

# CE EMC Test Report

**APPLICANT** : Texas Instruments Incorporated  
**EQUIPMENT** : CC3100MODR11MAMOB  
**BRAND NAME** : Texas Instruments  
**MODEL NAME** : CC3100MODR11MAMOB  
**MARKETING NAME** : SimpleLink™ Wi-Fi® CC3100MOD Wireless Network Processor Module  
**STANDARD** : ETSI EN 301 489-1 V2.1.1 (2017-02)  
ETSI EN 301 489-17 V3.1.1 (2017-02)  
**TEST DATE(S)** : May 22, 2017 ~ Jun. 13, 2017

The measurement shown in this partial report is tested in accordance with the test procedures given in ETSI EN 301 489-1 V2.1.1 (2017-02), ETSI EN 301 489-17 V3.1.1 (2017-02).

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

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Reviewed by: Louis Wu / Manager

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## REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
EH741317	Rev. 01	Initial issue of report	Jul. 20, 2017



## SUMMARY OF TEST RESULT

CLAUSE (EN301489-1)	TEST ITEMS	TEST STANDARD	RESULT (PASS/FAIL)	REMARK
<b>EMC Emission Measurements</b>				
8.2	Radiated Emission	EN 55032:2015/ AC: 2016 Class B	PASS	Under limit 3.53 dB at 34.590 MHz for peak
<b>EMC Immunity Tests</b>				
9.2	RF Electromagnetic Field	EN 61000-4-3:2006+A1:2 008+A2:2010	PASS	-
9.3	Electrostatic Discharge	EN 61000-4-2:2009	PASS	-

## APPLIED STANDARDS

According to the specifications of the manufacturer, the EUT must comply with the requirements of

- ETSI EN 301 489-1 V2.1.1 (2017-02)
- ETSI EN 301 489-17 V3.1.1 (2017-02)

Below are basic standards version used for all test items in this report.

Emission Test Items	Basic Standard Version used in this report	Remark
Radiated Emission	EN 55032:2015/ AC: 2016	There is no additional test requirement for this EUT, when EN 55032 : 2015 is updated to 55032 : 2015/AC:2016 versions.

Immunity Test Items	Basic Standard Version used in this report	Remark
RF Electromagnetic Field	EN 61000-4-3:2006+A1:2008+A2: 2010	-
Electrostatic Discharge	EN 61000-4-2:2009	-



## **1. General Description of Equipment under Test**

### **1.1 Applicant**

**Texas Instruments Incorporated**  
12500 TI BLVD., Dallas Texas, 75243

### **1.2 Manufacturer**

**Texas Instruments Incorporated**  
12500 TI BLVD., Dallas Texas, 75243

### 1.3 Product Feature of Equipment Under Test

Wi-Fi 2.4GHz 802.11b/g/n

	Brand	Antenna Type	Model	2.4GHz gain
1	Ethertronics	Dipole	1000423	-0.6dBi
2	LSR	Rubber Whip / Dipole	001-0012	2dBi
3			080-0013	2dBi
4			080-0014	2dBi
5	Laird	PCB	CAF94504	2dBi
6			CAF94505	2dBi
7	ACX	Multilayer Chip	AT3216-BR2R7HAA	0.5dBi
8			AT312-T2R4PAA	1.5dBi
9	TDK	Multilayer Ceramic Chip Antenna	ANT016008LCD2442MA1	1.6dBi
10	Mitsubishi Material	Chip Antenna	AM03DP-ST01	1.6dBi
11		Antenna Unit	UB18CP-100ST01	-1.0dBi
12	Taiyo Yuden	Chip Antenna / Herical Monopole	AF216M245001	1.5dBi
13		Chip Antenna / Monopole Type	AH212M245001	1.3dBi
14			AH316M245001	1.9dBi
15	Antenna Technology	Dipole	AA2402SPU	2.0dBi
16			AA2402RSPU	2.0dBi
17			AA2402A-UFLLP	2.0dBi
18			AA2402AU-UFLLP	2.0dBi
19	Staf	Mono-pole	1019-016	2.14dBi
20			1019-017	2.14dBi
21			1019-018	2.14dBi
22			1019-019	2.14dBi
23	Map Electronics	Rubber Whip	MEIWX-2411SAXX-2400	2.0dBi
24			MEIWX-2411RSXX-2400	2.0dBi
25			MEIWX-282XSAXX-2400	2.0dBi
26			MEIWX-282XRSXX-2400	2.0dBi
27			MEIWF-HP01RS2X-2400	2.0dBi
28	Yageo	Chip	ANT3216A063R2400A	1.69dBi
29	Mag Layers Scientific	Chip	LTA-3216-2G4S3-A1	1dBi
30			LTA-3216-2G4S3-A3	2dBi

Note: the EUT used a 2.4GHz Chip antenna (Antenna 14 from Taiyo Yuden)



## **1.4 Modification of EUT**

No modifications are made to the EUT during all test items.



## 2. Test Configuration of Equipment under Test

### 2.1 Details of EUT Test Modes

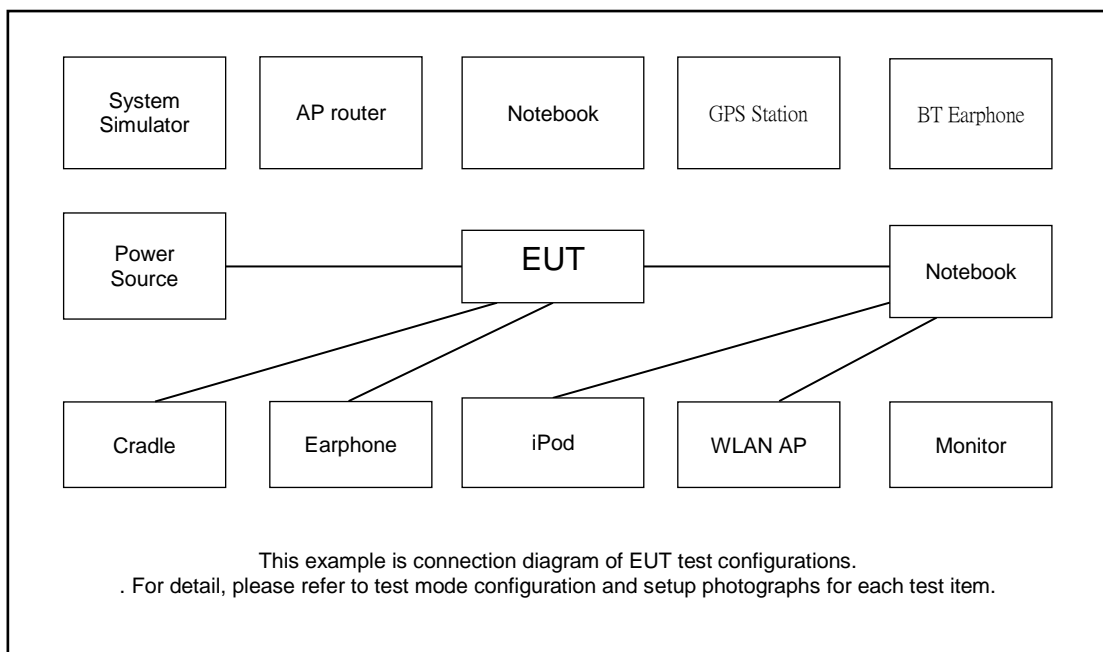
Details of Test line Items	
<b>Radiated Emission (Refer to EN301 489-1 Section 8.2)</b>	
Mode 1	: WLAN Link + Fixture
Mode 2	: WLAN Idle + Fixture
<b>Radio Frequency Electromagnetic Field (Refer to EN301 489-1 Section 9.2)</b>	
Mode 1	: WLAN Link + Fixture
Mode 2	: WLAN Idle + Fixture
<b>Electrostatic Discharge (Refer to EN301 489-1 Section 9.3)</b>	
Mode 1	: WLAN Link + Fixture
Mode 2	: WLAN Idle + Fixture

Worst mode of all test items listed in section 2.1

Test items	Worst mode
Radiated Emission	1
Radio Frequency Electromagnetic Field	1
Electrostatic Discharge	1

**Remark:** Only data of worst mode (if test item has) was reported in test result.

## 2.2 Connection Diagram of Test System



## 2.3 Supported Unit Used in Test Configuration and System

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	WLAN AP	D-Link	DIR-859	FCC DoC	N/A	Unshielded, 1.8 m
2.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded, 1.8 m
3.	Notebook	DELL	P20G	FCC DoC/ Contains FCC ID: QDS-BRCM1051	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	Notebook	Lenovo	TP00034A	FCC DoC/ Contains FCC ID:QDS-BRCM1058	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
5.	Fixture	TI	CC31XXEMUBOOST	FCC DoC	N/A	N/A

## 2.4 EUT Operation Test Setup

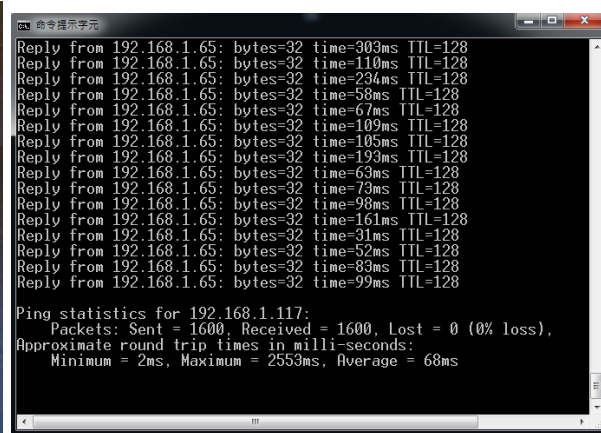
The EUT was set in below conditions during EMI and EMS testing.

### WLAN

1. Enable WLAN function of the EUT.
2. The EUT links with supported units
3. Execute "PING IP" function under the "cmd" of Window system to transfer packet bi-directionally between the EUT and supported units.
4. Monitor the packet loss and WLAN radio performance.



Monitor the WLAN function



Monitor the WLAN packet lost (0%)

## 2.5 Summary of Environment Condition, Test Date and Test Engineer for all Test Items

Test items	Ambient Temperature (°C)	Relative Humidity (%)	Atmospheric Pressure (kPa)	Test Date	Test Engineer
Radiated Emission	22~25	50~53	98	Jun. 12, 2017 ~ Jun. 13, 2017	James Chiu
Electrostatic Discharge (ESD)	24~25	30~33	98	May 22, 2017	Giant Chen
Radio frequency electromagnetic field (RS)	24~25	55~56	98	May 30, 2017	Jimmy Chang



### **3. Test Conditions of 301489 Series Standards**

#### **3.1 Special Conditions of Applied Standards for EUT**

Below each section is special condition applied for each application of EUT.

##### **3.1.1 Emission**

###### **EN301 489-17**

No special conditions shall apply to UE in the scope of the present document.

##### **3.1.2 Immunity**

###### **EN301489-17**

No special conditions are relevant for products covered in the present document.

## **3.2 RF Exclusion Band of Radio Equipment**

### **3.2.1 EN301489-1**

#### **3.2.1.1 Exclusion band for transmitters or the transmitter part of transceivers**

a. General

Exclusion bands shall not be applied when measuring transmitters in standby mode.

b. Channelised Equipment

For channelised equipment the exclusion band shall extend 250% of the channel width either side of the transmitter centre frequency.

NOTE: Exclusion band of 250 % is based on the ITU Radio Regulations, as the boundary between OOB and Spurious Domain.

c. Non-Channelised Equipment

For non-channelised equipment the exclusion band shall extend 250% of the occupied bandwidth either side of the transmitter centre frequency.

NOTE: Exclusion band of 250 % is based on the ITU Radio Regulations, as the boundary between OOB and Spurious Domain.

#### **3.2.1.2 Exclusion band for receivers or the receiver part of transceivers**

a. Applicability

Exclusion bands are not applied when testing emissions of receivers or receiver part of transceivers.

b. Channelised Equipment

For channelised equipment the exclusion band shall be calculated by using the following formulae:

For the lower edge for the exclusion band:-

$$\text{EXband(lower)} = \text{BandRX(lower)} - n\text{ChWRX}$$

and for the upper edge of the exclusion band:-

$$\text{EXband(upper)} = \text{BandRX(upper)} + n\text{ChWRX}$$

Where n = number of channel widths required for exclusion band

For equipment that support multiple channel widths the Channel Width used should be the widest support by the EUT.

Where the present document is being used in a stand-alone basis (i.e. with no reference to other relevant radio technology parts of ETSI EN 301 489 series), the value of n shall be 1.

c. Non-Channelised Equipment

For non-channelized equipment the exclusion band shall be calculated by using the following formula:

For the lower edge for the exclusion band:-

$$\text{EXband(lower)} = \text{BandRX(lower)} - n\text{BWRX}$$

and for the upper edge of the exclusion band:-

$$\text{EXband(upper)} = \text{BandRX(upper)} + n\text{BWRX}$$

Where n = multiple of whole bandwidths required to define exclusion band

Bandwidth of Receiver is the occupied bandwidth of the corresponding transmitter signal.

Where the present document is being used in a stand-alone basis (i.e. with no reference to other relevant radio technology parts of ETSI EN 301 489 series), the value of n shall be 1.

**3.2.2 EN301489-17**

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.

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.

The exclusion band for immunity testing of equipment operating in the 2.4GHz band shall be:

- lower limit of exclusion band = lowest allocated band edge frequency -120MHz, i.e. 2280MHz;
- upper limit of exclusion band = highest allocated band edge frequency +120MHz, i.e. 2603.5MHz.

The exclusion band for immunity testing of equipment operating in the 5GHz WiFi band shall be:

- lower limit of exclusion band = lowest allocated band edge frequency -270MHz, i.e. 4880MHz;
- upper limit of exclusion band = highest allocated band edge frequency +270MHz, i.e. 5995MHz.

The exclusion band for immunity testing of equipment operating in the 5.8GHz band shall be:

- lower limit of exclusion band = lowest allocated band edge frequency -270MHz, i.e. 5455MHz;
- As the immunity requirements have an upper frequency range of 6GHz and any upper edge exclusion band would be greater than this for the 5.8GHz band. The above frequency shall also be regarded as the upper end of the test range.

Note: These receiver exclusion band ranges align with the relevant blocking test ranges.

## 4. EMC Emission Measurements

### 4.1 Radiated Emission Test (Refer to EN301 489-1 Section 8.2)

#### 4.1.1 Limits for Radiated Emission Test

<Class B limit>

Frequency Range (MHz)	Measurement		Class B limits dB (μV/m)
	Distance (m)	Detector Type/ Bandwidth	OATS/SAC
30 ~ 230	10	Quasi Peak / 120 kHz	30
230 ~ 1000			37
30 ~ 230	3		40
230 ~ 1000			47

Frequency Range (MHz)	Measurement		Class B limits dB(μV/m)
	Distance (m)	Detector Type/ Bandwidth	FSOATS
1000 ~ 3000	3	Average / 1 MHz	50
3000 ~ 6000			54
1000 ~ 3000		Peak / 1 MHz	70
3000 ~ 6000			74

Conditional testing frequency:

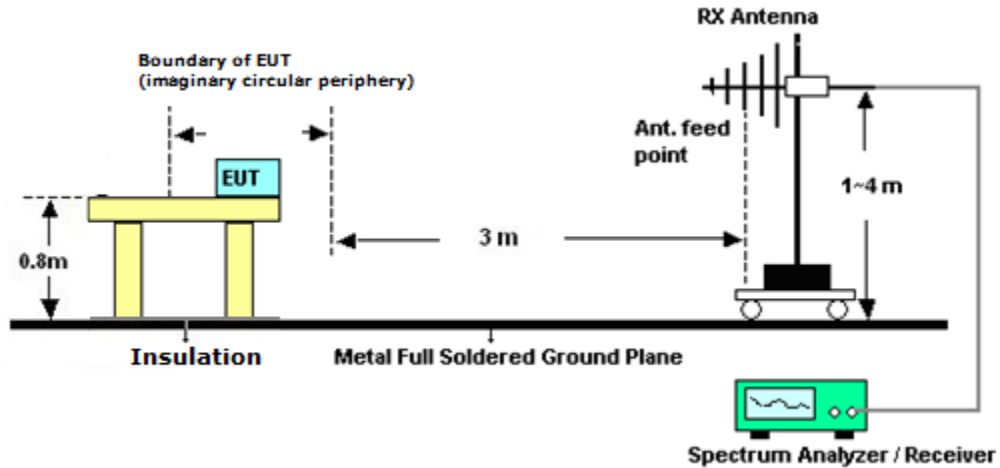
Highest measured frequency	Highest measured frequency
$F_x \leq 108 \text{ MHz}$	1 GHz
$108 \text{ MHz} < F_x \leq 500 \text{ MHz}$	2 GHz
$500 \text{ MHz} < F_x \leq 1 \text{ GHz}$	5 GHz
$F_x > 1 \text{ GHz}$	5 x $F_x$ up to a maximum of 6 GHz

NOTE: For FM and TV broadcast receivers,  $F_x$  is determined from the highest frequency generated or used excluding the local oscillator and tuned frequencies.

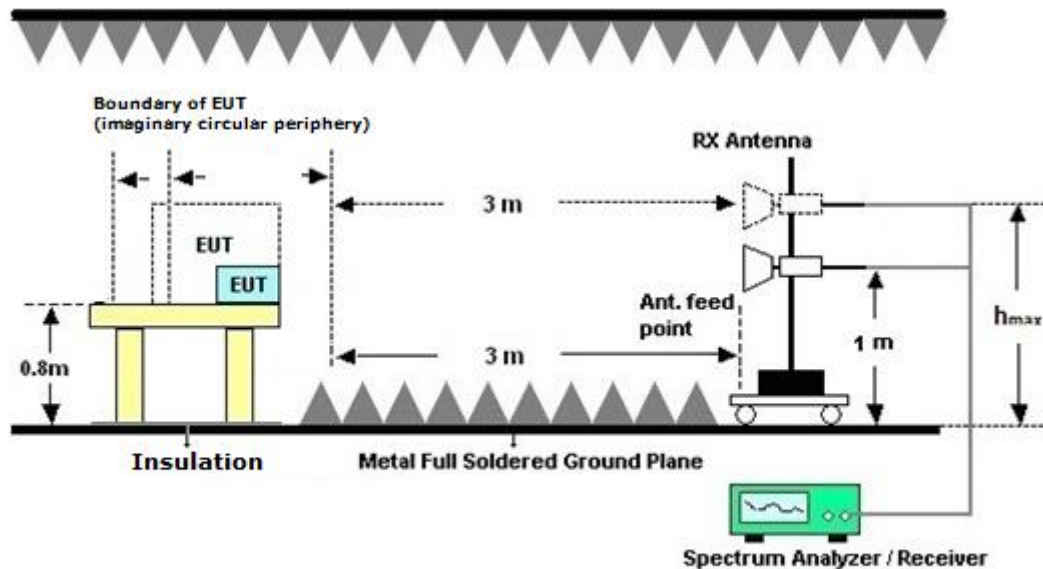


#### 4.1.2 Test Setup

<Radiated Emissions Frequency: 30 MHz to 1000 MHz>

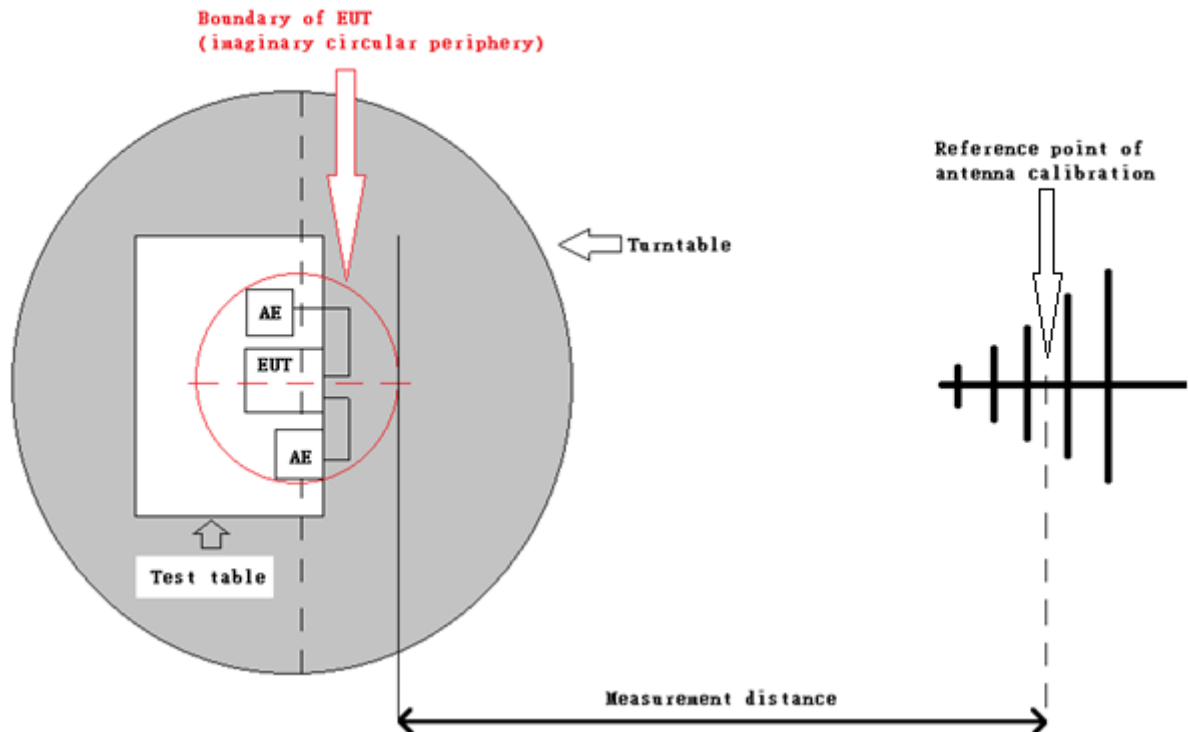


<Radiated Emissions Frequency: 1000 MHz to 6000 MHz>



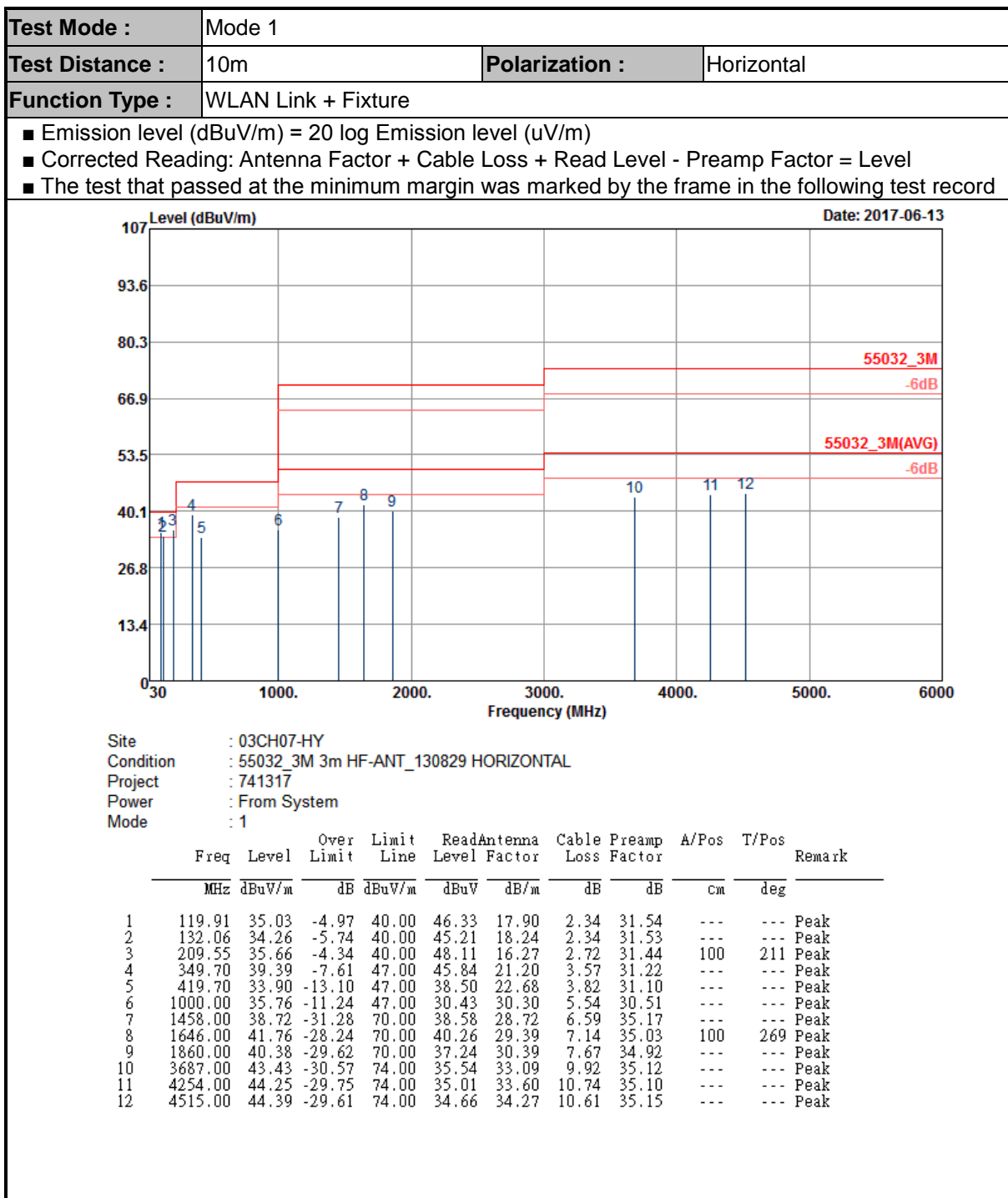
Remark: When EUT's height is over 172cm,  $h_{max}$  = top of EUT

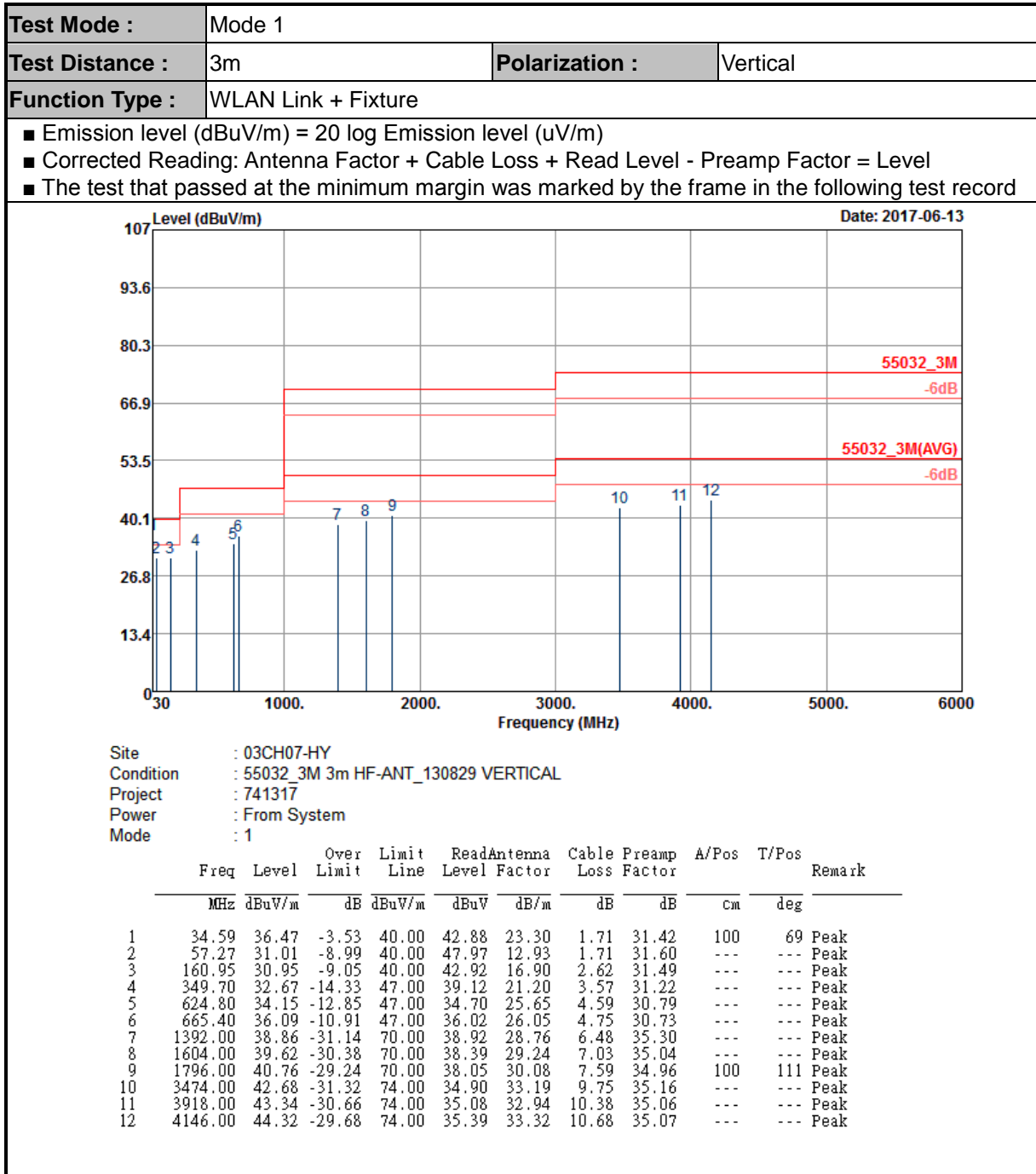
<Radiated Emissions Setup Configuration>

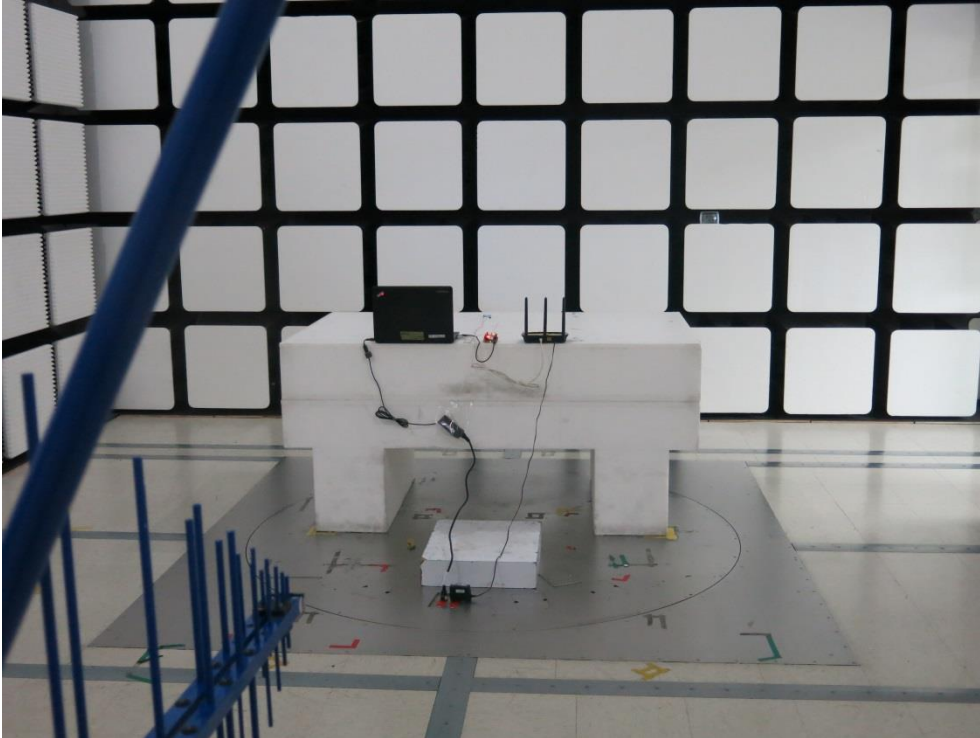
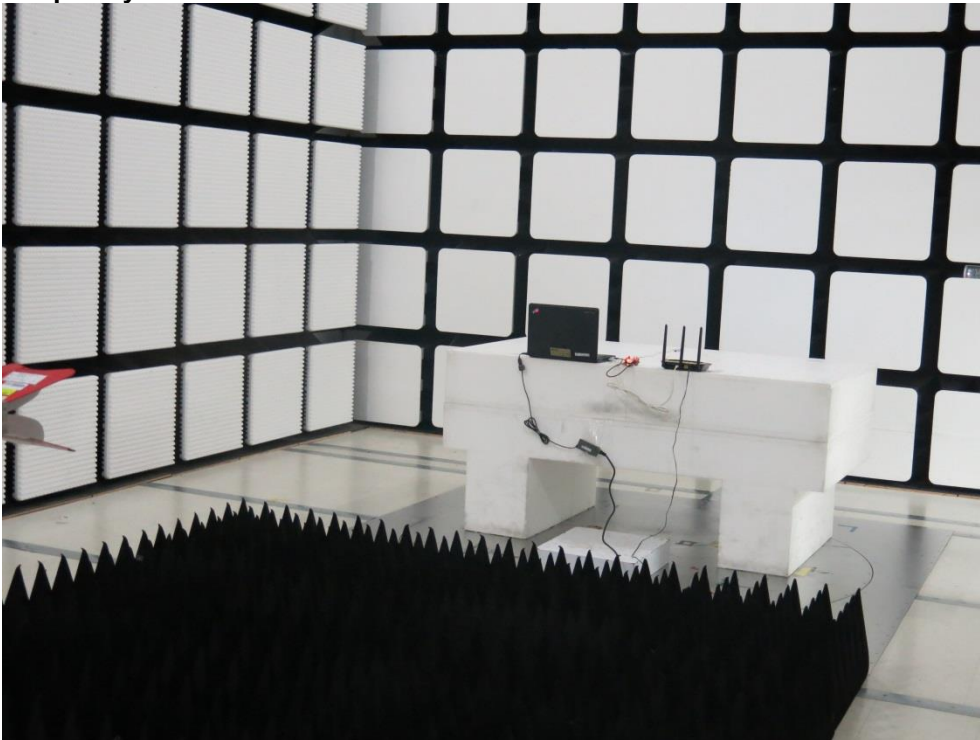


#### **4.1.3 Test Procedures**

- a. The EUT shall be placed upon a non-conductive table 0,8 m above the horizontal ground reference plane of the test site.
- b. The boundary of EUT was set 3 meters from the receiving antenna which was mounted on the top of a variable height antenna tower. Cables connecting to outside area is directly dropped to, but with an insulation holder less than 150mm height, the reference ground plane.
- c. The table was rotated 360 degrees to determine the position of the highest radiation.
- d. The height of the antenna is varied between 1 m and 4 m above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
- e. For each suspected emission, the EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading values.
- f. Ideally, the central point of the arrangement shall be positioned at the centre of the turntable and the rear of the arrangement shall be flush with the back of the supporting tabletop unless that would not be possible or typical of normal use.
- g. All units of equipment forming the system under test (includes the EUT as well as connected peripherals and associated equipment or devices) shall be arranged such that a nominal 0,1 m separation is achieved between the neighboring units.
- h. Where the mains cable supplied by the manufacturer is longer than 1 m, the excess should be folded at the centre into a bundle no longer than 0,4 m, so that its length is shortened to 1 m.
- i. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, peak values of EUT will be reported. Otherwise, the emission will be repeated by using the quasi-peak method and reported for frequency range below 1GHz.
- j. If emission level of the EUT in Peak measurement mode is 20dB lower than average limit line ( that means the emission level in Peak measurement mode complies with both Peak and Average limit lines), then only Peak measurement result is reported. Otherwise, emissions in Average measurement mode shall be measured, and reported.

**4.1.4 Test Result**




**4.1.5 Setup Photographs****Mode 1****Frequency: 30 MHz to 1000 MHz****Frequency: 1000 MHz to 6000 MHz**

## **5. Immunity Tests**

### **5.1 Requirements of Limit and EUT Performance Criteria for all Immunity Test Items**

Test limit including test level, test frequency range, pulse type, test duration...etc. requirements.

This section is intended to integrate requirements of limit, and required performance criteria for all immunity test items.

In subsection 5.1.1, includes two parts:

1. Subsection 5.1.1.1 : Support ports list of EUT, accessory, and cable record, where EUT intended to use in. These information will be used for decide test items and test limit
  - (1) Supported ports list of EUT: Because test limit are based on supported ports of EUT, this is necessary information.
  - (2) Accessory : include adapter type and remark EUT has battery or not.
  - (3) Cable record : includes cable type, cable length, indoor/outdoor. These parameters will decide tests shall be carrying out or not.
2. Subsection 5.1.1.2 : tables of immunity test level specified in EN301489 series standards and immunity test level specified by manufacturer.

If immunity test level specified by manufacturer are higher/stronger than level specified in EN301489 series standards, they will be also record in this table. Therefore anyone could distinguish requirements specified by standard or manufacturer from these tables.

In subsection 5.1.2, required performance criteria of EUT per EN301489 series standards.

Integrated required performance criteria of EN301489 series standards, they are used for all immunity test of this report.

**5.1.1 Test Limit****5.1.1.1 Information of supported ports of EUT, accessory, cable record where EUT intended to use in.**

1. Supported ports of EUT are listed as below (symbol ☒ means supported port ):

<input checked="" type="checkbox"/>	Enclosure Port
<input type="checkbox"/>	Input AC power port
<input type="checkbox"/>	Input DC power port
<input type="checkbox"/>	Telecommunication port

As per above information, corresponded test limit (including test level, test frequency range, pulse type, test duration...etc. requirements) specified in below table 1~4 have been selected to carry out test in this report.



### 5.1.1.2 Tables of Immunity Test Level Specified in EN301489 series standards and Immunity Test Level Specified by Manufacturer

When immunity test level specified by manufacturer are higher (stronger) than level specified in EN301489 series standards, they will be also record in this table. But if manufacturer doesn't specify immunity test level, "N/A" is filling in table and test level of all immunity test items are following requirements of EN301489 series standards.

**Table 1 - Enclosure Port**

Test item	Immunity test level specified in EN301489-1	Immunity test level specified by manufacturer
Electrostatic discharge (ESD)	± 2 kV, ± 4 kV contact	N/A
	± 2 kV, ± 4 kV, ± 8 kV air	N/A
Radio frequency electromagnetic field (RS)	3 V/m	N/A
	Frequency range : 80 MHz – 6 GHz	N/A
	Modulation: 80 % AM at 1 kHz	N/A

**Table 2 – Input AC Power Port (not necessary performed on EUT of this report)**

Test Item	Immunity test level specified in EN301489-1	Immunity Test level specified by manufacturer
Fast transients, common mode (EFT)	± 1 kV 5 kHz repetition frequency	N/A
Surges Line-to-line	± 0,5 kV, ± 1 kV	N/A
Surges Line-to-ground	± 0,5 kV, ± 1 kV, ± 2 kV	N/A
Radio frequency, common mode (CS)	3 Vrms	N/A
	Frequency range: 0,15 MHz – 80 MHz	N/A
	Modulation: 80 % AM at 1 kHz	N/A
Voltage dips	0 % residual; 0,5 cycle , 50Hz Phase At 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315°	N/A
	0 % residual; 1 cycle , 50Hz Phase At 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315°	
	70 % residual; 25 cycles , 50Hz Phase At 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315°	
Voltage interruptions	0 % residual; 250cycle , 50Hz	N/A

**Table 3 – Input DC Power Port (not necessary performed on EUT of this report)**

Test Item	Immunity test level specified in EN301489-1	Immunity Test level specified by manufacturer
Fast transients, common mode (EFT)	± 0.5 kV 5 kHz repetition frequency When cable length >3m	N/A
Radio frequency, common mode (CS)	3 Vrms When cable length >3m	N/A
	Frequency range: 0,15 MHz – 80 MHz	N/A
	Modulation: 80 % AM at 1 kHz	N/A
Transients and surges in the vehicular environment	As specified in ISO 7637-2 : Pulse type : 1, 2a, 2b, 3a, 3b, 4 Level : III	N/A

**Table 4 –Telecommunication Port (not necessary performed on EUT of this report)**

Test Item	Immunity test level specified in EN301489-1	Immunity Test level specified by manufacturer
Fast transients, common mode (EFT)	± 0.5 kV 5 kHz repetition frequency When cable length >3m	N/A
	± 0.5 kV 100 kHz repetition frequency for xDSL When cable length >3m	N/A
Surges Line-to-ground	± 0.5 kV for indoor cable When cable length >30m	N/A
	± 1 kV for outdoor cable	N/A
Radio frequency, common mode (CS)	3 Vrms When cable length >3m	N/A
	Frequency range: 0,15 MHz – 80 MHz	N/A
	Modulation: 80 % AM at 1 kHz	N/A

**5.1.2 Required Performance Criteria of EUT per EN301489 series standards**

Criteria	Performance criteria
CT/CR	<p>During and after the test, the apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a permissible performance level specified by the manufacturer when the apparatus is used as intended.</p> <p>At the conclusion of the test, the EUT shall operate as intended with no loss of user control functions or stored data, and the communication link shall have been maintained. In addition to confirming the above performance during a call, the test shall also be performed in idle mode, and the transmitter shall not unintentionally operate.</p> <ul style="list-style-type: none"><li>♦ The EUT shall operate as its intended operating condition during and after the test.</li></ul>
TT/TR	<p>After the test, the apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a permissible performance level specified by the manufacturer, when the apparatus is used as intended.</p> <p>At the conclusion of each exposure the EUT shall operate with no user noticeable loss of the communication link. At the conclusion of the total test comprising the series of individual exposures, the EUT shall operate as intended with no loss of user control functions or stored data, as declared by the manufacturer, and the communication link shall have been maintained. In addition to confirming the above performance during a call, the test shall also be performed in idle mode, and the transmitter shall not unintentionally operate.</p>

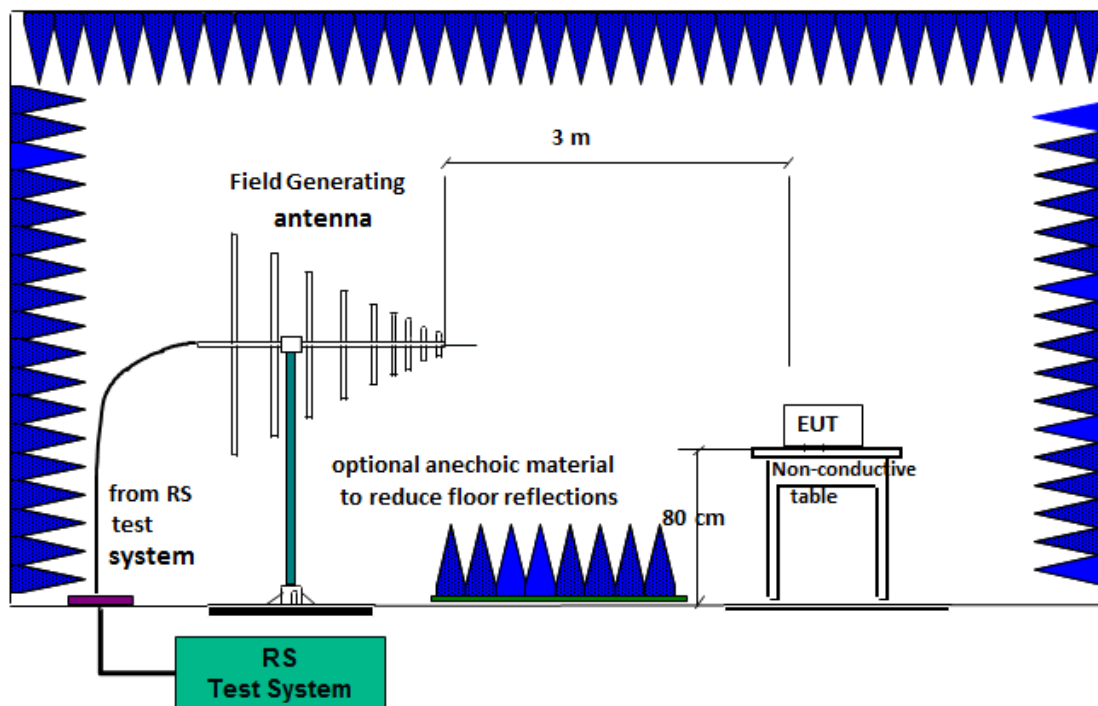
- Performance requirements table of 301489-17

<b>CLAUSE 6.2 of EN301489-17</b>		
<b>Criteria</b>	<b>During test</b>	<b>After test</b>
<b>A</b>	Shall operate as intended. May show degradation of performance (see note 1). Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance (see note 2). Shall be no loss of function. Shall be no loss of stored data or user programmable functions.
<b>B</b>	May show loss of function (one or more). May show degradation of performance (see note 1). No unintentional transmissions.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no degradation of performance (see note 2). Shall be no loss of stored data or user programmable functions.
<b>C</b>	May be loss of function (one or more).	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no degradation of performance (see note 2).
<p><b>NOTE 1:</b></p> <p>Degradation of performance during the test is understood as a degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance.</p> <p>If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.</p> <p><b>NOTE 2:</b></p> <p>No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed.</p> <p>If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.</p>		

<b>CLAUSE 6.3 to 6.6 of EN301489-17</b>	
<b>Criteria</b>	<b>Performance criteria</b>
CT	<p>The performance criteria A shall apply.</p> <p>Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an ACKnowledgement (ACK) or Not ACKnowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.</p>
CR	<p>The performance criteria A shall apply.</p> <p>Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.</p>
TT	<p>The performance criteria B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5 000 ms duration, for which performance criteria C shall apply.</p> <p>Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an acknowledgement (ACK) or not-acknowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.</p>
TR	<p>The performance criteria B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5 000 ms duration for which performance criteria C shall apply.</p> <p>Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.</p>

## 5.2 Radio frequency electromagnetic field (RS) Test (Refer to EN301 489-1 Section 9.2)

### 5.2.1 Test Setup



### 5.2.2 Test Instrument Setting

Frequency Step Size	1% increment ;
Modulation	80% AM (1kHz)
Dwell Time	3 seconds
Tested Antenna Height	1.55m

### 5.2.3 Test Procedures

The antenna is placed 3m away from the equipment. The required field strength is pre-calibrated and complies with the uniform field area requirement lay down in the IEC/EN 61000-4-3.

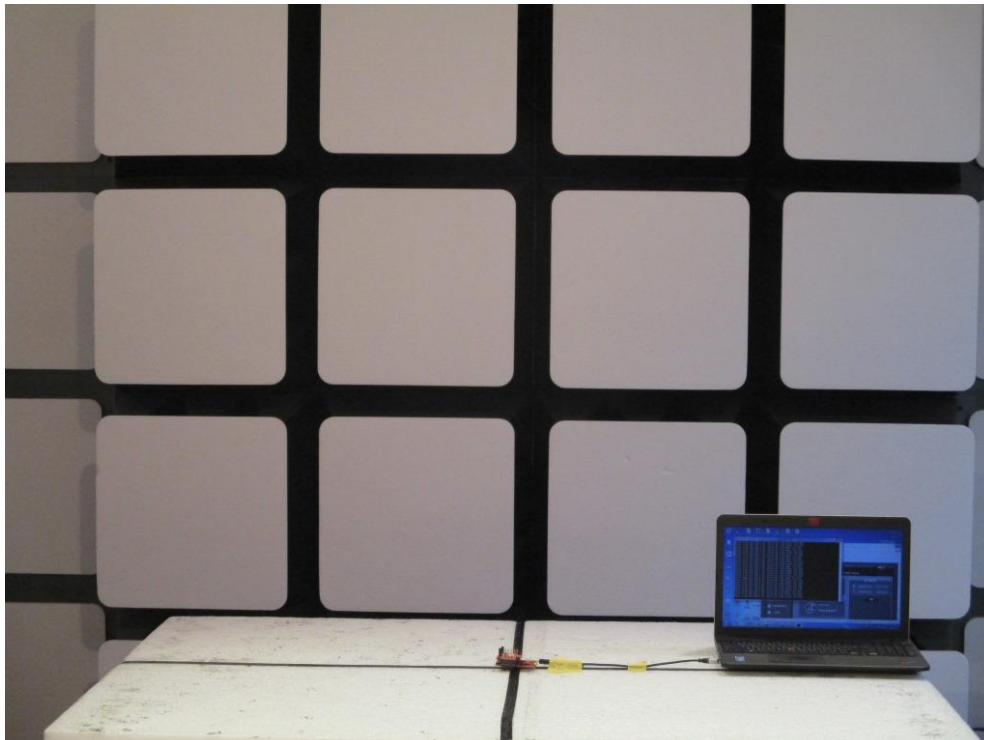
**5.2.4 Test Result**

<b>Test Standard</b>	EN 61000-4-3:2006+A1:2008+A2:2010
<b>Product Standard</b>	EN 301 489-1, EN 301 489-17
<b>EUT operated voltage during test</b>	230Vac, 50Hz
<b>Test Frequency Range</b>	80 MHz ~ 6 GHz
<b>Test Level</b>	3 V/m
<b>Polarity</b>	Horizontal and Vertical
<b>Azimuth</b>	0°, 180°
<b>Required Performance Criteria</b>	CT/CR
<b>Performance Criteria of EUT</b>	CT/CR
<b>Test Result</b>	PASS

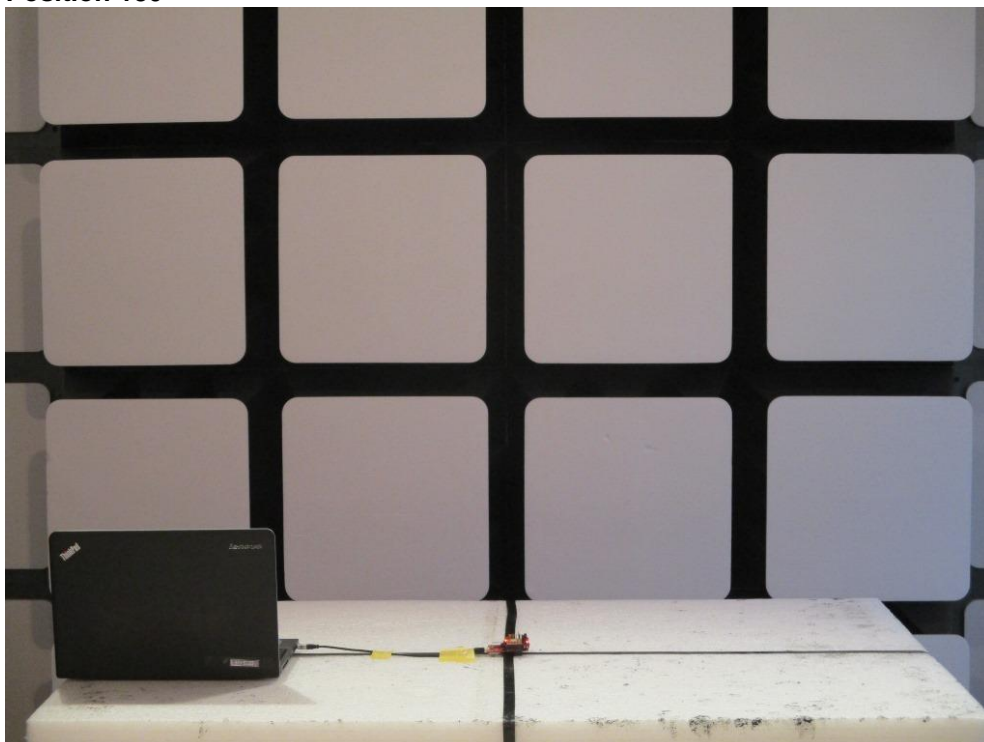


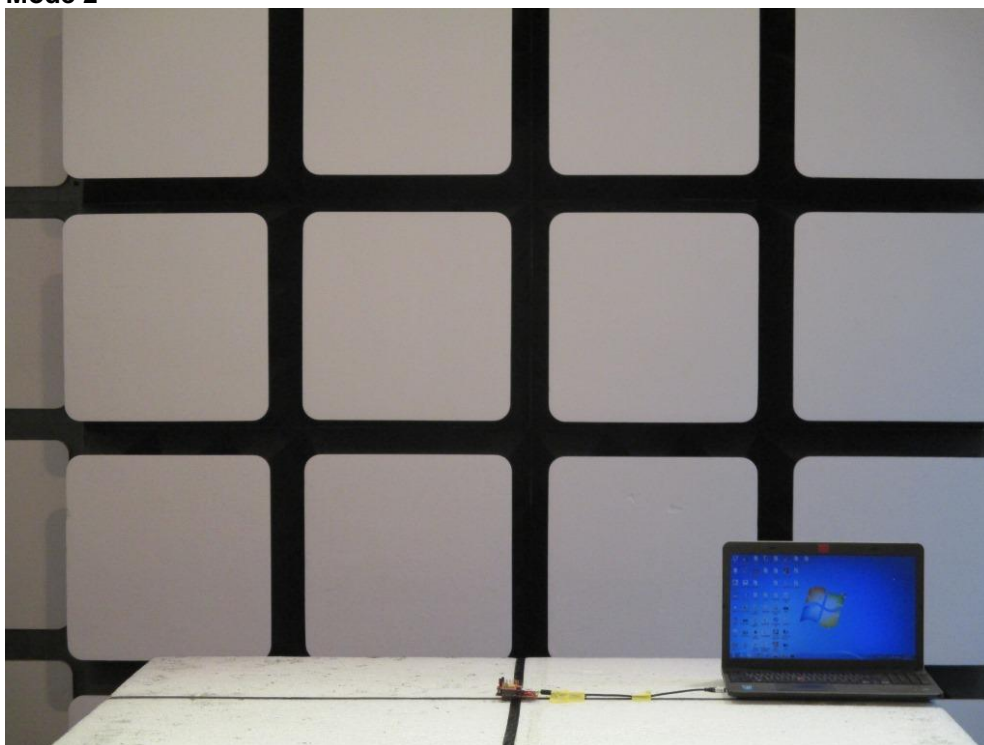
**5.2.5 Setup Photographs**

**Mode 1**  
**Position 0°**



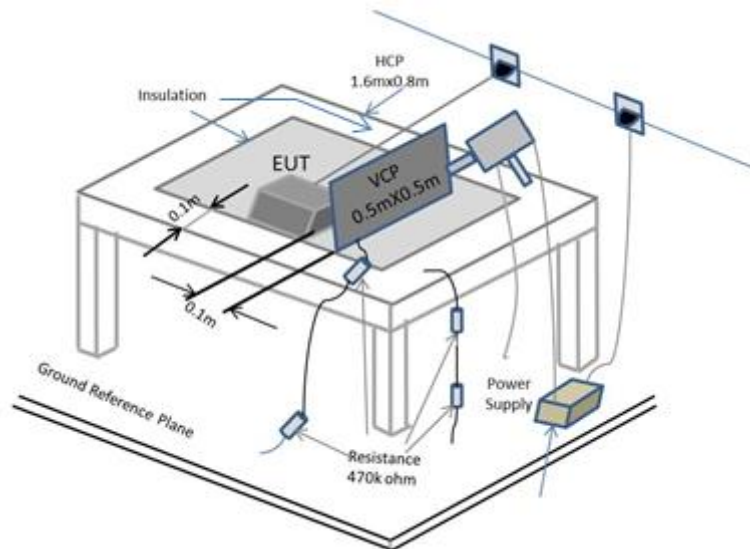
**Position 180°**



**Mode 2**

### 5.3 Electrostatic Discharge (ESD) Test (Refer to EN301 489-1 Section 9.3)

#### 5.3.1 Test Setup



A distance of 1m minimum was provided between the EUT and the wall or any other metallic structure. In cases where this length exceeds the length necessary to apply the discharges to the selected points, the excess length shall, where possible, be placed non-inductively off the ground reference plane and shall not be less than 0.2m to other conductive parts in the test setup.

The coupling plane is placed parallel to, and positioned at a distance of 0,1 m from the EUT.

#### 5.3.2 Test Instrument Setting

1. Tested number of air discharge is at least 10 discharges (in the most sensitive polarity). For contact discharge, tested number is at least 10 discharges.
2. For the time interval between successive single discharges an initial value of 1 s is recommended.
3. Sweeping of the EUT with a grounded carbon fibre brush with bleeder resistors (for example,  $2 \cdot 470 \text{ k}\Omega$ ) in the grounding cable.
4. Ensure parameters of current waveform of an ESD generator is within specifications before test.

### 5.3.3 Test Procedure

EUT and auxiliary instrument necessary to perform DIRECT and INDIRECT application of discharges to the EUT, in the following manner:

- CONTACT DISCHARGE to the conductive surfaces and to the coupling plane;
- AIR DISCHARGE at insulating surfaces.

a. Contact Discharges to the conductive surfaces and to coupling planes:

In the case of contact discharges, the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

In the case of painted surface covering a conducting substrate, the following procedure shall be adopted :

- If the coating is not declared to be an insulating coating by the equipment manufacturer, then the pointed tip of the generator shall penetrate the coating so as to make contact with the conducting substrate.
- Coating declared as insulating by the manufacturer shall only be submitted to the air discharge.
- The contact discharge test shall not be applied to such surfaces.

b. Air Discharge to apertures and insulation surfaces:

In the case of air discharges, the round discharge tip of the discharge electrode shall be approached as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator (discharge electrode) shall be removed from the EUT. The generator is then retriggered for a new single discharge. This procedure shall be repeated until the discharges are completed. In the case of an air discharge test, the discharge switch, which is used for contact discharge, shall be closed.

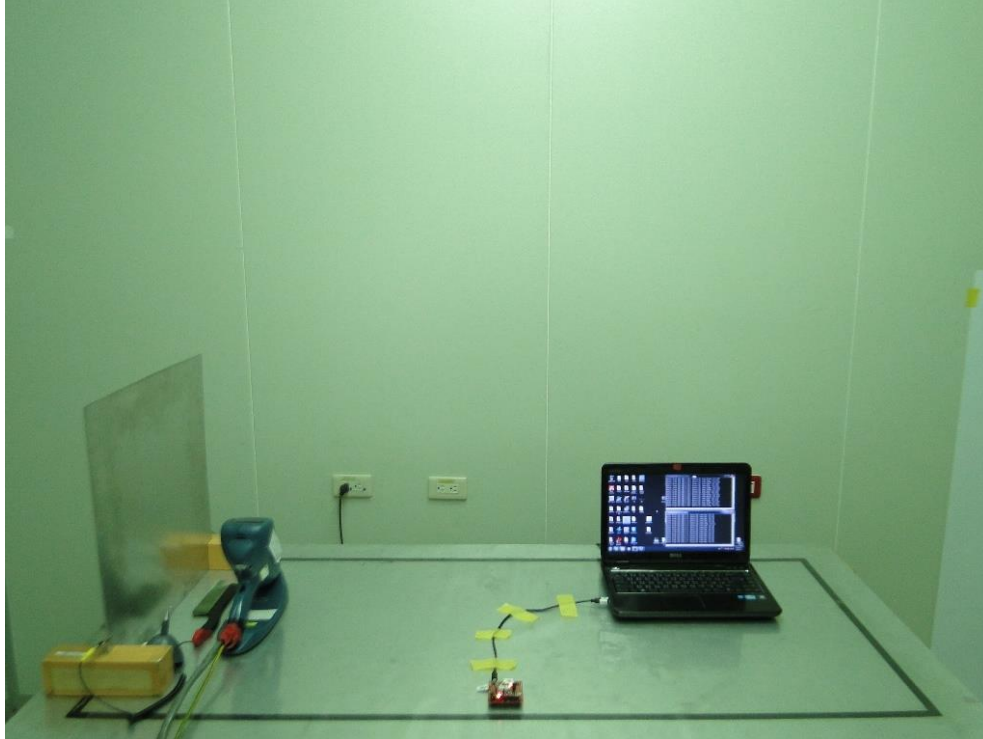
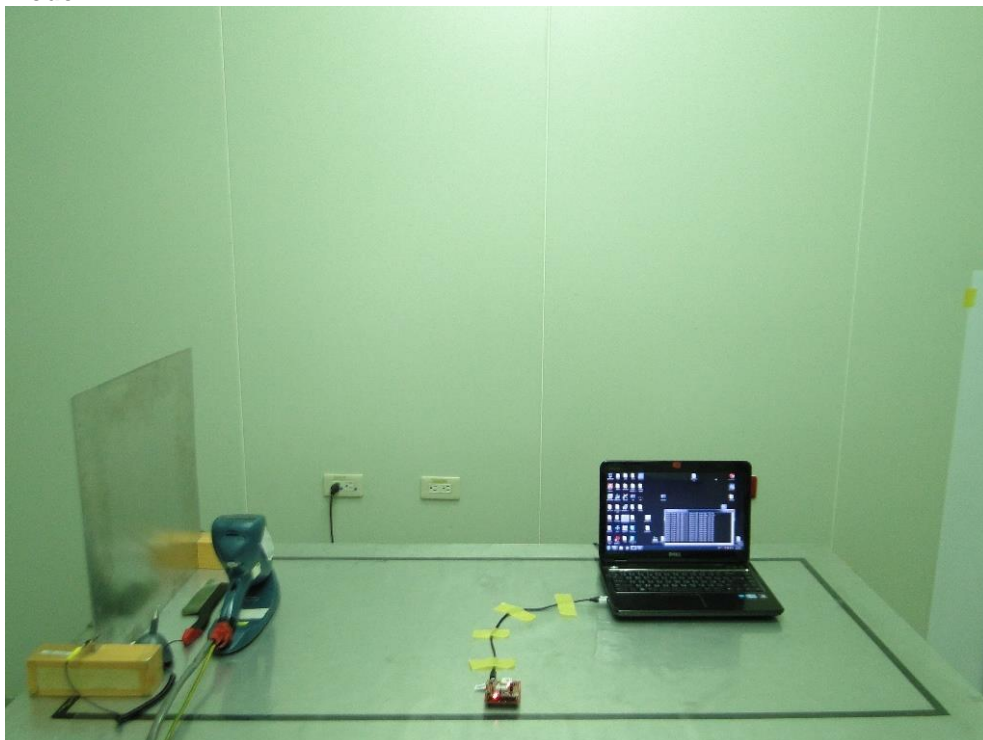
c. Ensure that the applied charge on the EUT has been dis-charged before next ESD pulse.

**5.3.4 Test Result**

<b>Test Standard</b>	EN 61000-4-2:2009
<b>Product Standard</b>	EN 301 489-1, EN 301 489-17
<b>EUT operated voltage during test</b>	230Vac, 50Hz
<b>Tested Level</b>	$\pm 2 / \pm 4$ kV for contact discharge
<b>Required Performance Criteria</b>	TT/TR
<b>Performance Criteria of EUT</b>	CT/CR
<b>Test Result</b>	PASS

**5.3.5 Photos for Identification of ESD Test Points**

**Remark:** Only carry out HCP/VCP test. There is no any test point on EUT.

**5.3.6 Setup Photographs****Mode 1****Mode 2**

## 6. Measurement Uncertainty

### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U=2U_c(y)$ )	5.7
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### Uncertainty of Radiated Emission Measurement (1000 MHz ~ 6000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U=2U_c(y)$ )	5.5
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### Uncertainty of Radiated Susceptibility Measurement (80 MHz ~ 6000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U=2U_c(y)$ )	5.66
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### Uncertainty of Electrostatic Discharge Measurement

	Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2U_c(y)$ ) %
Electrostatic Discharge ~ Rise Time	8.50%
Electrostatic Discharge ~ Peak Current	6.00%
Electrostatic Discharge ~ 30ns Current	6.00%
Electrostatic Discharge ~ 60ns Current	6.00%



**<For Electrical Fast Transients / BURST test>**

Measuring Uncertainty for a Level of Confidence of 95% ( $U=2U_c(y)$ )- budget for voltage rise time (tr)	0.15ns
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2U_c(y)$ )- EFT/B peak voltage value (VP)	0.30kV
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2U_c(y)$ )- EFT/B voltage pulse width (tw)	2.83ns

**<For Surge test>**

Measuring Uncertainty for a Level of Confidence of 95% ( $U=2U_c(y)$ )- Surge open-circuit voltage front time (TfV)	0.18 $\mu$ s
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2U_c(y)$ )- Surge open-circuit voltage peak value (VP)	0.31kV
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2U_c(y)$ )- surge open-circuit voltage duration (Td)	0.26 $\mu$ s



## 7. Testing Facility

<b>Test Site</b>	SPORTON INTERNATIONAL INC.
<b>Test Site Location</b>	No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978
<b>Test Site No.</b>	<b>Sporton Site No. :</b> <b>EMI Test :</b> 03CH07-HY <b>EMS Test :</b> ES04-HY

<b>Test Site</b>	SPORTON INTERNATIONAL INC.
<b>Test Site Location</b>	No.58, Aly. 75, Ln. 564, Wenhua 3rd Rd., Kwei-Shan District, Tao Yuan City, Taiwan R.O.C. TEL: +886-3-327-0868 FAX: +886-3-327-0855
<b>Test Site No.</b>	<b>Sporton Site No. :</b> <b>EMS Test :</b> RS05-HY

## 8. List of Measuring Equipment

### <EMI>

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Bilog Antenna	TESEQ	CBL 6111D&0080 0N1D01N-06	35419&03	30MHz to 1GHz	Jan. 07, 2017	Jun. 12, 2017 ~ Jun. 13, 2017	Jan. 06, 2018	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	00075962	1GHz ~ 18GHz	Aug. 19, 2016	Jun. 12, 2017 ~ Jun. 13, 2017	Aug. 18, 2017	Radiation (03CH07-HY)
EMI Test Receiver	Keysight	N9038A(MX E)	MY54130085	20Hz ~ 8.4GHz	Oct. 26, 2016	Jun. 12, 2017 ~ Jun. 13, 2017	Oct. 25, 2017	Radiation (03CH07-HY)
Preamplifier	COM-POWER	PA-103A	161241	10MHz-1GHz	Mar. 14, 2017	Jun. 12, 2017 ~ Jun. 13, 2017	Mar. 13, 2018	Radiation (03CH07-HY)
Preamplifier	Agilent	8449B	3008A02362	1GHz~ 26.5GHz	Oct. 12, 2016	Jun. 12, 2017 ~ Jun. 13, 2017	Oct. 11, 2017	Radiation (03CH07-HY)
Spectrum Analyzer	Agilent	N9030A	MY52350276	3Hz~44GHz	Mar. 23, 2017	Jun. 12, 2017 ~ Jun. 13, 2017	Mar. 22, 2018	Radiation (03CH07-HY)
Antenna Mast	Max-Full	MFA520BS	N/A	1m~4m	N/A	Jun. 12, 2017 ~ Jun. 13, 2017	N/A	Radiation (03CH07-HY)
Turn Table	ChainTek	Chaintek 3000	N/A	0~360 Degree	N/A	Jun. 12, 2017 ~ Jun. 13, 2017	N/A	Radiation (03CH07-HY)

### <EMS>

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Amplifier	Rohde & Schwarz	BBA100-B25 0C125	101748-1	80MHz ~ 400MHz(250W)/2 50MHz ~ 1GHz(125W)	N/A	May 30, 2017	N/A	RS (RS05-HY)
Amplifier	A. R.	100S1G6	0348138	1GHz ~ 6GHz(100W)	N/A	May 30, 2017	N/A	RS (RS05-HY)
Antenna	SCHWARZBE CK	STLP 9149	9149-274	0.7GHz-9GHz	N/A	May 30, 2017	N/A	RS (RS05-HY)
Antenna	Rohde & Schwarz	HL046E	100167	80MHz ~ 3GHz	N/A	May 30, 2017	N/A	RS (RS05-HY)
Field Sensor	A. R.	FL7006	0343231	100kHz~6GHz	Aug. 09, 2016	May 30, 2017	Aug. 08, 2017	RS (RS05-HY)
Power Sensor	Rohde & Schwarz	NRP-Z91	102724	9kHz~6GHz	Oct. 03, 2016	May 30, 2017	Oct. 02, 2017	RS (RS05-HY)
Power Sensor	Rohde & Schwarz	NRP-Z91	102725	9kHz~6GHz	Oct. 03, 2016	May 30, 2017	Oct. 02, 2017	RS (RS05-HY)
Signal Generator	Rohde & Schwarz	SMB 100A	108749	9kHz~6GHz	Oct. 04, 2016	May 30, 2017	Oct. 03, 2017	RS (RS05-HY)
ESD Simulator	TESEQ	NSG 438	877	±0.2 kV ~±30 kV	Jan. 17, 2017	May 22, 2017	Jan. 16, 2018	ESD (ES04-HY)
Anti-Static Dust Removal Brush	VORTEX	914	N/A	N/A	N/A	May 22, 2017	N/A	ESD (ES04-HY)
Electrostatic Voltmeter	Trek	520	N/A	0~±2kV	N/A	May 22, 2017	N/A	ESD (ES04-HY)