

TEST REPORT

Product Name : Doorbell camera
Model Number : IPB203, DB201
FCC ID : 2AQ7B-IPB203

Prepared for : SHENZHEN INTERTHINGS TECHNOLOGY CO.,LTD.
Address : L310, Jinhetai Business Center, NO. 329, 3rd Road
Longhuan, Helian Community, Longhua Street, Longhua
District, Shenzhen, China

Prepared by : EMTEK (DONGGUAN) CO., LTD.
Address : -1&2/F., Building 2, Zone A, Zhongda Marine Biotechnology
Research and Development Base, No.9, Xincheng Avenue,
Songshanhu High-technology Industrial Development Zone,
Dongguan, Guangdong, China

TEL: +86-0769-22807078
FAX: +86-0769-22807079

Report Number : EDG2304230044E00102R
Date(s) of Tests : May 16, 2023 to June 06, 2023
Date of issue : June 07, 2023

1 TEST RESULT CERTIFICATION

Applicant : SHENZHEN INTERTHINGS TECHNOLOGY CO.,LTD.
Address: : L310, Jinhetian Business Center, NO. 329, 3rd Road Longhuan, Helian Community, Longhua Street, Longhua District, Shenzhen, China
Manufacturer : SHENZHEN INTERTHINGS TECHNOLOGY CO.,LTD.
Address: : L310, Jinhetian Business Center, NO. 329, 3rd Road Longhuan, Helian Community, Longhua Street, Longhua District, Shenzhen, China
Factory : SHENZHEN INTERTHINGS TECHNOLOGY CO.,LTD.
Address : L310, Jinhetian Business Center, NO. 329, 3rd Road Longhuan, Helian Community, Longhua Street, Longhua District, Shenzhen, China
EUT : Doorbell camera
Model Name : IPB203, DB201
Trademark : 

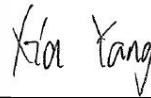
Measurement Procedure Used:

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC 47 CFR Part 2, Subpart J FCC 47 CFR Part 15, Subpart C	PASS

The above equipment was tested by EMTEK (DONGGUAN) CO., LTD. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10-2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.231(2018).

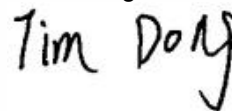
Date of Test : May 16, 2023 to June 06, 2023

Prepared by :



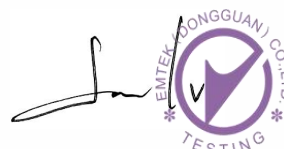
Xia Yang /Editor

Reviewer :



Tim Dong/ Supervisor

Approve & Authorized Signer :



Sam Lv / Manager

Modified History

Version	Report No.	Revision Date	Summary
	EDG2304230044E00102R	/	Original Report



Table of Contents

1 TEST RESULT CERTIFICATION	2
2 EUT TECHNICAL DESCRIPTION	5
3 SUMMARY OF TEST RESULT	6
4 TEST METHODOLOGY	7
4.1 GENERAL DESCRIPTION OF APPLIED STANDARDS	7
4.2 MEASUREMENT EQUIPMENT USED	7
4.3 DESCRIPTION OF TEST MODES	8
5 FACILITIES AND ACCREDITATIONS	8
5.1 FACILITIES	8
5.2 LABORATORY ACCREDITATIONS AND LISTINGS	8
6 TEST SYSTEM UNCERTAINTY	9
7 SETUP OF EQUIPMENT UNDER TEST	10
7.1 RADIO FREQUENCY TEST SETUP 1	10
7.2 RADIO FREQUENCY TEST SETUP 2	10
7.3 CONDUCTED EMISSION TEST SETUP	11
7.4 BLOCK DIAGRAM CONFIGURATION OF TEST SYSTEM	12
7.5 SUPPORT EQUIPMENT	12
8 TEST REQUIREMENTS	13
8.1 OCCUPIED BANDWIDTH	13
8.2 RADIATED SPURIOUS EMISSION	15
8.3 CONDUCTED EMISSION TEST	25
8.4 TRANSMISSION REQUIREMENT	28
8.5 ANTENNA APPLICATION	30

2 EUT TECHNICAL DESCRIPTION

Characteristics	Description
Product Name:	Doorbell camera
Model Number:	IPB203, DB201 All products are the same, only the model number and color of appearance are different Here we selected IPB203 for all the test
Device Type:	Doorbell camera
Modulation:	FSK
Operating Frequency Range(s):	433.92MHz
Maximum field strength:	74.36 dBuV@3m
Number of Channels:	1 channel
Antenna Type :	Brass Tube Antenna
Antenna Gain:	1.0 dBi
Power supply:	DC 5V 1A form USB, DC 3.7V form battery

Note: for more details, please refer to the User's manual of the EUT.

The EUT has been associated with peripherals pursuant to ANSI C63.10-2013 and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation (9 KHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

3 SUMMARY OF TEST RESULT

FCC Part Clause	Test Parameter	Verdict	Remark
15.231(c)	Occupied Bandwidth	PASS	
15.231(b)	Radiated Spurious Emissions	PASS	
15.231(b)	Transmission Requirement	PASS	
15.203	Antenna Requirement	PASS	
15.207(a)	Conducted Emission	PASS	
NOTE1: N/A (Not Applicable) ,EUT powered by battery.			

RELATED SUBMITTAL(S) / GRANT(S):

This submittal(s) (test report) is intended for FCC ID: 2AQ7B-IPB203 filing to comply with Section 15.231 of the FCC Part 15, Subpart C Rules

4 TEST METHODOLOGY

4.1 GENERAL DESCRIPTION OF APPLIED STANDARDS

According to its specifications, the EUT must comply with the requirements of the following standards:

FCC 47 CFR Part 2, Subpart J

FCC 47 CFR Part 15, Subpart C

4.2 MEASUREMENT EQUIPMENT USED

For Conducted Emission Test Equipment

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
EMI Test Receiver	Rohde&Schwarz	ESCI	100137	2023/5/11	1Year
AMN	Rohde&Schwarz	ENV216	101209	2023/5/11	1Year
AMN	Rohde&Schwarz	ENV216	100017	2023/5/11	1Year
RF Switching Unit	CDS	RSU-M2	38401	2023/5/11	1Year
AMN	Schwarzbeck	NNLK8121	8121-641	2023/5/11	1Year
AMN	Rohde&Schwarz	ESH3-Z6	101101	2023/5/11	1Year
AMN	Rohde&Schwarz	ESH3-Z6	101102	2023/5/11	1Year
Power Splitters & Dividers	Weinschel Associates	WA1506A	A1066	2023/5/11	1Year
Current Probe	FCC	F-52	8377	2023/5/11	1Year
Passive voltage probe	Rohde&Schwarz	ESH2-Z3	100122	2023/5/11	1Year

For Spurious Emissions Test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
EMI Test Receiver	Rohde&Schwarz	ESCI	101415	2023/5/11	1Year
Bi-log Hybrid Antenna	Schwarzbeck	VULB9163	141	2023/5/15	1Year
Pre-Amplifier	HP	8447F	OPH64	2023/5/11	1 Year
Signal Analyzer	R&S	FSV30	103039	2023/5/11	1 Year
Horn Antenna	Schwarzbeck	BBHA9120D	1272	2023/5/15	1Year
Horn Antenna	Schwarzbeck	BBHA9170	9170-567	2023/5/15	1Year
Pre-Amplifier	LUNAR EM	PM1-18-40	J10100000081	2023/5/11	1Year
Loop antenna	Schwarzbeck	FMZB1519	1519-012	2023/5/15	1Year

For other test items:

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Wireless Connectivity Tester	R&S	CMW270	102543	2023/05/11	1Year
Automatic Control Unit	Tonscend	JS0806-2	21I8060480	2023/05/11	1Year
Signal Analyzer	KEYSIGHT	N9010B	MY60242456	2023/05/11	1Year
Analog Signal Generator	KEYSIGHT	N5173B	MY61252625	2023/05/11	1Year
UP/DOWN-Converter	R&S	CMW-Z800A	100274	2023/05/11	1Year
Vector Signal Generator	KEYSIGHT	N5182B	MY61252674	2023/05/11	1Year
Frequency Extender	KEYSIGHT	N5182BX07	MY59362541	2023/05/11	1Year
Temperature&Humidity test chamber	ESPEC	EL-02KA	12107166	2023/05/11	1 Year

Remark: Each piece of equipment is scheduled for calibration once a year.

4.3 DESCRIPTION OF TEST MODES

The EUT has been tested under its typical operating condition.

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

5 FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at
-1&2/F., Building 2, Zone A, Zhongda Marine Biotechnology Research and Development Base, No.9, Xincheng Avenue, Songshanhu High-technology Industrial Development Zone, Dongguan, Guangdong, China.

5.2 LABORATORY ACCREDITATIONS AND LISTINGS

Site Description

EMC Lab.

: Accredited by CNAS, 2020.08.27
The certificate is valid until 2024.07.05
The Laboratory has been assessed and proved to be in compliance with
CNAS-CL01:2018
The Certificate Registration Number is L3150

Accredited by FCC
Designation Number: CN1300
Test Firm Registration Number: 945551

Accredited by A2LA, April 05, 2021
The Certificate Registration Number is 4321.02

Accredited by Industry Canada
The Certificate Registration Number is CN0113

Name of Firm

: EMTEK (DONGGUAN) CO., LTD.

Site Location

: -1&2/F., Building 2, Zone A, Zhongda Marine Biotechnology Research and Development Base, No.9, Xincheng Avenue, Songshanhu High-technology Industrial Development Zone, Dongguan, Guangdong, China

6 TEST SYSTEM UNCERTAINTY

The following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-5}$
Maximum Peak Output Power Test	$\pm 1.0\text{dB}$
Conducted Emissions Test	$\pm 2.0\text{dB}$
Radiated Emission Test	$\pm 2.0\text{dB}$
Occupied Bandwidth Test	$\pm 1.0\text{dB}$
Band Edge Test	$\pm 3\text{dB}$
All emission, radiated	$\pm 3\text{dB}$
Antenna Port Emission	$\pm 3\text{dB}$
Temperature	$\pm 0.5^{\circ}\text{C}$
Humidity	$\pm 3\%$

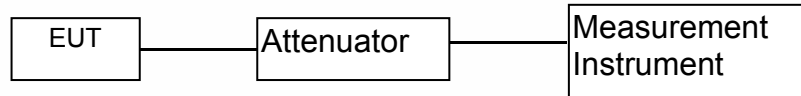
Measurement Uncertainty for a level of Confidence of 95%



7 SETUP OF EQUIPMENT UNDER TEST

7.1 RADIO FREQUENCY TEST SETUP 1

The component's antenna ports(s) of the EUT are connected to the measurement instrument per an appropriate attenuator. The EUT is controlled by PC/software to emit the specified signals for the purpose of measurements.



7.2 RADIO FREQUENCY TEST SETUP 2

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4 dB according to the standards: ANSI C63.10. The test distance is 3m. The setup is according to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 and CAN/CSA-CEI/IEC CISPR 22.

The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).

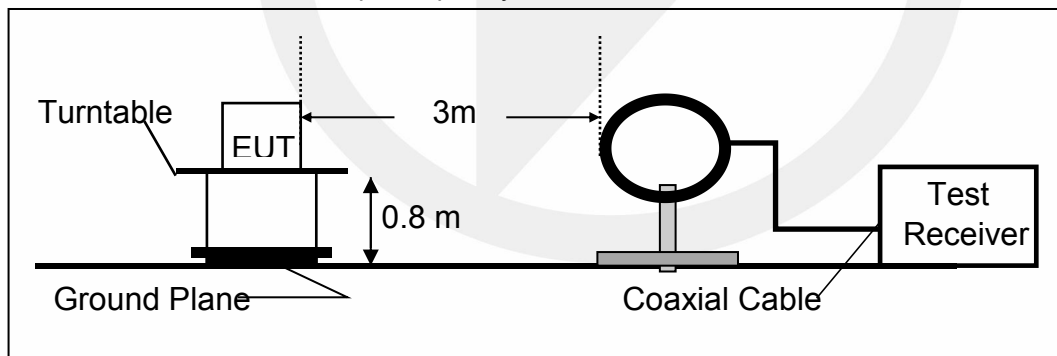
Below 30MHz:

The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna (loop antenna). The Antenna should be positioned with its plane vertical at the specified distance from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. The center of the loop shall be 1 m above the ground. For certain applications, the loop antenna plane may also need to be positioned horizontally at the the specified distance from the EUT.

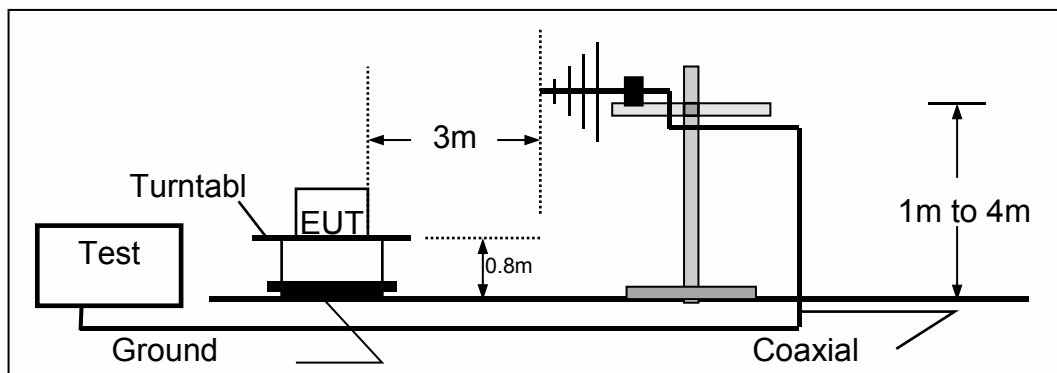
Above 30MHz:

The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).

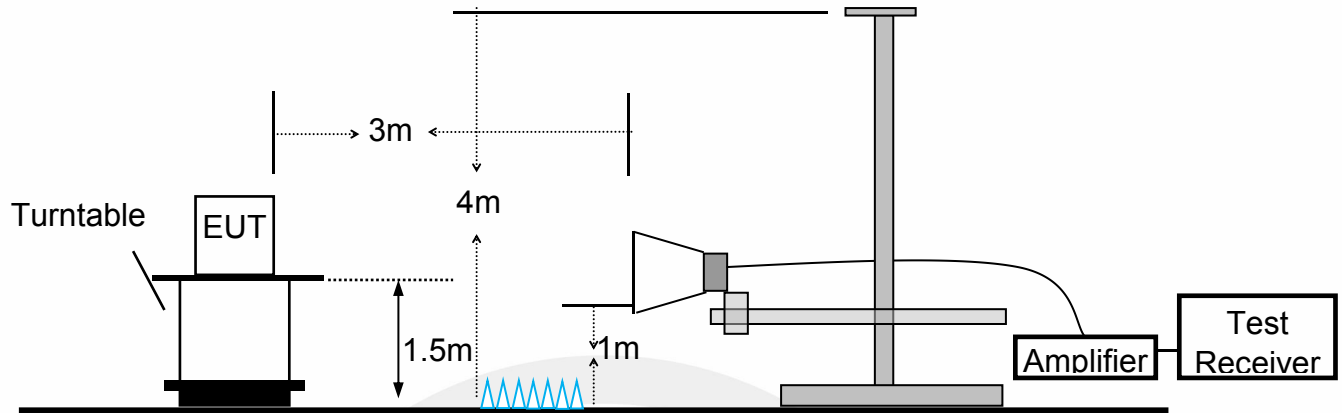
(a) Radiated Emission Test Set-Up, Frequency Below 30MHz



(b) Radiated Emission Test Set-Up, Frequency Below 1000MHz



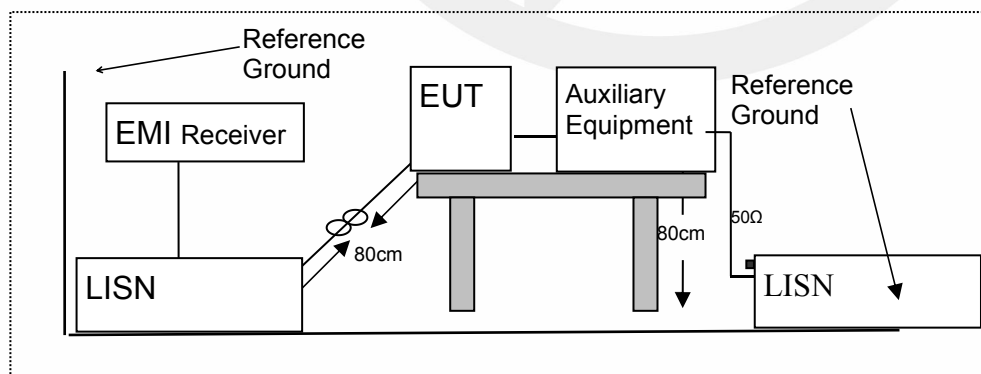
(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



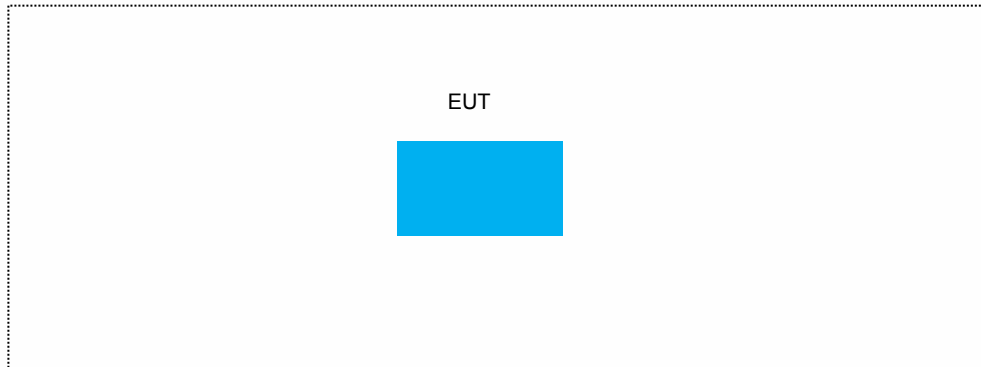
7.3 CONDUCTED EMISSION TEST SETUP

The mains cable of the EUT (maybe per AC/DC Adapter) must be connected to LISN. The LISN shall be placed 0.8 m from the boundary of EUT and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance is between the closest points of the LISN and the EUT. All other units of the EUT and associated equipment shall be at least 0.8m from the LISN. Ground connections, where required for safety purposes, shall be connected to the reference ground point of the LISN and, where not otherwise provided or specified by the manufacturer, shall be of same length as the mains cable and run parallel to the mains connection at a separation distance of not more than 0.1 m.

According to the requirements in ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode.



7.4 BLOCK DIAGRAM CONFIGURATION OF TEST SYSTEM



7.5 SUPPORT EQUIPMENT

EUT Cable List and Details			
Cable Description	Model	Shielded/Unshielded	With / Without Ferrite
USB Cable	1.0m	/	/

Auxiliary Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
Adapter 1	APPLE	YTY-12F-0105050US	/
Adapter 2	HUAWEI	YSV6-0501000	/
Notebook	Lenovo	E46L	11S168003748Z0LR06E0HG
/	/	/	/

Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

8 TEST REQUIREMENTS

8.1 OCCUPIED BANDWIDTH

8.1.1 Applicable Standard

According to FCC Part 2.1049 and part 15.231(c)

8.1.2 Conformance Limit

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

8.1.3 Test Configuration

Test according to clause 6.1 radio frequency test setup 1

8.1.4 Test Procedure

The EUT was operating in transmit mode and controlled its channel. Printed out the test result from the spectrum by hard copy function.

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.

Set to the maximum power setting and enable the EUT transmit continuously

Set RBW = 1% occupied bandwidth (3KHz).

Set the video bandwidth (VBW) = 10KHz.

Set Span = approximately 2 to 3 times the occupied bandwidth

Set Detector = Peak.

Set Trace mode = max hold.

Set Sweep = auto couple.

The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 99% down one side of the emission. Reset the markerdelta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 99% bandwidth of the emission.

If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation.

Measure and record the results in the test report.

Test Results

Temperature : 24.3°C Test Date : May 30, 2023
Humidity : 56.3 % Test By: XIA

Modulation Mode	Channel Number	Channel Frequency (MHz)	Measurement Bandwidth (kHz)	Limit (kHz)	Verdict
FSK	0	433.92	36.042	≤1084.8KHz	PASS

Note: N/A (Not Applicable)
BW=0.25% of the center frequency

Occupied Bandwidth

Channel : 433.92MHz



8.2 RADIATED SPURIOUS EMISSION

8.2.1 Applicable Standard

According to FCC Part 15.231(b) and 15.209

8.2.2 Conformance Limit

Intentional radiators may operate at a periodic rate exceeding that specified in paragraph (a) of this section and may be employed for any type of operation, including operation prohibited in paragraph (a) of this section, provided the intentional radiator complies with the provisions of paragraphs (b) through (d) of this section, except the field strength table in paragraph (b) of this section is replaced by the following:

FCC 15.205 Restricted frequency band

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)

FCC 15.209 Limited

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
960~1000	500	3
Above 1GHz	74 dBuV/m (PEAK) 54 dBuV/m (AVERAGE)	

15.231 Limited

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	1,250 to 3,750 **	125 to 375 **
174 - 260	3,750	375
260 - 470	3,750 to 12,500 **	375 to 1,250 **
Above 470	12,500	1,250

** linear interpolations

The field intensity in micro-volts per meter can then be determined by the following equation: $FI(V/m) = 10FI(dBV/m) / 20$ The FCC specified emission limits were calculated according the EUT operating frequency and obtained by following linear interpolation equations:

(a) For fundamental frequency:

$$f_{EUT} : \text{EUT Operating Frequency Emission Limit (V/m)} \\ = [f_{EUT}(\text{MHz}) - 260(\text{MHz})] \times \frac{12500(\text{V/m}) - 3750(\text{V/m})}{470(\text{MHz}) - 260(\text{MHz})} + 3750(\text{V/m})$$

(b) For spurious frequencies:

$$f_{EUT} : \text{EUT Operating Frequency Emission Limit (V/m)} \\ = [f_{EUT}(\text{MHz}) - 260(\text{MHz})] \times \frac{1250(\text{V/m}) - 375(\text{V/m})}{470(\text{MHz}) - 260(\text{MHz})} + 375(\text{V/m})$$

Other emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 15.209(a) limit in the table below has to be followed.

Note:

- (1) The tighter limit applies at the band edges.
- (2) Emission level (dBuV/m)=20log Emission level (uV/m).

FCC Part15 (15.231) , Subpart C		
Fundamental Frequency	Field Strength Of Fundamental	Field Strength of Spurious Emissions
433.9MHz	AV:80.83 dBuV/m at 3m distance	AV:60.83 dBuV/m at 3m distance
	PK:100.83dBuV/m at 3m distance	PK:80.83 dBuV/m at 3m distance

8.2.3 Calculation of Average factor

The average correction factor is computed by analyzing the on time in 100ms over one complete pulse train. Analysis of the remote transmitter on time in one complete pulse train, therefore the average value of fundamental frequency is: Average= Peak Value+20log(Duty Cycle), where the duty factor is calculated from following formula:
The duty cycle is simply the on-time divided by the period:
Duration of a single pulse=220 us
Number of cycles=25
The duration of one cycle=220 us*25=5500 us
Effective period of the cycle=26.81ms=26810 us
Duty Cycle=5500 us /26810 us=0.205
Therefore, the averaging factor is found by 20log(0.50)=-13.76

Please see the test plot below:



Field Strength of the fundamental signal

Freq. (MHz)	Ant. Pol. H/V	Emission Level (dBuV/m)	Emission Level (dBuV/m)	AV Factor	Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV		PK	AV	PK	AV
434.065	H	74.36	52.10	-13.76	100.8	80.8	-26.44	-28.70
434.065	V	66.24	53.90	-13.76	100.8	80.8	-34.56	-26.90
869.130	H	60.24	48.00	-13.76	80.8	60.8	-20.56	-12.80
869.130	V	56.42	44.20	-13.76	80.8	60.8	-24.38	-16.60



8.2.4 Measurement Result

Spurious Emission below 30MHz (9KHz to30MHz)

Modulation:	FSK	Test Date :	May 29, 2023
Frequency Range:	9KHz-30MHz	Temperature :	25.3 °C
Test Result:	PASS	Humidity :	54.5 %
Measured Distance:	3m	Test By:	Ccyf

Freq. (MHz)	Ant. Pol. H/V	Reading Level(dBuV/ m)		Correc t Factor dB	Emission Level(dBuV/ m)		AV G Fact or dB	Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV		PK	AV		PK	AV	PK	AV
-	-	-	-	-	-	-	-	-	-	-	-

Note: the amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

Distance extrapolation factor = $40 \log(\text{Specific distance} / \text{test distance})$ (dB);

Limit line = Specific limits(dBuV) + distance extrapolation factor

8.2.5 Radiated spurious emission below 1GHz

Modulation:	FSK	Test Date :	May 29, 2023
Frequency Range:	30-1000MHz	Temperature :	24.3 °C
Test Result:	PASS	Humidity :	54.5 %
Measured Distance:	3m	Test By:	Ccyf

Note: (1) All Readings are Peak Value.

(2) Correct Factor= Antenna Factor +Cable Loss- Amplifier Gain

(3) Emission Level= Reading Level+Probe Factor +Cable Loss

(4) True Value = Emission Level + Duty Cycle Correction Factor

(5) DF= Duty Cycle Correction Factor

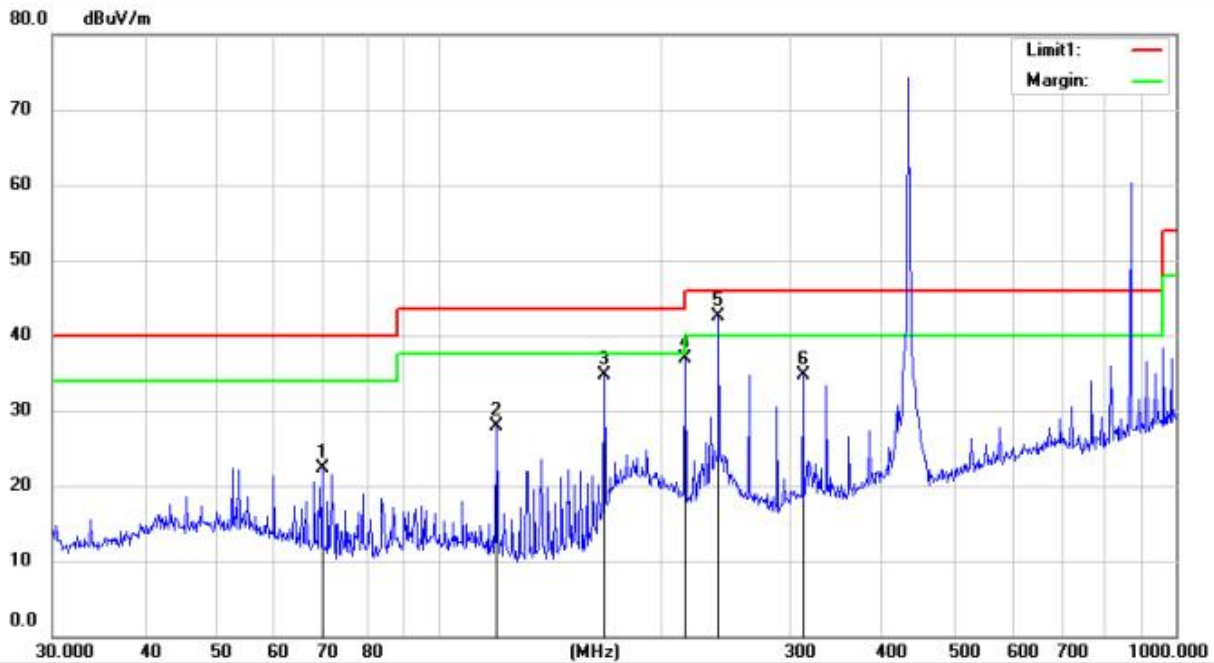
(6) Duty Cycle Correction Factor (dB) = $20\log(\text{Duty cycle}) = -13.76\text{dB}$

(7) Margin = PK Level – AV limit

(8) The “*” means restricted bands

(9) All the x/y/z orientation has been investigated, and only worst case is presented in this report.

(10) The EUT has been evaluated in xyz orientation, and the worst result have been recorded in the report.



Site Chamber #1

Polarization: **Horizontal**

Temperature: 22.8 C

Limit: FCC PART 15 C 3m(RE)

Power: AC 120V/60Hz

Humidity: 68 %

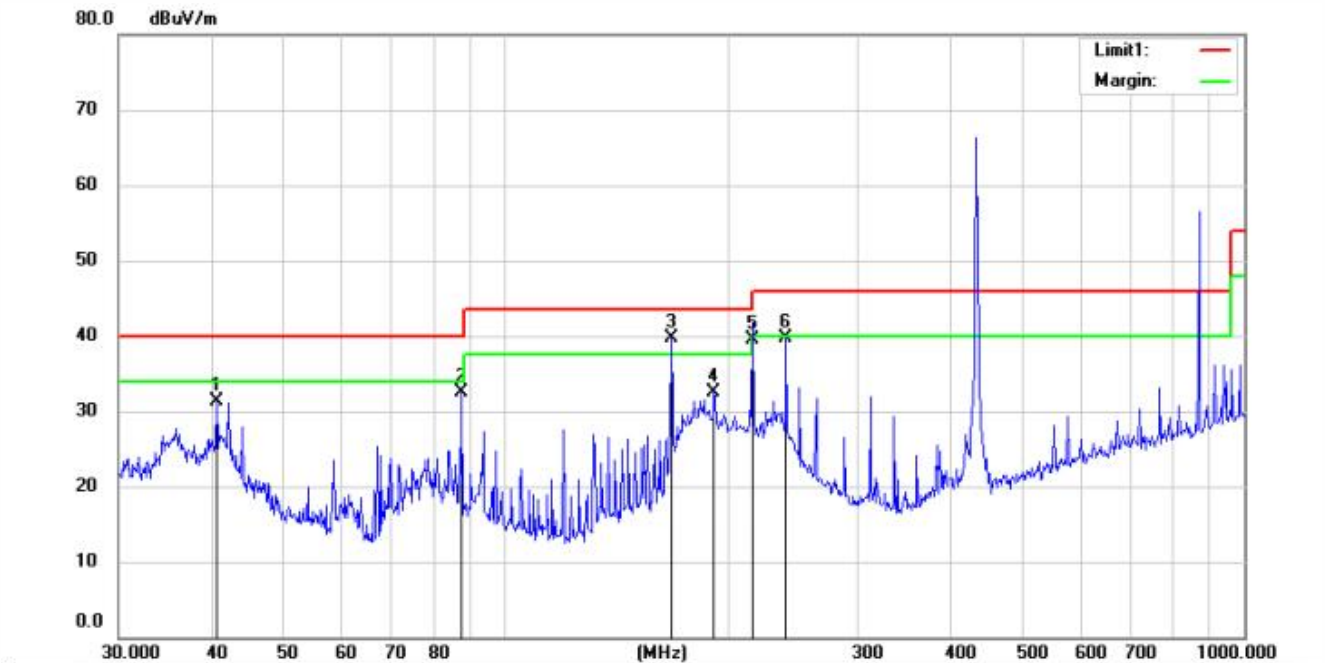
Mode: TX 433.92Mhz

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Ant. Factor dB/m	Pre Amp Gain dB	Cable loss dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	HI cm	Degree deg.	Comment
1		69.6004	41.84	9.98	30.55	1.11	22.38	40.00	-17.62	QP			
2		119.8556	47.73	9.82	30.78	1.22	27.99	43.50	-15.51	QP			
3		167.8242	54.36	9.37	30.53	1.53	34.73	43.50	-8.77	QP			
4		216.0240	53.32	12.05	30.28	1.84	36.93	46.00	-9.07	QP			
5	*	239.9873	57.93	12.72	30.15	2.04	42.54	46.00	-3.46	QP			
6		312.1794	48.19	14.17	29.83	2.21	34.74	46.00	-11.26	QP			

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

Operator: Ccyf



Site Chamber #1

Polarization: **Vertical**

Temperature: 22.8 C

Limit: FCC PART 15 C 3m(RE)

Power: AC 120V/60Hz

Humidity: 68 %

Mode: TX 433.92Mhz

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Ant. Factor dB/m	Pre Amp Gain dB	Cable loss dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	HI	Degree	Comment
1		40.7016	48.07	13.03	30.52	0.63	31.21	40.00	-8.79	QP		
2		87.4176	52.95	9.23	30.7	1.06	32.54	40.00	-7.46	QP		
3	*	167.8242	59.26	9.37	30.53	1.53	39.63	43.50	-3.87	QP		
4		191.7450	50.40	10.94	30.4	1.66	32.60	43.50	-10.90	QP		
5	!	216.0000	55.99	12.05	30.28	1.84	39.60	43.50	-3.90	QP		
6		239.9873	55.02	12.72	30.15	2.04	39.63	46.00	-6.37	QP		

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

Operator: Ccyf

Remark:

1. Measurement (dBuV/m) = Antenna Factor(dB) -Amp Factor(dB) +Cable Loss(dB) + Reading(dBuV/m)

2. Over (dB) = Measurement (dBuV/m) - Limit (dBuV/m)

8.2.6 Radiated spurious emission above 1GHz

Modulation:	FSK	Test Date :	May 29, 2023
Frequency Range:	1000-6000MHz	Temperature :	22.3 °C
Test Result:	PASS	Humidity :	53.5 %
Measured Distance:	3m	Test By:	Ccyf

Freq. (MHz)	Ant. Pol. H/V	Emission Level(dBuV/m)		AVG Factor dB	Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV		PK	AV	PK	AV
8378	V	57.42	42.89	-13.76	80.83	60.83	-23.41	-17.94
9432	V	57.35	42.79	-13.76	80.83	60.83	-23.48	-18.04
10248	V	56.64	42.08	-13.76	80.83	60.83	-24.19	-18.75
12118	V	57.80	43.31	-13.76	80.83	60.83	-23.03	-17.52
13682	V	58.21	43.95	-13.76	80.83	60.83	-22.62	-16.88
7086	H	57.66	43.13	-13.76	80.83	60.83	-23.17	-17.70
8038	H	58.30	43.87	-13.76	80.83	60.83	-22.53	-16.96
9942	H	56.91	42.46	-13.76	80.83	60.83	-23.92	-18.37
12492	H	57.64	43.05	-13.76	80.83	60.83	-23.19	-17.78
14124	H	56.77	42.25	-13.76	80.83	60.83	-24.06	-18.58

- Note: (1) All Readings are Peak Value.
 (2) Correct Factor= Antenna Factor +Cable Loss- Amplifier Gain
 (3) Emission Level= Reading Level+Probe Factor +Cable Loss
 (4) True Value = Emission Level + Duty Cycle Correction Factor
 (5) DF= Duty Cycle Correction Factor
 (6) Duty Cycle Correction Factor (dB) = $20\log(\text{Duty cycle}) - 13.76\text{dB}$
 (7) Margin = PK Level – AV limit
 (8) The “*” means restricted bands
 (9) All the x/y/z orientation has been investigated, and only worst case is presented in this report.
 (10) The EUT has been evaluated in xyz orientation, and the worst result have been recorded in the report.

8.3 CONDUCTED EMISSION TEST

8.3.1 Applicable Standard

According to FCC Part 15.207(a)

8.3.2 Conformance Limit

Frequency(MHz)	Conducted Emission Limit	
	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

8.3.3 Test Configuration

Test according to clause 6.3 conducted emission test setup

8.3.4 Test Procedure

The EUT was placed on a table which is 0.8m above ground plane.

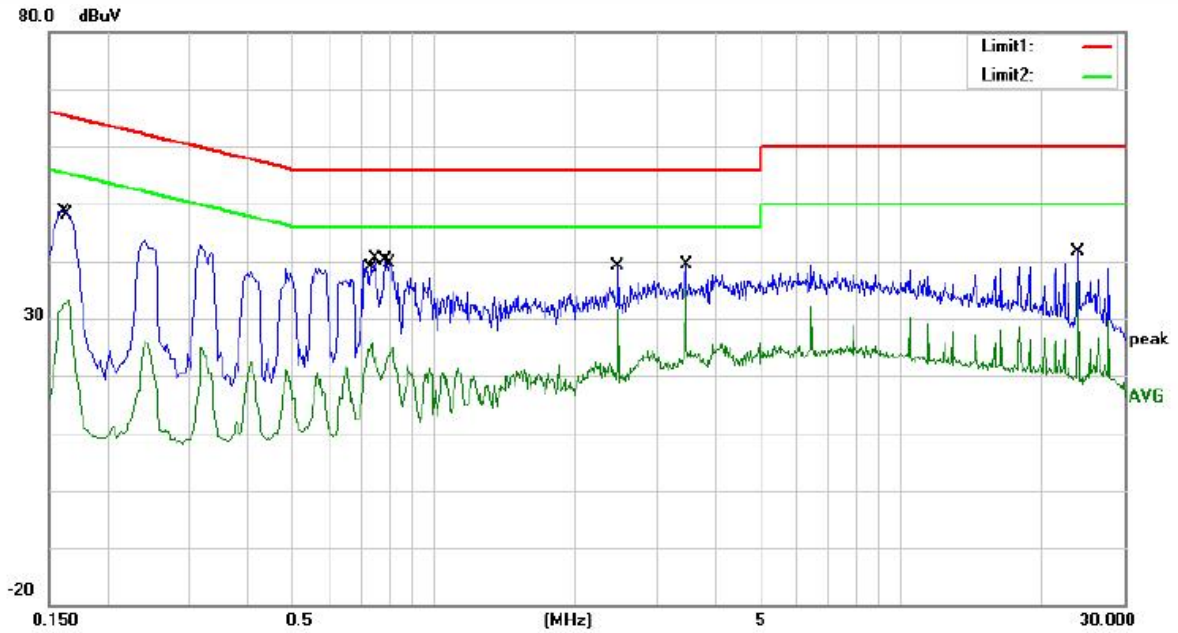
Maximum procedure was performed on the highest emissions to ensure EUT compliance.

Repeat above procedures until all frequency measured were complete.

8.3.5 Test Results

Pass

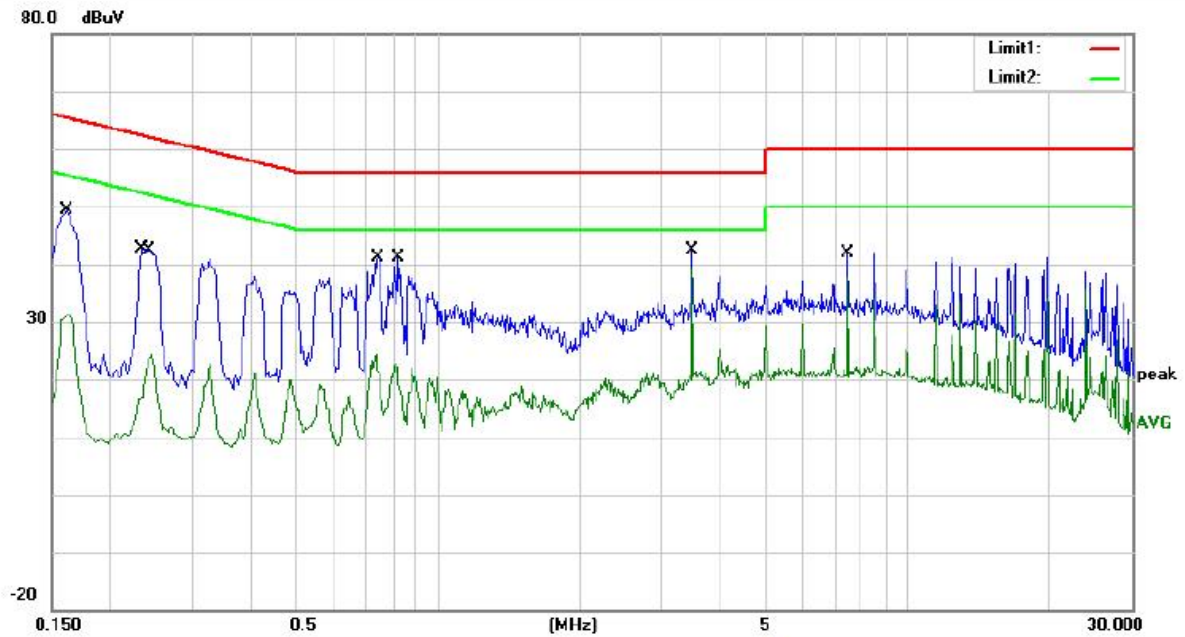
The AC120V &240V voltage have been tested, and the worst result recorded was report as below:



Site site #1 Phase: **N** Temperature: 25.2
Mode: TX 433.92MHz
Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1620	39.17	9.55	48.72	65.36	-16.64	QP	
2		0.1660	23.60	9.55	33.15	55.16	-22.01	AVG	
3		0.7380	16.30	9.51	25.81	46.00	-20.19	AVG	
4		0.7500	30.77	9.51	40.28	56.00	-15.72	QP	
5		0.7860	30.49	9.52	40.01	56.00	-15.99	QP	
6		0.8140	15.28	9.52	24.80	46.00	-21.20	AVG	
7		2.4780	29.46	9.57	39.03	56.00	-16.97	QP	
8		2.4780	22.18	9.57	31.75	46.00	-14.25	AVG	
9		3.4660	29.75	9.50	39.25	56.00	-16.75	QP	
10	*	3.4660	25.55	9.50	35.05	46.00	-10.95	AVG	
11		24.0020	31.98	9.60	41.58	60.00	-18.42	QP	
12		24.0020	26.68	9.60	36.28	50.00	-13.72	AVG	

*:Maximum data x:Over limit !:over margin Comment: Factor build in receiver. Operator: Lennard Lio



Site: site #1 Phase: **L1** Temperature: 25.2
Mode: TX 433.92MHz
Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1620	39.92	9.55	49.47	65.36	-15.89	QP	
2		0.1620	21.63	9.55	31.18	55.36	-24.18	AVG	
3		0.2340	33.06	9.56	42.62	62.31	-19.69	QP	
4		0.2460	14.86	9.57	24.43	51.89	-27.46	AVG	
5		0.7380	14.80	9.51	24.31	46.00	-21.69	AVG	
6		0.7460	31.64	9.51	41.15	56.00	-14.85	QP	
7		0.8100	13.00	9.52	22.52	46.00	-23.48	AVG	
8		0.8180	31.64	9.52	41.16	56.00	-14.84	QP	
9		3.4860	32.94	9.50	42.44	56.00	-13.56	QP	
10	*	3.4860	29.74	9.50	39.24	46.00	-6.76	AVG	
11		7.4740	32.36	9.55	41.91	60.00	-18.09	QP	
12		7.4740	28.14	9.55	37.69	50.00	-12.31	AVG	

*:Maximum data x:Over limit l:over margin Comment: Factor build in receiver. Operator: Lennard Lio

Remark:

1. Measurement (dBuV) = AMN Factor (dB) + Cable Loss (dB) + Reading (dBuV)

2. Over (dB) = Measurement (dBuV) - Limit (dBuV)

8.4 TRANSMISSION REQUIREMENT

8.4.1 Applicable Standard

According to FCC Part 15.231(a)

8.4.2 Conformance Limit

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

8.4.3 Test Configuration

Test according to clause 6.2 radio frequency test setup 2

8.4.4 Test Procedure

The following table is the setting of spectrum analyzer.

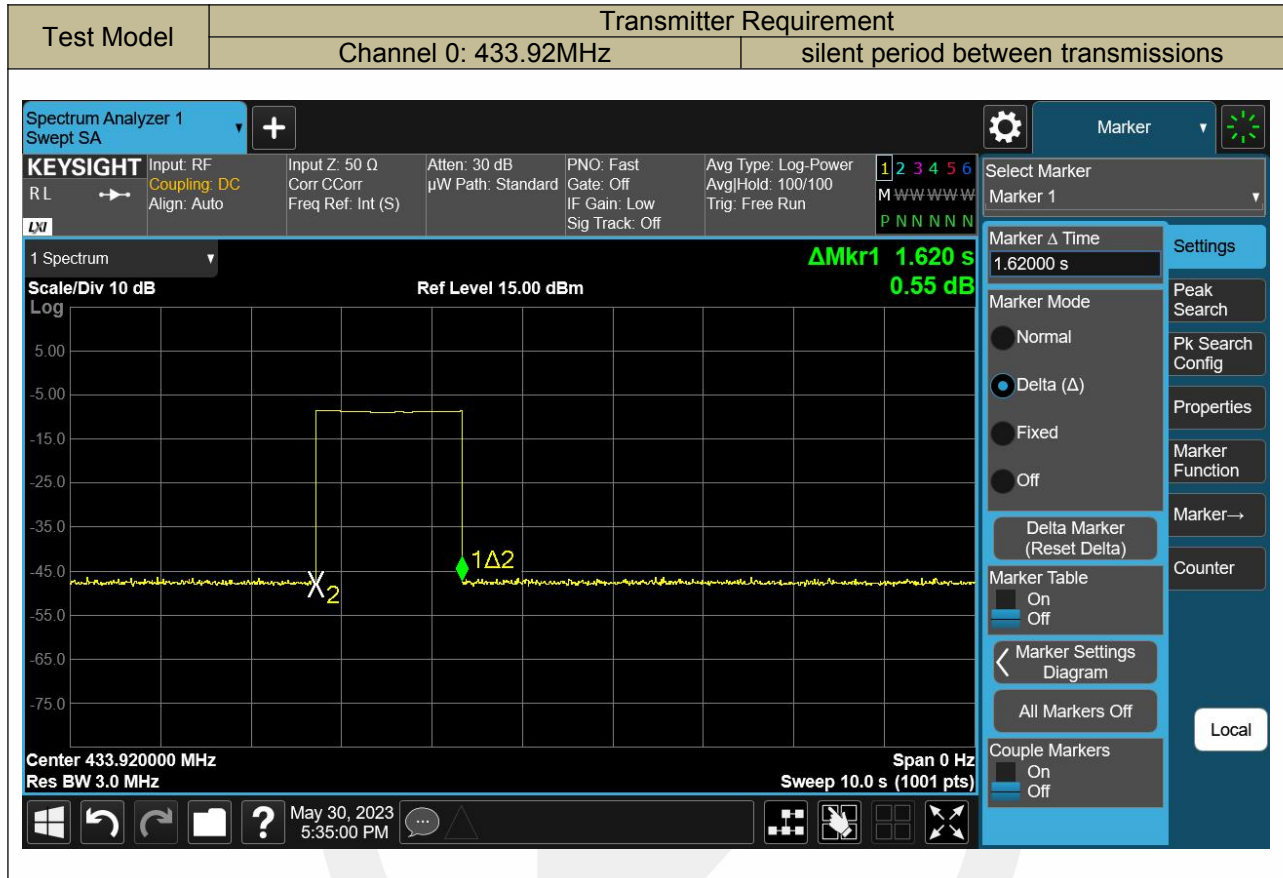
Spectrum analyzer	Setting
Attenuation	Auto
Span Frequency	0Hz
RBW	3M
VBW	3M
Detector	Peak
Trace	Max hold
Sweep Time	5S

- The transmitter output (antenna port) was connected to the spectrum analyzer.
- Set RBW of spectrum analyzer to 1MHz and VBW to 1MHz, Set Detector to Peak, Trace to Max Hold.
- Set the span to 0Hz and the sweep time to 10s and record the value.

8.4.5 Test Results

Temperature:	24℃	Test Date:	May 30, 2023
Humidity:	53 %	Test By:	XIA
Test mode:	TX Mode		

Frequency.(MHz)	silent period between transmissions	Limit	Verdict
433.92	1.620s	5 seconds	PASS



8.5 Antenna Application

8.5.1 Antenna Requirement

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.

8.5.2 Result

The EUT's antenna is internal antenna, using a permanently attached antenna which is not replaceable. The antenna's gain is 0dBi and meets the requirement.



-----The end -----

声 明 Statement

1. 本报告无授权批准人签字及“检验检测专用章”无效；

This report will be void without authorized signature or special seal for testing report.

2. 未经许可本报告不得部分复制；

This report shall not be copied partly without authorization.

3. 本报告的检测结果仅对送测样品有效，委托方对样品的代表性和资料的真实性负责；

The test results or observations are applicable only to tested sample. Client shall be responsible for representativeness of the sample and authenticity of the material.

4. 本检测报告中检测项目标注有特殊符号则该项目不在资质认定范围内，仅作为客户委托、科研、教学或内部质量控制等目的使用；

The observations or tests with special mark fall outside the scope of accreditation, and are only used for purpose of commission, research, training, internal quality control etc.

5. 本检测报告以实测值进行符合性判定，未考虑不确定度所带来的风险，本实验室不承担相关责任，特别约定、标准或规范中有明确规定的除外；

The test results or observations are provided in accordance with measured value, without taking risks caused by uncertainty into account. Without explicit stipulation in special agreements, standards or regulations, EMTEK shall not assume any responsibility.

6. 对本检测报告若有异议，请于收到报告之日起 20 日内提出；

Objections shall be raised within 20 days from the date receiving the report.