TEST REPORT

Product Name:	LoRa Module
Trademark:	B&T 博安通 , 安信可科技 Ai-Thinker
Model Number:	Ra-01SC
Prepared For:	Shenzhen Ai-Thinker Technology Co., Ltd
Address:	410, Block C, Huafeng Smart Innovation Port. Gushu 2nd Road, Gushu Community, Xixiang Street, Baoan District, Shenzhen, China
Manufacturer:	Shenzhen Ai-Thinker Technology Co., Ltd
Address:	410, Block C, Huafeng Smart Innovation Port. Gushu 2nd Road, Gushu Community, Xixiang Street, Baoan District, Shenzhen, China
Prepared By:	Shenzhen CTB Testing Technology Co., Ltd.
Address:	Floor 1&2, Building A, No. 26 of Xinhe Road, Xinqiao Street, Baoan District, Shenzhen, China
Sample Received Date:	May. 15, 2021
Sample tested Date:	May. 15, 2021 - May. 26, 2021
Issue Date:	Jul. 5, 2021
Report No.:	CTB210527019REX
Test Standards	ETSI EN 301 489-1 V2.2.3 (2019-11) ETSI EN 301 489-3 V2.1.1 (2019-03)
Test Results	PASS
Remark:	This is RED EMC test report.

Compiled by:	Reviewed by:	Approved by:
Arron Liu	Bin Mei	Rita Xiao / Director

The test report is effective only with both signature and specialized stamp. This result(s) shown in this report refer only to the sample(s) tested. Without written approval of Shenzhen CTB Testing Technology Co., Ltd. this report can't be reproduced except in full. The tested sample(s) and the sample information are provided by the client.

TABLE OF CONTENT

(Note: N/A means not applicable)

1. VERSION

Report No.	Issue Date	Description	Approved
CTB210527019REX	Jul. 5, 2021	Original	Valid

2. TEST SUMMARY

The Product has been tested according to the following specifications:

EMISSION		
Standard	**Test Item**	**Test result**
EN 55032	Conducted emissions from the AC mains power ports	Pass
EN 55032	Asymmetric mode conducted emissions	N/A[1]
EN 55032	Conducted differential voltage emissions	N/A[2]
EN 55032	Radiated emissions	Pass
EN 61000-3-2	Harmonic current emission(H)	N/A[3]
EN 61000-3-3	Voltage fluctuations & flicker(F)	N/A

IMMUNITY		
Standard	**Test Item**	**Test result**
IEC 61000-4-2	Electrostatic discharge (ESD)	Pass
IEC 61000-4-3	Continuous RF electromagnetic field disturbances(RS)	Pass[#]
IEC 61000-4-4	Electrical fast transients/burst (EFT)	N/A
IEC 61000-4-5	Surges	N/A
IEC 61000-4-6	Radio frequency, common mode	N/A
IEC 61000-4-11	Voltage dips and interruptions (DIPS)	N/A

Remark:
"#"indicates the testing item(s) was (were) fulfilled by subcontracted lab.
1. Applicable to ports listed above and intended to connect to cables longer than 3 m.
2. The Product has no antenna port.
3. The Product belongs to Class A, and its power is less than 75W, so it deems to fulfil this standard without testing.

3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Test item	Value (dB)
Conducted Emission (150KHz-30MHz)	3.2
Radiated Emission(30MHz ~ 1000MHz)	4.8
Radiated Emission(1GHz ~6GHz)	4.9

4. PRODUCT INFORMATION AND TEST SETUP

4.1 Product Information

Model(s): Ra-01SC

Model Description: N/A

SRD: 433.92MHz

Receiver Category: 2

Hardware Version: V1.1

Software Version: V1.1

Type of Modulation: Lora

Antenna installation: Internal Antenna

Ratings: DC 5V from PC

4.2 Test Setup Configuration

See test photographs attached in EUT TEST SETUP PHOTOGRAPHS for the actual connections between Product and support equipment.

4.3 Support Equipment

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
/	/	/	/	/	/

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.

4.4 Test Mode

Test item	Test Mode	Test Voltage
Conducted emissions from the AC mains power ports (150KHz-30MHz) Class B	SRD	AC 230V
	/	/
Radiated emissions(30MHz-6GHz) Class B	/	/
	SRD	AC 230V
Electrostatic discharge (ESD) ☒Air Discharge: ±2,4,8kV ☒Contact Discharge: ±2,4kV ☒HCP & VCP: ±2,4kV	/	/
	SRD	AC 230V
	/	/
Continuous RF electromagnetic field disturbances(RS) ☒80MHz-6000MHz , 3V/m,80%	/	/
	SRD	AC 230V
	/	/
All test mode were tested and passed, only Conducted Emissions, Radiated Emissions Harmonic Current Emissions and Voltage Fluctuations and Flicker shows (1)s the worst case mode which were recorded in this report.		

5. TEST FACILITY AND TEST INSTRUMENT USED

5.1 Test Facility

All measurement facilities used to collect the measurement data are located at Floor 1&2, Building A, No. 26 of Xinhe Road, Xinqiao Street, Baoan District, Shenzhen China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards.

5.2 Test Instrument Used

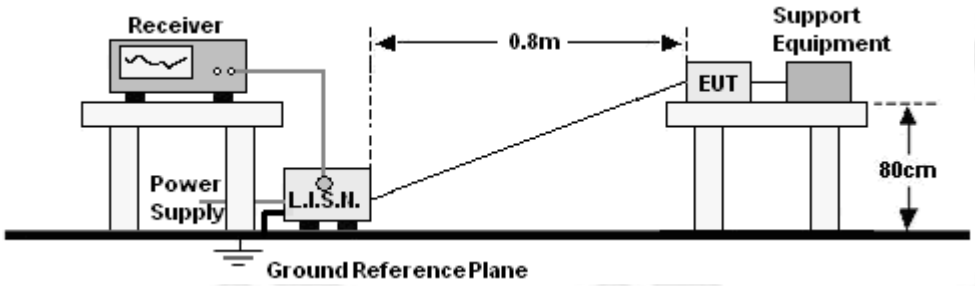
Conducted emissions Test					
Equipment	**Manufacturer**	**Model#**	**Serial#**	**Last Cal.**	**Next Cal.**
AMN	ROHDE&SCHWARZ	ESH3-Z5	100318	Sep. 28, 2020	Sep. 28, 2021
Pulse limiter	ROHDE&SCHWARZ	ESH3Z2	357881052	Sep. 28, 2020	Sep. 28, 2021
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESPI	100362	Sep. 28, 2020	Sep. 28, 2021
Coaxial cable	ZDECL	Z302S	18091269	Sep. 28, 2020	Sep. 28, 2021
ISN	TESEQ	NTFM8158	183	Sep. 28, 2020	Sep. 28, 2021
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	10428/003	Sep. 28, 2020	Sep. 28, 2021
Software	Fala	EZ-EMC	EMC-CON 3A1.1	\	\

Radiated emissions Test (966 chamber)					
Equipment	**Manufacturer**	**Model#**	**Serial#**	**Last Cal.**	**Next Cal.**
Double Ridged Broadband Horn Antenna	Schwarzbeck	BBHA 9120 D	1911	Nov. 02, 2020	Nov. 02, 2023
TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	00869	Nov. 02, 2020	Nov. 02, 2021
Amplifier	Agilent	8449B	3008A01838	Sep. 28, 2020	Sep. 28, 2021
Amplifier	HP	8447E	2945A02747	Sep. 28, 2020	Sep. 28, 2021
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESPI	100362	Sep. 28, 2020	Sep. 28, 2021
Coaxial cable	ZDECL	ZT26	18091906	Nov. 02, 2020	Nov. 01, 2021
Coaxial cable	ZDECL	ZT26	18097604	Nov. 02, 2020	Nov. 01, 2021
Coaxial cable	ZDECL	ZT26	18091908	Nov. 02, 2020	Nov. 01, 2021
Coaxial cable	ZDECL	ZT26	18091907	Nov. 02, 2020	Nov. 01, 2021
Software	Fala	EZ-EMC	FA-03A2 RE	\	\
966 chamber	C.R.T.	966 Room	966	Nov. 09, 2019	Nov. 08, 2022
3-Loop Antenna	Daze	ZN30401	17014	Sep. 28, 2020	Sep. 28, 2021
Spectrum Analyzer	R&S	FSP40	100550	Sep. 28, 2020	Sep. 28, 2021
loop antenna	ZHINAN	ZN30900A	GTS534	Sep. 28, 2020	Sep. 28, 2021
Horn antenna	A/H/System	SAS-574	588	Sep. 28, 2020	Sep. 28, 2021
Amplifier	AEROFLEX	/	S/N/ 097	Sep. 28, 2020	Sep. 28, 2021

Electrostatic discharge Test					
Equipment	**Manufacturer**	**Model#**	**Serial#**	**Last Cal.**	**Next Cal.**
ESD Simulator	TESTQ	NSG437	329	Nov. 02, 2020	Nov. 02, 2021

6. CONDUCTED EMISSIONS

6.1 Block Diagram Of Test Setup



6.2 Limit

Limits for Conducted emissions at the mains ports of Class B MME

Frequency range (MHz)	Limits dB(μV)	
	Quasi-peak	Average
0,15 to 0,50	66 to 56*	56 to 46*
0,50 to 5	56	46
5 to 30	60	50

Notes: 1. *Decreasing linearly with logarithm of frequency.
2. The lower limit shall apply at the transition frequencies.

6.3 Test procedure

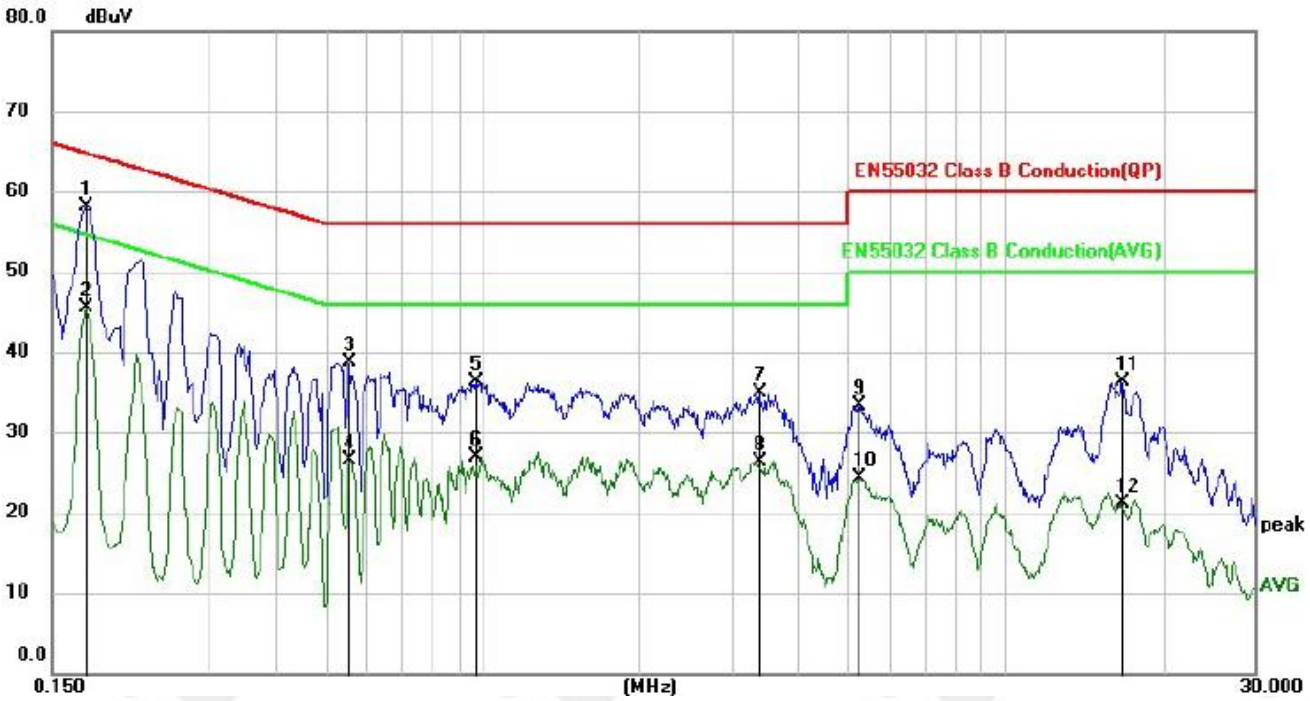
a. The Product was placed on a nonconductive table 0.8m above the horizontal ground reference plane, and 0.4 m from the vertical ground reference plane, and connected to the main through Line Impedance Stability Network (L.I.S.N).

b. The RBW of the receiver was set at 9 kHz in 150 kHz ~ 30MHz with Peak and AVG detector in Max Hold mode. Run the receiver's pre-scan to record the maximum disturbance generated from Product in all power lines in the full band.

c. For each frequency whose maximum record was higher or close to limit, measure its QP and AVG values and record.

6.4 Test Result

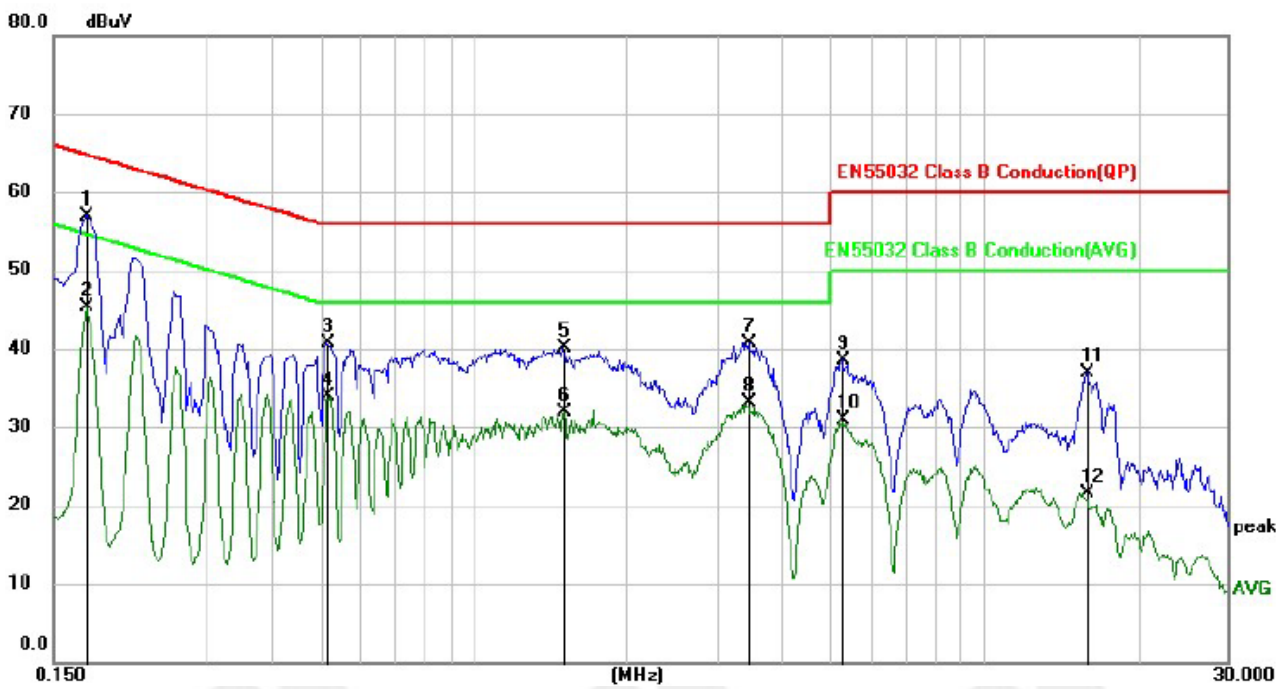
Temperature:	25.6℃	Relative Humidity:	57.8%
Pressure:	101.6kPa	Phase :	L
Test Mode	1	Remark:	N/A



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1	*	0.1740	48.11	9.96	58.07	64.77	-6.70	QP
2		0.1740	35.59	9.96	45.55	54.77	-9.22	AVG
3		0.5540	28.81	9.96	38.77	56.00	-17.23	QP
4		0.5540	16.55	9.96	26.51	46.00	-19.49	AVG
5		0.9700	26.37	9.96	36.33	56.00	-19.67	QP
6		0.9700	16.85	9.96	26.81	46.00	-19.19	AVG
7		3.3820	24.90	10.08	34.98	56.00	-21.02	QP
8		3.3820	16.28	10.08	26.36	46.00	-19.64	AVG
9		5.2460	23.10	10.20	33.30	60.00	-26.70	QP
10		5.2460	14.12	10.20	24.32	50.00	-25.68	AVG
11		16.6740	25.35	11.03	36.38	60.00	-23.62	QP
12		16.6740	10.01	11.03	21.04	50.00	-28.96	AVG

Remark: Result=Reading +Factor
Over Limit=Result -Limit

Temperature:	25.6 ℃	Relative Humidity:	57.8%
Pressure:	101.6kPa	Phase :	N
Test Mode	1	Remark:	N/A



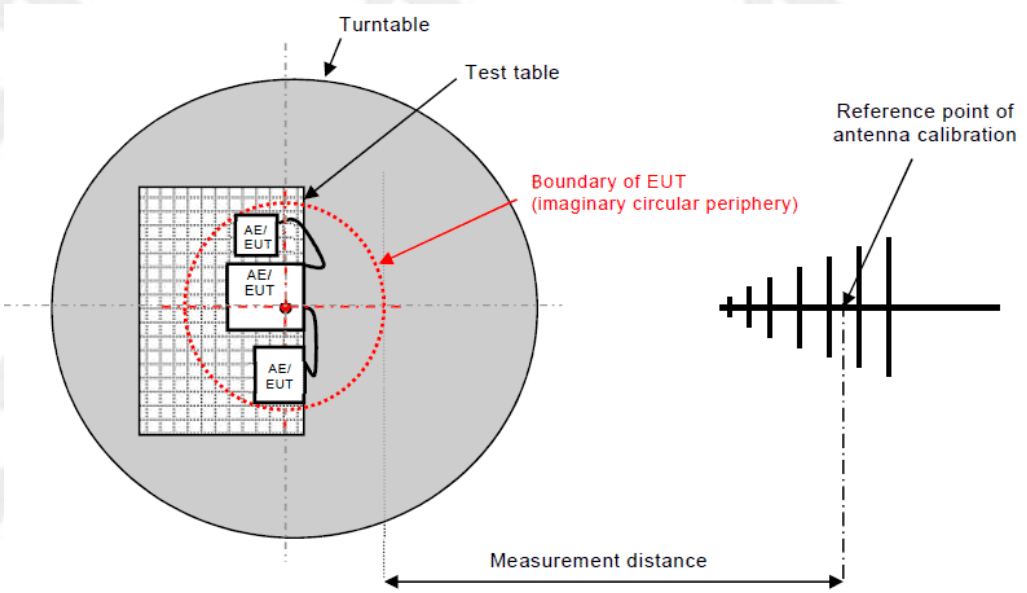
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1	*	0.1740	47.04	9.96	57.00	64.77	-7.77	QP
2		0.1740	35.36	9.96	45.32	54.77	-9.45	AVG
3		0.5180	30.72	9.96	40.68	56.00	-15.32	QP
4		0.5180	23.85	9.96	33.81	46.00	-12.19	AVG
5		1.5020	30.06	9.99	40.05	56.00	-15.95	QP
6		1.5020	21.87	9.99	31.86	46.00	-14.14	AVG
7		3.4620	30.58	10.09	40.67	56.00	-15.33	QP
8		3.4620	22.99	10.09	33.08	46.00	-12.92	AVG
9		5.2660	28.32	10.20	38.52	60.00	-21.48	QP
10		5.2660	20.75	10.20	30.95	50.00	-19.05	AVG
11		15.8020	25.95	11.00	36.95	60.00	-23.05	QP
12		15.8020	10.56	11.00	21.56	50.00	-28.44	AVG

Remark: Result=Reading +Factor
Over Limit=Result -Limit

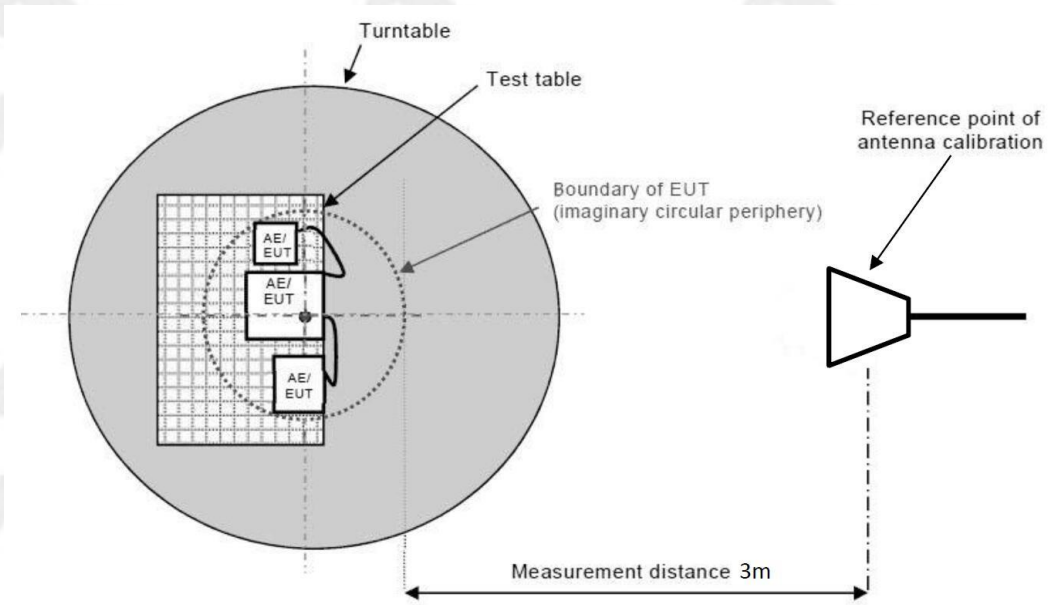
7. RADIATED EMISSIONS TEST

7.1 Block Diagram Of Test Setup

30MHz ~ 1GHz:



Above 1GHz:



7.2 Limits

Limits for radiated disturbance of Class B MME

Frequency (MHz)	Quasi-peak limits at 3m dB(μV/m)
30-230	40
230-1000	47

Frequency (GHz)	limit above 1G at 3m dB(μV/m)	
	Average	peak
1-3	50	70
3-6	54	74

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

7.3 Test Procedure

30MHz ~ 1GHz:

a. The Product was placed on the nonconductive turntable 0.8m above the ground in a semi anechoic chamber.

b. Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 120 kHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied between 1~4 m in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.

c. For each frequency whose maximum record was higher or close to limit, measure its QP value: vary the antenna's height and rotate the turntable from 0 to 360 degrees to find the height and degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to QP Detector and specified bandwidth with Maximum Hold Mode, and record the maximum value.

Above 1GHz:

a. The Product was placed on the non-conductive turntable 0.8m above the ground in a full anechoic chamber..

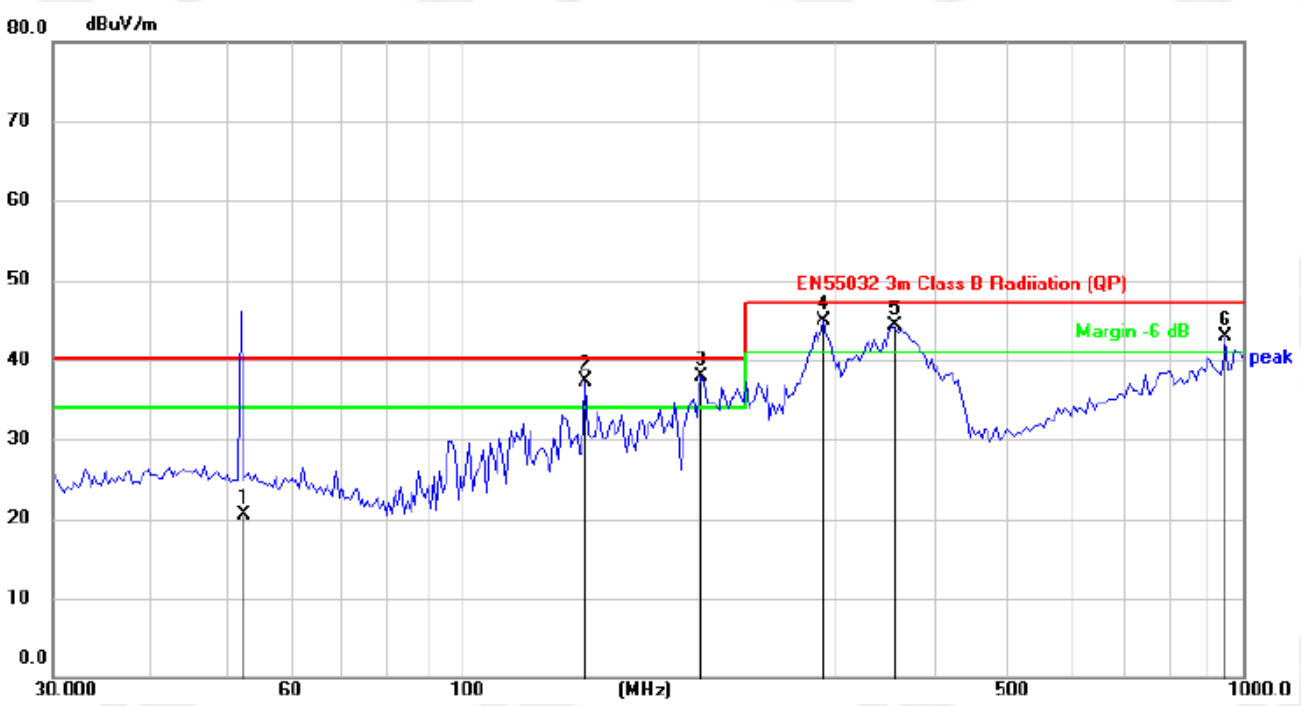
b. Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 1MHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.

c. For each frequency whose maximum record was higher or close to limit, measure its AV value: rotate the turntable from 0 to 360 degrees to find the degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to AV value and specified bandwidth with Maximum Hold Mode, and record the maximum value.

7.4 Test Results

Below 1GHz

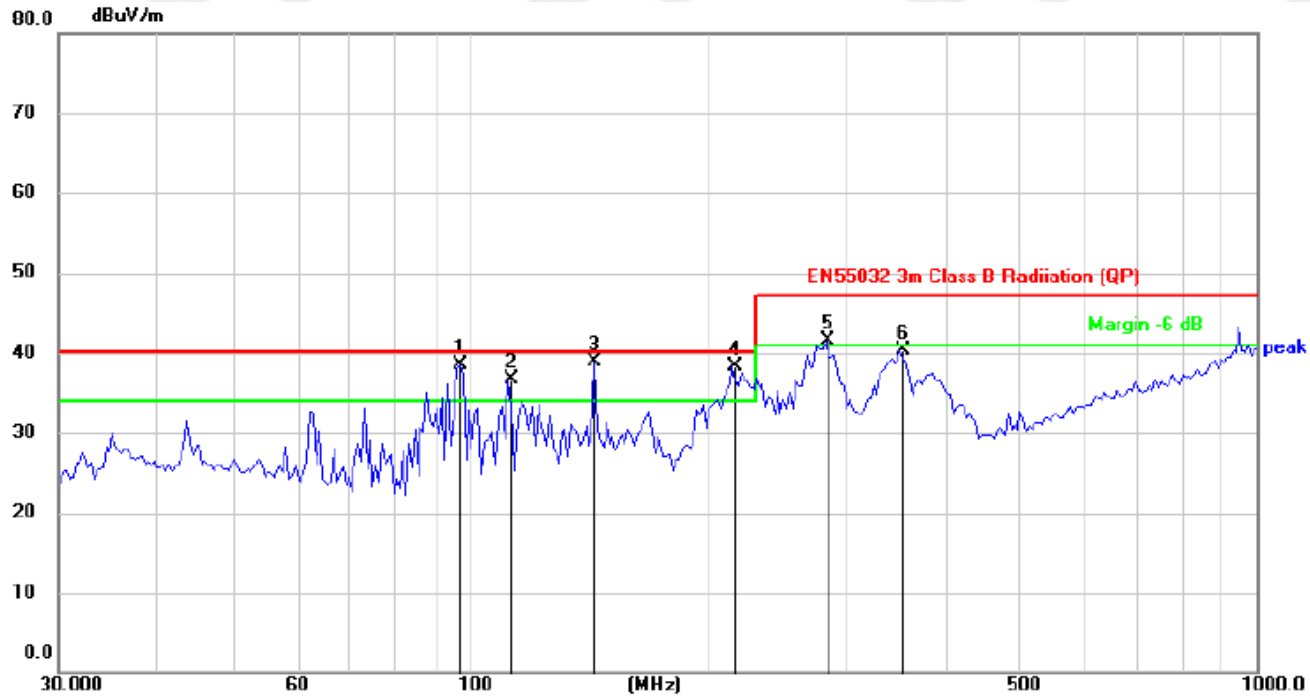
Temperature:	25.6 ℃	Relative Humidity:	57.8%
Pressure:	101.6kPa	Polarization :	Horizontal
Test Mode	1	Remark:	N/A



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		52.3314	21.85	-1.28	20.57	40.00	-19.43	QP
2	!	144.0819	38.50	-1.20	37.30	40.00	-2.70	QP
3	*	202.8103	42.11	-4.15	37.96	40.00	-2.04	QP
4	!	290.5260	45.89	-1.01	44.88	47.00	-2.12	QP
5	!	355.4273	43.87	0.40	44.27	47.00	-2.73	QP
6	!	948.7608	29.87	13.09	42.96	47.00	-4.04	QP

Remark: Result=Reading +Factor
Over Limit=Result -Limit

Temperature:	25.6 ℃	Relative Humidity:	57.8%
Pressure:	101.6kPa	Polarization :	Vertical
Test Mode	1	Remark:	N/A



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1	!	97.1148	43.12	-4.62	38.50	40.00	-1.50	QP
2	!	111.7380	40.01	-3.25	36.76	40.00	-3.24	QP
3	*	144.0819	40.07	-1.20	38.87	40.00	-1.13	QP
4	!	215.6456	41.67	-3.42	38.25	40.00	-1.75	QP
5	!	282.9852	42.78	-1.21	41.57	47.00	-5.43	QP
6		352.3251	39.90	0.34	40.24	47.00	-6.76	QP

Remark: Result=Reading +Factor
Over Limit=Result -Limit

Above 1GHz

Temperature:	25.6 ℃	Relative Humidity:	57.8%
Pressure:	101.6kPa	Polarization :	Horizontal
Test Mode	1(the worst data)	Remark:	N/A

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	1967.34	45.90	1.51	47.42	70.00	-22.58	peak
2	1968.59	28.27	1.51	29.78	50.00	-20.22	AVG
3	3776.82	44.56	5.79	50.36	74.00	-23.64	peak
4	3776.26	25.77	5.79	31.57	54.00	-22.43	AVG
5	4839.96	42.04	9.55	51.59	74.00	-22.41	peak
6	4840.46	25.18	9.55	34.73	54.00	-19.27	AVG

Remark: Result=Reading +Factor
Over Limit=Result -Limit

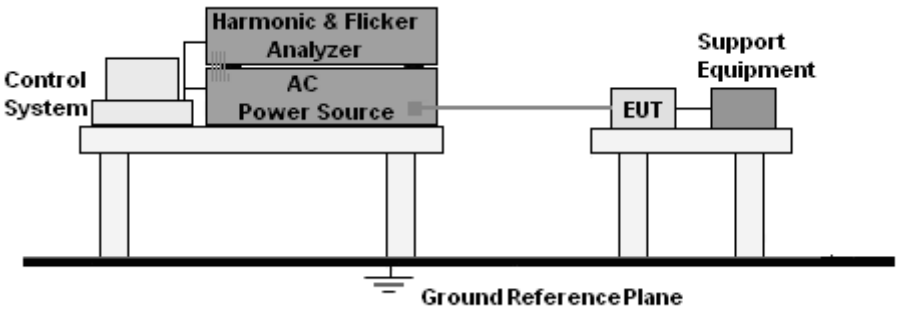
Temperature:	25.6 ℃	Relative Humidity:	57.8%
Pressure:	101.6kPa	Polarization :	Vertical
Test Mode	1(the worst data)	Remark:	N/A

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	1997.61	47.01	1.53	48.54	70.00	-21.46	peak
2	1993.43	30.24	1.53	31.76	50.00	-18.24	AVG
3	3807.15	45.09	5.92	51.01	74.00	-22.99	peak
4	3808.80	29.23	5.92	35.14	54.00	-18.86	AVG
5	4775.27	45.16	9.38	54.54	74.00	-19.46	peak
6	4772.56	27.53	9.38	36.91	54.00	-17.09	AVG

Remark: Result=Reading +Factor
Over Limit=Result -Limit

8. HARMONIC CURRENT EMISSION(H)

8.1 Block Diagram of Test Setup



8.2 Limit

EN 61000-3-2:2014 Clause 7.

8.3 Test Procedure

a. The Product was placed on the top of a non-conductive table above the ground and operated to produce the maximum harmonic components under normal operating conditions for each successive harmonic component in turn.

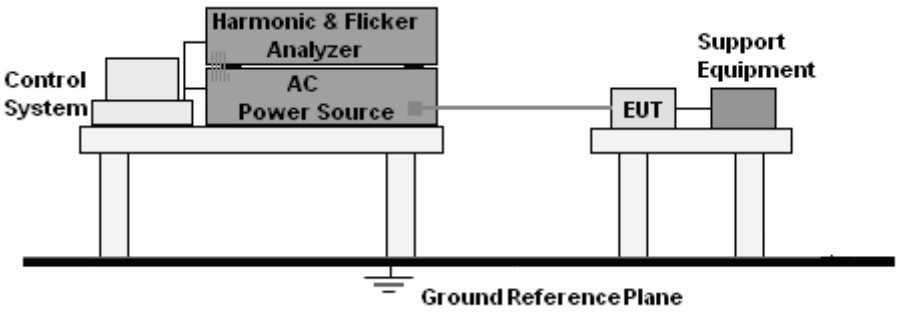
b. The correspondent test program of test instrument to measure the current harmonics emanated from Product was chosen. The measure time shall be not less than the time necessary for the Product to be exercised.8.4 Test Results

Temperature:	25.6 ℃	Relative Humidity:	57.8%
Pressure:	101.6kPa	Test Mode	1(the worst data)
Remark:	N/A	Test results	N/A

Remark: No limits apply for equipment with an active input power up to and including 75W.

9. VOLTAGE FLUCTUATIONS & FLICKER(F)

9.1 Block Diagram of Test Setup



9.2 Limit

EN 61000-3-3:2013 Clause 5.

9.3 Test Procedure

a. The Product was placed on the top of a non-conductive table above the ground and operated to produce the most unfavorable sequence of voltage changes under normal operating conditions.

b. During the flick test, the measure time shall include that part of whole operation cycle in which the Product produce the most unfavorable sequence of voltage changes. The observation period for short-term flicker indicator is 10 minutes and the observation period for long-term flicker indicator is 2 hours.

9.4 Test Results

Temperature:	25.6 ℃	Relative Humidity:	57.8%
Pressure:	101.6kPa	Test Mode	1(the worst data)
Remark:	N/A	Test results	PASS

Remark: Due to the maximum r.m.s input current (including inrush current) does not exceed 20A, and the supply current after inrush in within a variation band of 1.5A, it's not applicable to test the manual switching.
Since the EUT is working in steady state with very low supply current, it will not cause any fluctuations and flicker on the supply system. Considering this, no flicker and voltage fluctuation test had been performed on the EUT, and the EUT can be deemed to comply with the standard accordingly without testing.

10. IMMUNITY TEST OF GENERAL THE PERFORMANCE CRITERIA

Product Standard	ETSI EN 301 489-1
The performance criteria are used to take a decision on whether a radio equipment passes or fails immunity tests. For the purpose of the present document two categories of performance criteria apply: • Performance criteria for continuous phenomena. • Performance criteria for transient phenomena. NOTE: Normally, the performance criteria depends upon the type of radio equipment and/or its intended application. Thus, the present document only contains general performance criteria commonly used for the assessment of radio equipment.	
Performance criteria for continuous phenomena	During the test, the equipment shall: • continue to operate as intended; • not unintentionally transmit; • not unintentionally change its operating state; • not unintentionally change critical stored data.
Performance criteria for transient phenomena	For all ports and transient phenomena with the exception described below, the following applies: • The application of the transient phenomena shall not result in a change of the mode of operation (e.g. unintended transmission) or the loss of critical stored data. • After application of the transient phenomena, the equipment shall operate as intended. For surges applied to symmetrically operated wired network ports intended to be connected directly to outdoor lines the following criteria applies: • For products with only one symmetrical port intended for connection to outdoor lines, loss of function is allowed, provided the function is self-recoverable, or can be otherwise restored. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost. • For products with more than one symmetrical port intended for connection to outdoor lines, loss of function on the port under test is allowed, provided the function is self-recoverable. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

According To EN 301489 -3 standard, The General Performance Criteria As Following:

Table 1: Performance criteria

Criteria	During the test	After test (i.e. as a result of the application of the test)
A	Operate as intended No loss of function No unintentional responses	Operate as intended No loss of function No degradation of performance No loss of stored data or user programmable functions
B	May show loss of function No unintentional responses	Operate as intended Lost function(s) shall be self-recoverable No degradation of performance No loss of stored data or user programmable functions
NOTE: Whether a phenomenon is considered transient, continuous or otherwise is indicated in the test procedures for the phenomenon in ETSI EN 301 489-1 [1], clause 9.		

- performance criterion A applies for immunity tests with phenomena of a continuous nature;
- performance criterion B applies for immunity tests with phenomena of a transient nature.

Requirement:

No A unique identifier for one row of the table which may be used to identify a requirement.

Description A textual reference to the requirement.

Clause Number Identification of clause(s) defining the requirement in the present document unless another document is referenced explicitly.

Requirement Conditionality:

U/C Indicates whether the requirement is unconditionally applicable (U) or is conditional upon the manufacturer's claimed functionality of the equipment (C).

Condition Explains the conditions when the requirement is or is not applicable for a requirement which is classified "conditional".

Presumption of conformity stays valid only as long as a reference to the present document is maintained in the list published in the Official Journal of the European Union. Users of the present document should consult frequently the latest list published in the Official Journal of the European Union.

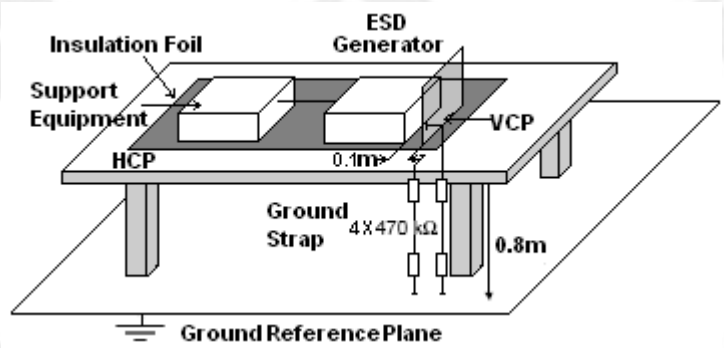
Other Union legislation may be applicable to the product(s) falling within the scope of the present document.

11. ELECTROSTATIC DISCHARGE (ESD)

11.1 Test Specification

Test Port	:	Enclosure port
Discharge Impedance	:	330 ohm / 150 pF
Discharge Mode	:	Single Discharge
Discharge Period	:	one second between each discharge

11.2 Block Diagram of Test Setup



11.3 Test Procedure

a. Electrostatic discharges were applied only to those points and surfaces of the Product that are accessible to users during normal operation.

b. The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.

c. The time interval between two successive single discharges was at least 1 second.

d. The ESD generator was held perpendicularly to the surface to which the discharge was applied and the return cable was at least 0.2 meters from the Product.

e. Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.

f. Air discharges were applied with the round discharge tip of the discharge electrode approaching the Product as fast as possible (without causing mechanical damage) to touch the Product. After each discharge, the ESD generator was removed from the Product and re-triggered for a new single discharge. The test was repeated until all discharges were complete.

g. At least ten single discharges (in the most sensitive polarity) were applied to the Horizontal Coupling Plane at points on each side of the Product. The ESD generator was positioned

vertically at a distance of 0.1 meters from the Product with the discharge electrode touching the HCP.

h. At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the Vertical Coupling Plane in sufficiently different positions that the four faces of the Product were completely illuminated. The VCP (dimensions 0.5m x 0.5m) was placed vertically to and 0.1 meters from the Product.

.

11.4 Test Results

Temperature：	25 ℃	Relative Humidity：	45%
Pressure：	101.6kPa	Test Mode：	Mode1, Mode 2

Discharge Method	Discharge Position	Voltage (±kV)	Min. No. of Discharge per polarity (Each Point)	Performance Criterion
Contact Discharge	Conductive Surfaces	4	10	A
	Indirect Discharge HCP	4	10	A
	Indirect Discharge VCP	4	10	A
Air Discharge	Slots, Apertures, and Insulating Surfaces	8	10	A
Note: A: No performance degradation during test. B: During the test, the EUT shut down, after the test, it reset by itself. C: During the test, the EUT shut down, after the test, it reset by user.				

Electrostatic Discharge
(Fig. 1 to 6 for Points of Discharge)

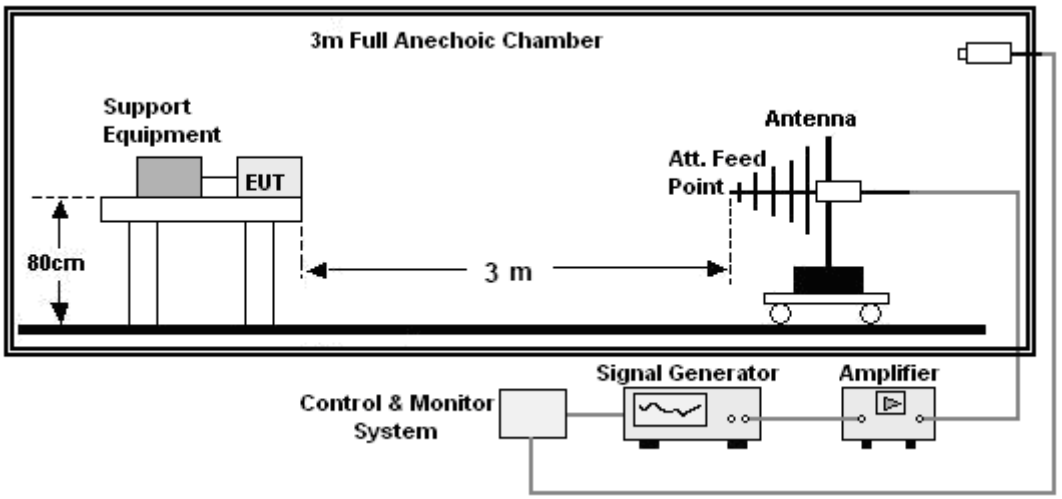
12. CONTINUOUS RF ELECTROMAGNETIC FIELD DISTURBANCES(RS)

12.1 Test Specification

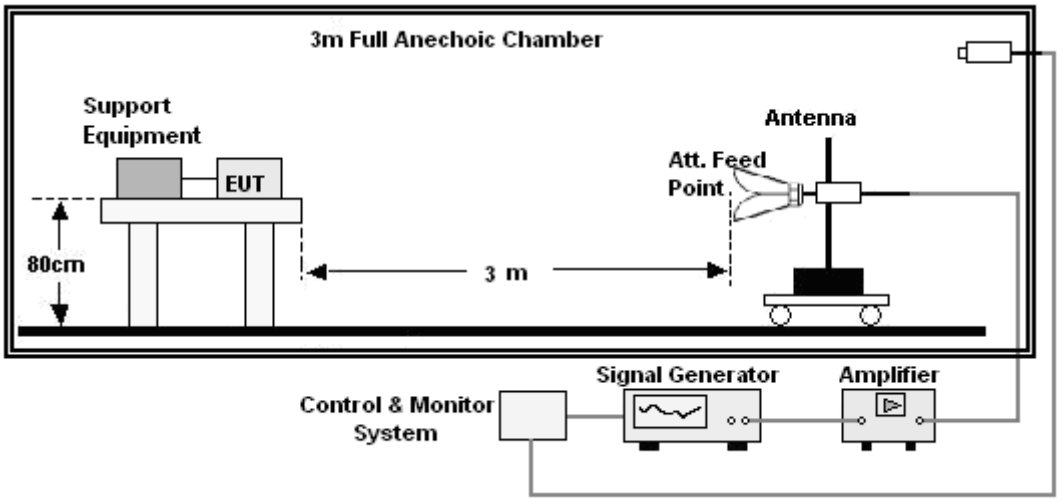
Test Port	:	Enclosure port
Step Size	:	1%
Modulation	:	1kHz, 80% AM
Dwell Time	:	1 second
Polarization	:	Horizontal & Vertical

12.2 Block Diagram of Test Setup

Below 1GHz:



Above 1GHz:



12.3 Test Procedure

a. The testing was performed in a fully-anechoic chamber. The transmit antenna was located at a distance of 3 meters from the Product.

b. The frequency range is swept from 80MHz to 6000MHz,with the signal 80% amplitude modulated with a 1 kHz sine wave,and the step size was 1%.

c. The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised and to be able to respond, but should not exceed 5 s at each of the frequencies during the scan.

d. The test was performed with the Product exposed to both vertically and horizontally polarized fields on each of the four sides.

e. For Broadcast reception function:Group 2 not apply in this test.

12.4 Test Results

Temperature：	25 ℃	Relative Humidity：	55%
Pressure：	101.6kPa	Test Mode：	Mode1, Mode 2

Frequency	Position	Field Strength (V/m)	Performance Criterion
80 - 6000MHz	Front, Right, Back, Left	3	A
Note: A: No performance degradation during test.			

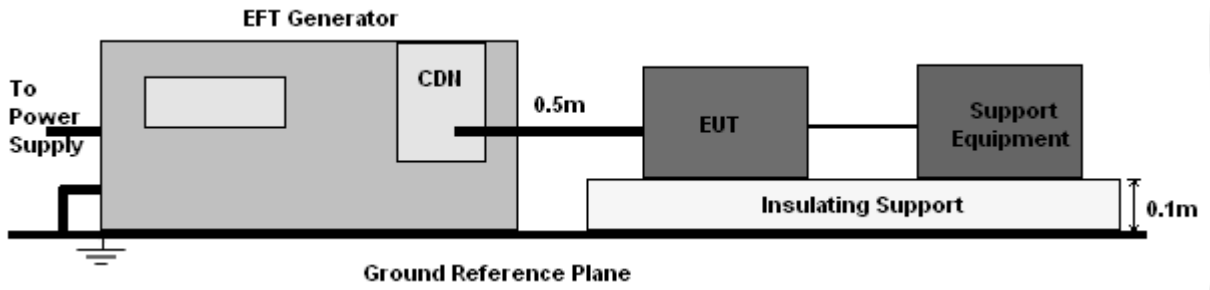
13 ELECTRICAL FAST TRANSIENTS/BURST (EFT)

13.1 Test Specification

Test Port	:	input a.c. power port
Impulse Frequency	:	5 kHz
Impulse Wave-shape	:	5/50 ns
Burst Duration	:	15 ms
Burst Period	:	300 ms
Test Duration	:	2 minutes per polarity

13.2 Block Diagram of EUT Test Setup

For input a.c. power port:



13.3 Test Procedure

a. The Product and support units were located on a non-conductive table above ground reference plane.

b. A 0.5m-long power cord was attached to Product during the test.

13.4 Test Results

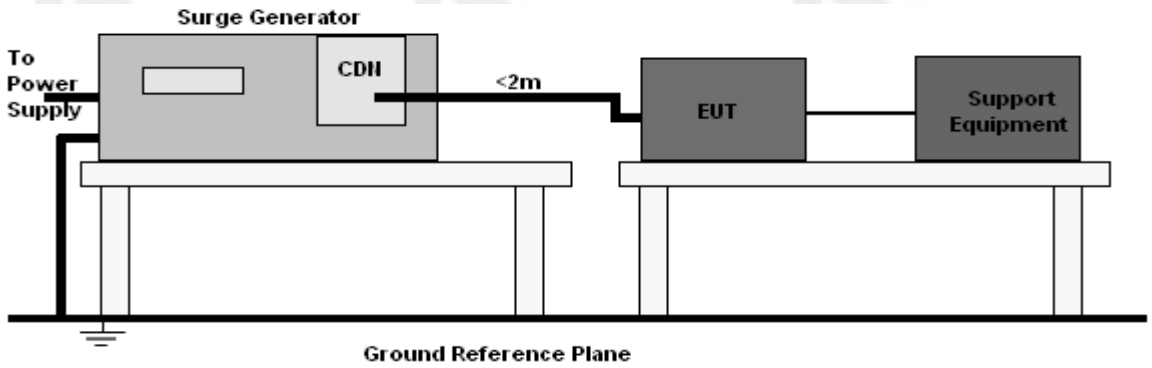
N/A

14 SURGES IMMUNITY TEST

14.1 Test Specification

Test Port	:	input a.c. power port
Wave-Shape	:	Open Circuit Voltage - 1.2 / 50 us Short Circuit Current - 8 / 20 us
Pulse Repetition Rate	:	1 pulse / min.
Phase Angle	:	0° / 90° / 180° / 270°
Test Events	:	5 pulses (positive & negative) for each polarity

14.2 Block Diagram of EUT Test Setup



14.3 Test Procedure

a. The surge is to be applied to the Product power supply terminals via the capacitive coupling network. Decoupling networks are required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines, and to provide sufficient decoupling impedance to the surge wave.

b. The power cord between the Product and the coupling/decoupling networks shall be 2 meters in length (or shorter). Interconnection line between the Product and the coupling/decoupling networks shall be 2 meters in length (or shorter).

14.4 Test Result

N/A

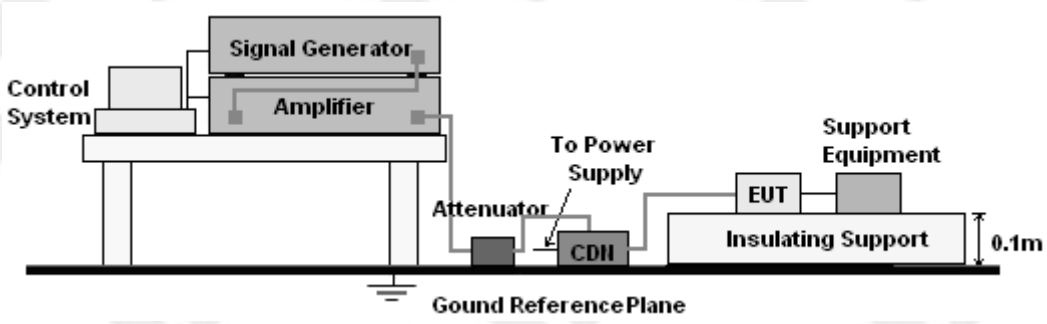
15 CONTINUOUS INDUCED RF DISTURBANCES (CS)

15.1 Test Specification

Test Port	:	input a.c. power port
Step Size	:	1%
Modulation	:	1kHz, 80% AM
Dwell Time	:	1 second

15.2 Block Diagram of EUT Test Setup

For input a.c. power port:



15.3 Test Procedure

For input a.c. power port:

a. The Product and support units were located at a ground reference plane with the interposition of a 0.1 m thickness insulating support and the CDN was located on GRP directly.

b. The frequency range is swept from 150 kHz to 10MHz, 10MHz to 30MHz, 30MHz to 80MHz with the signal 80% amplitude modulated with a 1 kHz sine wave, and the step size was 1% of fundamental.

c. The dwell time at each frequency shall be not less than the time necessary for the Product to be able to respond.

15.4 Test Result

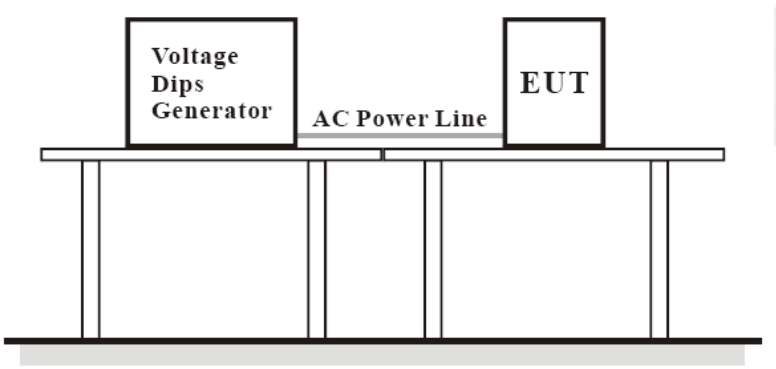
N/A

16 VOLTAGE DIPS AND INTERRUPTIONS (DIPS)

16.1 Test Specification

Test Port	:	input a.c. power port
Phase Angle	:	0°, 180°
Test cycle	:	3 times

16.2 Block Diagram of EUT Test Setup



16.3 Test Procedure

a. The Product and support units were located on a non-conductive table above ground floor.

b. Set the parameter of tests and then perform the test software of test simulator.

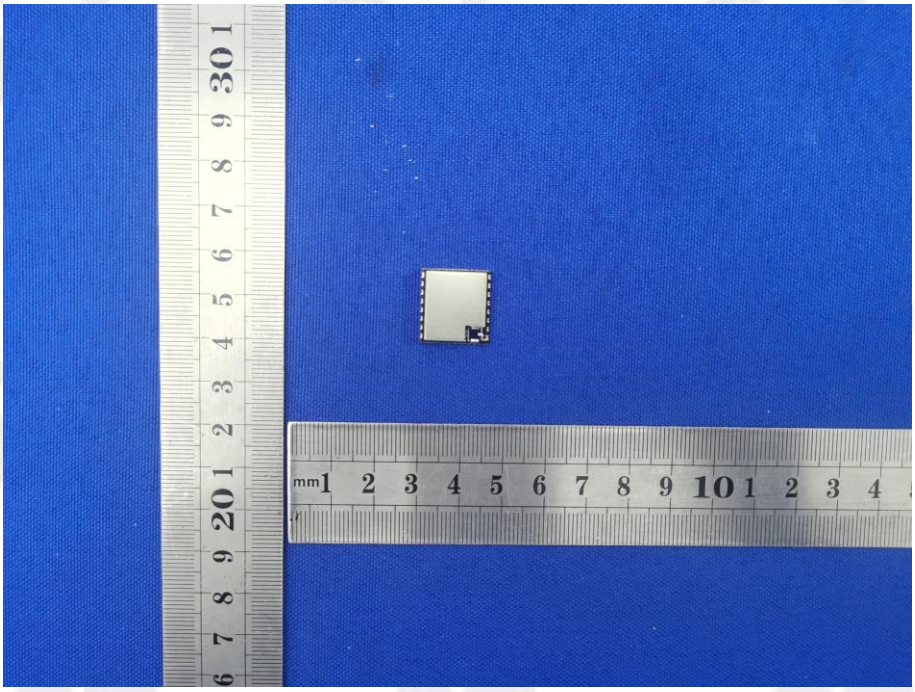
c. Conditions changes to occur at 0 degree crossover point of the voltage waveform.

16.4 Test Result

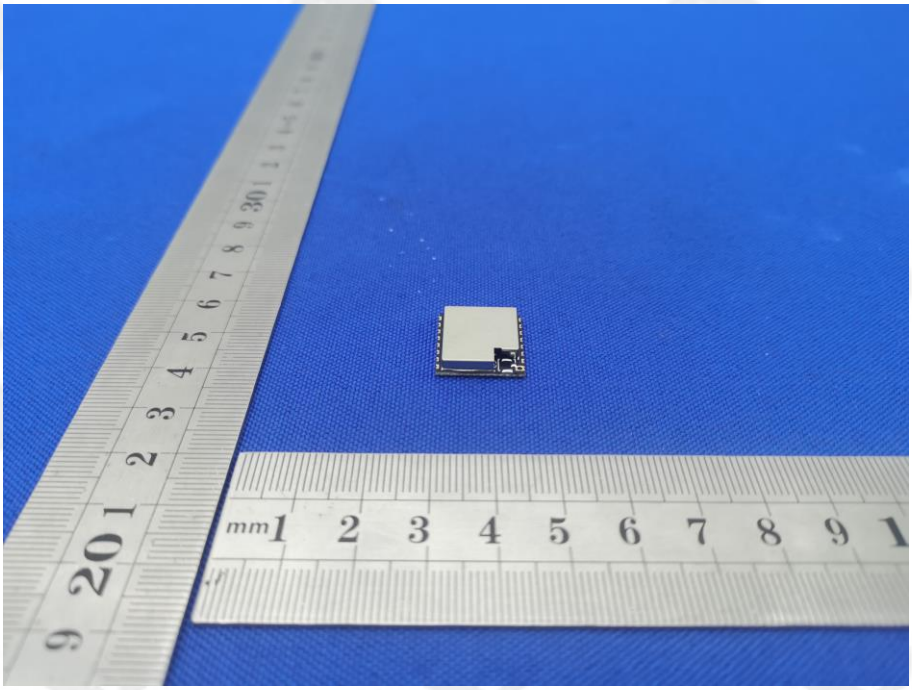
N/A

17 EUT PHOTOGRAPHS

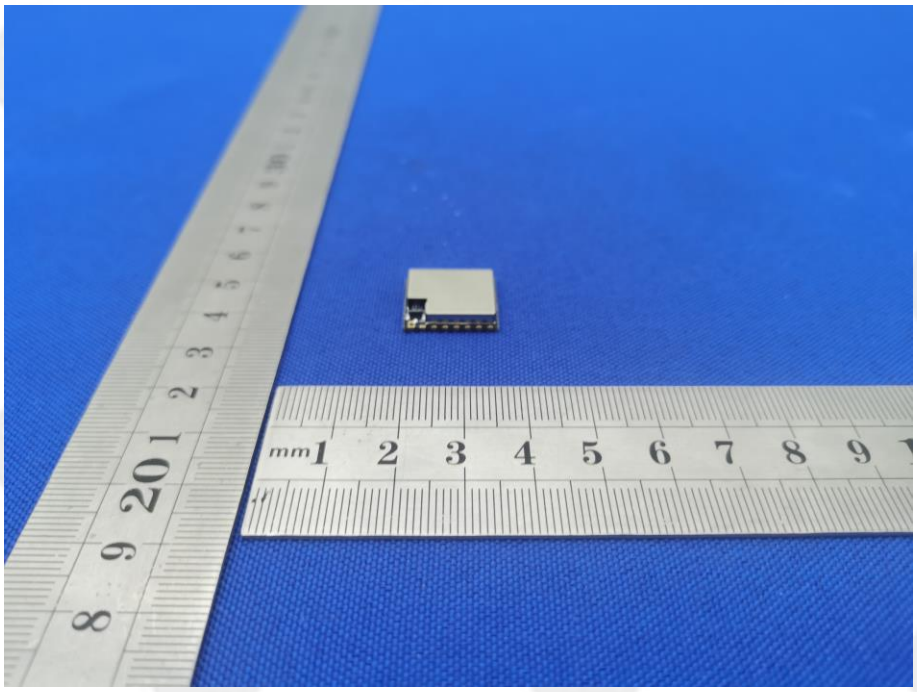
External Photos
EUT Photo 1



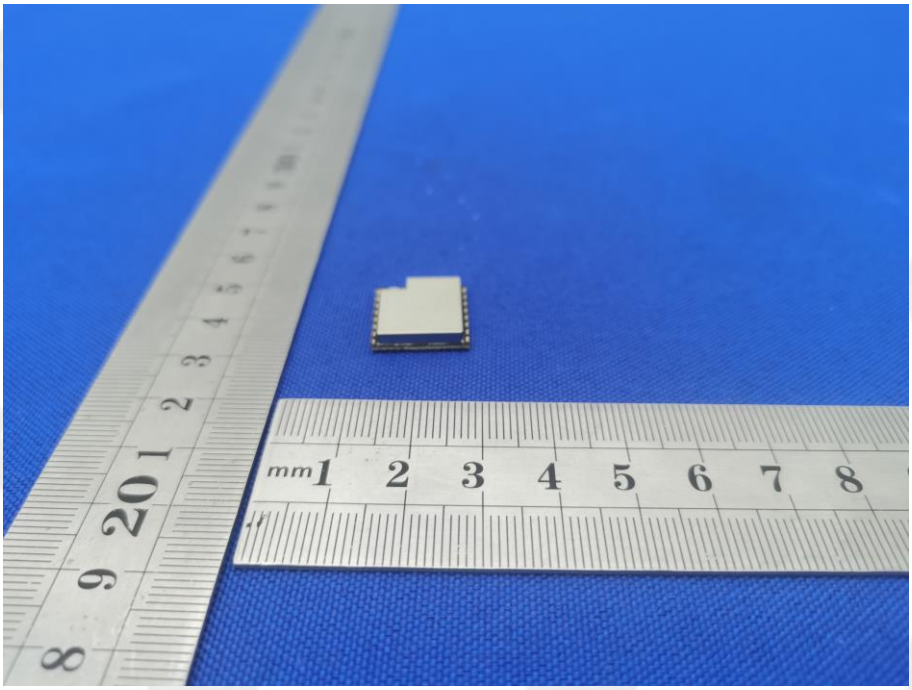
EUT Photo 2



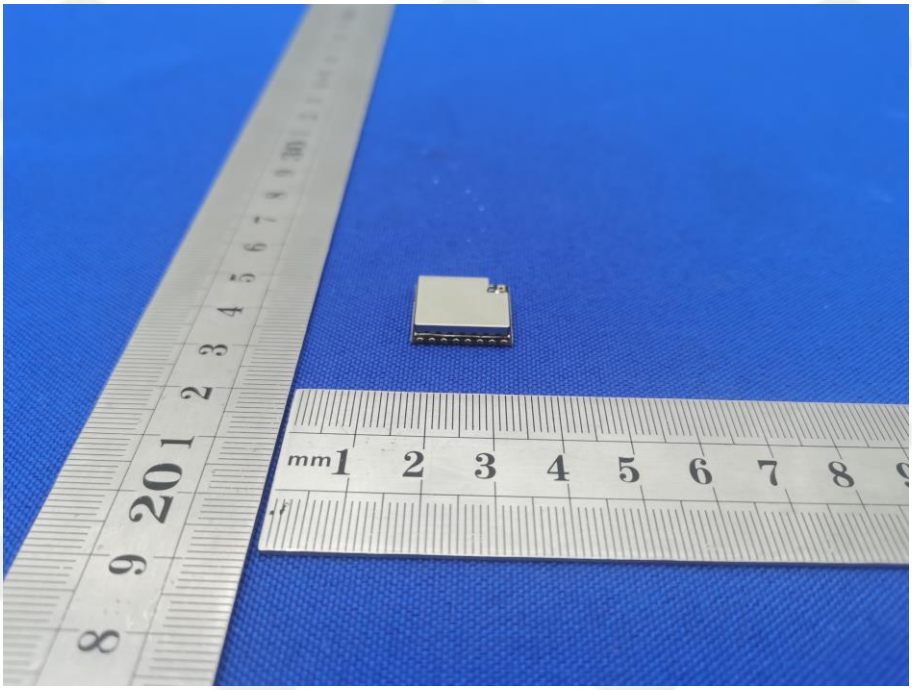
EUT Photo 3



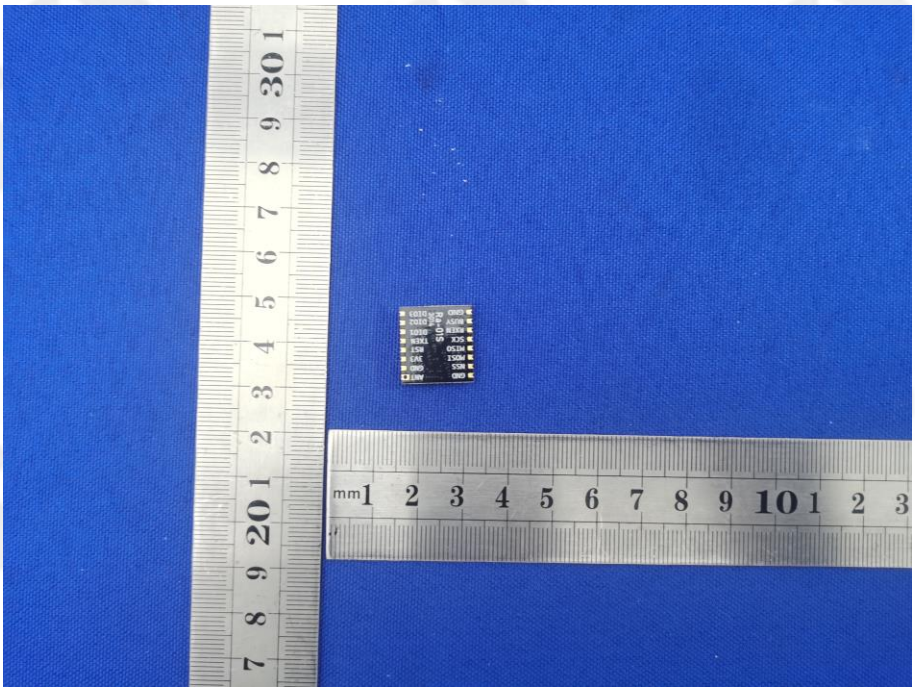
EUT Photo4



EUT Photo 5



EUT Photo 6



Internal Photos
EUT Photo 1

EUT Photo 2

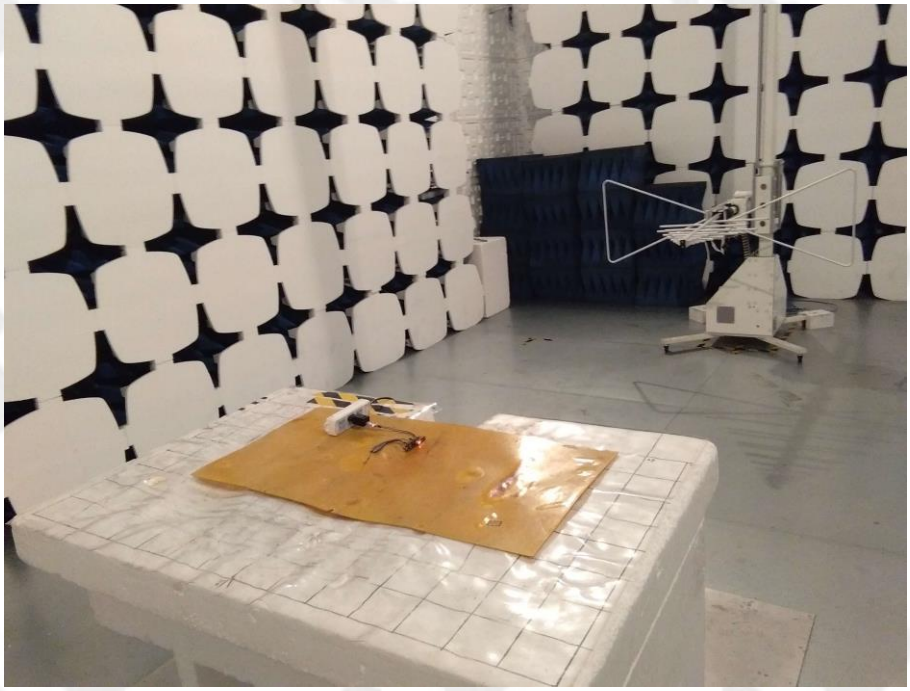
EUT Photo 3

EUT Photo 4

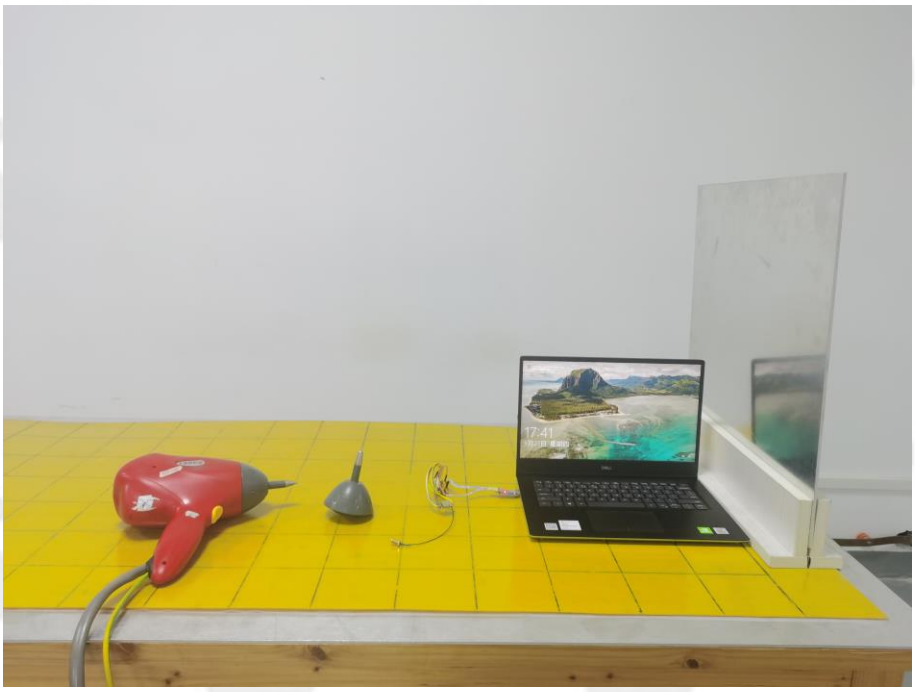
18 EUT TEST SETUP PHOTOGRAPHS

Conducted emissions

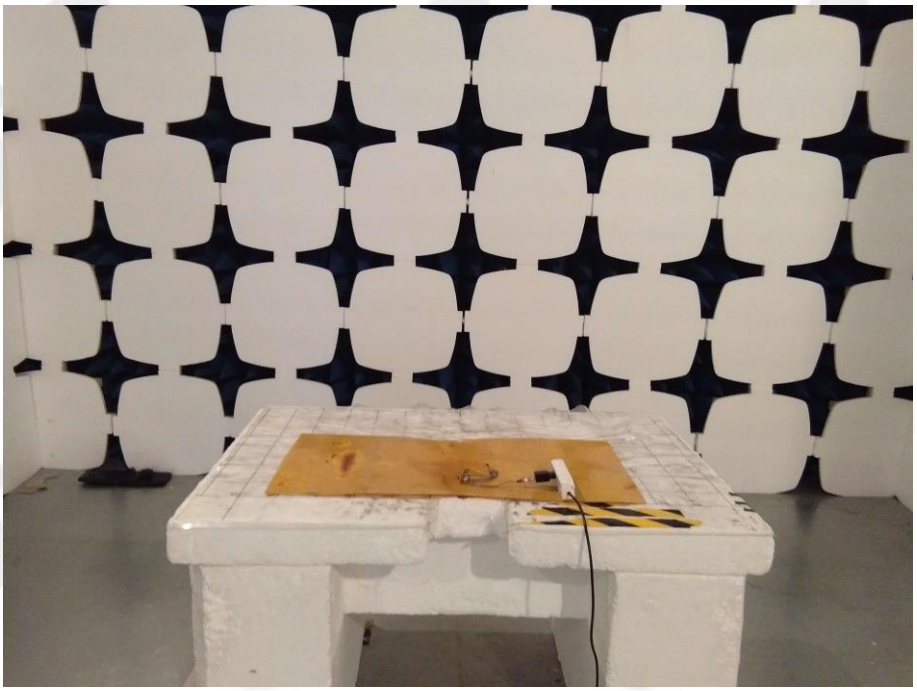
Radiated emissions below 1G



ESD



RS



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