



**ICES-003 Issue 7**

**TEST REPORT**

*For*

**Module**

**MODEL NUMBER: RFM95C**

**REPORT NUMBER: E04A24070244I00201**

**ISSUE DATE: September 18, 2024**

*Prepared for*

**Shenzhen HOPE Microelectronics Co., Ltd**

**30th floor of 8th Building, C Zone Vanke Cloud City, Xili Sub-district, Nanshan,  
Shenzhen, Guangdong, China**

*Prepared by*

**Guangdong Global Testing Technology Co., Ltd.**

**Room 101-105, 203-210, Building 1, No.2, Keji 8 Road, Songshan Lake Park,  
Dongguan city, Guangdong, People's Republic of China, 523808**

**This report is based on a single evaluation of the submitted sample(s) of the above mentioned product, it does not imply an assessment of the production of the products.**

**This report shall not be reproduced, except in full, without the written approval of Guangdong Global Testing Technology Co., Ltd.**

## Revision History

Rev.	Issue Date	Revisions	Revised By
V0	September 18, 2024	Initial Issue	

**Summary of Test Results**

<b>Emission</b>			
<b>Standard</b>	<b>Test Item</b>	<b>Limit</b>	<b>Result</b>
ICES-003 Issue 7	Radiated emissions below 1GHz	ICES-003 Issue 7 Section 3.2.2	Pass
	Radiated emissions above 1GHz	ICES-003 Issue 7 Section 3.2.2	Pass
	Conducted emissions	ICES-003 Issue 7 Section 3.2.1	Pass

\*This test report is only published to and used by the applicant, and it is not for evidence purpose in China.

\*The measurement result for the sample received is <Pass> according to <ICES-003 Issue 7> when <Accuracy Method> decision rule is applied.

## CONTENTS

<b>1. ATTESTATION OF TEST RESULTS .....</b>	<b>5</b>
<b>2. TEST METHODOLOGY .....</b>	<b>6</b>
<b>3. FACILITIES AND ACCREDITATION .....</b>	<b>6</b>
<b>4. CALIBRATION AND UNCERTAINTY .....</b>	<b>7</b>
4.1. <i>MEASURING INSTRUMENT CALIBRATION .....</i>	<i>7</i>
4.2. <i>MEASUREMENT UNCERTAINTY .....</i>	<i>7</i>
<b>5. EQUIPMENT UNDER TEST .....</b>	<b>8</b>
5.1. <i>DESCRIPTION OF EUT .....</i>	<i>8</i>
5.2. <i>TEST MODE .....</i>	<i>8</i>
5.3. <i>SUPPORT UNITS FOR SYSTEM TEST .....</i>	<i>8</i>
<b>6. MEASURING EQUIPMENT AND SOFTWARE USED .....</b>	<b>9</b>
<b>7. EMISSION TEST .....</b>	<b>10</b>
7.1. <i>Radiated emissions below 1GHz .....</i>	<i>10</i>
7.2. <i>Radiated emissions above 1GHz .....</i>	<i>14</i>
7.3. <i>Conducted emissions .....</i>	<i>18</i>
<b>APPENDIX: PHOTOGRAPHS OF TEST CONFIGURATION .....</b>	<b>22</b>
<b>APPENDIX: PHOTOGRAPHS OF THE EUT .....</b>	<b>24</b>

## 1. ATTESTATION OF TEST RESULTS

### Applicant Information

Company Name: Shenzhen HOPE Microelectronics Co., Ltd  
Address: 30th floor of 8th Building, C Zone Vanke Cloud City, Xili Sub-district, Nanshan, Shenzhen, Guangdong, China

### Manufacturer Information

Company Name: Shenzhen HOPE Microelectronics Co., Ltd  
Address: 30th floor of 8th Building, C Zone Vanke Cloud City, Xili Sub-district, Nanshan, Shenzhen, Guangdong, China

### EUT Information

Product Description: Module  
Model: RFM95C  
Series Model: /  
Brand: HOPERF  
Sample Received Date: August 1, 2024  
Sample Status: Normal  
Sample ID: A24070244 001  
Date of Tested: August 1, 2024 to September 18, 2024

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
ICES-003 Issue 7	Pass

Prepared By:

Win Huang

Win Huang

Project Engineer

Checked By:

Alan He

Alan He

Laboratory Leader

Approved By:

Shawn Wen

Shawn Wen

Laboratory Manager

## 2. TEST METHODOLOGY

All tests were performed in accordance with the standard ICES-003 Issue 7

## 3. FACILITIES AND ACCREDITATION

Accreditation Certificate	<p><b>A2LA (Certificate No.: 6947.01)</b> Guangdong Global Testing Technology Co., Ltd. has been assessed and proved to be in compliance with A2LA.</p> <p><b>FCC (FCC Designation No.: CN1343)</b> Guangdong Global Testing Technology Co., Ltd. has been recognized to perform compliance testing on equipment subject to Supplier's Declaration of Conformity (SDoC) and Certification rules</p> <p><b>ISED (Company No.: 30714)</b> Guangdong Global Testing Technology Co., Ltd. has been registered and fully described in a report filed with ISED. The Company Number is 30714 and the test lab Conformity Assessment Body Identifier (CABID) is CN0148.</p>
---------------------------	--

Note: All tests measurement facilities use to collect the measurement data are located at Room 101-105, 203-210, Building 1, No.2, Keji 8 Road, Songshan Lake Park, Dongguan city, Guangdong, People's Republic of China, 523808

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations and is traceable to recognized national standards.

### 4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Test Item	Measurement Frequency Range	K	U(dB)
Radiated emissions below 1GHz	30 MHz -1 GHz	2	3.79
Radiated emissions above 1GHz	1 GHz - 18 GHz	2	5.62
Conducted emissions	0.009 MHz - 30 MHz	2	3.37
Note1: This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of k=2.			
Note 2: According to the standard CISPR 16-4-2, the MU for the Conducted emissions from the AC mains power ports using AMN should not exceed 3.8 in range of 9kHz to 150kHz and 3.4 in range of 150kHz to 30MHz. We have considered the test results containing the value of U <sub>lab</sub> (in dB) for the measurement instrumentation actually used for the measurements.			

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

EUT Name		Module
Model		RFM95C
Series Model		/
Model Difference		/
Hardware Version		V1.1
Software Version		V1.0
Ratings		DC 3.3V 500mA
Power Supply	DC	5V

### 5.2. TEST MODE

Test Mode	Description
M01	Normal Working: Operate according to the user manual

### 5.3. SUPPORT UNITS FOR SYSTEM TEST

The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	Adapter	Xiaomi	MDY-11-EX	N/A	GTG Support

The following cables were used to form a representative test configuration during the tests.

Item	Type of cable	Shielded Type	Ferrite Core	Length
C-1	USB cable	Unshielded	without ferrite	1.0 m



## 6. MEASURING EQUIPMENT AND SOFTWARE USED

### Test Equipment of Radiated emissions below 1GHz

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due Date
Chamber	ETS	9*6*6	Q2146	2022/8/30	2025/8/29
Receiver	R&S	ESCI3	101409	2023/9/18	2024/9/17
Loop Antenna	ETS	6502	243668	2022/3/30	2025/3/30
Pre-Amplifier	HzEMC	HPA-9K0130	HYP A21001	2023/9/18	2024/9/17
Biconilog Antenna	Schwarzbeck	VULB 9168	1315	2022/10/10	2025/10/9
Biconilog Antenna	ETS	3142E	243646	2022/3/23	2025/3/22
Test Software for RE	Farad	EZ-EMC	V1.1.4.2	N/A	N/A

### Test Equipment of Radiated emissions above 1GHz

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due Date
Spectrum Analyzer	R&S	FSV40	101413	2023/9/18	2024/9/17
Pre-Amplifier	HzEMC	HPA-1G1850	HYP A21003	2023/9/18	2024/9/17
Horn antenna	ETS	3117	246069	2022/3/11	2025/3/10
Pre-Amplifier	ETS	HPA-184057	HYP A21004	2023/9/18	2024/9/17
Horn antenna	ETS	3116C	246265	2022/3/29	2025/3/28
Test Software for RE	Farad	EZ-EMC	V1.1.4.2	N/A	N/A

### Test Equipment of Conducted emissions

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due Date
Shielding Room 1	CHENG YU	8*5*4	N/A	2022/10/29	2025/10/28
LISN	R&S	ENV216	102843	2023/9/18	2024/9/17
EMI Test Receiver	R&S	ESR3	102647	2023/9/18	2024/9/17
LISN	Schwarzbeck	NNLK 8129 RC	5046	2023/9/18	2024/9/17
8-Wire ISN CAT6	Schwarzbeck	NTFM 8158	#237	2023/9/18	2024/9/17
CURRENT PROBE	R&S	EZ-17	101602	2023/9/18	2024/9/17
Test Software for CE	Farad	EZ-EMC	V1.1.4.2	N/A	N/A

## 7. EMISSION TEST

### 7.1. RADIATED EMISSIONS BELOW 1GHZ

#### LIMITS

Below 1 GHz

ICES-003 Issue 7		
Frequency (MHz)	Class A	Class B
	Field strength (dBuV/m) (at 3 m)	Field strength (dBuV/m) (at 3 m)
30 - 88	50	40
88 - 216	54	43.5
216 - 230	56.9	46
230 - 960	57	47
Above 960	60	54

Test Frequency Range of Radiated Disturbance Measurement

Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz)	Range (MHz)
Below 1.705	30
1.705 - 108	1000
108 - 500	2000
500 - 1000	5000
Above 1000	5 <sup>th</sup> harmonic of the highest frequency or 40 GHz, whichever is lower

#### NOTE:

- (1) The limit for radiated test was performed according to ICES-003 Issue 7;
- (2) The tighter limit applies at the band edges;
- (3) Emission level (dBuV/m) = 20log Emission level (uV/m),  
3m Emission level = 10 m Emission level + 20log(10 m/3 m);

#### TEST PROCEDURE

Below 1 GHz and above 30 MHz

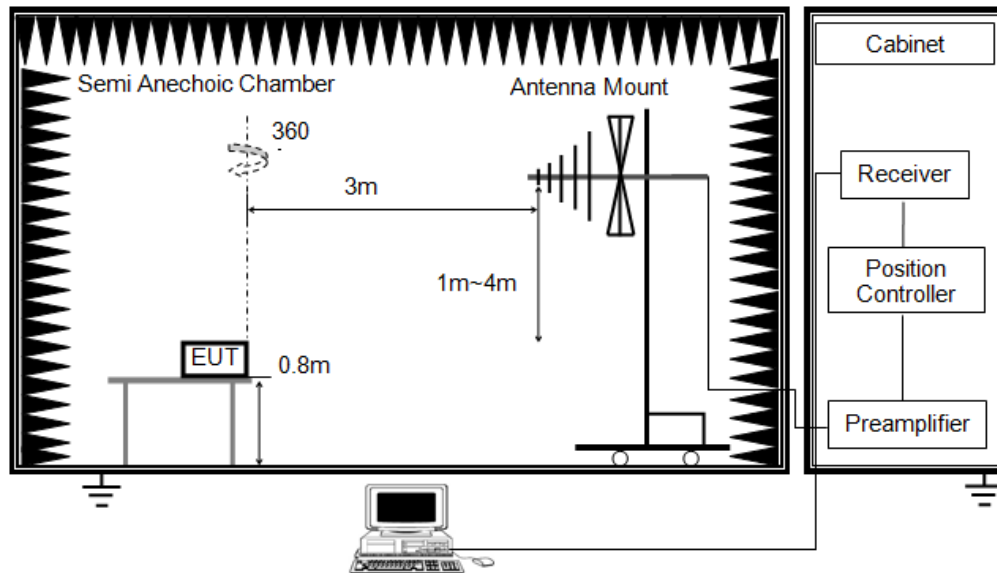
The setting of the spectrum analyser

RBW	120 kHz
VBW	300 kHz
Sweep	Auto
Detector	Peak and QP
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.4-2014.

2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp was used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 80 cm above ground.
4. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
5. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
6. Cables of hand-operated devices, such as keyboards and mice, shall be placed as for normal used.
7. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
8. For measurement below 1 GHz, 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 Quasi Peak detector mode re-measured.

#### **TEST SETUP**

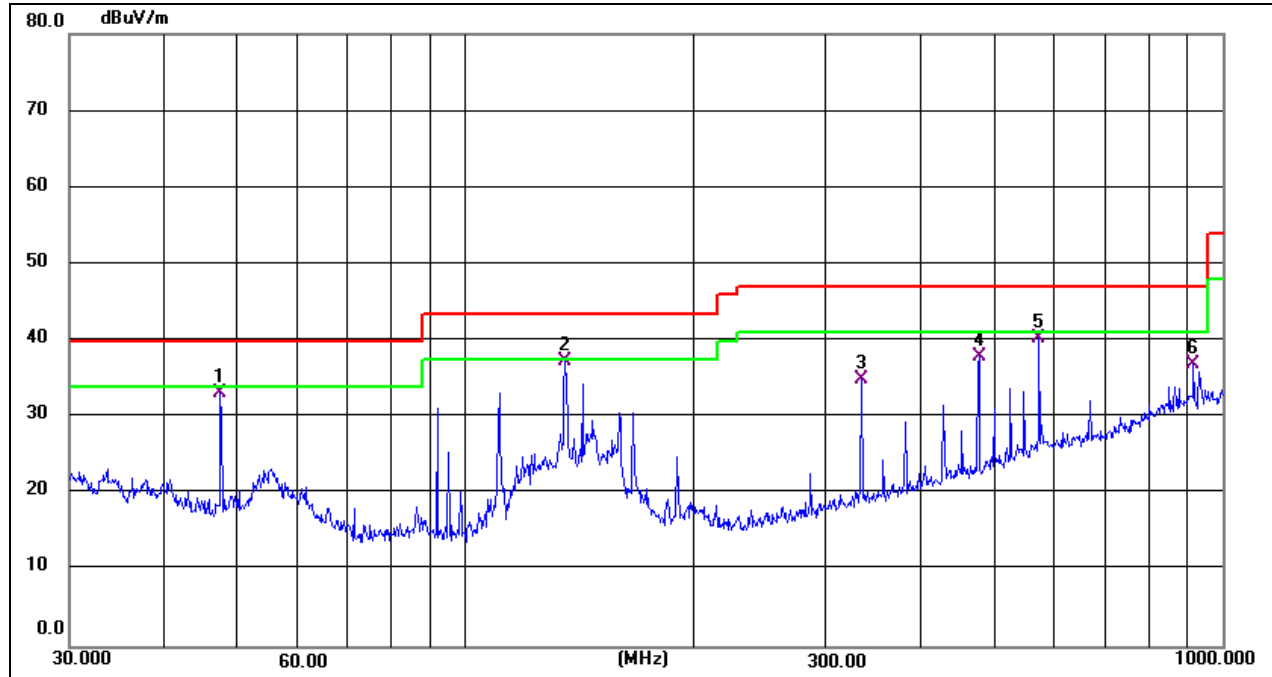


#### **TEST ENVIRONMENT**

Temperature	26°C	Relative Humidity	54%
Atmosphere Pressure	101kPa		

#### **TEST MODE**

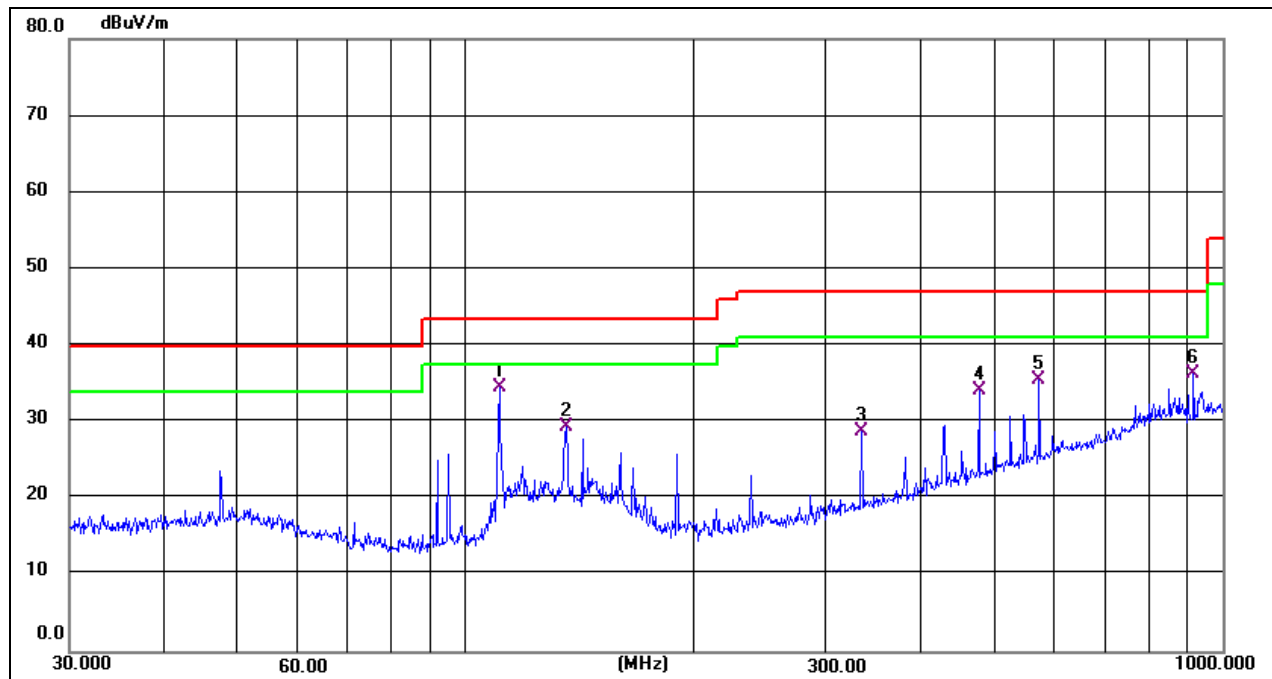
Pre-test Mode:	M01 ~ M01
Final Test Mode:	M01

**TEST RESULTS**

Antenna::Vertical

Mode: M01

No .	Frequenc y (MHz)	Reading Level(dBuV )	Correct Factor(dB/m )	Measure- ment(dBuV/m )	Limit (dBuV/m )	Margi n (dB)	Detecto r	Commen t
1	47.4918	45.54	-12.32	33.22	40.00	-6.78	QP	
2 *	135.5062	49.41	-12.03	37.38	43.50	-6.12	QP	
3	333.6867	46.57	-11.67	34.90	47.00	-12.10	QP	
4	477.1694	45.78	-7.89	37.89	47.00	-9.11	QP	
5	572.6144	45.76	-5.47	40.29	47.00	-6.71	QP	
6	916.0687	36.11	0.73	36.84	47.00	-10.16	QP	



Antenna::Horizontal

Mode: M01

No .	Frequenc y (MHz)	Reading Level(dBuV )	Correct Factor(dB/m )	Measure- ment(dBuV/m )	Limit (dBuV/m )	Margi n (dB)	Detecto r	Commen t
1 *	110.9571	48.67	-14.16	34.51	43.50	-8.99	QP	
2	135.9822	41.45	-11.98	29.47	43.50	-14.03	QP	
3	333.6867	40.54	-11.67	28.87	47.00	-18.13	QP	
4	477.1694	42.12	-7.89	34.23	47.00	-12.77	QP	
5	572.6144	41.05	-5.47	35.58	47.00	-11.42	QP	
6	916.0687	35.61	0.73	36.34	47.00	-10.66	QP	

Remark: 1. Result = Reading +Correct (Amplifier Factor + Cable Loss + Antenna Factor)  
 2. Margin = Result - Limit

## 7.2. RADIATED EMISSIONS ABOVE 1GHZ

### LIMITS

Above 1 GHz

ICES-003 Issue 7				
Frequency (MHz)	Class A		Class B	
	(dBuV/m) (at 3 m)		(dBuV/m) (at 3 m)	
	Peak	Average	Peak	Average
Above 1000	80	60	74	54

Test Frequency Range of Radiated Disturbance Measurement

Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz)	Range (MHz)
Below 1.705	30
1.705 - 108	1000
108 - 500	2000
500 - 1000	5000
Above 1000	5 <sup>th</sup> harmonic of the highest frequency or 40 GHz, whichever is lower

NOTE:

- (1) The limit for radiated test was performed according to ICES-003 Issue 7;
- (2) The tighter limit applies at the band edges;
- (3) Emission level (dBuV/m) = 20log Emission level (uV/m),  
3m Emission level = 10 m Emission level + 20log(10 m/3 m);

### TEST PROCEDURE

Above 1 GHz

The setting of the spectrum analyser

RBW	1 MHz
VBW	3 MHz
Sweep	Auto
Detector	Peak: Peak AVG: RMS
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.4-2014.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 80 cm above ground.
4. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

5. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

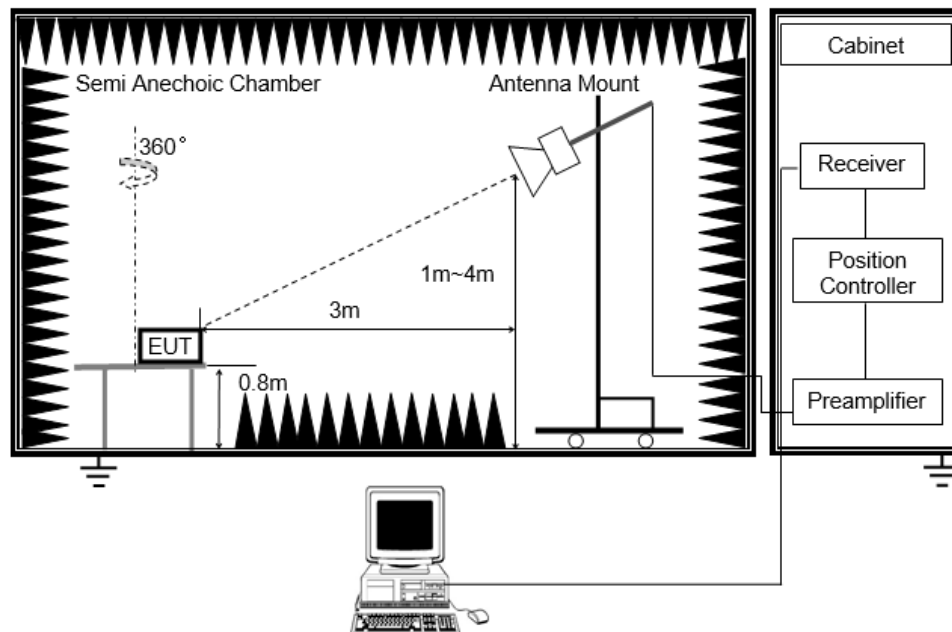
6. Cables of hand-operated devices, such as keyboards and mice, shall be placed as for normal used.

7. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

8. For measurement above 1 GHz, the peak emission measurement will be measured by the peak detector. This peak level, once corrected, must comply with the peak limit specified in Section 15.109. If peak result complies with average limit, average result is deemed to comply with average limit.

9. The average emission measurement will be measured by the RMS detector and must comply with the average limit specified in Section 15.109.

### **TEST SETUP**



### **TEST ENVIRONMENT**

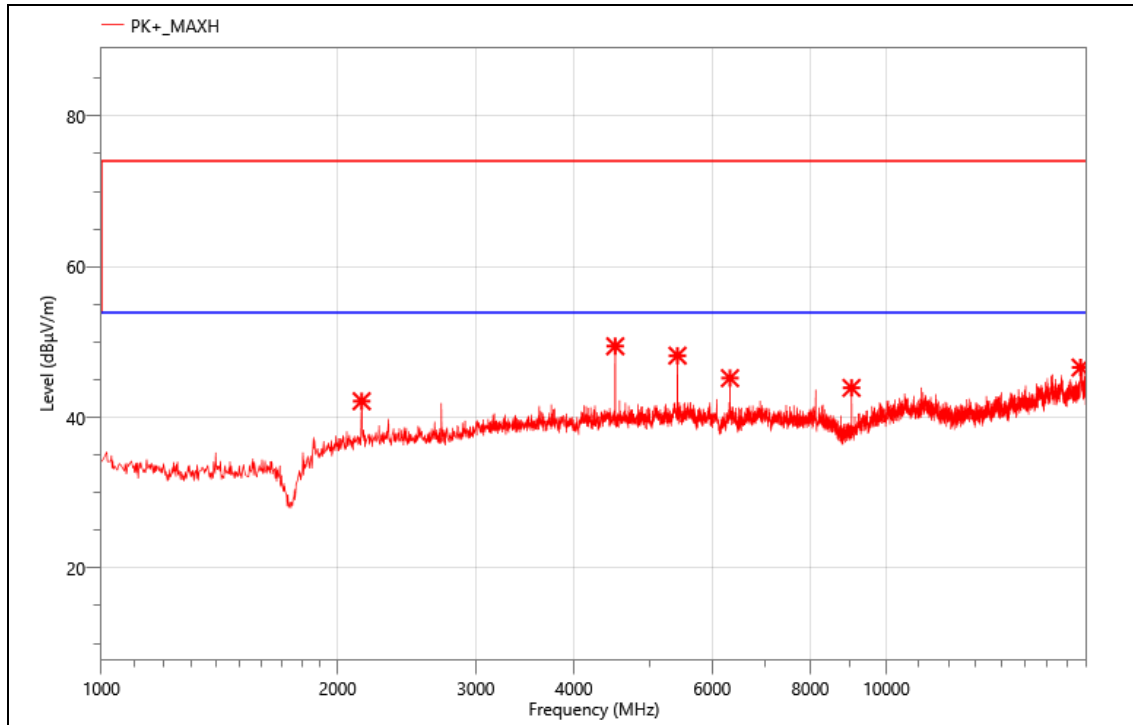
Temperature	23.8°C	Relative Humidity	53%
Atmosphere Pressure	101kPa		

### **TEST MODE**

Pre-test Mode:	M01 ~ M01
Final Test Mode:	M01

**TEST RESULTS**

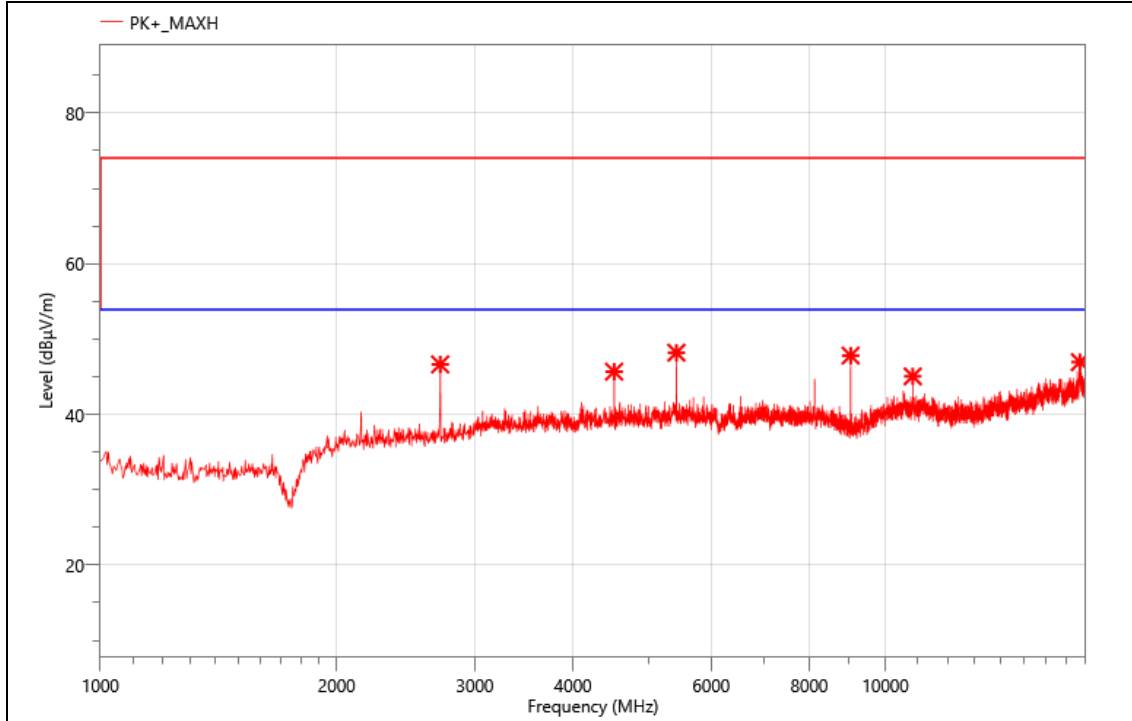
Mode:	M01
Power:	DC 5V
TE:	Big
Date	2024/9/13
T/A/P	23.8°C/53%/101Kpa

**Critical\_Freqs**

No.	Freq. (MHz)	Reading (dBμV)	Corr. (dB)	Meas. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Det.	Pol.
1	2146.000	60.14	-17.99	42.15	74.00	31.85	PK+	V
2	4515.000	61.47	-12.02	49.45	74.00	24.55	PK+	V
3	5419.500	57.98	-9.78	48.20	74.00	25.80	PK+	V
4	6321.000	52.99	-7.78	45.21	74.00	28.79	PK+	V
5	9028.500	51.43	-7.51	43.92	74.00	30.08	PK+	V
6	17680.500	46.33	0.29	46.62	74.00	27.38	PK+	V



Mode:	M01
Power:	DC 5V
TE:	Big
Date	2024/9/13
T/A/P	23.8°C/53%/101Kpa



### Critical\_Freqs

No.	Freq. (MHz)	Reading (dBμV)	Corr. (dB)	Meas. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Det.	Pol.
1	2710.000	63.51	-16.87	46.64	74.00	27.36	PK+	H
2	4513.500	57.69	-12.01	45.68	74.00	28.32	PK+	H
3	5418.000	57.95	-9.75	48.20	74.00	25.80	PK+	H
4	9031.500	55.27	-7.46	47.81	74.00	26.19	PK+	H
5	10837.500	50.17	-5.12	45.05	74.00	28.95	PK+	H
6	17697.000	46.74	0.2	46.94	74.00	27.06	PK+	H

Note : [Margin=Limit-Meas.]; [Meas.=Reading+Corr. ]

Remark: 1. Result = Reading +Correct (Amplifier Factor + Cable Loss + Antenna Factor)  
2. Margin = Result - Limit

### 7.3. CONDUCTED EMISSIONS

#### LIMITS

ICES-003 Issue 7				
FREQUENCY (MHz)	Class A (dBμV)		Class B (dBμV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46*
0.50 -5.0	73.00	60.00	56.00	46.00
5.0 -30.0	73.00	60.00	60.00	50.00

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " \* " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

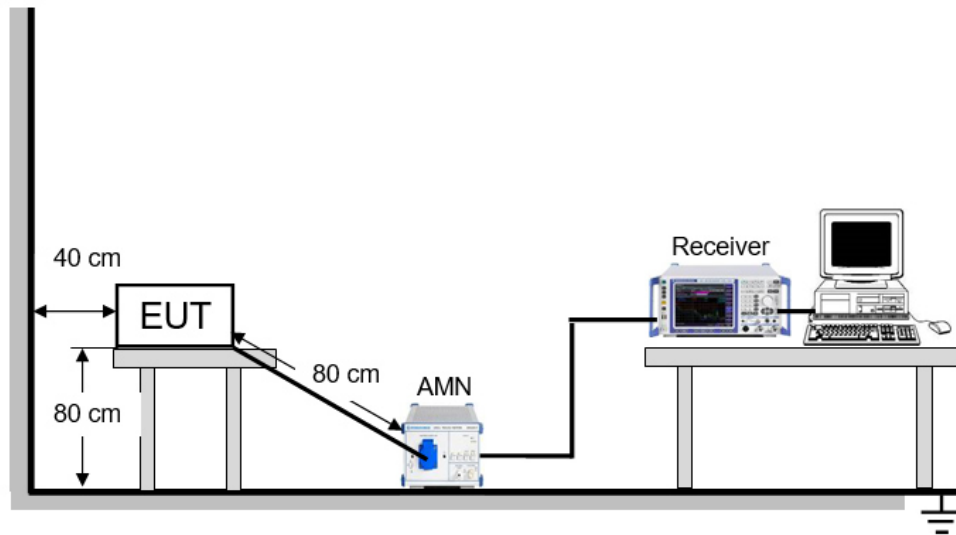
The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

#### TEST PROCEDURE

1. The testing follows the guidelines in ANSI C63.4-2014.
2. The EUT was placed on the top of a rotating table 0.8 meters above the horizontal ground plane and being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
3. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
4. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
5. Cables of hand-operated devices, such as keyboards and mice, shall be placed as for normal used.
6. LISN at least 80 cm from nearest part of EUT chassis.
7. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode.

## TEST SETUP

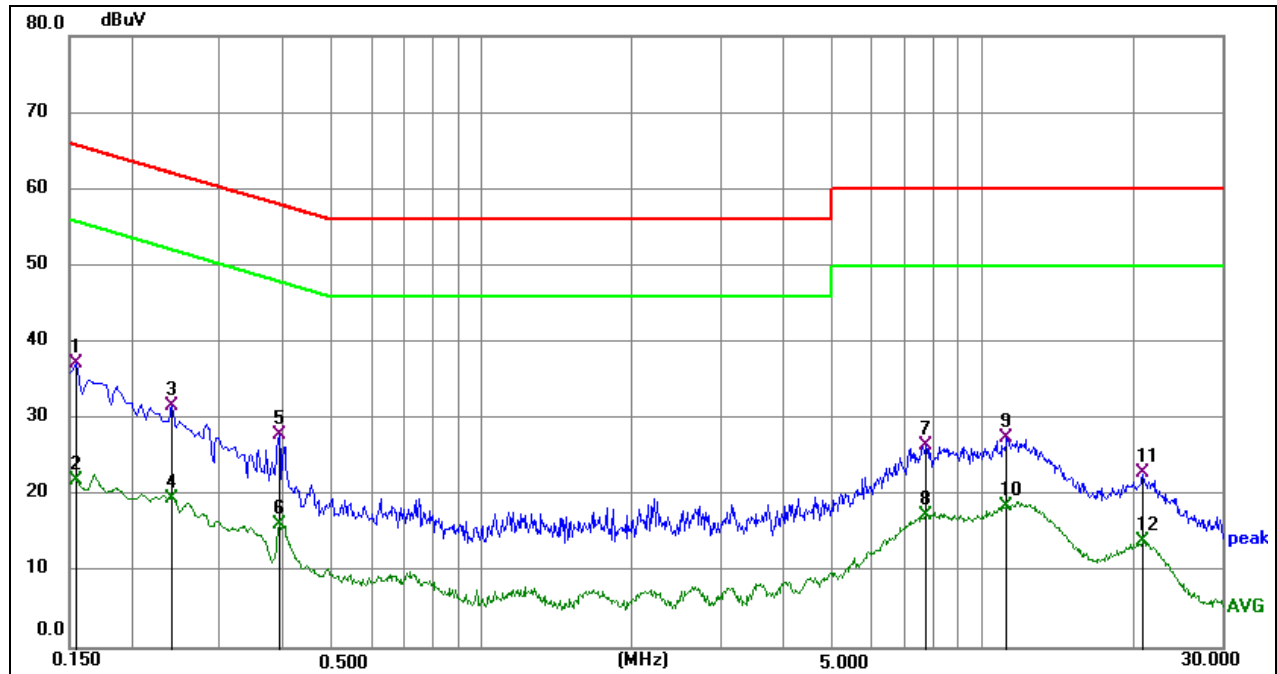


## TEST ENVIRONMENT

Temperature	26°C	Relative Humidity	54%
Atmosphere Pressure	101kPa		

## TEST MODE

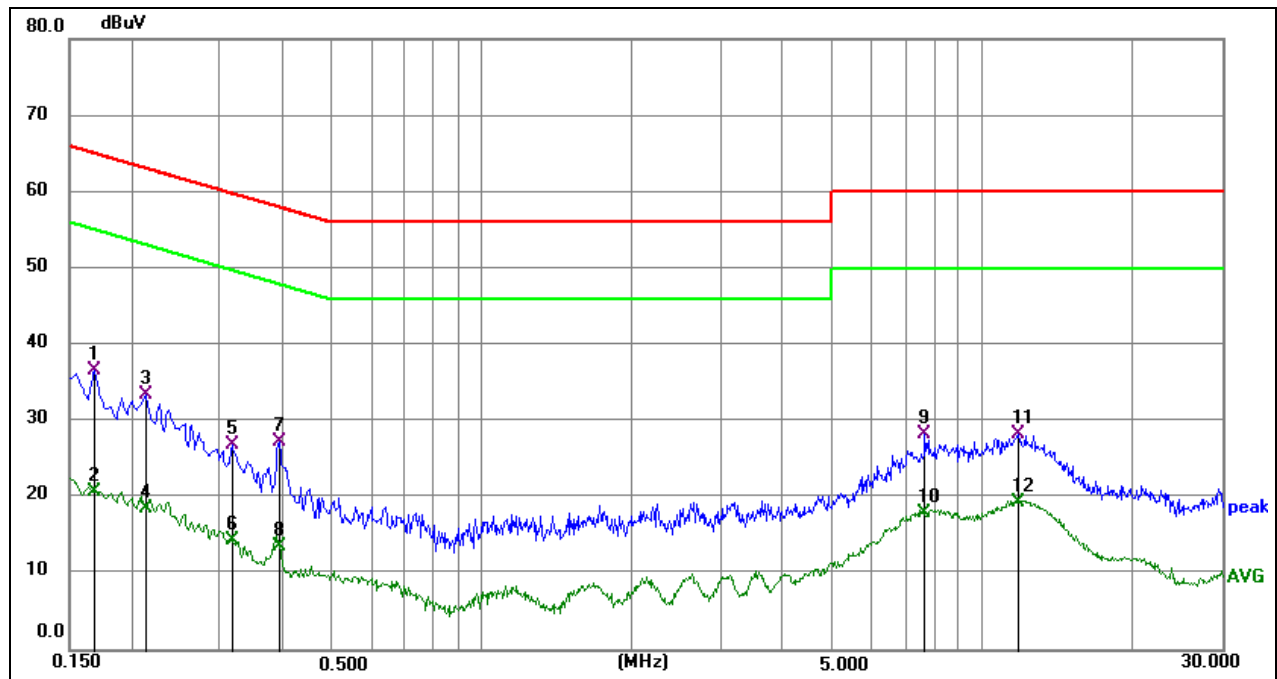
Pre-test Mode:	M01 ~ M01
Final Test Mode:	M01

**TEST RESULTS**

Phase: L1

Mode: M01

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1544	27.34	9.85	37.19	65.76	-28.57	QP
2	0.1544	12.16	9.85	22.01	55.76	-33.75	AVG
3	0.2400	21.78	9.84	31.62	62.10	-30.48	QP
4	0.2400	9.75	9.84	19.59	52.10	-32.51	AVG
5	0.3930	18.07	9.79	27.86	58.00	-30.14	QP
6	0.3930	6.35	9.79	16.14	48.00	-31.86	AVG
7	7.6920	16.66	9.77	26.43	60.00	-33.57	QP
8	7.6920	7.55	9.77	17.32	50.00	-32.68	AVG
9	11.1750	17.63	9.82	27.45	60.00	-32.55	QP
10	11.1750	8.66	9.82	18.48	50.00	-31.52	AVG
11	20.8814	12.58	10.25	22.83	60.00	-37.17	QP
12	20.8814	3.66	10.25	13.91	50.00	-36.09	AVG



Phase: N

Mode: M01

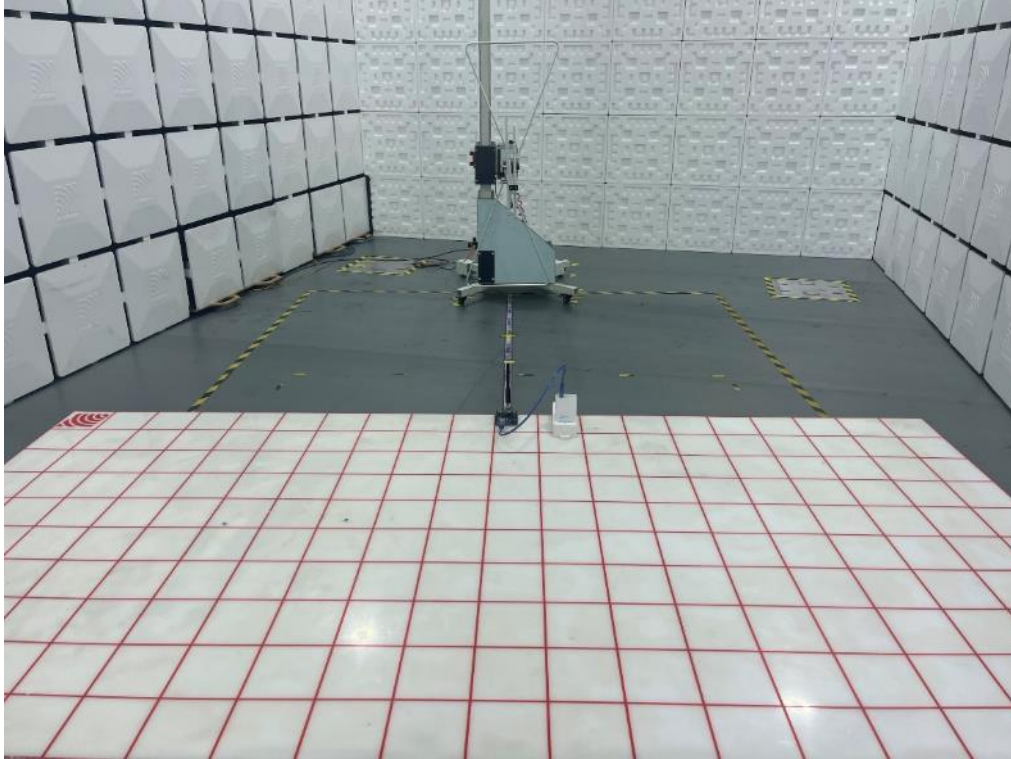
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1680	26.82	9.89	36.71	65.06	-28.35	QP
2	0.1680	10.79	9.89	20.68	55.06	-34.38	AVG
3	0.2130	23.55	9.87	33.42	63.09	-29.67	QP
4	0.2130	8.66	9.87	18.53	53.09	-34.56	AVG
5	0.3165	17.08	9.86	26.94	59.80	-32.86	QP
6	0.3165	4.45	9.86	14.31	49.80	-35.49	AVG
7	0.3930	17.45	9.80	27.25	58.00	-30.75	QP
8	0.3930	3.86	9.80	13.66	48.00	-34.34	AVG
9	7.6650	17.82	10.47	28.29	60.00	-31.71	QP
10	7.6650	7.53	10.47	18.00	50.00	-32.00	AVG
11	11.7915	16.64	11.59	28.23	60.00	-31.77	QP
12	11.7915	7.67	11.59	19.26	50.00	-30.74	AVG

Remark: Result = Reading +Correct (Insertion Loss + Cable Loss + Attenuator Factor)

Margin = Result - Limit

## APPENDIX: PHOTOGRAPHS OF TEST CONFIGURATION

**Radiated emissions below 1GHz**



**Radiated emissions above 1GHz**



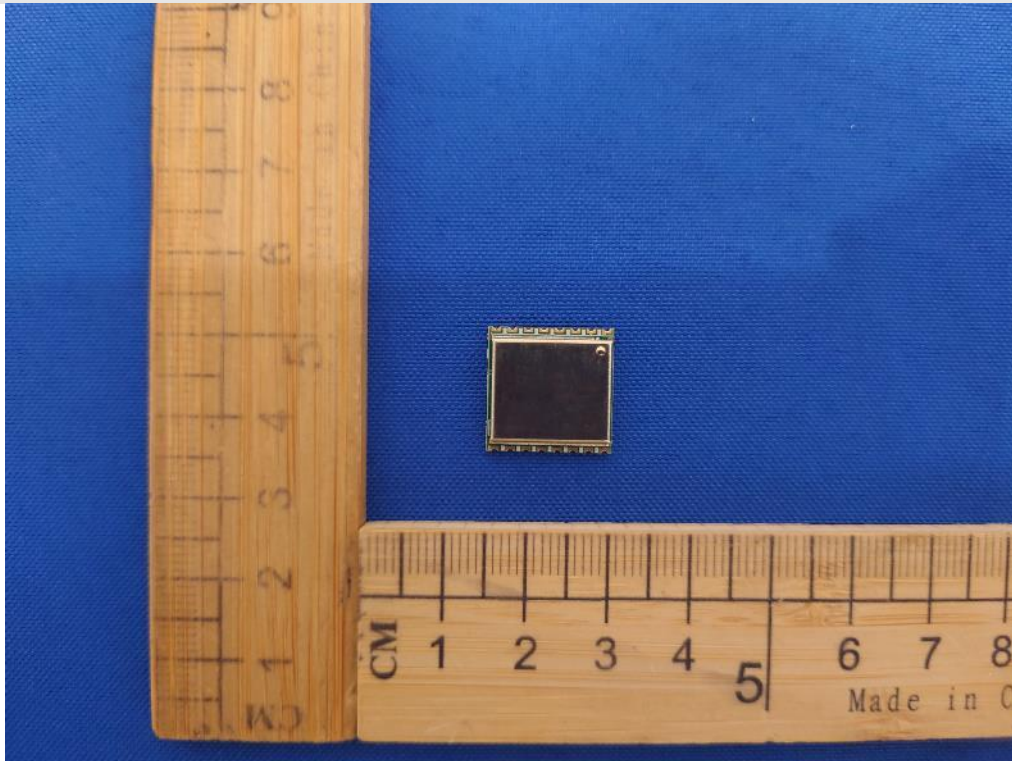
### Conducted emissions



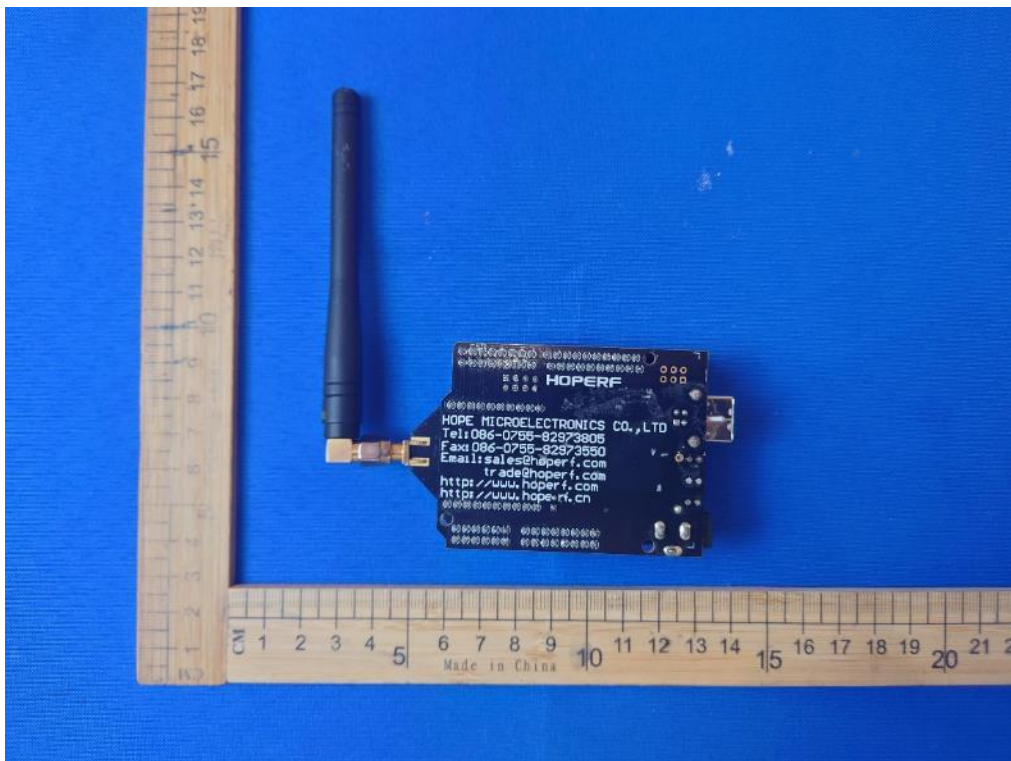
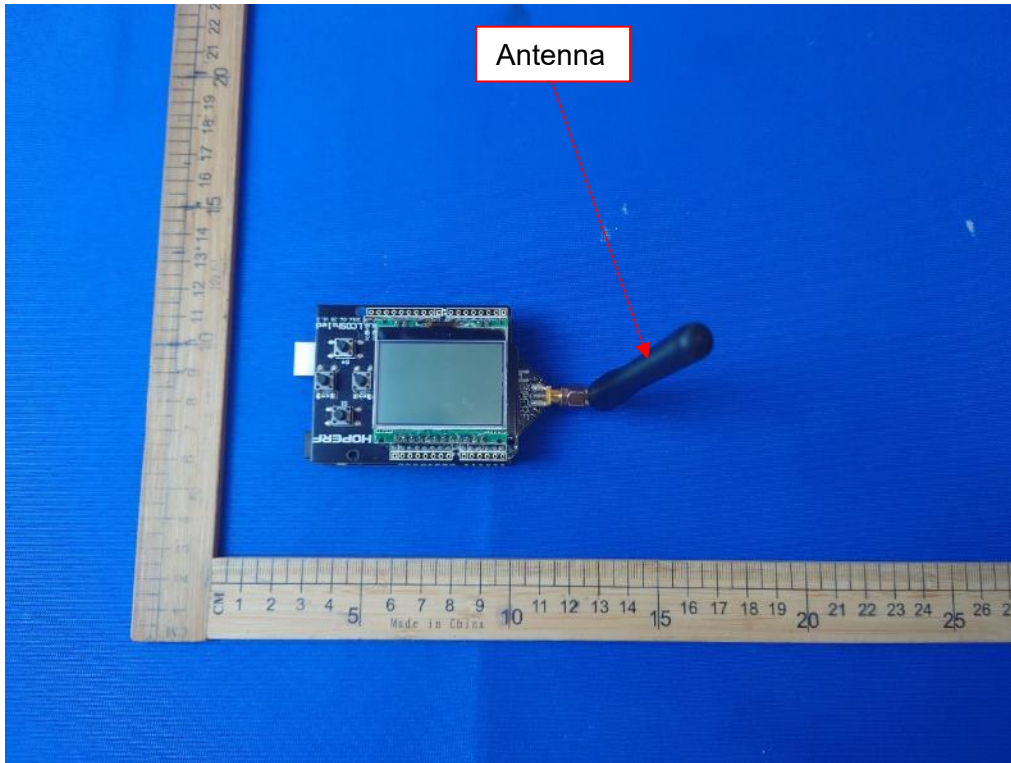


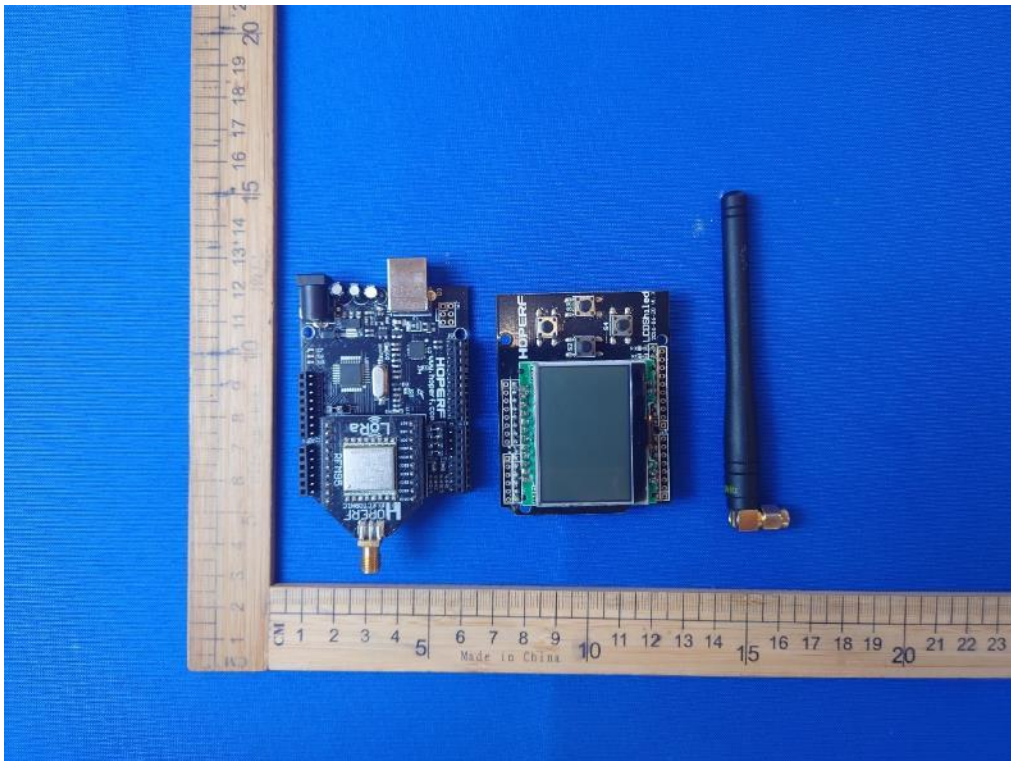
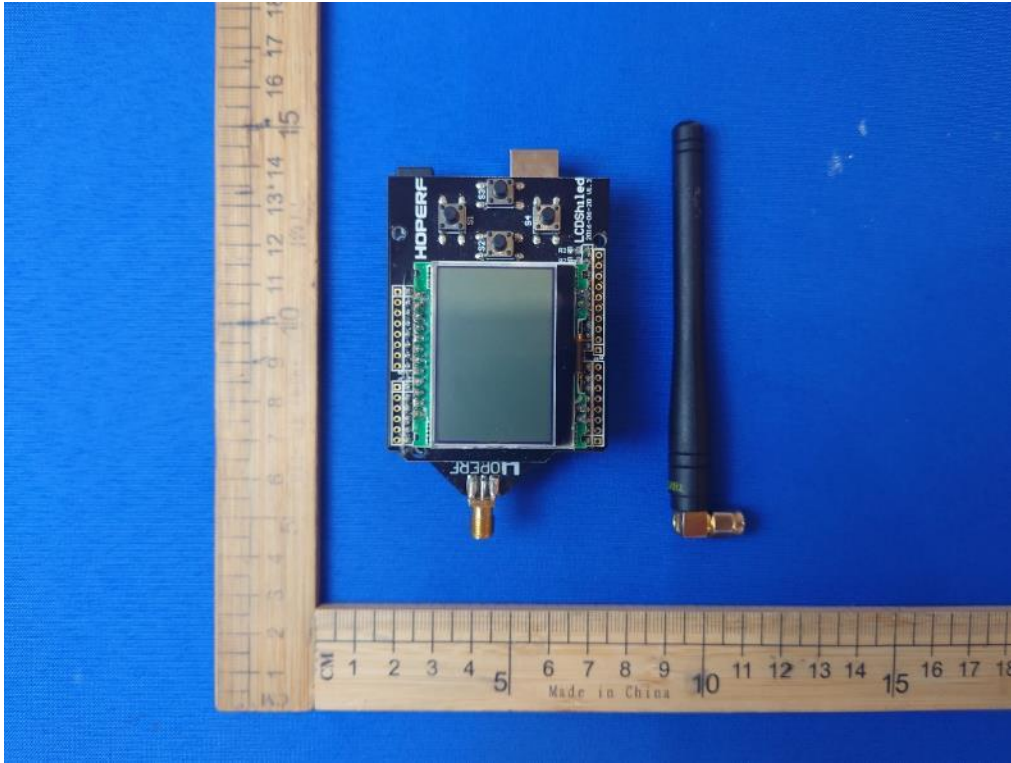
## APPENDIX: PHOTOGRAPHS OF THE EUT

## External

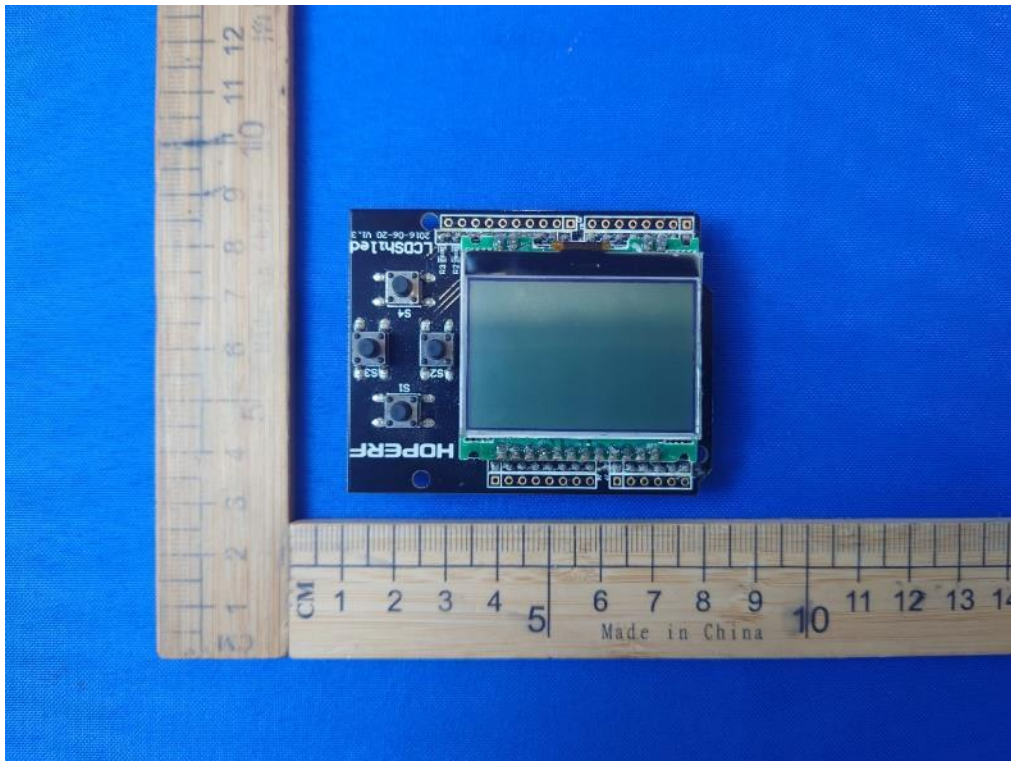
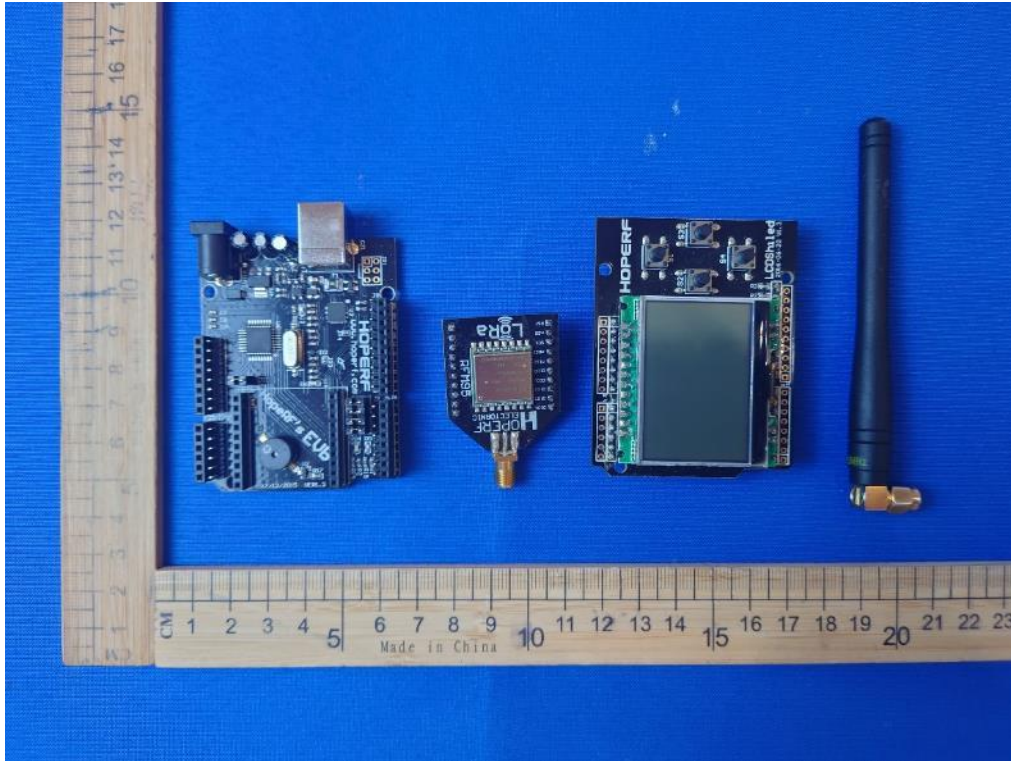


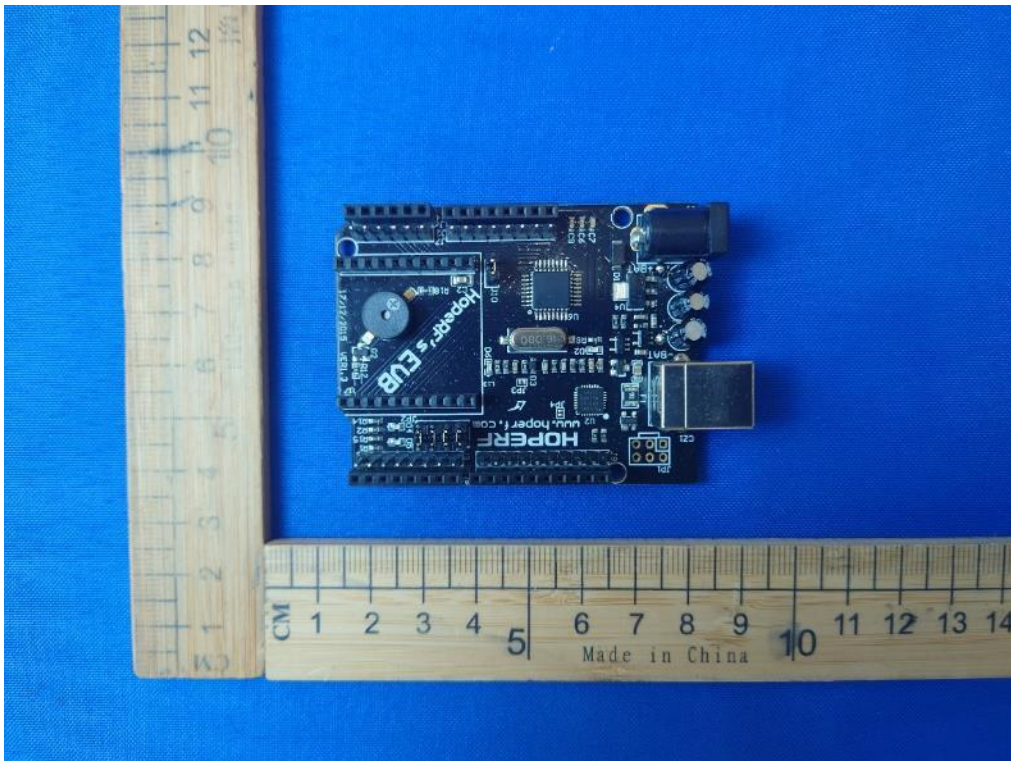
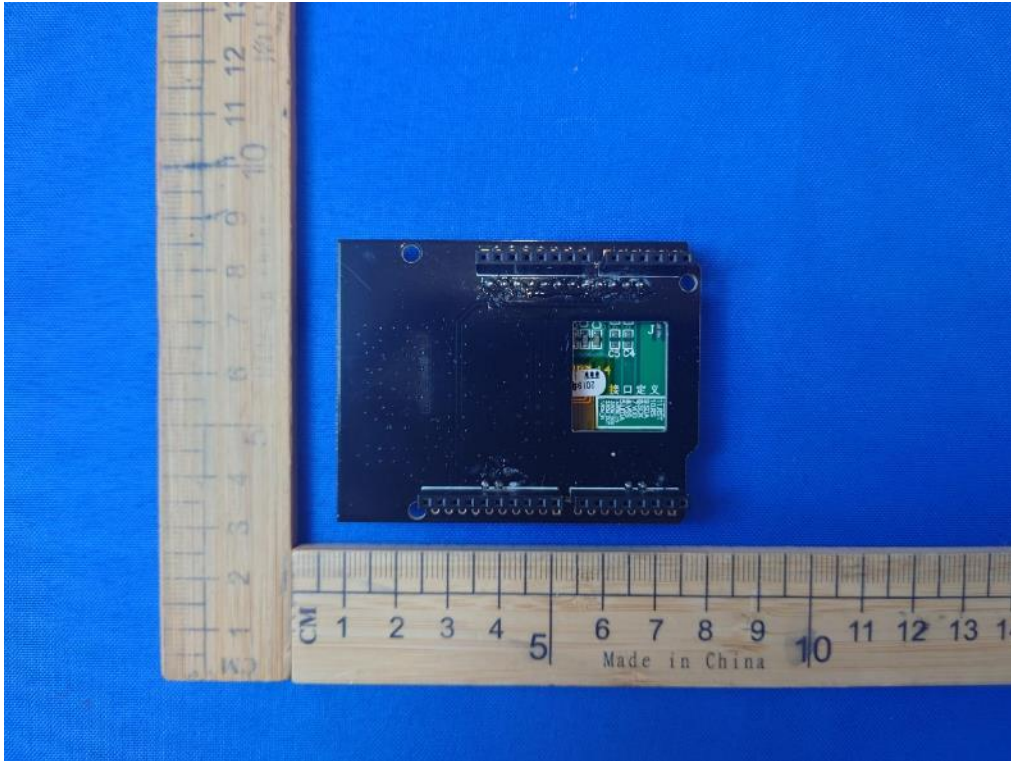




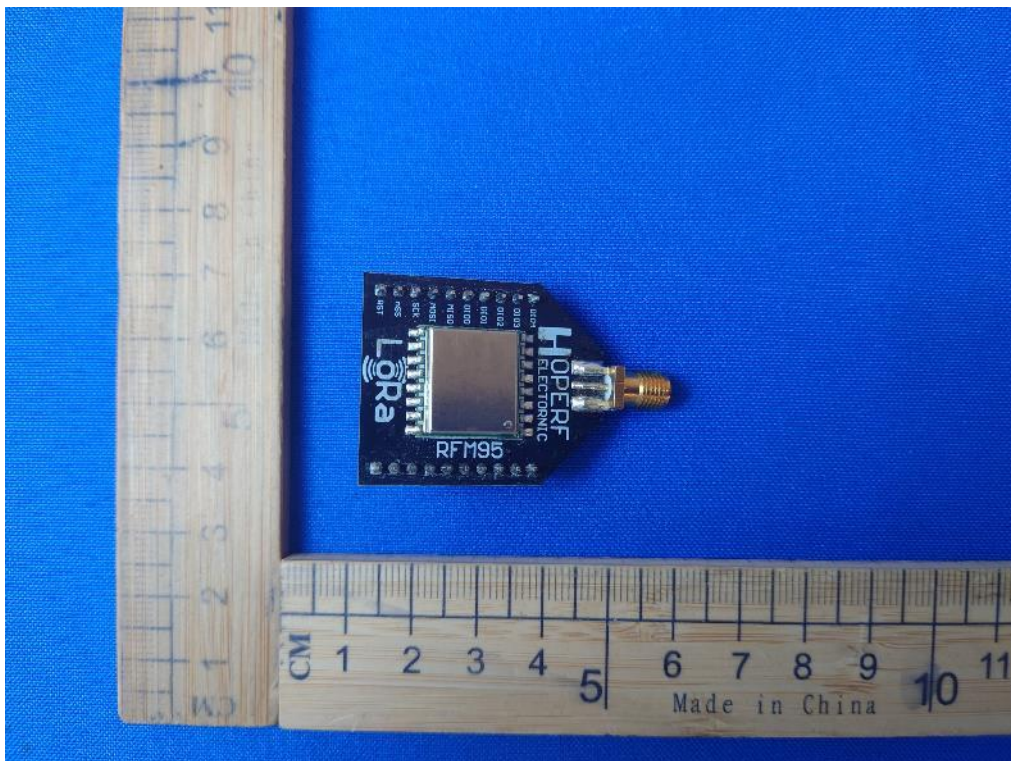
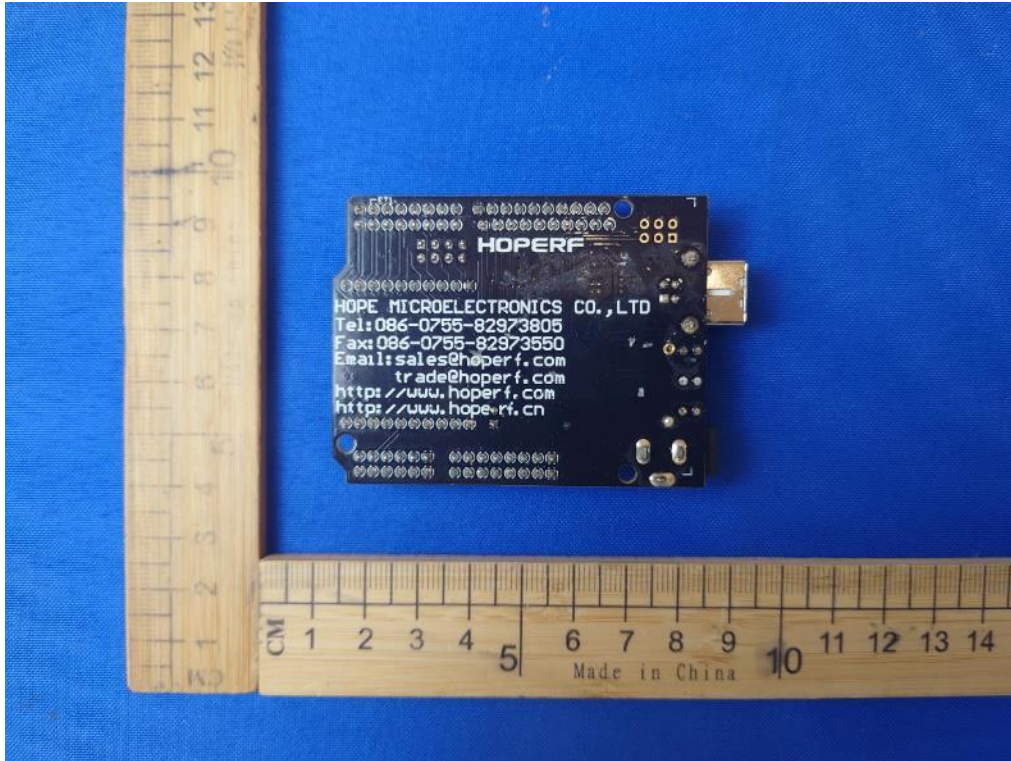


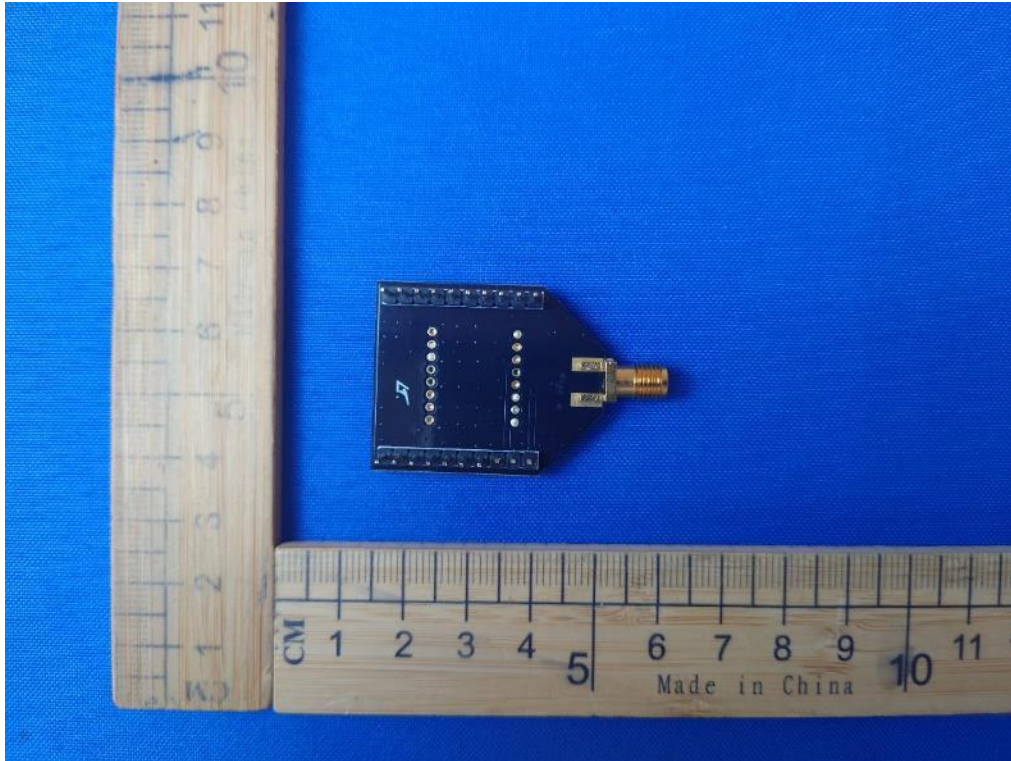








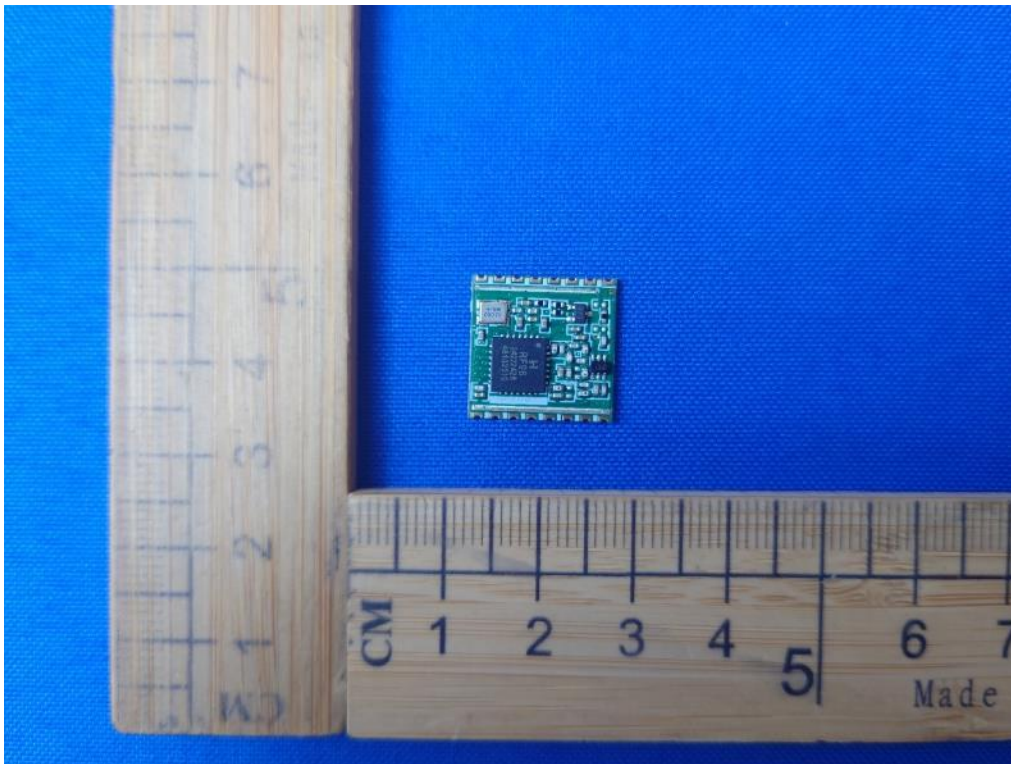
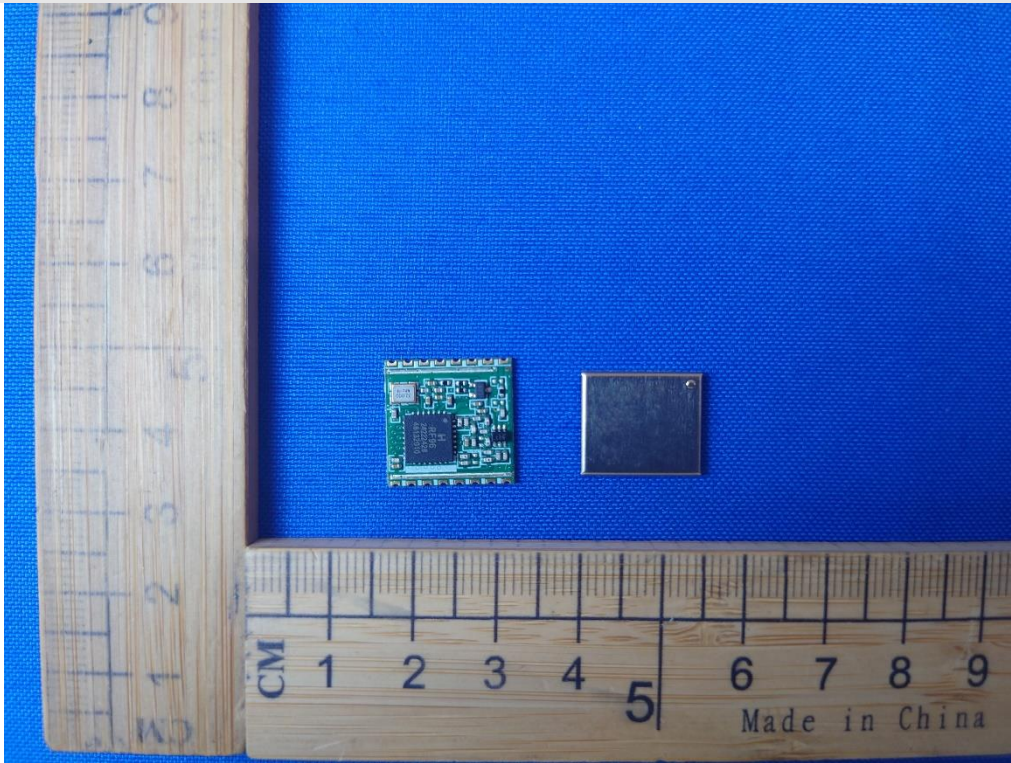








**Internal**







---

**END OF REPORT**