



243 Jubug-Ri, Yangji-Myeon, Yongin-Si, Gyeonggi-Do, Korea 449-822  
Tel: +82-31-323-6008 Fax: +82-31-323-6010  
<http://www.ltalab.com>

Dates of Tests: May 11 ~ 23, 2011

Test Report S/N: LR500111105G

Test Site : LTA CO., LTD.

## CERTIFICATION OF COMPLIANCE

FCC ID.

**X8U0002**

APPLICANT

**TESSERA TECHNOLOGY INC.**

Equipment Class	:	Digital Transmission System (DTS)
Manufacturing Description	:	Wireless unit
Manufacturer	:	TESSERA TECHNOLOGY INC.
Model name	:	MB-RF1146
Test Device Serial No.:	:	Identical prototype
Rule Part(s)	:	FCC Part 15.247 Subpart C ; ANSI C-63.4-2003
Frequency Range	:	2405MHz ~ 2480MHz
Max. Output Power	:	Max 3.54dBm – Conducted
Data of issue	:	May 24, 2011

This test report is issued under the authority of:

Hyun-Chae You, Manager

The test was supervised by:

Il-Shin kim, 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  
 Web site : <http://www.ltalab.com>  
 E-mail : [chahn@ltalab.com](mailto: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	2011-09-30	ECT accredited Lab.
RRL	KOREA	KR0049	2011-09-01	EMC accredited Lab.
FCC	U.S.A	610755	2014-04-27	FCC filing
FCC	U.S.A	649054	2011-05-26	FCC CAB
VCCI	JAPAN	R2133(10m), C2307	2011-06-21	VCCI registration
VCCI	JAPAN	T-2009	2013-12-23	VCCI registration
IC	CANADA	IC5799	2012-05-14	IC filing

## 2. Information's about test item

### 2-1 Client & Manufacturer

Company name : TESSERA TECHNOLOGY INC.  
 Address : 4F, 2710-1 Noborito, Tama-ku, Kawasaki-shi, Kanagawa, Japan  
 Tel / Fax : TEL No : +81-44-271-7533 / FAX No : +81-44-271-7534

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

Trade name : Tessera Technology Inc.  
 FCC ID : X8U0002  
 Model name : MB-RF1146  
 Serial number : Identical prototype  
 Date of receipt : May 11, 2011  
 EUT condition : Pre-production, not damaged  
 Antenna type : PCB pattern antenna Max Gain 1.4 dBi  
 Frequency Range : 2405MHz ~ 2480MHz (DSSS)  
 RF output power : Max 3.54dBm - Conducted  
 Number of channels : 16  
 Type of Modulation : O-QPSK  
 Channel spacing : 5MHz  
 Power Source : 3.0Vdc  
 Firmware Version : V1.00

### 2-3 Tested frequency

	LOW	MID	HIGH
Frequency (MHz)	2405	2440	2480

### 2-4 Ancillary Equipment

Equipment	Model No.	Serial No.	Manufacturer
PC	HP Compaq dx7400	CNG8330J9R	HP

### 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 TESSERA TECHNOLOGY INC. FCC ID: X8U0002 unit complies with the requirement of §15.203.

The antenna is PCB pattern antenna.

The sample was tested according to the following specification:

FCC Parts 15.247; ANSI C-63.4-2003

## 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 = 10 MHz

VBW = 100 kHz (VBW  $\geq$  RBW)

Sweep = auto

Trace = max hold

Detector function = peak

#### Measurement Data:

Frequency (MHz)	Test Results	
	Measured Bandwidth (MHz)	Result
2405	1.418	Complies
2440	1.534	Complies
2480	1.534	Complies

- See next pages for actual measured spectrum plots.

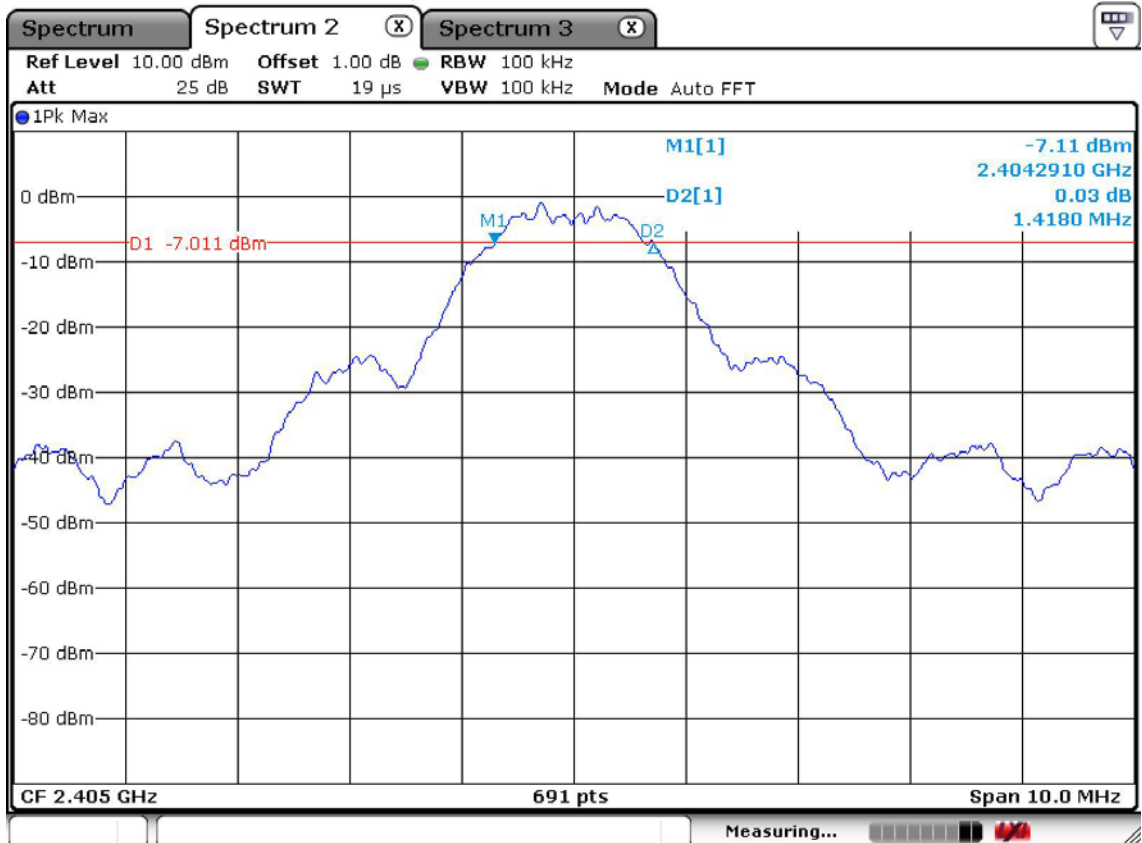
#### Minimum Standard:

6 dB Bandwidth > 500kHz

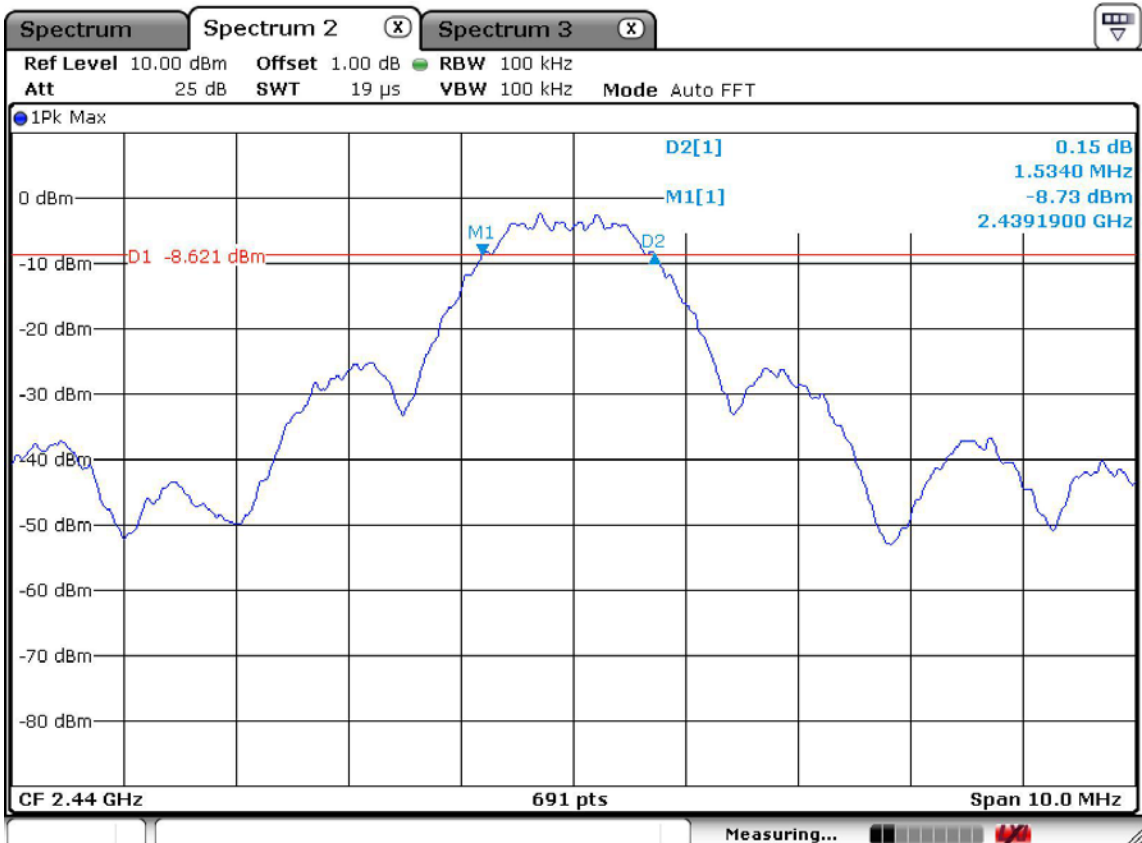
#### Measurement Setup

Same as the Chapter 3.2.1 (Figure 1)

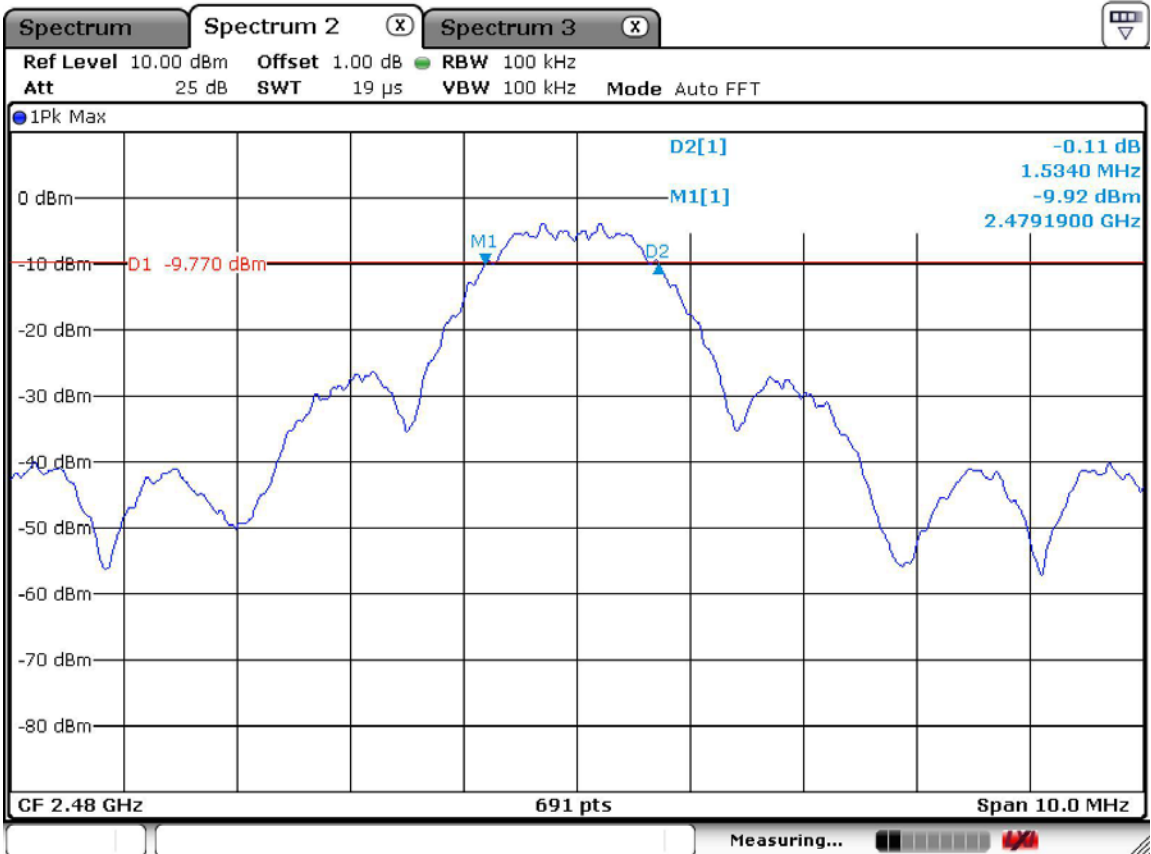
Low Channel



Mid Channel



High Channel





### 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:

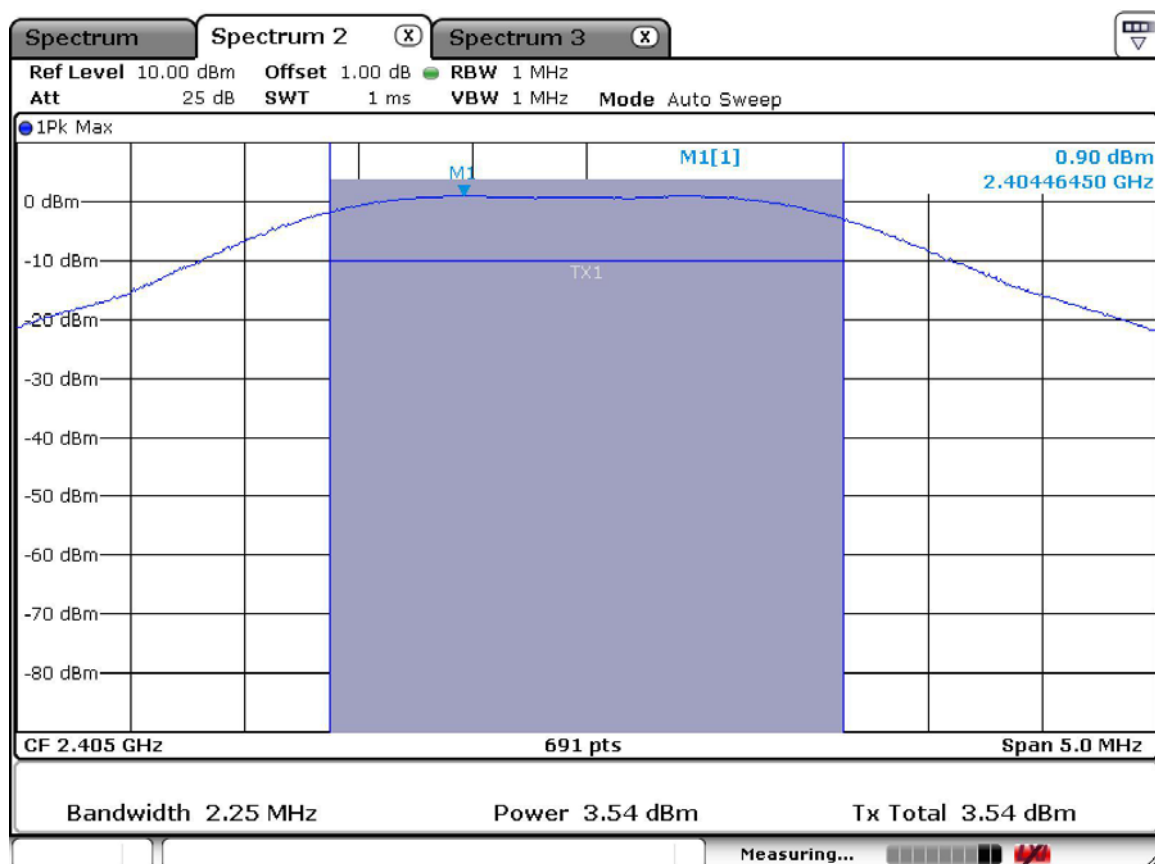
Frequency (MHz)	Test Results		
	dBm	mW	Result
2405	3.54	2.26	Complies
2440	2.65	1.84	Complies
2480	1.35	1.36	Complies

- See next pages for actual measured spectrum plots.

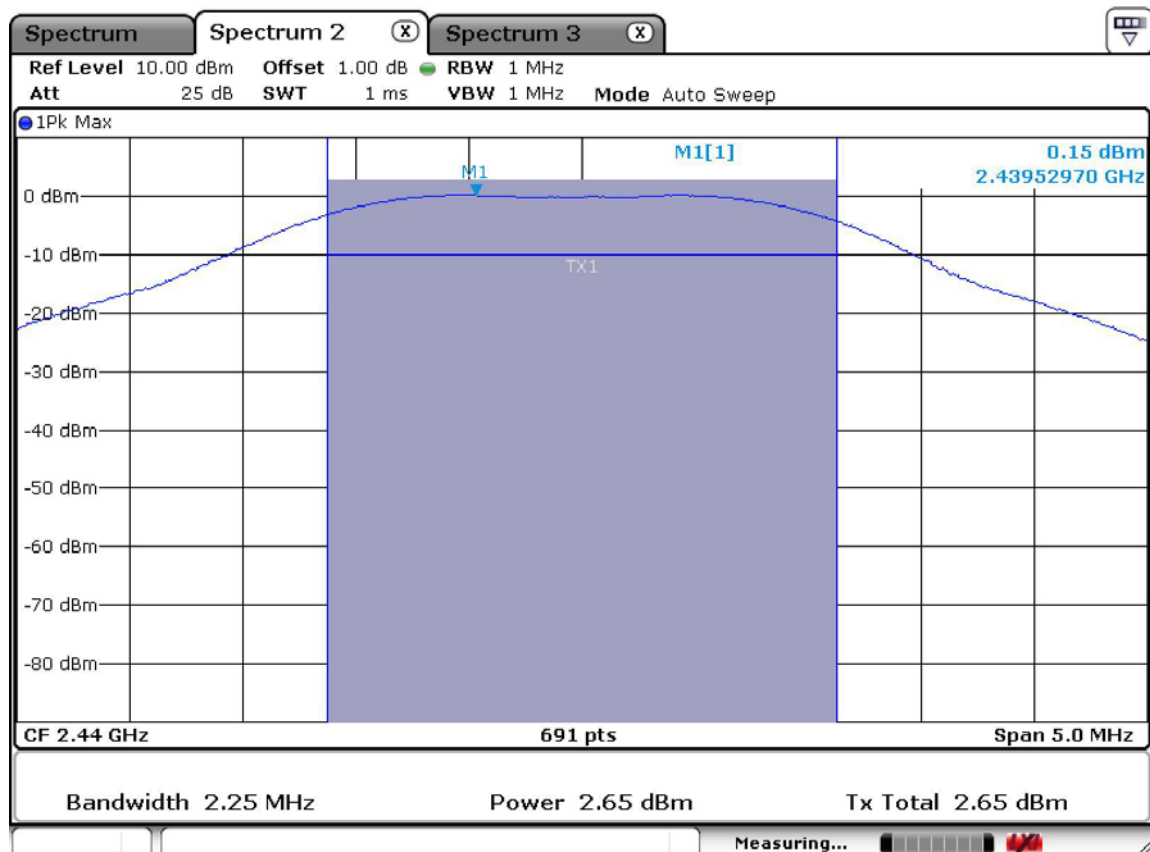
#### Minimum Standard:

Peak output power	< 1W
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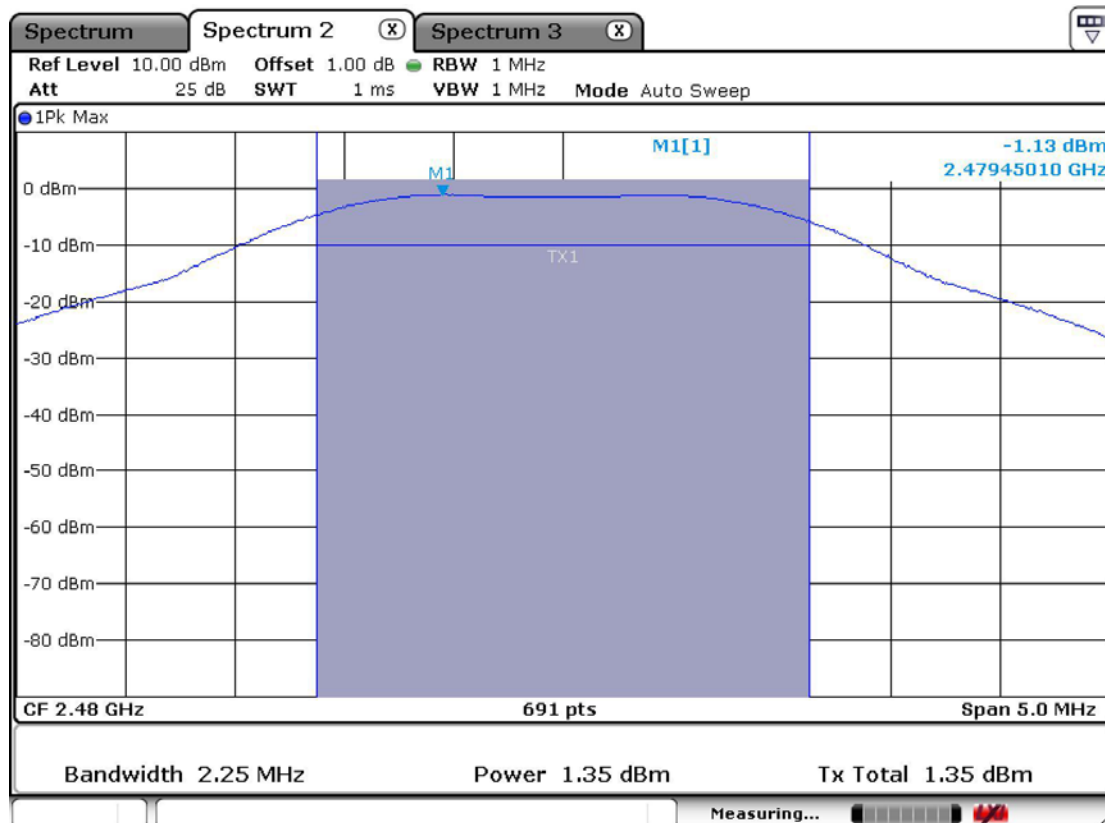
## Low Channel



## Mid Channel



## High Channel



### 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 = 10 kHz

Sweep = 100 sec

Detector function = peak

Trace = max hold

#### Measurement Data:

Frequency (MHz)	Test Results	
	dBm	Result
2405	-14.96	Complies
2440	-15.54	Complies
2480	-16.72	Complies

- See next pages for actual measured spectrum plots.

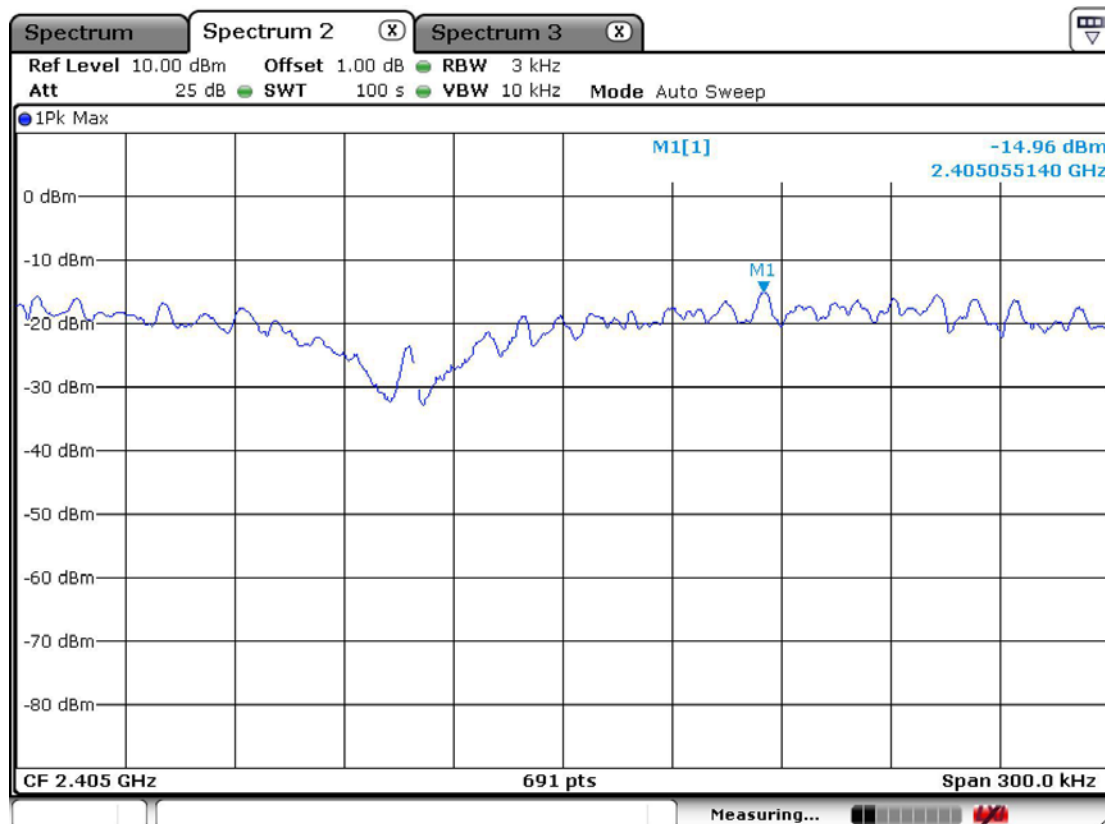
#### Minimum Standard:

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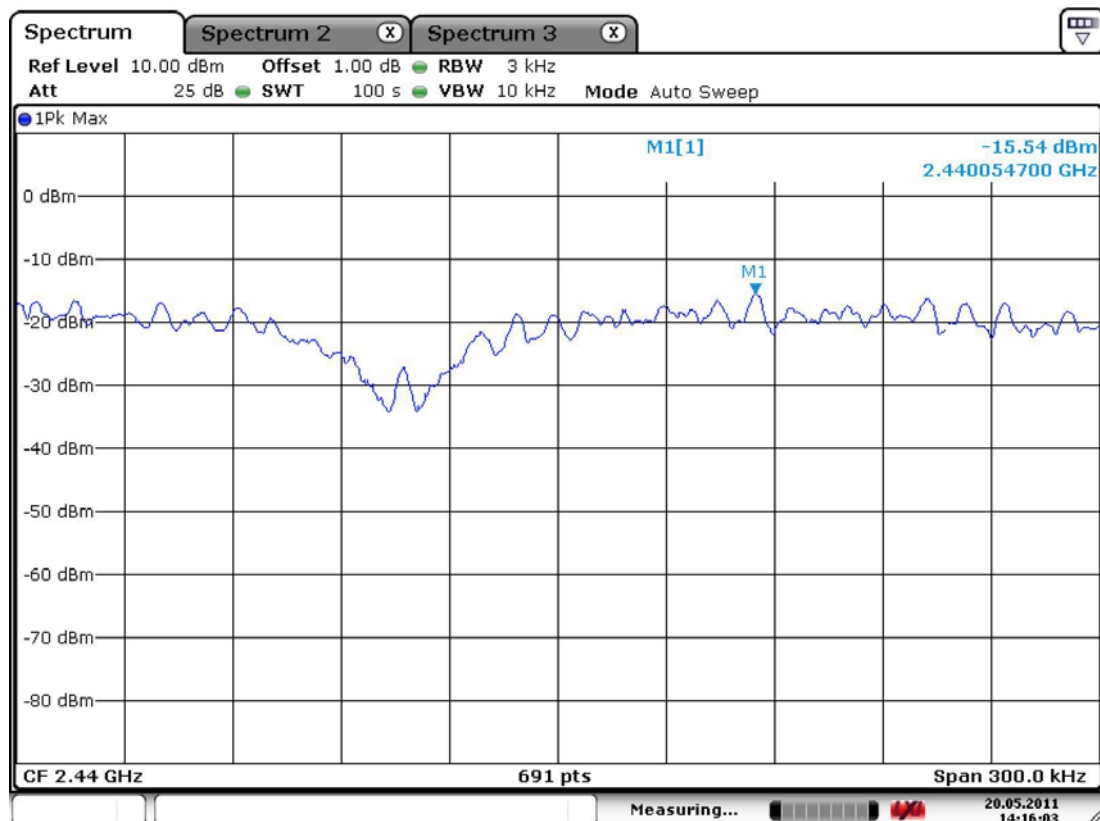
#### Measurement Setup

Same as the Chapter 3.2.1 (Figure 1)

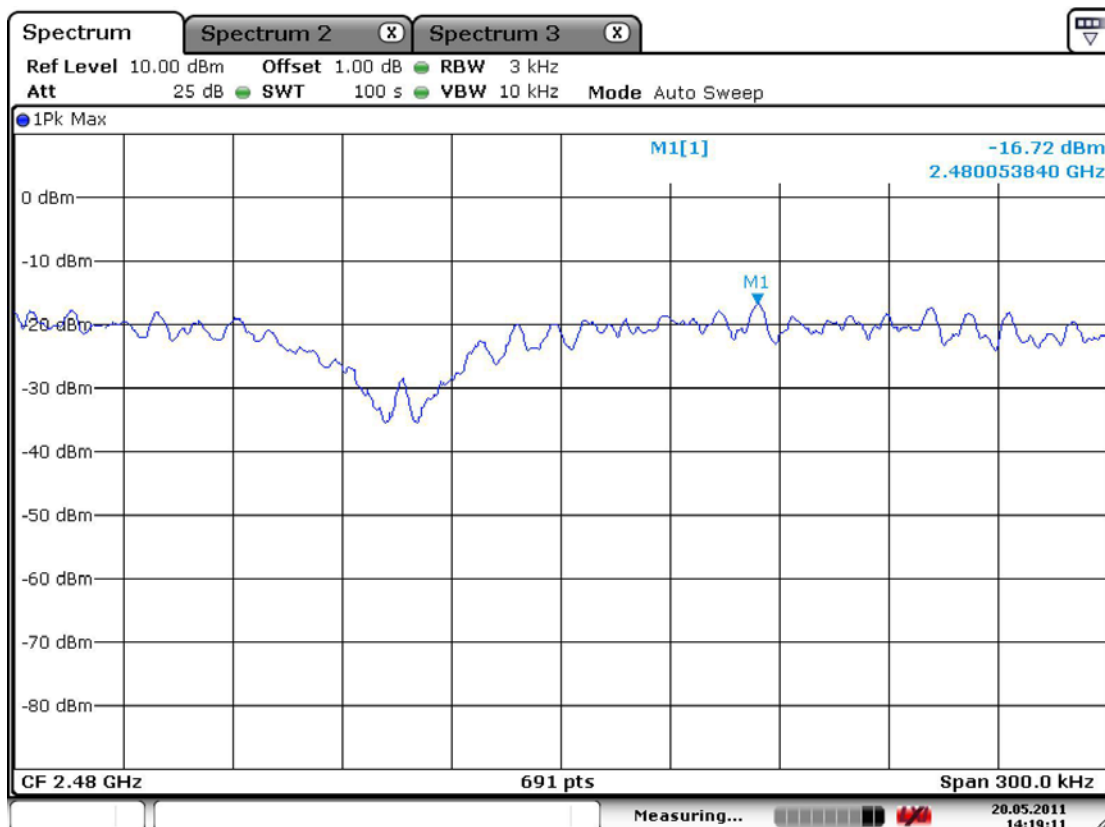
## Power Density Measurement Low Channel



## Mid Channel



# High Channel



### 3.2.4 Band - edge & Spurious

#### 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 = 50 MHz

Detector function = peak

Trace = max hold

Sweep = auto

Radiated emissions which fall in the restricted bands, as defined in 15.205(a), must also comply with the radiated emission limits specified in 15.209(a)

The spectrum analyzer is set to:

Center frequency = the highest, the lowest channels

PEAK:

RBW = VBW = 1MHz, Sweep=Auto

Average:

RBW = 1MHz, VBW=10Hz, Sweep=Auto

Measurement Distance:

3m

Polarization:

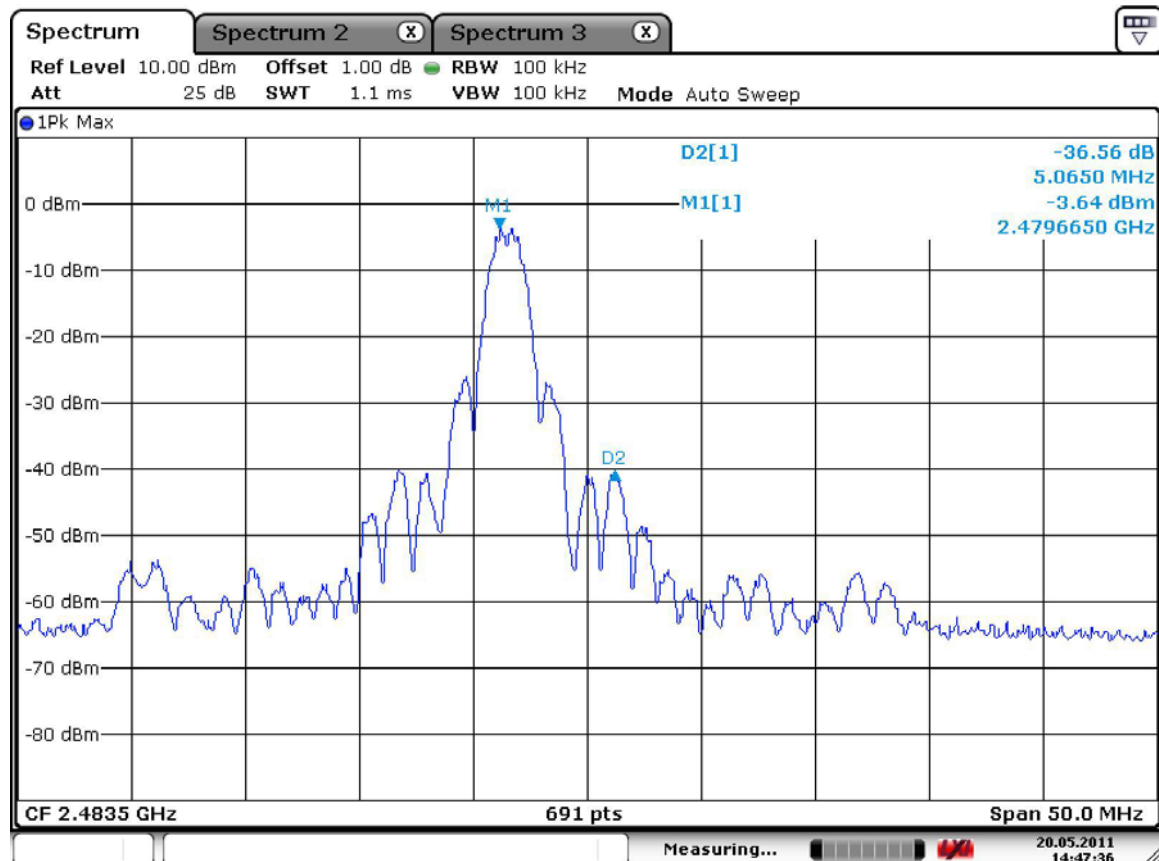
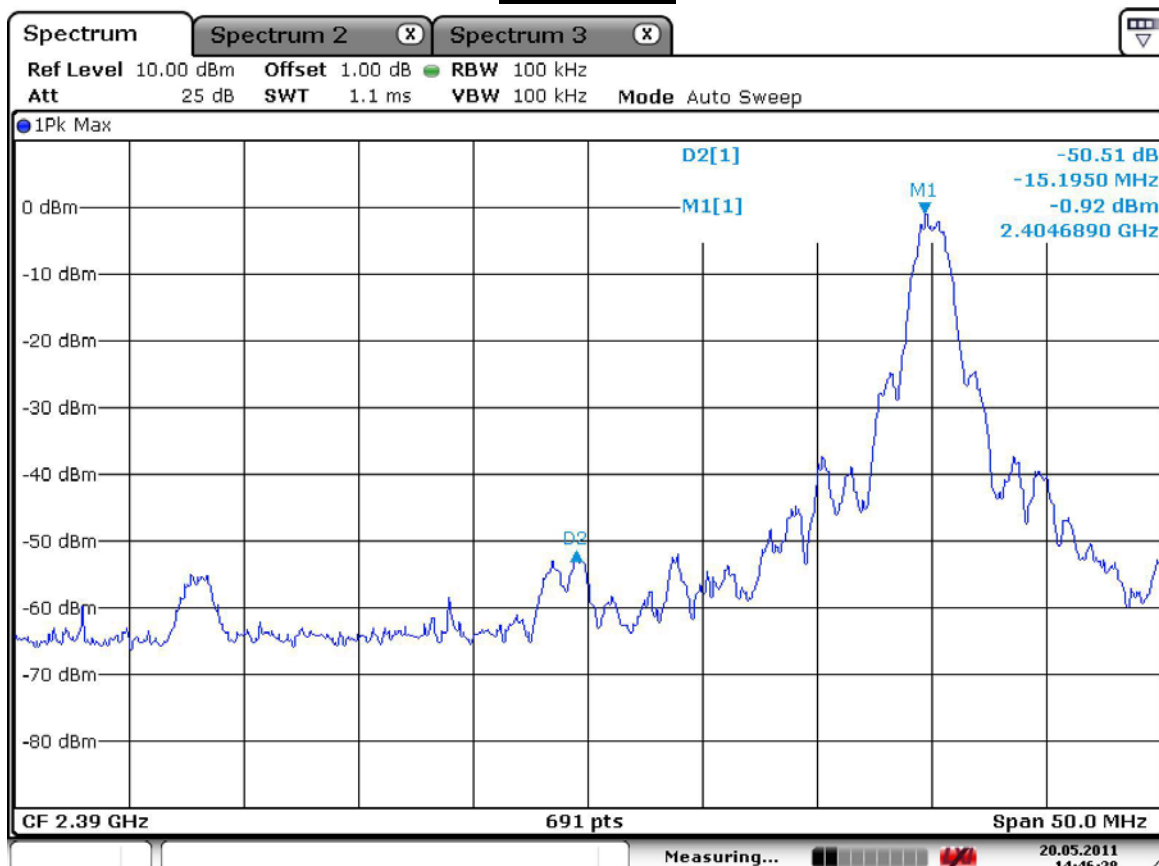
Horizontal / Vertical

#### Measurement Data: Complies

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

<b>Minimum Standard:</b>	> 20 dBc
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# **Band-edge**





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

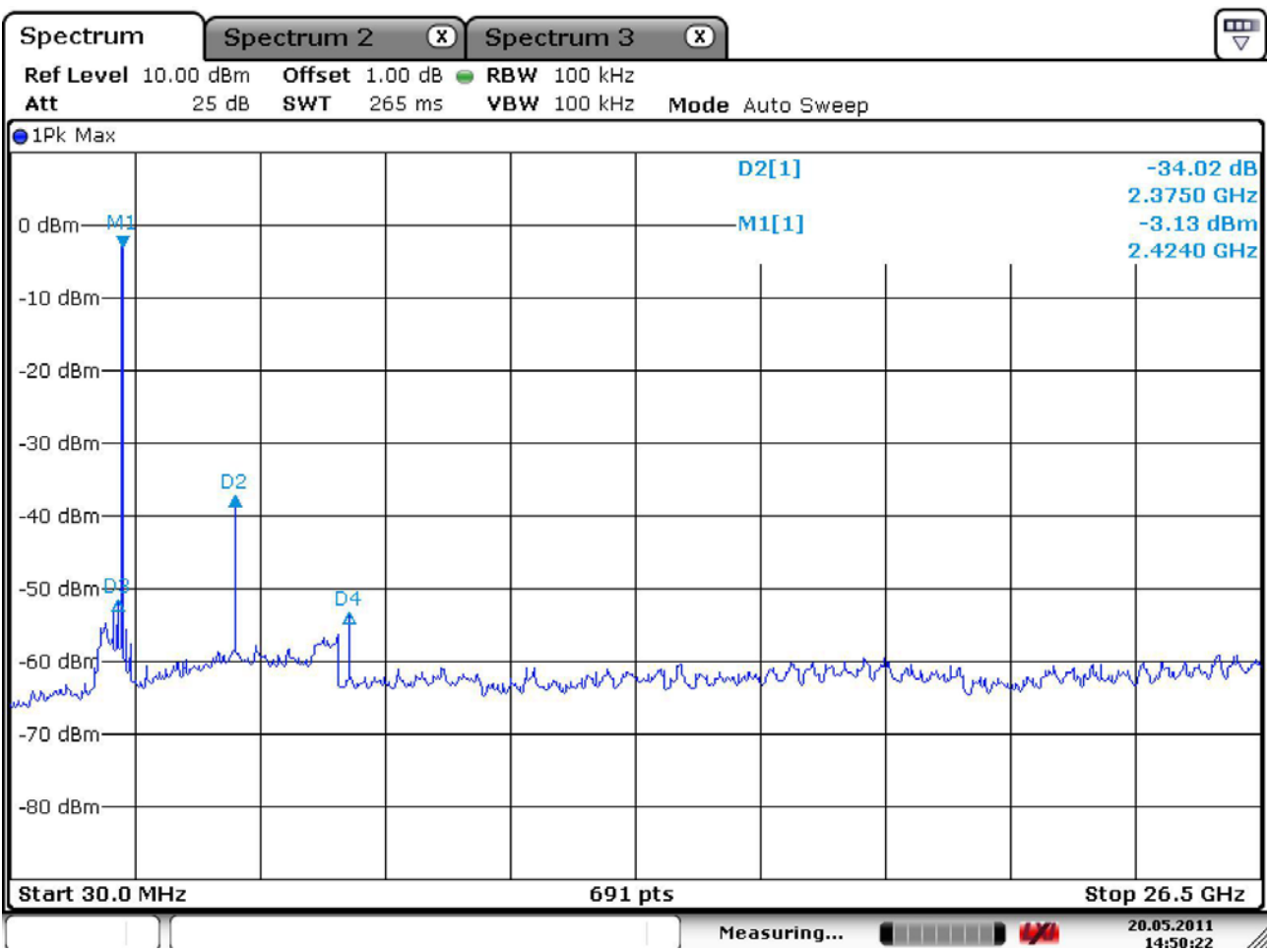
Frequency	Reading		Pol.	Correction			Limits		Result		Margin	
	[dBuV/m]			Factor			[dBuV/m]		[dBuV/m]		[dB]	
[MHz]	AV / Peak			Antenna	Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
2390.0	36.1	48.7	V	25.4	37.1	4.0	54.0	74.0	28.3	40.9	25.7	33.1

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

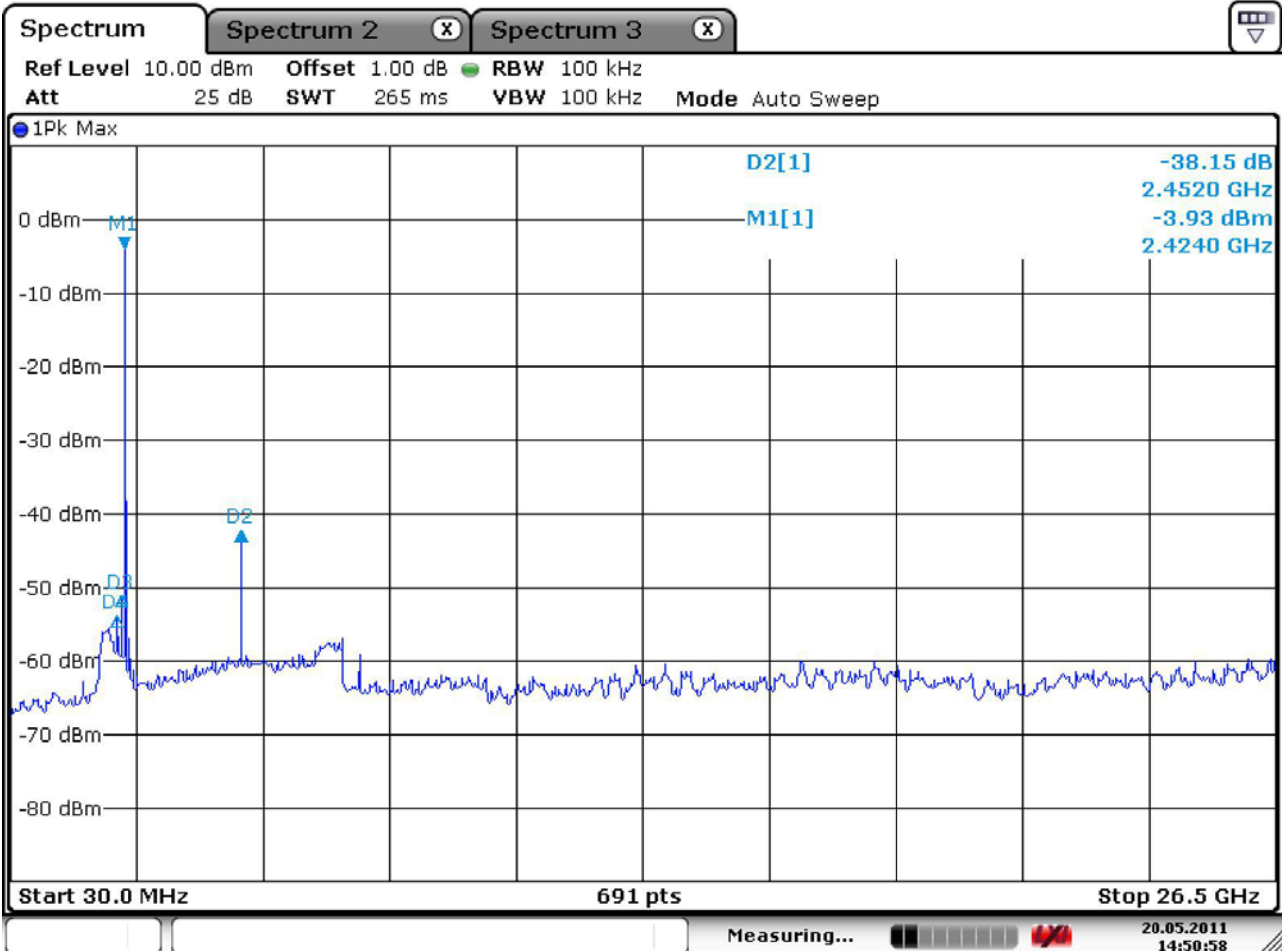
Frequency	Reading		Pol.	Correction			Limits		Result		Margin	
	[dBuV/m]			Factor			[dBuV/m]		[dBuV/m]		[dB]	
[MHz]	AV / Peak			Antenna	Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
2483.5	32.8	47.4	V	25.4	37.1	4.0	54.0	74.0	25.0	39.6	29.0	34.4

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

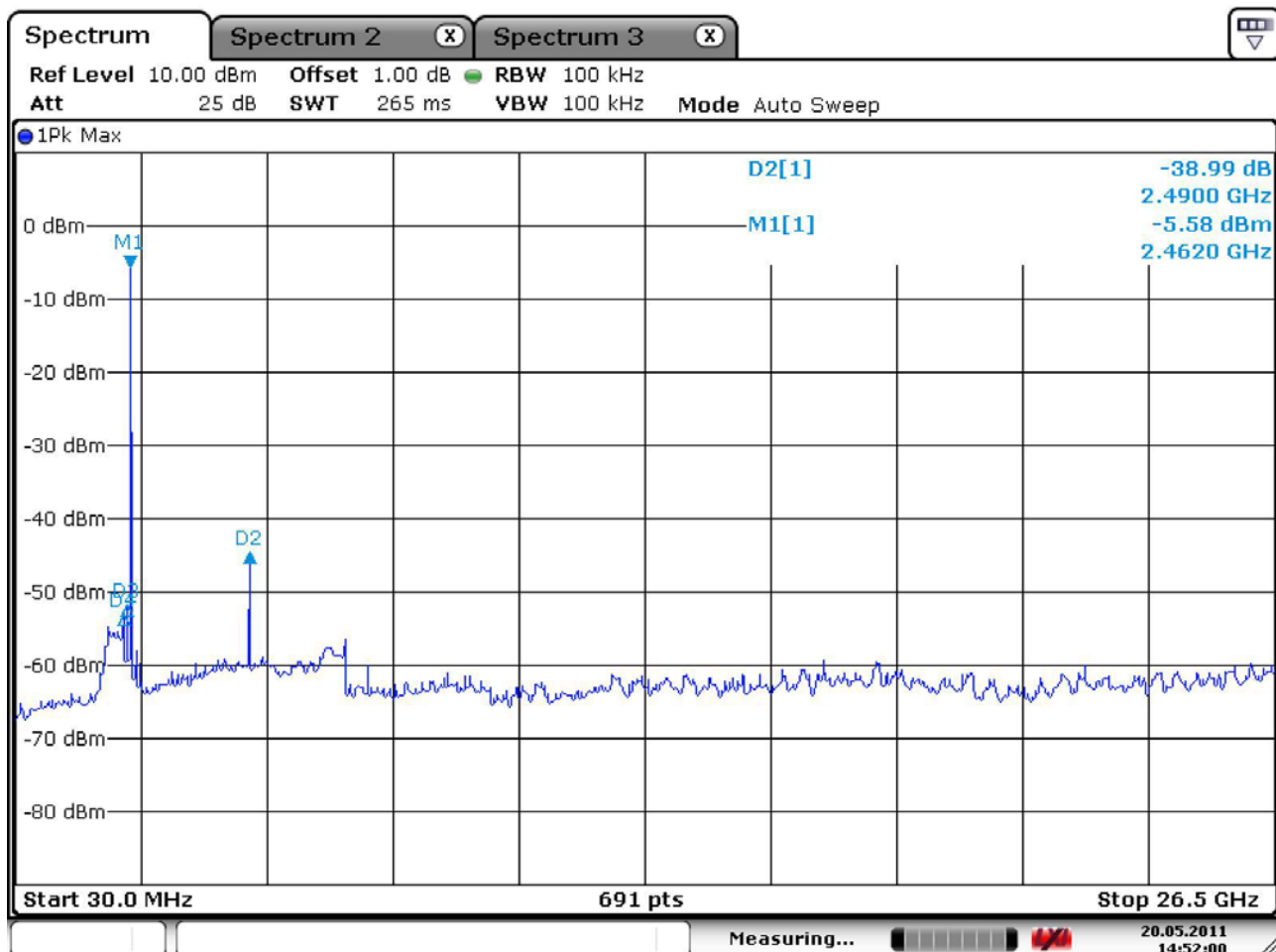
Low channel  
Frequency Range = 30 MHz ~ 10<sup>th</sup> harmonic.



Mid channel  
Frequency Range = 30 MHz ~ 10<sup>th</sup> harmonic.



**High channel**  
**Frequency Range = 30 MHz ~ 10<sup>th</sup> 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 ~ 10<sup>th</sup> harmonic.

RBW = 100 kHz ( 30MHz ~ 1 GHz)

VBW ≥ RBW

= 1 MHz (1 GHz ~ 10<sup>th</sup> 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 15.209(a)

Frequency (MHz)	Limit (uV/m) @ 3m
30 ~ 88	100 **
88 ~ 216	150 **
216 ~ 960	200 **
Above 960	500

\*\* Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

#### Minimum Standard: FCC Part 15.109

Frequency (MHz)	Limit (uV/m) @ 10m
30 ~ 88	90
88 ~ 216	150
216 ~ 960	210
Above 960	300

**Measurement Data:**

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	
4809.00	39.4	53.8	V	31.4	36.5	5.7	54.0	74.0	40.1	54.5	13.9	19.5
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
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	
4880.00	36.1	46.8	V	31.4	36.5	5.7	54.0	74.0	36.8	47.4	17.2	26.6
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
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	
4959.00	35.4	45.8	V	31.4	36.5	5.7	54.0	74.0	36.1	46.4	18.0	27.6
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

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

**Radiated Emissions – Zigbee**

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

EUT/Model No.: MB-RF1146

TEST MODE: Zigbee mode

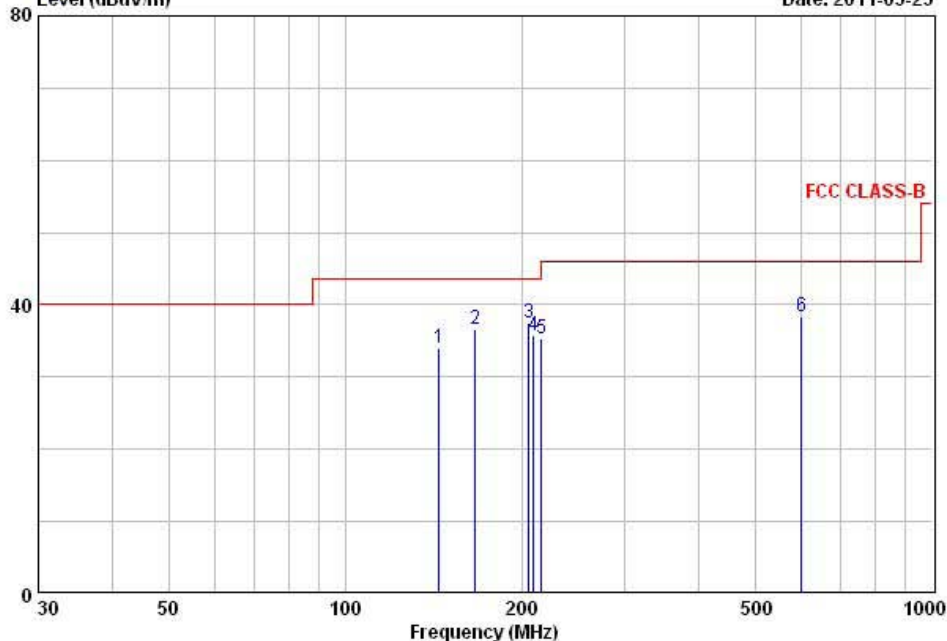
Temp Humi : 23 / 54

Tested by: PARK.H.W

Data: 82

Level (dBuV/m)

Date: 2011-05-23



	Freq	Reading	C.F	Result	Limit	Margin	Height	Angle	Polarity
	MHz	dBuV/m	dB/m	dBuV/m	dBuV/m	dB	cm	deg	
1	144.60	43.10	-9.05	34.05	43.50	9.45	111	180	VERTICAL
2	166.80	45.70	-9.15	36.55	43.50	6.95	106	38	VERTICAL
3	205.40	48.70	-11.30	37.40	43.50	6.10	108	340	VERTICAL
4	209.40	46.80	-11.08	35.72	43.50	7.78	125	36	VERTICAL
5	216.30	46.00	-10.71	35.29	46.00	10.71	100	192	VERTICAL
6	598.70	38.90	-0.48	38.42	46.00	7.58	134	350	VERTICAL

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

- See next pages for actual measured spectrum plots.
- No emissions were detected at a level greater than 10dB 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

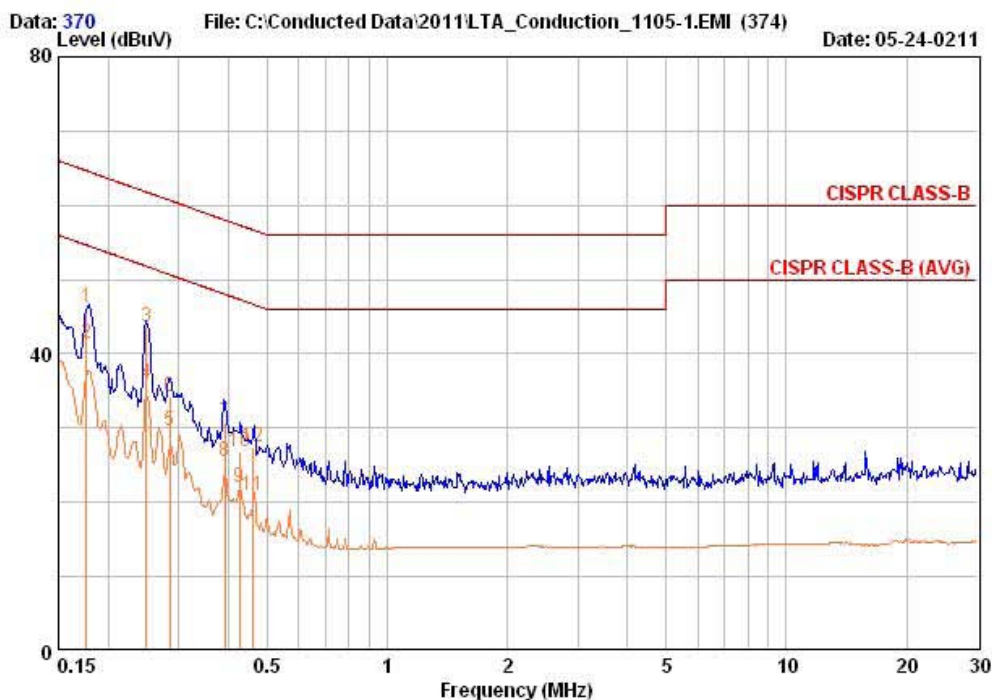
\* Decreases with the logarithm of the frequency



AC Conducted Emissions– Line

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

EUT / Model No. : MB-RF1146	Phase : LINE
Test Mode : ZigBee mode	Test Power : 120 / 60
Temp./Humi. : 22 / 49	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
0.176	36.64	31.84	9.65	46.29	41.49	64.67	54.67	18.38	13.18
0.249	34.03	26.33	9.64	43.67	35.97	61.79	51.79	18.12	15.82
0.285	24.53	19.93	9.65	34.18	29.58	60.67	50.67	26.49	21.09
0.391	21.03	15.93	9.67	30.70	25.60	58.04	48.04	27.34	22.44
0.426	17.13	12.43	9.67	26.80	22.10	57.33	47.33	30.53	25.23
0.461	17.82	11.22	9.67	27.49	20.89	56.67	46.67	29.18	25.78

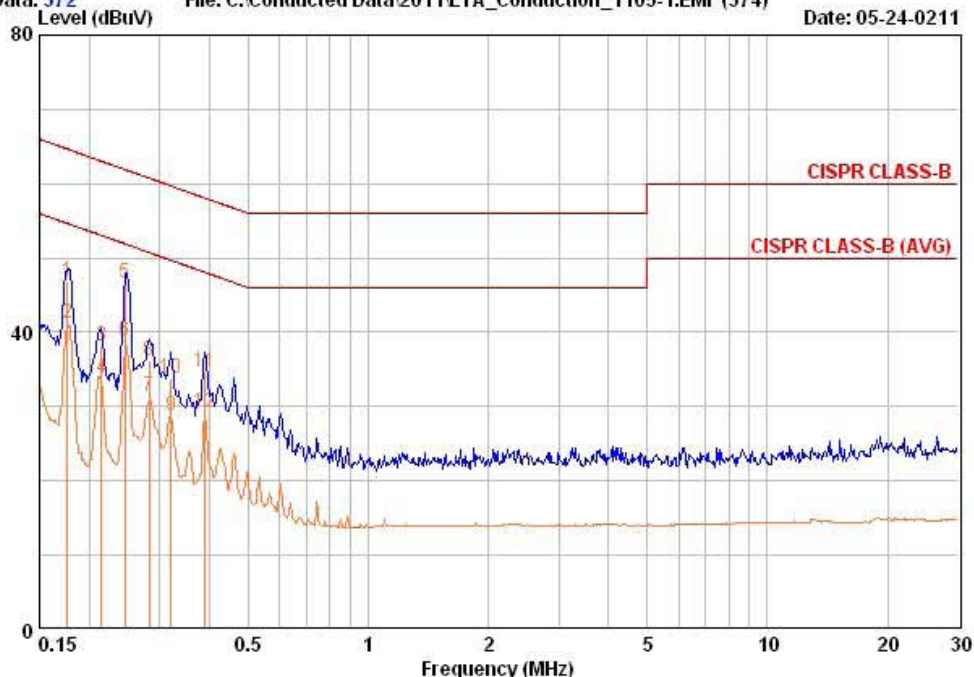
Remarks: C.F (Correction Factor) = Insertion loss + Cable loss

**AC Conducted Emissions- 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. : MB-RF1146	Phase : NEUTRAL
Test Mode : ZigBee mode	Test Power : 120 / 60
Temp./Humi. : 22 / 49	Test Engineer : PARK.H.W

Data: 372 File: C:\Conducted Data\2011\LTA\_Conduction\_1105-1.EMI (374) Date: 05-24-0211



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
0.176	37.24	31.64	9.65	46.89	41.29	64.67	54.67	17.78	13.38
0.214	28.54	24.04	9.64	38.18	33.68	63.05	53.05	24.87	19.37
0.246	37.03	29.23	9.65	46.68	38.88	61.89	51.89	15.21	13.01
0.282	26.43	21.83	9.65	36.08	31.48	60.76	50.76	24.68	19.28
0.321	24.13	19.23	9.65	33.78	28.88	59.68	49.68	25.90	20.80
0.390	24.93	19.63	9.65	34.58	29.28	58.06	48.06	23.48	18.78

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	2011-01-24
2	Spectrum Analyzer (~2.9GHz)	8594E	3710A04074	HP	2 year	2009-10-12
3	Signal Generator (~3.2GHz)	8648C	3623A02597	HP	1 year	2011-03-30
4	Signal Generator (1~20GHz)	83711B	US34490456	HP	1 year	2011-03-30
5	Attenuator (3dB)	8491A	37822	HP	2 year	2010-10-08
6	Attenuator (10dB)	8491A	63196	HP	2 year	2010-10-08
7	Attenuator (30dB)	8498A	3318A10929	HP	2 year	2011-01-05
8	Test Receiver (~30MHz)	ESHS10	828404/009	R&S	1 year	2011-03-30
9	EMI Test Receiver (~1GHz)	ESCI7	100722	R&S	1 year	2010-10-08
10	RF Amplifier (~1.3GHz)	8447D	2439A09058	HP	2 year	2010-10-08
11	RF Amplifier (1~18GHz)	8449B	3008A02126	HP	2 year	2010-03-29
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	2010-10-07
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	2 year	2010-04-12
21	Splitter (SMA)	ZFSC-2-2500	SF617800326	Mini-Circuits	-	-
22	Power Divider	11636A	6243	HP	2 year	2010-10-08
23	DC Power Supply	6622A	3448A03079	HP	-	-
24	Frequency Counter	5342A	2826A12411	HP	1 year	2011-03-30
25	Power Meter	EPM-441A	GB32481702	HP	1 year	2011-03-30
26	Power Sensor	8481A	US41030291	HP	1 year	2010-10-08
27	Audio Analyzer	8903B	3729A18901	HP	1 year	2010-10-08
28	Modulation Analyzer	8901B	3749A05878	HP	1 year	2010-10-08
29	TEMP & HUMIDITY Chamber	YJ-500	LTAS06041	JinYoung Tech	1 year	2010-10-08
30	Stop Watch	HS-3	601Q09R	CASIO	2 year	2010-03-31
31	LISN	ENV216	100408	R&S	1 year	2010-10-08
32	UNIVERSAL RADIO COMMUNICATION TESTER	CMU200	106243	R&S	2 year	2010-05-13
33	Highpass Filter	WHKX1.5/15G-10SS	74	Wainwright Instruments	-	-
34	Highpass Filter	WHKX3.0/18G-10SS	118	Wainwright Instruments	-	-