LTA
Laboratory for Test & Approval Co.,Ltd.

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Dates of Tests: November 26~ December 21, 2012
Test Report S/N: LR500111212I
Test Site : LTA CO., LTD.

CERTIFICATION OF COMPLIANCE

FCC ID **PBN-EX23DTH**

APPLICANT **ENTER TECH CO.,LTD.**

Equipment Class	**:**	**Part 15 Spread Spectrum Transmitter (DSS)**
Manufacturing Description	**:**	**HD MULTIMEDIA KARAOKE (Wireless MIC)**
Manufacturer	**:**	**ENTER TECH CO.,LTD.**
Model name	**:**	**EX23DTH**
Test Device Serial No.:	**:**	**Identical prototype**
Rule Part(s)	**:**	**FCC Part 15.247 Subpart C; ANSI C-63.4-2003**
Frequency Range	**:**	**2406 ~ 2474MHz**
RF power	**:**	**Max 7.74 dBm – Conducted**
Data of issue	**:**	**December 26, 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. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

NVLAP LAB Code.: 200723-0

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1. General information's

1-1 Test Performed

Company name : LTA Co., Ltd.

Address : 243, Jubug-ri,Yangji-Myeon,Youngin-Si, Kyunggi-Do, Korea. 449-822

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E-mail : chahn@ltalab.com

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Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the "General requirements for the competents of calibration and testing laboratory".

1-2 Accredited agencies

LTA Co., Ltd. is approved to perform EMC testing by the following agencies:

Agency	Country	Accreditation No.	Validity	Reference
NVLAP	U.S.A	200723-0	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

Company name	:	ENTER TECH CO.,LTD.
Address	:	156-7, Ojeong-dong, Ojeong-gu, Bucheon-city, Kyunggi-do, KOREA
Telephone / Facsimile	:	+82-32-680-9072 / +82-32-678-0818

2-2 Manufacturer

Company name	:	ENTER TECH CO.,LTD.
Address(Factory in Korea)	:	156-7, Ojeong-dong, Ojeong-gu, Bucheon-city, Kyunggi-do, KOREA
Address(Factory in China)		Baolai Area, 46 Xinhe Road, Shangmugu-Cun, Pinghu-Zhen, Longgang-Qu, Shenzhen, China
Telephone / Facsimile	:	+82-32-680-9072 / +82-32-678-0818

2-3 Equipment Under Test (EUT)

Trade name	:	MAGICSING
Model name	:	EX23DTH
Serial number	:	Identical prototype
Date of receipt	:	November 22, 2012
EUT condition	:	Pre-production, not damaged
Antenna type	:	PIFA antenna, Max Gain 3.63 dBi
Frequency Range	:	2406 ~ 2474MHz
RF output power	:	Max. 7.74 dBm - Conducted
Number of channels	:	18
Channel spacing	:	4MHz
Channel Access Protocol	:	Frequency Hopping Spread Spectrum (FHSS)
Power Source	:	3.0 Vdc by Battery (AA*2ea)
Firmware Version	:	V1.0.0

2-4 Tested frequency

Bluetooth	LOW	MID	HIGH
Frequency (MHz)	2406	2442	2474

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(a)	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	N/A
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 **ENTER TECH CO.,LTD.** FCC ID:**PBN-EX23DTH** unit complies with the requirement of §15.203.

The antenna type is PIFA antenna.

Note 2: This Product is operated by battery.

Note 3: The sample was tested according to the following specification:
FCC Parts 15.247; ANSI C-63.4-2003

Note 4: 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 **ENTER TECH CO.,LTD. FCC ID: PBN-EX23DTH**

3.2 Information about the FHSS characteristics:

3.2.1 Pseudorandom Frequency Hopping Sequence

The channel is represented by a pseudo-random hopping sequence hopping through the 18 RF channels. The hopping sequence is unique for the piconet and is determined by this device address of the master; the phase in the hopping sequence is determined by the RF Chip clock of the master. The channel is divided into time slots where each slot corresponds to an RF hop frequency. Consecutive hops correspond to different RF hop frequencies.

3.2.2 Equal Hopping Frequency Use

All units participating in the piconet are time and hop-synchronized to the channel.

3.2.3 System Receiver Input Bandwidth

Each channel bandwidth is 4MHz

3.2.4 Equipment Description

15.247(a)(1):
The hopping sequence must be pseudorandom all Channels are used equally on average the receiver input bandwidth is approximately equal to the transmit bandwidth the receiver hops in sequence with the transmitted signal

15.247(g):
The system is designed to comply with all of the regulations in Section 15.247 when the transmitter is presented with a continuous data (or information)

15.247(h):
The system does not coordinate its channel selection/hopping sequence with other frequency hopping systems for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters.

3.3 Transmitter requirements

3.3.1 Carrier Frequency Separation

Procedure:

The test follows DA000705. 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 = 15 MHz (wide enough to capture the peaks of two adjacent channels)

RBW = 30 kHz Sweep = auto

VBW = 30 kHz Detector function = peak

Trace = max hold

Measurement Data:

Test Results	
Carrier Frequency Separation (MHz)	**Result**
3.994	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

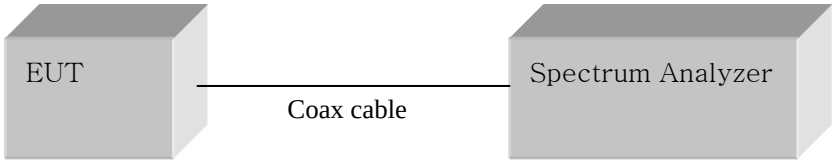
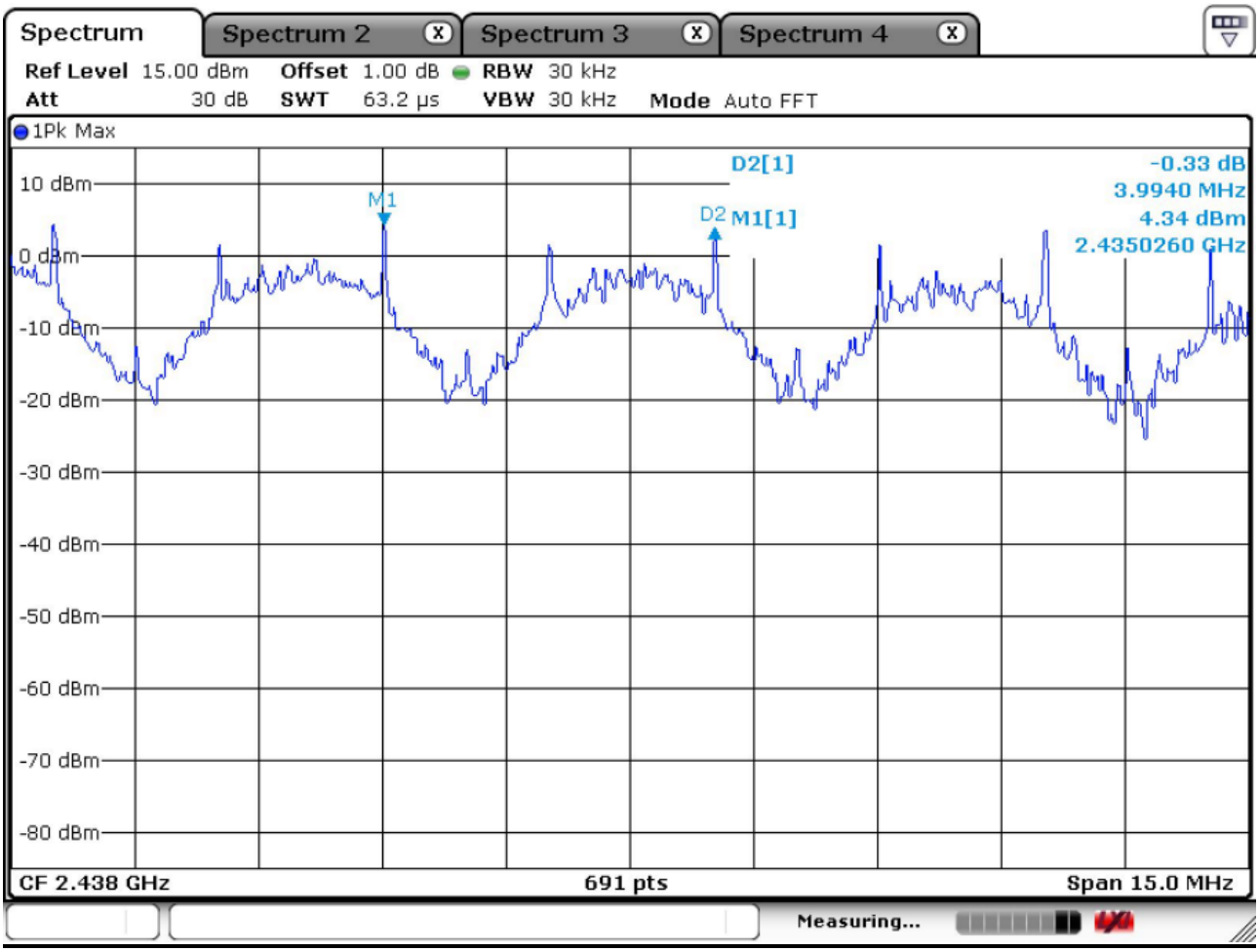


Figure 1: Measurement setup for the carrier frequency separation

Carrier Frequency Separation



3.3.2 Number of Hopping Frequencies

Procedure:

The test follows DA000705. 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 = 300 kHz Sweep = auto

VBW = 300 kHz (VBW ≥ RBW) Detector function = peak

Trace = max hold

Measurement Data : Complies

Total number of Hopping Channels	18

- See next pages for actual measured spectrum plots.

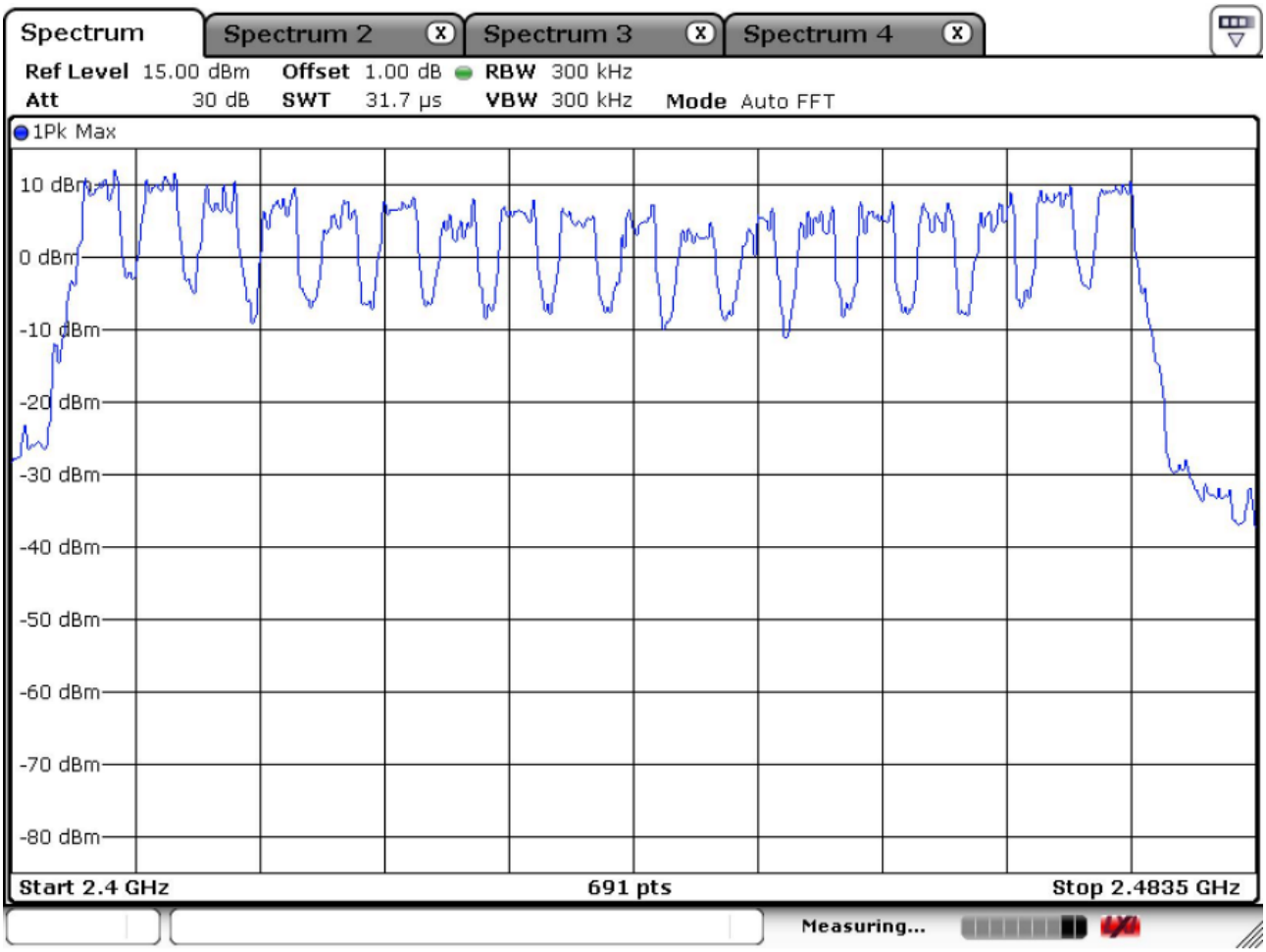
Minimum Standard:

At least 15 hopes

Measurement Setup

Same as the Chapter 3.2.1 (Figure 1)

Number of Hopping Frequencies



3.3.3 20 dB Bandwidth

Procedure:

The bandwidth at 20 dB below the highest in band 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 (Bluetooth):

Center frequency = the highest, middle and the lowest channels

Span = 5 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 :

Frequency (MHz)	Channel No.	Test Results(MHz)
		20dB Bandwidth
2406	1	3.81
2442	10	3.86
2474	18	3.80

- See next pages for actual measured spectrum plots.

Minimum Standard:

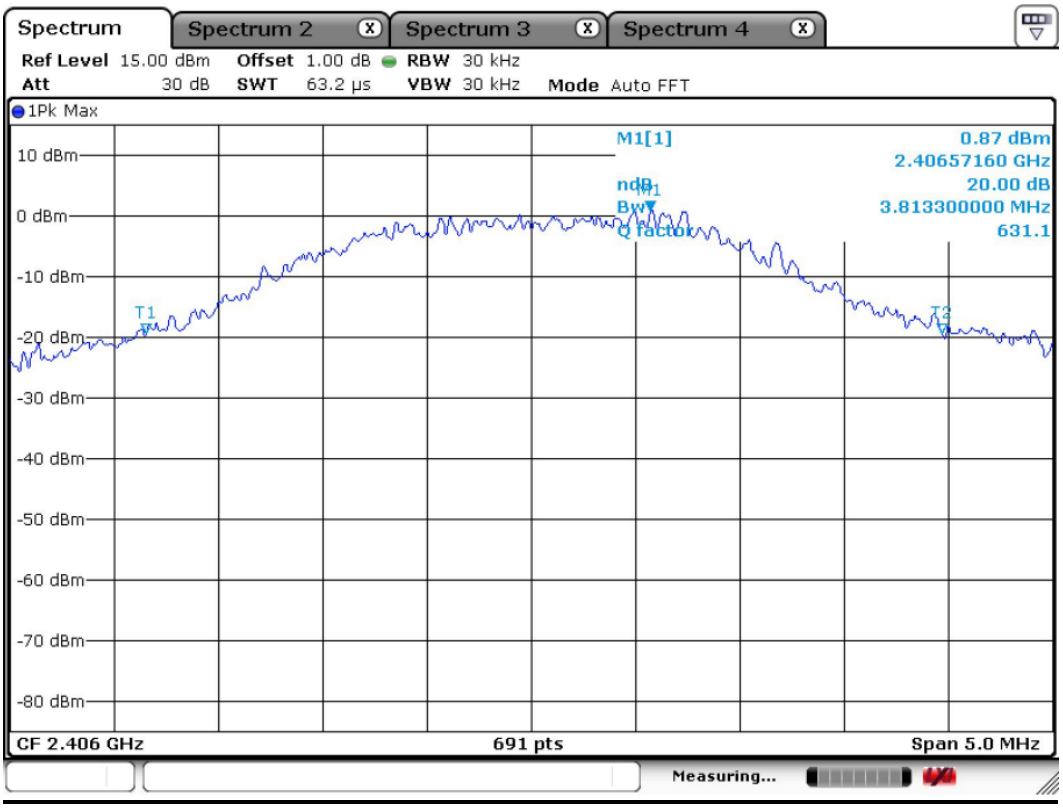
N/A

Measurement Setup

Same as the Chapter 3.2.1 (Figure 1)

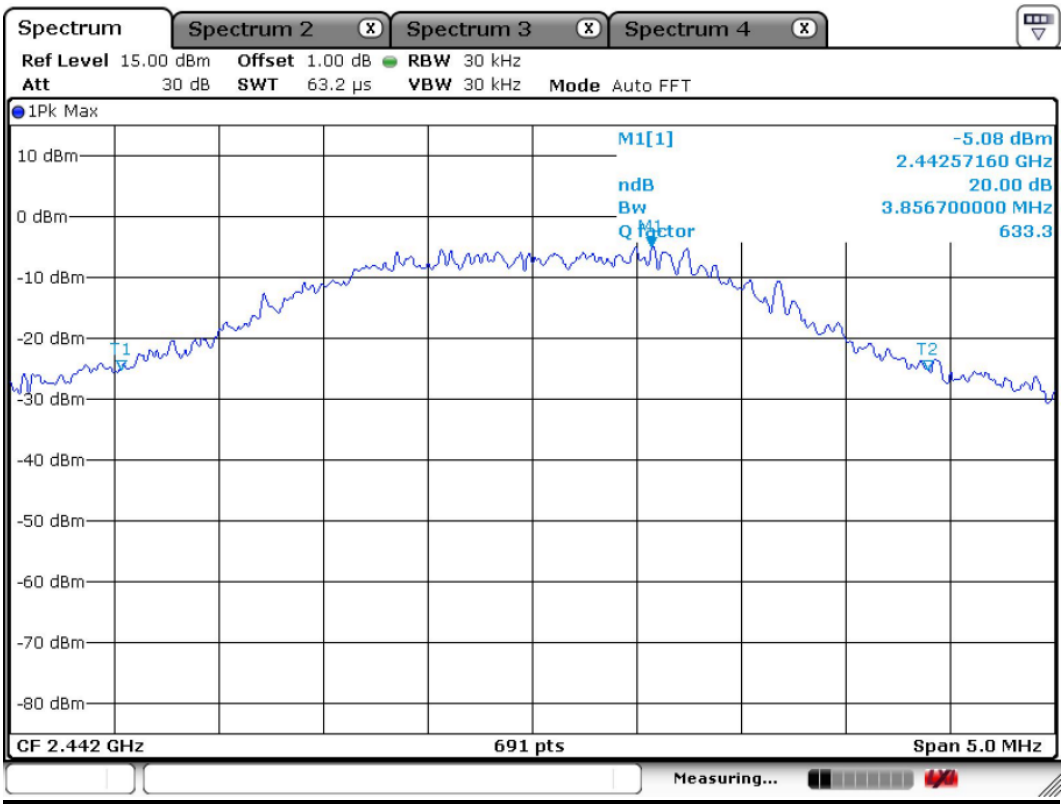
Channel 1 of basic mode

20 dB Bandwidth



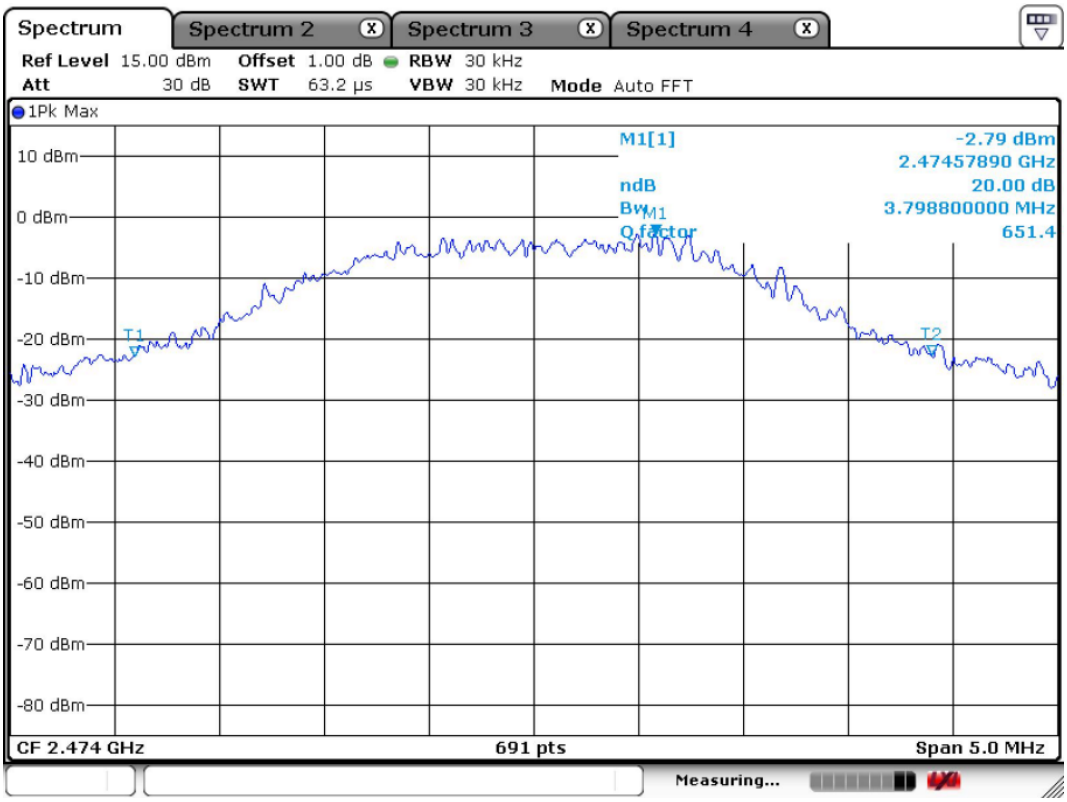
Channel 2 of basic mode

20 dB Bandwidth



Channel 3 of basic mode

20 dB Bandwidth



3.3.4 Time of Occupancy (Dwell Time)

Procedure:

The test follows DA000705. 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 = 2438 MHz — Span = zero

RBW = 1 MHz — VBW = 1 MHz (VBW ≥ RBW)

Trace = single sweep — Detector function = peak

Measurement Data:

Number of transmission in a 7.2s (18 Hopping*0.4)	Length of Transmission Time (msec)	Result (msec)	Limit (msec)
(Times / 7.2sec) = 41	**0.326**	**13.366**	**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

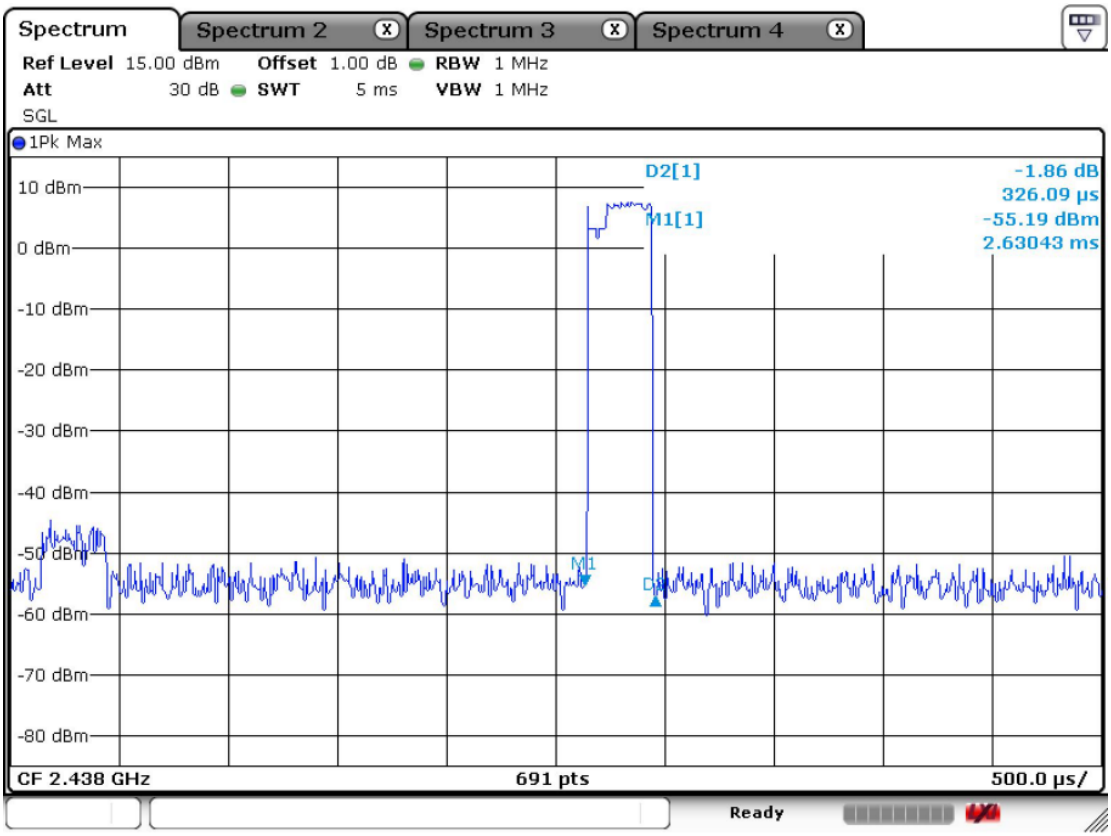
Minimum Standard:

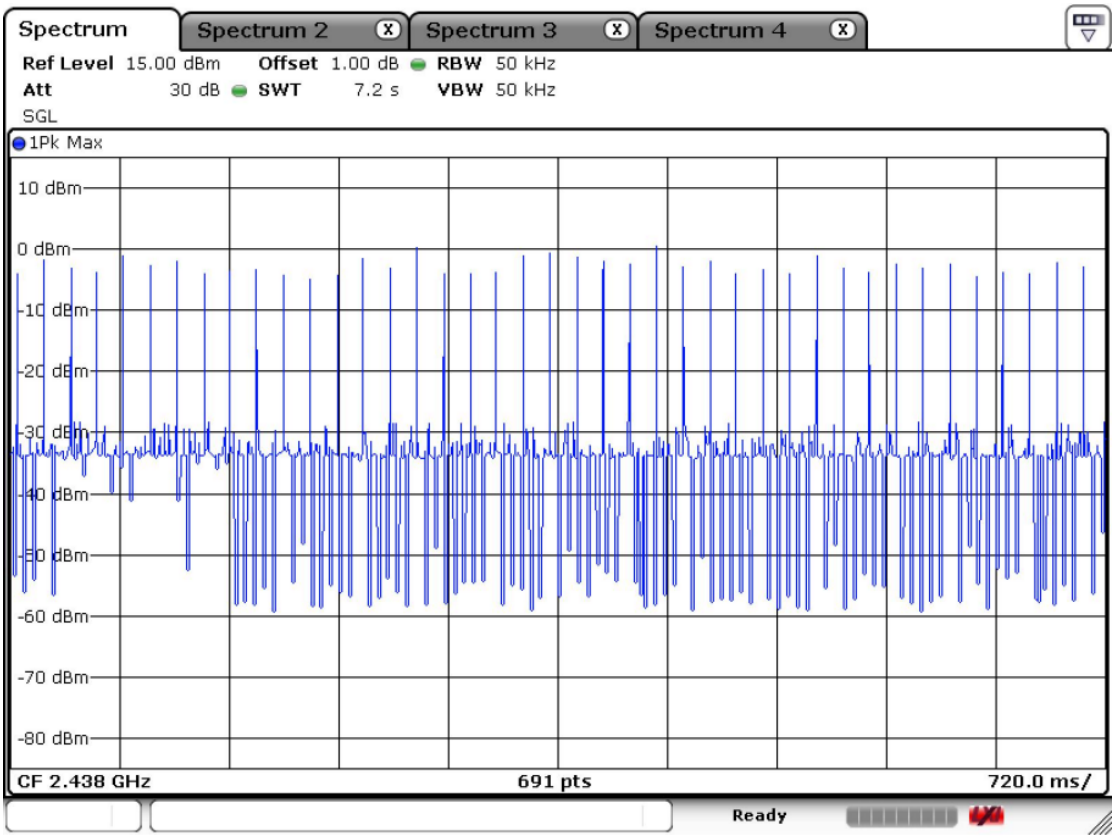
0.4 seconds within a 30 second period per any frequency

Measurement Setup

Same as the Chapter 3.2.1 (Figure 1)

Time of Occupancy for PACKET





3.3.5 Transmitter Output Power

Procedure:

The test follows DA000705. 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 :

Frequency (MHz)	Ch.	Test Results		
		dBm	mW	Result
2406	1	**7.74**	**5.94**	Complies
2442	10	**2.92**	**1.96**	Complies
2474	18	**3.33**	**2.15**	Complies

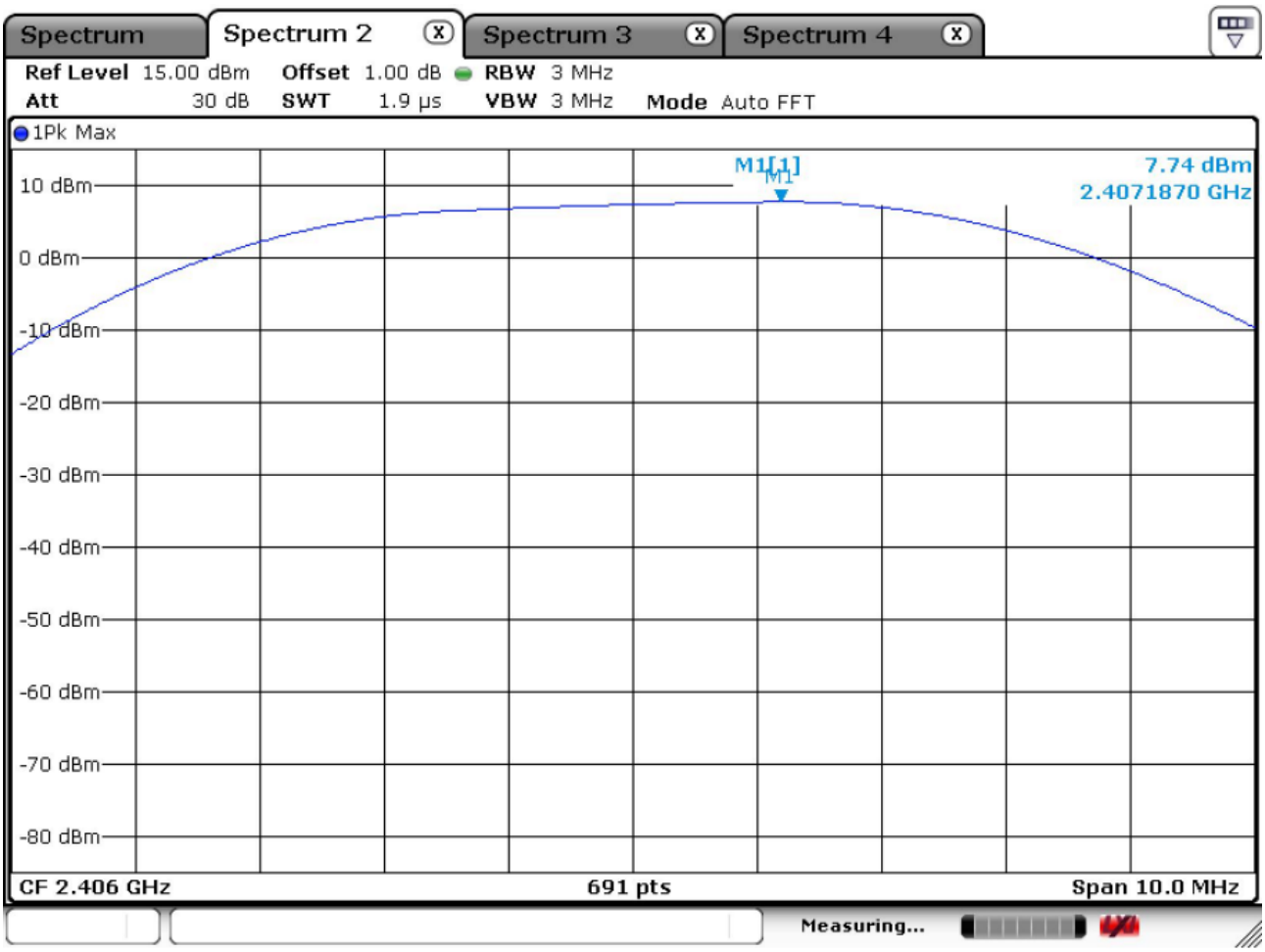
- See next pages for actual measured spectrum plots.

Minimum Standard:	< 250 mW

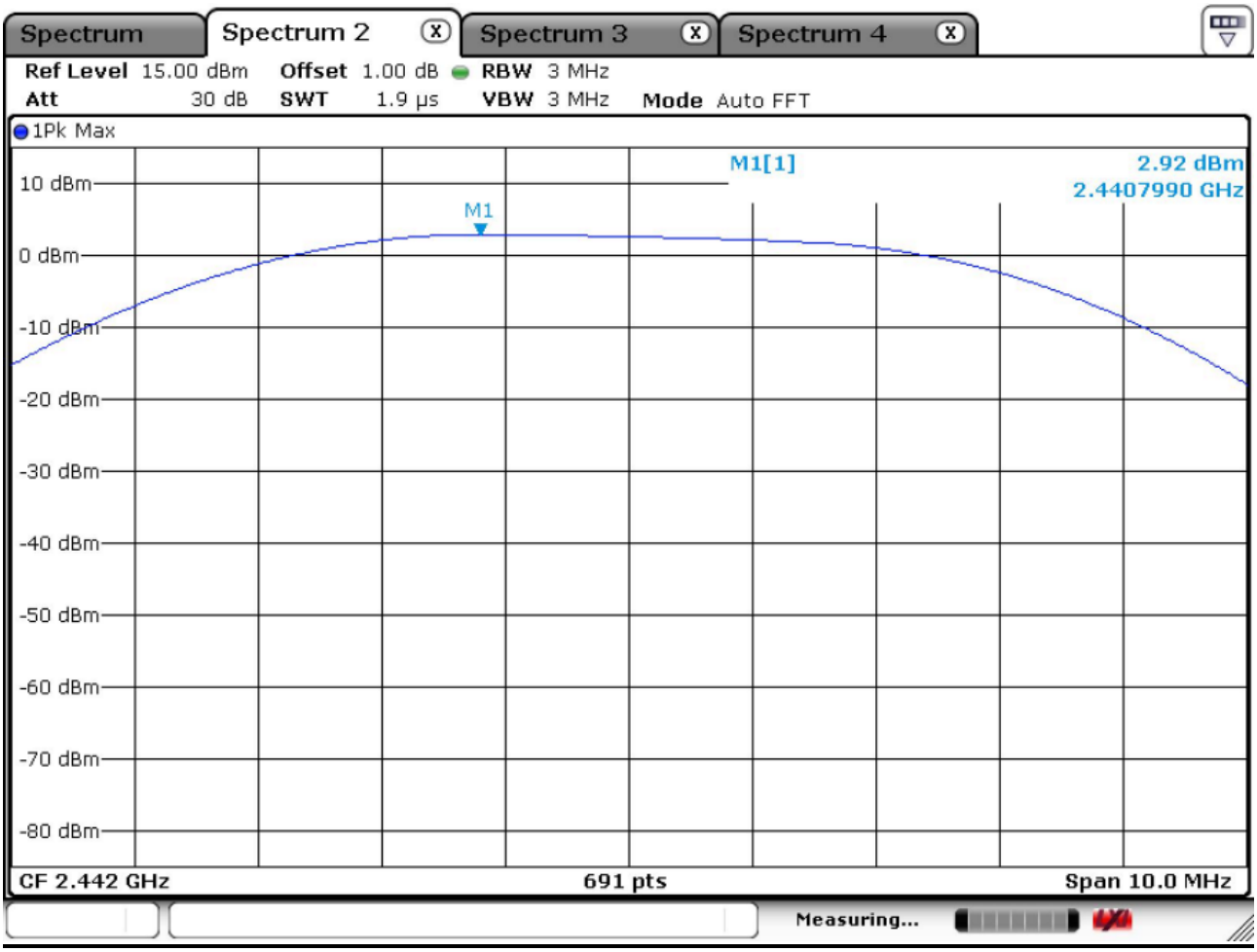
Measurement Setup

Same as the Chapter 3.2.1 (Figure 1)

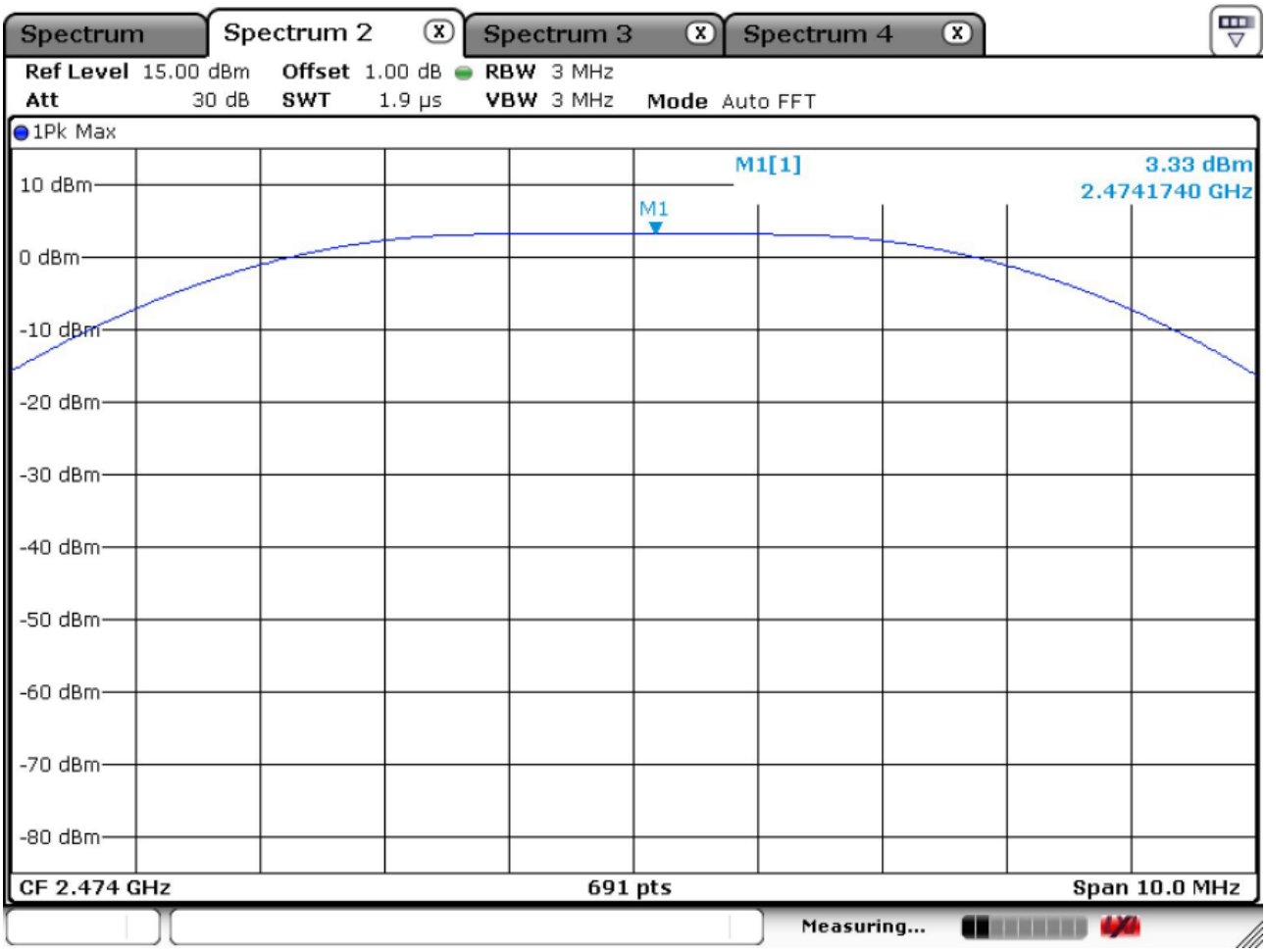
Channel 1



Channel 2


Spectrum
Spectrum 2
Spectrum 3
Spectrum 4
Ref Level 15.00 dBm
Offset 1.00 dB
RBW 3 MHz
Att 30 dB
SWT 1.9 µs
VBW 3 MHz
Mode Auto FFT
1Pk Max
M1[1]
2.92 dBm
2.4407990 GHz
M1
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.442 GHz
691 pts
Span 10.0 MHz
Measuring...

Channel 3



3.3.6 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 = 30-50 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.

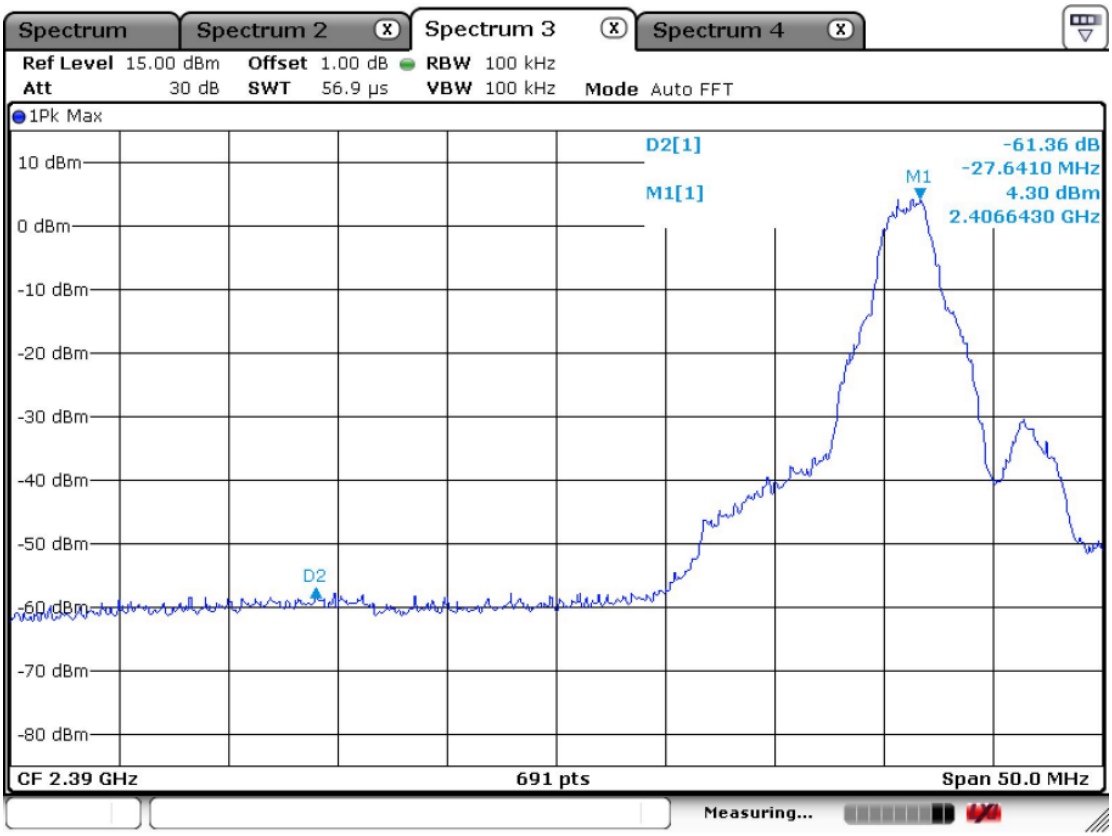
Minimum Standard:	> 20 dBc

Measurement Setup

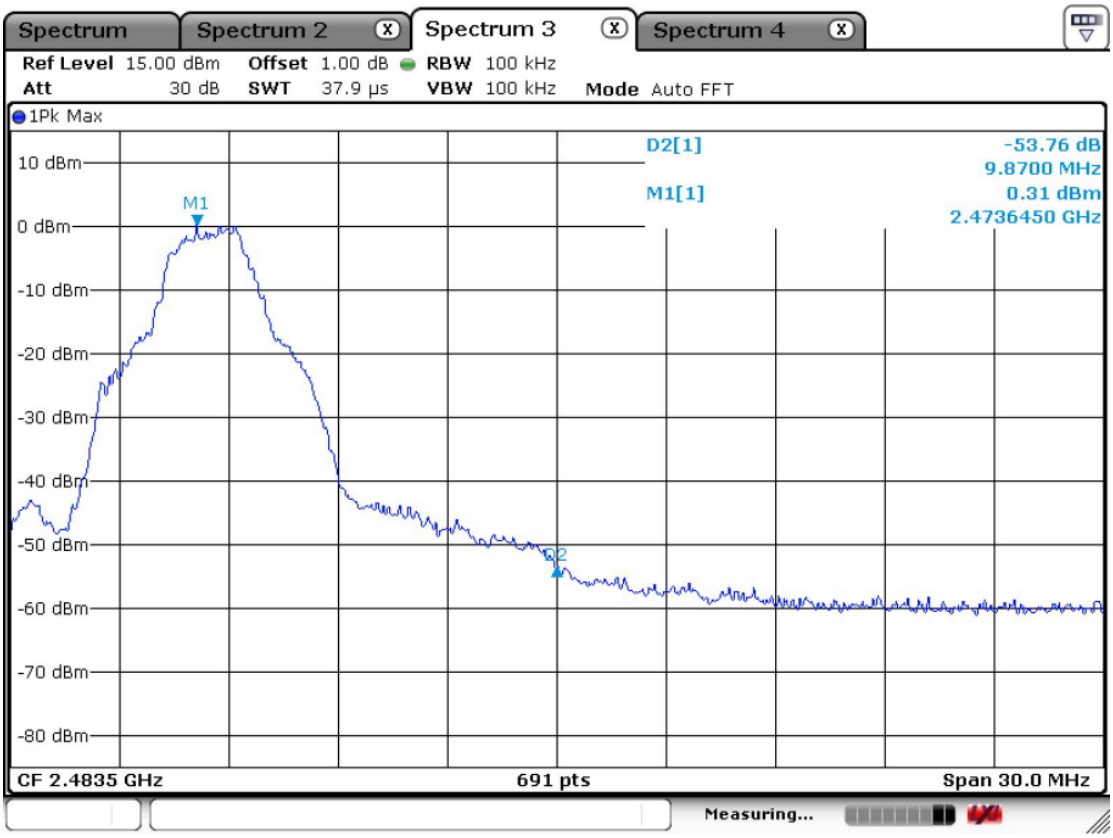
Same as the Chapter 3.2.1 (Figure 1)

Band – edge

Lower edge



Upper edge



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

Frequency [MHz]	Reading [dBuV/m] AV / Peak		Pol.	Correction Factor		Limits [dBuV/m] AV / Peak		Result [dBuV/m] AV / Peak		Margin [dB] AV / Peak	
				Antenna	Amp. Gain + Cable Loss						
2386.4	45.6	58.1	V	27.9	33.4	54.0	74.0	40.1	52.6	13.9	21.4

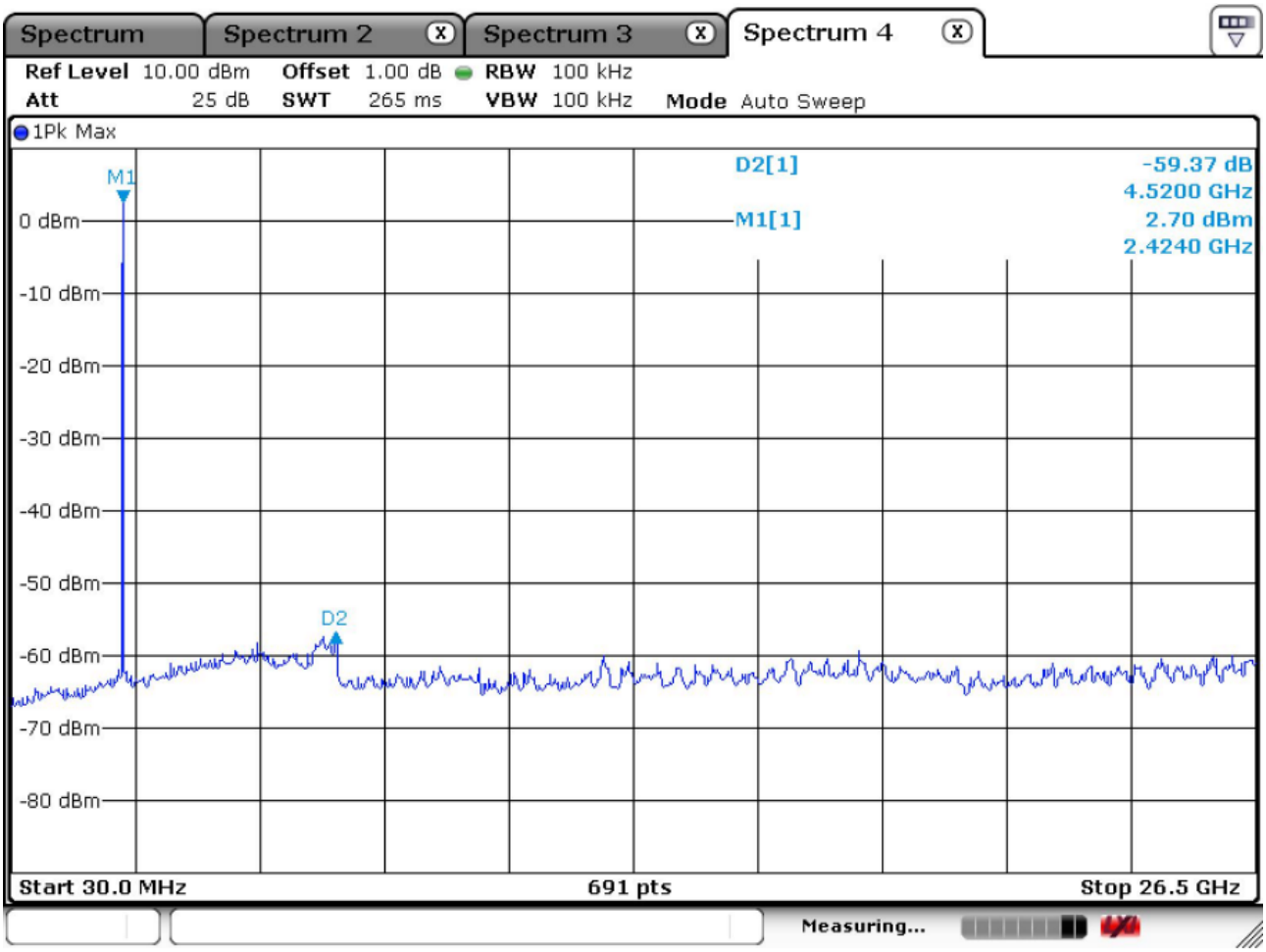
Band-edges in the restricted band 2483.5-2500 MHz measurement

Frequency [MHz]	Reading [dBuV/m] AV / Peak		Pol.	Correction Factor		Limits [dBuV/m] AV / Peak		Result [dBuV/m] AV / Peak		Margin [dB] AV / Peak	
				Antenna	Amp. Gain + Cable Loss						
2483.5	51.2	62.8	V	27.9	33.4	54.0	74.0	45.7	57.3	8.3	16.7

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

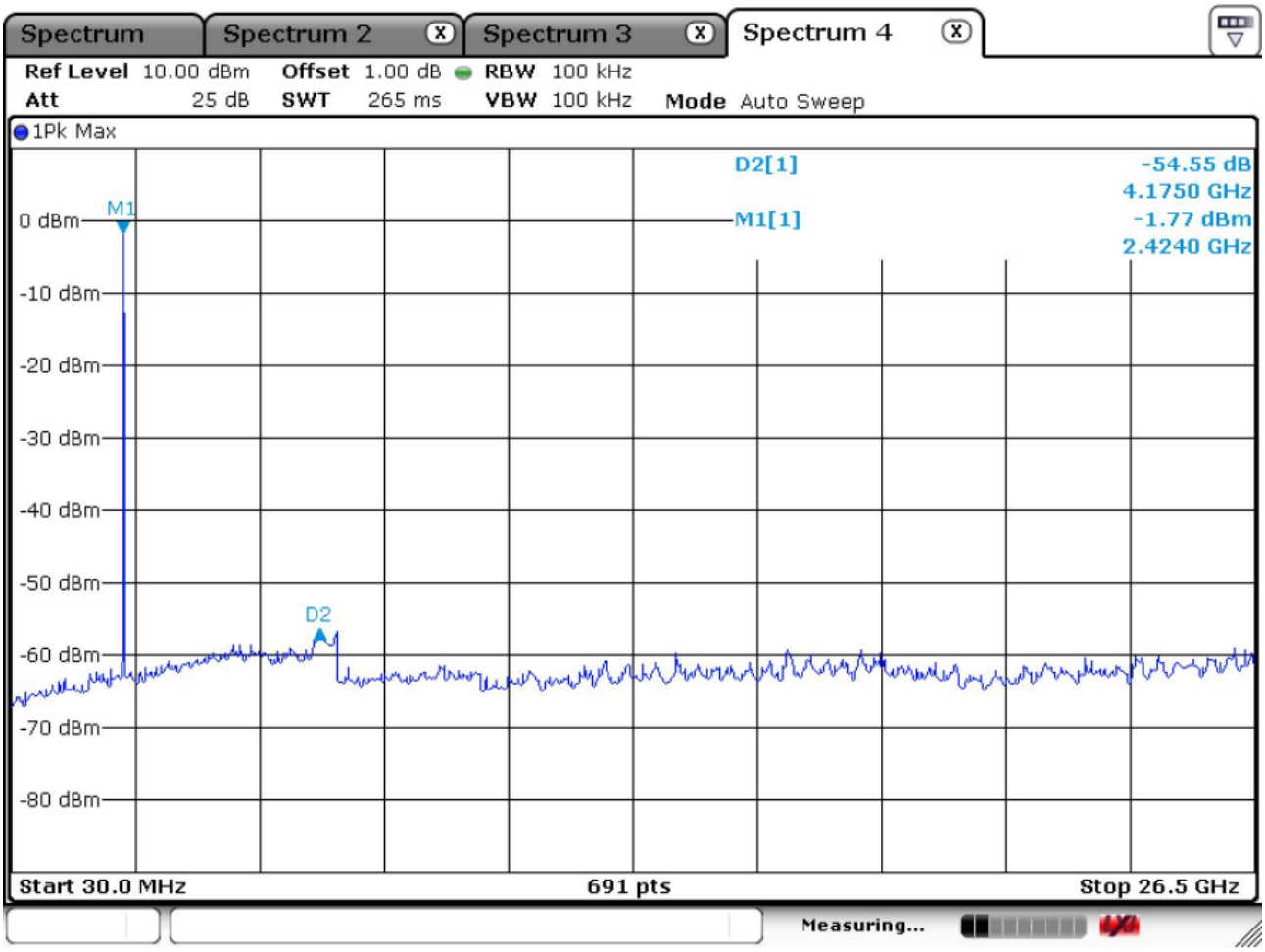
Unwanted Emission – Low channel

Frequency Range = 30 MHz ~ 26.5 GHz



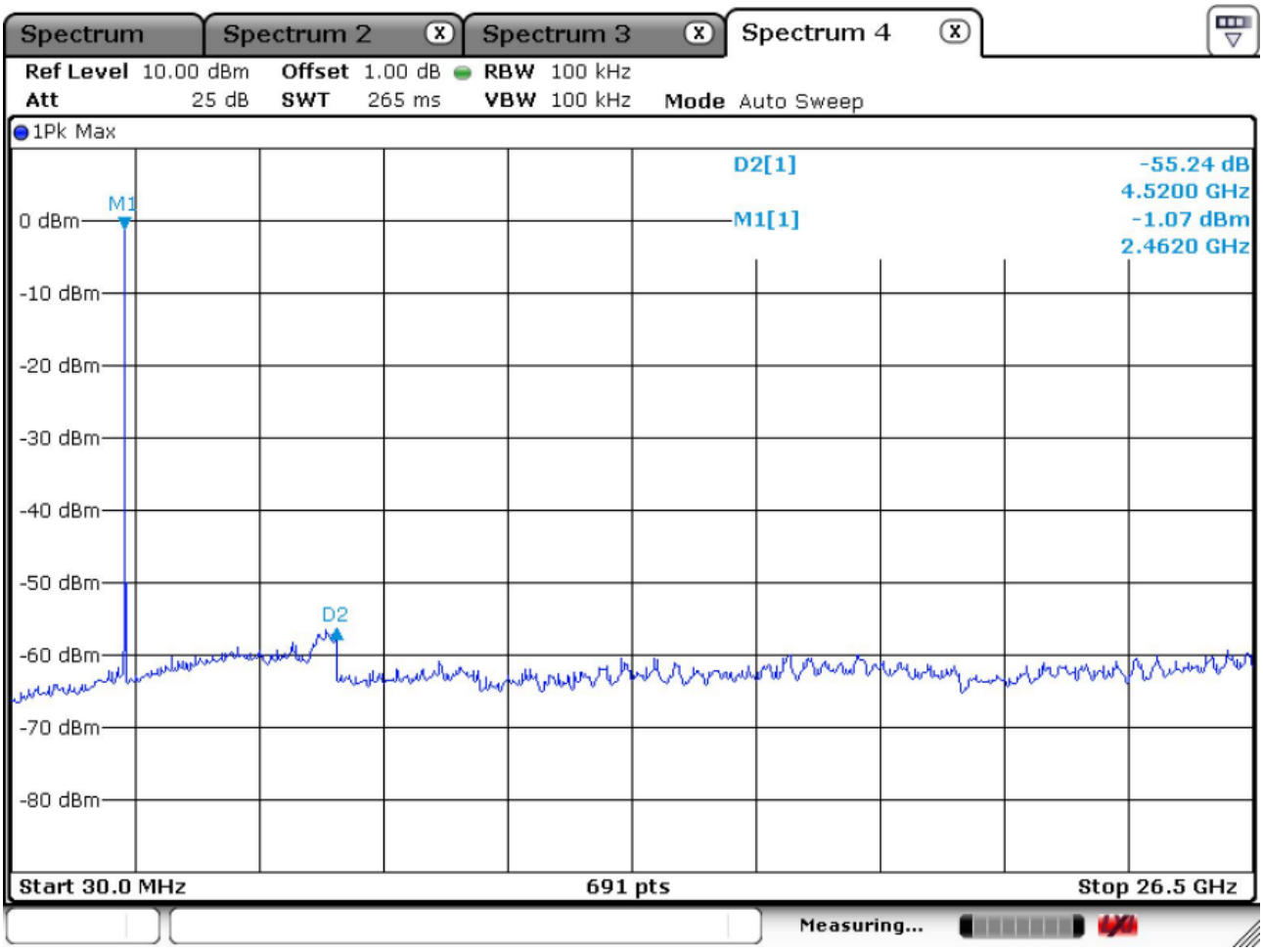
Unwanted Emission – Middle channel

Frequency Range = 30 MHz ~ 26.5 GHz



Unwanted Emission – High channel

Frequency Range = 30 MHz ~ 26.5 GHz



3.3.7 Field Strength of Harmonics

Procedure:

Radiated emissions from the EUT were measured according to the dictates of DA000705. 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 = 30 MHz ~ 10^{th} harmonic.

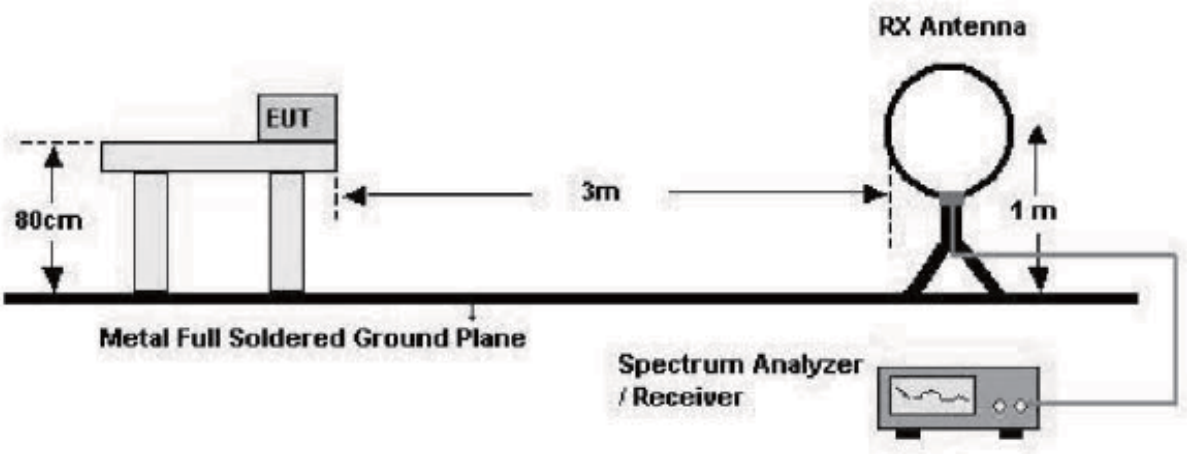
RBW = 100 kHz (30MHz ~ 1 GHz) — Peak: VBW ≥ RBW

= 1 MHz (1 GHz ~ 10^{th} harmonic) — Average: VBW=10Hz

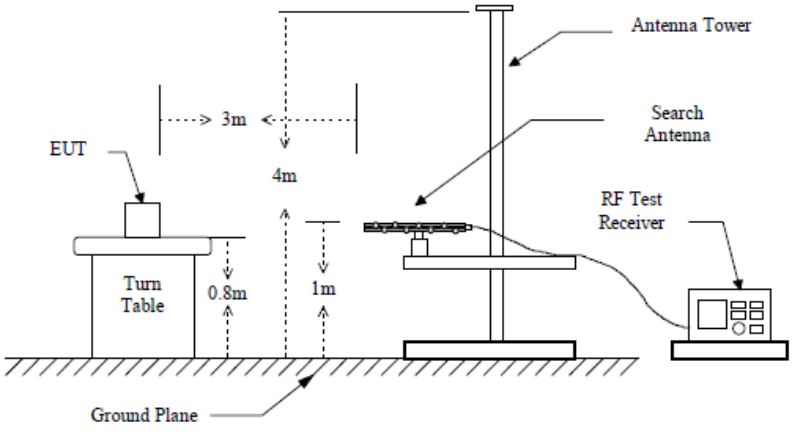
Span = 100 MHz — Detector function = peak

Trace = max hold — Sweep = auto

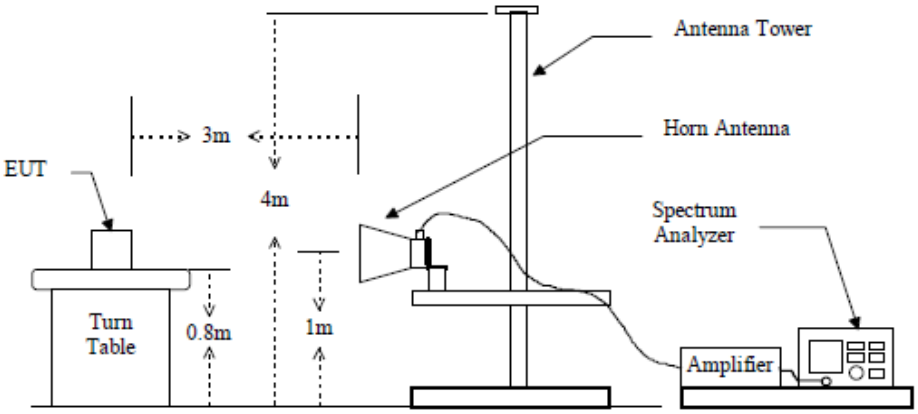
below 30MHz



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.

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 :

Frequency [MHz]	Reading [dBuV/m] AV / Peak		Pol.	Correction Factor		Limits [dBuV/m] AV/Peak		Result [dBuV/m] AV/Peak		Margin [dB] AV / Peak	
				Antenna	Amp.Gain+Cable						
4808.3	52.8	61.4	V	29.8	32.4	54.0	74.0	50.2	58.8	3.8	15.2
Frequency [MHz]	Reading [dBuV/m] AV / Peak		Pol.	Correction Factor		Limits [dBuV/m] AV/Peak		Result [dBuV/m] AV/Peak		Margin [dB] AV / Peak	
				Antenna	Amp.Gain+Cable						
4880.4	53.0	63.9	V	29.8	32.4	54.0	74.0	50.4	61.3	3.6	12.7
Frequency [MHz]	Reading [dBuV/m] AV / Peak		Pol.	Correction Factor		Limits [dBuV/m] AV/Peak		Result [dBuV/m] AV/Peak		Margin [dB] AV / Peak	
				Antenna	Amp.Gain+Cable						
4950.1	52.4	62.1	V	29.8	32.4	54.0	74.0	49.8	59.5	4.2	14.5

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

Radiated Emissions – Wireless mode

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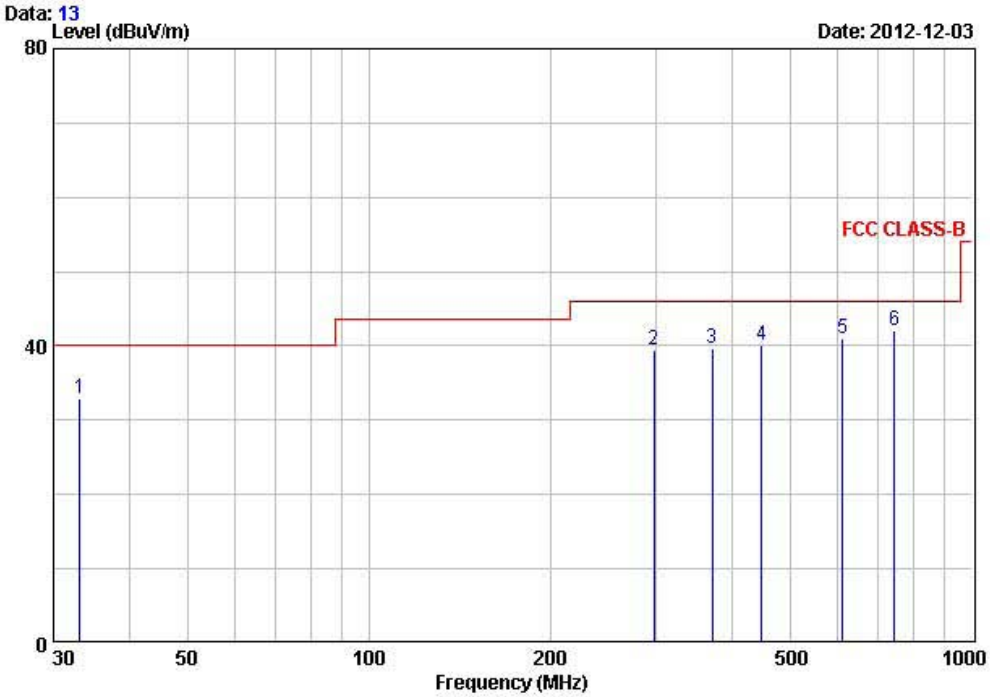
EUT/Model No.: EX23DTH TEST MODE: Wireless mode

Temp Humi : 2 / 31 Tested by: Ko Gun



	Freq	Reading	C.F	Result	Limit QP	Margin	Height	Angle	Polarity
	MHz	dBuV/m	dB/m	dBuV/m	dBuV/m	dB	cm	deg	
1	33.15	50.10	-17.15	32.95	40.00	7.05	100	186	VERTICAL
2	296.99	51.00	-11.63	39.37	46.00	6.63	366	180	HORIZONTAL
3	371.13	49.50	-9.81	39.69	46.00	6.31	335	110	HORIZONTAL
4	448.12	48.20	-8.13	40.07	46.00	5.93	234	311	HORIZONTAL
5	611.08	44.80	-3.80	41.00	46.00	5.00	296	109	HORIZONTAL
6	743.16	42.80	-0.65	42.15	46.00	3.85	316	207	HORIZONTAL

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

3.3.8 AC Conducted Emissions

Procedure:

AC power line conducted emissions from the EUT were measured according to the dictates of ANSI C63.4:2003. 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: **Not Applicable**

(This Product is operated by battery.)

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

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	3649A03649	HP	2 year	2012-03-26
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)	3115	114105	ETS	2 year	2012-01-26
13	Horn Antenna (18 ~ 40GHz)	SAS-574	154	Schwarzbeck	2 year	2012-11-24
14	Horn Antenna (18 ~ 40GHz)	SAS-574	155	Schwarzbeck	2 year	2012-11-24
15	TRILOG Antenna	VULB 9160	9160-3172	SCHWARZBECK	2 year	2012-09-20
16	Hygro-Thermograph	THB-36	0041557-01	ISUZU	1 year	2012-09-26
17	Splitter (SMA)	ZFSC-2-2500	SF617800326	Mini-Circuits	-	-
18	Power Divider	11636A	6243	HP	2 year	2012-09-22
19	DC Power Supply	6622A	3448A03079	HP	-	-
20	Frequency Counter	5342A	2826A12411	HP	1 year	2012-03-26
21	Power Meter	EPM-441A	GB32481702	HP	1 year	2012-03-26
22	Power Sensor	8481A	US41030291	HP	1 year	2012-09-22
23	Audio Analyzer	8903B	3729A18901	HP	1 year	2012-09-22
24	Modulation Analyzer	8901B	3749A05878	HP	1 year	2012-09-22
25	TEMP & HUMIDITY Chamber	YJ-500	LTAS06041	JinYoung Tech	1 year	2012-09-22
26	Stop Watch	HS-3	601Q09R	CASIO	2 year	2012-03-26
27	LISN	ENV216	100408	R&S	1 year	2012-09-22
28	UNIVERSAL RADIO COMMUNICATION TESTER	CMU200	106243	R&S	2 year	2012-06-27
29	Highpass Filter	WHKX1.5/15G-10SS	74	Wainwright Instruments	-	-
30	Highpass Filter	WHKX3.0/18G-10SS	118	Wainwright Instruments	-	-