

# TEST REPORT

## CERTIFICATE OF CONFORMITY

**Standard:** EN 301 489-1 V2.2.3 (2019-11)  
EN 301 489-17 V3.2.4 (2020-09)

**Report No.:** RMCDBM-WTW-P22030865

**Model No.:** MGM240P22A, MGM240P32A, MGM240P32N  
(refer to item 3.1 for more details)

**Series Model:** BGM240P22A, BGM240P32A, BGM240P32N  
(refer to item 3.1 for more details)

**Received Date:** 2022/3/22

**Test Date:** 2022/3/28 ~ 2022/4/8

**Issued Date:** 2022/6/16

**Applicant:** Silicon Laboratories Finland Oy

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**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch  
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**Approved by:** \_\_\_\_\_, **Date:** 2022/6/16  
Ace Wu / Project Engineer

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This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification.



Prepared by : Anna Lee / Specialist

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## Release Control Record

Issue No.	Description	Date Issued
RMCDDBM-WTW-P22030865	Original release.	2022/6/16

## 1 Certificate

**Product:** Bluetooth Low Energy and 802.15.4 wireless radio module

**Brand:** Silicon Labs

**Test Model:** MGM240P22A, MGM240P32A, MGM240P32N  
(refer to item 3.1 for more details)

**Series Model:** BGM240P22A, BGM240P32A, BGM240P32N  
(refer to item 3.1 for more details)

**Sample Status:** Engineering samples fully representing the production modules

**Applicant:** Silicon Laboratories Finland Oy

**Test Date:** 2022/3/28 ~ 2022/4/8

**Standard:** EN 301 489-1 V2.2.3 (2019-11)  
EN 301 489-17 V3.2.4 (2020-09)

**Measurement procedure:** EN 55032:2015 +A11:2020, Class B  
EN 61000-3-2:2014, Class B  
EN IEC 61000-3-2:2019+A1:2021, Class B  
EN 61000-3-3:2013  
EN 61000-3-3:2013+A1:2019  
EN 61000-4-2:2009  
EN 61000-4-3:2006 +A1:2008 +A2:2010  
EN IEC 61000-4-3:2020  
EN 61000-4-4:2012  
EN 61000-4-5:2014 +A1:2017  
EN 61000-4-6:2014+AC:2015  
EN 61000-4-11:2004 +A1: 2017  
EN IEC 61000-4-11:2020

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

## 2 Summary of Test Results

The test items that the EUT need to perform in accordance with its interfaces, evaluated functions, are as follows:

Standard	Test Item	Result	Remark
EN 55032	Conducted Emissions from Power Ports	Pass	Minimum passing Class B margin is -13.94 dB at 3.25000 MHz
EN 55032	Radiated Emissions up to 1 GHz	Pass	Minimum passing Class B margin is -3.17 dB at 83.59 MHz
EN 55032	Radiated Emissions above 1 GHz	Pass	Minimum passing Class B margin is -15.04 dB at 5852.86 MHz
EN 61000-4-2	Electrostatic Discharges (ESD)	Pass	<a href="#">For EN 301 489</a> Performance Criteria A
EN 61000-4-3 EN IEC 61000-4-3	Radio Frequency Electromagnetic Field (RS)	Pass	<a href="#">For EN 301 489</a> Performance Criteria A

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

## 2.1 Performance Criteria

### General Performance Criteria

For the purpose of the present document two categories of performance criteria apply:

- Performance criteria for **C**ontinuous **P**henomena (**CP**).
- Performance criteria for **T**ransient **P**henomena (**TP**).

NOTE: Normally, the performance criteria depends upon the type of radio equipment and/or its intended application.

### Performance criteria for Continuous Phenomena (CP)

During the test, the equipment shall:

- continue to operate as intended;
- not unintentionally transmit;
- not unintentionally change its operating state;
- not unintentionally change critical stored data.

### Performance criteria for Transient Phenomena (TP)

For all ports and transient phenomena with the exception described below, the following applies:

- The application of the transient phenomena shall not result in a change of the mode of operation (e.g. unintended transmission) or the loss of critical stored data.
- After application of the transient phenomena, the equipment shall operate as intended.

For surges applied to symmetrically operated wired network ports intended to be connected directly to outdoor lines the following criteria applies:

- For products with only one symmetrical port intended for connection to outdoor lines, loss of function is allowed, provided the function is self-recoverable, or can be otherwise restored. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.
- For products with more than one symmetrical port intended for connection to outdoor lines, loss of function on the port under test is allowed, provided the function is self-recoverable. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

For a 70 % residual voltage dip and voltage interruption tests, the following performance criteria apply:

- in the case where the equipment is fitted with or connected to a battery back-up, the performance criteria for transient phenomena (TP);
- in the case where the equipment is powered solely from the AC mains supply (without the use of a parallel battery back-up) volatile user data may have been lost and if applicable the communication link need not to be maintained and lost functions should be recoverable by user or operator;
- no unintentional responses shall occur at the end of the test, when the voltage is restored to nominal;
- in the event of loss of function(s) or in the event of loss of user stored data, this fact shall be recorded.

### Product Specific Performance Criteria

The particular performance criteria which are specified in the relevant part of EN 301 489 series dealing with the particular type of radio equipment, take precedence over the corresponding parts of the general performance criteria. Where particular performance criteria for specific functions are not given, then the general performance criteria shall apply.

### EN 301 489-17, Broadband Data Transmission Systems

The Performance criteria are:

- performance criteria A for immunity tests with phenomena of a continuous nature;
- performance criteria B for immunity tests with phenomena of a transient nature;
- performance criteria C for immunity tests with power interruptions exceeding a certain time.

The equipment shall meet the minimum performance criteria as specified in the following below Table A.

**Table A: Performance criteria**

Criteria	During test	After test (i.e. as a result of the application of the 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 be 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.

- **Minimum performance level**

For equipment that supports a PER or FER, the minimum performance level shall be a PER or FER less than or equal to 10 %.

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.

- **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.

## 2.2 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:

Measurement	Specification	Expanded Uncertainty (k=2) (±)	Maximum allowable uncertainty (±)
Conducted Emissions from Power Ports	9 kHz ~ 30 MHz	2.79 dB	3.4 dB ( $U_{\text{CISPR}}$ )
Radiated Emissions up to 1 GHz	30 MHz ~ 1 GHz	4.14 dB	6.3 dB ( $U_{\text{CISPR}}$ )
Radiated Emissions above 1 GHz	1 GHz ~ 6 GHz	5.04 dB	5.2 dB ( $U_{\text{CISPR}}$ )

The other instruments specified are routine verified to remain within the calibrated levels, no measurement uncertainty is required to be calculated.

## 2.3 Supplementary Information

There is not any deviation from the test standards for the test method, and no modifications required for compliance.

### 3 General Information

#### 3.1 Description of EUT

Product	Bluetooth Low Energy and 802.15.4 wireless radio module
Brand	Silicon Labs
Test Model	MGM240P22A, MGM240P32A, MGM240P32N
Series Model	BGM240P22A, BGM240P32A, BGM240P32N
Sample Status	Engineering samples fully representing the production modules
Operating Software	N/A
Power Supply Rating	1.8V to 3.8V, with nominal supply voltage of 3.0V for the low-power variants and 3.3V for the high-power variants
Accessory Device	N/A
Data Cable Supplied	N/A

Note:

1. The following models are provided to this EUT.

Sample 1 : MGM240P22A

Sample 2 : MGM240P32A

Sample 3 : MGM240P32N

Product Spec	Model		
	MGM240P22A (covers BGM240P22A)	MGM240P32A (covers BGM240P32A)	MGM240P32N (covers BGM240P32N)
	Low-Power/ Bluetooth Low Energy and 802.15.4 (802.15.4 being disabled for BGM240P22A)	High-Power/ Bluetooth Low Energy and 802.15.4 (802.15.4 being disabled for BGM240P32A)	High-Power/ Bluetooth Low Energy and 802.15.4 (802.15.4 being disabled for BGM240P32N)
Max nominal RF TX power, as declared by manufacturer	10dBm	20dBm	20dBm
Antenna type	integral antenna	integral antenna	RF pin
Hardware	<p>MGM240P22A (and BGM240P22A) --&gt; hardware variants with integral antenna and 10dBm max power, to be tested as DTS for both 802.15.4 and Bluetooth Low Energy</p> <p>MGM240P32A (and BGM240P32A) --&gt; hardware variants with integral antenna and 20dBm max power, to be tested as DTS for 802.15.4 and FHSS for Bluetooth Low Energy</p> <p>MGM240P32N (and BGM240P32N) --&gt; hardware variants with RF pin and 20dBm max power, to be tested as DTS for 802.15.4 and FHSS for Bluetooth Low Energy</p> <p>These three hardware variants should be RF tested separately, because PAs are configured differently and also antenna matching components are different between them, meaning for example that conducted RF measurements cannot be assumed to deliver the exact same results across the three samples.</p> <p>MGM modules are the ones under testing as they support both 802.15.4 and Bluetooth Low Energy, whereas the BGM modules are the series models because they are exactly the same except for the 802.15.4 being disabled.</p>		

#### 3.2 Primary Clock Frequencies of Internal Source

The highest frequency generated or used within the EUT or on which the EUT operates or tunes is 2.48 GHz, provided by Silicon Laboratories Finland Oy, for detailed internal source, please refer to the manufacturer's specifications.



### 3.3 Features of EUT

The tests reported herein were performed according to the method specified by Silicon Laboratories Finland Oy, for detailed feature description, please refer to the manufacturer's specifications or user's manual. Please refer to appendix of the report if the applicant has provided additional descriptions of the EUT.

### 3.4 Operating Modes of EUT and Determination of Worst Case Operating Mode

The EUT has been pre-tested under following test modes.

Test Condition	
Mode	Conducted Emissions from Power Ports
1	EUT 1 (MGM240P22A)+BT link with MGM240P32A+USB link Notebook
2	EUT 1 (MGM240P22A)+802.15.4 link with MGM240P32A+USB link Notebook
3	EUT 2 (MGM240P32A)+BT link with MGM240P22A+USB link Notebook
4	<b>EUT 3 (MGM240P32N)+BT link with MGM240P32A+USB link Notebook</b>
Note: There are both standby mode and normal mode to be pre-tested then normal mode has the highest emission value.	
Mode	Radiated Emissions up to 1 GHz
1	EUT 1 (MGM240P22A)+BT link with MGM240P32A+USB link Notebook
2	EUT 1 (MGM240P22A)+802.15.4 link with MGM240P32A+USB link Notebook
3	EUT 2 (MGM240P32A)+BT link with MGM240P22A+USB link Notebook
4	<b>EUT 3 (MGM240P32N)+BT link with MGM240P32A+USB link Notebook</b>
Note: There are both standby mode and normal mode to be pre-tested then normal mode has the highest emission value.	

Test modes are presented in the report as below.

Test Condition	
Mode	Conducted Emissions from Power Ports
A	EUT 3 (MGM240P32N)+BT link with MGM240P32A+USB link Notebook
Mode	Radiated Emissions up to 1 GHz
A	EUT 3 (MGM240P32N)+BT link with MGM240P32A+USB link Notebook
Mode	Radiated Emissions above 1 GHz
A	EUT 3 (MGM240P32N)+BT link with MGM240P32A+USB link Notebook
Mode	Electrostatic Discharges (ESD)
A	EUT 1 (MGM240P22A)+BT link with MGM240P32A+USB link Notebook
B	EUT 2 (MGM240P32A)+802.15.4 link with MGM240P22A+USB link Notebook
C	EUT 3 (MGM240P32N)+BT link with MGM240P22A+USB link Notebook
Mode	Radio Frequency Electromagnetic Field (RS)
A	EUT 1 (MGM240P22A)+BT link with MGM240P32A+USB link Notebook
B	EUT 2 (MGM240P32A)+802.15.4 link with MGM240P22A+USB link Notebook
C	EUT 3 (MGM240P32N)+BT link with MGM240P22A+USB link Notebook

### 3.5 Test Program Used and Operation Descriptions

#### For Emission test

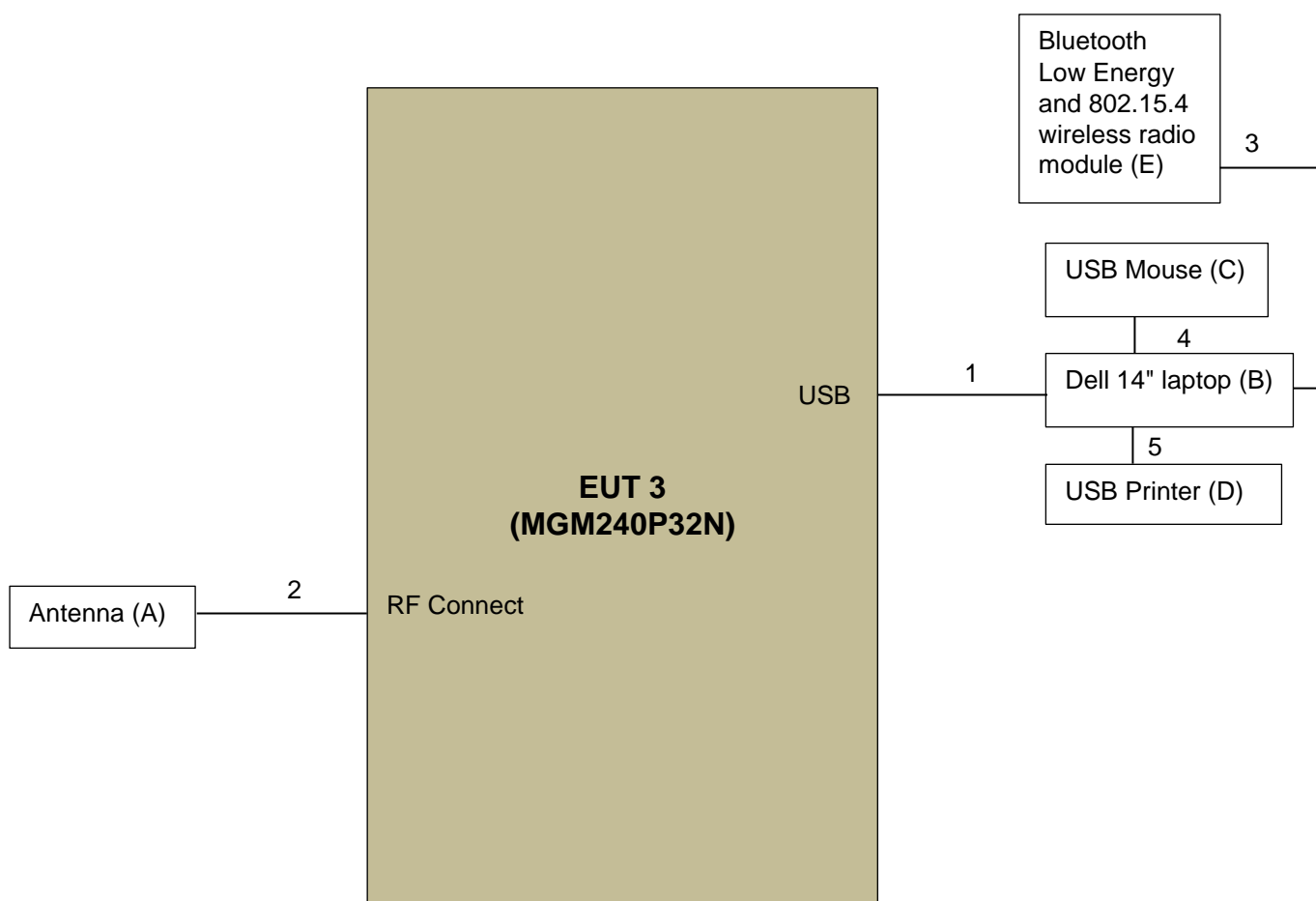
- a. The EUT 3 (MGM240P32N) connects to the MGM240P32A (EUT 2) via Bluetooth.
- b. The EUT 3 (MGM240P32N) connects to the Notebook via USB.
- c. The EUT 3 (MGM240P32N) connects to the Antenna via RF Cable.
- d. The MGM240P32A (EUT 2) connects to the Notebook via USB.

#### For Immunity test

- a. Connect the EUT to Notebook to perform test.
- b. The EUT and the Notebook are linked together via USB; the Notebook is acting as the host through which the data is exchanged and the performance is monitored.
- c. Step b-c were repeated.
- d. The EUT exchange Bluetooth Low Energy or 802.15.4 data packets with the remote transmission system made of another radio module acting as the wireless communication companion; PER is monitored at the EUT side for minimum performance level, which is set to have to be below 10%.

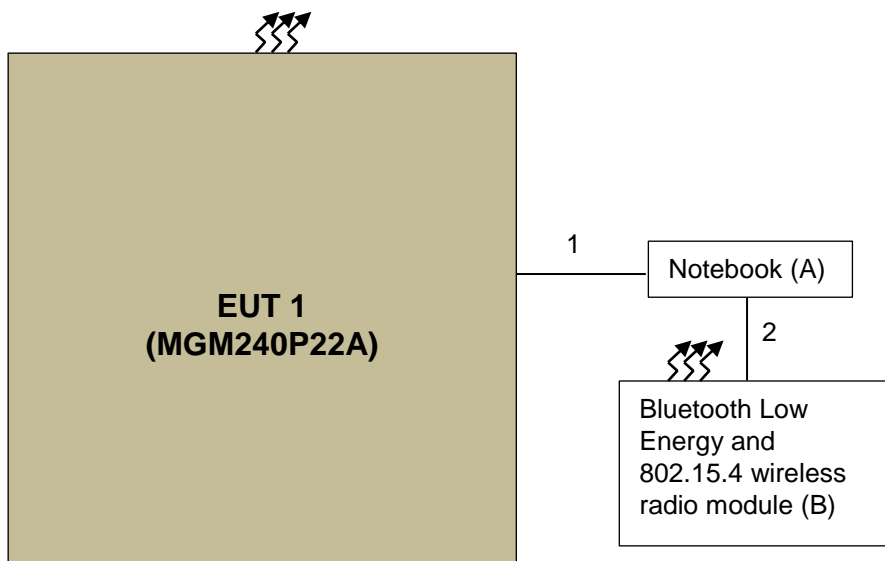
### 3.6 Connection Diagram of EUT and Peripheral Devices

For Emission test

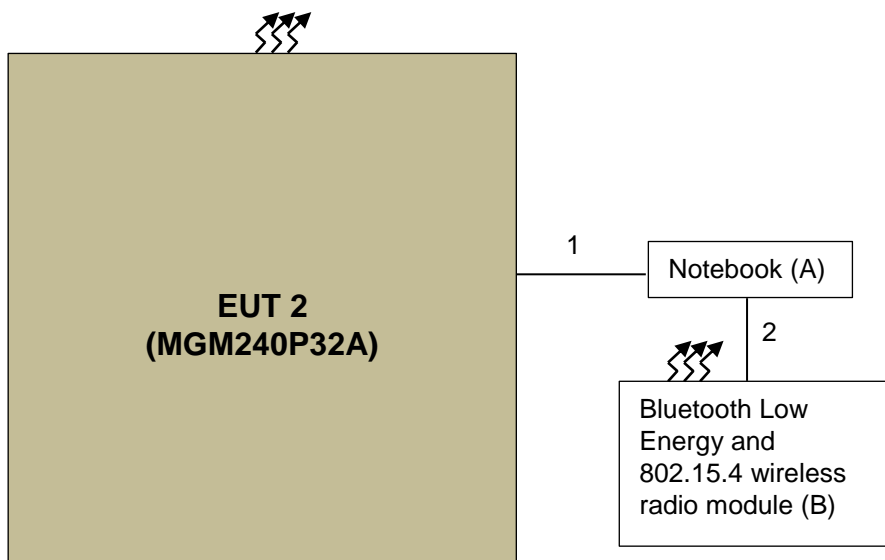




## For Mode A test

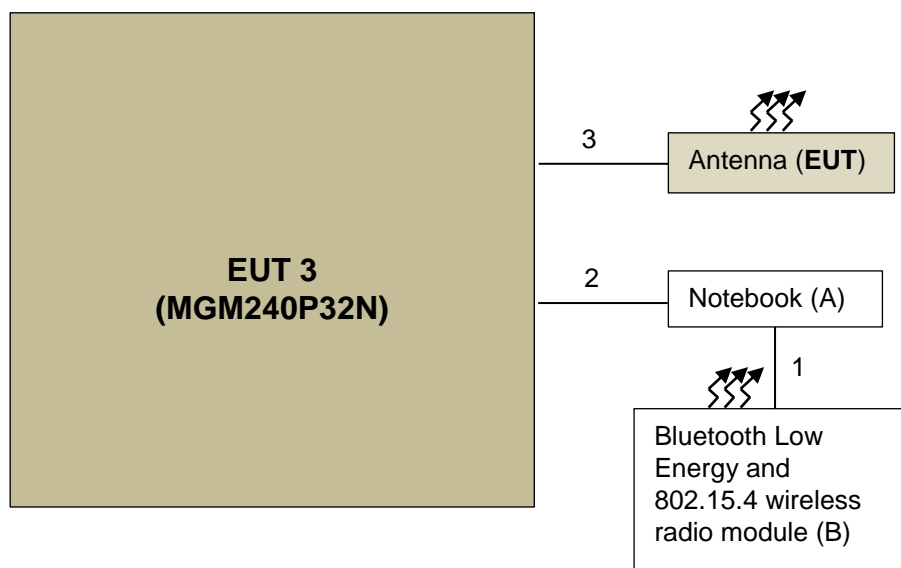


## For Mode B test





For Mode C test



### 3.7 Configuration of Peripheral Devices and Cable Connections

#### For Emission test

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	Antenna	N/A	N/A	N/A	N/A	Supplied by applicant
B	Dell 14" laptop	Dell	E5420	FHP55S1	FCC DoC Approved	-
C	USB Mouse	DELL	MOCZUL	CN-049TWY-PRC00-79E-02FW	FCC DoC Approved	-
D	USB Printer	EPSON	T22	MEEZ070388	FCC DoC Approved	-
E	Bluetooth Low Energy and 802.15.4 wireless radio module	Silicon Labs	MGM240P32A	N/A	N/A	Supplied by applicant

Note:

1. All power cords of the above support units are non-shielded (1.8m).

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	USB Cable	1	1	Yes	0	Supplied by applicant
2	RF Cable	1	0.1	Yes	0	Supplied by applicant
3	USB Cable	1	1	Yes	0	-
4	USB Cable	1	1.8	Yes	0	-
5	USB Cable	1	1.8	Yes	0	-

#### For Immunity test

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	Notebook	DELL	390	G4ZLYBX	FCC DoC Approved	-
B	Bluetooth Low Energy and 802.15.4 wireless radio module	Silicon	MGM240P22A	N/A	N/A	Supplied by applicant For Mode B & C
	Bluetooth Low Energy and 802.15.4 wireless radio module	Silicon	MGM240P32A	N/A	N/A	Supplied by applicant For Mode A

Note:

1. All power cords of the above support units are non-shielded (1.8m).

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	USB Cable	1	1	Yes	0	Supplied by applicant
2	USB Cable	1	1	Yes	0	-
3	RF Cable	1	0.1	Yes	0	Supplied by applicant

## 4 Test Instruments

The calibration interval of the all test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

### 4.1 Conducted Emissions from Power Ports

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
DC LISN R&S	ESH3-Z6	100219	2021/7/25	2022/7/24
		844950/018	2021/7/25	2022/7/24
DC-LISN SCHWARZBECK MESS- ELETRONIK	NNBM 8126G	8126G-069	2021/11/10	2022/11/9
LISN ROHDE & SCHWARZ	ENV216	101826	2022/3/14	2023/3/13
LISN R&S	ESH3-Z5	100311	2021/9/7	2022/9/6
	ENV216	100072	2021/6/16	2022/6/15
LISN Schwarzbeck	NNLK 8121	8121-731	2021/4/28	2022/4/27
RF Coaxial Cable WOKEN	5D-FB	Cable-cond1-01	2022/1/15	2023/1/14
Software BVADT	BVADT_Cond_ V7.3.7.4	N/A	N/A	N/A
Test Receiver Rohde&Schwarz	ESCI	100613	2021/12/3	2022/12/2
V-LISN Schwarzbeck	NNBL 8226-2	8226-142	2021/8/20	2022/8/19

Notes:

1. The test was performed in HY - Conduction 1.
2. Tested Date: 2022/3/28

## 4.2 Radiated Emissions up to 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Antenna Tower (H)	MFA-440	970705	N/A	N/A
Antenna Tower (V)	MFA-440	9707	N/A	N/A
Bi_Log Antenna Schwarbeck	VULB9168	9168-148	2021/10/19	2022/10/18
		9168-156	2021/10/19	2022/10/18
Controller (H)	MF7802	08093	N/A	N/A
Controller (V)	MF7802	074	N/A	N/A
Pre_Amplifier Sonoma	310N	352924	2021/6/5	2022/6/4
		352923	2021/6/5	2022/6/4
RF Coaxial Cable TIMES	LMR-600(18M)+LMR-400 (7M)	CABLE-CH1(VER)-01	2021/9/4	2022/9/3
	LMR-600(11.8M)+LMR- 400 (7M)	CABLE-CH1(HOR)-01	2021/9/4	2022/9/3
Software	ADT_Radiated_V8.7.08	N/A	N/A	N/A
Test Receiver ESR7 R&S	ESR	101240	2021/11/3	2022/11/2
		101264	2021/4/9	2022/4/8
Turn Table	DS430	50303	N/A	N/A

### Notes:

1. The test was performed in HY - 10M Chamber. The test site validated date: 2021/8/07 (NSA)
2. Tested Date: 2022/4/1



#### 4.3 Radiated Emissions above 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Antenna Tower BVADT	AT100	AT93021702	N/A	N/A
BandPass Filter MICRO-TRONICS	BRM17690-01	003	2021/9/4	2022/9/3
	BRM50716-01	G011	2021/9/4	2022/9/3
Controller BVADT	SC100	SC93021702	N/A	N/A
Fix tool for Boresight antenna tower BV	BAF-01	2	N/A	N/A
Horn Antenna Schwarzbeck	BBHA 9120D	9120D-405	2021/11/14	2022/11/13
Pre-Amplifier Agilent	8449B	3008A01961	2021/9/4	2022/9/3
RF Coaxial Cable EMCI	EMC102-KM-KM-1000	170820	2022/1/15	2023/1/14
RF Coaxial Cable Rosnol	K1K50-UP0279-K1K50- 3000	181129-2	2022/1/15	2023/1/14
RF Coaxial Cable ATK+EMC	JUNFLON+EMC104- SM-SM-6000	Cable-CH2- 02(MWX3221308G003+130710)	2022/1/15	2023/1/14
Software BVADT	ADT_Radiated_V8.7.08	N/A	N/A	N/A
Spectrum Analyzer Agilent	E4446A	MY51100039	2021/12/7	2022/12/6
Turn Table BVADT	TT100	TT93021702	N/A	N/A

Notes:

1. The test was performed in HY - 966 chamber 1. The test site validated date: 2021/1/9, 2022/1/8 (VSWR)
2. Tested Date: 2022/3/31

#### 4.4 Electrostatic Discharges (ESD)

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Electrostatic Analog Tester NoiseKen	ESS-B3011	ESS12Z5082	2021/11/18	2022/11/17
Electrostatic Analog Tester TESEQ	NSG 438	1614	2021/8/10	2022/8/9
Electrostatic Analog Tester SCHAFFNER	NSG-438	1326	2021/7/9	2022/7/8
ESD Generator EM Test	Dito	V0701102114	2021/11/18	2022/11/17
ESD Simulator Noiseken	ESS-B3011A	ESS1694113	2021/8/21	2022/8/20
Radio Communication Analyzer Anritsu	MT8820C	6201010285	2021/8/18	2022/8/17

Notes:

1. The test was performed in HY - ESD 2.
2. Tested Date: 2022/4/6

#### 4.5 Radio Frequency Electromagnetic Field (RS)

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Audio analyzer R&S	UPV	101009	2021/12/23	2022/12/22
Conditioning Amplifier B&K	2690	2790522	2021/10/28	2022/10/27
	Type 2690--0S2	2482371	2021/6/17	2022/6/16
ETS-LINDGREN 場強計 ETS-Lindgren	HI-6105	00212757	2021/12/21	2022/12/20
Log.-Per. Antenna Schwarzbeck	STLP 9149	9149-141	N/A	N/A
Log.-Per. Antenna ROHDE&SCHWARZ	HL046E	100114	N/A	N/A
Mouth Simulator B&K	4227	2411656	N/A	N/A
power amplifier BONN Elektronik	BLMA 1060-100/50D	118694	N/A	N/A
power amplifier R&S	BBA100	101011	N/A	N/A
POWER SENSOR R&S	NRP-Z91	101573	2021/5/21	2022/5/20
		101572	2021/5/21	2022/5/20
Pressure-field Microphone B&K	4192-L-001	2764583	2021/9/30	2022/9/29
Pressure-field Microphone Bruel&Kjaer	4192	2854670	2022/3/4	2023/3/3
SIGNAL GENERATOR R&S	SMB100A	105801	2021/12/6	2022/12/5
Software R&S	EMC32 Version 8.52.0	N/A	N/A	N/A

Notes:

1. The test was performed in HY - RS Chamber 2.
2. Tested Date: 2022/4/8

## 5 Limits of Test Items

### 5.1 Conducted Emissions from Power Ports

For AC mains power input/output Port

Frequency (MHz)	Class A (dB $\mu$ V)		Class B (dB $\mu$ V)	
	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.

For DC power input/output ports

Frequency (MHz)	(dB $\mu$ V)	
	Quasi-peak	Average
0.15 - 0.5	79	66
0.5 - 30	73	60

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

### 5.2 Radiated Emissions up to 1 GHz

Frequency (MHz)	Class A Quasi-peak (dBuV/m)		Class B Quasi-peak (dBuV/m)	
	at 3m	at 10m	at 3m	at 10m
30 - 230	50	40	40	30
230 - 1000	57	47	47	37

Notes: 1. The lower limit shall apply at the transition frequencies.

2. Emission level (dBuV/m) = 20 log Emission level (uV/m).

3. All emanations 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.

### 5.3 Radiated Emissions above 1 GHz

Frequency (GHz)	Class A (dBuV/m) (at 3m)		Class B (dBuV/m) (at 3m)	
	Average	Peak	Average	Peak
1 to 3	56	76	50	70
3 to 6	60	80	54	74

Notes: 1. The lower limit shall apply at the transition frequencies.

2. Emission level (dBuV/m) = 20 log Emission level (uV/m).

3. All emanations 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.

#### Frequency Range of Radiated Measurement (For unintentional radiators)

Highest internal frequency ( $F_x$ )	Highest measurement frequency ( $F_M$ ) (GHz)
$F_x \leq 108 \text{ MHz}$	1
$108 \text{ MHz} < F_x \leq 500 \text{ MHz}$	2
$500 \text{ MHz} < F_x \leq 1 \text{ GHz}$	5
$F_x > 1 \text{ GHz}$	$5 \times F_x$ up to a maximum of 6 GHz

$F_x$  is the highest fundamental frequency generated and/or used in the ITE or digital apparatus under test.

#### 5.4 General immunity requirements

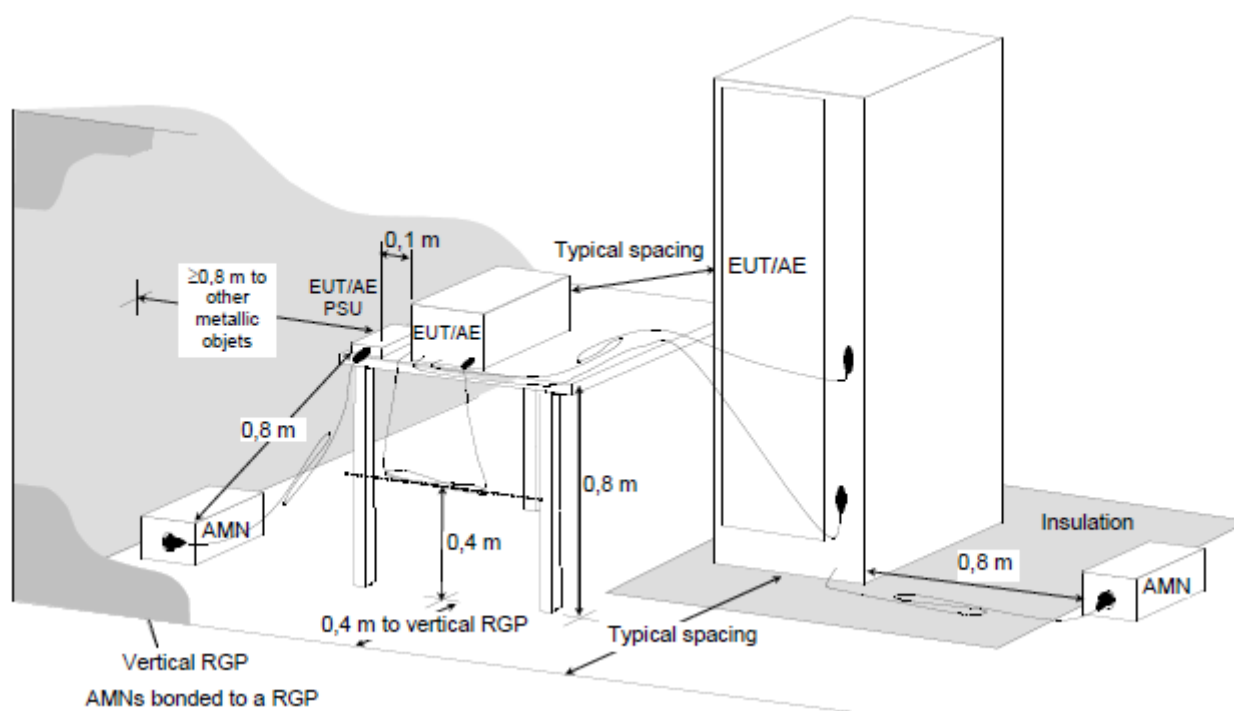
Port	Basic Standard	Test item	Test specification	Performance criteria
Enclosure	EN 61000-4-2	Electrostatic Discharge (ESD)	±4 kV (contact) ±8 kV (Air)	TP (B)
	EN 61000-4-3	Radio Frequency Electromagnetic Field (RS)	80 to 6000(MHz), 3 V/m, 80 % AM (1 kHz)	CP (A)
Power input (AC)	EN 61000-4-4	Fast Transients, Common Mode (EFT)	±1 kV 5/50 ns (Tr/Th) 5 kHz, repetition frequency	TP (B)
	EN 61000-4-5	Surge	In telecom centres: line to line: ±0.5 kV, 1.2/50 µs line to earth: ±1 kV, 1.2/50 µs In others location: line to line: ±1 kV, 1.2/50 µs line to earth: ±2 kV, 1.2/50 µs	TP (B)
	EN 61000-4-6	Radio Frequency, Common Mode (CS)	0.15 to 80(MHz), 3 V, 80 % AM (1 kHz)	CP (A)
	EN 61000-4-11	Voltage dips and interruptions (DIP)	Voltage Dips: 0% residual voltage, 0.5 cycle 0% residual voltage, 1 cycle 70% residual voltage, 25 cycles (at 50Hz) EUT with battery back-up EUT without battery back-up Voltage Interruption: 0% residual voltage, 250 cycles (at 50 Hz) EUT with battery back-up EUT without battery back-up	TP (B) TP (B) TP (B) C
				TP (B) C
DC power/ Wired network and Signal/ Control port	EN 61000-4-4	Fast Transients, Common Mode (EFT)	±0.5 kV 5/50 ns (Tr/Th) 100 kHz, repetition frequency for xDSL port 5 kHz, repetition frequency for other port	TP (B)
	EN 61000-4-5	Surge	Wired network ports (directly connected to outdoor cables): Symmetrically operated: lines to earth: ±1 kV, 10/700 µs Non-symmetrically operated: line to line: ±0.5 kV, 1.2/50µs line to earth, or shield to ground: ±1 kV, 1.2/50µs Wired network ports (indoor cables, longer than 30 m): line to earth, or shield to ground: ±0.5 kV, 1.2/50 µs	TP (B)
	EN 61000-4-6	Radio Frequency, Common Mode (CS)	0.15 to 80(MHz), 3 V, 80 % AM (1 kHz)	CP (A)

## 6 Test Arrangements

## 6.1 Conducted Emissions from Power Ports

- a. The EUT is 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), or an Artificial Network (AN) as specified in CISPR 25 if used in a vehicle. Other support units are connected to the power mains through another LISN and/or AN. They provide coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. 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.

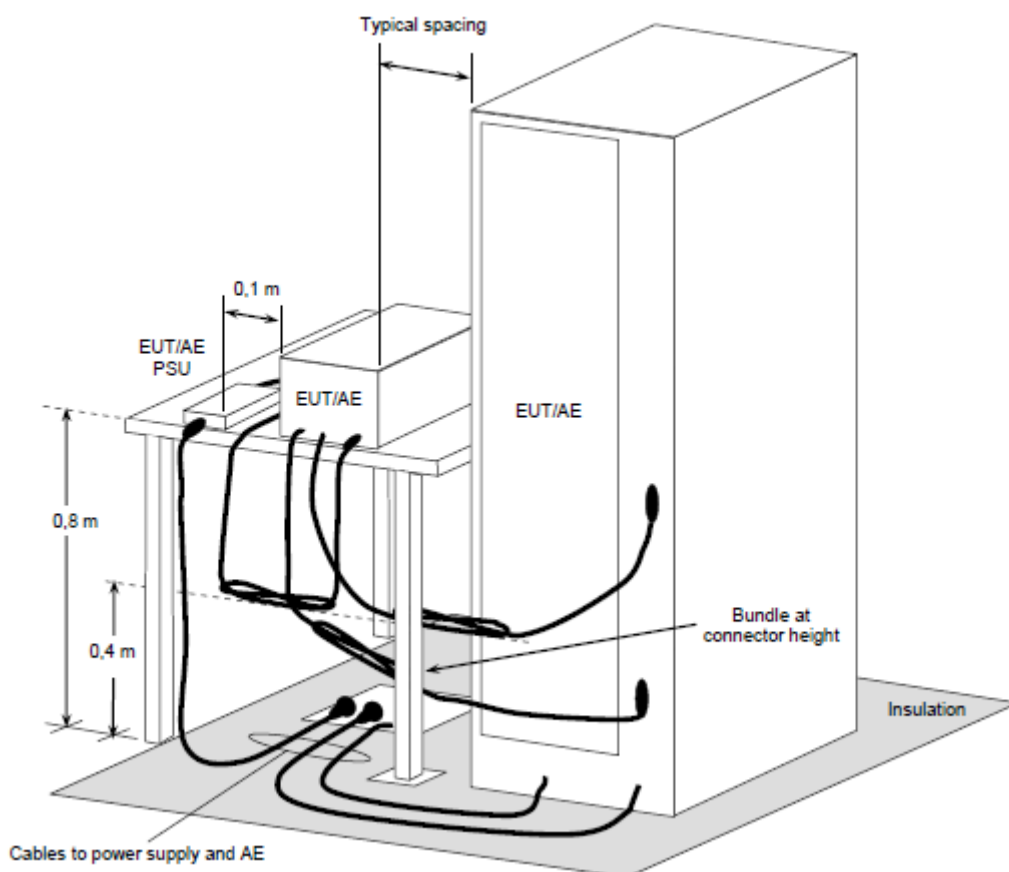


For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

## 6.2 Radiated Emissions up to 1 GHz

- For the table-top EUT is placed on a 0.8 meter to the top of rotating table; for the the floor standing EUT shall be insulated (by insulation of maximum thickness of 150 mm) from the horizontal reference ground plane. The rotating table is rotated 360 degrees to determine the position of the highest radiation. If the equipment requires a dedicated ground connection, this shall be provided and bonded to the RGP.
- The EUT is set 10 meters away from the interference-receiving antenna, which is mounted on the top of a variable-height antenna tower.
- The antenna is a broadband antenna, and its height is varied from one meter to four 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.
- For each suspected emission, the EUT is arranged to its worst case and then the antenna is tuned to heights from 1 m to 4 m and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system is set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is up to 1 GHz.

Note: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for quasi-peak detection (QP) at frequency up to 1GHz.

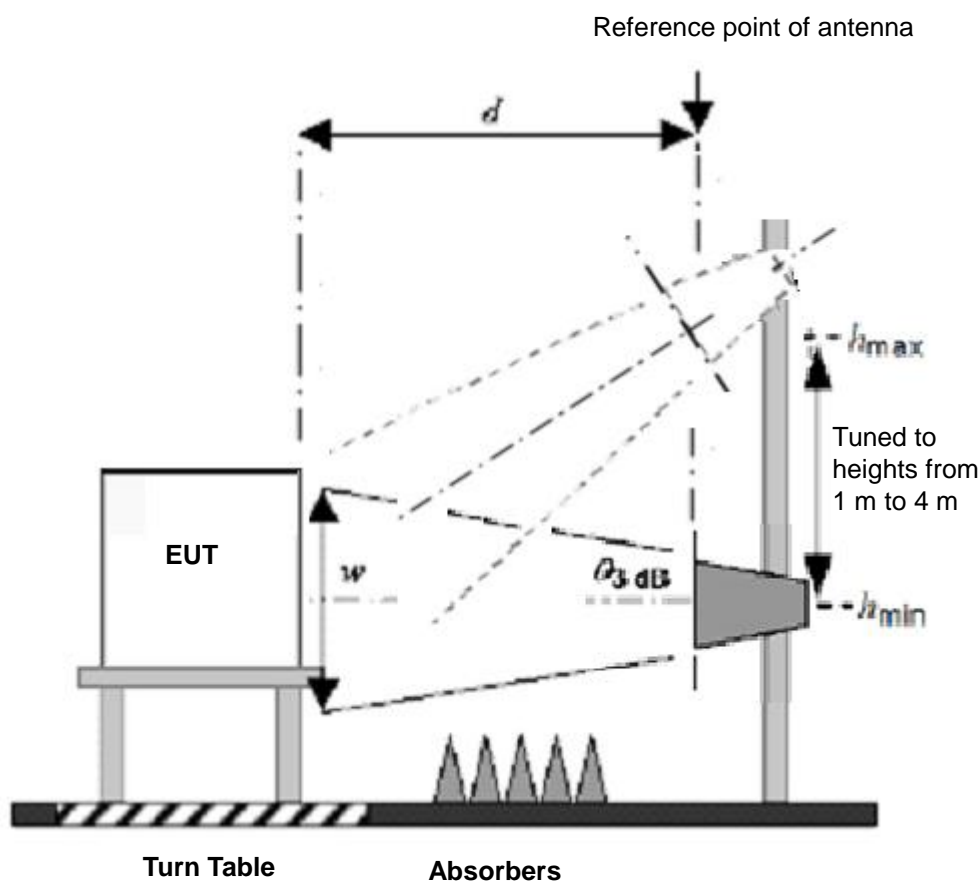


For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

### 6.3 Radiated Emissions above 1 GHz

- For the table-top EUT is placed on a 0.8 meter to the top of rotating table; for the the floor standing EUT shall be insulated (by insulation of 12 mm) from the horizontal reference ground plane. The rotating table is rotated 360 degrees to determine the position of the highest radiation. If the equipment requires a dedicated ground connection, this shall be provided and bonded to the RGP.
- The EUT was set  $d = 3$  meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 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.
- 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.
- The spectrum analyzer system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

Note: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection (PK) at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for Average detection (AV) at frequency above 1GHz.



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

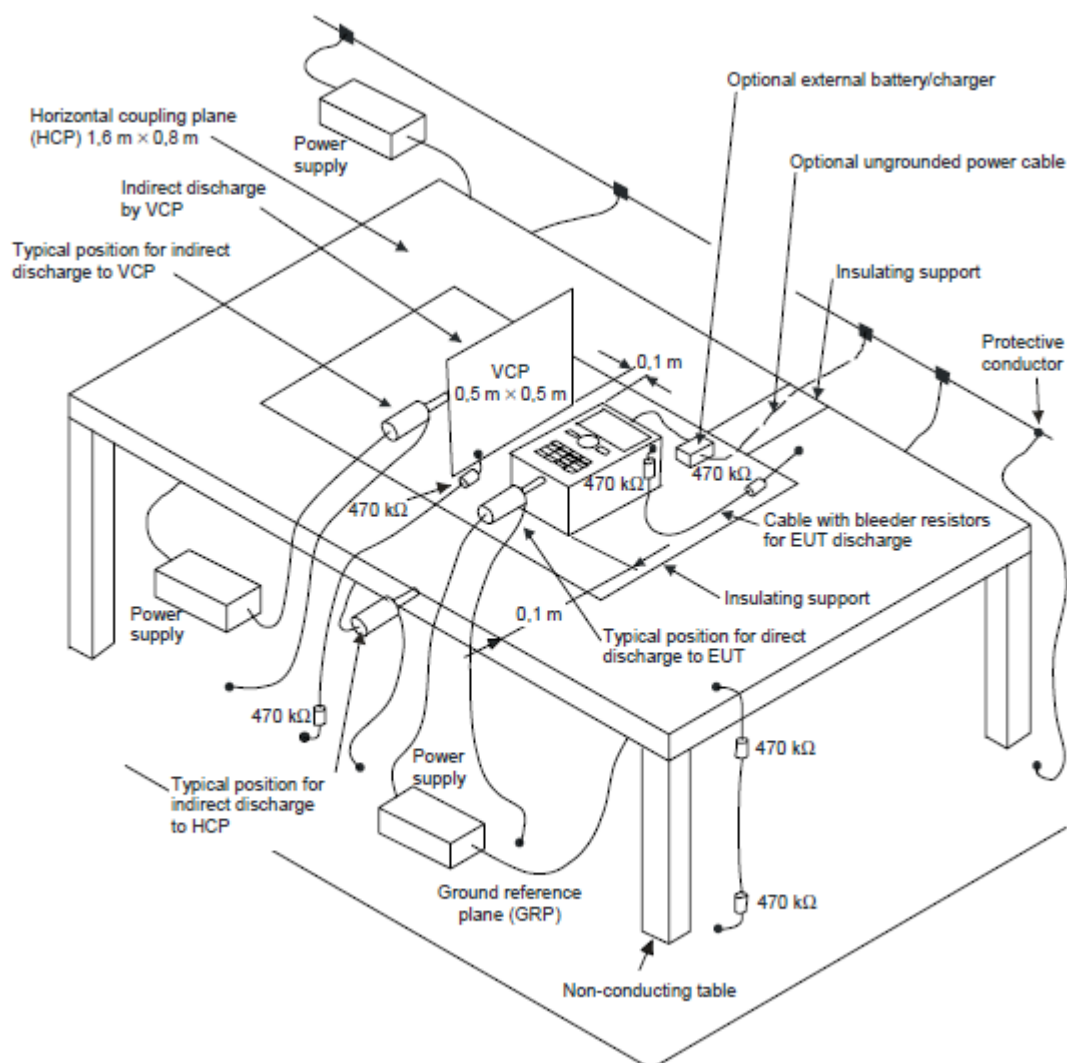
#### 6.4 Electrostatic Discharges (ESD)

<b>Discharge Impedance:</b>	330 ohm / 150 pF
<b>Number of Discharge:</b>	Air – Direct: 10 discharges per location (each polarity) Contact – Direct & Indirect: 10 discharges per location (each polarity)
<b>Discharge Period:</b>	1-second minimum

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

- Electrostatic discharges were applied only to those points and surfaces of the EUT that are accessible to users during normal operation.
- The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.
- The time interval between two successive single discharges was at least 1 second.
- The ESD generator was held perpendicularly to the surface to which the discharge was applied and the return cable was at least 0.2 meters from the EUT.
- Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
- 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.
- 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 at a distance of 0.1 meters from the EUT with the discharge electrode touching the **HCP**.
- 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.





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

**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 EN/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 1-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

**FLOOR-STANDING EQUIPMENT**

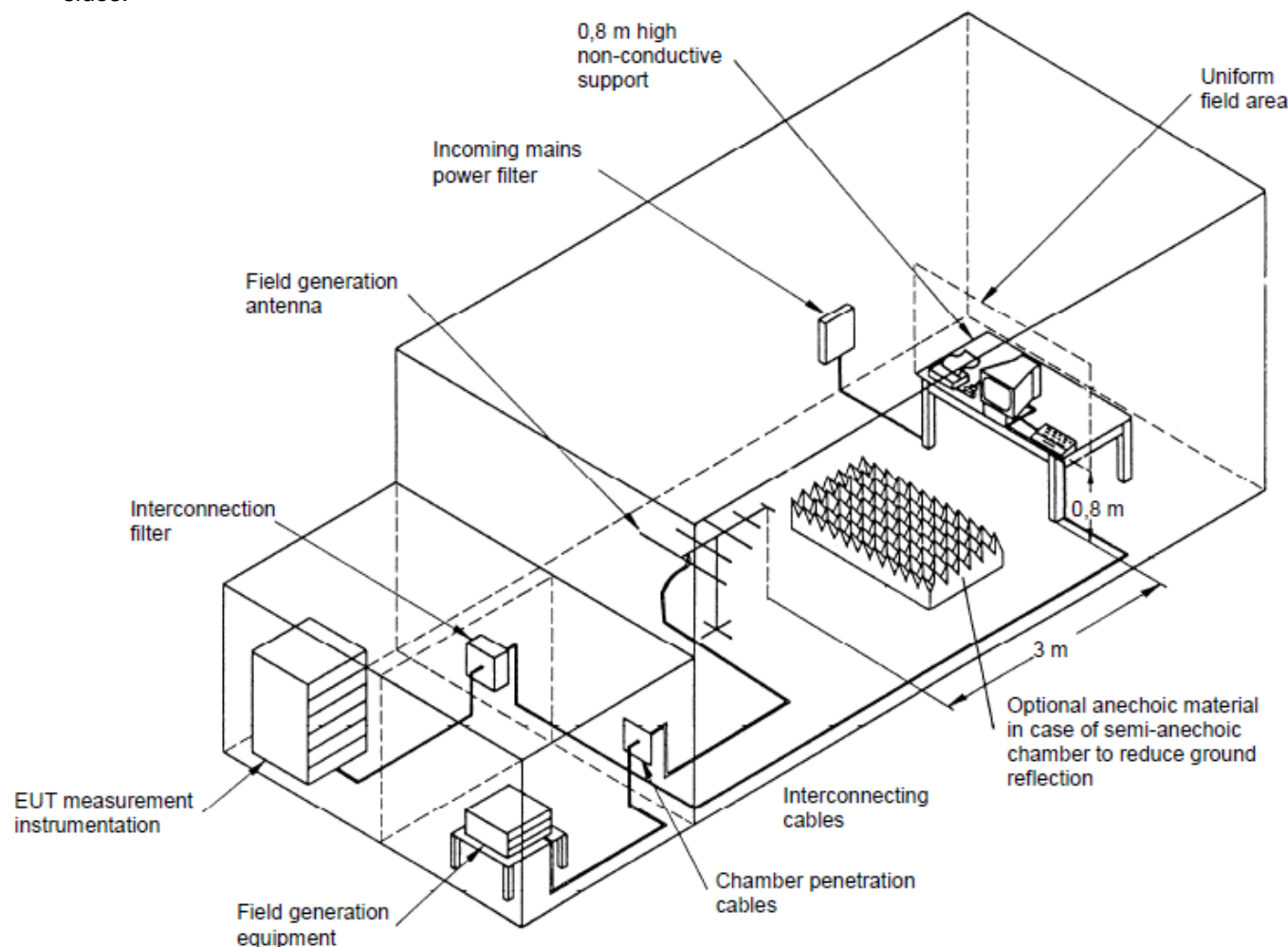
The equipment under test was installed in a representative system as described in section 7 of IEC 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1-meter thickness. The GRP consisted of a sheet of aluminum that is at least 0.25mm thick, and 2.5 meters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

## 6.5 Radio Frequency Electromagnetic Field (RS)

Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of preceding frequency value
Dwell Time:	3 seconds

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

- The testing was performed in a modified semi-anechoic chamber.
- The frequency range shall be swept, with the signal 80% amplitude modulated with a 1kHz sine wave.
- The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.



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/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.

#### **FLOOR STANDING EQUIPMENT**

The EUT installed in a representative system as described in section 7 of EN/IEC 61000-4-3 was placed on a non-conductive wood support 0.1 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

## 7 Test Results of Test Item

### 7.1 Conducted Emissions from Power Ports

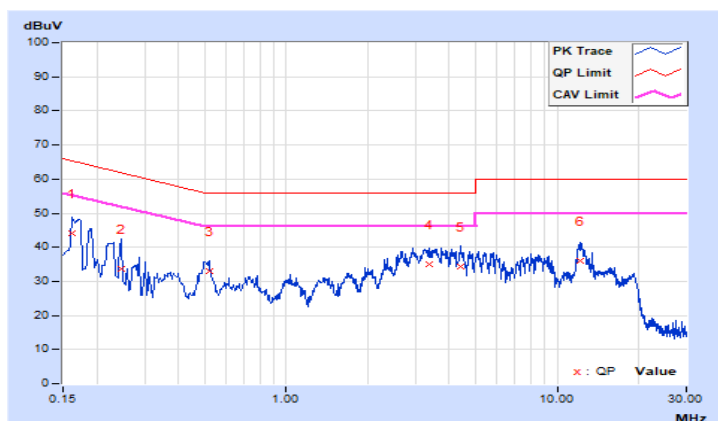
#### Mode A

Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	230 Vac, 50 Hz	Environmental Conditions	19 °C, 76 % RH
Tested by	Fox Chang		

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16200	9.62	34.56	22.76	44.18	32.38	65.36	55.36	-21.18	-22.98
2	0.24600	9.65	24.09	14.35	33.74	24.00	61.89	51.89	-28.15	-27.89
3	0.51800	9.69	23.40	18.87	33.09	28.56	56.00	46.00	-22.91	-17.44
4	3.37400	9.74	25.11	19.99	34.85	29.73	56.00	46.00	-21.15	-16.27
5	4.39400	9.75	24.60	19.32	34.35	29.07	56.00	46.00	-21.65	-16.93
6	12.11000	9.82	26.31	20.95	36.13	30.77	60.00	50.00	-23.87	-19.23

#### Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

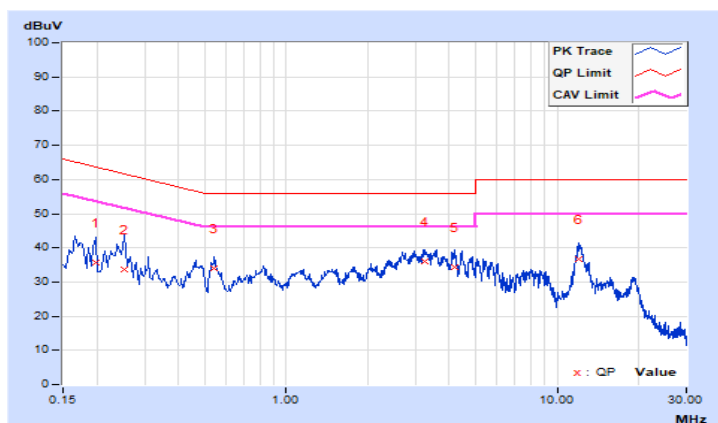


Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	230 Vac, 50 Hz	Environmental Conditions	19 °C, 76 % RH
Tested by	Fox Chang		

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.19800	9.64	26.01	17.34	35.65	26.98	63.69	53.69	-28.04	-26.71
2	0.25400	9.65	23.93	15.64	33.58	25.29	61.63	51.63	-28.05	-26.34
3	0.54200	9.69	24.38	19.33	34.07	29.02	56.00	46.00	-21.93	-16.98
4	3.25000	9.74	26.42	22.32	36.16	32.06	56.00	46.00	-19.84	-13.94
5	4.19000	9.75	24.73	20.21	34.48	29.96	56.00	46.00	-21.52	-16.04
6	12.02600	9.83	26.73	21.51	36.56	31.34	60.00	50.00	-23.44	-18.66

#### Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



## 7.2 Radiated Emissions up to 1 GHz

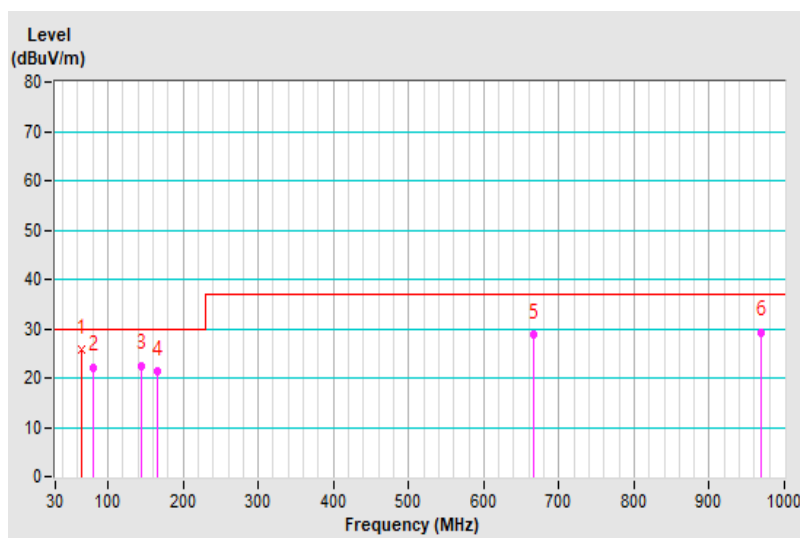
### Mode A

Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	230 Vac, 50 Hz	Environmental Conditions	21 °C, 72 % RH
Tested By	Kai Chu		

Antenna Polarity & Test Distance : Horizontal at 10 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	65.60	25.61 QP	30.00	-4.39	1.69 H	227	40.07	-14.46
2	81.17	22.05 QP	30.00	-7.95	2.50 H	316	39.90	-17.85
3	143.98	22.47 QP	30.00	-7.53	4.00 H	259	35.88	-13.41
4	166.24	21.25 QP	30.00	-8.75	4.00 H	75	34.83	-13.58
5	666.50	28.71 QP	37.00	-8.29	1.00 H	90	33.28	-4.57
6	968.28	29.14 QP	37.00	-7.86	2.00 H	183	28.04	1.10

#### Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)  
– Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value

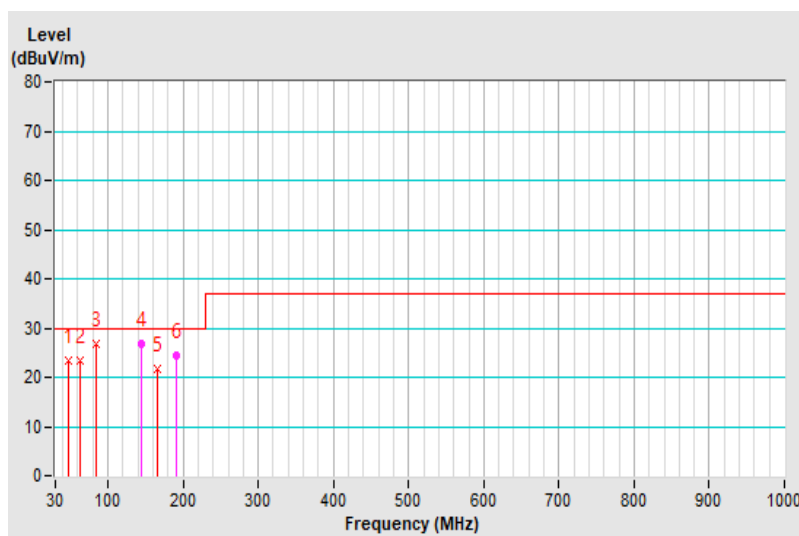


Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	230 Vac, 50 Hz	Environmental Conditions	21 °C, 72 % RH
Tested By	Kai Chu		

Antenna Polarity & Test Distance : Vertical at 10 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	48.15	23.51 QP	30.00	-6.49	1.00 V	342	36.65	-13.14
2	63.47	23.49 QP	30.00	-6.51	1.00 V	232	37.76	-14.27
3	83.59	26.83 QP	30.00	-3.17	1.00 V	332	45.47	-18.64
4	143.98	26.72 QP	30.00	-3.28	1.00 V	316	40.09	-13.37
5	166.00	21.68 QP	30.00	-8.32	1.00 V	194	35.15	-13.47
6	191.95	24.44 QP	30.00	-5.56	1.00 V	123	40.02	-15.58

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)  
– Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value



### 7.3 Radiated Emissions above 1 GHz

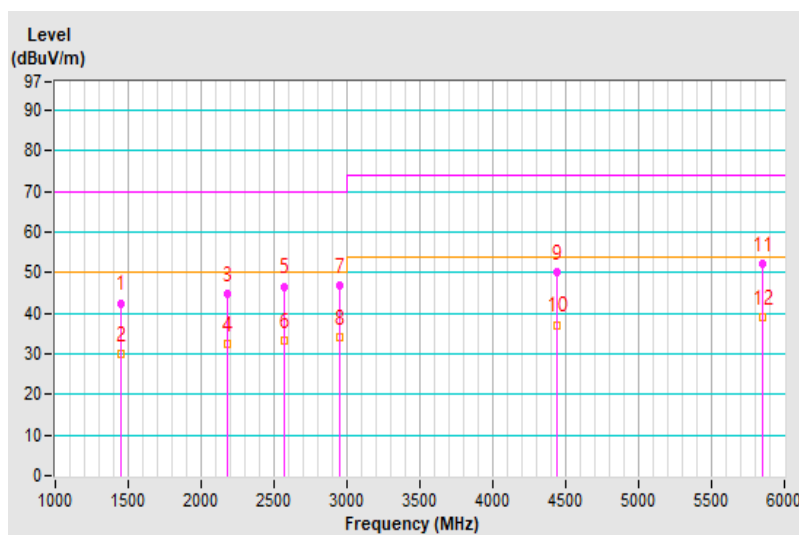
#### Mode A

Frequency Range	1GHz ~ 6GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1MHz
Input Power	230 Vac, 50 Hz	Environmental Conditions	22 °C, 65 % RH
Tested By	Kai Chu		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1449.88	42.48 PK	70.00	-27.52	1.00 H	357	43.16	-0.68
2	1449.88	29.97 AV	50.00	-20.03	1.00 H	357	30.65	-0.68
3	2181.17	44.85 PK	70.00	-25.15	1.45 H	352	40.38	4.47
4	2181.17	32.40 AV	50.00	-17.60	1.45 H	352	27.93	4.47
5	2568.95	46.60 PK	70.00	-23.40	1.43 H	53	42.98	3.62
6	2568.95	33.17 AV	50.00	-16.83	1.43 H	53	29.55	3.62
7	2947.87	46.89 PK	70.00	-23.11	1.00 H	337	40.99	5.90
8	2947.87	33.99 AV	50.00	-16.01	1.00 H	337	28.09	5.90
9	4437.92	49.97 PK	74.00	-24.03	1.00 H	290	40.40	9.57
10	4437.92	37.18 AV	54.00	-16.82	1.00 H	290	27.61	9.57
11	5852.86	52.11 PK	74.00	-21.89	1.88 H	9	39.37	12.74
12	5852.86	38.96 AV	54.00	-15.04	1.88 H	9	26.22	12.74

#### Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)  
– Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value

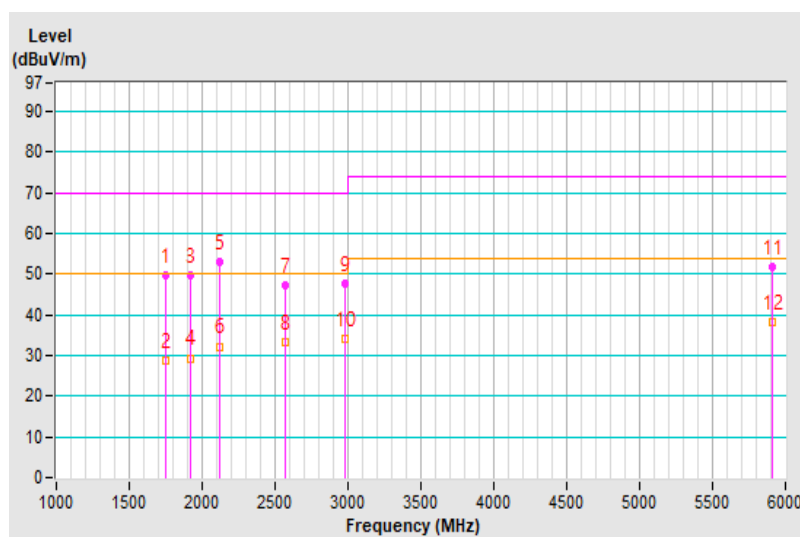


Frequency Range	1GHz ~ 6GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1MHz
Input Power	230 Vac, 50 Hz	Environmental Conditions	22 °C, 65 % RH
Tested By	Kai Chu		

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1745.69	49.86 PK	70.00	-20.14	1.39 V	293	50.10	-0.24
2	1745.69	28.86 AV	50.00	-21.14	1.39 V	293	29.10	-0.24
3	1915.49	49.79 PK	70.00	-20.21	1.96 V	11	49.16	0.63
4	1915.49	29.36 AV	50.00	-20.64	1.96 V	11	28.73	0.63
5	2118.27	53.12 PK	70.00	-16.88	1.89 V	340	49.79	3.33
6	2118.27	32.20 AV	50.00	-17.80	1.89 V	340	28.87	3.33
7	2565.20	47.40 PK	70.00	-22.60	1.66 V	124	43.78	3.62
8	2565.20	33.29 AV	50.00	-16.71	1.66 V	124	29.67	3.62
9	2980.41	47.56 PK	70.00	-22.44	1.42 V	137	41.74	5.82
10	2980.41	34.00 AV	50.00	-16.00	1.42 V	137	28.18	5.82
11	5910.28	51.85 PK	74.00	-22.15	1.94 V	5	39.02	12.83
12	5910.28	38.16 AV	54.00	-15.84	1.94 V	5	25.33	12.83

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)  
– Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value





## 7.4 Electrostatic Discharges (ESD)

### Mode A

#### For EN 301 489

Input Power	DC 5V	Environmental conditions	23 °C, 40 % RH 999 mbar
Tested by	Water Su		

Note: No conductive surfaces, therefore no contact discharge was executed.

Description of test points of direct application: Please refer to following page for representative mark only.

Test Results of Indirect Application					
Discharge Level (kV)	Polarity (+/-)	Test Point	Horizontal Coupling Plane	Vertical Coupling Plane	Performance Criteria
2,4	+/-	Four Sides	Note	Note	A

Description of test points of indirect application:

1. Front side                      2. Rear side                      3. Right side                      4. Left side

Note: The EUT is operated normal during the test.

Please refer to the attached page for description of test points.

## Mode B

### For EN 301 489

Input Power	DC 5V	Environmental conditions	23 °C, 40 % RH 999 mbar
Tested by	Water Su		

Note: No conductive surfaces, therefore no contact discharge was executed.

Description of test points of direct application: Please refer to following page for representative mark only.

Test Results of Indirect Application					
Discharge Level (kV)	Polarity (+/-)	Test Point	Horizontal Coupling Plane	Vertical Coupling Plane	Performance Criteria
2,4	+/-	Four Sides	Note	Note	A

Description of test points of indirect application:

1. Front side
2. Rear side
3. Right side
4. Left side

Note: The EUT is operated normal during the test.

Please refer to the attached page for description of test points.

## Mode C

### For EN 301 489

Input Power	DC 5V	Environmental conditions	23 °C, 40 % RH 999 mbar
Tested by	Water Su		

Note: No conductive surfaces, therefore no contact discharge was executed.

Description of test points of direct application: Please refer to following page for representative mark only.

Test Results of Indirect Application					
Discharge Level (kV)	Polarity (+/-)	Test Point	Horizontal Coupling Plane	Vertical Coupling Plane	Performance Criteria
2,4	+/-	Four Sides	Note	Note	A

Description of test points of indirect application:

1. Front side
2. Rear side
3. Right side
4. Left side

Note: The EUT is operated normal during the test.

Please refer to the attached page for description of test points.

## 7.5 Radio Frequency Electromagnetic Field (RS)

### Mode A

#### For EN 301 489

Input Power	DC 5V	Environmental conditions	23 °C, 55 % RH 988 mbar
Tested by	Andy Chang		

Frequency (MHz)	Polarity	Azimuth(°)	Applied Field Strength		Observation	Performance Criteria
			(V/m)	Modulation		
80 - 6000	V&H	0, 90, 180, 270	3	80% AM (1kHz)	Note*	A

Note: The EUT is operated normal during the test.

\* The exclusion band for the transmitter and / or receiver part of the BT function under test shall extend from 2280MHz to 2603.5MHz.

\* Establish the required communication link between EUT and remote device, reduce remote device power to point of link failure then increase by 30 dB.

## Mode B

### For EN 301 489

Input Power	DC 5V	Environmental conditions	23 °C, 55 % RH 988 mbar
Tested by	Andy Chang		

Frequency (MHz)	Polarity	Azimuth(°)	Applied Field Strength		Observation	Performance Criteria
			(V/m)	Modulation		
80 - 6000	V&H	0, 90, 180, 270	3	80% AM (1kHz)	Note*	A

Note: The EUT is operated normal during the test.

\* The exclusion band for the transmitter and / or receiver part of the 802.15.4 function under test shall extend from 2280MHz to 2520 MHz.

## Mode C

### For EN 301 489

Input Power	DC 5V	Environmental conditions	23 °C, 55 % RH 988 mbar
Tested by	Andy Chang		

Frequency (MHz)	Polarity	Azimuth(°)	Applied Field Strength		Observation	Performance Criteria
			(V/m)	Modulation		
80 - 6000	V&H	0, 90, 180, 270	3	80% AM (1kHz)	Note*	A

Note: The EUT is operated normal during the test.

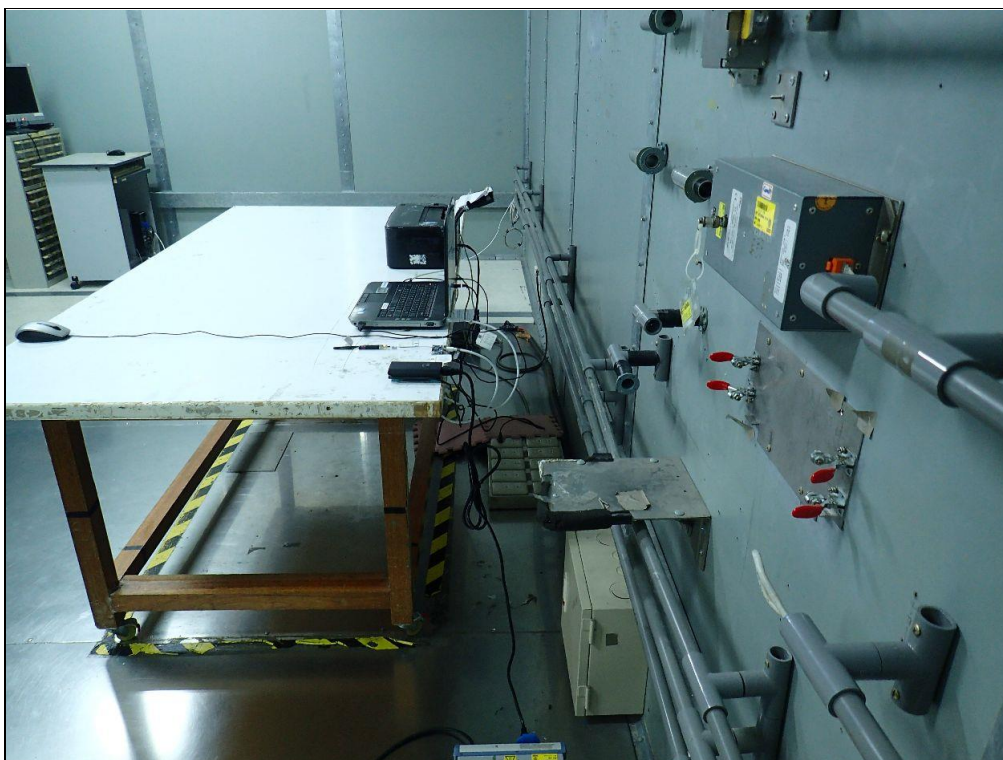
\* The exclusion band for the transmitter and / or receiver part of the BT function under test shall extend from 2280MHz to 2603.5MHz.

\* Establish the required communication link between EUT and remote device, reduce remote device power to point of link failure then increase by 30 dB.

## 8 Pictures of Test Arrangements

### 8.1 Conducted Emissions from Power Ports

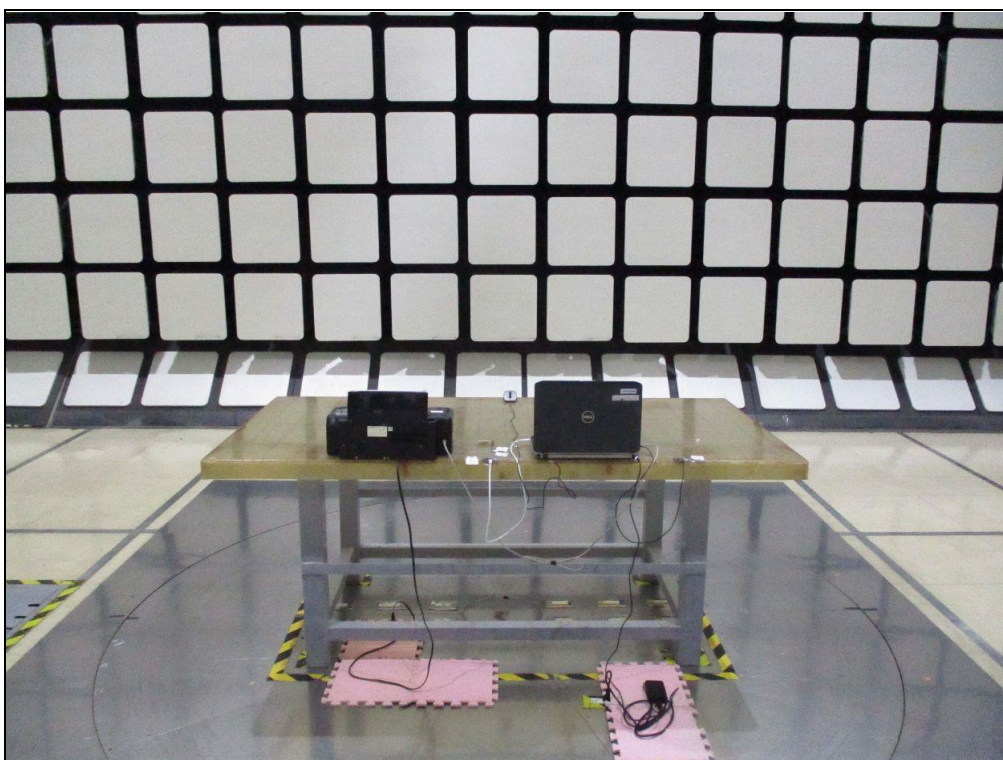
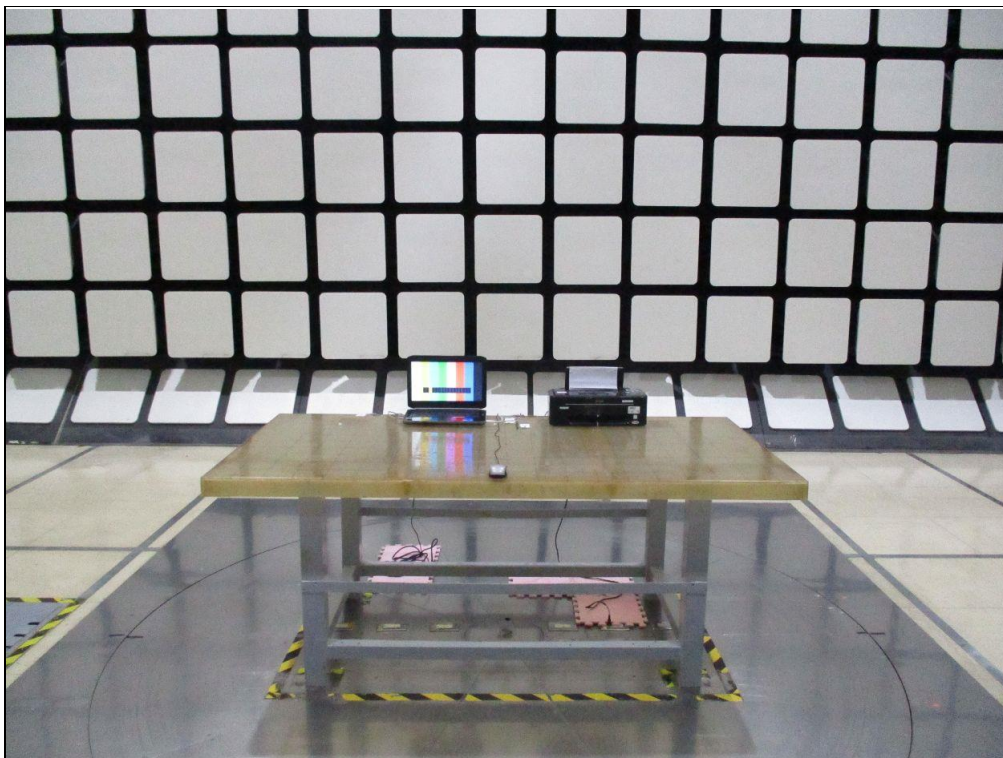
#### Mode A





## 8.2 Radiated Emissions up to 1 GHz

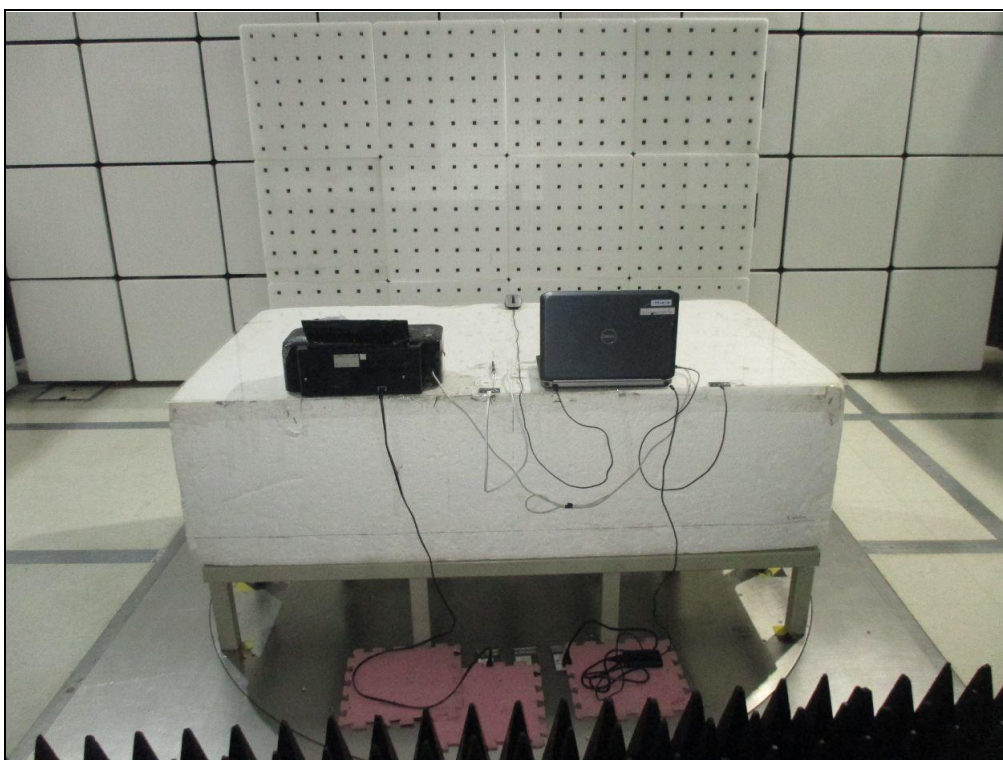
### Mode A





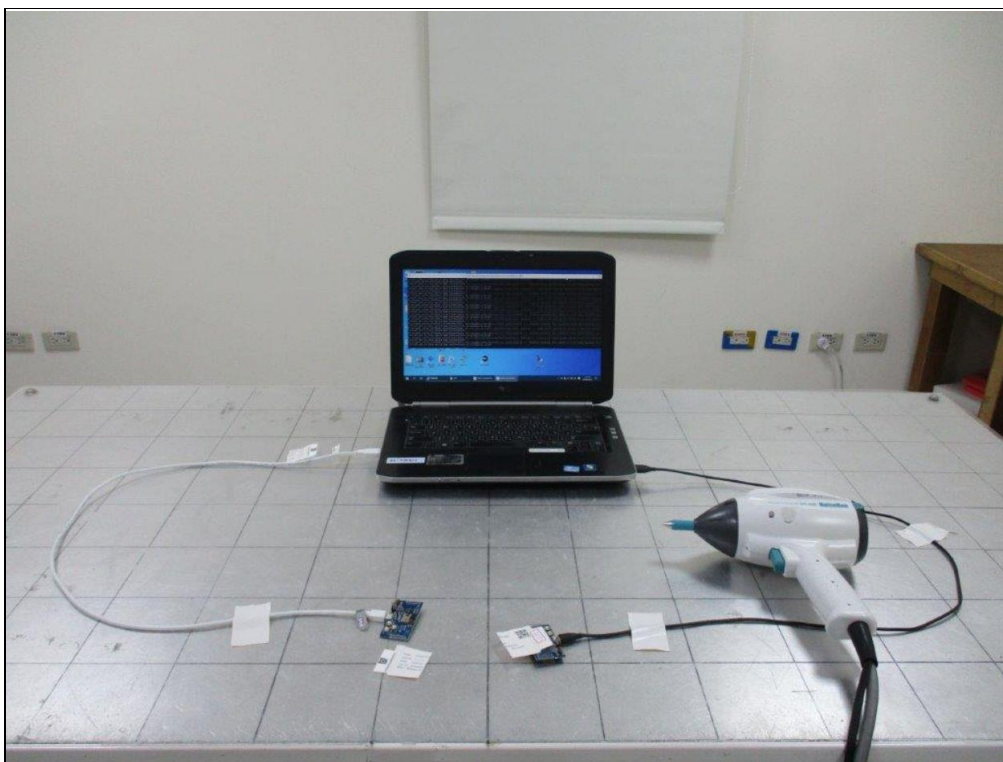
### 8.3 Radiated Emissions above 1 GHz

#### Mode A

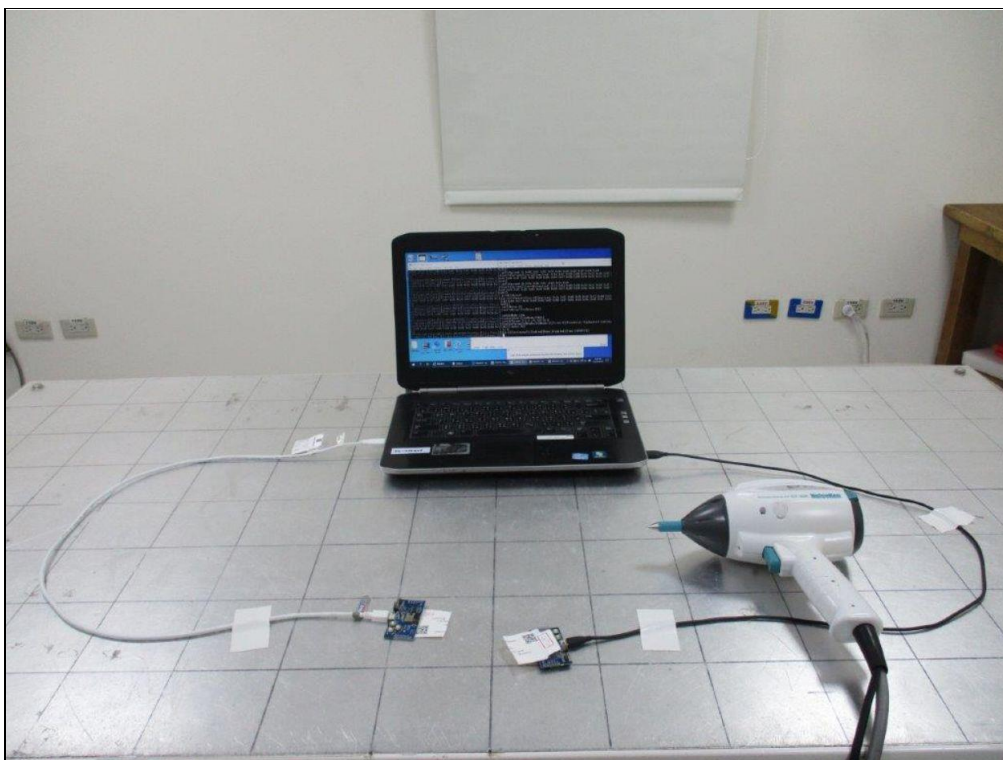


## 8.4 Electrostatic Discharges (ESD)

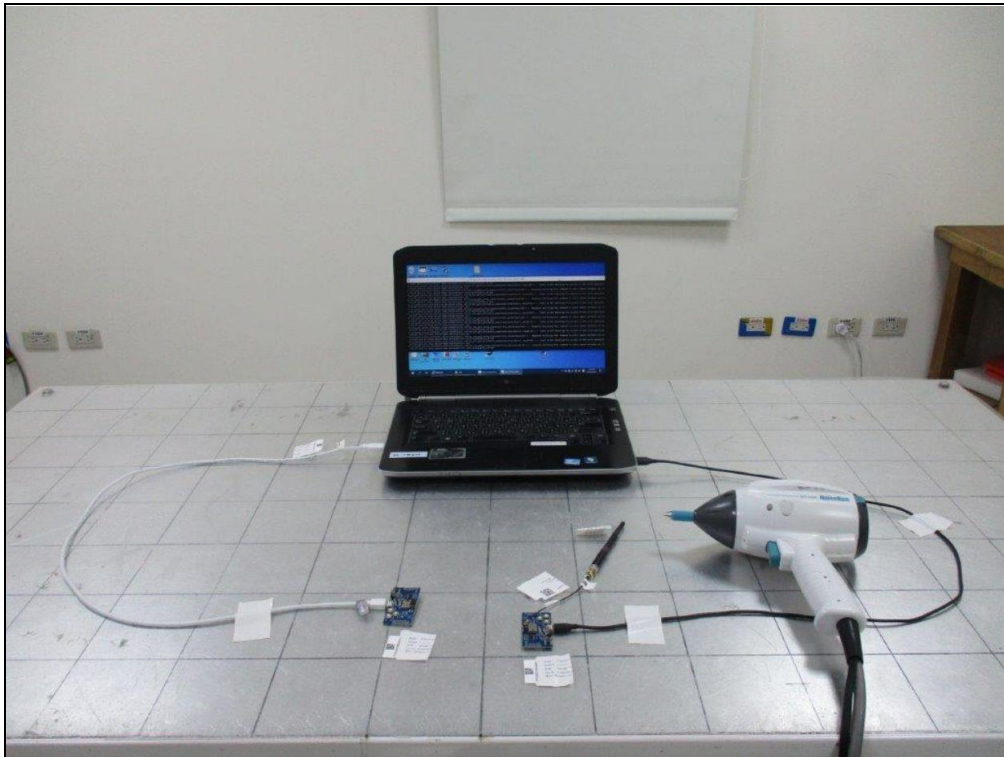
### Mode A



### Mode B



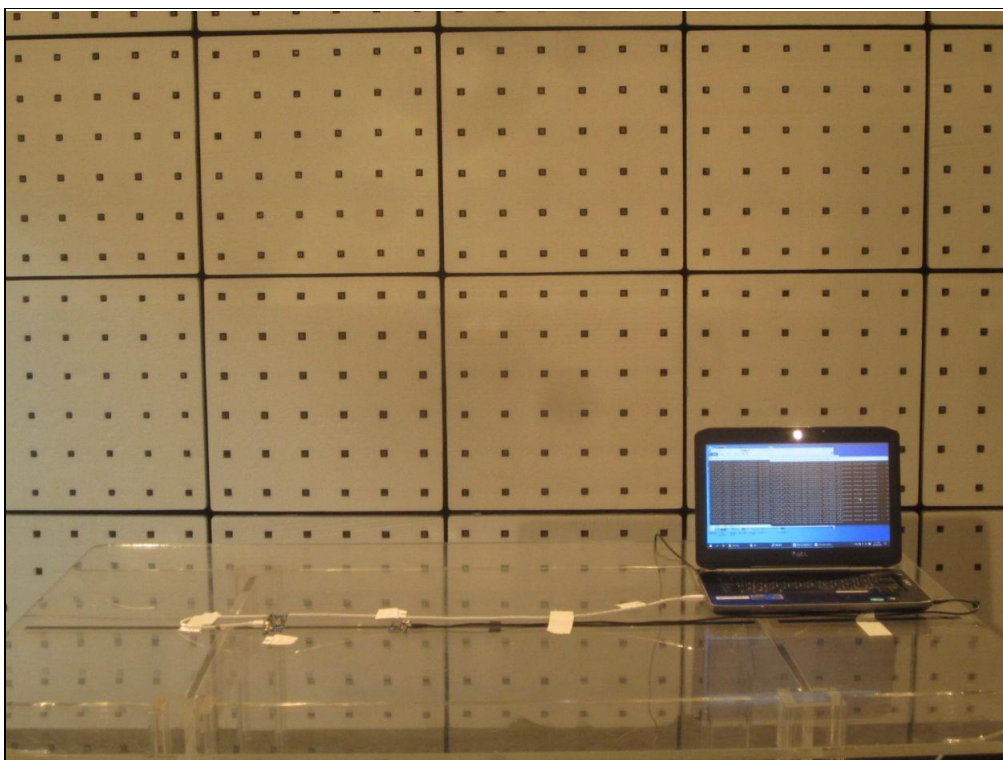
## Mode C



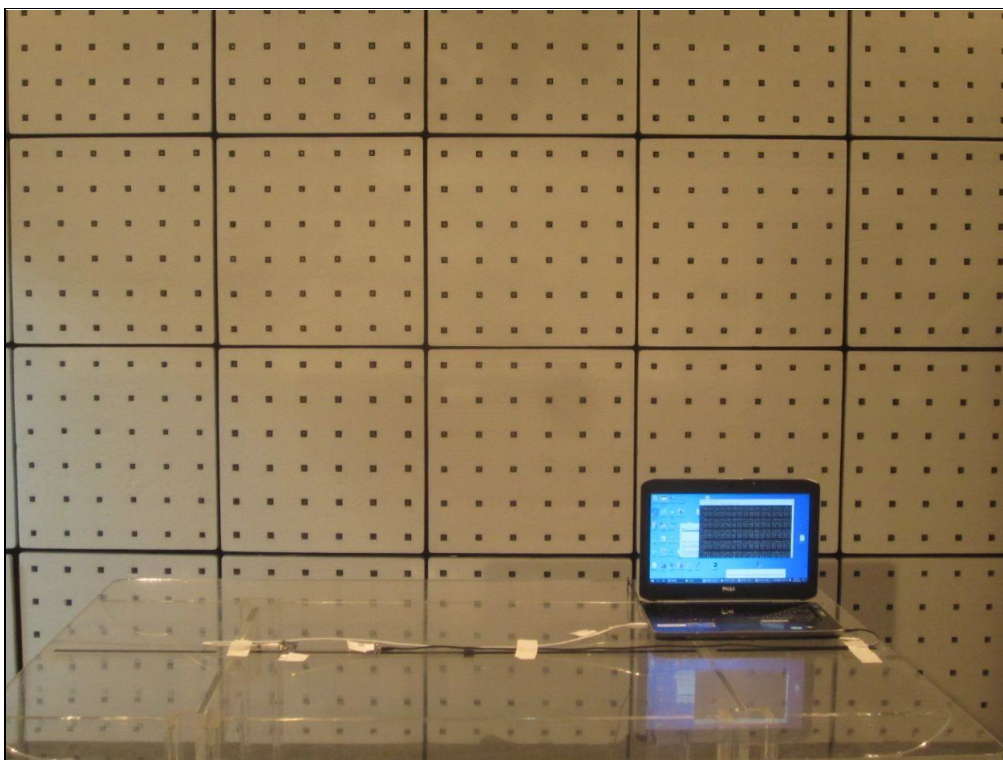


## 8.5 Radio Frequency Electromagnetic Field (RS)

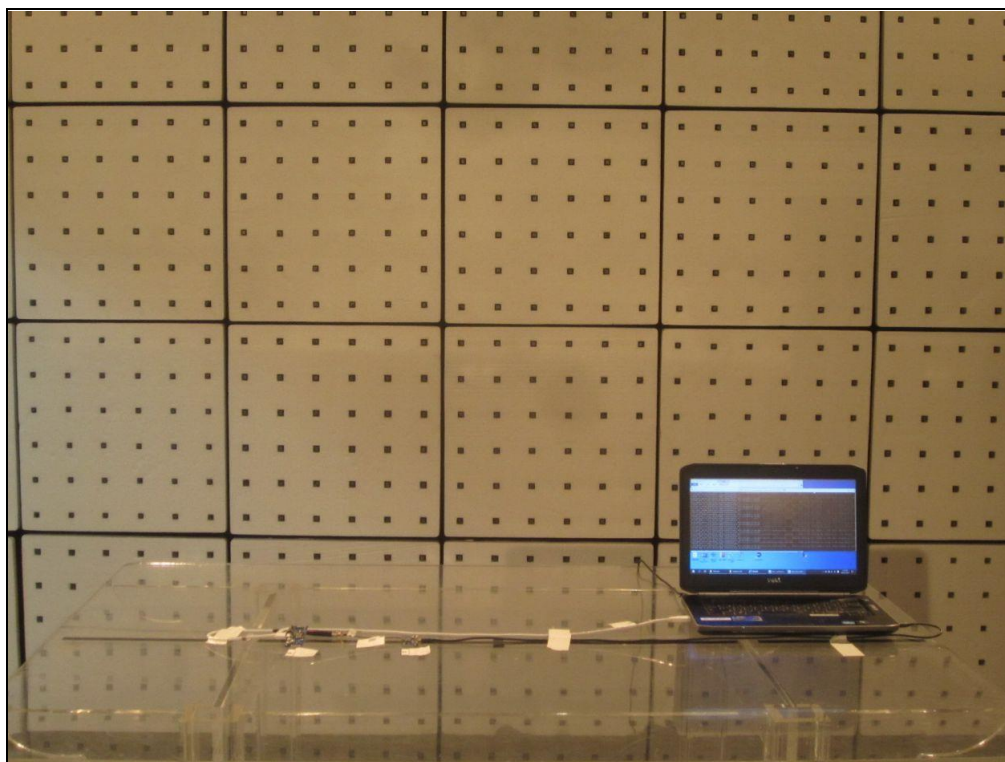
### Mode A



### Mode B



## Mode C



## 9 Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

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The address and road map of all our labs can be found in our web site also.

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