# EMC
# TEST REPORT

**Report No. : TS10030081-EME**
**Model No. : M01084-D**
**Issued Date : Apr. 19, 2010**

| | |
|---|---|
| **Applicant:** | **ACCO Brands, Inc.**<br>**333 Twin Dolphin Drive, 6th Floor, Redwood Shores, CA 94065** |
| **Test Method/ Standard:** | **47 CFR FCC Part 15.249 & ANSI C63.4 2003** |
| **Test By:** | **Intertek Testing Services Taiwan Ltd.**<br>**No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li, Shiang-Shan District, Hsinchu City, Taiwan** |



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Sunny Liu / Senior Officer

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Leon Cheng / Engineer

**The test report was reviewed by:** Jacky Chen

**Name** Jacky Chen
**Title** Engineer

# Table of Contents

**Summary of Tests**

| Test | Reference | Results |
|---|---|---|
| Radiated Emission test | 15.249(a), (c), (d), 15.209 | Pass |
| Emission on the Band Edge | 15.209 | Pass |
| Conducted Emission of AC Power | 15.207 | Pass |
| Calculation of Average Factor | 15.35 | Pass |

# 1. General information

## 1.1 Identification of the EUT

| | |
|---|---|
| Product: | Wireless Presenter Pro with Green Laser Pointer |
| Model No.: | M01084-D (Receiver) |
| FCC ID.: | GV3M01084-D |
| Frequency Range: | 2412 MHz ~ 2472 MHz |
| Channel Number: | 5 channels |
| Frequency of Each Channel: | 2412 MHz, 2427 MHz, 2450 MHz, 2467 MHz, 2472 MHz |
| Type of Modulation: | GFSK |
| Rated Power: | DC 5 V from Notebook PC |
| Power Cord: | N/A |
| Data Cable: | N/A |
| Sample Received: | Mar. 12, 2010 |
| Test Date(s): | Apr. 13, 2010 ~ Apr. 15, 2010 |
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| Note 2: | When determining the test conclusion, the Measurement Uncertainty of test has been considered. |

## 1.2 Additional information about the EUT

The EUT is a Wireless USB dongle and was defined as information technology equipment.

For more detail features, please refer to User's manual as file name “Installation guide.pdf”

## 1.3 Antenna description

The EUT uses a permanently connected antenna.

Antenna Type : PCB printed antenna
Connector Type : N/A

## 1.4 Peripherals equipment

| Peripherals | Brand | Model No. | Serial No. | Description of Data Cable |
|---|---|---|---|---|
| Notebook PC | DELL | Latitude D610 | 2YWZK1S | N/A |

## 2. Test specifications

### 2.1 Test standard

The EUT was performed according to the procedures in FCC Part 15 Subpart C Paragraph 15.249 for non-spread spectrum devices.

The test of radiated measurements according to FCC Part15 Section 15.33(a) had been conducted and the field strength of this frequency band was all meet limit requirement, thus we evaluate the EUT pass the specified test.

### 2.2 Operation mode

The EUT was continuously transmitted during the test.

## 2.3 Test equipment

| Equipment | Brand | Frequency range | Model No. |
|---|---|---|---|
| EMI Test Receiver | Rohde & Schwarz | 9kHz~2.75GHz | ESCS 30 |
| EMI Test Receiver | Rohde & Schwarz | 20Hz~26.5GHz | ESMI |
| Spectrum Analyzer | Rohde & Schwarz | 9kHz~30GHz | FSP 30 |
| Spectrum Analyzer | Rohde & Schwarz | 20Hz~40GHz | FSEK 30 |
| Horn Antenna | EMCO | 1GHz~18GHz | 3115 |
| Horn Antenna | SCHWARZBECK | 14GHz~40GHz | BBHA 9170 |
| Bilog Antenna | SCHWARZBECK | 25MHz~1.7GHz | VULB 9160 |
| Turn Table | HDGmbH | N/A | DS 420S |
| Antenna Tower | HDGmbH | N/A | MA 240 |
| Pre-Amplifier | MITER | 100MHz~26.5GHz | 919981 |
| LISN | Rohde & Schwarz | 9KHz~30MHz | ESH3-Z5 |

Note: The above equipments are within the valid calibration period.

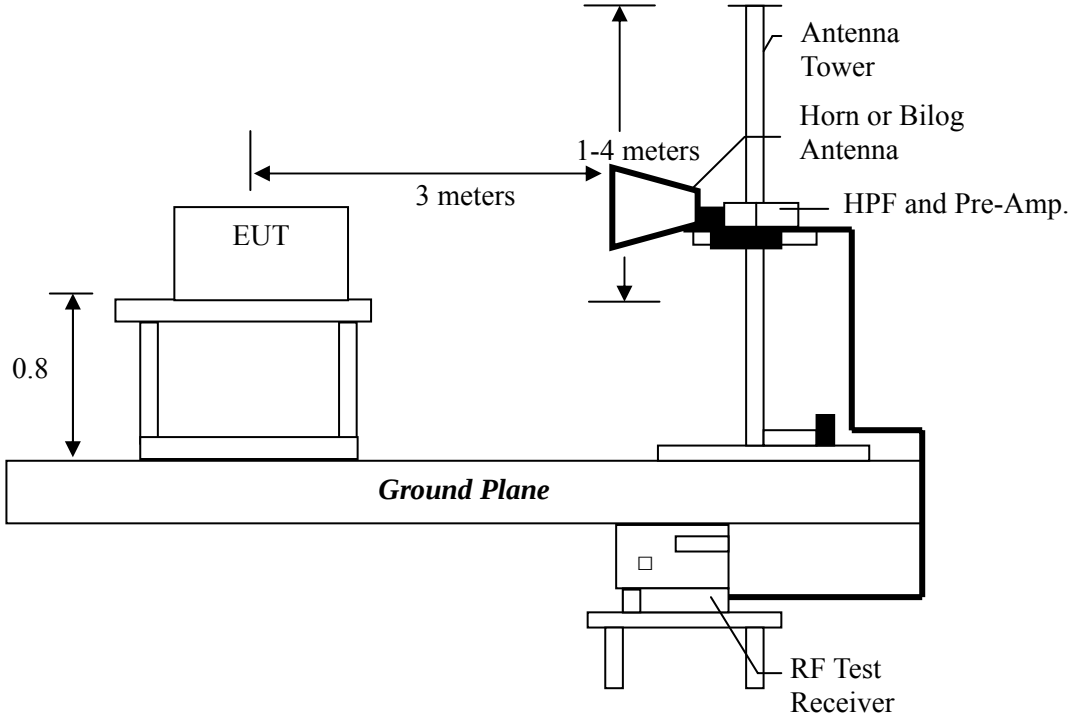
## 3. Radiated emission test

### 3.1 Operating environment

| | | |
|---|---|---|
| Temperature: | 22 | ℃ |
| Relative Humidity: | 56 | % |
| Atmospheric Pressure | 1023 | hPa |

### 3.2 Test setup & procedure

The Diagram below shows the test setup, which is utilized to make these measurements.




The signal is maximized through rotation and placement in the three orthogonal axes.

Radiated emissions were invested cover the frequency range from 30MHz to 1000MHz using a receiver RBW of 120kHz record QP reading, and the frequency over 1GHz using a spectrum analyzer RBW of 1MHz and 10Hz VBW record Average reading. (15.209 paragraph), the Peak reading (1MHz RBW/VBW) recorded also on the report.
The EUT for testing is arranged on a wooden turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

The EUT configuration please refer to the "Spurious set-up photo.pdf".

### 3.3 Emission limit

#### 3.3.1 Fundamental and harmonics emission limits

| Frequency (MHz) | Field Strength of Fundamental | | Field Strength of Harmonics | |
|---|---|---|---|---|
| | (mV/m@3m) | (dBuV/m@3m) | (uV/m@3m) | (dBuV/m@3m) |
| 2400-2483.5 | 50 | 94 | 500 | 54 |

#### 3.3.2 General radiated emission limits

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

| Frequency MHz | 15.209 Limits (dB $\mu$ V/m@3m) |
|---|---|
| 30-88 | 40 |
| 88-216 | 43.5 |
| 216-960 | 46 |
| Above 960 | 54 |

Remark:
1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

Measurement uncertainty was calculated in accordance with TR 100 028-1.

| Parameter | Uncertainty |
|---|---|
| Radiated Emission | ± 5.10 dB |

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

### 3.4 Radiated spurious emission test data

#### 3.4.1 Measurement results: frequencies equal to or less than 1 GHz

The test was performed on EUT under continuously transmitting mode. Low, middle and high channels were verified. The worst case occurred Tx at low channel.

EUT : M01084-D
Worst Case : Tx at low channel

| Polarization (circle) | Frequency (MHz) | Detector | Corr. Factor (dB/m) | Reading (dBuV) | Calculated dBuV/m | Limit (dBuV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| Vertical | 115.36 | QP | 8.19 | 21.89 | 30.08 | 43.50 | -13.42 |
| Vertical | 149.31 | QP | 14.27 | 14.32 | 28.59 | 43.50 | -14.91 |
| Vertical | 365.62 | QP | 15.06 | 16.46 | 31.52 | 46.00 | -14.48 |
| Vertical | 497.54 | QP | 18.43 | 13.87 | 32.30 | 46.00 | -13.70 |
| Vertical | 696.39 | QP | 22.33 | 12.48 | 34.80 | 46.00 | -11.20 |
| Vertical | 799.21 | QP | 23.19 | 11.79 | 34.98 | 46.00 | -11.02 |
| Horizontal | 249.22 | QP | 12.36 | 28.07 | 40.43 | 46.00 | -5.57 |
| Horizontal | 298.69 | QP | 14.17 | 24.84 | 39.00 | 46.00 | -7.00 |
| Horizontal | 365.62 | QP | 15.48 | 23.42 | 38.89 | 46.00 | -7.11 |
| Horizontal | 399.57 | QP | 16.74 | 17.75 | 34.49 | 46.00 | -11.51 |
| Horizontal | 431.58 | QP | 18.12 | 14.12 | 32.24 | 46.00 | -13.76 |
| Horizontal | 499.48 | QP | 18.64 | 13.45 | 32.09 | 46.00 | -13.91 |

Remark:
1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor

### 3.4.2 Measurement results: frequency above 1GHz

EUT : M01084-D
Test Condition : Tx at low channel

| Frequency (MHz) | Spectrum Analyzer Detector | Ant. Pol. (H/V) | Preamp. Gain (dB) | Correction Factor (dB/m) | Reading (dBuV) | Average Factor (dB) | Corrected Reading (dBuV/m) | Limit @ 3 m (dBuV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 4824.00 | PK | V | 35.1 | 38.54 | 53.68 | - | 57.12 | 74 | -16.88 |
| 4824.00 | AV | V | 35.1 | 38.54 | 53.68 | -8.17 | 48.95 | 54 | -5.05 |
| 7236.00 | PK | V | 33 | 44.6 | 40.56 | - | 52.16 | 74 | -21.84 |
| 7236.00 | AV | V | 33 | 44.6 | 40.56 | -8.17 | 43.99 | 54 | -10.01 |
| 4824.00 | PK | H | 35.1 | 38.54 | 53.45 | - | 56.89 | 74 | -17.11 |
| 4824.00 | AV | H | 35.1 | 38.54 | 53.45 | -8.17 | 48.72 | 54 | -5.28 |
| 7236.00 | PK | H | 33 | 44.6 | 44.56 | - | 56.16 | 74 | -17.84 |
| 7236.00 | AV | H | 33 | 44.6 | 44.56 | -8.17 | 47.99 | 54 | -6.01 |

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz. The data value listed above which is higher than the system noise floor.

EUT : M01084-D
Test Condition : Tx at middle channel

| Frequency (MHz) | Spectrum Analyzer Detector | Ant. Pol. (H/V) | Preamp. Gain (dB) | Correction Factor (dB/m) | Reading (dBuV) | Average Factor (dB) | Corrected Reading (dBuV/m) | Limit @ 3 m (dBuV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 4900.00 | PK | V | 35.1 | 38.54 | 53.88 | - | 57.32 | 74 | -16.68 |
| 4900.00 | AV | V | 35.1 | 38.54 | 53.88 | -8.17 | 49.15 | 54 | -4.85 |
| 7350.00 | PK | V | 33 | 44.6 | 39.98 | - | 51.58 | 74 | -22.42 |
| 7350.00 | AV | V | 33 | 44.6 | 39.98 | -8.17 | 43.41 | 54 | -10.59 |
| 4900.00 | PK | H | 35.1 | 38.54 | 52.28 | - | 55.72 | 74 | -18.28 |
| 4900.00 | AV | H | 35.1 | 38.54 | 52.28 | -8.17 | 47.55 | 54 | -6.45 |
| 7350.00 | PK | H | 33 | 44.6 | 48 | - | 59.60 | 74 | -14.40 |
| 7350.00 | AV | H | 33 | 44.6 | 48 | -8.17 | 51.43 | 54 | -2.57 |

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz. The data value listed above which is higher than the system noise floor.

EUT : M01084-D
Test Condition : Tx at high channel

| Frequency (MHz) | Spectrum Analyzer Detector | Ant. Pol. (H/V) | Preamp. Gain (dB) | Correction Factor (dB/m) | Reading (dBuV) | Average Factor (dB) | Corrected Reading (dBuV/m) | Limit @ 3 m (dBuV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 4944.00 | PK | V | 35.1 | 38.54 | 58.44 | - | 61.88 | 74 | -12.12 |
| 4944.00 | AV | V | 35.1 | 38.54 | 58.44 | -8.17 | 53.71 | 54 | -0.29 |
| 7416.00 | PK | V | 33 | 44.6 | 42.23 | - | 53.83 | 74 | -20.17 |
| 7416.00 | AV | V | 33 | 44.6 | 42.23 | -8.17 | 45.66 | 54 | -8.34 |
| 4944.00 | PK | H | 35.1 | 38.54 | 53.79 | - | 57.23 | 74 | -16.77 |
| 4944.00 | AV | H | 35.1 | 38.54 | 53.79 | -8.17 | 49.06 | 54 | -4.94 |
| 7416.00 | PK | H | 33 | 44.6 | 49.15 | - | 60.75 | 74 | -13.25 |
| 7416.00 | AV | H | 33 | 44.6 | 49.15 | -8.17 | 52.58 | 54 | -1.42 |

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz. The data value listed above which is higher than the system noise floor.

### 3.4.3 Measurement results: Fundamental emission

EUT : M01084-D
Test Condition : Tx at low channel

| Frequency (MHz) | Spectrum Analyzer Detector | Ant. Pol. (H/V) | Correction Factor (dB/m) | Reading (dBuV) | Average Factor (dB) | Corrected Reading (dBuV/m) | Limit @ 3 m (dBuV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| 2412.00 | PK | H | 32.86 | 59.75 | - | 92.61 | 113.9794 | -21.37 |
| 2412.00 | AV | H | 32.86 | 59.75 | -8.17 | 84.44 | 93.9794 | -9.54 |

Remark:
1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor

EUT : M01084-D
Test Condition : Tx at middle channel

| Frequency (MHz) | Spectrum Analyzer Detector | Ant. Pol. (H/V) | Correction Factor (dB/m) | Reading (dBuV) | Average Factor (dB) | Corrected Reading (dBuV/m) | Limit @ 3 m (dBuV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| 2450.00 | PK | H | 32.95 | 57.05 | - | 90.00 | 113.9794 | -23.98 |
| 2450.00 | AV | H | 32.95 | 57.05 | -8.17 | 81.83 | 93.9794 | -12.15 |

Remark:
1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor

EUT : M01084-D
Test Condition : Tx at high channel

| Frequency (MHz) | Spectrum Analyzer Detector | Ant. Pol. (H/V) | Correction Factor (dB/m) | Reading (dBuV) | Average Factor (dB) | Corrected Reading (dBuV/m) | Limit @ 3 m (dBuV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| 2472.00 | PK | H | 33.06 | 58.57 | - | 91.63 | 113.9794 | -22.35 |
| 2472.00 | AV | H | 33.06 | 58.57 | -8.17 | 83.46 | 93.9794 | -10.52 |

Remark:
1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor

## 4. Radiated emission on the band edge FCC 15.209

**Method of Measurement:**

**Reference FCC document: KDB558074, ANSI C63.4**

The frequency range from 30 MHz to 1000 MHz using Bilog Antenna.
The frequency range over 1 GHz using Horn Antenna.

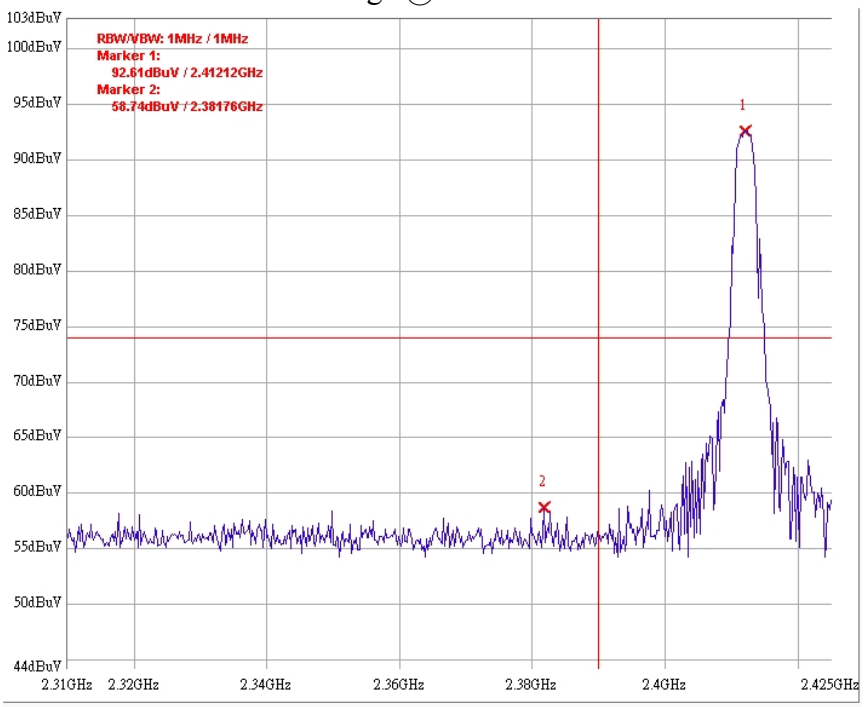
**§ 15.35 Measurement detector functions and bandwidths**

(c) Unless otherwise specified, e.g. § 15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.

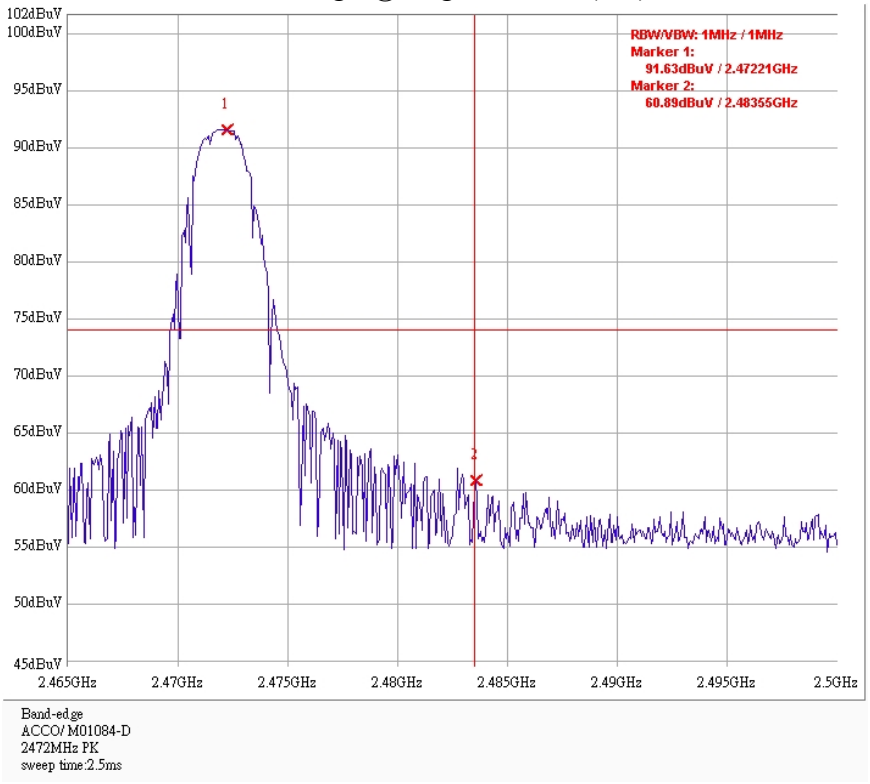
| Frequency | Measurement Freq.Band (MHz) | Detector | The Max. Field Strength in Restrict Band (dBuV/m) | Limit @ 3 m (dBuV/m) | Margin (dB) |
|---|---|---|---|---|---|
| 2412 MHz | 2310-2390 | PK | 58.74 | 74 | -15.26 |
| 2412 MHz | 2310-2390 | AV | 50.57 | 54 | -3.43 |
| 2472 MHz | 2483.5-2500 | PK | 60.89 | 74 | -13.11 |
| 2472 MHz | 2483.5-2500 | AV | 52.72 | 54 | -1.28 |

Note: Duty cycle correction factor = -8.17 dB

Band Edge @ Low channel




Band Edge @ High channel (PK)

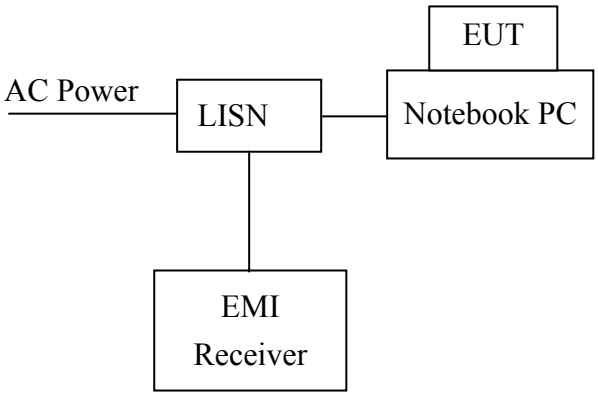


## 5. Conducted emission test FCC 15.207

### 5.1 Operating environment

| | | |
|---|---|---|
| Temperature: | 24 | ℃ |
| Relative Humidity: | 53 | % |
| Atmospheric Pressure | 1023 | hPa |

### 5.2 Test setup & procedure




The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a 50 ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination.
Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4/1992 on conducted measurement.
The bandwidth of the field strength meter (R & S Test Receiver ESCS 30) is set at 9kHz.

The EUT configuration please refer to the "Conducted set-up photo.pdf".

### 5.3 Emission limit

| Freq. (MHz) | Conducted Limit (dBuV) | |
|---|---|---|
| | Q.P. | Ave. |
| 0.15~0.50 | 66 – 56* | 56 – 46* |
| 0.50~5.00 | 56 | 46 |
| 5.00~30.0 | 60 | 50 |

*Decreases with the logarithm of the frequency.

## 5.4 Uncertainty of Conducted Emission

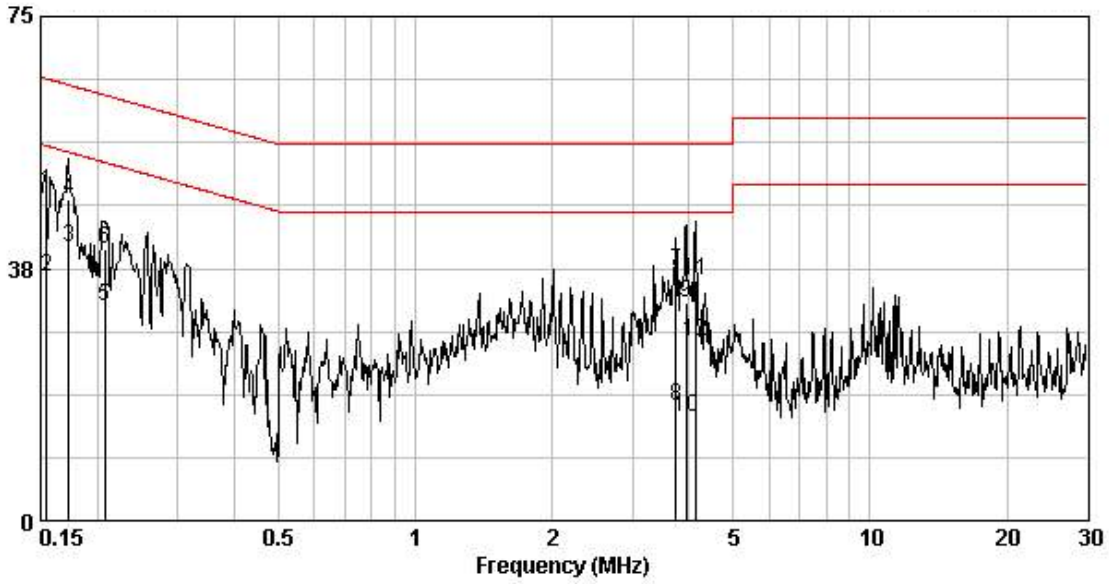
Expanded uncertainty (k=2) of conducted emission measurement is ± 2.786 dB.

## 5.5 Conducted emission data FCC 15.207

Phase: Line
Model No.: M01084-D
Test Condition: Normal operating mode

| Frequency (MHz) | Corr. Factor (dB) | Level Qp (dBuV) | Limit Qp (dBuV) | Level AV (dBuV) | Limit Av (dBuV) | Margin (dB) Qp | Av |
|---|---|---|---|---|---|---|---|
| 0.15 | 0.81 | 48.88 | 65.74 | 36.38 | 55.74 | -16.86 | -19.36 |
| 0.17 | 0.81 | 47.80 | 64.81 | 40.62 | 54.81 | -17.02 | -14.20 |
| 0.21 | 0.77 | 40.50 | 63.32 | 31.74 | 53.32 | -22.82 | -21.58 |
| 3.74 | 0.23 | 37.00 | 56.00 | 17.00 | 46.00 | -19.00 | -29.00 |
| 3.94 | 0.24 | 32.30 | 56.00 | 15.47 | 46.00 | -23.70 | -30.53 |
| 4.14 | 0.25 | 35.79 | 56.00 | 26.65 | 46.00 | -20.21 | -19.35 |

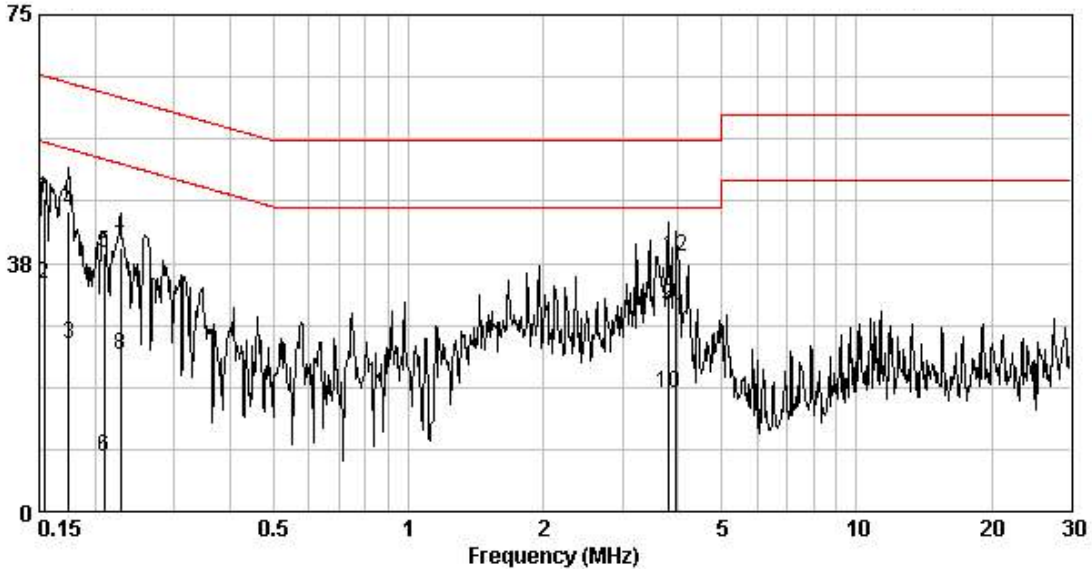
Remark:
1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)



Phase: Neutral
Model No.: M01084-D
Test Condition: Normal operating mode

| Frequency (MHz) | Corr. Factor (dB) | Level Qp (dBuV) | Limit Qp (dBuV) | Level AV (dBuV) | Limit Av (dBuV) | Margin (dB) Qp | Av |
|---|---|---|---|---|---|---|---|
| 0.15 | 0.11 | 47.38 | 65.78 | 34.47 | 55.78 | -18.40 | -21.31 |
| 0.17 | 0.11 | 45.26 | 64.72 | 25.33 | 54.72 | -19.47 | -29.40 |
| 0.21 | 0.11 | 38.99 | 63.23 | 8.35 | 53.23 | -24.24 | -44.88 |
| 0.23 | 0.11 | 39.79 | 62.52 | 23.66 | 52.52 | -22.74 | -28.87 |
| 3.80 | 0.24 | 31.13 | 56.00 | 17.88 | 46.00 | -24.87 | -28.12 |
| 3.96 | 0.24 | 38.49 | 56.00 | 29.50 | 46.00 | -17.51 | -16.50 |

Remark:
1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)



## 6. Calculation of Average Factor

The specification for output field strengths in accordance with the FCC rules specify measurements with an average detector. During testing, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

The time period over which the duty cycle is measured in 100 ms or the repetition cycle, whichever is a shorter time frame. The duty cycle is measured by placing the spectrum analyzer in zero span mode at 100 resolution bandwidth.

The duty cycles of handset and base unit are exactly the same.

Duty cycle correction factor in dB = 20log (duty cycle)

The duty cycle is simply the on-time divided by the period:

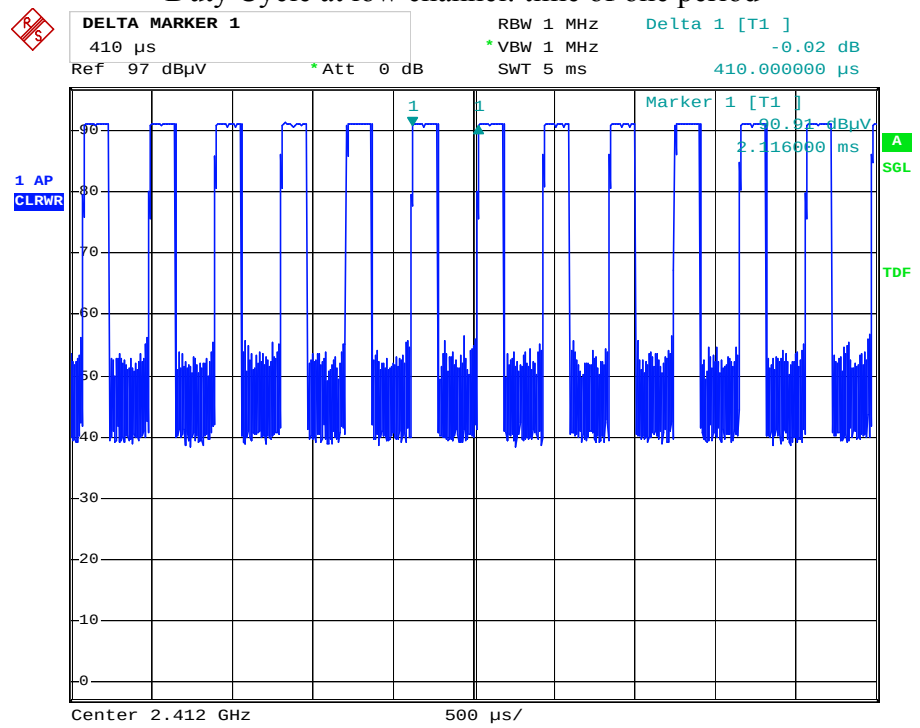
The number of pulses in each period (1 multiplied by the duration of each pulses 0.516ms

Duty Cycle = 0.16ms / 0.41ms = 0.39024

Therefore, the duty cycle correction factor will be 20 log10 (0.39024) = -8.17 dB

Please see the plot below.

## Duty Cycle at low channel: time of one period

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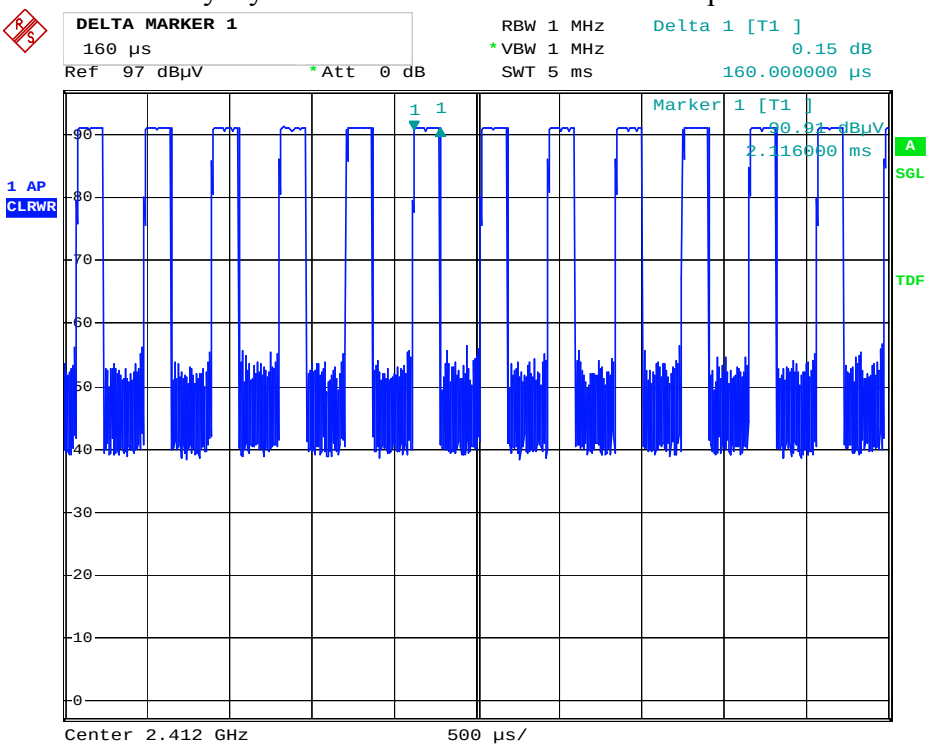
## Duty Cycle at low channel: on time of one pulse

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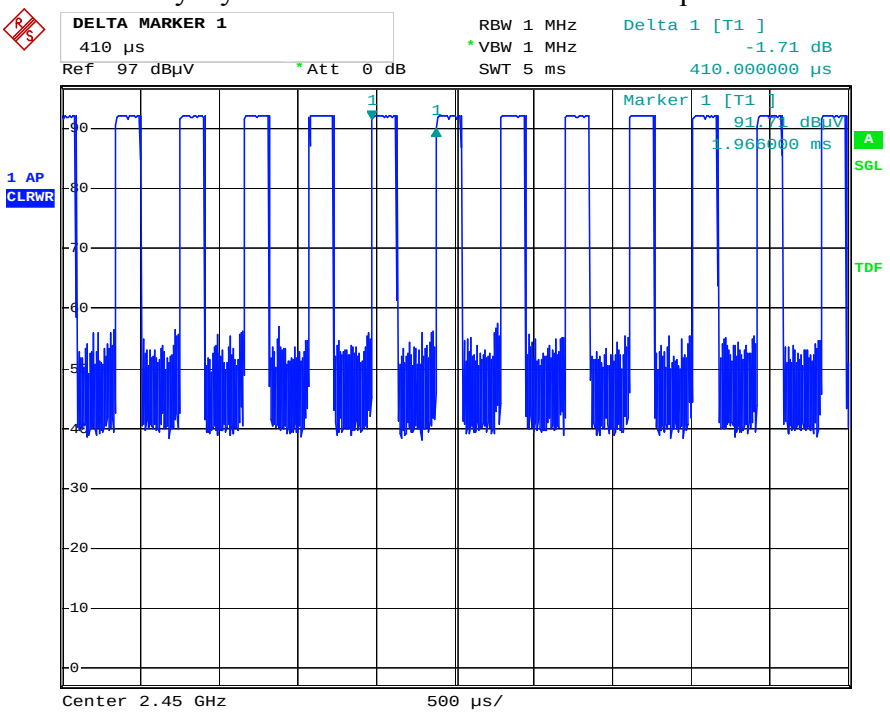
## Duty Cycle at middle channel: time of one period

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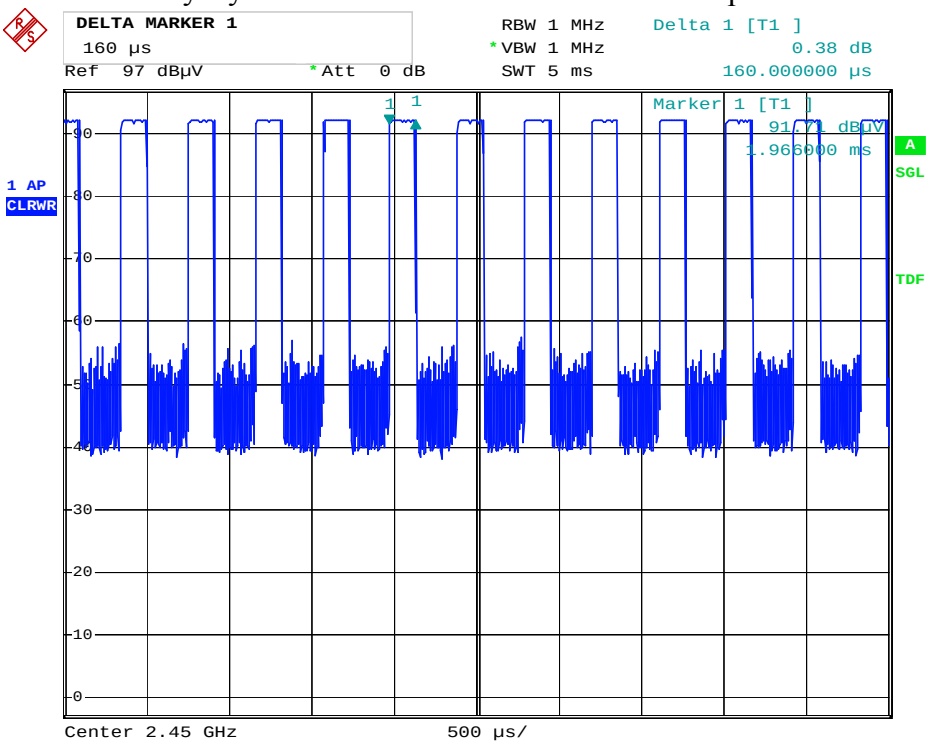
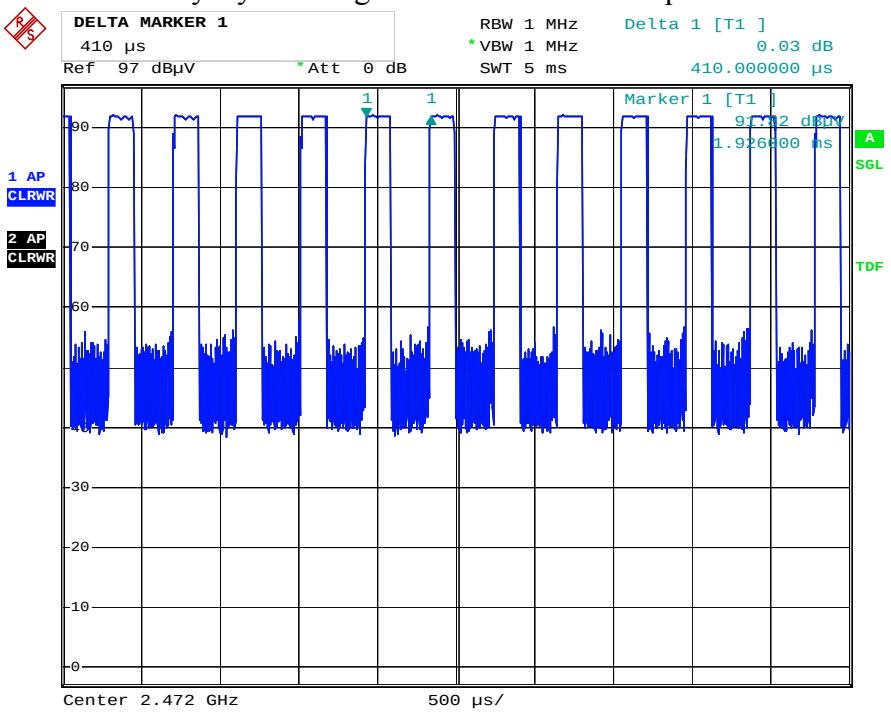
## Duty Cycle at middle channel: on time of one pulse




Date: 13.APR.2010 17:12:38

## Duty Cycle at high channel: time of one period

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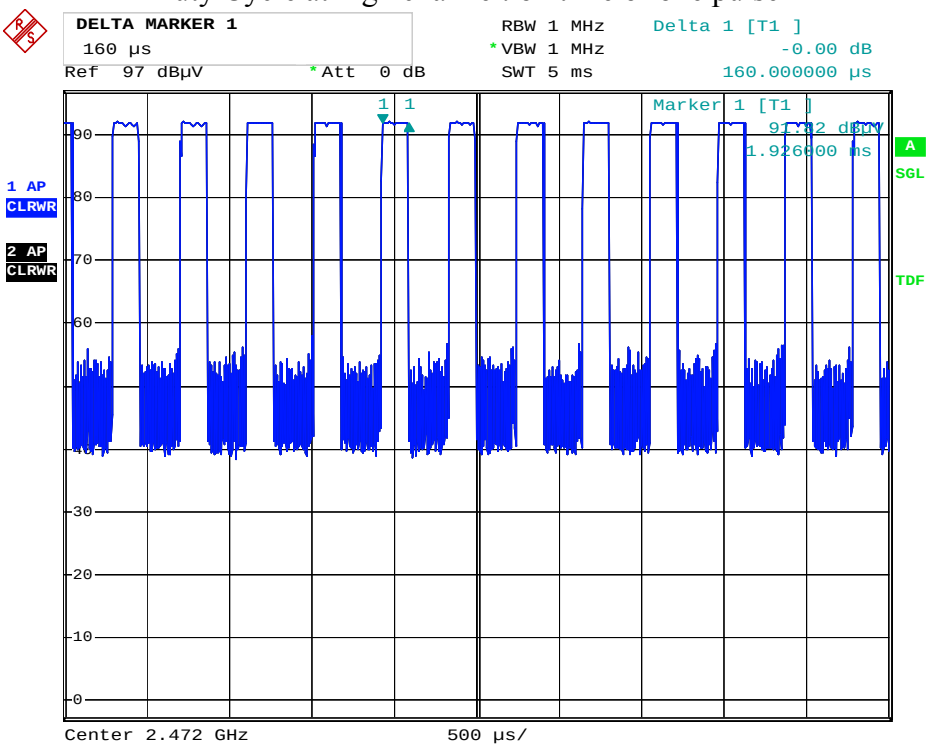
## Duty Cycle at high channel: on time of one pulse




Date: 13.APR.2010 17:13:49