

# EMC TEST REPORT

**Report No.** : TS09090114-EME

**Model No.** : TTD-82T

**Issued Date** : Oct. 12, 2009

**Applicant:** Tranwo Technology Corp.  
6F., No. 49, Guangming 6<sup>th</sup> Rd., Jubei City, Hsinchu,  
Taiwan

**Test Method/  
Standard:** FCC Part 15 Subpart C Section §15.205 、 §15.207 、  
§15.209 、 §15.247, DA 00-705 and ANSI C63.4/2003.

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## Summary of Tests

### **2.4GHz Digital Wireless USB Outdoor Camera-Model: TTD-82T FCC ID: O6LTTD-82T**

| Test                                  | Reference      | Results |
|---------------------------------------|----------------|---------|
| 20dB Bandwidth test                   | 15.247(a)(1)   | Pass    |
| Carrier Frequency Separation test     | 15.247(a)(1)   | Pass    |
| Number of hopping frequencies test    | 15.247(a)(1)   | Pass    |
| Time of Occupancy (dwell time) test   | 15.247(a)(1)   | Pass    |
| Maximum Output Power test             | 15.247(b)      | Pass    |
| RF Antenna Conducted Spurious test    | 15.247(d)      | Pass    |
| Radiated Spurious Emission test       | 15.205, 15.209 | Pass    |
| Emission on the Band Edge test        | 15.247(d)      | Pass    |
| AC Power Line Conducted Emission test | 15.207         | Pass    |

## 1. General information

### 1.1 Identification of the EUT

|                        |  |
|------------------------|--|
| Product:               | 2.4GHz Digital Wireless USB Outdoor Camera   |
| Model No.:             | TTD-82T  |
| FCC ID:                | O6LTTD-82T   |
| Rated Power:           | DC 9 V from adapter (Model No.: HK-J105-A09)<br>I/P: 100-240 Vac, 50/60 Hz   |
| Operating Frequency:   | 2408.625MHz ~ 2469.375 MHz   |
| Channel Number:        | 18 Channel   |
| Type of Modulation:    | GFSK, FHSS   |
| Power Cord:            | N/A  |
| Data Cable:            | N/A  |
| Sample receiving date: | Sep. 25, 2009  |
| Testing date:          | Sep. 30, 2009 ~ Oct. 09, 2009  |
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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 2.4GHz Digital Wireless USB Outdoor Camera, and was defined as information technology equipment.

### Channel Table

| Channel | TX Freq      | Channel | TX Freq      |
|---------|--------------|---------|--------------|
| 0       | 2408.625 MHz | 45      | 2440.125 MHz |
| 4       | 2412.000 MHz | 32      | 2444.625 MHz |
| 8       | 2415.375 MHz | 36      | 2448.000 MHz |
| 12      | 2418.750 MHz | 40      | 2451.375 MHz |
| 16      | 2423.250 MHz | 44      | 2454.750 MHz |
| 20      | 2426.625 MHz | 48      | 2458.125 MHz |
| 24      | 2430.000 MHz | 52      | 2462.625 MHz |
| 19      | 2433.375 MHz | 56      | 2466.000 MHz |
| 28      | 2436.750 MHz | 60      | 2469.375 MHz |

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 Gain : 1.5 dBi max

Antenna Type : Monopole antenna

Connector Type : N/A

## 1.4 Peripherals equipment

| Peripherals | Manufacturer | Product No. | Serial No. |
|-------------|--------------|-------------|------------|
| PC          | DELL         | GX-520      | CWJK1S     |
| USB Dongle  | Tranwo       | TTD-52R     | N/A        |

## **2. Test specifications**

### **2.1 Test standard**

The EUT was performed according to the procedures in FCC Part 15 Subpart C Section § 15.205 、§15.207 、§15.209 、§15.247, DA 00-705 and ANSI C63.4/2003.

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

### **2.2 Operation mode**

The EUT was supplied DC 9 V from adapter (Test voltage: 120 Vac, 60 Hz) and it was run in TX mode that was controlled by “RF Engineer tools” program.

### 2.3 Test equipment

| Equipment                         | Brand           | Frequency range | Model No.           |
|-----------------------------------|-----------------|-----------------|---------------------|
| EMI Test Receiver                 | Rohde & Schwarz | 9kHz~2.75GHz    | ESCS 30             |
| Spectrum Analyzer                 | Rohde & Schwarz | 9kHz~30GHz      | FSP 30              |
| Spectrum Analyzer                 | Rohde & Schwarz | 20Hz~40GHz      | FSEK 30             |
| Horn Antenna                      | SCHWARZBECK     | 1GHz~18GHz      | BBHA 9120 D         |
| Horn Antenna                      | SCHWARZBECK     | 14GHz~40GHz     | BBHA 9170           |
| Bilog Antenna                     | SCHWARZBECK     | 25MHz~1.7GHz    | VULB 9168           |
| Pre-Amplifier                     | MITEQ           | 100MHz~26.5GHz  | 919981              |
| Pre-Amplifier                     | MITEQ           | 26GHz~40GHz     | 828825              |
| Wideband Peak Power Meter/ Sensor | Anritsu         | 100MHz~18GHz    | ML2495A/<br>MA2411B |
| Controller                        | HDGmbH          | N/A             | HD 100              |
| Antenna Tower                     | HDGmbH          | N/A             | MA 240              |
| Turn Table                        | HDGmbH          | N/A             | DS 420S             |
| LISN                              | Rohde & Schwarz | 9KHz~30MHz      | ESH3-Z5             |

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



### 3. 20dB Bandwidth test

#### 3.1 Operating environment

Temperature: 25 °C  
Relative Humidity: 55 %  
Atmospheric Pressure: 1023 hPa

#### 3.2 Test setup & procedure

**The test procedure was according to FCC measurement guidelines DA 00-705.**

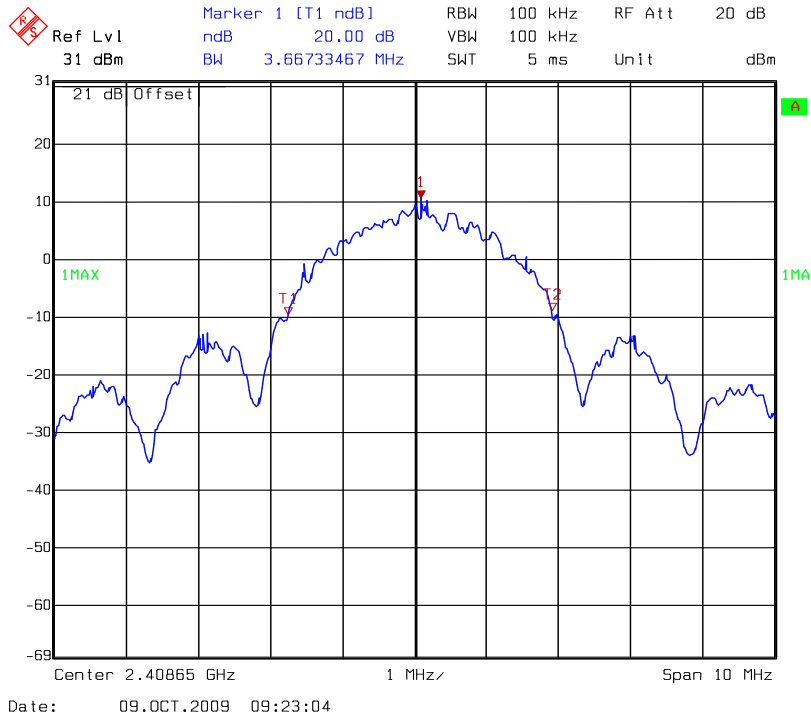
The 20dB bandwidth per FCC §15.247(a)(1) was measured using a 50 ohm spectrum analyzer with the resolutions bandwidth set at 100 kHz, the video bandwidth  $\geq$  RBW, and the SPAN may equal to approximately 2 to 3 times the 20dB bandwidth. The test was performed at 3 channels (lowest, middle and highest channel). The maximum 20dB modulation bandwidth is in the following Table.

#### 3.3 Measured data of modulated bandwidth test results

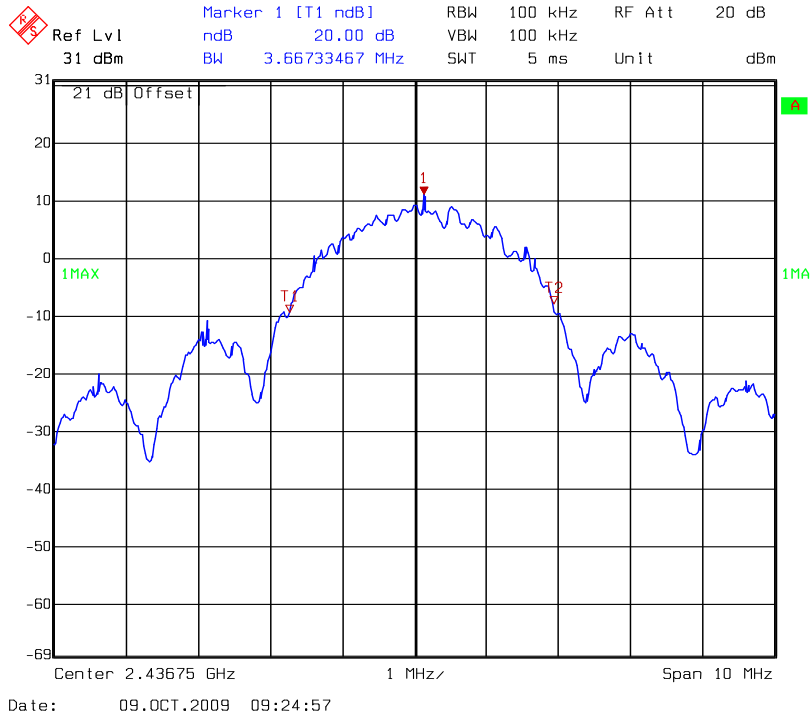
| Channel | Frequency (MHz) | Bandwidth (kHz) |
|---------|-----------------|-----------------|
| 0       | 2408.625        | 3667.335        |
| 28      | 2436.750        | 3667.335        |
| 60      | 2469.375        | 3687.375        |

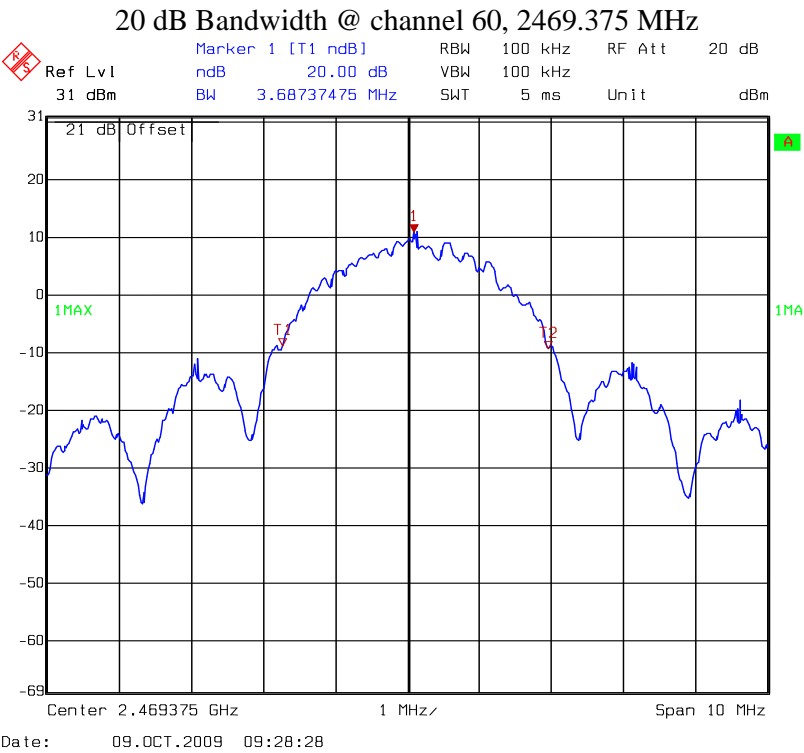
Please see the plot below.

20 dB Bandwidth @ channel 0, 2408.625 MHz



20 dB Bandwidth @ channel 28, 2436.750 MHz





#### 4. Carrier Frequency Separation test

##### 4.1 Operating environment

Temperature: 25 °C  
Relative Humidity: 55 %  
Atmospheric Pressure: 1023 hPa

##### 4.2 Test setup & procedure

**The test procedure was according to FCC measurement guidelines DA 00-705.**

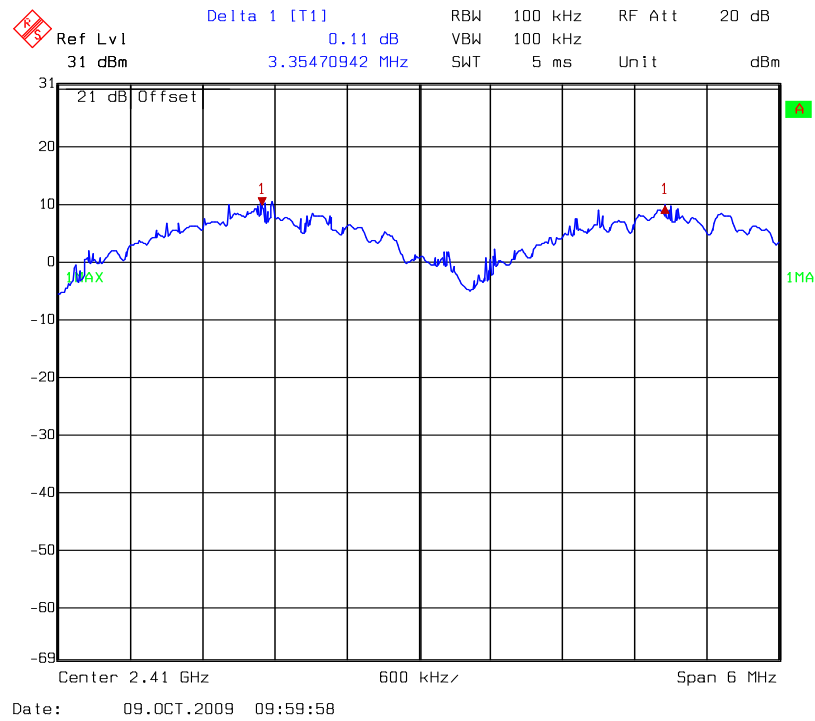
The carrier frequency separation per FCC §15.247(a)(1) was measured using a 50 ohm spectrum analyzer with the resolutions bandwidth set at  $\geq 1\%$  of the span, the video bandwidth  $\geq$  RBW, and the SPAN was wide enough to capture the peaks of two adjacent channels. The carrier frequency separation result is in the following Table.

##### 4.3 Measured data of Carrier Frequency Separation test result

| Frequency (MHz) | Measurement<br>Frequency separation<br>(kHz) |
|-----------------|--|
| 2408.625        | 3354.709                                     |
| 2412.000        |  |

Please see the plot below.

Carrier Frequency Separation test



## 5. Number of hopping frequencies test

### 5.1 Operating environment

Temperature: 25 °C  
Relative Humidity: 55 %  
Atmospheric Pressure: 1023 hPa

### 5.2 Test setup & procedure

**The test procedure was according to FCC measurement guidelines DA 00-705.**

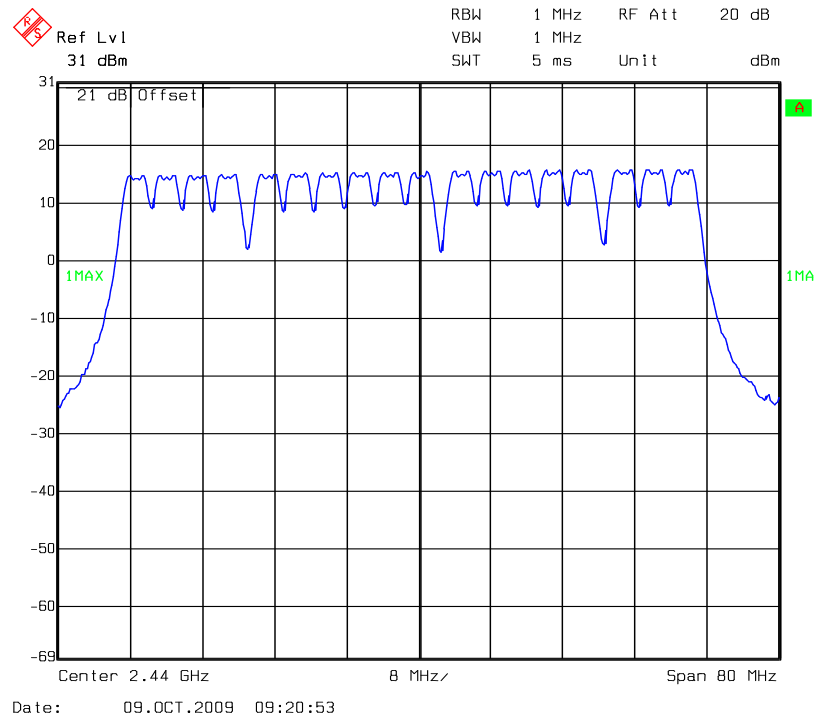
The number of hopping frequencies per FCC §15.247(a)(1) was measured using a 50 ohm spectrum analyzer with the resolutions bandwidth set at  $\geq 1\%$  of the span, the video bandwidth  $\geq$  RBW, and the SPAN was the frequency band of operation. The carrier frequency separation result is in the following Table.

### 5.3 Measured data of number of hopping frequencies test result

| Frequency Range<br>(MHz) | Total hopping channels |
|--------------------------|------------------------|
| 2408.625 ~ 2469.375      | 18                     |

Please see the plot below.

## Number of hopping frequencies test



## 6. Time of Occupancy (dwell time) test

### 6.1 Operating environment

Temperature: 25 °C  
Relative Humidity: 55 %  
Atmospheric Pressure: 1023 hPa

### 6.2 Test setup & procedure

**The test procedure was according to FCC measurement guidelines DA 00-705.**

The time of occupancy (dwell time) per FCC §15.247(a)(1) was measured using a 50 ohm spectrum analyzer with the resolutions bandwidth set at 1MHz, the video bandwidth  $\geq$  RBW, and the zero span function of spectrum analyzer was enable. The EUT has its hopping function enable.

Total sweep time= $0.4 \times 18\text{ch}$ =7.2 seconds

We determined to reduce the sweep time to 720ms,

Count the number of hops and multiply by 10, the total number of hops will be multiplied by the measured time of one pulse.

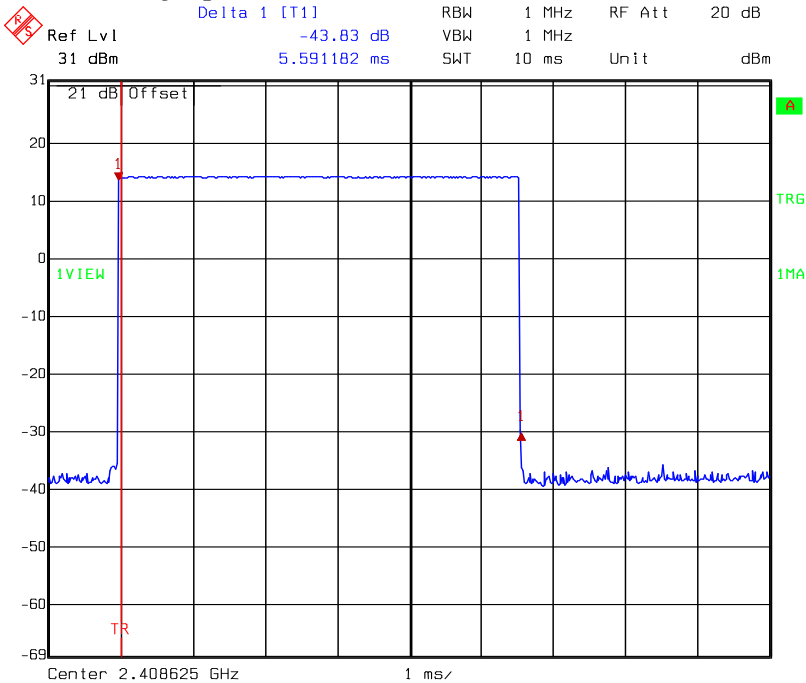
Number of hops in 720ms=7 , total number of hops in 7.2s= $7(10)$ =70

Single pulse width=0.0056s, time of occupancy= $70 \times (0.0056)$ =0.392s <0.4sec

Please see the plot below.

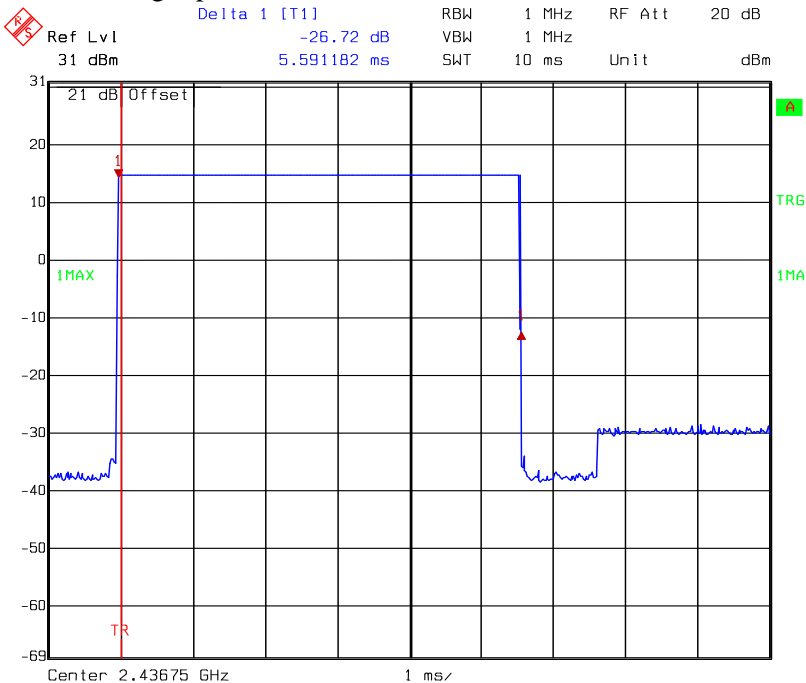


### Single pulse width @ channel 0, 2408.625 MHz



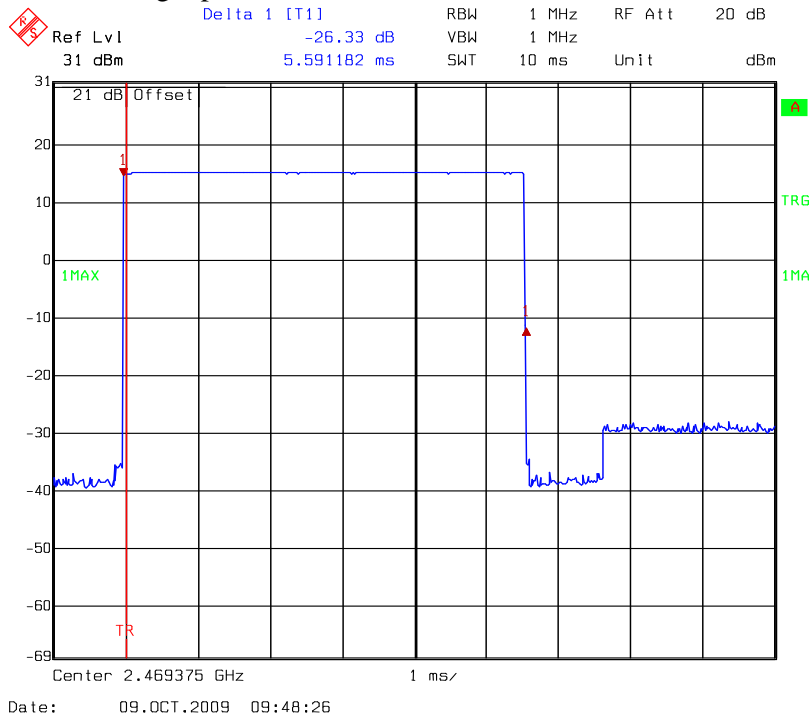
Date: 09.OCT.2009 09:46:36

### Single pulse width @ channel 28, 2436.750 MHz

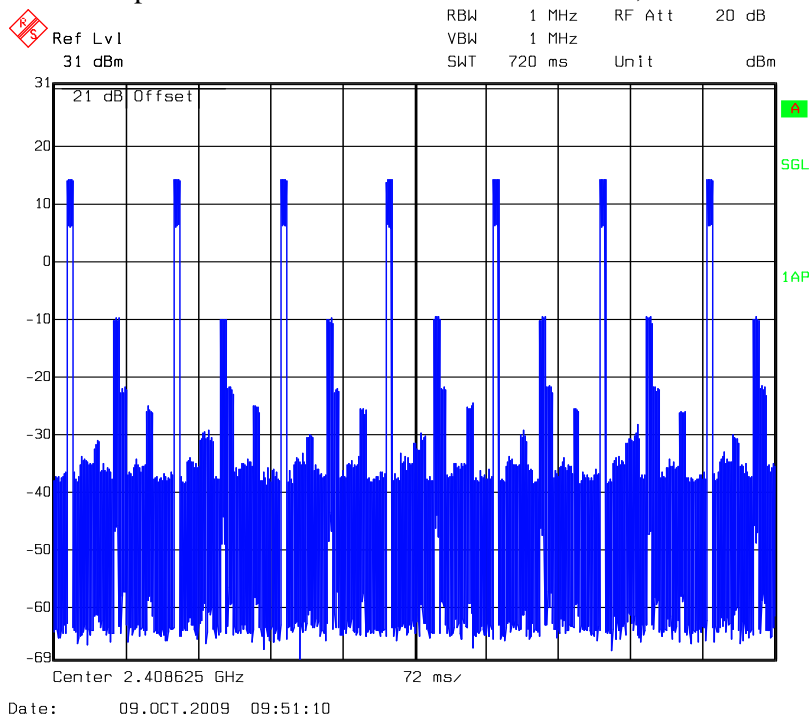


Date: 09.OCT.2009 09:47:50

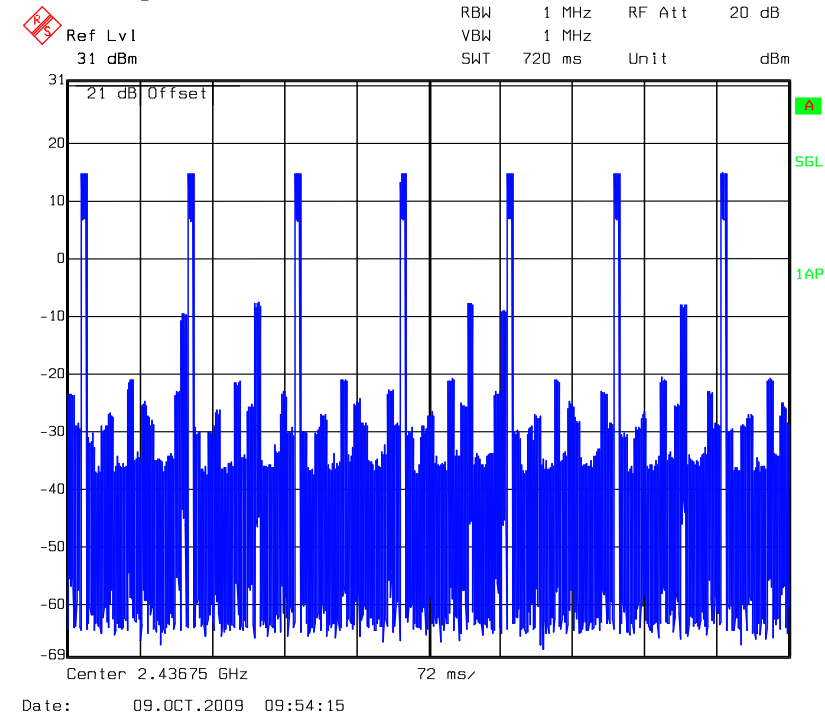
## Single pulse width @ channel 60, 2469.375 MHz



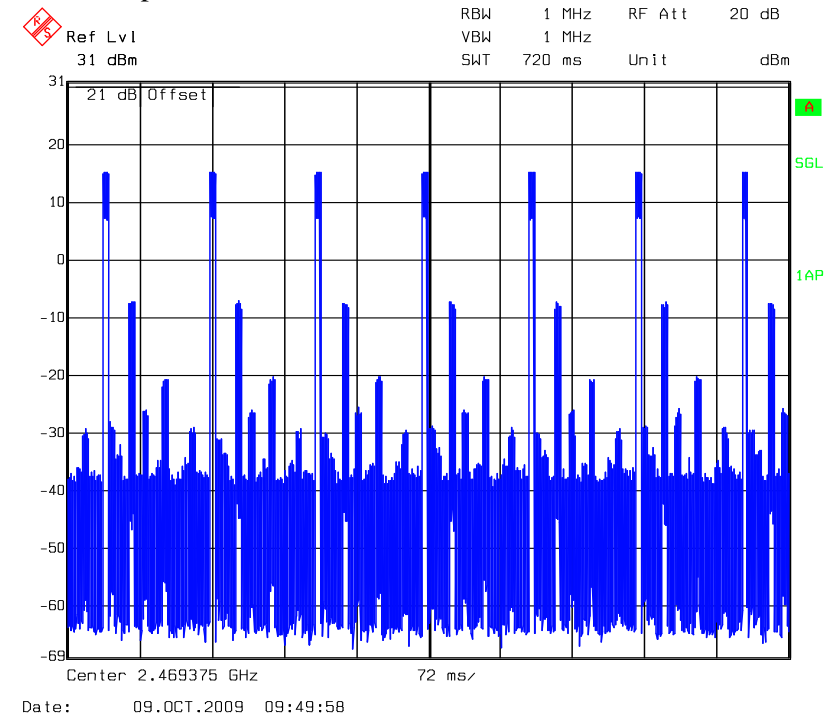
## Number of pulses observed in 720ms=7 @ channel 0, 2408.625 MHz



Number of pulses observed in 720ms=7 @ channel 28, 2436.750 MHz



Number of pulses observed in 720ms=7 @ channel 60, 2469.375 MHz



## 7. Maximum Output Power test

### 7.1 Operating environment

Temperature: 25 °C  
Relative Humidity: 50 %  
Atmospheric Pressure: 1022 hPa

### 7.2 Test setup & procedure

**The test procedure was according to FCC measurement guidelines DA 00-705.**

The power output per FCC §15.247(b) was measured on the EUT using a 50 ohm SMA cable connected to peak power meter via power sensor. Power was read directly and cable loss correction (1.0 dB) was added to the reading to obtain power at the EUT antenna terminals. The test was performed at 3 channels (lowest, middle and highest channel).

### 7.3 Measured data of Maximum Output Power test results

| Freq.<br>(MHz) | Reading<br>(dBm) | Conducted Peak<br>Output Power |       | Limit<br>(dBm) |
|----------------|------------------|--------------------------------|-------|----------------|
|                |                  | (dBm)                          | (mW)  |                |
| 2408.625       | 14.96            | 14.96                          | 31.33 | 21             |
| 2436.750       | 15.50            | 15.50                          | 35.48 | 21             |
| 2469.375       | 15.96            | 15.96                          | 39.45 | 21             |

## 8. RF Antenna Conducted Spurious test

### 8.1 Operating environment

|                    |    |    |
|--------------------|----|----|
| Temperature:       | 25 | °C |
| Relative Humidity: | 58 | %  |

### 8.2 Test setup & procedure

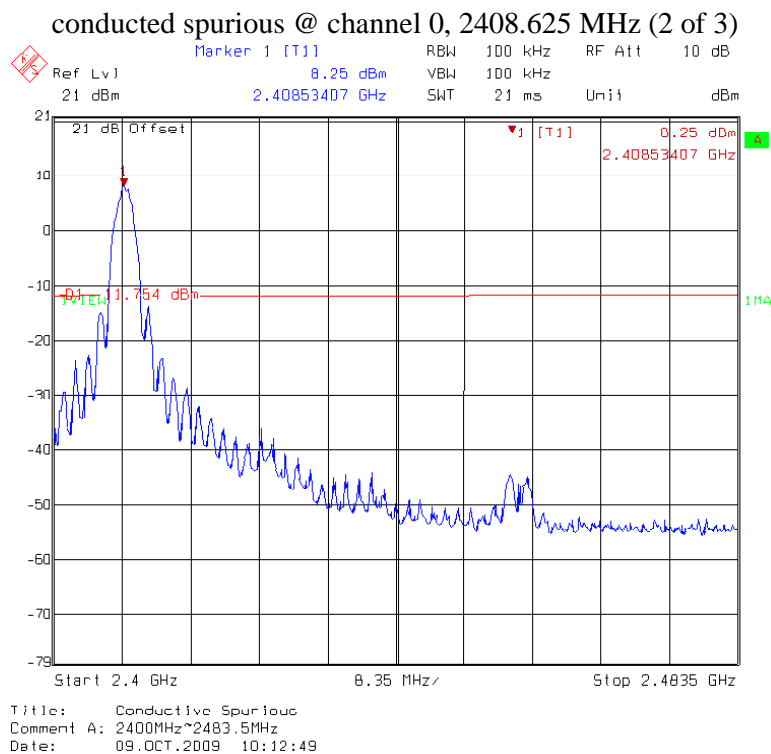
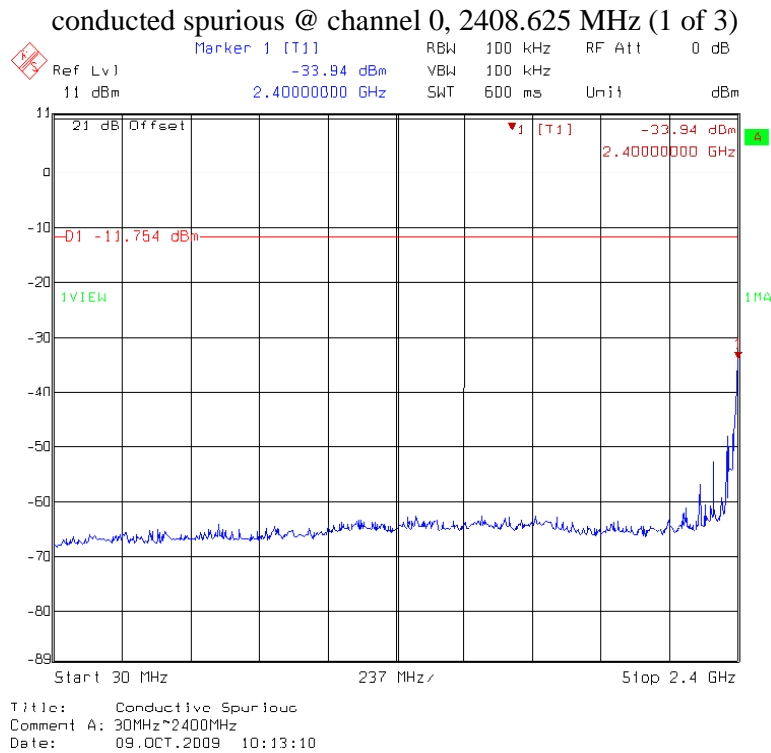
**The test procedure was according to FCC measurement guidelines DA 00-705.**

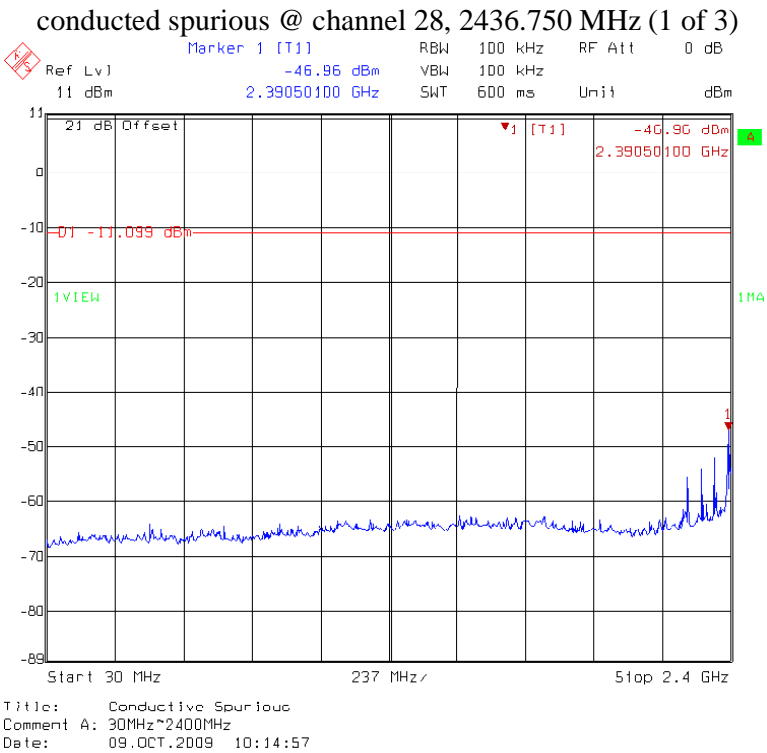
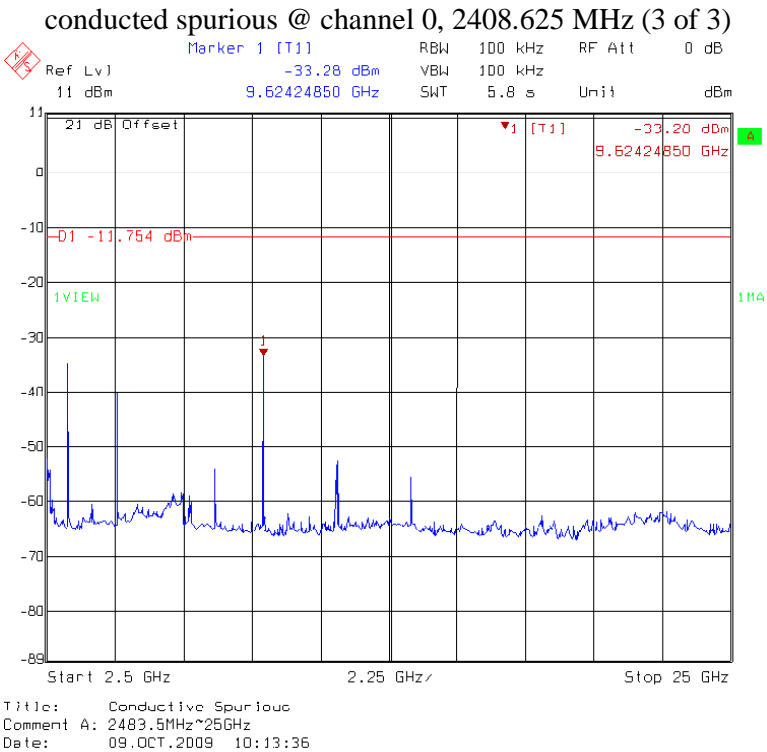
The measurements were performed from 30MHz to 25GHz RF antenna conducted per FCC 15.247 (c) was measured from the EUT antenna port using a 50ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 100 kHz.

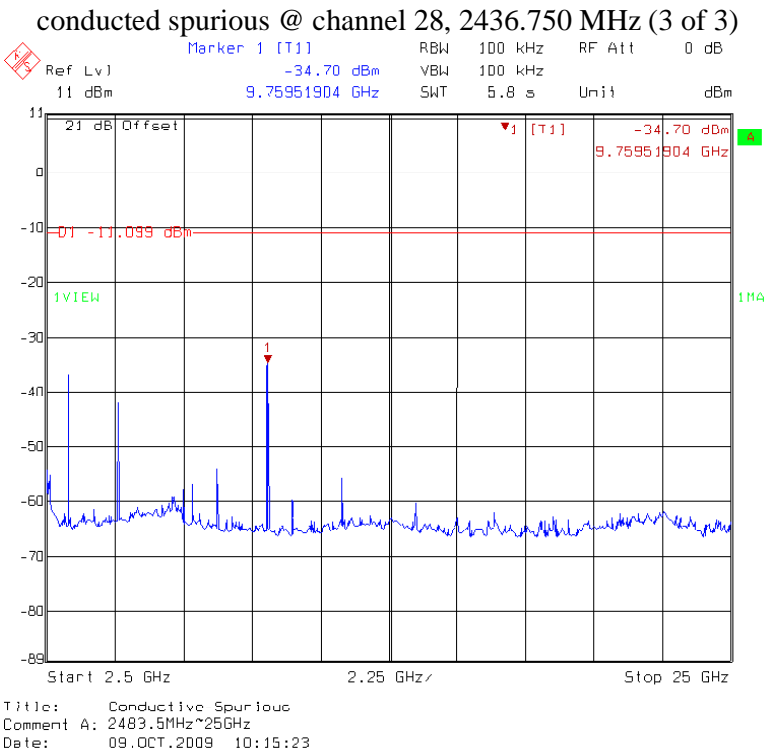
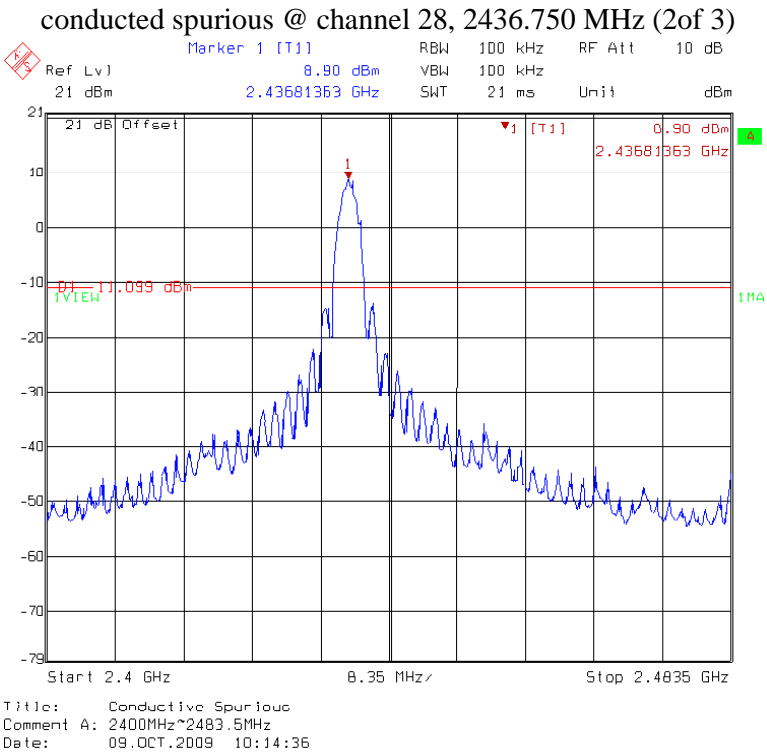
Harmonics and spurious noise must be at least 20dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW. The table below is the results from the highest emission for each channel within the authorized band. This table was used to determine the spurious limits for each channel.

### 8.3 Measured data of the highest RF Antenna Conducted Spurious test result

The test results please see the plot below.

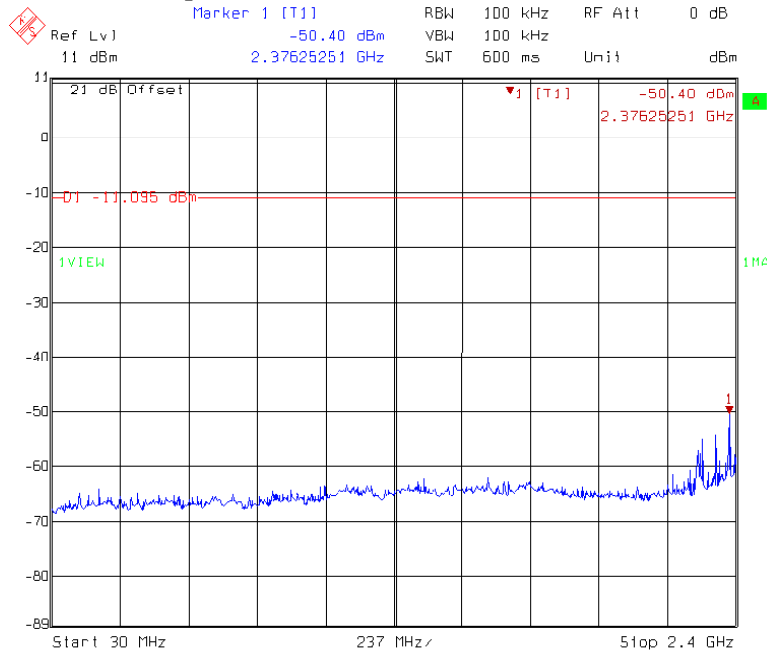






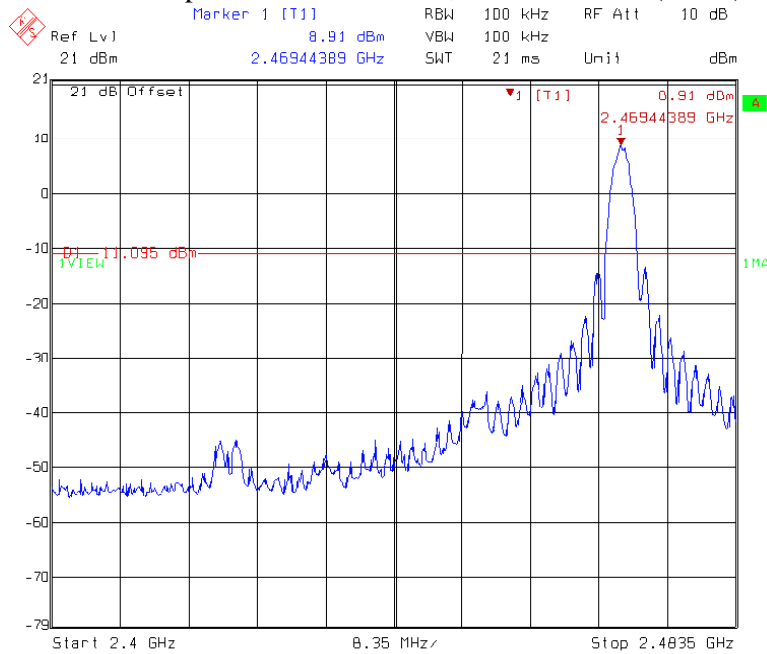


conducted spurious @ channel 60, 2469.375 MHz (1 of 3)

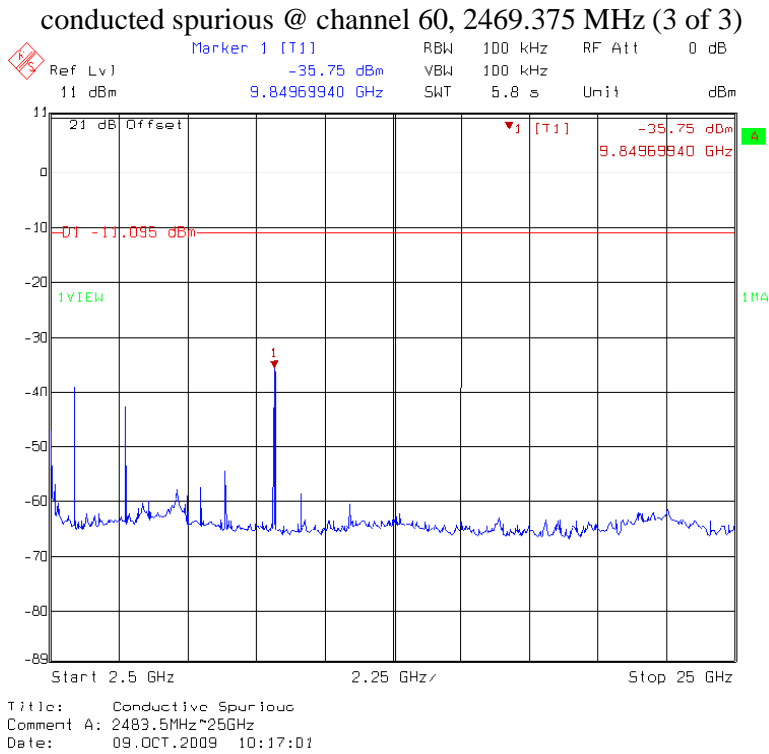


Title: Conductive Spurious  
 Comment A: 30MHz~2400MHz  
 Date: 09.OCT.2009 10:16:35

conducted spurious @ channel 60, 2469.375 MHz (2 of 3)



Title: Conductive Spurious  
 Comment A: 2400MHz~2483.5MHz  
 Date: 09.OCT.2009 10:16:14



## 9. Radiated Emission test

### 9.1 Operating environment

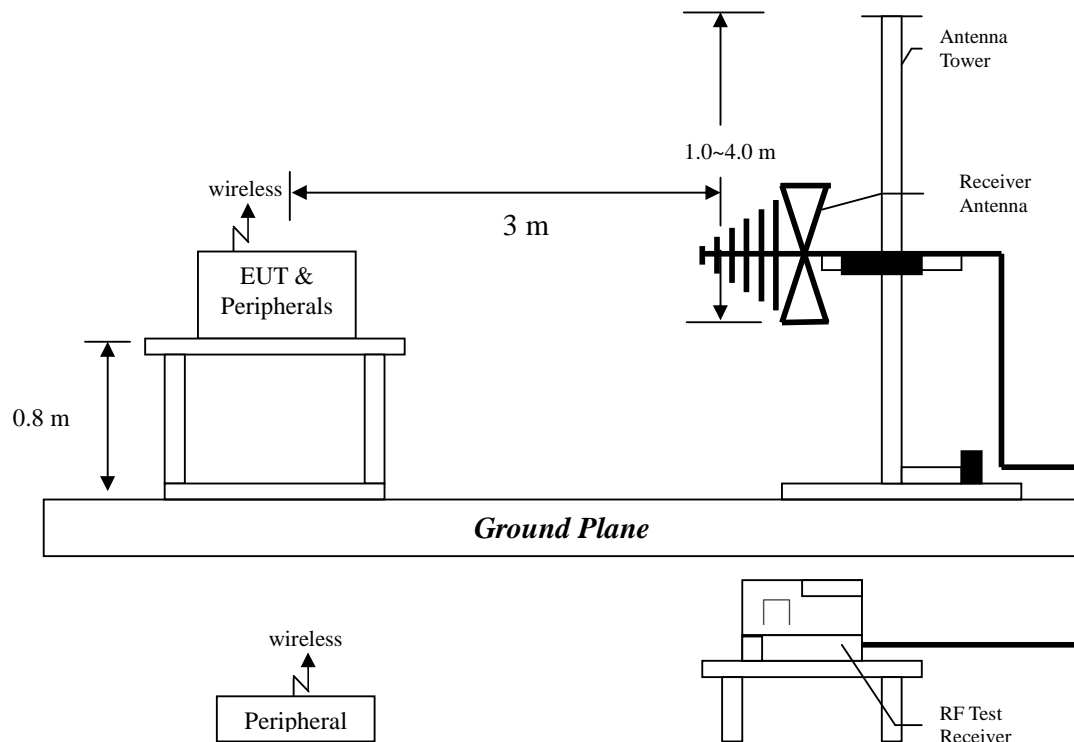
Temperature: 23 °C  
Relative Humidity: 53 %  
Atmospheric Pressure: 1023 hPa

### 9.2 Test setup & procedure

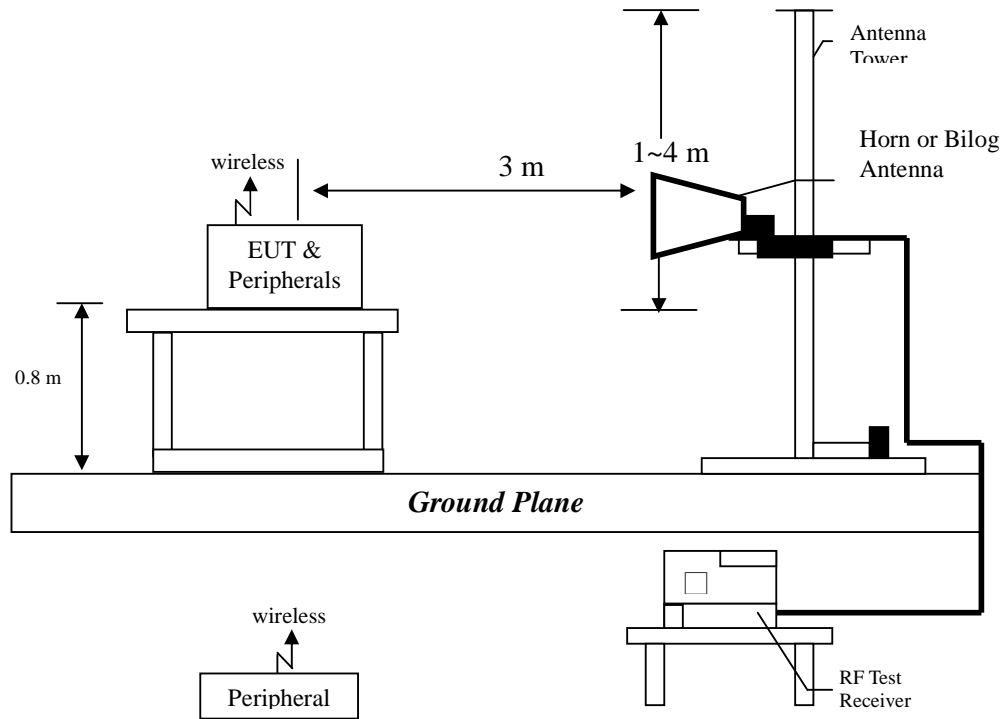
The test procedure was according to FCC measurement guidelines DA 00-705 and ANSI C63.4/2003.

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

The frequency spectrum from 30MHz to 1000MHz was investigated.



The frequency spectrum from over 1GHz was investigated.



Radiated emission measurements were performed from 30MHz to 25GHz. Spectrum Analyzer Resolution Bandwidth is 100kHz or greater for frequencies 30MHz to 1GHz, 1MHz – for frequencies above 1GHz.

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 3 meter reading using inverse scaling with distance.

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

### 9.3 Emission limits

The spurious Emission shall test through the 10th harmonic. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

| Frequency<br>(MHz) | Limits<br>(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 | $\pm 5.056$ dB |

## 9.4 Radiated spurious emission test data

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

The test was performed on EUT under 2408.625 MHz, 2436.750 MHz and 2469.375 MHz continuously transmitting mode. The worst case occurred at 2408.625 MHz.

EUT : TTD-82T  
Worst Case : TX channel 0, 2408.625 MHz

| Antenna Polariz. (V/H) | Freq. (MHz) | Receiver Detector | Corr. Factor (dB/m) | Reading (dBuV) | Corrected Level (dBuV/m) | Limit @ 3 m (dBuV/m) | Margin (dB) |
|------------------------|-------------|-------------------|---------------------|----------------|--------------------------|----------------------|-------------|
| V                      | 37.760      | QP                | 12.62               | 22.25          | 34.87                    | 40.00                | -5.13       |
| V                      | 335.550     | QP                | 14.98               | 23.08          | 38.06                    | 46.00                | -7.94       |
| V                      | 527.610     | QP                | 19.46               | 21.09          | 40.55                    | 46.00                | -5.45       |
| V                      | 576.110     | QP                | 20.71               | 21.09          | 41.80                    | 46.00                | -4.20       |
| V                      | 623.640     | QP                | 20.75               | 19.00          | 39.75                    | 46.00                | -6.25       |
| V                      | 671.170     | QP                | 21.50               | 17.93          | 39.43                    | 46.00                | -6.57       |
| H                      | 288.020     | QP                | 13.85               | 27.58          | 41.42                    | 46.00                | -4.58       |
| H                      | 335.550     | QP                | 14.40               | 28.66          | 43.05                    | 46.00                | -2.95       |
| H                      | 407.330     | QP                | 16.81               | 25.70          | 42.51                    | 46.00                | -3.49       |
| H                      | 527.610     | QP                | 19.65               | 20.21          | 39.86                    | 46.00                | -6.14       |
| H                      | 671.170     | QP                | 21.52               | 16.91          | 38.42                    | 46.00                | -7.58       |
| H                      | 767.200     | QP                | 23.02               | 16.96          | 39.98                    | 46.00                | -6.02       |

Remark:

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

#### 9.4.2 Measurement results: frequency above 1GHz

EUT : TTD-82T  
Test Condition : Tx at channel 0, 2408.625 MHz

| Frequency<br>(MHz) | Spectrum<br>Analyzer<br>Detector | Antenna<br>Polariz.<br>(H/V) | Correction<br>Factor<br>(dB/m) | Reading<br>(dBuV) | Duty cycle<br>correction factor<br>(dB) | Corrected<br>Level<br>(dBuV/m) | Limit<br>@ 3 m<br>(dBuV/m) | Margin<br>(dB) |
|--------------------|----------------------------------|------------------------------|--------------------------------|-------------------|---|--------------------------------|----------------------------|----------------|
| 3210.00            | PK                               | V                            | -7.34                          | 62.37             | 0.00                                    | 55.03                          | 74.00                      | -18.97         |
| 3210.00            | AV                               | V                            | -7.34                          | 62.37             | -25.03                                  | 30.00                          | 54.00                      | -24.00         |
| 4816.00            | PK                               | V                            | -3.93                          | 66.78             | 0.00                                    | 62.85                          | 74.00                      | -11.15         |
| 4816.00            | AV                               | V                            | -3.93                          | 66.78             | -25.03                                  | 37.82                          | 54.00                      | -16.18         |
| 7224.00            | PK                               | V                            | 1.07                           | 48.45             | 0.00                                    | 49.52                          | 74.00                      | -24.48         |
| 7224.00            | AV                               | V                            | 1.07                           | 48.45             | -25.03                                  | 24.49                          | 54.00                      | -29.51         |
| 9632.00            | PK                               | V                            | 8.74                           | 55.90             | 0.00                                    | 64.64                          | 74.00                      | -9.36          |
| 9632.00            | AV                               | V                            | 8.74                           | 55.90             | -25.03                                  | 39.61                          | 54.00                      | -14.39         |
| 12040.00           | PK                               | V                            | 11.66                          | 42.19             | 0.00                                    | 53.85                          | 74.00                      | -20.15         |
| 12040.00           | AV                               | V                            | 11.66                          | 42.19             | -25.03                                  | 28.82                          | 54.00                      | -25.18         |
| 3210.00            | PK                               | H                            | -7.34                          | 56.76             | 0.00                                    | 49.42                          | 74.00                      | -24.58         |
| 3210.00            | AV                               | H                            | -7.34                          | 56.76             | -25.03                                  | 24.39                          | 54.00                      | -29.61         |
| 4816.00            | PK                               | H                            | -3.93                          | 61.03             | 0.00                                    | 57.10                          | 74.00                      | -16.90         |
| 4816.00            | AV                               | H                            | -3.93                          | 61.03             | -25.03                                  | 32.07                          | 54.00                      | -21.93         |
| 7224.00            | PK                               | H                            | 1.07                           | 45.61             | 0.00                                    | 46.68                          | 74.00                      | -27.32         |
| 7224.00            | AV                               | H                            | 1.07                           | 45.61             | -25.03                                  | 21.65                          | 54.00                      | -32.35         |
| 9632.00            | PK                               | H                            | 8.74                           | 53.43             | 0.00                                    | 62.17                          | 74.00                      | -11.83         |
| 9632.00            | AV                               | H                            | 8.74                           | 53.43             | -25.03                                  | 37.14                          | 54.00                      | -16.86         |
| 12040.00           | PK                               | H                            | 11.73                          | 41.38             | 0.00                                    | 53.11                          | 74.00                      | -20.89         |
| 12040.00           | AV                               | H                            | 11.73                          | 41.38             | -25.03                                  | 28.08                          | 54.00                      | -25.92         |

#### Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1GHz to 25GHz. The data value listed above which is higher than the noise floor, the others please refer to noise floor level.
4. Duty cycle correction factor =  $20\log(\text{dwell time}/100\text{ms})$   
 $= 20\log(5.6\text{ms}/100\text{ms}) = -25.03$   
Please see dwell time test in page 34 of this report.

EUT : TTD-82T  
Test Condition : Tx at channel 28, 2436.750 MHz

| Frequency<br>(MHz) | Spectrum<br>Analyzer<br>Detector | Antenna<br>Polariz.<br>(H/V) | Correction<br>Factor<br>(dB/m) | Reading<br>(dBuV) | Duty cycle<br>correction factor<br>(dB) | Corrected<br>Level<br>(dBuV/m) | Limit<br>@ 3 m<br>(dBuV/m) | Margin<br>(dB) |
|--------------------|----------------------------------|------------------------------|--------------------------------|-------------------|---|--------------------------------|----------------------------|----------------|
| 3240.00            | PK                               | V                            | -7.29                          | 61.41             | 0.00                                    | 54.12                          | 74.00                      | -19.88         |
| 3240.00            | AV                               | V                            | -7.29                          | 61.41             | -25.03                                  | 29.09                          | 54.00                      | -24.91         |
| 4872.00            | PK                               | V                            | -3.86                          | 67.04             | 0.00                                    | 63.18                          | 74.00                      | -10.82         |
| 4872.00            | AV                               | V                            | -3.86                          | 67.04             | -25.03                                  | 38.15                          | 54.00                      | -15.85         |
| 7308.00            | PK                               | V                            | 1.24                           | 49.98             | 0.00                                    | 51.22                          | 74.00                      | -22.78         |
| 7308.00            | AV                               | V                            | 1.24                           | 49.98             | -25.03                                  | 26.19                          | 54.00                      | -27.81         |
| 9744.00            | PK                               | V                            | 9.02                           | 56.41             | 0.00                                    | 65.43                          | 74.00                      | -8.57          |
| 9744.00            | AV                               | V                            | 9.02                           | 56.41             | -25.03                                  | 40.40                          | 54.00                      | -13.60         |
| 3240.00            | PK                               | H                            | -7.29                          | 56.31             | 0.00                                    | 49.02                          | 74.00                      | -24.98         |
| 3240.00            | AV                               | H                            | -7.29                          | 56.31             | -25.03                                  | 23.99                          | 54.00                      | -30.01         |
| 4872.00            | PK                               | H                            | -3.86                          | 58.52             | 0.00                                    | 54.66                          | 74.00                      | -19.34         |
| 4872.00            | AV                               | H                            | -3.86                          | 58.52             | -25.03                                  | 29.63                          | 54.00                      | -24.37         |
| 7308.00            | PK                               | H                            | 1.24                           | 45.62             | 0.00                                    | 46.86                          | 74.00                      | -27.14         |
| 7308.00            | AV                               | H                            | 1.24                           | 45.62             | -25.03                                  | 21.83                          | 54.00                      | -32.17         |
| 9744.00            | PK                               | H                            | 9.02                           | 53.80             | 0.00                                    | 62.82                          | 74.00                      | -11.18         |
| 9744.00            | AV                               | H                            | 9.02                           | 53.80             | -25.03                                  | 37.79                          | 54.00                      | -16.21         |
| 12180.00           | PK                               | H                            | 11.37                          | 41.55             | 0.00                                    | 52.92                          | 74.00                      | -21.08         |
| 12180.00           | AV                               | H                            | 11.37                          | 41.55             | -25.03                                  | 27.89                          | 54.00                      | -26.11         |

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1GHz to 25GHz. The data value listed above which is higher than the noise floor, the others please refer to noise floor level.
4. Duty cycle correction factor =  $20\log(\text{dwell time}/100\text{ms})$   
 $= 20\log(5.6\text{ms}/100\text{ms}) = -25.03$   
Please see dwell time test in page 34 of this report.

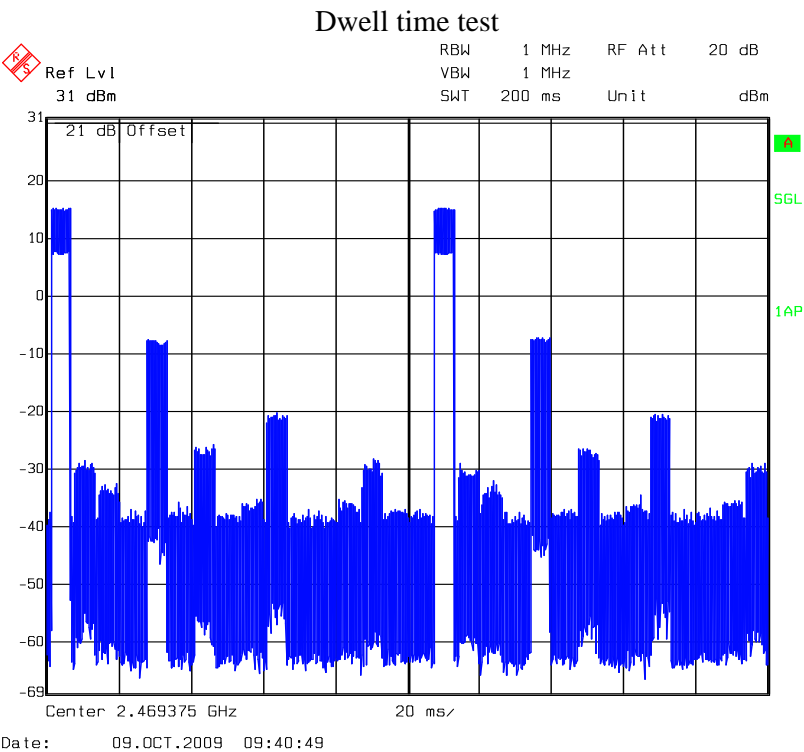
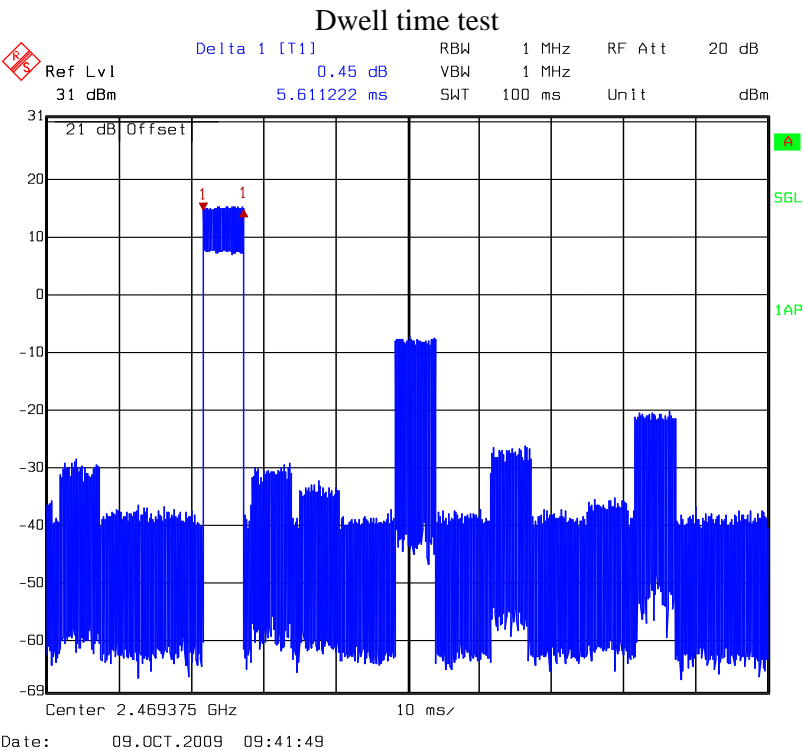


EUT : TTD-82T  
Test Condition : Tx at channel 60, 2469.375 MHz

| Frequency<br>(MHz) | Spectrum<br>Analyzer<br>Detector | Antenna<br>Polariz.<br>(H/V) | Correction<br>Factor<br>(dB/m) | Reading<br>(dBuV) | Duty cycle<br>correction factor<br>(dB) | Corrected<br>Level<br>(dBuV/m) | Limit<br>@ 3 m<br>(dBuV/m) | Margin<br>(dB) |
|--------------------|----------------------------------|------------------------------|--------------------------------|-------------------|---|--------------------------------|----------------------------|----------------|
| 3270.00            | PK                               | V                            | -7.24                          | 60.16             | 0.00                                    | 52.92                          | 74.00                      | -21.08         |
| 3270.00            | AV                               | V                            | -7.24                          | 60.16             | -25.03                                  | 27.89                          | 54.00                      | -26.11         |
| 4938.00            | PK                               | V                            | -3.79                          | 65.94             | 0.00                                    | 62.15                          | 74.00                      | -11.85         |
| 4938.00            | AV                               | V                            | -3.79                          | 65.94             | -25.03                                  | 37.12                          | 54.00                      | -16.88         |
| 7407.00            | PK                               | V                            | 1.57                           | 52.06             | 0.00                                    | 53.63                          | 74.00                      | -20.37         |
| 7407.00            | AV                               | V                            | 1.57                           | 52.06             | -25.03                                  | 28.60                          | 54.00                      | -25.40         |
| 9876.00            | PK                               | V                            | 9.31                           | 55.60             | 0.00                                    | 64.91                          | 74.00                      | -9.09          |
| 9876.00            | AV                               | V                            | 9.31                           | 55.60             | -25.03                                  | 39.88                          | 54.00                      | -14.12         |
| 12345.00           | PK                               | V                            | 10.94                          | 41.32             | 0.00                                    | 52.26                          | 74.00                      | -21.74         |
| 12345.00           | AV                               | V                            | 10.94                          | 41.32             | -25.03                                  | 27.23                          | 54.00                      | -26.77         |
| 3270.00            | PK                               | H                            | -7.24                          | 55.55             | 0.00                                    | 48.31                          | 74.00                      | -25.69         |
| 3270.00            | AV                               | H                            | -7.24                          | 55.55             | -25.03                                  | 23.28                          | 54.00                      | -30.72         |
| 4938.00            | PK                               | H                            | -3.79                          | 60.23             | 0.00                                    | 56.44                          | 74.00                      | -17.56         |
| 4938.00            | AV                               | H                            | -3.79                          | 60.23             | -25.03                                  | 31.41                          | 54.00                      | -22.59         |
| 7407.00            | PK                               | H                            | 1.57                           | 47.59             | 0.00                                    | 49.16                          | 74.00                      | -24.84         |
| 7407.00            | AV                               | H                            | 1.57                           | 47.59             | -25.03                                  | 24.13                          | 54.00                      | -29.87         |
| 9876.00            | PK                               | H                            | 9.31                           | 53.59             | 0.00                                    | 62.90                          | 74.00                      | -11.10         |
| 9876.00            | AV                               | H                            | 9.31                           | 53.59             | -25.03                                  | 37.87                          | 54.00                      | -16.13         |
| 12345.00           | PK                               | H                            | 10.94                          | 42.96             | 0.00                                    | 53.90                          | 74.00                      | -20.10         |
| 12345.00           | AV                               | H                            | 10.94                          | 42.96             | -25.03                                  | 28.87                          | 54.00                      | -25.13         |

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1GHz to 25GHz. The data value listed above which is higher than the noise floor, the others please refer to noise floor level.
4. Duty cycle correction factor =  $20\log(\text{dwell time}/100\text{ms})$   
 $= 20\log(5.6\text{ms}/100\text{ms}) = -25.03$   
Please see dwell time test in page 34 of this report.



**10. Emission on the band edge §FCC 15.247(d)**

|                      |                    |
|----------------------|--------------------|
| <b>Name of Test</b>  | Emission Band Edge |
| <b>Base Standard</b> | FCC 15.247(d)      |

**Test Result:** Complies  
**Measurement Data:** See Tables & plots below

**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.

Radiated emissions were investigated cover the frequency range from 30 MHz to 1000 MHz using a receiver RBW of 120 kHz record QP reading, and the frequency over 1 GHz using a spectrum analyzer RBW of 1 MHz and 10 Hz VBW record Average reading. (15.209 paragraph), the Peak reading (1 MHz RBW/VBW) recorded also on the report.

**Note:** The EUT was tested while in a continuous transmit mode. The EUT was tuned to a low and high channel.

**10.1 Test setup & procedure**

Please refer to the clause 9.2 of this report.

Please see the plot below.

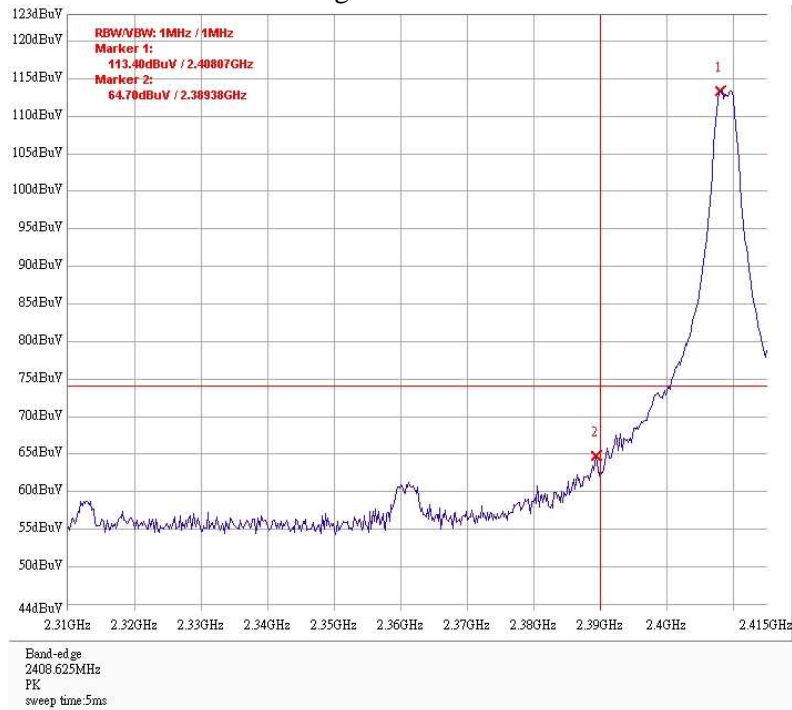
## 10.2 Test Result

| Channel      | Measurement<br>Freq.Band<br>(MHz) | Detector | The Max.<br>Field<br>Strength in<br>Restrict<br>Band<br>(dBuV/m) | Limit<br>@ 3 m<br>(dBuV/m) | Margin<br>(dB) |
|--------------|-----------------------------------|----------|--|----------------------------|----------------|
| 0 (lowest)   | 2310-2390                         | PK       | 64.70  | 74                         | -9.30          |
|              |                                   | AV       | 39.67  | 54                         | -14.33         |
| 60 (highest) | 2483.5-2500                       | PK       | 63.45  | 74                         | -10.55         |
|              |                                   | AV       | 38.42  | 54                         | -15.58         |

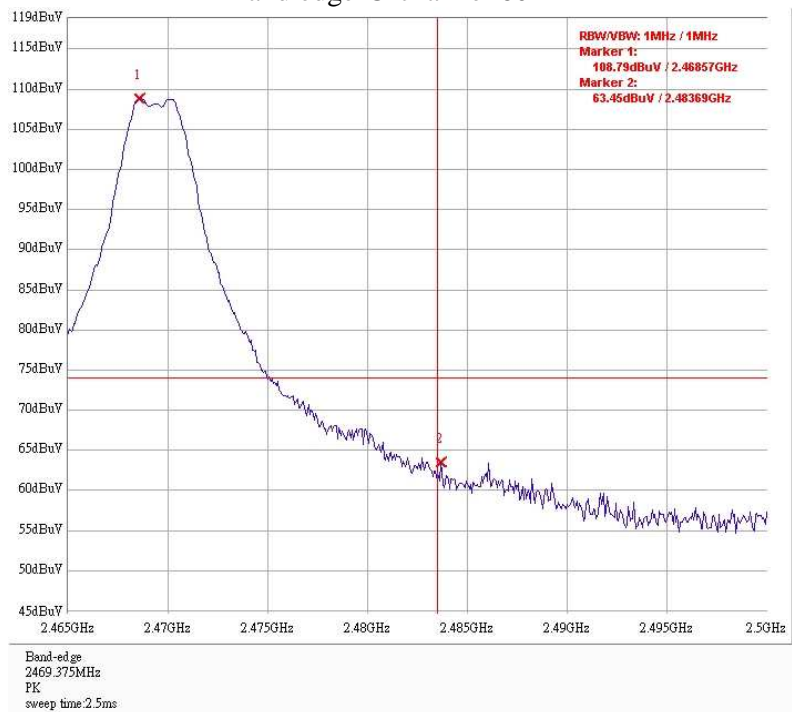
Note: Duty cycle correction factor = -25.03 dB

## 10.2.1 Band-edge

Band edge @ channel 0 PK



Band edge @ channel 60 PK

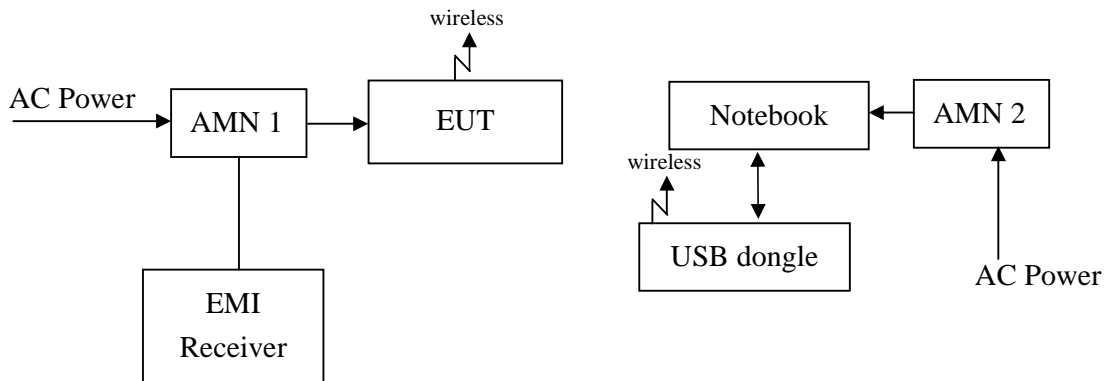


## 11. Power Line Conducted Emission test §FCC 15.207

### 11.1 Operating environment

Temperature: 25 °C  
Relative Humidity: 60 %  
Atmospheric Pressure 1023 hPa

### 11.2 Test setup & procedure



The test procedure was according to ANSI C63.4/2003.

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 C63.4/2003 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”.

### 11.3 Emission limit

| Freq.<br>(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.

### 11.4 Uncertainty of Conducted Emission

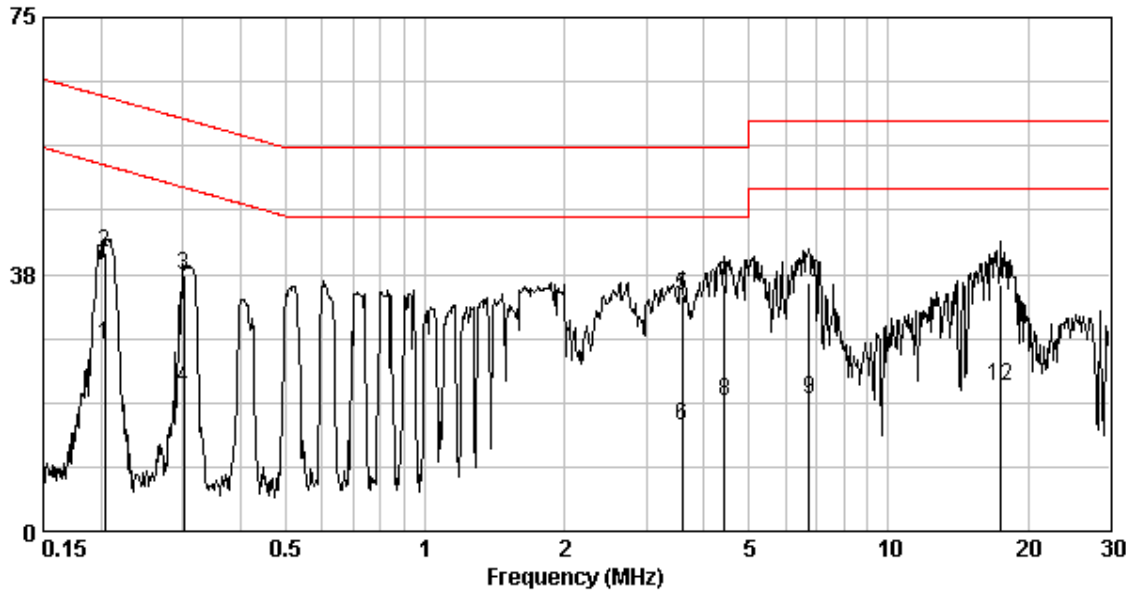
Expanded uncertainty (k=2) of conducted emission measurement is  $\pm 2.786$  dB.

### 11.5 Power Line Conducted Emission test data

Phase : Line  
EUT : TTD-82T  
Test Condition : Normal operating mode

| Frequency<br>(MHz) | Corr.<br>Factor<br>(dB) | Level<br>Qp<br>(dBuV) | Limit<br>Qp<br>(dBuV) | Level<br>Av<br>(dBuV) | Limit<br>Av<br>(dBuV) | Margin<br>(dB) |        |
|--------------------|-------------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------------|--------|
|                    |                         |                       |                       |                       |                       | Qp             | Av     |
| 0.20               | 0.78                    | 40.54                 | 63.45                 | 27.20                 | 53.45                 | -22.91         | -26.25 |
| 0.30               | 0.40                    | 37.27                 | 60.21                 | 20.81                 | 50.21                 | -22.94         | -29.40 |
| 3.58               | 0.27                    | 34.42                 | 56.00                 | 15.26                 | 46.00                 | -21.58         | -30.74 |
| 4.43               | 0.32                    | 35.94                 | 56.00                 | 18.84                 | 46.00                 | -20.06         | -27.16 |
| 6.73               | 0.42                    | 36.17                 | 60.00                 | 19.32                 | 50.00                 | -23.83         | -30.68 |
| 17.47              | 0.87                    | 35.92                 | 60.00                 | 21.26                 | 50.00                 | -24.08         | -28.74 |

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





Phase : Neutral  
EUT : TTD-82T  
Test Condition : Normal operating mode

| Frequency<br>(MHz) | Corr.<br>Factor<br>(dB) | Level<br>Qp<br>(dBuV) | Limit<br>Qp<br>(dBuV) | Level<br>Av<br>(dBuV) | Limit<br>Av<br>(dBuV) | Margin<br>(dB) |        |
|--------------------|-------------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------------|--------|
|                    |                         |                       |                       |                       |                       | Qp             | Av     |
| 0.21               | 0.11                    | 39.93                 | 63.23                 | 24.52                 | 53.23                 | -23.30         | -28.71 |
| 0.30               | 0.11                    | 34.89                 | 60.28                 | 17.14                 | 50.28                 | -25.39         | -33.14 |
| 0.51               | 0.11                    | 33.68                 | 56.00                 | 22.00                 | 46.00                 | -22.32         | -24.00 |
| 1.59               | 0.13                    | 28.45                 | 56.00                 | 4.40                  | 46.00                 | -27.55         | -41.60 |
| 6.42               | 0.35                    | 34.04                 | 60.00                 | 14.66                 | 50.00                 | -25.96         | -35.34 |
| 18.04              | 0.52                    | 29.68                 | 60.00                 | 15.63                 | 50.00                 | -30.32         | -34.37 |

Remark:

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

