

# Certificate

Issue Date: January 10, 2022  
Ref. Report No. ISL-21LR042CT

Product Name : Lora module  
Main Model : LR62XE  
Series Model : NA  
Responsible Party : Fanstel Corporation, Taipei  
Address : 10F-10, No. 79, Sec. 1, Hsin Tai Wu Rd.,  
Hsi-Chih, New Taipei City 221 Taiwan

We, **International Standards Laboratory Corp.**, hereby certify that:

The device bearing the trade name and model specified above has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in the EMI part of RCM Mark. And Our laboratories is the accredited laboratories and are approved according to ISO/IEC 17025. The device was passed the test performed according to :



**Standards:**

AS/NZS CISPR 32:2015+A1:2020: Class B: Electromagnetic compatibility of multimedia equipment- Emission requirements

I attest to the accuracy of data and all measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

The determination of the test results is determined by customer agreement, regulations or standard document specifications.

The Laboratory evaluates measurement inaccuracies based on regulatory or standard document specifications and is listed in the report for reference. The quantitative project part judges the conformity of the test results based on the evaluation results of the standard cited uncertainty, and the qualitative project does not temporarily evaluate the measurement uncertainty.

*Angus Chu*

Angus Chu / Sr. Manager

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

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

# TEST REPORT

of  
**RCM Class B**

Product: **Lora module**  
Main Model: **LR62XE**  
Series Model: **NA**  
Brand: **Fanstel**  
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.**



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

Report No.: **ISL-21LR042CT**

Issue Date : **January 10, 2022**

This report totally contains 34 pages including this cover page and contents page.

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.

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# 1. General

## 1.1 Certification of Accuracy of Test Data

**Standards:** AS/NZS CISPR 32:2015+A1:2020: Class B:  
Electromagnetic compatibility of multimedia equipment-  
Emission requirements

**Equipment Tested:** Lora module

**Main Model:** LR62XE

**Series Model:** NA

**Brand:** Fanstel

**Applicant:** Fanstel Corporation, Taipei

**Sample received Date:** November 23, 2021

**Final test Date:** refer to the date of test data

**Test Site:** Chamber12; Chamber 19; Conduction 03; Immunity02

**Test Distance:** 10m; 3m (above 1GHz)

**Temperature:** refer to each site test data

**Humidity:** refer to each site test data

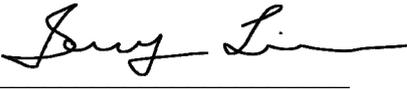
**Atmospheric Pressure:** 86 kPa to 106 kPa

**Input power:** Conduction input power: AC 230 V / 50 Hz  
Radiation input power: 1/10/2022 10:08:46 AM

**Test Result:** PASS

**Report Engineer:** Gigi Yeh

**Test Engineer:**   
Jason Chao

**Approved By:**   
Jerry Liu / Assistant Manager

## 1.2 Summary of Test Result

| Performed Item   | Test Performed | Deviation | Result |
|--|----------------|-----------|--------|
| Conducted emissions from the AC mains power ports            | Yes            | No        | PASS   |
| Telecommunication Port Conducted Emissions (asymmetric mode) | Yes            | No        | 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    |

### 1.3 Description of EUT

#### EUT

General:

|                   |                         |
|-------------------|-------------------------|
| Product Name:     | Lora transceiver module |
| Brand Name:       | Fanstel                 |
| Model Name:       | LR62XE                  |
| Model Difference: | N/A                     |
| Power Supply:     | 5Vdc from USB (JIG)     |
| RF function       | Lora                    |

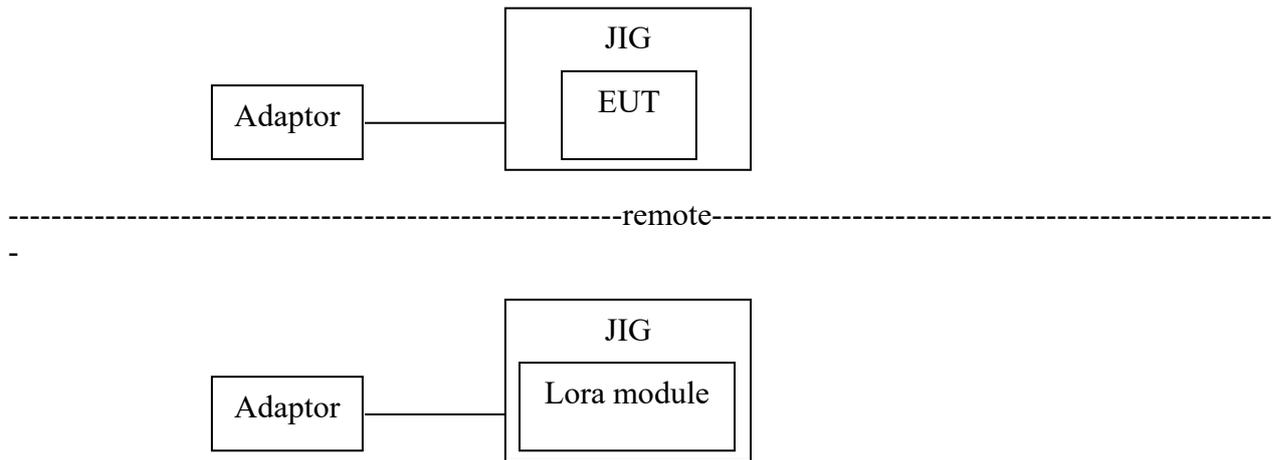
#### Test Plan

| Applicable standard |   | AS/NZS CISPR 32         |                          |
|---------------------|---|-------------------------|--------------------------|
| Test Configuration  |   | Config 1                | Config 2                 |
| Operation mode      |   | LoRa link(long antenna) | LoRa link(short antenna) |
| No.                 | Description                             |                         |                          |
| 1                   | Radiated emission(30M~1GHz)(above 1GHz) | Measured                | Pre-test                 |
| 2                   | Conducted emission (AC Power)           | Measured                | N/A                      |

### 1.4 Description of Support Equipment

Fig. 1-1 Configuration

Config 1



**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        | Non-Shielded /0.5m |

**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 | 0.5m         | Non-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.



### 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<br>MHz  | QP<br>dB( $\mu$ V) | AV<br>dB( $\mu$ V) |
|---|--------------------|--------------------|
| 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<br>MHz  | QP<br>dB( $\mu$ V) | AV<br>dB( $\mu$ V) |
|---|--------------------|--------------------|
| 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 |                    |                    |

- Neutral

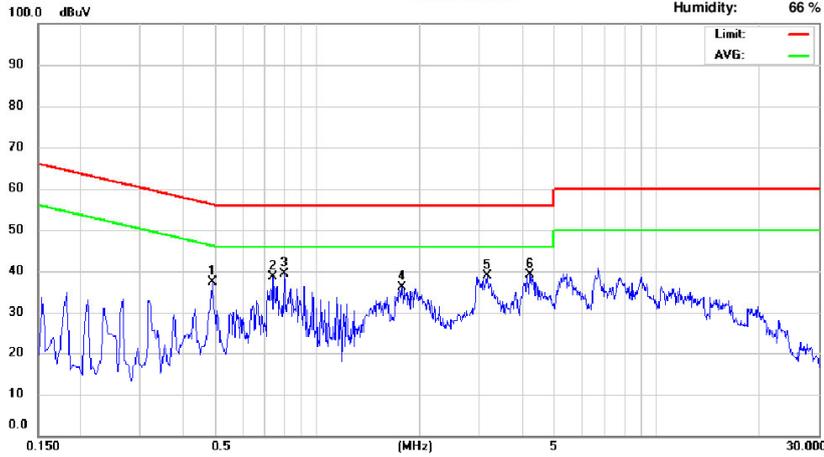


Address: No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist.,  
Tao Yuan City 325, Taiwan.  
Tel: 03-2638888

Conducted Emission Measurement

operator: Jeff Chou  
Temperature: 22 °C  
Humidity: 66 %

Date: 2021/12/3



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   | 0.490           | 24.06       | 10.61        | 9.68                | 33.74              | 56.17           | -22.43         | 20.29               | 46.17            | -25.88          |
| 2   | 0.742           | 22.72       | 14.66        | 9.69                | 32.41              | 56.00           | -23.59         | 24.35               | 46.00            | -21.65          |
| 3   | 0.798           | 24.25       | 15.43        | 9.69                | 33.94              | 56.00           | -22.06         | 25.12               | 46.00            | -20.88          |
| 4   | 1.778           | 22.28       | 13.23        | 9.72                | 32.00              | 56.00           | -24.00         | 22.95               | 46.00            | -23.05          |
| 5   | 3.170           | 22.45       | 14.59        | 9.76                | 32.21              | 56.00           | -23.79         | 24.35               | 46.00            | -21.65          |
| 6   | 4.238           | 23.81       | 14.63        | 9.78                | 33.59              | 56.00           | -22.41         | 24.41               | 46.00            | -21.59          |

Note:

Margin = QP/AVG Emission - Limit

QP/AVG Emission = QP\_R/AVG\_R + Correct Factor

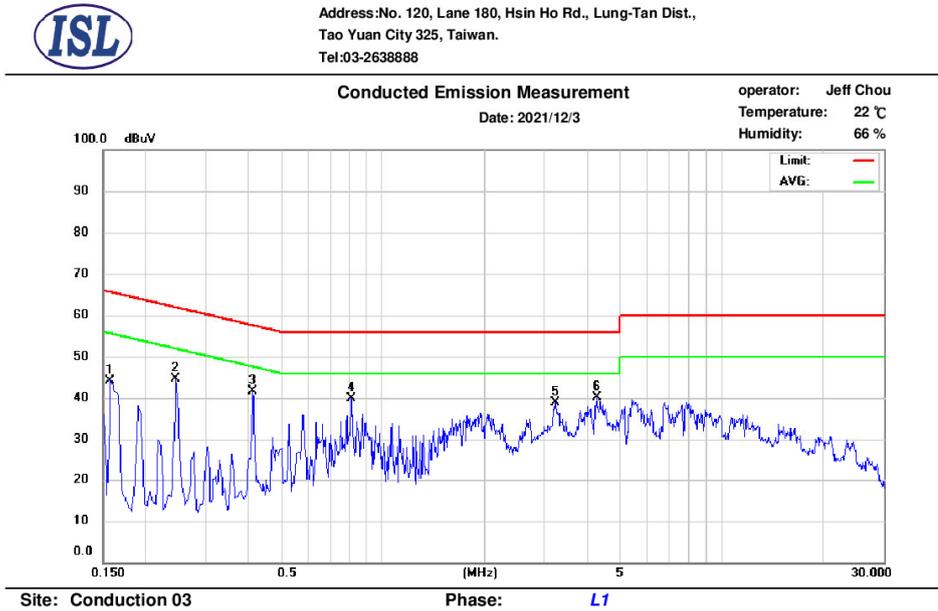
Correct Factor = LISN Loss + Cable Loss

A margin of -8dB means that the emission is 8dB below the limit

The frequency spectrum graph is for final peak graph, and the attached table is for QP/AVG test result.

If peak data can pass, it will be shown in "QP/AVG Correct" column, if not, QP/AVG data will instead.

## 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   | 0.158           | 34.54       | 10.44        | 9.64                | 44.18              | 65.57           | -21.39         | 20.08               | 55.57            | -35.49          |
| 2   | 0.246           | 30.94       | 8.94         | 9.65                | 40.59              | 61.89           | -21.30         | 18.59               | 51.89            | -33.30          |
| 3   | 0.414           | 25.21       | 6.54         | 9.66                | 34.87              | 57.57           | -22.70         | 16.20               | 47.57            | -31.37          |
| 4   | 0.810           | 26.13       | 14.61        | 9.68                | 35.81              | 56.00           | -20.19         | 24.29               | 46.00            | -21.71          |
| 5   | 3.230           | 22.96       | 14.94        | 9.74                | 32.70              | 56.00           | -23.30         | 24.68               | 46.00            | -21.32          |
| 6   | 4.286           | 21.20       | 14.22        | 9.76                | 30.96              | 56.00           | -25.04         | 23.98               | 46.00            | -22.02          |

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

The frequency spectrum graph is for final peak graph, and the attached table is for QP/AVG test result.

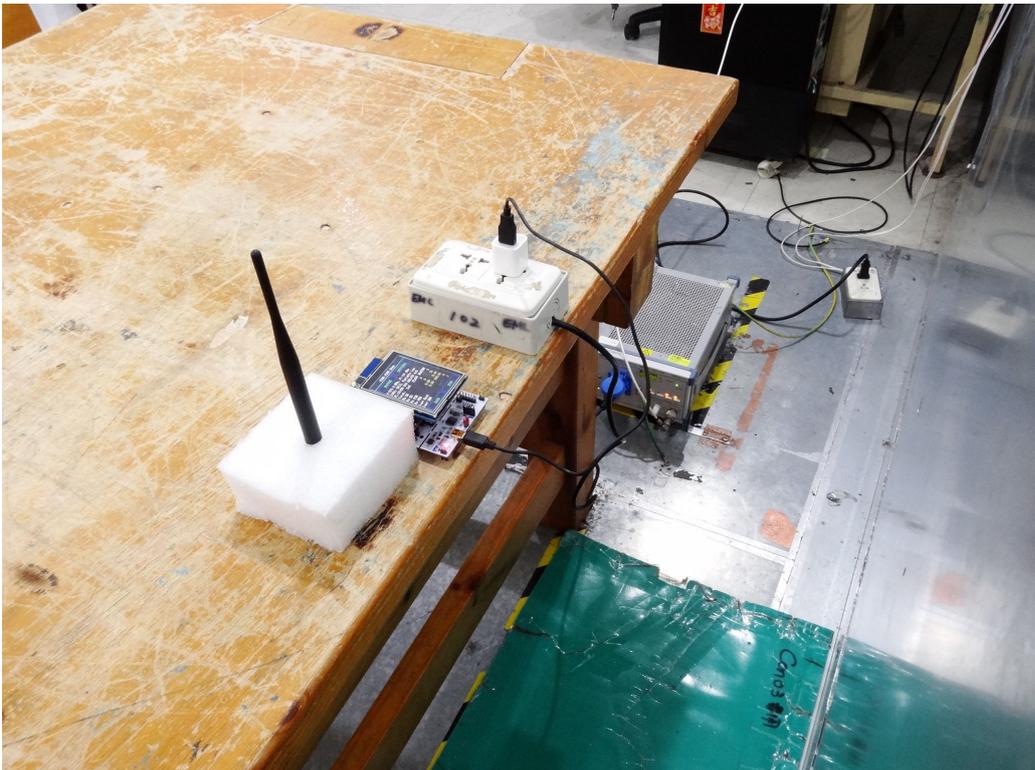
If peak data can pass, it will be shown in "QP/AVG Correct" column, if not, QP/AVG data will instead.

### 2.3 Test Setup Photo

Front View



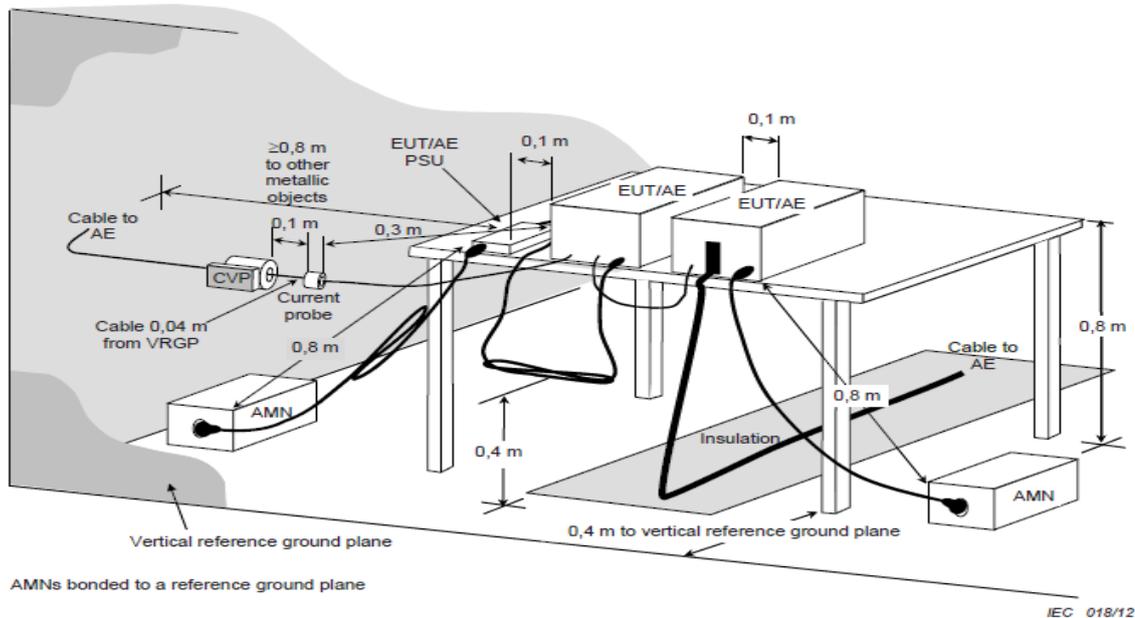
Back View



### 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 & AS/NZS CISPR 32 requirements.

The port of the EUT was connected to the support equipment through the ISN 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 LISN.

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 fibre ports with metallic shield or tension members.
3. antenna ports.

| Frequency range MHz | Coupling device       | Detector type / bandwidth | Class_A voltage limits dB( $\mu$ V) | Class_A current limits dB( $\mu$ A) |
|---------------------|-----------------------|---------------------------|-------------------------------------|-------------------------------------|
| 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 fibre 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( $\mu$ V) | Class_B current limits dB( $\mu$ A) |
|---------------------|-----------------------|---------------------------|-------------------------------------|-------------------------------------|
| 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                                  |

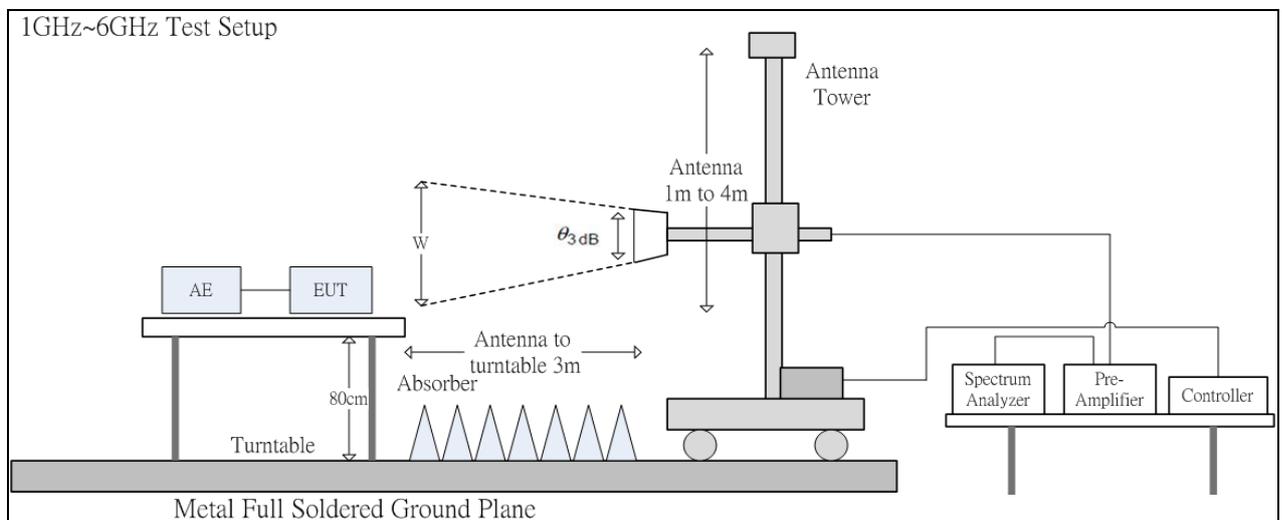
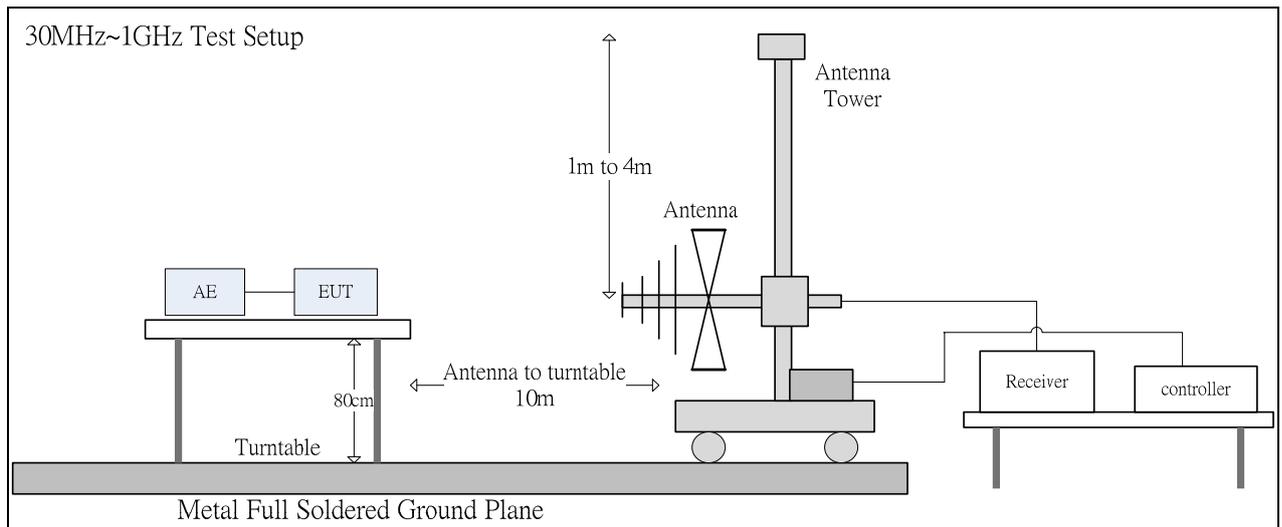
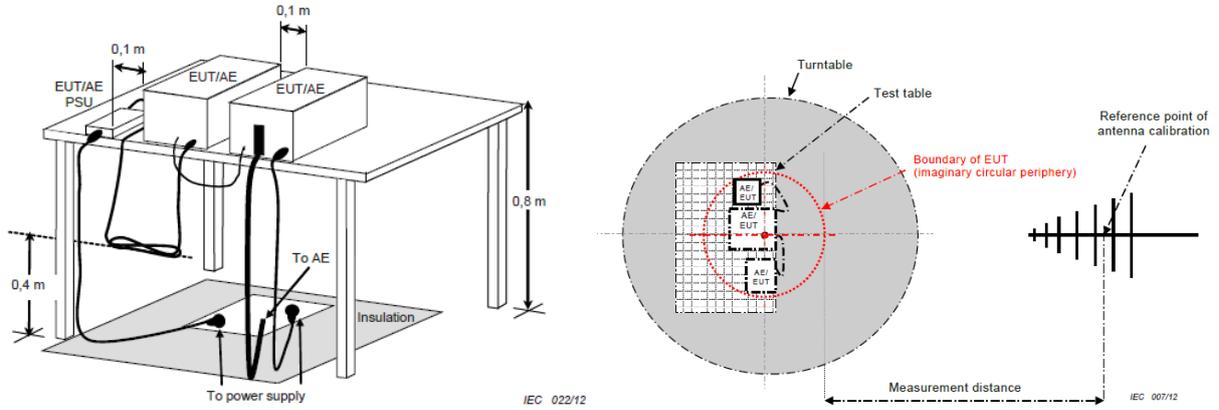
### 3.2 Test Result

**\*\*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 | $\theta_{3dB}(\text{min})$ | 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 & AS/NZS CISPR 32 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<br>MHz | Measurement   |                              | Class_A limits dB(μV/m) |
|------------------------|---------------|------------------------------|-------------------------|
|                        | Distance<br>m | Detector type /<br>bandwidth | OATS/SAC                |
| 30-230                 | 10            | Quasi Peak /<br>120 kHz      | 40                      |
| 230-1000               |               |                              | 47                      |
| 30-230                 | 3             |                              | 50                      |
| 230-1000               |               |                              | 57                      |

**Radiated emissions at frequencies above 1 GHz for Class A equipment:**

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

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

| Frequency range<br>MHz | Measurement   |                              | Class_B limits dB(μV/m) |
|------------------------|---------------|------------------------------|-------------------------|
|                        | Distance<br>m | Detector type /<br>bandwidth | OATS/SAC                |
| 30-230                 | 10            | Quasi Peak /<br>120 kHz      | 30                      |
| 230-1000               |               |                              | 37                      |
| 30-230                 | 3             |                              | 40                      |
| 230-1000               |               |                              | 47                      |

**Radiated emissions at frequencies above 1 GHz for Class B equipment:**

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

**Radiated emissions from FM receivers:**

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

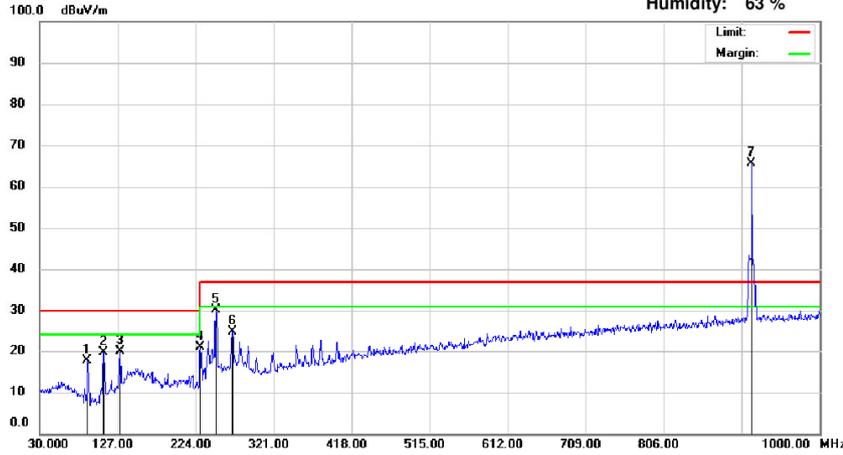
### 4.3 Radiation Test Data: Configuration 1 - Radiated Emissions (Horizontal)



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

Radiated Emission Measurement  
Date: 2021/12/3

Operator: Mamie\_Chen  
Temperature: 22 °C  
Humidity: 63 %



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   | 89.17           | 39.84       | -22.18               | 17.66             | 30.00          | -12.34      | 400          | 199            | peak     |
| 2   | 109.54          | 38.87       | -19.23               | 19.64             | 30.00          | -10.36      | 400          | 334            | peak     |
| 3   | 129.91          | 37.31       | -17.52               | 19.79             | 30.00          | -10.21      | 400          | 334            | peak     |
| 4   | 229.82          | 38.88       | -17.98               | 20.90             | 30.00          | -9.10       | 308          | 78             | peak     |
| 5   | 249.22          | 46.10       | -16.02               | 30.08             | 37.00          | -6.92       | 300          | 321            | peak     |
| 6   | 269.59          | 39.73       | -15.20               | 24.53             | 37.00          | -12.47      | 300          | 321            | peak     |
| 7   | 915.61          | 67.53       | -2.02                | 65.51             | 37.00          | 28.51       | 400          | 232            | peak     |



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

Radiated Emission Measurement      Operator: Mamie\_Chen  
Date: 2021/12/3      Temperature: 22 °C  
Humidity: 63 %

Site : Chamber 02

Polarization: *Horizontal*

EUT :

Model Name : LR62XE

Mode :

Note : Config01

| Frequency (MHz) | Emission (dBuV/m) | Margin (dB) | Note                  |
|-----------------|-------------------|-------------|-----------------------|
| 915.6100        | 65.51             | 28.51       | Fundamental frequency |

\* Note:

Margin = Emission – Limit

Emission = Radiated Amplitude + Correct Factor

Correct Factor = Antenna Correction Factor + Cable Loss – Pre-Amplifier Gain

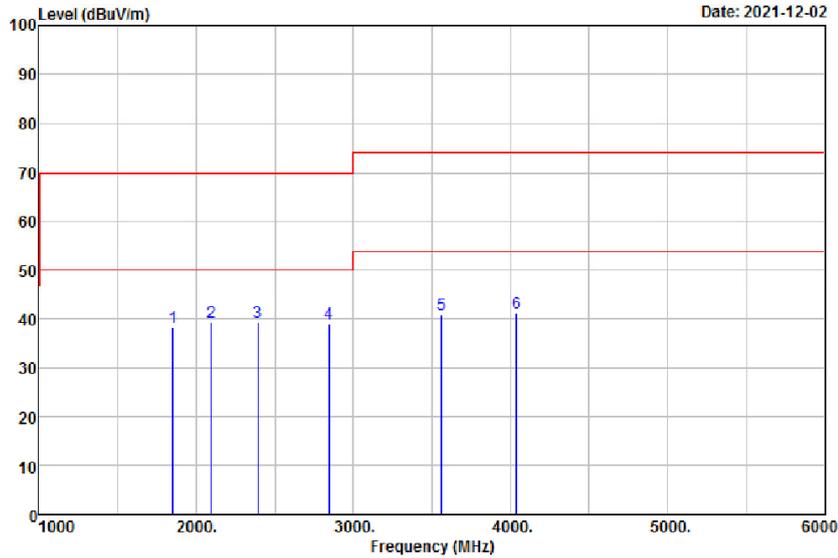
A margin of -8dB means that the emission is 8dB below the limit

Antenna Distance: 10 meters

Below 1GHz test, if the peak measured value meets the QP limit, it is unnecessary to perform the QP measurement.



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

|   | Read Freq | Read Level | Factor | Level  | Limit Line | Over Limit | Remark | Pol/Phase  |
|---|-----------|------------|--------|--------|------------|------------|--------|------------|
|   | MHz       | dBuV       | dB/m   | dBuV/m | dBuV/m     | dB         |        |            |
| 1 | 1850.00   | 50.98      | -12.86 | 38.12  | 70.00      | -31.88     | Peak   | HORIZONTAL |
| 2 | 2095.00   | 51.96      | -12.84 | 39.12  | 70.00      | -30.88     | Peak   | HORIZONTAL |
| 3 | 2390.00   | 50.99      | -11.80 | 39.19  | 70.00      | -30.81     | Peak   | HORIZONTAL |
| 4 | 2845.00   | 50.22      | -11.23 | 38.99  | 70.00      | -31.01     | Peak   | HORIZONTAL |
| 5 | 3560.00   | 50.09      | -9.39  | 40.70  | 74.00      | -33.30     | Peak   | HORIZONTAL |
| 6 | 4040.00   | 50.01      | -9.05  | 40.96  | 74.00      | -33.04     | Peak   | HORIZONTAL |

- 1 -

\* 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

Above 1GHz test, if the peak measured value meets the average limit, it is unnecessary to perform the average measurement.

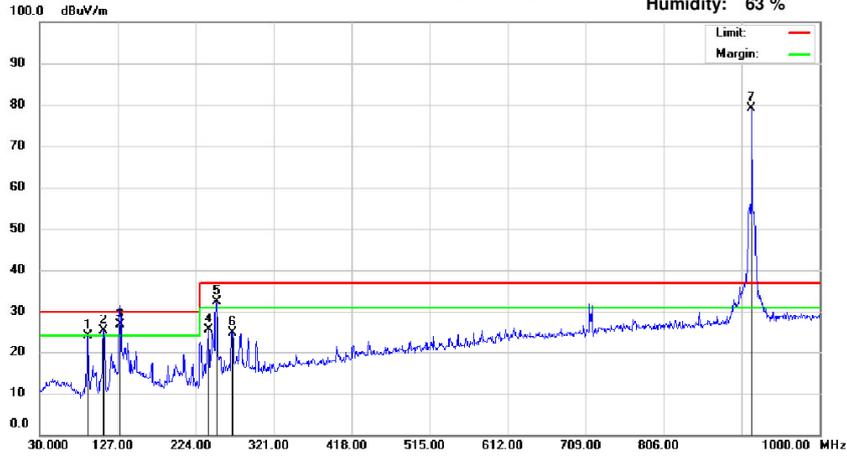
### -Radiated Emissions (Vertical)



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

Radiated Emission Measurement  
Date: 2021/12/3

Operator: Mamie\_Chen  
Temperature: 22 °C  
Humidity: 63 %



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   | 90.14           | 45.93       | -22.10               | 23.83             | 30.00          | -6.17       | 100          | 169            | peak     |
| 2   | 109.54          | 44.48       | -19.23               | 25.25             | 30.00          | -4.75       | 100          | 242            | peak     |
| 3   | 130.19          | 44.24       | -17.51               | 26.73             | 30.00          | -3.27       | 100          | 232            | QP       |
| 4   | 240.49          | 41.83       | -16.38               | 25.45             | 37.00          | -11.55      | 100          | 82             | peak     |
| 5   | 250.19          | 48.41       | -15.98               | 32.43             | 37.00          | -4.57       | 100          | 156            | peak     |
| 6   | 269.59          | 39.85       | -15.20               | 24.65             | 37.00          | -12.35      | 100          | 156            | peak     |
| 7   | 915.61          | 81.05       | -2.02                | 79.03             | 37.00          | 42.03       | 100          | 233            | peak     |



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

Radiated Emission Measurement      Operator: Mamie\_Chen  
Date: 2021/12/3                              Temperature: 22 °C  
Humidity: 63 %

Site : Chamber 02

Polarization: *Vertical*

EUT :

Model Name : LR62XE

Mode :

Note : Config01

| Frequency (MHz) | Emission (dBuV/m) | Margin (dB) | Note                  |
|-----------------|-------------------|-------------|-----------------------|
| 915.6100        | 79.03             | 42.03       | Fundamental frequency |

\* Note:

Margin = Emission – Limit

Emission = Radiated Amplitude + Correct Factor

Correct Factor = Antenna Correction Factor + Cable Loss – Pre-Amplifier Gain

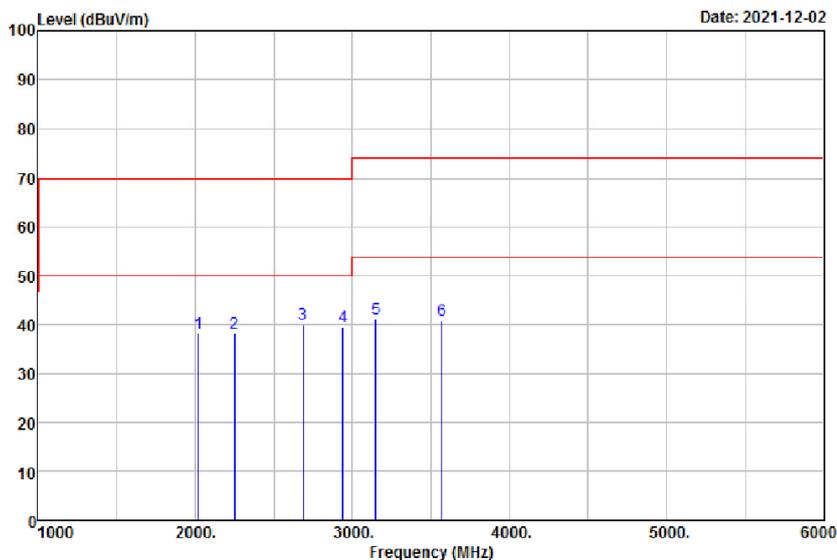
A margin of -8dB means that the emission is 8dB below the limit

Antenna Distance: 10 meters

Below 1GHz test, if the peak measured value meets the QP limit, it is unnecessary to perform the QP measurement.



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 | 2020.00 | 51.16      | -13.02 | 38.14  | 70.00      | -31.86     | Peak   | VERTICAL  |
| 2 | 2250.00 | 50.60      | -12.50 | 38.10  | 70.00      | -31.90     | Peak   | VERTICAL  |
| 3 | 2685.00 | 50.89      | -10.97 | 39.92  | 70.00      | -30.08     | Peak   | VERTICAL  |
| 4 | 2940.00 | 50.55      | -11.13 | 39.42  | 70.00      | -30.58     | Peak   | VERTICAL  |
| 5 | 3150.00 | 51.34      | -10.23 | 41.11  | 74.00      | -32.89     | Peak   | VERTICAL  |
| 6 | 3570.00 | 50.19      | -9.42  | 40.77  | 74.00      | -33.23     | Peak   | VERTICAL  |

- 1 -

\* Note:

Margin = Emission – Limit

Emission = Radiated Amplitude + Correct Factor

Correct Factor = Antenna Correction Factor + Cable Loss – Pre-Amplifier Gain

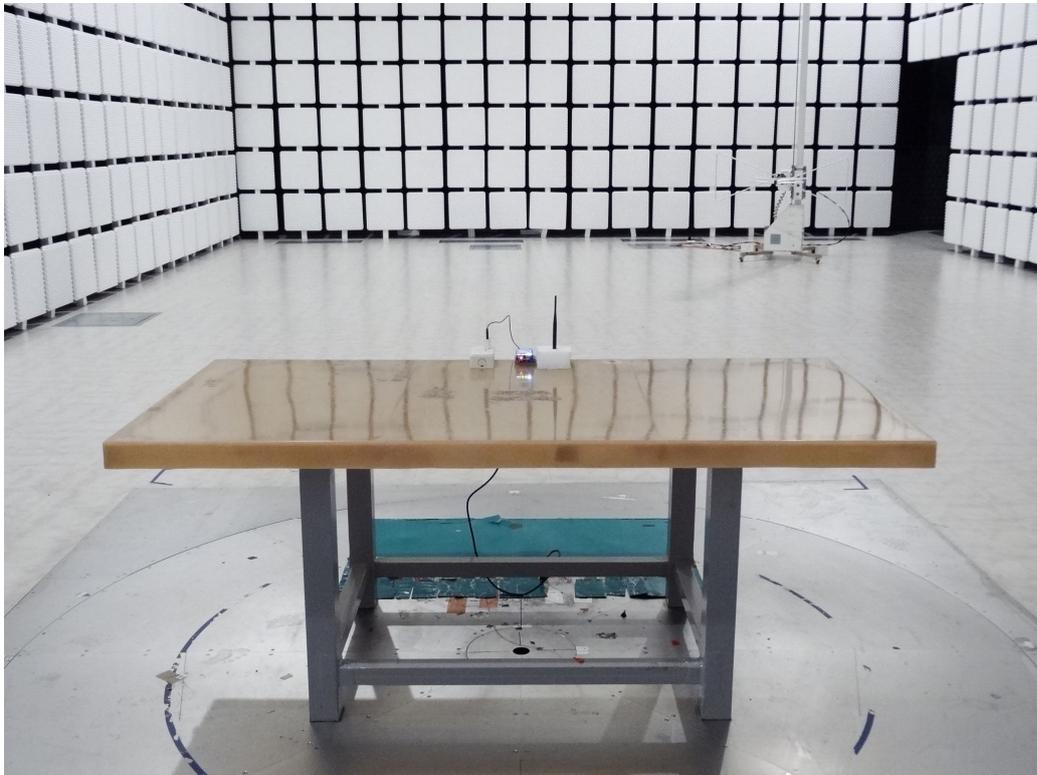
A margin of -8dB means that the emission is 8dB below the limit

Antenna Distance: 3 meters

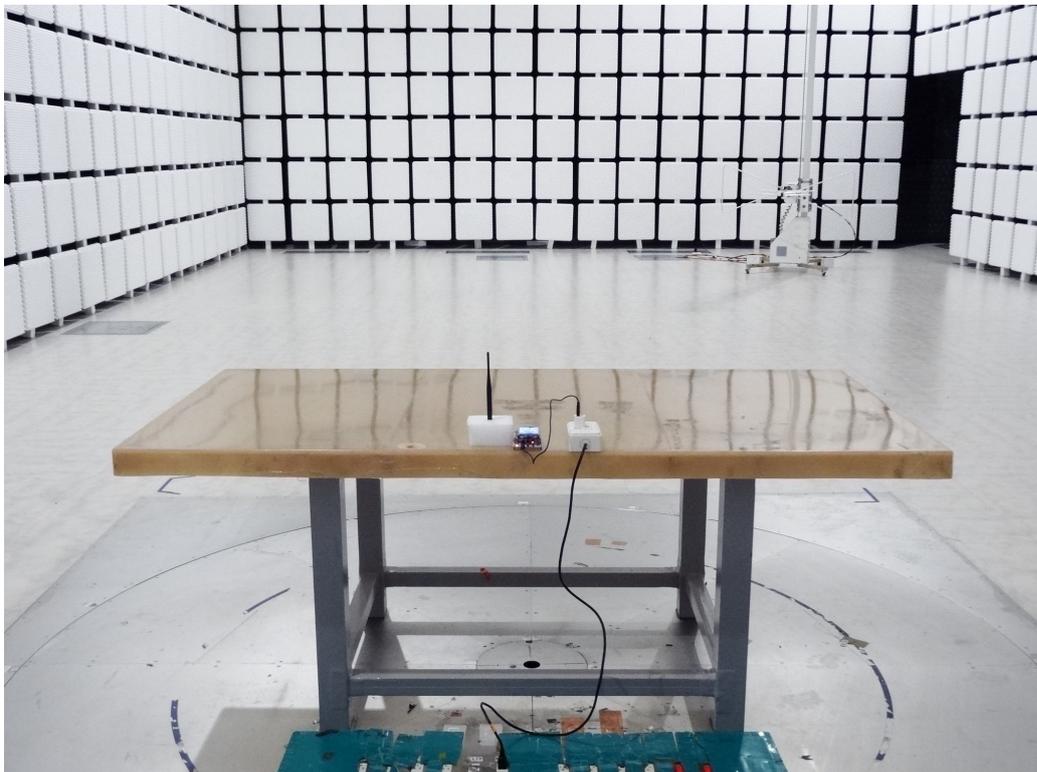
Above 1GHz test, if the peak measured value meets the average limit, it is unnecessary to perform the average measurement.

#### 4.4 Test Setup Photo

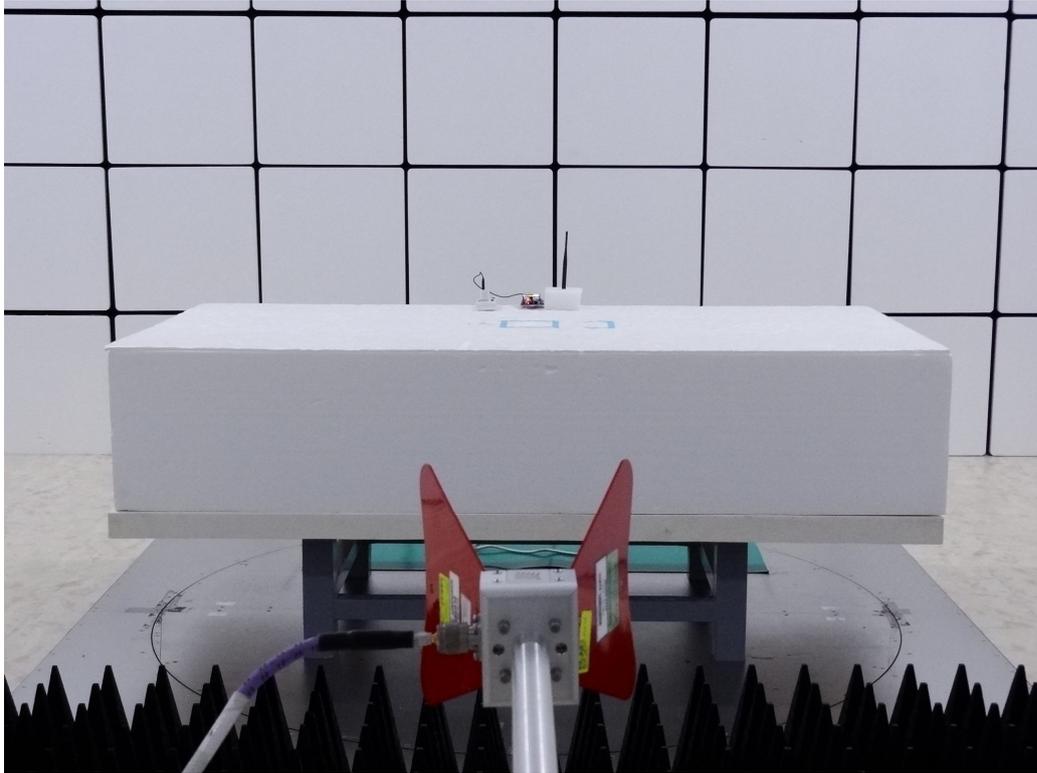
Front View (30MHz~1GHz)



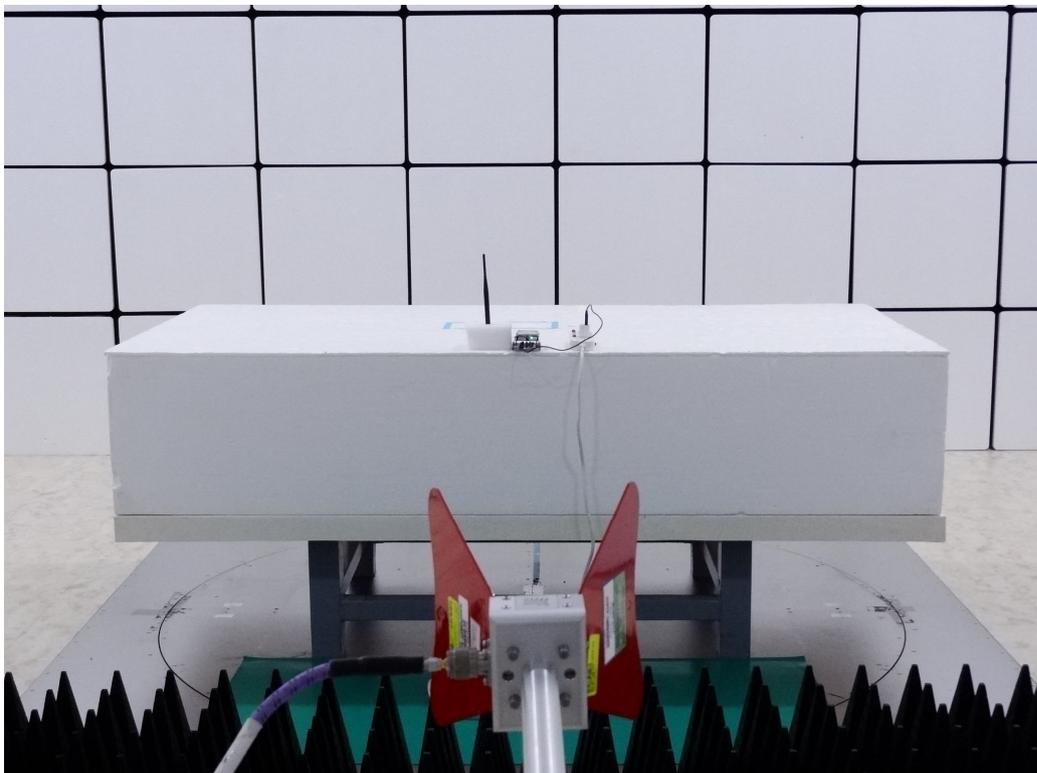
Back View (30MHz~1GHz)



Front View (above 1GHz)



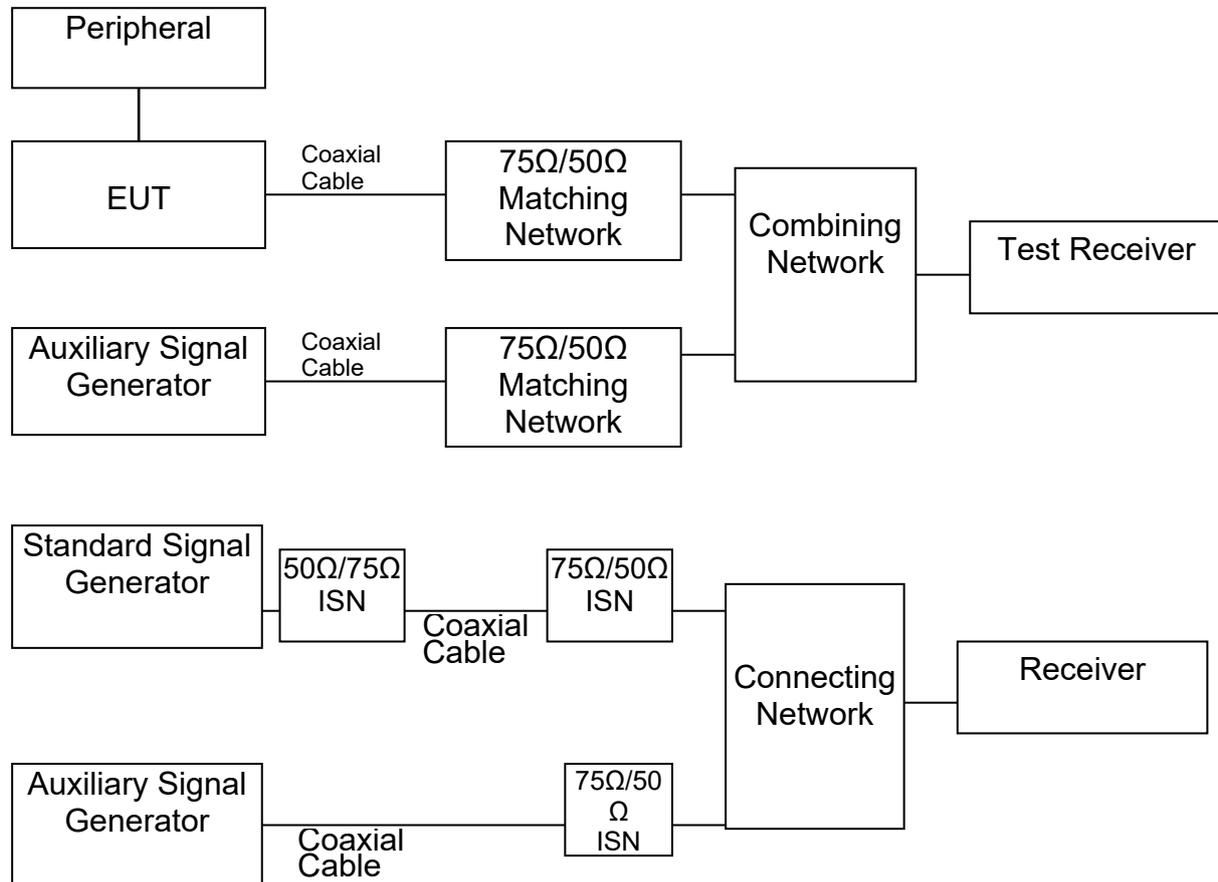
Back View (above 1GHz)



## 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 70dBuV 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.

| Table clause | Frequency range MHz | Detector type/ bandwidth                             | Class B limits dB(μV) 75 Ω |                              |                            | Applicability |
|--------------|---------------------|--|----------------------------|------------------------------|----------------------------|---------------|
|              |                     |  | Other                      | Local Oscillator Fundamental | Local Oscillator Harmonics |               |
| A12.1        | 30 – 950            | For frequencies ≤1 GHz<br><br>Quasi Peak/<br>120 kHz | 46                         | 46                           | 46                         | See a)        |
|              | 950 – 2 150         |  | 46                         | 54                           | 54                         |               |
| A12.2        | 950 – 2 150         |  | 46                         | 54                           | 54                         | See b)        |
| A12.3        | 30 – 300            |  | For frequencies ≥1 GHz     | 46                           | 54                         | 50            |
|              | 300 – 1 000         | 52   |                            |                              |                            |               |
| A12.4        | 30 – 300            | Peak/<br>1 MHz                                       | 46                         | 66                           | 59                         | See d)        |
|              | 300 – 1 000         |  |                            |                              | 52                         |               |
| A12.5        | 30 – 950            |  | 46                         | 76                           | 46                         | See e)        |
|              | 950 – 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.

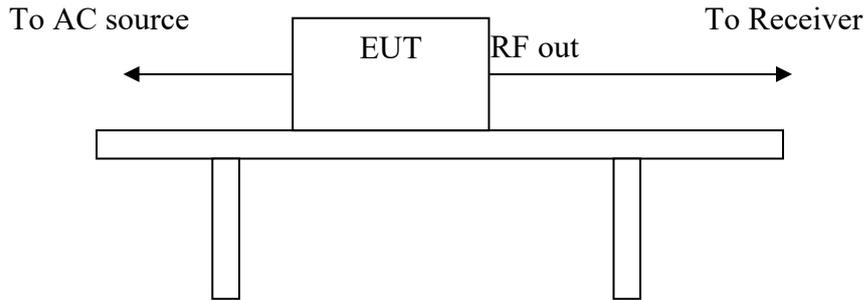
e) Applicable to EUTs with RF modulator output ports (for example DVD equipment, video recorders, camcorders and decoders etc.) designed to connect to TV broadcast receiver tuner ports.

**\*\*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 70dBuV 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.**

| Table clause | Frequency range MHz | Detector type/ bandwidth                             | Class B limits dB(μV) 75 Ω |                              |                            | Applicability |
|--------------|---------------------|--|----------------------------|------------------------------|----------------------------|---------------|
|              |                     |  | Other                      | Local Oscillator Fundamental | Local Oscillator Harmonics |               |
| A12.1        | 30 – 950            | For frequencies ≤1 GHz<br><br>Quasi Peak/<br>120 kHz | 46                         | 46                           | 46                         | See a)        |
|              | 950 – 2 150         |  | 46                         | 54                           | 54                         |               |
| A12.2        | 950 – 2 150         |  | 46                         | 54                           | 54                         | See b)        |
| A12.3        | 30 – 300            |  | For frequencies ≥1 GHz     | 46                           | 54                         | 50            |
|              | 300 – 1 000         | 52   |                            |                              |                            |               |
| A12.4        | 30 – 300            | Peak/<br>1 MHz                                       | 46                         | 66                           | 59                         | See d)        |
|              | 300 – 1 000         |  |                            |                              | 52                         |               |
| A12.5        | 30 – 950            | Peak/<br>1 MHz                                       | 46                         | 76                           | 46                         | See e)        |
|              | 950 – 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.

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

## 7. Appendix

### 7.1 Appendix A: Test Equipment

#### 7.1.1 Test 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                     | SCHWARZBECK     | 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             | SCHWARZBECK     | NTFM 8158     | 8158 0123          | 01/17/2021     | 01/17/2022     |
| 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  | 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   | Equipment Name                 | Brand           | Model                  | S/N                     | Last Cal. Date | Next Cal. Date |
|------------|--------------------------------|-----------------|------------------------|-------------------------|----------------|----------------|
| Chamber 19 | Signal analyzer                | R&S             | FSV40                  | 101919                  | 8/18/2021      | 8/18/2022      |
| Chamber 19 | EMI Receiver                   | R&S             | ESR3                   | 102461                  | 5/05/2021      | 5/05/2022      |
| Chamber 19 | Loop Antenna                   | EM              | EM-6879                | 271                     | 09/29/2021     | 09/29/2022     |
| Chamber 19 | Bilog Antenna<br>(30MHz-1GHz)  | Schwarzbeck     | VULB9168 w<br>6dB Att. | 9168-736                | 2/22/2021      | 2/22/2022      |
| Chamber 19 | Horn antenna<br>(1GHz-18GHz)   | ETS             | 3117                   | 00218718                | 10/12/2021     | 10/12/2022     |
| Chamber 19 | Horn antenna<br>(18GHz-26GHz)  | Com-power       | AH-826                 | 081001                  | 11/30/2021     | 11/30/2022     |
| Chamber 19 | Horn antenna<br>(26GHz-40GHz)  | Com-power       | AH-640                 | 100A                    | 03/11/2021     | 03/11/2022     |
| Chamber 19 | Preamplifier<br>(9kHz-1GHz)    | HP              | 8447F                  | 3113A04621              | 06/22/2021     | 06/22/2022     |
| Chamber 19 | Preamplifier<br>(1GHz - 26GHz) | EM              | EM01M26G               | 060681                  | 05/07/2021     | 05/07/2022     |
| Chamber 19 | Preamplifier<br>(26GHz-40GHz)  | MITEQ           | JS4-26004000-<br>27-5A | 818471                  | 05/07/2021     | 05/07/2022     |
| Chamber 19 | RF Cable<br>(100kHz-26.5GHz)   | Huber Suhner    | Sucoflex 104A          | MY1394/4A<br>& 50886/4A | 08/30/2021     | 08/30/2022     |
| Chamber 19 | RF Cable<br>(18GHz-40GHz)      | HUBER<br>SUHNER | Sucoflex 102           | 27963/2&374<br>21/2     | 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            |

### 7.1.2 Software for Controlling Spectrum/Receiver and Calculating Test Data

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

## 7.2 Appendix B: Uncertainty of Measurement

The laboratory measurement uncertainty accordance with refers to CISPR 16-4-2. If  $U_{lab}$  is less than or equal to  $U_{cisp}$  in Table 1, then the test report may either state the value of  $U_{lab}$  or state that  $U_{lab}$  is less than  $U_{cisp}$ .

The coverage factor  $k = 2$  yields approximately a 95 % level of confidence.

### <Conduction 03>

AMN:  $\pm 2.90$ dB

ISN T4:  $\pm 3.05$ dB

ISN T8:  $\pm 3.05$ dB

CVP:  $\pm 3.62$ dB

CP:  $\pm 2.88$ dB

### <Chamber 02 (10m)>

Horizontal

30MHz~200MHz:  $\pm 4.52$ dB

200MHz~1000MHz:  $\pm 4.42$ dB

Vertical

30MHz~200MHz:  $\pm 4.51$ dB

200MHz~1000MHz:  $\pm 4.70$ dB

### <Chamber 19 (3M)>

30MHz~1000MHz:  $\pm 4.22$  dB

1GHz~40GHz:  $\pm 4.08$  dB

--- END ---