

EMC TEST REPORT

ETSI EN 301 489-1 V2.1.1 (2017-02)

ETSI EN 301 489-17 V3.1.1 (2017-02)

Product : Bluetooth Keyboard
Trade Name : N/A
Model Name : HB-030
Serial Model : HB-028/033/030/098/098D/129/220/250/25
0C/118/119/092/131/133/141/190/X3/X5/X8
/X9/X10

Prepared for

DONGGUAN JINGZUN INTELLIGENT TECHNOLOGY CO.,LTD
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Prepared by

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TEST RESULT CERTIFICATION

Applicant's name.....: DONGGUAN JINGZUN INTELLIGENT TECHNOLOGY CO.,LTD
Address.....: 208, building B, Xingang Industrial Park, No. 38 Xingang Road, Xin'an Community, Chang'an Town, Dongguan
Manufacture's Name.....: DONGGUAN JINGZUN INTELLIGENT TECHNOLOGY CO.,LTD
Address.....: 208, building B, Xingang Industrial Park, No. 38 Xingang Road, Xin'an Community, Chang'an Town, Dongguan

Product description
Product name.....: Bluetooth Keyboard
Model and/or type reference.....: HB-030
Serial Model : HB-028/033/030/098/098D/129/220/250/250C/118/119/092/131/133/141/190/X3/X5/X8/X9/X10
Rating(s).....: DC 5V \pm , 500mA, 0.25W
Standards.....: ETSI EN 301 489-1 V2.1.1 (2017-02)
ETSI EN 301 489-17 V3.1.1 (2017-02)

This device described above has been tested by ZCT, and the test results show that the equipment under test (EUT) is in compliance with the 2014/53/EU RED Directive Art.3.1(b) 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.....: Jun. 22, 2020 ~Jun. 30, 2020
Date of Issue.....: Jun. 30, 2020
Test Result.....: **Pass**

Testing Engineer

Authorized Signatory



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1. TEST RESULTS SUMMARY

Table 1 Test Results Summary

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

N/A* Please refer to Applicability overview tables in sections 7.1 and 7.2 of EN 301 489-1 requirements.

Test sites

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2. GENERAL INFORMATION

2.1. Report information

- 2.1.1. This report is not a certificate of quality; it only applies to the sample of the specific product/equipment given at the time of its testing. The results are not used to indicate or imply that they are application to the similar items. In addition, such results must not be used to indicate or imply that ZCT approves recommends or endorses the manufacture, supplier or use of such product/equipment, or that ZCT in any way guarantees the later performance of the product/equipment.
- 2.1.2. The sample/s mentioned in this report is/are supplied by Applicant, ZCT therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture or any information supplied.
- 2.1.3. Additional copies of the report are available to the Applicant at an additional fee. No third part can obtain a copy of this report through ZCT, unless the applicant has authorized ZCT in writing to do so.

2.2. 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	$\pm 2\%$



3. PRODUCT DESCRIPTION

3.1. EUT Description

		Bluetooth Keyboad
Frequency Range	:	2400-2480MHz
Number of Channels	:	79
Type of Antenna	:	Internal Antenna
Antenna Gain	:	0.5 dBi
Data Rate	:	/
Power Supply	:	DC 5V \pm 5%, 500mA, 0.25W



3.2. Block Diagram of EUT Configuration

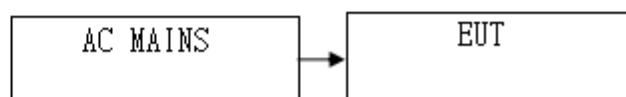


Figure 1 EUT SETUP

3.3. Support Equipment List

Table 2 Ancillary Equipment

Name	Model No	S/N	Manufacturer
-		-	

3.4. Operating Condition of EUT

Test mode 1: BT communication mode

Test mode 2: Play music mode

3.5. Test Conditions

Temperature: 20-26°C

Relative Humidity: 50-68 %

3.6. Modifications

No modification was made.



3.7. Abbreviations

AC	Alternating Current
AMN	Artificial Mains Network
DC	Direct Current
EM	ElectroMagnetic
EMC	ElectroMagnetic Compatibility
EUT	Equipment Under Test
IF	Intermediate Frequency
RF	Radio Frequency
rms	Root Mean Square
EMI	Electromagnetic Interference
EMS	Electromagnetic Susceptibility



3.8. Performance Criterion

For Bluetooth, Wi-Fi, GPS,

Criterion A: The equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the equipment is used as intended.

Criterion B: After the test, the equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the equipment is used as intended.

Criterion C: Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions.

For GSM,

CT, CR, TT, TR

Monitoring for Continuous Phenomena Applied to MS

At the start of the test, a communication link shall be established. During the test, the operator shall observe whether the communication link is maintained. Traffic quality is measured by SS. It should be not more than 3. At the conclusion of the test, the operator shall directly check whether the EUT operate as intended with no loss of user control functions or stored data.

In addition to confirming the above performance during a call, the test is also been performed in idle mode, with an interference receiver to monitor whether the transmitter unintentionally operates.

Monitoring for Transient Phenomena Applied to MS

At the start of the test, a communication link shall be established. At the conclusion of each

exposure, the operator shall directly observe if the EUT operate with no user noticeable loss of the communication link. At the conclusion of the total test comprising the series of individual

exposures, the operator shall directly check if the EUT operate as intended with no loss of user

control functions or stored data, and the communication link has been maintained.

In addition to confirming the above performance during a call, the test is also been performed in idle mode, and monitor if transmitter unintentionally operates with an interference receiver.



4. TEST EQUIPMENT USED

4.1. Test Equipment Used to Measure Conducted Disturbance

Table 1 Conducted Disturbance Test Equipment

No.	Equipment	Manufacturer	Model No.	Last Cal.	Cal. Interval
SB3319	EMI Test Receiver	Rohde & Schwarz	ESCS30	Aug.12.2020	1 Year
SB4357	AMN	Rohde & Schwarz	ENV216	Aug.12.2020	1 Year

4.2. Test Equipment Used to Measure Radiated Disturbance

Table 2 Radiated Disturbance Test Equipment

No.	Equipment	Manufacturer	Model No.	Last Cal.	Cal. Interval
SB3436	EMI Test Receiver	Rohde & Schwarz	ESI26	Aug.12.2020	1 Year
SB3440	Bilog Antenna	Chase	CBL6112B	Aug.12.2020	1 Year
SB4436	Horn Antenna	Sunol Sciences	DRH-118	Aug.12.2020	1 Year

4.3. Test Equipment Used to Measure Harmonic Current /Voltage Fluctuation and Flicker

Table 3 Harmonic Current /Voltage Fluctuation and Flicker Test Equipment

No.	Equipment	Manufacturer	Model No.	Last Cal.	Cal. Interval
SB2588	Power	CI	5001ix-CTS-400	Aug.12.2020	1 Year
SB2588/01	Three Phase Harmonic flicker test system	CI	PACS-3	Aug.12.2020	1 Year
SB2588/02	Power	CI	5001ix-CTS-400-NO	Aug.12.2020	1 Year
SB2588/03	Power	CI	5001ix-CTS-400-NO	Aug.12.2020	1 Year

4.4. Test Equipment Used to Measure Electrostatic Discharge Immunity

Table 4 ESD Immunity Test Equipment

No.	Equipment	Manufacturer	Model No.	Last Cal.	Cal. Interval
SB2561	ESD tester	SCHNAFFNER	NSG435	Aug.12.2020	1 Year

4.5. Test Equipment Used to Measure Burst/Surge/Voltage Dips and Interruptions Immunity

Table 5 Surge Immunity Test Equipment

No.	Equipment	Manufacturer	Model No.	Last Cal.	Cal. Interval
SB3070	Simulator	EMTEST	UCS500M4	Aug.12.2020	1 Year



4.6. Test Equipment Used to Measure RF Electromagnetic Fields Immunity

And to Measure Conducted Immunity

Table 6 Radiated Electromagnetic Field Immunity and Conducted Immunity, keyed carrier Test Equipment

No.	Equipment	Manufacturer	Model No.	Last Cal.	Cal. Interval
n/a	Shielding Effectiveness of Anechoic chamber	Changzhou zhongyu	966	Aug.12.2020	1 Year
3426A01345	Signal Generator (9KHz-3.2GHz)	HP	8648C	Aug.12.2020	1 Year
H1004497	Power Amplifier (30MHz-1GHz)	Amplifier Research	250W1000A	NCR	1 Year
H1004498	Power Amplifier (800MHz-3.0GHz)	Amplifier Research	60S1G3	NCR	1 Year
A040904-2	Bi-log Antenna (28MHz-2GHz)	Sunol Sciences	JB1	Aug.12.2020	1 Year
n/a	High gain horn Antenna (800MHz-5GHz)	Amplifier Research	AT4002A	Aug.12.2020	1 Year
106891	Universal Radio Communication Tester	R & S	CMU200	Aug.12.2020	1 Year
1201-05	CDN	EM Test	M3	Aug.12.2020	1 Year
303277	C/S Tester	EM Test	CWS500	Aug.12.2020	1 Year
303282	Attenuator	EM Test	6 dB	NCR	1 Year
n/a	Shielding Effectiveness of Anechoic chamber	Changzhou zhongyu	743	Aug.12.2020	1 Year

4.7. Test Equipment Used to Measure Burst/Surge/Voltage Dips and Interruptions Immunity

Table 7 Surge Immunity Test Equipment

No.	Equipment	Manufacturer	Model No.	Last Cal.	Cal. Interval
SB3070	Simulator	EMTEST	UCS500M4	Aug.12.2020	1 Year



5. CONDUCTED DISTURBANCE TEST

5.1. Test Standard and Limit

5.1.1. Test Standard

ETSI EN 301 489-1 V2.1.1 (2017-02)

ETSI EN 301 489-17 V3.1.1 (2017-02)

5.1.2. Test Limit

Table 10 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. Test Procedure

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 form 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.

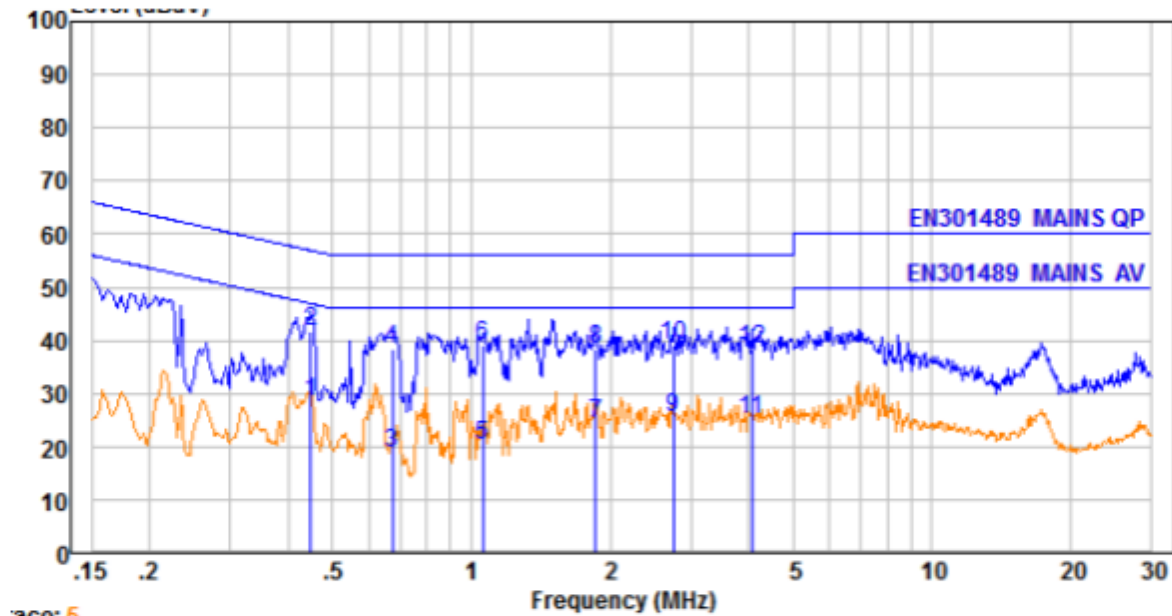
5.4. Test Data

Table 11 Conducted Disturbance Test Data

Test Mode: BT communication mode Worst case mode



230 V/ 50 Hz, Line

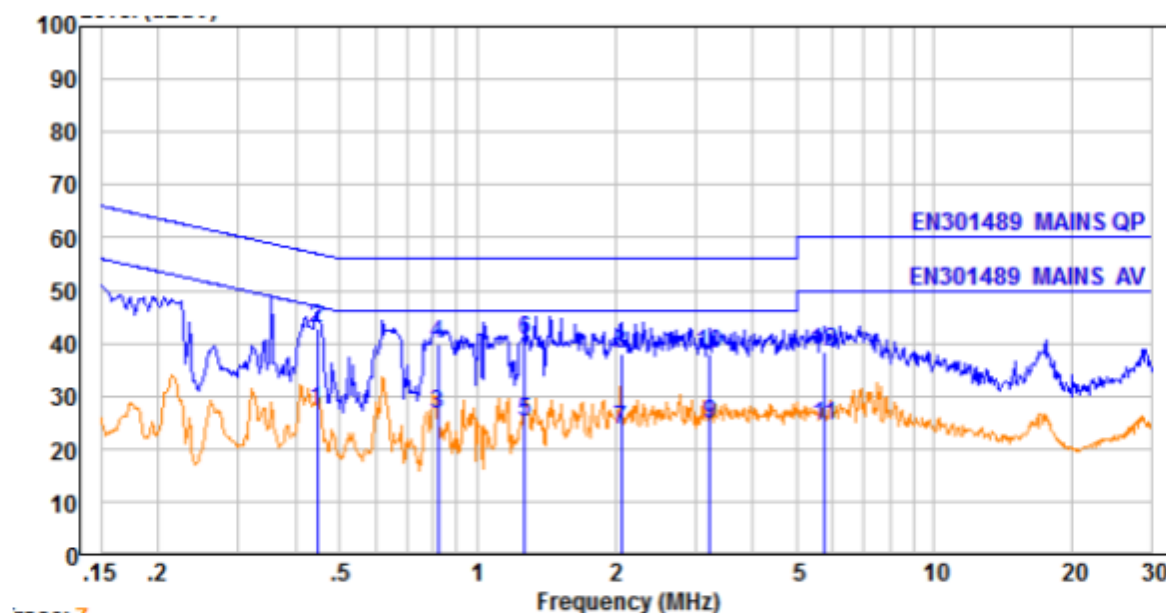


ace: 5

No.	Freq MHz	Cable Loss dB	AMN Factor dB	Receiver Reading dBμV	Emission Level dBμV	Limit dBμV	Over Limit dB	Remark
1.	0.449	0.42	9.61	18.44	28.47	46.89	-18.42	Average
2.	0.449	0.42	9.61	31.80	41.83	56.89	-15.06	QP
3.	0.675	0.44	9.61	8.81	18.86	46.00	-27.14	Average
4.	0.675	0.44	9.61	28.46	38.51	56.00	-17.49	QP
5.	1.060	0.46	9.61	10.28	20.35	46.00	-25.65	Average
6.	1.060	0.46	9.61	28.95	39.02	56.00	-16.98	QP
7.	1.858	0.47	9.61	14.35	24.43	46.00	-21.57	Average
8.	1.858	0.47	9.61	28.31	38.39	56.00	-17.61	QP
9.	2.750	0.47	9.63	15.34	25.44	46.00	-20.56	Average
10.	2.750	0.47	9.63	28.95	39.05	56.00	-16.95	QP
11.	4.070	0.47	9.65	15.03	25.15	46.00	-20.85	Average
12.	4.070	0.47	9.65	28.27	38.39	56.00	-17.61	QP



230 V/ 50 Hz, Neutral:



Trace: 7

No.	Freq MHz	Cable Loss dB	AMN Factor dB	Receiver Reading dBμV	Emission Level dBμV	Limit dBμV	Over Limit dB	Remark
1.	0.447	0.42	9.63	17.15	27.20	46.93	-19.73	Average
2.	0.447	0.42	9.63	32.58	42.63	56.93	-14.30	QP
3.	0.822	0.45	9.64	16.66	26.75	46.00	-19.25	Average
4.	0.822	0.45	9.64	29.78	39.87	56.00	-16.13	QP
5.	1.269	0.46	9.64	15.06	25.16	46.00	-20.84	Average
6.	1.269	0.46	9.64	30.31	40.41	56.00	-15.59	QP
7.	2.066	0.47	9.64	13.69	23.80	46.00	-22.20	Average
8.	2.066	0.47	9.64	27.92	38.03	56.00	-17.97	QP
9.	3.224	0.47	9.66	14.59	24.72	46.00	-21.28	Average
10.	3.224	0.47	9.66	27.96	38.09	56.00	-17.91	QP
11.	5.774	0.52	9.73	14.08	24.33	50.00	-25.67	Average
12.	5.774	0.52	9.73	27.95	38.20	60.00	-21.80	QP



6. RADIATED DISTURBANCE TEST

6.1. Test Standard and Limit

6.1.1. Test Standard

ETSI EN 301 489-1 V2.1.1 (2017-02)

ETSI EN 301 489-17 V3.1.1 (2017-02)

6.1.2. Test Limit

Radiated Disturbance Test Limit (Class B)

Frequency	Limit (dB μ V/m)
	Quasi-peak Level
30MHz~230MHz	37
230MHz~1000MHz	42

* 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	47	65
3000MHz~6000MHz	51	69

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.

6.3. Test Arrangement

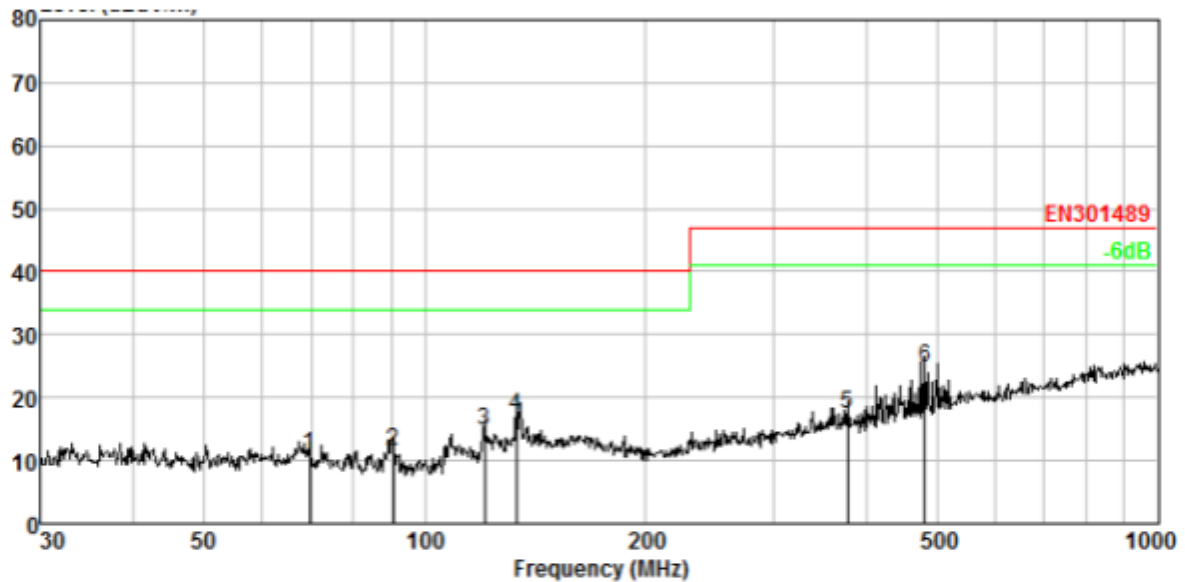
The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application. The detailed information refers to test picture.



6.4. Test Data

Test mode: *BT communication mode* **Worst case mode**

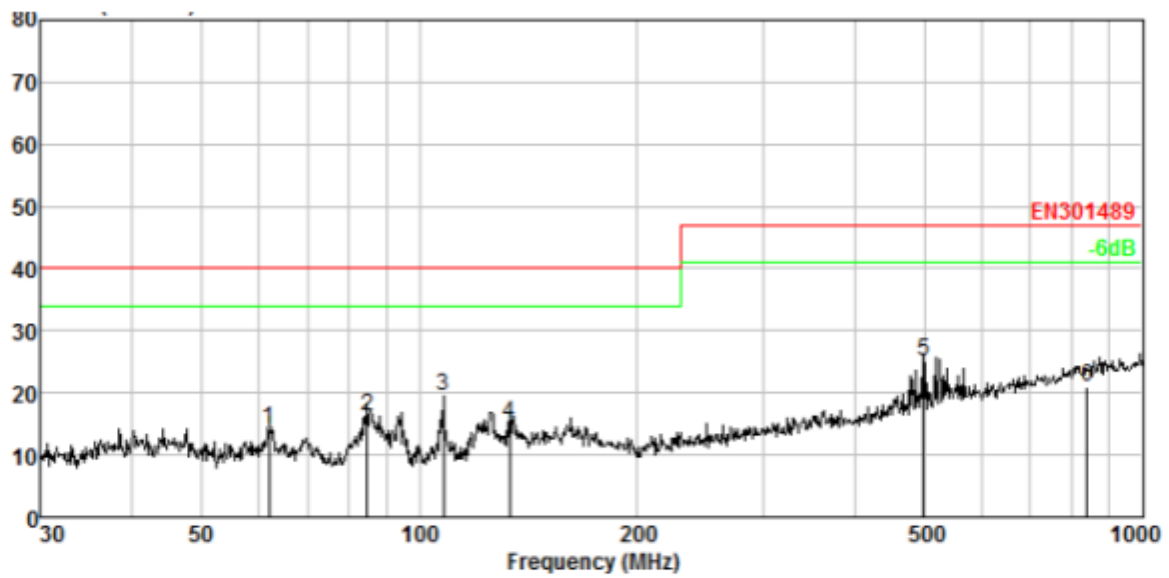
Horizontal



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.	69.600	2.65	10.17	28.20	29.95	11.07	40.00	-28.93	QP
2.	90.537	3.10	9.19	29.26	29.98	11.57	40.00	-28.43	QP
3.	120.699	3.60	12.05	28.98	30.00	14.63	40.00	-25.37	QP
4.	133.151	3.77	12.88	30.60	30.01	17.24	40.00	-22.76	QP
5.	377.259	5.56	14.62	27.90	30.62	17.46	47.00	-29.54	QP
6.	480.528	5.97	16.65	32.91	30.86	24.67	47.00	-22.33	QP



Vertical



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.	61.995	2.45	11.41	30.19	29.94	14.11	40.00	-25.89	QP
2.	84.702	2.99	8.72	34.59	29.97	16.33	40.00	-23.67	QP
3.	107.888	3.40	10.56	35.45	30.00	19.41	40.00	-20.59	QP
4.	133.151	3.77	12.88	28.53	30.01	15.17	40.00	-24.83	QP
5.	497.677	6.03	17.05	32.79	30.90	24.97	47.00	-22.03	QP
6.	839.182	6.93	21.56	23.68	31.12	21.05	47.00	-25.95	QP



1 G-6G:

Note:

Emissions attenuated more than 20 dB below the permissible value are not reported.

phase	Frequency (MHz)	Reading (dBuV/m)	Detector	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Result
H	1189.35	44.49	peak	0.47	44.96	70.00	PASS
H	1189.35	32.57	AVG	0.47	33.04	50.00	PASS
H	2361.66	42.81	peak	6.64	49.45	70.00	PASS
H	2361.66	29.22	AVG	6.64	35.86	50.00	PASS
H	2972.98	42.06	peak	10.28	52.34	70.00	PASS
H	2972.98	26.22	AVG	10.28	36.5	50.00	PASS
V	1199.31	46.98	peak	0.47	47.45	70.00	PASS
V	1199.31	33.66	AVG	0.47	34.13	50.00	PASS
V	2381.75	39.01	peak	6.89	45.9	70.00	PASS
V	2381.75	25.86	AVG	6.89	32.75	50.00	PASS
V	2975.18	42.93	peak	10.28	53.21	70.00	PASS
V	2975.18	28.53	AVG	10.28	38.81	50.00	PASS



7. HARMONIC CURRENT EMISSION TEST

7.1. Test Standard and Limit

7.1.1. Test Standard

ETSI EN 301 489-1 V2.1.1 (2017-02)

ETSI EN 301 489-17 V3.1.1 (2017-02)

7.1.2. Limits

Table 13 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
$8 \leq n \leq 40$	$0.23 \times 8/n$

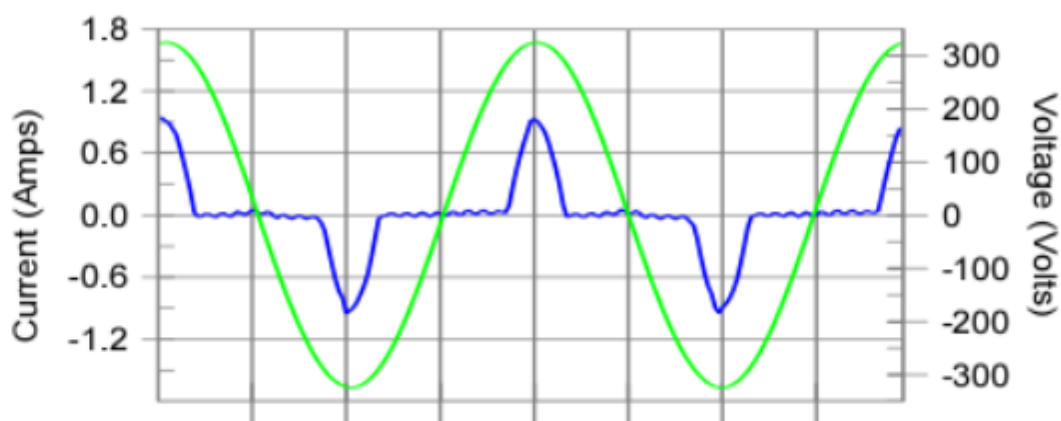
7.2. Test Procedure

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.



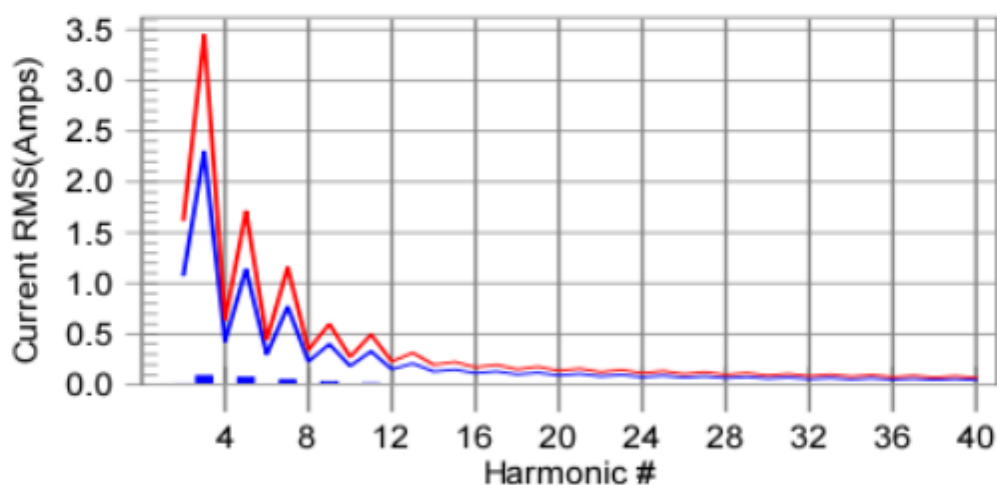
7.3. Test Data

Current & voltage waveforms



Harmonics and Class A limit line

European Limits



Test result: Pass Worst harmonic was #9 with 6.8% of the limit.



Current Test Result Summary (Run time)

Test Result: Pass Source qualification: Normal
 THC(A): 0.126 I-THD(%): 115.2 POHC(A): 0.000 POHC Limit(A): 0.251
 Highest parameter values during test:
 V_RMS (Volts): 229.79 Frequency(Hz): 50.00
 I_Peak (Amps): 0.957 I_RMS (Amps): 0.335
 I_Fund (Amps): 0.169 Crest Factor: 4.404
 Power (Watts): 39.0 Power Factor: 0.703

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.008	1.080	0.7	0.009	1.620	0.6	Pass
3	0.088	2.300	3.8	0.138	3.450	4.0	Pass
4	0.005	0.430	N/A	0.006	0.645	N/A	Pass
5	0.071	1.140	6.2	0.104	1.710	6.1	Pass
6	0.002	0.300	N/A	0.003	0.450	N/A	Pass
7	0.046	0.770	6.0	0.061	1.155	5.3	Pass
8	0.003	0.230	N/A	0.003	0.345	N/A	Pass
9	0.027	0.400	6.8	0.031	0.600	5.1	Pass
10	0.001	0.184	N/A	0.002	0.276	N/A	Pass
11	0.012	0.330	3.8	0.016	0.495	3.2	Pass
12	0.001	0.153	N/A	0.002	0.230	N/A	Pass
13	0.006	0.210	3.0	0.009	0.315	2.9	Pass
14	0.001	0.131	N/A	0.001	0.197	N/A	Pass
15	0.006	0.150	3.7	0.009	0.225	4.0	Pass
16	0.001	0.115	N/A	0.001	0.173	N/A	Pass
17	0.005	0.132	4.0	0.007	0.198	3.7	Pass
18	0.001	0.102	N/A	0.001	0.153	N/A	Pass
19	0.005	0.118	N/A	0.006	0.178	N/A	Pass
20	0.001	0.092	N/A	0.001	0.138	N/A	Pass
21	0.004	0.107	N/A	0.004	0.161	N/A	Pass
22	0.000	0.084	N/A	0.001	0.125	N/A	Pass
23	0.003	0.098	N/A	0.004	0.147	N/A	Pass
24	0.000	0.077	N/A	0.001	0.115	N/A	Pass
25	0.003	0.090	N/A	0.003	0.135	N/A	Pass
26	0.000	0.071	N/A	0.000	0.107	N/A	Pass
27	0.002	0.083	N/A	0.002	0.125	N/A	Pass
28	0.000	0.066	N/A	0.001	0.099	N/A	Pass
29	0.002	0.078	N/A	0.003	0.116	N/A	Pass
30	0.000	0.061	N/A	0.001	0.092	N/A	Pass
31	0.002	0.073	N/A	0.003	0.109	N/A	Pass
32	0.000	0.058	N/A	0.001	0.086	N/A	Pass
33	0.002	0.068	N/A	0.003	0.102	N/A	Pass
34	0.000	0.054	N/A	0.000	0.081	N/A	Pass
35	0.002	0.064	N/A	0.003	0.096	N/A	Pass
36	0.000	0.051	N/A	0.000	0.077	N/A	Pass
37	0.001	0.061	N/A	0.002	0.091	N/A	Pass
38	0.000	0.048	N/A	0.000	0.073	N/A	Pass
39	0.001	0.058	N/A	0.002	0.087	N/A	Pass
40	0.000	0.046	N/A	0.000	0.069	N/A	Pass



Voltage Source Verification Data (Run time)

Test Result: Pass Source qualification: Normal

Highest parameter values during test:

Voltage (Vrms):	229.79	Frequency(Hz):	50.00
I_Peak (Amps):	0.957	I_RMS (Amps):	0.335
I_Fund (Amps):	0.169	Crest Factor:	4.404
Power (Watts):	39.0	Power Factor:	0.703

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.157	0.460	34.11	OK
3	0.542	2.068	26.22	OK
4	0.053	0.459	11.47	OK
5	0.029	0.919	3.15	OK
6	0.038	0.460	8.17	OK
7	0.048	0.689	6.90	OK
8	0.024	0.459	5.12	OK
9	0.025	0.459	5.40	OK
10	0.028	0.460	6.16	OK
11	0.017	0.230	7.25	OK
12	0.020	0.230	8.85	OK
13	0.022	0.230	9.64	OK
14	0.012	0.230	5.14	OK
15	0.017	0.230	7.39	OK
16	0.015	0.230	6.33	OK
17	0.013	0.230	5.47	OK
18	0.015	0.230	6.36	OK
19	0.014	0.230	5.91	OK
20	0.016	0.230	6.88	OK
21	0.009	0.230	3.82	OK
22	0.007	0.230	3.18	OK
23	0.009	0.230	4.08	OK
24	0.005	0.230	2.31	OK
25	0.010	0.230	4.32	OK
26	0.009	0.230	4.05	OK
27	0.007	0.230	3.20	OK
28	0.007	0.230	3.19	OK
29	0.004	0.230	1.72	OK
30	0.007	0.230	3.16	OK
31	0.009	0.230	3.77	OK
32	0.006	0.230	2.76	OK
33	0.004	0.230	1.77	OK
34	0.002	0.230	1.01	OK
35	0.006	0.230	2.79	OK
36	0.003	0.230	1.44	OK
37	0.003	0.230	1.33	OK
38	0.003	0.230	1.25	OK
39	0.006	0.230	2.53	OK
40	0.006	0.230	2.72	OK



8. VOLTAGE FLUCTUATION AND FLICKER TEST

8.1. Test Standard and Limit

8.1.1. Test Standard

ETSI EN 301 489-1 V2.1.1 (2017-02)

ETSI EN 301 489-17 V3.1.1 (2017-02)

8.1.2. Limit

Table 14 Flicker Test Limit

Test items	Limits
Pst	1.0
dc	3.3%
dmax	4.0%
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

Maximum Flicker results			
	EUT values	Limit	Result
Pst	0.06	1.00	PASS
dc [%]	0.00	3.30	PASS
dmax [%]	0.04	4.00	PASS
dt [s]	0.00	0.50	PASS



9. ELECTROSTATIC DISCHARGE IMMUNITY TEST

9.1. Test Requirements

9.1.1. Test Standard

ETSI EN 301 489-1 V2.1.1 (2017-02)

ETSI EN 301 489-17 V3.1.1 (2017-02)

9.1.2. Test Level

Table 16 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

Table 17 ESD Immunity Test Data

Test Mode: please refer to page 8			
Location	Test condition	Performance criterion	Results
Slots	Air discharge 10 times per test point Level: ± 2 kV, ± 4 kV, ± 8 kV	B	Pass
Non-metal keys		B	Pass
VCP	Contact discharge 10 times per test point Level: ± 2 kV, ± 4 kV	B	Pass
HCP		B	Pass
Screw		B	Pass
Surface		B	Pass



10. RADIATED ELECTROMAGNETIC FIELD IMMUNITY TEST

10.1. Test Requirements

10.1.1. Test Standard

ETSI EN 301 489-1 V2.1.1 (2017-02)

ETSI EN 301 489-17 V3.1.1 (2017-02)

10.1.2. Test Level

Table 18 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)

10.1.3. 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

Table 19 Radiated Electromagnetic Field Immunity Test Data

Test Mode: <i>please refer to page 8</i>		
Frequency (MHz)	Rang	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 V2.1.1 (2017-02)

ETSI EN 301 489-17 V3.1.1 (2017-02)

11.1.2. Level

Table 20 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 1 minute.



11.3. Test Data

Table 21 EFT Test Data

Test Mode: please refer to page 8					
Injected Line	Voltage (kV)	Test Time (s)	Injected Method	Performance criterion	Result
L	+1	60	Direct	B	Pass
	-1	60	Direct	B	Pass
N	+1	60	Direct	B	Pass
	-1	60	Direct	B	Pass
L,N	+1	60	Direct	B	Pass
	-1	60	Direct	B	Pass



12. TRANSIENTS AND SURGES TEST

12.1. Test Requirements

12.1.1. Test Standard

ETSI EN 301 489-1 V2.1.1 (2017-02)

ETSI EN 301 489-17 V3.1.1 (2017-02)

12.1.2. Level

Table 22 Test Level for Surge

Severity Level	Open-Circuit Test Voltage KV
1	13.5
2	14.0
3	15.0
4	4.0
*	Special

15.1.1. Performance criterion: **B, TT, TR**

15.2. 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.



15.3. Test Data

Table 23 Surge Test Data

Test Mode: please refer to page 8							
Injected Line	Wave Form	Voltage (kV)	Phase	Number of Pulse	Performance criterion	Interval time	Result
L-N	1.2/50us	+1.0	0°, 90°, 180°, 270°	20	B	60s	Pass
		-1.0	0°, 90°, 180°, 270°	20	B	60s	Pass



16. CONDUCTED IMMUNITY TEST

16.1. Test Requirements

16.1.1. Test Standard

ETSI EN 301 489-1 V2.1.1 (2017-02)

ETSI EN 301 489-17 V3.1.1 (2017-02)

16.1.2. Level

Table 24 Test Level for Conducted Immunity

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

16.1.3. Performance criterion: **A, CT, CR**

16.2. 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.



16.3. Test Data

Table 25 Conducted Immunity Test Data

Test Mode: <i>please refer to page 8</i>				
Frequency Range (MHz)	Injected Position	Strength	Performance criterion	Result
0.15MHz ~ 80MHz	AC Lines	3V(rms), Unmodulated	A	Pass
Dwell time: 1s; Steps: 1%				



17. VOLTAGE DIPS AND INTERRUPTIONS IMMUNITY TEST

17.1. Test Requirements

17.1.1. Test Standard

ETSI EN 301 489-1 V2.1.1 (2017-02)

ETSI EN 301 489-17 V3.1.1 (2017-02)

17.1.2. Level

Table 26 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

17.2. Test Procedure

Refer to EN 61000-4-11

17.3. Test Data

Test Mode: <i>please refer to page 8</i>				
Test Level % UT	Voltage Dips & Short Interruptions % UT	Duration (in periods)	Performance criterion	Result
0	100	0.5P	A	Pass
0	100	1P	A	Pass
70	30	25P	A	Pass
0	100	250P	A	Pass
Note: 1. UT is the rated voltage for the equipment. 2. P = 20ms				



APPENDIX PHOTOS

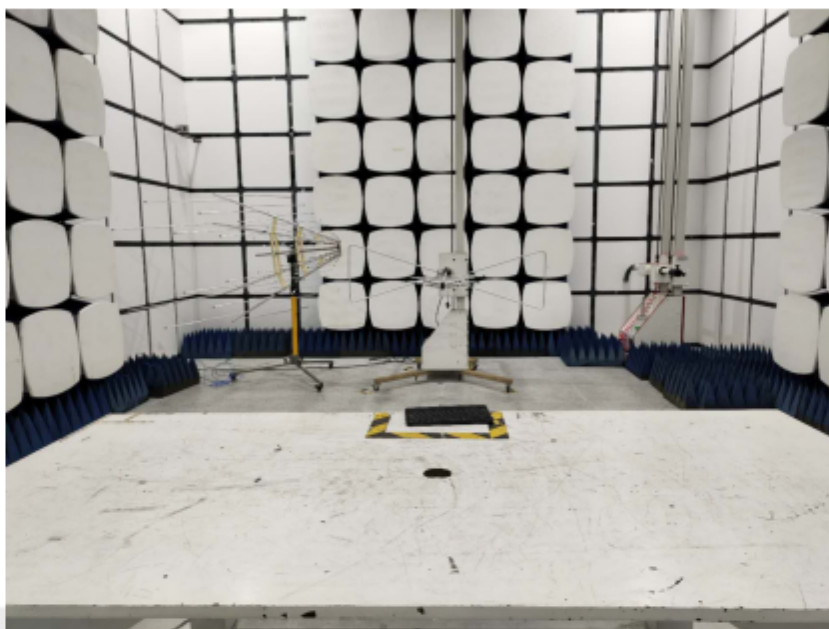


Photo 1

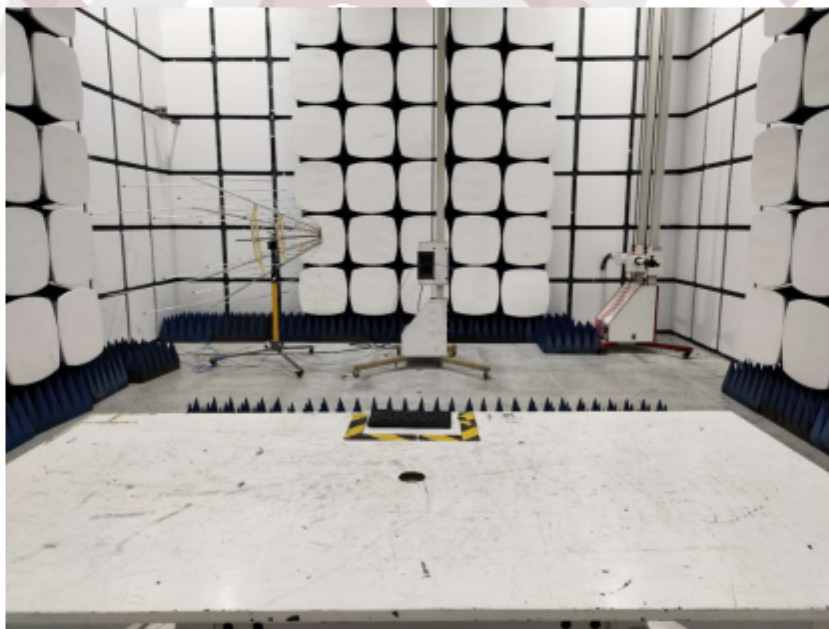


Photo 2





Photo 3



Photo 4





Photo 5

*****END OF REPORT*****

