# TEST REPORT

of

## EN 55032 / CISPR 32 / BS EN 55032
## AS/NZS CISPR 32 Class B
## EN 55035 / CISPR 35 / BS EN 55035 IMMUNITY
## EN IEC 61000-3-2 / BS EN IEC 61000-3-2
## EN 61000-3-3 / BS EN 61000-3-3

| | |
|---|---|
| Product: | **M.2 PCIe SSD** |
| Main Model: | **PV16E-M2110** |
| Brand: | **Apacer Technology Inc.** |
| Applicant: | **Apacer Technology Inc.** |
| Address: | **1F., No.32, Zhongcheng Rd., Tucheng Dist., New Taipei City 236, Taiwan , R.O.C.** |

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-23LE0516CE35-MA**
Issue Date : **October 26, 2023**

Testing Laboratory
0997

## Contents of Report

# 1. General

## 1.1 Certification of Accuracy of Test Data

| | |
|---|---|
| **Standards:** | Please refer to 1.2 |
| **Equipment Tested:** | M.2 PCIe SSD |
| **Main Model:** | PV16E-M2110 |
| **Brand:** | Apacer Technology Inc. |
| **Applicant:** | Apacer Technology Inc. |
| **Sample received Date:** | September 11, 2023 |
| **Final test Date:** | EMI: refer to the date of test data<br>EMS: September 19, 2023 |
| **Test Site:** | Chamber 02; Chamber 14; Conduction 02; Immunity 02 |
| **Test Distance:** | 10m; 3m (above 1GHz) (EMI test) |
| **Temperature:** | refer to each site test data |
| **Humidity:** | refer to each site test data |
| **Atmospheric Pressure:** | 86 kPa to 106 kPa |
| **Input power:** | Conduction input power: AC 230 V / 50 Hz<br>Radiation input power: AC 230 V / 50 Hz<br>Immunity input power: AC 230 V / 50 Hz |
| **Test Result:** | **PASS** |
| **Report Engineer:** | Jayla Lu |
| **Test Engineer:** | Jovi Liu |
| **Approved By:** | Angus Chu / Sr. Manager |

## 1.2 Test Standards

The tests which this report describes were conducted by an independent electromagnetic compatibility consultant, International Standards Laboratory Corp. in accordance with the following

EN 55032:2015+A11:2020 and EN 55032:2015+A1:2020 and CISPR 32:2015+A1:2019 and BS EN 55032:2015+A11:2020 and BS EN 55032:2015+A1:2020 Class B Electromagnetic compatibility of multimedia equipment - Emission requirements.
AS/NZS CISPR 32:2015+A1:2020 Class B Electromagnetic compatibility of multimedia equipment- Emission requirements

| Performed Item | Test Performed | Deviation | Result |
|---|---|---|---|
| Conducted emissions from the AC mains power ports | Yes | No | PASS |
| Telecommunication Port Conducted Emissions (asymmetric mode) | N/A | N/A | N/A |
| Radiated emissions at frequencies below 1 GHz | Yes | No | PASS |
| Radiated emissions at frequencies above 1 GHz | Yes | No | PASS |
| Radiated emissions from FM receivers | N/A | N/A | N/A |
| Voltage Disturbance Emissions at Antenna Terminals | N/A | N/A | N/A |
| Differential voltage emissions | N/A | N/A | N/A |
| Outdoor units of home satellite receiving systems | N/A | N/A | N/A |

EN 55035:2017+A11:2020 and CISPR 35:2016 modified and BS EN 55035: 2017+A11:2020 Electromagnetic compatibility of multimedia equipment - Immunity requirements.

| Standard | Description | Results | Criteria |
|---|---|---|---|
| EN 61000-4-2:2009<br>IEC 61000-4-2:2008<br>BS EN 61000-4-2:2009 | Electrostatic discharge immunity | Pass | B |
| EN IEC 61000-4-3:2020<br>IEC 61000-4-3:2020<br>BS EN IEC 61000-4-3:2020 | Radiated, radio-frequency, electromagnetic field immunity | Pass | A |
| EN 61000-4-4:2012<br>IEC 61000-4-4:2012<br>BS EN 61000-4-4:2012 | Electrical fast transient/burst immunity | Pass | B |
| EN 61000-4-5:2014+A1:2017<br>IEC 61000-4-5:2014+A1:2017<br>BS EN 61000-4-5:2014+A1:2017 | Surge immunity | Pass | B |
| EN 61000-4-6:2014+AC:2015<br>IEC 61000-4-6:2013<br>BS EN 61000-4-6:2014 | Immunity to conducted disturbances | Pass | A |
| EN 61000-4-8:2010<br>IEC 61000-4-8:2009<br>BS EN 61000-4-8:2010 | Power frequency magnetic field immunity | Pass | A |
| EN IEC 61000-4-11:2020+AC:2022<br>IEC 61000-4-11:2020+COR2:2022<br>BS EN IEC 61000-4-11:2020+AC:2022 | Voltage dips, short interruptions and voltage variations immunity | | |
| | >95% in 0.5 cycle | Pass | B |
| | 30% in 25 cycle | Pass | C |
| | >95% in 250 cycle | Pass | C |

| Standard | Description | Results |
|---|---|---|
| EN 61000-3-2:2014<br>IEC 61000-3-2:2014<br>EN IEC 61000-3-2:2019+A1:2021<br>IEC 61000-3-2:2018+A1:2020<br>BS EN IEC 61000-3-2:2019+A1:2021 | Limits for harmonic current emissions (equipment input current ≤ 16A per phase) | Pass |
| EN 61000-3-3:2013<br>IEC 61000-3-3:2013<br>EN 61000-3-3:2013+A2:2021+AC:2022<br>IEC 61000-3-3:2013+A2:2021+COR1:2022<br>BS EN 61000-3-3:2013+A2:2021+AC:2022 | Limits for voltage fluctuations and flicker in low-voltage supply systems (equipment with input current ≤ 16 A per phase) | Pass |

### 1.2.1 Performance Criteria for Compliance: EN 55035 and BS EN 55035

**Performance criterion A**
The equipment shall continue to operate as intended without operator intervention. No degradation of performance, loss of function or change of operating state is allowed below a performance level specified by the manufacturer when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

**Performance criterion B**
During the application of the disturbance, degradation of performance is allowed. However, no unintended change of actual operating state or stored data is allowed to persist after the test.

After the test, the equipment shall continue to operate as intended without operator intervention; no degradation of performance or loss of function is allowed, below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance.

If the minimum performance level (or the permissible performance loss), or recovery time, is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

**Performance criterion C**
Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. A reboot or re-start operation is allowed.

Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

## 1.3 Description of EUT

# EUT

**This report test data using the report number ISL-23LE0516CE35**

| | |
|---|---|
| Product Name | M.2 PCIe SSD |
| Condition | Pre-Production |
| Main Model | PV16E-M2110 |
| Control IC | PS5018 |
| PCB Number | Q205018HE008401G;<br>Q205018HE00840XX-XXXXX(X=0~9;A~Z) |
| Memory Capacity | 1GB~8TB |
| Power Supply | From Personal Computer Support |
| Maximum Operating Frequency | 8GHz |

The memory capacities listed below is chosen by the applicant to be the representative configuration for testing in this report.

**Test configuration:**

| Configuration | Control IC | PCB Number | Memory Capacity |
|---|---|---|---|
| 1 | PS5018 | Q205018HE008401G | 8TB |

**EMI Noise Source:**

| Refer to the photo | Crystal | Point |
|---|---|---|
| EUT-4 | 25MHz | Y1 |

**EMI Solution**

**N/A**

## 1.4 Description of Support Equipment

**For EMI test Configuration Support unit: 1~6**
**For EMS test Configuration Support unit: 4~9**

| No | Unit | Model / Serial No. | Brand | Power Cord | FCC ID |
|---|---|---|---|---|---|
| 1 | USB Keyboard | KB216<br>S/N: N/A | DELL | N/A | FCC<br>DOC |
| 2 | USB Mouse | MS116<br>S/N: N/A | DELL | N/A | FCC<br>DOC |
| 3 | Type-C HDD | My Passport Ultra<br>S/N: N/A | WD | N/A | FCC<br>DOC |
| 4 | LCD Monitor | P2416D<br>S/N: N/A | DELL | Non-shielded | FCC<br>DOC |
| 5 | Printer | C930<br>S/N: N/A | HP | Non-shielded | FCC<br>DOC |
| 6 | Personal Computer | B550<br>S/N: N/A | Gigabyte | Non-shielded | FCC<br>DOC |
| 7 | USB Keyboard | SK-8115<br>S/N: N/A | DELL | N/A | FCC<br>DOC |
| 8 | USB Mouse | MS111-P<br>S/N: N/A | DELL | N/A | FCC<br>DOC |
| 9 | Type-C HDD | SK2-U31AS-AKT<br>S/N: N/A | AKiTiO | N/A | FCC<br>DOC |

### 1.5 Software for Controlling Support Unit

Test programs exercising various part of EUT were used. The programs were executed as follows:

1. PC running Winthrax to read and write the EUT.
2. Send signal to the Printer through PC USB Port.
3. Read and write Type-C HDD through PC USB 3.0 Port.
4. Send Color Bar to the LCD Monitor through PC HDMI Port.
5. Repeat the above steps.

| | Filename | Version |
|---|---|---|
| EUT | Winthrax | 3.09.02 |
| LCD Monitor | Windows Media Player | 12.0 |
| Printer | IntelEMC | 1.1 |
| Type-C HDD | IntelEMC | 1.1 |

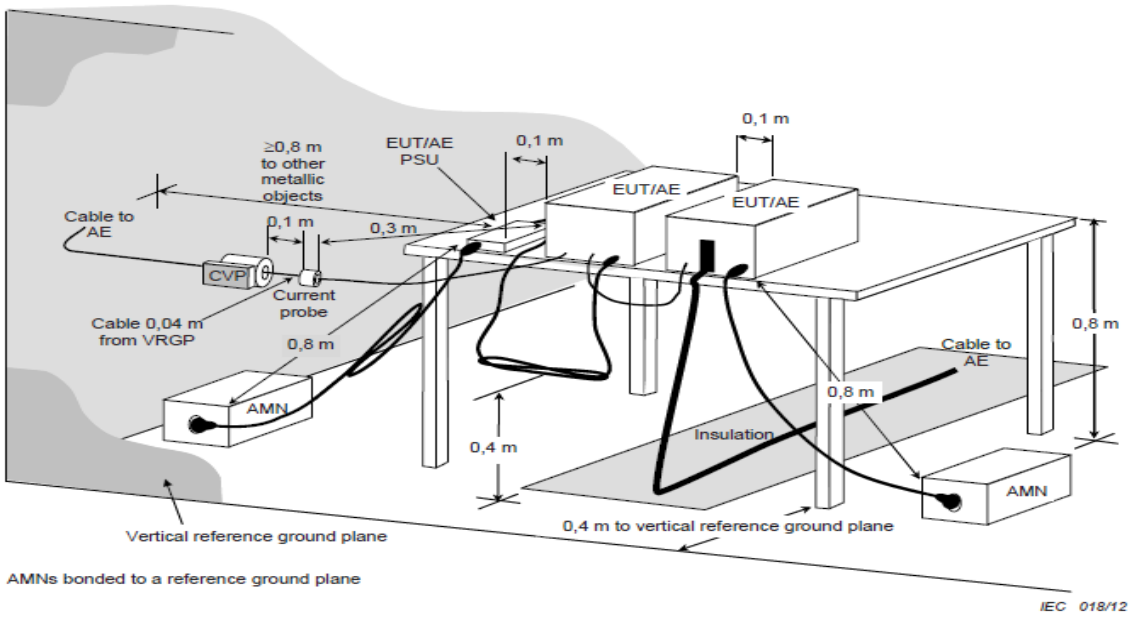
## 1.6 I/O Cable Condition of EUT and Support Units

| Description | Path | Length | Shielding | Core | Remark |
|---|---|---|---|---|---|
| AC Power Cable | 100V (~240V) to PC SPS | 1.8m | No | No | |
| HDMI Cable | LCD Monitor HDMI Port to PC HDMI Port | 1.8m | Yes | No | |
| USB Keyboard Data Cable | USB Keyboard to PC USB 3.0 Port | 1.8m | Yes | Yes | |
| USB Mouse Data Cable | USB Mouse to PC USB 3.0 Port | 1.8m | Yes | Yes | |
| Printer Data Cable | Printer to PC USB Port | 1.8m | Yes | No | |
| USB data cable | Type-C HDD to PC USB 3.0 port | 1.5m | Yes | No | |

# 2. Power Main Port Conducted Emissions

## 2.1 Test Setup and Procedure

### 2.1.1 Test Setup




### 2.1.2 Test Procedure

The measurements are performed in a shielded room test site. The EUT was placed on non-conduction 1.0m x 1.5m table, which is 0.8 meters above an earth-grounded.

Power to the EUT was provided through the AMN which has the Impedance (50ohm/50uH) vs. Frequency Characteristic in accordance with the standard. Power to the AMNs were filtered to eliminate ambient signal interference and these filters were bonded to the ground plane. Peripheral equipment required to provide a functional system (support equipment) for EUT testing was powered from the second AMN through a ganged, metal power outlet box which is bonded to the ground plane at the AMN.

The interconnecting cables were arranged and moved to get the maximum measurement. Both the line of power cord, live and neutral, were measured. All of the interface cables were manipulated according to EN 55032 / BS EN 55032 requirements.

The highest emissions were analyzed in details by operating the spectrum analyzer in fixed tuned mode to determine the nature of the emissions and to provide information which could be useful in reducing their amplitude.

### 2.1.3 EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested)

| | |
|---|---|
| Frequency Range: | 150kHz--30MHz |
| Detector Function: | Quasi-Peak / Average Mode |
| Resolution Bandwidth: | 9kHz |

### 2.1.4 Limit

**Conducted emissions from the AC mains power ports of Class_A equipment**:

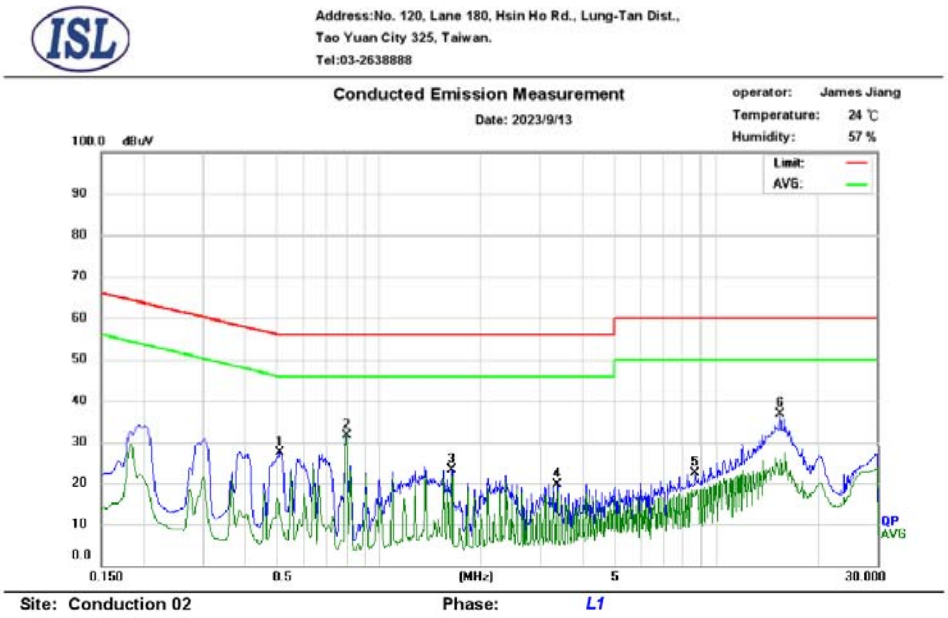
| Frequency | QP | AV |
|---|---|---|
| MHz | dB(μV) | dB(μV) |
| 0.15-0.50 | 79 | 66 |
| 0.50-30 | 73 | 60 |
| Note: The lower limit shall apply at the transition frequencies | | |

**Conducted emissions from the AC mains power ports of Class_B equipment:**

| Frequency | QP | AV |
|---|---|---|
| MHz | dB(μV) | dB(μV) |
| 0.15-0.50 | 66-56 | 56-46 |
| 0.50-5.0 | 56 | 46 |
| 5.0-30 | 60 | 50 |
| Note: The lower limit shall apply at the transition frequencies | | |

## 2.2 Conduction Test Data: Configuration 1

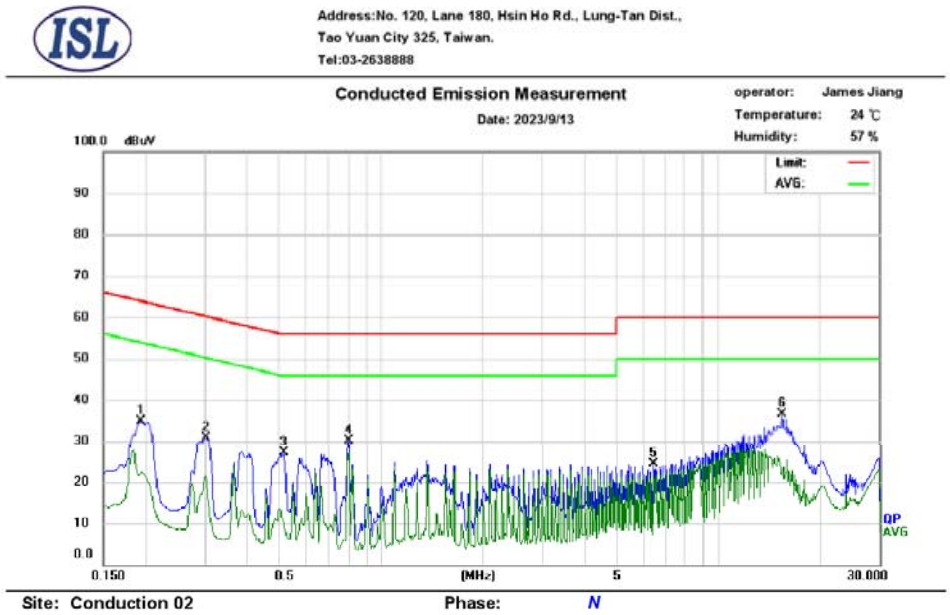
**-Live**




| 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 | 0.508 | 17.81 | 2.25 | 9.65 | 27.46 | 56.00 | -28.54 | 11.90 | 46.00 | -34.10 |
| 2* | 0.800 | 22.06 | 21.44 | 9.67 | 31.73 | 56.00 | -24.27 | 31.11 | 46.00 | -14.89 |
| 3 | 1.644 | 13.53 | 11.92 | 9.71 | 23.24 | 56.00 | -32.76 | 21.63 | 46.00 | -24.37 |
| 4 | 3.381 | 9.93 | 8.27 | 9.75 | 19.68 | 56.00 | -36.32 | 18.02 | 46.00 | -27.98 |
| 5 | 8.682 | 12.64 | 8.23 | 9.85 | 22.49 | 60.00 | -37.51 | 18.08 | 50.00 | -31.92 |
| 6 | 15.486 | 27.01 | 15.75 | 9.91 | 36.92 | 60.00 | -23.08 | 25.66 | 50.00 | -24.34 |

Note:
Margin = QP/AVG Emission - Limit
QP/AVG Emission = QP_R/AVG_R + Correct Factor
Correct Factor = LISN Loss + Cable Loss
A margin of -8dB means that the emission is 8dB below the limit

**- Neutral**




| 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 | 0.193 | 25.35 | 12.71 | 9.63 | 34.98 | 63.92 | -28.94 | 22.34 | 53.92 | -31.58 |
| 2 | 0.303 | 21.15 | 10.16 | 9.64 | 30.79 | 60.16 | -29.37 | 19.80 | 50.16 | -30.36 |
| 3 | 0.514 | 17.49 | 0.52 | 9.65 | 27.14 | 56.00 | -28.86 | 10.17 | 46.00 | -35.83 |
| 4* | 0.800 | 20.38 | 17.48 | 9.67 | 30.05 | 56.00 | -25.95 | 27.15 | 46.00 | -18.85 |
| 5 | 6.398 | 14.52 | 12.20 | 9.81 | 24.33 | 60.00 | -35.67 | 22.01 | 50.00 | -27.99 |
| 6 | 15.488 | 26.69 | 13.41 | 9.97 | 36.66 | 60.00 | -23.34 | 23.38 | 50.00 | -26.62 |

Note:
Margin = QP/AVG Emission - Limit
QP/AVG Emission = QP_R/AVG_R + Correct Factor
Correct Factor = LISN Loss + Cable Loss
A margin of -8dB means that the emission is 8dB below the limit

## 2.3 Test Setup Photo

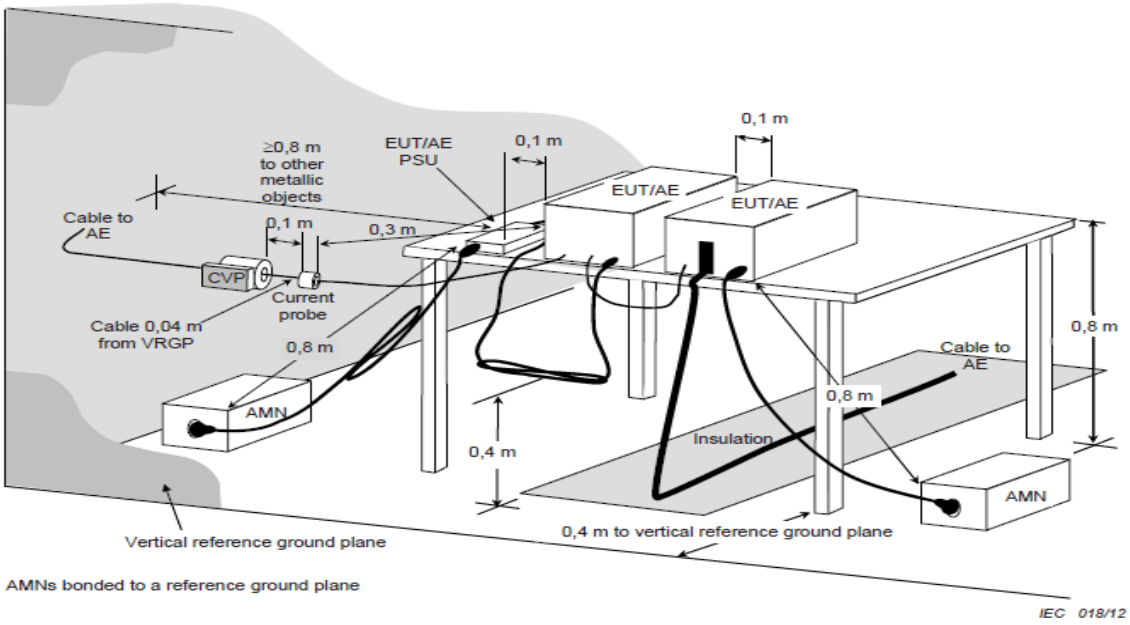
Front View

Back View

# 3. Telecommunication Port Conducted Emissions

## 3.1 Test Setup and Procedure

### 3.1.1 Test Setup




### 3.1.2 Test Procedure

The measurements are performed in a shielded room test site. The EUT was placed on non-conduction 1.0m x 1.5m table, which is 0.8 meters above an earth-grounded.

The EUT, any support equipment, and any interconnecting cables were arranged and moved to get the maximum measurement. All of the interface cables were manipulated according to EN 55032 / BS EN 55032 requirements.

The port of the EUT was connected to the support equipment through the AAN and linked in normal condition.

AC input power for the EUT & the support equipment power outlets were obtained from the same filtered source that provided input power to the AMN.

The highest emissions were analyzed in details by operating the spectrum analyzer in fixed tuned mode to determine the nature of the emissions and to provide information could be useful in reducing their amplitude.

### 3.1.3 EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested)

| | |
|---|---|
| Frequency Range: | 150kHz--30MHz |
| Detector Function: | Quasi-Peak / Average Mode |
| Resolution Bandwidth: | 9kHz |

### 3.1.4 Limit

**Asymmetric mode conducted emissions from Class_A equipment:**
**Applicable to**
1. wired network ports.
2. optical fiber ports with metallic shield or tension members.
3. antenna ports.

| Frequency range MHz | Coupling device | Detector type / bandwidth | Class_A voltage limits dB(μV) | Class_A current limits dB(μA) |
|---|---|---|---|---|
| 0.15-0.5 | AAN | Quasi Peak / 9 kHz | 97-87 | n/a |
| 0.5-30 | | | 87 | |
| 0.15-0.5 | AAN | Average / 9 kHz | 84-74 | |
| 0.5-30 | | | 74 | |
| 0.15-0.5 | CVP and current probe | Quasi Peak / 9 kHz | 97-87 | 53-43 |
| 0.5-30 | | | 87 | 43 |
| 0.15-0.5 | CVP and current probe | Average / 9 kHz | 84-74 | 40-30 |
| 0.5-30 | | | 74 | 30 |
| 0.15-0.5 | Current Probe | Quasi Peak / 9 kHz | n/a | 53-43 |
| 0.5-30 | | | | 43 |
| 0.15-0.5 | Current Probe | Average / 9 kHz | | 40-30 |
| 0.5-30 | | | | 30 |

**Asymmetric mode conducted emissions from Class_B equipment:**
**Applicable to:**
1. wired network ports.
2. optical fiber ports with metallic shield or tension members.
3. broadcast receiver tuner ports.
4. antenna ports.

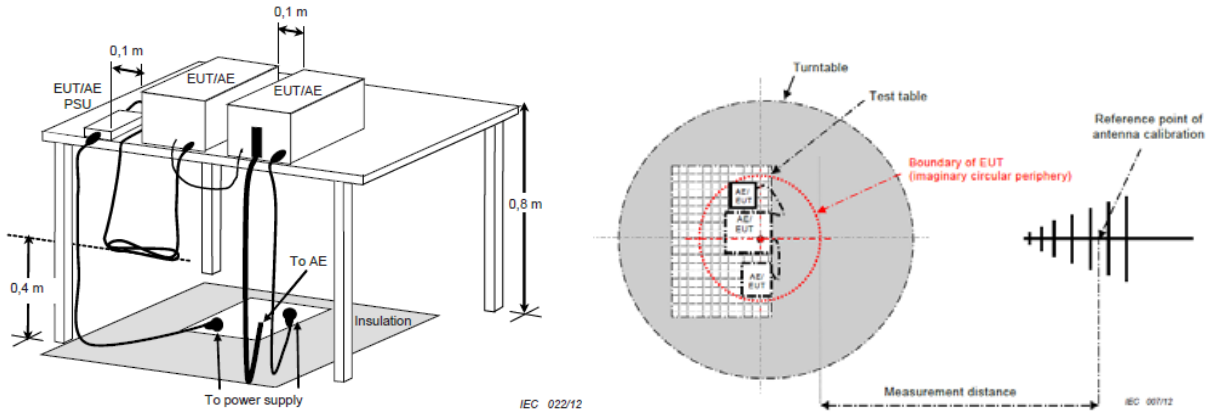
| Frequency range MHz | Coupling device | Detector type / bandwidth | Class_B voltage limits dB(μV) | Class_B current limits dB(μA) |
|---|---|---|---|---|
| 0.15-0.5 | AAN | Quasi Peak / 9 kHz | 84-74 | n/a |
| 0.5-30 | | | 74 | |
| 0.15-0.5 | AAN | Average / 9 kHz | 74-64 | |
| 0.5-30 | | | 64 | |
| 0.15-0.5 | CVP and current probe | Quasi Peak / 9 kHz | 84-74 | 40-30 |
| 0.5-30 | | | 74 | 30 |
| 0.15-0.5 | CVP and current probe | Average / 9 kHz | 74-64 | 30-20 |
| 0.5-30 | | | 64 | 20 |
| 0.15-0.5 | Current Probe | Quasi Peak / 9 kHz | n/a | 40-30 |
| 0.5-30 | | | | 30 |
| 0.15-0.5 | Current Probe | Average / 9 kHz | | 30-20 |
| 0.5-30 | | | | 20 |

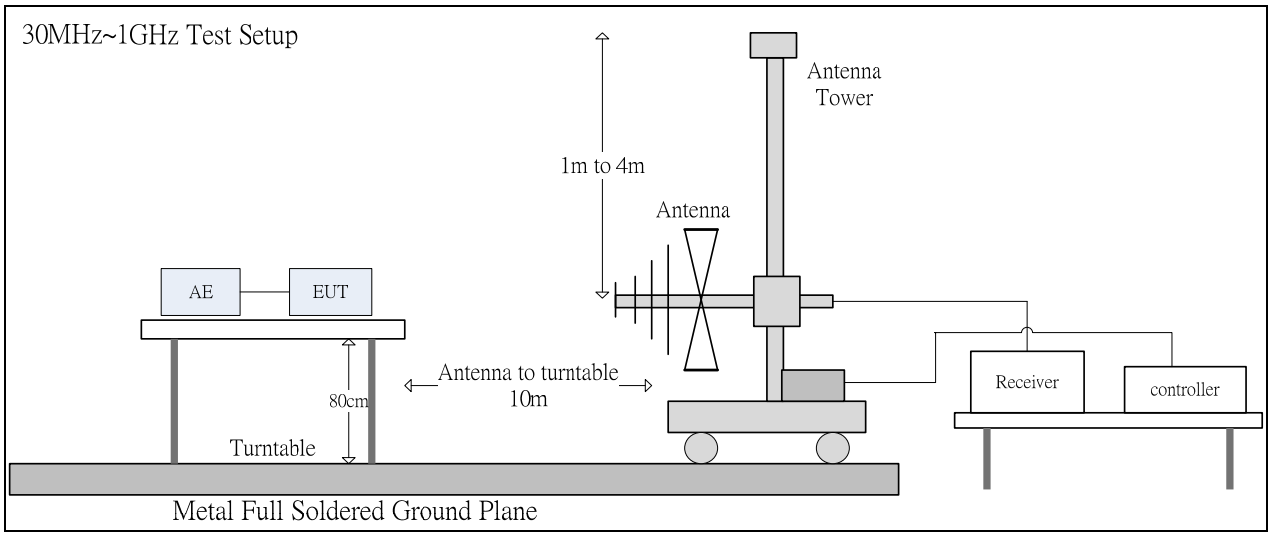
****Remarks: It is not necessary to be tested on this item.**

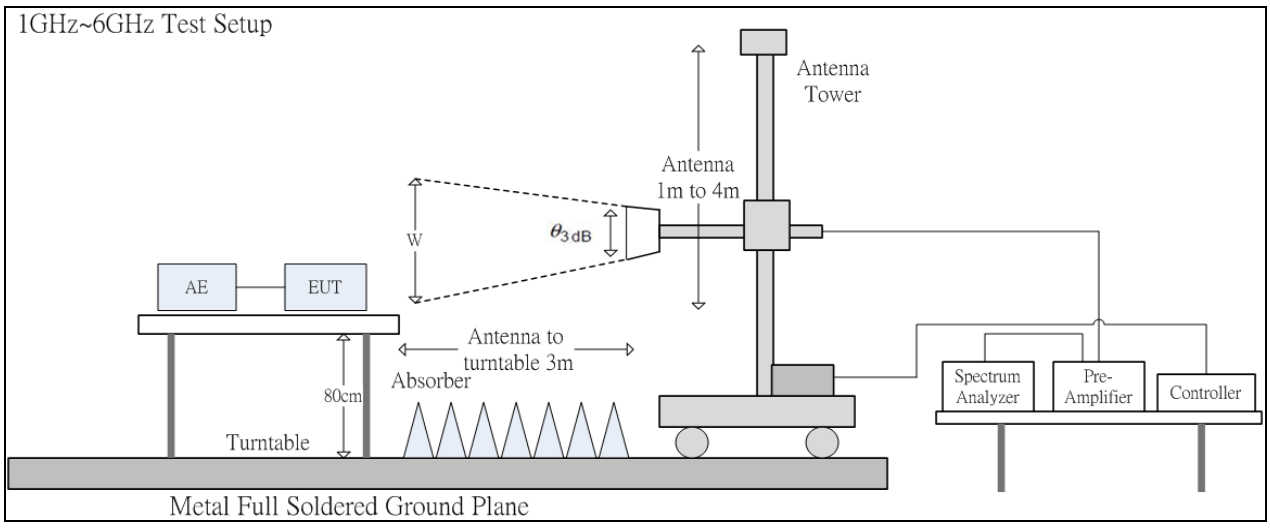
# 4. Radiated Disturbance Emissions

## 4.1 Test Setup and Procedure

### 4.1.1 Test Setup



The 3dB beam width of the horn antenna used for the test is as shown in the table below.

| Frequency (GHz) | E-plane | H-plane | $\theta_{3\,dB}$ (min) | d= 3 m |
|---|---|---|---|---|
| | | | | w (m) |
| 1 | 88° | 147° | 88° | 5.79 |
| 2 | 68° | 119° | 68° | 4.04 |
| 3 | 73° | 92° | 73° | 4.44 |
| 4 | 70° | 89° | 70° | 4.20 |
| 5 | 55° | 60° | 55° | 3.12 |
| 6 | 63° | 62° | 62° | 3.60 |

### 4.1.2 Test Procedure

The radiated emissions test will then be repeated on the chamber to measure the amplitudes accurately and without the multiple reflections existing in the shielded room. The EUT and support equipment are set up on the turntable of one of 10 meter chamber. Desktop EUT are set up on a FRP stand 0.8 meter above the ground or floor-standing arrangement shall be placed on the horizontal ground reference plane.

For the initial measurements, the receiving antenna is varied from 1-4 meter height and is changed in the vertical plane from vertical to horizontal polarization at each frequency. The highest emissions between 30 MHz to 1000 MHz were analyzed in details by operating the spectrum analyzer and/or EMI receiver in quasi-peak mode to determine the precise amplitude of the emissions. The highest emissions between 1 GHz to 6 GHz were analyzed in details by operating the spectrum analyzer in peak and average mode to determine the precise amplitude of the emissions. The test volume for a height of up to 30 cm may be obstructed by absorber placed on the ground plane.

At the highest amplitudes observed, the EUT is rotated in the horizontal plane while changing the antenna polarization in the vertical plane to maximize the reading. The interconnecting cables were arranged and moved to get the maximum measurement. Once the maximum reading is obtained, the antenna elevation and polarization will be varied between specified limits to maximize the readings. All of the interface cables were manipulated according to EN 55032 / BS EN 55032 requirements.

The highest internal source of an EUT is defined as the highest frequency generated or used within the EUT or on which the EUT operates or tunes.

If the highest frequency of the internal sources of the EUT is less than 108 MHz, the measurement shall only be made up to 1 GHz.

If the highest frequency of the internal sources of the EUT is between 108 MHz and 500 MHz, the measurement shall only be made up to 2 GHz.

If the highest frequency of the internal sources of the EUT is between 500 MHz and 1 GHz, the measurement shall only be made up to 5 GHz.

If the highest frequency of the internal sources of the EUT is above 1 GHz, the measurement shall be made up to 5 times the highest frequency or 6 GHz, whichever is less.

### 4.1.3 Spectrum Analyzer Configuration (for the frequencies tested)

Frequency Range: 30MHz--1000MHz
Detector Function: Quasi-Peak Mode
Resolution Bandwidth: 120kHz

Frequency Range: Above 1 GHz to 6 GHz
Detector Function: Peak/Average Mode
Resolution Bandwidth: 1MHz

## 4.2 Limit

**Radiated emissions at frequencies up to 1 GHz for Class_A equipment:**

| Frequency range MHz | Measurement | | Class_A limits dB(μV/m) |
|---|---|---|---|
| | Distance m | Detector type / bandwidth | OATS/SAC |
| 30-230 | 10 | Quasi Peak / 120 kHz | 40 |
| 230-1000 | | | 47 |
| 30-230 | 3 | | 50 |
| 230-1000 | | | 57 |

**Radiated emissions at frequencies above 1 GHz for Class_A equipment of the EN 55032:2015+A11:2020:**

| Frequency range MHz | Measurement | | Class_A limits dB(μV/m) |
|---|---|---|---|
| | Distance m | Detector type / bandwidth | FSOATS |
| 1000-3000 | 3 | Average / 1MHz | 56 |
| 3000-6000 | | | 60 |
| 1000-3000 | | Peak / 1MHz | 76 |
| 3000-6000 | | | 80 |

**Radiated emissions at frequencies above 1 GHz for Class_A equipment of the EN 55032:2015+A1:2020:**

| Frequency range MHz | Measurement | | Class_A limits dB(μV/m) |
|---|---|---|---|
| | Distance m | Detector type / bandwidth | FSOATS |
| 1000-6000 | 3 | Average / 1MHz | 60 |
| 1000-6000 | | Peak / 1MHz | 80 |

Note 1: The radiated emissions at frequencies above 1 GHz test limit in this report is based on EN 55032:2015+A11:2020.

Note 2: Test data in this report has been taken against the EN 55032:2015+A11:2020 limit as it is the most stringent limit. By complying with the more restrictive EN 55032:2015+A11:2020 limit compliance with the EN 55032:2015+A1:2020 limit is also demonstrated.

**Radiated emissions at frequencies up to 1 GHz for Class_B equipment:**

| 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 |

**Radiated emissions at frequencies above 1 GHz for Class_B equipment of the EN 55032:2015+A11:2020:**

| Frequency range MHz | Measurement | | Class_B limits dB(μV/m) |
|---|---|---|---|
| | Distance m | Detector type / bandwidth | FSOATS |
| 1000-3000 | 3 | Average / 1MHz | 50 |
| 3000-6000 | | | 54 |
| 1000-3000 | | Peak / 1MHz | 70 |
| 3000-6000 | | | 74 |

**Radiated emissions at frequencies above 1 GHz for Class_B equipment of the EN 55032:2015+A1:2020:**

| Frequency range MHz | Measurement | | Class_B limits dB(μV/m) |
|---|---|---|---|
| | Distance m | Detector type / bandwidth | FSOATS |
| 1000-6000 | 3 | Average / 1MHz | 54 |
| 1000-6000 | | Peak / 1MHz | 74 |

Note 1:The radiated emissions at frequencies above 1 GHz test limit in this report is based on EN 55032:2015+A11:2020.

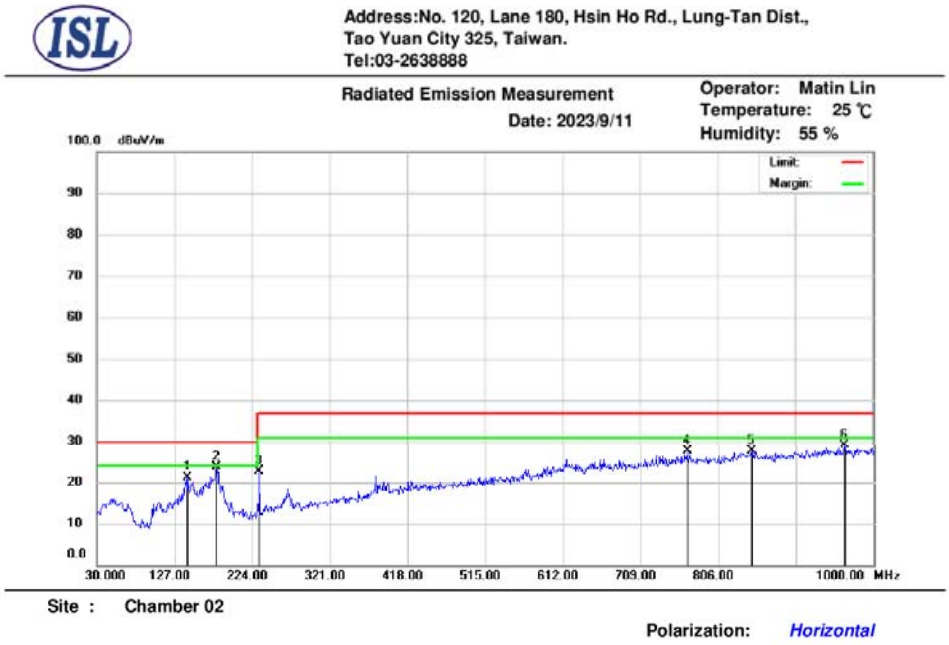
Note 2:Test data in this report has been taken against the EN 55032:2015+A11:2020 limit as it is the most stringent limit. By complying with the more restrictive EN 55032:2015+A11:2020 limit compliance with the EN 55032:2015+A1:2020 limit is also demonstrated.

**Radiated emissions from FM receivers:**

| Frequency range MHz | Measurement | | Class_B limits dB(μV/m) | |
|---|---|---|---|---|
| | Distance m | Detector type / bandwidth | Fundamental | Harmonics |
| | | | OATS/SAC | OATS/SAC |
| 30-230 | 10 | Quasi Peak / 120 kHz | 50 | 42 |
| 230-300 | | | | 42 |
| 300-1000 | | | | 46 |
| 30-230 | 3 | | 60 | 52 |
| 230-300 | | | | 52 |
| 300-1000 | | | | 56 |

## 4.3 Radiation Test Data: Configuration 1

## - Radiated Emissions (Horizontal)



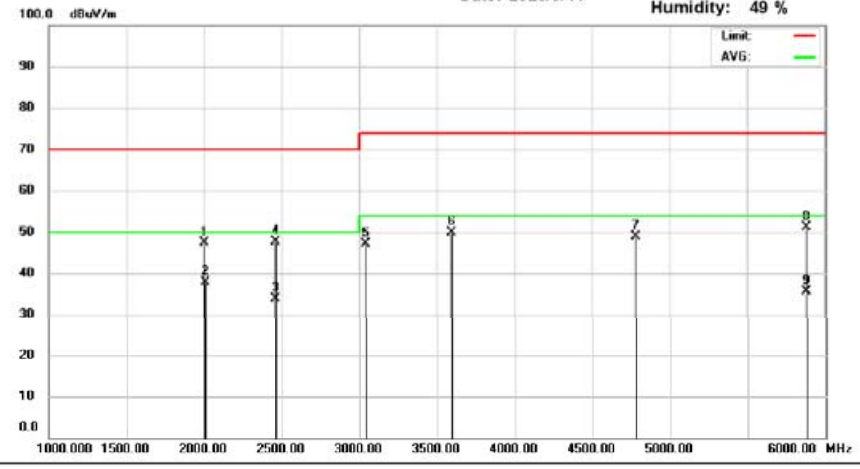

| Mk. | Frequency (MHz) | RX_R (dBuV) | Correct Factor(dB/m) | Emission (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Ant.Pos (cm) | Tab.Pos (deg.) | Detector |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 143.49 | 37.02 | -15.85 | 21.17 | 30.00 | -8.83 | 400 | 184 | QP |
| 2* | 179.38 | 40.26 | -16.71 | 23.55 | 30.00 | -6.45 | 300 | 152 | QP |
| 3 | 232.73 | 39.93 | -17.35 | 22.58 | 37.00 | -14.42 | 300 | 152 | QP |
| 4 | 767.20 | 31.08 | -3.49 | 27.59 | 37.00 | -9.41 | 100 | 246 | QP |
| 5 | 847.71 | 30.14 | -2.50 | 27.64 | 37.00 | -9.36 | 222 | 0 | QP |
| 6 | 964.11 | 30.41 | -1.39 | 29.02 | 37.00 | -7.98 | 300 | 304 | QP |

* Note:
Margin = Emission – Limit
Emission = Radiated Amplitude + Correct Factor
Correct Factor = Antenna Correction Factor + Cable Loss – Pre-Amplifier Gain
A margin of -8dB means that the emission is 8dB below the limit
Antenna Distance: 10 meters
If the peak measured value meets the QP limit, The QP value is inherently compliant.

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

Radiated Emission Measurement
Date: 2023/9/14

Operator: Kevin Chaqn
Temperature: 25 ℃
Humidity: 49 %



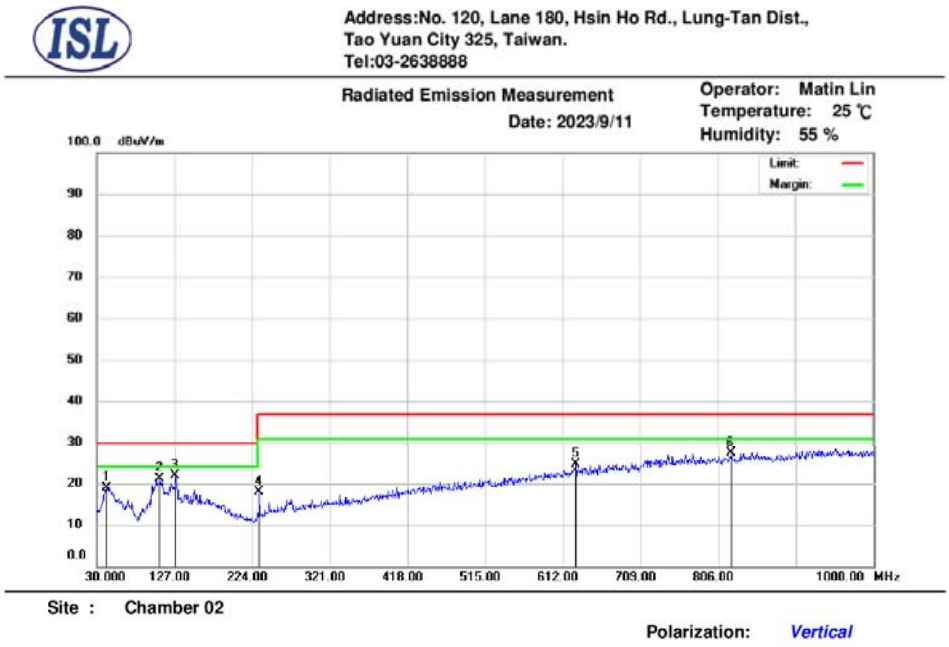

Site : Chamber 14

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 | 2005.00 | 58.10 | -10.81 | 47.29 | 70.00 | -22.71 | 278 | 28 | peak |
| 2* | 2006.60 | 48.70 | -10.82 | 37.88 | 50.00 | -12.12 | 277 | 0 | AVG |
| 3 | 2463.97 | 43.78 | -9.92 | 33.86 | 50.00 | -16.14 | 400 | 320 | AVG |
| 4 | 2465.00 | 57.45 | -9.91 | 47.54 | 70.00 | -22.46 | 400 | 295 | peak |
| 5 | 3040.00 | 55.57 | -8.49 | 47.08 | 74.00 | -26.92 | 100 | 9 | peak |
| 6 | 3595.00 | 57.76 | -7.99 | 49.77 | 74.00 | -24.23 | 100 | 187 | peak |
| 7 | 4785.00 | 55.98 | -7.09 | 48.89 | 74.00 | -25.11 | 300 | 322 | peak |
| 8 | 5880.00 | 57.04 | -5.82 | 51.22 | 74.00 | -22.78 | 400 | 72 | peak |
| 9 | 5880.39 | 41.57 | -5.82 | 35.75 | 54.00 | -18.25 | 400 | 55 | AVG |

* Note:
Margin = Emission – Limit
Emission = Radiated Amplitude + Correct Factor
Correct Factor = Antenna Correction Factor + Cable Loss – Pre-Amplifier Gain
A margin of -8dB means that the emission is 8dB below the limit
Antenna Distance: 3 meters
If the peak measured value meets the Average limit, The Average value is inherently compliant.

## -Radiated Emissions (Vertical)



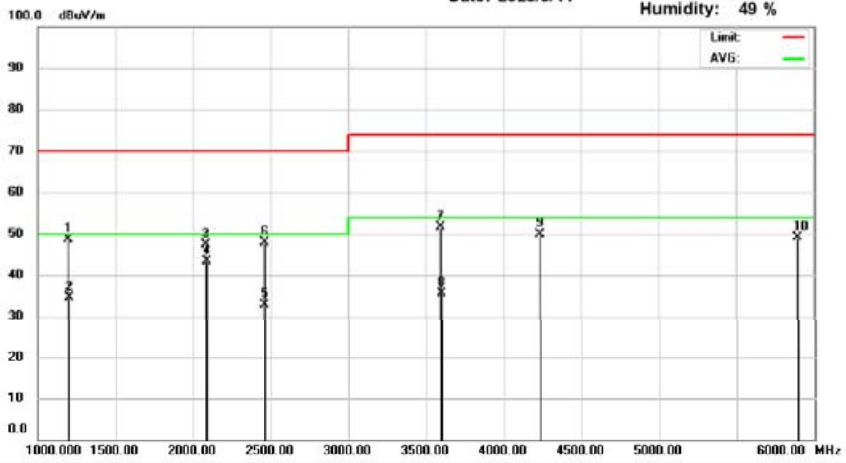

| Mk. | Frequency (MHz) | RX_R (dBuV) | Correct Factor(dB/m) | Emission (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Ant.Pos (cm) | Tab.Pos (deg.) | Detector |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 42.61 | 35.38 | -16.50 | 18.88 | 30.00 | -11.12 | 300 | 278 | QP |
| 2 | 108.57 | 40.34 | -19.17 | 21.17 | 30.00 | -8.83 | 100 | 102 | QP |
| 3* | 127.97 | 39.56 | -17.56 | 22.00 | 30.00 | -8.00 | 100 | 113 | QP |
| 4 | 232.73 | 35.16 | -17.35 | 17.81 | 37.00 | -19.19 | 100 | 49 | QP |
| 5 | 628.49 | 30.70 | -6.10 | 24.60 | 37.00 | -12.40 | 200 | 64 | QP |
| 6 | 822.49 | 30.45 | -3.08 | 27.37 | 37.00 | -9.63 | 400 | 345 | QP |

* Note:
Margin = Emission – Limit
Emission = Radiated Amplitude + Correct Factor
Correct Factor = Antenna Correction Factor + Cable Loss – Pre-Amplifier Gain
A margin of -8dB means that the emission is 8dB below the limit
Antenna Distance: 10 meters
If the peak measured value meets the QP limit, The QP value is inherently compliant.

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

Radiated Emission Measurement
Date: 2023/9/14

Operator: Kevin Chaqn
Temperature: 25 ℃
Humidity: 49 %




Site : Chamber 14

Polarization: Vertical

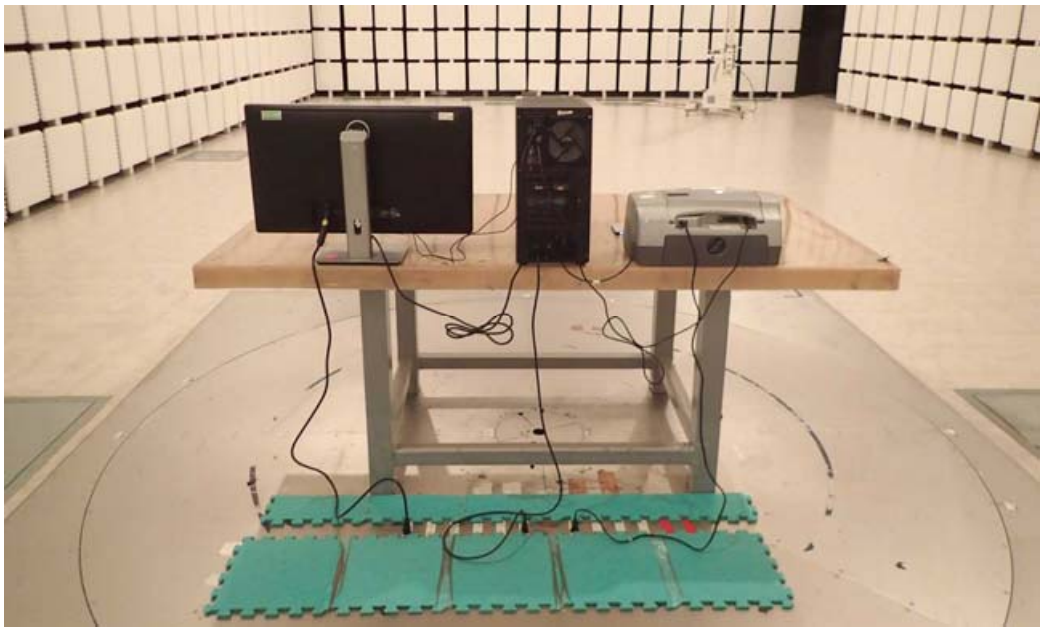
| Mk. | Frequency (MHz) | RX_R (dBuV) | Correct Factor(dB/m) | Emission (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Ant.Pos (cm) | Tab.Pos (deg.) | Detector |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1195.00 | 62.91 | -14.34 | 48.57 | 70.00 | -21.43 | 100 | 162 | peak |
| 2 | 1196.69 | 48.86 | -14.35 | 34.51 | 50.00 | -15.49 | 100 | 190 | AVG |
| 3 | 2085.00 | 58.15 | -10.66 | 47.49 | 70.00 | -22.51 | 100 | 175 | peak |
| 4* | 2086.46 | 53.93 | -10.65 | 43.28 | 50.00 | -6.72 | 100 | 141 | AVG |
| 5 | 2459.18 | 42.74 | -9.91 | 32.83 | 50.00 | -17.17 | 128 | 359 | AVG |
| 6 | 2460.00 | 57.78 | -9.91 | 47.87 | 70.00 | -22.13 | 127 | 279 | peak |
| 7 | 3595.00 | 59.51 | -7.99 | 51.52 | 74.00 | -22.48 | 300 | 274 | peak |
| 8 | 3596.90 | 43.57 | -8.05 | 35.52 | 54.00 | -18.48 | 300 | 286 | AVG |
| 9 | 4235.00 | 57.30 | -7.40 | 49.90 | 74.00 | -24.10 | 100 | 272 | peak |
| 10 | 5895.00 | 54.99 | -5.75 | 49.24 | 74.00 | -24.76 | 300 | 113 | peak |

* Note:
Margin = Emission – Limit
Emission = Radiated Amplitude + Correct Factor
Correct Factor = Antenna Correction Factor + Cable Loss – Pre-Amplifier Gain
A margin of -8dB means that the emission is 8dB below the limit
Antenna Distance: 3 meters
If the peak measured value meets the Average limit, The Average value is inherently compliant.

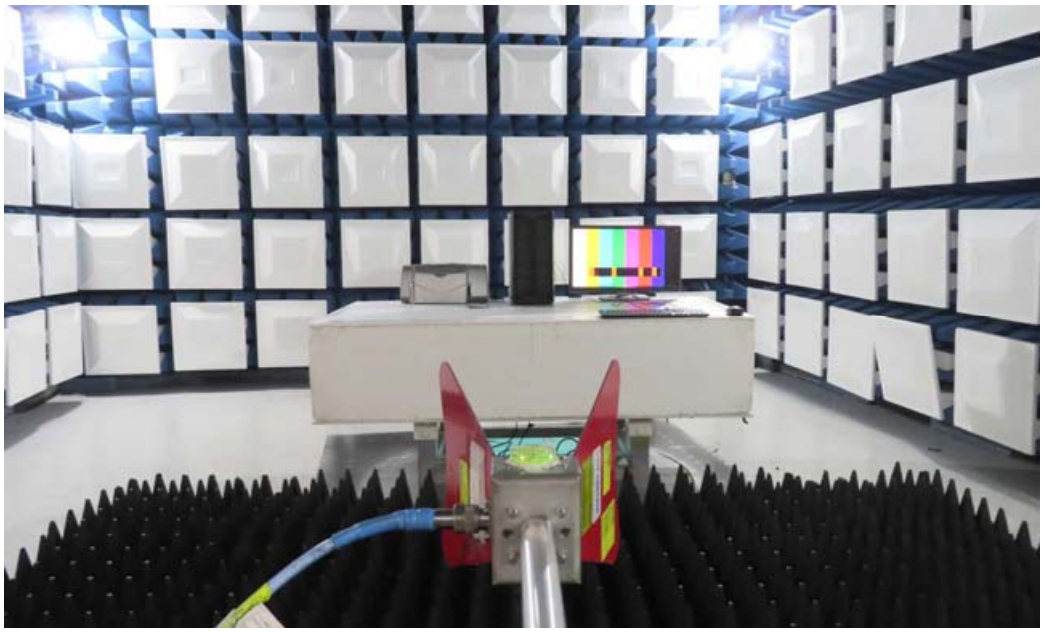
## 4.4 Test Setup Photo

Front View (30MHz~1GHz)

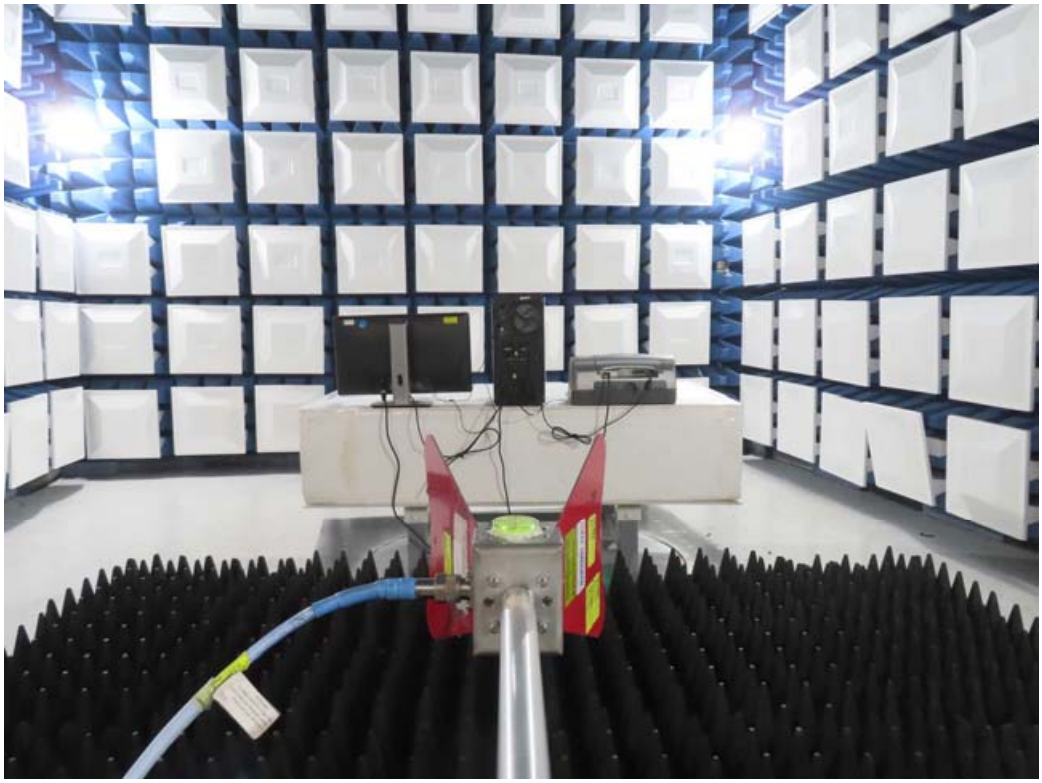
Back View (30MHz~1GHz)



Front View (above 1GHz)



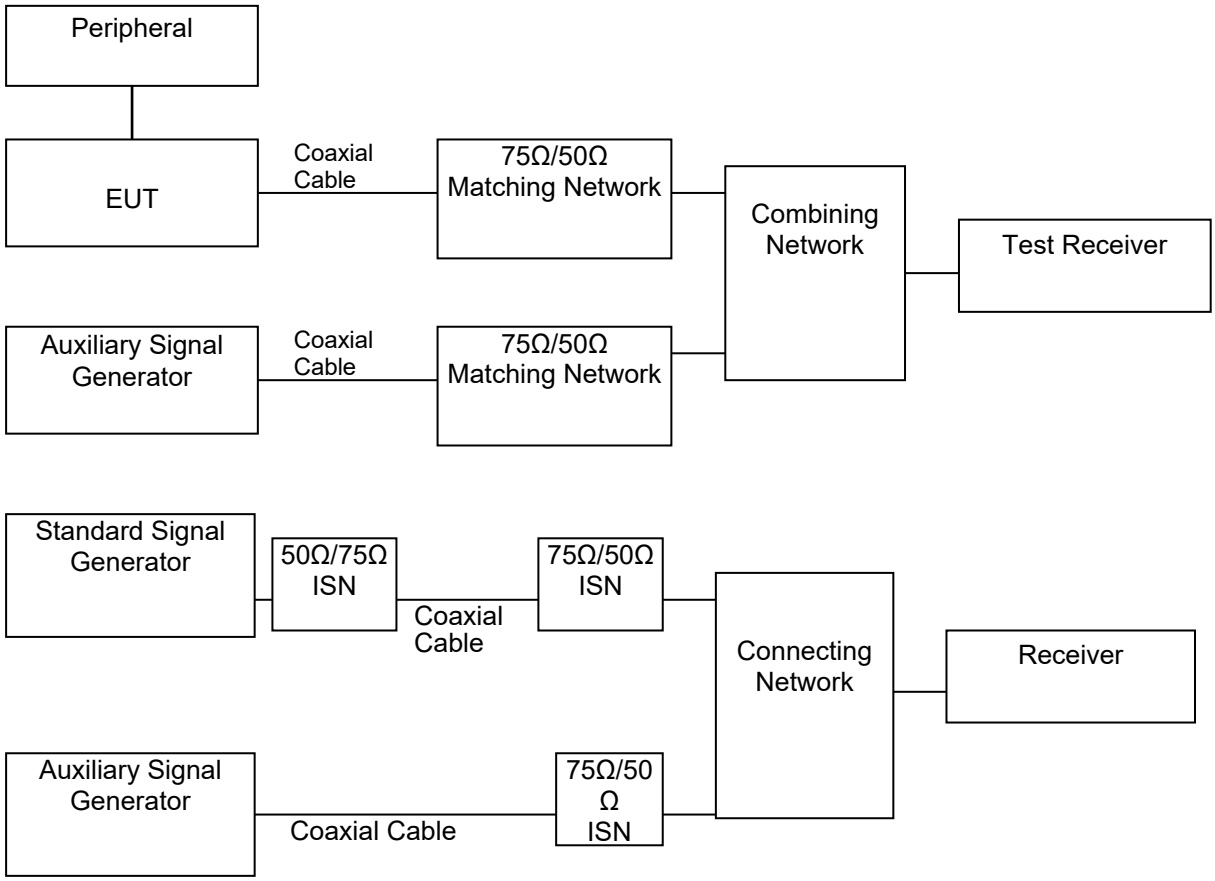
Back View (above 1GHz)



# 5. Voltage Disturbance Emissions at Antenna Terminals

## 5.1 Test Setup and Procedure

### 5.1.1 Test Setup




### 5.1.2 Test Procedure

The output level of the auxiliary signal generator was set to 70dBμV at the EUT antenna terminal with 75 ohms impedance with an un-modulated carrier.
The highest emissions were analyzed in details by operating the spectrum analyzer and/or EMI receiver in quasi-peak mode to determine the precise amplitude of the emissions. The power of EUT was switched off to make sure the emission was not contributed by the auxiliary signal generator. While doing so, the interconnecting cables and major parts of the system were moved around to maximize the emission.

### 5.1.3 EMI Receiver Configuration (for the frequencies tested)

| | |
|---|---|
| Frequency Range: | 30MHz-2150MHz |
| Detector Function: | Quasi-Peak Mode |
| Resolution Bandwidth: | 120kHz |

### 5.1.4 Limit

**Applicable to:**
1. TV broadcast receiver tuner ports with an accessible connector.
2. RF modulator output ports.
3. FM broadcast receiver tuner ports with an accessible connector.

**Applicable to**
1. TV broadcast receiver tuner ports (3.1.8) with an accessible connector
2. RF modulator output ports (3.1.29)
3. FM broadcast receiver tuner ports (3.1.8) with an accessible connector

| Table clause | Frequency range MHz | Detector type/ bandwidth | Class B limits dB(μV) 75 Ω | | | Applicability |
|---|---|---|---|---|---|---|
| | | | Other | Local Oscillator Fundamental | Local Oscillator Harmonics | |
| A13.1 | 30 to 950 | For frequencies ≤1 GHz Quasi Peak/ 120 kHz | 46 | 46 | 46 | See [a] |
| | 950 to 2 150 | | 46 | 54 | 54 | |
| A13.2 | 950 to 2 150 | | 46 | 54 | 54 | See [b] |
| A13.3 | 30 to 300 | | 46 | 54 | 50 | See [c] |
| | 300 to 1 000 | | | | 52 | |
| A13.4 | 30 to 300 | For frequencies ≥1 GHz Peak/ 1 MHz | 46 | 66 | 59 | See [d] |
| | 300 to 1 000 | | | | 52 | |
| A13.5 | 30 to 950 | | 46 | 76 | 46 | See [e] |
| | 950 to 2 150 | | | n/a | 54 | |

[a] Television receivers (analogue or digital), video recorders and PC TV broadcast receiver tuner cards working in channels between 30 MHz and 1 GHz, and digital audio receivers.

[b] Tuner units (not the LNB) for satellite signal reception.

[c] Frequency modulation audio receivers and PC tuner cards.

[d] Frequency modulation car radios.

[e] Applicable to EUTs with RF modulator output ports (for example DVD equipment, video recorders, camcorders and decoders etc.) designed to connect to TV broadcast receiver tuner ports. Limits specified for the LO are for the RF modulator carrier signal and harmonics.

The term 'other' refers to all emissions other than the fundamental and the harmonics of the LO.

The measurement shall cover the entire frequency range.

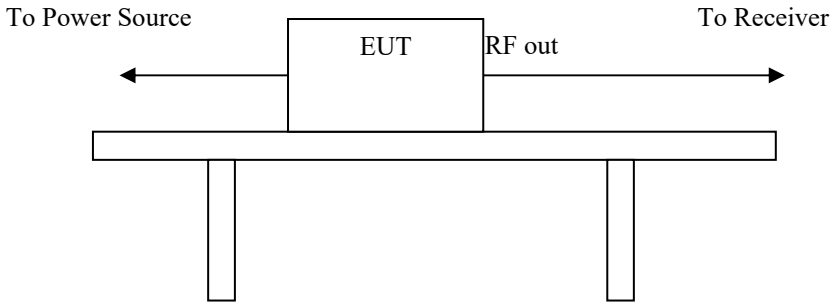
The EUT shall be tuned in accordance with Table B.3 and clause C.4.2.1.

****Remarks: It is not necessary to be tested on this item.**

# 6. Differential Voltage Emissions

## 6.1 Test Setup and Procedure

### 6.1.1 Test Setup




### 6.1.2 Test Procedure

The output level of the auxiliary signal generator was set to 70dBμV at the EUT antenna terminal with 75 ohms impedance with an un-modulated carrier.
The highest emissions were analyzed in details by operating the spectrum analyzer and/or EMI receiver in quasi-peak mode to determine the precise amplitude of the emissions. The power of EUT was switched off to make sure the emission was not contributed by the auxiliary signal generator. While doing so, the interconnecting cables and major parts of the system were moved around to maximize the emission.

### 6.1.3 EMI Receiver Configuration (for the frequencies tested)

| | |
|---|---|
| Frequency Range: | 30MHz-2150MHz |
| Detector Function: | Quasi-Peak Mode |
| Resolution Bandwidth: | 120kHz |

### 6.1.4 Limit

**Applicable to:**
1. TV broadcast receiver tuner ports with an accessible connector.
2. RF modulator output ports.
3. FM broadcast receiver tuner ports with an accessible connector.

**Applicable to**
1. TV broadcast receiver tuner ports (3.1.8) with an accessible connector
2. RF modulator output ports (3.1.29)
3. FM broadcast receiver tuner ports (3.1.8) with an accessible connector

| Table clause | Frequency range MHz | Detector type/ bandwidth | Class B limits dB(μV) 75 Ω | | | Applicability |
|---|---|---|---|---|---|---|
| | | | Other | Local Oscillator Fundamental | Local Oscillator Harmonics | |
| A13.1 | 30 to 950 | For frequencies ≤1 GHz Quasi Peak/ 120 kHz | 46 | 46 | 46 | See [a] |
| | 950 to 2 150 | | 46 | 54 | 54 | |
| A13.2 | 950 to 2 150 | | 46 | 54 | 54 | See [b] |
| A13.3 | 30 to 300 | | 46 | 54 | 50 | See [c] |
| | 300 to 1 000 | | | | 52 | |
| A13.4 | 30 to 300 | For frequencies ≥1 GHz Peak/ 1 MHz | 46 | 66 | 59 | See [d] |
| | 300 to 1 000 | | | | 52 | |
| A13.5 | 30 to 950 | | 46 | 76 | 46 | See [e] |
| | 950 to 2 150 | | | n/a | 54 | |

[a] Television receivers (analogue or digital), video recorders and PC TV broadcast receiver tuner cards working in channels between 30 MHz and 1 GHz, and digital audio receivers.

[b] Tuner units (not the LNB) for satellite signal reception.

[c] Frequency modulation audio receivers and PC tuner cards.

[d] Frequency modulation car radios.

[e] Applicable to EUTs with RF modulator output ports (for example DVD equipment, video recorders, camcorders and decoders etc.) designed to connect to TV broadcast receiver tuner ports. Limits specified for the LO are for the RF modulator carrier signal and harmonics.

The term 'other' refers to all emissions other than the fundamental and the harmonics of the LO.

The measurement shall cover the entire frequency range.

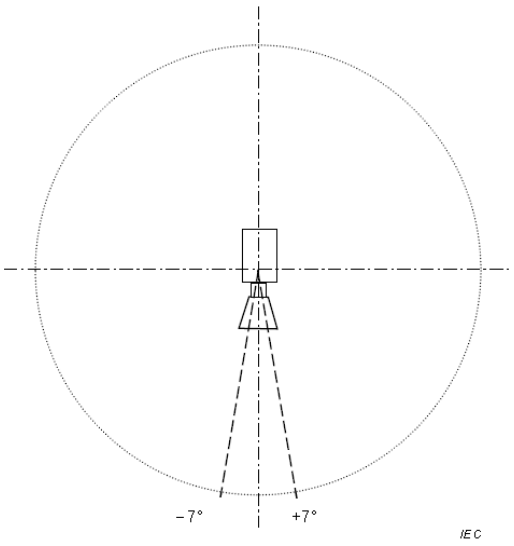
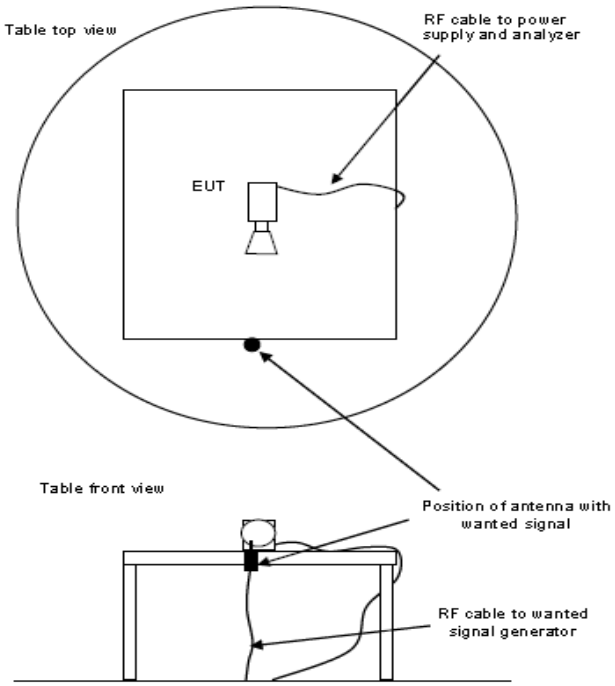
The EUT shall be tuned in accordance with Table B.3 and clause C.4.2.1.

****Remarks: It is not necessary to be tested on this item.**

# 7. Outdoor units of home satellite receiving systems

## 7.1 Test Setup and Procedure

### 7.1.1 Test Setup

| | |
|---|---|
|  |  |
| Description of ±7° of the main beam axis of the EUT | Measurement arrangements of transmit antenna for the wanted signal |

### 7.1.2 Test Procedure

The input signal shall be adjusted to get the maximum rated output level from the EUT. For the measurement in the frequency range from 30 MHz to 18 GHz the input signal shall be adjusted so that the output frequency is within this frequency range. For the measurement in the frequency range above 1 GHz, the frequency of the input signal shall be adjusted in such a way that the EUT is measured, as a minimum, at the lowest, middle and highest rated output frequency within the measured frequency range.

### 7.1.3 Spectrum Analyzer Configuration (for the frequencies tested)

| | |
|---|---|
| Frequency Range: | 30MHz--1000MHz |
| Detector Function: | Quasi-Peak Mode |
| Resolution Bandwidth: | 120kHz |
| | |
| Frequency Range: | Above 1000MHz |
| Detector Function: | Peak/Average Mode |
| Resolution Bandwidth: | 1MHz |

### 7.1.4 Limit

**EN 55032:2015+A11:2020**

| Table Clause | Frequency Range MHz | Measurement | | | Class B Limits | Applicable to |
|---|---|---|---|---|---|---|
| | | Facility (see Table A.1) | Distance m | Detector type / Bandwidth | | |
| A7.1 | 30 to 1 000 | SAC / OATS / FAR | See Table A.4 | Quasi Peak / 120 kHz | See Table A.4 | |
| A7.2 | 1 000 to 2 500 | FSOATS | 3 | Average / 1 MHz | 50 dB(µV/m) | LO leakage and spurious radiated emissions from the EUT, in the region outside ±7° of the main beam axis. See Figure H.1 |
| | 2 500 to 18 000 | | | | 64 dB(µV/m) | |
| A7.3 | 1 000 to 18 000 | FSOATS | 3 | Average / 1 MHz | 37 dB(µV/m) | LO leakage from the EUT, in the region within ±7° of the main beam axis. See Figure H.1 |
| A7.4 | 1 000 to 18 000 | Conducted (Clause H.4) | n/a | Average / 1 MHz | 30 dBpW | |
| For details of the EUT configuration, see Annex H.<br>For radiated emissions measurements at frequencies up to 1 GHz, the requirements defined in Table A.4 shall be satisfied.<br>Apply the appropriate limits across the entire frequency range.<br>Apply the limits defined in table Clause A7.1 and A7.2. Also apply the limits defined in either table Clause A7.3 or A7.4. | | | | | | |

**EN 55032:2015+A1:2020**

| Table Clause | Frequency Range MHz | Measurement | | | Class B Limits | Notes |
|---|---|---|---|---|---|---|
| | | Facility (see Table A.1) | Distance m | Detector type / Bandwidth | | |
| A7.1 | 30 to 1 000 | SAC / OATS / FAR | See Table A.4 | Quasi Peak / 120 kHz | See Table A.4 | See Annex H |
| A7.2 | 1 000 to 2 500 | FSOATS | 3 | Average / 1 MHz | 50 dB(µV/m) | LO leakage and spurious radiated emissions from the EUT, in the region outside ±7° azimuth of the main beam axis. See Annex H |
| | 2 500 to 18 000 | | | | 64 dB(µV/m) | |
| A7.3 | 1 000 to 18 000 | FSOATS | 3 | Average / 1 MHz | 70 dB(µV/m) | LO leakage from the EUT, in the region within ±7° azimuth of the main beam axis. See Annex H |
| A7.4 | 1 000 to 18 000 | Conducted (Clause H.4) | n/a | Average / 1 MHz | 63 dBpW | |
| Apply the limits defined in table Clause A7.1 and A7.2. Also apply the limits defined in either table Clause A7.3 or A7.4.<br>For details of the EUT configuration, see Annex H.<br>For radiated emissions measurements at frequencies up to 1 GHz, the requirements defined in Table A.4 shall be satisfied.<br>Apply the appropriate limits across the entire frequency range. | | | | | | |

Note 1: The test limit in this report is based on EN 55032:2015+A11:2020.

Note 2: Test data in this report has been taken against the EN 55032:2015+A11:2020 limit as it is the most stringent limit. By complying with the more restrictive EN 5032:2015+A11:2020 limit compliance with the EN 55032:2015+A1:2020 limit is also demonstrated.

****Remarks: It is not necessary to be tested on this item.**

# 8. Electrostatic discharge immunity

## 8.1 Test Specification and Setup

### 8.1.1 Test Specification

| | |
|---|---|
| Port: | Enclosure |
| Basic Standard: | EN 61000-4-2 / IEC 61000-4-2 / BS EN 61000-4-2<br>(details referred to Sec 1.2) |
| Test Level: | Air +/- 2 kV, +/- 4 kV, +/- 8 kV<br>Contact +/- 4 kV |
| Criteria: | B |
| Test Procedure: | refer to ISL QA -T4-E-S7 |
| Temperature: | 22°C |
| Humidity: | 40% |

**Selected Test Point**

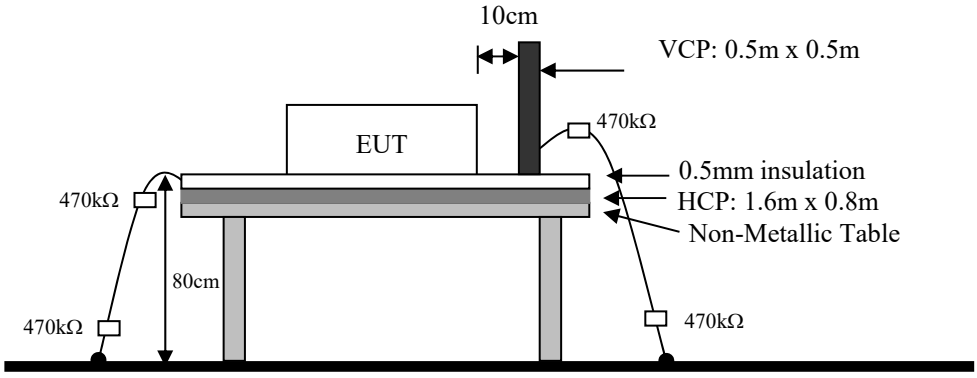
Air: discharges were applied to slots, aperture or insulating surfaces. 10 single air discharges were applied to each selected points.

Contact: 10 discharges minimum were to the selected contact points.

Indirect Contact Points: 10 discharges were applied to center of one edge of VCP and each EUT side of HCP with 10 cm away from EUT.

### 8.1.2 Test Setup

EUT is 1m from the wall and other metallic structure. When Battery test mode is needed, a cable with one 470kΩ resister at two rare ends is connected from metallic part of EUT and screwed to HCP.




Ground reference Plane

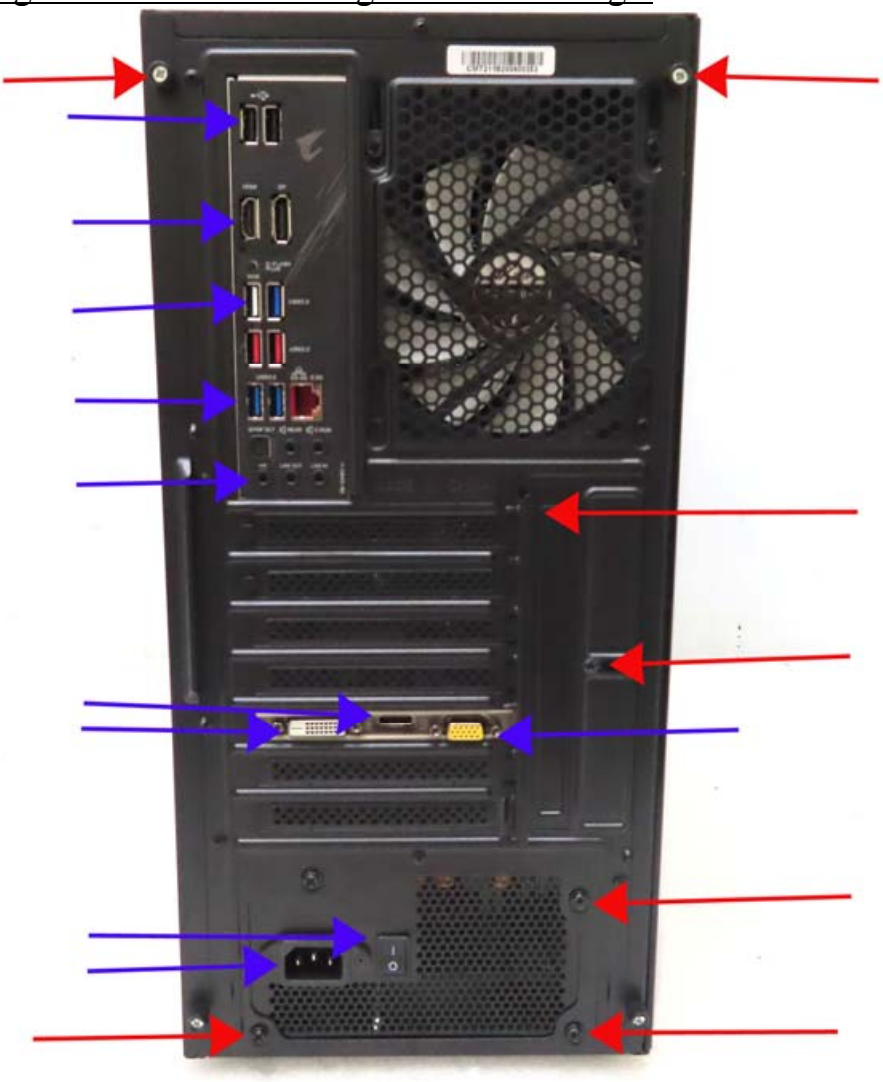
### 8.1.3 Test Result

**Performance of EUT complies with the given specification.**

## 8.2 Test Point

Red arrow lines indicate the contact points, and blue arrow lines indicate the air points.

Figure 1: Test Point Assignments Discharge:



## 8.3 Test Setup Photo

# 9. Radiated, radio-frequency, electromagnetic field immunity

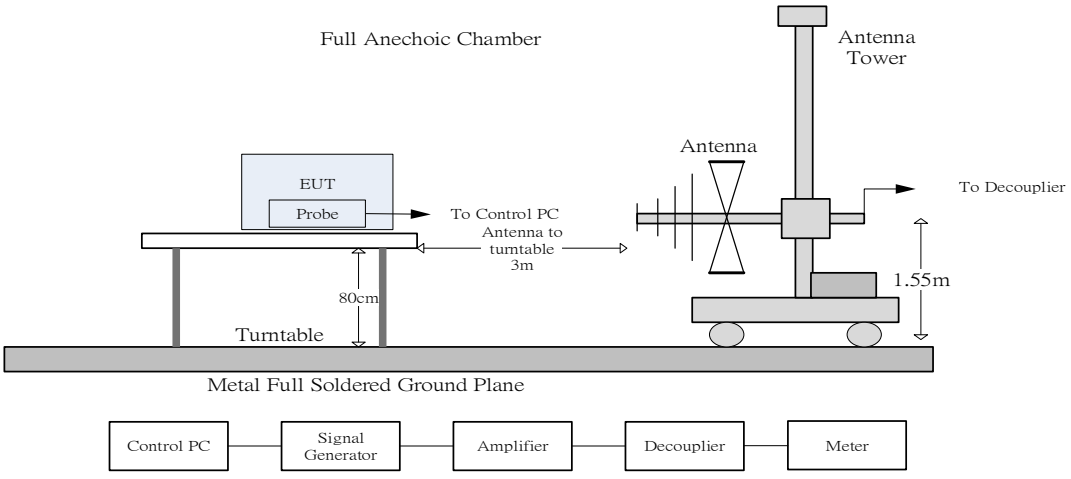
## 9.1 Test Specification and Setup

### 9.1.1 Test Specification

| | |
|---|---|
| Port: | Enclosure |
| Basic Standard: | EN IEC 61000-4-3 / IEC 61000-4-3 / BS EN IEC 61000-4-3 (details referred to Sec 1.2) |
| Test Level: | 3 V/m |
| Modulation: | AM 1kHz 80% |
| Frequency range: | 80 MHz~1 GHz<br>1800MHz, 2600MHz, 3500MHz, 5000MHz |
| Frequency Step: | 1% of last step frequency |
| Dwell time: | 2s |
| Polarization: | Vertical and Horizontal |
| EUT Azimuth Angle | ☒0° ☒90° ☒180° ☒270° |
| Criteria: | A |
| Test Procedure: | refer to ISL QA -T4-E-S8 |
| Temperature: | 24°C |
| Humidity: | 58% |

### 9.1.2 Test Setup

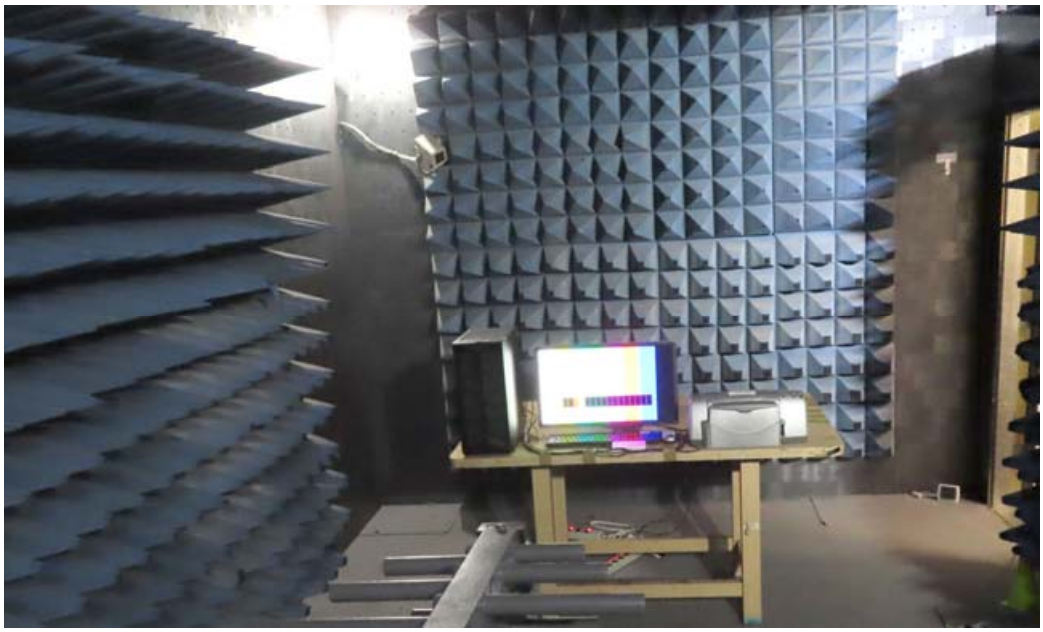
The field sensor is placed at one calibration grid point to check the intensity of the established fields on both polarizations. EUT is adjusted to have each side of EUT face coincident with the calibration plane. A CCD camera and speakers are used to monitor the condition of EUT for the performance judgment.




### 9.1.3 Test Result

**Performance of EUT complies with the given specification.**

## 9.2 Test Setup Photo



# 10. Electrical fast transient/burst immunity

## 10.1 Test Specification and Setup

### 10.1.1 Test Specification

| | |
|---|---|
| Port: | AC mains |
| Basic Standard: | EN 61000-4-4 / IEC 61000-4-4 / BS EN 61000-4-4<br>(details referred to Sec 1.2) |
| Test Level: | AC Power Port: +/- 1 kV |
| Rise Time: | 5ns |
| Hold Time: | 50ns |
| Burst Period: | 300ms |
| Repetition Frequency: | 5kHz |
| Criteria: | B |
| Test Procedure: | refer to ISL QA -T4-E-S9 |
| Temperature: | 24°C |
| Humidity: | 59% |

**Test Procedure**

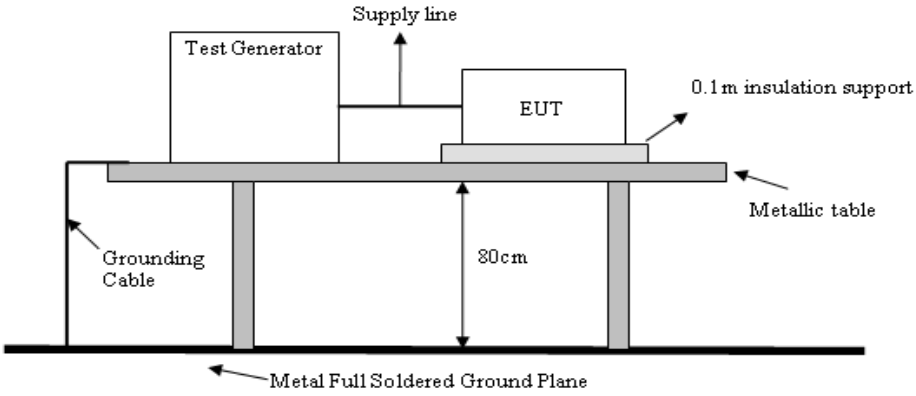
The EUT was setup on a nonconductive table 0.1 m above a reference ground plane.

| Test Points | Polarity | Result | Comment |
|---|---|---|---|
| Line | + | N | 60 sec |
| | - | N | 60 sec |
| Neutral | + | N | 60 sec |
| | - | N | 60 sec |
| Ground | + | N | 60 sec |
| | - | N | 60 sec |
| Line and Neutral | + | N | 60 sec |
| | - | N | 60 sec |
| Line and Ground | + | N | 60 sec |
| | - | N | 60 sec |
| Neutral and Ground | + | N | 60 sec |
| | - | N | 60 sec |
| Line and Neutral and Ground | + | N | 60 sec |
| | - | N | 60 sec |

Note: 'N' means normal, the EUT function is correct during the test.

### 10.1.2 Test Setup

EUT is at least 50cm from the conductive structure.




### 10.1.3 Test Result

**Performance of EUT complies with the given specification.**

## 10.2 Test Setup Photo

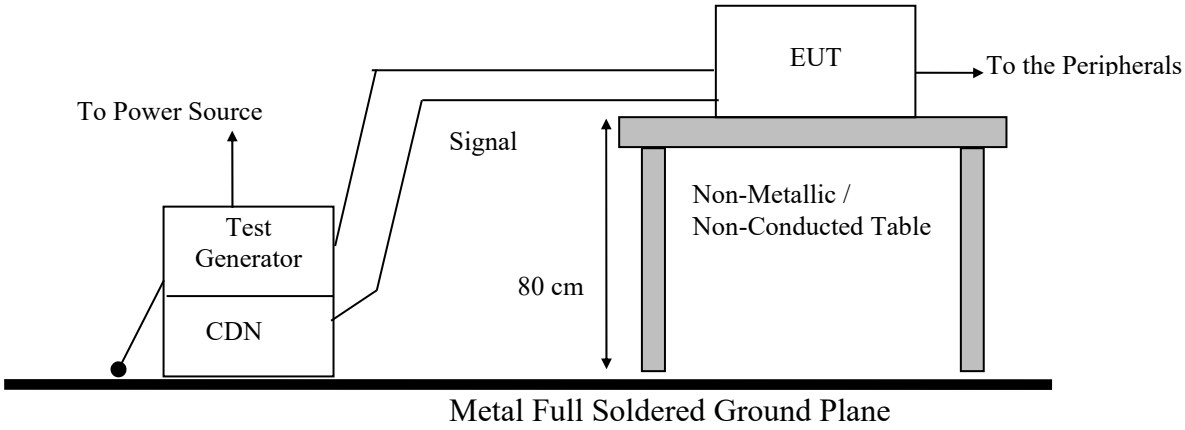
# 11. Surge immunity

## 11.1 Test Specification and Setup

### 11.1.1 Test Specification

| | |
|---|---|
| Port: | AC mains |
| Basic Standard: | EN 61000-4-5 / IEC 61000-4-5 / BS EN 61000-4-5<br>(details referred to Sec 1.2) |
| Test Level: | Line to Line:<br>+/- 0.5 kV, +/- 1 kV<br>Line to Earth:<br>+/- 0.5 kV, +/- 1 kV, +/- 2kV |
| Rise Time: | 1.2us |
| Hold Time: | 50us |
| Repetition Rate: | 30 seconds |
| Angle: | ☐0° ☒90° ☐180° ☒270° |
| Criteria: | B |
| Test Procedure: | refer to ISL QA -T4-E-S10 |
| Temperature: | 25°C |
| Humidity: | 59% |

### 11.1.2 Test Setup




### 11.1.3 Test Result

**Performance of EUT complies with the given specification.**

## 11.2 Test Setup Photo

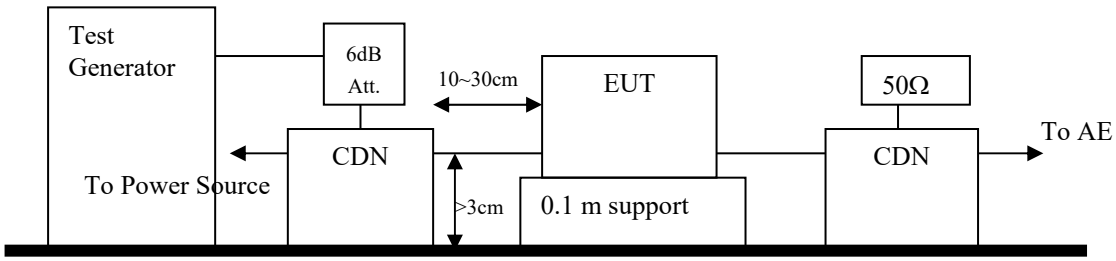
# 12. Immunity to conducted disturbances

## 12.1 Test Specification and Setup

### 12.1.1 Test Specification

| | |
|---|---|
| Port: | AC mains |
| Basic Standard: | EN 61000-4-6 / IEC 61000-4-6 / BS EN 61000-4-6<br>(details referred to Sec 1.2) |
| Frequency range and Test Level: | 0.15MHz to 10MHz: 3 Vrms<br>10MHz to 30MHz: 3Vrms to 1Vrms<br>30MHz to 80MHz: 1Vrms |
| Modulation: | AM 1kHz 80% |
| Frequency Step: | 1% of last Frequency |
| Dwell time: | 2s |
| Criteria: | A |
| CDN Type: | CDN M2+M3 |
| Test Procedure: | refer to ISL QA -T4-E-S11 |
| Temperature: | 24°C |
| Humidity: | 60% |

### 12.1.2 Test Setup




Reference Ground Plane

### 12.1.3 Test Result

**Performance of EUT complies with the given specification.**

## 12.2 Test Setup Photo

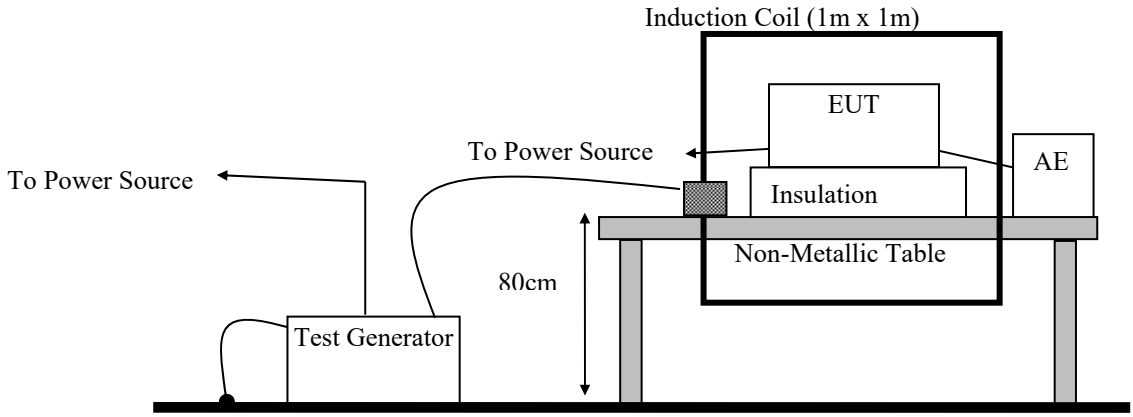
# 13. Power frequency magnetic field immunity

## 13.1 Test Specification and Setup

### 13.1.1 Test Specification

| | |
|---|---|
| Port: | Enclosure |
| Basic Standard: | EN 61000-4-8 / IEC 61000-4-8 / BS EN 61000-4-8<br>(details referred to Sec 1.2) |
| Test Level: | 1A/m |
| Polarization: | X, Y, Z |
| Criteria: | A |
| Test Procedure: | refer to ISL QA -T4-E-S12 |
| Temperature: | 24°C |
| Humidity: | 60% |

### 13.1.2 Test Setup




### 13.1.3 Test Result

**Performance of EUT complies with the given specification.**

## 13.2 Test Setup Photo

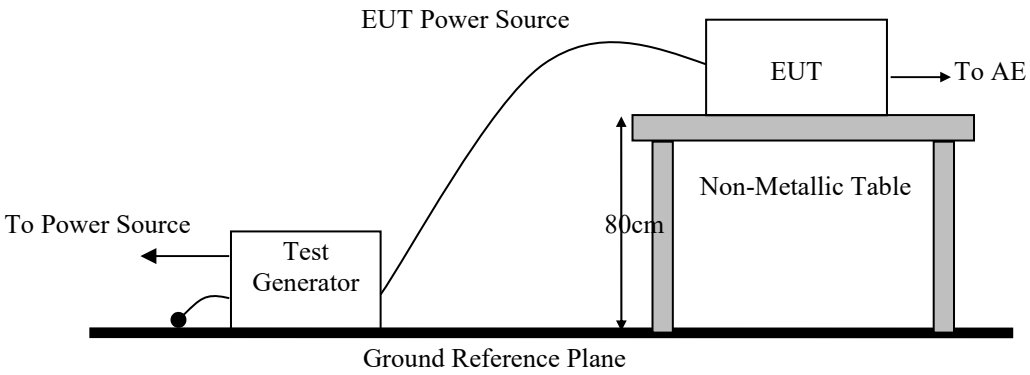
# 14. Voltage dips, short interruptions and voltage variations immunity

## 14.1 Test Specification and Setup

### 14.1.1 Test Specification

| | |
|---|---|
| Port: | AC mains |
| Basic Standard: | EN IEC 61000-4-11 / IEC 61000-4-11 / BS EN IEC 61000-4-11 (details referred to Sec 1.2) |
| When the product is greater than 16A does not apply to this Standard, it is not necessary to be tested on this item. In addition, IEC/EN 61000-4-34 Standard was used to evaluating. | |
| Test Level:<br>Criteria: | >95% in 0.5 cycle<br>B |
| Test Level:<br>Criteria: | 30% in 25 cycle<br>C |
| Test Level:<br>Criteria: | >95% in 250 cycle<br>C |
| Phase: | 0°; 180° |
| Test intervals: | 3 times with 10s each |
| Test Procedure: | refer to ISL QA -T4-E-S13 |
| Temperature: | 25°C |
| Humidity: | 59% |

### 14.1.2 Test Setup




### 14.1.3 Test Result

**Performance of EUT complies with the given specification.**

## 14.2 Test Setup Photo

# 15. Harmonics

## 15.1 Test Specification and Setup

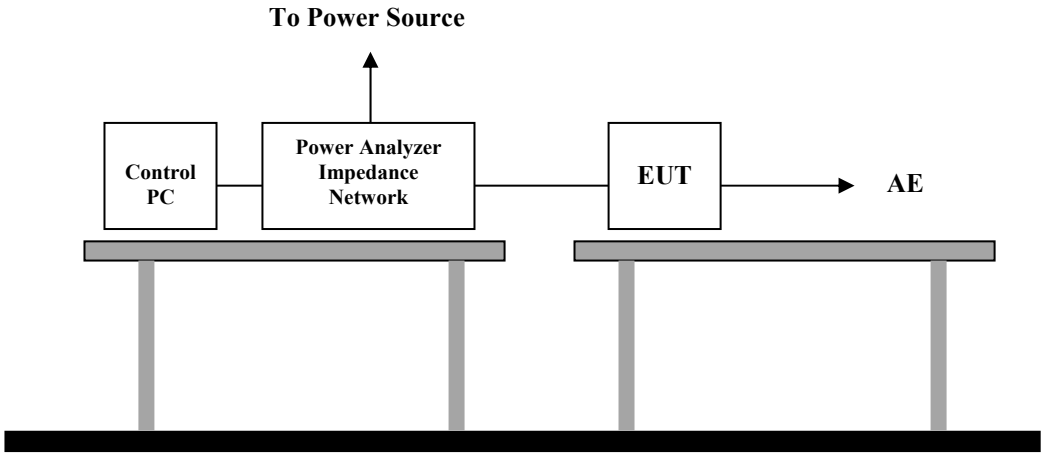
### 15.1.1 Test Specification

| | |
|---|---|
| Port: | AC mains |
| Active Input Power: | <75W |
| Basic Standard: | EN IEC 61000-3-2 / IEC 61000-3-2 / BS EN IEC 61000-3-2 (details referred to Sec 1.2) |
| Test Duration: | 2.5min |
| Class: | A |
| Test Procedure: | refer to ISL QA -T4-E-S14 |
| Temperature: | 24°C |
| Humidity: | 60% |

**Test Procedure**

The EUT is supplied in series with shunts or current transformers from a source having the same nominal voltage and frequency as the rated supply voltage and frequency of the EUT. The EUT is configured to its rated current with additional resistive load when the testing is performed.
Equipment having more than one rated voltage shall be tested at the rated voltage producing the highest harmonics as compared with the limits.

### 15.1.2 Test Setup



### 15.1.3 Limit

Limits of Class **A** Harmonics Currents

| Harmonics Order n | Maximum Permissible harmonic current A | Harmonics Order n | Maximum Permissible harmonic current A |
|---|---|---|---|
| Odd harmonics | | Even harmonics | |
| 3 | 2.30 | 2 | 1.08 |
| 5 | 1.14 | 4 | 0.43 |
| 7 | 0.77 | 6 | 0.30 |
| 9 | 0.40 | 8 ≤ n≤ 40 | 0.23 * 8/n |
| 11 | 0.33 | | |
| 13 | 0.21 | | |
| 15 ≤ n ≤39 | 0.15 * 15/n | | |

### 15.1.4 Test Result

**Active input power under 75W, no limit apply, declare compliance**

# 16. Voltage fluctuations and flicker

## 16.1 Test Specification and Setup

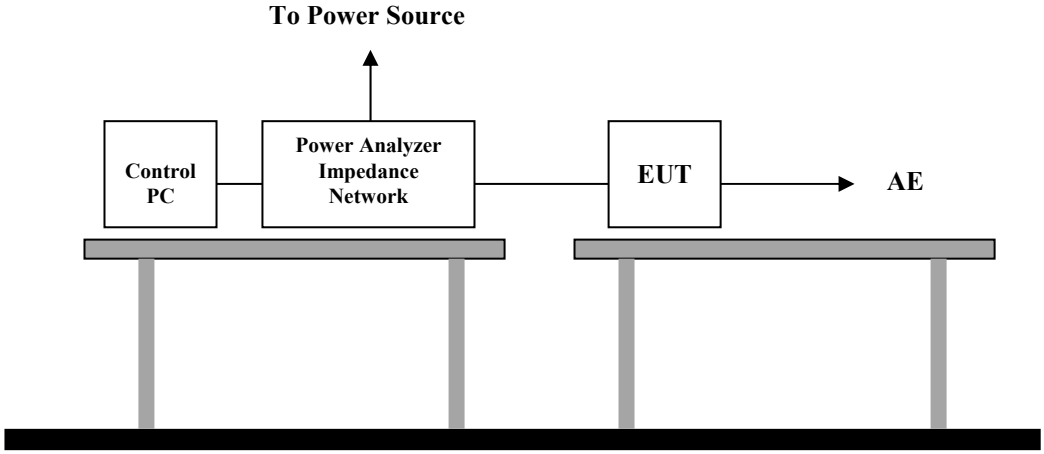
### 16.1.1 Test Specification

| | |
|---|---|
| Port: | AC mains |
| Basic Standard: | EN 61000-3-3 / IEC 61000-3-3 / BS EN 61000-3-3<br>(details referred to Sec 1.2) |
| Test Procedure: | refer to ISL QA -T4-E-S14 |
| Observation period: | For Pst 10min |
| | For Plt 2 hours |
| Temperature: | 24°C |
| Humidity: | 60% |

**Test Procedure**

The EUT is supplied in series with reference impedance from a power source with the voltage and frequency as the nominal supply voltage and frequency of the EUT.

### 16.1.2 Test Setup




### 16.1.3 Test Result

**Performance of EUT complies with the given specification.**

## 16.2 Test Data

**Test File:** F-20230914_2583

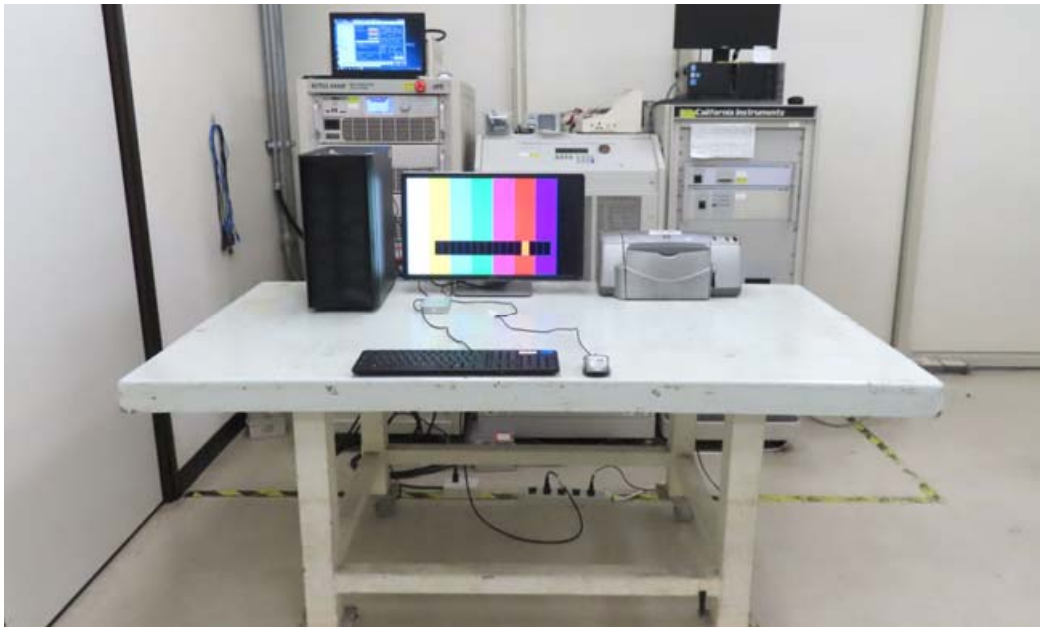
**Test Class:** Flicker Test, All Parameters
**Test Result:** PASS
**Test Duration (min):** 10

**Phase A**

| | | | |
|---|---|---|---|
| **Vrms (Volts):** | **230.08** | **Frequency (Hz):** | **50.00** |
| **I_rms (Amps):** | **0.328** | **Power (W):** | **58.1** |
| **V-THD (%):** | **0.384** | **T-Max (ms):** | **0 (500)** |
| **dmax (%):** | **0.000 (4.000)** | **Hi dmax (%):** | **0.000 (4.000)** |
| **dc (%):** | **0.000 (3.300)** | **Hi dc (%):** | **0.000 (3.300)** |
| **Pst-1 :** | **0.039 (1.000)** | | |
| **Plt :** | **0.017 (0.650)** | | |

**Pst Spectrum**

## 16.3 Test Setup Photo



# 17. Appendix

## 17.1 Appendix A: Test Equipment

### 17.1.1 Test Equipment List

| Location | Equipment Name | Brand | Model | S/N | Last Cal. Date | Next Cal. Date |
|---|---|---|---|---|---|---|
| Conduction 02 | EMI Receiver 19 | R&S | ESR3 | 102460 | 05/08/2023 | 05/08/2024 |
| Conduction 02 | Conduction 02-1 Cable | WOKEN | CFD 300-NL | Conduction 02 -1 | 10/11/2022 | 10/11/2023 |
| Conduction 02 | LISN 26 | R&S | ENV216 | 102378 | 12/08/2022 | 12/08/2023 |
| Conduction 02 | LISN 15 | R&S | ENV216 | 101335 | 12/08/2022 | 12/08/2023 |

| Location Chamber02 | Equipment Name | Brand | Model | S/N | Last Cal. Date | Next Cal. Date |
|---|---|---|---|---|---|---|
| Radiation (Chamber02) | BILOG Antenna 17 (30MHz~1GHz) | SCHWARZBECK | VULB 9168+EMCI-N-6-05 | 645 | 05/09/2023 | 05/09/2024 |
| Radiation (Chamber02) | Preamplifier 25 | EMCI | EMC9135 | 980295 | 03/24/2023 | 03/24/2024 |
| Radiation (Chamber02) | Coaxial Cable Chmb 02-10M-02 | EMC | RG214U | Chmb 02-10M-02 | 10/04/2022 | 10/04/2023 |
| Radiation (Chamber02) | EMI Receiver 17 | R&S | ESCI 7 | 100887 | 11/02/2022 | 11/02/2023 |

| Location Chmb14 | Equipment Name | Brand | Model | S/N | Last Cal. Date | Next Cal. Date |
|---|---|---|---|---|---|---|
| Rad. Above 1GHz | Spectrum Analyzer 25 | R&S | FSV 40 | 101499 | 10/26/2022 | 10/26/2023 |
| Rad. Above 1GHz | Horn Antenna 06 | ETS-Lindgren | 3117 | 00066665 | 12/15/2022 | 12/15/2023 |
| Rad. Above 1GHz | Preamplifier 20 | EMCI | EMC051845 | 980084 | 11/25/2022 | 11/25/2023 |
| Rad. Above 1GHz | Microwave Cable 11 | HUBER SUHNER | SUCOFLEX 106 | 78034/6 | 03/13/2023 | 03/13/2024 |
| Rad. Above 1GHz | Microwave Cable 26 | EMCI | EMC104-NM-SM-800 | 141112 | 03/13/2023 | 03/13/2024 |

| Location | Equipment Name | Brand | Model | S/N | Last Cal. Date | Next Cal. Date |
|---|---|---|---|---|---|---|
| EN61K-4-2 | ESD Gun 12 | EM TEST | Dito | P1650188689 | 04/10/2023 | 04/10/2024 |
| 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 | 250W1000C | 358877 | N/A | N/A |
| EN61K-4-3 | Amplifier 0.7~6GHz 60W | AR | 60S1G6 | 358973 | 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 1-6GHz | Woken | STI07-0005-40 | N/A | N/A | N/A |
| EN61K-4-3 | Signal Generator 07 | R&S | SMB100A | 107780 | 01/05/2023 | 01/05/2024 |
| EN61K-4-4 | Signal Generator 10 | EMC Partner | IMU3000 | 1547 | 09/07/2023 | 09/07/2024 |
| EN61K-4-5 | CDN-UTP8_ED3 | EMC-PARTNER | CDN-UPT8 | 1509 | 04/10/2023 | 04/10/2024 |
| EN61K-4-5 | Surge Tester | EMC Partner | MIG0603IN3 | 523 | 07/11/2023 | 07/11/2024 |
| EN61K-4-6 | CDN M2+M3 05 | FRANKONIA | CDN M2+M3 | A2210235/2013 | 08/30/2023 | 08/30/2024 |
| EN61K-4-6 | Coaxial Cable 4-6 02-1 | | | 4-6 02-1 | N/A | N/A |
| EN61K-4-6 | Conducted Immunity Test System 02 | Frankonia | CIT-10-75-DC | 126B1301/2014 | 03/21/2023 | 03/21/2024 |
| EN61K-4-8 | Magnetic Field Immunity Loop | FCC | F-1000-4-8-L-1M | 01037 | 05/11/2023 | 05/11/2024 |
| EN61K-4-8 | Magnetic Field Test Generator | FCC | F-1000-4-8-G-125A | 01038 | 05/11/2023 | 05/11/2024 |
| EN61K-4-11 | Voltage Dip and UP Simulator 01 | NoiseKen | VDS-2002 | VDS1750439 | 09/05/2023 | 09/05/2024 |
| EN61K-3-2/3, EN61K-3-11-12 | Harmonics & Flickers Test System 04 | PACIFIC*APS | ECTS2-3450F-n | 550072 | 04/27/2023 | 04/27/2024 |

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

**Software for Controlling Spectrum/Receiver and Calculating Test Data

| Test Item | Filename | Version |
|---|---|---|
| EN IEC 61000-3-2 | HFa-16 Program | v1.0.0.14 |
| EN 61000-3-3 | HFa-16 Program | v1.0.0.14 |
| EN 61000-4-2 | N/A | 2.0 |
| EN IEC 61000-4-3 | i2 | 529b |
| EN 61000-4-4 | TEM A3000 | v4.6.1 |
| EN 61000-4-5 | EMC Partner | 1.69 |
| EN 61000-4-6 | i2 | 529b |
| EN 61000-4-8 | N/A | |
| EN IEC 61000-4-11 (<16A) | NOISE KEN | 2.0 |

| Site | Filename | Version |
|---|---|---|
| Conduction/Radiation | EZ EMC | ISL-03A2 |

## 17.2 Appendix B: Uncertainty of Measurement

The laboratory measurement uncertainty accordance with refers to CISPR 16-4-2. If Ulab is less than or equal to Ucispr in Table 1, then the test report may either state the value of Ulab or state that Ulab is less than Ucispr.
The coverage factor k = 2 yields approximately a 95 % level of confidence.

<Conduction 02>
AMN: ± 2.93 dB

<Chamber 02 (10m)>
Horizontal
30MHz~200MHz: ±4.42dB
200MHz~1000MHz: ±4.24dB
Vertical
30MHz~200MHz: ±4.81dB
200MHz~1000MHz: ±4.64dB

<Chamber 14 (3m)>
1GHz~6GHz: ±5.01dB

<Immunity 02>

| Test item | Uncertainty | Test item | Uncertainty |
|---|---|---|---|
| EN 61000-4-2 (ESD) | | EN 61000-4-6 (CS) | |
| Rise time tr | ≦ 10.92% | CDN | 1.81 dB |
| Peak current Ip | ≦ 5.84% | EM Clamp | 3.38 dB |
| current at 30 ns | ≦ 5.92% | EN 61000-4-8 (Magnetic) | 5.51 % |
| current at 60 ns | ≦ 5.85% | EN IEC 61000-4-11 (Dips) | 0.57 % |
| EN IEC 61000-4-3 (RS) | 2.67 dB | EN IEC 61000-3-2 (Harmonics) | 1.16 % |
| EN 61000-4-4 (EFT) | | EN 61000-3-3 (Fluctuations and Flicker) | 8.06 % |
| voltage rise time (tr) | 7.2 % | | |
| peak voltage value (VP) | 6.28 % | | |
| voltage pulse width ($t_w$) | 5.1 % | | |
| EN 61000-4-5 (Surge) | | | |
| open-circuit voltage front time | 11.2 % | | |
| open-circuit voltage peak value | 8.7 % | | |
| open-circuit voltage duration ($T_d$) | 0.55% | | |

## 17.3 Appendix C: Photographs of EUT

Please refer to the File of **ISL-23LE0516P-MA**

--- END ---