

TEST REPORT

Applicant	Particle Industries, Inc
Address	126 Post St,4th floor, San Francisco, CA 94108 USA

Manufacturer or Supplier	Particle Industries, Inc	
Address	126 Post St,4th floor, San Francisco, CA 94108 USA	
Product	Argon	
Brand Name	Particle Industries, Inc	
Model	ARGN	
Additional Model & Model Difference	N/A	
Date of tests	Aug. 17, 2018 ~ Oct. 25, 2018	

The submitted sample of the above equipment has been tested according to the requirements of the following standards:

- EN 55032:2015+A11:2020, Class B
- EN 55035:2017+A11:2020
- EN 301 489-1 V2.2.3(2019-11)
- EN 301 489-3 V2.1.1 (2019-03)
- EN 301 489-17 V3.2.4 (2020-09)

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

Tested by Andy Zhu
Supervisor / EMC Department

Approved by Madison Luo
Assistant Manager / EMC Department




Date: Aug. 13, 2021

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Table of Contents

1	SUMMARY OF TEST RESULTS.....	4
1.1	MEASUREMENT UNCERTAINTY	5
2	GENERAL INFORMATION	6
2.1	GENERAL DESCRIPTION OF EUT	6
2.2	DESCRIPTION OF TEST MODES	7
2.3	TEST PROGRAM USED AND OPERATION DESCRIPTIONS.....	8
2.4	GENERAL DESCRIPTION OF APPLIED STANDARDS	8
2.5	DESCRIPTION OF SUPPORT UNITS.....	8
3	CONDUCTED EMISSION FROM THE AC MAINS POWER PORT	9
3.1	LIMITS	9
3.2	TEST INSTRUMENT.....	9
3.3	TEST ARRANGEMENT	9
3.4	TEST SETUP	10
3.5	SUPPLEMENTARY INFORMATION.....	10
3.6	TEST RESULTS	11
4	RADIATED EMISSION MEASUREMENT.....	13
4.1	LIMITS OF RADIATED EMISSION MEASUREMENT	13
4.2	TEST INSTRUMENTS	15
4.3	TEST PROCEDURE	16
4.4	TEST SETUP	18
4.5	SUPPLEMENTARY INFORMATION.....	18
4.6	TEST RESULTS (BELOW 1GHZ).....	19
4.7	TEST RESULTS (ABOVE 1GHZ)	21
5	IMMUNITY TEST.....	22
5.1	GENERAL DESCRIPTION.....	22
5.1.1	GENERAL DESCRIPTION OF EN 55035	22
5.1.2	PERFORMANCE CRITERIA	23
5.1.3	EUT OPERATING CONDITION.....	25
5.2	ELECTROSTATIC DISCHARGE IMMUNITY TEST (ESD) (EN55035, EN301 489)	26
5.2.1	TEST SPECIFICATION	26
5.2.2	TEST INSTRUMENTS	26
5.2.3	TEST PROCEDURE	27
5.2.4	DEVIATION FROM TEST STANDARD	28
5.2.5	TEST SETUP	28
5.2.6	TEST RESULTS	29
5.3	RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD IMMUNITY TEST (RS) (EN55035)	30
5.3.1	TEST SPECIFICATION	30
5.3.2	TEST INSTRUMENTS	30
5.3.3	TEST PROCEDURE	31
5.3.4	DEVIATION FROM TEST STANDARD	31
5.3.5	TEST SETUP	32
5.3.6	TEST RESULTS	34
5.4	RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD IMMUNITY TEST (RS) (EN301 489)	35
5.4.1	TEST SPECIFICATION	35
5.4.2	TEST INSTRUMENT.....	35
5.4.3	TEST PROCEDURE	36
5.4.4	DEVIATION FROM TEST STANDARD.....	36
5.4.5	TEST SETUP	36
5.4.6	TEST RESULTS	37
6	PHOTOGRAPHS OF THE TEST CONFIGURATION	38
7	APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB.....	41



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Test Report No.: CE2107WDG0228

RELEASE CONTROL RECORD

Issue No.	Description	Date Issued
CE180817N043	Original release	Nov. 30, 2018
CE2107WDG0228	Basic the above original report to updated: 1) Reduced IEEE802.15.4 functions; 2) Renew all standards. No need to be retested after evaluation.	Aug. 13, 2021



1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

EMISSION			
Standard	Test Item	Result	Remarks
EN 55032:2015 + A11:2020, Class B	Conducted emission from the AC mains power port	PASS	Minimum passing Class B margin is -28.92 dB at 0.80250 MHz
	Radiated emission 30MHz-1000MHz	PASS	Minimum passing Class B margin is -12.85 dB at 39.604 MHz
	Radiated emission 1GHz -6GHz	PASS	Minimum passing Class B margin is -11.30 dB at 2147.960 MHz

IMMUNITY (EN 55035:2017+A11:2020)			
Standard	Test Type	Result	Remarks
IEC 61000-4-2:2008 ED. 2.0	Electrostatic discharge immunity test	PASS	Electrostatic Discharge – ESD: 8kV Air discharge, 4kV Contact discharge, Performance Criterion A
IEC 61000-4-3:2010 ED. 3.2	Radiated, radio-frequency, electromagnetic field immunity test	PASS	Meets the requirements

IMMUNITY (EN 301 489-1 V2.2.3, EN 301 489-3 V2.1.1, EN 301489-17 V3.2.4)			
Standard	Test Type	Result	Remarks
EN 61000-4-2:2009	Electrostatic discharge immunity test	PASS	Electrostatic Discharge – ESD: 8kV Air discharge, 4kV Contact discharge, Performance Criterion A
EN 61000-4-3:2006 A1:2008 + A2:2010	Radiated, radio-frequency, electromagnetic field immunity test	PASS	Radio-Frequency Electromagnetic Field Susceptibility Test – RS: 80-6000 MHz, 3V/m, 80% AM (1kHz), Performance Criterion A



1.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

The listed uncertainties are the worst case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results.

MEASUREMENT	FREQUENCY	UNCERTAINTY
Mains Terminal Disturbance Voltage Test	0.15MHz ~ 30MHz	+/-3.05 dB
Radiated Disturbance Test	30MHz ~ 1000MHz	+/- 4.00 dB
	1GHz ~ 6GHz	+/- 5.17 dB



2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Argon
BRAND	Particle Industries, Inc
TEST MODEL	ARGN
ADDITIONAL MODEL	N/A
POWER SUPPLY	Li+ PIN /Battery connector: DC 3.7V from Li-ion Battery or VUSB PIN /USB connector :DC 5V from USB Host Unit
OPERATING FREQUENCY	2412 - 2472MHz for WiFi, 13.56MHz for NFC
DATA CABLE	N/A

Notes:

1. For the test results, the EUT had been tested with all conditions. But only the worst case was showed in test report.
2. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
3. Please refer to the EUT photo document (Reference No.: 180817N043) for detailed product photo.
4. The EUT is wireless module, it no any accessories, the test standard and items were specified by applicant.



2.2 DESCRIPTION OF TEST MODES

The EUT was tested under the following modes' the final worst mode were marked in boldface and recorded in this report.

◆ FOR CONDUCTED EMISSION TEST:

Test Mode	Test Standard	Test Voltage
WIFI Link Data Transmitting	EN55032, EN301489	DC 5V from Adapter
NFC Normal Working		

◆ FOR RADIATED EMISSIONS TEST(Below 1GHz):

Test Mode	Test Standard	Test Voltage
WIFI Link Data Transmitting	EN55032, EN301489	DC 3.7V from Battery
NFC Normal Working		
WIFI Link Data Transmitting		DC 5V from Adapter

◆ FOR RADIATED EMISSIONS TEST(Above 1GHz):

Test Mode	Test Standard	Test Voltage
WIFI Link Data Transmitting	EN55032, EN301489	DC 3.7V from Battery

◆ FOR IMMUNITY TESTS

Test Mode	Test Standard	Test Voltage
WIFI Link Data Transmitting	EN301489, EN55035	DC 3.7V from Battery or DC 5V from Adapter
NFC Normal Working		



2.3 TEST PROGRAM USED AND OPERATION DESCRIPTIONS

- a. Turned on the power of all equipment.
- b. EUT was operated according to the type described in manufacturer's specifications or the user's manual.

2.4 GENERAL DESCRIPTION OF APPLIED STANDARDS

According to the specifications of the manufacturers, the EUT must comply with the requirements of the following standards:

EN 55032:2015+A11:2020, CLASS B

EN 55035:2017+A11:2020

IEC 61000-4-2:2008 ED. 2.0

IEC 61000-4-3:2010 ED. 3.2

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

EN 301 489-3 V2.1.1 (2019-03)

EN 301 489-17 V3.2.4 (2020-09)

EN 61000-4-2:2009

EN 61000-4-3:2006 + A1:2008 + A2:2010

All applicable tests have been performed and recorded as per the above standards.

2.5 DESCRIPTION OF SUPPORT UNITS

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

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	Adapter	N/A	DC 5V 1.5A	N/A	N/A
2	iPhone 6s	Apple	ML7F2CH/A	C6KQKXLAGRY8	N/A
3	Li-ion Battery	N/A	DC3.7V	N/A	N/A

NO.	DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	USB Line: Unshielded, detachable 0.6m.
2, 3	N/A



3 CONDUCTED EMISSION FROM THE AC MAINS POWER PORT

3.1 LIMITS

Frequency (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

- NOTES:** 1. The lower limit shall apply at the transition frequencies.
 2. The limit decreases linearly with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

3.2 TEST INSTRUMENT

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESR7	101494	Mar. 21,18	Mar. 20,19
Artificial Mains Network	Rohde&Schwarz	ENV216	101173	Mar. 03,18	Mar. 02,19
Artificial Mains Network	Rohde&Schwarz	ESH3-Z5	100317	Apr. 11,18	Apr. 10,19
Voltage probe	SCHWARZBECK	TK 9421	TK 9421-176	Jan. 17,18	Jan. 16,19
Test software	ADT	ADT_Cond V7.3.7	N/A	N/A	N/A

- NOTES:** 1. The calibration interval of the above test instruments is 12 months. And the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
 2. The test was performed at Shielded Room 553.

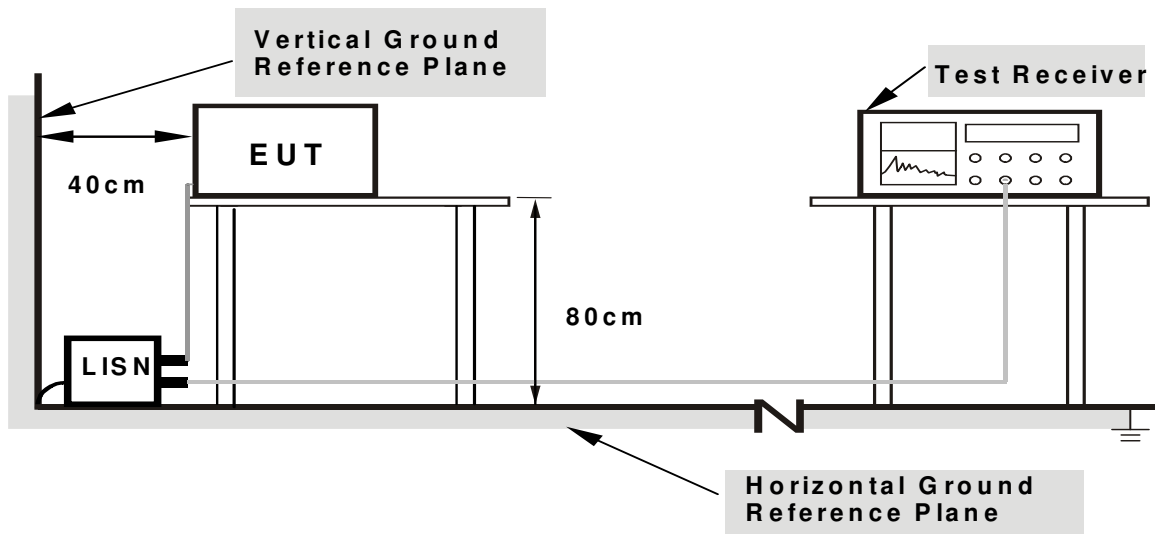
3.3 TEST ARRANGEMENT

- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The test results of conducted emissions at mains ports are recorded of six worst margins for quasi-peak (mandatory) [and average (if necessary)] values against the limits at frequencies of interest unless the margin is 20 dB or greater.

Note: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.



3.4 TEST SETUP



- Note:**
1. Support units were connected to second LISN.
 2. Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.

3.5 SUPPLEMENTARY INFORMATION

N/A

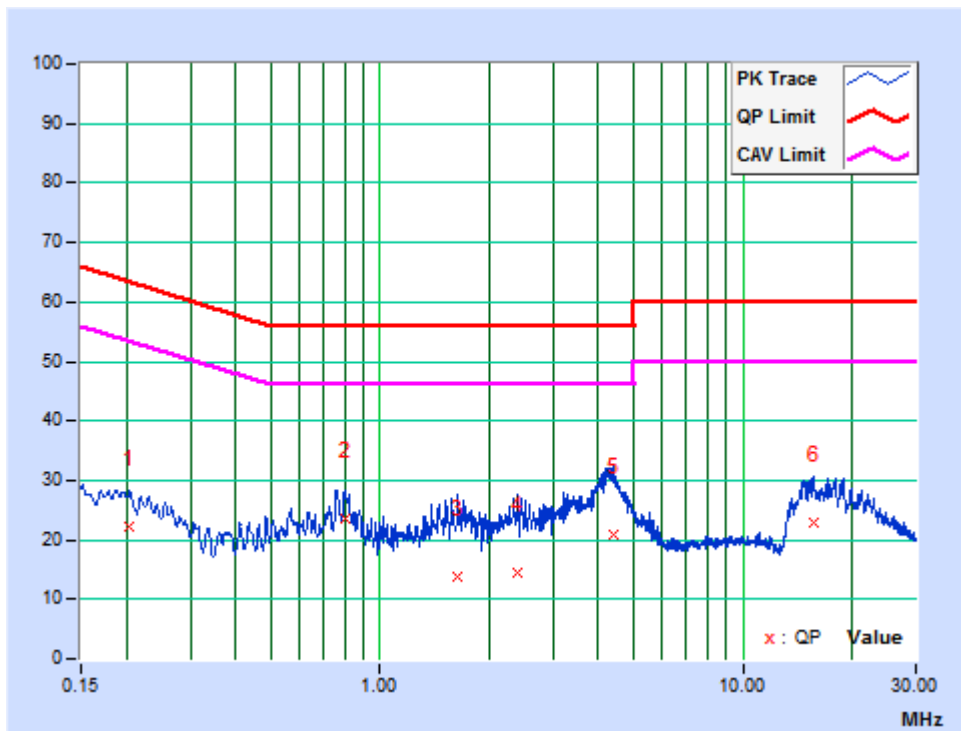


3.6 TEST RESULTS

TEST MODE	WIFI Link Data Transmitting	6DB BANDWIDTH	9 kHz
TEST VOLTAGE	DC 5V from Adapter	PHASE	Line (L)
ENVIRONMENTAL CONDITIONS	22deg. C, 50% RH	TESTED BY	Dragon

No.	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.20410	10.29	11.92	0.70	22.21	10.99	63.44	53.44	-41.23	-42.45
2	0.80250	10.47	13.07	6.61	23.54	17.08	56.00	46.00	-32.46	-28.92
3	1.63725	10.25	3.59	-3.63	13.84	6.62	56.00	46.00	-42.16	-39.38
4	2.39550	10.05	4.42	-3.50	14.47	6.55	56.00	46.00	-41.53	-39.45
5	4.41375	9.99	11.02	0.75	21.01	10.74	56.00	46.00	-34.99	-35.26
6	15.60525	9.82	13.11	7.30	22.93	17.12	60.00	50.00	-37.07	-32.88

REMARK: The emission levels of other frequencies were very low against the limit.





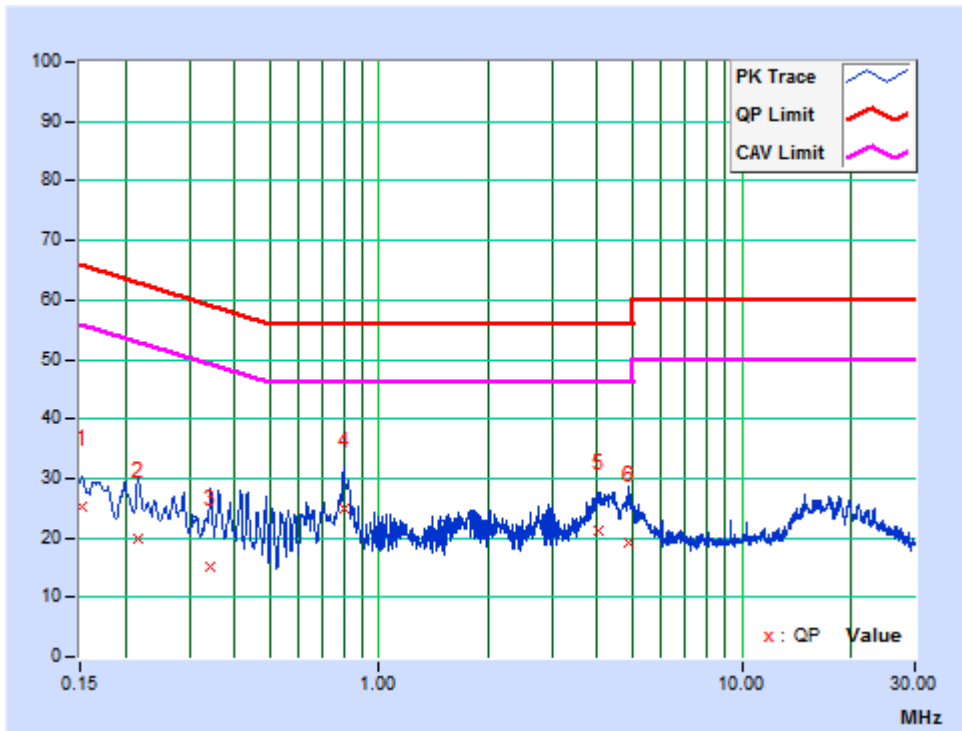
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Test Report No.: CE2107WDG0228

TEST MODE	WIFI Link Data Transmitting	6DB BANDWIDTH	9 kHz
TEST VOLTAGE	DC 5V from Adapter	PHASE	Neutral (N)
ENVIRONMENTAL CONDITIONS	22deg. C, 50% RH	TESTED BY	Dragon

No.	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15225	9.72	15.41	1.14	25.13	10.86	65.88	55.88	-40.75	-45.02
2	0.21745	9.76	10.03	-2.55	19.79	7.21	62.92	52.92	-43.12	-45.70
3	0.34335	10.25	4.97	-3.97	15.22	6.28	59.12	49.12	-43.90	-42.84
4	0.80250	9.95	15.09	5.99	25.04	15.94	56.00	46.00	-30.96	-30.06
5	4.02200	9.69	11.56	3.28	21.25	12.97	56.00	46.00	-34.75	-33.03
6	4.86825	9.76	9.52	1.50	19.28	11.26	56.00	46.00	-36.72	-34.74

REMARK: The emission levels of other frequencies were very low against the limit.





4 RADIATED EMISSION MEASUREMENT

4.1 LIMITS OF RADIATED EMISSION MEASUREMENT

FOR FREQUENCY BELOW 1000 MHz

FREQUENCY (MHz)	Class A (at 10m)	Class B (at 10m)
	Quasi-Peak dBuV/m	Quasi-Peak dBuV/m
30 – 230	40	30
230 – 1000	47	37

FREQUENCY (MHz)	Class A (at 3m)	Class B (at 3m)
	Quasi-Peak dBuV/m	Quasi-Peak dBuV/m
30 – 230	50	40
230 – 1000	57	47

For FM receivers

Distance (m)	Source	Frequency Range (MHz)	Limits dB (uV/m)	
			Quasi-peak	
10	Local oscillator	≤1000	Fundamental	50
		30 to 300	Harmonics	42
	Other	300 to 1000	Harmonics	46
		30 to 230		30
		230 to 1000		37
3	Local oscillator	≤1000	Fundamental	60
		30 to 300	Harmonics	52
	Other	300 to 1000	Harmonics	56
		30 to 230		40
		230 to 1000		47



FREQUENCY RANGE OF RADIATED MEASUREMENT (For unintentional radiators)

Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz)	Range (MHz)
Below 108	1000
108 – 500	2000
500 – 1000	5000
Above 1000	Up to 5 times of the highest frequency or 6 GHz, whichever is less

FOR FREQUENCY ABOVE 1000 MHz

FREQUENCY (GHz)	Class A (dBuV/m) (at 3m)		Class B (dBuV/m) (at 3m)	
	PEAK	AVERAGE	PEAK	AVERAGE
1 to 3	76	56	70	50
3 to 6	80	60	74	54

- NOTES:**
1. The lower limit shall apply at the transition frequencies.
 2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
 3. All emanation from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.



4.2 TEST INSTRUMENTS

FREQUENCY RANGE BELOW 1GHz

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESU26	100005	Aug. 24,18	Aug. 23,19
EMI Test Receiver	Rohde&Schwarz	ESR7	101564	Jan. 18,18	Jan. 17,19
Trilog-Broadband Antenna	SCHWARZBECK	VULB 9168	9168-555	Nov. 10, 17	Nov. 09, 18
Trilog-Broadband Antenna	SCHWARZBECK	VULB 9168	9168-554	Dec. 10, 17	Dec. 09, 18
Preamplifier	EMCI	EMC1135	980378	Mar. 19,18	Mar. 18,19
Preamplifier	EMCI	EMC1135	980423	Mar. 19,18	Mar. 18,19
10m Semi-anechoic Chamber	CHANGLING	21.4m*12.1m* 8.8m	NSEMC006	Feb. 10,18	Feb. 09,19
Test Software	ADT	ADT_Radiated V8.7.07	N/A	N/A	N/A

- NOTES:** 1. The test was performed in 10m Chamber.
2. The calibration interval of the above test instruments is 12 months. And the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

FREQUENCY RANGE ABOVE 1GHz

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Horn Antenna	ETS-Lindgren	3117	00085519	Dec. 10, 17	Dec. 09, 18
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170242	May 05,18	May 04,19
Signal and Spectrum Analyzer	Rohde&Schwarz	FSV40	101003	Apr. 21,18	Apr. 20,19
Broadband Preamplifier (1~18GHz)	SCHWARZBECK	BBV9718	266	Apr. 18,18	Apr. 18,19
Pre-Amplifier (18GHz-40GHz)	EMCI	EMC 184045	980102	Nov. 08,17	Nov. 07,18
Test Software	ADT	ADT_Radiated V8.7.07	N/A	N/A	N/A

- NOTES:** 1. The test was performed in 10m Chamber.
2. The calibration interval of the above test instruments is 12 months. And the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.



4.3 TEST PROCEDURE

<Frequency Range below 1GHz>

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter semi-anechoic chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from 1 meter to 4 meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1GHz.

NOTES:

1. The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
3. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) (if the raw value not contains the amplifier);
4. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Amplifier Gain(dB) (if the raw value contains the amplifier).
5. Margin value = Emission level – Limit value.



<Frequency Range above 1GHz>

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna can be varied from one meter-to four meters, the height of adjustment depends on the EUT height and the antenna 3dB beamwidth both, to detect the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test receiver/spectrum was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

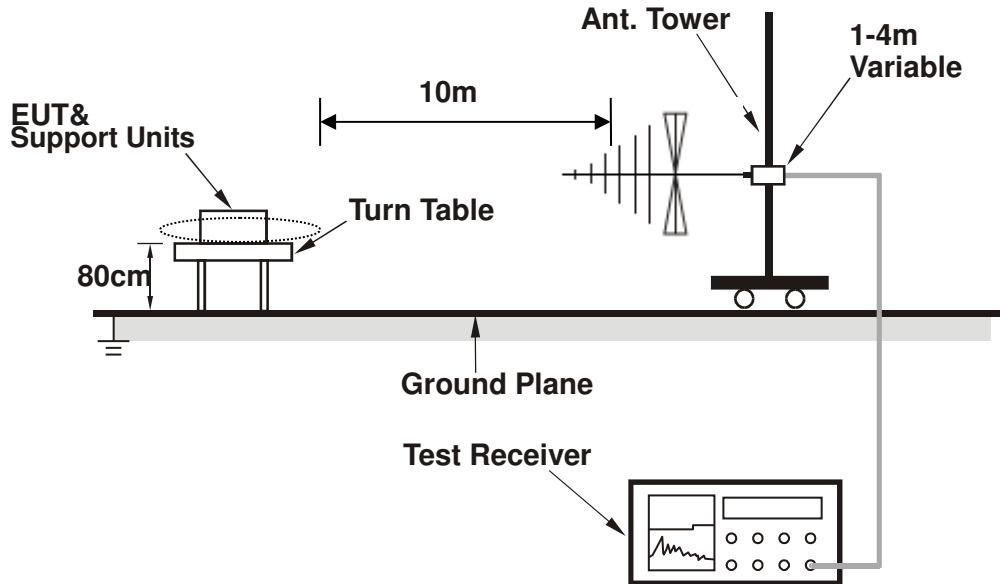
NOTES:

1. The resolution bandwidth is 1MHz and video bandwidth of test receiver/spectrum analyzer is 3MHz for Peak detection at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for Average detection (AV) at frequency above 1GHz.
2. For measurement of frequency above 1000 MHz, the EUT was set 3 meters away from the receiver antenna.
3. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
4. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) (if the raw value not contains the amplifier);
5. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Amplifier Gain(dB) (if the raw value contains the amplifier).
6. Margin value = Emission level – Limit value.

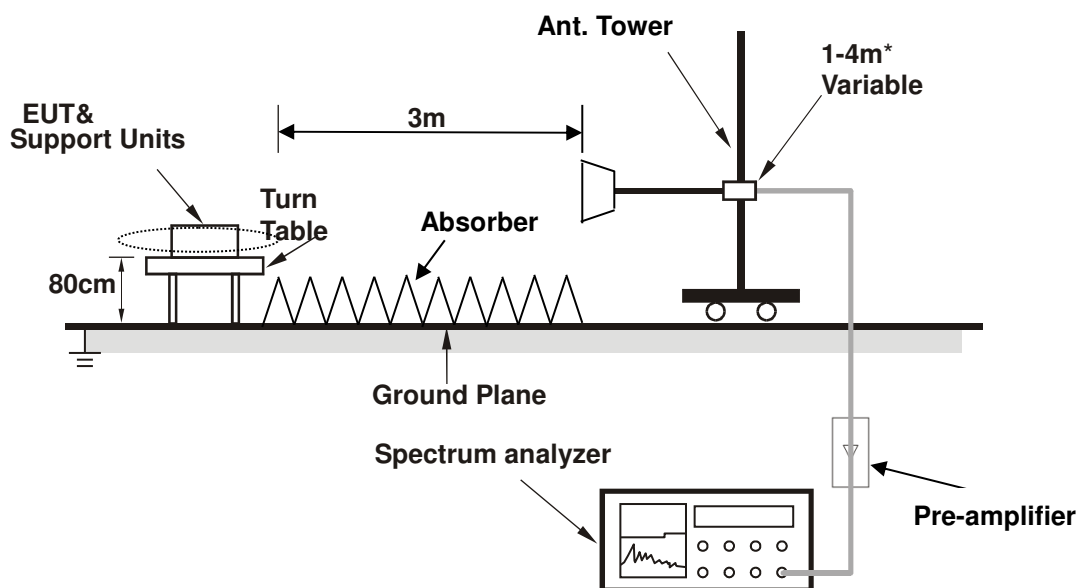


4.4 TEST SETUP

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



* : depends on the EUT height and the antenna 3dB beamwidth both, refer to section 7.3 of CISPR 16-2-3

4.5 SUPPLEMENTARY INFORMATION

The more stringent measurement method of paragraph 8.3.2 in ANSI C63.4:2014 amended as per ANSI C63.4a:2017 was applied for the test.

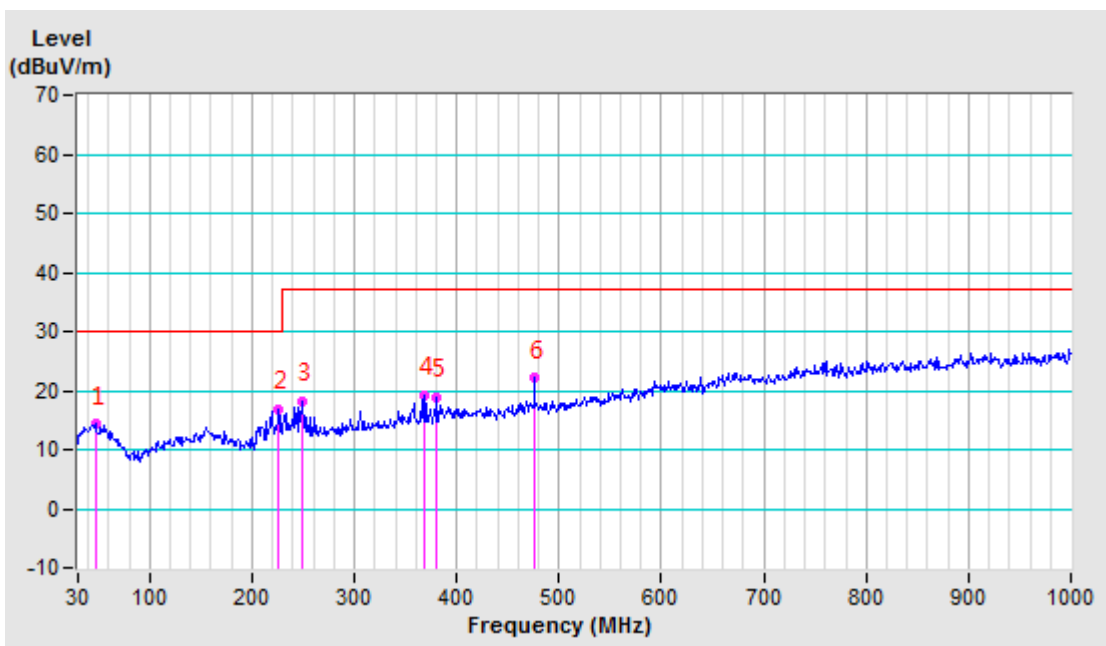


4.6 TEST RESULTS (BELOW 1GHz)

TEST MODE	WIFI Link data transmitting	FREQUENCY RANGE	30-1000MHz
TEST VOLTAGE	DC 3.7V from Battery	DETECTOR FUNCTION & RESOLUTION BANDWIDTH	Quasi-Peak, 120kHz
ENVIRONMENTAL CONDITIONS	21.0deg. C, 59.0% RH	TESTED BY: Luke	

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 10 M								
No.	Freq. (MHz)	Correction Factor (dB/m)	Raw Value (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)
1	46.854	-17.30	31.59	14.29	30.00	-15.71	400	53
2	226.304	-18.22	35.12	16.90	30.00	-13.10	200	210
3	249.463	-17.42	35.63	18.21	37.00	-18.79	400	43
4	369.136	-13.97	33.15	19.18	37.00	-17.82	200	252
5	380.898	-13.81	32.64	18.83	37.00	-18.17	200	162
6	475.836	-11.74	33.82	22.08	37.00	-14.92	200	35

REMARKS: The emission levels of other frequencies were very low against the limit.

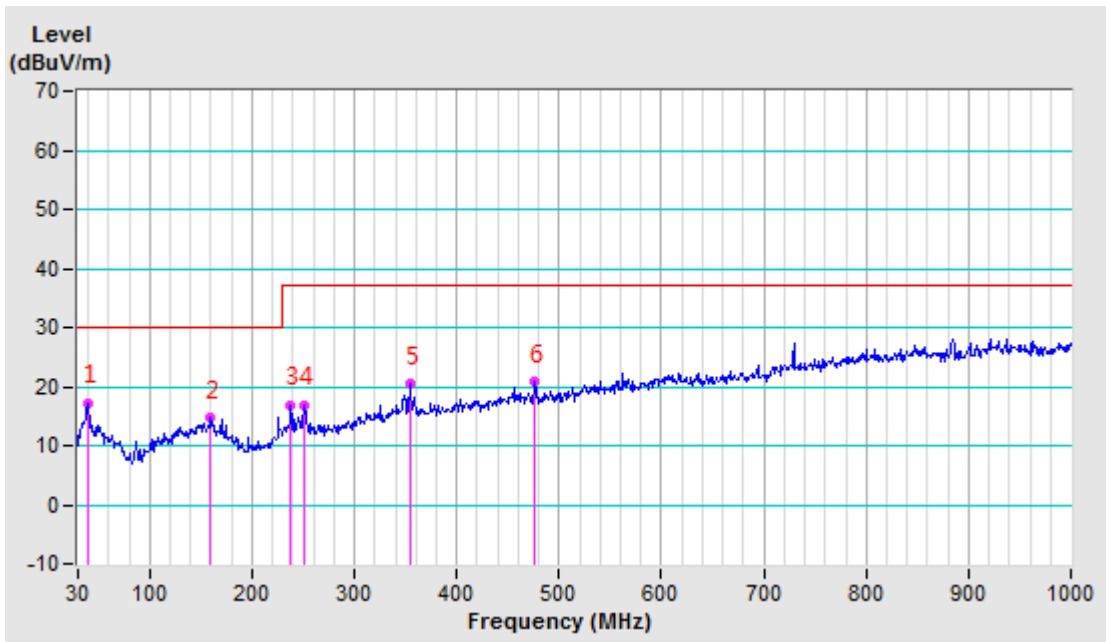




TEST MODE	WIFI Link data transmitting	FREQUENCY RANGE	30-1000MHz
TEST VOLTAGE	DC 3.7V from Battery	DETECTOR FUNCTION & RESOLUTION BANDWIDTH	Quasi-Peak, 120kHz
ENVIRONMENTAL CONDITIONS	21.0deg. C, 59.0% RH	TESTED BY: Luke	

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 10 M								
No.	Freq. (MHz)	Correction Factor (dB/m)	Raw Value (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)
1	39.604	-17.77	34.92	17.15	30.00	-12.85	100	211
2	159.841	-15.98	30.61	14.63	30.00	-15.37	100	210
3	237.881	-16.70	33.41	16.71	37.00	-20.29	100	302
4	251.899	-16.18	33.01	16.83	37.00	-20.17	300	12
5	353.851	-12.93	33.28	20.35	37.00	-16.65	100	269
6	475.786	-10.50	31.26	20.76	37.00	-16.24	300	357

REMARKS: The emission levels of other frequencies were very low against the limit.





4.7 TEST RESULTS (ABOVE 1GHz)

TEST MODE	WIFI Link data transmitting		
TEST VOLTAGE	DC 3.7V from Battery	FREQUENCY RANGE	1-6 GHz
ENVIRONMENTAL CONDITIONS	21.0deg. C, 59.0% RH	TESTED BY: Daniel	

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	Freq. (MHz)	Correction Factor (dB/m)	Raw Value (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)
1	2147.960PK	2.32	56.07	58.39	70.00	-11.61	100	122
2	2147.960AV	2.32	36.38	38.70	50.00	-11.30	100	122
3	3359.710PK	4.51	54.86	59.37	74.00	-14.63	100	89
4	3359.710AV	4.51	35.29	39.80	54.00	-14.20	100	89
5	4158.970PK	5.89	54.39	60.28	74.00	-13.72	100	338
6	4158.970AV	5.89	34.81	40.70	54.00	-13.30	100	338
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	Freq. (MHz)	Correction Factor (dB/m)	Raw Value (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)
1	2124.890PK	2.25	56.12	58.37	70.00	-11.63	100	322
2	2124.890AV	2.25	35.85	38.10	50.00	-11.90	100	322
3	3294.330PK	4.34	55.04	59.38	74.00	-14.62	100	124
4	3294.330AV	4.34	35.36	39.70	54.00	-14.30	100	124
5	4218.321PK	6.05	54.09	60.14	74.00	-13.86	100	227
6	4218.321AV	6.05	34.55	40.60	54.00	-13.40	100	227

- REMARKS:**
1. Peak detector quick scan is showed on the graph and final quasi-peak detector data is measured corresponding to relevant limit and recorded in the data table.
 2. Negative sign (-) in the margin column signify levels below the limit.
 3. Frequency range scanned: 1GHz to 6GHz.
 4. Only emissions significantly above equipment noise floor are reported.



5 IMMUNITY TEST

5.1 GENERAL DESCRIPTION

5.1.1 GENERAL DESCRIPTION

Product Standard	EN 55035:2017+A11:2020	
Basic Standard, specification requirement, and Performance Criteria:	IEC 61000-4-2	Electrostatic Discharge – ESD: 8kV air discharge, 4kV Contact discharge, Performance Criterion B
	IEC 61000-4-3	Radio-Frequency Electromagnetic Field Susceptibility Test – RS: 80-1000 MHz, 3V/m, 80% AM (1kHz), 1800 MHz,3V/m, 80% AM (1kHz), 2600 MHz,3V/m, 80% AM (1kHz), 3500 MHz,3V/m, 80% AM (1kHz), 5000 MHz,3V/m, 80% AM (1kHz)

Product Standard	EN 301 489-1 V2.2.3 (2019-11) EN 301 489-3 V2.1.1 (2019-03) EN 301 489-17 V3.2.4 (2020-09)	
Basic Standard, Specification, and Performance Criterion required	EN 61000-4-2	Electrostatic Discharge – ESD: 8 kV air discharge, 4 kV contact discharge, Performance Criterion B
	EN 61000-4-3	Radio-Frequency Electromagnetic Field Susceptibility Test – RS: 80 ~ 6000 MHz, 3 V/m, 80% AM (1 kHz), Performance Criterion A



5.1.2 PERFORMANCE CRITERIA

According to Clause 8.2, 8.3, 8.4 of EN 55035:2017+A11:2020 standard, the following describes the general performance criteria.

CRITERION A	The equipment shall continue to operate as intended without operator intervention. No degradation of performance, loss of function or change of operating state is allowed below a performance level specified by the manufacturer when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.
	For audio output device: The measured acoustic interference ratio and/or the measured electrical interference during the test shall be -20dB or better(see note1)
CRITERION B	<p>During the application of the disturbance, degradation of performance is allowed. However, no unintended change of actual operating state or stored data is allowed to persist after the test.</p> <p>After the test, 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. The performance level may be replaced by a permissible loss of performance.</p> <p>If the minimum performance level (or the permissible performance loss), or recovery time, is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.</p>
CRITERION C	<p>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. A reboot or re-start operation is allowed.</p> <p>Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.</p>

Note 1: This performance criterion only using for Continuous induced RF disturbances and Continuous RF electromagnetic field disturbances item.



Modified test levels for performance criterion A for the broadcast reception function:

Performance criteria	Test Item	Group 1	Group 2
A	RS	The disturbance level is reduced to 1V/m for in-band frequencies	No test requirements apply
A	CS	The disturbance level is reduced to 1V/m for in-band frequencies	

Notes: 1. In-band is defined as the entire tuneable operating range of the selected broadcast reception function.
 2. The tuned channel $\pm 0,5$ MHz (lower edge frequency – 0,5 MHz up to the upper edge frequency + 0,5 MHz of the tuned channel) is excluded from testing.
 3. Group 1: Equipment in which the desired RF broadcast signal enters the equipment through a coaxial broadcast receiver tuner port. These coaxial ports are intended to be connected via a coaxial cable to an antenna or a cable distribution system.
 4. Group 2: Broadcast reception equipment which is not included in Group 1.

For EN 301 489-3

The phenomena allowed during and after test in each criterion are clearly stated in the following table.

Performance criteria		
Criteria	During test	After 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 Loss of function(s) shall be self-recoverable No degradation of performance No loss of stored data or user programmable functions



For EN 301 489-17

The performance criteria		
Performance criteria A for immunity tests with phenomena of a continuous nature	continuous phenomena	1. Where the EUT is a transmitter in standby mode, unintentional transmission shall not occur during the test. 2. Where the EUT is a transceiver in receive mode, unintentional transmission shall not occur during the test
Performance criteria B for immunity tests with phenomena of a transient nature	Transient phenomena	1. Where the EUT is a transmitter in standby mode, unintentional transmission shall not occur as a result of the application of the test 2. Where the EUT is a transceiver in receive mode, unintentional transmission shall not occur as a result of the application of the test
Performance criteria C for immunity tests with power interruptions exceeding a certain time	Transient phenomena	Voltage dips greater than or equal to 100 ms and voltage interruptions of 5000 ms duration, for which performance criteria C shall apply

The phenomena allowed during and after test in each criterion are clearly stated in the following table.

Performance criteria		
Criteria	During test	After test
A	Shall operate as intended. (see note). Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance. Shall be no loss of function. Shall be no loss of stored data.
B	May show loss of function	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no loss of critical stored data.
C	May be loss of function.	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no loss of critical stored data.

NOTE: Operate as intended during the test allows a level of degradation in accordance with a and b.
 (a) For equipment that supports a PER or FER, the minimum performance level shall be a PER or FER less than or equal to 10 %.
 (b) For equipment that does not support a PER or a FER, the minimum performance level shall be no loss of the wireless transmission function needed for the intended use of the equipment.

5.1.3 EUT OPERATING CONDITION

Same as item 2.3



5.2 ELECTROSTATIC DISCHARGE IMMUNITY TEST (ESD) (EN55035, EN301 489)

5.2.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-2
Discharge Impedance:	330 ohm / 150 pF
Discharge Voltage:	Contact Discharge : 4 kV (Direct & Indirect) Air Discharge: 8kV (Direct)
Polarity:	Positive / Negative
Number of Discharge:	20 times at each test point
Discharge Mode:	Single Discharge
Discharge Period:	1-second

5.2.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
ESD Generator	TESEQ	NSG 437	279	Mar. 07,18	Mar. 06,19
Test Software	TESEQ	V03.03	N/A	N/A	N/A
ESD Generator	EM TEST	Dito	V1211112265	Jan. 16,18	Jan. 15,19
Test Software	EM TEST	V 2.31	N/A	N/A	N/A

- NOTES:** 1. The test was performed in ESD Room.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.



5.2.3 TEST PROCEDURE

The basic test procedure was in accordance with IEC 61000-4-2:

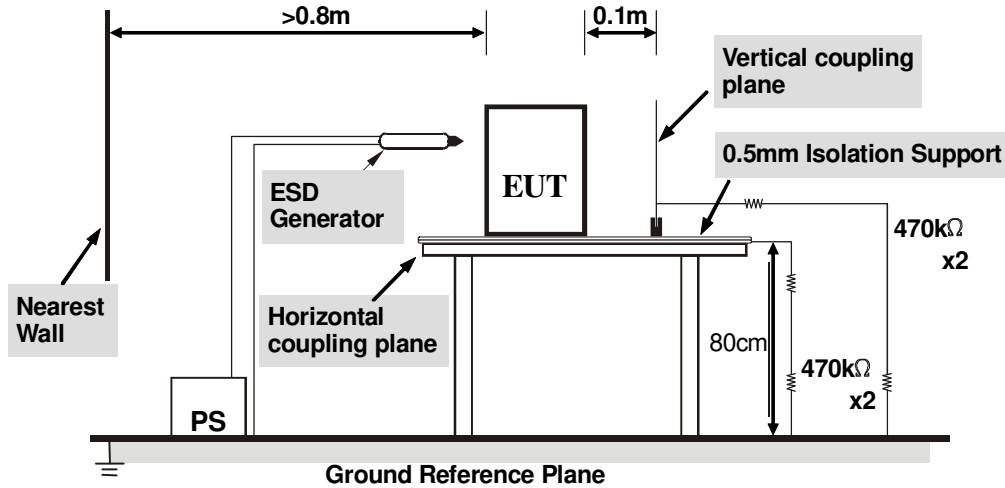
- a. Electrostatic discharges were applied only to those points and surfaces of the EUT that are accessible to users during normal operation.
- b. The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.
- c. The time interval between two successive single discharges was at least 1 second.
- d. The discharge return cable of the generator shall be kept at a distance of at least 0.2 m from the EUT whilst the discharge is being applied and should not be held by the operator.
- 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 EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT 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 EUT. The ESD generator was positioned horizontally at a distance of 0.1 meters from the EUT 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 EUT were completely illuminated. The VCP (dimensions 0.5m x 0.5m) was placed vertically to and 0.1 meters from the EUT.



5.2.4 DEVIATION FROM TEST STANDARD

No deviation.

5.2.5 TEST SETUP



NOTE:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the **Ground Reference Plane**. The **GRP** consisted of a sheet of aluminum at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system. A **Horizontal Coupling Plane** (1.6m x 0.8m) was placed on the table and attached to the **GRP** by means of a cable with 940kΩ total impedance. The equipment under test, was installed in a representative system as described in section 7 of IEC 61000-4-2, and its cables were placed on the **HCP** and isolated by an insulating support of 0.5mm thickness. A distance of 0.8-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

FLOOR-STANDING EQUIPMENT

The equipment under test was installed in a representative system as described in section 7 of IEC 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1-meter thickness. The GRP consisted of a sheet of aluminum that is at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system and extended at least 0.5 meters from the EUT on all sides.



5.2.6 TEST RESULTS

TEST VOLTAGE	See section 2.2	ENVIRONMENTAL CONDITIONS	23.7deg. C, 43.8% RH, 101.0kPa
TESTED BY	Hu		

Indirect Discharge Application				
Discharge Level (kV)	Polarity	Test Point	Test Result of HCP	Test Result of VCP
4	+ /-	HCP	A	N/A
4	+ /-	VCP	N/A	A

NOTE: A: There was no change compared with initial operation during the test.



5.3 RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD IMMUNITY TEST (RS) (EN55035)

5.3.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-3
Frequency Range:	80-1000MHz,1800MHz, 2600MHz, 3500MHz, 5000MHz
Field Strength:	3 V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Polarity of Antenna:	Horizontal and Vertical
Antenna Height:	1.5m
Dwell Time:	at least 3 seconds

5.3.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Signal Generator	Agilent	N5181A	MY50142530	Oct. 13,18	Oct. 12,19
Bilog Antenna	Teseq	CBL 6111D	27089	Jul. 19,18	Jul. 18,19
Antenna Log-Periodic	AR	ATR80M6G	0337307	N/A	N/A
Antenna Log-Periodic	AR	ATS700M11G	0336821	N/A	N/A
Switch Controller	AR	SC1000	0337343	N/A	N/A
RF Power Meter	ESE	4242	13984	Nov. 04,17	Nov. 03,18
Power Sensor	ESE	51011EMC	35716	Nov. 04,17	Nov. 03,18
Power Sensor	ESE	51011EMC	35715	Nov. 04,17	Nov. 03,18
E-Field probe	Narda	NBM-520	2403/01B	Mar. 08,18	Mar. 07,19
Power Amplifier	TESEQ	CBA 1G-150	T44029	N/A	N/A
Power Amplifier	TESEQ	CBA 3G-100	T44030	N/A	N/A
Power Amplifier	TESEQ	CBA 6G-050	1041204	N/A	N/A
Dual Directional Coupler	TESEQ	C5982	95208	Nov. 04,17	Nov. 03,18
Dual Directional Coupler	TESEQ	C6187	95175	Nov. 04,17	Nov. 03,18
Dual Directional Coupler	TESEQ	CPH-274F	M251304-01	Nov. 04,17	Nov. 03,18
Test Software	ADT	BVADT_RS_V 7.6.4-DG	N/A	N/A	N/A
Audio analyzer	Rohde&Schwarz	UPV	101397	Oct. 13,18	Oct. 12,19
EAR SIMULATOR	B&K	4192	2764719	Oct. 13,18	Oct. 12,19
Sound Calibrator	B&K	Type 4231	2463874	Oct. 13,18	Oct. 12,19
Conditioning Amplifier	Rohde&Schwarz	2690A0S2	2437856	Oct. 13,18	Oct. 12,19

- NOTES:** 1. The test was performed in RS chamber.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.



5.3.3 TEST PROCEDURE

The test procedure was in accordance with IEC 61000-4-3

- a. The testing was performed in a fully-anechoic chamber.
- b. The frequency range is swept from 80 MHz to 1000 MHz, 1800MHz, 2600MHz, 3500MHz, 5000MHz, with the signal 80% amplitude modulated with a 1kHz sine wave.
- c. The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised and to respond, but shall in no case be less than 0,5s.
- d. The field strength levels were 3V/m.
- e. The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

For Broadcast reception function:

- f. **Group1:** Equipment in which the desired RF broadcast signal enters the equipment through a coaxial broadcast receiver tuner port. These coaxial ports are intended to be connected via a coaxial cable to an antenna or a cable distribution system.
- g. **Group 2:** Broadcast reception equipment which is not included in Group 1.
- h. AM/FM/DAB equipment with a coaxial broadcast receiver tuner port is classified as Group 2 equipment if the manufacturer declares that the equipment is not intended to be connected to a CATV or other cable distribution network.
- i. The broadcast reception function shall be tested in each reception mode for which the receiver is designed, for example analogue reception, DVB-T, DVB-T2, DVB-C, DVB-C2, DVB-S, DVB-S2. The receiver shall be tuned to one channel and provided with an appropriate wanted signal on that channel or other input typical of normal use.

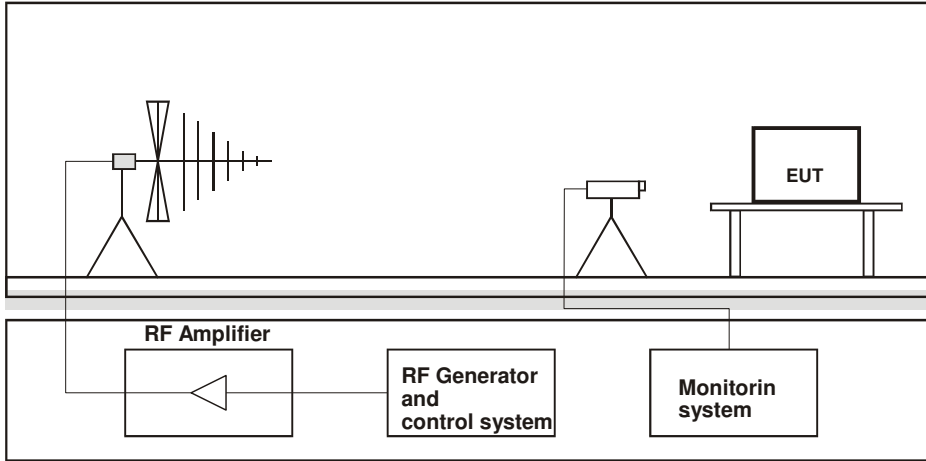
5.3.4 DEVIATION FROM TEST STANDARD

No deviation.

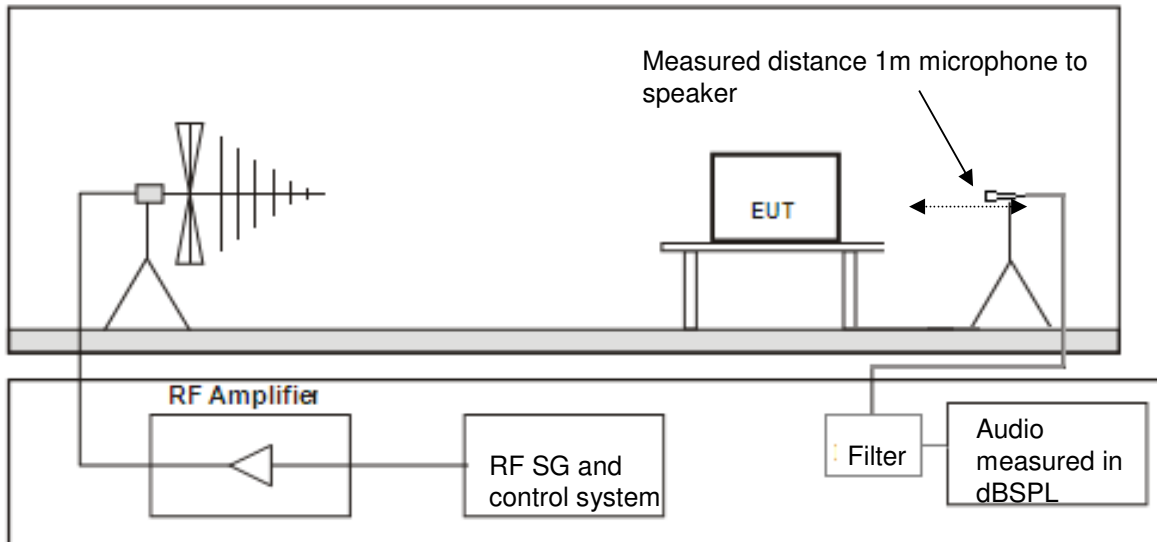


5.3.5 TEST SETUP

For Picture monitoring:

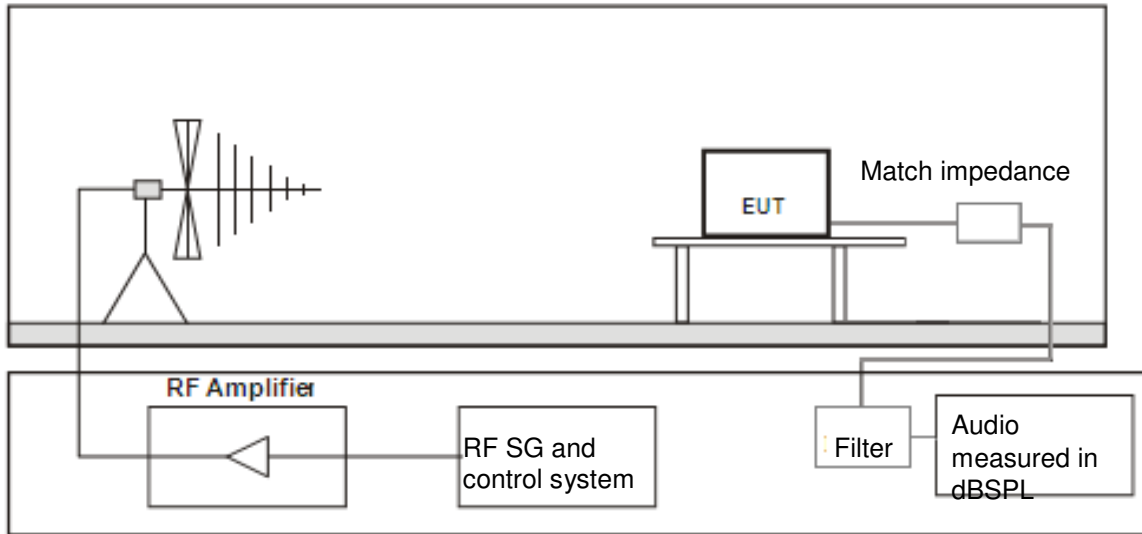


For Acoustic mode:





For Electrical mode:



NOTES:

1. The EUT installed in a representative system as described in section 7 of IEC 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.
2. Filter: 1kHz 3dB band pass filter.
3. The measurement distance: EUT to interference antenna was 3m.



5.3.6 TEST RESULTS

TEST MODE	See section 2.2	TEST VOLTAGE	See section 2.2
ENVIRONMENTAL CONDITIONS	26.2deg.C, 57.1% RH	TESTED BY: Andy	

Field Strength (V/m)	Test Frequency (MHz)	Polarization of antenna (Horizontal / Vertical)	Test Distance (m)	Test Result	Remark
3	80-1000MHz, 1800MHz, 2600MHz, 3500MHz, 5000MHz	H&V	3	A	Pass

NOTE: A: There was no change compared with initial operation during the test



5.4 RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD IMMUNITY TEST (RS) (EN301 489)

5.4.1 TEST SPECIFICATION

Basic Standard:	EN 61000-4-3
Frequency Range:	80 MHz ~ 6000 MHz
Field Strength:	3 V/m
Modulation:	1 kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1% of preceding frequency value
Polarity of Antenna:	Horizontal and Vertical
Antenna Height:	1.5 m
Dwell Time:	3 seconds

5.4.2 TEST INSTRUMENT

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Signal Generator	Agilent	N5181A	MY50142530	Oct. 20,18	Oct. 19,19
Antenna Log-Periodic	AR	ATR80M6G	0337307	N/A	N/A
Antenna Log-Periodic	AR	ATS700M11G	0336821	N/A	N/A
Switch Controller	AR	SC1000	0337343	N/A	N/A
RF Power Meter	ESE	4242	13984	Jan. 02,18	Jan. 01,19
Power Sensor	ESE	51011EMC	35716	Jan. 02,18	Jan. 01,19
Power Sensor	ESE	51011EMC	35715	Jan. 02,18	Jan. 01,19
E-Field probe	Narda	NBM-520	2403/01B	Sep. 28,18	Sep. 27,19
Power Amplifier	TESEQ	CBA 1G-150	T44029	N/A	N/A
Power Amplifier	TESEQ	CBA 3G-100	T44030	N/A	N/A
Power Amplifier	TESEQ	CBA 6G-050	1041204	N/A	N/A
Dual Directional Coupler	TESEQ	C5982	95208	Nov. 08,17	Nov. 07,18
Dual Directional Coupler	TESEQ	C6187	95175	Nov. 08,17	Nov. 07,18
Dual Directional Coupler	TESEQ	CPH-274F	M251304-01	Nov. 08,17	Nov. 07,18
Test Software	Tonscend	TS+	2.5.0.0	N/A	N/A
Test Software	ADT	BVADT_RS_V 7.6.4-DG	N/A	N/A	N/A

- NOTES:** 1. The test was performed in RS chamber.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.



5.4.3 TEST PROCEDURE

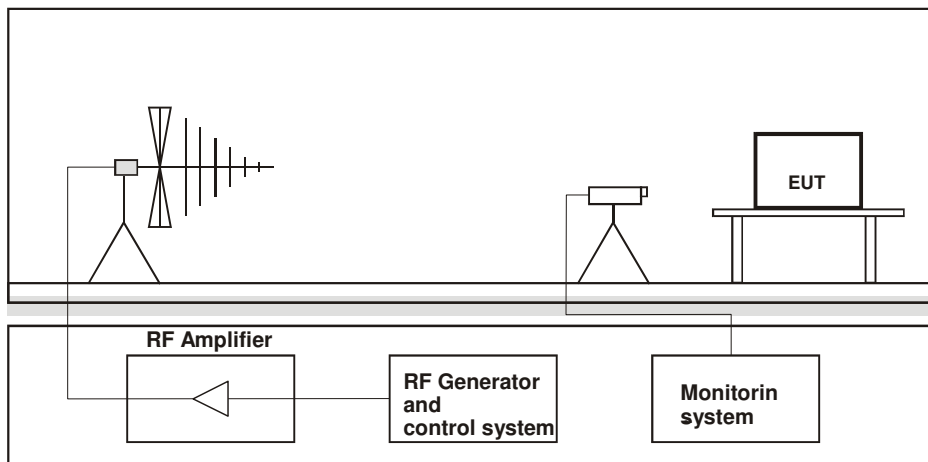
The test procedure was in accordance with EN 61000-4-3.

- a. The testing was performed in a fully-anechoic chamber.
- b. The frequency range is swept from 80 MHz to 6000 MHz with the signal 80% amplitude modulated with a 1 kHz sine wave.
- c. The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised and to respond, but shall in no case be less than 0.5s.
- d. The field strength level was 3 V/m.
- e. The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

5.4.4 DEVIATION FROM TEST STANDARD

No deviation.

5.4.5 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLETOP EQUIPMENT

The EUT installed in a representative system as described in section 7 of EN 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.



5.4.6 TEST RESULTS

TEST MODE	See section 2.2	TEST VOLTAGE	See section 2.2
ENVIRONMENTAL CONDITIONS	27.1deg., 65.7% RH	TESTED BY: Andy	

Field Strength (V/m)	Test Frequency Note#1 (MHz)	Polarization of antenna (Horizontal / Vertical)	Test Distance (m)	Test Result	Remark
3	80 - 6000	H / V	3	A	Note 1

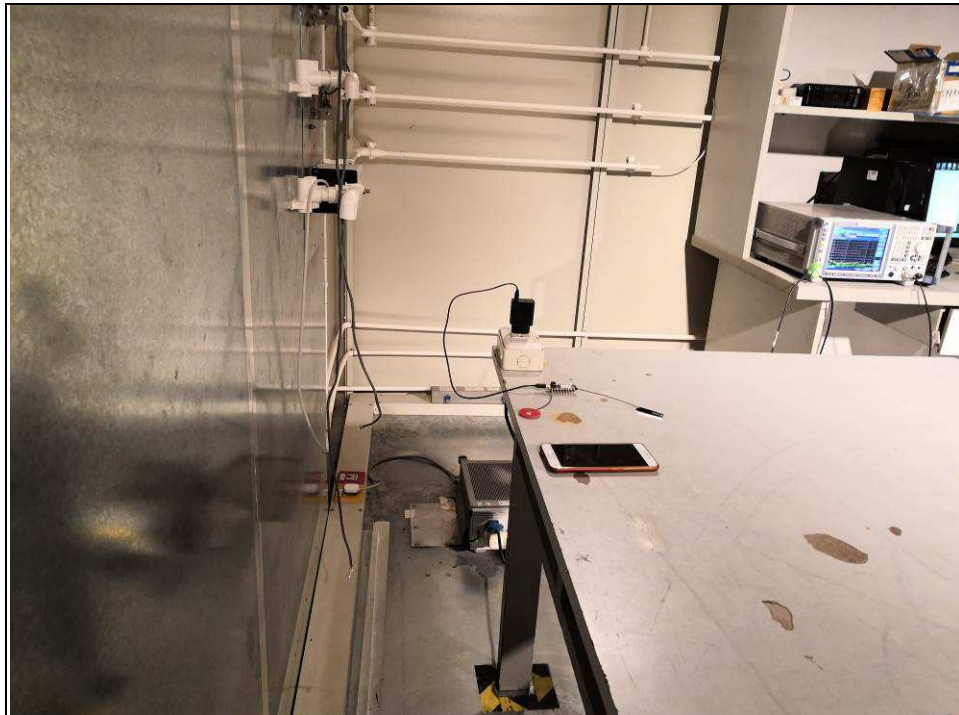
Note#1: Tested Israel SII Frequencies 89,100,107,144,163,196,244,315,434,460,600,825,845,880 MHz

Note 1: A: There was no change compared with initial operation during the test.

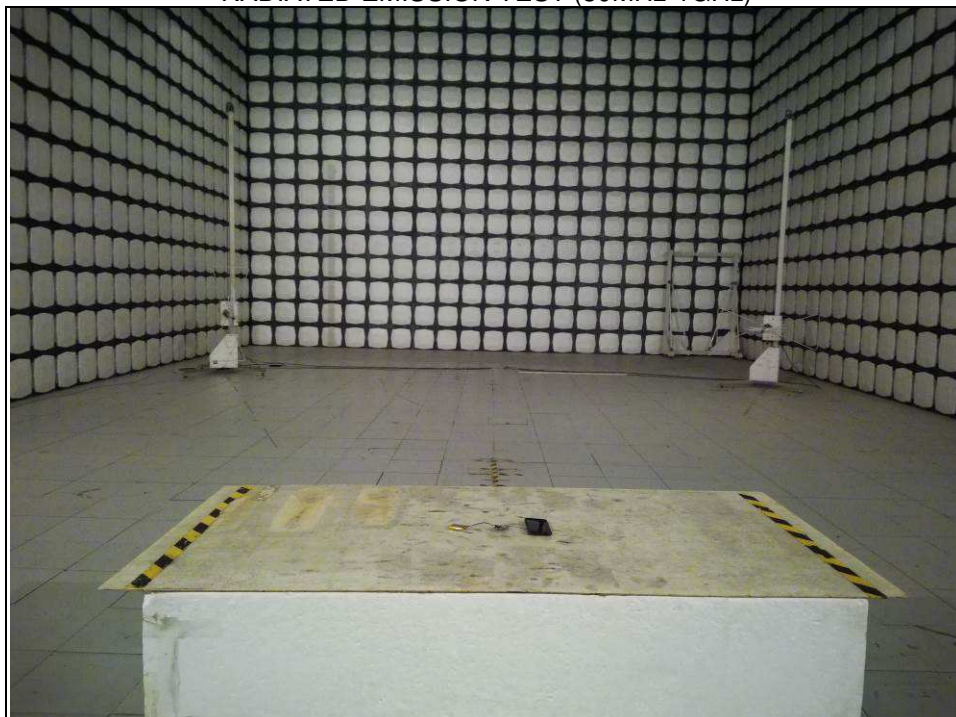


6 PHOTOGRAPHS OF THE TEST CONFIGURATION

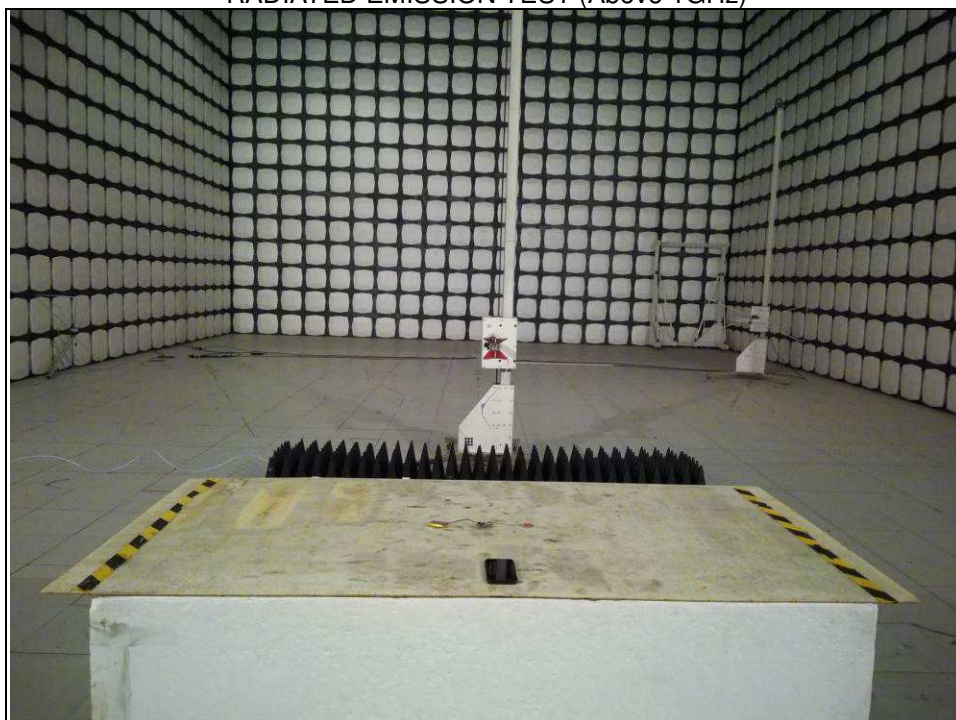
CONDUCTED EMISSION TEST



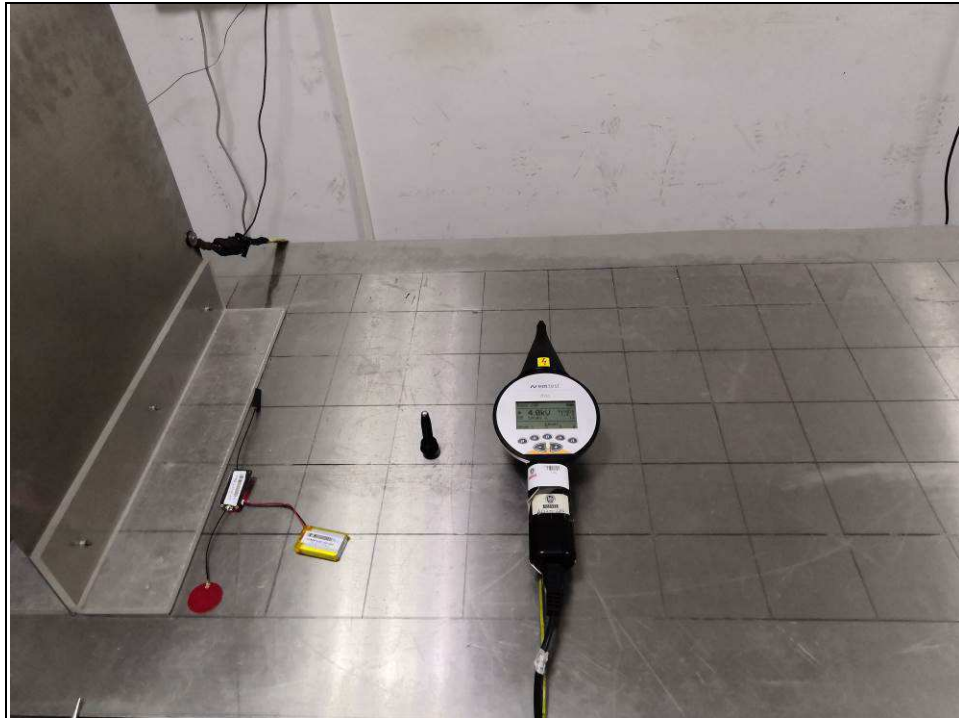
RADIATED EMISSION TEST (30MHz-1GHz)



RADIATED EMISSION TEST (Above 1GHz)



ESD TEST



RS TEST





**BUREAU
VERITAS**

Test Report No.: CE2107WDG0228

7 APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications were made to the EUT by the lab during the test.

---END---