

**Brilliant Network & Automation  
Integrated System Co.,Ltd**

# TEST REPORT

**Model:**

STD AD100

**REPORT NUMBER**

220900036THC-001

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# Radio Spectrum TEST REPORT

|                               |                                                                                                                                                                          |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Applicant:</b>             | <b>Brilliant Network &amp; Automation Integrated System Co.,Ltd<br/>No. 41, Keyi St., Zhunan Township, Miaoli County 350402,<br/>Taiwan</b>                              |
| <b>Product:</b>               | <b>Standalone N2 Purge System</b>                                                                                                                                        |
| <b>Model No.:</b>             | <b>STD AD100</b>                                                                                                                                                         |
| <b>FCC ID:</b>                | <b>2A583-STDAD100</b>                                                                                                                                                    |
| <b>Test Method/ Standard:</b> | <b>47 CFR FCC Part 15.209</b>                                                                                                                                            |
| <b>Test By:</b>               | <b>Intertek Testing Services Taiwan Ltd.,<br/>Hsinchu Laboratory<br/>No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li,<br/>Shiang-Shan District, Hsinchu City, Taiwan</b> |



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### Revision History

| Report No.       | Issue Date    | Revision Summary |
|------------------|---------------|------------------|
| 220900036THC-001 | Oct. 31, 2022 | Original report  |

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**Summary of Test Data**

| Test Requirement        | Applicable Rule | Result |
|-------------------------|-----------------|--------|
| Radiated Emission test  | 15.209          | Pass   |
| Conducted Emission test | 15.207          | Pass   |
| Antenna Requirement     | 15.203          | Pass   |

Note: Please note that the test results with statement of conformity, the decision rules which are based on: Safety Testing: the specification, standard or IEC Guide 115.

Other Testing: the specification, standard and not taking into account the measurement uncertainty.

## 1. General Information

### 1.1 Identification of the EUT

|                               |                            |
|-------------------------------|----------------------------|
| <b>Product:</b>               | Standalone N2 Purge System |
| <b>Model No.:</b>             | STD AD100                  |
| <b>Operating Frequency:</b>   | 134.2 kHz                  |
| <b>Rated Power:</b>           | DC 24V                     |
| <b>Power Cord:</b>            | N/A                        |
| <b>Sample receiving date:</b> | 2022/09/15                 |
| <b>Sample condition:</b>      | Workable                   |
| <b>Test Date(s):</b>          | 2022/09/16 ~ 2022/09/26    |

### 1.2 Antenna description

**Antenna Type** : Dipole antenna  
**Connector Type** : PH

## 2. Test specifications

### 2.1 Test standard

The EUT was performed according to the requirement in FCC Part 15 Subpart C Section 15.209.

### 2.2 Operation mode

TX mode: EUT connected to Notebook PC USB port, executing "3in1\_Plus\_Test\_V1.0.0.4\_DO6" and start.

### 2.3 Peripherals equipment

| Peripherals     | Brand   | Model No.         | Serial No. | Data cable            |
|-----------------|---------|-------------------|------------|-----------------------|
| Notebook PC     | HP      | HP ProBook 440 G3 | 5CD8021S9H | USB To RS232 Cable 3m |
| DC Power Supply | Twintex | TP-1603C          | N/A        | N/A                   |

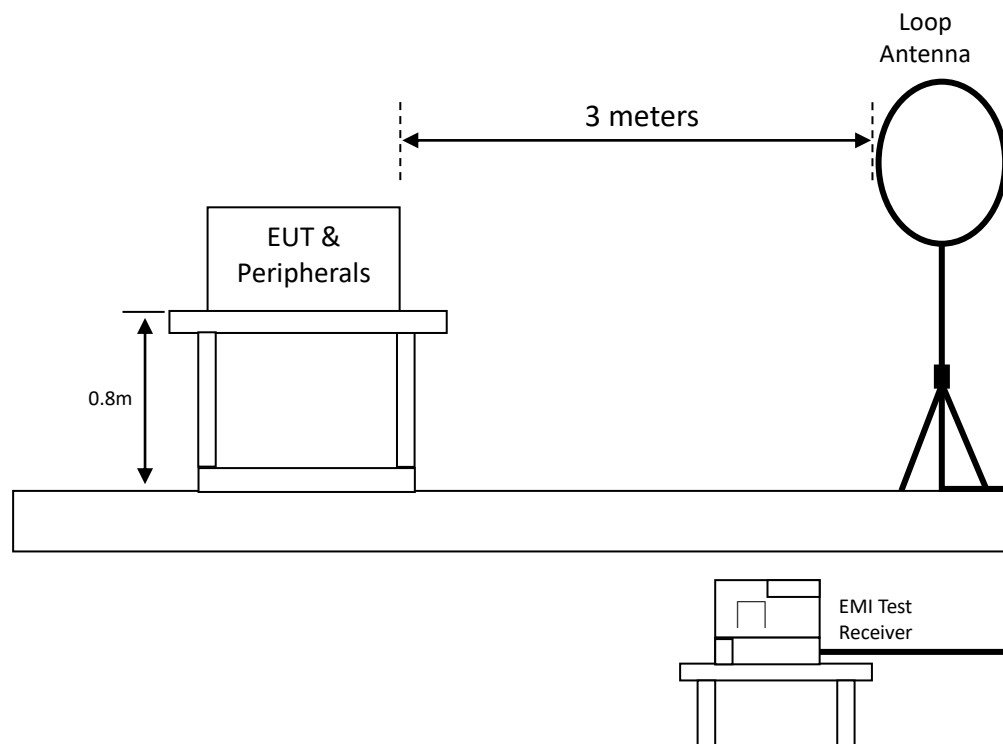
### 3. Radiated emission test FCC 15.209

#### 3.1 Operating environment

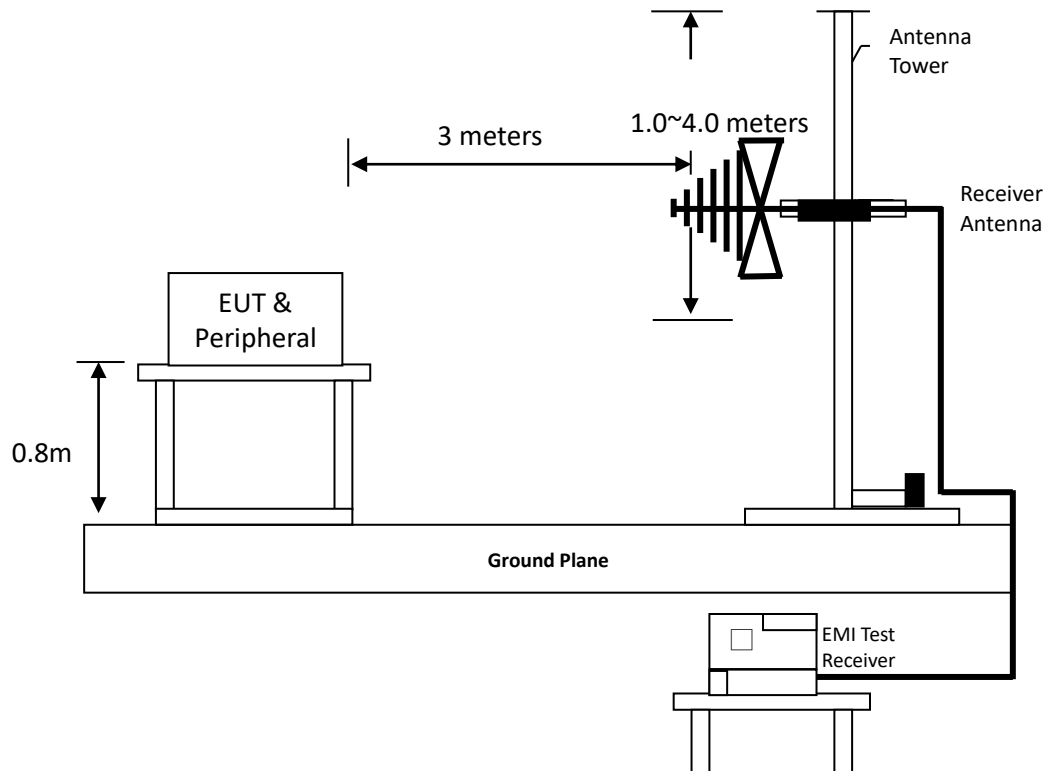
|                    |    |    |
|--------------------|----|----|
| Temperature:       | 26 | °C |
| Relative Humidity: | 61 | %  |

#### 3.2 Test setup & procedure

**Radiated emission from 9kHz to 30MHz uses Loop Antenna:**



## Radiated emission below 1GHz using Bilog Antenna



Radiated emissions were investigated cover the frequency range from 30MHz to 1000MHz using a receiver RBW of 120kHz record QP reading, and the frequency over 1GHz using a spectrum analyzer RBW of 1MHz and 10Hz VBW record Average reading. (15.209 paragraph), the Peak reading (1 MHz RBW/ 3 MHz VBW) recorded also on the report.

The EUT for testing is arranged on a turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

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### 3.3 Radiated emission limit

#### 3.3.1 General radiated emission limit

The spurious Emission shall test through the 10th harmonic. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

| Frequency (MHz) | Field Strength (μV/m) | Field Strength (dBμV/m) | Measurement Distance |
|-----------------|-----------------------|-------------------------|----------------------|
| 0.009-0.490     | 2400/F(KHz)           | 20 log (uV/m)           | 300                  |
| 0.490-1.705     | 2400/F(KHz)           | 20 log (uV/m)           | 30                   |
| 1.705-30        | 30                    | 29.5                    | 30                   |
| 30-88           | 100                   | 40                      | 3                    |
| 88-216          | 150                   | 43.5                    | 3                    |
| 216-960         | 200                   | 46                      | 3                    |
| Above 960       | 500                   | 54                      | 3                    |

Remark:

1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

### 3.4 Radiated emission test data FCC 15.209

#### 3.4.1 Measurement results: Fundamental emission

| Antenna Polarization | Frequency (MHz) | Spectrum Analyzer Detector | Correction Factor (dB/m) | Reading (dBμV) | Corrected Reading (dBμV/m) | Limit @ 3 m (dBμV/m) | Margin (dB) |
|----------------------|-----------------|----------------------------|--------------------------|----------------|----------------------------|----------------------|-------------|
| Perpendicular        | 0.134           | AV                         | 18.06                    | 77.92          | 95.98                      | 105.19               | -9.21       |
| Parallel             | 0.134           | AV                         | 18.06                    | 74.36          | 92.42                      | 105.19               | -12.77      |
| Ground-parallel      | 0.134           | AV                         | 18.06                    | 78.11          | 96.17                      | 105.19               | -9.02       |

Remark: Corr. Factor = Antenna Factor + Cable Loss

## TEST REPORT

### 3.4.2 Measurement results: Frequencies equal to or less than 1 GHz

| Antenna Polarization | Frequency (MHz) | Spectrum Analyzer Detector | Correction Factor (dB/m) | Reading (dBμV) | Corrected Reading (dBμV/m) | Limit @ 3 m (dBμV/m) | Margin (dB) |
|----------------------|-----------------|----------------------------|--------------------------|----------------|----------------------------|----------------------|-------------|
| Perpendicular        | 0.249           | AV                         | 18.45                    | 48.13          | 66.58                      | 99.69                | -33.11      |
| Perpendicular        | 0.369           | AV                         | 18.68                    | 38.60          | 57.28                      | 96.28                | -39.00      |
| Perpendicular        | 0.519           | QP                         | 18.81                    | 22.91          | 41.72                      | 73.34                | -31.62      |
| Perpendicular        | 0.639           | QP                         | 18.89                    | 29.95          | 48.84                      | 71.55                | -22.71      |
| Perpendicular        | 0.909           | QP                         | 19.04                    | 24.81          | 43.85                      | 68.49                | -24.64      |
| Perpendicular        | 1.209           | QP                         | 19.10                    | 30.38          | 49.48                      | 65.96                | -16.48      |

Remark: Corr. Factor = Antenna Factor + Cable Loss

| Antenna Polarization | Frequency (MHz) | Spectrum Analyzer Detector | Correction Factor (dB/m) | Reading (dBμV) | Corrected Reading (dBμV/m) | Limit @ 3 m (dBμV/m) | Margin (dB) |
|----------------------|-----------------|----------------------------|--------------------------|----------------|----------------------------|----------------------|-------------|
| Parallel             | 0.369           | AV                         | 18.68                    | 38.50          | 57.18                      | 96.28                | -39.10      |
| Parallel             | 0.639           | QP                         | 18.89                    | 29.99          | 48.88                      | 71.55                | -22.67      |
| Parallel             | 0.909           | QP                         | 19.04                    | 25.79          | 44.83                      | 68.49                | -23.66      |
| Parallel             | 1.269           | QP                         | 19.10                    | 21.65          | 40.75                      | 65.56                | -24.81      |
| Parallel             | 1.449           | QP                         | 19.10                    | 18.67          | 37.77                      | 64.40                | -26.63      |
| Parallel             | 1.748           | QP                         | 19.10                    | 16.59          | 35.69                      | 69.54                | -33.85      |

Remark: Corr. Factor = Antenna Factor + Cable Loss

| Antenna Polarization | Frequency (MHz) | Spectrum Analyzer Detector | Correction Factor (dB/m) | Reading (dBμV) | Corrected Reading (dBμV/m) | Limit @ 3 m (dBμV/m) | Margin (dB) |
|----------------------|-----------------|----------------------------|--------------------------|----------------|----------------------------|----------------------|-------------|
| Ground-parallel      | 0.399           | AV                         | 18.71                    | 41.38          | 60.09                      | 95.59                | -35.50      |
| Ground-parallel      | 0.669           | QP                         | 18.90                    | 32.03          | 50.93                      | 71.18                | -20.25      |
| Ground-parallel      | 0.939           | QP                         | 19.07                    | 26.45          | 45.52                      | 68.19                | -22.67      |
| Ground-parallel      | 1.209           | QP                         | 19.10                    | 23.19          | 42.29                      | 65.96                | -23.67      |
| Ground-parallel      | 1.479           | QP                         | 19.10                    | 19.14          | 38.24                      | 64.22                | -25.98      |
| Ground-parallel      | 1.748           | QP                         | 19.10                    | 18.14          | 37.24                      | 69.54                | -32.30      |

Remark: Corr. Factor = Antenna Factor + Cable Loss

**TEST REPORT**

| Antenna Polarity | Frequency (MHz) | Spectrum Analyzer Detector | Correction Factor (dB/m) | Reading (dBμV) | Corrected Reading (dBμV/m) | Limit @ 3 m (dBμV/m) | Margin (dB) |
|------------------|-----------------|----------------------------|--------------------------|----------------|----------------------------|----------------------|-------------|
| Vertical         | 385.99          | QP                         | 23.99                    | 2.19           | 26.18                      | 46.00                | -19.82      |
| Vertical         | 450.01          | QP                         | 25.89                    | 0.65           | 26.54                      | 46.00                | -19.46      |
| Vertical         | 489.78          | QP                         | 26.32                    | 7.01           | 33.33                      | 46.00                | -12.67      |
| Vertical         | 520.82          | QP                         | 27.02                    | 5.50           | 32.52                      | 46.00                | -13.48      |
| Vertical         | 728.40          | QP                         | 30.99                    | 2.12           | 33.11                      | 46.00                | -12.89      |
| Vertical         | 831.22          | QP                         | 32.53                    | 1.00           | 33.53                      | 46.00                | -12.47      |

Remark: Corr. Factor = Antenna Factor + Cable Loss

| Antenna Polarity | Frequency (MHz) | Spectrum Analyzer Detector | Correction Factor (dB/m) | Reading (dBμV) | Corrected Reading (dBμV/m) | Limit @ 3 m (dBμV/m) | Margin (dB) |
|------------------|-----------------|----------------------------|--------------------------|----------------|----------------------------|----------------------|-------------|
| Horizontal       | 165.80          | QP                         | 20.33                    | 4.60           | 24.93                      | 43.50                | -18.57      |
| Horizontal       | 491.72          | QP                         | 26.39                    | 8.70           | 35.09                      | 46.00                | -10.91      |
| Horizontal       | 515.00          | QP                         | 26.90                    | 6.11           | 33.01                      | 46.00                | -12.99      |
| Horizontal       | 587.75          | QP                         | 28.67                    | 1.63           | 30.30                      | 46.00                | -15.70      |
| Horizontal       | 677.96          | QP                         | 29.95                    | 1.57           | 31.52                      | 46.00                | -14.48      |
| Horizontal       | 731.31          | QP                         | 31.10                    | 2.34           | 33.44                      | 46.00                | -12.56      |

Remark: Corr. Factor = Antenna Factor + Cable Loss

#### 4. Conducted emission FCC 15.207

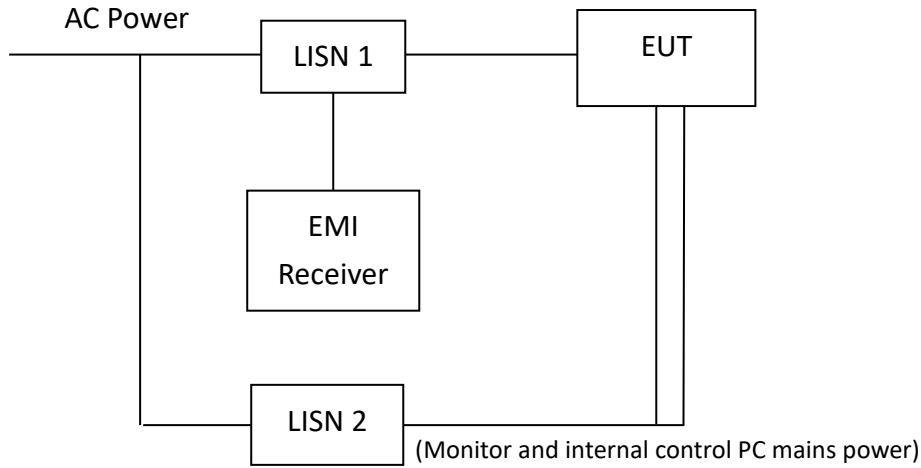
##### 4.1 Measuring instrument setting

| Receiver Function | Setting |
|-------------------|---------|
| Detector          | QP      |
| Start frequency   | 0.15MHz |
| Stop frequency    | 30MHz   |
| IF bandwidth      | 9 kHz   |
| Attenuation       | 10dB    |

##### 4.2 Test Procedure

|        |                                                                                                                                                                                                                               |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Step 1 | Configure the EUT according to ANSI C63.10:2013. The EUT or host of EHT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface. |
| Step 2 | Connect EUT or host of EUT to the power mains through a line impedance stabilization network.                                                                                                                                 |
| Step 3 | All the companion devices are connected to the other LISN. The LISN should provide 50Uh/50ohms coupling impedance.                                                                                                            |
| Step 4 | The frequency range from 150 kHz to 30MHz was searched.                                                                                                                                                                       |
| Step 5 | Set the test-receiver system to peak detector and specified bandwidth with maximum hold mode.                                                                                                                                 |
| Step 6 | The measurement has to be done between each power line and ground at the power terminal.                                                                                                                                      |

### 4.3 Test Diagram

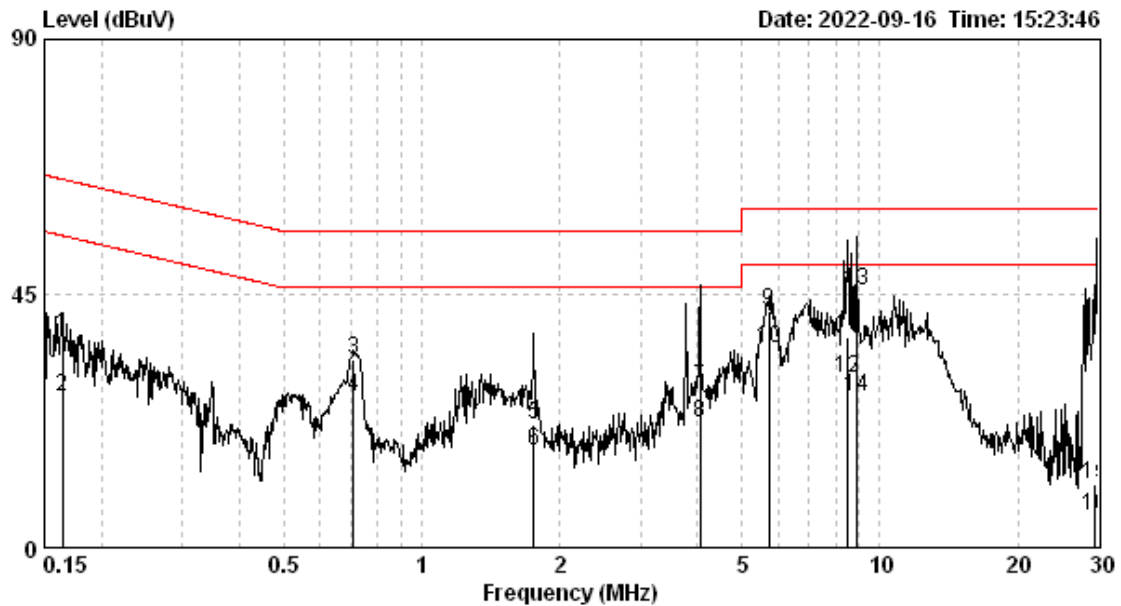


### 4.4 Limit

| Frequency<br>(MHz) | Conducted Limit (dBuV) |         |
|--------------------|------------------------|---------|
|                    | Q.P.                   | Ave.    |
| 0.15~0.50          | 66 – 56                | 56 – 46 |
| 0.50~5.00          | 56                     | 46      |
| 5.00~30.0          | 60                     | 50      |

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### 4.5 Test Results



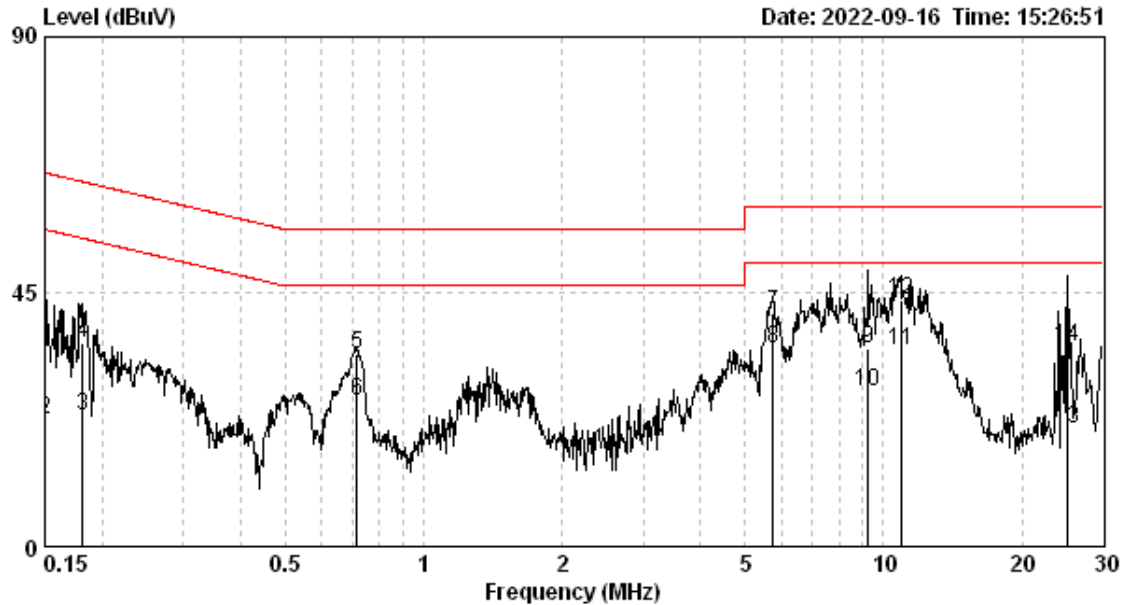
Test voltage :120Vac, 60Hz  
Temp./ R.H. :22°C / 54 %RH  
Atmospheric pressure :1005 hPa

| Phase | Frequency (MHz) | Corr. Factor (dB) | Reading QP (dBuV) | Level QP (dBuV) | Limit QP (dBuV) | Reading AV (dBuV) | Level AV (dBuV) | Limit AV (dBuV) | Margin (dB) |        |
|-------|-----------------|-------------------|-------------------|-----------------|-----------------|-------------------|-----------------|-----------------|-------------|--------|
|       |                 |                   |                   |                 |                 |                   |                 |                 | QP          | AV     |
| LINE  | 0.164           | 0.08              | 37.40             | 37.48           | 65.25           | 26.64             | 26.72           | 55.25           | -27.77      | -28.53 |
| LINE  | 0.708           | 0.11              | 33.18             | 33.29           | 56.00           | 26.44             | 26.55           | 46.00           | -22.71      | -19.45 |
| LINE  | 1.753           | 0.18              | 21.61             | 21.79           | 56.00           | 17.10             | 17.28           | 46.00           | -34.21      | -28.72 |
| LINE  | 4.049           | 0.24              | 27.96             | 28.20           | 56.00           | 21.72             | 21.96           | 46.00           | -27.80      | -24.04 |
| LINE  | 5.713           | 0.40              | 41.53             | 41.93           | 60.00           | 34.81             | 35.21           | 50.00           | -18.07      | -14.79 |
| LINE  | 8.501           | 0.60              | 36.81             | 37.42           | 60.00           | 29.29             | 29.89           | 50.00           | -22.58      | -20.11 |
| LINE  | 8.869           | 0.63              | 44.96             | 45.59           | 60.00           | 26.13             | 26.76           | 50.00           | -14.41      | -23.24 |
| LINE  | 29.371          | 1.11              | 9.98              | 11.09           | 60.00           | 4.62              | 5.74            | 50.00           | -48.91      | -44.26 |

#### Remark:

1. Corr. Factor (dB) = AMN Factor (dB) + Cable Loss (dB)
2. Level (dBuV) = Corr. Factor (dB) + Reading (dBuV)
3. Margin (dB) = Level (dBuV) – Limit (dBuV)

# TEST REPORT



Test voltage :120Vac, 60Hz  
Temp./ R.H. :22°C / 54 %RH  
Atmospheric pressure :1005 hPa

| Phase   | Frequency (MHz) | Corr. Factor (dB) | Reading QP (dBuV) | Level QP (dBuV) | Limit QP (dBuV) | Reading AV (dBuV) | Level AV (dBuV) | Limit AV (dBuV) | Margin (dB) |        |
|---------|-----------------|-------------------|-------------------|-----------------|-----------------|-------------------|-----------------|-----------------|-------------|--------|
|         |                 |                   |                   |                 |                 |                   |                 |                 | QP          | AV     |
| NEUTRAL | 0.150           | 0.08              | 39.15             | 39.23           | 66.00           | 22.18             | 22.26           | 56.00           | -26.77      | -33.74 |
| NEUTRAL | 0.182           | 0.08              | 35.81             | 35.89           | 64.42           | 23.03             | 23.11           | 54.42           | -28.53      | -31.31 |
| NEUTRAL | 0.716           | 0.10              | 33.92             | 34.02           | 56.00           | 25.65             | 25.75           | 46.00           | -21.98      | -20.25 |
| NEUTRAL | 5.744           | 0.29              | 40.98             | 41.27           | 60.00           | 34.58             | 34.87           | 50.00           | -18.73      | -15.13 |
| NEUTRAL | 9.253           | 0.42              | 34.40             | 34.82           | 60.00           | 27.00             | 27.42           | 50.00           | -25.18      | -22.58 |
| NEUTRAL | 10.905          | 0.47              | 43.06             | 43.53           | 60.00           | 34.12             | 34.59           | 50.00           | -16.47      | -15.41 |
| NEUTRAL | 25.055          | 0.76              | 34.59             | 35.34           | 60.00           | 20.14             | 20.89           | 50.00           | -24.66      | -29.11 |

## Remark:

1. Corr. Factor (dB) = AMN Factor (dB) + Cable Loss (dB)
2. Level (dBuV) = Corr. Factor (dB) + Reading (dBuV)
3. Margin (dB) = Level (dBuV) – Limit (dBuV)

## Appendix A: Test equipment list

| Test Equipment/<br>Test site   | Brand                          | Model No.           | Serial No.    | Calibration Date | Next Calibration Date |
|--------------------------------|--------------------------------|---------------------|---------------|------------------|-----------------------|
| EMI Test Receiver              | R&S                            | ESU40               | 100381        | 2022/05/16       | 2023/05/15            |
| Active Loop Antenna            | SCHWARZBECK<br>MESS-ELEKTRONIC | FMZB1519            | 1519-067      | 2022/04/13       | 2023/04/12            |
| Bi-log Hybrid Antenna          | ETC                            | MCTD2786            | BL13S03017    | 2022/05/19       | 2023/05/18            |
| 966-1(A) Cable                 | SUHNER                         | SMA / SUCOFLEX 104  | 29510614      | 2022/04/08       | 2023/04/07            |
| 966-1(B) Cable                 | JUNFLON                        | SMA / J12J100880-00 | AUG-26-08-001 | 2022/04/08       | 2023/04/07            |
| 966-1_3m Semi-Anechoic Chamber | 966_1                          | CEM-966_1           | N/A           | 2022/01/07       | 2023/01/06            |
| Test software                  | Audix                          | e3                  | V4.20040112L  | NCR              | NCR                   |
| EMI Test Receiver              | R&S                            | ESR7                | 101232        | 2022/02/07       | 2023/02/06            |
| LISN                           | R&S                            | ENV216              | 101160        | 2022/07/13       | 2023/07/12            |
| CON-3 Cable                    | SUHNER                         | SUCOFLEX 106        | 27222 /6      | 2022/01/12       | 2023/01/11            |
| Test software                  | Audix                          | e3                  | V4.20040112L  | NCR              | NCR                   |

Note: No Calibration Required (NCR).

## Appendix B: Measurement Uncertainty

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of  $k=2$ .

| Item                                                                                                        | Uncertainty |
|-------------------------------------------------------------------------------------------------------------|-------------|
| Fundamental emission                                                                                        | 4.32 dB     |
| Radiated disturbances from 9kHz~30MHz in a semi-anechoic chamber at a distance of 3m                        | 3.70 dB     |
| Vertically polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m   | 5.16 dB     |
| Horizontally polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m | 5.02 dB     |
| AC Power Line Conducted Emission                                                                            | 3.08 dB     |