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Tel: +82-31-323-6008 Fax: +82-31-323-6010
http://www.ltalab.com

Dates of Tests: May 01 ~09, 2012
Test Report S/N: LR500111205A
Test Site : LTA CO., LTD.

CERTIFICATION OF COMPLIANCE

FCC ID **S7A-SP05**
IC **8154A-SP05**
APPLICANT **Sena Technologies, Inc.**

Equipment Class	:	**Part 15 Spread Spectrum Transmitter (DSS)**
Manufacturing Description	:	**Dual Stream Bluetooth Stereo Transmitter**
Manufacturer	:	**Sena Technologies, Inc.**
Model name	:	**SM10**
Variant Model name	:	**SM10S**
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 5.70 dBm - Conducted**
Data of issue	:	**May 09, 2012**

This test report is issued under the authority of:

Kyu-Hyun Lee, Manager

The test was supervised by:

Ki-Hun Cho, 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

TABLE OF CONTENTS

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
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	2012-09-30	ECT accredited Lab.
RRL	KOREA	KR0049	2013-04-24	EMC accredited Lab.
FCC	U.S.A	610755	2014-04-27	FCC filing
FCC	U.S.A	649054	2013-04-13	FCC CAB
VCCI	JAPAN	R2133(10m), C2307	2014-06-21	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	:	Sena Technologies, Inc.
Address	:	210 Yangjae-dong Seocho-gu Seoul 137-130 Korea
Telephone / Facsimile	:	+82-2-571-8283/ +82-2-573-7710

2-2 Equipment Under Test (EUT)

Trade name	:	Dual Stream Bluetooth Stereo Transmitter
FCC ID	:	S7A-SP05
Model name	:	SM10
Varient model name	:	SM10S
Serial number	:	Identical prototype
Date of receipt	:	April 30, 2012
EUT condition	:	Pre-production, not damaged
Antenna type	:	Chip antenna (M/N: SENA_F0135) Max Gain 0 dBi
Frequency Range	:	2402 ~ 2480MHz
RF output power	:	Max.5.70 dBm - Conducted
Number of channels	:	79
Duty cycle	:	80.51 %
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 3.7V by internal battery (Li-ion)
Firmware Version	:	V1.0.0

2-4 Tested frequency

	LOW	MID	HIGH
Frequency (MHz)	2402	2441	2480

2-5 Ancillary Equipment

Equipment	Model No.	Serial No.	Manufacturer
Bluetooth headset	UBHS-NE1A / UBHS-NE3	-	UBIXON
Smart phone	SHV-E160S	R33C20PNN0R	SAMSUNG

2-6 Model Description

M/N	Type	Type Description
SM10	Basic Model	Two Bluetooth modules embedded (Modules are equal to each other, This product is pairing of the two modules at the same time)
SM10S	Varient Model	One Bluetooth module embedded (In the basic model, this one had to delete a single module)

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	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.

Note 1: Antenna Requirement

→ The Sena Technologies, Inc. FCC ID:S7A-SP05 unit complies with the requirement of §15.203.
The antenna is Chip 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

Note3: TEST METHODOLOGY
The measurement procedure described in the American National Standard for Testing Unlicensed Wireless Devices(ANSI C63.10-2009) and FCC Public Notice DA 00-705 dated March 30, 2000 entitled "**Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems**" were used in the measurement of the **Sena Technologies, Inc. FCC ID: S7A-SP05**

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 = 2~ 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: Module 1

Test Results	
Carrier Frequency Separation (MHz)	**Result**
1.0014	Complies

- See next pages for actual measured spectrum plots.

Measurement Data: Module 2

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

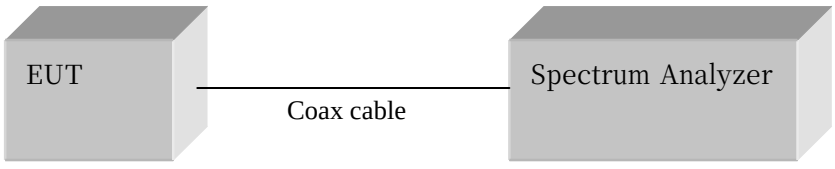
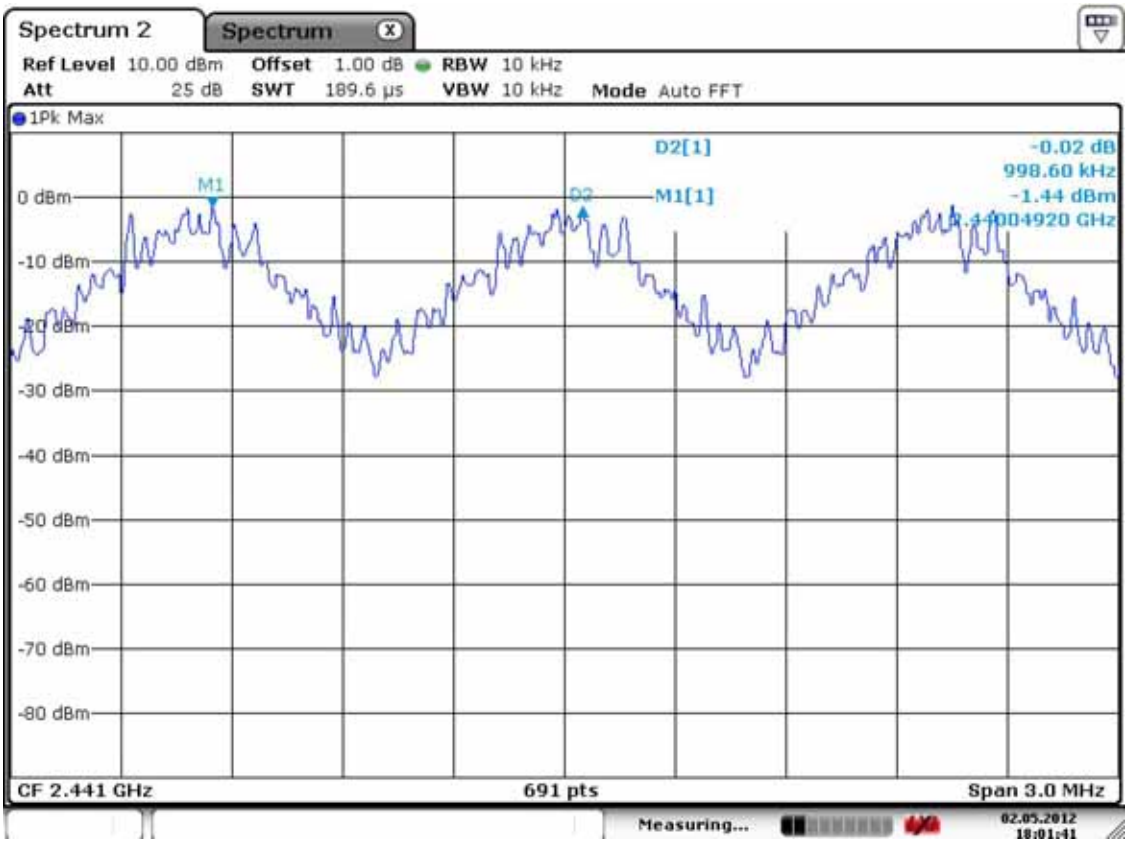


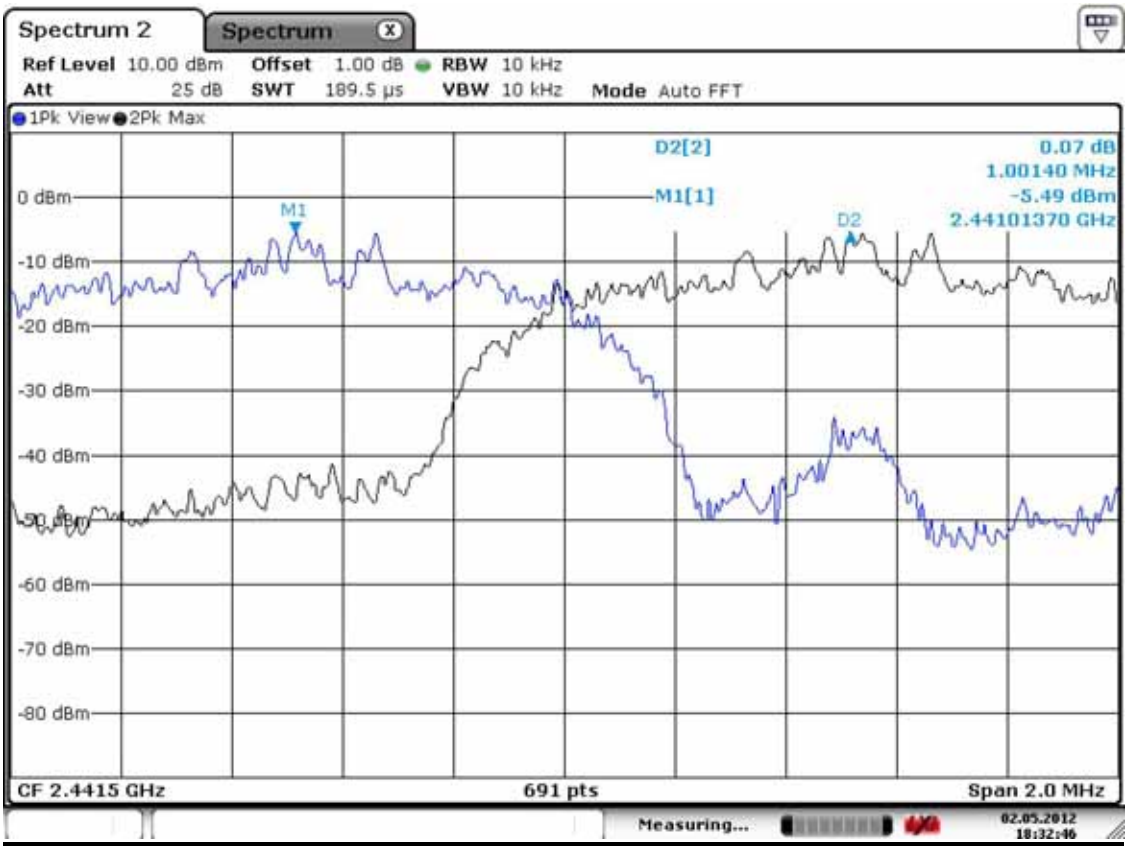
Figure 1: Measurement setup for the carrier frequency separation

Carrier Frequency Separation

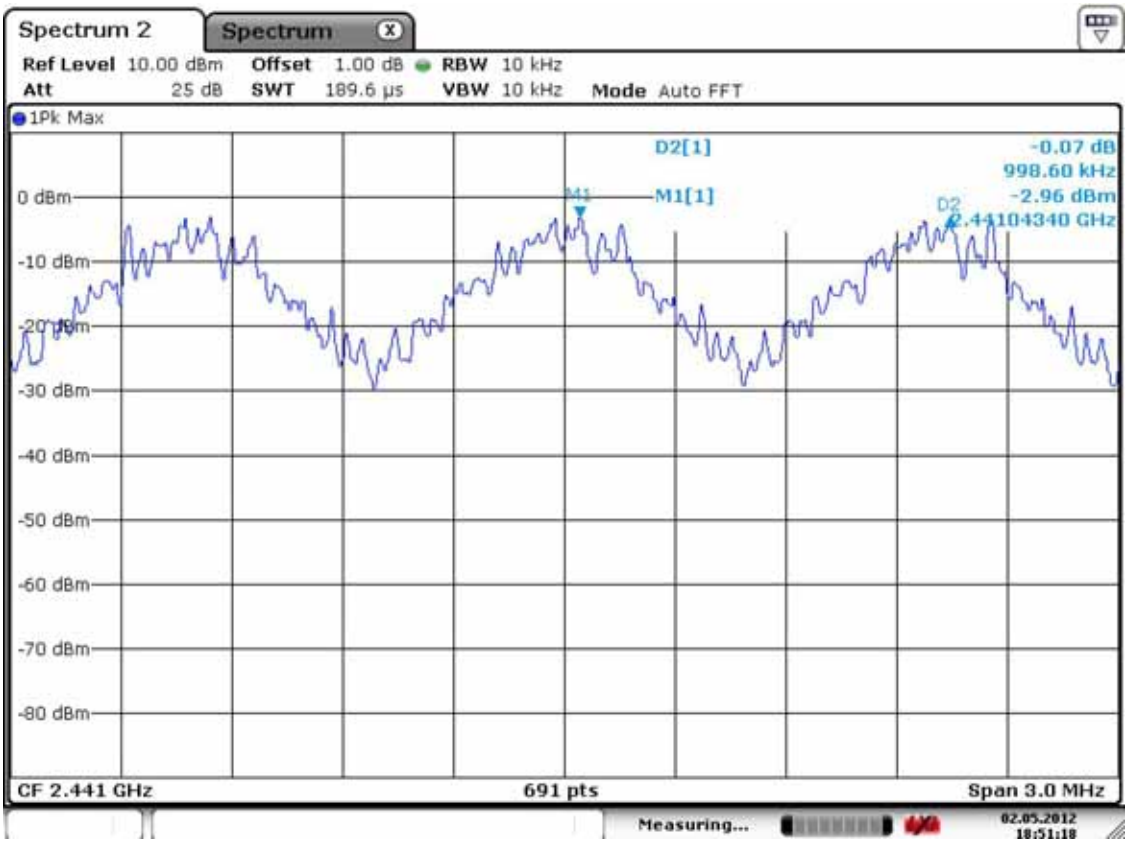
Basic Mode – Module 1



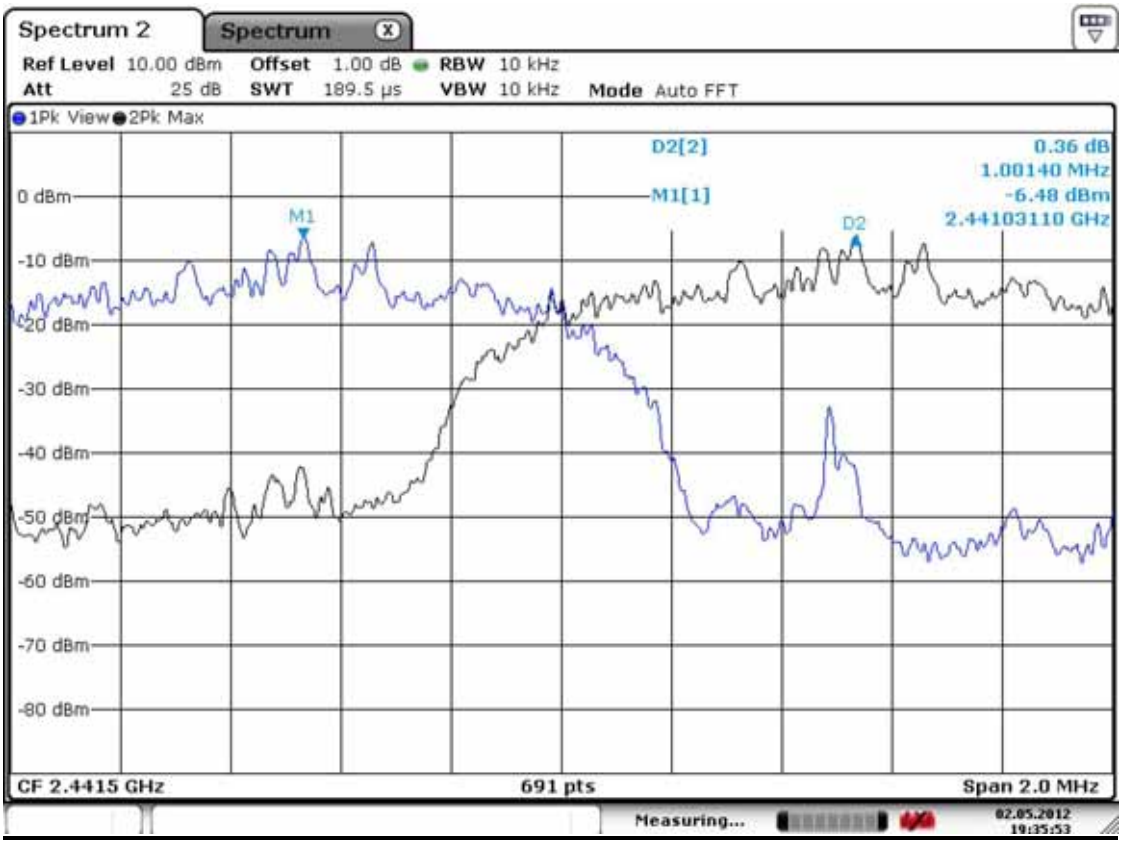
EDR Mode – Module 1



Basic Mode – Module 2



EDR Mode – Module 2



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 Start = 2400.0MHz, Stop = 2483.5 MHz

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

VBW = 100 kHz (VBW ≥ RBW) Detector function = peak

Trace = max hold Span > 40MHz

Measurement Data: Complies (Module 1,2 equal)

Total number of Hopping Channels	79

- See next pages for actual measured spectrum plots.

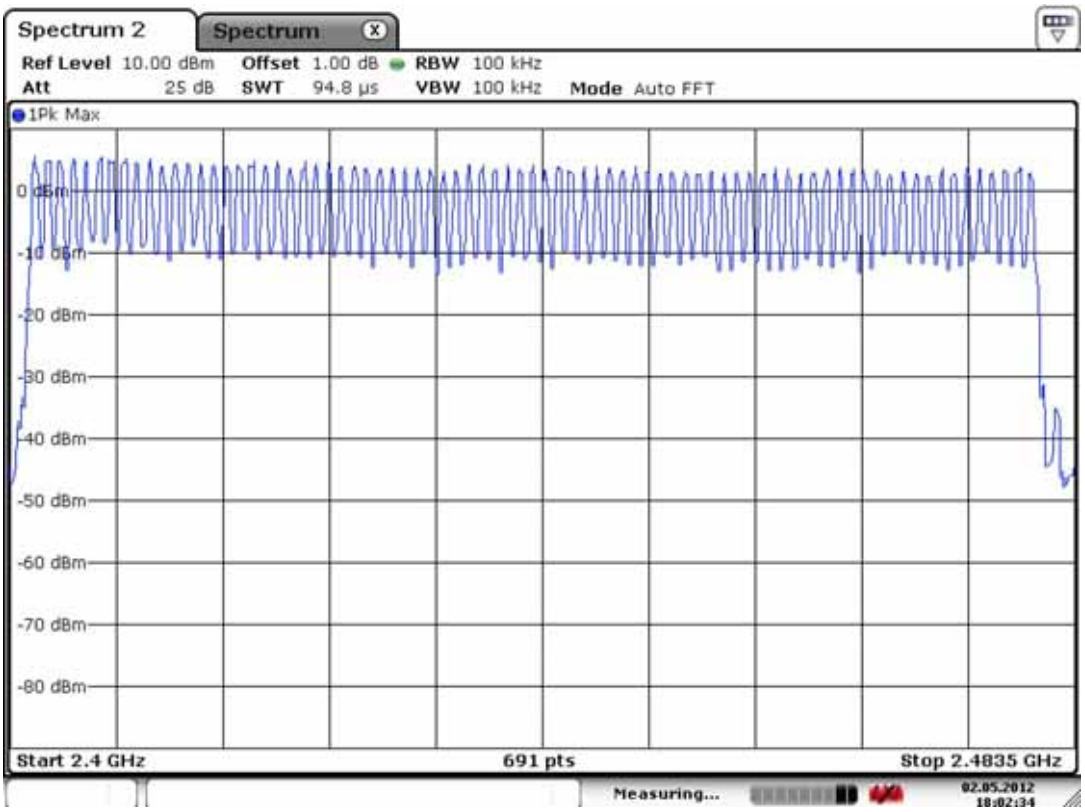
Minimum Standard:

At least 15 hopes

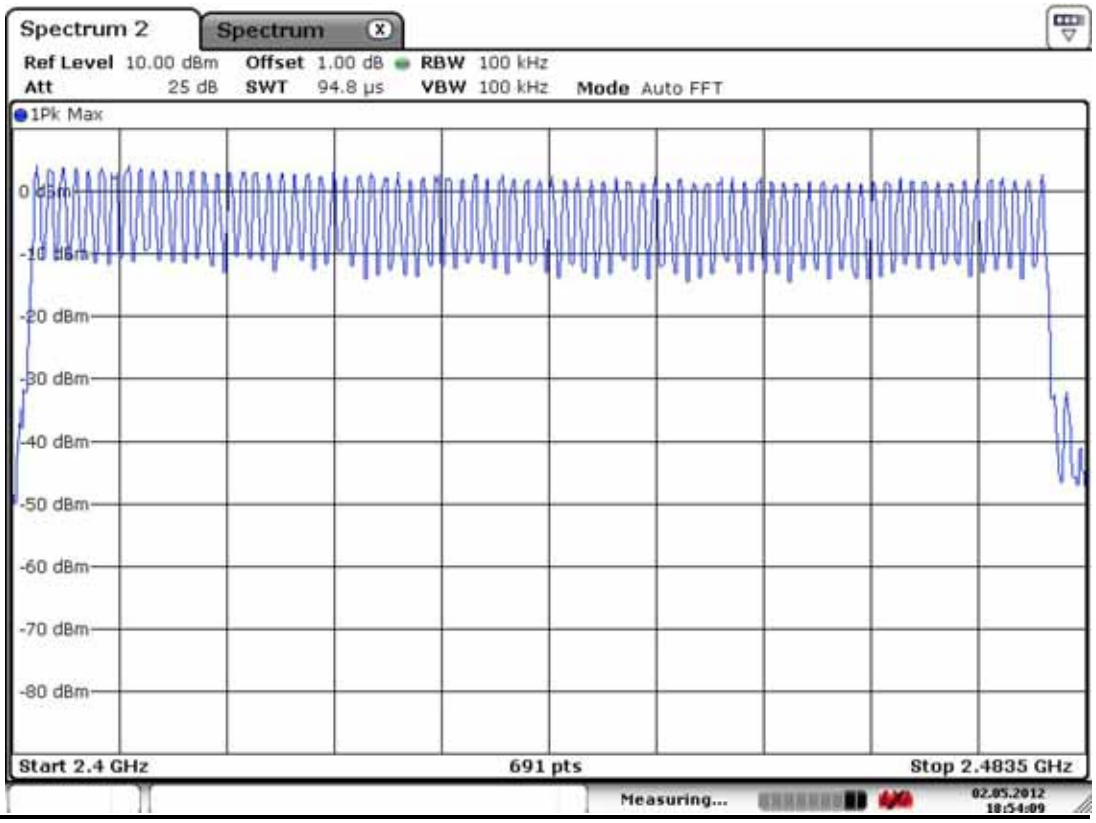
Measurement Setup

Same as the Chapter 3.2.1 (Figure 1)

Number of Hopping Frequencies –Module 1



Number of Hopping Frequencies –Module 2



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 ≥ RBW)

Detector function = peak

Trace = max hold

Measurement Data: Basic Mode – Module 1

Frequency (MHz)	Channel No.	Test Results(MHz)	
		20dB Bandwidth	99% Bandwidth
2402	0	0.886	0.868
2441	39	0.886	0.863
2480	78	0.838	0.894

Measurement Data: EDR Mode – Module 1

Frequency (MHz)	Channel No.	Test Results(MHz)	
		20dB Bandwidth	99% Bandwidth
2402	0	1.276	1.641
2441	39	1.268	1.164
2480	78	1.268	1.155

Minimum Standard:

N/A

Measurement Data: Basic Mode – Module 2

Frequency (MHz)	Channel No.	Test Results(MHz)	
		20dB Bandwidth	99% Bandwidth
2402	0	0.838	0.868
2441	39	0.886	0.864
2480	78	0.838	0.864

Measurement Data: EDR Mode – Module 2

Frequency (MHz)	Channel No.	Test Results(MHz)	
		20dB Bandwidth	99% Bandwidth
2402	0	1.224	1.159
2441	39	1.268	1.159
2480	78	1.263	1.164

- See next pages for actual measured spectrum plots.

Minimum Standard:

N/A

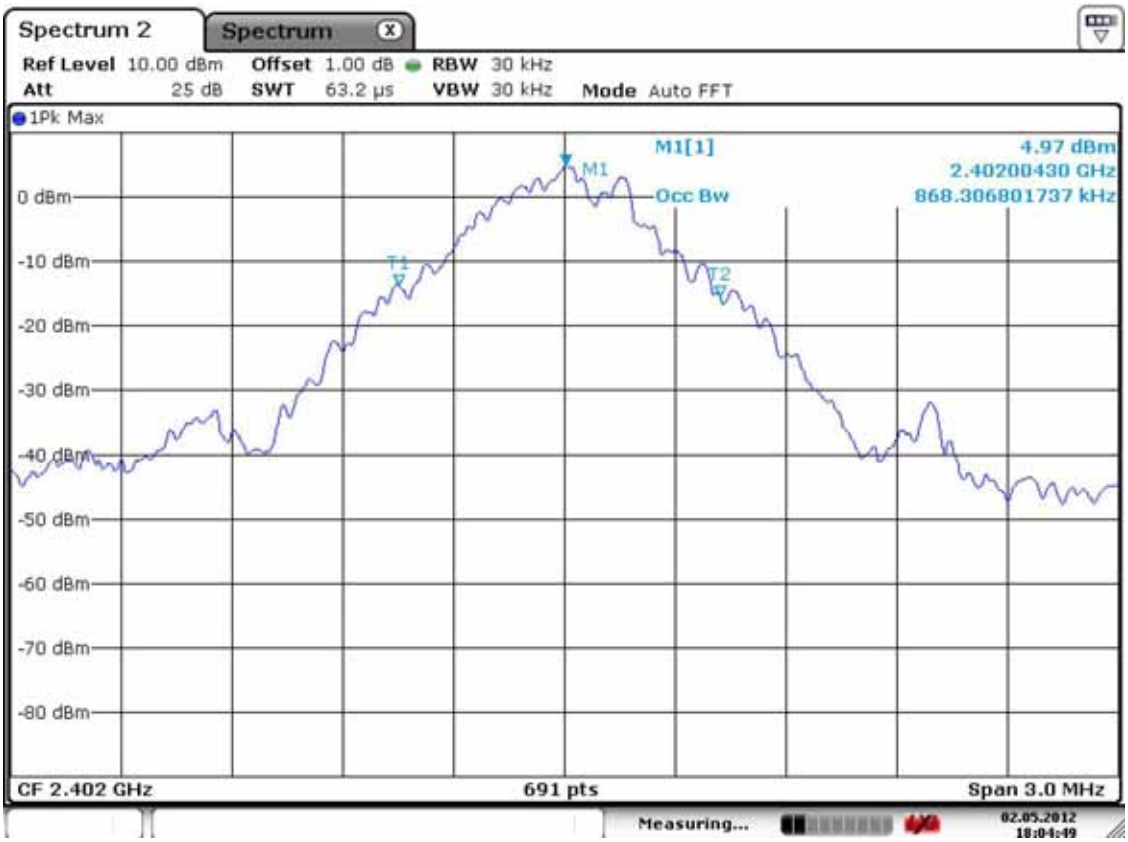
Measurement Setup

Same as the Chapter 3.2.1 (Figure 1)

Channel 1 of basic mode

20 dB Bandwidth – Module 1

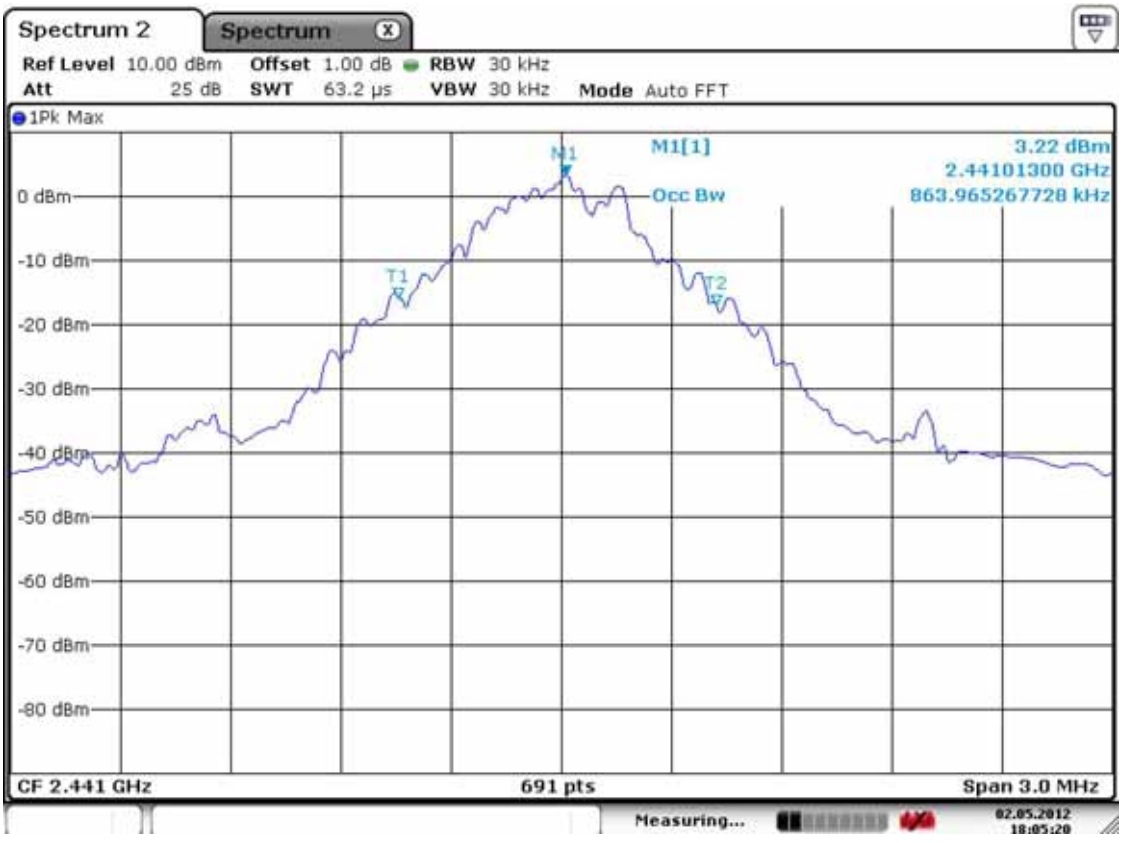
99% Bandwidth – Module 1



Channel 2 of basic mode

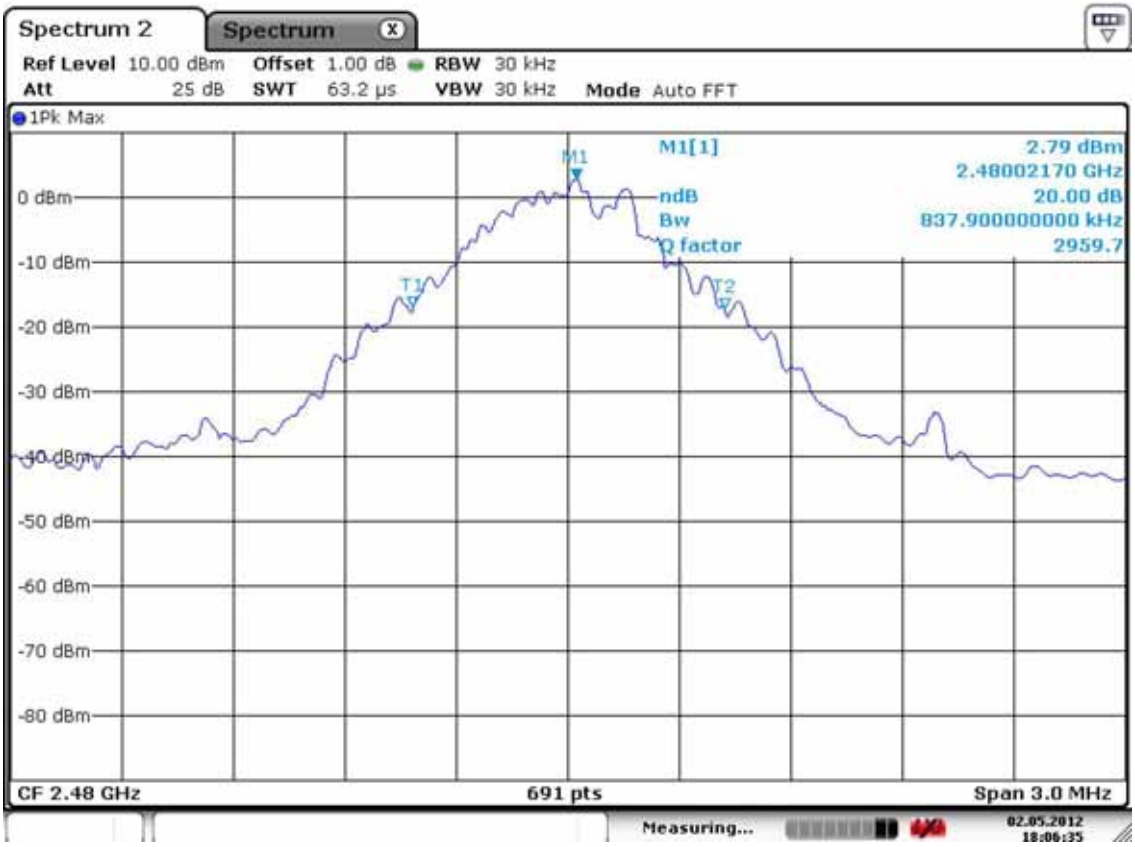
20 dB Bandwidth – Module 1

99% Bandwidth – Module 1

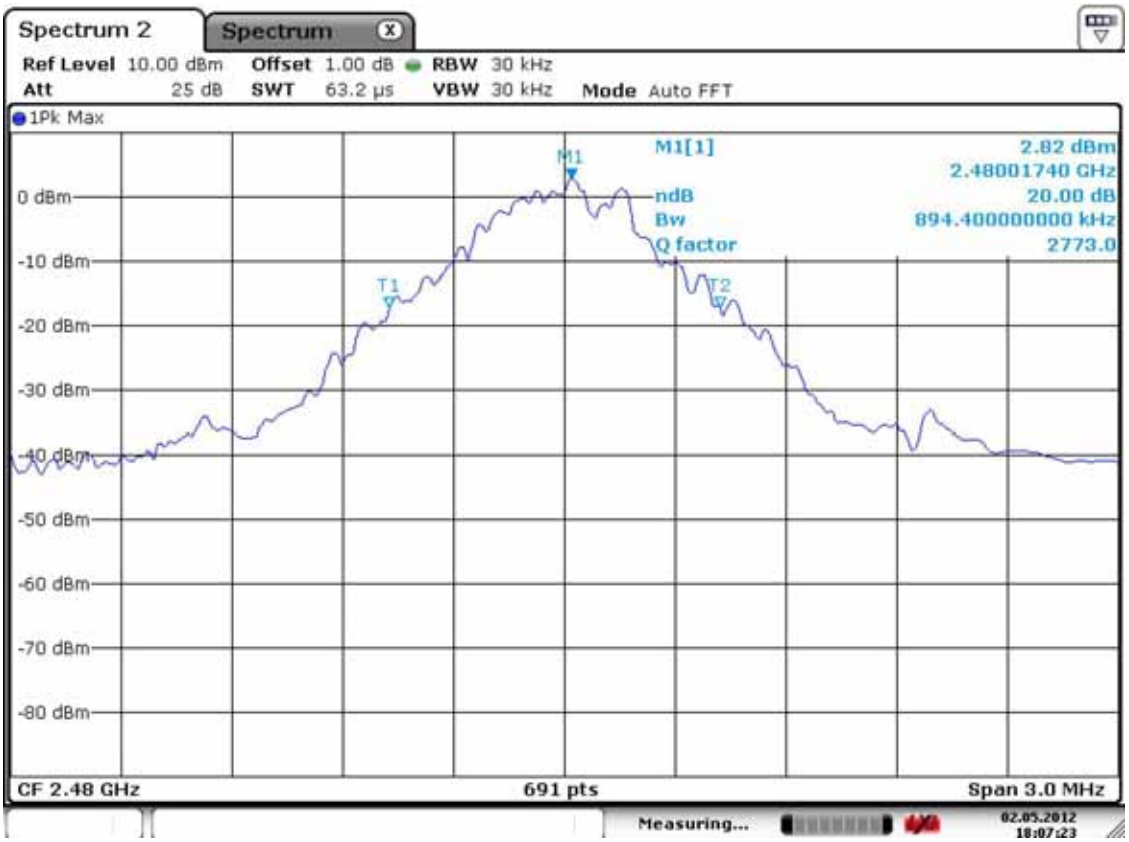


Channel 3 of basic mode

20 dB Bandwidth – Module 1



99% Bandwidth – Module 1



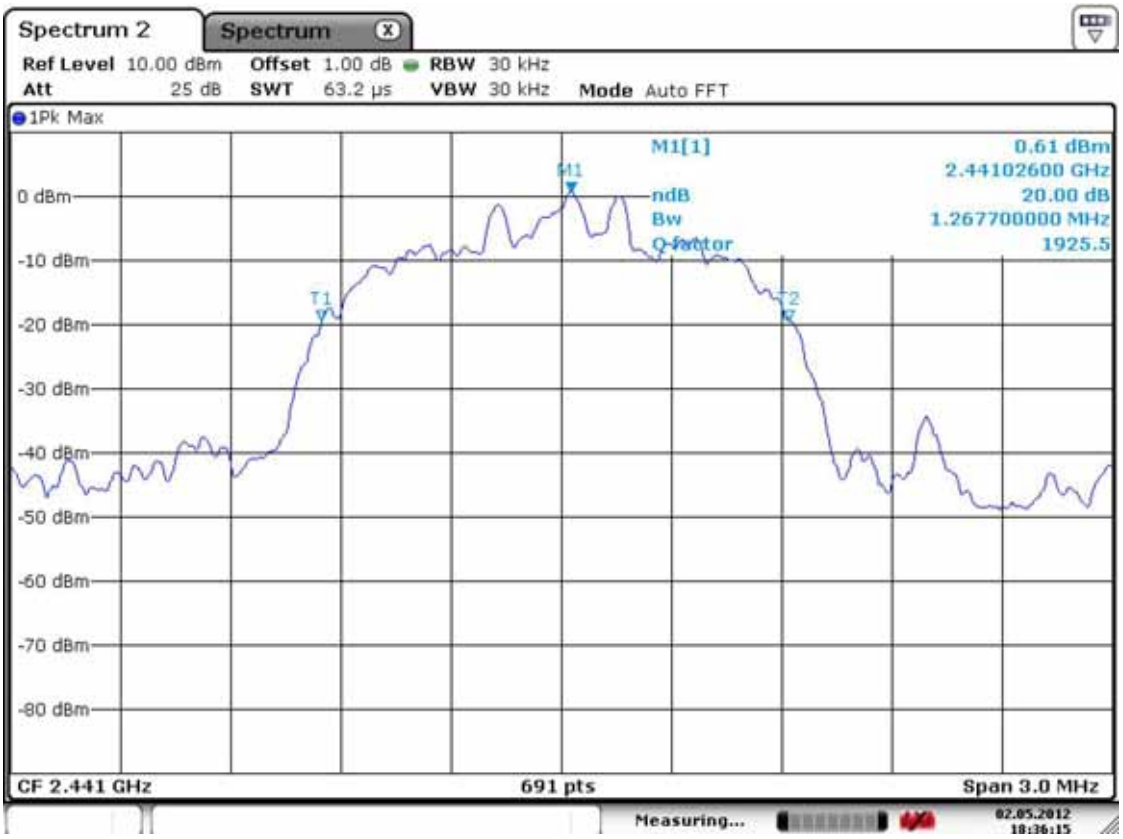
Channel 1 at EDR mode

20 dB Bandwidth – Module 1

99% Bandwidth – Module 1

Channel 2 at EDR mode

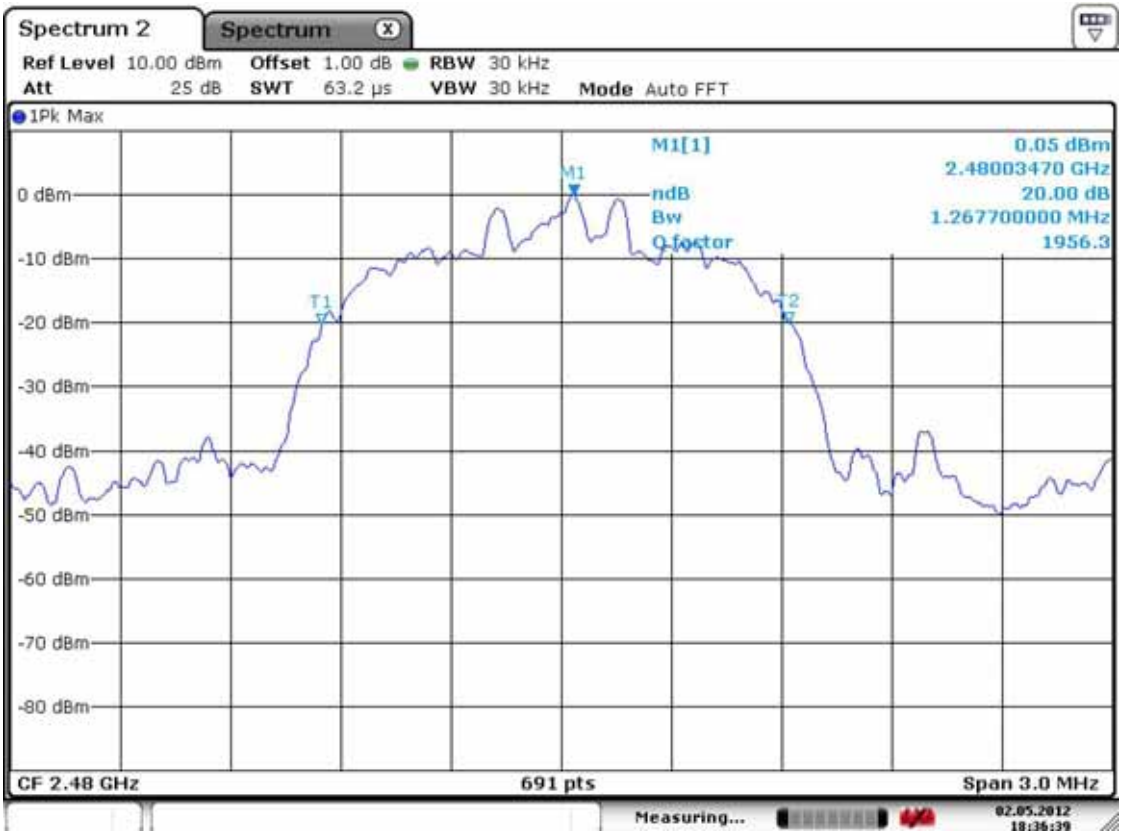
20 dB Bandwidth – Module 1



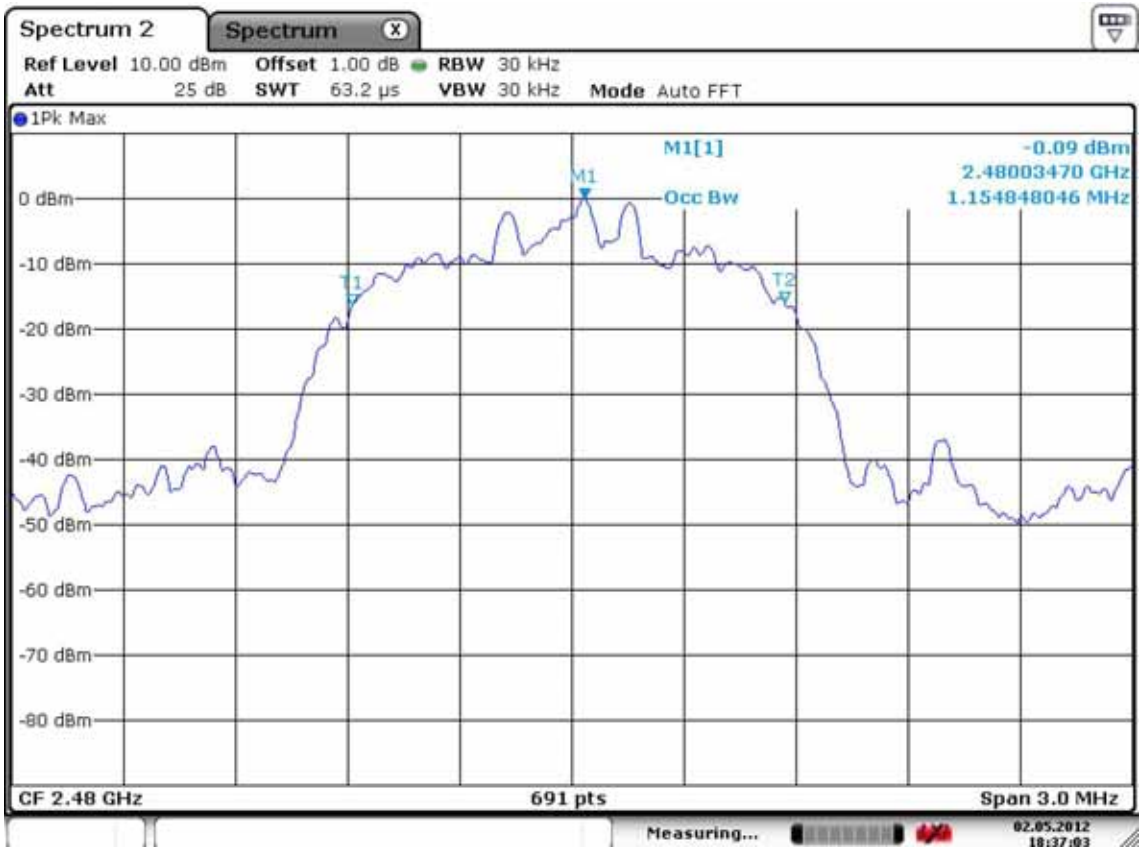
99% Bandwidth – Module 1

Channel 3 at EDR mode

20 dB Bandwidth – Module 1

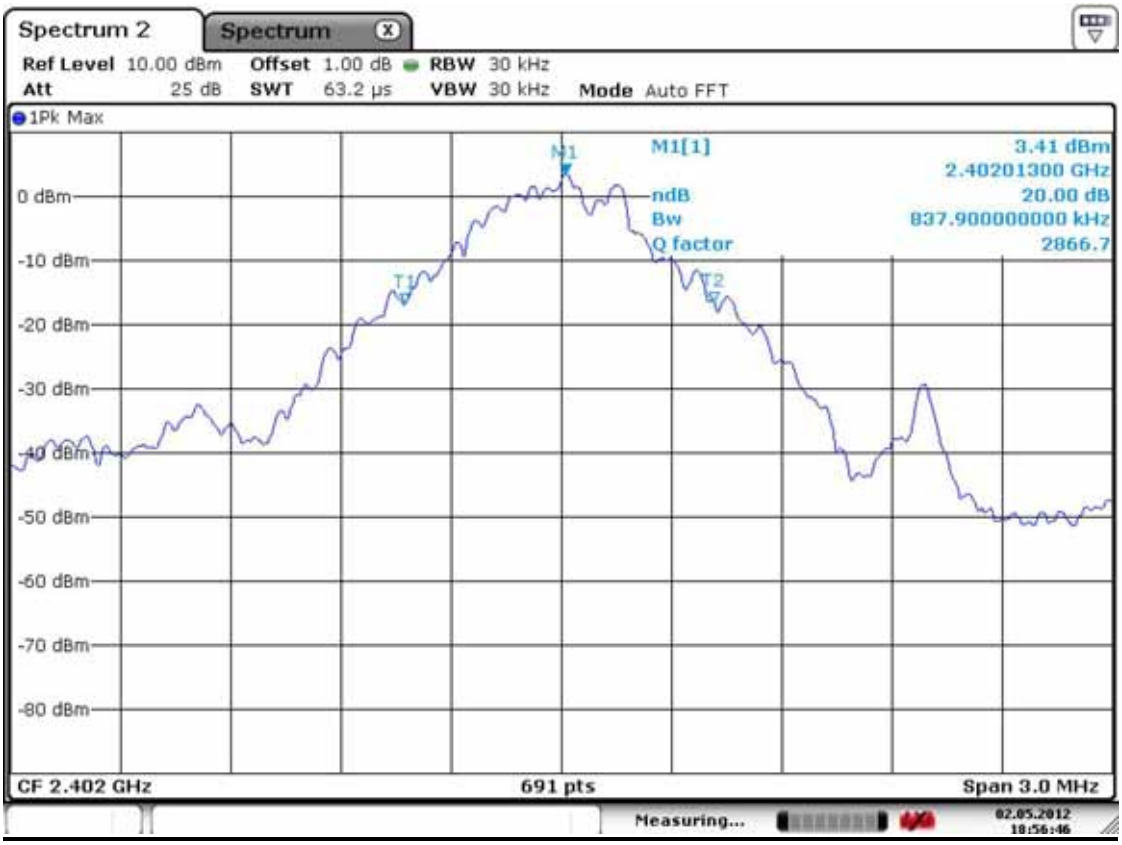


99% Bandwidth – Module 1

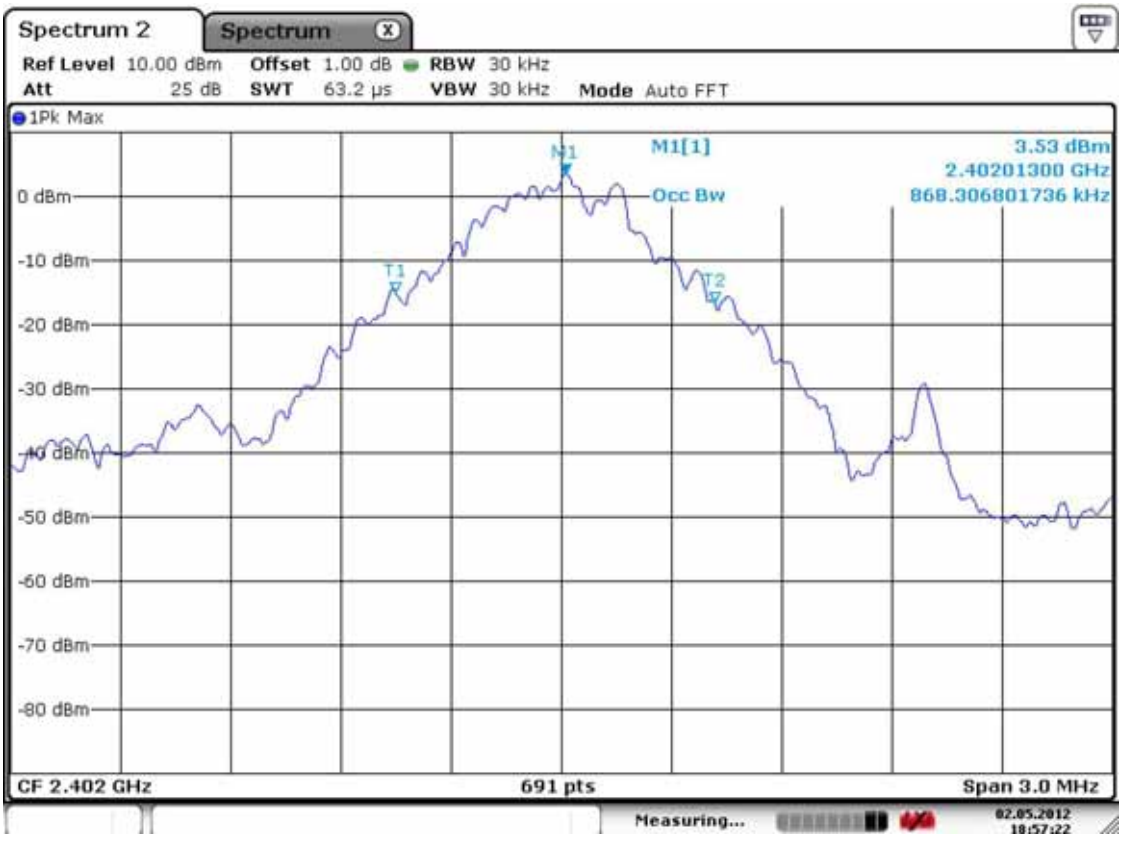


Channel 1 of basic mode

20 dB Bandwidth – Module 2



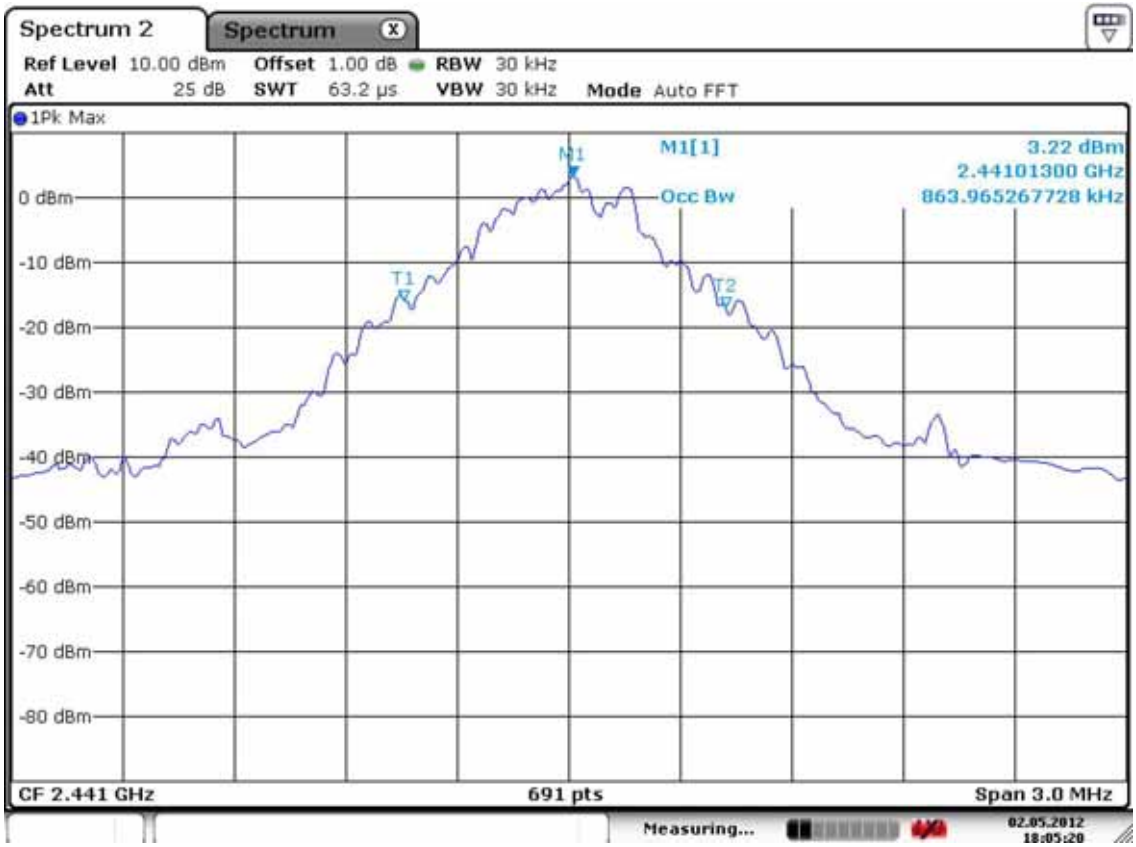
99% Bandwidth – Module 2



Channel 2 of basic mode

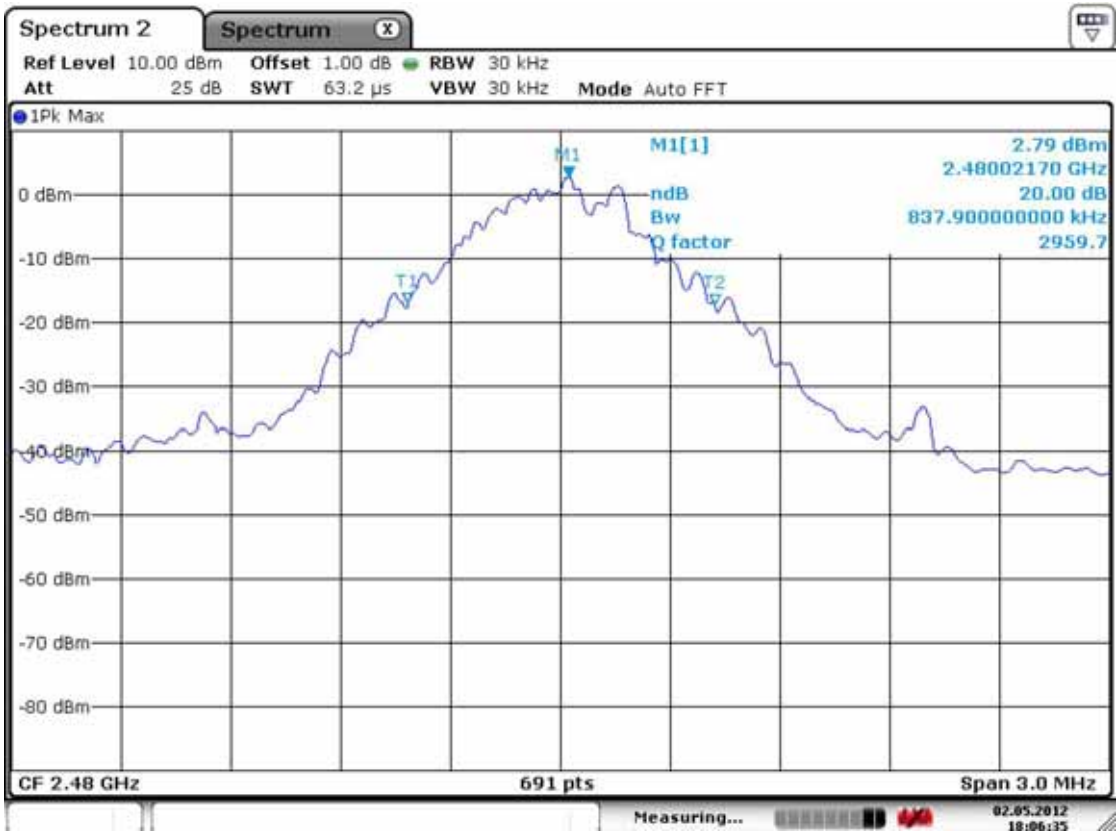
20 dB Bandwidth – Module 2

99% Bandwidth – Module 2

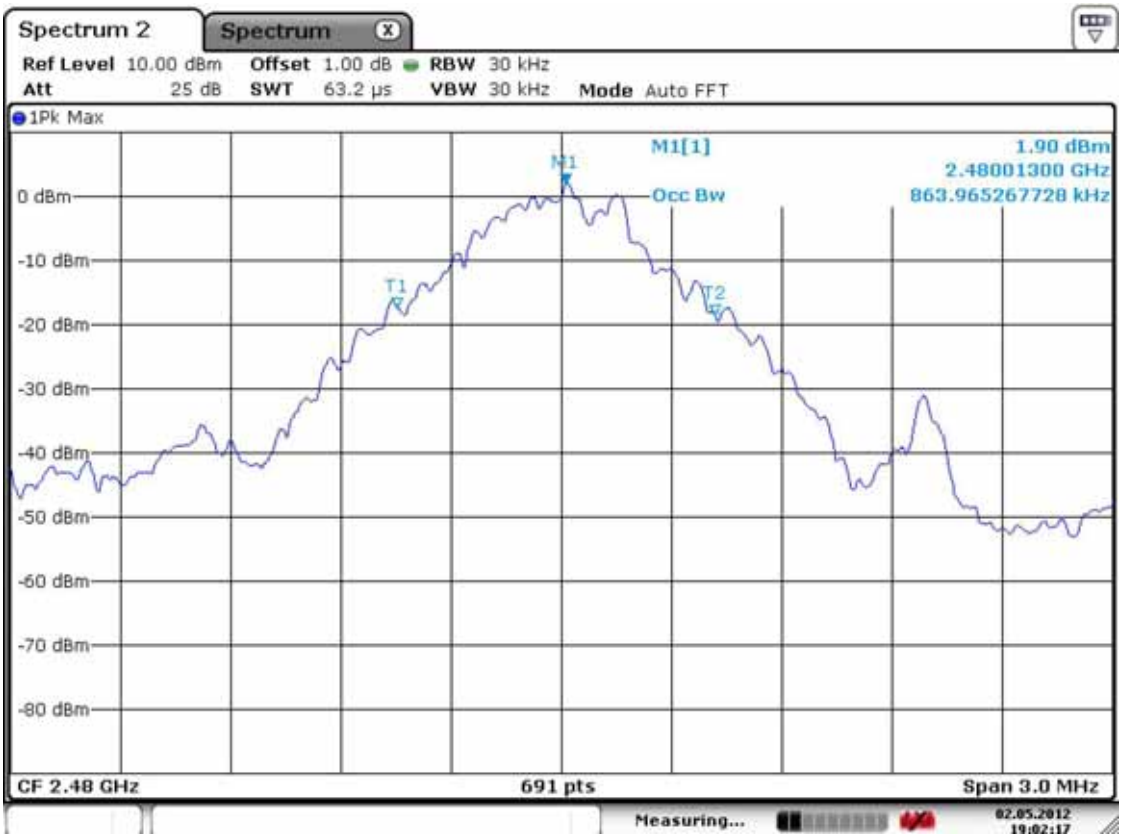


Channel 3 of basic mode

20 dB Bandwidth – Module 2

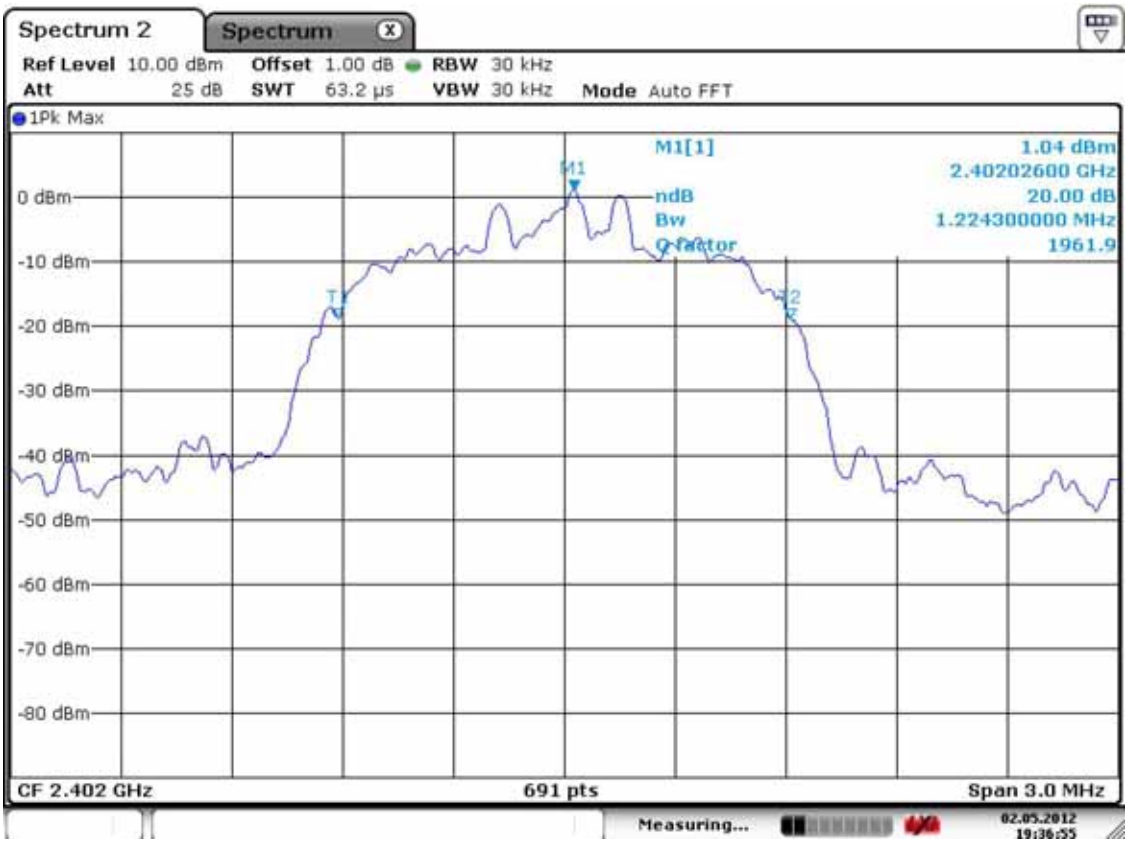


99% Bandwidth – Module 2



Channel 1 at EDR mode

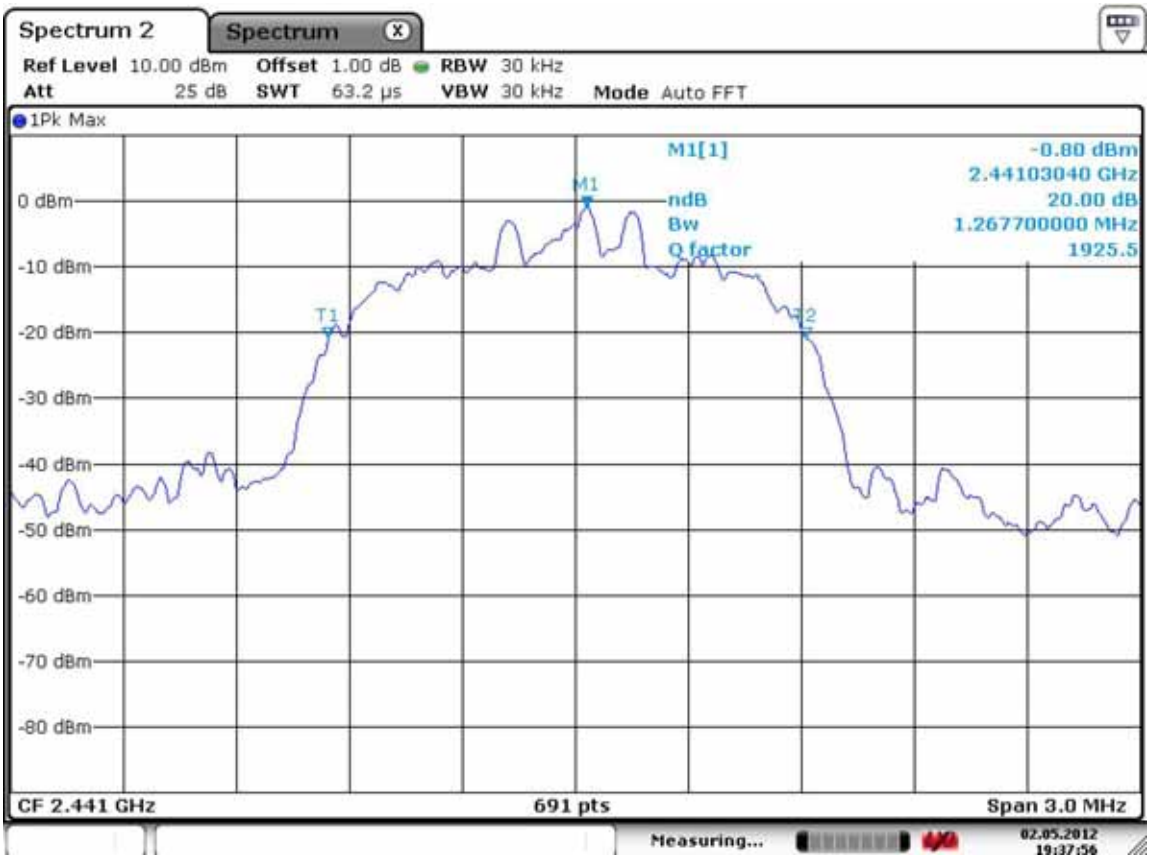
20 dB Bandwidth – Module 2



99% Bandwidth – Module 2

Channel 2 at EDR mode

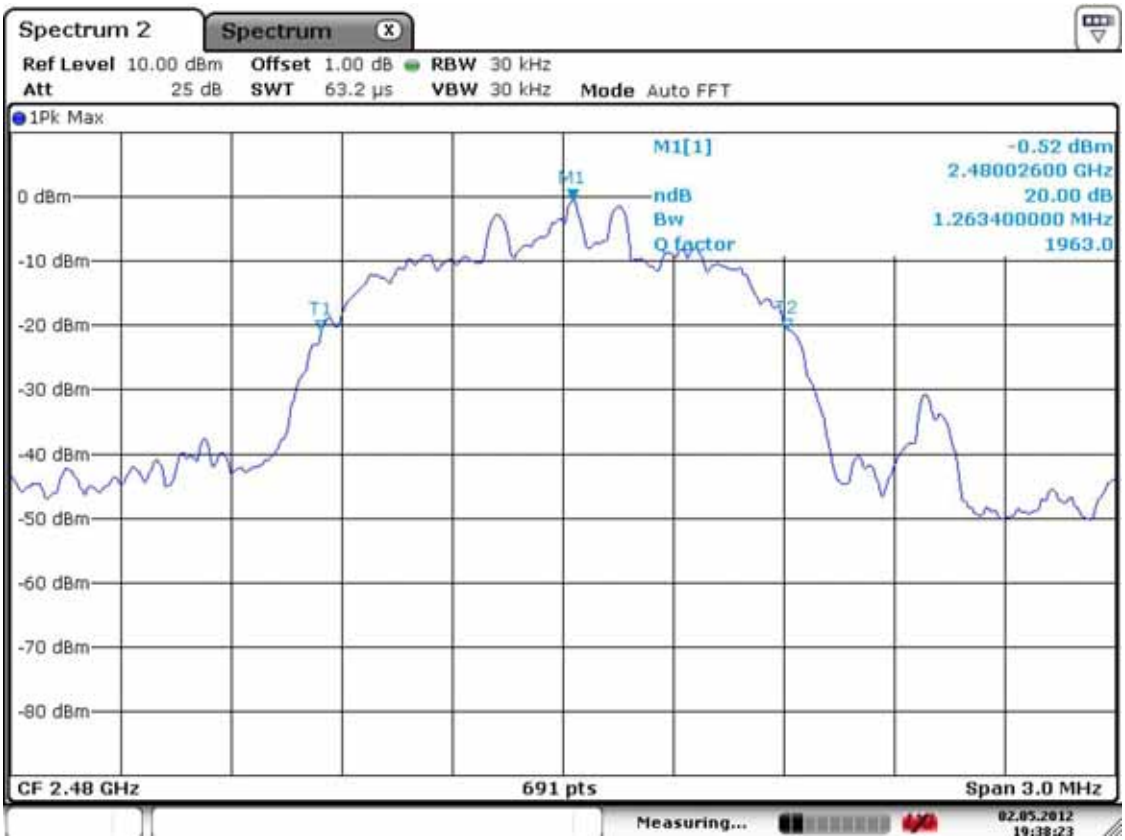
20 dB Bandwidth – Module 2



99% Bandwidth – Module 2

Channel 3 at EDR mode

20 dB Bandwidth – Module 2



99% Bandwidth – Module 2

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 ≥ RBW)

Trace = max hold — Detector function = peak

Measurement Data: Module 1

Mode	Number of transmission ina 31.6s (79Hopping*0.4)	Length of Transmission Time (msec)	Result (msec)	Limit (msec)
DH1	30(Times / 3sec) *10.533 = 315.99	0.539	170.31	400
DH3	15(Times / 3sec) *10.533 = 158.00	1.791	282.98	400
DH5	10(Times / 3sec) *10.533 = 105.33	3.051	321.36	400
EDR 3Mbps DH5	10(Times / 3sec) *10.533 = 105.33	3.058	322.10	400

Measurement Data: Module 2

Mode	Number of transmission ina 31.6s (79Hopping*0.4)	Length of Transmission Time (msec)	Result (msec)	Limit (msec)
DH1	30(Times / 3sec) *10.533 = 315.99	0.533	168.42	400
DH3	15(Times / 3sec) *10.533 = 158.00	1.791	282.98	400
DH5	10(Times / 3sec) *10.533 = 105.33	3.058	322.10	400
EDR 3Mbps DH5	10(Times / 3sec) *10.533 = 105.33	3.058	322.10	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

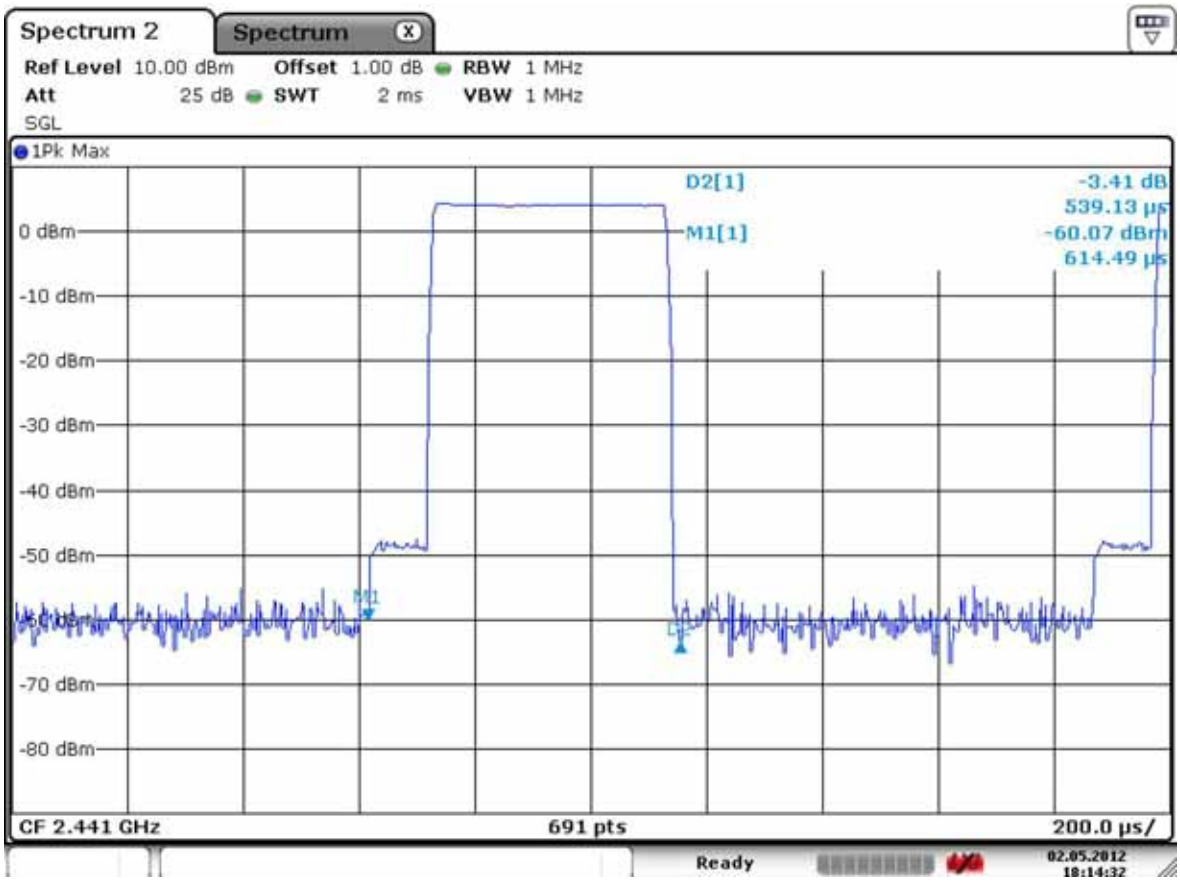
Minimum Standard:

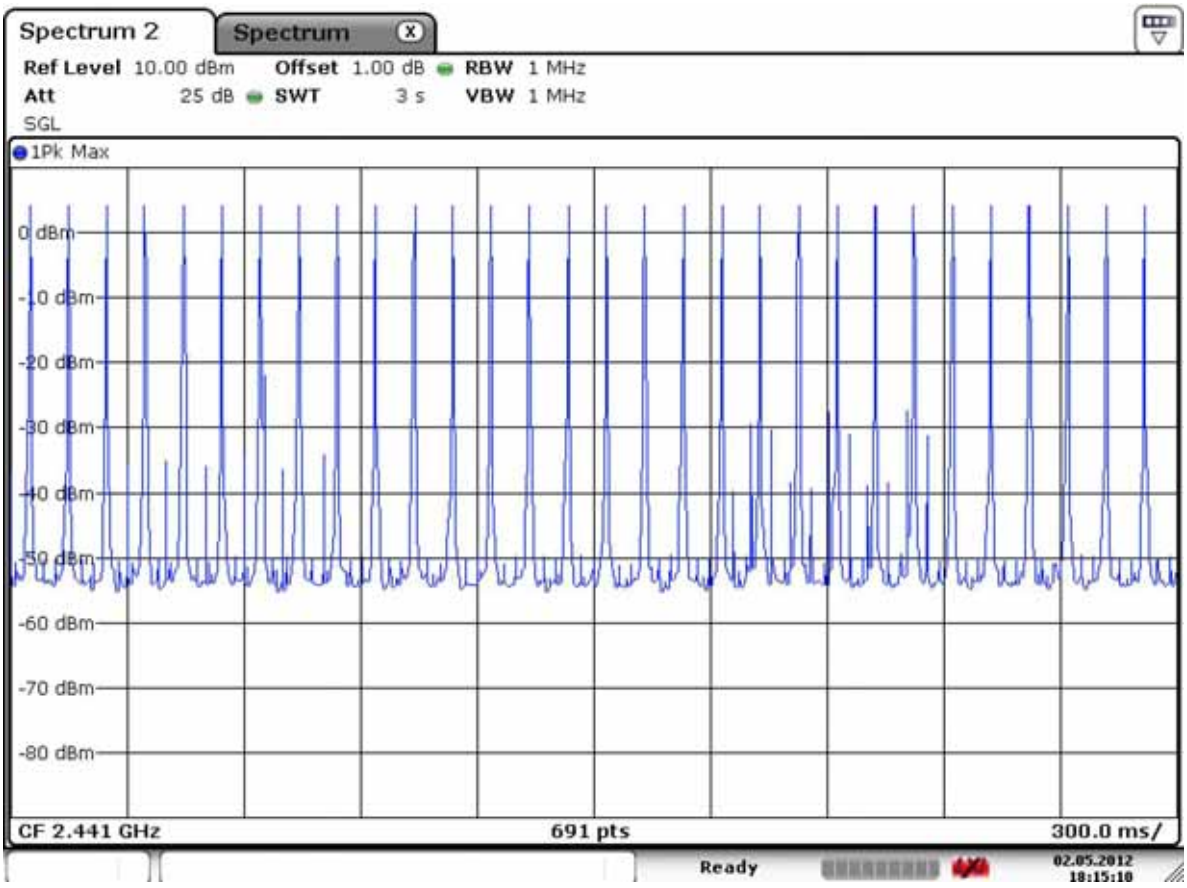
0.4 seconds within a 30 second period per any frequency

Measurement Setup

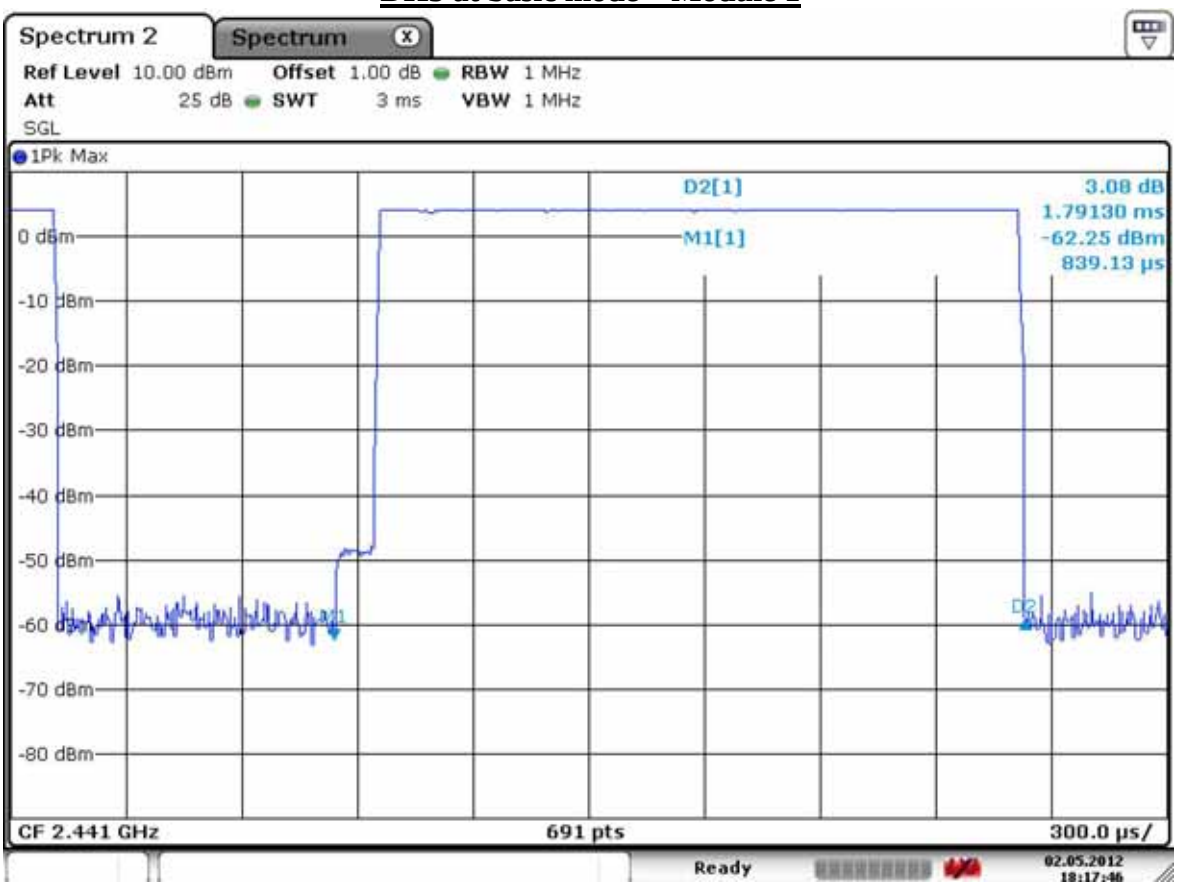
Same as the Chapter 3.2.1 (Figure 1)

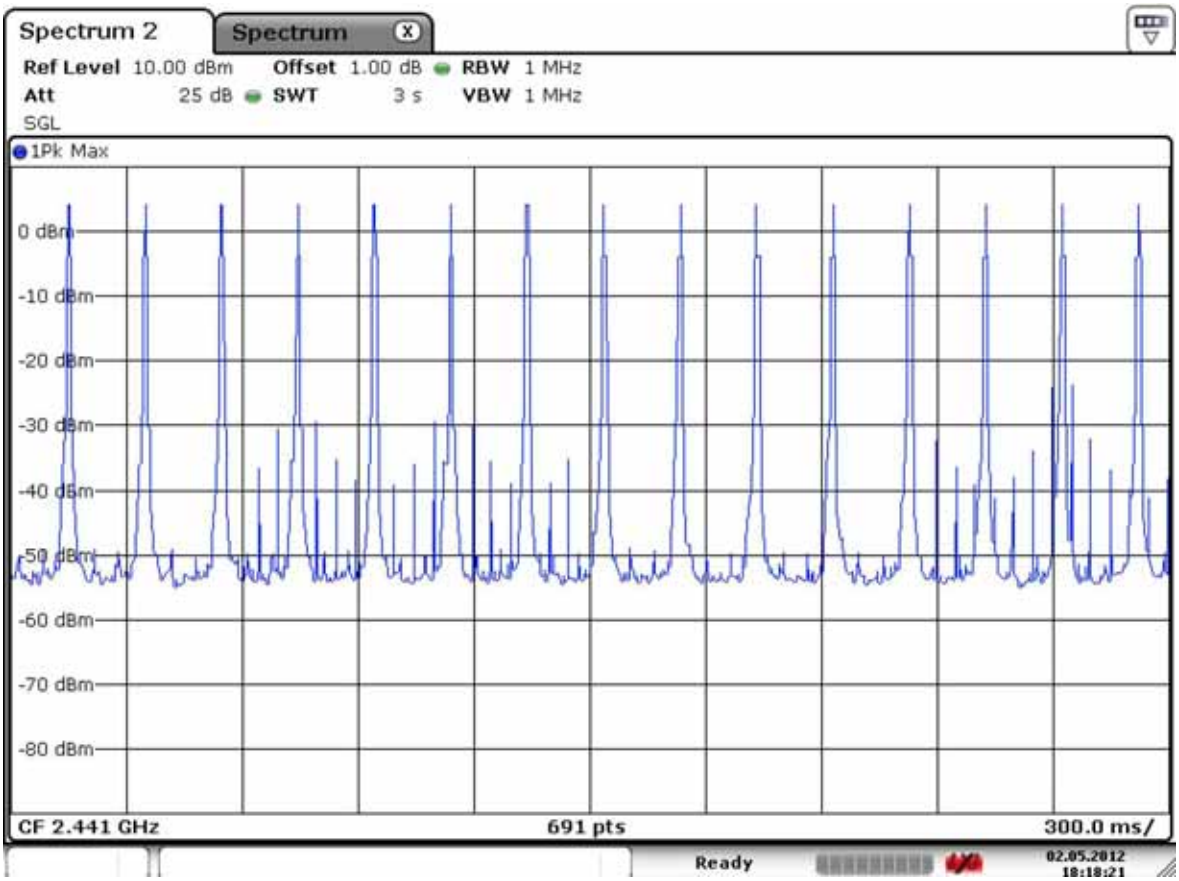
DH1 at basic mode – Module 1



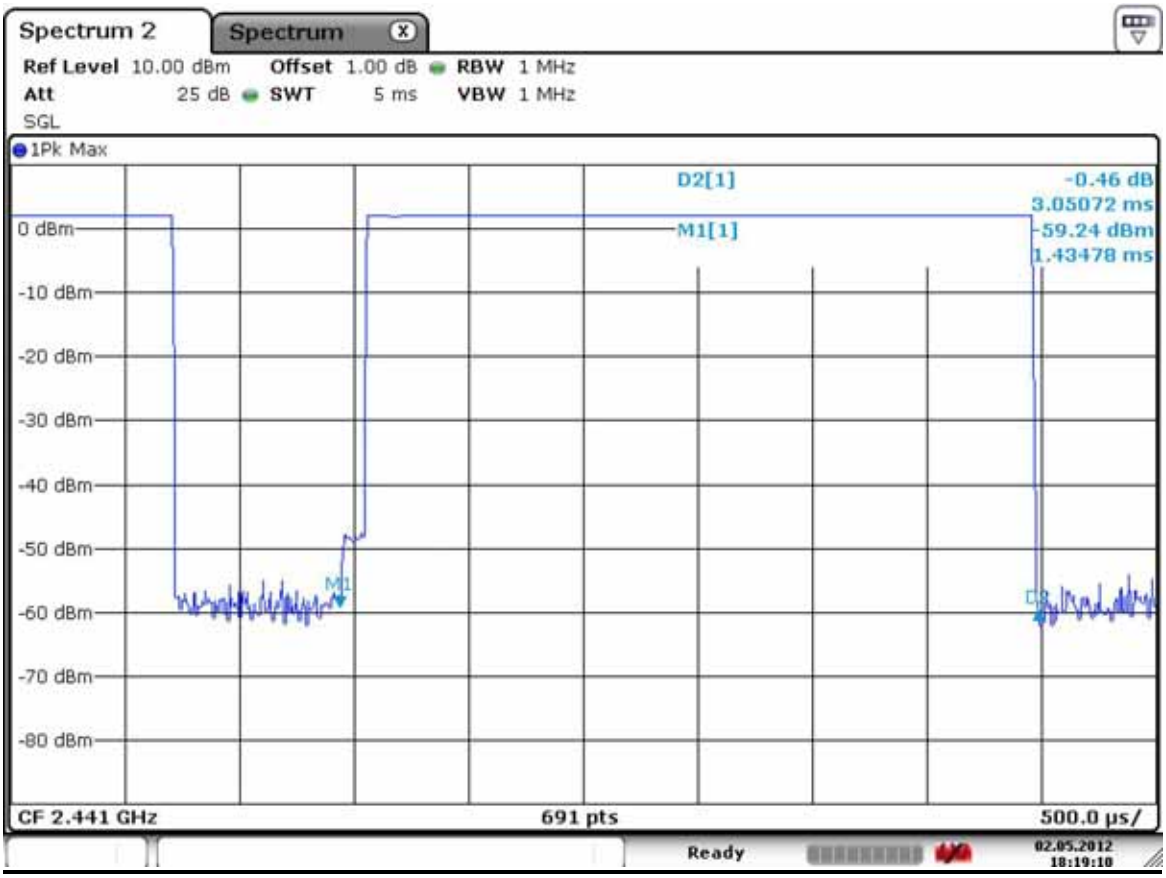


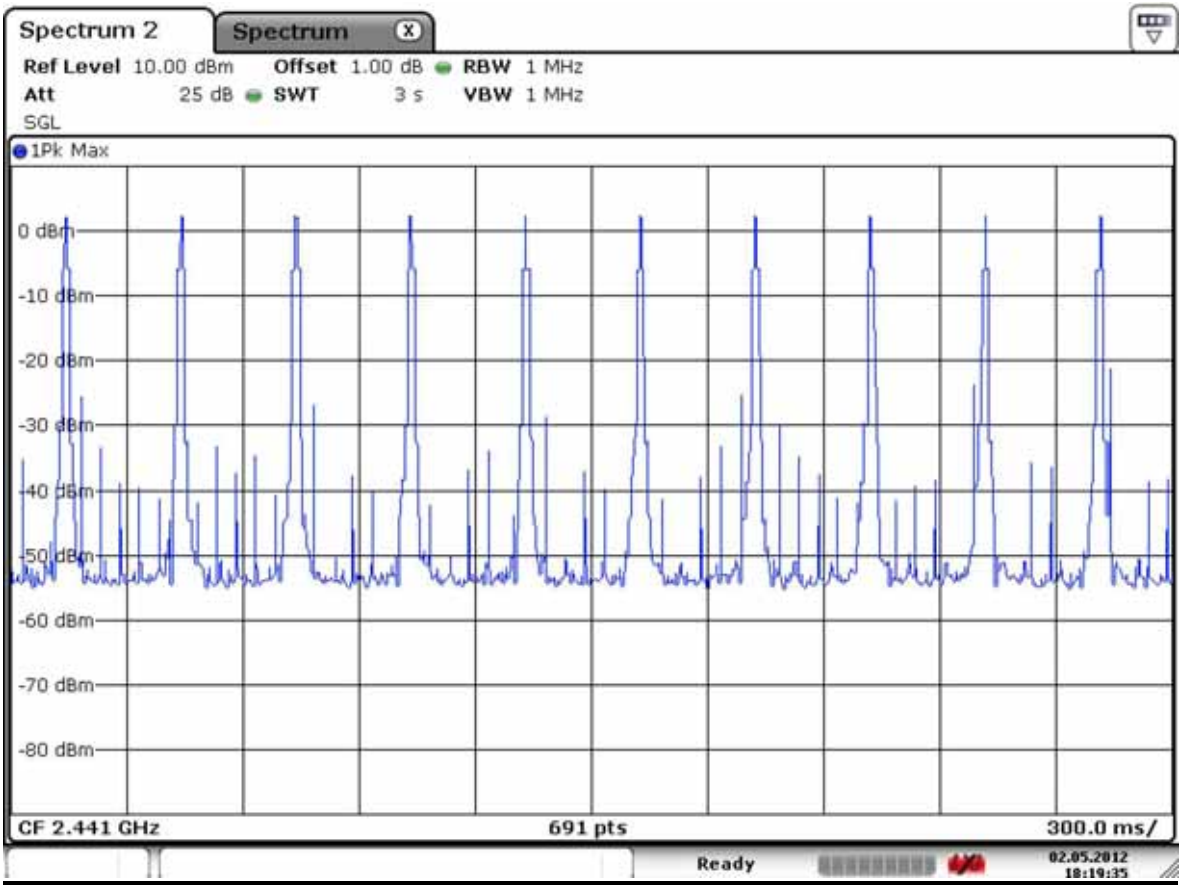
DH3 at basic mode – Module 1



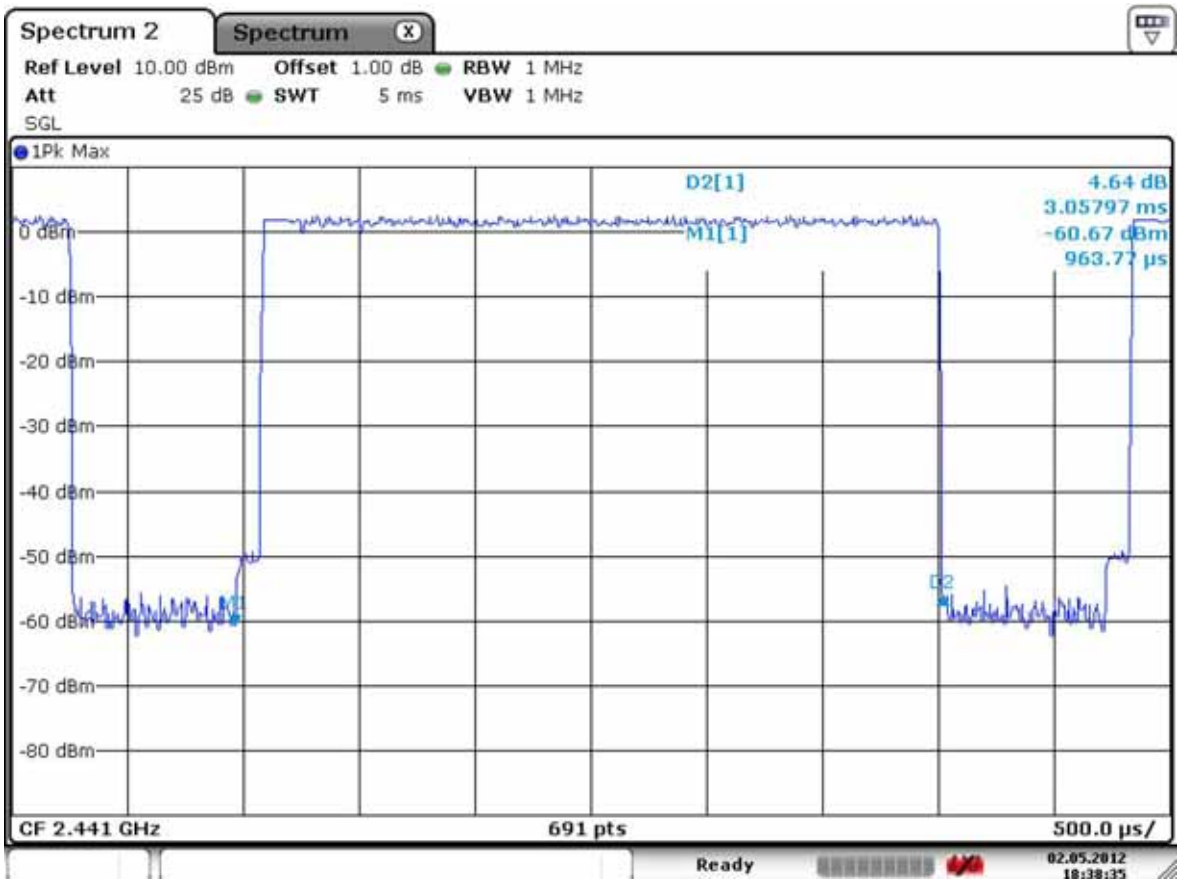


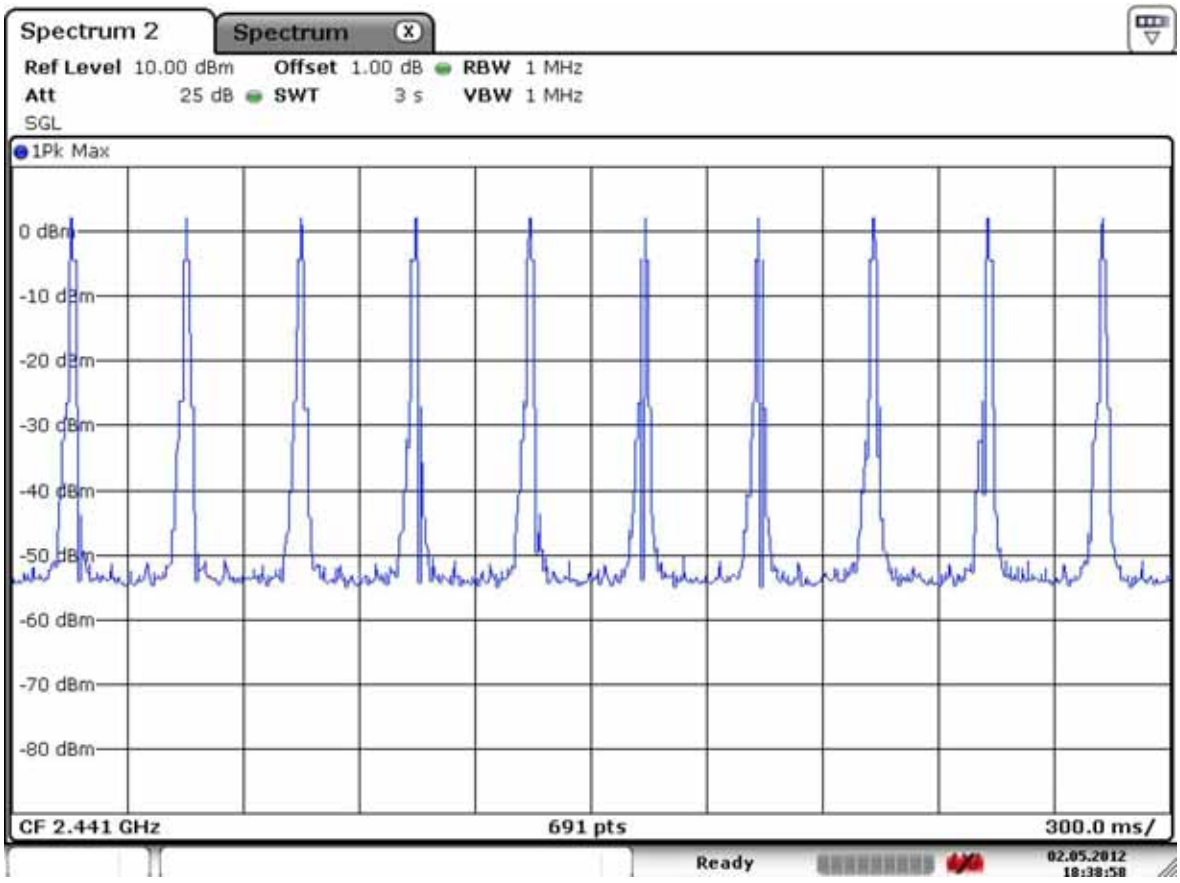
DH5 at basic mode – Module 1



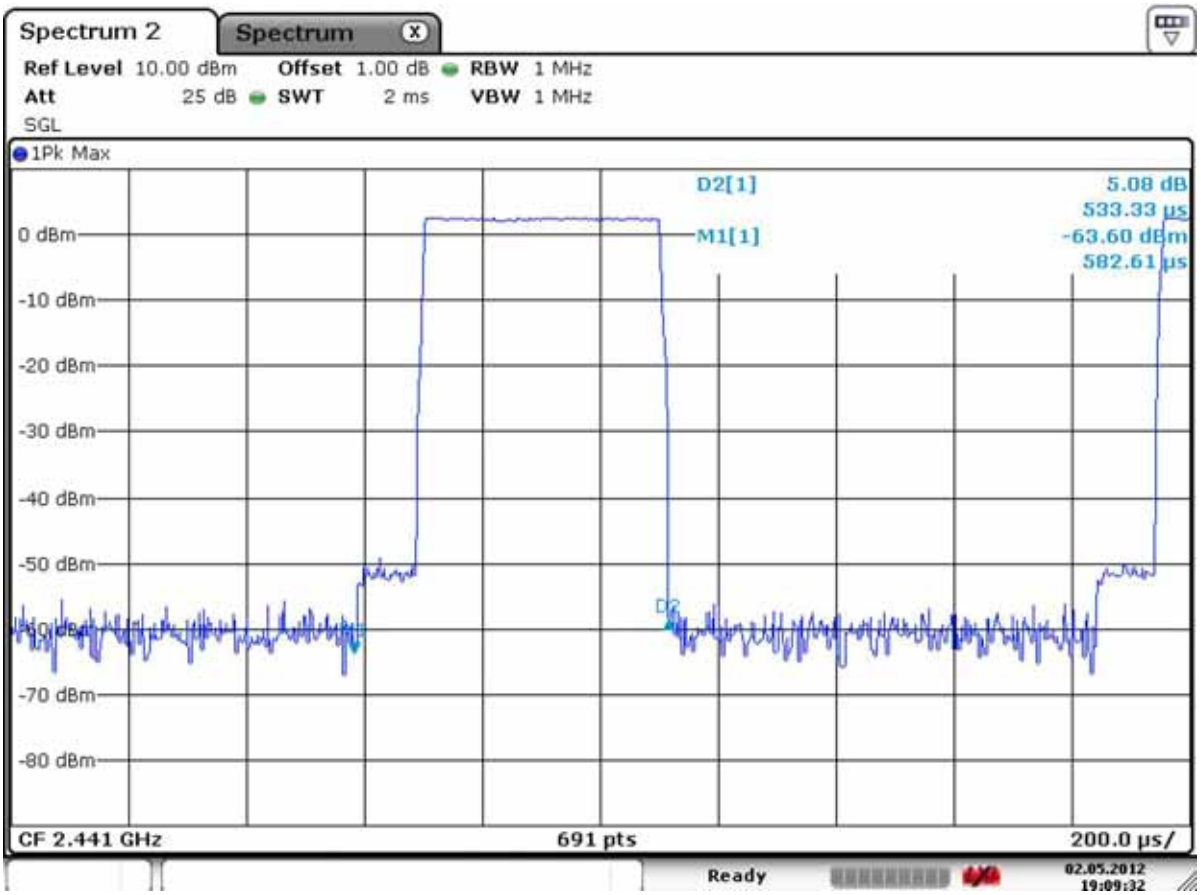


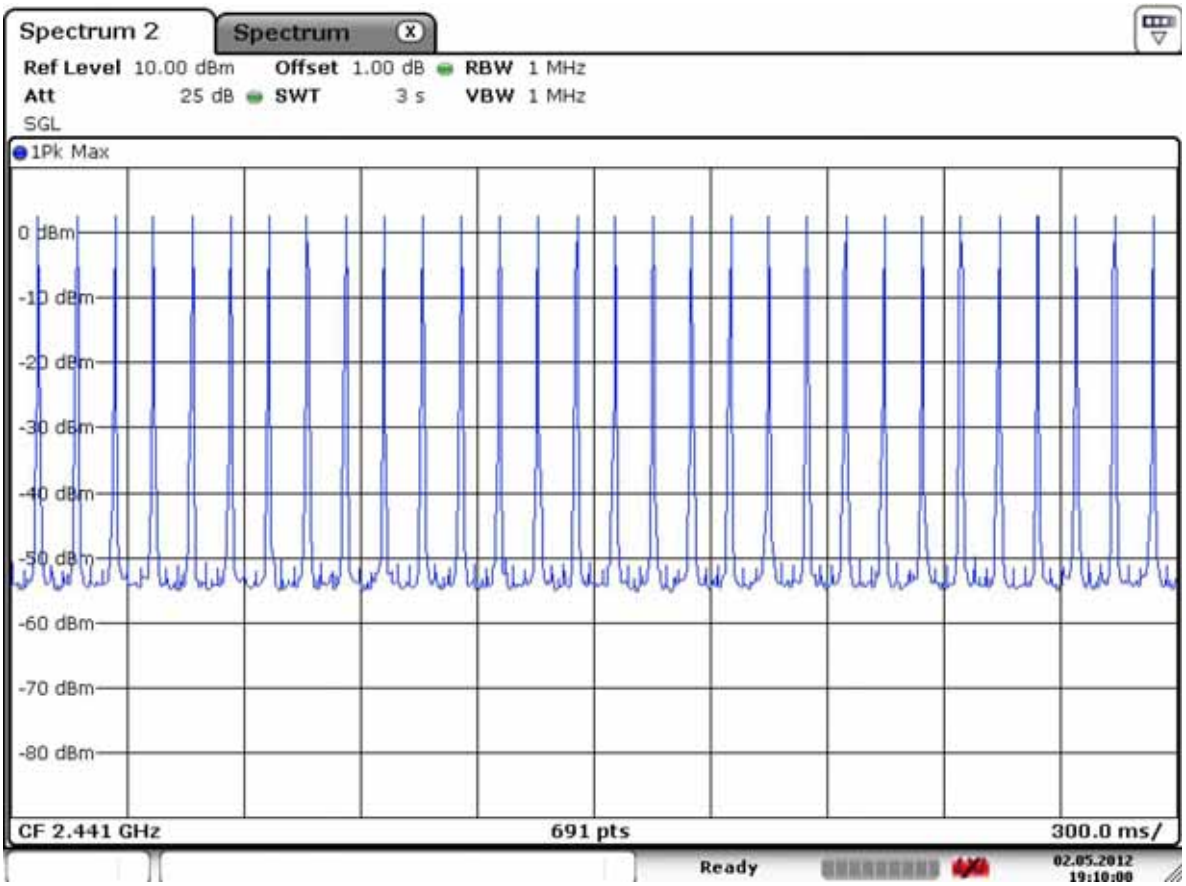
DH5 at EDR mode with 3Mbps – Module 1



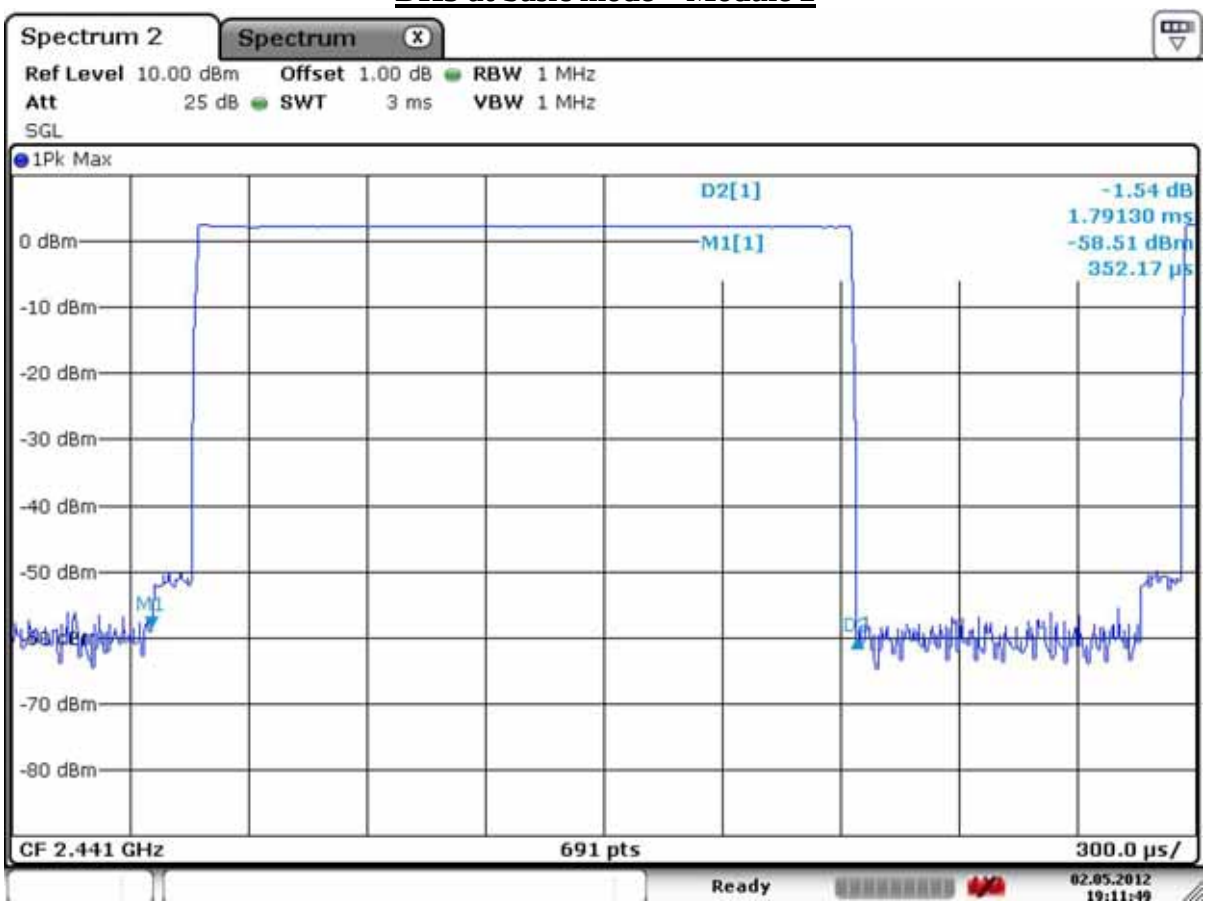


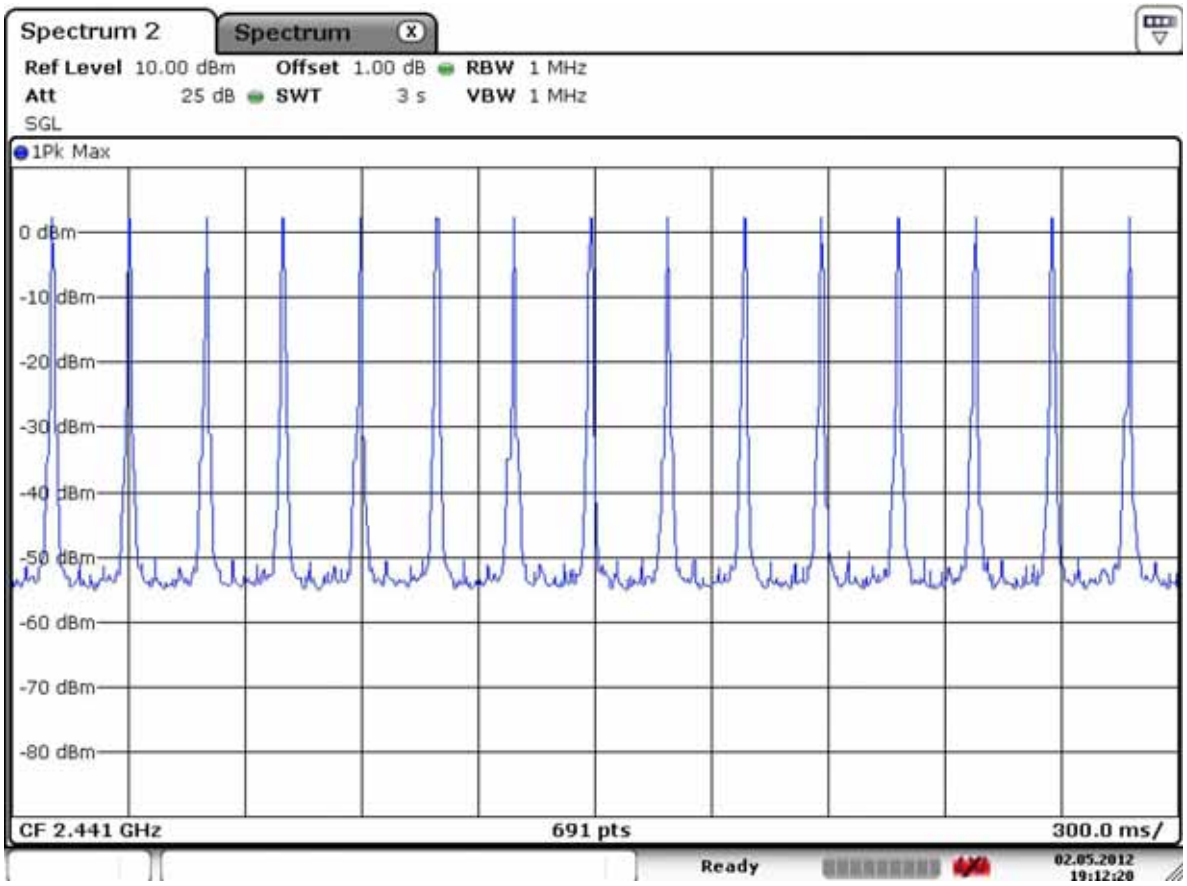
DH1 at basic mode – Module 2



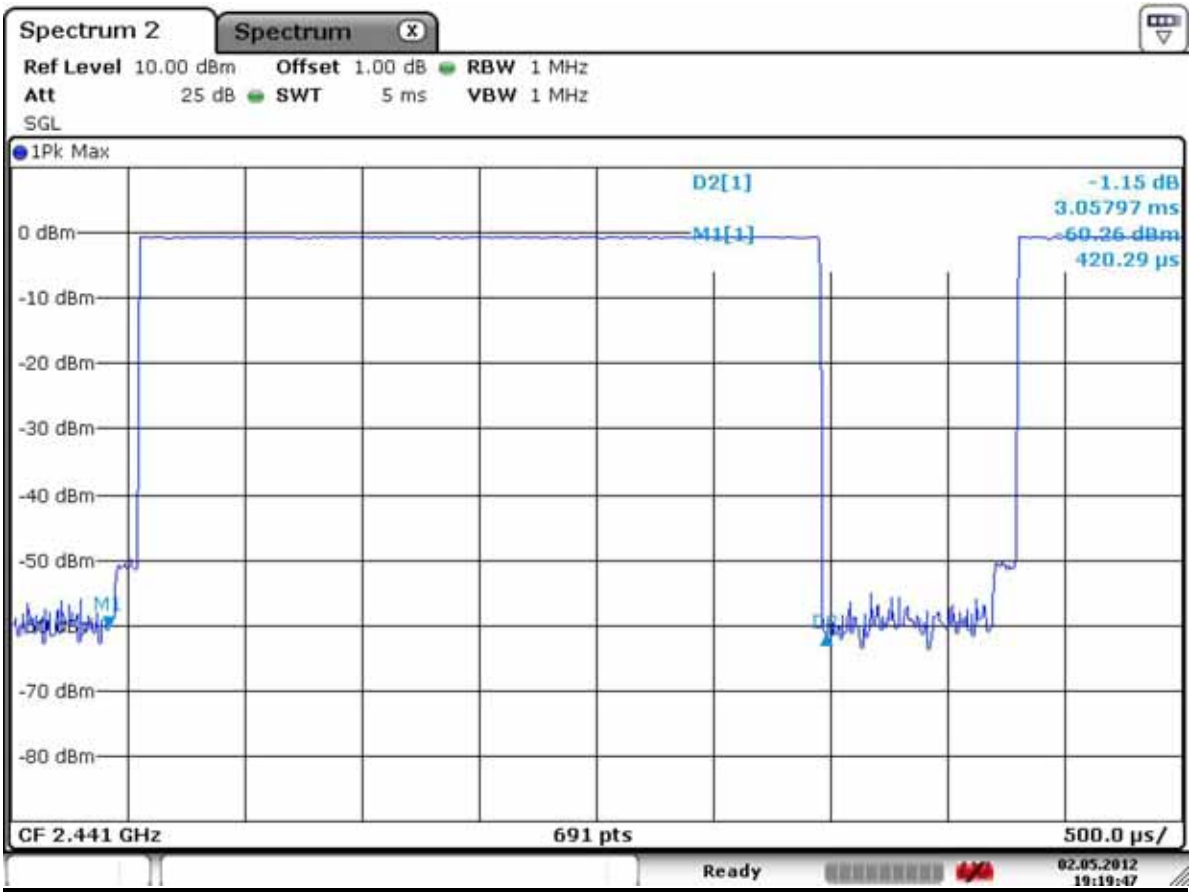


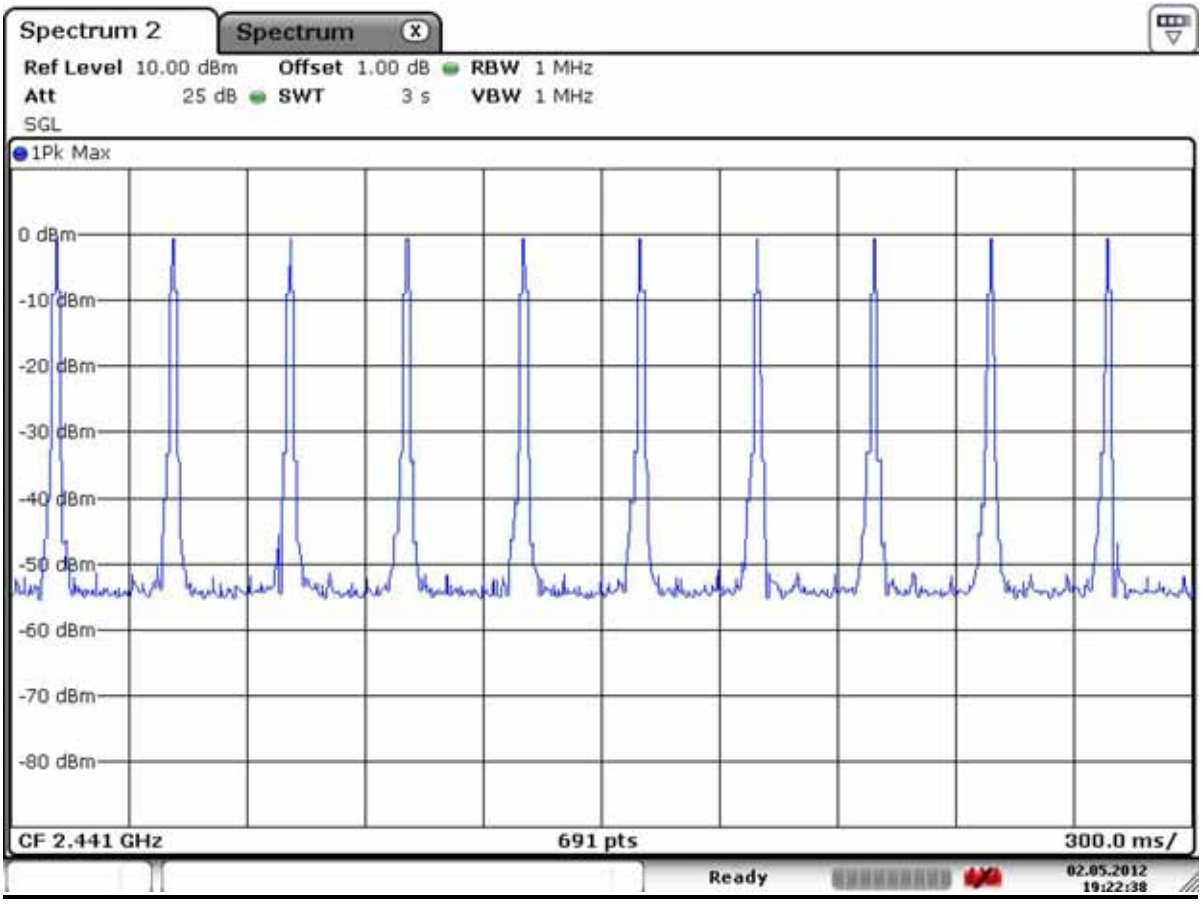
DH3 at basic mode – Module 2



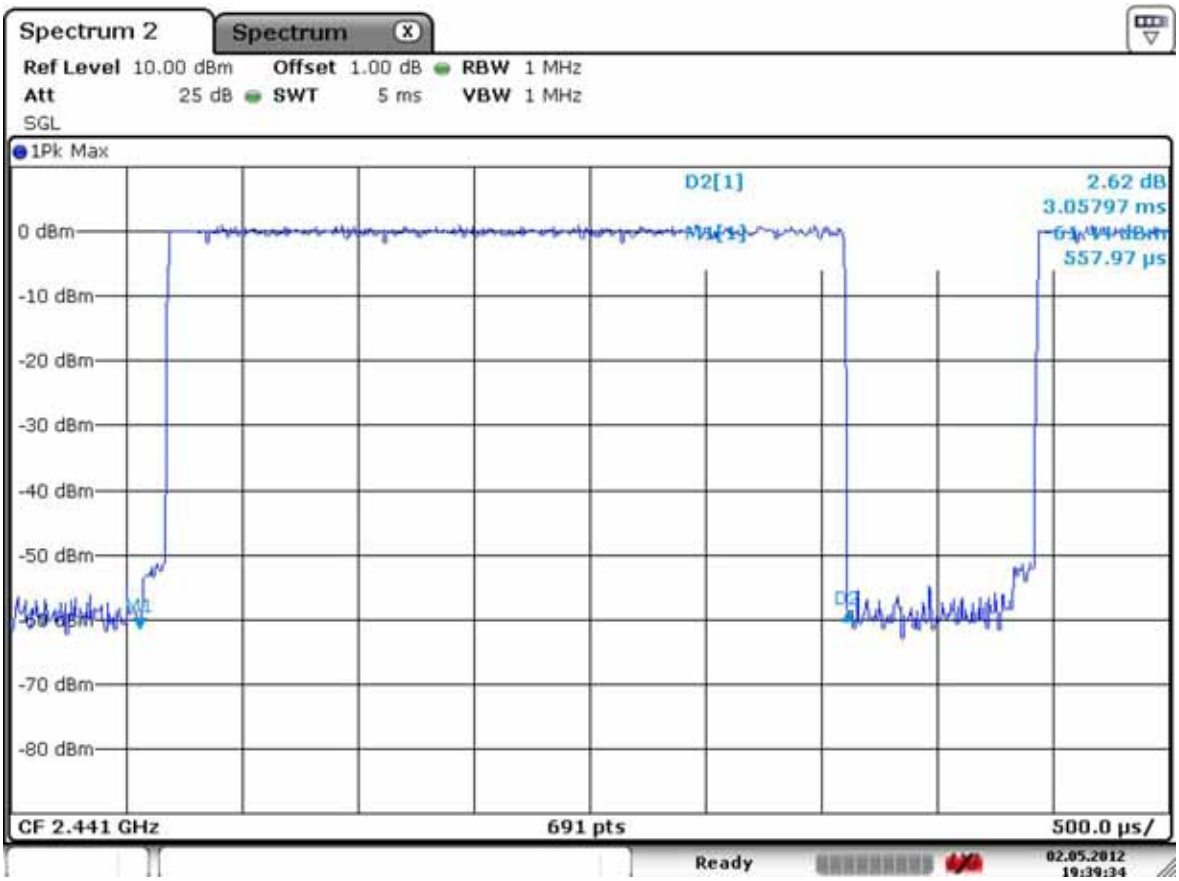


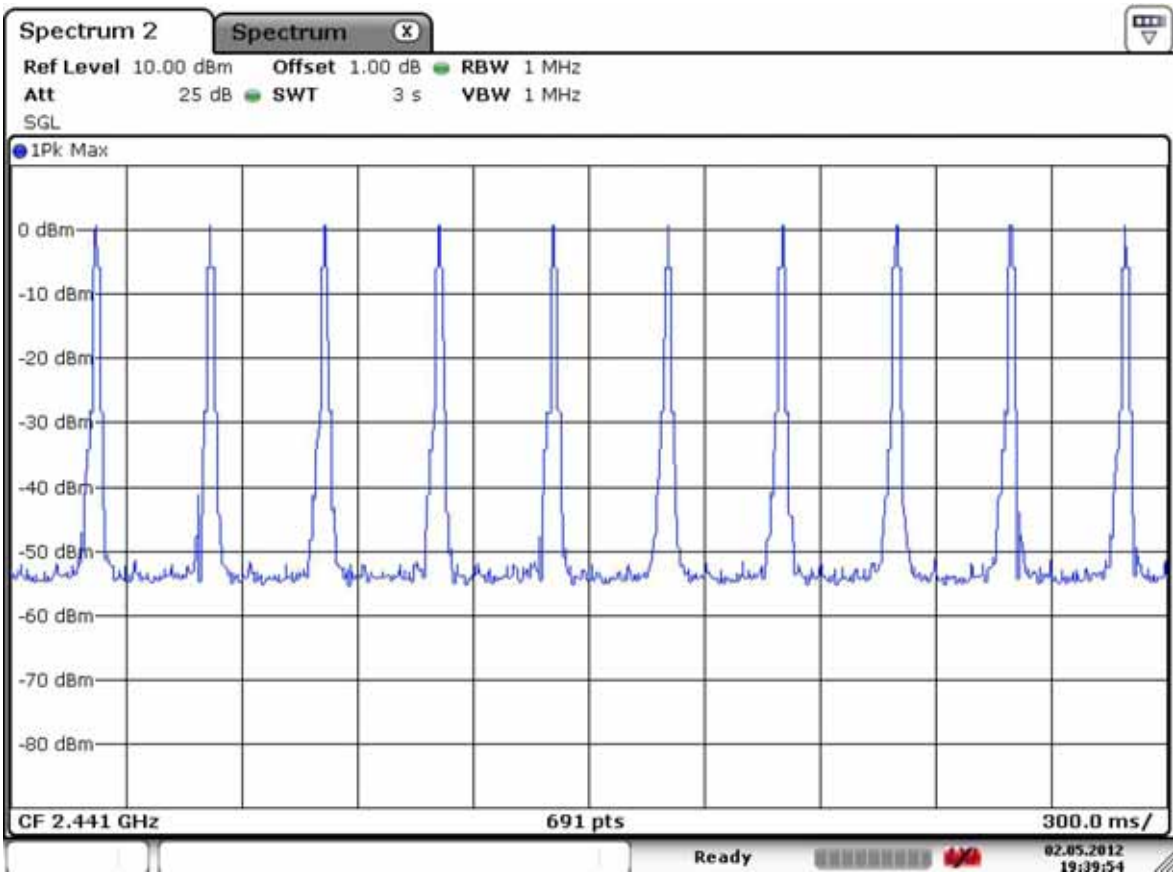
DH5 at basic mode – Module 2





DH5 at EDR mode with 3Mbps – Module 2





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 ≥ RBW) Detector function = peak

Trace = max hold Sweep = auto

Measurement Data: Basic Mode – Module 1

Frequency (MHz)	Ch.	Test Results		
		dBm	mW	Result
2402	0	**5.70**	**3.72**	Complies
2441	39	**4.30**	**2.69**	Complies
2480	78	**3.75**	**2.37**	Complies

Measurement Data: EDR Mode – Module 1

Frequency (MHz)	Ch.	Test Results		
		dBm	mW	Result
2402	0	**4.90**	**3.09**	Complies
2441	39	**3.12**	**2.05**	Complies
2480	78	**2.72**	**1.87**	Complies

Minimum Standard:	< 250 mW

Measurement Data: Basic Mode – Module 2

Frequency (MHz)	Ch.	Test Results		
		dBm	mW	Result
2402	0	**4.76**	**2.99**	Complies
2441	39	**2.81**	**1.90**	Complies
2480	78	**2.84**	**1.92**	Complies

Measurement Data: EDR Mode – Module 2

Frequency (MHz)	Ch.	Test Results		
		dBm	mW	Result
2402	0	**3.34**	**2.15**	Complies
2441	39	**1.48**	**1.41**	Complies
2480	78	**1.57**	**1.44**	Complies

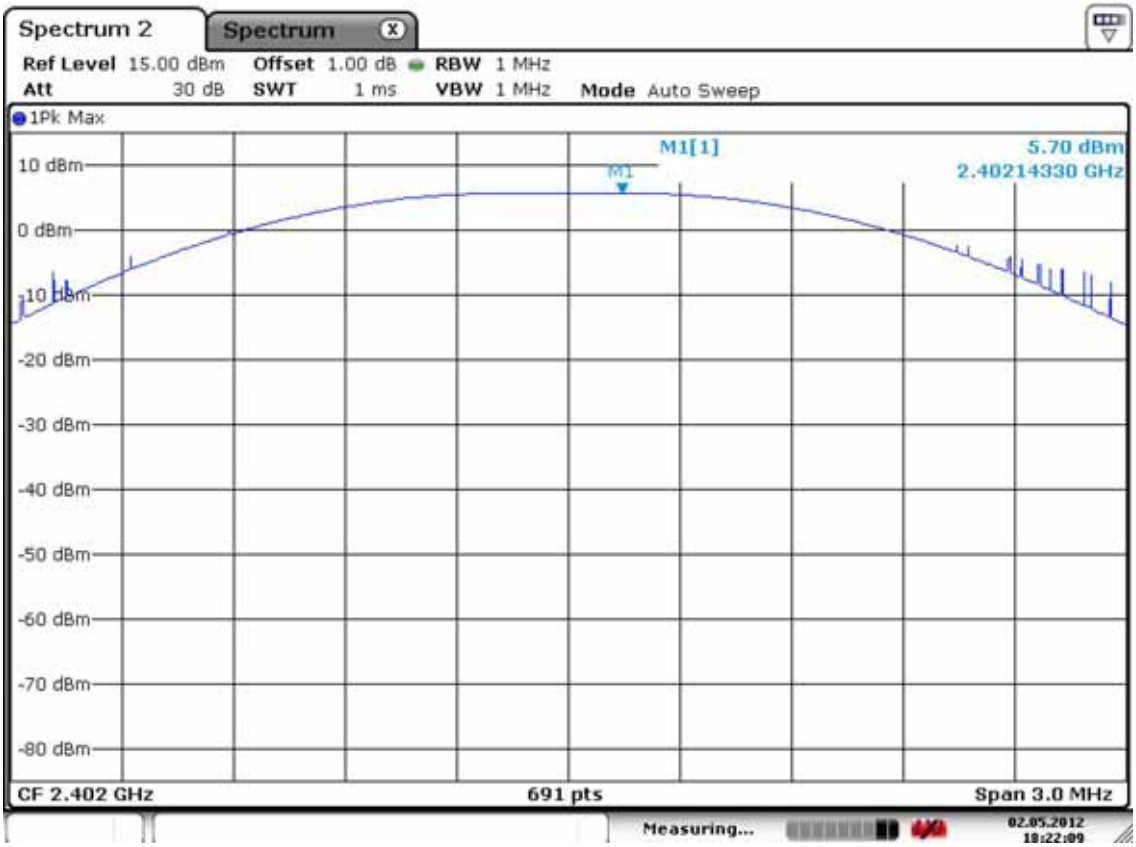
- See next pages for actual measured spectrum plots.

Minimum Standard:	< 250 mW

Measurement Setup

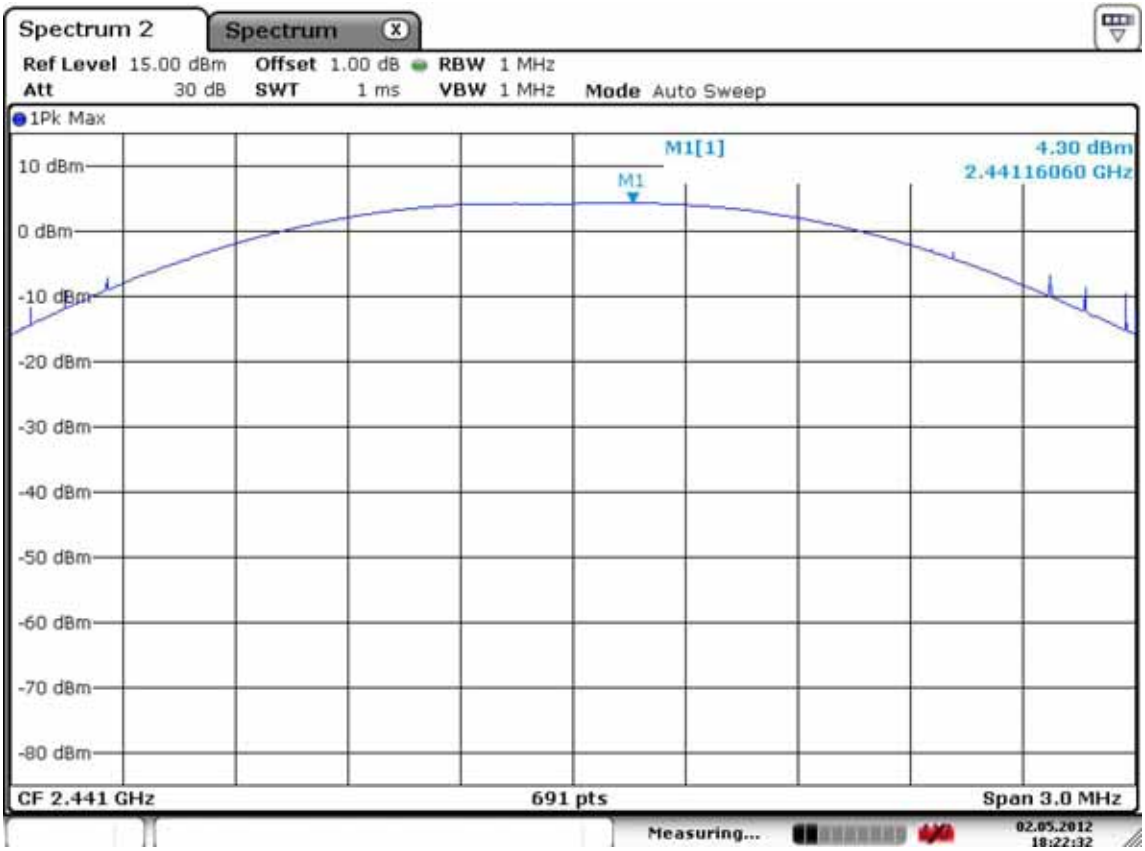
Same as the Chapter 3.2.1 (Figure 1)

Channel 1
Basic mode - Module 1

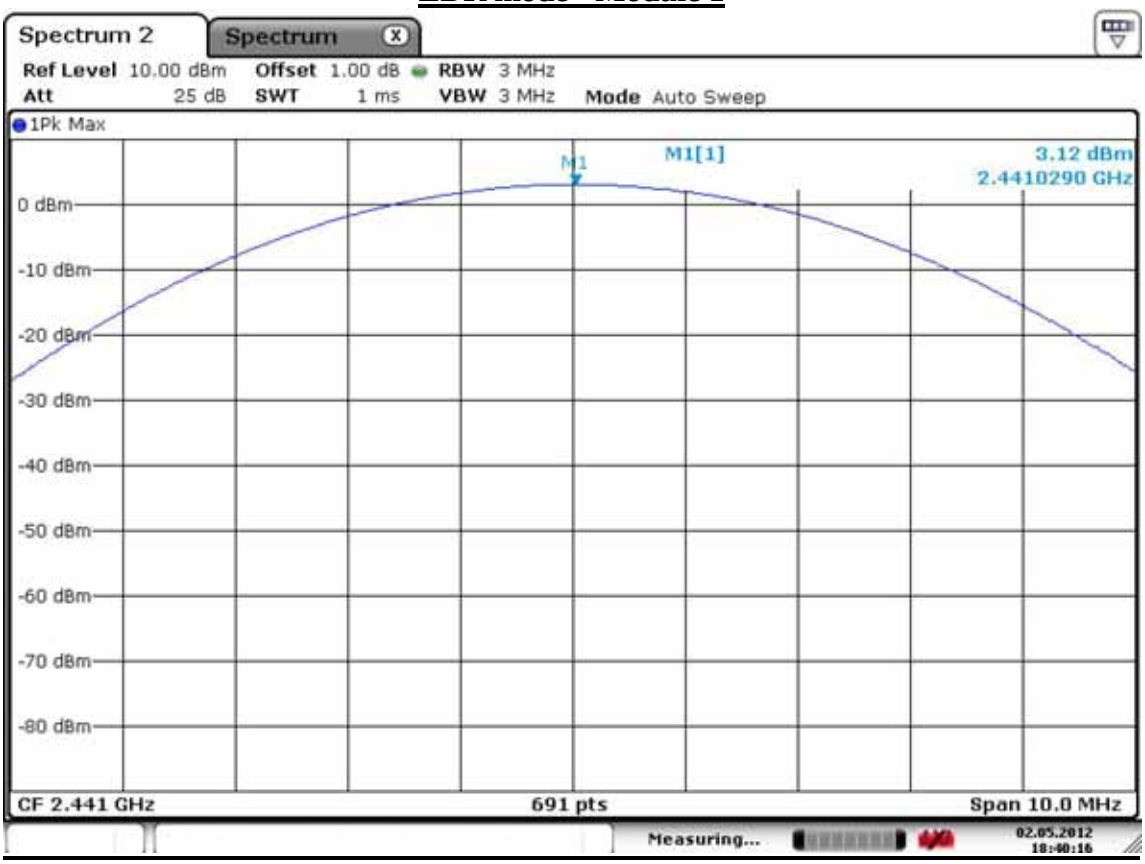


EDR mode - Module 1

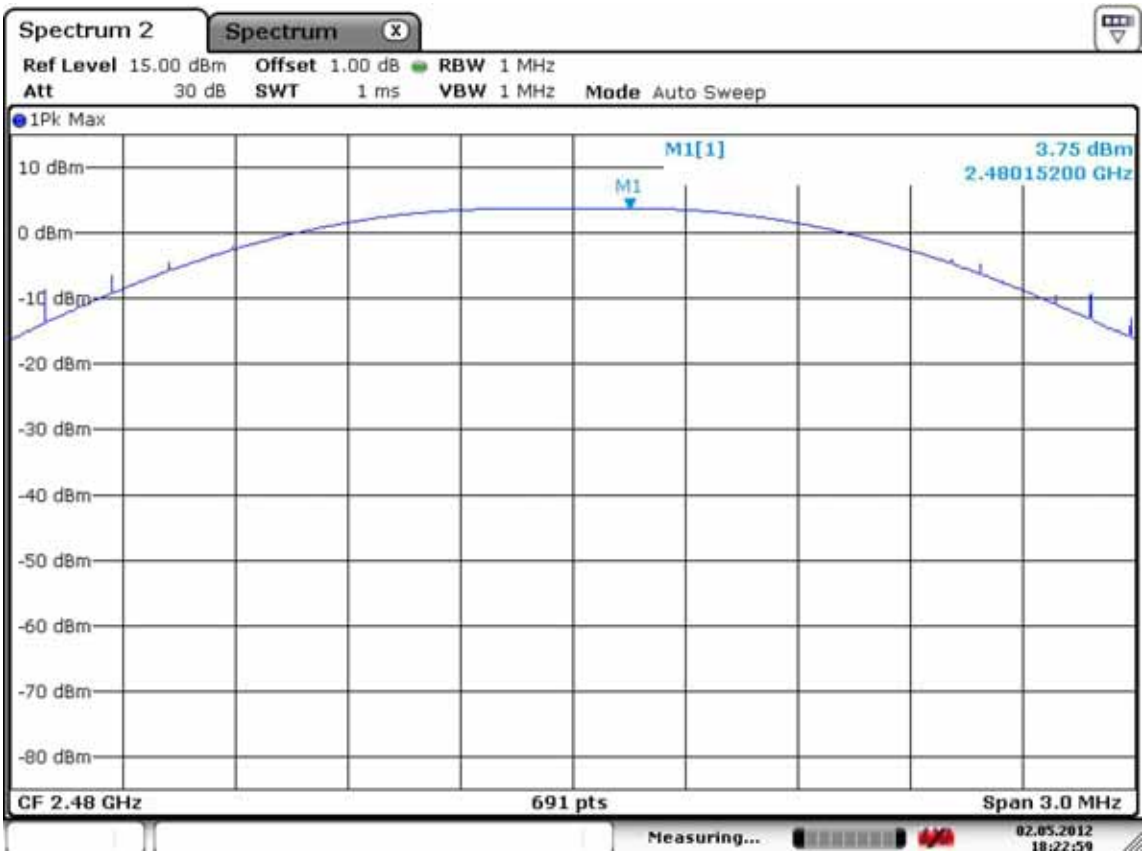
Channel 2
Basic mode - Module 1



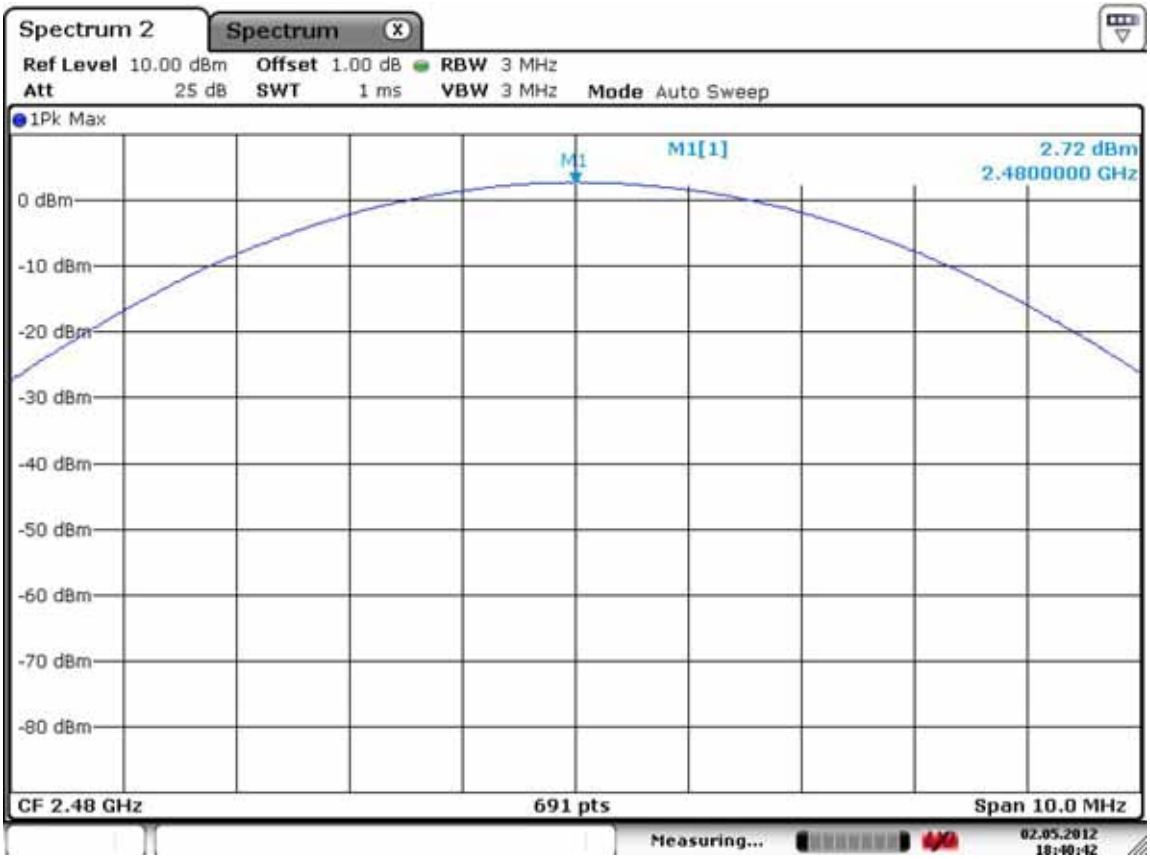
EDR mode - Module 1



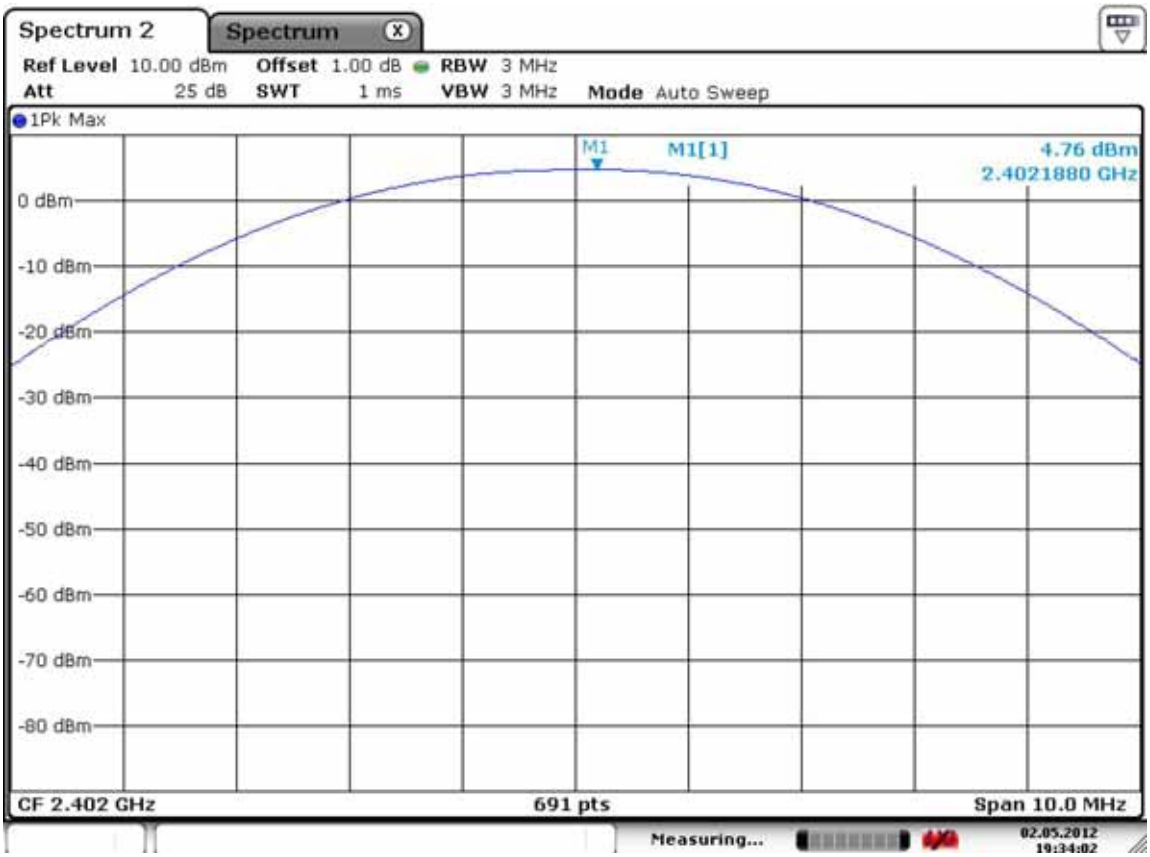
Channel 3
Basic mode - Module 1



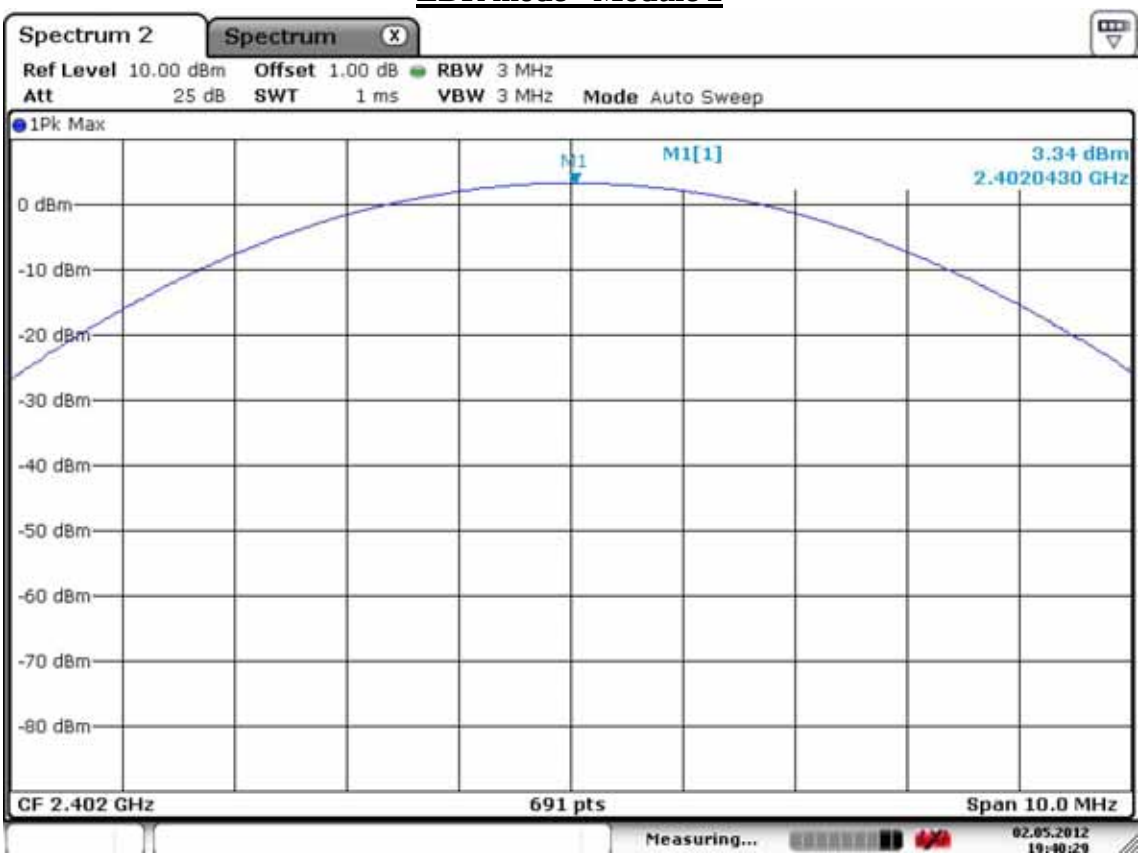
EDR mode - Module 1



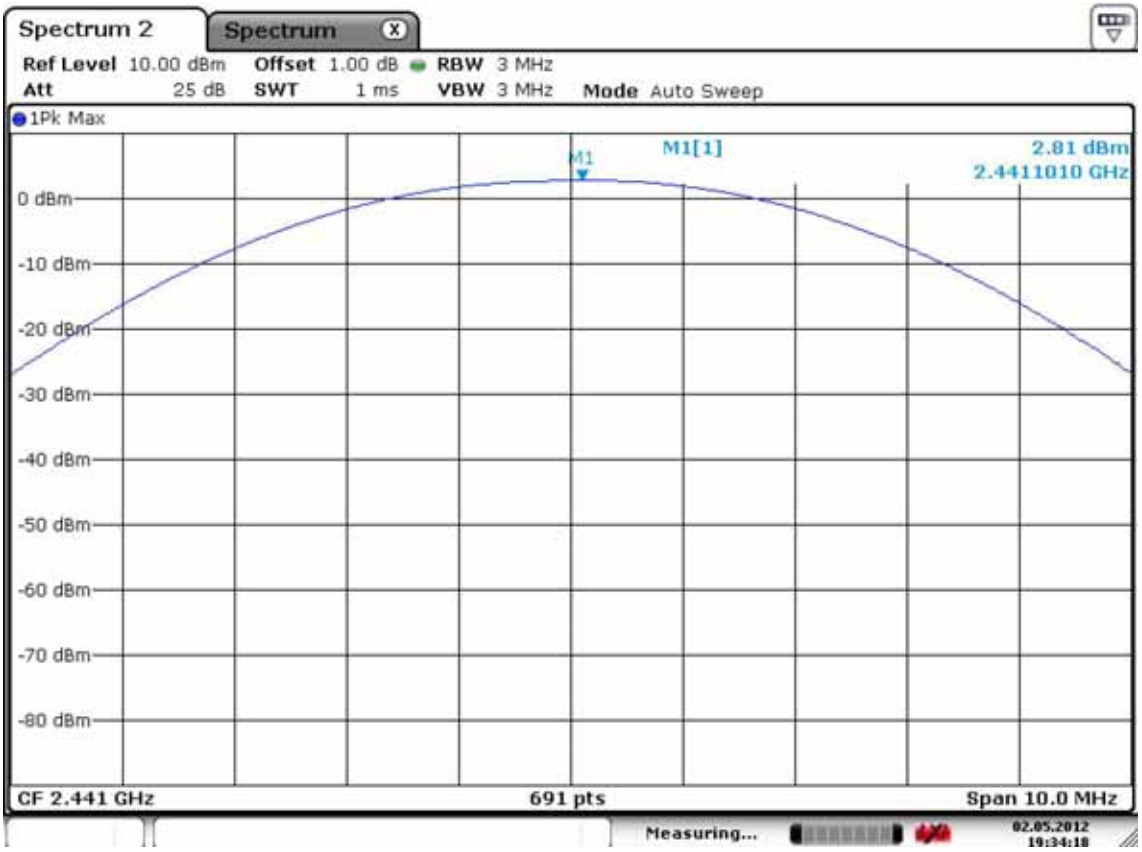
Channel 1
Basic mode - Module 2



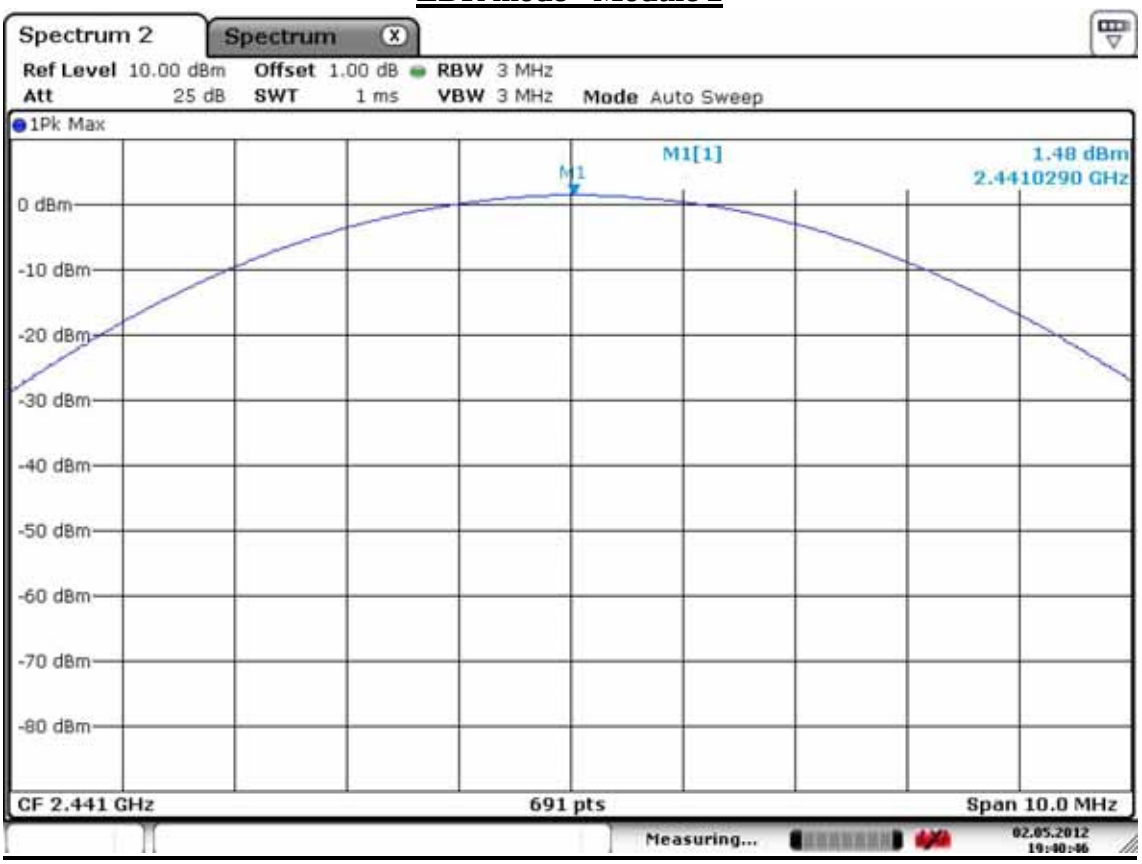
EDR mode - Module 2



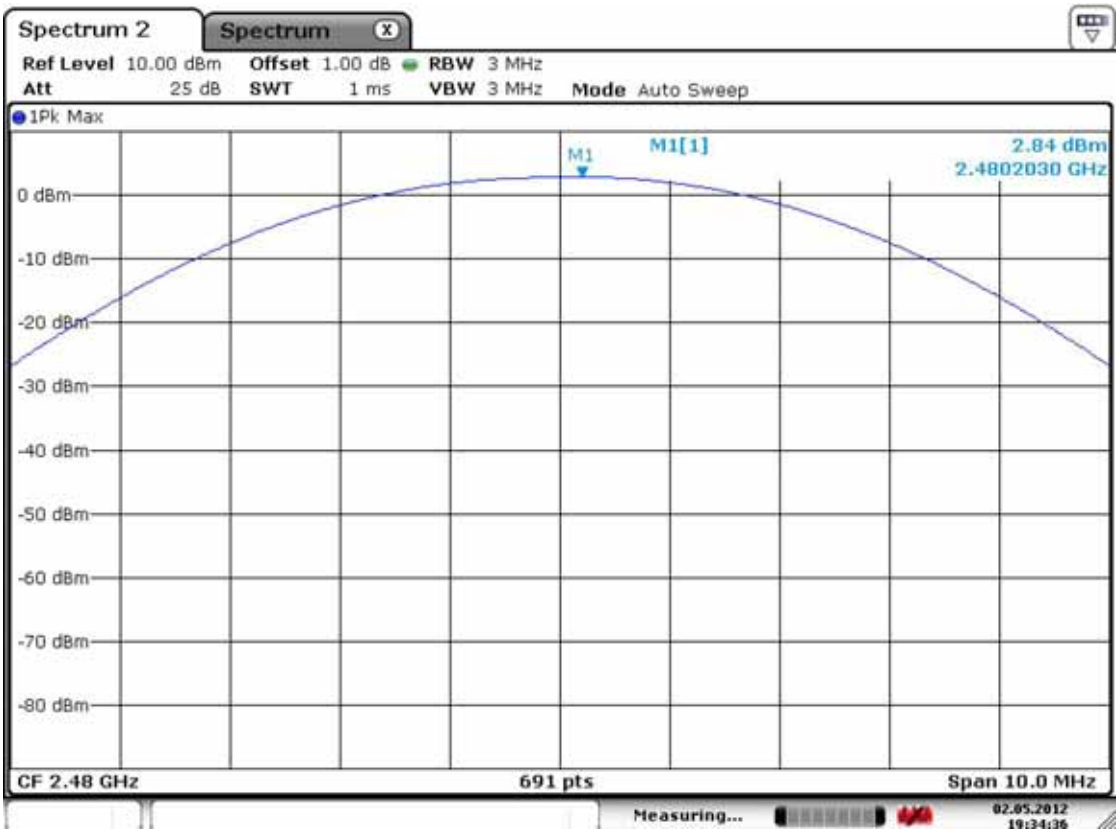
Channel 2
Basic mode - Module 2



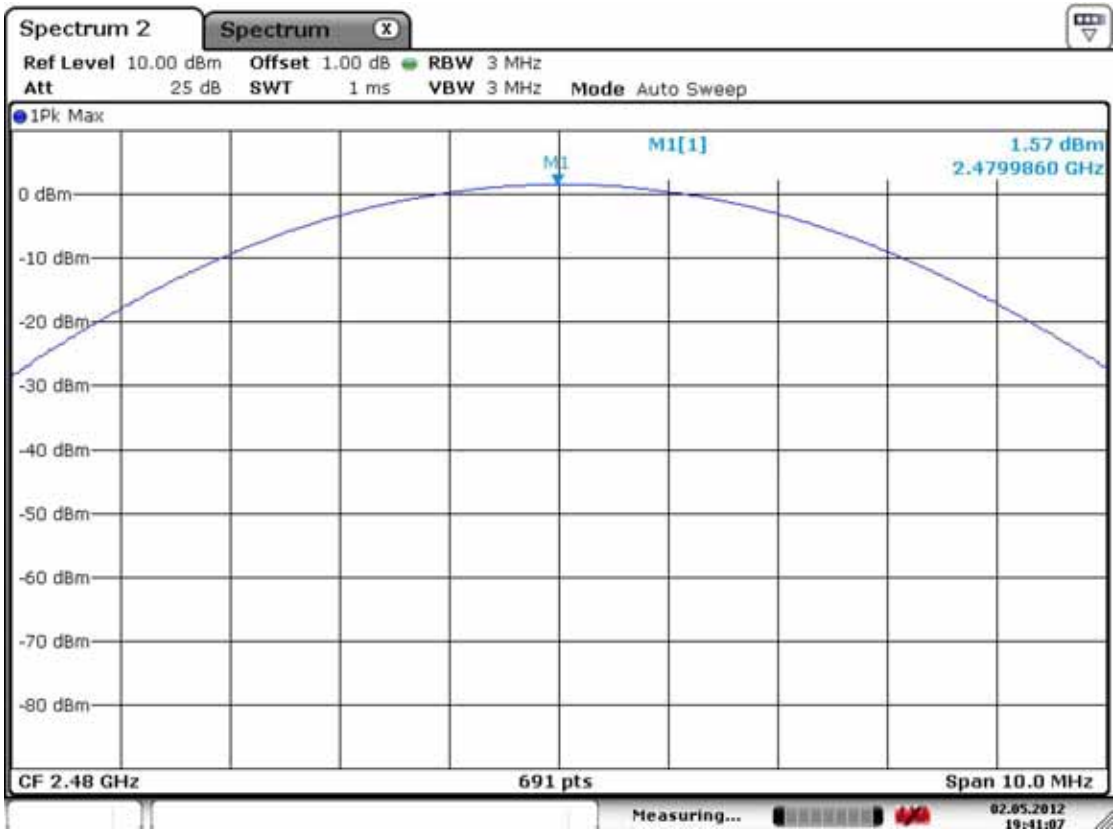
EDR mode - Module 2



Channel 3
Basic mode - Module 2



EDR mode - Module 2



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 (Module 1, 2 equal)

- 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.

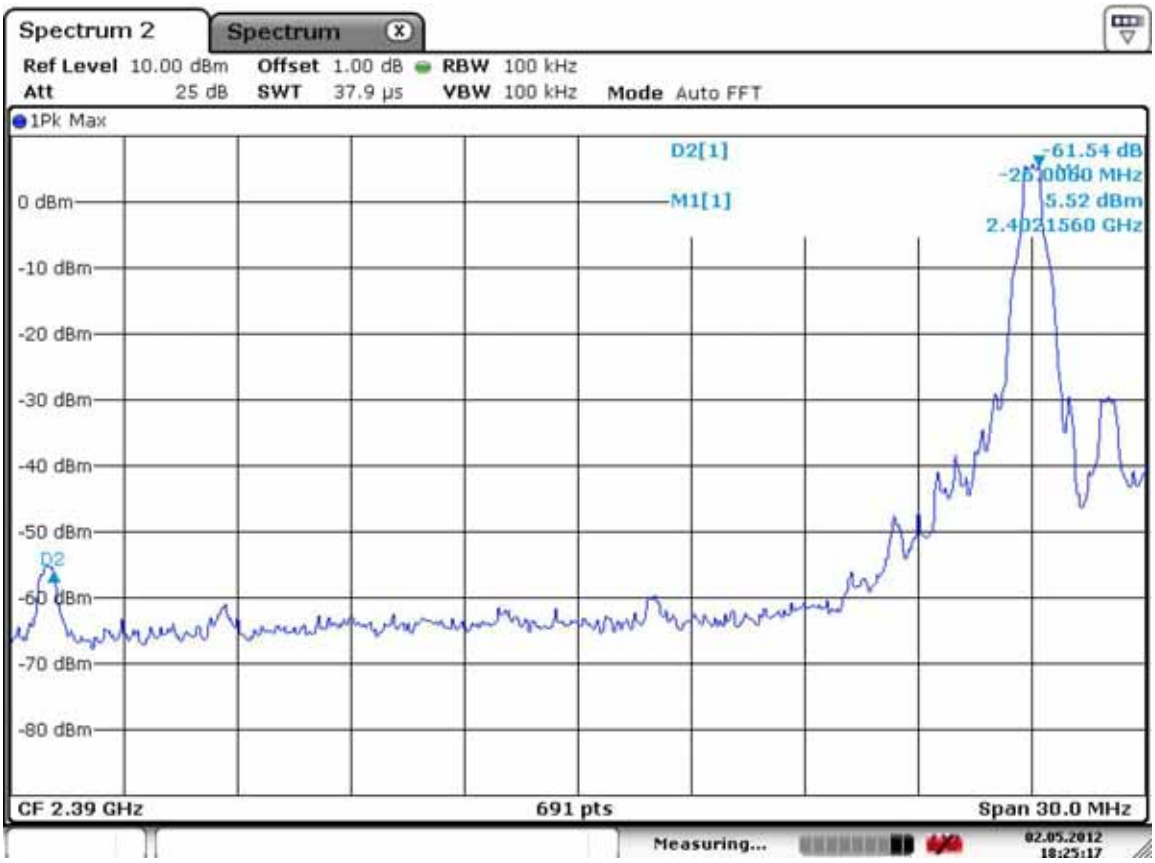
Minimum Standard:	> 20 dBc

Measurement Setup

Same as the Chapter 3.2.1 (Figure 1)

Band – edge

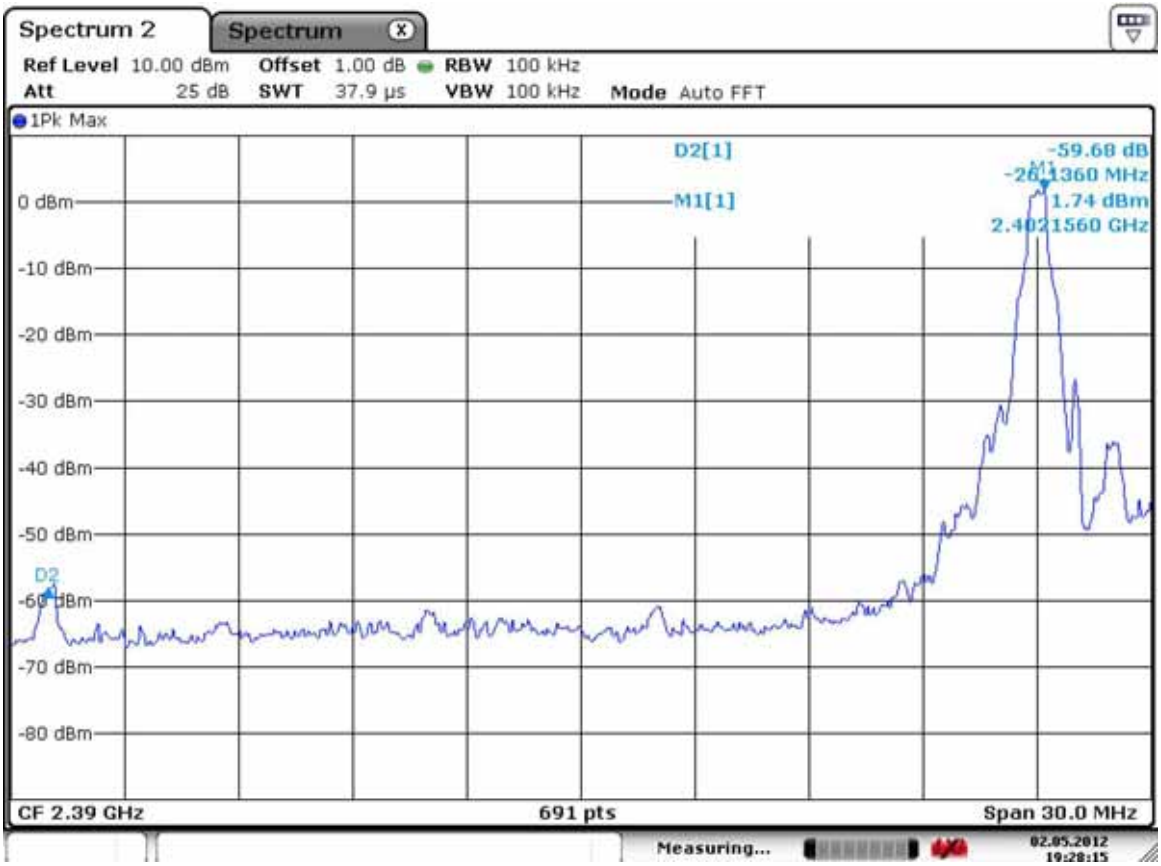
Lower edge – Module 1



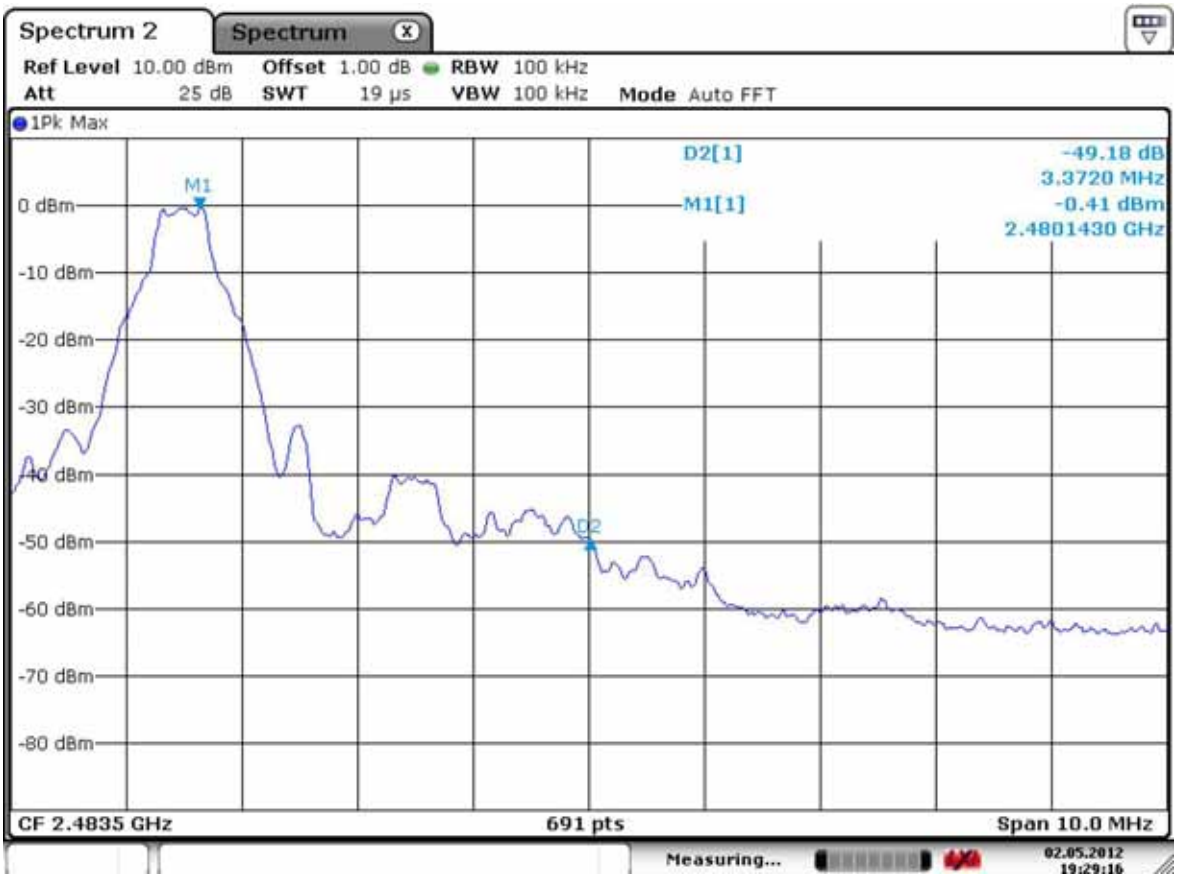
Upper edge – Module 1

Band – edge

Lower edge – Module 2



Upper edge – Module 2



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

Measurement Data: Module 1

Frequency [MHz]	Reading [dBuV/m] AV	Reading [dBuV/m] Peak	Pol.	Correction Factor Antenna	Correction Factor Amp. Gain	Correction Factor Cable	Limits [dBuV/m] AV	Limits [dBuV/m] Peak	Result [dBuV/m] AV	Result [dBuV/m] Peak	Margin [dB] AV	Margin [dB] Peak
2376.0	40.1	53.6	H	25.4	37.1	4.0	54.0	74.0	32.4	45.9	21.7	28.2

Measurement Data: Module 2

Frequency [MHz]	Reading [dBuV/m] AV	Reading [dBuV/m] Peak	Pol.	Correction Factor Antenna	Correction Factor Amp. Gain	Correction Factor Cable	Limits [dBuV/m] AV	Limits [dBuV/m] Peak	Result [dBuV/m] AV	Result [dBuV/m] Peak	Margin [dB] AV	Margin [dB] Peak
2376.0	38.9	50.5	H	25.4	37.1	4.0	54.0	74.0	31.2	42.8	22.9	31.3

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

Measurement Data: Module 1

Frequency [MHz]	Reading [dBuV/m] AV	Reading [dBuV/m] Peak	Pol.	Correction Factor Antenna	Correction Factor Amp. Gain	Correction Factor Cable	Limits [dBuV/m] AV	Limits [dBuV/m] Peak	Result [dBuV/m] AV	Result [dBuV/m] Peak	Margin [dB] AV	Margin [dB] Peak
2483.5	41.8	53.2	H	25.4	37.1	4.0	54.0	74.0	34.1	45.5	20.0	28.6

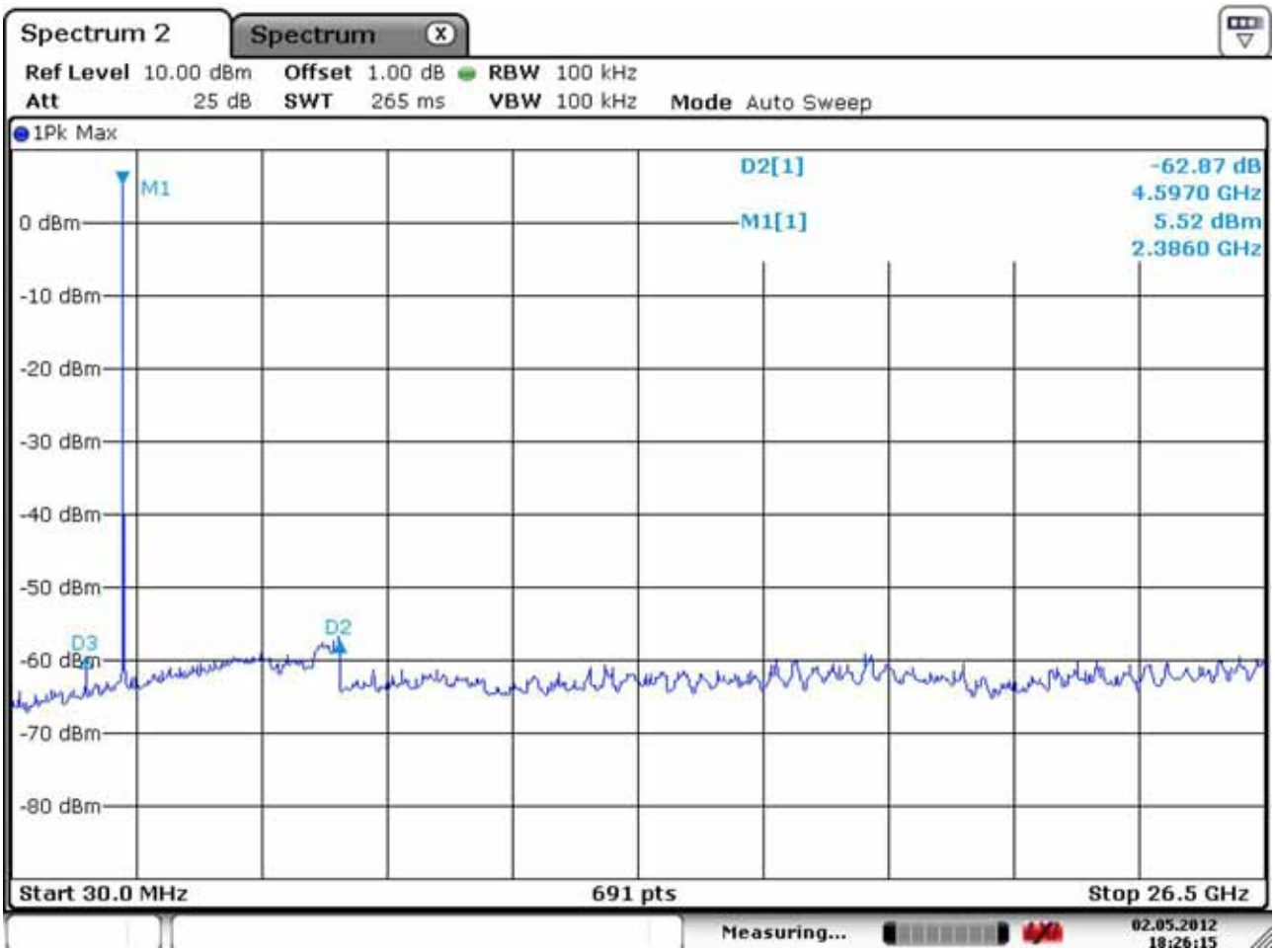
Measurement Data: Module 2

Frequency [MHz]	Reading [dBuV/m] AV	Reading [dBuV/m] Peak	Pol.	Correction Factor Antenna	Correction Factor Amp. Gain	Correction Factor Cable	Limits [dBuV/m] AV	Limits [dBuV/m] Peak	Result [dBuV/m] AV	Result [dBuV/m] Peak	Margin [dB] AV	Margin [dB] Peak
2483.5	41.1	52.3	H	25.4	37.1	4.0	54.0	74.0	33.4	44.6	20.7	29.5

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

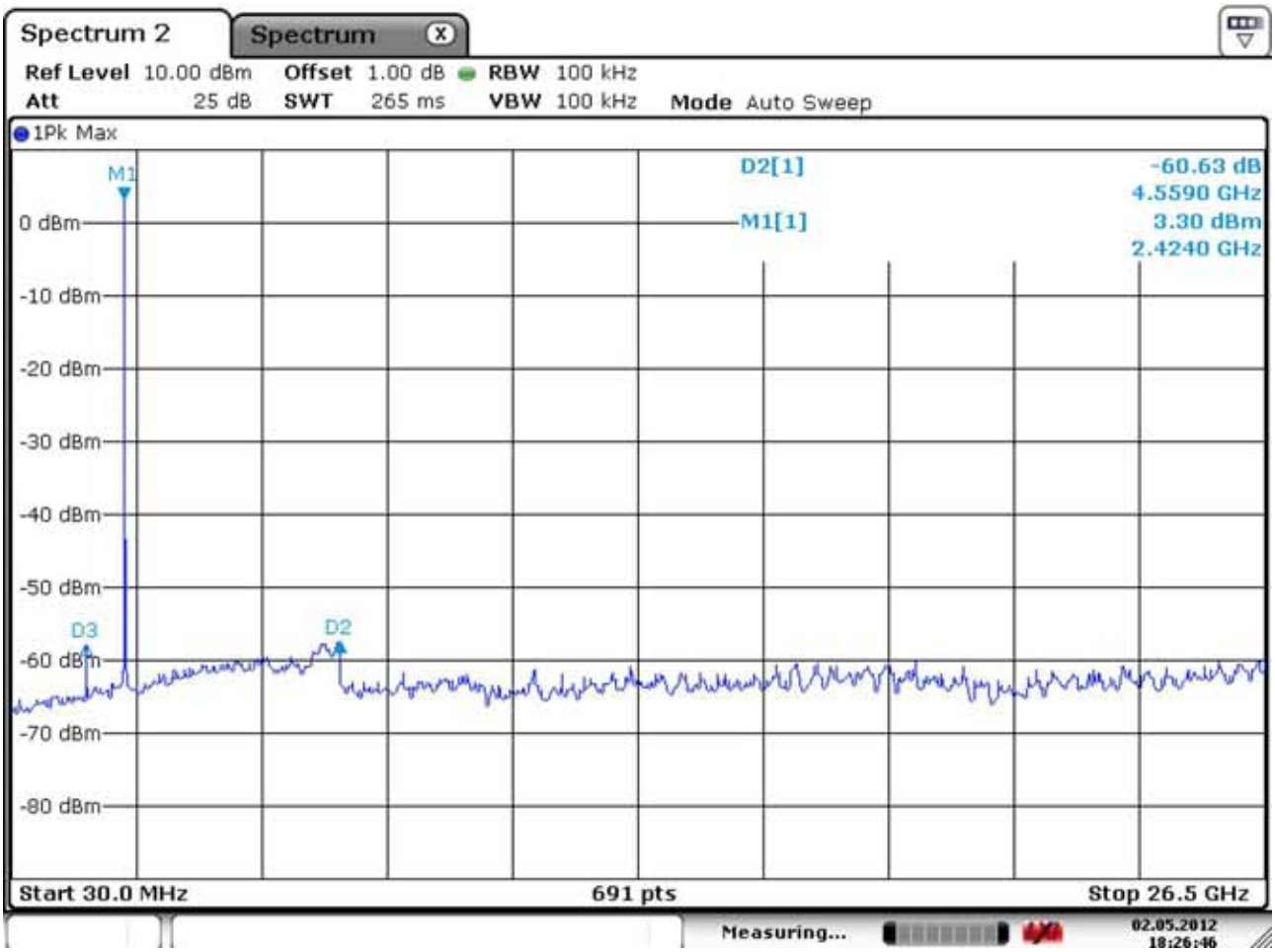
Unwanted Emission – Low channel – Module 1

Frequency Range = 30 MHz ~ 26.5 GHz



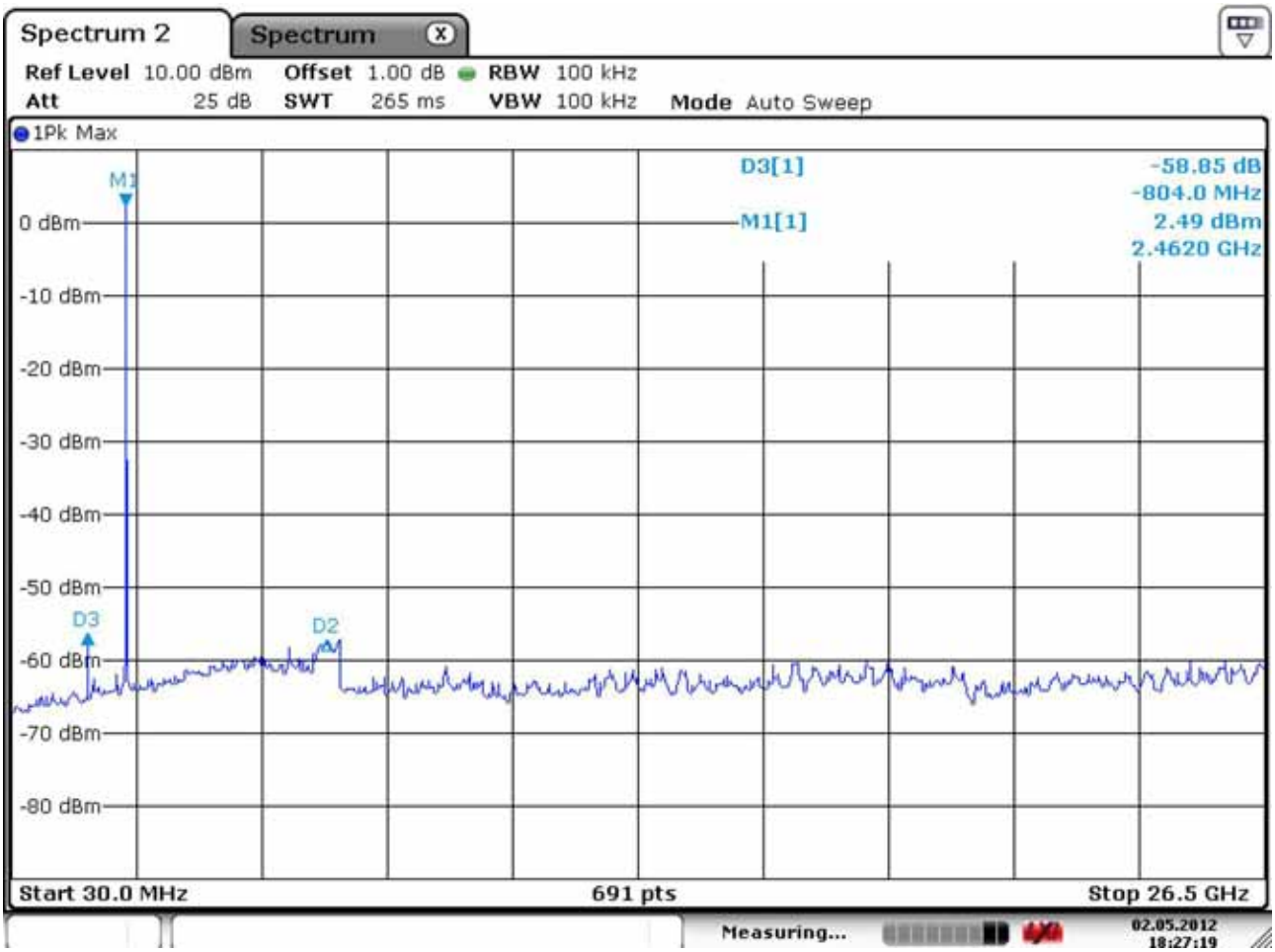
Unwanted Emission – Middle channel – Module 1

Frequency Range = 30 MHz ~ 26.5 GHz



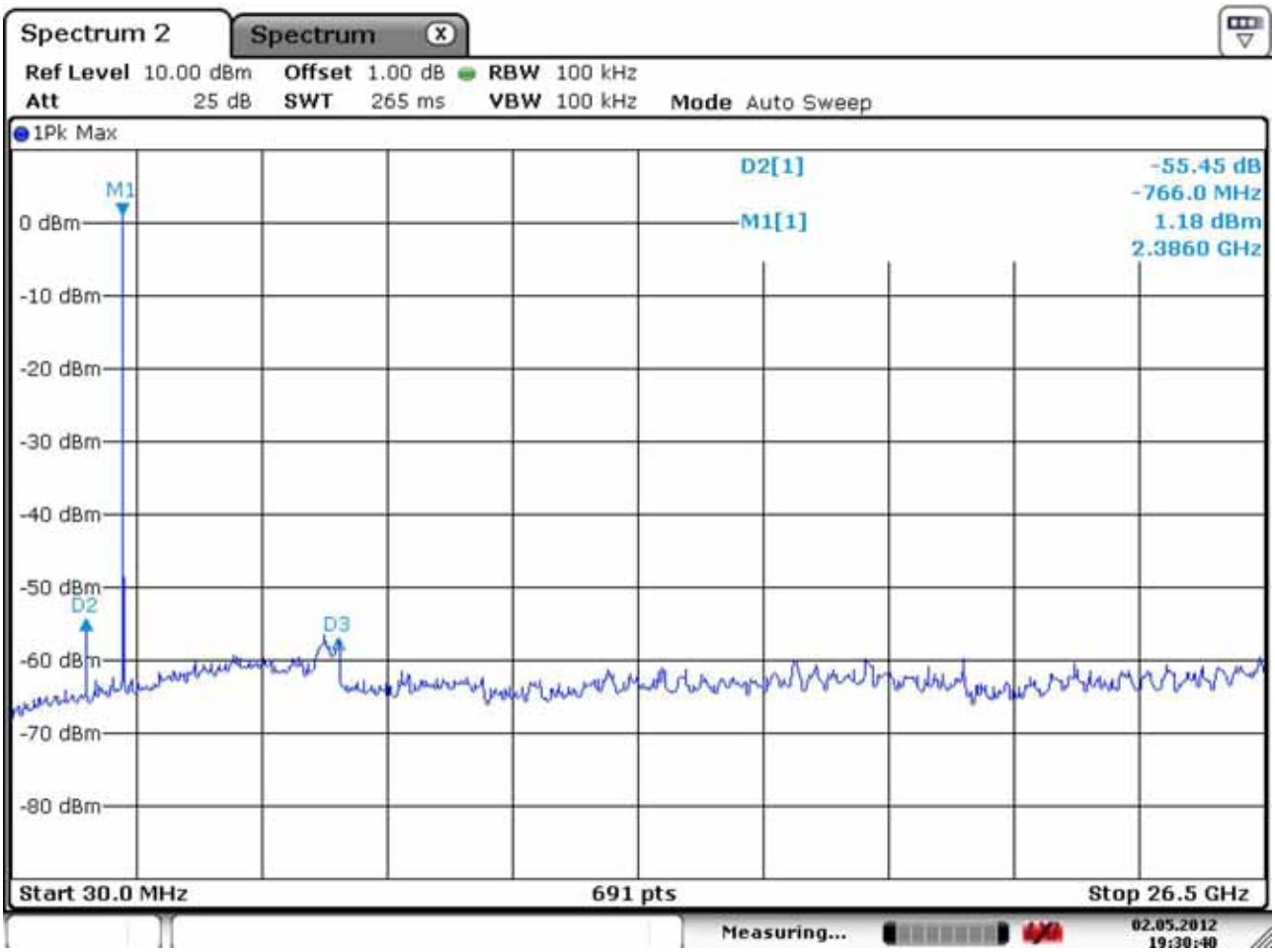
Unwanted Emission – High channel – Module 1

Frequency Range = 30 MHz ~ 26.5 GHz



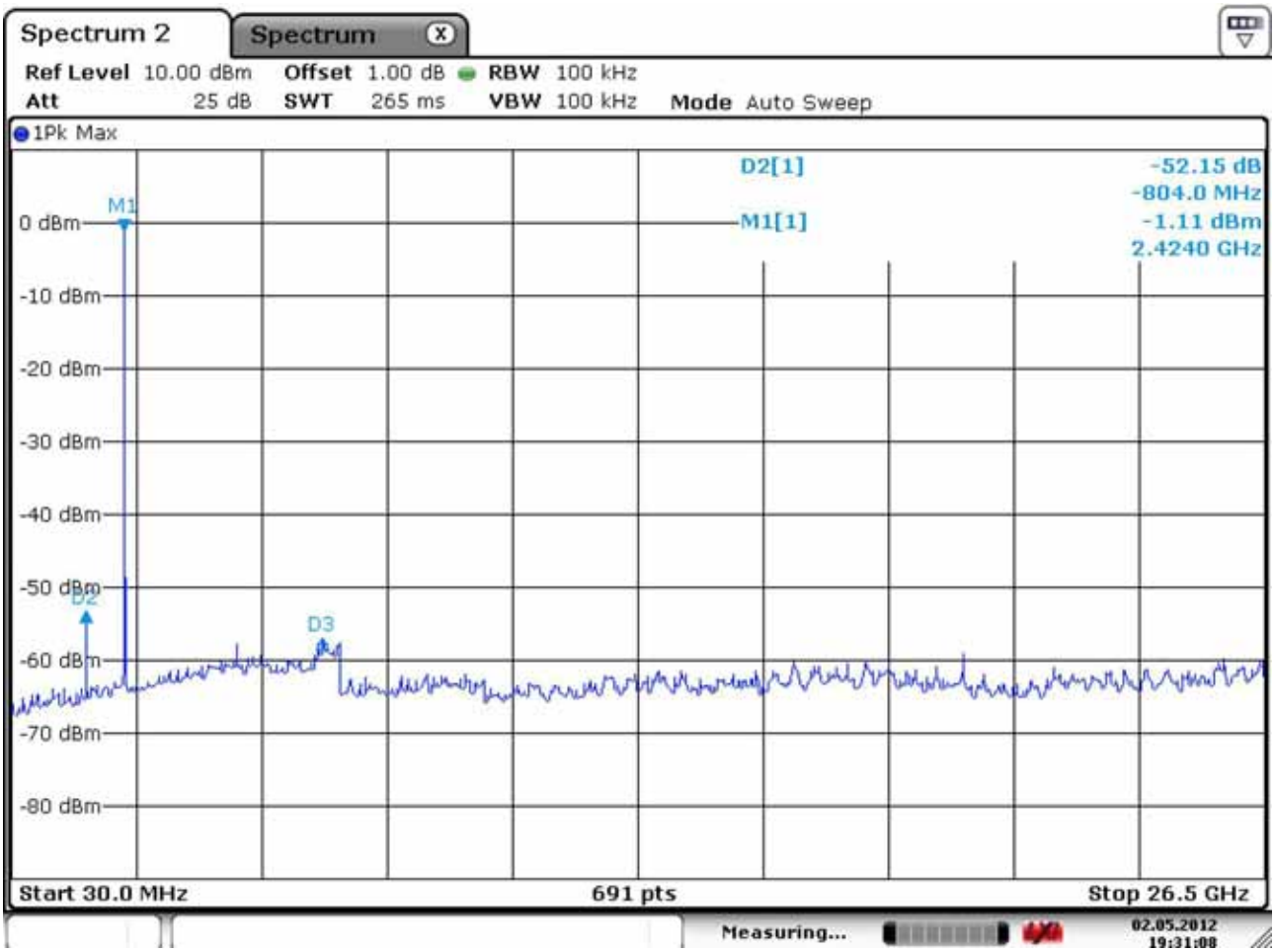
Unwanted Emission – Low channel – Module 2

Frequency Range = 30 MHz ~ 26.5 GHz



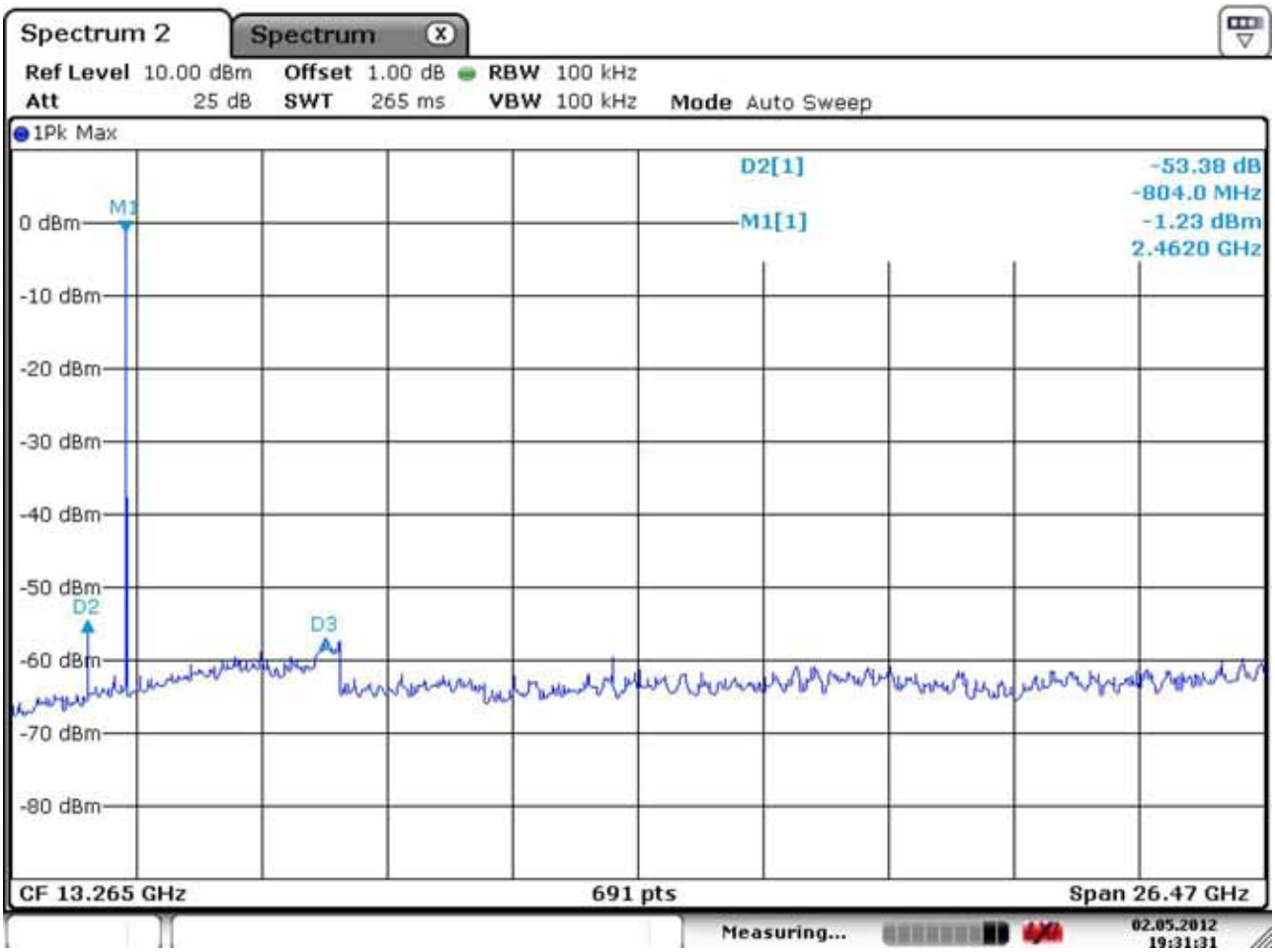
Unwanted Emission – Middle channel – Module 2

Frequency Range = 30 MHz ~ 26.5 GHz



Unwanted Emission – High channel – Module 2

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.

(a) In the frequency range of 9kHz to 30 MHz, magnetic field is measured with Loop Test Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.

(b) In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is carried from 1m to 4m above the ground to determine the maximum value of the field strength. The emission levels at both horizontal and vertical polarizations should be tested.

The spectrum analyzer is set to:

Center frequency = the worst channel

Frequency Range = 25 MHz ~ 10^{th} harmonic.

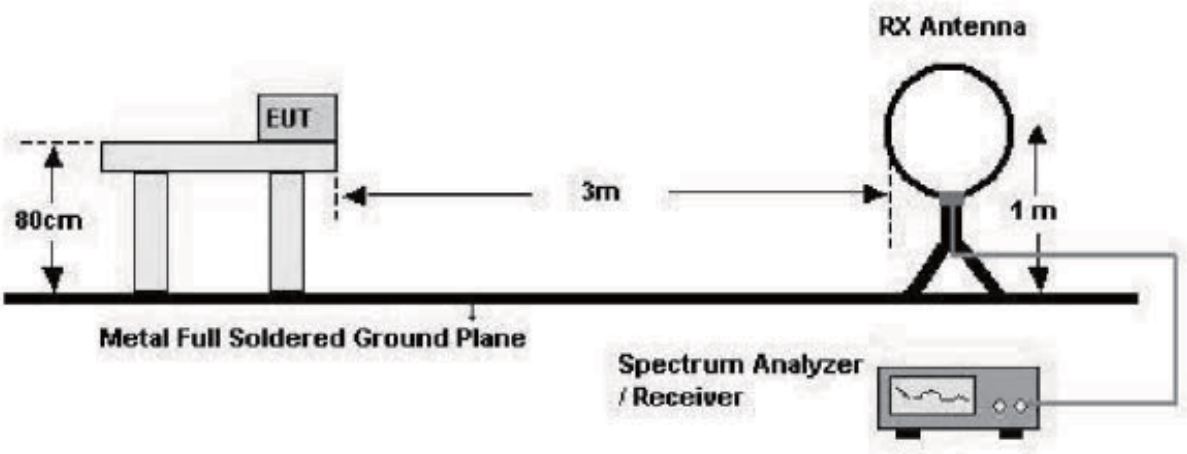
RBW = 100 kHz (10MHz ~ 1 GHz) VBW $\geq$ RBW

= 1 MHz (1 GHz ~ 10^{th} harmonic)

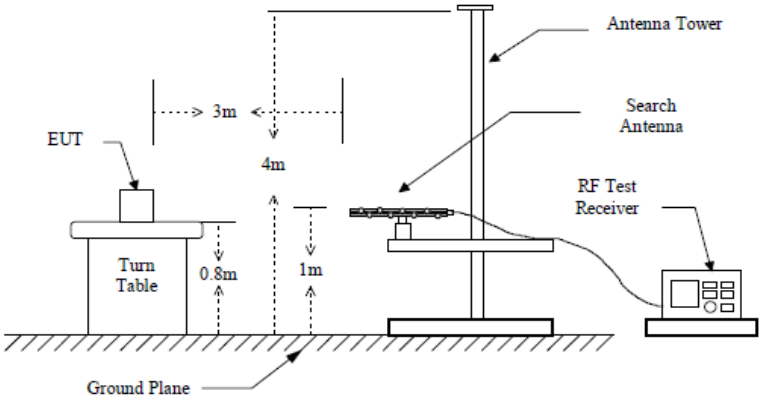
Span = 100 MHz Detector function = peak

Trace = max hold Sweep = auto

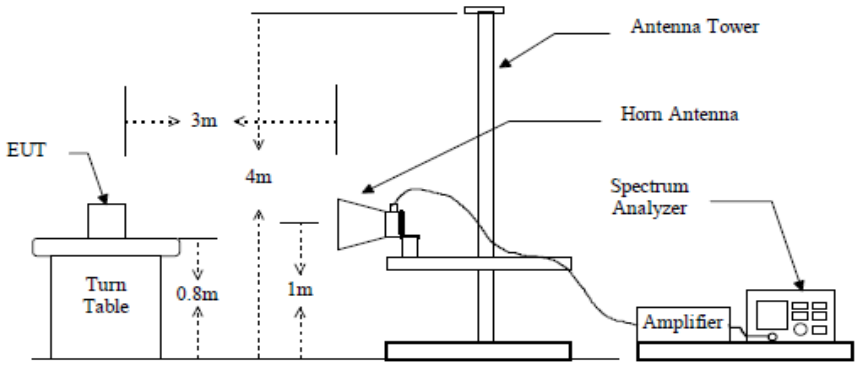
below 30MHz



below 1GHz (30MHz to 1GHz)



above 1GHz



Measurement Data: Complies

- See next pages for actual measured data.
- No other emissions were detected at a level greater than 20dB below limit include from 9KHz to 30MHz.
- The three antennas were used with this EUT during the Testing.

Minimum Standard: FCC Part 15.209(a)

Frequency (MHz)	Limit (uV/m) @ 3m
0.009 ~ 0.490	2400/F(kHz) **(@ 300m)**
0.490 ~ 1.705	24000/F(kHz) **(@ 30m)**
1.705 ~ 30	30**(@ 30m)**
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: Module 1

Frequency [MHz]	Reading [dBuV/m] AV	Reading [dBuV/m] Peak	Pol.	Correction Factor Antenna	Correction Factor Amp.Gain	Correction Factor Cable	D.C.F	Limits [dBuV/m] AV	Limits [dBuV/m] Peak	Result [dBuV/m] AV	Result [dBuV/m] Peak	Margin [dB] AV	Margin [dB] Peak
4804.0	41.5	50.9	H	31.4	36.5	5.7	-30.29	54.0	74.0	11.9	21.3	42.1	52.7
4882.0	47.4	55.8	H	31.4	36.5	5.7	-30.29	54.0	74.0	17.8	26.2	36.2	47.8
4960.0	45.2	56.5	H	31.4	36.5	5.7	-30.29	54.0	74.0	15.6	26.9	38.4	47.1

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

- D.C.F (Duty Cycle Correction Factor) = 20log(The worst Case DWELL Time/100ms)

= 20log(3.058ms/100ms) = -30.29

Measurement Data: Module 2

Frequency [MHz]	Reading [dBuV/m] AV	Reading [dBuV/m] Peak	Pol.	Correction Factor Antenna	Correction Factor Amp.Gain	Correction Factor Cable	D.C.F	Limits [dBuV/m] AV	Limits [dBuV/m] Peak	Result [dBuV/m] AV	Result [dBuV/m] Peak	Margin [dB] AV	Margin [dB] Peak
4804.0	40.3	49.5	H	31.4	36.5	5.7	-30.29	54.0	74.0	10.7	19.9	43.3	54.1
4882.0	47.1	54.5	H	31.4	36.5	5.7	-30.29	54.0	74.0	17.5	24.9	36.5	49.1
4960.0	47.8	59.2	H	31.4	36.5	5.7	-30.29	54.0	74.0	18.2	29.6	35.8	44.4

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

- D.C.F (Duty Cycle Correction Factor) = 20log(The worst Case DWELL Time/100ms)

= 20log(3.058ms/100ms) = -30.29

Radiated Emissions – BT + Charging mode

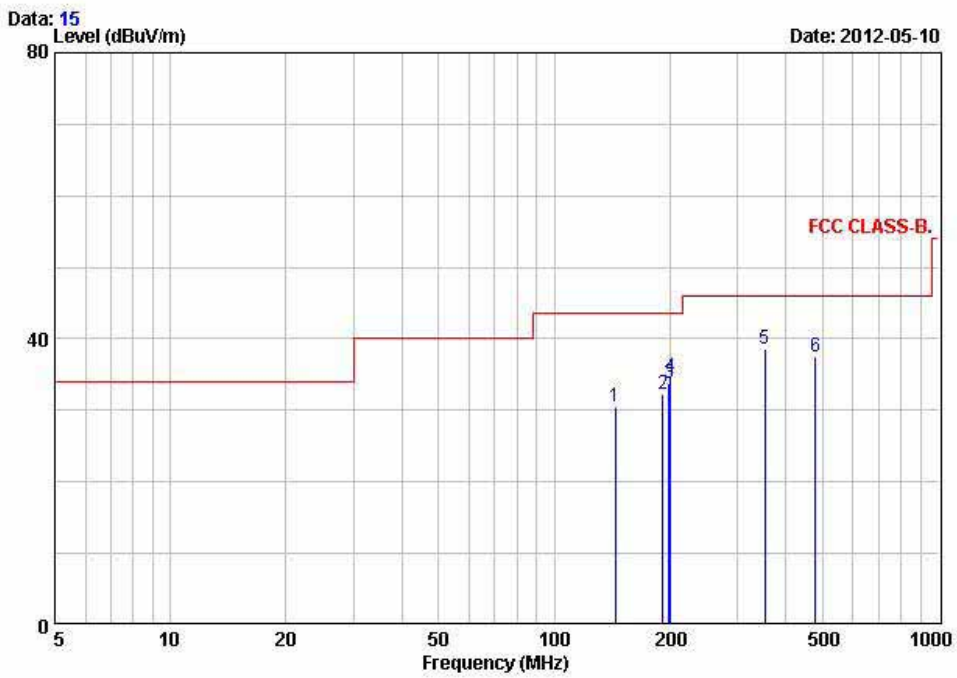
(Worst case : Pairing of two modules at the same time)

LTA
Laboratory for Test & Approval Co.,Ltd.

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

EUT/Model No.: SM10 TEST MODE: BT+Charging mode

Temp Humi : 21 / 37 Tested by: PARK.H.W



	Freq	Reading	C.F	Result	Limit QP	Margin	Height	Angle	Polarity
	MHz	dBuV/m	dB/m	dBuV/m	dBuV/m	dB	cm	deg	
1	144.00	43.80	-13.20	30.60	43.50	12.90	257	84	HORIZONTAL
2	192.16	47.20	-14.89	32.31	43.50	11.19	195	136	HORIZONTAL
3	198.63	49.10	-15.39	33.71	43.50	9.79	204	197	HORIZONTAL
4	201.30	50.00	-15.42	34.58	43.50	8.92	177	314	HORIZONTAL
5	354.01	48.20	-9.61	38.59	46.00	7.41	132	169	HORIZONTAL
6	480.02	44.20	-6.75	37.45	46.00	8.55	100	76	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	:	25 MHz ~ 10th harmonic.
Bandwidth	:	120 kHz (F < 1GHz) 1 MHz (F > 1GHz)
Distance of antenna	:	3 meters
Test mode	:	Rx mode
Result	:	**Complies**

Measurement Data:

- Refer to the next page.
- No other emissions were detected at a level greater than 20dB below limit
- It gave the worse case emissions.

Field Strength Limit

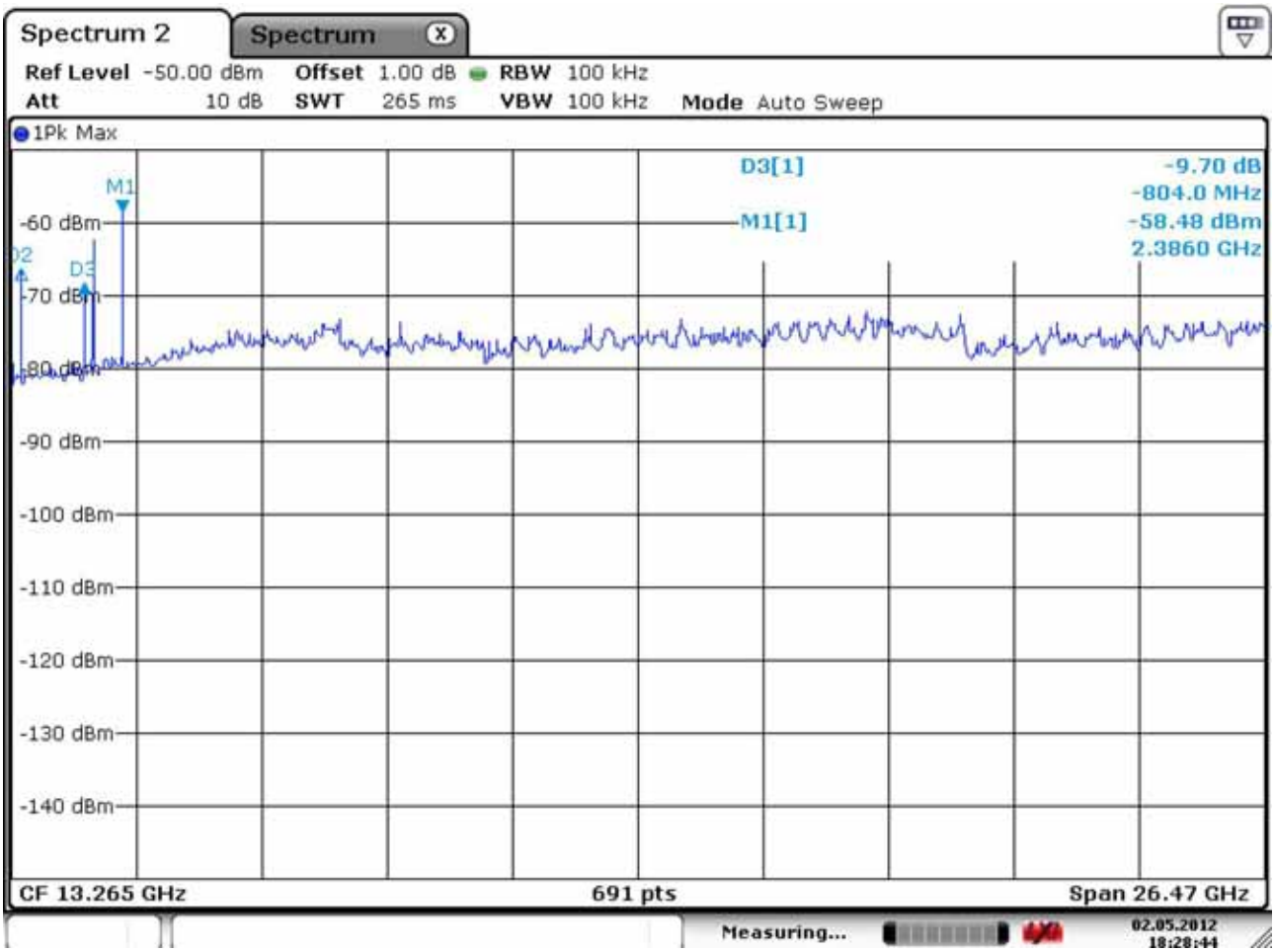
Part 15.209 LIMIT:

Frequency (MHz)	Limit (uV/m) @ 3m
0.009 ~ 0.490	2400/F(kHz)
0.490 ~ 1.705	24000/F(kHz)
1.705 ~ 30	30
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.

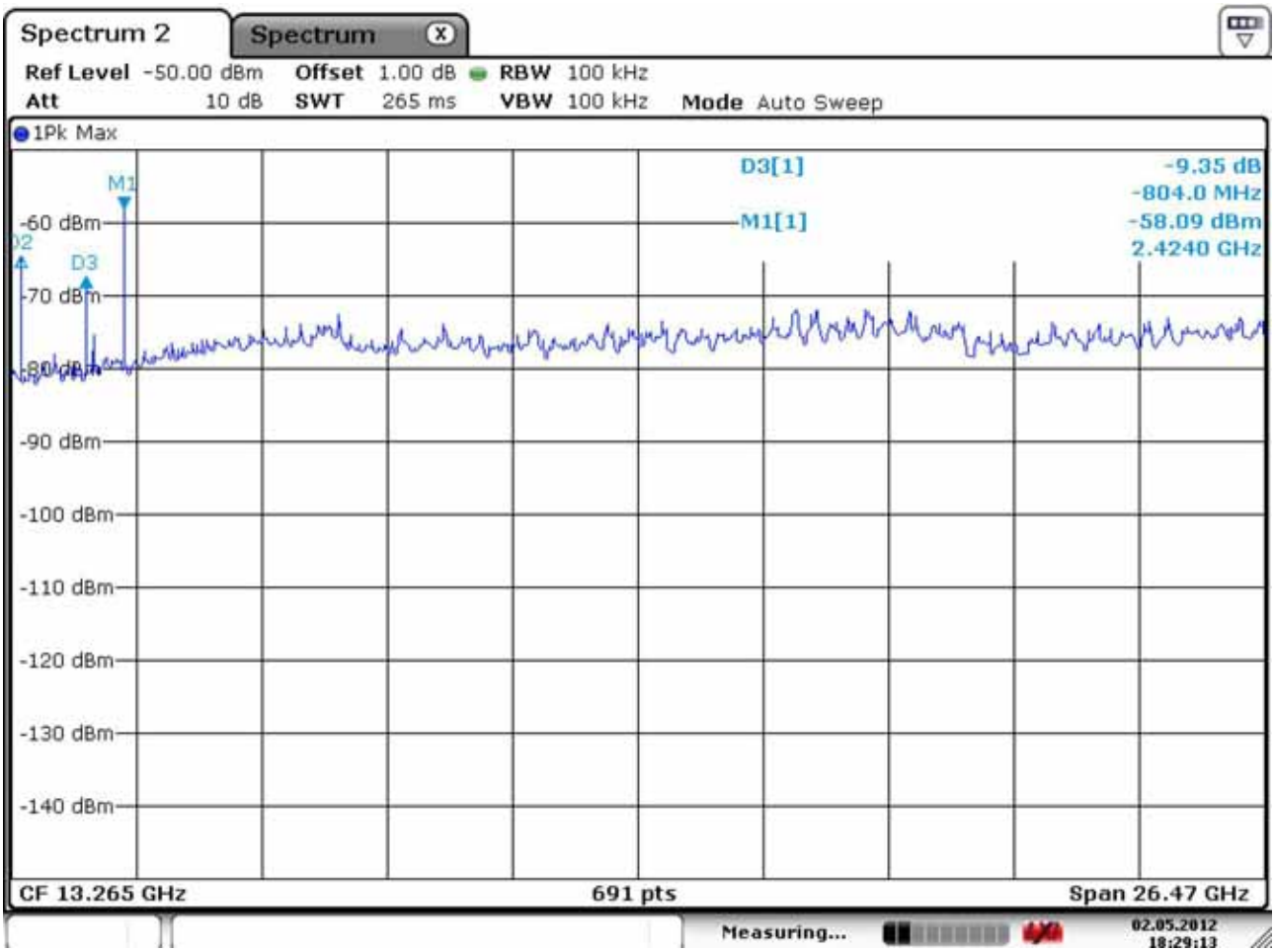
Conducted Emission – Low channel – Module 1

Frequency Range = 30 MHz ~ 26.5 GHz



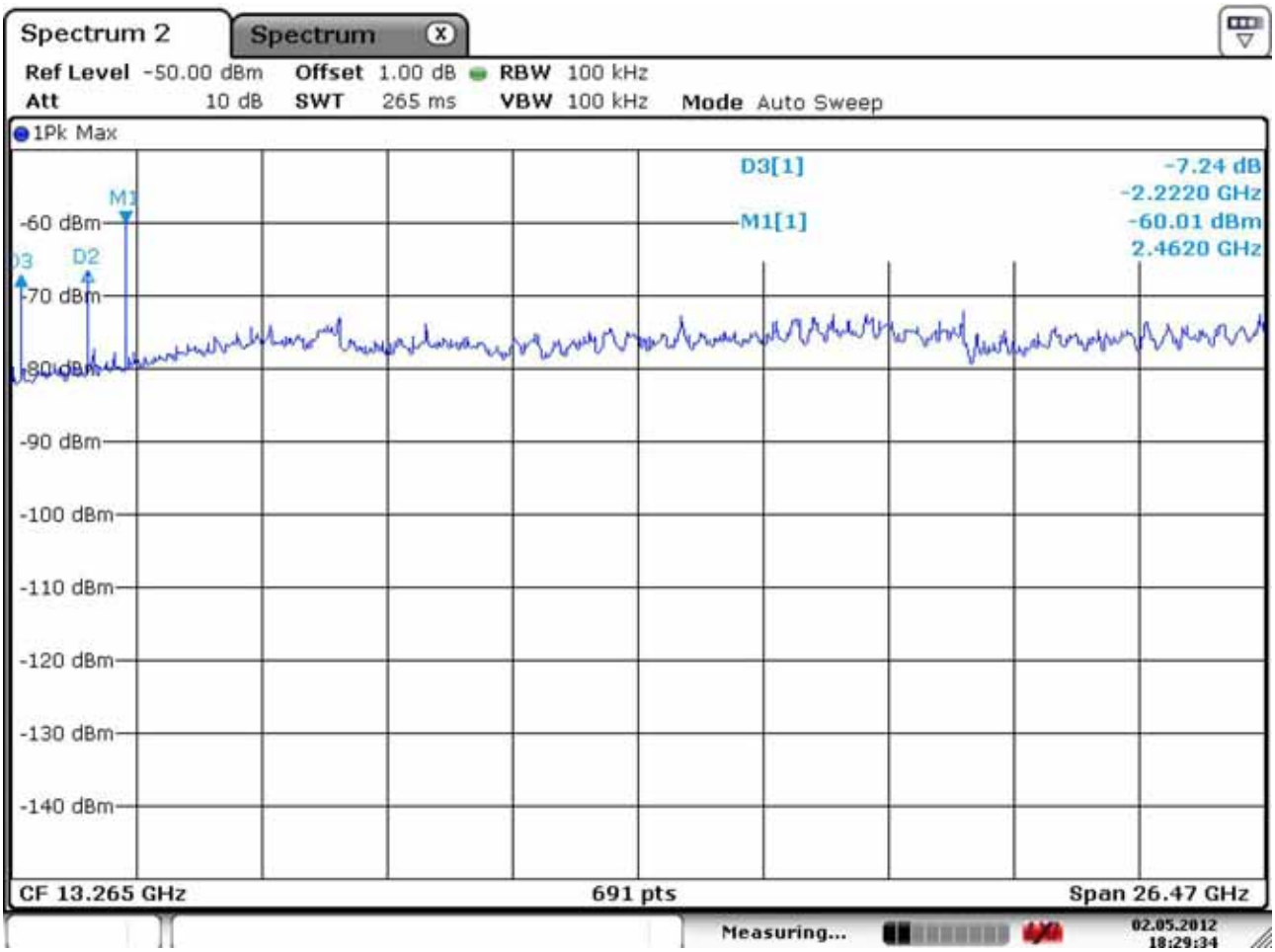
Conduceted Emission – Middle channel – Module 1

Frequency Range = 30 MHz ~ 26.5 GHz



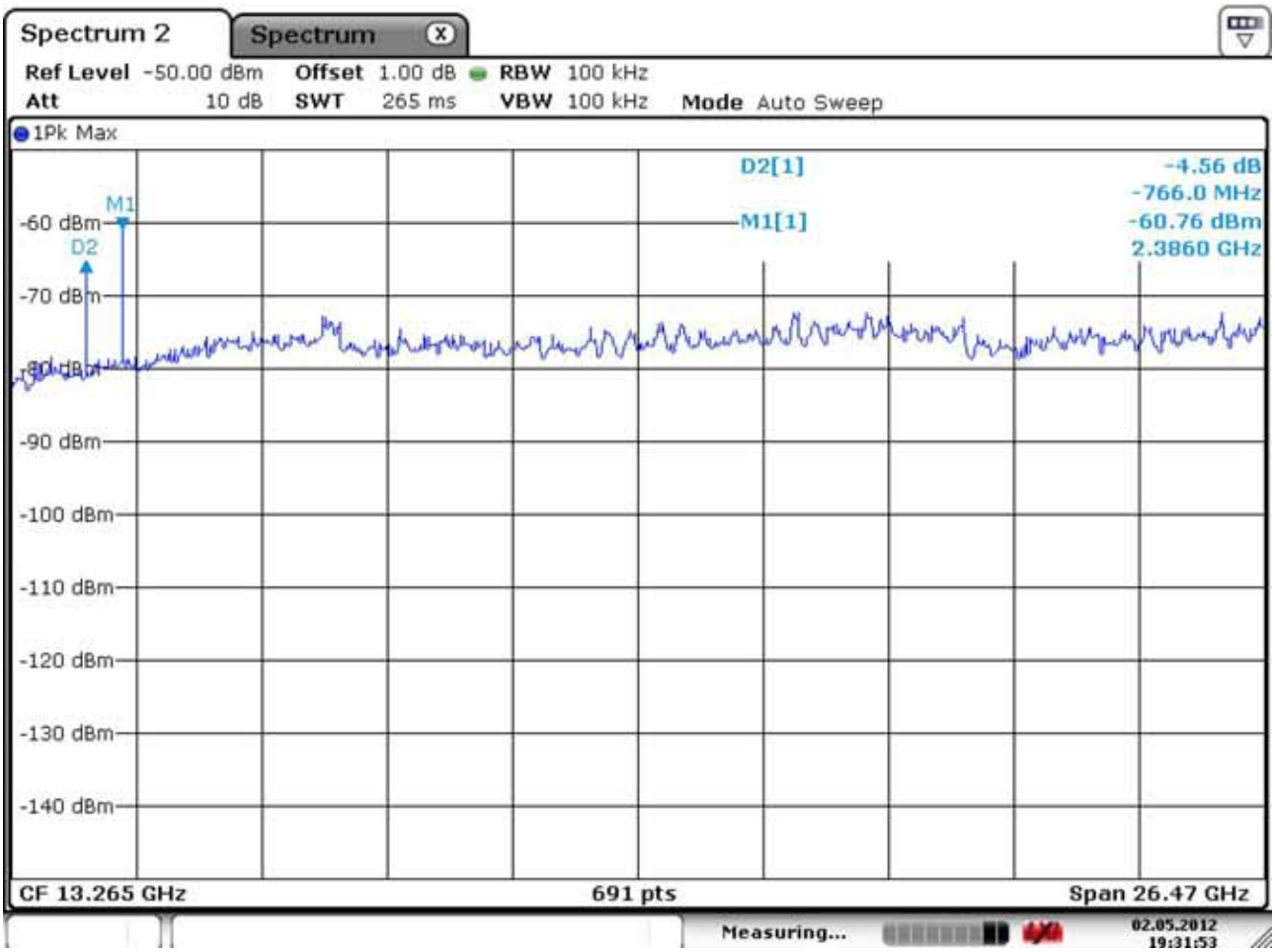
Conduceted Emission – High channel – Module 1

Frequency Range = 30 MHz ~ 26.5 GHz



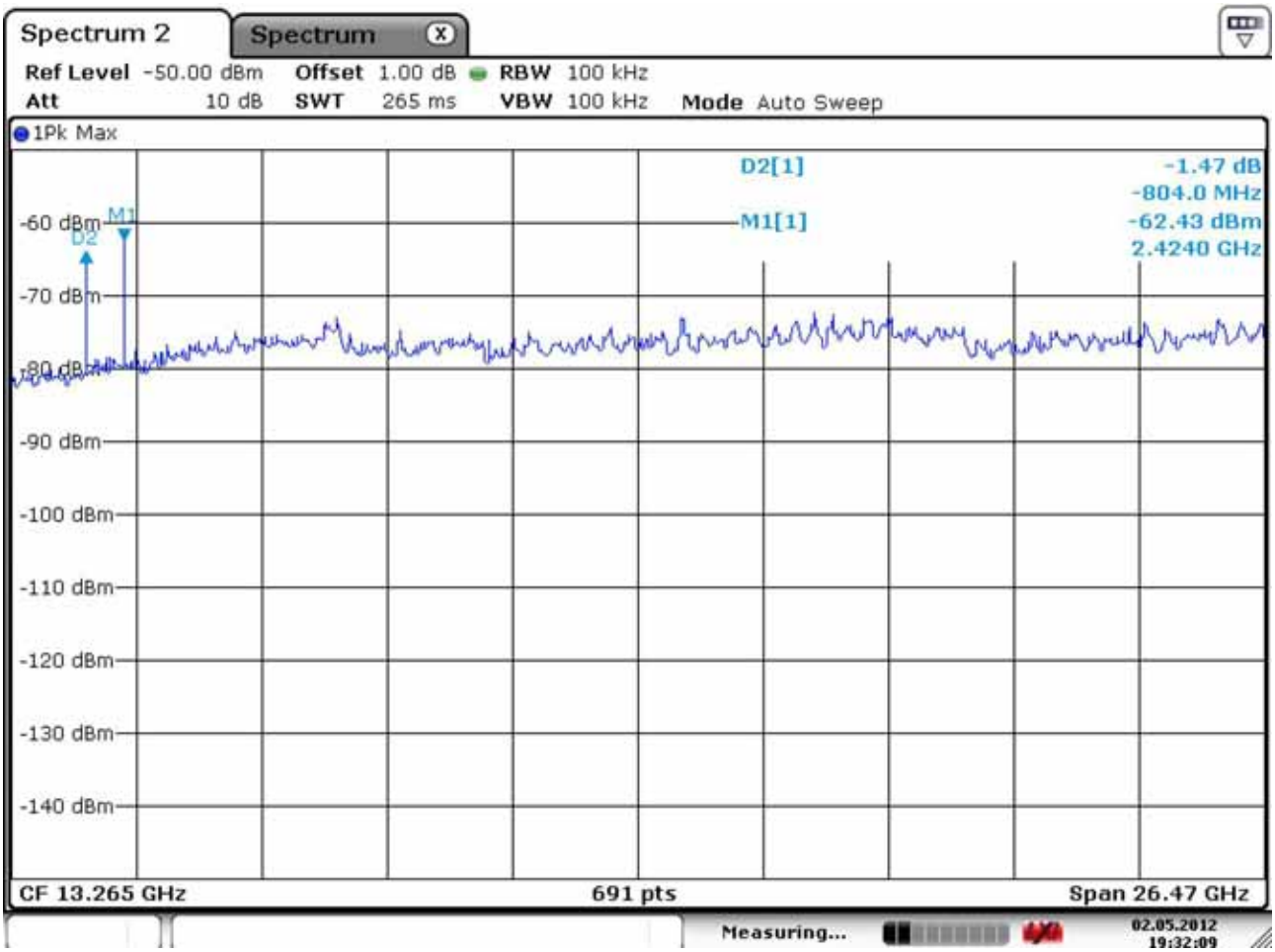
Conducted Emission – Low channel – Module 2

Frequency Range = 30 MHz ~ 26.5 GHz



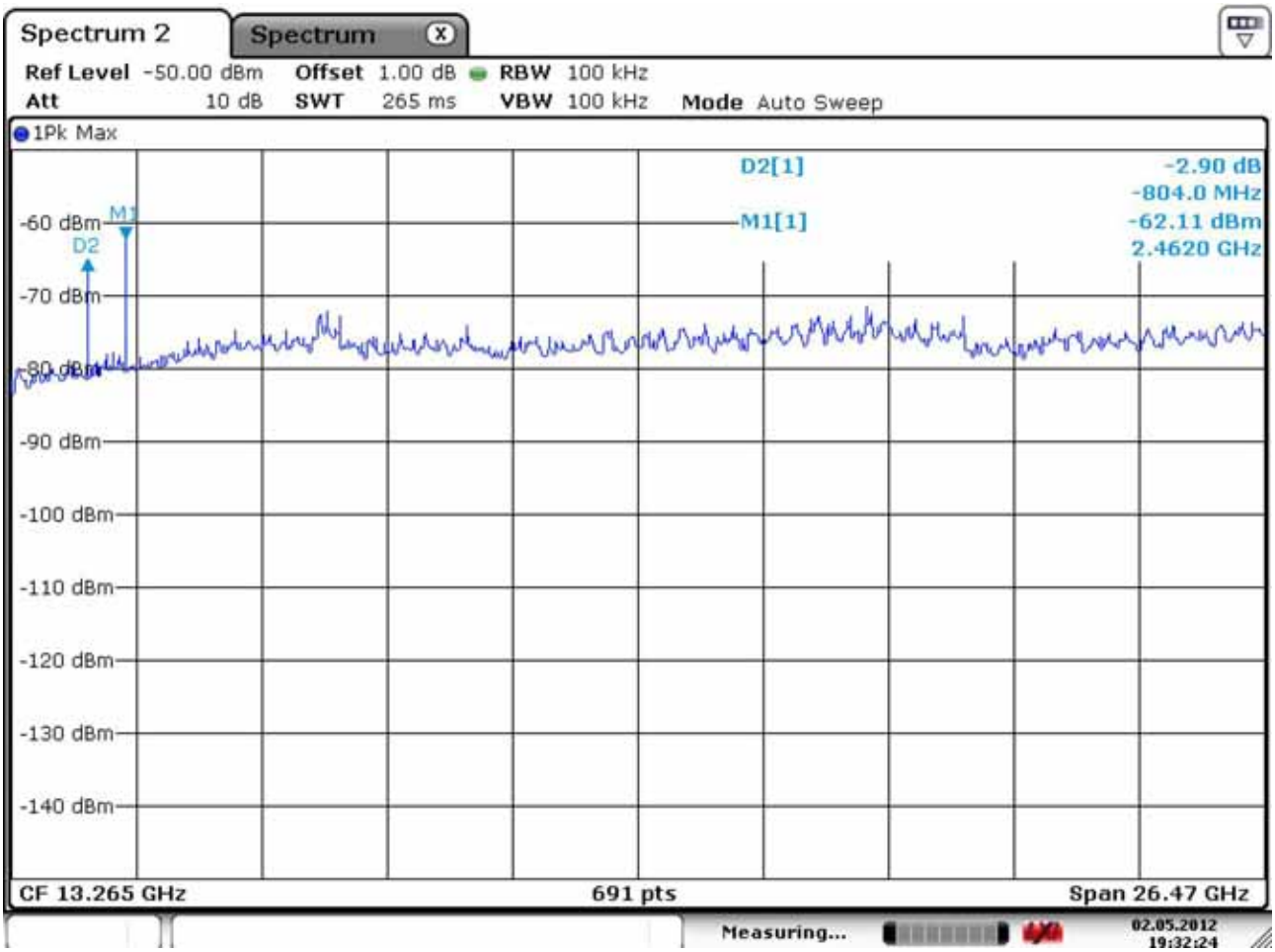
Conduceted Emission – Middle channel – Module 2

Frequency Range = 30 MHz ~ 26.5 GHz



Conduceted Emission – High channel – Module 2

Frequency Range = 30 MHz ~ 26.5 GHz



Measurement Data: Module 1

Frequency [MHz]	Reading [dBuV/m] AV	Reading [dBuV/m] Peak	Pol.	Correction Factor Antenna	Correction Factor Amp. Gain	Correction Factor Cable	Limits [dBuV/m] AV	Limits [dBuV/m] Peak	Result [dBuV/m] AV	Result [dBuV/m] Peak	Margin [dB] AV	Margin [dB] Peak
2401	40.4	46.9	H	25.4	37.1	4.0	54.0	74.0	32.7	39.2	21.4	34.9

Frequency [MHz]	Reading [dBuV/m] AV	Reading [dBuV/m] Peak	Pol.	Correction Factor Antenna	Correction Factor Amp. Gain	Correction Factor Cable	Limits [dBuV/m] AV	Limits [dBuV/m] Peak	Result [dBuV/m] AV	Result [dBuV/m] Peak	Margin [dB] AV	Margin [dB] Peak
2440	40.1	46.5	H	25.4	37.1	4.0	54.0	74.0	32.4	38.8	21.7	35.3

Frequency [MHz]	Reading [dBuV/m] AV	Reading [dBuV/m] Peak	Pol.	Correction Factor Antenna	Correction Factor Amp. Gain	Correction Factor Cable	Limits [dBuV/m] AV	Limits [dBuV/m] Peak	Result [dBuV/m] AV	Result [dBuV/m] Peak	Margin [dB] AV	Margin [dB] Peak
2480	43.8	48.0	H	25.4	37.1	4.0	54.0	74.0	36.1	40.3	18.0	33.8

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

Measurement Data: Module 2

Frequency [MHz]	Reading [dBuV/m] AV	Reading [dBuV/m] Peak	Pol.	Correction Factor Antenna	Correction Factor Amp. Gain	Correction Factor Cable	Limits [dBuV/m] AV	Limits [dBuV/m] Peak	Result [dBuV/m] AV	Result [dBuV/m] Peak	Margin [dB] AV	Margin [dB] Peak
2402	42.5	48.0	H	25.4	37.1	4.0	54.0	74.0	34.8	40.3	19.3	33.8
Frequency [MHz]	Reading [dBuV/m] AV	Reading [dBuV/m] Peak	Pol.	Correction Factor Antenna	Correction Factor Amp. Gain	Correction Factor Cable	Limits [dBuV/m] AV	Limits [dBuV/m] Peak	Result [dBuV/m] AV	Result [dBuV/m] Peak	Margin [dB] AV	Margin [dB] Peak
2440	43.3	47.9	H	25.4	37.1	4.0	54.0	74.0	35.6	40.2	18.5	33.9
Frequency [MHz]	Reading [dBuV/m] AV	Reading [dBuV/m] Peak	Pol.	Correction Factor Antenna	Correction Factor Amp. Gain	Correction Factor Cable	Limits [dBuV/m] AV	Limits [dBuV/m] Peak	Result [dBuV/m] AV	Result [dBuV/m] Peak	Margin [dB] AV	Margin [dB] Peak
2480	45.1	50.2	H	25.4	37.1	4.0	54.0	74.0	37.4	42.5	16.7	31.6

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 data.

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

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

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

AC Conducted Emissions– BT + Charging mode – Line

(Worst case: Pairing of two modules at the same time)

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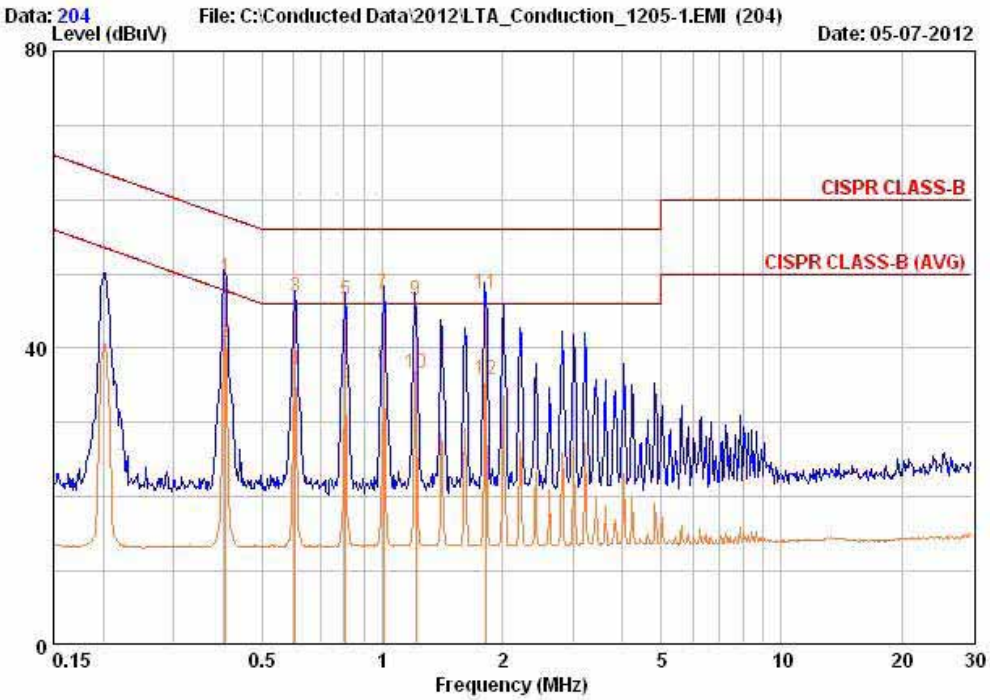
Fax:+82-31-3236010

EUT / Model No.	: SM10	Phase	: LINE
Test Mode	: BT+Charging mode	Test Power	: 120 / 60
Temp./Humi.	: 26 / 46	Test Engineer	: PARK H W



Freq	RD QP	RD AV	C.F	Result QP	Result AV	Limit QP	Limit AV	Margin QP	Margin AV
MHz	dBuV	dBuV	dB	dBuV	dBuV	dBuV	dBuV	dB	dB
0.404	39.83	31.23	9.62	49.45	40.85	57.77	47.77	8.32	6.92
0.605	37.12	27.52	9.64	46.76	37.16	56.00	46.00	9.24	8.84
0.807	36.72	25.62	9.68	46.40	35.30	56.00	46.00	9.60	10.70
1.009	37.63	27.93	9.71	47.34	37.64	56.00	46.00	8.66	8.36
1.211	36.63	26.93	9.72	46.36	36.66	56.00	46.00	9.64	9.34
1.815	37.55	25.95	9.73	47.27	35.67	56.00	46.00	8.73	10.33

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

AC Conducted Emissions– BT + Charging mode - Neutral

(Worst case: Pairing of two modules at the same time)

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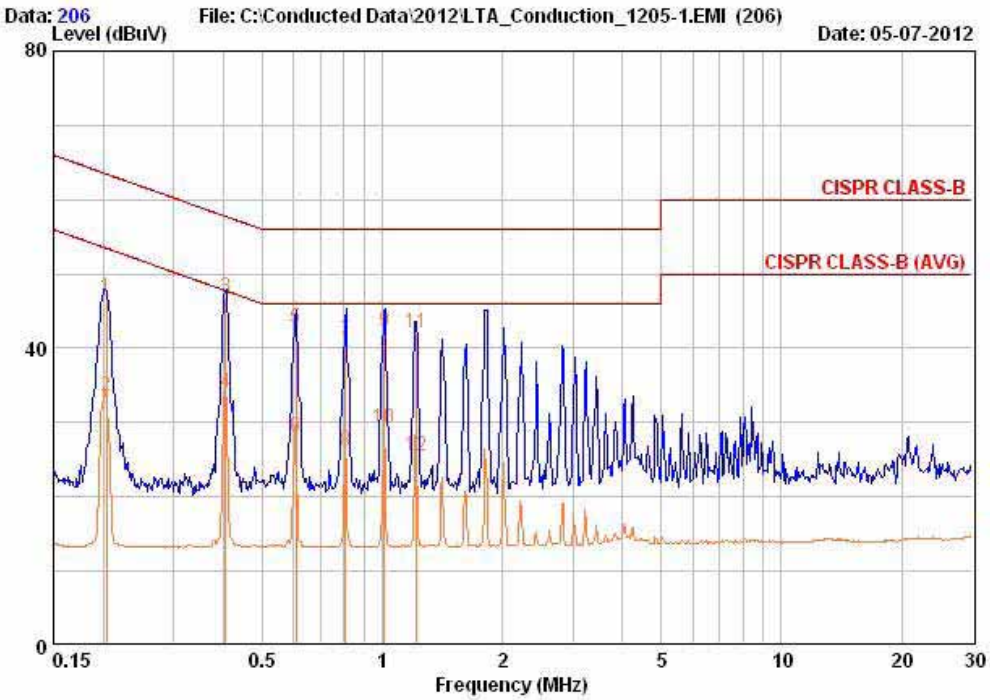
Tel :+82-31-3236008,9
Fax:+82-31-3236010

EUT / Model No.	: SM10	Phase	: NEUTRAL
Test Mode	: BT+Charging mode	Test Power	: 120 / 60
Temp./Humi.	: 26 / 46	Test Engineer	: PARK H W



Freq	RD QP	RD AV	C.F	Result QP	Result AV	Limit QP	Limit AV	Margin QP	Margin AV
MHz	dBuV	dBuV	dB	dBuV	dBuV	dBuV	dBuV	dB	dB
0.204	37.24	23.94	9.52	46.76	33.46	63.45	53.45	16.68	19.98
0.405	37.13	24.43	9.66	46.79	34.09	57.75	47.75	10.96	13.66
0.607	33.02	18.59	9.63	42.65	28.22	56.00	46.00	13.35	17.78
0.810	31.42	16.52	9.60	41.03	26.13	56.00	46.00	14.97	19.87
1.011	32.73	19.63	9.64	42.37	29.27	56.00	46.00	13.63	16.73
1.217	32.43	15.93	9.65	42.08	25.58	56.00	46.00	13.92	20.42

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

APPENDIX

TEST EQUIPMENT USED FOR TESTS

	Description	Model No.	Serial No.	Manufacturer	Interval	Last Cal. Date
1	Spectrum Analyzer (~30GHz)	FSV-30	100757	R&S	1 year	2012-01-10
2	Signal Generator (~3.2GHz)	8648C	3623A02597	HP	1 year	2012-03-26
3	Signal Generator (1~20GHz)	83711B	US34490456	HP	1 year	2012-03-26
4	Attenuator (3dB)	8491A	37822	HP	2 year	2010-10-08
5	Attenuator (10dB)	8491A	63196	HP	2 year	2010-10-08
6	Attenuator (30dB)	8498A	3318A10929	HP	2 year	2011-01-05
7	Test Receiver (~30MHz)	ESHS10	828404/009	R&S	1 year	2012-03-26
8	EMI Test Receiver (~1GHz)	ESCI7	100722	R&S	1 year	2011-10-07
9	RF Amplifier (~1.3GHz)	8447D	2439A09058	HP	2 year	2010-10-08
10	RF Amplifier (1~18GHz)	8449B	3008A02126	HP	2 year	2012-03-26
11	Horn Antenna (1~18GHz)	BBHA 9120D	9120D122	SCHWARZBECK	2 year	2010-12-24
12	Horn Antenna (18 ~ 40GHz)	SAS-574	154	Schwarzbeck	2 year	2010-11-25
13	Horn Antenna (18 ~ 40GHz)	SAS-574	155	Schwarzbeck	2 year	2010-11-25
14	TRILOG Antenna	VULB 9160	9160-3172	SCHWARZBECK	2 year	2010-10-07
15	Dipole Antenna	VHA9103	2116	SCHWARZBECK	2 year	2010-11-25
16	Dipole Antenna	VHA9103	2117	SCHWARZBECK	2 year	2010-11-25
17	Dipole Antenna	VHA9105	2261	SCHWARZBECK	2 year	2010-11-25
18	Dipole Antenna	VHA9105	2262	SCHWARZBECK	2 year	2010-11-25
19	Hygro-Thermograph	THB-36	0041557-01	ISUZU	2 year	2012-04-11
20	Splitter (SMA)	ZFSC-2-2500	SF617800326	Mini-Circuits	-	-
21	Power Divider	11636A	6243	HP	2 year	2010-10-08
22	DC Power Supply	6622A	3448A03079	HP	-	-
23	Frequency Counter	5342A	2826A12411	HP	1 year	2012-03-26
24	Power Meter	EPM-441A	GB32481702	HP	1 year	2012-03-26
25	Power Sensor	8481A	US41030291	HP	1 year	2011-10-07
26	Audio Analyzer	8903B	3729A18901	HP	1 year	2011-10-07
27	Modulation Analyzer	8901B	3749A05878	HP	1 year	2011-10-07
28	TEMP & HUMIDITY Chamber	YJ-500	LTAS06041	JinYoung Tech	1 year	2011-10-07
29	Stop Watch	HS-3	601Q09R	CASIO	2 year	2012-03-26
30	LISN	ENV216	100408	R&S	1 year	2011-10-07
31	UNIVERSAL RADIO COMMUNICATION TESTER	CMU200	106243	R&S	2 year	2010-05-13
32	Highpass Filter	WHKX1.5/15G-10SS	74	Wainwright Instruments	-	-
33	Highpass Filter	WHKX3.0/18G-10SS	118	Wainwright Instruments	-	-
34	Loop Antenna	FMZB 1516	151602/94	SCHWARZBECK	2 year	2011-04-05