TEST REPORT

FCC PART 15 SUBPART C 15.231

Test Report
On Behalf of
GGE Corp., Limited
For

LED Star Projector Light

Model No.: GGE01

FCC ID: 2AYE7-GGE01

Prepared for : **GGE Corp., Limited**
3rd Floor, Building 6, Jiayiyuan Technology Park, Huaning Road, Dalang Street, Longhua District, Shenzhen, China

Prepared By : **Shenzhen HUAK Testing Technology Co., Ltd.**
1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park, Fuhai Street, Bao'an District, Shenzhen City, China

Date of Test: **Oct. 23, 2020**
Date of Report: **Oct. 23, 2020 -- Dec. 04, 2020**
Report Number: **HK2010293162-E**

TEST RESULT CERTIFICATION

Applicant's name ..... : GGE Corp., Limited

Address ..... : 3rd Floor, Building 6, Jiayiyuan Technology Park, Huaning Road, Dalang Street, Longhua District, Shenzhen, China

Manufacture's Name ..... : GGE Corp., Limited

Address ..... : 3rd Floor, Building 6, Jiayiyuan Technology Park, Huaning Road, Dalang Street, Longhua District, Shenzhen, China

Product description

Trade Mark ..... : N/A

Product name..... : LED Star Projector Light

Model and/or type reference : GGE01

Standards ..... : **47 CFR FCC Part 15 Subpart C 15.231**

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Date of Test ..... :

Date (s) of performance of tests..... : Oct. 23, 2020

Date of Issue..... : Oct. 23, 2020 -- Dec. 04, 2020

Test Result..... : **Pass**

Prepared by: Gary Qian

Project Engineer

Reviewed by: Edan Hu

Project Supervisor

Approved by: Jason Zhou

Technical Director

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1. SUMMARY

1.1. TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.231: Periodic operation in the band 40.66-40.70 MHz and above 70 MHz.

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

1.2. Test Description

Standard Section	Test Item	Result
15.203	Antenna Requirement	PASS
15.207	Conducted Emission	N/A
15.205/15.209/15.231(b)	Spurious Emission	PASS
15.231(c)	20dB Occupied Bandwidth	PASS
15.231(a)	Deactivation Testing	PASS
Remark: “N/A” is an abbreviation for Not Applicable.		

1.3. Test Facility

1.3.1 Address of the test laboratory

Shenzhen HUAK Testing Technology Co., Ltd.
Add.:1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park,Heping Community, Fuhai Street, Bao'an District, Shenzhen, China

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4 and CISPR 32/EN 55032 requirements.

1.3.2 Laboratory accreditation

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

IC Registration No.: 21210

The 3m alternate test site of Shenzhen HUAK Testing Technology Co., Ltd. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration No.: 21210 on May 24, 2016.

1.4. 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 HUAK 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 HUAK laboratory is reported:

Test	Measurement Uncertainty	Notes
Transmitter power conducted	±0.57 dB	(1)
Transmitter power Radiated	±2.20 dB	(1)
Conducted spurious emission 9KHz-40 GHz	±2.20 dB	(1)
Occupied Bandwidth	±0.01ppm	(1)
Radiated Emission 30~1000MHz	±4.10dB	(1)
Radiated Emission Above 1GHz	±4.32dB	(1)
Conducted Disturbance0.15~30MHz	±3.20dB	(1)

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

2. GENERAL INFORMATION

2.1. Environmental conditions

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

Normal Temperature:	25°C
Relative Humidity:	55 %
Air Pressure:	101 kPa

2.2. General Description of EUT

Product Name	LED Star Projector Light	
Model No.	GGE01	
Trade Mark	N/A	
Test Power Supply	DC 3.0V from battery	
Product Description	Operation Frequency:	433.92MHz
	Number of Channel:	1 Channels
	Modulation Type:	ASK
	Antenna Type:	PCB antenna
	Antenna Gain(Peak):	-1.5dbi

Remark:
1) Use new batteries when testing
2)For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2.3. DESCRIPTION OF TEST SETUP

Operation of EUT during conducted testing:

N/A

Operation of EUT during Radiation and Above1GHz Radiation testing:

EUT

Note: When testing, the battery is fully charged

2.4. List of channels

Channel	Freq. (MHz)	Note (Modulation Type)
01	433.92	ASK

2.5. Equipments Used during the Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	R&S	ENV216	HKE-002	Dec. 26, 2019	1 Year
2.	Receiver	R&S	ESCI 7	HKE-010	Dec. 26, 2019	1 Year
3.	RF automatic control unit	Tonscend	JS0806-2	HKE-060	Dec. 26, 2019	1 Year
4.	Spectrum analyzer	R&S	FSP40	HKE-025	Dec. 26, 2019	1 Year
5.	Spectrum analyzer	Agilent	N9020A	HKE-048	Dec. 26, 2019	1 Year
6.	Preamplifier	Schwarzbeck	BBV 9743	HKE-006	Dec. 26, 2019	1 Year
7.	EMI Test Receiver	Rohde & Schwarz	ESCI 7	HKE-010	Dec. 26, 2019	1 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	HKE-012	Dec. 26, 2019	1 Year
9.	Loop Antenna	Schwarzbeck	FMZB 1519 B	HKE-014	Dec. 26, 2019	1 Year
10.	Horn Antenna	Schewarzbeck	9120D	HKE-013	Dec. 26, 2019	1 Year
11.	Pre-amplifier	EMCI	EMC051845 SE	HKE-015	Dec. 26, 2019	1 Year
12.	Pre-amplifier	Agilent	83051A	HKE-016	Dec. 26, 2019	1 Year
13.	EMI Test Software EZ-EMC	Tonscend	JS1120-B Version	HKE-083	Dec. 27, 2018	N/A
14.	Power Sensor	Agilent	E9300A	HKE-086	Dec. 26, 2019	1 Year
15.	Spectrum analyzer	Agilent	N9020A	HKE-048	Dec. 26, 2019	1 Year
16.	Signal generator	Agilent	N5182A	HKE-029	Dec. 26, 2019	1 Year
17.	Signal Generator	Agilent	83630A	HKE-028	Dec. 26, 2019	1 Year
18.	Shielded room	Shiel Hong	4*3*3	HKE-039	Dec. 27, 2017	3 Year
19.	Power Meter	R&S	NRVD	SEL0069	Dec. 26, 2019	1 Year
20	High Gain Antenna	Schewarzbeck	LB-180400K F	HKE-054	Dec. 26, 2019	1 Year

The calibration interval was one year

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

This submittal(s) (test report) is intended to comply with Section 15.231 of the FCC Part 15, Subpart C Rules.

2.7. Modifications

No modifications were implemented to meet testing criteria. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Description	Information	Manufacturer	Remark	Certificate
LED Star Projector(RX)	DC 5V in	GGE Corp., Limited	Provide by applicant	SDOC
/	/	/	/	/

3. TEST CONDITIONS AND RESULTS

3.1. Conducted Emissions Test

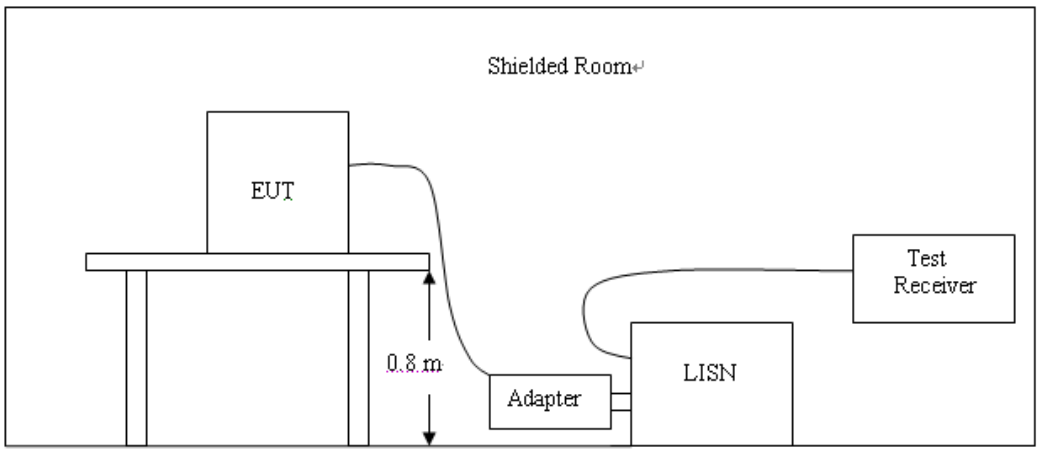
LIMIT

According to FCC CFR Title 47 Part 15 Subpart C Section 15.207 and RSS Gen 8.8, AC Power Line Conducted Emissions Limits for Licence-Exempt Radio Apparatus as below:

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 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 adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5. All support equipments received AC power from a second LISN, if any.
6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.

TEST RESULTS

N/A

3.2. Radiated Emissions and Band Edge

Limit

According to §15.231(b), the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

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

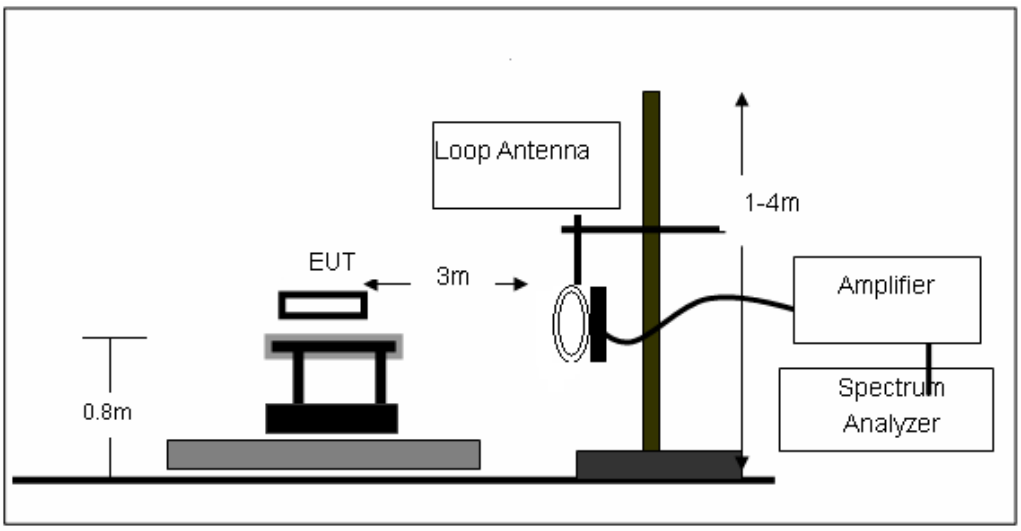
The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

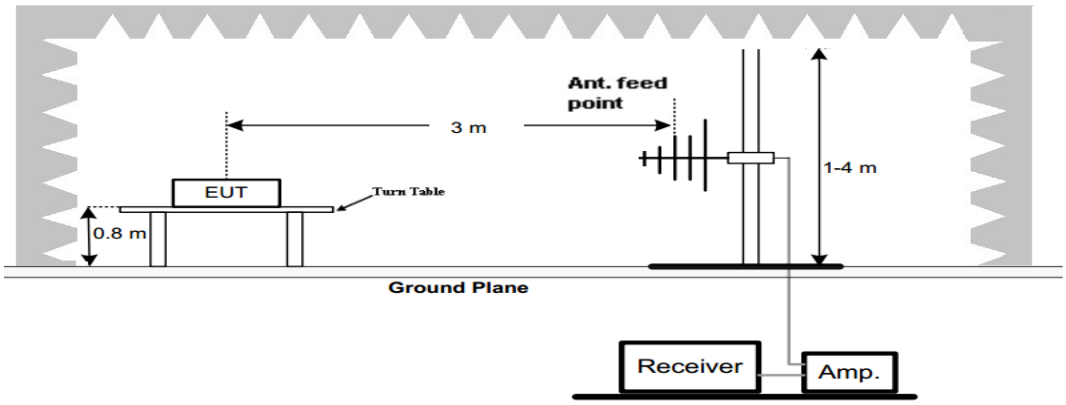
Compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

TEST CONFIGURATION

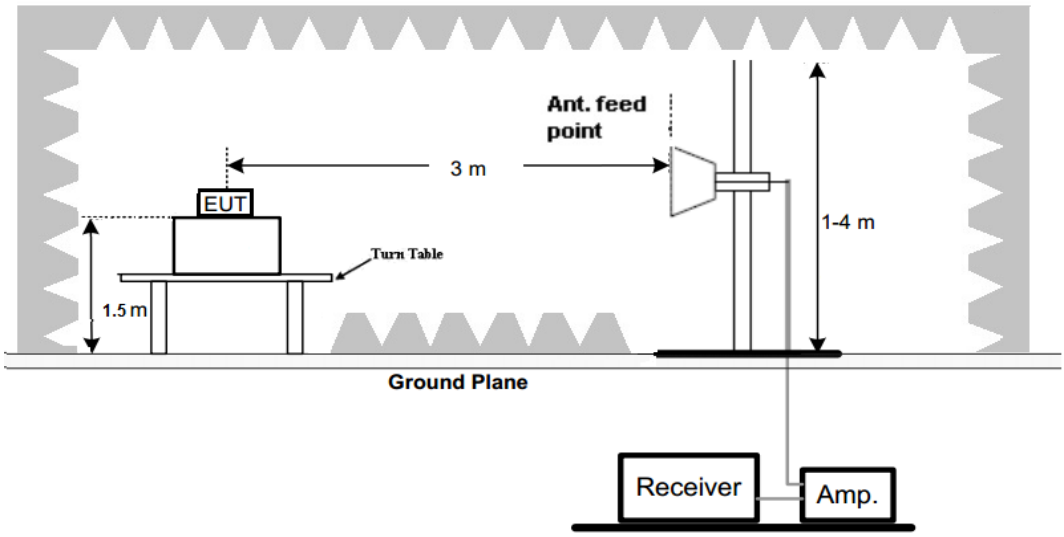
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency below 1000MHz



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



Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading +Ant.Loss +Cab. Loss – Ampl.Gain

The "Margin" column of the following data tables indicates the degree of compliance with the applicable limit.For example, a margin of -6dB V means the emission is 6dB V below the maximum limit. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – Limit

[Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 260-470 MHz, μV/m at 3 meters =41.6667(F) –7083.3333. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.]

TEST RESULTS

Note: The calculation method and calculated value of AV Factor value, on page 17 of the report

AV Factor=-5.76

Emission Styles	Frequency (MHz)	Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Direction (H/V)
Fundamental	433.92	83.41	100.8	-17.39	PK	H
Harmonic	866.04	53.19	80.8	-27.61	PK	H
Fundamental	433.02	84.57	100.8	-16.23	PK	V
Harmonic	866.04	52.48	80.8	-28.32	PK	V

Emission Styles	Frequency (MHz)	PK Level (dBuV/m)	AV Factor (dB/m)	AV Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Direction (H/V)
Fundamental	433.92	83.41	-5.76	77.65	80.8	-3.15	H
Harmonic	866.04	53.19	-5.76	47.43	60.8	-13.37	H
Fundamental	433.92	84.57	-5.76	78.81	80.8	-1.99	V
Harmonic	866.04	52.48	-5.76	46.72	60.8	-14.08	V

Above 1GHz:

Horizontal

No.	Frequency	Reading	Corr. Factor	AV Factor	Result	Limit	Margin	Detector
	MHz	dBuV/m	(dB)	(dB)	dBuV/m	dBuV/m	dB	
1	1301.76	28.99	25.83	/	54.82	74	-19.18	PK
	1301.76	/	/	-5.76	49.06	54	-4.94	AV
2.	1735.68	29.06	27.25	/	56.31	74	-17.69	PK
	1735.68	/	/	-5.76	50.55	54	-3.45	AV

Vertical

No.	Frequency	Reading	Corr. Factor	AV Factor	Result	Limit	Margin	Detector
	MHz	dBuV/m	(dB)	(dB)	dBuV/m	dBuV/m	dB	
1	1301.76	31.96	25.83	/	57.79	74	-16.21	PK
	1301.76	/	/	-5.76	52.03	54	-1.97	AV
2.	1735.68	29.45	27.25	/	56.70	74	-17.30	PK
	1735.68	/	/	-5.76	50.94	54	-3.06	AV

Note: Testing is carried out with frequency rang 30MHz to the tenth harmonics, which above 5th Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

The fundamental frequency is 433.02MHz, so the fundamental and spurious emissions radiated limit base on the the operating frequency 433.02MHz.

Frequency Range (9 kHz-30MHz)

Frequency (MHz)	Level@3m (dBμV/m		Limit@3m (dBμV/m)	
--	--	--	--	--
--	--	--	--	--
--	--	--	--	--

Note: 1. Emission Level=Reading+ Cable loss-Antenna factor-Amp factor

2. The emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement.

3.3. 20dB Bandwidth

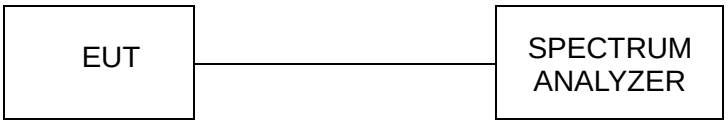
Limit

According to FCC Part 15.231(c), 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. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Test Procedure

With the EUT's antenna attached, the EUT's 20dB Bandwidth power was received by the test antenna, which was connected to the spectrum analyzer with the START, and STOP frequencies set to the EUT'soperation band.

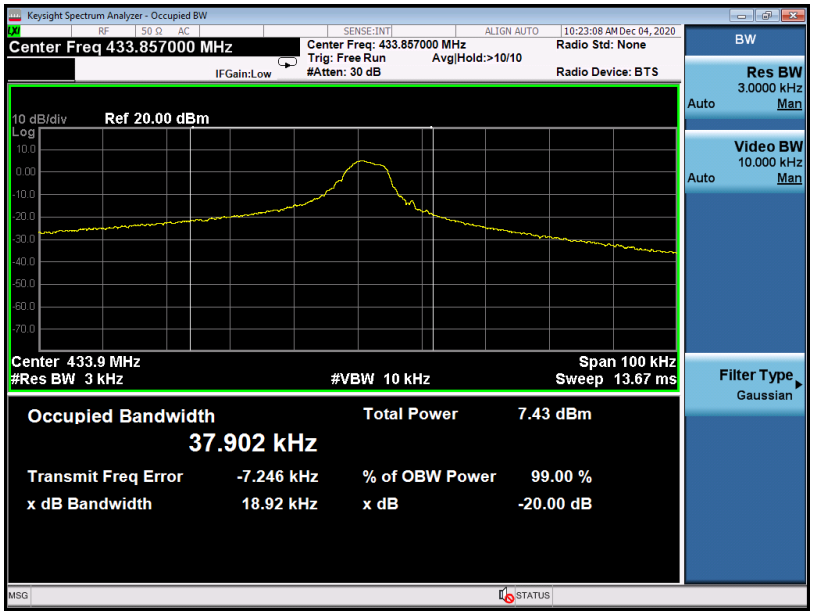
Test Configuration



Test Results

Modulation	Channel Frequency (MHz)	99% OBW (KHz)	20dB bandwidth (KHz)	Limit (MHz)	Result
ASK	433.92	37.902	18.92	0.25%*433.92MHz=108.48	Pass

Test plot as follows:



3.4. Transmission Time

Limit

According to FCC Part 15.231(a), the transmitter shall be complied the following requirements:

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

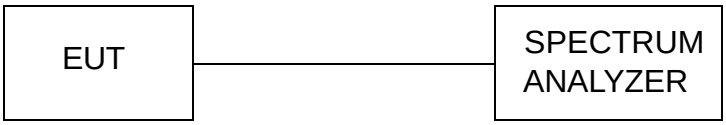
(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

(3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

Test Procedure

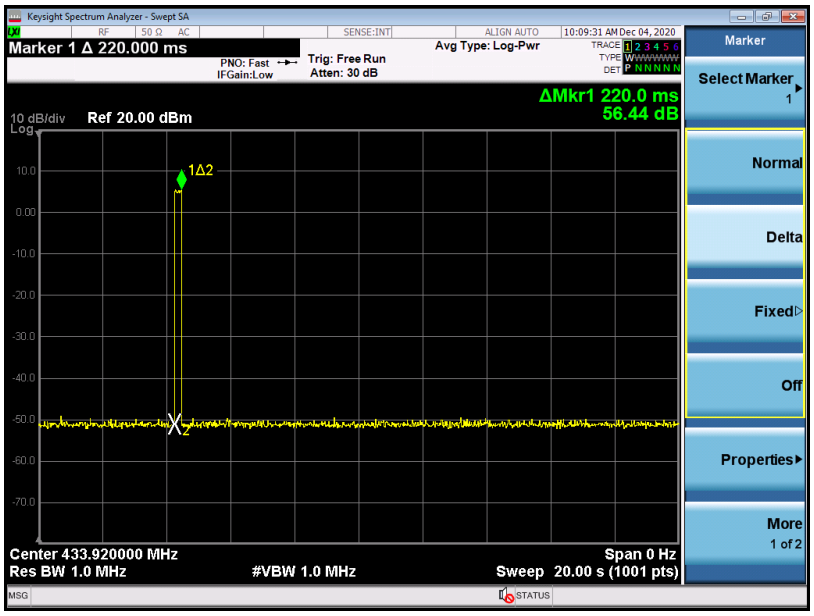
With the EUT's antenna attached, the EUT's output signal was received by the test antenna, which was connected to the spectrum analyzer. Set the center frequency to 433.02MHz, than set the spectrum analyzer to Zero Span for the release time reading. During the testing, the switch was released then the EUT automatically deactivated.

Test Configuration



Test Results

Transmission Type	Test Frequency (MHz)	Transmission Time (s)	Limit/ (s)	Result
Manually	433.92	0.22	≤5s	PASS



3.5. Duty Cycle

Limit

According to FCC Part 15.231(b)(2) and 15.35 (c),For pulse operation transmitter, the averaging pulsed emissions are calculated by peak value of measured emission plus duty cycle factor.

Test Procedure

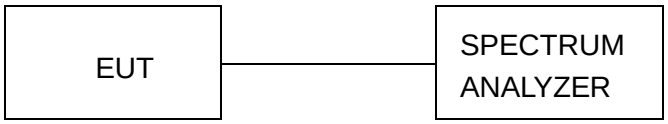
1) The EUT was placed on a turntable which is 0.8m above ground plane.

2) Set EUT operating in continuous transmitting mode

3) Set Test Receiver into spectrum analyzer mode, Tune the spectrum analyzer to the transmitter carrier
frequency, and set the spectrum analyzer resolution bandwidth(RBW) to 1000kHz and video bandwidth(VBW) to 1000kHz, Span was set to 0Hz.

4) The Duty Cycle was measured and recorded.

Test Configuration

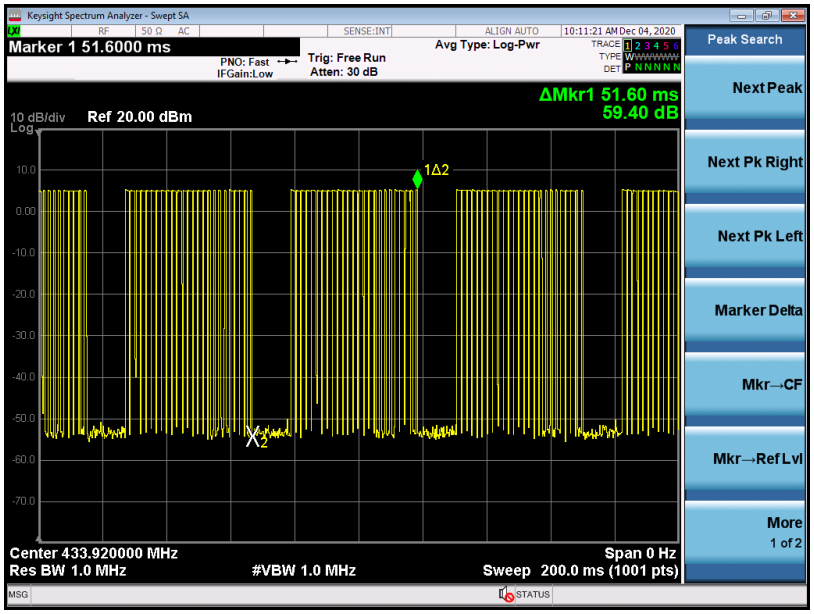


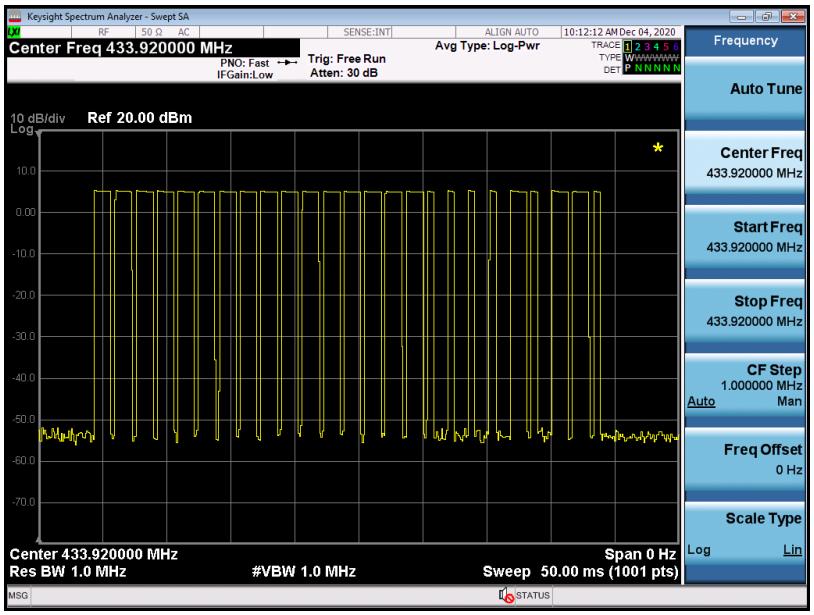
Test Results

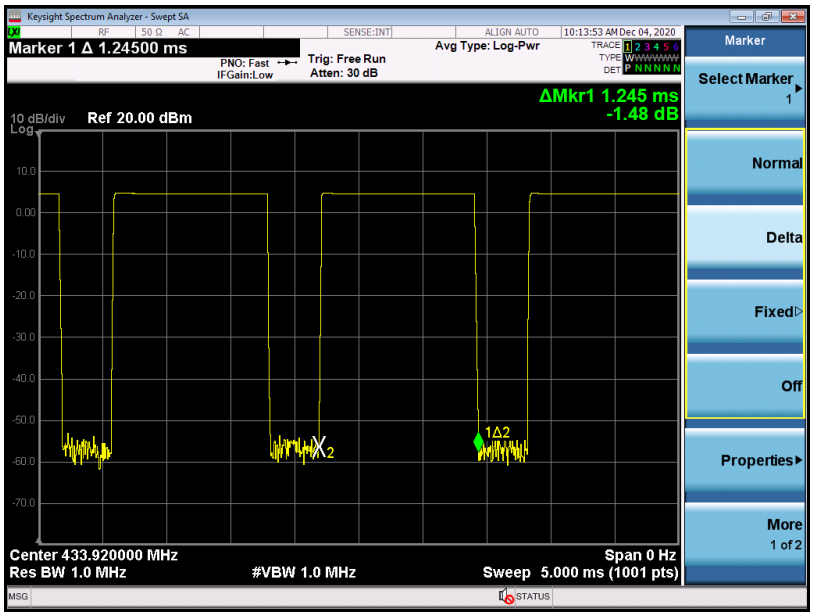
Duty cycle numbers	T period (ms)	T on time (ms)	Duty cycle
25	51.6	26.556	0.515

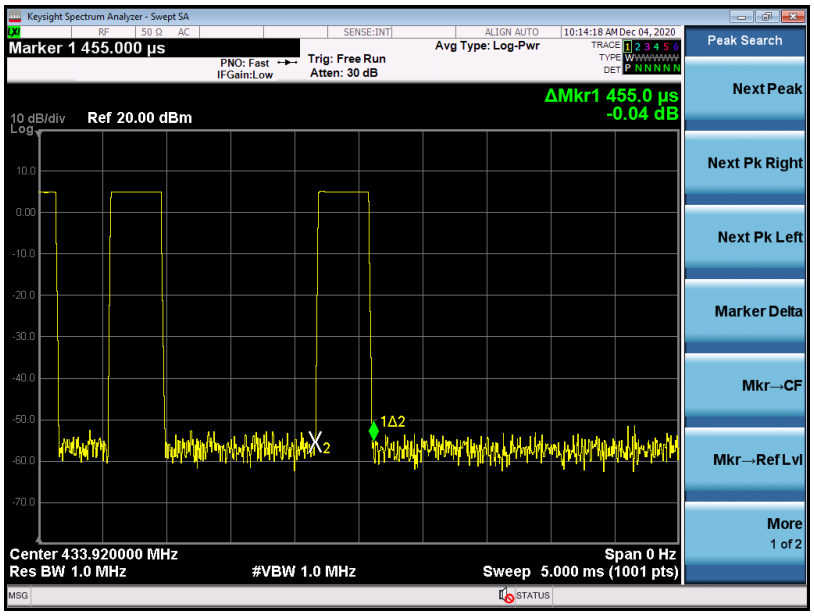
1. AV Level (dBuV/m)= PK Level (dBuV/m)+ AV Factor(dB)
2. T on time=19*1.254 + 0.455*6=23.826+2.73=26.556
   Duty Cycle= T on time/ T period=0.515
   AV Factor=20*log(Duty Cycle)=20*log(0.515)=-5.76

Test plot as follows:





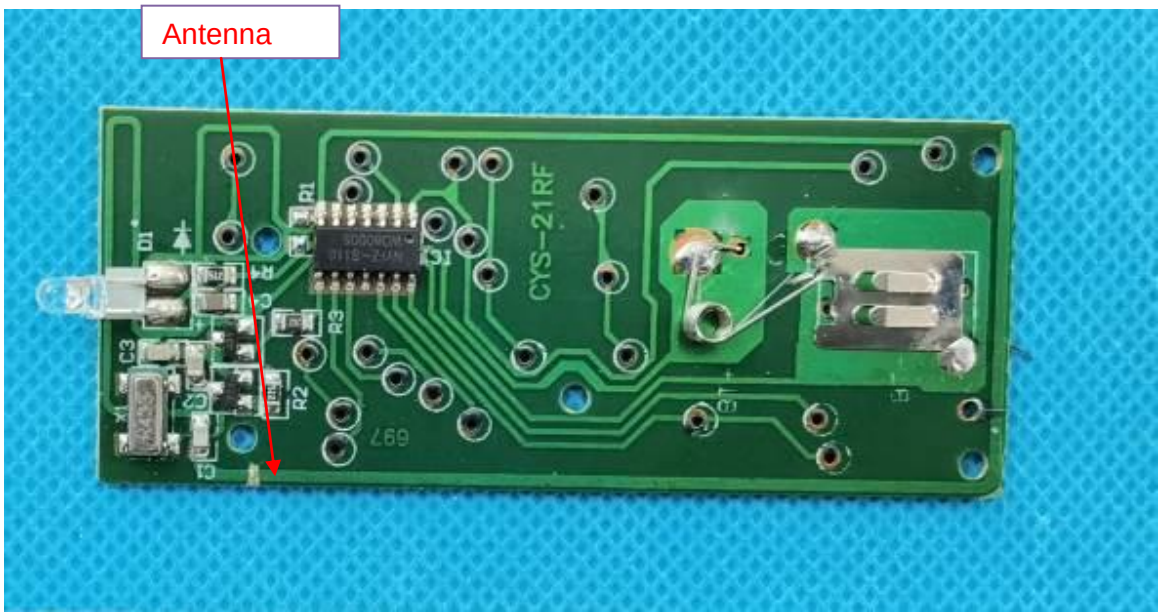

Keysight Spectrum Analyzer - Swept SA
Marker 1 Δ 1.24500 ms
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
10:13:53 AM Dec 04, 2020
ΔMkr1 1.245 ms
-1.48 dB
10 dB/div Ref 20.00 dBm
Log
1Δ2
Center 433.920000 MHz
Res BW 1.0 MHz
#VBW 1.0 MHz
Span 0 Hz
Sweep 5.000 ms (1001 pts)
Marker
Select Marker
Normal
Delta
Fixed
Off
Properties
More
1 of 2


Keysight Spectrum Analyzer - Swept SA
Marker 1 455.000 µs
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
10:14:18 AM Dec 04, 2020
ΔMkr1 455.0 µs
-0.04 dB
10 dB/div Ref 20.00 dBm
Log
1Δ2
Center 433.920000 MHz
Res BW 1.0 MHz
#VBW 1.0 MHz
Span 0 Hz
Sweep 5.000 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

3.6. ANTENNA REQUIREMENT

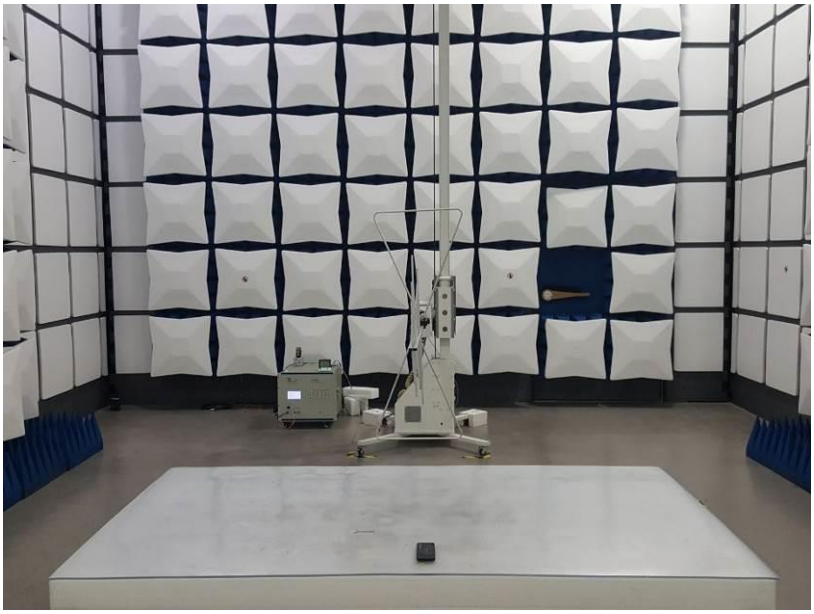
Antenna Connected Construction

The Spring antenna used in the product is a permanently connected antenna that complies with the provisions of part 15.203 requirement in this section. The antenna used in this product is a Spring antenna, The directional gains of antenna used for transmitting is -2 dBi.



4. Test Setup Photos of the EUT

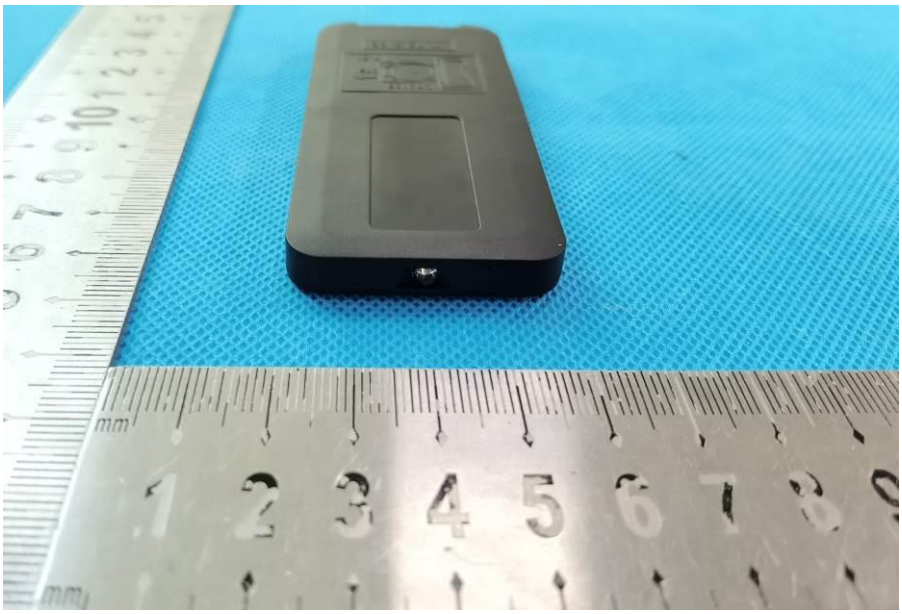
30MHz-1000MHz



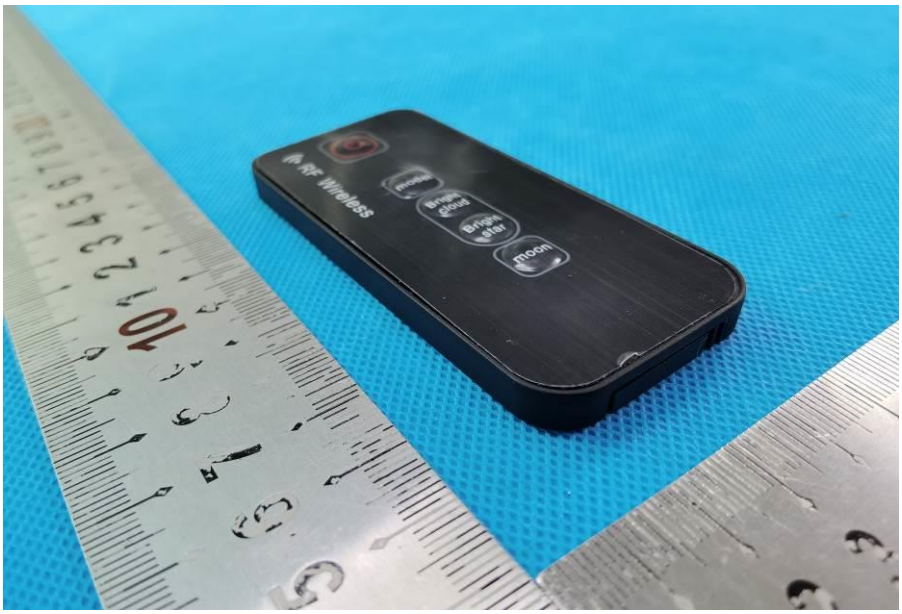
Above 1000MHz

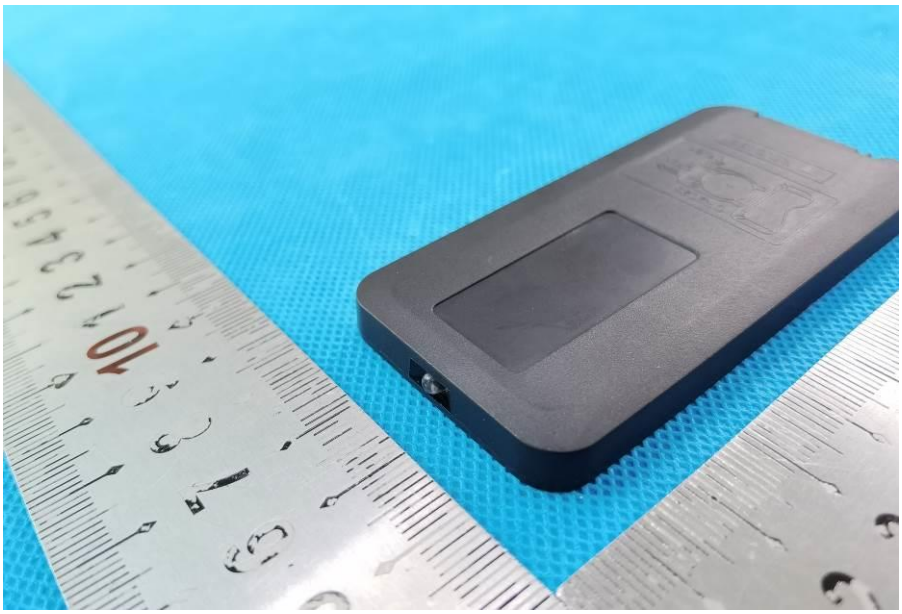
5. PHOTOS OF THE EUT

External photos

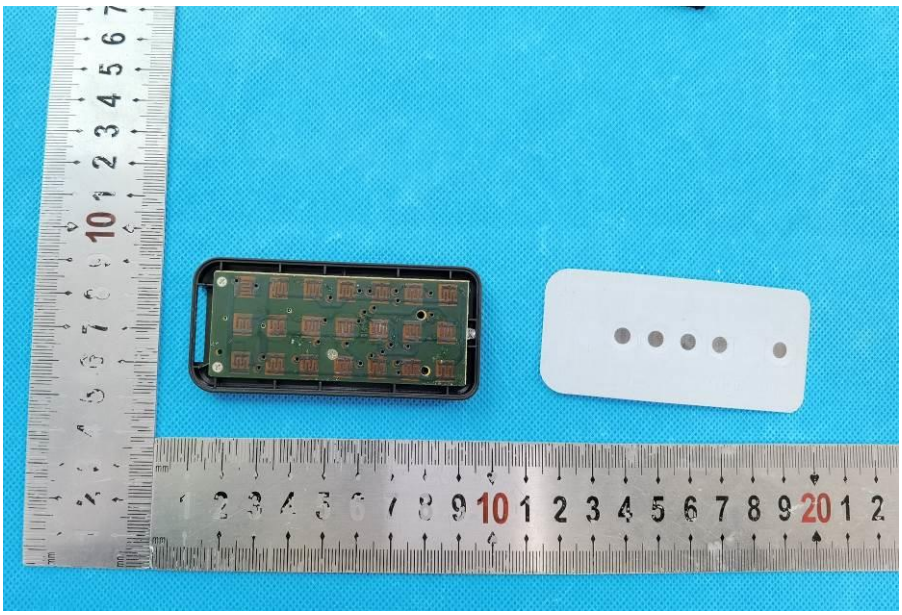


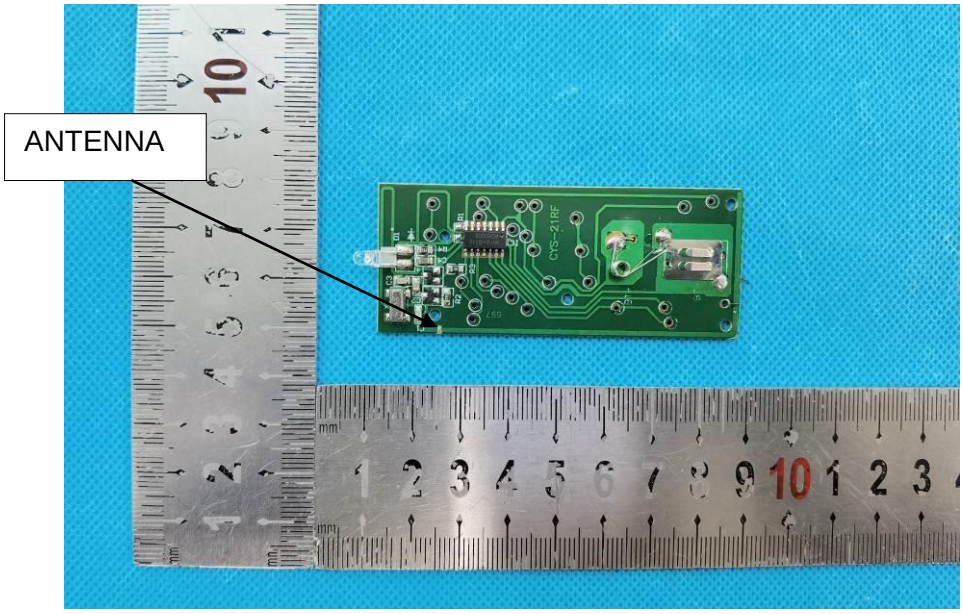
RELEASE

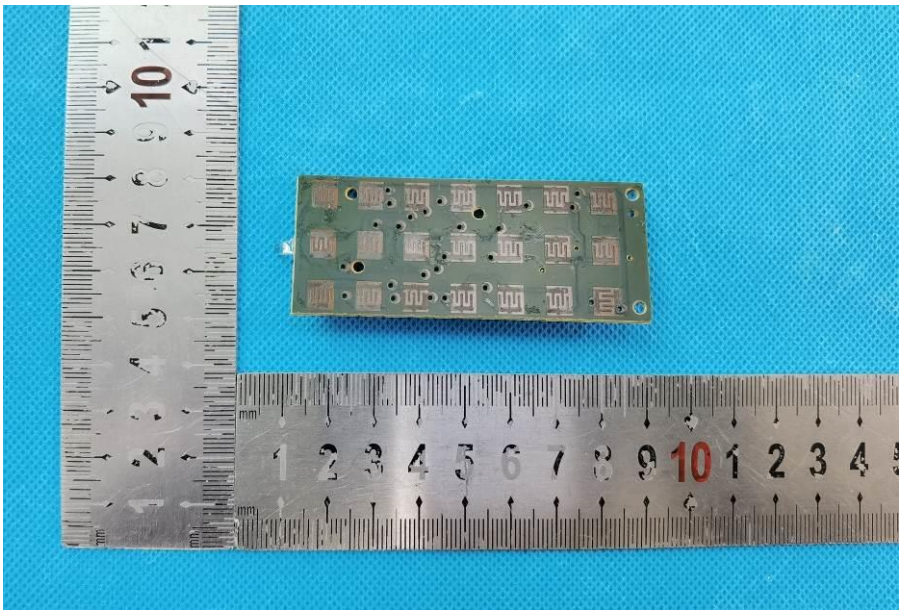

RF Wireless
mode
Bright cloud
Bright star
moon



Internal photos







END