



# FCC TEST REPORT

for

## 47 CFR Part 15 Subpart C

**Equipment** : EDGE900/GSM1800/PCS1900 GSM/GPRS mobile phone  
**Trade Name** : NOKIA  
**Model No.** : RM-139  
**FCC ID** : QTLRM-139  
**Filing Type** : Certification  
**Applicant** : Nokia (China) Investment Co., Ltd.  
Pacific Century Place 2A, Gong Ti Bei Ku, Chaoyang District, Beijing, China  
**Reference Number** : NL-6000

- The test result refers exclusively to the test presented test model / sample.
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- The data shown in this test report were carried out on Sep. 30, 2005 at **Sporton International Inc. LAB.**

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Rev. 01



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## History of this test report

Report No.: FR511807-02

Report Issue Date: Oct. 11, 2005

| Original Report Issue Date | Description |
|----------------------------|-------------|
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## 1. General Description of Equipment under Test

### 1.1. Applicant

**Nokia (China) Investment Co., Ltd.**

Pacific Century Place 2A, Gong Ti Bei Ku, Chaoyang District, Beijing, China

### 1.2. Manufacturer

**Beijing economic & technology development area**

No. 5 Donghuan Zhonglu, Beijing, 100176, P.R. China

### 1.3. Basic Description of Equipment under Test

Equipment : EDGE900/GSM1800/PCS1900 GSM/GPRS mobile phone  
Trade Name : NOKIA  
Model No. : RM-139  
FCC ID : QTLRM-139  
Power Supply Type : Switching  
AC Power Cord : AC 120V, Non-Shielded, Wall-mount, 1.8 meter, 2 pin

### 1.4. Feature of Equipment under Test

| Product Feature & Specification                       |                        |  |               |
|-------------------------------------------------------|------------------------|--|---------------|
| 1. Modulation Type/Data Rate                          | GFSK                   |  |               |
| 2. Frequency Range.                                   | 2400 MHz ~ 2483.5 MHz  |  |               |
| Number of Channels                                    | 79                     |  |               |
| 3. Carrier Frequency of each channel                  | 2402+ n*1 MHz, n= 0~78 |  |               |
| 4. Channel Spacing                                    | 1 MHz                  |  |               |
| 5. Maximum Output Power to Antenna (Normal condition) | 1.72 dBm               |  |               |
| 6. Type of Antenna Connector                          | N/A                    |  |               |
| 7. Antenna Type                                       | PIFA Antenna           |  |               |
| 8. Antenna Gain                                       | 0 dBi                  |  |               |
| 9. HW Version                                         | 101A1-1                |  |               |
| 10. SW Version                                        | 50902_CN_r1(preV3)     |  |               |
| 11. Function Type                                     | Transmitter            |  | Transceiver V |



## 2. Test Configuration of Equipment under Test

### 2.1. Test Manner

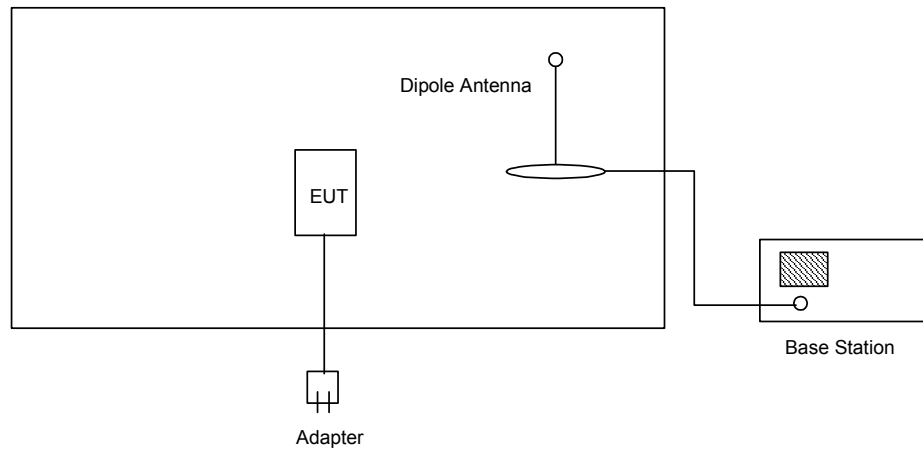
- a. The EUT has been associated with peripherals pursuant to ANSI C63.4-2003 and configuration operated in a manner tended to maximize its emission characteristics in a typical application.
- b. For spurious emission below 1GHz, only one channel of each application was tested because it is not related to channel selection.
- c. The EUT is programmed to transmit signal continuously for all testings.
- d. Frequency range investigated: conduction 150 kHz to 30 MHz, radiation 30 MHz to 25000MHz.

### 2.2. Test Mode

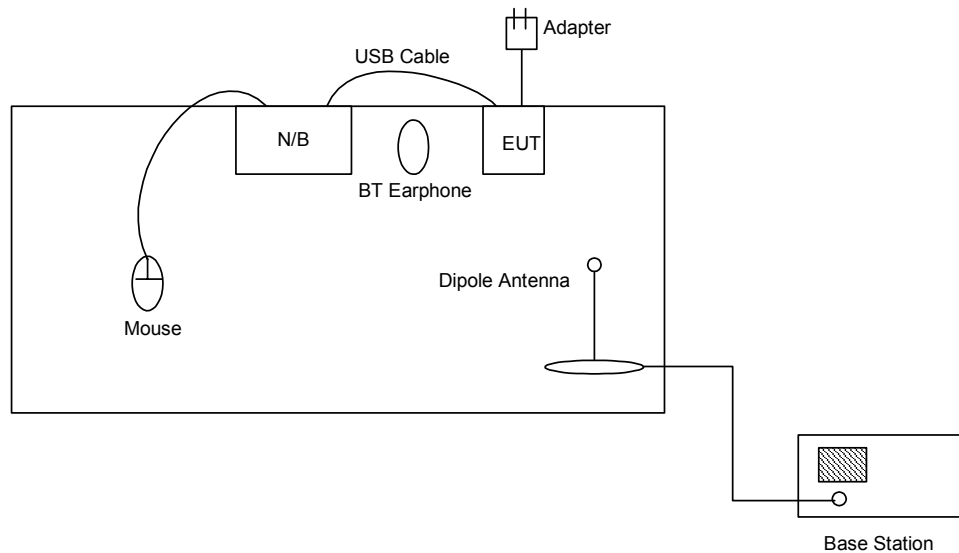
| Application        | Bluetooth                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------|
| Radiated Emission  | Mode 1: Tx_CH00_2402 MHz<br>Mode 2: Tx_CH39_2441 MHz<br>Mode 3: Tx_CH78_2480 MHz                                         |
| Conducted Emission | Mode 1: PCS 1900 Idle Mode + MP3 Player + BT Link + USB Link<br>Mdde 2: PCS 1900 Idle Mode + Camera + BT Link + USB Link |

## 2.3. Connection Diagram of Test System

### <Radiation Emission>



### <Conducted Emission>



## 2.4. Ancillary Equipment List

N/A



### **3. RF Utility**

The EUT is in BT Link mode With BT device for conducted emission or in BT continuous Tx Mode controlled by base station simulator for radiation emission.



## **4. General Information of Test**

Test Site Location : No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park,  
Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.  
TEL : 886-3-327-3456  
FAX : 886-3-318-0055  
Test Site No : CO01-HY, 03CH06-HY

### **4.1. Test Voltage**

AC 120V

### **4.2. Standard for Methods of Measurement**

ANSI C63.4-2003

### **4.3. Test in Compliance with**

47 CFR Part 15 Subpart C

### **4.4. Frequency Range Investigated**

Conduction: from 150 kHz to 30 MHz

Radiation: from 30 MHz to 25000MHz

### **4.5. Test Distance**

The test distance of radiated emission from antenna to EUT is 3 m.



## 5. Report of Measurements and Examinations

### 5.1. List of Measurements and Examinations

| FCC Rule          | Description of Test                                    | Result | Section |
|-------------------|--------------------------------------------------------|--------|---------|
| 15.247(a)(1)      | Hopping Channel Separation                             | Pass   | 5.2     |
| 15.247(a)(1)(iii) | Number of Hopping Frequency Used                       | Pass   | 5.3     |
| 15.247(a)(1)      | Hopping Channel Bandwidth                              | Pass   | 5.4     |
| 15.247(a)(1)(iii) | Dwell Time of Each Frequency within a 30 Second Period | Pass   | 5.5     |
| 15.247(b)(1)      | Output Power                                           | Pass   | 5.6     |
| 15.247(c)         | 100kHz Bandwidth of Frequency Band Edges               | Pass   | 5.7     |
| 15.207            | Conducted Emission                                     | Pass   | 5.8     |
| 15.209            | Radiated Emission                                      | Pass   | 5.9     |
| 15.203            | Antenna Requirement                                    | Pass   | 5.10    |

## 5.2. Hopping Channel Separation

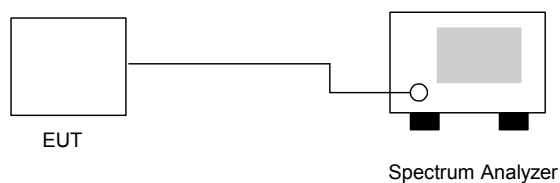
### 5.2.1. Measuring Instruments :

As described in chapter 6 of this test report.

### 5.2.2. Test Procedure :

1. The transmitter output was connected to the spectrum analyzer directly.
2. Set RBW of spectrum analyzer to 30kHz and VBW to 100kHz.
3. The Hopping Channel Separation is defined as the channel is separated with the next channel.

### 5.2.3. Test Setup Layout :



### 5.2.4. Test Result : The spectrum analyzer plots are attached as below

- Temperature: 24°C
- Relative Humidity: 52%
- Test Engineer : Jay

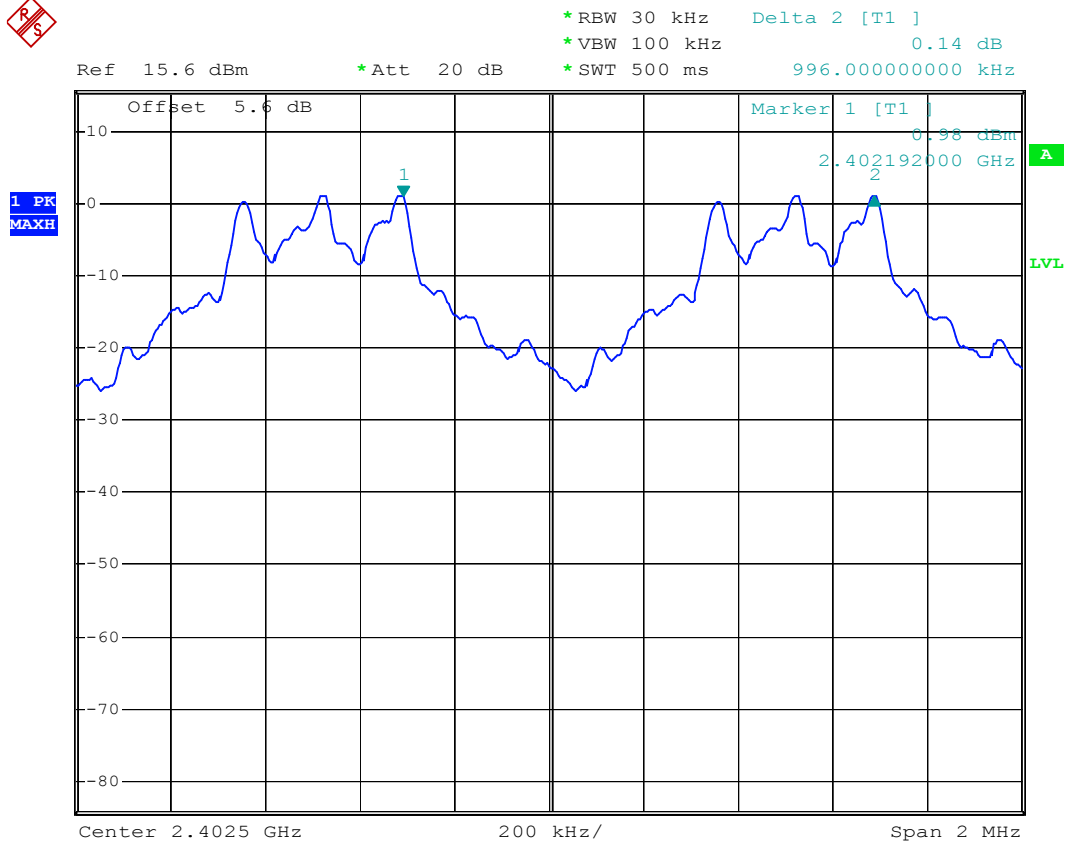
| Channel | Frequency<br>( MHz ) | Hopping Channel<br>Separation<br>( MHz ) | Limits<br>( MHz ) | Plot<br>Ref. No. |
|---------|----------------------|------------------------------------------|-------------------|------------------|
| 00      | 2402                 | 0.996                                    | 0.692             | Mode 1           |
| 39      | 2441                 | 1.0                                      | 0.692             | Mode 2           |
| 78      | 2480                 | 1.0                                      | 0.694             | Mode 3           |

Remark: Limit is the greater one of 25kHz or the 20dB bandwidth of the hopping channel.



## 5.2.5 Hopping Channel Separation

Mode 1: CH00 (2402MHz)

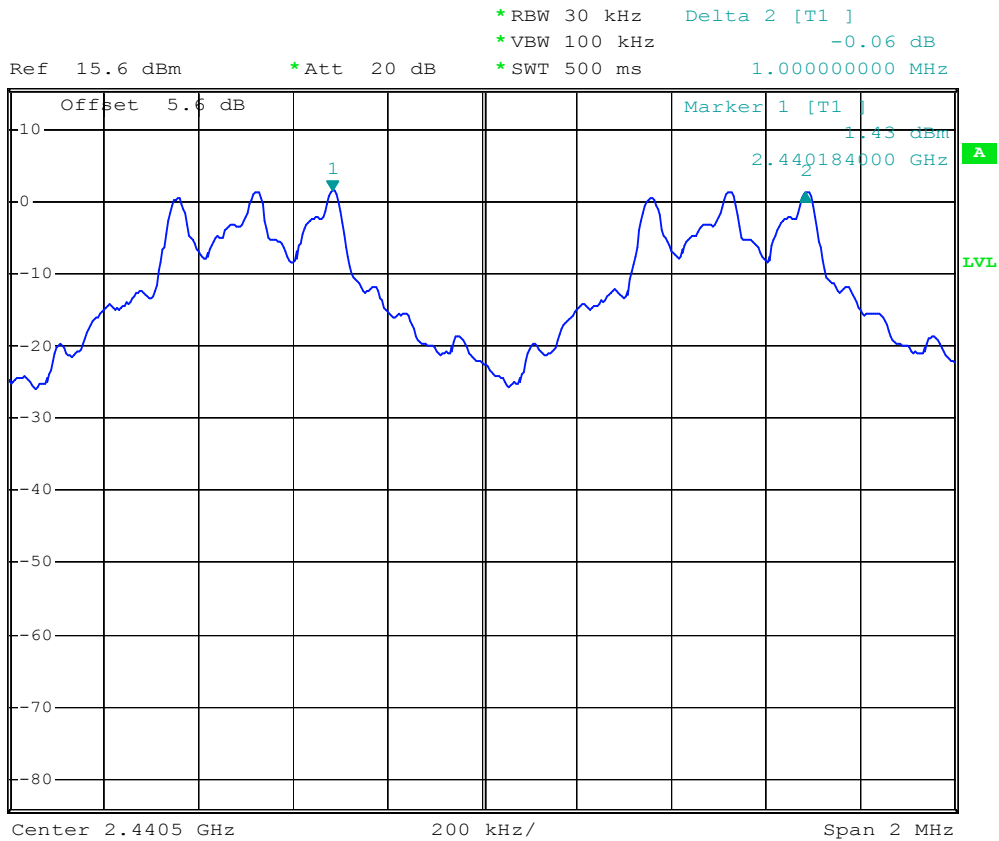




Mode 2: CH39 (2441MHz)

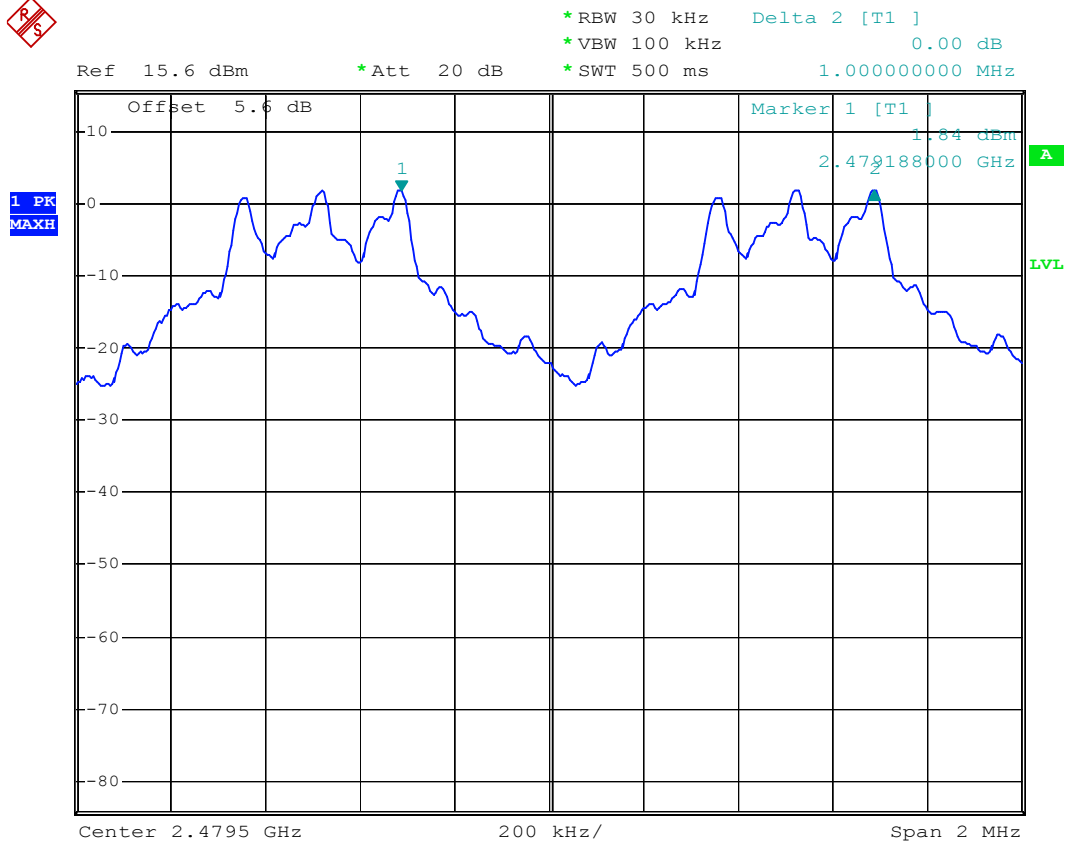


1 PK  
MAXH





Mode 3: CH78 (2480MHz)



### 5.3. Number of Hopping Frequency

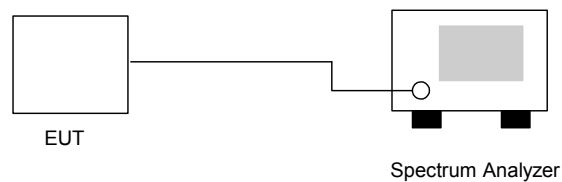
#### 5.3.1. Measuring Instruments :

As described in chapter 6 of this test report.

#### 5.3.2. Test Procedure :

1. The transmitter output was connected to the spectrum analyzer directly.
2. Set RBW of spectrum analyzer to 100kHz and VBW to 100kHz.
3. The number of hopping frequency used is defined as the device has the numbers of total channel.

#### 5.3.3. Test Setup Layout :



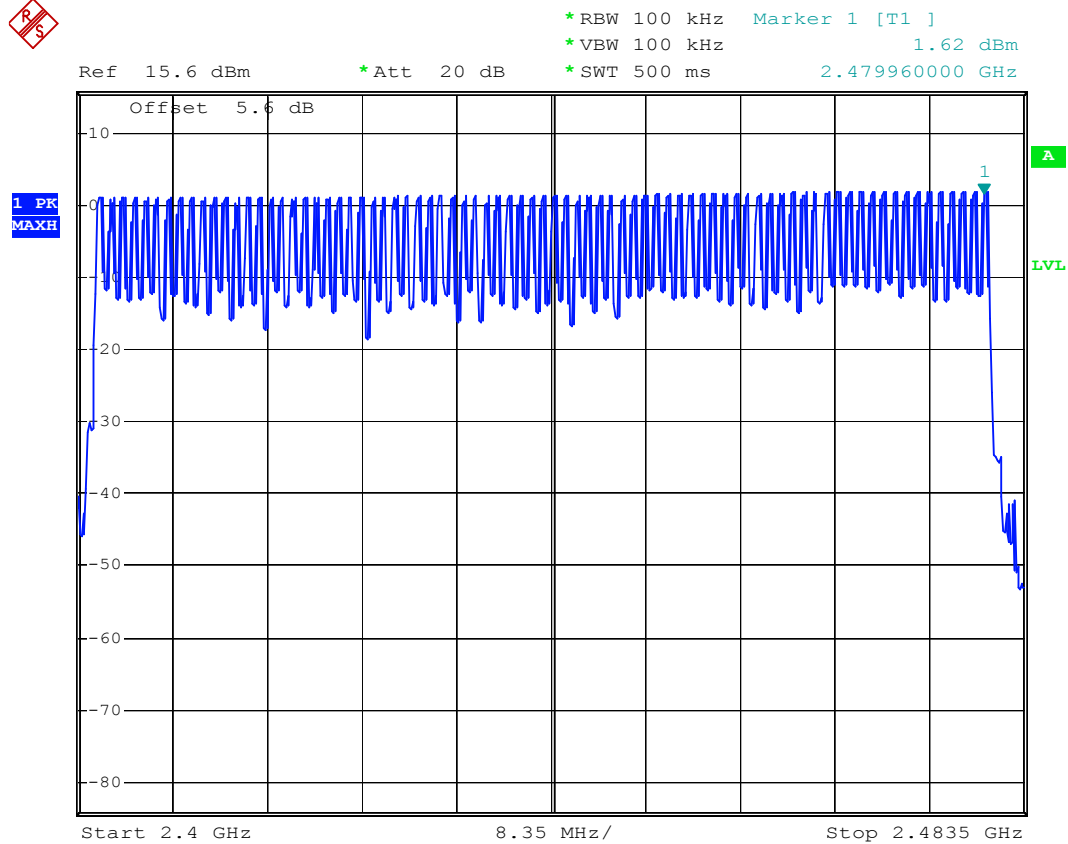
#### 5.3.4. Test Result : See spectrum analyzer plots below

- Temperature: 24°C
- Relative Humidity: 52%
- Test Engineer : Jay

| Number of Hopping Frequency<br>(Channel) | Limits<br>(Channel) |
|------------------------------------------|---------------------|
| 79                                       | 15                  |



5.3.5 Number of Hopping Frequency



## 5.4 Hopping Channel Bandwidth

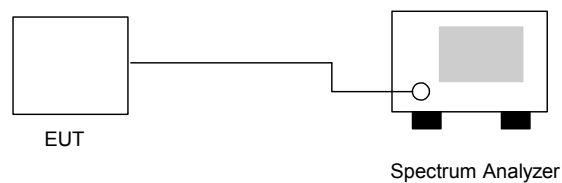
### 5.4.1 Measuring Instruments :

As described in chapter 6 of this test report.

### 5.4.2 Test Procedure :

1. The transmitter output was connected to the spectrum analyzer directly.
2. Set RBW of spectrum analyzer to 30kHz and VBW to 300kHz.
3. The Hopping Channel bandwidth is defined as the frequency range where the power is higher than peak power minus 20dB.

### 5.4.3 Test Setup Layout :



### 5.4.4 Test Result : See spectrum analyzer plots below

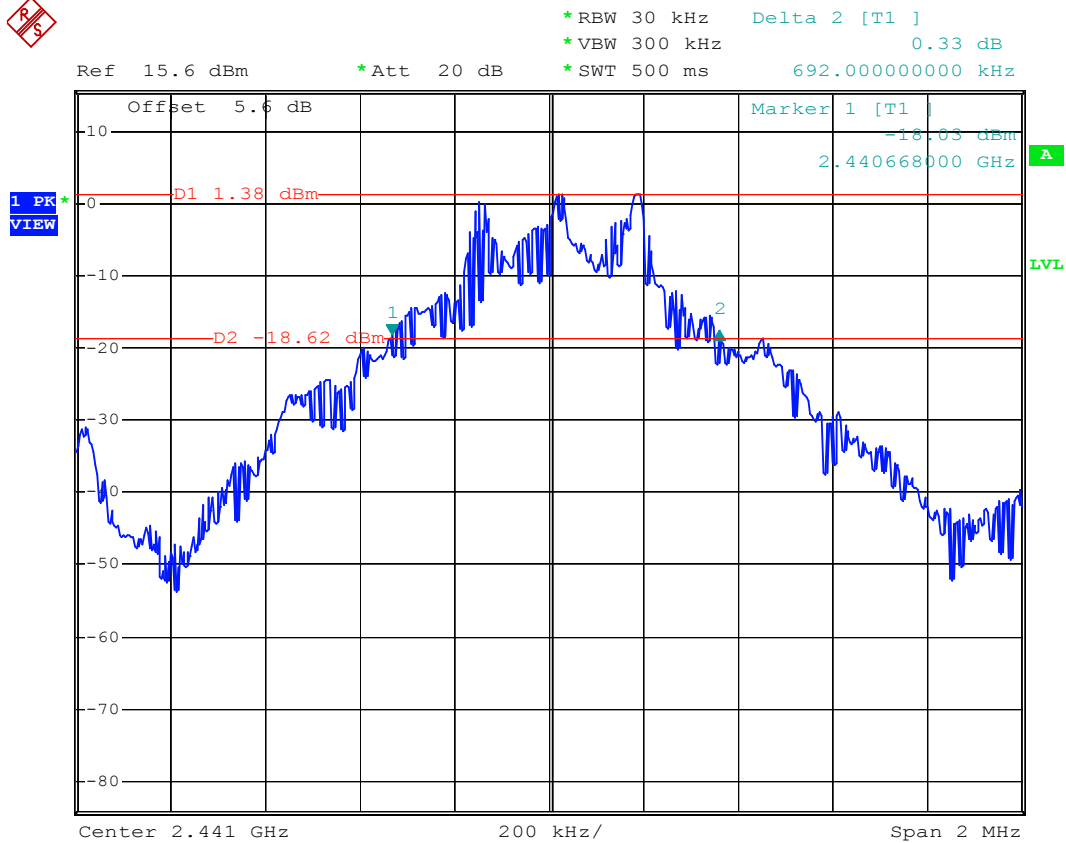
- Temperature: 24°C
- Relative Humidity: 52%
- Test Engineer : Jay

| Channel | Frequency<br>(MHz) | Hopping Channel Bandwidth<br>(MHz) | Limits<br>(MHz) | Plot<br>Ref. No. |
|---------|--------------------|------------------------------------|-----------------|------------------|
| 00      | 2402               | 0.692                              | 1.0             | Mode 1           |
| 39      | 2441               | 0.692                              | 1.0             | Mode 2           |
| 78      | 2480               | 0.694                              | 1.0             | Mode 3           |



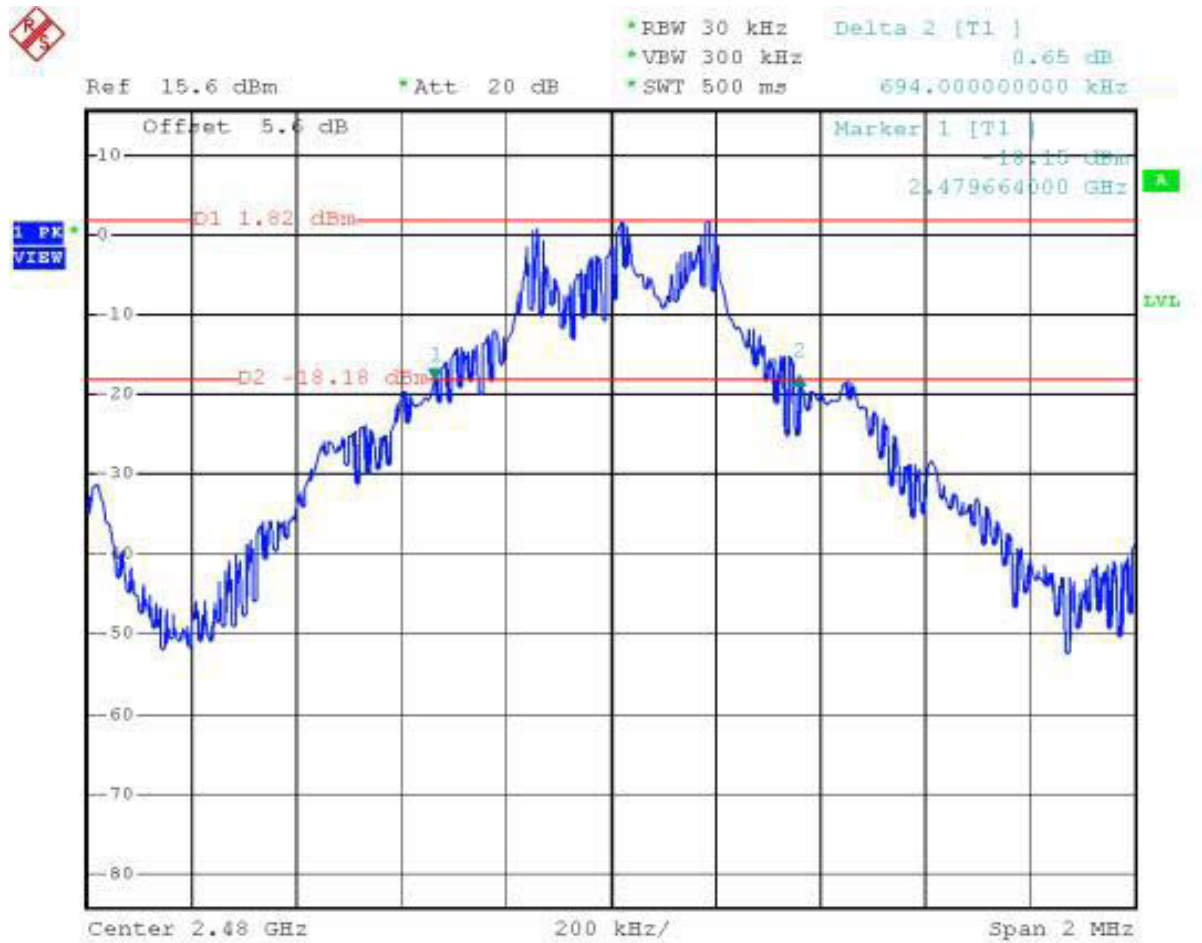


Mode 2: CH39 (2441MHz)





Mode 3: CH78 (2480MHz)



## 5.5 Dwell Time of Each Frequency within a 30 Seconds Period

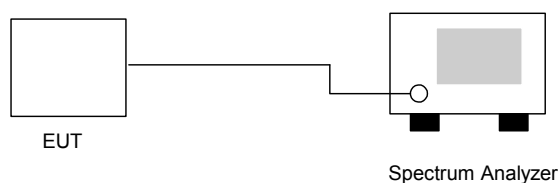
### 5.5.1 Measuring Instruments :

As described in chapter 6 of this test report.

### 5.5.2 Test Procedure :

1. The transmitter output was connected to the spectrum analyzer directly.
2. Set RBW of spectrum analyzer to 1MHz and VBW to 1MHz.
3. Set the center frequency on any frequency would be measured and set the frequency span to zero span.
4. The equation =  $30 \times (1600/79) \times t$  (t = the time duration of one single pulse )

### 5.5.3 Test Setup Layout :



### 5.5.4 Test Result : See spectrum analyzer plots below

- Temperature: 24°C
- Relative Humidity: 52%
- Test Engineer : Jay

Ch39

| Package Mode | Average Hopping Channel | Package Transfer Time<br>(us) | Dwell Time<br>(s) | Limit<br>(s) |
|--------------|-------------------------|-------------------------------|-------------------|--------------|
| DH1          | 9.2                     | 452                           | 0.131             | 0.4          |
| DH3          | 3                       | 1740                          | 0.165             | 0.4          |
| DH5          | 1.9                     | 2960                          | 0.178             | 0.4          |

※ Remark:

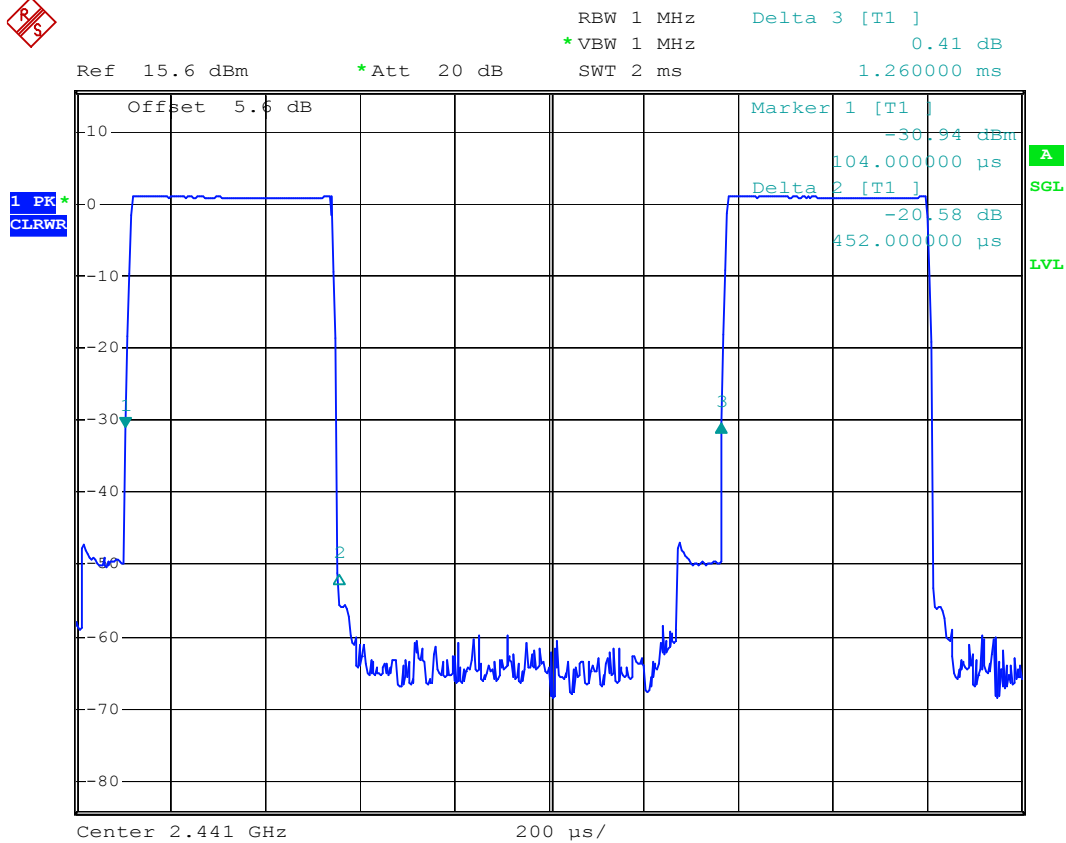
1. Dwell Time = 79(channels) x 0.4(s) x average hopping channel x package transfer time
2. 79channels come from the Hopping Channel number.
3. Average Hopping Channel = hops/sweep time
4. t: Package Transfer Time(us)



5.5.5 Dwell Time

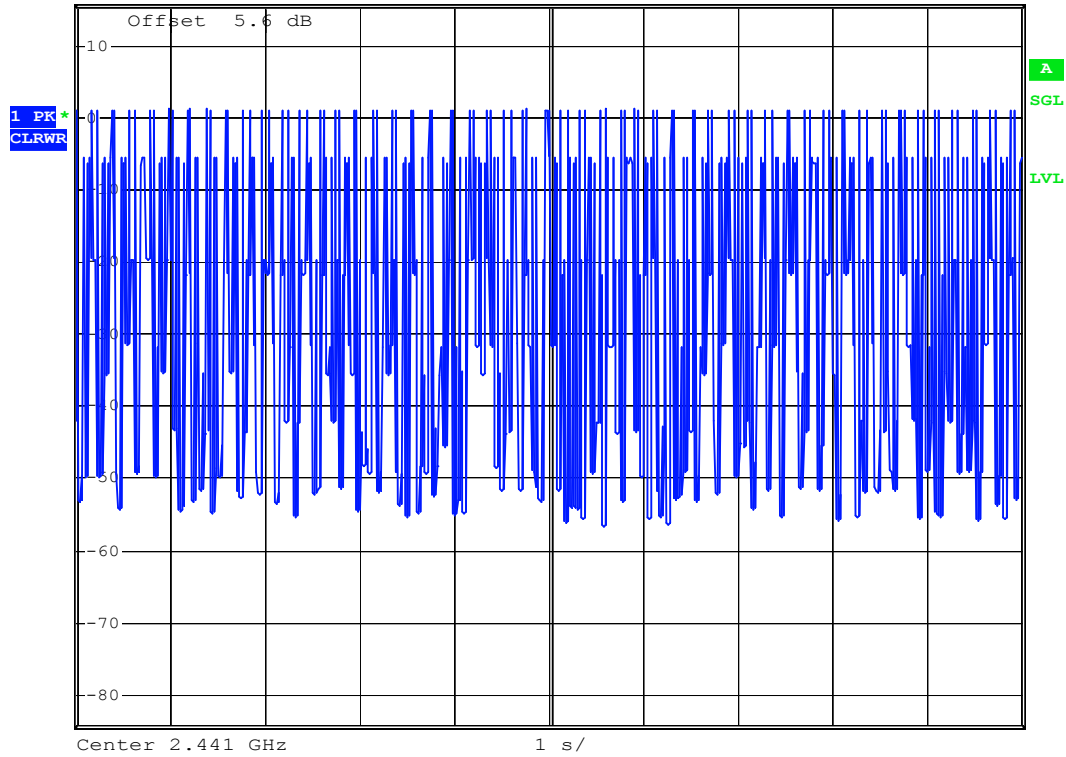
CH39

DH1



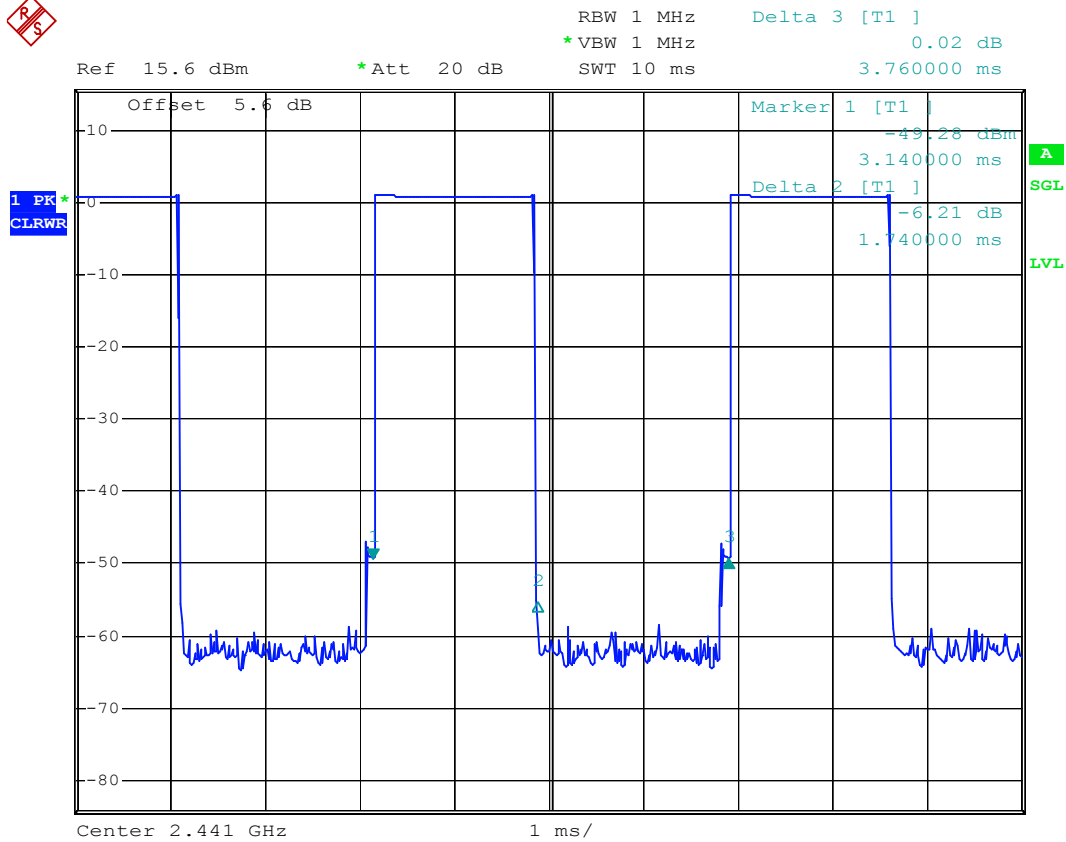


Ref 15.6 dBm RBW 1 MHz  
\*Att 20 dB \*VBW 1 MHz  
SWT 10 s



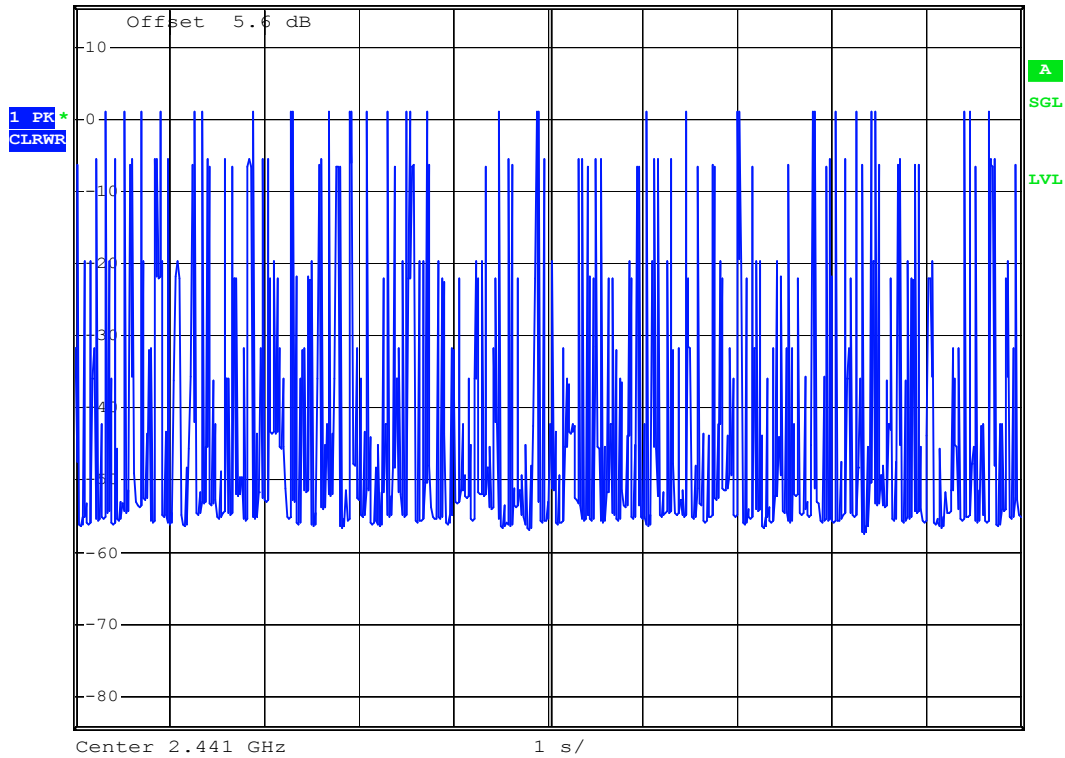


DH3



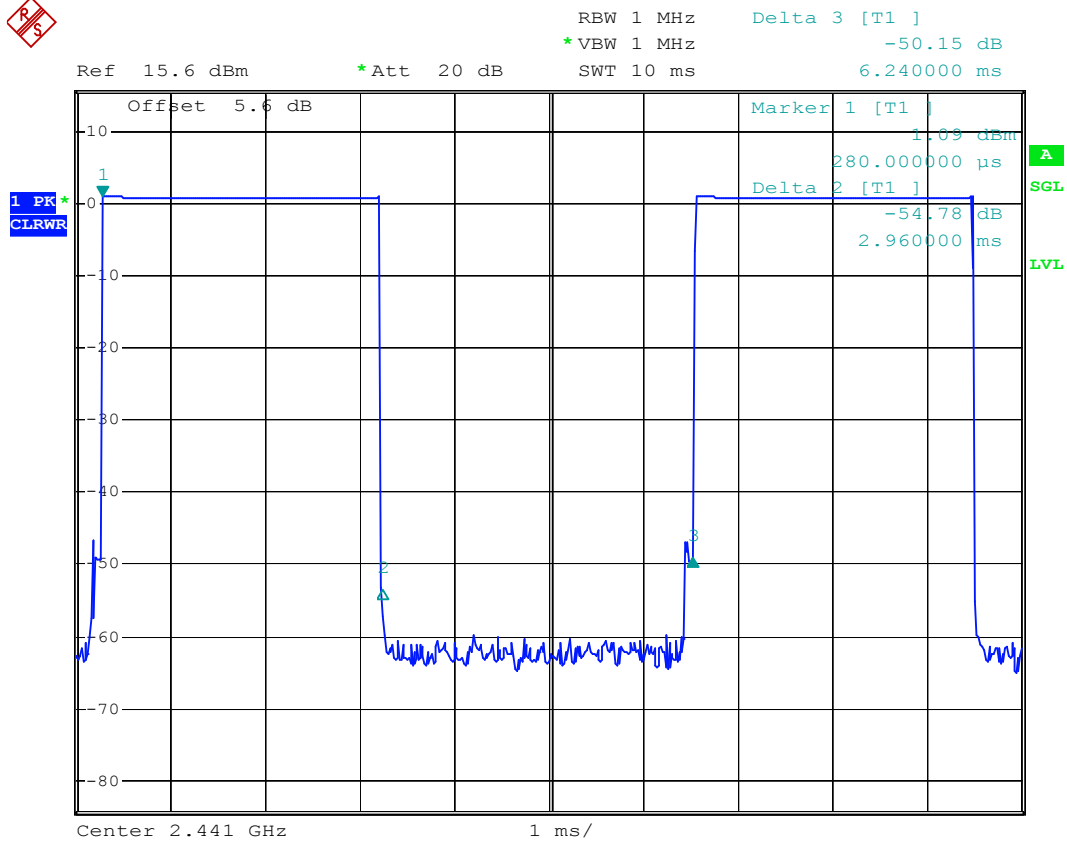


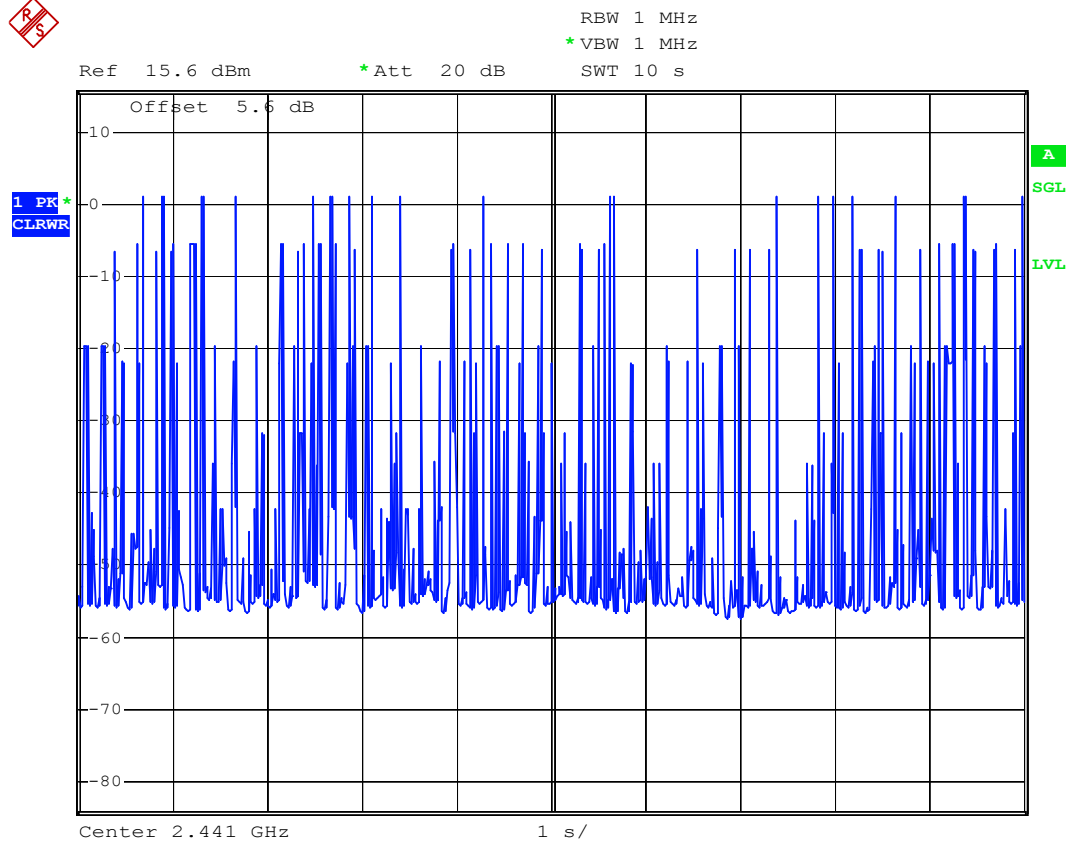
Ref 15.6 dBm RBW 1 MHz  
\* Att 20 dB \* VBW 1 MHz  
SWT 10 s





DH5





## 5.6 Output Power

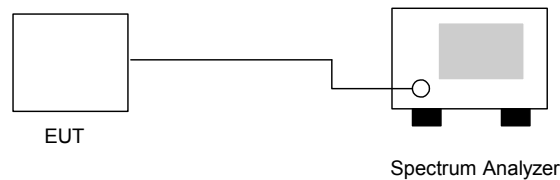
### 5.6.1 Measuring Instruments :

As described in chapter 6 of this test report.

### 5.6.2 Test Procedure :

1. The transmitter output was connected to the spectrum analyzer directly.
2. The center frequency of the spectrum analyzer was set to the fundamental frequency and set RBW to 3MHz and VBW to 3MHz.

### 5.6.3 Test Setup Layout :



### 5.6.4 Test Result : See spectrum analyzer plots below

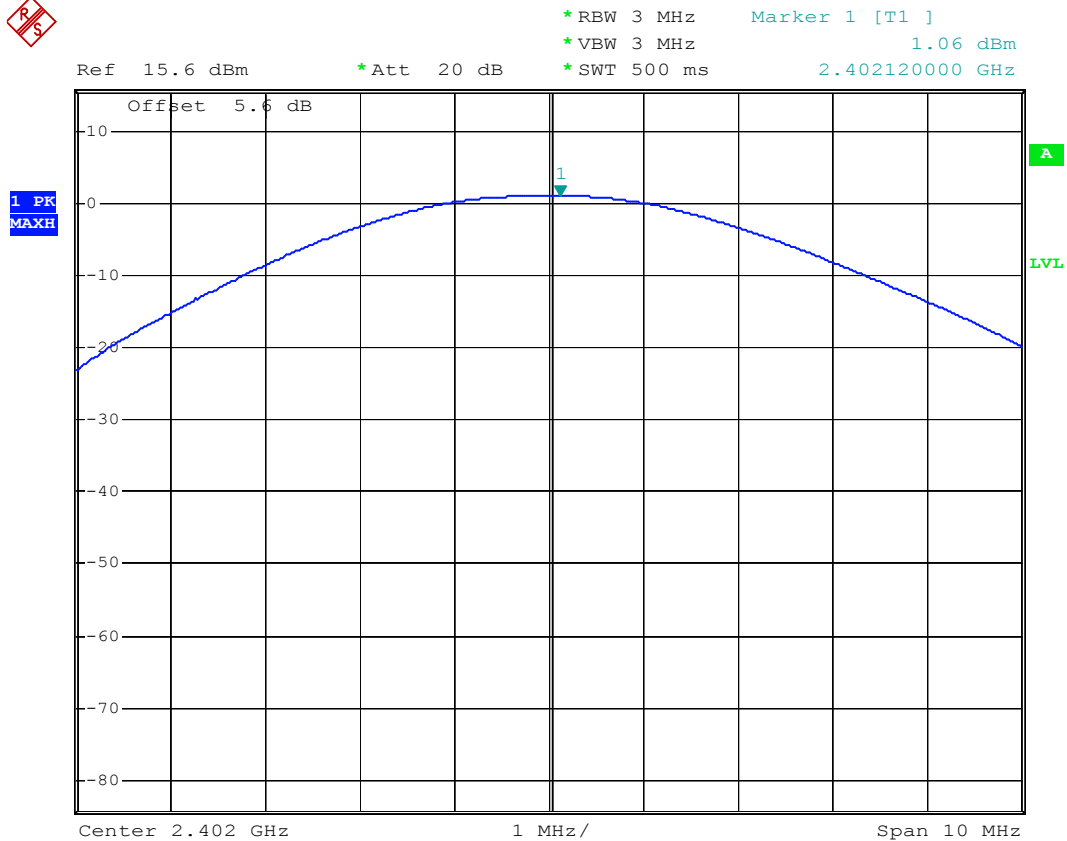
- Temperature: 24°C
- Relative Humidity: 52%
- Test Engineer : Jay

| Channel | Frequency<br>(MHz) | Measured Output Power<br>(dBm) | Limits<br>(Watt/dBm ) | Plot<br>Ref. No. |
|---------|--------------------|--------------------------------|-----------------------|------------------|
| 00      | 2402               | 1.06                           | 1W/30 dBm             | Mode 1           |
| 39      | 2441               | 1.31                           | 1W/30 dBm             | Mode 2           |
| 78      | 2480               | 1.72                           | 1W/30 dBm             | Mode 3           |



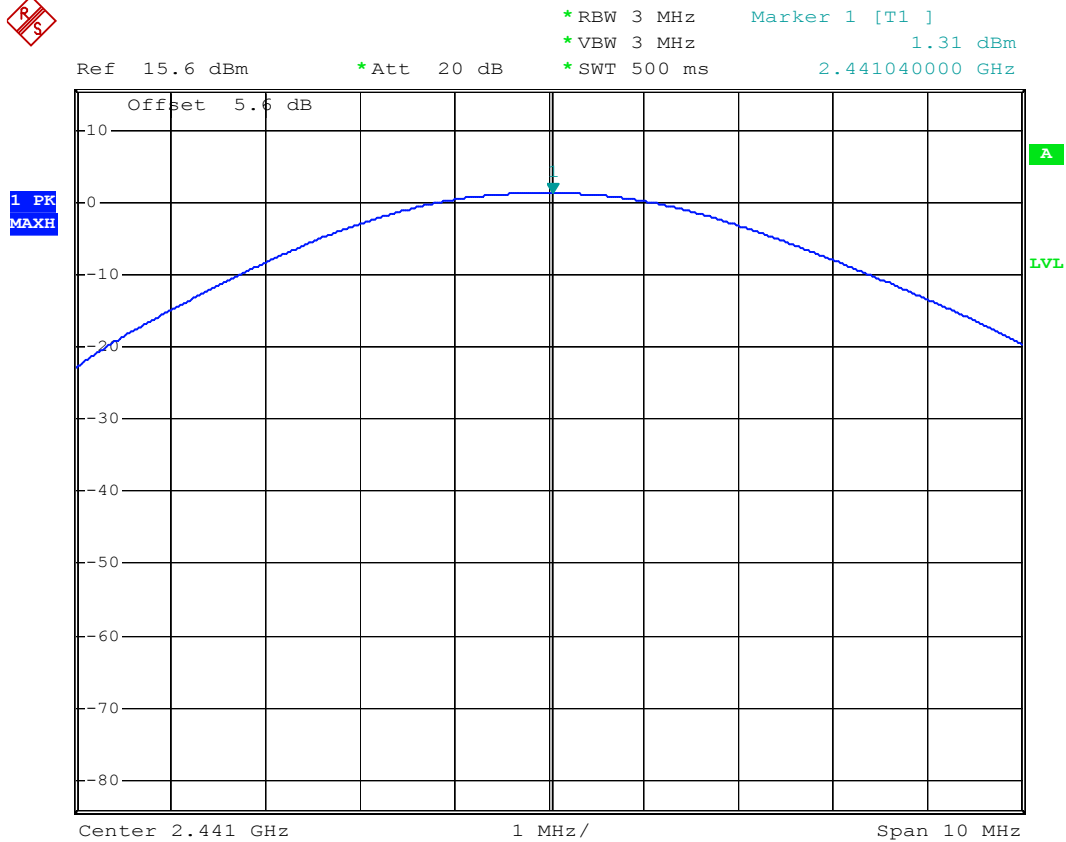
### 5.6.5 Output Power

Mode 1: CH00 (2402MHz)





Mode 2: CH39 (2441MHz)

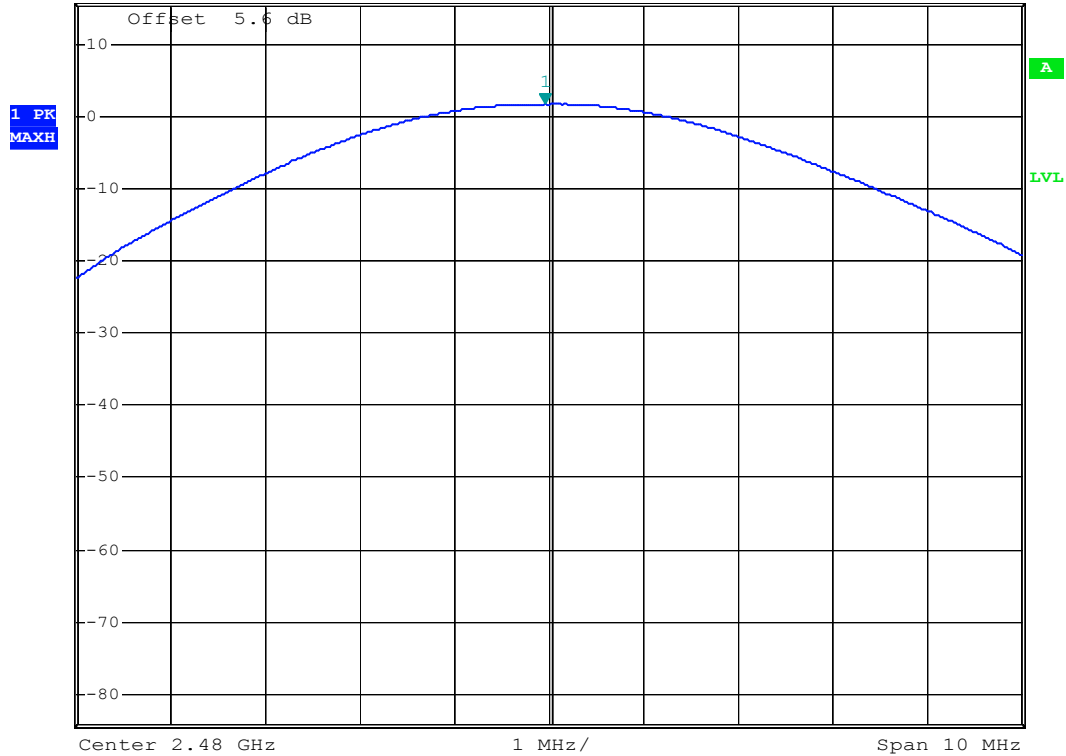




Mode 3: CH78 (2480MHz)



Ref 15.6 dBm \*Att 20 dB \*RBW 3 MHz \*VBW 3 MHz \*SWT 500 ms Marker 1 [T1 ] 1.72 dBm 2.479960000 GHz





## 5.7 100kHz Bandwidth of Frequency Band Edges

### 5.7.1 Measuring Instruments :

As described in chapter 6 of this test report.

### 5.7.2 Test Procedure :

1. The transmitter output was connected to the spectrum analyzer via a low lose cable.
2. Set both RBW and VBW of spectrum analyzer to 100kHz with suitable frequency span for the conducted measurement, and RBW/VBW=1MHz/1MHz for peak measurement and RBW/VBW=1MHz/300Hz for average measurement in the radiated measurement.
3. The band edges was measured and recorded.

### 5.7.3 Test Result :

- Temperature: 24°C
- Relative Humidity: 52%
- Test Engineer : Jay

Test Result in lower band (Channel 00) : PASS

Test Result in higher band(Channel 78) : PASS

### 5.7.4 Note on Band edge Emission

#### CH00 (Horizontal)

| Frequency<br>(MHz) | Level<br>(dBuV/m) | Over<br>Limit<br>(dB) | Limit<br>Line<br>(dBuV/m) | Read<br>Level<br>(dBuV) | Antenna<br>Factor<br>(dB) | Cable<br>Loss<br>(dB) | Preamp<br>Factor<br>(dB) | Ant<br>Pos<br>(cm) | Table<br>Pos<br>(deg) | Detect<br>Mode |
|--------------------|-------------------|-----------------------|---------------------------|-------------------------|---------------------------|-----------------------|--------------------------|--------------------|-----------------------|----------------|
| 2390.00            | 48.94             | -25.06                | 74.00                     | 49.65                   | 30.48                     | 4.26                  | 35.46                    | 200                | 360                   | Peak           |
| 2390.00            | 38.72             | -15.28                | 54.00                     | 39.43                   | 30.48                     | 4.26                  | 35.46                    | 200                | 239                   | Average        |

#### CH00 (Vertical)

| Frequency<br>(MHz) | Level<br>(dBuV/m) | Over<br>Limit<br>(dB) | Limit<br>Line<br>(dBuV/m) | Read<br>Level<br>(dBuV) | Antenna<br>Factor<br>(dB) | Cable<br>Loss<br>(dB) | Preamp<br>Factor<br>(dB) | Ant<br>Pos<br>(cm) | Table<br>Pos<br>(deg) | Detect<br>Mode |
|--------------------|-------------------|-----------------------|---------------------------|-------------------------|---------------------------|-----------------------|--------------------------|--------------------|-----------------------|----------------|
| 2390.00            | 49.42             | -24.58                | 74.00                     | 50.13                   | 30.48                     | 4.26                  | 35.46                    | 200                | 360                   | Peak           |
| 2390.00            | 38.62             | -15.38                | 54.00                     | 39.33                   | 30.48                     | 4.26                  | 35.46                    | 189                | 100                   | Average        |

**CH78 (Horizontal)**

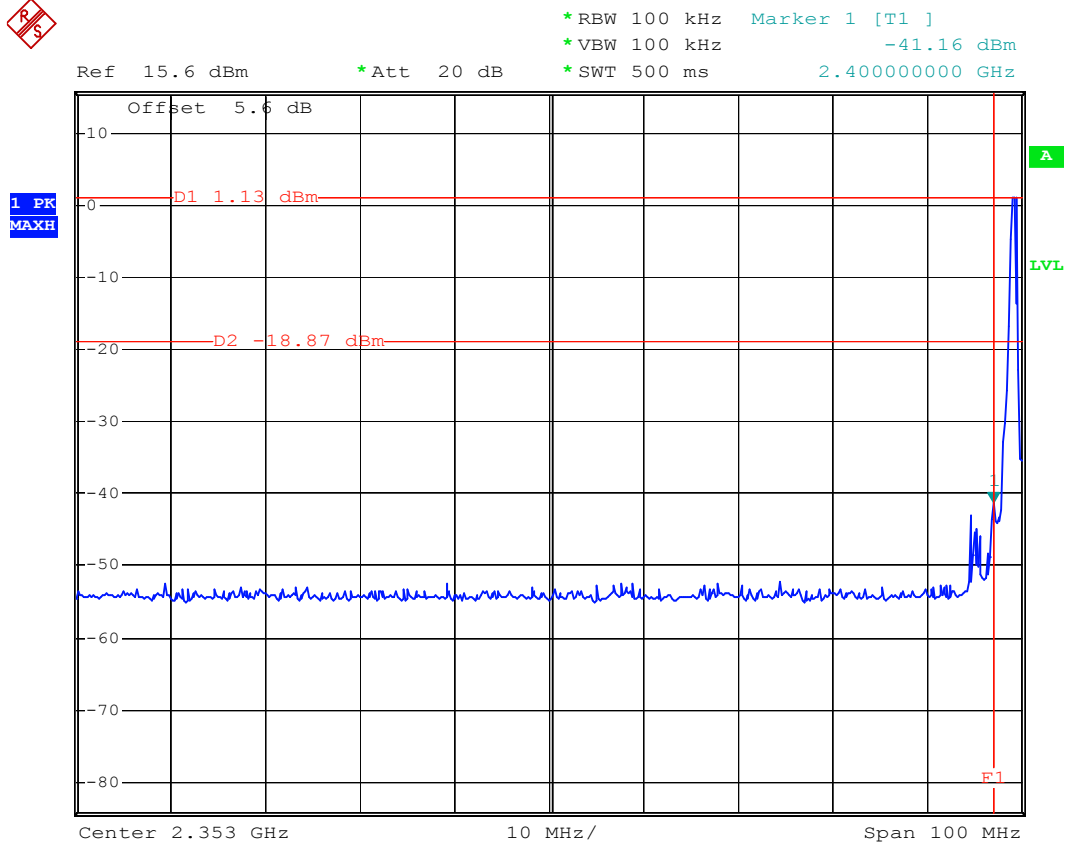
| Frequency | Level    | Over  | Limit    | Read   | Antenna | Cable | Preamp | Ant  | Table | Detect  |
|-----------|----------|-------|----------|--------|---------|-------|--------|------|-------|---------|
| (MHz)     | (dBuV/m) | Limit | Line     | Level  | Factor  | Loss  | Factor | Pos  | Pos   | Mode    |
|           |          | (dB)  | (dBuV/m) | (dBuV) | (dB)    | (dB)  | (dB)   | (cm) | (deg) |         |
| 2483.50   | 73.19    | -0.81 | 74.00    | 73.93  | 30.41   | 4.36  | 35.51  | 200  | 0     | Peak    |
| 2483.50   | 46.36    | -7.64 | 54.00    | 47.10  | 30.41   | 4.36  | 35.51  | 157  | 157   | Average |

**CH78 (Vertical)**

| Frequency | Level    | Over  | Limit    | Read   | Antenna | Cable | Preamp | Ant  | Table | Detect  |
|-----------|----------|-------|----------|--------|---------|-------|--------|------|-------|---------|
| (MHz)     | (dBuV/m) | Limit | Line     | Level  | Factor  | Loss  | Factor | Pos  | Pos   | Mode    |
|           |          | (dB)  | (dBuV/m) | (dBuV) | (dB)    | (dB)  | (dB)   | (cm) | (deg) |         |
| 2483.50   | 73.05    | -0.95 | 74.00    | 73.79  | 30.41   | 4.36  | 35.51  | 100  | 360   | Peak    |
| 2483.50   | 46.61    | -7.39 | 54.00    | 47.35  | 30.41   | 4.36  | 35.51  | 100  | 112   | Average |

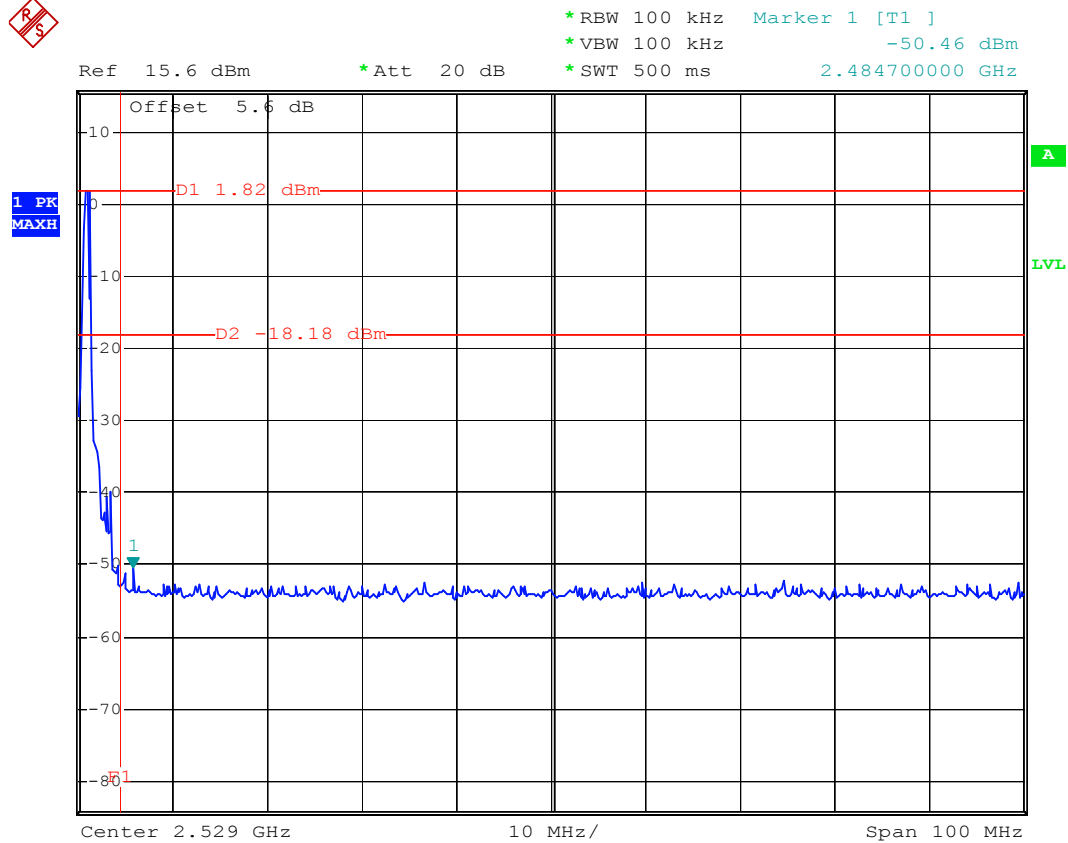
**5.7.5 Frequency Band Edge**

Mode 1: CH00 (2402 MHz)





Mode 3: CH78 (2480 MHz)



## **5.8 Conducted Emission**

### **5.8.1 Measuring Instruments**

As described in chapter 6 of this test Report.

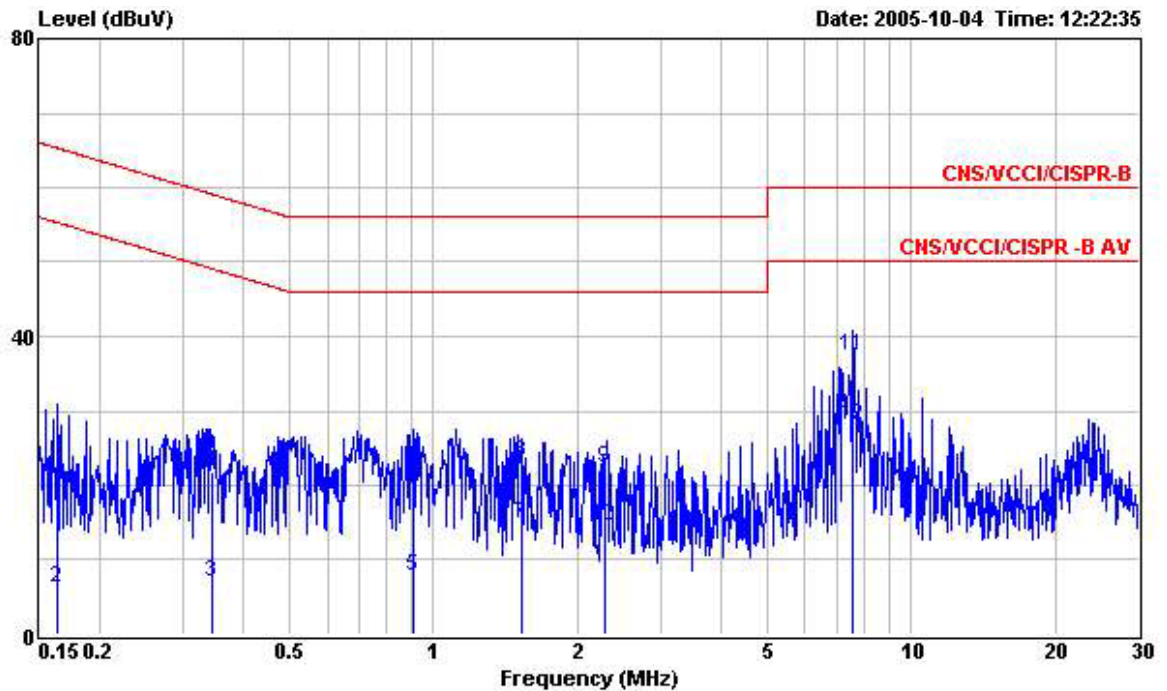
### **5.8.2 Test Procedures :**

- a. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
- b. Connect EUT to the power port of a line impedance stabilization network (LISN).
- c. All the support units are connected to the other LISN.
- d. The LISN provides 50 ohm coupling impedance for the measuring instrument.
- e. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
- f. Both sides of AC line were checked for maximum conducted interference.
- g. The frequency range from 150 kHz to 30 MHz was searched.
- h. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

**5.8.3 Test Data Test Mode 1**

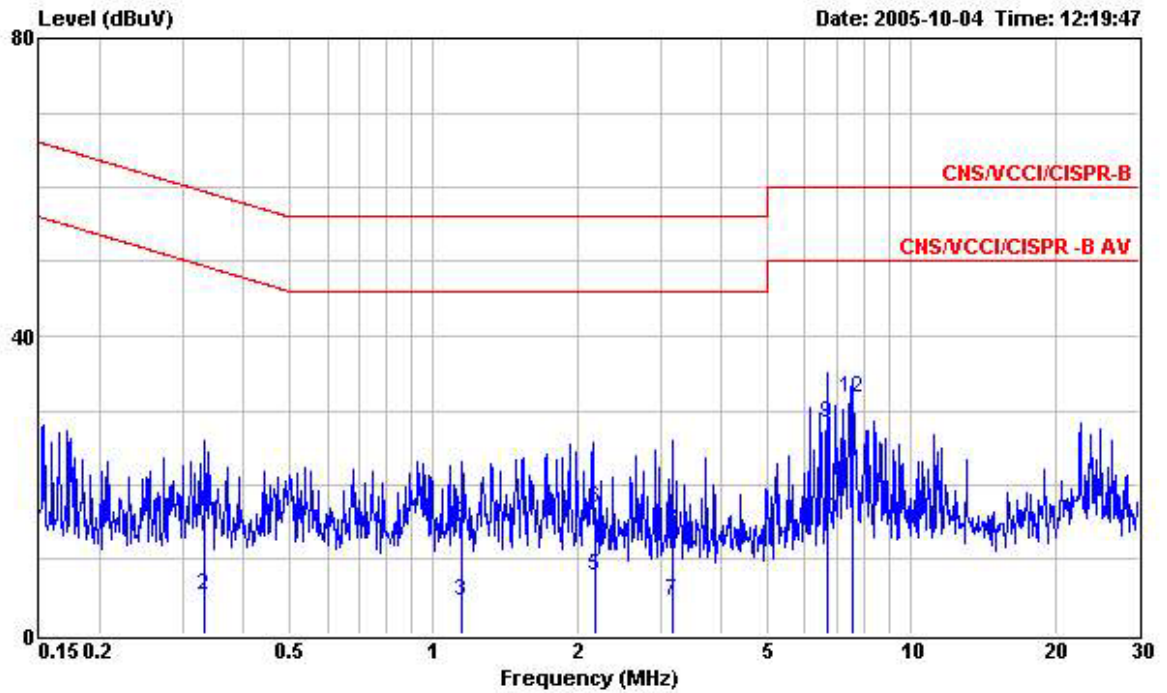
- Temperature: 24°C
- Relative Humidity: 52%
- Test Engineer : Jay
- Test Mode : Mode 1

■ The test that passed at minimum margin was marked by the frame in the following table.



Site : site  
Condition : CNS/VCCI/CISPR-B 2001/004 200505 LINE  
EUT : GSM Tri Band Mobil Phone(Bluetooth)  
Power : 120V/60Hz  
Model : FD511807-02  
Memo : PCS 1900 Idle + MP3 Player + BT Link  
Memo : + USB Link  
Memo :

|    | Freq  | Level | Over Limit | Limit Line | Read Level | Probe Factor | Cable Loss | Remark  |
|----|-------|-------|------------|------------|------------|--------------|------------|---------|
|    | MHz   | dBuV  | dB         | dBuV       | dBuV       | dB           | dB         |         |
| 1  | 0.163 | 19.58 | -45.73     | 65.31      | 19.39      | 0.06         | 0.13       | QP      |
| 2  | 0.163 | 6.27  | -49.04     | 55.31      | 6.08       | 0.06         | 0.13       | Average |
| 3  | 0.344 | 7.14  | -41.96     | 49.10      | 7.01       | 0.06         | 0.07       | Average |
| 4  | 0.344 | 21.85 | -37.25     | 59.10      | 21.72      | 0.06         | 0.07       | QP      |
| 5  | 0.910 | 7.71  | -38.29     | 46.00      | 7.53       | 0.10         | 0.08       | Average |
| 6  | 0.910 | 21.67 | -34.33     | 56.00      | 21.49      | 0.10         | 0.08       | QP      |
| 7  | 1.528 | 14.72 | -31.28     | 46.00      | 14.51      | 0.11         | 0.10       | Average |
| 8  | 1.528 | 23.08 | -32.92     | 56.00      | 22.87      | 0.11         | 0.10       | QP      |
| 9  | 2.295 | 22.23 | -33.77     | 56.00      | 21.97      | 0.13         | 0.13       | QP      |
| 10 | 2.295 | 14.45 | -31.55     | 46.00      | 14.19      | 0.13         | 0.13       | Average |
| 11 | 7.530 | 37.42 | -22.58     | 60.00      | 37.01      | 0.21         | 0.20       | QP      |
| 12 | 7.530 | 28.05 | -21.95     | 50.00      | 27.64      | 0.21         | 0.20       | Average |



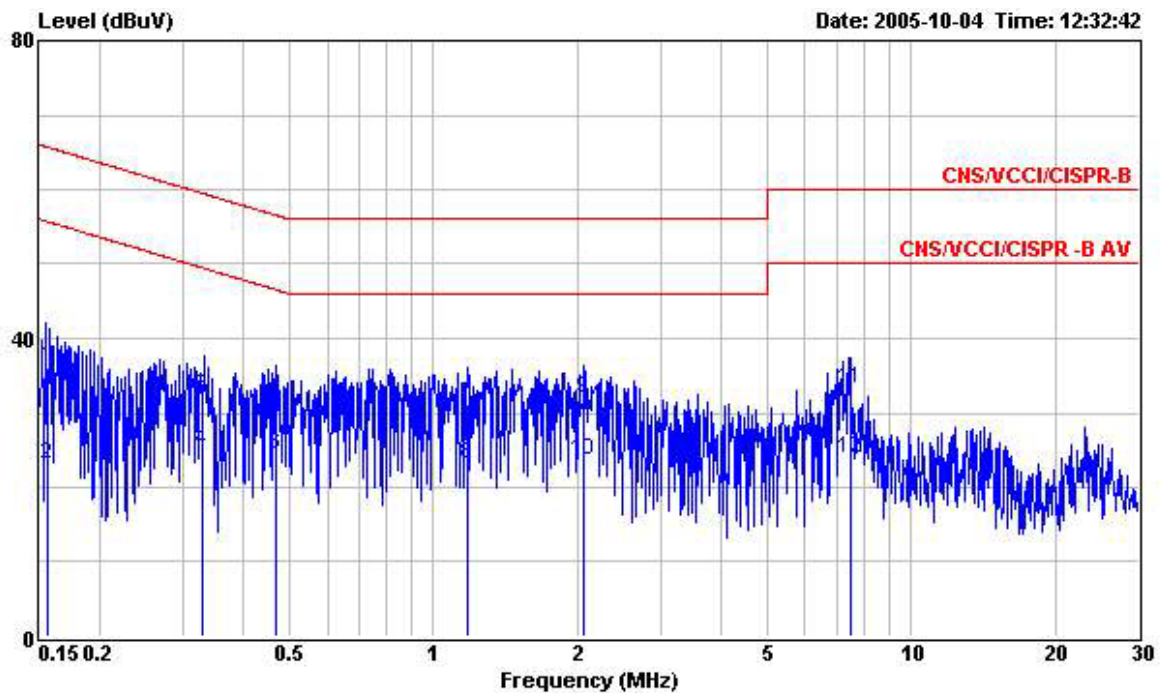
Site : site  
 Condition : CNS/VCCI/CISPR-B 2001/004 200505 NEUTRAL  
 EUT : GSM Tri Band Mobil Phone(Bluetooth)  
 Power : 120V/60Hz  
 Model : FD511807-02  
 Memo : PCS 1900 Idle + MP3 Player + BT Link  
 Memo : + USB Link  
 Memo :

|    | Freq  | Level | Over   | Limit | Read  | Probe  | Cable |         |
|----|-------|-------|--------|-------|-------|--------|-------|---------|
|    | MHz   | dBuV  | Limit  | Line  | Level | Factor | Loss  | Remark  |
|    | MHz   | dBuV  | dB     | dBuV  | dBuV  | dB     | dB    |         |
| 1  | 0.332 | 16.49 | -42.91 | 59.40 | 16.31 | 0.11   | 0.07  | QP      |
| 2  | 0.332 | 5.16  | -44.24 | 49.40 | 4.98  | 0.11   | 0.07  | Average |
| 3  | 1.150 | 4.48  | -41.52 | 46.00 | 4.16  | 0.23   | 0.09  | Average |
| 4  | 1.150 | 15.03 | -40.97 | 56.00 | 14.71 | 0.23   | 0.09  | QP      |
| 5  | 2.182 | 7.82  | -38.18 | 46.00 | 7.46  | 0.23   | 0.13  | Average |
| 6  | 2.182 | 16.91 | -39.09 | 56.00 | 16.55 | 0.23   | 0.13  | QP      |
| 7  | 3.160 | 4.47  | -41.53 | 46.00 | 4.09  | 0.23   | 0.15  | Average |
| 8  | 3.160 | 13.98 | -42.02 | 56.00 | 13.60 | 0.23   | 0.15  | QP      |
| 9  | 6.652 | 28.29 | -31.71 | 60.00 | 27.81 | 0.29   | 0.19  | QP      |
| 10 | 6.652 | 15.29 | -34.71 | 50.00 | 14.81 | 0.29   | 0.19  | Average |
| 11 | 7.530 | 21.43 | -28.57 | 50.00 | 20.93 | 0.30   | 0.20  | Average |
| 12 | 7.530 | 31.62 | -28.38 | 60.00 | 31.12 | 0.30   | 0.20  | QP      |

#### 5.8.4 Test Data Test Mode 2

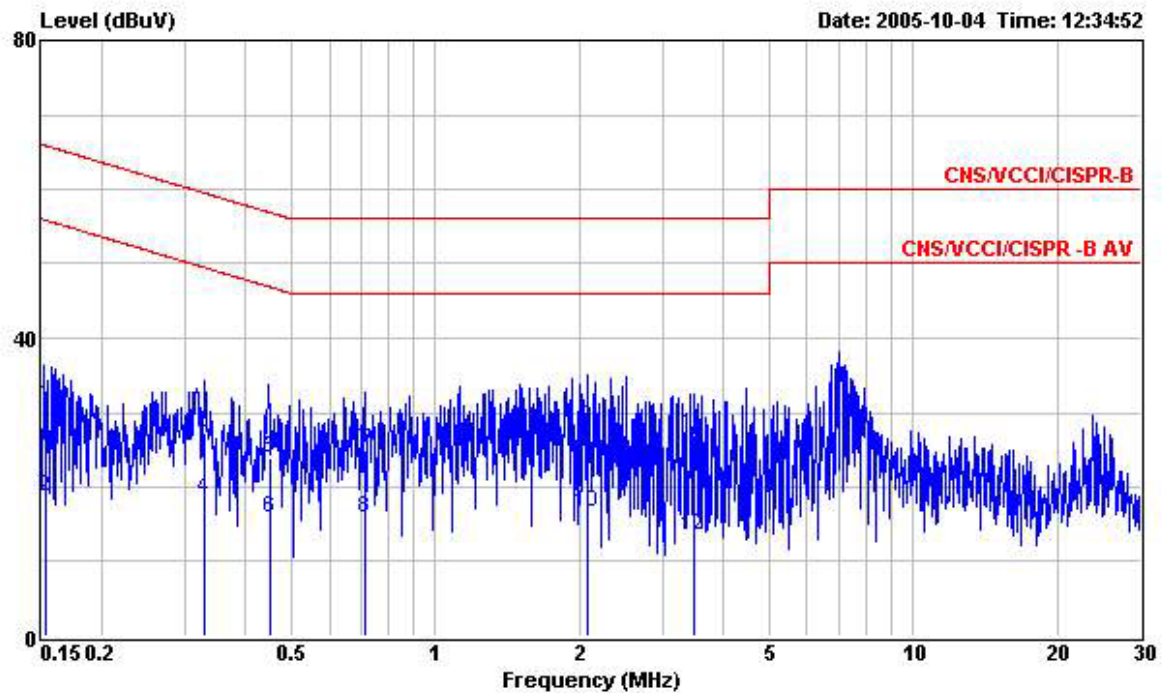
- Temperature: 24°C
- Relative Humidity: 52%
- Test Engineer : Jay
- Test Mode : Mode 1

■ The test that passed at minimum margin was marked by the frame in the following table.



Site : site  
 Condition : CNS/VCCI/CISPR-B 2001/004 200505 LINE  
 EUT : GSM Tri Band Mobil Phone(Bluetooth)  
 Power : 120V/60Hz  
 Model : FD511807-02  
 Memo : PCS 1900 Idle + CAMERA + BT Link  
 Memo : + USB Link  
 Memo :

|    | Freq  | Level | Over Limit | Limit Line | Read Level | Probe Factor | Cable Loss | Remark  |
|----|-------|-------|------------|------------|------------|--------------|------------|---------|
|    | MHz   | dBuV  | dB         | dBuV       | dBuV       | dB           | dB         |         |
| 1  | 0.156 | 36.02 | -29.64     | 65.66      | 35.84      | 0.06         | 0.12       | QP      |
| 2  | 0.156 | 23.10 | -32.56     | 55.66      | 22.92      | 0.06         | 0.12       | Average |
| 3  | 0.329 | 32.16 | -27.33     | 59.49      | 32.03      | 0.06         | 0.07       | QP      |
| 4  | 0.329 | 25.01 | -24.48     | 49.49      | 24.88      | 0.06         | 0.07       | Average |
| 5  | 0.466 | 31.82 | -24.76     | 56.58      | 31.70      | 0.07         | 0.05       | QP      |
| 6  | 0.466 | 24.43 | -22.15     | 46.58      | 24.31      | 0.07         | 0.05       | Average |
| 7  | 1.180 | 31.04 | -24.96     | 56.00      | 30.84      | 0.11         | 0.09       | QP      |
| 8  | 1.180 | 23.11 | -22.89     | 46.00      | 22.91      | 0.11         | 0.09       | Average |
| 9  | 2.070 | 31.93 | -24.07     | 56.00      | 31.70      | 0.11         | 0.12       | QP      |
| 10 | 2.070 | 23.76 | -22.24     | 46.00      | 23.53      | 0.11         | 0.12       | Average |
| 11 | 7.450 | 33.13 | -26.87     | 60.00      | 32.72      | 0.21         | 0.20       | QP      |
| 12 | 7.450 | 23.99 | -26.01     | 50.00      | 23.58      | 0.21         | 0.20       | Average |



Site : site  
 Condition : CNS/VCCI/CISPR-B 2001/004 200505 NEUTRAL  
 EUT : GSM Tri Band Mobil Phone(Bluetooth)  
 Power : 120V/60Hz  
 Model : FD511807-02  
 Memo : PCS 1900 Idle + CAMERA + BT Link  
 Memo : + USB Link  
 Memo :

|    | Freq  | Level | Over<br>Limit | Limit<br>Line | Read<br>Level | Probe<br>Factor | Cable<br>Loss | Remark  |
|----|-------|-------|---------------|---------------|---------------|-----------------|---------------|---------|
|    | MHz   | dBuV  | dB            | dBuV          | dBuV          | dB              | dB            |         |
| 1  | 0.152 | 30.89 | -34.98        | 65.87         | 30.67         | 0.11            | 0.11          | QP      |
| 2  | 0.152 | 18.75 | -37.12        | 55.87         | 18.53         | 0.11            | 0.11          | Average |
| 3  | 0.329 | 27.34 | -32.14        | 59.48         | 27.16         | 0.11            | 0.07          | QP      |
| 4  | 0.329 | 18.39 | -31.09        | 49.48         | 18.21         | 0.11            | 0.07          | Average |
| 5  | 0.452 | 24.00 | -32.84        | 56.84         | 23.82         | 0.13            | 0.05          | QP      |
| 6  | 0.452 | 15.91 | -30.93        | 46.84         | 15.73         | 0.13            | 0.05          | Average |
| 7  | 0.712 | 24.98 | -31.02        | 56.00         | 24.72         | 0.19            | 0.07          | QP      |
| 8  | 0.712 | 15.73 | -30.27        | 46.00         | 15.47         | 0.19            | 0.07          | Average |
| 9  | 2.090 | 27.98 | -28.02        | 56.00         | 27.63         | 0.23            | 0.12          | QP      |
| 10 | 2.090 | 16.70 | -29.30        | 46.00         | 16.35         | 0.23            | 0.12          | Average |
| 11 | 3.490 | 27.09 | -28.91        | 56.00         | 26.71         | 0.23            | 0.15          | QP      |
| 12 | 3.490 | 13.39 | -32.61        | 46.00         | 13.01         | 0.23            | 0.15          | Average |

## **5.9 Radiated Emission Measurement**

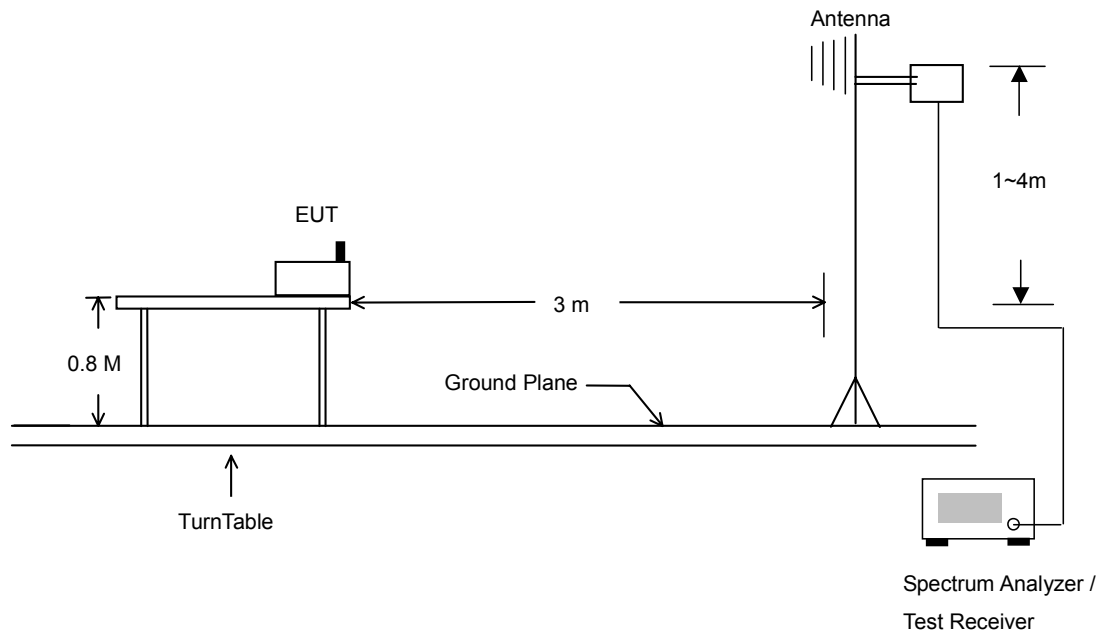
### **5.9.1 Measuring Instruments**

As described in chapter 6 of this Report.

### **5.9.2 Test Procedures**

1. The EUT was placed on a rotatable table top 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna is a broadband antenna and its height is varied between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
7. For testing below 1GHz, If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the quasi-peak method and reported.
8. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average 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.

### 5.9.3 Typical Test Setup Layout of Radiated Emission



#### 5.9.4 Test Data

- Temperature : 26 °C
- Relating Humidity : 53 %
- Test Enginner : Jay
- Test Mode : Mode 1
- Polarization : Horizontal

■ The test that passed at the minimum margin was marked by the frame in the following test record

|     | Freq    | Level  | Over Limit | Limit Line | ReadAntenna Level | Antenna Factor | Cable Loss | Preamplifier Factor | Ant Pos | Table Pos | Remark  |
|-----|---------|--------|------------|------------|-------------------|----------------|------------|---------------------|---------|-----------|---------|
|     | MHz     | dBuV/m | dB         | dBuV/m     | dBuV              | dB/m           | dB         | dB                  | cm      | deg       |         |
| 1 @ | 2390.00 | 48.94  | -25.06     | 74.00      | 49.65             | 30.48          | 4.26       | 35.46               | 200     | 360       | Peak    |
| 2 @ | 2390.00 | 38.72  | -15.28     | 54.00      | 39.43             | 30.48          | 4.26       | 35.46               | 200     | 239       | Average |
| 3 @ | 2402.00 | 93.00  |            |            | 93.73             | 30.47          | 4.26       | 35.46               | 200     | 360       | Peak    |
| 4 @ | 2402.00 | 66.96  |            |            | 67.67             | 30.48          | 4.26       | 35.46               | 200     | 239       | Average |
| 5 @ | 2483.50 | 48.66  | -25.34     | 74.00      | 49.40             | 30.41          | 4.36       | 35.51               | 200     | 360       | Peak    |
| 6 @ | 2483.50 | 38.61  | -15.39     | 54.00      | 39.35             | 30.41          | 4.36       | 35.51               | 200     | 239       | Average |

Remark: #3 and #4 Fundamental Signal

- Test Mode : Mode 1
- Polarization : Vertical

■ The test that passed at minimum margin was marked by the frame in the following table.

|     | Freq    | Level  | Over Limit | Limit Line | ReadAntenna Level | Antenna Factor | Cable Loss | Preamplifier Factor | Ant Pos | Table Pos | Remark  |
|-----|---------|--------|------------|------------|-------------------|----------------|------------|---------------------|---------|-----------|---------|
|     | MHz     | dBuV/m | dB         | dBuV/m     | dBuV              | dB/m           | dB         | dB                  | cm      | deg       |         |
| 1 @ | 2390.00 | 49.42  | -24.58     | 74.00      | 50.13             | 30.48          | 4.26       | 35.46               | 200     | 360       | Peak    |
| 2 @ | 2390.00 | 38.62  | -15.38     | 54.00      | 39.33             | 30.48          | 4.26       | 35.46               | 189     | 100       | Average |
| 3 @ | 2402.00 | 91.92  |            |            | 92.65             | 30.47          | 4.26       | 35.46               | 200     | 360       | Peak    |
| 4 @ | 2402.00 | 66.31  |            |            | 67.02             | 30.48          | 4.26       | 35.46               | 189     | 100       | Average |
| 5 @ | 2483.50 | 49.04  | -24.96     | 74.00      | 49.78             | 30.41          | 4.36       | 35.51               | 200     | 360       | Peak    |
| 6 @ | 2483.50 | 38.57  | -15.43     | 54.00      | 39.31             | 30.41          | 4.36       | 35.51               | 189     | 100       | Average |

Remark: #3 and #4 Fundamental Signal



- Test Mode : Mode 2
- Polarization : Horizontal

■ The test that passed at minimum margin was marked by the frame in the following table.

|     | Freq   | Level  | Over Limit | Limit Line | ReadAntenna Level | Antenna Factor | Cable Loss | Preamplifier Factor | Ant Pos | Table Pos | Remark |
|-----|--------|--------|------------|------------|-------------------|----------------|------------|---------------------|---------|-----------|--------|
|     | MHz    | dBuV/m | dB         | dBuV/m     | dBuV              | dB/m           | dB         | dB                  | cm      | deg       |        |
| 1 @ | 42.69  | 21.64  | -18.36     | 40.00      | 39.55             | 13.19          | 0.57       | 31.67               | 400     | 0         | Peak   |
| 2 @ | 158.79 | 21.54  | -21.96     | 43.50      | 41.27             | 10.22          | 1.69       | 31.64               | 400     | 0         | Peak   |
| 3 @ | 276.78 | 21.55  | -24.45     | 46.00      | 37.31             | 12.92          | 2.41       | 31.10               | 400     | 0         | Peak   |

|     | Freq   | Level  | Over Limit | Limit Line | ReadAntenna Level | Antenna Factor | Cable Loss | Preamplifier Factor | Ant Pos | Table Pos | Remark |
|-----|--------|--------|------------|------------|-------------------|----------------|------------|---------------------|---------|-----------|--------|
|     | MHz    | dBuV/m | dB         | dBuV/m     | dBuV              | dB/m           | dB         | dB                  | cm      | deg       |        |
| 1 @ | 600.30 | 31.02  | -14.98     | 46.00      | 39.58             | 17.94          | 4.14       | 30.64               | 100     | 0         | Peak   |
| 2 @ | 799.80 | 35.62  | -10.38     | 46.00      | 38.95             | 21.90          | 4.90       | 30.12               | 178     | 254       | Peak   |
| 3 @ | 899.90 | 30.99  | -15.01     | 46.00      | 35.90             | 19.94          | 5.74       | 30.59               | 100     | 0         | Peak   |

|     | Freq    | Level  | Over Limit | Limit Line | ReadAntenna Level | Antenna Factor | Cable Loss | Preamplifier Factor | Ant Pos | Table Pos | Remark  |
|-----|---------|--------|------------|------------|-------------------|----------------|------------|---------------------|---------|-----------|---------|
|     | MHz     | dBuV/m | dB         | dBuV/m     | dBuV              | dB/m           | dB         | dB                  | cm      | deg       |         |
| 1 @ | 2390.00 | 48.76  | -25.24     | 74.00      | 49.48             | 30.48          | 4.26       | 35.46               | 100     | 360       | Peak    |
| 2 @ | 2390.00 | 38.62  | -15.38     | 54.00      | 39.33             | 30.48          | 4.26       | 35.46               | 100     | 336       | Average |
| 3 @ | 2441.00 | 92.19  |            |            | 92.93             | 30.44          | 4.29       | 35.47               | 100     | 360       | Peak    |
| 4 @ | 2441.00 | 67.17  |            |            | 67.90             | 30.44          | 4.33       | 35.49               | 100     | 336       | Average |
| 5 @ | 2483.50 | 49.53  | -24.47     | 74.00      | 50.27             | 30.41          | 4.36       | 35.51               | 100     | 360       | Peak    |
| 6 @ | 2483.50 | 38.57  | -15.43     | 54.00      | 39.31             | 30.41          | 4.36       | 35.51               | 100     | 336       | Average |

Remark: #3 and #4 Fundamental Signal



- Test Mode : Mode 2
- Polarization : Vertical

■ The test that passed at minimum margin was marked by the frame in the following table.

|     | Freq   | Level  | Over Limit | Limit Line | ReadAntenna Level | Antenna Factor | Cable Loss | Preamp Factor | Ant Pos | Table Pos | Remark |
|-----|--------|--------|------------|------------|-------------------|----------------|------------|---------------|---------|-----------|--------|
|     | MHz    | dBuV/m | dB         | dBuV/m     | dBuV              | dB/m           | dB         | dB            | cm      | deg       |        |
| 1 @ | 41.88  | 33.69  | -6.31      | 40.00      | 51.04             | 13.74          | 0.60       | 31.69         | 158     | 224       | Peak   |
| 2 @ | 101.28 | 23.19  | -20.31     | 43.50      | 42.84             | 10.57          | 1.07       | 31.29         | 400     | 0         | Peak   |
| 3 @ | 199.29 | 21.50  | -22.00     | 43.50      | 40.95             | 9.93           | 1.96       | 31.34         | 400     | 0         | Peak   |

|     | Freq   | Level  | Over Limit | Limit Line | ReadAntenna Level | Antenna Factor | Cable Loss | Preamp Factor | Ant Pos | Table Pos | Remark |
|-----|--------|--------|------------|------------|-------------------|----------------|------------|---------------|---------|-----------|--------|
|     | MHz    | dBuV/m | dB         | dBuV/m     | dBuV              | dB/m           | dB         | dB            | cm      | deg       |        |
| 1 @ | 600.30 | 29.14  | -16.86     | 46.00      | 37.70             | 17.94          | 4.14       | 30.64         | 100     | 0         | Peak   |
| 2 @ | 726.30 | 30.50  | -15.50     | 46.00      | 36.77             | 19.79          | 4.47       | 30.53         | 100     | 0         | Peak   |
| 3 @ | 799.80 | 32.98  | -13.02     | 46.00      | 36.30             | 21.90          | 4.90       | 30.12         | 100     | 0         | Peak   |

|     | Freq    | Level  | Over Limit | Limit Line | ReadAntenna Level | Antenna Factor | Cable Loss | Preamp Factor | Ant Pos | Table Pos | Remark  |
|-----|---------|--------|------------|------------|-------------------|----------------|------------|---------------|---------|-----------|---------|
|     | MHz     | dBuV/m | dB         | dBuV/m     | dBuV              | dB/m           | dB         | dB            | cm      | deg       |         |
| 1 @ | 2390.00 | 48.90  | -25.10     | 74.00      | 49.61             | 30.48          | 4.26       | 35.46         | 200     | 0         | Peak    |
| 2 @ | 2390.00 | 38.60  | -15.40     | 54.00      | 39.31             | 30.48          | 4.26       | 35.46         | 176     | 109       | Average |
| 3 @ | 2441.00 | 92.41  |            |            | 93.15             | 30.44          | 4.29       | 35.47         | 200     | 0         | Peak    |
| 4 @ | 2441.00 | 66.58  |            |            | 67.31             | 30.44          | 4.33       | 35.49         | 176     | 109       | Average |
| 5 @ | 2483.50 | 48.22  | -25.78     | 74.00      | 48.96             | 30.41          | 4.36       | 35.51         | 200     | 0         | Peak    |
| 6 @ | 2483.50 | 38.59  | -15.41     | 54.00      | 39.33             | 30.41          | 4.36       | 35.51         | 176     | 109       | Average |

Remark: #3 and #4 Fundamental Signal



- Test Mode : Mode 3
- Polarization : Horizontal

■ The test that passed at minimum margin was marked by the frame in the following table.

|     | Freq    | Level  | Over Limit | Limit Line | ReadAntenna Level | Antenna Factor | Cable Loss | Preamp Factor | Ant Pos | Table Pos | Remark  |
|-----|---------|--------|------------|------------|-------------------|----------------|------------|---------------|---------|-----------|---------|
|     | MHz     | dBuV/m | dB         | dBuV/m     | dBuV              | dB/m           | dB         | dB            | cm      | deg       |         |
| 1   | 2390.00 | 48.72  | -25.28     | 74.00      | 49.43             | 30.48          | 4.26       | 35.46         | 200     | 0         | Peak    |
| 2   | 2390.00 | 38.61  | -15.39     | 54.00      | 39.32             | 30.48          | 4.26       | 35.46         | 157     | 157       | Average |
| 3 X | 2480.00 | 94.84  |            |            | 95.58             | 30.41          | 4.36       | 35.51         | 200     | 0         | Peak    |
| 4 X | 2480.00 | 67.94  |            |            | 68.68             | 30.41          | 4.36       | 35.51         | 157     | 157       | Average |
| 5 ! | 2483.50 | 73.19  | -0.81      | 74.00      | 73.93             | 30.41          | 4.36       | 35.51         | 200     | 0         | Peak    |
| 6   | 2483.50 | 46.36  | -7.64      | 54.00      | 47.10             | 30.41          | 4.36       | 35.51         | 157     | 157       | Average |

Remark: #3 and #4 Fundamental Signal.

- Test Mode : Mode 3
- Polarization : Vertical

■ The test that passed at minimum margin was marked by the frame in the following table.

|     | Freq    | Level  | Over Limit | Limit Line | ReadAntenna Level | Antenna Factor | Cable Loss | Preamp Factor | Ant Pos | Table Pos | Remark  |
|-----|---------|--------|------------|------------|-------------------|----------------|------------|---------------|---------|-----------|---------|
|     | MHz     | dBuV/m | dB         | dBuV/m     | dBuV              | dB/m           | dB         | dB            | cm      | deg       |         |
| 1   | 2390.00 | 49.81  | -24.19     | 74.00      | 50.52             | 30.48          | 4.26       | 35.46         | 100     | 360       | Peak    |
| 2   | 2390.00 | 38.63  | -15.37     | 54.00      | 39.34             | 30.48          | 4.26       | 35.46         | 100     | 112       | Average |
| 3 @ | 2480.00 | 95.78  |            |            | 96.52             | 30.41          | 4.36       | 35.51         | 100     | 360       | Peak    |
| 4 X | 2480.00 | 68.66  |            |            | 69.40             | 30.41          | 4.36       | 35.51         | 100     | 112       | Average |
| 5 ! | 2483.50 | 73.05  | -0.95      | 74.00      | 73.79             | 30.41          | 4.36       | 35.51         | 100     | 360       | Peak    |
| 6   | 2483.50 | 46.61  | -7.39      | 54.00      | 47.35             | 30.41          | 4.36       | 35.51         | 100     | 112       | Average |

Remark: #3 and #4 Fundamental Signal



## **5.10 Antenna Requirements**

### **5.10.1 Standard Applicable**

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no other antenna except assembled by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (b), if directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi.

### **5.10.2 Antenna Connected Construction**

The antenna used in this product is a PIFA antenna without connector and it is considered to meet antenna requirement of FCC.

### **5.10.3 Antenna Gain**

The antenna gain of EUT is less than 6dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

## 6. List of Measuring Equipments Used

| Instrument          | Manufacturer       | Model No. | Serial No. | Characteristics | Calibration Date | Due Date      | Remark                |
|---------------------|--------------------|-----------|------------|-----------------|------------------|---------------|-----------------------|
| EMC Receiver        | R&S                | ESCS 30   | 100174     | 9kHz – 2.75GHz  | Feb. 19, 2005    | Feb. 19, 2006 | Conduction (CO01-HY)  |
| LISN                | MessTec            | NNB-2/16Z | 2001/009   | 9kHz – 30MHz    | Apr. 26, 2005    | Apr. 26, 2006 | Conduction (CO01-HY)  |
| LISN (Support Unit) | MessTec            | NNB-2/16Z | 2001/008   | 9kHz – 30MHz    | May 06, 2005     | May 06, 2006  | Conduction (CO01-HY)  |
| EMI Filter          | LINDGREN           | LRE-2060  | 1004       | < 450Hz         | N/A              | N/A           | Conduction (CO01-HY)  |
| EMI Filter          | LINDGREN           | N6006     | 201052     | 0 – 60Hz        | N/A              | N/A           | Conduction (CO01-HY)  |
| RF Cable-CON        | Suhner Switzerland | RG223/U   | CB029      | 9kHz – 30MHz    | Dec. 23, 2004    | Dec. 23, 2005 | Conduction (CO01-HY)  |
| Spectrum analyzer   | Agilent            | E4408B    | MY44211030 | 9KHz-26.5GHz    | Jul. 27, 2004    | Jul. 27, 2006 | Radiation (03CH06-HY) |
| Receiver            | R&S                | ESCS30    | 100356     | 9KHz-2.75GHz    | Jul. 09,2004     | Jul. 09,2006  | Radiation (03CH06-HY) |
| Controller          | CT                 | SC100     | N/A        | N/A             | N/A              | N/A           | Radiation (03CH06-HY) |
| Bilog Antenna       | SCHAFFNER          | CBL6112B  | 2885       | 30MHz -2GHz     | Nov. 22, 2004    | Nov. 22, 2005 | Radiation (03CH06-HY) |
| Horn Antenna        | Com-Power          | AH118     | 071025     | 1G-18G          | Feb. 22, 2005    | Feb. 22, 2006 | Radiation (03CH06-HY) |
| SHF-EHF Horn        | SCHWARZBECK        | BBHA 9170 | 9170-249   | 14G - 40G       | Jul. 21, 2005    | Jul. 20, 2006 | Radiation (03CH06-HY) |
| HF Amplifier        | MITEQ              | AFS44     | 973248     | 0.1G - 26.5G    | Dec. 17, 2004    | Dec. 17, 2005 | Radiation (03CH06-HY) |
| Amplifier           | MITEQ              | AMF-6F    | 997165     | 26G - 40G       | Jul. 21, 2005    | Jul. 20, 2006 | Radiation (03CH06-HY) |
| Turn Table          | HD                 | DS 420    | 420/650/00 | 0 ~ 360 degree  | N/A              | N/A           | Radiation (03CH06-HY) |
| Antenna Mast        | HD                 | MA 240    | 240/560/00 | 1 m - 4 m       | N/A              | N/A           | Radiation (03CH06-HY) |

## 7. Uncertainty Evaluation

Uncertainty of Conducted Emission Measurement (150kHz ~ 30MHz)

| Contribution                                                           | Uncertainty of $x_i$ |                          | $u(x_i)$ |
|------------------------------------------------------------------------|----------------------|--------------------------|----------|
|                                                                        | dB                   | Probability Distribution |          |
| Receiver reading                                                       | 0.10                 | Normal(k=2)              | 0.05     |
| Cable loss                                                             | 0.10                 | Normal(k=2)              | 0.05     |
| AMN insertion loss                                                     | 2.50                 | Rectangular              | 0.63     |
| Receiver Spec                                                          | 1.50                 | Rectangular              | 0.43     |
| Site imperfection                                                      | 1.39                 | Rectangular              | 0.80     |
| Mismatch                                                               | +0.34/-0.35          | U-shape                  | 0.24     |
| <b>combined standard uncertainty Uc(y)</b>                             | <b>1.13</b>          |                          |          |
| <b>Measuring uncertainty for a level of confidence of 95% U=2Uc(y)</b> | <b>2.26</b>          |                          |          |

Uncertainty of Radiated Emission Evaluation (30MHz ~ 1000MHz)

| Contribution                                                           | Uncertainty of $x_i$ |                          | $u(x_i)$ |
|------------------------------------------------------------------------|----------------------|--------------------------|----------|
|                                                                        | dB                   | Probability Distribution |          |
| Receiver reading                                                       | 0.15                 | Normal(k=2)              | 0.08     |
| Antenna factor calibration                                             | 1.12                 | Normal(k=2)              | 0.56     |
| Cable loss calibration                                                 | 0.12                 | Normal(k=2)              | 0.06     |
| Pre Amplifier Gain calibration                                         | 0.13                 | Normal(k=2)              | 0.07     |
| RCV/SPA specification                                                  | 2.5                  | Rectangular              | 0.72     |
| Antenna Factor Interpolation for Frequency                             | 1                    | Rectangular              | 0.29     |
| Site imperfection                                                      | 2.1                  | Rectangular              | 1.21     |
| Mismatch                                                               | +0.39/-0.41          | U-shaped                 | 0.28     |
| <b>combined standard uncertainty Uc(y)</b>                             | <b>1.58</b>          |                          |          |
| <b>Measuring uncertainty for a level of confidence of 95% U=2Uc(y)</b> | <b>3.16</b>          |                          |          |



## Uncertainty of Radiated Emission Measurement (1GHz ~ 40GHz)

| Contribution                                                                                                                               | Uncertainty of $x_i$ |                          | $u(x_i)$ | $C_i$ | $C_i * u(x_i)$ |
|--------------------------------------------------------------------------------------------------------------------------------------------|----------------------|--------------------------|----------|-------|----------------|
|                                                                                                                                            | dB                   | Probability Distribution |          |       |                |
| Receiver reading                                                                                                                           | $\pm 0.10$           | Normal(k=1)              | 0.10     | 1     | 0.10           |
| Antenna factor calibration                                                                                                                 | $\pm 1.70$           | Normal(k=2)              | 0.85     | 1     | 0.85           |
| Cable loss calibration                                                                                                                     | $\pm 0.50$           | Normal(k=2)              | 0.25     | 1     | 0.25           |
| Receiver Correction                                                                                                                        | $\pm 2.00$           | Rectangular              | 1.15     | 1     | 1.15           |
| Antenna Factor Directional                                                                                                                 | $\pm 1.50$           | Rectangular              | 0.87     | 1     | 0.87           |
| Site imperfection                                                                                                                          | $\pm 2.80$           | Triangular               | 1.14     | 1     | 1.14           |
| Mismatch<br>Receiver VSWR $\Gamma_1 = 0.197$<br>Antenna VSWR $\Gamma_2 = 0.194$<br>Uncertainty = $20 \log(1 - \Gamma_1 \Gamma_2 \Gamma_3)$ | +0.34/-0.35          | U-shaped                 | 0.244    | 1     | 0.244          |
| <b>Combined standard uncertainty <math>U_c(y)</math></b>                                                                                   | <b>2.36</b>          |                          |          |       |                |
| <b>Measuring uncertainty for a level of confidence of 95% <math>U = 2U_c(y)</math></b>                                                     | <b>4.72</b>          |                          |          |       |                |