



FCC TEST REPORT

REPORT NO.: RF110613E07

MODEL NO.: M-R0027

FCC ID: JNZMR0027

RECEIVED: June 13, 2011

TESTED: June 14 to 15, 2011

ISSUED: June 23, 2011

APPLICANT: LOGITECH FAR EAST LTD.

ADDRESS: #2 Creation Rd. 4, Science-Based Ind. Park
Hsinchu Taiwan, R.O.C.

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

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Table of Contents

| | |
|---|----|
| RELEASE CONTROL RECORD | 3 |
| 1 CERTIFICATION..... | 4 |
| 2 SUMMARY OF TEST RESULTS..... | 5 |
| 2.1 MEASUREMENT UNCERTAINTY..... | 5 |
| 3 GENERAL INFORMATION | 6 |
| 3.1 GENERAL DESCRIPTION OF EUT | 6 |
| 3.2 DESCRIPTION OF TEST MODES | 7 |
| 3.3 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL..... | 7 |
| 3.4 GENERAL DESCRIPTION OF APPLIED STANDARDS | 8 |
| 3.5 DESCRIPTION OF SUPPORT UNITS | 9 |
| 3.6 CONFIGURATION OF SYSTEM UNDER TEST | 9 |
| 4 TEST PROCEDURES AND RESULTS | 10 |
| 4.1 RADIATED EMISSION MEASUREMENT | 10 |
| 4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT | 10 |
| 4.1.2 TEST INSTRUMENTS | 11 |
| 4.1.3 TEST PROCEDURES | 13 |
| 4.1.4 DEVIATION FROM TEST STANDARD | 13 |
| 4.1.5 TEST SETUP | 14 |
| 4.1.6 EUT OPERATING CONDITIONS..... | 14 |
| 4.1.7 TEST RESULTS..... | 15 |
| 4.2 CONDUCTED - OUT BAND MEASUREMENT | 22 |
| 4.2.1 LIMITS OF CONDUCTED - OUT BAND MEASUREMENT | 22 |
| 4.2.2 TEST INSTRUMENTS | 22 |
| 4.2.3 TEST PROCEDURE..... | 22 |
| 4.2.4 DEVIATION FROM TEST STANDARD | 22 |
| 4.2.5 EUT OPERATING CONDITION | 22 |
| 4.2.6 TEST RESULTS..... | 23 |
| 5 INFORMATION ON THE TESTING LABORATORIES | 25 |
| 6 APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB | 26 |



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RELEASE CONTROL RECORD

| ISSUE NO. | REASON FOR CHANGE | DATE ISSUED |
|-------------|-------------------|---------------|
| RF110613E07 | Original release | June 23, 2011 |



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1 CERTIFICATION

PRODUCT : 2.4GHz Cordless Mouse

BRAND NAME : Logitech

MODEL NO. : M-R0027

TEST SAMPLE : ENGINEERING SAMPLE

APPLICANT : LOGITECH FAR EAST LTD.

TESTED : June 14 to 15, 2011

STANDARDS : FCC Part 15, Subpart C (Section 15.249)

ANSI C63.4-2003

ANSI C63.10-2009

The above equipment (Model: M-R0027) 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 : , **DATE:** June 23, 2011
(Claire Kuan, Specialist)

APPROVED BY : , **DATE:** June 23, 2011
(May Chen, Deputy Manager)



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2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

| APPLIED STANDARD: 47 CFR Part 15, Subpart C | | | |
|---|----------------------------------|--------|--|
| Standard Paragraph | Test Type | Result | Remark |
| 15.207 | Conducted Emission Test | NA | Power supply is DC 1.5V from battery |
| 15.249 | Radiated Emission Test | PASS | Minimum passing margin is -3.4dB at 2400.00MHz |
| 15.249 | Conducted - Out Band Measurement | PASS | Meet the requirement of limit |
| 15.203 | Antenna Requirement | PASS | No antenna connector is used. |

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:

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

| Measurement | Value |
|-----------------------------------|---------|
| Radiated emissions (30MHz-1GHz) | 3.81 dB |
| Radiated emissions (1GHz -18GHz) | 2.19 dB |
| Radiated emissions (18GHz -40GHz) | 2.56 dB |



3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

| | |
|--|---|
| PRODUCT | 2.4GHz Cordless Mouse |
| MODEL NO. | M-R0027 |
| FCC ID | JNZMR0027 |
| POWER SUPPLY | DC 1.5V from battery |
| MODULATION TYPE | GFSK |
| CARRIER FREQUENCY OF EACH CHANNEL | 2405MHz ~ 2474MHz |
| NUMBER OF CHANNEL | 12 |
| ANTENNA TYPE | PCB printed antenna with 2.82dBi antenna gain |
| DATA CABLE | NA |
| I/O PORTS | NA |
| ASSOCIATED DEVICES | NA |

NOTE:

1. The above EUT information was declared by the manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.



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3.2 DESCRIPTION OF TEST MODES

Twelve channels are provided in this EUT.

| Channel | Freq. (MHz) | Channel | Freq. (MHz) | Channel | Freq. (MHz) | Channel | Freq. (MHz) |
|---------|----------------|---------|----------------|---------|----------------|---------|----------------|
| 1 | 2405 | 4 | 2417 | 7 | 2441 | 10 | 2465 |
| 2 | 2408 | 5 | 2432 | 8 | 2444 | 11 | 2471 |
| 3 | 2414 | 6 | 2435 | 9 | 2462 | 12 | 2474 |

NOTE:

1. Below 1 GHz, the channel 1, 8, and 12 were pre-tested in chamber. The channel 12, worst case one, was chosen for final test.
2. Above 1 GHz, the channel 1, 8, and 12 were tested individually.

3.3 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

| EUT CONFIGURE MODE | APPLICABLE TO | | | | DESCRIPTION |
|--------------------------|---------------|---------|--------------|----|-------------|
| | PLC | RE < 1G | RE \geq 1G | OB | |
| - | - | ✓ | ✓ | ✓ | - |

Where **PLC**: Power Line Conducted Emission

RE < 1G: Radiated Emission below 1GHz

RE \geq 1G: Radiated Emission above 1GHz

OB: CONDUCTED OUT-BAND EMISSION MEASUREMENT

RADIATED EMISSION TEST (BELOW 1 GHz):

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

| AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE |
|----------------------|-------------------|--------------------|
| 1 to 12 | 12 | GFSK |



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RADIATED EMISSION TEST (ABOVE 1 GHz):

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

| AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE |
|-------------------|----------------|-----------------|
| 1 to 12 | 1, 8, 12 | GFSK |

CONDUCTED OUT-BAND EMISSION MEASUREMENT:

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

| AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE |
|-------------------|----------------|-----------------|
| 1 to 12 | 1, 12 | GFSK |

3.4 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 (Section 15.249)

ANSI C63.4: 2003

ANSI C63.10: 2009

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

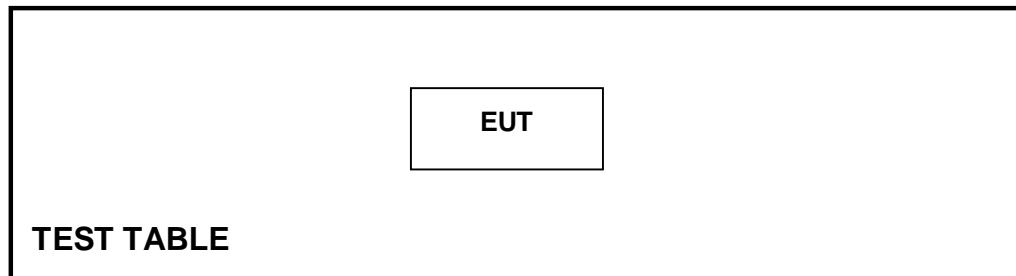


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3.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit.

3.6 CONFIGURATION OF SYSTEM UNDER TEST





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4 TEST PROCEDURES AND RESULTS

4.1 RADIATED EMISSION MEASUREMENT

4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT

According to 15.249 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 (dBuV/m) | |
|---|---|----------------|
| | Peak | Average |
| 2400 ~ 2483.5 | 114 | 94 |
| Field Strength of Harmonics (dBuV/m) | | |
| | 74 | 54 |

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

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. 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.
2. Section 15.205 restricted bands of operation shall compliance with the limits in Section 15.209.



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4.1.2 TEST INSTRUMENTS

For Below 1GHz:

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED DATE | CALIBRATED UNTIL |
|--------------------------------------|--------------------------|-------------------------------------|-----------------|------------------|
| Agilent Spectrum Analyzer | E4446A | MY48250254 | July 14, 2010 | July 13, 2011 |
| Agilent Pre-Selector | N9039A | MY46520311 | July 14, 2010 | July 13, 2011 |
| Agilent Signal Generator | N5181A | MY49060517 | July 14, 2010 | July 13, 2011 |
| Mini-Circuits Pre-Amplifier | ZFL-1000VH2B | AMP-ZFL-03 | Nov. 16, 2010 | Nov. 15, 2011 |
| Agilent Pre-Amplifier | 8449B | 3008A02578 | July 05, 2010 | July 04, 2011 |
| Miteq Pre-Amplifier | AFS33-1800265 0-30-8P-44 | 881786 | NA | NA |
| SCHWARZBECK Trilog Broadband Antenna | VULB 9168 | 9168-360 | Apr. 14, 2011 | Apr. 13, 2012 |
| AISI Horn_Antenna | AIH.8018 | 0000320091110 | Nov. 12, 2010 | Nov. 11, 2011 |
| SCHWARZBECK Horn_Antenna | BBHA 9170 | 9170-424 | Oct. 08, 2010 | Oct. 07, 2011 |
| RF CABLE | NA | RF104-201 RF104-203 RF104-204 | Dec. 27, 2010 | Dec. 26, 2011 |
| RF Cable | NA | CHGCAB_001 | NA | NA |
| Software | ADT_Radiated_V8.7.05 | NA | NA | NA |
| CT Antenna Tower & Turn Table | NA | 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 horn antenna, preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in 966 Chamber No. G.
4. The FCC Site Registration No. is 966073.
5. The VCCI Site Registration No. is G-137.
6. The CANADA Site Registration No. is IC 7450H-2.



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For Above 1GHz:

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED DATE | CALIBRATED UNTIL |
|--------------------------------------|--------------------------|-------------------------------------|-----------------|------------------|
| Agilent Spectrum Analyzer | E4446A | MY48250253 | Aug. 23, 2010 | Aug. 22, 2011 |
| Agilent Pre-Selector | N9039A | MY46520310 | Aug. 23, 2010 | Aug. 22, 2011 |
| Agilent Signal Generator | N5181A | MY49060347 | July 30, 2010 | July 29, 2011 |
| Mini-Circuits Pre-Amplifier | ZFL-1000VH2B | AMP-ZFL-04 | Nov. 16, 2010 | Nov. 15, 2011 |
| Agilent Pre-Amplifier | 8449B | 3008A02465 | Feb. 28, 2011 | Feb. 27, 2012 |
| Miteq Pre-Amplifier | AFS33-1800265 0-30-8P-44 | 881786 | NA | NA |
| SCHWARZBECK Trilog Broadband Antenna | VULB 9168 | 9168-361 | Apr. 14, 2011 | Apr. 13, 2012 |
| AISI Horn_Antenna | AIH.8018 | 0000220091110 | Nov. 22, 2010 | Nov. 21, 2011 |
| SCHWARZBECK Horn_Antenna | BBHA 9170 | 9170-424 | Oct. 08, 2010 | Oct. 07, 2011 |
| RF CABLE | NA | RF104-205 RF104-207 RF104-202 | Dec. 28, 2010 | Dec. 27, 2011 |
| RF Cable | NA | CHHCAB_001 | NA | NA |
| Software | ADT_Radiated_V8.7.05 | NA | NA | NA |
| CT Antenna Tower & Turn Table | NA | 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 horn antenna, preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in 966 Chamber No. H.
4. The FCC Site Registration No. is 797305.
5. The CANADA Site Registration No. is IC 7450H-3.



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4.1.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meters chamber room. 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 height of antenna 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 spectrum analyzer system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The spectrum analyzer system was set to peak detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

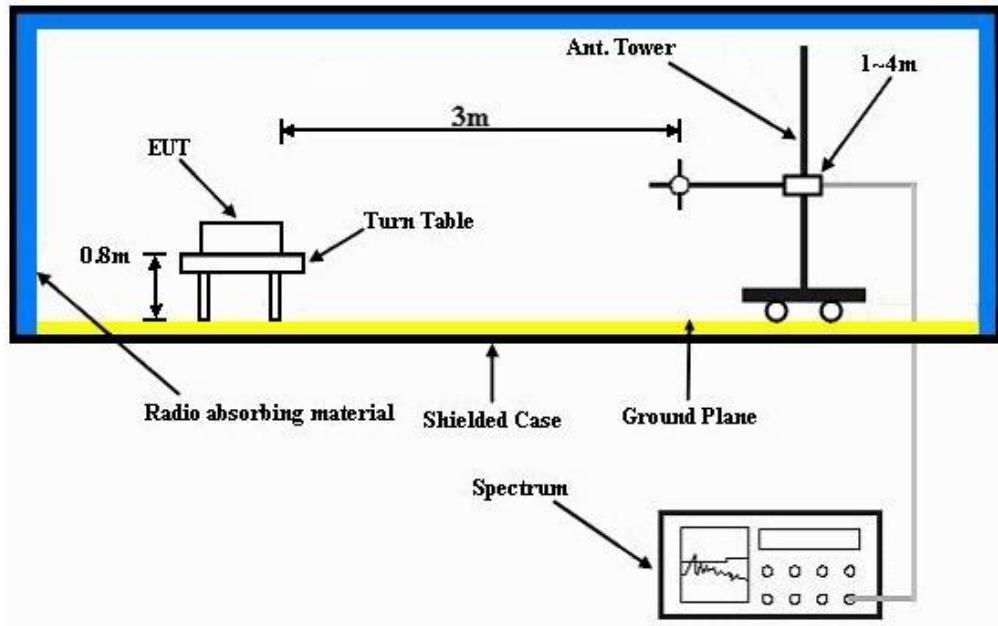
NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth is 1MHz and video bandwidth of test receiver/spectrum analyzer is 3MHz for Peak detection at frequency above 1GHz.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation

4.1.5 TEST SETUP



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

4.1.6 EUT OPERATING CONDITIONS

Set the EUT under transmission / receiver condition continuously at specific channel frequency.



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4.1.7 TEST RESULTS

BELOW 1GHz WORST-CASE DATA

| EUT TEST CONDITION | | MEASUREMENT DETAIL | | |
|--------------------------|--|-----------------------------|--|-------------------|
| CHANNEL | | Channel 12 | | FREQUENCY RANGE |
| INPUT POWER | | 1.5Vdc from battery | | DETECTOR FUNCTION |
| ENVIRONMENTAL CONDITIONS | | 22deg. C, 70%RH 1002 hPa | | TESTED BY |
| | | | | Frank Liu |

| 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 | 60.08 | 14.5 QP | 40.0 | -25.5 | 1.50 H | 252 | 0.82 | 13.65 |
| 2 | 146.05 | 16.3 QP | 43.5 | -27.2 | 1.50 H | 13 | 1.71 | 14.57 |
| 3 | 229.07 | 14.4 QP | 46.0 | -31.6 | 1.00 H | 52 | 1.94 | 12.47 |
| 4 | 290.29 | 17.6 QP | 46.0 | -28.4 | 1.50 H | 105 | 2.79 | 14.81 |
| 5 | 774.29 | 22.8 QP | 46.0 | -23.2 | 1.00 H | 201 | -1.74 | 24.51 |
| 6 | 827.46 | 24.1 QP | 46.0 | -21.9 | 1.50 H | 331 | -1.45 | 25.56 |
| 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 | 30.24 | 22.1 QP | 40.0 | -17.9 | 1.50 V | 360 | 9.11 | 13.03 |
| 2 | 59.96 | 20.8 QP | 40.0 | -19.2 | 2.00 V | 349 | 7.13 | 13.66 |
| 3 | 134.21 | 15.5 QP | 43.5 | -28.0 | 1.00 V | 8 | 1.68 | 13.82 |
| 4 | 286.39 | 17.0 QP | 46.0 | -29.0 | 1.50 V | 29 | 2.31 | 14.66 |
| 5 | 693.05 | 23.7 QP | 46.0 | -22.3 | 1.50 V | 95 | 1.11 | 22.55 |
| 6 | 823.43 | 23.9 QP | 46.0 | -22.1 | 2.00 V | 303 | -1.63 | 25.50 |

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.



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ABOVE 1GHz DATA

| EUT TEST CONDITION | | MEASUREMENT DETAIL | | |
|--------------------------|--|-----------------------------|--|-----------------------------|
| CHANNEL | | Channel 1 | | FREQUENCY RANGE 1 ~ 25GHz |
| INPUT POWER | | 1.5Vdc from battery | | DETECTOR FUNCTION Peak (PK) |
| ENVIRONMENTAL CONDITIONS | | 24deg. C, 61%RH 1002 hPa | | TESTED BY Kent Liu |

| 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 | 2400.00 | 70.6 PK | 74.0 | -3.4 | 1.15 H | 148 | 39.36 | 31.24 |
| 2 | 2400.00 | 40.1 AV | 54.0 | -13.9 | 1.15 H | 148 | 8.86 | 31.24 |
| 3 | *2405.00 | 100.2 PK | 114.0 | -13.8 | 1.15 H | 148 | 68.95 | 31.25 |
| 4 | *2405.00 | 69.7 AV | 94.0 | -24.3 | 1.15 H | 148 | 38.45 | 31.25 |
| 5 | 4810.00 | 54.2 PK | 74.0 | -19.8 | 1.08 H | 107 | 14.83 | 39.37 |
| 6 | 4810.00 | 23.7 AV | 54.0 | -30.3 | 1.08 H | 107 | -15.67 | 39.37 |
| 7 | 7215.00 | 55.5 PK | 74.0 | -18.5 | 1.32 H | 66 | 11.50 | 44.00 |
| 8 | 7215.00 | 25.0 AV | 54.0 | -29.0 | 1.32 H | 66 | -19.00 | 44.00 |
| 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 | 2400.00 | 61.8 PK | 74.0 | -12.2 | 1.71 V | 32 | 30.56 | 31.24 |
| 2 | 2400.00 | 31.3 AV | 54.0 | -22.7 | 1.71 V | 32 | 0.06 | 31.24 |
| 3 | *2405.00 | 95.1 PK | 114.0 | -18.9 | 1.71 V | 32 | 63.85 | 31.25 |
| 4 | *2405.00 | 64.6 AV | 94.0 | -29.4 | 1.71 V | 32 | 33.35 | 31.25 |
| 5 | 4810.00 | 56.1 PK | 74.0 | -17.9 | 1.05 V | 92 | 16.73 | 39.37 |
| 6 | 4810.00 | 25.6 AV | 54.0 | -28.4 | 1.05 V | 92 | -13.77 | 39.37 |
| 7 | 7215.00 | 56.5 PK | 74.0 | -17.5 | 1.07 V | 120 | 12.50 | 44.00 |
| 8 | 7215.00 | 26.0 AV | 54.0 | -28.0 | 1.07 V | 120 | -18.00 | 44.00 |

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:

$$20 \log (\text{Duty cycle}) = 20 \log (0.2333 \text{ ms} / 7.8 \text{ ms}) = -30.5 \text{ dB}$$
Please see page 19 for plotted duty.



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| EUT TEST CONDITION | | MEASUREMENT DETAIL | |
|--------------------------|-----------------------------|--------------------|-----------|
| CHANNEL | Channel 8 | FREQUENCY RANGE | |
| INPUT POWER | 1.5Vdc from battery | DETECTOR FUNCTION | Peak (PK) |
| ENVIRONMENTAL CONDITIONS | 24deg. C, 61%RH 1002 hPa | TESTED BY | Kent Liu |

| 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 | *2444.00 | 101.3 PK | 114.0 | -12.7 | 1.12 H | 151 | 69.95 | 31.35 |
| 2 | *2444.00 | 70.8 AV | 94.0 | -23.2 | 1.12 H | 151 | 39.45 | 31.35 |
| 3 | 4888.00 | 54.2 PK | 74.0 | -19.8 | 1.08 H | 103 | 14.53 | 39.67 |
| 4 | 4888.00 | 23.7 AV | 54.0 | -30.3 | 1.08 H | 103 | -15.97 | 39.67 |
| 5 | 7332.00 | 55.5 PK | 74.0 | -18.5 | 1.31 H | 56 | 11.37 | 44.13 |
| 6 | 7332.00 | 25.0 AV | 54.0 | -29.0 | 1.31 H | 56 | -19.13 | 44.13 |

| 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 | *2444.00 | 95.4 PK | 114.0 | -18.6 | 1.36 V | 86 | 64.05 | 31.35 |
| 2 | *2444.00 | 64.9 AV | 94.0 | -29.1 | 1.36 V | 86 | 33.55 | 31.35 |
| 3 | 4888.00 | 56.5 PK | 74.0 | -17.5 | 1.05 V | 99 | 16.83 | 39.67 |
| 4 | 4888.00 | 26.0 AV | 54.0 | -28.0 | 1.05 V | 99 | -13.67 | 39.67 |
| 5 | 7332.00 | 57.2 PK | 74.0 | -16.8 | 1.07 V | 118 | 13.07 | 44.13 |
| 6 | 7332.00 | 26.7 AV | 54.0 | -27.3 | 1.07 V | 118 | -17.43 | 44.13 |

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:

$$20 \log (\text{Duty cycle}) = 20 \log (0.2333 \text{ ms} / 7.8 \text{ ms}) = -30.5 \text{ dB}$$
Please see page 19 for plotted duty.



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| EUT TEST CONDITION | | MEASUREMENT DETAIL | |
|--------------------------|-----------------------------|--------------------|-----------|
| CHANNEL | Channel 12 | FREQUENCY RANGE | 1 ~ 25GHz |
| INPUT POWER | 1.5Vdc from battery | DETECTOR FUNCTION | Peak (PK) |
| ENVIRONMENTAL CONDITIONS | 24deg. C, 61%RH 1002 hPa | TESTED BY | Kent Liu |

| 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 | *2474.00 | 102.1 PK | 114.0 | -11.9 | 1.13 H | 153 | 70.67 | 31.43 |
| 2 | *2474.00 | 71.6 AV | 94.0 | -22.4 | 1.13 H | 153 | 40.17 | 31.43 |
| 3 | 2483.50 | 65.6 PK | 74.0 | -8.4 | 1.13 H | 153 | 34.14 | 31.46 |
| 4 | 2483.50 | 35.1 AV | 54.0 | -18.9 | 1.13 H | 153 | 3.64 | 31.46 |
| 5 | 4948.00 | 53.9 PK | 74.0 | -20.1 | 1.08 H | 107 | 13.98 | 39.92 |
| 6 | 4948.00 | 23.4 AV | 54.0 | -30.6 | 1.08 H | 107 | -16.52 | 39.92 |
| 7 | 7422.00 | 54.9 PK | 74.0 | -19.1 | 1.34 H | 65 | 10.68 | 44.22 |
| 8 | 7422.00 | 24.4 AV | 54.0 | -29.6 | 1.34 H | 65 | -19.82 | 44.22 |

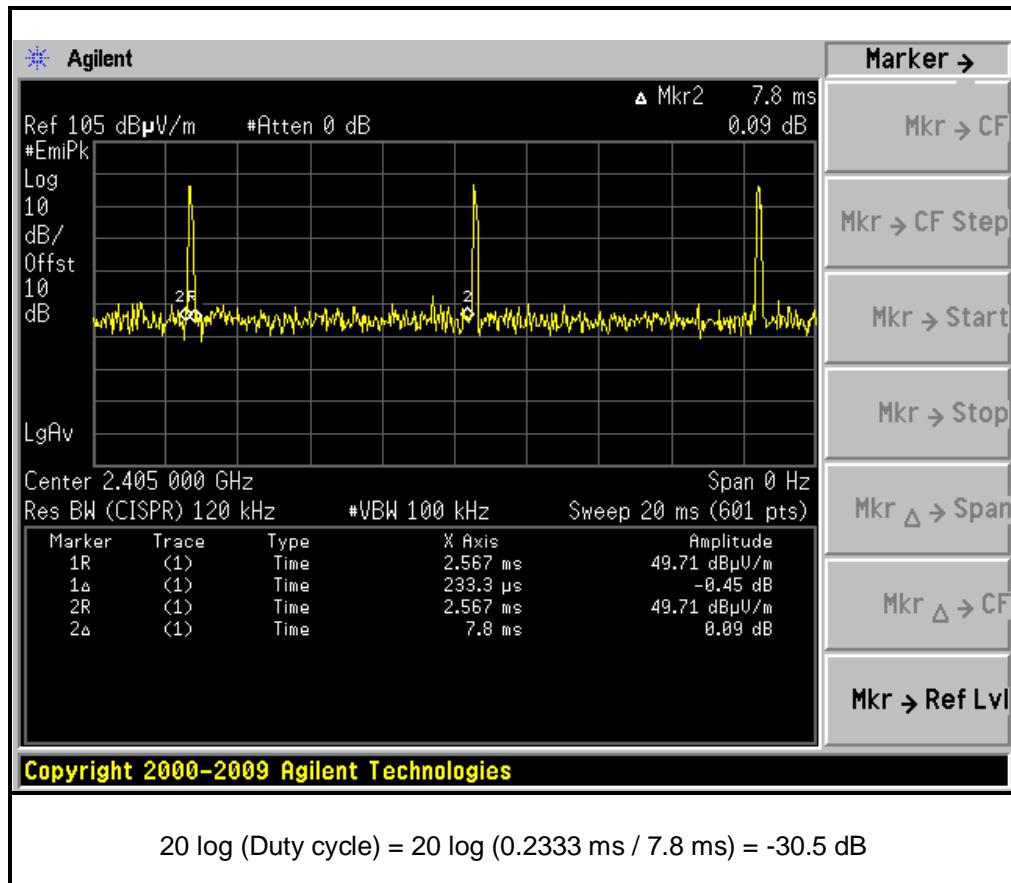
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | |
|---|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | *2474.00 | 93.6 PK | 114.0 | -20.4 | 1.00 V | 82 | 62.17 | 31.43 |
| 2 | *2474.00 | 63.1 AV | 94.0 | -30.9 | 1.00 V | 82 | 31.67 | 31.43 |
| 3 | 2483.50 | 61.1 PK | 74.0 | -12.9 | 1.00 V | 82 | 29.64 | 31.46 |
| 4 | 2483.50 | 30.6 AV | 54.0 | -23.4 | 1.00 V | 82 | -0.86 | 31.46 |
| 5 | 4948.00 | 55.7 PK | 74.0 | -18.3 | 1.06 V | 94 | 15.78 | 39.92 |
| 6 | 4948.00 | 25.2 AV | 54.0 | -28.8 | 1.06 V | 94 | -14.72 | 39.92 |
| 7 | 7422.00 | 56.9 PK | 74.0 | -17.1 | 1.07 V | 111 | 12.68 | 44.22 |
| 8 | 7422.00 | 26.4 AV | 54.0 | -27.6 | 1.07 V | 111 | -17.82 | 44.22 |

REMARKS:

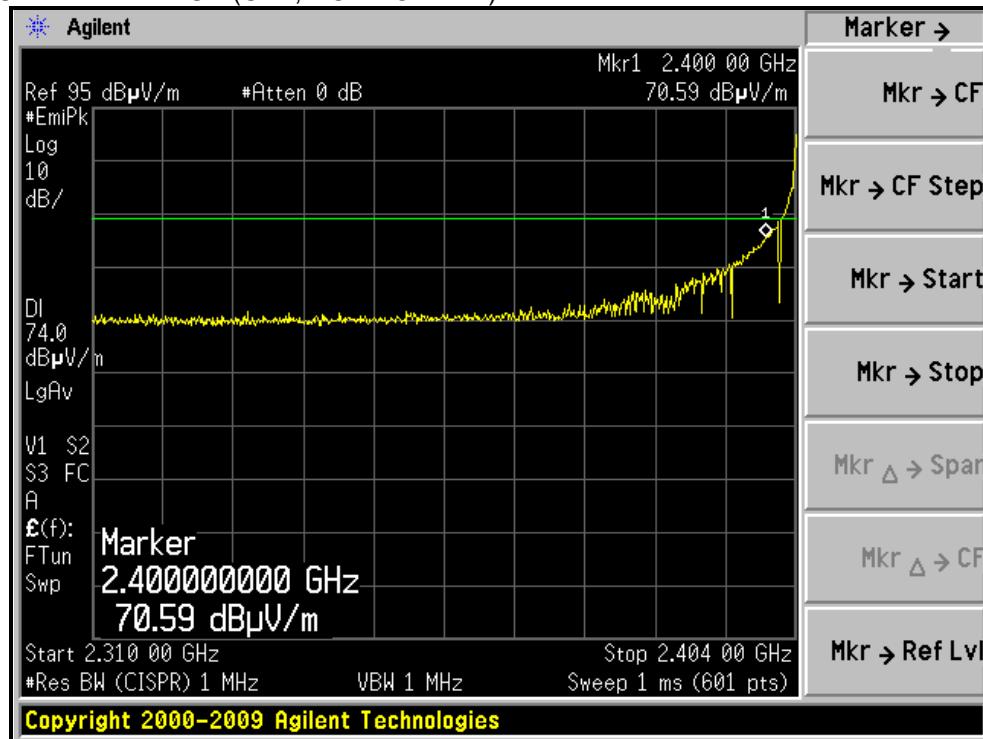
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. “*”: Fundamental frequency
6. The average value of fundamental frequency is: Average = Peak value + $20\log(\text{Duty cycle})$ Where the duty factor is calculated from following formula:
 $20 \log (\text{Duty cycle}) = 20 \log (0.2333 \text{ ms} / 7.8 \text{ ms}) = -30.5 \text{ dB}$
Please see page 19 for plotted duty.



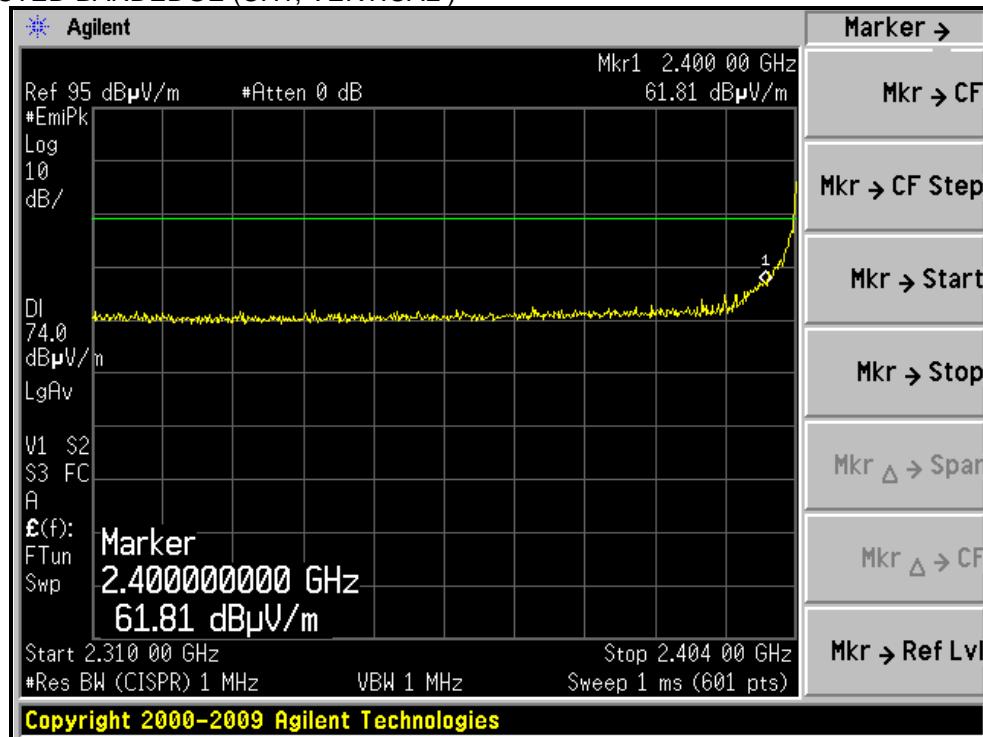
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RESTRICTED BANDEDGE (CH1, HORIZONTAL)

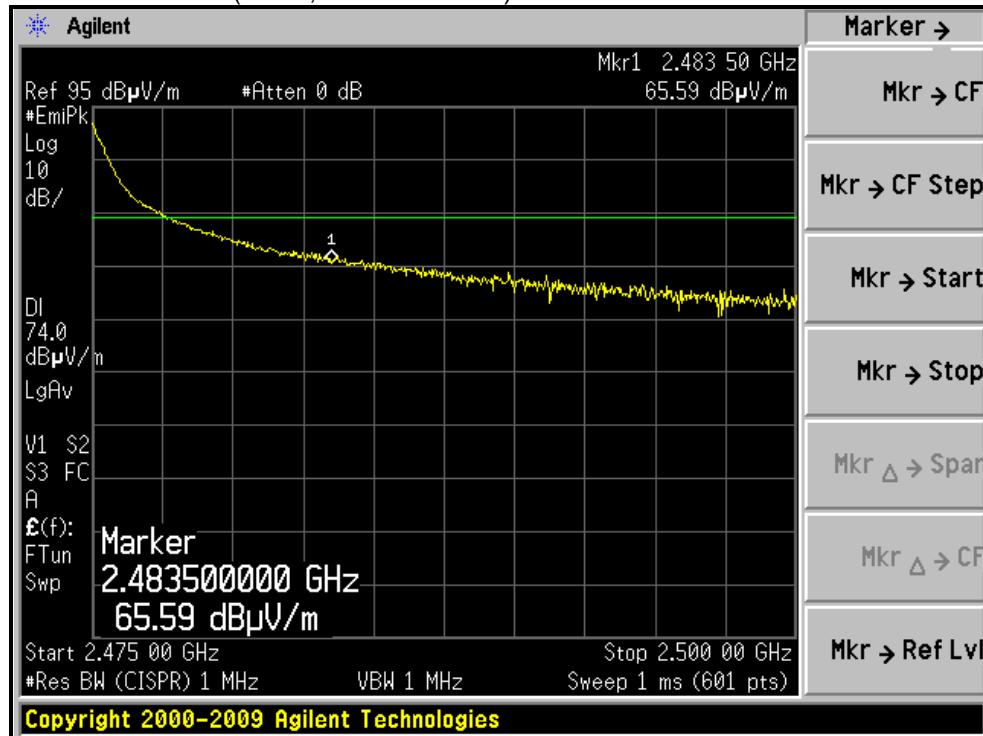


RESTRICTED BANDEDGE (CH1, VERTICAL)

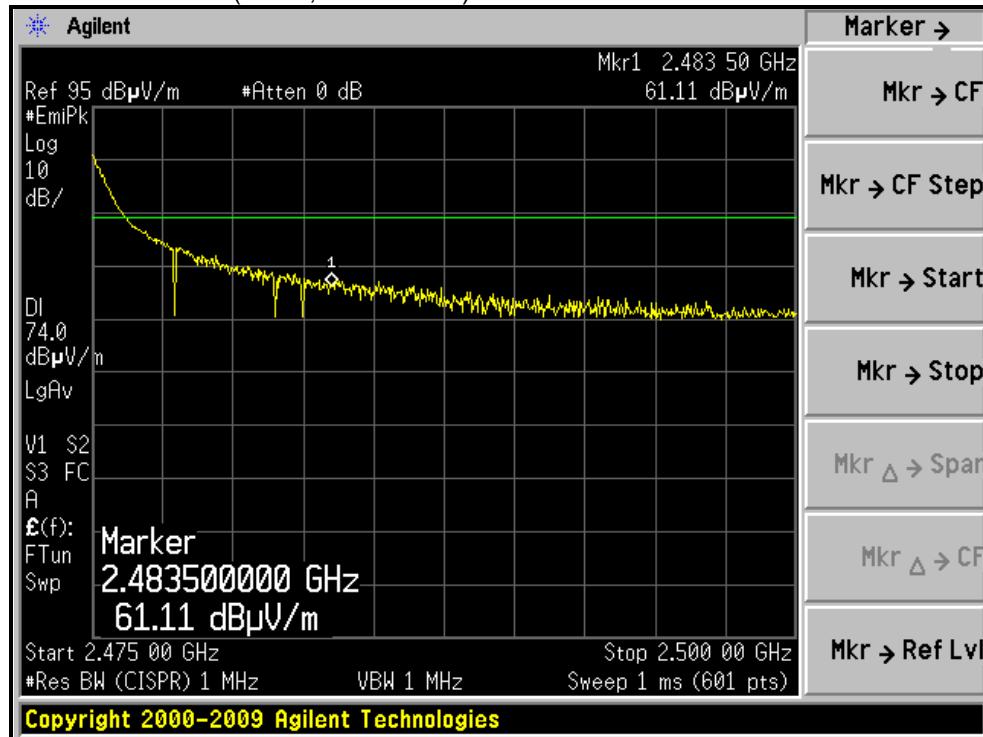


* The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle). And it meets the requirement of limit.

RESTRICTED BANDEDGE (CH12, HORIZONTAL)



RESTRICTED BANDEDGE (CH12, VERTICAL)



* The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle). And it meets the requirement of limit.



4.2 CONDUCTED - OUT BAND MEASUREMENT

4.2.1 LIMITS OF CONDUCTED - OUT BAND MEASUREMENT

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

4.2.2 TEST INSTRUMENTS

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED DATE | CALIBRATED UNTIL |
|-------------------------------|-----------|---------------|--------------------|---------------------|
| R&S SPECTRUM ANALYZER | FSP40 | 100036 | Dec. 08, 2010 | Dec. 07, 2011 |

NOTE:

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

4.2.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low loss cable. Set both RBW and VBW of spectrum analyzer to 100 kHz and 300 kHz with suitable frequency span from band edge. The band edges was measured and recorded.

4.2.4 DEVIATION FROM TEST STANDARD

No deviation

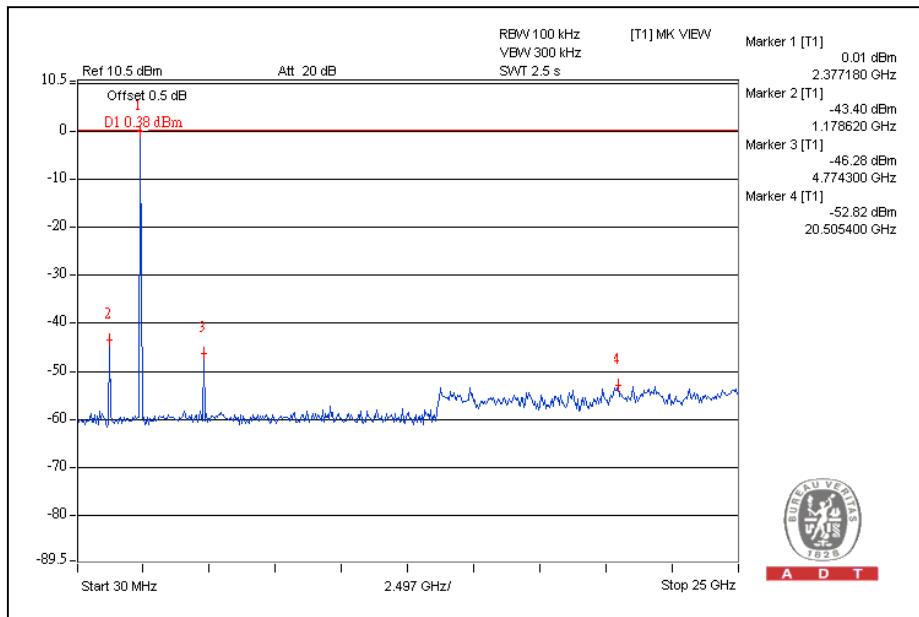
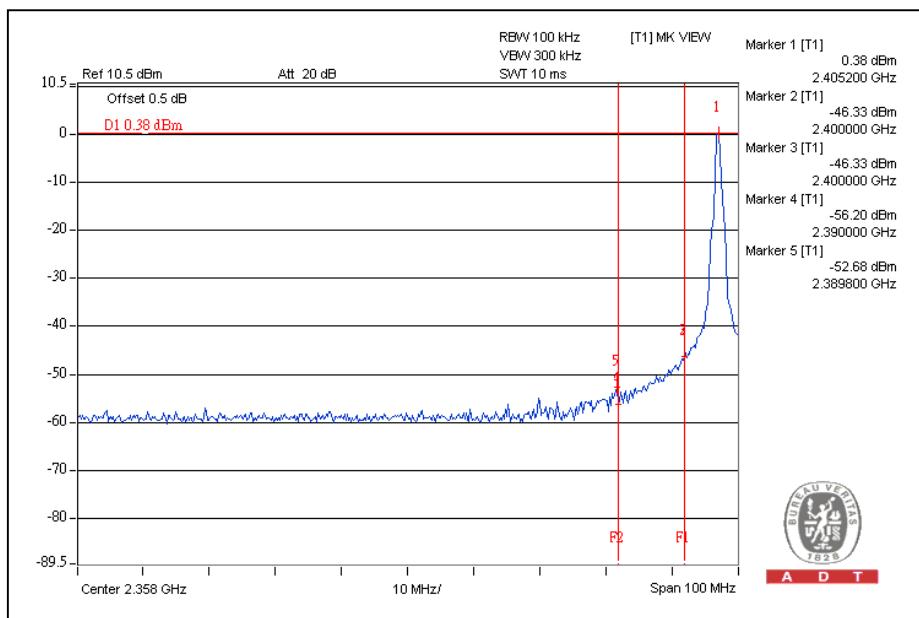
4.2.5 EUT OPERATING CONDITION

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.2.6 TEST RESULTS

Emissions radiated outside of the specified frequency bands, please refer following pages for met the requirement of the general radiated emission limits in § 15.209.

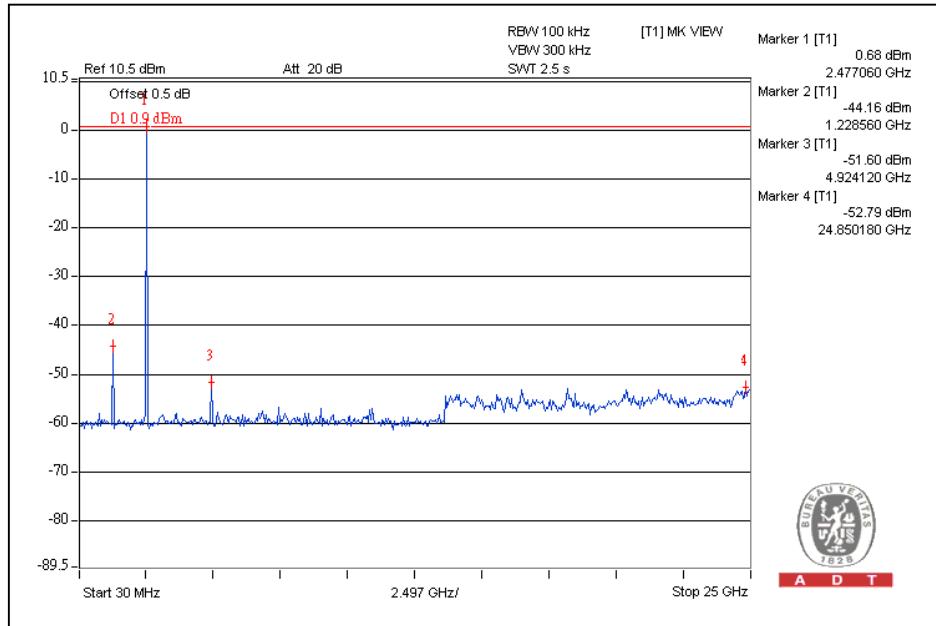
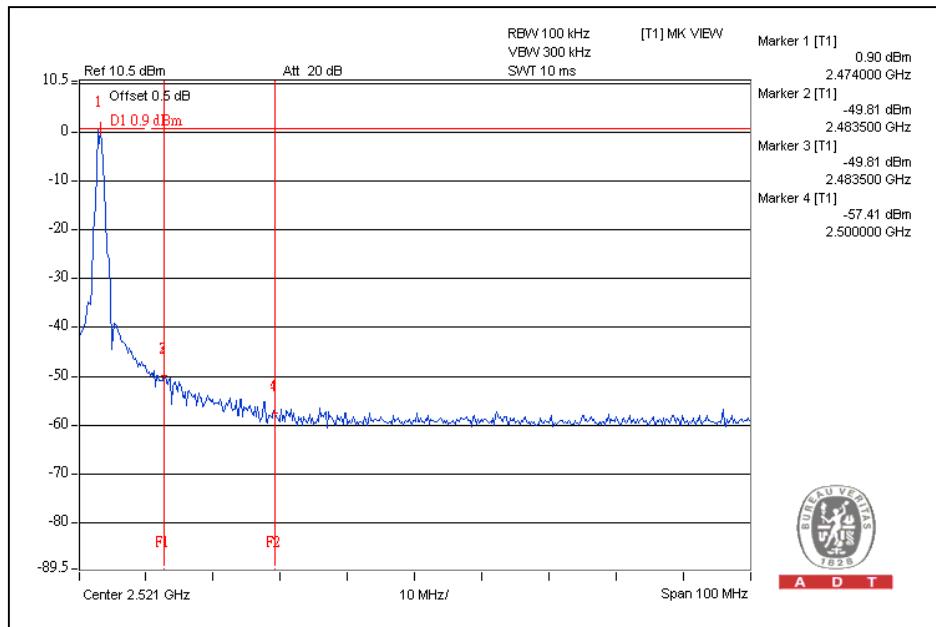
CH1





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CH12





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5 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: 886-2-26052943

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

Email: service.adt@tw.bureauveritas.com

Web Site: www.adt.com.tw

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



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6 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 ---