits both conducted and radiated emissions. The test results are contained in this test report and Shenzhen Alpha Product Testing Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

After the test, our opinion is that EUT compliance with the requirement of the above standards.

This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Shenzhen Alpha Product Testing Co., Ltd.

Tested by (name + signature).....: Yannis Wen
Project Engineer



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



Date of issue.....: August 5, 2024

Revision History

Revision	Issue Date	Revisions	Revised By
V0	July 30, 2024	Initial released Issue	Yannis Wen
V1	August 5, 2024	Manufacturer information has been modified	Yannis Wen

1. General Information

1.1. Description of Device (EUT)

EUT : Wireless remote control

Model No. : Coccinella E-Copy

DIFF. : N/A

Power supply : DC 12V by battery

Operation frequency : 433.92MHz

Modulation : ASK

Antenna Type : Internal Antenna, Maximum Gain is 3dBi

Software version : V1.0

Hardware version : V1.0

Intend use : Residential, commercial and light industrial environment
environment

1.2. Accessories of Device (EUT)

Accessories1 : /

Manufacturer : /

Model : /

Power supply : /

1.3. Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number	Certification
/	/	/	/	/	/

1.4. 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: 12135A

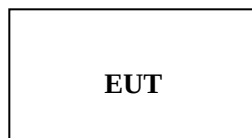
2. Summary of Test

2.1. Summary of Test Result

Description of Test Item	Standard	Results
Spurious Emission	Section 15.231&15.209	PASS
Conduction Emission	Section 15.207	N/A
Occupied bandwidth	Section 15.231	PASS
Transmission time	Section 15.231	PASS
Band Edge	Section 15.231	N/A
Antenna Requirement	Section 15.203	PASS
Note : Test according to ANSI C63.10-2013		

2.2. Block Diagram

1. For radiated emissions test: EUT was placed on a turn table, which is 0.8 meters high above ground for below 1 GHz test and 1.5 meters high above ground for below 1 GHz test . EUT was set into test mode before test. New battery is used during all test



2.3. Test Mode

EUT work in Continuous TX mode, and select test channel, wireless mode

Tested mode, channel, and data rate information		
Mode	Channel	Frequency (MHz)
1	CH1	433.92MHz

2.4. Test Conditions

Temperature range	21-25°C
Humidity range	40-75%
Pressure range	86-106kPa

2.5. Measurement Uncertainty (95% confidence levels, k=2)

Item	Uncertainty
Uncertainty for Power point Conducted Emissions Test	1.63dB
Uncertainty for Radiation Emission test in 3m chamber (below 30MHz)	3.5dB
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	3.74dB(Polarize: V)
	3.76dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz)	3.77dB(Polarize: V)
	3.80dB(Polarize: H)
Uncertainty for radio frequency	5.06×10^{-8} GHz
Uncertainty for conducted RF Power	0.40dB
Uncertainty for temperature	0.2°C
Uncertainty for humidity	1%
Uncertainty for DC and low frequency voltages	0.06%

2.6. Test Equipment

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

3. Radiation Emission

3.1. Radiation Emission Limits(15.209&231)

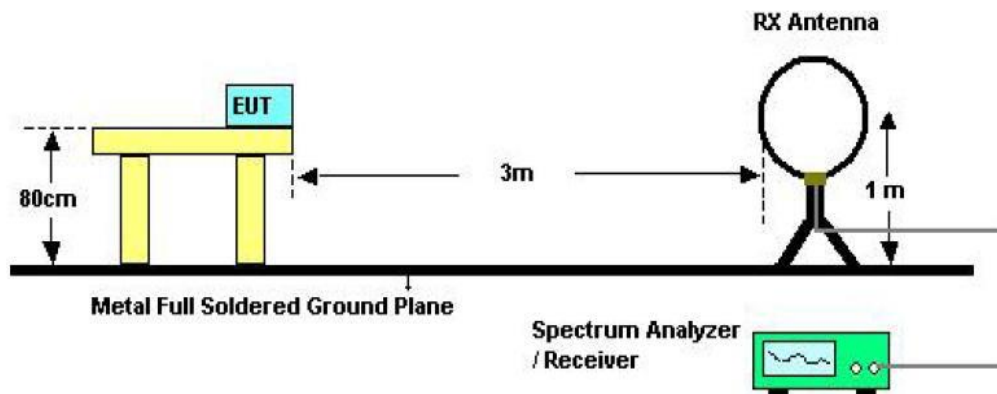
Frequency (MHz)	Field Strength Limits at 3 metres (watts, e.i.r.p.)		
	uV/m	dB uV/m	Measurement distance(m)
0.009-0.490	2400/F(kHz)	XX	300
0.490-1.705	24000/F(kHz)	XX	30
1.705-30	30	29.5	30
30~88	100(3nW)	40	3
88~216	150(6.8nW)	43.5	3
216~960	200(12nW)	46	3
Above960	500(75nW)	54	3
Carrier frequency		75.6(AV)	3
Carrier frequency		95.6(PK)	3

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	¹ 1,250 to 3,750	¹ 125 to 375
174-260	3,750	375
260-470	¹ 3,750 to 12,500	¹ 375 to 1,250
Above 470	12,500	1,250

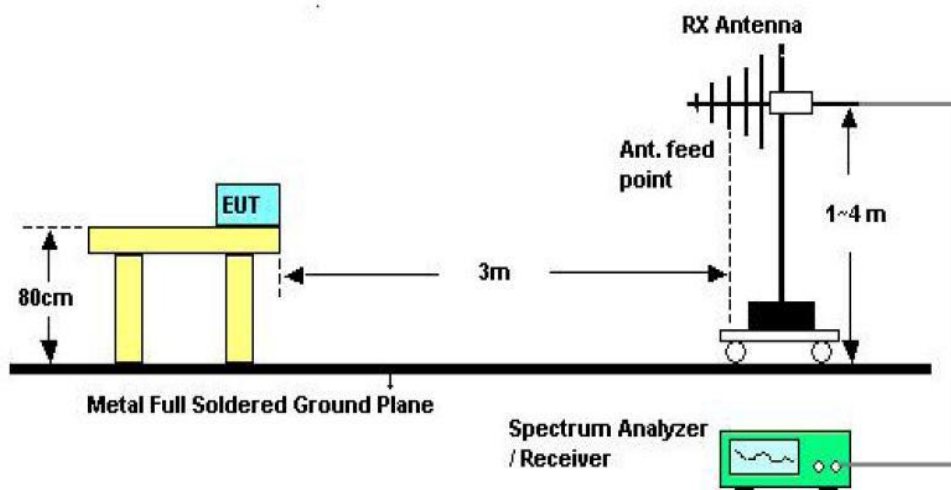
NOTE:

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

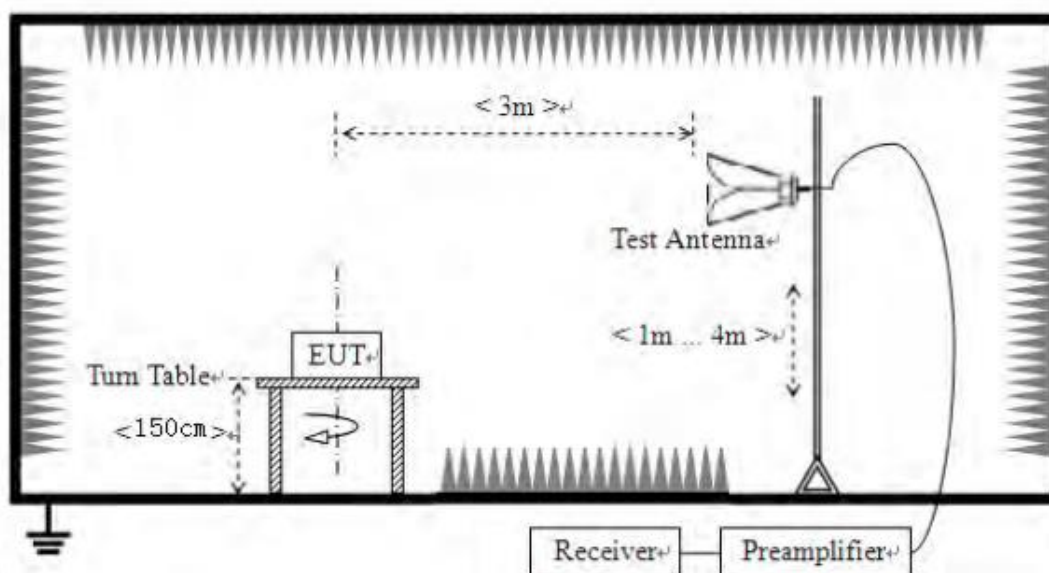
3.2. Test Setup



Below 30MHz Test Setup



Above 30MHz Test Setup



Above 1GHz Test Setup

3.3. Test Procedure

- The measuring distance of 3m shall be used for measurements at frequency up to 1GHz and above 1GHz, The EUT was placed on a rotating 0.8 m high above ground, 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 to 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 remeasured
- 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.

3.4. Test Equipment Setting For emission test.

9kHz~150kHz	RBW 200Hz	VBW1kHz
150kHz~30MHz	RBW 9kHz	VBW 30kHz
30MHz~1GHz	RBW 120kHz	VBW 300kHz
Above 1GHz	RBW 1MHz	VBW 3MHz

3.5. Test Condition

Continual Transmitting in maximum power(The new battery be used during Test)

3.6. Test Result

We have scanned the 10th harmonic from 9KHz to the EUT.
Detailed information please see the following page.

From 9KHz to 30MHz: Conclusion: PASS

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

Notes: 1 --Means other frequency and mode comply with standard requirements and at least have
20dB margin.

Correct Factor=Cable Loss+Antenna Factor-Amplifier Gain

Measurement Result=Reading + Correct Factor

Margin=Measurement Result-Limit

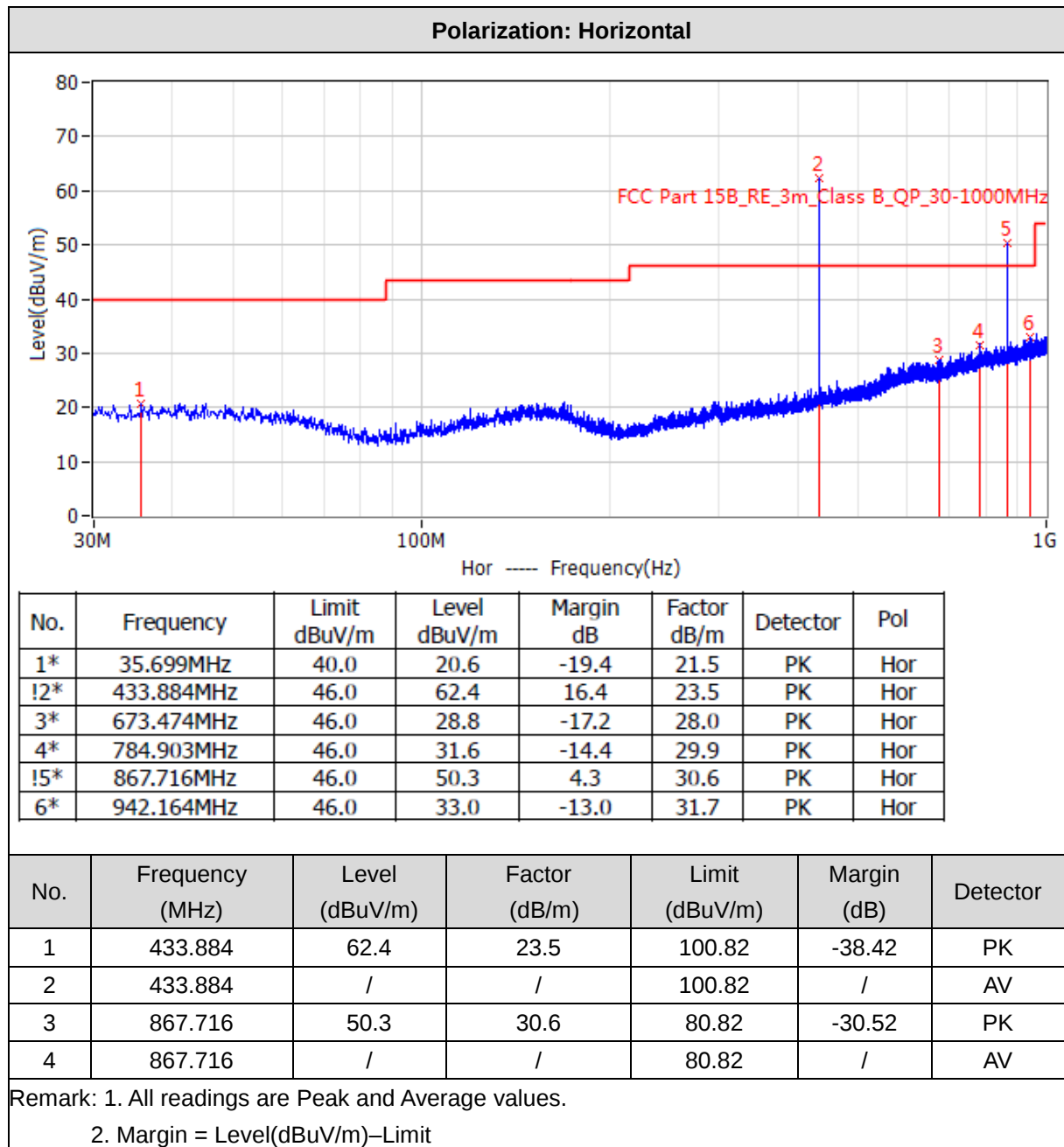
2 –Spectrum setting:

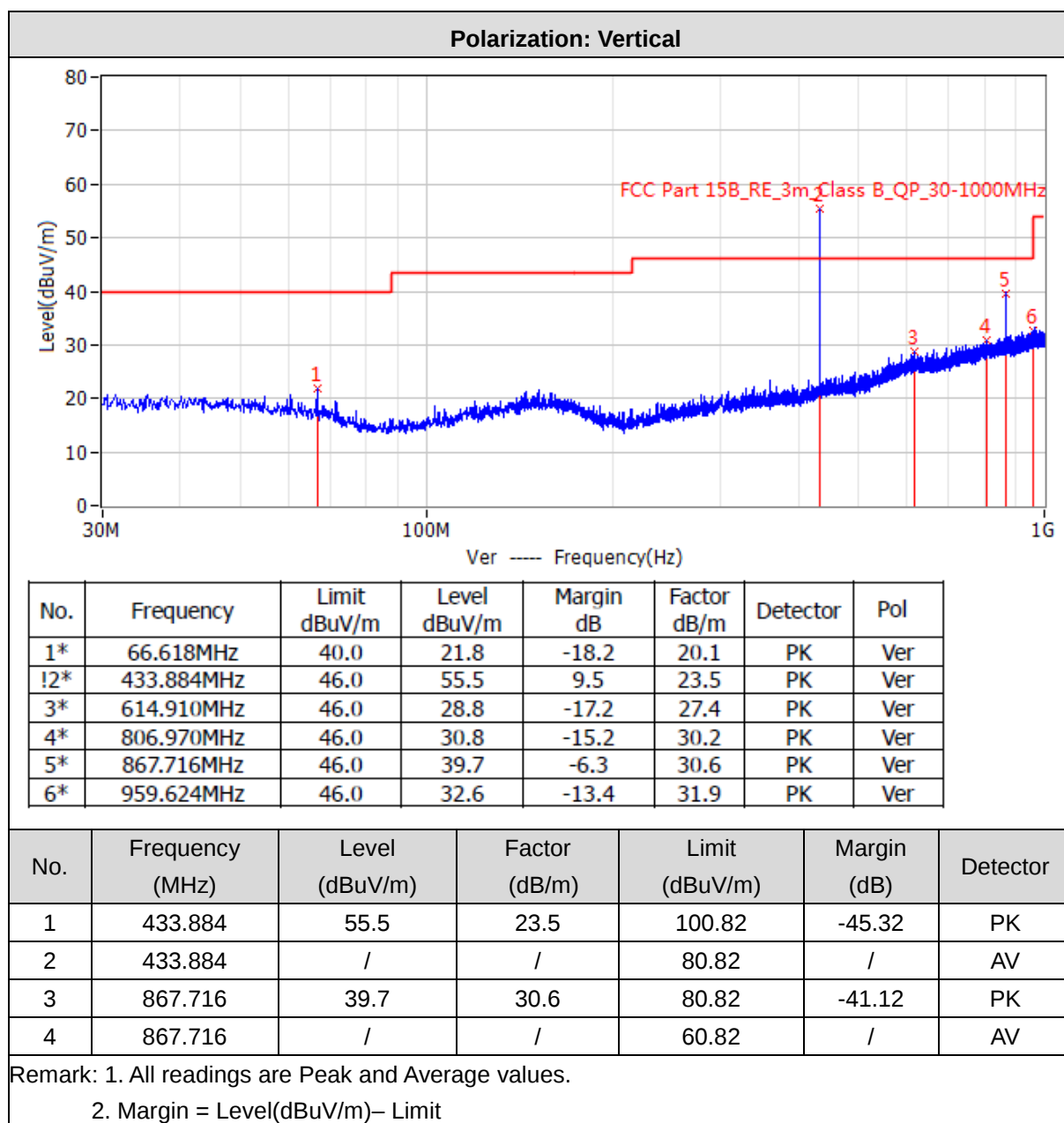
a. Peak setting 30MHz-1GHz, RBW=100kHz, VBW=300kHz.

3- PK measure result values is less than the AVG limit values, so AV measure result values
test not applicable.

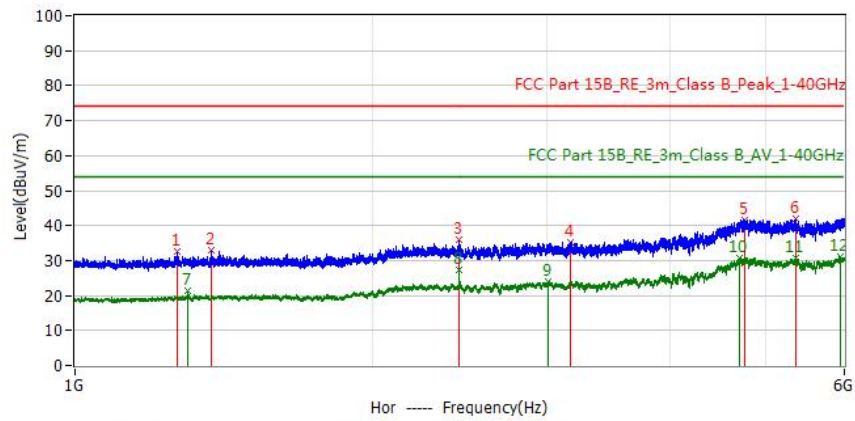
Radiated Emissions Result of Inside band

Below 1GHz:





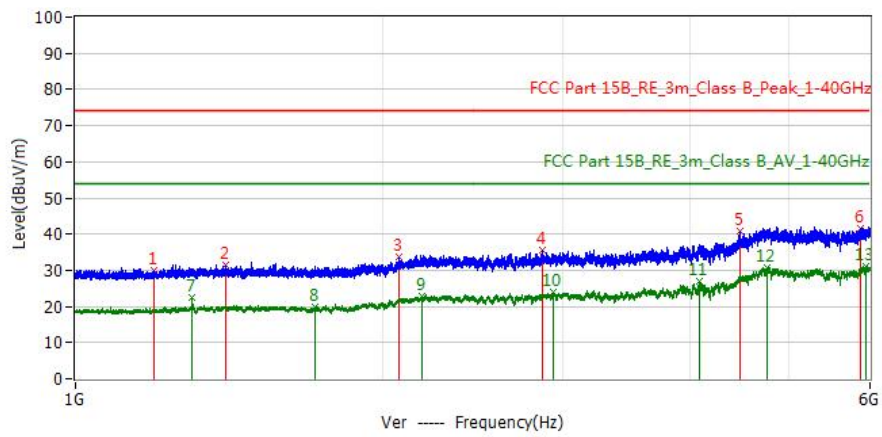
Above 1GHz:

Polarization: Horizontal

No.	Frequency	Limit dBuV/m	Level dBuV/m	Margin dB	Factor dB/m	Detector	Pol
1*	1.268GHz	74.0	32.4	-41.6	-22.3	PK	Hor
2*	1.375GHz	74.0	32.8	-41.2	-21.8	PK	Hor
3*	2.444GHz	74.0	35.8	-38.2	-17.8	PK	Hor
4*	3.169GHz	74.0	35.3	-38.7	-16.1	PK	Hor
5*	4.754GHz	74.0	41.7	-32.3	-9.0	PK	Hor
6*	5.361GHz	74.0	41.9	-32.1	-8.6	PK	Hor

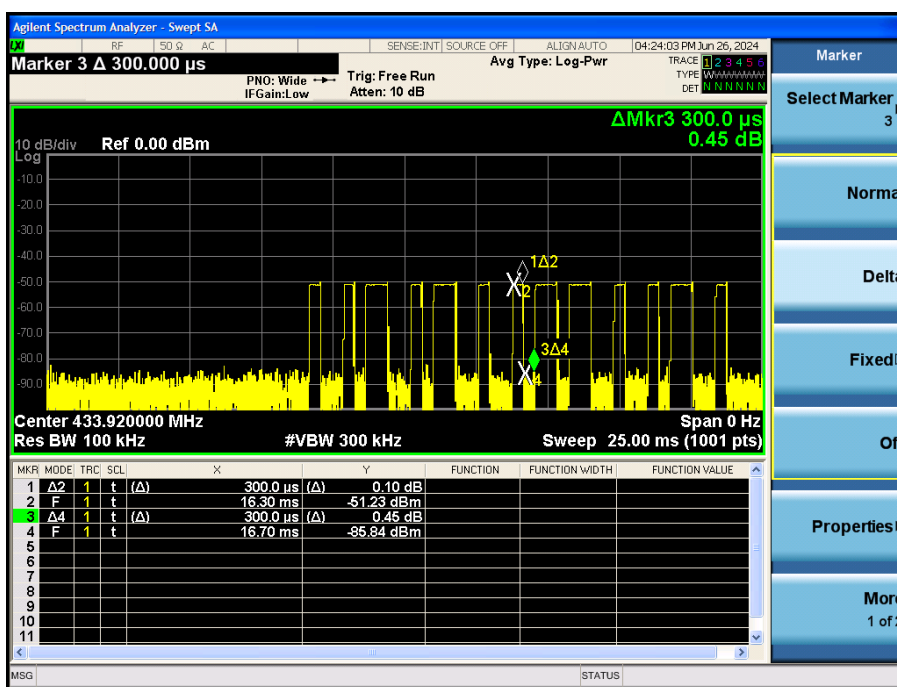
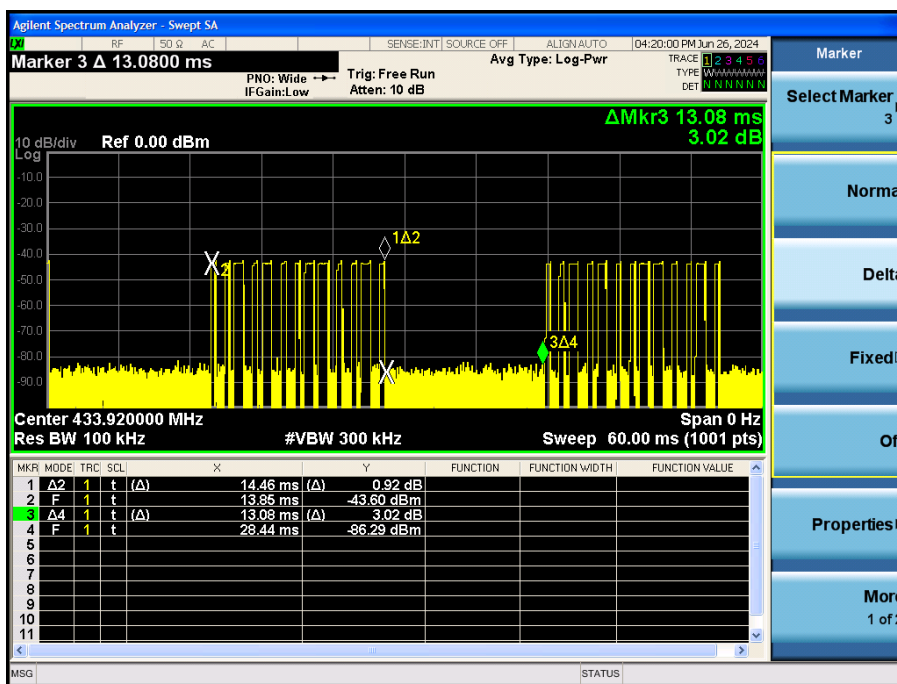
7*	1.302GHz	54.0	21.5	-32.5	-22.0	AV	Hor
8*	2.444GHz	54.0	27.2	-26.8	-17.8	AV	Hor
9*	3.007GHz	54.0	24.1	-29.9	-16.3	AV	Hor
10*	4.707GHz	54.0	30.8	-23.2	-9.3	AV	Hor
11*	5.364GHz	54.0	30.6	-23.4	-8.6	AV	Hor
12*	5.952GHz	54.0	31.1	-22.9	-7.6	AV	Hor

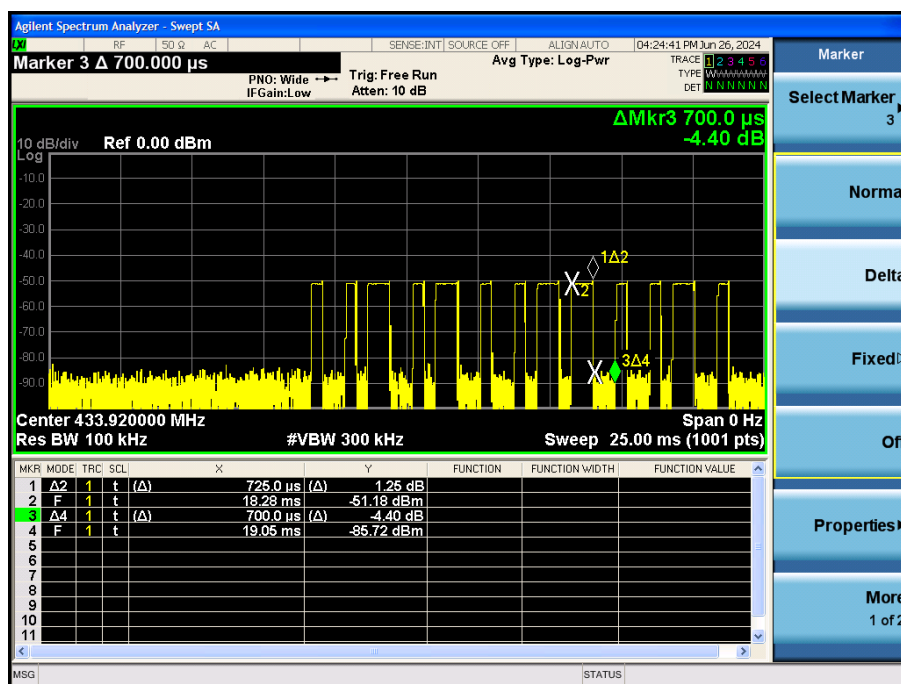
Polarization: Vertical



No.	Frequency	Limit dBuV/m	Level dBuV/m	Margin dB	Factor dB/m	Detector	Pol
1*	1.193GHz	74.0	30.1	-43.9	-22.7	PK	Ver
2*	1.402GHz	74.0	31.3	-42.7	-21.9	PK	Ver
3*	2.075GHz	74.0	33.7	-40.3	-19.2	PK	Ver
4*	2.864GHz	74.0	35.6	-38.4	-16.8	PK	Ver
5*	4.477GHz	74.0	41.0	-33.0	-11.4	PK	Ver
6*	5.871GHz	74.0	41.7	-32.3	-8.0	PK	Ver
7*	1.302GHz	54.0	22.3	-31.7	-22.0	AV	Ver
8*	1.715GHz	54.0	19.9	-34.1	-21.8	AV	Ver
9*	2.184GHz	54.0	22.7	-31.3	-18.1	AV	Ver
10*	2.939GHz	54.0	23.8	-30.2	-16.5	AV	Ver
11*	4.085GHz	54.0	27.0	-27.0	-12.5	AV	Ver
12*	4.757GHz	54.0	30.7	-23.3	-8.9	AV	Ver
13*	5.954GHz	54.0	31.2	-22.8	-7.6	AV	Ver

Duty cycle





$$T = 14.46 + 13.08 = 27.54 \text{ ms}, T_{\text{on}} = 0.3 \cdot 8 + 0.725 \cdot 5 = 6.025 \text{ ms}$$

$$\text{So Duty Cycle} = T_{\text{on}} / T = 6.025 / 27.54 = 0.2188$$

Average should be determined by duty cycle factor.

the total on time in 27.54ms is 6.025ms,

$$\text{Duty cycle factor} = 20 \log (6.025 / 27.54) = -13.2$$

4. Power Line Conducted Emission

4.1. Conducted Emission Limits (15.209)

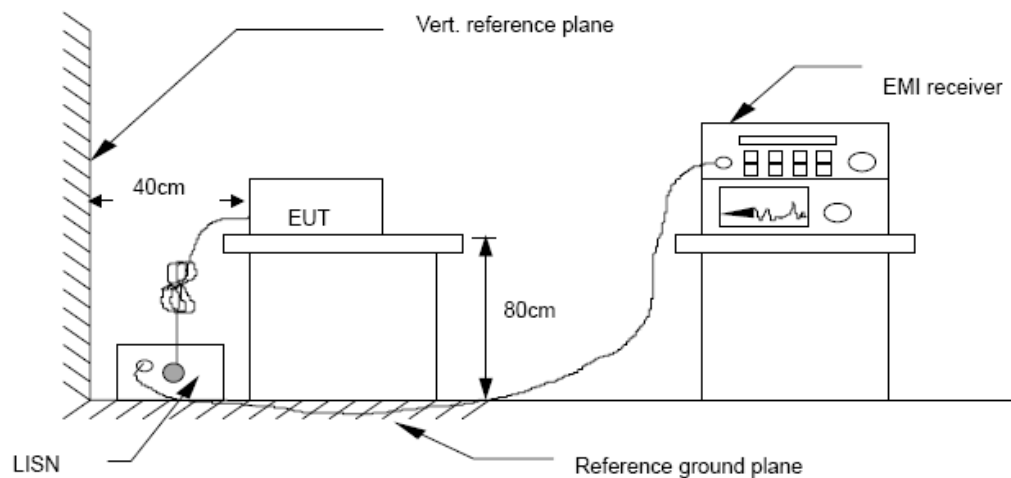
Frequency MHz	Limits dB(μ V)	
	Quasi-peak Level	Average Level
0.15 -0.50	66 -56*	56 - 46*
0.50 -5.00	56	46
5.00 -30.00	60	50

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 the rang of 0.15 to 0.50 MHz.

4.2. Test Setup



4.3. 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 (R & S ESCI) is set at 9 kHz.

4.4. Test Results

EUT power supply by battery, so the test not applicable.

5. Occupied bandwidth

5.1. Test Limit

Please refer section RSS-210 & 15.231

According to §15.231(C), The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz.

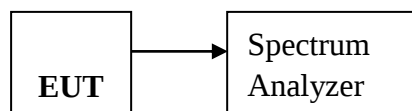
5.2. Method of Measurement

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 RBW set 30KHz, VBW set 30KHz, Sweep time set auto.

5.3. Test Setup

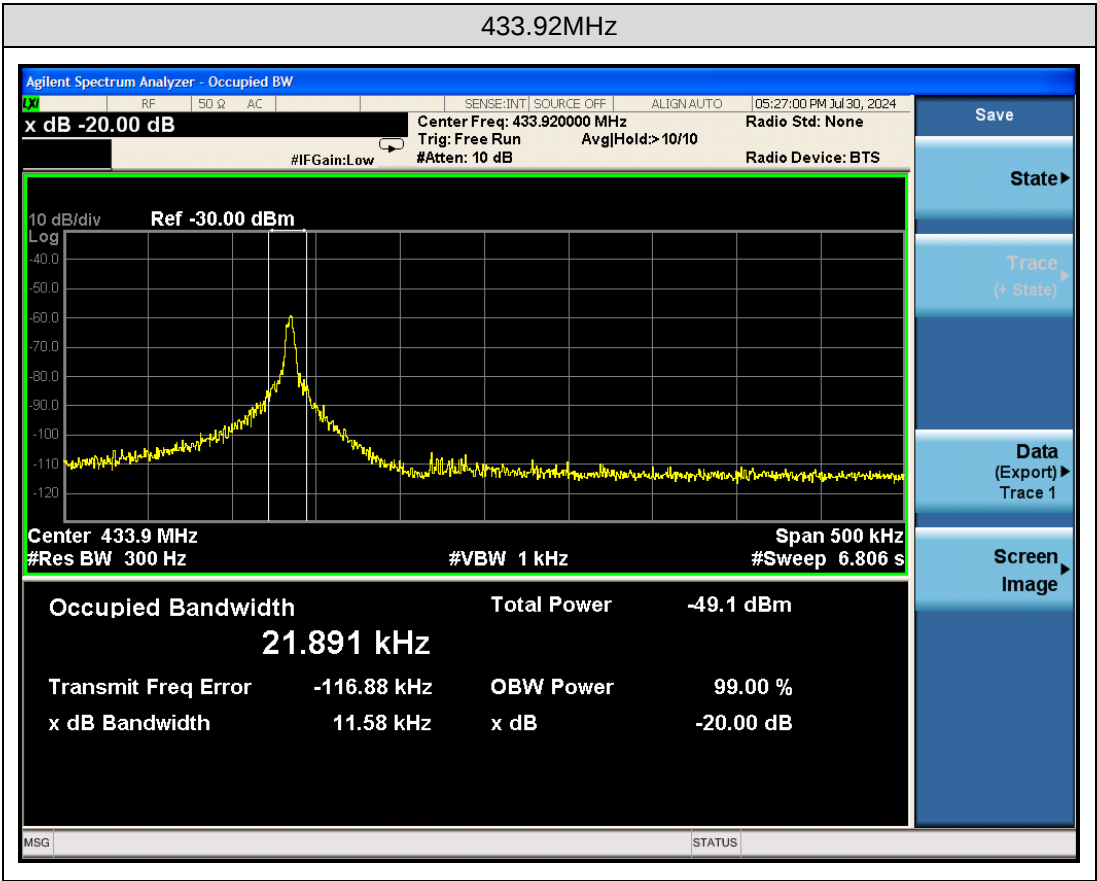


5.4. Test Results

Mode	Freq (MHz)	20dB Bandwidth (kHz)	99% Bandwidth(kHz)	Limit (kHz)	Conclusion
FSK	433.92	11.58	21.891	1084.8	PASS

Note:

Limit = 433.92MHz * 0.25% = 1084.8 kHz



6. Transmission Time

6.1. Test Limit

Please refer section RSS-210 & 15.231

According to §15.231(a)(1), A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

6.2. Method of Measurement

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

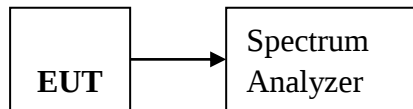
6.2.2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

6.2.3. Set spectrum analyzer Center= 433.92MHz, Span = 0MHz, Sweep = 5s.

6.2.4. Set the spectrum analyzer as RBW, VBW=1MHz,

6.2.5. Max hold, view and count how many channel in the band.

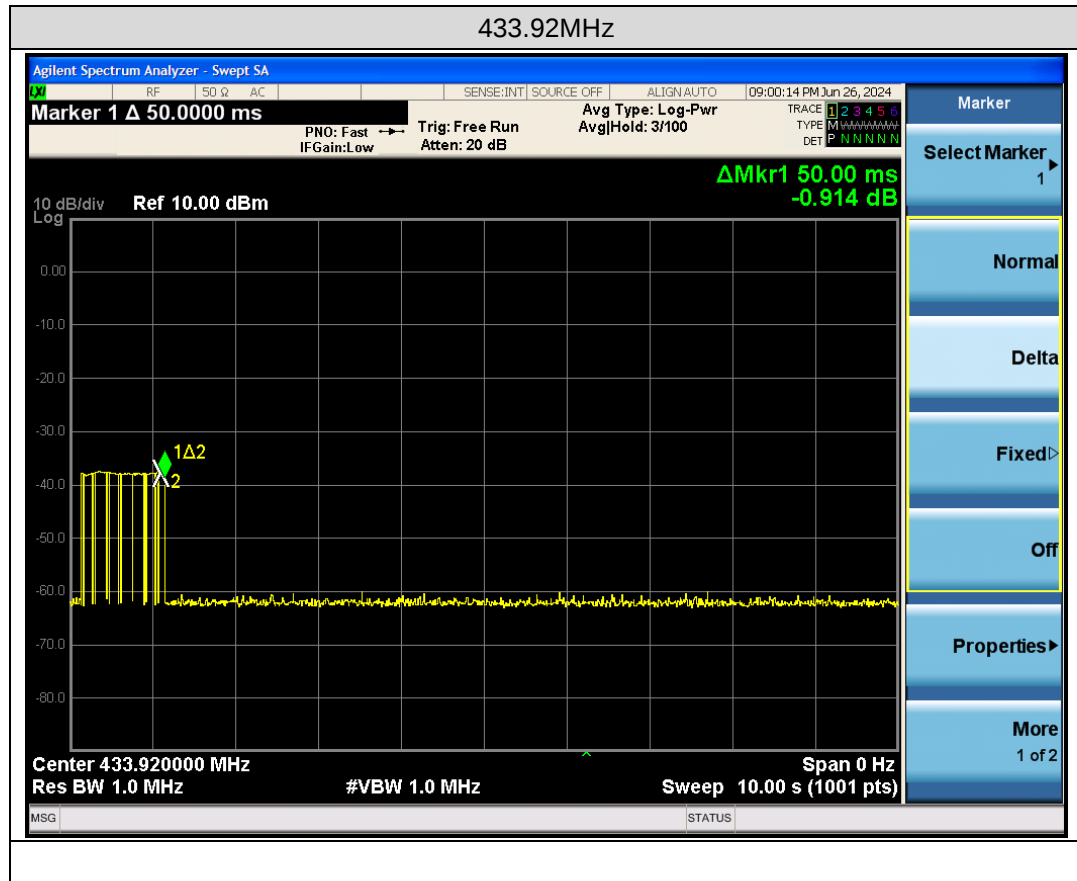
6.3. Test Setup



6.4. Test Results

Freq (MHz)	Test Result(s)	Limit (s)	Conclusion
433.92	0.05	< 5s	PASS

EUT After Release the button, EUT emission Continue 0.05seconds, Compliance with 15.231 a(1) section.



7. Antenna Requirement

7.1. 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.

7.2. Antenna Connected Construction

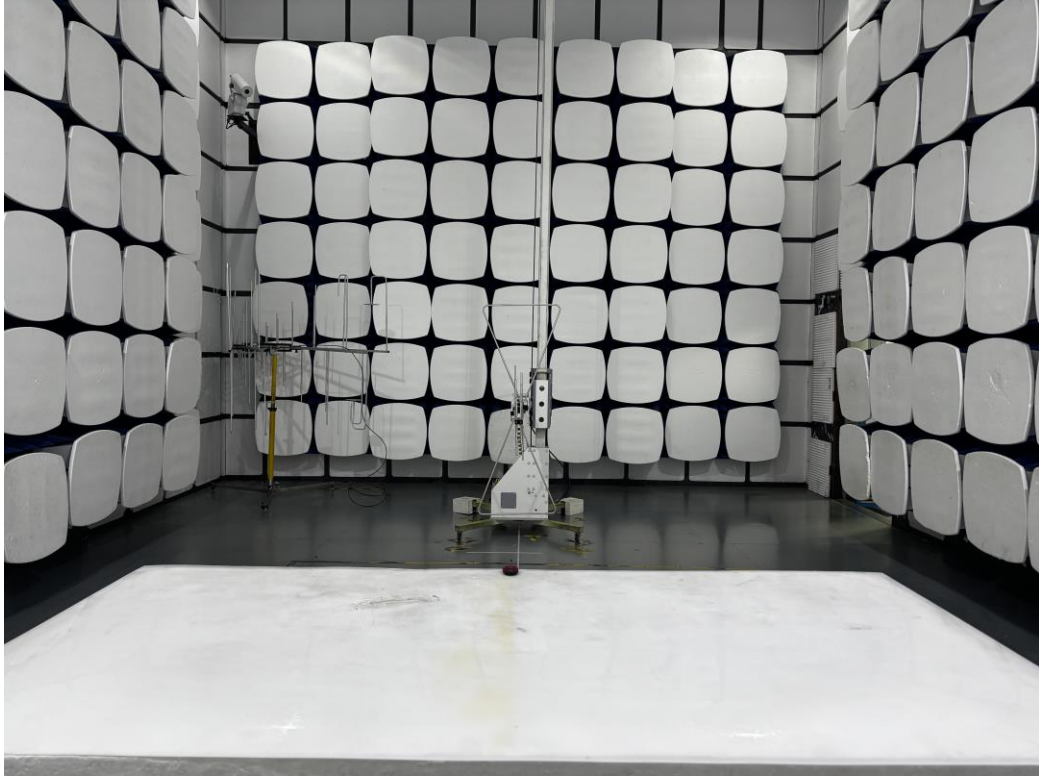
The directional gains of antenna used for transmitting is 0 dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement. Please see EUT photo for details.

7.3. Result

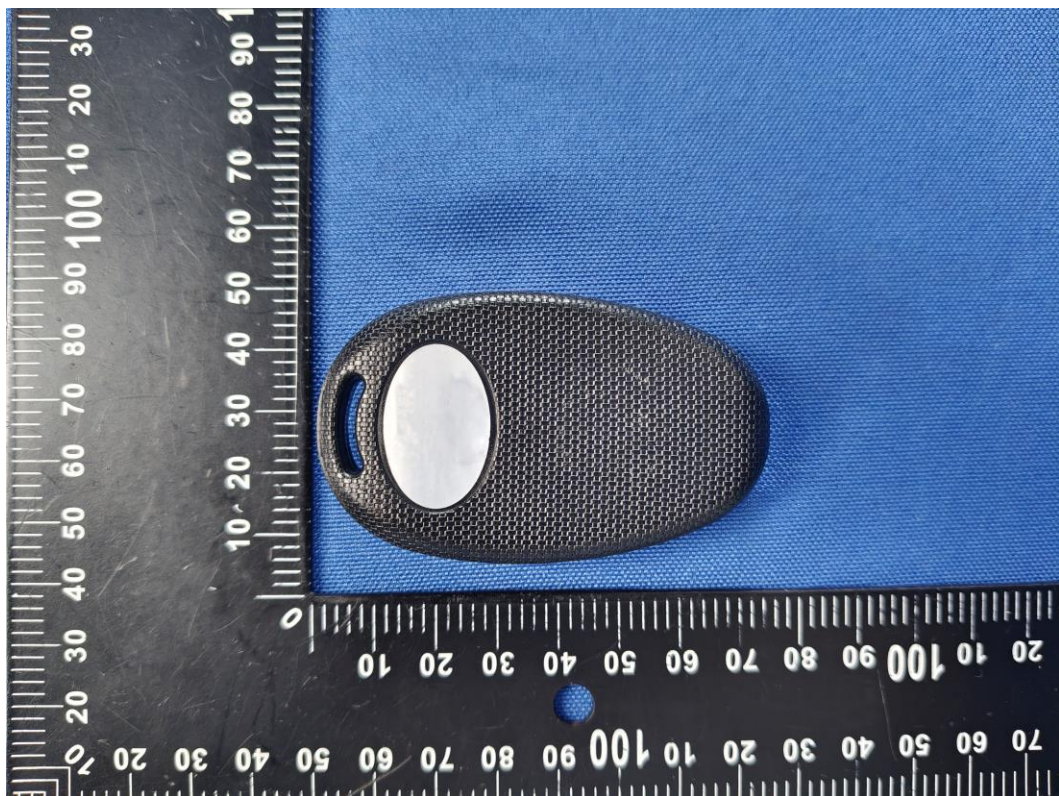
The EUT antenna is internal antenna. It comply with the standard requirement.

8. Test Setup Photo

Photos of Radiated emission

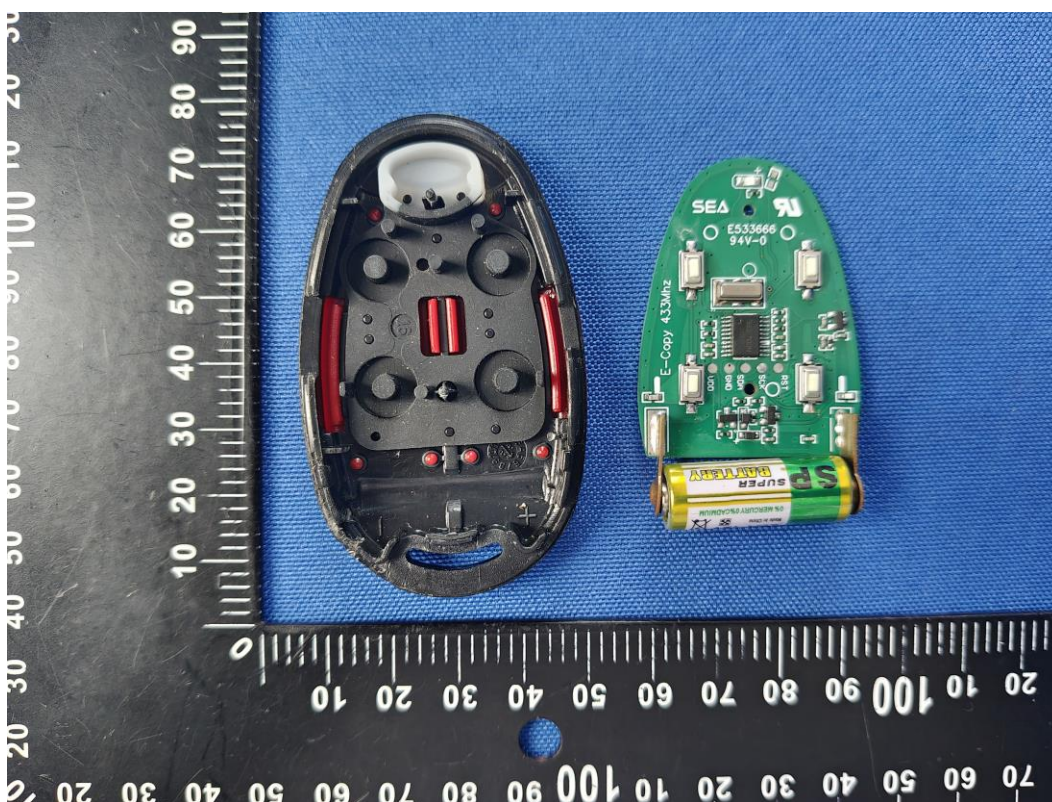
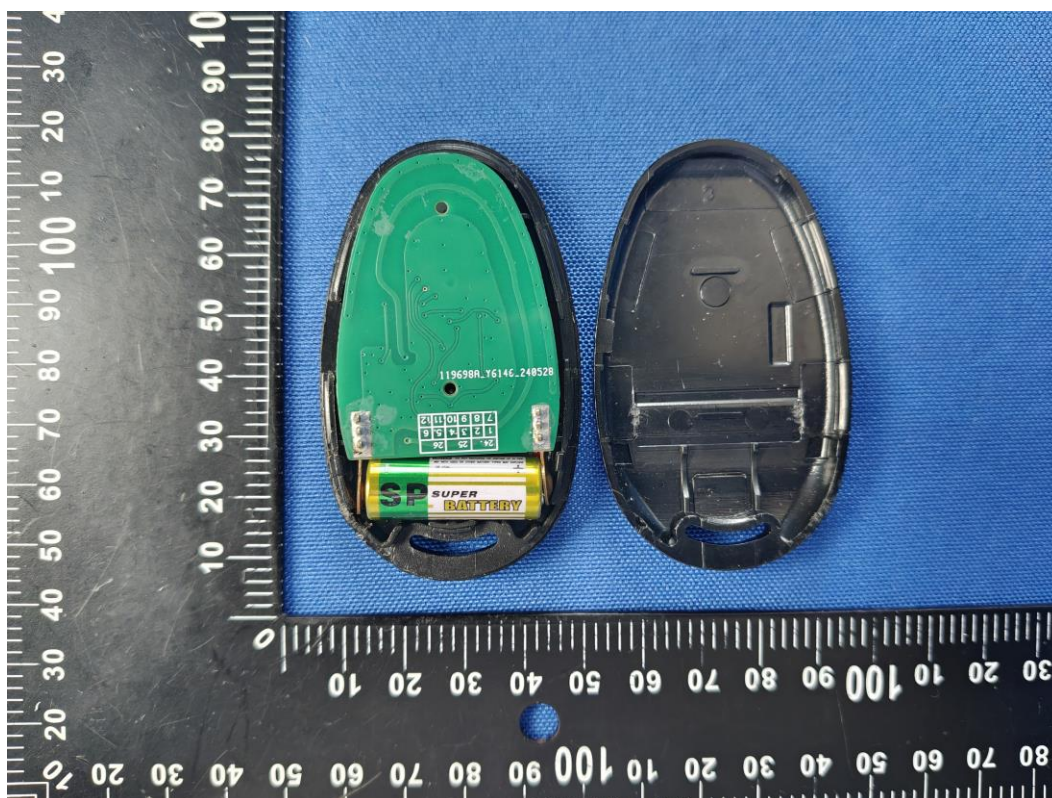


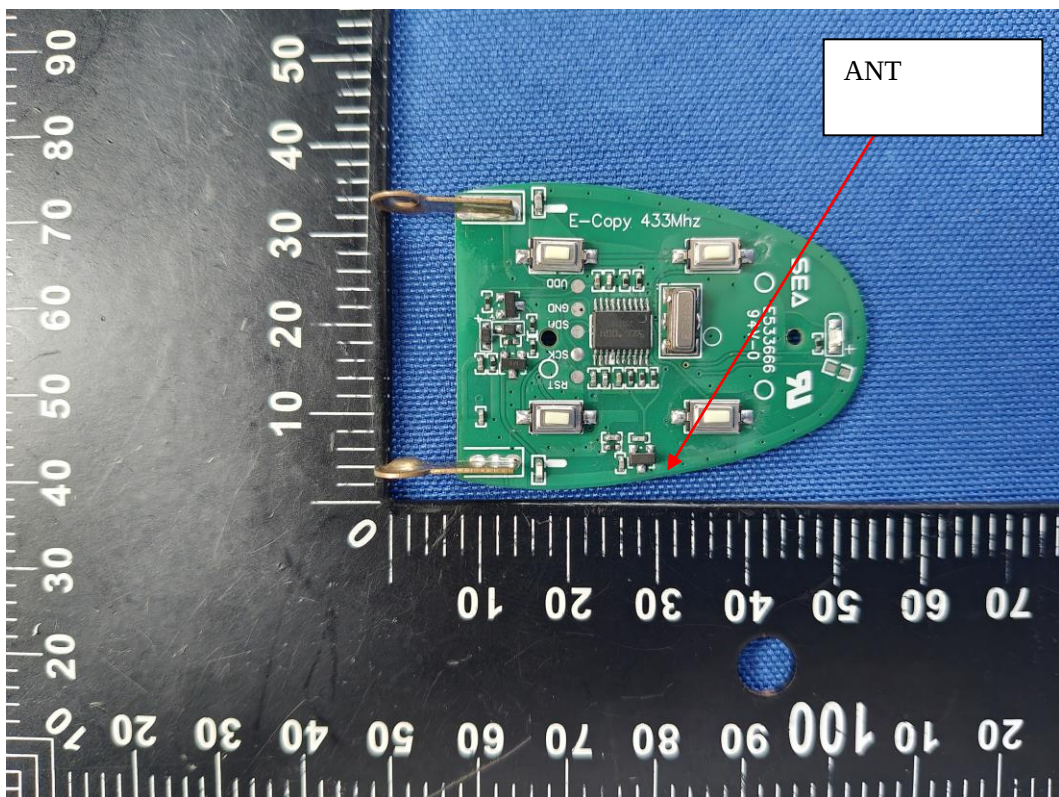
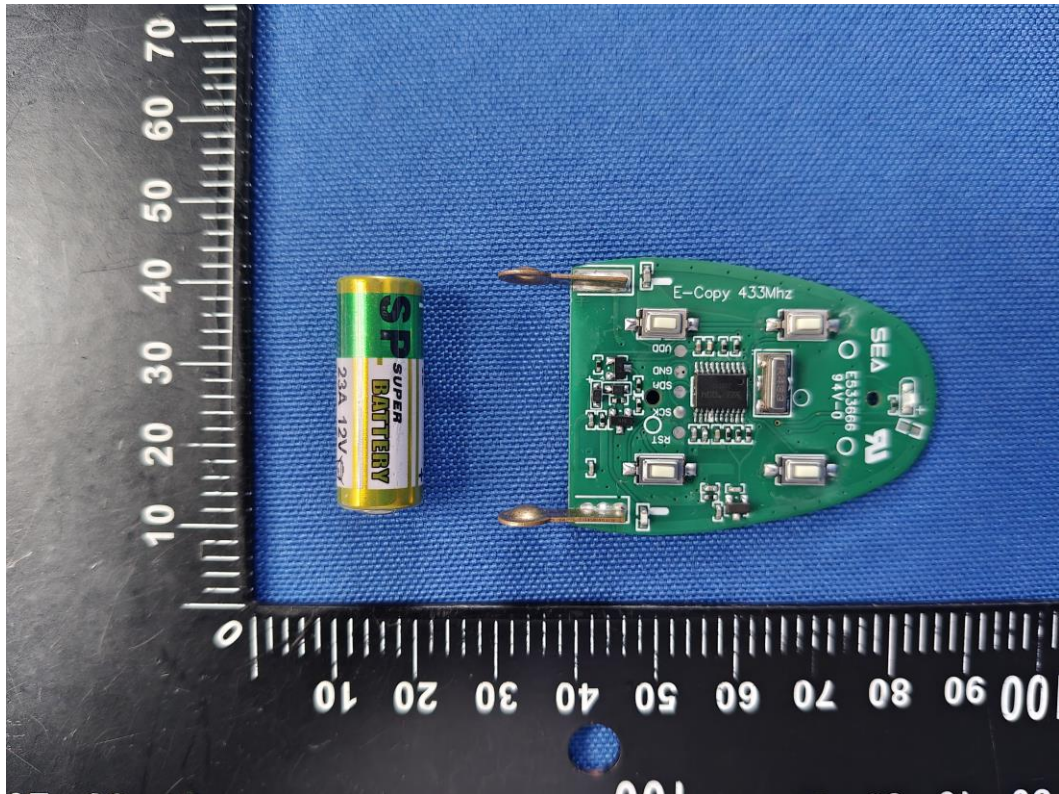
9. Photos of EUT

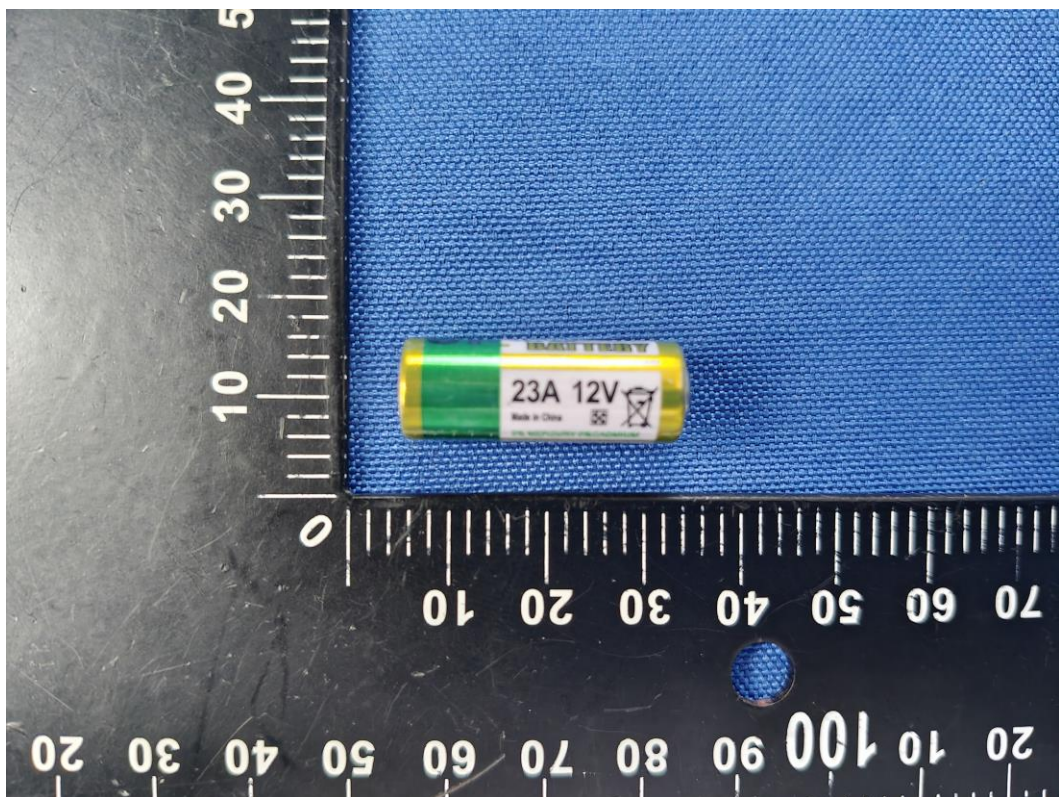
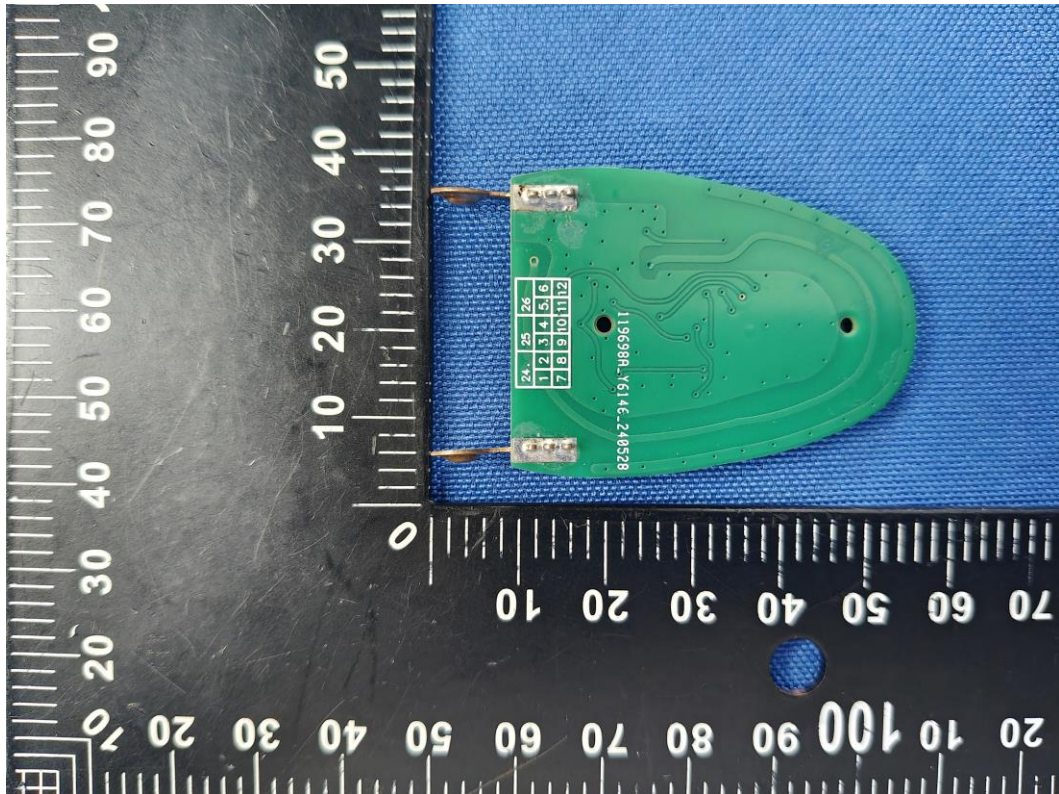












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