

# FCC Test Report

## Client Information:

Applicant: KENNET CO., LTD  
Applicant add.: 5F TSUKIJI622, 6-22 AKASHI-CHO, CHUO-KU,  
TOKYO 104-0044 JAPAN

## EUT Information:

EUT Name: Wireless Digital Tour Guide System  
Model No.: KR-2.4G-T  
Brand Name: Kennet  
FCC ID: SYZKR24GT

## Prepared By:

Asia Institute Technology (Dongguan) Limited  
Add.: No.6 Binhe Road, Tianxin Village, Huangjiang,  
Dongguan, Guangdong, China.  
Date of Receipt: Dec. 05, 2011      Date of Test: Dec. 06~13, 2011  
Date of Issue: Dec. 14, 2011      Test Result: **Pass**

## Test procedure used: ANSI C63.4-2009

This device described above has been tested by Asia Institute Technology (Dongguan) Limited, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

\*This test report must not be used by the client to claim product endorsement by any agency of the U.S. government.

Reviewed by:

*Seal.chen*

Seal.chen

Approved by:



Jason.Zhu

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## 2 Test Summary

### 2.1 Compliance with FCC Part 15 subpart C

| Test                         | Test Requirement   | Standard Paragraph   | Result      |
|------------------------------|--------------------|----------------------|-------------|
| Antenna Requirement          | FCC Part 15 C:2008 | Section 15.247(c)    | <b>PASS</b> |
| Conduction Emissions         | FCC Part 15 C:2008 | Section 15.207(a)    | <b>PASS</b> |
| Radiated Emissions           | FCC Part 15 C:2008 | Section 15.247(d)    | <b>PASS</b> |
| Occupied Bandwidth           | FCC Part 15 C:2008 | Section 15.247(a)(2) | <b>PASS</b> |
| Peak power density           | FCC Part 15 C:2008 | Section 15.247(e)    | <b>PASS</b> |
| Maximum Peak Output Power    | FCC Part 15 C:2008 | Section 15.247(b)(1) | <b>PASS</b> |
| Band edge                    | FCC Part 15 C:2008 | Section 15.247(d)    | <b>PASS</b> |
| Conducted Spurious Emissions | FCC Part 15 C:2008 | Section 15.247(d)    | <b>PASS</b> |

### 2.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, The following measurements uncertainty Level have estimated based on ANSI C63.4:2009, the maximum value of the uncertainty as below

| No. | Item                    | Uncertainty         |
|-----|-------------------------|---------------------|
| 1   | Conducted Emission Test | $\pm 1.38\text{dB}$ |
| 2   | Radiated Emission Test  | $\pm 3.57\text{dB}$ |

### 3 Test Facility

**The test facility is recognized, certified or accredited by the following organizations:**

**.FCC- Registration No: 248337**

The 3m Semi-Anechoic Chamber, 3m/10m Open Area Test Site and Shielding Room of Asia Institute Technology (Dong guan) Limited have been registered by Federal Communications Commission (FCC) on Dec.07, 2006.

**.Industry Canada(IC)-Registration No: IC6819A-1 & IC6819A-2**

The 3m Semi-Anechoic Chamber and 3m/10m Open Area Test Site of Asia Institute Technology (Dongguan) Limited have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing on Nov.07, 2006.

**.VCCI- Registration No: R-2482 & C-2730**

The 3m/10m Open Area Test Site and Shielding Room of Asia Institute Technology (Dongguan) Limited have been registered by Voluntary Control Council for Interference on Jan.24, 2007. The Telecommunication Ports Conducted Disturbance Measurement of Asia Institute Technology (Dongguan) Limited have been registered by Voluntary Control Council for Interference on Sep. 06, 2011.

**.TUV Rhineland**

Asia Institute Technology (Dongguan) Limited has been assessed on Jan.16, 2007 that it can carry out EMC tests by order and under supervision of TUV Rhineland.

**.ITS- Registration No: TMPSHA031**

Asia Institute Technology (Dongguan) Limited has been assessed and included in Intertek Shanghai TMP Program regarding Laboratory facilities and test equipment on Nov.10, 2006.

#### 3.1 Deviation from standard

None

#### 3.2 Abnormalities from standard conditions

None

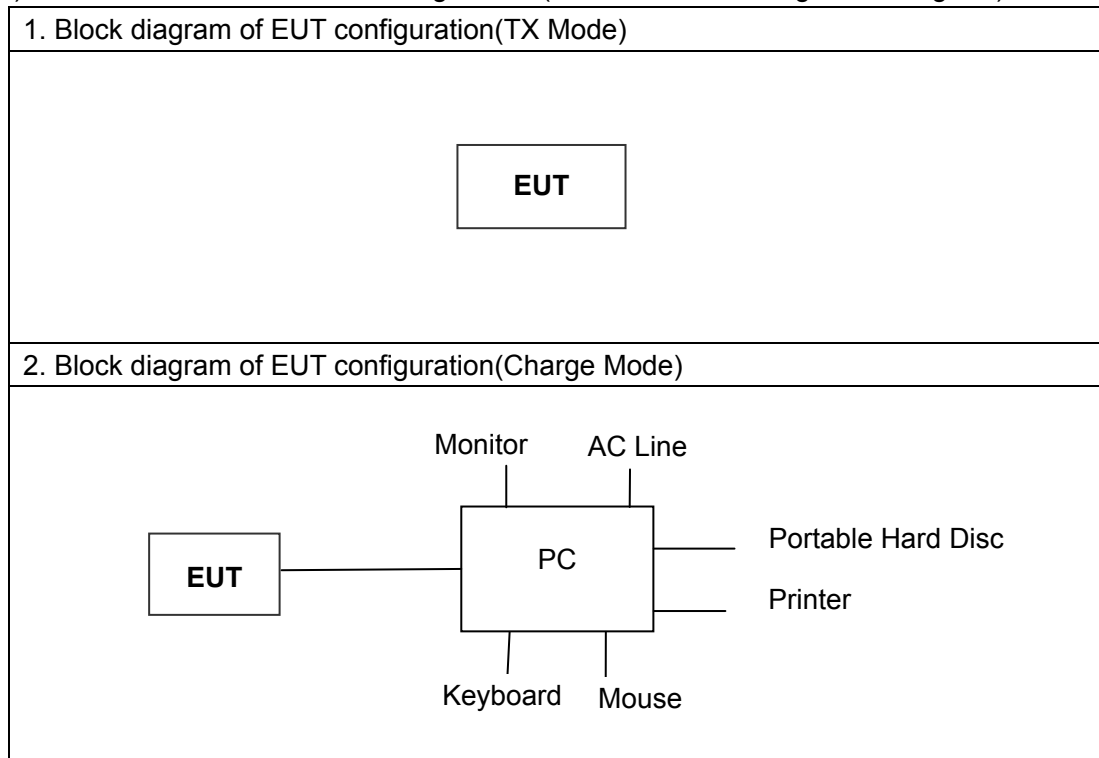
## 4 General Information

### 4.1 General Description of EUT

|                         |                                                                               |         |                 |
|-------------------------|-------------------------------------------------------------------------------|---------|-----------------|
| Manufacturer:           | Dong Guan Galien Electron Co., LTD                                            |         |                 |
| Manufacturer Address:   | 3 <sup>rd</sup> Industry Zone, Xie-Gang Town, Dongguan City, Guangdong, China |         |                 |
| EUT Name:               | Wireless Digital Tour Guide System                                            |         |                 |
| Model No:               | KR-2.4G-T                                                                     |         |                 |
| Operation frequency:    | 2404 MHz to 2473MHz                                                           |         |                 |
| Channel Number:         | 16                                                                            |         |                 |
| Modulation Technology:  | GFSK (DSSS)                                                                   |         |                 |
| Antenna Type:           | Internal                                                                      |         |                 |
| Brand Name:             | Kennet                                                                        |         |                 |
| Serial No:              | N/A                                                                           |         |                 |
| Power Supply Range:     | DC 2.4V - 3.0V                                                                |         |                 |
| Power Supply:           | DC 3V from Battery                                                            |         |                 |
| Power Cord:             | N/A                                                                           |         |                 |
| Output power（max）：      | 10.25dBm                                                                      |         |                 |
| Model description: N/A  |                                                                               |         |                 |
| Description of Channel: |                                                                               |         |                 |
| channel                 | Frequency (MHz)                                                               | channel | Frequency (MHz) |
| 1                       | 2404                                                                          | 9       | 2452            |
| 2                       | 2407                                                                          | 10      | 2455            |
| 3                       | 2410                                                                          | 11      | 2458            |
| 4                       | 2413                                                                          | 12      | 2461            |
| 5                       | 2416                                                                          | 13      | 2464            |
| 6                       | 2419                                                                          | 14      | 2467            |
| 7                       | 2422                                                                          | 15      | 2470            |
| 8                       | 2425                                                                          | 16      | 2473            |

## 4.2 Description of Test conditions

(1) EUT was tested in normal configuration (Please See following Block diagram)



(2) E.U.T. test conditions:

15.31(e): For intentional radiators, measurements of the variation of the input power or the adiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

(3) Test frequencies:

According to the 15.31(m) Measurements on intentional radiators or receivers, other than TV broadcast receivers, shall be performed and, if required, reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table:

| Frequency range over which device operates | Number of frequencies | Location in the range of operation          |
|--------------------------------------------|-----------------------|---------------------------------------------|
| 1 MHz or less                              | 1                     | Middle                                      |
| 1 to 10 MHz                                | 2                     | 1 near top and 1 near bottom                |
| More than 10 MHz                           | 3                     | 1 near top, 1 near middle and 1 near bottom |

(4) Frequency range of radiated measurements:

According to the 15.33, The test range will be up to the tenth harmonic of the highest fundamental frequency .

### 4.3 EUT Peripheral List

| No. | Equipment | Manufacturer | Model No. | Serial No. | Power cord | signal cable |
|-----|-----------|--------------|-----------|------------|------------|--------------|
| 1   | N/A       | N/A          | N/A       | N/A        | N/A        | N/A          |

### 4.4 Test Peripheral List

| No. | Equipment          | Manufacturer | EMC Compliance | Model No.           | Serial No.                | Power cord                  | signal cable                  |
|-----|--------------------|--------------|----------------|---------------------|---------------------------|-----------------------------|-------------------------------|
| 1   | Personal computer  | H P          | CE 、 FCC       | DX2310              | CNG8250MZ3                | 1.8m/unshielded /detachable | N/A                           |
| 2   | Keyboard           | DELL         | CE             | SK-8115             | CN-ONM432-71616-81M-OLK B | N/A                         | 1.5m/unshielded /undetachable |
| 3   | Mouse              | Microsoft    | CE             | X800898             | 30603                     | N/A                         | 1.5m/unshielded /undetachable |
| 4   | Printer            | EPSON        | CE             | STYLUS C45          | FY9YC48288                | 1.5m/unshielded /detachable | 1.8m/unshielded /detachable   |
| 5   | Portable Hard Disc | ALUMINUM     | CE             | 3.5 HDD Storage Box | 06832c009                 | 1.8m/unshielded /detachable | 1.2m/unshielded /detachable   |
| 6   | Monitor            | DELL         | CE             | T980KAC DK21SN      | TWS20006045               | 1.8m/unshielded /detachable | 1.8m/shielded /detachable     |

## 5 Equipments List for All Test Items

| No | Test Equipment                      | Manufacturer | Model No         | Serial No  | Cal. Date  | Cal. Due Date |
|----|-------------------------------------|--------------|------------------|------------|------------|---------------|
| 1  | Spectrum Analyzer                   | ADVANTEST    | R3182            | 150900201  | 2011.10.16 | 2012.10.15    |
| 2  | EMI Measuring Receiver              | Schaffner    | SCR3501          | 235        | 2011.10.16 | 2012.10.15    |
| 3  | Low Noise Pre Amplifier             | Tsj          | MLA-10K01-B01-27 | 1205323    | 2011.09.08 | 2012.09.07    |
| 4  | Low Noise Pre Amplifier             | Tsj          | MLA-0120-A02-34  | 2648A04738 | 2011.04.08 | 2012.04.07    |
| 5  | TRILOG Super Broadband test Antenna | SCHWARZBECK  | VULB9160         | 9160-3206  | 2011.07.15 | 2012.07.14    |
| 6  | Broadband Horn Antenna              | SCHWARZBECK  | BBHA9120A        | 451        | 2011.07.15 | 2012.07.14    |
| 7  | 50Ω Coaxial Switch                  | Anritsu      | MP59B            | 6200264416 | 2011.09.08 | 2012.09.07    |
| 8  | EMI Test Receiver                   | R&S          | ESCI             | 100124     | 2010.12.29 | 2011.12.28    |
| 9  | LISN                                | Kyoritsu     | KNW-242          | 8-837-4    | 2011.04.08 | 2012.04.07    |
| 10 | LISN                                | Kyoritsu     | KNW-407          | 8-1789-3   | 2011.04.08 | 2012.04.07    |
| 11 | 50Ω Coaxial Switch                  | Anritsu      | MP59B            | 6200264417 | 2011.09.08 | 2012.09.07    |
| 12 | Loop Antenna                        | ARA          | PLA-1030/B       | 1029       | 2011.03.20 | 2012.03.19    |

## **6 Test Result**

### **6.1 Antenna Requirement**

#### **6.1.1 Standard requirement**

15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

15.247(c) (1)(i) requirement: (i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

#### **6.1.2 EUT Antenna**

The antenna is integrated on the main PCB and no consideration of replacement. Antenna gain is 2 dbi max.

## 6.2 Conduction Emissions Measurement

### 6.2.1 Applied procedures / Limit

| Frequency of Emission (MHz) | Conducted Limit (dB $\mu$ V) |            |
|-----------------------------|------------------------------|------------|
|                             | Quasi-peak                   | Average    |
| 0.15-0.5                    | 66 to 56 *                   | 56 to 46 * |
| 0.5-5                       | 56                           | 46         |
| 5-30                        | 60                           | 50         |

Note: Decreases with the logarithm of the frequency.

### 6.2.2 Test procedure

EUT was placed upon a wooden test table 0.8m above the horizontal metal reference plane and 0.4m from the vertical ground plane, and it was connected to an AMN. The closest distance between the boundary of the EUT and the surface of the AMN is 0.8m. All peripherals were connected to another AMN, and placed at a distance of 10cm from each other. A spectrum and receiver was connected to the RF output port of the AMN. Both average and quasi-peak value were detected.

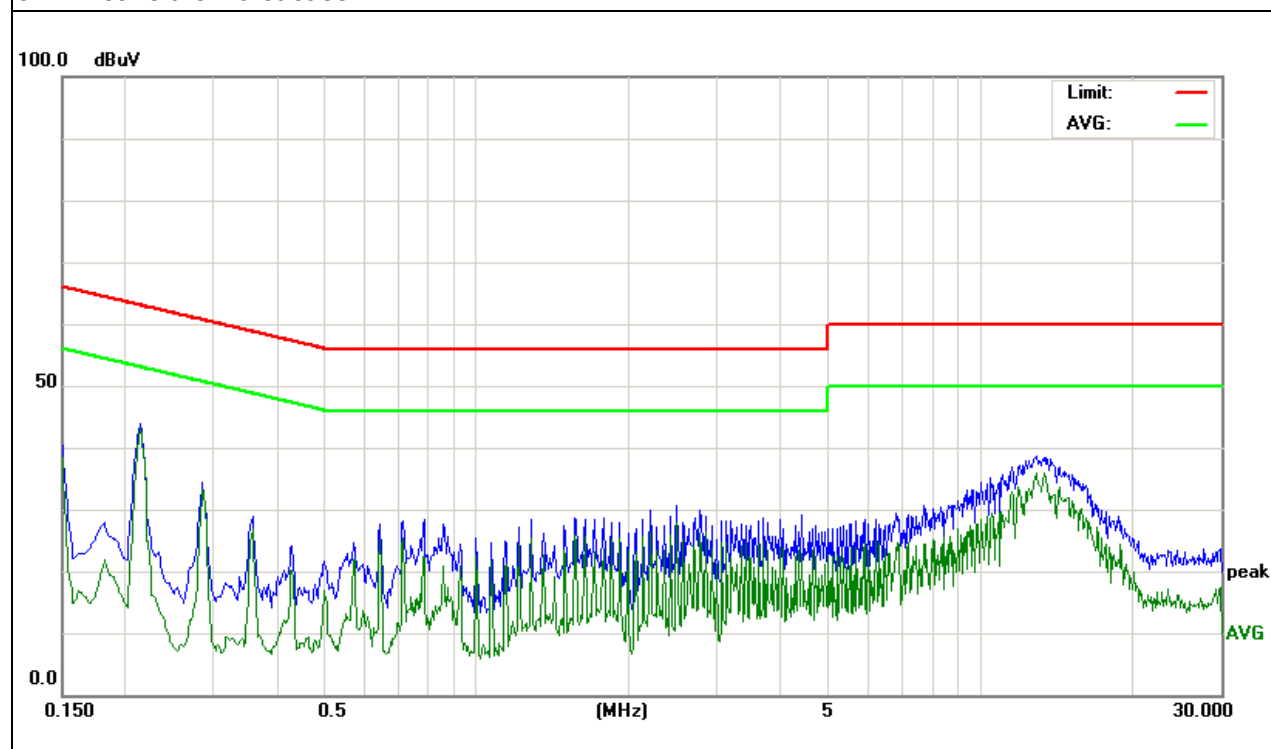
## 6.2.3 Test results

|                       |                                         |                    |            |
|-----------------------|-----------------------------------------|--------------------|------------|
| EUT:                  | Wireless Digital Tour Guide System      | Model Name. :      | KR-2.4G-T  |
| Temperature:          | 26 °C                                   | Relative Humidity: | 54%        |
| Pressure:             | 1010hPa                                 | Test Date :        | 2011-12-09 |
| Test Mode:            | Charge                                  | Phase :            | Line       |
| <b>Test Voltage :</b> | DC 3V from battery ,AC 120V/60Hz for PC |                    |            |

| Frequency<br>(MHz) | Factor<br>(dB) | Meter Reading (dBμV) |         | Emission Level (dBμV) |         | Limits (dBμV) |         | Margin (dB) |         |
|--------------------|----------------|----------------------|---------|-----------------------|---------|---------------|---------|-------------|---------|
|                    |                | QP                   | Average | QP                    | Average | QP            | Average | QP          | Average |
| *0.2140            | 11.03          | 32.83                | 31.98   | 43.86                 | 43.01   | 63.04         | 53.04   | -19.18      | -10.03  |
| 0.3580             | 10.61          | 18.34                | 16.14   | 28.95                 | 26.75   | 58.77         | 48.77   | -29.82      | -22.02  |
| 0.7140             | 10.26          | 17.80                | 15.07   | 28.06                 | 25.33   | 56.00         | 46.00   | -27.94      | -20.67  |
| 2.4940             | 10.17          | 20.44                | 17.67   | 30.61                 | 27.84   | 56.00         | 46.00   | -25.39      | -18.16  |
| 6.1979             | 10.20          | 18.27                | 14.69   | 28.47                 | 24.89   | 60.00         | 50.00   | -31.53      | -25.11  |
| 13.3939            | 1.34           | 37.09                | 34.62   | 38.43                 | 35.96   | 60.00         | 50.00   | -21.57      | -14.04  |

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.
3. '\*' means the worst case

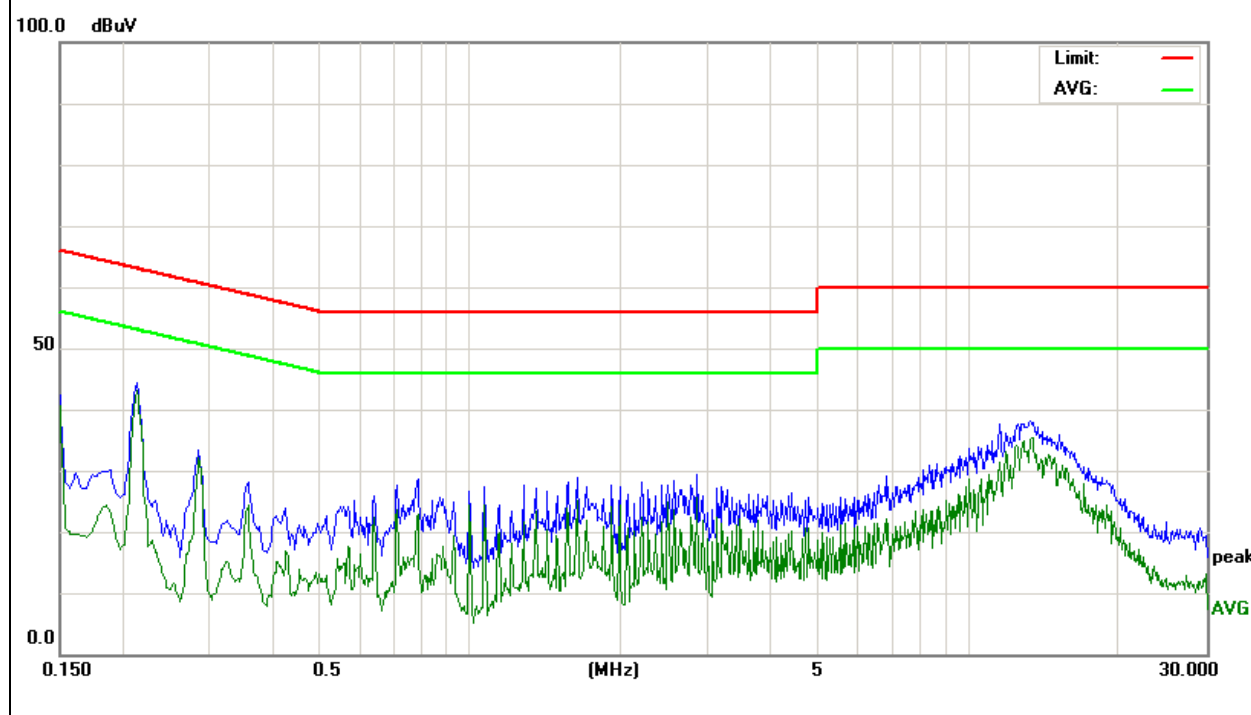


|                       |                                         |                    |            |
|-----------------------|-----------------------------------------|--------------------|------------|
| EUT:                  | Wireless Digital Tour Guide System      | Model Name. :      | KR-2.4G-T  |
| Temperature:          | 26 °C                                   | Relative Humidity: | 54%        |
| Pressure:             | 1010hPa                                 | Test Date :        | 2011-12-09 |
| Test Mode:            | Charge                                  | Phase :            | Neutral    |
| <b>Test Voltage :</b> | DC 3V from battery ,AC 120V/60Hz for PC |                    |            |

| Frequency | Factor | Meter Reading (dBμV) |         | Emission Level (dBμV) |         | Limits (dBμV) |         | Margin (dB) |         |
|-----------|--------|----------------------|---------|-----------------------|---------|---------------|---------|-------------|---------|
| (MHz)     | (dB)   | QP                   | Average | QP                    | Average | QP            | Average | QP          | Average |
| *0.2140   | 11.03  | 33.34                | 32.13   | 44.37                 | 43.16   | 63.04         | 53.04   | -18.67      | -9.88   |
| 0.3580    | 10.61  | 17.42                | 13.87   | 28.03                 | 24.48   | 58.77         | 48.77   | -30.74      | -24.29  |
| 0.9980    | 10.19  | 12.73                | 14.24   | 22.92                 | 24.43   | 56.00         | 46.00   | -33.08      | -21.57  |
| 2.8500    | 10.18  | 19.15                | 15.57   | 29.33                 | 25.75   | 56.00         | 46.00   | -26.67      | -20.25  |
| 6.8379    | 10.23  | 19.00                | 11.97   | 29.23                 | 22.20   | 60.00         | 50.00   | -30.77      | -27.80  |
| 13.4659   | 1.34   | 35.77                | 34.14   | 37.11                 | 35.48   | 60.00         | 50.00   | -22.89      | -14.52  |

**Remark:**

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.
3. '\*' means the worst case



## 6.3 Radiated Emissions Measurement

### 6.3.1 Applied procedures / Limit

15.247(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

| Frequency of Emission (MHz) | Field Strength  |                          | Measurement Distance (meters) |
|-----------------------------|-----------------|--------------------------|-------------------------------|
|                             | $\mu\text{V/m}$ | $\text{dB}\mu\text{V/m}$ |                               |
| 0.009-0.49                  | 2400/F(kHz)     |                          | 300                           |
| 0.49-1.705                  | 24000/F(kHz)    |                          | 30                            |
| 1.705-30                    | 30              |                          | 30                            |
| 30-88                       | 100             | 40                       | 3                             |
| 88-216                      | 150             | 43.5                     | 3                             |
| 216-960                     | 200             | 46                       | 3                             |
| Above 960                   | 500             | 54                       | 3                             |

### 6.3.2 Test procedure

EUT was placed upon a wooden test table which was placed on the turn table 0.8m above the horizontal metal ground plane, and operating in the mode as mentioned above. A receiving antenna was placed 3m away from the EUT. During testing, turn around the turn table and move the antenna from 1m to 4m to find the maximum field-strength reading. All peripherals were placed at a distance of 10cm between each other. Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported.

### 6.3.3 Test Result

There is not detected blow 30MHz.

|                      |                                                        |                    |                    |
|----------------------|--------------------------------------------------------|--------------------|--------------------|
| EUT:                 | Wireless Digital Tour Guide System                     | Model Name :       | KR-2.4G-T          |
| Temperature:         | 25 °C                                                  | Test Data          | 2011-12-07         |
| Pressure:            | 1010 hPa                                               | Relative Humidity: | 60%                |
| Test Mode :          | TX                                                     | Test Voltage :     | DC 3V from battery |
| Measurement Distance | 3 m                                                    | Frenqucy Range     | 30MHz to 1GHz      |
| RBW/VBW              | 100KHz / 300KHz for spectrum, RBW=120KHz for receiver. |                    |                    |

(a) Antenna polarization: Horizontal

| Frequency (MHz)  | Reading Level (dBuV) | Correct Factor (dB) | Measure Level (dBuV/m) | Limit (dBuV/m) | Margin (dB)   | Detector Type    |
|------------------|----------------------|---------------------|------------------------|----------------|---------------|------------------|
| 35.6240          | 32.23                | -16.30              | 15.93                  | 40.00          | -24.07        | QUASIPeAK        |
| 96.4361          | 35.86                | -16.26              | 19.60                  | 43.50          | -23.90        | QUASIPeAK        |
| 197.2000         | 35.57                | -11.93              | 23.64                  | 43.50          | -19.86        | QUASIPeAK        |
| 364.2595         | 37.63                | -8.70               | 28.93                  | 46.00          | -17.07        | QUASIPeAK        |
| <b>*480.5276</b> | <b>42.93</b>         | <b>-7.16</b>        | <b>35.77</b>           | <b>46.00</b>   | <b>-10.23</b> | <b>QUASIPeAK</b> |
| 501.1789         | 34.87                | -6.02               | 28.85                  | 46.00          | -17.15        | QUASIPeAK        |

(b) Antenna polarization: vertical

| Frequency (MHz)  | Reading Level (dBuV) | Correct Factor (dB) | Measure Level (dBuV/m) | Limit (dBuV/m) | Margin (dB)   | Detector Type    |
|------------------|----------------------|---------------------|------------------------|----------------|---------------|------------------|
| 53.8817          | 32.72                | -15.29              | 17.43                  | 40.00          | -22.57        | QUASIPeAK        |
| 107.8876         | 29.68                | -14.03              | 15.65                  | 43.50          | -27.85        | QUASIPeAK        |
| 243.3771         | 29.99                | -10.62              | 19.37                  | 46.00          | -26.63        | QUASIPeAK        |
| 361.7139         | 41.03                | -8.70               | 32.33                  | 46.00          | -13.67        | QUASIPeAK        |
| <b>*480.5276</b> | <b>41.63</b>         | <b>-7.16</b>        | <b>34.47</b>           | <b>46.00</b>   | <b>-11.53</b> | <b>QUASIPeAK</b> |
| 550.9479         | 31.30                | -3.22               | 28.08                  | 46.00          | -17.92        | QUASIPeAK        |

Note: '\*' means the worst case

Measurement Level = Reading Level + Factor

Factor=Ant Factor + Cable Loss

|                      |                                            |                    |                    |
|----------------------|--------------------------------------------|--------------------|--------------------|
| EUT:                 | Wireless Digital Tour Guide System         | Model Name :       | KR-2.4G-T          |
| Temperature:         | 25 °C                                      | Test Data          | 2011-12-07         |
| Pressure:            | 1010 hPa                                   | Relative Humidity: | 60%                |
| Test Mode :          | TX                                         | Test Voltage :     | DC 3V from battery |
| Measurement Distance | 3 m                                        | Frenqucy Range     | 1GHz to 18GHz      |
| RBW/VBW              | 1MHz/1MHz for Peak, 1MHz/10Hz for Average. |                    |                    |

(a) Antenna polarization: Horizontal

| Frequency (MHz)  | Reading Level (dBuV) | Correct Factor (dB) | Measure Level (dBuV/m) | Limit (dBuV/m) | Margin (dB)  | Detector Type  |
|------------------|----------------------|---------------------|------------------------|----------------|--------------|----------------|
| 4808.000         | 60.41                | 5.06                | 65.47                  | 74.00          | -8.53        | PEAK           |
| <b>*4808.000</b> | <b>43.72</b>         | <b>5.06</b>         | <b>48.78</b>           | <b>54.00</b>   | <b>-5.22</b> | <b>AVERAGE</b> |
| 7212.000         | 49.15                | 7.05                | 56.20                  | 74.00          | -17.80       | PEAK           |
| 7212.000         | 35.14                | 7.05                | 42.19                  | 54.00          | -11.81       | AVERAGE        |
| 9616.000         | 43.17                | 10.66               | 53.83                  | 74.00          | -20.17       | PEAK           |
| 9616.000         | 30.38                | 10.66               | 41.04                  | 54.00          | -12.96       | AVERAGE        |

(b) Antenna polarization: Vertical

| Frequency (MHz)  | Reading Level (dBuV) | Correct Factor (dB) | Measure Level (dBuV/m) | Limit (dBuV/m) | Margin (dB)  | Detector Type  |
|------------------|----------------------|---------------------|------------------------|----------------|--------------|----------------|
| 4808.000         | 59.61                | 5.06                | 64.67                  | 74.00          | -9.33        | PEAK           |
| <b>*4808.000</b> | <b>42.72</b>         | <b>5.06</b>         | <b>47.78</b>           | <b>54.00</b>   | <b>-6.22</b> | <b>AVERAGE</b> |
| 7212.000         | 49.12                | 7.05                | 56.17                  | 74.00          | -17.83       | PEAK           |
| 7212.000         | 35.34                | 7.05                | 42.39                  | 54.00          | -11.61       | AVERAGE        |
| 9616.000         | 44.26                | 10.66               | 54.92                  | 74.00          | -19.08       | PEAK           |
| 9616.000         | 32.24                | 10.66               | 42.90                  | 54.00          | -11.10       | AVERAGE        |

Note: '\*' means the worst case

Measurement Level = Reading Level + Factor

Factor=Ant Factor + Cable Loss

Low Channel: 2404 MHz

(a) Antenna polarization: Horizontal

| Frequency (MHz)  | Reading Level (dBuV) | Correct Factor (dB) | Measure Level (dBuV/m) | Limit (dBuV/m) | Margin (dB)  | Detector Type  |
|------------------|----------------------|---------------------|------------------------|----------------|--------------|----------------|
| 4904.000         | 61.36                | 5.16                | 66.52                  | 74.00          | -7.48        | PEAK           |
| <b>*4904.000</b> | <b>43.35</b>         | <b>5.16</b>         | <b>48.51</b>           | <b>54.00</b>   | <b>-5.49</b> | <b>AVERAGE</b> |
| 7356.000         | 48.47                | 7.69                | 56.16                  | 74.00          | -17.84       | PEAK           |
| 7356.000         | 33.73                | 7.69                | 41.42                  | 54.00          | -12.58       | AVERAGE        |
| 9808.000         | 40.29                | 11.60               | 51.89                  | 74.00          | -22.11       | PEAK           |
| 9808.000         | 28.68                | 11.60               | 40.28                  | 54.00          | -13.72       | AVERAGE        |

(b) Antenna polarization: Vertical

| Frequency (MHz)  | Reading Level (dBuV) | Correct Factor (dB) | Measure Level (dBuV/m) | Limit (dBuV/m) | Margin (dB)  | Detector Type  |
|------------------|----------------------|---------------------|------------------------|----------------|--------------|----------------|
| 4904.000         | 60.73                | 5.16                | 65.89                  | 74.00          | -8.11        | PEAK           |
| <b>*4904.000</b> | <b>44.25</b>         | <b>5.16</b>         | <b>49.41</b>           | <b>54.00</b>   | <b>-4.59</b> | <b>AVERAGE</b> |
| 7356.000         | 48.64                | 7.69                | 56.33                  | 74.00          | -17.67       | PEAK           |
| 7356.000         | 35.76                | 7.69                | 43.45                  | 54.00          | -10.55       | AVERAGE        |
| 9808.000         | 43.29                | 11.60               | 54.89                  | 74.00          | -19.11       | PEAK           |
| 9808.000         | 29.87                | 11.60               | 41.47                  | 54.00          | -12.53       | AVERAGE        |

Note: '\*' means the worst case

Measurement Level = Reading Level + Factor

Factor=Ant Factor + Cable Loss

Middle Channel: 2452 MHz

(a) Antenna polarization: Horizontal

| Frequency (MHz)  | Reading Level (dBuV) | Correct Factor (dB) | Measure Level (dBuV/m) | Limit (dBuV/m) | Margin (dB)  | Detector Type  |
|------------------|----------------------|---------------------|------------------------|----------------|--------------|----------------|
| 4946.000         | 61.34                | 5.21                | 66.55                  | 74.00          | -7.45        | PEAK           |
| <b>*4946.000</b> | <b>43.62</b>         | <b>5.21</b>         | <b>48.83</b>           | <b>54.00</b>   | <b>-5.17</b> | <b>AVERAGE</b> |
| 7419.000         | 49.73                | 7.96                | 57.69                  | 74.00          | -16.31       | PEAK           |
| 7419.000         | 33.18                | 7.96                | 41.14                  | 54.00          | -12.86       | AVERAGE        |
| 9892.000         | 40.89                | 12.00               | 52.89                  | 74.00          | -21.11       | PEAK           |
| 9892.000         | 24.24                | 12.00               | 36.24                  | 54.00          | -17.76       | AVERAGE        |

(b) Antenna polarization: Vertical

| Frequency (MHz)  | Reading Level (dBuV) | Correct Factor (dB) | Measure Level (dBuV/m) | Limit (dBuV/m) | Margin (dB)  | Detector Type  |
|------------------|----------------------|---------------------|------------------------|----------------|--------------|----------------|
| 4946.000         | 60.47                | 5.21                | 65.68                  | 74.00          | -8.32        | PEAK           |
| <b>*4946.000</b> | <b>42.25</b>         | <b>5.21</b>         | <b>47.46</b>           | <b>54.00</b>   | <b>-6.54</b> | <b>AVERAGE</b> |
| 7419.000         | 48.38                | 7.96                | 56.34                  | 74.00          | -17.66       | PEAK           |
| 7419.000         | 33.45                | 7.96                | 41.41                  | 54.00          | -12.59       | AVERAGE        |
| 9892.000         | 36.77                | 12.00               | 48.77                  | 74.00          | -25.23       | PEAK           |
| 9892.000         | 25.63                | 12.00               | 37.63                  | 54.00          | -16.37       | AVERAGE        |

Note: '\*' means the worst case

Measurement Level = Reading Level + Factor

Factor=Ant Factor + Cable Loss

High Channel: 2473 MHz

## 6.4 BANDWIDTH TEST

### 6.4.1 Applied procedures / Limit

15.247(a) (2) Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

### 6.4.2 Test procedure

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- b. Spectrum Setting: RBW= 100KHz, VBW $\geq$ RBW, Sweep time = Auto.

### 6.4.3 Deviation from standard

No deviation.

### 6.4.4 Test setup



### 6.4.5 Test results

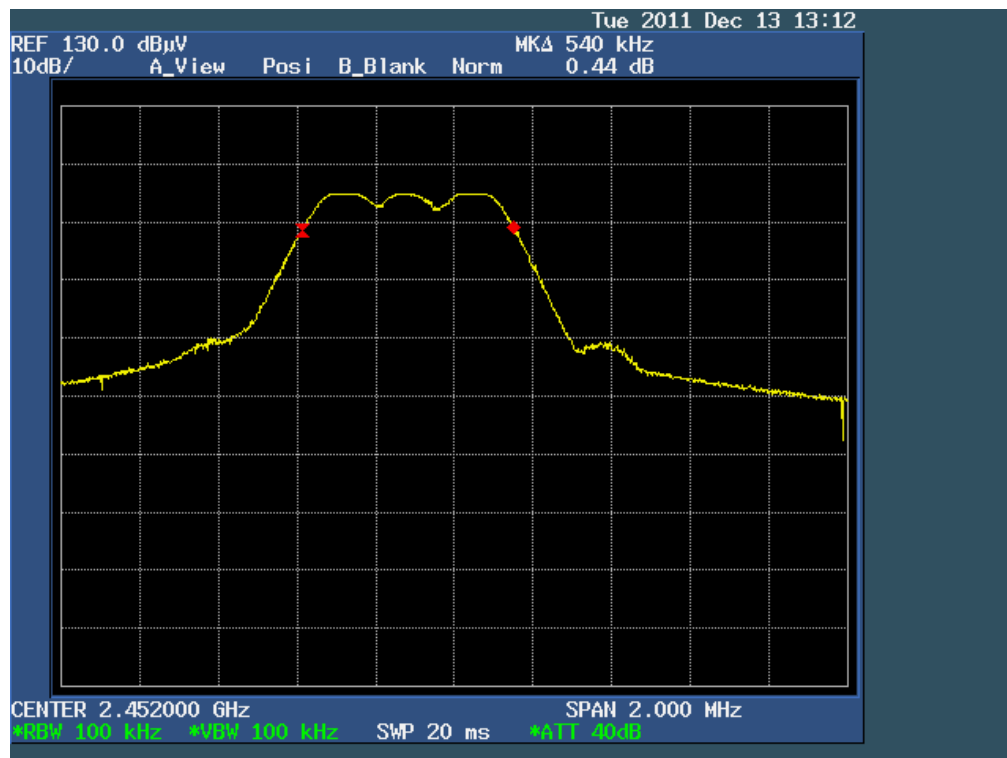
|              |                                    |                    |                    |
|--------------|------------------------------------|--------------------|--------------------|
| EUT:         | Wireless Digital Tour Guide System | Model Name :       | KR-2.4G-T          |
| Temperature: | 26 °C                              | Relative Humidity: | 53%                |
| Pressure:    | 1010 hPa                           | Test Power :       | DC 3V from battery |
| Test Mode :  | TX                                 |                    |                    |

| Test Channel | Frequency (MHz) | 6 dBc Bandwidth (KHz) | Limit (kHz) |
|--------------|-----------------|-----------------------|-------------|
| CH01         | 2404            | 536                   | 500         |
| CH09         | 2452            | 540                   | 500         |
| CH16         | 2473            | 524                   | 500         |

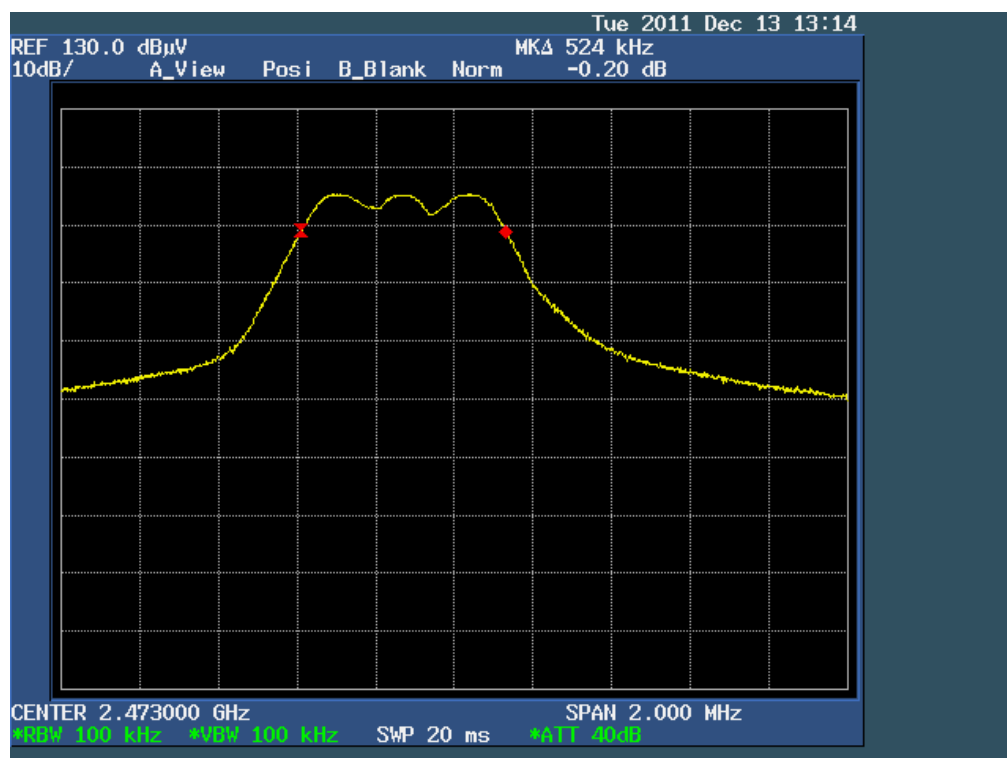
#### The Lowest Channel 01: 2404MHz



### The Middle Channel 09: 2452MHz



### The High Channel 16: 2473MHz



## **6.5 Peak Power Density**

### **6.5.1 Applied procedures / Limit**

15.247(a) (e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

### **6.5.2 Test procedure**

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- b. Connected the antenna port to the Spectrum Analyzer, set the Spectrum Analyzer as RBW=3kHz, VBW=10kHz, Sweep time=100s, span=300KHz, Detector Function=Average.

### **6.5.3 Deviation from standard**

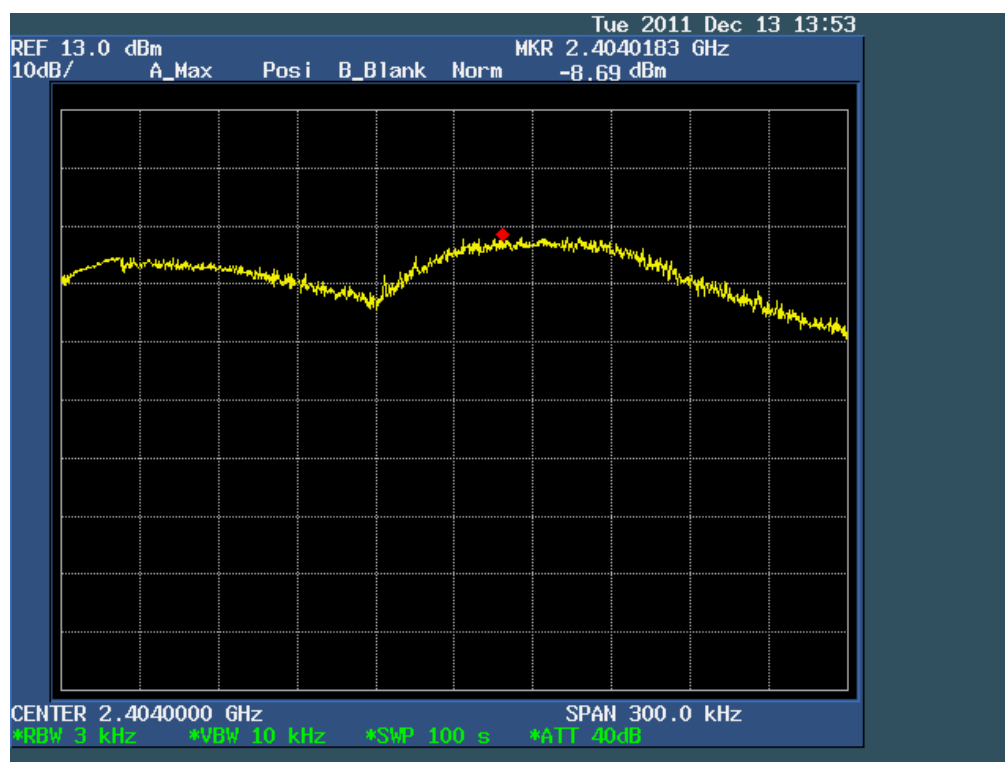
No deviation.

## 6.5.4 Test results

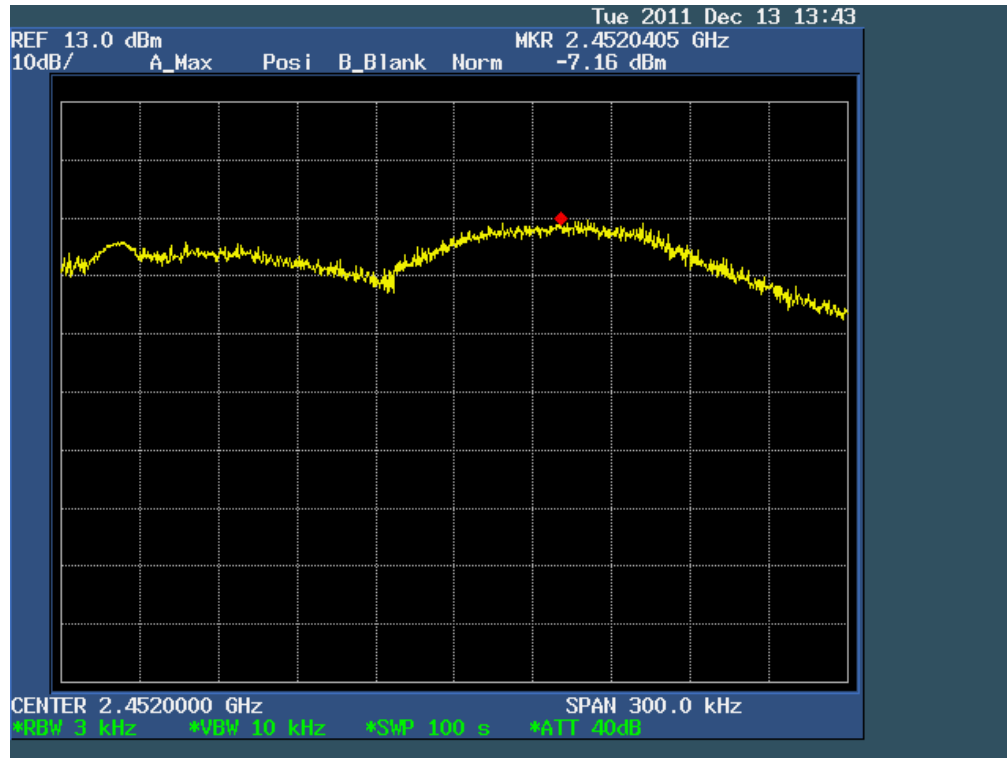
|              |                                    |                    |                    |
|--------------|------------------------------------|--------------------|--------------------|
| EUT:         | Wireless Digital Tour Guide System | Model Name :       | KR-2.4G-T          |
| Temperature: | 22 °C                              | Relative Humidity: | 53%                |
| Pressure:    | 1010 hPa                           | Test Power :       | DC 3V from battery |
| Test Mode :  | TX                                 |                    |                    |

| channel | Channel frequency (MHz) | Reading (dBm) | Cable loss (dB) | Peak power density (dBm) | Limit (dBm) | Conclusion |
|---------|-------------------------|---------------|-----------------|--------------------------|-------------|------------|
| Low     | 2404                    | -8.69         | 2.0             | -6.69                    | 8           | Pass       |
| Middle  | 2452                    | -7.16         | 2.0             | -5.16                    | 8           | Pass       |
| Highest | 2473                    | -6.13         | 2.0             | -4.13                    | 8           | Pass       |

### The Lowest Channel 01: 2404MHz



### The Middle Channel 09: 2452MHz



### The High Channel 16: 2473MHz



## 6.6 Maximum Peak Output Power

### 6.6.1 Applied procedures / Limit

15.247(b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

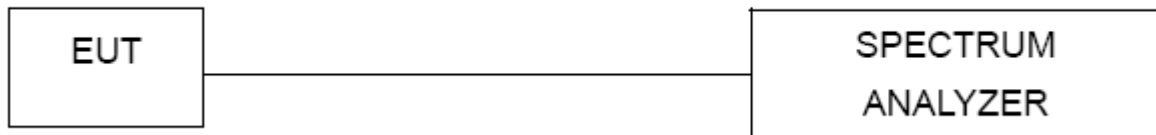
### 6.6.2 Test procedure

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- Spectrum Setting: RBW=1MHz, VBW  $\geq$  RBW, Sweep time=Auto, Detector Function=Peak.

### 6.6.3 Deviation from standard

No deviation.

### 6.6.4 Test setup

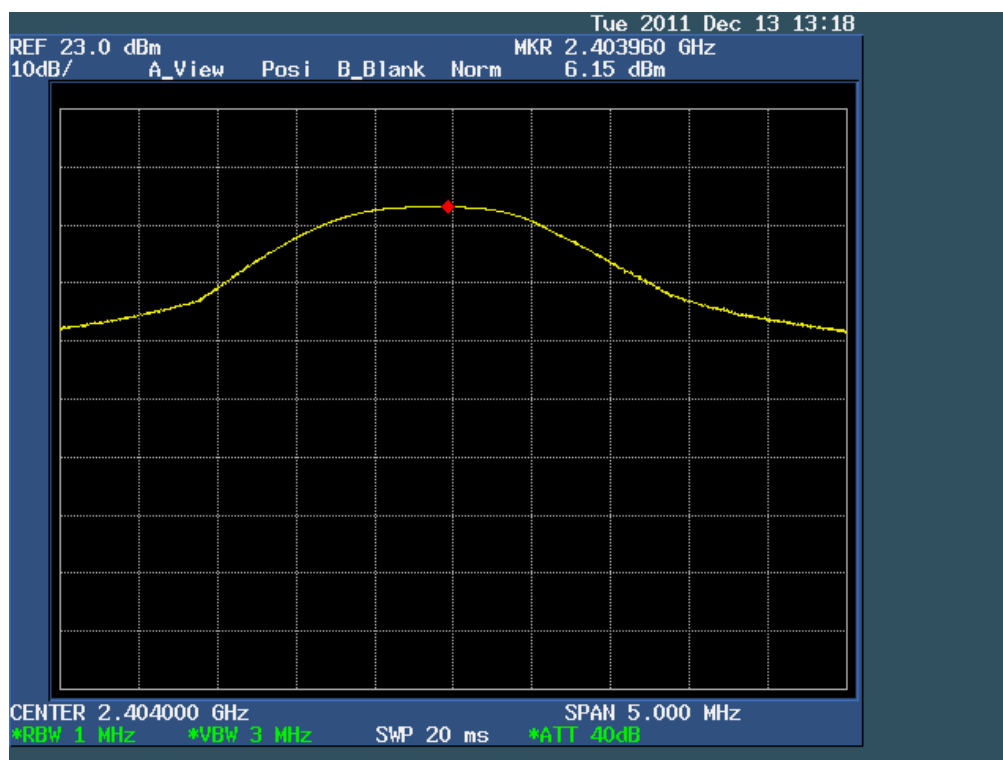


### 6.6.5 Test results

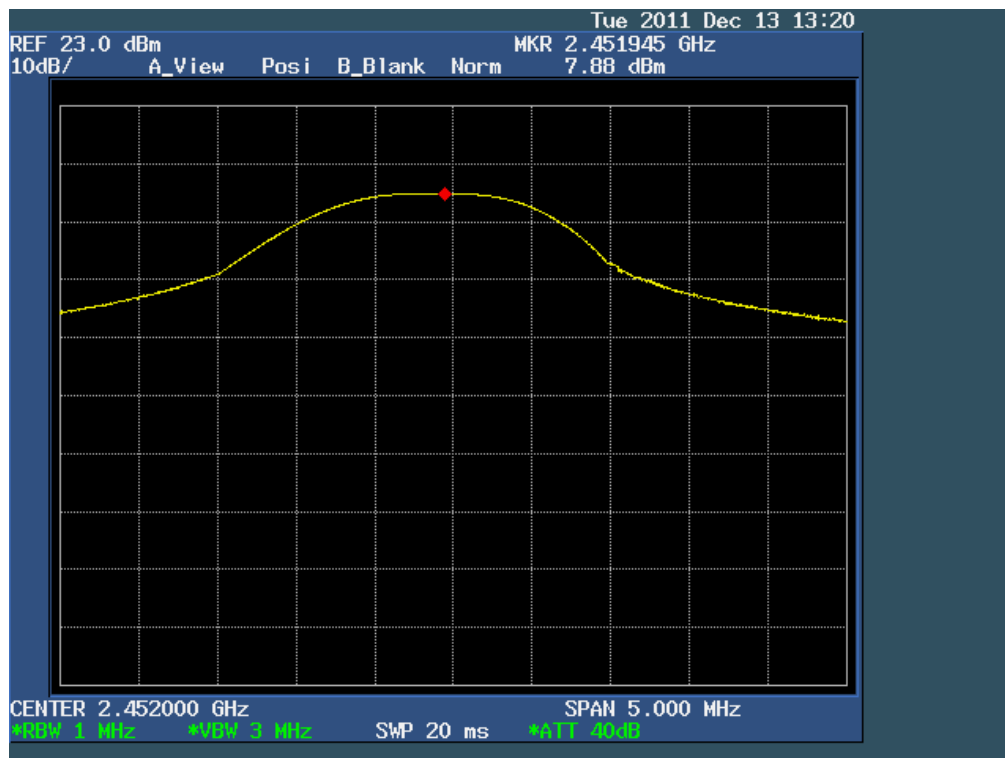
|              |                                    |                    |                    |
|--------------|------------------------------------|--------------------|--------------------|
| EUT:         | Wireless Digital Tour Guide System | Model Name :       | KR-2.4G-T          |
| Temperature: | 22 °C                              | Relative Humidity: | 60%                |
| Pressure:    | 1010 hPa                           | Test Voltage :     | DC 3V from battery |
| Test Mode :  | TX                                 |                    |                    |

| Frequency | Reading Power (dBm) | Cable Loss (dB) | Output Power (dBm) | Limit (dBm) | Result |
|-----------|---------------------|-----------------|--------------------|-------------|--------|
| 2404 MHz  | 6.15                | 2.0             | 8.15               | 30          | Pass   |
| 2452 MHz  | 7.88                | 2.0             | 9.88               | 30          | Pass   |
| 2473 MHz  | 8.25                | 2.0             | 10.25              | 30          | Pass   |

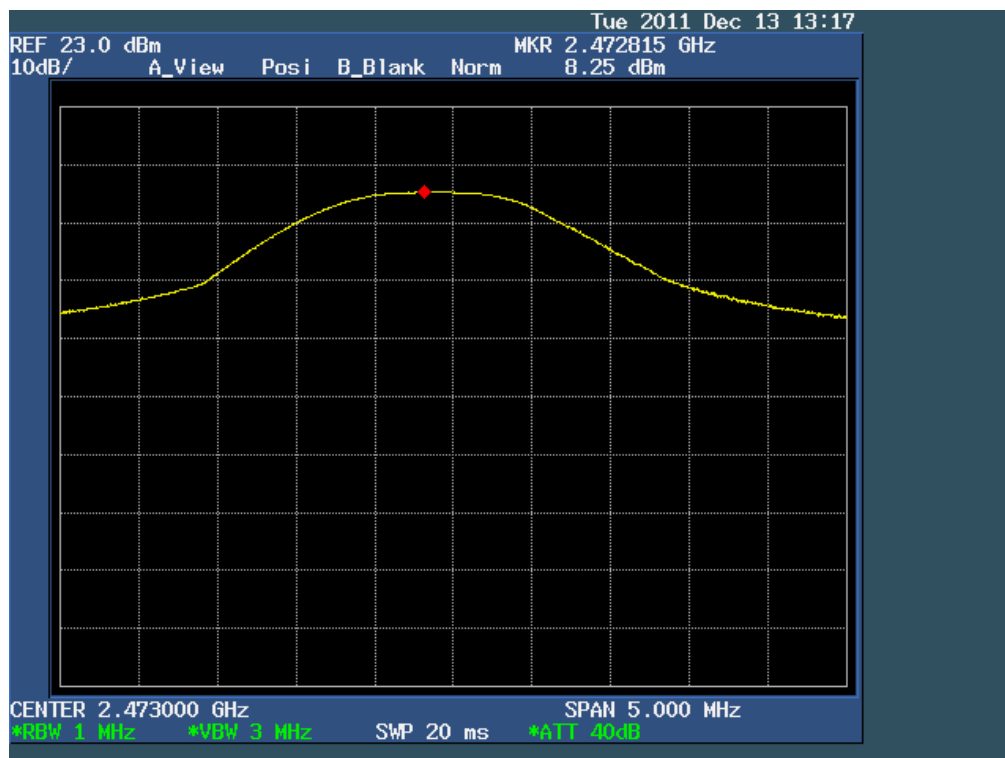
#### The Lowest Channel 01: 2404MHz



### The Middle Channel 09: 2452MHz



### The High Channel 16: 2473MHz



## 6.7 Band edge

### 6.7.1 Applied procedures / Limit

15.247(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

### 6.7.2 Test procedure

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- b. Spectrum Setting : RBW=100kHz,VBW $\geq$ RBW,Sweep time=Auto, Detector Function=Peak.

### 6.7.3 Deviation from standard

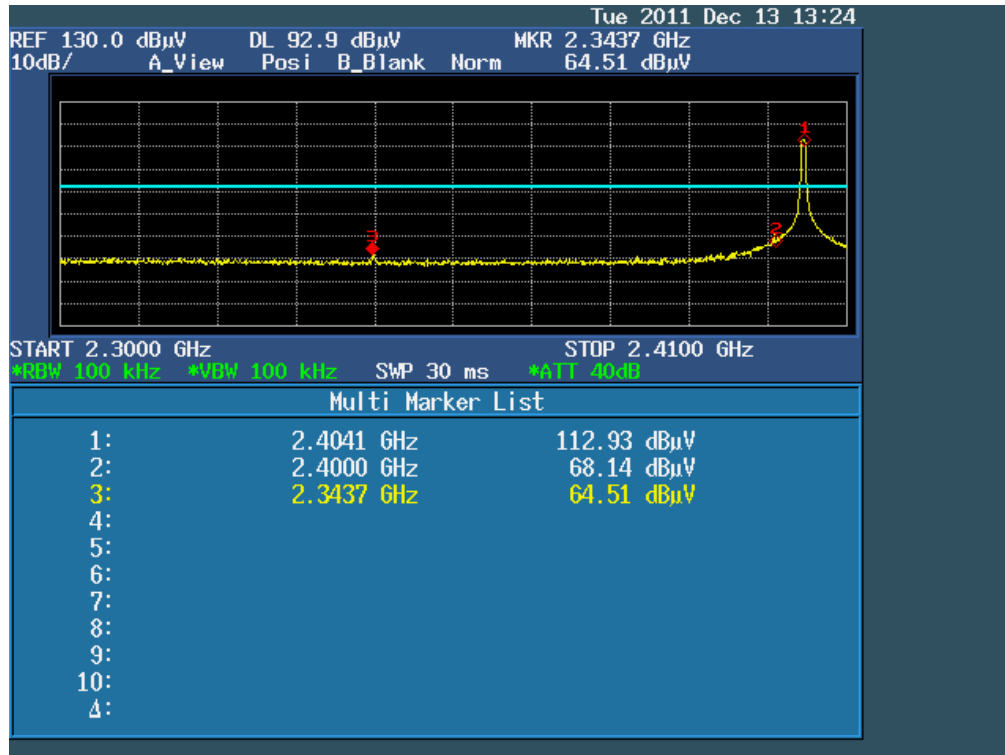
No deviation.

### 6.7.4 Test setup



## 6.7.5 Test results

### CH01 (Lower)



### CH 16 (Upper)



## 6.8 Conducted Spurious Emissions

### 6.8.1 Applied procedures / Limit

15.247(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

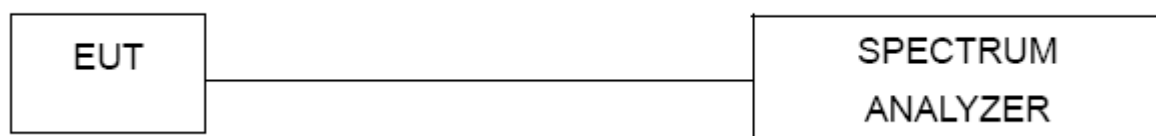
### 6.8.2 Test procedure

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- b. Spectrum Setting: RBW=100kHz, VBW $\geq$ RBW, Sweep time=Auto, Detector Function=Peak.

### 6.8.3 Deviation from standard

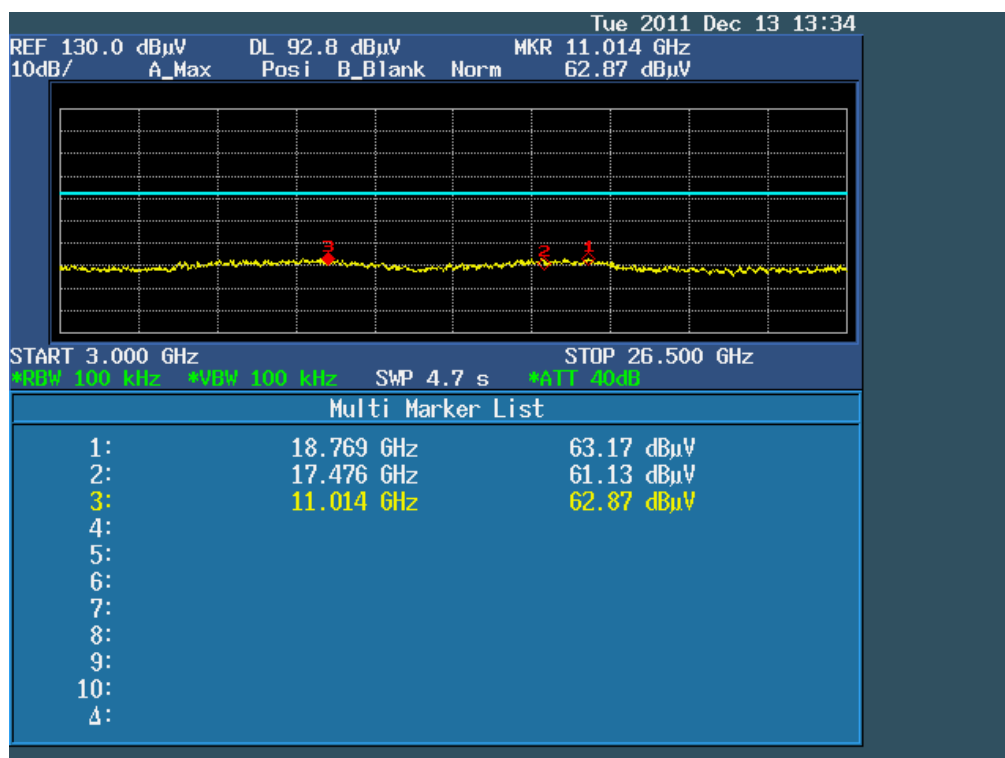
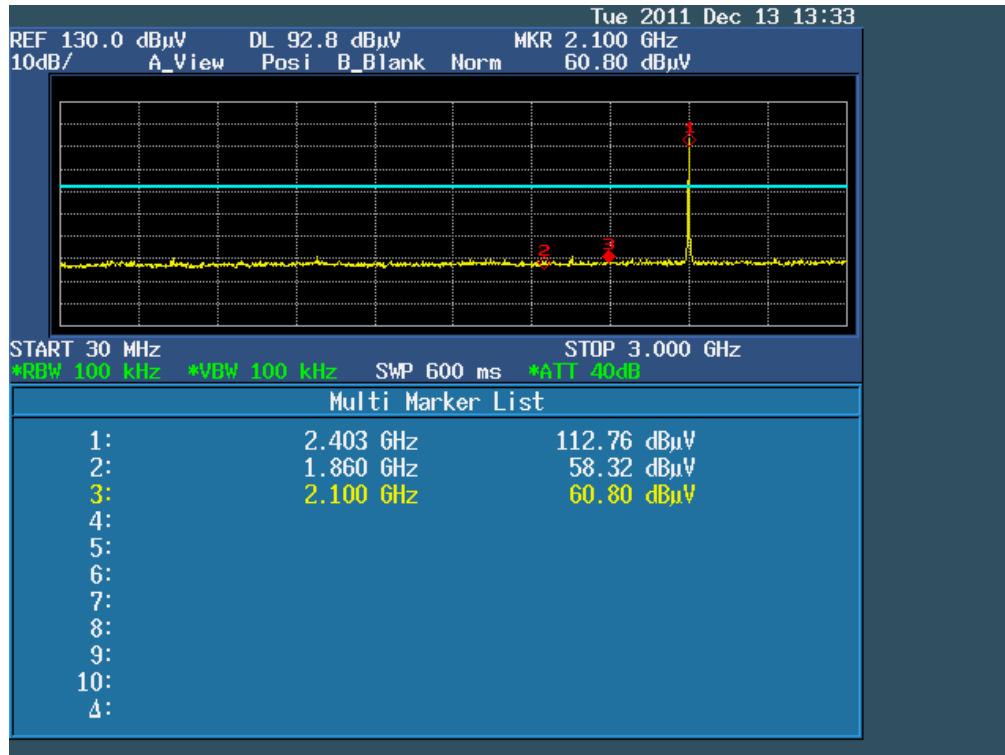
No deviation.

### 6.8.4 Test setup

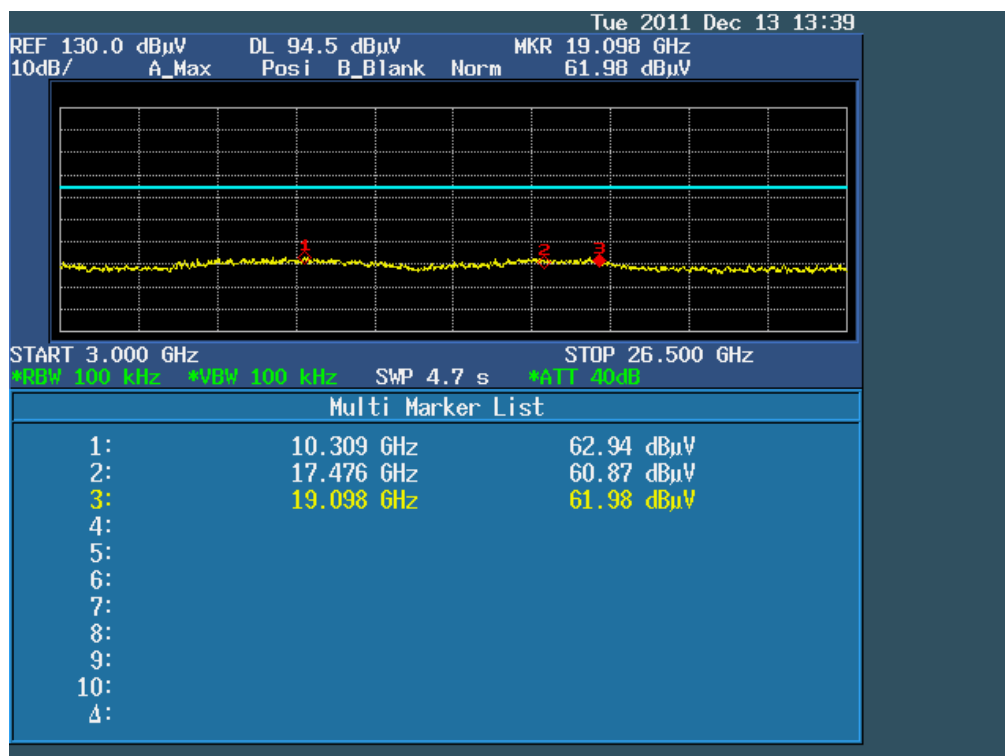
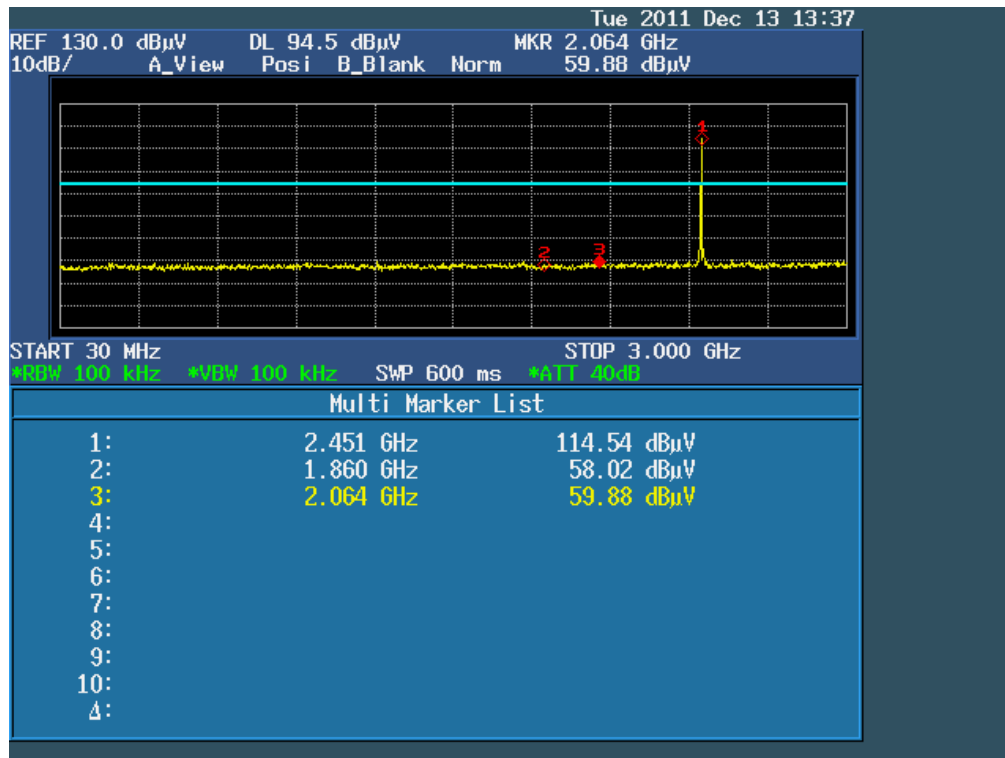


## 6.8.5 Test results

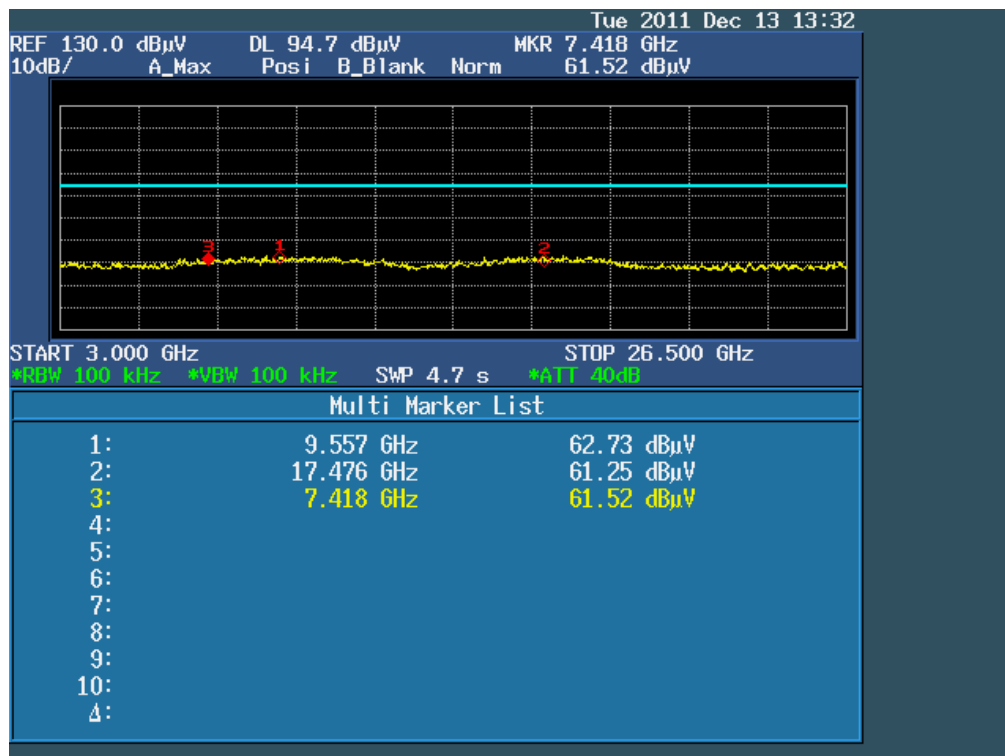
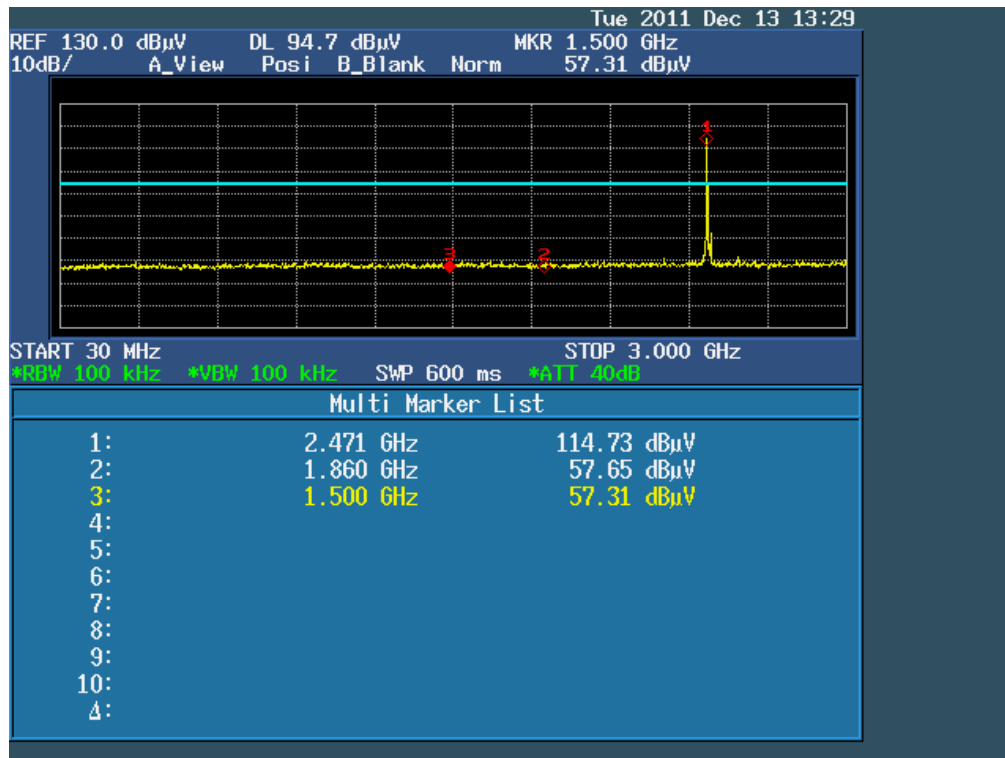
### CH01



## CH 09



# CH 16

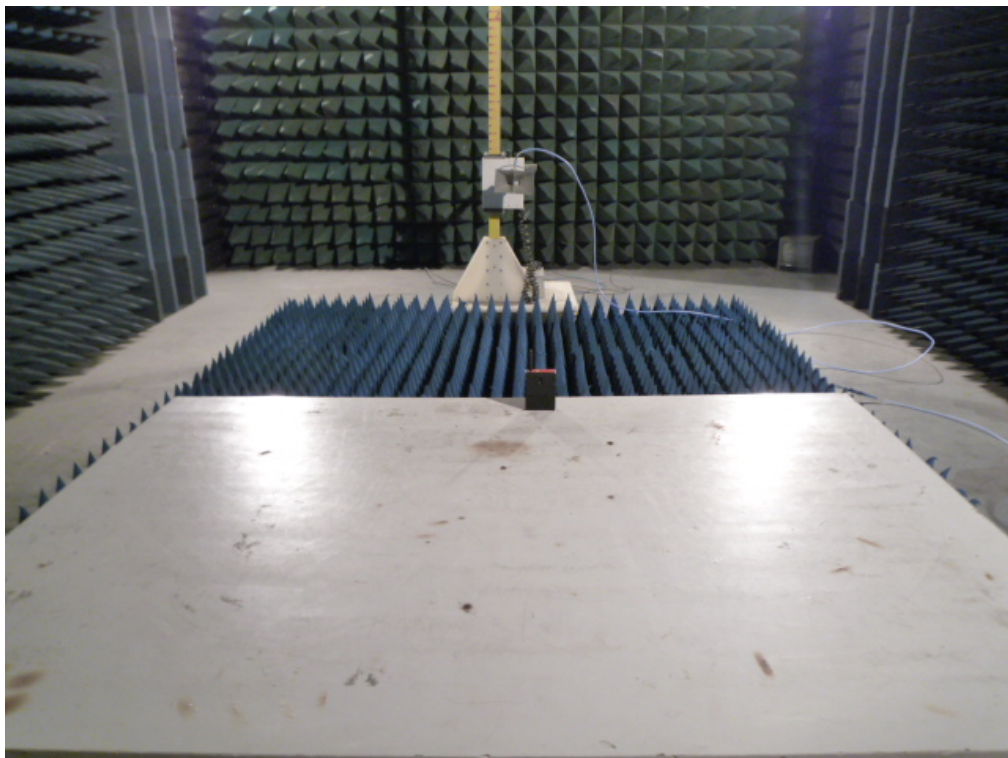
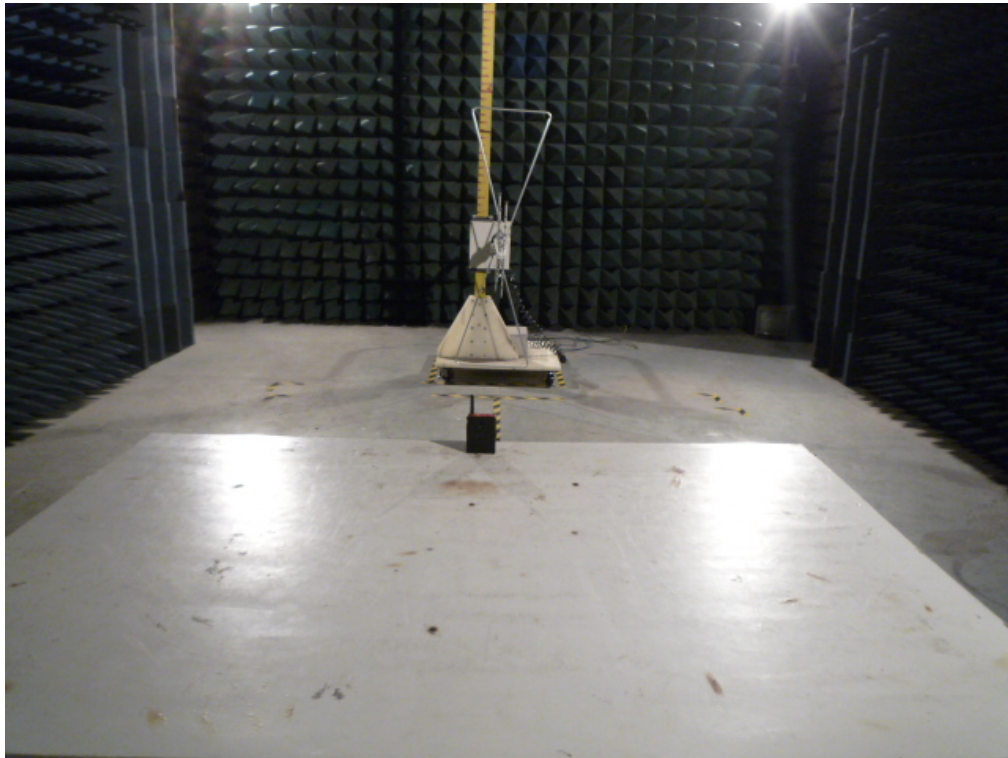


## 7 Test Setup photograph

### Conducted Measurement Photos



## Radiated Measurement Photos



## 8 APPENDIX-Photographs of EUT Constructional Details

Photo 1



Photo 2



Photo 3

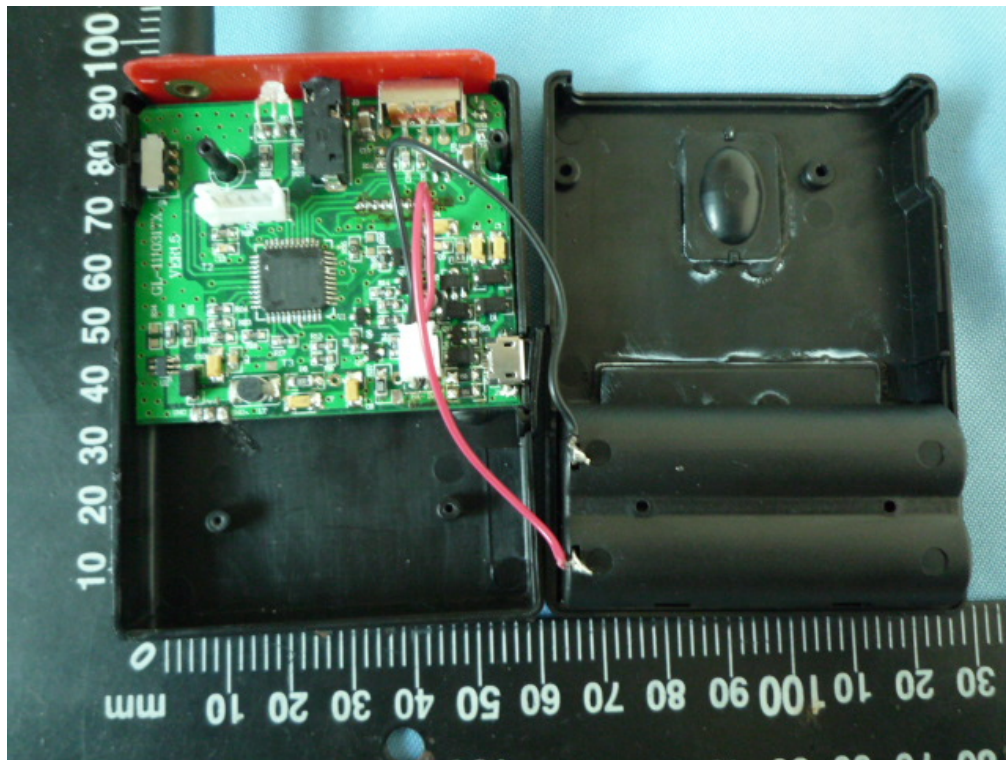


Photo 4

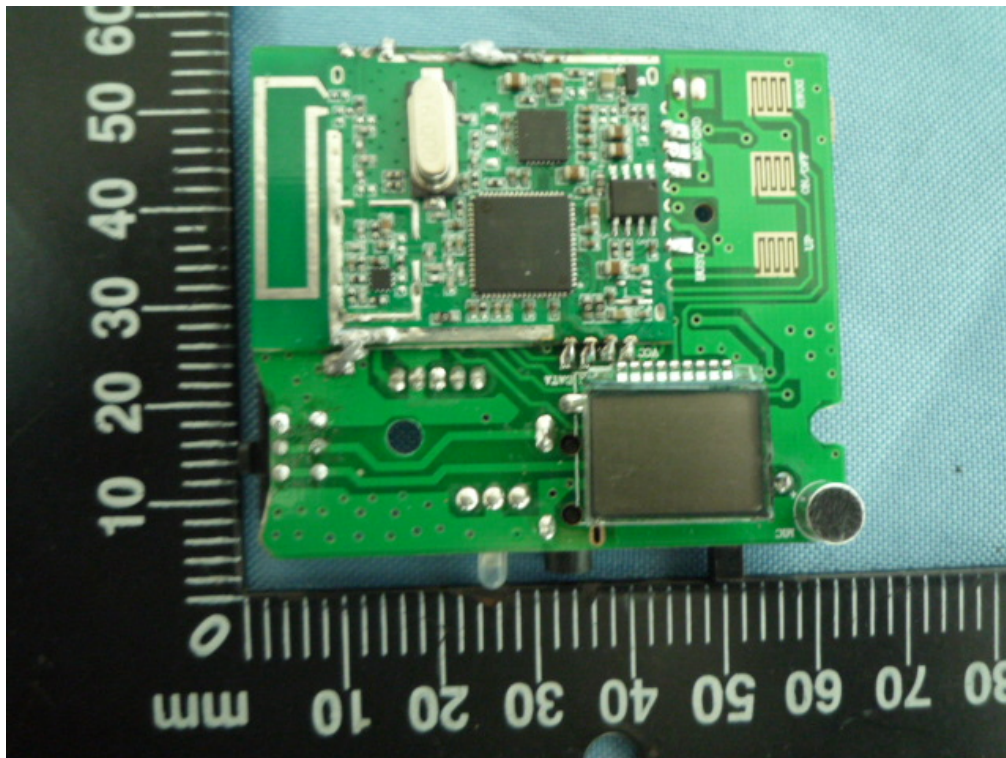


Photo 5

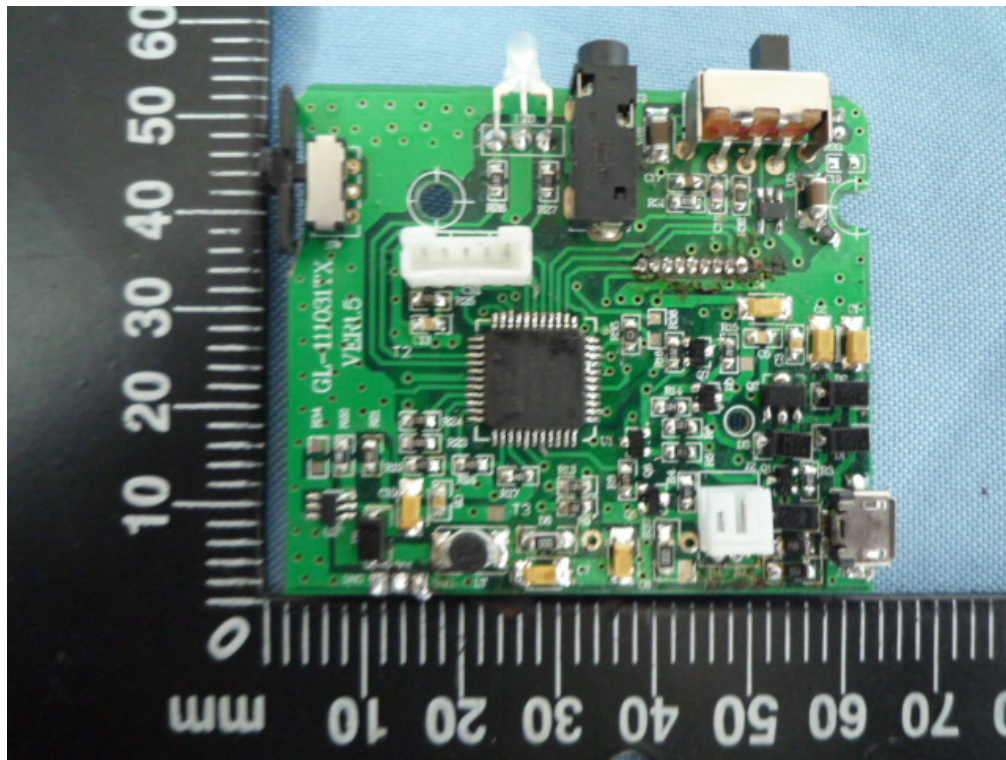


Photo 6

