



Dates of Tests : August 01~20, 2012

Test Report S/N: LR500111208E

Test Site : LTA CO., LTD

CERTIFICATION OF COMPLIANCE

FCC ID

YI7HES2E4A0T

APPLICANT

eZEX Corporation

Equipment Class	:	Digital Transmission System (DTS)
Manufacturing Description	:	Home Energy Gateway
Manufacturer	:	SEP CO., LTD.
Brand Name	:	General Electric (GE)
Model Name	:	HES2E4A0T
Test Device Serial No.:	:	Identical prototype
Rule Part(s)	:	FCC Part 15.247 Subpart C; ANSI C-63.4-2003
Frequency Range	:	2412MHz ~ 2462MHz (802.11b/g/n) 2405MHz ~ 2480MHz (Zigbee 1, 2)
Max. Output Power	:	Max 20.92dBm - Conducted (802.11b) Max 22.09dBm - Conducted (802.11g) Max 20.87dBm - Conducted (802.11n) Max 21.67dBm - Conducted (Zigbee 1) Max 21.57dBm - Conducted (Zigbee 2)
Data of issue	:	August 16, 2012

This test report is issued under the authority of:

The test was supervised by:



Kyu-Hyun Lee, Manager



Jung-Moo Her, Test Engineer

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NVLAP LAB Code.: 200723-0

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1. General information

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	2013-09-30	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
VCCI	JAPAN	G-563	2015-05-28	VCCI registration
IC	CANADA	5799A-1	2015-06-21	IC filing

2. Product Information

2-1 Applicant

Company name : eZEX Corporation
 Address : Rm 508, Ssangyong IT Twin-tower 2, 442-5, Sangdaewon-dong, Jungwon-gu,
 Seongnam-si, Gyeonggi-do, South Korea
 Tel / Fax : +82-31-608-4700 / +82-31-608-4701

2-2 Manufacturer

Company name : SEP CO., LTD.
 Address : 2B-19LOT, 930, Gosaek-Dong, Gwonseon-gu, Suwon-si
 Gyeonggi-do, 441-813
 Tel / Fax : +82-31-546-2200 / +82-31-546-2201

2-3 Equipment Under Test (EUT)

Trade name : Home Energy Gateway
 Brand name : General Electric (GE)
 Model name : HES2E4A0T
 Serial number : Identical prototype
 Date of receipt : August 1, 2012
 EUT condition : Pre-production, not damaged
 Antenna type : Chip antenna (M/N: SDBTPTR3015) with Max. 3.75 dBi gain
 Frequency Range : 2412MHz ~ 2462MHz (802.11b/g/n)
 2405MHz ~ 2480MHz (Zigbee 1, 2)
 RF output power : Max 20.92dBm - Conducted (802.11b)
 Max 22.09dBm - Conducted (802.11g)
 Max 20.87dBm - Conducted (802.11n)
 Max 21.67dBm - Conducted (Zigbee 1)
 Max 21.57dBm - Conducted (Zigbee 2)
 Number of channels : 802.11b/g/n for 11 and Zigbee 1, 2 for 16
 Type of Modulation : CCK, DQPSK, DBPSK for DSSS
 64QAM, 16QAM, QPSK, BPSK for OFDM
 O-QPSK for Zigbee
 Transfer Rate : 11, 5.5, 2, 1 Mbps for 802.11b
 54, 48, 36, 24, 18, 12, 9, 6 Mbps for 802.11g
 65/72.2, 58.5/65, 52/57.8, 39/43.3, 26/28.9, 19.5/21.7,
 13/14.4, 6.5/7.2Mbps for 802.11n
 Power Source : 120VAC
 Firmware Version : V1.0.0

2-4 Tested frequency

	LOW	MID	HIGH
Frequency (MHz) for 802.11b/g/n	2412	2442	2462
Frequency (MHz) for Zigbee 1, 2	2405	2440	2480

2-5 Ancillary Equipment

Equipment	Model No.	Serial No.	Manufacturer
Notebook	VOSTRO 1015	DN9RBN1	DELL

3. Test Report

3.1 Summary of tests

FCC Part Section(s)	Parameter	Limit	Test Condition	Status (note 1)
15.247(a)	6 dB Bandwidth	> 500kHz	Conducted	C
15.247(b)	Transmitter Peak Output Power	< 1Watt		C
15.247(d)	Transmitter Power Spectral Density	< 8dBm @ 3kHz		C
15.247(d)	Band Edge & Spurious	> 20 dBc		C
15.209	Field Strength of Harmonics	Emission	Radiated	C
15.207	AC Conducted Emissions	Emissions	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.

→ Antenna Requirement

The **eZEX Corporation HES2E4A0T** unit complies with the requirement of §15.203.
The antenna is connected to inside of EUT. And type is **Chip antenna**.

The sample was tested according to the following specification:

*FCC Parts 15.247; ANSI C-63.4-2003

*FCC KDB Publication No. 558074 D01 DTS Meas. Guidance V01

*FCC TCB Workshop 2012, April

3.2 Technical Characteristics Test (802.11b/g/n)

3.2.1 6 dB Bandwidth

Procedure:

*The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance and TCB Workshop 2012, April.

The bandwidth at 6dB below the highest in-band spectral density was measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate frequencies.

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 6dB 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 6 dB bandwidth of the emission.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

RBW = 100 kHz

Span = 30 MHz

VBW = 300 kHz (VBW \geq RBW)

Sweep = auto

Trace = max hold

Detector function = peak

Measurement Data: 802.11b

Frequency (MHz)	Channel No.	Test Results(MHz)	
		6dB Bandwidth	99% Bandwidth
2412	1	9.667	13.719
2442	7	9.783	13.604
2462	11	9.957	13.604

Measurement Data: 802.11g

Frequency (MHz)	Channel No.	Test Results(MHz)	
		6dB Bandwidth	99% Bandwidth
2412	1	16.498	16.498
2442	7	16.590	16.440
2462	11	16.556	16.440

Measurement Data: 802.11n

Frequency (MHz)	Channel No.	Test Results(MHz)	
		6dB Bandwidth	99% Bandwidth
2412	1	17.771	17.656
2442	7	17.829	17.656
2462	11	17.771	17.656

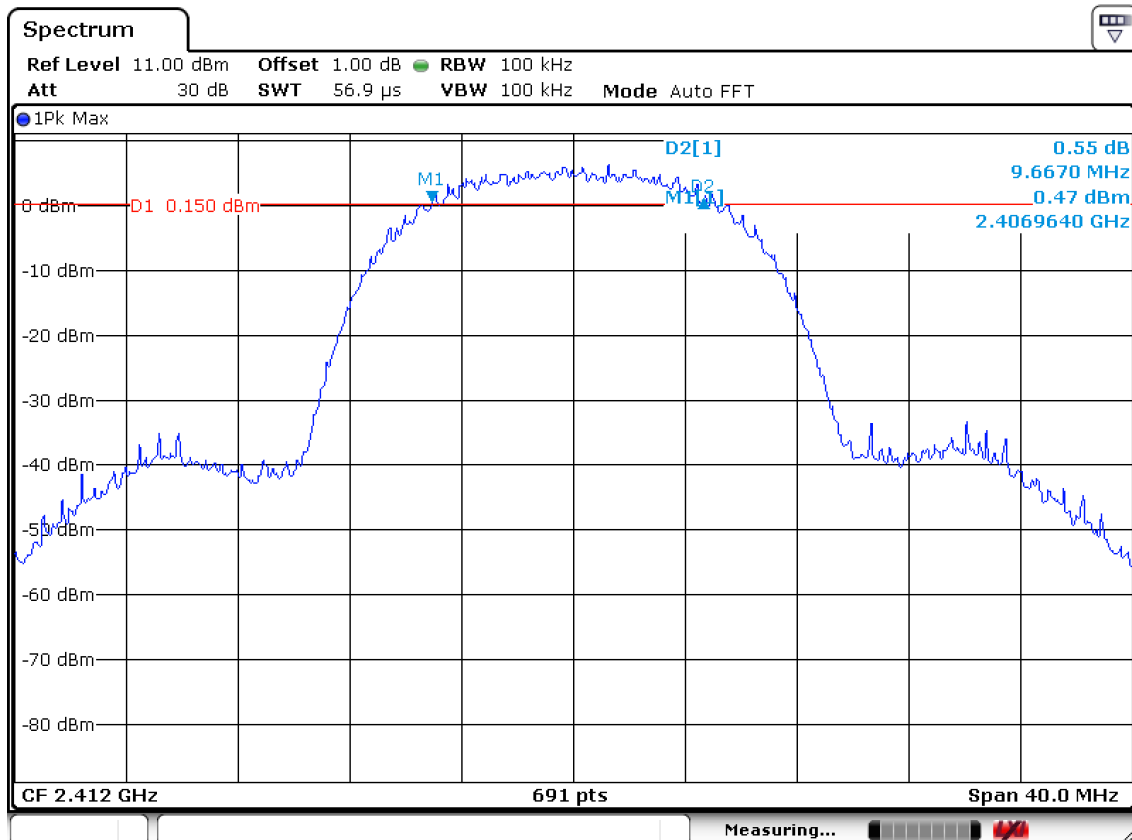
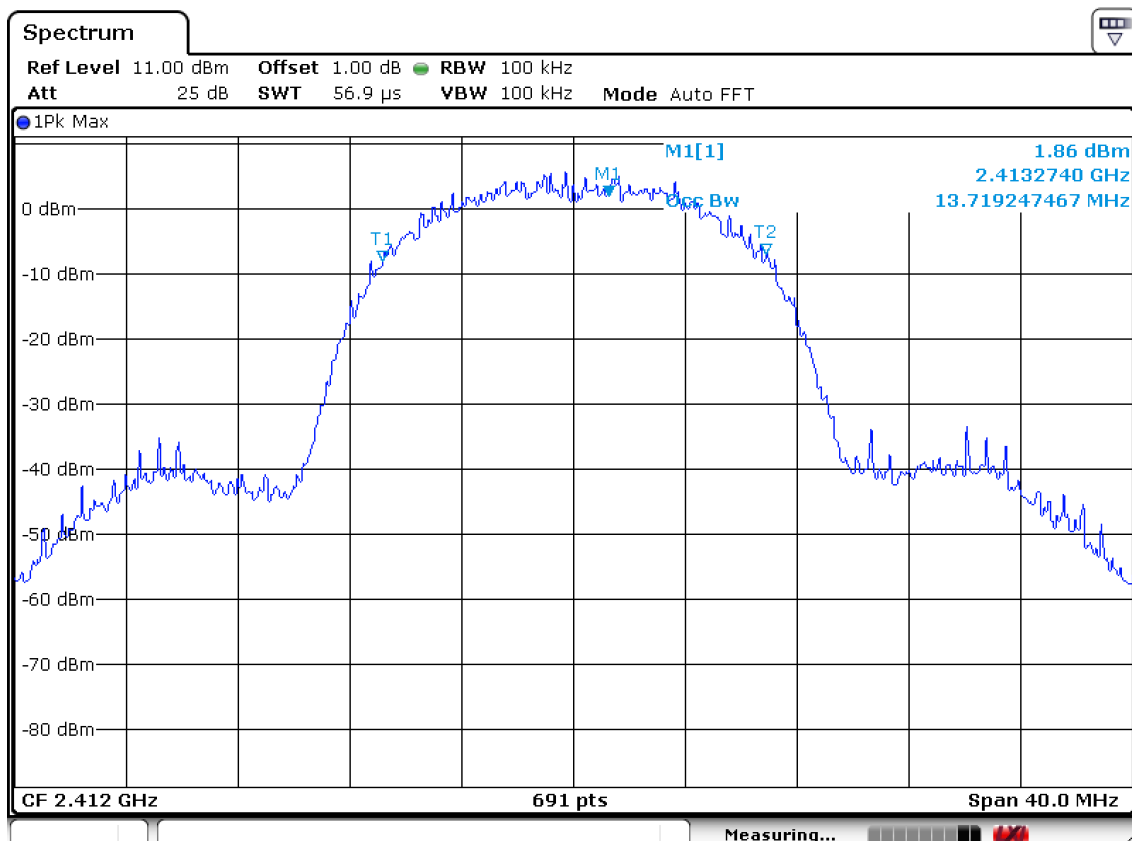
- See next pages for actual measured spectrum plots.

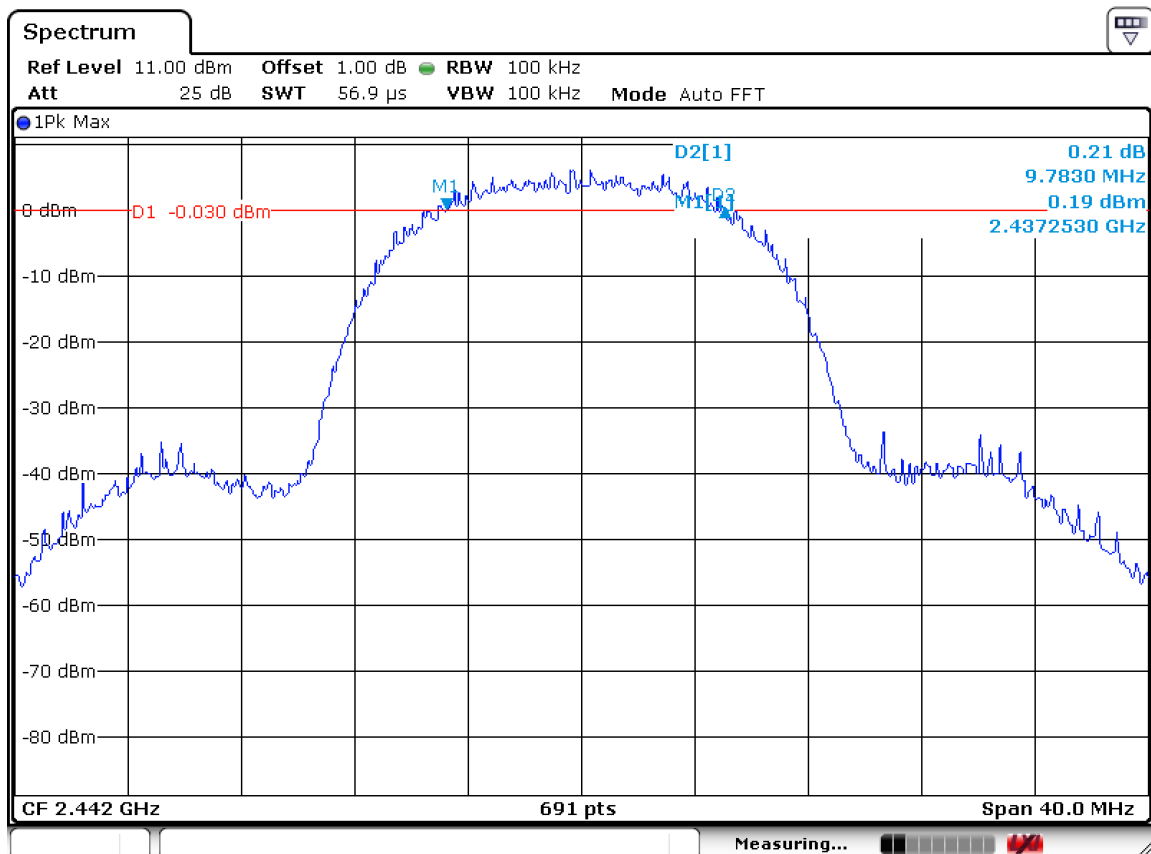
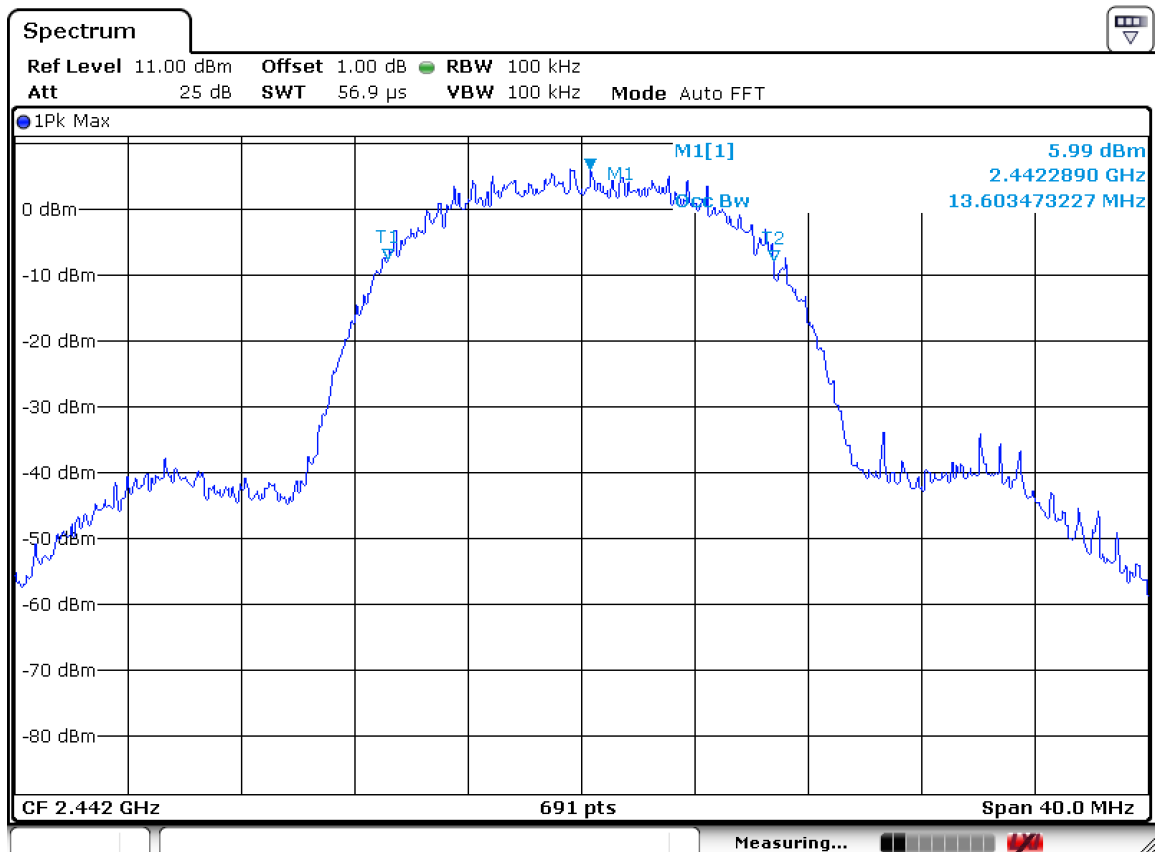
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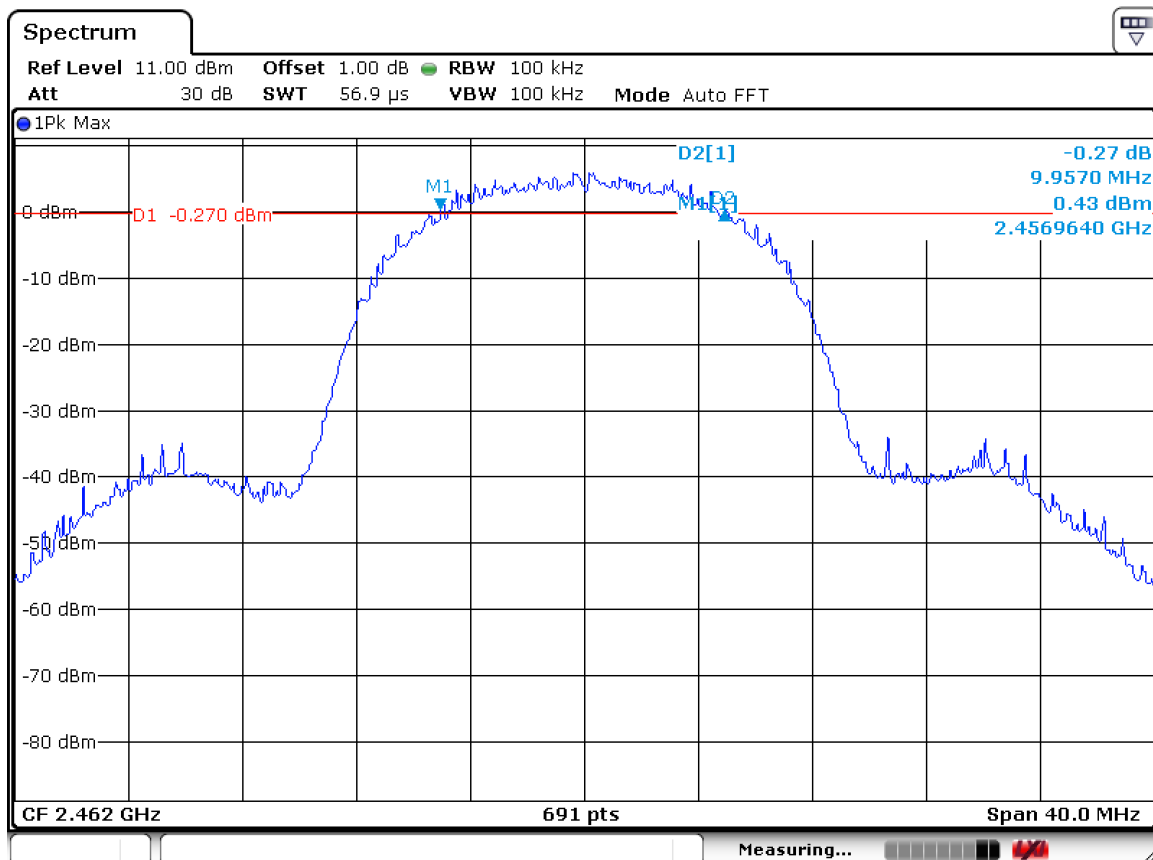
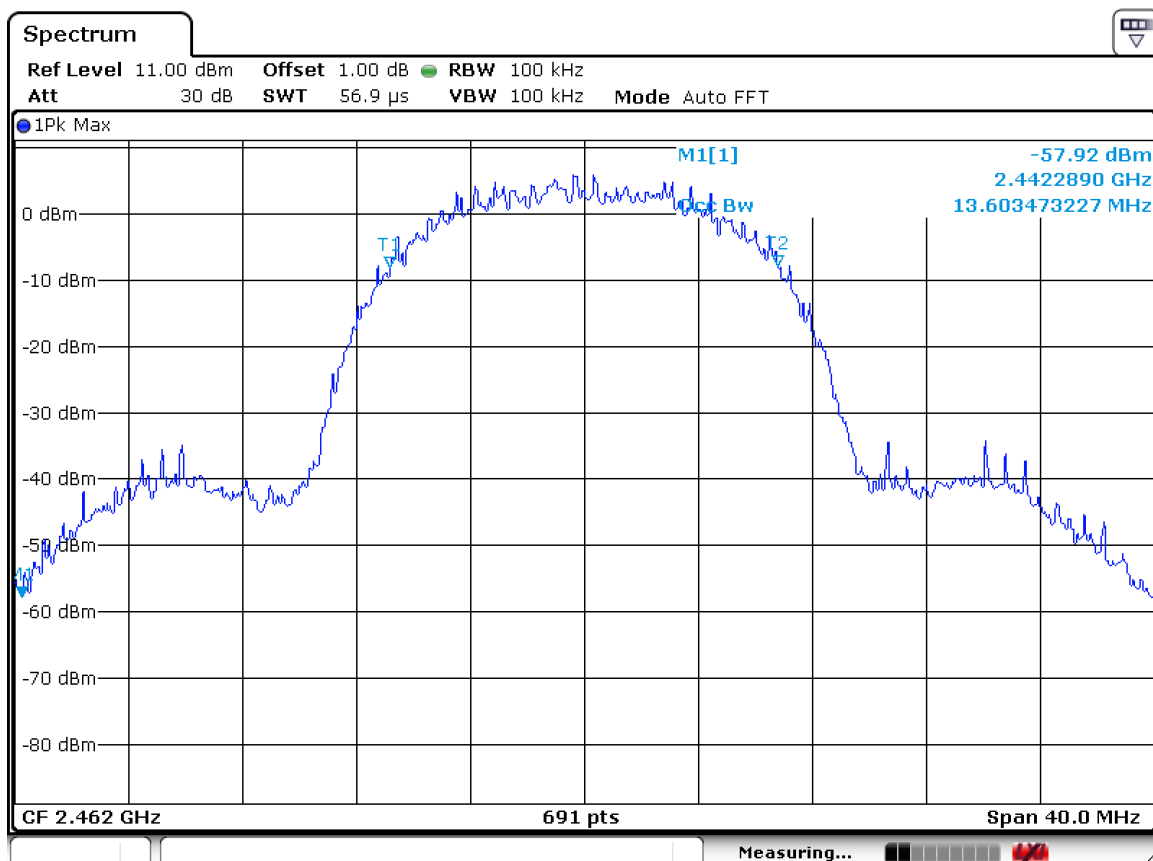
6 dB Bandwidth > 500kHz

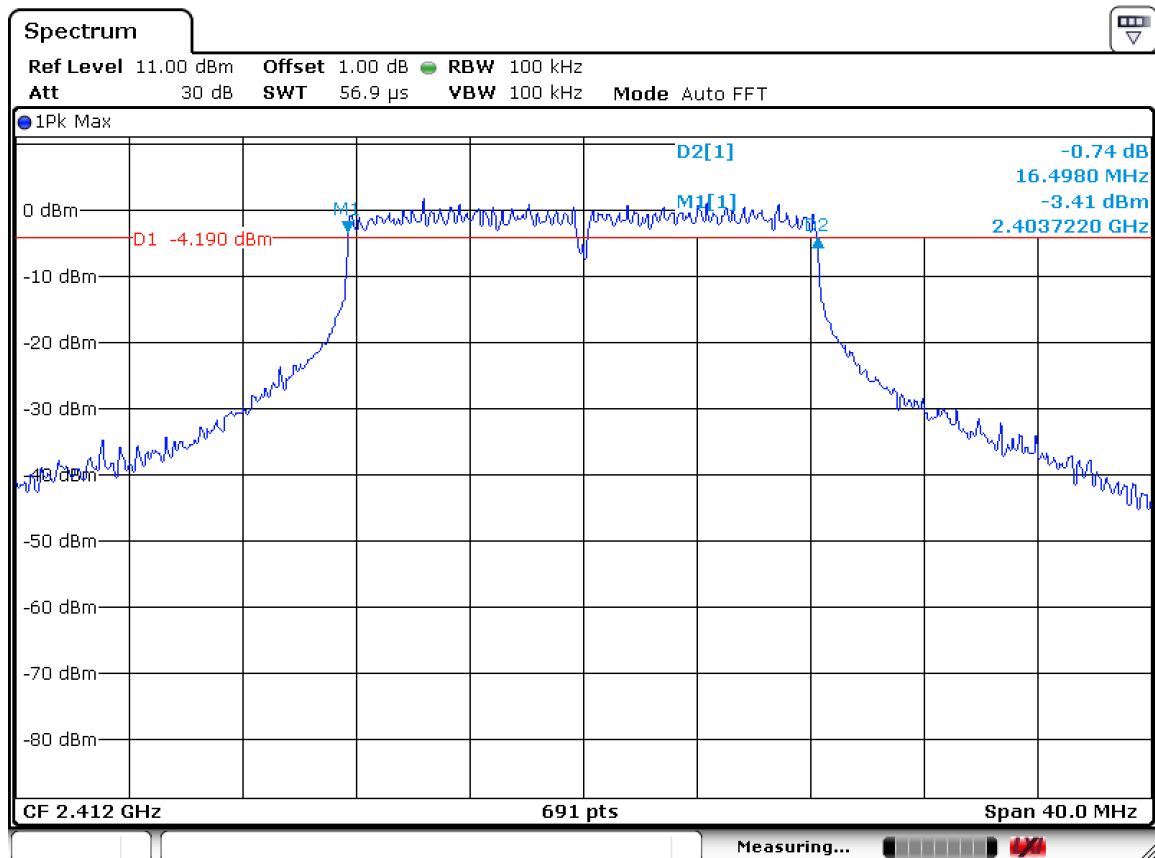
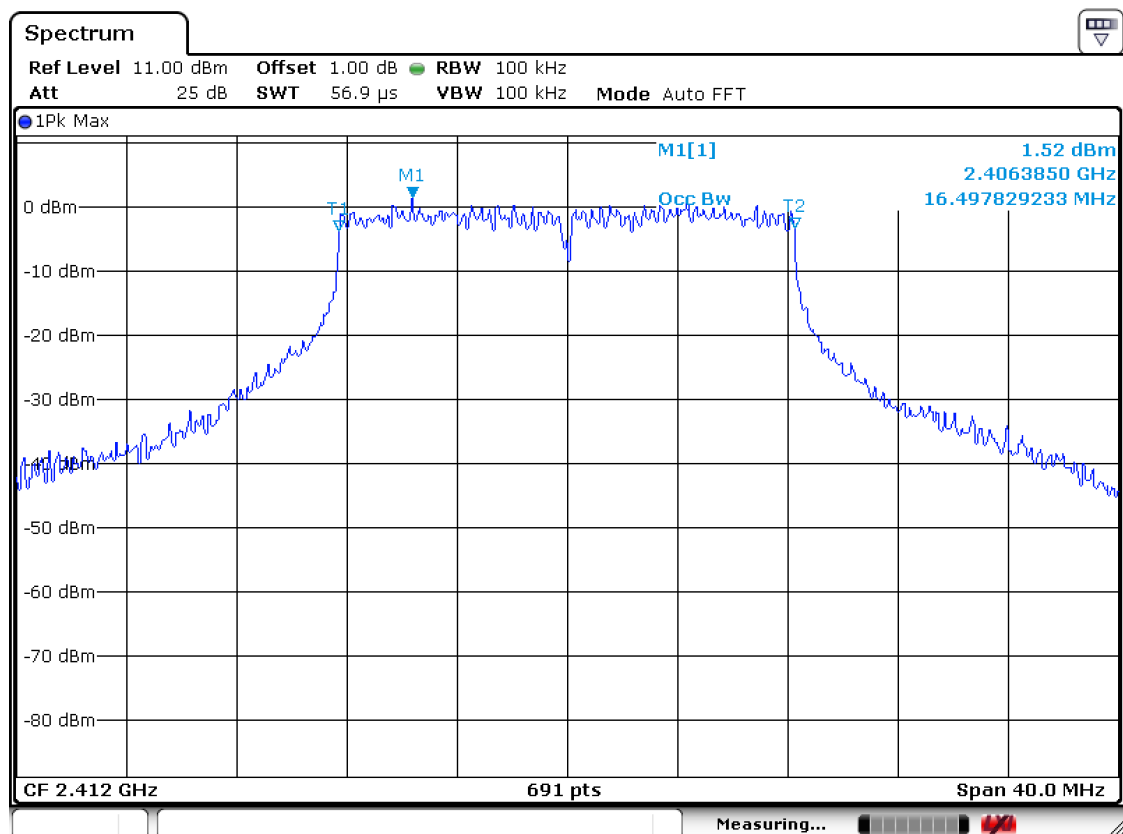
Measurement Setup

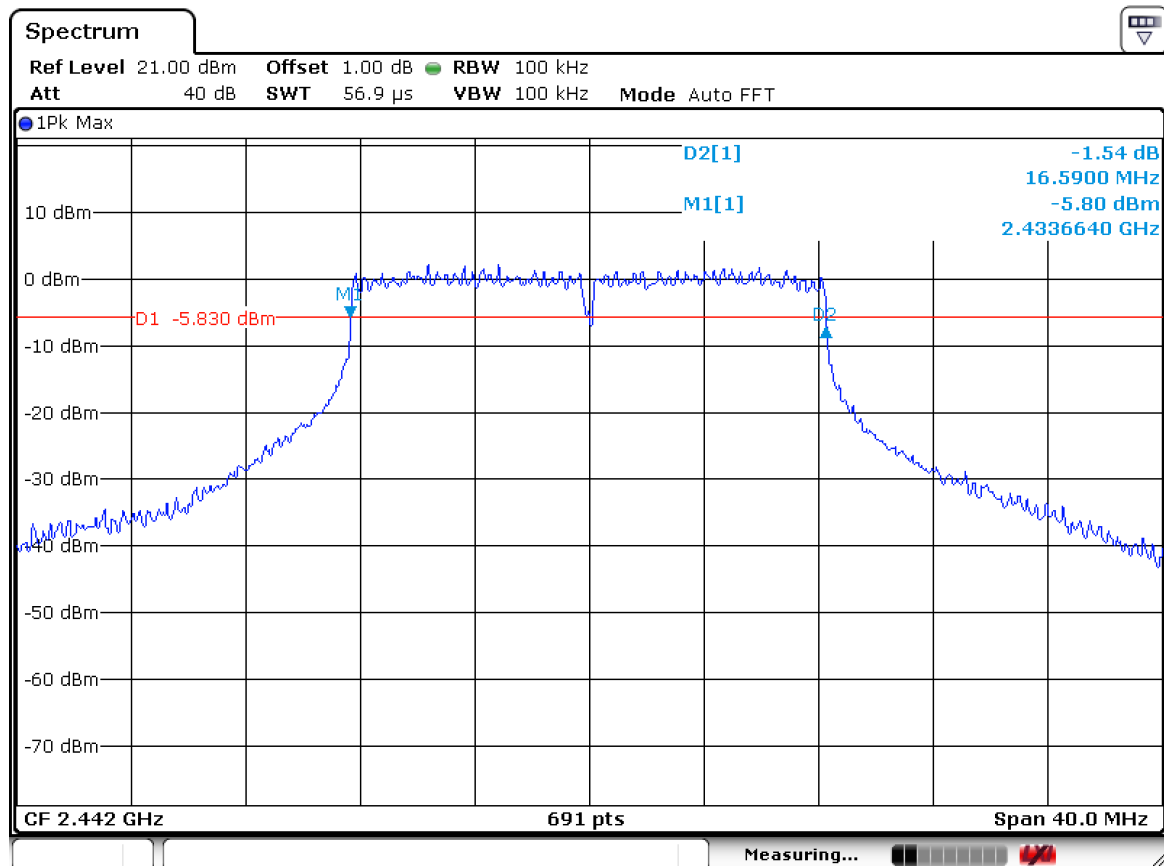
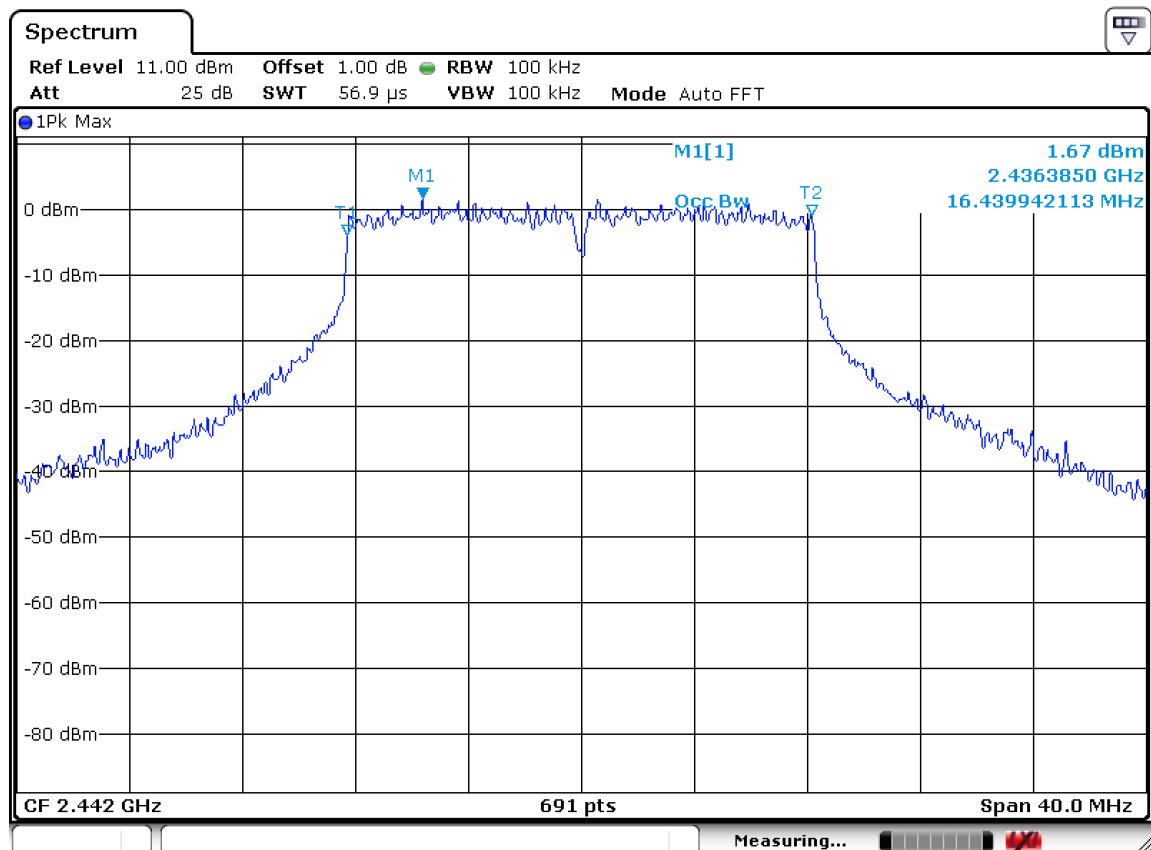
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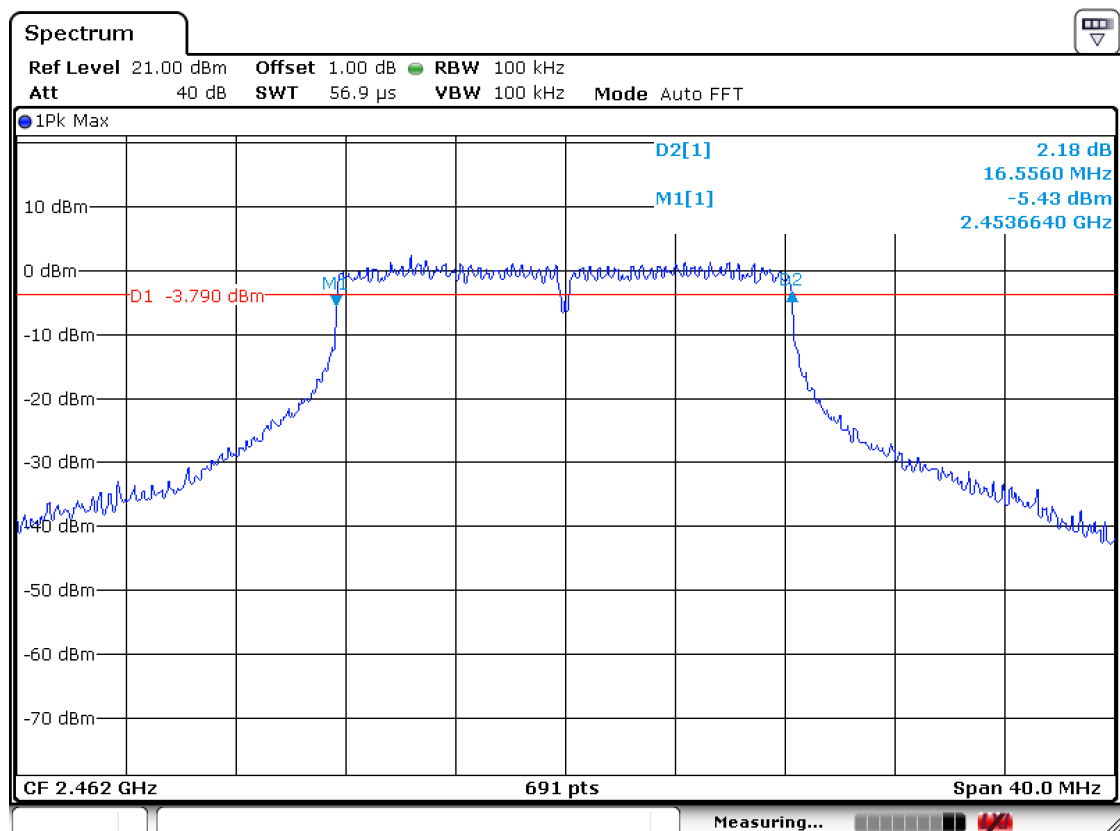
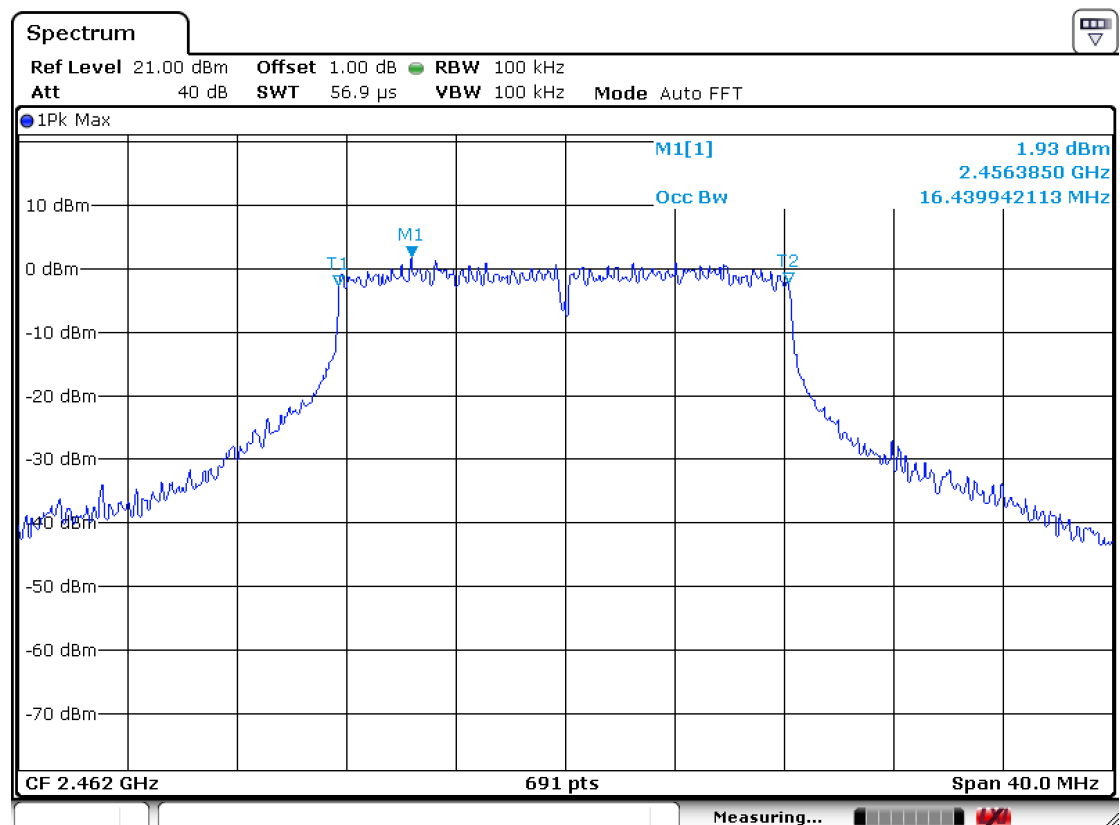
Channel 1 802.11b mode**6dB Bandwidth****99% Bandwidth**

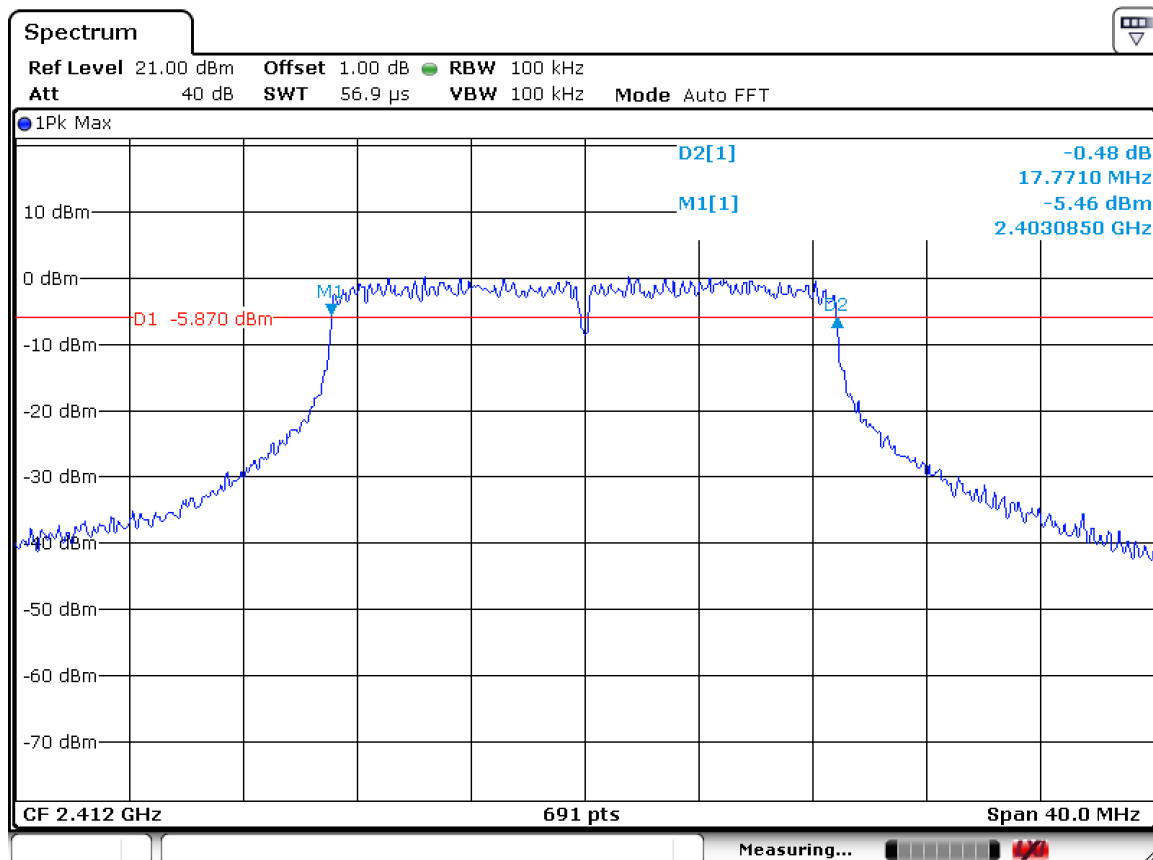
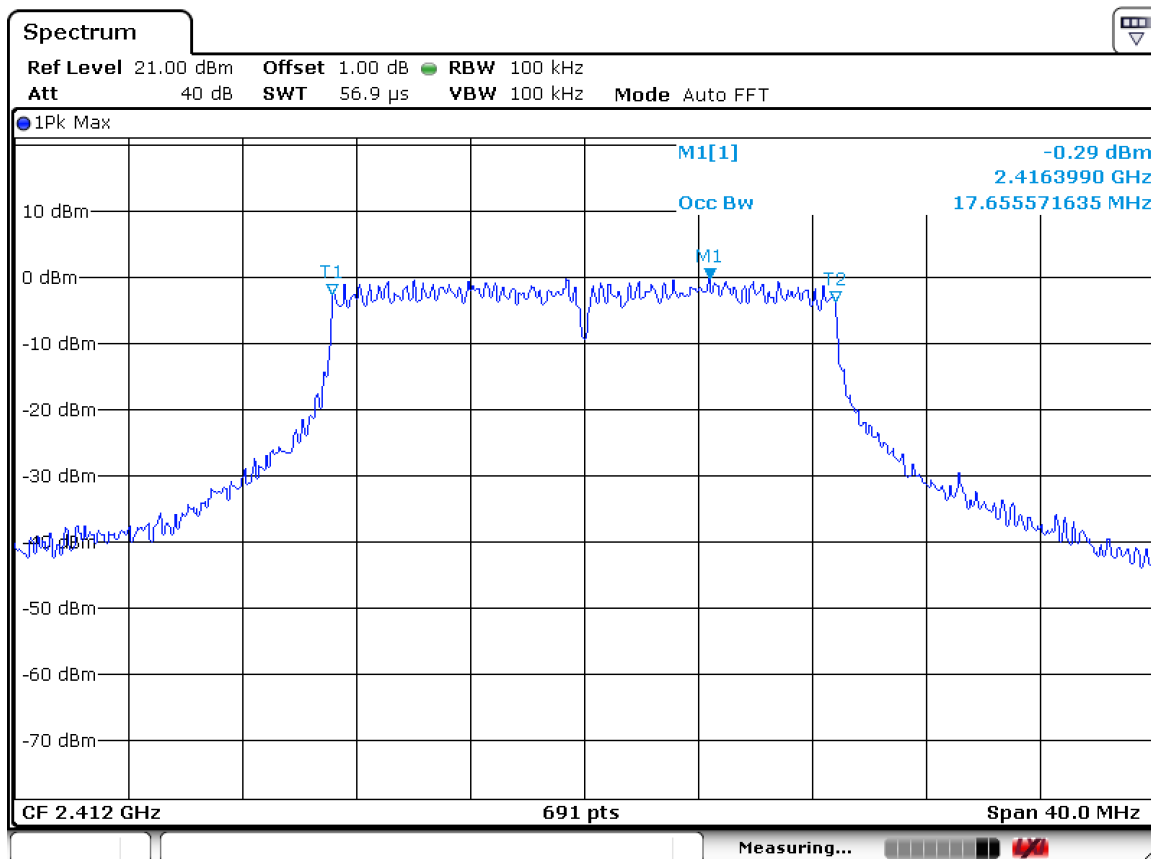
Channel 6 of 802.11b mode**6 dB Bandwidth****99% Bandwidth**

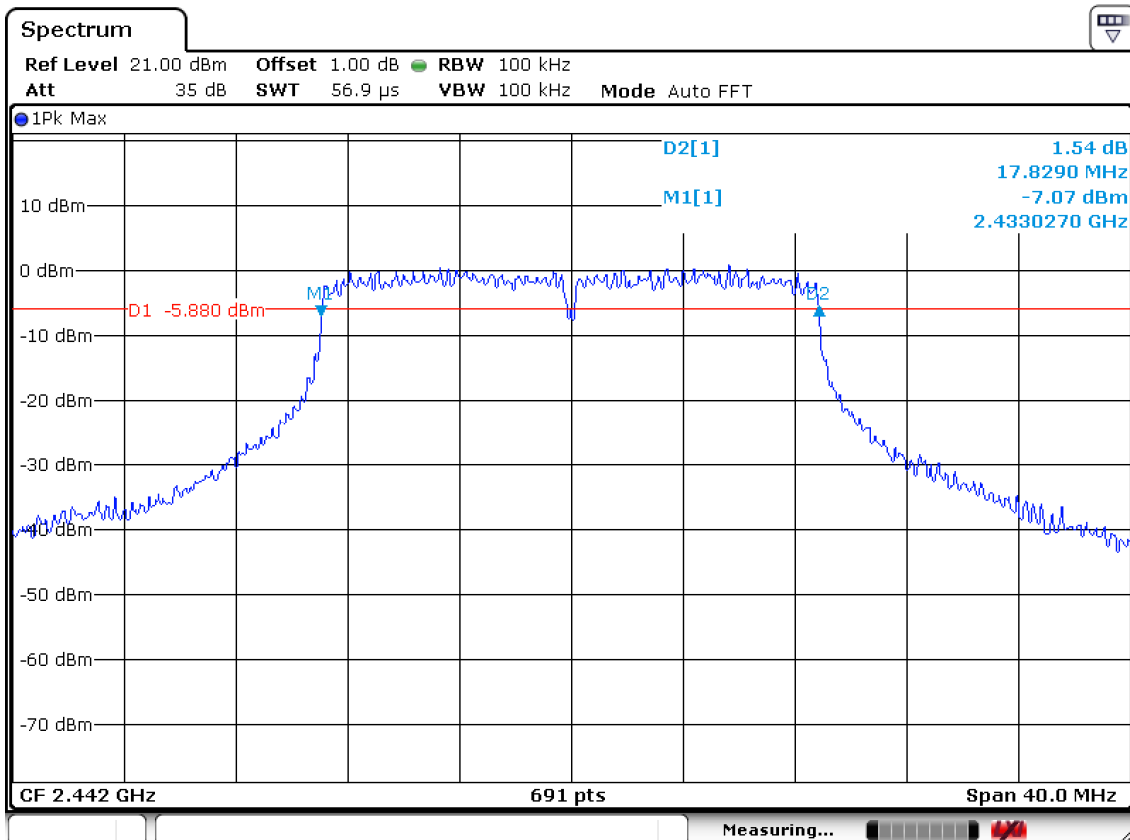
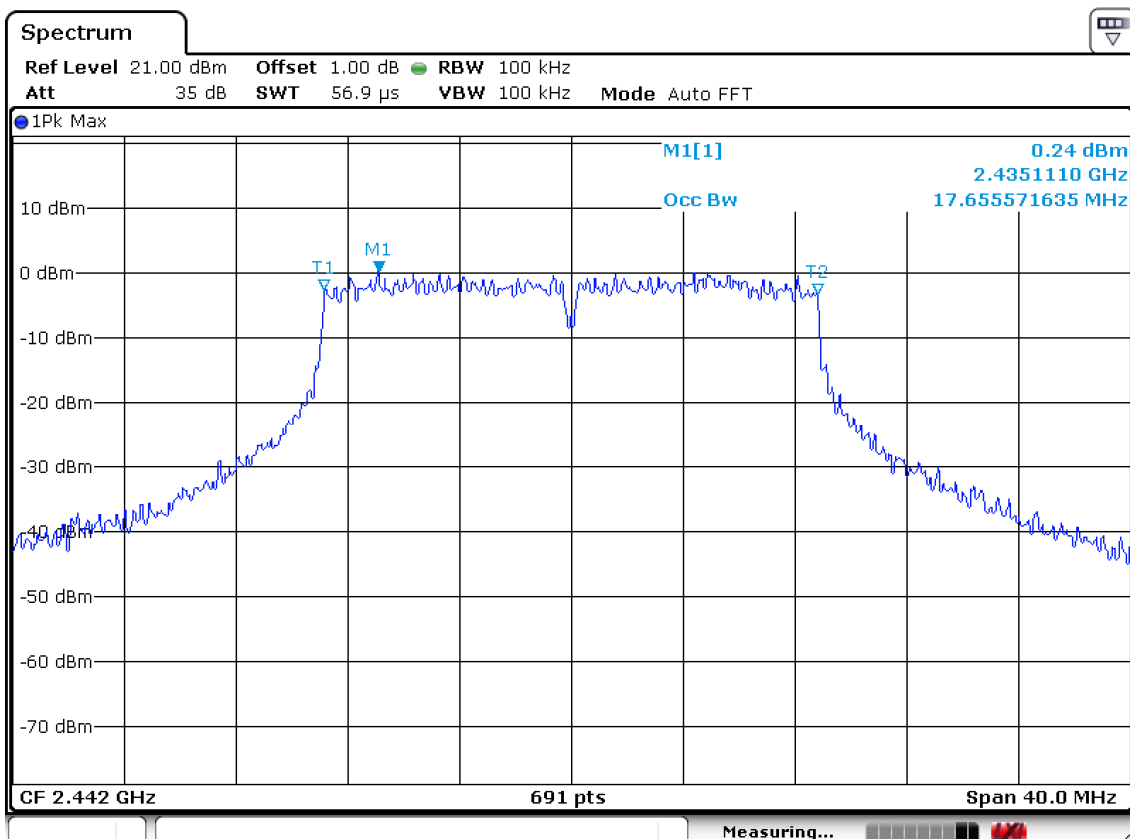
Channel 11 of 802.11b mode**6 dB Bandwidth****99% Bandwidth**

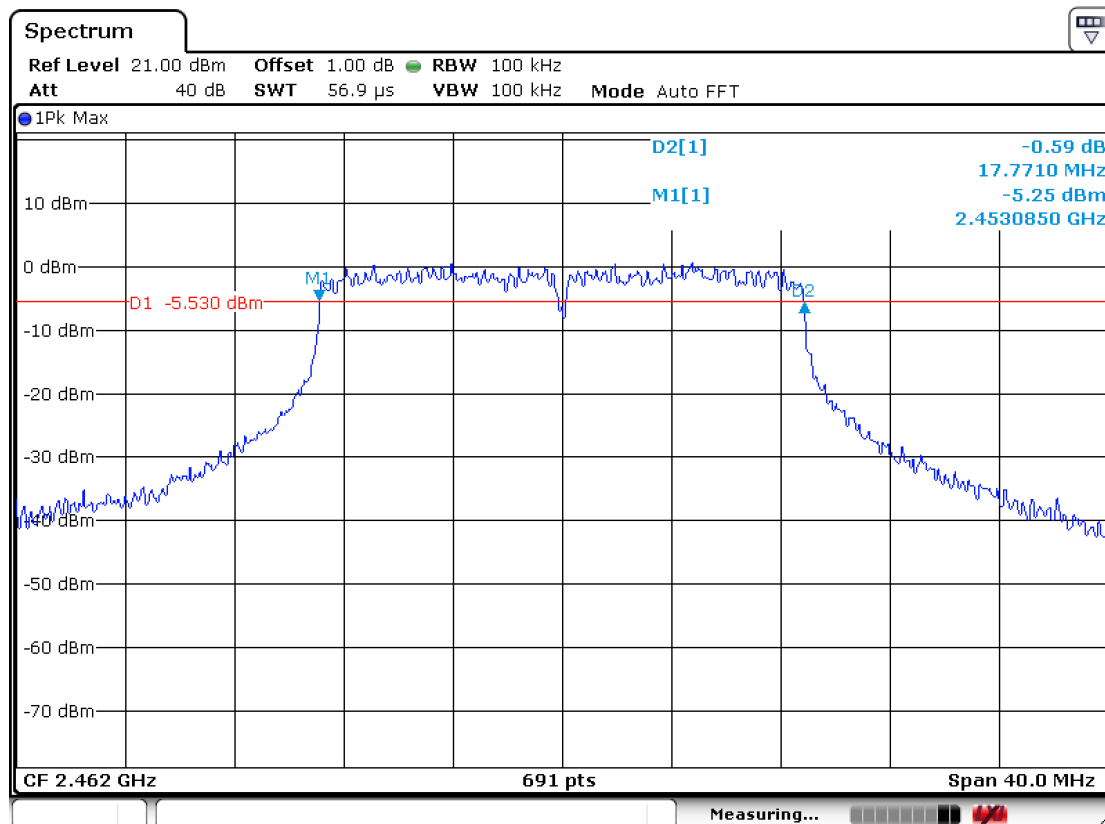
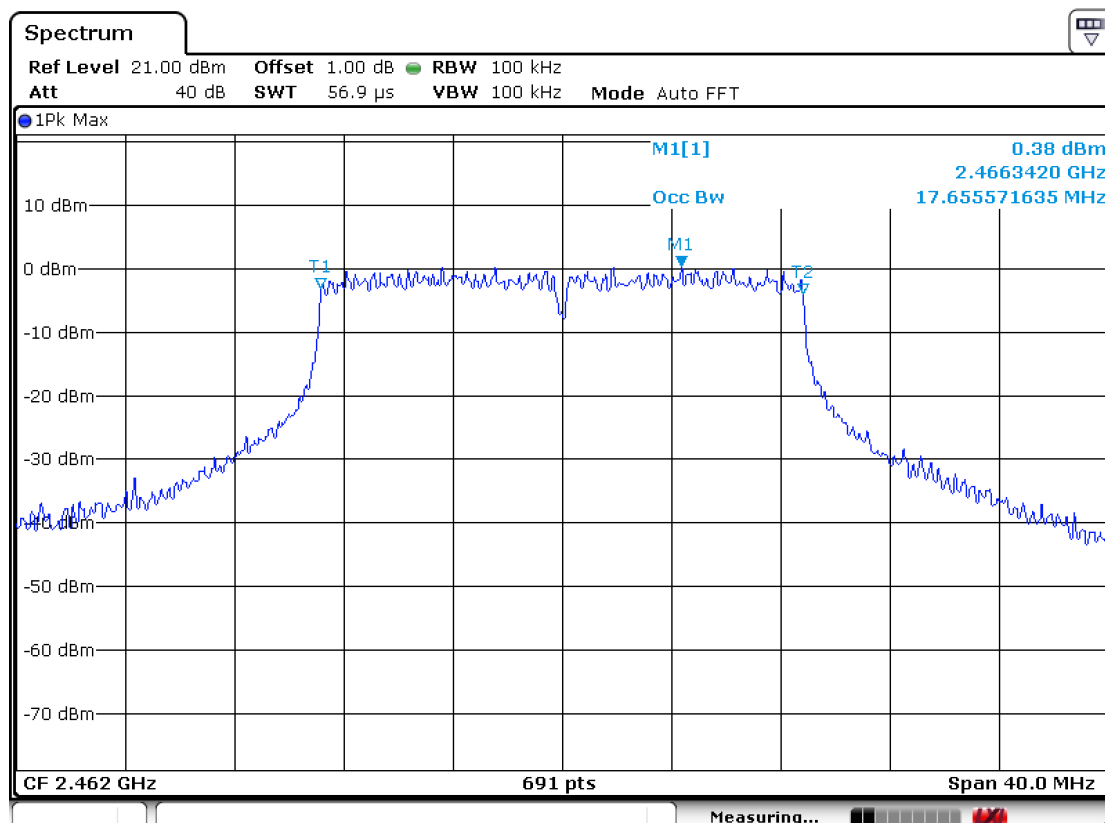
Channel 1 of 802.11g mode**6 dB Bandwidth****99% Bandwidth**

Channel 7 of 802.11g mode**6 dB Bandwidth****99% Bandwidth**

Channel 11 of 802.11g mode**6 dB Bandwidth****99% Bandwidth**

Channel 1 of 802.11n mode**6 dB Bandwidth****99% Bandwidth**

Channel 7 of 802.11n mode**6 dB Bandwidth****99% Bandwidth**

Channel 11 of 802.11n mode**6 dB Bandwidth****99% Bandwidth**

3.2.2 Peak Output Power Measurement

Procedure:

*The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance and TCB Workshop 2012, April. The maximum peak output power was measured with the spectrum analyzer connected to the antenna output of the EUT. The spectrum analyzer's internal channel power integration function is used to integrate the power over a bandwidth greater than or equal to the 99% bandwidth. The EUT was operating in transmit mode at the appropriate center frequency.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

RBW = 1MHz

Span = auto

VBW = 3MHz (VBW \geq RBW)

Sweep = auto

Detector function = peak

Measurement Data:

Mode	Frequency (MHz)	Channel No.	Test Results	
			Measured Data (dBm)	Result
802.11b	2412	1	20.53	Complies
	2442	7	20.92	Complies
	2462	11	20.86	Complies
802.11g	2412	1	22.09	Complies
	2442	7	21.94	Complies
	2462	11	21.97	Complies
802.11n	2412	1	20.87	Complies
	2442	7	20.79	Complies
	2462	11	20.62	Complies

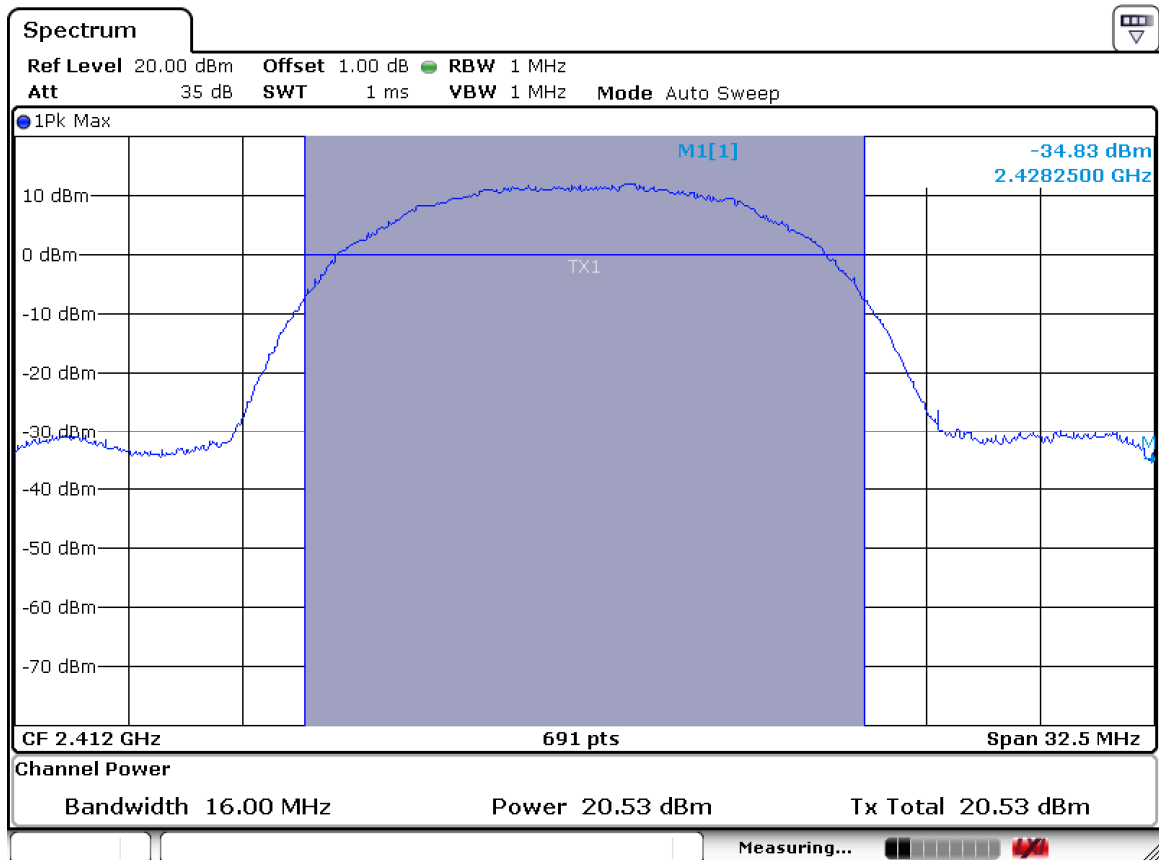
- See next pages for actual measured spectrum plots.

Minimum Standard:

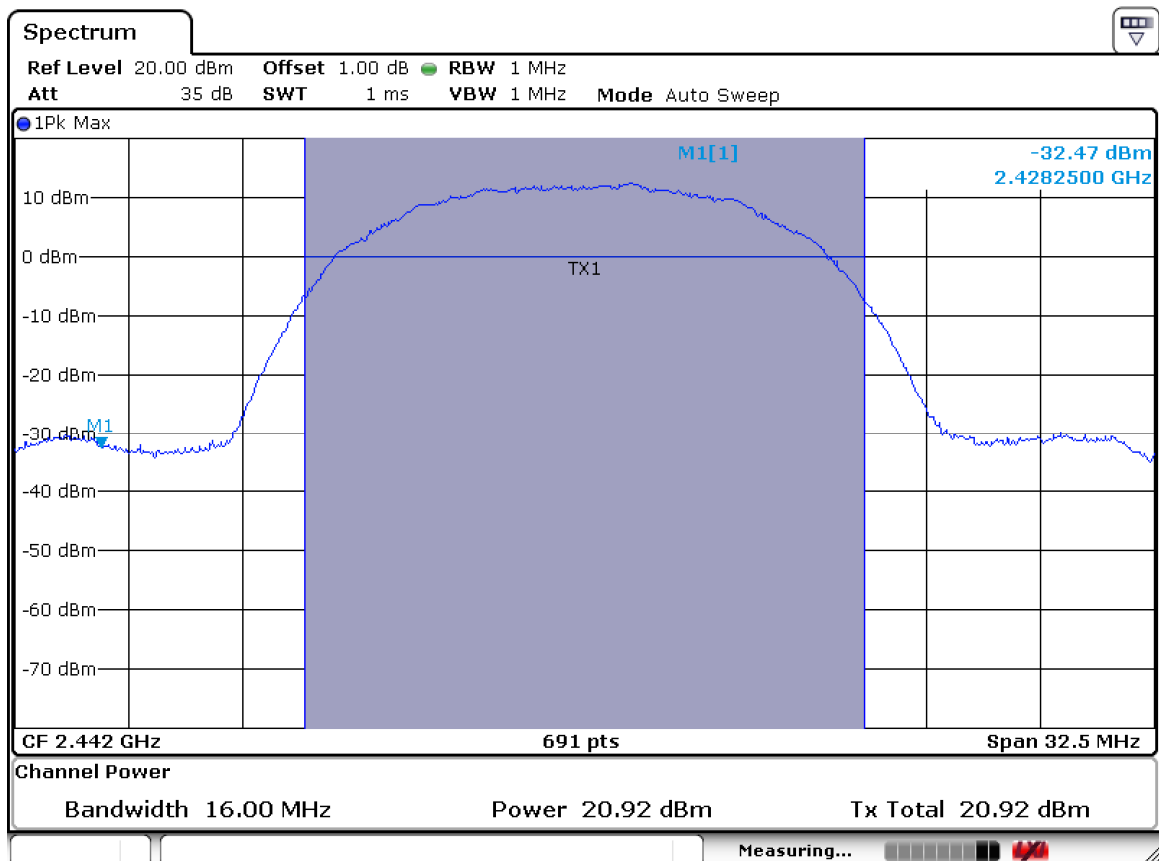
Peak output power	< 1W
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802.11b

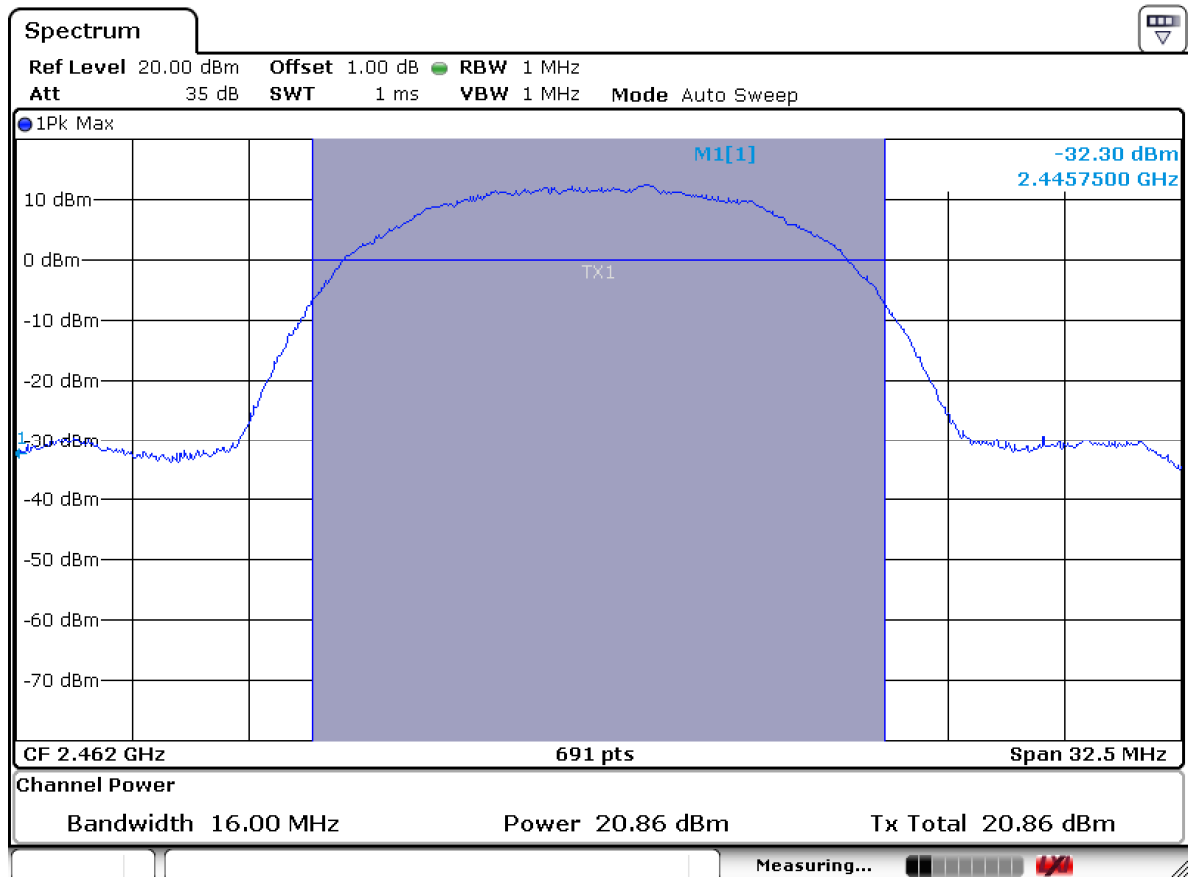
CH 1



CH 7

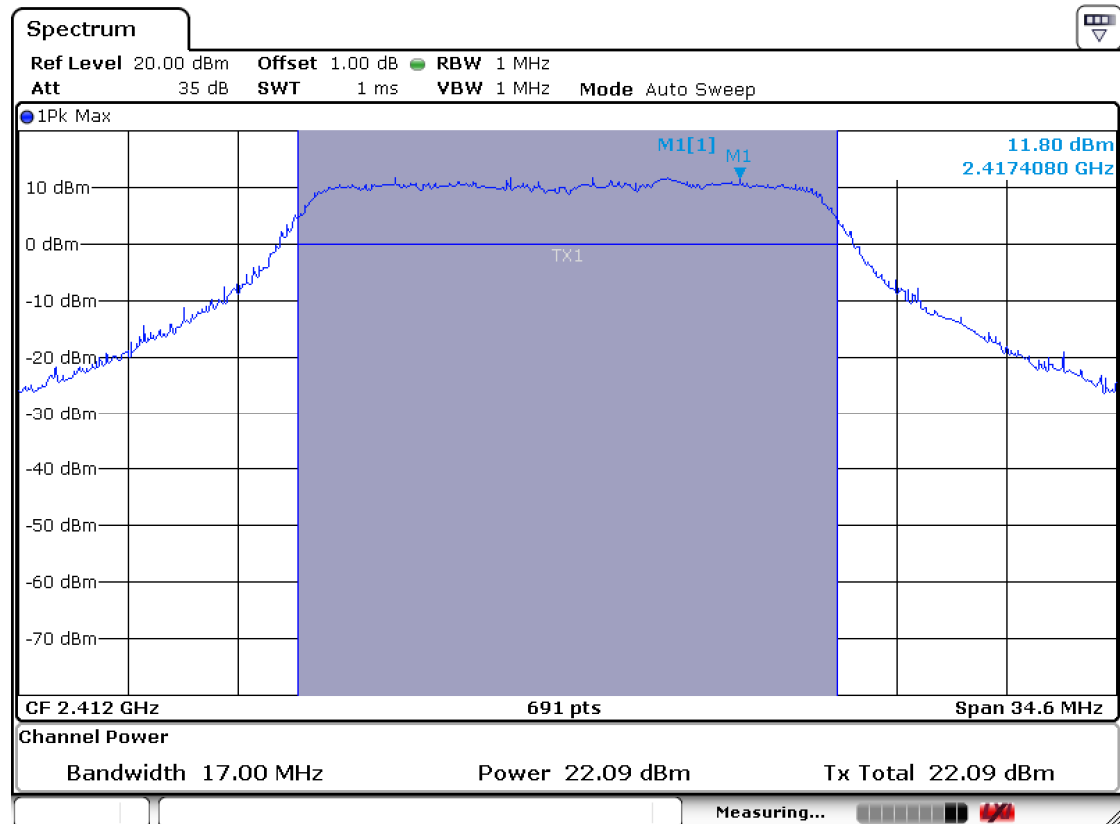


CH 11

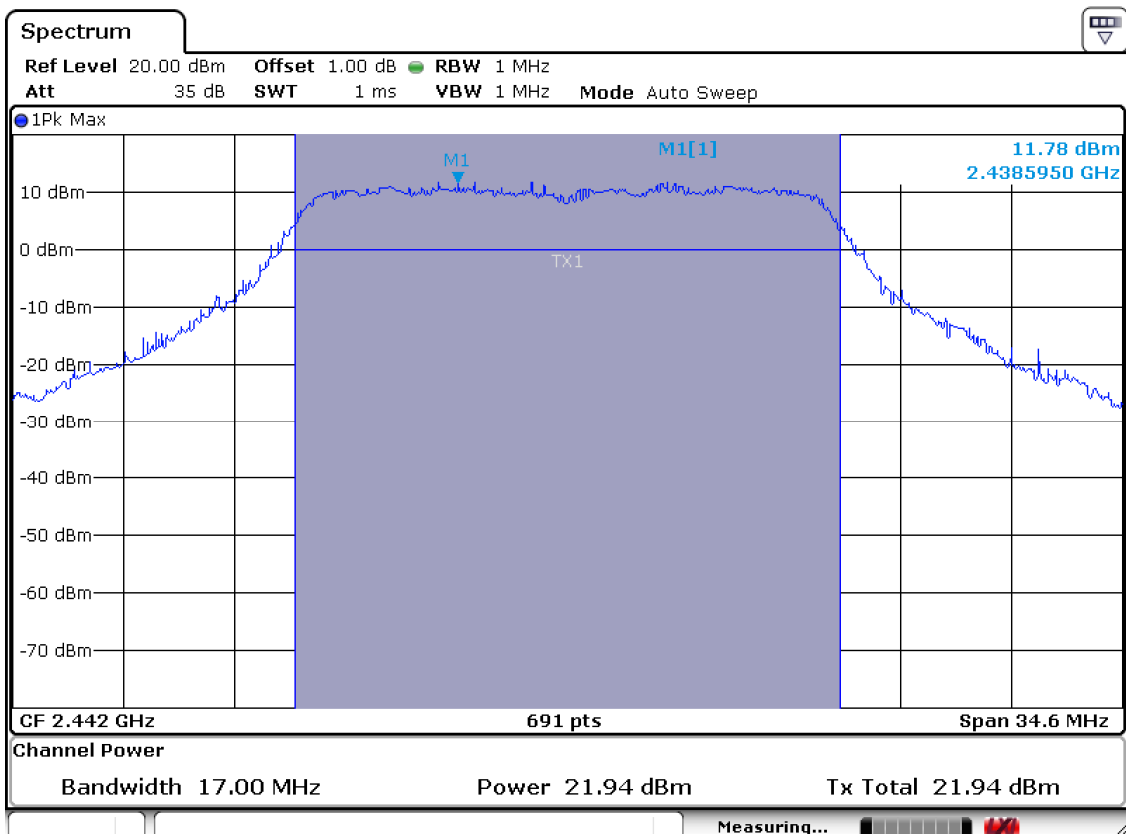


802.11g

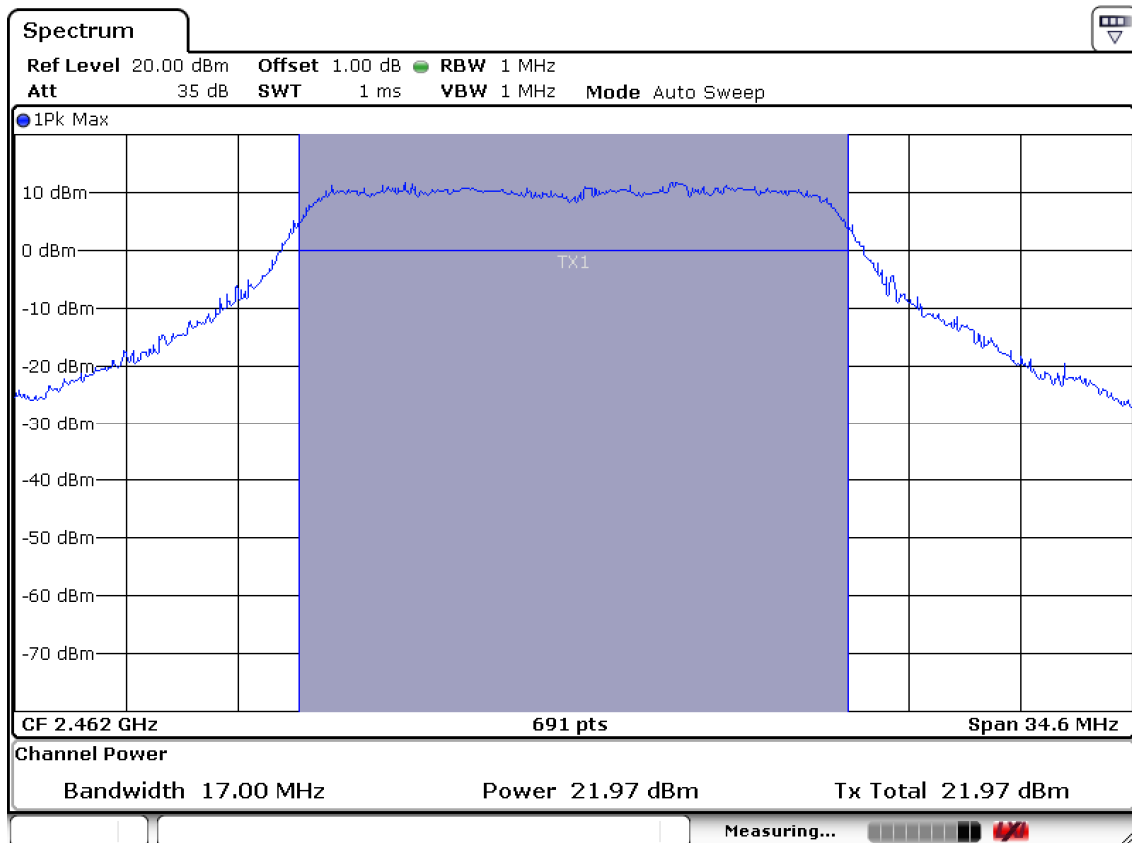
CH 1



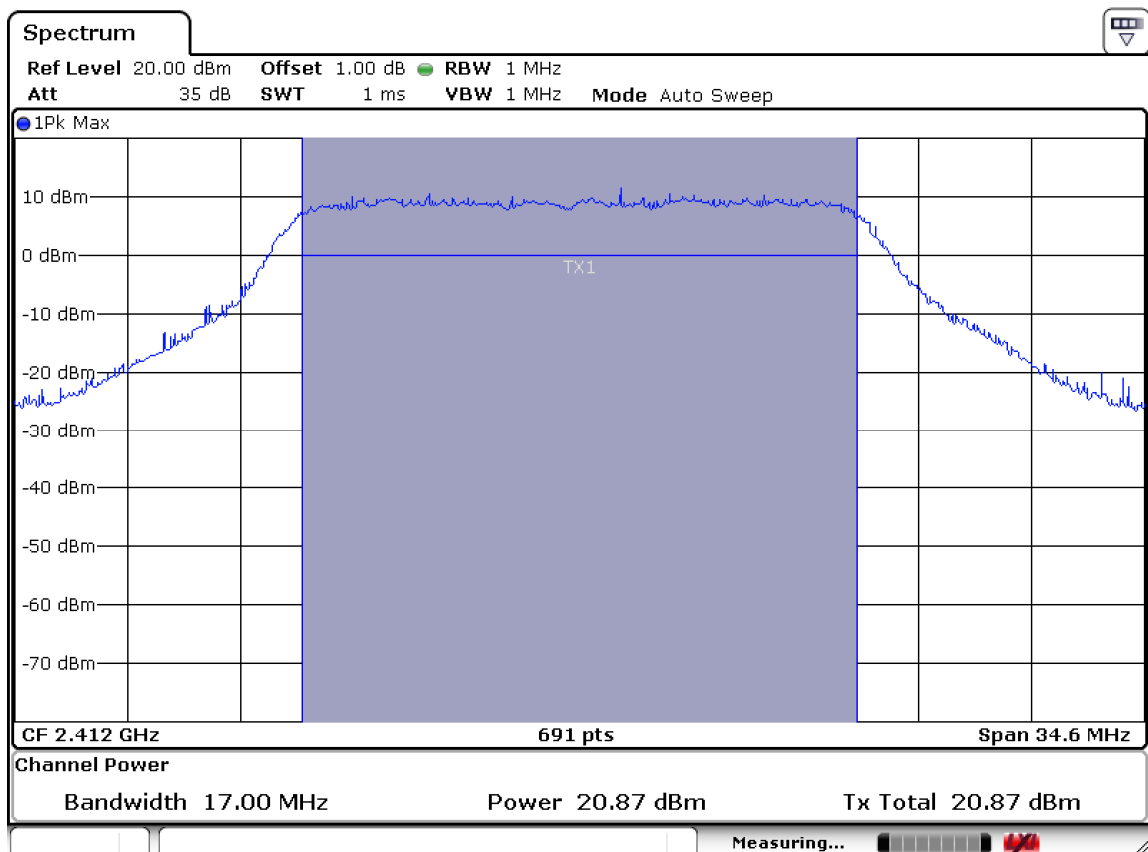
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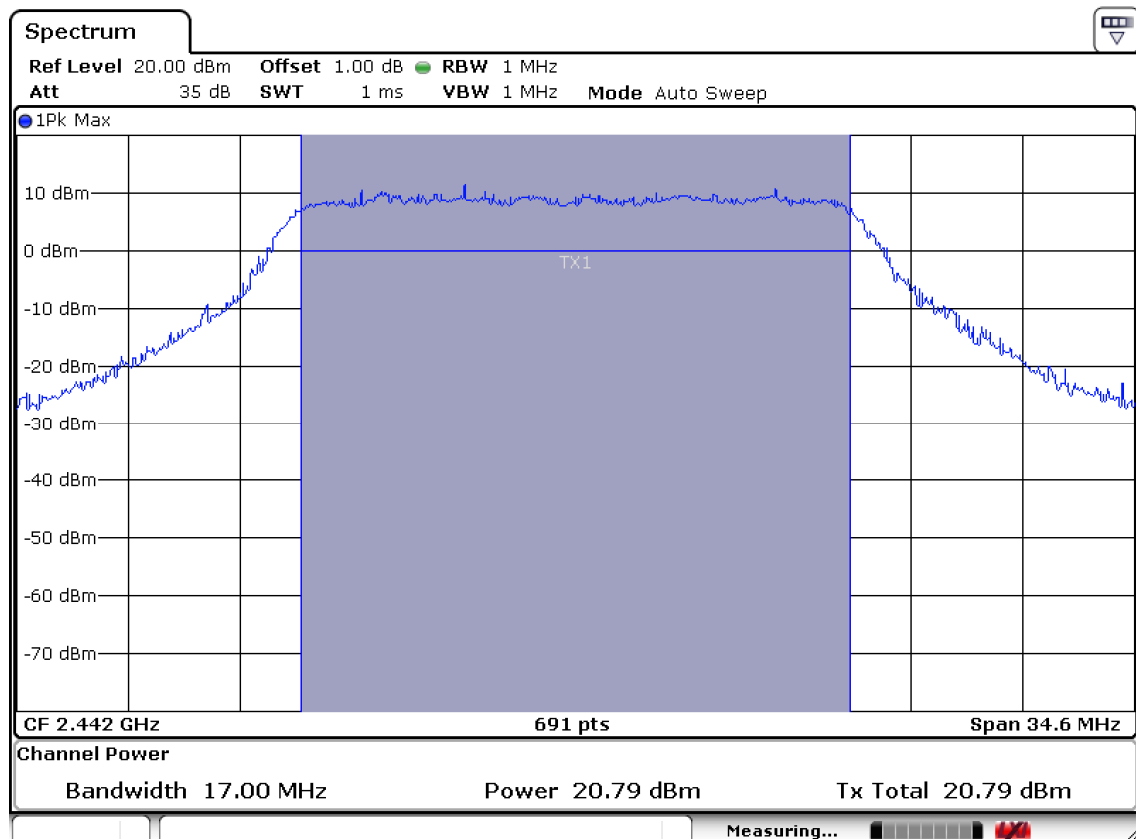
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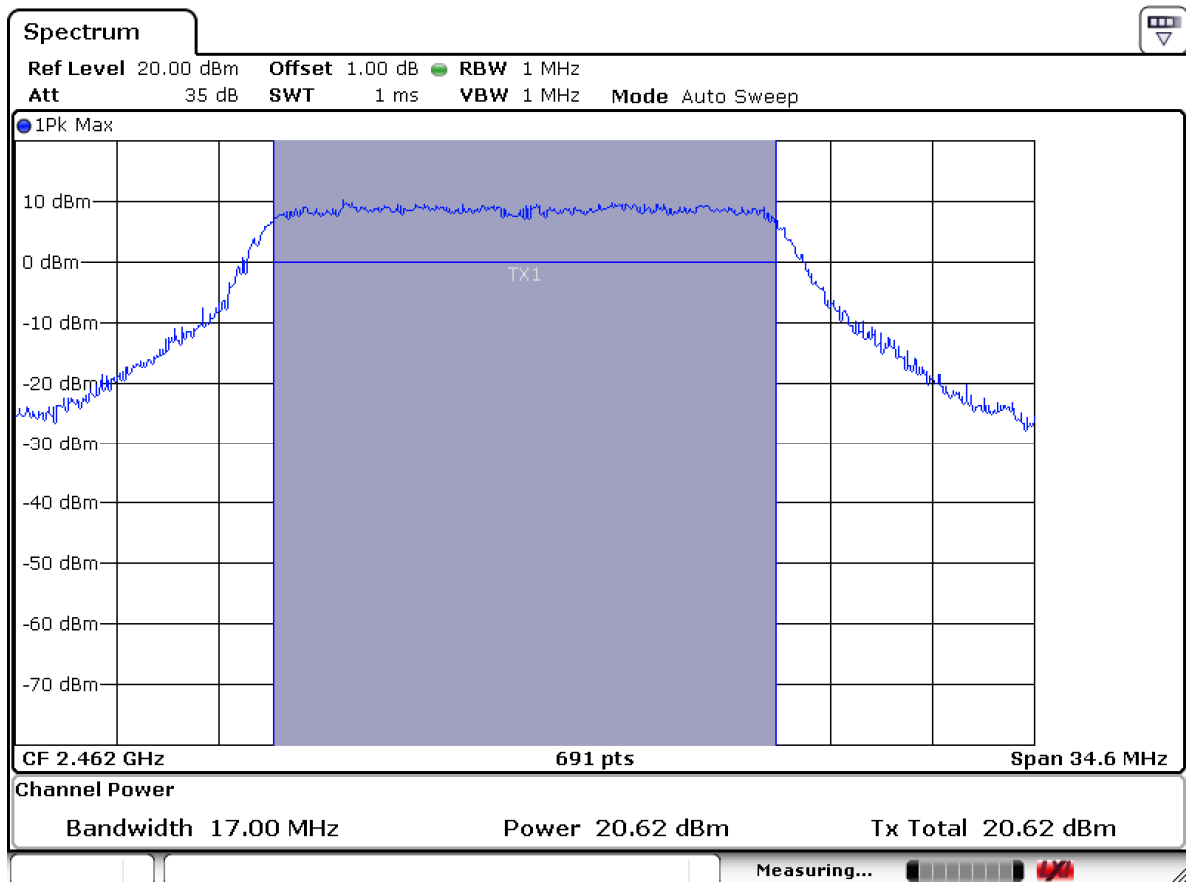
802.11n CH 1



CH 7



CH 11



3.2.3 Power Spectral Density

Procedure:

*The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance and TCB Workshop 2012, April.

The peak power density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies.

The spectrum analyzer is set to:

RBW = 3 kHz

Span = 300 kHz

VBW = 3 kHz

Sweep = 100 sec

Detector function = peak

Trace = max hold

Measurement Data:

Mode	Frequency (MHz)	Ch.	Test Results	
			dBm	Result
802.11b	2412	1	-7.42	Complies
	2442	7	-7.49	Complies
	2462	11	-6.91	Complies
802.11b	2412	1	-12.52	Complies
	2442	7	-11.25	Complies
	2462	11	-11.92	Complies
802.11n	2412	1	-14.76	Complies
	2442	7	-12.86	Complies
	2462	11	-11.58	Complies

- See next pages for actual measured spectrum plots.

Minimum Standard:

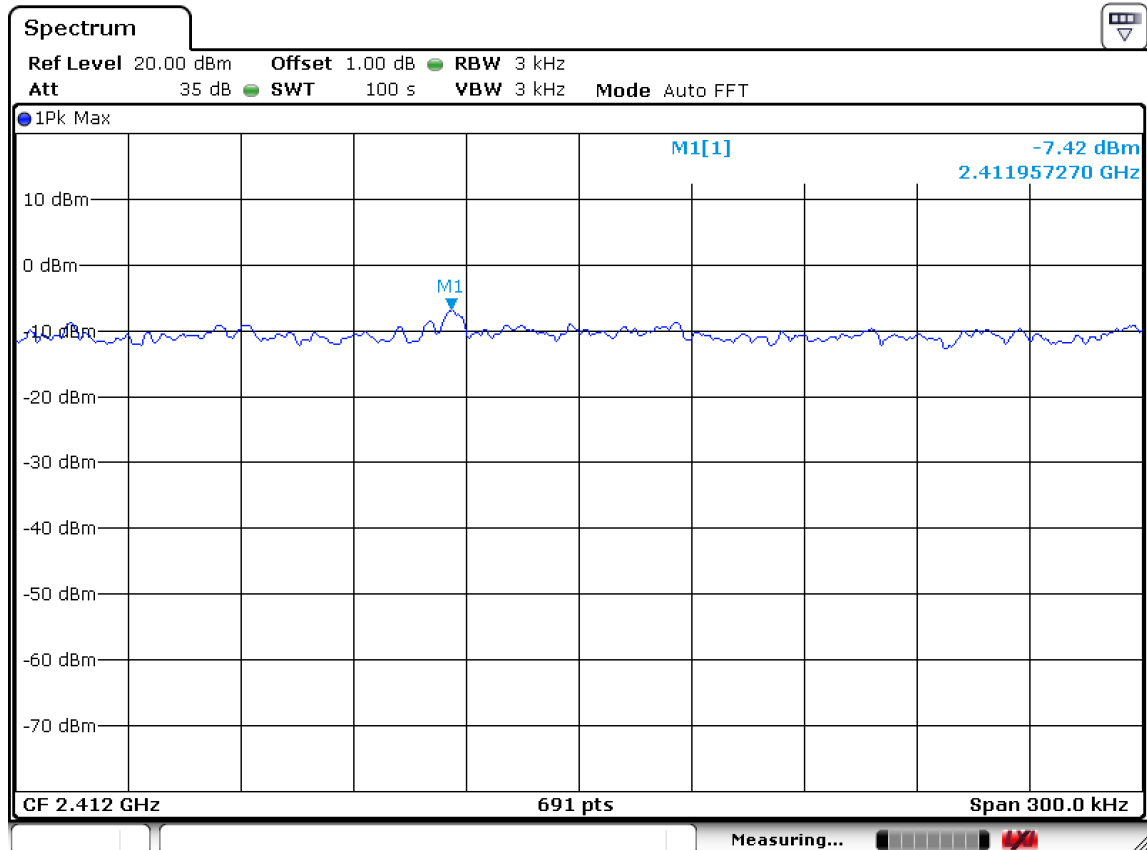
Power Spectral Density	< 8dBm @ 3kHz BW
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Measurement Setup

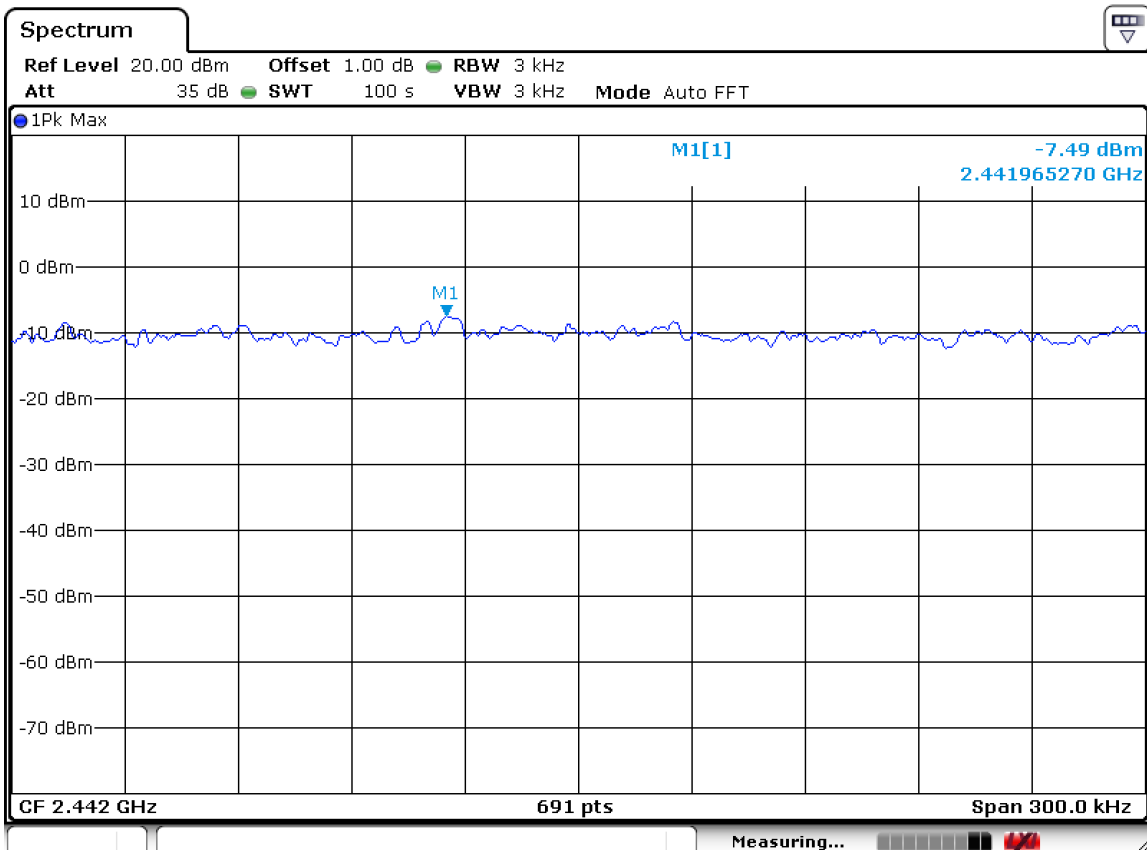
Same as the Chapter 3.2.1 (Figure 1)

802.11b Power Density Measurement

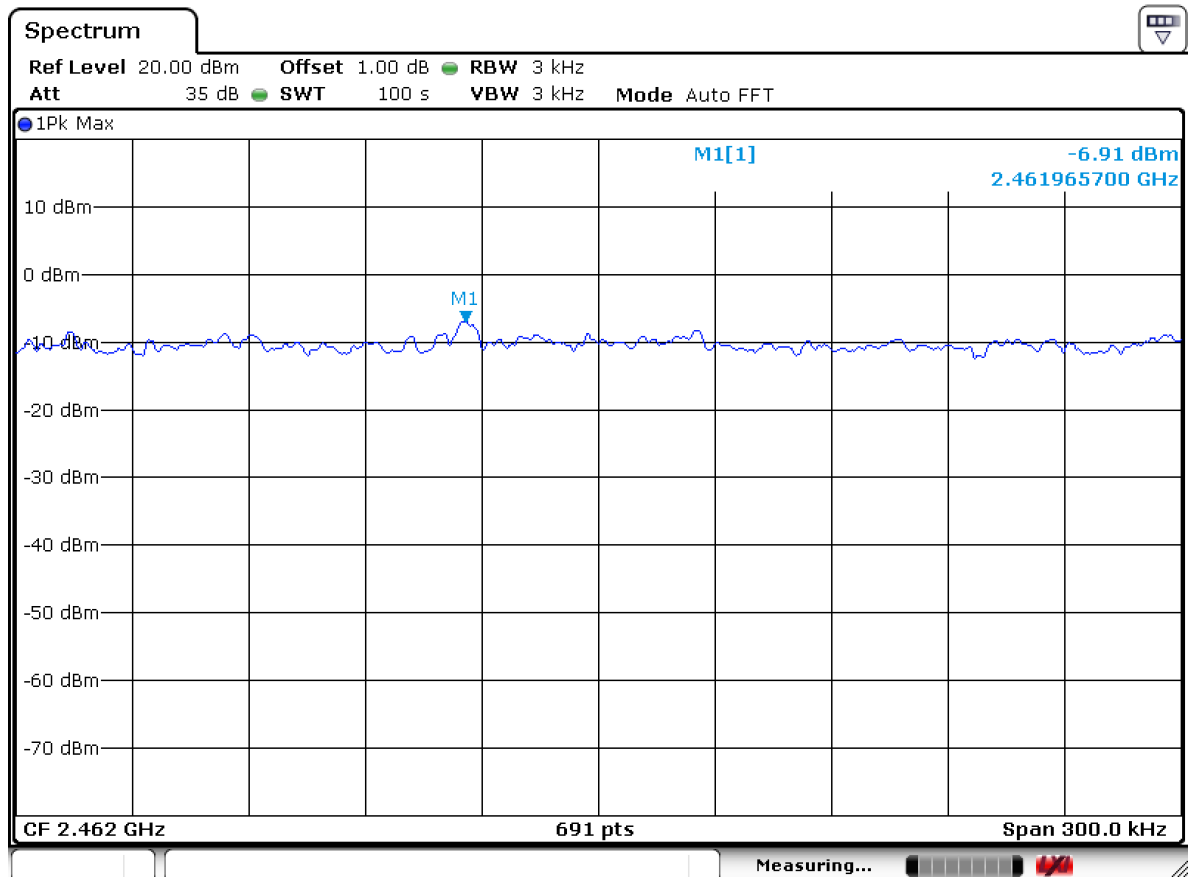
CH 1



CH 7

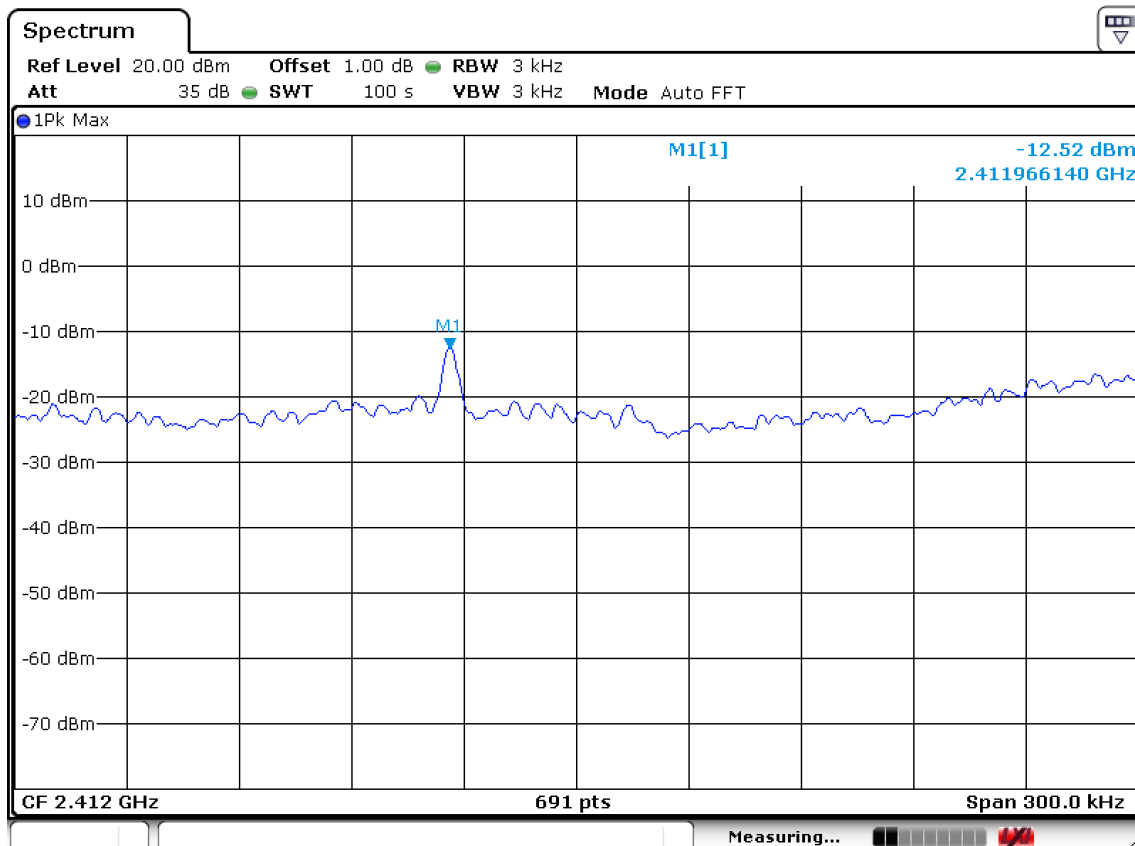


CH 11

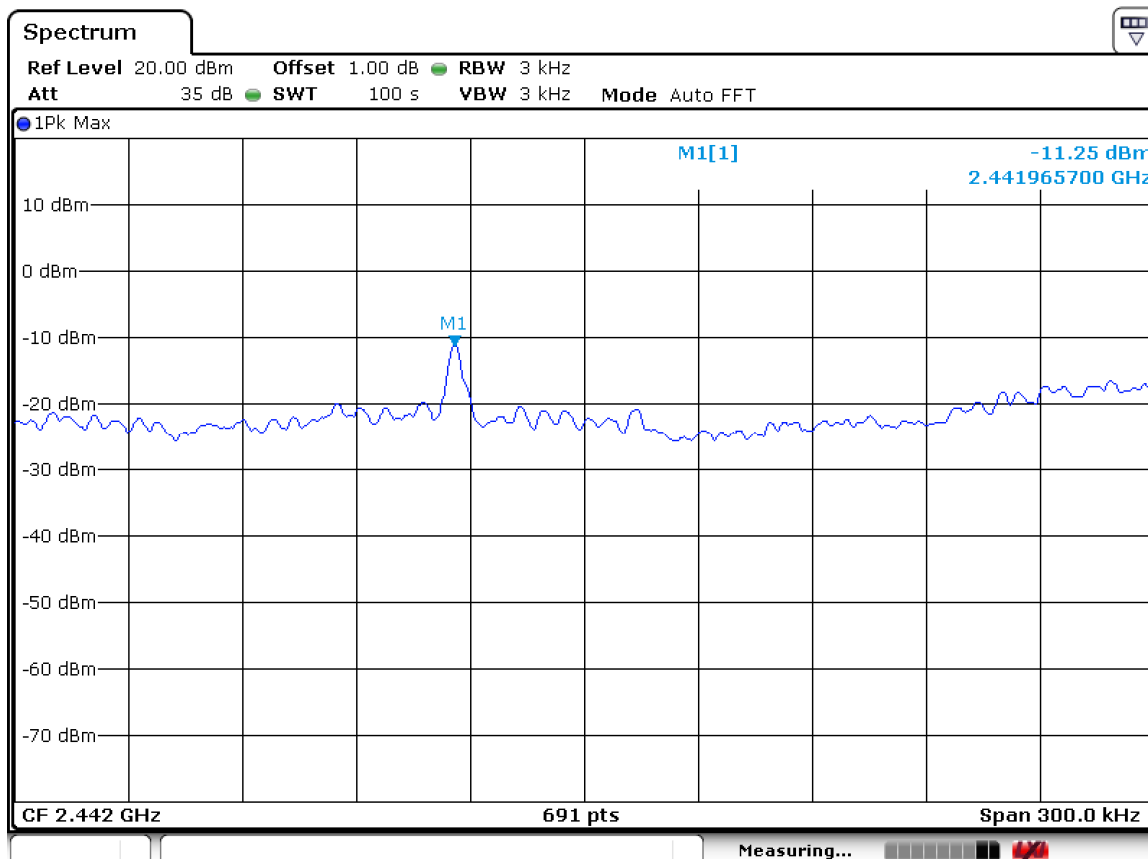


802.11g Power Density Measurement

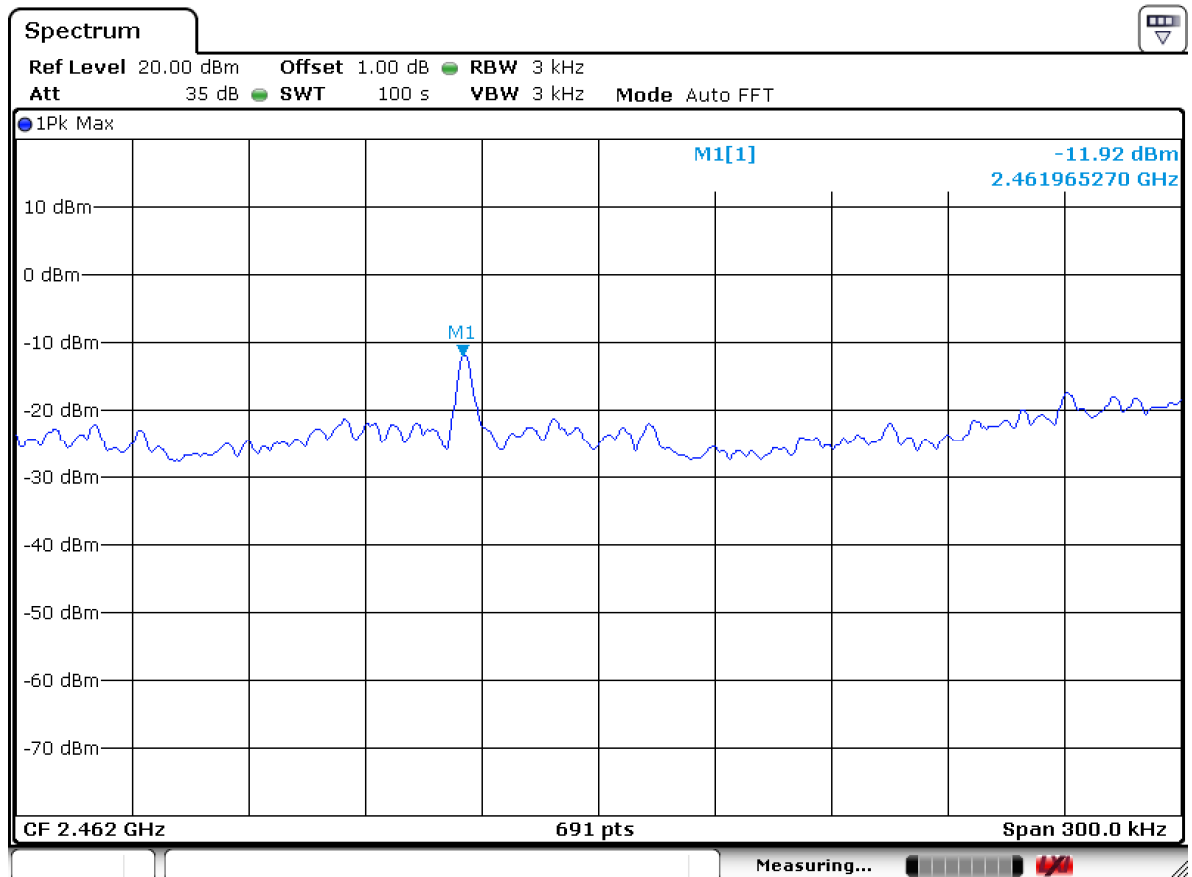
CH 1



CH 7

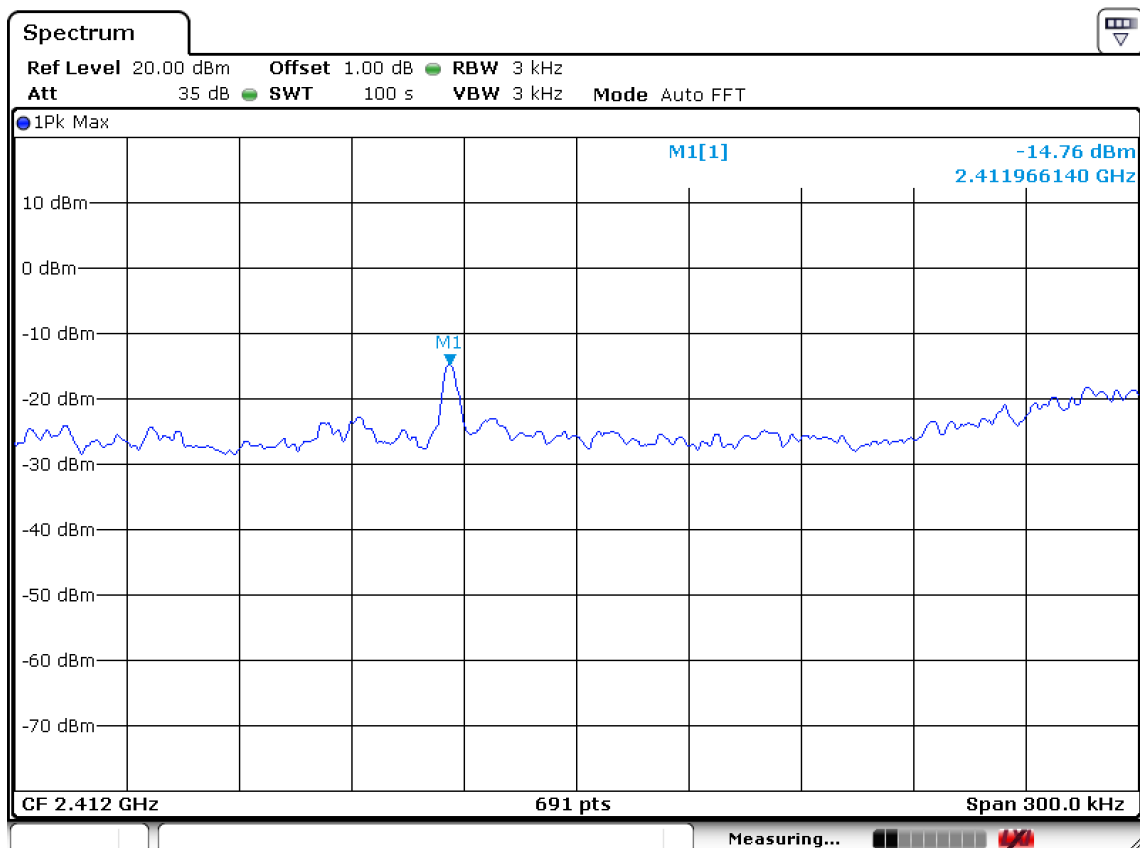


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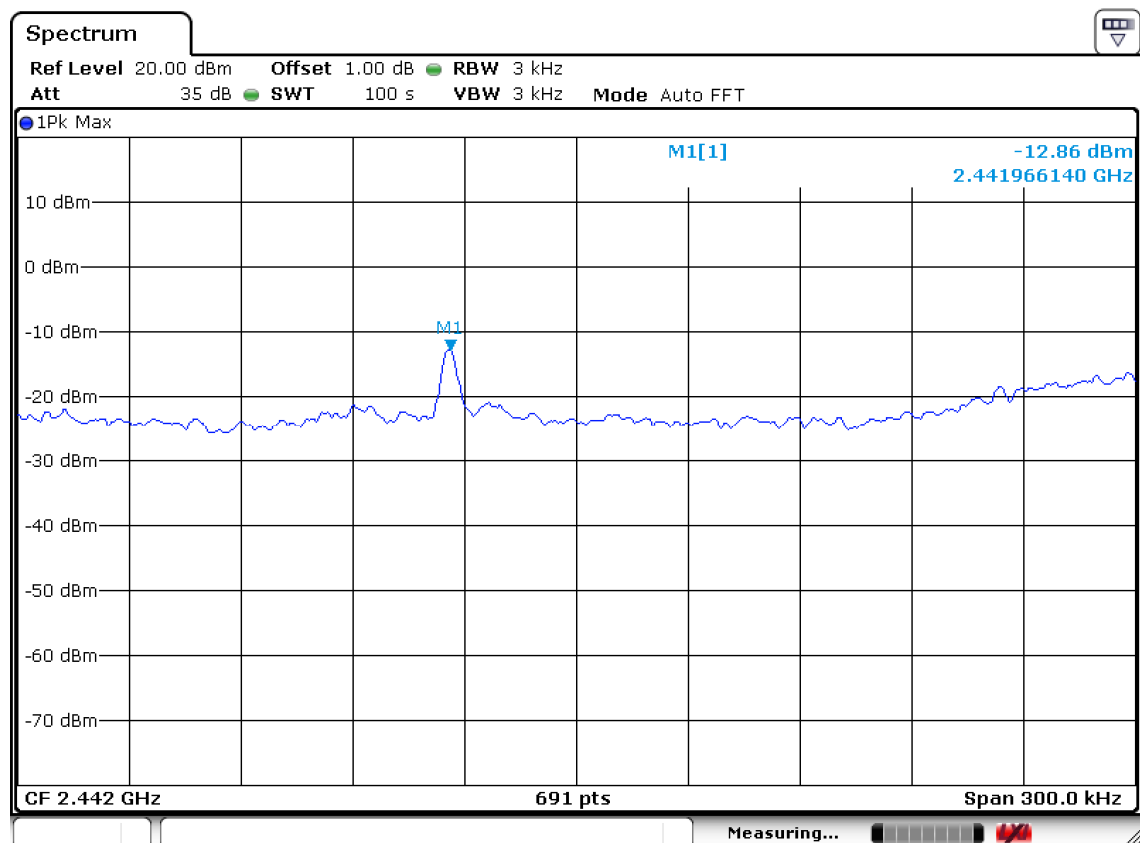


802.11n Power Density Measurement

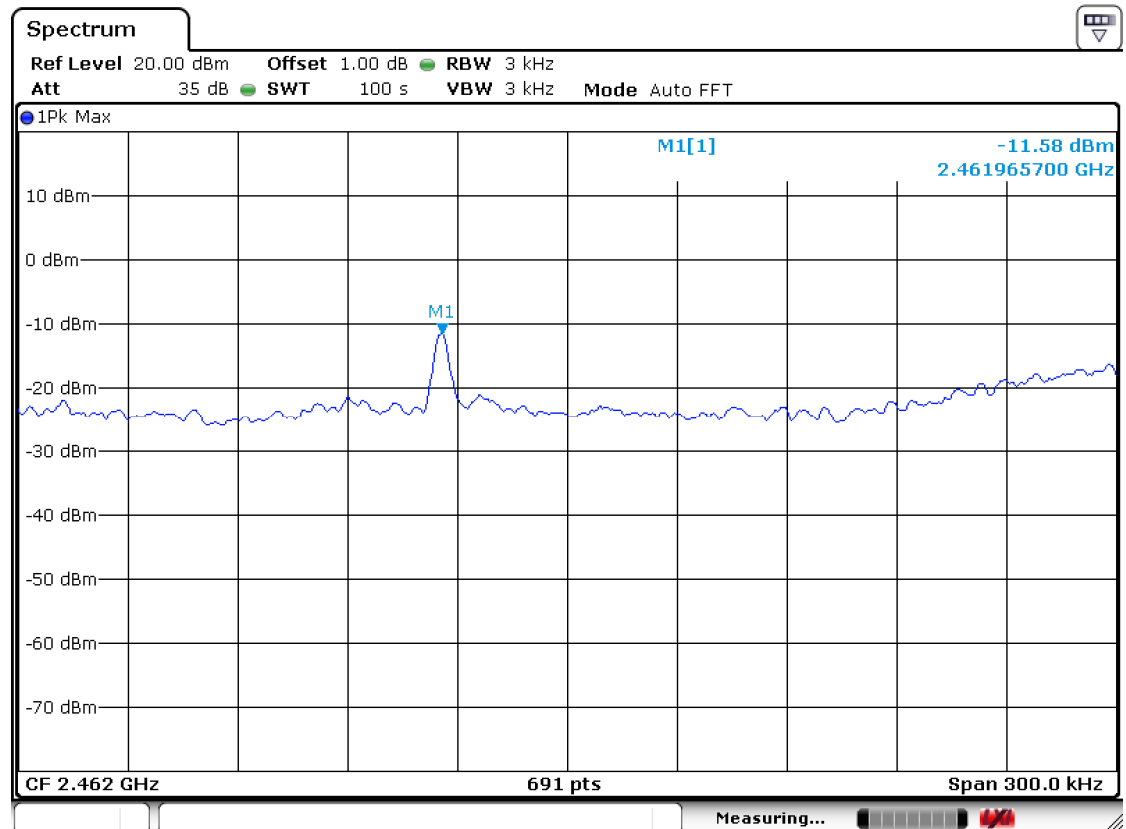
CH 1



CH 7



CH 11



3.2.4 Band - edge

Procedure:

*The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance and TCB Workshop 2012, April.

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 = 80 MHz

Detector function = peak

Trace = max hold

Sweep = auto

Measurement Data: Complies

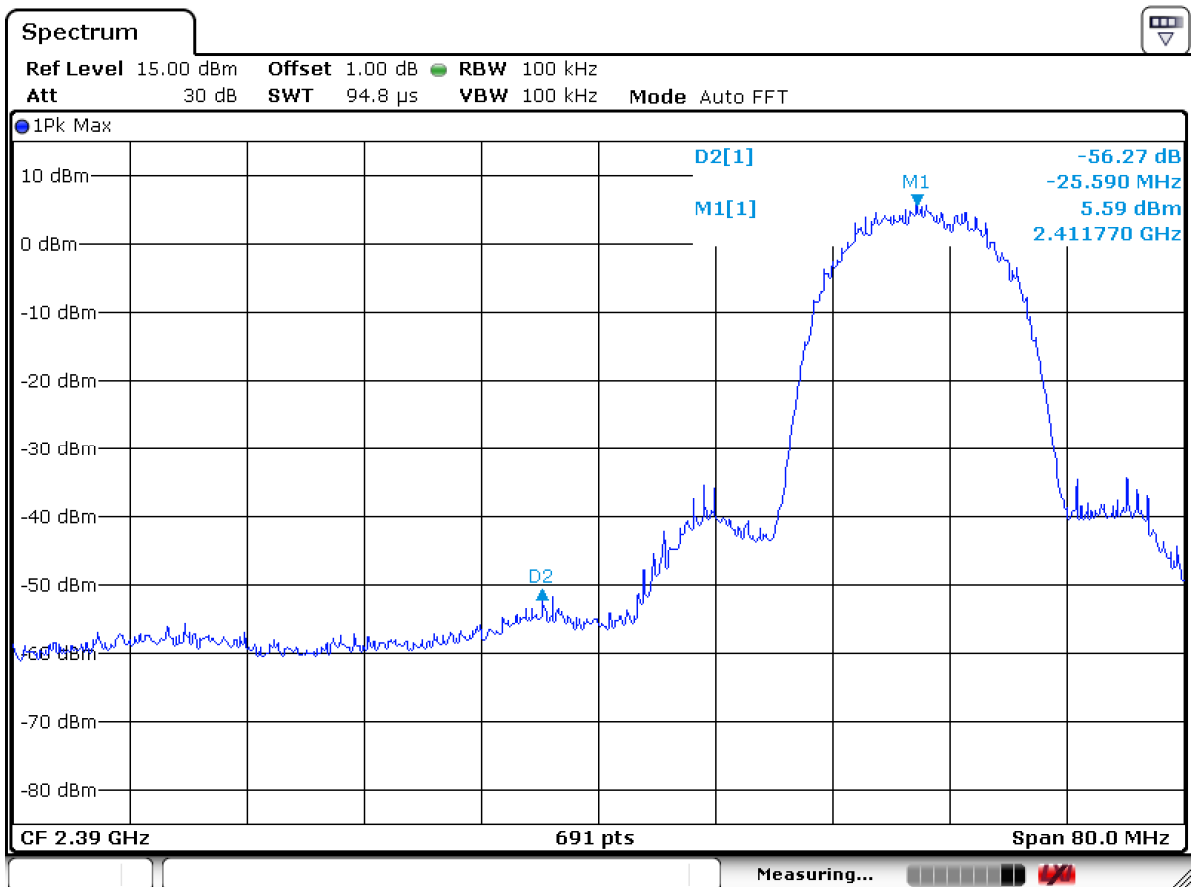
- All conducted emission in any 100kHz bandwidth outside of the spread spectrum band was at least 20dB lower than the highest inband spectral density. Therefore the applying equipment meets the requirement.
- See next pages for actual measured spectrum plots.

Minimum Standard:	> 20 dBc
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Measurement Setup

Same as the Chapter 3.2.1 (Figure 1)

802.11b Band-edge : Conducted Measurements



Band-edges in the restricted band 2310-2390 MHz measurement (802.11b mode)

Frequency	Reading		Pol.	Correction			Limits		Result		Margin	
	[dBuV/m]			Factor			[dBuV/m]		[dBuV/m]		[dB]	
[MHz]	AV / Peak			Antenna	Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
2390.0	46.69	55.78	V	25.4	37.1	4.0	54.0	74.0	38.9	48.0	15.1	26.0

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	
2483.9	47.55	57.97	V	25.4	37.1	4.0	54.0	74.0	39.8	50.2	14.2	23.8

Band-edges in the restricted band 2310-2390 MHz measurement (802.11g mode)

Frequency	Reading		Pol.	Correction			Limits		Result		Margin	
	[dBuV/m]			Factor			[dBuV/m]		[dBuV/m]		[dB]	
[MHz]	AV / Peak			Antenna	Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
2390.0	49.56	60.22	V	25.4	37.1	4.0	54.0	74.0	41.8	52.5	12.2	21.5

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

Frequency [MHz]	Reading		Pol.	Correction			Limits		Result		Margin	
	[dBuV/m]			Factor			[dBuV/m]		[dBuV/m]		[dB]	
	AV / Peak			Antenna	Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
2483.5	48.84	60.15	V	25.4	37.1	4.0	54.0	74.0	41.1	52.4	12.9	21.6

Band-edges in the restricted band 2310-2390 MHz measurement (802.11n mode)

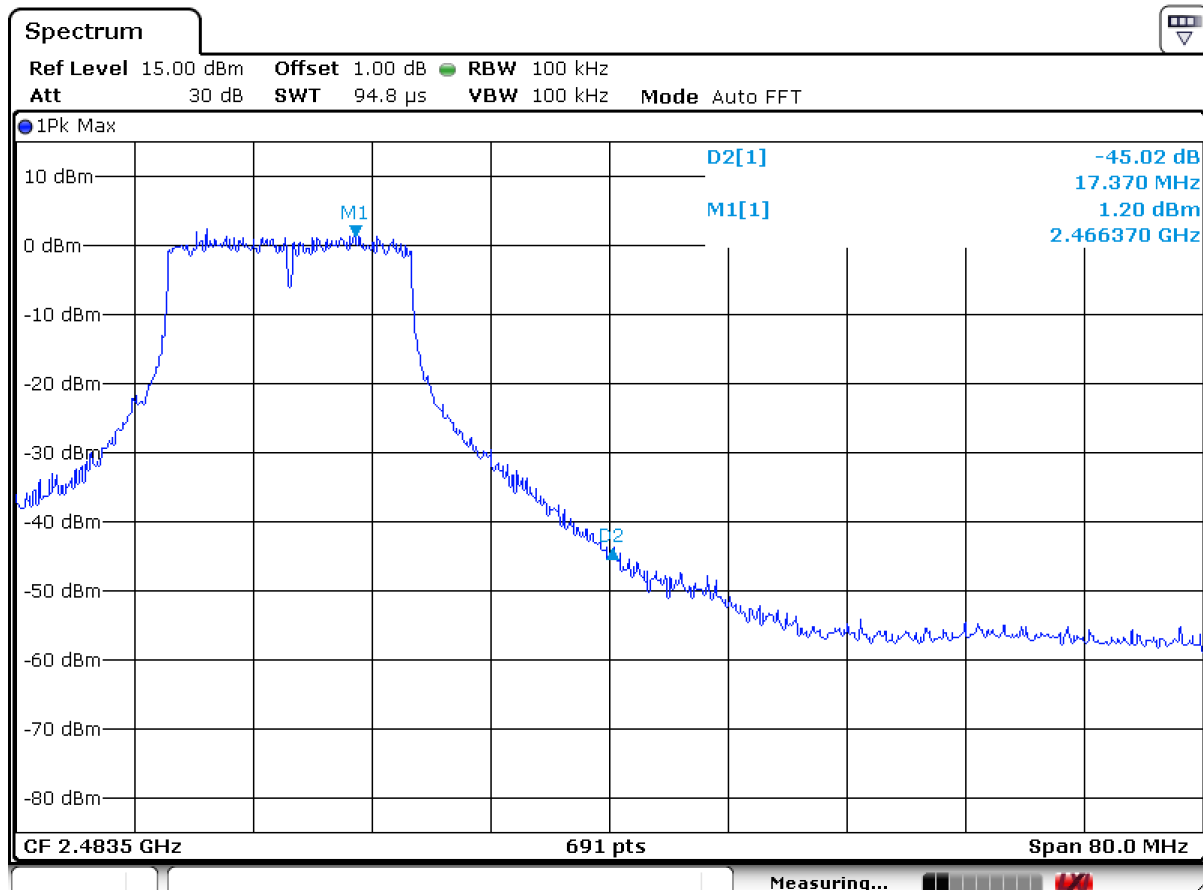
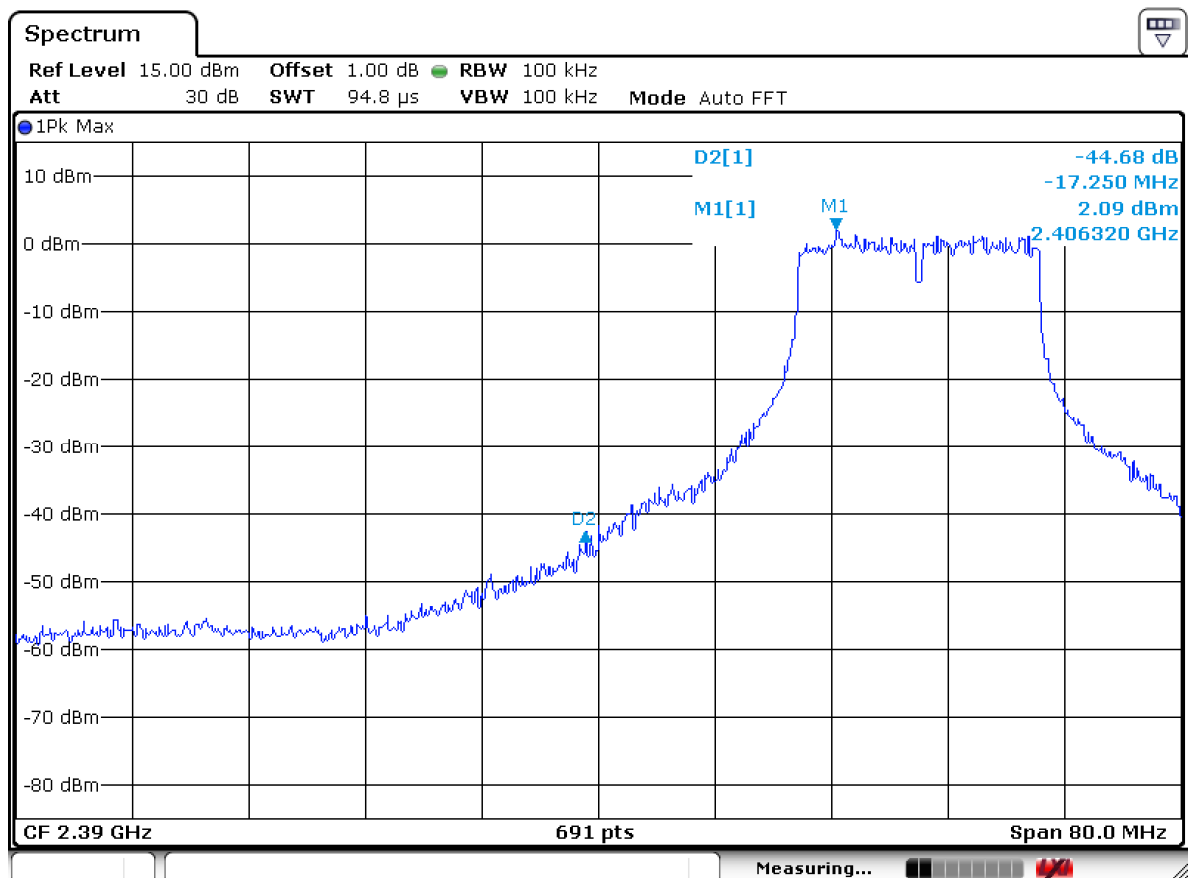
Frequency	Reading		Pol.	Correction			Limits		Result		Margin	
	[dBuV/m]			Factor			[dBuV/m]		[dBuV/m]		[dB]	
	AV / Peak			Antenna	Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
2389.9	45.82	56.26	V	25.4	37.1	4.0	54.0	74.0	38.1	48.5	15.9	25.5

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

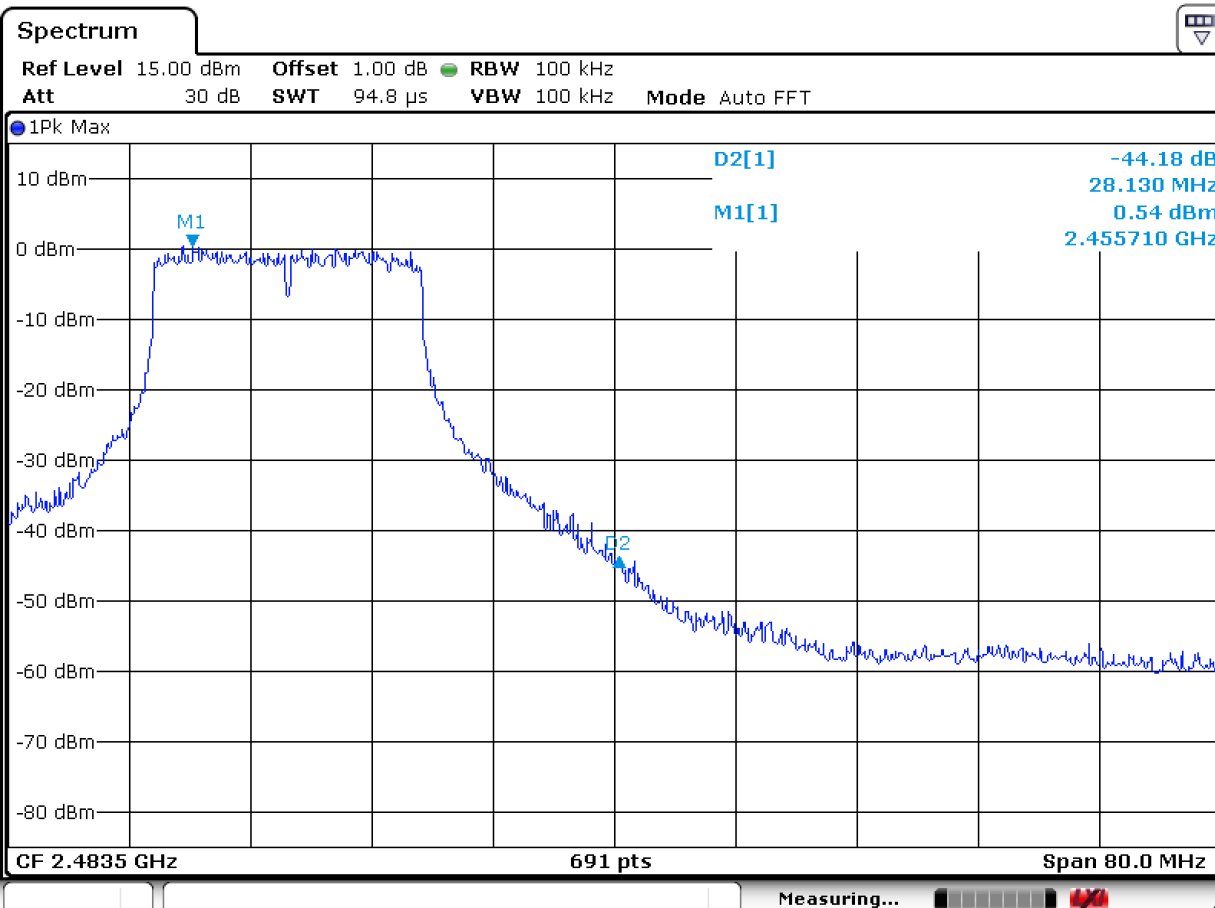
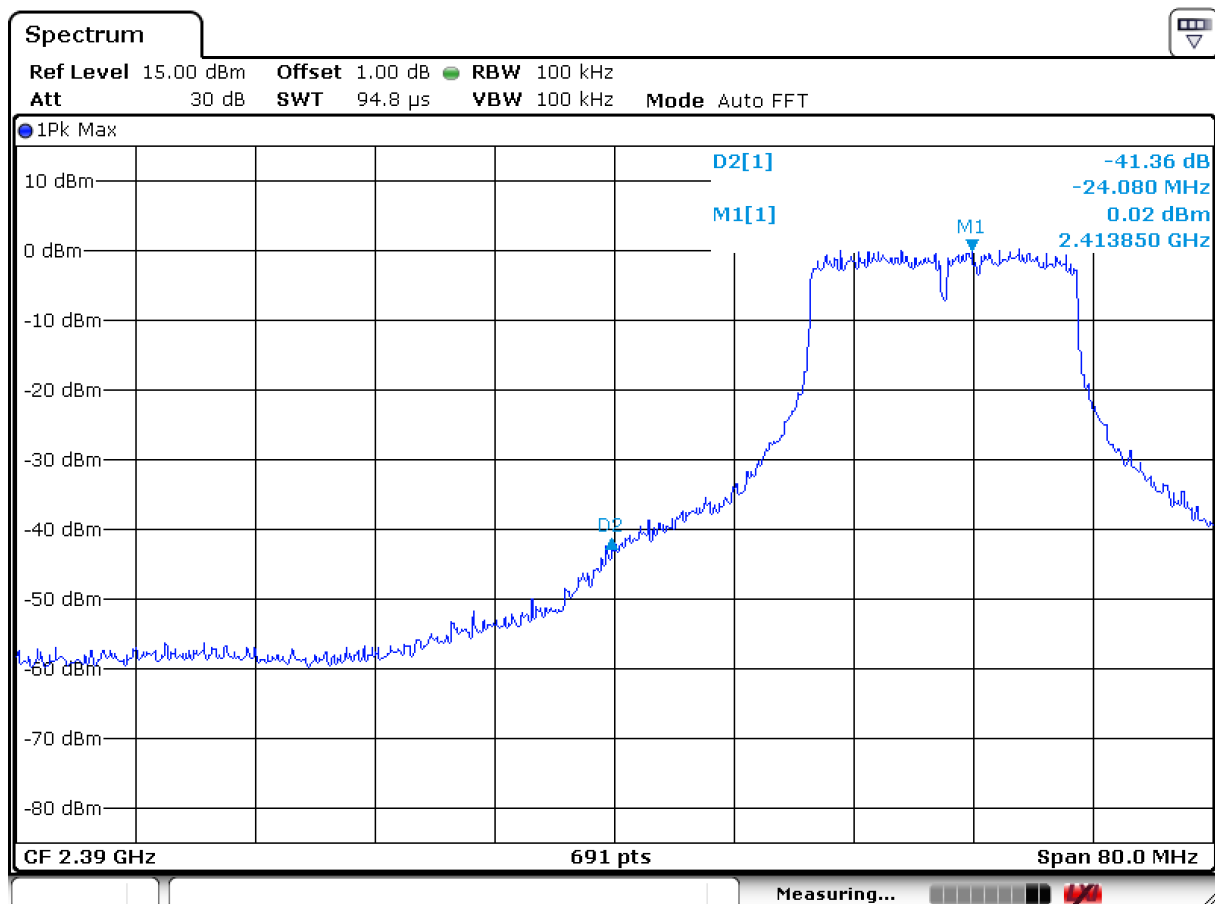
Frequency [MHz]	Reading [dBuV/m]		Pol.	Correction Factor			Limits [dBuV/m]		Result [dBuV/m]		Margin [dB]	
	AV / Peak			Antenna	Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
2483.5	44.14	53.83	V	25.4	37.1	4.0	54.0	74.0	36.4	46.1	17.6	27.9

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

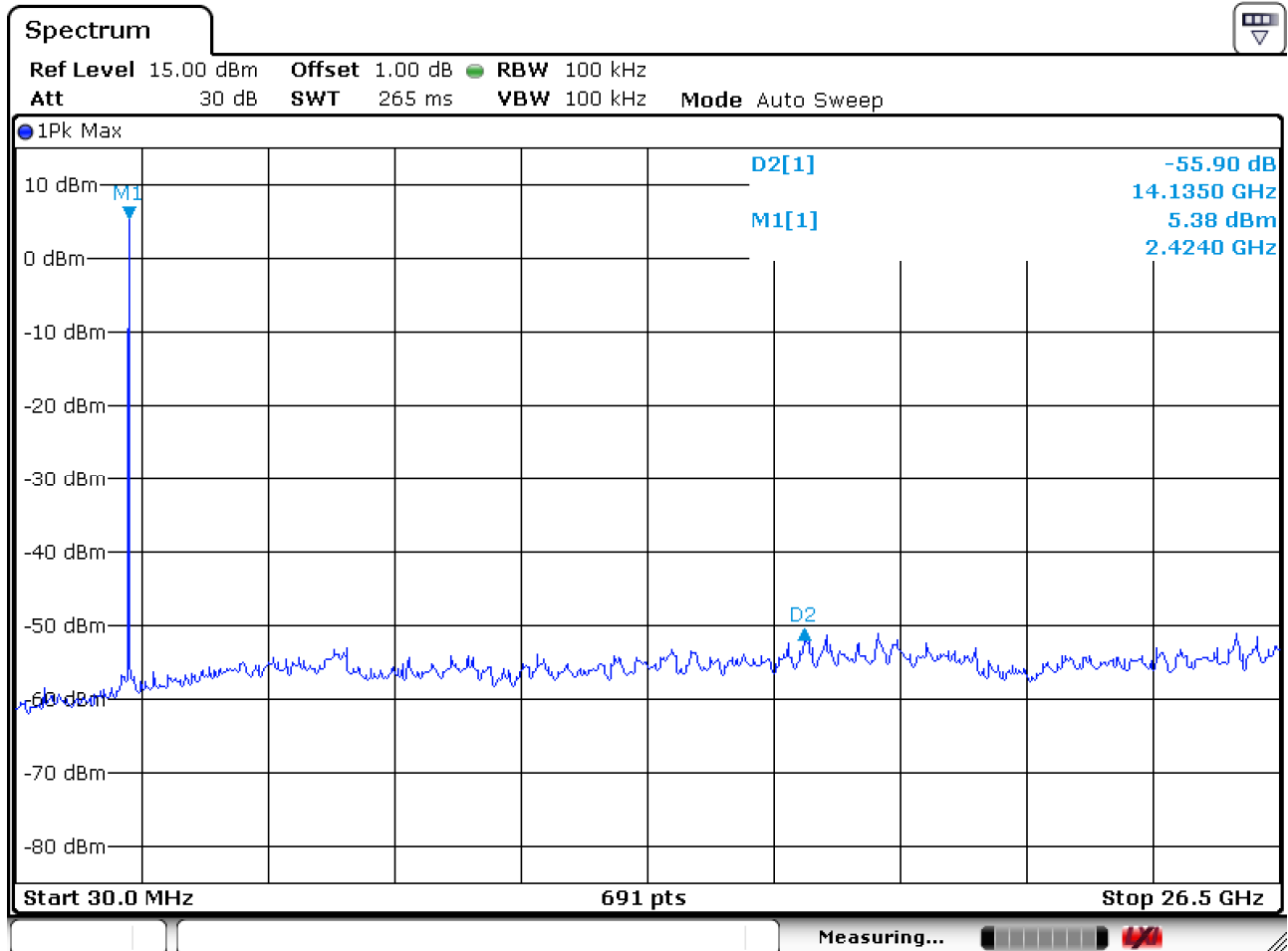
802.11g Band-edge : Conducted Measurements



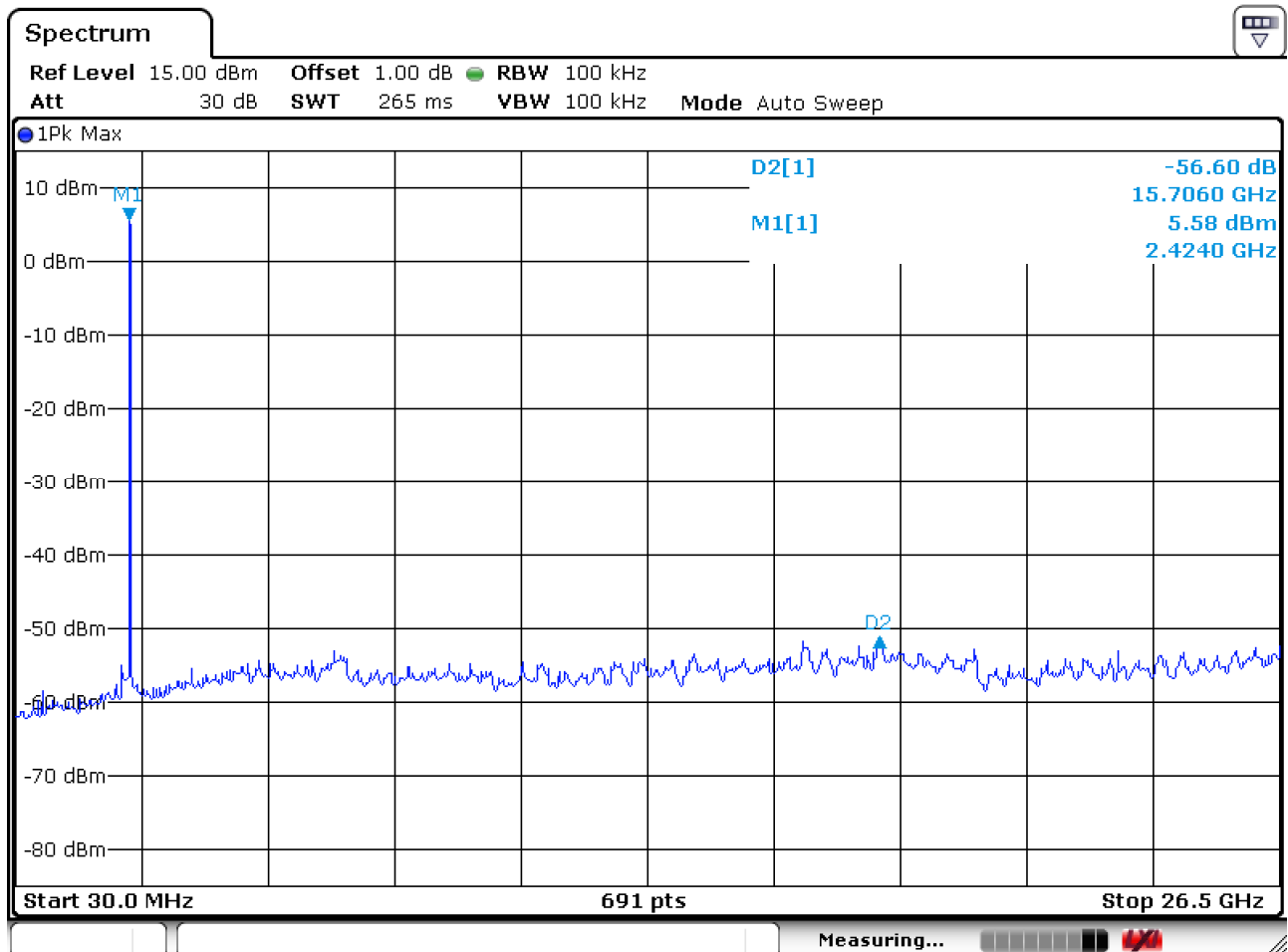
802.11n Band-edge : Conducted Measurements



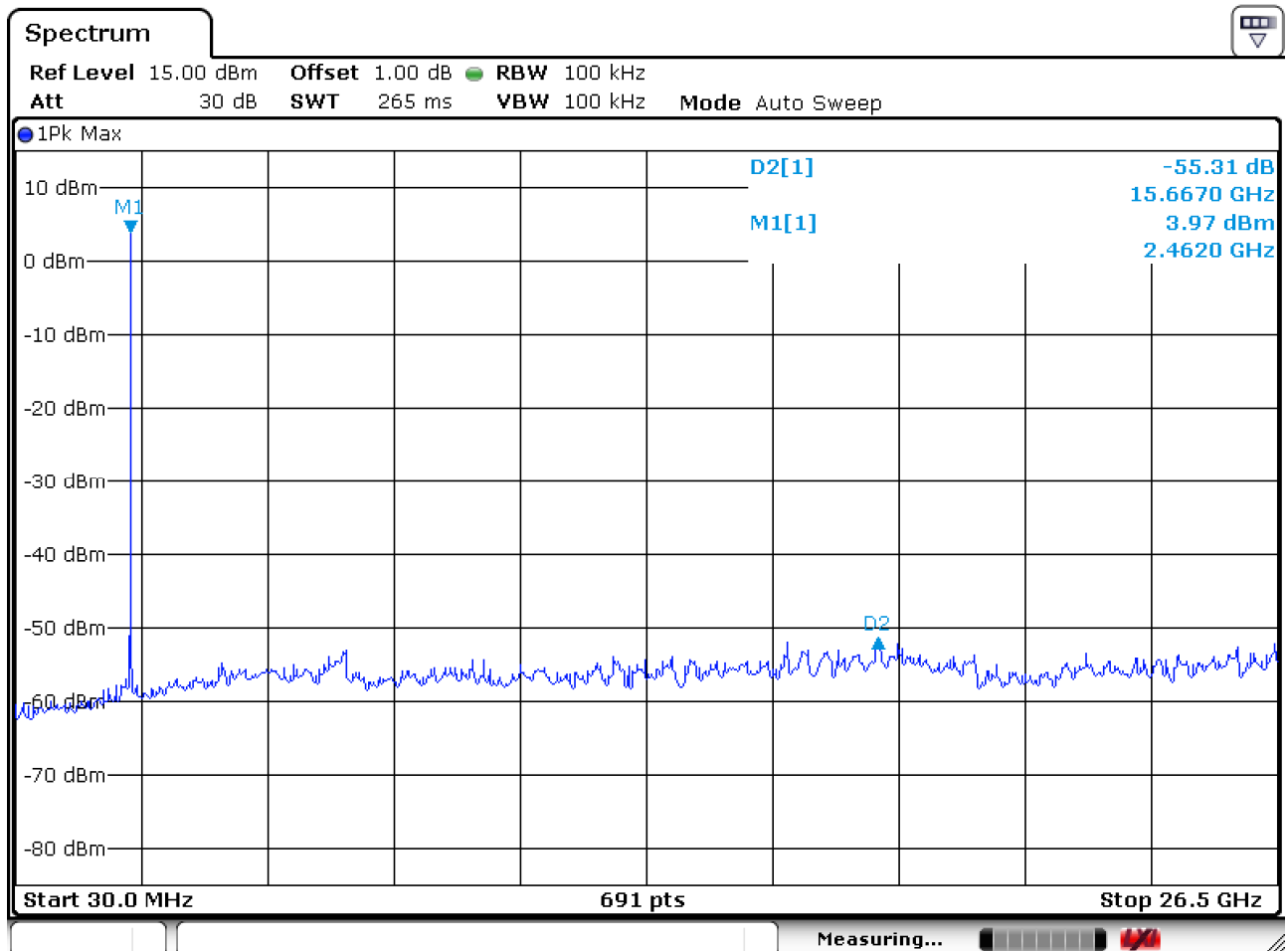
802.11b - Low channel
Frequency Range = 30 MHz ~ 10th harmonic.



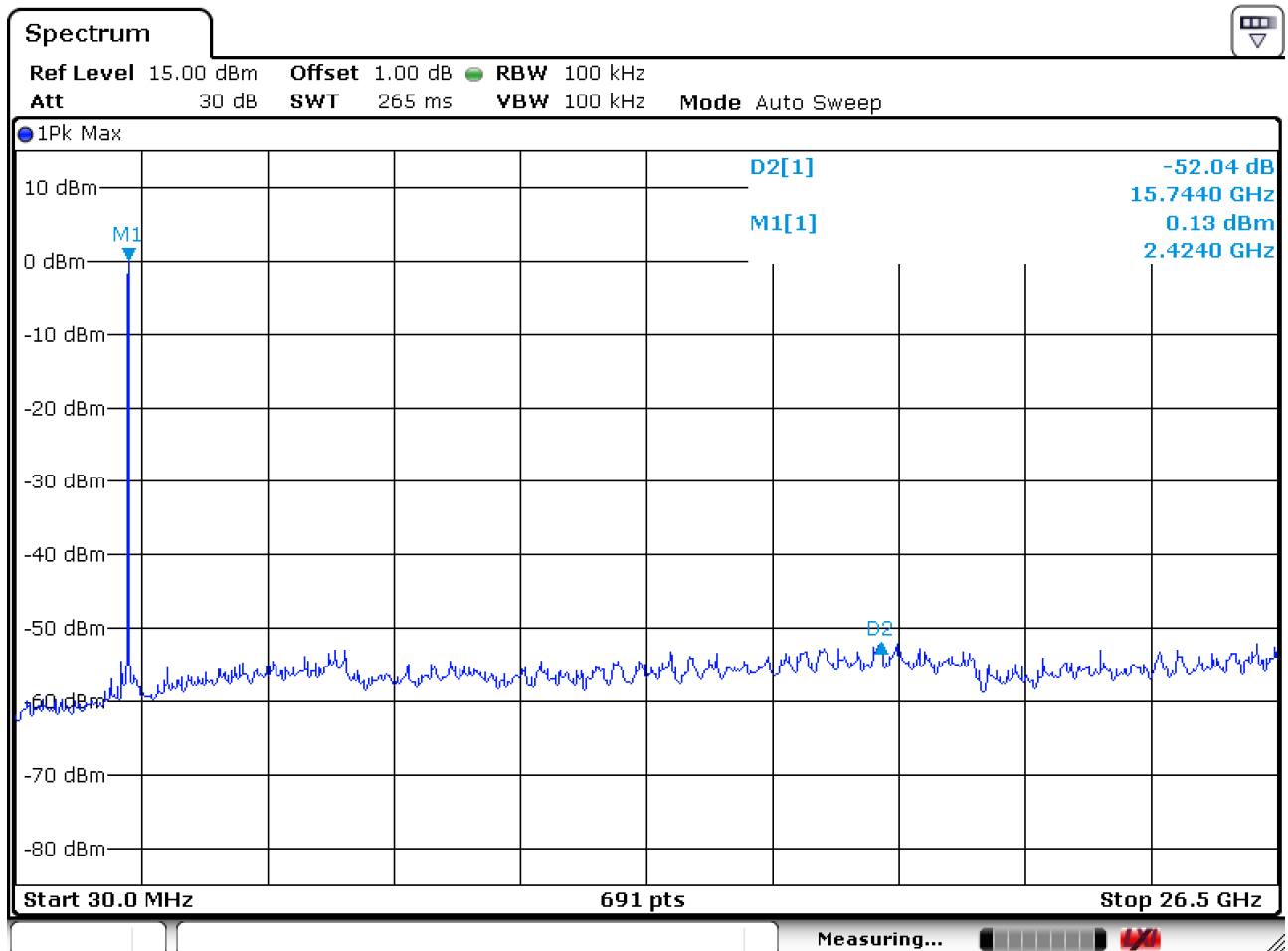
802.11b - Mid channel
Frequency Range = 30 MHz ~ 10th harmonic.



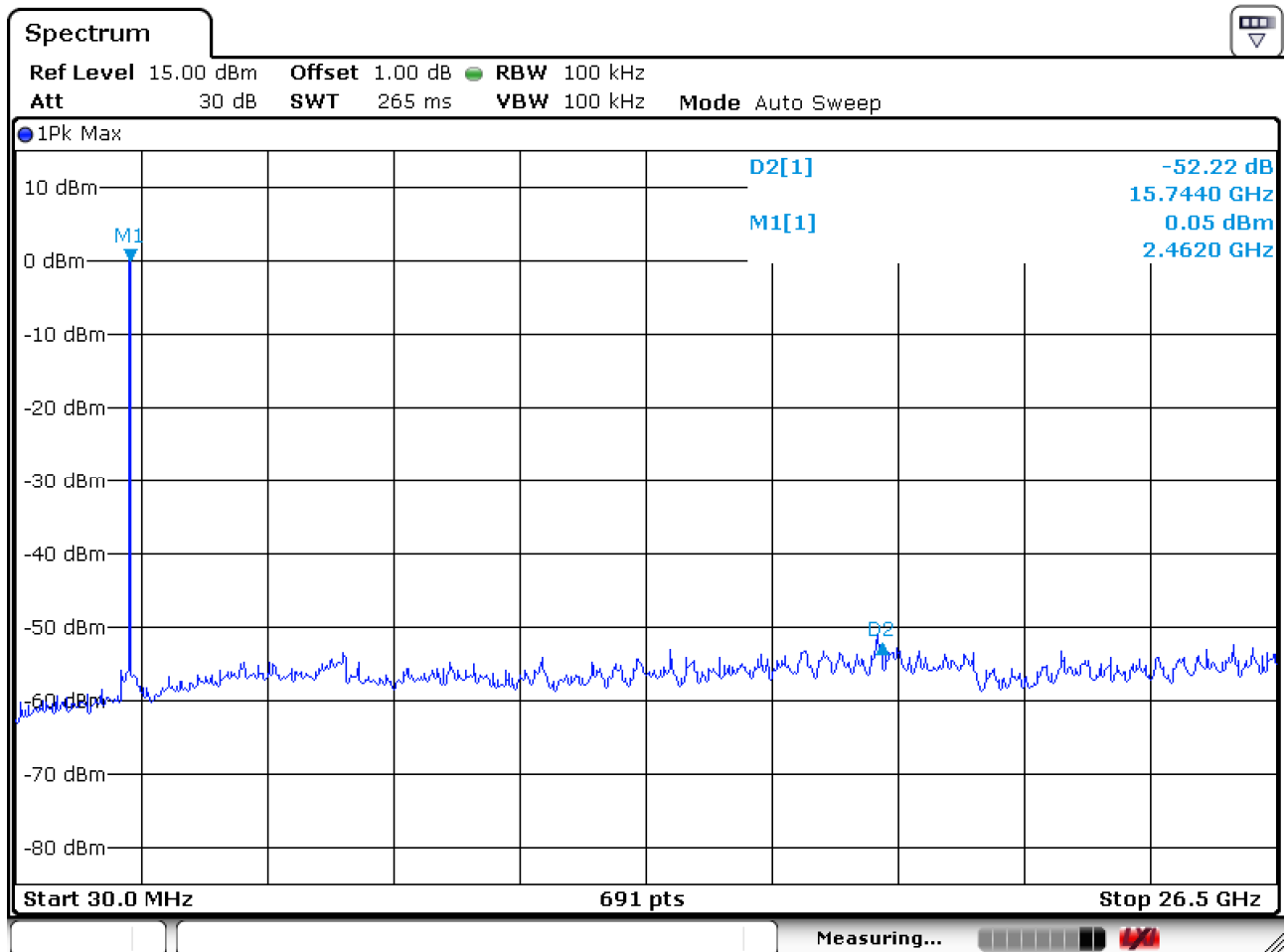
802.11b – High channel
Frequency Range = 30 MHz ~ 10th harmonic.



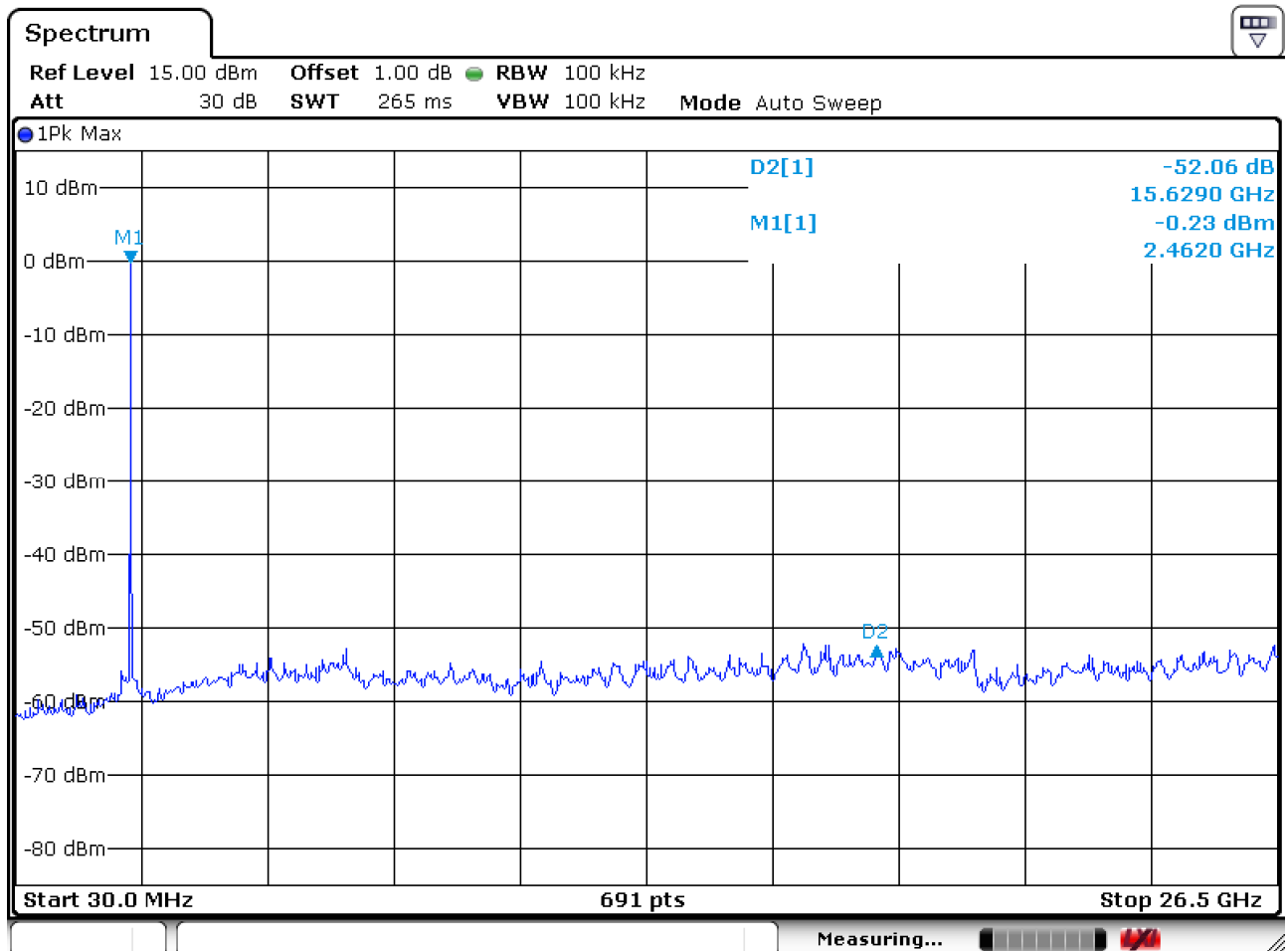
802.11g - Low channel
Frequency Range = 30 MHz ~ 10th harmonic.



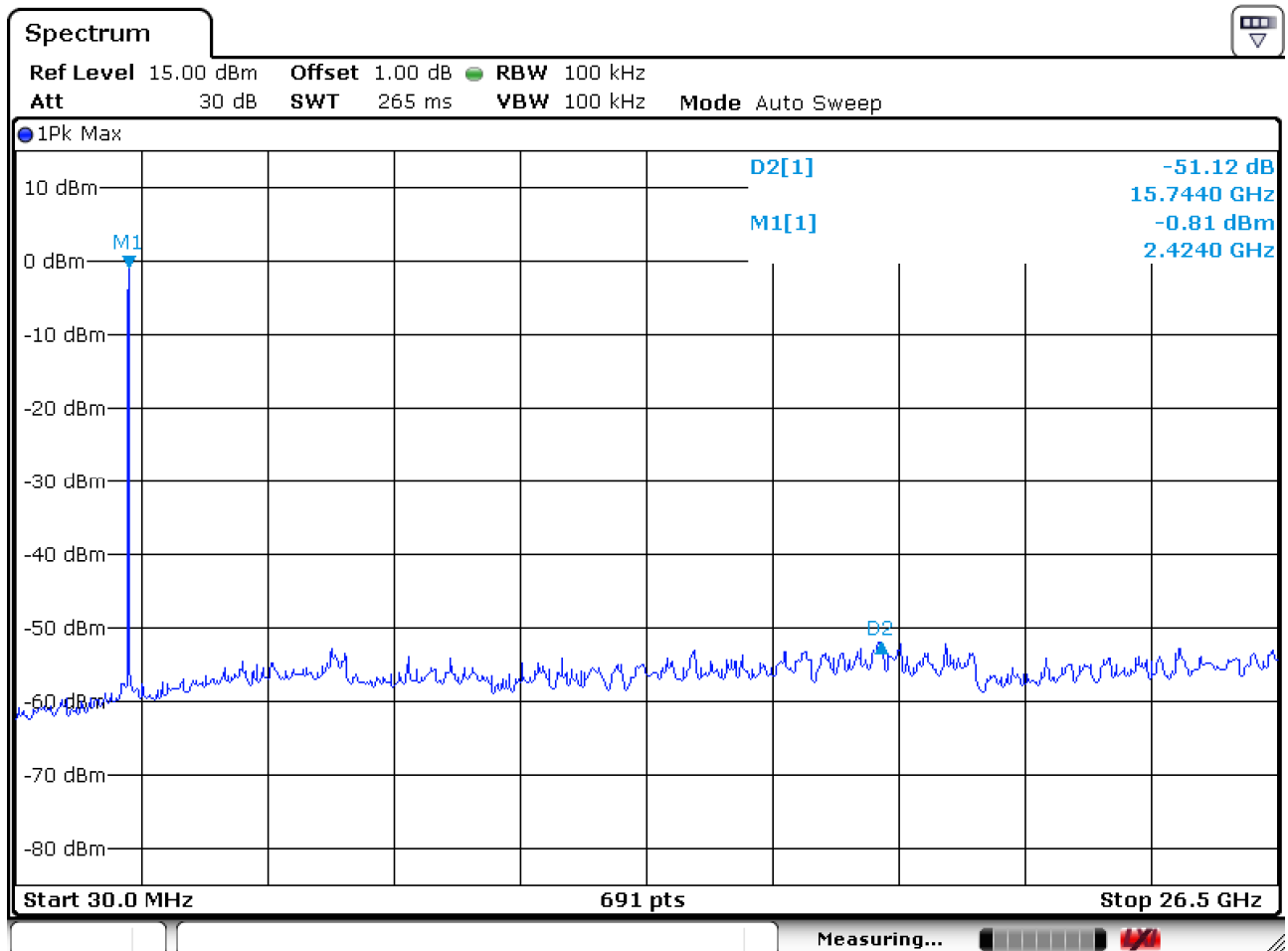
802.11g - Mid channel
Frequency Range = 30 MHz ~ 10th harmonic.



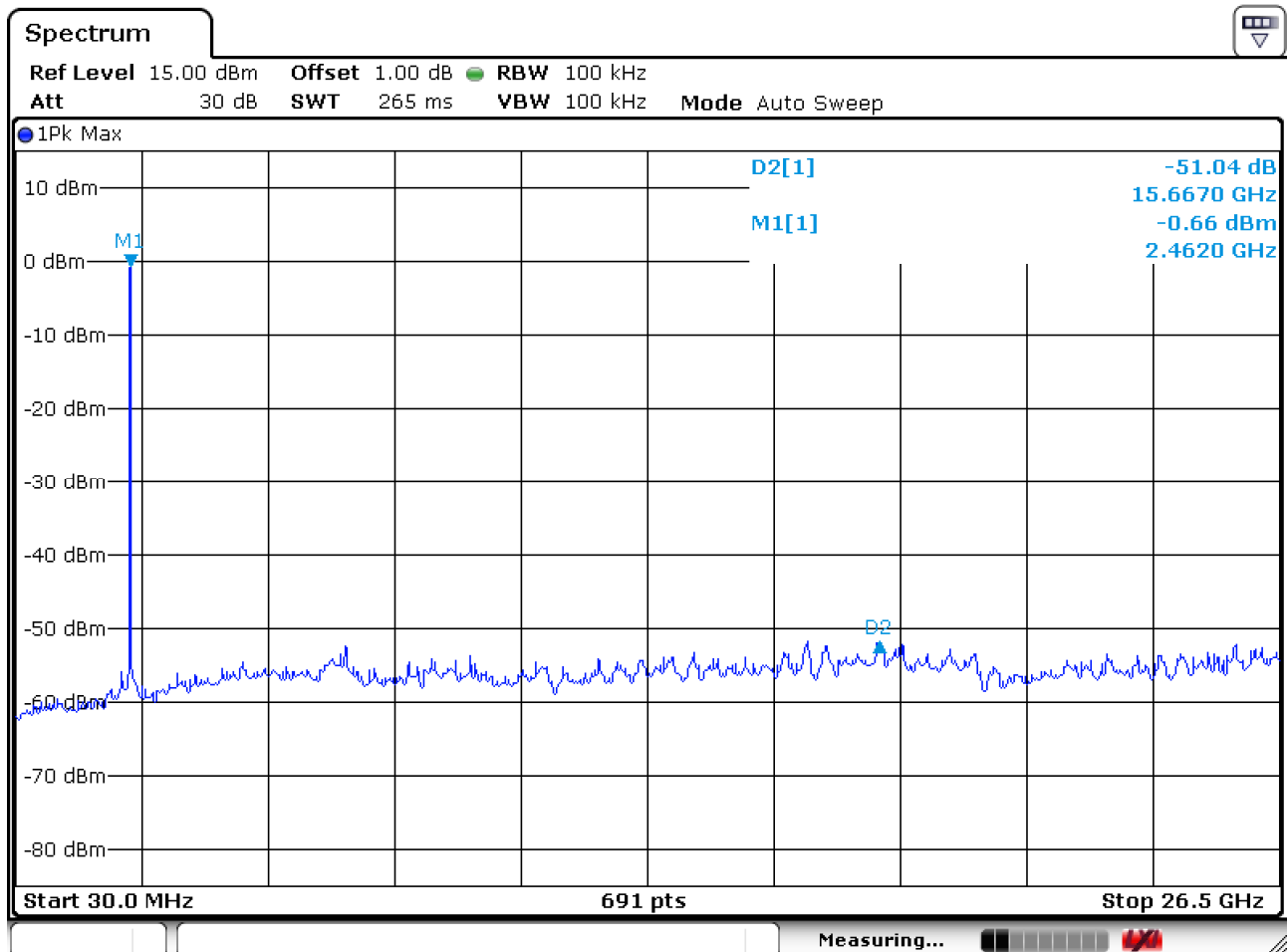
802.11g – High channel
Frequency Range = 30 MHz ~ 10th harmonic.



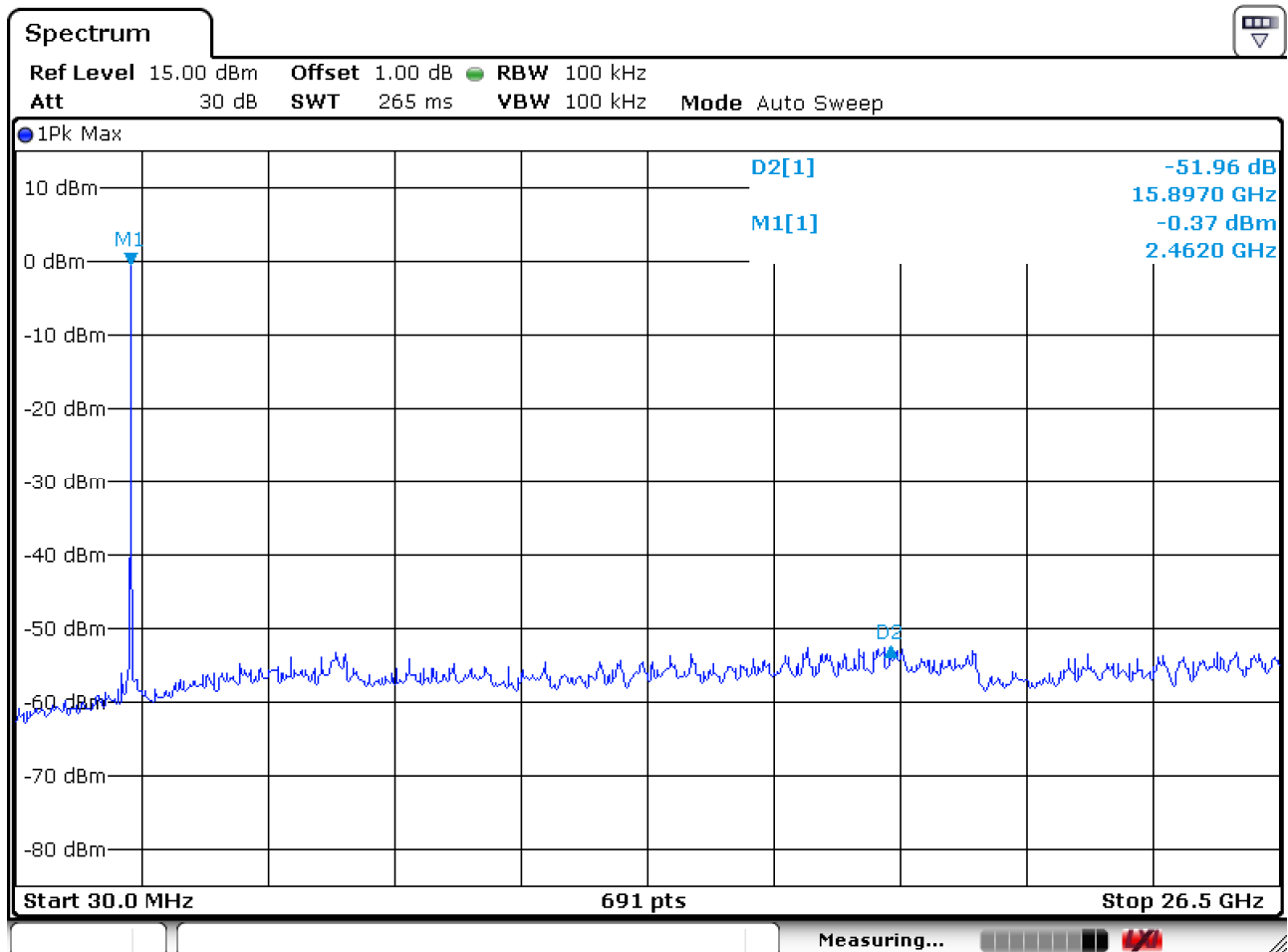
802.11n - Low channel
Frequency Range = 30 MHz ~ 10th harmonic.



802.11n - Mid channel
Frequency Range = 30 MHz ~ 10th harmonic.



802.11n – High channel
Frequency Range = 30 MHz ~ 10th harmonic.



3.2.5 Field Strength of Harmonics-Transmitter

Procedure:

*The testing follows TCB Workshop 2012, April and fulfills ANSI C63.4-2003 and the guidelines in ANSI C63.10-2009 test requirement. 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 ~ 10th harmonic.

RBW = 100 kHz (30MHz ~ 1 GHz)

= 1 MHz (1 GHz ~ 10th 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 20dB below limit.
- 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.

***802.11b Measurement Data: (Above 1GHz)**

Frequency	Reading		Pol.	Correction			Limits		Result		Margin	
	[dBuV/m]			Factor			[dBuV/m]		[dBuV/m]		[dB]	
[MHz]	AV / Peak			Antenna	Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
4824	41.15	56.69	V	31.4	36.5	5.7	54.0	74.0	41.8	57.4	12.2	16.6
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
Frequency	Reading		Pol.	Correction			Limits		Result		Margin	
	[dBuV/m]			Factor			[dBuV/m]		[dBuV/m]		[dB]	
[MHz]	AV / Peak			Antenna	Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
4884	45.88	57.91	V	31.4	36.5	5.7	54.0	74.0	46.6	58.6	7.5	15.4
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
Frequency	Reading		Pol.	Correction			Limits		Result		Margin	
	[dBuV/m]			Factor			[dBuV/m]		[dBuV/m]		[dB]	
[MHz]	AV / Peak			Antenna	Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
4924	47.11	58.89	V	31.4	36.5	5.7	54.0	74.0	47.8	59.6	6.2	14.4
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

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

***802.11b Measurement Data: (9kHz - 30MHz)**

Frequency	Reading		Pol.	Correction			Limits		Result		Margin	
	[dBuV/m]			Factor			[dBuV/m]		[dBuV/m]		[dB]	
[MHz]	AV / Peak			Antenna	Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
-	-	-	-	-	-	-	-	-	-	-	-	-
No emissions were detected at a level greater than 20dB below limit.												
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

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

***802.11g Measurement Data: (Above 1GHz)**

Frequency	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	
4823	43.23	57.11	V	31.4	36.5	5.7	54.0	74.0	43.9	57.8	10.1	16.2
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
Frequency	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	
4884	41.91	53.47	V	31.4	36.5	5.7	54.0	74.0	42.6	54.1	11.4	19.9
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
Frequency	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	
4923	43.32	55.25	V	31.4	36.5	5.7	54.0	74.0	44.0	55.9	10.0	18.1
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

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

***802.11g Measurement Data: (9kHz - 30MHz)**

Frequency	Reading		Pol.	Correction			Limits		Result		Margin	
	[dBuV/m]			Factor			[dBuV/m]		[dBuV/m]		[dB]	
[MHz]	AV / Peak			Antenna	Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
-	-	-	-	-	-	-	-	-	-	-	-	-
No emissions were detected at a level greater than 20dB below limit.												
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

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

***802.11n Measurement Data: (Above 1GHz)**

Frequency	Reading		Pol.	Correction			Limits		Result		Margin	
	[dBuV/m]			Factor			[dBuV/m]		[dBuV/m]		[dB]	
[MHz]	AV / Peak			Antenna	Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
4824	40.31	52.27	V	31.4	36.5	5.7	54.0	74.0	41.0	52.9	13.0	21.1
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
Frequency	Reading		Pol.	Correction			Limits		Result		Margin	
	[dBuV/m]			Factor			[dBuV/m]		[dBuV/m]		[dB]	
[MHz]	AV / Peak			Antenna	Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
4883	39.69	50.18	V	31.4	36.5	5.7	54.0	74.0	40.4	50.9	13.6	23.2
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
Frequency	Reading		Pol.	Correction			Limits		Result		Margin	
	[dBuV/m]			Factor			[dBuV/m]		[dBuV/m]		[dB]	
[MHz]	AV / Peak			Antenna	Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
4924	41.15	52.32	V	31.4	36.5	5.7	54.0	74.0	41.8	53.0	12.2	21.0
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

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

***802.11n Measurement Data: (9kHz - 30MHz)**

Frequency	Reading		Pol.	Correction			Limits		Result		Margin	
	[dBuV/m]			Factor			[dBuV/m]		[dBuV/m]		[dB]	
[MHz]	AV / Peak			Antenna	Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
-	-	-	-	-	-	-	-	-	-	-	-	-
No emissions were detected at a level greater than 20dB below limit.												
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

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

Radiated Emissions – WLAN mode (Worst case, G mode)

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

EUT/Model No.: HES2E4A0T

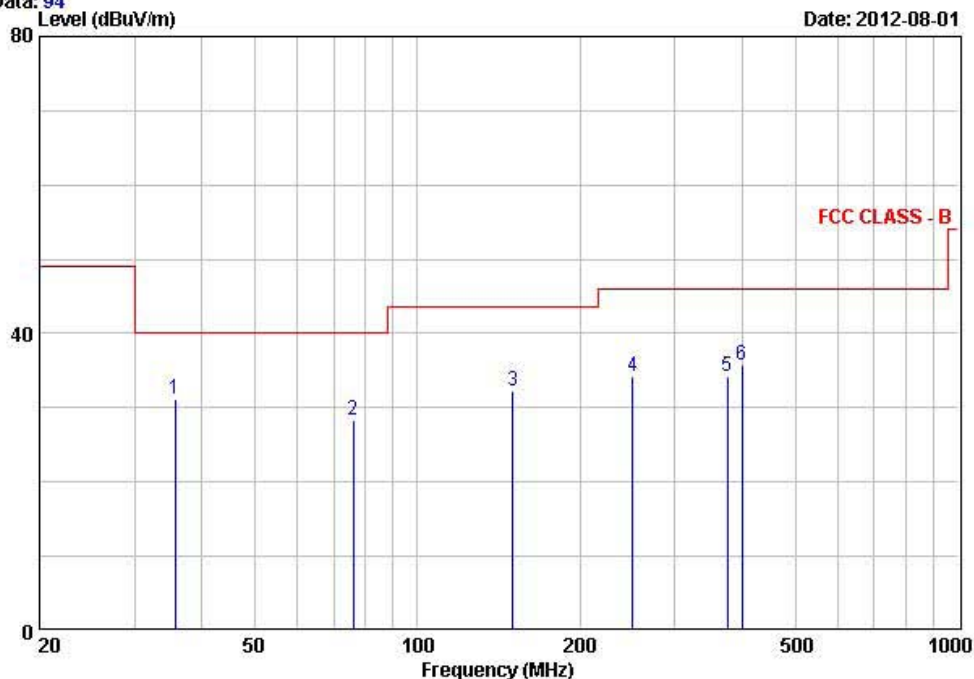
TEST MODE: WLAN g mode

Temp Humi : 27 / 49

Tested by: PARK H W

Data: 94

Date: 2012-08-01



	Freq	Reading	C.F	Result	Limit	Margin	Height	Angle	Polarity
	MHz	dBuV/m	dB/m	dBuV/m	QP	dB	cm	deg	
1	35.67	47.90	-16.69	31.21	40.00	8.79	100	175	VERTICAL
2	76.26	46.90	-18.57	28.33	40.00	11.67	100	82	VERTICAL
3	150.01	45.30	-13.02	32.28	43.50	11.22	214	159	HORIZONTAL
4	250.01	46.90	-12.74	34.16	46.00	11.84	157	147	HORIZONTAL
5	375.02	43.50	-9.20	34.30	46.00	11.70	100	81	HORIZONTAL
6	399.00	44.60	-8.74	35.86	46.00	10.14	100	81	HORIZONTAL

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

3.2.6 AC Conducted Emissions

Procedure:

*The testing follows the guidelines in ANSI C63.4-2003 and ANSI C63.10-2009. 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 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

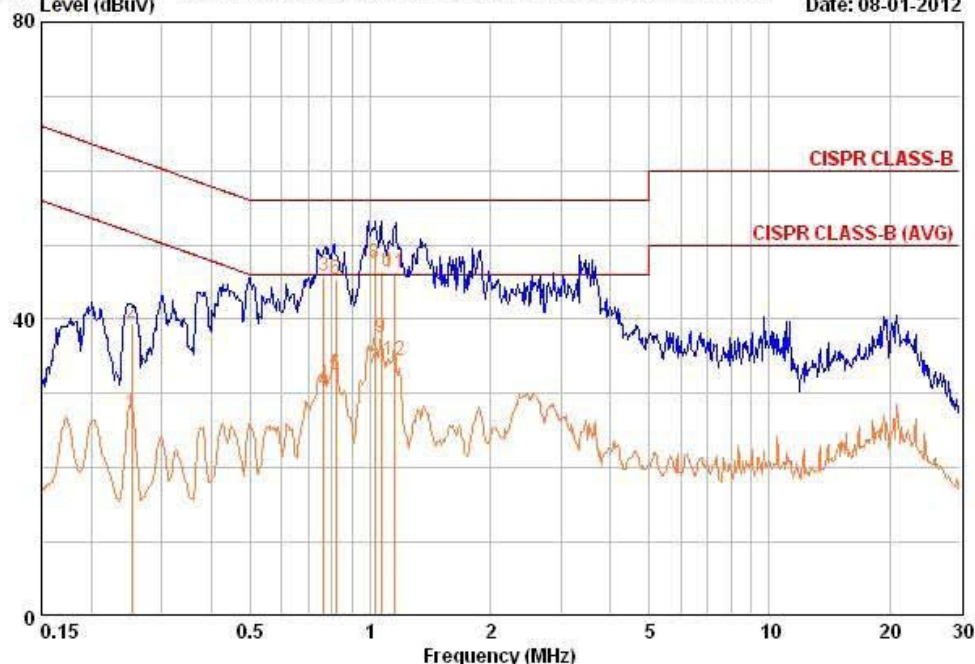
* Decreases with the logarithm of the frequency

AC Conducted Emissions –WLAN – Line (Worst case, G mode)

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

EUT / Model No. : HES2E4A0T	Phase : LINE
Test Mode : WLAN mode	Test Power : 120 / 60
Temp./Humi. : 25 / 52	Test Engineer : PARK H W

Data: 112 File: C:\Conducted Data\2012\LTA_Conduction_1207-3.EMI (112) Date: 08-01-2012



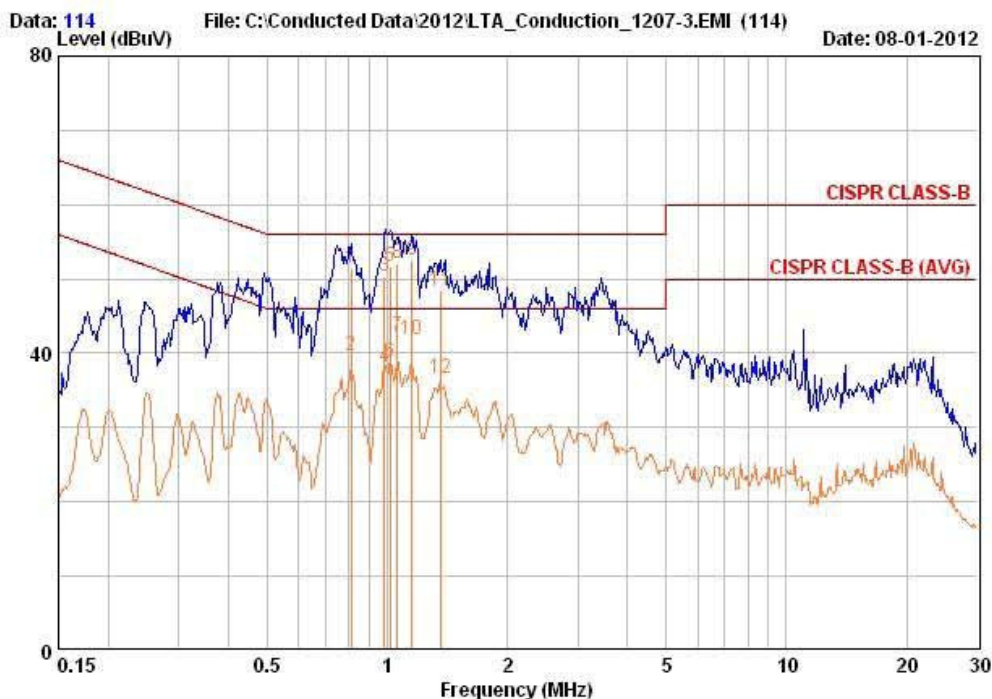
Freq	RD	RD	C.F	Result	Result	Limit	Limit	Margin	Margin
MHz	QP	AV		QP	AV	QP	AV	QP	AV
	dBuV	dBuV	dB	dBuV	dBuV	dBuV	dBuV	dB	dB
0.253	29.93	17.73	9.57	39.50	27.30	61.66	51.66	22.16	24.36
0.766	36.02	20.72	9.67	45.70	30.40	56.00	46.00	10.30	15.60
0.818	35.72	22.72	9.68	45.41	32.41	56.00	46.00	10.59	13.59
1.025	37.83	23.73	9.71	47.54	33.44	56.00	46.00	8.46	12.56
1.066	36.73	27.73	9.71	46.45	37.45	56.00	46.00	9.55	8.55
1.150	36.53	24.73	9.72	46.25	34.45	56.00	46.00	9.75	11.55

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

AC Conducted Emissions – PING +WLAN – Neutral (Worst case, G mode)

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

EUT / Model No. : HES2E4A0T	Phase : NEUTRAL
Test Mode : WLAN mode	Test Power : 120 / 60
Temp./Humi. : 25 / 52	Test Engineer : PARK H W



Freq	RD	RD	C.F	Result	Result	Limit	Limit	Margin	Margin
MHz	QP	AV	dB	QP	AV	QP	AV	QP	AV
	dBuV	dBuV		dBuV	dBuV	dBuV	dBuV	dB	dB
0.813	41.82	30.02	9.61	51.43	39.63	56.00	46.00	4.57	6.37
0.983	40.73	28.43	9.64	50.37	38.07	56.00	46.00	5.63	7.93
1.016	42.03	29.13	9.64	51.67	38.77	56.00	46.00	4.33	7.23
1.059	42.53	32.73	9.64	52.17	42.37	56.00	46.00	3.83	3.63
1.151	42.93	32.13	9.64	52.58	41.78	56.00	46.00	3.42	4.22
1.360	38.84	26.94	9.65	48.49	36.59	56.00	46.00	7.51	9.41

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

3.3 Technical Characteristics Test (Zigbee 1, 2)

3.3.1 6 dB Bandwidth

Procedure:

*The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance and TCB Workshop 2012, April.

The bandwidth at 6dB below the highest in-band spectral density was measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate frequencies.

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 6dB 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 6 dB bandwidth of the emission.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

RBW = 100 kHz

Span = 30 MHz

VBW = 300 kHz (VBW \geq RBW)

Sweep = auto

Trace = max hold

Detector function = peak

Measurement Data: (Zigbee 1)

Frequency (MHz)	Channel No.	Test Results(MHz)	
		6dB Bandwidth	99% Bandwidth
2405	11	1.599	2.452
2440	18	1.599	2.417
2480	26	1.585	2.410

Measurement Data: (Zigbee 2)

Frequency (MHz)	Channel No.	Test Results(MHz)	
		6dB Bandwidth	99% Bandwidth
2405	11	1.570	2.393
2440	18	1.599	2.402
2480	26	1.591	2.402

Measurement Data:

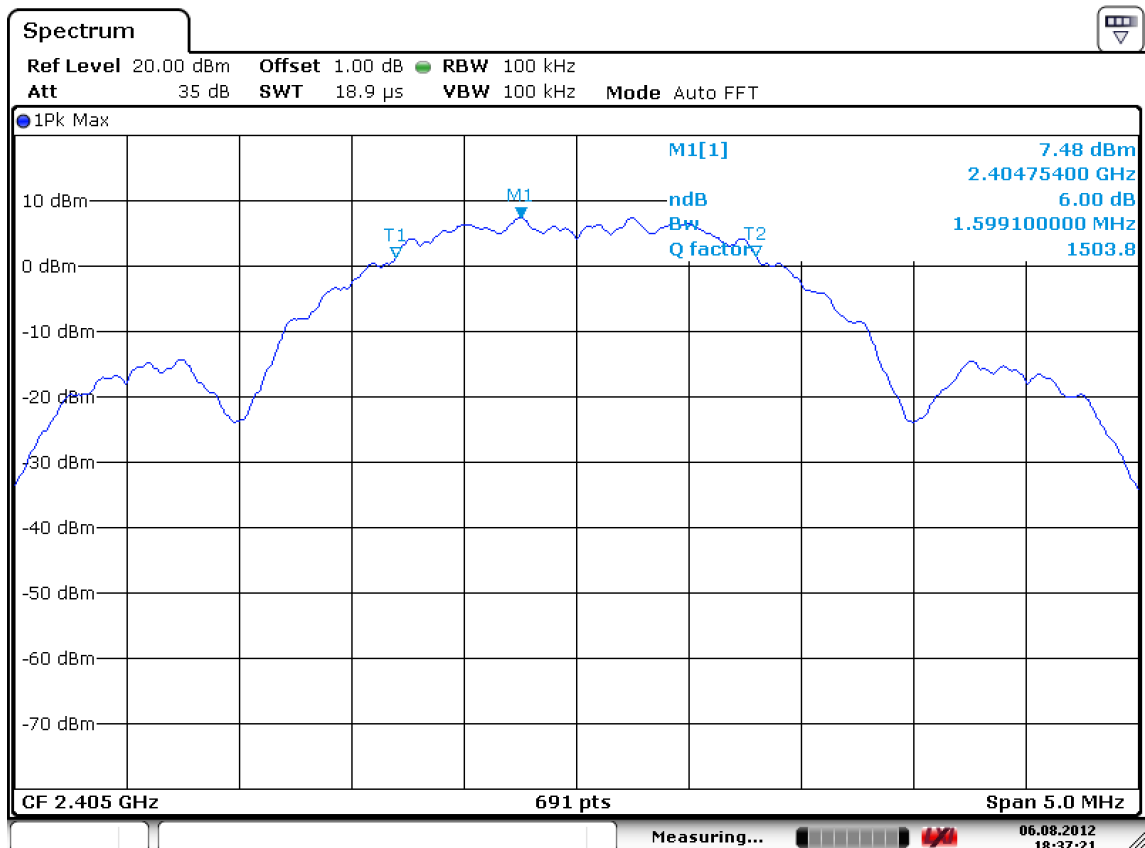
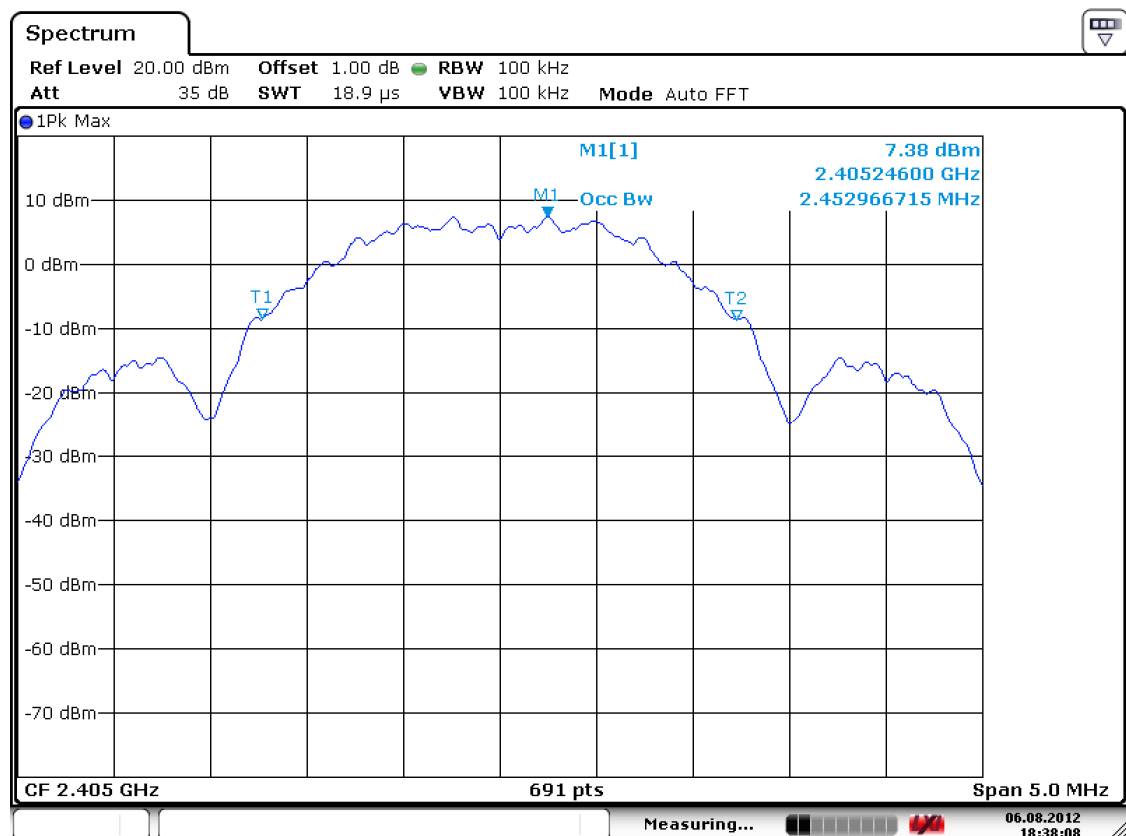
- See next pages for actual measured spectrum plots.

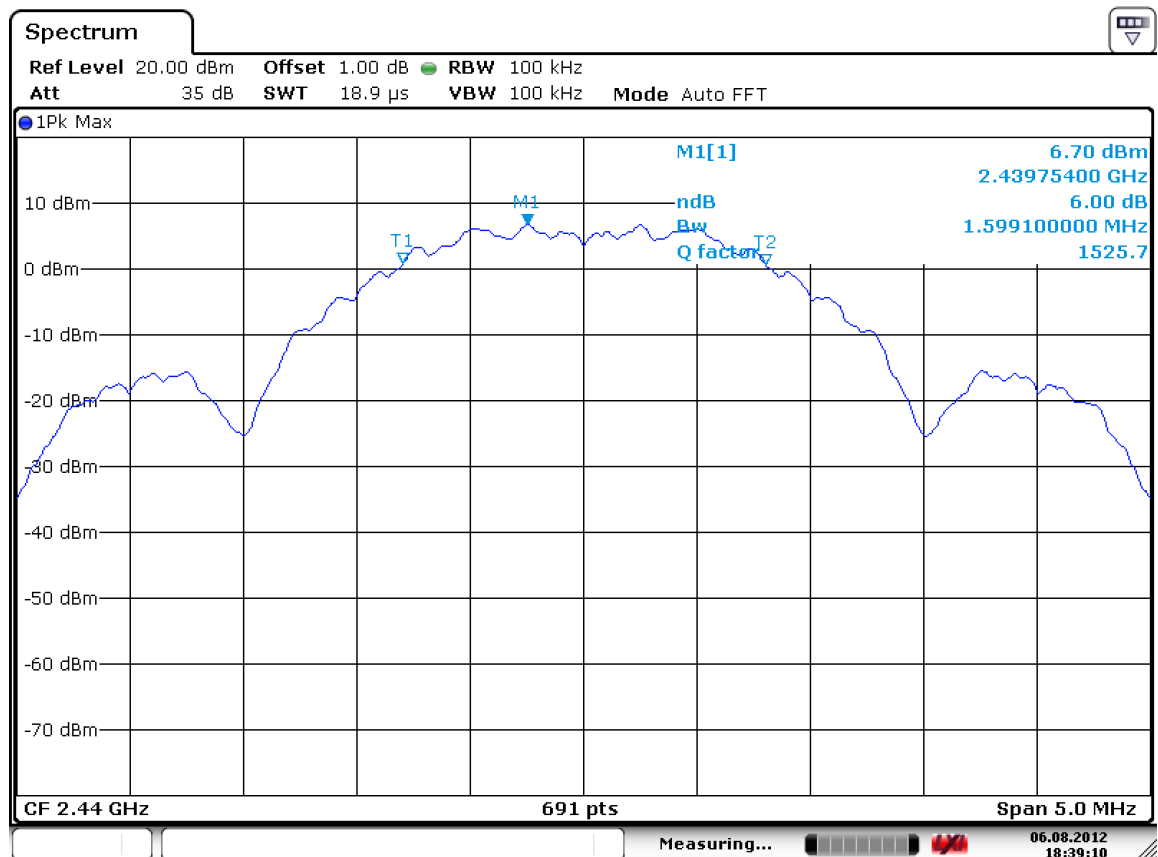
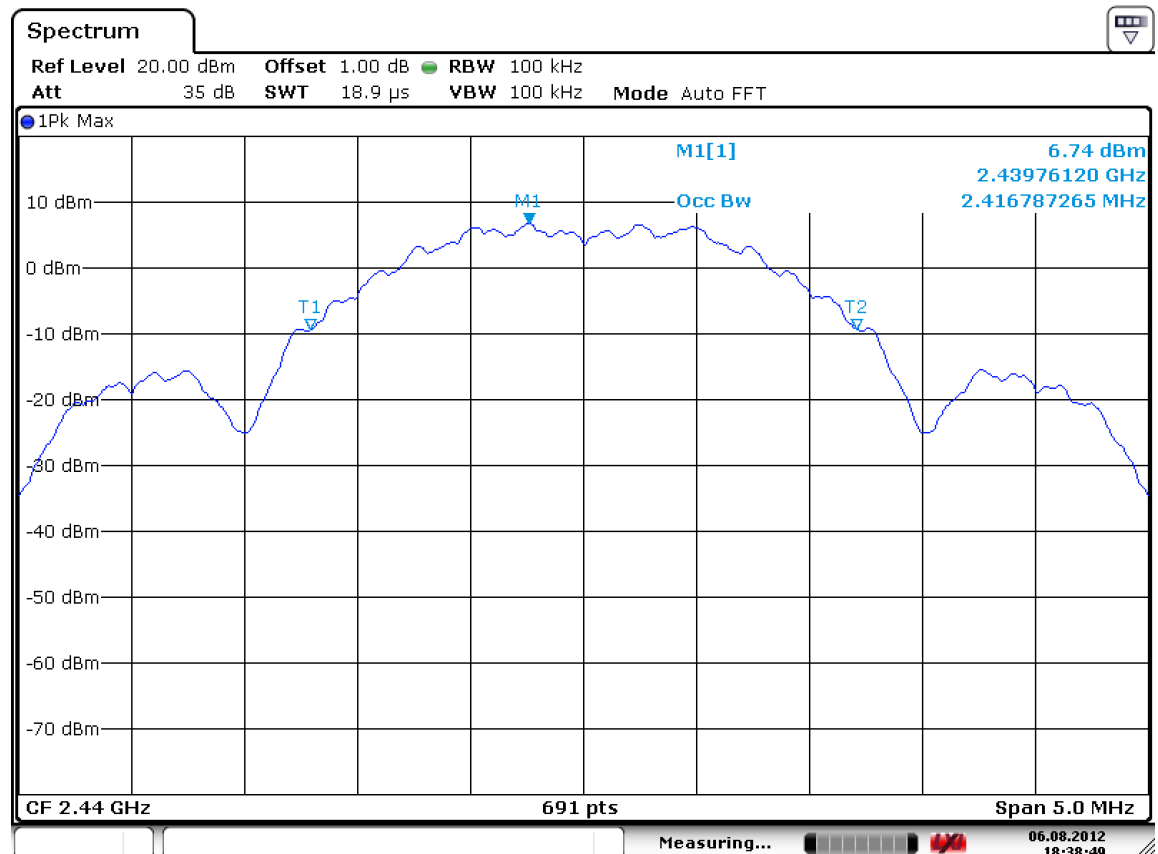
Minimum Standard:

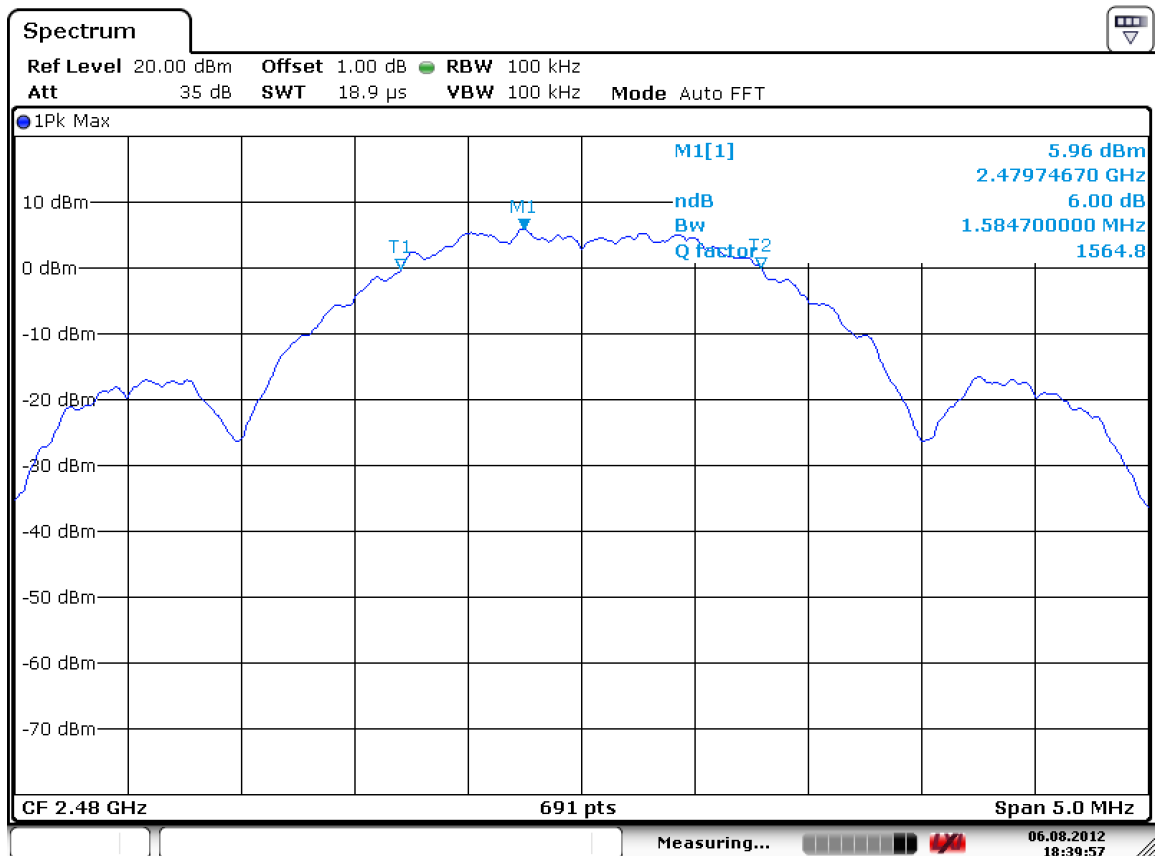
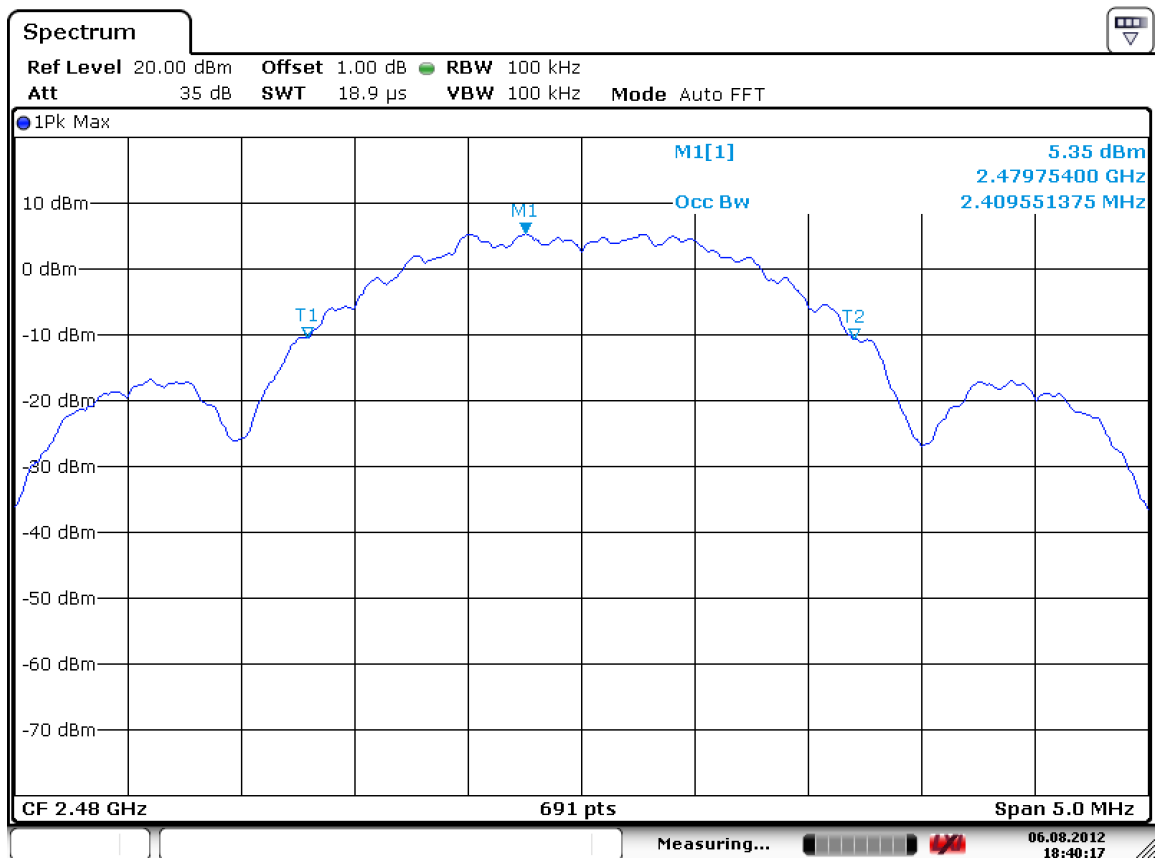
6 dB Bandwidth > 500kHz

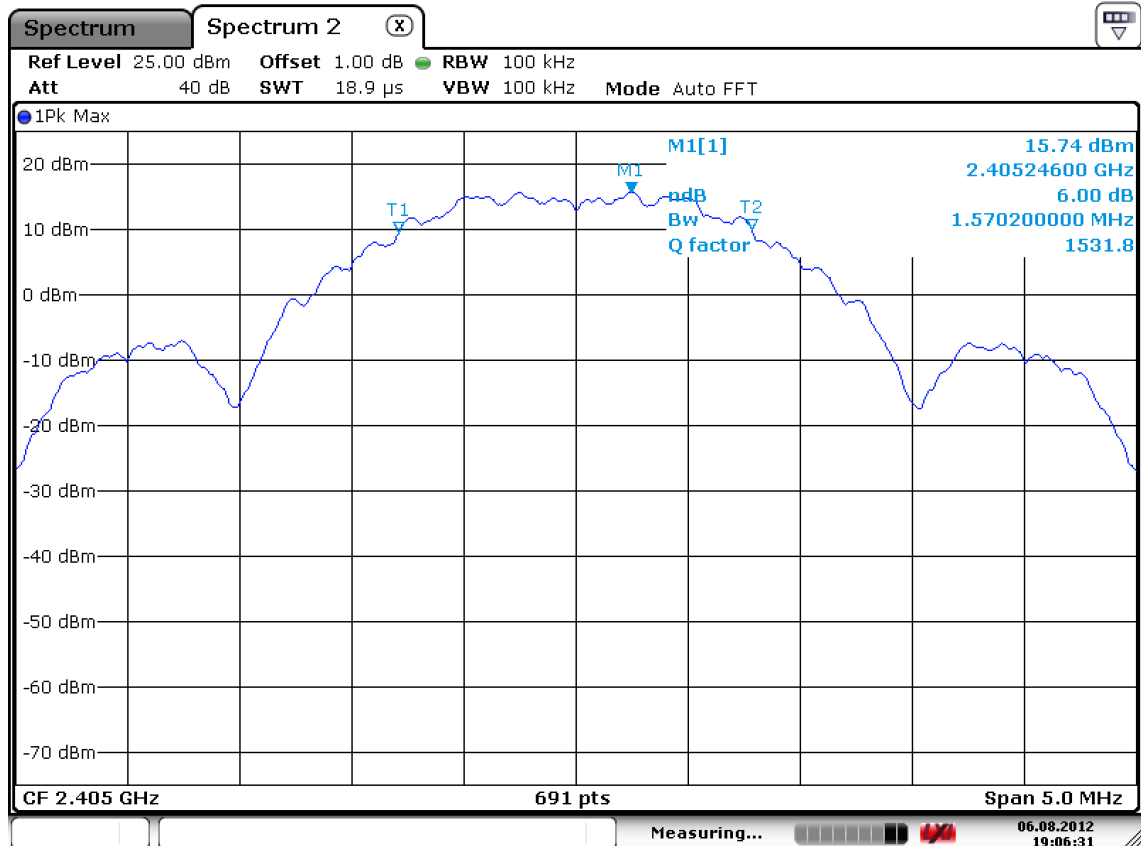
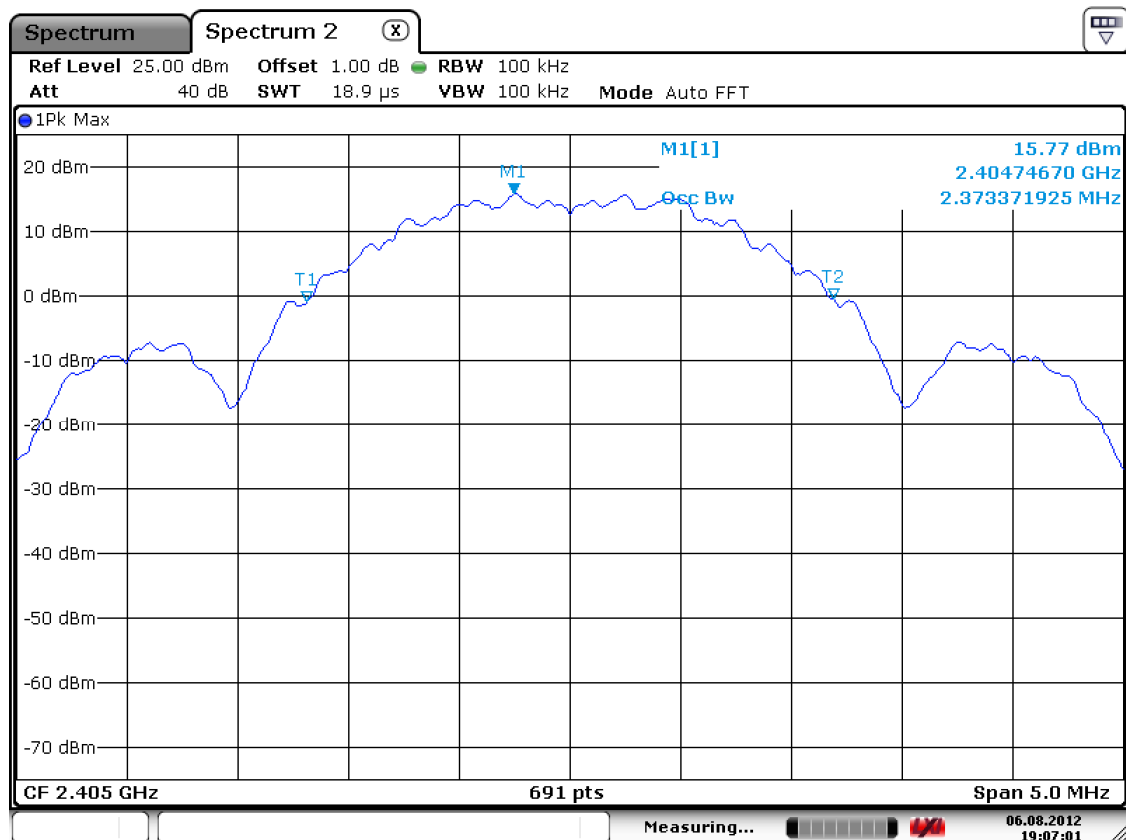
Measurement Setup

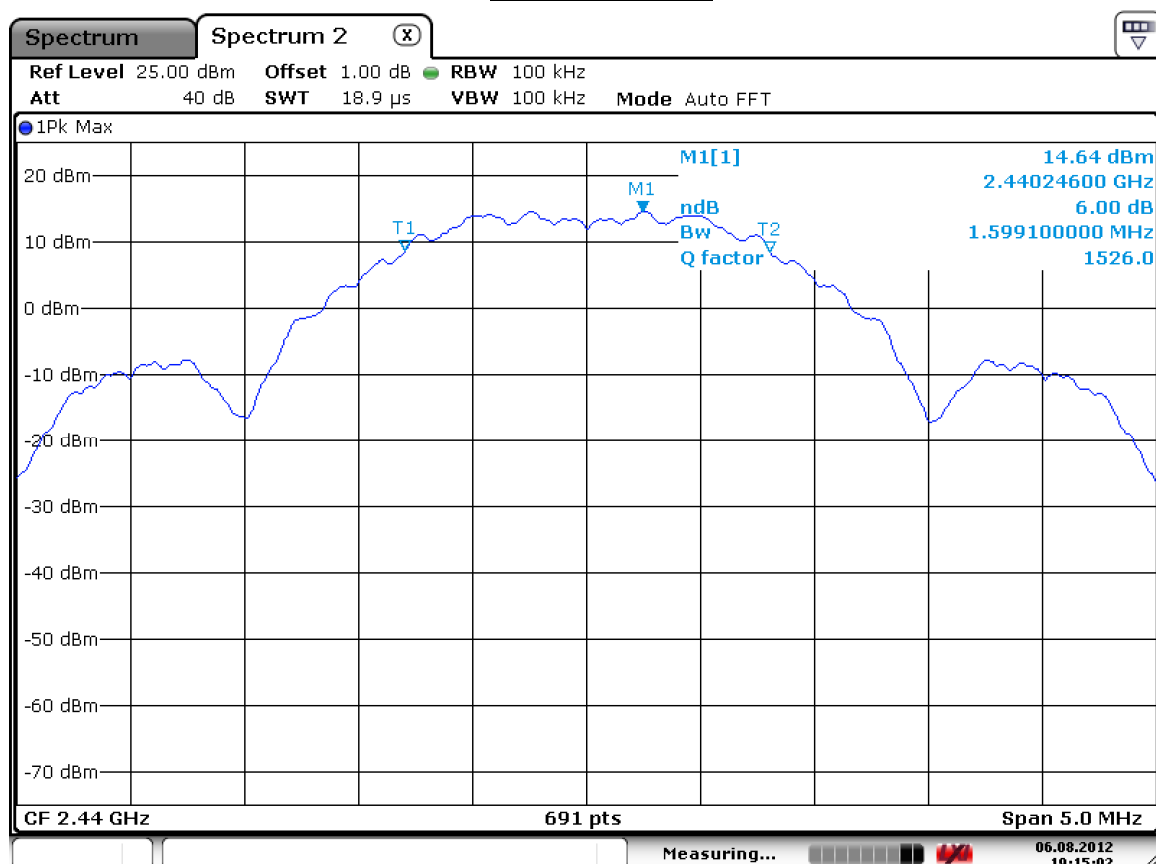
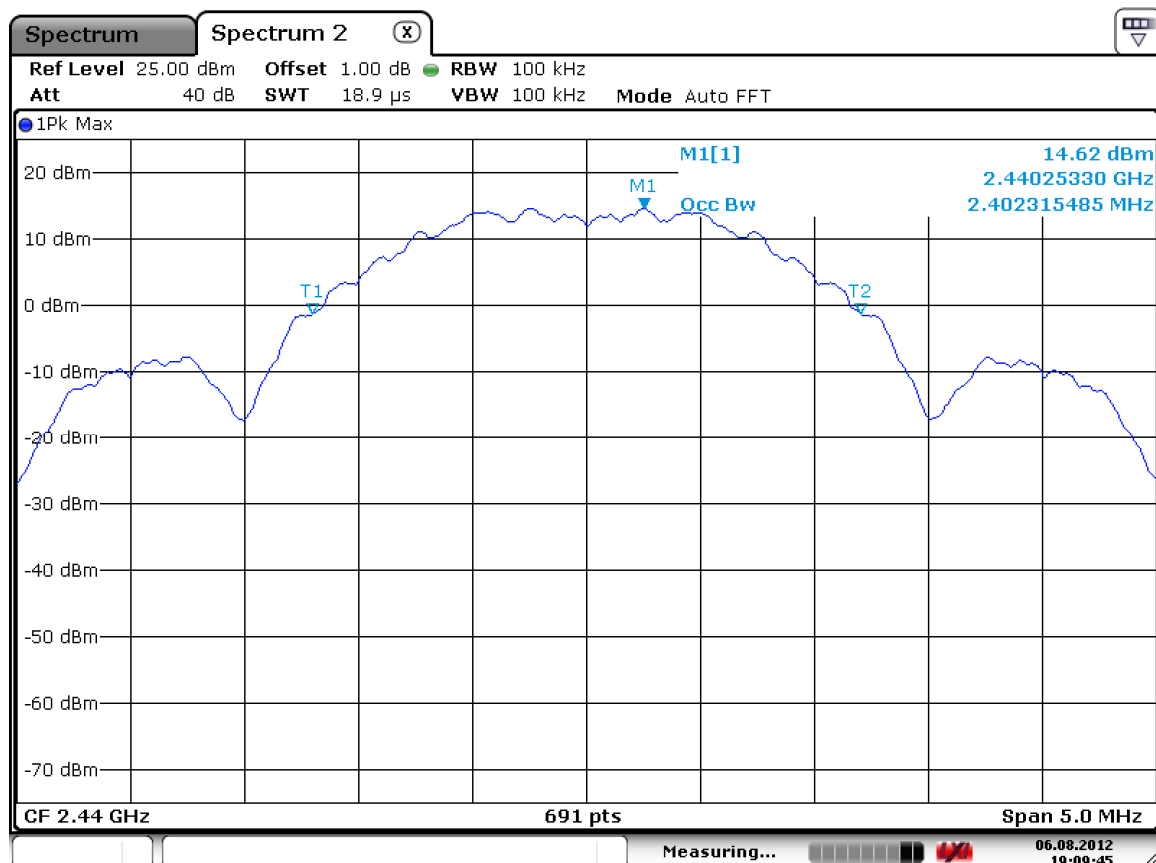
Same as the Chapter 3.2.1 (Figure 1)

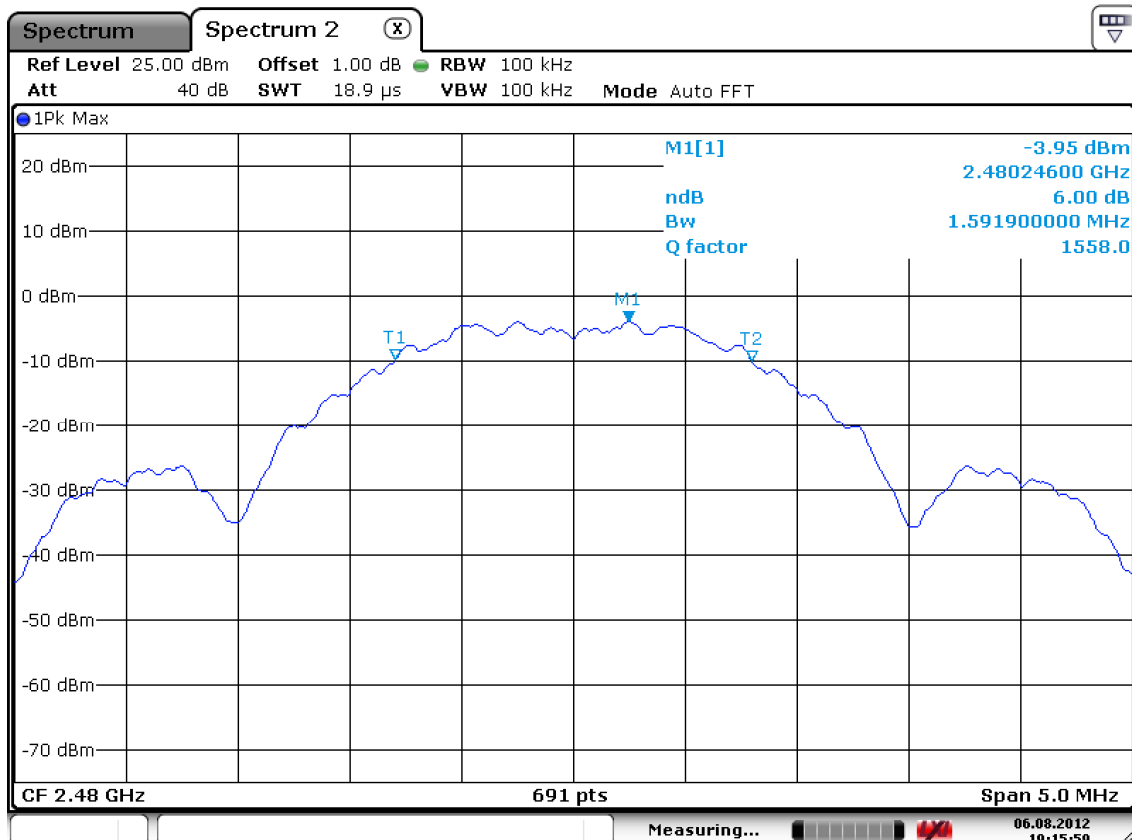
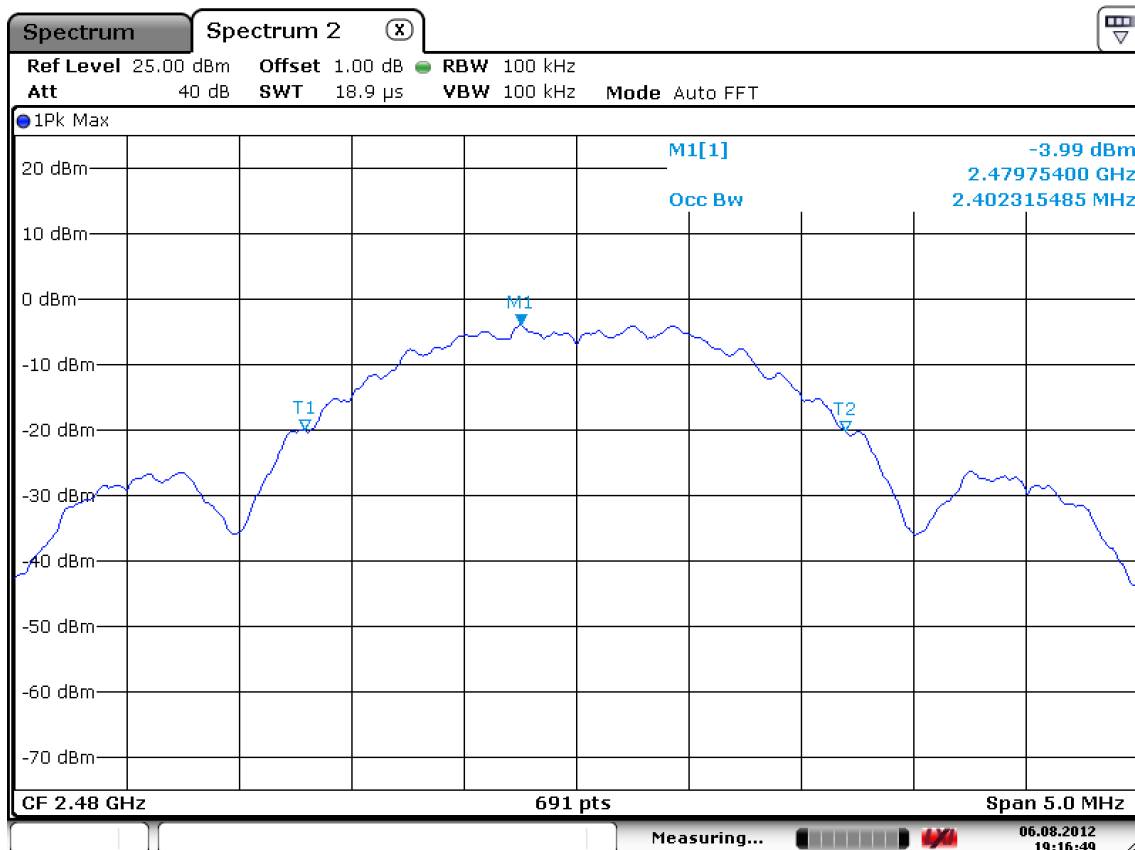
Channel 11 of Zigbee 1 mode**6 dB Bandwidth****99% Bandwidth**

Channel 18 of Zigbee 1 mode**6 dB Bandwidth****99% Bandwidth**

Channel 26 of Zigbee 1 mode**6 dB Bandwidth****99% Bandwidth**

Channel 11 of Zigbee 2 mode**6 dB Bandwidth****99% Bandwidth**

Channel 18 of Zigbee 2 mode**6 dB Bandwidth****99% Bandwidth**

Channel 26 of Zigbee 2 mode**6 dB Bandwidth****99% Bandwidth**

3.3.2 Peak Output Power Measurement

Procedure:

*The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance and TCB Workshop 2012, April. The maximum peak output power was measured with the spectrum analyzer connected to the antenna output of the EUT. The spectrum analyzer's internal channel power integration function is used to integrate the power over a bandwidth greater than or equal to the 99% bandwidth. The EUT was operating in transmit mode at the appropriate center frequency.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

RBW = 1MHz

Span = auto

VBW = 3MHz (VBW \geq RBW)

Sweep = auto

Detector function = peak

Measurement Data: (Zigbee 1)

Mode	Frequency (MHz)	Channel No.	Test Results	
			Measured Data (dBm)	Result
Zigbee 1	11	2405	21.67	Complies
	18	2440	20.60	Complies
	26	2480	2.95	Complies

Measurement Data: (Zigbee 2)

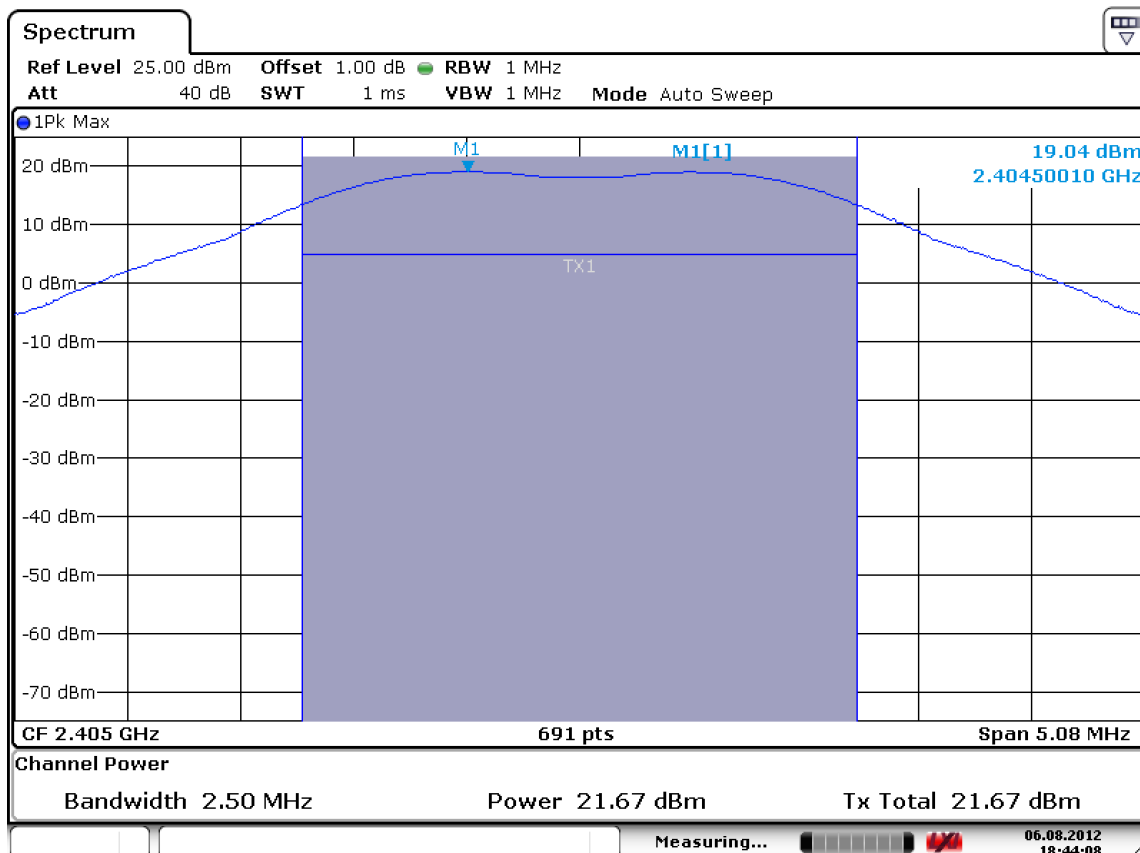
Mode	Frequency (MHz)	Channel No.	Test Results	
			Measured Data (dBm)	Result
Zigbee 2	11	2405	21.57	Complies
	18	2440	20.48	Complies
	26	2480	1.98	Complies

- See next pages for actual measured spectrum plots.

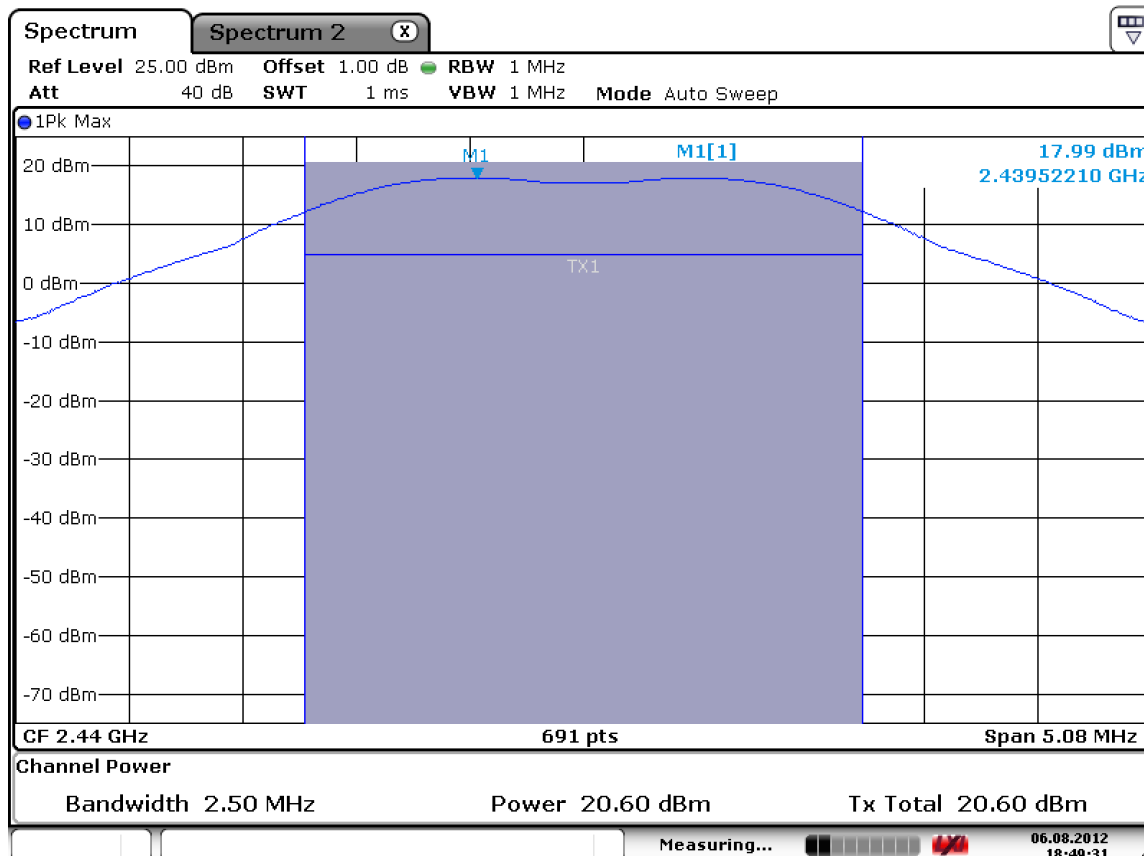
Minimum Standard:

Peak output power	< 1W
-------------------	------

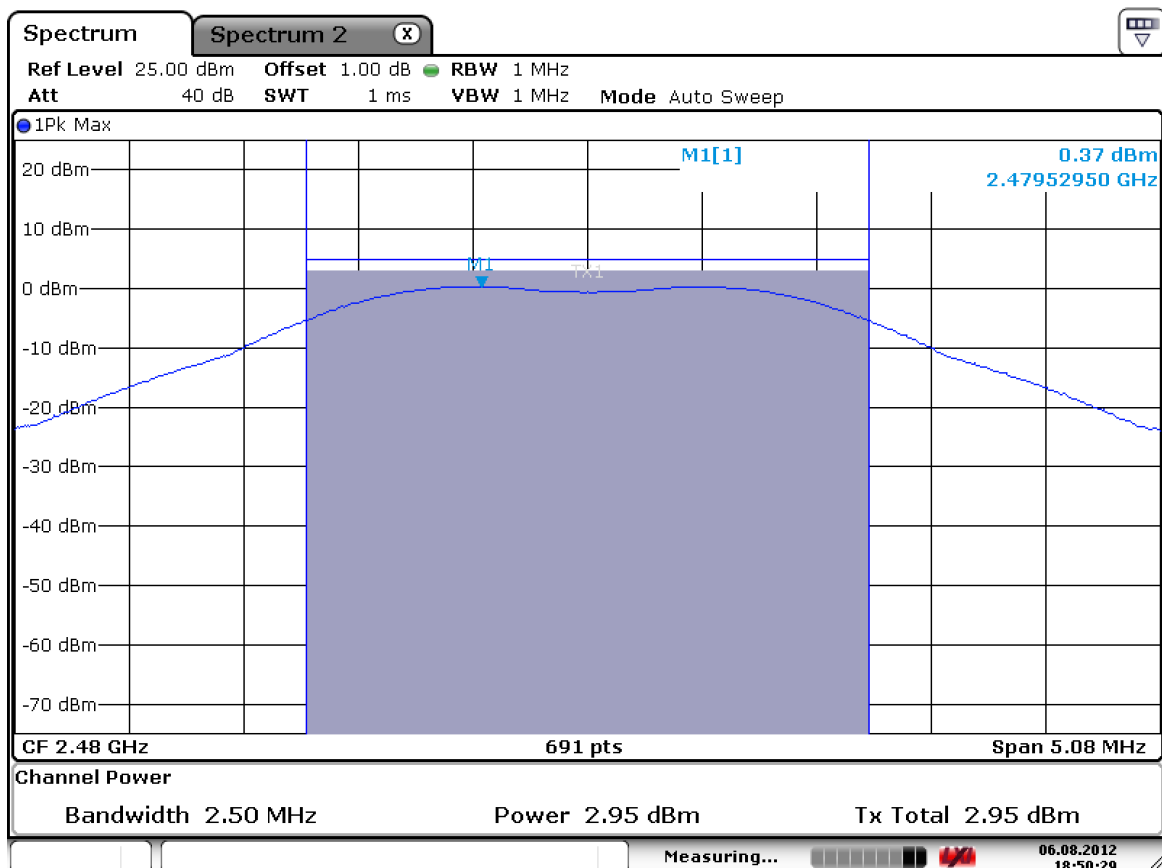
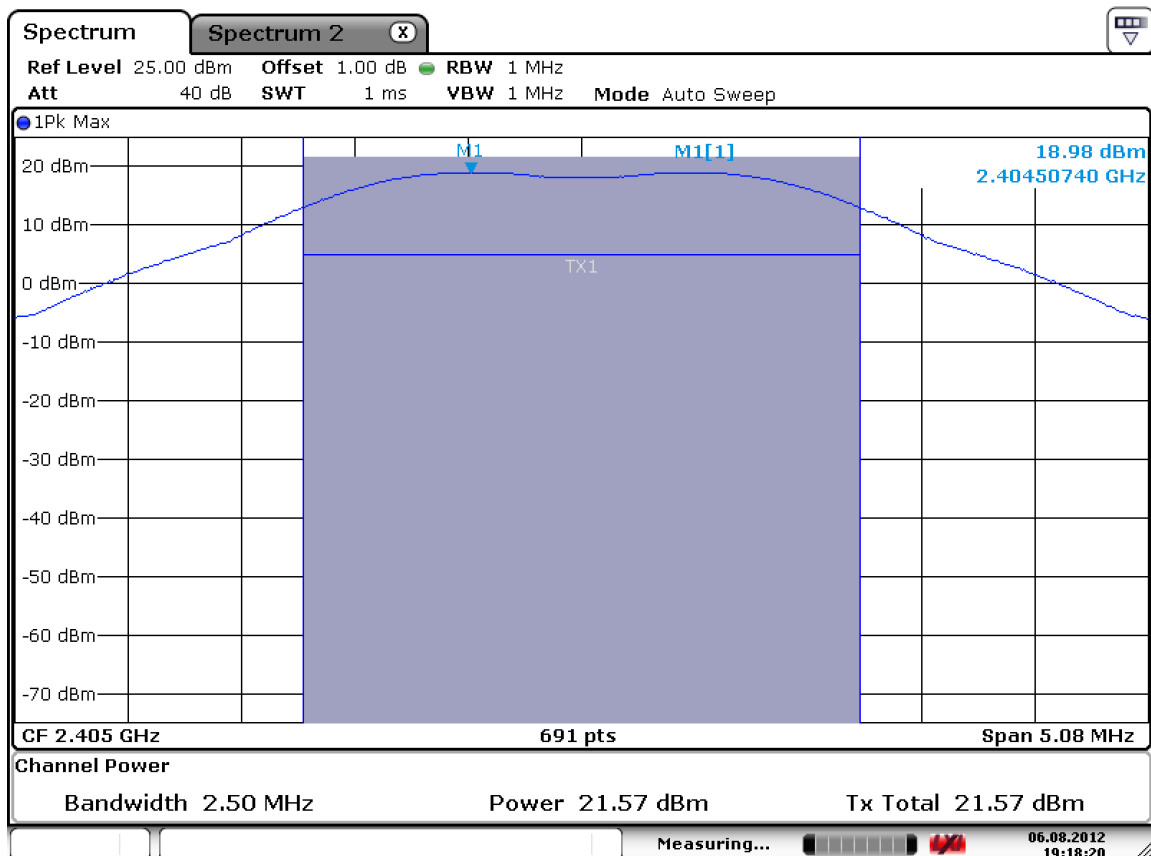
Zigbee 1 mode CH 11



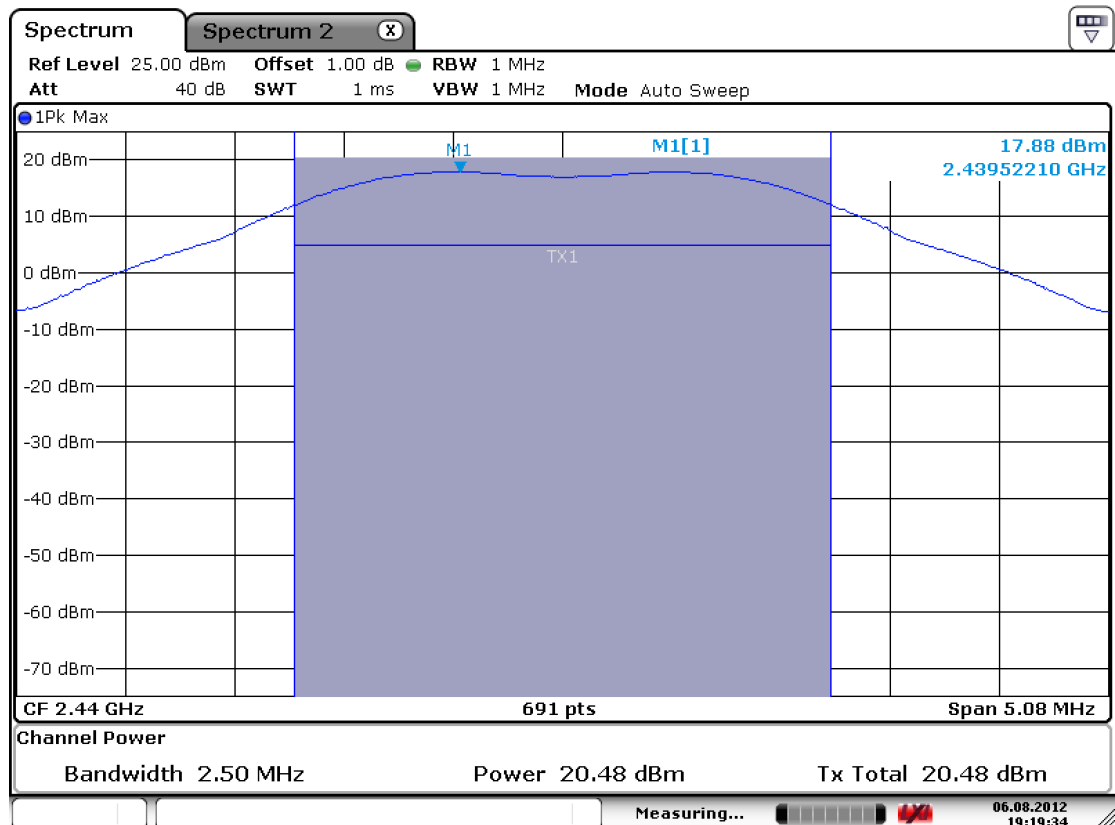
CH 18



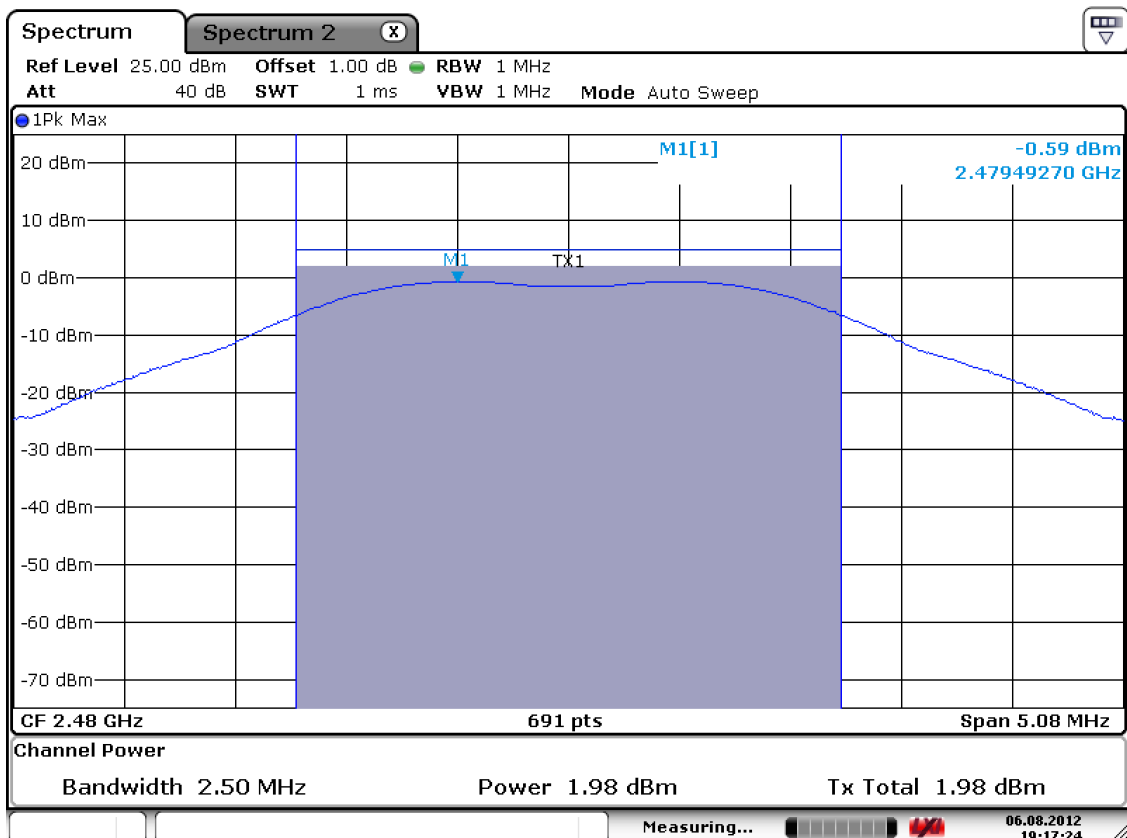
CH 26

Zigbee 2 mode
CH 11

CH 18



CH 26



3.3.3 Power Spectral Density

Procedure:

*The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance and TCB Workshop 2012, April.

The peak power density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies.

The spectrum analyzer is set to:

RBW = 3 kHz

Span = 300 kHz

VBW = 3 kHz

Sweep = 100 sec

Detector function = peak

Trace = max hold

Measurement Data: (Zigbee 1)

Mode	Ch.	Frequency (MHz)	Test Results	
			dBm	Result
Zigbee	11	2405	3.83	Complies
	18	2440	3.02	Complies
	26	2480	-13.95	Complies

Measurement Data: (Zigbee 2)

Mode	Ch.	Frequency (MHz)	Test Results	
			dBm	Result
Zigbee	11	2405	3.93	Complies
	18	2440	3.59	Complies
	26	2480	-14.89	Complies

- See next pages for actual measured spectrum plots.

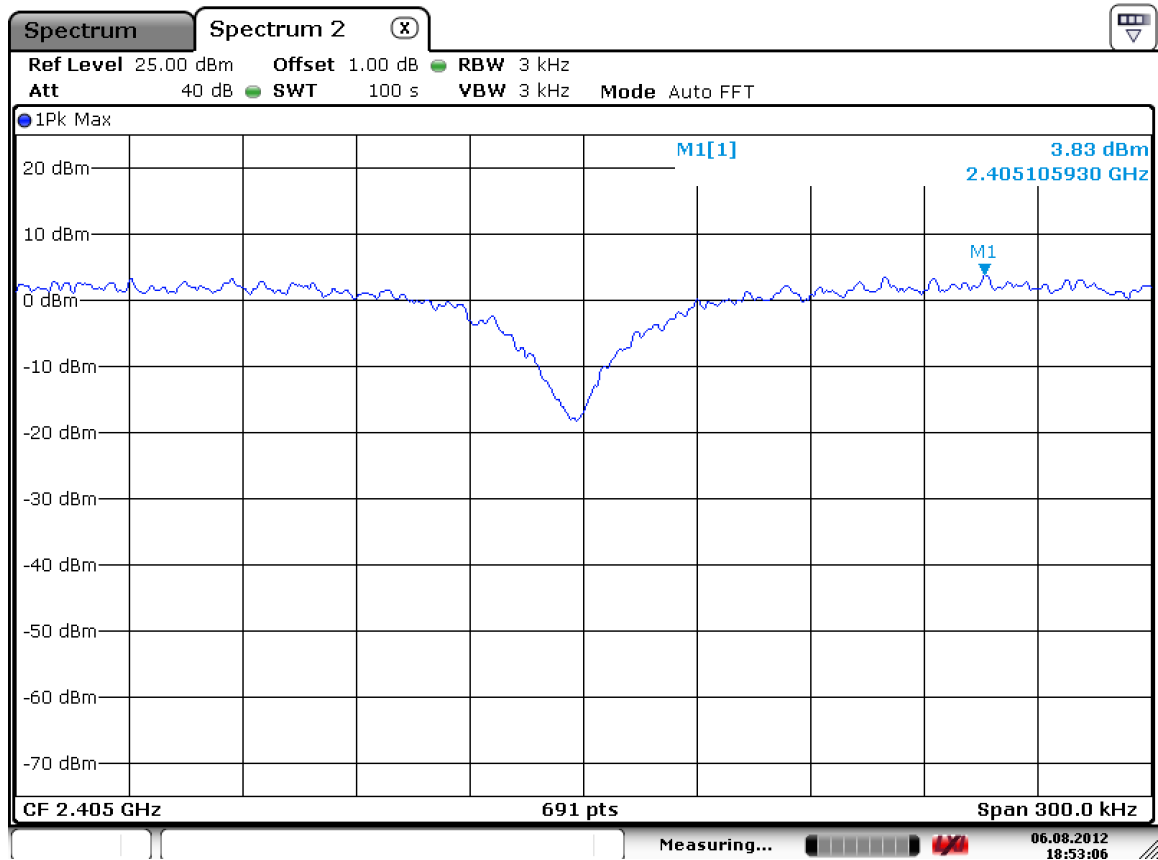
Minimum Standard:

Power Spectral Density	< 8dBm @ 3kHz BW
------------------------	------------------

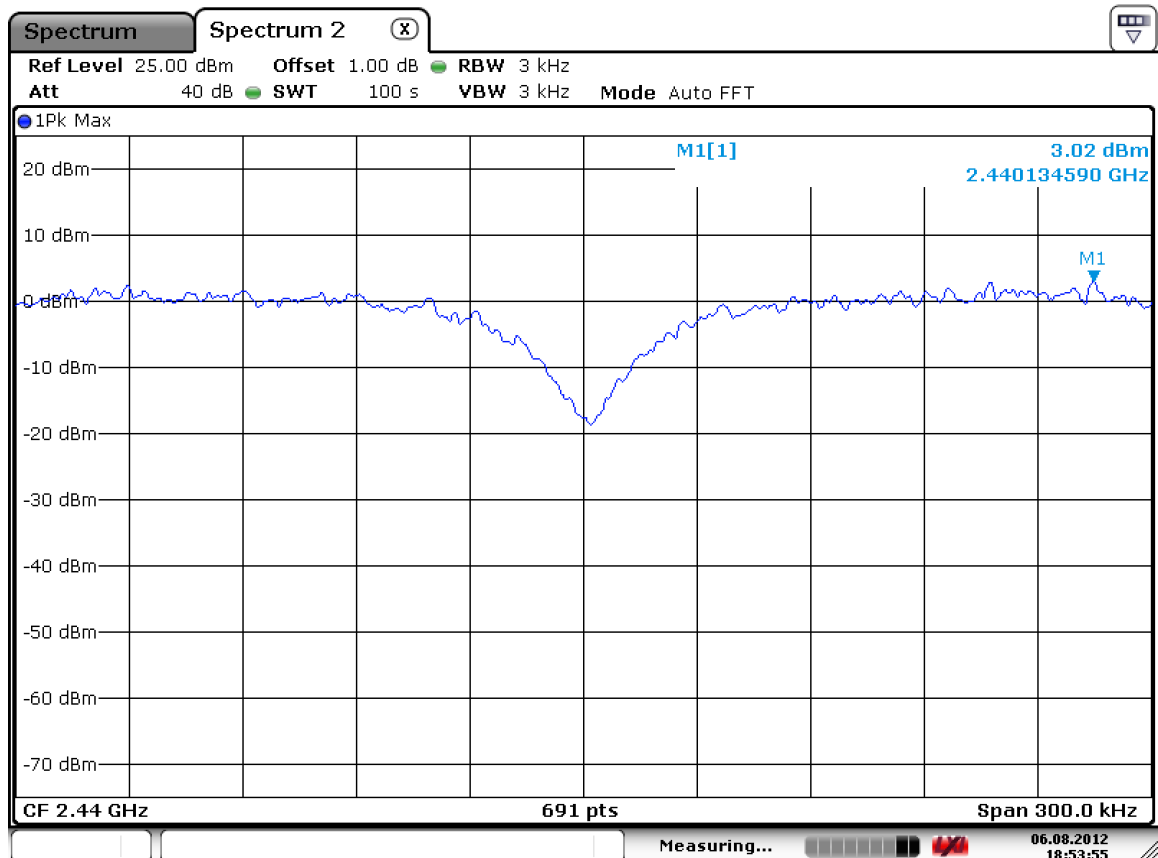
Measurement Setup

Same as the Chapter 3.2.1 (Figure 1)

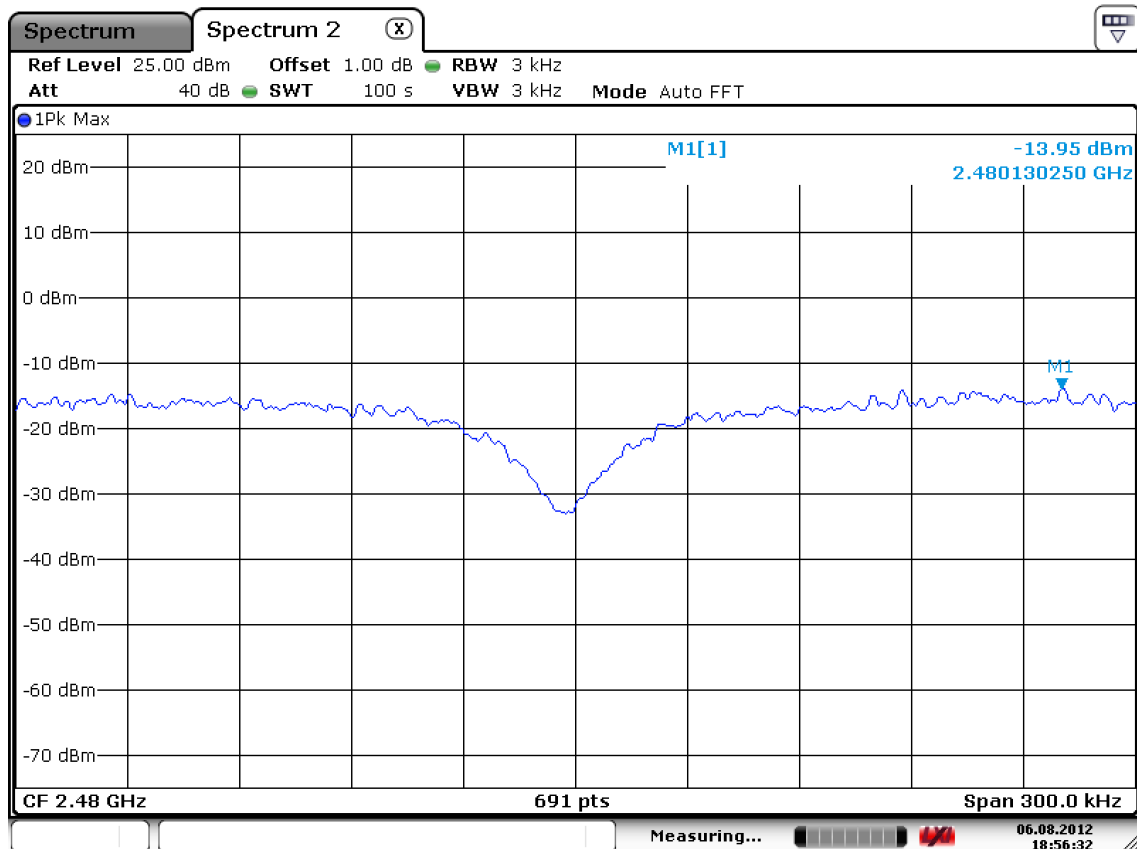
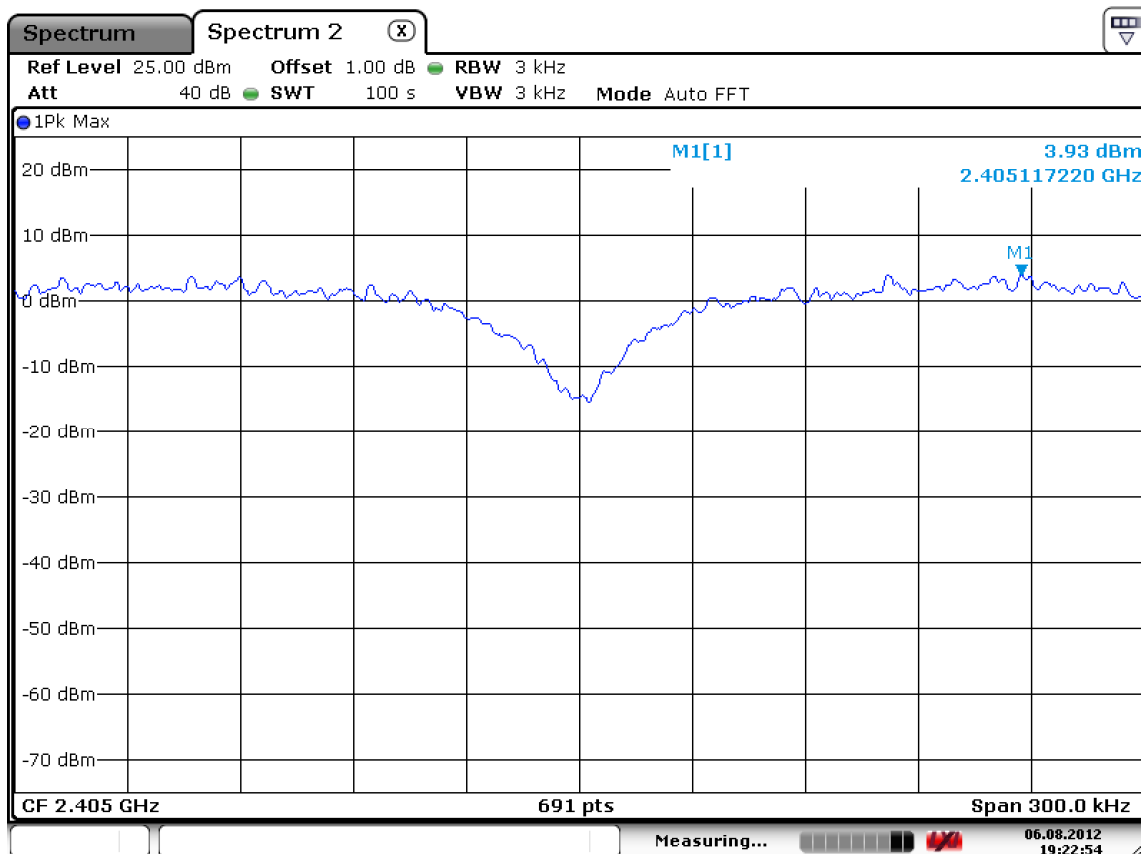
Zigbee 1 mode CH 11



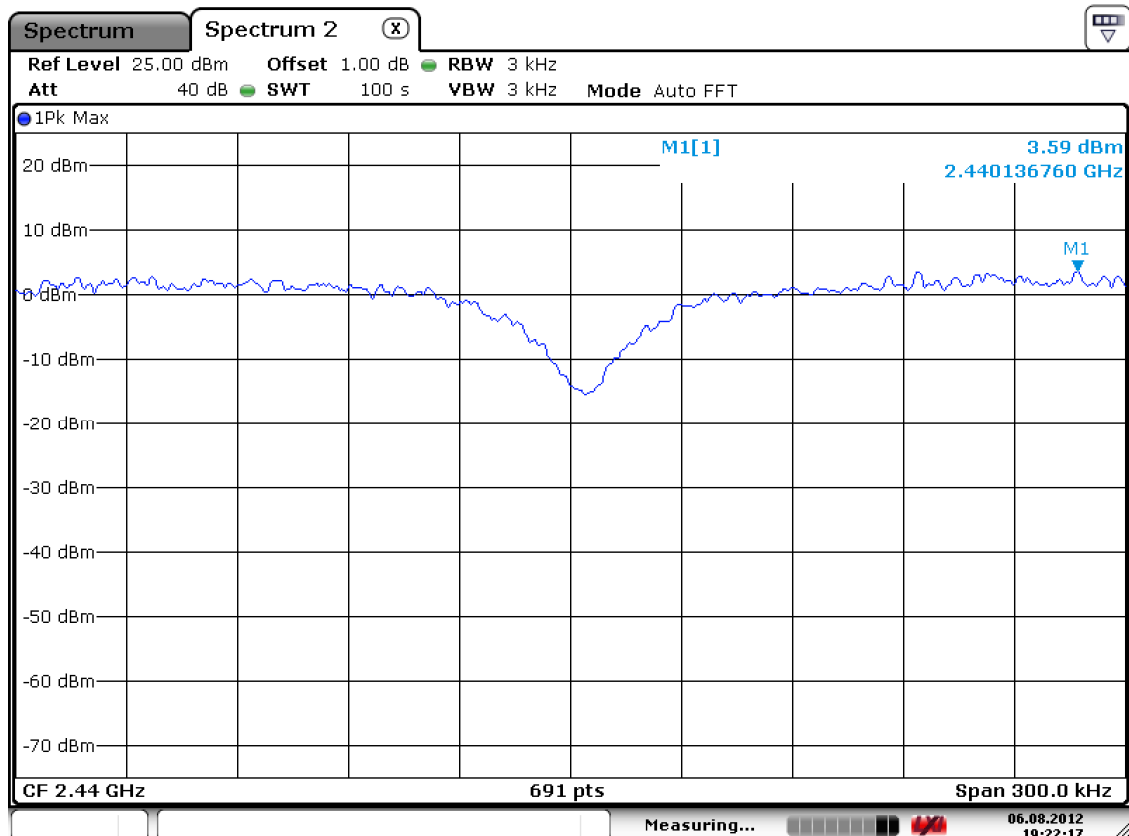
CH 18



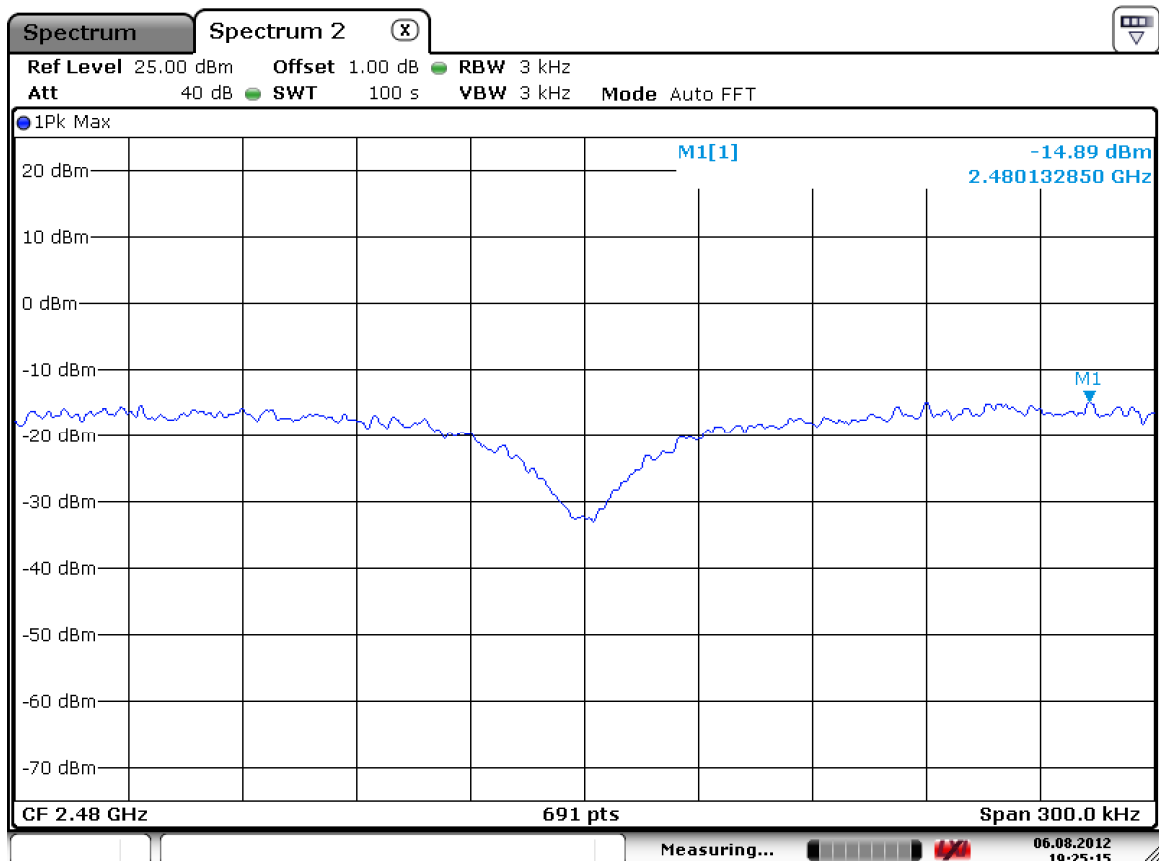
CH 26

Zigbee 2 mode
CH 11

CH 18



CH 26



3.3.4 Band - edge

Procedure:

*The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance and TCB Workshop 2012, April.

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 = 20 MHz / 50MHz

Detector function = peak

Trace = max hold

Sweep = auto

Measurement Data: Complies

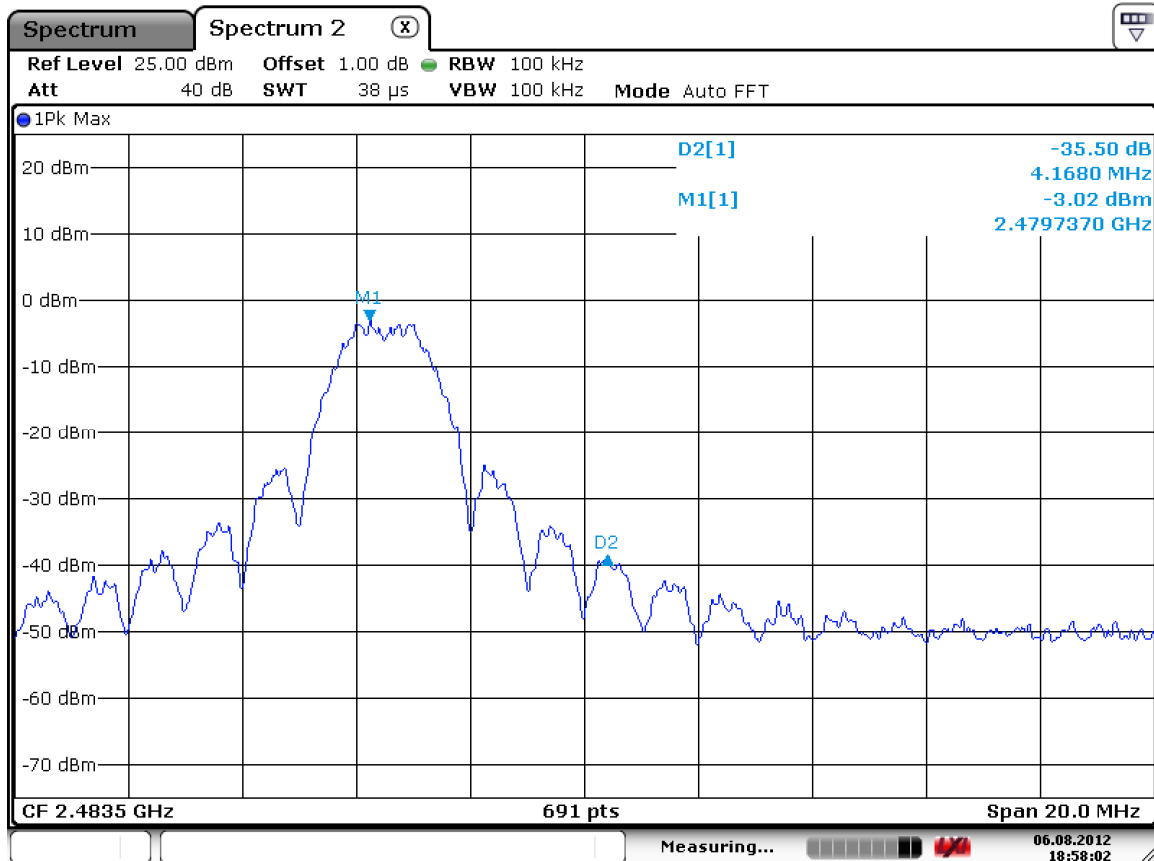
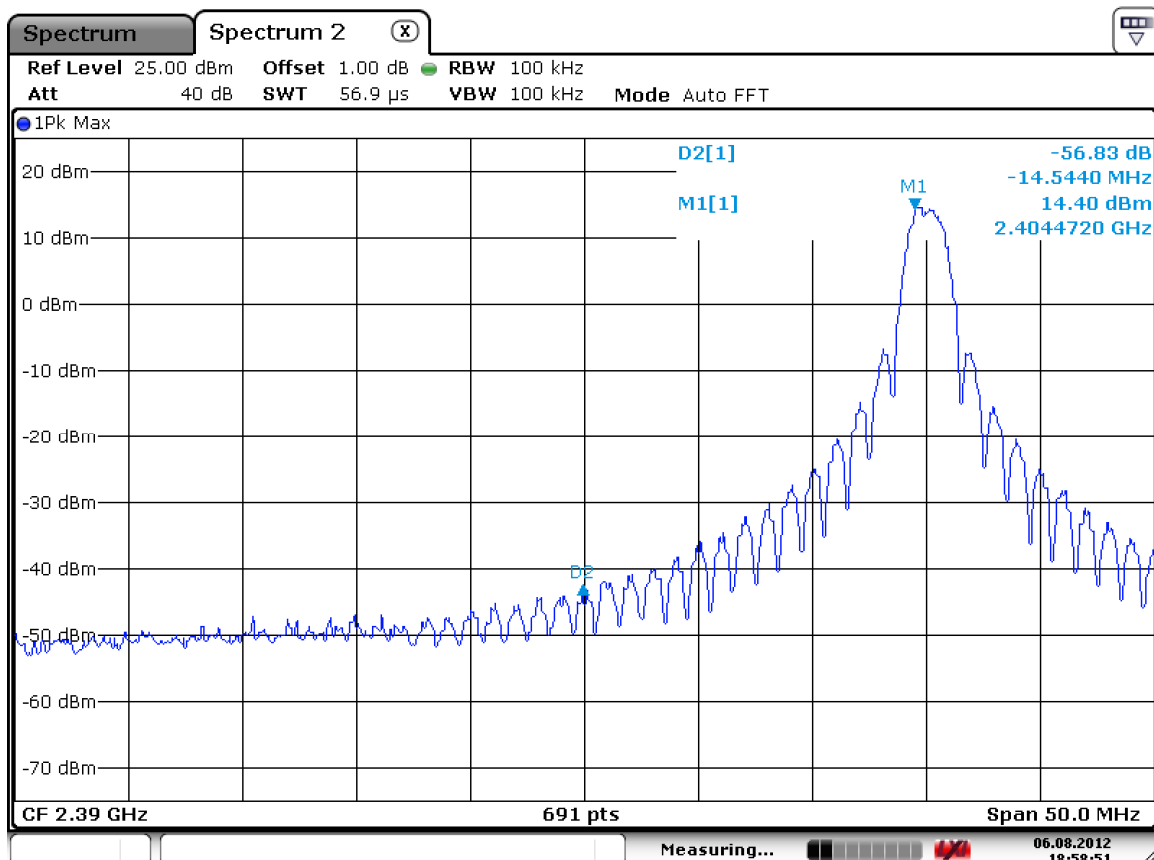
- All conducted emission in any 100kHz bandwidth outside of the spread spectrum band was at least 20dB lower than the highest inband spectral density. Therefore the applying equipment meets the requirement.
- See next pages for actual measured spectrum plots.

Minimum Standard:	> 20 dBc
--------------------------	----------

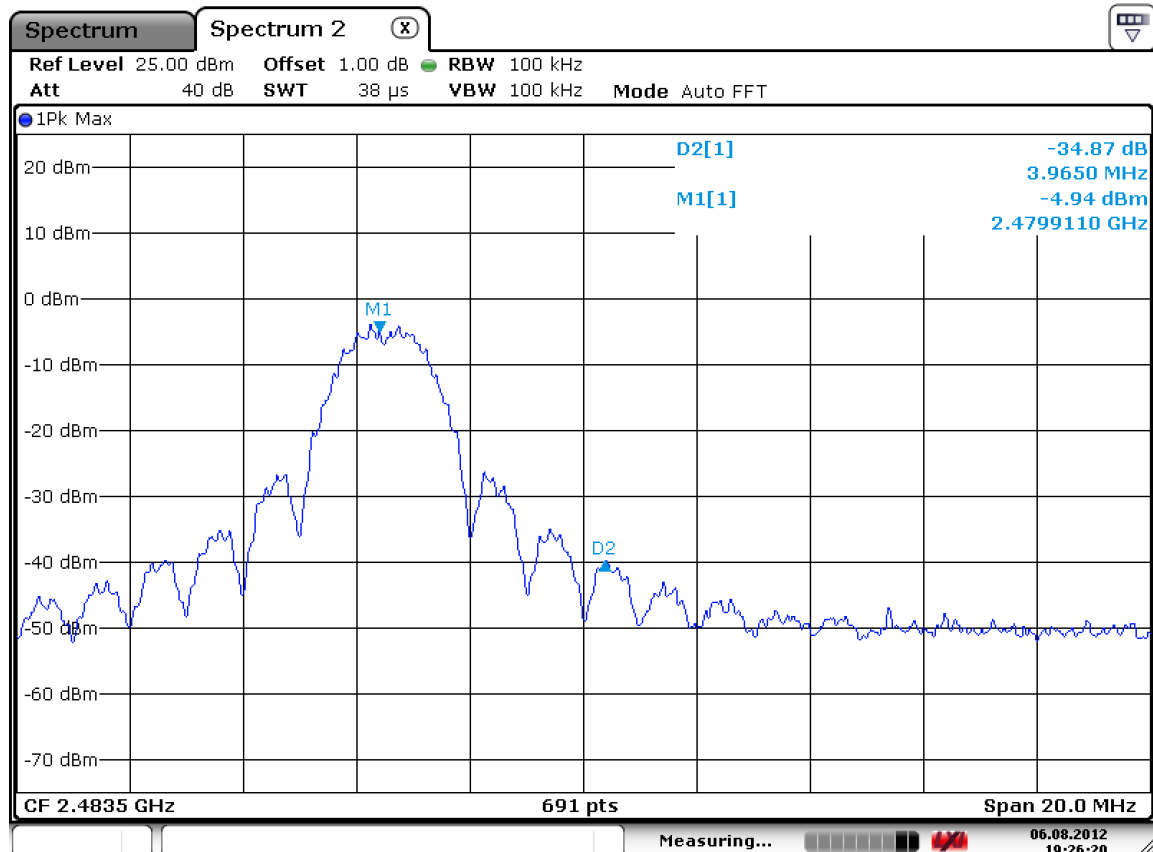
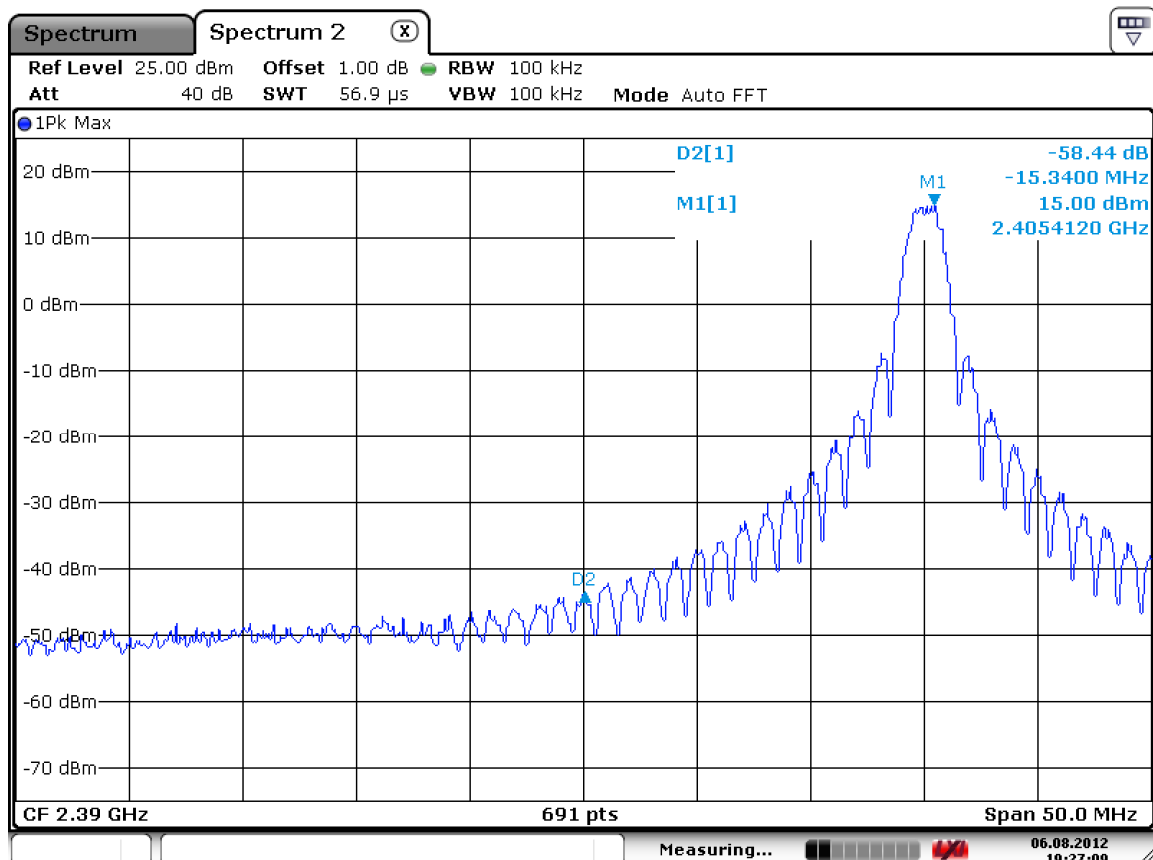
Measurement Setup

Same as the Chapter 3.2.1 (Figure 1)

Zigbee 1 mode Band-edge : Conducted Measurements



Zigbee 2 mode Band-edge : Conducted Measurements



Zigbee 1 Mode*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. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
2389.9	50.12	65.49	V	25.4	37.1	4.0	54.0	74.0	42.4	57.7	11.6	16.3

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. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
2483.5	49.48	63.21	V	25.4	37.1	4.0	54.0	74.0	41.7	55.5	12.3	18.5

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

Zigbee 2 Mode*Band-edges in the restricted band 2310-2390 MHz measurement**

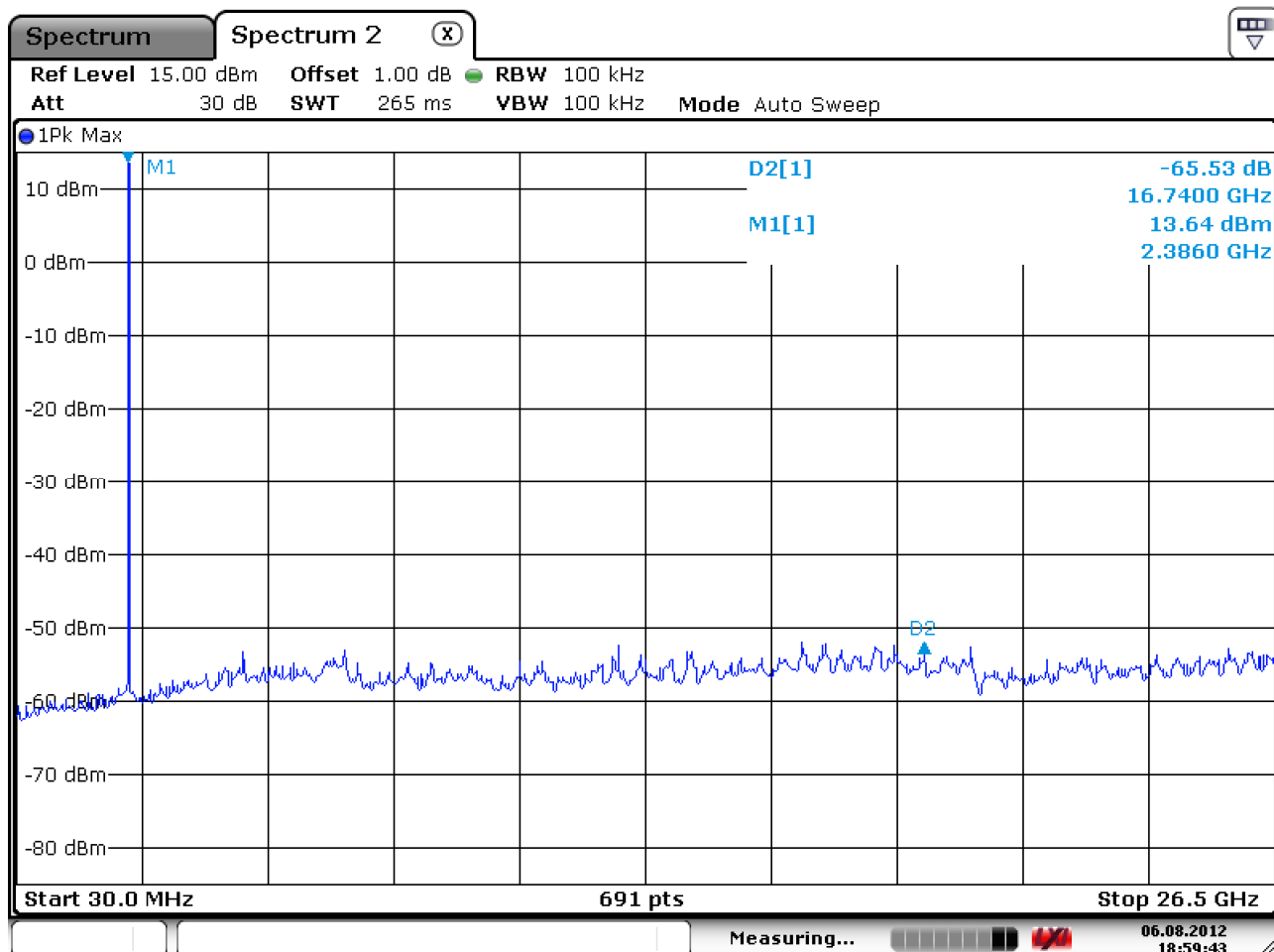
Frequency	Reading		Pol.	Correction			Limits		Result		Margin	
	[dBuV/m]			Factor			[dBuV/m]		[dBuV/m]		[dB]	
[MHz]	AV / Peak			Antenna	Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
2390	51.21	65.41	V	25.4	37.1	4.0	54.0	74.0	43.5	57.7	10.5	16.3

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

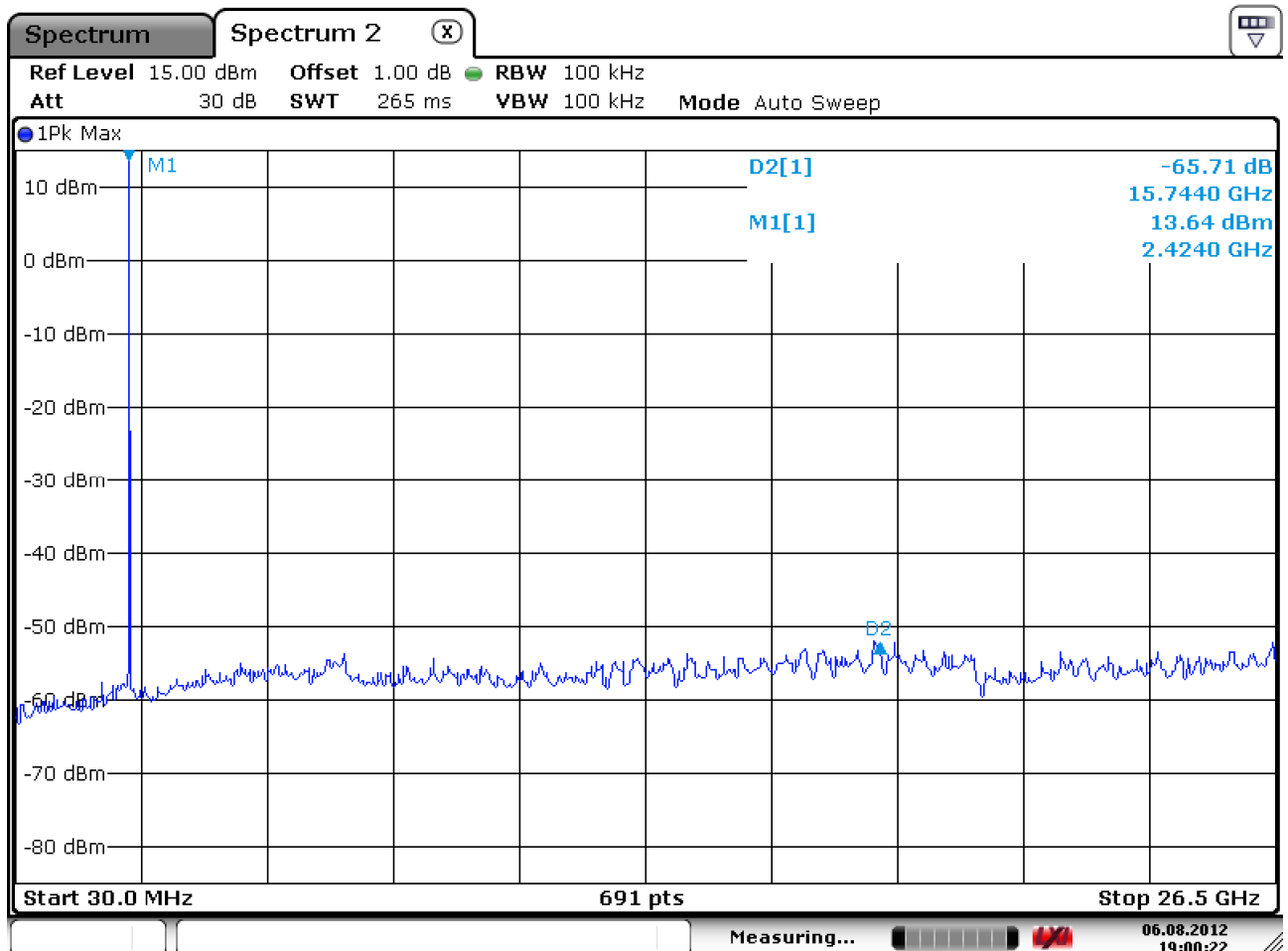
Frequency [MHz]	Reading [dBuV/m]		Pol.	Correction Factor			Limits [dBuV/m]		Result [dBuV/m]		Margin [dB]	
	AV / Peak			Antenna	Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
2483.5	50.84	64.43	V	25.4	37.1	4.0	54.0	74.0	43.1	56.7	10.9	17.3

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

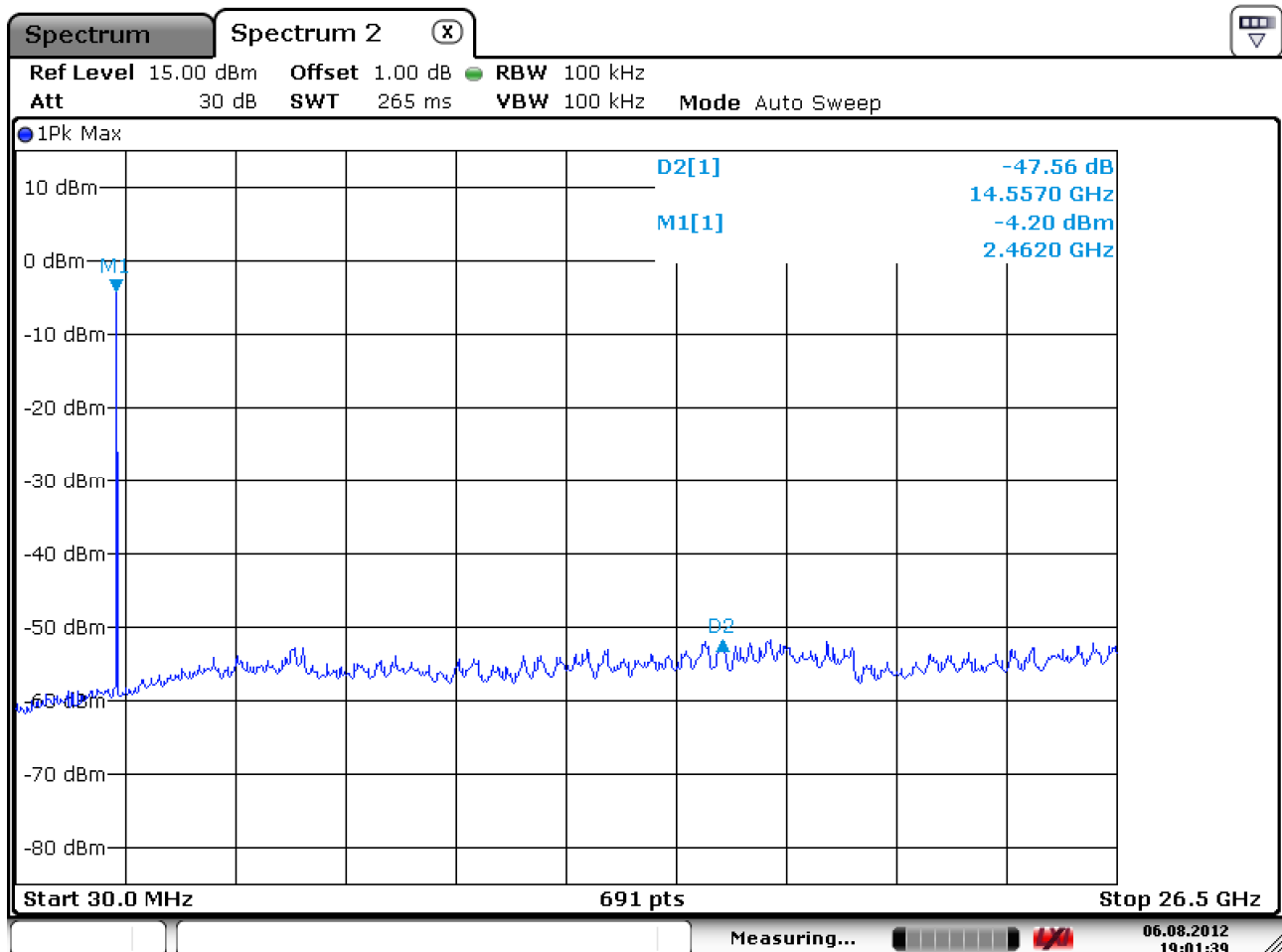
Zigbee 1 mode - Low channel **Frequency Range = 30 MHz ~ 10th harmonic.**



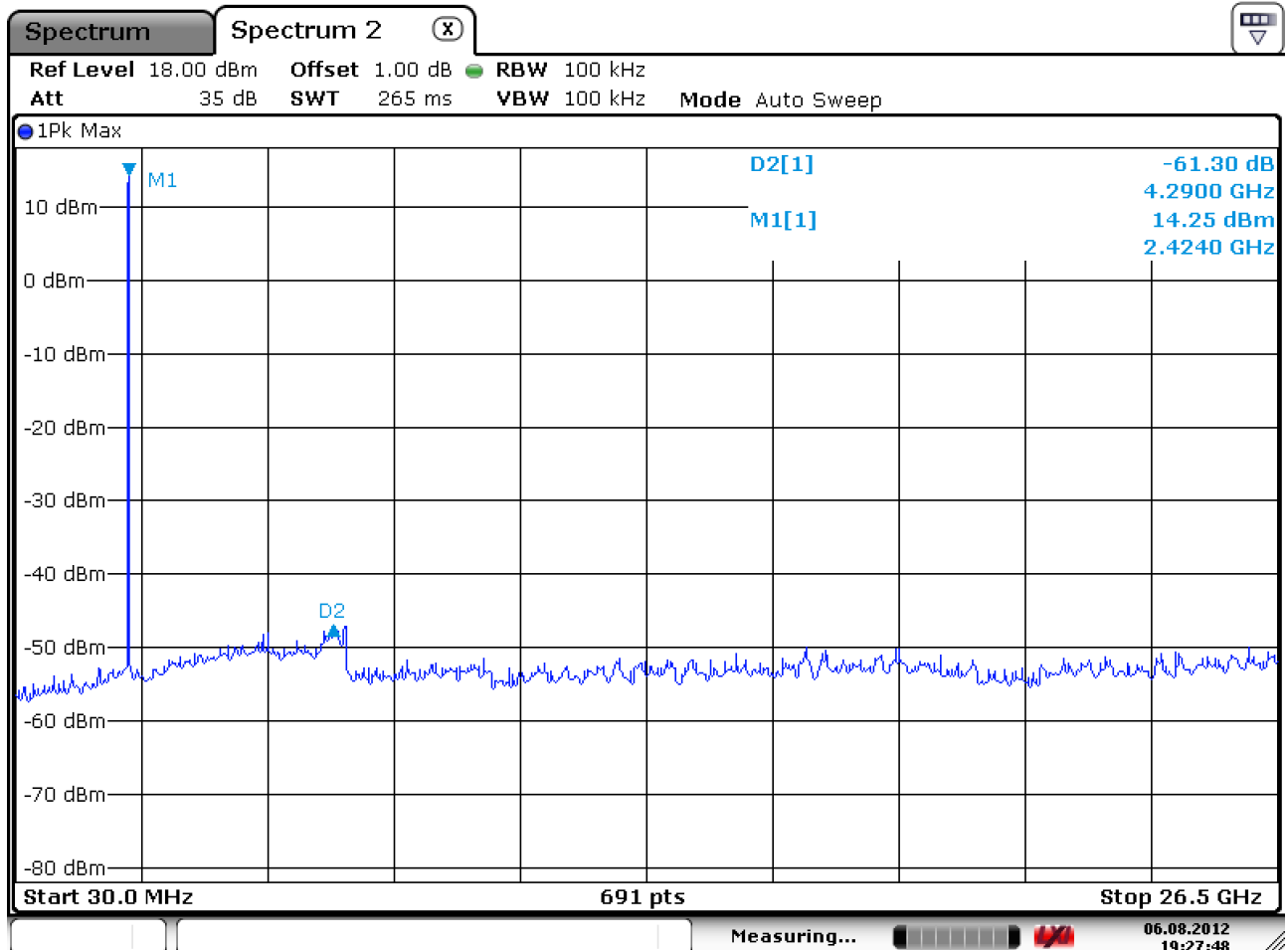
Zigbee 1 mode - Mid channel
Frequency Range = 30 MHz ~ 10th harmonic.



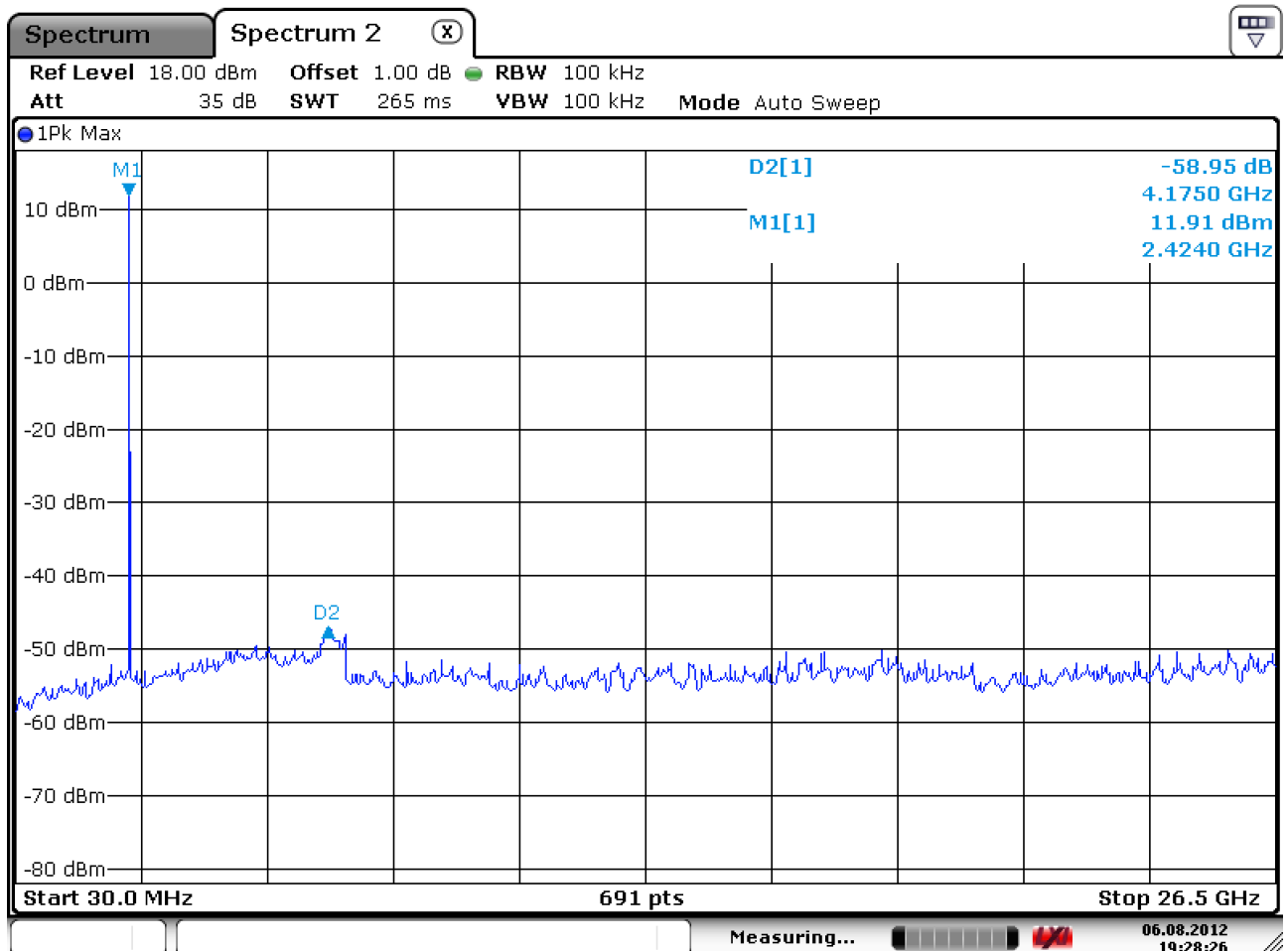
Zigbee 1 mode – High channel
Frequency Range = 30 MHz ~ 10th harmonic.



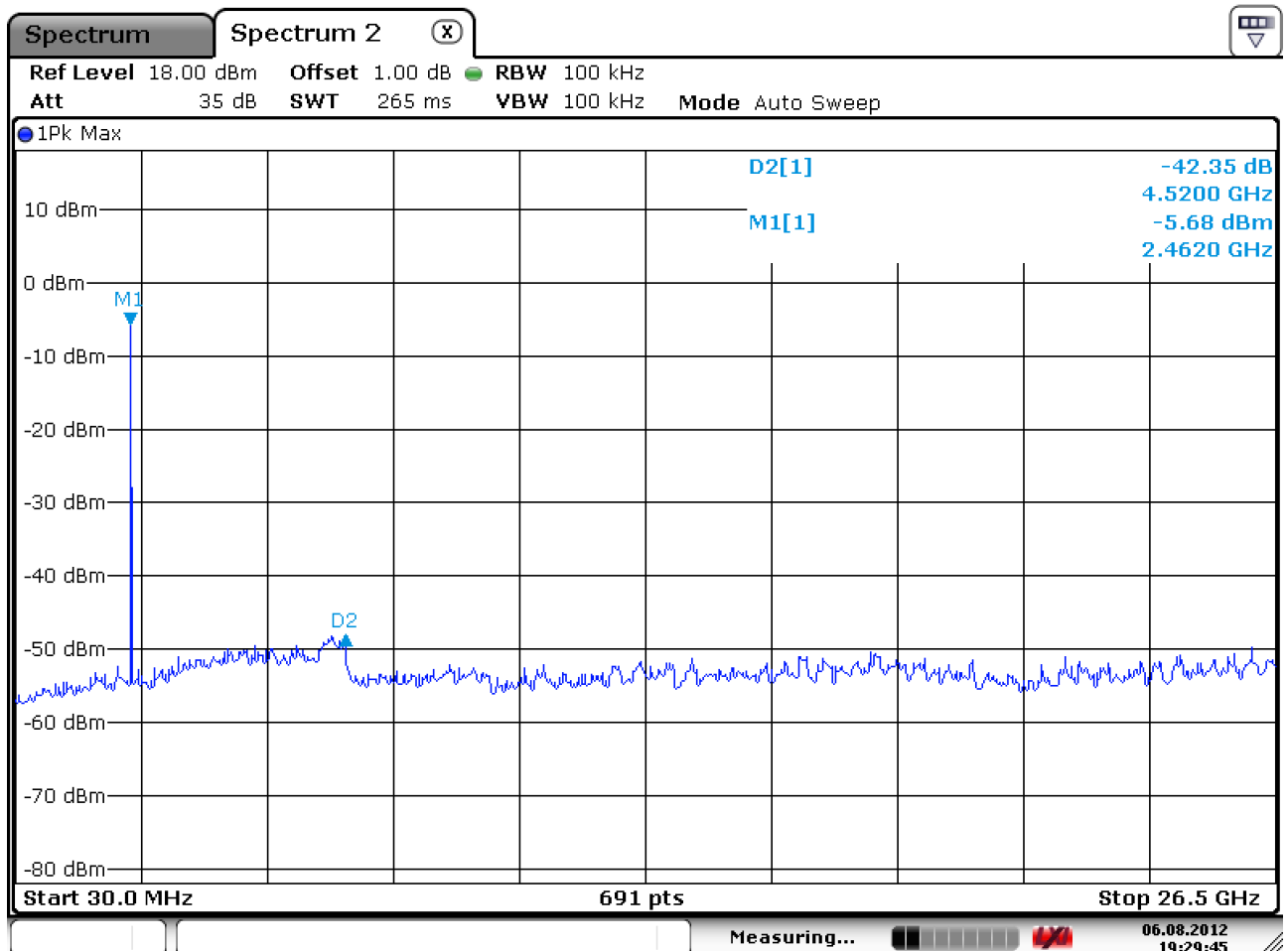
Zigbee 2 mode - Low channel
Frequency Range = 30 MHz ~ 10th harmonic.



Zigbee 2 mode - Mid channel
Frequency Range = 30 MHz ~ 10th harmonic.



Zigbee 2 mode – High channel
Frequency Range = 30 MHz ~ 10th harmonic.



3.3.5 Field Strength of Harmonics

Procedure:

*The testing follows TCB Workshop 2012, April and fulfills ANSI C63.4-2003 and the guidelines in ANSI C63.10-2009 test requirement. 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 ~ 10th harmonic.

RBW = 100 kHz (30MHz ~ 1 GHz)

= 1 MHz (1 GHz ~ 10th 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 20dB below limit.
- 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.

Zigbee 1 Mode*Zigbee 1 mode Measurement Data: (Above 1GHz)**

Frequency	Reading		Pol.	Correction			Limits		Result		Margin	
	[dBuV/m]			Factor			[dBuV/m]		[dBuV/m]		[dB]	
[MHz]	AV / Peak			Antenna	Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
4810	45.35	58.97	V	31.4	36.5	5.7	54.0	74.0	46.0	59.6	8.0	14.4
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
Frequency	Reading		Pol.	Correction			Limits		Result		Margin	
	[dBuV/m]			Factor			[dBuV/m]		[dBuV/m]		[dB]	
[MHz]	AV / Peak			Antenna	Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
4880	44.31	58.09	V	31.4	36.5	5.7	54.0	74.0	45.0	58.8	9.0	15.2
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
Frequency	Reading		Pol.	Correction			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	39.59	50.35	V	31.4	36.5	5.7	54.0	74.0	40.3	51.0	13.7	23.0
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

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

Zigbee 1 mode Measurement Data: (9kHz - 30MHz)

Frequency	Reading		Pol.	Correction			Limits		Result		Margin	
	[dBuV/m]			Factor			[dBuV/m]		[dBuV/m]		[dB]	
[MHz]	AV / Peak			Antenna	Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
-	-	-	-	-	-	-	-	-	-	-	-	-
No emissions were detected at a level greater than 20dB below limit.												
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

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

Zigbee 2 Mode*Zigbee 2 mode Measurement Data: (Above 1GHz)**

Frequency	Reading		Pol.	Correction			Limits		Result		Margin	
	[dBuV/m]			Factor			[dBuV/m]		[dBuV/m]		[dB]	
[MHz]	AV / Peak			Antenna	Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
4810	42.88	54.51	V	31.4	36.5	5.7	54.0	74.0	43.6	55.2	10.5	18.8
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
Frequency	Reading		Pol.	Correction			Limits		Result		Margin	
	[dBuV/m]			Factor			[dBuV/m]		[dBuV/m]		[dB]	
[MHz]	AV / Peak			Antenna	Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
4880	43.66	56.54	V	31.4	36.5	5.7	54.0	74.0	44.3	57.2	9.7	16.8
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
Frequency	Reading		Pol.	Correction			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	37.22	49.38	V	31.4	36.5	5.7	54.0	74.0	37.9	50.1	16.1	24.0
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

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

Zigbee 2 mode Measurement Data: (9kHz - 30MHz)

Frequency	Reading [dBuV/m]		Pol.	Correction			Limits [dBuV/m]		Result [dBuV/m]		Margin [dB]	
				Factor								
[MHz]	AV / Peak			Antenna	Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
-	-	-	-	-	-	-	-	-	-	-	-	-
No emissions were detected at a level greater than 20dB below limit.												
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

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

Radiated Emissions – Zigbee 1 mode

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

EUT/Model No.: HES2E4A0T

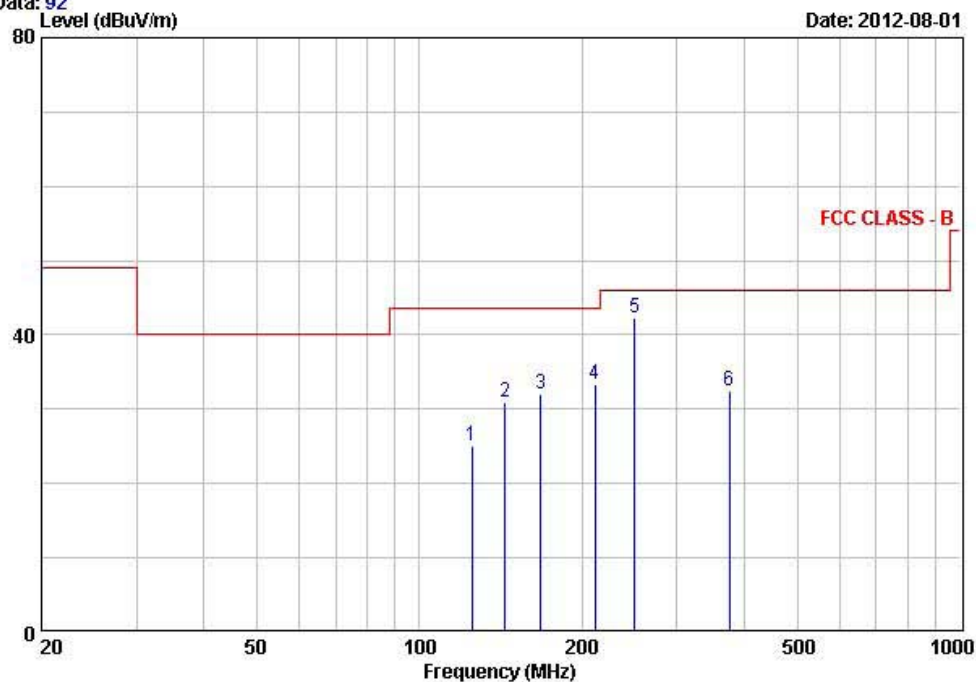
TEST MODE: ZIGBEE 1 mode

Temp Humi : 27 / 49

Tested by: PARK H W

Data: 92

Date: 2012-08-01



Freq	Reading	C.F	Result	Limit	Margin	Height	Angle	Polarity
MHz	dBuV/m	dB/m	dBuV/m	dBuV/m	dB	cm	deg	
1 125.00	41.00	-15.83	25.17	43.50	18.33	253	333	HORIZONTAL
2 144.00	44.10	-13.20	30.90	43.50	12.60	217	143	HORIZONTAL
3 168.00	45.30	-13.22	32.08	43.50	11.42	171	165	HORIZONTAL
4 211.55	48.10	-14.80	33.30	43.50	10.20	178	83	HORIZONTAL
5 250.00	55.10	-12.74	42.36	46.00	3.64	127	29	HORIZONTAL
6 375.00	41.70	-9.20	32.50	46.00	13.50	100	350	HORIZONTAL

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

Radiated Emissions – Zigbee 2 mode

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

EUT/Model No.: HRS2EA0T

TEST MODE: ZIGBEE 2 mode

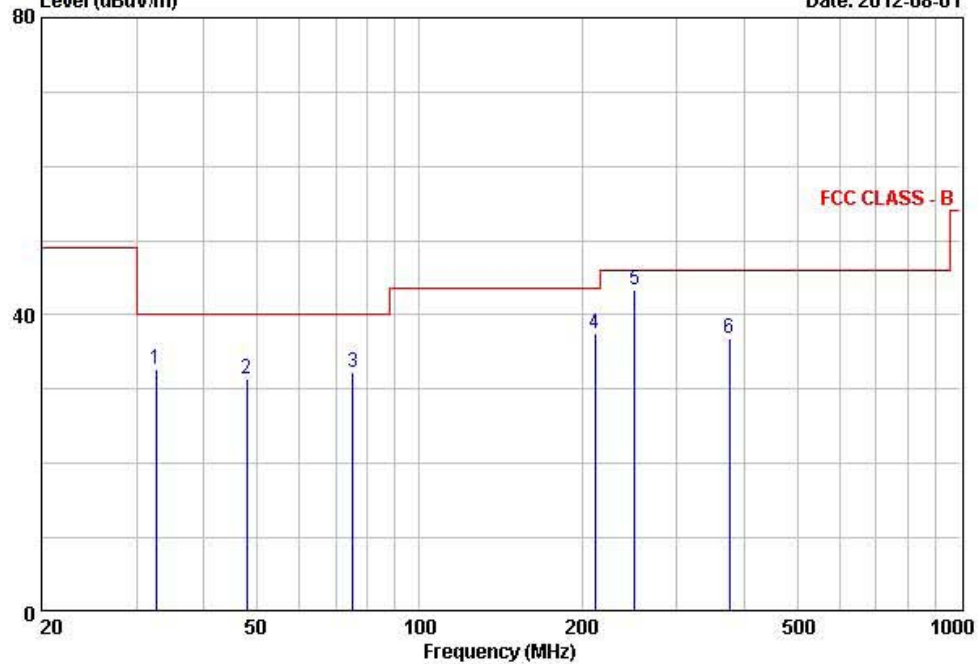
Temp Humi : 27 / 49

Tested by: PARK H W

Data: 93

Level (dBuV/m)

Date: 2012-08-01



	Freq	Reading	C.F	Result	Limit	Margin	Height	Angle	Polarity
	MHz	dBuV/m	dB/m	dBuV/m	QP	dB	cm	deg	
1	32.64	49.60	-16.80	32.80	40.00	7.20	100	76	VERTICAL
2	48.03	46.90	-15.45	31.45	40.00	8.55	100	87	VERTICAL
3	75.33	50.60	-18.34	32.26	40.00	7.74	100	254	VERTICAL
4	211.25	52.30	-14.82	37.48	43.50	6.02	100	281	HORIZONTAL
5	250.00	56.10	-12.74	43.36	46.00	2.64	144	18	HORIZONTAL
6	375.00	46.00	-9.20	36.80	46.00	9.20	100	134	HORIZONTAL

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

3.3.6 AC Conducted Emissions

Procedure:

*The testing follows the guidelines in ANSI C63.4-2003 and ANSI C63.10-2009. 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 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

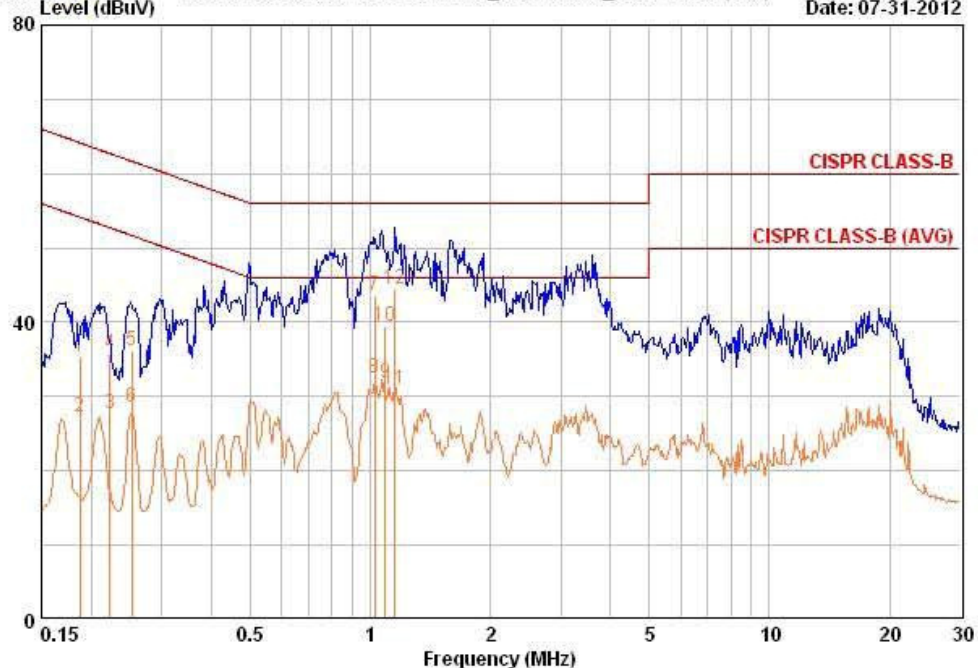
* Decreases with the logarithm of the frequency

AC Conducted Emissions – ZIGBEE 1 mode – Line

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

EUT / Model No. : HES2E4A0T	Phase : LINE
Test Mode : ZIGBEE1 mode	Test Power : 120 / 60
Temp./Humi. : 25 / 52	Test Engineer : PARK H W

Data: 104 File: C:\Conducted Data\2012\LTA_Conduction_1207-3.EMI (110) Date: 07-31-2012



Freq	RD	RD	C.F	Result	Result	Limit	Limit	Margin	Margin
MHz	QP	AV	dB	QP	AV	QP	AV	QP	AV
	dBuV	dBuV		dBuV	dBuV	dBuV	dBuV	dB	dB
0.187	25.74	17.54	9.63	35.37	27.17	64.17	54.17	28.80	27.00
0.223	26.24	18.04	9.59	35.82	27.62	62.71	52.71	26.88	25.08
0.253	26.53	19.03	9.57	36.10	28.60	61.69	51.69	25.59	23.09
1.028	33.83	22.73	9.71	43.54	32.44	56.00	46.00	12.46	13.56
1.091	29.83	22.03	9.71	39.55	31.75	56.00	46.00	16.45	14.25
1.147	34.83	21.33	9.72	44.55	31.05	56.00	46.00	11.45	14.95

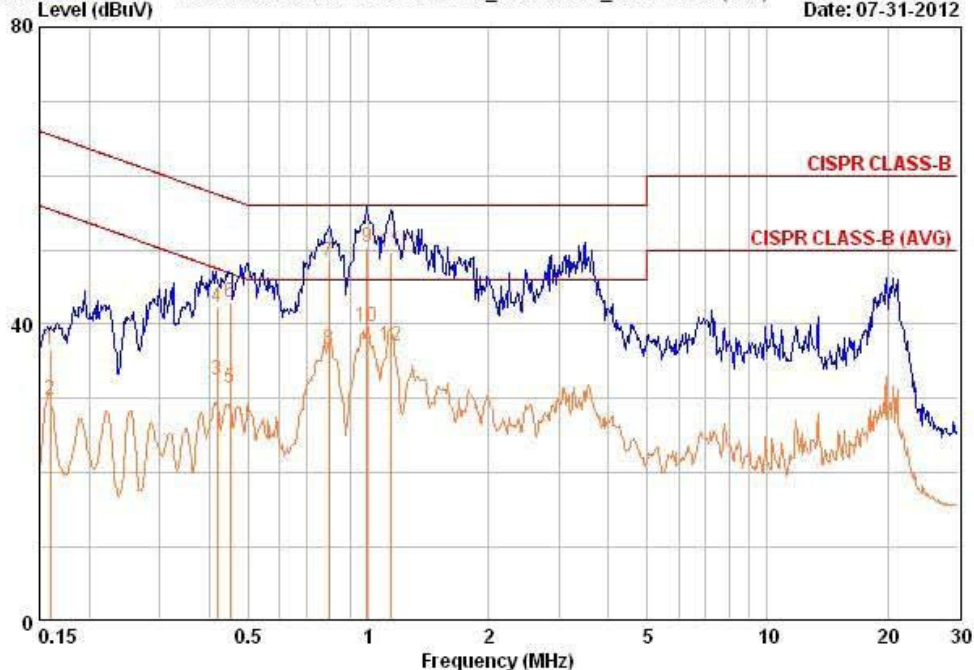
Remarks: C.F (Correction Factor) = Insertion loss + Cable loss

AC Conducted Emissions – PING+ZIGBEE 1 mode – Neutral

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

EUT / Model No. : HES2E4A0T	Phase : NEUTRAL
Test Mode : ZIGBEE1 mode	Test Power : 120 / 60
Temp./Humi. : 25 / 52	Test Engineer : PARK H W

Data: 106 File: C:\Conducted Data\2012\LTA_Conduction_1207-3.EMI (110) Date: 07-31-2012



Freq	RD	RD	C.F	Result	Result	Limit	Limit	Margin	Margin
MHz	QP	AV	dB	QP	AV	QP	AV	QP	AV
	dBuV	dBuV		dBuV	dBuV	dBuV	dBuV	dB	dB
0.160	26.94	20.34	9.58	36.52	29.92	65.46	55.46	28.94	25.54
0.418	32.53	22.73	9.66	42.19	32.39	57.49	47.49	15.30	15.10
0.450	33.32	21.72	9.68	43.00	31.40	56.88	46.88	13.87	15.47
0.798	38.72	26.92	9.60	48.33	36.53	56.00	46.00	7.67	9.47
0.991	40.63	30.13	9.64	50.27	39.77	56.00	46.00	5.73	6.23
1.136	40.03	27.33	9.64	49.68	36.98	56.00	46.00	6.32	9.02

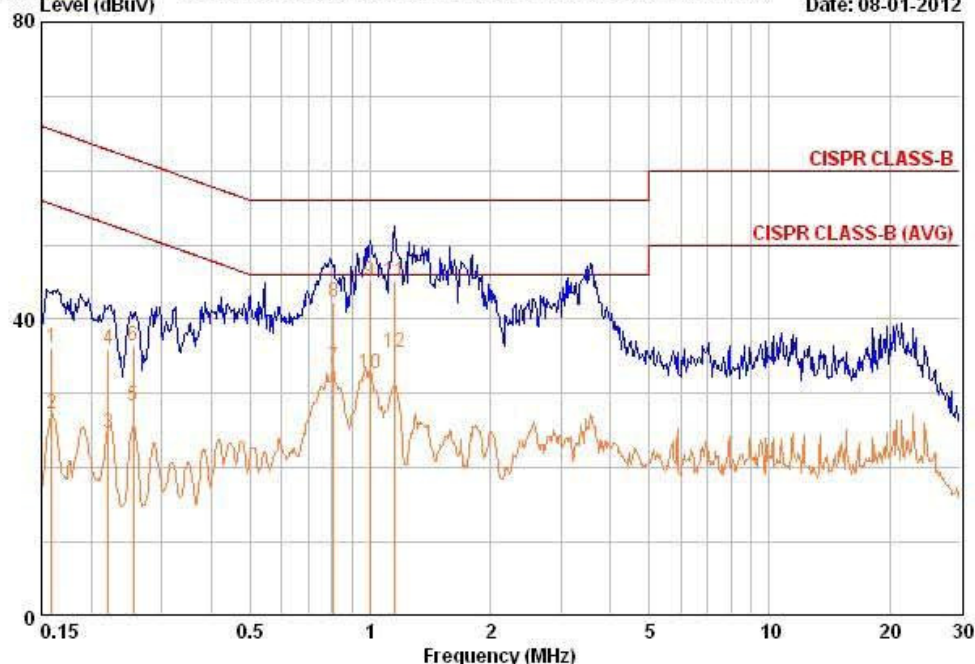
Remarks: C.F (Correction Factor) = Insertion loss + Cable loss

AC Conducted Emissions –ZIGBEE 2 mode – Line

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Gyeonggi-do 449-822 Korea
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Fax:+82-31-3236010

EUT / Model No. :	HES2E4A0T	Phase :	LINE
Test Mode :	ZIGBEE2 mode	Test Power :	120 / 60
Temp./Humi. :	25 / 52	Test Engineer :	PARK H W

Data: 108 File: C:\Conducted Data\2012\LTA_Conduction_1207-3.EMI (110) Date: 08-01-2012



Freq	RD	RD	C.F	Result	Result	Limit	Limit	Margin	Margin
MHz	QP	AV		QP	AV	QP	AV	QP	AV
	dBuV	dBuV	dB	dBuV	dBuV	dBuV	dBuV	dB	dB
0.159	26.44	17.64	9.66	36.10	27.30	65.52	55.52	29.42	28.22
0.221	26.44	14.94	9.59	36.03	24.53	62.78	52.78	26.75	28.25
0.255	26.83	18.73	9.57	36.40	28.30	61.59	51.59	25.19	23.29
0.808	32.52	23.82	9.68	42.20	33.50	56.00	46.00	13.80	12.50
0.998	35.43	22.93	9.71	45.14	32.64	56.00	46.00	10.86	13.36
1.146	35.43	25.73	9.72	45.15	35.45	56.00	46.00	10.85	10.55

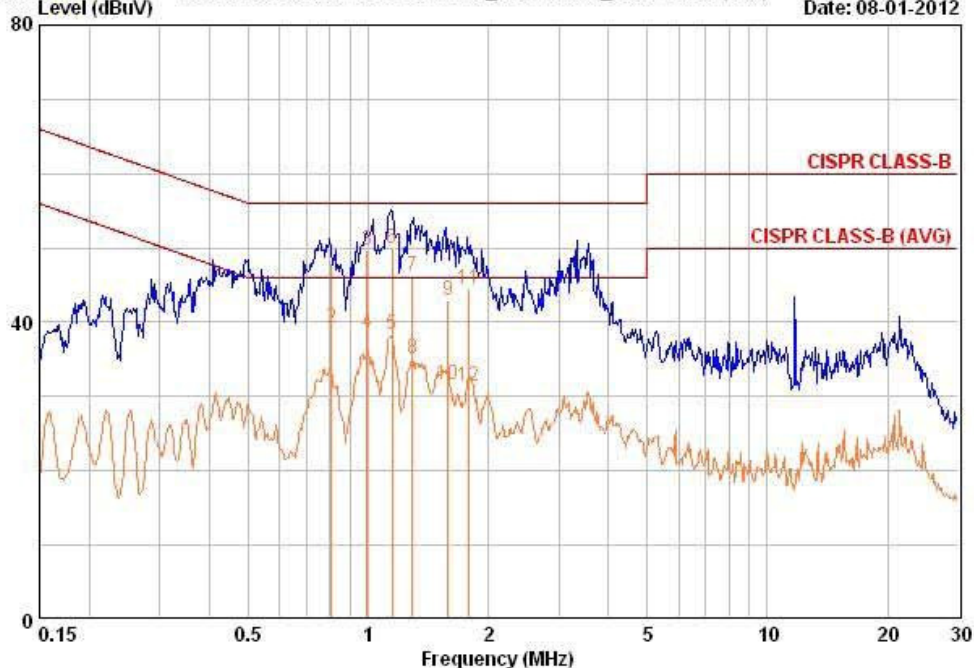
Remarks: C.F (Correction Factor) = Insertion loss + Cable loss

AC Conducted Emissions –ZIGBEE 2 mode – Neutral

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

EUT / Model No. : HES2E4A0T	Phase : NEUTRAL
Test Mode : ZIGBEE2 mode	Test Power : 120 / 60
Temp./Humi. : 25 / 52	Test Engineer : PARK H W

Data: 110 File: C:\Conducted Data\2012\LTA_Conduction_1207-3.EMI (110) Date: 08-01-2012



Freq	RD	RD	C.F	Result	Result	Limit	Limit	Margin	Margin
MHz	QP	AV	dB	QP	AV	QP	AV	QP	AV
	dBuV	dBuV		dBuV	dBuV	dBuV	dBuV	dB	dB
0.809	29.72	---	9.60	39.33	0.00	56.00	0.00	16.67	0.00
0.994	40.13	28.93	9.64	49.77	38.57	56.00	46.00	6.23	7.43
1.149	40.23	28.73	9.64	49.88	38.38	56.00	46.00	6.12	7.62
1.290	36.54	25.54	9.65	46.19	35.19	56.00	46.00	9.81	10.81
1.583	33.24	21.84	9.66	42.91	31.51	56.00	46.00	13.09	14.49
1.783	34.75	21.75	9.68	44.42	31.42	56.00	46.00	11.58	14.58

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	2012-09-22
5	Attenuator (10dB)	8491A	63196	HP	2 year	2012-09-22
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	-	-
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	9160-3242	SCHWARZBECK	2 year	2011-06-09
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	2013-04-26
20	Splitter (SMA)	ZFSC-2-2500	SF617800326	Mini-Circuits	-	-
21	DC Power Supply	6622A	3448A03079	HP	-	-
22	Frequency Counter	5342A	2826A12411	HP	1 year	2012-03-26
23	Power Meter	EPM-441A	GB32481702	HP	1 year	2012-03-26
24	Power Sensor	8481A	US41030291	HP	1 year	2011-10-07
25	Audio Analyzer	8903B	3729A18901	HP	1 year	2011-10-07
26	Modulation Analyzer	8901B	3749A05878	HP	1 year	2011-10-07
27	TEMP & HUMIDITY Chamber	YJ-500	LTAS06041	JinYoung Tech	1 year	2011-10-07
28	Stop Watch	HS-3	601Q09R	CASIO	2 year	2012-03-26
29	LISN	ENV216	100408	R&S	1 year	2011-10-07
30	Highpass Filter	WHKX1.5/15G-10SS	74	Wainwright Instruments	-	-
31	Highpass Filter	WHKX3.0/18G-10SS	118	Wainwright Instruments	-	-
32	Loop Antenna	FMZB 1516	151602/94	SCHWARZBECK	2 year	2011-04-05