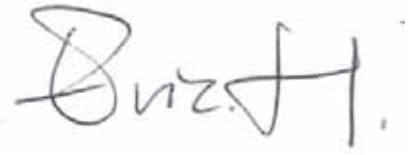
# VERIFICATION OF COMPLIANCE

**This Verification of Compliance is hereby issued to the product designated below.**

| | |
|---|---|
| **Product** | Switching Power Supply |
| **Model** | 850 B5 |
| **Data Applies To** | N/A |
| **Brand** | EVGA |
| **Applicant** | **EVGA Corporation**<br>18F., No.176, Jian 1st Rd., Zhonghe Dist., New Taipei City 235, Taiwan |
| **Manufacturer** | **EVGA Corporation**<br>18F., No.176, Jian 1st Rd., Zhonghe Dist., New Taipei City 235, Taiwan |
| **Applicable Standard(s)** | **EN 55032: 2012+AC: 2013, Class B**<br>EN 61000-3-2: 2014; EN 61000-3-3: 2013<br>**EN 55024: 2010**<br>IEC 61000-4-2: 2008; IEC 61000-4-3: 2006+A1: 2007+A2: 2010<br>IEC 61000-4-4: 2012; IEC 61000-4-5: 2014+A1: 2017<br>IEC 61000-4-6: 2013+C1: 2015; IEC 61000-4-8: 2009<br>IEC 61000-4-11: 2004+A1: 2017 |
| **Reference No.** | T200109N08-E |
| **Test Laboratory** | **Compliance Certification Services Inc.**<br>**Tainan Laboratory**<br>No.8,Jiucengling, Xinhua Dist., Tainan City 712, Taiwan (R.O.C.)<br>http://www.ccsrf.com |

**This device has been tested and found to comply with the stated standard, which is required by the Council Directive of 2014/30/EU. The test results are indicated in the test report and are applicable only to the tested sample identified in the report.**



**Eric Huang / Section Manager**
**Tainan Lab**
**Date: February 10, 2020**

# CE EMC
# TEST REPORT

for

**Switching Power Supply**

**Model: 850 B5**

**Data Applies To: N/A**

**Brand:** EVGA

Test Report Number:
T200109N08-E

Issued to:

**EVGA Corporation**

**18F., No.176, Jian 1st Rd., Zhonghe Dist., New Taipei City 235, Taiwan**

Issued by:

**Compliance Certification Services Inc.**

**Tainan Laboratory**

No.8,Jiucengling, Xinhua Dist., Tainan City
712, Taiwan (R.O.C.)

**TEL: 886-6-5802201**

**FAX: 886-6-5802202**

**Issued Date: February 10, 2020**

**Note:** *This document may be altered or revised by Compliance Certification Services Inc. personnel only, and shall be noted in the revision section of the document. The client should not use it to claim product endorsement by TAF, NIST or any government agencies.*

## REVISION HISTORY

| Rev. | Issue Date | Revisions | Effect Page | Revised By |
|---|---|---|---|---|
| 00 | February 10, 2020 | Initial Issue | ALL | Polly Wang |
| | | | | |
| | | | | |

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# 1 TEST CERTIFICATION

| | |
|---|---|
| **Product:** | Switching Power Supply |
| **Model:** | 850 B5 |
| **Data Applies To:** | N/A |
| **Brand:** | EVGA |
| **Applicant:** | **EVGA Corporation**<br>18F., No.176, Jian 1st Rd., Zhonghe Dist., New Taipei City 235, Taiwan |
| **Manufacturer:** | **EVGA Corporation**<br>18F., No.176, Jian 1st Rd., Zhonghe Dist., New Taipei City 235, Taiwan |
| **Tested:** | January 13, 2020 ~ February 03, 2020 |
| **Applicable Standards:** | **EN 55032: 2012+AC: 2013, Class B**<br>EN 61000-3-2: 2014<br>EN 61000-3-3: 2013<br><br>**EN 55024: 2010**<br>IEC 61000-4-2: 2008<br>IEC 61000-4-3: 2006+A1: 2007+A2: 2010<br>IEC 61000-4-4: 2012<br>IEC 61000-4-5: 2014+A1: 2017<br>IEC 61000-4-6: 2013+C1: 2015<br>IEC 61000-4-8: 2009<br>IEC 61000-4-11: 2004+A1: 2017 |

| **Deviation from Applicable Standard** |
|---|
| None |
| **Statements of Conformity** |
| Determining compliance shall be based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty. |

The above equipment was tested by Compliance Certification Services Inc. for compliance with the requirements of technical standards specified above under the EMC Directive 2014/30/EU. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

**Approved by:**

**Eric Huang**
Section Manager

**Reviewed by:**

**John Chen**
Supervisor

# 2 TEST RESULT SUMMARY

| EMISSION | | | |
|---|---|---|---|
| **Standard** | **Item** | **Result** | **Remarks** |
| **EN 55032: 2012+AC: 2013** | Conducted (Power Port) | PASS | Meet Class B limit |
| | Conducted (Analogue/Digital Data Ports) | N/A | No Requirement |
| | Radiated (Below 1GHz) | PASS | Meet Class B limit |
| | Radiated (Above 1GHz) | N/A | No Requirement |
| EN 61000-3-2: 2014 | Harmonic current emissions | PASS | Meet the requirement |
| EN 61000-3-3: 2013 | Voltage fluctuations & flicker | PASS | Meet the requirement |

| IMMUNITY【 EN 55024: 2010】 | | | |
|---|---|---|---|
| **Standard** | **Item** | **Result** | **Remarks** |
| IEC 61000-4-2: 2008 | ESD | PASS | Meets the requirements of Performance Criterion A |
| IEC 61000-4-3: 2006+A1: 2007+A2: 2010 | RS | PASS | Meets the requirements of Performance Criterion A |
| IEC 61000-4-4: 2012 | EFT | PASS | Meets the requirements of Performance Criterion A |
| IEC 61000-4-5: 2014+A1: 2017 | Surge | PASS | Meets the requirements of Performance Criterion A |
| IEC 61000-4-6: 2013+C1: 2015 | CS | PASS | Meets the requirements of Performance Criterion A |
| IEC 61000-4-8: 2009 | PFMF | PASS | Meets the requirements of Performance Criterion A |
| IEC 61000-4-11: 2004+A1: 2017 | Voltage dips & voltage variations | PASS | Meets the requirements of<br>**Voltage Dips:**<br>1) >95% reduction Performance Criterion A<br>2) 30% reduction Performance Criterion A<br>**Voltage Interruptions:**<br>1) >95% reduction Performance Criterion B |

**Note:**

1. The statements of test result on the above are decided by the request of test standard only; the measurement uncertainties are not factored into this compliance determination.
2. The information of measurement uncertainty is available upon the customer's request.

# 3 EUT DESCRIPTION

| | |
|---|---|
| **Product** | Switching Power Supply |
| **Model** | 850 B5 |
| **Data Applies To** | N/A |
| **Brand Name** | EVGA |
| **Applicant** | EVGA Corporation |
| **Manufacture** | EVGA Corporation |
| **Housing material** | Plastic with metal plate |
| **Identify Number** | T200109N08 |
| **Received Date** | January 09, 2020 |
| **Reported Date** | February 06, 2020 |
| **EUT Power Rating** | 100V-240Vac, 10A-5A, 60/50Hz |
| **EUT Size (L*W*H)** | 15*15*8.6 (cm) |

**Note:**
1. Client consigns 1 model sample(s) to test (Model Number: **850 B5**). Therefore, the testing Lab. Just guarantees the unit, which has been tested.
2. For more details, please refer to the User's manual of the EUT.

# 4 TEST METHODOLOGY

## 4.1. DECISION OF FINAL TEST MODE

The EUT was tested together with the above additional components, and a configuration, which produced the worst emission levels, was selected and recorded in this report.

The test configuration/ modes are as the following:

**Conduction (Power port) Modes:**

| | |
|---|---|
| **1.** | **Full Load** |

**Conduction (Analogue/Digital Data Ports) Modes:**

| | |
|---|---|
| **1.** | **N/A** |

**Radiation (Below 1GHz) Modes:**

| | |
|---|---|
| **1.** | **Full Load** |

**Radiation (Above 1GHz) Modes:**

| | |
|---|---|
| **1.** | **N/A** |

**Immunity Mode: Full Load**

| | |
|---|---|
| **1.** | **Full Load** |

## 4.2. EUT SYSTEM OPERATION

1. Setup a whole system for test as shown on setup diagram.
2. Turn on power and check function.
3. Start to test by test mode.

# 5 SETUP OF EQUIPMENT UNDER TEST

## 5.1. DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

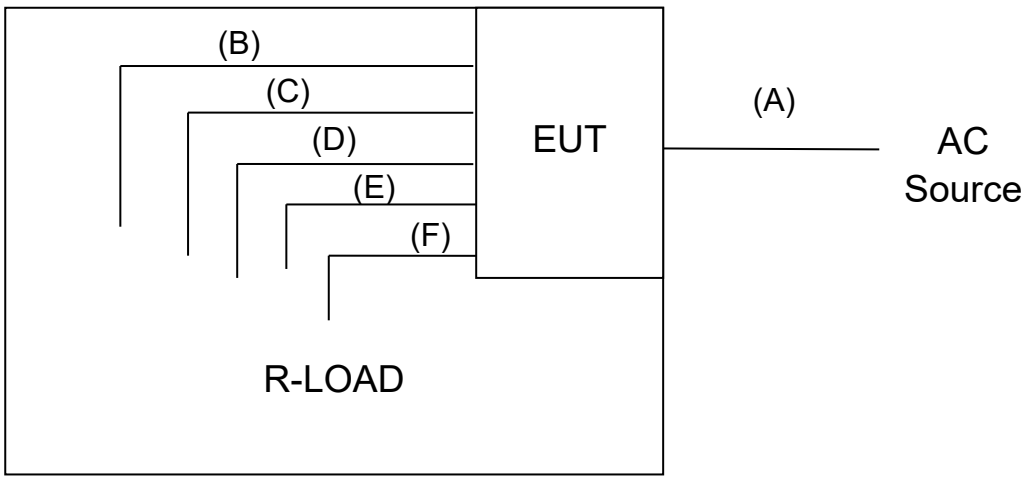
| No. | Product | Manufacturer | Model No. | Certify No. | Signal cable |
|---|---|---|---|---|---|
| 1 | R-Load | N/A | N/A | N/A | N/A |

| No. | Signal cable description | |
|---|---|---|
| A | AC Cable | Unshielded, 1.4m, 1pcs. |
| B | MB | Unshielded, 0.6m, 1pcs. |
| C | CPU | Unshielded, 0.6m, 2pcs. |
| D | SATA | Unshielded, 0.7m, 3pcs. |
| E | PERIF | Unshielded, 0.7m, 1pcs. |
| F | VGA | Unshielded, 0.7m, 3pcs. |

**Note:**

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

## 5.2. CONFIGURATION OF SYSTEM UNDER TEST



# 6 FACILITIES AND ACCREDITATIONS

## 6.1. FACILITIES

All measurement facilities used to collect the measurement data are located at CCS Taiwan Tainan Laboratory at
No.8, Jiucengling, Xinhua Dist., Tainan City 712, Taiwan (R.O.C.)

The sites are constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22. All receiving equipment conforms to CISPR 16-1-1, CISPR 16-1-2, CISPR 16-1-3, CISPR 16-1-4 and CISPR 16-1-5.

## 6.2. ACCREDITATIONS

Our laboratories are accredited and approved by the following accreditation body according to ISO/IEC 17025.

| | |
|---|---|
| **Taiwan** | TAF |

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

| | |
|---|---|
| **Canada** | Industry Canada |
| **Germany** | TUV NORD |
| **Taiwan** | BSMI |
| **USA** | FCC |
| **Japan** | VCCI |

Copies of granted accreditation certificates are available for downloading from our web site, http://www.ccsrf.com

## 6.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

| Measurement | | Frequency | Uncertainty |
|---|---|---|---|
| Power Line Conducted Emission | | 9kHz~30MHz | ±1.6dB |
| Conduction Emission (ISN) | | 150kHz~30MHz | ±1.4dB |
| Clamp | | 30 MHz~300MHz | ±2.1dB |
| Radiated Emission (10m) | Test Site : OATS-5 | 30 MHz ~200 MHz | ±3.4dB |
| | | 200 MHz ~1000 MHz | ±3.0dB |
| | Test Site : OATS-6 | 30 MHz ~200 MHz | ±3.1dB |
| | | 200 MHz ~1000 MHz | ±2.2dB |
| | Test Site : OATS-7 | 30 MHz ~200 MHz | ±3.3dB |
| | | 200 MHz ~1000 MHz | ±3.2dB |
| Radiated Emission (3m) | Test Site : OATS-5 | 30 MHz ~200 MHz | ±3.4dB |
| | | 200 MHz ~1000 MHz | ±2.6dB |
| | Test Site : OATS-6 | 30 MHz ~200 MHz | ±3.4dB |
| | | 200 MHz ~1000 MHz | ±3.2dB |
| | Test Site : OATS-7 | 30 MHz ~200 MHz | ±3.5dB |
| | | 200 MHz ~1000 MHz | ±3.3dB |
| | Chamber 966 | 1000Mhz~6000MHz | ±2.7dB |

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

# 7 EMISSION TEST

## 7.1. CONDUCTED EMISSION MEASUREMENT

### 7.1.1. LIMITS

| FREQUENCY (MHz) | Class A (dBuV) | | Class B (dBuV) | |
|---|---|---|---|---|
| | Quasi-peak | Average | Quasi-peak | Average |
| 0.15 - 0.5 | 79 | 66 | 66 - 56 | 56 - 46 |
| 0.50 - 5.0 | 73 | 60 | 56 | 46 |
| 5.0 - 30.0 | 73 | 60 | 60 | 50 |

**Note**:

1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

### 7.1.2. TEST INSTRUMENTS

| Conducted Emission room #1 | | | | |
|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Due** |
| BNC Coaxial Cable | CCS | BNC50 | 11 | 01/21/2021 |
| EMI Test Receiver | R&S | ESCS 30 | 100348 | 02/18/2020 |
| LISN | SCHWARZBECK | NNLK8130 | 8130124 | 01/16/2021 |
| LISN | FCC | FCC-LISN-50 -32-2 | 08009 | 06/11/2020 |
| Pulse Limiter | R&S | ESH3-Z2 | 100116 | 01/21/2021 |
| Test S/W | e3(6.101222) | | | |

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

## 7.1.3. TEST PROCEDURES

**Procedure of Preliminary Test**

The EUT and Support equipment, if needed, was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per EN 55032 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor standing equipment, it is placed on the ground plane, which has a 15 cm non-conductive covering to insulate the EUT from the ground plane.

All I/O cables were positioned to simulate typical actual usage as per EN 55032.

The test equipment EUT installed received main power, through a Line Impedance Stabilization Network (LISN), which supplied power source and was grounded to the ground plane.

All support equipment power received from a second LISN.

The EUT test program was started. Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.

The Receiver scanned from 150kHz to 30MHz for emissions in each of the test modes.

During the above scans, the emissions were maximized by cable manipulation.

The test mode(s) described in Item 4.1 were scanned during the preliminary test.

After the preliminary scan, we found the test mode described in Item 4.1 producing the highest emission level.

The EUT configuration and cable configuration of the above highest emission levels were recorded for reference of the final test.

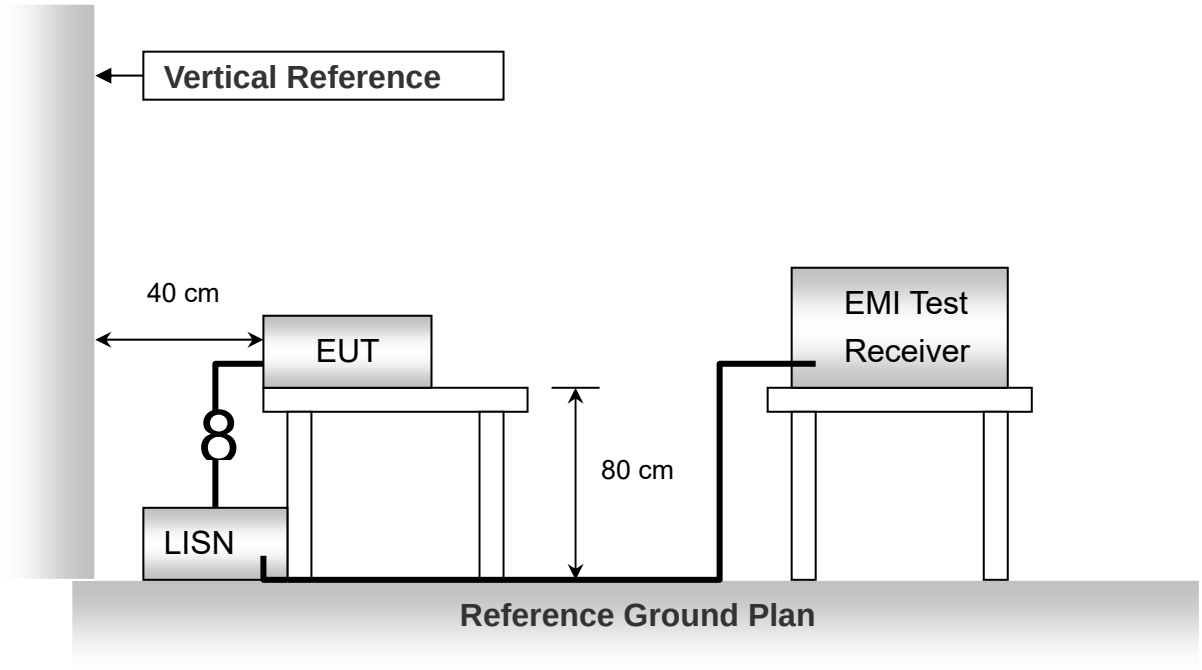
**Procedure of Final Test**

EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.

A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.

The test data of the worst-case condition(s) was recorded.

### 7.1.4. TEST SETUP




For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

### 7.1.5. DATA SAMPLE

| Freq. (MHz) | LISN Factor (dB) | Cable Loss (dB) | Meter Reading (dBuV) | Measured Level (dBuV) | Limits (dBuV) | Over Limits (dBuV) | Detector |
|---|---|---|---|---|---|---|---|
| x.xx | 9.6 | 0.1 | 15.7 | 25.4 | 46 | -20.6 | QP |

Freq. = Emission frequency in MHz
Reading = Uncorrected Analyzer/Receiver reading
C.F = LISN Factor + Cable Loss
LISN Factor = Insertion loss of LISN and Pulse Limiter
Cable Loss = Cable's loss (LISN to EMI Tester Receiver)
Limit = Limit stated in standard
Over Limit = Measured Level - Limits
Detector : Peak/PK = Peak Reading
QP = Quasi-peak Reading
AV = Average Reading

**Calculation Formula**

1. Result (dBuV) = C.F (dB) + Reading Level (dBuV)
2. Over Limit (dBuV) = Measured Level (dBuV) – Limits (dBuV)

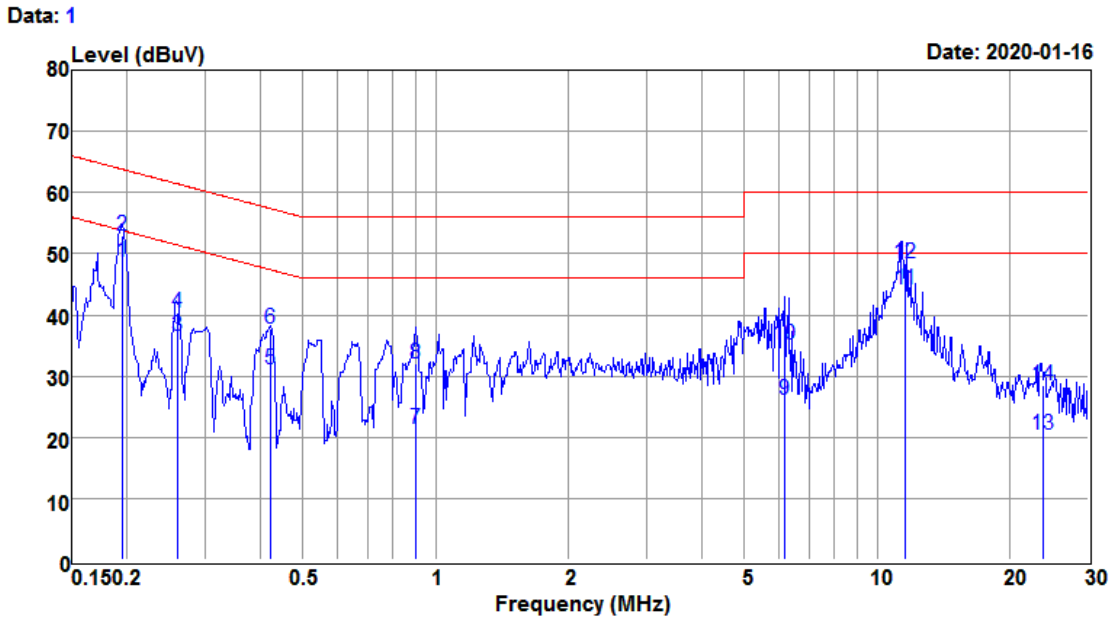
**Report No.:** T200109N08-E

### 7.1.6. TEST RESULTS

**Test Voltage: AC110V, 60Hz**

| Model No. | 850 B5 | Test Mode | Full Load |
|---|---|---|---|
| Environmental Conditions | 24.8℃, 66% RH | Resolution Bandwidth | 9 kHz |
| Tested by | Leo Wang | | |

**LINE**

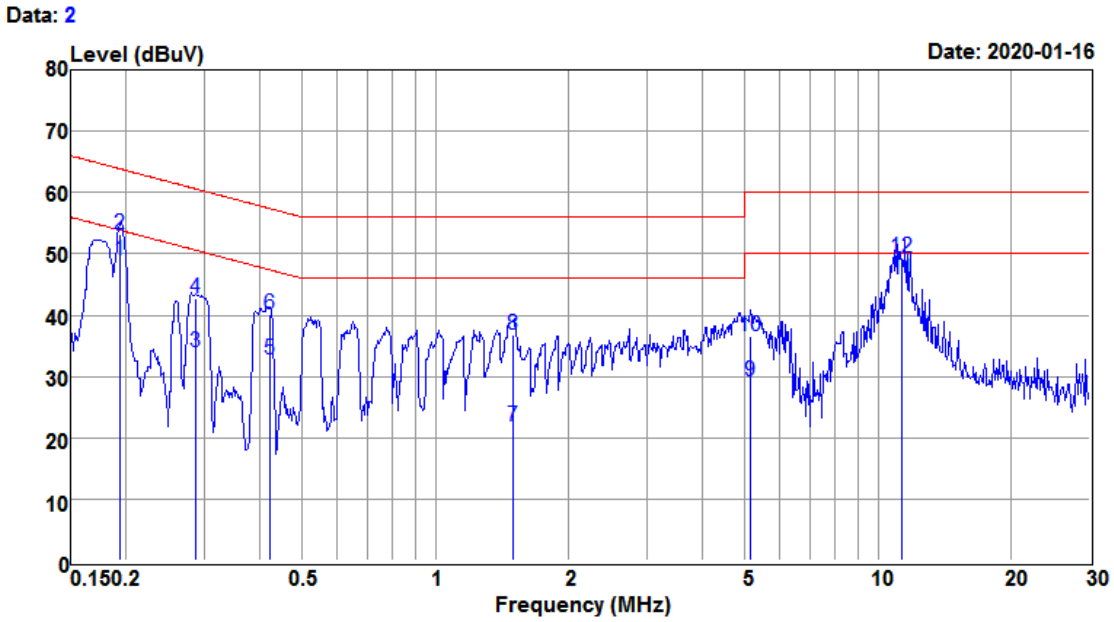



| Freq | Reading Level | C.F | Result | Limit | Over Limit | Detector |
|---|---|---|---|---|---|---|
| MHz | dBuV | dB | dBuV | dBuV | dB | |
| 0.195 | 39.79 | 8.81 | 48.60 | 53.80 | -5.20 | Average |
| 0.195 | 44.12 | 8.81 | 52.93 | 63.80 | -10.87 | QP |
| 0.260 | 27.69 | 8.85 | 36.54 | 51.42 | -14.88 | Average |
| 0.260 | 31.56 | 8.85 | 40.41 | 61.42 | -21.01 | QP |
| 0.421 | 22.13 | 8.94 | 31.07 | 47.42 | -16.35 | Average |
| 0.421 | 28.76 | 8.94 | 37.70 | 57.42 | -19.72 | QP |
| 0.904 | 12.33 | 9.06 | 21.39 | 46.00 | -24.61 | Average |
| 0.904 | 23.00 | 9.06 | 32.06 | 56.00 | -23.94 | QP |
| 6.156 | 16.52 | 9.57 | 26.09 | 50.00 | -23.91 | Average |
| 6.156 | 25.65 | 9.57 | 35.22 | 60.00 | -24.78 | QP |
| 11.556 | 34.48 | 9.76 | 44.24 | 50.00 | -5.76 | Average |
| 11.556 | 38.56 | 9.76 | 48.32 | 60.00 | -11.68 | QP |
| 23.636 | 10.25 | 10.10 | 20.35 | 50.00 | -29.65 | Average |
| 23.636 | 18.43 | 10.10 | 28.53 | 60.00 | -31.47 | QP |

**Report No.:** T200109N08-E

| | | | |
|---|---|---|---|
| **Model No.** | 850 B5 | **Test Mode** | Full Load |
| **Environmental Conditions** | 24.8℃, 66% RH | **Resolution Bandwidth** | 9 kHz |
| **Tested by** | Leo Wang | | |

**NEUTRAL**



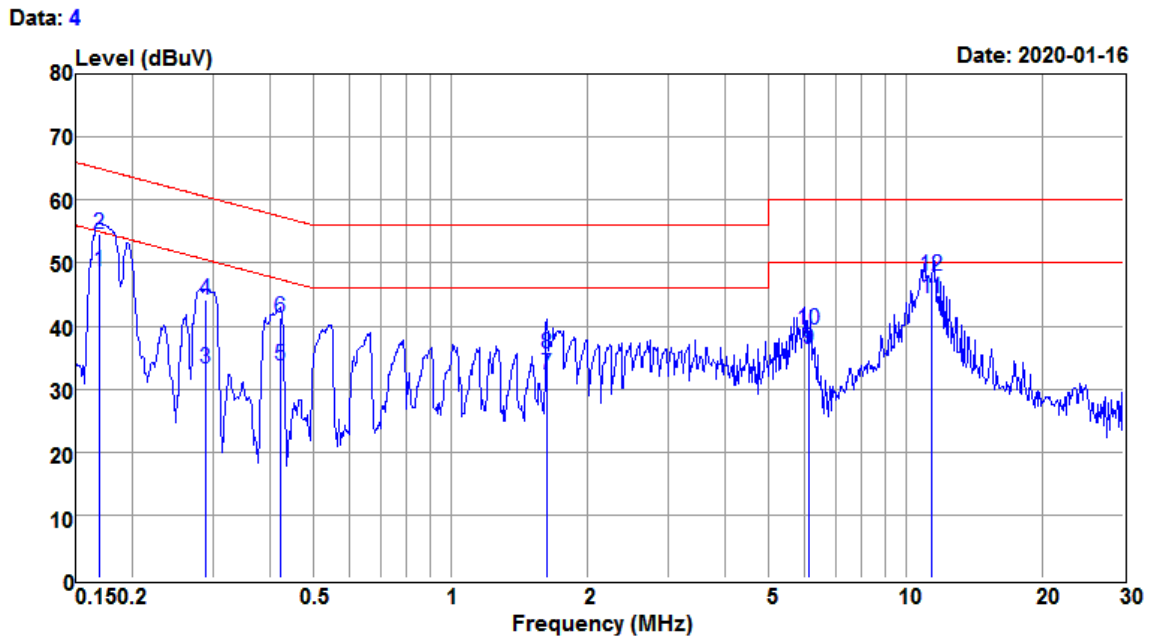

| Freq | Reading Level | C.F | Result | Limit | Over Limit | Detector |
|---|---|---|---|---|---|---|
| MHz | dBuV | dB | dBuV | dBuV | dB | |
| 0.194 | 40.20 | 8.81 | 49.01 | 53.84 | -4.83 | Average |
| 0.194 | 44.40 | 8.81 | 53.21 | 63.84 | -10.63 | QP |
| 0.287 | 25.19 | 8.87 | 34.06 | 50.62 | -16.56 | Average |
| 0.287 | 33.87 | 8.87 | 42.74 | 60.62 | -17.88 | QP |
| 0.421 | 23.92 | 8.94 | 32.86 | 47.42 | -14.56 | Average |
| 0.421 | 31.15 | 8.94 | 40.09 | 57.42 | -17.33 | QP |
| 1.501 | 12.70 | 9.12 | 21.82 | 46.00 | -24.18 | Average |
| 1.501 | 27.75 | 9.12 | 36.87 | 56.00 | -19.13 | QP |
| 5.139 | 19.58 | 9.52 | 29.10 | 50.00 | -20.90 | Average |
| 5.139 | 26.96 | 9.52 | 36.48 | 60.00 | -23.52 | QP |
| 11.320 | 36.00 | 9.75 | 45.75 | 50.00 | -4.25 | Average |
| 11.320 | 39.62 | 9.75 | 49.37 | 60.00 | -10.63 | QP |

**Report No.:** T200109N08-E

**Test Voltage: AC230V, 50Hz**

| | | | |
|---|---|---|---|
| **Model No.** | 850 B5 | **Test Mode** | Full Load |
| **Environmental Conditions** | 24.8℃, 66% RH | **Resolution Bandwidth** | 9 kHz |
| **Tested by** | Leo Wang | | |

**LINE**

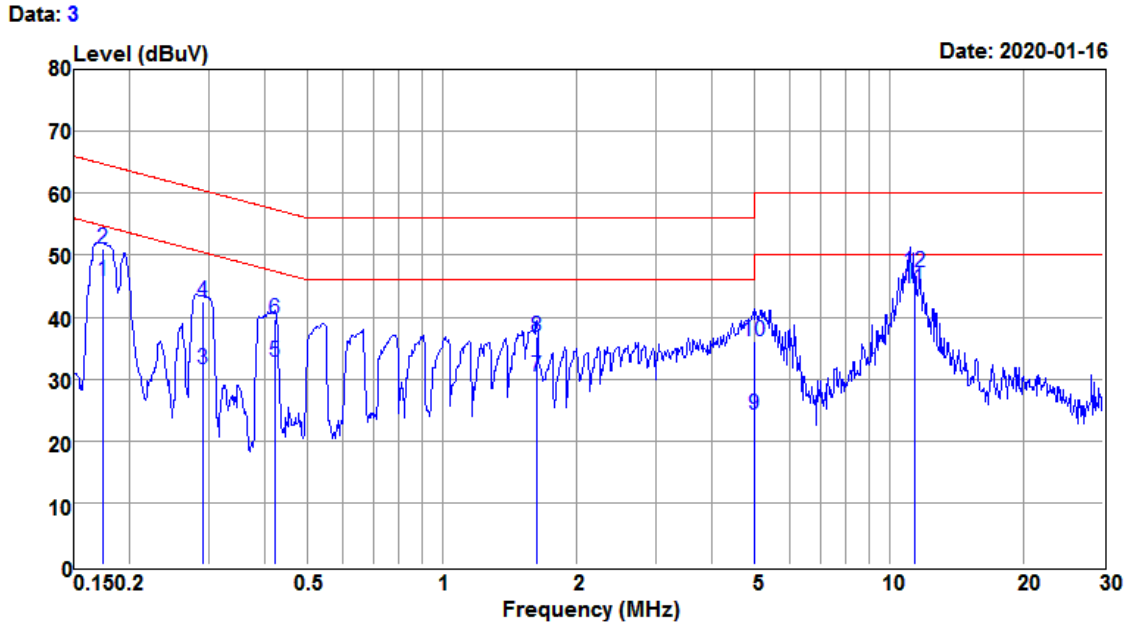



| Freq | Reading Level | C.F | Result | Limit | Over Limit | Detector |
|---|---|---|---|---|---|---|
| MHz | dBuV | dB | dBuV | dBuV | dB | |
| 0.169 | 39.77 | 8.79 | 48.56 | 54.99 | -6.43 | Average |
| 0.169 | 45.79 | 8.79 | 54.58 | 64.99 | -10.41 | QP |
| 0.289 | 24.45 | 8.87 | 33.32 | 50.54 | -17.22 | Average |
| 0.289 | 35.18 | 8.87 | 44.05 | 60.54 | -16.49 | QP |
| 0.421 | 24.89 | 8.94 | 33.83 | 47.42 | -13.59 | Average |
| 0.421 | 32.42 | 8.94 | 41.36 | 57.42 | -16.06 | QP |
| 1.628 | 23.15 | 9.13 | 32.28 | 46.00 | -13.72 | Average |
| 1.628 | 26.44 | 9.13 | 35.57 | 56.00 | -20.43 | QP |
| 6.131 | 26.70 | 9.57 | 36.27 | 50.00 | -13.73 | Average |
| 6.131 | 29.82 | 9.57 | 39.39 | 60.00 | -20.61 | QP |
| 11.419 | 34.70 | 9.75 | 44.45 | 50.00 | -5.55 | Average |
| 11.419 | 38.13 | 9.75 | 47.88 | 60.00 | -12.12 | QP |

**Report No.:** T200109N08-E

| Model No. | 850 B5 | Test Mode | Full Load |
|---|---|---|---|
| Environmental Conditions | 24.8℃, 66% RH | Resolution Bandwidth | 9 kHz |
| Tested by | Leo Wang | | |

**NEUTRAL**




| Freq | Reading Level | C.F | Result | Limit | Over Limit | Detector |
|---|---|---|---|---|---|---|
| MHz | dBuV | dB | dBuV | dBuV | dB | |
| 0.175 | 37.12 | 8.79 | 45.91 | 54.72 | -8.81 | Average |
| 0.175 | 42.26 | 8.79 | 51.05 | 64.72 | -13.67 | QP |
| 0.291 | 22.76 | 8.87 | 31.63 | 50.50 | -18.87 | Average |
| 0.291 | 33.54 | 8.87 | 42.41 | 60.50 | -18.09 | QP |
| 0.421 | 23.77 | 8.94 | 32.71 | 47.42 | -14.71 | Average |
| 0.421 | 30.83 | 8.94 | 39.77 | 57.42 | -17.65 | QP |
| 1.628 | 21.26 | 9.13 | 30.39 | 46.00 | -15.61 | Average |
| 1.628 | 27.73 | 9.13 | 36.86 | 56.00 | -19.14 | QP |
| 5.005 | 14.78 | 9.52 | 24.30 | 50.00 | -25.70 | Average |
| 5.005 | 26.54 | 9.52 | 36.06 | 60.00 | -23.94 | QP |
| 11.346 | 34.78 | 9.75 | 44.53 | 50.00 | -5.47 | Average |
| 11.346 | 37.61 | 9.75 | 47.36 | 60.00 | -12.64 | QP |

## 7.2. CONDUCTED EMISSION MEASUREMENT AT ANALOGUE/DIGITAL DATA PORTS

### 7.2.1. LIMITS

For Class A Equipment

| FREQUENCY (MHz) | Voltage Limit (dBuV) | | Current Limit (dBuA) | |
|---|---|---|---|---|
| | Quasi-peak | Average | Quasi-peak | Average |
| 0.15 ~ 0.5 | 97 ~ 87 | 84 ~ 74 | 53 ~ 43 | 40 ~ 30 |
| 0.5 ~ 30.0 | 87 | 74 | 43 | 30 |

***Note:*** *The limits decrease linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.*

For Class B Equipment

| FREQUENCY (MHz) | Voltage Limit (dBuV) | | Current Limit (dBuA) | |
|---|---|---|---|---|
| | Quasi-peak | Average | Quasi-peak | Average |
| 0.15 - 0.5 | 84 ~ 74 | 74 ~ 64 | 40 ~ 30 | 30 ~ 20 |
| 0.5 - 30.0 | 74 | 64 | 30 | 20 |

***Note:*** *The limits decrease linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.*

### 7.2.2. TEST INSTRUMENTS

| Conducted Emission room # 1 | | | | |
|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Due** |
| BNC Coaxial Cable | CCS | BNC50 | 11 | 01/21/2021 |
| EMI Test Receiver | R&S | ESCS 30 | 100348 | 02/18/2020 |
| FOUR BALACED PAIR ISN | FCC | F-071115-1057-1-09 | 111130 | 12/10/2020 |
| LISN | SCHWARZBECK | NNLK8130 | 8130124 | 01/16/2021 |
| LISN | Schwarzbeck | NSLK 8127 | 8127526 | 05/07/2020 |
| Pulse Limiter | R&S | ESH3-Z2 | 100116 | 01/21/2021 |
| Software | e3(6.101222) | | | |

**Note:**

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R = No Calibration Required.

### 7.2.3. TEST PROCEDURE

Selecting ISN for unscreened cable or a current probe for screened cable to take measurement.

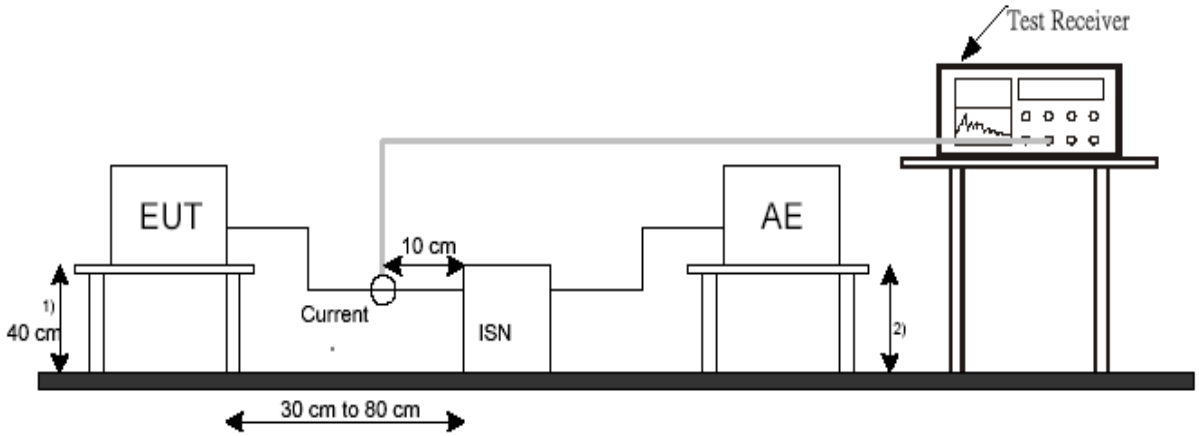
The port of the EUT was connected to the remote side support equipment through the ISN/Current Probe and communication in normal condition.

Making a overall range scan by using the test receiver controlled by controller and record at least six highest emissions for showing in the test report.

Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.

In case of measuring on the screened cable, the current limit shall be applied; otherwise the voltage limit should be applied.

### 7.2.4. TEST SETUP




1) Distance to the ground reference plane (vertical or horizontal).

2) Distance to the ground reference plane is not critical.

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

### 7.2.5. DATA SAMPLE

| Freq. (MHz) | LISN Factor (dB) | Cable Loss (dB) | Meter Reading ()dBuV | Measured Level (dBuV) | Limits (dBuV) | Over Limits (dBuV) | Detector |
|---|---|---|---|---|---|---|---|
| x.xx | 9.71 | 0.02 | 37.17 | 46.9 | 66 | -19.10 | QP |

Freq. = Emission frequency in MHz
LISN Factor = Insertion loss of ISN and Pulse Limiter
Cable loss = Insertion loss of of Cable (ISN to EMI Tester Receiver)
Meter Reading = Uncorrected Analyzer/Receiver reading
Measured Level = Read Level + Factor
Limit = Limit stated in standard
Over Limit = Reading in reference to limit
Peak = Peak Reading
QP = Quasi-peak Reading
AV = Average Reading

**Calculation Formula**

Over Limit (dB) = Level (dBuV) – Limit (dBuV)

### 7.2.6. TEST RESULTS

**※ Note: Not applicable, the EUT doesn't have LAN Port or Modem port.**

## 7.3. RADIATED EMISSION MEASUREMENT

### 7.3.1. LIMITS

**Below 1GHz**

| FREQUENCY (MHz) | dBuV/m (At 10m) | |
|---|---|---|
| | Class A | Class B |
| 30 ~ 230 | 40 | 30 |
| 230 ~ 1000 | 47 | 37 |

**Note**: The lower limit shall apply at the transition frequencies.

**Above 1GHz**

| FREQUENCY (MHz) | Class A (dBuV/m) (At 3m) | | Class B (dBuV/m) (At 3m) | |
|---|---|---|---|---|
| | Average | Peak | Average | Peak |
| 1000 ~ 3000 | 56 | 76 | 50 | 70 |
| 3000 ~ 6000 | 60 | 80 | 54 | 74 |

**Note**: The lower limit shall apply at the transition frequencies.

According to EN 55032, the measurement frequency range shown in the following table:

| Highest frequency generated or used within the EUT or on which the EUT operates or tunes (MHz) | Upper frequency of measurement range (MHz) |
|---|---|
| Less than 108 | 1000 |
| 108-500 | 2000 |
| 500-1000 | 5000 |
| Above 1000 | 5 times of the highest frequency or 6GHz, whichever is less |

### 7.3.2. TEST INSTRUMENTS

☒ **Open Area Test Site # 5**

| Open Area Test Site # 5 | | | | |
|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Due** |
| Bi-Log Antenna | Sunol | JB1 | A070506-1 | 09/09/2020 |
| EMI Test Receiver | R&S | ESCI | 101336 | 05/15/2020 |
| Type N coxical cable | Suhner | RG_214_U/2X | 5 | 01/21/2021 |
| Test Software | e3(6.101222) | | | |

☐ **Open Area Test Site # 7**

| Open Area Test Site # 7 | | | | |
|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Due** |
| Bi-Log Antenna | Sunol | JB1 | A021306 | 09/09/2020 |
| EMI Test Receiver | R&S | ESCI | 101336 | 05/15/2020 |
| Type N coxical cable | Suhner | RG_214_U/2X | 7 | 02/12/2020 |
| Software | e3(6.101222) | | | |

☐ **Chamber 966 (Above 1GHz)**

| Chamber 966 (Above 1GHz) | | | | |
|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Due** |
| Cable | Suhner | SUCOFLEX104PEA | 20520/4PEA&O6 | 01/29/2021 |
| EXA Spectrum Analyzer | KEYSIGHT | N9010A | MY54430216 | 07/17/2020 |
| Horn Antenna | Com-Power | AH-118 | 071032 | 04/29/2020 |
| Pre-Amplifier | EMCI | EMC012645 | 980098 | 01/29/2021 |
| Software | Excel(ccs-o6-2019 v1.2) | | | |

**NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R = No Calibration Required.

## 7.3.3. TEST PROCEDURE

**Procedure of Preliminary Test**

The equipment was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane. When the EUT is a floor standing equipment, it is placed on the ground plane which has a 15 cm non-conductive covering to insulate the EUT from the ground plane.

Support equipment, if needed, was placed as per EN 55032.

All I/O cables were positioned to simulate typical usage as per EN 55032.

The EUT received power source from the outlet socket under the turntable. All support equipment power received from another socket under the turntable.

The antenna was placed at 10/3 meter away from the EUT as stated in EN 55032. The antenna connected to the Spectrum Analyzer via a cable and at times a pre-amplifier would be used.

The Analyzer / Receiver quickly scanned from 30MHz to 6000MHz. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.

The test mode(s) described in Item 4.1 were scanned during the preliminary test:

After the preliminary scan, we found the test mode described in Item 4.1 producing the highest emission level.

The EUT and cable configuration, antenna position, polarization and turntable position of the above highest emission level were recorded for the final test.

**Procedure of Final Test**

EUT and support equipment were set up on the turntable as per the configuration with highest emission level in the preliminary test.

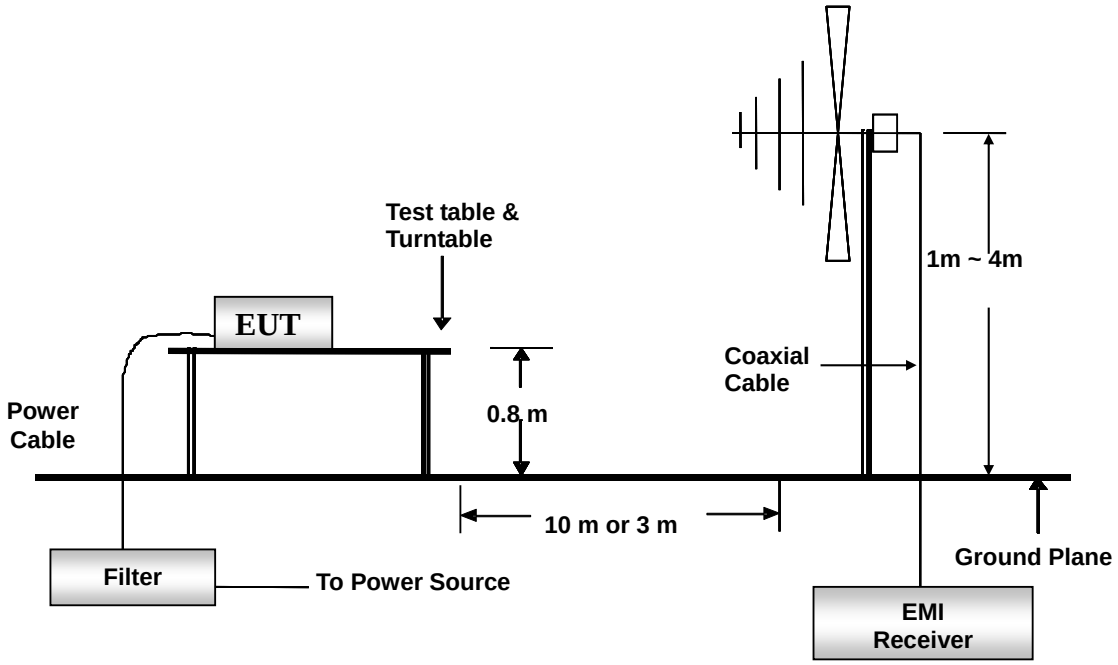
The Analyzer / Receiver scanned from 30MHz to 6000MHz. Emissions were scanned and measured rotating the EUT to 360 degrees, varying cable placement and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.

Recorded at least the six highest emissions. Emission frequency, amplitude, antenna position, polarization and turntable position were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit and only Q.P. reading is presented.

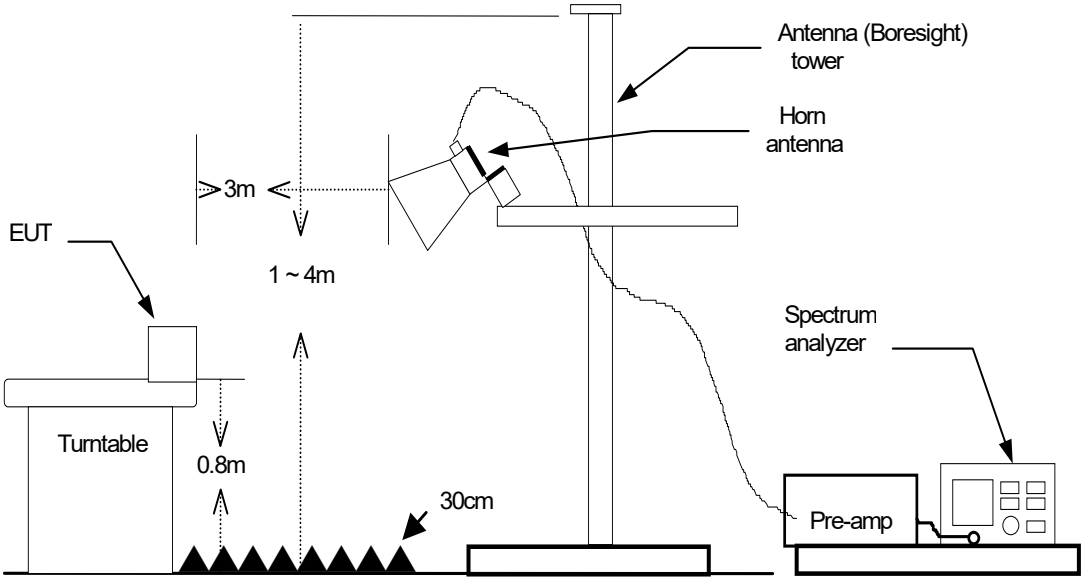
The test data of the worst-case condition(s) was recorded.

### 7.3.4. TEST SETUP

**Below 1 GHz**




**Above 1 GHz**




For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

### 7.3.5. DATA SAMPLE

**Below 1GHz**

| Freq. (MHz) | Reading (dBuV/m) | Antenna Factor (dB) | Cable loss (dB) | Measure level (dBuV/m) | Limit (dBu/m) | Over limit (dBuV/m) | Detector |
|---|---|---|---|---|---|---|---|
| x.xx | 24.48 | 7.33 | 1.50 | 33.31 | 40 | -6.69 | QP |

Freq. = Emission frequency in MHz
Reading = Uncorrected Analyzer/Receiver reading
Antenna Factor = Antenna Factor
Cable los = Cable's loss
Measure level = Reading + Antenna Factor + Cable loss
Limit = Limit stated in standard
Over limit = Measure level – Limit
Detector: Peak/PK = Peak Reading
QP = Quasi-peak Reading
AV = Average Reading

**Calculation Formula**

Over limit (dBuV/m) = Result (dBuV/m) – Limit (dBuV/m)

**Above 1GHz**

| Freq. | Reading | AF | C loss | Pre-amp | Filter | Level | Limit | Margin | Mark |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | (dBμV) | (dBμV) | (dB) | (dB) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | (P/Q/A) |
| XXXX. XX | 56.00 | 25.14 | 2.07 | 41.77 | 0.72 | 42.16 | 70.00 | -27.84 | P |

Freq. = Emission frequency in MHz
Reading Level = Uncorrected Analyzer/Receiver reading
C.F = AF + C loss - Pre-amp +Filter
AF = Antenna Factor
C_loss = Insertion loss of cable
Pre-amp = Pre-amplifier Gain
Result = Readind+AF+Closs-Pre-amp+Fliter
Limit = Limit stated in standard
Over Limit = Reading in reference to limit
Detector: P = Peak Reading
Q= Quasi-peak Reading
A = Average Reading

**Calculation Formula**

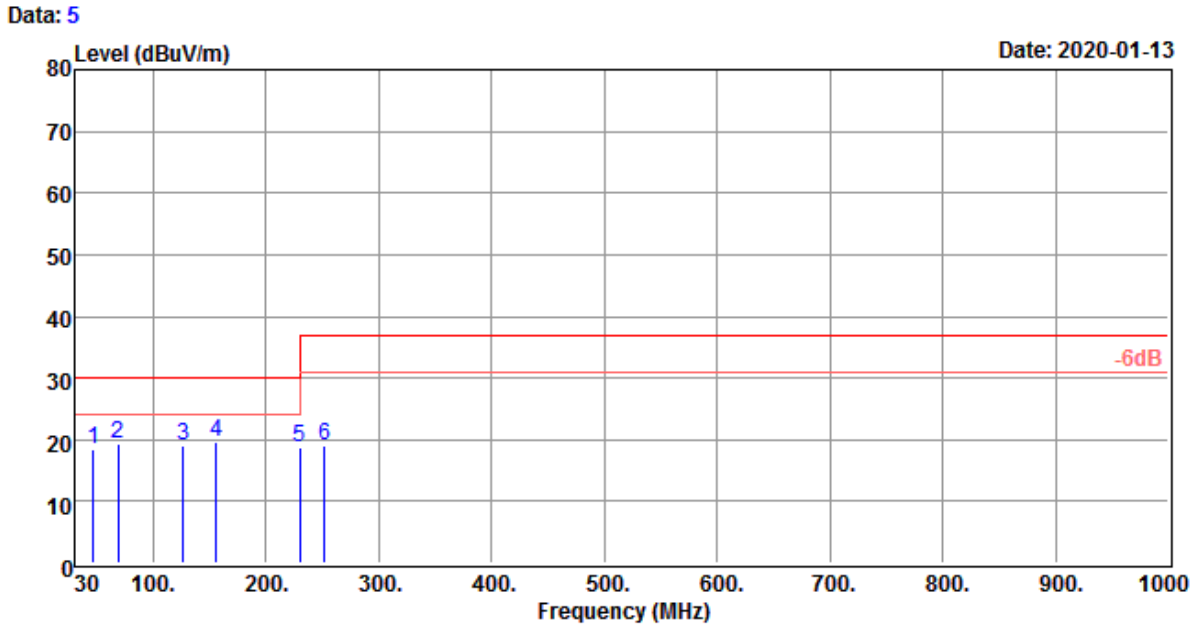
Over Limit (dB) =Result (dBuV/m) – Limit (dBuV/m)

**Report No.:** T200109N08-E

## 7.3.6. TEST RESULTS

**Below 1GHz**
**Test Voltage: AC110V, 60Hz**

| | | | |
|---|---|---|---|
| **Model No.** | 850 B5 | **Test Mode** | Full Load |
| **Environmental Conditions** | 26.1℃, 53% RH | **Resolution Bandwidth** | 120 kHz |
| **Antenna Pole** | Vertical | **Antenna Distance** | 10m |
| **Detector Function** | Quasi-peak. | **Tested by** | Peter Chu |

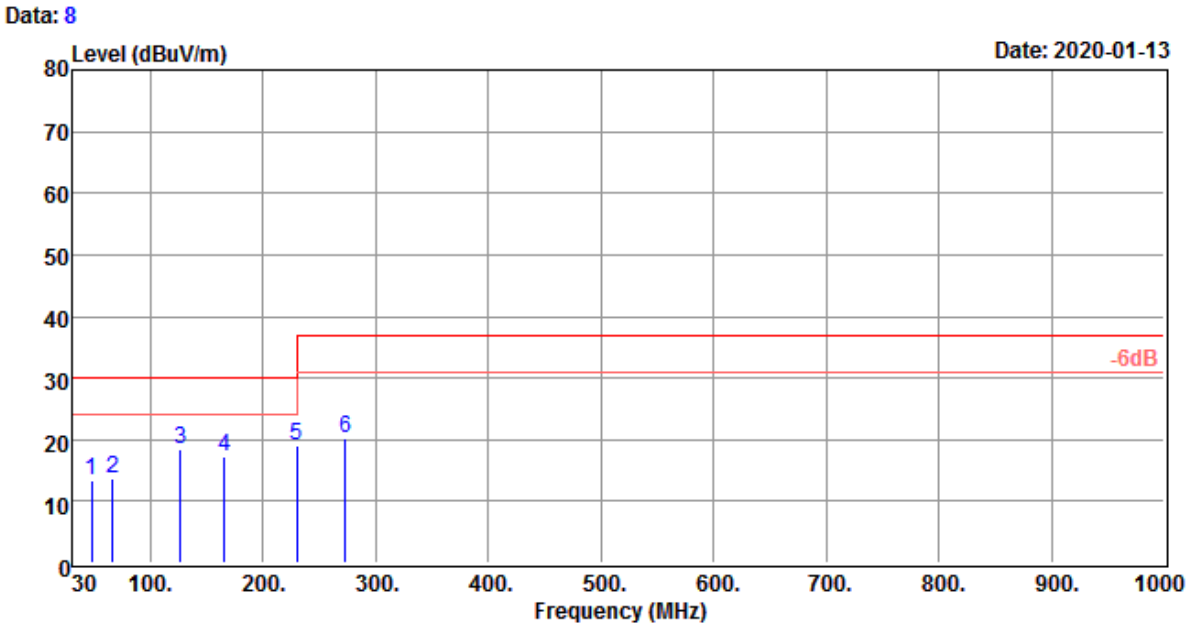



| Freq | Reading Level | C.F | Result | Limit | Over Limit | Detector |
|---|---|---|---|---|---|---|
| MHz | dBuV | dB | dBuV/m | dBuV/m | dB | |
| 46.95 | 1.77 | 16.56 | 18.33 | 30.00 | -11.67 | QP |
| 69.05 | 3.34 | 16.10 | 19.44 | 30.00 | -10.56 | QP |
| 126.80 | -3.71 | 22.60 | 18.89 | 30.00 | -11.11 | QP |
| 155.45 | -1.70 | 21.28 | 19.58 | 30.00 | -10.42 | QP |
| 230.00 | -1.81 | 20.57 | 18.76 | 30.00 | -11.24 | QP |
| 251.75 | -2.27 | 21.30 | 19.03 | 37.00 | -17.97 | QP |

**REMARKS：** 1.QP= Quasi-peak Reading.
2.The other emission levels were very low against the limit.

**Report No.:** T200109N08-E

| | | | |
|---|---|---|---|
| **Model No.** | 850 B5 | **Test Mode** | Full Load |
| **Environmental Conditions** | 26.1℃, 53% RH | **Resolution Bandwidth** | 120 kHz |
| **Antenna Pole** | Horizontal | **Antenna Distance** | 10m |
| **Detector Function:** | Quasi-peak. | **Tested by** | Peter Chu |




| Freq | Reading Level | C.F | Result | Limit | Over Limit | Detector |
|---|---|---|---|---|---|---|
| MHz | dBuV | dB | dBuV/m | dBuV/m | dB | |
| 47.40 | -2.98 | 16.39 | 13.41 | 30.00 | -16.59 | QP |
| 66.50 | -2.18 | 15.91 | 13.73 | 30.00 | -16.27 | QP |
| 126.20 | -4.17 | 22.59 | 18.42 | 30.00 | -11.58 | QP |
| 165.30 | -4.01 | 21.18 | 17.17 | 30.00 | -12.83 | QP |
| 229.85 | -1.67 | 20.56 | 18.89 | 30.00 | -11.11 | QP |
| 272.70 | -2.83 | 23.17 | 20.34 | 37.00 | -16.66 | QP |

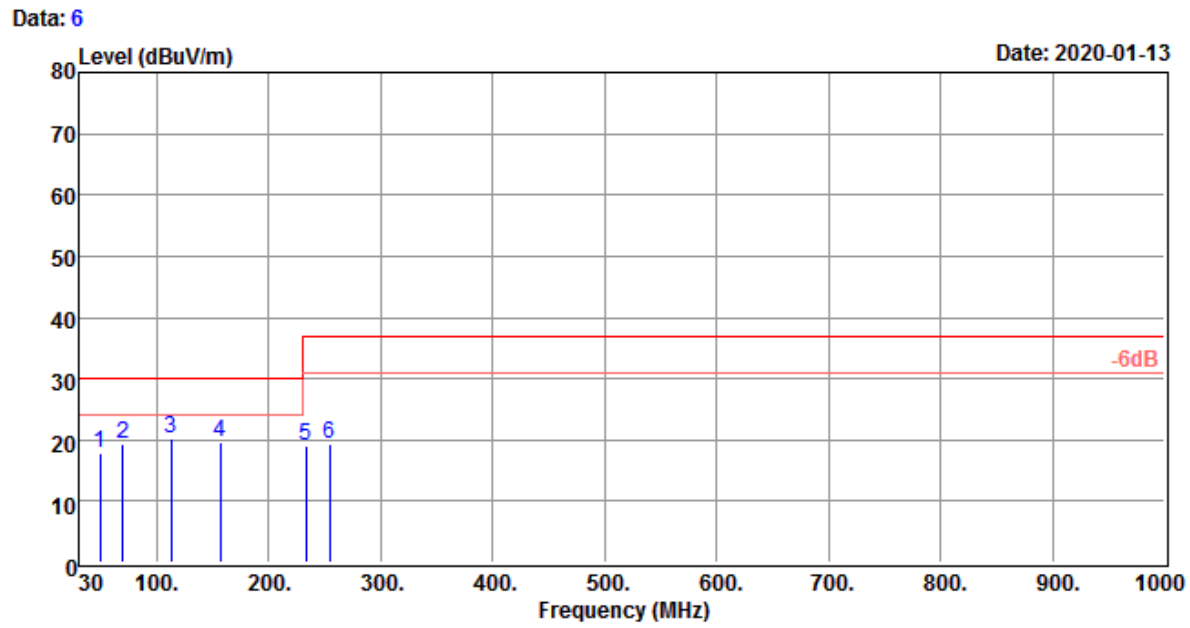
**REMARKS：** 1.QP= Quasi-peak Reading.

2.The other emission levels were very low against the limit.

**Report No.:** T200109N08-E

**Test Voltage: AC230V, 50Hz**

| | | | |
|---|---|---|---|
| **Model No.** | 850 B5 | **Test Mode** | Full Load |
| **Environmental Conditions** | 26.1℃, 53% RH | **Resolution Bandwidth** | 120 kHz |
| **Antenna Pole** | Vertical | **Antenna Distance** | 10m |
| **Detector Function** | Quasi-peak. | **Tested by** | Peter Chu |



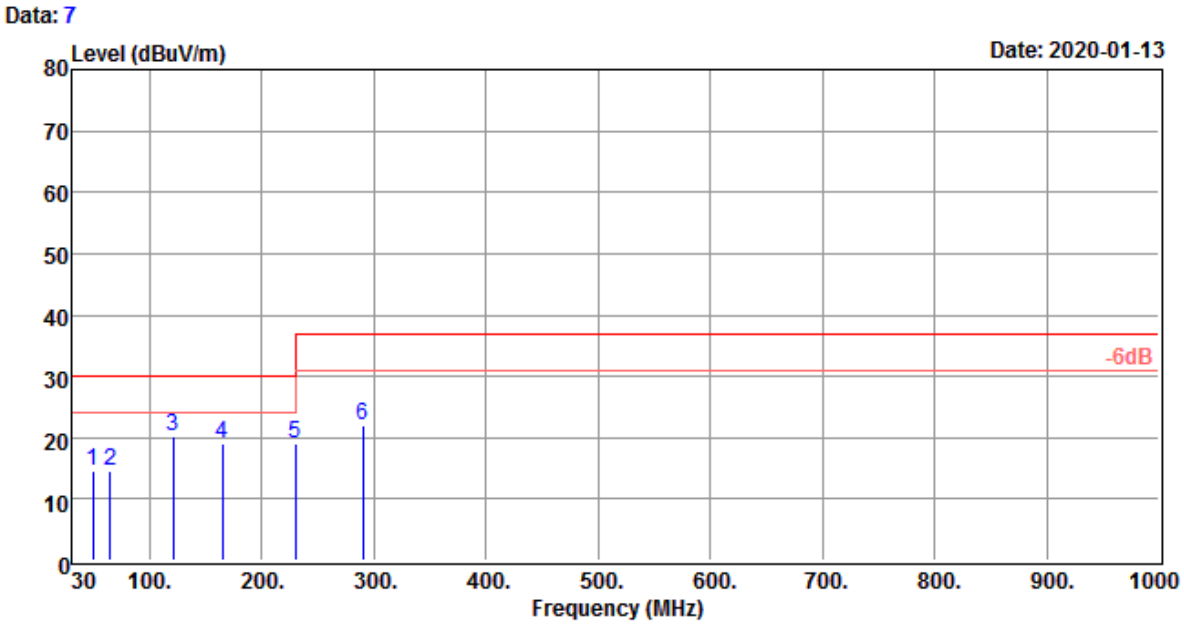

| Freq | Reading Level | C.F | Result | Limit | Over Limit | Detector |
|---|---|---|---|---|---|---|
| MHz | dBuV | dB | dBuV/m | dBuV/m | dB | |
| 49.00 | 2.16 | 15.78 | 17.94 | 30.00 | -12.06 | QP |
| 69.20 | 3.24 | 16.11 | 19.35 | 30.00 | -10.65 | QP |
| 112.95 | -1.52 | 21.65 | 20.13 | 30.00 | -9.87 | QP |
| 156.35 | -1.59 | 21.29 | 19.70 | 30.00 | -10.30 | QP |
| 232.70 | -1.59 | 20.75 | 19.16 | 37.00 | -17.84 | QP |
| 253.90 | -1.97 | 21.35 | 19.38 | 37.00 | -17.62 | QP |

**REMARKS：** 1.QP= Quasi-peak Reading.

2.The other emission levels were very low against the limit.

**Report No.:** T200109N08-E

| | | | |
|---|---|---|---|
| **Model No.** | 850 B5 | **Test Mode** | Full Load |
| **Environmental Conditions** | 26.1℃, 53% RH | **Resolution Bandwidth** | 120 kHz |
| **Antenna Pole** | Horizontal | **Antenna Distance** | 10m |
| **Detector Function:** | Quasi-peak. | **Tested by** | Peter Chu |




| Freq | Reading Level | C.F | Result | Limit | Over Limit | Detector |
|---|---|---|---|---|---|---|
| MHz | dBuV | dB | dBuV/m | dBuV/m | dB | |
| 49.19 | -1.07 | 15.74 | 14.67 | 30.00 | -15.33 | QP |
| 64.60 | -1.52 | 15.95 | 14.43 | 30.00 | -15.57 | QP |
| 121.11 | -2.14 | 22.45 | 20.31 | 30.00 | -9.69 | QP |
| 164.39 | -2.05 | 21.18 | 19.13 | 30.00 | -10.87 | QP |
| 230.05 | -1.49 | 20.57 | 19.08 | 37.00 | -17.92 | QP |
| 290.00 | -1.39 | 23.26 | 21.87 | 37.00 | -15.13 | QP |

**REMARKS：** 1.QP= Quasi-peak Reading.
2.The other emission levels were very low against the limit.

**Above 1GHz**

**※ Not applicable, since the highest frequency of the internal sources of the EUT is less than 108MHz, the measurement shall only be made up to 1 GHz.**

# 7.4. HARMONICS CURRENT MEASUREMENT

## 7.4.1. LIMITS OF HARMONICS CURRENT MEASUREMENT

| Limits for Class A equipment | |
|---|---|
| Harmonics Order n | Max. permissible harmonics current A |
| Odd harmonics | |
| 3 | 2.30 |
| 5 | 1.14 |
| 7 | 0.77 |
| 9 | 0.40 |
| 11 | 0.33 |
| 13 | 0.21 |
| 15<=n<=39 | 0.15x15/n |
| Even harmonics | |
| 2 | 1.08 |
| 4 | 0.43 |
| 6 | 0.30 |
| 8<=n<=40 | 0.23x8/n |

| Limits for Class D equipment | | |
|---|---|---|
| Harmonics Order n | Max. permissible harmonics current per watt mA/W | Max. permissible harmonics current A |
| Odd Harmonics only | | |
| 3 | 3.4 | 2.30 |
| 5 | 1.9 | 1.14 |
| 7 | 1.0 | 0.77 |
| 9 | 0.5 | 0.40 |
| 11 | 0.35 | 0.33 |
| 13 | 0.30 | 0.21 |
| 15<=n<=39 | 3.85/n | 0.15x15/n |
| | | |
| | | |
| | | |
| | | |
| | | |

**Note:**

1. Class A and Class D are classified according to item 7.4.3.
2. According to section 7 of EN 61000-3-2, the above limits for all equipment except for lighting equipment having an active input power > 75 W and no limits apply for equipment with an active input power up to and including 75 W.

## 7.4.2. TEST INSTRUMENTS

| Name of Equipment | Manufacturer | Model | Serial Number | Calibration Due |
|---|---|---|---|---|
| Harmonic & Flicker Test System | Teseq | NSG 1007/CCN 1000-1 | 1504A02655 | 03/24/2020 |
| Software | Win2100V4 V4.14.0 | | | |

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

### 7.4.3. TEST PROCEDURE

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

The classification of EUT is according to section 5 of EN 61000-3-2.

The EUT is classified as follows:

Class A: Balanced three-phase equipment, Household appliances excluding equipment as Class D, Tools excluding portable tools, Dimmers for incandescent lamps, audio equipment, equipment not specified in one of the three other classes.

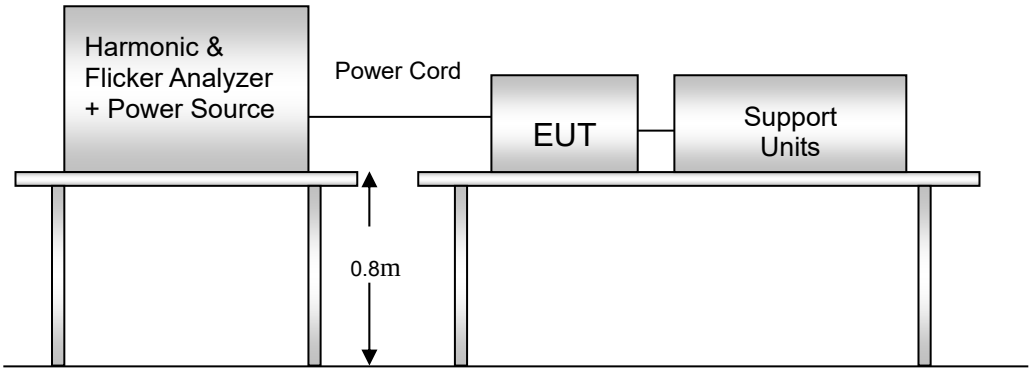
Class B: Portable tools; Arc welding equipment which is not professional equipment.

Class C: Lighting equipment.

Class D: Equipment having a specified power less than or equal to 600 W of the following types: Personal computers and personal computer monitors and television receivers.

The correspondent test program of test instrument to measure the current harmonics emanated from EUT is chosen. The measure time shall be not less than the time necessary for the EUT to be exercised.

### 7.4.4. TEST SETUP




For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

**Report No.:** T200109N08-E

### 7.4.5. TEST RESULTS

**Test Model : 850 B5**

| | | | |
|---|---|---|---|
| **Environmental Conditions** | 20℃, 52% RH, 1019 mbar | **Test Results** | Pass |
| **Tested By** | John Chen | **Limits** | Class ☒A ☐B ☐C ☐D |

**NOTE:** 1. Limits classified according to item 7.3.3
2. According to section 7 of EN 61000-3-2, the above limits for all equipment except for lighting equipment having an active input power > 75 W and no limits apply for equipment with an active input power up to and including 75 W.

**Test Result**

**Harmonics – Class-D per Ed. Ed. 5.0 (2018)(Run time)**

**EUT: 850 B5** **Tested by: John Chen**

**Test category: Class-D per Ed. 5.0 (2018) (European limits)** **Test Margin: 100**

**Test date: 2020/1/30** **Start time: P.M. 04:05:46** **End time: P.M. 04:15:58**

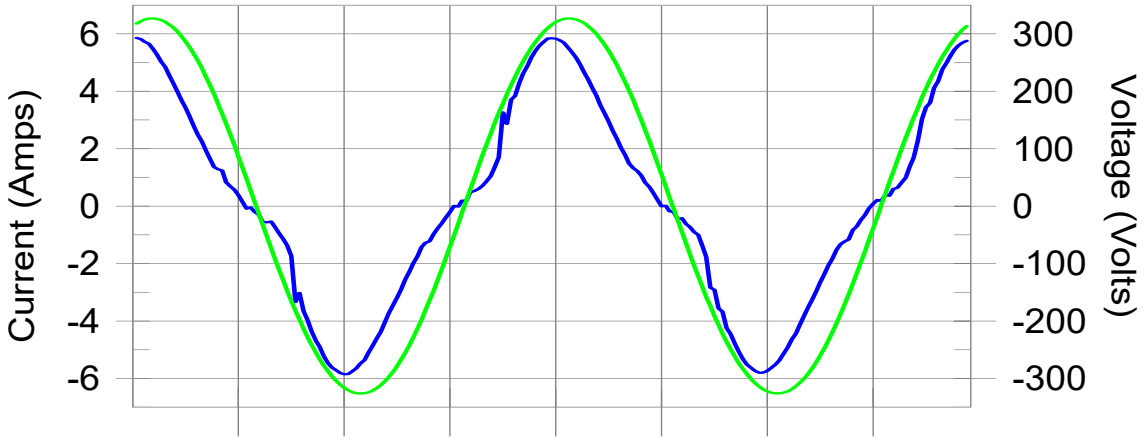
**Test duration (min): 10** **Data file name: H-000102.cts_data**

**Comment: Comment**

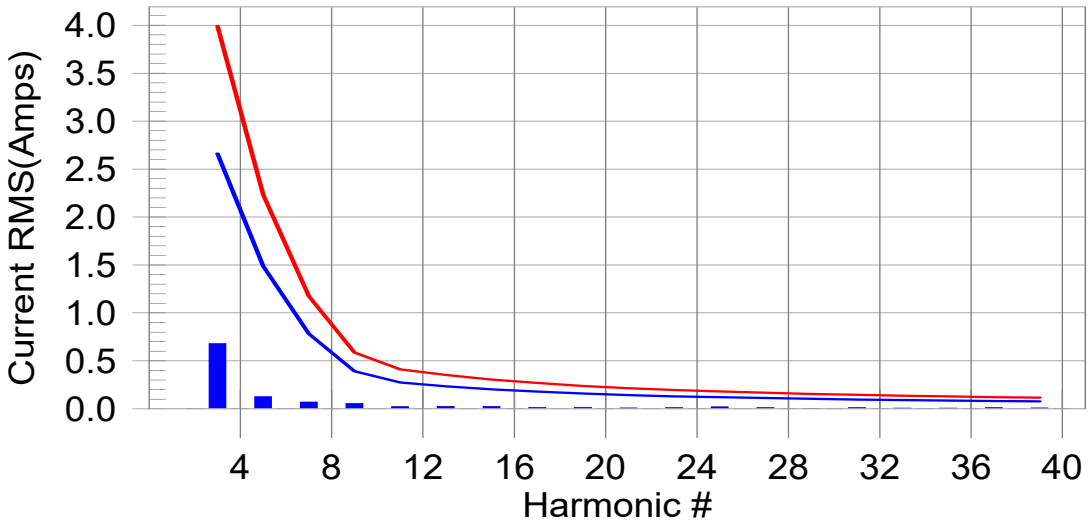
**Customer: EVGA Corporation**

**Test Result: Not Class D** **Source qualification: Normal**

**Current & voltage waveforms**



**Harmonics and Class D limit line** **European Limits**




**Test result: Not Class D Worst harmonics H3-17.5% of 150% limit, H3-25.6% of 100% limit**

**Report No.:** T200109N08-E

## Current Test Result Summary (Run time)

**EUT: 850 B5** **Tested by: John Chen**

**Test category: Class-D per Ed. 5.0 (2018) (European limits)** **Test Margin: 100**

**Test date: 2020/1/30** **Start time: P.M. 04:05:46** **End time: P.M. 04:15:58**

**Test duration (min): 10** **Data file name: H-000102.cts_data**

**Comment: Comment**

**Customer: EVGA Corporation**

**Test Result: Not Class D** **Source qualification: Normal**

**THC(A): 0.701** **I-THD(%): 20.5** **POHC(A): 0.038** **POHC Limit(A): 0.337**

**Highest parameter values during test:**

| | | | |
|---|---|---|---|
| **V_RMS (Volts):** | **231.08** | **Frequency(Hz):** | **50.00** |
| **I_Peak (Amps):** | **5.893** | **I_RMS (Amps):** | **3.533** |
| **I_Fund (Amps):** | **3.422** | **Crest Factor:** | **1.682** |
| **Power (Watts):** | **783.0** | **Power Factor:** | **0.970** |

| Harm# | Harms(avg) | 100%Limit | %of Limit | Harms(max) | 150%Limit | %of Limit | Status |
|---|---|---|---|---|---|---|---|
| 2 | 0.002 | 0.000 | N/A | 0.003 | 0.000 | N/A | Not-D |
| 3 | 0.681 | 2.662 | 25.6 | 0.698 | 3.993 | 17.5 | Not-D |
| 4 | 0.001 | 0.000 | N/A | 0.001 | 0.000 | N/A | Not-D |
| 5 | 0.127 | 1.488 | 8.5 | 0.129 | 2.231 | 5.8 | Not-D |
| 6 | 0.000 | 0.000 | N/A | 0.000 | 0.000 | N/A | Not-D |
| 7 | 0.071 | 0.783 | 9.1 | 0.079 | 1.174 | 6.8 | Not-D |
| 8 | 0.000 | 0.000 | N/A | 0.001 | 0.000 | N/A | Not-D |
| 9 | 0.056 | 0.391 | 14.3 | 0.063 | 0.587 | 10.8 | Not-D |
| 10 | 0.000 | 0.000 | N/A | 0.000 | 0.000 | N/A | Not-D |
| 11 | 0.022 | 0.274 | 8.0 | 0.024 | 0.411 | 5.8 | Not-D |
| 12 | 0.000 | 0.000 | N/A | 0.000 | 0.000 | N/A | Not-D |
| 13 | 0.026 | 0.235 | 11.1 | 0.033 | 0.352 | 9.4 | Not-D |
| 14 | 0.000 | 0.000 | N/A | 0.000 | 0.000 | N/A | Not-D |
| 15 | 0.026 | 0.204 | 13.0 | 0.030 | 0.305 | 9.9 | Not-D |
| 16 | 0.000 | 0.000 | N/A | 0.000 | 0.000 | N/A | Not-D |
| 17 | 0.014 | 0.180 | N/A | 0.018 | 0.270 | N/A | Not-D |
| 18 | 0.000 | 0.000 | N/A | 0.000 | 0.000 | N/A | Not-D |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **19** | **0.016** | **0.159** | **N/A** | **0.021** | **0.238** | **N/A** | **Not-D** |
| **20** | **0.001** | **0.000** | **N/A** | **0.001** | **0.000** | **N/A** | **Not-D** |
| **21** | **0.009** | **0.143** | **N/A** | **0.010** | **0.215** | **N/A** | **Not-D** |
| **22** | **0.000** | **0.000** | **N/A** | **0.001** | **0.000** | **N/A** | **Not-D** |
| **23** | **0.012** | **0.131** | **N/A** | **0.020** | **0.196** | **N/A** | **Not-D** |
| **24** | **0.000** | **0.000** | **N/A** | **0.001** | **0.000** | **N/A** | **Not-D** |
| **25** | **0.021** | **0.121** | **17.7** | **0.026** | **0.181** | **14.3** | **Not-D** |
| **26** | **0.001** | **0.000** | **N/A** | **0.001** | **0.000** | **N/A** | **Not-D** |
| **27** | **0.013** | **0.112** | **N/A** | **0.015** | **0.168** | **N/A** | **Not-D** |
| **28** | **0.002** | **0.000** | **N/A** | **0.002** | **0.000** | **N/A** | **Not-D** |
| **29** | **0.004** | **0.104** | **N/A** | **0.012** | **0.156** | **N/A** | **Not-D** |
| **30** | **0.001** | **0.000** | **N/A** | **0.001** | **0.000** | **N/A** | **Not-D** |
| **31** | **0.013** | **0.097** | **N/A** | **0.016** | **0.146** | **N/A** | **Not-D** |
| **32** | **0.001** | **0.000** | **N/A** | **0.002** | **0.000** | **N/A** | **Not-D** |
| **33** | **0.008** | **0.091** | **N/A** | **0.010** | **0.136** | **N/A** | **Not-D** |
| **34** | **0.001** | **0.000** | **N/A** | **0.001** | **0.000** | **N/A** | **Not-D** |
| **35** | **0.007** | **0.086** | **N/A** | **0.016** | **0.129** | **N/A** | **Not-D** |
| **36** | **0.000** | **0.000** | **N/A** | **0.001** | **0.000** | **N/A** | **Not-D** |
| **37** | **0.013** | **0.081** | **N/A** | **0.016** | **0.122** | **N/A** | **Not-D** |
| **38** | **0.000** | **0.000** | **N/A** | **0.001** | **0.000** | **N/A** | **Not-D** |
| **39** | **0.009** | **0.078** | **N/A** | **0.011** | **0.116** | **N/A** | **Not-D** |
| **40** | **0.001** | **0.000** | **N/A** | **0.002** | **0.000** | **N/A** | **Not-D** |

***Note: Dynamic limits were applied for this test. The highest harmonics values in the above table may not occur at the same window as the maximum harmonics/limit ratio.***

**Report No.:** T200109N08-E

## Voltage Source Verification Data (Run time)

**EUT: 850 B5** **Tested by: John Chen**

**Test category: Class-D per Ed. 5.0 (2018) (European limits)** **Test Margin: 100**

**Test date: 2020/1/30** **Start time: P.M. 04:05:46** **End time: P.M. 04:15:58**

**Test duration (min): 10** **Data file name: H-000102.cts_data**

**Comment: Comment**

**Customer: EVGA Corporation**

**Test Result: Not Class D** **Source qualification: Normal**

**Highest parameter values during test:**

| | | | |
|---|---|---|---|
| **Voltage (Vrms):** | **231.08** | **Frequency(Hz):** | **50.00** |
| **I_Peak (Amps):** | **5.893** | **I_RMS (Amps):** | **3.533** |
| **I_Fund (Amps):** | **3.422** | **Crest Factor:** | **1.682** |
| **Power (Watts):** | **783.0** | **Power Factor:** | **0.970** |

| Harm# | Harmonics V-rms | Limit V-rms | % of Limit | Status |
|---|---|---|---|---|
| 2 | 0.039 | 0.462 | 8.47 | OK |
| 3 | 0.540 | 2.079 | 25.97 | OK |
| 4 | 0.019 | 0.462 | 4.06 | OK |
| 5 | 0.060 | 0.924 | 6.50 | OK |
| 6 | 0.012 | 0.462 | 2.67 | OK |
| 7 | 0.043 | 0.693 | 6.18 | OK |
| 8 | 0.010 | 0.462 | 2.19 | OK |
| 9 | 0.012 | 0.462 | 2.65 | OK |
| 10 | 0.008 | 0.462 | 1.83 | OK |
| 11 | 0.022 | 0.231 | 9.54 | OK |
| 12 | 0.012 | 0.231 | 5.39 | OK |
| 13 | 0.024 | 0.231 | 10.46 | OK |
| 14 | 0.006 | 0.231 | 2.52 | OK |
| 15 | 0.015 | 0.231 | 6.43 | OK |
| 16 | 0.007 | 0.231 | 2.87 | OK |
| 17 | 0.015 | 0.231 | 6.58 | OK |
| 18 | 0.006 | 0.231 | 2.69 | OK |
| 19 | 0.018 | 0.231 | 7.85 | OK |

| | | | | |
|---|---|---|---|---|
| **20** | **0.025** | **0.231** | **10.79** | **OK** |
| **21** | **0.013** | **0.231** | **5.67** | **OK** |
| **22** | **0.006** | **0.231** | **2.60** | **OK** |
| **23** | **0.023** | **0.231** | **10.12** | **OK** |
| **24** | **0.008** | **0.231** | **3.32** | **OK** |
| **25** | **0.023** | **0.231** | **9.85** | **OK** |
| **26** | **0.007** | **0.231** | **2.86** | **OK** |
| **27** | **0.010** | **0.231** | **4.40** | **OK** |
| **28** | **0.004** | **0.231** | **1.89** | **OK** |
| **29** | **0.016** | **0.231** | **6.80** | **OK** |
| **30** | **0.003** | **0.231** | **1.22** | **OK** |
| **31** | **0.018** | **0.231** | **7.80** | **OK** |
| **32** | **0.002** | **0.231** | **0.99** | **OK** |
| **33** | **0.015** | **0.231** | **6.33** | **OK** |
| **34** | **0.002** | **0.231** | **0.87** | **OK** |
| **35** | **0.020** | **0.231** | **8.85** | **OK** |
| **36** | **0.003** | **0.231** | **1.19** | **OK** |
| **37** | **0.023** | **0.231** | **9.85** | **OK** |
| **38** | **0.002** | **0.231** | **0.99** | **OK** |
| **39** | **0.019** | **0.231** | **8.32** | **OK** |
| **40** | **0.018** | **0.231** | **7.77** | **OK** |

# 7.5. VOLTAGE FLUCTUATION AND FLICKER MEASUREMENT

## 7.5.1. LIMITS OF VOLTAGE FLUCTUATION AND FLICKER MEASUREMENT

| TEST ITEM | LIMIT | REMARK |
|---|---|---|
| $P_{st}$ | 1.0 | $P_{st}$ means short-term flicker indicator. |
| $P_{lt}$ | 0.65 | $P_{lt}$ means long-term flicker indicator. |
| $T_{dt}$ (ms) | 500 | $T_{dt}$ means maximum time that dt exceeds 3 %. |
| $d_{max}$ (%) | 4% | $d_{max}$ means maximum relative voltage change. |
| dc (%) | 3.3% | dc means relative steady-state voltage change |

## 7.5.2. TEST INSTRUMENTS

| IMMUNITY SHIELDED ROOM | | | | |
|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Due** |
| Harmonic & Flicker Test System | Teseq | NSG 1007/CCN 1000-1 | 1504A02655 | 03/24/2020 |
| Software | Win2100V4 V4.14.0 | | | |

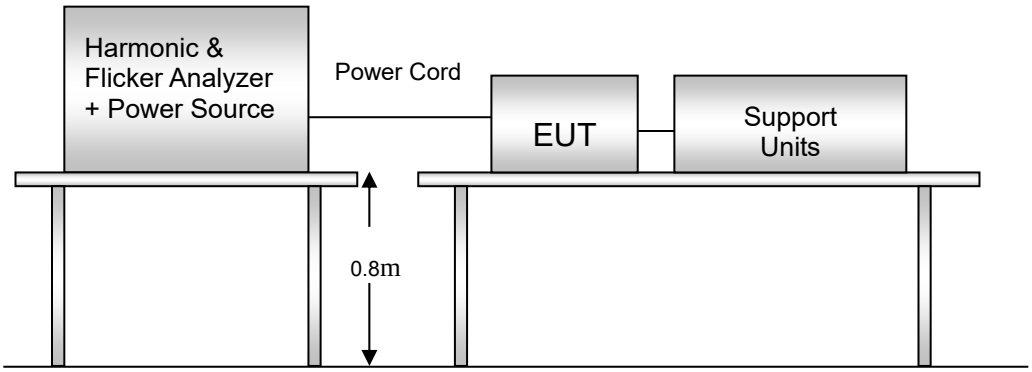
**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

## 7.5.3. TEST PROCEDURE

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

During the flick measurement, the measure time shall include that part of whole operation cycle in which the EUT produce the most unfavorable sequence of voltage changes. The observation period for short-term flicker indicator is 10 minutes and the observation period for long-term flicker indicator is 2 hours.

## 7.5.4. TEST SETUP




For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

**Report No.:** T200109N08-E

### 7.5.5. TEST RESULTS

**Test Model : 850 B5**

| | | | |
|---|---|---|---|
| **Observation Period (Tp)** | 10 min | **Tested by** | John Chen |
| **Environmental Conditions** | 24℃ 50% RH, 1025mbar | | |

## Test Result

**Flicker Test Summary per EN/IEC61000-3-3 Ed. 3.0 (2013) (Run time)**

**EUT: 850 B5** **Tested by: John Chen**

**Test category: All parameters (European limits)** **Test Margin: 100**

**Test date: 2020/1/30** **Start time: P.M. 04:18:04** **End time: P.M. 04:28:31**

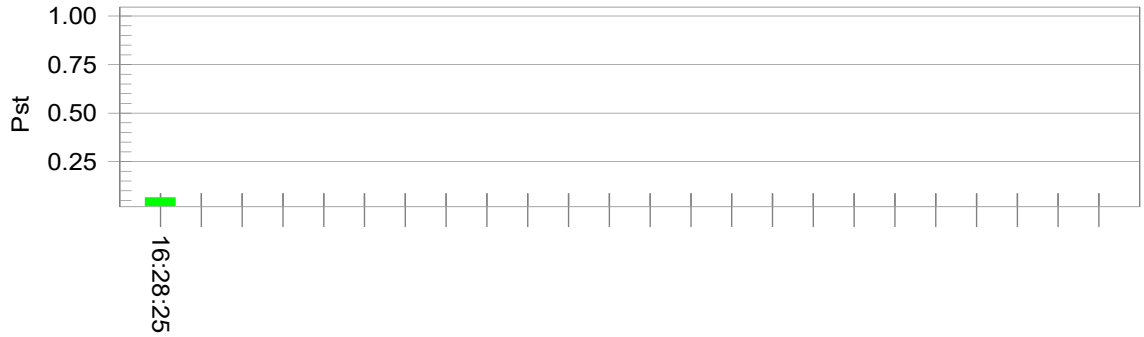
**Test duration (min): 10** **Data file name: F-000103.cts_data**

**Comment: Comment**

**Customer: EVGA Corporation**

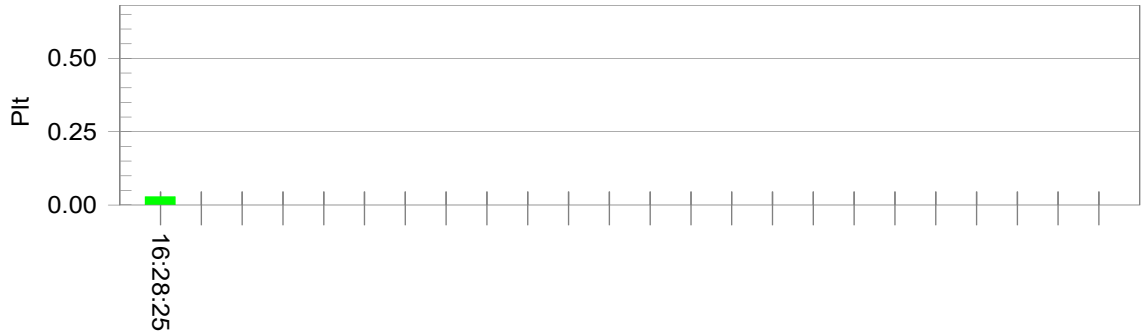
**Test Result: Pass** **Status: Test Completed**

**$Pst_i$ and limit line** **European Limits**




**Plt and limit line**

**Report No.:** T200109N08-E




**Parameter values recorded during the test:**

| | | | | |
|---|---|---|---|---|
| **Vrms at the end of test (Volt):** | **229.77** | | | |
| **T-max (mS):** | **0** | **Test limit (mS):** | **500.0** | **Pass** |
| **Highest dc (%):** | **0.00** | **Test limit (%):** | **3.30** | **Pass** |
| **Highest dmax (%):** | **0.00** | **Test limit (%):** | **4.00** | **Pass** |
| **Highest Pst (10 min. period):** | **0.064** | **Test limit:** | **1.000** | **Pass** |
| **Highest Plt (2 hr. period):** | **0.028** | **Test limit:** | **0.650** | **Pass** |

# 8 IMMUNITY TEST

## 8.1. GENERAL DESCRIPTION

| Product Standard | EN 55024: 2010 | |
|---|---|---|
| | **Test Type** | **Minimum Requirement** |
| **Basic Standard, Specification, and Performance Criterion required** | IEC 61000-4-2 | Electrostatic Discharge – ESD:<br>8KV air discharge, 4kV Contact discharge,<br>Performance Criterion B |
| | IEC 61000-4-3 | Radio-Frequency Electromagnetic Field Susceptibility Test – RS:<br>80 ~1000 MHz, 3V/m, 80% AM(1kHz),<br>Performance Criterion A |
| | IEC 61000-4-4 | Electrical Fast Transient/Burst - EFT,<br>AC Power Port: 1kV<br>DC Power Port: 0.5kV<br>Signal Ports and Telecommunication Ports: 0.5kV<br>Performance Criterion B |
| | IEC 61000-4-5 | Surge Immunity Test:<br>1.2/50 us Open Circuit Voltage,<br>8/20 us Short Circuit Current,<br>AC Power Port ~ line to line: 1kV,<br>line to earth (ground): 2kV<br>DC Power Port ~ line to earth: 0.5kV<br>Signal and Telecommunication Ports ~ line to ground: 1kV<br>Performance Criterion B |
| | IEC 61000-4-6 | Conducted Radio Frequency Disturbances Test – CS:<br>0.15 ~ 80 MHz, 3Vrms, 80% AM, 1kHz,<br>Performance Criterion A |
| | IEC 61000-4-8 | Power frequency magnetic field immunity test<br>50 Hz, 1A/m<br>Performance Criterion A |
| | IEC 61000-4-11 | Voltage Dips:<br>i) >95% reduction for 0.5 periods,<br>Performance Criterion B<br>ii) 30% reduction for 25 periods,<br>Performance Criterion C<br>Voltage Interruptions:<br>>95% reduction for 250 periods<br>Performance Criterion C |

## 8.2. GENERAL PERFORMANCE CRITERIA DESCRIPTION

| | |
|---|---|
| **Criteria A:** | The apparatus shell continues 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 apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. If the manufacturer does not specify the minimum performance level or the permissible performance loss, 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. |
| **Criteria B:** | After test, the apparatus shell continues to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomenon below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance.<br>During the test, degradation of performance is however allowed. However, no change of operating state if stored data is allowed to persist after the test. If the manufacturer does not specify the minimum performance level or the permissible performance loss, 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. |
| **Criteria C:** | Temporary loss of function is allowed, provided the functions is self-recoverable or can be restored by the operation of controls by the user in accordance with the manufacturer instructions.<br>Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost. |

# 8.3. ELECTROSTATIC DISCHARGE (ESD)

## 8.3.1. TEST SPECIFICATION

| | |
|---|---|
| **Basic Standard:** | IEC 61000-4-2 |
| **Discharge Impedance:** | 330 ohm / 150 pF |
| **Discharge Voltage:** | Air Discharge: --- kV (Direct)<br>Contact Discharge: 2, 4 kV (Direct/Indirect) |
| **Polarity:** | Positive & Negative |
| **Number of Discharge:** | Air Discharge: min. 10 times at each test point for each polarity<br>Contact Discharge: min. 200 times in total |
| **Discharge Mode:** | Single Discharge<br>1 second minimum |

## 8.3.2. TEST INSTRUMENT

| IMMUNITY SHIELDED ROOM | | | | |
|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Due** |
| ESD Simulator | NoiseKen | ESS-B3011 | ESS1478775 | 07/30/2020 |
| Software | NO. | | | |

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

### 8.3.3. TEST PROCEDURE

The discharges shall be applied in two ways:

a) Contact discharges to the conductive surfaces and coupling planes:

The EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points. One of the test points shall be subjected to at least 50 indirect discharges to the center of the front edge of the **H**orizontal **C**oupling **P**lane (**HCP**). The remaining three test points shall each receive at least 50 direct contact discharges. If no direct contact test points are available, then at least 200 indirect discharges shall be applied in the indirect mode. Test shall be performed at a maximum repetition rate of one discharge per second.

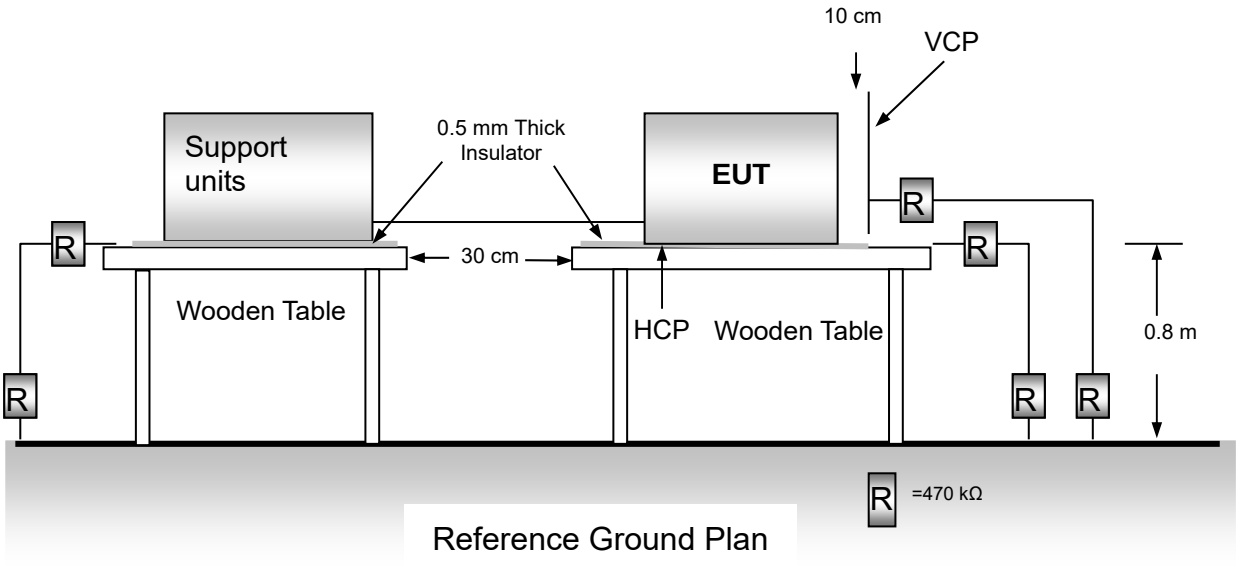
b) Air discharges at slots and apertures and insulating surfaces:

On those parts of the EUT where it is not possible to perform contact discharge testing, the equipment should be investigated to identify user accessible points where breakdown may occur. Such points are tested using the air discharge method. This investigation should be restricted to those area normally handled by the user. A minimum of 10 single air discharges shall be applied to the selected test point for each such area.

The basic test procedure was in accordance with IEC 61000-4-2:

a) The EUT was located 0.1 m minimum from all side of the **HCP** (dimensions 1.6m x 0.8m).
b) The support units were located another table 30 cm away from the EUT, but direct support unit was/were located at same location as EUT on the HCP and keep at a distance of 10 cm with EUT.
c) The time interval between two successive single discharges was at least 1 second.
d) Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
e) Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were complete.
f) At least ten single discharges (in the most sensitive polarity) were applied at the front edge of each **HCP** opposite the center point of each unit of the EUT and 0.1 meters from the front of the EUT. The long axis of the discharge electrode was in the plane of the **HCP** and perpendicular to its front edge during the discharge.
g) At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the **V**ertical **C**oupling **P**lane (**VCP**) in sufficiently different positions that the four faces of the EUT were completely illuminated. The **VCP** (dimensions 0.5m x 0.5m) was placed vertically to and 0.1 meters from the EUT.

## 8.3.4. TEST SETUP




For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

**Note:**

TABLETOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the **G**round **R**eference **P**lane. The **GRP** consisted of a sheet of aluminum at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system. A **H**orizontal **C**oupling **P**lane (1.6m x 0.8m) was placed on the table and attached to the **GRP** by means of a cable with 940kohm total impedance. The equipment under test, was installed in a representative system as described in section 7 of IEC 61000-4-2, and its cables were placed on the **HCP** and isolated by an insulating support of 0.5mm thickness. A distance of 1-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

FLOOR-STANDING EQUIPMENT

The equipment under test was installed in a representative system as described in section 7 of IEC 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1-meter thickness. The GRP consisted of a sheet of aluminum that is at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system and extended at least 0.5 meters from the EUT on all sides.

**Report No.:** T200109N08-E

### 8.3.5. TEST RESULTS
**For Model: 850 B5**

| | | | |
|---|---|---|---|
| **Temperature** | 17°C | **Humidity** | 48% RH |
| **Pressure** | 1018mbar | **Tested By** | John Chen |
| **Required Passing Performance** | **Criterion B** | **Test Mode** | Full load |

**Test Date: 2020/02/03**

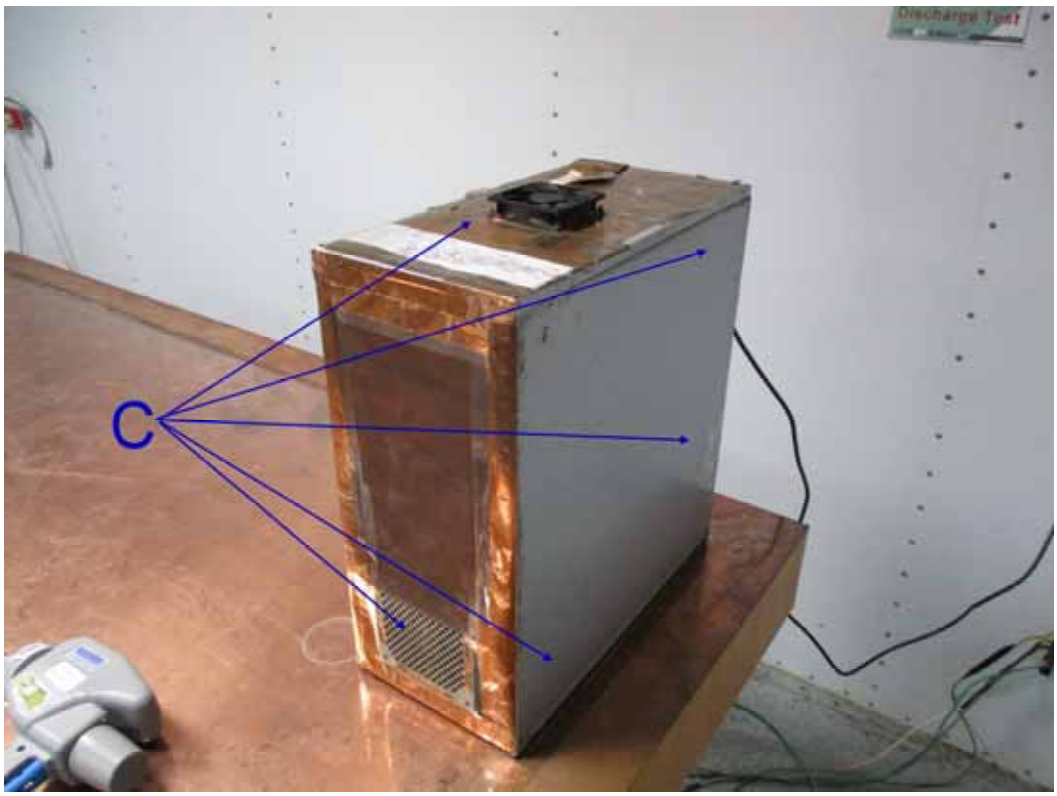
| Air Discharge | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Test Points** | **Test Levels** | | | **Results** | | | |
| | **± 2 kV** | **± 4 kV** | **± 8 kV** | **Pass** | **Fail** | **Performance Criterion** | |
| Front | ☐ | ☐ | ☐ | ☐ | ☐ | ☐A ☐B | |
| Back | ☐ | ☐ | ☐ | ☐ | ☐ | ☐A ☐B | |
| Left | ☐ | ☐ | ☐ | ☐ | ☐ | ☐A ☐B | |
| Right | ☐ | ☐ | ☐ | ☐ | ☐ | ☐A ☐B | |
| Top | ☐ | ☐ | ☐ | ☐ | ☐ | ☐A ☐B | |
| Bottom | ☐ | ☐ | ☐ | ☐ | ☐ | ☐A ☐B | |
| Output | ☐ | ☐ | ☐ | ☐ | ☐ | ☐A ☐B | |

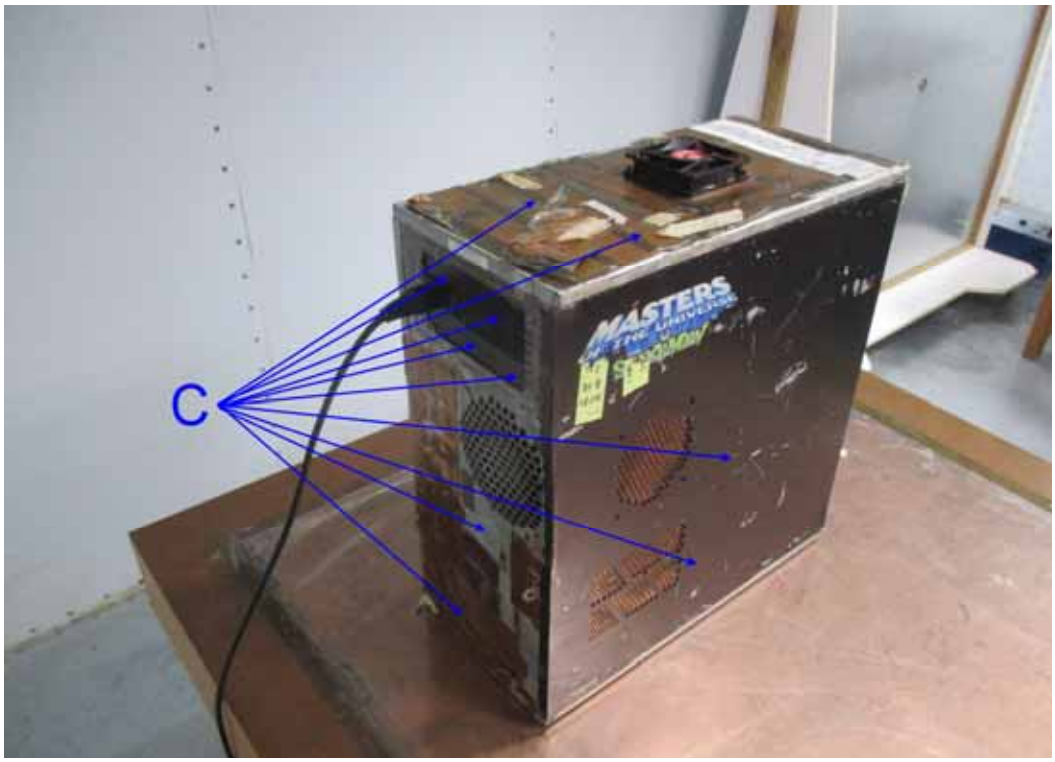
| Contact Discharge | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Test Points** | **Test Levels** | | | **Results** | | | |
| | **± 2 kV** | **± 4 kV** | **± 8 kV** | **Pass** | **Fail** | **Performance Criterion** | |
| Front | ☒ | ☒ | ☐ | ☒ | ☐ | ☒A ☐B | |
| Back | ☒ | ☒ | ☐ | ☒ | ☐ | ☒A ☐B | |
| Left | ☒ | ☒ | ☐ | ☒ | ☐ | ☒A ☐B | |
| Right | ☒ | ☒ | ☐ | ☒ | ☐ | ☒A ☐B | |
| Top | ☒ | ☒ | ☐ | ☒ | ☐ | ☒A ☐B | |
| Bottom | ☐ | ☐ | ☐ | ☐ | ☐ | ☐A ☐B | |

| Discharge To Horizontal Coupling Plane | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Side of EUT** | **Test Levels** | | | **Results** | | | |
| | **± 2 kV** | **± 4 kV** | **± 8 kV** | **Pass** | **Fail** | **Performance Criterion** | |
| Front | ☐ | ☒ | ☐ | ☒ | ☐ | ☒A ☐B | |
| Back | ☐ | ☒ | ☐ | ☒ | ☐ | ☒A ☐B | |
| Left | ☐ | ☒ | ☐ | ☒ | ☐ | ☒A ☐B | |
| Right | ☐ | ☒ | ☐ | ☒ | ☐ | ☒A ☐B | |

| Discharge To Vertical Coupling Plane | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Side of EUT** | **Test Levels** | | | **Results** | | | |
| | **± 2 kV** | **± 4 kV** | **± 8 kV** | **Pass** | **Fail** | **Performance Criterion** | |
| Front | ☐ | ☒ | ☐ | ☒ | ☐ | ☒A ☐B | |
| Back | ☐ | ☒ | ☐ | ☒ | ☐ | ☒A ☐B | |
| Left | ☐ | ☒ | ☐ | ☒ | ☐ | ☒A ☐B | |
| Right | ☐ | ☒ | ☐ | ☒ | ☐ | ☒A ☐B | |

***The Photo for Discharge Points of EUT***




'A' Mark — Air Discharged ;'C' Mark —Contact Discharged

## 8.4. RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD (RS)

### 8.4.1. TEST SPECIFICATION

| | |
|---|---|
| **Basic Standard:** | IEC 61000-4-3 |
| **Frequency Range:** | 80 MHz ~1000 MHz |
| **Field Strength:** | 3 V/m |
| **Modulation:** | 1kHz Sine Wave, 80%, AM Modulation |
| **Frequency Step:** | 1 % of preceding frequency value |
| **Polarity of Antenna:** | Horizontal and Vertical |
| **Test Distance:** | 3 m |
| **Antenna Height:** | 1.5m |

### 8.4.2. TEST INSTRUMENT

| 966 RS Chamber | | | | |
|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Due** |
| Power SENSOR | Boonton | 51011-EMC | 33428 | 08/15/2020 |
| Power SENSOR | Boonton | 51011-EMC | 33429 | 08/15/2020 |
| RS Power Meter | Boonton | 4232A-01-02 | 122202 | 08/15/2020 |
| Signal Generator | R & S | SMF 100A | 100567 | 11/17/2020 |
| Signal Generator | hp | ESG-D3000A | US36260655 | 08/14/2020 |
| Amplifier | ar | 50S1G6M1 | 0343693 | N.C.R |
| Amplifier | TESEQ | CBA 1G-600B | T2499-0619 | N.C.R |
| Antenna | ar | AT5080 | 309817 | N.C.R |
| Software | EMCWARE Ver 3.4.3 | | | |

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R. = No Calibration required

### 8.4.3. TEST PROCEDURE

The test procedure was in accordance with IEC 61000-4-3

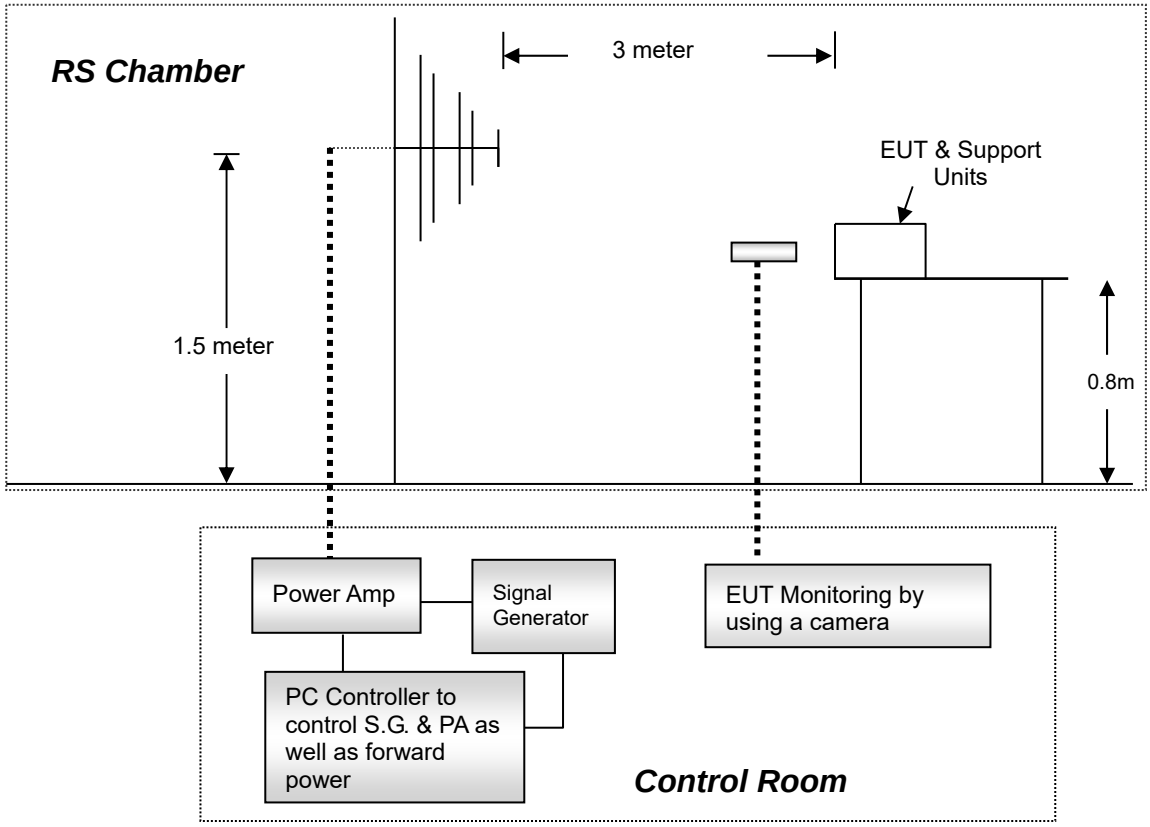
a) The testing was performed in a fully anechoic chamber. The transmit antenna was located at a distance of 3 meters from the EUT.

b) The frequency range is swept from 80 MHz to 1000 MHz, with the signal 80% amplitude modulated with a 1kHz sine-wave. The rate of sweep did not exceed 1.5 x $10^{-3}$ decade/s, where the frequency range is swept incrementally, the step size was 1% of preceding frequency value.

c) The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.

d) The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

### 8.4.4. TEST SETUP




For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

**Note:**

TABLETOP EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

FLOOR-STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC 61000-4-3 was placed on a non-conductive wood support 0.1 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

### 8.4.5. TEST RESULTS

**For Model: 850 B5**

| | | | |
|---|---|---|---|
| **Temperature** | 19°C | **Humidity** | 51% RH |
| **Pressure** | 1019mbar | **Dwell Time** | 3 sec. |
| **Tested By** | John Chen | **Test Mode** | Full load |
| **Required Passing Performance** | | **Criterion A** | |

Test Date: 2020/02/03

| Frequency (MHz) | Polarity | Azimuth | Field Strength (V/m) | Performance Criterion | Result | Observation |
|---|---|---|---|---|---|---|
| 80 ~ 1000 | V&H | 0 | 3 | ☒A ☐B | PASS | |
| 80 ~ 1000 | V&H | 90 | 3 | ☒A ☐B | PASS | |
| 80 ~ 1000 | V&H | 180 | 3 | ☒A ☐B | PASS | |
| 80 ~ 1000 | V&H | 270 | 3 | ☒A ☐B | PASS | |

## 8.5. ELECTRICAL FAST TRANSIENT (EFT)

### 8.5.1. TEST SPECIFICATION

| | |
|---|---|
| **Basic Standard:** | IEC 61000-4-4 |
| **Test Voltage:** | AC Power Port: 1 kV<br>DC Power Port: --- kV<br>Signal Ports and Telecommunication Ports: --- kV |
| **Polarity:** | Positive & Negative |
| **Impulse Frequency:** | 5 kHz |
| **Impulse Wave-shape:** | 5/50 ns |
| **Burst Duration:** | 15 ms |
| **Burst Period:** | 300 ms |
| **Test Duration:** | Not less than 1 min. |

### 8.5.2. TEST INSTRUMENT

| Immunity Shield Room | | | | |
|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Due** |
| Capactivite Coupling Clamp | EM TEST | HFK | P1504147703 | 04/02/2020 |
| Ultra Compact Simulator | EM TEST | UCS 500N7 | P1552169754 | 04/01/2020 |
| Software | iec.control V5.4.4 | | | |

**Note:**

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R.= No Calibration required

### 8.5.3. TEST PROCEDURE

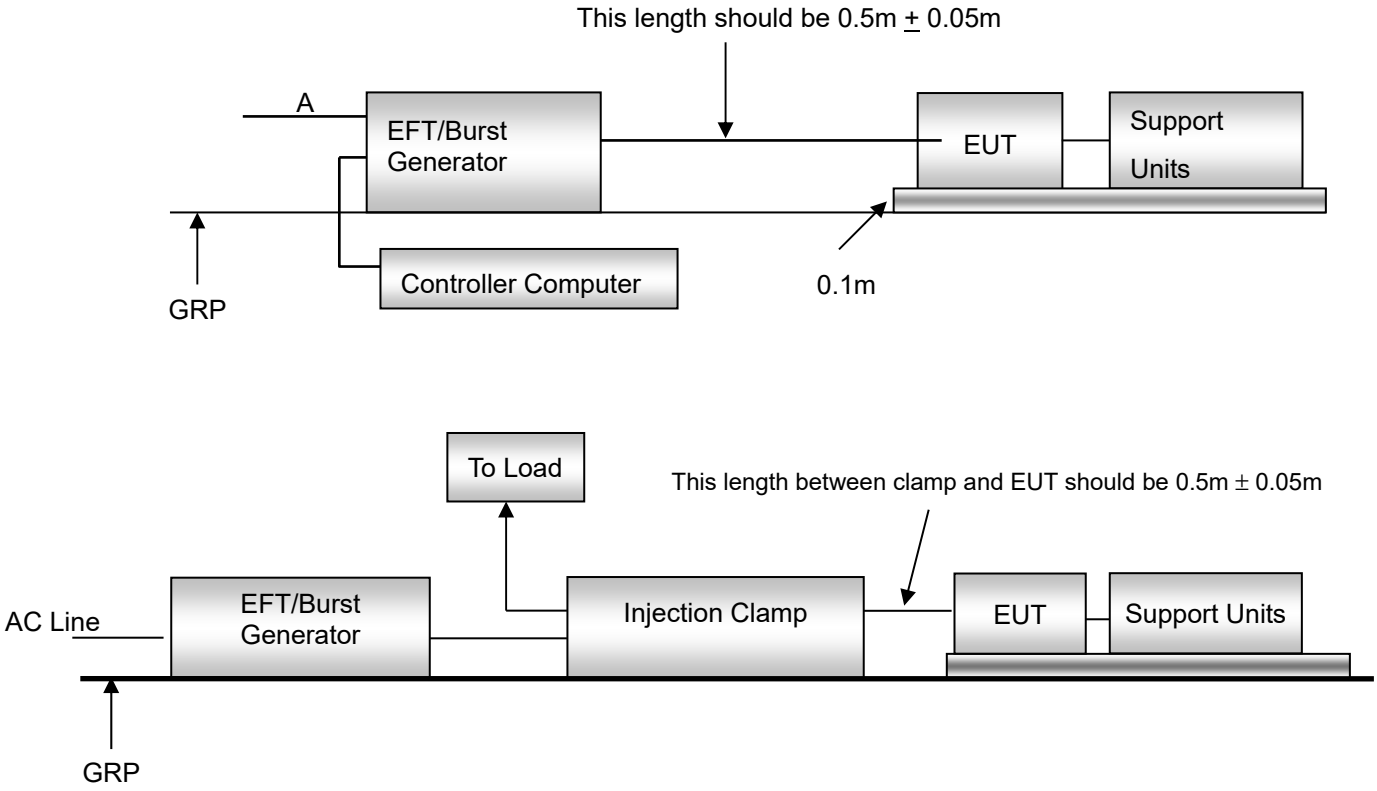
a) Both positive and negative polarity discharges were applied.

b) The length of the “hot wire” from the coaxial output of the EFT generator to the terminals on the EUT should not exceed 0.5 meter.

c) The duration time of each test sequential was 1 minute.

d) The transient/burst waveform was in accordance with IEC 61000-4-4, 5/50ns.

### 8.5.4. TEST SETUP




For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

**Note:**

TABLETOP EQUIPMENT

The configuration consisted of a wooden table (0.1m high) standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system. A minimum distance of 0.5m was provided between the EUT and the walls of the laboratory or any other metallic structure.

FLOOR-STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC 61000-4-4 and its cables, were isolated from the Ground Reference Plane by an insulating support that is 0.1-meter thick. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system.

**Report No.:** T200109N08-E

### 8.5.5. TEST RESULTS

**For Model: 850 B5**

| | | | |
|---|---|---|---|
| **Temperature** | 20°C | **Humidity** | 52% RH |
| **Pressure** | 1019mbar | **Tested By** | John Chen |
| **Required Passing Performance** | **Criterion B** | **Test Mode** | Full load |

Test Date: 2020/02/03

| Test Point | Polarity | Test Level (kV) | Performance Criterion | Result | Observation |
|---|---|---|---|---|---|
| L | +/- | 1kV | ☒A ☐B | PASS | |
| N | +/- | 1kV | ☒A ☐B | PASS | |
| PE | +/- | 1kV | ☒A ☐B | PASS | |
| L+N | +/- | 1kV | ☒A ☐B | PASS | |
| L+PE | +/- | 1kV | ☒A ☐B | PASS | |
| N+PE | +/- | 1kV | ☒A ☐B | PASS | |
| L+N+PE | +/- | 1kV | ☒A ☐B | PASS | |

## 8.6. SURGE IMMUNITY TEST

### 8.6.1. TEST SPECIFICATION

| | |
|---|---|
| **Basic Standard:** | IEC 61000-4-5 |
| **Wave-Shape:** | Combination Wave<br>1.2/50 μs Open Circuit Voltage<br>8/20 μs Short Circuit Current |
| **Test Voltage:** | AC Power Port~ line to line: 1kV, line to ground: 2kV<br>DC Power Port~ line to earth: --- kV<br>Signal and Telecommunication Ports ~ line to ground: ---kV |
| **Surge Input/Output:** | AC Power Line: L-N、L-PE、N-PE |
| **Generator Source Impedance:** | 2 ohm between networks<br>12 ohm between network and ground |
| **Polarity:** | Positive/Negative |
| **Phase Angle:** | 0° / 90° / 180° / 270° |
| **Pulse Repetition Rate:** | 1 time / min. (maximum) |
| **Number of Tests:** | 5 positive and 5 negative at selected points |

### 8.6.2. TEST INSTRUMENT

| Immunity Shield Room | | | | |
|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Due** |
| CDN | EMC-PAPTNER | CDN-UTP8 | 1504 | 05/31/2020 |
| Ultra Compact Simulator | EM TEST | UCS 500N7 | P1552169754 | 04/01/2020 |
| Software | iec.control V5.4.4 | | | |

**Note:**

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R. = No Calibration required

### 8.6.3. TEST PROCEDURE

a) For EUT power supply:

The surge is applied to the EUT power supply terminals via the capacitive coupling network. Decoupling networks are required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines, and to provide sufficient decoupling impedance to the surge wave. The power cord between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.

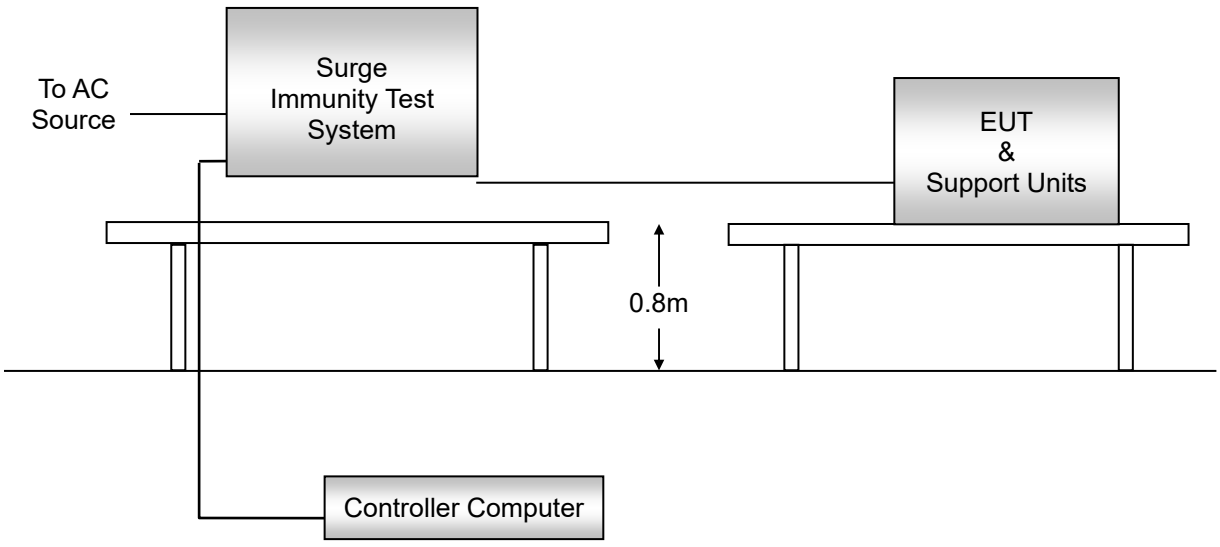
b) For test applied to unshielded un-symmetrically operated interconnection lines of EUT:

The surge was applied to the lines via the capacitive coupling. The coupling / decoupling networks didn't influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.

c) For test applied to unshielded symmetrically operated interconnection / telecommunication lines of EUT:

The surge was applied to the lines via gas arrestors coupling. Test levels below the ignition point of the coupling arrestor were not specified. The interconnection line between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.

### 8.6.4. TEST SETUP




For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

### 8.6.5. TEST RESULTS

**For Model: 850 B5**

| | | | |
|---|---|---|---|
| **Temperature** | 20°C | **Humidity** | 52% RH |
| **Pressure** | 1019mbar | **Tested By** | John Chen |
| **Required Passing Performance** | **Criterion B** | **Test Mode** | Full load |

Test Date: 2020/02/03

| Test Point | Polarity | Test Level (kV) | Performance Criterion | Result | Observation |
|---|---|---|---|---|---|
| L - N | +/- | 1 | ☒**A** ☐**B** | PASS | |
| L – PE | +/- | 2 | ☒**A** ☐**B** | PASS | |
| N - PE | +/- | 2 | ☒**A** ☐**B** | PASS | |

# 8.7. CONDUCTED RADIO FREQUENCY DISTURBANCES (CS)

## 8.7.1. TEST SPECIFICATION

| | |
|---|---|
| **Basic Standard:** | IEC 61000-4-6 |
| **Frequency Range:** | 0.15 MHz ~ 80 MHz |
| **Field Strength:** | 3 Vrms |
| **Modulation:** | 1kHz Sine Wave, 80%, AM Modulation |
| **Frequency Step:** | 1 % of preceding frequency value |
| **Coupling device:** | CDN-M3 (3 wires) |

## 8.7.2. TEST INSTRUMENT

| CS Test Site (IEC/EN 61000-4-6) | | | | |
|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Due** |
| CDN | Frankonia | CDN M2+M3 | A3011095 | 12/09/2020 |
| Continuous Wave Simulator | EM TEST | CWS 500N1.4 | P1247105414 | 12/10/2020 |
| Couplihd/Decoupling Networks | FRANKONIA | CDN-RJ45 | A3100030/2013 | 06/12/2020 |
| EM Injection Clamp | FCC | F-203I-23MM | 449 | 06/12/2020 |
| 6dB Attenuator | BIRD | 75-A-FFN-06 | 0346 | N.C.R |
| Software | icd.control V5.3.8 | | | |

**Note:**

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R.= No Calibration required

## 8.7.3. TEST PROCEDURE

The EUT shall be tested within its intended operating and climatic conditions.

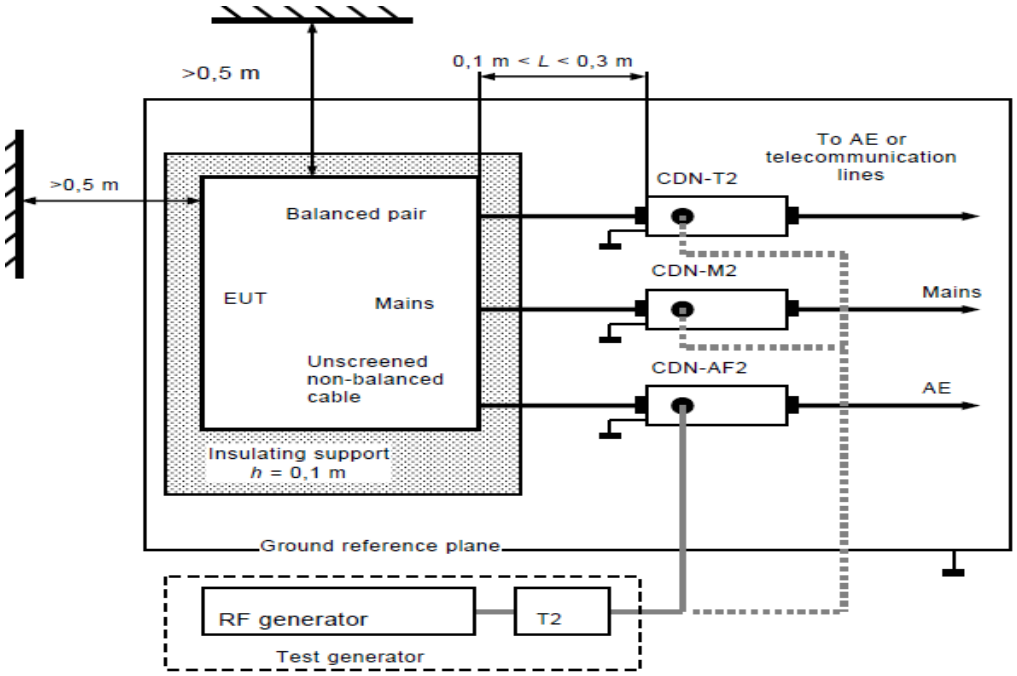
The test shell performed with the test generator connected to each of the coupling and decoupling devices in turn, while the other non-excited RF input ports of the coupling devices are terminated by a 50-ohm load resistor.

The frequency range was swept from 150 kHz to 80 MHz, using the signal level established during the setting process and with a disturbance signal of 80 % amplitude. The signal was modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. The sweep rate was 1.5 x $10^{-3}$ decades/s. Where the frequency range is swept incrementally, the step size was 1 % of preceding frequency value from 150 kHz to 80 MHz.

The dwell time at each frequency was less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies such as clock frequency(ies) and harmonics or frequencies of dominant interest, was analyzed separately.

Attempts were made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility.

## 8.7.4. TEST SETUP




Note:

1. The EUT is setup 0.1m above Ground Reference Plane
2. The CDNs and / or EM clamp used for real test depend on ports and cables configuration of EUT.

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

**Note:**

TABLETOP AND FLOOR-STANDING EQUIPMENT

The equipment to be tested is placed on an insulating support of 0.1 meters height above a ground reference plane. All relevant cables shall be provided with the appropriate coupling and decoupling devices at a distance between 0.1 meters and 0.3 meters from the projected geometry of the EUT on the ground reference plane.

**Report No.:** T200109N08-E

### 8.7.5. TEST RESULTS

**For Model: 850 B5**

| | | | |
|---|---|---|---|
| **Temperature** | 20°C | **Humidity** | 52% RH |
| **Pressure** | 1019mbar | **Tested By** | John Chen |
| **Required Passing Performance** | **Criterion A** | **Test Mode** | Full load |

Test Date: 2020/02/03

| Frequency Band (MHz) | Field Strength (Vrms) | Cable | Injection Method | Performance Criterion | Result | Observation |
|---|---|---|---|---|---|---|
| 0.15 ~ 80 | 3 | AC Power | CDN-M3 | ☒**A** ☐**B** | PASS | |

## 8.8. POWER FREQUENCY MAGNETIC FIELD

### 8.8.1. TEST SPECIFICATION

| | |
|---|---|
| **Basic Standard:** | IEC 61000-4-8 |
| **Frequency Range:** | 50Hz |
| **Field Strength:** | 1 A/m |
| **Observation Time:** | 1 minute |
| **Inductance Coil:** | Rectangular type, 1mx1m |

### 8.8.2. TEST INSTRUMENT

| Immunity Shield Room | | | | |
|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Due** |
| AC/DC CLAMP METER | PROVA | 2003 | 02190104 | 05/13/2020 |
| Triaxial ELF Magnetic Field Meter | F.W. BELL | 4190 | 1222007 | 06/12/2021 |
| Magnetic generator | Schaffner | MFO 6501 | 154 | N.C.R |
| Magnetic loops | Schaffner | INA 702 | 158 | N.C.R |

**Note:**

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R.= No Calibration required

### 8.8.3. TEST PROCEDURE

a) The equipment is configured and connected to satisfy its functional requirements. It shall be placed on the GRP with the interposition of a 0.1m-thick insulating support.

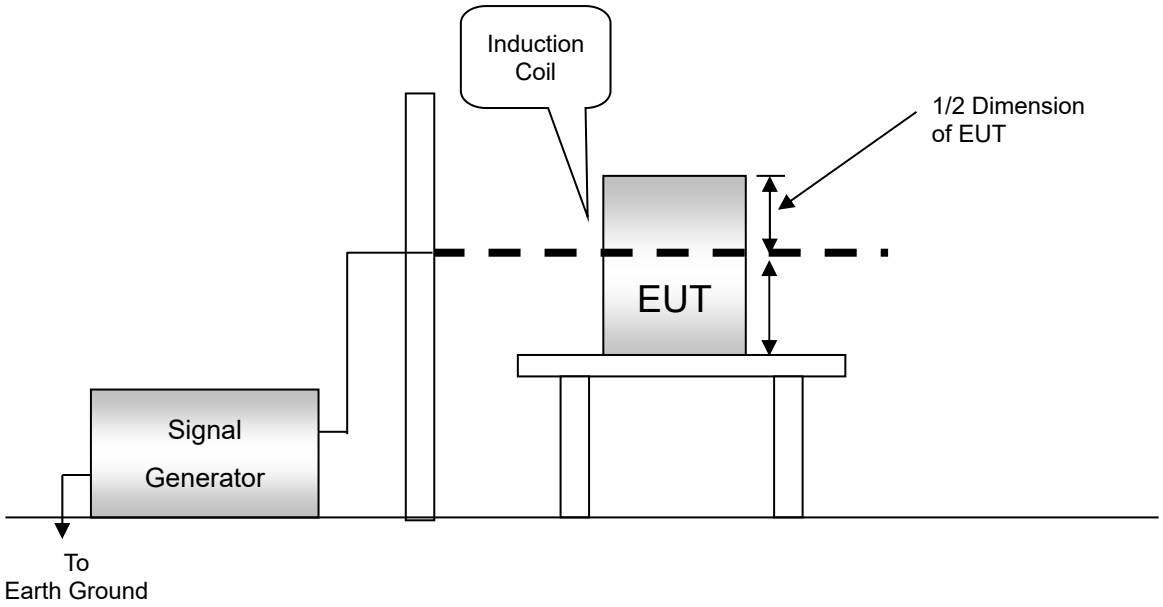
b) The equipment cabinets shall be connected to the safety earth directly on the GRP via the earth terminal of the EUT.

c) The power supply, input and output circuits shall be connected to the sources of power supply, control and signal.

d) The cables supplied or recommended by the equipment manufacturer shall be used. 1 meter of all cables used shall be exposed to the magnetic field.

**Report No.:** T200109N08-E

### 8.8.4. TEST SETUP




For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

**Note:**
TABLETOP EQUIPMENT
The equipment shall be subjected to the test magnetic field by using the induction coil of standard dimension (1 m x 1 m). The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

FLOOR-STANDING EQUIPMENT
The equipment shall be subjected to the test magnetic field by using induction coils of suitable dimensions. The test shall be repeated by moving and shifting the induction coils, in order to test the whole volume of the EUT for each orthogonal direction. The test shall be repeated with the coil shifted to different positions along the side of the EUT, in steps corresponding to 50 % of the shortest side of the coil. The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

### 8.8.5. TEST RESULTS

**For Model: 850 B5**

| | | | |
|---|---|---|---|
| **Temperature** | 17°C | **Humidity** | 48% RH |
| **Pressure** | 1018mbar | **Tested By** | John Chen |
| **Required Passing Performance** | **Criterion A** | **Test Mode** | Full load |

Test Date: 2020/02/03

| DIRECTION | Field Strength (A/m) | Performance Criterion | Result | Observation |
|---|---|---|---|---|
| X | 1 | ☒A ☐B | PASS | |
| Y | 1 | ☒A ☐B | PASS | |
| Z | 1 | ☒A ☐B | PASS | |

# 8.9. VOLTAGE DIPS & VOLTAGE INTERRUPTIONS

## 8.9.1. TEST SPECIFICATION

| | |
|---|---|
| **Basic Standard:** | IEC 61000-4-11 |
| **Test duration time:** | Minimum three test events in sequence |
| **Interval between event:** | Minimum 10 seconds |
| **Phase Angle:** | 0º / 45º / 90º / 135º / 180º / 225º / 270º / 315º / 360º |
| **Test cycle:** | 3 times |

## 8.9.2. TEST INSTRUMENT

| **Immunity shielded room** | | | | |
|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Due** |
| Ultra Compact Simulator | EM TEST | UCS 500N7 | P1552169754 | 04/01/2020 |
| Software | iec.control V5.4.4 | | | |

**Note:**

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R. = No Calibration Required.

## 8.9.3. TEST PROCEDURE

a) The EUT and support units were located on a wooden table, 0.8 m away from ground floor.

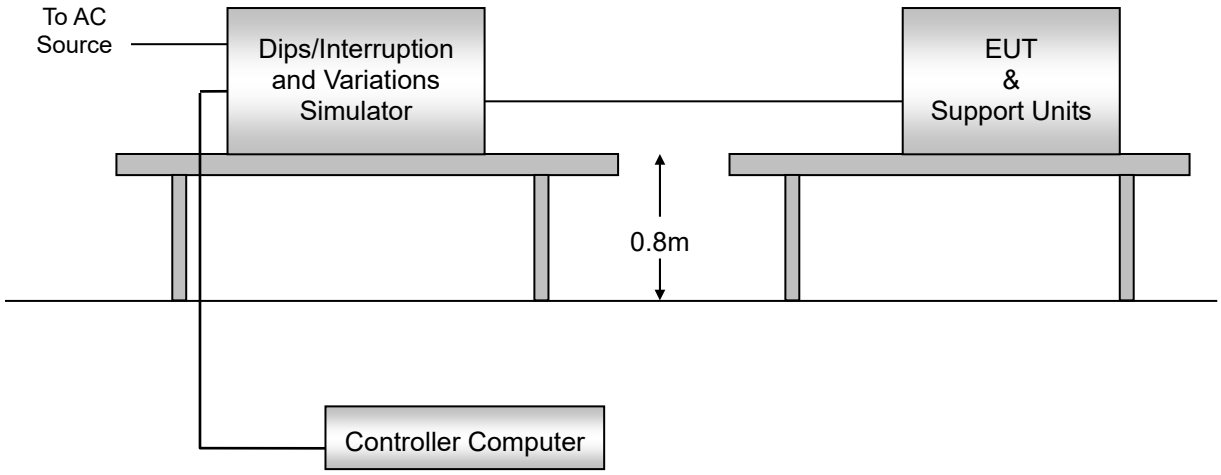
b) Setting the parameter of tests and then perform the test software of test simulator.

c) Conditions changes to occur at 0 degree crossover point of the voltage waveform.

d) Recording the test result in test record form.

**Report No.:** T200109N08-E

### 8.9.4. TEST SETUP




For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

### 8.9.5. TEST RESULTS

**For Model: 850 B5**

| | | | |
|---|---|---|---|
| **Environmental Conditions** | 20°C, 52% RH, 1019mbar | **Test Mode** | Full load |
| **Required Passing Performance** | **Criterion B: >95% reduction 0.5 periods Criterion C: 30% reduction 25 periods & >95% reduction 250 periods** | **Tested By** | John Chen |

Test Date: 2020/02/03

| **Test Power: 230Vac, 50Hz** | | | | |
|---|---|---|---|---|
| **Item** | **Voltage (% Reduction)** | **Duration (Period)** | **Performance Criterion** | **Test Result** |
| Voltage Dips | >95 | 0.5 | ☒**A** ☐**B** ☐**C** | PASS |
| | 30 | 25 | ☒**A** ☐**B** ☐**C** | PASS |
| Voltage Interruption | >95 | 250 | ☐**A** ☒**B** ☐**C** | PASS |

**Report No.:** T200109N08-E

# 9 PHOTOGRAPHS OF THE TEST CONFIGURATION

## CONDUCTED EMISSION TEST

## RADIATED EMISSION TEST

**Report No.:** T200109N08-E

## Harmonics Test (Model: 850 B5)

## Flicker Test (Model: 850 B5)

**Report No.:** T200109N08-E

## ESD Test (Model: 850 B5)

## RS Test (Model: 850 B5)

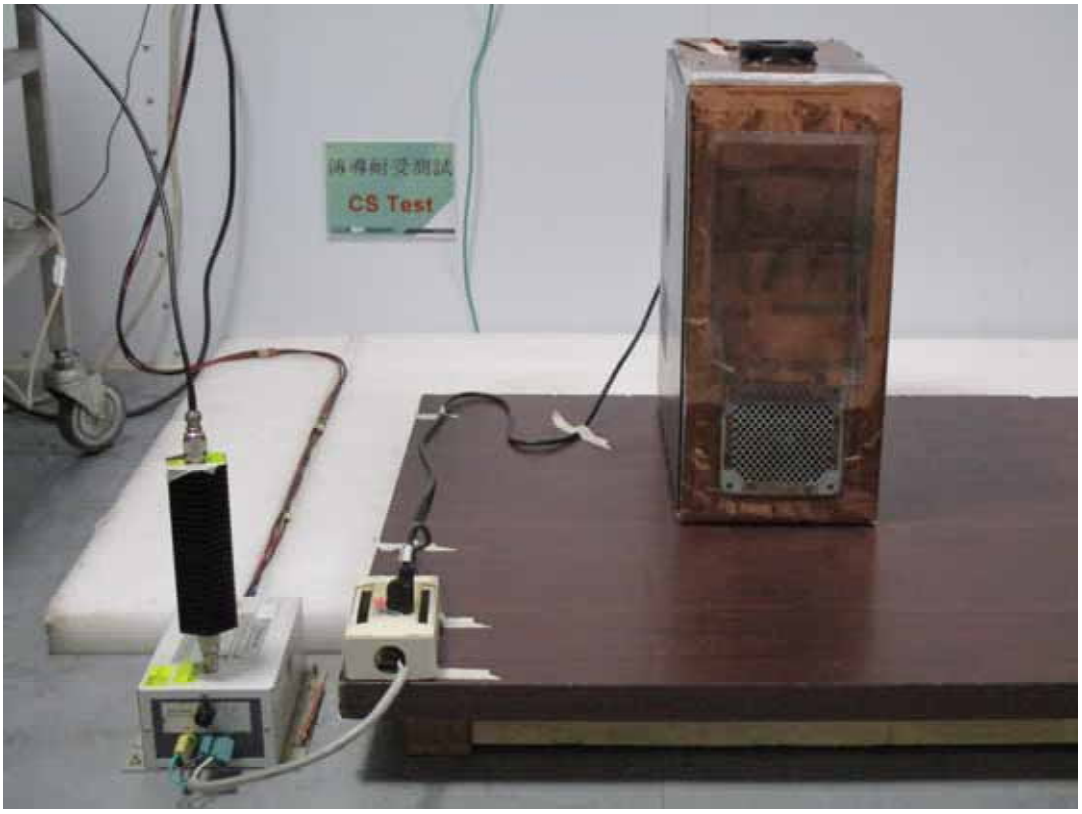
**Report No.:** T200109N08-E

## EFT Test (Model: 850 B5)

## SURGE Test (Model: 850 B5)

**Report No.:** T200109N08-E

## CS Test (Model: 850 B5)




## PFMF Test (Model: 850 B5)

**Report No.:** T200109N08-E

## Voltage Dips / Interruptions Test (Model: 850 B5)

# External Photo (Model: 850 B5)


**Report No.:** T200109N08