

EMC Test Report

Report No.: RM171207E101

Test Model: BLACK bean

Received Date: Oct. 08, 2014

Test Date: Nov. 10, 2014; Mar. 29 to Apr. 01, 2017

Issued Date: Apr. 15, 2019

Applicant: UAB 8devices

Address: Antakalnio 17, LT-10312, Vilnius, Lithuania

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Hsin Chu Laboratory

Lab Address: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,
Taiwan R.O.C.

Test Location (1): E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,
Taiwan R.O.C.

Test Location (2): No. 49, Ln. 206, Wende Rd., Shangshan Tsuen, Chiung Lin Hsiang, Hsin
Chu Hsien 307, Taiwan R.O.C.



This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification. The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencies.

Table of Contents

| | |
|---|-----------|
| Release Control Record | 4 |
| 1 Certificate of Conformity | 5 |
| 2 Summary of Test Results | 6 |
| 2.1 Measurement Uncertainty..... | 8 |
| 2.2 Modification Record..... | 8 |
| 3 General Information | 9 |
| 3.1 Description of EUT..... | 9 |
| 3.2 Features of EUT..... | 10 |
| 3.3 Description of Antenna..... | 11 |
| 3.4 Operating Modes of EUT and Determination of Worst Case Operating Mode..... | 12 |
| 3.5 Test Program Used and Operation Descriptions..... | 12 |
| 3.6 Primary Clock Frequencies of Internal Source..... | 12 |
| 3.7 Miscellaneous..... | 13 |
| 4 Configuration and Connections with EUT | 14 |
| 4.1 Connection Diagram of EUT and Peripheral Devices..... | 14 |
| 4.2 Configuration of Peripheral Devices and Cable Connections..... | 16 |
| 5 Conducted Emission from the AC Mains Power Port | 17 |
| 5.1 Limits..... | 17 |
| 5.2 Test Instruments..... | 17 |
| 5.3 Test Arrangement..... | 18 |
| 5.4 Supplementary Information..... | 18 |
| 5.5 Test Results..... | 19 |
| 6 Radiated Emission at Frequencies up to 1GHz | 21 |
| 6.1 Limits..... | 21 |
| 6.2 Test Instruments..... | 21 |
| 6.3 Test Arrangement..... | 22 |
| 6.4 Supplementary Information..... | 22 |
| 6.5 Test Results..... | 23 |
| 7 Radiated Emission at Frequencies above 1GHz | 25 |
| 7.1 Limits..... | 25 |
| 7.2 Test Instruments..... | 25 |
| 7.3 Test Arrangement..... | 26 |
| 7.4 Supplementary Information..... | 26 |
| 7.5 Test Results..... | 27 |
| 8 General Immunity requirements | 29 |
| 8.2 Performance Criteria..... | 30 |
| 9 Electrostatic Discharge Immunity Test (ESD) | 32 |
| 9.1 Test Specification..... | 32 |
| 9.2 Test Instruments..... | 32 |
| 9.3 Test Arrangement..... | 32 |
| 9.4 Supplementary Information..... | 33 |
| 9.5 Test Results (Mode 1 & 2)..... | 34 |
| 10 Radiated, Radio-frequency, Electromagnetic Field Immunity Test (RS) | 35 |
| 10.1 Test Specification..... | 35 |
| 10.2 Test Instruments..... | 35 |



| | | |
|-----------|--|-----------|
| 10.3 | Test Arrangement..... | 36 |
| 10.4 | Supplementary Information..... | 36 |
| 10.5 | Test Results (Mode 1)..... | 37 |
| 10.6 | Test Results (Mode 2)..... | 37 |
| 11 | Pictures of Test Arrangements..... | 38 |
| 11.1 | Conducted Emission from the AC Mains Power Port..... | 38 |
| 11.2 | Radiated Emission at Frequencies up to 1GHz..... | 39 |
| 11.3 | Radiated Emission at Frequencies above 1GHz..... | 40 |
| 11.4 | Electrostatic Discharge Immunity Test (ESD)..... | 41 |
| 11.5 | Radio-frequency, Electromagnetic Field Immunity Test (RS)..... | 41 |
| | Appendix – Information on the Testing Laboratories..... | 42 |

Release Control Record

| Issue No. | Description | Date Issued |
|--------------|-------------------|---------------|
| RM171207E101 | Original release. | Apr. 15, 2019 |

1 Certificate of Conformity

Product: BLACK-Bean

Brand: 8devices

Test Model: BLACK bean

Sample Status: R&D SAMPLE

Applicant: UAB 8devices

Test Date: Nov. 10, 2014; Mar. 29 to Apr. 01, 2017

Standards: EN 301 489-1 V2.1.1 (2017-02)
EN 301 489-17 V3.1.1 (2017-02)
EN 55032:2015 +AC:2016, Class B
CISPR 32:2015+AC:2016, Class B
AS/NZS CISPR 32:2015, Class B
EN 61000-3-2:2014(Not Applicable)
EN 61000-3-3:2013(Not Applicable)
EN 61000-4-2:2009
EN 61000-4-3:2006 +A1:2008 +A2:2010
EN 61000-4-4:2012(Not Applicable)
EN 61000-4-5:2014(Not Applicable)
EN 61000-4-6:2014(Not Applicable)
EN 61000-4-11:2004(Not Applicable)

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : Phoenix Huang , **Date:** Apr. 15, 2019
Phoenix Huang / Specialist

Approved by : Ken Lu , **Date:** Apr. 15, 2019
Ken Lu / Manager

2 Summary of Test Results

| EN 301 489-series, Emission | | | | | |
|-----------------------------|---------------------------|--|--|--|---------|
| Clause | Basic Standard | Phenomenon | Application | Result/Remarks | Verdict |
| 8.2 | EN 55032:2015 +AC:2016 | Radiated emission 30-1000 MHz | Enclosure of ancillary equipment measured on a stand alone basis | Minimum passing Class B margin is -3.17 dB at 399.86 MHz | Pass |
| | | Radiated emission 1-6 GHz | | Minimum passing Class B margin is -13.20 dB at 1995.37 MHz | Pass |
| 8.3 | EN 55032:2015 +AC:2016 | Conducted emission 150 kHz - 30 MHz | DC power input/output ports (fixed) | Not applicable, because the port is absent in the EUT | N/A |
| | | Conducted emission 150 kHz - 30 MHz | DC power input ports (vehicular) | Not applicable, because the port is absent in the EUT | N/A |
| 8.4 | EN 55032:2015 +AC:2016 | Conducted emission 150 kHz - 30 MHz | AC mains input/output ports | Minimum passing Class B margin is -14.35 dB at 2.47266 MHz | Pass |
| 8.5 | EN 61000-3-2:2014 | Harmonic current emissions | AC mains input port | Not applicable, because the port is absent in the EUT | N/A |
| 8.6 | EN 61000-3-3:2013 | Voltage fluctuations and flicker | AC mains input port | Not applicable, because the port is absent in the EUT | N/A |
| 8.7 | EN 55032:2015 +AC:2016 | Conducted disturbance 150 kHz - 30 MHz | Wired network ports | Not applicable, because the port is absent in the EUT | N/A |

| EN 301 489-series, Immunity | | | | | |
|------------------------------------|--|---|--|-------------------------|---------|
| Clause | Basic Standard | Phenomenon | Application | Result/Remarks | Verdict |
| 9.2 | EN 61000-4-3:2006 +A1:2008 +A2:2010 | RF Electromagnetic Field (RS) | Enclosure | Performance Criterion A | Pass |
| 9.3 | EN 61000-4-2:2009 | Electrostatic Discharges (ESD) | Enclosure | Performance Criterion A | Pass |
| 9.4 | EN 61000-4-4:2012 | Fast Transients Common Mode (EFT) | Signal, telecommunication and control ports, DC and AC power ports | Refer below Note | N/A |
| 9.5 | EN 61000-4-6:2014 | RF Common Mode 150 kHz to 80 MHz (CS) | Signal, telecommunication and control ports, DC and AC power ports | Refer below Note | N/A |
| 9.6 | ISO 7637-2:2004 | Transients and Surges | DC power input ports (Vehicular) | Refer below Note | N/A |
| 9.7 | EN 61000-4-11:2004 | Voltage Dips and Interruptions | AC mains power input ports | Refer below Note | N/A |
| 9.8 | EN 61000-4-5:2014 | Surges | AC mains power input ports, line to line and line to ground Telecommunication ports, line to ground | Refer below Note | N/A |

N/A: Not Applicable

Note:

1. There is no deviation to the applied test methods and requirements covered by the scope of this report.
2. The EUT is not appointed by clause 9.4 of EN 301 489-1, therefore the standard, EN 61000-4-4, is not applicable.
3. The EUT is not appointed by clause 9.8 of EN 301 489-1, therefore the standard, EN 61000-4-5, is not applicable.
4. The EUT is not appointed by clause 9.5 of EN 301 489-1, therefore the standard, EN 61000-4-6, is not applicable.
5. The EUT is not appointed by clause 9.7 of EN 301 489-1, therefore the standard, EN 61000-4-11, is not applicable.
6. The EUT is not appointed by clause 9.6 of EN 301 489-1, therefore the standard, ISO 7637-2, is not applicable.

2.1 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:

The listed uncertainties are the worst case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results.

| Measurement | Expanded Uncertainty (k=2) (\pm) | Maximum allowable uncertainty (\pm) |
|--|---|--|
| Conducted disturbance at mains port using AMN, 150kHz ~ 30MHz | 1.84 dB | 3.4 dB (U_{CISPR}) |
| Radiated disturbance, 30MHz ~ 1GHz | 3.91 dB | 6.3 dB (U_{CISPR}) |
| Radiated disturbance, 1GHz ~ 6GHz | 4.39 dB | 5.2 dB (U_{CISPR}) |

The other instruments specified are routine verified to remain within the calibrated levels, no measurement uncertainty is required to be calculated.

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 Description of EUT

| | | |
|---------------------|----------------------------|--|
| Product | BLACK-Bean | |
| Brand | 8devices | |
| Test Model | BLACK bean | |
| Sample Status | R&D SAMPLE | |
| Operating Software | NA | |
| Power Supply rating | 3.3Vdc from host equipment | |
| Modulation Type | WLAN | CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode and 11n (BW20), 11n (BW40) mode of 2.4GHz Band |
| | BT-EDR | GFSK, $\pi/4$ -DQPSK, 8DPSK |
| | BT-LE | DTS |
| | BT-HS | 16QAM, QPSK, BPSK |
| Operating Frequency | WLAN | 2.4GHz: 2412 ~ 2472MHz 5.0GHz: 5180MHz ~ 5240MHz, 5260MHz ~ 5320MHz, 5500MHz ~ 5700MHz |
| | BT-EDR, BT-LE | 2402MHz ~ 2480MHz |
| | BT-HS | 2412MHz ~ 2472MHz |
| Antenna Type | See item 3.3 | |
| I/O Ports | Refer to user's manual | |
| Accessory Device | NA | |
| Data Cable Supplied | NA | |

Note:

1. There are Bluetooth technology and WLAN technology used for the EUT.
2. The EUT incorporates a 1T1R function.

| MODULATION MODE | DATA RATE (MCS) | TX & RX CONFIGURATION | |
|----------------------------|-----------------|-----------------------|-----|
| 802.11b | 1 ~ 11Mbps | 1TX | 1RX |
| 802.11g | 6 ~ 54Mbps | 1TX | 1RX |
| 802.11n (HT20) (2.4GHz) | MCS 0~7 | 1TX | 1RX |
| 802.11n (HT40) (2.4GHz) | MCS 0~7 | 1TX | 1RX |
| VHT20 (2.4GHz) | MCS 0~8, Nss=1 | 1TX | 1RX |
| VHT40 (2.4GHz) | MCS 0~8, Nss=1 | 1TX | 1RX |
| 802.11a | 6 ~ 54Mbps | 1TX | 1RX |
| 802.11n (HT20) (5GHz) | MCS 0~7 | 1TX | 1RX |
| 802.11n (HT40) (5GHz) | MCS 0~7 | 1TX | 1RX |
| 802.11ac (VHT20) (5GHz) | MCS 0~8, Nss=1 | 1TX | 1RX |
| 802.11ac (VHT40) (5GHz) | MCS 0~9, Nss=1 | 1TX | 1RX |
| 802.11ac (VHT80) (5GHz) | MCS 0~9, Nss=1 | 1TX | 1RX |

3. WLAN/BT coexistence mode:

- ◆ 1x1 WLAN + BT:
 - 5GHz 802.11a/an (or 11ac) transmit concurrent with BT.
 - 2.4GHz: timely shared coexistence.

3.2 Features of EUT

The tests reported herein were performed according to the method specified by UAB 8 devices, for detailed feature description, please refer to the manufacturer's specifications or user's manual.

3.3 Description of Antenna

The antenna gain was declared by client; please refer to the following table:

| Ant. No. | Transmitter Circuit | Brand | Model | Ant. Type | 2.4GHz Gain with cable loss (dBi) | 5GHz Gain with cable loss (dBi) | 2.4GHz Cable Loss (dBi) | 5G Cable Loss (dBi) | Connector Type | Cable Length (mm) |
|----------|---------------------|-------|--------------|-----------|-----------------------------------|---------------------------------|-------------------------|---------------------|----------------|-------------------|
| 1 | Main | WNC | 81-EBJ15.005 | PIFA | 3.00 | Band 1&2: 2.56 | 1.15 | Band 1&2: 1.70 | IPEX | 300 |
| | | | | | | Band 3: 4.76 | | Band 3: 1.74 | | |
| | | | | | | Band 4: 4.76 | | Band 4: 1.79 | | |
| | Aux | WNC | 81-EBJ15.005 | PIFA | 3.62 | Band 1&2: 3.08 | 1.15 | Band 1&2: 1.70 | IPEX | 300 |
| | | | | | | Band 3: 3.31 | | Band 3: 1.74 | | |
| | | | | | | Band 4: 2.42 | | Band 4: 1.79 | | |
| 2 | Main | WNC | 81.ED415.001 | PIFA | 0.22 | Band 1&2: 5.56 | 0.96 | Band 1&2: 1.29 | IPEX | 300 |
| | | | | | | Band 3: 5.03 | | Band 3: 1.36 | | |
| | | | | | | Band 4: 3.14 | | Band 4: 1.38 | | |
| | Aux | WNC | 81.ED415.001 | PIFA | 1.48 | Band 1&2: 5.17 | 0.96 | Band 1&2: 1.29 | IPEX | 300 |
| | | | | | | Band 3: 5.34 | | Band 3: 1.36 | | |
| | | | | | | Band 4: 2.93 | | Band 4: 1.38 | | |

Note: 1. Above antenna gains of antenna are Total (H+V).

3.4 Operating Modes of EUT and Determination of Worst Case Operating Mode

EUT has been pre-tested under following test modes, and test mode 2 was the worst case for final test.

| Test Condition | | |
|----------------|--------------------------------|--------------------|
| Mode | Description | Remark |
| 1 | WLAN (5GHz) + BT mode | Normal mode |
| 2 | WLAN (2.4GHz) + BT mode | Normal mode |
| 3 | WLAN (2.4GHz) + BT mode | Standby mode |

Test modes are presented in the report as below.

| Test Condition | | |
|---|-------------------------|-------------|
| Conducted emission / Radiated emission test | | |
| Mode | Description | Remark |
| 1 | WLAN (2.4GHz) + BT mode | Normal mode |
| Immunity tests | | |
| Mode | Description | Remark |
| 1 | WLAN (2.4GHz) + BT mode | Normal mode |
| 2 | WLAN (5GHz) + BT mode | Normal mode |

3.5 Test Program Used and Operation Descriptions

For Conducted / Radiated test

1. Turn on the power of all equipment.
2. Support unit A (NOTEBOOK COMPUTER) runs test program "Ping.exe" to link with support unit E (ROUTER) via EUT by Wireless.
3. Support unit A (NOTEBOOK COMPUTER) sends audio messages to support unit F (BT SPEAKER) via EUT by BT.
4. Support unit A (NOTEBOOK COMPUTER) runs "color bar" on its screen.

For Immunity test

1. Turn on the power of all equipment.
2. Support unit A (NOTEBOOK COMPUTER) runs test program "Ping.exe" to link with support unit B (ROUTER) via EUT by Wireless.
3. Support unit A (NOTEBOOK COMPUTER) sends audio messages to support unit C (BT SPEAKER) via EUT by BT.

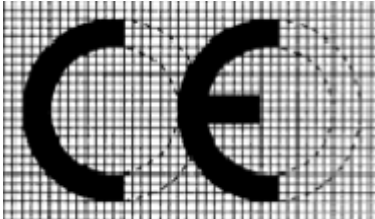
3.6 Primary Clock Frequencies of Internal Source

The highest frequency generated or used within the EUT or on which the EUT operates or tunes is 5850 MHz, provided by UAB 8devices, for detailed internal source, please refer to the manufacturer's specifications.

3.7 Miscellaneous

➤ Affix CE marking

The marking must be placed visibly and legibly on the product or, if not possible due to the nature of the product, be affixed to the packaging and the accompanying document. The CE marking shall consist of the initials 'CE' taking the following form:



A minimum height of 5 mm is required to ensure that it is legible. However on account of the nature of radio equipment, the height of the CE marking affixed to radio equipment may be lower than 5 mm, provided that it remains visible and legible. If the CE marking is reduced or enlarged, the proportions given in the graduated drawing above must be respected.

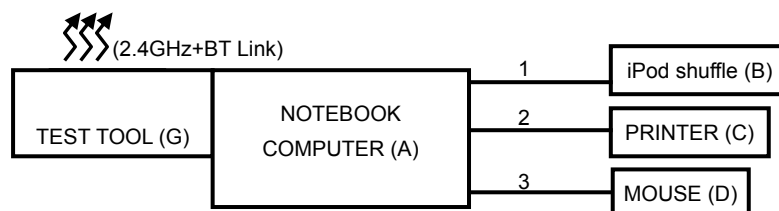
When the product is subject to other Directives covering other aspects and which also provide for the 'CE' marking, the accompanying documents must indicate that the product also conforms to those other Directives.

However, when one or more of those Directives allow the manufacturer, during a transitional period, to choose which arrangements to apply, the 'CE' marking has to indicate conformity only with the Directives applied by the manufacturer. In this case, the particularities of the Directives applied, as published in the Official Journal of the European Union, must be given in the documents, notices or instructions required by the Directives and accompanying such products.

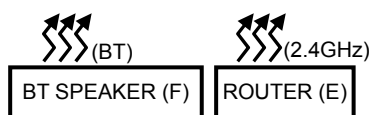
4 Configuration and Connections with EUT

4.1 Connection Diagram of EUT and Peripheral Devices

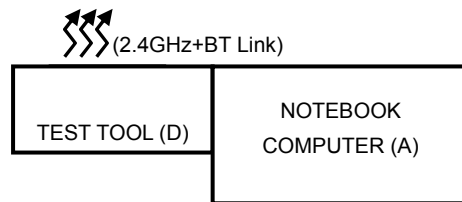
For Conducted emission / Radiated emission test



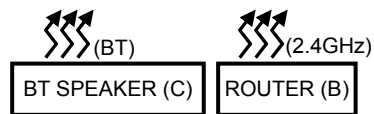
Remote site



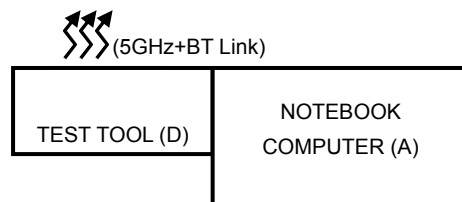
For For Immunity Mode 1 test



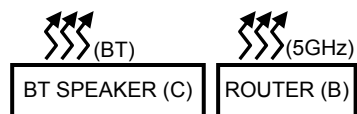
Remote site



For For Immunity Mode 2 test



Remote site



4.2 Configuration of Peripheral Devices and Cable Connections

| For Conducted emission / Radiated emission test | | | | | | |
|---|-------------------|----------|-----------|--------------|---------|--------------------|
| No. | Product | Brand | Model No. | Serial No. | FCC ID | Remark |
| A | NOTEBOOK COMPUTER | DELL | E5420 | CHHYLQ1 | FCC DoC | Provided by Lab |
| B | iPod shuffle | Apple | MD778TA/A | CC4JMCMXF4T1 | NA | Provided by Lab |
| C | PRINTER | EPSON | LQ-300+II | G88Y074083 | FCC DoC | Provided by Lab |
| D | MOUSE | DELL | MOC5UO | I1401LVG | FCC DoC | Provided by Lab |
| E | ROUTER | Linksys | WRT320N | NA | NA | Supplied by Client |
| F | BT SPEAKER | LOGITECH | S-00122 | NA | NA | Provided by Lab |
| G | TEST TOOL | 8devices | NA | NA | NA | Supplied by Client |

NOTE:

- All power cords of the above support units are non-shielded (1.8 m).

| For Conducted emission / Radiated emission test | | | | | | |
|---|-------|------|------------|--------------------|----------------|-----------------|
| No. | Cable | Qty. | Length (m) | Shielded (Yes/ No) | Cores (Number) | Remark |
| 1 | USB | 1 | 0.1 | Yes | 0 | Provided by Lab |
| 2 | USB | 1 | 1.8 | Yes | 0 | Provided by Lab |
| 3 | USB | 1 | 1.8 | Yes | 0 | Provided by Lab |

| For Immunity test | | | | | | |
|-------------------|-------------------|----------|-----------|------------|---------|--------------------|
| No. | Product | Brand | Model No. | Serial No. | FCC ID | Remark |
| A | NOTEBOOK COMPUTER | DELL | E5420 | CHHYLQ1 | FCC DoC | Provided by Lab |
| B | ROUTER | Linksys | WRT320N | NA | NA | Supplied by Client |
| C | BT SPEAKER | LOGITECH | S-00122 | NA | NA | Provided by Lab |
| D | TEST TOOL | 8devices | NA | NA | NA | Supplied by Client |

NOTE:

- All power cords of the above support units are non-shielded (1.8 m).

5 Conducted Emission from the AC Mains Power Port

5.1 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 |

Notes: 1. The lower limit shall apply at the transition frequencies.
 2. The limit decreases linearly with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

5.2 Test Instruments

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED DATE | CALIBRATED UNTIL |
|---|-------------------------|------------|-----------------|------------------|
| Test Receiver R&S | ESCS 30 | 100375 | May 09, 2016 | May 08, 2017 |
| Line-Impedance Stabilization Network (for EUT) SCHWARZBECK | NSLK-8127 | 8127-522 | Aug. 31, 2016 | Aug. 30, 2017 |
| Line-Impedance Stabilization Network (for Peripheral) R&S | ENV216 | 100072 | June 13, 2016 | June 12, 2017 |
| RF Cable | 5D-FB | COACAB-002 | Mar. 03, 2017 | Mar. 02, 2018 |
| 10 dB PAD Mini-Circuits | HAT-10+ | CONATT-003 | Sep. 13, 2016 | Sep. 12, 2017 |
| 50 ohms Terminator | N/A | EMC-03 | Sep. 29, 2016 | Sep. 28, 2017 |
| 50 ohms Terminator | N/A | EMC-02 | Sep. 29, 2016 | Sep. 28, 2017 |
| Software BVADT | BVADT_Cond_ V7.3.7.4 | NA | NA | NA |

Note:

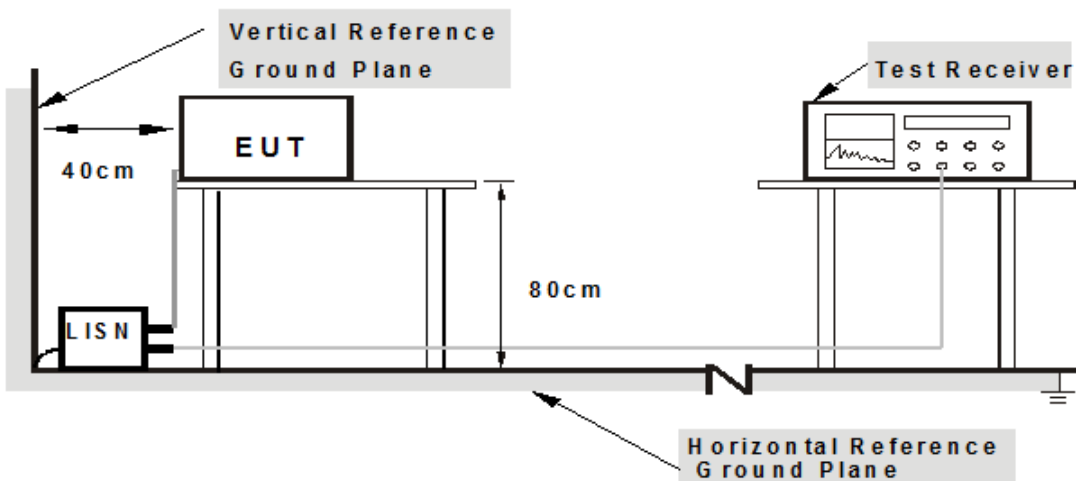
1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Shielded Room No. C.
- 3 The VCCI Con C Registration No. is C-3611.
- 4 Tested Date: Mar. 29, 2017

5.3 Test Arrangement

- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The test results of conducted disturbance at mains ports are recorded of six worst margins for quasi-peak (mandatory) [and average (if necessary)] values against the limits at frequencies of interest unless the margin is 20 dB or greater.

Note:

The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.



Note: 1. Support units were connected to second LISN.

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

5.4 Supplementary Information

There is not any deviation from the test standards for the test method.

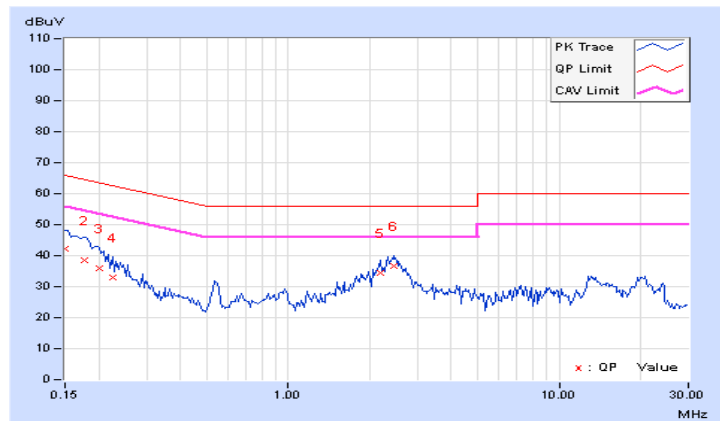
5.5 Test Results

| | | | |
|----------------------|----------------|-------------------------------|--------------------------------------|
| Frequency Range | 150kHz ~ 30MHz | Detector Function & Bandwidth | Quasi-Peak (QP) / Average (AV), 9kHz |
| Input Power (System) | 230Vac, 50Hz | Environmental Conditions | 20°C, 69%RH |
| Tested by | Wythe Lin | | |
| Test Mode | Mode 1 | | |

| Phase Of Power : Line (L) | | | | | | | | | | |
|---------------------------|-----------------|------------------------|----------------------|-------|-----------------------|-------|--------------|-------|-------------|--------|
| No | Frequency (MHz) | Correction Factor (dB) | Reading Value (dBuV) | | Emission Level (dBuV) | | Limit (dBuV) | | Margin (dB) | |
| | | | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. |
| 1 | 0.15000 | 10.14 | 32.06 | 15.72 | 42.20 | 25.86 | 66.00 | 56.00 | -23.80 | -30.14 |
| 2 | 0.17734 | 10.13 | 28.53 | 12.65 | 38.66 | 22.78 | 64.61 | 54.61 | -25.95 | -31.83 |
| 3 | 0.20078 | 10.12 | 25.85 | 11.43 | 35.97 | 21.55 | 63.58 | 53.58 | -27.61 | -32.03 |
| 4 | 0.22422 | 10.12 | 22.90 | 9.26 | 33.02 | 19.38 | 62.66 | 52.66 | -29.64 | -33.28 |
| 5 | 2.20313 | 10.28 | 24.33 | 18.75 | 34.61 | 29.03 | 56.00 | 46.00 | -21.39 | -16.97 |
| 6 | 2.46484 | 10.28 | 26.27 | 20.68 | 36.55 | 30.96 | 56.00 | 46.00 | -19.45 | -15.04 |

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

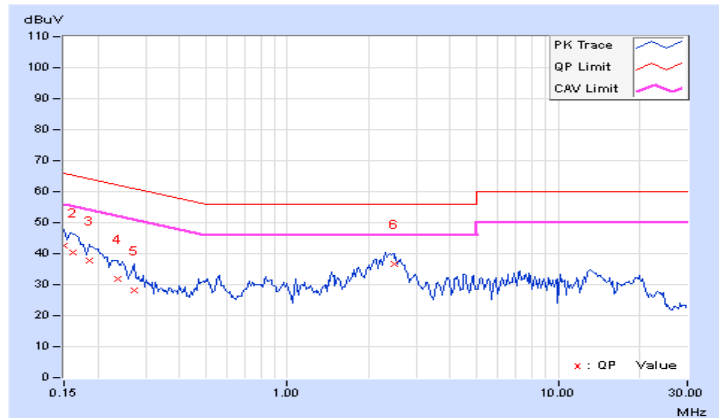


| | | | |
|-----------------------------|----------------|--|--------------------------------------|
| Frequency Range | 150kHz ~ 30MHz | Detector Function & Bandwidth | Quasi-Peak (QP) / Average (AV), 9kHz |
| Input Power (System) | 230Vac, 50Hz | Environmental Conditions | 20°C, 69%RH |
| Tested by | Wythe Lin | | |
| Test Mode | Mode 1 | | |

| Phase Of Power : Neutral (N) | | | | | | | | | | |
|------------------------------|-----------------|------------------------|----------------------|--------------|-----------------------|--------------|--------------|--------------|---------------|---------------|
| No | Frequency (MHz) | Correction Factor (dB) | Reading Value (dBuV) | | Emission Level (dBuV) | | Limit (dBuV) | | Margin (dB) | |
| | | | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. |
| 1 | 0.15000 | 10.19 | 32.22 | 16.69 | 42.41 | 26.88 | 66.00 | 56.00 | -23.59 | -29.12 |
| 2 | 0.16172 | 10.16 | 30.34 | 14.90 | 40.50 | 25.06 | 65.38 | 55.38 | -24.88 | -30.32 |
| 3 | 0.18516 | 10.10 | 27.58 | 12.39 | 37.68 | 22.49 | 64.25 | 54.25 | -26.57 | -31.76 |
| 4 | 0.23594 | 10.08 | 21.67 | 9.31 | 31.75 | 19.39 | 62.24 | 52.24 | -30.49 | -32.85 |
| 5 | 0.27109 | 10.08 | 18.12 | 7.54 | 28.20 | 17.62 | 61.08 | 51.08 | -32.88 | -33.46 |
| 6 | 2.47266 | 10.22 | 26.35 | 21.43 | 36.57 | 31.65 | 56.00 | 46.00 | -19.43 | -14.35 |

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



6 Radiated Emission at Frequencies up to 1GHz

6.1 Limits

| Frequency (MHz) | Class A (at 10m) | Class B (at 10m) |
|-----------------|------------------|------------------|
| | dBuV/m | dBuV/m |
| 30 - 230 | 40 | 30 |
| 230 - 1000 | 47 | 37 |

- Notes: 1. The lower limit shall apply at the transition frequencies.
 2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
 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.

6.2 Test Instruments

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED DATE | CALIBRATED UNTIL |
|--|--------------------------|--|-----------------|------------------|
| Test Receiver Agilent | N9038A | MY50010125 | Apr. 16, 2016 | Apr. 15, 2017 |
| | N9038A | MY50010132 | June 28, 2016 | June 27, 2017 |
| Pre-Amplifier Sonoma | 310N | 352925 | Aug. 29, 2016 | Aug. 28, 2017 |
| | 310N | 352926 | Aug. 29, 2016 | Aug. 28, 2017 |
| Trilog Broadband Antenna SCHWARZBECK | VULB 9168 | 9168-359 | Dec. 28, 2016 | Dec. 27, 2017 |
| | VULB 9168 | 9168-358 | Dec. 16, 2016 | Dec. 15, 2017 |
| Fixed attenuator Mini-Circuits | UNAT-5+ | CHF-001 | Sep. 09, 2016 | Sep. 08, 2017 |
| | UNAT-5+ | CHF-002 | Sep. 09, 2016 | Sep. 08, 2017 |
| RF Cable | 8D-FB | CHFCAB-001-1 CHFCAB-001-3 CHFCAB-001-4 | Sep. 22, 2016 | Sep. 21, 2017 |
| | | CHFCAB-002-1 CHFCAB-002-3 CHFCAB-002-4 | Sep. 22, 2016 | Sep. 21, 2017 |
| Software BVADT | ADT_Radiated_V 8.7.08 | NA | NA | NA |
| Antenna Tower & Turn Table CT | NA | NA | NA | NA |

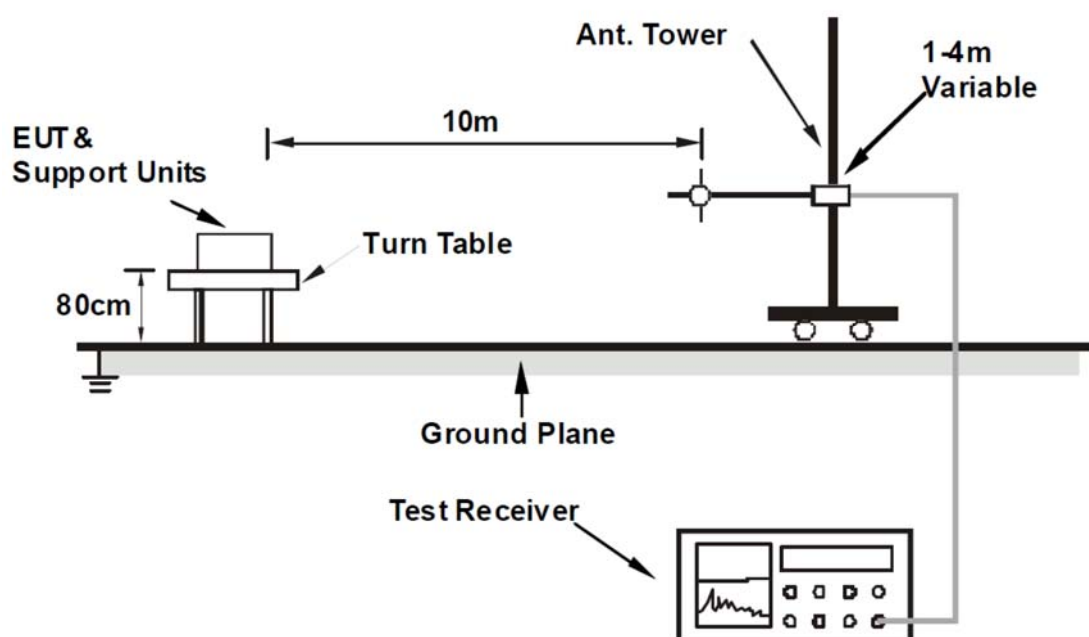
Note:

1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in 10m Chamber No. F.
3. The FCC Site Registration No. is 928149.
4. The VCCI Site Registration No. is R-3252.
5. The CANADA Site Registration No. is IC 7450H-1.
6. Tested Date: Apr. 01, 2017

6.3 Test Arrangement

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at an accredited test facility. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is up to 1 GHz.

Note: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for quasi-peak detection (QP) at frequency up to 1GHz.



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

6.4 Supplementary Information

Be added with EN 55032 - applicable for the radio equipment(s)

6.5 Test Results

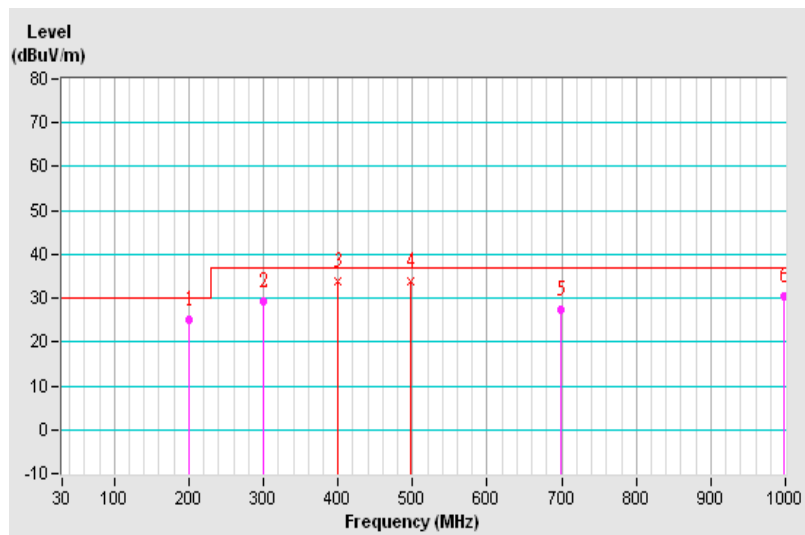
| | | | |
|-----------------|----------------------------|-------------------------------|-------------------------|
| Frequency Range | 30MHz ~ 1GHz | Detector Function & Bandwidth | Quasi-Peak (QP), 120kHz |
| Input Power | 3.3Vdc from host equipment | Environmental Conditions | 26°C, 60%RH |
| Tested by | Mike Hsieh | | |
| Test Mode | Mode 1 | | |

Antenna Polarity & Test Distance : Horizontal at 10 m

| No | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
|----------|-----------------|-------------------------|----------------|--------------|--------------------|----------------------|------------------|--------------------------|
| 1 | 199.92 | 25.12 QP | 30.00 | -4.88 | 4.00 H | 44 | 40.52 | -15.40 |
| 2 | 299.85 | 29.30 QP | 37.00 | -7.70 | 2.00 H | 14 | 40.67 | -11.37 |
| 3 | 399.86 | 33.83 QP | 37.00 | -3.17 | 2.00 H | 8 | 42.80 | -8.97 |
| 4 | 497.90 | 33.67 QP | 37.00 | -3.33 | 2.00 H | 296 | 40.16 | -6.49 |
| 5 | 699.74 | 27.51 QP | 37.00 | -9.49 | 1.00 H | 53 | 30.28 | -2.77 |
| 6 | 997.99 | 30.39 QP | 37.00 | -6.61 | 1.00 H | 82 | 27.51 | 2.88 |

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
– Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value

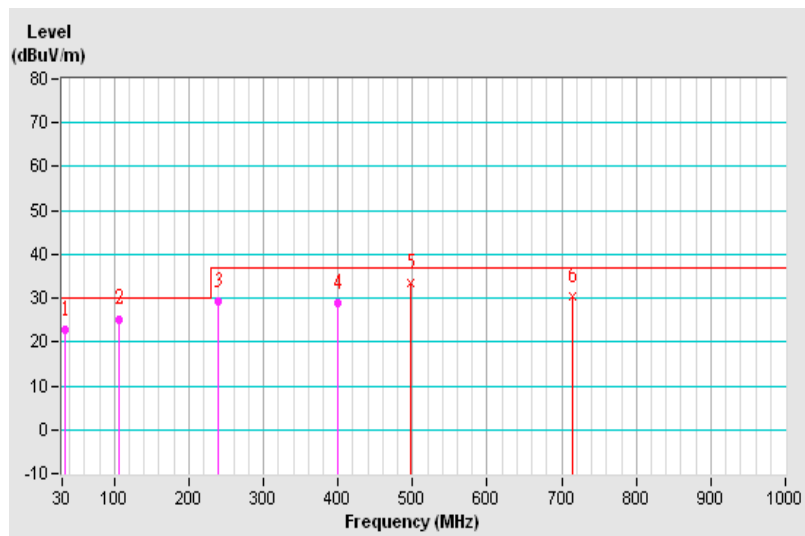


| | | | |
|-----------------|----------------------------|-------------------------------|-------------------------|
| Frequency Range | 30MHz ~ 1GHz | Detector Function & Bandwidth | Quasi-Peak (QP), 120kHz |
| Input Power | 3.3Vdc from host equipment | Environmental Conditions | 26°C, 60%RH |
| Tested by | Mike Hsieh | | |
| Test Mode | Mode 1 | | |

| Antenna Polarity & Test Distance : Vertical at 10 m | | | | | | | | |
|---|-----------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| No | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 33.20 | 22.92 QP | 30.00 | -7.08 | 1.00 V | 90 | 37.03 | -14.11 |
| 2 | 106.51 | 25.24 QP | 30.00 | -4.76 | 4.00 V | 305 | 41.23 | -15.99 |
| 3 | 239.30 | 29.30 QP | 37.00 | -7.70 | 4.00 V | 3 | 43.07 | -13.77 |
| 4 | 399.84 | 28.71 QP | 37.00 | -8.29 | 1.00 V | 309 | 37.56 | -8.85 |
| 5 | 497.93 | 33.61 QP | 37.00 | -3.39 | 3.00 V | 76 | 39.90 | -6.29 |
| 6 | 714.07 | 30.41 QP | 37.00 | -6.59 | 2.00 V | 255 | 32.64 | -2.23 |

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
– Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value



7 Radiated Emission at Frequencies above 1GHz

7.1 Limits

| Frequency (GHz) | Class A (dBuV/m) (at 3m) | | Class B (dBuV/m) (at 3m) | |
|-----------------|--------------------------|------|--------------------------|------|
| | Average | Peak | Average | Peak |
| 1 to 3 | 56 | 76 | 50 | 70 |
| 3 to 6 | 60 | 80 | 54 | 74 |

- Notes: 1. The lower limit shall apply at the transition frequencies.
 2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
 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.

Frequency Range of Radiated Measurement (For unintentional radiators)

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

7.2 Test Instruments

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED DATE | CALIBRATED UNTIL |
|-------------------------------------|--------------------------|------------|-----------------|------------------|
| Test Receiver Agilent | N9038A | MY50010125 | Apr. 16, 2016 | Apr. 15, 2017 |
| Pre-Amplifier Agilent | 8449B | 3008A01975 | Feb. 26, 2017 | Feb. 25, 2018 |
| Horn Antenna SCHWARZBECK | BBHA 9120D | D123 | Dec. 15, 2016 | Dec. 14, 2017 |
| RF Cable | SUCOFLEX104 | RF-104-209 | Dec. 09, 2016 | Dec. 08, 2017 |
| RF Cable | EMC104-SM-SM -6000 | 150325 | Jan. 16, 2017 | Jan. 15, 2018 |
| RF Cable | 104 RF cable | 131221 | Dec. 09, 2016 | Dec. 08, 2017 |
| Software BVADT | ADT_Radiated_ V8.7.08 | NA | NA | NA |
| Antenna Tower & Turn Table CT | NA | NA | NA | NA |

Note:

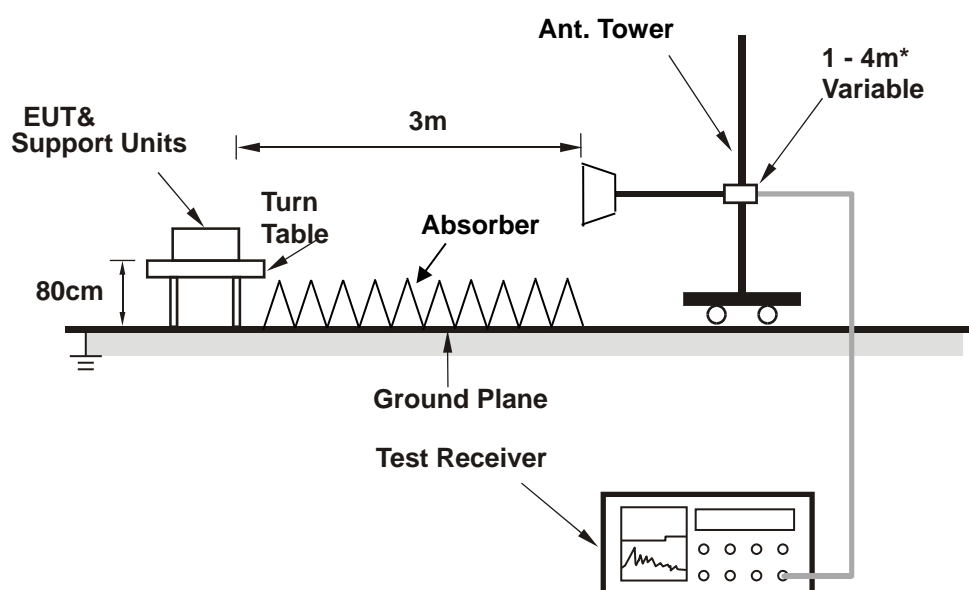
- The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
- The test was performed in 10m Chamber No. F.
- The VCCI Site Registration No. is G-136.
- The 3dB beamwidth of the horn antenna is minimum 30 degree (or w = 1.6m at 3m distance) for 1~6 GHz.
- Tested Date: Mar. 29, 2017

7.3 Test Arrangement

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at an accredited chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The height of antenna can be varied from one meter to four meters, the height of adjustment depends on the EUT height and the antenna 3dB beamwidth both, to detect the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The spectrum analyzer system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

Note:

- The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection (PK) at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for Average detection (AV) at frequency above 1GHz.



* : depends on the EUT height and the antenna 3dB beamwidth both.

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

7.4 Supplementary Information

Be added with EN 55032 - applicable for the radio equipment(s)

7.5 Test Results

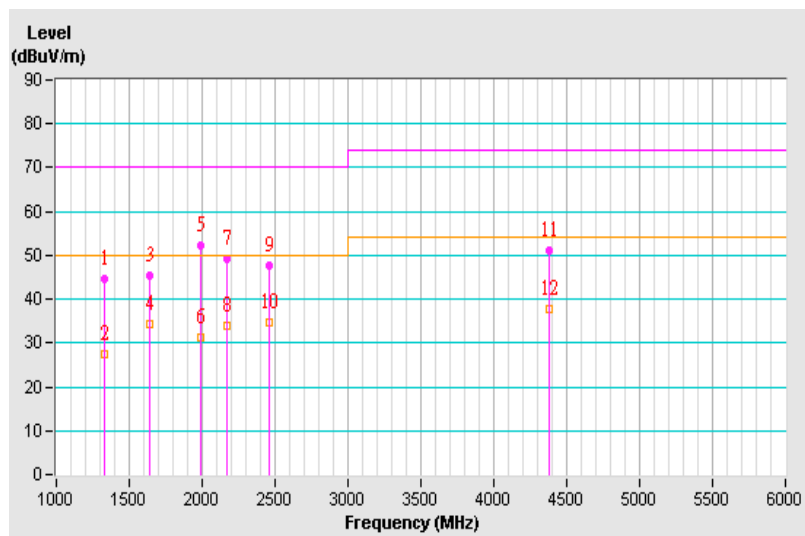
| | | | |
|-----------------|----------------------------|-------------------------------|--------------------------------|
| Frequency Range | 1GHz ~ 6GHz | Detector Function & Bandwidth | Peak (PK) / Average (AV), 1MHz |
| Input Power | 3.3Vdc from host equipment | Environmental Conditions | 20°C, 65%RH |
| Tested by | Jason Huang | | |
| Test Mode | Mode 1 | | |

Antenna Polarity & Test Distance : Horizontal at 3 m

| No | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
|----|-----------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| 1 | 1333.00 | 44.70 PK | 70.00 | -25.30 | 1.00 H | 129 | 47.30 | -2.60 |
| 2 | 1333.00 | 27.60 AV | 50.00 | -22.40 | 1.00 H | 129 | 30.20 | -2.60 |
| 3 | 1638.87 | 45.50 PK | 70.00 | -24.50 | 1.00 H | 219 | 46.20 | -0.70 |
| 4 | 1638.87 | 34.20 AV | 50.00 | -15.80 | 1.00 H | 219 | 34.90 | -0.70 |
| 5 | 1994.87 | 52.30 PK | 70.00 | -17.70 | 1.00 H | 360 | 51.10 | 1.20 |
| 6 | 1994.87 | 31.40 AV | 50.00 | -18.60 | 1.00 H | 360 | 30.20 | 1.20 |
| 7 | 2172.12 | 49.20 PK | 70.00 | -20.80 | 1.00 H | 34 | 46.40 | 2.80 |
| 8 | 2172.12 | 33.80 AV | 50.00 | -16.20 | 1.00 H | 34 | 31.00 | 2.80 |
| 9 | 2459.62 | 47.60 PK | 70.00 | -22.40 | 1.00 H | 331 | 44.40 | 3.20 |
| 10 | 2459.62 | 34.60 AV | 50.00 | -15.40 | 1.00 H | 331 | 31.40 | 3.20 |
| 11 | 4384.12 | 51.20 PK | 74.00 | -22.80 | 1.00 H | 111 | 41.80 | 9.40 |
| 12 | 4384.12 | 37.80 AV | 54.00 | -16.20 | 1.00 H | 111 | 28.40 | 9.40 |

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value

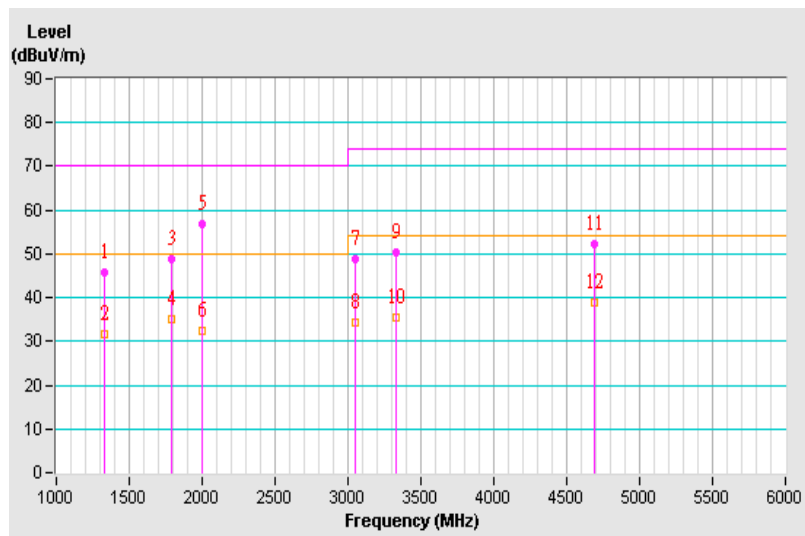


| | | | |
|-----------------|----------------------------|-------------------------------|--------------------------------|
| Frequency Range | 1GHz ~ 6GHz | Detector Function & Bandwidth | Peak (PK) / Average (AV), 1MHz |
| Input Power | 3.3Vdc from host equipment | Environmental Conditions | 20°C, 65%RH |
| Tested by | Jason Huang | | |
| Test Mode | Mode 1 | | |

| Antenna Polarity & Test Distance : Vertical at 3 m | | | | | | | | |
|--|-----------------|-------------------------|----------------|---------------|--------------------|----------------------|------------------|--------------------------|
| No | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1 | 1330.75 | 45.90 PK | 70.00 | -24.10 | 1.00 V | 14 | 48.50 | -2.60 |
| 2 | 1330.75 | 31.60 AV | 50.00 | -18.40 | 1.00 V | 14 | 34.20 | -2.60 |
| 3 | 1788.37 | 48.70 PK | 70.00 | -21.30 | 1.00 V | 3 | 48.40 | 0.30 |
| 4 | 1788.37 | 34.90 AV | 50.00 | -15.10 | 1.00 V | 3 | 34.60 | 0.30 |
| 5 | 1995.37 | 56.80 PK | 70.00 | -13.20 | 1.00 V | 255 | 55.60 | 1.20 |
| 6 | 1995.37 | 32.30 AV | 50.00 | -17.70 | 1.00 V | 255 | 31.10 | 1.20 |
| 7 | 3049.50 | 48.80 PK | 74.00 | -25.20 | 1.00 V | 34 | 44.00 | 4.80 |
| 8 | 3049.50 | 34.40 AV | 54.00 | -19.60 | 1.00 V | 34 | 29.60 | 4.80 |
| 9 | 3328.25 | 50.40 PK | 74.00 | -23.60 | 1.00 V | 334 | 44.70 | 5.70 |
| 10 | 3328.25 | 35.30 AV | 54.00 | -18.70 | 1.00 V | 334 | 29.60 | 5.70 |
| 11 | 4691.37 | 52.30 PK | 74.00 | -21.70 | 1.00 V | 360 | 42.10 | 10.20 |
| 12 | 4691.37 | 38.90 AV | 54.00 | -15.10 | 1.00 V | 360 | 28.70 | 10.20 |

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value



8.2 Performance Criteria

General Performance Criteria

- Performance criteria for continuous phenomena applied to transmitters and receivers (CT/CR)

During and after the test, the apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a permissible performance level specified by the manufacturer when the apparatus is used as intended. In some cases this permissible performance level may be replaced by a permissible loss of performance.

During the test the EUT shall not unintentionally transmit or change its actual operating state and stored data.

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

- Performance criteria for transient phenomena applied to transmitters and receivers (TT/TR)

After the test, the apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a permissible performance level specified by the manufacturer, when the apparatus is used as intended. In some cases this permissible performance level may be replaced by a permissible loss of performance.

During the EMC exposure to an electromagnetic phenomenon, a degradation of performance is, however, allowed. No change of the actual mode of operation (e.g. unintended transmission) or stored data is allowed.

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

- Performance criteria for equipment which does not provide a continuous communication link

For radio equipment which does not provide a continuous communication link, the performance criteria described in CT/CR and TT/TR are not appropriate, then the manufacturer shall declare, for inclusion in the test report, his own specification for an acceptable level of performance or degradation of performance during and/or after the immunity tests.

The performance criteria specified by the manufacturer shall give the same degree of immunity protection as called for in CT/CR and TT/TR.

- Performance criteria for ancillary equipment tested on a stand alone basis

If ancillary equipment is intended to be tested on a stand alone basis, the performance criteria described in CT/CR and TT/TR are not appropriate, then the manufacturer shall declare, for inclusion in the test report, his own specification for an acceptable level of performance or degradation of performance during and/or after the immunity tests.

The performance criteria specified by the manufacturer shall give the same degree of immunity protection as called for in CT/CR and TT/TR.

Product Specific Performance Criteria

The particular performance criteria which are specified in the relevant part of EN 301 489 series dealing with the particular type of radio equipment, take precedence over the corresponding parts of the general performance criteria.

Where particular performance criteria for specific functions are not given, then the general performance criteria shall apply.

EN 301 489-17, Broadband Data Transmission Systems

The performance criteria are:

- performance criteria A for immunity tests with phenomena of a continuous nature (CT/CR);
- performance criteria B for immunity tests with phenomena of a transient nature (TT/TR);
- performance criteria C for immunity tests with power interruptions exceeding a certain time.

| Special conditions for EN 301489-17 | | |
|-------------------------------------|---|--|
| Criteria | During test | After test |
| A | Shall operate as intended. May show degradation of performance (see note1). Shall be no loss of function. Shall be no unintentional transmissions. | Shall operate as intended. Shall be no degradation of performance (see note 2). Shall be no loss of function. Shall be no loss of stored data or user programmable functions. |
| B | May show loss of function (one or more). May show degradation of performance (see note 1). No unintentional transmissions. | Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no degradation of performance (see note 2). Shall be no loss of stored data or user programmable functions. |
| C | May be loss of function (one or more). | Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no degradation of performance (see note 2). |

Note 1: Degradation of performance during the test is understood as a degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance.

If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

Note 2: No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

9 Electrostatic Discharge Immunity Test (ESD)

9.1 Test Specification

| | |
|-----------------------------|--|
| Basic Standard: | EN 61000-4-2 |
| Discharge Impedance: | 330 ohm / 150 pF |
| Discharge Voltage: | Air Discharge : NA Contact Discharge : $\pm 2, \pm 4$ kV (Indirect) |
| Number of Discharge: | Minimum 20 times at each test point |
| Discharge Mode: | Single Discharge |
| Discharge Period: | 1 second minimum |

9.2 Test Instruments

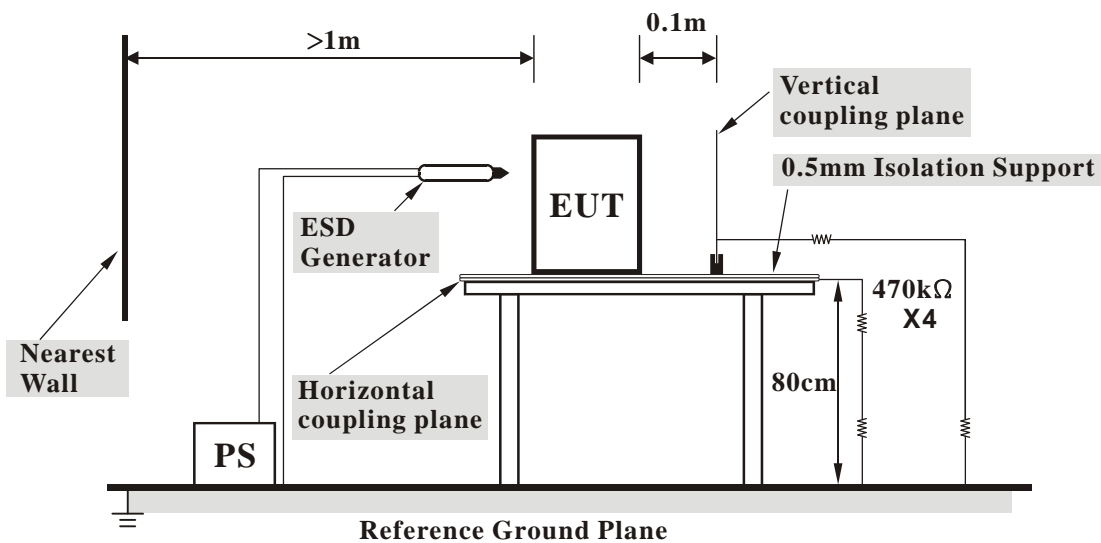
| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED DATE | CALIBRATED UNTIL |
|----------------------------|-------------|------------|-----------------|------------------|
| ESD Simulator NoiseKen | ESS-100L(A) | 0189C01491 | May 29, 2014 | May 28, 2015 |

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. The test was performed in ESD room A .
3. Tested Date: Nov. 10, 2014

9.3 Test Arrangement

- a. Electrostatic discharges were applied only to those points and surfaces of the EUT that are accessible to users during normal operation.
- b. The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.
- c. The time interval between two successive single discharges was at least 1 second.
- d. The ESD generator was held perpendicularly to the surface to which the discharge was applied and the return cable was at least 0.2 meters from the EUT.
- e. Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
- f. 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.
- g. At least ten single discharges (in the most sensitive polarity) were applied to the **Horizontal Coupling Plane** at points on each side of the EUT. The ESD generator was positioned at a distance of 0.1 meters from the EUT with the discharge electrode touching the **HCP**.
- h. At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the **Vertical Coupling Plane** 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.



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

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 940kΩ total impedance. The equipment under test, was installed in a representative system as described in section 7 of EN/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.

9.4 Supplementary Information

There is not any deviation from the test standards for the test method.

9.5 Test Results (Mode 1 & 2)

| | | | |
|--------------------------|----------------------------|-----------|------------|
| Input Power | 3.3Vdc from host equipment | Tested by | Barry Lee |
| Environmental conditions | 23 °C, 45% RH 1005 mbar | Test mode | Mode 1 & 2 |

Note: No direct discharge surfaces found, therefore no direct discharge was executed.

| Test Results of Indirect Application | | | | | |
|--------------------------------------|----------------|------------|---------------------------|-------------------------|-----------------------|
| Discharge Level (kV) | Polarity (+/-) | Test Point | Horizontal Coupling Plane | Vertical Coupling Plane | Performance Criterion |
| 2, 4 | +/- | Four Sides | Note 1 | Note 1 | A |

Description of test points of indirect application:

1. Front side 2. Rear side 3. Right side 4. Left side

Note: 1. The EUT function was correct during the test.

10 Radiated, Radio-frequency, Electromagnetic Field Immunity Test (RS)

10.1 Test Specification

| | |
|----------------------|------------------------------------|
| Basic Standard: | EN 61000-4-3 |
| Frequency Range: | 80 MHz ~ 6000 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 |
| Antenna Height: | 1.5m |
| Dwell Time: | 3 seconds |

10.2 Test Instruments

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED DATE | CALIBRATED UNTIL |
|--------------------------------------|-----------|------------|-----------------|------------------|
| Signal Generator KEYSIGHT | N5182B | MY53051971 | Sep. 26, 2016 | Sep. 25, 2017 |
| Power Amplifier ETS-LINGREN | 8100-002 | 00163537 | NA | NA |
| Power Amplifier ETS-LINGREN | 8100-008 | 00163547 | NA | NA |
| RF Voltage Meter KEYSIGHT | N1914A | MY55326005 | Sep. 29, 2016 | Sep. 28, 2017 |
| Electric Field Sensor ETS-LINGREN | HI-6105 | 00203614 | Oct. 07, 2016 | Oct. 06, 2017 |
| LOG ANTENNA ETS-LINGREN | AT5080ANT | 309740 | NA | NA |
| HORN ANTENNA ETS-LINGREN | 3119 | 00203652 | NA | NA |
| TILE!(Software) ETS-LINGREN | 7.1.3.34 | NA | NA | NA |

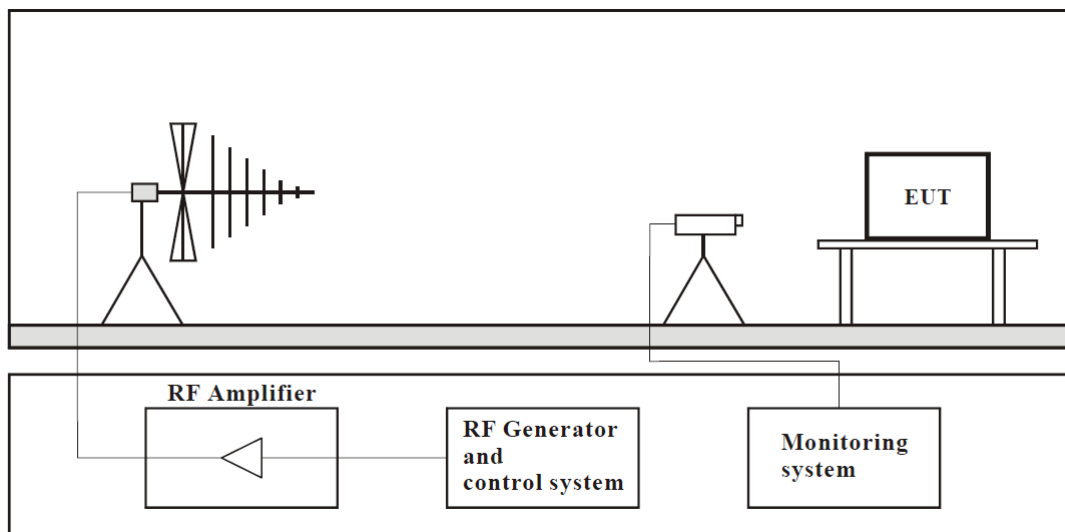
Note:

1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Chamber Room No. H.
- 3 The transmit antenna was located at a distance of 3.0 meters from the EUT.
4. Tested Date: Mar. 31, 2017

10.3 Test Arrangement

The test procedure was in accordance with EN 61000-4-3.

- The testing was performed in a modified semi-anechoic chamber.
- The frequency range is swept from 80 MHz to 6000 MHz, with the signal 80% amplitude modulated with a 1kHz sine wave.
- The field strength level was 3 V/m.
- The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.



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 EN/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 EN/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.

10.4 Supplementary Information

There is not any deviation from the test standards for the test method.

10.5 Test Results (Mode 1)

| | | | |
|--------------------------|----------------------------|-----------|----------|
| Input Power | 3.3Vdc from host equipment | Test Mode | Mode 1 |
| Environmental Conditions | 22°C, 60% RH | Tested By | Jay Chan |

| Frequency (MHz) | Polarity | Azimuth(°) | Applied Field Strength | | Observation | Remarks | Performance Criterion |
|-----------------|----------|-----------------|------------------------|---------------|-------------|---------|-----------------------|
| | | | (V/m) | Modulation | | | |
| 80 - 6000 | V&H | 0, 90, 180, 270 | 3 | 80% AM (1kHz) | Note 1* | Pass | A |

Note: 1. The EUT function was correct during the test.

- * The EUT has function lose from 2280MHz to 2603.5MHz during the test, but this band is exclusion band in EN 301 489-17, the test result (the function lose) is acceptable under this condition.

10.6 Test Results (Mode 2)

| | | | |
|--------------------------|----------------------------|-----------|----------|
| Input Power | 3.3Vdc from host equipment | Test Mode | Mode 2 |
| Environmental Conditions | 22°C, 60% RH | Tested By | Jay Chan |

| Frequency (MHz) | Polarity | Azimuth(°) | Applied Field Strength | | Observation | Remarks | Performance Criterion |
|-----------------|----------|-----------------|------------------------|---------------|-------------|---------|-----------------------|
| | | | (V/m) | Modulation | | | |
| 80 - 6000 | V&H | 0, 90, 180, 270 | 3 | 80% AM (1kHz) | Note 1* | Pass | A |

Note: 1. The EUT function was correct during the test.

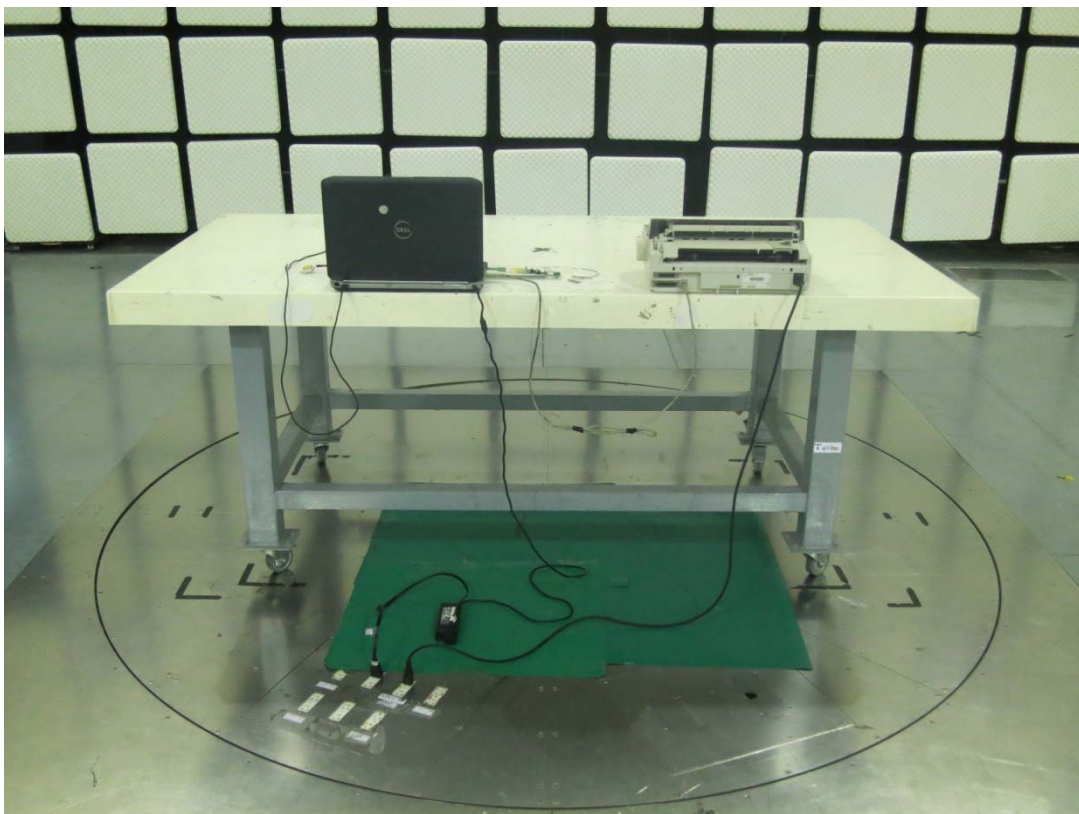
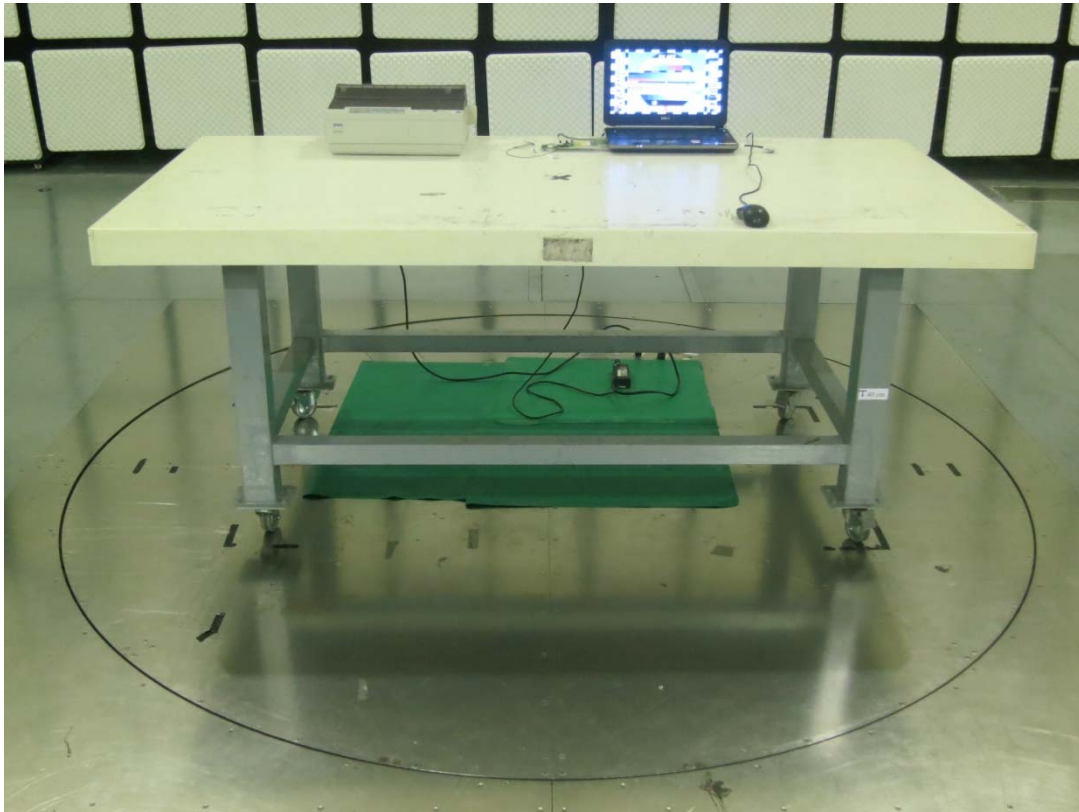
- * The EUT has function lose from 4880MHz to 5995MHz during the test, but this band is exclusion band in EN 301 489-17, the test result (the function lose) is acceptable under this condition.

11 Pictures of Test Arrangements

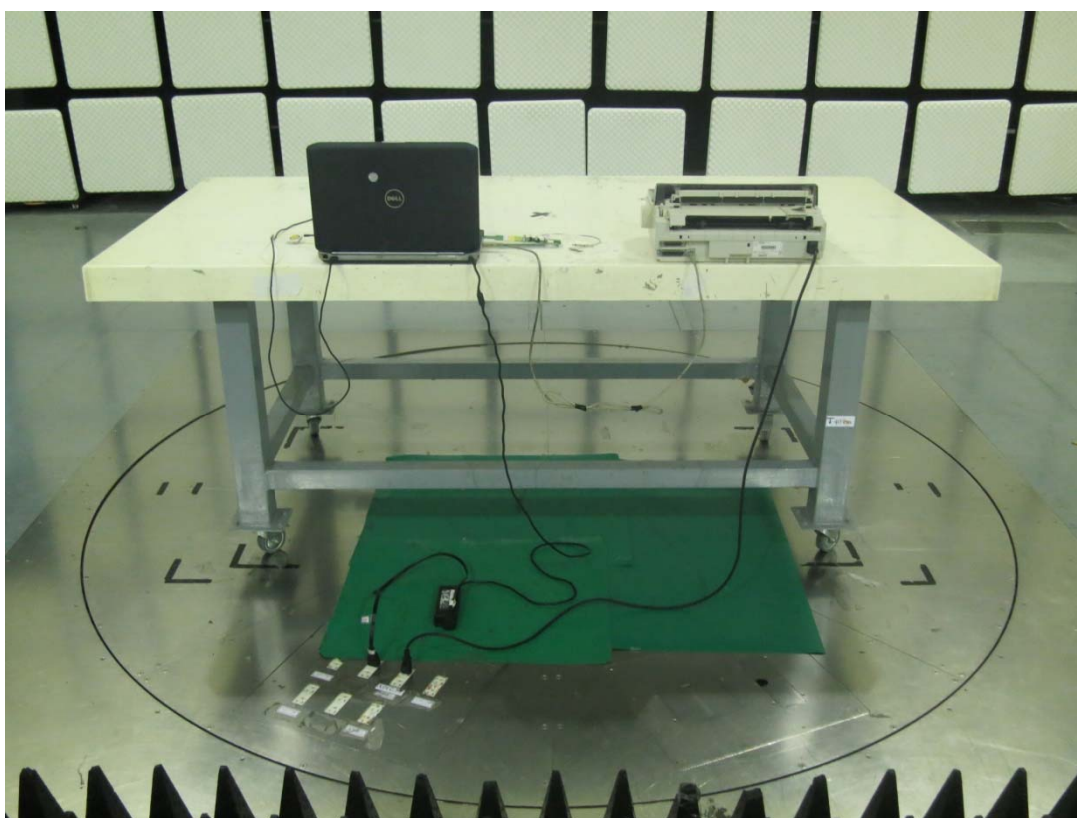
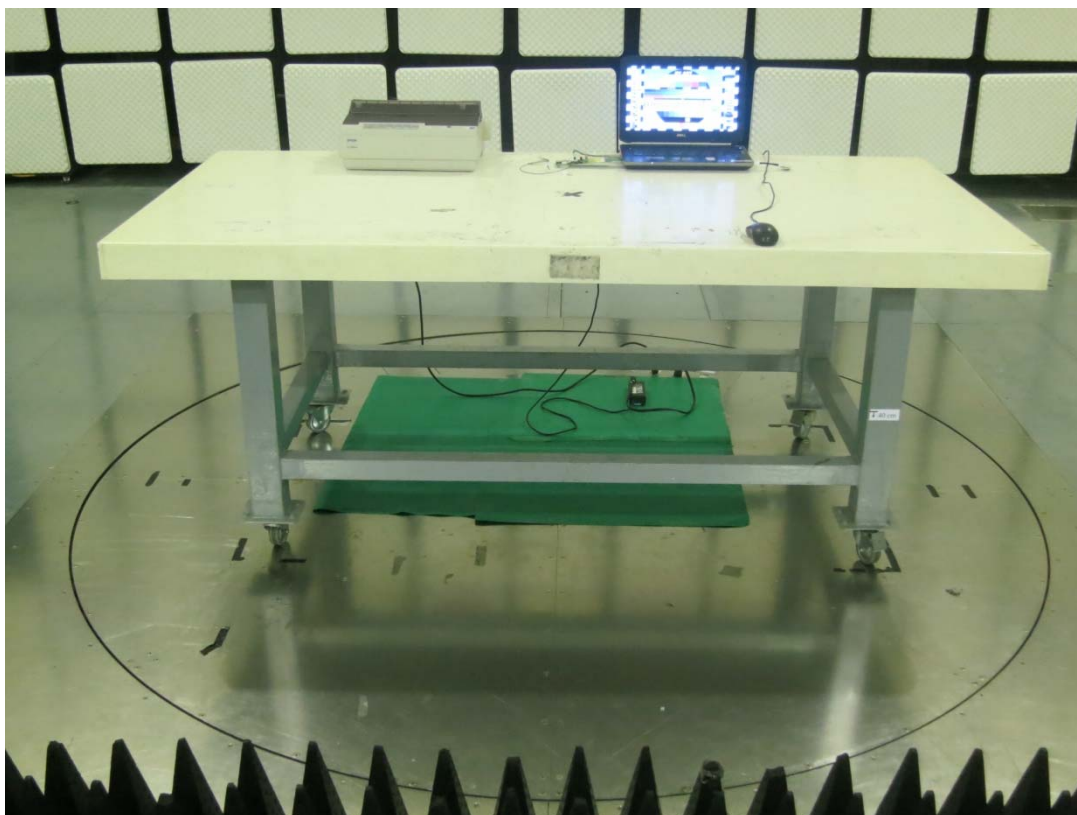
11.1 Conducted Emission from the AC Mains Power Port



11.2 Radiated Emission at Frequencies up to 1GHz



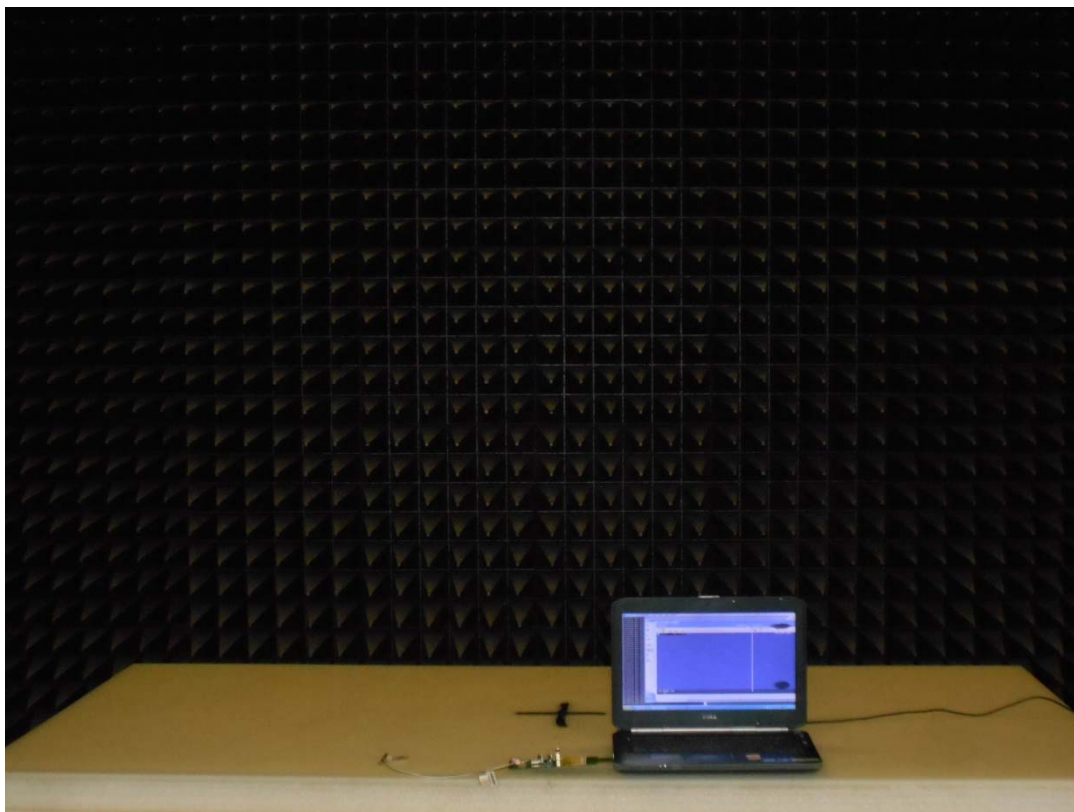
11.3 Radiated Emission at Frequencies above 1GHz



11.4 Electrostatic Discharge Immunity Test (ESD)



11.5 Radio-frequency, Electromagnetic Field Immunity Test (RS)



Appendix – Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

--- END ---