



243 Jubug-Ri, Yangji-Myeon, Yongin-Si, Gyeonggi-Do, Korea 449-822  
Tel: +82-31-323-6008 Fax: +82-31-323-6010  
<http://www.ltalab.com>

**SENA**

Dates of Tests: Oct 25~Nov 02, 2010

Test Report S/N: LR500191011A

Test Site : LTA CO., LTD.

## CERTIFICATION OF COMPLIANCE

FCC ID.

IC

APPLICANT

**S7APARANISD1000U****8154A-SD1000U****Sena Technologies, Inc.**

|                           |   |                                                                                    |
|---------------------------|---|------------------------------------------------------------------------------------|
| Equipment Class           | : | Part 15 Spread Spectrum Transmitter (DSS)                                          |
| Manufacturing Description | : | Bluetooth USB-Serial Adapter                                                       |
| Manufacturer              | : | Sena Technologies, Inc.                                                            |
| Model name                | : | Parani-SD1000U                                                                     |
| Test Device Serial No.:   | : | Identical prototype                                                                |
| Rule Part(s)              | : | FCC Part 15.247 Subpart C; ANSI C-63.4-2003<br>RSS-210 and ISSUE No.: 7 Date: 2007 |
| Frequency Range           | : | 2402 ~ 2480MHz                                                                     |
| RF power                  | : | 13.3 dBm - Conducted                                                               |
| Data of issue             | : | November 2, 2010                                                                   |

This test report is issued under the authority of:

Kyung-Taek LEE, Technical Manager

The test was supervised by:

Hyun-Chae You, Test Engineer

This test result only responds to the tested sample. It is not allowed to copy this report even partly without the allowance of the test laboratory. This report must not be used by the applicant to claim product endorsement by any agency.



NVLAP LAB Code.: 200723-0

## **TABLE OF CONTENTS**

|                                                |    |
|------------------------------------------------|----|
| 1. GENERAL INFORMATION'S                       | 3  |
| 2. INFORMATION'S ABOUT TEST ITEM               | 4  |
| 3. TEST REPORT                                 | 5  |
| 3.1 SUMMARY OF TESTS                           | 5  |
| 3.2 TECHNICAL CHARACTERISTICS TEST             | 6  |
| 3.2.1 CARRIER FREQUENCY SEPARATION             | 6  |
| 3.2.2 NUMBER OF HOPPING FREQUENCIES            | 8  |
| 3.2.3 20 dB BANDWIDTH                          | 10 |
| 3.2.4 TIME OF OCCUPANCY (Dwell Time)           | 17 |
| 3.2.5 TRANSMITTER OUTPUT POWER                 | 22 |
| 3.2.6 BAND – EDGE & SPURIOUS                   | 26 |
| 3.2.7 FIELD STRENGTH OF HARMONICS -Transmitter | 32 |
| 3.2.8 FIELD STRENGTH OF HARMONICS -Receiver    | 36 |
| 3.2.9 AC CONDUCTED EMISSIONS                   | 39 |
| <br><b>APPENDIX</b>                            |    |
| APPENDIX TEST EQUIPMENT USED FOR TESTS         | 42 |

## 1. General information's

### 1-1 Test Performed

Company name : LTA Co., Ltd.  
 Address : 243, Jubug-ri, Yangji-Myeon, Youngin-Si, Kyunggi-Do, Korea. 449-822  
 Web site : <http://www.ltalab.com>  
 E-mail : [chahn@ltalab.com](mailto:chahn@ltalab.com)  
 Telephone : +82-31-323-6008  
 Facsimile : +82-31-323-6010

Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the “General requirements for the competents of calibration and testing laboratory”.

### 1-2 Accredited agencies

LTA Co., Ltd. is approved to perform EMC testing by the following agencies:

| Agency | Country | Accreditation No. | Validity   | Reference           |
|--------|---------|-------------------|------------|---------------------|
| NVLAP  | U.S.A   | 200723-0          | 2011-09-30 | ECT accredited Lab. |
| RRL    | KOREA   | KR0049            | 2011-06-20 | EMC accredited Lab. |
| FCC    | U.S.A   | 610755            | 2011-04-22 | FCC filing          |
| VCCI   | JAPAN   | R2133, C2307      | 2011-06-21 | VCCI registration   |
| IC     | CANADA  | IC5799            | 2012-05-14 | IC filing           |



### 3. Test Report

#### 3.1 Summary of tests

| FCC Part<br>Section(s) | Parameter                        | Limit             | Test<br>Condition | Status<br>(note 1) |
|------------------------|----------------------------------|-------------------|-------------------|--------------------|
| 15.247(a)              | Carrier Frequency Separation     | > 25 kHz          | Conducted         | C                  |
| 15.247(a)              | Number of Hopping Frequencies    | > 15 hops         |                   | C                  |
| 15.247(a)              | 20 dB Bandwidth<br>99% Bandwidth | > 1.5 MHz         |                   | C                  |
| 15.247                 | Dwell Time                       | < 0.4 seconds     |                   | C                  |
| 15.247(b)              | Transmitter Output Power         | < 250 mWatt       |                   | C                  |
| 15.247(d)              | Conducted Spurious emission      | > 20 dBc          |                   | C                  |
| 15.247(d)              | Band Edge                        | > 20 dBc          |                   | C                  |
| 15.249 / 15.209        | Field Strength of Harmonics      | < 54 dBuV (at 3m) | Radiated          | C                  |
| 15.109                 | Field Strength                   | -                 |                   | C                  |
| 15.207 / 15.107        | AC Conducted Emissions           | EN 55022          | Line Conducted    | C                  |
| 15.203                 | Antenna requirement              | -                 | -                 | C                  |

Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable

Note 2: The data in this test report are traceable to the national or international standards.

The sample was tested according to the following specification:

FCC Parts 15.247; ANSI C-63.4-2003

RSS-210 and ISSUE No.: 7 Date: 2007

#### → Antenna Requirement

The Sena Technologies, Inc. Parani-SD1000U unit complies with the requirement of §15.203.

The antenna connector is the reverse polarity SMA connector.

## 3.2 Transmitter requirements

### 3.2.1 Carrier Frequency Separation

#### Procedure:

The carrier frequency separation was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

After the trace being stable, the reading value between the peaks of the adjacent channels using the marker-delta function was recorded as the measurement results.

The spectrum analyzer is set to:

Span = 3 MHz (wide enough to capture the peaks of two adjacent channels)

RBW = 10 kHz (1% of the span or more)      Sweep = auto

VBW = 10 kHz      Detector function = peak

Trace = max hold

#### Measurement Data:

| Test Results                       |          |
|------------------------------------|----------|
| Carrier Frequency Separation (MHz) | Result   |
| 1.003                              | Complies |

- See next pages for actual measured spectrum plots.

#### Minimum Standard:

The EUT shall have hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of 20dB bandwidth of the hopping channel, whichever is greater.

#### Measurement Setup

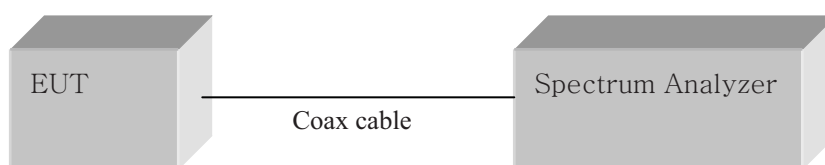
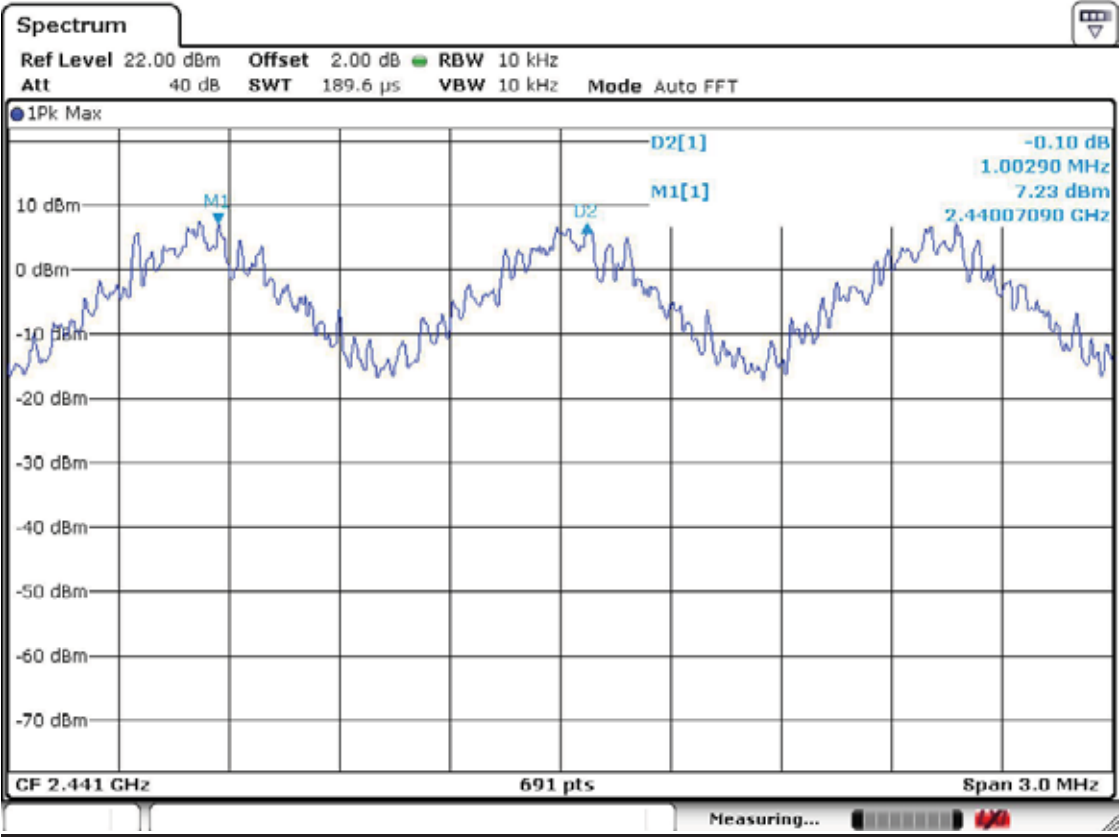
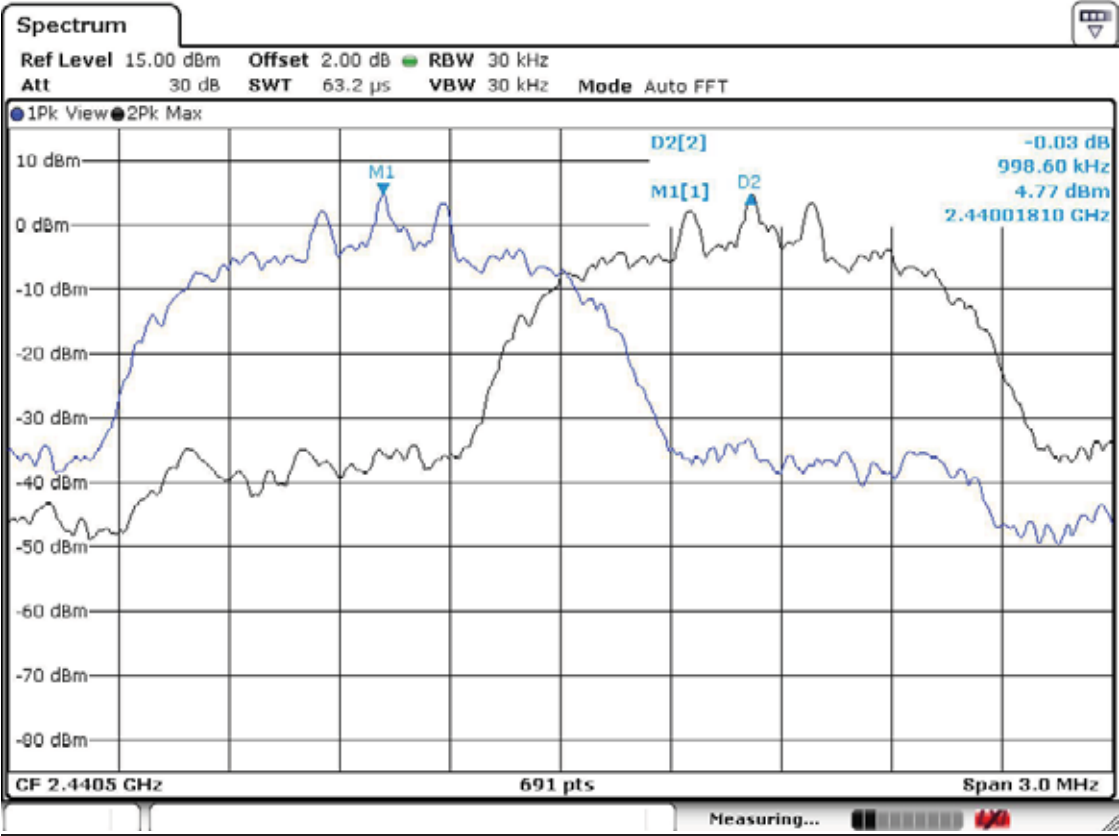


Figure 1: Measurement setup for the carrier frequency separation

Carrier Frequency Separation  
Basic Mode

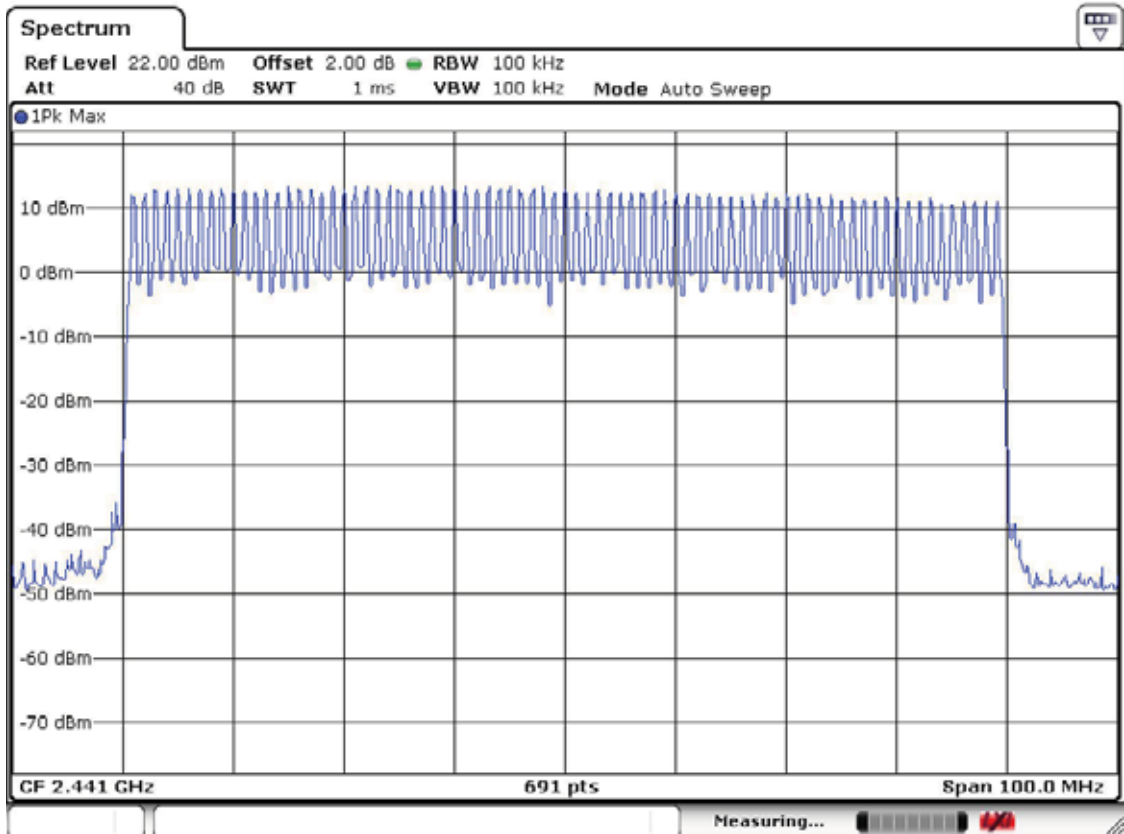


EDR Mode





Number of Hopping Frequencies



### 3.2.3 20 dB Bandwidth

#### Procedure:

The bandwidth at 20 dB below the highest inband spectral density was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function disabled at the highest, middle and the lowest available channels..

After the trace being stable, Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is ( as close as possible to ) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

Span = 3 MHz (approximately 2 or 3 times of the 20 dB bandwidth)

RBW = 30 kHz

Sweep = auto

VBW = 30 kHz (VBW  $\geq$  RBW)

Detector function = peak

Trace = max hold

dB/Div = 5dB

#### Measurement Data: Basic Mode

| Frequency<br>(MHz) | Channel No. | Test Results(MHz) |               |
|--------------------|-------------|-------------------|---------------|
|                    |             | 20dB Bandwidth    | 99% Bandwidth |
| 2402               | 0           | 0.834             | 0.899         |
| 2441               | 39          | 0.890             | 0.894         |
| 2480               | 78          | 0.834             | 0.886         |

#### Measurement Data: EDR Mode

| Frequency<br>(MHz) | Channel No. | Test Results(MHz) |               |
|--------------------|-------------|-------------------|---------------|
|                    |             | 20dB Bandwidth    | 99% Bandwidth |
| 2402               | 0           | 1.216             | 1.172         |
| 2441               | 39          | 1.216             | 1.172         |
| 2480               | 78          | 1.207             | 1.172         |

- See next pages for actual measured spectrum plots.

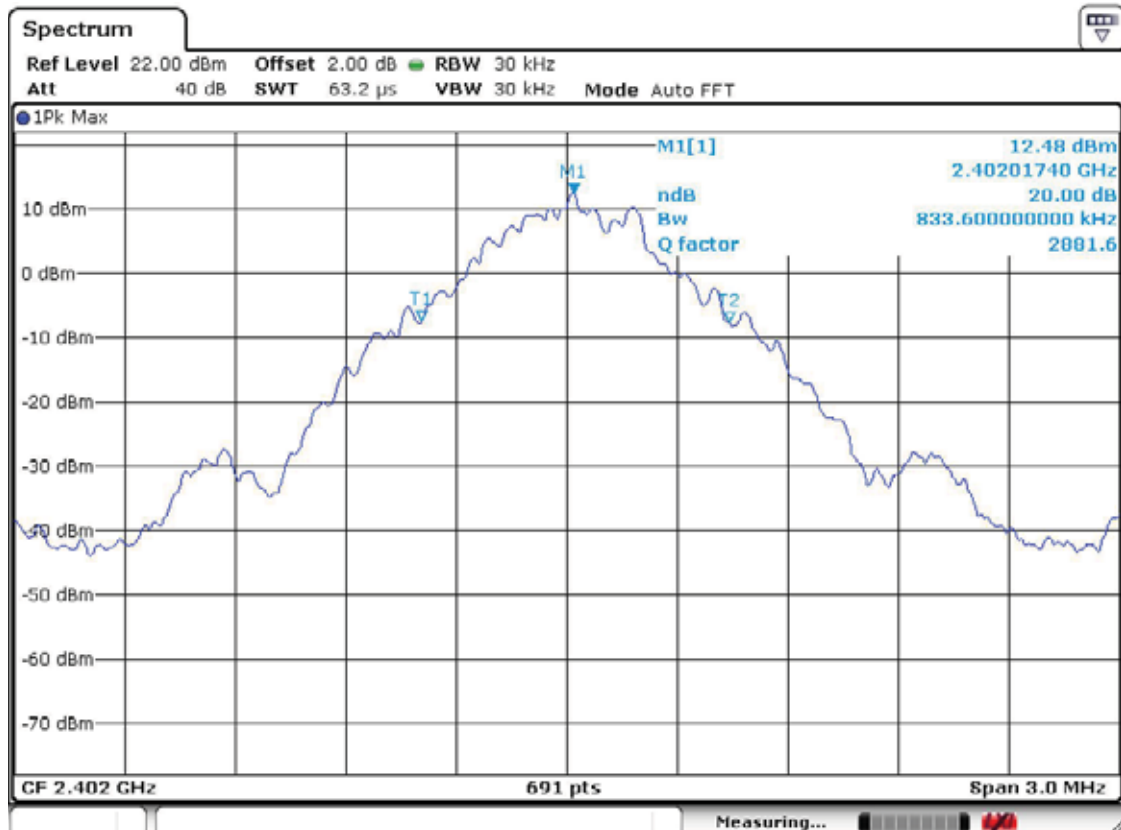
#### Minimum Standard:

N/A

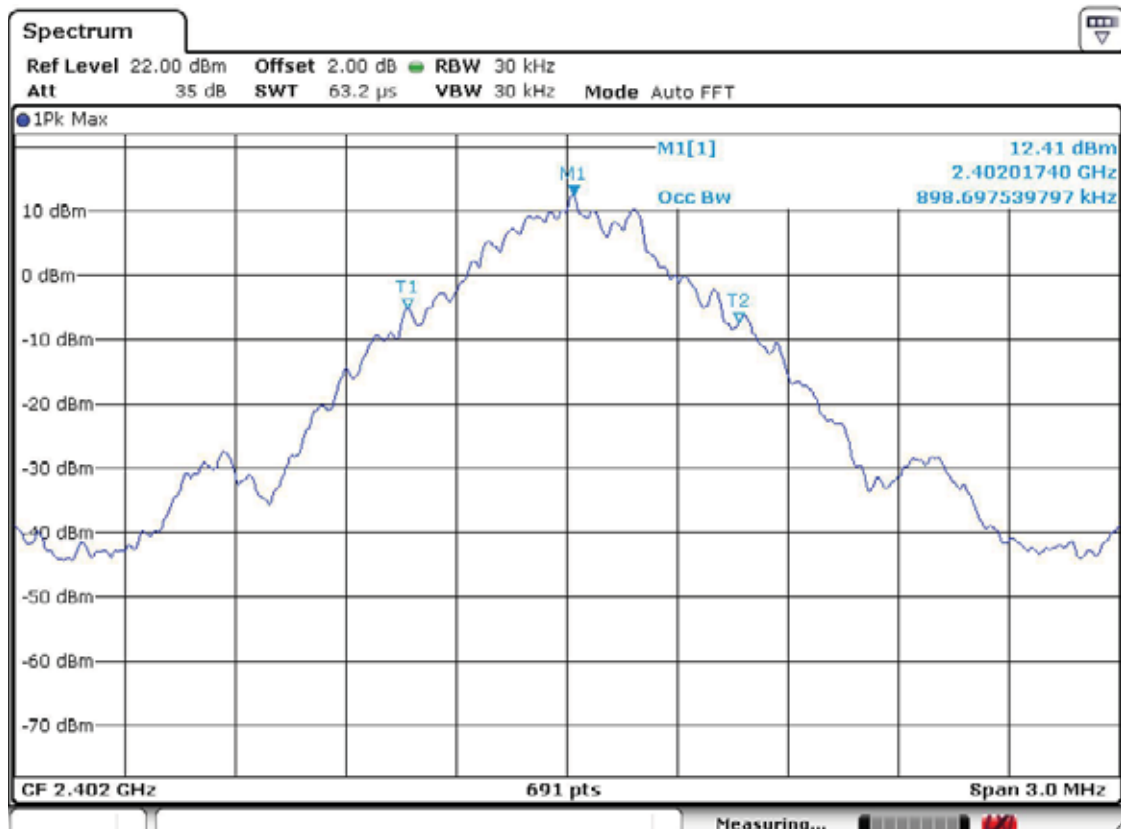
#### Measurement Setup

Same as the Chapter 3.2.1 (Figure 1)

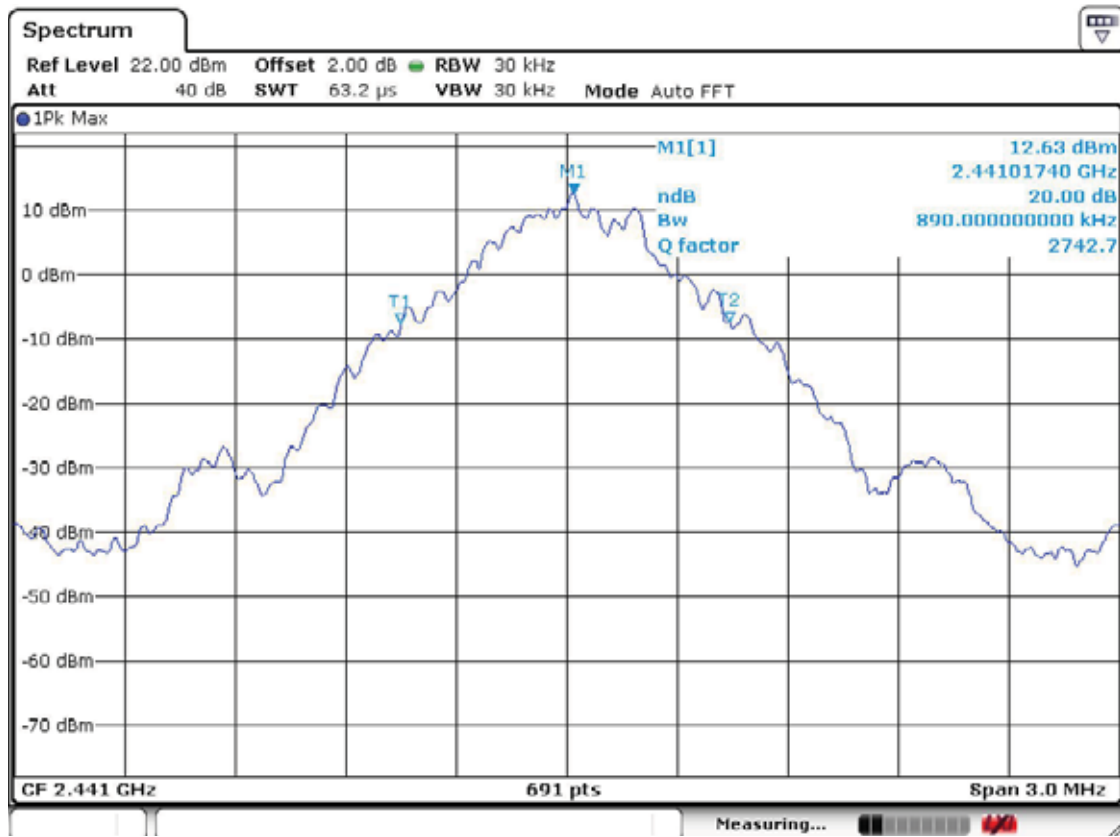
**Channel 1 of basic mode**  
**20 dB Bandwidth**



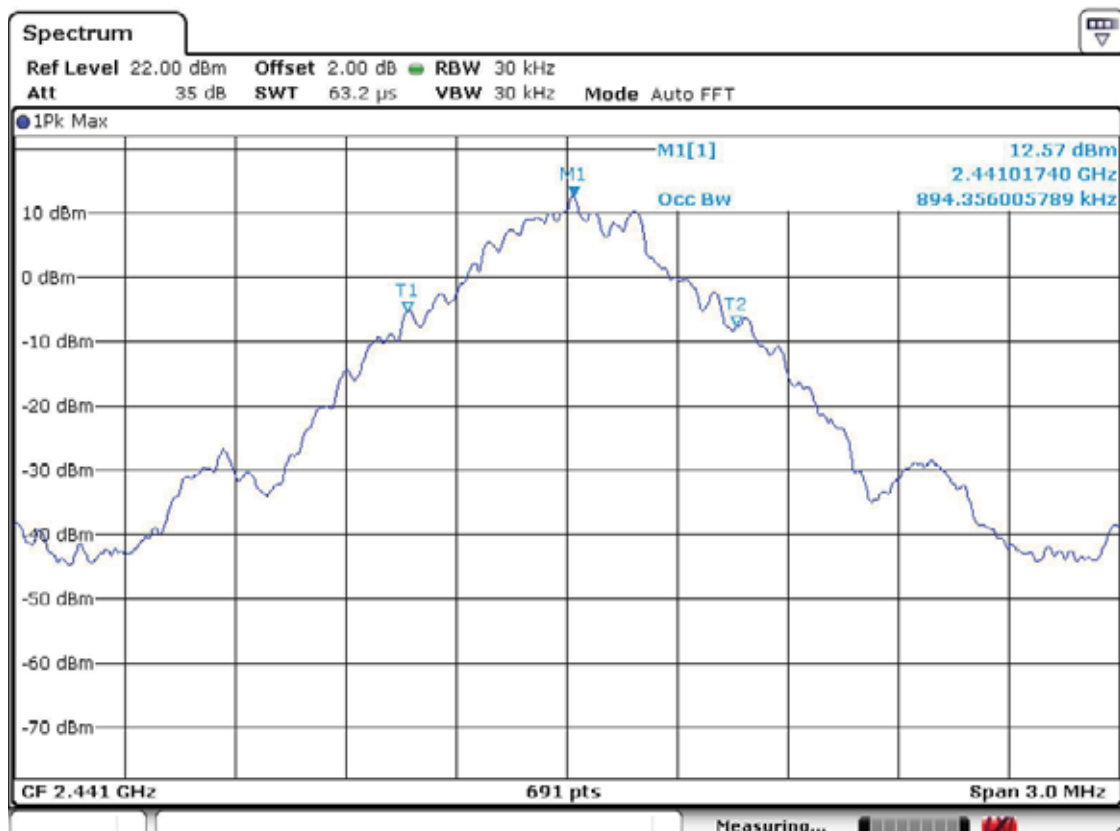
**99% Bandwidth**

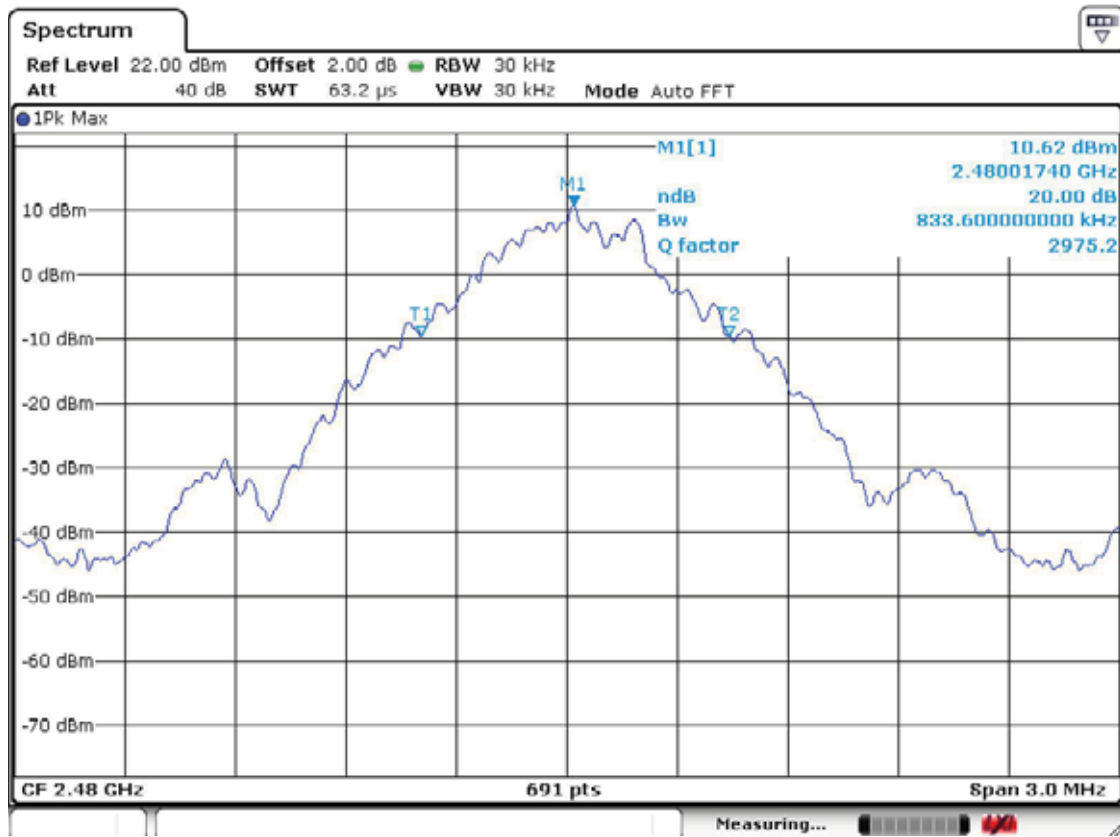


**Channel 2 of basic mode**  
**20 dB Bandwidth**

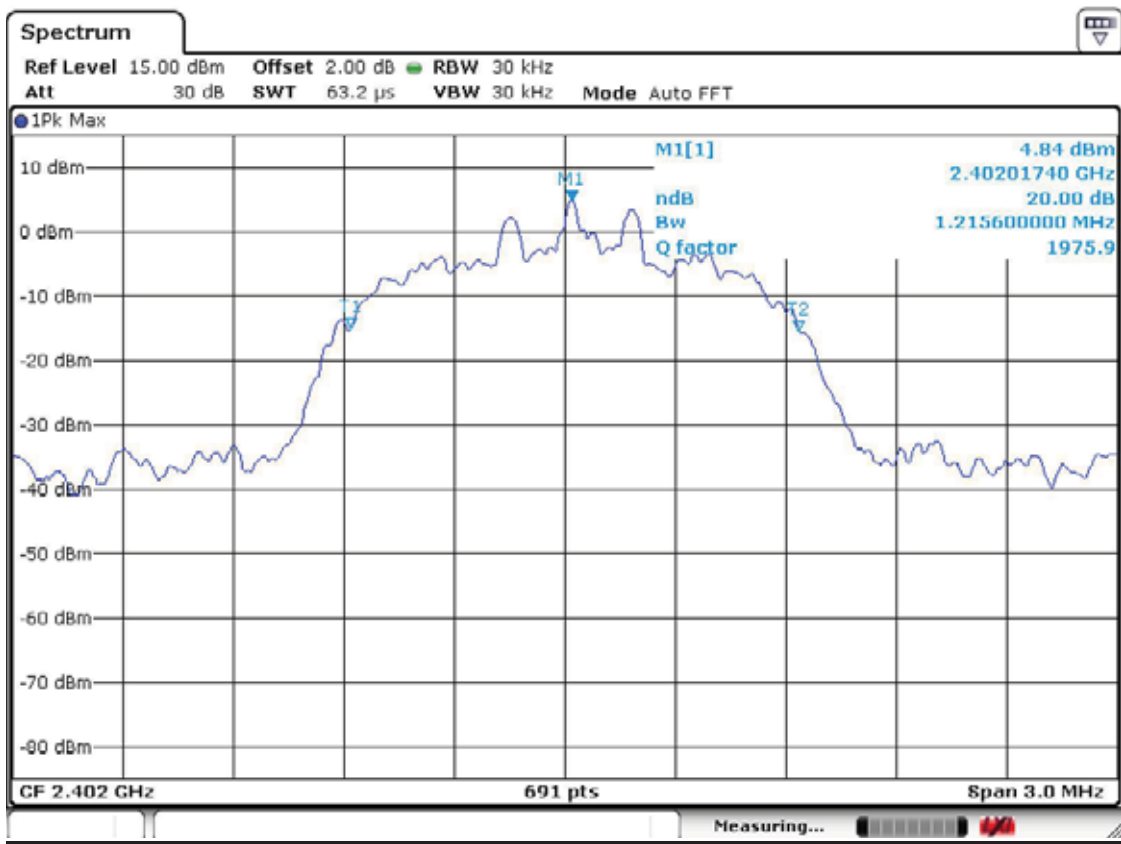


**99% Bandwidth**

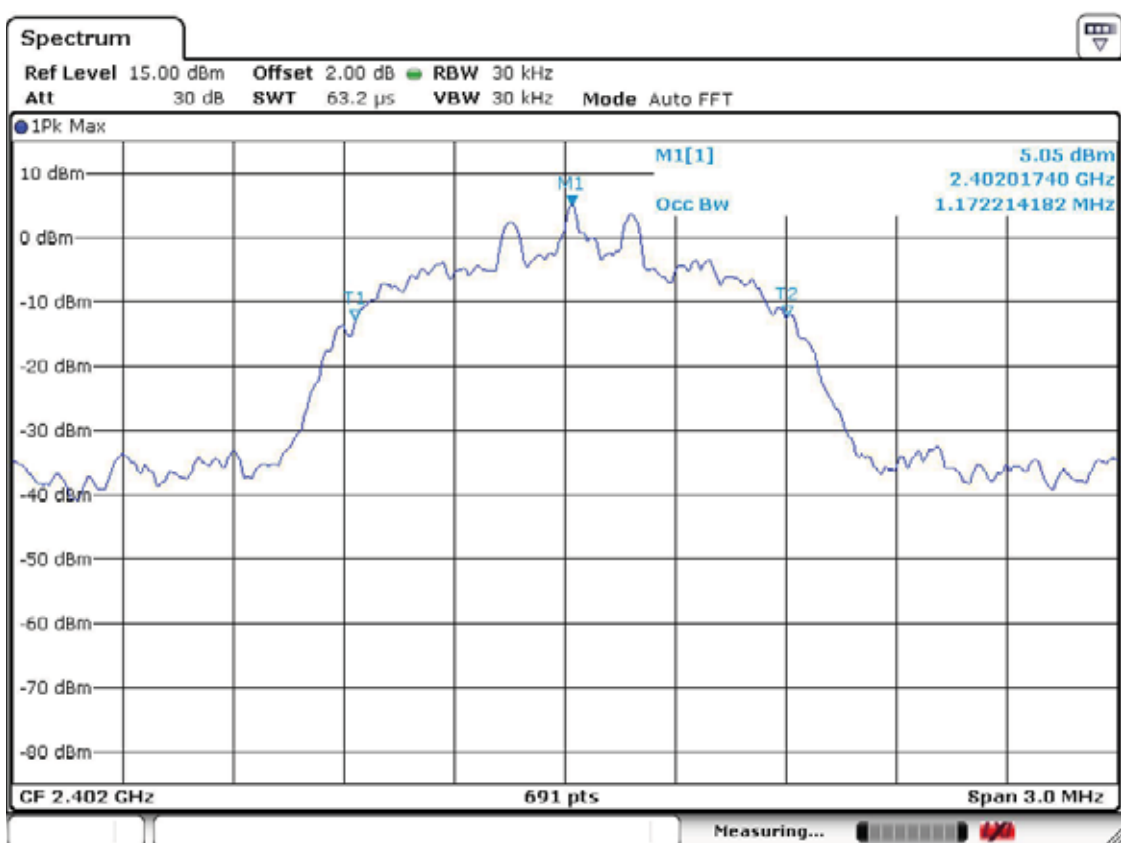


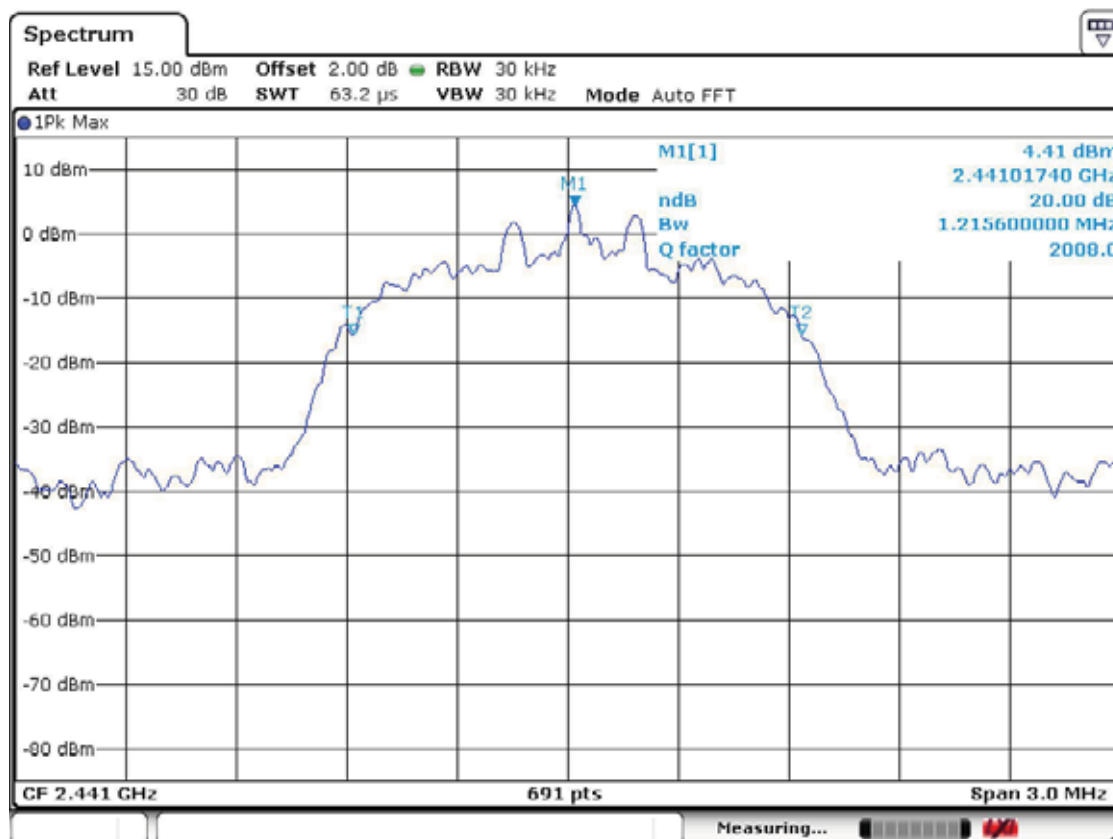
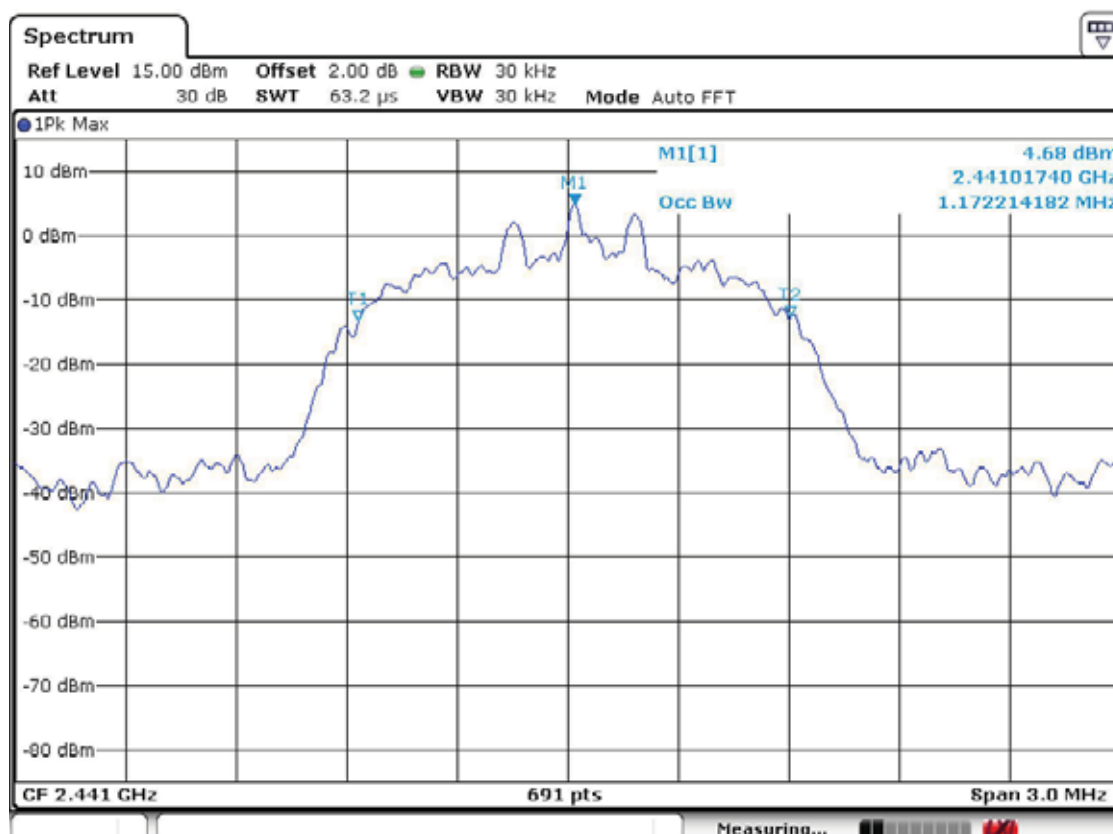
**Channel 3 of basic mode****20 dB Bandwidth****99% Bandwidth**

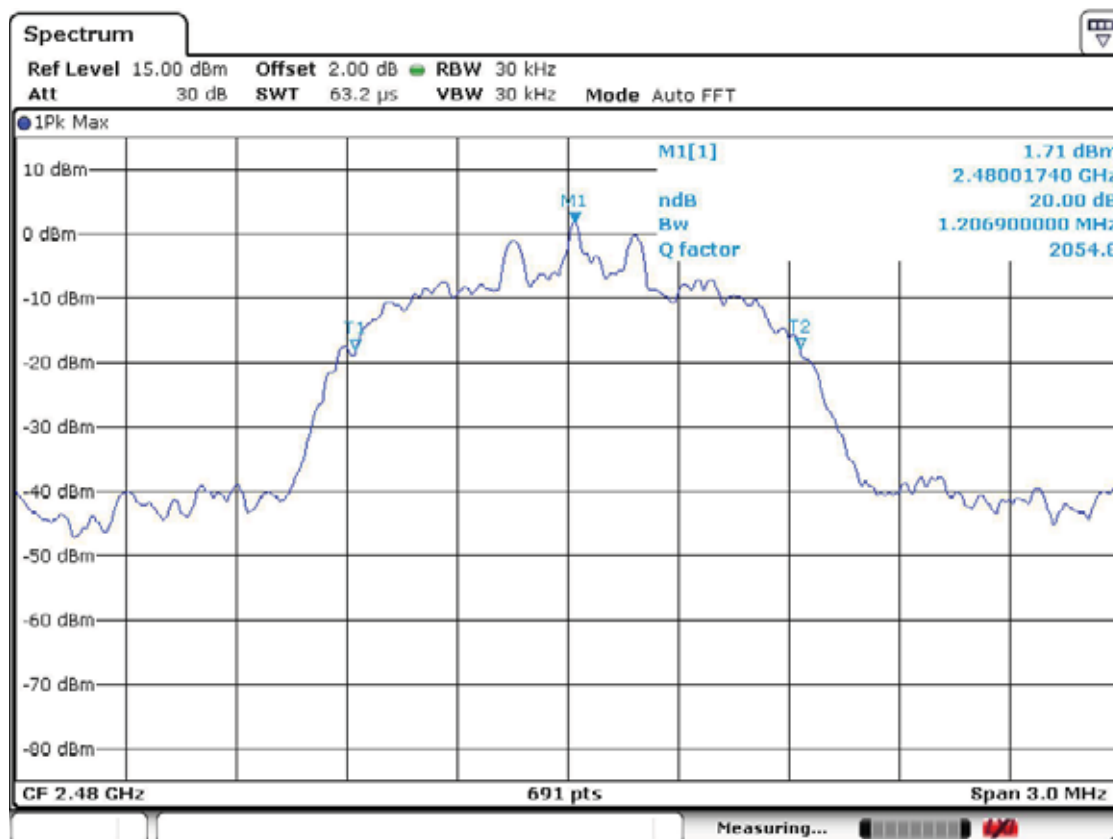
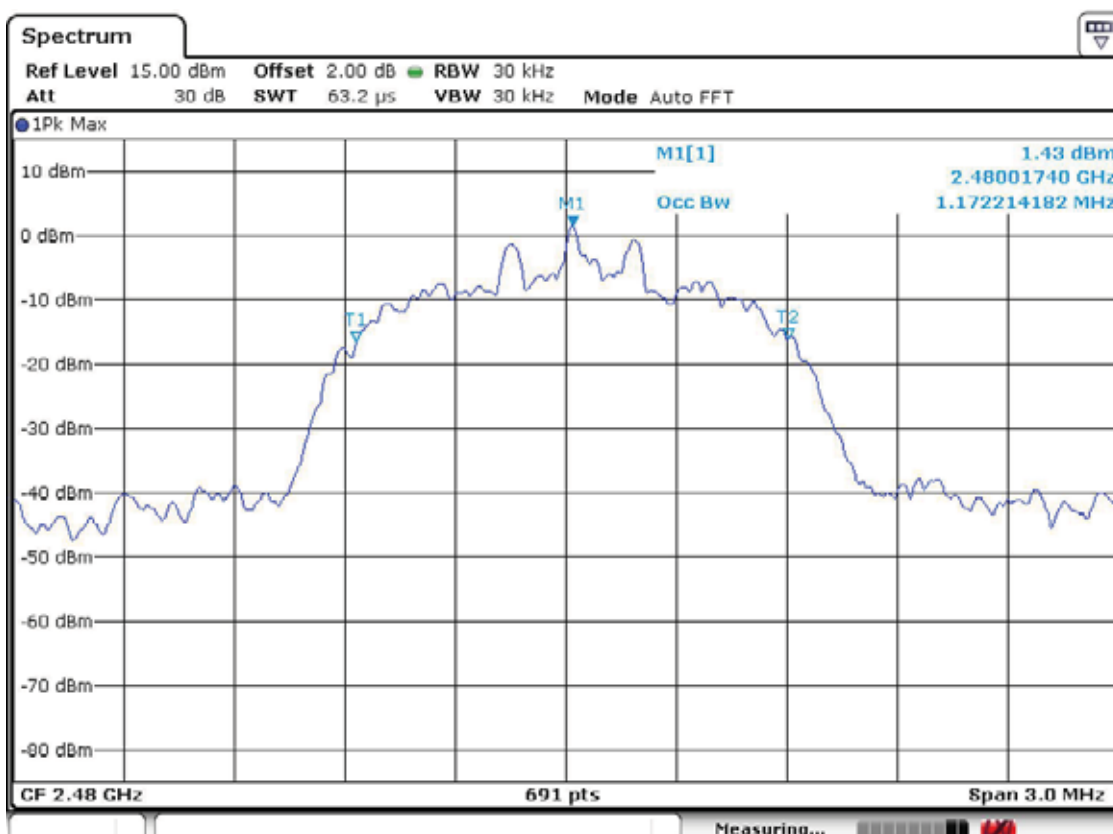
**Channel 1 at EDR mode**  
**20 dB Bandwidth**



**99% Bandwidth**



**Channel 2 at EDR mode****20 dB Bandwidth****99% Bandwidth**

**Channel 3 at EDR mode****20 dB Bandwidth****99% Bandwidth**

### 3.2.4 Time of Occupancy (Dwell Time)

#### Procedure:

The dwell time was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

The spectrum analyzer is set to:

Center frequency = 2441 MHz

Span = zero

RBW = 1 MHz

VBW = 1 MHz (VBW  $\geq$  RBW)

Trace = max hold

Detector function = peak

#### Measurement Data:

| Mode          | Number of transmission in a<br>31.6s ( 79Hopping*0.4) | Length of Transmission<br>Time (msec) | Result<br>(msec) | Limit<br>(msec) |
|---------------|-------------------------------------------------------|---------------------------------------|------------------|-----------------|
| DH1           | 30(Times / 3sec) *10.533 = 315.99                     | 0.522                                 | 164.95           | 400             |
| DH3           | 15(Times / 3sec) *10.533 = 158.00                     | 1.752                                 | 276.82           | 400             |
| DH5           | 10(Times / 3sec) *10.533 = 105.33                     | 3.028                                 | 318.94           | 400             |
| EDR 3Mbps DH5 | 10(Times / 3sec) *10.533 = 105.33                     | 3.073                                 | 323.68           | 400             |

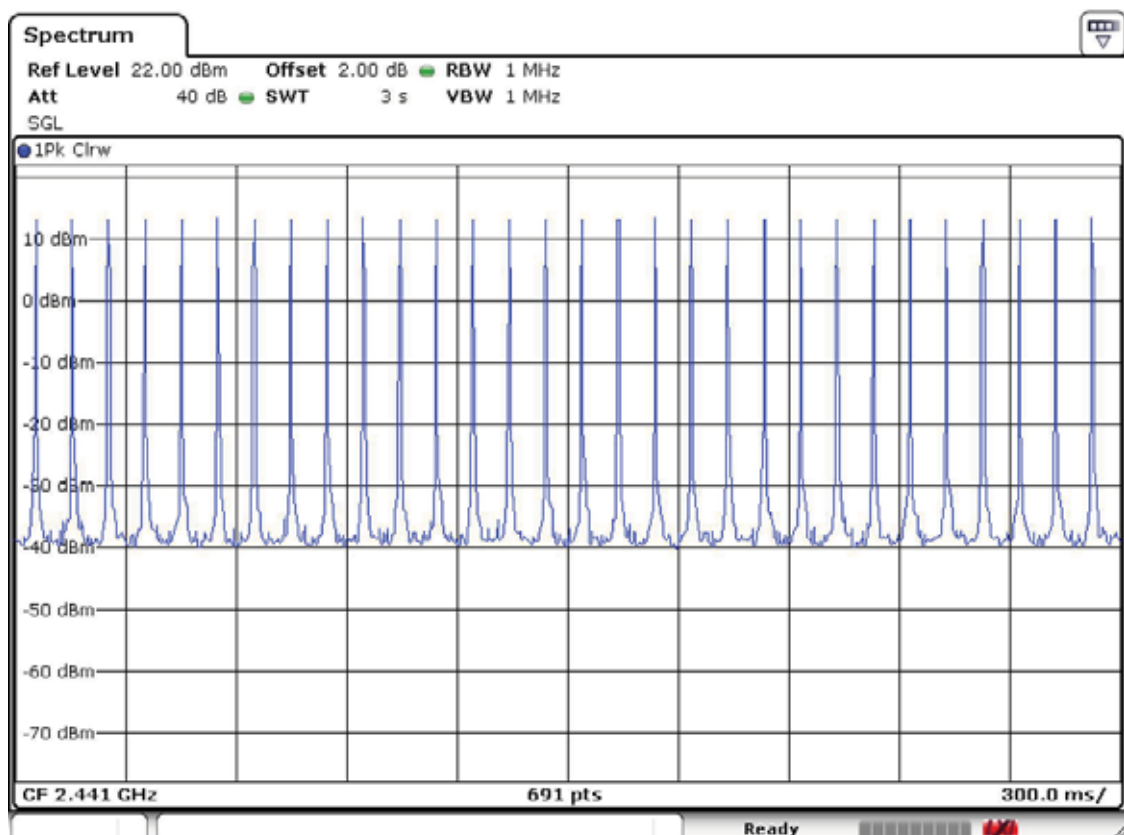
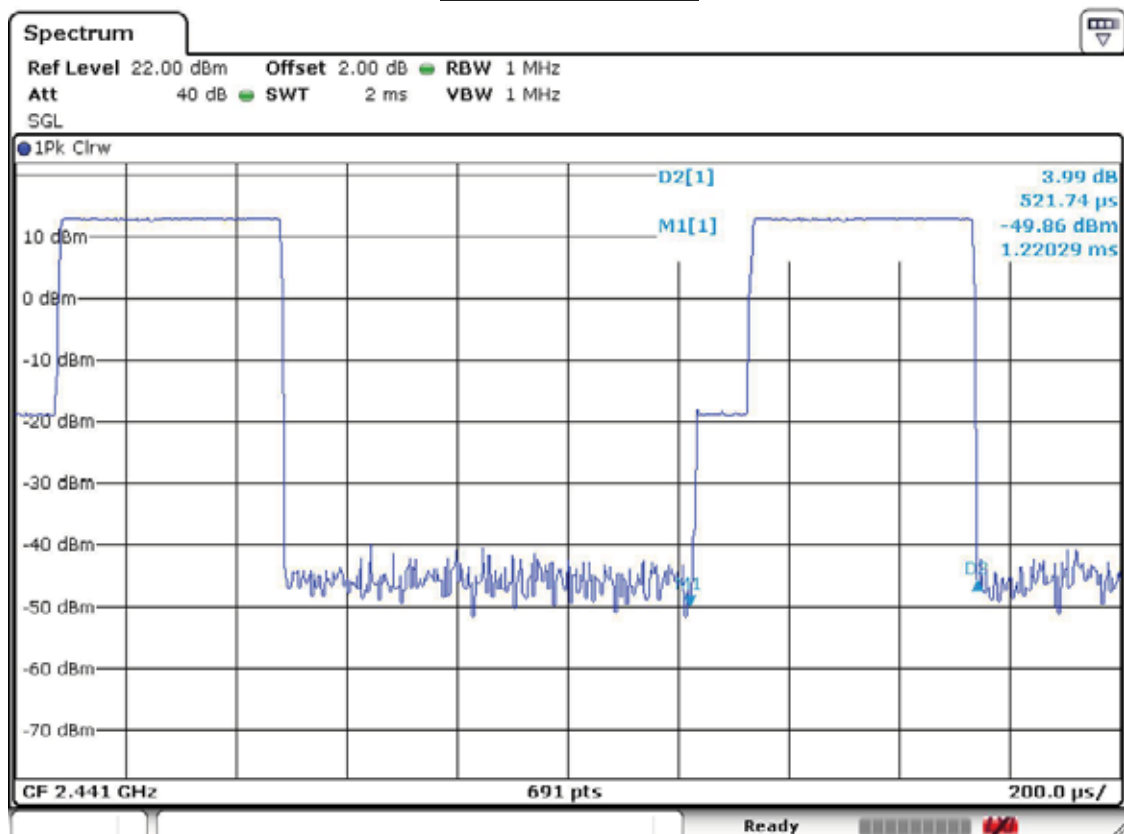
- See next pages for actual measured spectrum plots.
- dwell time = {(number of hopping per second / number of slot ) x duration time per channel} x 0.4 ms

#### Minimum Standard:

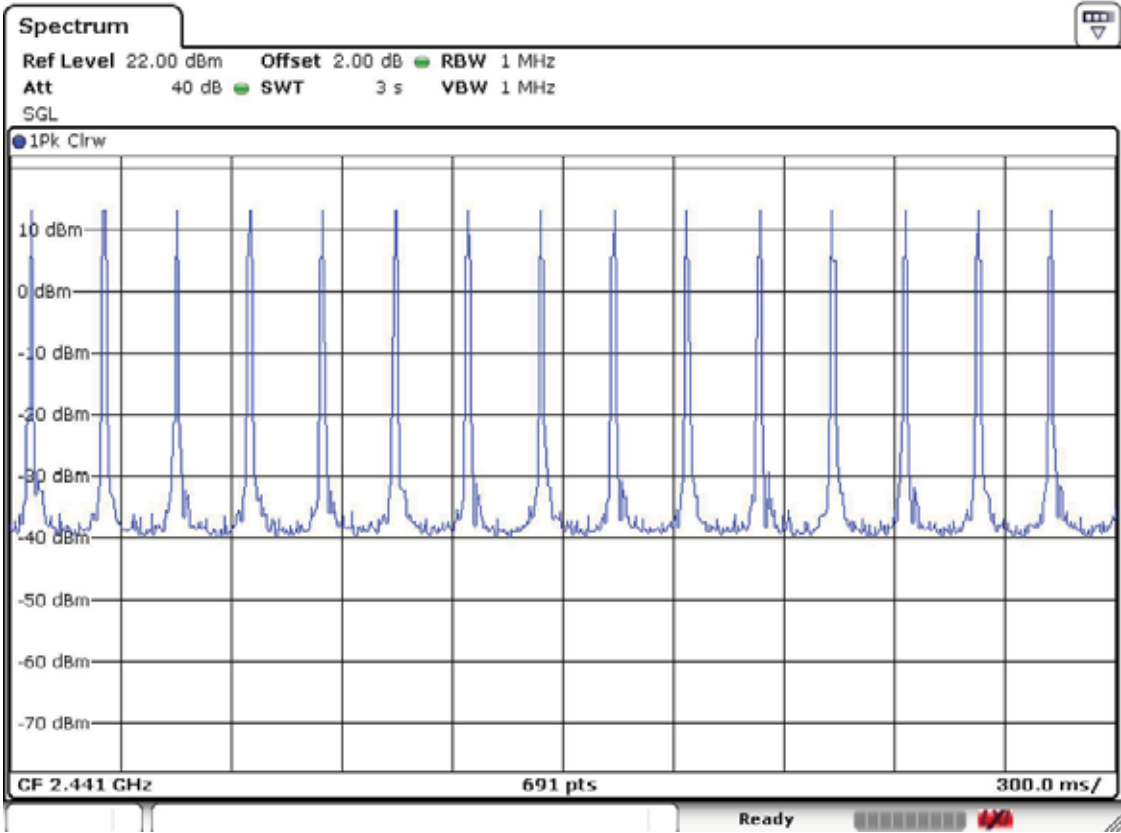
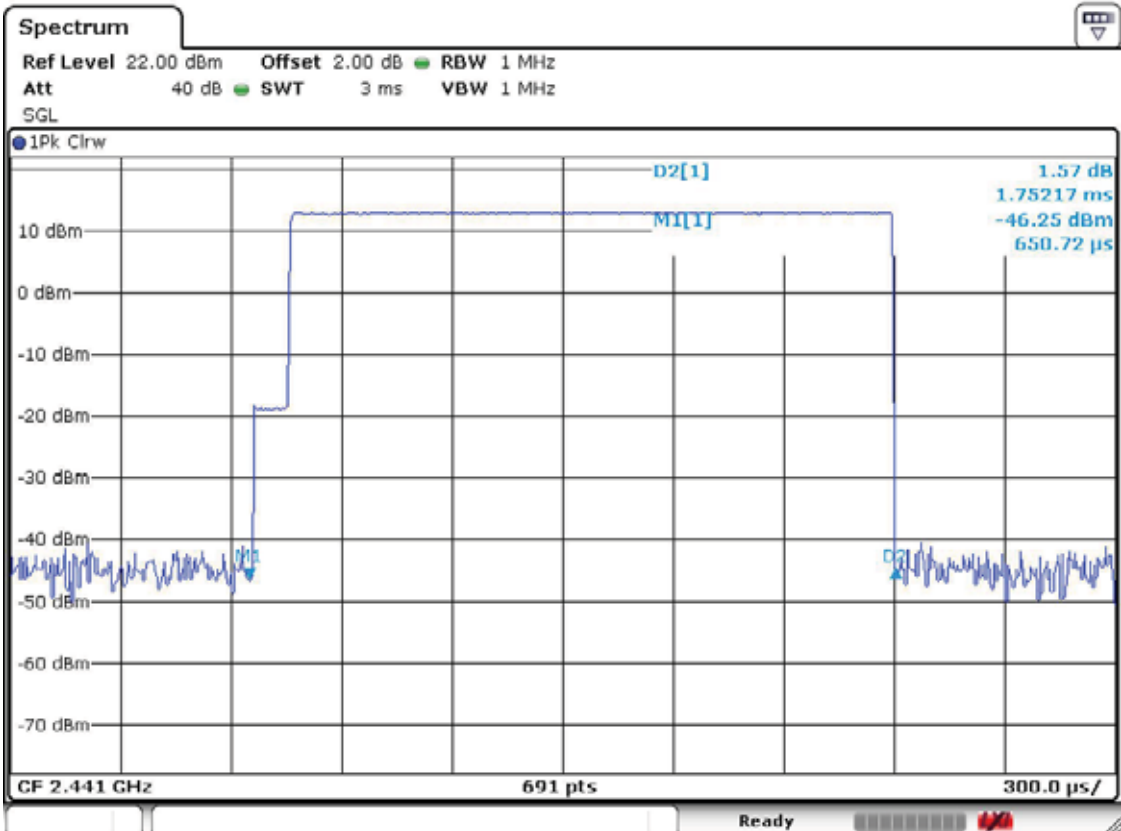
0.4 seconds within a 30 second period per any frequency

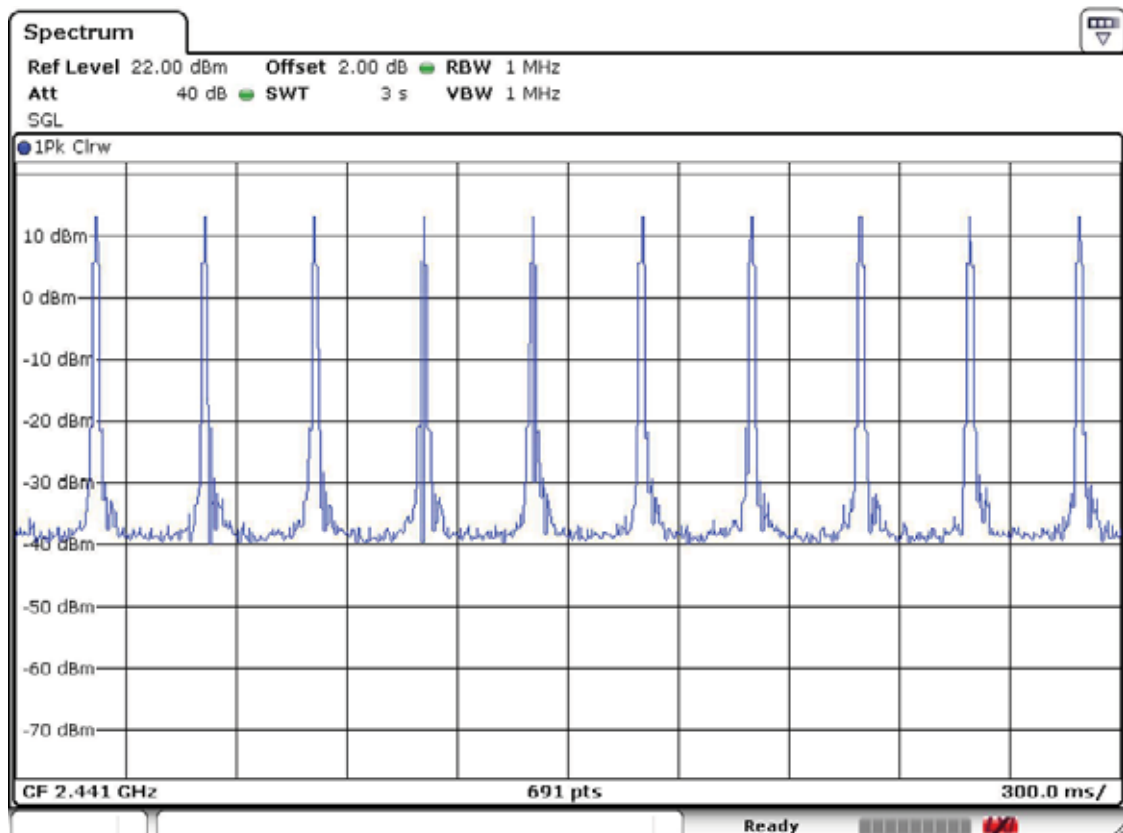
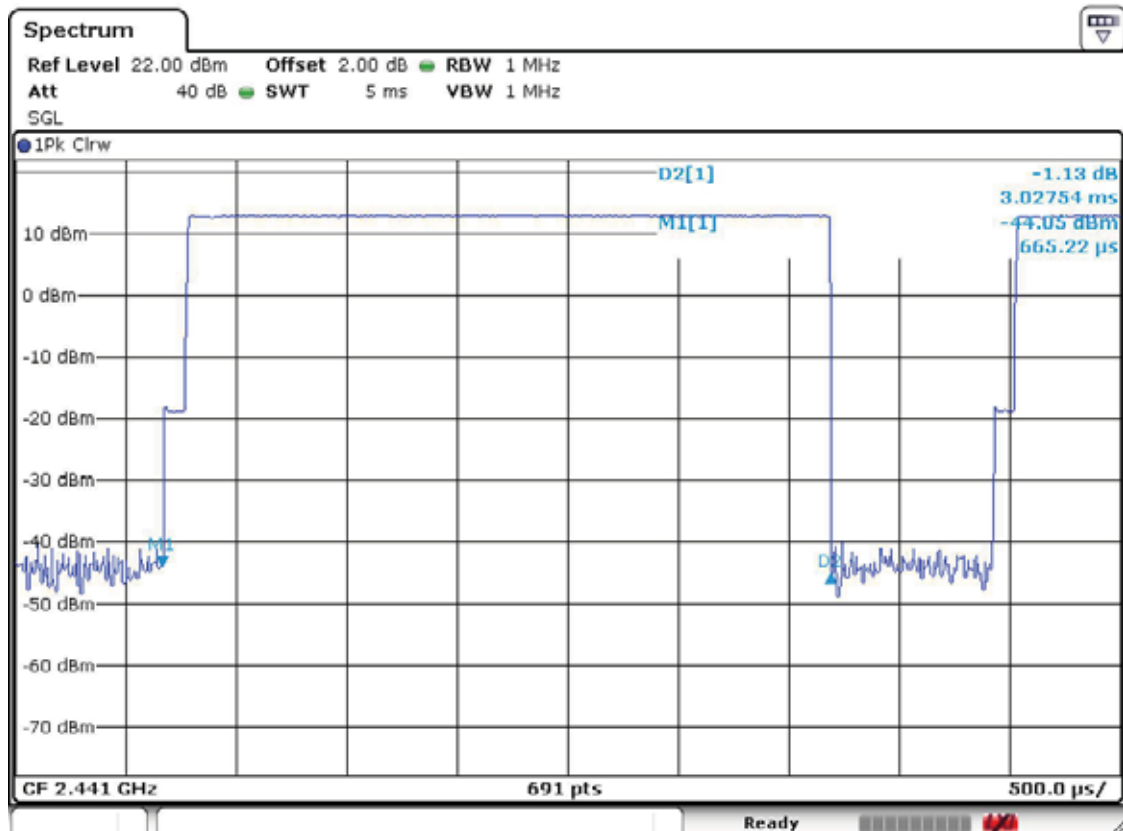
#### Measurement Setup

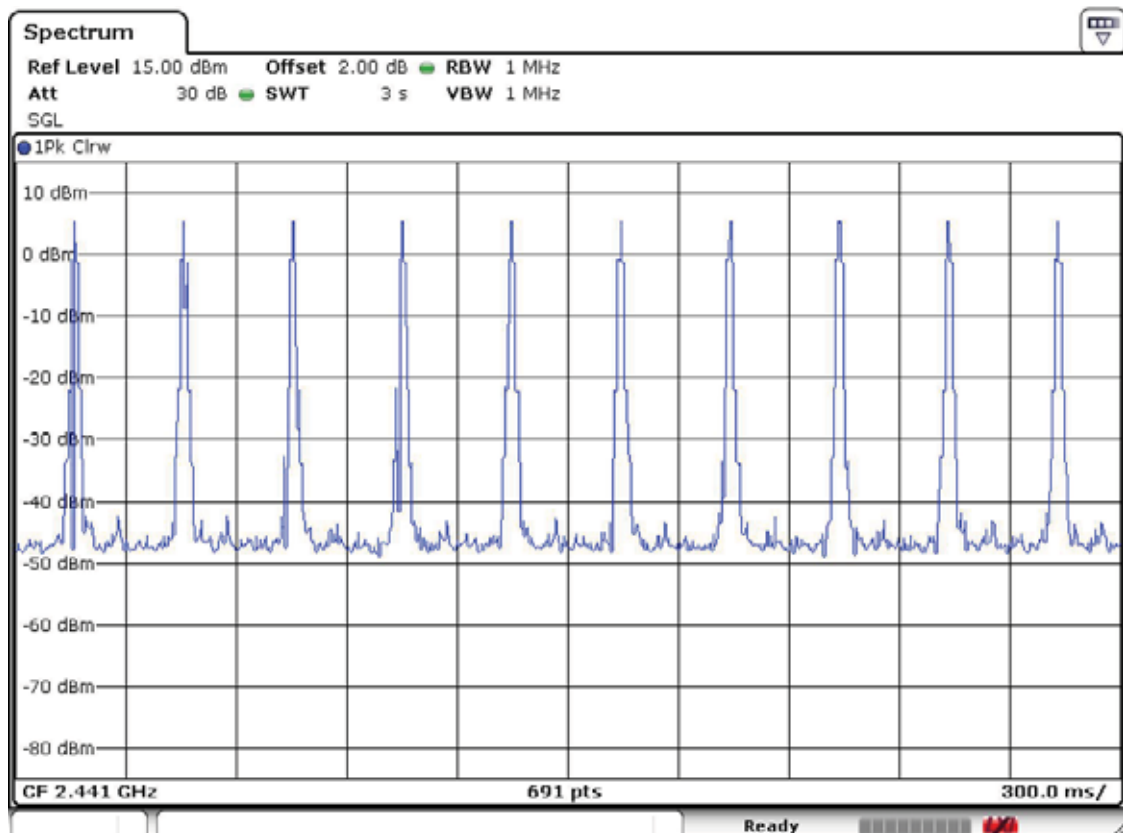
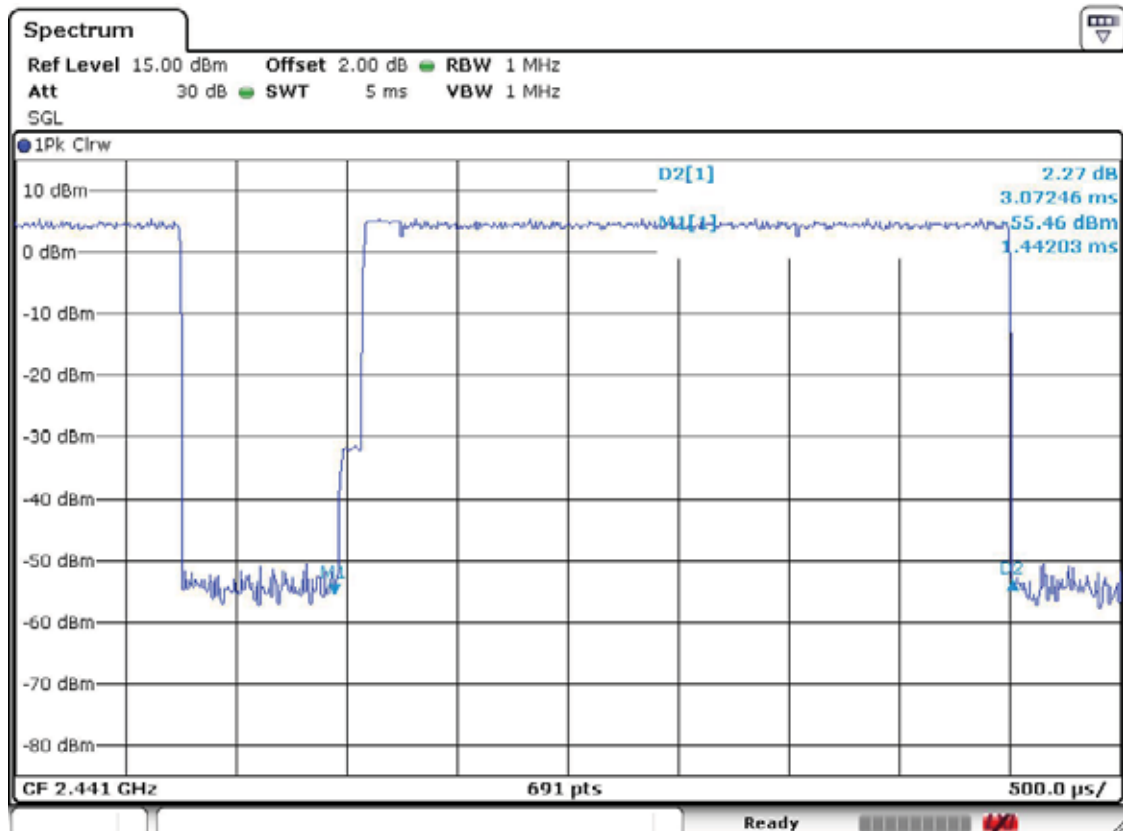
Same as the Chapter 3.2.1 (Figure 1)

DH1 at basic mode

DH3 at basic mode



DH5 at basic mode

**DH5 at EDR mode with 3Mbps**

### 3.2.5 Transmitter Output Power

#### Procedure:

The peak output power was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function disabled at the highest, middle and the lowest available channels..

After the trace being stable, Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power.

#### The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

Span = 20 MHz (approximately 5 times of the 20 dB bandwidth)

RBW = 3 MHz (greater than the 20dB bandwidth of the emission being measured)

VBW = 3 MHz (VBW  $\geq$  RBW)

Detector function = peak

Trace = max hold

Sweep = auto

#### Measurement Data: Basic Mode

| Frequency (MHz) | Ch. | Test Results |       |          |
|-----------------|-----|--------------|-------|----------|
|                 |     | dBm          | mW    | Result   |
| 2402            | 0   | 13.14        | 20.61 | Complies |
| 2441            | 39  | 13.30        | 21.38 | Complies |
| 2480            | 78  | 11.31        | 13.52 | Complies |

#### Measurement Data: EDR Mode

| Frequency (MHz) | Ch. | Test Results |      |          |
|-----------------|-----|--------------|------|----------|
|                 |     | dBm          | mW   | Result   |
| 2402            | 0   | 6.08         | 4.06 | Complies |
| 2441            | 39  | 5.70         | 3.72 | Complies |
| 2480            | 78  | 2.65         | 1.84 | Complies |

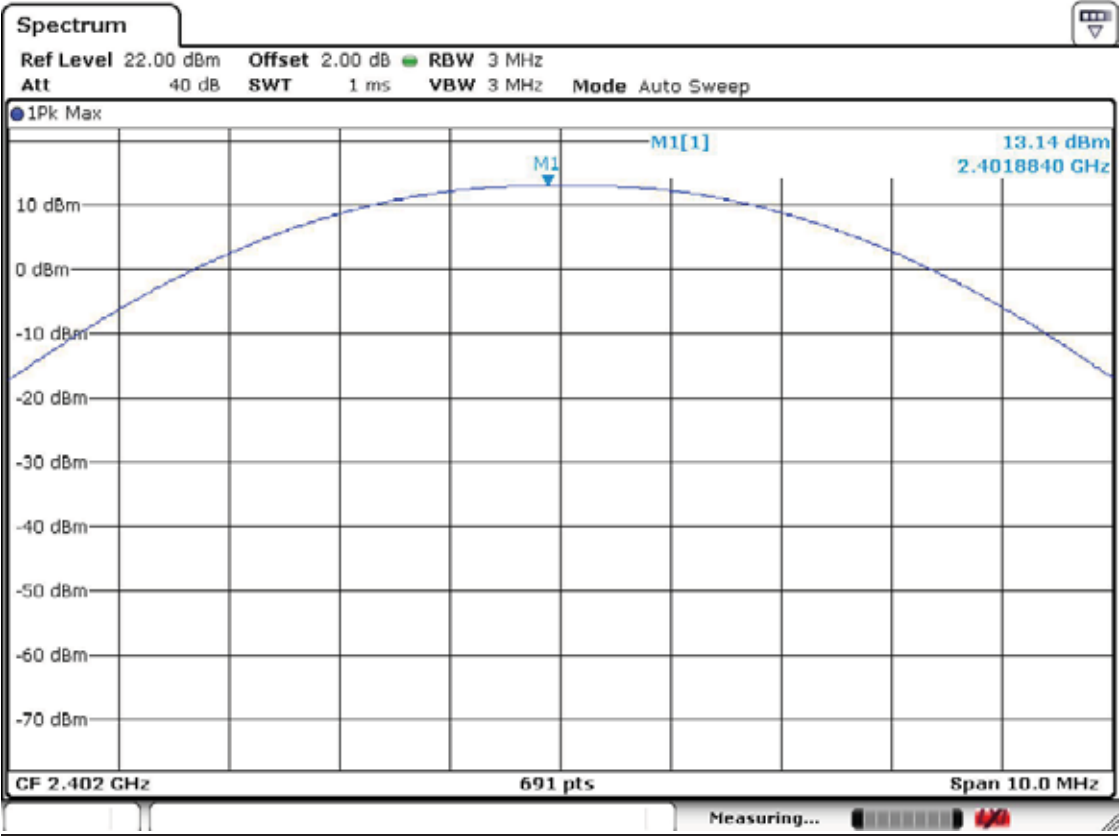
- See next pages for actual measured spectrum plots.

|                   |          |
|-------------------|----------|
| Minimum Standard: | < 250 mW |
|-------------------|----------|

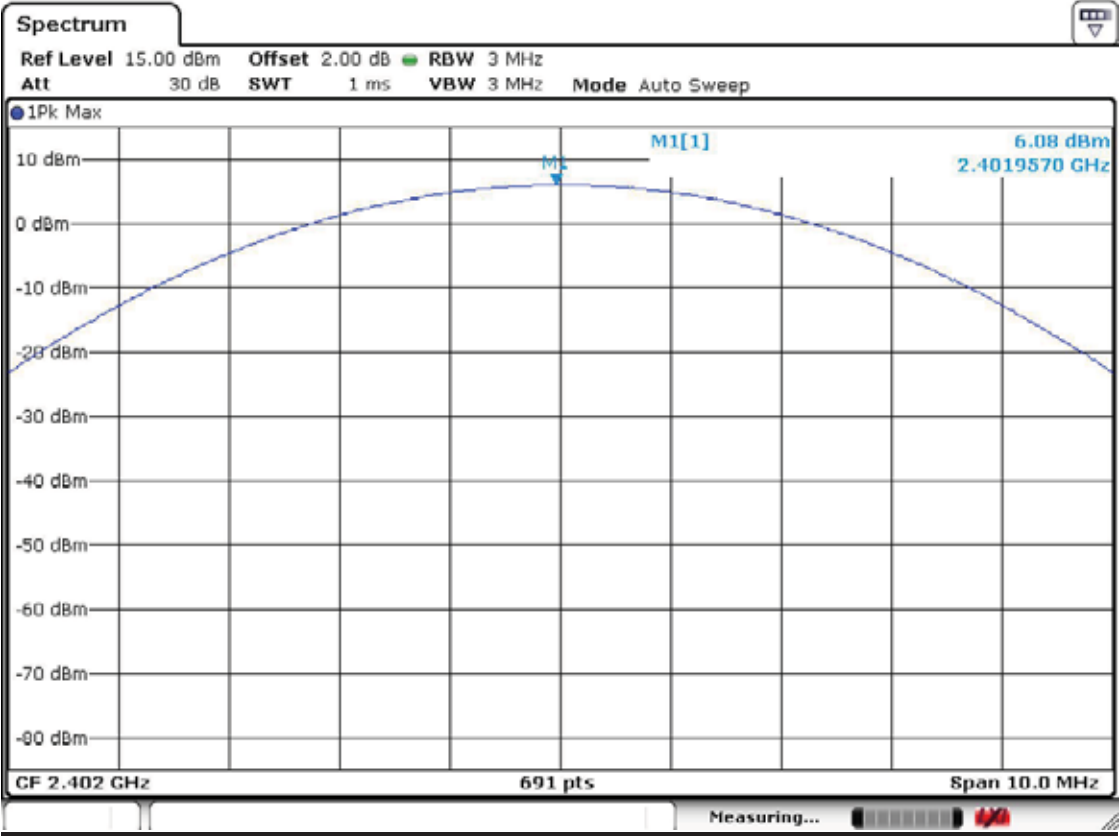
#### Measurement Setup

Same as the Chapter 3.2.1 (Figure 1)

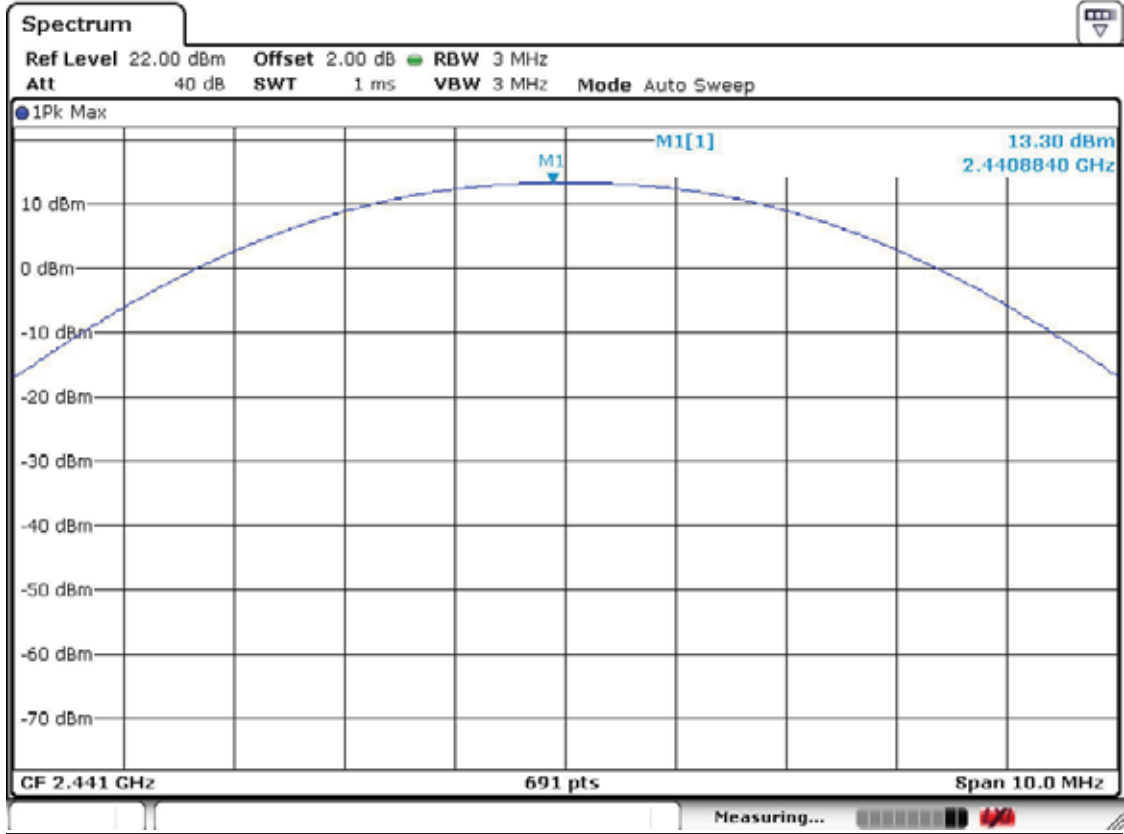
**Channel 1**  
**Basic mode**



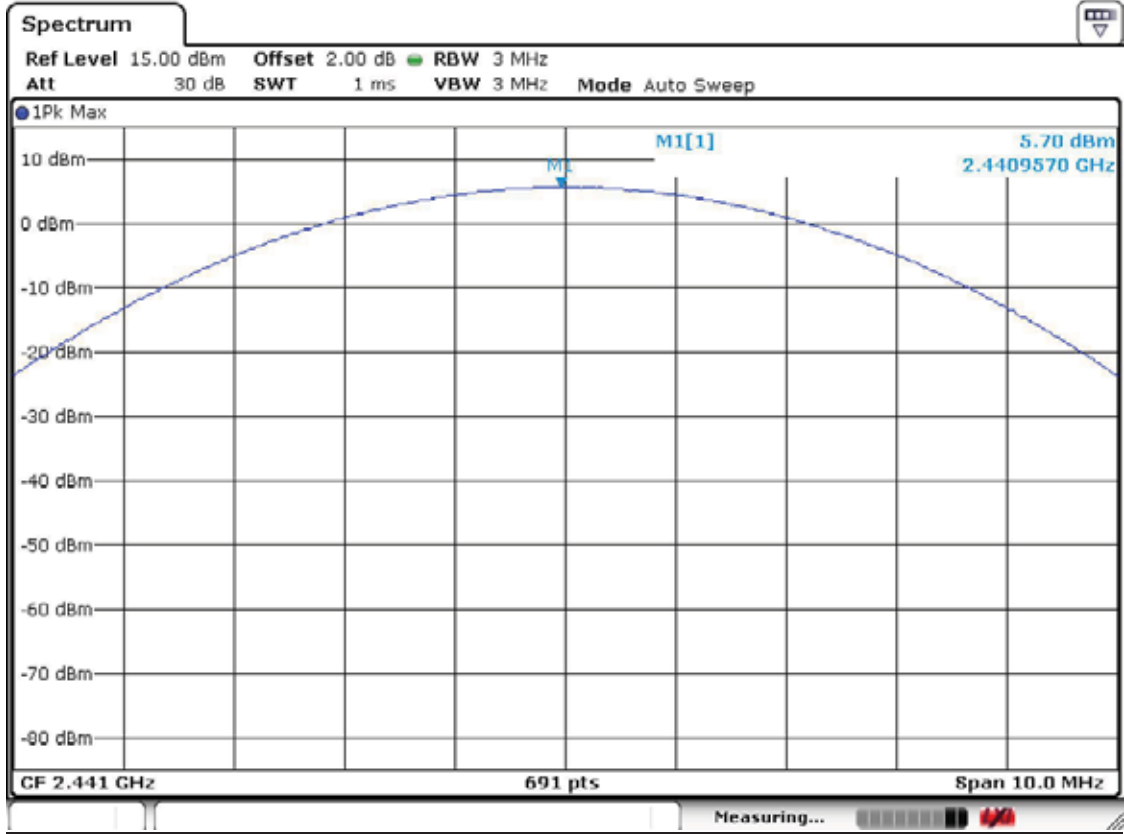
**EDR mode**



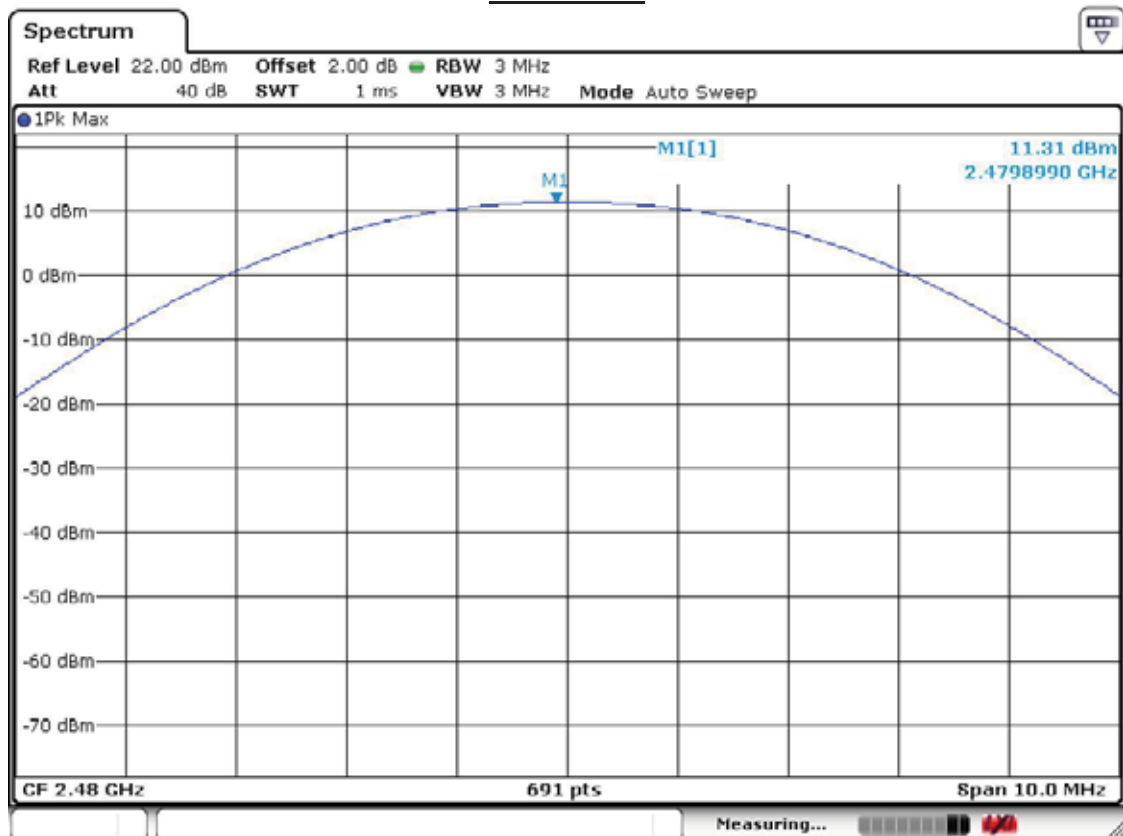
**Channel 2**  
**Basic mode**



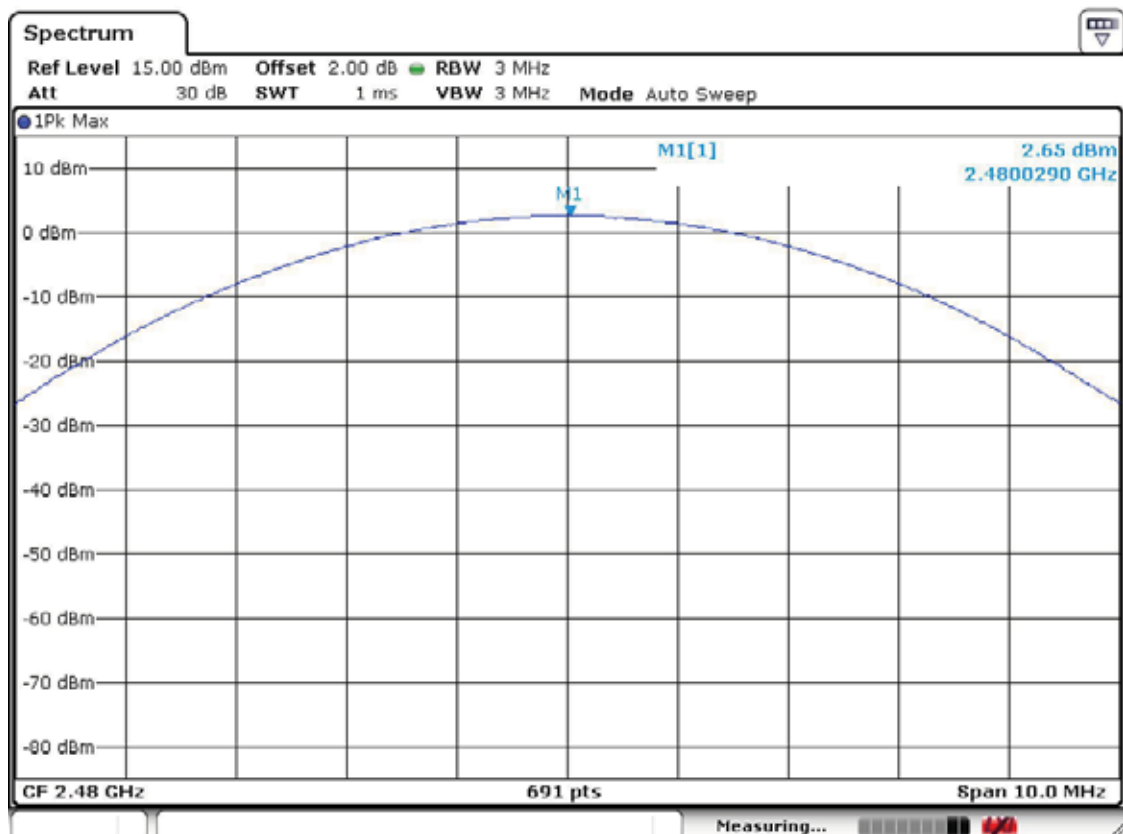
**EDR mode**



### Channel 3 Basic mode



### EDR mode



### 3.2.6 Band Edge

#### Procedure:

The bandwidth at 20dB down from the highest inband spectral density is measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function disabled at the highest, middle and the lowest available channels.

After the trace being stable, Use the marker-to-peak function to measure 20 dB down both sides of the intentional emission.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

RBW = 100 kHz

VBW = 100 kHz

Span = 10 MHz

Detector function = peak

Trace = max hold

Sweep = auto

#### Measurement Data: Complies

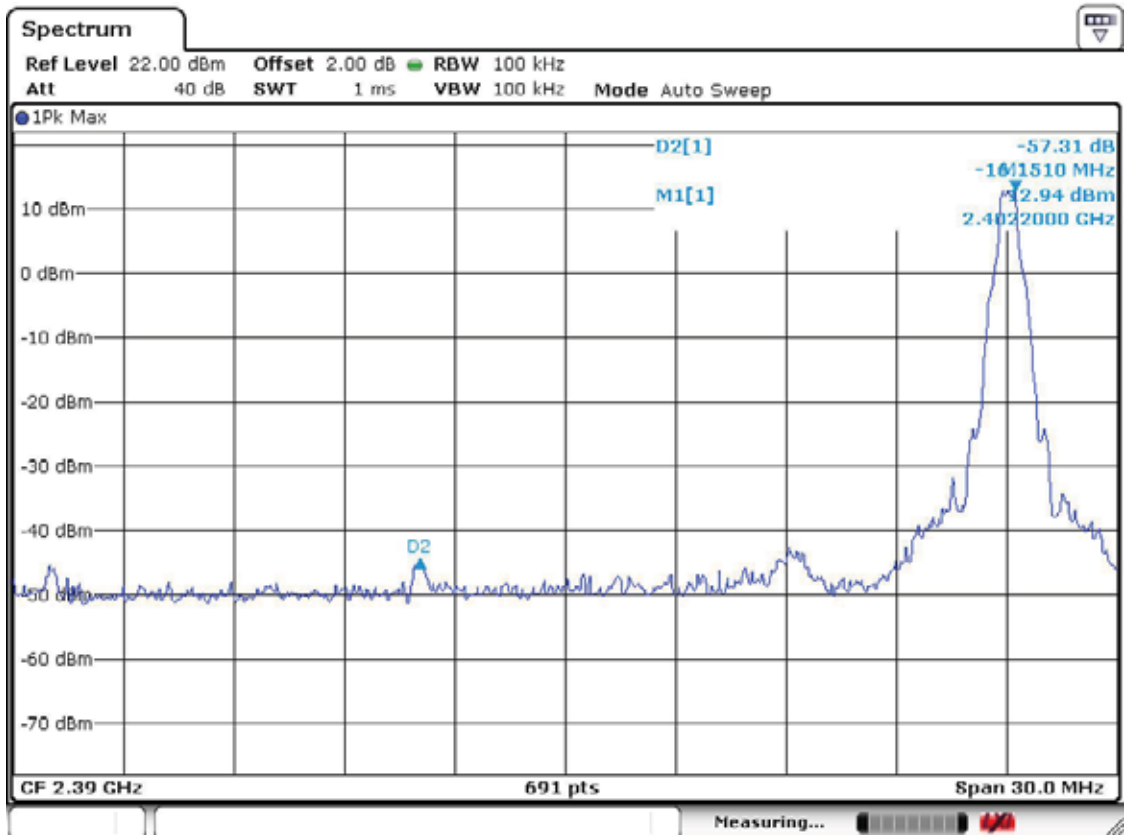
- All conducted emission in any 100kHz bandwidth outside of the spread spectrum band was at least 20dB lower than the highest inband spectral density. Therefore the applying equipment meets the requirement.
- See next pages for actual measured spectrum plots.

|                          |          |
|--------------------------|----------|
| <b>Minimum Standard:</b> | > 20 dBc |
|--------------------------|----------|

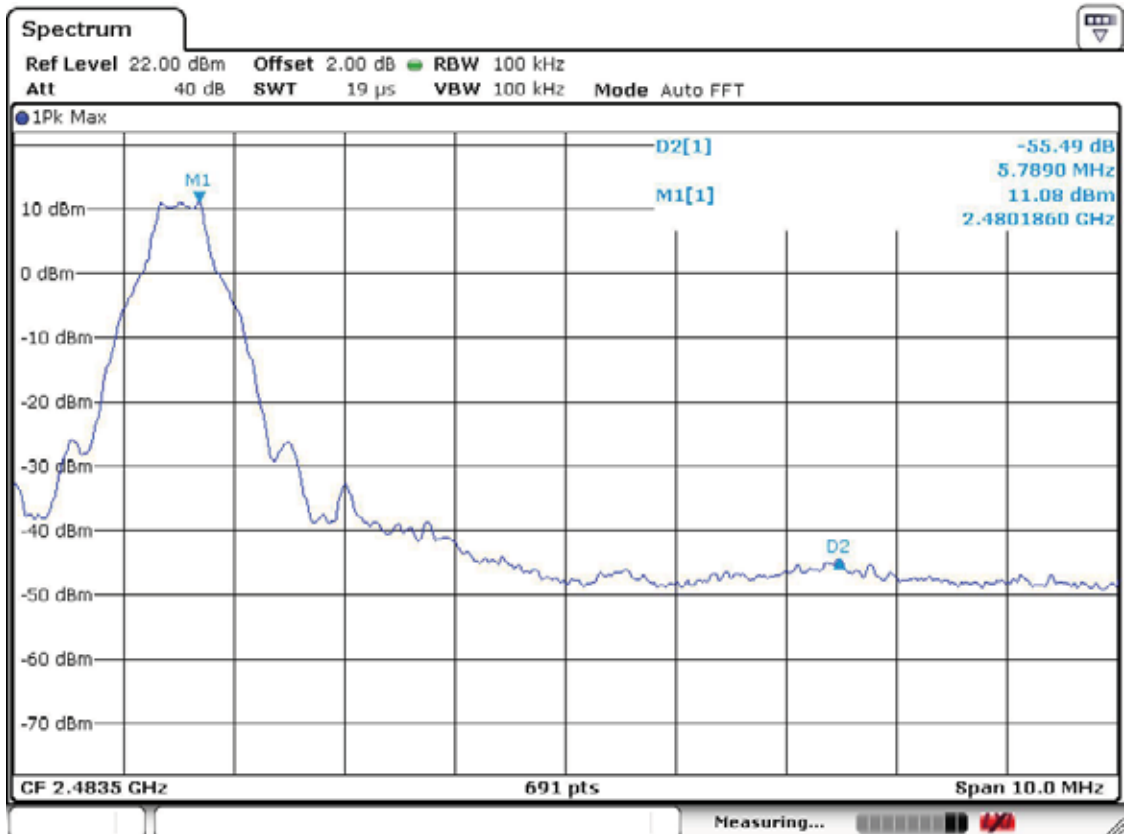
#### Measurement Setup

Same as the Chapter 3.2.1 (Figure 1)

Band – edge  
Lower edge



Upper edge



**Measurement Data (ANT M/N : HIF-2400)****Band-edges in the restricted band 2310-2390 MHz measurement**

| Frequency | Reading   |      | Pol. | Correction |              |       | Limits    |      | Result    |      | Margin    |      |
|-----------|-----------|------|------|------------|--------------|-------|-----------|------|-----------|------|-----------|------|
|           | [dBuV/m]  |      |      | Factor     |              |       | [dBuV/m]  |      | [dBuV/m]  |      | [dB]      |      |
| [MHz]     | AV / Peak |      |      | Antenna    | Amp.<br>Gain | Cable | AV / Peak |      | AV / Peak |      | AV / Peak |      |
| 2390      | 49.8      | 61.2 | H    | 26.0       | 36.0         | 8.2   | 54.0      | 74.0 | 48.0      | 59.4 | 6.0       | 14.6 |

**Band-edges in the restricted band 2483.5-2500 MHz measurement**

| Frequency | Reading   |      | Pol. | Correction |              |       | Limits    |      | Result    |      | Margin    |      |
|-----------|-----------|------|------|------------|--------------|-------|-----------|------|-----------|------|-----------|------|
|           | [dBuV/m]  |      |      | Factor     |              |       | [dBuV/m]  |      | [dBuV/m]  |      | [dB]      |      |
| [MHz]     | AV / Peak |      |      | Antenna    | Amp.<br>Gain | Cable | AV / Peak |      | AV / Peak |      | AV / Peak |      |
| 2483.5    | 47.5      | 60.3 | H    | 26.0       | 36.0         | 8.2   | 54.0      | 74.0 | 45.7      | 58.5 | 8.3       | 15.5 |

Note : This EUT was tested in 3 orthogonal positions and the worst-case data was presented.

**Measurement Data (ANT M/N : R-AN2400-1901RS)****Band-edges in the restricted band 2310-2390 MHz measurement**

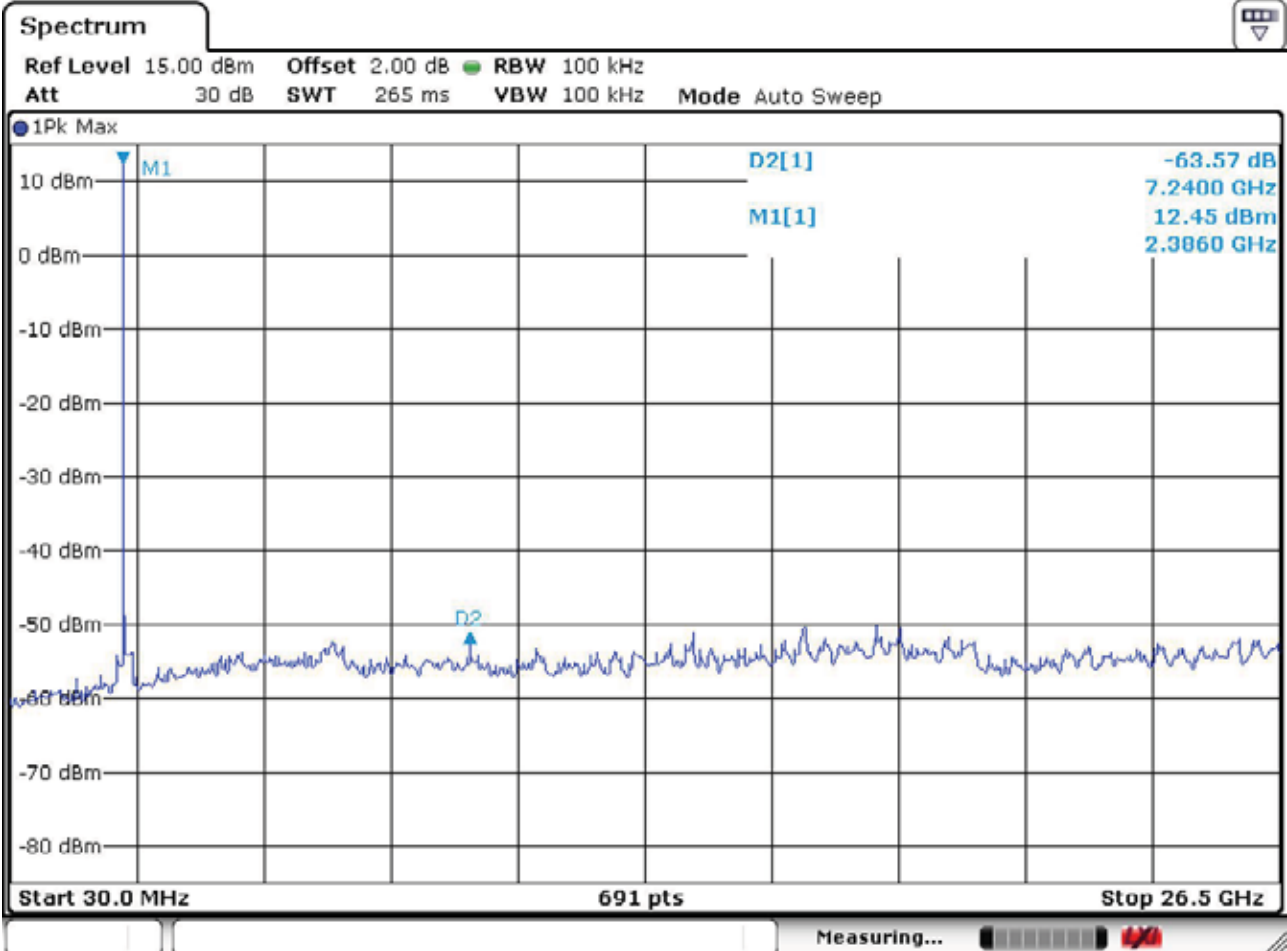
| Frequency | Reading   |      | Pol. | Correction |              |       | Limits    |      | Result    |      | Margin    |      |
|-----------|-----------|------|------|------------|--------------|-------|-----------|------|-----------|------|-----------|------|
|           | [dBuV/m]  |      |      | Factor     |              |       | [dBuV/m]  |      | [dBuV/m]  |      | [dB]      |      |
| [MHz]     | AV / Peak |      |      | Antenna    | Amp.<br>Gain | Cable | AV / Peak |      | AV / Peak |      | AV / Peak |      |
| 2390      | 46.7      | 58.2 | H    | 26.0       | 36.0         | 8.2   | 54.0      | 74.0 | 44.9      | 56.4 | 9.1       | 17.6 |

**Band-edges in the restricted band 2483.5-2500 MHz measurement**

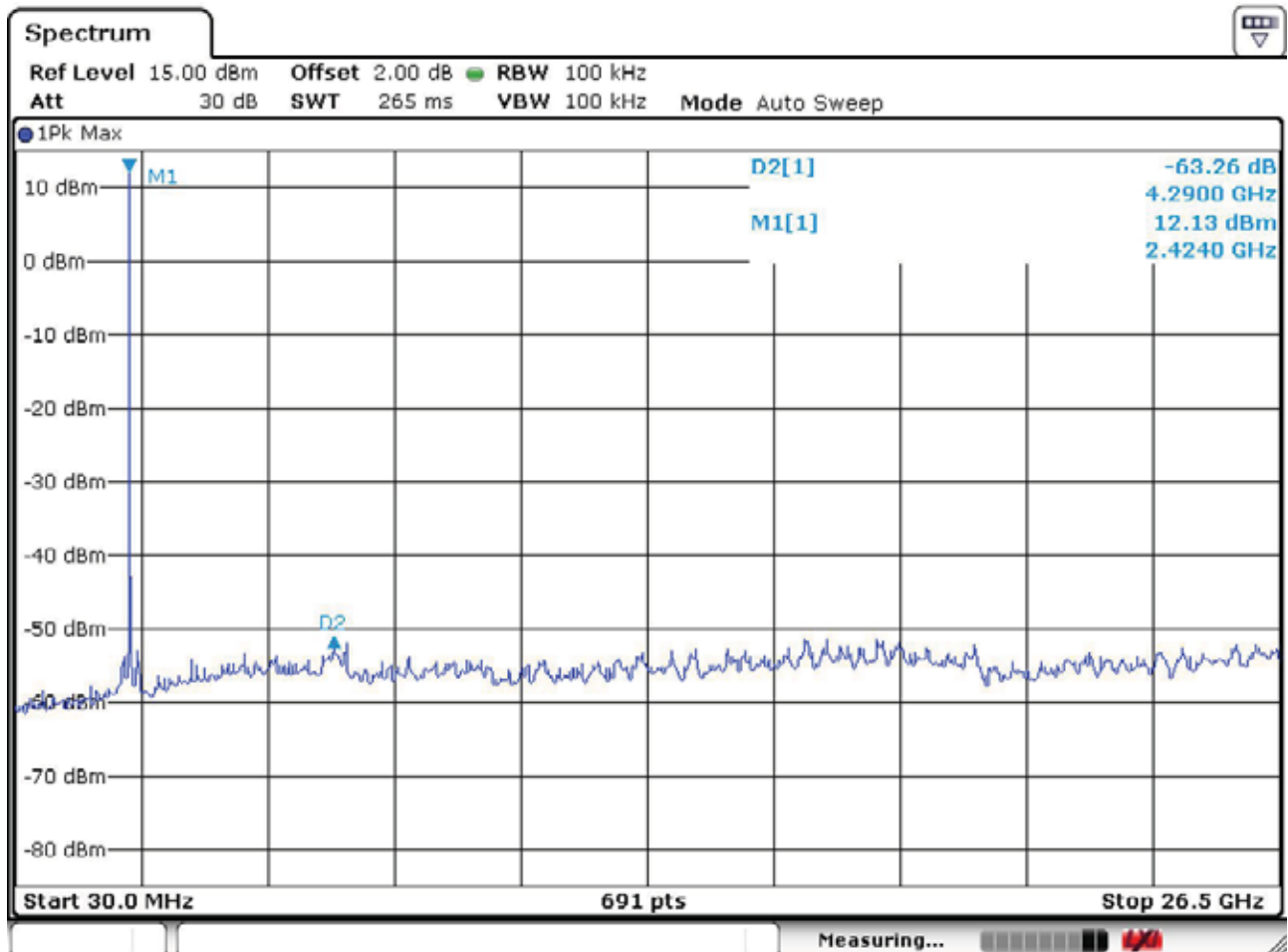
| Frequency | Reading   |      | Pol. | Correction |              |       | Limits    |      | Result    |      | Margin    |      |
|-----------|-----------|------|------|------------|--------------|-------|-----------|------|-----------|------|-----------|------|
|           | [dBuV/m]  |      |      | Factor     |              |       | [dBuV/m]  |      | [dBuV/m]  |      | [dB]      |      |
| [MHz]     | AV / Peak |      |      | Antenna    | Amp.<br>Gain | Cable | AV / Peak |      | AV / Peak |      | AV / Peak |      |
| 2483.5    | 44.8      | 56.5 | H    | 26.0       | 36.0         | 8.2   | 54.0      | 74.0 | 43.0      | 54.7 | 11.0      | 19.3 |

Note : This EUT was tested in 3 orthogonal positions and the worst-case data was presented.

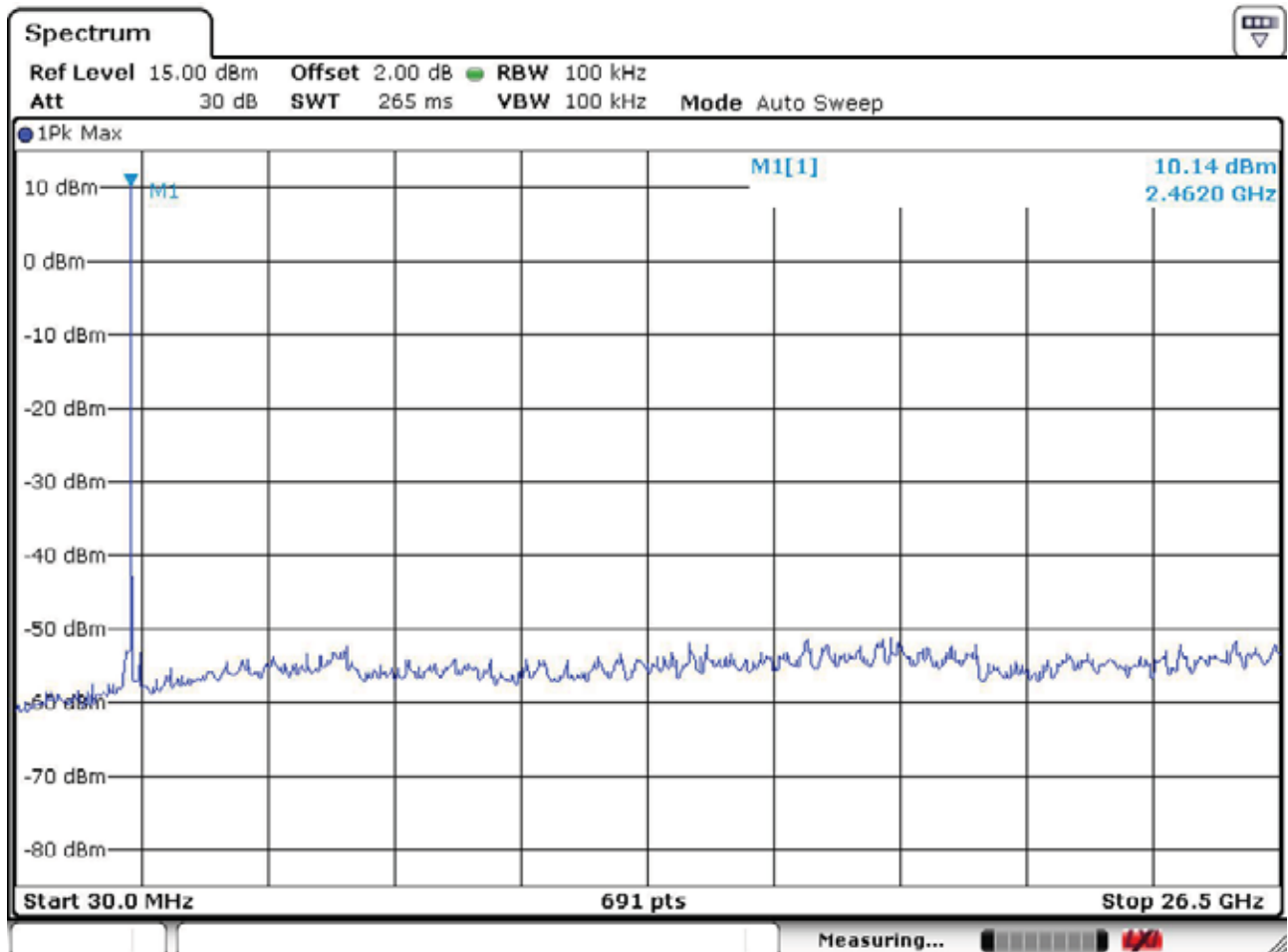
Unwanted Emission – Low channel  
Frequency Range = 30 MHz ~ 26.5 GHz



**Unwanted Emission – Middle channel**  
**Frequency Range = 30 MHz ~ 26.5 GHz**



**Unwanted Emission – High channel**  
**Frequency Range = 30 MHz ~ 26.5 GHz**



### 3.2.7 Field Strength of Harmonics

#### Procedure:

The EUT was placed on a 0.8m high wooden table inside a shielded enclosure. An antenna was placed near the EUT and measurements of frequencies and amplitudes of field strengths were recorded for reference during final measurements. For final radiated testing, measurements were performed in OATS. Measurements were performed with the EUT oriented in 3 orthogonal axis and rotated 360 degrees to determine worst-case orientation for maximum emissions.

#### The spectrum analyzer is set to:

Center frequency = the worst channel

Frequency Range = 30 MHz ~ 10<sup>th</sup> harmonic.

RBW = 100 kHz ( 30MHz ~ 1 GHz)

= 1 MHz (1 GHz ~ 10<sup>th</sup> harmonic )

Span = 100 MHz

Trace = max hold

Peak:VBW  $\geq$  RBW

Average:VBW=10Hz

Detector function = Peak and Average

Sweep = auto

#### Measurement Data: Complies

- Refer to the next page.
- No other emissions were detected at a level greater than 10dB below limit.
- The three antennas were used with this EUT during the Testing.
- The used antenna is “R-AN2400-1901RS”/ “HIF-2400” and it gave the worse case emissions.

#### Minimum Standard: FCC Part 15.209(a)

| Frequency (MHz) | Limit (uV/m) @ 3m |
|-----------------|-------------------|
| 30 ~ 88         | 100 **            |
| 88 ~ 216        | 150 **            |
| 216 ~ 960       | 200 **            |
| Above 960       | 500               |

\*\* Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

**Measurement Data (ANT M/N : HIF-2400)**

| Frequency | Reading   |      | Pol. | Correction |          |       | D.C.F  | Limits   |      | Result   |      | Margin    |      |
|-----------|-----------|------|------|------------|----------|-------|--------|----------|------|----------|------|-----------|------|
|           | [dBuV/m]  |      |      | Factor     |          |       |        | [dBuV/m] |      | [dBuV/m] |      | [dB]      |      |
| [MHz]     | AV / Peak |      |      | Antenna    | Amp.Gain | Cable |        | AV/Peak  |      | AV/Peak  |      | AV / Peak |      |
| 4804.00   | 53.4      | 62.8 | H    | 31.4       | 34.6     | 8.7   | -30.25 | 54.0     | 74.0 | 28.6     | 38.0 | 25.4      | 36.0 |
|           |           |      |      |            |          |       |        |          |      |          |      |           |      |
| Frequency | Reading   |      | Pol. | Correction |          |       | D.C.F  | Limits   |      | Result   |      | Margin    |      |
|           | [dBuV/m]  |      |      | Factor     |          |       |        | [dBuV/m] |      | [dBuV/m] |      | [dB]      |      |
| [MHz]     | AV / Peak |      |      | Antenna    | Amp.Gain | Cable |        | AV/Peak  |      | AV/Peak  |      | AV / Peak |      |
| 4882.0    | 53.8      | 62.6 | H    | 31.4       | 34.6     | 8.7   | -30.25 | 54.0     | 74.0 | 29.0     | 37.8 | 25.0      | 36.2 |
|           |           |      |      |            |          |       |        |          |      |          |      |           |      |
| Frequency | Reading   |      | Pol. | Correction |          |       | D.C.F  | Limits   |      | Result   |      | Margin    |      |
|           | [dBuV/m]  |      |      | Factor     |          |       |        | [dBuV/m] |      | [dBuV/m] |      | [dB]      |      |
| [MHz]     | AV / Peak |      |      | Antenna    | Amp.Gain | Cable |        | AV/Peak  |      | AV/Peak  |      | AV / Peak |      |
| 4960.0    | 55.6      | 64.5 | H    | 31.4       | 34.6     | 8.7   | -30.25 | 54.0     | 74.0 | 30.8     | 39.7 | 23.2      | 34.3 |
|           |           |      |      |            |          |       |        |          |      |          |      |           |      |

**NOTE.**

- No other emissions were detected at a level greater than 20dB below limit.
- Sample Calculation.

$$\text{Margin} = \text{Limit} - \text{Result} \quad / \quad \text{Result} = \text{Reading} + \text{C.F} + \text{DF} \quad / \quad \text{C.F} = \text{AF} + \text{CL} - \text{AG}$$

Where, C.F = Correction Factor, AF=Antenna, CL=Cable, AG=Amp.Gain

D.C.F ( Duty Cycle Correction Factor) =  $20\log(\text{The worst Case DWELL Time}/100\text{ms})$

$$= 20\log(3.073\text{ms}/100\text{ms}) = -30.25$$

## Measurement Data (ANT M/N : R-AN2400-1901RS)

| Frequency | Reading   |      | Pol. | Correction |          |       | D.C.F  | Limits   |      | Result   |      | Margin    |      |
|-----------|-----------|------|------|------------|----------|-------|--------|----------|------|----------|------|-----------|------|
|           | [dBuV/m]  |      |      | Factor     |          |       |        | [dBuV/m] |      | [dBuV/m] |      | [dB]      |      |
| [MHz]     | AV / Peak |      |      | Antenna    | Amp.Gain | Cable |        | AV/Peak  |      | AV/Peak  |      | AV / Peak |      |
| 4804.00   | 44.9      | 53.8 | H    | 31.4       | 34.6     | 8.7   | -30.25 | 54.0     | 74.0 | 20.1     | 29.0 | 33.9      | 45.0 |
|           |           |      |      |            |          |       |        |          |      |          |      |           |      |
| Frequency | Reading   |      | Pol. | Correction |          |       | D.C.F  | Limits   |      | Result   |      | Margin    |      |
|           | [dBuV/m]  |      |      | Factor     |          |       |        | [dBuV/m] |      | [dBuV/m] |      | [dB]      |      |
| [MHz]     | AV / Peak |      |      | Antenna    | Amp.Gain | Cable |        | AV/Peak  |      | AV/Peak  |      | AV / Peak |      |
| 4882.0    | 46.5      | 56   | H    | 31.4       | 34.6     | 8.7   | -30.25 | 54.0     | 74.0 | 21.7     | 31.2 | 32.3      | 42.8 |
|           |           |      |      |            |          |       |        |          |      |          |      |           |      |
| Frequency | Reading   |      | Pol. | Correction |          |       | D.C.F  | Limits   |      | Result   |      | Margin    |      |
|           | [dBuV/m]  |      |      | Factor     |          |       |        | [dBuV/m] |      | [dBuV/m] |      | [dB]      |      |
| [MHz]     | AV / Peak |      |      | Antenna    | Amp.Gain | Cable |        | AV/Peak  |      | AV/Peak  |      | AV / Peak |      |
| 4960.0    | 48.6      | 58.5 | H    | 31.4       | 34.6     | 8.7   | -30.25 | 54.0     | 74.0 | 23.8     | 33.7 | 30.2      | 40.3 |
|           |           |      |      |            |          |       |        |          |      |          |      |           |      |

## NOTE.

- No other emissions were detected at a level greater than 20dB below limit.
- Sample Calculation.

$$\text{Margin} = \text{Limit} - \text{Result} \quad / \quad \text{Result} = \text{Reading} + \text{C.F} + \text{DF} \quad / \quad \text{C.F} = \text{AF} + \text{CL} - \text{AG}$$

Where, C.F = Correction Factor, AF=Antenna, CL=Cable, AG=Amp.Gain

D.C.F ( Duty Cycle Correction Factor) =  $20\log(\text{The worst Case DWELL Time}/100\text{ms})$

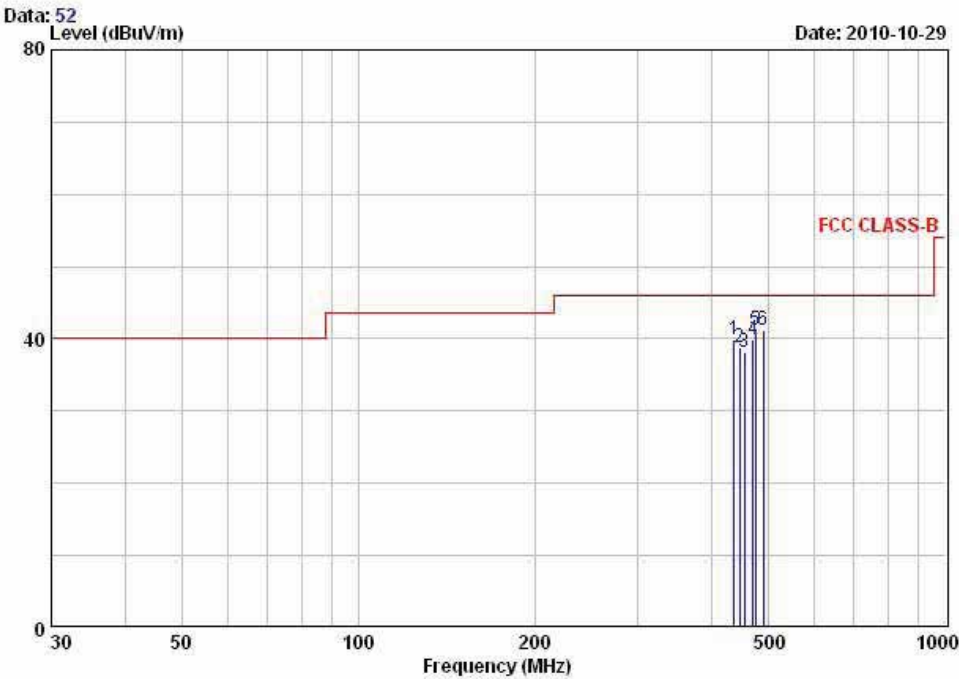
$$= 20\log(3.065\text{ms}/100\text{ms}) = -30.27$$

BT mode



243 Jubug-ni, yangji-Myeon, Youngin-si,  
Gyeonggi-do 449-822 Korea  
Tel :+82-31-3236008,9  
Fax:+82-31-3236010

EUT/Model No.: Parani-SD1000U      TEST MODE: Bluetooth mode  
Temp Humi : 12 / 37      Tested by: PARK.H.W



| Freq     | Reading | C.F   | Result | Limit  | Margin | Height | Angle | Polarity   |
|----------|---------|-------|--------|--------|--------|--------|-------|------------|
| MHz      | dBuV/m  | dB/m  | dBuV/m | dBuV/m | dB     | cm     | deg   |            |
| 1 437.03 | 46.00   | -6.15 | 39.85  | 46.00  | 6.15   | 100    | 325   | HORIZONTAL |
| 2 446.33 | 44.90   | -6.02 | 38.88  | 46.00  | 7.12   | 100    | 257   | HORIZONTAL |
| 3 455.63 | 44.00   | -5.88 | 38.12  | 46.00  | 7.88   | 103    | 252   | HORIZONTAL |
| 4 470.37 | 45.60   | -5.68 | 39.92  | 46.00  | 6.08   | 101    | 164   | HORIZONTAL |
| 5 475.96 | 46.70   | -5.60 | 41.10  | 46.00  | 4.90   | 105    | 147   | HORIZONTAL |
| 6 490.75 | 46.60   | -5.40 | 41.20  | 46.00  | 4.80   | 100    | 79    | HORIZONTAL |

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

### 3.2.8 Field Strength of Harmonics -Receiver

#### Definition:

The field strength of emissions from intentional radiators was measured.

|                     |                                          |
|---------------------|------------------------------------------|
| Test method         | : FCC Part 15.209                        |
| Frequency Range     | : 30 MHz ~ 10 <sup>th</sup> harmonic.    |
| Bandwidth           | : 120 kHz (F < 1GHz)    1 MHz (F > 1GHz) |
| Distance of antenna | : 3 meters                               |
| Test mode           | : Rx mode                                |
| Result              | : <b>Complies</b>                        |

#### Measurement Data:

- No other emissions were detected at a level greater than 20dB below limit.
- Refer to the next page.
- The used antenna is “R-AN2400-1901RS”/ “HIF-2400” and it gave the worse case emissions.

#### Field Strength Limit

##### Part 15.209 LIMIT:

| Frequency (MHz) | Limit (uV/m) @ 3m |
|-----------------|-------------------|
| 30 ~ 88         | 100**             |
| 88 ~ 216        | 150**             |
| 216 ~ 960       | 200**             |
| Above 960       | 500               |

\*\* Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

**Measurement Data (ANT M/N : HIF-2400)**

| Frequency<br>[MHz] | Reading<br>[dBuV/m]<br>AV / Peak |      | Pol. | Correction<br>Factor<br>Antenna Amp.Gain Cable |      |     | Limits<br>[dBuV/m]<br>AV / Peak |      | Result<br>[dBuV/m]<br>AV / Peak |      | Margin<br>[dB]<br>AV / Peak |      |
|--------------------|----------------------------------|------|------|------------------------------------------------|------|-----|---------------------------------|------|---------------------------------|------|-----------------------------|------|
|                    |                                  |      |      |                                                |      |     |                                 |      |                                 |      |                             |      |
| 2404.00            | 34.1                             | 36.2 | H    | 26.0                                           | 36.0 | 8.2 | 54.0                            | 74.0 | 32.3                            | 34.4 | 21.7                        | 39.6 |
| 2443.0             | 33.9                             | 35.8 | H    | 26.0                                           | 36.0 | 8.2 | 54.0                            | 74.0 | 32.1                            | 34.0 | 21.9                        | 40.0 |
| 2482.0             | 34.5                             | 36.8 | H    | 26.0                                           | 36.0 | 8.2 | 54.0                            | 74.0 | 32.7                            | 35.0 | 21.3                        | 39.0 |

No other emissions were detected at a level greater than 20dB below limit.

## Measurement Data (ANT M/N : R-AN2400-1901RS)

| Frequency<br>[MHz] | Reading<br>[dBuV/m]<br>AV / Peak |      | Pol. | Correction<br>Factor<br>Antenna Amp.Gain Cable |      |     | Limits<br>[dBuV/m]<br>AV / Peak |      | Result<br>[dBuV/m]<br>AV / Peak |      | Margin<br>[dB]<br>AV / Peak |      |
|--------------------|----------------------------------|------|------|------------------------------------------------|------|-----|---------------------------------|------|---------------------------------|------|-----------------------------|------|
|                    |                                  |      |      |                                                |      |     |                                 |      |                                 |      |                             |      |
| 2404.00            | 30.4                             | 32.6 | H    | 26.0                                           | 36.0 | 8.2 | 54.0                            | 74.0 | 28.6                            | 30.8 | 25.4                        | 43.2 |
| Frequency<br>[MHz] | Reading<br>[dBuV/m]<br>AV / Peak |      | Pol. | Correction<br>Factor<br>Antenna Amp.Gain Cable |      |     | Limits<br>[dBuV/m]<br>AV / Peak |      | Result<br>[dBuV/m]<br>AV / Peak |      | Margin<br>[dB]<br>AV / Peak |      |
|                    |                                  |      |      |                                                |      |     |                                 |      |                                 |      |                             |      |
| 2443.0             | 31.2                             | 33.5 | H    | 26.0                                           | 36.0 | 8.2 | 54.0                            | 74.0 | 29.4                            | 31.7 | 24.6                        | 42.3 |
| Frequency<br>[MHz] | Reading<br>[dBuV/m]<br>AV / Peak |      | Pol. | Correction<br>Factor<br>Antenna Amp.Gain Cable |      |     | Limits<br>[dBuV/m]<br>AV / Peak |      | Result<br>[dBuV/m]<br>AV / Peak |      | Margin<br>[dB]<br>AV / Peak |      |
|                    |                                  |      |      |                                                |      |     |                                 |      |                                 |      |                             |      |
| 2482.0             | 30.1                             | 34.5 | H    | 26.0                                           | 36.0 | 8.2 | 54.0                            | 74.0 | 28.3                            | 32.7 | 25.7                        | 41.3 |

No other emissions were detected at a level greater than 20dB below limit.

### 3.2.9 AC Conducted Emissions

**Procedure:**

The conducted emissions are measured in the shielded room with a spectrum analyzer in peak hold. While the measurement, EUT had its hopping function disabled at the middle channels in line with Section 15.31(m). Emissions closest to the limit are measured in the quasi-peak mode (QP) with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation and Exerciser operation. The highest emissions relative to the limit are listed.

**Measurement Data: Complies**

- See next pages for actual measured spectrum plots.
- No emissions were detected at a level greater than 10dB below limit.
- The used antenna is “R-AN2400-1901RS” and it gave the worse case emissions.

**Minimum Standard: FCC Part 15.207(a)/EN 55022**

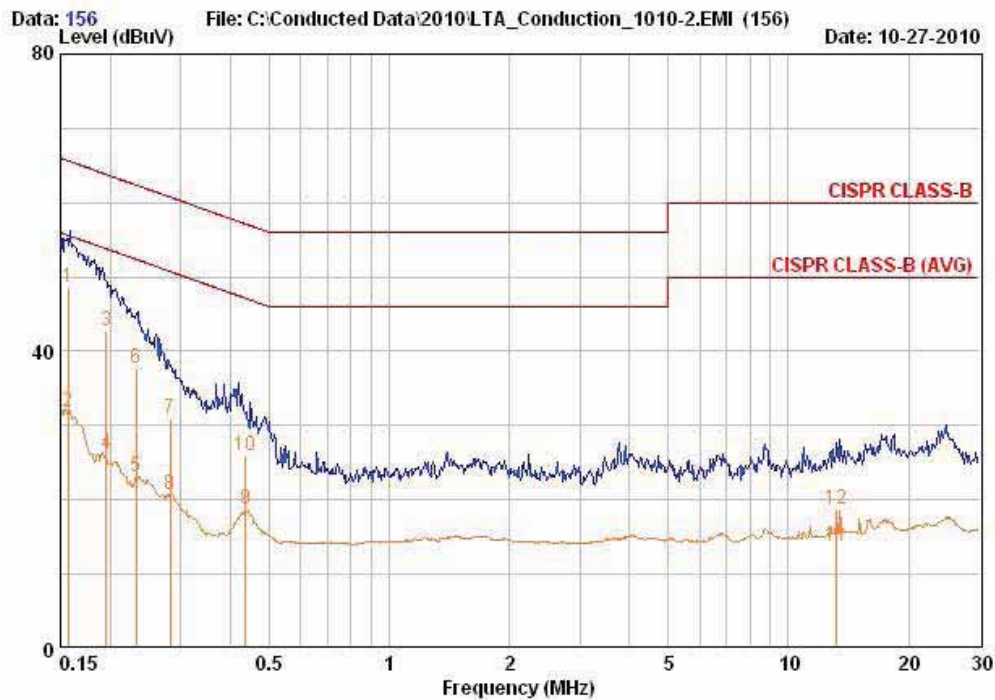
| Frequency Range<br>(MHz) | Conducted Limit (dBuV) |            |
|--------------------------|------------------------|------------|
|                          | Quasi-Peak             | Average    |
| 0.15 ~ 0.5               | 66 to 56 *             | 56 to 46 * |
| 0.5 ~ 5                  | 56                     | 46         |
| 5 ~ 30                   | 60                     | 50         |

\* Decreases with the logarithm of the frequency

**AC Conducted Emissions at BT mode – Line**

243 Jibug-ni, yangji-Myeon, Youngin-si,  
Gyeonggi-do 449-822 Korea  
Tel +82-31-3236008,9  
Fax:+82-31-3236010

|                                  |                          |
|----------------------------------|--------------------------|
| EUT / Model No. : Parani-SD1000U | Phase : LINE             |
| Test Mode : Bluetooth mode       | Test Power : 120 / 60    |
| Temp./Humi. : 21 / 43            | Test Engineer : PARK.H.W |



| Freq   | RD    | RD    | C.F   | Result | Result | Limit | Limit | Margin | Margin |
|--------|-------|-------|-------|--------|--------|-------|-------|--------|--------|
| MHz    | QP    | AV    | dB    | QP     | AV     | QP    | AV    | QP     | AV     |
|        | dBuV  | dBuV  |       | dBuV   | dBuV   | dBuV  | dBuV  | dB     | dB     |
| 0.157  | 38.85 | 22.15 | 9.65  | 48.50  | 31.80  | 65.62 | 55.62 | 17.12  | 23.82  |
| 0.195  | 33.16 | 16.46 | 9.65  | 42.81  | 26.11  | 63.82 | 53.82 | 21.01  | 27.71  |
| 0.232  | 28.05 | 13.35 | 9.66  | 37.71  | 23.01  | 62.38 | 52.38 | 24.67  | 29.37  |
| 0.282  | 21.36 | 11.06 | 9.65  | 31.01  | 20.71  | 60.76 | 50.76 | 29.75  | 30.05  |
| 0.436  | 16.35 | 9.05  | 9.67  | 26.02  | 18.72  | 57.14 | 47.14 | 31.12  | 28.42  |
| 13.200 | 8.40  | 3.40  | 10.32 | 18.72  | 13.72  | 60.00 | 50.00 | 41.28  | 36.28  |

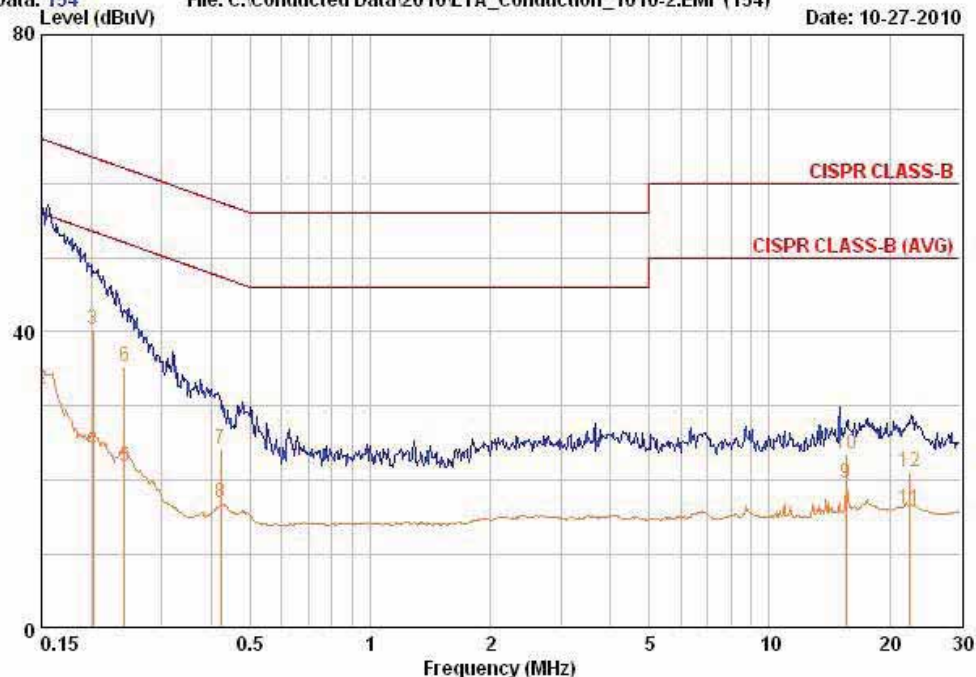
Remarks: C.F (Correction Factor) = Insertion loss + Cable loss

**AC Conducted Emissions at BT mode – Neutral**

243 Jibug-ni, yangji-Myeon, Youngin-si,  
Gyeonggi-do 449-822 Korea  
Tel :+82-31-3236008,9  
Fax:+82-31-3236010

|                                  |                          |
|----------------------------------|--------------------------|
| EUT / Model No. : Parani-SD1000U | Phase : NEUTRAL          |
| Test Mode : Bluetooth mode       | Test Power : 120 / 60    |
| Temp./Humi. : 21 / 43            | Test Engineer : PARK.H.W |

Data: 154 File: C:\Conducted Data\2010\LTA\_Conduction\_1010-2.EMI (154) Date: 10-27-2010



| Freq   | RD    | RD    | C.F   | Result | Result | Limit | Limit | Margin | Margin |
|--------|-------|-------|-------|--------|--------|-------|-------|--------|--------|
| MHz    | QP    | AV    | dB    | QP     | AV     | QP    | AV    | QP     | AV     |
|        | dBuV  | dBuV  |       | dBuV   | dBuV   | dBuV  | dBuV  | dB     | dB     |
| 0.150  | 38.25 | 22.65 | 9.66  | 47.91  | 32.31  | 66.00 | 56.00 | 18.09  | 23.69  |
| 0.202  | 30.56 | 14.36 | 9.66  | 40.22  | 24.02  | 63.53 | 53.53 | 23.31  | 29.51  |
| 0.242  | 25.75 | 12.05 | 9.66  | 35.41  | 21.71  | 62.03 | 52.03 | 26.62  | 30.32  |
| 0.423  | 14.45 | 7.25  | 9.66  | 24.11  | 16.91  | 57.39 | 47.39 | 33.28  | 30.48  |
| 15.550 | 13.11 | 9.11  | 10.43 | 23.54  | 19.54  | 60.00 | 50.00 | 36.46  | 30.46  |
| 22.416 | 10.45 | 5.45  | 10.65 | 21.10  | 16.10  | 60.00 | 50.00 | 38.90  | 33.90  |

Remarks: C.F (Correction Factor) = Insertion loss + Cable loss

APPENDIX

**TEST EQUIPMENT USED FOR TESTS**

|    | Description              | Model No.   | Serial No.    | Manufacturer  | Next Cal. Date |
|----|--------------------------|-------------|---------------|---------------|----------------|
| 1  | Spectrum Analyzer        | FSV-30      | 100757        | R&S           | Feb-11         |
| 2  | Spectrum Analyzer        | 8563E       | 3425A02505    | HP            | Mar-11         |
| 3  | Spectrum Analyzer        | 8594E       | 3710A04074    | HP            | Oct-11         |
| 4  | Signal Generator         | 8648C       | 3623A02597    | HP            | Mar-11         |
| 5  | Signal Generator         | 83711B      | US34490456    | HP            | Mar-11         |
| 6  | Attenuator (3dB)         | 8491A       | 37822         | HP            | Oct-11         |
| 7  | Attenuator (10dB)        | 8491A       | 63196         | HP            | Oct-11         |
| 8  | Attenuator (30dB)        | 8498A       | 1801A06689    | HP            | Oct-11         |
| 9  | EMI Test Receiver        | ESVD        | 843748/001    | R&S           | Mar-11         |
| 10 | Horn Antenna(18 ~ 40GHz) | SAS-574     | 154           | Schwarzbeck   | Nov-10         |
| 11 | Horn Antenna(18 ~ 40GHz) | SAS-574     | 155           | Schwarzbeck   | Nov-10         |
| 12 | RF Amplifier             | 8447D       | 2949A02670    | HP            | Oct-11         |
| 13 | RF Amplifier             | 8449B       | 3008A02126    | HP            | Mar-11         |
| 14 | Test Receiver            | ESHS10      | 828404/009    | R&S           | Mar-11         |
| 15 | TRILOG Antenna           | VULB 9160   | 9160-3212     | SCHWARZBECK   | Apr-11         |
| 16 | Log.-Per. Antenna        | VULP 9118   | 9118 A 401    | SCHWARZBECK   | Apr-11         |
| 17 | Biconical Antenna        | BBA 9106    | VHA 9103-2315 | SCHWARZBECK   | Apr-11         |
| 18 | Horn Antenna             | 3115        | 00055005      | ETS LINDGREN  | Mar-11         |
| 19 | Horn Antenna             | BBHA 9120D  | 9120D122      | SCHWARZBECK   | Dec-11         |
| 20 | Dipole Antenna           | VHA9103     | 2116          | SCHWARZBECK   | Nov-10         |
| 21 | Dipole Antenna           | VHA9103     | 2117          | SCHWARZBECK   | Nov-10         |
| 22 | Dipole Antenna           | VHA9105     | 2261          | SCHWARZBECK   | Nov-10         |
| 23 | Dipole Antenna           | VHA9105     | 2262          | SCHWARZBECK   | Nov-10         |
| 24 | Hygro-Thermograph        | THB-36      | 0041557-01    | ISUZU         | Mar-11         |
| 25 | Splitter (SMA)           | ZFSC-2-2500 | SF617800326   | Mini-Circuits | -              |
| 26 | RF Switch                | MP59B       | 6200414971    | ANRITSU       | -              |
| 27 | Power Divider            | 11636A      | 6243          | HP            | Oct-11         |
| 28 | DC Power Supply          | 6622A       | 3448A03079    | HP            | Oct-11         |
| 29 | Frequency Counter        | 5342A       | 2826A12411    | HP            | Mar-11         |
| 30 | Power Meter              | EPM-441A    | GB32481702    | HP            | Mar-11         |
| 31 | Power Sensor             | 8481A       | 2702A64048    | HP            | Mar-11         |
| 32 | Audio Analyzer           | 8903B       | 3729A18901    | HP            | Oct-11         |
| 33 | Modulation Analyzer      | 8901B       | 3749A05878    | HP            | Oct-11         |
| 34 | TEMP & HUMIDITY Chamber  | YJ-500      | LTAS06041     | JinYoung Tech | Oct-11         |
| 35 | LOOP-ANTENNA             | FMZB 1516   | 151602/94     | SCHWARZBECK   | Mar-11         |
| 36 | Stop Watch               | HS-3        | 601Q09R       | CASIO         | Mar-11         |
| 37 | LISN                     | ENV216      | 100408        | R&S           | Oct-11         |