EMC TEST REPORT

For

Shenzhen Chainway Information Technology Co.,Ltd.

UHF RFID Module

Test Model: CM2000-1

Additional Model No.: /

Prepared for	:	Shenzhen Chainway Information Technology Co.,Ltd.
Address	:	9/F, Building 2, Daqian Industrial Park, Longchang Rd., District 67, Bao'an, Shenzhen
Prepared by	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
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Mail	:	webmaster@LCS-cert.com
Date of receipt of test sample	:	November 15, 2019
Number of tested samples	:	1
Serial number	:	Prototype
Date of Test	:	November 15, 2019 ~ December 30, 2019
Date of Report	:	December 31, 2019

CE

EMC TEST REPORT
ETSI EN301 489-3 V2.1.1(2019-3)

Electromagnetic compatibility and Radio spectrum Matters (ERM);Electromagnetic Compatibility (EMC)standard for radio equipment and services

Report Reference No.	:	**LCS191111082AEA**
Date Of Issue	:	December 31, 2019
Testing Laboratory Name	:	**Shenzhen LCS Compliance Testing Laboratory Ltd.**
Address	:	101, 601, Xingyuan Industrial Park, Gushu Community, Xixiang Street, Bao' an District, Shenzhen, Guangdong, China
Testing Location/ Procedure	:	Full application of Harmonised standards ■ Partial application of Harmonised standards □ Other standard testing method □
Applicant's Name	:	**Shenzhen Chainway Information Technology Co.,Ltd.**
Address	:	9/F, Building 2, Daqian Industrial Park, Longchang Rd., District 67, Bao'an, Shenzhen
Test Specification		
Standard	:	ETSI EN 301 489-1 V2.1.1 (2017-02) ETSI EN301 489-3 V2.1.1(2019-3)
Test Report Form No.	:	LCSEMC-1.0
TRF Originator	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF	:	Dated 2017-06

Test Item Description.	:	**UHF RFID Module**
Trade Mark	:	Chainway
Test Model	:	CM2000-1
Ratings	:	Input: DC 3.5V-5.25V, 8W
Result	:	**Positive**

Compiled by:	Supervised by:	Approved by:
Ray Yang/ Administrators	Jin Wang/ Technique principal	Gavin Liang/ Manager

EMC -- TEST REPORT

Test Report No. : LCS191111082AEA	December 31, 2019 Date of issue

Test Model.....	:	CM2000-1
EUT.....	:	UHF RFID Module
Applicant.....	**:**	**Shenzhen Chainway Information Technology Co.,Ltd.**
Address.....	:	9/F, Building 2, Daqian Industrial Park, Longchang Rd., District 67, Bao'an, Shenzhen
Telephone.....	:	/
Fax.....	:	/
Manufacturer.....	**:**	**Shenzhen Chainway Information Technology Co.,Ltd.**
Address.....	:	9/F, Building 2, Daqian Industrial Park, Longchang Rd., District 67, Bao'an, Shenzhen
Telephone.....	:	/
Fax.....	:	/
Factory.....	**:**	**Shenzhen Chainway Information Technology Co.,Ltd.**
Address.....	:	9/F, Building 2, Daqian Industrial Park, Longchang Rd., District 67, Bao'an, Shenzhen
Telephone.....	:	/
Fax.....	:	/

Test Result	**Positive**

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Revision History

Revision	Issue Date	Revisions	Revised By
000	December 31, 2019	Initial Issue	Gavin Liang

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Test Report Description Page

1. GENERAL INFORMATION

1.1. Product Description for Equipment Under Test (EUT)

EUT	:	UHF RFID Module
Test Model	:	CM2000-1
Additional Model No	:	/
Model Declaration	:	/
Power Supply	:	Input: DC 3.5V-5.25V, 8W
Hardware Version	:	V2.5
Software Version	:	V6.17
RF ID		
Frequency Range	:	865.7-867.5MHz
Channel Number	:	4 channels(865.7MHz, 866.3MHz, 866.9MHz, 867.5MHz)
Channel Spacing	:	600KHz
Modulation Type	:	ASK
Antenna Description	:	External antenna, 0dBi(Max.)

1.2. Objective

ETSI EN 301 489-1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Electro Magnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements
ETSI EN301 489-3 V2.1.1	ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 3: Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 246 MHz; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU

The objective is to determine compliance with ETSI EN 301 489-1 V2.1.1 (2017-02), Final draft ETSI EN301 489-3 V2.1.1(2019-3).

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

No Related Submittals.

1.4. Test Methodology

All measurements contained in this report were conducted with ETSI EN 301 489-1 V2.1.1 (2017-02), Final draft ETSI EN301 489-3 V2.1.1(2019-3) .

1.5. Description of Test Facility

FCC Registration Number is 254912.
Industry Canada Registration Number is 9642A-1.
EMSD Registration Number is ARCB0108.
UL Registration Number is 100571-492.
TUV SUD Registration Number is SCN1081.
TUV RH Registration Number is UA 50296516-001.
NVLAP Accreditation Code is 600167-0.
FCC Designation Number is CN5024.
CAB identifier: CN0071.

1.6. Support equipment List

Manufacturer	Description	Model	Serial Number	Certificate
--	--	--	--	--

1.7. External I/O

I/O Port Description	Quantity	Cable
--	--	--

1.8. Measurement Uncertainty

Item	MU	Remark
Uncertainty for Power point Conducted Emissions Test	±2.42dB	
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	±3.54dB	Polarize: V
	±4.1dB	Polarize: H
Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz)	±2.08dB	Polarize: H
	±2.56dB	Polarize: V
Uncertainty for radio frequency	$\pm 3*10^{-7}$MHz	
Uncertainty for conducted RF Power	±0.65dB	
Uncertainty for temperature	±0.2℃	
Uncertainty for humidity	±1%	
Uncertainty for DC and low frequency voltages	±0.05V	

1.9. Description Of Test Modes

There was 3 test Modes. TM1 to TM2 were shown below:

TM1: Operate in RF ID mode.
TM2: Idle mode

***Note:
All test modes were tested, but we only recorded the worst case in this report.

2. SUMMARY OF TEST RESULTS

Rule	Description of Test Items	Result
§7.1	Reference to clauses EN 301 489-1 §8.4 AC mains power input/output ports	Compliant
§7.1	Reference to clauses EN 301 489-1 §8.3 DC power input/output ports	N/A
§7.1	Reference to clauses EN 301 489-1 §8.2 Enclosure of ancillary equipment measured on a stand alone basis	Compliant
§7.1	Reference to clauses EN 301 489-1 §8.5 Harmonic current emissions (AC mains input port)	N/A
§7.1	Reference to clauses EN 301 489-1 §8.6 Voltage fluctuations and flicker (AC mains input port)	Compliant
§7.1	Reference to clauses EN 301 489-1 §8.7 Telecommunication ports	Compliant
§7.2	Reference to clauses EN 301 489-1 §9.3 Electrostatic discharge (EN 61000-4-2)	Compliant
§7.2	Reference to clauses EN 301 489-1 §9.2 Radio frequency electromagnetic field (80 MHz to 6000 MHz)(EN 61000-4-3)	Compliant
§7.2	Reference to clauses EN 301 489-1 §9.4 Fast transients, common mode (EN 61000-4-4)	Compliant
§7.2	Reference to clauses EN 301 489-1 §9.8 Surges (EN 61000-4-5)	Compliant
§7.2	Reference to clauses EN 301 489-1 §9.5 Radio frequency, common mode (EN 61000-4-6)	Compliant
§7.2	Reference to clauses EN 301 489-1 §9.6 Transients and surges in the vehicular environment (ISO 7637-2)	N/A
§7.2	Reference to clauses EN 301 489-1 §9.7 Voltage dips and interruptions (EN 61000-4-11)	Compliant

Note: N/A means not applicable.

3. LINE CONDUCTED EMISSION

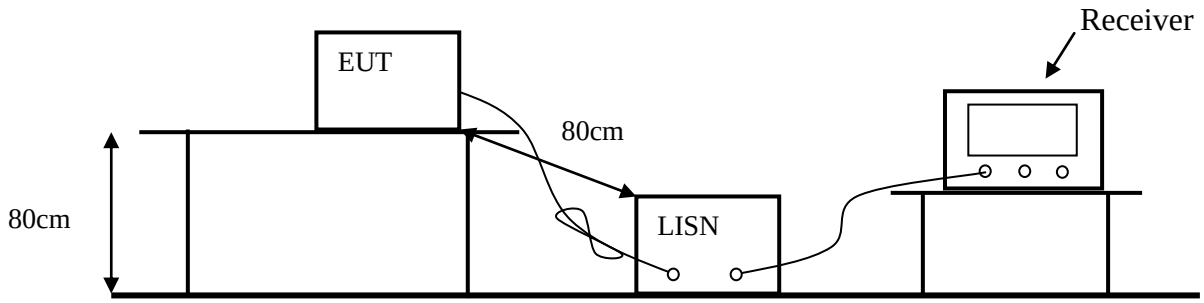
3.1. Conducted Emission Limit

ETSI EN 301 489-1 V2.1.1 (2017-02)/EN 55032

Limits for Line Conducted Emission

Frequency (MHz)	Limit (dBμV)	
	Quasi-peak Level	Average Level
0.15~0.50	66.0 ~ 56.0 *	56.0 ~ 46.0 *
0.50~5.00	56.0	46.0
5.00~30.00	60.0	50.0
NOTE1-The lower limit shall apply at the transition frequencies. NOTE2-The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.		

3.2. Test Configuration



The setup of EUT is according with per ETSI EN 301 489-1 measurement procedure. The specification used was with the ETSI EN 301 489-1 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle. The spacing between the peripherals was 10 cm.

The EUT received DC 5V charging power from the Adapter which received power through a LISN supplying power of AC 230V/50Hz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	30MHz~1000MHz
(IF)RB	9kH

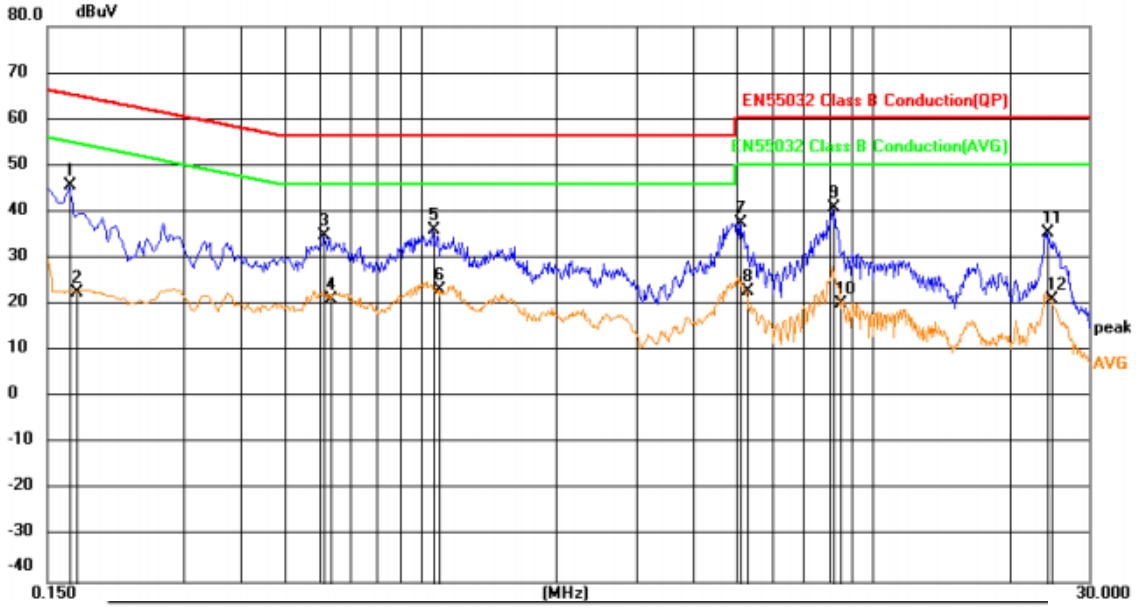
All data was recorded in the Quasi-peak and average detection mode.

Marked on both the 6 highest Quasi-Peak & 6 highest Average emissions points of the EUT.

3.3. Test Data

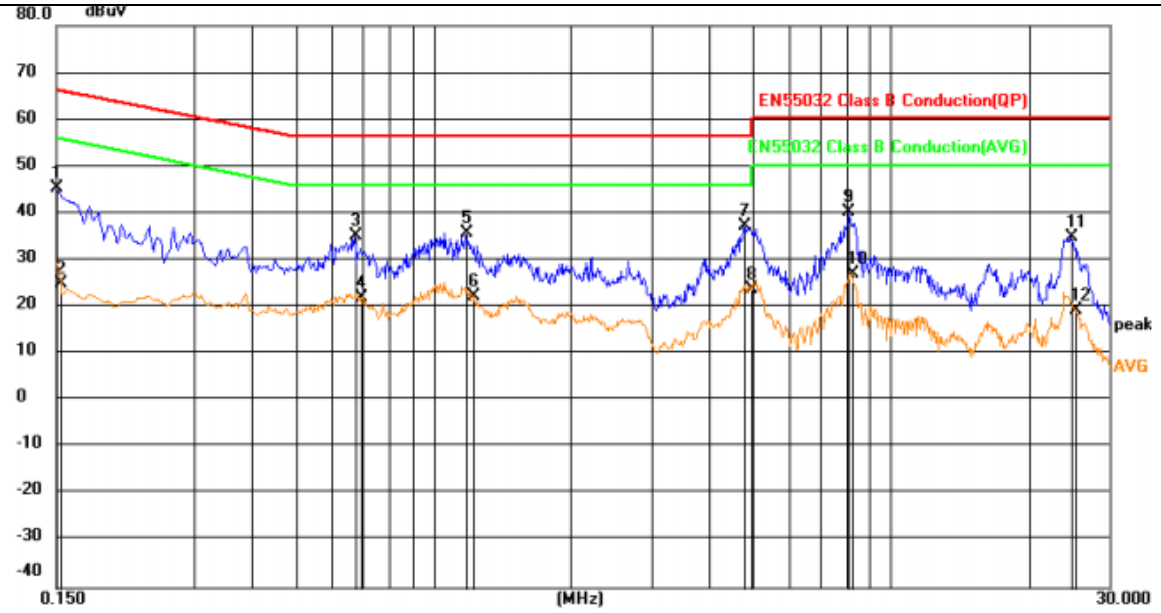
For pre-scan, the worst test case is TM1, and the test data was show as follow:

Model No.	CM2000-1	Test Mode	TM1
Environmental Conditions	24.1℃, 52.7% RH	Test Engineer	QUXIN
Pol	Line	Test Voltage	AC 230V/50Hz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1680	26.38	19.16	45.54	65.06	-19.52	QP
2		0.1731	3.48	19.16	22.64	54.81	-32.17	AVG
3		0.6134	15.59	19.19	34.78	56.00	-21.22	QP
4		0.6360	1.83	19.22	21.05	46.00	-24.95	AVG
5		1.0680	16.78	19.27	36.05	56.00	-19.95	QP
6		1.0950	3.77	19.27	23.04	46.00	-22.96	AVG
7		5.0954	18.04	19.49	37.53	60.00	-22.47	QP
8		5.2755	3.21	19.51	22.72	50.00	-27.28	AVG
9	*	8.1825	21.10	19.64	40.74	60.00	-19.26	QP
10		8.4570	0.65	19.65	20.30	50.00	-29.70	AVG
11		24.2205	15.07	20.24	35.31	60.00	-24.69	QP
12		24.7875	0.69	20.23	20.92	50.00	-29.08	AVG

Model No.	CM2000-1	Test Mode	TM1
Environmental Conditions	24.1℃, 52.7% RH	Test Engineer	QUXIN
Pol	Neutral	Test Voltage	AC 230V/50Hz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1500	26.20	19.14	45.34	66.00	-20.66	QP
2		0.1532	5.93	19.14	25.07	55.82	-30.75	AVG
3		0.6720	15.75	19.26	35.01	56.00	-20.99	QP
4		0.6945	2.76	19.28	22.04	46.00	-23.96	AVG
5		1.1805	16.31	19.29	35.60	56.00	-20.40	QP
6		1.2255	2.86	19.29	22.15	46.00	-23.85	AVG
7	*	4.7940	17.71	19.49	37.20	56.00	-18.80	QP
8		4.9290	4.25	19.49	23.74	46.00	-22.26	AVG
9		8.0880	20.48	19.64	40.12	60.00	-19.88	QP
10		8.1960	7.30	19.64	26.94	50.00	-23.06	AVG
11		24.6795	14.65	20.24	34.89	60.00	-25.11	QP
12		25.3590	-0.93	20.20	19.27	50.00	-30.73	AVG

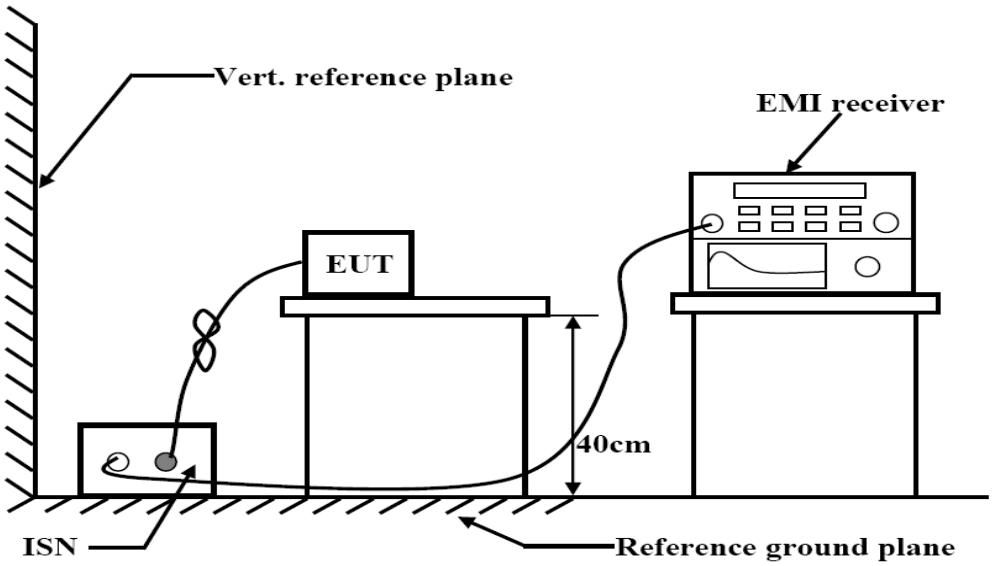
Note: For conducted emission and radiated emission test, a power supply of 230VAC and 120VAC was used for testing respectively, and only recorded the worst case of 230VAC.

4. CONDUCTED EMISSION (WIRED NETWORK PORT)

4.1. Conducted Emission Limit(Wired Network Port)

Limits for asymmetric mode conducted emissions				
Frequency (MHz)	Class B voltage limits (dBμV)		Class B current limits (dBμA)	
	Quasi-peak Level	Average Level	Quasi-peak Level	Average Level
0.15 ~ 0.50	84.0~74.0	74.0~64.0	40.0~30.0	30.0~20.0
0.50 ~ 30.00	74.0	64.0	30.0	20.0
NOTE 1-The limits decrease linearly with the logarithm of the frequency in the range 0,15 MHz to 0,5 MHz. NOTE 2-The current and voltage disturbance limits are derived for use with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of 150Ω to the telecommunication port under test (conversion factor is 20 log10 150 / l = 44 dB).				

4.2. Test Configuration



4.3. EMI Test Receiver Setup

During the conducted emission test, the EMI test receiver was set with the following configurations:

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	150KHz ~ 30MHz
(IF)RBW	9kHz

All data was recorded in the Quasi-peak and average detection mode.

4.4. Test Procedure

Please refer to ETSI EN 301 489-1 Clause 8.7.2 and EN 55032 Clause 6 for the measurement methods.

4.5. Test Data

N/A

5. RADIATED DISTURBANCE

5.1. Radiated Emission Limit

ETSI EN 301 489-1 V2.1.1 (2017-02)/EN 55032 Class B

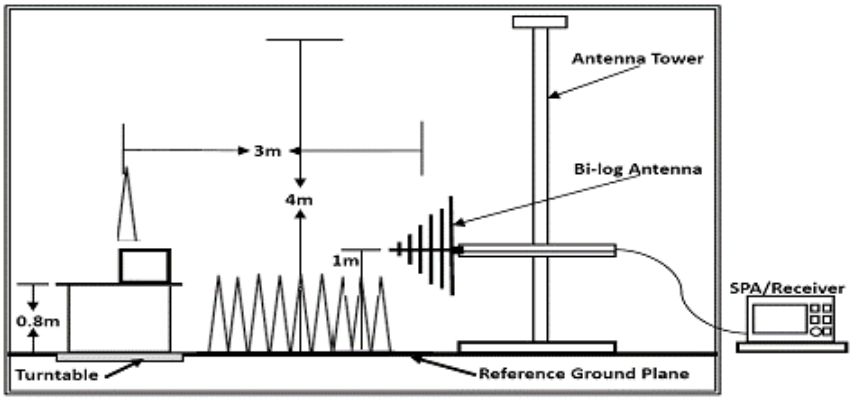
Limits for radiated disturbance Below 1GHz

Frequency (MHz)	Distance (Meters)	Field Strengths Limit (dBμV/m)
30 ~ 230	3	42-35
230 ~ 1000	3	42
Note**:** (1) The smaller limit shall apply at the combination point between two frequency bands. (2) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the EUT.		

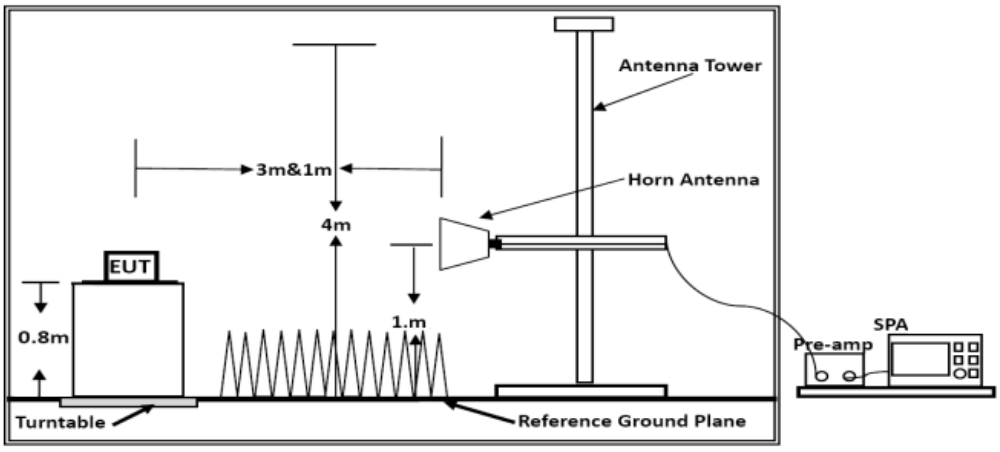
Limits for radiated disturbance Above 1GHz

Frequency (MHz)	Distance (Meters)	Average Limit (dBμV/m)	Peak Limit (dBμV/m)
1000-3000	3	50	70
3000-6000	3	54	74
Note**:** The lower limit applies at the transition frequency.			

5.2. Test Configuration



Below 1GHz



Above 1GHz

5.3. Test Procedure

1) **Sequence of testing 30 MHz to 1 GHz**

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0 °to 315 °using 45 °steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 4 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45 °) and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

2) **Sequence of testing 1 GHz to 6 GHz**

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0 °to 315 °using 45 °steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height scan range is 1 meter to 4 meter.

--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45 °) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

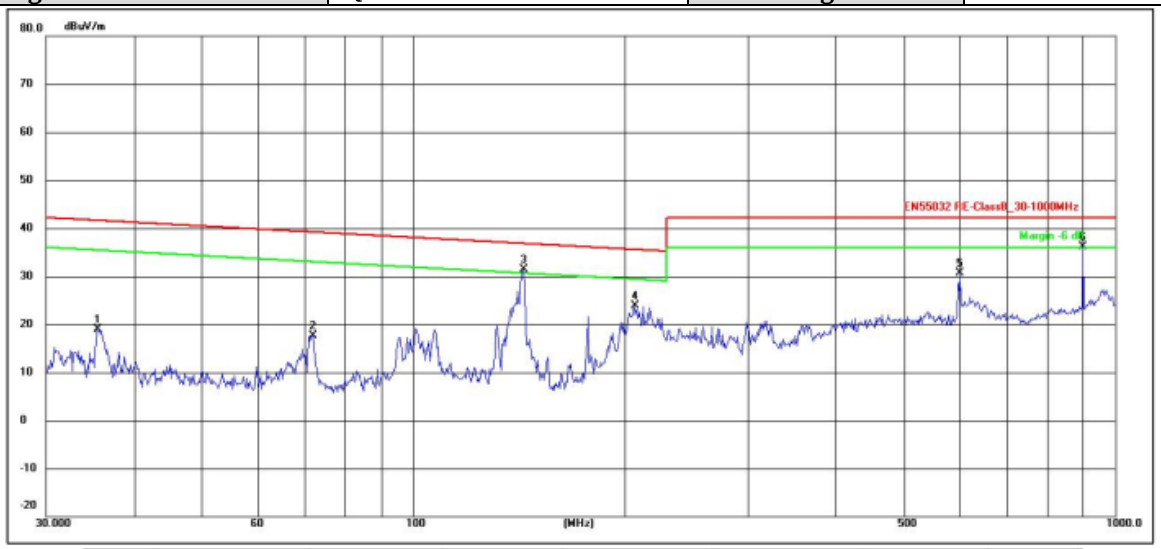
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	30MHz~1000MHz / RB 100kHz for QP

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	6000 MHz
RB / VB	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average

5.4. Test Data

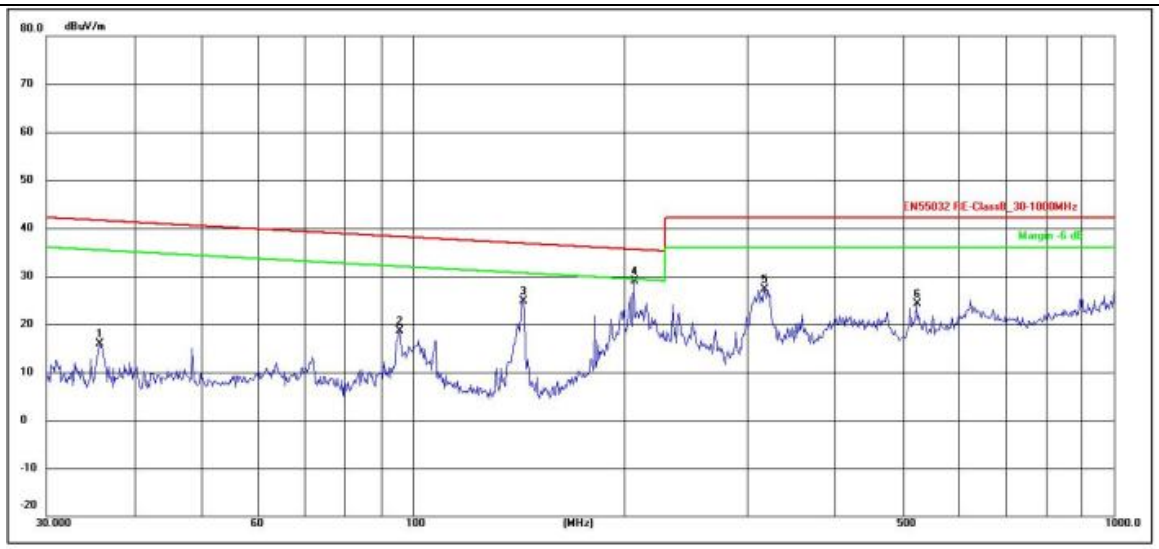
The worst test mode of the EUT was TM1, and its test data was showed as the follow:

Model No.	CM2000-1	Test Mode	TM1
Environmental Conditions	23.9℃, 52.6% RH	Detector Function	Quasi-peak
Pol	Vertical	Distance	3m
Test Engineer	QUXIN	Test Voltage	AC 230V/50Hz



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	35.4993	37.07	-18.10	18.97	41.42	-22.45	QP
2	72.0843	37.81	-20.10	17.71	38.99	-21.28	QP
3 *	143.3261	52.47	-21.07	31.40	36.63	-5.23	QP
4	206.3976	41.09	-17.16	23.93	35.37	-11.44	QP
5	601.4265	38.33	-7.70	30.63	42.00	-11.37	QP
6 !	900.1474	39.46	-3.33	36.13	42.00	-5.87	QP

Model No.	CM2000-1	Test Mode	TM1
Environmental Conditions	23.9℃, 52.6% RH	Detector Function	Quasi-peak
Pol	Horizontal	Distance	3m
Test Engineer	QUXIN	Test Voltage	AC 230V/50Hz



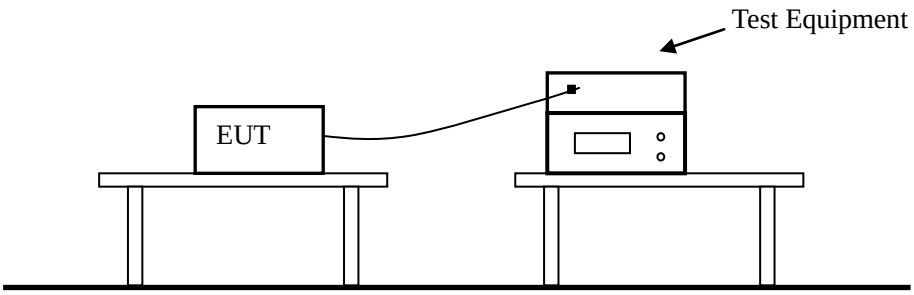
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	35.7490	33.93	-18.02	15.91	41.40	-25.49	QP
2	95.7622	36.80	-18.21	18.59	38.01	-19.42	QP
3	143.3261	45.91	-21.07	24.84	36.63	-11.79	QP
4 *	206.3976	46.05	-17.16	28.89	35.37	-6.48	QP
5	316.5890	41.72	-14.37	27.35	42.00	-14.65	QP
6	522.7180	33.83	-9.60	24.23	42.00	-17.77	QP

Model No.	CM2000-1	**Test Mode**	TM1
Environmental Conditions	23.9℃, 52.6% RH	**Distance**	3m
Test Engineer	QUXIN		

Frequency MHz	Emission Level dBμV/m		Limits dBμV/m		Margin dBμV/m		Polarization
	Peak	AV	Peak	AV	Peak	AV	
1360.18	49.72	37.35	70.00	50.00	-20.28	-12.65	H
1713.82	51.00	31.43	70.00	50.00	-19.00	-18.57	H
2520.10	53.13	40.22	70.00	50.00	-16.87	-9.78	H
3884.73	51.50	34.35	74.00	54.00	-22.50	-19.65	H
4066.42	53.73	31.08	74.00	54.00	-20.27	-22.92	H
5278.38	55.42	37.24	74.00	54.00	-18.58	-16.76	H
1162.72	54.92	35.48	70.00	50.00	-15.08	-14.52	V
1654.80	53.13	35.60	70.00	50.00	-16.87	-14.40	V
2473.12	48.89	38.60	70.00	50.00	-21.11	-11.40	V
3118.10	52.10	37.15	74.00	54.00	-21.90	-16.85	V
4015.59	60.85	30.31	74.00	54.00	-13.15	-23.69	V
5561.00	55.83	36.84	74.00	54.00	-18.17	-17.16	V

6. HARMONIC CURRENT EMISSIONS

6.1. Test Configuration



6.2. Test Standard

According to EN 301 489-1 V2.1.1(2017-02) & EN 61000-3-2: 2014

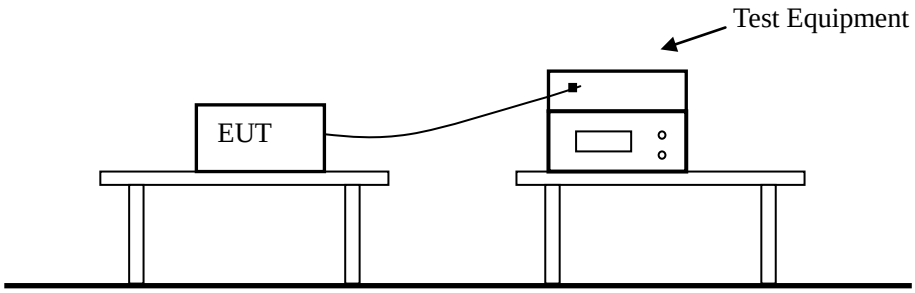
6.3. Test Data

N/A

Note:Because power of EUT less than 75W, According standard EN 61000-3-2, Harmonic current unnecessary to test.

7. VOLTAGE FLUCTUATION AND FLICKER

7.1. Test Configuration



7.2. Test Standard

According to EN 301489-1 V1.9.2 (2011-09) & EN 61000-3-3: 2013

7.3. Test Data

Overall Result:	Notes:
PASS	Measurement method - Voltage

	Pst	dc (%)	dmax (%)	Tmax(> 3.3%)(ms)
Limit	1.000	3.300	4.000	500
Reading 1	0.090	0.008	0.250	0

8. GENERAL PERFORMANCE CRITERIA FOR IMMUNITY TEST

8.1. Performance criteria for Continuous phenomena applied to Transmitter (CT)

For equipment of type II or type III that requires a communication link that is maintained during the test, it shall be verified by appropriate means supplied by the manufacturer that the communication link is maintained during each individual exposure in the test sequence.
Where the EUT is a transmitter, tests shall be repeated with the EUT in standby mode to ensure that any unintentional transmission does not occur.

8.2. Performance criteria for Transient phenomena applied to Transmitter (TT)

For equipment of type II or type III that requires a communication link that is maintained during the test, this shall be verified by appropriate means supplied by the manufacturer during each individual exposure in the test sequence. Where the EUT is a transmitter, tests shall be repeated with the EUT in standby mode to ensure that any unintentional transmission does not occur.

8.3. Performance criteria for Continuous phenomena applied to Receiver (CR)

For equipment of type II or III that requires a communication link that is maintained during the test, it shall be verified by appropriate means supplied by the manufacturer that the communication link is maintained during each individual exposure in the test sequence. Where the EUT is a transceiver, under no circumstances shall the transmitter operate unintentionally during the test.

8.4. Performance criteria for Transient phenomena applied to Receiver (TR)

For equipment of type II or type III that requires a communication link that is maintained during the test, this shall be verified by appropriate means supplied by the manufacturer during each individual exposure in the test sequence. Where the EUT is a transceiver, under no circumstances shall the transmitter operate unintentionally during the test.

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

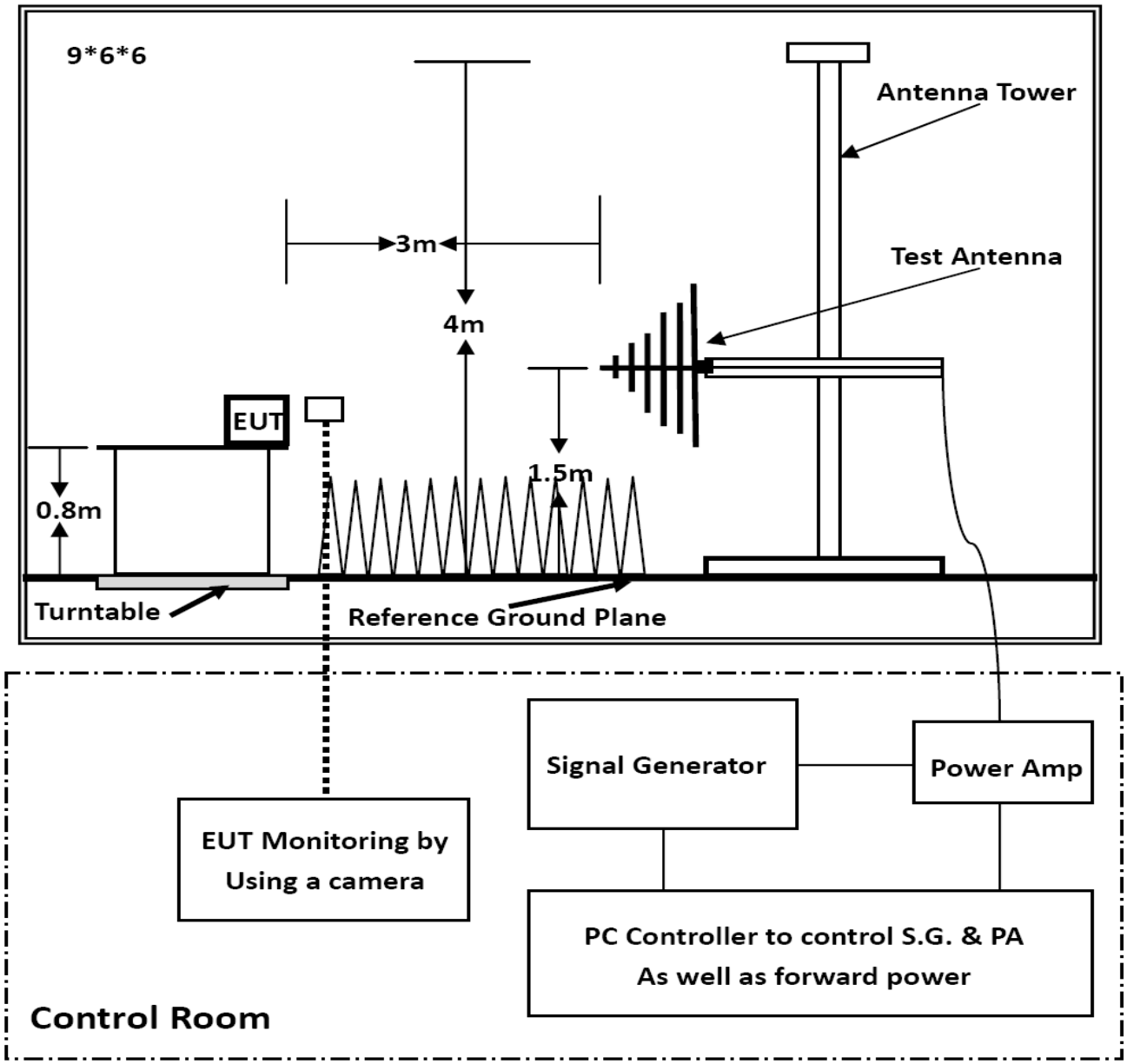
Criteria	During test	After test
A	Shall operate as intended. May show degradation of performance(see note 1). Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance (see note 2). Shall be no loss of function. Shall be no loss of stored data or user programmable functions.
B	May show loss of function (one or more). May show degradation of performance(see note 1). No unintentional transmissions.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no degradation of performance (see note 2). Shall be no loss of stored data or user programmable functions.
C	May be loss of function (one or more).	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no degradation of performance (see note 2).

NOTE 1: Degradation of performance during the test is understood as a degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

NOTE 2: No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed.
If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

9. RF ELECTROMAGNETIC FIELD (80 MHZ–6000 MHZ)

9.1. Test Configuration



9.2. Test Standard

ETSI 301 489-1, EN 301 489-17
/(EN 61000-4-3: 2006+A2: 2010)

Test level 2 at 3V / m.

9.3. Severity Level

Level	Field Strength V/m
1.	1
2.	3
3.	10
X	Special

Performance criterion: **A**

9.4. 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 polarization 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, a CCD camera is used to monitor EUT screen. All the scanning conditions are as follows:

Condition of Test	Remarks
1. Fielded Strength	3 V/m (Severity Level 2)
2. Radiated Signal	Unmodulated
3. Scanning Frequency	80 – 6000 MHz
4. Dwell time of radiated	0.0015 decade/s
5. Waiting Time	3 Sec.

9.5. Test Result

RF ELECTROMAGNETIC FIELD			
Standard	☐ IEC 61000-4-3 ☑ EN 61000-4-3		
Applicant	Shenzhen Chainway Information Technology Co.,Ltd.		
EUT	UHF RFID Module	**Temperature**	23.9℃
M/N	CM2000-1	**Humidity**	52.6%
Test Mode	TM1-TM2	**Criterion**	B
Test Engineer	QUXIN		

RF ID Test Result:

EUT Working Mode	Antenna Polarity	Frequency (MHz)	Field Strength (V/m)	Observation	Position	Conclusion
Operating Mode	Vertical	80--6000	3	CT,CR	Front, Right, Left, Back	Pass
	Horizontal	80--6000	3	CT,CR	Front, Right, Left, Back	Pass
Idle	Vertical	80--6000	3	See Note	Front, Right, Left, Back	Pass
	Horizontal	80--6000	3	See Note	Front, Right, Left, Back	Pass

TM2 Test Result:

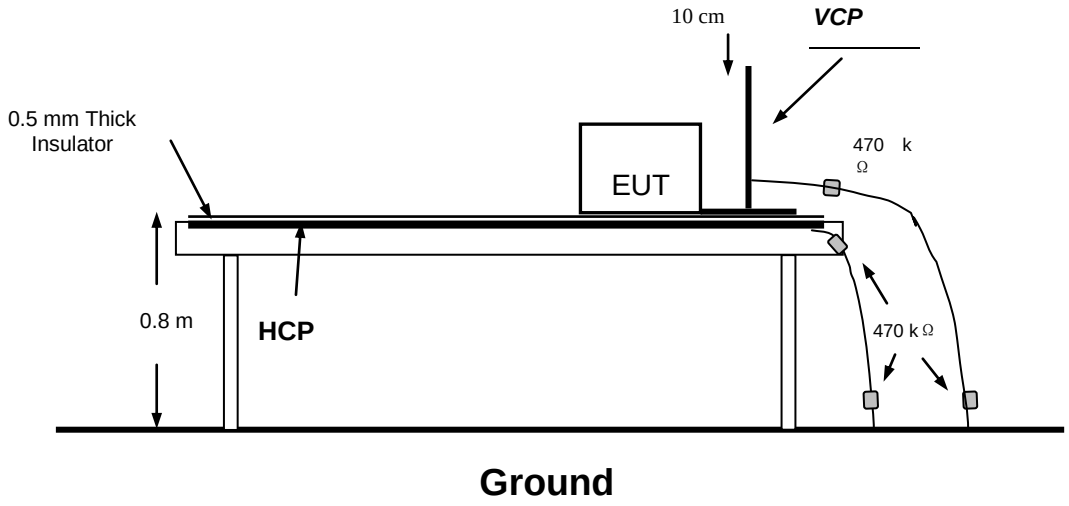
EUT Working Mode	Antenna Polarity	Frequency (MHz)	Field Strength (V/m)	Observation	Position	Conclusion
Operating Mode	Vertical	80--6000	3	See Note	Front, Right, Left, Back	Pass
	Horizontal	80--6000	3	See Note	Front, Right, Left, Back	Pass
Idle	Vertical	80--6000	3	See Note	Front, Right, Left, Back	Pass
	Horizontal	80--6000	3	See Note	Front, Right, Left, Back	Pass

***Note: Unintentional transmission is not founded from the EUT.

10. ELECTROSTATIC DISCHARGE

Please refer to ETSI EN 301 489-1 and EN 61000-4-2.

10.1. Test Configuration



EN 61000-4-2 specifies that a tabletop EUT shall be placed on a non-conducting table which is 80 centimeters above a ground reference plane and that floor mounted equipment shall be placed on a insulating support approximately 10 centimeters above a ground plane. During the tests, the EUT is positioned over a ground reference plane in conformance with this requirement.

For tabletop equipment, a 1.5 by 1.0-meter metal sheet (HCP) is placed on the table and connected to the ground plane via a metal strap with two 470 k Ohms resistors in series. The EUT and attached cables are isolated from this metal sheet by 0.5-millimeter thick insulating material. A Vertical Coupling Plane (VCP) grounded on the ground plane through the same configuration as in the HCP is used.

10.2. Test Procedure

ETSI EN 301 489-1 V2.1.1 (2017-02)/ EN 61000-4-2: 2009
Test level 3 for Air Discharge at ±8 kV
Test level 2 for Contact Discharge at ±4 kV

10.2.1. Air Discharge

This test is done on a non-conductive surface. 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.

10.2.2. Contact Discharge

All the procedure shall be same as Section 9.2.1. except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

10.2.3. Indirect Discharge For Horizontal Coupling Plane

At least 10 single discharges (in the most sensitive polarity) shall be applied at the front edge of each HCP opposite the center point of each unit (if applicable) of the EUT and 0.1m from the front of the EUT. The long axis of the discharge electrode shall be in the plane of the HCP and perpendicular to its front edge during the discharge.

10.2.4. Indirect Discharge For Vertical Coupling Plane

At least 10 single discharges (in the most sensitive polarity) 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.

10.3. Test Data

PASS.

Electrostatic Discharge Test Results

Standard	☐ IEC 61000-4-2 ☑ EN 61000-4-2		
Applicant	Shenzhen Chainway Information Technology Co.,Ltd.		
EUT	UHF RFID Module	**Temperature**	25.1℃
M/N	CM2000-1	**Humidity**	52.9％
Criterion	B	**Pressure**	1021mbar
Test Mode	TM1-TM2		
Test Engineer	QUXIN		

TEST RESULT OF RF ID

Test Voltage	Coupling	Observation	Result (Pass/Fail)
±2KV, ±4kV	Contact Discharge	TT, TR	Pass
±2KV, ±4kV, ±8kV	Air Discharge	TT, TR	Pass
±2KV, ±4kV	Indirect Discharge HCP	TT, TR	Pass
±2KV, ±4kV	Indirect Discharge VCP	TT, TR	Pass

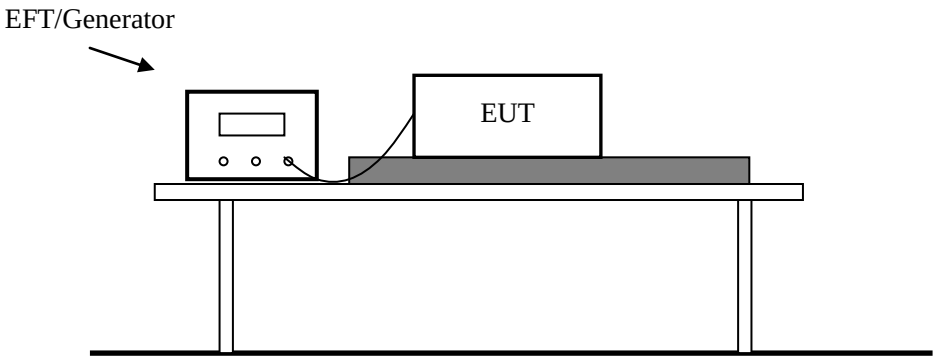
TEST RESULT OF TM2

Test Voltage	Coupling	Result (Pass/Fail)
±2KV, ±4kV	Contact Discharge	Pass
±2KV, ±4kV, ±8kV	Air Discharge	Pass
±2KV, ±4kV	Indirect Discharge HCP	Pass
±2KV, ±4kV	Indirect Discharge VCP	Pass

Note: The EUT performance complied with performance criteria for CT&CR to MS Function and there is no any degradation of performance and function.

11. ELECTRICAL FAST TRANSIENT IMMUNITY

11.1. Test Configuration



11.2. Test Standard

EN 301 489-1 V2.1.1/ EN61000-4-4: 2012
Test level 2 at 1 kV

Test level

Open Circuit Output Test Voltage ±10%		
Level	On Power Supply Lines	On I/O (Input/Output) Signal data and control lines
1	0.5 kV	0.25 kV
2	1 kV	0.5 kV
3	2 kV	1 kV
4	4 kV	2 kV
X	Special	Special

Performance criterion: B

11.3. Test Procedure

The EUT is put on the table, which is 0.8 meter high above the ground. This reference ground plane shall project beyond the EUT by at least 0.1m on all sides and the minimum distance between EUT and all other conductive structure, except the ground plane beneath the EUT, shall be more than 0.5m.

11.3.1.For input and output AC 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 2 minutes.

11.3.2.For signal lines and control lines ports: No I/O ports. It's unnecessary to test.

11.3.3.For DC output line ports: It's unnecessary to test.

11.4. Test Data

PASS.

Please refer to the following page.

Electrical Fast Transient/Burst Test Results

Standard	☐ IEC 61000-4-4 ☑ EN 61000-4-4		
Applicant	Shenzhen Chainway Information Technology Co.,Ltd.		
EUT	UHF RFID Module	**Temperature**	23.7℃
M/N	CM2000-1	**Humidity**	53.1％
Test Mode	TM1-TM3	**Criterion**	B
Test Engineer	QUXIN		

TEST RESULT OF RF ID

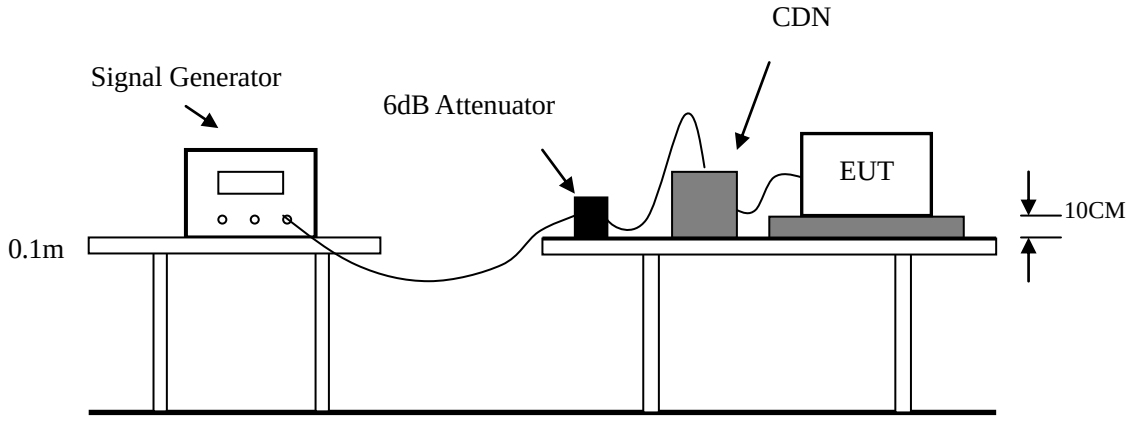
Line	Test Voltage	Polarity	Observation	Result (Pass/Fail)
L	1KV	+/-	TT, TR	Pass
N	1KV	+/-	TT, TR	Pass
L-N	1KV	+/-	TT, TR	Pass

TEST RESULT OF TM2

Line	Test Voltage	Polarity	Result (Pass/Fail)
L	1KV	+/-	Pass
N	1KV	+/-	Pass
L-N	1KV	+/-	Pass

12. RF COMMON MODE

12.1. Test Configuration



12.2. Test Standard

EN 301 489-1 V2.1.1/ EN 61000-4-6: 2014
Test level 2 at 3 V (r.m.s.), 0.15 MHz ~ 80 MHz,
Modulation type: AM
Modulation depth: 80%
Modulation signal: 1 kHz

Test level

Level	Voltage Level (r.m.s..) (V)
1	1
2	3
3	10
X	Special

Performance criterion: A

12.3. Test Procedure

12.3.1. Let the EUT work in test mode and test it.

12.3.2. The EUT are placed on an insulating support 0.1 m high above a ground reference plane. CDN (coupling and decoupling device) is placed on the ground plane about 0.3 m from EUT. Cables between CDN and EUT are as short as possible, and their height above the ground reference plane shall be between 30 and 50 mm (where possible).

12.3.3. The disturbance signal described below is injected to EUT through CDN.

12.3.4. The EUT operates within its operational mode(s) under intended climatic conditions after power on.

12.3.5. The frequency range is swept from 150 kHz to 80 MHz using 3V signal level, and with the disturbance signal 80% amplitude modulated with a 1kHz sine wave.

12.3.6. The rate of sweep shall not exceed 1.5*10-3 decades/s. Where the frequency is swept incrementally, the step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value.

12.3.7. Recording the EUT operating situation during compliance testing and decide the EUT immunity criterion.

12.4. Test Data

PASS.

Please refer to the following page.

Injected Currents Susceptibility Test Results

Standard	☐ IEC 61000-4-6 ☑ EN 61000-4-6		
Applicant	Shenzhen Chainway Information Technology Co.,Ltd.		
EUT	UHF RFID Module	**Temperature**	22.5℃
M/N	CM2000-1	**Humidity**	52.9%
Test Mode	TM1-TM3	**Criterion**	A
Test Engineer	QUXIN		

TEST RESULT OF RF ID

Frequency Range (MHz)	Injected Position	Strength (Unmodulated)	Observation	Result (Pass/Fail)
0.15 ~ 80	AC Mains	3V	CT, CR	Pass

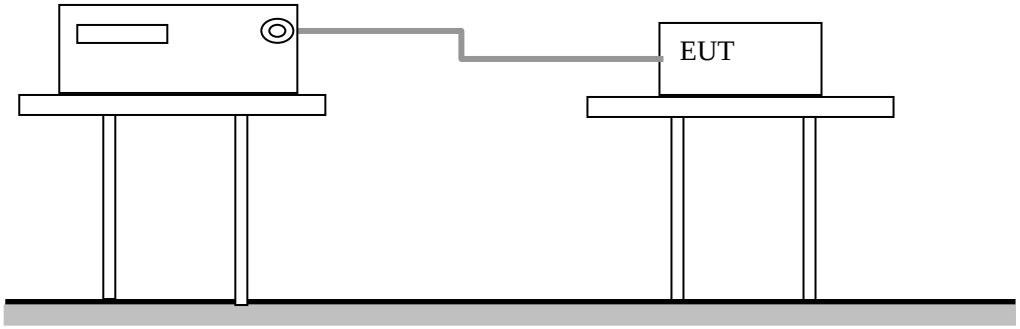
TEST RESULT OF TM2

Frequency Range (MHz)	Injected Position	Strength (Unmodulated)	Result (Pass/Fail)
0.15 ~ 80	AC Mains	3V	Pass

Remark:
1. Modulation Signal:1kHz 80% AM
2. Measurement Equipment :
Simulator: CIT-10 (FRANKONIA)
CDN : ☑CDN-M2 (FRANKONIA)
☐CDN-M3 (FRANKONIA)

13. SURGES, LINE TO LINE AND LINE TO GROUND

13.1. Test Configuration



Ground Plane

13.2. Test Standard

ETSI EN 301 489-1 V2.1.1 / EN 61000-4-5: 2014
L-N: Test level 2 at 1 kV
L-PE, N-PE Test Level 3 at 2kV

Test Level

Open Circuit Output Test Voltage ±10%		
Level	On Power Supply Lines	On I/O (Input/Output) Signal data and control lines
1	0.5 kV	0.25 kV
2	1 kV	0.5 kV
3	2 kV	1 kV
4	4 kV	2 kV
X	Special	Special

Performance criterion: B

13.3. Test Procedure

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

13.4. Test Data

Surge Immunity Test Result			
Standard	☐ IEC 61000-4-5 ☑ EN 61000-4-5		
Applicant	Shenzhen Chainway Information Technology Co.,Ltd.		
EUT	UHF RFID Module	**Temperature**	25.1℃
M/N	CM2000-1	**Humidity**	52.9%
Test Mode	TM1-TM3	**Criterion**	A
Test Engineer	QUXIN		

TEST RESULT OF RF ID

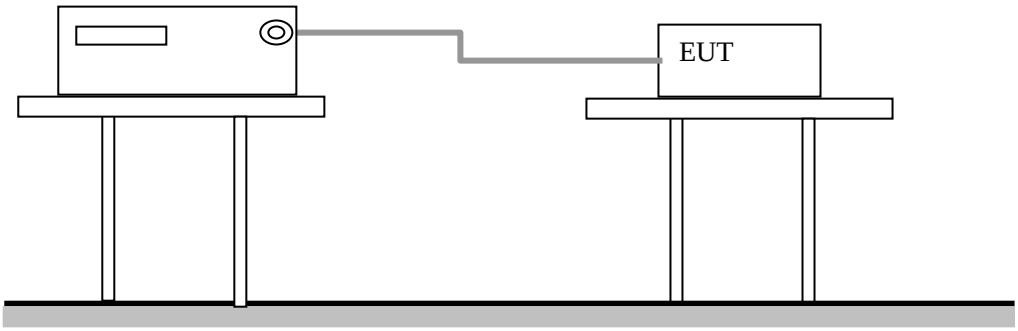
Location	Polarity	Phase Angle	Number of Pulse	Pulse Voltage (KV)	Observation	Result (Pass/Fail)
L-N	+	0^o, 90^o, 180^o, 270^o	5	1.0	TT, TR	Pass
	-	0^o, 90^o, 180^o, 270^o	5	1.0	TT, TR	Pass

TEST RESULT OF TM2

Location	Polarity	Phase Angle	Number of Pulse	Pulse Voltage (KV)	Result (Pass/Fail)
L-N	+	0^o, 90^o, 180^o, 270^o	5	1.0	Pass
	-	0^o, 90^o, 180^o, 270^o	5	1.0	Pass

14. VOLTAGE DIPS/INTERRUPTIONS IMMUNITY TEST

14.1. Test Configuration



Ground Plane

14.2. Test Standard

ETSI EN 301 489-1 V2.1.1/ EN 61000-4-11: 2004
Test levels and Performance Criterion

Test Level

Voltage Reduction %UT	Voltage dips %UT	Duration (in period)
100	0	0.5
100	0	1
30	70	5
Voltage Reduction %UT	Voltage Interruptions %UT	Duration (in period)
100	0	250

Performance criterion: B&C

14.3. Test Procedure

13.3.1. The interruption is introduced at selected phase angles with specified duration.

13.3.2. Record any degradation of performance.

14.4. Test Data

Voltage Dips And Interruptions Test Results			
Standard	☐ IEC 61000-4-11 ☑ EN 61000-4-11		
Applicant	Shenzhen Chainway Information Technology Co.,Ltd.		
EUT	UHF RFID Module	**Temperature**	23.7℃
M/N	CM2000-1	**Humidity**	53.1%
Test Mode	TM1-TM3	**Criterion**	A
Test Engineer	QUXIN		

TEST RESULT OF RF ID				
Test Level % U_T	**Voltage Dips & Short Interruptions % U_T**	**Duration (in periods)**	**Observation**	**Result (Pass/Fail)**
0	100	0.5P	TT, TR	Pass
0	100	1P	TT, TR	Pass
70	30	25P	TT, TR	Pass
0	100	250P	TT, TR	Pass

TEST RESULT OF TM2			
Test Level % U_T	**Voltage Dips & Short Interruptions % U_T**	**Duration (in periods)**	**Result (Pass/Fail)**
0	100	0.5P	Pass
0	100	1P	Pass
70	30	25P	Pass
0	100	250P	Pass

15. LIST OF MEASURING EQUIPMENT

LINE CONDUCTED EMISSION

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	EMI Test Software	AUDIX	E3	/	N/A	N/A
2	EMI Test Receiver	R&S	ESPI	101840	2019-06-11	2020-06-10
3	Artificial Mains	R&S	ENV216	101288	2019-06-12	2020-06-11
4	10dB Attenuator	SCHWARZBECK	MTS-IMP-136	261115-001-0032	2019-06-11	2020-06-10

RADIATED DISTURBANCE

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	EMI Test Software	AUDIX	E3	/	N/A	N/A
2	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2019-06-12	2020-06-11
3	Positioning Controller	MF	MF-7082	/	2019-06-12	2020-06-11
4	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2019-07-25	2020-07-24
5	Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1925	2019-07-01	2020-06-30
6	EMI Test Receiver	R&S	ESR 7	101181	2019-06-12	2020-06-11
7	RS SPECTRUM ANALYZER	R&S	FSP40	100503	2018-11-15	2019-11-14
8	Broadband Preamplifier	/	BP-01M18G	P190501	2019-07-01	2020-06-30
9	RF Cable-R03m	Jye Bao	RG142	CB021	2019-06-12	2020-06-11
10	RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	2019-06-12	2020-06-11

VOLTAGE FLUCTUATION AND FLICKER/HARMONIC CURRENT EMISSIONS

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	Power Analyzer Test System	Voltech	PM6000	200006700523	2019-06-12	2020-06-11

RF ELECTROMAGNETIC FIELD

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	RS Test Software	Tonscend	/	/	N/A	N/A
2	ESG Vector Signal Generator	Agilent	E4438C	MY42081396	2019-11-15	2020-11-14
3	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2019-06-12	2020-06-11
4	RF POWER AMPLIFIER	OPHIR	5225R	1052	NCR	NCR
5	RF POWER AMPLIFIER	OPHIR	5273F	1019	NCR	NCR
6	Stacked Broadband Log Periodic Antenna	SCHWARZBECK	STLP 9128	9128ES-145	NCR	NCR
7	Stacked Mikrowellen Log.-Per Antenna	SCHWARZBECK	STLP 9149	9149-484	NCR	NCR
8	Electric field probe	Narda S.TS./PMM	EP601	611WX80208	2019-03-25	2020-03-24

ELECTROSTATIC DISCHARGE

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	ESD Simulator	SCHLODER	SESD 230	604035	2019-06-13	2020-06-12

ELECTRICAL FAST TRANSIENT IMMUNITY

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	Immunity Simulative Generator	EM TEST	UCS500 M4	0101-34	2019-06-11	2020-06-10

RF COMMON MODE

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	Simulator	FRANKONIA	CIT-10/75	A126A1195	2019-06-11	2020-06-10
2	CDN	FRANKONIA	CDN-M2+M3	A2210177	2019-06-11	2020-06-10
3	6dB Attenuator	FRANKONIA	DAM25W	1172040	2019-06-11	2020-06-10

SURGES, LINE TO LINE AND LINE TO GROUND

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	Immunity Simulative Generator	EM TEST	UCS500 M4	0101-34	2019-06-11	2020-06-10

VOLTAGE DIPS/INTERRUPTIONS IMMUNITY TEST

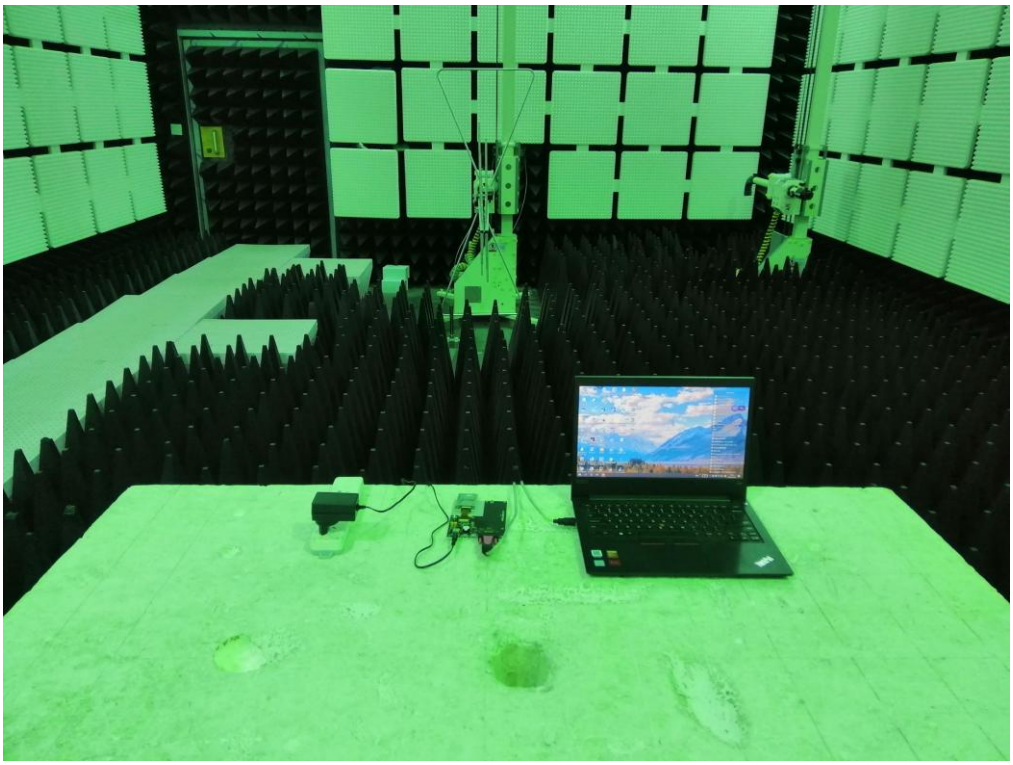
Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	Voltage dips and up generator	3CTEST	VDG-1105G	EC0171014	2019-06-11	2020-06-10

Note: All equipment is calibrated through GUANGZHOU LISAI CALIBRATION AND TEST CO.,LTD.

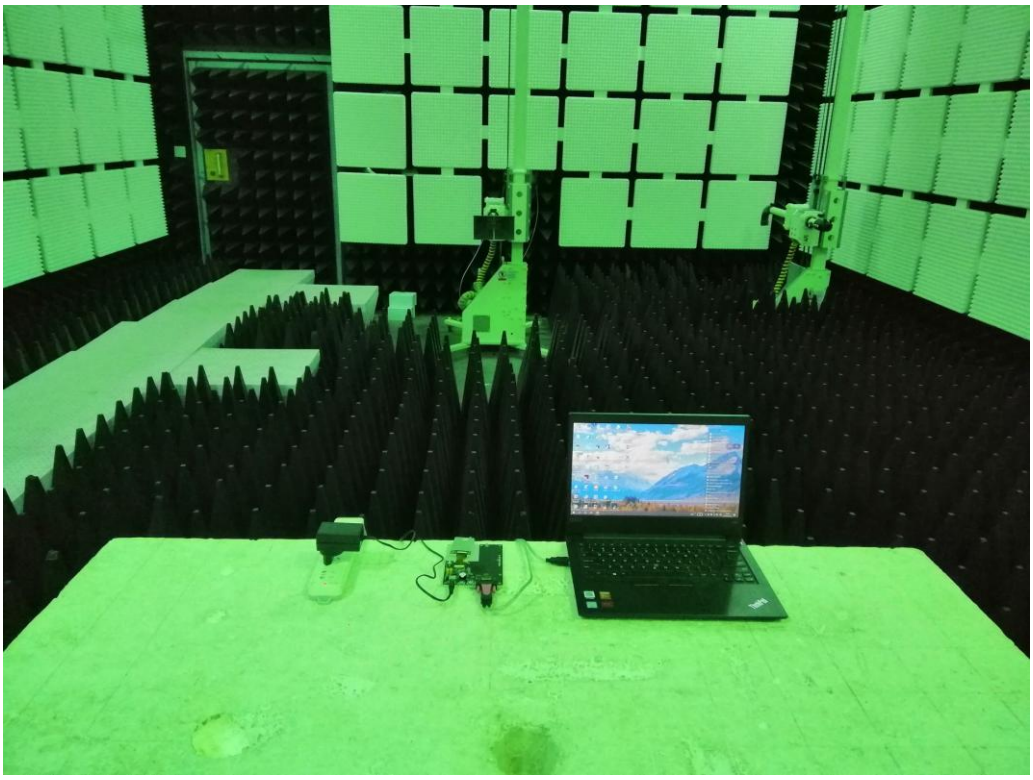
----------THE END OF REPORT----------

1. TEST SETUP PHOTOGRAPHS

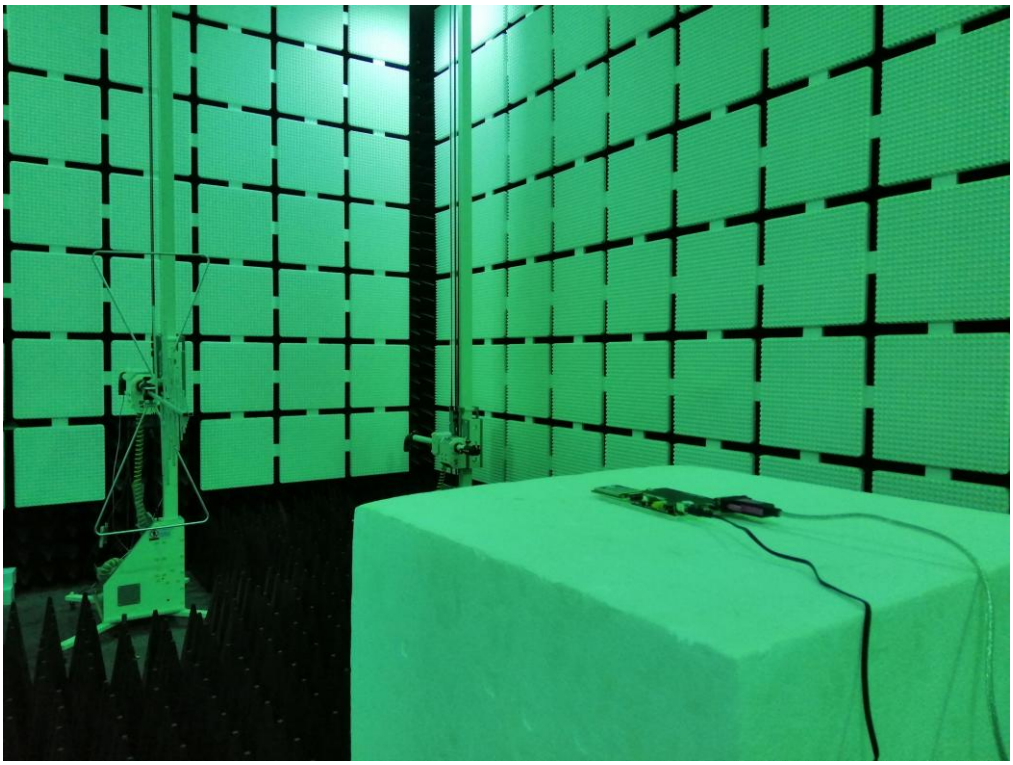
1.1. Photo of Radiated Emissions Measurement



Below 1GHz



Above 1GHz

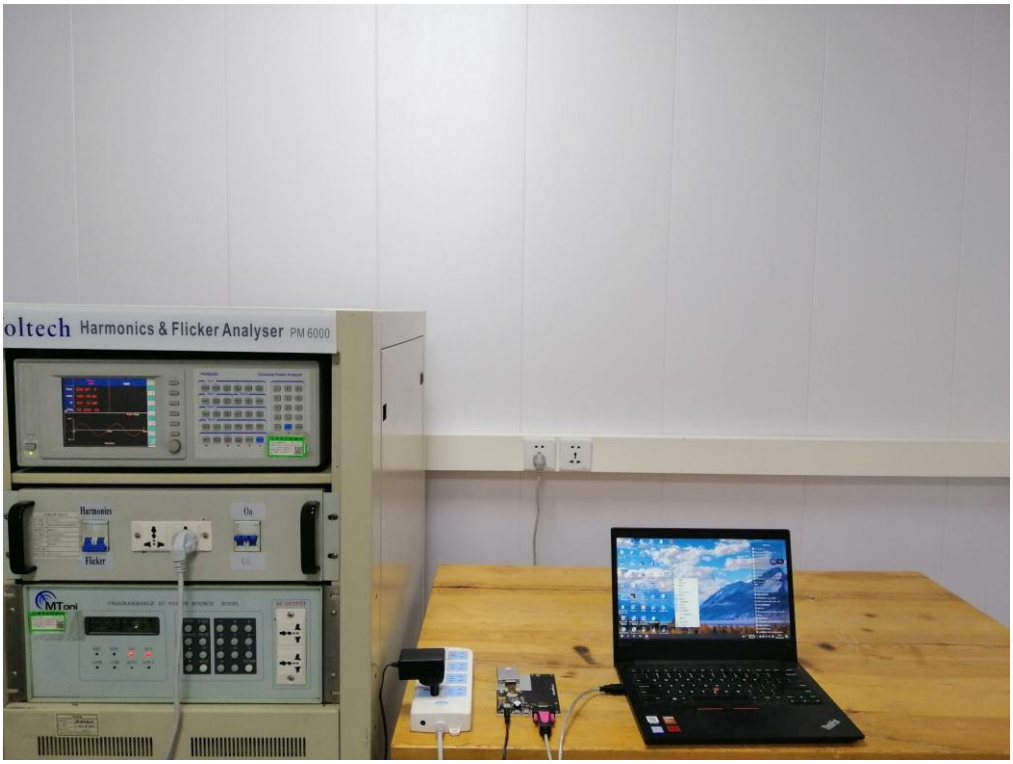


Below 1GHz

Above 1GHz

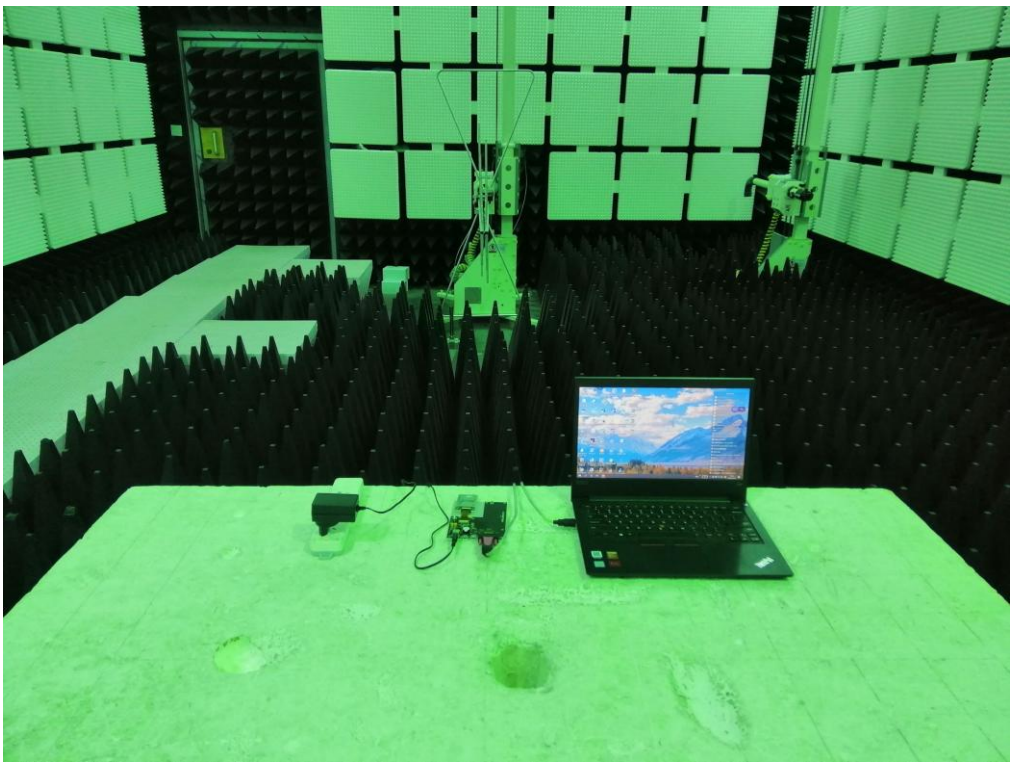
1.2. Photo of Power Line Conducted Emissions Measurement

1.3. Photo of Harmonic & Flicker Measurement

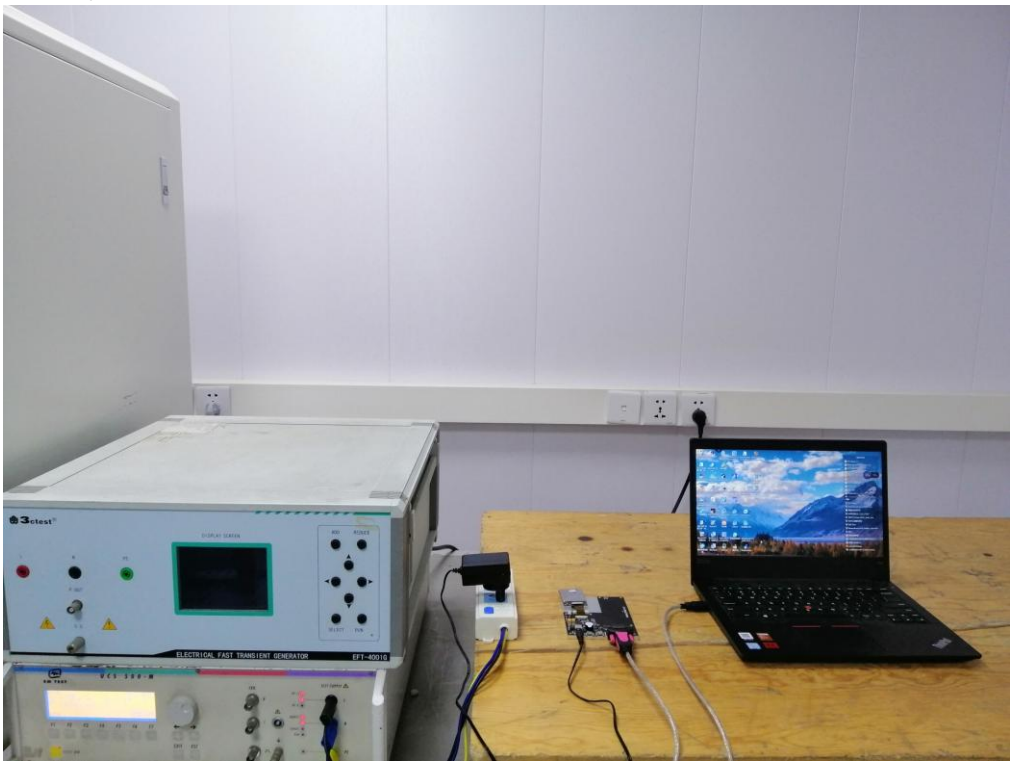


1.4. Photo of Electrostatic Discharge Test

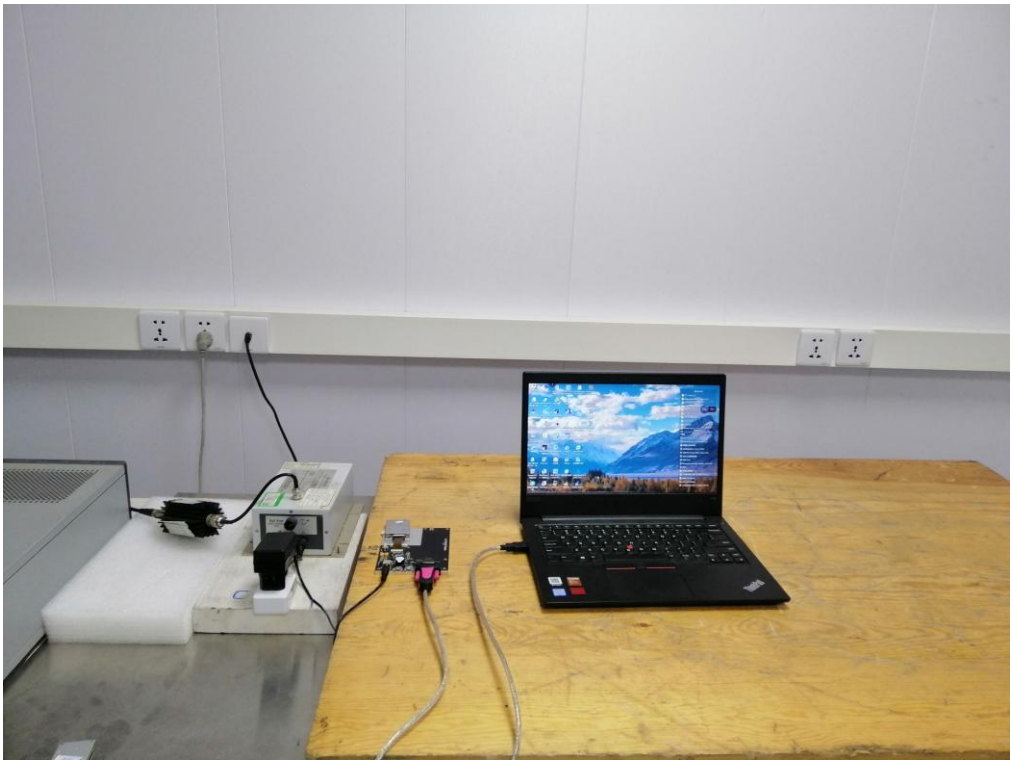
1.5. Photo of Radio-frequency, Continuous radiated disturbance



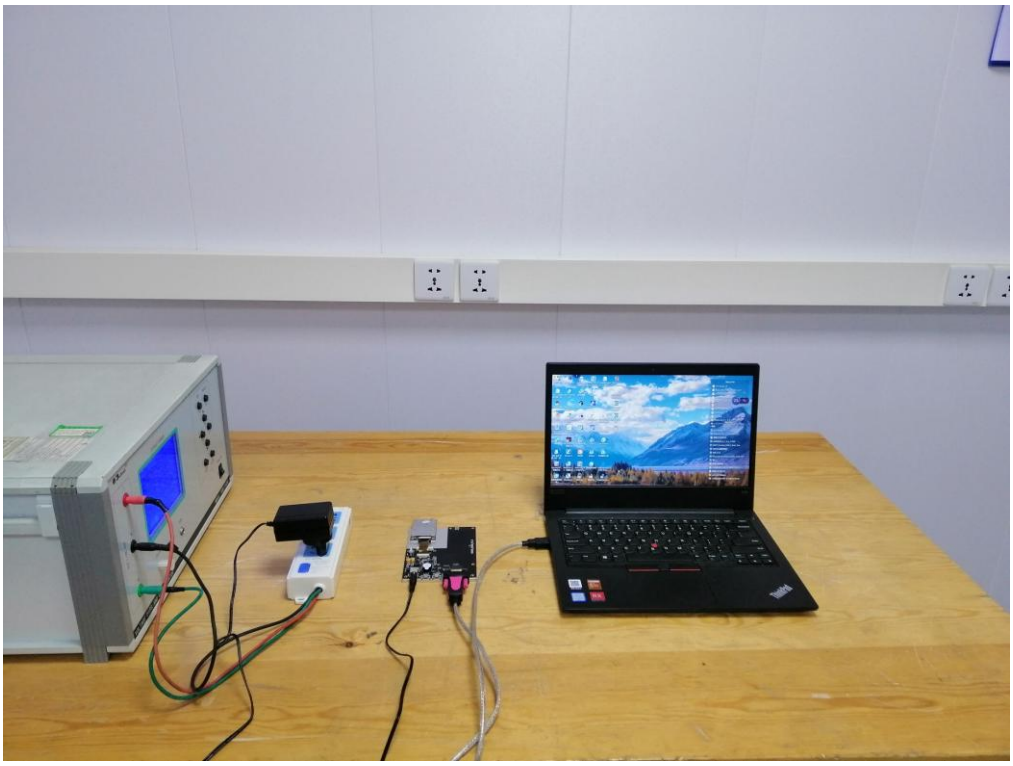
1.6. Photo of Electrical Fast Transient/Burst& Surge Immunity Short Interruptions Immunity Test



1.7. Photo of Injected Currents Susceptibility Test



1.8. Photo of Voltage Dips and Short Interruptions Immunity Test



1. EXTERIOR PHOTOGRAPHS

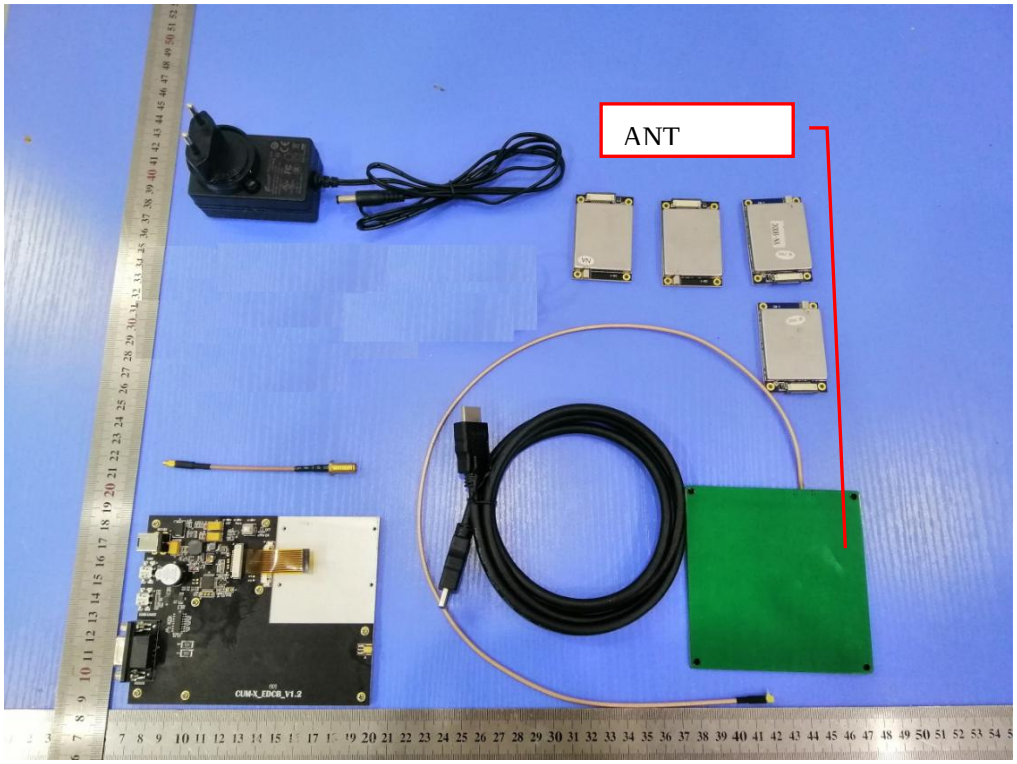


Fig. 1

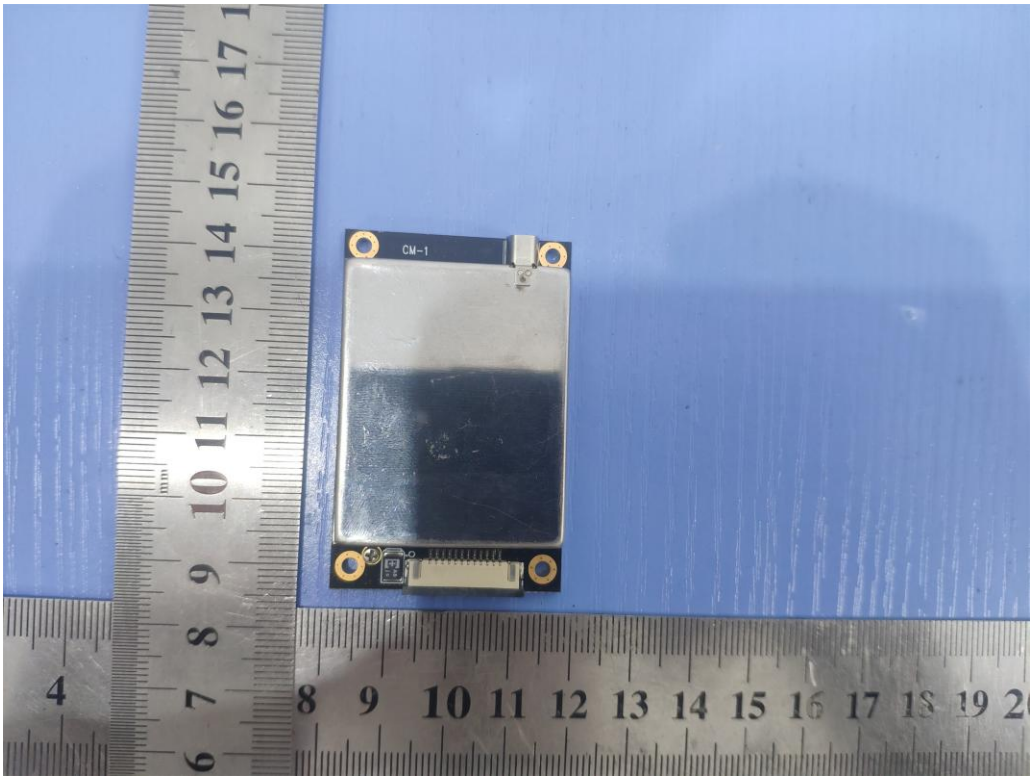


Fig. 2

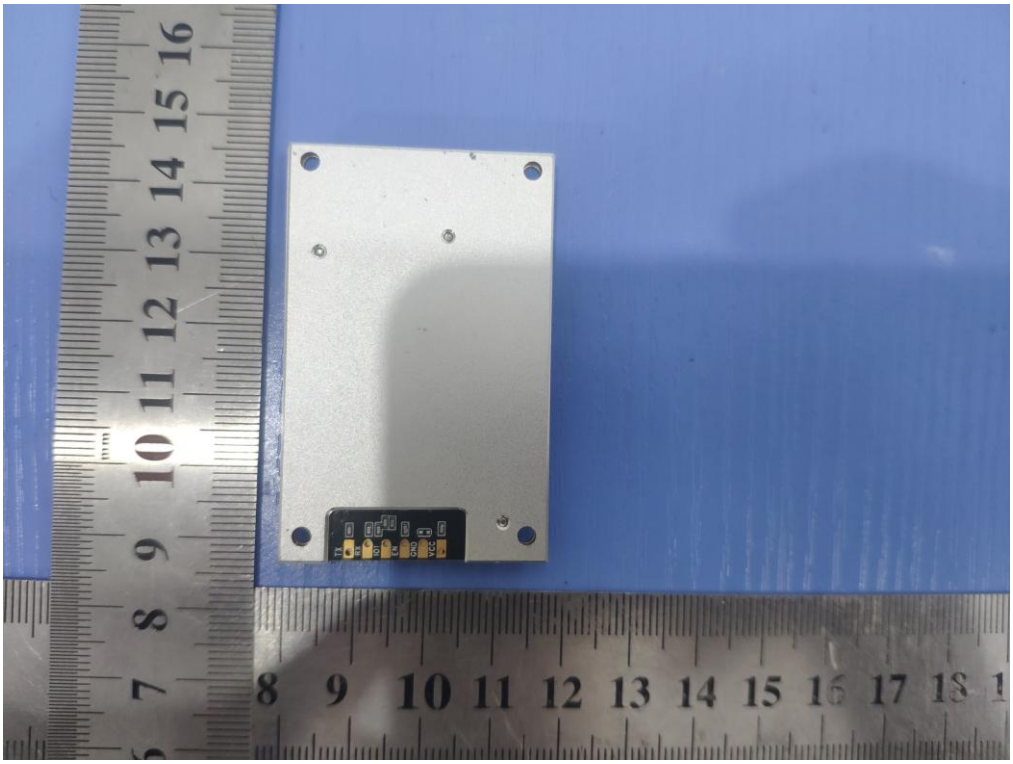


Fig. 3

1. INTERIOR PHOTOGRAPHS

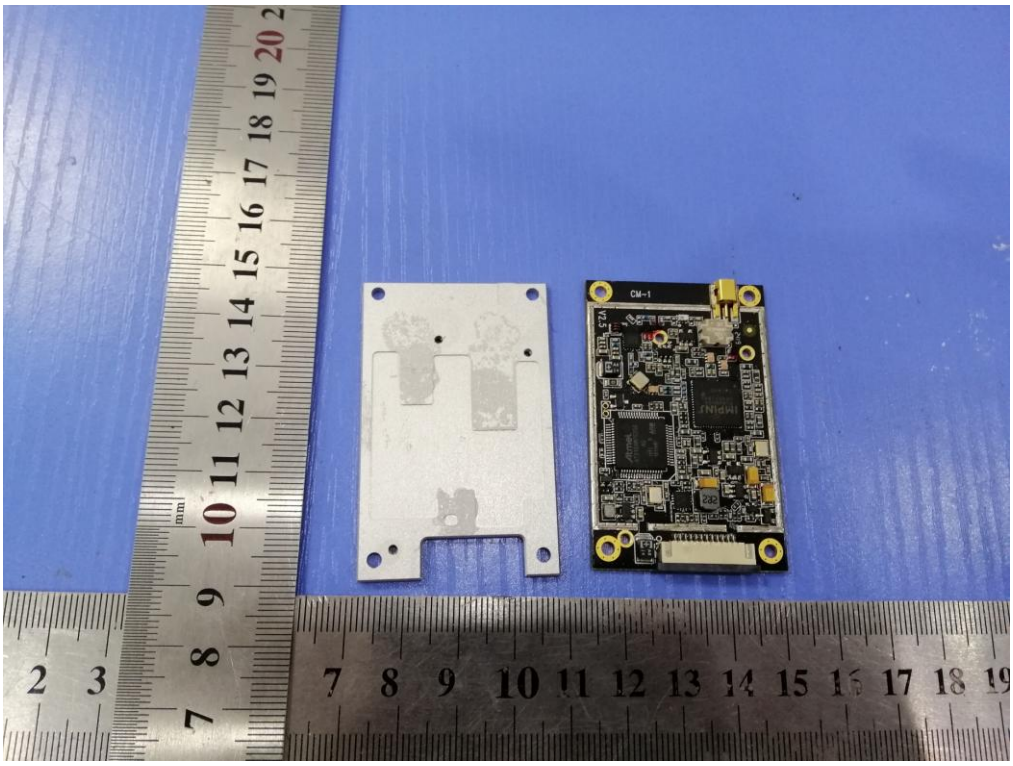


Fig.1

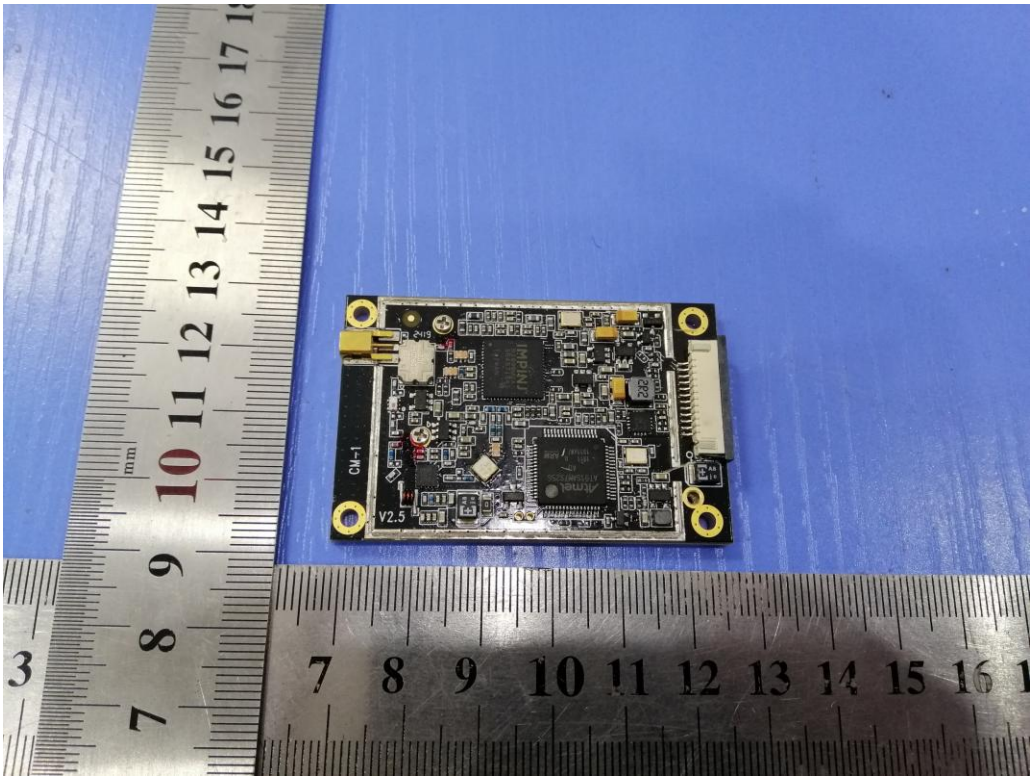


Fig.2

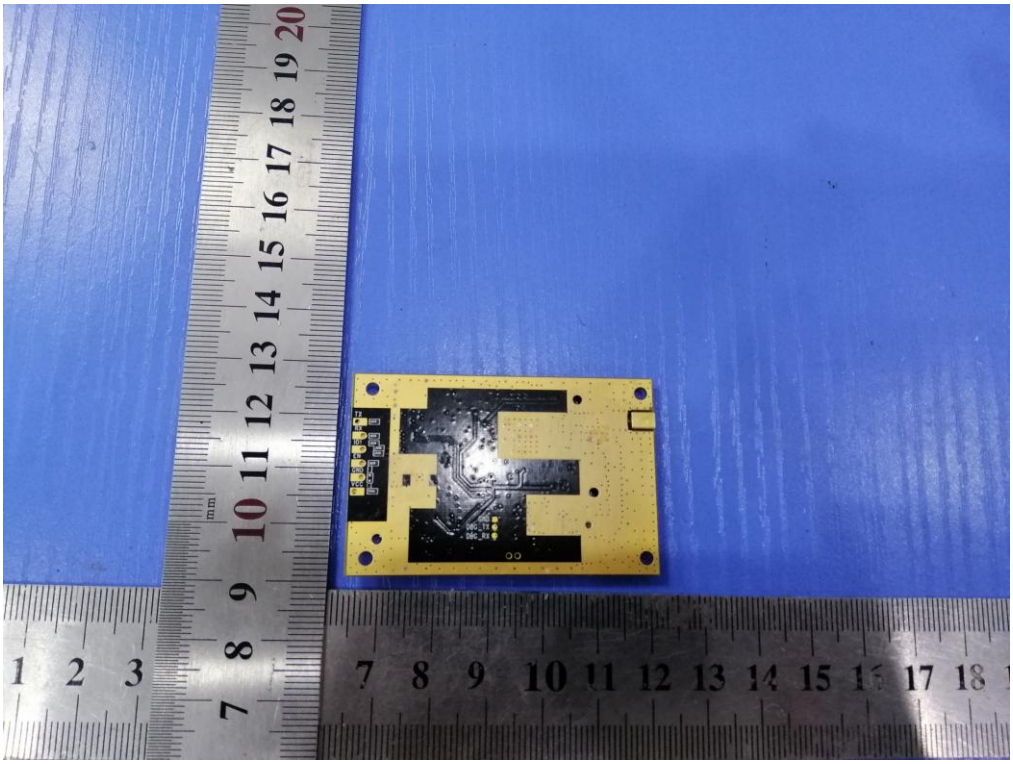


Fig.3

Fig.4