



FCC TEST REPORT

REPORT NO.: RF990708C04
MODEL NO.: DHM-401T
FCC ID : KA2HM401TA1
RECEIVED: Jun. 30, 2010
TESTED: Jul. 13 ~ Jul. 29, 2010
ISSUED: Aug. 04, 2010

APPLICANT : D-Link Corporation.

ADDRESS : 17595 Mt. Herrmann, Fountain Valley, CA 92708,
U.S.A.

ISSUED BY : Bureau Veritas Consumer Products Services (H.K.)
Ltd., Taoyuan Branch

LAB ADDRESS : No. 47, 14th Ling, Chia Pau Tsuen, Lin Kou
Hsiang, Taipei Hsien 244, Taiwan, R.O.C.

TEST LOCATION : No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei
Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.

This test report consists of 33 pages in total. It may be duplicated completely for legal use with the approval of the applicant. It should not be reproduced except in full, without the written approval of our laboratory. The client should not use it to claim product certification, approval, or endorsement by TAF or any government agency. The test results in the report only apply to the tested sample.





Table of Contents

| | | |
|-------|--|----|
| 4 | CERTIFICATION | 3 |
| 5 | SUMMARY OF TEST RESULTS | 4 |
| 2.1 | MEASUREMENT UNCERTAINTY | 4 |
| 6 | GENERAL INFORMATION | 5 |
| 6.2 | GENERAL DESCRIPTION OF EUT | 5 |
| 6.3 | DESCRIPTION OF TEST MODES | 6 |
| 6.3.1 | CONFIGURATION OF SYSTEM UNDER TEST | 6 |
| 6.3.2 | TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL | 7 |
| 6.4 | GENERAL DESCRIPTION OF APPLIED STANDARDS | 9 |
| 6.5 | DESCRIPTION OF SUPPORT UNITS | 9 |
| 7 | TEST PROCEDURE AND RESULT | 10 |
| 4.1 | RADIATED EMISSION MEASUREMENT | 10 |
| 4.1.1 | LIMITS OF RADIATED EMISSION MEASUREMENT | 10 |
| 4.1.2 | TEST INSTRUMENT | 11 |
| 4.1.3 | TEST PROCEDURE | 12 |
| 4.1.4 | TEST SETUP | 13 |
| 4.1.5 | EUT OPERATING CONDITION | 13 |
| 4.1.6 | TEST RESULTS | 14 |
| 4.2 | CONDUCTED EMISSION MEASUREMENT | 18 |
| 4.2.1 | LIMITS OF CONDUCTED EMISSION MEASUREMENT | 18 |
| 4.2.2 | TEST INSTRUMENTS | 18 |
| 4.2.3 | TEST PROCEDURES | 19 |
| 4.2.4 | DEVIATION FROM TEST STANDARD | 19 |
| 4.2.5 | TEST SETUP | 20 |
| 4.2.6 | EUT OPERATING CONDITIONS | 20 |
| 7.2.1 | TEST RESULTS | 21 |
| 4.3 | 20DB OCCUPIED BANDWIDTH MEASUREMENT | 25 |
| 4.3.1 | LIMITS OF EMISSION BANDWIDTH MEASUREMENT | 25 |
| 4.3.2 | TEST INSTRUMENT | 25 |
| 4.3.3 | TEST PROCEDURE | 25 |
| 4.3.4 | DEVIATION FROM TEST STANDARD | 26 |
| 4.3.5 | TEST SETUP | 26 |
| 4.3.6 | TEST RESULTS | 26 |
| 4.4 | DEACTIVATION TIME | 28 |
| 4.4.1 | LIMITS OF DEACTIVATION TIME MEASUREMENT | 28 |
| 4.4.2 | TEST INSTRUMENTS | 28 |
| 4.4.3 | TEST PROCEDURES | 28 |
| 4.4.4 | DEVIATION FROM TEST STANDARD | 28 |
| 4.4.5 | TEST SETUP | 29 |
| 4.4.6 | TEST RESULTS | 29 |
| 8 | PHOTOGRAPHS OF THE TEST CONFIGURATION | 31 |
| 9 | INFORMATION ON THE TESTING LABORATORIES | 32 |
| 10 | APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB | 33 |



4 CERTIFICATION

PRODUCT: Home Monitoring Gateway
MODEL: DHM-401T
BRAND: D-Link
APPLICANT: D-Link Corporation
TESTED: Jul. 13 ~ Jul. 29, 2010
TEST SAMPLE: ENGINEERING SAMPLE
STANDARDS: **FCC Part 15, Subpart C (Section 15.231)**
ANSI C63.4-2003

The above equipment (model: DHM-401T) 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 : Andrea Hsia , **DATE:** Aug. 04, 2010
Andrea Hsia / Specialist

TECHNICAL ACCEPTANCE : Long Chen , **DATE:** Aug. 04, 2010
Responsible for RF Long Chen / Senior Engineer

APPROVED BY : Gary Chang , **DATE:** Aug. 04, 2010
Gary Chang / Assistant Manager

5 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

| APPLIED STANDARD: FCC Part 15, Subpart C (Section 15.231) | | | |
|---|--------------------------------|--------|--|
| STANDARD SECTION | TEST TYPE AND LIMIT | RESULT | REMARK |
| 15.207 | AC Power Conducted Emission | PASS | Meet the requirement of limit. Minimum passing margin is -9.98dB at 0.154MHz |
| 15.209 15.231(b) | Radiated Emission Test | PASS | Meet the requirement of limit. Minimum passing margin is -6.7dB at 315.00MHz |
| 15.231(c) | Emission Bandwidth Measurement | PASS | Meet the requirement of limit |
| 15.231(a) | De-activation | PASS | Meet the requirement of limit |

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:

| MEASUREMENT | FREQUENCY | UNCERTAINTY |
|---------------------|-----------------|-------------|
| Conducted emissions | 150kHz~30MHz | 2.44 dB |
| Radiated emissions | 30MHz ~ 200MHz | 3.19 dB |
| | 200MHz ~1000MHz | 3.21 dB |
| | 1GHz ~ 18GHz | 2.26 dB |
| | 18GHz ~ 40GHz | 1.94 dB |

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

6 GENERAL INFORMATION

6.2 GENERAL DESCRIPTION OF EUT

| | |
|--------------------------|---|
| PRODUCT | Home Monitoring Gateway |
| MODEL NO. | DHM-401T |
| FCC ID | KA2HM401TA1 |
| POWER SUPPLY | 12Vdc from Adapter |
| MODULATION TYPE | GFSK |
| CARRIER FREQUENCY | 314.9972MHz |
| NUMBER OF CHANNEL | 1 |
| ANTENNA TYPE | monopole printed antenna with 0dBi gain |
| DATA CABLE | NA |
| I/O PORTS | NA |
| ACCESSORY DEVICES | Battery |

NOTE:

1. The EUT is powered by the following adapter.

| | |
|---------------------|--------------------------------------|
| BRAND | D-Link |
| MODEL NO | CG2412-B |
| INPUT POWER | 100-240Vac, 0.5A, 50/60Hz |
| OUTPUT POWER | 12Vdc, 2A |
| POWER LINE | 1.8m non-shielded cable without core |

2. Co-transmitting emission of the product and Z-wave/3G dongle have been evaluated and no non-compliance detected
3. The above EUT information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

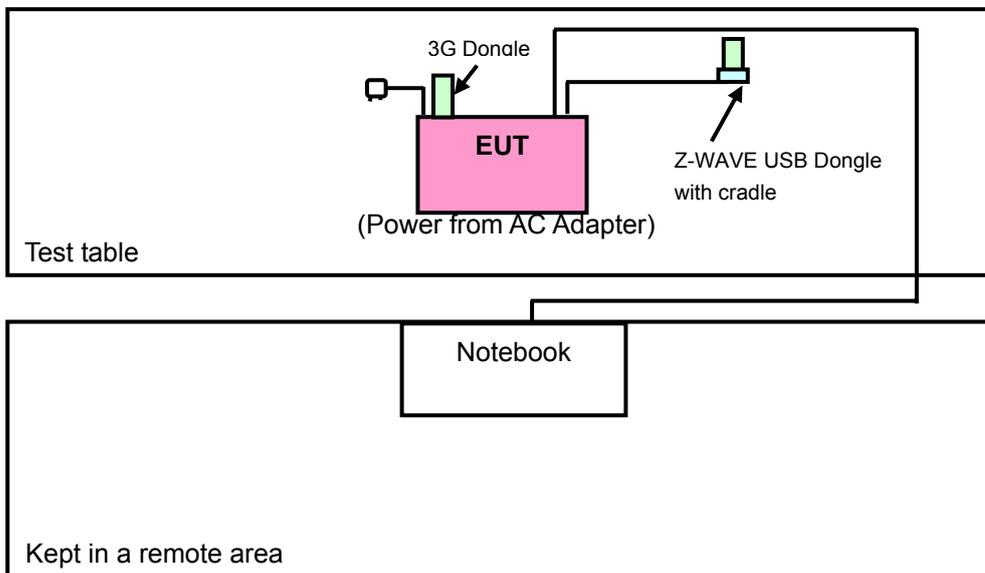
6.3 DESCRIPTION OF TEST MODES

One channel was provided to this EUT.

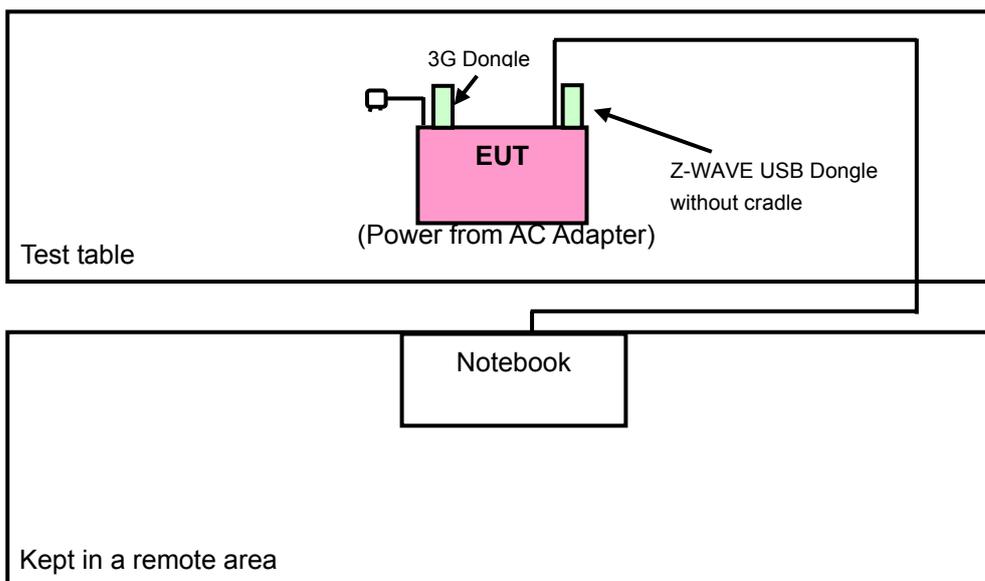
| CHANNEL | FREQUENCY |
|---------|-------------|
| 1 | 314.9972MHz |

6.3.1 CONFIGURATION OF SYSTEM UNDER TEST

Test Mode A



Test Mode B





6.3.2 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

| EUT CONFIGURE MODE | APPLICABLE TO | | | | | DESCRIPTION |
|--------------------|---------------|---------|-----|----|----|------------------------------------|
| | RE ≥ 1G | RE < 1G | PLC | EB | DT | |
| A | - | √ | √ | - | - | EUT + Z wave dongle with cradle |
| B | √ | √ | √ | √ | √ | EUT + Z wave dongle without cradle |

Where **RE ≥ 1G**: Radiated Emission above 1GHz **RE < 1G**: Radiated Emission below 1GHz
PLC: Power Line Conducted Emission **EB**: 20dB Bandwidth measurement
DT: Deactivation Time measurement **NOTE**: "-" means no effect.

RADIATED EMISSION TEST (ABOVE 1 GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and XYZ axis.
- Following channel(s) was (were) selected for the final test as listed below.

| EUT CONFIGURE MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE | AXIS |
|--------------------|-------------------|----------------|-----------------|------|
| B | 1 | 1 | GFSK | Z |

RADIATED EMISSION TEST (BELOW 1 GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and XYZ axis.
- Following channel(s) was (were) selected for the final test as listed below.

| EUT CONFIGURE MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE | AXIS |
|--------------------|-------------------|----------------|-----------------|------|
| A | 1 | 1 | GFSK | Z |
| B | 1 | 1 | GFSK | Z |

POWER LINE CONDUCTED EMISSION TEST:

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

| EUT CONFIGURE MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE |
|--------------------|-------------------|----------------|-----------------|
| A | 1 | 1 | GFSK |
| B | 1 | 1 | GFSK |

EMISSION BANDWIDTH MEASUREMENT:

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations.
- Following channel(s) was (were) selected for the final test as listed below.

| EUT CONFIGURE MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE |
|--------------------|-------------------|----------------|-----------------|
| B | 1 | 1 | GFSK |



DEACTIVATION TIME MEASUREMENT:

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations.
- Following channel(s) was (were) selected for the final test as listed below.

| EUT CONFIGURE MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE |
|--------------------|-------------------|----------------|-----------------|
| B | 1 | 1 | GFSK |

TEST CONDITION:

| APPLICABLE TO | ENVIRONMENTAL CONDITIONS | INPUT POWER | TESTED BY |
|---------------|---------------------------|-------------|-------------|
| RE \geq 1G | 24deg. C, 62%RH, 1011 hPa | 12Vdc | Kevin Liang |
| RE $<$ 1G | 24deg. C, 62%RH, 1011 hPa | 12Vdc | Kevin Liang |
| PLC | 24deg. C, 62%RH, 1011 hPa | 12Vdc | Peter Lin |
| EB | 22deg. C, 65%RH, 1009 hPa | 12Vdc | Kevin Liang |
| DT | 24deg. C, 63%RH, 1011 hPa | 12Vdc | Kevin Liang |

6.4 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C (15.231) **ANSI C63.4-2003**

All test items have been performed and recorded as per the above standards.

NOTE: The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

6.5 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.

| NO. | PRODUCT | BRAND | MODEL NO. | SERIAL NO. | FCC ID |
|-----|-------------------|--------|-----------|-------------|------------|
| 1 | 3G DONGLE | D-Link | DWM-156 | NA | KA2-WM1561 |
| 2 | Z-WAVE USB DONGLE | D-Link | DHM-101 | NA | KA2HM101A1 |
| 3 | NOTEBOOK | DELL | PP05L | 12130898320 | E2K24CLNS |

| NO. | SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS |
|-----|---|
| 1 | NA |
| 2 | 0.96m shielded USB cable without core |
| 3 | NA |

NOTE: 1. All power cords of the above support units are non shielded (1.8m).
2. Item 3 act as a communication partner to transfer data.
3. Item 2 ~ 3 & USB cable (0.96m) were supplied from client.

7 TEST PROCEDURE AND RESULT

4.1 RADIATED EMISSION MEASUREMENT

4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT

According to 15.231 the field strength of emissions from intentional radiators operated under these frequencies bands shall not exceed the following:

| Fundamental Frequency (MHz) | Field Strength of Fundamental | | Field Strength of Spurious | |
|-----------------------------|-------------------------------|---------------|----------------------------|---------------|
| | uV/meter | dBuV/meter | uV/meter | dBuV/meter |
| 40.66 ~ 40.70 | 2250 | 67.04 | 225 | 48.04 |
| 70 ~ 130 | 1250 | 61.94 | 125 | 41.94 |
| 130 ~ 174 | 1250 ~ 3750 | 61.94 ~ 71.48 | 125 ~ 375 | 41.94 ~ 51.48 |
| 174 ~ 260 | 3750 | 71.48 | 75 | 37.50 |
| 260 ~ 470 | 3750 ~ 12500 | 71.48 ~ 81.94 | 375 ~ 1250 | 51.48 ~ 61.94 |
| Above 470 | 12500 | 81.94 | 1250 | 61.94 |

NOTE:

1. Where F is the frequency in MHz, the formula for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, uV/m at 3 meters = $56.81818(F)-6136.3636$; for the band 260-470 MHz, uV/m at 3 meters = $41.6667(F)- 7083.3333$. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.
2. The above field strength limits are specified at a distance of 3meters. The tighter limits apply at the band edges.

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

| Frequencies (MHz) | Field strength (microvolts/meter) | Measurement distance (meters) |
|-------------------|-----------------------------------|-------------------------------|
| 0.009 ~ 0.490 | 2400/F(kHz) | 300 |
| 0.490 ~ 1.705 | 24000/F(kHz) | 30 |
| 1.705 ~ 30.0 | 30 | 30 |
| 30 ~ 88 | 100 | 3 |
| 88 ~ 216 | 150 | 3 |
| 216 ~ 960 | 200 | 3 |
| Above 960 | 500 | 3 |

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

4.1.2 TEST INSTRUMENT

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | DATE OF CALIBRATION | DUE DATE OF CALIBRATION |
|---|------------------------------|----------------------|---------------------|-------------------------|
| Test Receiver ROHDE & SCHWARZ | ESIB7 | 100188 | Dec. 21, 2009 | Dec. 20, 2010 |
| Spectrum Analyzer ROHDE & SCHWARZ | FSP40 | 100041 | Jul. 09, 2010 | Jul. 08, 2011 |
| BILOG Antenna SCHWARZBECK | VULB9168 | 9168-156 | Apr. 30, 2010 | Apr. 29, 2011 |
| HORN Antenna SCHWARZBECK | BBHA 9120 D | 9120D-563 | Aug. 10, 2009 | Aug. 09, 2010 |
| HORN Antenna SCHWARZBECK | BBHA 9170 | BBHA9170242 | Dec. 25, 2009 | Dec. 24, 2010 |
| Preamplifier Agilent | 8449B | 3008A01910 | Sep. 11, 2009 | Sep. 10, 2010 |
| Preamplifier Agilent | 8447D | 2944A10638 | Dec. 21, 2009 | Dec. 20, 2010 |
| RF signal cable HUBER+SUHNNER | SUCOFLEX 104 | 218190/4 231241/4 | May 14, 2010 | May 13, 2011 |
| RF signal cable Worken | 8D-FB | Cable-HYCH9-01 | Aug. 17, 2009 | Aug. 16, 2010 |
| Software | ADT_Radiated_ V7.6.15.9.2 | NA | NA | NA |
| Antenna Tower EMCO | 2070/2080 | 512.835.4684 | NA | NA |
| Turn Table EMCO | 2087-2.03 | NA | NA | NA |
| Antenna Tower & Turn Table Controller EMCO | 2090 | NA | NA | NA |

- 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 HwaYa Chamber 9.
 3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
 4. The FCC Site Registration No. is 460141.
 5. The IC Site Registration No. is IC 7450F-4.

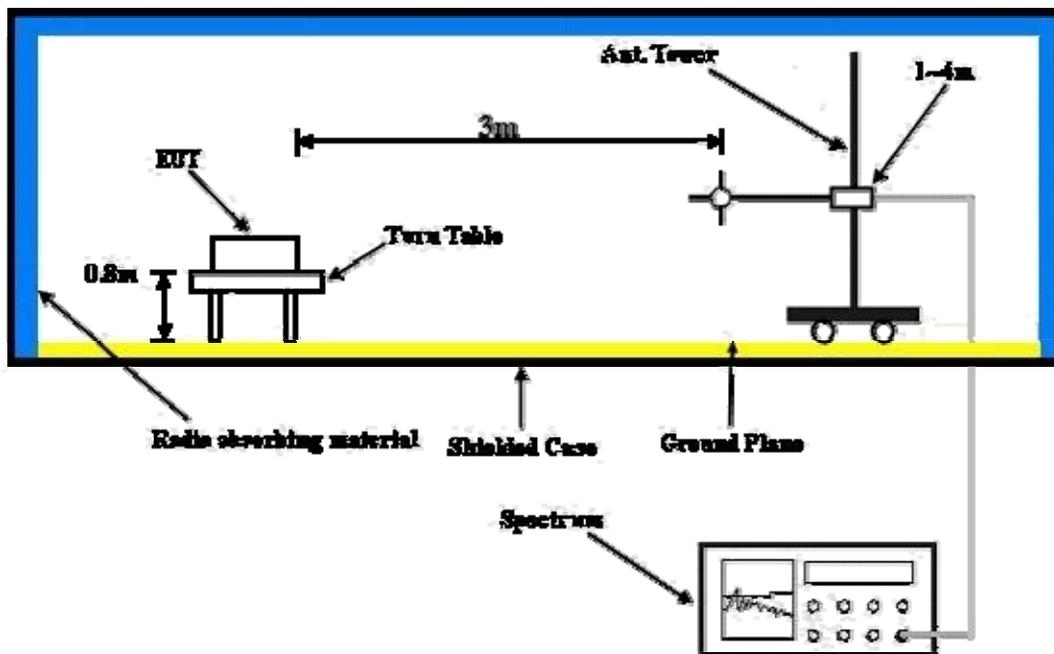
4.1.3 TEST PROCEDURE

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. 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.
- d. 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.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using the quasi-peak method or average method as specified and then reported in Data sheet peak mode and QP mode.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 TEST SETUP



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.5 EUT OPERATING CONDITION

Set the transmitter part of EUT under transmission condition continuously at specific channel frequency.



4.1.6 TEST RESULTS

ABOVE 1GHz DATA

| EUT TEST CONDITION | | MEASUREMENT DETAIL | |
|--------------------------|-----------------------------|--------------------|---------------------------|
| CHANNEL | Channel 1 | FREQUENCY RANGE | 1 ~ 5GHz |
| INPUT POWER | 3Vdc | DETECTOR FUNCTION | Peak (PK) Average (AV) |
| ENVIRONMENTAL CONDITIONS | 25deg. C, 62%RH 1011 hPa | TESTED BY | Kevin Liang |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | |
|---|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | 1575.00 | 45.9 PK | 74.0 | -28.1 | 1.50 H | 135 | 16.40 | 29.50 |
| 2 | 1575.00 | 22.5 AV | 54.0 | -31.5 | 1.50 H | 135 | -7.00 | 29.50 |
| 3 | 2835.00 | 45.7 PK | 74.0 | -28.3 | 1.30 H | 82 | 11.90 | 33.80 |
| 4 | 2835.00 | 22.3 AV | 54.0 | -31.7 | 1.30 H | 82 | -11.50 | 33.80 |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | |
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | 1575.00 | 44.8 PK | 74.0 | -29.2 | 1.29 V | 37 | 15.30 | 29.50 |
| 2 | 1575.00 | 21.4 AV | 54.0 | -32.6 | 1.29 V | 37 | -8.10 | 29.50 |
| 3 | 2835.00 | 44.8 PK | 74.0 | -29.2 | 1.29 V | 139 | 11.00 | 33.80 |
| 4 | 2835.00 | 21.4 AV | 54.0 | -32.6 | 1.29 V | 139 | -12.40 | 33.80 |

- 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).
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.
 5. “ * “ : Fundamental frequency
 6. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:
 $20 \log (\text{Duty cycle}) = 20 \log (6.78 \text{ ms} / 100 \text{ ms}) = -23.4\text{dB}$

Please see page 17 for plotted duty.



A D T

Below 1GHz Worst-Case Data

| EUT TEST CONDITION | | MEASUREMENT DETAIL | |
|--------------------|---------------|--------------------------|-----------------------------|
| FREQUENCY RANGE | Below 1000MHz | DETECTOR FUNCTION | Quasi-Peak / Peak / Average |
| INPUT POWER | 3Vdc | ENVIRONMENTAL CONDITIONS | 25deg. C, 62%RH 1011 hPa |
| TEST MODE | A | TESTED BY | Kevin Liang |

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
|-----|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| 1 | 62.45 | 20.6 QP | 40.0 | -19.4 | 1.50 H | 107 | 7.60 | 13.00 |
| 2 | 114.75 | 29.8 QP | 43.5 | -13.7 | 1.25 H | 141 | 18.60 | 11.20 |
| 3 | 195.12 | 26.7 QP | 43.5 | -16.8 | 1.50 H | 111 | 15.70 | 11.00 |
| 4 | 397.55 | 32.3 QP | 46.0 | -13.7 | 1.75 H | 251 | 16.20 | 16.10 |
| 5 | 595.40 | 33.9 QP | 46.0 | -12.1 | 1.50 H | 78 | 12.00 | 21.90 |
| 6 | 688.01 | 30.3 QP | 46.0 | -15.7 | 1.00 H | 297 | 7.60 | 22.70 |

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
|-----|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| 1 | 64.90 | 31.3 QP | 40.0 | -8.7 | 1.25 V | 122 | 18.80 | 12.50 |
| 2 | 117.45 | 33.6 QP | 43.5 | -9.9 | 1.25 V | 79 | 22.10 | 11.50 |
| 3 | 243.66 | 25.4 QP | 46.0 | -20.6 | 1.50 V | 144 | 12.80 | 12.60 |
| 4 | 500.45 | 29.8 QP | 46.0 | -16.2 | 1.75 V | 251 | 10.50 | 19.30 |
| 5 | 595.64 | 32.5 QP | 46.0 | -13.5 | 2.00 V | 351 | 10.60 | 21.90 |
| 6 | 700.54 | 30.5 QP | 46.0 | -15.5 | 1.50 V | 122 | 7.70 | 22.80 |

- 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).
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.



| EUT TEST CONDITION | | MEASUREMENT DETAIL | |
|--------------------|---------------|--------------------------|-----------------------------|
| FREQUENCY RANGE | Below 1000MHz | DETECTOR FUNCTION | Quasi-Peak / Peak / Average |
| INPUT POWER | 3Vdc | ENVIRONMENTAL CONDITIONS | 25deg. C, 62%RH 1011 hPa |
| TEST MODE | B | TESTED BY | Kevin Liang |

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

| No. | Freq. (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
|-----|----------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| 1 | 47.40 | 26.4 QP | 40.0 | -13.6 | 1.25 H | 286 | 13.3 | 13.1 |
| 2 | 249.60 | 32.5 QP | 46.0 | -13.5 | 1.25 H | 247 | 19.6 | 12.9 |
| 3 | *315.00 | 74.8 PK | 95.6 | -6.7 | 1.00 H | 231 | 74.8 | 14.1 |
| 4 | *315.00 | 51.4 AV | 75.6 | -10.1 | 1.00 H | 231 | 51.4 | 14.1 |
| 5 | 397.37 | 32.7 QP | 46.0 | -13.3 | 2.00 H | 250 | 16.7 | 16.0 |
| 6 | 500.42 | 30.7 QP | 46.0 | -15.3 | 1.50 H | 247 | 11.4 | 19.3 |
| 7 | 630.00 | 39.9 PK | 75.6 | -35.7 | 1.20 H | 236 | 17.7 | 22.2 |
| 8 | 630.00 | 16.5 AV | 55.6 | -39.1 | 1.20 H | 236 | -5.7 | 22.2 |
| 9 | 700.68 | 32.1 QP | 46.0 | -13.9 | 2.00 H | 64 | 9.3 | 22.8 |
| 10 | 945.00 | 48.4 PK | 75.6 | -27.2 | 1.63 H | 125 | 21.9 | 26.5 |
| 11 | 945.00 | 25.0 AV | 55.6 | -30.6 | 1.63 H | 125 | -1.5 | 26.5 |
| 12 | 963.16 | 38.0 QP | 54.0 | -16.0 | 1.25 H | 289 | 11.4 | 26.6 |

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

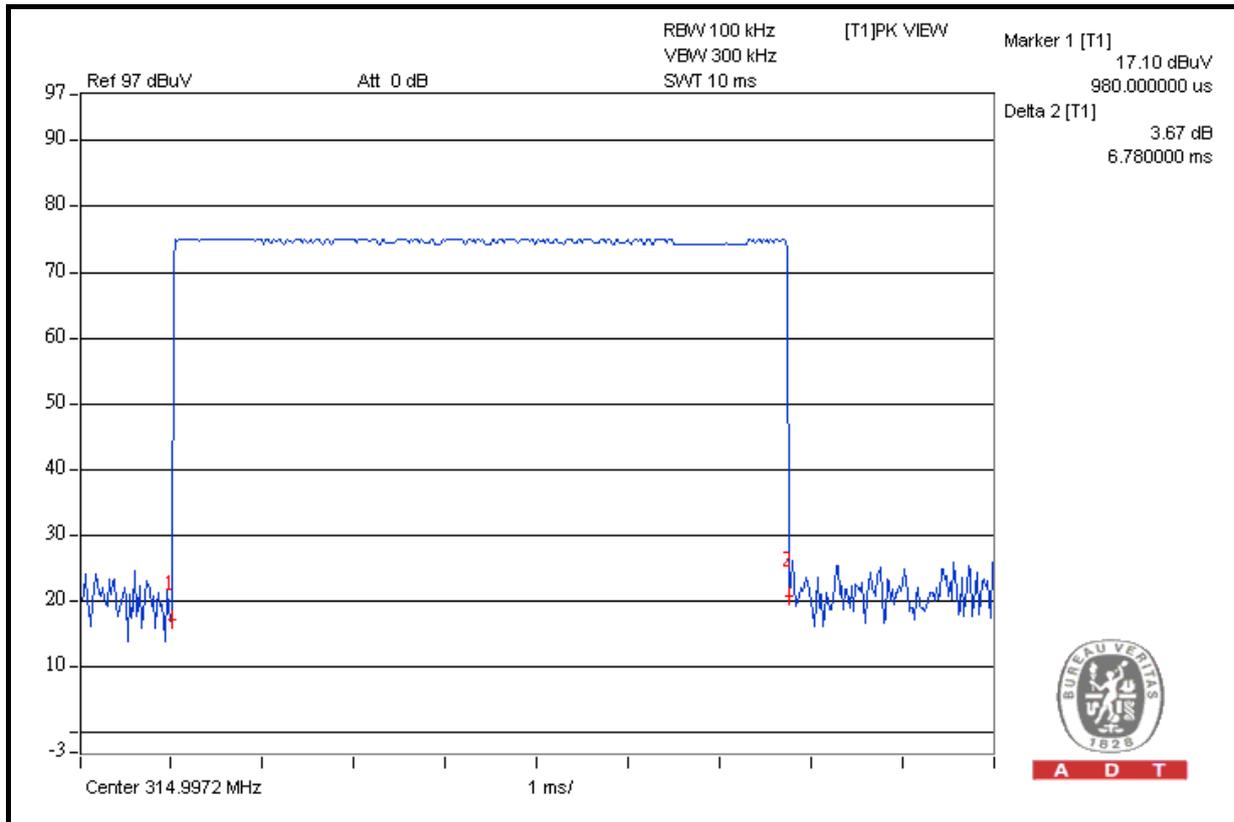
| No. | Freq. (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
|-----|----------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| 1 | 105.73 | 31.6 QP | 43.5 | -11.9 | 1.00 V | 280 | 21.50 | 10.10 |
| 2 | 249.60 | 28.1 QP | 46.0 | -17.9 | 1.00 V | 268 | 15.20 | 12.90 |
| 3 | *315.00 | 73.6 PK | 95.6 | -7.9 | 1.51 V | 305 | 73.6 | 14.1 |
| 4 | *315.00 | 50.2 AV | 75.6 | -11.3 | 1.51 V | 305 | 50.2 | 14.1 |
| 5 | 397.37 | 36.6 QP | 46.0 | -9.4 | 1.25 V | 277 | 20.60 | 16.00 |
| 6 | 500.42 | 28.9 QP | 46.0 | -17.1 | 2.00 V | 208 | 9.60 | 19.30 |
| 7 | 630.00 | 33.5 PK | 75.6 | -42.1 | 1.00 V | 0 | 11.3 | 22.2 |
| 8 | 630.00 | 10.1 AV | 55.6 | -45.5 | 1.00 V | 0 | -12.1 | 22.2 |
| 9 | 700.68 | 34.0 QP | 46.0 | -12.0 | 1.25 V | 103 | 11.20 | 22.80 |
| 10 | 945.00 | 51.1 PK | 75.6 | -24.5 | 1.01 V | 8 | 24.6 | 26.5 |
| 11 | 945.00 | 27.7 AV | 55.6 | -27.9 | 1.01 V | 8 | 1.2 | 26.5 |
| 12 | 963.16 | 35.0 QP | 54.0 | -19.0 | 1.00 V | 31 | 8.40 | 26.60 |

- 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).
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.
 5. “ * ” : Fundamental frequency
 6. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:
20 log (Duty cycle) = 20 log (6.78 ms / 100 ms) = -23.4dB

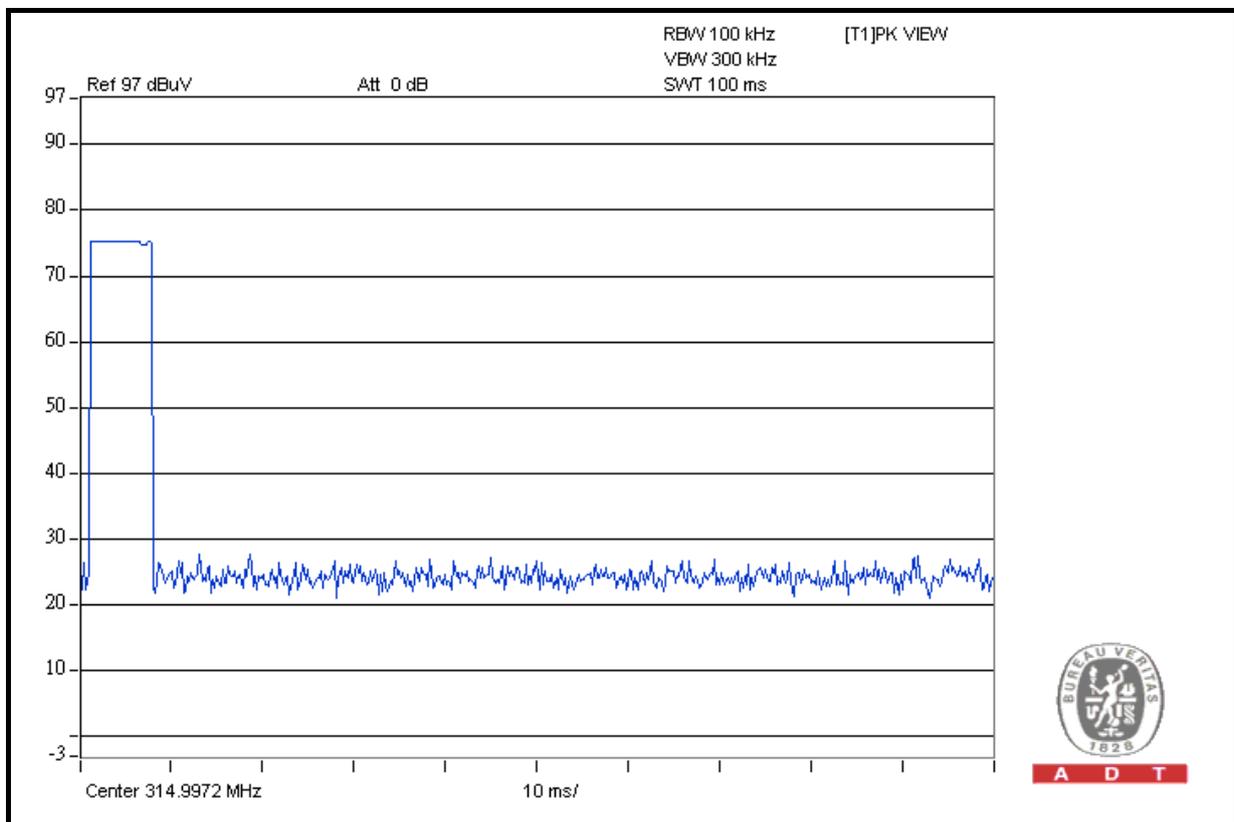
Please see page 17 for plotted duty.



A D T



A D T



A D T

$$20 \log (\text{Duty cycle}) = 20 \log (6.78 \text{ ms} / 100 \text{ ms}) = -23.4 \text{ dB}$$

4.2 CONDUCTED EMISSION MEASUREMENT

4.2.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

| FREQUENCY OF EMISSION (MHz) | CONDUCTED LIMIT (dB μ V) | |
|-----------------------------|------------------------------|----------|
| | Quasi-peak | Average |
| 0.15-0.5 | 66 to 56 | 56 to 46 |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

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

4.2.2 TEST INSTRUMENTS

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | DATE OF CALIBRATION | DUE DATE OF CALIBRATION |
|----------------------------------|---------------------|----------------|---------------------|-------------------------|
| Test Receiver ROHDE & SCHWARZ | ESCS30 | 100291 | Dec. 16, 2009 | Dec. 15, 2010 |
| RF signal cable Woken | 5D-FB | Cable-HYC01-01 | Nov. 12, 2009 | Nov. 11, 2010 |
| LISN SCHWARZBECK | NNBL 8226-2 | 8226-142 | Jun. 12, 2010 | Jun. 12, 2011 |
| LISN ROHDE & SCHWARZ | ESH3-Z5 | 835239/001 | Feb., 10, 2010 | Feb. 09, 2011 |
| Software ADT | ADT_Cond_ V7.3.7 | NA | NA | NA |

- 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 HwaYa Shielded Room 1.
 3. The VCCI Site Registration No. is C-2040.

4.2.3 TEST PROCEDURES

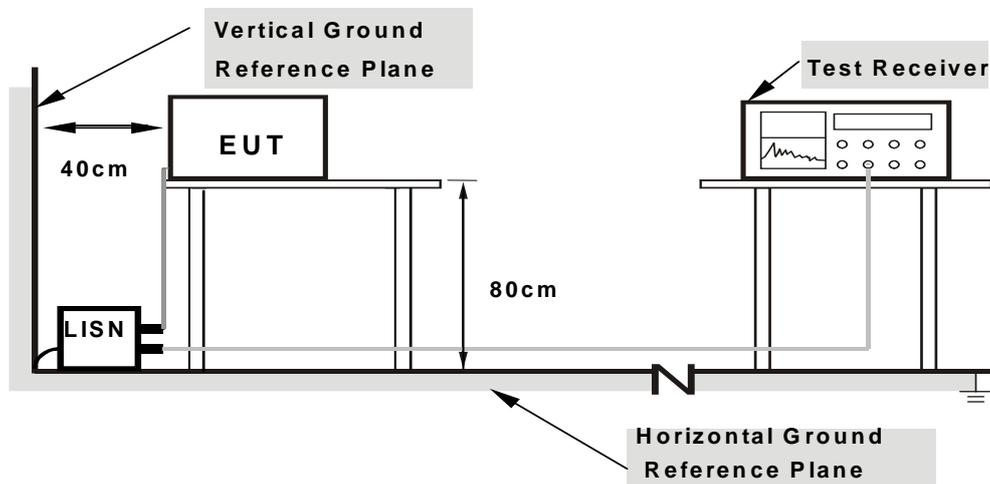
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE: All modes of operation were investigated and the worst-case emissions are reported.

4.2.4 DEVIATION FROM TEST STANDARD

No deviation.

4.2.5 TEST SETUP



- Note:** 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.2.6 EUT OPERATING CONDITIONS

Same as 4.1.6.

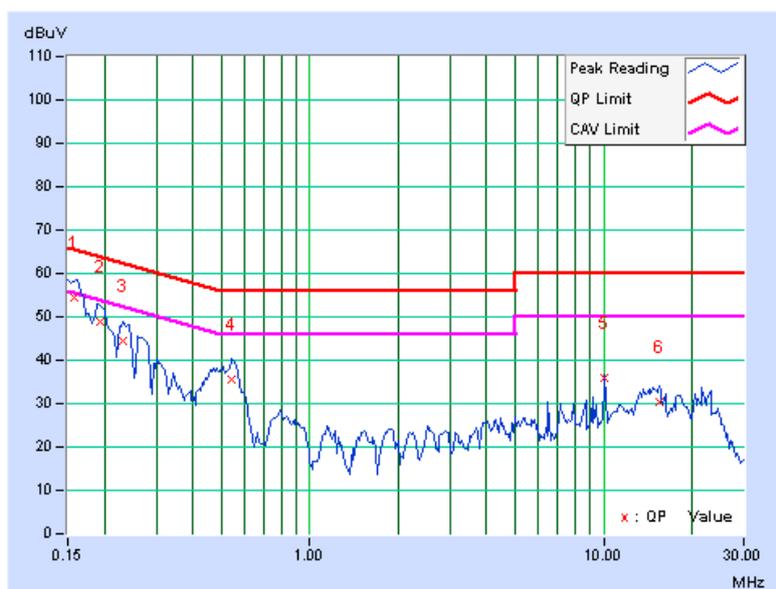
4.2.7 TEST RESULTS

CONDUCTED WORST-CASE DATA :

| | | | |
|-----------|--------|---------------|------|
| PHASE | Line 1 | 6dB BANDWIDTH | 9kHz |
| TEST MODE | A | | |

| No | Freq. [MHz] | Corr. Factor (dB) | Reading Value | | Emission Level | | Limit | | Margin | |
|----|----------------|-------------------------|---------------|-----|----------------|-----|-----------|-------|--------|-----|
| | | | [dB (uV)] | | [dB (uV)] | | [dB (uV)] | | (dB) | |
| | | | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. |
| 1 | 0.158 | 0.12 | 54.40 | - | 54.52 | - | 65.58 | 55.58 | -11.06 | - |
| 2 | 0.193 | 0.11 | 48.83 | - | 48.94 | - | 63.90 | 53.90 | -14.96 | - |
| 3 | 0.232 | 0.11 | 44.36 | - | 44.47 | - | 62.38 | 52.38 | -17.90 | - |
| 4 | 0.545 | 0.14 | 35.46 | - | 35.60 | - | 56.00 | 46.00 | -20.40 | - |
| 5 | 10.000 | 0.64 | 35.33 | - | 35.97 | - | 60.00 | 50.00 | -24.03 | - |
| 6 | 15.434 | 1.09 | 29.15 | - | 30.24 | - | 60.00 | 50.00 | -29.76 | - |

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value = Emission level - Limit value
 5. Correction factor = Insertion loss + Cable loss
 6. Emission Level = Correction Factor + Reading Value.



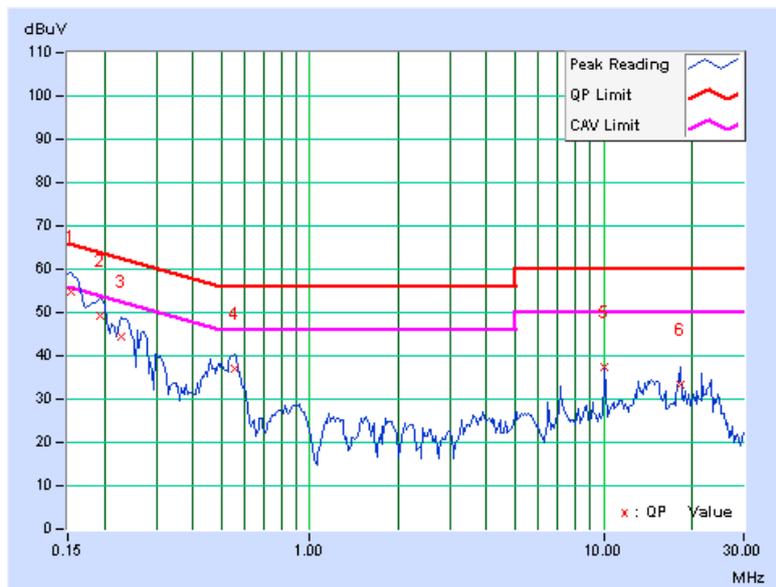


A D T

| | | | |
|-----------|--------|---------------|------|
| PHASE | Line 2 | 6dB BANDWIDTH | 9kHz |
| TEST MODE | A | | |

| No | Freq. | Corr. | Reading Value | | Emission Level | | Limit | | Margin | |
|----|--------|--------|---------------|-----|----------------|-----|-----------|-------|--------|-----|
| | [MHz] | Factor | [dB (uV)] | | [dB (uV)] | | [dB (uV)] | | (dB) | |
| | | (dB) | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. |
| 1 | 0.153 | 0.10 | 54.87 | - | 54.97 | - | 65.83 | 55.83 | -10.86 | - |
| 2 | 0.193 | 0.10 | 49.01 | - | 49.11 | - | 63.91 | 53.91 | -14.80 | - |
| 3 | 0.229 | 0.10 | 44.52 | - | 44.62 | - | 62.47 | 52.47 | -17.85 | - |
| 4 | 0.556 | 0.13 | 36.79 | - | 36.92 | - | 56.00 | 46.00 | -19.08 | - |
| 5 | 10.000 | 0.56 | 36.77 | - | 37.33 | - | 60.00 | 50.00 | -22.67 | - |
| 6 | 18.242 | 1.17 | 32.22 | - | 33.39 | - | 60.00 | 50.00 | -26.61 | - |

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value = Emission level - Limit value
 5. Correction factor = Insertion loss + Cable loss
 6. Emission Level = Correction Factor + Reading Value.



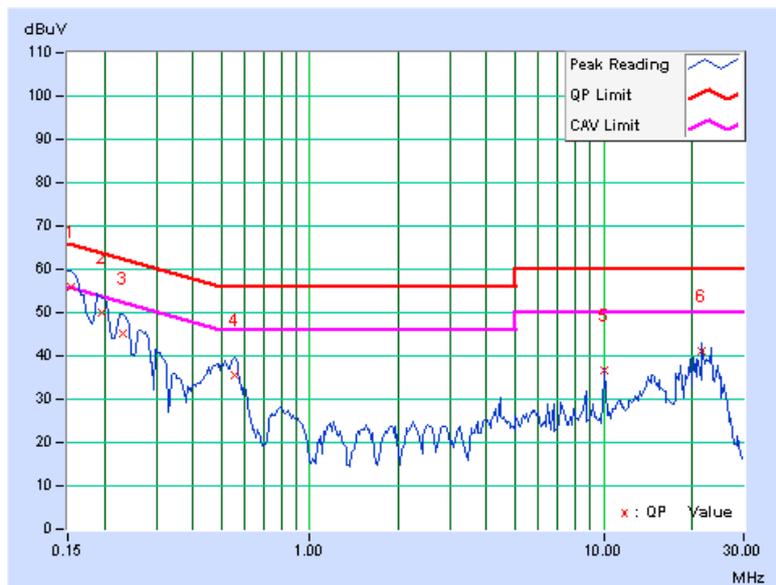


A D T

| | | | |
|-----------|--------|---------------|------|
| PHASE | Line 1 | 6dB BANDWIDTH | 9kHz |
| TEST MODE | B | | |

| No | Freq. [MHz] | Corr. Factor (dB) | Reading Value | | Emission Level | | Limit | | Margin | |
|----|----------------|-------------------------|---------------|-------|----------------|-------|-----------|-------|--------|--------|
| | | | [dB (uV)] | | [dB (uV)] | | [dB (uV)] | | (dB) | |
| | | | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. |
| 1 | 0.154 | 0.12 | 55.69 | 42.63 | 55.81 | 42.75 | 65.79 | 55.79 | -9.98 | -13.04 |
| 2 | 0.195 | 0.11 | 49.82 | - | 49.93 | - | 63.80 | 53.80 | -13.87 | - |
| 3 | 0.232 | 0.11 | 45.23 | - | 45.34 | - | 62.38 | 52.38 | -17.03 | - |
| 4 | 0.556 | 0.14 | 35.58 | - | 35.72 | - | 56.00 | 46.00 | -20.28 | - |
| 5 | 10.000 | 0.64 | 36.02 | - | 36.66 | - | 60.00 | 50.00 | -23.34 | - |
| 6 | 21.664 | 1.60 | 39.64 | - | 41.24 | - | 60.00 | 50.00 | -18.76 | - |

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value = Emission level - Limit value
 5. Correction factor = Insertion loss + Cable loss
 6. Emission Level = Correction Factor + Reading Value.



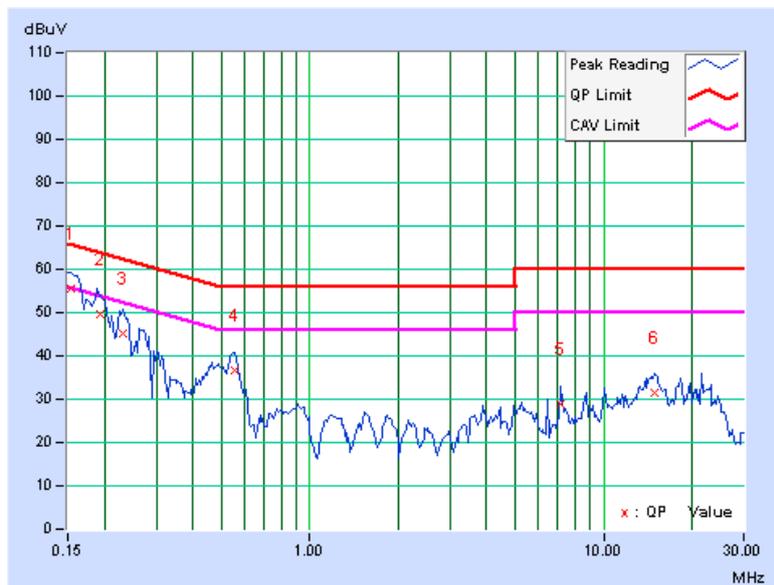


A D T

| | | | |
|-----------|--------|---------------|------|
| PHASE | Line 2 | 6dB BANDWIDTH | 9kHz |
| TEST MODE | B | | |

| No | Freq. [MHz] | Corr. Factor (dB) | Reading Value | | Emission Level | | Limit | | Margin | |
|----|----------------|-------------------------|---------------|-----|----------------|-----|-----------|-------|--------|-----|
| | | | [dB (uV)] | | [dB (uV)] | | [dB (uV)] | | (dB) | |
| | | | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. |
| 1 | 0.154 | 0.10 | 55.41 | - | 55.51 | - | 65.79 | 55.79 | -10.28 | - |
| 2 | 0.193 | 0.10 | 49.70 | - | 49.80 | - | 63.91 | 53.91 | -14.11 | - |
| 3 | 0.232 | 0.10 | 45.13 | - | 45.23 | - | 62.38 | 52.38 | -17.14 | - |
| 4 | 0.556 | 0.13 | 36.67 | - | 36.80 | - | 56.00 | 46.00 | -19.20 | - |
| 5 | 7.176 | 0.45 | 28.47 | - | 28.92 | - | 60.00 | 50.00 | -31.08 | - |
| 6 | 15.004 | 0.92 | 30.57 | - | 31.49 | - | 60.00 | 50.00 | -28.51 | - |

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value = Emission level - Limit value
 5. Correction factor = Insertion loss + Cable loss
 6. Emission Level = Correction Factor + Reading Value.



4.3 20dB OCCUPIED BANDWIDTH MEASUREMENT

4.3.1 LIMITS OF EMISSION BANDWIDTH MEASUREMENT

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for device operating above 70 MHz and below 900 MHz.

| Fundamental Frequency (MHz) | Limit of Emission Bandwidth(kHz) |
|-----------------------------|----------------------------------|
| 314.9972 | 787.5 |

4.3.2 TEST INSTRUMENT

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | DATE OF CALIBRATION | DUE DATE OF CALIBRATION |
|----------------------------|-----------|------------|---------------------|-------------------------|
| SPECTRUM ANALYZER R&S | FSP40 | 100040 | Jul. 09, 2010 | Jul. 08, 2011 |

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

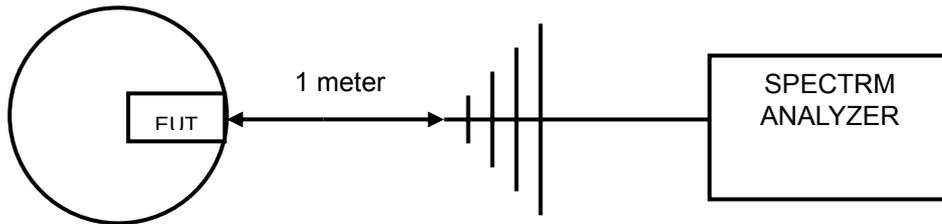
4.3.3 TEST PROCEDURE

- a. The EUT was placed on the turn table.
- b. The signal was coupled to the spectrum analyzer through an antenna.
- c. Set the resolution bandwidth to 10 kHz and video bandwidth to 30 kHz then select Peak function to scan the channel frequency.
- d. The emission bandwidth was measured and recorded.

4.3.4 DEVIATION FROM TEST STANDARD

No deviation.

4.3.5 TEST SETUP



4.3.6 TEST RESULTS

| Frequency (MHz) | 20dB Bandwidth (kHz) | Maximum Limit (kHz) | PASS/FAIL |
|-----------------|----------------------|---------------------|-----------|
| 314.9972 | 91 | 787.5 | PASS |

The plot of test result is attached as below.

4.4 DEACTIVATION TIME

4.4.1 LIMITS OF DEACTIVATION TIME MEASUREMENT

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

4.4.2 TEST INSTRUMENTS

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | DATE OF CALIBRATION | DUE DATE OF CALIBRATION |
|----------------------------|-----------|------------|---------------------|-------------------------|
| SPECTRUM ANALYZER R&S | FSP40 | 100040 | Jul. 09, 2010 | Jul. 08, 2011 |

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

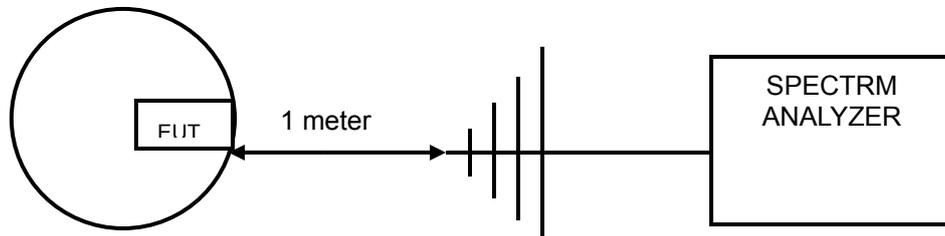
4.4.3 TEST PROCEDURES

- a. The EUT was placed on the turning table.
- b. The signal was coupled to the spectrum analyzer through an antenna.
- c. Set the resolution bandwidth to 100kHz and video bandwidth to 100kHz. The spectrum analyser was turned to the centre frequency of the transmitter's and the analyser's marker function was used to determine the duration of transmission.
- d. The transmission duration was measured and recorded.

4.4.4 DEVIATION FROM TEST STANDARD

No deviation

4.4.5 TEST SETUP



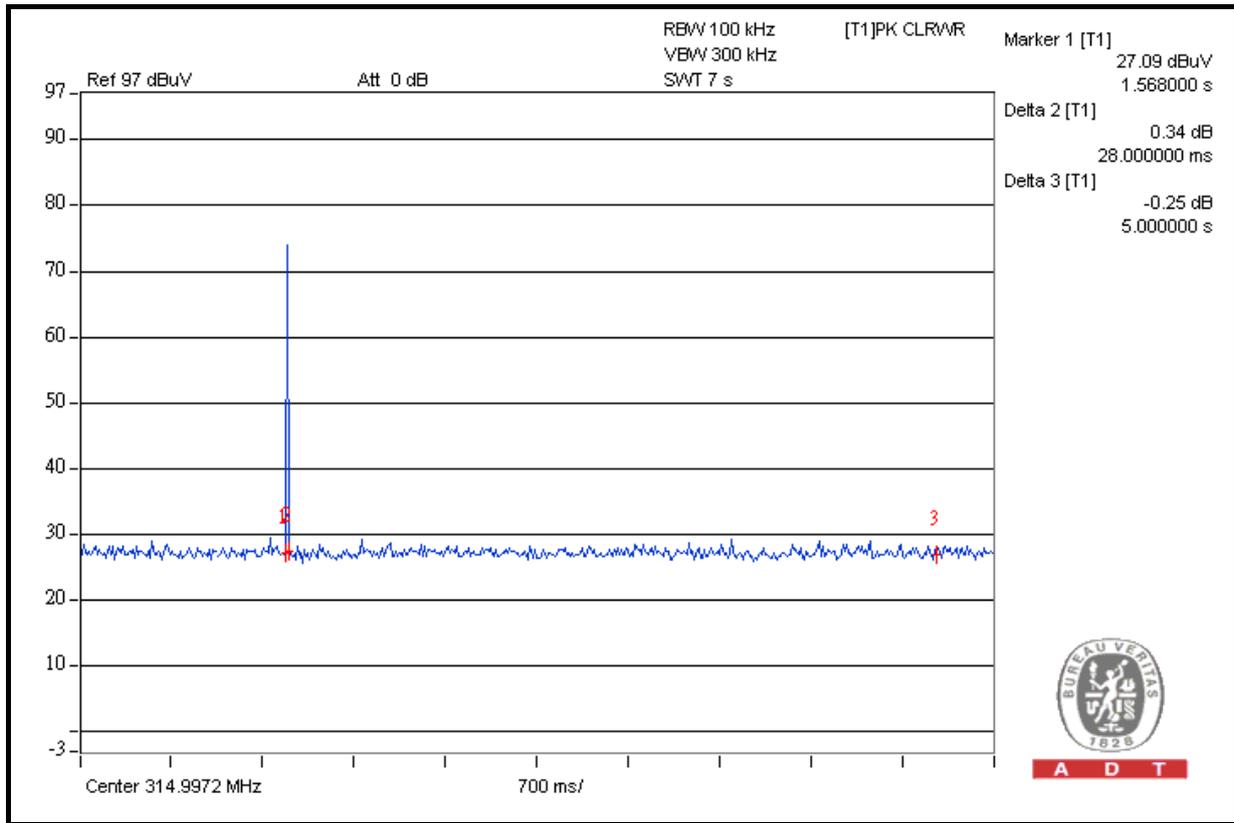
4.4.6 TEST RESULTS

| Push button | Frequency (MHz) | Maximum limit (sec) | PASS/FAIL |
|-------------|-----------------|---------------------|-----------|
| 1 | 315.0 | 5 | PASS |

The plots of test results are attached as below.



A D T





A D T

8 PHOTOGRAPHS OF THE TEST CONFIGURATION

Please refer to the attached file (Test Setup Photo).



9 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.

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site: www.adt.com.tw/index.5/phtml. 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 Lab

Tel: 886-3-5935343

Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety/Telecom Lab

Tel: 886-3-3183232

Fax: 886-3-3185050

Web Site: www.adt.com.tw

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

10 APPENDIX A - Modifications recorders for engineering changes to the eut BY THE LAB

No any modifications are made to the EUT by the lab during the test.

--- END ---