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**SENA**

Dates of Tests: Oct 01~08, 2010  
 Test Report S/N: LR500191010D  
 Test Site : LTA CO., LTD.

**CERTIFICATION OF COMPLIANCE**

FCC ID.  
 IC  
 APPLICANT

**S7APARANISD1000A**  
**8154A-SD1000A**  
**Sena Technologies, Inc.**

**Equipment Class** : **Part 15 Spread Spectrum Transmitter (DSS)**  
**Manufacturing Description** : **Bluetooth Serial Adapter**  
**Manufacturer** : **Sena Technologies, Inc.**  
**Model name** : **Parani-SD1000**  
**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.:** **7 Date: 2007**  
**Frequency Range** : **2402 ~ 2480MHz**  
**RF power** : **14.84 dBm - Conducted**  
**Data of issue** : **October 8, 2010**

This test report is issued under the authority of:

The test was supervised by:

Kyung-Taek LEE, Technical Manager

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

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## 1. General information's

### 1-1 Test Performed

Company name : LTA Co., Ltd.  
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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

## 2. Information's about test item

### 2-1 Applicant & Manufacturer

Company name : Sena Technologies, Inc.  
 Address : 210 Yangjae-dong Seocho-gu Seoul 137-130 Korea  
 Tel / Fax : +82-2-571-8283/ +82-2-573-7710

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

Trade name : Bluetooth Serial Adapter  
 FCC ID : S7APARANISD1000A  
 Model name : Parani-SD1000A  
 Serial number : Identical prototype  
 Date of receipt : October 1, 2010  
 EUT condition : Pre-production, not damaged  
 Antenna type : Patch Antenna (M/N: HIF-2400) Max Gain 8.92 dBi  
                   Dipole Antenna (M/N: R-AN2400-1901RS) Max Gain 5.37 dBi  
                   Dipole Antenna (M/N: R-AN2400-5801RS) Max Gain 3.27 dBi  
                   Dipole Antenna (M/N: AN2400-3306RS) Max Gain 1.40 dBi  
 Frequency Range : 2402 ~ 2480MHz  
 RF output power : Maximum 14.84 dBm  
 Number of channels : 79  
 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 for adapter : DC 9.0V 0.66A(M/N : 3A-061WP12)  
 Power Source for battery : DC 3.7V

### 2-3 Tested frequency

	LOW	MID	HIGH
Frequency (MHz)	2402	2441	2480

### 2-4 Ancillary Equipment

Equipment	Model No.	Serial No.	Manufacturer
PC	HP Compaq dx7400 dx7400 microtower	CNG8330J9R	HP
MONITOR	HPL1710	CNC816QHF2	HP
KEYBOARD	SK-8115	68A-04Q6	DELL
MOUSE	MO56UOA	F0J00NOL	DELL
PRINTER	STYLUS C65	N/A	EPSON

### 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 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
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-SD1000 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

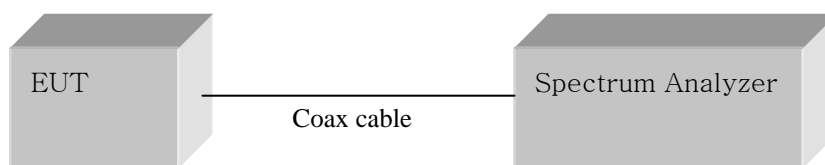
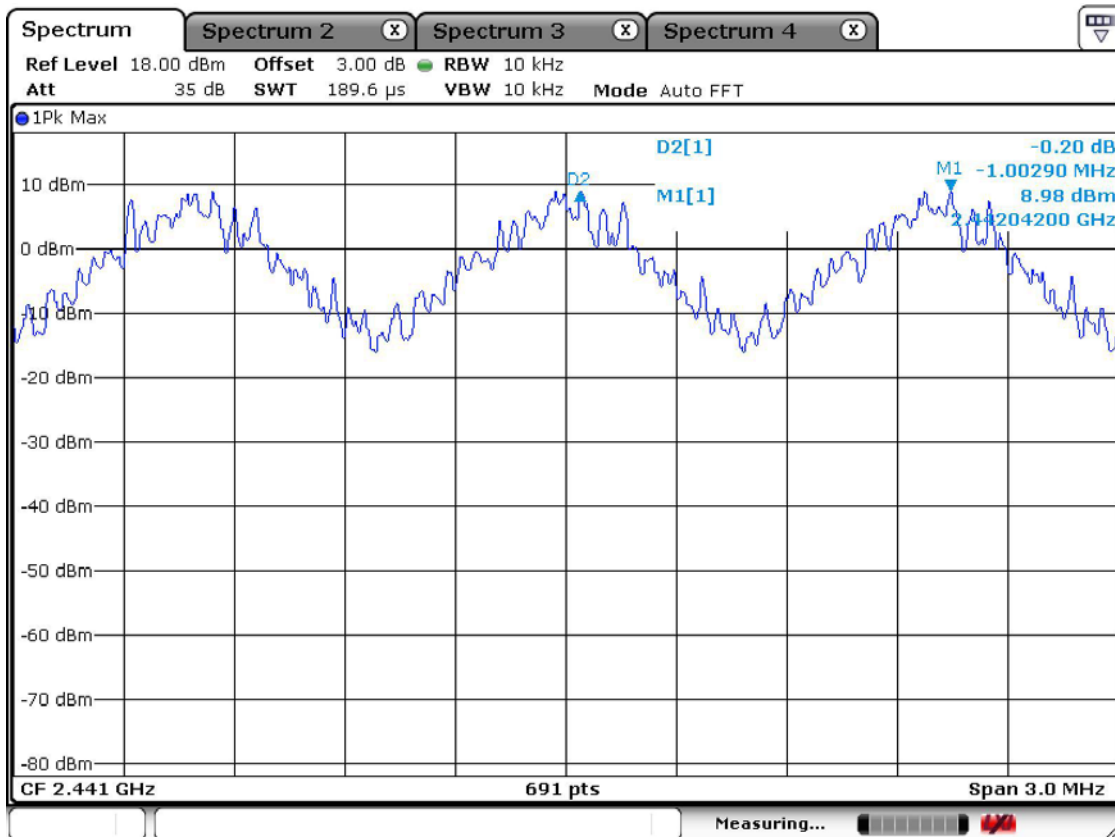


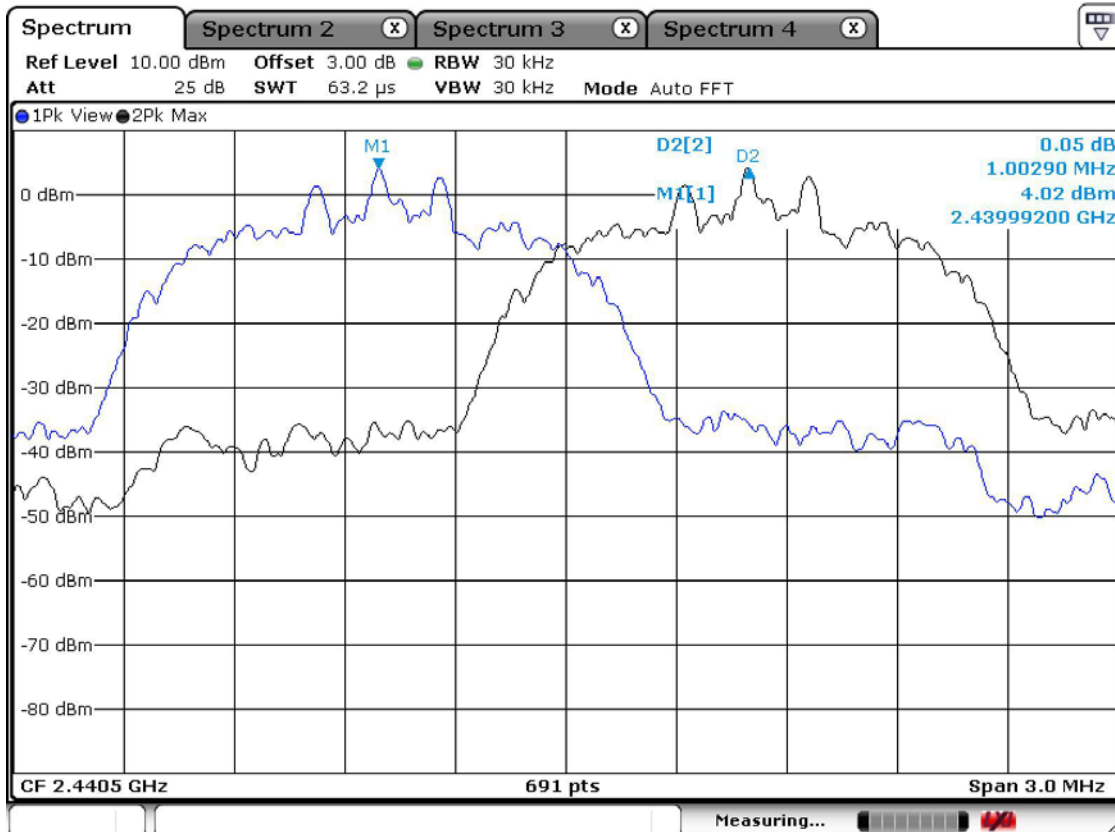
Figure 1: Measurement setup for the carrier frequency separation

## Carrier Frequency Separation

### Basic Mode



### EDR Mode



### 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
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- See next pages for actual measured spectrum plots.

#### Minimum Standard:

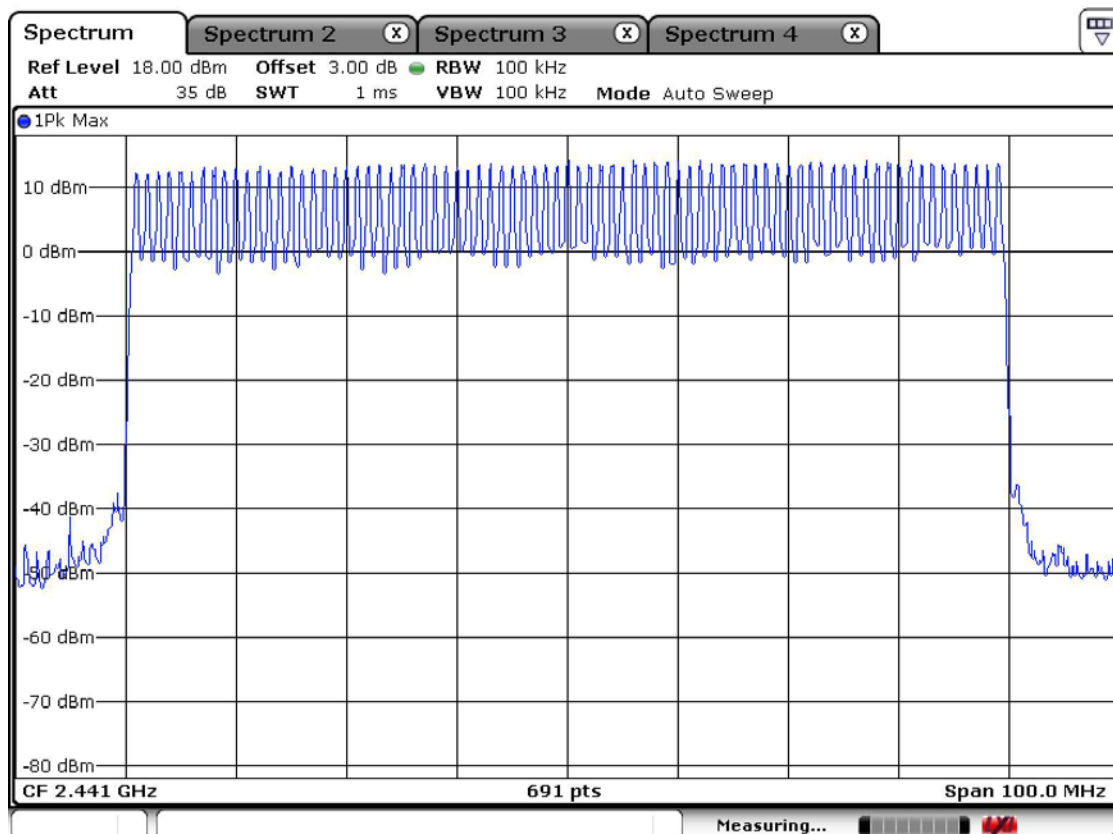
At least 15 hopes

#### 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

dB/Div = 5dB

#### Measurement Data: Basic Mode

Frequency (MHz)	Channel No.	Test Results(MHz)	
		20dB Bandwidth	99% Bandwidth
2402	0	0.825	0.873
2441	39	0.834	0.881
2480	78	0.903	0.903

#### Measurement Data: EDR Mode

Frequency (MHz)	Channel No.	Test Results(MHz)	
		20dB Bandwidth	99% Bandwidth
2402	0	1.220	1.172
2441	39	1.216	1.168
2480	78	1.211	1.164

- See next pages for actual measured spectrum plots.

#### Minimum Standard:

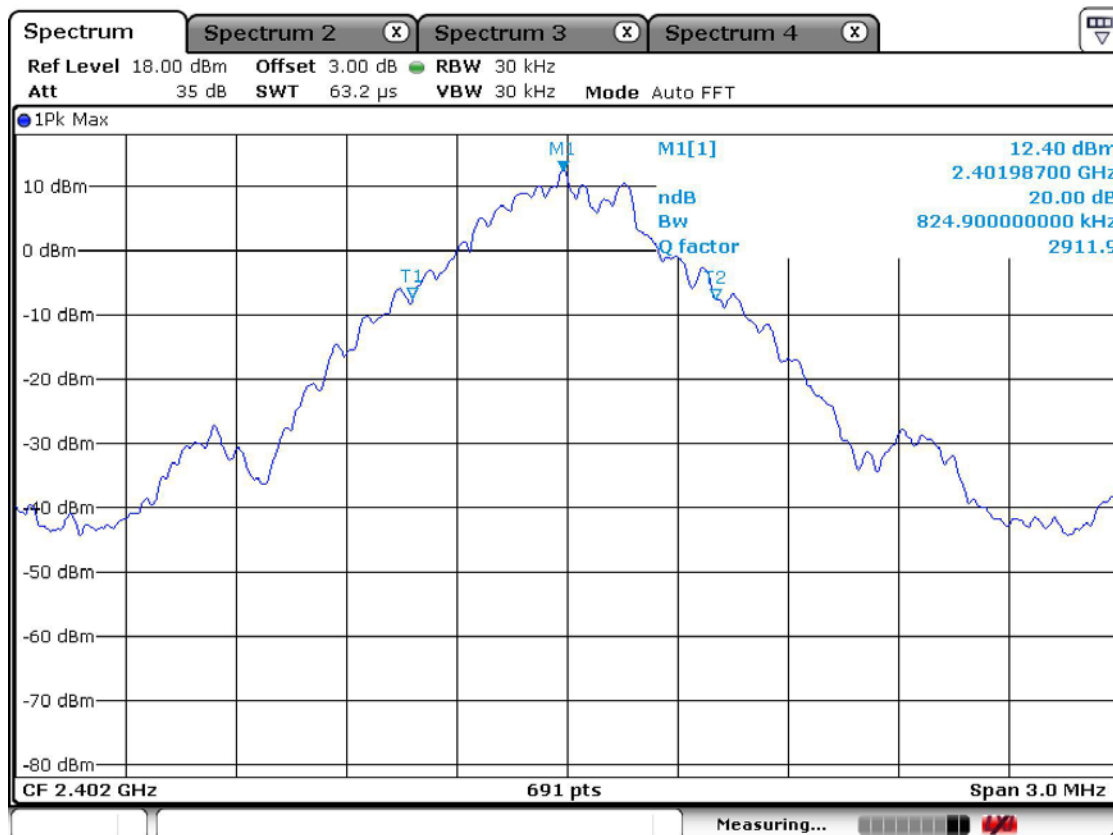
N/A

#### Measurement Setup

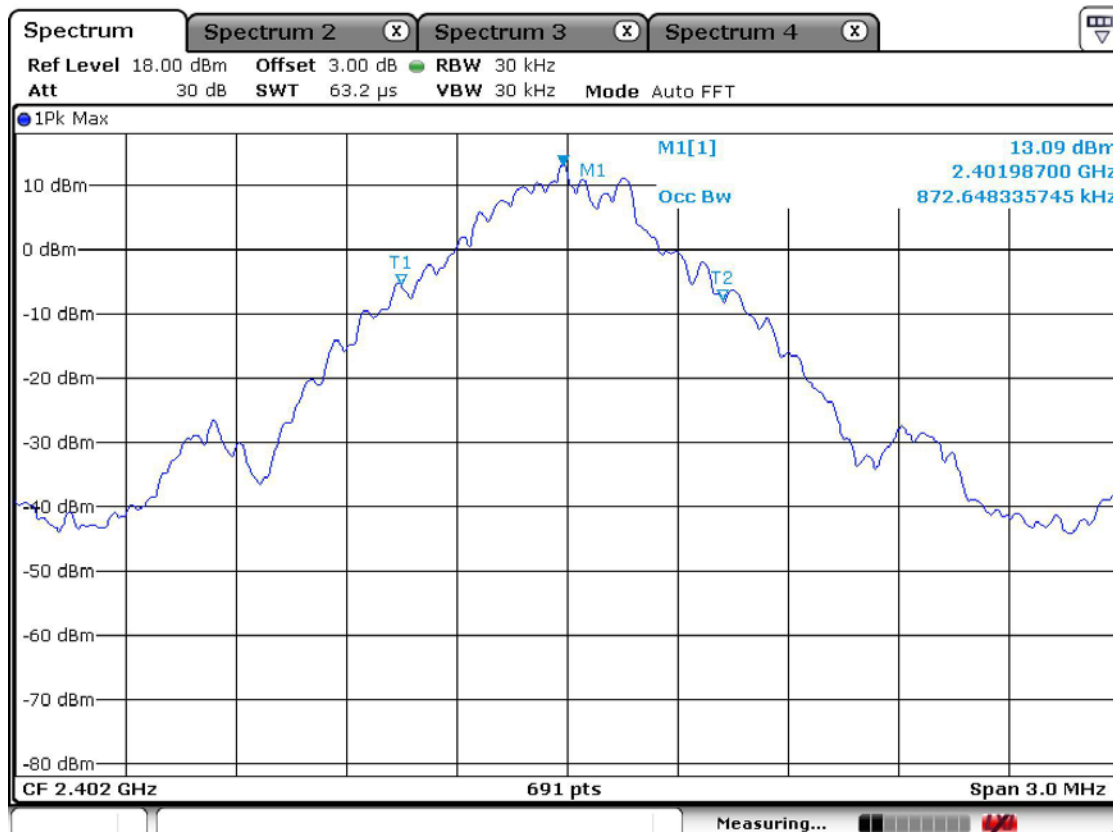
Same as the Chapter 3.2.1 (Figure 1)

**Channel 1 of basic mode**

**20 dB Bandwidth**

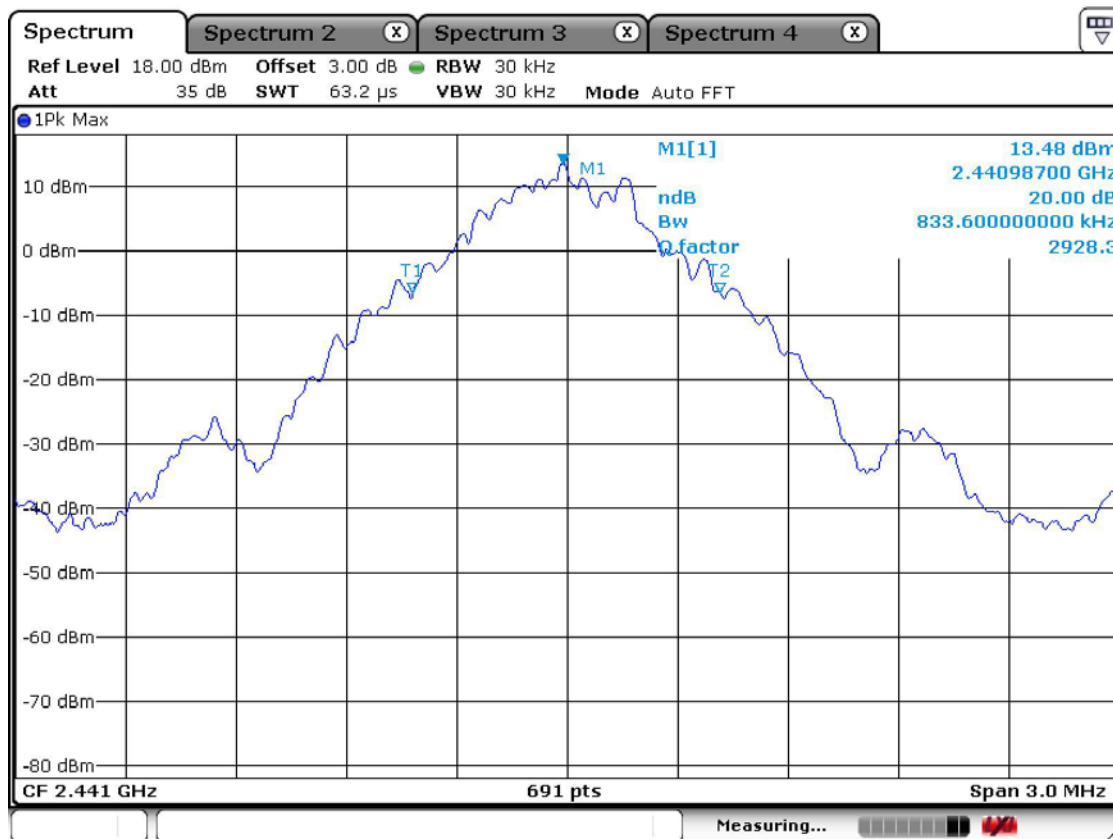


**99% Bandwidth**



**Channel 2 of basic mode**

**20 dB Bandwidth**

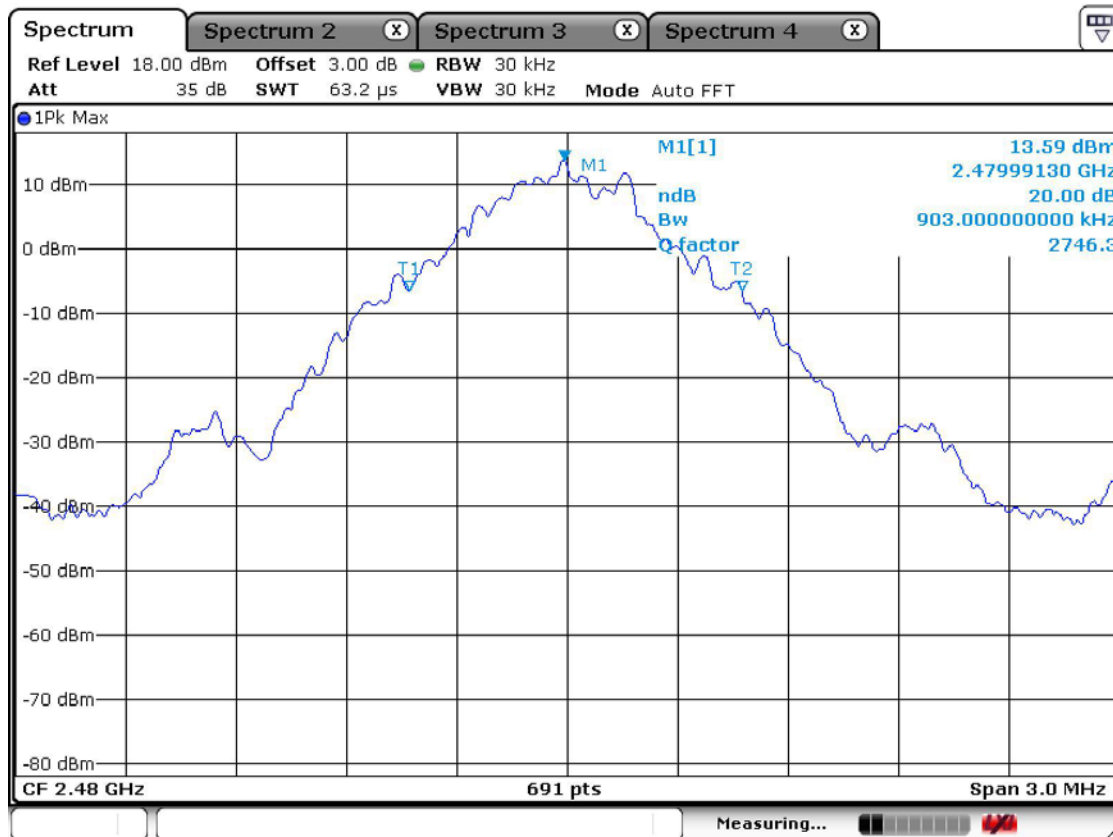


**99% Bandwidth**

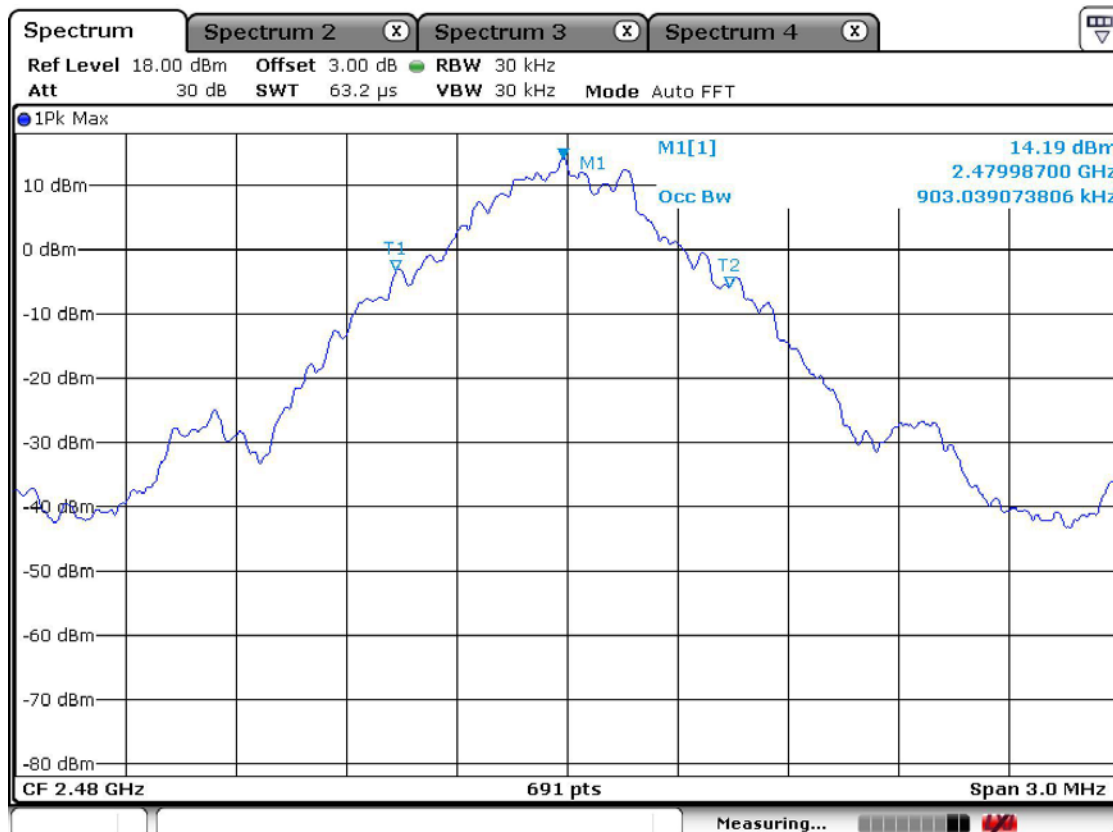


**Channel 3 of basic mode**

**20 dB Bandwidth**

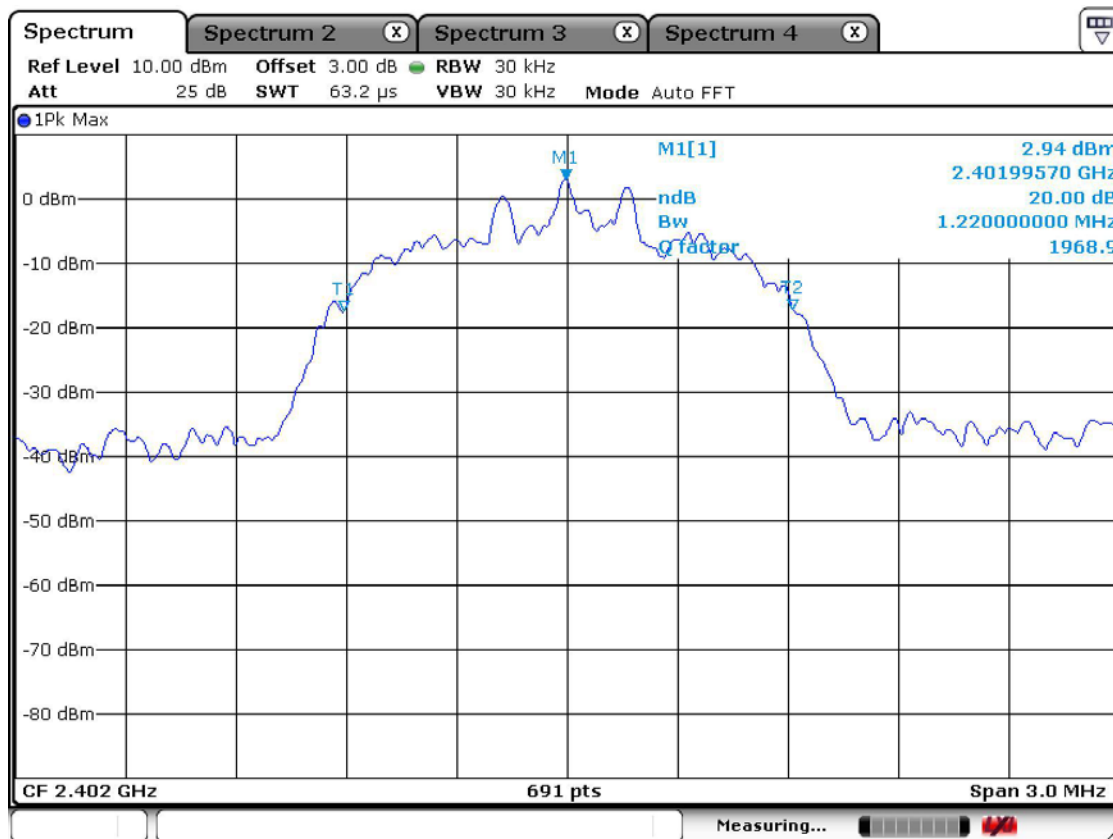


**99% Bandwidth**

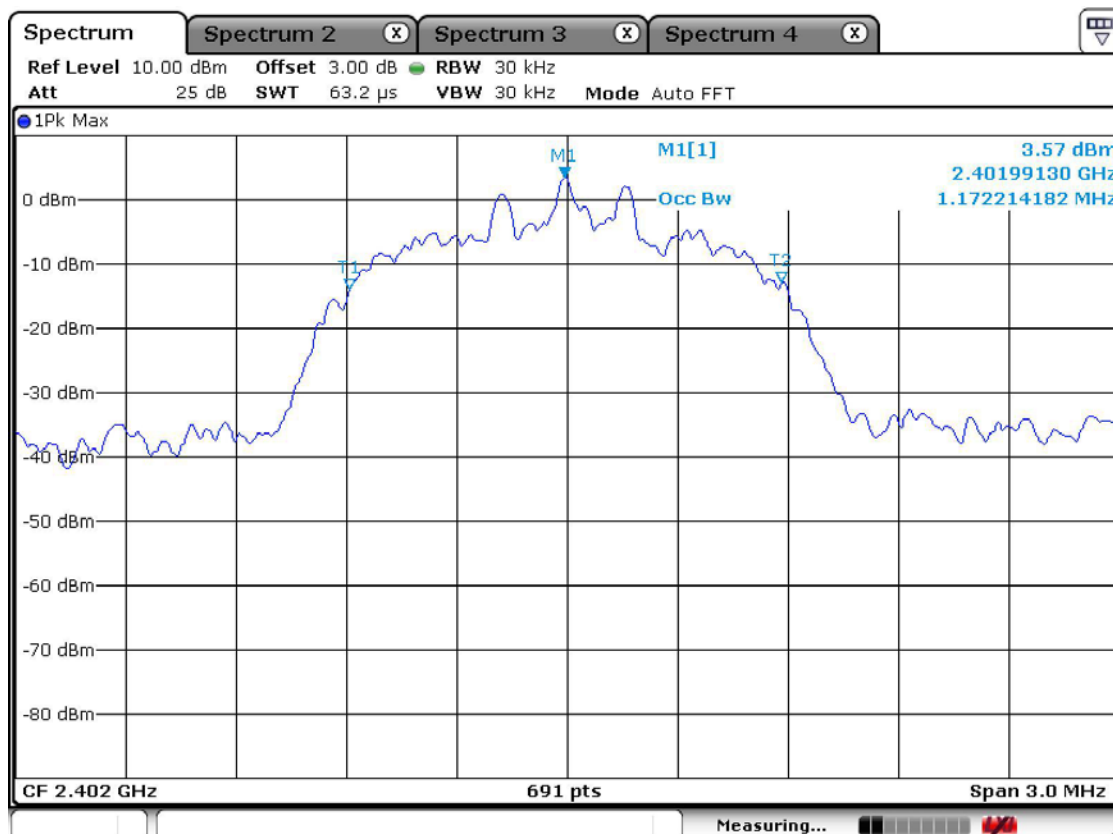


**Channel 1 at EDR mode**

**20 dB Bandwidth**

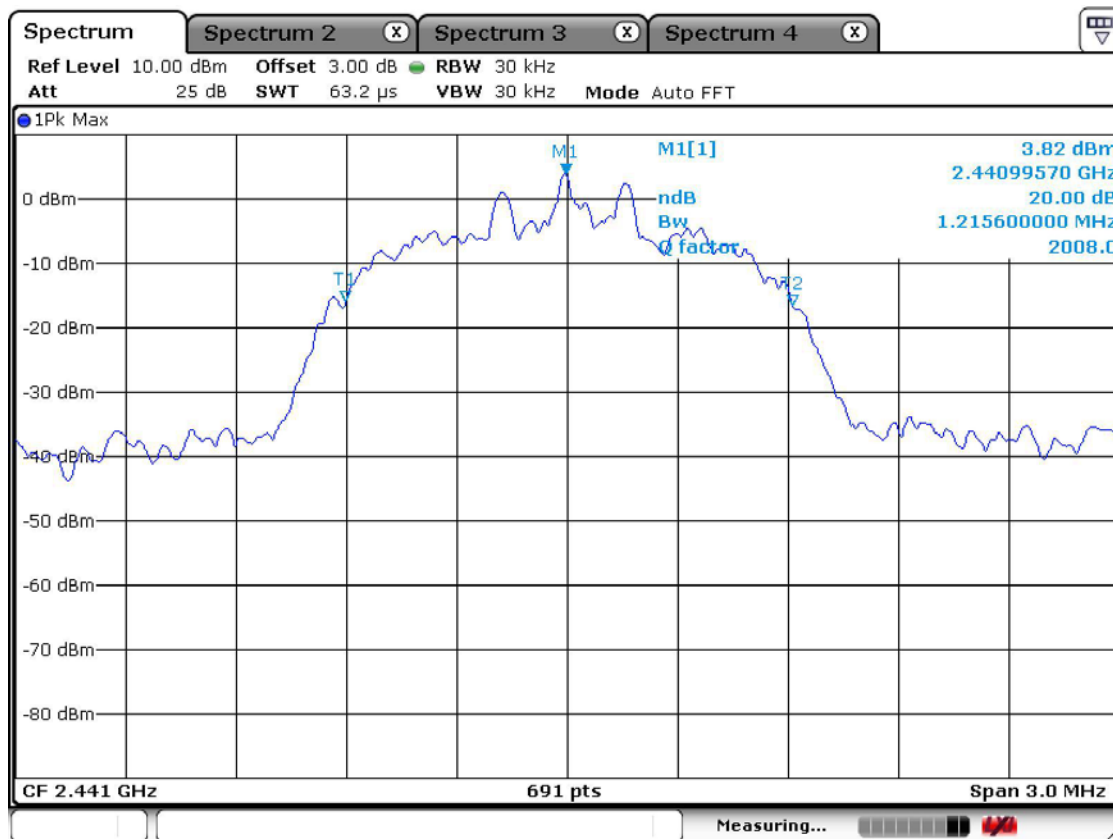


**99% Bandwidth**

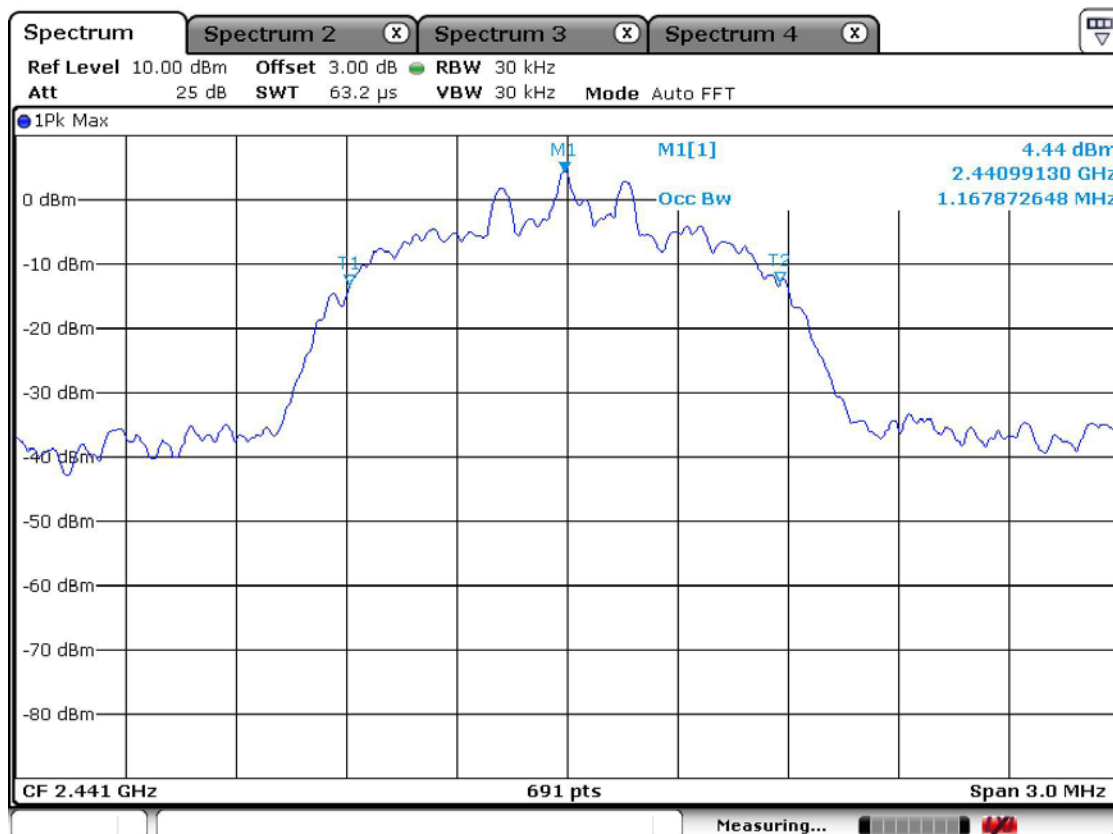


**Channel 2 at EDR mode**

**20 dB Bandwidth**

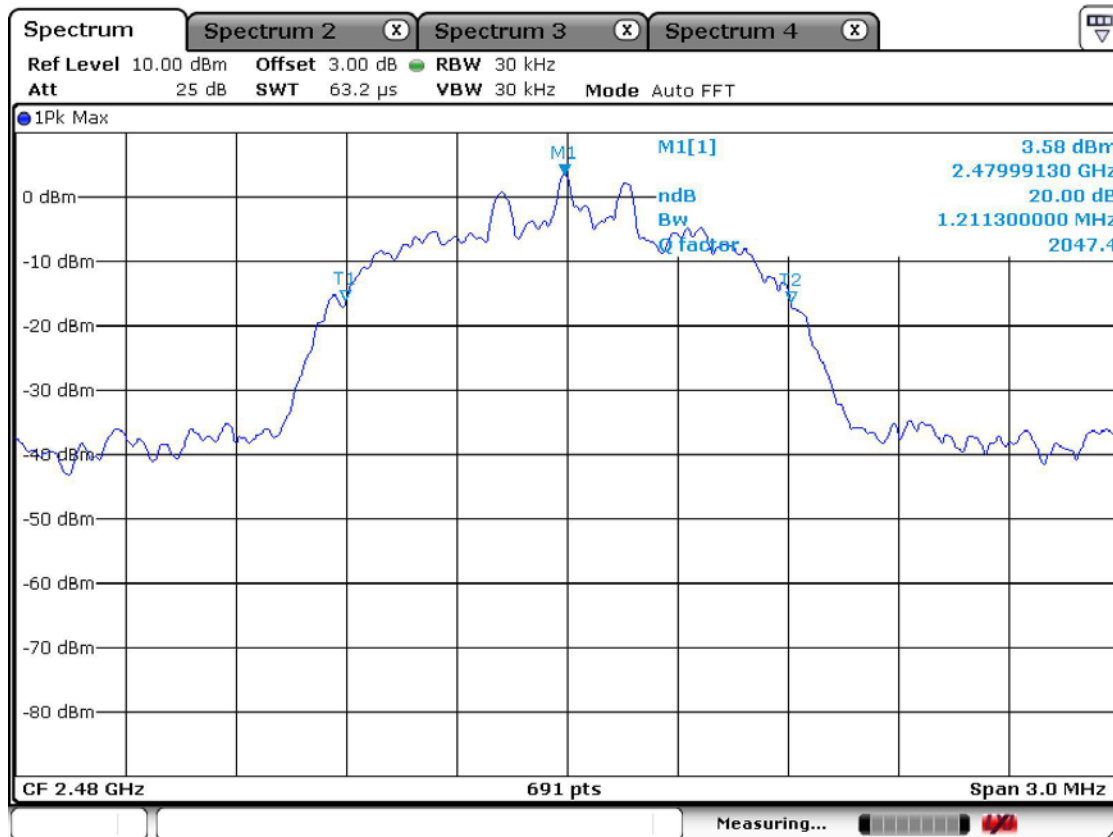


**99% Bandwidth**

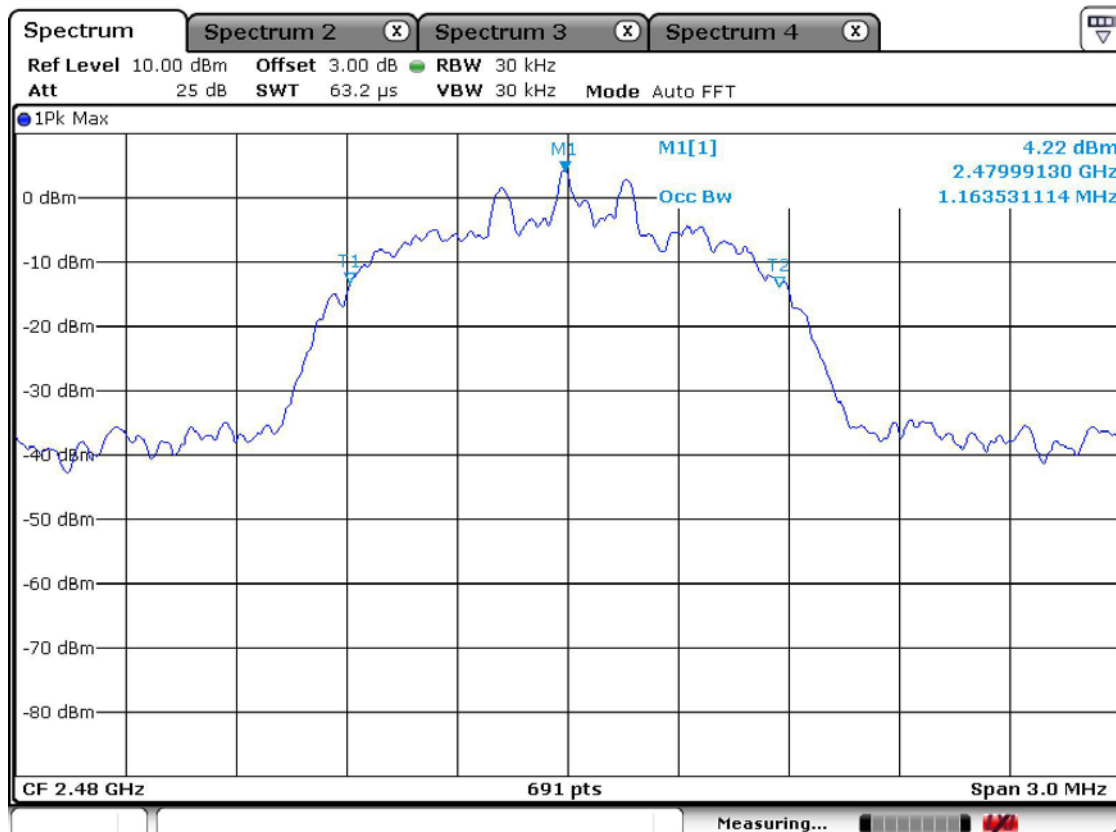


**Channel 3 at EDR mode**

**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 31.6s ( 79Hopping*0.4)	Length of Transmission Time (msec)	Result (msec)	Limit (msec)
DH1	30(Times / 3sec) *10.533 = 315.99	0.519	164.00	400
DH3	15(Times / 3sec) *10.533 = 158.00	1.752	276.82	400
DH5	10(Times / 3sec) *10.533 = 105.33	3.029	319.04	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

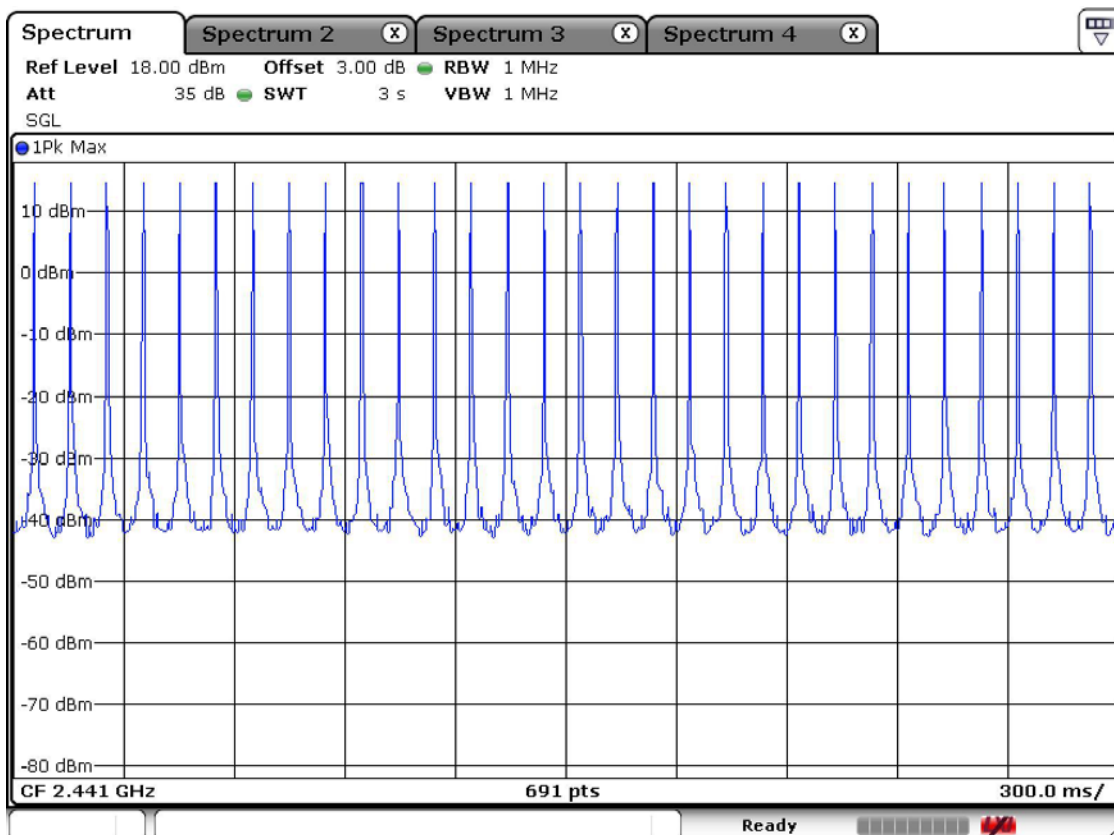
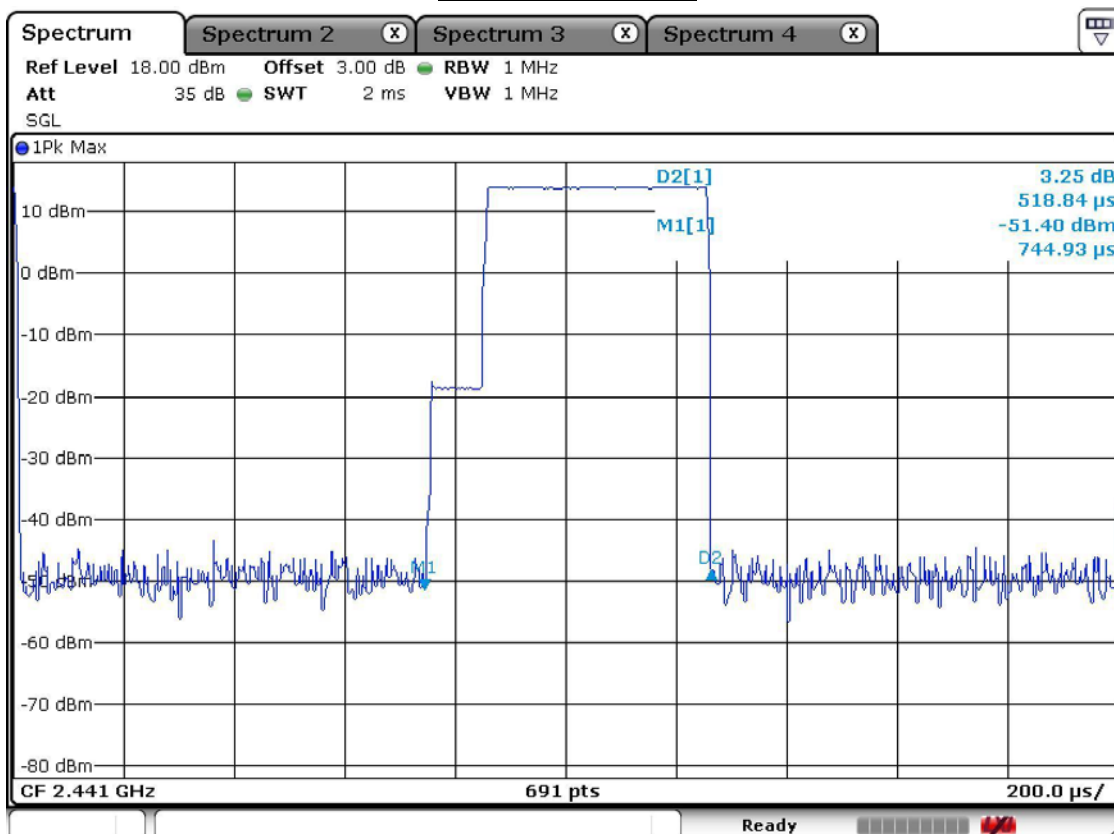
#### Minimum Standard:

0.4 seconds within a 30 second period per any frequency

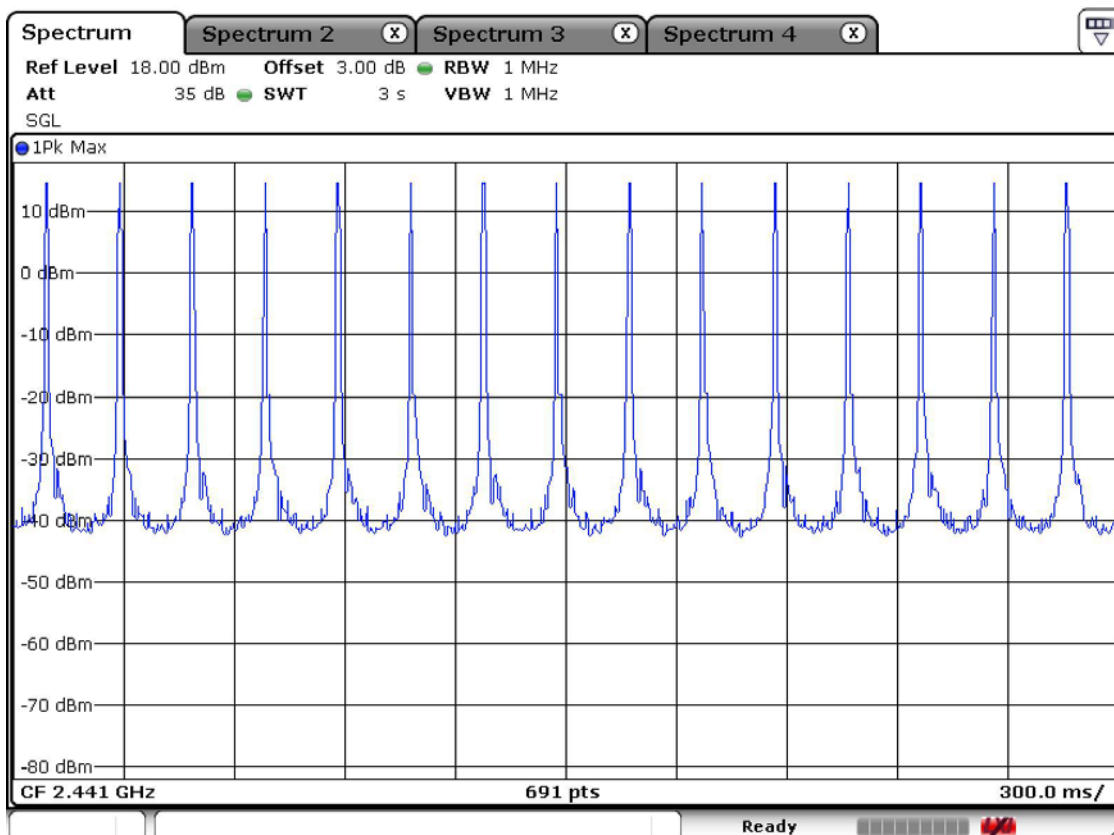
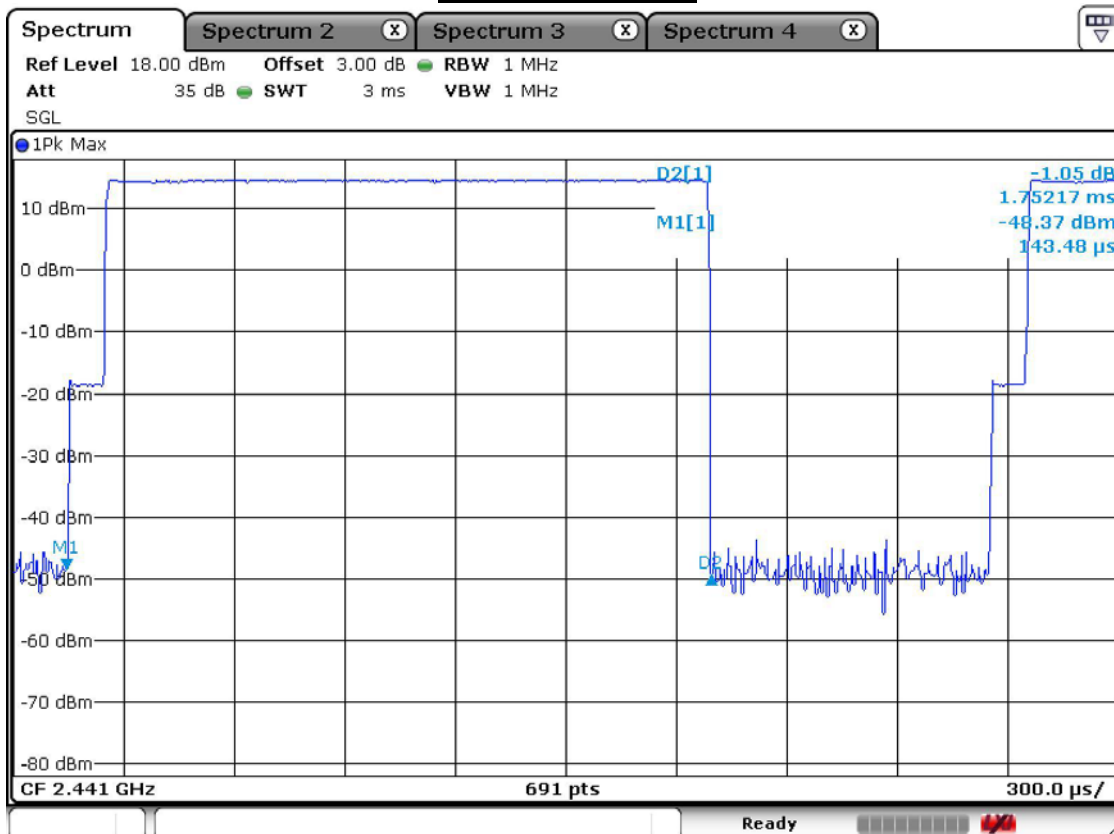
#### Measurement Setup

Same as the Chapter 3.2.1 (Figure 1)

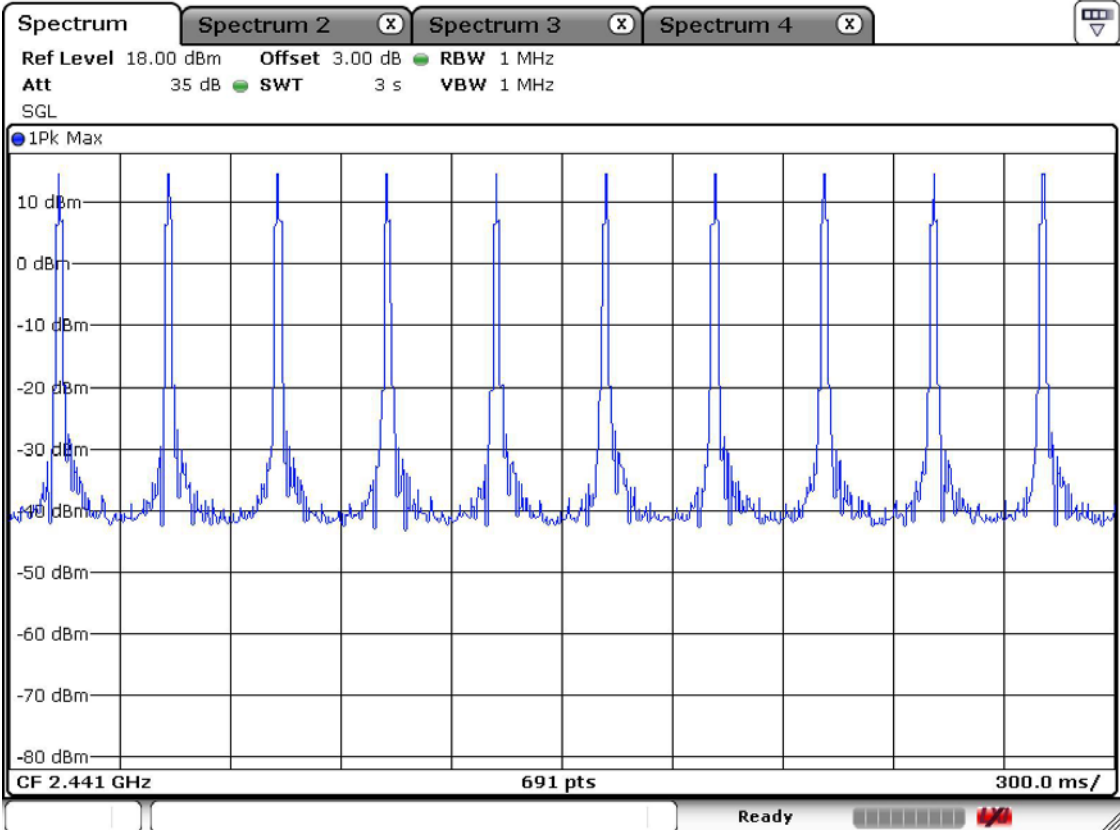
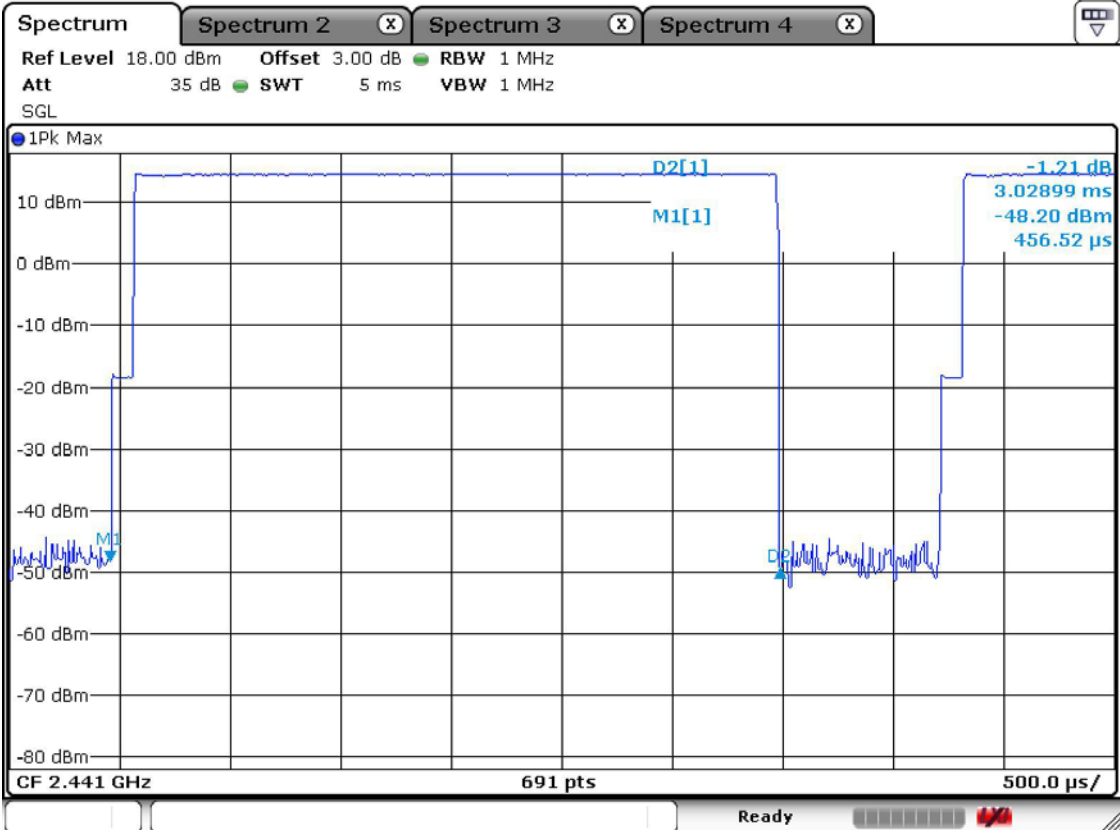
### DH1 at basic mode



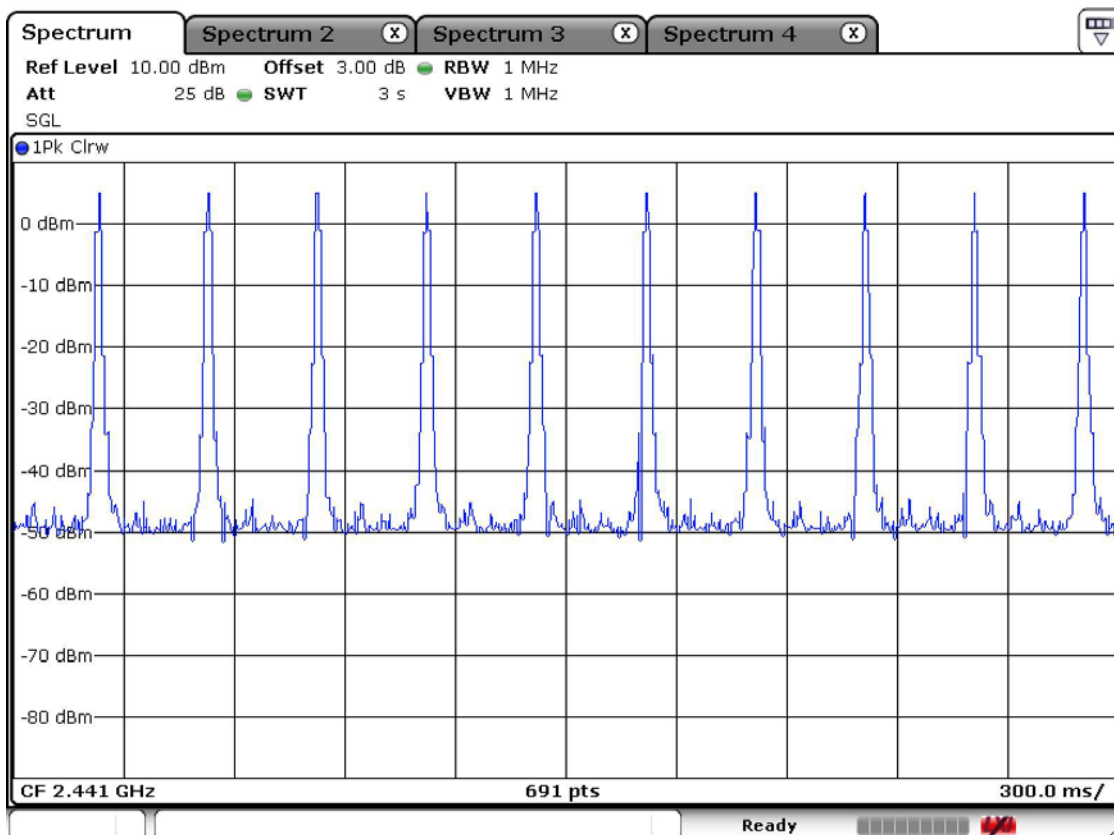
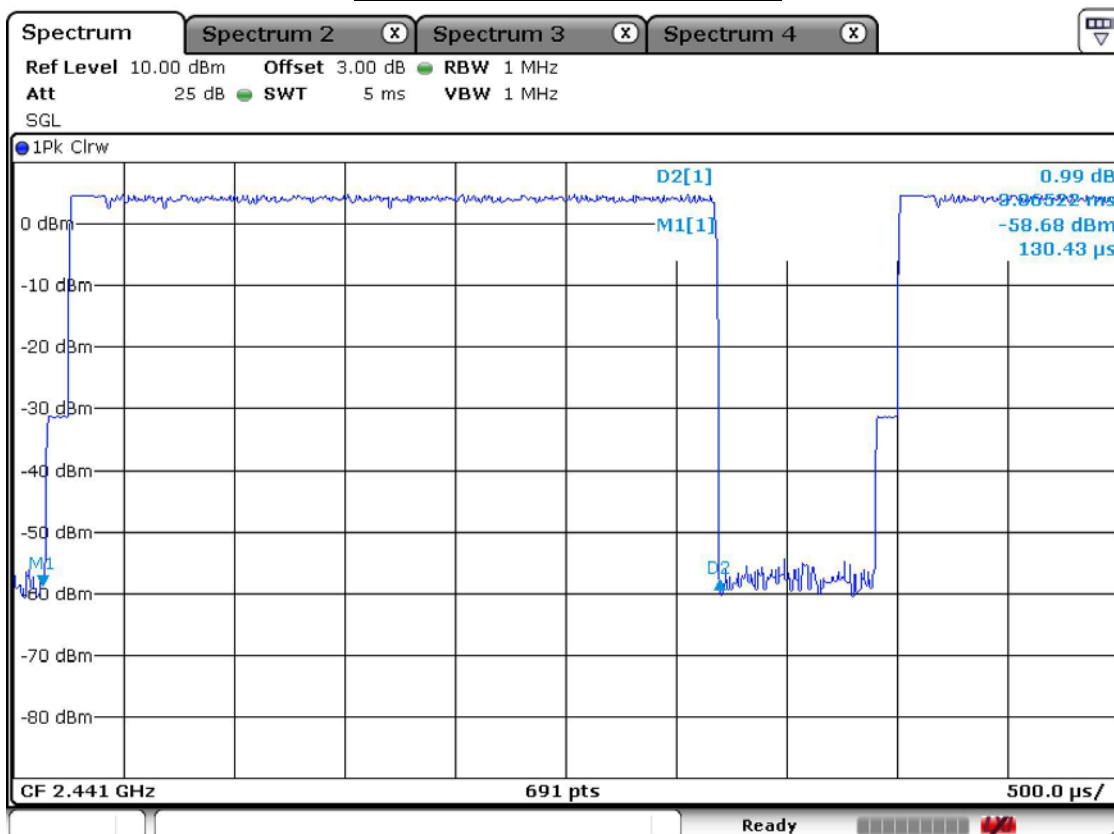
### DH3 at basic mode



### 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 = 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	13.56	22.70	Complies
2441	39	14.67	29.31	Complies
2480	78	14.84	30.48	Complies

#### Measurement Data: EDR Mode

Frequency (MHz)	Ch.	Test Results		
		dBm	mW	Result
2402	0	4.94	3.12	Complies
2441	39	5.60	3.63	Complies
2480	78	5.23	3.33	Complies

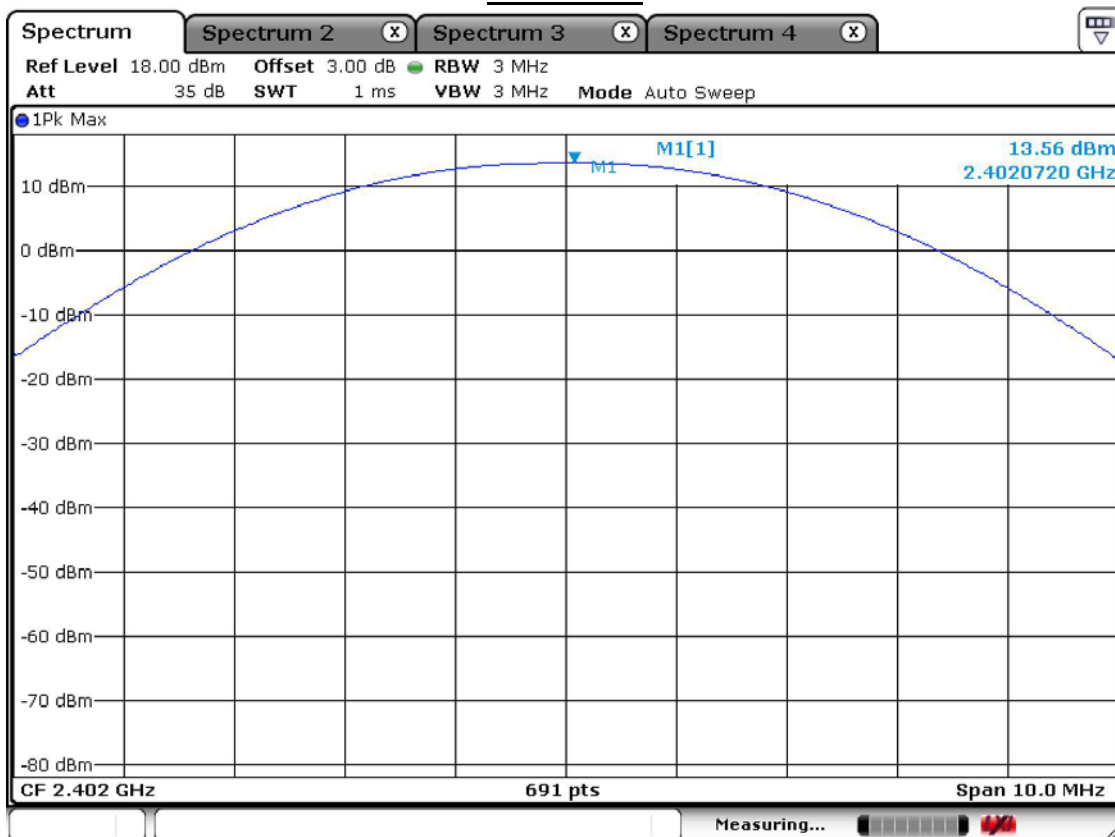
- See next pages for actual measured spectrum plots.

<b>Minimum Standard:</b>	< 250 mW
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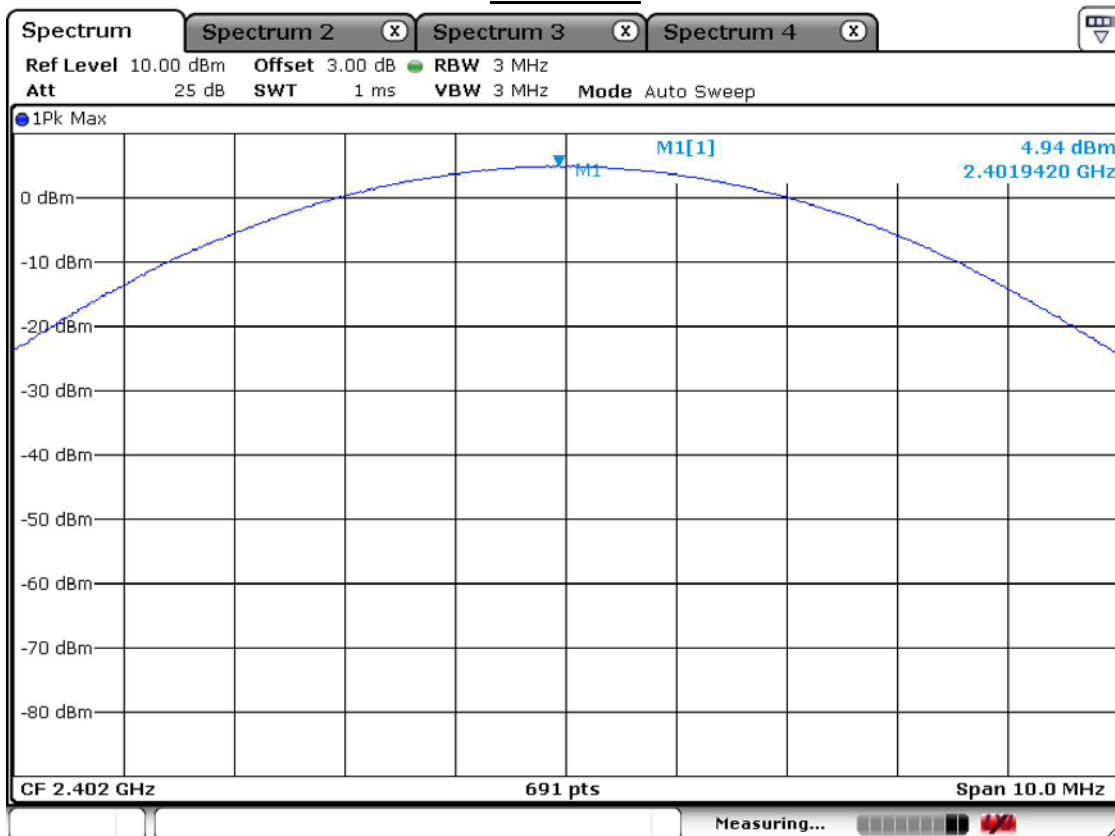
#### Measurement Setup

Same as the Chapter 3.2.1 (Figure 1)

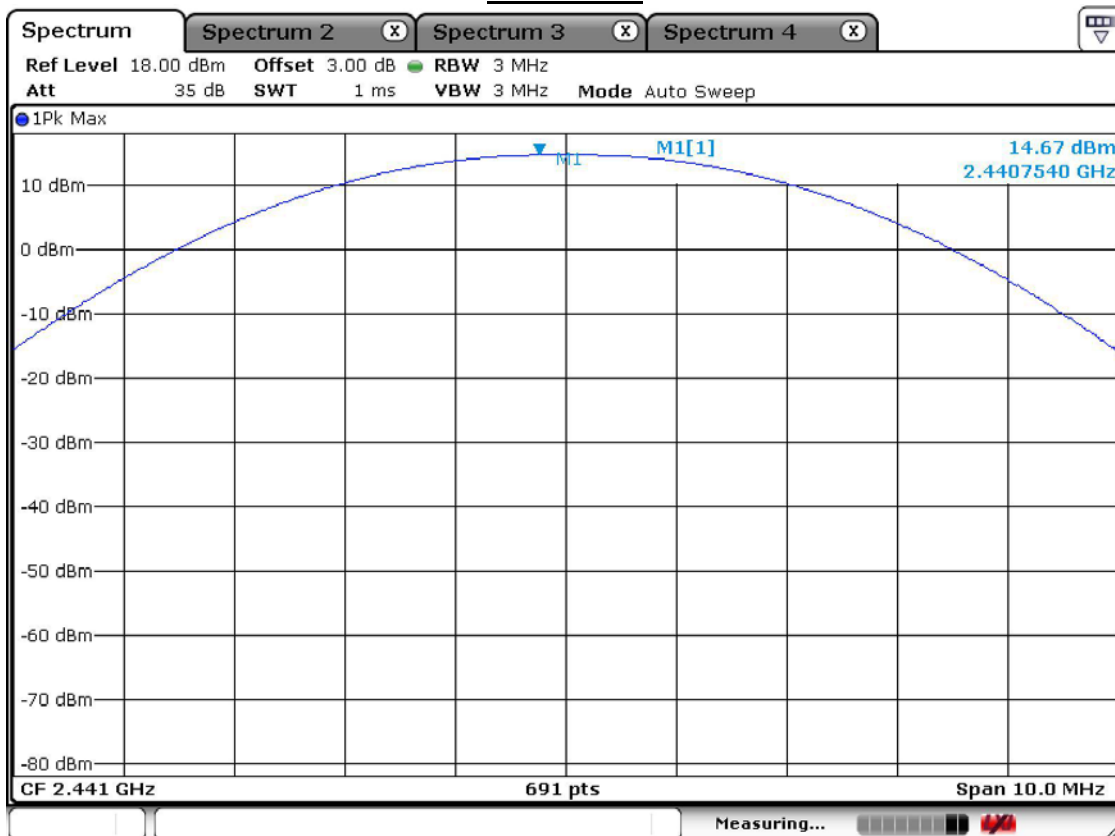
### Channel 1 Basic mode



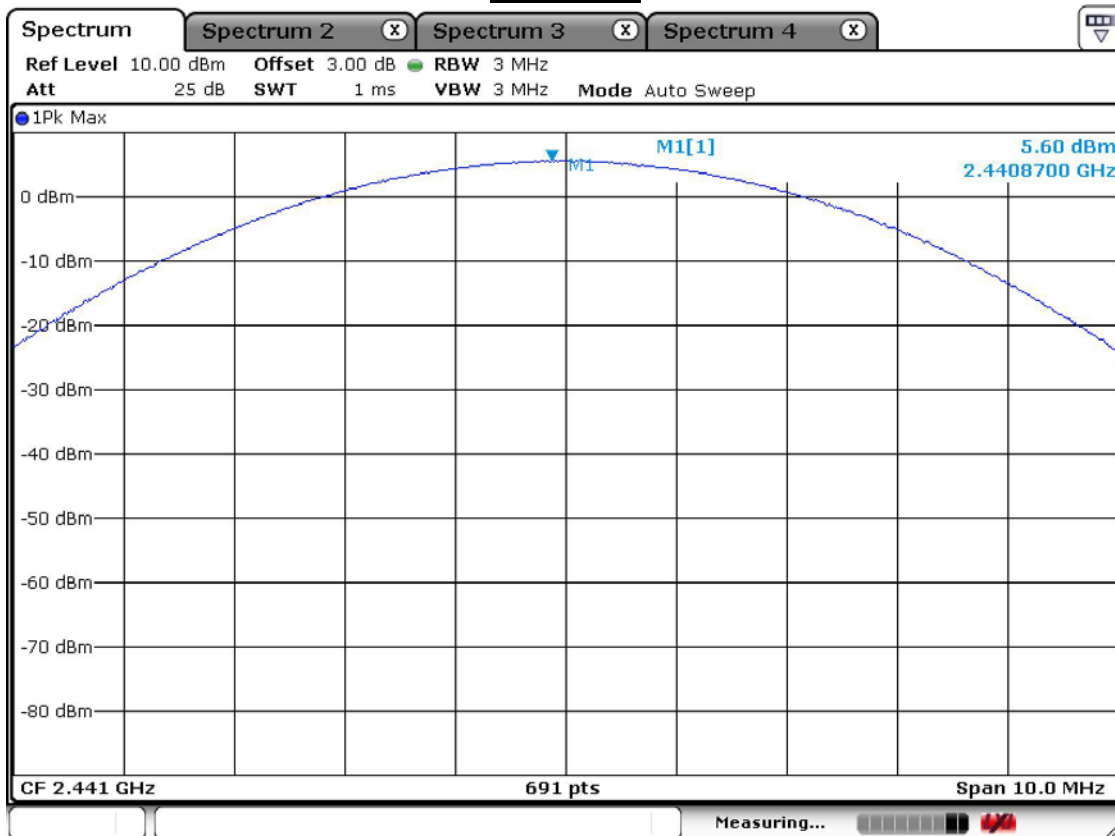
### EDR mode



### Channel 2 Basic mode

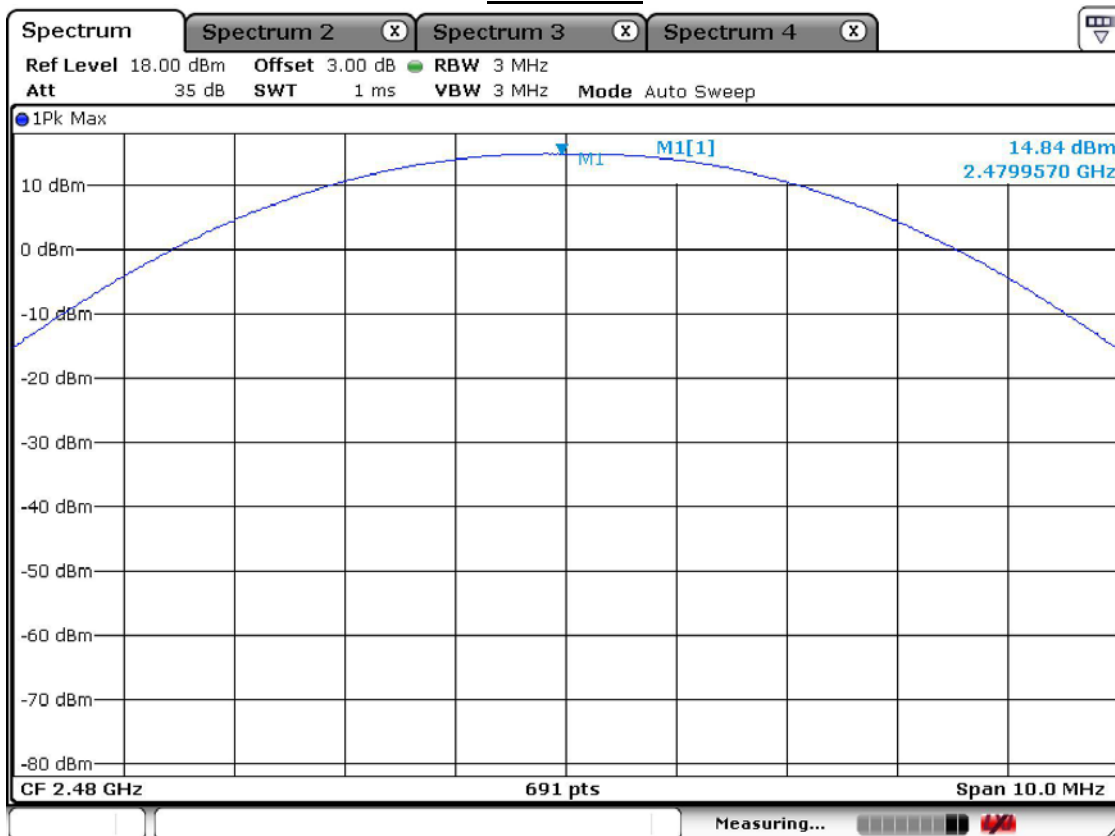


### EDR mode

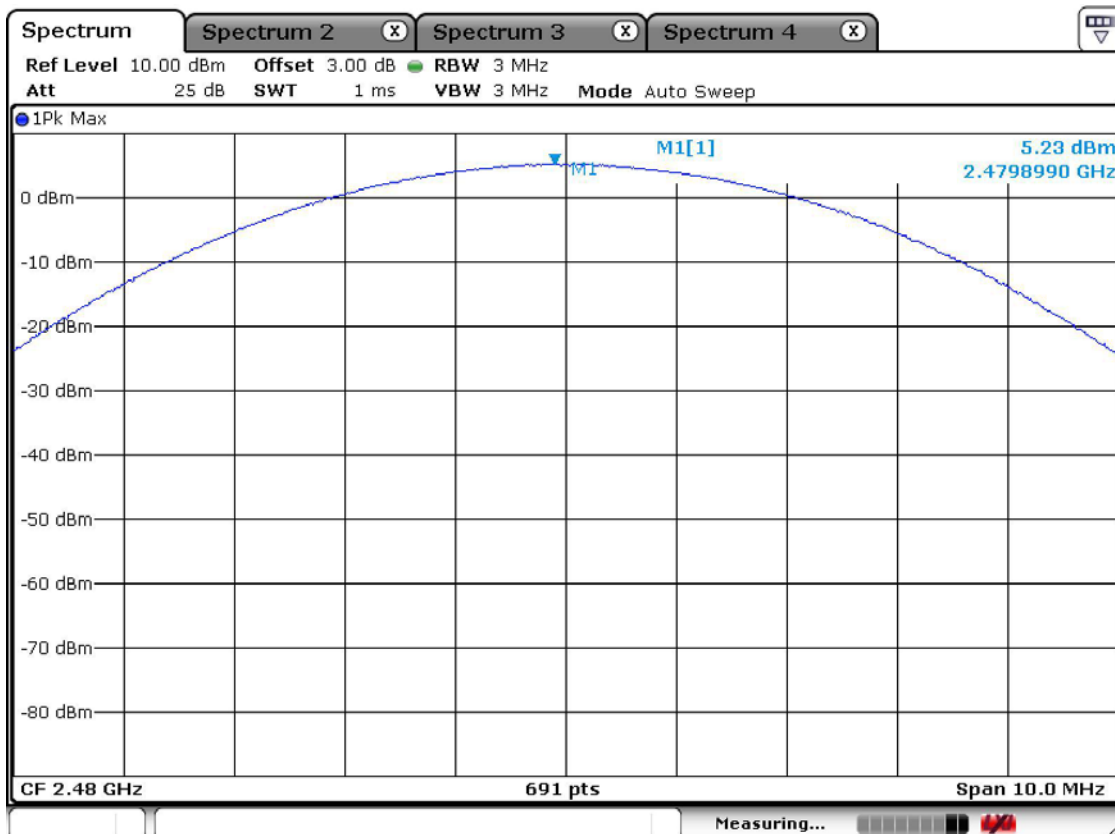




### Channel 3 Basic mode



### 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.

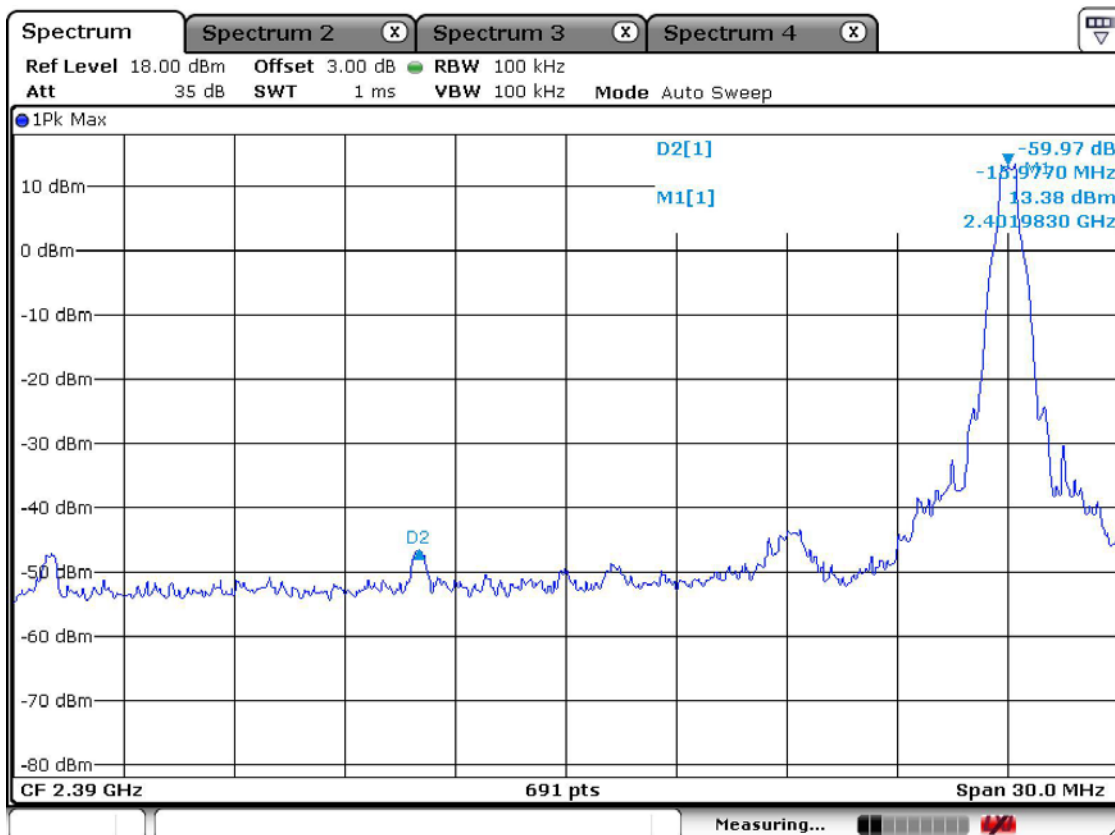
<b>Minimum Standard:</b>	> 20 dBc
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**Measurement Setup**

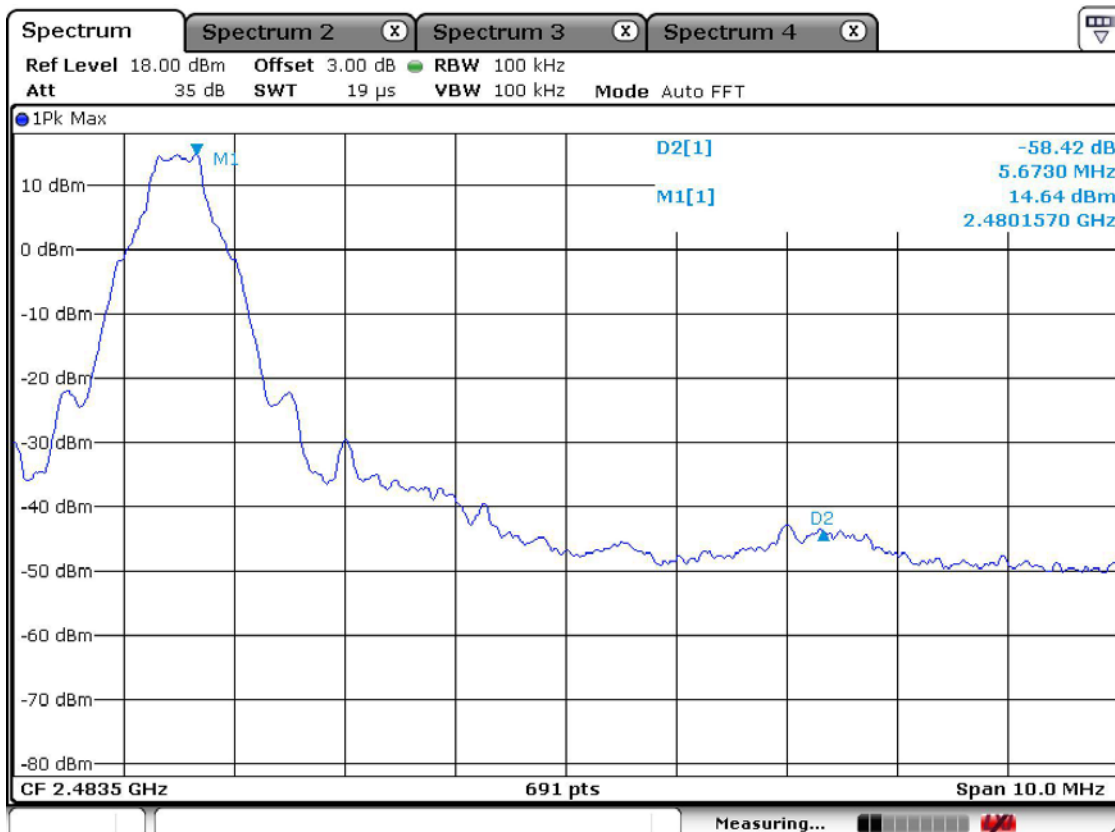
Same as the Chapter 3.2.1 (Figure 1)

**Band – edge**

**Lower edge**



**Upper edge**



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

Frequency [MHz]	Reading [dBuV/m]		Pol.	Correction Factor			Limits [dBuV/m]		Result [dBuV/m]		Margin [dB]	
	AV / Peak			Antenna	Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
2390	51.4	63.5	H	26.0	36.0	8.2	54.0	74.0	49.6	61.7	4.4	12.3

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

Frequency [MHz]	Reading [dBuV/m]		Pol.	Correction Factor			Limits [dBuV/m]		Result [dBuV/m]		Margin [dB]	
	AV / Peak			Antenna	Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
2483.5	50.8	63.3	H	26.0	36.0	8.2	54.0	74.0	49.0	61.5	5.0	12.5

**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**

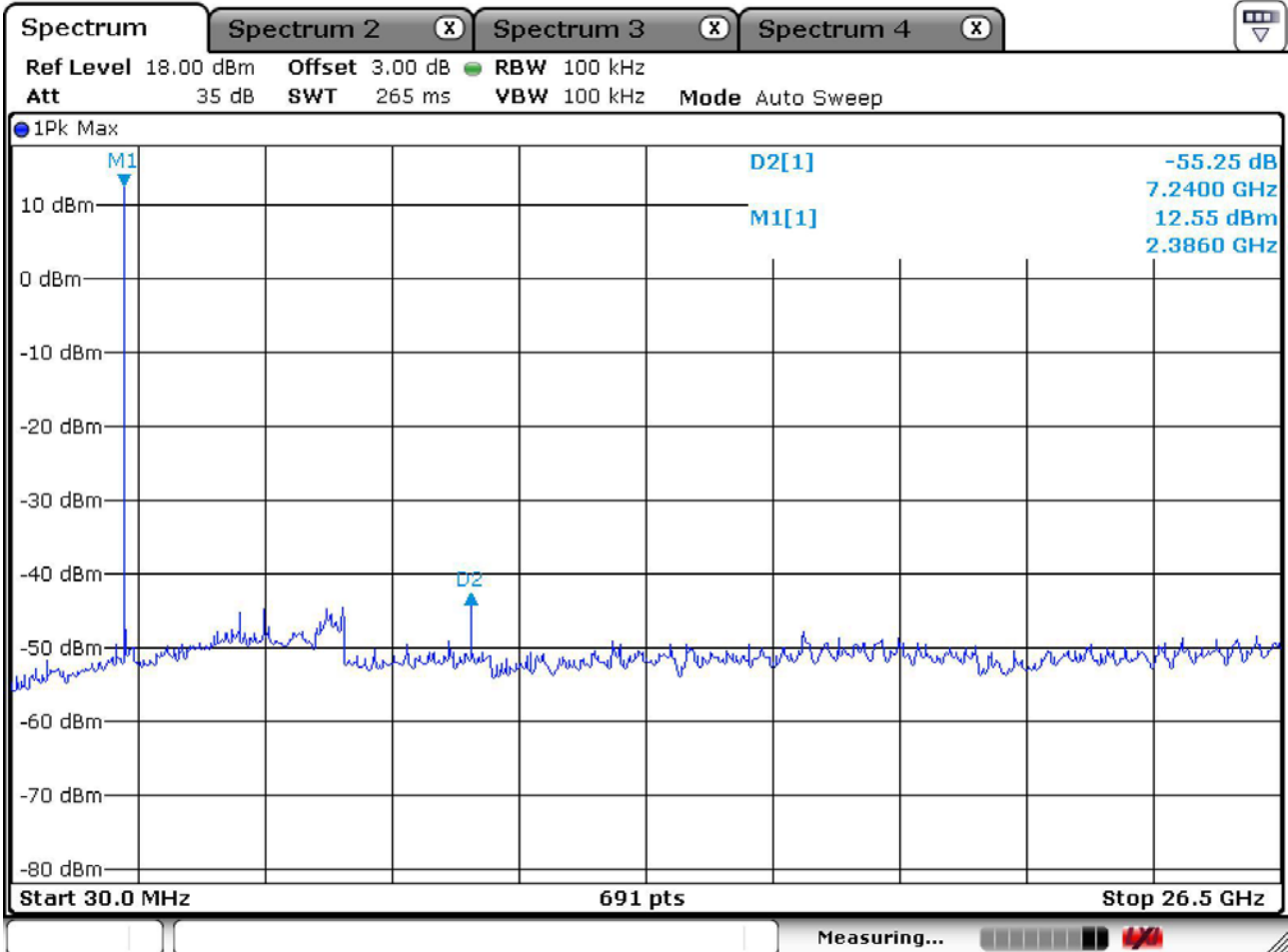
Frequency [MHz]	Reading [dBuV/m]		Pol.	Correction Factor			Limits [dBuV/m]		Result [dBuV/m]		Margin [dB]	
	AV / Peak			Antenna	Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
2390	48.5	60.5	H	26.0	36.0	8.2	54.0	74.0	46.7	58.7	7.3	15.3

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

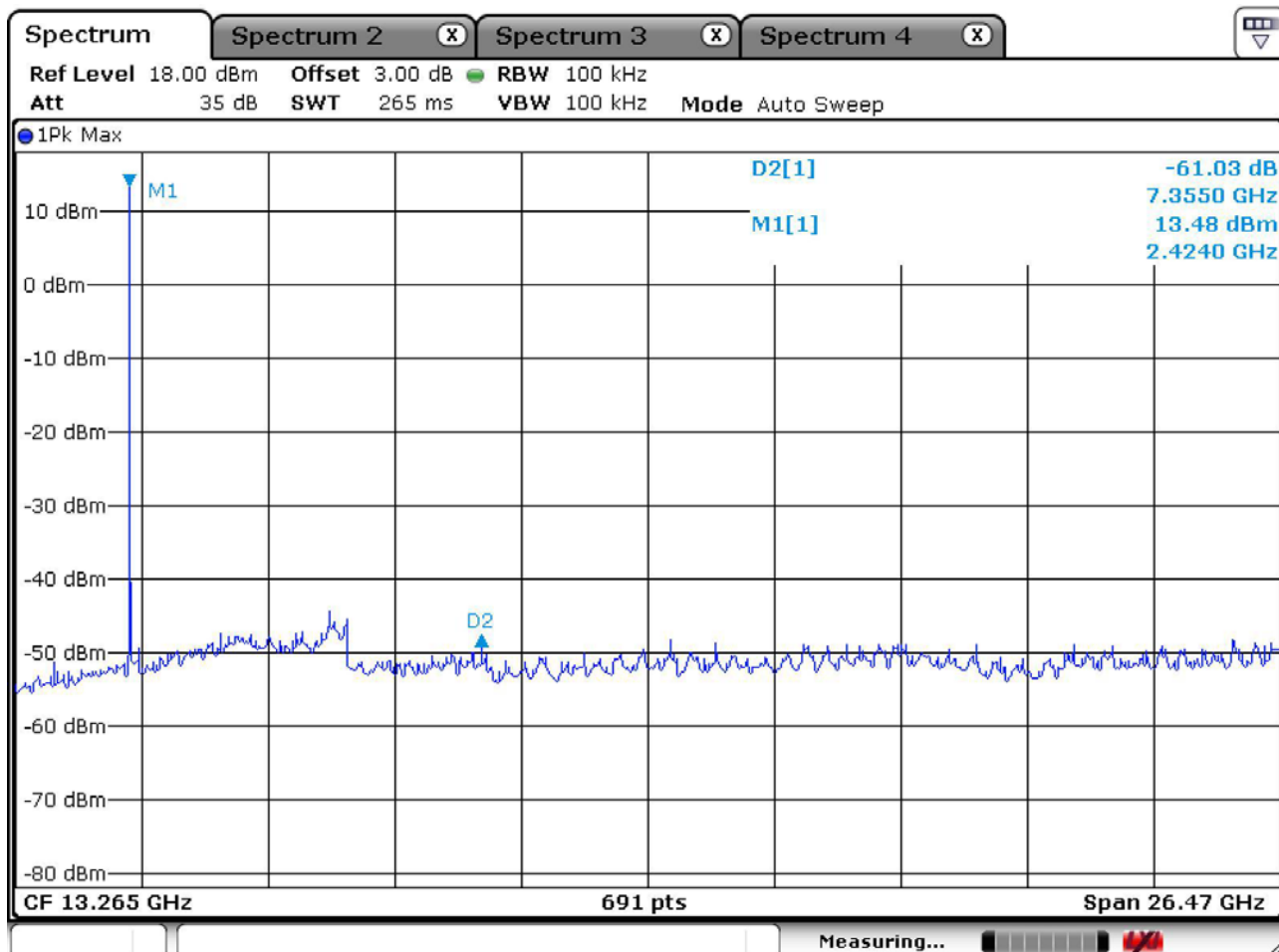
Frequency [MHz]	Reading [dBuV/m]		Pol.	Correction Factor			Limits [dBuV/m]		Result [dBuV/m]		Margin [dB]	
	AV / Peak			Antenna	Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
2483.5	47.6	59.8	H	26.0	36.0	8.2	54.0	74.0	45.8	58.0	8.2	16.0

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

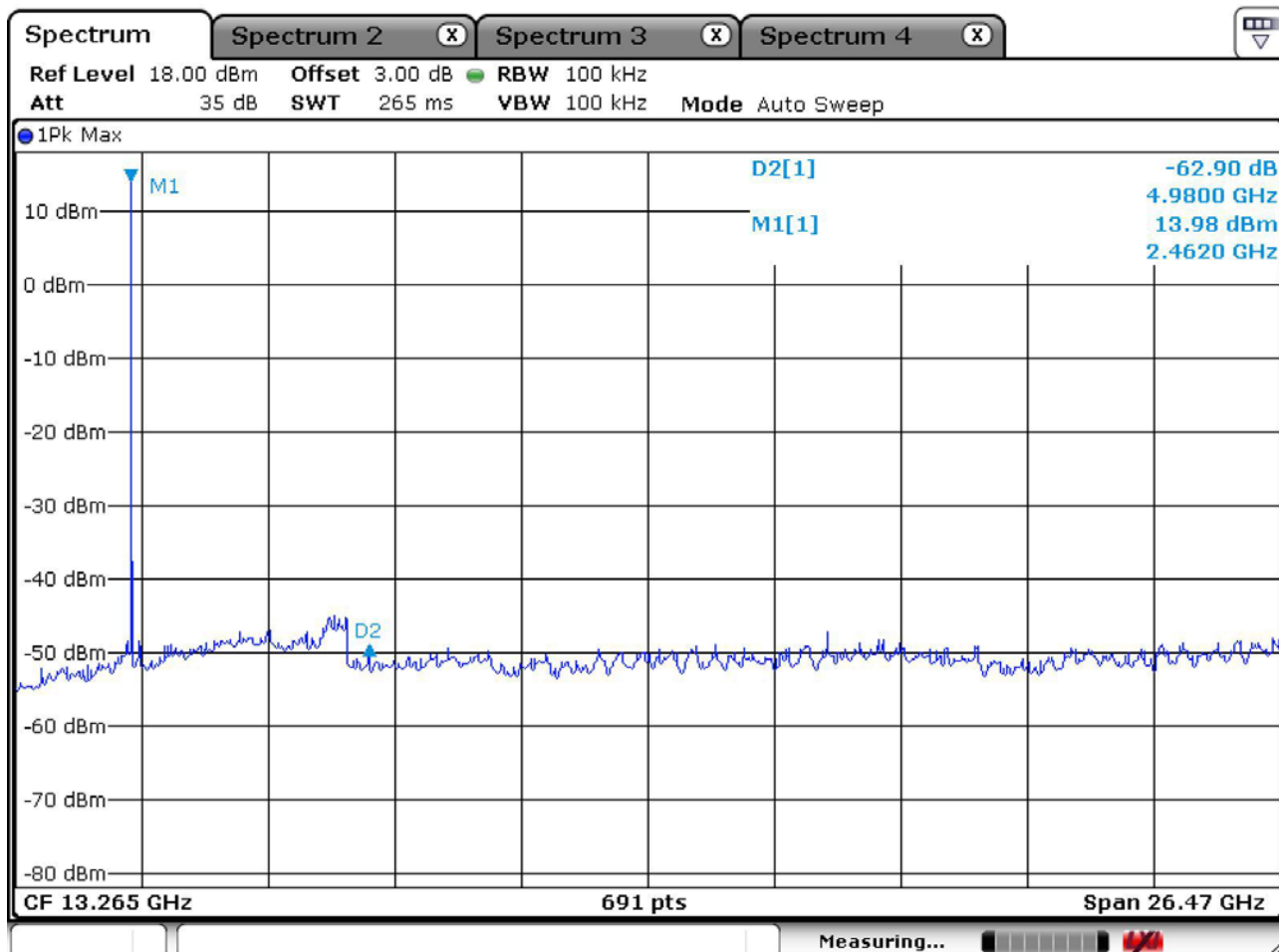
**Unwanted Emission – Low channel**  
**Frequency Range = 30 MHz ~ 26.5 GHz**



**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 [MHz]	Reading [dBuV/m]		Pol.	Correction Factor			D.C.F	Limits [dBuV/m]		Result [dBuV/m]		Margin [dB]	
	AV / Peak			Antenna	Amp.Gain	Cable		AV/Peak		AV/Peak		AV / Peak	
4804.00	55.4	64.3	H	31.4	34.6	8.7	-30.27	54.0	74.0	30.6	39.5	23.4	34.5
4882.0	55.9	64.5	H	31.4	34.6	8.7	-30.27	54.0	74.0	31.1	39.7	22.9	34.3
4960.0	59.3	66.8	H	31.4	34.6	8.7	-30.27	54.0	74.0	34.5	42.0	19.5	32.0

## 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

$$\begin{aligned} \text{D.C.F (Duty Cycle Correction Factor)} &= 20\log(\text{The worst Case DWELL Time}/100\text{ms}) \\ &= 20\log(3.065\text{ms}/100\text{ms}) = -30.27 \end{aligned}$$

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

Frequency [MHz]	Reading [dBuV/m]		Pol.	Correction Factor			D.C.F	Limits [dBuV/m]		Result [dBuV/m]		Margin [dB]	
	AV / Peak			Antenna	Amp.Gain	Cable		AV/Peak		AV/Peak		AV / Peak	
4804.00	46.5	55.9	H	31.4	34.6	8.7	-30.27	54.0	74.0	21.7	31.1	32.3	42.9
4882.0	46.8	56.2	H	31.4	34.6	8.7	-30.27	54.0	74.0	22.0	31.4	32.0	42.6
4960.0	49.2	59.3	H	31.4	34.6	8.7	-30.27	54.0	74.0	24.4	34.5	29.6	39.5

## 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

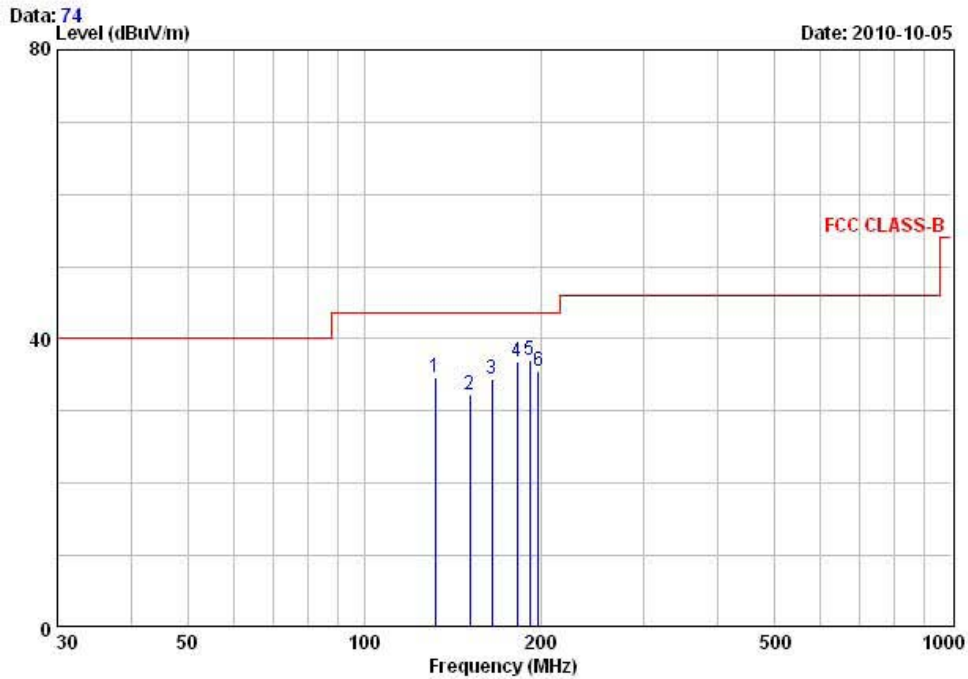
$$\begin{aligned} \text{D.C.F (Duty Cycle Correction Factor)} &= 20\log(\text{The worst Case DWELL Time}/100\text{ms}) \\ &= 20\log(3.065\text{ms}/100\text{ms}) = -30.27 \end{aligned}$$

**BT mode**



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EUT/Model No.: Parani-SD1000A TEST MODE: BLUE TEST mode  
Temp Humi : 24 / 56 Tested by: PARK.H.W



Peak	Freq MHz	Reading dBuV/m	C.F dB/m	Result dBuV/m	Limit QP dBuV/m	Margin dB	Height cm	Angle deg	Polarity
1	132.10	47.60	-12.87	34.73	43.50	8.77	143	319	VERTICAL
2	151.40	43.80	-11.54	32.26	43.50	11.24	100	209	HORIZONTAL
3	165.35	46.00	-11.66	34.34	43.50	9.16	122	16	VERTICAL
4	182.11	48.80	-11.93	36.87	43.50	6.63	176	158	VERTICAL
5	191.32	49.20	-12.23	36.97	43.50	6.53	134	27	VERTICAL
6	198.14	48.00	-12.43	35.57	43.50	7.93	125	144	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 [MHz]	Reading [dBuV/m]		Pol.	Correction Factor			Limits [dBuV/m]		Result [dBuV/m]		Margin [dB]	
	AV / Peak			Antenna	Amp.Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
2404.00	34.3	36.5	H	26.0	36.0	8.2	54.0	74.0	32.5	34.7	21.5	39.3
Frequency [MHz]	Reading [dBuV/m]		Pol.	Correction Factor			Limits [dBuV/m]		Result [dBuV/m]		Margin [dB]	
[MHz]	AV / Peak			Antenna	Amp.Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
2443.0	34.8	36.9	H	26.0	36.0	8.2	54.0	74.0	33.0	35.1	21.0	38.9
Frequency [MHz]	Reading [dBuV/m]		Pol.	Correction Factor			Limits [dBuV/m]		Result [dBuV/m]		Margin [dB]	
[MHz]	AV / Peak			Antenna	Amp.Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
2482.0	35.1	37.5	H	26.0	36.0	8.2	54.0	74.0	33.3	35.7	20.7	38.3

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

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

Frequency [MHz]	Reading [dBuV/m]		Pol.	Correction Factor			Limits [dBuV/m]		Result [dBuV/m]		Margin [dB]	
	AV / Peak			Antenna	Amp.Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
2404.00	31.5	33.1	H	26.0	36.0	8.2	54.0	74.0	29.7	31.3	24.3	42.7
Frequency [MHz]	Reading [dBuV/m]		Pol.	Correction Factor			Limits [dBuV/m]		Result [dBuV/m]		Margin [dB]	
AV / Peak		Antenna		Amp.Gain	Cable	AV / Peak		AV / Peak		AV / Peak		
2443.0	31.6	33.8	H	26.0	36.0	8.2	54.0	74.0	29.8	32.0	24.2	42.0
Frequency [MHz]	Reading [dBuV/m]		Pol.	Correction Factor			Limits [dBuV/m]		Result [dBuV/m]		Margin [dB]	
AV / Peak		Antenna		Amp.Gain	Cable	AV / Peak		AV / Peak		AV / Peak		
2482.0	30.5	34.2	H	26.0	36.0	8.2	54.0	74.0	28.7	32.4	25.3	41.6

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: 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 (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

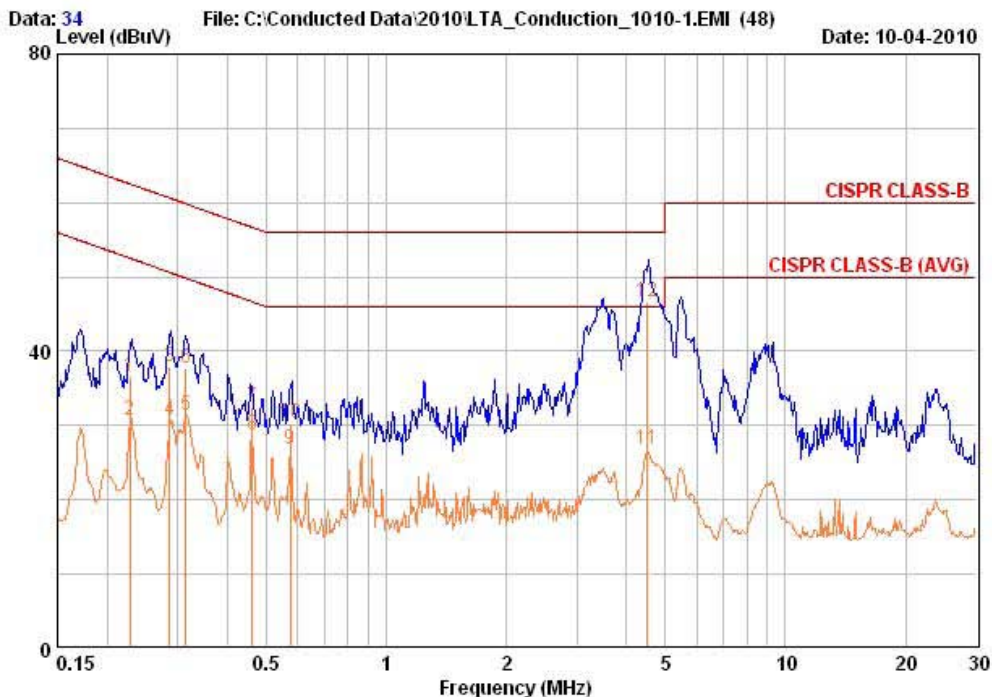
\* Decreases with the logarithm of the frequency

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



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EUT / Model No. : Parani-SD1000A Phase : LINE  
 Test Mode : BLUE TEST mode Test Power : 120 / 60  
 Temp./Humi. : 25 / 44 Test Engineer : PARK H W



Freq MHz	RD		C.F	Result		Limit		Margin	
	QP dBuV	AV dBuV		QP dBuV	AV dBuV	QP dBuV	AV dBuV	QP dB	AV dB
0.228	27.05	21.15	9.66	36.71	30.81	62.52	52.52	25.81	21.71
0.287	28.26	21.06	9.65	37.91	30.71	60.61	50.61	22.70	19.90
0.314	28.16	21.66	9.65	37.81	31.31	59.86	49.86	22.05	18.55
0.461	22.75	19.15	9.67	32.42	28.82	56.67	46.67	24.25	17.85
0.575	20.65	17.15	9.71	30.37	26.87	56.00	46.00	25.63	19.13
4.518	36.84	16.84	9.91	46.75	26.75	56.00	46.00	9.25	19.25

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

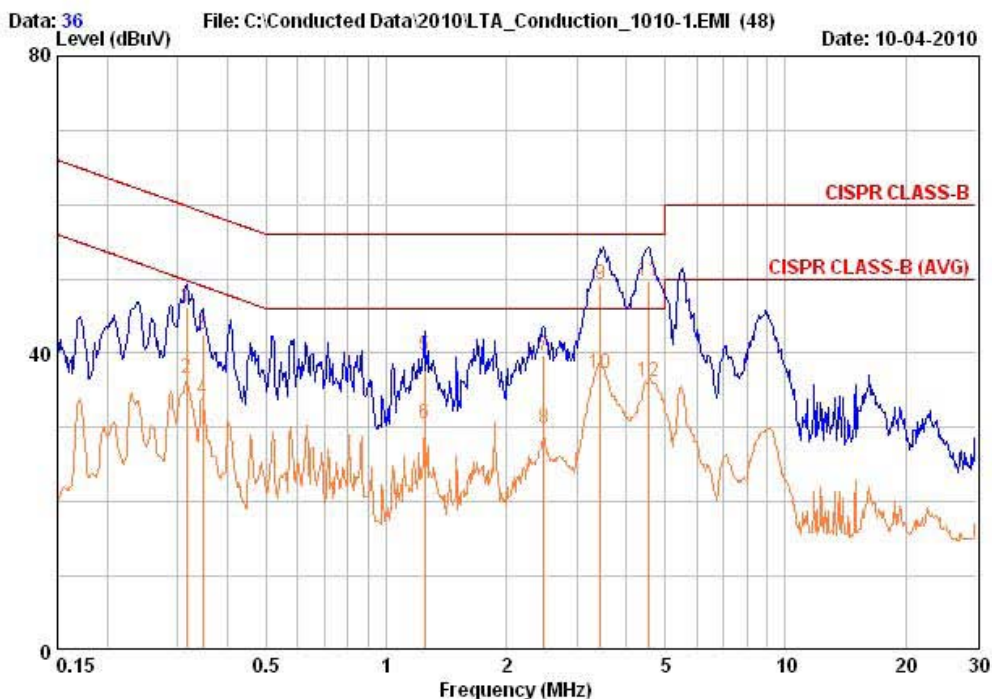


**AC Conducted Emissions at BT mode – Neutral**



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EUT / Model No. : Parani-SD1000A	Phase : NEUTRAL
Test Mode : BLUE TEST mode	Test Power : 120 / 60
Temp./Humi. : 25 / 44	Test Engineer : PARK H W



Freq MHz	RD		C.F	Result		Limit		Margin	
	QP dBuV	AV dBuV		QP dBuV	AV dBuV	QP dBuV	AV dBuV	QP dB	AV dB
0.316	36.56	27.06	9.66	46.22	36.72	59.81	49.81	13.59	13.09
0.347	32.95	24.05	9.66	42.61	33.71	59.03	49.03	16.42	15.32
1.249	29.98	20.68	9.79	39.77	30.47	56.00	46.00	16.23	15.53
2.479	29.78	20.08	9.83	39.62	29.92	56.00	46.00	16.38	16.08
3.447	39.34	27.34	9.86	49.20	37.20	56.00	46.00	6.80	8.80
4.563	39.74	26.24	9.91	49.65	36.15	56.00	46.00	6.35	9.85

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-10
4	Signal Generator	8648C	3623A02597	HP	Mar-11
5	Signal Generator	83711B	US34490456	HP	Mar-11
6	Attenuator (3dB)	8491A	37822	HP	Oct-10
7	Attenuator (10dB)	8491A	63196	HP	Oct-10
8	Attenuator (30dB)	8498A	1801A06689	HP	Oct-10
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-10
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-10
28	DC Power Supply	6622A	3448A03079	HP	Oct-10
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-10
33	Modulation Analyzer	8901B	3749A05878	HP	Oct-10
34	TEMP & HUMIDITY Chamber	YJ-500	LTAS06041	JinYoung Tech	Oct-10
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-10