

# TEST REPORT

of

## RE Directive (2014/53/EU) EN 301 489-1/17

**Product :** Bluetooth 4.2 Module  
**Brand:** FANSTEL  
**Model:** BC832  
**Model Difference:** N/A  
**Applicant:** Fanstel Corporation, Taipei  
**Address:** 10F-10, No. 79, Sec. 1, Hsin Tai Wu Rd.,  
Hsi-Chih, New Taipei City 221 Taiwan

Test Performed by:



**International Standards Laboratory Corp. LT Lab.**

TEL: +886-3-263-8888 FAX: +886-3-263-8899

No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist., Tao Yuan City 325,  
Taiwan

Report No.: **ISL-16LR342E489-R2**  
Issue Date :**2022/02/18**



Test results given in this report apply only to the specific sample(s) tested and are traceable to national or international standard through calibration of the equipment and evaluating measurement uncertainty herein.

The uncertainty of the measurement does not include in consideration of the test result unless the customer required the determination of uncertainty via the agreement, regulation or standard document specification.

This test report shall not be reproduced except in full, without the written approval of International Standards Laboratory Corp.

### VERIFICATION OF COMPLIANCE

**Applicant:** Fanstel Corporation, Taipei  
**Equipment Under Test:** Bluetooth 4.2 Module  
**Brand Name:** FANSTEL  
**Model Number:** BC832  
**Model Different:** N/A  
**Date of Test:** 2022/01/19 ~ 2022/02/17  
**Date of EUT Received:** 2022/01/19

| APPLICABLE STANDARDS        |                                    |
|-----------------------------|------------------------------------|
| EN 301 489 –1 v2.2.3: 2019  | EN 301 489 –17 v3.2.4: 2020        |
| EMI: EN 55032 2015+A11:2020 |                                    |
| EMS:                        |                                    |
| EN 61000-4-2:2009           | EN 61000-4-3:2006+A1:2008 +A2:2010 |

In the configuration tested, the EUT complied with the standards specified above.

**Remarks:**

This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of **International Standards Laboratory Corp.** or testing done by in connection with distribution or use of the product described in this report must be approved by **International Standards Laboratory Corp.** in writing.

**Test By:** Jason Chao **Date:** 2022/02/18  
*Jason Chao / Senior Engineer*

**Prepared By:** Gigi yeh **Date:** 2022/02/18  
*Gigi Yeh / Senior Engineer*

**Approved By:** Jerry Liu **Date:** 2022/02/18  
*Jerry Liu / Assistant Manager*

## Version

| <b>Version No.</b> | <b>Date</b> | <b>Description</b>           |
|--------------------|-------------|------------------------------|
| 00                 | 2022/02/18  | Initial creation of document |
|                    |             |                              |

## TABLE OF CONTENTS

|  |           |
|--|-----------|
| <b>1. GENERAL DESCRIPTION.....</b>   | <b>5</b>  |
| 1.1 DESCRIPTION OF EQUIPMENT UNDER TEST (EUT).....   | 5         |
| 1.2 GENERAL DESCRIPTION OF APPLIED STANDARDS .....   | 6         |
| 1.3 DESCRIPTION OF TEST MODES:.....  | 6         |
| 1.4 TEST FACILITY:.....  | 8         |
| 1.5 MODIFICATION LIST:.....  | 8         |
| 1.6 TEST CONDITION:.....   | 8         |
| 1.7 EQUIPMENT LIST:.....   | 9         |
| 1.8 CONFIGURATION OF TESTED SYSTEM .....   | 12        |
| 1.9 EXCLUSION BAND .....   | 13        |
| <b>2. RADIO DISTURBANCE.....</b>   | <b>15</b> |
| 2.1 TEST CONFIGURATION: .....  | 15        |
| 2.2 SPECIAL CONDITIONS:.....   | 15        |
| 2.3 SUMMARY OF TEST RESULTS.....   | 15        |
| 2.4 ENCLOSURE OF ANCILLARY EQUIPMENT MEASURED ON A STANDALONE BASIS. ....                                      | 16        |
| 2.5 DC POWER INPUT/OUTPUT PORTS MEASUREMENT.....   | 23        |
| 2.6 AC MAINS POWER INPUT/OUTPUT PORTS MEASUREMENT. ....  | 25        |
| 2.7 HARMONIC CURRENT EMISSIONS (AC MAINS INPUT PORT) MEASUREMENT. REFER TO EN 301 489-1 SECTION 8.5.....       | 28        |
| 2.8 VOLTAGE FLUCTUATIONS AND FLICKER (AC MAINS INPUT PORT) MEASUREMENT. REFER TO EN 301 489-1 SECTION 8.6..... | 31        |
| 2.9 TELECOMMUNICATION PORT MEASUREMENT. REFER TO EN 301 489-1 SECTION 8.7.....                                 | 32        |
| <b>3. IMMUNITY .....</b>   | <b>33</b> |
| 3.1 TEST CONFIGURATION: .....  | 33        |
| 3.2 SPECIAL CONDITIONS:.....   | 33        |
| 3.3 SUMMARY OF TEST RESULTS: .....   | 33        |
| 3.4 PERFORMANCE CRITERIA DESCRIPTION:.....   | 34        |
| 3.5 ELECTROSTATIC DISCHARGE MEASUREMENT. REFER TO EN 301 489-1 SECTION 9.3.....                                | 36        |
| 3.6 RADIO FREQUENCY ELECTROMAGNETIC FIELD (80MHz TO 6GHz) MEASUREMENT. REFER TO EN 301 489-1 SECTION 9.2.....  | 39        |
| 3.7 FAST TRANSIENTS, COMMON MODE MEASUREMENT. REFER TO EN 301 489-1 SECTION 9.4.....                           | 41        |
| 3.8 SURGES MEASUREMENT. REFER TO EN 301 489-1 SECTION 9.8 .....  | 42        |
| 3.9 RADIO FREQUENCY, COMMON MODE MEASUREMENT. REFER TO EN 301 489-1 SECTION 9.5.....                           | 43        |
| 3.10 TRANSIENTS AND SURGES IN THE VEHICULAR ENVIRONMENT MEASUREMENT. REFER TO EN 301 489-1 SECTION 9.6.....    | 44        |
| 3.11 VOLTAGE DIPS AND INTERRUPTIONS MEASUREMENT. REFER TO EN 301 489-1 SECTION 9.7.....                        | 46        |
| <b>ESD TEST POINT.....</b>   | <b>47</b> |
| <b>PHOTOGRAPHS OF TEST SETUP.....</b>  | <b>49</b> |
| <b>PHOTOGRAPHS OF EUT .....</b>  | <b>54</b> |

# 1. General Description

## 1.1 Description of Equipment under Test (EUT)

|                  |                      |
|------------------|----------------------|
| Product Name:    | Bluetooth 4.2 Module |
| Brand:           | FANSTEL              |
| Model:           | BC832                |
| Model different: | N/A                  |
| Power Supply:    | 5Vdc from USB (JIG)  |
| RF function      | BT 4.2               |

Remark: The above DUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

## 1.2 General Description of Applied Standards

The EUT According to the Specifications, it must comply with the requirements of the following standards:

ETSI EN301 489-1 V2.2.3: ElectroMagnetic Compatibility (EMC) standard for radio equipment and services;

Part 1: Common technical requirements; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU

ETSI EN301 489-17 V3.2.4:

Part 17: Specific conditions for Broadband Data Transmission Systems; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU

EN 55032 2015+A11:2020:

Electromagnetic compatibility of multimedia equipment - Emission requirements.

## 1.3 Description of Test Modes:

The transmitter shall be modulated with normal test modulation as specified for that type of equipment. Where transmitters do not have a modulation input port, the internal equipment modulation shall be used.

The wanted signals and/or controls required to establish a communications link shall be defined by the manufacturer.

The transmitter shall be operated at its maximum rated RF output power as specified for that type of equipment. The manufacturer may provide a suitable companion receiver that can be used to set up a communications link and/or to receive messages.

The tests shall be made exercising all primary functions in the most representative mode consistent with typical applications. The test sample shall be configured in a manner consistent with typical installation practice.

## Test Plan

|                            |  |                             |
|----------------------------|--|-----------------------------|
| <b>Applicable standard</b> |  | EN 301 489-17               |
| <b>Test Configuration</b>  |  | Config 1                    |
|                            |  | EUT<br>+ Smart mobile phone |
| <b>Operation mode</b>      |  | BT link                     |
| <b>No.</b>                 | <b>Description</b>                       |                             |
| 1                          | radiated emission (30M-1GHz) (1-6GHz)    | measured                    |
| 2                          | conducted emission (DC Power)            | N/A                         |
| 3                          | conducted emission (AC Power)            | measured                    |
| 4                          | harmonic current emissions               | N/A                         |
| 5                          | voltage fluctuations and flicker         | N/A                         |
| 6                          | Conducted emission (wired network)       | N/A                         |
| 7                          | RF electromagnetic field (80MHz to 6GHz) | measured                    |
| 8                          | electrostatic discharge                  | measured                    |
| 9                          | fast transients common mode              | N/A                         |
| 10                         | RF common mode 0,15 MHz to 80 MHz        | N/A                         |
| 11                         | transients and surges                    | N/A                         |
| 12                         | voltage dips and interruptions           | N/A                         |
| 13                         | surges, line to line and line to ground  | N/A                         |

*Note 1: the test plan was accepted by the applicant*

#### **1.4 Test Facility:**

The 10m anechoic chamber radiated emission measurement facilities used to collect the data are located at <LT Lab.> Address: No. 120, Lane 180, Hsin Ho Rd. Lung-Tan Dist., Tao Yuan City 325, Taiwan, The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

The 966 anechoic chamber radiated emission measurement (Above 1GHz) facilities used to collect the data are located at <LT Lab.> Address: No. 120, Lane 180, Hsin Ho Rd. Lung-Tan Dist., Tao Yuan City 325, Taiwan, The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

The AC power line conducted emission, flicker and all of immunity measurement facilities used to collect the data are located at <LT Lab.> Address: No. 120, Lane 180, Hsin Ho Rd. Lung-Tan Dist., Tao Yuan City 325, Taiwan, The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

#### **1.5 Modification List:**

No modification by International Standards Laboratory Corp.

#### **1.6 Test Condition:**

Refer to EN 301 489-1, Section 4 and EN 301 489-17, Section4 for the details.



### 1.7 Equipment List:

| Location      | Equipment Name              | Brand           | Model         | S/N                | Last Cal. Date | Next Cal. Date |
|---------------|-----------------------------|-----------------|---------------|--------------------|----------------|----------------|
| Conduction 03 | EMI Receiver 15             | ROHDE & SCHWARZ | ESCI          | 101166             | 07/07/2021     | 07/07/2022     |
| Conduction 03 | Chamber05 -1 Cable          | WOKEN           | CFD 300-NL    | Chamber05 -1 Cable | 08/30/2021     | 08/30/2022     |
| Conduction 03 | LISN 19                     | R&S             | ENV216        | 101425             | 11/11/2021     | 11/11/2022     |
| Conduction 03 | LISN 22                     | R&S             | ENV216        | 101478             | 10/28/2021     | 10/28/2022     |
| Conduction 03 | LISN 24                     | SCHWARZBEC K    | NNLK 8121     | 8121-829           | 07/26/2021     | 07/26/2022     |
| Conduction 03 | ISN T4 09                   | Teseq GmbH      | ISN T400A     | 49914              | 08/02/2021     | 08/02/2022     |
| Conduction 03 | ISN T8 09                   | Teseq GmbH      | ISN T800      | 36190              | 09/30/2021     | 09/30/2022     |
| Conduction 03 | ISN T8 CAT6A_01             | SCHWARZBEC K    | NTFM 8158     | 8158 0123          | 01/25/2022     | 01/25/2023     |
| Conduction 03 | CDN ISN ST08A_1             | Teseq GmbH      | CDN ISN ST08A | 43352              | 10/07/2021     | 10/07/2022     |
| Conduction 03 | Capacitive Voltage Probe 01 | SCHAFFNER       | CVP 2200A     | 18711              | 08/05/2021     | 08/05/2022     |
| Conduction 03 | Current Probe               | SCHAFFNER       | SMZ 11        | 18030              | 03/04/2021     | 03/04/2022     |

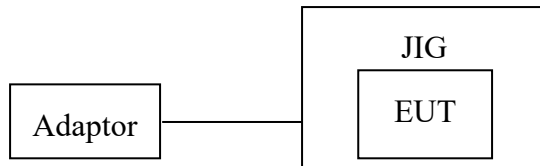
| Location Chamber02 | Equipment Name                | Brand           | Model                             | S/N            | Last Cal. Date | Next Cal. Date |
|--------------------|-------------------------------|-----------------|-----------------------------------|----------------|----------------|----------------|
| Radiation          | BILOG Antenna 17 (30MHz~1GHz) | Schwarzbeck     | Schwarzbeck VULB 9168+EMCI-N-6-05 | 645            | 04/13/2021     | 04/13/2022     |
| Radiation          | Preamplifier 25               | EMCI            | EMC9135                           | 980295         | 04/03/2021     | 04/03/2022     |
| Radiation          | Coaxial Cable Chmb 02-10M-02  | EMC             | RG214U                            | Chmb 02-10M-02 | 10/13/2021     | 10/13/2022     |
| Radiation          | EMI Receiver 12               | ROHDE & SCHWARZ | ESCI                              | 100804         | 08/04/2021     | 08/04/2022     |

| Location Conducted | Equipment Name             | Brand        | Model                  | S/N                     | Last Cal. Date | Next Cal. Date |
|--------------------|----------------------------|--------------|------------------------|-------------------------|----------------|----------------|
| Chamber 19         | Spectrum analyzer          | R&S          | FSV40                  | 101919                  | 08/18/2021     | 08/18/2022     |
| Chamber 19         | EMI Receiver               | R&S          | ESR3                   | 102461                  | 05/05/2021     | 05/05/2022     |
| Chamber 19         | Loop Antenna               | EM           | EM-6879                | 271                     | 09/29/2021     | 09/29/2022     |
| Chamber 19         | Bilog Antenna (30MHz-1GHz) | Schwarzbeck  | VULB9168 w<br>6dB Att. | 9168-736                | 02/22/2021     | 02/22/2022     |
| Chamber 19         | Horn antenna (1GHz-18GHz)  | ETS          | 3117                   | 00218718                | 10/12/2021     | 10/12/2022     |
| Chamber 19         | Horn antenna (18GHz-26GHz) | Com-power    | AH-826                 | 081001                  | 11/30/2021     | 11/30/2022     |
| Chamber 19         | Horn antenna (26GHz-40GHz) | Com-power    | AH-640                 | 100A                    | 03/11/2021     | 03/11/2022     |
| Chamber 19         | Preamplifier (9kHz-1GHz)   | HP           | 8447F                  | 3113A04621              | 06/22/2021     | 06/22/2022     |
| Chamber 19         | Preamplifier (1GHz-26GHz)  | EM           | EM01M26G               | 060681                  | 05/07/2021     | 05/07/2022     |
| Chamber 19         | Preamplifier (26GHz-40GHz) | MITEQ        | JS4-26004000-27-5A     | 818471                  | 05/07/2021     | 05/07/2022     |
| Chamber 19         | RF Cable (100kHz-26.5GHz)  | HUBER SUHNER | Sucoflex 104A          | MY1394/4A &<br>50886/4A | 08/30/2021     | 08/30/2022     |
| Chamber 19         | RF Cable (18GHz-40GHz)     | HUBER SUHNER | Sucoflex 102           | 27963/2&37421/2         | 11/17/2021     | 11/17/2022     |
| Chamber 19         | Signal Generator           | Anritsu      | MG3692A                | 20311                   | 12/28/2021     | 12/28/2022     |
| Chamber 19         | Test Software              | Audix        | E3<br>Ver:6.12023      | N/A                     | N/A            | N/A            |

| Location  | Equipment Name                 | Brand              | Model             | S/N              | Last Cal. Date | Next Cal. Date |
|-----------|--------------------------------|--------------------|-------------------|------------------|----------------|----------------|
| EN61K-4-2 | ESD Gun 12                     | EM TEST            | Dito              | P1650188689      | 05/05/2021     | 05/05/2022     |
| EN61K-4-2 | ESD Gun 07                     | NoiseKen           | ESS-2002EX        | ESS0878638       | 01/14/2022     | 01/14/2023     |
| EN61K-4-2 | ESD Gun 11                     | TESEQ              | NSG438            | 1278             | 11/02/2021     | 11/02/2022     |
| EN61K-4-3 | Broadband Log-Periodic Antenna | AR                 | AT1080            | 310698           | N/A            | N/A            |
| EN61K-4-3 | Horn Antenna RF-01             | AR                 | ATS700M11G        | 0335864          | N/A            | N/A            |
| EN61K-4-3 | Amplifier 80Mz~1GHz 250W       | AR                 | 250W1000A         | 312494           | N/A            | N/A            |
| EN61K-4-3 | Amplifier 800MHz~4.2GHz 50W    | AR                 | 50S1G4M1          | 312762           | N/A            | N/A            |
| EN61K-4-3 | Amplifier 4.0~8.0GHz 35W       | AR                 | 35S4G8AM1         | 0335752          | N/A            | N/A            |
| EN61K-4-3 | Broadband Coupler 80M~1GHz     | Amplifier Research | DC6180A           | 0341805          | N/A            | N/A            |
| EN61K-4-3 | Coaxial Cable                  | INSULATED          | NPS-4806-2360-NP3 | 108599.003.01.03 | N/A            | N/A            |
| EN61K-4-3 | Broadband Coupler 0.8G~4.26GHz | AR                 | DC7144A           | 0335226          | N/A            | N/A            |
| EN61K-4-3 | Broadband Coupler 4G~8GHz      | AR                 | DC7350A           | 0335817          | N/A            | N/A            |
| EN61K-4-3 | Signal Generator 08            | ROHDE&SCHWARZ      | SMB100A           | 106541           | 05/12/2021     | 05/12/2022     |
| EN61K-4-3 | Couditioning Amplifier_1       | B&K                | WH 3278           | 3003172          | 03/09/2021     | 03/09/2022     |
| EN61K-4-3 | Microphone Type 4192-2         | B&K                | 4192              | 2752005          | 10/19/2021     | 10/19/2022     |

PS: N/A => The equipment does not need calibration.

## 1.8 Configuration of Tested System



-----remote-----

Smart mobile  
phone

**Table 1-1 Support Equipment Used in Tested System**

| Item | Equipment          | Mrf/Brand | Model name | Series No | Data Cable | Power Cable  |
|------|--------------------|-----------|------------|-----------|------------|--------------|
| 1    | adaptor            | Apple     | A1385      | N/A       | N/A        | Shielded /1m |
| 2    | Smart mobile phone | hTC       | PL99110    | N/A       | N/A        | N/A          |

**I/O Cable Condition of EUT and Support Units**

| Description     | Path                                   | Cable Length | Cable Type | Connector Type |
|-----------------|--|--------------|------------|----------------|
| USB power cable | Adaptor USB port to JIG micro USB port | 1.2m         | Shielded   | Metal Head     |

**Note:** All the above equipment/cables were placed in worse case positions to maximize emission signals during emission test.

**Grounding:** Grounding was in accordance with the manufacturer's requirements and conditions for the intended use.

## 1.9 Exclusion band

### For EN301489-1

Exclusion band for transmitters or the transmitter part of transceivers

Channelized Equipment

For channelized 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.

Non-Channelized Equipment

For non-channelized 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.

Exclusion band for receivers or the receiver part of transceivers

Channelized Equipment

For channelized 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.

Non-Channelized 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

**For EN 301489-17**

The frequencies on which the transmitter part of the EUT is intended to operate shall be excluded from conducted and radiated emission measurements when performed in transmit mode of operation.

The exclusion band for immunity testing of equipment operating in the 2,4 GHz band shall be:  
lower limit of exclusion band = lowest allocated band edge frequency -120 MHz, i.e. 2 280 MHz;  
upper limit of exclusion band = highest allocated band edge frequency +120 MHz, i.e. 2 603,5MHz.

The exclusion band for immunity testing of equipment operating in the 5 GHz Wi-Fi band shall be:  
lower limit of exclusion band = lowest allocated band edge frequency -270 MHz, i.e. 4 880 MHz;  
upper limit of exclusion band = highest allocated band edge frequency +270 MHz, i.e. 5 995 MHz.

The exclusion band for immunity testing of equipment operating in the 5,8 GHz band shall be:  
lower limit of exclusion band = lowest allocated band edge frequency -270 MHz, i.e. 5 455 MHz;  
as the immunity requirements have an upper frequency range of 6 GHz and any upper edge exclusion band would be greater than this for the 5,8 GHz band. The above frequency shall also be regarded as the upper end of the test range.

## 2. Radio Disturbance

EN 301 489-17

### 2.1 Test Configuration:

Refer to EN 301 489-1, Section 8.1.

### 2.2 Special Conditions:

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

### 2.3 Summary of Test Results

| Test Items  | Reference section                              | Result |
|---|--|--------|
| Enclosure of ancillary equipment measured on a stand alone basis, EN 55032, Class B | EN 301 489-1 Section 8.2<br>EN 55032 Annex A.2 | PASS   |
| DC mains power input/output ports   | EN 301 489-1 Section 8.3                       | N/A    |
| AC mains power input/output ports<br>EN 55032, Class B                              | EN 301 489-1 Section 8.4<br>EN 55032 Annex A.3 | PASS   |
| Harmonic current emission, Class A  | EN 301 489-1 Section 8.5<br>EN 61000-3-2       | N/A    |
| Voltage fluctuations and flicker  | EN 301 489-1 Section 8.6<br>EN 61000-3-3       | N/A    |
| Telecommunication Port  | EN 301 489-1 Section 8.7<br>EN 55032 Annex B.2 | N/A    |

## 2.4 Enclosure of ancillary equipment measured on a standalone basis.

### 2.4.1 Test Method:

| Standard                | Description   |
|-------------------------|---|
| EN 55032 2015+A11:2020: | Electromagnetic compatibility of multimedia equipment – Emission requirements |

### Limits: Class B

| Frequency range MHz | Measurement   |                             | Class B limits<br>dB( $\mu$ V/m) |
|---------------------|---------------|-----------------------------|----------------------------------|
|                     | Distance<br>m | Detector type/<br>bandwidth | OATS/SAC                         |
| 30 – 230            | 10            | Quasi Peak /<br>120 kHz     | 30                               |
| 230 – 1000          | 10            |                             | 37                               |
| 30 – 230            | 3             |                             | 40                               |
| 230 – 1000          | 3             |                             | 47                               |

| Frequency range MHz | Measurement   |                             | Class B limits<br>dB( $\mu$ V/m) |
|---------------------|---------------|-----------------------------|----------------------------------|
|                     | Distance<br>m | Detector type/<br>bandwidth | FSOATS                           |
| 1000 – 3000         | 3             | Average /<br>1 MHz          | 50                               |
| 3000 – 6000         |               |                             | 54                               |
| 1000 – 3000         |               | Peak /<br>1 MHz             | 70                               |
| 3000 – 6000         |               |                             | 74                               |

| Highest internal frequency<br>(F <sub>x</sub> ) | Highest measured frequency                  |
|---|---|
| F <sub>x</sub> ≤ 108 MHz                        | 1 GHz                                       |
| 108 MHz < F <sub>x</sub> ≤ 500 MHz              | 2 GHz                                       |
| 500 MHz < F <sub>x</sub> ≤ 1 GHz                | 5 GHz                                       |
| F <sub>x</sub> > 1 GHz                          | 5 × F <sub>x</sub> up to a maximum of 6 GHz |

NOTE 1 For FM and TV broadcast receivers, F<sub>x</sub> is determined from the highest frequency generated or used excluding the local oscillator and tuned frequencies.

NOTE 2 F<sub>x</sub> is defined in 3.1.19. of EN 55032

The highest internal source of an EUT is above 1GHz.



#### **2.4.2 Test Procedure:**

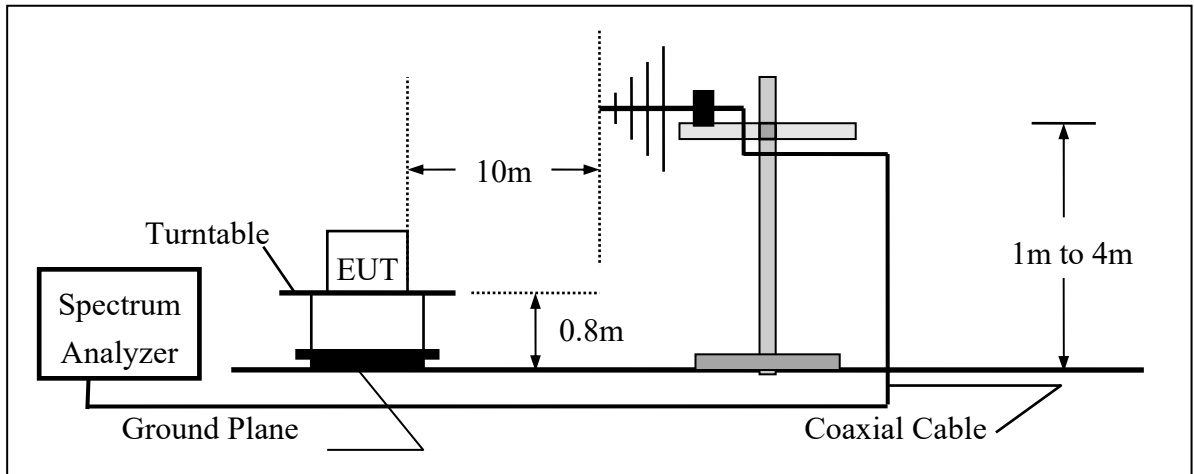
1. EUT was placed on an 0.8m wooden table.
2. Set up EUT with support units and turn on the power of all equipment.
3. Link the EUT with Telecommunication tester, setup the test mode. The transmitter operating at continuously mode and max output rated power.
4. The receive antenna is placed at 10m or 3m (3m for above 1GHz) distance from the EUT and search height from 1-4m.
5. The turntable was slowly rotated to locate the direction of maximum emission. Once maximum direction is determined, the search antenna was raised and lowered in both vertical and horizontal polarizations.

#### **2.4.3 Test Instruments:**

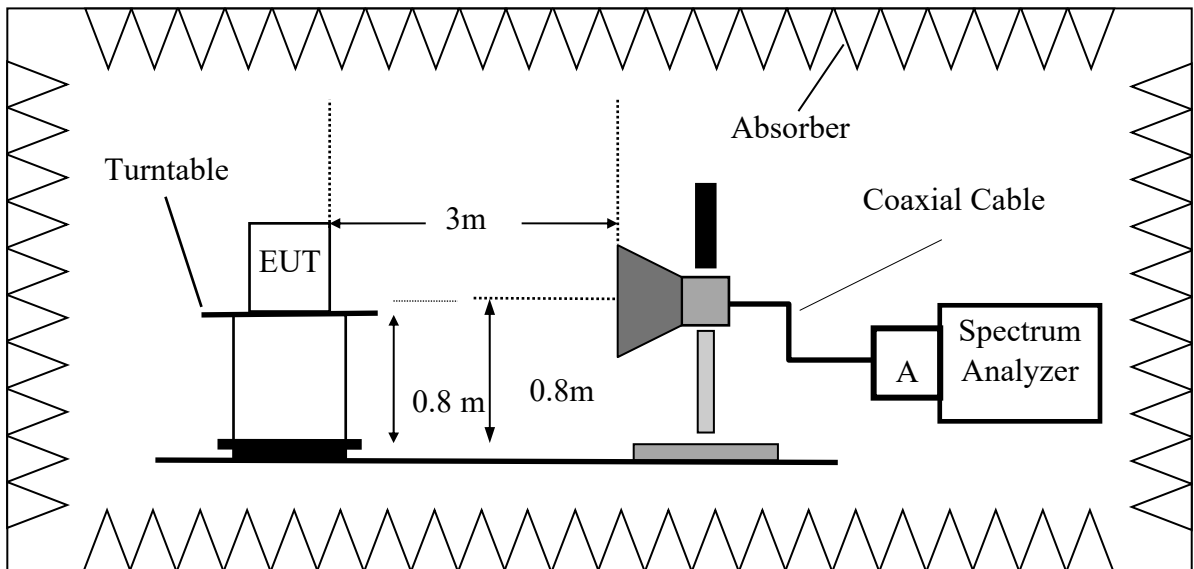
Refer to section 1.7 in this report

### 2.4.4 Test SET-UP (Block Diagram of Configuration)

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(B) Radiated Emission Test Set-UP Frequency Over 1 GHz

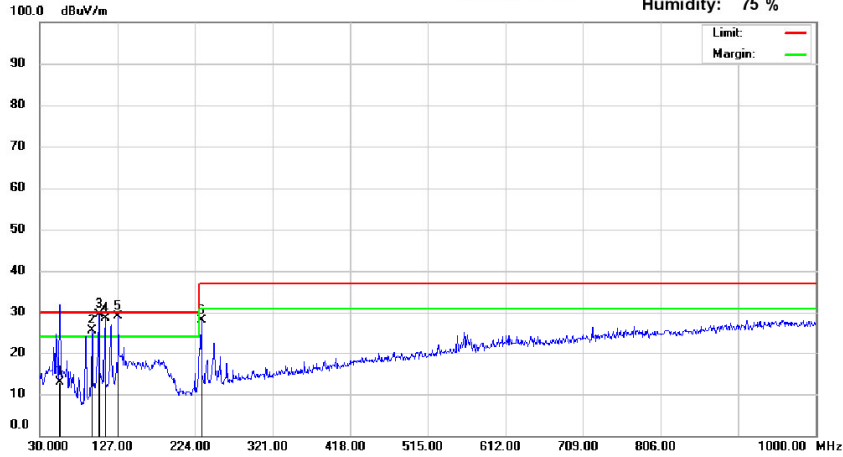


### Radiated Emission Measurement Data



Address: No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist.,  
Tao Yuan City 325, Taiwan.  
Tel: 03-2638888

Radiated Emission Measurement      Operator: Dan Lee  
Date: 2022/1/27                              Temperature: 19 °C  
Humidity: 75 %



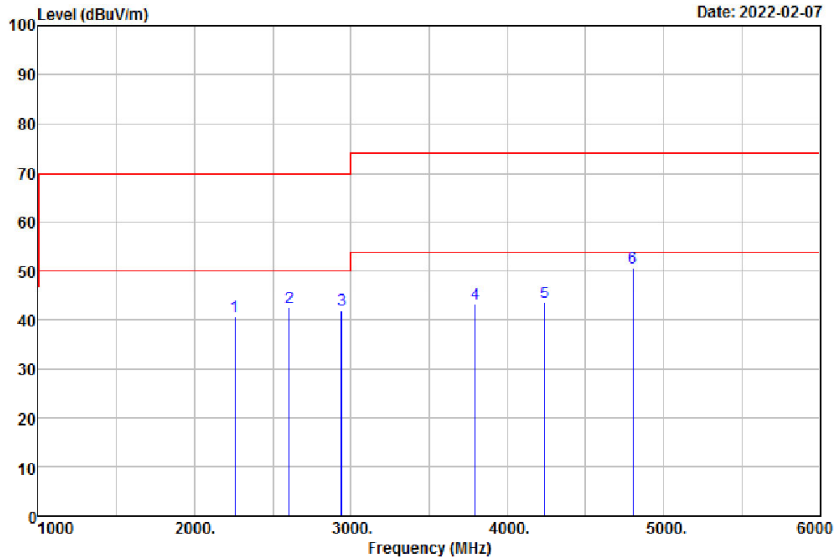
Site : Chamber 02

Polarization: Vertical

| Mk. | Frequency (MHz) | RX_R (dBuV) | Correct Factor (dB/m) | Emission (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Ant.Pos (cm) | Tab.Pos (deg.) | Detector |
|-----|-----------------|-------------|-----------------------|-------------------|----------------|-------------|--------------|----------------|----------|
| 1   | 56.02           | 29.49       | -16.56                | 12.93             | 30.00          | -17.07      | 100          | 299            | QP       |
| 2   | 94.99           | 46.94       | -21.60                | 25.34             | 30.00          | -4.66       | 100          | 148            | peak     |
| 3   | 103.72          | 49.50       | -20.18                | 29.32             | 30.00          | -0.68       | 200          | 0              | peak     |
| 4   | 111.48          | 47.65       | -19.22                | 28.43             | 30.00          | -1.57       | 200          | 106            | peak     |
| 5   | 127.97          | 46.83       | -17.94                | 28.89             | 30.00          | -1.11       | 100          | 168            | peak     |
| 6   | 231.76          | 45.52       | -17.60                | 27.92             | 37.00          | -9.08       | 100          | 196            | peak     |



International Standard Laboratory Corp.  
Company Address: No. 120, Lane 180, Hsin Ho Rd.  
Lung-Tan Dist., Tao Yuan City 325, Taiwan  
Tel: (03)4071718 ; Fax: (03)4071738  
Web: www.isl.com.tw



Condition: 55032 CLASS B PK 3m VERTICAL  
Site : Chamber 19

Operator : Jason

|   | Freq    | Read Level | Factor | Level  | Limit Line | Over Limit | Remark | Pol/Phase |
|---|---------|------------|--------|--------|------------|------------|--------|-----------|
|   | MHz     | dBuV       | dB/m   | dBuV/m | dBuV/m     | dB         |        |           |
| 1 | 2260.00 | 52.03      | -11.56 | 40.47  | 70.00      | -29.53     | Peak   | VERTICAL  |
| 2 | 2605.00 | 52.66      | -10.34 | 42.32  | 70.00      | -27.68     | Peak   | VERTICAL  |
| 3 | 2940.00 | 51.85      | -10.04 | 41.81  | 70.00      | -28.19     | Peak   | VERTICAL  |
| 4 | 3795.00 | 51.28      | -8.06  | 43.22  | 74.00      | -30.78     | Peak   | VERTICAL  |
| 5 | 4240.00 | 50.62      | -7.08  | 43.54  | 74.00      | -30.46     | Peak   | VERTICAL  |
| 6 | 4805.00 | 56.49      | -5.82  | 50.67  | 74.00      | -23.33     | Peak   | VERTICAL  |



Address: No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist.,  
Tao Yuan City 325, Taiwan.  
Tel: 03-2638888

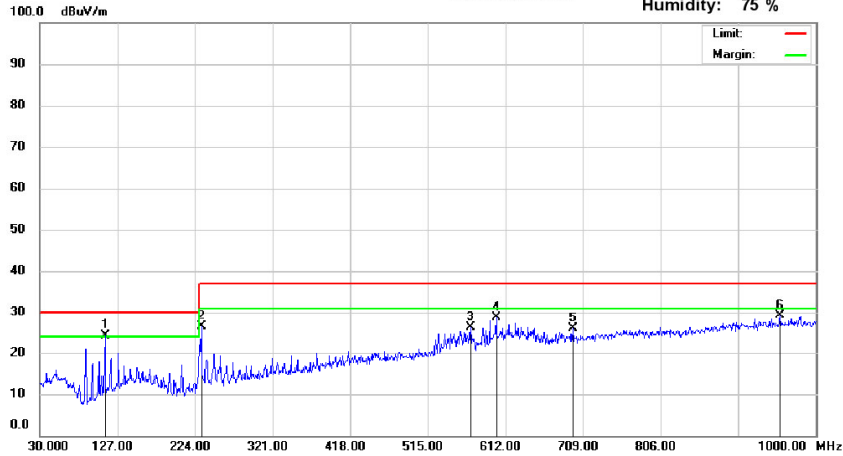
Radiated Emission Measurement

Date: 2022/1/27

Operator: Dan Lee

Temperature: 19 °C

Humidity: 75 %



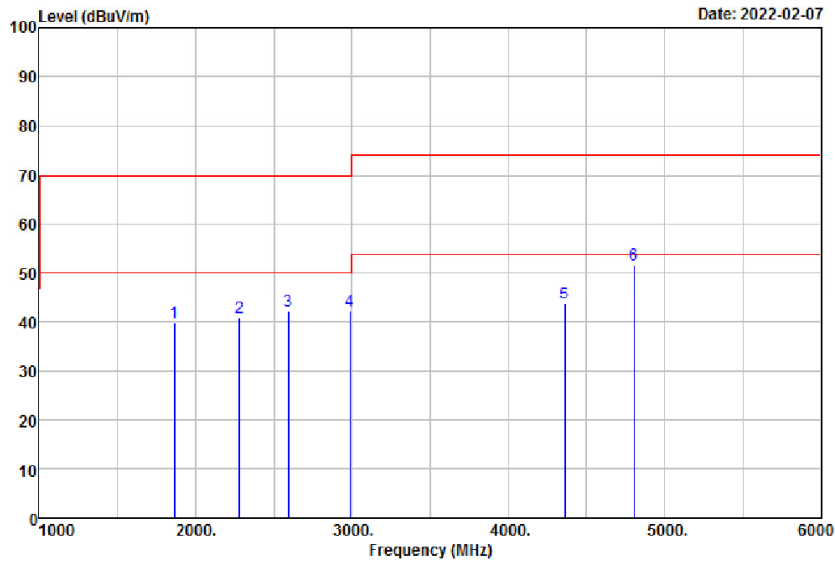
Site : Chamber 02

Polarization: *Horizontal*

| Mk. | Frequency (MHz) | RX_R (dBuV) | Correct Factor (dB/m) | Emission (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Ant.Pos (cm) | Tab.Pos (deg.) | Detector |
|-----|-----------------|-------------|-----------------------|-------------------|----------------|-------------|--------------|----------------|----------|
| 1   | 111.48          | 43.35       | -19.22                | 24.13             | 30.00          | -5.87       | 400          | 56             | peak     |
| 2   | 231.76          | 43.96       | -17.60                | 26.36             | 37.00          | -10.64      | 200          | 118            | peak     |
| 3   | 568.35          | 33.60       | -7.57                 | 26.03             | 37.00          | -10.97      | 200          | 266            | peak     |
| 4   | 600.36          | 35.40       | -6.65                 | 28.75             | 37.00          | -8.25       | 200          | 231            | peak     |
| 5   | 696.39          | 31.11       | -5.25                 | 25.86             | 37.00          | -11.14      | 400          | 190            | peak     |
| 6   | 955.38          | 30.29       | -1.18                 | 29.11             | 37.00          | -7.89       | 300          | 307            | peak     |



International Standard Laboratory Corp.  
Company Address: No. 120, Lane 180, Hsin Ho Rd.  
Lung-Tan Dist., Tao Yuan City 325, Taiwan  
Tel: (03)4071718 ; Fax: (03)4071738  
Web: www.isl.com.tw



Condition: 55032 CLASS B PK 3m HORIZONTAL  
Site : Chamber 19

Operator : Jason

|   | Freq    | Read  |        | Limit  | Over   |        |                 |
|---|---------|-------|--------|--------|--------|--------|-----------------|
|   | MHz     | Level | Factor | Level  | Line   | Limit  | Remark          |
|   |         | dBuV  | dB/m   | dBuV/m | dBuV/m | dB     | Pol/Phase       |
| 1 | 1865.00 | 51.76 | -12.14 | 39.62  | 70.00  | -30.38 | Peak HORIZONTAL |
| 2 | 2280.00 | 52.24 | -11.46 | 40.78  | 70.00  | -29.22 | Peak HORIZONTAL |
| 3 | 2595.00 | 52.63 | -10.37 | 42.26  | 70.00  | -27.74 | Peak HORIZONTAL |
| 4 | 2985.00 | 51.89 | -9.65  | 42.24  | 70.00  | -27.76 | Peak HORIZONTAL |
| 5 | 4360.00 | 50.46 | -6.70  | 43.76  | 74.00  | -30.24 | Peak HORIZONTAL |
| 6 | 4805.00 | 57.56 | -5.82  | 51.74  | 74.00  | -22.26 | Peak HORIZONTAL |

## 2.5 DC power input/output ports measurement.

### 2.5.1 Test Method:

| Standard                | Description   |
|-------------------------|---|
| EN 55032 2015+A11:2020: | Electromagnetic compatibility of multimedia equipment – Emission requirements |

Refer to section 8.3.2 of EN301489-1 for detail.

### 2.5.2 Limit:

| Frequency range     | Limit (quasi-peak)<br>(dB $\mu$ V) | Limit (average)<br>(dB $\mu$ V) |
|---------------------|------------------------------------|---------------------------------|
| 0,15 MHz to 0,5 MHz | 66 to 56                           | 56 to 46                        |
| > 0,5 MHz to 5 MHz  | 56                                 | 46                              |
| > 5 MHz to 30 MHz   | 60                                 | 50                              |

NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0,15 MHz to 0,50 MHz.

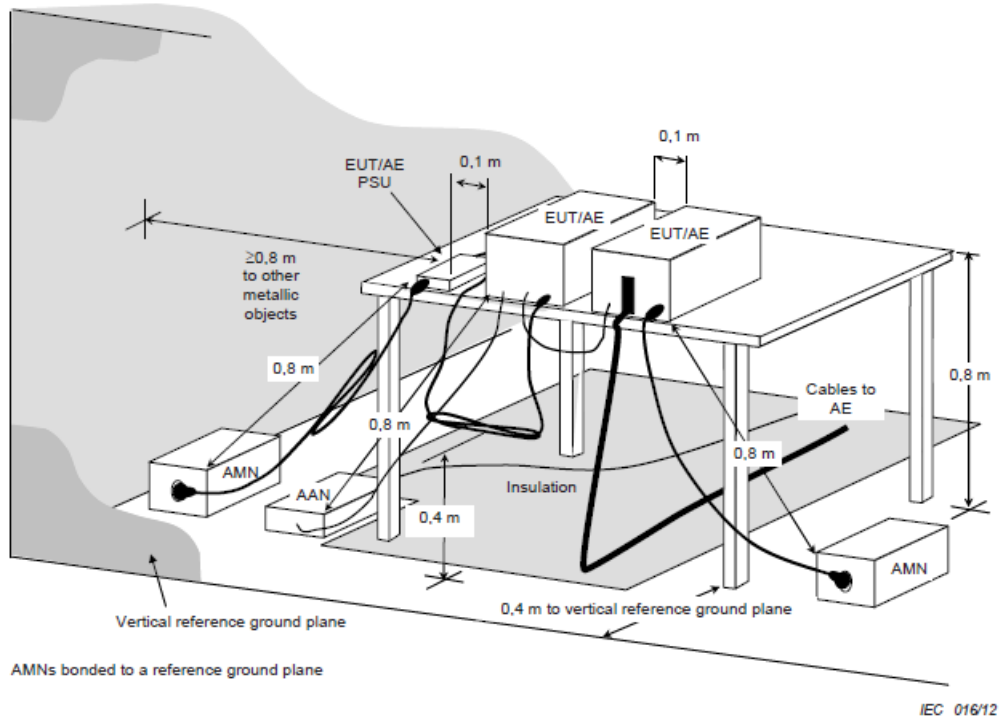
### 2.5.3 Test Procedure:

1. EUT was placed on an 0.8m wooden table above ground plane.
2. Set up EUT with support units and turn on the power of all equipment.
3. Link the EUT with Telecommunication tester, setup the test mode. The transmitter operating at continuously mode and max output rated power.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. Repeat above procedures until all frequency measured were complete.

### 2.5.4 Test Instruments:

Refer to section 1.7 in this report

### 2.5.5 Test SET-UP (Block Diagram of Configuration)



### 2.5.6 Measurement Result:

N/A,



## **2.6 AC Mains power input/output ports measurement.**

### **2.6.1 Test Method:**

| Standard                | Description   |
|-------------------------|---|
| EN 55032 2015+A11:2020: | Electromagnetic compatibility of multimedia equipment – Emission requirements |

Refer to section 8.4.2 of EN301489-1 and 55032 Annex A for detail.

**2.6.2 Limit: Refer to 2.5.2**

**2.6.3 Test Procedure: Refer to 2.5.3**

**2.6.4 Test Instruments: Refer to 2.5.4**

**2.6.5 Conduction Emission Test Set-up: Refer to 2.5.5**

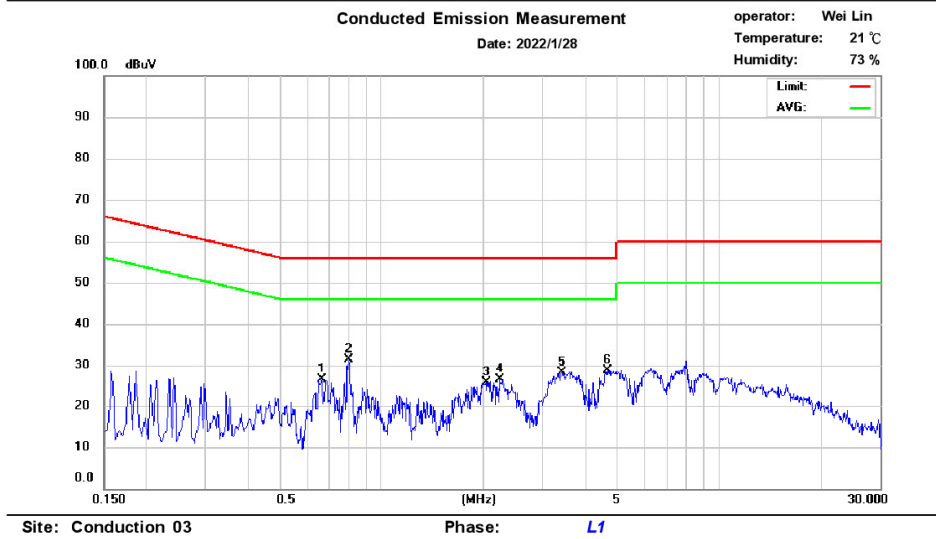
**2.6.6 Measurement Result:**

Refer to next page for details.

### 2.6.7 Measurement Data:



Address: No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist.,  
Tao Yuan City 325, Taiwan.  
Tel: 03-2638888



| No. | Frequency (MHz) | QP_R (dBuV) | AVG_R (dBuV) | Correct Factor (dB) | QP Emission (dBuV) | QP Limit (dBuV) | QP Margin (dB) | AVG Emission (dBuV) | AVG Limit (dBuV) | AVG Margin (dB) |
|-----|-----------------|-------------|--------------|---------------------|--------------------|-----------------|----------------|---------------------|------------------|-----------------|
| 1   | 0.662           | 11.10       | 3.10         | 9.67                | 20.77              | 56.00           | -35.23         | 12.77               | 46.00            | -33.23          |
| 2   | 0.798           | 16.39       | 7.50         | 9.68                | 26.07              | 56.00           | -29.93         | 17.18               | 46.00            | -28.82          |
| 3   | 2.038           | 10.93       | 2.95         | 9.73                | 20.66              | 56.00           | -35.34         | 12.68               | 46.00            | -33.32          |
| 4   | 2.246           | 11.61       | 3.36         | 9.73                | 21.34              | 56.00           | -34.66         | 13.09               | 46.00            | -32.91          |
| 5   | 3.430           | 13.35       | 5.07         | 9.75                | 23.10              | 56.00           | -32.90         | 14.82               | 46.00            | -31.18          |
| 6   | 4.666           | 13.01       | 4.72         | 9.78                | 22.79              | 56.00           | -33.21         | 14.50               | 46.00            | -31.50          |

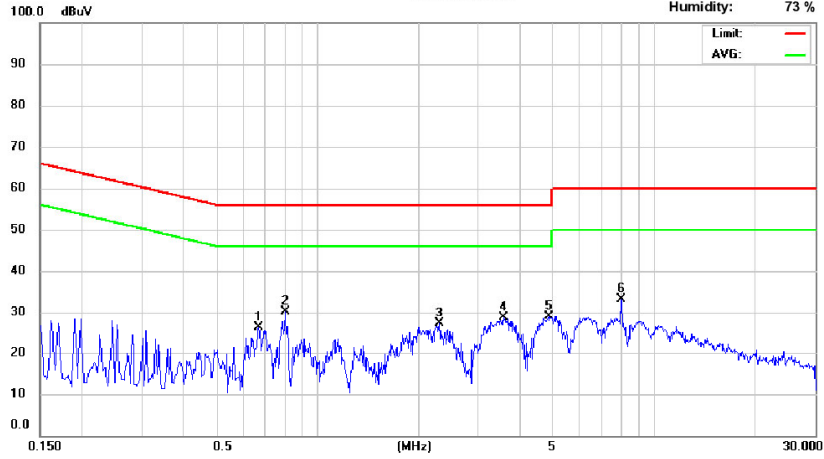


Address: No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist.,  
Tao Yuan City 325, Taiwan.  
Tel: 03-2638888

Conducted Emission Measurement

Date: 2022/1/28

operator: Wei Lin  
Temperature: 21 °C  
Humidity: 73 %



Site: Conduction 03

Phase: N

| No. | Frequency (MHz) | QP_R (dBuV) | AVG_R (dBuV) | Correct Factor (dB) | QP Emission (dBuV) | QP Limit (dBuV) | QP Margin (dB) | AVG Emission (dBuV) | AVG Limit (dBuV) | AVG Margin (dB) |
|-----|-----------------|-------------|--------------|---------------------|--------------------|-----------------|----------------|---------------------|------------------|-----------------|
| 1   | 0.670           | 10.49       | 3.29         | 9.69                | 20.18              | 56.00           | -35.82         | 12.98               | 46.00            | -33.02          |
| 2   | 0.802           | 16.10       | 8.09         | 9.69                | 25.79              | 56.00           | -30.21         | 17.78               | 46.00            | -28.22          |
| 3   | 2.302           | 11.42       | 3.90         | 9.74                | 21.16              | 56.00           | -34.84         | 13.64               | 46.00            | -32.36          |
| 4   | 3.578           | 13.77       | 6.13         | 9.77                | 23.54              | 56.00           | -32.46         | 15.90               | 46.00            | -30.10          |
| 5   | 4.854           | 14.24       | 6.64         | 9.80                | 24.04              | 56.00           | -31.96         | 16.44               | 46.00            | -29.56          |
| 6   | 7.998           | 18.18       | 5.46         | 9.88                | 28.06              | 60.00           | -31.94         | 15.34               | 50.00            | -34.66          |

**2.7 Harmonic Current Emissions (AC mains input port) measurement. Refer to EN 301 489-1 Section 8.5**

**2.7.1 Test Method: Refer to 61000-3-2:2014 and IEC 61000-3-2:2014**

**2.7.2 Limit**

**Table 1 – Limits for Class A equipment**

| Harmonic order<br>n   | Maximum permissible<br>harmonic current<br>A |
|-----------------------|--|
| <b>Odd harmonics</b>  |  |
| 3                     | 2,30   |
| 5                     | 1,14   |
| 7                     | 0,77   |
| 9                     | 0,40   |
| 11                    | 0,33   |
| 13                    | 0,21   |
| $15 \leq n \leq 39$   | $0,15 \frac{15}{n}$                          |
| <b>Even harmonics</b> |  |
| 2                     | 1,08   |
| 4                     | 0,43   |
| 6                     | 0,30   |
| $8 \leq n \leq 40$    | $0,23 \frac{8}{n}$                           |

**Note :For Class B equipment, the harmonics of the input current shall not exceed the values given in table 1 multiplied by a factor of 1,5.**

**Table 2 – Limits for Class C equipment**

| Harmonic order<br>n                         | Maximum permissible harmonic current<br>expressed as a percentage of the input<br>current at the fundamental frequency<br>% |
|---|---|
| 2   | 2   |
| 3   | $30 \cdot \lambda^*$  |
| 5   | 10  |
| 7   | 7   |
| 9   | 5   |
| $11 \leq n \leq 39$<br>(odd harmonics only) | 3   |

\*  $\lambda$  is the circuit power factor

**Table 3 – Limits for Class D equipment**

| Harmonic order<br>n                         | Maximum permissible<br>harmonic current<br>per watt<br>mA/W | Maximum permissible<br>harmonic current<br>A |
|---|---|--|
| 3   | 3,4   | 2,30   |
| 5   | 1,9   | 1,14   |
| 7   | 1,0   | 0,77   |
| 9   | 0,5   | 0,40   |
| 11  | 0,35  | 0,33   |
| $13 \leq n \leq 39$<br>(odd harmonics only) | $\frac{3,85}{n}$  | See Table 1                                  |

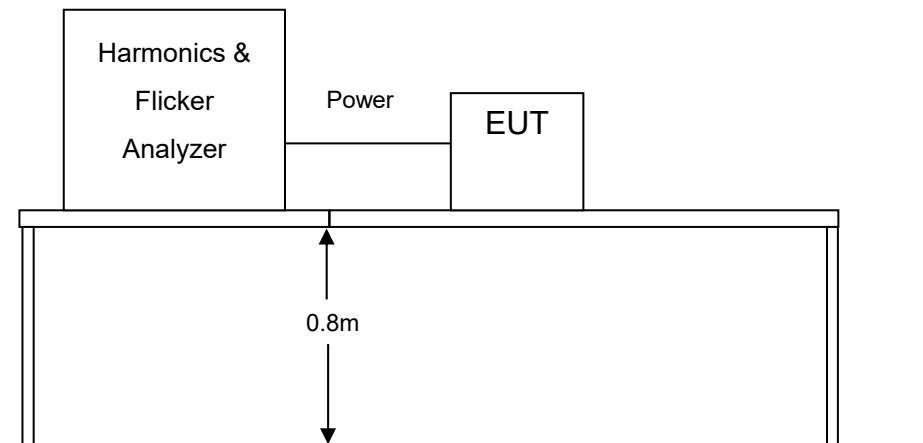
### 2.7.3 Test Procedure:

The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the maximum harmonic components under normal operating conditions for each successive harmonic component in turn.

### 2.7.4 Test Instruments:

Refer to section 1.7 in this report

### 2.7.5 Test Set-up



### 2.7.6 Measurement Result:

N/A

## 2.8 Voltage Fluctuations and Flicker (AC mains input port) measurement. Refer to EN 301 489-1 Section 8.6

### 2.8.1 Test Method: Refer to EN 61000-3-3:2013 and IEC 61000-3-3:2013

### 2.8.2 Limit

| TEST ITEM     | LIMIT |
|---------------|-------|
| $P_{st}$      | 1.0   |
| $P_{lt}$      | 0.65  |
| $D(t)(ms)$    | 500ms |
| $d_{max} (%)$ | 4%    |
| dc (%)        | 3.3%  |

### 2.8.3 Test Procedure:

The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the most unfavorable sequence of voltage changes under normal operating conditions.

### 2.8.4 Test Instruments:

Refer to section 1.7 in this report

### 2.8.5 Test Set-up

Refer to 2.7.5

### 2.8.6 Measurement Result: N/A

**2.9 Telecommunication Port measurement. Refer to EN 301 489-1 Section 8.7**

**2.9.1 Test Method:**

| Standard                | Description   |
|-------------------------|---|
| EN 55032 2015+A11:2020: | Electromagnetic compatibility of multimedia equipment – Emission requirements |

Refer to section 8.7.2 of EN301489-1 for detail.

**2.9.2 Limit: Limits for conducted emissions from telecommunication ports**

| Frequency range  | Voltage limits                 |                                | Current limits                 |                                |
|--|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
|  | Quasi-peak                     | Average                        | Quasi-peak                     | Average                        |
| 0.15 MHz to 0.5 MHz  | 84 dB $\mu$ V to 74 dB $\mu$ V | 74 dB $\mu$ V to 64 dB $\mu$ V | 40 dB $\mu$ A to 30 dB $\mu$ A | 30 dB $\mu$ A to 20 dB $\mu$ A |
| 0.5 MHz to 30 MHz  | 74 dB $\mu$ V                  | 64 dB $\mu$ V                  | 30 dB $\mu$ A                  | 20 dB $\mu$ A                  |
| NOTE 1: The limits decrease linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.   |                                |                                |                                |                                |
| NOTE 2: The current and voltage disturbance limits are derived for use with an Impedance Stabilization Network (ISN) which presents a common mode (asymmetric mode) impedance of 150 $\Omega$ to the telecommunication port under test (conversion factor is $20 \log_{10} 150/I = 44\text{dB}$ )  |                                |                                |                                |                                |
| NOTE 3: The emission requirement only applies to telecommunication ports as specified in EN 55032 . The provisional relaxation of 10 dB will be reviewed no later than 3 years after the date of withdrawal based on the results and interference cases seen in this period. Wherever possible it is recommended to comply with the limits without the provisional relaxation. |                                |                                |                                |                                |

**2.9.3 Test Procedure: Refer to EN 55032**

**2.9.4 Test Instruments: Refer to 2.5.4**

**2.9.5 Conduction Emission Test Set-up: Refer to 2.5.5**

**2.9.6 Measurement Result: N/A**



## 3. IMMUNITY

EN 301 489-17

### 3.1 Test Configuration:

Refer to EN 301 489-1, Section 9.1.

### 3.2 Special Conditions:

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

### 3.3 Summary of Test Results:

| Test Items   | Reference Section        | Result |
|--|--------------------------|--------|
| Electrostatic discharge  | EN 301 489-1 Section 9.3 | PASS   |
| Radio frequency electromagnetic field (80 to 1000MHz and 1000MHz to 6000MHz) | EN 301 489-1 Section 9.2 | PASS   |
| Fast transients, common mode   | EN 301 489-1 Section 9.4 | N/A    |
| Surges   | EN 301 489-1 Section 9.8 | N/A    |
| Radio Frequency, common mode   | EN 301 489-1 Section 9.5 | N/A    |
| Voltage Dips and interruptions   | EN 301 489-1 Section 9.7 | N/A    |
| Transients and surges in the vehicular environment                           | EN 301 489-1 Section 9.6 | N/A    |

### 3.4 Performance Criteria Description:

#### 3.4.1 EN 301 489-17

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 clauses.

| Criteria | During test   | After test<br>(i.e. as a result of the application of the test)   |
|----------|---|---|
| A        | <ul style="list-style-type: none"> <li>• Shall operate as intended. (See note).</li> <li>• Shall be no loss of function.</li> <li>• Shall be no unintentional transmissions.</li> </ul>   | <ul style="list-style-type: none"> <li>• Shall operate as intended.</li> <li>• Shall be no degradation of performance.</li> <li>• Shall be no loss of function.</li> <li>• Shall be no loss of critical stored data.</li> </ul> |
| B        | <ul style="list-style-type: none"> <li>• May be loss of function.</li> </ul>  | <ul style="list-style-type: none"> <li>• Functions shall be self-recoverable.</li> <li>• Shall operate as intended after recovering.</li> <li>• Shall be no loss of critical stored data.</li> </ul>                            |
| C        | <ul style="list-style-type: none"> <li>• May be loss of function.</li> </ul>  | <ul style="list-style-type: none"> <li>• Functions shall be recoverable by the operator.</li> <li>• Shall operate as intended after recovering.</li> <li>• Shall be no loss of critical stored data.</li> </ul>                 |
| NOTE     | <p>Operate as intended during the test allows a level of degradation:</p> <p>Minimum performance level:</p> <ul style="list-style-type: none"> <li>• For equipment that supports a PER or FER, the minimum performance level shall be a PER or FER less than or equal to 10 %.</li> <li>• 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.</li> </ul> |   |

### **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 5000 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.

### 3.5 Electrostatic Discharge Measurement. Refer to EN 301 489-1 Section 9.3

#### 3.5.1 Test Method and Procedure:

EN 61000-4-2 and EN 301 489-1 Section 9.3.2.

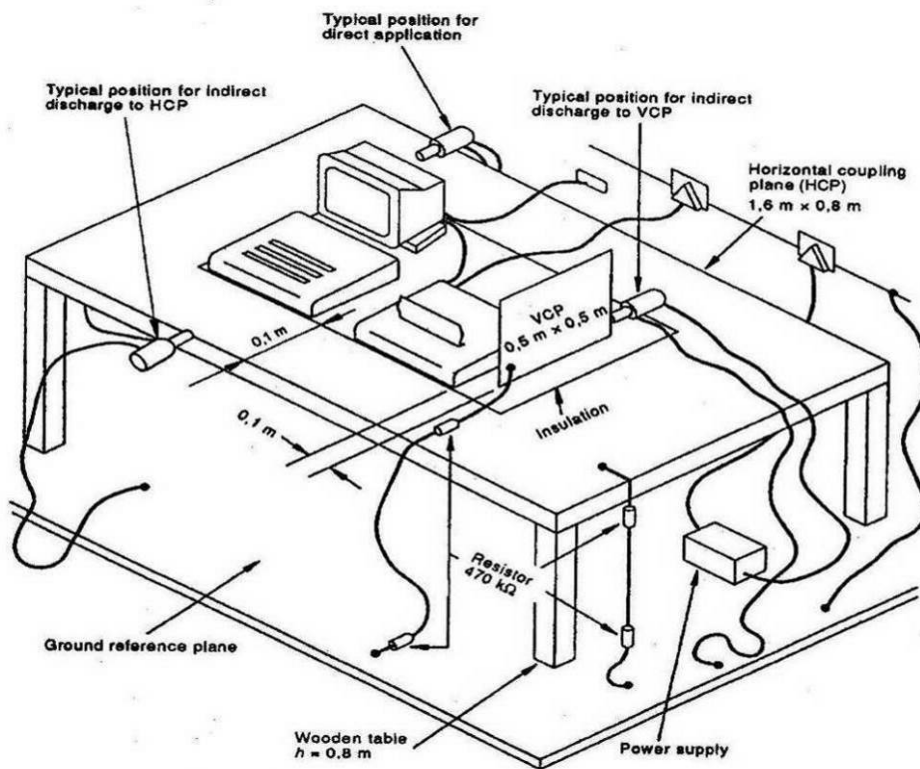
#### 3.5.2 Performance criteria:

Refer to EN 301 489-1 Section 9.3.3.

#### 3.5.3 Test Instruments:

Refer to section 1.7 in this report

#### 3.5.4 Test SET-UP (Block Diagram of Configuration)





| Air Discharge            |   |                          |   |                          |   |                          |                          |
|--------------------------|---|--------------------------|---|--------------------------|---|--------------------------|--------------------------|
| Test Levels              |   |                          |   |                          |   | Results                  |                          |
| ±2kV                     | Performance Criterion   | ±4kV                     | Performance Criterion   | ± 8kV                    | Performance Criterion   | Pass                     | Fail                     |
| <input type="checkbox"/> | <input type="checkbox"/> A <input type="checkbox"/> B<br><input type="checkbox"/> C | <input type="checkbox"/> | <input type="checkbox"/> A <input type="checkbox"/> B<br><input type="checkbox"/> C | <input type="checkbox"/> | <input type="checkbox"/> A <input type="checkbox"/> B<br><input type="checkbox"/> C | <input type="checkbox"/> | <input type="checkbox"/> |

| Contact Discharge                   |  |                                     |  |                          |   |                                     |                          |
|-------------------------------------|--|-------------------------------------|--|--------------------------|---|-------------------------------------|--------------------------|
| Test Levels                         |  |                                     |  |                          |   | Results                             |                          |
| ±2kV                                | Performance Criterion  | ±4kV                                | Performance Criterion  | ± 6kV                    | Performance Criterion   | Pass                                | Fail                     |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> A <input type="checkbox"/> B<br><input type="checkbox"/> C | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> A <input type="checkbox"/> B<br><input type="checkbox"/> C | <input type="checkbox"/> | <input type="checkbox"/> A <input type="checkbox"/> B<br><input type="checkbox"/> C | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

| Discharge To VCP                    |  |                                     |  |                          |   |                                     |                          |
|-------------------------------------|--|-------------------------------------|--|--------------------------|---|-------------------------------------|--------------------------|
| Test Levels                         |  |                                     |  |                          |   | Results                             |                          |
| ±2kV                                | Performance Criterion  | ±4kV                                | Performance Criterion  | ± 6kV                    | Performance Criterion   | Pass                                | Fail                     |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> A <input type="checkbox"/> B<br><input type="checkbox"/> C | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> A <input type="checkbox"/> B<br><input type="checkbox"/> C | <input type="checkbox"/> | <input type="checkbox"/> A <input type="checkbox"/> B<br><input type="checkbox"/> C | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

| Discharge To HCP                    |  |                                     |  |                          |   |                                     |                          |
|-------------------------------------|--|-------------------------------------|--|--------------------------|---|-------------------------------------|--------------------------|
| Test Levels                         |  |                                     |  |                          |   | Results                             |                          |
| ±2kV                                | Performance Criterion  | ±4kV                                | Performance Criterion  | ± 6kV                    | Performance Criterion   | Pass                                | Fail                     |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> A <input type="checkbox"/> B<br><input type="checkbox"/> C | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> A <input type="checkbox"/> B<br><input type="checkbox"/> C | <input type="checkbox"/> | <input type="checkbox"/> A <input type="checkbox"/> B<br><input type="checkbox"/> C | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

**Remark:**

A: No degradation in the performance of the EUT was observed.

**3.6 Radio Frequency Electromagnetic Field (80MHz to 6GHz) Measurement. Refer to EN 301 489-1 Section 9.2**

**3.6.1 Test Method and Procedure:**

EN 61000-4-3 and EN 301 489-1 Section 9.2.2.

**3.6.2 Performance criteria:**

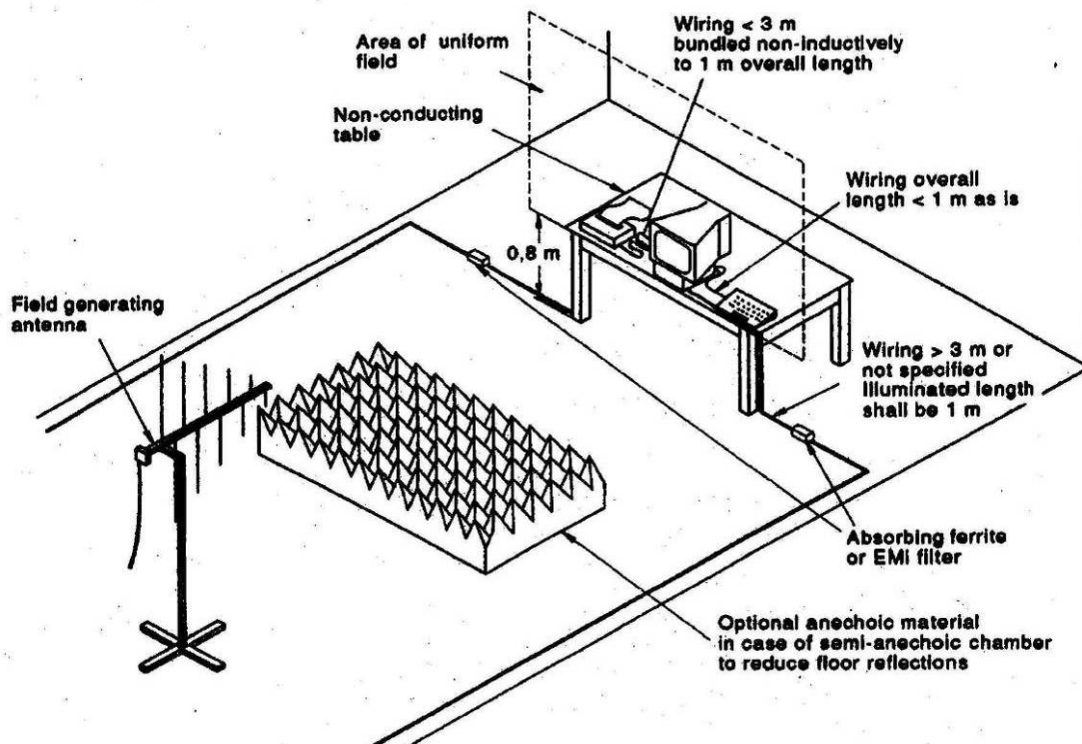
Refer to EN 301 489-1 Section 9.2.3.

**3.6.3 Test Instruments:**

Refer to section 1.7 in this report

**3.6.4 Test SET-UP (Block Diagram of Configuration):**

Test setup:



**3.6.5 Measurement Result:**

Refer to below for results.

### 3.6.6 Measurement Data:

|                 |          |            |          |
|-----------------|----------|------------|----------|
| Operation Mode: | Config 1 | Test Date: | 2022/2/7 |
| Temperature:    | 21 °C    | Humidity:  | 55 %     |
|                 |          | Test By:   | Jason    |

Basic Standard : EN 61000-4-3  
 Frequency range : 80 to 6000MHz  
 Field strength : 3 V/m  
 Modulation : AM 80%, 1 kHz Sinewave  
 Frequency step : 1 % of fundamental  
 Polarity of Antenna : Horizontal and Vertical  
 Test distance : 3 m (EUT to antenna reference point)

| No. | Frequency (MHz) | Antenna Orientation | Observation  | EUT Orientation |
|-----|-----------------|---------------------|--|-----------------|
| 1   | 80 - 6000       | Vertical/Horizontal | CT, CR and A, the EUT to be continuously received with no timeouts | 0 degree        |
| 2   | 80 - 6000       | Vertical/Horizontal |  | 90 degree       |
| 3   | 80 - 6000       | Vertical/Horizontal |  | 180 degree      |
| 4   | 80 - 6000       | Vertical/Horizontal |  | 270 degree      |

**Remark:**

A : No degradation in the performance of the EUT was observed.  
 N/A : Not Applicable.



**3.7 Fast Transients, Common Mode Measurement. Refer to EN 301 489-1 Section 9.4**

**3.7.1 Test Method and Procedure:**

EN 61000-4-4, and EN 301 489-1 Section 9.4.2.

**3.7.2 Performance criteria:**

Refer to EN 301 489-1 Section 9.4.3.

**3.7.3 Test Instruments**

Refer to section 1.7 in this report

**3.7.4 Test SET-UP (Block Diagram of Configuration):**

Refer to Appendix 2 setup photo

**3.7.5 Measurement Result:**

N/A

**3.8 Surges Measurement. Refer to EN 301 489-1 Section 9.8**

**3.8.1 Test Method and Procedure:**

EN 61000-4-5, and EN 301 489-1 Section 9.8.2.

**3.8.2 Performance criteria:**

Refer to EN 301 489-1 Section 9.8.3.

**3.8.3 Test Instruments:**

Refer to section 1.7 in this report

**3.8.4 Test SET-UP (Block Diagram of Configuration):**

Refer to Appendix 2 setup photo

**3.8.5 Measurement Result:**

N/A

**3.9 Radio Frequency, Common Mode Measurement. Refer to EN 301 489-1 Section 9.5**

**3.9.1 Test Method and Procedure:**

EN 61000-4-6, and EN 301 489-1 Section 9.5.2.

**3.9.2 Performance criteria:**

Refer to EN 301 489-1 Section 9.5.3.

**3.9.3 Test Instruments:**

Refer to section 1.7 in this report

**3.9.4 Test SET-UP (Block Diagram of Configuration):**

Refer to Appendix 2 setup photo

**3.9.5 Measurement Result:**

N/A

### 3.10 Transients and surges in the vehicular environment measurement. Refer to EN 301 489-1 Section 9.6

#### 3.10.1 Test Method and Procedure:

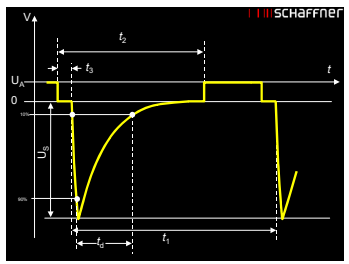
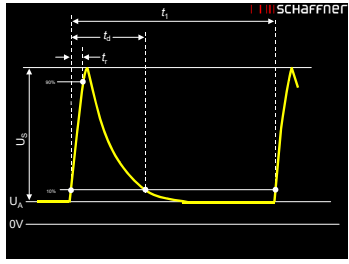
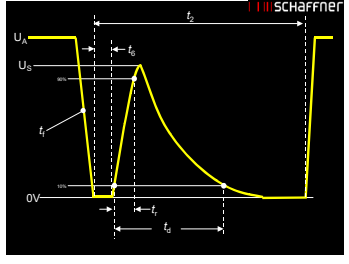
Refer to ISO 7637-2 for 12Vdc and 24Vdc equipment. , and EN 301 489-1 Section 9.6.2.

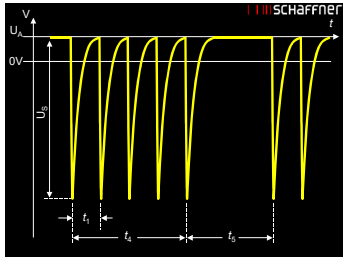
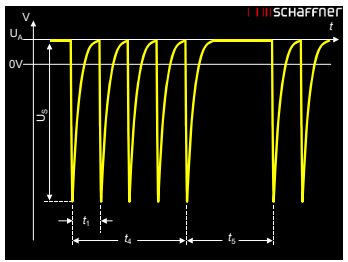
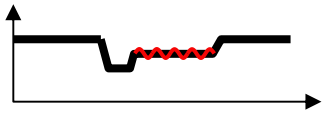
#### 3.10.2 Performance criteria:

Refer to EN 301 489-1 Section 9.6.3.

#### 3.10.3 Test Instruments:

Refer to section 1.7 in this report

| Pulse                        | Us/Vs | Ri       | Test parameters                    | Delay  | Figure  |
|------------------------------|-------|----------|------------------------------------|--------|---|
| ISO 7637-2 (2004) – Pulse 1  | -450V | 50.0 Ohm | td = 1.0ms, t1 = 2.5s, t2 = 200.0m | 0.0 s  |   |
| ISO 7637-2 (2004) – Pulse 2A | 37.5V | 2.0 Ohm  | td = 50.0us, t1 = 3.0s             | 0.0 s  |  |
| ISO 7637-2 (2004) – Pulse 2B | 20.0V | 0.0 Ohm  | td = 1.0s                          | 60.0 s |  |

|                              |       |          |  |        |   |
|------------------------------|-------|----------|--|--------|---|
| ISO 7637-2 (2004) – Pulse 3A | -150V | 50.0 Ohm | t1 = 100.0us, t4 = 10.0ms, t5 = 90.0ms                                       | 0.0 s  |  |
| ISO 7637-2 (2004) – Pulse 3B | 150V  | 50.0 Ohm | t1 = 100.0us, t4 = 10.0ms, t5 = 90.0ms                                       | 0.0 s  |  |
| ISO 7637-2 (2004) – Pulse 4  | -12V  | 0.0 Ohm  | Ua = -5.0V, t7 = 70.0ms, t8 = 30.0ms, t9 = 10.0s, t10 = 10.0ms, t11 = 50.0ms | 60.0 s |  |

### 3.10.4 Test SET-UP (Block Diagram of Configuration):

Refer to Appendix 2 setup photo.

### 3.10.5 Measurement Result:

N/A.

**3.11 Voltage Dips and Interruptions Measurement. Refer to EN 301 489-1 Section 9.7**

**3.11.1 Test Method and Procedure:**

EN 61000-4-11, and EN 301 489-1 Section 9.7.2.

**3.11.2 Performance criteria:**

Refer to EN 301 489-1 Section 9.7.3.

**3.11.3 Test Instruments**

Refer to section 1.7 in this report

**3.11.4 Test SET-UP:**

Refer to Appendix 2 setup photo

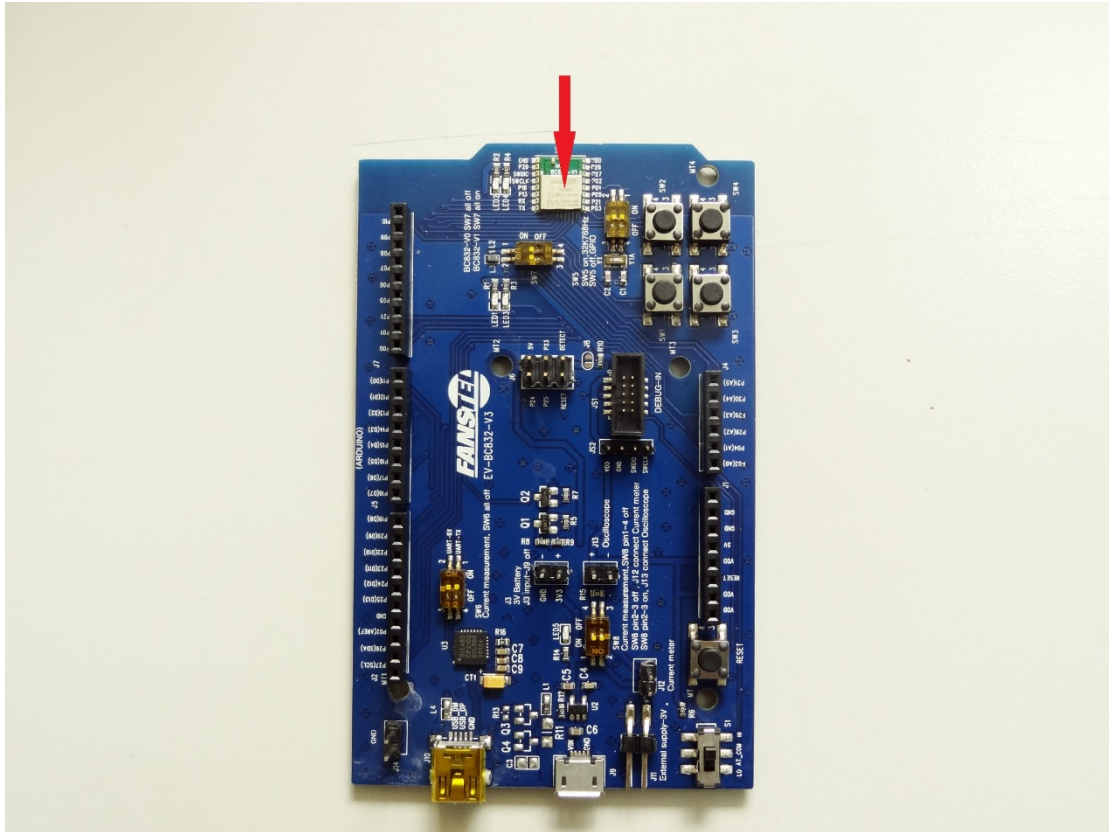
**3.11.5 Measurement Result:**

N/A

# APPENDIX 1

## ESD TEST POINT

*Photo 1*

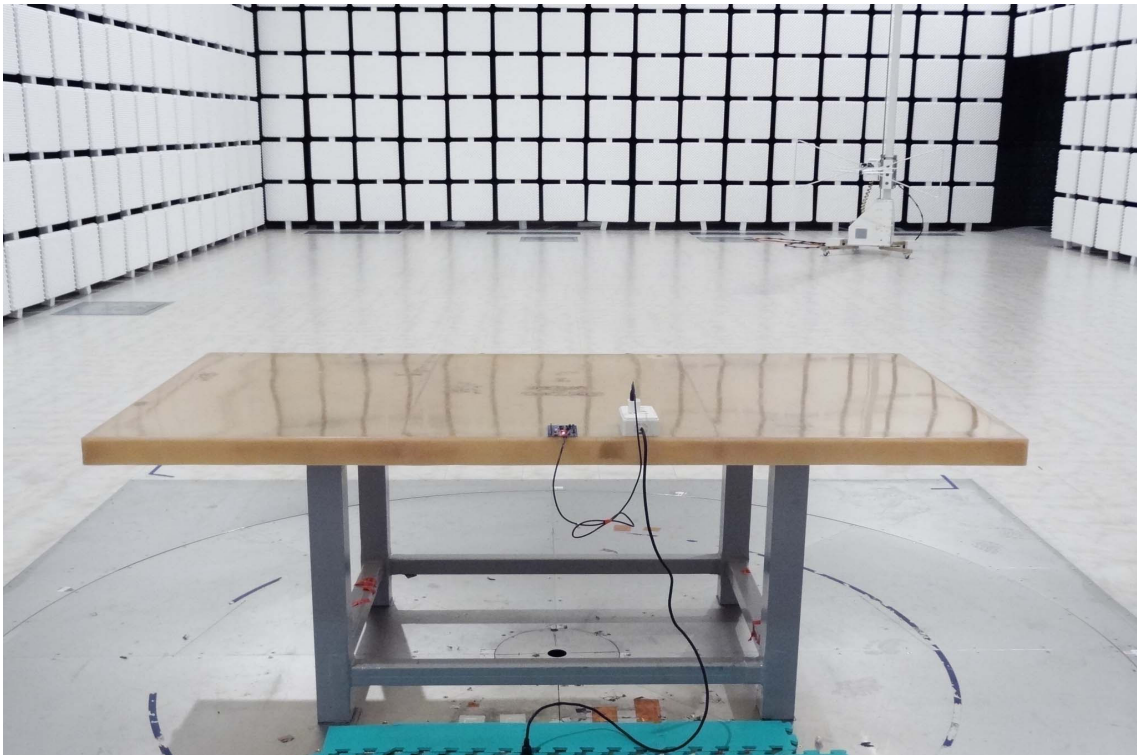
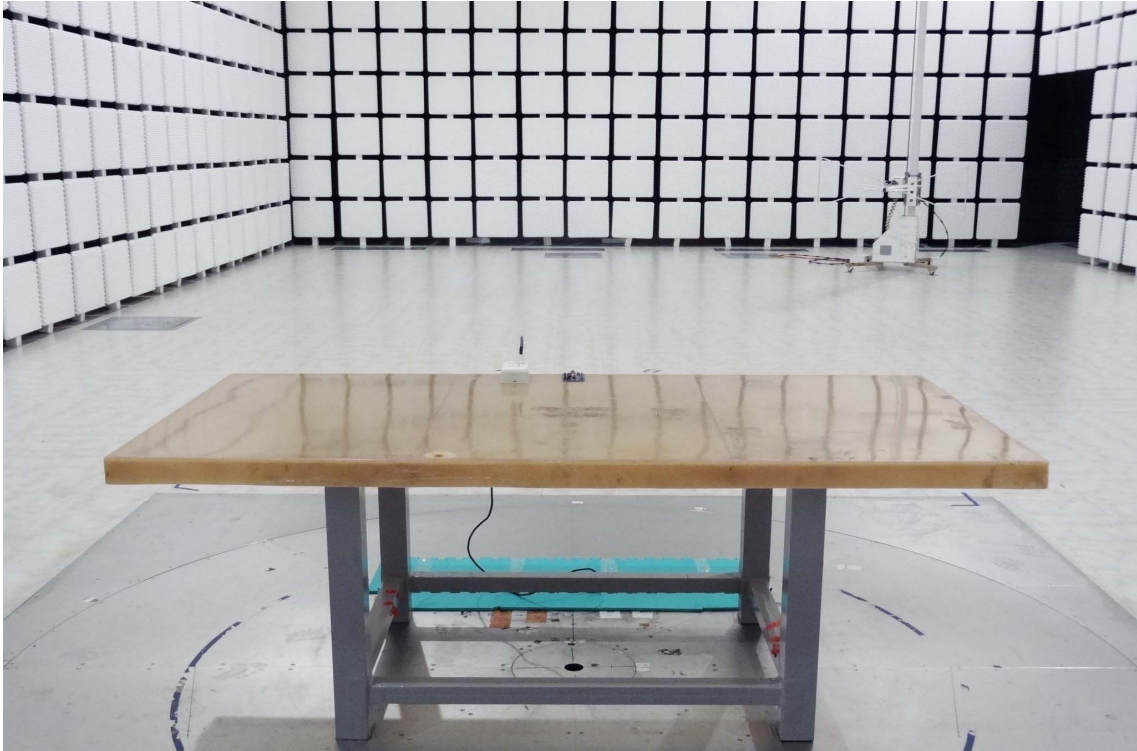


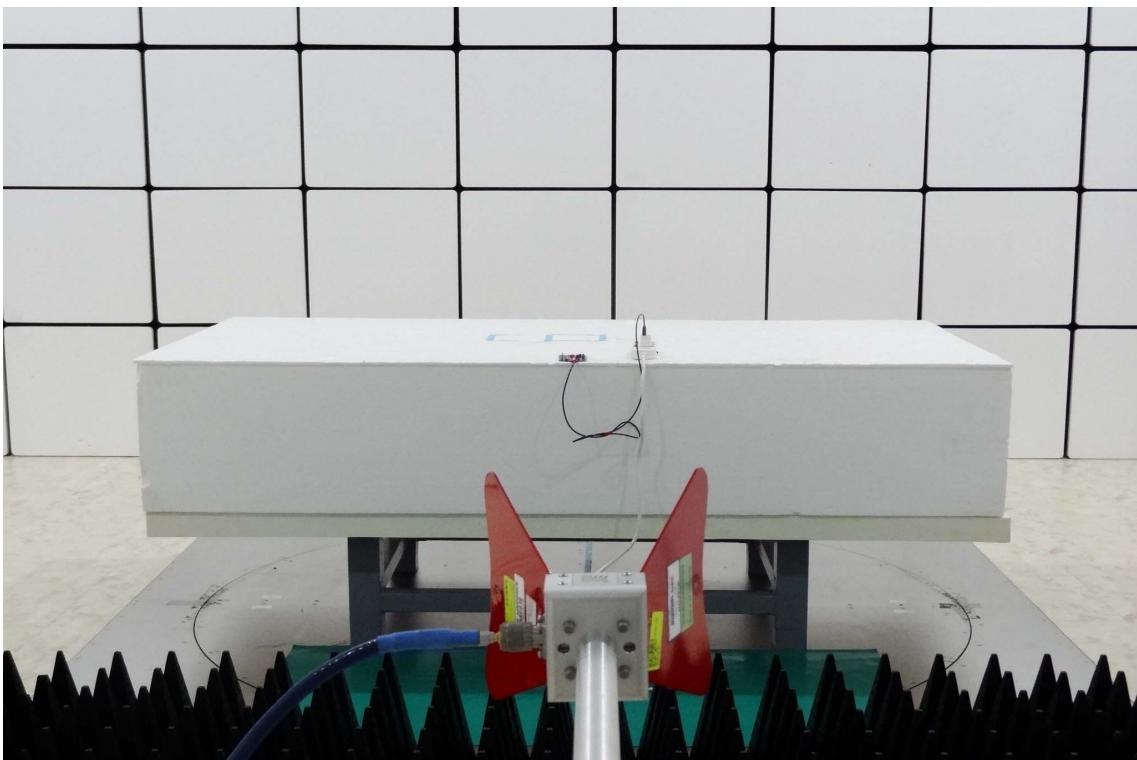
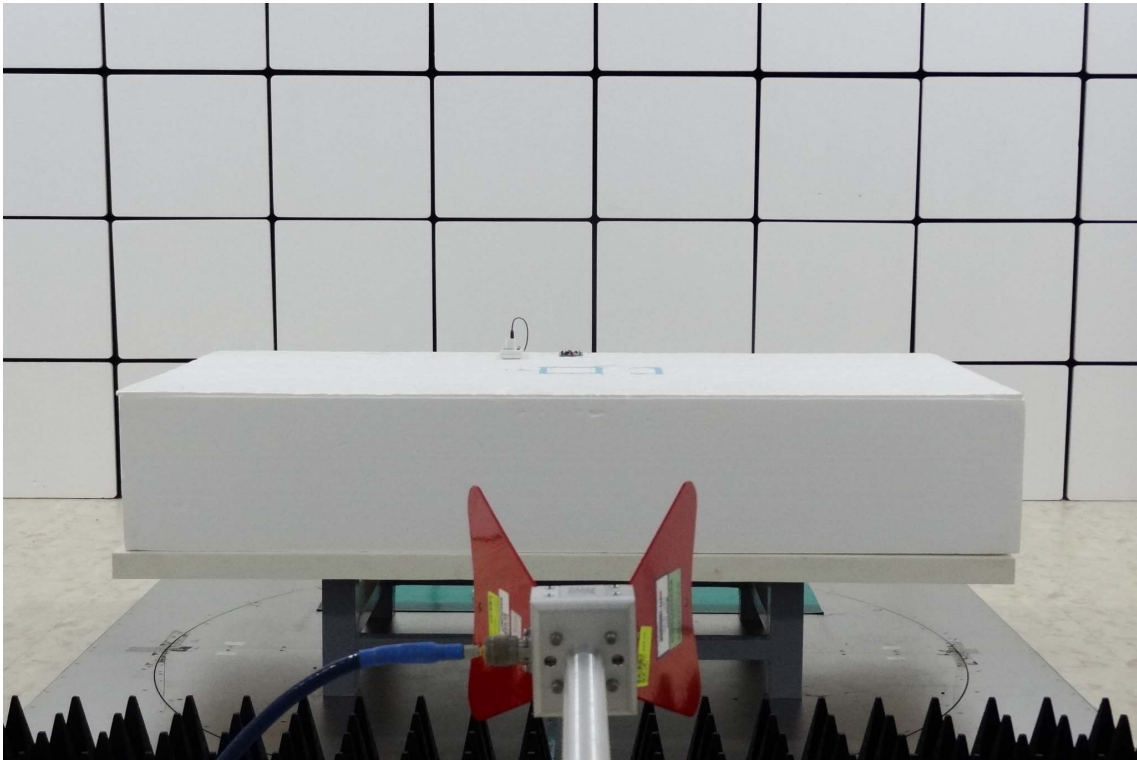


## **APPENDIX 2**

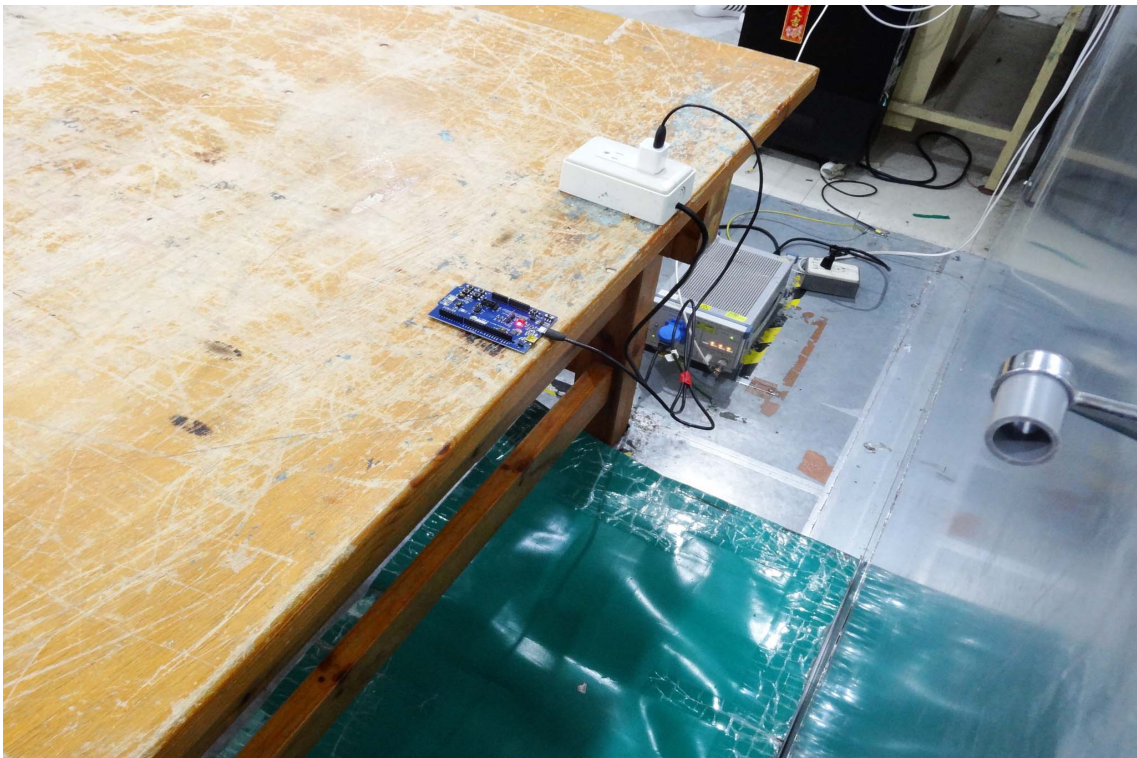
# **PHOTOGRAPHS OF TEST SETUP**

**RADIATED EMISSION TEST**





**AC POWER LINE CONDUCTED EMISSION TEST**



**ELECTROSTATIC DISCHARGE TEST (EN 61000-4-2) Config 1**



**RADIATED ELECTROMAGNETIC FIELD (EN 61000-4-3) Config 1**



## **APPENDIX 3**

# **PHOTOGRAPHS OF EUT**

*EUT 1*



*EUT 2*



***EUT 3***

