



FCC PART 15 SUBPART C TEST REPORT

FCC PART 15.247

Report Reference No.: TRE1305000901 R/C:40532

FCC ID: X5QRD71206

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Date of issue: May 21, 2013

Testing Laboratory Name: Shenzhen Huatongwei International Inspection Co., Ltd

Address: Keji Nan No.12 Road, Hi-tech Park, Shenzhen, China

Applicant's name: Jetlun(ShenZhen)Corporation

Address: 1008A Skyworth Building Gao-xin RD South High-tech Park
Nanshan District Shenzhen China

Test specification:

Standard: FCC Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz

TRF Originator: Shenzhen Huatongwei International Inspection CO., Ltd

Master TRF: Dated 2006-06

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Test item description: Energy manager plus

Trade Mark:

Model/Type reference: RD71206

Listed Models: /

Operation Frequency: From 2405MHz to 2480MHz

Result: Positive

T E S T R E P O R T

Test Report No. : TRE1305000901	May 21, 2013 Date of issue
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Equipment under Test : Energy manager plus

Model /Type : RD71206

Listed Models : /

Applicant : **Jetlun(ShenZhen)Corporation**

Address : 1008A Skyworth Building Gao-xin RD South High-tech
Park Nanshan District Shenzhen China

Manufacturer **ZHUHAI YUEHUA ELECTRONIC CO., LTD**

Address : #13, No.4 PINGDONG ROAD, NANPING TECHNOLOGY
DISTRICT, ZHUHAI, GUANGDONG, CHINA

Test Result according to the standards on page 4:	Positive
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The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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1. TEST STANDARDS

The tests were performed according to following standards:

[FCC Rules Part 15.247](#): Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

[ANSI C63.10](#): American National Standard for Testing Unlicensed Wireless Devices

[KDB558074](#): DTS Meas Guidance D01 v03 of Measurement Procedure

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	May 05, 2013
Testing commenced on	:	May 09, 2013
Testing concluded on	:	May 21, 2013

2.2. Equipment Under Test

Power supply system utilised

Power supply voltage	:	<input checked="" type="radio"/> 120V / 60 Hz	<input type="radio"/> 115V / 60Hz
		<input type="radio"/> 12 V DC	<input type="radio"/> 24 V DC
		<input type="radio"/> Other (specified in blank below)	

/

2.3. Short description of the Equipment under Test (EUT)

2.4GHz (Energy manager plus (RD71206))

For more details, refer to the user's manual of the EUT.

Serial number: Prototype

2.4. EUT operation mode

The EUT has been tested under typical operating condition. The Applicant provides software to control the EUT for staying in continuous transmitting and receiving mode for testing. There are 16 channels of EUT, and the test carried out at the lowest channel, middle channel and highest channel.

Channel	Frequency	Channel	Frequency
11	2405 MHz	19	2445 MHz
12	2410 MHz	20	2450 MHz
13	2415 MHz	21	2455 MHz
14	2420 MHz	22	2460 MHz
15	2425 MHz	23	2465 MHz
16	2430 MHz	24	2470 MHz
17	2435 MHz	25	2475 MHz
18	2440 MHz	26	2480 MHz

2.5. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

● - supplied by the manufacturer

○ - supplied by the lab

<input type="radio"/>	Power Cable	Length (m) :	/
		Shield :	/
		Detachable :	/
<input type="radio"/>	Multimeter	Manufacturer :	/
		Model No. :	/

2.6. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: X5QRD71206** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.7. Modifications

No modifications were implemented to meet testing criteria.

2.8. NOTE

- The EUT is an Energy manager plus, The functions of the EUT listed as below:

	Test Standards	Reference Report
Zigbee	FCC Part 15 Subpart C (Section15.247)	TRE 1305000901
EMC REPORT	FCC PART 15 Subpart B	TRE 1305000902
MPE REPORT	FCC Per 47 CFR 2.1091(b)	TRE 1305000903

- The frequency bands used in this EUT are listed as follows:

Frequency Band(MHz)	2400-2483.5	5150-5350	5470-5725	5725-5850
Zigbee	√	—	—	—

- The EUT provides one completed transmitter and receiver.

Modulation Mode	TX Function
Zigbee	1TX

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Shenzhen Huatongwei International Inspection Co., Ltd
Keji Nan No.12 Road, Hi-tech Park, Shenzhen, China
Phone: 86-755-26715686 Fax: 86-755-26748089

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 (2009) and CISPR Publication 22.

3.2. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L1225

Shenzhen Huatongwei International Inspection Co., Ltd has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories, Date of Registration: August 02, 2012. Valid time is until Feb 28, 2015.

A2LA-Lab Cert. No. 2243.01

Shenzhen Huatongwei International Inspection Co., Ltd, EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing. Valid time is until Sept 30, 2013.

FCC-Registration No.: 662850

Shenzhen Huatongwei International Inspection Co., Ltd, EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 662850, Renewal date June 01, 2015.

IC-Registration No.: 5377

The 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 5377 on Jan 25, 2011. Valid time is until Jan 24, 2014

ACA

Shenzhen Huatongwei International Inspection Co., Ltd, EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our A2LA accreditation.

NEMKO-Aut. No.: ELA125

Shenzhen Huatongwei International Inspection Co., Ltd has been assessed the quality assurance system, the testing facilities, qualifications and testing practices of the relevant parts of the organization. The quality assurance system of the Laboratory has been validated against ISO/IEC 17025:2005 or equivalent. The laboratory also fulfils the conditions described in Nemko Document NLA-10; the Authorization is valid through July 07, 2013.

VCCI

The 3m Semi-anechoic chamber (12.2m×7.95m×6.7m) and Shielded Room (8m×4m×3m) of Shenzhen Huatongwei International Inspection Co., Ltd has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-2484. Date of Registration: December 20, 2012. Valid time is until December 19, 2015.

Main Ports Conducted Interference Measurement of Shenzhen Huatongwei International Inspection Co., Ltd has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: C-2726. Date of Registration: December 20, 2012. Valid time is until December 19, 2015.

DNV

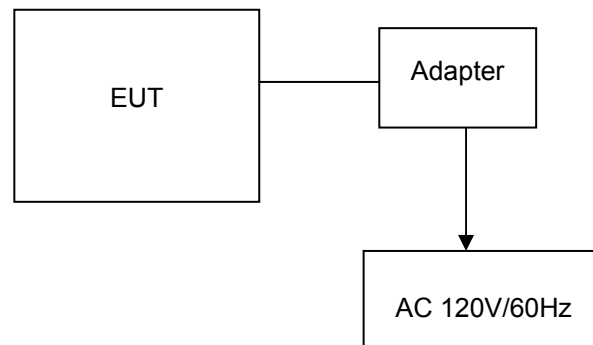
Shenzhen Huatongwei International Inspection Co Ltd has been found to comply with the requirements of DNV towards subcontractor of EMC and safety testing services in conjunction with the EMC and Low voltage Directives and in the voluntary field. The acceptance is based on a formal quality Audit and follow-ups according to relevant parts of ISO/IEC Guide 17025(2005), in accordance with the requirements of the DNV Laboratory Quality Manual towards subcontractors. Valid time is until Aug 24, 2013.

3.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	<u>15-35 ° C</u>
Humidity:	<u>30-60 %</u>
Atmospheric pressure:	<u>950-1050mbar</u>

3.4. Configuration of Tested System



Equipment Used in Tested System

3.5. Test Description

FCC PART 15 15.247		
FCC Part 15.207	AC Power Conducted Emission	PASS
FCC Part 15.247(a)(2)	6dB Bandwidth	PASS
FCC Part 15.247(d)	Spurious RF Conducted Emission	PASS
FCC Part 15.247(b)	Maximum Peak Output Power	PASS
FCC Part 15.247(e)	Power Spectral Density	PASS
FCC Part 15.109/ 15.205/ 15.209	Radiated Emissions	PASS
FCC Part 15.247(d)	Band Edge	PASS
FCC Part 15.203/15.247 (b)	Antenna Requirement	PASS

Remark: The measurement uncertainty is not included in the test result.

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases.

3.6. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen Huatongwei International Inspection Co., Ltd quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen Huatongwei laboratory is reported:

Test Items	Measurement Uncertainty	Notes
Frequency stability	25 Hz	(1)
Transmitter power conducted	0.57 dB	(1)
Transmitter power Radiated	2.20 dB	(1)
Conducted spurious emission 9KHz-12.75 GHz	1.60 dB	(1)
Radiated spurious emission 9KHz-12.75 GHz	2.20 dB	(1)
Conducted Emission 9KHz-30MHz	3.39 dB	(1)
Radiated Emission 30~1000MHz	4.24 dB	(1)
Radiated Emission 1~18GHz	5.16 dB	(1)
Radiated Emission 18-40GHz	5.54 dB	(1)
Occupied Bandwidth	-----	(1)
Emission Mask	-----	(1)
Modulation Characteristic	-----	(1)
Transmitter Frequency Behavior	-----	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

3.7. Equipments Used during the Test

AC Power Conducted Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Artificial Mains	Rohde&Schwarz	ESH2-Z5	100028	2012/10/27
2	EMI Test Receiver	Rohde&Schwarz	ESCS 30	100038	2012/10/27
3	Pulse Limiter	Rohde&Schwarz	ESHSZ2	100044	2012/10/27
4	EMI Test Software	Rohde&Schwarz	ES-K1 V1.71	N/A	2012/10/27

Radiated Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	ULTRA-BROADBAND ANTENNA	Rohde&Schwarz	HL562	100015	2012/10/27
2	EMI TEST RECEIVER	Rohde&Schwarz	ESI 26	100009	2012/10/27
3	RF TEST PANEL	Rohde&Schwarz	TS / RSP	335015/ 0017	2012/10/27
4	TURNTABLE	ETS	2088	2149	2012/10/27
5	ANTENNA MAST	ETS	2075	2346	2012/10/27
6	EMI TEST SOFTWARE	Rohde&Schwarz	ESK1	N/A	2012/10/27
7	HORN ANTENNA	Rohde&Schwarz	HF906	100039	2012/10/27
8	Amplifier	Sonoma	310N	E009-13	2012/10/27
9	JS amplifier	Rohde&Schwarz	JS4-00101800-28-5A	F201504	2012/10/27
10	High pass filter	Compliance Direction systems	BSU-6	34202	2012/10/27
11	Horn Antenna	SCHWARZBECK	BBHA9170	25841	2012/10/27
12	Amplifier	Compliance Direction systems	PAP-1G-40	48	2012/10/27
13	Loop Antenna	Rohde&Schwarz	HFH2-Z2	100020	2012/10/27
14	Ultra-Broadband Antenna	ShwarzBeck	VULB9163	539	2012/10/27
15	HORN ANTENNA	ShwarzBeck	9120D	1011	2012/10/27
16	TURNTABLE	MATURO	TT2.0	----	2012/10/27
17	ANTENNA MAST	MATURO	TAM-4.0-P	----	2012/10/27

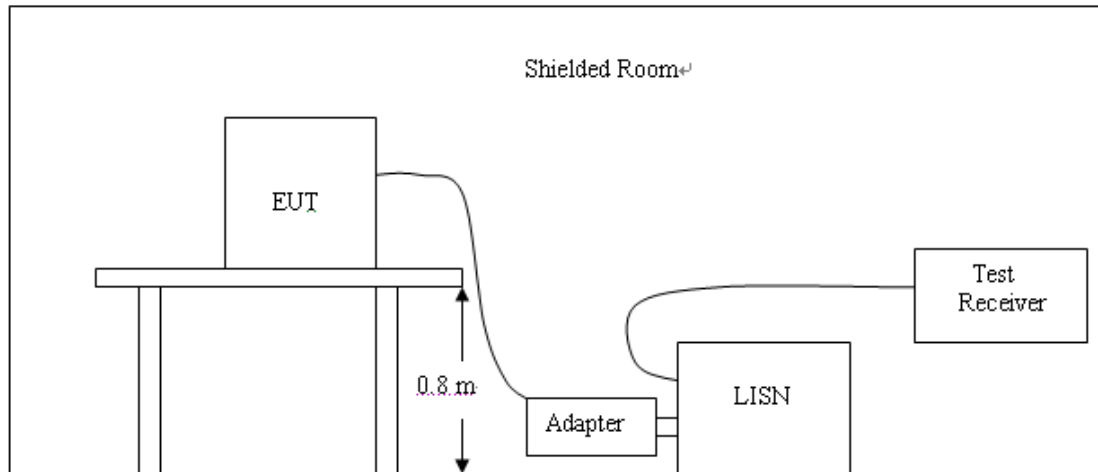
Maximum Peak Output Power / Power Spectral Density / 6dB Bandwidth / Band Edge Compliance of RF Emission / Spurious RF Conducted Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Spectrum Analyzer	Rohde&Schwarz	FSP40	1164.4391.40	2012/10/27

The calibration interval was one year.

4. TEST CONDITIONS AND RESULTS

4.1. AC Power Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

- 1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.4-2009.
- 2 Support equipment, if needed, was placed as per ANSI C63.4-2009
- 3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4-2009
- 4 The EUT received DC12V power from the adapter, the adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5 All support equipments received AC power from a second LISN, if any.
- 6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
- 8 During the above scans, the emissions were maximized by cable manipulation.

AC Power Conducted Emission Limit

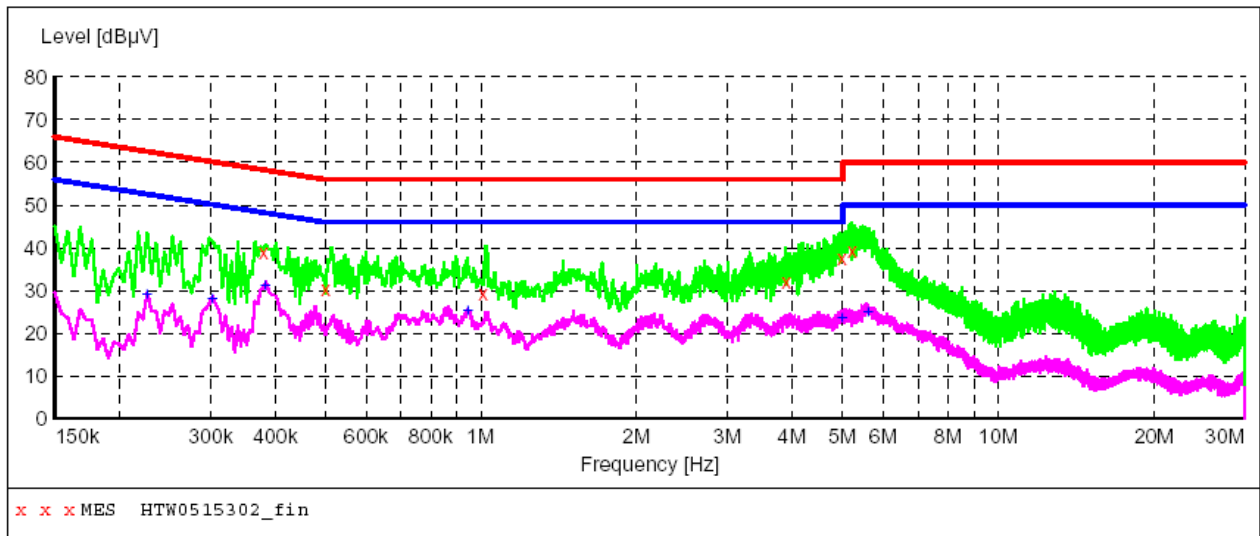
For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following :

Frequency (MHz)	Maximum RF Line Voltage (dBμV)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

* Decreasing linearly with the logarithm of the frequency

TEST RESULTS**SCAN TABLE: "Voltage (9K-30M)FIN"**

Short Description: 150K-30M Voltage

**MEASUREMENT RESULT: "HTW0515302_fin"**

5/15/2013 9:47AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.379500	38.80	10.2	58	19.5	QP	L1	GND
0.501000	30.30	10.2	56	25.7	QP	L1	GND
1.009500	29.10	10.3	56	26.9	QP	L1	GND
3.903000	32.20	10.4	56	23.8	QP	L1	GND
4.983000	37.40	10.4	56	18.6	QP	L1	GND
5.212500	39.10	10.4	60	20.9	QP	L1	GND

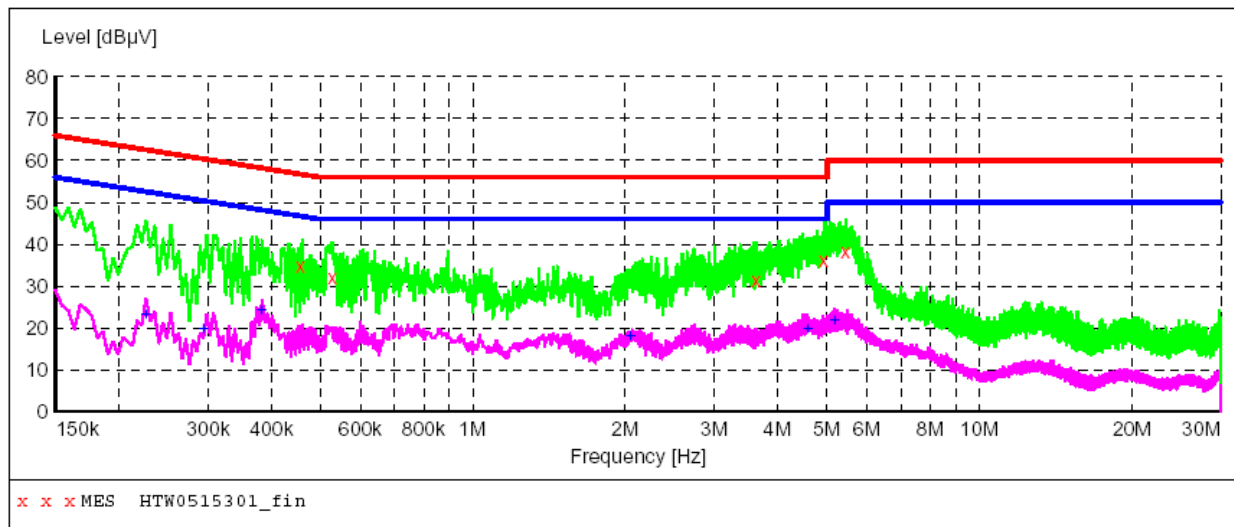
MEASUREMENT RESULT: "HTW0515302_fin2"

5/15/2013 9:47AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.226500	29.10	10.2	53	23.5	AV	L1	GND
0.303000	28.10	10.2	50	22.1	AV	L1	GND
0.384000	31.30	10.2	48	16.9	AV	L1	GND
0.942000	25.50	10.3	46	20.5	AV	L1	GND
4.996500	23.60	10.4	46	22.4	AV	L1	GND
5.604000	25.10	10.4	50	24.9	AV	L1	GND

SCAN TABLE: "Voltage (9K-30M)FIN"

Short Description: 150K-30M Voltage

**MEASUREMENT RESULT: "HTW0515301_fin"**

5/15/2013 9:44AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.456000	34.80	10.2	57	22.0	QP	N	GND
0.528000	32.20	10.2	56	23.8	QP	N	GND
3.619500	31.40	10.4	56	24.6	QP	N	GND
4.911000	36.20	10.4	56	19.8	QP	N	GND
5.437500	38.30	10.4	60	21.7	QP	N	GND

MEASUREMENT RESULT: "HTW0515301_fin2"

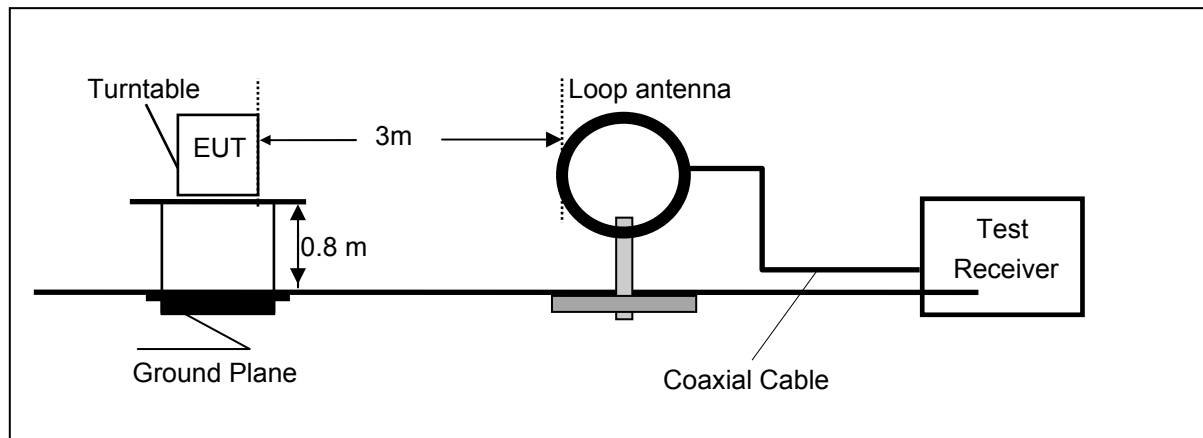
5/15/2013 9:44AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.226500	23.40	10.2	53	29.2	AV	N	GND
0.294000	20.10	10.2	50	30.3	AV	N	GND
0.384000	24.50	10.2	48	23.7	AV	N	GND
2.053500	18.30	10.4	46	27.7	AV	N	GND
4.587000	20.00	10.4	46	26.0	AV	N	GND
5.185500	21.90	10.4	50	28.1	AV	N	GND

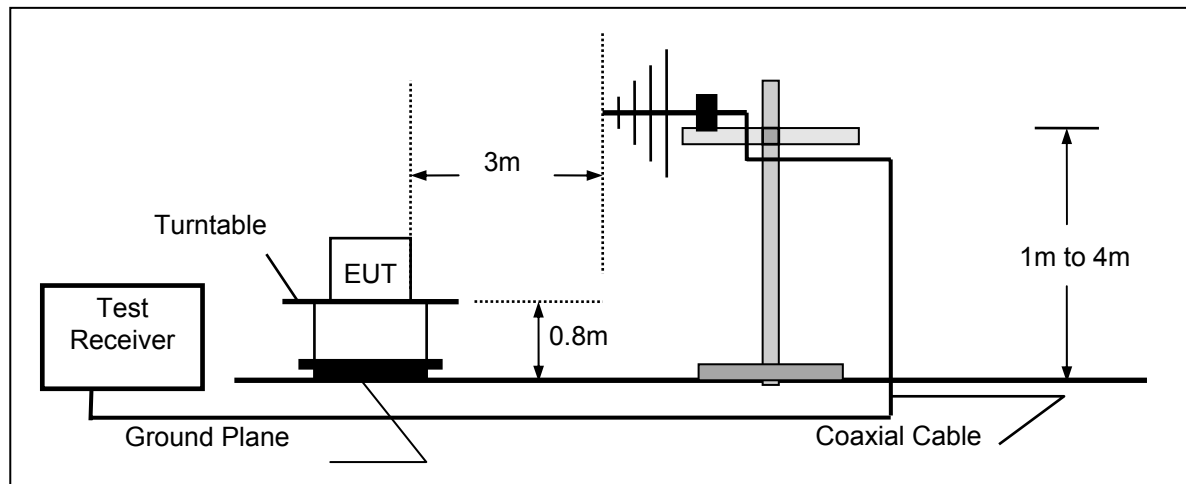
4.2. Radiated Emission

TEST CONFIGURATION

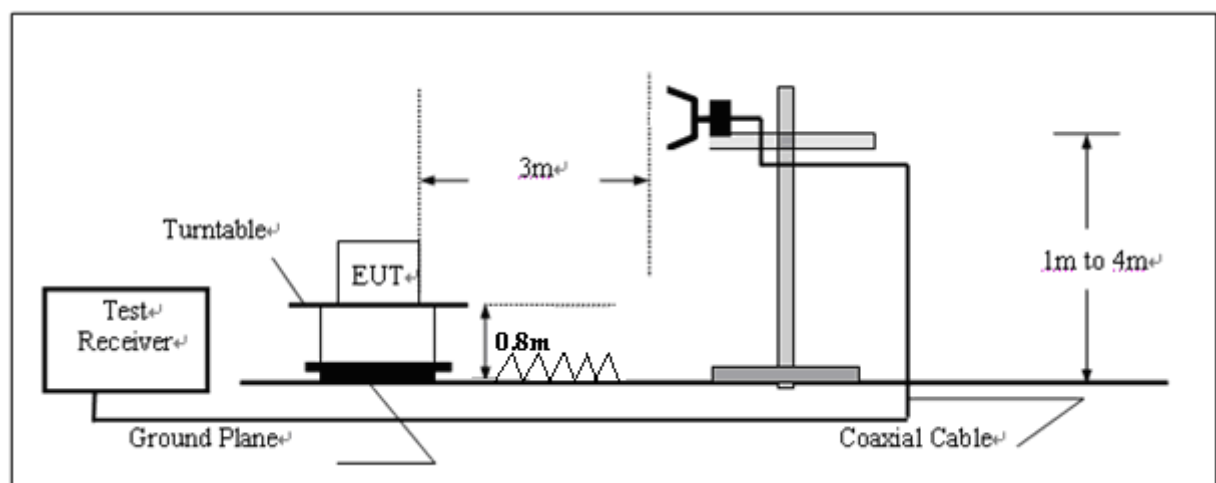
(a) Frequency range 9KHz – 30MHz



(b) Radiated Emission Test Set-Up, Frequency below 1000MHz



(c) Radiated Emission Test Set-Up, Frequency above 1000MHz



TEST PROCEDURE

- 1 The EUT was placed on a turn table which is 0.8m above ground plane.
- 2 Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0°C to 360°C to acquire the highest emissions from EUT

3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. The crystal was 8MHz and maximum operation frequency was 2480MHz,so the radiated frequency range was from 32.768KHz to 25GHz.

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

RADIATION LIMIT

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators shall not exceed the following table. According to § 15.247(d), in any 100kHz bandwidth outside the frequency band in which the EUT is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of desired power.

The frequency spectrum above 1 GHz for Transmitter was investigated. All emission not reported are much lower than the prescribed limits. Set the RBW=1MHz,VBW=3MHz for Peak Detector while the RBW=1MHz,VBW=10Hz for Average Detector,Readings are both peak and average values.

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	300	$20\log(2400/F(KHz))$	$2400/F(KHz)$
0.49-1.705	30	$20\log(24000/F(KHz))$	$24000/F(KHz)$
1.705-30	30	$20\log(30)$	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the following table.

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)
0.009-0.49	3	$20\log(2400/F(KHz))+40\log(300/3)$
0.49-1.705	3	$20\log(24000/F(KHz))+40\log(30/3)$
1.705-30	3	$20\log(30)+40\log(30/3)$
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

TEST RESULTS

- Note:
1. The radiated measurement are performed the each channel (low/mid/high), the datum recorded below (the middle channel) is the worst case for all the channel.
 2. ULTRA-BROADBAND ANTENNA for the radiation emission test below 1G.
 3. HORN ANTENNA for the radiation emission test above 1G.

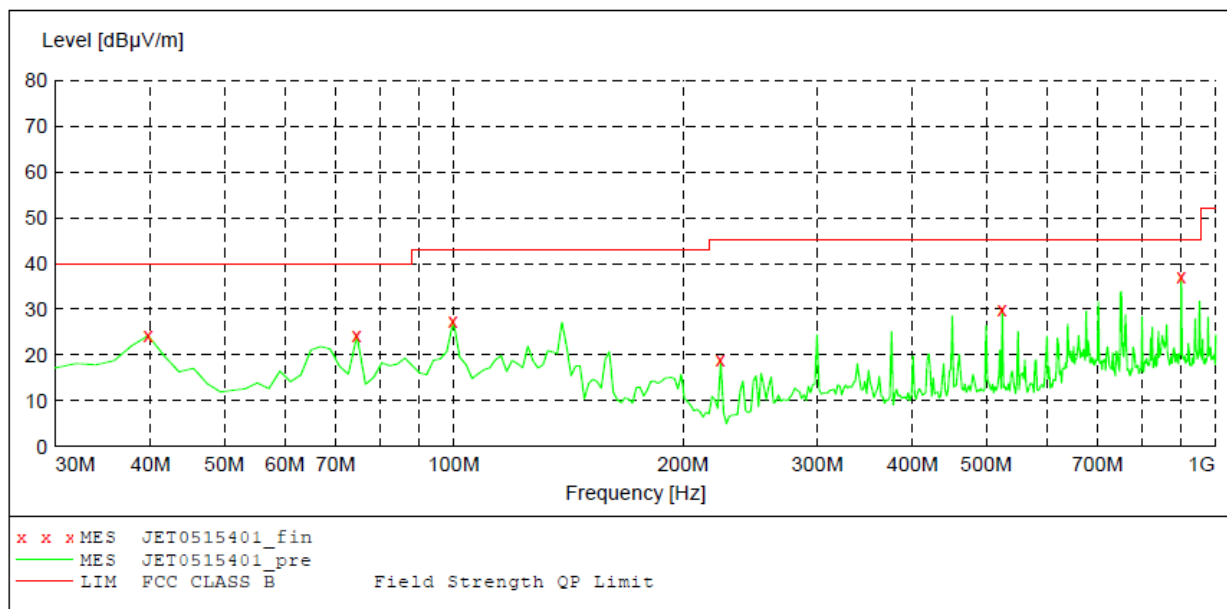
For 9KHz to 30MHz

Frequency (MHz)	Corrected Reading (dB μ V/m)@3m	FCC Limit (dB μ V/m) @3m	Margin (dB)	Detector	Result
0.59	63.2	72.19	8.99	QP	PASS
3.76	45.25	69.54	24.29	QP	PASS
7.58	44.35	69.54	25.19	QP	PASS
19.57	44.76	69.54	24.78	QP	PASS

For 30MHz to 1000MHz**SCAN TABLE: "test Field (30M-1G) QP"**

Short Description: Field Strength (30M-1G)

Start	Stop	Step	Detector	Meas.	IF	Transducer
Frequency	Frequency	Width		Time	Bandw.	
30.0 MHz	1.0 GHz	60.0 kHz	QuasiPeak	1.0 s	120 kHz	HL562

**MEASUREMENT RESULT: "JET0515401_fin"**

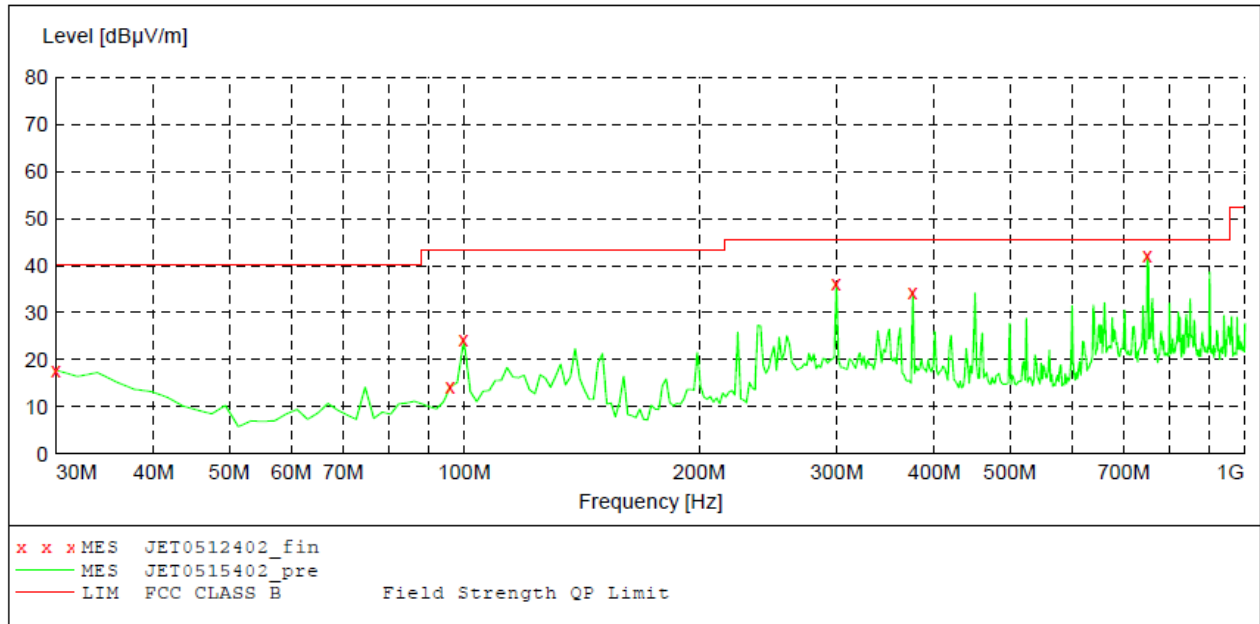
5/15/2013 12:54PM

Frequency MHz	Level dB μ V/m	Transd dB	Limit dB μ V/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
39.700000	24.30	-16.9	40.0	15.7	QP	100.0	59.00	VERTICAL
74.620000	24.30	-22.8	40.0	15.7	QP	100.0	359.00	VERTICAL
99.840000	27.50	-20.4	43.5	15.5	QP	100.0	293.00	VERTICAL
224.000000	18.90	-21.1	46.0	27.1	QP	100.0	98.00	VERTICAL
524.700000	30.00	-14.3	46.0	16.0	QP	100.0	307.00	VERTICAL
901.060000	37.10	-9.1	46.0	8.9	QP	100.0	108.00	VERTICAL

SCAN TABLE: "test Field (30M-1G) QP"

Short Description: Field Strength (30M-1G)

Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer
Frequency 30.0 MHz	Frequency 1.0 GHz	Width 60.0 kHz	QuasiPeak	1.0 s	120 kHz	HL562

**MEASUREMENT RESULT: "JET0515402_fin"**

5/15/2013 12:56PM

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	17.80	-11.6	40.0	22.2	QP	300.0	22.00	HORIZONTAL
95.960000	14.20	-20.4	43.5	29.3	QP	300.0	0.00	HORIZONTAL
99.840000	24.20	-20.4	43.5	19.3	QP	300.0	22.00	HORIZONTAL
299.660000	36.20	-18.0	46.0	9.8	QP	100.0	209.00	HORIZONTAL
375.320000	34.40	-17.8	46.0	11.6	QP	100.0	93.00	HORIZONTAL
749.740000	42.10	-11.7	46.0	3.9	QP	100.0	161.00	HORIZONTAL

Above 1G

The frequency spectrum above 1 GHz for Transmitter was investigated. All emission not reported are much lower than the prescribed limits. Set the RBW=1MHz,VBW=3MHz for Peak Detector while the RBW=1MHz,VBW=10Hz for Average Detector,Readings are both peak and average values. The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

Channel 11

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M												
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
11	*2405.00	108.45	PK	74		1.00	245	111.85	28.3	4.90	36.6	-3.40
1	*2405.00	105.53	AV	54		1.00	245	108.93	28.3	4.90	36.6	-3.40
2	4810.00	61.45	PK	74.00	12.55	1.00	235	58.25	32.7	7.00	36.5	3.20
2	4810.00	42.38	AV	54.00	11.62	1.00	235	39.18	32.7	7.00	36.5	3.20
3	7215.00	54.35	PK	74.00	19.65	1.00	217	44.95	35.8	8.90	35.3	9.40
3	7215.00	45.54	AV	54.00	8.46	1.00	217	36.14	35.8	8.90	35.3	9.40
4	10243.21	57.63	PK	74.00	16.37	1.00	184	41.03	38.0	11.30	32.7	16.60
4	10243.21	41.35	AV	54.00	12.65	1.00	184	24.75	38.0	11.30	32.7	16.60

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M												
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
11	*2405.00	107.57	PK			1.00	225	110.97	28.3	4.90	36.6	-3.40
1	*2405.00	103.38	AV			1.00	225	106.78	28.3	4.90	36.6	-3.40
2	4810.00	62.45	PK	74.00	11.55	1.00	157	59.25	32.7	7.00	36.5	3.20
2	4810.00	43.35	AV	54.00	10.65	1.00	157	40.15	32.7	7.00	36.5	3.20
3	7215.00	55.35	PK	74.00	18.65	1.00	28	45.95	35.8	8.90	35.3	9.40
3	7215.00	45.35	AV	54.00	8.65	1.00	28	35.95	35.8	8.90	35.3	9.40
4	10243.21	56.75	PK	74.00	17.25	1.00	138	40.15	38.0	11.30	32.7	16.60
4	10243.21	43.57	AV	54.00	10.43	1.00	138	26.97	38.0	11.30	32.7	16.60

Channel 18

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M												
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	*2440.00	107.58	PK			1.00	158	110.98	28.3	5.10	36.6	-3.20
1	*2440.00	105.75	AV			1.00	158	109.15	28.3	5.10	36.6	-3.20
2	4880.00	62.45	PK	74.00	11.55	1.00	36	59.25	32.3	7.60	36.5	3.40
2	4880.00	42.57	AV	54.00	11.43	1.00	36	39.37	32.3	7.60	36.5	3.40
3	7320.00	55.38	PK	74.00	18.62	1.00	347	45.98	36.1	8.60	35.3	9.40
3	7320.00	46.75	AV	54.00	7.25	1.00	347	37.35	36.1	8.60	35.3	9.40
4	12200.00	55.76	PK	74.00	18.24	1.00	268	39.16	38.0	11.30	32.7	16.60
4	12200.00	41.35	AV	54.00	12.65	1.00	268	24.75	38.0	11.30	32.7	16.60

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	*2440.00	106.38	PK		1.00	75	109.78	28.3	5.10	36.6	-3.20
1	*2440.00	103.24	AV		1.00	75	106.64	28.3	5.10	36.6	-3.20
2	4880.00	61.58	PK	74.00	1.00	96	58.38	32.3	7.60	36.5	3.40
2	4880.00	45.35	AV	54.00	1.00	96	42.15	32.3	7.60	36.5	3.40
3	7320.00	55.75	PK	74.00	1.00	315	46.35	36.1	8.60	35.3	9.40
3	7320.00	46.76	AV	54.00	1.00	315	37.36	36.1	8.60	35.3	9.40
4	12200.00	57.35	PK	74.00	1.00	165	40.75	38.0	11.30	32.7	16.60
4	12200.00	45.75	AV	54.00	1.00	165	29.15	38.0	11.30	32.7	16.60

Channel 26**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M**

No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	*2480.00	86.88	PK		1.00	45	90.28	28.2	5.10	36.6	-3.30
1	*2480.00	84.23	AV		1.00	45	87.63	28.2	5.10	36.6	-3.30
2	4960.00	56.35	PK	74.00	1.00	118	53.15	33.0	7.00	36.2	3.80
2	4960.00	46.35	AV	54.00	1.00	118	43.15	33.0	7.00	36.2	3.80
3	7340.00	53.53	PK	74.00	1.00	310	44.13	36.2	8.50	35.3	9.40
3	7340.00	---	AV	54.00	1.00	310	---	36.2	8.50	35.3	9.40
4	10535.10	53.12	PK	74.00	1.00	215	36.52	38.0	11.30	32.7	16.60
4	10535.10	---	AV	54.00	1.00	215	---	38.0	11.30	32.7	16.60

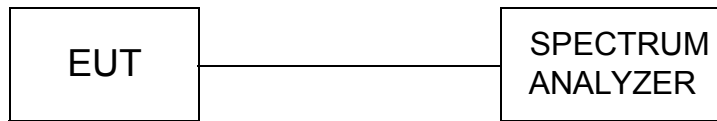
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	*2480.00	87.57	PK		1.00 V	85	90.97	28.2	5.10	36.6	-3.30
1	*2480.00	85.68	AV		1.00 V	57	89.08	28.2	5.10	36.6	-3.30
2	4960.00	57.37	PK	74.00	1.00 V	214	54.17	36.2	8.50	35.3	3.80
2	4960.00	49.38	AV	54.00	1.00 V	214	46.18	36.2	8.50	35.3	3.80
3	7340.00	57.57	PK	74.00	1.00 V	326	48.17	37.4	10.10	34.8	9.40
3	7340.00	43.35	AV	54.00	1.00 V	326	33.95	37.4	10.10	34.8	9.40
4	10361.45	53.24	PK	74.00	1.00 V	147	36.64	38.0	11.30	32.7	16.60
4	10361.45	---	AV	54.00	1.00 V	147	---	38.0	11.30	32.7	16.60

- REMARKS:**
1. Emission level (dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
 2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) -Pre-amplifier Factor
 3. The other emission levels were very low against the limit.
 4. Margin value = Limit value- Emission level.
 5. The limit value is defined as per 15.247
 6. "*" : Fundamental frequency

4.3. Maximum Peak Output Power

TEST CONFIGURATION



TEST PROCEDURE

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

LIMIT

The Maximum Peak Output Power Measurement limit is 30dBm.

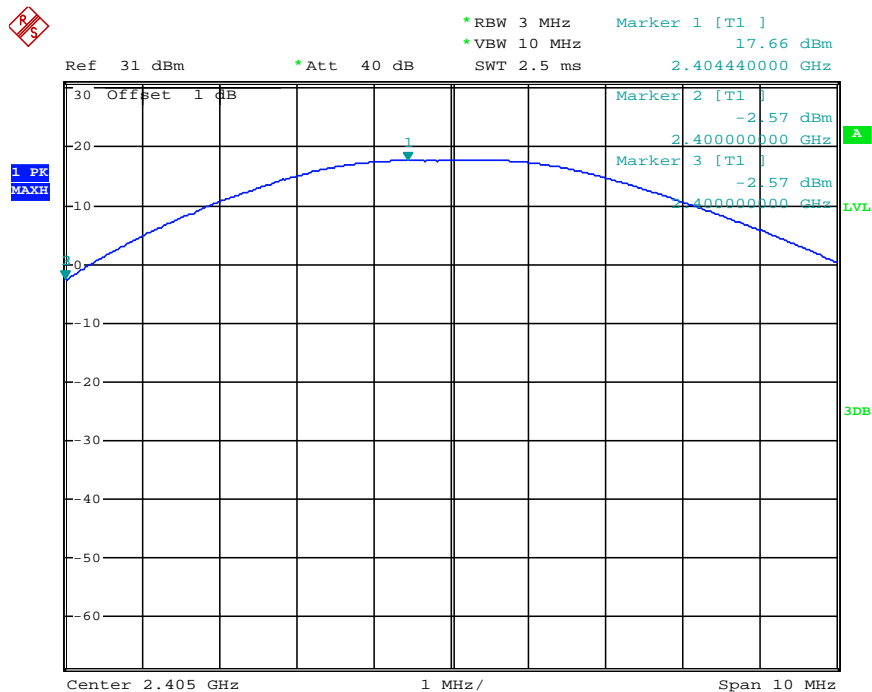
TEST RESULTS

Channel	Frequency (MHz)	Peak Power Output (dBm)	Peak Power Limit (dBm)	Verdict
11	2405	17.66	30	PASS
18	2440	17.88	30	PASS
26	2480	1.97	30	PASS

Note: The test results including the cable loss.

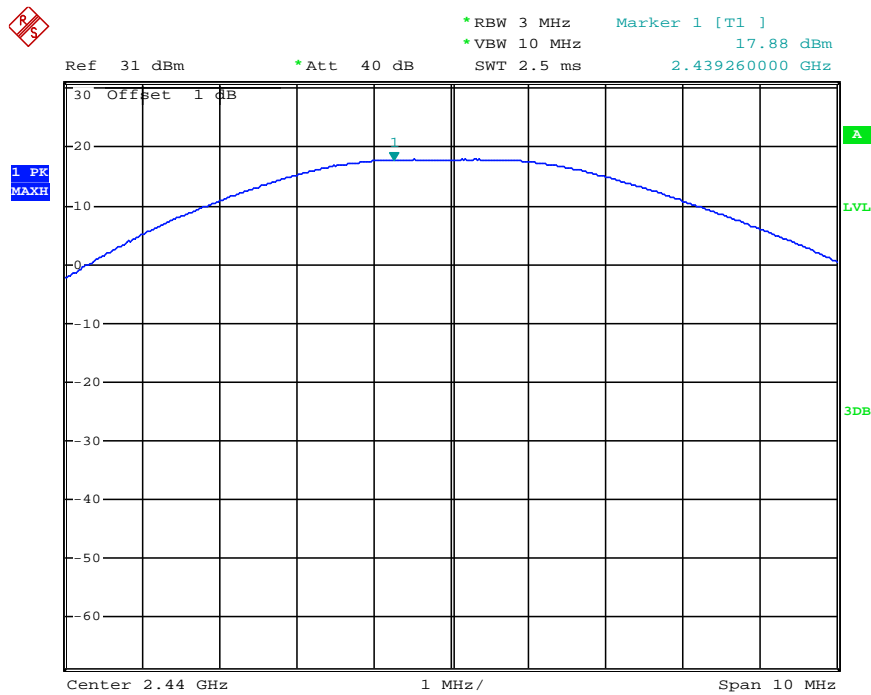
Photos of Maximum Peak Output Power

Channel 11



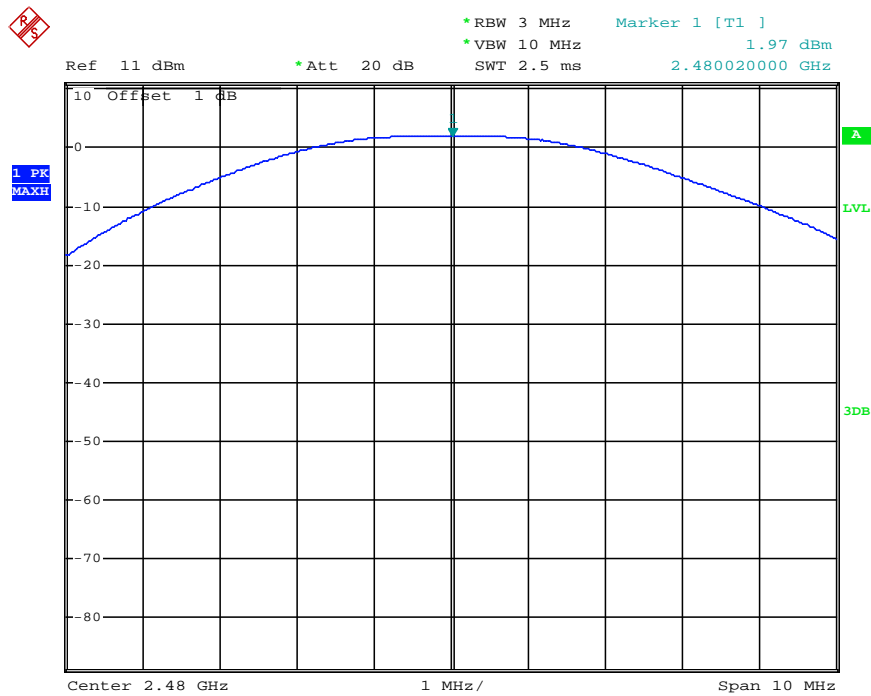
Date: 8.MAY.2013 12:05:16

Channel 18



Date: 8.MAY.2013 12:09:43

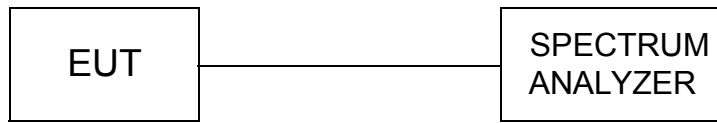
Channel 26



Date: 8.MAY.2013 11:52:33

4.4. Power Spectral Density

TEST CONFIGURATION



TEST PROCEDURE

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW ≥ 3 kHz.
3. Set the VBW $\geq 3 \times$ RBW.
4. Set the span to 1.5 times the DTS channel bandwidth.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum power level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.
11. The resulting peak PSD level must be 8 dBm.
12. Follow KDB 558074 D01 DTS Meas Guidance D01 v03 of measurement procedure

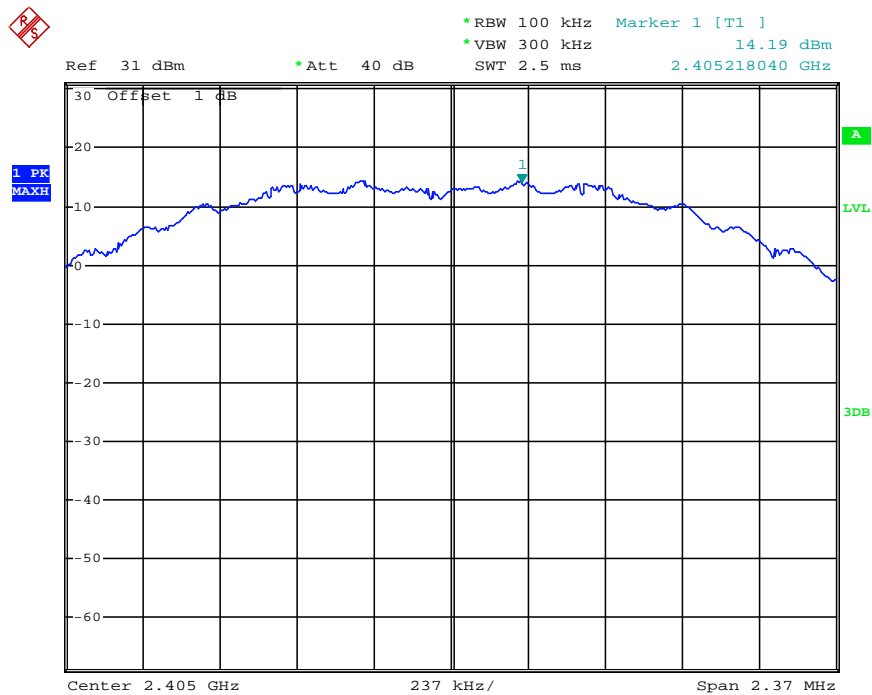
LIMIT

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

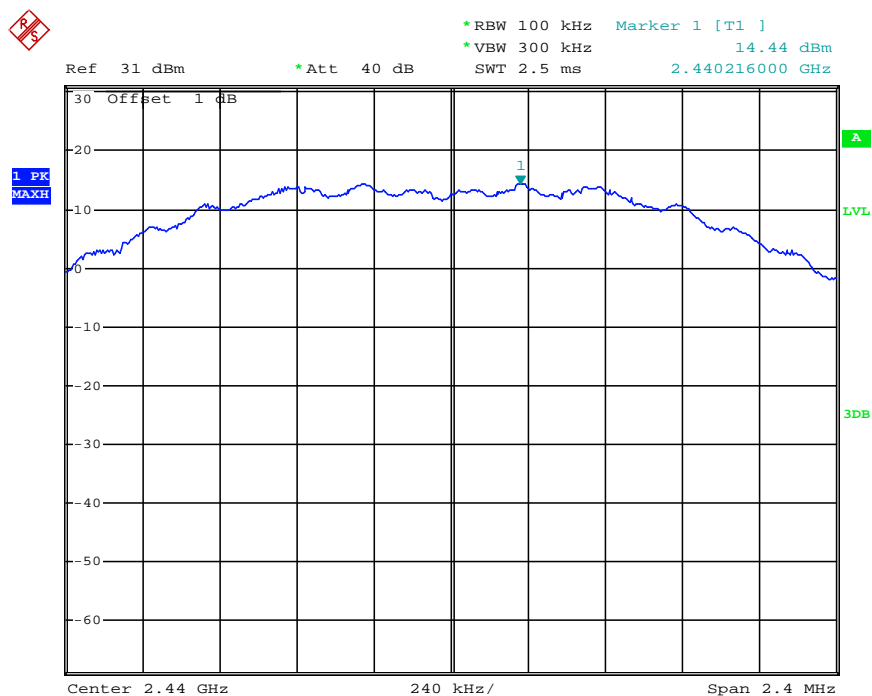
TEST RESULTS

Channel Number	Frequency (MHz)	Measured PSD (dBm/100kHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
11	2405	14.19	-1.01	8	PASS
18	2440	14.44	-0.76	8	PASS
26	2480	1.83	-13.37	8	PASS

Note: The test results including the cable lose.

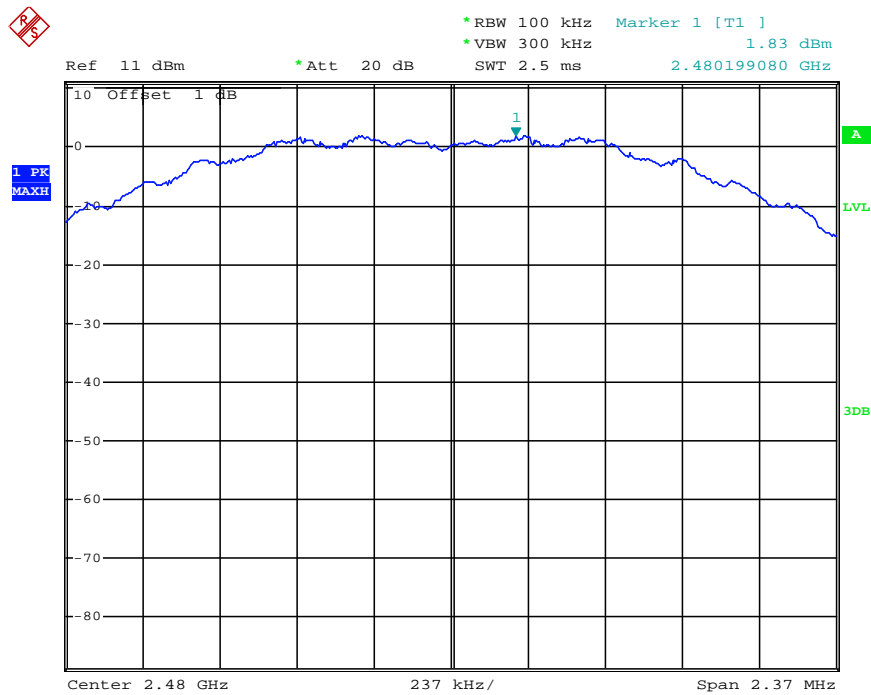
Photos of Power Spectral Density Measurement**Channel 11**

Date: 8.MAY.2013 12:06:36

Channel 18

Date: 8.MAY.2013 12:10:59

Channel 26



Date: 8.MAY.2013 11:55:13

4.5. Band Edge Compliance of RF Emission

Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, 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) (see §15.205(c)).

TEST PROCEDURE

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. For Radiated emissions restricted band RBW=1MHz, VBW=3MHz for peak detector and RBW=1MHz, VBW=10Hz for average detector.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.
6. § 15.209(a) specifies radiated emissions limits for unwanted emissions in the restricted bands in terms of the maximum permissible electric field strength at a specified measurement distance. A correspondent EIRP level can be determined from the following relationship:

$$E = \text{EIRP} - 20\log(d) + 104.8$$
 where:
 EIRP = the equivalent isotropic radiated power in dBm,
 E = electric field strength in dBμV/m,
 d = measurement distance in meters.
7. For emissions at frequencies less than or equal to 30 MHz , a maximum ground reflection factor of 6 dB shall be used and for emissions at frequencies greater than 30 MHz but less than or equal to 1000 MHz, a maximum ground reflection factor of 4.7 dB shall be used. For emissions on frequencies greater than 1000 MHz, no ground reflection factor is applied.

LIMIT

Below -20dB of the highest emission level in operating band.

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)

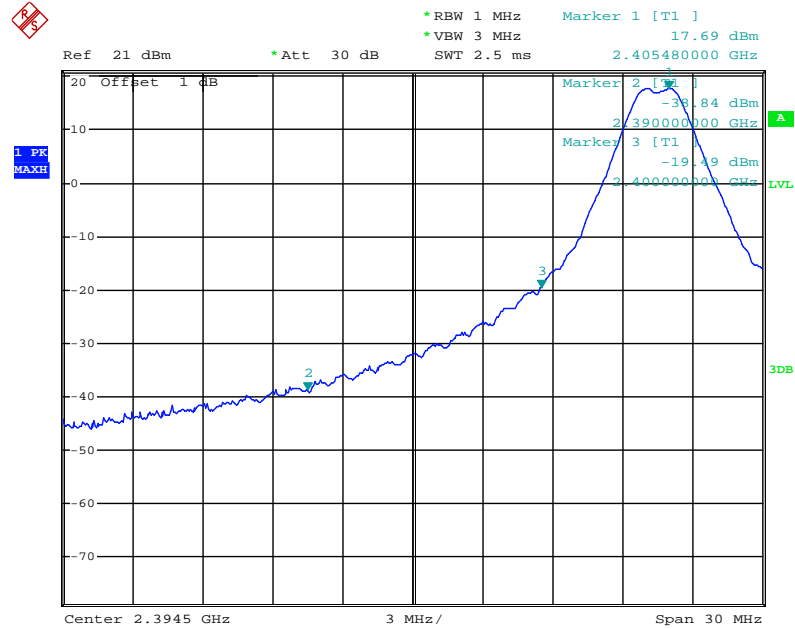
TEST RESULTS

For Radiated Band Edge

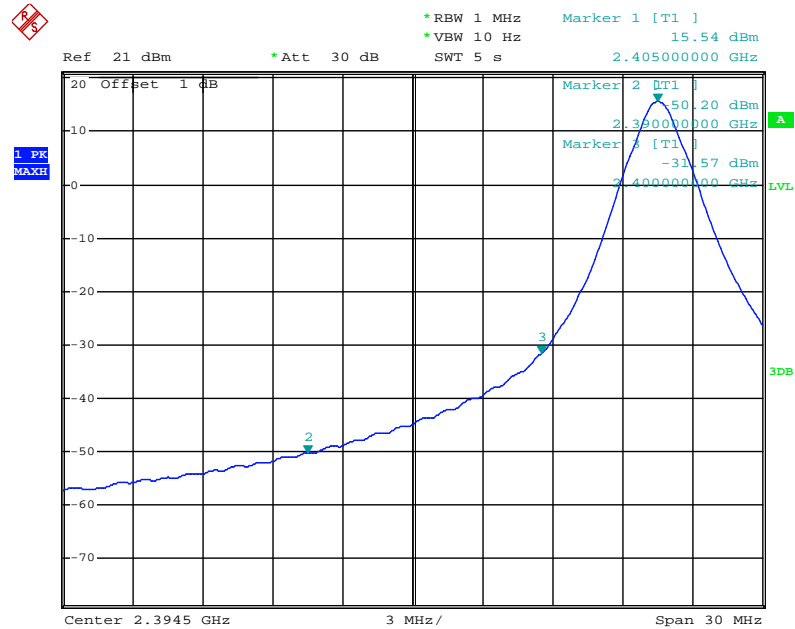
Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	Ground reflection factor(dBi)	Covert Radiated E Level At 3m (dBuV/m)	Detector	Limit (dBuV/m)
2390.00	-38.84	3.0	0	59.42	PK	74.00
2390.00	-50.20	3.0	0	48.06	AV	54.00
2483.50	-32.24	3.0	0	66.02	PK	74.00
2483.50	-45.52	3.0	0	52.74	AV	54.00

For Conducted Band Edge

Channel Number	Channel Frequency (MHz)	Delta Peak to Band emission (dBc)	Limit (dBc)	Verdict
11	2400.00	41.05	20	PASS
26	2483.50	35.97	20	PASS

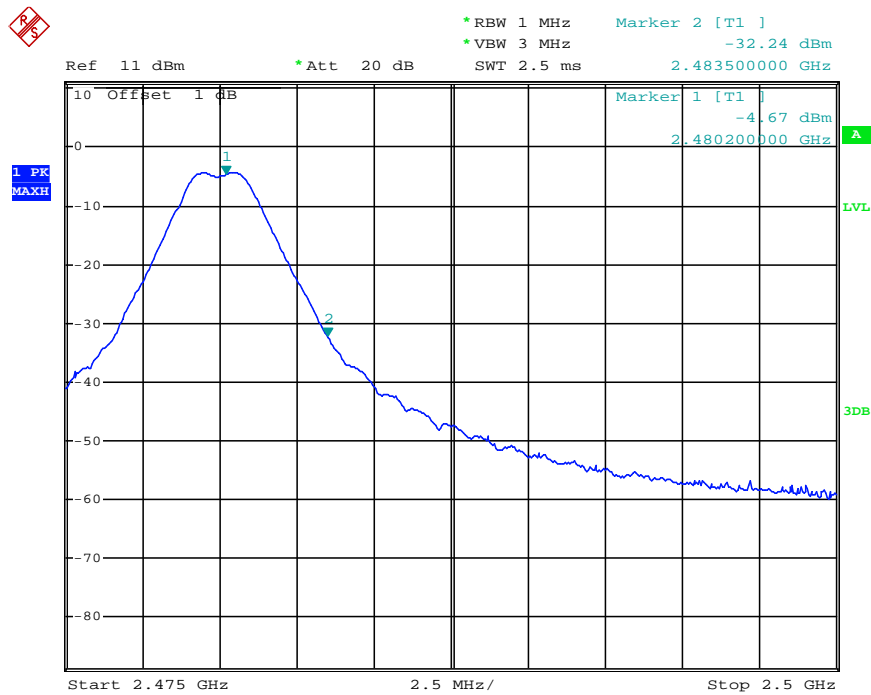
Photos of Radiated Band Edge Measurement**Channel 11**

Date: 8.MAY.2013 12:03:25

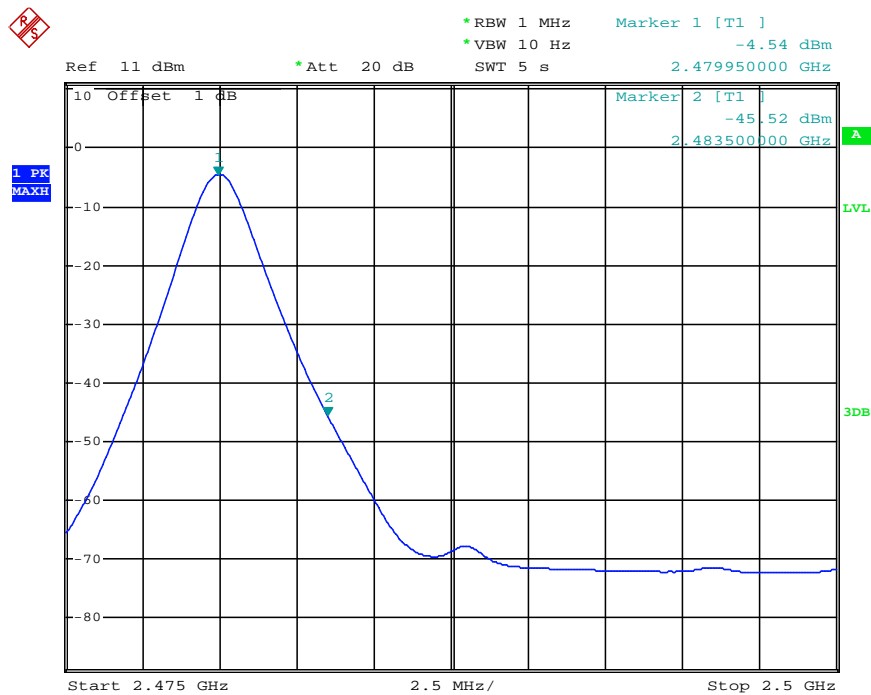


Date: 8.MAY.2013 12:03:48

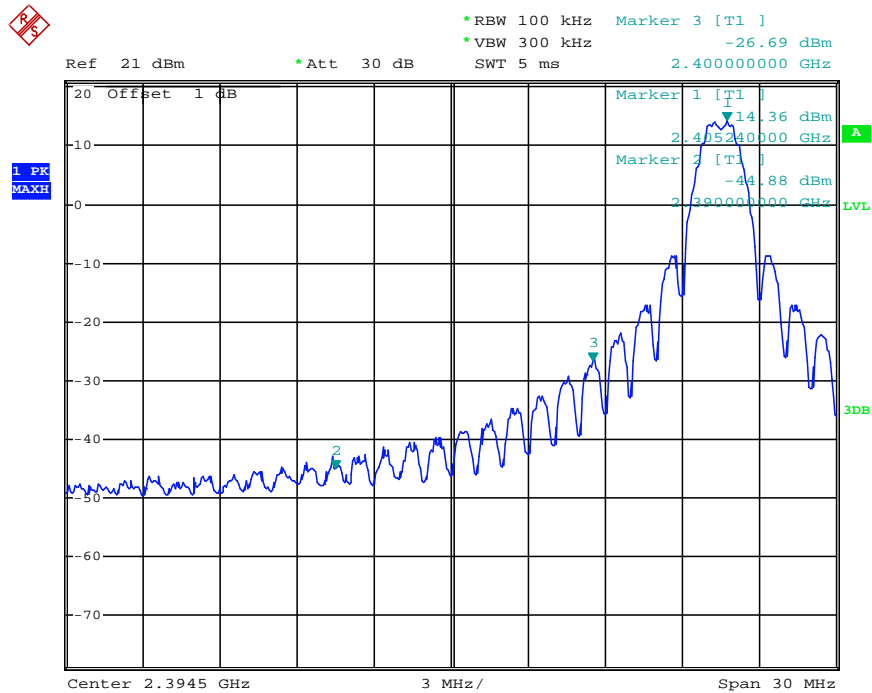
Channel 26



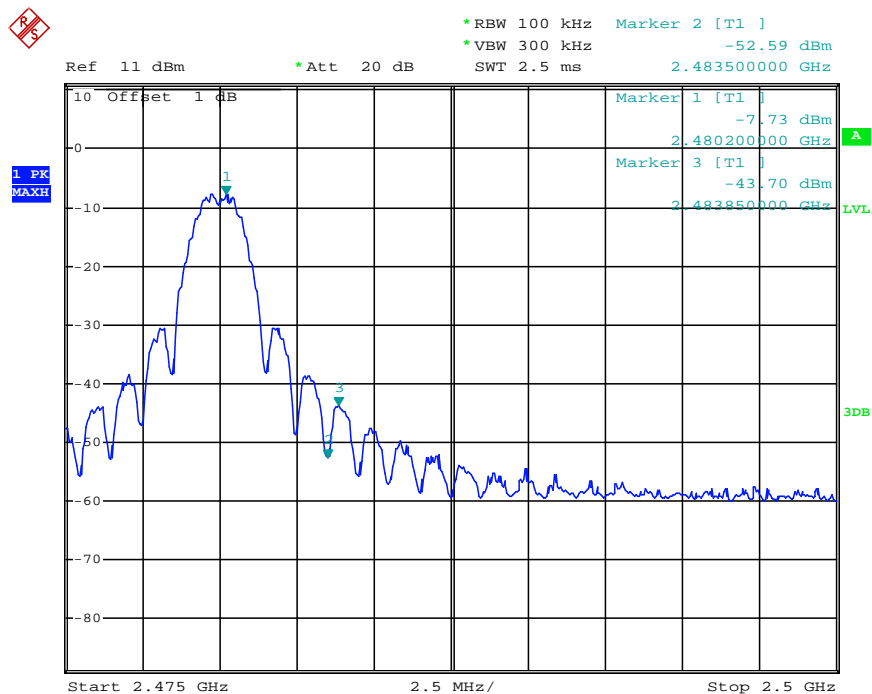
Date: 8.MAY.2013 11:28:03



Date: 8.MAY.2013 11:29:51

Photos of Conducted Band Edge Measurement**Channel 11**

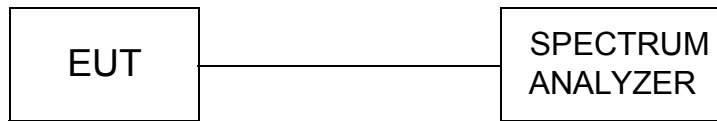
Date: 8.MAY.2013 12:02:25

Channel 26

Date: 8.MAY.2013 11:26:53

4.6. Spurious RF Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

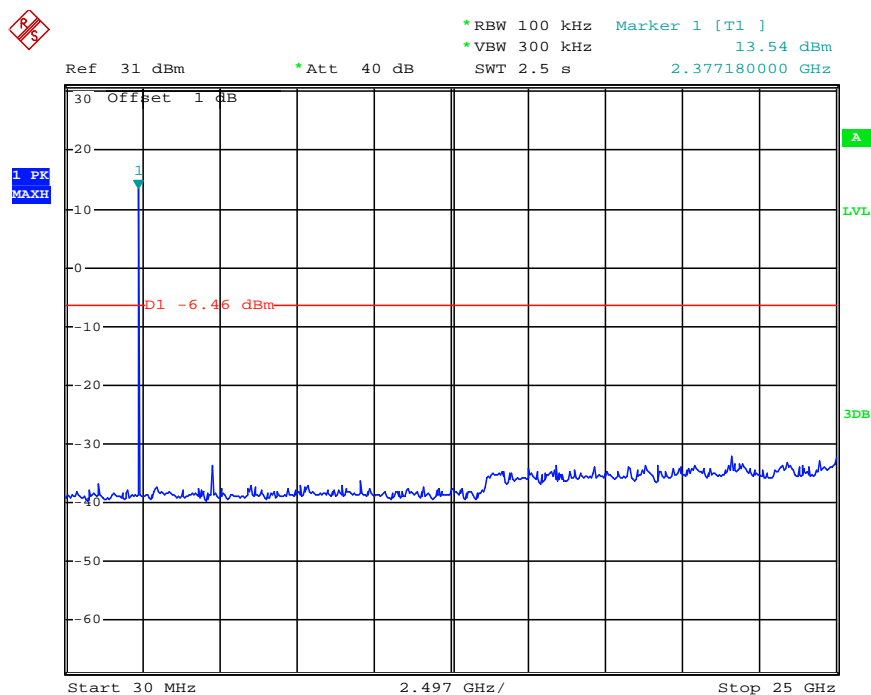
The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2009 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW=100kHz and VBM= 300KHz to measure the peak field strength , and measure frequency range from 30MHz to 26.5GHz.

LIMIT

1. Below -20dB of the highest emission level in operating band.
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

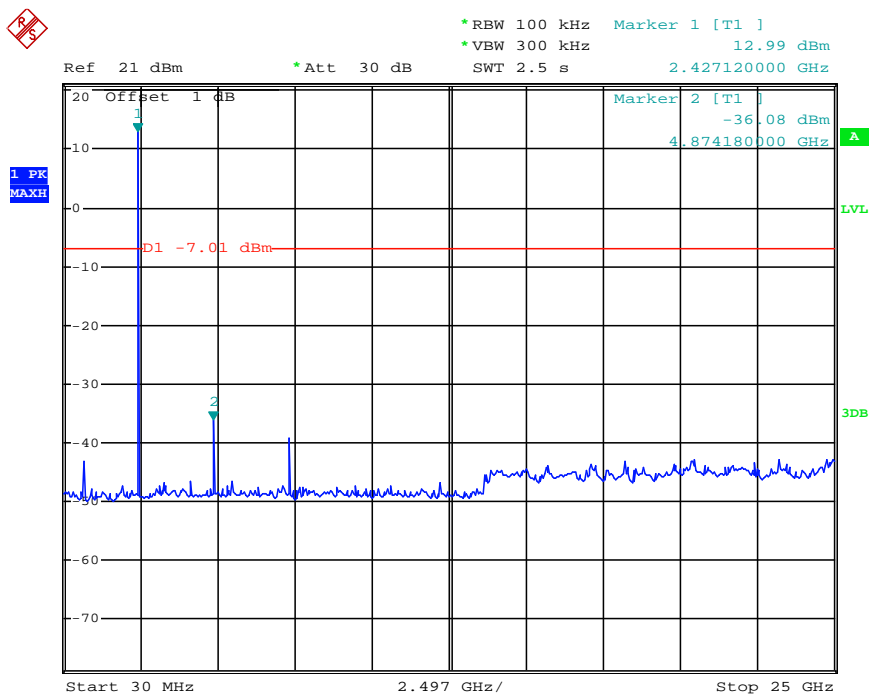
TEST RESULTS

Channel 11



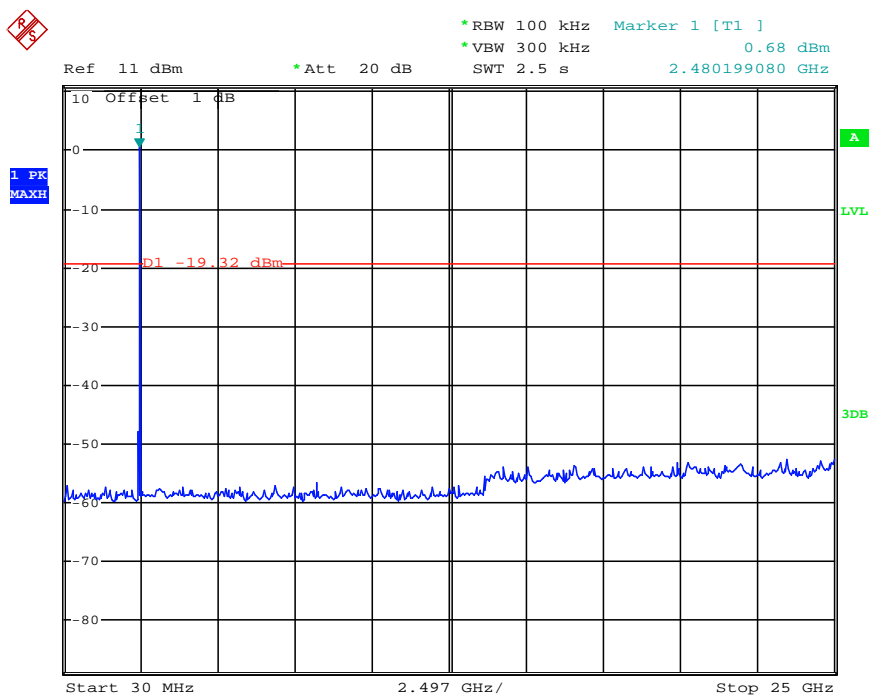
Date: 8.MAY.2013 12:07:35

Channel 18



Date: 8.MAY.2013 11:58:07

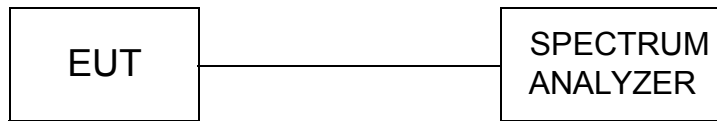
Channel 26



Date: 8.MAY.2013 11:56:14

4.7. 6dB Bandwidth

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 KHz RBW and 300KHz VBW.

The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

LIMIT

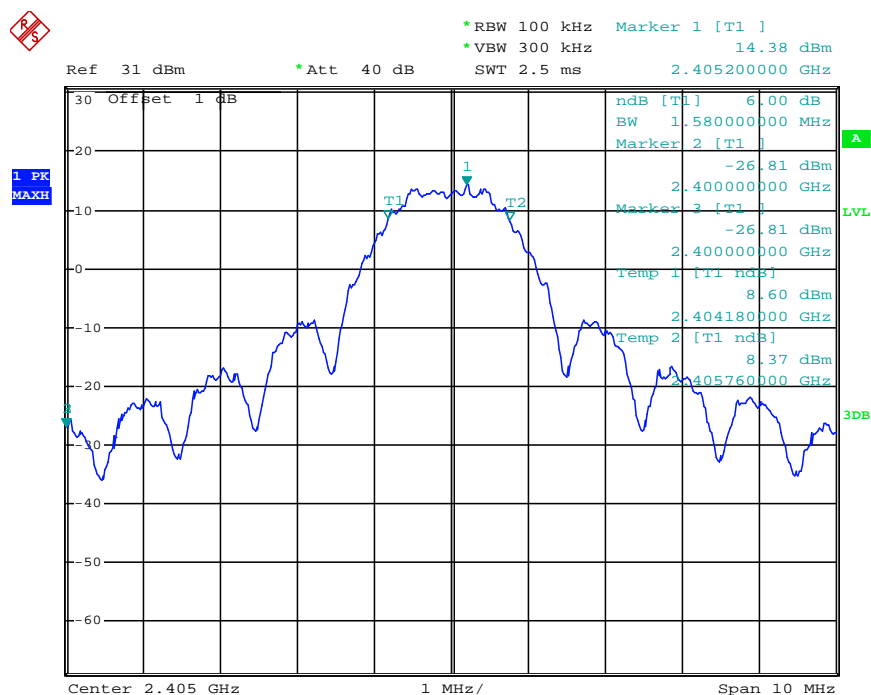
For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

TEST RESULTS

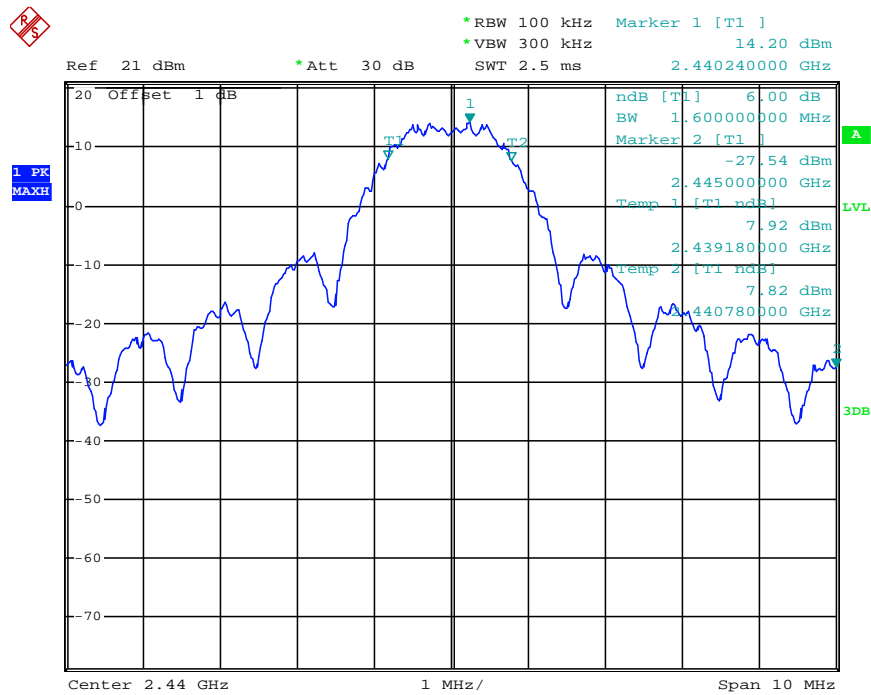
Channel Number	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Verdict
11	2405	1.580	0.5	PASS
18	2440	1.600	0.5	PASS
26	2480	1.580	0.5	PASS

Photos of 6dB Bandwidth Measurement

Channel 11

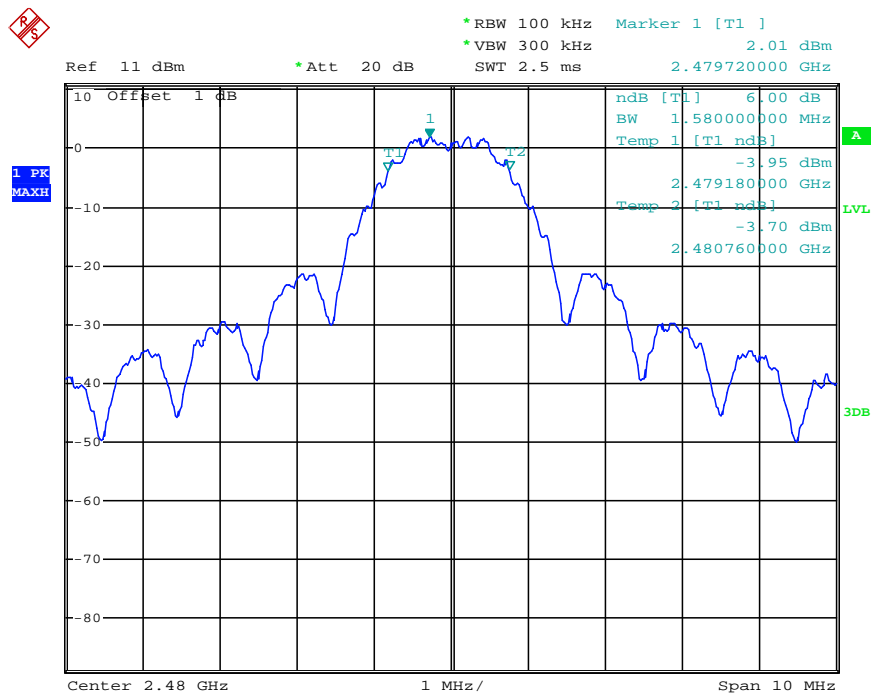


Channel 18



Date: 8.MAY.2013 11:58:45

Channel 26



Date: 8.MAY.2013 11:53:53

4.8. Antenna Requirement

Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

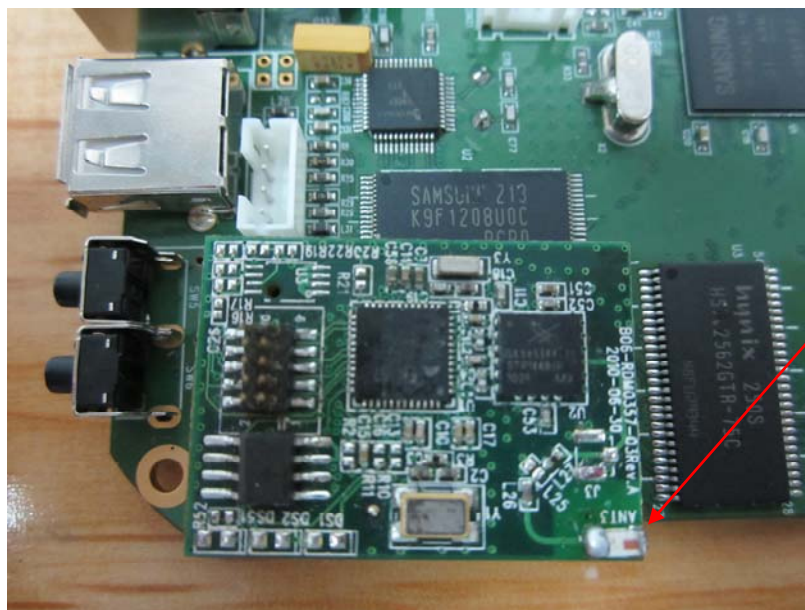
And according to FCC 47 CFR Section 15.247 (c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Refer to statement below for compliance

The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

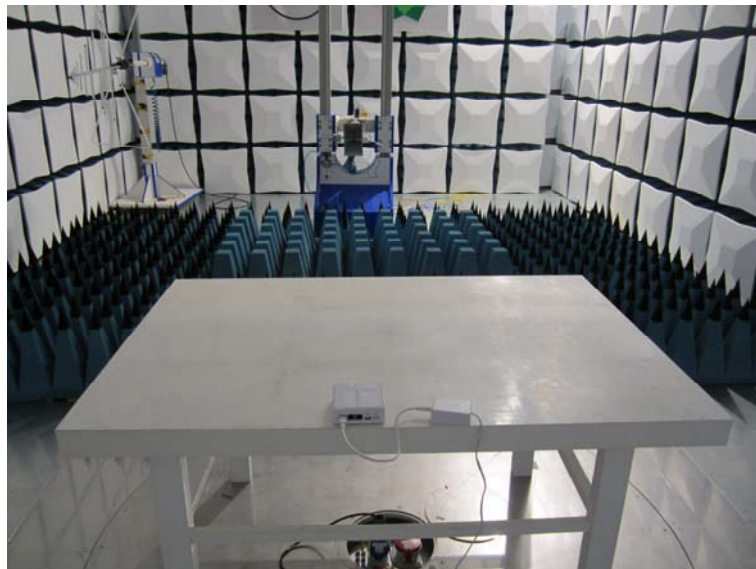
Antenna Connected Construction

The Gain of the antenna is 3.0dBi.



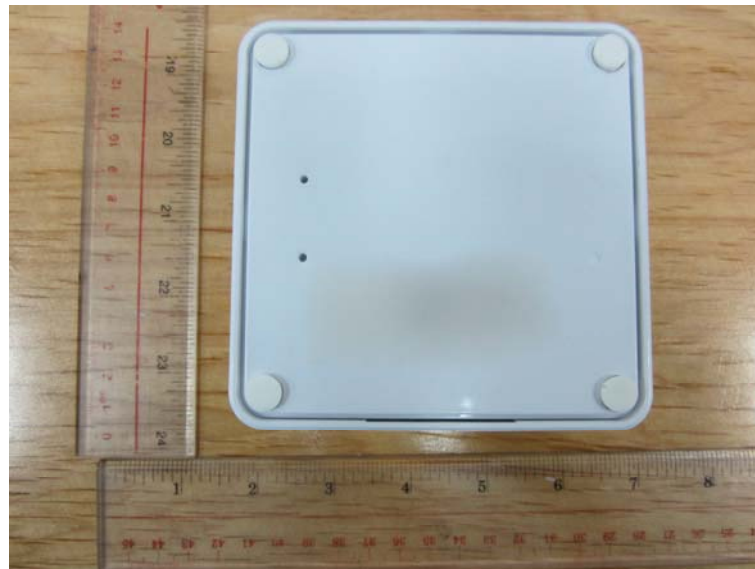
Internal
Antenna

5. Test Setup Photos of the EUT



6. External and Internal Photos of the EUT

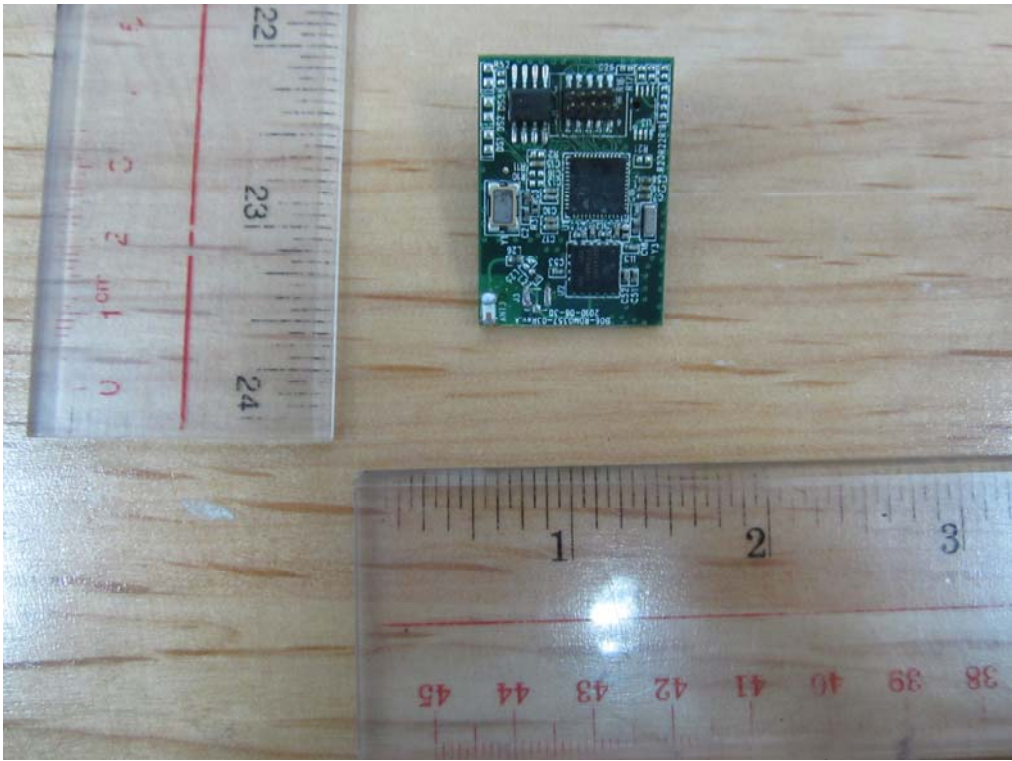
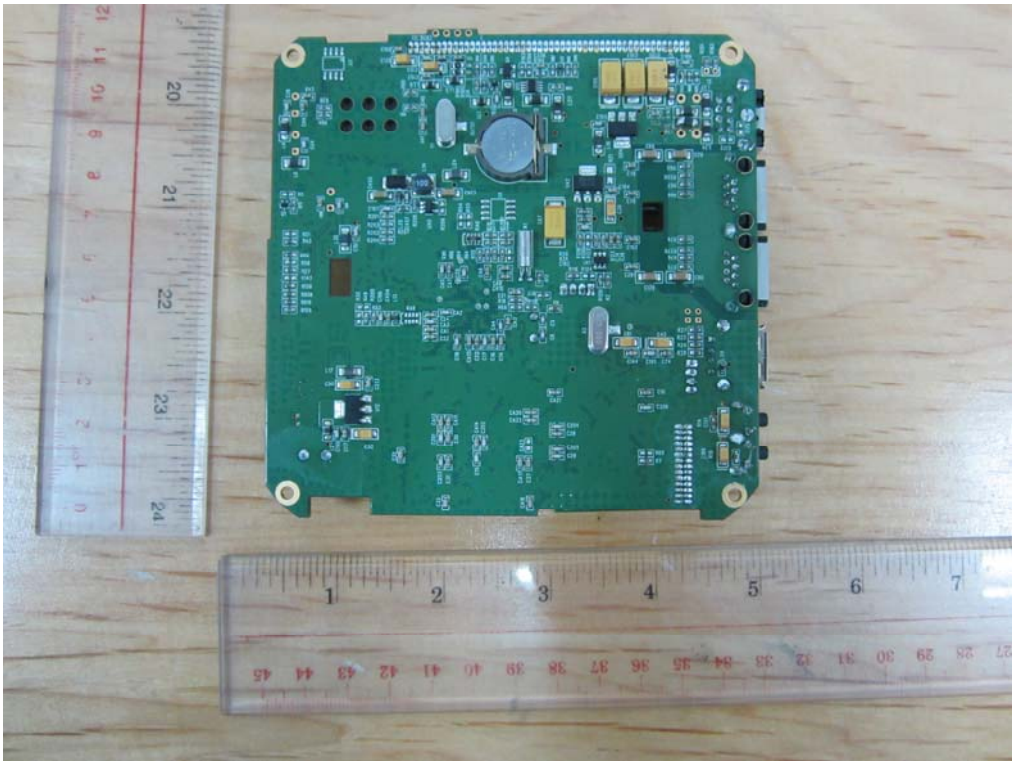
External Photos

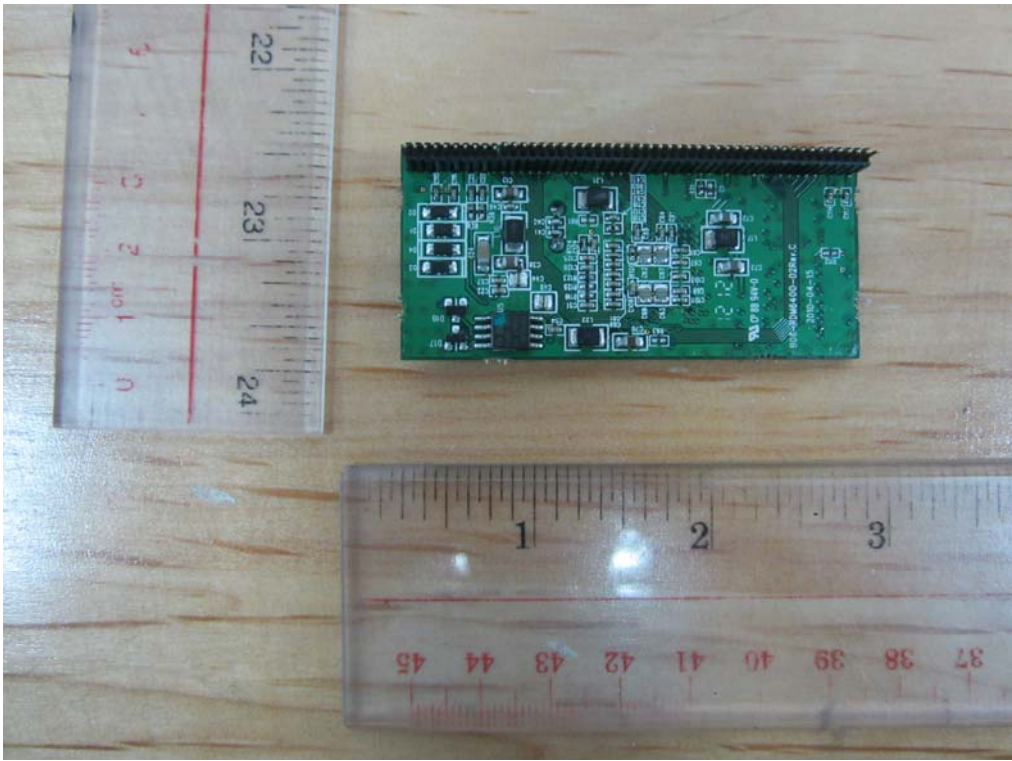
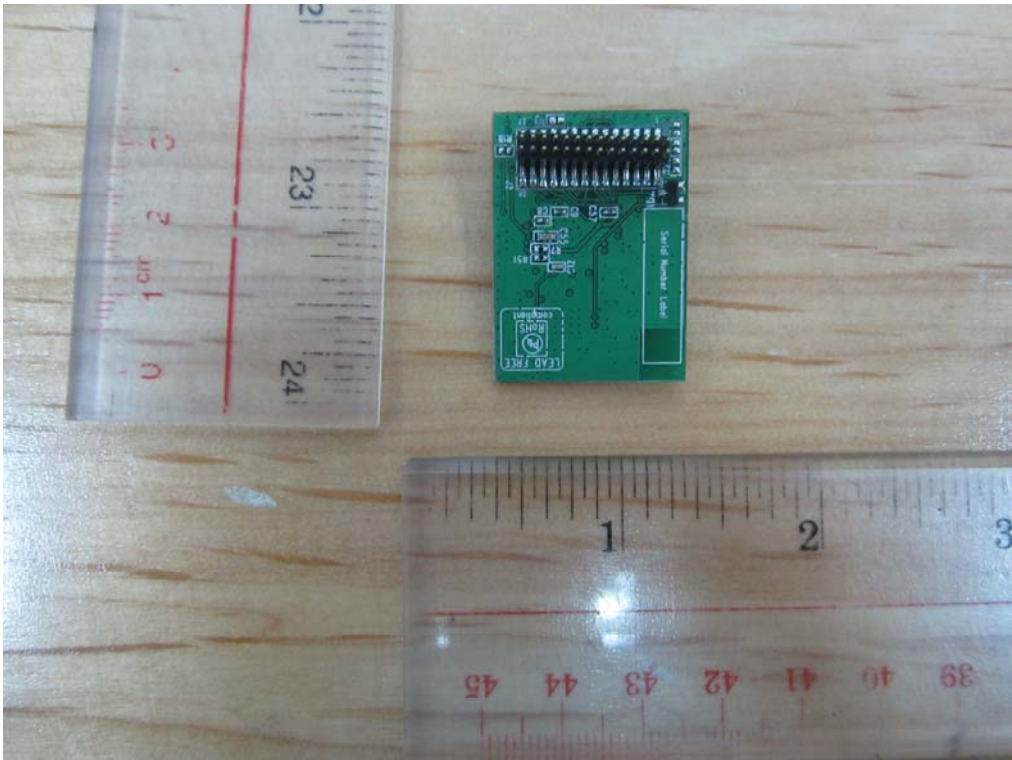


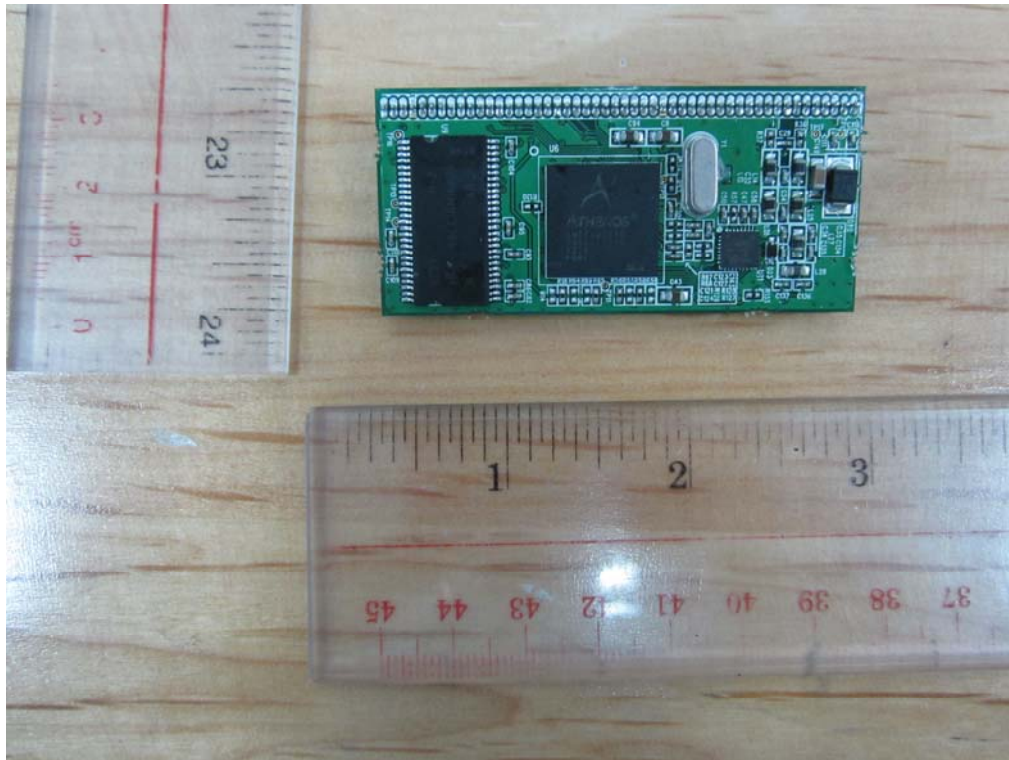


Internal Photos









.....End of Report.....