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# Radio Test Report

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Report No.: AGC20M120301-2F2

**FCC ID** : T54DV70E

**PRODUCT DESIGNATION** : 2.4GHz digital wireless receiver with SD card recorder

**BRAND NAME** : N/A

**TEST MODEL** : DV70E, ADW280

**CLIENT** : AnJieLun Electronic Technology Limited

**DATE OF ISSUE** : Apr. 11, 2012

**STANDARD(S)** : FCC Part 15 Rules

**REPORT VERSION** : V1.2

Attestation of **Global Compliance Co., Ltd.**

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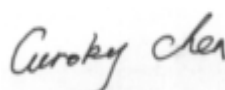
## VERIFICATION OF COMPLIANCE

|                     |   |
|---------------------|---|
| Applicant           | AnJieLun Electronic Technology Limited  |
|                     | 2F, 12st, LONGBI INDUSTRIAL PARK, BANTIAN VILLAGE,<br>BUJI TOWN, SHENZHEN, GUANG DONG PROVIDENCE, CHINA |
| Manufacturer        | AnJieLun Electronic Technology Limited  |
|                     | 2F, 12st, LONGBI INDUSTRIAL PARK, BANTIAN VILLAGE,<br>BUJI TOWN, SHENZHEN, GUANG DONG PROVIDENCE, CHINA |
| Product Designation | 2.4GHz digital wireless receiver with SD card recorder  |
| Brand Name          | N/A   |
| Test Model          | DV70E   |
| Serious Model       | ADW280  |
| Model Difference    | All the same except for the model name.   |
| Report Number       | AGC20M120301-2F2  |
| Date of Test        | Apr. 08, 2012 to Apr. 10, 2012  |

### WE HEREBY CERTIFY THAT:

The above equipment was tested by Attestation of Global Compliance Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C 63.4:2003. The sample tested as described in this report is in compliance with the FCC Rules Part 15 requirements.

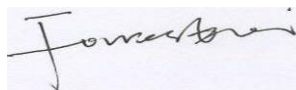
Tested By:



Curoky Chen

Apr. 11, 2012

Reviewed By:



Forrest Lei

Apr. 11, 2012

Approved By:



Solger Zhang

Apr. 11, 2012

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## 1 GENERAL INFORMATION

### 1.1 PRODUCT DESCRIPTION

The EUT is a **2.4GHz digital wireless receiver with SD card recorder** designed as an “Communication Device”. It is designed by way of utilizing the FHSS technology to achieve the system operation. It employed a hopping sequence to make sure that the 24 Ch are equally used. The Rx input bandwidth is 3 MHz. A major technical description of EUT is described as following

|                     |                           |
|---------------------|---------------------------|
| Operation Frequency | 2408.95 MHz to 2474.23MHz |
| Rated Output Power  | 15.40dBm(max)             |
| Hardware Version    | V1.0                      |
| Software Version    | V1.0                      |
| Modulation          | GFSK                      |
| Number of channels  | 24                        |
| Antenna Designation | Detachable                |
| Antenna Gain        | 1.6dBi                    |
| Power Supply        | DC 5V by adapter          |

## **1.2 RELATED SUBMITTAL(S) / GRANT (S)**

This submittal(s) (test report) is intended for **FCC ID: T54DV70E**, filing to comply with the FCC Part 15 requirements.

## **1.3 TEST METHODOLOGY**

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 (2003). Radiated testing was performed at an antenna to EUT distance 3 meters.

## **1.4 TEST FACILITY**

The test site used to collect the radiated data is located on the address of Attestation of Global Compliance Co., Ltd. 2F., No.2 Building, Huafeng No.1 Technical Industrial Park, Sanwei, Xixiang, Baoan District, Shenzhen. The test site is constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2003 .  
FCC register No.: 259865

## **1.5 SPECIAL ACCESSORIES**

Refer to section 2.2.

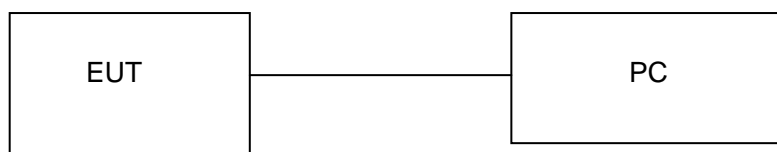
## **1.6 EQUIPMENT MODIFICATIONS**

Not available for this EUT intended for grant.

## 2 SYSTEM TEST CONFIGURATION

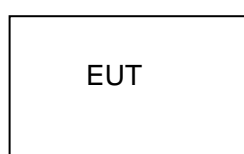
### 2.1 CONFIGURATION OF EUT SYSTEM

Configure 1:



*Note: the EUT controlled by PC to work in continuous TX mode.*

Configure 2:



*Note: EUT worked in Normal hopping mode.*

### 2.2 EQUIPMENT USED IN EUT SYSTEM

| Item | Equipment   | Mfr/Brand | Model/Type No. | Remark    |
|------|---|-----------|----------------|-----------|
| 1    | 2.4GHz digital wireless receiver<br>with SD card recorder | N/A       | DV70E          | EUT       |
| 2    | Power supply  | Nalin     | NLA10050W1A    | Accessory |
| 3    | PC  | Dell      | Inspiron N5110 | A.E       |

*Note: All the accessories have been used during the test.  
the EUT in test setup diagram means "EUT system".*

### 3 SUMMARY OF TEST RESULTS

| FCC RULES | DESCRIPTION OF TEST         | RESULT    |
|-----------|-----------------------------|-----------|
| §15.247   | Peak Output Power           | Compliant |
| §15.247   | 20 dB Bandwidth             | Compliant |
| §15.247   | Conducted Spurious Emission | Compliant |
| §15.209   | Radiated Emission           | Compliant |
| §15.247   | Band Edges                  | Compliant |
| §15.247   | Number of Hopping Frequency | Compliant |
| §15.247   | Time of Occupancy           | Compliant |
| §15.247   | Frequency Separation        | Compliant |
| §15.207   | Line Conduction Emission    | Compliant |



#### 4. DESCRIPTION OF TEST MODES

The EUT has been operated in three modulations: GFSK independently.  
The following operating modes were applied for the related test items.

| No. | TEST MODES         |
|-----|--------------------|
| 1   | Low Channel(TX)    |
| 2   | Middle Channel(TX) |
| 3   | High Channel(TX)   |
| 4   | Normal Hopping     |

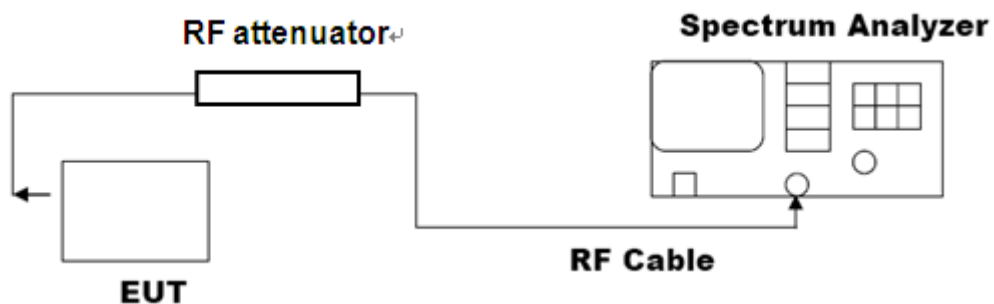
**Note:** All test modes were performed during the testing with configure in section 2.1, only the result of the worst case was recorded in the report.

## 5 PEAK OUTPUT POWER

### 5.1 MEASUREMENT PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
3. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
4. Set Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel  
RBW > the 20 dB bandwidth of the emission being measured  
VBW  $\geq$  RBW; Sweep = auto; Detector function = peak
5. Set SPA Trace 1 Max hold, then View.

### 5.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)



### 5.3 MEASUREMENT EQUIPMENT USED

| Description       | Manufacturer | Model   | SERIAL NUMBER | Cal. Date  | Cal. Due   |
|-------------------|--------------|---------|---------------|------------|------------|
| Spectrum Analyzer | Agilent      | E4440A  | N/A           | 06/27/2011 | 06/26/2012 |
| RF attenuator     | N/A          | RFA20db | N/A           | N/A        | N/A        |

### 5.4 LIMITS AND MEASUREMENT RESULT

| PEAK OUTPUT POWER MEASUREMENT RESULT<br>FOR GFSK MODULATION |                 |                            |              |
|---|-----------------|----------------------------|--------------|
| Frequency<br>(GHz)  | Result<br>(dBm) | Applicable Limits<br>(dBm) | Pass or Fail |
| Channel 0   | 14.65           | 30                         | Pass         |
| Channel 12  | 14.95           | 30                         | Pass         |
| Channel 23  | 15.40           | 30                         | Pass         |

## 6 20 DB BANDWIDTH

### 6.1 MEASUREMENT PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
3. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
4. Set Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel  
RBW  $\geq$  1% of the 20 dB bandwidth, VBW  $\geq$  RBW; Sweep = auto; Detector function = peak
5. Set SPA Trace 1 Max hold, then View.

### 6.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

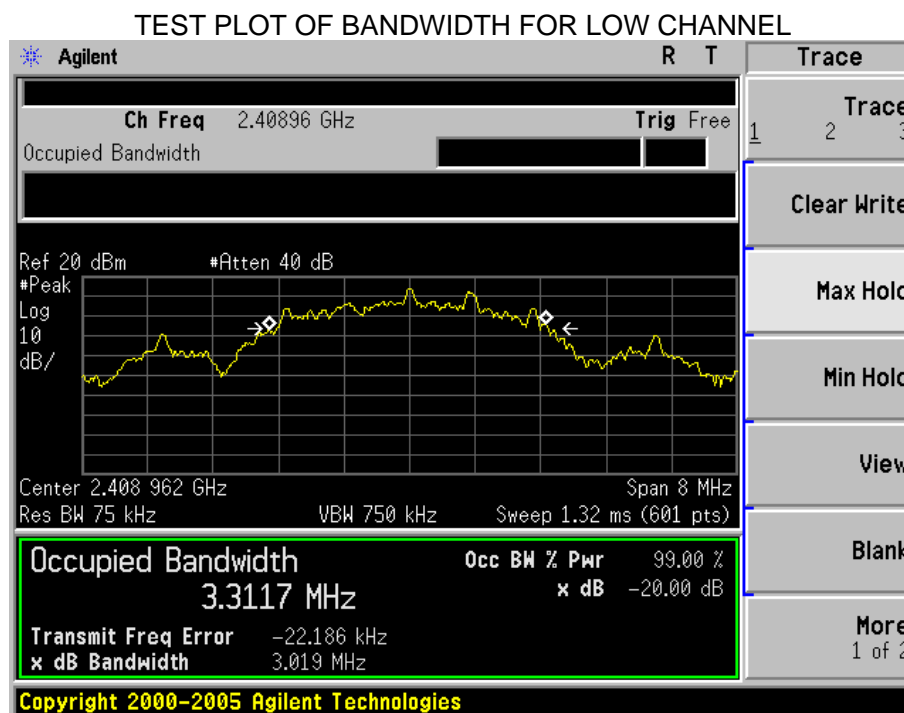
The same as described in Section 5.2

### 6.3 MEASUREMENT EQUIPMENT USED

The same as described in Section 5.3

### 6.4 LIMITS AND MEASUREMENT RESULTS

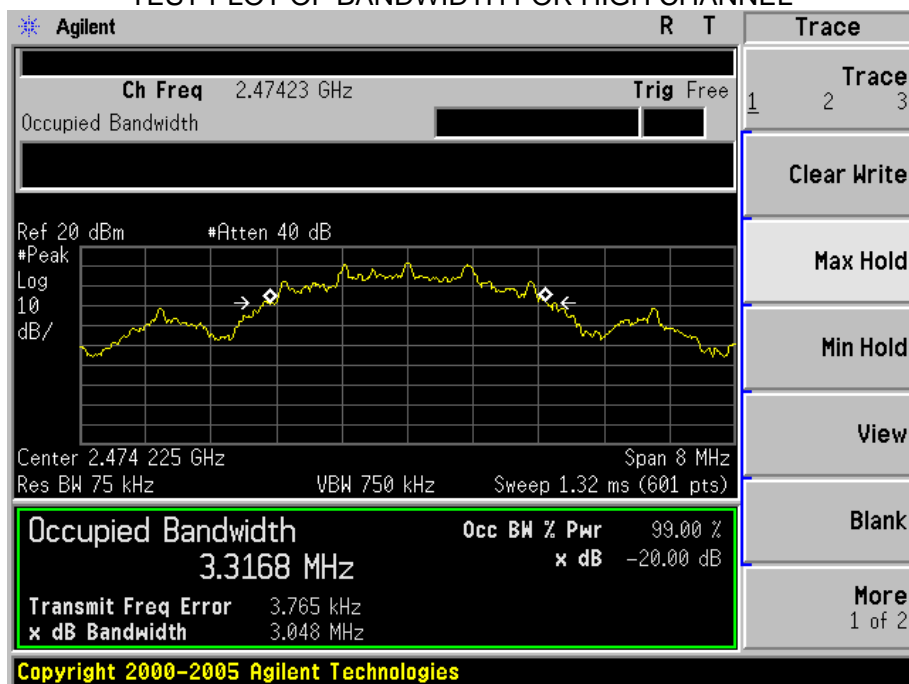
| TEST RESULT       |                    |       |          |
|-------------------|--------------------|-------|----------|
| Applicable Limits | Measurement Result |       |          |
|                   | Test Data (MHz)    |       | Criteria |
| --                | Low Channel        | 3.019 | PASS     |
|                   | Middle Channel     | 3.072 | PASS     |
|                   | High Channel       | 3.048 | PASS     |



### TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



### TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



## 7. CONDUCTED SPURIOUS EMISSION

### 7.1 MEASUREMENT PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
3. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
4. Set the Span = wide enough to capture the peak level of the in-band emission and all spurious emissions from the lowest frequency generated in the EUT up through the 10th harmonic.  
RBW = 100 kHz; VBW  $\geq$  RBW; Sweep = auto; Detector function = peak.
5. Set SPA Trace 1 Max hold, then View.

### 7.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

The Same as described in section 5.2

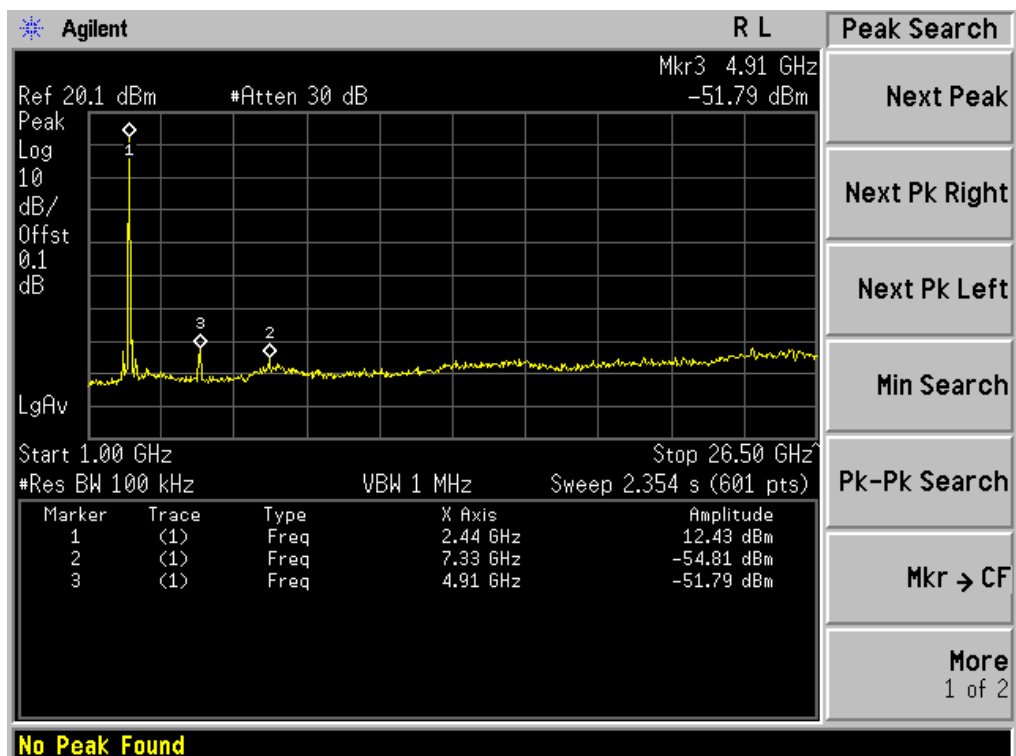
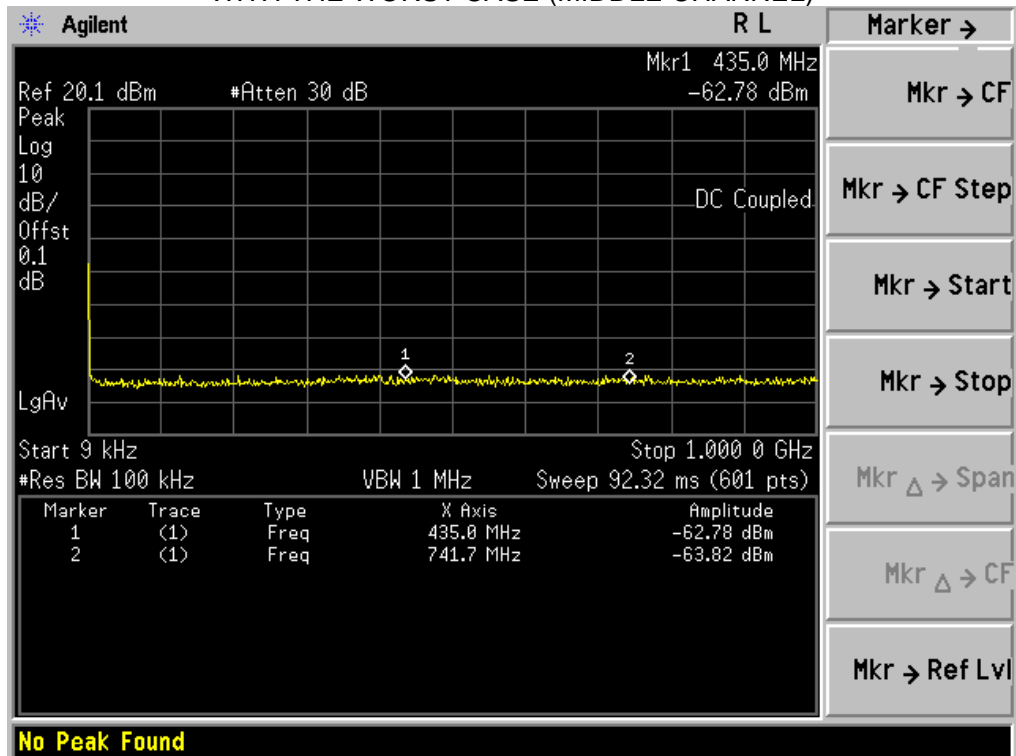
### 7.3 MEASUREMENT EQUIPMENT USED

The Same as described in section 5.3

### 7.4 LIMITS AND MEASUREMENT RESULT

| LIMITS AND MEASUREMENT RESULT  |  |          |
|--|--|----------|
| Applicable Limits  | Measurement Result   |          |
|  | Test Data  | Criteria |
| In any 100 KHz Bandwidth Outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produce by the intentional radiator shall be at least 20 dB below that in 100KHz bandwidth within the band that contains the highest level of the desired power. | At least -20dBc than the limit Specified on the BOTTOM Channel | PASS     |
| In addition, radiation 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))  | At least -20dBc than the limit Specified on the TOP Channel    | PASS     |

# TEST PLOT OF OUT OF BAND EMISSIONS WITH THE WORST CASE (MIDDLE CHANNEL)



## **8. RADIATED EMISSION**

### **8.1 MEASUREMENT PROCEDURE**

1. Configure the EUT according to ANSI C63.4: 2003. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High – Low scan is not required in this case.



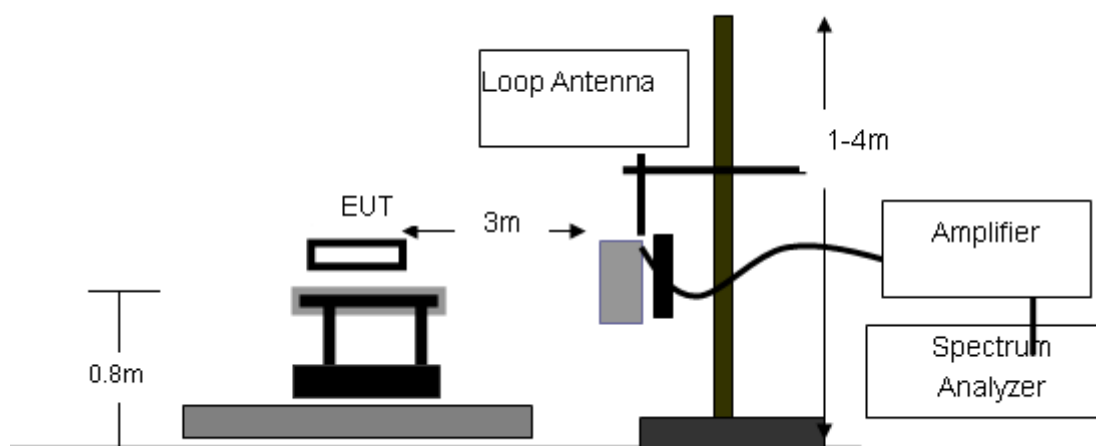
The following table is the setting of spectrum analyzer and receiver.'

| Spectrum Parameter                     | Setting                                   |
|--|---|
| Start Frequency                        | 1GHz                                      |
| Stop Frequency                         | 26.5GHz                                   |
| RB/VB(Emission in restricted band)     | 1MHz/1MHz for Peak, 1MHz/10Hz for Average |
| RB/VB(Emission in non-restricted band) | 1MHz/1MHz for Peak                        |

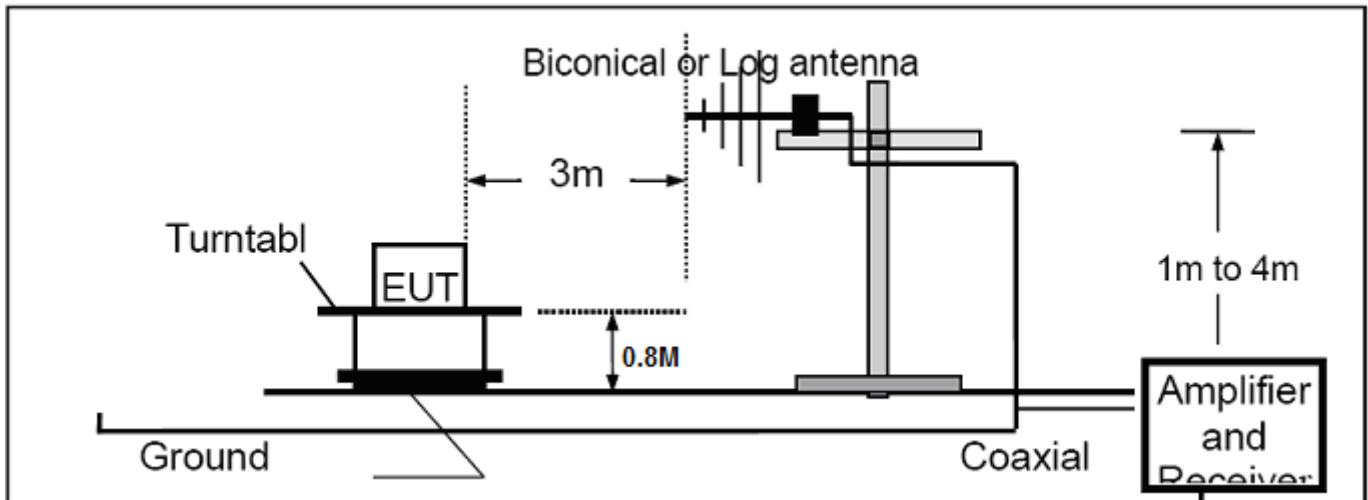
| Receiver Parameter    | Setting                        |
|-----------------------|--------------------------------|
| Start ~Stop Frequency | 9KHz~150KHz/RB 200Hz for QP    |
| Start ~Stop Frequency | 150KHz~30MHz/RB 9KHz for QP    |
| Start ~Stop Frequency | 30MHz~1000MHz/RB 120KHz for QP |

## 8.2 TEST SETUP

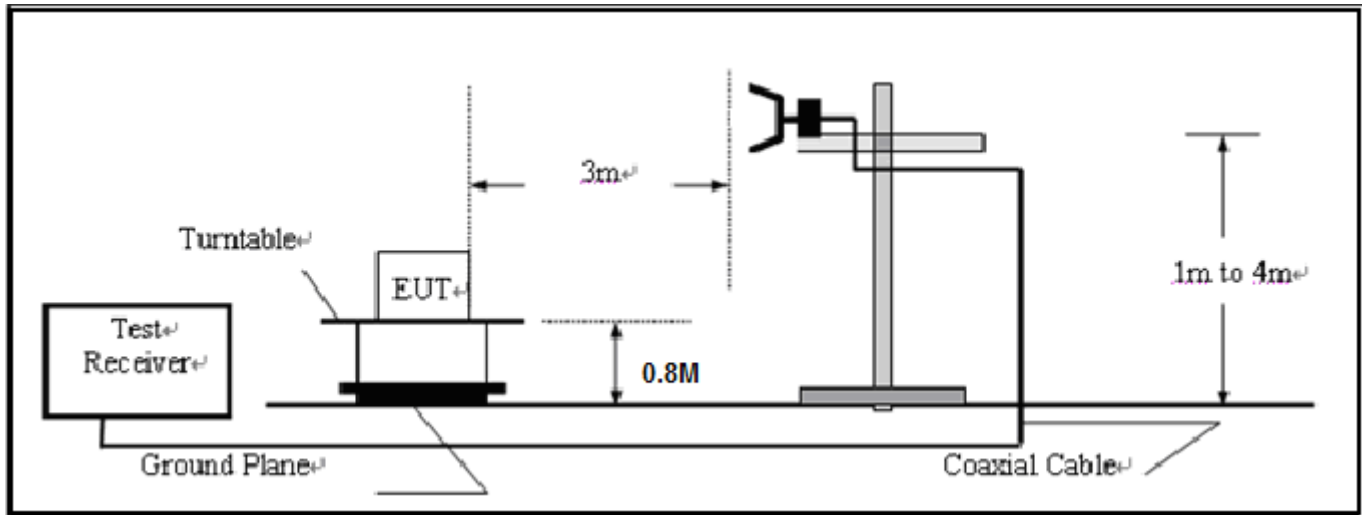
### RADIATED EMISSION TEST SETUP BELOW 30MHz



RADIATED EMISSION TEST SETUP 30MHz-1000MHz



RADIATED EMISSION TEST SETUP ABOVE 1000MHz



### 8.3 TEST EQUIPMENT LIST

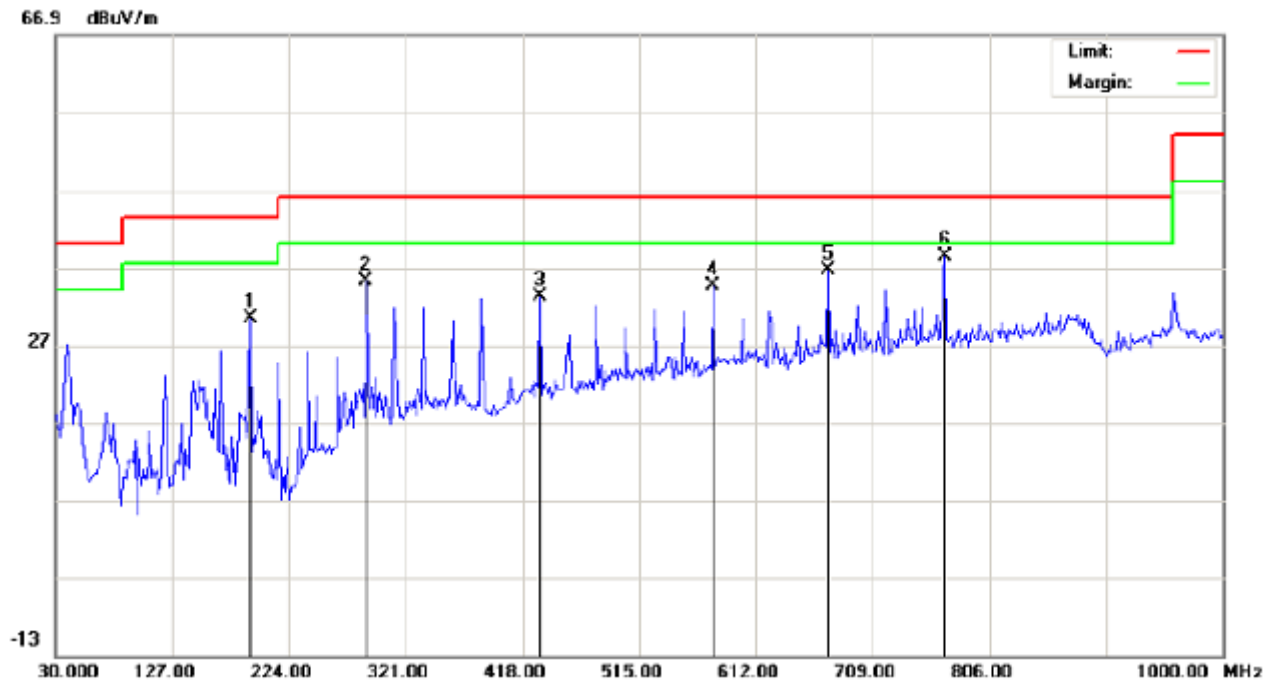
| Description           | Manufacturer      | Model       | SERIAL NUMBER | Cal. Date  | Cal. Due   |
|-----------------------|-------------------|-------------|---------------|------------|------------|
| Spectrum Analyzer     | Agilent           | E4440A      | N/A           | 06/27/2011 | 06/26/2012 |
| Amplifier             | EM                | EM30180     | 0607030       | 06/27/2011 | 06/26/2012 |
| Horn Antenna          | EM                | EM-AH-10180 | N/A           | 06/27/2011 | 06/26/2012 |
| EMI Test Receiver     | Rohde & Schwarz   | ESCI        | N/A           | 06/27/2011 | 06/26/2012 |
| Amplifier             | EM                | EM30180     | N/A           | 06/27/2011 | 06/26/2012 |
| Biological Antenna    | A.H. Systems Inc. | SAS-521-4   | N/A           | 06/27/2011 | 06/26/2012 |
| Loop Antenna          | Daze              | ZN30900N    | SEL0097       | 06/27/2011 | 06/26/2012 |
| Isolation Transformer | LETEAC            | LTBK        | --            | 06/27/2011 | 06/26/2012 |

## 8.4 TEST RESULT

### RADIATED EMISSION BELOW 30MHZ

No emission found between lowest internal used/generated frequencies to 30MHz.

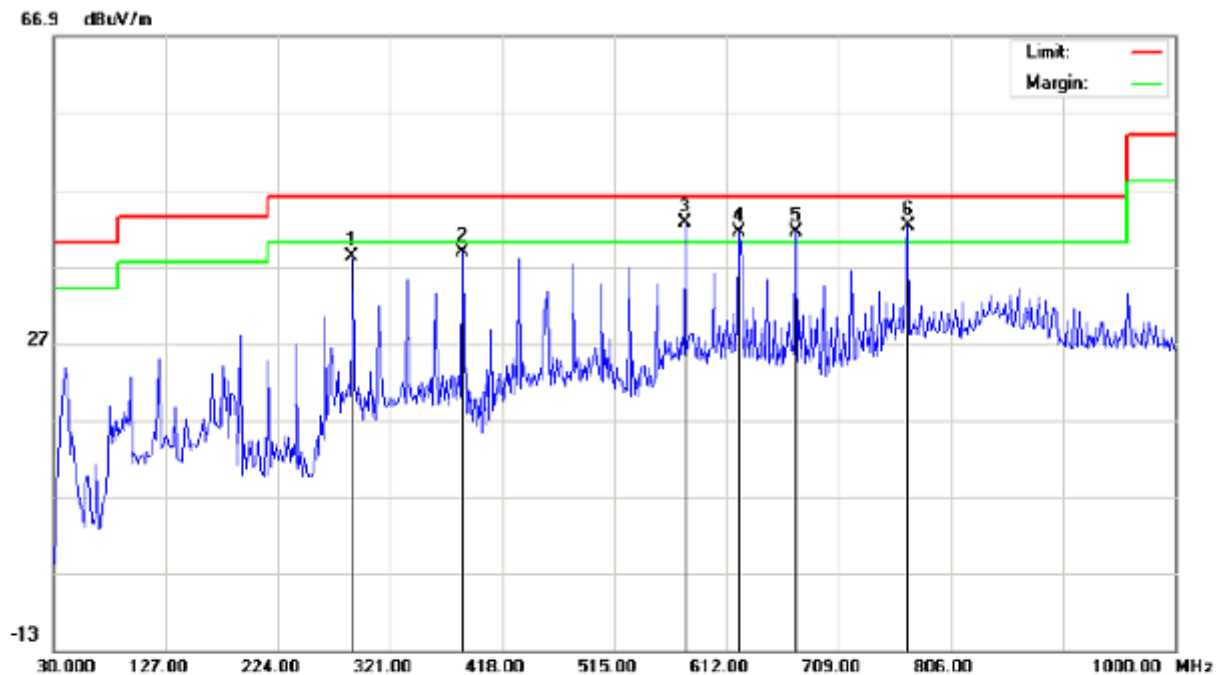
### RADIATED EMISSION BELOW 1GHZ



Site: site #1  
Limit: FCC Class B 3M Radiation  
EUT: 2.4GHz digital wireless receiver with SD card recorder  
M/N: DV70E  
Mode: channel 12 TX  
Note:

Polarization: **Vertical**  
Power: AC 120V/60Hz  
Temperature: 26  
Humidity: 60 %  
Distance: 3m

| No. | Mk | Freq.    | Reading | Factor | Measurement | Limit  | Over   | Detector | Antenna Height | Table Degree | Comment |
|-----|----|----------|---------|--------|-------------|--------|--------|----------|----------------|--------------|---------|
|     |    | MHz      | dBuV    | dB/m   | dBuV/m      | dBuV/m | dB     |          | cm             | degree       |         |
| 1   |    | 191.6667 | 20.74   | 9.61   | 30.35       | 43.50  | -13.15 | peak     |                |              |         |
| 2   |    | 288.6666 | 18.13   | 17.11  | 35.24       | 46.00  | -10.76 | peak     |                |              |         |
| 3   |    | 432.5500 | 11.73   | 21.47  | 33.20       | 46.00  | -12.80 | peak     |                |              |         |
| 4   |    | 576.4333 | 10.00   | 24.54  | 34.54       | 46.00  | -11.46 | peak     |                |              |         |
| 5   |    | 671.8167 | 10.82   | 25.82  | 36.64       | 46.00  | -9.36  | peak     |                |              |         |
| 6   | *  | 768.8167 | 11.10   | 27.36  | 38.46       | 46.00  | -7.54  | peak     |                |              |         |



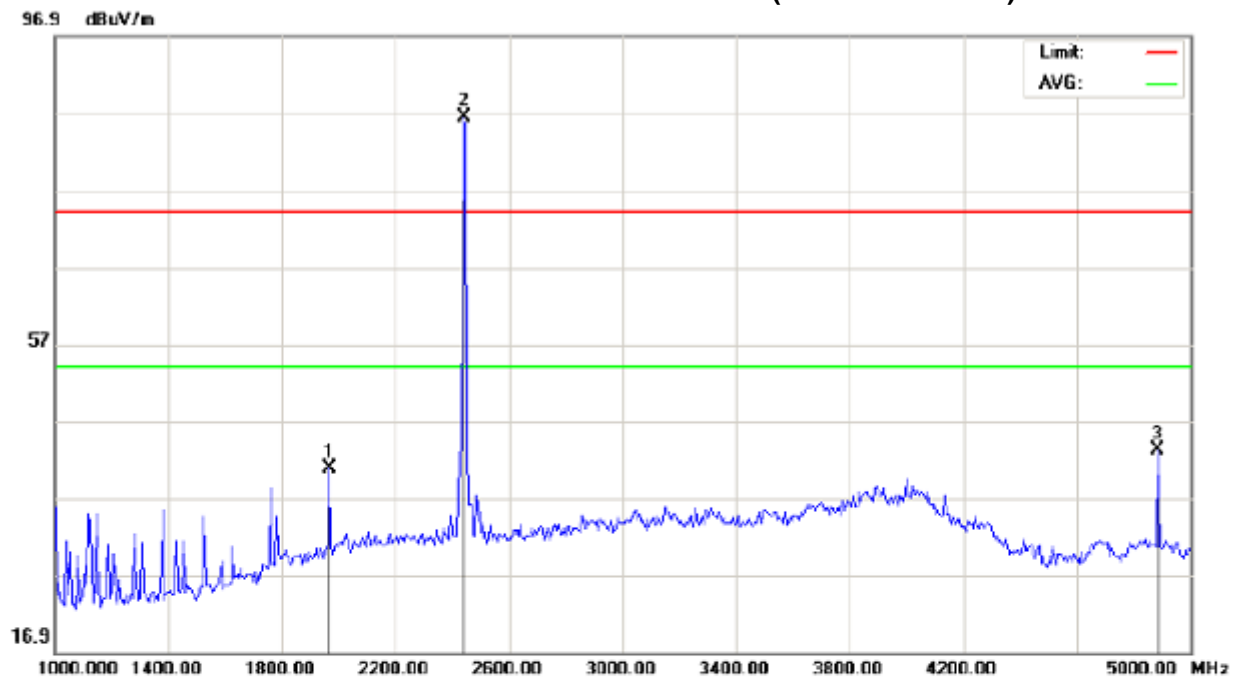
Site: site #1  
Limit: FCC Class B 3M Radiation  
EUT: 2.4GHz digital wireless receiver with SD card recorder  
M/N: DV70E  
Mode: channel 12 TX  
Note:

Polarization: *Horizontal*  
Power: AC 120V/60Hz

Temperature: 26  
Humidity: 60 %  
Distance: 3m

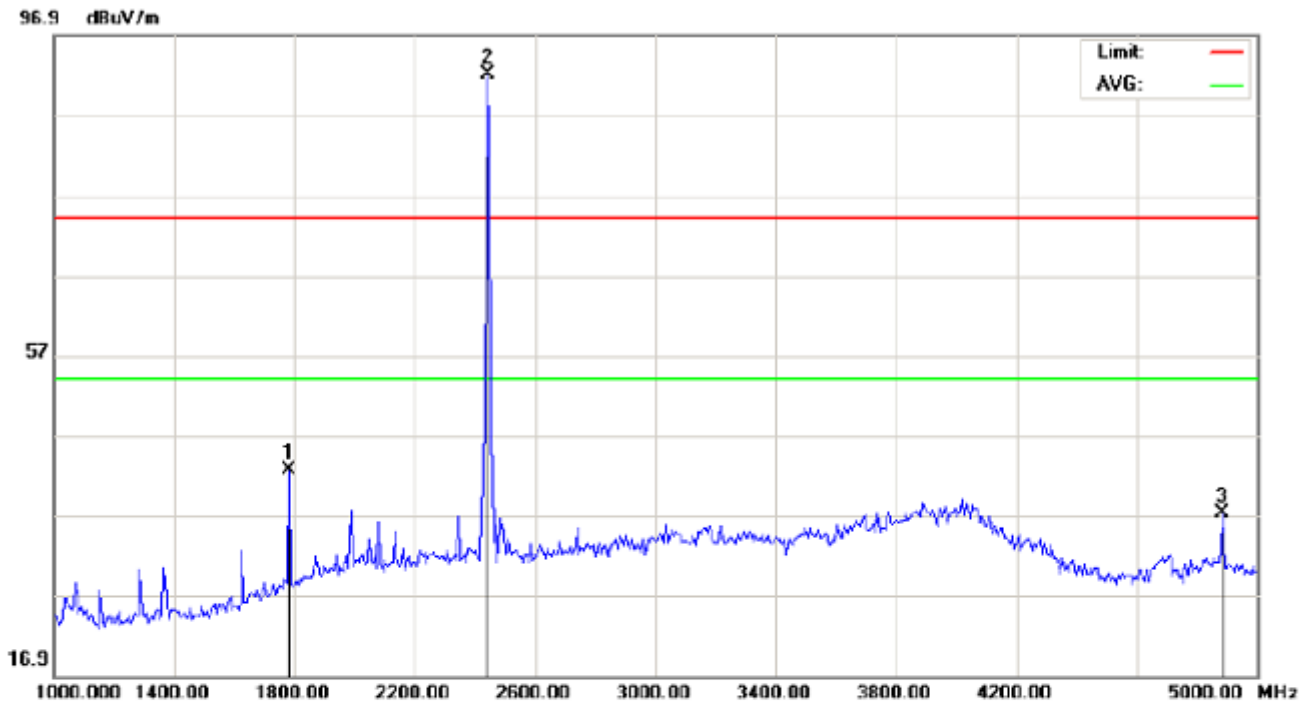
| No. | Mk | Freq.    | Reading | Factor | Measurement | Limit  | Over  | Detector | Antenna Height | Table Degree | Comment |
|-----|----|----------|---------|--------|-------------|--------|-------|----------|----------------|--------------|---------|
|     |    | MHz      | dBuV    | dB/m   | dBuV/m      | dBuV/m | dB    |          | cm             | degree       |         |
| 1   |    | 288.6666 | 21.18   | 17.11  | 38.29       | 46.00  | -7.71 | peak     |                |              |         |
| 2   |    | 384.0500 | 20.18   | 18.55  | 38.73       | 46.00  | -7.27 | peak     |                |              |         |
| 3   | *  | 576.4333 | 18.05   | 24.54  | 42.59       | 46.00  | -3.41 | peak     |                |              |         |
| 4   | !  | 623.3167 | 16.49   | 25.01  | 41.50       | 46.00  | -4.50 | peak     |                |              |         |
| 5   | !  | 671.8167 | 17.63   | 23.82  | 41.45       | 46.00  | -4.55 | peak     |                |              |         |
| 6   | !  | 768.8167 | 14.41   | 27.81  | 42.22       | 46.00  | -3.78 | peak     |                |              |         |

# RADIATED EMISSION ABOVE 1GHZ (1-10<sup>th</sup> Harmonics)



Site: site #1 Polarization: *Horizontal* Temperature: 26  
Limit: FCC Class B 3M Radiation above 1GHZ(PK) Power: Humidity: 60 %  
EUT: 2.4GHz digital wireless receiver with SD card recorder Distance: 3m  
M/N: DV70E  
Mode: channel 12 TX  
Note:

| No. | Mk | Freq.    | Reading | Factor | Measurement | Limit  | Over   | Detector | Antenna Height | Table Degree | Comment |
|-----|----|----------|---------|--------|-------------|--------|--------|----------|----------------|--------------|---------|
|     |    | MHz      | dBuV    | dB/m   | dBuV/m      | dBuV/m | dB     |          | cm             | degree       |         |
| 1   |    | 1966.667 | 31.30   | 9.53   | 40.83       | 74.00  | -33.17 | peak     |                |              |         |
| 2   | *  | 2440.000 | 76.00   | 10.36  | 86.36       | 74.00  | 12.36  | peak     |                |              |         |
| 3   |    | 4886.667 | 35.28   | 7.90   | 43.18       | 74.00  | -30.82 | peak     |                |              |         |



Site: site #1 Polarization: **Vertical** Temperature: 26  
Limit: FCC Class B 3M Radiation above 1GHZ(PK) Power: Humidity: 60 %  
EUT: 2.4GHz digital wireless receiver with SD card recorder Distance: 3m  
M/N: DV70E  
Mode: channel 12 TX  
Note:

| No. | Mk | Freq.    | Reading | Factor | Measurement | Limit  | Over   | Detector | Antenna Height | Table Degree | Comment |
|-----|----|----------|---------|--------|-------------|--------|--------|----------|----------------|--------------|---------|
|     |    | MHz      | dBuV    | dB/m   | dBuV/m      | dBuV/m | dB     |          | cm             | degree       |         |
| 1   |    | 1780.000 | 35.09   | 7.57   | 42.66       | 74.00  | -31.34 | peak     |                |              |         |
| 2   | *  | 2440.000 | 81.55   | 10.36  | 91.91       | 74.00  | 17.91  | peak     |                |              |         |
| 3   |    | 4886.667 | 29.23   | 7.90   | 37.13       | 74.00  | -36.87 | peak     |                |              |         |

**Note:** 5~25GHz at least have 20dB margin. no recording in the test report.  
Factor=Antenna Factor+ Cable loss-Amplifier gain, Margin=Measurement-Limit.

## 9 BAND EDGES EMISSION

### 9.1 MEASUREMENT PROCEDURE

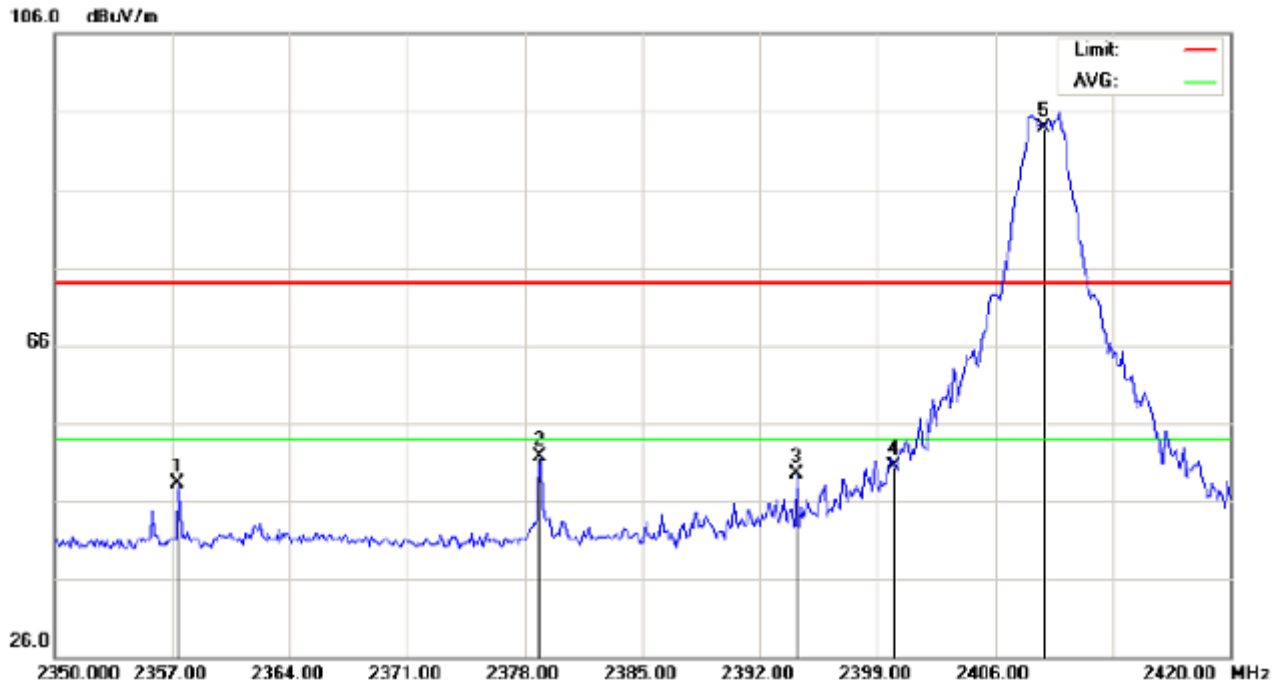
1. Set the EUT Work on the top, the bottom operation frequency individually.
2. Set SPA Start or Stop Frequency = Operation Frequency, RBW $\geq$ 1%span, VBW $\geq$ RBW
3. The band edges was measured and recorded.

### 9.2 TEST SET-UP

The Same as described in section 8.2

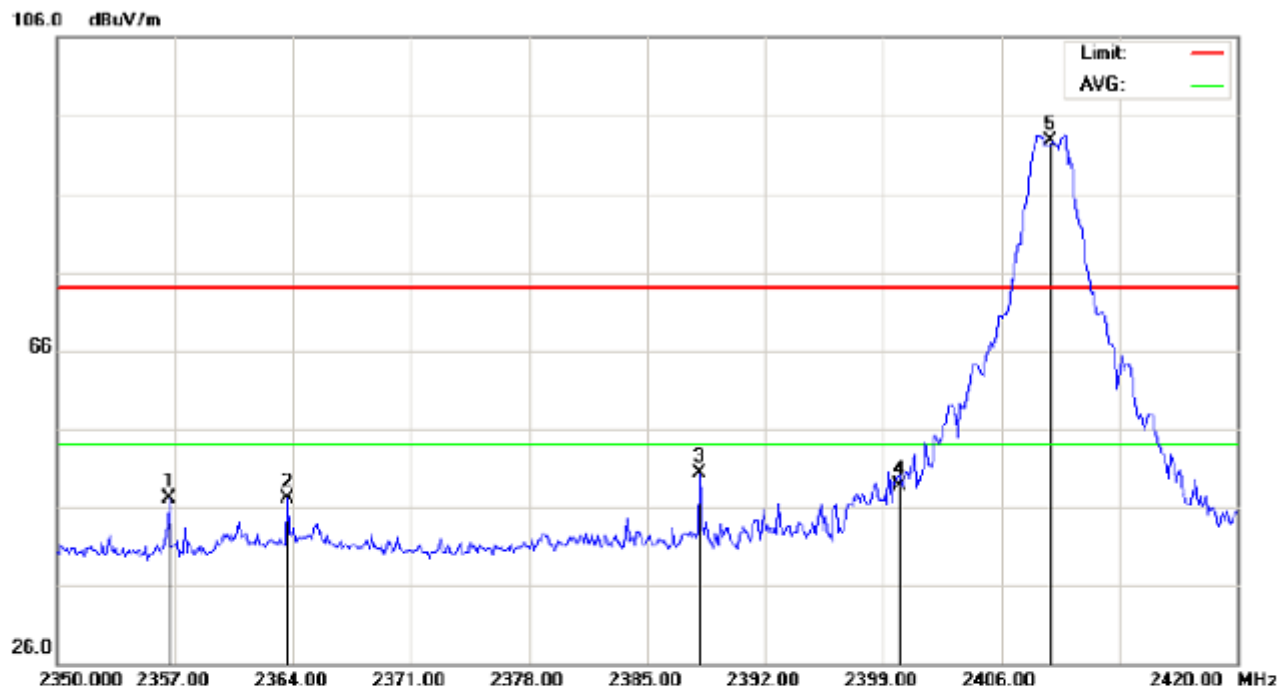
### 9.3 TEST RESULT

TEST PLOT OF BAND EDGE FOR LOW CHANNEL



Site: site #1 Polarization: *Horizontal* Temperature: 26  
Limit: FCC Class B 3M Radiation above 1GHZ(PK) Power: Humidity: 60 %  
EUT: 2.4GHz digital wireless receiver with SD card recorder Distance: 3m  
M/N: DV70E  
Mode: channel 0 TX  
Note:

| No. | Mk | Freq.<br>MHz | Reading<br>dBuV | Factor<br>dB/m | Measurement<br>dBuV/m | Limit<br>dBuV/m | Over<br>dB | Detector | Antenna<br>Height<br>cm | Table<br>Degree<br>degree | Comment |
|-----|----|--------------|-----------------|----------------|-----------------------|-----------------|------------|----------|-------------------------|---------------------------|---------|
| 1   |    | 2357.350     | 37.98           | 10.27          | 48.25                 | 74.00           | -25.75     | peak     |                         |                           |         |
| 2   |    | 2378.933     | 41.33           | 10.30          | 51.63                 | 74.00           | -22.37     | peak     |                         |                           |         |
| 3   |    | 2394.217     | 39.23           | 10.31          | 49.54                 | 74.00           | -24.46     | peak     |                         |                           |         |
| 4   |    | 2400.000     | 40.21           | 10.32          | 50.53                 | 74.00           | -23.47     | peak     |                         |                           |         |
| 5   | *  | 2408.950     | 83.59           | 10.33          | 93.92                 | 74.00           | 19.92      | peak     |                         |                           |         |



Site: site #1 Polarization: **Vertical** Temperature: 26  
Limit: FCC Class B 3M Radiation above 1GHZ(PK) Power: Humidity: 60 %  
EUT: 2.4GHz digital wireless receiver with SD card recorder Distance: 3m  
M/N: DV70E  
Mode: channel 0 TX  
Note:

| No. | Mk | Freq.    | Reading | Factor | Measurement | Limit  | Over   | Detector | Antenna Height | Table Degree | Comment |
|-----|----|----------|---------|--------|-------------|--------|--------|----------|----------------|--------------|---------|
|     |    | MHz      | dBuV    | dB/m   | dBuV/m      | dBuV/m | dB     |          | cm             | degree       |         |
| 1   |    | 2356.650 | 36.78   | 10.27  | 47.05       | 74.00  | -26.95 | peak     |                |              |         |
| 2   |    | 2363.650 | 36.78   | 10.28  | 47.06       | 74.00  | -26.94 | peak     |                |              |         |
| 3   |    | 2388.150 | 39.90   | 10.31  | 50.21       | 74.00  | -23.79 | peak     |                |              |         |
| 4   |    | 2400.000 | 38.45   | 10.32  | 48.77       | 74.00  | -25.23 | peak     |                |              |         |
| 5   | *  | 2408.950 | 82.37   | 10.33  | 92.70       | 74.00  | 18.70  | peak     |                |              |         |

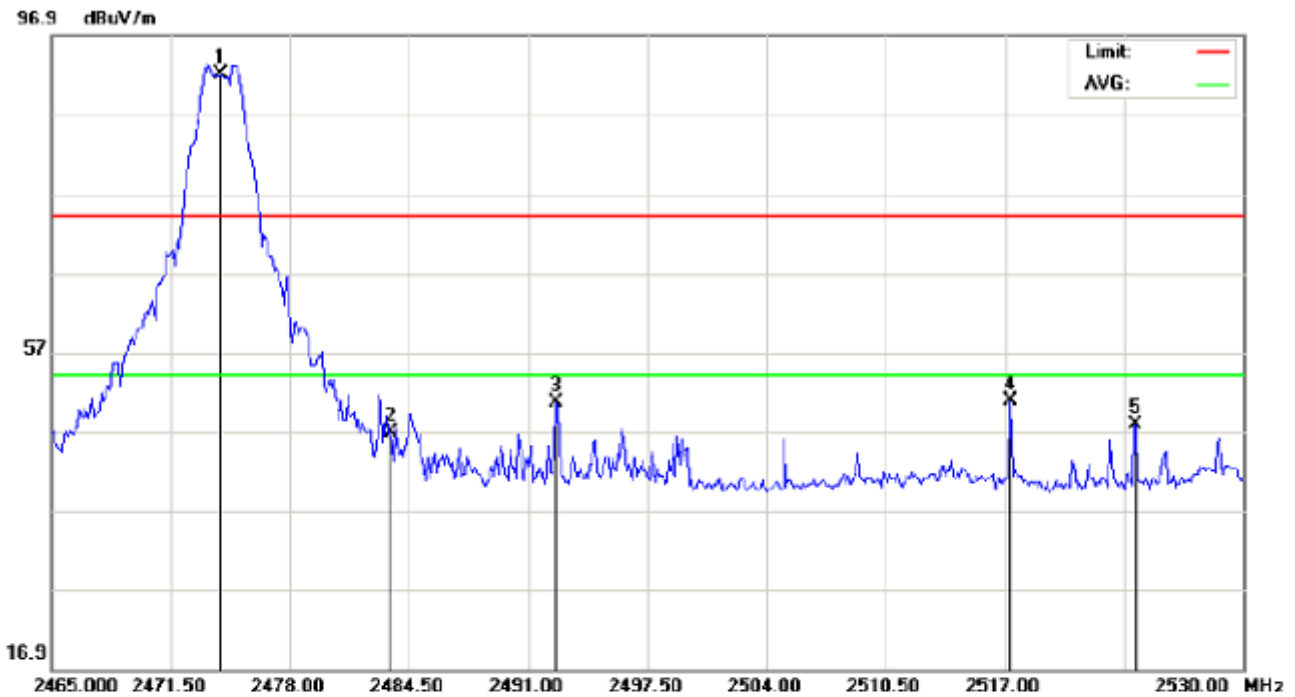


# TEST PLOT OF BAND EDGE FOR HIGH CHANNEL



Site: site #1 Polarization: *Horizontal* Temperature: 26  
Limit: FCC Class B 3M Radiation above 1GHZ(PK) Power: Humidity: 60 %  
EUT: 2.4GHz digital wireless receiver with SD card recorder Distance: 3m  
M/N: DV70E  
Mode: channel 23 TX  
Note:

| No. | Mk | Freq.    | Reading | Factor | Measurement | Limit  | Over   | Detector | Antenna Height | Table Degree | Comment |
|-----|----|----------|---------|--------|-------------|--------|--------|----------|----------------|--------------|---------|
|     |    | MHz      | dBuV    | dB/m   | dBuV/m      | dBuV/m | dB     |          | cm             | degree       |         |
| 1   | *  | 2474.225 | 82.28   | 10.40  | 92.68       | 74.00  | 18.68  | peak     |                |              |         |
| 2   |    | 2483.500 | 37.05   | 10.41  | 47.46       | 74.00  | -26.54 | peak     |                |              |         |
| 3   |    | 2484.500 | 40.29   | 10.41  | 50.70       | 74.00  | -23.30 | peak     |                |              |         |
| 4   |    | 2519.600 | 32.55   | 10.48  | 43.03       | 74.00  | -30.97 | peak     |                |              |         |



Site: site #1 Polarization: *Vertical* Temperature: 26  
Limit: FCC Class B 3M Radiation above 1GHZ(PK) Power: Humidity: 60 %  
EUT: 2.4GHz digital wireless receiver with SD card recorder Distance: 3m  
M/N: DV70E  
Mode: channel 23 TX  
Note:

| No. | Mk | Freq.    | Reading | Factor | Measurement | Limit  | Over   | Detector | Antenna Height | Table Degree | Comment |
|-----|----|----------|---------|--------|-------------|--------|--------|----------|----------------|--------------|---------|
|     |    | MHz      | dBuV    | dB/m   | dBuV/m      | dBuV/m | dB     |          | cm             | degree       |         |
| 1   | *  | 2474.225 | 81.66   | 10.40  | 92.06       | 74.00  | 18.06  | peak     |                |              |         |
| 2   |    | 2483.500 | 36.44   | 10.41  | 46.85       | 74.00  | -27.15 | peak     |                |              |         |
| 3   |    | 2492.517 | 40.26   | 10.42  | 50.68       | 74.00  | -23.32 | peak     |                |              |         |
| 4   |    | 2517.325 | 40.36   | 10.47  | 50.83       | 74.00  | -23.17 | peak     |                |              |         |
| 5   |    | 2524.150 | 37.41   | 10.49  | 47.90       | 74.00  | -26.10 | peak     |                |              |         |

## 10. NUMBER OF HOPPING FREQUENCY

### 10.1 MEASUREMENT PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer Start = 2.4GHz Stop = 2.4835GHz.
4. Set the Spectrum Analyzer as RBW $\geq$ 1%span, VBW $\geq$ RBW.

### 10.2 TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 5.2  
Conducted Method.

### 10.3 MEASUREMENT EQUIPMENT USED

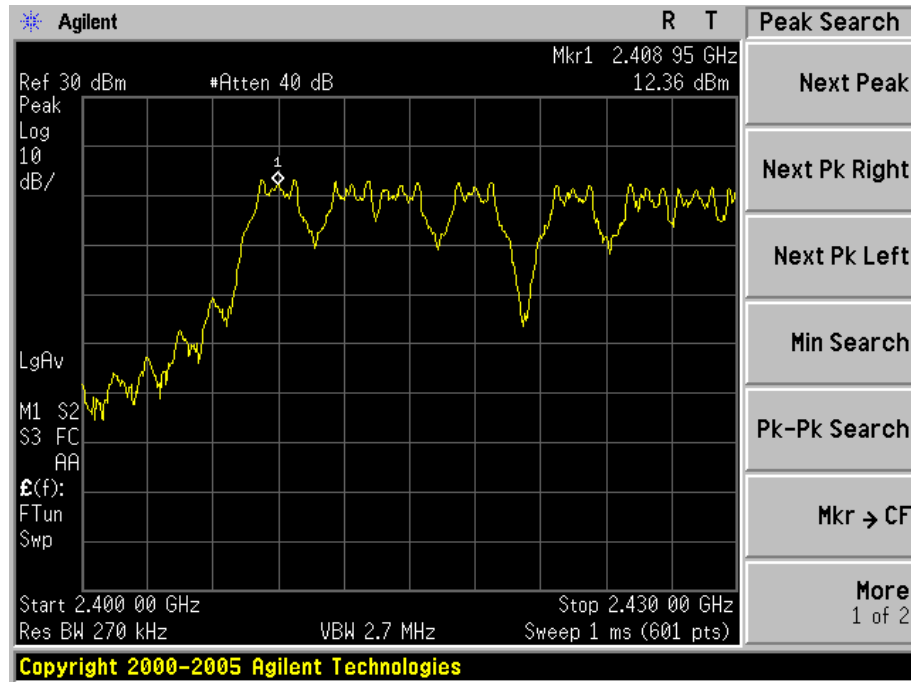
The Same as described in section 5.3

### 10.4 AND MEASUREMENT RESULT

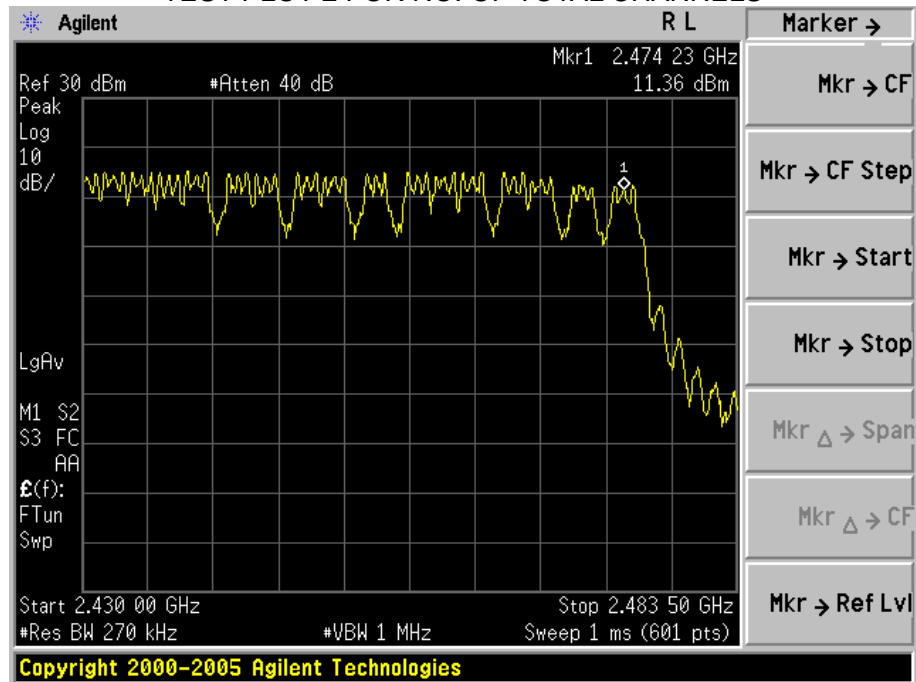
| TOTAL NO. OF<br>HOPPING CHANNEL | LIMIT (NO. OF CH) | MEASUREMENT (NO.<br>OF CH) | RESULT |
|---------------------------------|-------------------|----------------------------|--------|
|                                 | $\geq 15$         | 24                         | PASS   |

| Channel | Frequency (GHz) | Channel | Frequency (GHz) |
|---------|-----------------|---------|-----------------|
| 00      | 2.40895         | 14      | 2.44834         |
| 01      | 2.41234         | 15      | 2.45060         |
| 02      | 2.41459         | 16      | 2.45397         |
| 03      | 2.41797         | 17      | 2.45735         |
| 04      | 2.42247         | 18      | 2.45960         |
| 05      | 2.42584         | 19      | 2.46185         |
| 06      | 2.42809         | 20      | 2.46522         |
| 07      | 2.43034         | 21      | 2.46747         |
| 08      | 2.43259         | 22      | 2.47085         |
| 09      | 2.43484         | 23      | 2.47423         |
| 10      | 2.43709         |         |                 |
| 11      | 2.43934         |         |                 |
| 12      | 2.44272         |         |                 |
| 13      | 2.44497         |         |                 |

TEST PLOT-1 FOR NO. OF TOTAL CHANNELS



TEST PLOT-2 FOR NO. OF TOTAL CHANNELS



## 11. TIME OF OCCUPANCY (DWELL TIME)

### 11.1 MEASUREMENT PROCEDURE

1. Place the EUT on the table and set it in transmitting mode
2. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum analyzer
3. Set Span = zero span, centered on a hopping channel
4. Set the spectrum analyzer as RBW=1MHz, VBW>=RBW, Span = 0 Hz,.

### 11.2 TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 5.2  
Conducted Method

### 11.3 MEASUREMENT EQUIPMENT USED

The same as described in section 5.3

### 11.4 LIMITS AND MEASUREMENT RESULT

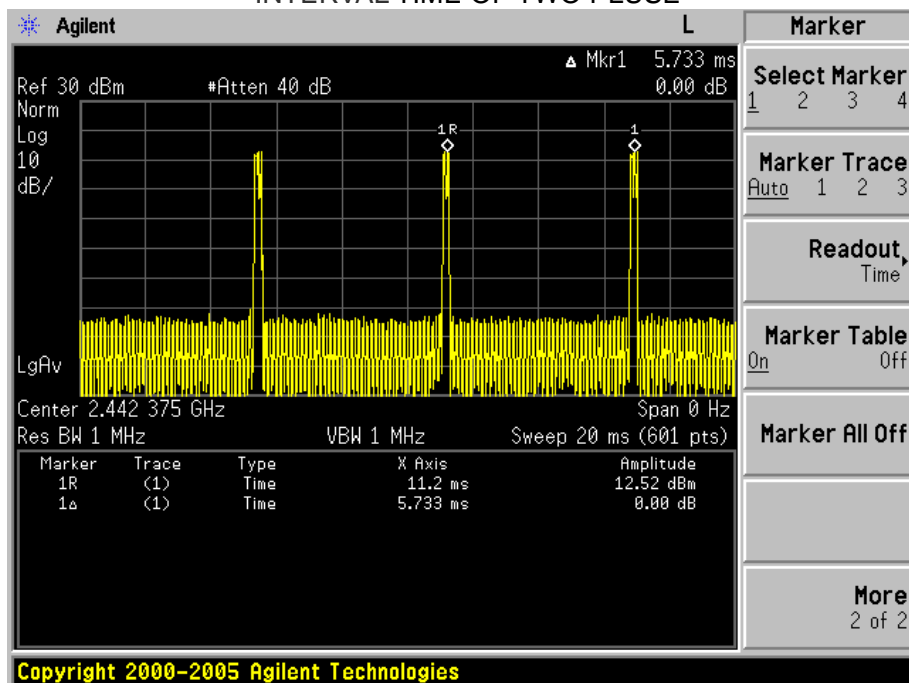
| Test Result           |                                     |                    |               |
|-----------------------|-------------------------------------|--------------------|---------------|
| Time of Pulse<br>(ms) | Interval Time Of Two Pluses<br>(ms) | Dwell Time<br>(ms) | Limit<br>(ms) |
| 0.2184                | 5.733                               | 365.71             | 400           |

Interval Time of Two Pluse= 5.733ms

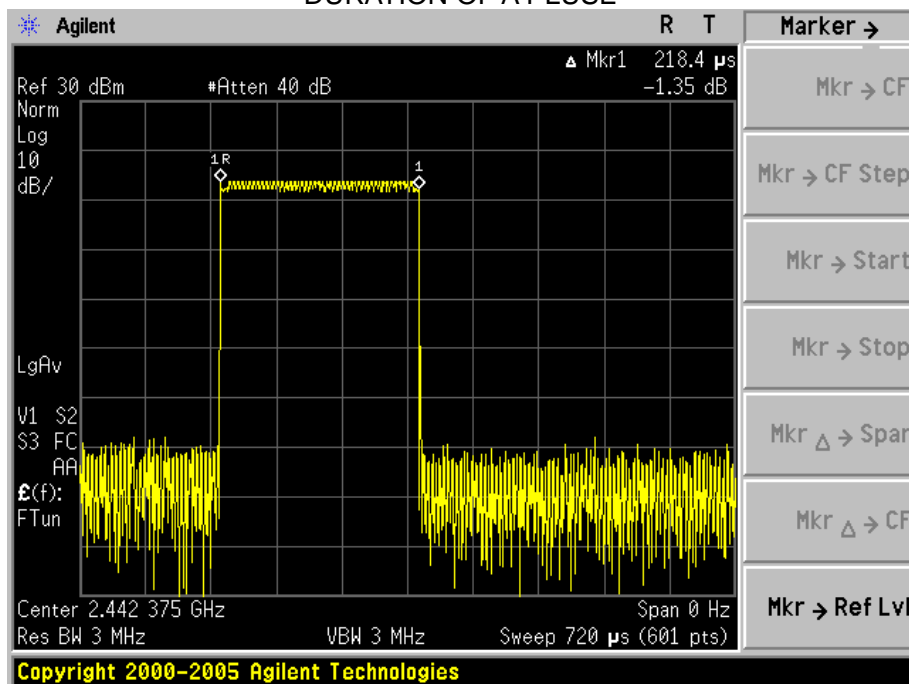
Duration of A Pluse = 0.2184ms

Dwell time =  $24 \times 0.4 \times 1000 \text{ (ms)} \times 0.2184 \text{ ms} / 5.733 \text{ ms} = 365.71 \text{ ms}$

### INTERVAL TIME OF TWO PULSE



### DURATION OF A PULSE



## 12. FREQUENCY SEPARATION

### 12.1 MEASUREMENT PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum analyzer.
3. Set Span = wide enough to capture the peaks of two adjacent channels Resolution (or IF) Bandwidth (RBW)  $\geq 1\%$  of the span Video (or Average) Bandwidth (VBW)  $\geq$  RBW; Sweep = auto; Detector function = peak; Trace = max hold.

### 12.2 TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 5.2

### 12.3 MEASUREMENT EQUIPMENT USED

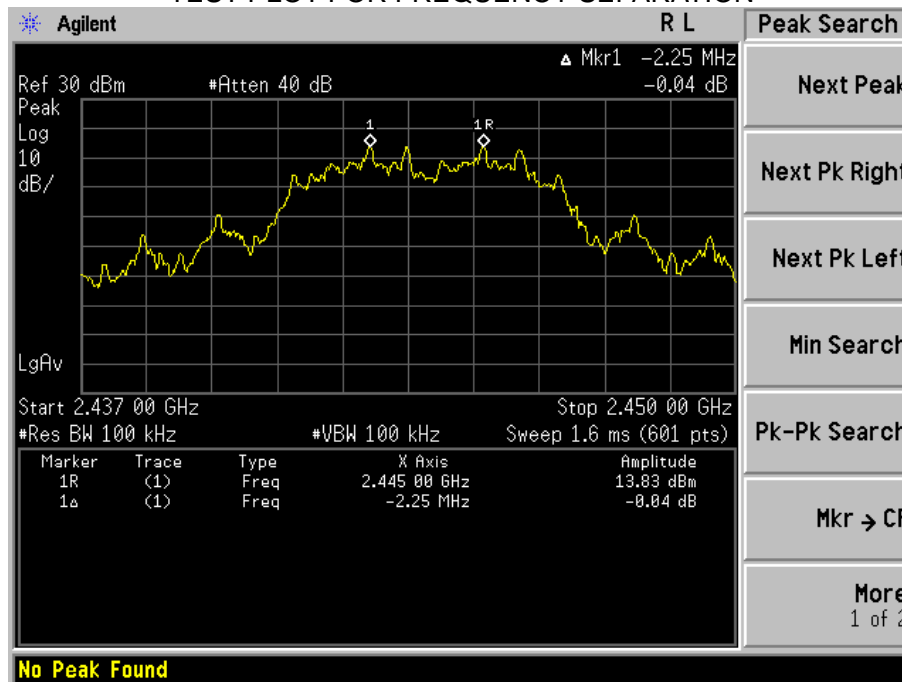
The same as described in section 5.3

### 12.4 LIMITS AND MEASUREMENT RESULT

TEST RESULT (WORST CASE)

| CHANNEL   | CHANNEL SEPARATION | LIMIT                         | RESULT |
|-----------|--------------------|-------------------------------|--------|
|           | MHz                | KHz                           |        |
| CH13-CH14 | 2.25               | $\geq 25$ KHz or 2/3 20 dB BW | Pass   |

TEST PLOT FOR FREQUENCY SEPARATION



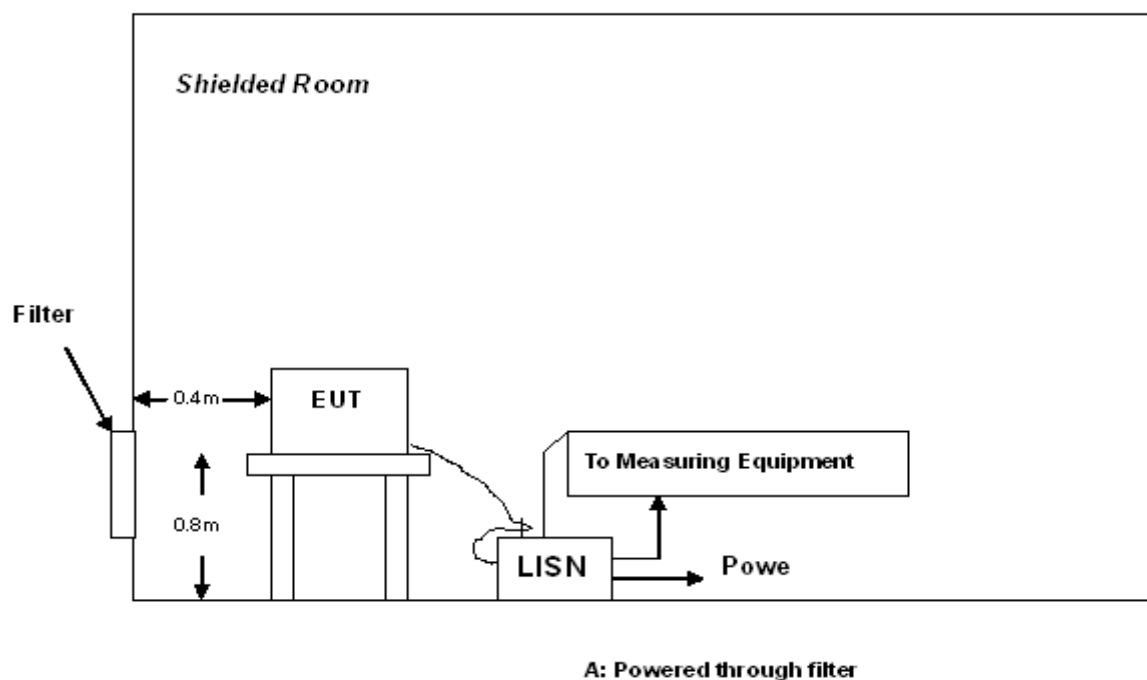
### 13 FCC LINE CONDUCTED EMISSION TEST

#### 13.1 LIMITS OF LINE CONDUCTED EMISSION TEST

| Frequency     | Maximum RF Line Voltage |                |
|---------------|-------------------------|----------------|
|               | Q.P.( dBuV)             | Average( dBuV) |
| 150kHz~500kHz | 66-56                   | 56-46          |
| 500kHz~5MHz   | 56                      | 46             |
| 5MHz~30MHz    | 60                      | 50             |

\*\*Note: 1. The lower limit shall apply at the transition frequency.  
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz

#### 13.2 BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST





### **13.3 PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST**

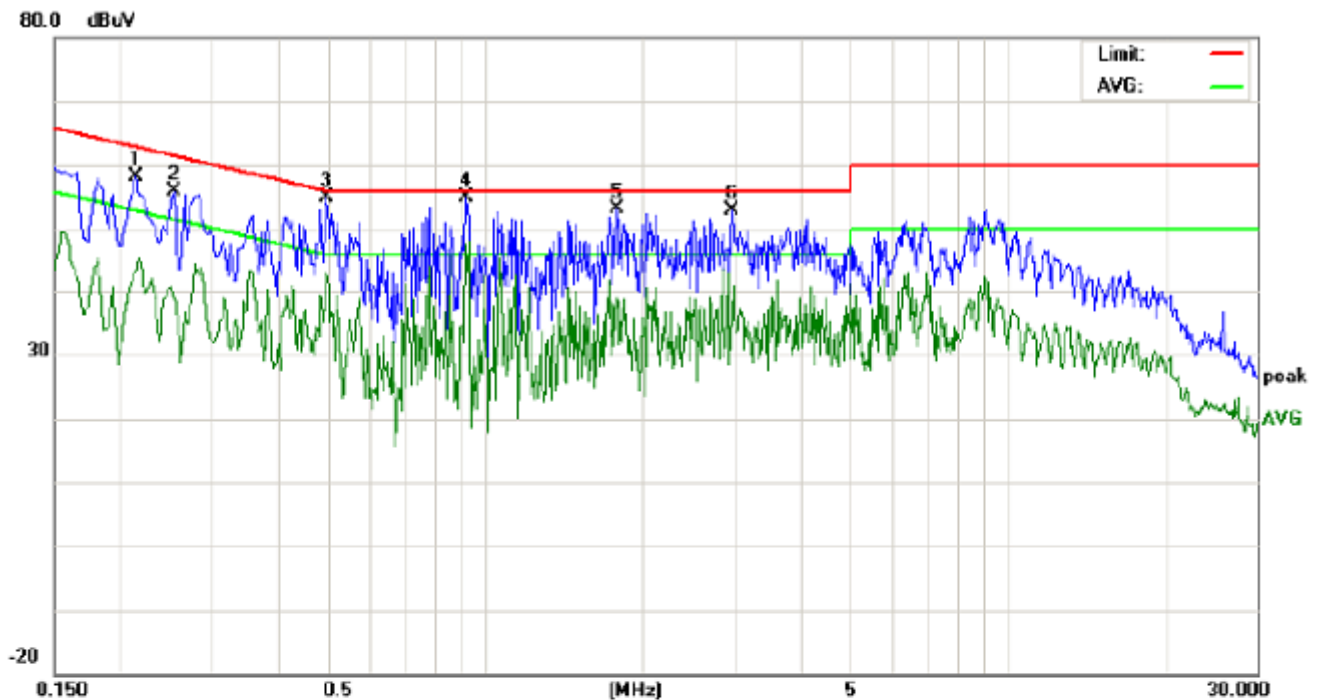
- 1) The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.4 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- 2) Support equipment, if needed, was placed as per ANSI C63.4.
- 3) All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.
- 4) All support equipments received AC120V/60Hz power from a LISN, if any.
- 5) The EUT supplied by adapter which received power from a LISN..
- 6) The test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7) Analyzer / Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.
- 8) During the above scans, the emissions were maximized by cable manipulation.
- 9) The test mode(s) were scanned during the preliminary test.  
Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

### **13.4 FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST**

- 1) EUT and support equipment was set up on the test bench as per step 2 of the preliminary test.
- 2) A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less -2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.
- 3) The test data of the worst case condition(s) was reported on the Summary Data page.

### 13.5 TEST RESULT OF LINE CONDUCTED EMISSION TEST

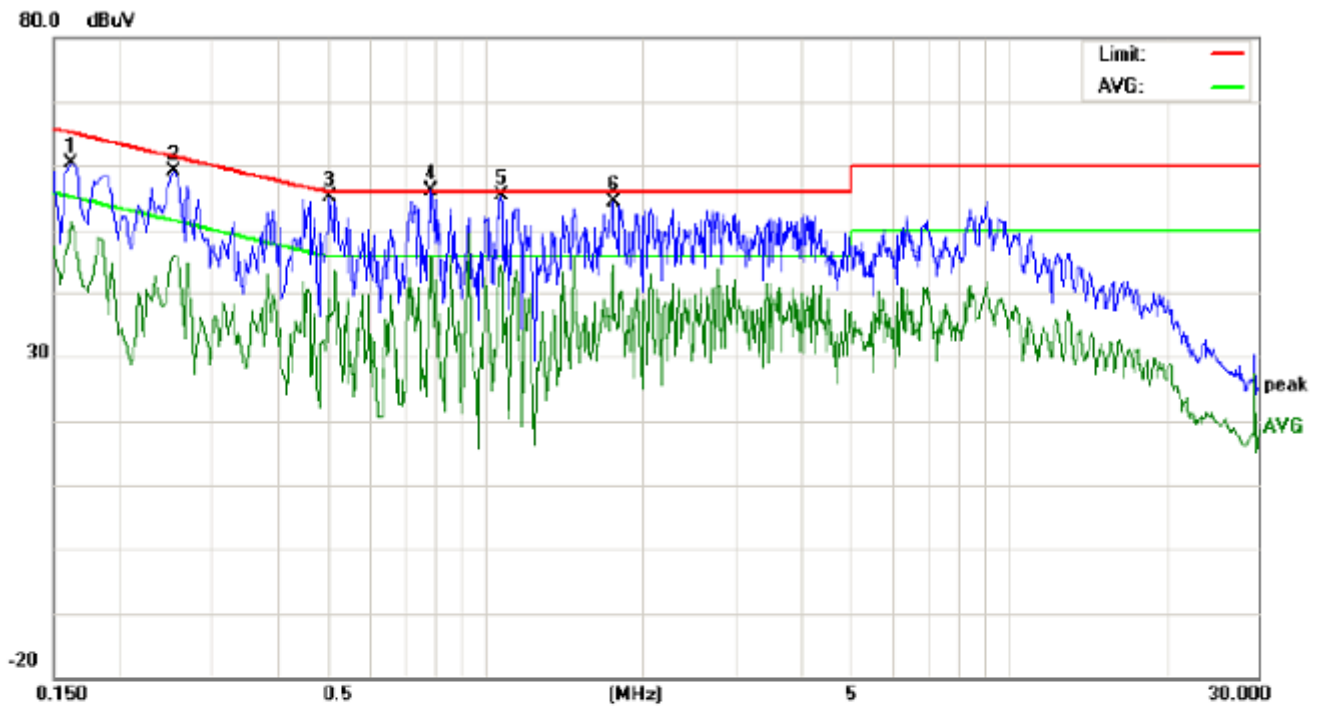
Line Conducted Emission Test Line 1-L



Site: Conduction Phase: **L1** Temperature: 26  
Limit: FCC Class B Conduction(QP) Power: AC 120V/60Hz Humidity: 60 %  
EUT: 2.4GHz digital wireless receiver with SD card recorder  
M/N: DV70E  
Mode: Normal Hopping  
Note:

| No. | Freq.<br>(MHz) | Reading_Level<br>(dBuV) |       |       | Correct<br>Factor<br>dB | Measurement<br>(dBuV) |       |       | Limit<br>(dBuV) |       | Margin<br>(dB) |        | P/F | Comment |
|-----|----------------|-------------------------|-------|-------|-------------------------|-----------------------|-------|-------|-----------------|-------|----------------|--------|-----|---------|
|     |                | Peak                    | QP    | AVG   |                         | Peak                  | QP    | AVG   | QP              | AVG   | QP             | AVG    |     |         |
| 1   | 0.2140         | 47.94                   |       | 32.96 | 10.23                   | 58.17                 |       | 43.19 | 63.04           | 53.04 | -4.87          | -9.85  | P   |         |
| 2   | 0.2540         | 45.55                   |       | 28.62 | 10.27                   | 55.82                 |       | 38.89 | 61.62           | 51.62 | -5.80          | -12.73 | P   |         |
| 3   | 0.4980         | 44.60                   | 38.43 | 24.28 | 10.40                   | 55.00                 | 48.83 | 34.68 | 56.03           | 46.03 | -7.20          | -11.35 | P   |         |
| 4   | 0.9220         | 44.55                   | 39.81 | 28.35 | 10.40                   | 54.95                 | 50.21 | 38.75 | 56.00           | 46.00 | -5.79          | -7.25  | P   |         |
| 5   | 1.7860         | 42.79                   | 36.57 | 24.49 | 10.29                   | 53.08                 | 46.86 | 34.78 | 56.00           | 46.00 | -9.14          | -11.22 | P   |         |
| 6   | 2.9660         | 42.25                   |       | 25.59 | 10.54                   | 52.79                 |       | 36.13 | 56.00           | 46.00 | -3.21          | -9.87  | P   |         |

Line Conducted Emission Test Line 2-N



Site: Conduction Phase: **N** Temperature: 26  
Limit: FCC Class B Conduction(QP) Power: AC 120V/60Hz Humidity: 60 %  
EUT: 2.4GHz digital wireless receiver with SD card recorder  
M/N: DV70E  
Mode: Normal Hopping  
Note:

| No. | Freq.<br>(MHz) | Reading_Level<br>(dBuV) |       |       | Correct<br>Factor<br>dB | Measurement<br>(dBuV) |       |       | Limit<br>(dBuV) |       | Margin<br>(dB) |        | P/F | Comment |
|-----|----------------|-------------------------|-------|-------|-------------------------|-----------------------|-------|-------|-----------------|-------|----------------|--------|-----|---------|
|     |                | Peak                    | QP    | AVG   |                         | Peak                  | QP    | AVG   | QP              | AVG   | QP             | AVG    |     |         |
| 1   | 0.1620         | 50.33                   |       | 40.91 | 10.17                   | 60.50                 |       | 51.08 | 65.36           | 55.36 | -4.86          | -4.28  | P   |         |
| 2   | 0.2540         | 48.90                   | 45.20 | 30.83 | 10.27                   | 59.17                 | 55.47 | 41.10 | 61.62           | 51.62 | -6.15          | -10.52 | P   |         |
| 3   | 0.5060         | 44.73                   | 39.32 | 25.30 | 10.39                   | 55.12                 | 49.71 | 35.69 | 56.00           | 46.00 | -6.29          | -10.31 | P   |         |
| 4   | 0.7900         | 45.93                   | 42.19 | 29.76 | 10.29                   | 56.22                 | 52.48 | 40.05 | 56.00           | 46.00 | -3.52          | -5.95  | P   |         |
| 5   | 1.0740         | 45.13                   | 41.70 | 29.97 | 10.37                   | 55.50                 | 52.07 | 40.34 | 56.00           | 46.00 | -3.93          | -5.66  | P   |         |
| 6   | 1.7620         | 44.04                   | 38.17 | 23.34 | 10.30                   | 54.34                 | 48.47 | 33.64 | 56.00           | 46.00 | -7.53          | -12.36 | P   |         |

**APPENDIX I**  
**PHOTOGRAPHS OF THE EUT**  
TOP VIEW OF SAMPLE



**BOTTOM VIEW OF SAMPLE**



LEFT VIEW OF SAMPLE



RIGHT VIEW OF SAMPLE





FRONT VIEW OF SAMPLE



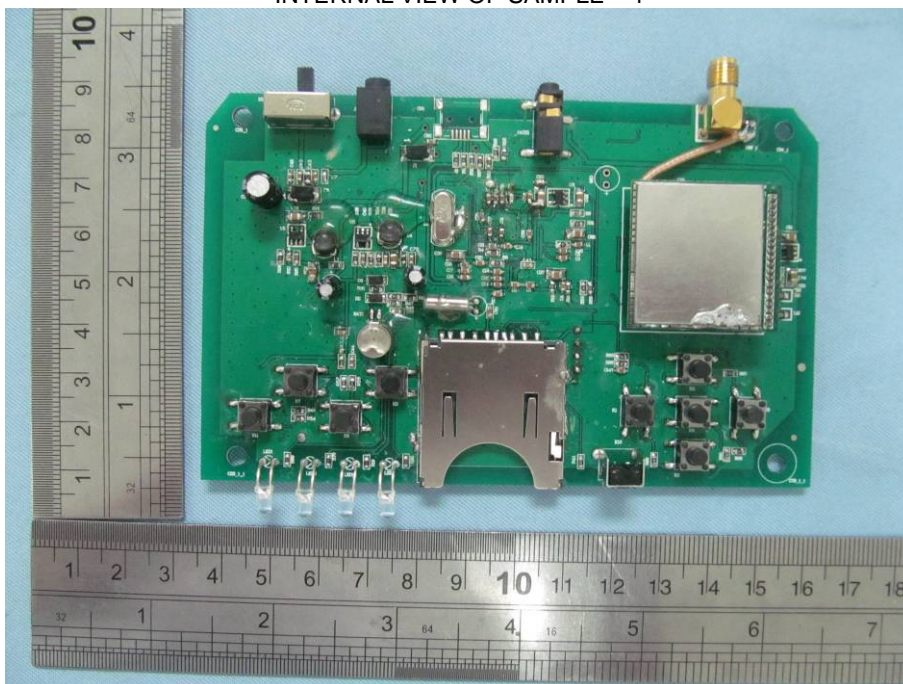
BACK VIEW OF SAMPLE



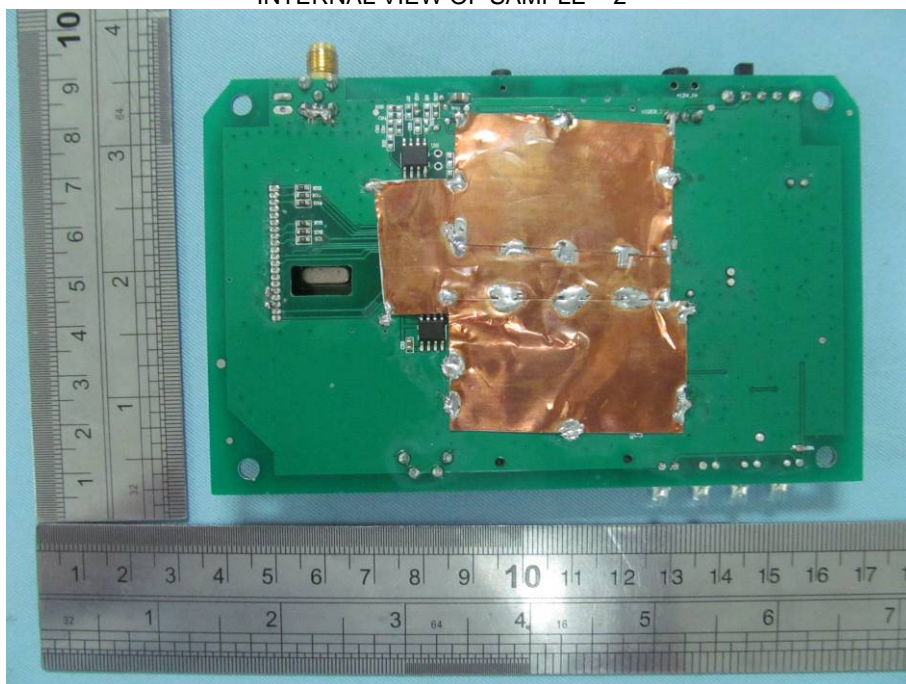
ALL VIEW OF SAMPLE



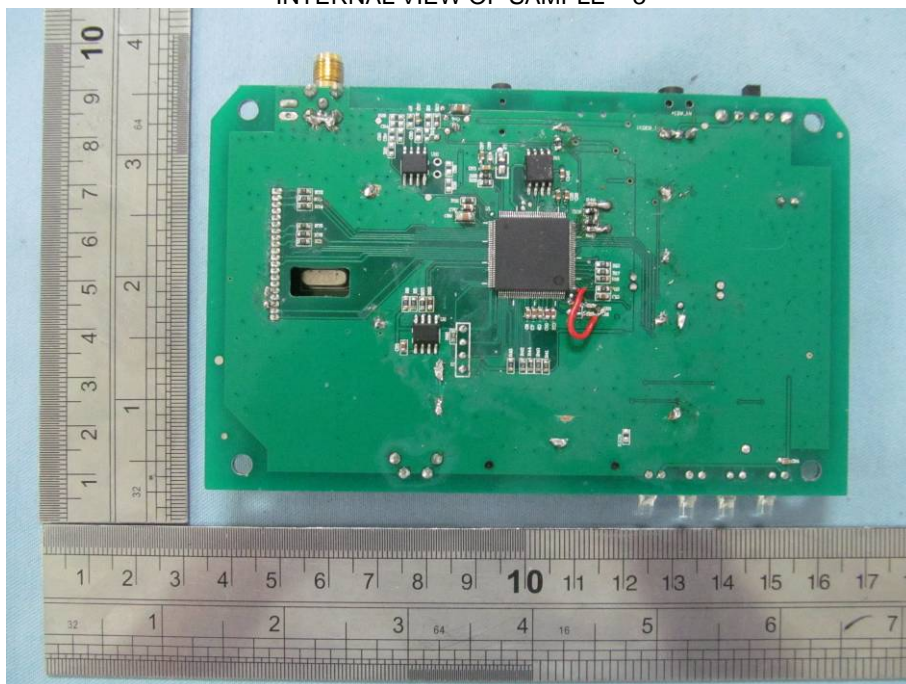
INTERNAL VIEW OF SAMPLE – 1



INTERNAL VIEW OF SAMPLE – 2

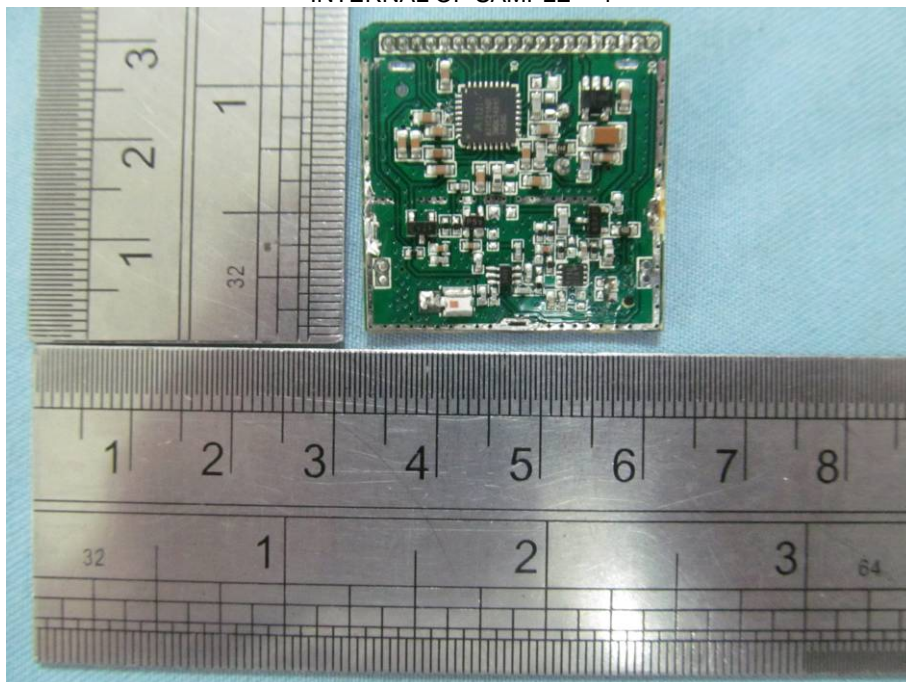


INTERNAL VIEW OF SAMPLE – 3

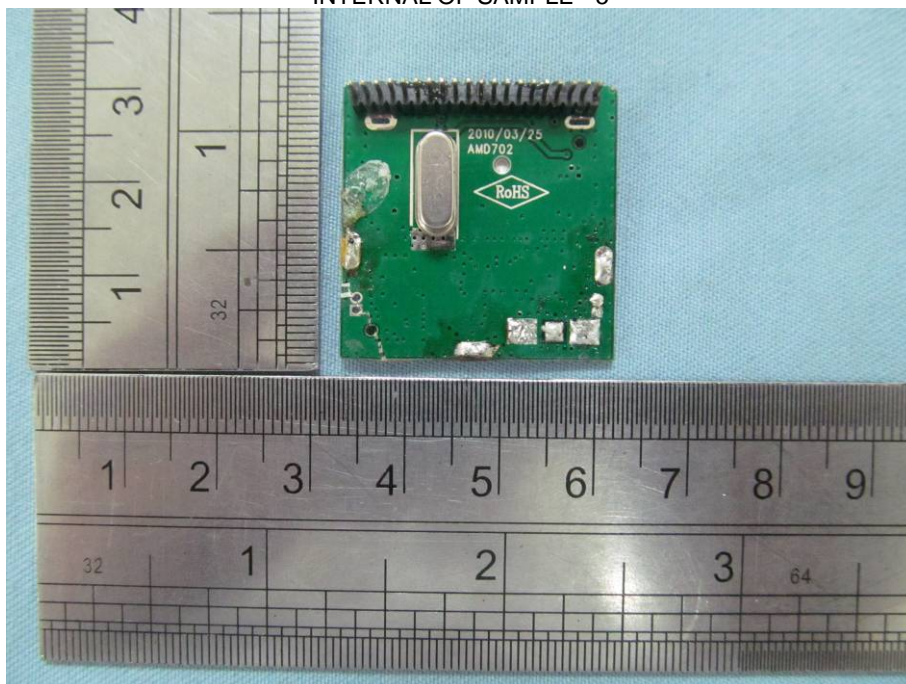




INTERNAL OF SAMPLE – 4



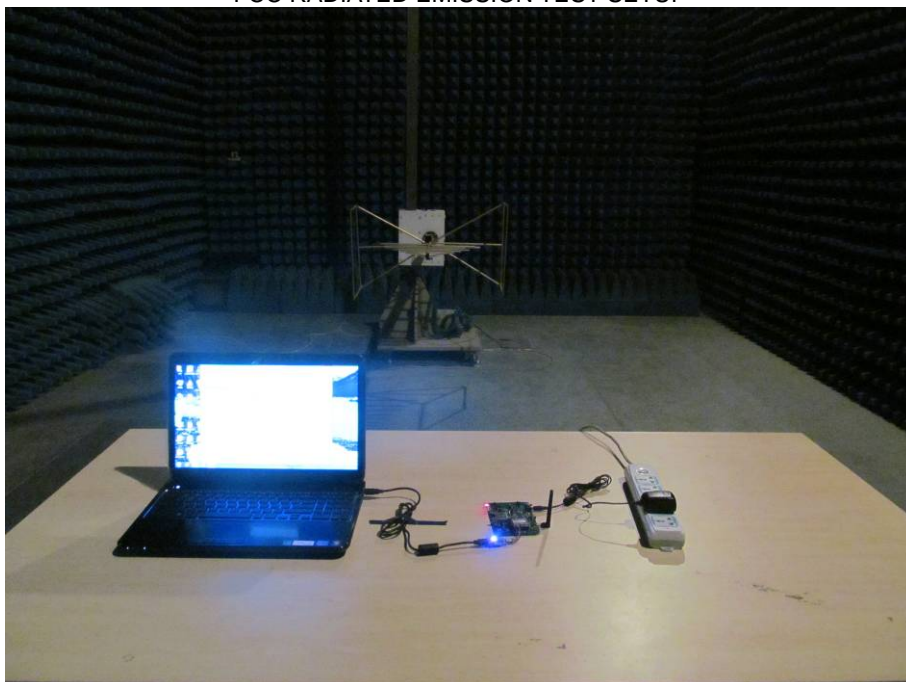
INTERNAL OF SAMPLE - 5

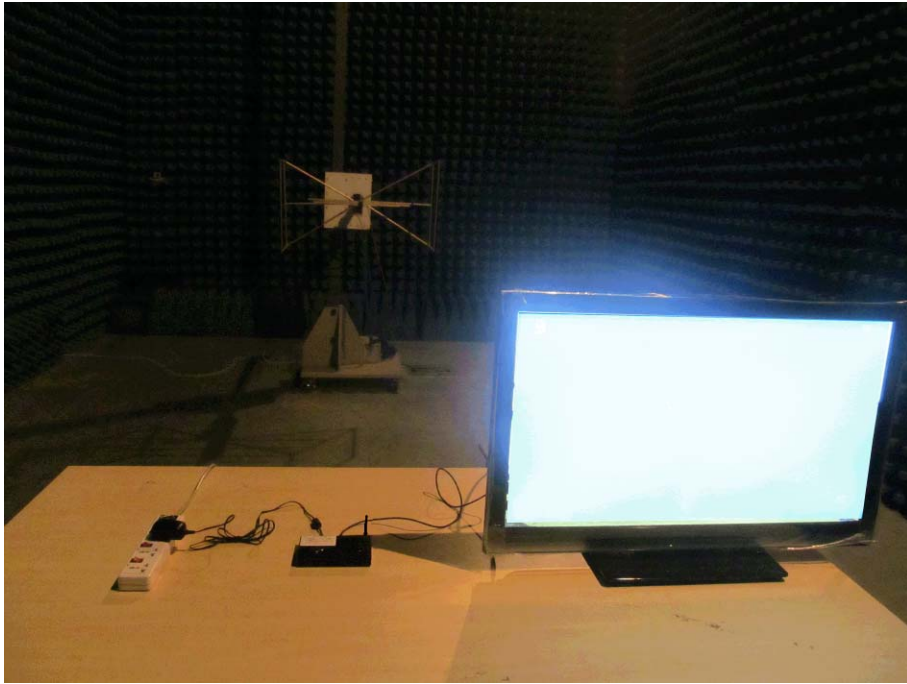


**APPENDIX II**  
**PHOTOGRAPHS OF THE TEST SETUP**  
FCC LINE CONDUCTED EMISSION TEST SETUP



FCC RADIATED EMISSION TEST SETUP





----END OF REPORT----