# CE EMC Test Report

| | | |
|---|---|---|
| **Project No.** | : | 1907C057 |
| **Equipment** | : | Gaming Mouse Mat |
| **Test Model** | : | RZ02-0302 |
| **Series Model** | : | RZ02-0302XXXX-XXXX (X: Can Be :A~Z, 0~9) |
| **Applicant** | : | Razer Inc. |
| **Address** | : | 201 3rd Street, Suite 900, San Francisco, CA 94103 USA |

| | | |
|---|---|---|
| **Date of Receipt** | : | Jul. 05, 2019 |
| **Date of Test** | : | Jul. 11, 2019 ~ Jul. 19, 2019 |
| **Issued Date** | : | Oct. 08, 2019 |
| **Tested by** | : | BTL Inc. |

**Testing Engineer** : Simon Ling
(Simon Ling)

**Technical Manager** : Bill Zhang
(Bill Zhang)

**Authorized Signatory** : Kevin Li
(Kevin Li)


**BTL INC.**

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Certificate #5123.02

## Declaration

**BTL** represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

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The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

## Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.
Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.

## Table of Contents

## Table of Contents Page

## Table of Contents

Page

## REPORT ISSUED HISTORY

| Report Version | Description | Issued Date |
|---|---|---|
| R00 | Original Issue. | Oct. 08, 2019 |

## 1. GENERAL SUMMARY

| | | |
|---|---|---|
| Equipment | : | Gaming Mouse Mat |
| Brand Name | : | RAZER |
| Test Model | : | RZ02-0302 |
| Series Model | : | RZ02-0302XXXX-XXXX (X: Can Be :A~Z, 0~9) |
| Applicant | : | Razer Inc. |
| Manufacturer | : | Razer (Asia-Pacific) Pte.,Ltd. |
| Address | : | 514 Chai Chee Lane, #07-01-06,Singapore 469029 |
| Factory | : | RAZER TECHNOLOGY AND DEVELOPMENT (SHENZHEN) CO., LTD |
| Address | : | East Wing, 3rd Floor, Block 2, Phase 1 of Vision Shenzhen Business Park Keji South Road, Hi-Tech Industrial Park, Shenzhen 518057, China |
| Date of Test | : | Jul. 11, 2019 ~ Jul. 19, 2019 |
| Test Sample | : | Engineering Sample No.: DG19070252 |
| Standard(s) | : | EN 55032:2015+AC:2016 Class B<br>EN 55035:2017<br>EN 61000-4-2:2009<br>EN 61000-4-3:2006+A1:2008+A2:2010<br>EN 61000-4-4:2012<br>EN 61000-4-5:2014<br>EN 61000-4-6:2014<br>EN 61000-4-8:2010<br>EN 61000-4-11:2004 |

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.
The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-EMC-1-1907C057) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of A2LA according to the ISO/IEC 17025 quality assessment standard and technical standard(s).

## 2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

| Emission | | | | | |
|---|---|---|---|---|---|
| Standard(s) | Test Item | | Limit | Judgment | Remark |
| EN 55032: 2015+AC:2016 | Radiated emissions up to 1 GHz | | Class B | PASS | |
| | Radiated emissions above 1 GHz | | ------ | N/A | NOTE (1) NOTE (2) |
| | Radiated emissions from FM receivers | | ------ | N/A | NOTE (1) NOTE (6) |
| | Conducted emissions AC mains power port | | Class B | PASS | NOTE (7) |
| | Asymmetric mode conducted emissions | AAN | ------ | N/A | NOTE (1) NOTE (8) |
| | | Current Probe | ------ | N/A | |
| | | CVP | ------ | N/A | |
| | Conducted differential voltage emissions | | ------ | N/A | NOTE (1) NOTE (9) |

| Immunity (EN 55035:2017) | | | | |
|---|---|---|---|---|
| Section(s) | Test Item | Performance Criterion | Results Judgment | Remark |
| EN 61000-4-2:2009 | Electrostatic discharge immunity | B | PASS | |
| EN 61000-4-3:2006+A1:2008+A2:2010 | Continuous RF electromagne tic field disturbances | A | PASS | |
| EN 61000-4-4:2012 | Electrical fast transient/burst immunity | B | PASS | |
| EN 61000-4-5:2014 | Surge immunity | B/C | PASS | NOTE (4) |
| EN 61000-4-6:2014 | Continuous induced RF disturbances | A | PASS | |
| EN 61000-4-8:2010 | Power frequency magnetic field immunity | A | PASS | |
| EN 61000-4-11:2004 | Voltage dips, short interruptions and voltage variations immunity | B / C / C | PASS | NOTE (5) |
| 4.2.7 | Broadbandimpulse noisedisturbances,repetitive | A | N/A | NOTE (1) |
| 4.2.7 | Broadbandimpulse noisedisturbances,isolated | B | N/A | NOTE (1) |

NOTE:

(1) ”N/A” denotes test is not applicable to this device.

(2) The EUT’s max operating frequency is 48 MHz which does not exceed 108 MHz, so the test will not be performed.

(3) If the power consumptionis less than 75W, there is no limit applied.

(4) Port Type: unshielded symmetrical :
Performance Criterion C for signal ports and telecommunication ports.
Port Type: coaxial or shielded:
Performance Criterion B for signal ports and telecommunication ports.
Performance Criterion B for input d.c. power port and a.c. power ports.

(5) Voltage dips:
(B) Residual voltage＜5% 0.5 Cycles
(C) Residual voltage70% 25 Cycles (50Hz),30 Cycles (60Hz)
Voltage interruptions:
(C) Residual voltage＜5% 250 Cycles (50Hz),300 Cycles (60Hz)

(6) If the EUT has FM function the test will be performed.

(7) If the EUT has AC power mains port the test will be performed.

(8)

| Cable Type | Number of pairs | Measurement type | Procedures |
|---|---|---|---|
| Balanced Unscreened | 1 (2 wire);2 (4 wire);<br>3 (6 wire);4 (8 wire) | Voltage | AAN |
| Balanced Unscreened | See a) | Voltage and Current | CP+CVP |
| Screened or Coaxial | n/a | Voltage | AAN |
| Screened or Coaxial | n/a | Voltage or Current | CP or CVP |
| Unbalanced cables | n/a | Voltage and Current | CP+CVP |

Ports connected to cables with more than 4 balanced pairs or where the port is unable to function correctly whenconnected through an AAN.

(9) If the EUT has tuner port the test will be performed.

(10) The requirement followed by the client’s specification.

## 2.1 TEST FACILITY

The test facilities used to collect the test data in this report is at the location of No.3,Jinshagang 1st Road, Shixia,Dalang Town, Dongguan, Guangdong, China.

## 2.2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimatedfor tests performed on the EUT as specified in CISPR 16-4-2, The BTL measurement uncertainty is less than the CISPR 16-4-2 $U_{cispr}$ requirement.

The reported uncertainty of measurement **y** ±**U**, where expanded uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k=2**, providing a level of confidence of approximately **95**%.

A. Radiated emissions up to 1 GHzmeasurement:

| Test Site | Method | Measurement Frequency Range | Ant. H / V | U, (dB) |
|---|---|---|---|---|
| DG-CB08 (10m) | CISPR | 30MHz ~ 200MHz | V | 4.54 |
| | | 30MHz ~ 200MHz | H | 3.98 |
| | | 200MHz ~ 1,000MHz | V | 3.98 |
| | | 200MHz ~ 1,000MHz | H | 3.76 |

B. Conducted emissions AC mains power port measurement:

| Test Site | Method | Measurement Frequency Range | U, (dB) |
|---|---|---|---|
| DG-C02 | CISPR | 150 kHz ~ 30MHz | 2.32 |

C. Immunity Measurement:

| Test Site | Method | Measurement Frequency Range | U, (dB) |
|---|---|---|---|
| DG-SR02 | EN 61000-4-2 | Rise time tr | 14.60 % |
| | | Peak current Ip | 1.72 % |
| | | Current at 30 ns | 2.0 % |
| | | Current at 60 ns | 1.84 % |
| DG-CB05 | EN 61000-4-3 | 80 MHz~1 GHz, 1 GHz~6 GHz | 2.175 dB |
| | | On-ear acoustic & Acoustic measurements on loudspeakers | 2.287 dB |
| | | Electrical measurements | 2.267 dB |
| | | Measuring the demodulation on analogue wired network lines | 2.267 dB |
| | | Audio breakthrough measurement, test set-up for RS 2G/3G | 2.349 dB |
| | | Audio breakthrough measurement, test set-up for RS 4G | 2.413 dB |
| DG-SR05 | EN 61000-4-4 | Voltage rise time (tr) | 10.40 % |
| | | Voltage peak value($V_P$) | 8.20 % |
| | | Voltage pulse width(tw) | 6.0 % |
| DG-SR05 | EN 61000-4-5 | Voltage front time ($T_{fv}$) | 5.80 % |
| | | Voltage peak value($V_P$) | 3.90 % |
| | | Voltage duration($t_d$) | 0.60 % |
| DG-CB06 | EN 61000-4-6 | CDN | 3.25 dB |
| | | EM clamp | 4.410 dB |
| | | On-ear acoustic & Acoustic measurements on loudspeakers | 3.272 dB |
| | | Electrical measurements | 3.258 dB |
| | | measuring the demodulation on analogue wired network lines | 3.258 dB |
| DG-SR05 | EN 61000-4-8 | Magnetic Field Level | 3.787 % |
| DG-SR05 | EN 61000-4-11 | voltage fall time ($T_f$) | 2.0 % |

Note: Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

# 3. GENERAL INFORMATION

## 3.1 GENERAL DESCRIPTION OF EUT

| | |
|---|---|
| Equipment | Gaming Mouse Mat |
| Brand Name | RAZER |
| Test Model | RZ02-0302 |
| Series Model | RZ02-0302XXXX-XXXX (X: Can Be :A~Z, 0~9) |
| Model Difference(s) | It is the same as the basic model and X is used to define which country it is for under the same family series. |
| Power Source | Supplied from USB port. |
| Power Rating | DC 5V 500mA |
| Connecting I/O Port(s) | 1* USB port |

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

## 3.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

| Pretest Mode | Description |
|---|---|
| Mode 1 | USB LINK(Normal light) |
| Mode 2 | USB LINK(white light) |

| For Radiated Test | |
|---|---|
| Final Test Mode | Description |
| Mode 1 | USB LINK(Normal light) |

| For Conducted Test | |
|---|---|
| Final Test Mode | Description |
| Mode 1 | USB LINK(Normal light) |

| For EMS Test | |
|---|---|
| Final Test Mode | Description |
| Mode 1 | USB LINK(Normal light) |

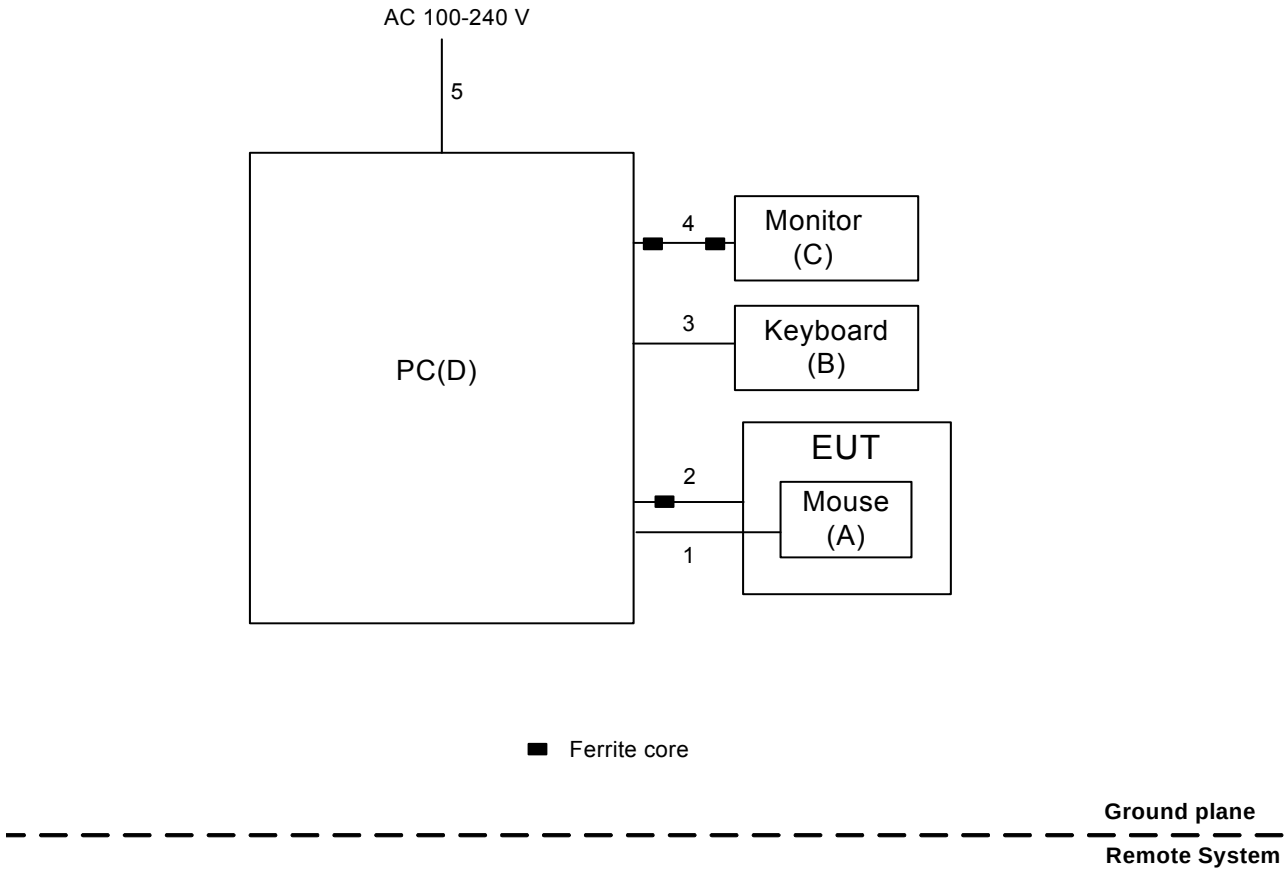
Note: The worst case is recorded in this report.

## 3.3 EUT OPERATING CONDITIONS

The EUT exercise program used during radiated and/or conducted emission measurement was designed to exercise the various system components in a manner similar to a typical use. The standard test signals and output signal as following:

1. EUT connected to PC via USB cable.
2. PC connected to monitor via D-SUB cable.
3. PC connected to keyboard and mouse via USB cable.

## 3.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



### 3.5 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.

| Item | Equipment | Mfr/Brand | Model/Type No. | Series No. |
|---|---|---|---|---|
| A | Mouse | Gaming Mouse | RZ03-0252 | N/A |
| B | Keyboard | Gaming Keyboard | RZ01-0256 | N/A |
| C | Monitor | DELL | E177FPC | CN-OFJ79-64180-763-0TKS |
| D | PC | DELL | Vostro 470 | 24454162837 |

| Item | Cable Type | Shielded Type | Ferrite Core | Length |
|---|---|---|---|---|
| 1 | USB Cable | YES | NO | 1.8m |
| 2 | USB Cable | YES | YES | 1.8m |
| 3 | USB Cable | YES | NO | 1.8m |
| 4 | D-SUB Cable | YES | YES | 1.8m |
| 5 | AC Cable | NO | NO | 1.8m |

## 4.EMC EMISSION TEST

### 4.1 RADIATED EMISSION

#### 4.1.1 LIMITS

Class A equipment up to 1000MHz

| Table clause | Frequency range MHz | Measurement | | | Class A limits dB(μV/m) |
|---|---|---|---|---|---|
| | | Facility (see Table A.1) | Distance m | Detector type/ bandwidth | |
| A2.1 | 30-230 | OATS/SAC | 10 | Quasi peak / 120 kHz | 40 |
| | 230-1000 | | | | 47 |
| A2.2 | 30-230 | OATS/SAC | 3 | | 50 |
| | 230-1000 | | | | 57 |
| A2.3 | 30-230 | FAR | 10 | Quasi peak / 120 kHz | 42 to 35 |
| | 230-1000 | | | | 42 |
| A2.4 | 30-230 | FAR | 3 | | 52 to 45 |
| | 230-1000 | | | | 52 |
| Apply only A2.1 or A2.2 or A2.3 or A2.4 across the entire frequency range. | | | | | |

Class B equipment up to 1000MHz

| Table clause | Frequency range MHz | Measurement | | | Class B limits dB(μV/m) |
|---|---|---|---|---|---|
| | | Facility (see Table A.1) | Distance m | Detector type/ bandwidth | |
| A4.1 | 30-230 | OATS/SAC | 10 | Quasi peak / 120 kHz | 30 |
| | 230-1000 | | | | 37 |
| A4.2 | 30-230 | OATS/SAC | 3 | | 40 |
| | 230-1000 | | | | 47 |
| A4.3 | 30-230 | FAR | 10 | Quasi peak / 120 kHz | 32 to 25 |
| | 230-1000 | | | | 32 |
| A4.4 | 30-230 | FAR | 3 | | 42 to 35 |
| | 230-1000 | | | | 42 |
| Apply only table clause A4.1 or A4.2 or A4.3 or A4.4 across the entire frequency range. These requirements are not applicable to the local oscillator and harmonics frequencies of equipment covered by Table A.6. | | | | | |

Notes:

(1) The limit for radiated test was performed according to as following: EN 55032

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

(4) The test result calculated as following:

Measurement Value = Reading Level + Correct Factor

Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain(if use)

Margin Level = Measurement Value - Limit Value

Required highest frequency for radiated measurement

| Highest internal frequency ($F_x$) MHz | Highest measured frequency MHz |
|---|---|
| $F_x \leqq 108$ | 1000 |
| $108 < F_x \leqq 500$ | 2000 |
| $500 < F_x \leqq 1000$ | 5000 |
| $F_x > 1000$ | 5th up to a maximum6 GHz, |

Note for FM and TV broadcast receiver, $F_x$ is determined from the highest frequency generated or used excluding the local oscillator and tuned frequencies.

### 4.1.2 MEASUREMENT INSTRUMENTS LIST

**Up to 1GHz:**

| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
|---|---|---|---|---|---|
| 1 | Receiver | Keysight | N9038A | MY54450004 | Aug. 11, 2019 |
| 2 | MXE EMI Receiver | Agilent | N9038A | MY53220133 | Mar. 10, 2020 |
| 3 | Pre-Amplifier | EMC INSTRUMENT | EMC 9135 | 980284 | Mar. 10, 2020 |
| 4 | Pre-Amplifier | EMC INSTRUMENT | EMC 9135 | 980283 | Mar. 10, 2020 |
| 5 | Trilog-Broadband Antenna | Schwarzbeck | VULB9168 | 946 | Nov. 24, 2019 |
| 6 | Trilog-Broadband Antenna | Schwarzbeck | VULB9168 | 947 | Nov. 24, 2019 |
| 7 | Cable | emci | LMR-400(5m+11m+15m) | N/A | Aug. 07, 2019 |
| 8 | Cable | emci | LMR-400(5m+8m+8m) | N/A | Aug. 07, 2019 |
| 9 | Measurement Software | Farad | EZ-EMC Ver.BTL-2ANT-1 | N/A | N/A |
| 10 | Multi-Device Controller | ETS-Lindgren | 2090 | N/A | N/A |
| 11 | Attenuator | EMCI | EMCI-N-6-06 | N0670 | Nov. 24, 2019 |
| 12 | Attenuator | EMCI | EMCI-N-6-06 | N0671 | Nov. 24, 2019 |

Remark: “N/A” denotes no model name, no serial no. or no calibration specified.
All calibration period of equipment list is one year.

### 4.1.3 TEST PROCEDURE

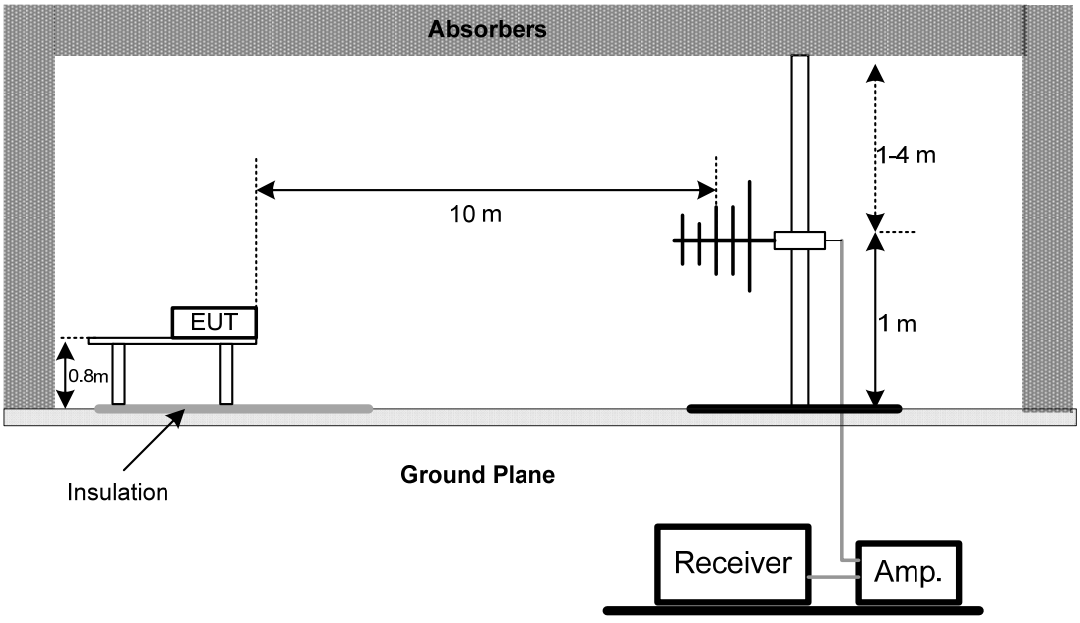
a. The measuring distance of 10 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz).
b. The height of the equipment or of the substitution antenna shall be 0.8 m, the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
c. The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
d. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn‘t perform. (below 1GHz)
e. For the actual test configuration, please refer to the related Item - Block Diagram of system tested (please refer to 3.4).

### 4.1.4 DEVIATIONFROMTESTSTANDARD

No deviation

### 4.1.5 TESTSETUP

**UP TO 1 GHZ**




Note: The antenna can be moved between 1 to 4 meters above the ground.

### 4.1.6 MEASUREMENT DISTANCE

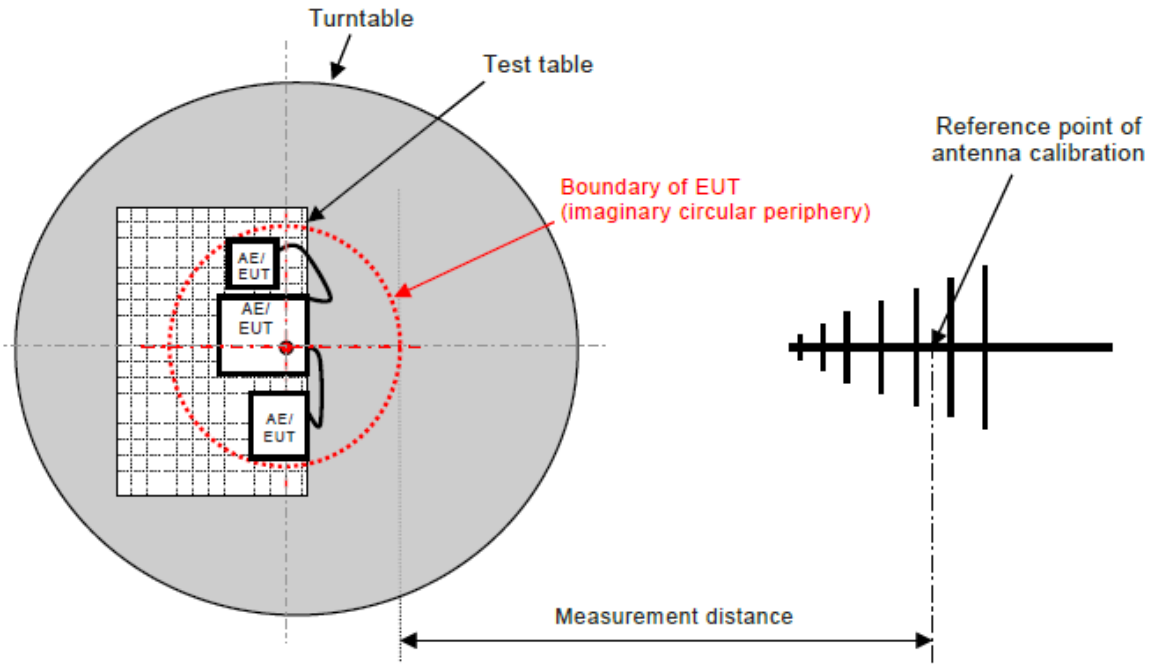



**Figure C.1 – Measurement distance**

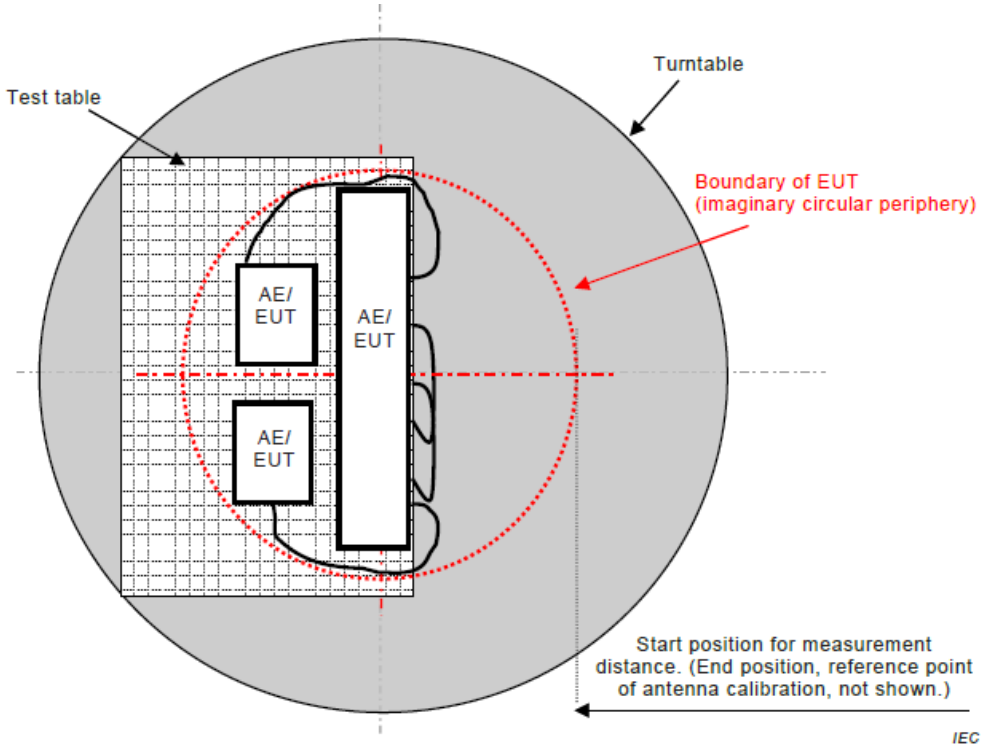
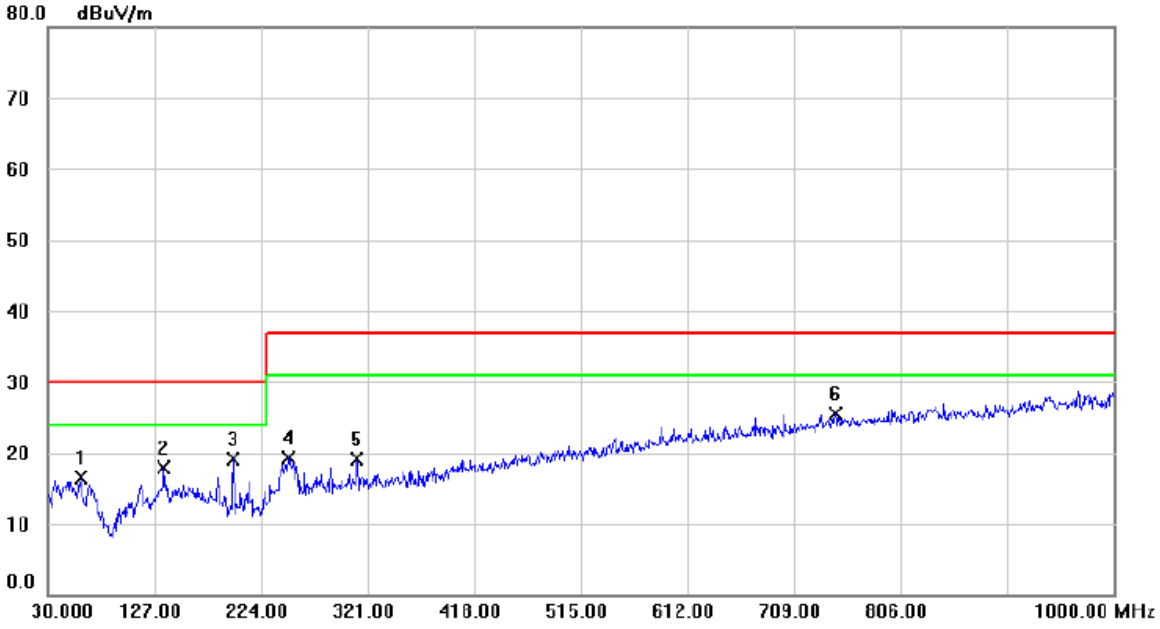



**Figure C.2 – Boundary of EUT, Local AE and associated cabling**

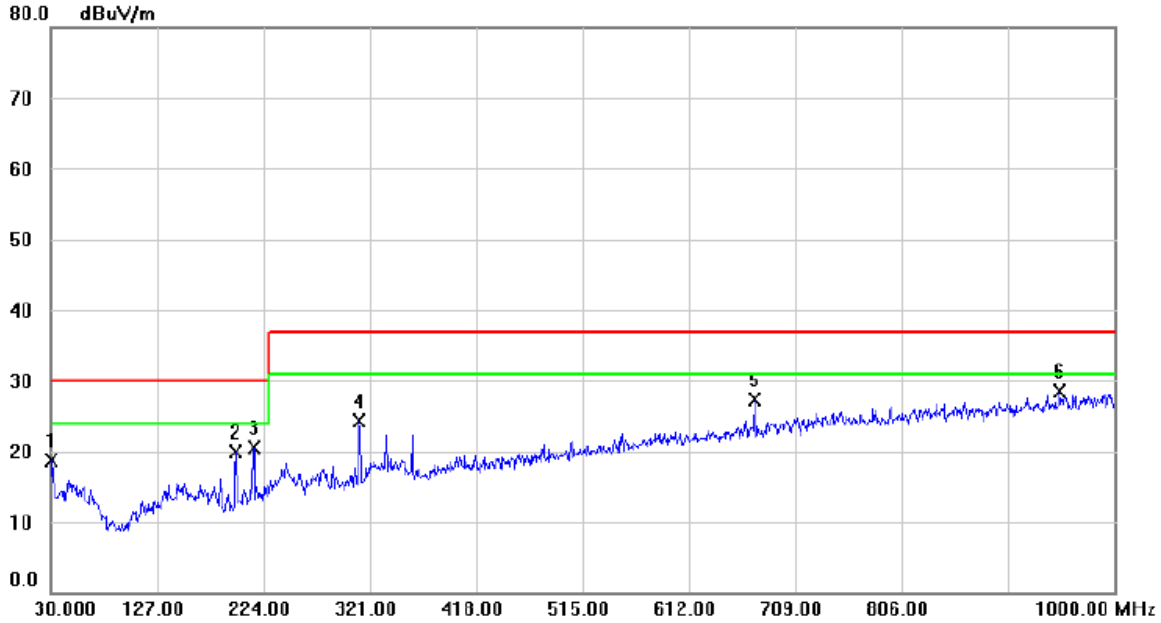
### 4.1.7 TEST RESULTS (UP TO 1 GHZ)

| EUT | Gaming Mouse Mat | Model Name | RZ02-0302 |
|---|---|---|---|
| Temperature | 25°C | Relative Humidity | 60% |
| Test Voltage | AC 230V/50Hz | Polarization | Vertical |
| Test Mode | Mode 1 | | |
| Test Engineer | Simon Ling | | |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | | 60.0700 | 33.70 | -17.15 | 16.55 | 30.00 | -13.45 | QP | |
| 2 | | 135.7300 | 34.86 | -17.05 | 17.81 | 30.00 | -12.19 | QP | |
| 3 | * | 198.7800 | 38.29 | -19.15 | 19.14 | 30.00 | -10.86 | QP | |
| 4 | | 249.2200 | 36.41 | -17.08 | 19.33 | 37.00 | -17.67 | QP | |
| 5 | | 311.3000 | 33.79 | -14.71 | 19.08 | 37.00 | -17.92 | QP | |
| 6 | | 746.8300 | 31.92 | -6.33 | 25.59 | 37.00 | -11.41 | QP | |

| | | | |
|---|---|---|---|
| EUT | Gaming Mouse Mat | Model Name | RZ02-0302 |
| Temperature | 25°C | Relative Humidity | 60% |
| Test Voltage | AC 230V/50Hz | Polarization | Horizontal |
| Test Mode | Mode 1 | | |
| Test Engineer | Simon Ling | | |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | | 30.9700 | 36.88 | -18.21 | 18.67 | 30.00 | -11.33 | QP | |
| 2 | | 198.7800 | 38.93 | -18.94 | 19.99 | 30.00 | -10.01 | QP | |
| 3 | | 215.2700 | 39.73 | -19.28 | 20.45 | 30.00 | -9.55 | QP | |
| 4 | | 311.3000 | 39.01 | -14.71 | 24.30 | 37.00 | -12.70 | QP | |
| 5 | | 672.1400 | 34.80 | -7.51 | 27.29 | 37.00 | -9.71 | QP | |
| 6 | * | 950.5300 | 32.33 | -3.79 | 28.54 | 37.00 | -8.46 | QP | |

## 4.2 CONDUCTED EMISSION MEASUREMENTAT AC MAINS POWER PORTS

### 4.2.1 LIMITS

Requirements for conducted emissions from AC mains power ports of Class A equipment

| Table clause | Frequency Range MHz | Coupling Device | Detector Type / bandwidth | Class A Limits (dB(μV) ) |
|---|---|---|---|---|
| A9.1 | 0.15 - 0.5 | AMN | Quasi Peak / 9 kHz | 79 |
| | 0.5 - 30 | | | 73 |
| A9.2 | 0.15 - 0.5 | AMN | Average / 9 kHz | 66 |
| | 0.5 - 30 | | | 60 |
| Apply A9.1 and A9.2 across the entire frequency range. | | | | |

Requirements for conducted emissions from AC mains power ports of Class B equipment

| Table clause | Frequency Range MHz | Coupling Device | Detector Type / bandwidth | Class B Limits (dB(μV) ) |
|---|---|---|---|---|
| A10.1 | 0.15 - 0.5 | AMN | Quasi Peak / 9 kHz | 66-56 |
| | 0.5 - 5 | | | 56 |
| | 5 - 30 | | | 60 |
| A10.2 | 0.15 - 0.5 | AMN | Average / 9 kHz | 56-46 |
| | 0.5 - 5 | | | 46 |
| | 5 - 30 | | | 50 |
| Apply A10.1 and A10.2 across the entire frequency range. | | | | |

NOTE:

(1) The test result calculated as following:
Measurement Value = Reading Level + Correct Factor
Correct Factor = Insertion Loss + Cable Loss + Attenuator Factor(if use)
Margin Level = Measurement Value – Limit Value

### 4.2.2 MEASUREMENT INSTRUMENTS LIST

| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
|---|---|---|---|---|---|
| 1 | EMI Test Receiver | R&S | ESCI | 100382 | Mar. 10, 2020 |
| 2 | LISN | EMCO | 3816/2 | 52765 | Mar. 10, 2020 |
| 3 | TWO-LINE V-NETWORK | R&S | ENV216 | 101447 | May. 19, 2020 |
| 4 | 50Ω Terminator | SHX | TF5-3 | 15041305 | Mar. 10, 2020 |
| 5 | Measurement Software | Farad | EZ-EMC Ver.NB-03A 1-01 | N/A | N/A |
| 6 | Cable | N/A | RG223 | 12m | Mar. 12, 2020 |

Remark: “N/A” denotes no model name, no serial no. or no calibration specified.
All calibration period of equipment list is one year.

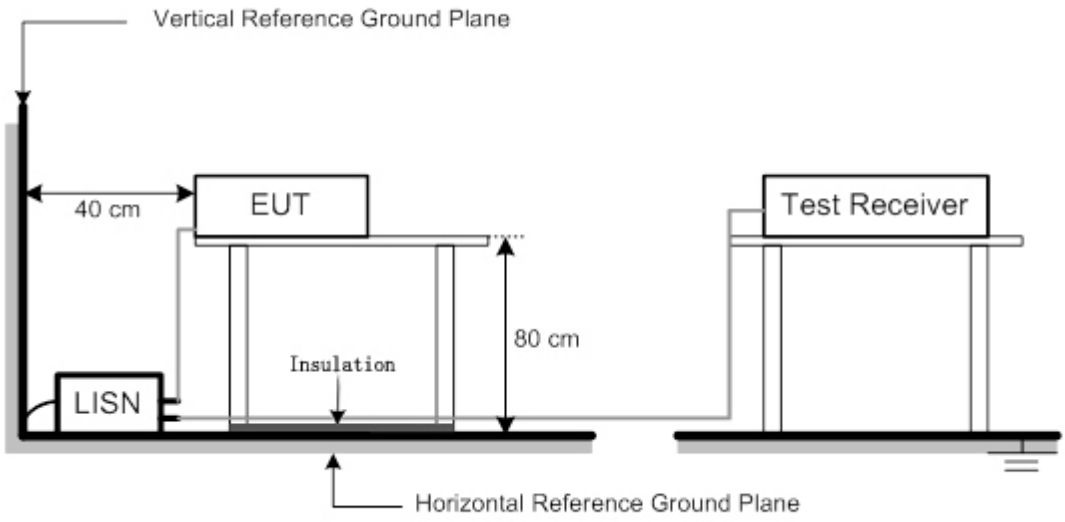
### 4.2.3 TEST PROCEDURE

a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
d. LISN at least 80 cm from nearest part of EUT chassis.
e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

### 4.2.4 DEVIATION FROM TEST STANDARD

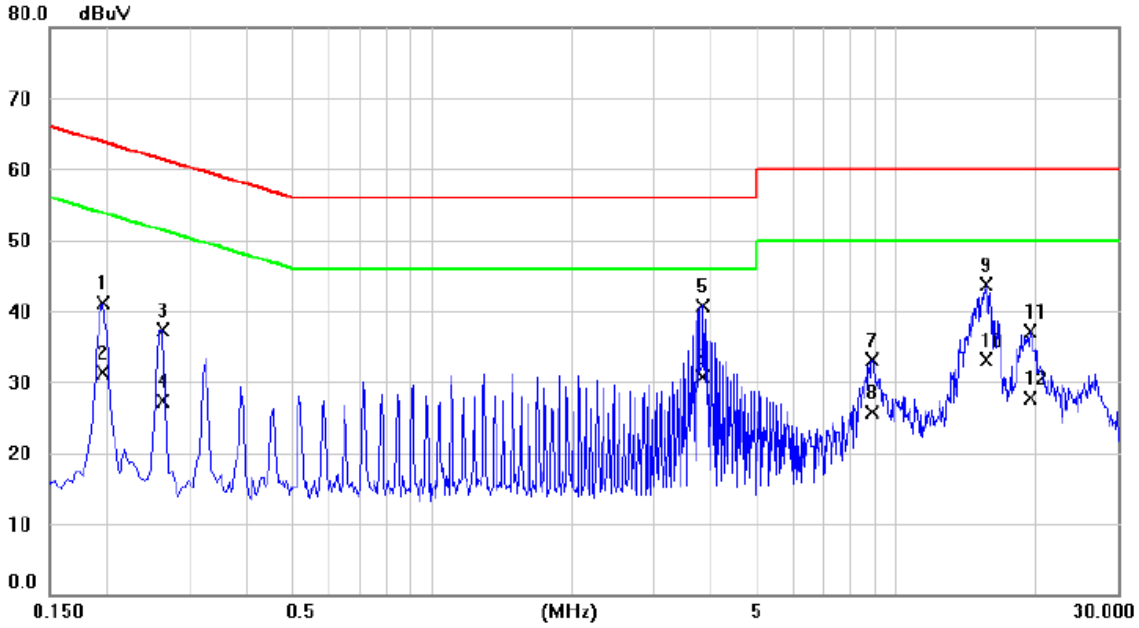
No deviation

### 4.2.5 TEST SETUP



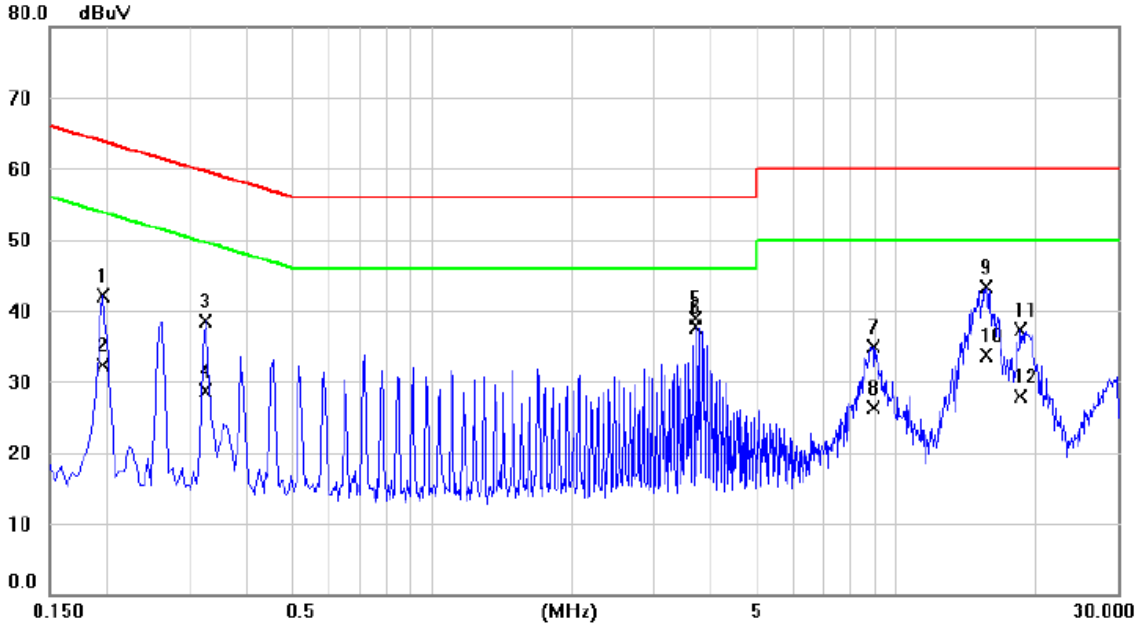
### 4.2.6 TEST RESULTS

| EUT | Gaming Mouse Mat | Model Name | RZ02-0302 |
|---|---|---|---|
| Temperature | 25°C | Relative Humidity | 53% |
| Test Voltage | AC 230V/50Hz | Phase | Line |
| Test Mode | Mode 1 | | |
| Test Engineer | Simon Ling | | |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector | Comment |
| 1 | | 0.1950 | 31.35 | 9.81 | 41.16 | 63.82 | -22.66 | QP | |
| 2 | | 0.1950 | 21.58 | 9.81 | 31.39 | 53.82 | -22.43 | AVG | |
| 3 | | 0.2625 | 27.47 | 9.83 | 37.30 | 61.35 | -24.05 | QP | |
| 4 | | 0.2625 | 17.52 | 9.83 | 27.35 | 51.35 | -24.00 | AVG | |
| 5 | | 3.8310 | 30.55 | 10.11 | 40.66 | 56.00 | -15.34 | QP | |
| 6 | * | 3.8310 | 20.58 | 10.11 | 30.69 | 46.00 | -15.31 | AVG | |
| 7 | | 8.8935 | 22.58 | 10.43 | 33.01 | 60.00 | -26.99 | QP | |
| 8 | | 8.8935 | 15.34 | 10.43 | 25.77 | 50.00 | -24.23 | AVG | |
| 9 | | 15.6075 | 32.85 | 10.79 | 43.64 | 60.00 | -16.36 | QP | |
| 10 | | 15.6075 | 22.36 | 10.79 | 33.15 | 50.00 | -16.85 | AVG | |
| 11 | | 19.4100 | 26.04 | 11.14 | 37.18 | 60.00 | -22.82 | QP | |
| 12 | | 19.4100 | 16.57 | 11.14 | 27.71 | 50.00 | -22.29 | AVG | |

| | | | |
|---|---|---|---|
| EUT | Gaming Mouse Mat | Model Name | RZ02-0302 |
| Temperature | 25°C | Relative Humidity | 53% |
| Test Voltage | AC 230V/50Hz | Phase | Neutral |
| Test Mode | Mode 1 | | |
| Test Engineer | Simon Ling | | |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector | Comment |
| 1 | | 0.1950 | 32.11 | 9.90 | 42.01 | 63.82 | -21.81 | QP | |
| 2 | | 0.1950 | 22.46 | 9.90 | 32.36 | 53.82 | -21.46 | AVG | |
| 3 | | 0.3255 | 28.53 | 9.98 | 38.51 | 59.57 | -21.06 | QP | |
| 4 | | 0.3255 | 18.67 | 9.98 | 28.65 | 49.57 | -20.92 | AVG | |
| 5 | | 3.7050 | 28.64 | 10.30 | 38.94 | 56.00 | -17.06 | QP | |
| 6 | * | 3.7050 | 27.47 | 10.30 | 37.77 | 46.00 | -8.23 | AVG | |
| 7 | | 8.9070 | 24.30 | 10.68 | 34.98 | 60.00 | -25.02 | QP | |
| 8 | | 8.9070 | 15.67 | 10.68 | 26.35 | 50.00 | -23.65 | AVG | |
| 9 | | 15.6255 | 32.25 | 11.13 | 43.38 | 60.00 | -16.62 | QP | |
| 10 | | 15.6255 | 22.59 | 11.13 | 33.72 | 50.00 | -16.28 | AVG | |
| 11 | | 18.5550 | 25.93 | 11.37 | 37.30 | 60.00 | -22.70 | QP | |
| 12 | | 18.5550 | 16.57 | 11.37 | 27.94 | 50.00 | -22.06 | AVG | |

## 5. EMC IMMUNITY TEST

### 5.1 STANDARD COMPLIANCE/SEVERITY LEVEL/CRITERIA

| Tests<br>Standard No. | Test Specification Level /<br>Test Mode | Test Ports | Criteria |
|---|---|---|---|
| Electrostatic discharge<br>EN 61000-4-2<br>(ESD) | ±8kV air discharge<br>±4kV contact discharge<br>(Direct Mode) | Enclosure | B |
| | ±4kV HCP discharge<br>±4kV VCP discharge<br>(Indirect Mode) | Enclosure | B |
| Continuous RF electromagne tic field disturbances,swept test<br>EN 61000-4-3<br>(RS) | 80 MHz to 1000 MHz<br>3V/m(unmodulated, r.m.s),<br>1 kHz, 80%,<br>AM modulated | Enclosure | A |
| Continuous RF electromagne tic field disturbances,spot test<br>EN 61000-4-3<br>(RS) | 1800 MHz, 2600MHz,<br>3500 MHz, 5000MHz(±1 %)<br>3V/m(unmodulated, r.m.s),<br>1 kHz, 80%,<br>AM modulated | Enclosure | A |
| Electrical fast transient/burst immunity<br>EN 61000-4-4<br>(EFT/Burst) | ±0.5kV(peak)<br>5/50ns Tr/Th<br>5kHz Repetition Frequency<br>(100kHz Repetition Frequency for xDSL port) | Analogue/digital data ports<br>**(NOTE 1)** | B |
| | ±0.5kV(peak)<br>5/50ns Tr/Th<br>5kHz Repetition Frequency | DC network power ports<br>**(NOTE 1)** | B |
| | ±1 kV(peak)<br>5/50ns Tr/Th<br>5kHz Repetition Frequency | AC mains power ports | B |

<table>
<tr><td rowspan="8">Surge immunity<br>EN 61000-4-5<br>(Surges)</td><td colspan="3">Port Type: unshielded symmetrical<br>Apply: lines to ground</td></tr>
<tr><td>Primary protection is Intended<br>±1 kV and ±4 kV<br>10/700(5/320)Tr/Th μs(NOTE 3)</td><td rowspan="2">Analogue/digital data ports<br>(NOTE 1)</td><td>C</td></tr>
<tr><td>Primary protection is not Intended<br>±1 kV<br>10/700(5/320) Tr/Th μs(NOTE 3)</td><td>C</td></tr>
<tr><td colspan="3">Port type: coaxial or shielded<br>Apply: shield to ground</td></tr>
<tr><td>±0.5 kV<br>1.2/50(8/20) Tr/Th μs(NOTE 3)</td><td>Analogue/digital data ports<br>(NOTE 1)</td><td>B</td></tr>
<tr><td>line to reference ground for each individual line:<br>±0.5 kV(peak)<br>1.2/50(8/20) Tr/Th μs</td><td>DC network power ports<br>(NOTE 1)& (NOTE 2)</td><td>B</td></tr>
<tr><td>±1 kV(peak)<br>1.2/50(8/20) Tr/Th μs<br>(line to line)<br>±2 kV(peak)<br>1.2/50(8/20) Tr/Th μs<br>(line to earth or ground)</td><td>AC mains power ports</td><td>B</td></tr>
<tr><td rowspan="3">Continuous induced RF disturbances<br>EN 61000-4-6<br>(Injected Current)</td><td>0.15 MHz to 10 MHz<br>3V(unmodulated, r.m.s),<br>10 MHz to 30 MHz<br>3V to 1V(unmodulated, r.m.s),<br>30 MHz to 80 MHz<br>1V(unmodulated, r.m.s),<br>1kHz 80%, AM<br>150Ω source impedance</td><td>Analogue/digital data ports<br>(NOTE 1)</td><td>A</td></tr>
<tr><td>0.15 MHz to 10 MHz<br>3V(unmodulated, r.m.s),<br>10 MHz to 30 MHz<br>3V to 1V(unmodulated, r.m.s),<br>30 MHz to 80 MHz<br>1V(unmodulated, r.m.s),<br>1kHz 80%, AM<br>150Ω source impedance</td><td>DC network power ports<br>(NOTE 1)</td><td>A</td></tr>
<tr><td>0.15 MHz to 10 MHz<br>3V(unmodulated, r.m.s),<br>10 MHz to 30 MHz<br>3V to 1V(unmodulated, r.m.s),<br>30 MHz to 80 MHz<br>1V(unmodulated, r.m.s),<br>1kHz 80%, AM<br>150Ω source impedance</td><td>AC mains power ports</td><td>A</td></tr>
</table>

| | | | |
|---|---|---|---|
| Power frequency magnetic field immunity<br>EN 61000-4-8<br>(PFMF) | 50 Hz or 60Hz,<br>1A/m(r.m.s) | Enclosure | A |
| Voltage dips, short interruptions and voltage variations immunity<br>EN 61000-4-11<br>(Voltage Interruption/Dips) | Voltage dips:<br>Residual voltage＜5%<br>0.5 Cycles<br>Residual voltage＜70%<br>25 Cycles (50Hz),<br>30 Cycles (60Hz)<br>Voltage interruptions:<br>Residual voltage＜5%<br>250 Cycles (50Hz),<br>300 Cycles (60Hz) | AC Power Ports | B<br>C<br>C |
| Broadband impulse noise disturbances,repetitive | 0.15MHz to 0.5 MHz<br>107dBuV<br>0.5 MHz to 10 MHz<br>107dBuV to 36dBuV<br>10 MHz to 30 MHz<br>36dBuV to 30 dBuV | Analogue/digital data ports<br>**(Applicable only to CPE xDSL ports)**<br>**(NOTE 1)** | A |
| | 0.70 ms<br>8.3 ms(for 60Hz)<br>10 ms(for 50Hz) | Analogue/digital data ports<br>**(Apply period based on the AC mains frequency)**<br>**(NOTE 1)** | A |
| Broadband impulse noise disturbances,isolated | 0.15MHz to 30 MHz<br>110dBuV | Analogue/digital data ports<br>**(Applicable only to CPE xDSL ports)**<br>**(NOTE 1)** | B |
| | 0.24 ms<br>10 ms(for 60Hz)<br>300 ms(for 50Hz) | Analogue/digital data ports<br>**(Apply all burst durations)**<br>**(NOTE 1)** | B |

Note.

1) Applicable only to ports which, according to the manufacturer's specification, may connect directly to outdoor cables.
2) Applicable only to ports which, according to the manufacturer's specification, support cable lengths greater than 3 m.
3) Where the coupling network for the 10/700 μs waveform affects the functioning of high speed data ports, the test shall be carried out using a 1,2/50 (8/20) μs waveform and appropriate coupling network.

## 5.2 GENERAL PERFORMANCE CRITERIA

According to **EN 55035** standards, the general performance criteria as following:

| | |
|---|---|
| **Criterion A** | The equipment shall continue to operate as intended without operator intervention. No degradation of performance, loss of function or change of operating state is allowed below aperformance level specified by the manufacturer when the equipment is used as intended.The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer,then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended. |
| **Criterion B** | During the application of the disturbance, degradation of performance is allowed. However, nounintended change of actual operating state or stored data is allowed to persist after the test.<br>After the test, the equipment shall continue to operate as intended without operatorintervention; no degradation of performance or loss of function is allowed, below aperformance level specified by the manufacturer, when the equipment is used as intended.The performance level may be replaced by a permissible loss of performance.<br>If the minimum performance level (or the permissible performance loss), or recovery time, isnot specified by the manufacturer, then either of these may be derived from the productdescription and documentation, and by what the user may reasonably expect from the equipment if used as intended. |
| **Criterion C** | Loss of function is allowed, provided the function is self-recoverable, or can be restored bythe operation of the controls by the user in accordance with the manufacturer's instructions. Areboot or re-start operation is allowed. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost. |

## 5.3 ELECTROSTATIC DISCHARGE IMMUNITY TEST (ESD)

### 5.3.1 TEST SPECIFICATION

| | |
|---|---|
| Basic Standard | EN 61000-4-2 |
| Discharge Impedance | 330 ohm / 150 pF |
| Required Performance | B |
| Discharge Voltage | Air Discharge: ±2kV, ±4kV, ±8kV (Direct)<br>Contact Discharge: ±2kV, ±4kV (Indirect) |
| Polarity | Positive & Negative |
| Number of Discharge | Air Discharge: min. 20 times at each test point<br>Contact Discharge: min. 20 times at each test point |
| Discharge Mode | Single Discharge |
| Discharge Period | 1 second minimum |

### 5.3.2 MEASUREMENT INSTRUMENTS

| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
|---|---|---|---|---|---|
| 1 | ESD Generator | TESEQ AG | NSG 437 | 450 | Sep. 28, 2019 |

Remark: “N/A” denotes no model name, no serial No. or no calibration specified.
All calibration period of equipment list is one year.

### 5.3.3 TEST PROCEDURE

The test generator necessary to perform direct and indirect application of discharges to the EUT in the following manner:

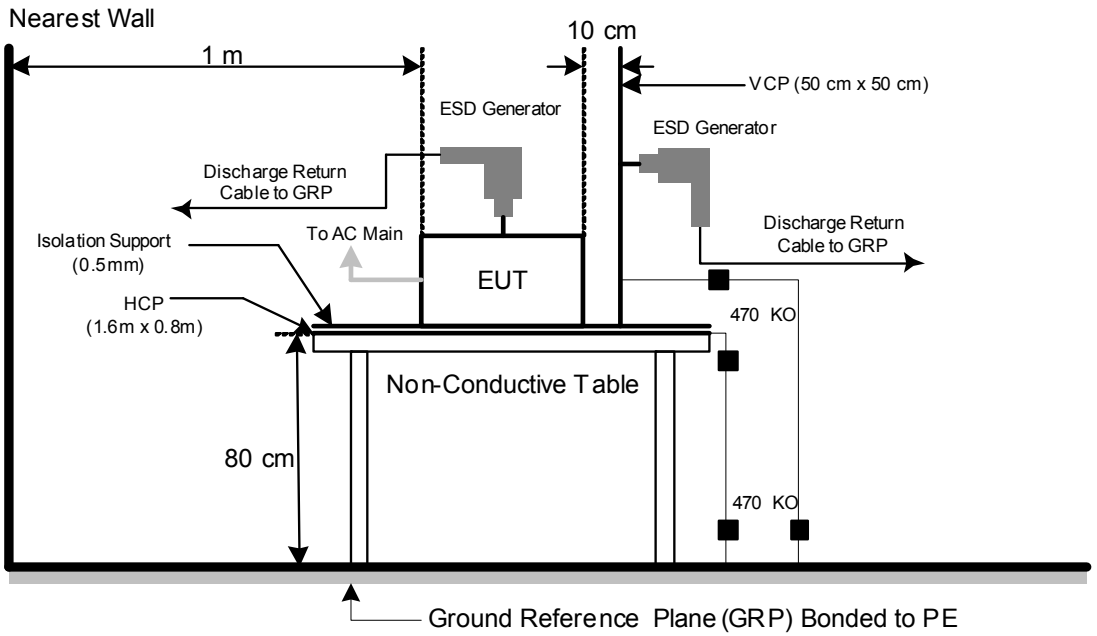
a. The test shall be performed with single discharges. On each pre-selected point at least 10single discharges (in the most sensitive polarity) shall be applied.
NOTE 1 The minimum number of discharges applied is depending on the EUT; for products with synchronizedcircuits the number of discharges should be larger.For the time interval bet ween successive single discharges an initial value of 1 s isrecommended. Longer intervals m ay be necessary to determine whether a system failure hasoccurred.
NOTE 2 The points to which the discharges should be applied may be selected by means of an explorationcarried out at a repetition rate of 20 discharges per second, or more.
Vertical Coupling Plane (VCP):
The coupling plane, of dimensions 0.5m x 0.5m, is placed parallel to, and positioned at adistance 0.1m from, the EUT, with the Discharge Electrode touching the coupling plane. The four faces of the EUT will be performed with electrostatic discharge.
Horizontal Coupling Plane (HCP):
The coupling plane is placed under to the EUT. The generator shall be positioned verticallyat a distance of 0.1m from the EUT, with the Discharge Electrode touching the couplingplane. The four faces of the EUT will be performed with electrostatic discharge.

b. Air discharges at insulation surfaces of the EUT.
It was at least ten single discharges with positive and negative at the same selected point.

### 5.3.4 DEVIATION FROM TEST STANDARD

No deviation

### 5.3.5 TEST SETUP




Note:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the Ground Reference Plane. 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 Horizontal Coupling Plane (1.6m x 0.8m) was placed on the table and attached to the GRP by means of a cable with 940k total impedance. The equipment under test was installed in a representative system as described inIEC 61000-4-2, and its cables were placed on the HCP and isolated by an insulating support of 0.5mm thickness. A distance of1-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 IEC 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of0.1-meter thickness. The GRP consisted of a sheet of aluminum that is at least 0.25mm thick, and 2.5meters square connected to the protective grounding system and extended at least 0.5 meters from the EUT on all sides.

### 5.3.6 TEST RESULTS

| EUT | Gaming Mouse Mat | Model Name | RZ02-0302 |
|---|---|---|---|
| Temperature | 24°C | Relative Humidity | 49% |
| Test Voltage | AC 230V/50Hz | Pressure | 1017hPa |
| Test Mode | Mode 1 | | |

| Mode | Air Discharge | | | | | | | | Contact Discharge | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2kV | | 4kV | | 8kV | | - kV | | 2kV | | 4kV | | -kV | |
| Location | P | N | P | N | P | N | P | N | P | N | P | N | P | N |
| 1 | A | A | A | A | A | A | - | - | - | - | - | - | - | - |
| 2 | A | A | A | A | B | B | - | - | - | - | - | - | - | - |
| 3 | A | A | A | A | B | B | - | - | - | - | - | - | - | - |
| Criteria | B | | | | | | - | | B | | | | - | |
| Result | B | | | | | | - | | N/A | | | | - | |
| Judgment | PASS | | | | | | - | | N/A | | | | - | |

| Mode | HCP Contact Discharge | | | | | | VCP Contact Discharge | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2kV | | 4kV | | -kV | | 2kV | | 4kV | | -kV | |
| Location | P | N | P | N | P | N | P | N | P | N | P | N |
| 1 | A | A | A | A | - | - | A | A | A | A | - | - |
| 2 | A | A | A | A | - | - | A | A | A | A | - | - |
| 3 | A | A | A | A | - | - | A | A | A | A | - | - |
| 4 | A | A | A | A | - | - | A | A | A | A | - | - |
| Criteria | B | | | | - | | B | | | | - | |
| Result | A | | | | - | | A | | | | - | |
| Judgment | PASS | | | | - | | PASS | | | | - | |

Note:

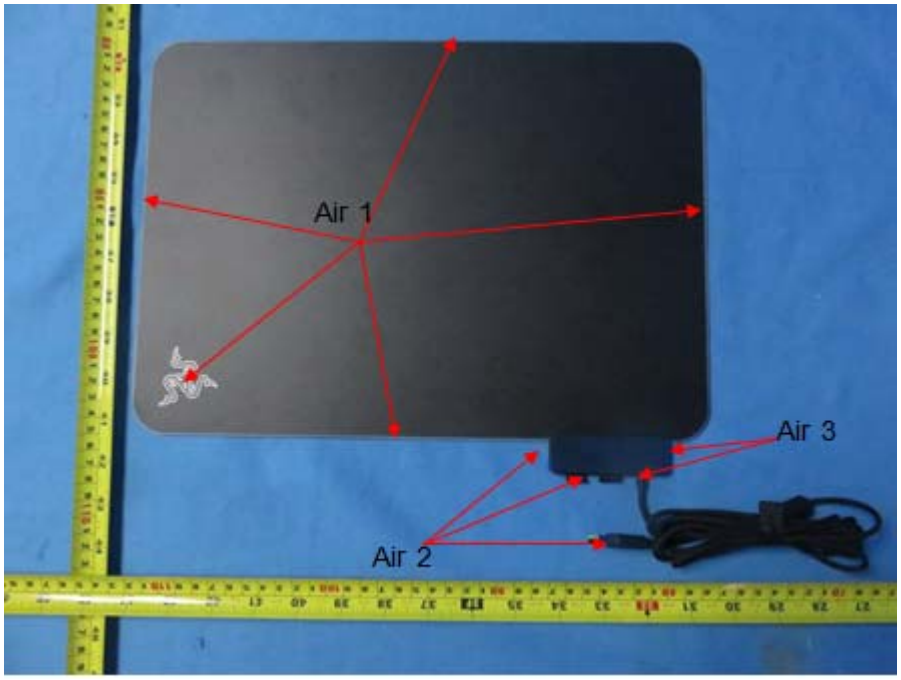
1) Test condition:
Direct/Indirect(HCP/VCP) discharges: Minimum 20 times (Positive/Negative) at eachpoint.
Air discharges: Minimum 20 times (Positive/Negative) at each point.

2) Test location(s) in which discharge (Air and contact discharge) to be applied illustrated by photos shown in next page(s)

3) The Indirect (HCP/VCP) discharges description of test point as following:
1.left side; 2.right side; 3.front side; 4.rear side.

4) N/A - denotes test is not applicable in device.

PHOTO(S) SHOWN THE LOCATION(S) OF ESD EVALUATED



## 5.4 RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD IMMUNITY TEST (RS)

### 5.4.1 TEST SPECIFICATION

| | |
|---|---|
| Basic Standard | EN 61000-4-3 |
| Required Performance | A |
| Frequency Range | 80 MHz - 1000 MHz<br>1800 MHz, 2600 MHz, 3500 MHz, 5000MHz |
| Field Strength | 3 V/m(unmodulated, r.m.s) |
| Modulation | 1 kHz Sine Wave, 80%, AM Modulation |
| Frequency Step | 1% of fundamental |
| Polarity of Antenna | Horizontal and Vertical |
| Test Distance | 3 m |
| Antenna Height | 1.55 m |
| Dwell Time | at least 3 seconds |

### 5.4.2 MEASUREMENT INSTRUMENTS

| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
|---|---|---|---|---|---|
| 1 | Antenna | ETS | 3142C | 47662 | Mar. 09, 2020 |
| 2* | Amplifier | AR | 50S1G4A | 326720 | Apr. 08, 2021 |
| 3 | MXG Analog Signal Generator | Agilent | N5181A | MY49060710 | Aug. 11, 2019 |
| 4* | Power amplifier | MILMEGA | AS1860-50 | 1064834 | Mar. 10, 2022 |
| 5 | Microwave Log.-Per. Antenna | TESEQ | STLP 9149 | 9149-277 | Mar. 10, 2020 |
| 6* | Power amplifier | MILMEGA | 80RF1000-250 | 1064833 | Mar. 10, 2022 |
| 7 | Measurement Software | TOYO | IM5/RS Ver 3.8.050 | N/A | N/A |

Remark: “N/A” denotes no model name, no serial No. or no calibration specified.
All calibration period of equipment list is one year.
“*” calibration period of equipment list is three year.

### 5.4.3 TEST PROCEDURE

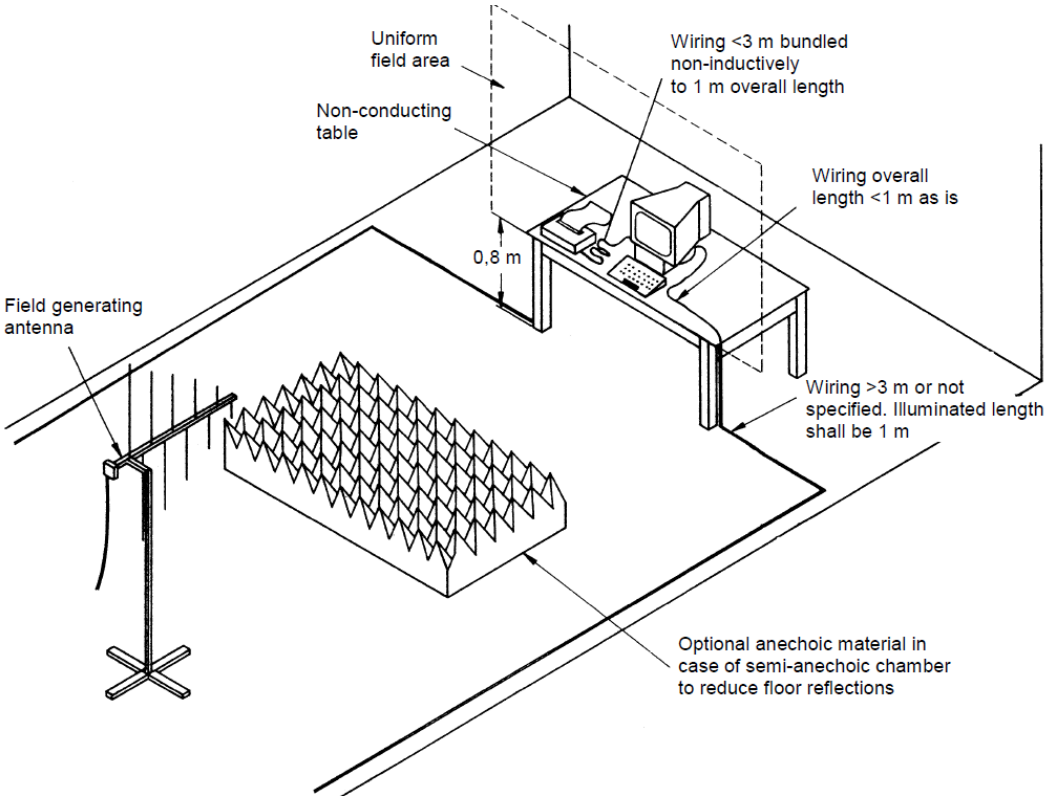
The EUT and support equipment, which are placed on a table that is 0.8 meter above ground and the testing was performed in a fully-anechoic chamber.
The testing distance from antenna to the EUT was 3 meters.
The other condition as following manner:

a. The field strength level was 3V/m(unmodulated, r.m.s).
b. The frequency range is swept from 80 MHz to 1000 MHz, 1800 MHz, 2600 MHz, 3500 MHz, 5000MHz with the signal 80%amplitude modulated with a 1 kHz sine wave. The rate of sweep did not exceed 1.5x 10-3 decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
c. The dwell time at each frequency shall be not less than the time necessary for theEUT to be able to respond.
d. The test was performed with the EUT exposed to both vertically and horizontallypolarized fields on each of the four sides.

### 5.4.4 DEVIATION FROM TEST STANDARD

No deviation

### 5.4.5 TEST SETUP




NOTE:

TABLE-TOP EQUIPMENT

The EUT installed in a representative system as described in EN 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 inEN 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.

### 5.4.6 TEST RESULTS

| EUT | Gaming Mouse Mat | Model Name | RZ02-0302 |
|---|---|---|---|
| Temperature | 24°C | Relative Humidity | 54% |
| Test Voltage | AC 230V/50Hz | | |
| Test Mode | Mode 1 | | |

| Frequency Range (MHz) | RF Field Position | R.F. Field Strength | Azimuth | Criterion | Result | Judgment |
|---|---|---|---|---|---|---|
| 80 - 1000 | H / V | 3V/m (unmodulated, r.m.s) AM Modulated 1000Hz, 80% | 0 | A | A | PASS |
| | | | 90 | | | |
| | | | 180 | | | |
| | | | 270 | | | |
| 1800 (±1 %) | H / V | 3V/m (unmodulated, r.m.s) AM Modulated 1000Hz, 80% | 0 | A | A | PASS |
| | | | 90 | | | |
| | | | 180 | | | |
| | | | 270 | | | |
| 2600 (±1 %) | H / V | 3V/m (unmodulated, r.m.s) AM Modulated 1000Hz, 80% | 0 | A | A | PASS |
| | | | 90 | | | |
| | | | 180 | | | |
| | | | 270 | | | |
| 3500 (±1 %) | H / V | 3V/m (unmodulated, r.m.s) AM Modulated 1000Hz, 80% | 0 | A | A | PASS |
| | | | 90 | | | |
| | | | 180 | | | |
| | | | 270 | | | |
| 5000 (±1 %) | H / V | 3V/m (unmodulated, r.m.s) AM Modulated 1000Hz, 80% | 0 | A | A | PASS |
| | | | 90 | | | |
| | | | 180 | | | |
| | | | 270 | | | |

Note:

1) N/A - denotes test is not applicable in device.

## 5.5 ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST (EFT/BURST)

### 5.5.1 TEST SPECIFICATION

| | |
|---|---|
| Basic Standard | EN 61000-4-4 |
| Required Performance | B |
| Test Voltage | AC mains power ports: ±1 kV |
| Polarity | Positive & Negative |
| Impulse Frequency | 5 kHz: except for xDSL port<br>100 kHz: only for single lines of xDSL port. |
| Impulse Wave shape | 5/50 ns |
| Burst Duration | 15 ms |
| Burst Period | 300 ms |
| Test Duration | Not less than 1 min. |

### 5.5.2 MEASUREMENT INSTRUMENTS

| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
|---|---|---|---|---|---|
| 1 | THE MODULAR SOLUTION FOR 6 KV APPLICATIONS | Teseq | NSG 3060 | 1423 | Aug. 11, 2019 |

Remark: “N/A” denotes no model name, no serial No. or no calibration specified.
All calibration period of equipment list is one year.

### 5.5.3 TEST PROCEDURE

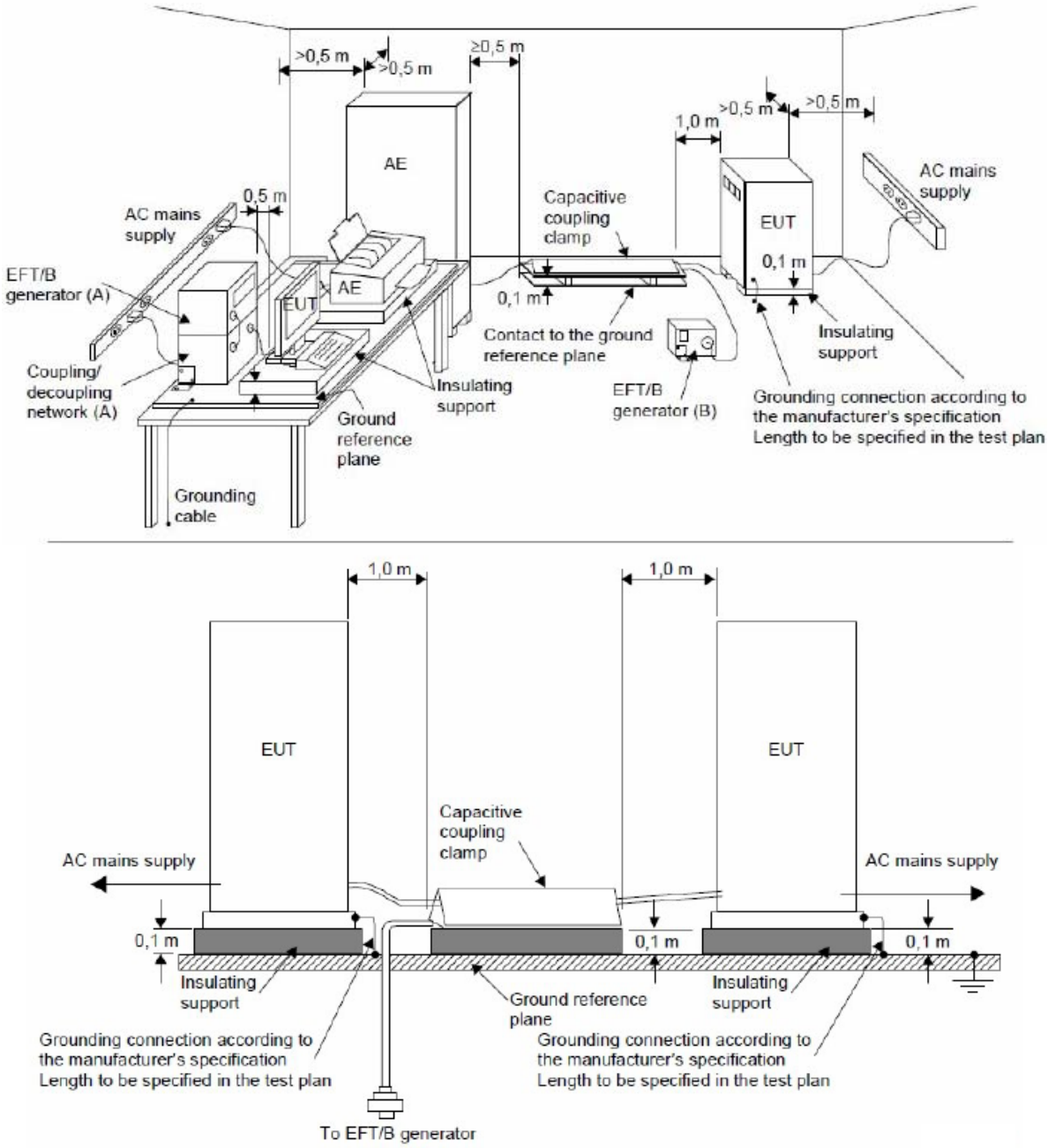
The EUT and support equipment, are placed on a table that is 0.8 meter above a metal ground plane measured 1m*1m min. and 0.65mm thick min.
The other condition as following manner:

a. Both positive and negative polarity discharges were applied.
b. The duration time of each test sequential was 1 minute

### 5.5.4 DEVIATION FROM TEST STANDARD

No deviation

### 5.5.5 TEST SETUP




Note:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table (0.8m high) standing on the Ground Reference Plane and should be located 0.1 m+/- 0.01m above 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 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.

### 5.5.6 TEST RESULTS

| EUT | Gaming Mouse Mat | Model Name | RZ02-0302 |
|---|---|---|---|
| Temperature | 25°C | Relative Humidity | 51% |
| Test Voltage | AC 230V/50Hz | | |
| Test Mode | Mode 1 | | |

| EUT Ports Tested | | Polarity | Repetition Frequency | Test Level | Criterion | Result | Judgment |
|---|---|---|---|---|---|---|---|
| | | | | 1kV | | | |
| AC mains power ports | Line (L) | + | 5 kHz | A | B | A | PASS |
| | | - | 5 kHz | A | | | |
| | Neutral (N) | + | 5 kHz | A | B | A | PASS |
| | | - | 5 kHz | A | | | |
| | Ground (PE) | + | 5 kHz | A | B | A | PASS |
| | | - | 5 kHz | A | | | |
| | L+N | + | 5 kHz | A | B | A | PASS |
| | | - | 5 kHz | A | | | |
| | L+PE | + | 5 kHz | A | B | A | PASS |
| | | - | 5 kHz | A | | | |
| | N+PE | + | 5 kHz | A | B | A | PASS |
| | | - | 5 kHz | A | | | |
| | L+N+PE | + | 5 kHz | A | B | A | PASS |
| | | - | 5 kHz | A | | | |

Note:

1) N/A - denotes test is not applicable in device.

## 5.6 SURGE IMMUNITY TEST

### 5.6.1 TEST SPECIFICATION

| | |
|---|---|
| Basic Standard | EN 61000-4-5 |
| Required Performance | B(AC mains power ports)<br>B/C(Analogue/digital data ports) |
| Wave-Shape | Combination Wave for power lines<br>1.2/50 us Open Circuit Voltage<br>8 /20 us Short Circuit Current |
| Test Voltage | AC mains power ports: ±0.5 kV, ±1 kV, ±2 kV |
| Surge Input/Output | L – N, L – PE, N – PE |
| Generator Source Impedance | 2 Ω of the low-voltage power supply network.<br>12 Ω (10Ω+2Ω) of the low-voltage power supply network and ground. |
| Phase Angle and Polarity: | Five positive pulses line-to-neutral at 90° phase<br>Five negative pulses line-to-neutral at 270° phase<br>Five positive pulses line-to-earth at 90° phase<br>Five negative pulses line-to-earth at 270° phase<br>Five negative pulses neutral-to-earth at 90° phase<br>Five positive pulses neutral-to-earth at 270° phase |
| Pulse Repetition Rate | 1 time / min. (maximum) |
| Number of Tests | 5 positive and 5 negative at selected points |

### 5.6.2 MEASUREMENT INSTRUMENTS

| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
|---|---|---|---|---|---|
| 1 | THE MODULAR SOLUTION FOR 6 KV APPLICATIONS | Teseq | NSG 3060 | 1423 | Aug. 11, 2019 |

Remark: “N/A” denotes no model name, no serial No. or no calibration specified.
All calibration period of equipment list is one year.

### 5.6.3 TEST PROCEDURE

a. For EUT power supply:

The surge is to be 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 shall be 2meters in length (or shorter).

b. For test applied to unshielded unsymmetrically operated interconnection lines of EUT :

The surge is applied to the lines via the capacitive coupling. The coupling /decoupling networks shall not influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

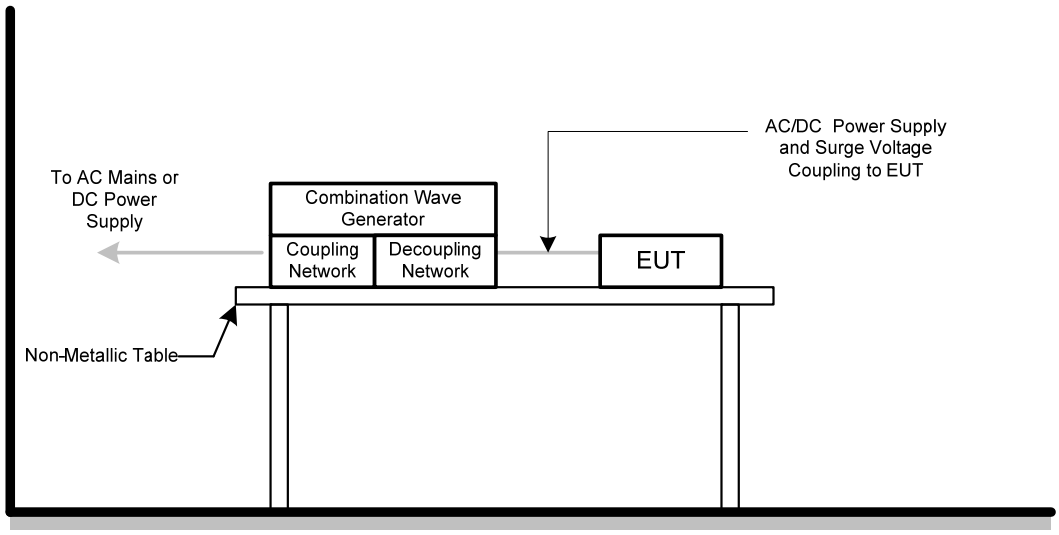
c. For test applied to unshielded symmetrically operated interconnection /telecommunication lines of EUT :

The surge is applied to the lines via gas arrestors coupling. Test levels below the ignition point of the coupling arrestor cannot be specified. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

### 5.6.4 DEVIATION FROM TEST STANDARD

No deviation

### 5.6.5 TEST SETUP



### 5.6.6 TEST RESULTS

| EUT | Gaming Mouse Mat | Model Name | RZ02-0302 |
|---|---|---|---|
| Temperature | 25°C | Relative Humidity | 50% |
| Test Voltage | AC 230V/50Hz | | |
| Test Mode | Mode 1 | | |

| Wave Form EUT Ports Tested | | 1.2/50(8/20)Tr/Thμs | | | | | | Criterion | Result | Judgment |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Polarity | Phase | Voltage | | | | | | |
| | | | | 0.5kV | 1kV | -- kV | -- kV | | | |
| AC | L – N | + | 90° | A | A | - | - | B | A | PASS |
| | | - | 270° | A | A | - | - | | | |

| Wave Form EUT Ports Tested | | 1.2/50(8/20)Tr/Thμs | | | | | | Criterion | Result | Judgment |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Polarity | Phase | Voltage | | | | | | |
| | | | | 0.5kV | 1kV | 2kV | -- kV | | | |
| AC | L – PE | + | 90° | A | A | A | - | B | A | PASS |
| | | - | 270° | A | A | A | - | | | |
| | N – PE | - | 90° | A | A | A | - | B | A | PASS |
| | | + | 270° | A | A | A | - | | | |

Note:

1) N/A - denotes test is not applicable in device.

## 5.7 IMMUNITY TO CONDUCTED DISTURBANCES, INDUCED BY RADIO-FREQUENCY FIELDS TEST (CS)

### 5.7.1 TEST SPECIFICATION

| | |
|---|---|
| Basic Standard | EN 61000-4-6 |
| Required Performance | A |
| Frequency Range&Field Strength | 0.15 MHz - 10 MHz - 3V (unmodulated, r.m.s.)<br>10 MHz - 30 MHz - 3V to 1V (unmodulated, r.m.s.)<br>30 MHz - 80 MHz - 1V (unmodulated, r.m.s.) |
| Modulation | 1 kHz Sine Wave, 80%, AM Modulation |
| Frequency Step | 1% of fundamental |
| Dwell Time | at least 3 seconds |

### 5.7.2 MEASUREMENT INSTRUMENTS

| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
|---|---|---|---|---|---|
| 1 | TEST SYSTEM FOR CONDUCTED AND RADIATED IMMUNITY | TESEQ | NSG 4070B | 37513 | Aug. 11, 2019 |
| 2 | Power CDN | FCC | FCC-801-M 2/M3-16A | 100270 | Mar. 10, 2020 |
| 3 | Measurement Software | Farad | EZ-CS (V2.0.1.3) | N/A | N/A |

Remark: “N/A” denotes no model name, no serial No. or no calibration specified.
All calibration period of equipment list is one year.

### 5.7.3 TEST PROCEDURE

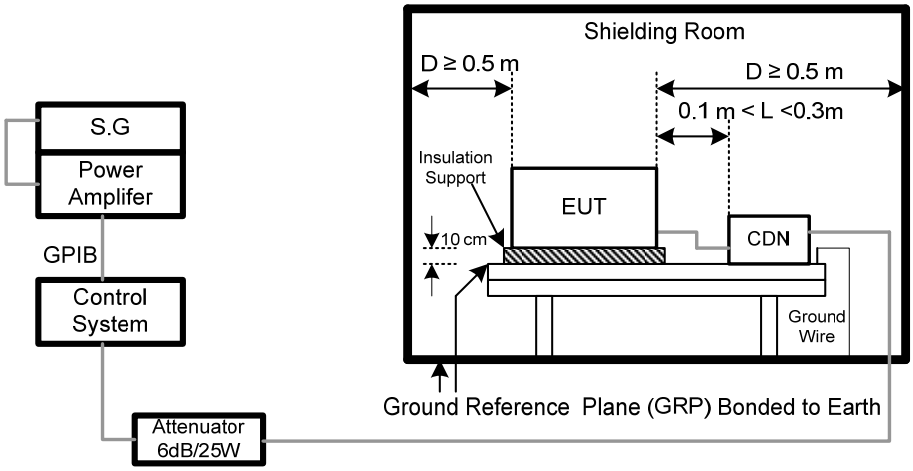
The EUT and support equipment, are placed on a table that is 0.8 meter above a metal ground plane measured 1m*1m min. and 0.65mm thick min.
The other condition as following manner:

a. The field strength level was 3 V (unmodulated, r.m.s.)
b. The frequency range is swept from 150 kHz to 80 MHz, with the signal 80%amplitude modulated with a 1 kHz sine wave. The rate of sweep did not exceed 1.5x 10-3 decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
c. The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.

### 5.7.4 DEVIATION FROM TEST STANDARD

No deviation

### 5.7.5 TEST SETUP




NOTE:

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.

### 5.7.6 TEST RESULTS

| EUT | Gaming Mouse Mat | Model Name | RZ02-0302 |
|---|---|---|---|
| Temperature | 25°C | Relative Humidity | 56% |
| Test Voltage | AC 230V/50Hz | | |
| Test Mode | Mode 1 | | |

| Test Ports (Mode) | Freq.Range (MHz) | Field Strength | Criteria | Results | Judgment |
|---|---|---|---|---|---|
| AC mains power ports | 0.15 - 10 | 3V (unmodulated, r.m.s.) | A | A | PASS |
| | 10 - 30 | 3V to 1V (unmodulated, r.m.s.) | | | |
| | 30 - 80 | 1V (unmodulated, r.m.s.) | | | |

Note:

1). N/A - denotes test is not applicable in device.

## 5.8 POWER FREQUENCY MAGNETIC FIELD IMMUNITY TEST (PFMF)

### 5.8.1 TEST SPECIFICATION

| | |
|---|---|
| Basic Standard | EN 61000-4-8 |
| Required Performance | A |
| Frequency Range | 50/60 Hz |
| Field Strength | 1 A/m |
| Observation Time | 1 minute |
| Inductance Coil | Rectangular type, 1mx1m |

### 5.8.2 MEASUREMENT INSTRUMENTS

| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
|---|---|---|---|---|---|
| 1 | Magnetic Field test Generator | FCC | F-1000-4-8-G-125A | 4032 | Mar. 10, 2020 |
| 2 | Magnetic Field immunity loop | Thermo KeyTek | F-1000-4-8/9/10-L-1M | 4024 | Mar. 10, 2020 |

Remark: “N/A” denotes no model name, no serial No. or no calibration specified.
All calibration period of equipment list is one year.

### 5.8.3 TEST PROCEDURE

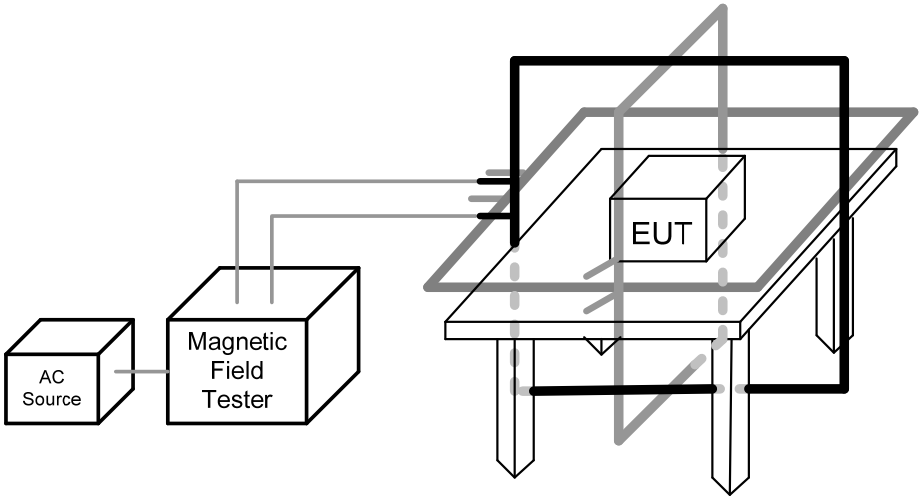
The EUT and support equipment, are placed on a table that is 0.8 meter above a metal ground plane measured 1m*1m min. and 0.65mm thick min.
The other condition as following manner:

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

### 5.8.4 DEVIATION FROM TEST STANDARD

No deviation

### 5.8.5 TEST SETUP




Note:

TABLE-TOP 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 percent 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.

### 5.8.6 TEST RESULTS

| EUT | Gaming Mouse Mat | Model Name | RZ02-0302 |
|---|---|---|---|
| Temperature | 25°C | Relative Humidity | 51% |
| Test Voltage | AC 230V/50Hz | | |
| Test Mode | Mode 1 | | |

50Hz

| Test Mode | Test Level | Antenna aspect | Duration (s) | Criteria | Results | Judgment |
|---|---|---|---|---|---|---|
| Enclosure | 1 A/m | X | 60 | A | A | PASS |
| Enclosure | 1 A/m | Y | 60 | A | A | PASS |
| Enclosure | 1 A/m | Z | 60 | A | A | PASS |

60Hz

| Test Mode | Test Level | Antenna aspect | Duration (s) | Criteria | Results | Judgment |
|---|---|---|---|---|---|---|
| Enclosure | 1 A/m | X | 60 | A | A | PASS |
| Enclosure | 1 A/m | Y | 60 | A | A | PASS |
| Enclosure | 1 A/m | Z | 60 | A | A | PASS |

Note:

1). N/A - denotes test is not applicable in device.

## 5.9 VOLTAGE DIPS, SHORT INTERRUPTIONS AND VOLTAGE VARIATIONS IMMUNITY TEST

### 5.9.1 TEST SPECIFICATION

| | |
|---|---|
| Basic Standard | EN 61000-4-11 |
| Required Performance | Voltage dips:<br>(B) Residual voltage＜5% 0.5 Cycles<br>(C) Residual voltage70% 25 Cycles (50Hz),30 Cycles (60Hz)<br>Voltage interruptions:<br>(C) Residual voltage＜5% 250 Cycles (50Hz), 300 Cycles (60Hz) |
| Test Duration Time | Minimum three test events in sequence |
| Interval between Event | Minimum ten seconds |
| Phase Angle | 0°/180° |
| Test Cycle | 3 times |

### 5.9.2 MEASUREMENT INSTRUMENTS

| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
|---|---|---|---|---|---|
| 1 | THE MODULAR SOLUTION FOR 6 KV APPLICATIONS | Teseq | NSG 3060 | 1423 | Aug. 11, 2019 |

Remark: “N/A” denotes no model name, no serial No. or no calibration specified.
All calibration period of equipment list is one year.

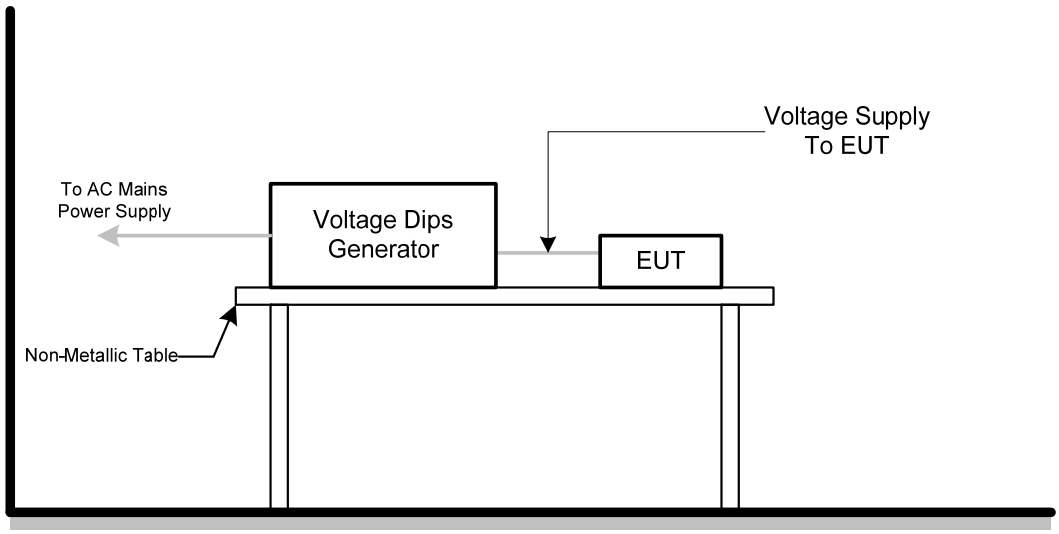
### 5.9.3 TEST PROCEDURE

The EUT shall be tested for each selected combination of test levels and duration with a sequence of three dips/interruptions with intervals of 10 s minimum (between each test event). Each representative mode of operation shall be tested. Abrupt changes in supply voltage shall occur at zero crossings of the voltage waveform.

### 5.9.4 DEVIATION FROM TEST STANDARD

No deviation

### 5.9.5 TEST SETUP



### 5.9.6 TEST RESULTS

| EUT | Gaming Mouse Mat | Model Name | RZ02-0302 |
|---|---|---|---|
| Temperature | 25°C | Relative Humidity | 50% |
| Test Voltage | AC 100V/50Hz, AC 230V/50Hz, AC 240V/50Hz | | |
| Test Mode | Mode 1 | | |

| AC 100V/50Hz | | | | | |
|---|---|---|---|---|---|
| Item | Residual Voltage | Cycles | Criteria | Results | Judgment |
| Voltage dips | ＜5% | 0.5 | B | A | PASS |
| Voltage dips | 70% | 25 | C | A | PASS |
| Voltage Interruption | ＜5% | 250 | C | C | PASS |

| AC 230V/50Hz | | | | | |
|---|---|---|---|---|---|
| Item | Residual Voltage | Cycles | Criteria | Results | Judgment |
| Voltage dips | ＜5% | 0.5 | B | A | PASS |
| Voltage dips | 70% | 25 | C | A | PASS |
| Voltage Interruption | ＜5% | 250 | C | C | PASS |

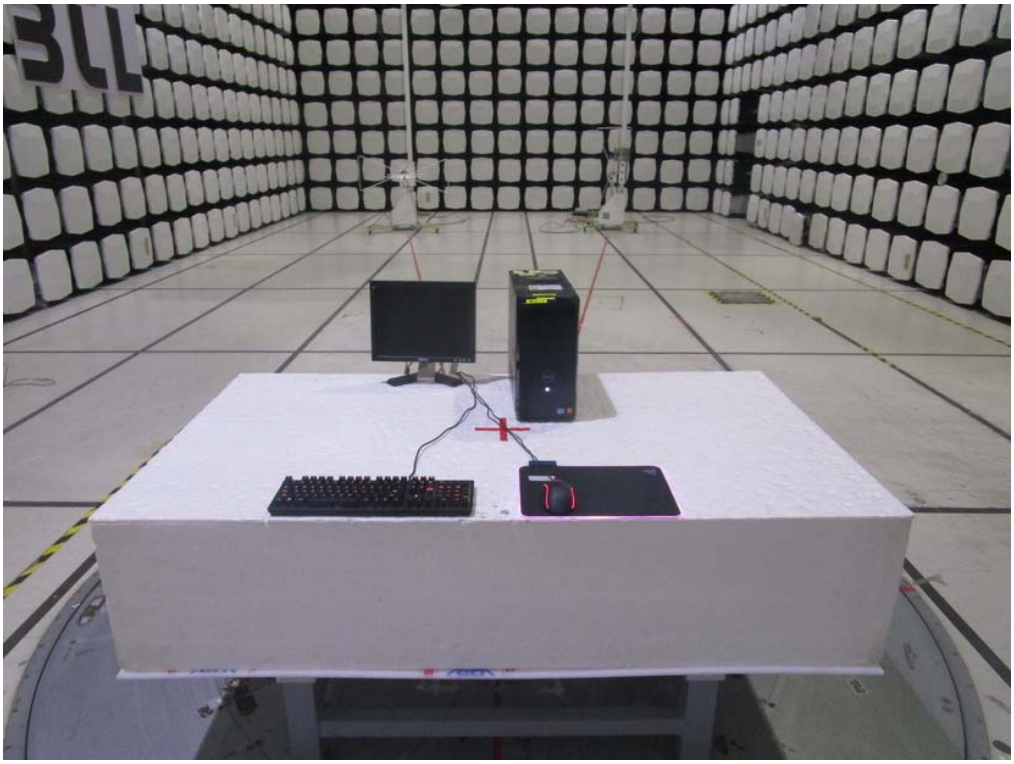
| AC 240V/50Hz | | | | | |
|---|---|---|---|---|---|
| Item | Residual Voltage | Cycles | Criteria | Results | Judgment |
| Voltage dips | ＜5% | 0.5 | B | A | PASS |
| Voltage dips | 70% | 25 | C | A | PASS |
| Voltage Interruption | ＜5% | 250 | C | C | PASS |

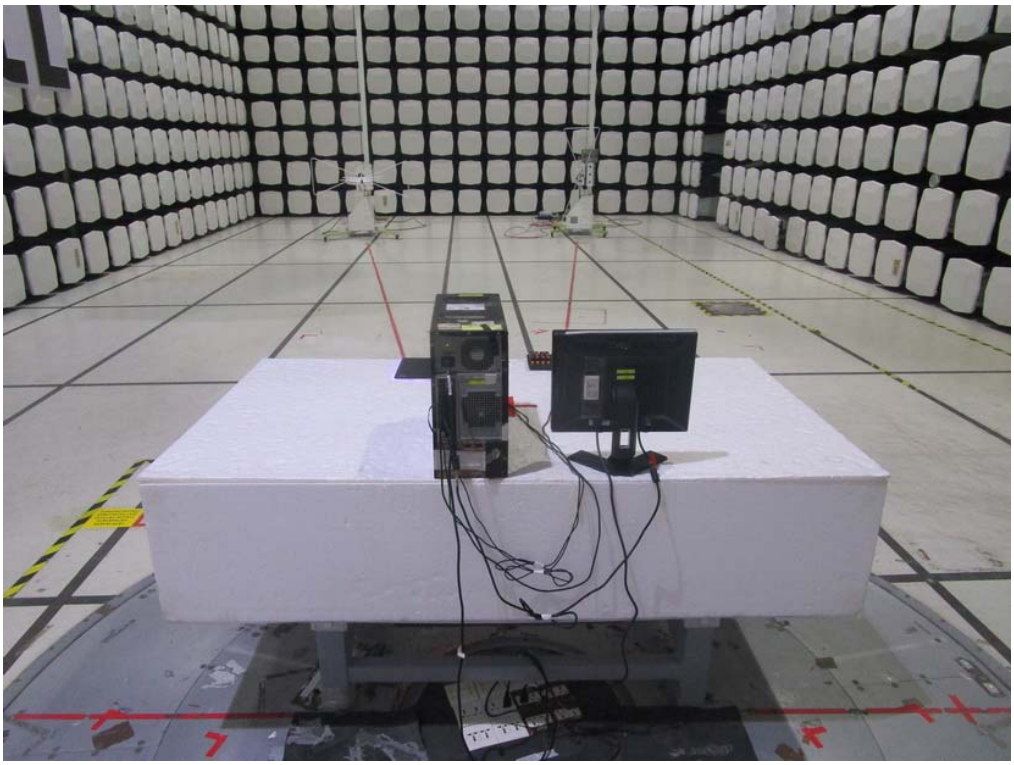
Note:

1). N/A - denotes test is not applicable in device.

## 6.EUT TEST PHOTO

Radiated emissions up to 1 GHz



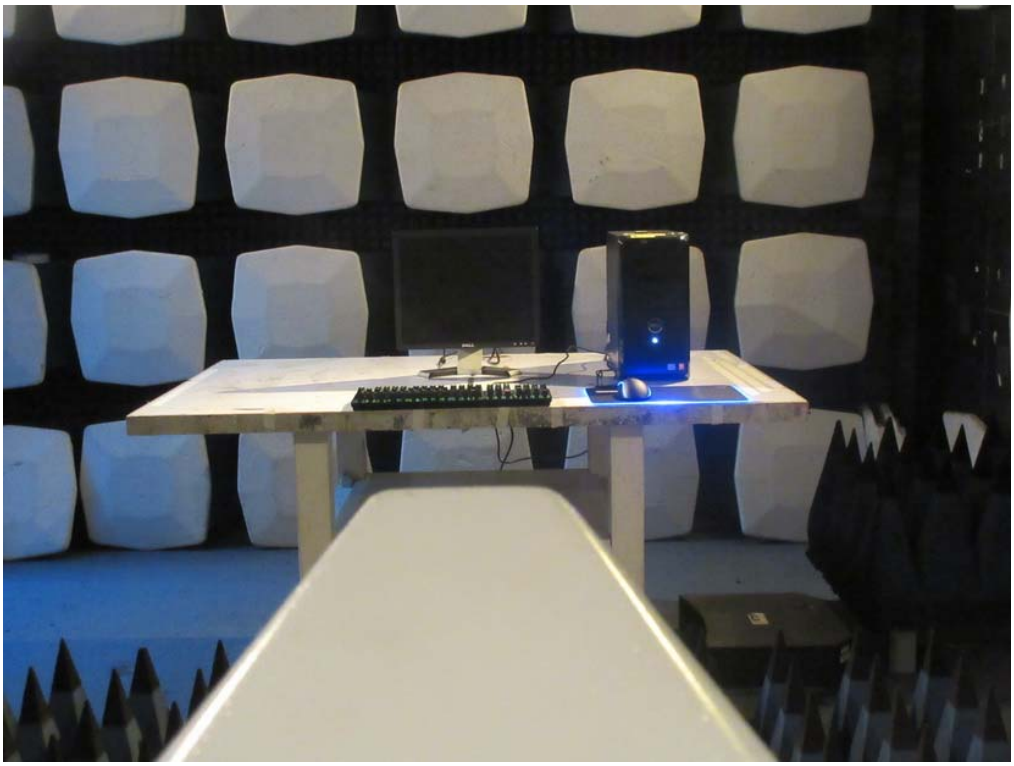


Conducted emissions AC mains power port

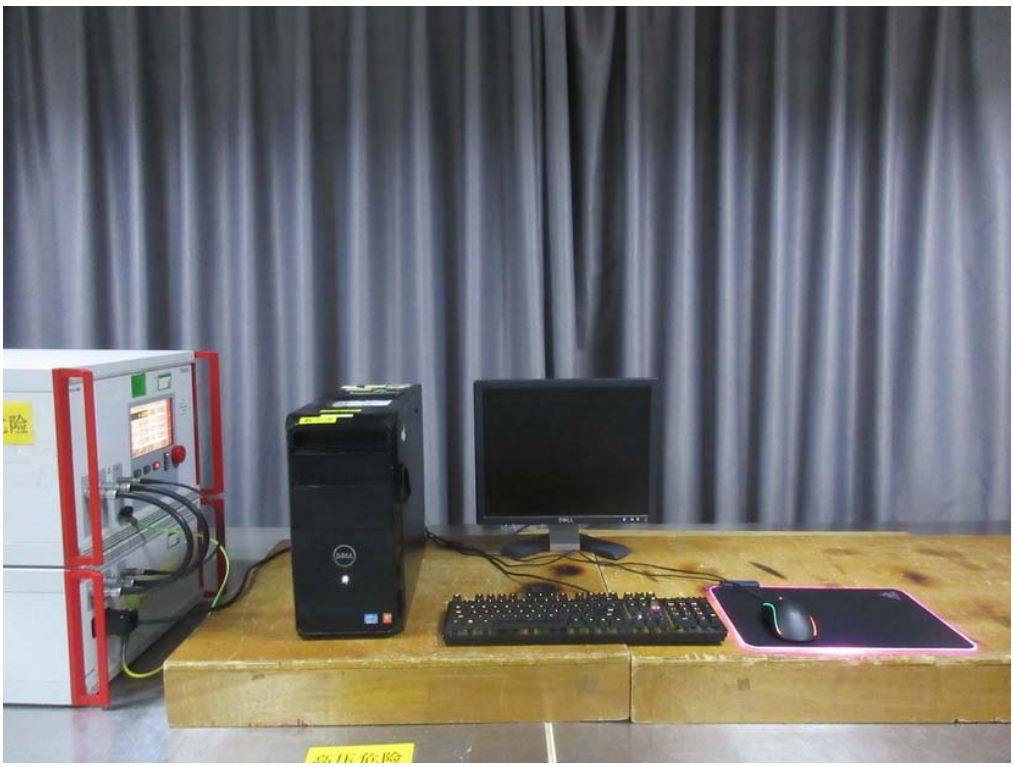
Electrostatic discharge immunity

Radiated, radio-frequency, electromagnetic field immunity – Up to 1GHz

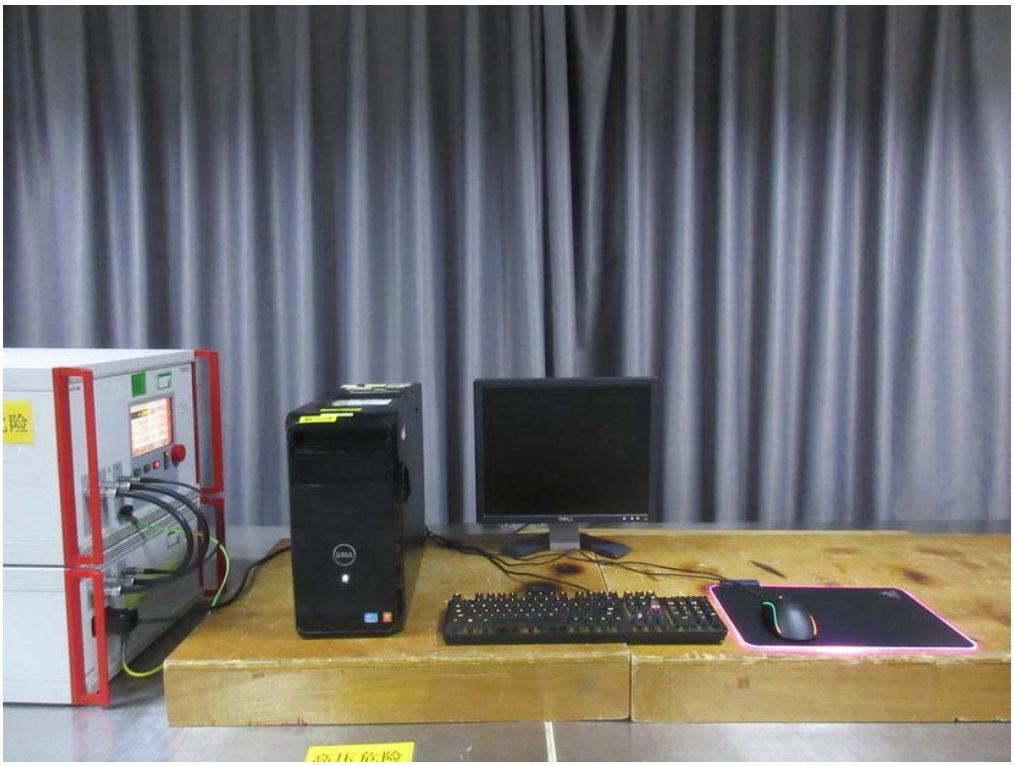
Radiated, radio-frequency, electromagnetic field immunity – Above 1GHz



Electrical fast transient/burst immunity

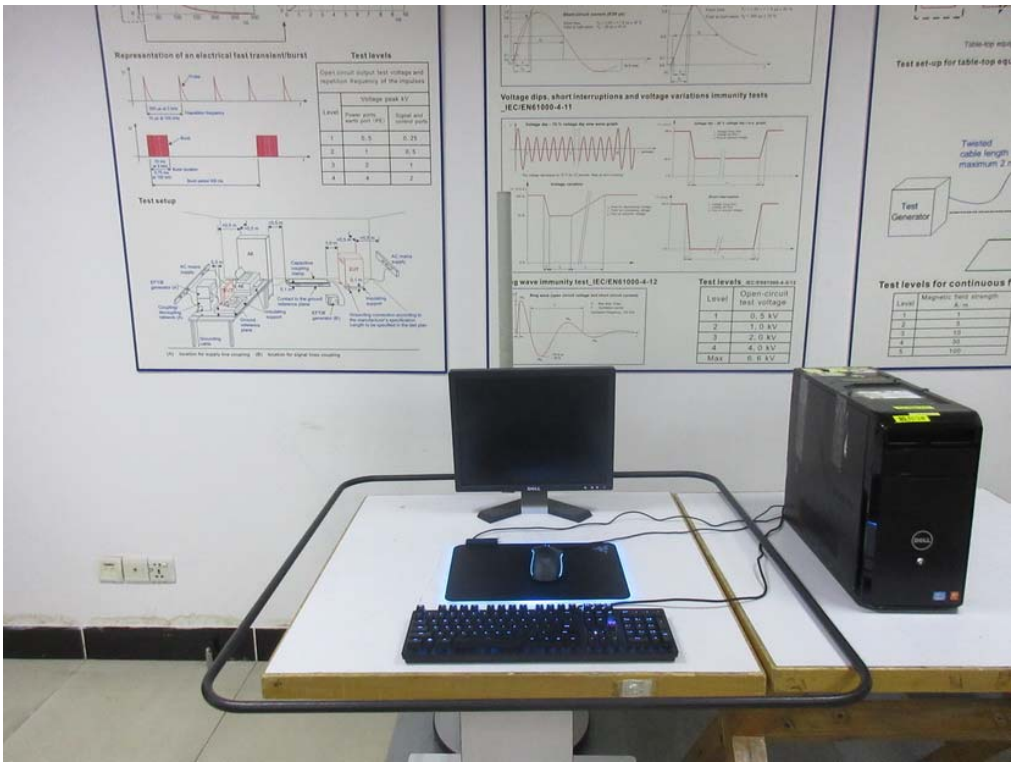


Surge immunity

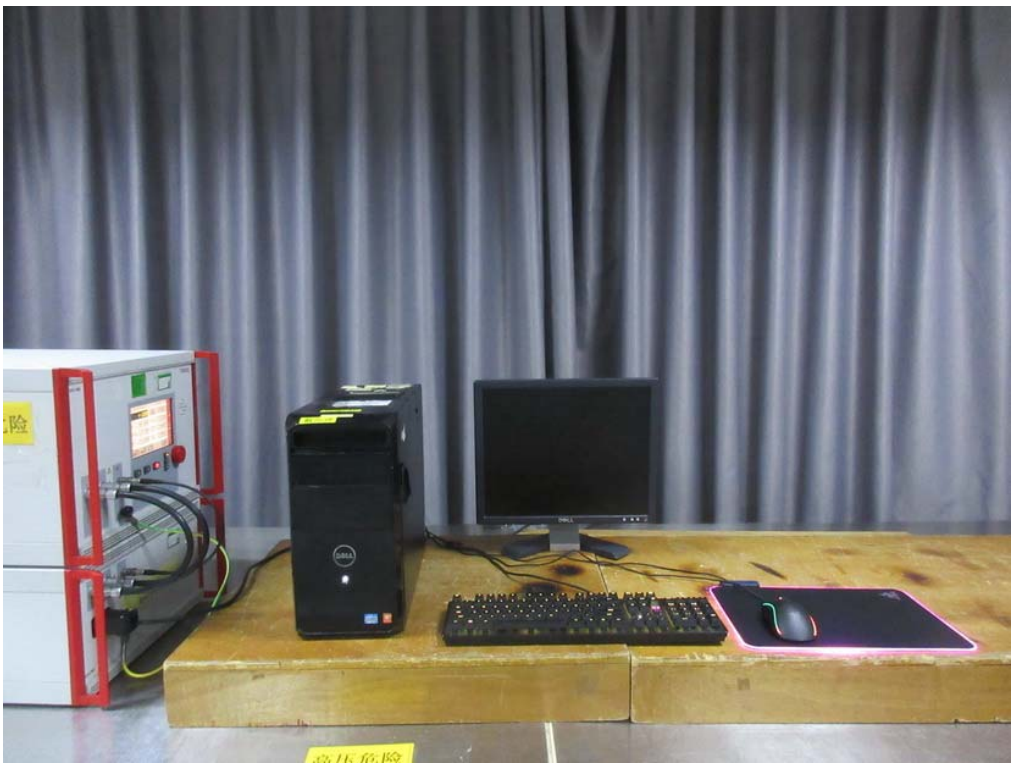


Immunity to conducted disturbances, induced by radio-frequency fields

Power frequency magnetic field immunity




Voltage dips, short interruptions and voltage variations immunity



**End of Test Report**