



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>

ENUSTECH

Dates of Tests: Apr 12~20, 2011  
Test Report S/N: LR500111104E  
Test Site : LTA CO., LTD.

## CERTIFICATION OF COMPLIANCE

FCC ID.  
IC  
APPLICANT

**TT2KLAT8-BR**  
**6329A-KLAT8BR**  
**ENUSTECH.,INC.**

|                           |   |                                             |
|---------------------------|---|---------------------------------------------|
| Equipment Class           | : | Part 15 Spread Spectrum Transmitter (DSS)   |
| Manufacturing Description | : | Bluetooth Hands-free Kit                    |
| Manufacturer              | : | ENUSTECH.,INC.                              |
| Model name                | : | KlaT8-BR                                    |
| Test Device Serial No.:   | : | Identical prototype                         |
| Rule Part(s)              | : | FCC Part 15.247 Subpart C; ANSI C-63.4-2003 |
|                           | : | RSS-210 and ISSUE No.: 8 Date: 2010         |
| Frequency Range           | : | 2402 ~ 2480MHz                              |
| RF power                  | : | Max 5.54 dBm - Conducted                    |
| Data of issue             | : | April 22, 2011                              |

This test report is issued under the authority of:

The test was supervised by:

Hyun-Chae You, Manager

Il-Shin kim, 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. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.



NVLAP LAB Code.: 200723-0

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## 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            | 2011-09-01 | EMC accredited Lab. |
| FCC    | U.S.A   | 610755            | 2011-04-22 | FCC filing          |
| FCC    | U.S.A   | 649054            | 2011-05-26 | FCC CAB             |
| VCCI   | JAPAN   | R2133(10m), C2307 | 2011-06-21 | VCCI registration   |
| VCCI   | JAPAN   | T-2009            | 2013-12-23 | VCCI registration   |
| IC     | CANADA  | IC5799            | 2012-05-14 | IC filing           |

## 2. Information's about test item

### 2-1 Client & Manufacturer

Company name : ENUSTECH.,INC.  
 Address : Dooi Bldg., 5F, 1196-2 Gaepo-4dong, Gangnam-gu, Seoul 135-240, Korea  
 Telephone / Facsimile : +82-70-7547-7599 / +82-2-3452-3603

### 2-2 Equipment Under Test (EUT)

Trade name : Bluetooth Hands-free Kit  
 FCC ID : TT2KLAT8-BR  
 Model name : KlaT8-BR  
 Serial number : Identical prototype  
 Date of receipt : April 8, 2011  
 EUT condition : Pre-production, not damaged  
 Antenna type : Pattern Antenna Max Gain 3.847dBi  
 Frequency Range : 2402 ~ 2480MHz  
 RF output power : Max. 5.54dBm - Conducted  
 Number of channels : 79  
 Duty cycle : 81.43 %  
 Channel spacing : 1MHz  
 Channel Access Protocol : Frequency Hopping Spread Spectrum (FHSS)  
 Type of Modulation : Basic Mode(GFSK), EDR Mode(Pi/4 DQPSK, 8DPSK)  
 Power Source : DC 12-24V  
 Firmware version : V1.0

### 2-3 Tested frequency

|                 | LOW  | MID  | HIGH |
|-----------------|------|------|------|
| Frequency (MHz) | 2402 | 2441 | 2480 |

### 2-4 Ancillary Equipment

| Equipment | Model No. | Serial No. | Manufacture |
|-----------|-----------|------------|-------------|
| -         | -         | -          | -           |

### 3. Test Report

#### 3.1 Summary of tests

| FCC Part Section(s) | Parameter                        | Limit             | Test Condition | Status (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 | NA <sup>3</sup> |
| 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.

Note 3: This device is only operated by DC

#### Note 1: Antenna Requirement

→ The ENUSTECH.,INC. Klat8-BR unit complies with the requirement of §15.203.

The antenna is PCB Pattern antenna.

**Note 2:** The sample was tested according to the following specification:

FCC Parts 15.247; ANSI C-63.4-2003

RSS-210 and ISSUE No.: 8 Date: 2010

## 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   |
| 1.0014                             | 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

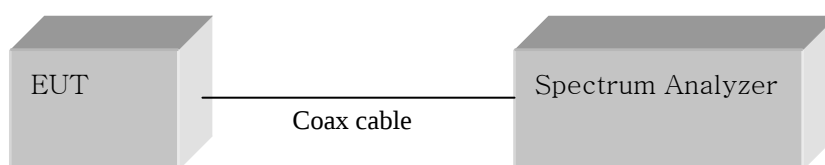
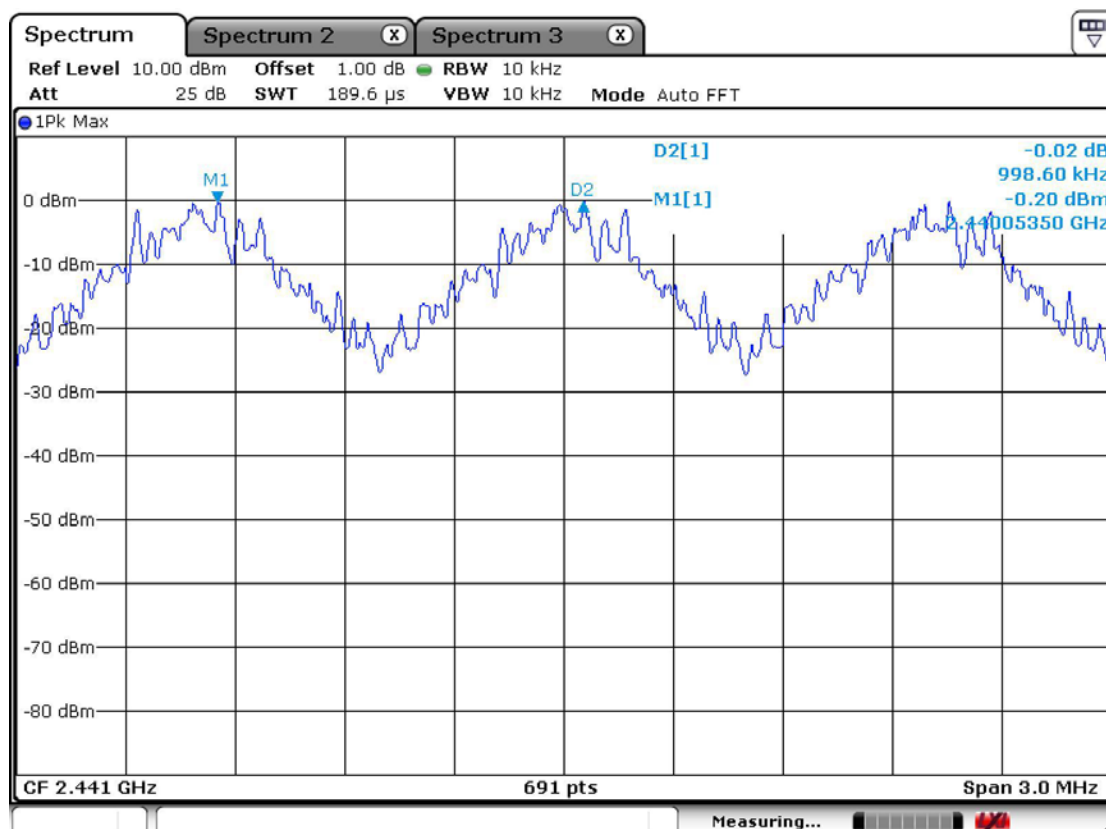


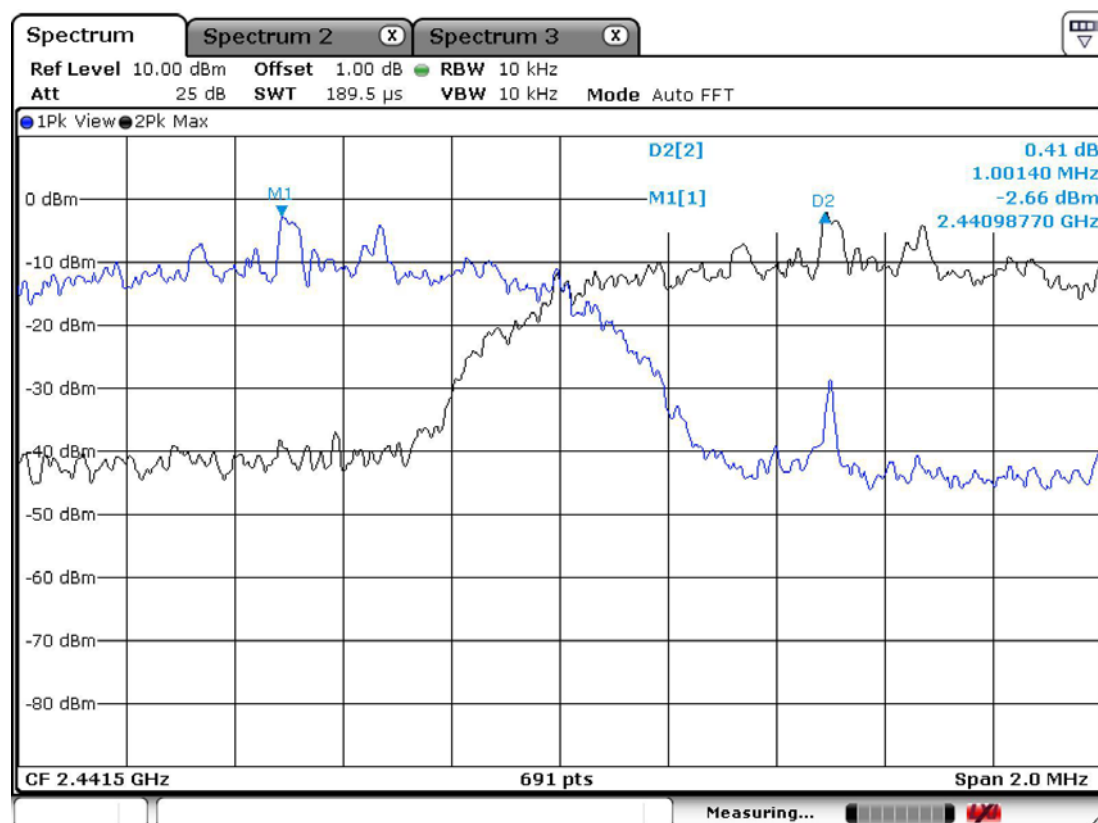
Figure 1: Measurement setup for the carrier frequency separation

## Carrier Frequency Separation

### Basic Mode



### EDR Mode



### 3.2.2 Number of Hopping Frequencies

#### Procedure:

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

To get higher resolution, four frequency ranges within the 2400 ~ 2483.5 MHz FH band were examined.

#### The spectrum analyzer is set to:

Frequency range    1: Start = 2400.0MHz,    Stop = 2441.5 MHz

                             2: Start = 2441.5MHz,    Stop = 2483.5 MHz

RBW = 100 kHz (1% of the span or more)       Sweep = auto

VBW = 100 kHz (VBW  $\geq$  RBW)                Detector function = peak

Trace = max hold                                    Span > 40MHz

#### Measurement Data:    Complies

|                                         |    |
|-----------------------------------------|----|
| <b>Total number of Hopping Channels</b> | 79 |
|-----------------------------------------|----|

- See next pages for actual measured spectrum plots.

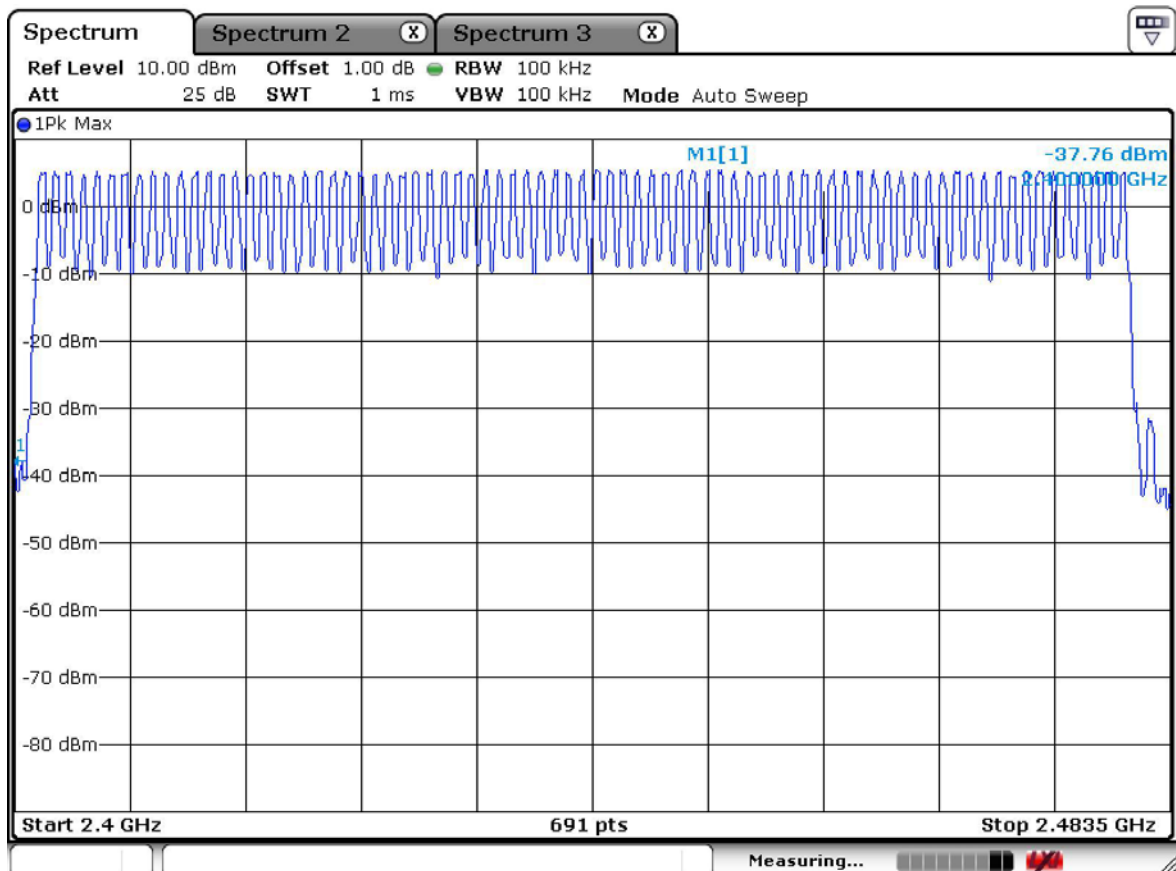
#### Minimum Standard:

At least 15 hopes

#### Measurement Setup

Same as the Chapter 3.2.1 (Figure 1)

### 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

#### Measurement Data: Basic Mode

| Frequency (MHz) | Channel No. | Test Results(MHz) |               |
|-----------------|-------------|-------------------|---------------|
|                 |             | 20dB Bandwidth    | 99% Bandwidth |
| 2402            | 0           | 0.821             | 0.860         |
| 2441            | 39          | 0.816             | 0.860         |
| 2480            | 78          | 0.821             | 0.855         |

#### Measurement Data: EDR Mode

| Frequency (MHz) | Channel No. | Test Results(MHz) |               |
|-----------------|-------------|-------------------|---------------|
|                 |             | 20dB Bandwidth    | 99% Bandwidth |
| 2402            | 0           | 1.237             | 1.190         |
| 2441            | 39          | 1.237             | 1.181         |
| 2480            | 78          | 1.229             | 1.172         |

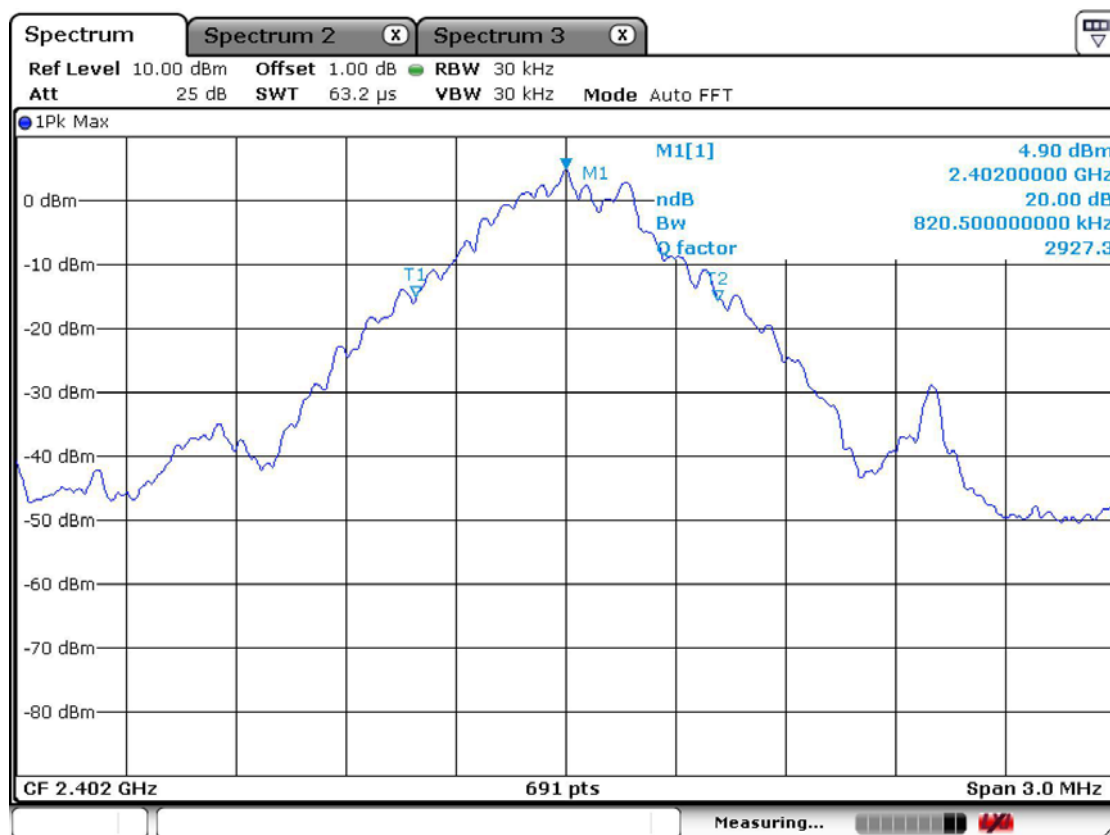
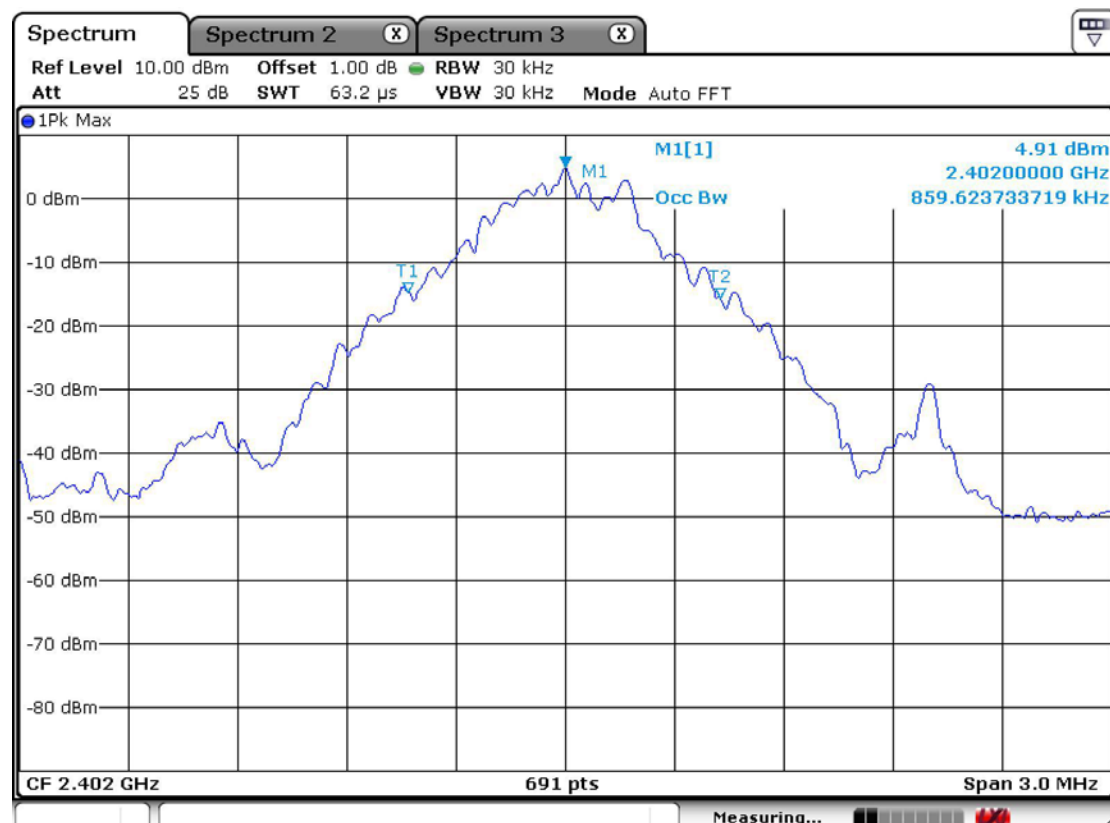
- See next pages for actual measured spectrum plots.

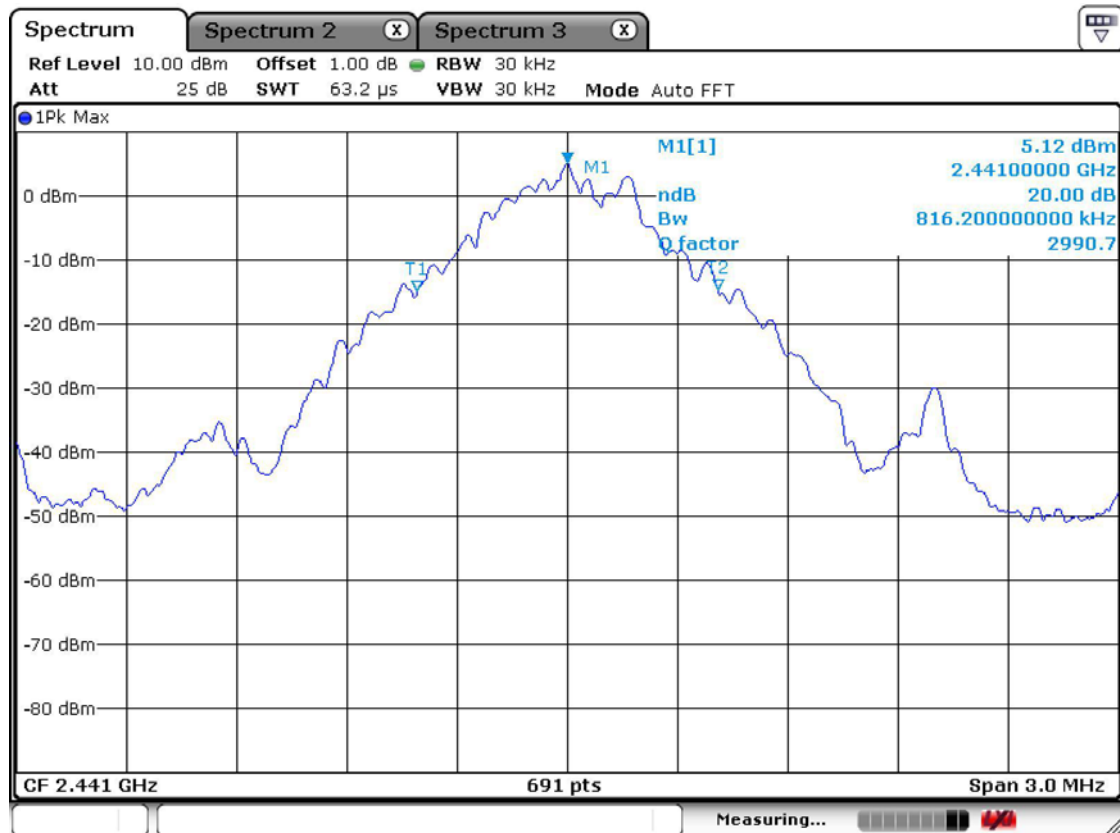
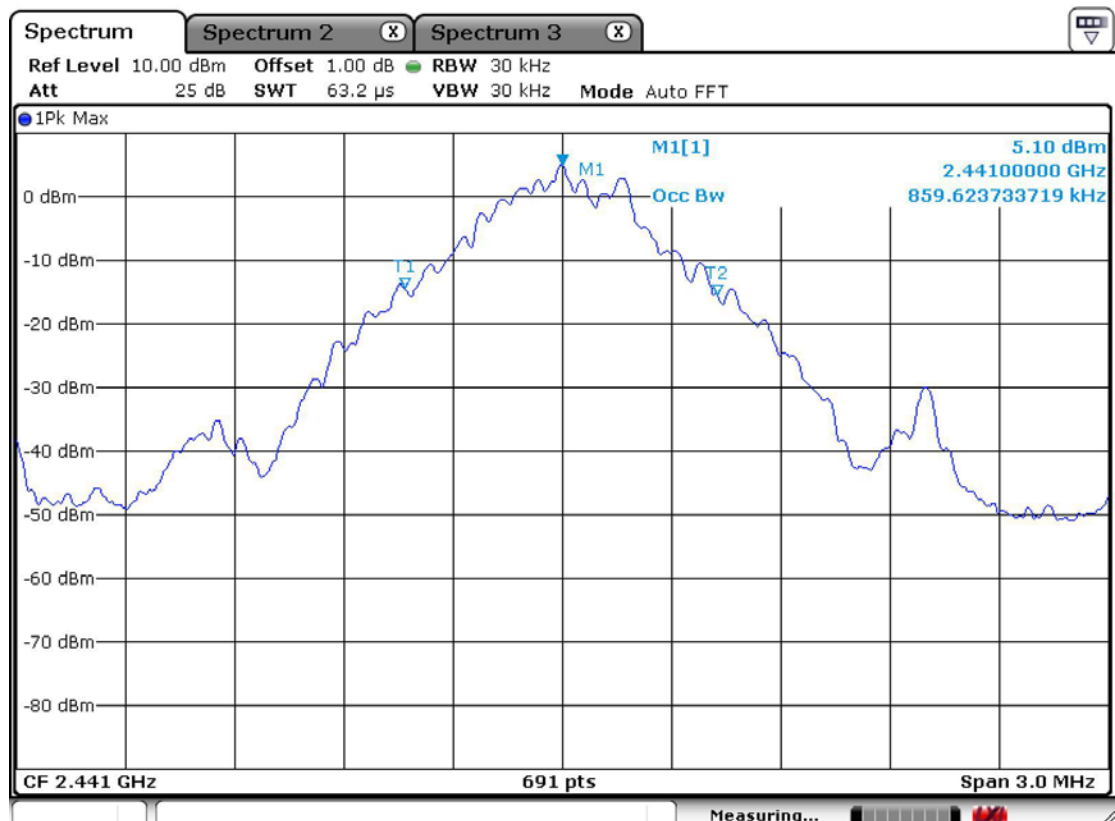
#### Minimum Standard:

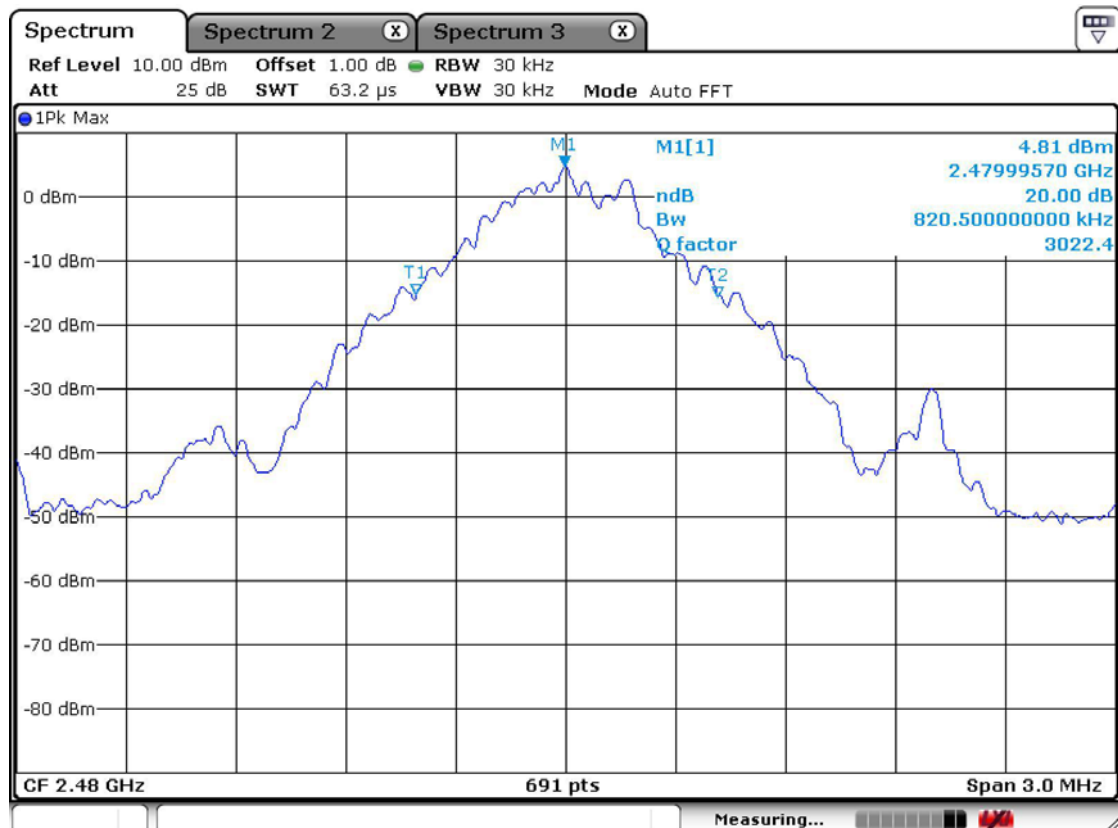
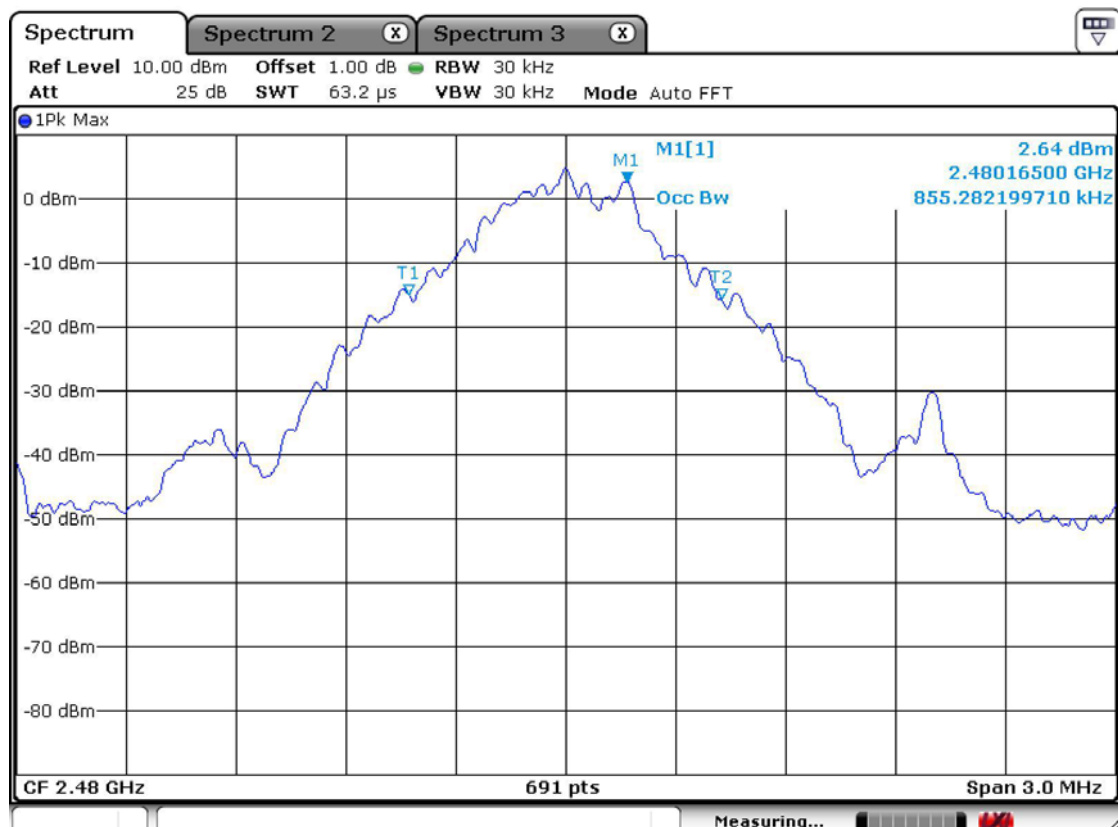
N/A

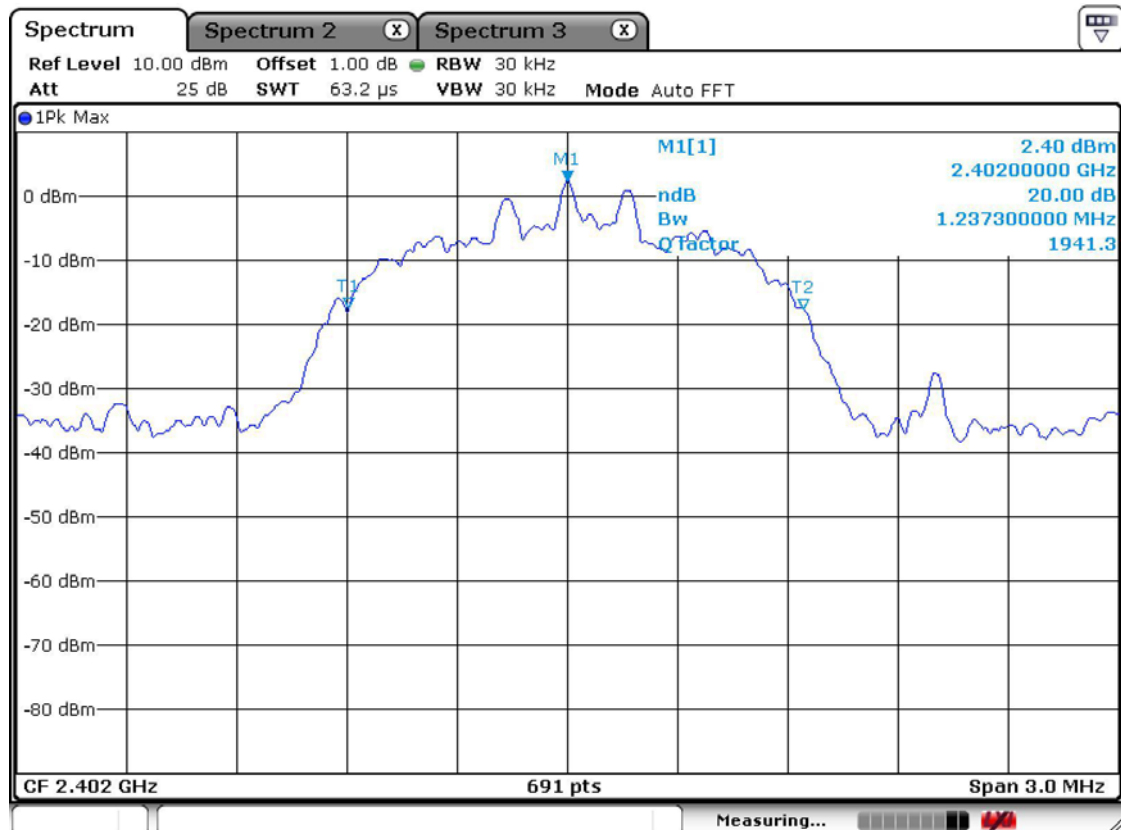
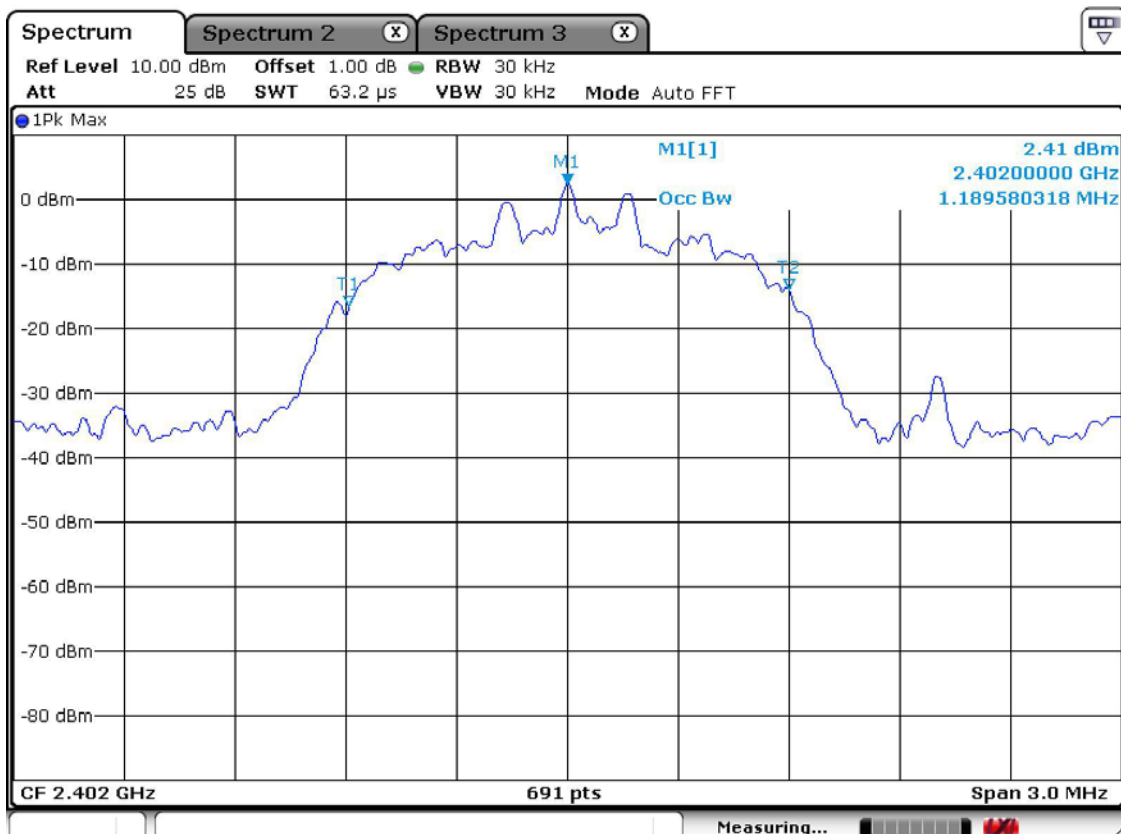
#### Measurement Setup

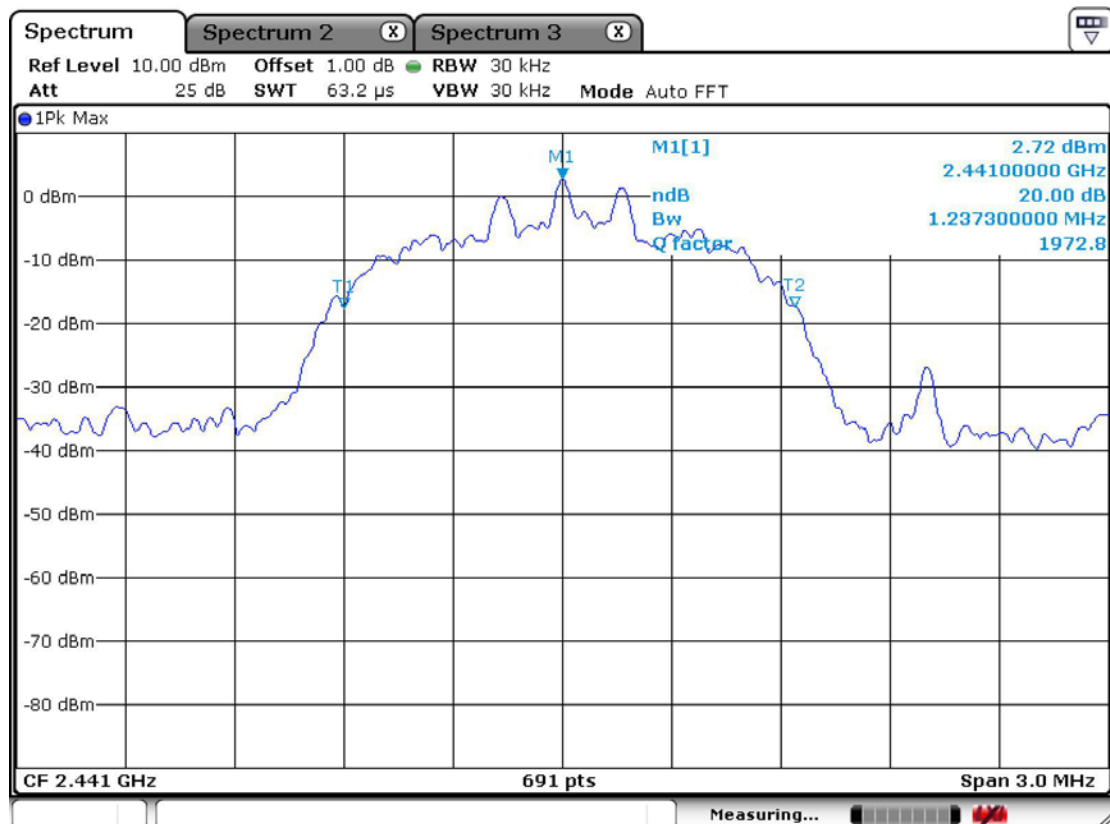
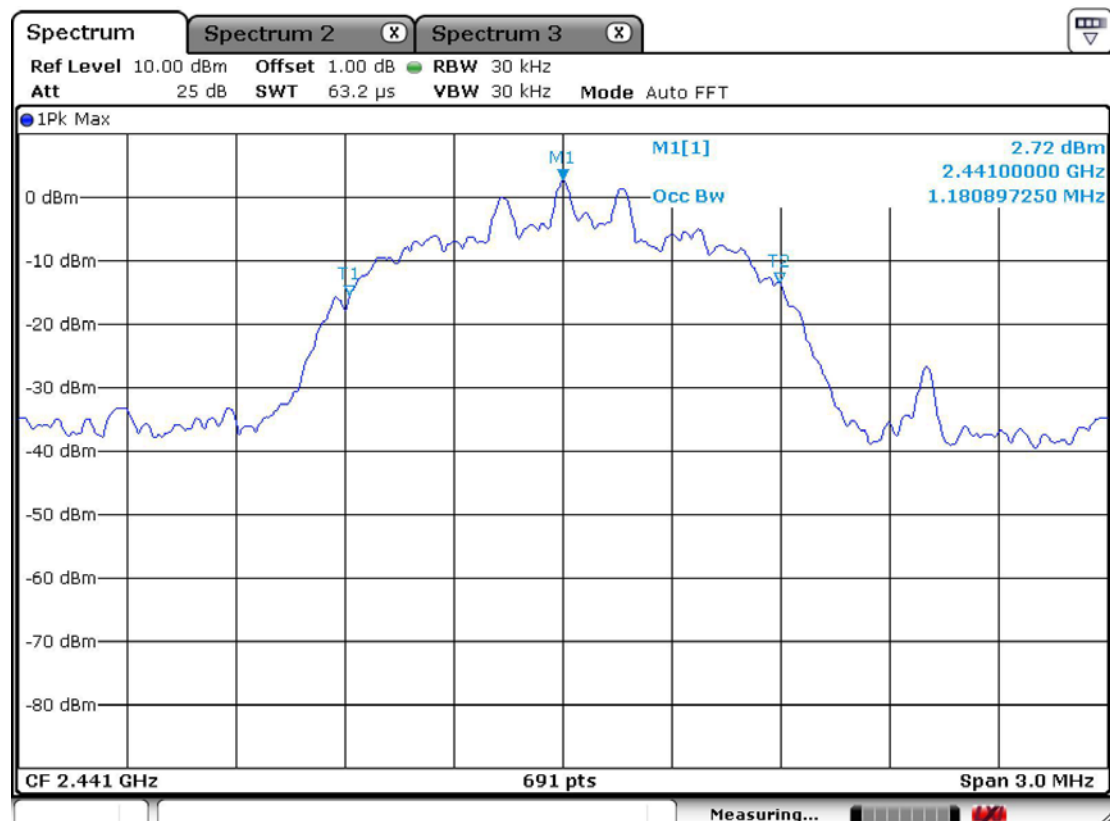
Same as the Chapter 3.2.1 (Figure 1)

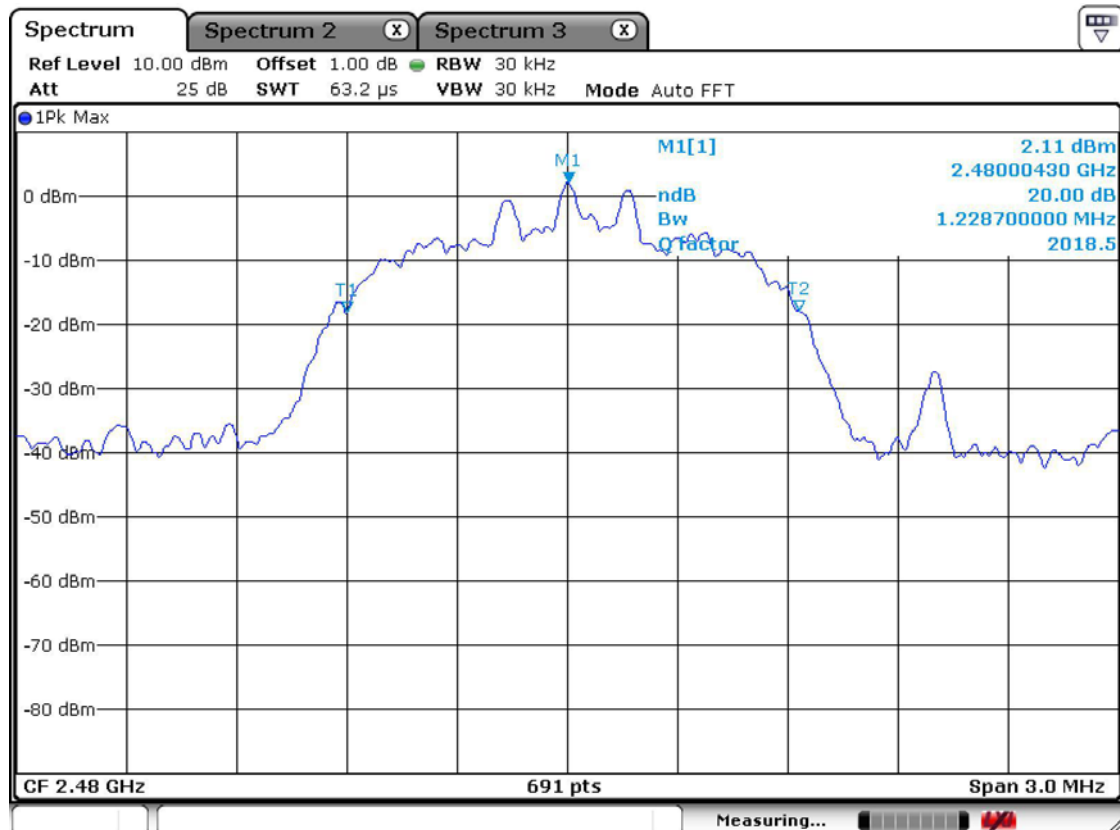
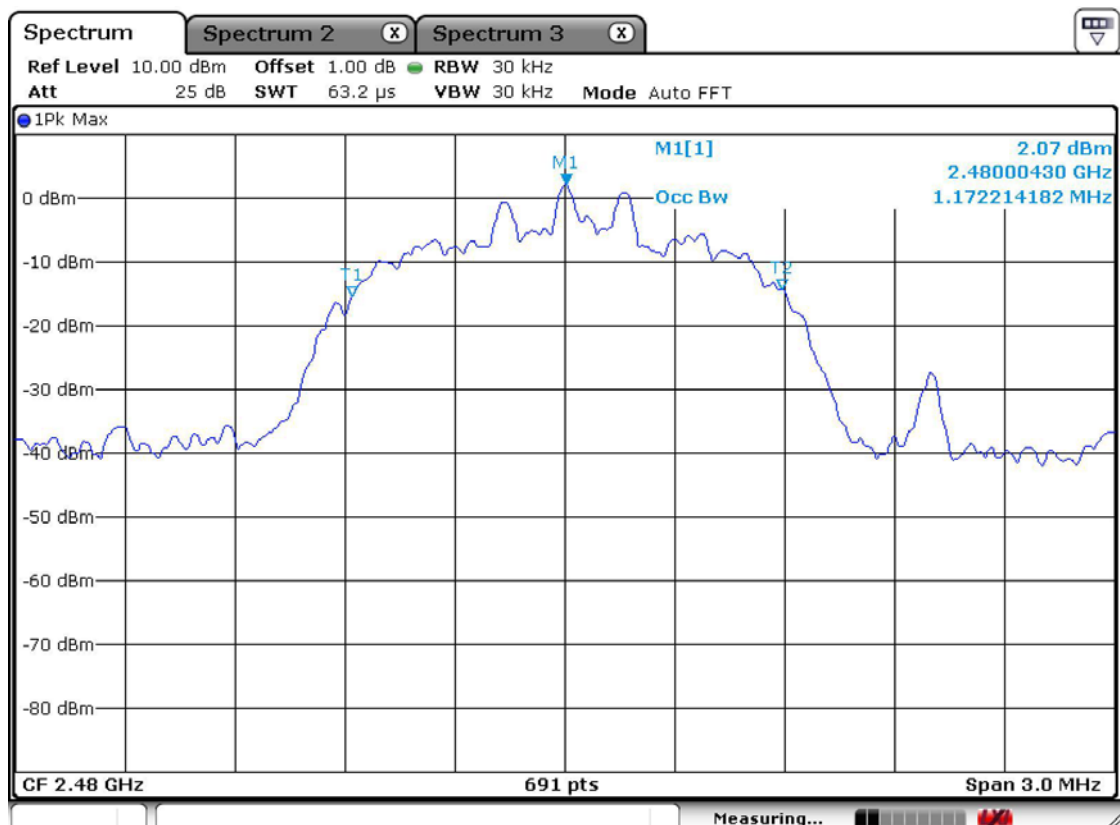
**Channel 1 of basic mode****20 dB Bandwidth****99% Bandwidth**

**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                     | 0.533                                 | 168.42           | 400             |
| DH3           | 15(Times / 3sec) *10.533 = 158.00                     | 1.774                                 | 280.29           | 400             |
| DH5           | 10(Times / 3sec) *10.533 = 105.33                     | 3.051                                 | 321.36           | 400             |
| EDR 3Mbps DH5 | 10(Times / 3sec) *10.533 = 105.33                     | 3.065                                 | 322.84           | 400             |

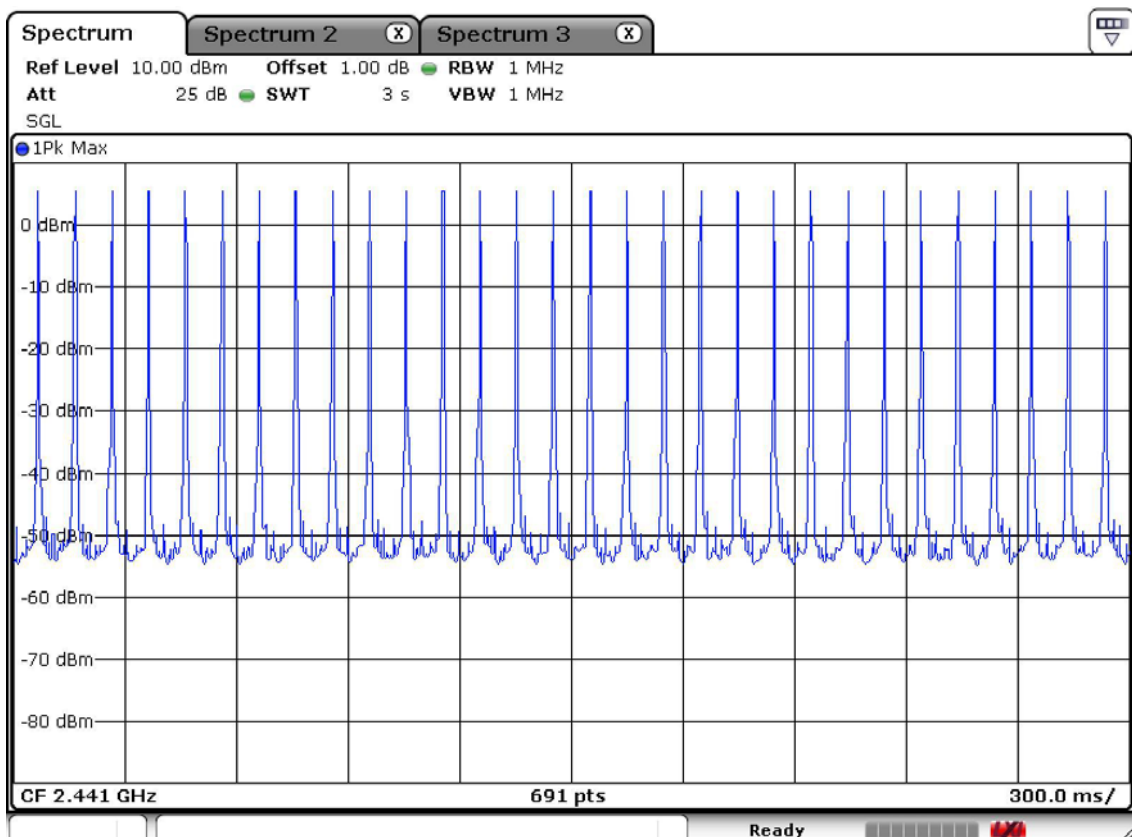
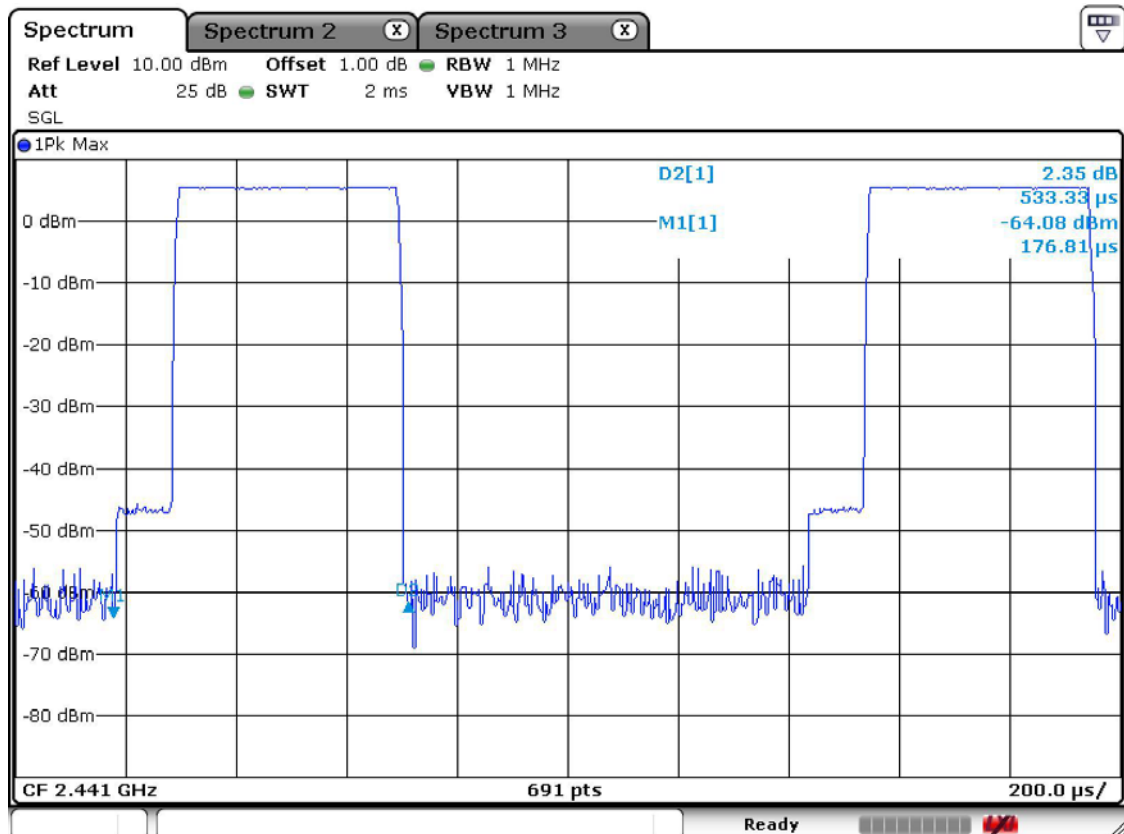
- See next pages for actual measured spectrum plots.
- dwell time = {(number of hopping per second / number of slot ) x duration time per channel} x 0.4 ms

#### Minimum Standard:

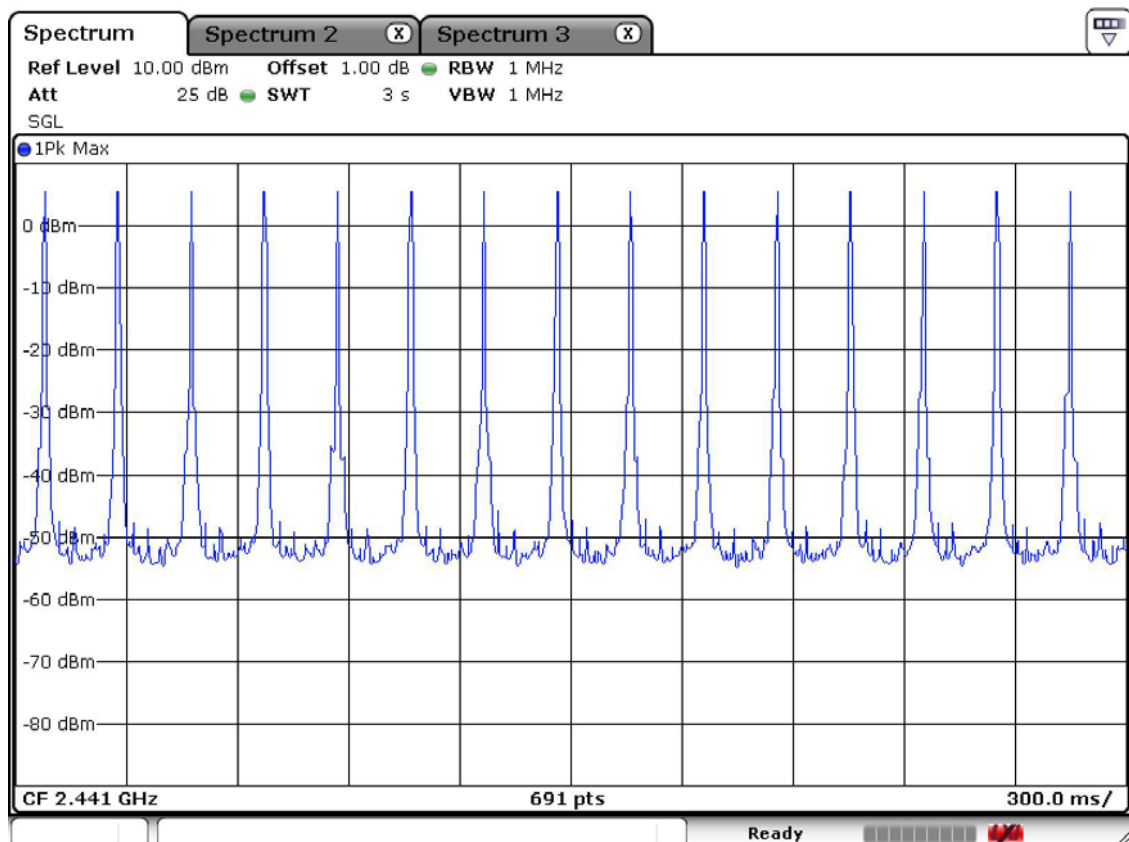
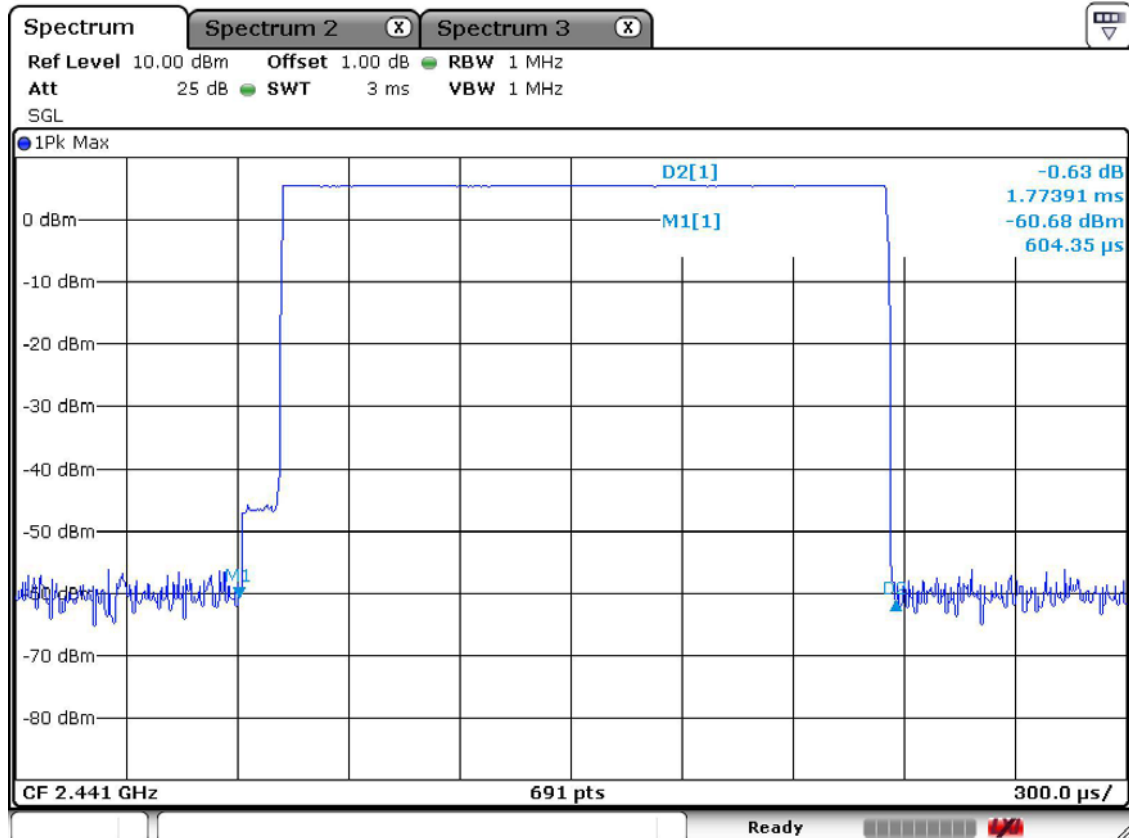
0.4 seconds within a 30 second period per any frequency

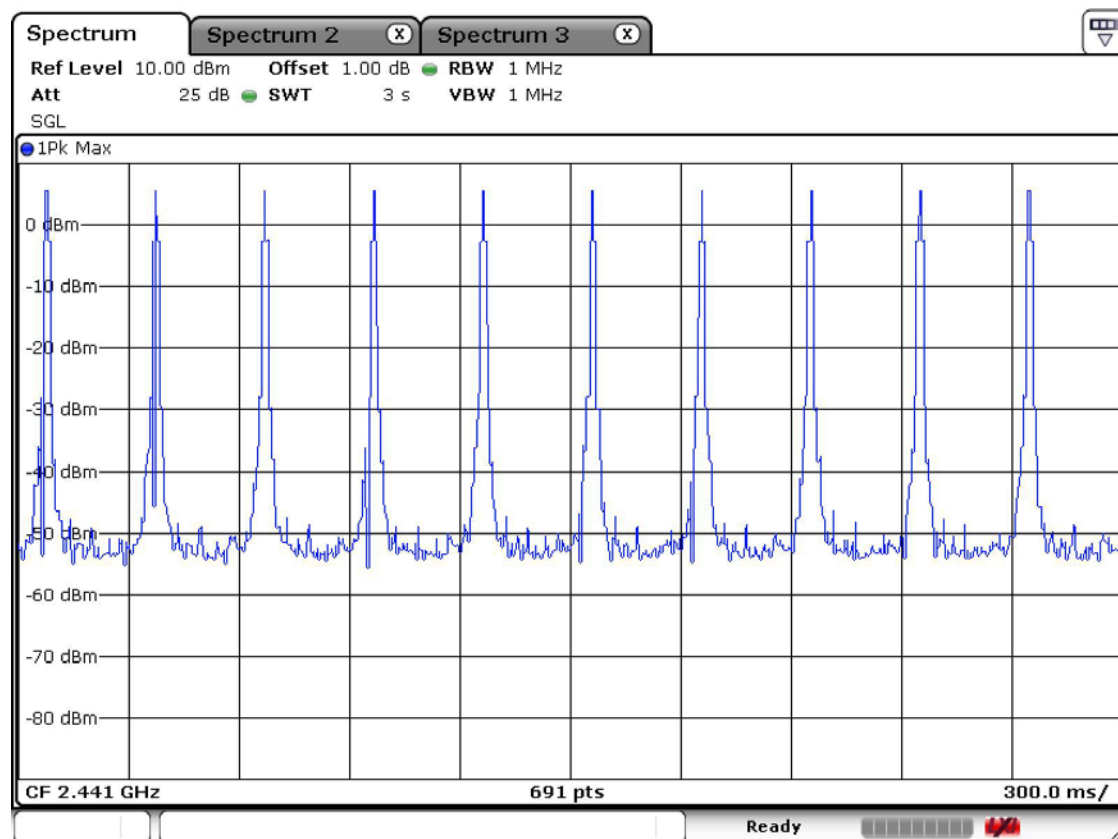
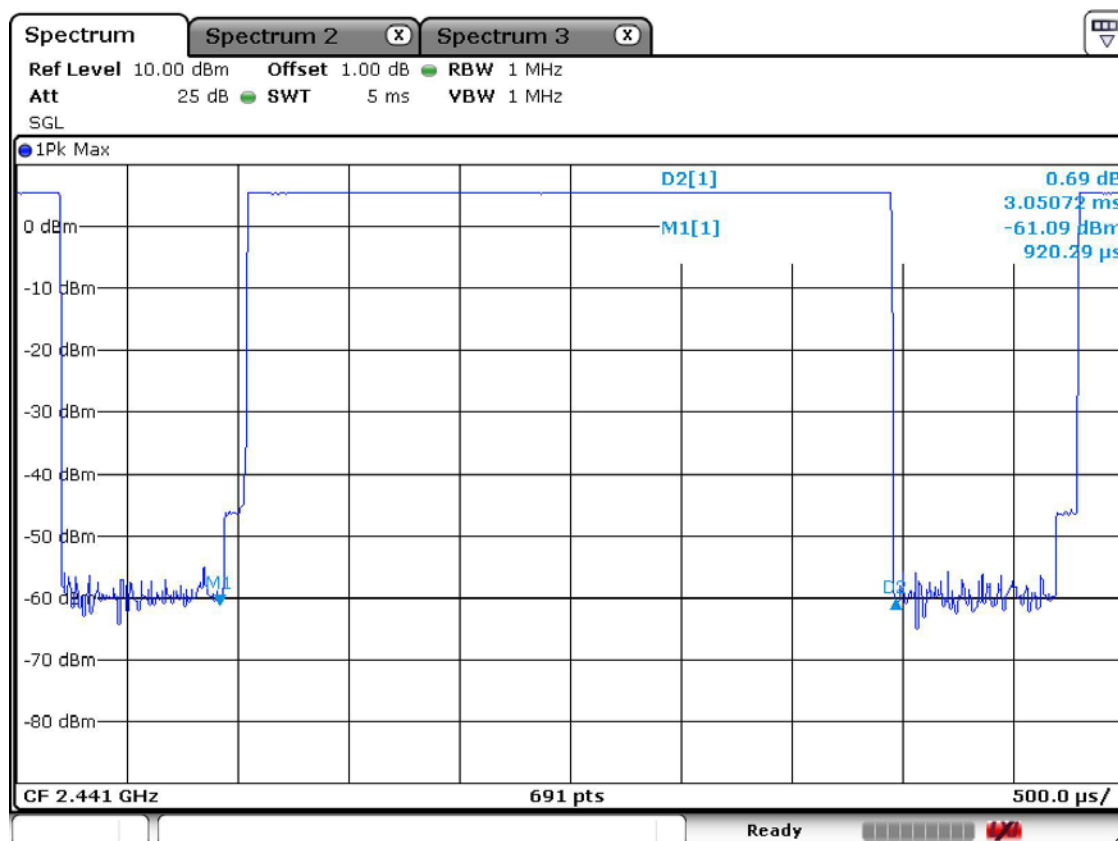
#### Measurement Setup

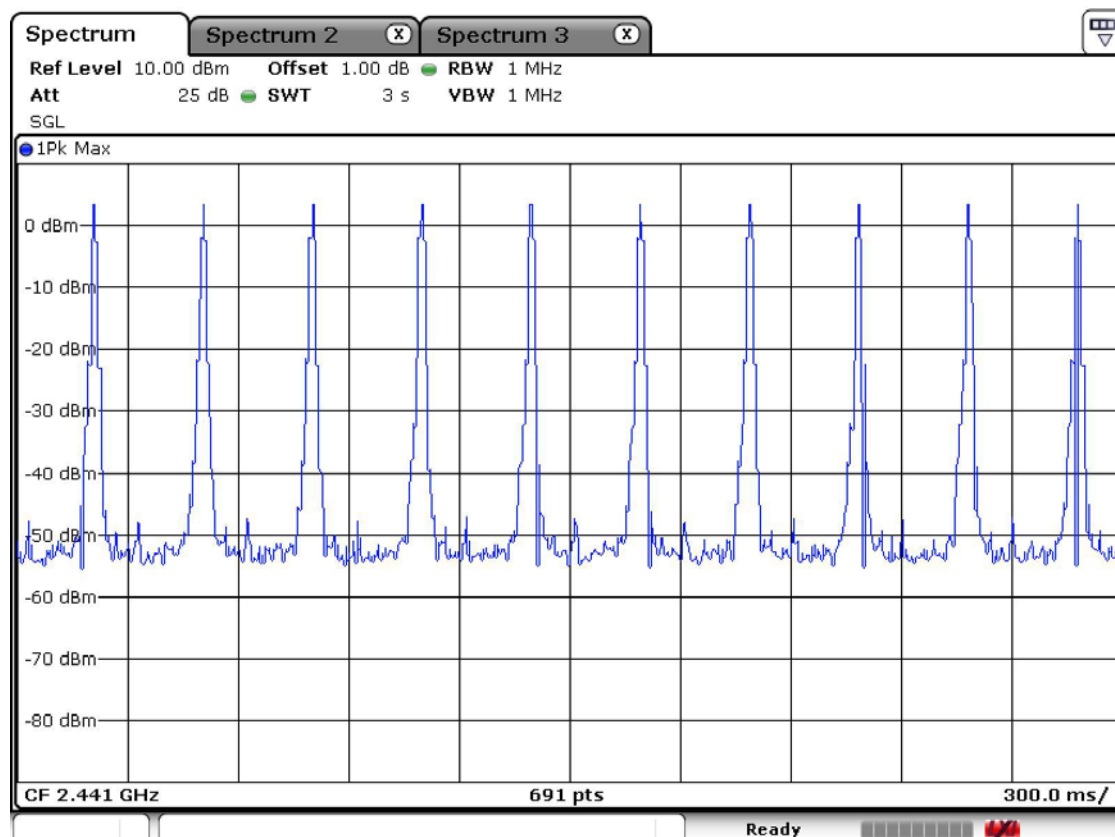
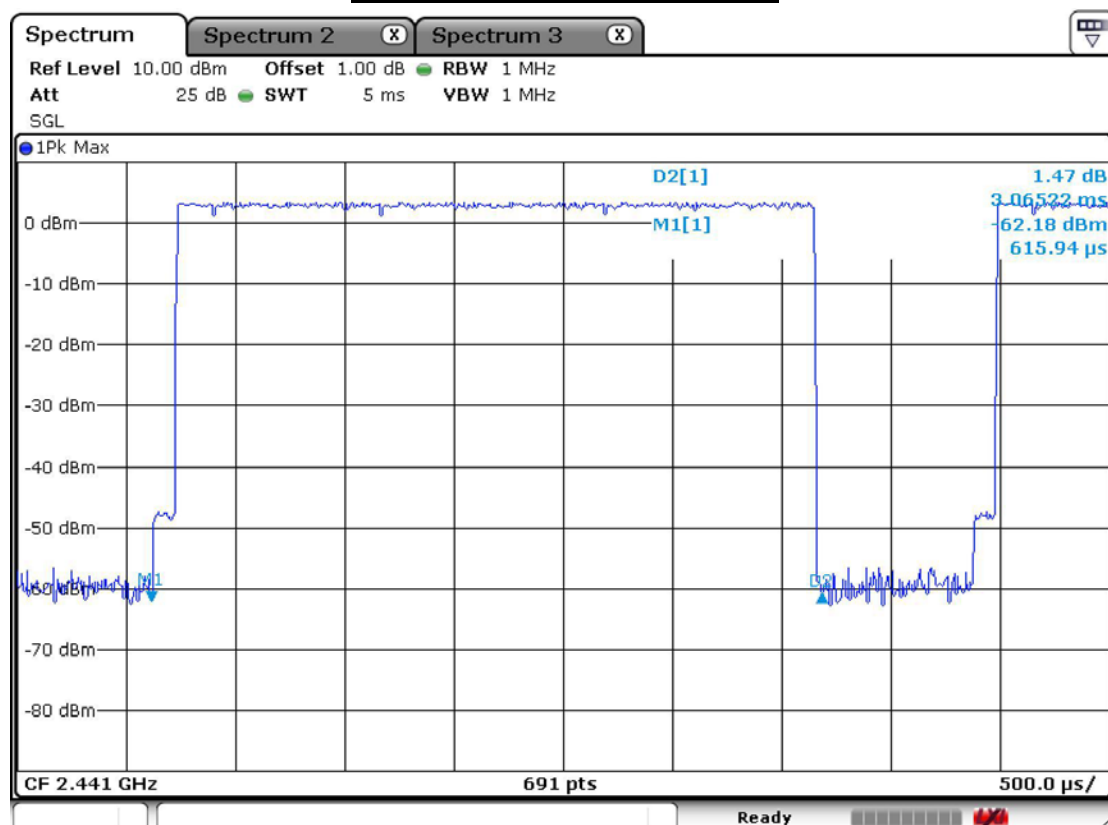
Same as the Chapter 3.2.1 (Figure 1)

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 = 10 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   | 5.35         | 3.43 | Complies |
| 2441            | 39  | 5.54         | 3.58 | Complies |
| 2480            | 78  | 5.27         | 3.37 | Complies |

#### Measurement Data: EDR Mode

| Frequency (MHz) | Ch. | Test Results |      |          |
|-----------------|-----|--------------|------|----------|
|                 |     | dBm          | mW   | Result   |
| 2402            | 0   | 3.67         | 2.33 | Complies |
| 2441            | 39  | 4.03         | 2.53 | Complies |
| 2480            | 78  | 3.62         | 2.30 | Complies |

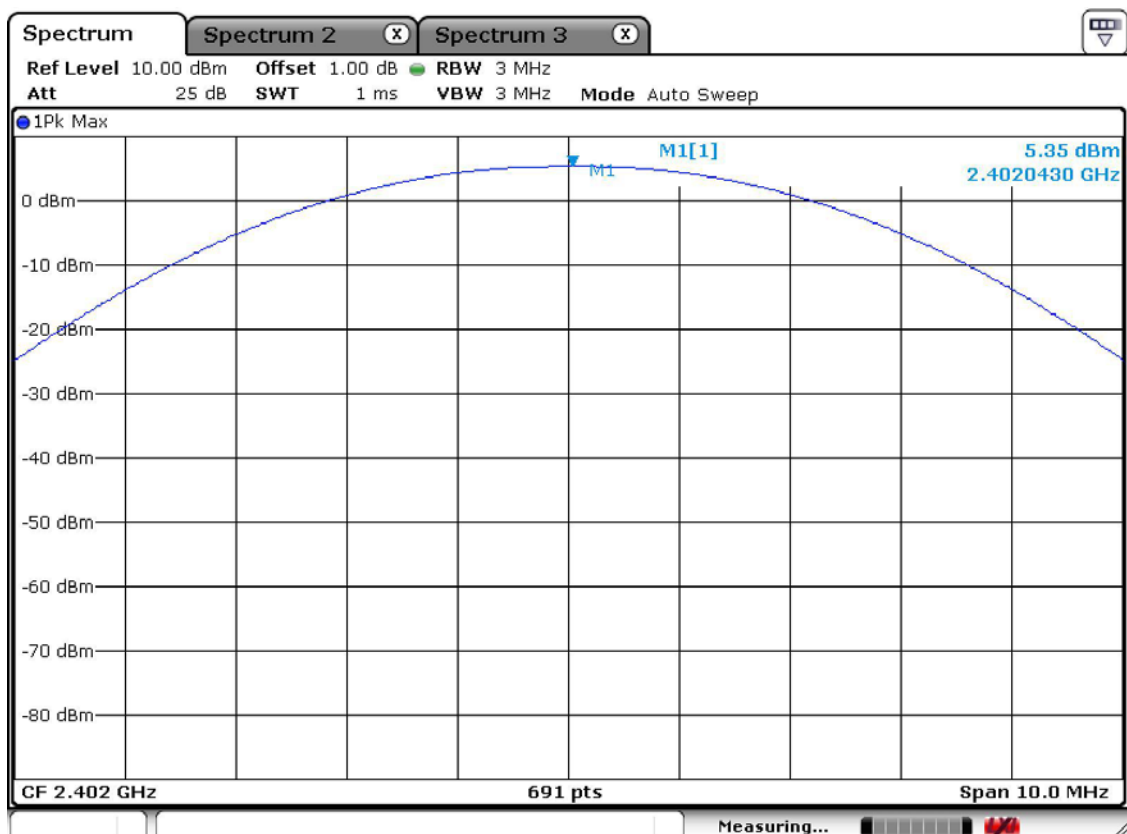
- See next pages for actual measured spectrum plots.

|                          |          |
|--------------------------|----------|
| <b>Minimum Standard:</b> | < 250 mW |
|--------------------------|----------|

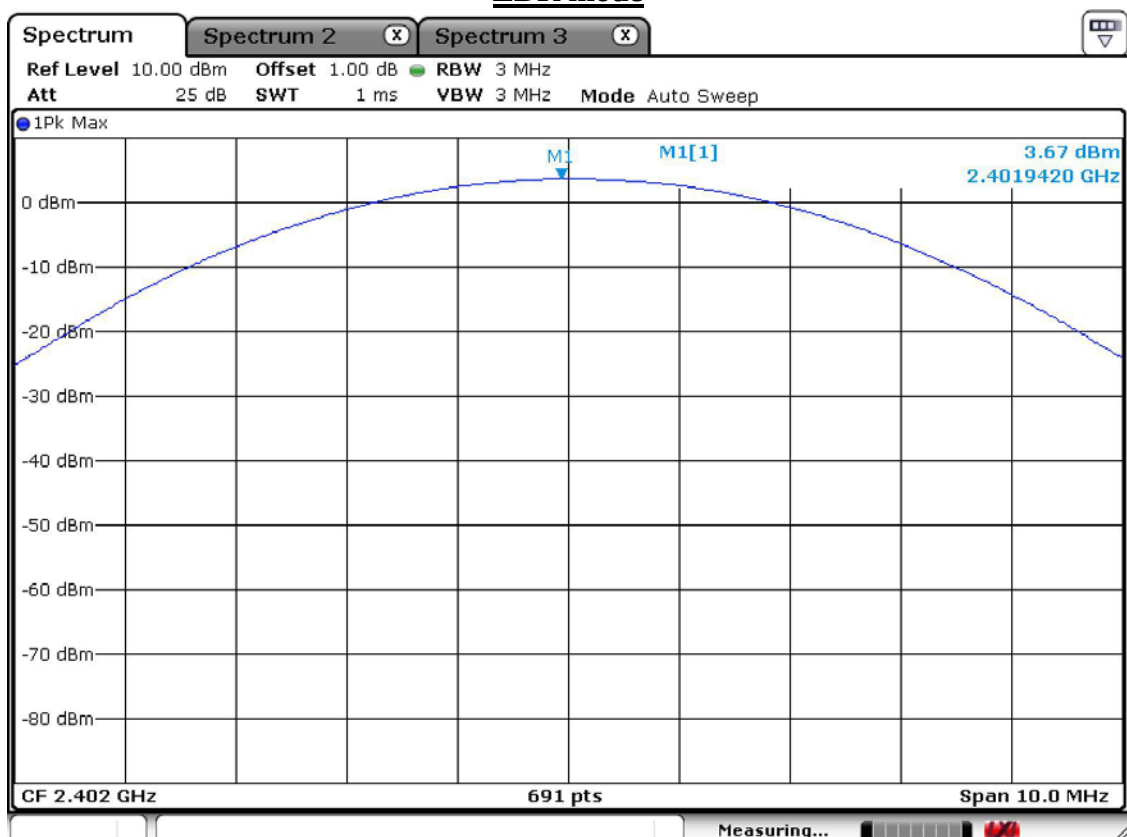
#### Measurement Setup

Same as the Chapter 3.2.1 (Figure 1)

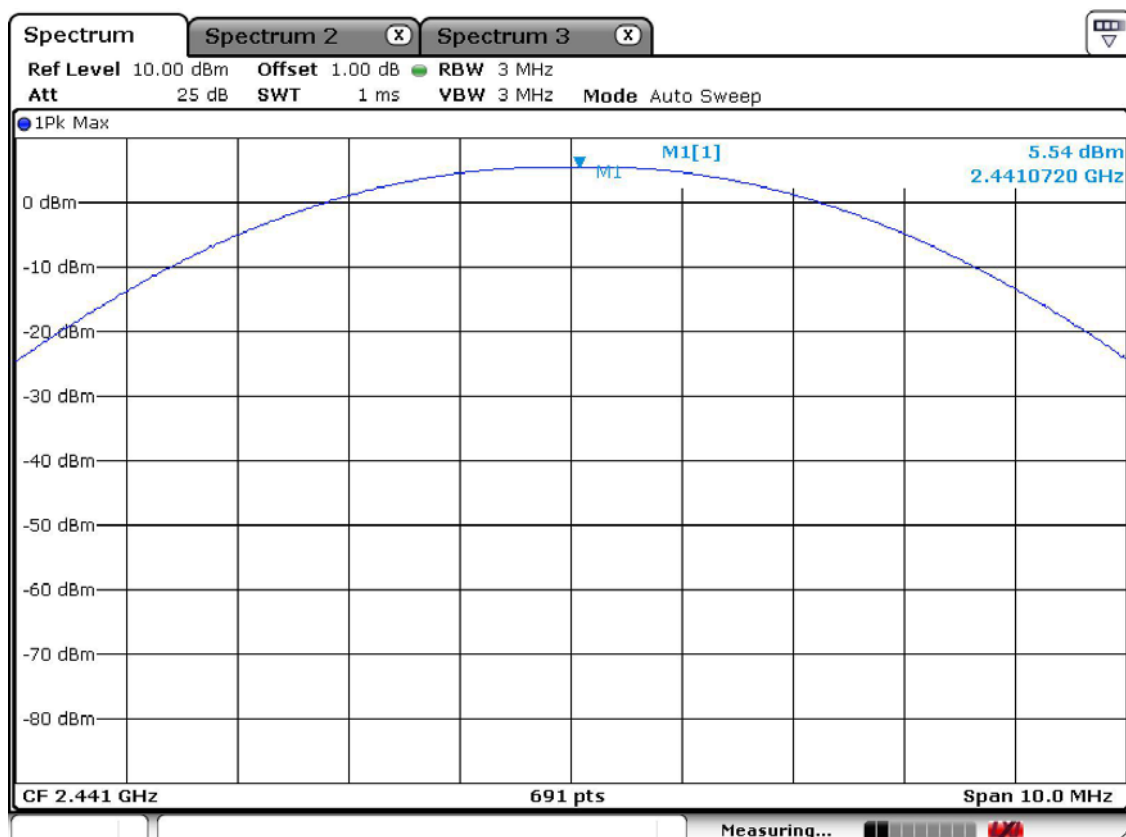
### Channel 1 Basic mode



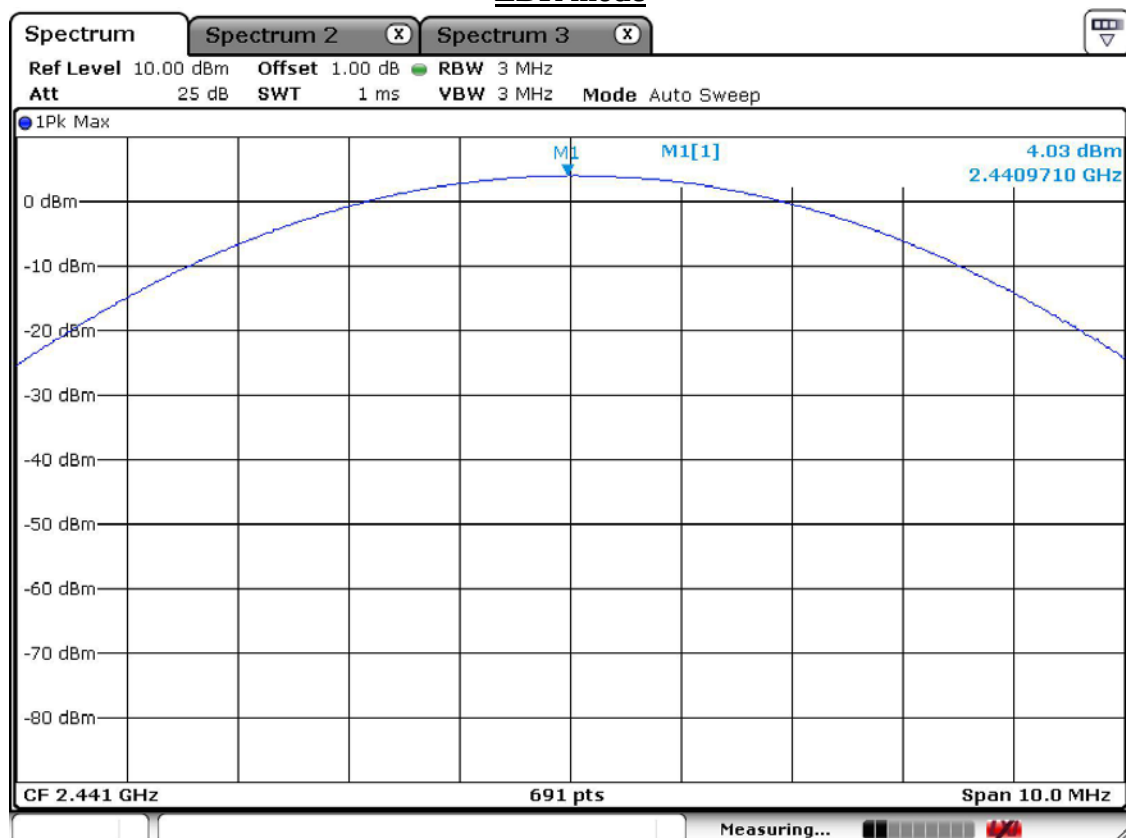
### EDR mode



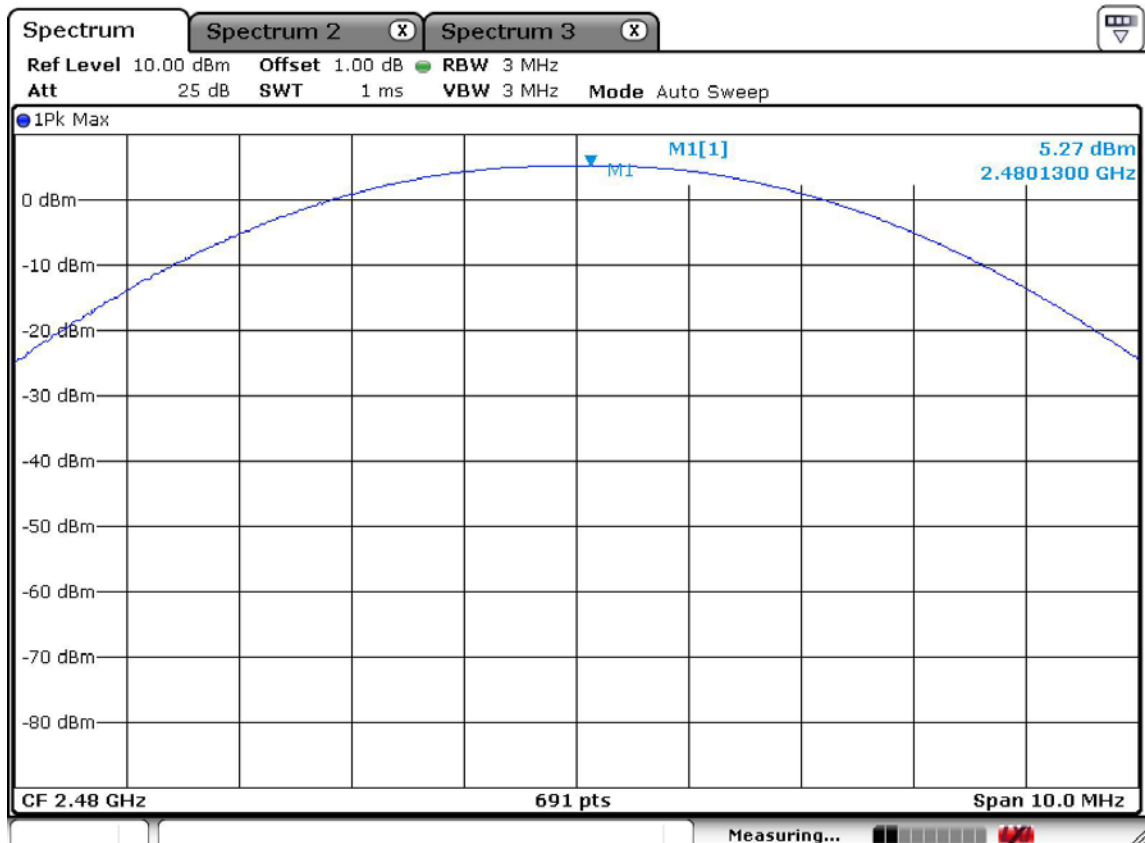
## Channel 2 Basic mode



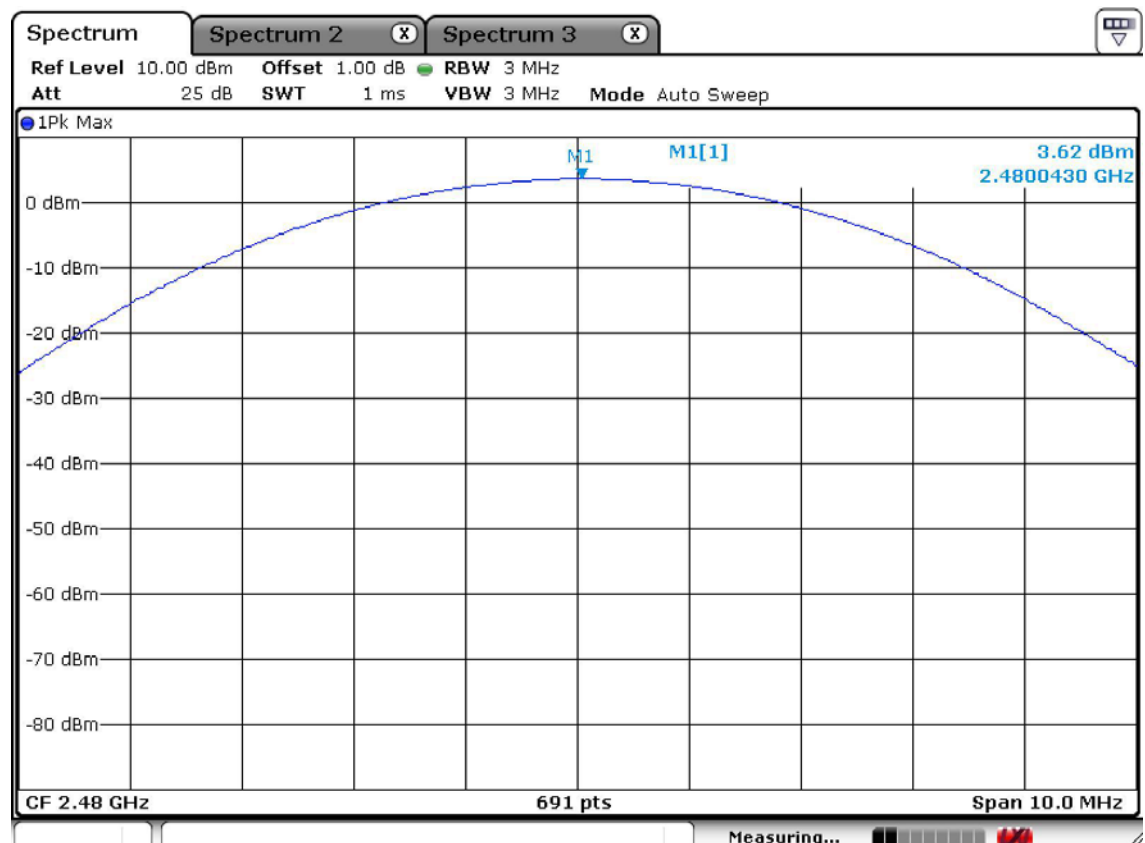
## EDR mode



### 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 = 10~30 MHz

Detector function = peak

Trace = max hold

Sweep = auto

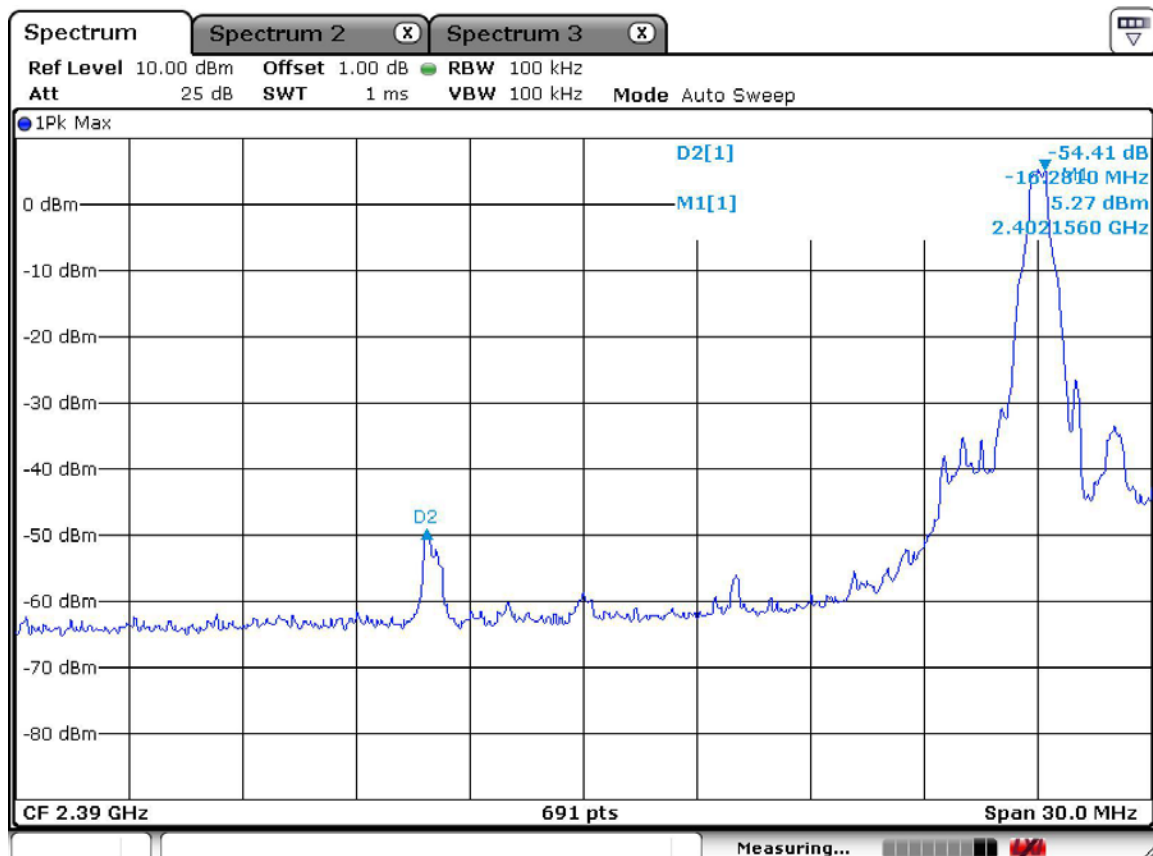
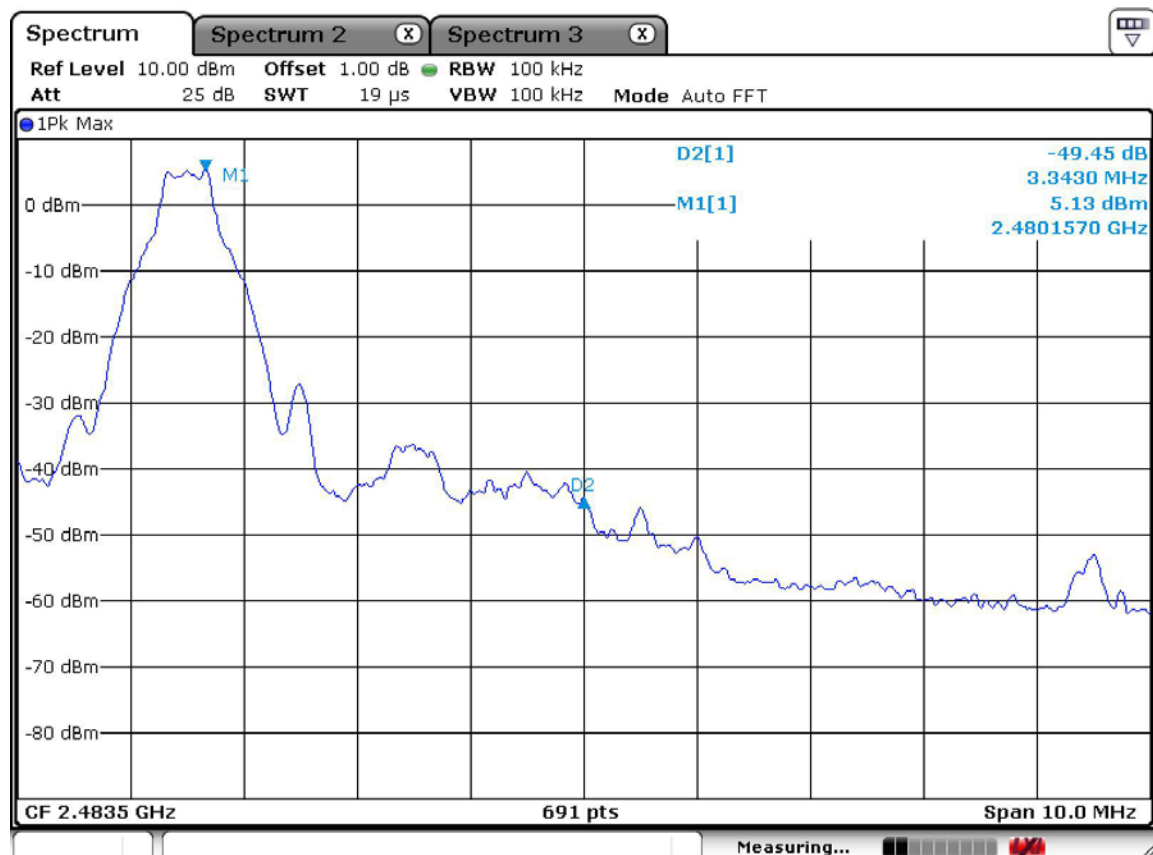
#### Measurement Data: Complies

- 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**

**Band-edges in the restricted band 2310-2390 MHz measurement**

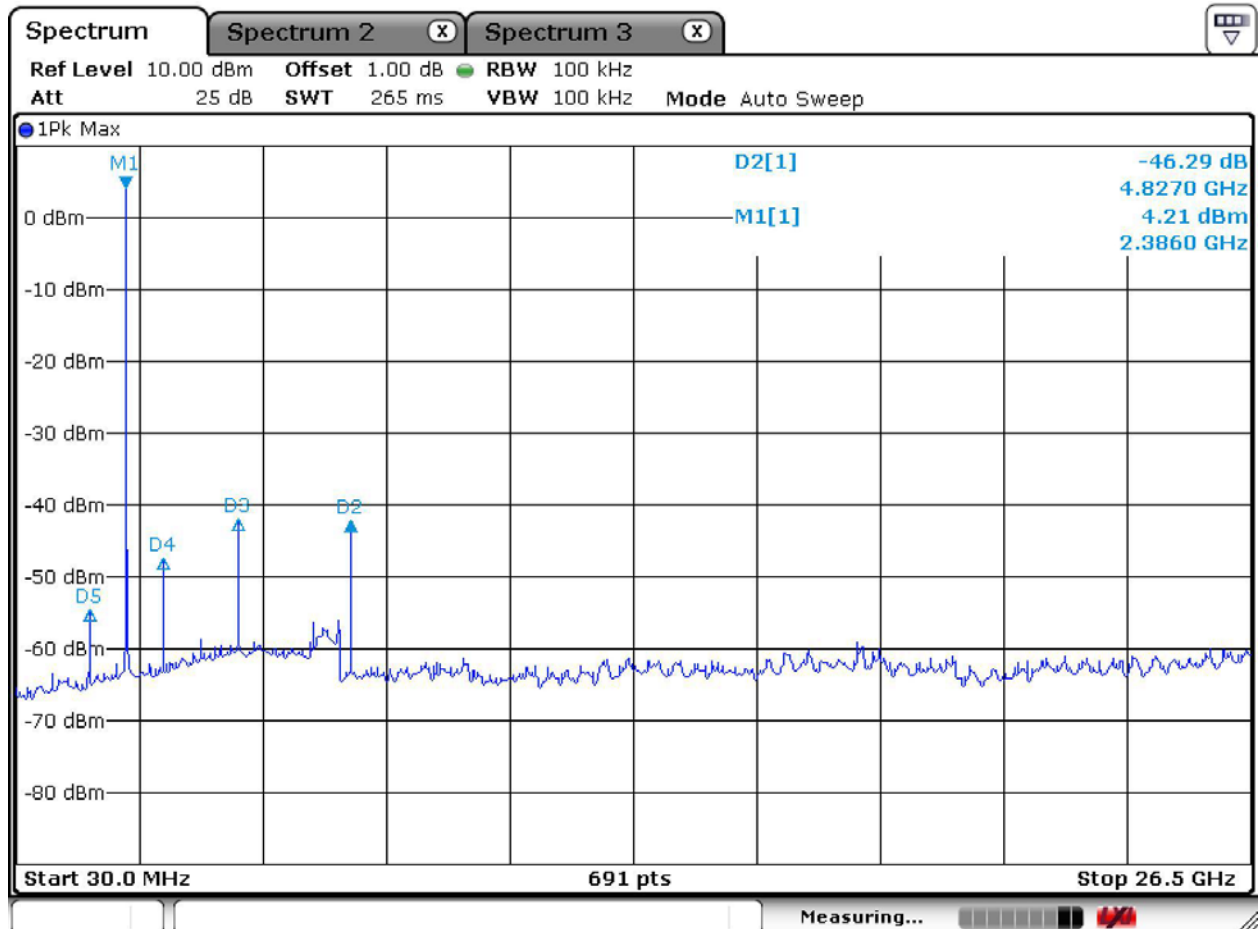
| Frequency | Reading    |      | Pol. | Correction |              |       | Limits     |      | Result     |      | Margin    |      |
|-----------|------------|------|------|------------|--------------|-------|------------|------|------------|------|-----------|------|
|           | [dBuV / m] |      |      | Factor     |              |       | [dBuV / m] |      | [dBuV / m] |      | [dB]      |      |
| [MHz]     | AV / Peak  |      |      | Antenna    | Amp.<br>Gain | Cable | AV / Peak  |      | AV / Peak  |      | AV / Peak |      |
| 2386      | 48.4       | 58.5 | V    | 25.4       | 37.1         | 4.0   | 54.0       | 74.0 | 40.7       | 50.8 | 13.4      | 23.3 |

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

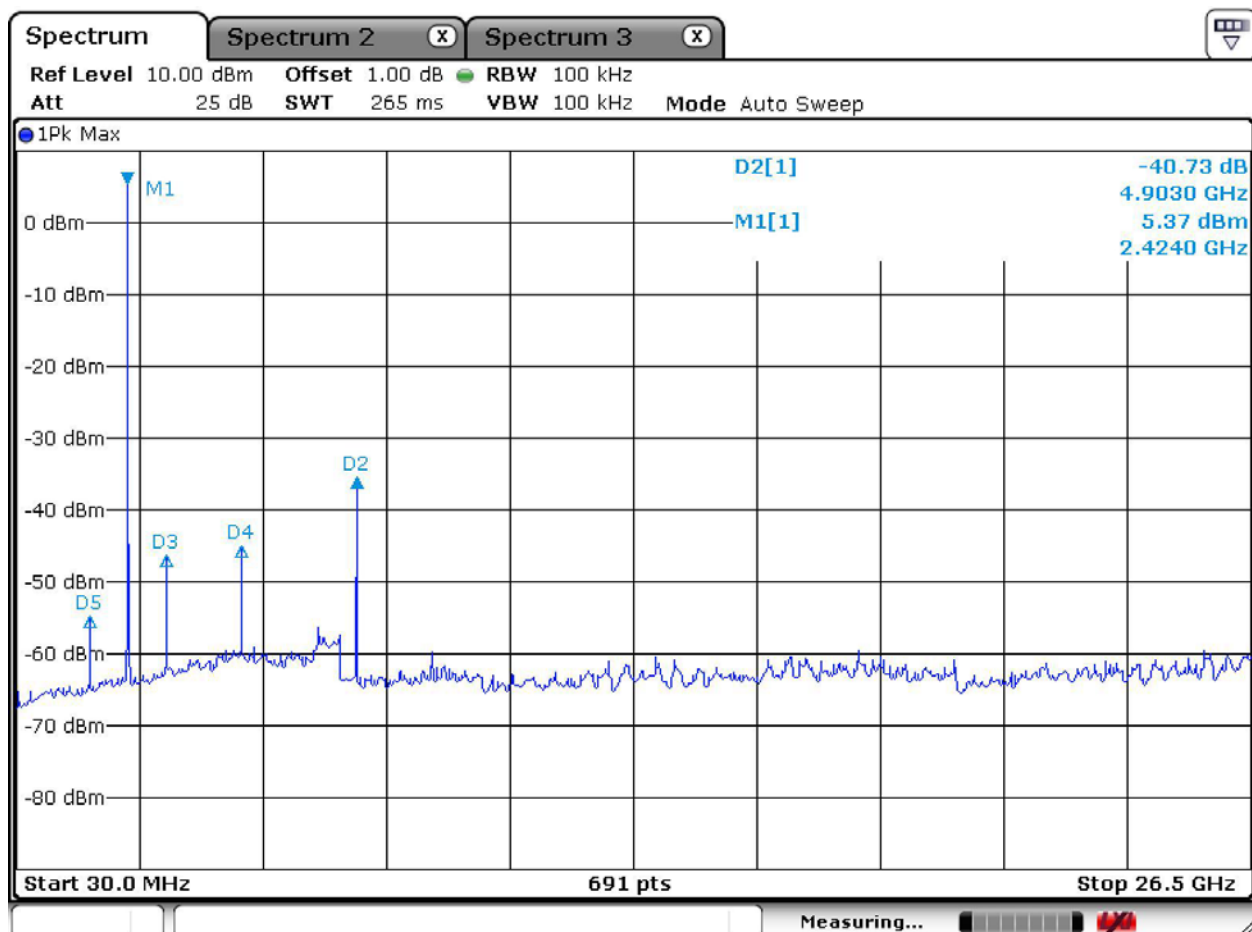
| Frequency | Reading    |      | Pol. | Correction |              |       | Limits     |      | Result     |      | Margin    |      |
|-----------|------------|------|------|------------|--------------|-------|------------|------|------------|------|-----------|------|
|           | [dBuV / m] |      |      | Factor     |              |       | [dBuV / m] |      | [dBuV / m] |      | [dB]      |      |
| [MHz]     | AV / Peak  |      |      | Antenna    | Amp.<br>Gain | Cable | AV / Peak  |      | AV / Peak  |      | AV / Peak |      |
| 2483.5    | 51.5       | 63.5 | V    | 25.4       | 37.1         | 4.0   | 54.0       | 74.0 | 43.8       | 55.8 | 10.3      | 18.3 |

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

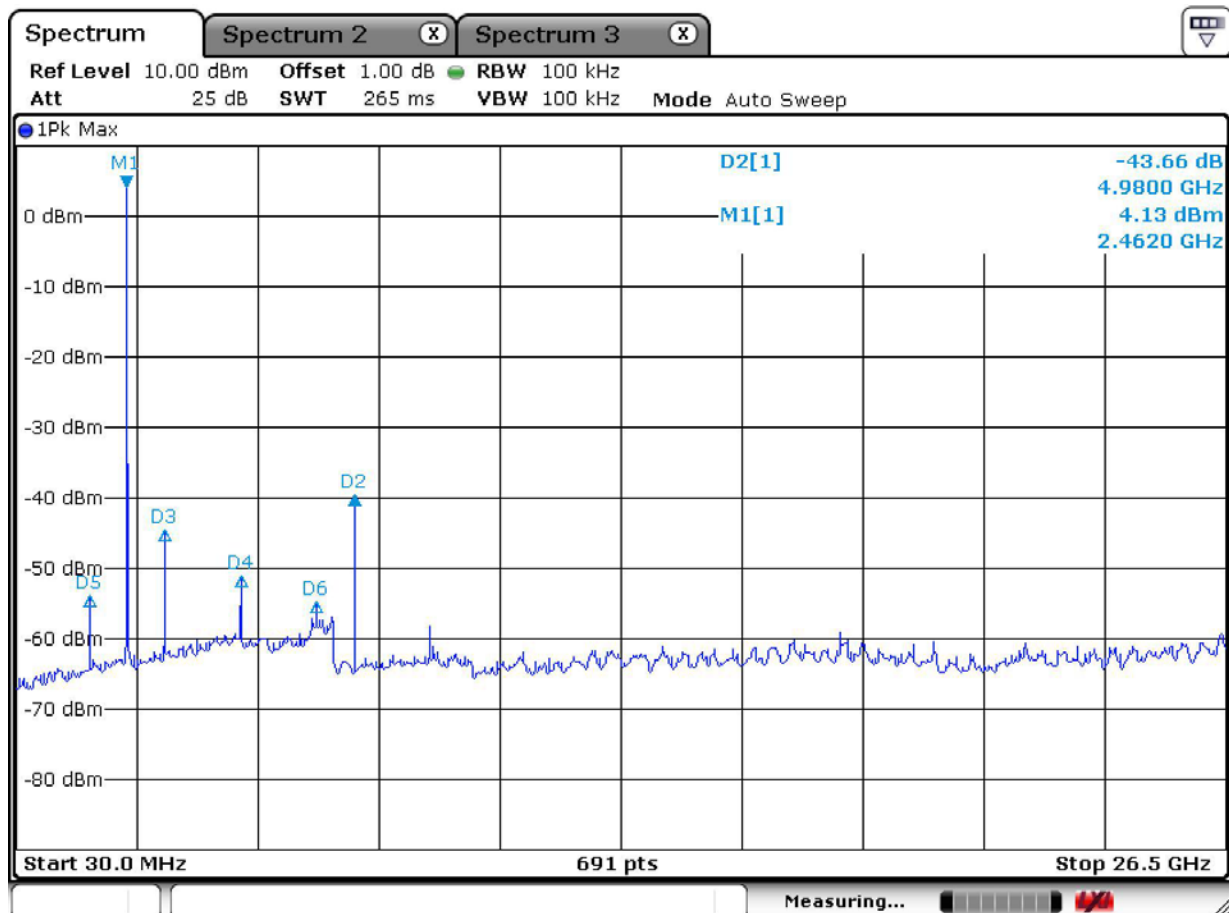
**Unwanted Emission – Low channel**  
**Frequency Range = 30 MHz ~ 26.5 GHz**



**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 - Transmitter

#### 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. In case of the air temperature of the test site is out of the range is 10 to 40°C before the testing proceeds the warm-up time of EUT maintain adequately

#### 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.
- The warm-up time of the EUT is 20min.
- No other emissions were detected at a level greater than 20dB below limit.

#### 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:

| 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 |      |
| 4804.0    | 54.9       | 61.6 | V    | 31.4       | 36.5     | 5.7   | -30.31 | 54.0       | 74.0 | 25.3       | 32.0 | 28.7      | 42.0 |
|           |            |      |      |            |          |       |        |            |      |            |      |           |      |
| 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    | 57.3       | 63.9 | V    | 31.4       | 36.5     | 5.7   | -30.31 | 54.0       | 74.0 | 27.7       | 34.3 | 26.3      | 39.7 |
| 7323.0    | 45.3       | 57.2 | V    | 35.7       | 36.5     | 7.4   | -30.31 | 54.0       | 74.0 | 21.6       | 33.5 | 32.4      | 40.5 |
|           |            |      |      |            |          |       |        |            |      |            |      |           |      |
| 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    | 54.5       | 61   | V    | 31.4       | 36.5     | 5.7   | -30.31 | 54.0       | 74.0 | 24.9       | 31.4 | 29.1      | 42.6 |
| 7440.0    | 32.4       | 41.8 | V    | 35.7       | 36.5     | 7.4   | -30.31 | 54.0       | 74.0 | 8.7        | 18.1 | 45.3      | 55.9 |
|           |            |      |      |            |          |       |        |            |      |            |      |           |      |

- No other emissions were detected at a level greater than 20dB below limit.
- D.C.F ( Duty Cycle Correction Factor ) =  $20\log(\text{The worst Case DWELL Time}/100\text{ms})$   
 $= 20\log(3.051\text{ms}/100\text{ms}) = -30.31$

**Radiated Emissions**

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

EUT/Model No.: K1aT8-BR

TEST MODE: Bluetooth mode

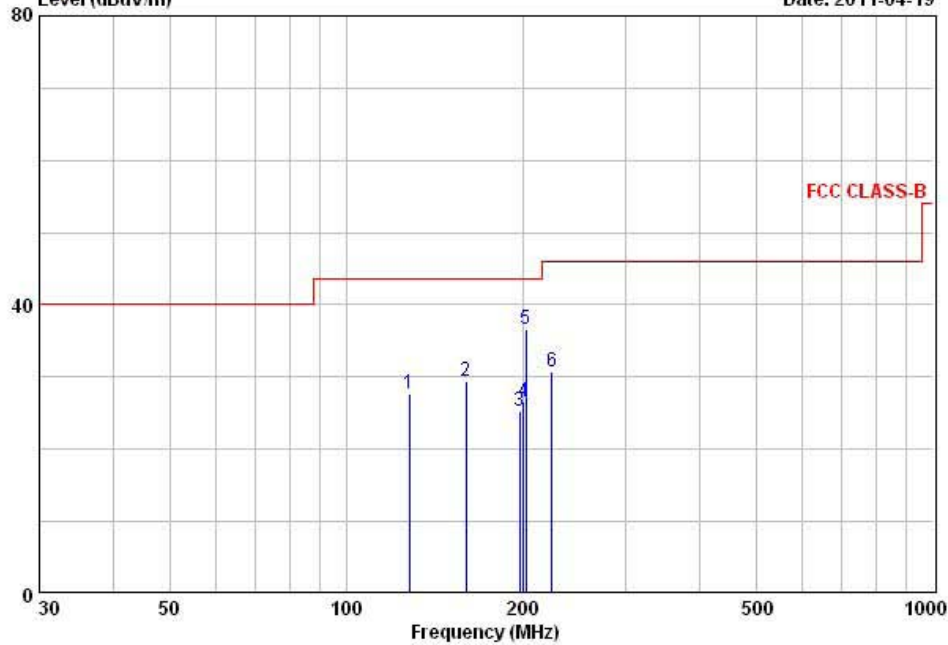
Temp Humi : 19 / 23

Tested by: PARK.H.W

Data: 32

Level (dBuV/m)

Date: 2011-04-19



|   | Freq   | Reading | C.F    | Result | Limit<br>QP | Margin | Height | Angle | Polarity   |
|---|--------|---------|--------|--------|-------------|--------|--------|-------|------------|
|   | MHz    | dBuV/m  | dB/m   | dBuV/m | dBuV/m      | dB     | cm     | deg   |            |
| 1 | 127.98 | 38.00   | -10.32 | 27.68  | 43.50       | 15.82  | 193    | 252   | HORIZONTAL |
| 2 | 160.00 | 38.50   | -8.98  | 29.52  | 43.50       | 13.98  | 264    | 272   | HORIZONTAL |
| 3 | 197.32 | 37.00   | -11.68 | 25.32  | 43.50       | 18.18  | 200    | 147   | HORIZONTAL |
| 4 | 200.73 | 38.50   | -11.81 | 26.69  | 43.50       | 16.81  | 162    | 164   | HORIZONTAL |
| 5 | 202.66 | 48.30   | -11.71 | 36.59  | 43.50       | 6.91   | 192    | 166   | HORIZONTAL |
| 6 | 224.00 | 41.50   | -10.67 | 30.83  | 46.00       | 15.17  | 131    | 268   | HORIZONTAL |

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

### 3.2.8 Field Strength of Harmonics - Receivers

#### Definition:

The field strength of emissions from intentional radiators was measured. In case of the air temperature of the test site is out of the range is 10 to 40°C before the testing proceeds the warm-up time of EUT maintain adequately

|                     |                                          |
|---------------------|------------------------------------------|
| 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:

- Refer to the next page.
- The warm-up time of the EUT is 20min.
- No other emissions were detected at a level greater than 20dB below limit
- It gave the worse case emissions.

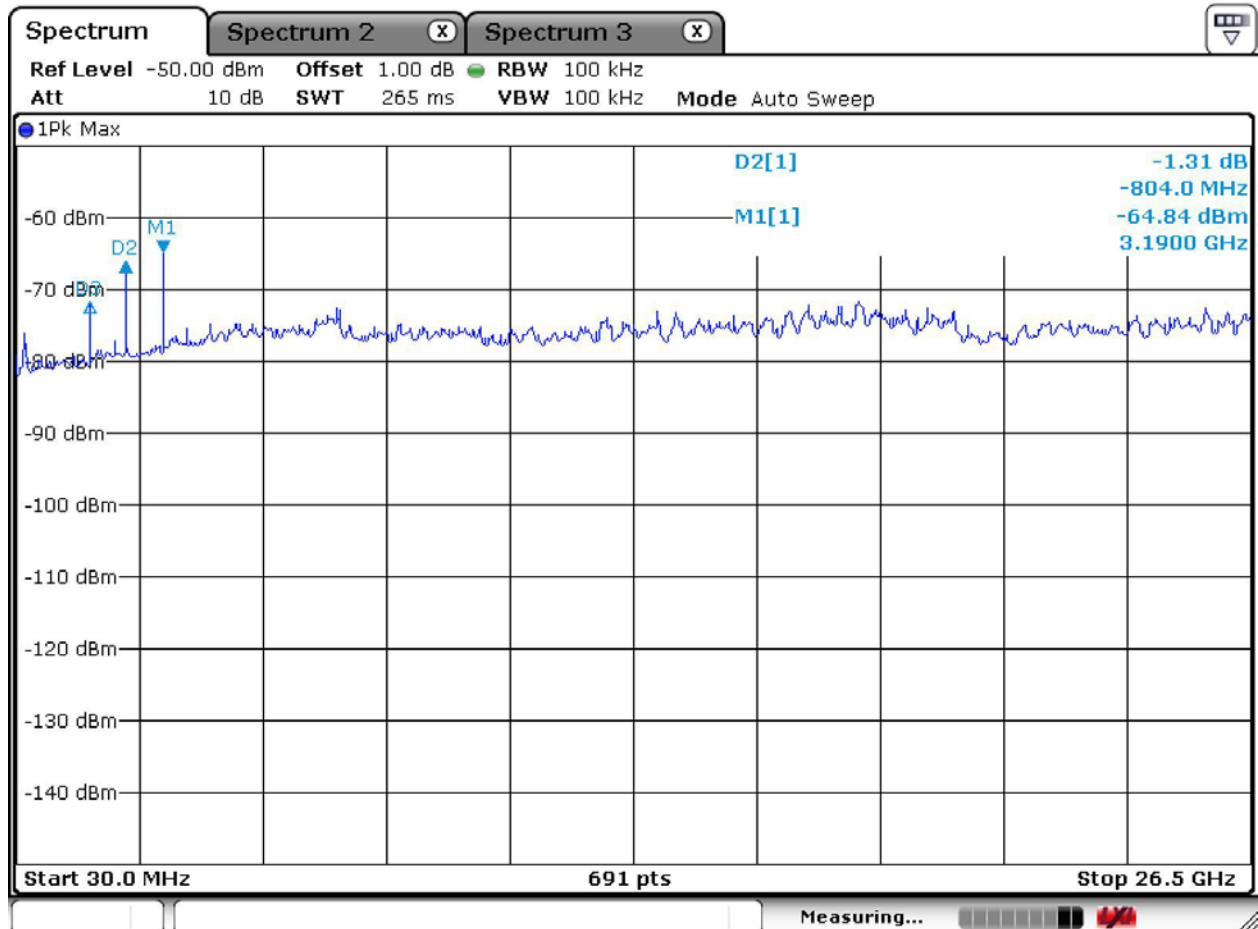
#### Field Strength Limit

##### Part 15.209 LIMIT:

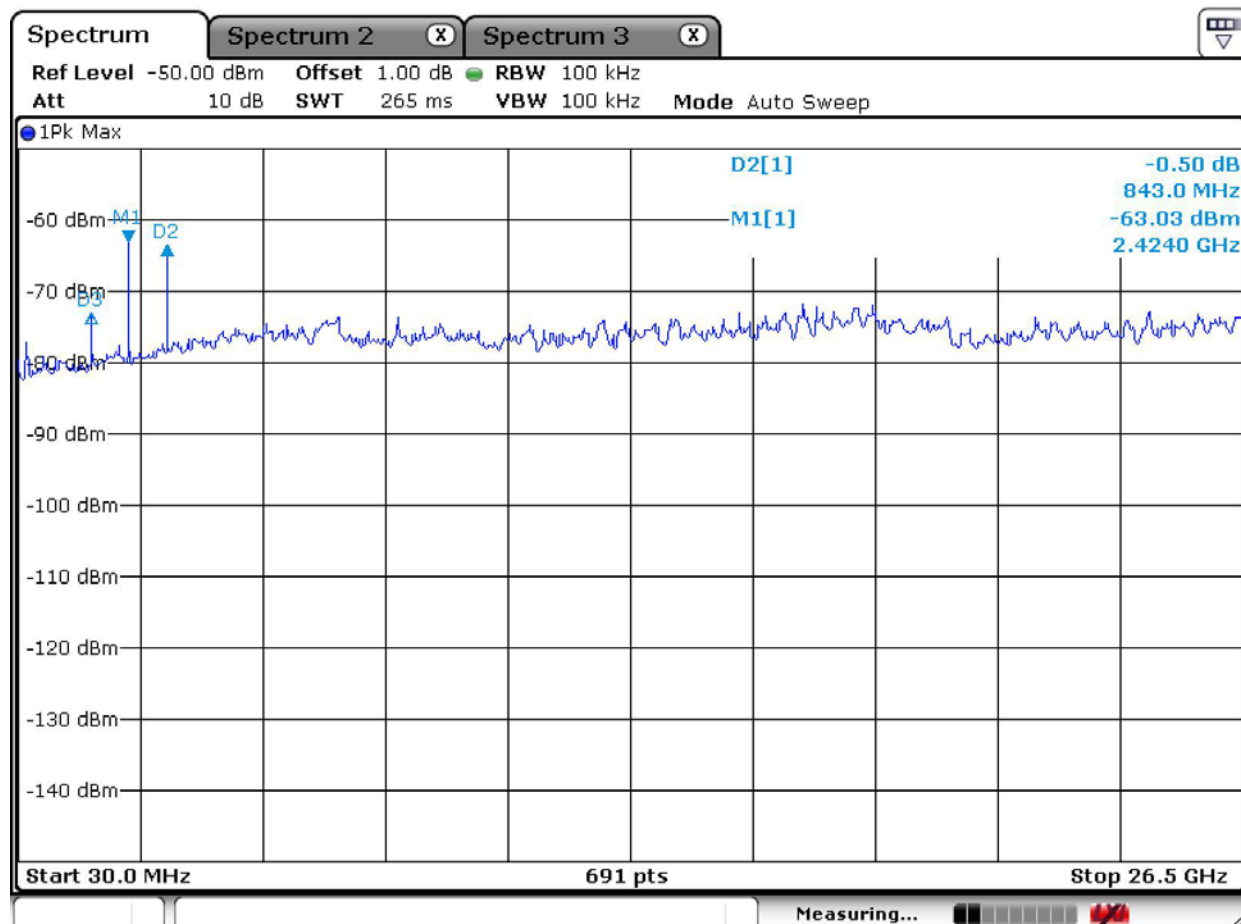
| Frequency (MHz) | Limit (uV/m) @ 3m |
|-----------------|-------------------|
| 30 ~ 88         | 100**             |
| 88 ~ 216        | 150**             |
| 216 ~ 960       | 200**             |
| Above 960       | 500               |

\*\* 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.

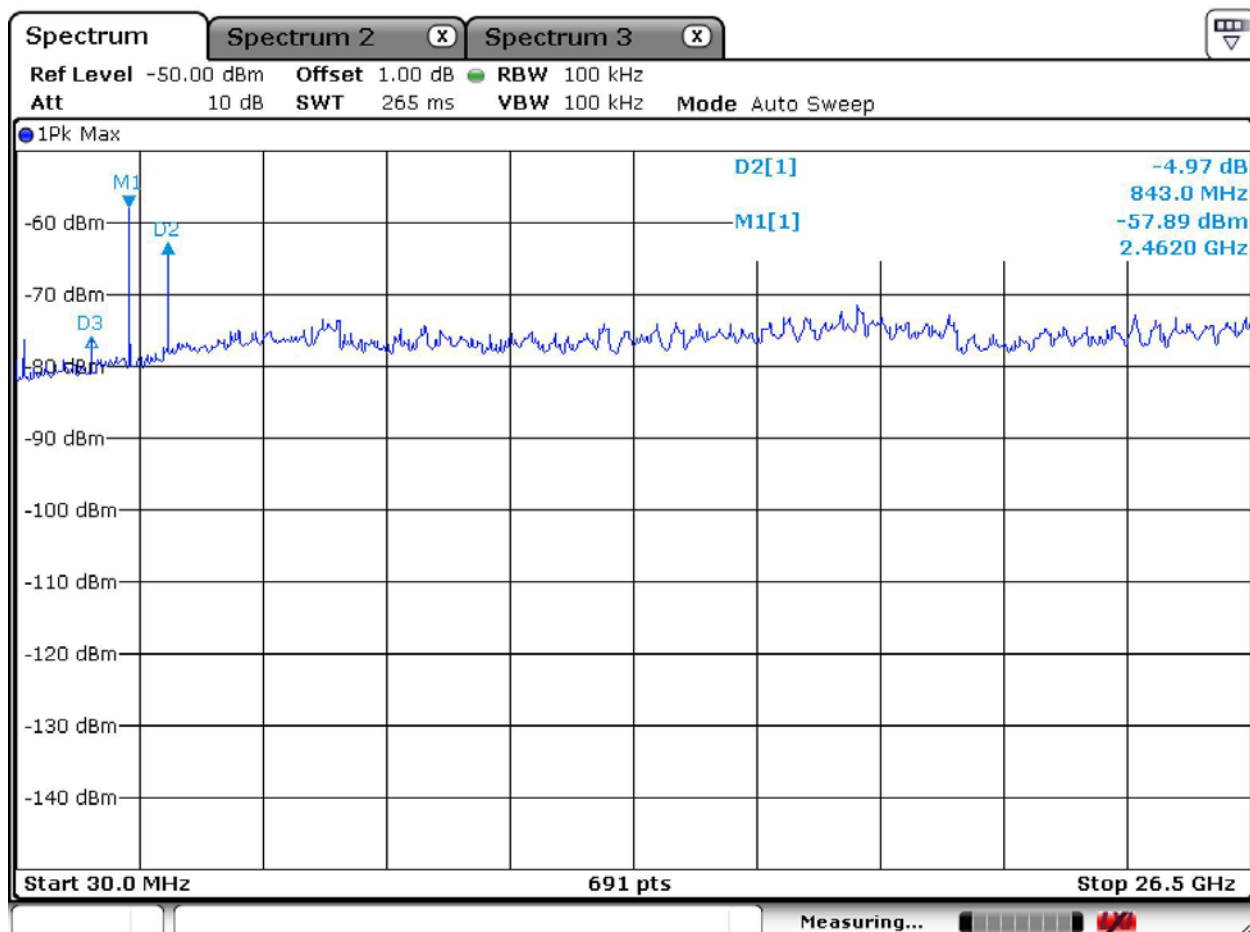
**Conduceted Emission – Low channel**  
**Frequency Range = 30 MHz ~ 26.5 GHz**



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



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



**Measurement Data:**

| Frequency |  | Reading<br>[dBuV / m] |      | Pol. | Correction<br>Factor |          |       | Limits<br>[dBuV / m] |      | Result<br>[dBuV / m] |      | Margin<br>[dB] |      |
|-----------|--|-----------------------|------|------|----------------------|----------|-------|----------------------|------|----------------------|------|----------------|------|
| [MHz]     |  | AV / Peak             |      |      | Antenna              | Amp.Gain | Cable | AV / Peak            |      | AV / Peak            |      | AV / Peak      |      |
| 2403.0    |  | 48.1                  | 51.4 | V    | 25.4                 | 37.1     | 4.0   | 54.0                 | 74.0 | 40.4                 | 43.7 | 13.7           | 30.4 |
|           |  |                       |      |      |                      |          |       |                      |      |                      |      |                |      |
| Frequency |  | Reading<br>[dBuV / m] |      | Pol. | Correction<br>Factor |          |       | Limits<br>[dBuV / m] |      | Result<br>[dBuV / m] |      | Margin<br>[dB] |      |
| [MHz]     |  | AV / Peak             |      |      | Antenna              | Amp.Gain | Cable | AV / Peak            |      | AV / Peak            |      | AV / Peak      |      |
|           |  |                       |      |      |                      |          |       |                      |      |                      |      |                |      |
|           |  |                       |      |      |                      |          |       |                      |      |                      |      |                |      |
| Frequency |  | Reading<br>[dBuV / m] |      | Pol. | Correction<br>Factor |          |       | Limits<br>[dBuV / m] |      | Result<br>[dBuV / m] |      | Margin<br>[dB] |      |
| [MHz]     |  | AV / Peak             |      |      | Antenna              | Amp.Gain | Cable | AV / Peak            |      | AV / Peak            |      | AV / Peak      |      |
| 2481.00   |  | 52.0                  | 54.2 | V    | 25.4                 | 37.1     | 4.0   | 54.0                 | 74.0 | 44.3                 | 46.5 | 9.8            | 27.6 |
|           |  |                       |      |      |                      |          |       |                      |      |                      |      |                |      |

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: N/A**

- The EUT operates by the DC.

**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         |

\* Note: The limits will decrease with the frequency logarithmically within 0.15MHz to 0.5MHz

**APPENDIX**

**TEST EQUIPMENT USED FOR TESTS**

|    | Description                          | Model No.   | Serial No.  | Manufacturer  | Interval | Last Cal. Date |
|----|--------------------------------------|-------------|-------------|---------------|----------|----------------|
| 1  | Spectrum Analyzer                    | FSV-30      | 100757      | R&S           | 1 year   | 2011-01-24     |
| 2  | Spectrum Analyzer                    | 8563E       | 3425A02505  | HP            | 2 year   | 2010-03-29     |
| 3  | Spectrum Analyzer                    | 8594E       | 3710A04074  | HP            | 2 year   | 2009-10-12     |
| 4  | Signal Generator                     | 8648C       | 3623A02597  | HP            | 1 year   | 2011-03-30     |
| 5  | Signal Generator                     | 83711B      | US34490456  | HP            | 1 year   | 2011-03-30     |
| 6  | Attenuator (3dB)                     | 8491A       | 37822       | HP            | 2 year   | 2010-10-08     |
| 7  | Attenuator (10dB)                    | 8491A       | 63196       | HP            | 2 year   | 2010-10-08     |
| 8  | EMI Test Receiver                    | ESCI7       | 100722      | R&S           | 1 year   | 2010-10-08     |
| 9  | Horn Antenna(18 ~ 40GHz)             | SAS-574     | 154         | Schwarzbeck   | 2 year   | 2010-11-25     |
| 10 | Horn Antenna(18 ~ 40GHz)             | SAS-574     | 155         | Schwarzbeck   | 2 year   | 2010-11-25     |
| 11 | RF Amplifier                         | 8447D       | 2439A09058  | HP            | 2 year   | 2010-10-08     |
| 12 | RF Amplifier                         | 8449B       | 3008A02126  | HP            | 2 year   | 2010-03-29     |
| 13 | Test Receiver                        | ESHS10      | 828404/009  | R&S           | 1 year   | 2011-03-30     |
| 14 | TRILOG Antenna                       | VULB 9160   | 9160-3172   | SCHWARZBECK   | 2 year   | 2010-10-07     |
| 15 | Horn Antenna                         | BBHA 9120D  | 9120D122    | SCHWARZBECK   | 2 year   | 2010-12-24     |
| 16 | Dipole Antenna                       | VHA9103     | 2116        | SCHWARZBECK   | 2 year   | 2010-11-25     |
| 17 | Dipole Antenna                       | VHA9103     | 2117        | SCHWARZBECK   | 2 year   | 2010-11-25     |
| 18 | Dipole Antenna                       | VHA9105     | 2261        | SCHWARZBECK   | 2 year   | 2010-11-25     |
| 19 | Dipole Antenna                       | VHA9105     | 2262        | SCHWARZBECK   | 2 year   | 2010-11-25     |
| 20 | Hygro-Thermograph                    | THB-36      | 0041557-01  | ISUZU         | 2 year   | 2010-04-12     |
| 21 | Splitter (SMA)                       | ZFSC-2-2500 | SF617800326 | Mini-Circuits | -        | -              |
| 22 | Power Divider                        | 11636A      | 6243        | HP            | 2 year   | 2010-10-08     |
| 23 | DC Power Supply                      | 6622A       | 3448A03079  | HP            | -        | -              |
| 24 | Frequency Counter                    | 5342A       | 2826A12411  | HP            | 1 year   | 2011-03-30     |
| 25 | Power Meter                          | EPM-441A    | GB32481702  | HP            | 1 year   | 2011-03-30     |
| 26 | Power Sensor                         | 8481A       | US41030291  | HP            | 1 year   | 2010-10-08     |
| 27 | Audio Analyzer                       | 8903B       | 3729A18901  | HP            | 1 year   | 2010-10-08     |
| 28 | Modulation Analyzer                  | 8901B       | 3749A05878  | HP            | 1 year   | 2010-10-08     |
| 29 | TEMP & HUMIDITY Chamber              | YJ-500      | LTAS06041   | JinYoung Tech | 1 year   | 2010-10-08     |
| 30 | Stop Watch                           | HS-3        | 601Q09R     | CASIO         | 2 year   | 2010-03-31     |
| 31 | LISN                                 | ENV216      | 100408      | R&S           | 1 year   | 2010-10-08     |
| 32 | UNIVERSAL RADIO COMMUNICATION TESTER | CMU200      | 106243      | R&S           | 2 year   | 2010-05-13     |
| 33 | Attenuator (30dB)                    | 8498A       | 3318A10929  | HP            | 2 year   | 2011-01-05     |