
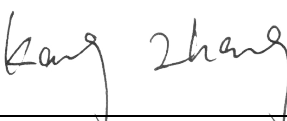


CE EMC Test Report

Project No. : 1910C137C
Equipment : WiFi Module
Brand Name : Dialog
Test Model : DA16200MOD-AAE4WA32
Series Model : N/A
Applicant : Renesas Design Korea Inc.
Address : B-7F, 35, Pangyo-ro 255beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do (Zip 13486), Republic of Korea
Manufacturer : Iton Technology Corp.
Address : 7 FLOOR EAST, BUILDING C, NO1006 SHENNAN ROAD SHENZHEN INTERNATIONAL INNOVATION CENTER (FUTIAN TECHNOLOGY SQUARE), HUAFU STREET, FUTIAN DISTRICT, SHENZHEN GUANGDONG CHINA
Factory : Iton Technology Corp.
Address : 7 FLOOR EAST, BUILDING C, NO1006 SHENNAN ROAD SHENZHEN INTERNATIONAL INNOVATION CENTER (FUTIAN TECHNOLOGY SQUARE), HUAFU STREET, FUTIAN DISTRICT, SHENZHEN GUANGDONG CHINA
Date of Receipt : Nov. 07, 2019
Nov. 29, 2021
Date of Test : Nov. 18, 2019 ~ Nov. 22, 2019
Nov. 30, 2021 ~ Dec. 06, 2021
Issued Date : Jul. 30, 2024
Report Version : R00
Test Sample : Engineering Sample No.: DG2019110651, DG2021113047
Standard(s) : ETSI EN 301 489-1 V2.2.3 (2019-11)
ETSI EN 301 489-17 V3.2.4 (2020-09)

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.

Prepared by : 
Lea Lu

Approved by : 
Kang Zhang

Room 108, Building 2, No.1, Yile Road, Songshan Lake Zone, Dongguan City, Guangdong, People's Republic of China

Tel: +86-769-8318-3000 Web: www.newbtl.com Service mail: btl_qa@newbtl.com

Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. BTL assumes no responsibility for the data provided by the customer, any statements, inferences or generalizations drawn by the customer or others from the reports issued by BTL.

This report is the confidential property of the client. As a mutual protection to the clients, the public and ourselves, the test report shall not be reproduced, except in full, without our written approval.

BTL's laboratory quality assurance procedures are in compliance with the ISO/IEC 17025: 2017 requirements, and accredited by the conformity assessment authorities listed in this test report.

BTL is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.

Table of Contents	Page
REPORT ISSUED HISTORY	5
1 . SUMMARY OF TEST RESULTS	6
1.1 TEST FACILITY	7
1.2 MEASUREMENT UNCERTAINTY	7
1.3 TEST ENVIRONMENT CONDITIONS	8
2 . GENERAL INFORMATION	9
2.1 GENERAL DESCRIPTION OF EUT	9
2.2 DESCRIPTION OF TEST MODES	10
2.3 EUT OPERATING CONDITIONS	11
2.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED	11
2.5 DESCRIPTION OF SUPPORT UNITS	12
3 . EMC EMISSION TEST	13
3.1 RADIATED EMISSIONS UP TO 1 GHZ	13
3.1.1 LIMITS	13
3.1.2 TEST PROCEDURE	13
3.1.3 DEVIATION FROM TEST STANDARD	13
3.1.4 TEST SETUP	14
3.1.5 MEASUREMENT DISTANCE	15
3.1.6 TEST RESULTS (UP TO 1 GHZ)	15
3.2 RADIATED EMISSIONS ABOVE 1 GHZ	16
3.2.1 LIMITS	16
3.2.2 TEST PROCEDURE	16
3.2.3 DEVIATION FROM TEST STANDARD	17
3.2.4 TEST SETUP	17
3.2.5 MEASUREMENT DISTANCE	18
3.2.6 TEST RESULTS (ABOVE 1 GHZ)	18
4 . EMC IMMUNITY TEST	19
4.1 STANDARD COMPLIANCE/SEVERITY LEVEL/CRITERIA	19
4.2 GENERAL PERFORMANCE CRITERIA	20
4.3 ELECTROSTATIC DISCHARGE (ESD)	21
4.3.1 TEST SPECIFICATION	21
4.3.2 TEST PROCEDURE	21
4.3.3 DEVIATION FROM TEST STANDARD	21
4.3.4 TEST SETUP	22
4.3.5 TEST RESULTS	22
4.4 RADIO FREQUENCY ELECTROMAGNETIC FIELD (RS)	23
4.4.1 TEST SPECIFICATION	23
4.4.2 TEST PROCEDURE	23

Table of Contents	Page
4.4.3 DEVIATION FROM TEST STANDARD	23
4.4.4 TEST SETUP	24
4.4.5 TEST RESULTS	24
4.5 FAST TRANSIENTS, COMMON MODE (EFT)	25
4.5.1 TEST SPECIFICATION	25
4.5.2 TEST PROCEDURE	25
4.5.3 DEVIATION FROM TEST STANDARD	25
4.5.4 TEST SETUP	25
4.5.5 TEST RESULTS	25
5 . MEASUREMENT INSTRUMENTS LIST	26
6 . EUT TEST PHOTO	28
APPENDIX A - RADIATED EMISSION UP TO 1GHZ	32
APPENDIX B - RADIATED EMISSION ABOVE 1GHZ	37
APPENDIX C - ELECTROSTATIC DISCHARGE	42
APPENDIX D - RF ELECTROMAGNETIC FIELD	45
APPENDIX E - FAST TRANSIENTS COMMON MODE	47

REPORT ISSUED HISTORY

Report No.	Version	Description	Issued Date	Note
BTL-ETSE-1-1910C137C	R00	This is a copy report which referencing test data are provided from test report (BTL-ETSE-1-1910C137B). The device is identical to the original one recorded in the referencing report. And in this report only update applicant information, manufacturer and factory address. Other are kept the same.	Jul. 30, 2024	Valid

Remark: For the original report (BTL-ETSE-1-1910C137B), the test data, data evaluation, and equipment configuration contained was accredited by the Authority of A2LA according to the ISO/IEC 17025 quality assessment standard and technical standard(s).

1. SUMMARY OF TEST RESULTS

Emission EN 301 489-1 / EN 301 489-17		
Ref Standard(s)	Test Item	Result
EN 55032:2015+A11:2020	Radiated emissions up to 1 GHz	PASS
	Radiated emissions above 1 GHz	PASS
	Conducted emissions AC mains power port	N/A
	Conducted emissions DC power port	N/A
	Asymmetric mode conducted emissions	AAN
		Current Probe
		CP+CVP
EN IEC 61000-3-2:2019	Harmonic current	N/A
EN 61000-3-3:2013+A1:2019	Voltage fluctuations (Flicker)	N/A

Immunity EN 301 489-1 / EN 301 489-17		
Ref Standard(s)	Test Item	Result
EN 61000-4-2:2009	ESD	PASS
EN IEC 61000-4-3:2020	RS	PASS
EN 61000-4-4:2012	EFT	PASS
EN 61000-4-5:2014+A1:2017	Surge	N/A
EN 61000-4-6:2014+AC:2015	CS	N/A
EN IEC 61000-4-11:2020	Dips	N/A

NOTE:

(1) "N/A" denotes test is not applicable to this device.

1.1 TEST FACILITY

The test facilities used to collect the test data in this report is at the location of No.3, Jinshagang 1st Road, Dalang, Dongguan City, Guangdong, People's Republic of China.

1.2 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 BTL measurement uncertainty is less than the CISPR 16-4-2 U_{CISPR} requirement.

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

A. Radiated emissions up to 1 GHz measurement:

Test Site	Method	Measurement Frequency Range	Ant. H / V	U , (dB)
DG-CB03 (3m)	CISPR	30MHz ~ 200MHz	V	4.88
		30MHz ~ 200MHz	H	4.14
		200MHz ~ 1,000MHz	V	4.62
		200MHz ~ 1,000MHz	H	4.80

B. Radiated emissions above 1 GHz measurement:

Test Site	Method	Measurement Frequency Range	U , (dB)
DG-CB03 (3m)	CISPR	1GHz ~ 6GHz	4.58

C. Immunity Measurement:

Test Site	Method	Item	U
DG-SR02	EN 61000-4-2	Rise time t_r	6.80%
		Peak current I_p	6.30%
		Current at 30 ns	6.50%
		Current at 60 ns	6.90%
DG-CB05	EN IEC 61000-4-3	Electromagnetic field immunity test	2.00dB
		PER or FER measurement, test set-up for RS (WLAN 2.4G&5G, BT)	2.08dB
DG-SR05	EN 61000-4-4	Peak voltage (V_P)	3.7%
		Rise time (t_r)	4.4%
		Pulse width(t_w)	4.1%
		Pulse Freq.(kHz)	0.8%
		Burst Duration(ms)	1.4%
		Burst Period(ms)	1.4%
		Peak voltage (V_P)-with clamp	3.7%
		Rise time (t_r) -with clamp	5.0%
		Pulse width(t_w) -with clamp	4.8%

Note: Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

1.3 TEST ENVIRONMENT CONDITIONS

Test Item	Temperature	Humidity	Tested By
Radiated emissions up to 1 GHz	25°C	60%	Promise Yin
Radiated emissions above 1 GHz	25°C	60%	Promise Yin

Test Item	Temperature	Humidity	Pressure	Tested By
ESD	25°C	49%	1012hPa	Celina Lai
RS	24°C	51%	/	Hunter Xu
EFT	23°C	50%	/	Maggie Peng

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	WiFi Module
Brand Name	Dialog
Test Model	DA16200MOD-AAE4WA32
Series Model	N/A
Model Difference(s)	N/A
Power Source	DC voltage supplied from external power supply.
Power Rating	DC 3.3V
Classification of EUT	Class B
Intended Operating Frequency(Fo)	2412 MHz ~ 2472 MHz
Highest Internal Frequency(Fx)	2472 MHz

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	FULL SYSTEM (AP Mode 2.4G WIFI)
Mode 2	FULL SYSTEM (WIFI Adapter Mode 2.4G WIFI)

Radiated emissions up to 1 GHz test	
Final Test Mode	Description
Mode 1	FULL SYSTEM (AP Mode 2.4G WIFI)
Mode 2	FULL SYSTEM (WIFI Adapter Mode 2.4G WIFI)

Radiated emissions Above 1 GHz test	
Final Test Mode	Description
Mode 1	FULL SYSTEM (AP Mode 2.4G WIFI)
Mode 2	FULL SYSTEM (WIFI Adapter Mode 2.4G WIFI)

Immunity Test	
Final Test Mode	Description
Mode 1	FULL SYSTEM (AP Mode 2.4G WIFI)
Mode 2	FULL SYSTEM (WIFI Adapter Mode 2.4G WIFI)

Note:

1. The product supports 2.4G WIFI function.
The frequency exemptions are 2400-2483.5MHz.
2. Radiated emission above 1GHz tested with 2.4G filter.

2.3 EUT OPERATING CONDITIONS

The EUT exercise program used during radiated and/or conducted emission measurement was designed to exercise the various system components in a manner similar to a typical use. The standard test signals and output signal as following:

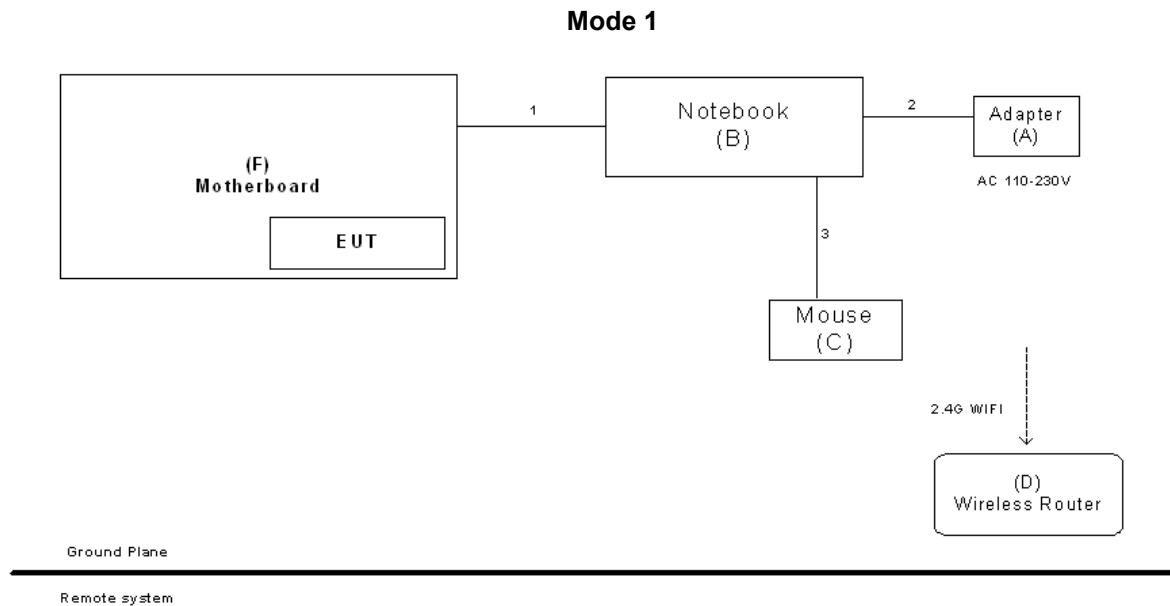
For Mode 1:

1. EUT is plugged into the Motherboard.
2. Motherboard connected to Notebook via USB cable.
3. Notebook connected to Adapter via DC cable
4. Notebook connected to Mouse via USB Cable.
5. EUT connected to Wireless Router (D) via 2.4G WIFI and perform "Ping.exe" to conduct data communication.

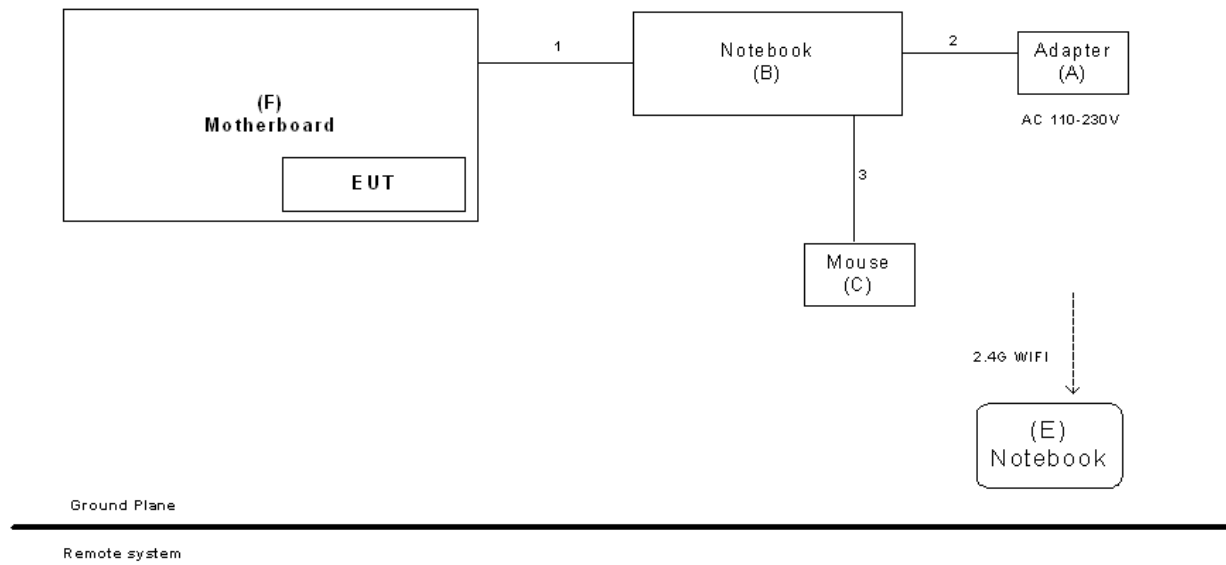
For Mode 2:

1. EUT is plugged into the Motherboard.
2. EUT connected to Notebook via USB cable.
3. Notebook connected to Adapter via DC cable
4. Notebook connected to Mouse via USB Cable.
5. EUT connected to Notebook (E) via 2.4G WIFI and perform "Ping.exe" to conduct data communication.

2.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



Mode 2



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.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.
A	Adapter	Lenovo	N/A	N/A
B	Notebook	Lenovo	V310-14IKB	LR07SH58
C	Mouse	DELL	MO56UOA	FQJ000BS
D	Wireless Router	TP-LINK	TL-WR1041N	1142123O01143
E	Notebook	Lenovo	V310-14IKB	LR07SH58
F	Motherboard	N/A	N/A	N/A

Item	Cable Type	Shielded Type	Ferrite Core	Length
1	USB Cable	NO	NO	1m
2	DC Cable	NO	NO	1.5m
3	USB Cable	NO	NO	1.5m

3. EMC EMISSION TEST

3.1 RADIATED EMISSIONS UP TO 1 GHZ

3.1.1 LIMITS

Class B equipment up to 1 GHz

Frequency Range MHz	Measurement			Class B limits dB(μV/m)
	Facility	Distance m	Detector type/ bandwidth	
30 - 230	SAC	3	Quasi peak / 120 kHz	40
230 - 1000				47

Notes:

- (1) The limit for radiated test was performed according to as following: EN 55032
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).
- (4) The test result calculated as following:
 Measurement Value = Reading Level + Correct Factor
 Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain(if use)
 Margin Level = Measurement Value - Limit Value

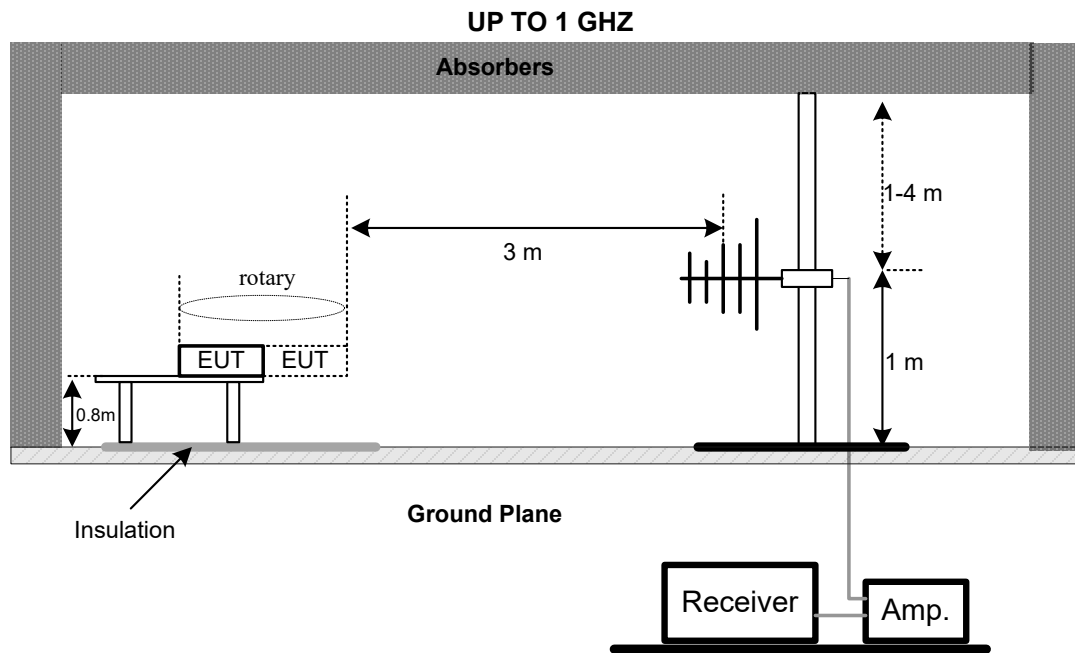
3.1.2 TEST PROCEDURE

- a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz).
- b. The height of the equipment or of the substitution antenna shall be 0.8 m, the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- c. The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- d. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform.
(below 1GHz)
- e. For the actual test configuration, please refer to the related Item - Block Diagram of system tested.

3.1.3 DEVIATION FROM TEST STANDARD

No deviation

3.1.4 TEST SETUP



3.1.5 MEASUREMENT DISTANCE

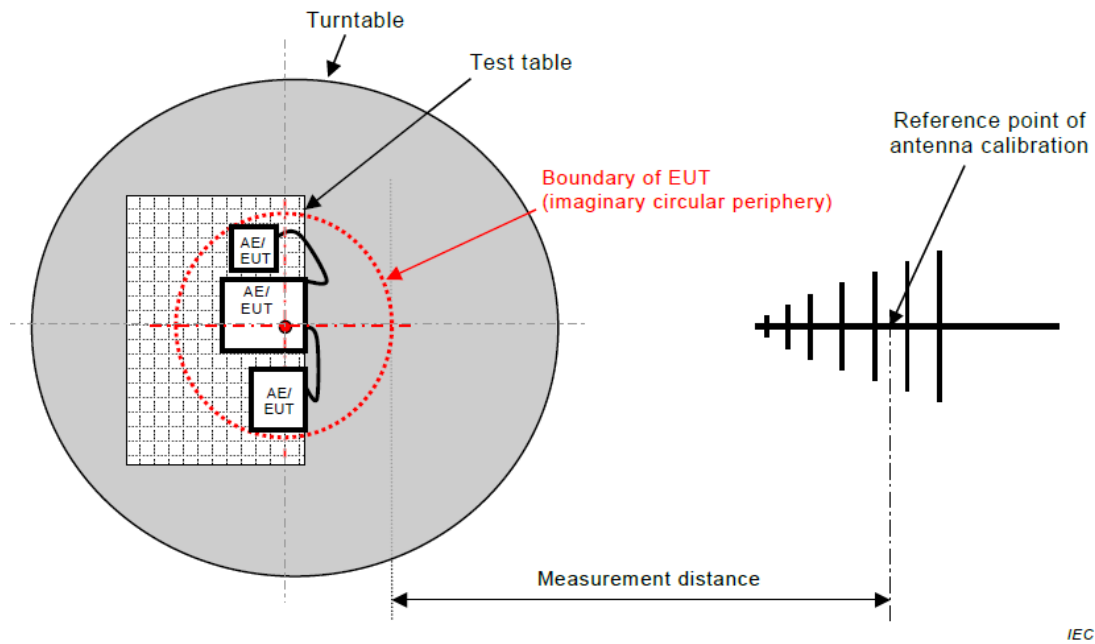


Figure C.1 – Measurement distance

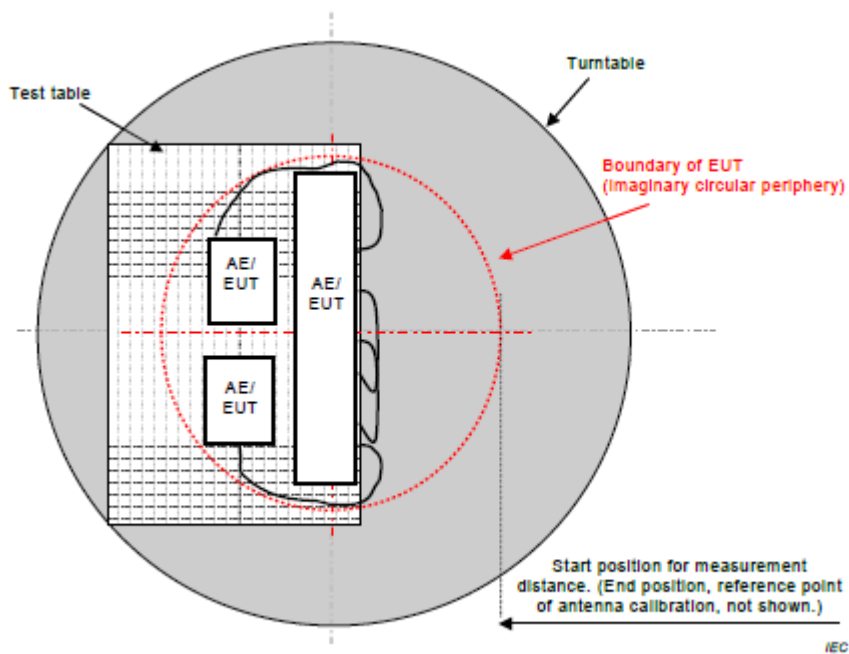


Figure C.2 – Boundary of EUT, Local AE and associated cabling

3.1.6 TEST RESULTS (UP TO 1 GHZ)

Please refer to the Appendix A.

3.2 RADIATED EMISSIONS ABOVE 1 GHZ

3.2.1 LIMITS

Class B equipment above 1 GHz

Frequency Range MHz	Measurement			Class B limits dB(μV/m)
	Facility	Distance m	Detector type/bandwidth	
1000 - 3000	FSOATS	3	Average / 1 MHz	50
3000 - 6000				54
1000 - 3000			Peak / 1 MHz	70
3000 - 6000				74

Notes:

- (1) The limit for radiated test was performed according to as following: EN 55032
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).
- (4) The test result calculated as following:
 Measurement Value = Reading Level + Correct Factor
 Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain(if use)
 Margin Level = Measurement Value - Limit Value

Required highest frequency for radiated measurement

Highest internal frequency (F _x)	Highest measured frequency
F _x ≤108 MHz	1 GHz
108<F _x ≤500 MHz	2 GHz
500<F _x ≤1000 MHz	5 GHz
F _x >1 GHz	5 x F _x up to a maximum of 6 GHz

3.2.2 TEST PROCEDURE

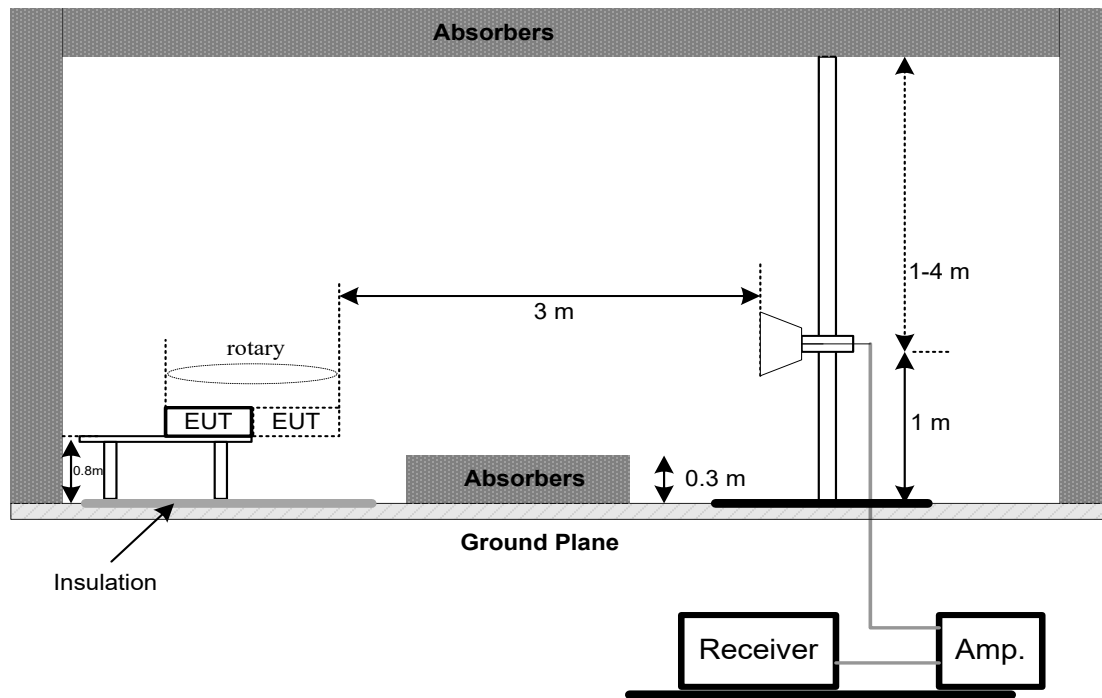
- a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz).
- b. The height of the equipment or of the substitution antenna shall be 0.8 m, the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- c. The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- d. All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn't perform. (above 1GHz)
- e. For the actual test configuration, please refer to the related Item - Block Diagram of system tested.
- f. For transmitters:
 The frequencies on which the transmitter part of the EUT is intended to operate shall be excluded from radiated emission measurements when performed in transmit mode of operation.
- g. For receivers:
 There shall be no frequency exclusion band applied to emission measurements of the receiver part of transceivers or the stand alone receiver under test, and/or associated ancillary equipment.

3.2.3 DEVIATION FROM TEST STANDARD

No deviation

3.2.4 TEST SETUP

ABOVE 1 GHZ



3.2.5 MEASUREMENT DISTANCE

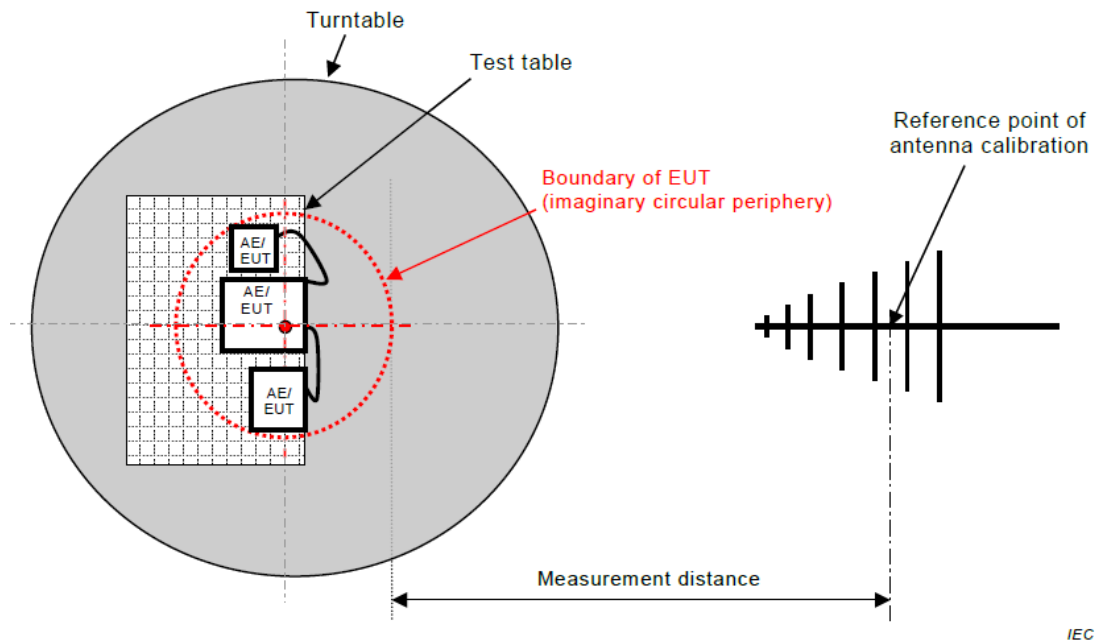


Figure C.1 – Measurement distance

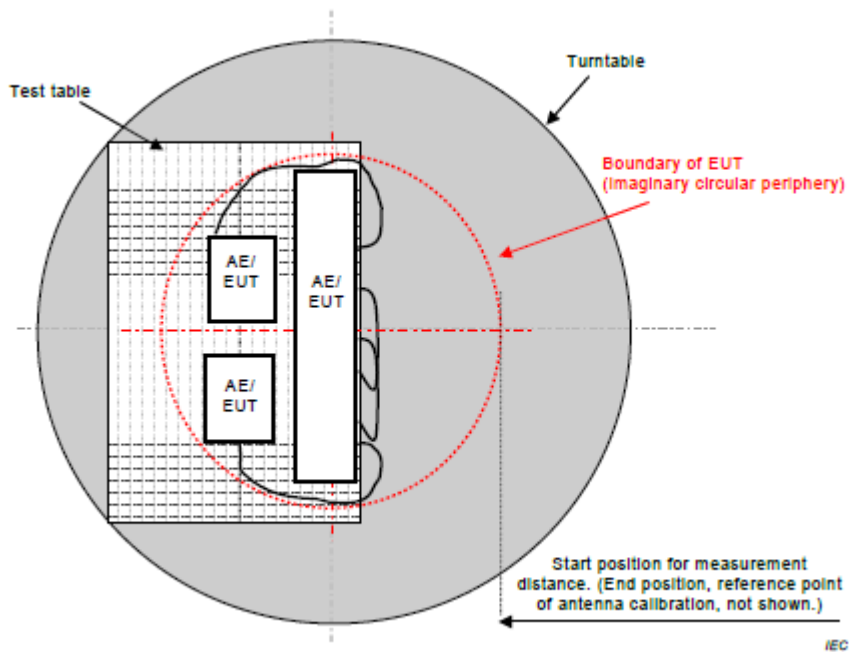


Figure C.2 – Boundary of EUT, Local AE and associated cabling

3.2.6 TEST RESULTS (ABOVE 1 GHZ)

Please refer to the Appendix B.

4. EMC IMMUNITY TEST

4.1 STANDARD COMPLIANCE/SEVERITY LEVEL/CRITERIA

Equipment operating in locations other than telecommunication centres			
Test Standard No.	Test Specification Level	Test Mode Test Port	Performance Criteria
Electrostatic discharge EN 61000-4-2 (ESD)	± 8 kV air discharge ± 4 kV contact discharge	Direct Mode	B
	± 4 kV HCP discharge ± 4 kV VCP discharge	Indirect Mode	B
Radio frequency electromagnetic Field EN IEC 61000-4-3 (RS)	80 MHz to 6000 MHz 3 V/m (unmodulated, r.m.s), 1000 Hz or 400 Hz, 80%, AM modulated (NOTE 1)	Enclosure	A
Fast transients, common mode EN 61000-4-4 (EFT)	± 1 kV(peak) 5/50 ns Tr/Th 5 kHz Repetition Frequency	AC mains power port	B
	±0.5 kV(peak) 5/50ns Tr/Th 5 kHz Repetition Frequency	DC power port (NOTE 2)	B
	± 0.5 kV(peak) 5/50 ns Tr/Th 5 kHz Repetition Frequency	Signal port, Wired network port, Control port (NOTE 2)	B

NOTE:

(1) If the wanted signal is modulated at 1 000 Hz, then an audio signal of 400 Hz shall be used.

(2) If the cables may be longer than 3 m.

4.2 GENERAL PERFORMANCE CRITERIA

1.	Performance criteria for continuous phenomena applied to transmitters (CT)
2.	Performance criteria for transient phenomena applied to transmitters (TT)
3.	Performance criteria for continuous phenomena applied to receivers (CR)
4.	Performance criteria for transient phenomena applied to receivers (TR)

According to **ETSI EN 301 489-17** standard, the general performance criteria as following:

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 critical 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 minimum performance level.		

Performance criteria for Continuous phenomena

The performance criteria A shall apply.

Where the EUT is a transmitter in standby mode, unintentional transmission shall not occur during the test.

Where the EUT is a transceiver in receive mode, unintentional transmission shall not occur during the test.

Performance criteria for Transient phenomena

The performance criteria B shall apply, except for voltage dips greater than or equal to 100 ms and voltage interruptions of 5 000 ms duration, for which performance criteria C shall apply.

Where the EUT is a transmitter in standby mode, unintentional transmission shall not occur as a result of the application of the test.

Where the EUT is a transceiver in receive mode, unintentional transmission shall not occur as a result of the application of the test.

4.3 ELECTROSTATIC DISCHARGE (ESD)

4.3.1 TEST SPECIFICATION

Test Method:	EN 61000-4-2
Discharge Impedance:	330 ohm / 150 pF
Required Performance	B
Discharge Voltage:	Air Discharge: ± 2 kV, ± 4 kV, ± 8 kV Contact Discharge: ± 2 kV, ± 4 kV
Polarity:	Positive & Negative
Number of Discharge	20 times at each test point
Discharge Mode:	Single Discharge
Discharge Period:	1 second

4.3.2 TEST PROCEDURE

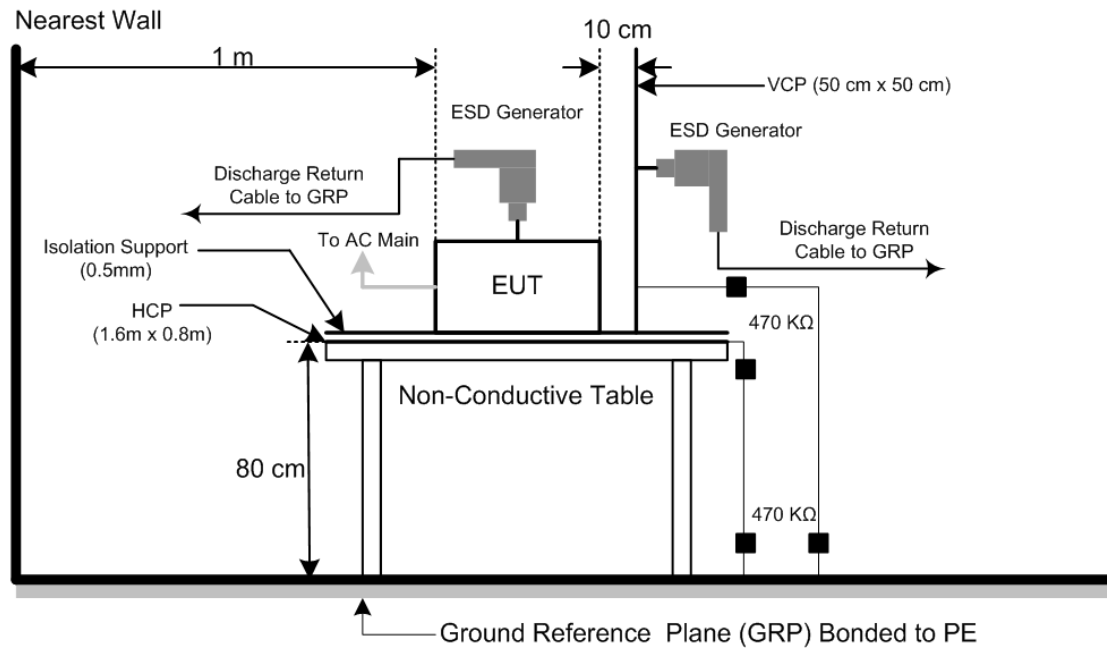
The test generator necessary to perform direct and indirect application of discharges to the EUT in the following manner:

- a. The test shall be performed with single discharges. On each pre-selected point at least 10 single discharges (in the most sensitive polarity) shall be applied.
 NOTE 1 The minimum number of discharges applied is depending on the EUT; for products with synchronized circuits the number of discharges should be larger.
 For the time interval between successive single discharges an initial value of 1 s is recommended. Longer intervals may be necessary to determine whether a system failure has occurred.
 NOTE 2 The points to which the discharges should be applied may be selected by means of an exploration carried out at a repetition rate of 20 discharges per second, or more.
 Vertical Coupling Plane (VCP):
 The coupling plane, of dimensions 0.5m x 0.5m, is placed parallel to, and positioned at a distance 0.1m from, the EUT, with the Discharge Electrode touching the coupling plane.
 The four faces of the EUT will be performed with electrostatic discharge.
 Horizontal Coupling Plane (HCP):
 The coupling plane is placed under to the EUT. The generator shall be positioned vertically at a distance of 0.1m from the EUT, with the Discharge Electrode touching the coupling plane.
 The four faces of the EUT will be performed with electrostatic discharge.
- b. Air discharges at insulation surfaces of the EUT.
 It was at least ten single discharges with positive and negative at the same selected point.
- c. For 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 940k total impedance. The equipment under test was installed in a representative system as described in EN 61000-4-2, and its cables were placed on the HCP and isolated by an insulating support of 0.5mm thickness. A distance of 1-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

4.3.3 DEVIATION FROM TEST STANDARD

No deviation.

4.3.4 TEST SETUP



4.3.5 TEST RESULTS

Please refer to the Appendix C.

4.4 RADIO FREQUENCY ELECTROMAGNETIC FIELD (RS)

4.4.1 TEST SPECIFICATION

Test Method:	EN IEC 61000-4-3
Required Performance	A
Frequency Range:	80 MHz - 6000 MHz
Field Strength:	3 V/m (unmodulated, r.m.s)
Modulation:	1000 Hz Sine Wave, 80%, AM Modulation
Frequency Step	1% of the preceding frequency
Polarity of Antenna:	Horizontal and Vertical
Test Distance:	3 m
Antenna Height:	1.55 m
Dwell Time:	3 seconds

4.4.2 TEST PROCEDURE

The EUT and support equipment are in a fully-anechoic chamber.

The testing distance from antenna to the EUT was 3 meters.

For TABLE-TOP equipment:

The EUT installed in a representative system as described in EN 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.

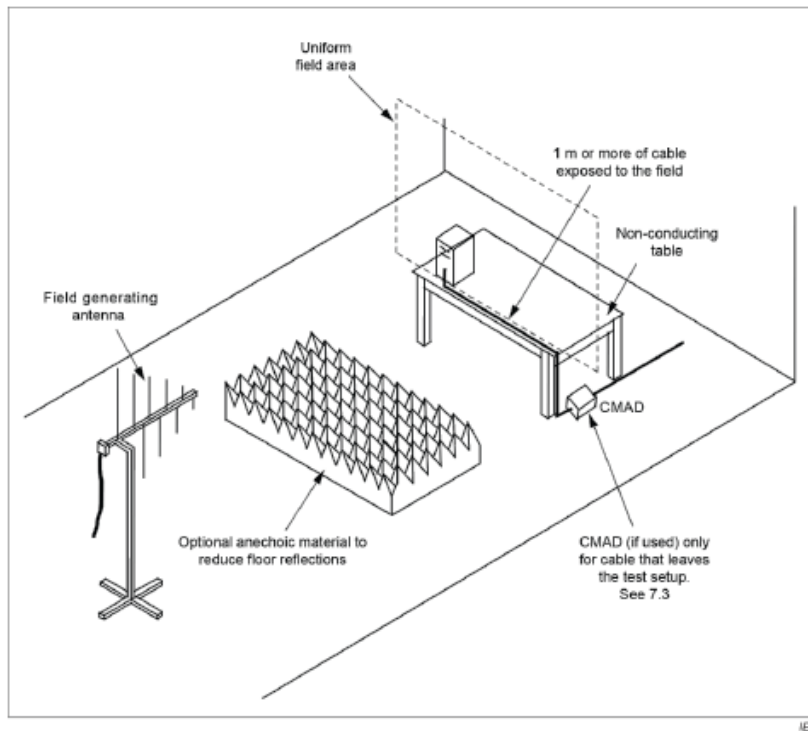
The other condition as following manner:

- a. The test level shall be 3 V/m (measured unmodulated).
The test signal shall be amplitude modulated to a depth of 80 % by a sinusoidal audio signal of 1000 Hz.
The test shall be performed over the frequency range 80 MHz to 6000 MHz.
For receivers and transmitters the stepped frequency increments shall be 1% of the preceding frequency.
- b. The exclusion band of equipment operating in the 2,4 GHz band shall be:
 - Lower limit of exclusion band = lowest allocated band edge frequency -120 MHz
 - Upper limit of exclusion band = highest allocated band edge frequency +120 MHz
- c. The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- d. The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

4.4.3 DEVIATION FROM TEST STANDARD

No deviation.

4.4.4 TEST SETUP



4.4.5 TEST RESULTS

Please refer to the Appendix D.

4.5 FAST TRANSIENTS, COMMON MODE (EFT)

4.5.1 TEST SPECIFICATION

Test Method:	EN 61000-4-4
Required Performance	B
Test Voltage	AC power port: ± 1 kV
Polarity:	Positive & Negative
Impulse Frequency:	5 kHz
Impulse Wave shape :	5/50 ns
Burst Duration:	15 ms
Burst Period:	300 ms
Test Duration:	1 min.

4.5.2 TEST PROCEDURE

For TABLE-TOP equipment:

The configuration consisted of a wooden table (0.8m high) standing on the Ground Reference Plane and should be located 0.1 m+/- 0.01m above the Ground Reference Plane. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system. A minimum distance of 0.5m was provided between the EUT and the walls of the laboratory or any other metallic structure.

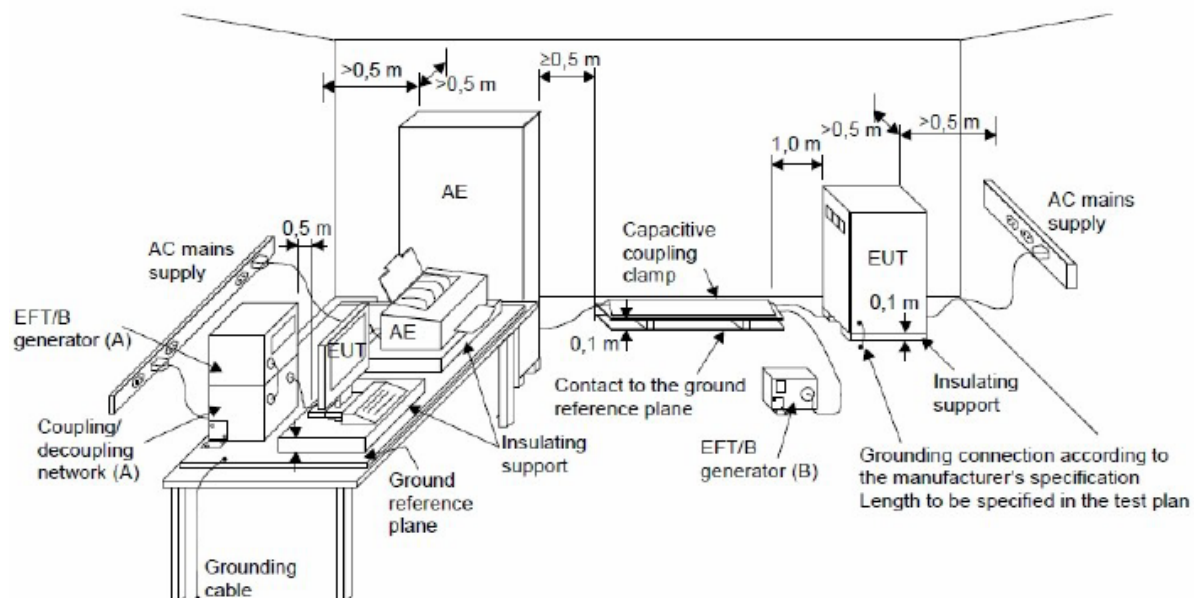
The other condition as following manner:

- Both positive and negative polarity discharges were applied.
- The duration time of each test sequential was 1 minute

4.5.3 DEVIATION FROM TEST STANDARD

No deviation.

4.5.4 TEST SETUP



4.5.5 TEST RESULTS

Please refer to the Appendix E.

5. MEASUREMENT INSTRUMENTS LIST

Radiated emission up to 1GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Amplifier	HP	8447D	2944A08742	Mar. 10, 2020
2	Receiver	Agilent	N9038A	MY52130039	Aug. 03, 2020
3	Cable	emci	LMR-400(30MHz-1GHz)(8m+5m)	N/A	May 24, 2020
4	Controller	CT	SC100	N/A	N/A
5	Controller	MF	MF-7802	MF780208416	N/A
6	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

Radiated emission above 1GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Double Ridged Guide Antenna	ETS	3115	75789	Mar. 09, 2020
2	Amplifier	Agilent	8449B	3008A02333	Mar. 10, 2020
3	Receiver	Agilent	N9038A	MY52130039	Aug. 03, 2020
4	Controller	CT	SC100	N/A	N/A
5	Controller	MF	MF-7802	MF780208416	N/A
6	Cable	mitron	B10-01-01-12M	18072744	Jun. 29, 2020
7	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
8	EXA Spectrum Analyzer	Keysight	N9010A	MY56480488	Mar. 10, 2020

Electrostatic discharge					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	ESD Simulator	EM TEST	dito	305018	Jul. 17, 2020

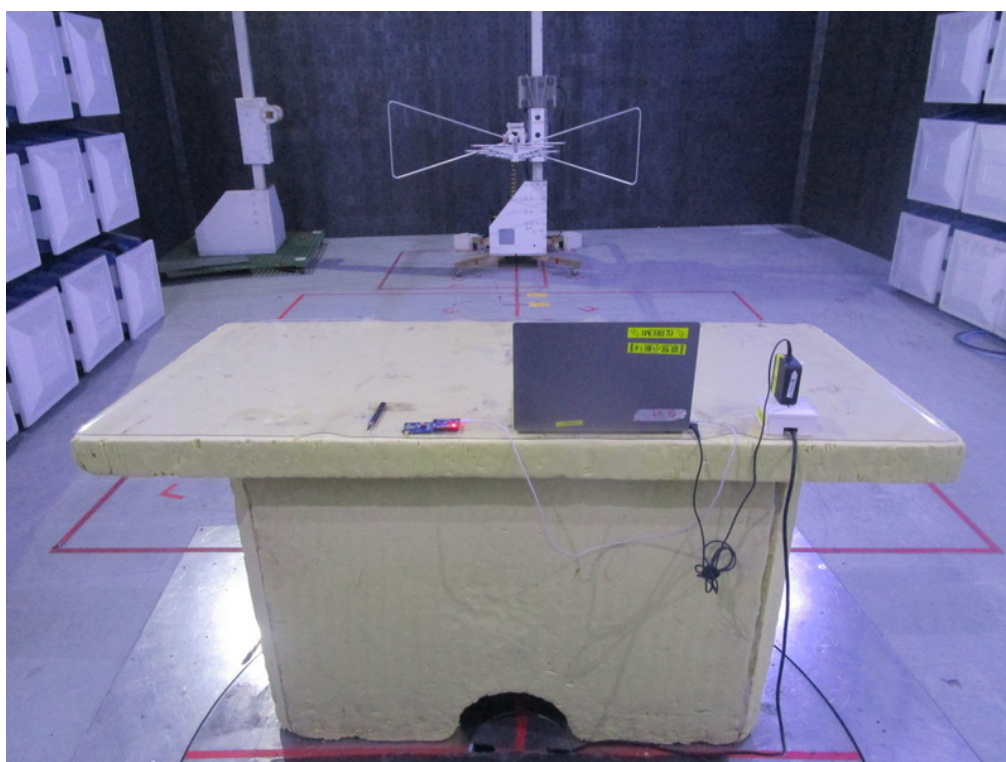
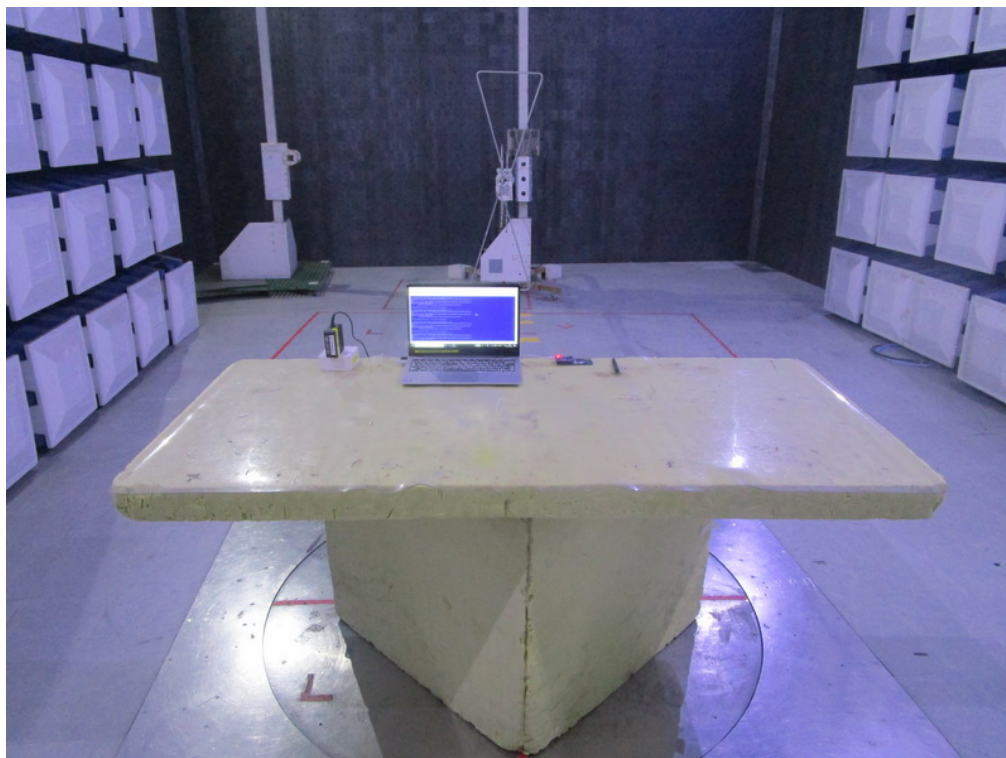
Radio frequency electromagnetic Field					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	EMCO	3142C	66462	Mar. 26, 2022
2	Amplifier	AR	50S1G4A	326720	Feb. 28, 2022
3	Power amplifier	MILMEGA	AS1860-50	1064834	Feb. 28, 2022
4	Microwave Log.-Per. Antenna	Schwarzbeck	STLP 9149	9149-277	Apr. 14, 2022
5	Power amplifier	MILMEGA	80RF1000-250	1064833	Feb. 28, 2022
6	MXG Analog Signal Generator	Agilent	N5181A	MY49060710	Jul. 10, 2022
7	Measurement Software	Farad	(EZ-RS)V2.0.1.3	N/A	N/A

Fast transients, common mode					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Capacitor Clamp	Thermo KeyTek	CCL	502215	Aug. 03, 2020
2	Fast Transient Burst Simulator	Prima	EFT61004TA	PR190741004	Aug. 27, 2020

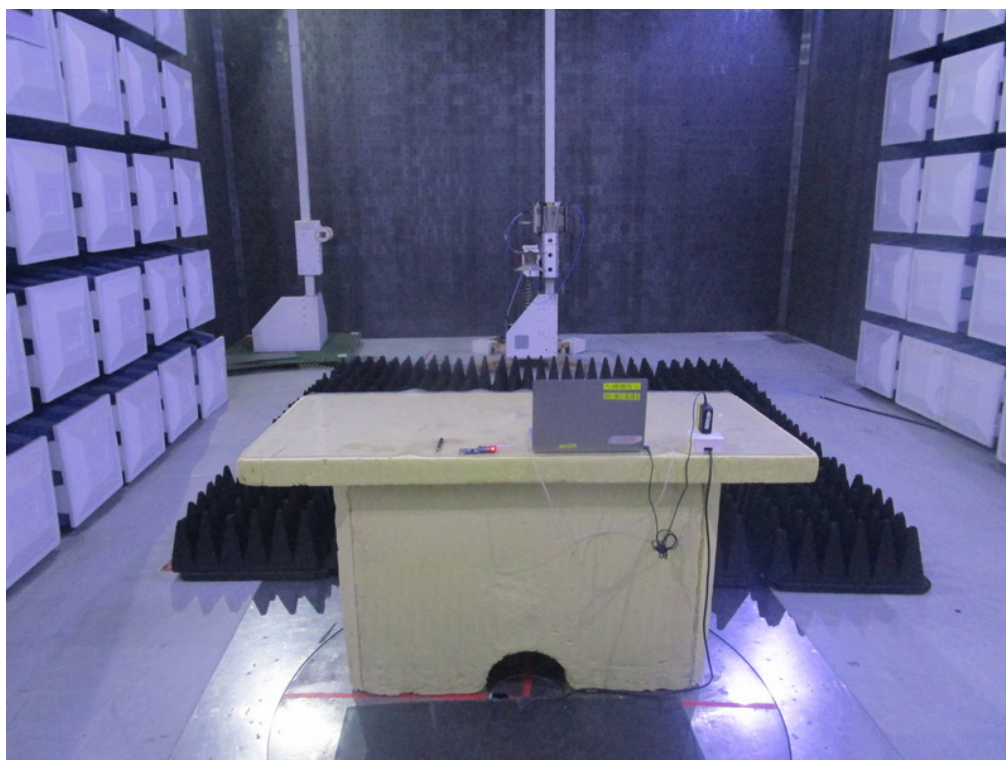
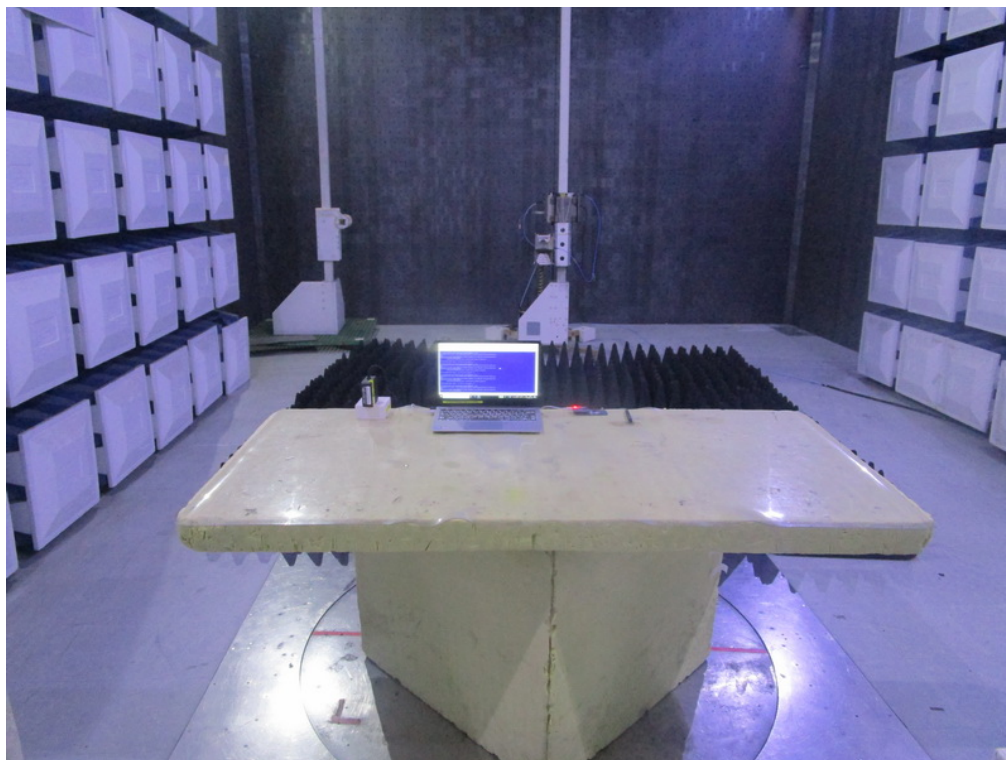
Remark: "N/A" denotes no model name, serial no. or calibration specified.
All calibration period of equipment list is one year.

6. EUT TEST PHOTO

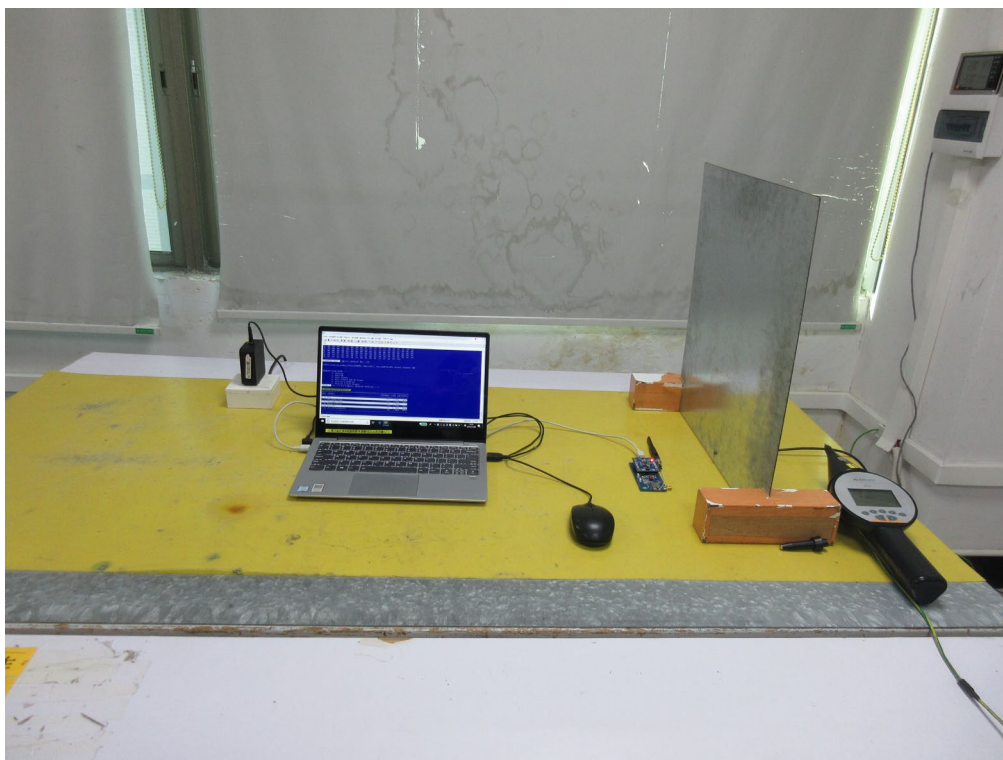
Radiated emissions up to 1 GHz



Radiated emissions above 1 GHz



Electrostatic discharge immunity



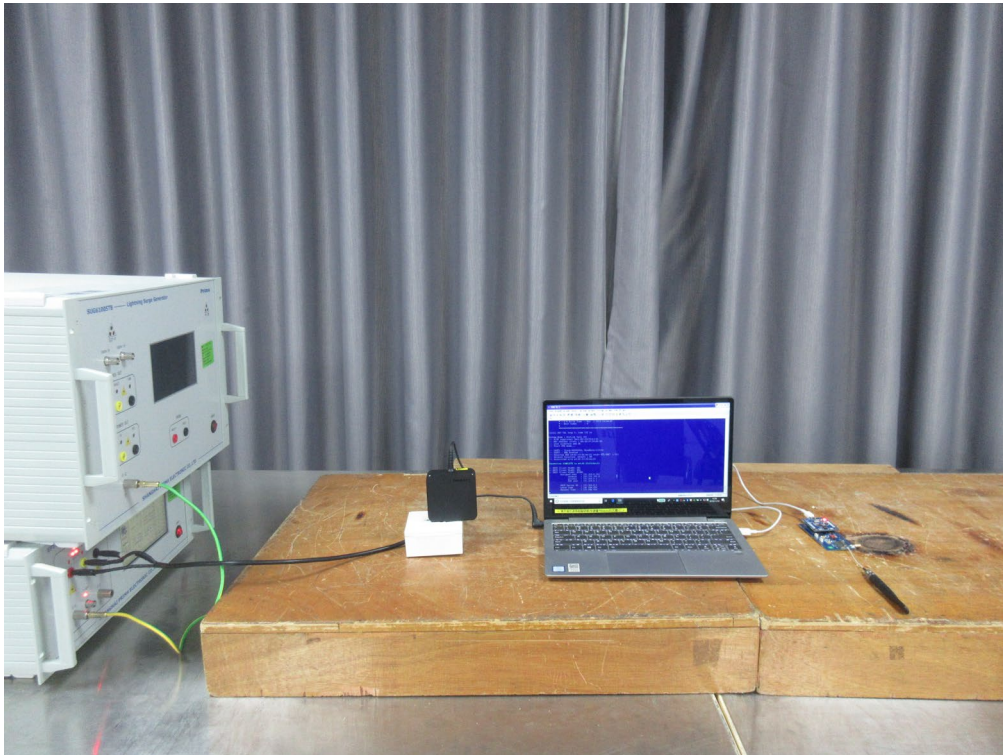
Radiated, radio-frequency, electromagnetic field immunity – Up to 1GHz



Radiated, radio-frequency, electromagnetic field immunity – Above 1GHz

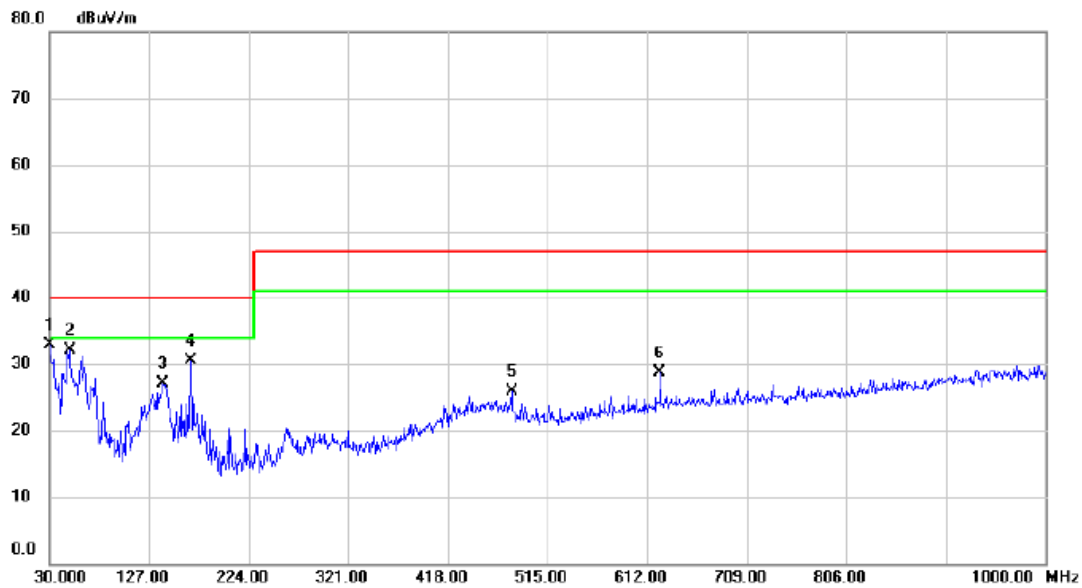


Electrical fast transient/burst immunity



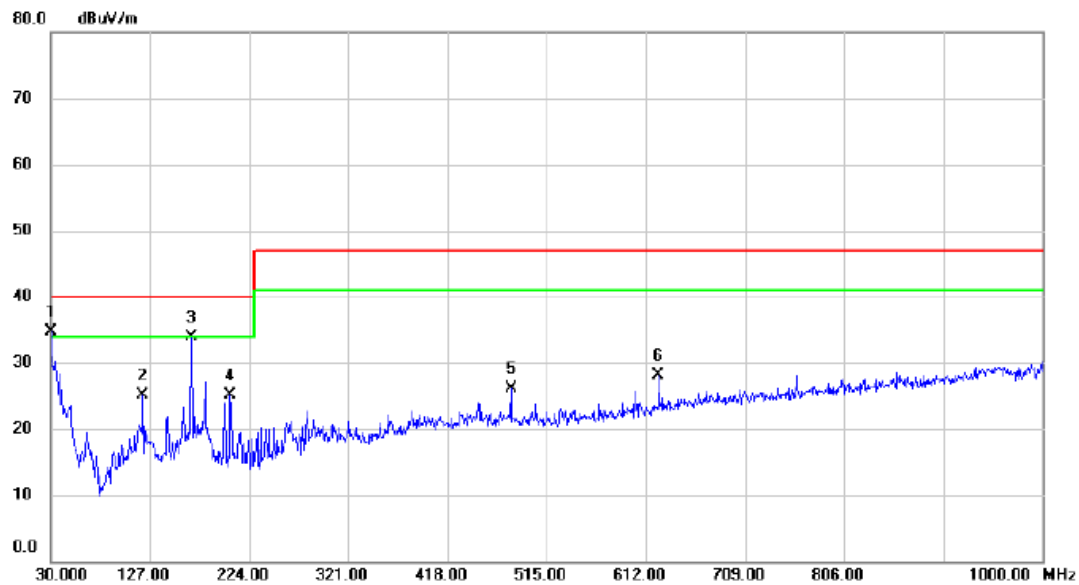
APPENDIX A - RADIATED EMISSION UP TO 1GHZ

Test Voltage	AC 230V/50Hz	Polarization	Vertical
Test Mode	Mode 1		



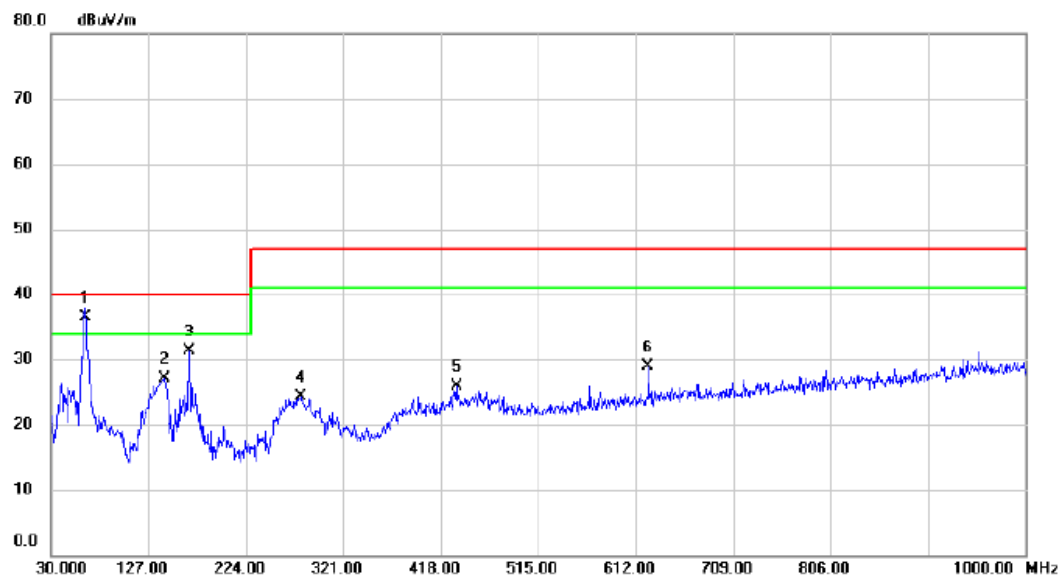
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	30.0000	47.88	-15.02	32.86	40.00	-7.14	QP	
2		49.4000	46.15	-13.99	32.16	40.00	-7.84	QP	
3		140.5800	40.00	-12.90	27.10	40.00	-12.90	QP	
4		167.7400	42.59	-12.17	30.42	40.00	-9.58	QP	
5		480.0800	33.81	-7.91	25.90	47.00	-21.10	QP	
6		624.6100	34.00	-5.27	28.73	47.00	-18.27	QP	

Test Voltage	AC 230V/50Hz	Polarization	Horizontal
Test Mode	Mode 1		



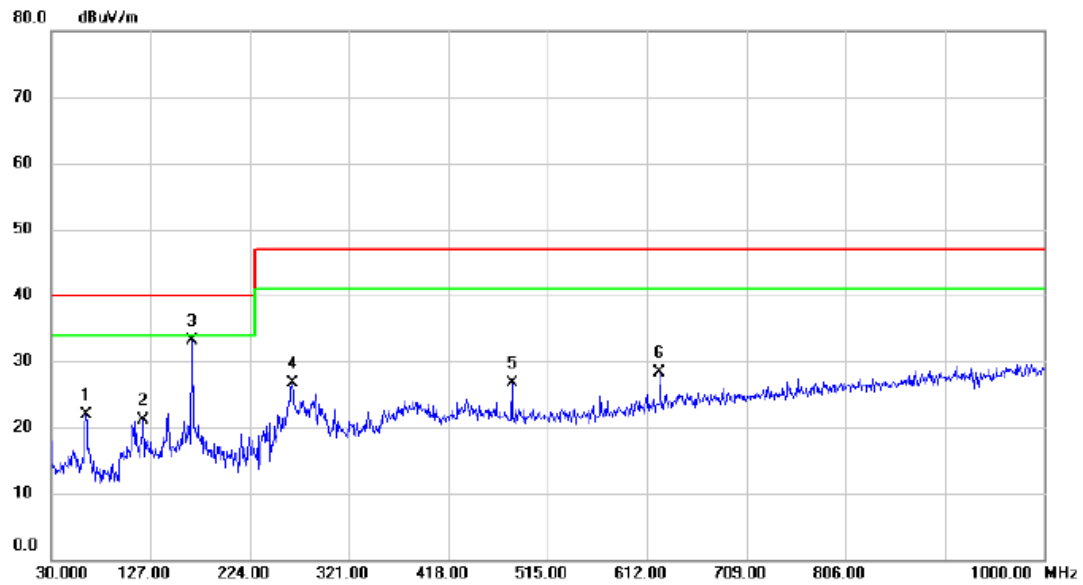
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	30.0000	49.78	-15.02	34.76	40.00	-5.24	QP	
2		120.2100	38.10	-13.09	25.01	40.00	-14.99	QP	
3		167.7400	46.02	-12.17	33.85	40.00	-6.15	QP	
4		205.5700	40.64	-15.48	25.16	40.00	-14.84	QP	
5		480.0800	33.97	-7.91	26.06	47.00	-20.94	QP	
6		624.6100	33.46	-5.27	28.19	47.00	-18.81	QP	

Test Voltage	AC 230V/50Hz	Polarization	Vertical
Test Mode	Mode 2		



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	63.9500	51.58	-15.13	36.45	40.00	-3.55	QP	
2		142.5200	39.80	-12.79	27.01	40.00	-12.99	QP	
3		167.7400	43.54	-12.17	31.37	40.00	-8.63	QP	
4		279.2900	37.00	-12.72	24.28	47.00	-22.72	QP	
5		433.5200	34.54	-8.60	25.94	47.00	-21.06	QP	
6		624.6100	34.12	-5.27	28.85	47.00	-18.15	QP	

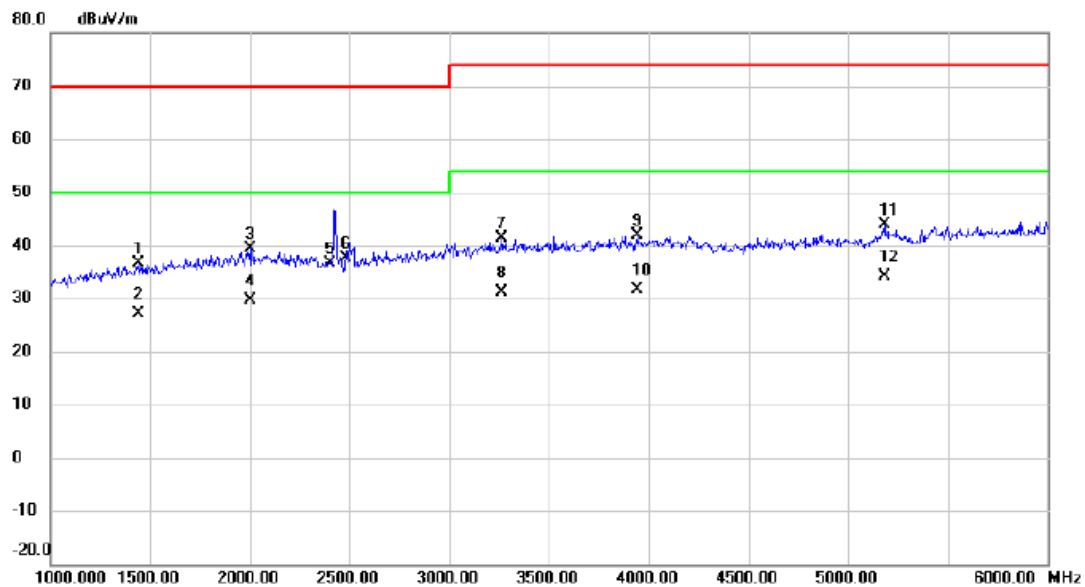
Test Voltage	AC 230V/50Hz	Polarization	Horizontal
Test Mode	Mode 2		



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		63.9500	37.02	-15.13	21.89	40.00	-18.11	QP	
2		120.2100	34.14	-13.09	21.05	40.00	-18.95	QP	
3	*	167.7400	45.27	-12.17	33.10	40.00	-6.90	QP	
4		265.7100	39.69	-12.98	26.71	47.00	-20.29	QP	
5		480.0800	34.62	-7.91	26.71	47.00	-20.29	QP	
6		624.6100	33.49	-5.27	28.22	47.00	-18.78	QP	

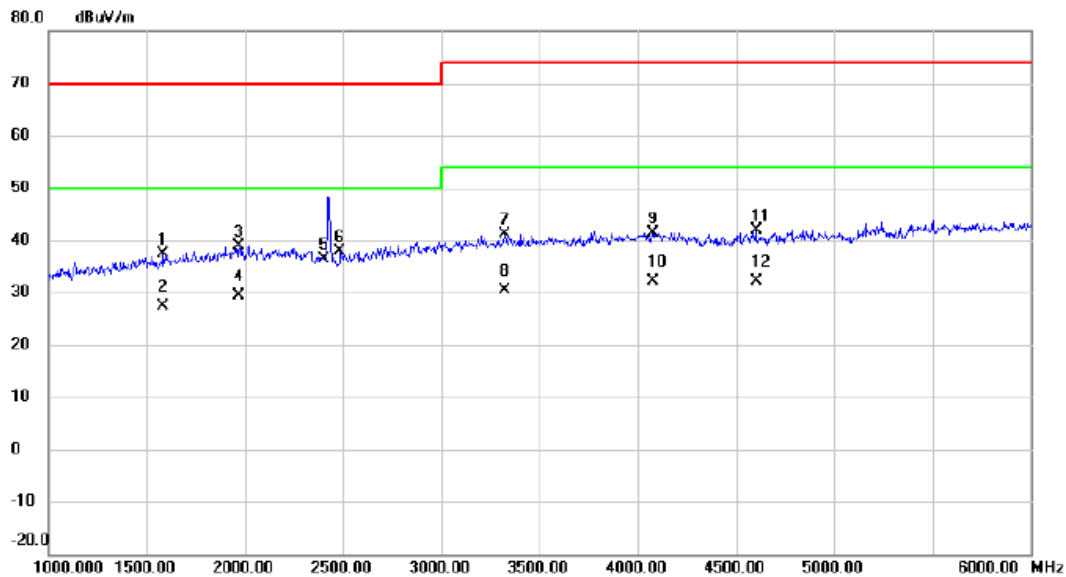
APPENDIX B - RADIATED EMISSION ABOVE 1GHZ

Test Voltage	AC 230V/50Hz	Polarization	Vertical
Test Mode	Mode 1		
Note	2.4G WIFI(2400-2483.5MHz) is intentional transmissions, which is not applicable to the radiation emission requirements in this standard.		



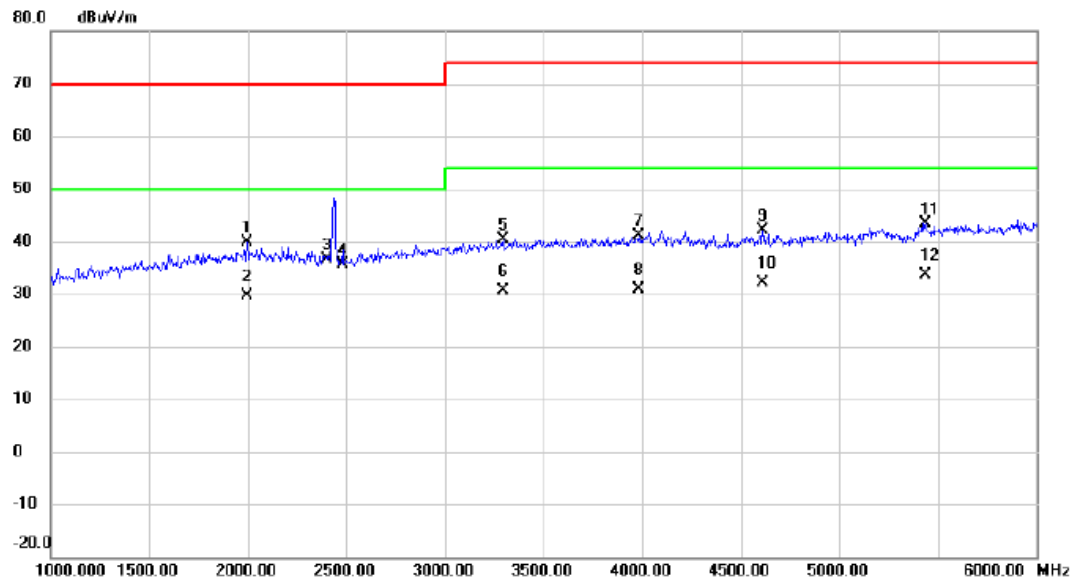
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		1445.000	43.11	-6.41	36.70	70.00	-33.30	peak	
2		1445.000	33.62	-6.41	27.21	50.00	-22.79	AVG	
3		2000.000	42.52	-3.02	39.50	70.00	-30.50	peak	
4		2000.000	32.57	-3.02	29.55	50.00	-20.45	AVG	
5		2400.000	40.03	-3.48	36.55	70.00	-33.45	peak	
6		2483.500	41.25	-3.57	37.68	70.00	-32.32	peak	
7		3265.000	41.12	0.14	41.26	74.00	-32.74	peak	
8		3265.000	31.08	0.14	31.22	54.00	-22.78	AVG	
9		3945.000	39.69	2.17	41.86	74.00	-32.14	peak	
10		3945.000	29.45	2.17	31.62	54.00	-22.38	AVG	
11		5185.000	39.41	4.39	43.80	74.00	-30.20	peak	
12	*	5185.000	29.66	4.39	34.05	54.00	-19.95	AVG	

Test Voltage	AC 230V/50Hz	Polarization	Horizontal
Test Mode	Mode 1		
Note	2.4G WIFI(2400-2483.5MHz) is intentional transmissions, which is not applicable to the radiation emission requirements in this standard.		



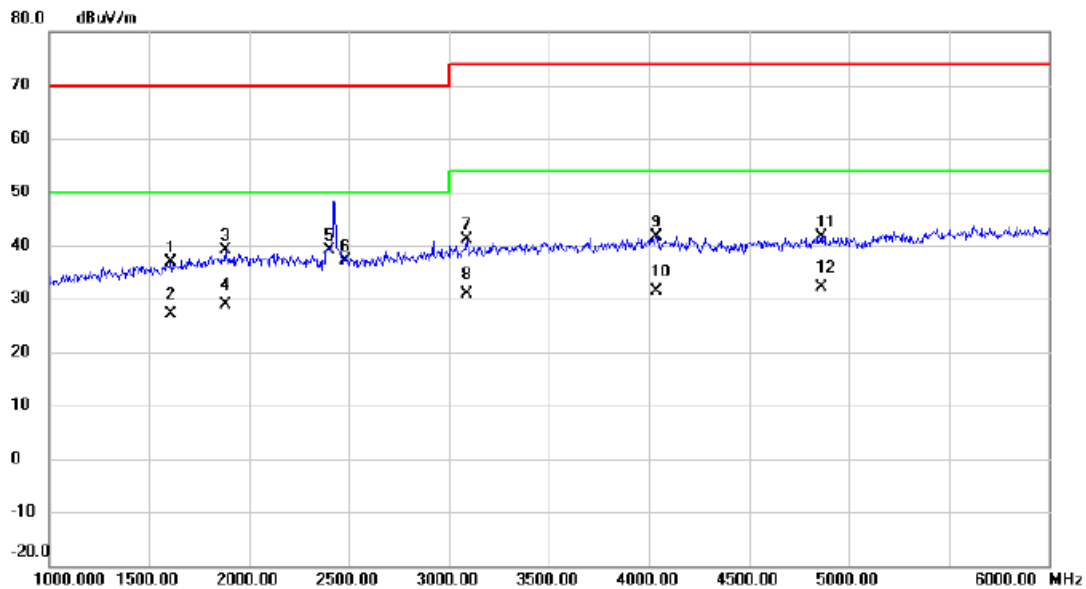
No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	1585.000	43.07	-5.61	37.46	70.00	-32.54	peak	
2	1585.000	33.08	-5.61	27.47	50.00	-22.53	AVG	
3	1970.000	42.21	-3.21	39.00	70.00	-31.00	peak	
4 *	1970.000	32.64	-3.21	29.43	50.00	-20.57	AVG	
5	2400.000	39.81	-3.48	36.33	70.00	-33.67	peak	
6	2483.500	41.57	-3.57	38.00	70.00	-32.00	peak	
7	3325.000	40.69	0.39	41.08	74.00	-32.92	peak	
8	3325.000	30.11	0.39	30.50	54.00	-23.50	AVG	
9	4075.000	39.15	2.33	41.48	74.00	-32.52	peak	
10	4075.000	29.75	2.33	32.08	54.00	-21.92	AVG	
11	4600.000	39.17	2.76	41.93	74.00	-32.07	peak	
12	4600.000	29.45	2.76	32.21	54.00	-21.79	AVG	

Test Voltage	AC 230V/50Hz	Polarization	Vertical
Test Mode	Mode 2		
Note	2.4G WIFI(2400-2483.5MHz) is intentional transmissions, which is not applicable to the radiation emission requirements in this standard.		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		1995.000	42.95	-3.05	39.90	70.00	-30.10	peak	
2	*	1995.000	32.80	-3.05	29.75	50.00	-20.25	AVG	
3		2400.000	40.15	-3.48	36.67	70.00	-33.33	peak	
4		2483.500	39.13	-3.57	35.56	70.00	-34.44	peak	
5		3295.000	40.13	0.26	40.39	74.00	-33.61	peak	
6		3295.000	30.45	0.26	30.71	54.00	-23.29	AVG	
7		3980.000	38.91	2.25	41.16	74.00	-32.84	peak	
8		3980.000	28.75	2.25	31.00	54.00	-23.00	AVG	
9		4610.000	39.40	2.79	42.19	74.00	-31.81	peak	
10		4610.000	29.46	2.79	32.25	54.00	-21.75	AVG	
11		5435.000	38.41	4.99	43.40	74.00	-30.60	peak	
12		5435.000	28.65	4.99	33.64	54.00	-20.36	AVG	

Test Voltage	AC 230V/50Hz	Polarization	Horizontal
Test Mode	Mode 2		
Note	2.4G WIFI(2400-2483.5MHz) is intentional transmissions, which is not applicable to the radiation emission requirements in this standard.		



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		1610.000	42.22	-5.45	36.77	70.00	-33.23	peak	
2		1610.000	32.48	-5.45	27.03	50.00	-22.97	AVG	
3		1880.000	42.80	-3.77	39.03	70.00	-30.97	peak	
4	*	1880.000	32.58	-3.77	28.81	50.00	-21.19	AVG	
5		2400.000	42.69	-3.48	39.21	70.00	-30.79	peak	
6		2483.500	40.75	-3.57	37.18	70.00	-32.82	peak	
7		3090.000	41.65	-0.57	41.08	74.00	-32.92	peak	
8		3090.000	31.45	-0.57	30.88	54.00	-23.12	AVG	
9		4035.000	39.40	2.31	41.71	74.00	-32.29	peak	
10		4035.000	29.08	2.31	31.39	54.00	-22.61	AVG	
11		4865.000	38.05	3.56	41.61	74.00	-32.39	peak	
12		4865.000	28.65	3.56	32.21	54.00	-21.79	AVG	

APPENDIX C - ELECTROSTATIC DISCHARGE

Test Voltage	AC 230V/50Hz
Test Mode	Mode 1-2

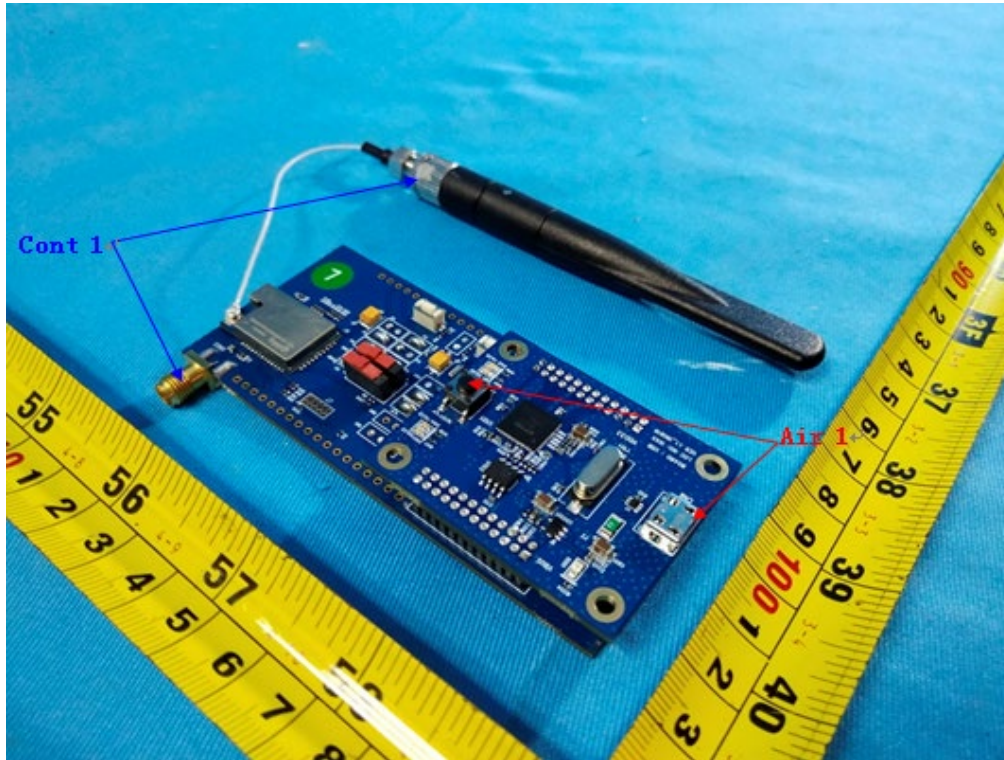
Mode	Air Discharge								Contact Discharge					
Test Level	2kV		4kV		8kV		- kV		2kV		4kV		6kV	
Location	P	N	P	N	P	N	P	N	P	N	P	N	P	N
1	A	A	A	A	A	A	-	-	A	A	A	A	-	-
Criteria	B								B					
Result	A								A					

Mode	HCP Contact Discharge						VCP Contact Discharge					
Test Level	2kV		4kV		6kV		2kV		4kV		6kV	
Location	P	N	P	N	P	N	P	N	P	N	P	N
Left side	A	A	A	A	-	-	A	A	A	A	-	-
Right side	A	A	A	A	-	-	A	A	A	A	-	-
Front side	A	A	A	A	-	-	A	A	A	A	-	-
Rear side	A	A	A	A	-	-	A	A	A	A	-	-
Criteria	B						B					
Result	A						A					

Note:

- 1) P/N denotes the Positive/Negative polarity of the output voltage.
- 2) N/A - denotes test is not applicable in this test report

PHOTO(S) SHOWN THE LOCATION(S) OF ESD EVALUATED



APPENDIX D - RF ELECTROMAGNETIC FIELD

Test Voltage	AC 230V/50Hz
Test Mode	Mode 1-2

Frequency Range (MHz)	RF Field Position	R.F. Field Strength	Modulation	Azimuth	Criteria	Results
80 - 1000	V/H	3 V/m	AM Modulated 1000 Hz, 80%	0	A	A
				90		
				180		
				270		
1000 - 3000	V/H	3 V/m	AM Modulated 1000 Hz, 80%	0	A	A
				90		
				180		
				270		
3000 - 6000	V/H	3 V/m	AM Modulated 1000 Hz, 80%	0	A	A
				90		
				180		
				270		

APPENDIX E - FAST TRANSIENTS COMMON MODE

Test Voltage	AC 230V/50Hz
Test Mode	Mode 1-2

EUT Ports Tested		Polarity	Repetition Frequency	Test Level 1kV	Criterion	Result
AC Power Port	Line (L)	+	5 kHz	A	B	A
		-	5 kHz	A		
	Neutral (N)	+	5 kHz	A	B	A
		-	5 kHz	A		
	L+N	+	5 kHz	A	B	A
		-	5 kHz	A		

End of Test Report