

TEST REPORT

ETSI EN 301 489-1 V2.2.3 (2019-11)

ETSI EN 301 489-3 V2.1.2 (2021-03)

Product : Controller
Model Name : GFC005
Brand : GFLAI-0915
Report No. : KEYS21091509004EM-02

Prepared for

Shenzhen Greatfavian Electronic CO.,LTD.

5F,Tongfuyu Industrial Park,Lezhujiao ,Zhoushi Road, Baoan District, Shenzhen,China 518126

Prepared by

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Dongguan City



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Report No.: KEYS21091509004EM-02

1 TEST RESULT CERTIFICATION

Applicant's name : Shenzhen Greatfaronian Electronic CO.,LTD.

Address : 5F,Tongfuyu Industrial Park,Lezhujiao ,Zhoushi Road, Baoan District,
Shenzhen,China 518126

Manufacture's name : Shenzhen Greatfaronian Electronic CO.,LTD.

Address : 5F,Tongfuyu Industrial Park,Lezhujiao ,Zhoushi Road, Baoan District,
Shenzhen,China 518126

Product name : Controller

Model name : GFC005

This device described above has been tested by KEYS, and the test results show that the equipment under test (EUT) is in compliance with the Radio Equipment Regulations 2017 and its amendment requirements. And it is applicable only to the tested sample identified in the report.

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Date of Test

Date (s) of performance of tests: September 15, 2021 to September 24, 2021

Date of Issue: September 26, 2021

Test Result: PASS

Test Engineer:

Technical Manager:

Sunny Li / Engineer



Jason Zhan / Manager

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2 Test Summary

Test Items	Test Results
Conducted Disturbance	N/A
Radiated Emission	Pass
Harmonic Current	N/A
Voltage Fluctuation and Flicker	N/A
Electrostatic Discharge Immunity	Pass
Radiated Electromagnetic Fields Immunity	Pass
Electric Fast Transient Burst Immunity	N/A
Surge Immunity	N/A
Conducted Immunity	N/A
Voltage dips and interruptions Immunity	N/A

N/A* Please refer to Applicability overview tables in sections 7. 1 and 7.2 of EN 301 489- 1 requirements.

3 General Information

3.1 General Description of E.U.T.

Product Name	:	Controller
Model Name	:	GFC005
Additional model	:	N/A
Frequency Range	:	433MHz
Type of Modulation	:	ASK
Antenna Type	:	PCB antenna
Antenna Gain	:	2.5dBi
Number of Channels	:	5 Channel
Channel Spacing	:	20kHz, Narrowband
Rating	:	6V,1A
Class 1 equipment	:	Sub-class 20

4 Equipment During Test

4.1 Equipments List

Conducted Disturbance Test Equipment

Name of Equipment	Manufacturer	Model	Serial No.	Calibration Due
EMI Test Receiver	Rohde & Schwarz	ESCS30	101417	Aug. 21, 2022
AMN	Rohde & Schwarz	ENV216	102453	Aug. 21, 2022

Radiated Disturbance Test Equipment

Name of Equipment	Manufacturer	Model	Serial No.	Calibration Due
EMI Test Receiver	Rohde & Schwarz	ESI26	101417	Aug. 21, 2022
Bilog Antenna	Chase	CBL6112B	102453	Aug. 21, 2022
Horn Antenna	Sunol Sciences	DRH- 118	101342	Aug. 21, 2022

Harmonic Current /Voltage Fluctuation and Flicker Test Equipment

Name of Equipment	Manufacturer	Model	Serial No.	Calibration Due
Power	CI	5001ix-CTS-400	1534A00401	Aug. 21, 2022
Three Phase Harmonic flicker test system	CI	PACS-3	1534A00401	Aug. 21, 2022
Power	CI	5001ix-CTS-400- NO	1534A00411	Aug. 21, 2022
Power	CI	5001ix-CTS-400- NO	1534A00101	Aug. 21, 2022
Test S/W	AMETEK	CTS 4		

Surge Immunity Test Equipment

Name of Equipment	Manufacturer	Model	Serial No.	Calibration Due
Simulator	EMTEST	UCS500M4	606137	Aug. 21, 2022

Radiated Electromagnetic Field Immunity and Conducted Immunity, keyed carrier Test Equipment

Name of Equipment	Manufacturer	Model	Serial No.	Calibration Due
Shielding Effectiveness of Anechoic chamber	Changzhou zhongyu	966	MY53050160	Aug. 21, 2022
Signal Generator (9KHz-3.2GHz)	HP	8648C	313157	Aug. 21, 2022
Power Amplifier (30MHz- 1GHz)	Amplifier Research	250W1000A	0342835	Aug. 21, 2022
Power Amplifier (800MHz-3 0GHz)	Amplifier Research	60S1G3	9149.222	Aug. 21, 2022
Bi-log Antenna (28MHz-2GHz)	Sunol Sciences	JB1	0342652	Aug. 21, 2022
High gain horn Antenna (800MHz-5GHz)	Amplifier Research	AT4002A	9128E-012	Aug. 21, 2022
Universal Radio Communication	R & S	CMU200	9118E-012	Aug. 21, 2022

Tester				
CDN	EM Test	M3	MY53000160	Aug. 21, 2022
C/S Tester	EM Test	CWS500	313057	Aug. 21, 2022
Attenuator	EM Test	6 dB	034205	Aug. 21, 2022
Shielding Effectiveness of	Changzhou zhongyu	743	9149.022	Aug. 21, 2022

Surge Immunity Test Equipment

Name of Equipment	Manufacturer	Model	Serial No.	Calibration Due
Simulator	EMTEST	UCS500M4	170901/190901	Aug. 21, 2022

4.2 Measurement Uncertainty

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %

No.	Item	Uncertainty
1	Conducted Emission Test	$\pm 1.38\text{dB}$
2	RF power, conducted	$\pm 0.16\text{dB}$
3	Spurious emissions, conducted	$\pm 0.21\text{dB}$
4	All emissions, radiated (<1G)	$\pm 4.68\text{dB}$
5	All emissions, radiated (>1G)	$\pm 4.89\text{dB}$
6	Temperature	$\pm 0.5^\circ\text{C}$
7	Humidity	$\pm 2\%$

5 CONDUCTED DISTURBANCE TEST

5.1 Test Standard and Limit

5.1.1 Test Standard

ETSI EN 301 489-1 V2.2.3 (2019-11)

ETSI EN 301 489-3 V2.1.2 (2021-03)

5.1.2 Test Limit

Conducted Disturbance Test Limit

Frequency	Maximum RF Line Voltage (dB μ V)	
	Quasi-peak Level	Average Level
150kHz~500kHz	66 ~ 56 *	56 ~ 46 *
500kHz~5MHz	56	46
5MHz~30MHz	60	50

* Decreasing linearly with logarithm of the frequency

5.2 Radiated Emissions

The EUT is put on a table of non-conducting material that is 80cm high. The vertical conducting wall of shielding is located 40cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.). A EMI test receiver is used to test the emissions from both sides of AC line. The bandwidth of EMI test receiver is set at 9kHz.

5.3 Test Arrangement

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application. The detailed information refers to test picture.

5.4 Test Data

N/A

Note: the equipment is battery powered and this item will not be tested.

6 RADIATED DISTURBANCE TEST

6.1 Test Standard and Limit

6.1.1 Test Standard

ETSI EN 301 489-1 V2.2.3 (2019-11)

ETSI EN 301 489-3 V2.1.2 (2021-03)

6.1.2 Test Limit

Radiated Disturbance Test Limit (Class B)

Frequency	Limit (dB μ V/m)
	Quasi-peak Level
30MHz~230MHz	40
230MHz~1000MHz	47

* The lower limit shall apply at the transition frequency.

* The test distance is 3m.

Frequency range	Average Limit (dB μ V/m)	Peak Limit (dB μ V/m)
1000MHz~3000MHz	50	70
3000MHz~6000MHz	54	74

NOTE: The lower limit applies at the transition frequency

6.2 Test Procedure

The EUT is placed on a turntable, which is 0.8 meter above ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can move up and down between 1 to 4 meters to find out the maximum emission level. Broadband antenna is used as a receiving antenna. Both horizontal and vertical polarization of the antenna is set on test..

The correspondent test program of test instrument to measure the current harmonics emanated from EUT is chosen. The measure time shall be not less than the time necessary for the EUT to be exercised.

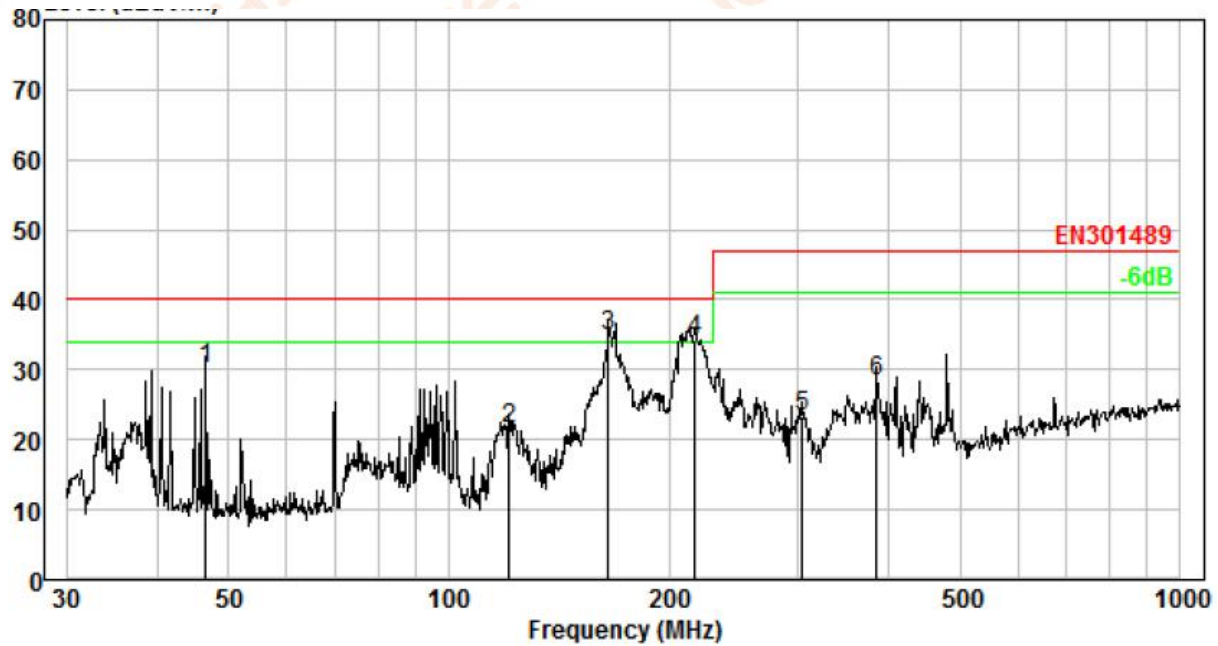
6.3 Test Arrangement

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application. The detailed information refers to test picture.

6.4 Test Data

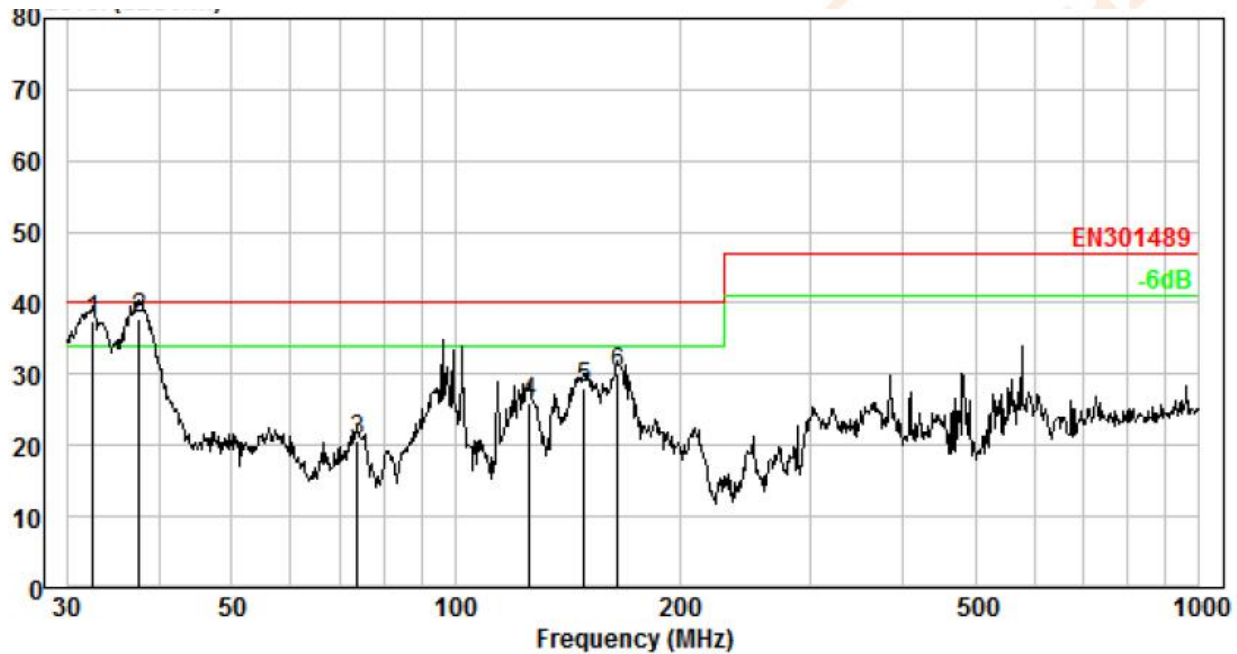
Test mode: Standby (Worst case mode)

Horizontal.



No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamplifier Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	46.503	1.96	12.94	45.24	30.12	30.02	40.00	-9.98	QP
2.	121.123	3.61	12.10	36.44	30.46	21.69	40.00	-18.31	QP
3.	165.487	4.14	13.57	47.73	30.56	34.88	40.00	-5.12	QP
4.	216.783	4.60	10.70	49.52	30.66	34.16	40.00	-5.84	QP
5.	304.610	5.19	13.30	35.62	30.78	23.33	47.00	-23.67	QP
6.	385.281	5.59	15.00	38.65	30.86	28.38	47.00	-18.62	QP

Vertical



No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	32.520	1.34	13.22	52.89	30.00	37.45	40.00	-2.55	QP
2.	37.548	1.59	13.51	52.71	30.05	37.76	40.00	-2.24	QP
3.	73.876	2.75	9.90	38.40	30.28	20.77	40.00	-19.23	QP
4.	125.886	3.67	12.39	40.47	30.47	26.06	40.00	-13.94	QP
5.	148.963	3.96	13.85	40.75	30.53	28.03	40.00	-11.97	QP
6.	165.487	4.14	13.57	42.84	30.56	29.99	40.00	-10.01	QP

7 HARMONIC CURRENT EMISSION TEST

7.1 Test Standard and Limit

7.1.1 Test Standard

ETSI EN 301 489-1 V2.2.3 (2019-11)

ETSI EN 301 489-3 V2.1.2 (2021-03)

7.1.2 Limits

Harmonic Current Test Limit (Class A)

Harmonic order (n)	Maximum permissible harmonic current (A)
Odd harmonics	
3	2.30
5	1.14
7	0.77
9	0.40
11	0.33
13	0.21
$15 \leq n \leq 39$	$0.15 \times 15/n$
Even harmonics	
2	1.08
4	0.43
6	0.30
$8 \leq n \leq 40$	$0.23 \times 8/n$

7.2 Test Procedure

The power cord of the EUT is connected to the output of the test system. Turn on the Power of the EUT and use the test system to test the harmonic current level.

7.3 Test Data

N/A

Note: the equipment is battery powered and this item will not be tested

8 VOLTAGE FLUCTUATION AND FLICKER TEST

8.1 Test Standard and Limit

8.1.1 Test Standard

ETSI EN 301 489-1 V2.2.3 (2019-11)

ETSI EN 301 489-3 V2.1.2 (2021-03)

8.1.2 Flicker Test Limit

Test items	Limits
Pst	1 0
d c	3.3%
d max	Max
dt	Not exceed 3 3% for 500ms

8.2 Test Procedure

The power cord of the EUT is connected to the output of the test system. Turn on the power of the EUT and use the test system to test the harmonic current level.

8.3 Test Data

N/A

Note:the equipment is battery powered and this item will not be tested.

9 ELECTROSTATIC DISCHARGE IMMUNITY TEST

9.1 Test Requirements

9.1.1 Test Standard

ETSI EN 301 489-1 V2.2.3 (2019-11)

ETSI EN 301 489-3 V2.1.2 (2021-03)

9.1.2 Test Level

Test Level for ESD Immunity Test

Port	Test Specification
Enclosure Port	8kV air discharge 4kV contact discharge

9.1.3 Performance criterion: B, TT, TR

9.2 Test Procedure

9.2.1 Contact Discharge:

The ESD generator is held perpendicular to the surface to which the discharge is applied and the tip of the discharge electrode touch the surface of EUT. Then turn the discharge switch. The generator is then re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed

9.2.2 Air Discharge:

Air discharge is used where contact discharge can't be applied.. The round discharge tip of the discharge electrode shall be approached as fast as possible to touch the EUT. After each discharge, the discharge electrode shall be removed from the EUT. The generator is then re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed

9.2.3 Indirect discharge for horizontal coupling plane

At least 10 single discharges shall be applied to the horizontal coupling plane, at points on each side of the EUT

9.2.4 Indirect discharge for vertical coupling plane

At least 10 single discharge shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m X 0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges shall be applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

9.3 Test Data

ESD Immunity Test Data

Location	Test condition	Performance criterion	Results
Slots	Air discharge 10 times per test point Level: 2 kV, 4 kV, 8 kV	B	Pass
Surface		B	Pass
metal		B	Pass
VCP	Contact discharge 10 times per test point Level: ± 2 kV, ± 4 kV	B	Pass
HCP		B	Pass

10 RADIATED ELECTROMAGNETIC FIELD IMMUNITY TEST

10.1 Test Requirements

ETSI EN 301 489-1 V2.2.3 (2019-11)

ETSI EN 301 489-3 V2.1.2 (2021-03)

10.1.1 Test Level

Test Level for Radiated Electromagnetic Field Immunity Test

Port	Test Specification
Enclosure Port	80-1000MHz, 1.4GHz-2.7GHz 3 V/m 80 % AM (1kHz)

10.1.2 Performance criterion: A, CT, CR

10.2 Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. EUT is set 3 meter away from the transmitting antenna which is mounted on an antenna tower. Both horizontal and vertical polarizations of the antenna are set on test. Each of the four sides of EUT must be faced this transmitting antenna and measured individually. In order to judge the EUT performance.

10.3 Test Data

Radiated Electromagnetic Field Immunity Test Data

Frequency Rang (MHz)	80 MHz –1GHz, 1.4GHz-2.7GHz	
Field Strength (V/m)	3V/m	
Steps (%)	1%	
Performance criterion: A		
	Horizontal	Vertical
Front	Pass	Pass
Rear	Pass	Pass
Left	Pass	Pass
Right	Pass	Pass

11 ELECTRICAL FAST TRANSIENTS/BURSTS IMMUNITY TEST

11.1 Test Requirements

11.1.1 Test Standard

ETSI EN 301 489-1 V2.2.3 (2019-11)

ETSI EN 301 489-3 V2.1.2 (2021-03)

11.1.2 Level

Test Level for EFT Immunity Test

Port	Test Specification
AC Power input	1kV (peak) 5/50 ns Tr/Th 5kHz repetition frequency
Signal line	1kV (peak) 5/50 ns Tr/Th 5kHz repetition frequency

11.1.3 Performance criterion: B, TT, TR

11.2 Test Procedure

11.2.1 For AC mains power ports:

The EUT is connected to the power mains by using a coupling device, which couples the EFT interference signal to AC power lines. Both polarities of the test voltage should be applied during compliance test and the duration of the test is 1minute.

11.3 Test Data

N/A

Note:the equipment is battery powered and this item will not be tested

12 TRANSIENTS AND SURGES TEST

12.1 Test Requirements

12.1.1 Test Standard

ETSI EN 301 489-1 V2.2.3 (2019-11)

ETSI EN 301 489-3 V2.1.2 (2021-03)

12.1.2 Level

Test Level for Surge

Severity Level	Open-Circuit Test Voltage KV
1	0.5
2	1.0
3	2.0
4	4.0
*	Special

12.1.3 Performance criterion: B, TT, TR

12.2 Test Procedure

Set up the EUT and test generator For line to line coupling mode, provide a 0.5KV 1.2/50us voltage surge (at open-circuit condition) and 8/20us current surge to EUT selected points. At least 5 positive and 5 negative (polarity) tests with a maximum 1/min repetition rate are conducted during test. Different phase angles are done individually. Record the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test.

12.3 Test Data

N/A

Note:the equipment is battery powered and this item will not be tested.

13 CONDUCTED IMMUNITY TEST

13.1 Test Requirements

13.1.1 Test Standard

ETSI EN 301 489-1 V2.2.3 (2019-11)

ETSI EN 301 489-3 V2.1.2 (2021-03)

13.1.2 Level

Test Level for Conducted Immunity

Port	Test Specification
Input and output AC power port	0.15MHz~80MHz 3V(r.m.s.) (unmodulated)

13.1.3 Performance criterion: A, CT, CR

13.2 Test Procedure

Set up the EUT, CDN and test generators as shown above. The test is performed with the generator contacted to each CDN in turn. The frequency range is swept from 150kHz to 230MHz, using the signal levels established during the setting process, and with the disturbance signal 80% amplitude modulated with a 1kHz sine wave.

13.3 Test Data

N/A

Note:the equipment is battery powered and this item will not be tested.

14 VOLTAGE DIPS AND INTERRUPTIONS IMMUNITY TEST

14.1 Test Requirements

14.1.1 Test Standard

ETSI EN 301 489-1 V2.2.3 (2019-11)

ETSI EN 301 489-3 V2.1.2 (2021-03)

14.1.2 Level

Test Level for Voltage Dips and Interruptions

Port	Environmental phenomenon	Voltage dip and short interruptions %U _T	Cycle
Input AC power port	Voltage dips	0 %	0.5
		0 %	1
	Voltage interruptions	70 %	25
		0 %	250

14.2 Test Procedure

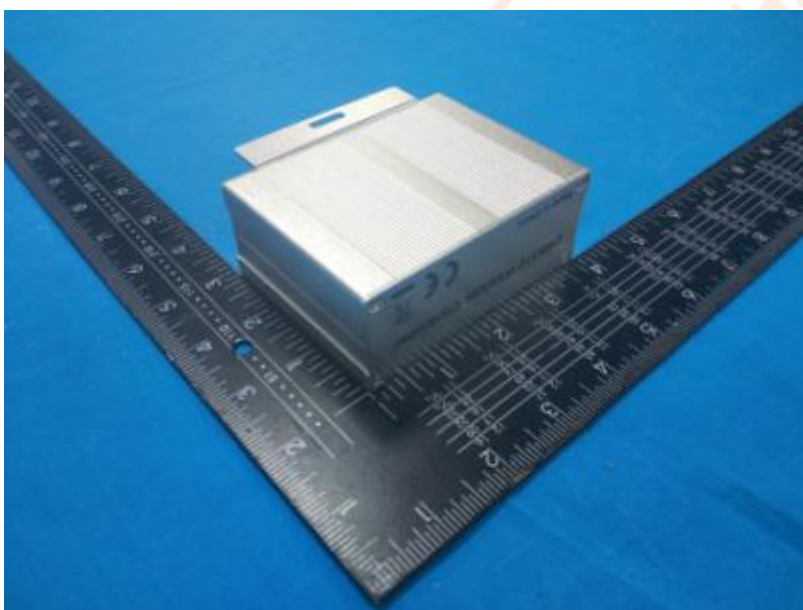
Refer to EN 61000-1-11

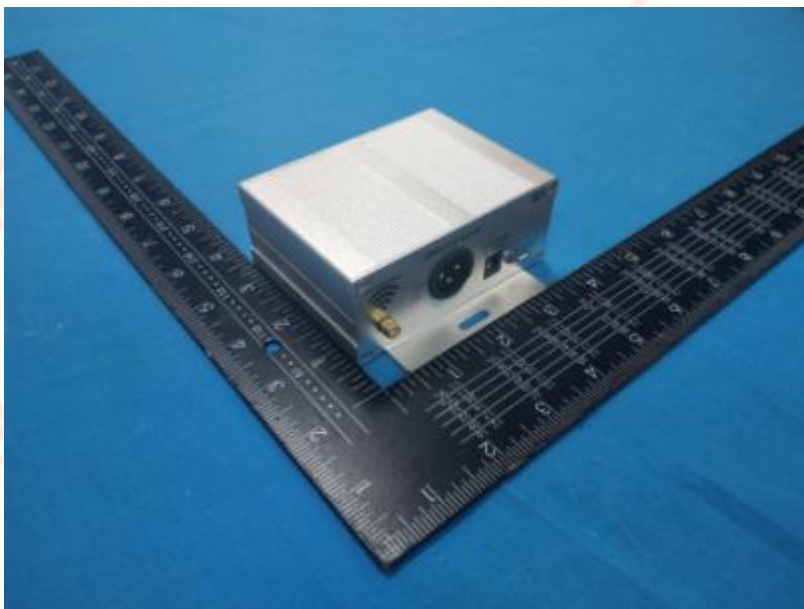
14.3 Test Data

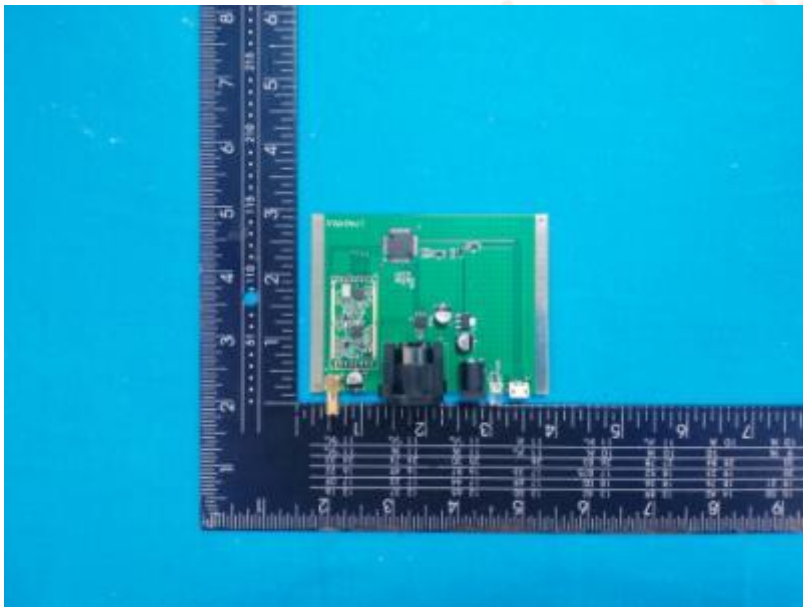
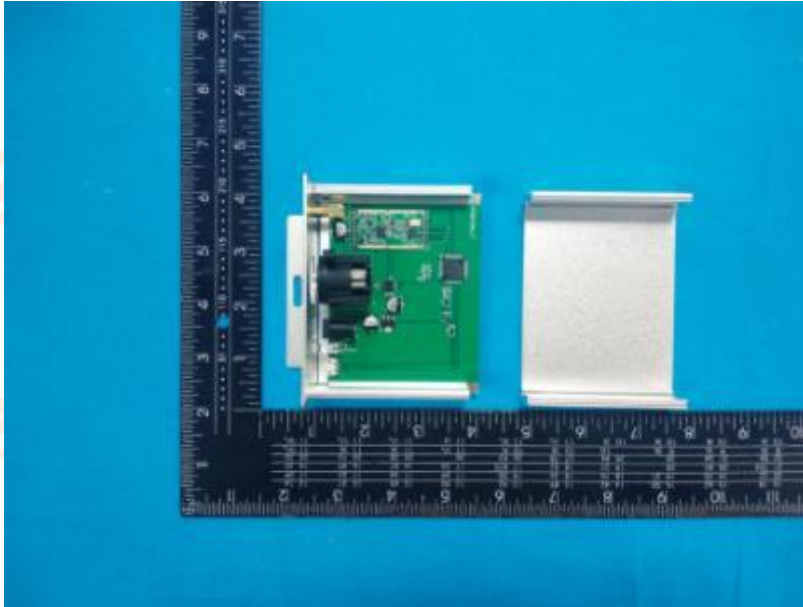
N/A

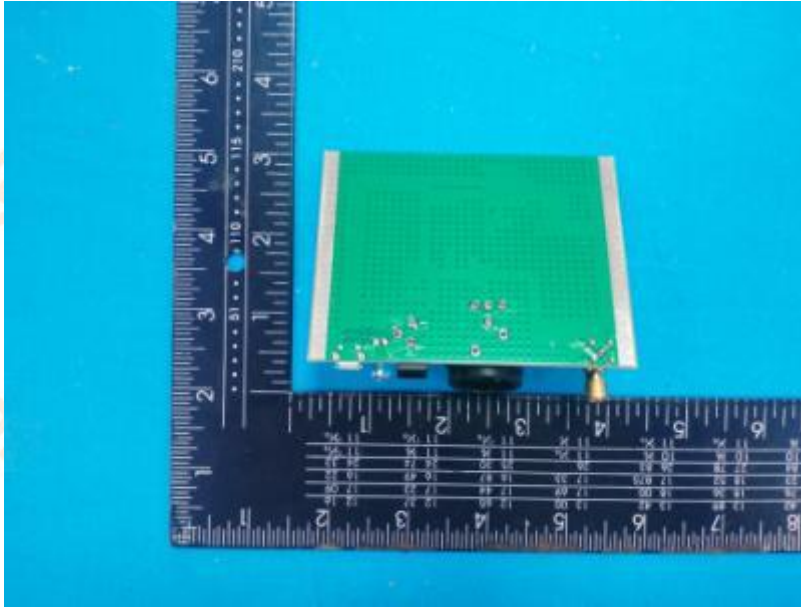
Note:the equipment is battery powered and this item will not be tested.

PHOTOGRAPHS OF EUT









*****THE END REPORT*****