



Dates of Tests: September 20~ October 11, 2012

Test Report S/N: LR500111210A

Test Site : LTA CO., LTD.

CERTIFICATION OF COMPLIANCE

FCC ID.

PSAIM-1000

APPLICANT

TOPCON TECHNOHOUSE CORPORATION

Equipment Class	:	Digital Transmission System (DTS)
Manufacturing Description	:	Illuminance spectro meter(WLAN embedded)
Manufacturer	:	TOPCON TECHNOHOUSE CORPORATION
Model name	:	IM-1000
Test Device Serial No.:	:	Identical prototype
Rule Part(s)	:	FCC Part 15.247 Subpart C; ANSI C-63.4-2003
Frequency Range	:	2412MHz ~ 2462MHz
Max. Output Power	:	Max 12.54dBm - Conducted
Data of issue	:	October 11, 2012

This test report is issued under the authority of:



Kyu-Hyun Lee, Manager

The test was supervised by:



Jung-Moo Her, Test Engineer

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



NVLAP LAB Code.: 200723-0

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1. General information's

1-1 Test Performed

Company name : LTA Co., Ltd.
 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. Information's about test item

2-1 Client& Manufacturer

Company name : TOPCON TECHNOHOUSE CORPORATION
 Address : 75-1, Hasunuma-cho, Itabashi-ku, Tokyo 174-8580, Japan
 Tel / Fax : Tel : +81-3-3558-2774 / Fax : +81-3-3966-2486

2-2 Equipment Under Test (EUT)

Trade name : TOPCON TECHNOHOUSE CORPORATION
 Model name : IM-1000
 Serial number : Identical prototype
 Date of receipt : September 17, 2012
 EUT condition : Pre-production, not damaged
 Antenna type : Chip antenna with Max 2.0 dBi gain
 Frequency Range : 2412MHz ~ 2462MHz (DSSS)
 RF output power : Max 12.54dBm - Conducted
 Number of channels : 11
 Type of Modulation : CCK, DQPSK, DBPSK for DSSS
 Transfer Rate : 11/5.5/2/1Mbps
 Power for Adaptor. : Input: 100-240Vac, 0.4A Output: 5.0Vdc, 2A
 Power for Batt. : Battery Pack: 6Vdc (1.5Vdc battery(AA Size) x 4)
 Firmware Version : V1.0.0

2-3 Tested frequency

	LOW	MID	HIGH
Frequency (MHz)	2412	2437	2462

2-4 Ancillary Equipment

Equipment	Model No.	Serial No.	Manufacturer
-	-	-	-

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.

Note 1: Antenna Requirement

The **TOPCON TECHNOHOUSE CORPORATION** FCC ID: **PSAIM-1000** unit complies with the requirement of §15.203. The antenna type is chip antenna.

Note 2: 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

3.2.1 6 dB Bandwidth

Procedure:

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 = 100 kHz (VBW \geq RBW)

Sweep = auto

Trace = max hold

Detector function = peak

Measurement Data:

Mode	Frequency (MHz)	Channel No.	Test Results	
			Measured Bandwidth (MHz)	Result
802.11b	2412	1	7.29	Complies
	2437	6	8.08	Complies
	2462	11	7.34	Complies

- See next pages for actual measured spectrum plots.

Minimum Standard:

6 dB Bandwidth > 500kHz

Measurement Setup

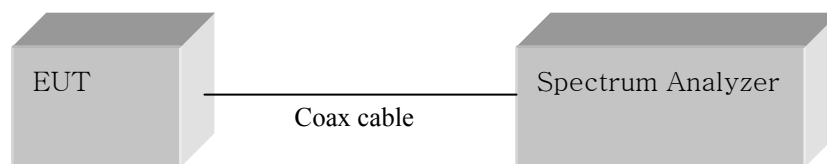
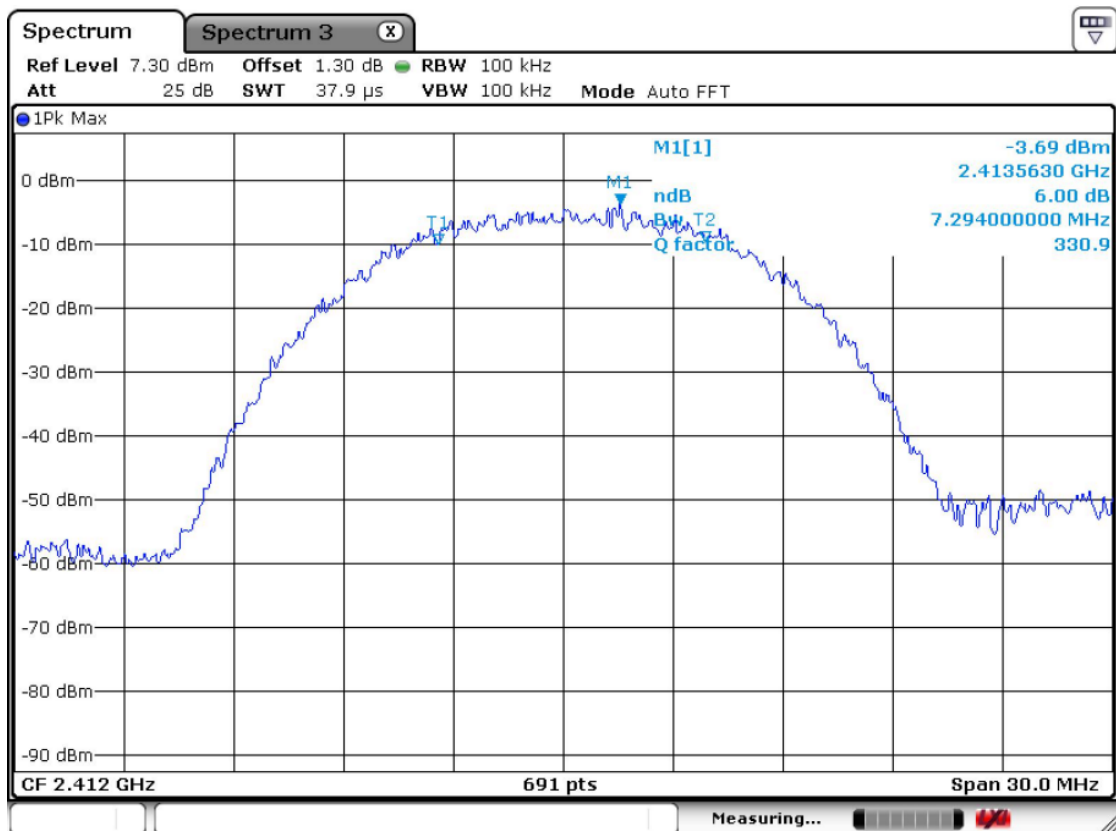
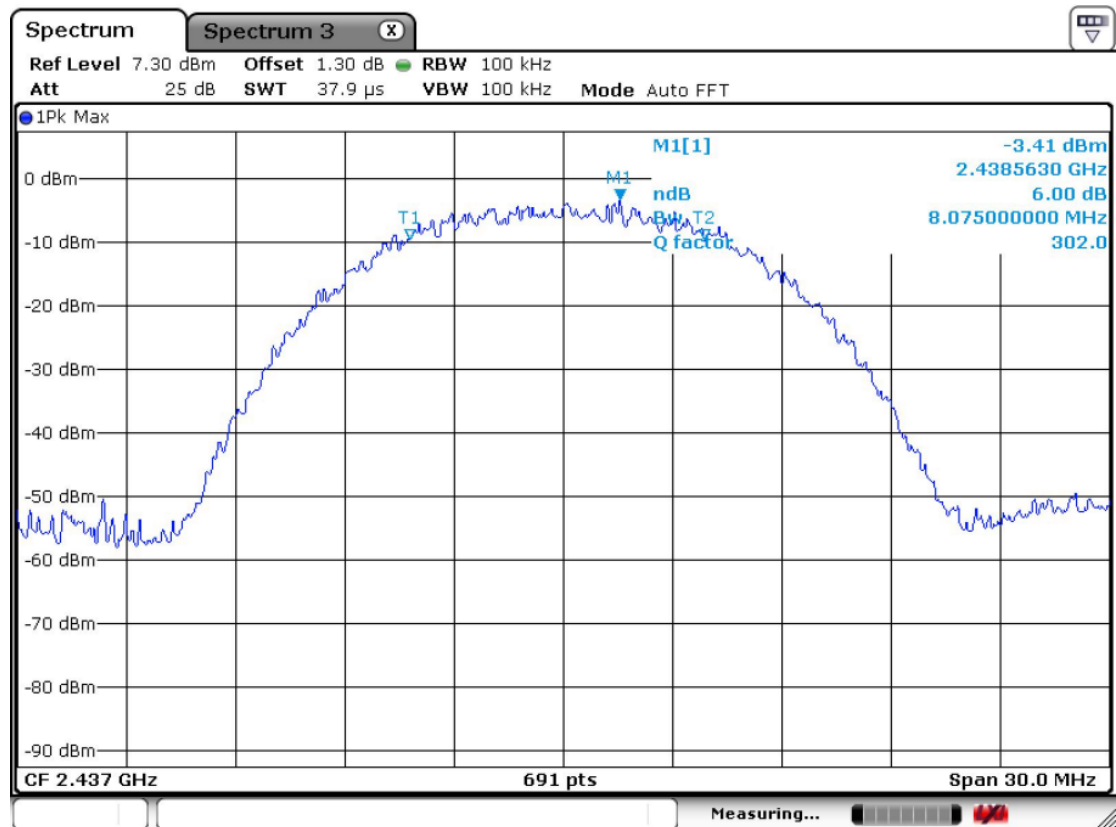


Figure 1: Measurement setup for the carrier frequency separation

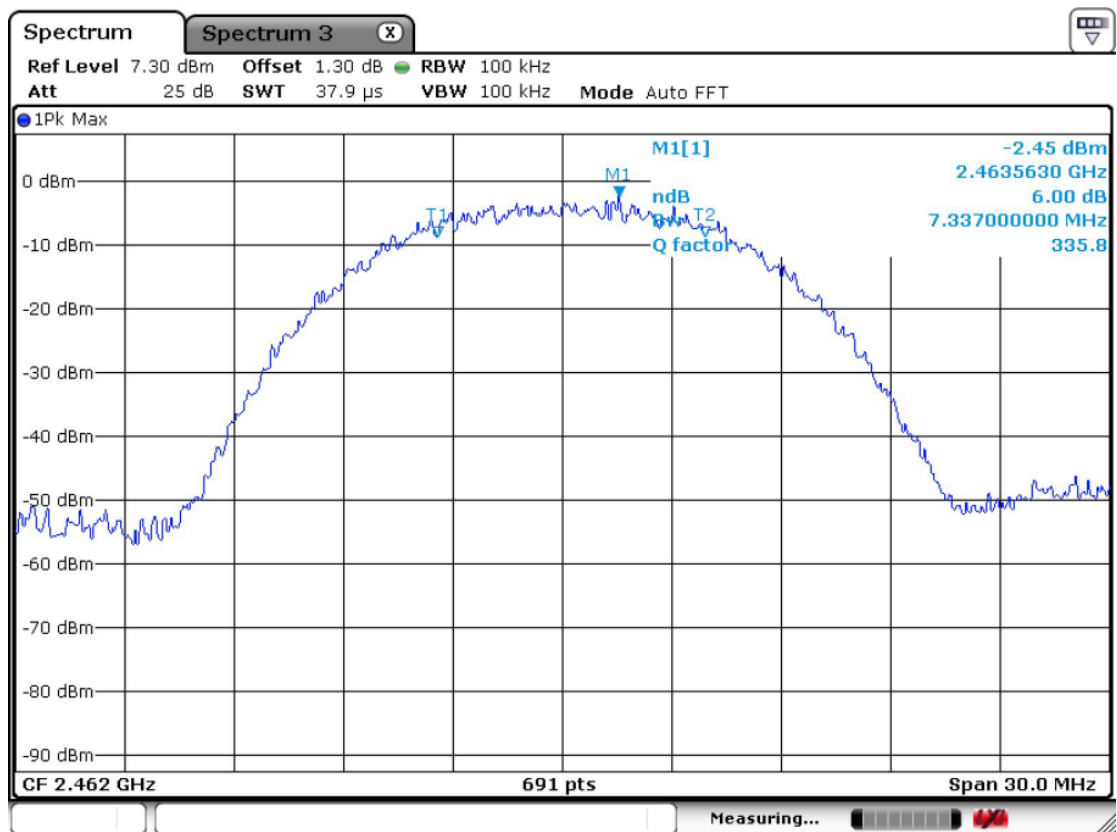
802.11b CH 1



CH 6



CH 11



3.2.2 Peak Output Power Measurement

Procedure:

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 = 1MHz (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	11.30	Complies
	2437	6	11.85	Complies
	2462	11	12.54	Complies

- See next pages for actual measured spectrum plots.

Minimum Standard:

Peak output power	< 1W
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Measurement Setup

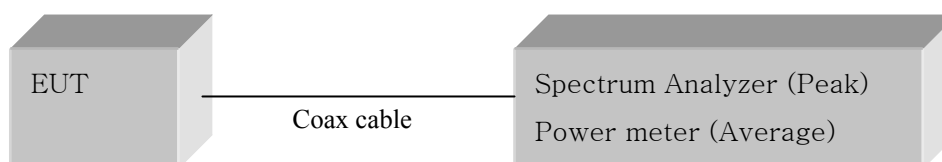
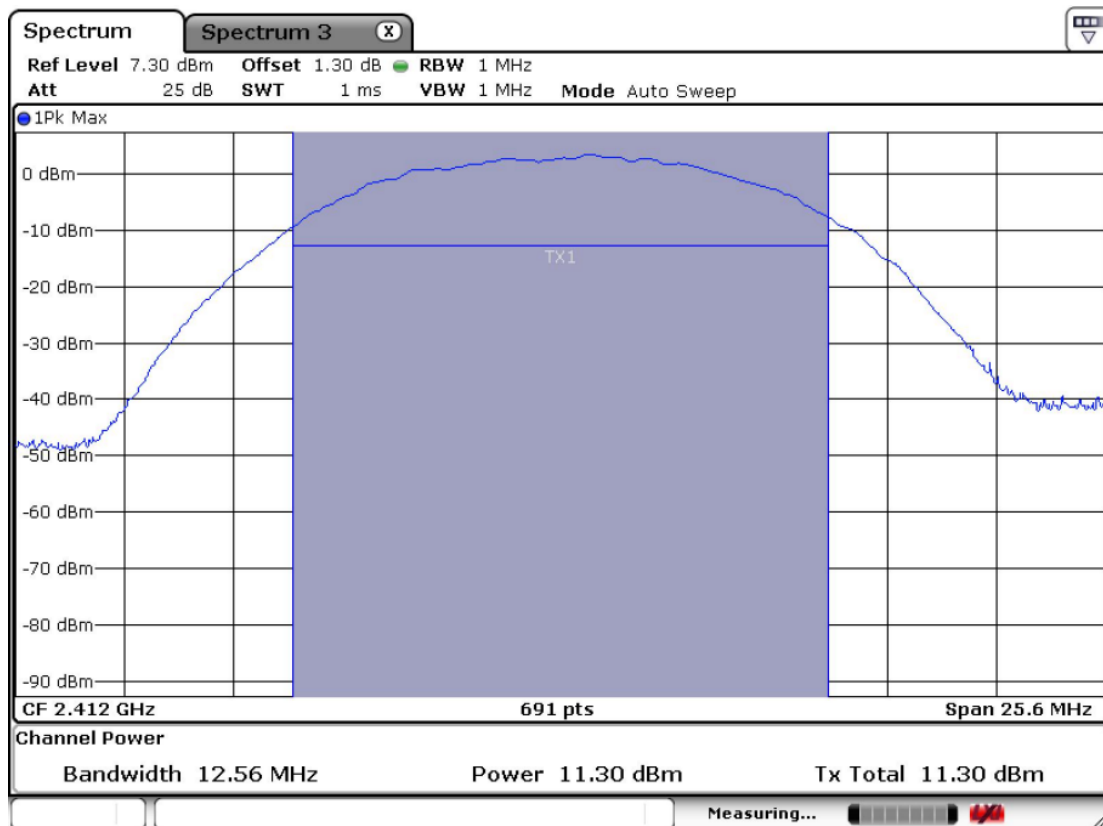
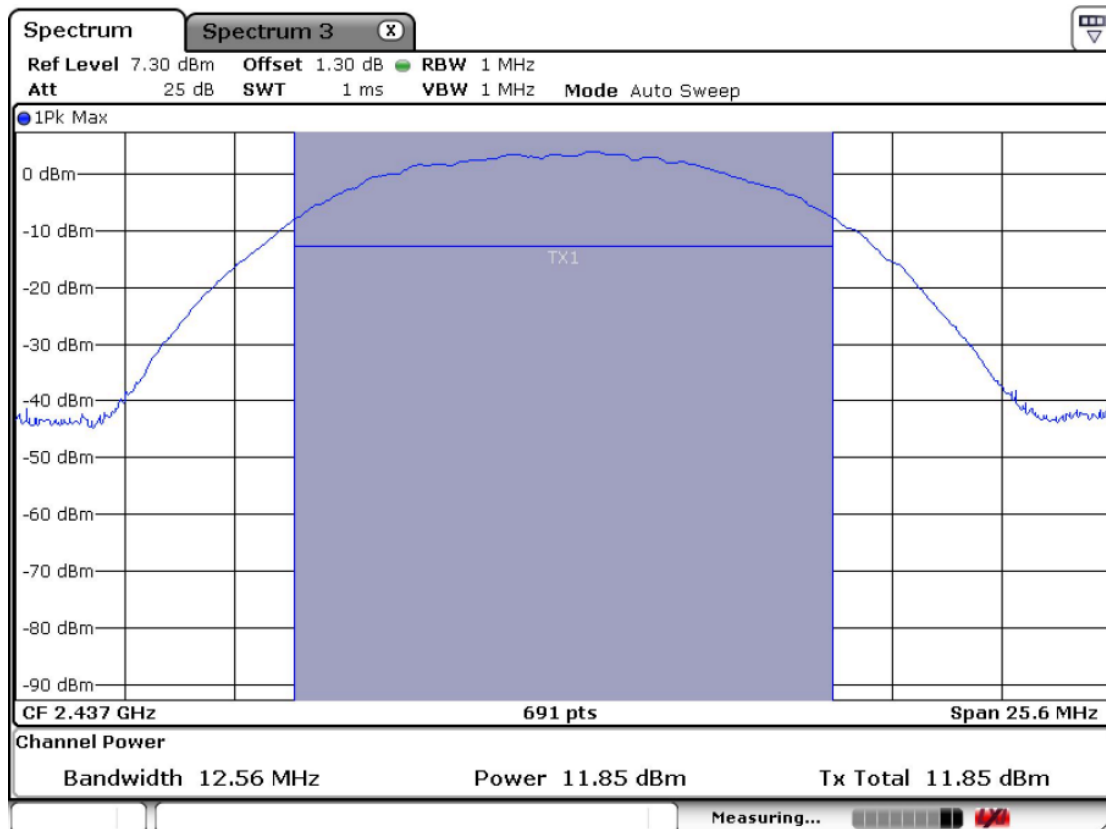


Figure 1: Measurement setup for the carrier frequency separation

802.11b CH 1



CH 6



3.2.3 Power Spectral Density

Procedure:

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	-17.39	Complies
	2437	6	-17.42	Complies
	2462	11	-16.09	Complies

- See next pages for actual measured spectrum plots.

Minimum Standard:

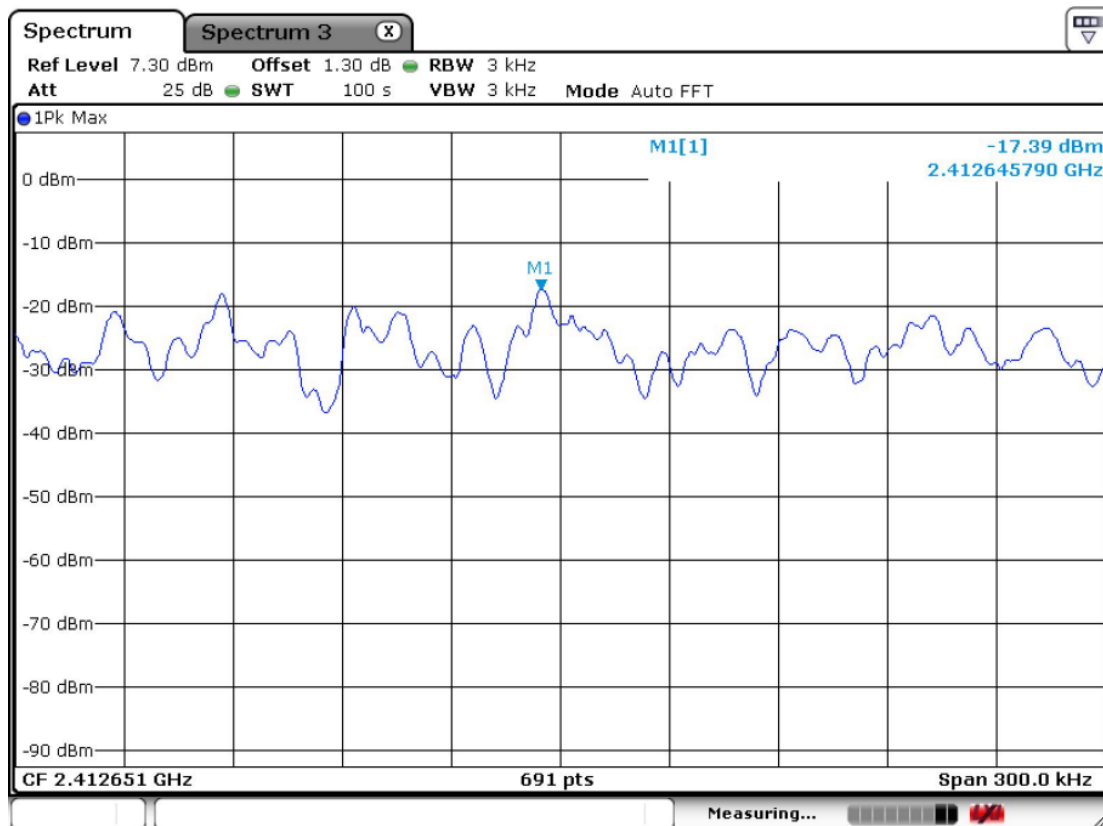
Power Spectral Density	< 8dBm @ 3kHz BW
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Measurement Setup

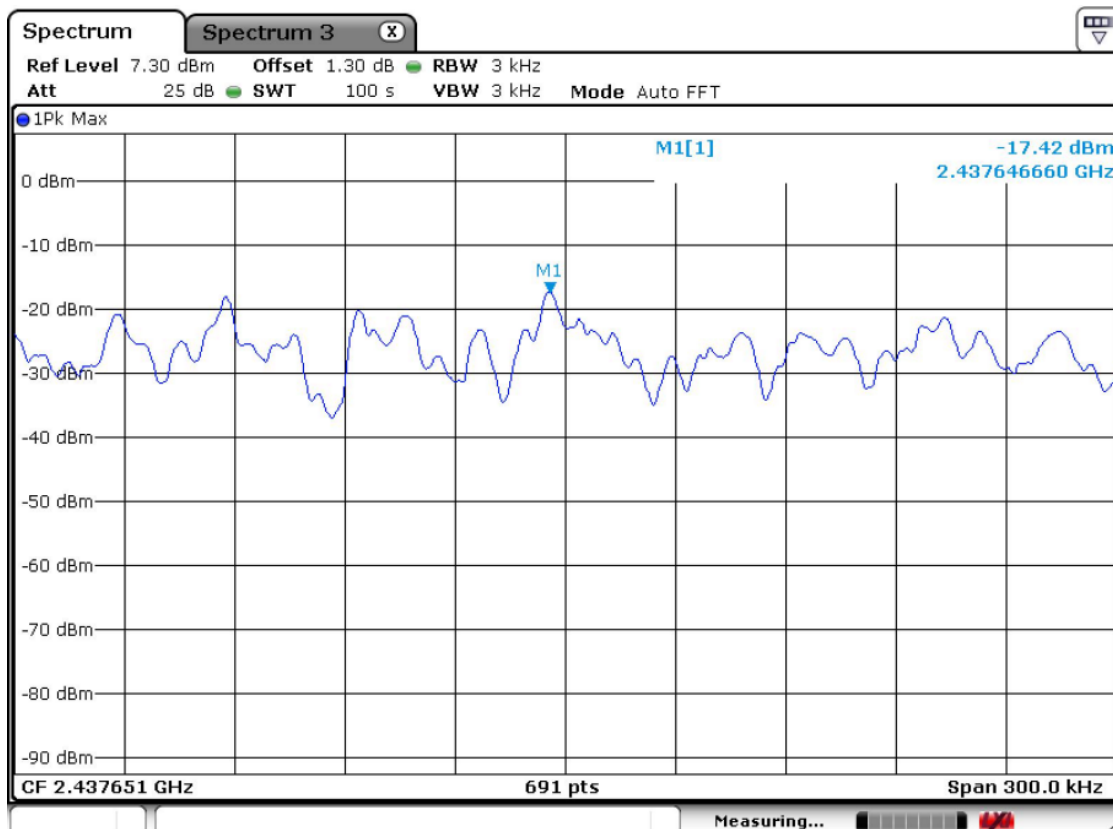
Same as the Chapter 3.2.1 (Figure 1)

802.11b Power Density Measurement

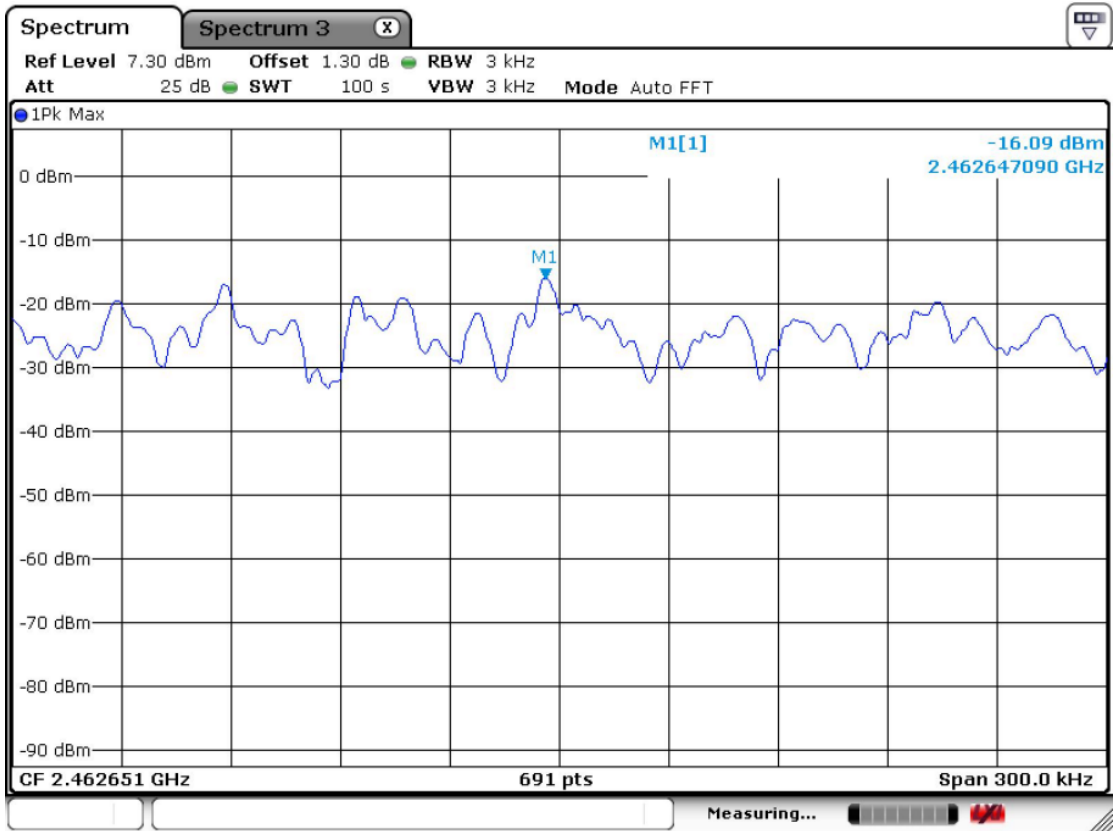
CH 1



CH 6



CH 11



3.2.4 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 is operating in transmission mode at the appropriate frequencies.

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

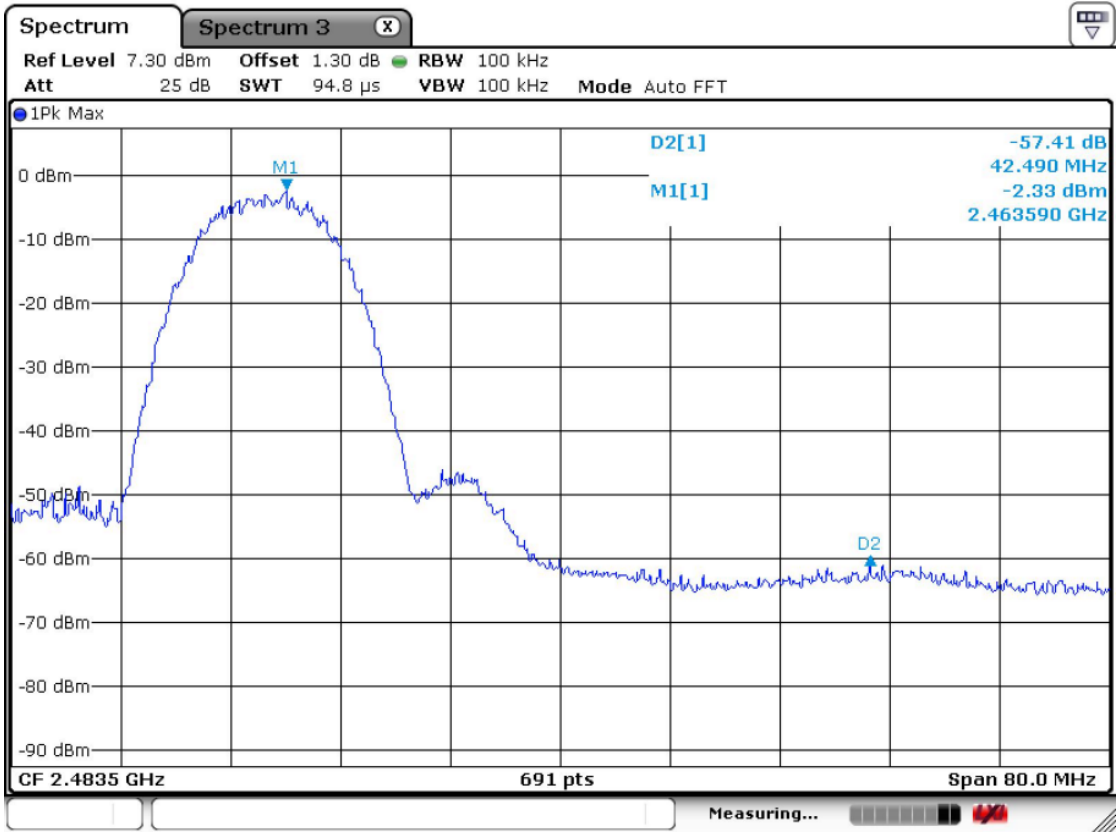
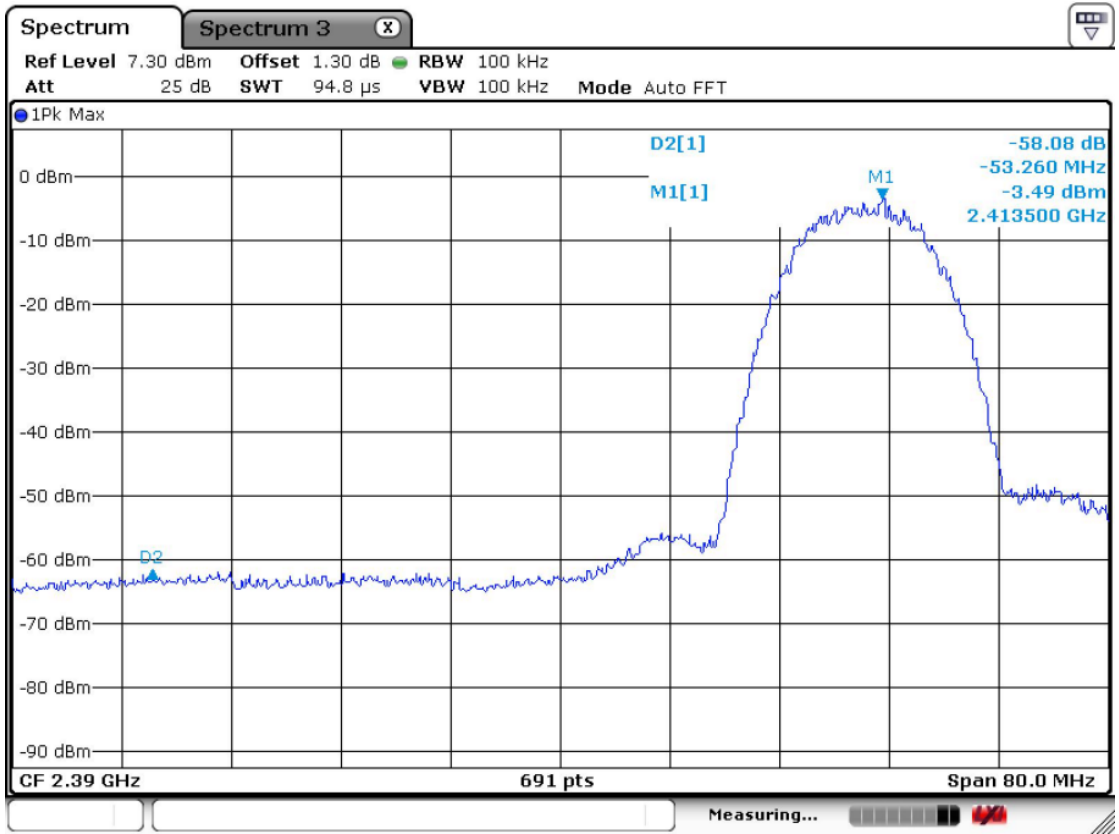
Sweep = auto

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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802.11b Band-edge : Conducted Measurements



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

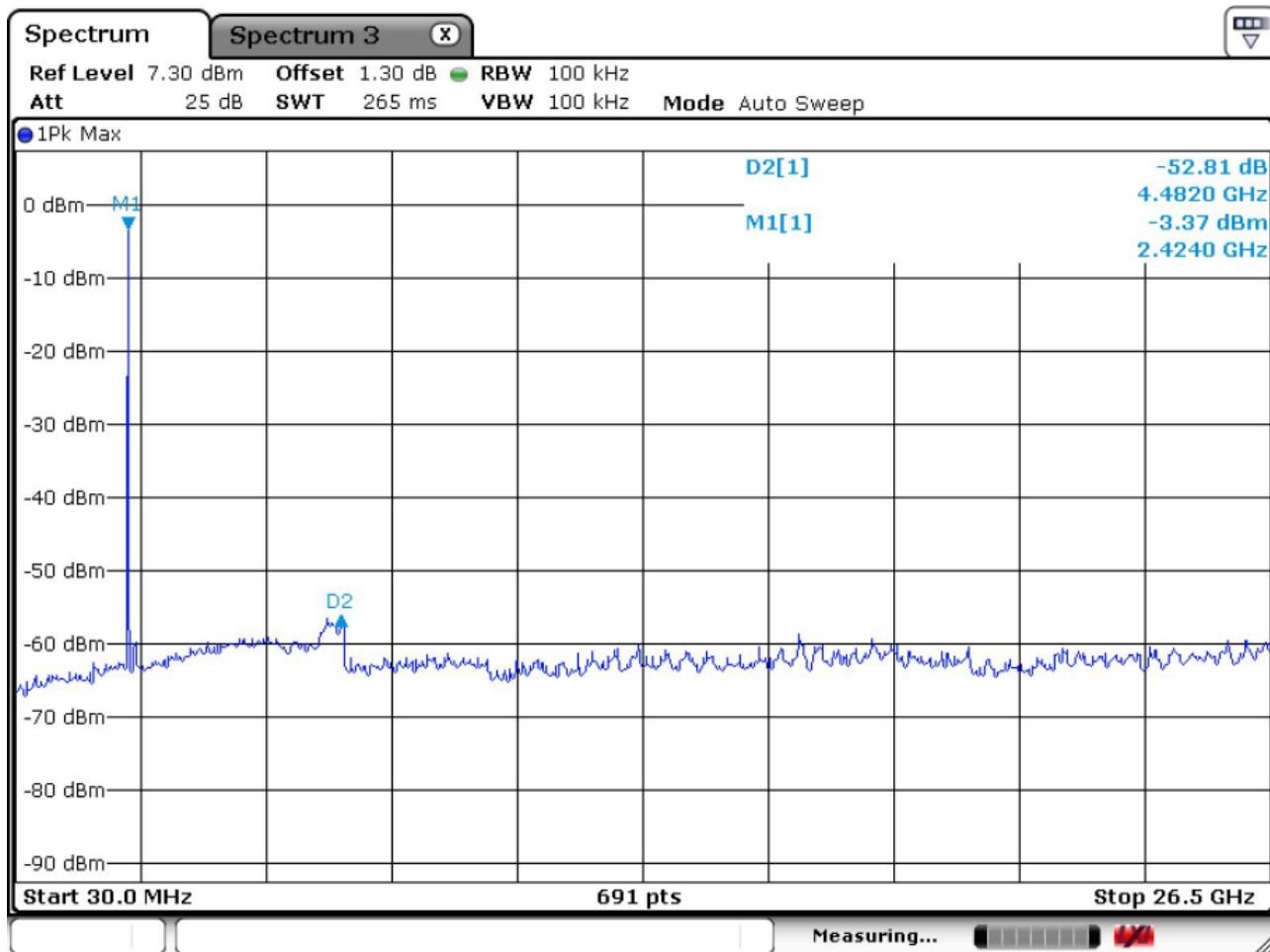
Frequency [MHz]	Reading [dBuV/m]		Pol.	Correction Factor		Limits [dBuV/m]		Result [dBuV/m]		Margin [dB]	
	AV / Peak			Antenna	Amp.Gain+Cable	AV / Peak		AV / Peak		AV / Peak	
2319.2	30.8	44.6	H	28.2	26.3	54.0	74.0	32.7	46.5	21.3	27.5

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

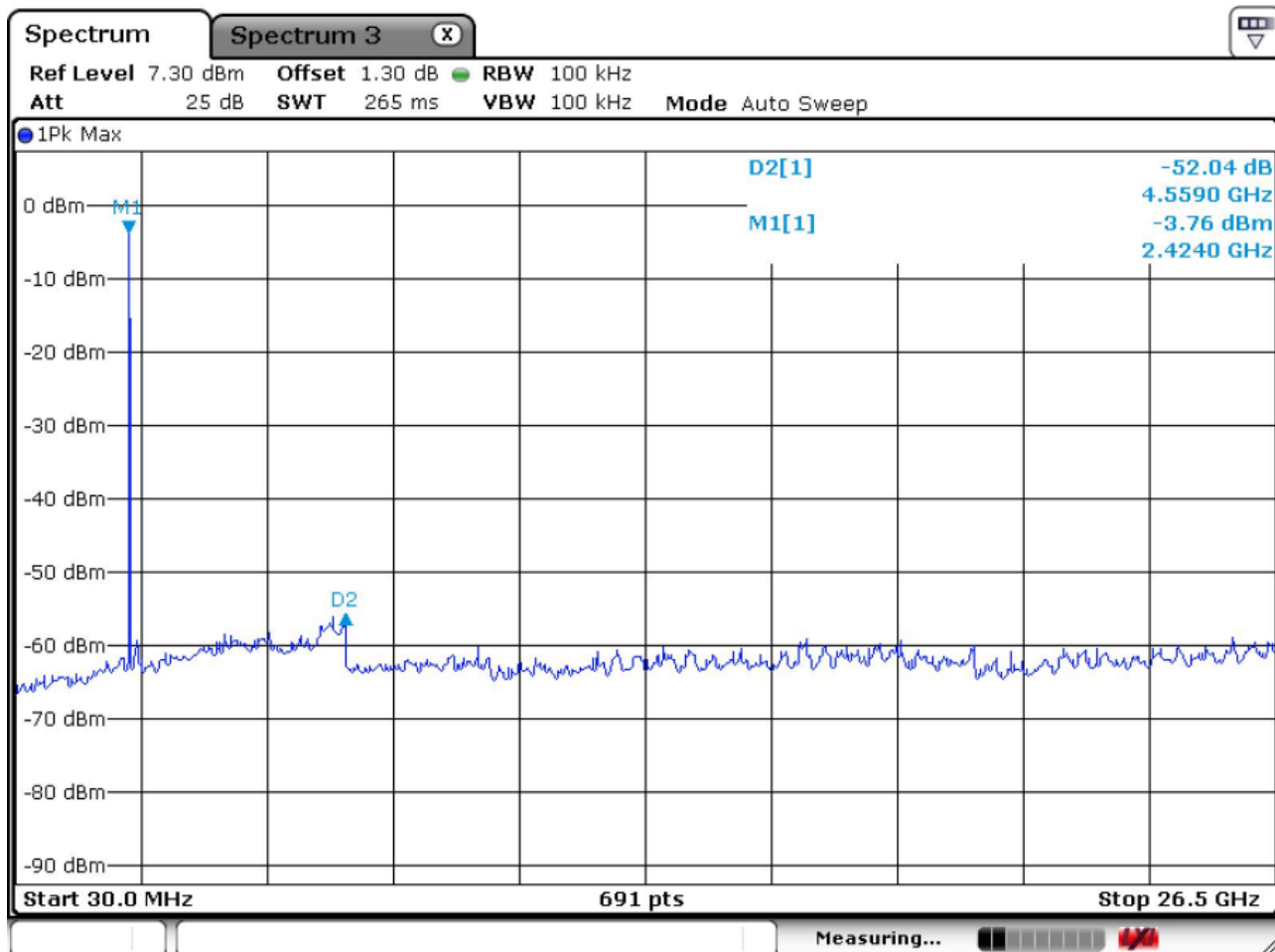
Frequency [MHz]	Reading [dBuV/m]		Pol.	Correction Factor		Limits [dBuV/m]		Result [dBuV/m]		Margin [dB]	
	AV / Peak			Antenna	Amp.Gain+Cable	AV / Peak		AV / Peak		AV / Peak	
2497.3	31.6	44.5	H	28.2	26.3	54.0	74.0	33.5	46.4	20.5	27.6

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

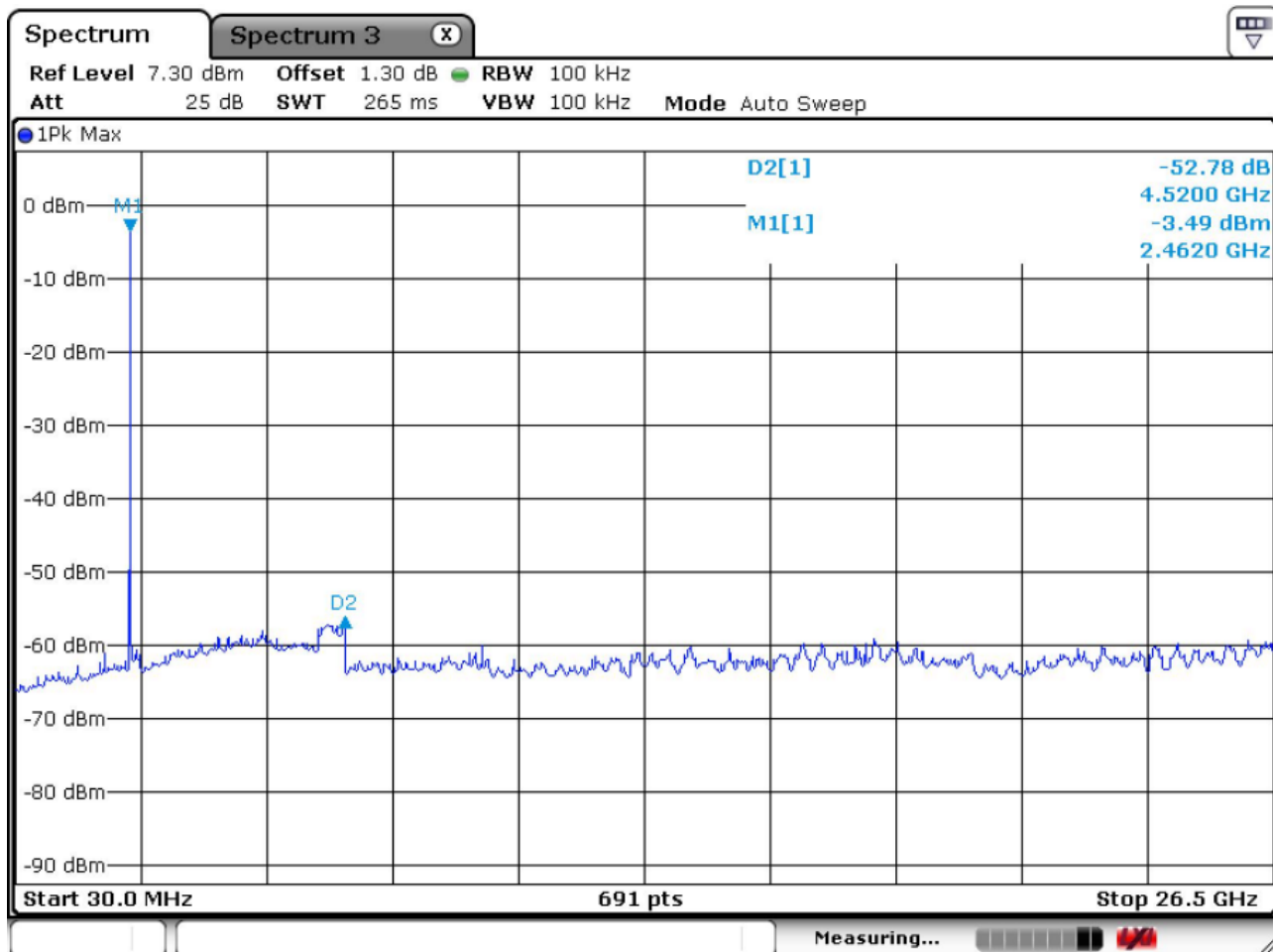
802.11b - Low channel
Frequency Range = 30 MHz ~ 10th harmonic.



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



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



3.2.5 Field Strength of Harmonics

Procedure:

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

The spectrum analyzer is set to:

Center frequency = the worst channel

Frequency Range = 30 MHz ~ 10th harmonic.

RBW = 100 kHz (30MHz ~ 1 GHz)

VBW ≥ RBW

= 1 MHz (1 GHz ~ 10th harmonic)

Span = 100 MHz

Detector function = peak

Trace = max hold

Sweep = auto

Measurement Data: Complies

- See next pages for actual measured data.

Minimum Standard: FCC Part 15.109

Frequency (MHz)	Limit (uV/m) @ 10m
0.009 ~ 0.490	2400/F (kHz) @ 300m
0.490 ~ 1.705	24000/F (kHz) @ 30m
1.705 ~ 30	30 @ 30m
30 ~ 88	90
88 ~ 216	150
216 ~ 960	210
Above 960	300

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

***802.11b 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.

Radiated Emissions –WLAN 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.: IM-1000

TEST MODE: Wi-Fi mode

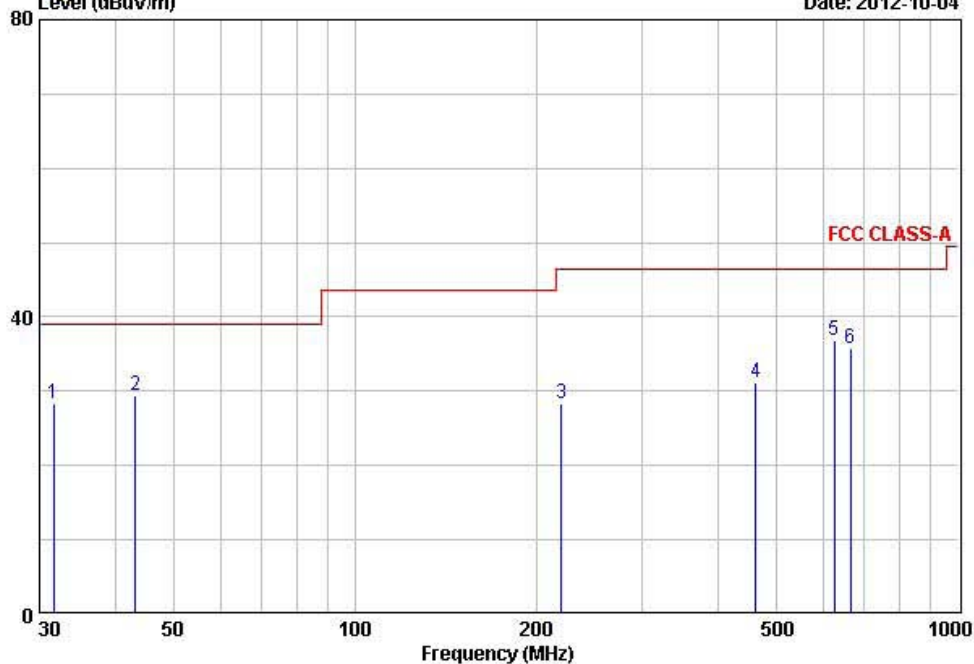
Temp Humi : 20 / 48

Tested by: PARK.H.W

Data: 74

Level (dBuV/m)

Date: 2012-10-04



	Freq	Reading	C.F	Result	Limit	Margin	Height	Angle	Polarity
	MHz	dBuV/m	dB/m	dBuV/m	QP	dB	cm	deg	
1	31.64	45.70	-17.28	28.42	39.00	10.58	100	128	VERTICAL
2	43.26	45.30	-15.86	29.44	39.00	9.56	100	97	VERTICAL
3	219.84	43.50	-15.12	28.38	46.40	18.02	400	26	HORIZONTAL
4	462.36	38.90	-7.83	31.07	46.40	15.33	123	169	VERTICAL
5	624.17	40.20	-3.44	36.76	46.40	9.64	149	85	HORIZONTAL
6	663.47	38.20	-2.43	35.77	46.40	10.63	136	2	HORIZONTAL

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

3.2.6 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

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

Minimum Standard: FCC Part 15.107

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	79 dBuV	66 dBuV
0.5 ~ 30	73 dBuV	60 dBuV

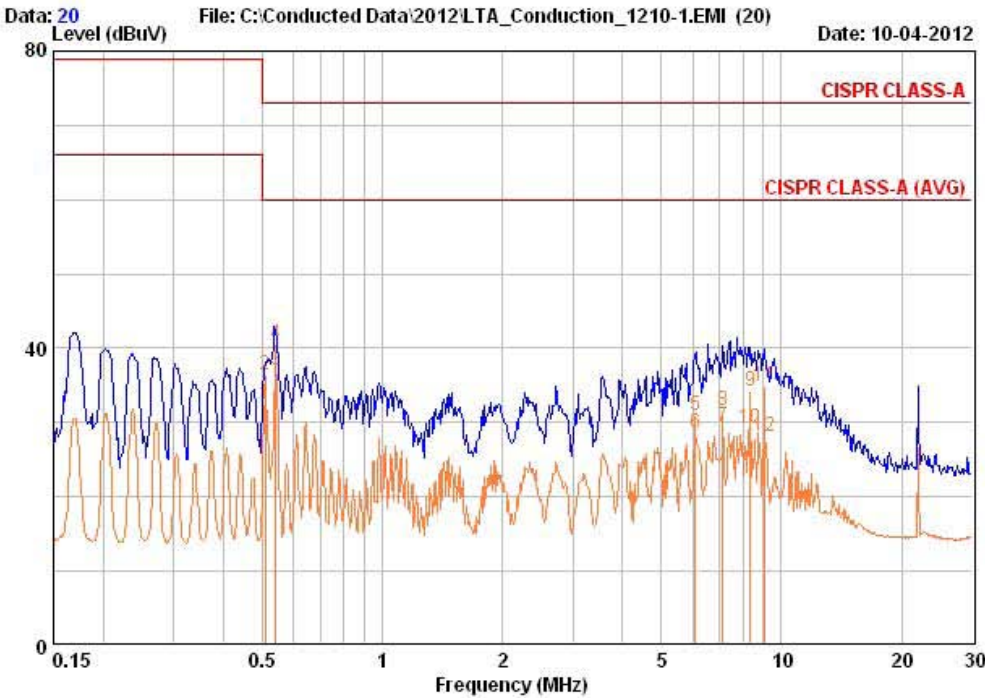
* Decreases with the logarithm of the frequency

Radiated Emissions – WLAN - 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. :	IM-1000	Phase	: LINE
Test Mode	: WiFi mode	Test Power	: 120 / 60
Temp./Humi.	: 26 / 54	Test Engineer	: PARK.H.W



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
0.510	26.76	22.92	9.63	36.39	32.55	73.00	60.00	36.61	27.45
0.541	30.86	27.46	9.62	40.48	37.08	73.00	60.00	32.52	22.92
6.089	21.37	18.78	9.67	31.04	28.45	73.00	60.00	41.96	31.55
7.137	21.87	19.81	9.68	31.55	29.49	73.00	60.00	41.45	30.51
8.367	24.48	19.55	9.71	34.19	29.26	73.00	60.00	38.81	30.74
9.059	25.08	18.47	9.73	34.81	28.20	73.00	60.00	38.19	31.80

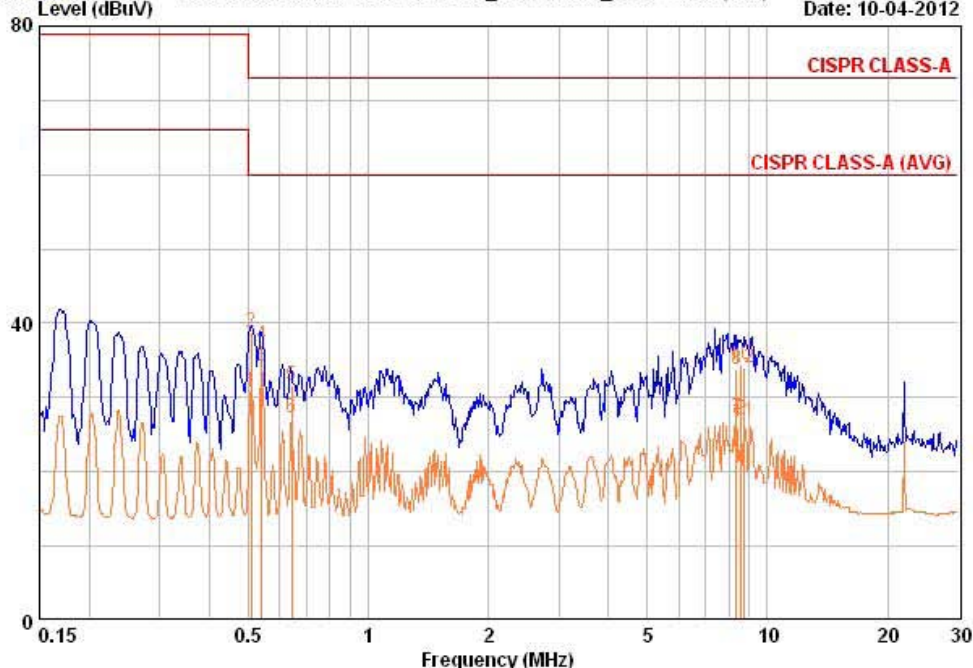
Remarks: C.F (Correction Factor) = Insertion loss + Cable loss

Radiated Emissions – WLAN - 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. : IM-1000	Phase : NEUTRAL
Test Mode : WiFi mode	Test Power : 120 / 60
Temp./Humi. : 26 / 54	Test Engineer : PARK.H.W

Data: 22 File: C:\Conducted Data\2012\LTA_Conduction_1210-1.EMI (140) Date: 10-04-2012



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
0.510	29.16	21.08	9.63	38.79	30.71	73.00	60.00	34.21	29.29
0.541	27.46	24.53	9.62	37.08	34.15	73.00	60.00	35.92	25.85
0.644	22.06	17.59	9.59	31.65	27.18	73.00	60.00	41.35	32.82
8.367	24.08	17.61	9.73	33.80	27.33	73.00	60.00	39.20	32.67
8.592	24.68	17.27	9.73	34.41	27.00	73.00	60.00	38.59	33.00
8.776	24.18	17.18	9.74	33.91	26.91	73.00	60.00	39.09	33.09

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	Spectrum Analyzer (~2.9GHz)	8594E	3710A04074	HP	2 year	Self-Calibration
3	Signal Generator (~3.2GHz)	8648C	3623A02597	HP	1 year	2012-03-26
4	Signal Generator (1~20GHz)	83711B	US34490456	HP	1 year	2012-03-26
5	Attenuator (3dB)	8491A	37822	HP	2 year	2012-09-22
6	Attenuator (10dB)	8491A	63196	HP	2 year	2012-09-22
7	Attenuator (30dB)	8498A	3318A10929	HP	2 year	2011-01-05
8	Test Receiver (~30MHz)	ESHS10	828404/009	R&S	1 year	2012-03-26
9	EMI Test Receiver (~7GHz)	ESCI7	100722	R&S	1 year	2012-09-22
10	RF Amplifier (~1.3GHz)	8447D	2439A09058	HP	2 year	2012-09-22
11	RF Amplifier (1~18GHz)	8449B	3008A02126	HP	2 year	2012-03-26
12	Horn Antenna (1~18GHz)	BBHA 9120D	9120D122	SCHWARZBECK	2 year	2010-12-24
13	Horn Antenna (18 ~ 40GHz)	SAS-574	154	Schwarzbeck	2 year	2010-11-25
14	Horn Antenna (18 ~ 40GHz)	SAS-574	155	Schwarzbeck	2 year	2010-11-25
15	TRILOG Antenna	VULB 9160	9160-3172	SCHWARZBECK	2 year	2012-09-20
16	Dipole Antenna	VHA9103	2116	SCHWARZBECK	2 year	2010-11-25
17	Dipole Antenna	VHA9103	2117	SCHWARZBECK	2 year	2010-11-25
18	Dipole Antenna	VHA9105	2261	SCHWARZBECK	2 year	2010-11-25
19	Dipole Antenna	VHA9105	2262	SCHWARZBECK	2 year	2010-11-25
20	Hygro-Thermograph	THB-36	0041557-01	ISUZU	1 year	2012-09-26
21	Splitter (SMA)	ZFSC-2-2500	SF617800326	Mini-Circuits	-	-
22	Power Divider	11636A	6243	HP	2 year	2012-09-22
23	DC Power Supply	6622A	3448A03079	HP	-	-
24	Frequency Counter	5342A	2826A12411	HP	1 year	2012-03-26
25	Power Meter	EPM-441A	GB32481702	HP	1 year	2012-03-26
26	Power Sensor	8481A	US41030291	HP	1 year	2012-09-22
27	Audio Analyzer	8903B	3729A18901	HP	1 year	2012-09-22
28	Modulation Analyzer	8901B	3749A05878	HP	1 year	2012-09-22
29	TEMP & HUMIDITY Chamber	YJ-500	LTAS06041	JinYoung Tech	1 year	2012-09-22
30	Stop Watch	HS-3	601Q09R	CASIO	2 year	2012-03-26
31	LISN	ENV216	100408	R&S	1 year	2012-09-22
32	UNIVERSAL RADIO COMMUNICATION TESTER	CMU200	106243	R&S	2 year	2012-06-27
33	Highpass Filter	WHKX1.5/15G-10SS	74	Wainwright Instruments	-	-
34	Highpass Filter	WHKX3.0/18G-10SS	118	Wainwright Instruments	-	-
35	Loop Antenna	FMZB 1516	151602/94	SCHWARZBECK	2 year	2011-04-05