



FCC PART 15 SUBPART C TEST REPORT

FCC PART 15.247

Report Reference No.: TRE1203003201

FCC ID: FTOSTTBTMC2BC3

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Date of issue: Mar 30, 2012

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

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

Applicant's name: Stalmart Technology Limited

Address: Rm116-1107E, Building F, Xihaimingzhu, No.1, Taoyuan Road, Nanshan, Shenzhen, Guangdong, China

Test specification:

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

TRF Originator: Shenzhen Huatongwei International Inspection CO., Ltd

Master TRF: Dated 2006-06

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Test item description: 2.4GHz WIRELESS MODULE

Trade Mark: /

Model/Type reference: STTBTMC2BC3

Listed Models: /

Operation Frequency: From 2400MHz to 2483.5MHz

Result: Positive

TEST REPORT

Test Report No. : TRE1203003201	Mar 30, 2012 Date of issue
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Equipment under Test : 2.4GHz WIRELESS MODULE

Model /Type : STTBTMC2BC3

Listed Models : /

Applicant : **Stalmart Technology Limited**

Address : Rm116-1107E, Building F, Xihaimingzhu, No.1, Taoyuan Road, Nanshan, Shenzhen, Guangdong, China

Manufacturer : **Stalmart Technology Limited**

Address : Rm116-1107E, Building F, Xihaimingzhu, No.1, Taoyuan Road, Nanshan, Shenzhen, 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 C63.10-2009: American National Standard for Testing Unlicensed Wireless Devices

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	Mar 12, 2012
Testing commenced on	:	Mar 12, 2012
Testing concluded on	:	Mar 30, 2012

2.2. Equipment Under Test

Power supply system utilised

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

DC 3.3V

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

2.4GHz (2.4GHz WIRELESS MODULE (STTBTC2BC3))

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. It is BDR (Basic Data Rate) mode. The Applicant provides communication tools software to control the EUT for staying in continuous transmitting and receiving mode for testing. There are 79 channels of EUT, and the test carried out at the lowest channel, middle channel and highest channel .

Frequency Range:	2400-2483.5MHz
Channel number:	79 channels
Modulation type:	Frequency Hopping Spread Spectrum
Antenna:	PCB Antenna

Test Channel	Test Frequency
Low Channel	2402 MHz
Middle Channel	2441 MHz
High Channel	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

○	Power Cable	Length (m) :	/
		Shield :	/
		Detachable :	/
○	Multimeter	Manufacturer :	/
		Model No. :	/

2.6. Configuration of Tested System

Fig. 2-1 Configuration of Tested System

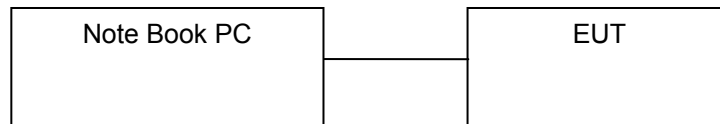


Table 2-1 Equipment Used in Tested System

No.	Product	Manufacturer	Model No.	Serial No.	FCC ID
1	Notebook PC	DELL	D610	CN-0D4571-48643-51S-0236	-----

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

This submittal(s) (test report) is intended for **FCC ID: FTOSTTBTMC2BC3** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.8. Modifications

No modifications were implemented to meet testing criteria.

2.9. NOTE

- The EUT is a an Bluetooth Standard type device, The functions of the EUT listed as below:

	Test Standards	Reference Report
Radio	FCC Part 15 Subpart C (Section15.247)	TRE1203003201
RF Exposure	FCC Per 47 CFR 2.1091(b)	TRE1203003202

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

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

- The EUT provides one completed transmitter and receiver.

Modulation Mode	TX Function
Bluetooth	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: Mar 30, 2009. 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 Jun 01, 2009.

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, 2006. Valid time is until December 20, 2012.

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, 2006. Valid time is until December 19, 2012.

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. 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	150 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)
Conducted Emission 9KHz-30MHz	3.39 dB	(1)
Radiated Emission 30~1000MHz	4.24 dB	(1)
Radiated Emissio 1~18GHz	5.16 dB	(1)
Radiated Emissio 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.

3.5. Test Description

FCC PART 15 Subpart C		
FCC Part 15.207	AC Power Conducted Emission	N/A
FCC Part 15.247(a)	20dB Bandwidth	PASS
FCC Part 15.247(d)	Spurious Emission	PASS
FCC Part 15.247(b)	Maximum Peak Output Power	PASS
FCC Part 15.109/ 15.205/ 15.209	Radiated Emissions	PASS
FCC Part 15.247(d)	Band Edge	PASS
FCC Part 15.247(a)(1)	Frequency Separation	PASS
FCC Part 15.247(a)(1)(iii)	Number of hopping frequency	PASS
FCC Part 15.247(a)(1)(iii)	Time of Occupancy	PASS
FCC Part 15.203/15.247 (b)	Antenna Requirement	PASS

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

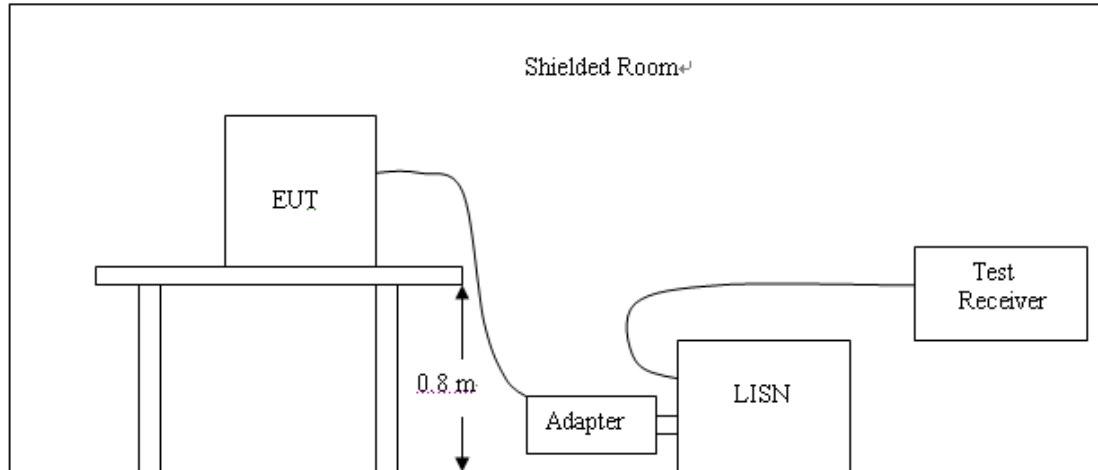
3.6. Equipments Used during the Test

Test equipments					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	ULTRA-BROADBAND ANTENNA	ROHDE & SCHWARZ	HL562	100015	2011/10/23
2	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESI 26	100009	2011/10/23
3	Spectrum Analyzer	AGILENT	E4407B	MY44210775	2011/10/23
4	RF TEST PANEL	ROHDE & SCHWARZ	TS / RSP	335015/ 0017	2011/10/23
5	TURNTABLE	ETS	2088	2149	2011/10/23
6	ANTENNA MAST	ETS	2075	2346	2011/10/23
7	EMI TEST SOFTWARE	ROHDE & SCHWARZ	ESK1	N/A	2011/10/23
8	HORN ANTENNA	ROHDE & SCHWARZ	HF906	100039	2011/10/23
9	Broad-Band Horn Antenna	SCHWARZBECK	BBHA9170	470	2011/10/23
10	Amplifier	Sonoma	310N	E009-13	2011/10/23
11	JS amplifier	ROHDE & SCHWARZ	JS4-00101800-28-5A	F201504	2011/10/23
12	High pass filter	Compliance Direction systems	BSU-6	34202	2011/10/23
13	EMI Test Receiver	ROHDE & SCHWARZ	ESCI	100106	2011/10/23
14	Artificial Mains	ROHDE & SCHWARZ	ESH2-Z5	100028	2011/10/23
15	Pulse Limiter	ROHDE & SCHWARZ	ESHSZ2	100044	2011/10/23
16	EMI Test Software	ROHDE & SCHWARZ	ESK1	N/A	2011/10/23
17	Loop Antenna	ROHDE & SCHWARZ	HFH2-Z2	100020	2011/10/23
18	EMI Test Receiver	ROHDE & SCHWARZ	ESCS30	100038	2011/10/23

4. TEST CONDITIONS AND RESULTS

4.1. AC Power Conducted Emission (Not applicable)

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 C63.10-2009.
- 2 Support equipment, if needed, was placed as per ANSI C63.10-2009
- 3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2009
- 4 The EUT received DC5V 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

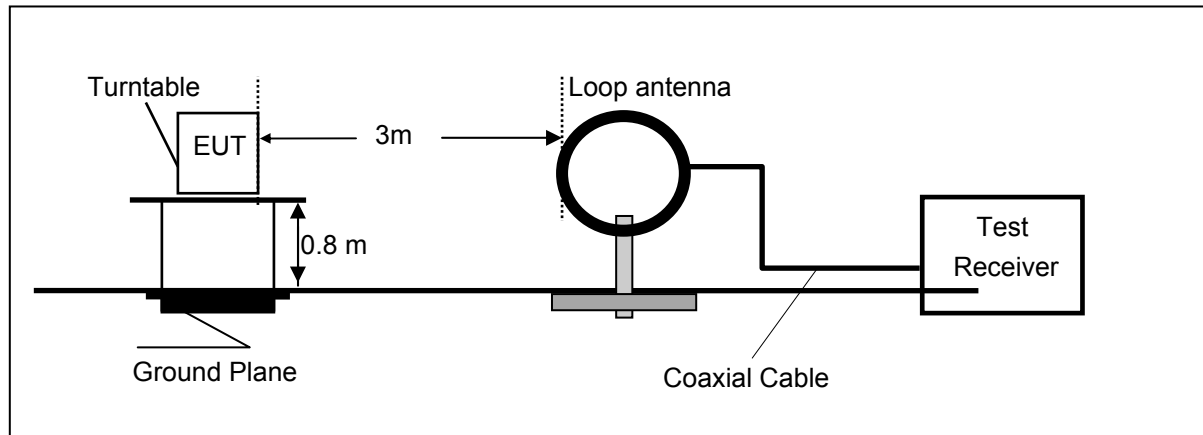
TEST RESULTS

Not applicable to this device (because the equipment power by DC)

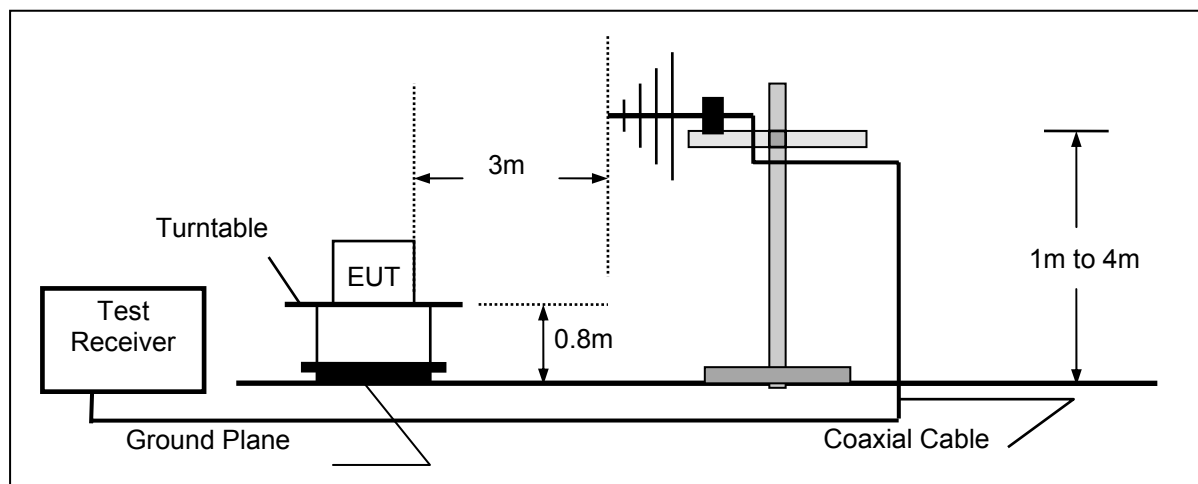
4.2. Radiated Emission

TEST CONFIGURATION

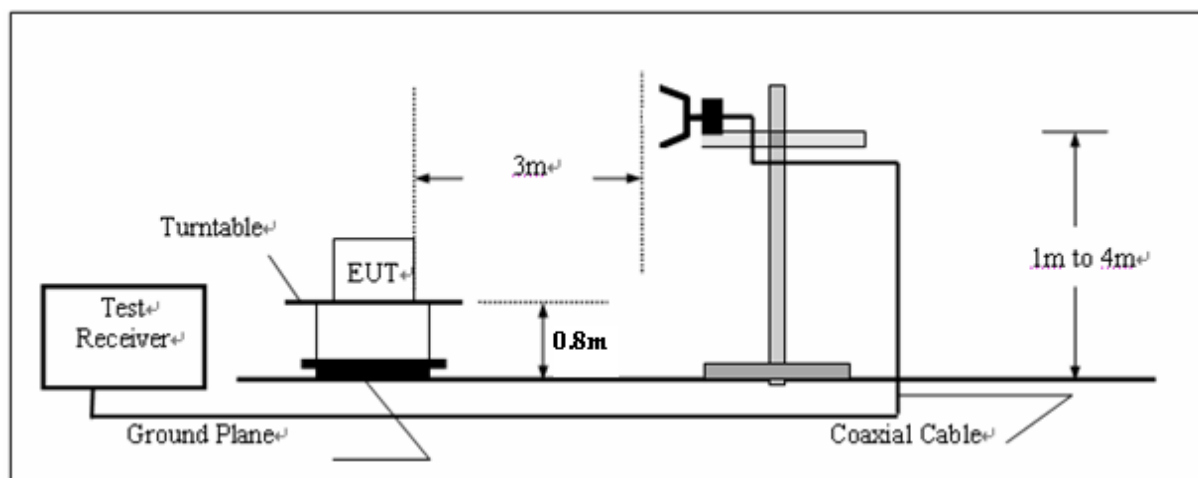
Radiated Emission Test Set-Up
Frequency range 9KHz – 30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



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 fundamental frequency is 2400-2483.5MHz, So the radiation emissions frequency range were tested from 9KHz 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	

For example

Frequency (MHz)	FS (dBμV/m)	RA (dBμV/m)	AF (dB)	CL (dB)	AG (dB)	Transd (dB)
300.00	40	58.1	12.2	1.6	31.90	-18.1

$$\text{Transd} = \text{AF} + \text{CL} - \text{AG}$$

RADIATION LIMIT

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters 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.

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

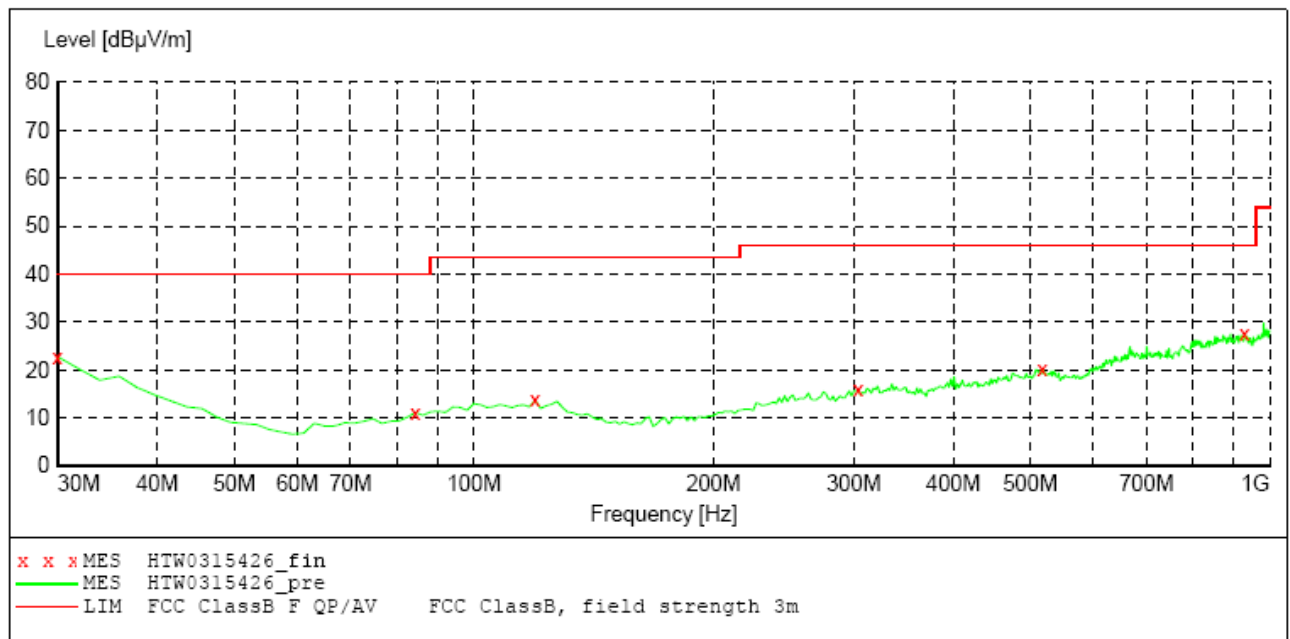
TEST RESULTS**For 9KHz to 30MHz**

Frequency (MHz)	Corrected Reading (dB μ V/m)@3m	FCC Limit (dB μ V/m) @3m	Margin (dB)	Detector	Result
0.53	48.52	73.11	24.59	QP	Pass
1.22	42.45	65.87	23.42	QP	Pass
16.00	40.52	69.54	29.02	QP	Pass
21.20	42.58	69.54	26.96	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: "HTW0315426_fin"**

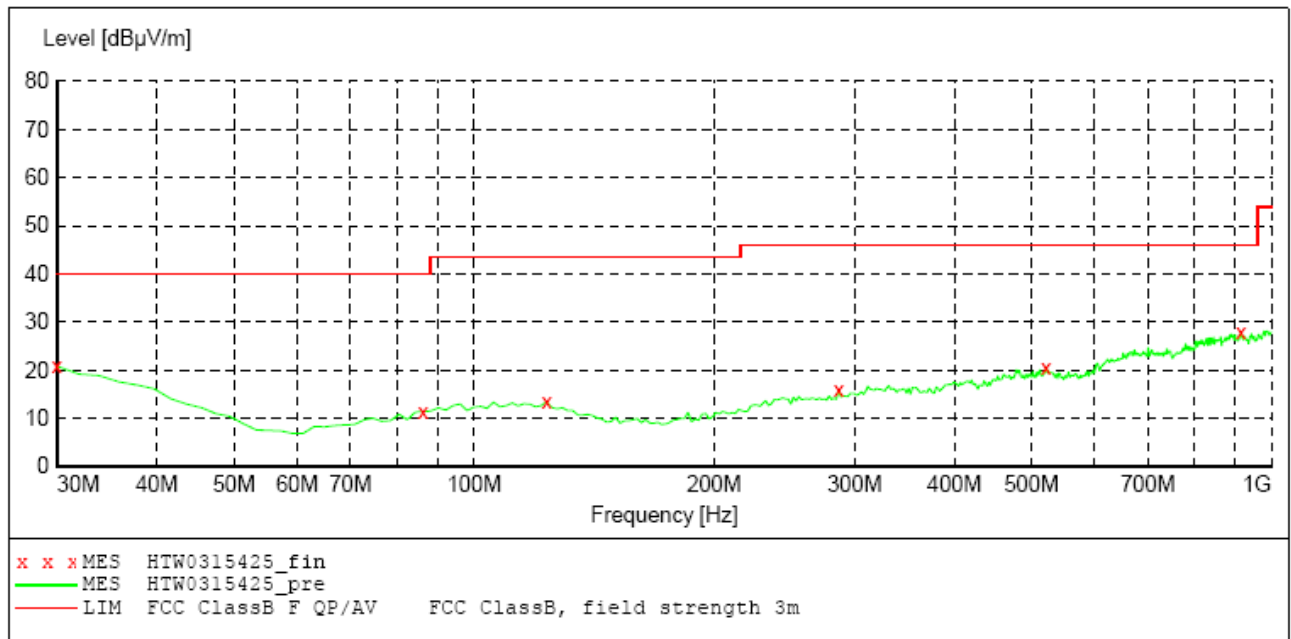
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Frequency MHz	Level dB μ V/m	Transd dB	Limit dB μ V/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	22.80	-11.3	40.0	17.2	QP	100.0	331.00	VERTICAL
84.428858	11.10	-21.2	40.0	28.9	QP	100.0	75.00	VERTICAL
119.418838	13.70	-19.3	43.5	29.8	QP	100.0	306.00	VERTICAL
304.088176	16.00	-16.7	46.0	30.0	QP	100.0	212.00	VERTICAL
517.915832	20.20	-13.0	46.0	25.8	QP	100.0	95.00	VERTICAL
930.020040	27.50	-7.1	46.0	18.5	QP	100.0	210.00	VERTICAL

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: "HTW0315425_fin"**

3/15/2012 9:03AM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	20.80	-11.3	40.0	19.2	QP	300.0	269.00	HORIZONTAL
86.372745	11.40	-20.8	40.0	28.6	QP	300.0	71.00	HORIZONTAL
123.306613	13.40	-19.5	43.5	30.1	QP	100.0	175.00	HORIZONTAL
286.593186	15.80	-17.8	46.0	30.2	QP	100.0	355.00	HORIZONTAL
521.803607	20.70	-13.0	46.0	25.3	QP	300.0	343.00	HORIZONTAL
916.412826	27.90	-7.2	46.0	18.1	QP	300.0	215.00	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.

Low channel**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	*2402.00	92.15	PK			1.00	178	95.55	28.3	4.90	36.6	-3.40
1	*2402.00	85.21	AV			1.00	178	88.61	28.3	4.90	36.6	-3.40
2	4804.00	48.24	PK	74.00	25.76	1.00	152	45.04	32.7	7.00	36.5	3.20
2	4804.00	--	AV	54.00	--	1.00	152	--	32.7	7.00	36.5	3.20
3	7206.00	49.15	PK	74.00	24.85	1.00	98	39.75	35.8	8.90	35.3	9.40
3	7206.00	--	AV	54.00	--	1.00	98	--	35.8	8.90	35.3	9.40
4	10243.21	50.55	PK	74.00	23.45	1.00	322	33.95	38.0	11.30	32.7	16.6
4	10243.21	--	AV	54.00	--	1.00	322	--	38.0	11.30	32.7	16.6

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	*2402.00	92.52	PK			1.00	145	95.9	28.3	4.90	36.6	-3.40
1	*2402.00	86.47	AV			1.00	145	89.8	28.3	4.90	36.6	-3.40
2	4804.00	47.58	PK	74.00	26.42	1.00	256	44.3	32.7	7.00	36.5	3.20
2	4804.00	--	AV	54.00	--	1.00	256	--	32.7	7.00	36.5	3.20
3	7206.00	49.55	PK	74.00	24.45	1.00	327	40.1	35.8	8.90	35.3	9.40
3	7206.00	--	AV	54.00	--	1.00	327	--	35.8	8.90	35.3	9.40
4	10423.45	50.14	PK	74.00	23.86	1.00	85	33.5	38.0	11.30	32.7	16.6
4	10423.45	--	AV	54.00	--	1.00	85	--	38.0	11.30	32.7	16.6

Middle channel**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	*2441.00	90.25	PK			1.00	322	93.45	28.3	5.10	36.6	-3.20
1	*2441.00	83.25	AV			1.00	322	86.45	28.3	5.10	36.6	-3.20
2	4882.00	47.58	PK	74.00	26.42	1.00	141	44.18	32.3	7.60	36.5	3.40
2	4882.00	--	AV	54.00	--	1.00	141	--	32.3	7.60	36.5	3.40
3	7323.00	50.52	PK	74.00	23.48	1.00	258	41.12	36.1	8.60	35.3	9.40
3	7323.00	--	AV	54.00	--	1.00	258	--	36.1	8.60	35.3	9.40
4	10536.45	51.58	PK	74.00	22.42	1.00	36	34.98	38.0	11.30	32.7	16.6
4	10536.45	--	AV	54.00	--	1.00	36	--	38.0	11.30	32.7	16.6

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)
1	*2441.00	91.12	PK			1.00	179	94.32	28.3	5.10	36.6	-3.20
1	*2441.00	83.41	AV			1.00	179	86.61	28.3	5.10	36.6	-3.20
2	4882.00	48.52	PK	74.00	25.48	1.00	146	45.12	32.3	7.60	36.5	3.40
2	4882.00	--	AV	54.00	--	1.00	146	--	32.3	7.60	36.5	3.40
3	7323.00	50.54	PK	74.00	23.46	1.00	210	41.14	36.1	8.60	35.3	9.40
3	7323.00	--	AV	54.00	--	1.00	210	--	36.1	8.60	35.3	9.40
4	10632.54	52.45	PK	74.00	21.55	1.00	265	35.85	38.0	11.30	32.7	16.6
4	10632.54	--	AV	54.00	--	1.00	265	--	38.0	11.30	32.7	16.6

High channel**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	*2480.00	88.33	PK			1.00	320	91.63	28.2	5.10	36.6	-3.30
1	*2480.00	80.10	AV			1.00	320	83.40	28.2	5.10	36.6	-3.30
2	4960.00	48.52	PK	74.00	25.48	1.00	141	44.72	33.0	7.00	36.2	3.80
2	4960.00	--	AV	54.00	--	1.00	141	--	33.0	7.00	36.2	3.80
3	7340.00	50.21	PK	74.00	23.79	1.00	256	40.81	36.2	8.50	35.3	9.40
3	7340.00	--	AV	54.00	--	1.00	256	--	36.2	8.50	35.3	9.40
4	10535.10	52.41	PK	74.00	21.59	1.00	87	35.81	38.0	11.30	32.7	16.6
4	10535.10	--	AV	54.00	--	1.00	87	--	38.0	11.30	32.7	16.6

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

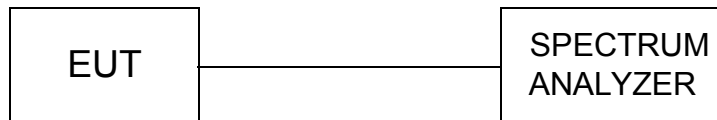
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	*2480.00	89.14	PK			1.00	48	92.4	28.2	5.10	36.6	-3.30
1	*2480.00	81.87	AV			1.00	48	85.1	28.2	5.10	36.6	-3.30
2	4960.00	49.52	PK	74.00	24.48	1.00	252	45.7	36.2	8.50	35.3	3.80
2	4960.00	--	AV	54.00	--	1.00	252	--	36.2	8.50	35.3	3.80
3	7340.00	50.22	PK	74.00	23.78	1.00	32	40.8	37.4	10.10	34.8	9.40
3	7340.00	--	AV	54.00	--	1.00	32	--	37.4	10.10	34.8	9.40
4	10361.45	52.81	PK	74.00	21.19	1.00	144	36.2	38.0	11.30	32.7	16.6
4	10361.45	--	AV	54.00	--	1.00	144	--	38.0	11.30	32.7	16.6

Suprious emission in restricted band

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	2390.00	52.44	PK	74.00	21.56	1.00 H	154	55.84	28.3	4.90	36.6	-3.40
1	2390.00	--	AV	54.00	--	1.00 H	154	--	28.3	4.90	36.6	-3.40
2	2390.00	52.78	PK	74.00	21.22	1.00 V	355	56.18	28.3	4.90	36.6	-3.40
2	2390.00	--	AV	54.00	--	1.00 V	355	--	28.3	4.90	36.6	-3.40
3	2483.5	57.85	PK	74.00	16.15	1.00 H	102	61.15	28.2	5.10	36.6	-3.30
3	2483.5	47.61	AV	54.00	6.39	1.00 H	102	50.91	28.2	5.10	36.6	-3.30
4	2483.5	58.25	PK	74.00	15.75	1.00 V	90	61.55	28.2	5.10	36.6	-3.30
4	2483.5	49.21	AV	54.00	4.79	1.00 V	90	52.51	28.2	5.10	36.6	-3.30

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.

LIMIT

The Maximum Peak Output Power Measurement limit is 30dBm.

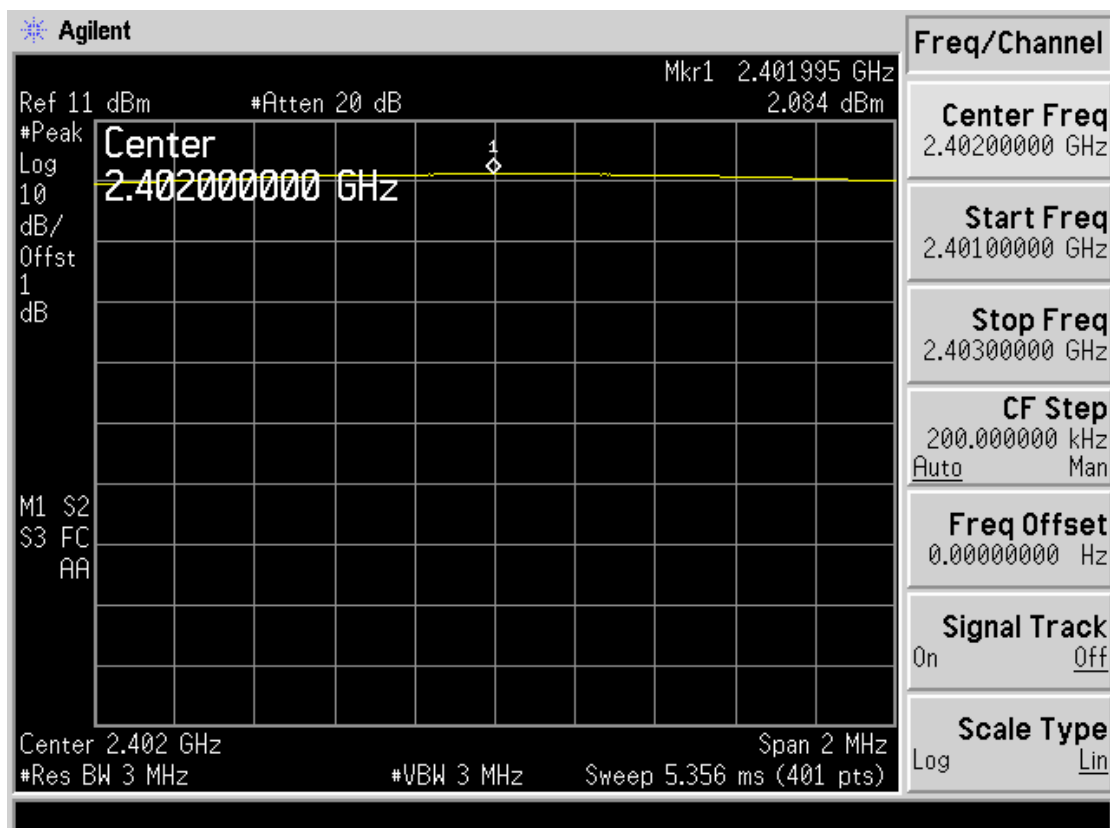
TEST RESULTS

BDR Mode:

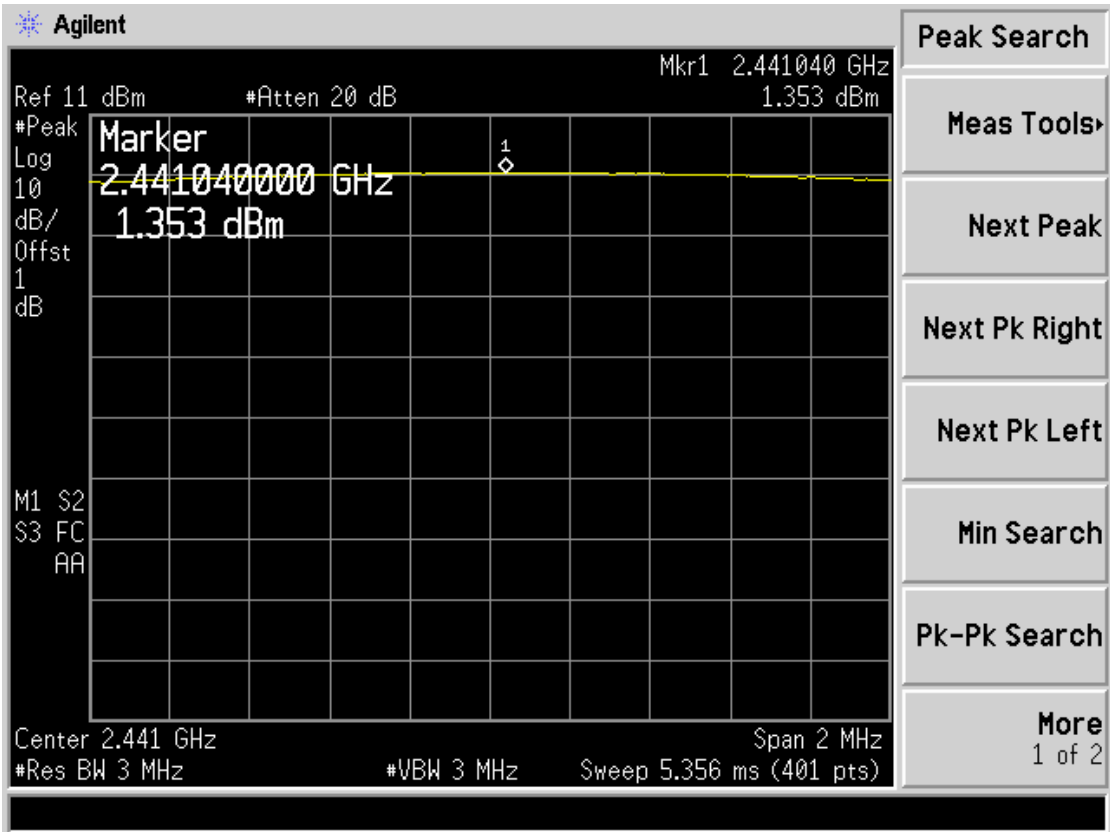
Channel Frequency (MHz)	Peak Power Output (dBm)	Peak Power Limit (dBm)	Pass / Fail
2402	2.402	30	PASS
2441	1.353	30	PASS
2480	0.567	30	PASS

Note: The test results including the cable loss.

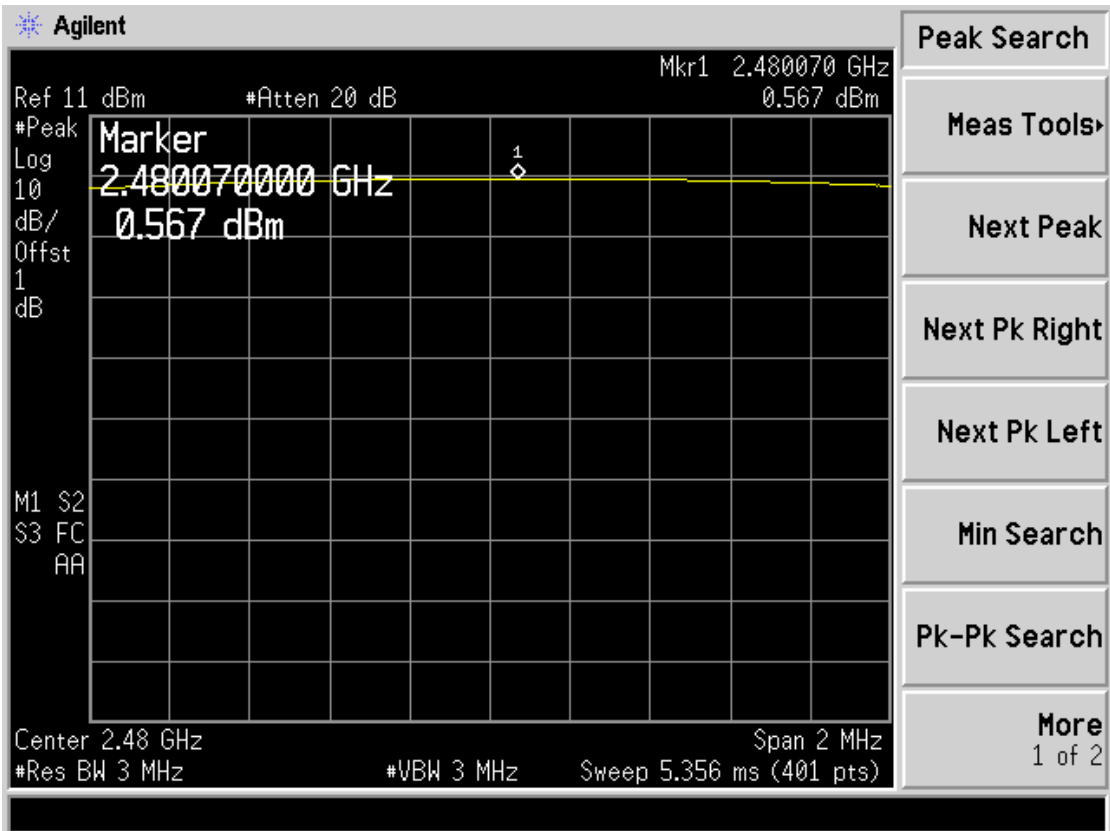
Low channel



Middle channel

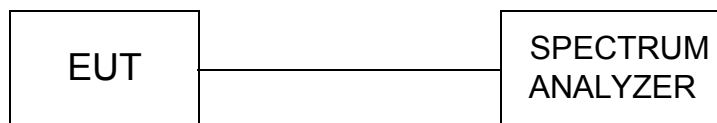


High channel



4.4. 20dB 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 30 KHz RBW and 100KHz VBW.

The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

LIMIT

For frequency hopping systems operating in the 2400MHz-2483.5MHz no limit for 20dB bandwidth.

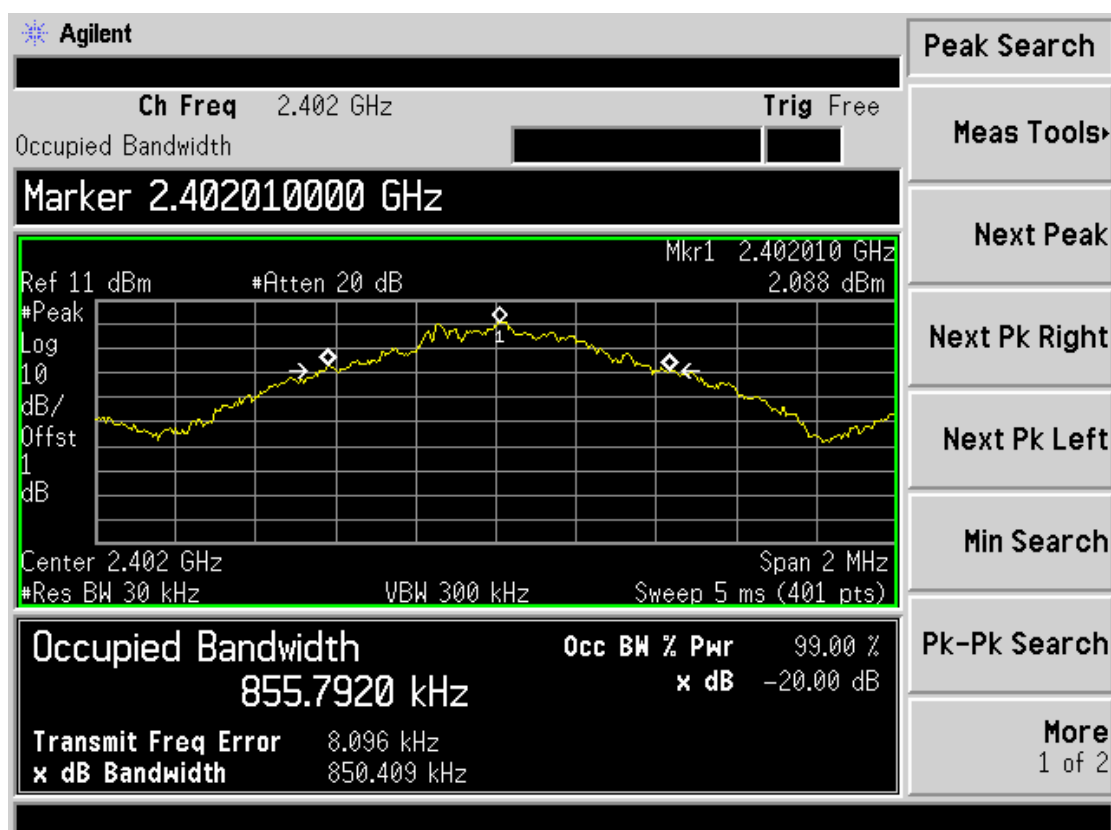
TEST RESULTS

BDR Mode:

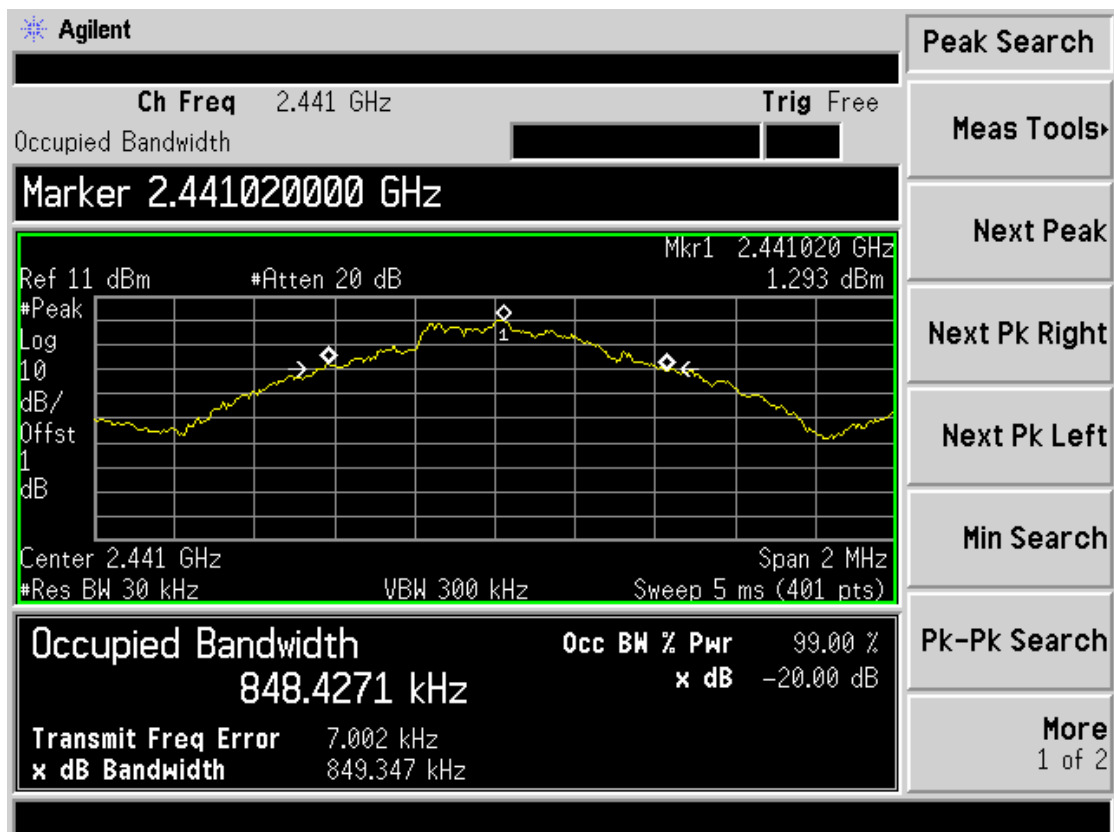
CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)	LIMIT (MHz)	PASS/FAIL
2402	0.850	/	PASS
2441	0.849	/	PASS
2480	0.867	/	PASS

Photos of 20dB Bandwidth Measurement(BDR Mode)

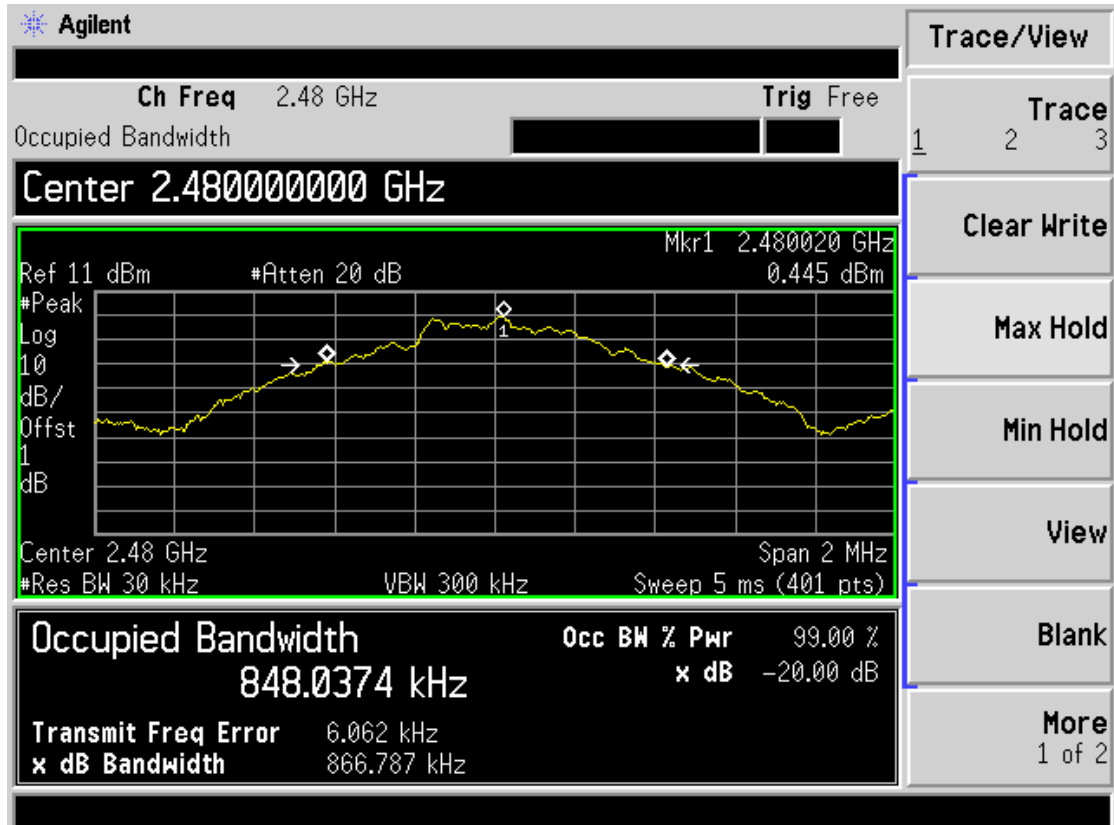
Low Channel



Middle Channel



High Channel



4.5. Band Edge

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. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, for Radiated emissions restricted band RBW=1MHz, VBW=3MHz.
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.

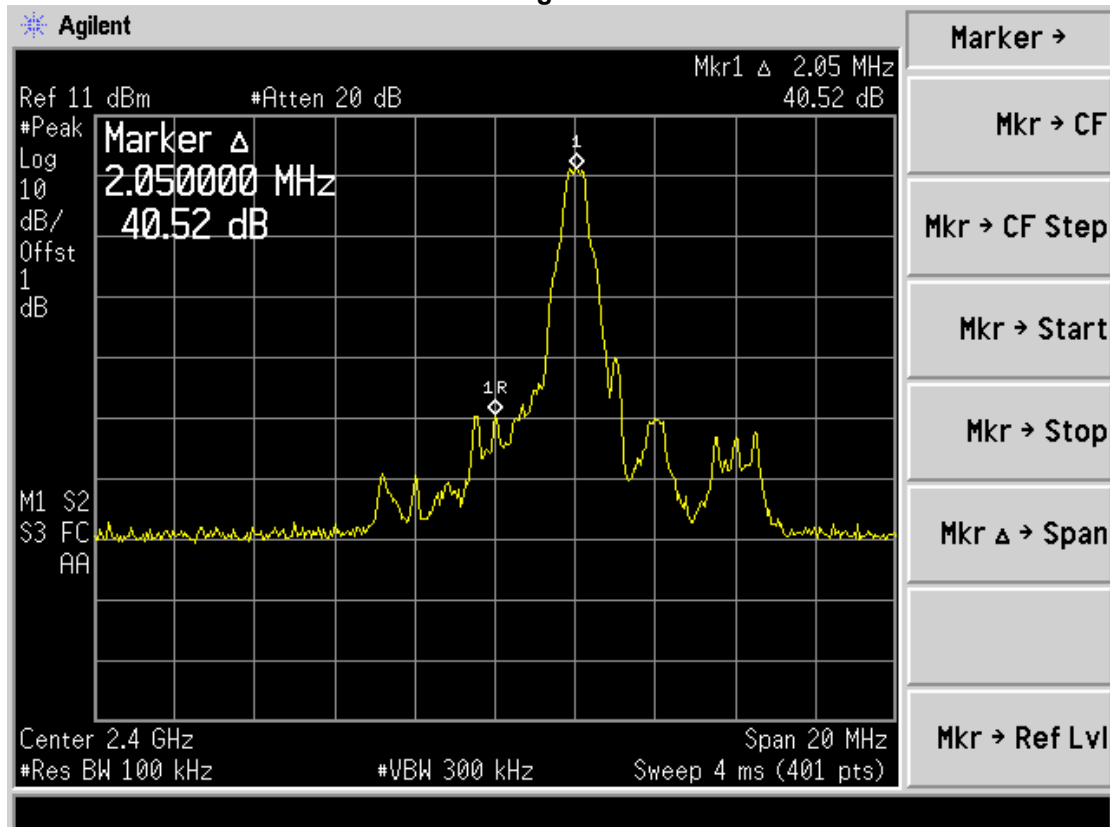
TEST RESULTS

Suprious emission in restricted band please see page 16

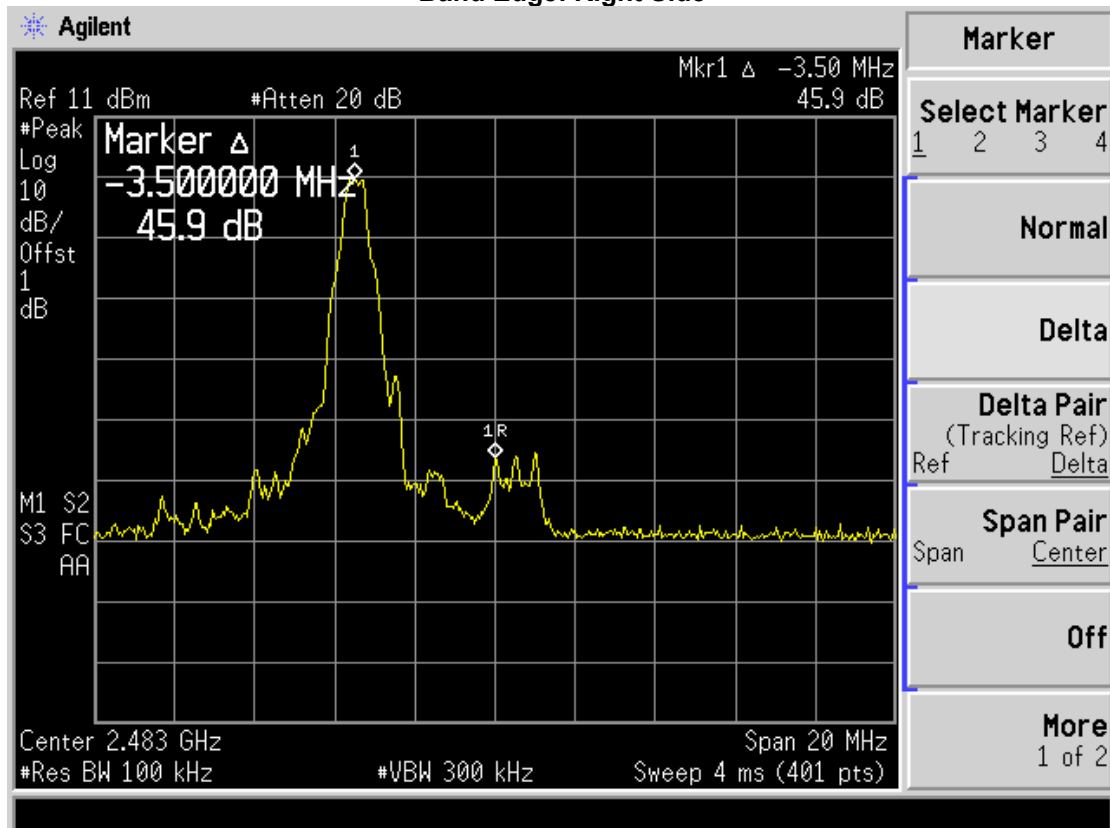
Plots of Conducted Band Edge Measurement (BDR Mode)

Frequency	Delta peak to band emission	Limit(dBc)
2400MHz	40.52	20
2483.5MHz	45.90	20

Band Edge: Left Side

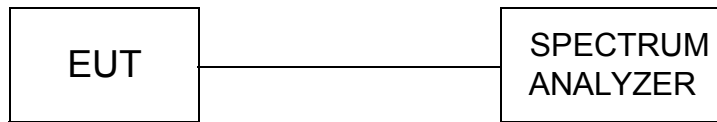


Band Edge: Right Side



4.6. Frequency Separation

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 30 KHz RBW and 100KHz VBW.

LIMIT

According to 15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25KHz or the $2/3 \times 20\text{dB}$ bandwidth of the hopping channel, whichever is greater.

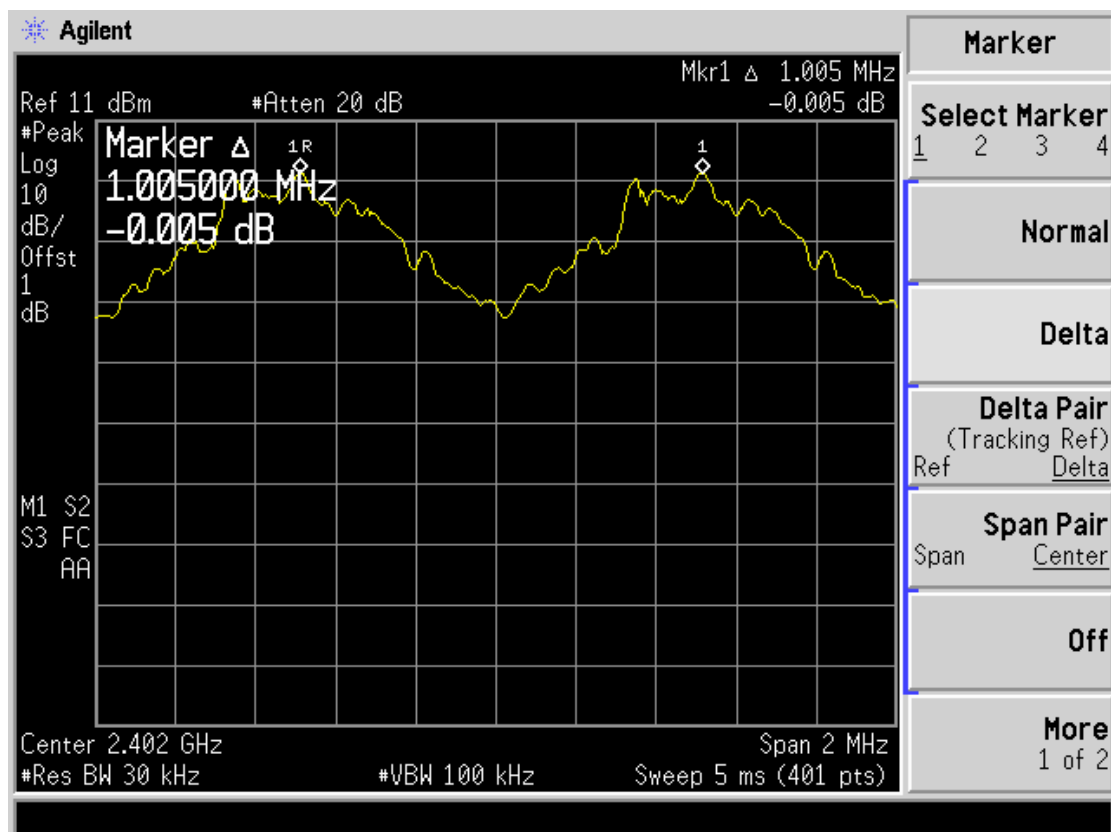
TEST RESULTS

BDR Mode:

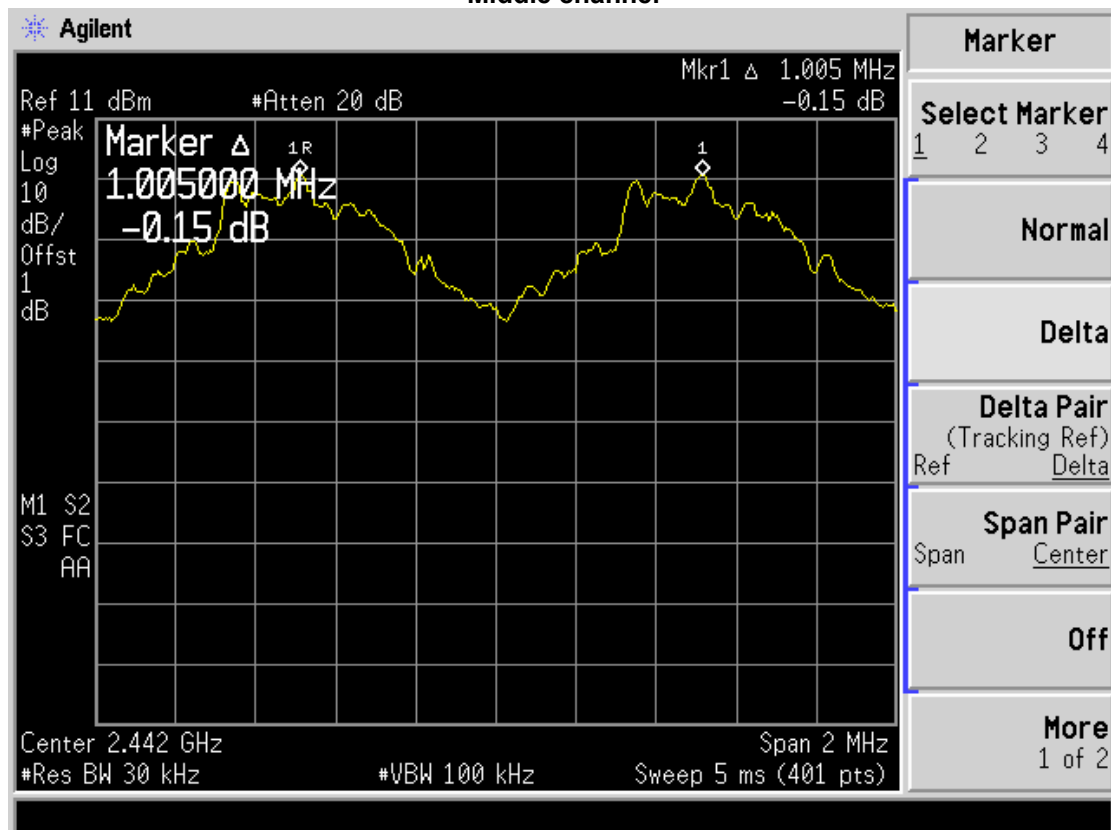
Channel	Channel Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
Low Channel	2402	1.005	25KHz or $2/3 \times 20\text{dB}$ bandwidth(0.567MHz)	Pass
Adjacency Channel	2403			
Mid Channel	2441	1.005	25KHz or $2/3 \times 20\text{dB}$ bandwidth(0.566MHz)	Pass
Adjacency Channel	2442			
High Channel	2480	1.005	25KHz or $2/3 \times 20\text{dB}$ bandwidth(0.578MHz)	Pass
Adjacency Channel	2479			

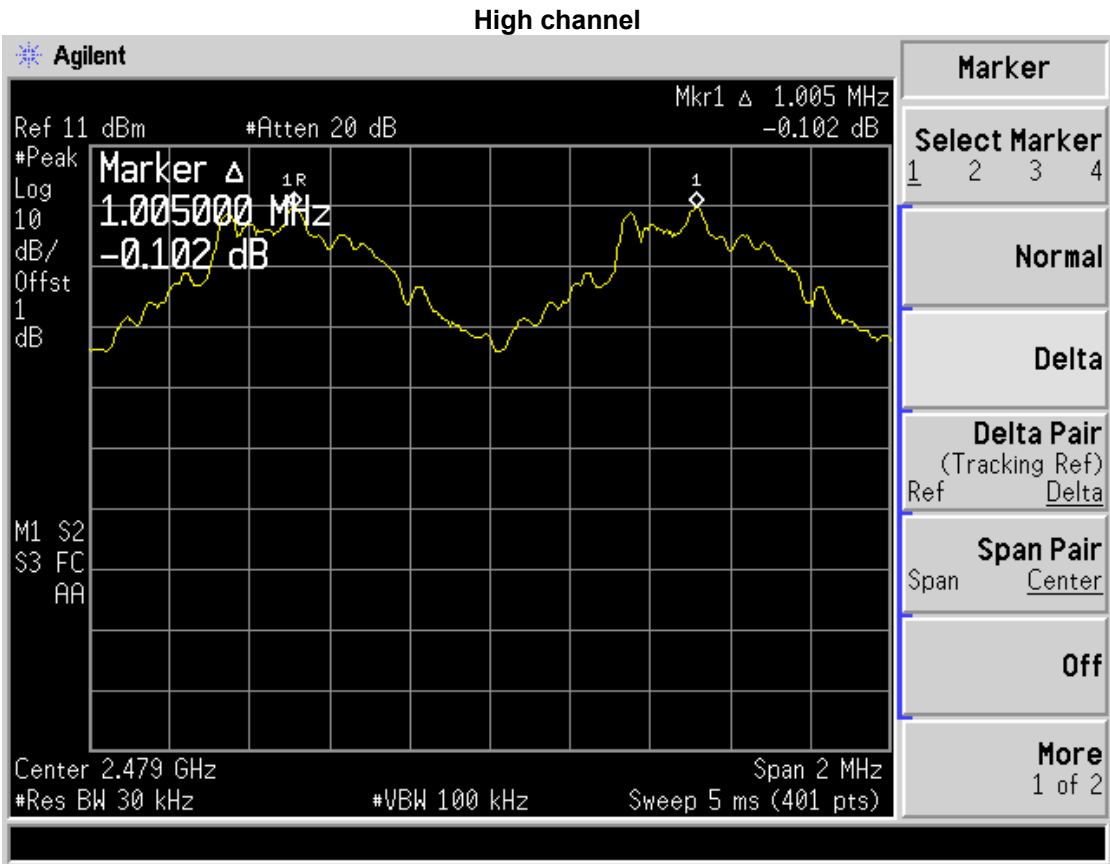
Photos of Frequency separation Measurement

Low channel



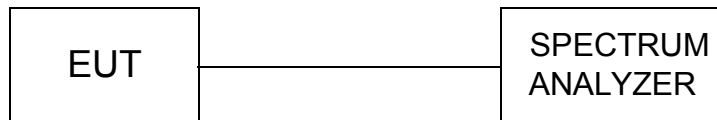
Middle channel





4.7. Number of hopping frequency

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. Set spectrum analyzer start 2400MHz to 2483.5MHz with 30 KHz RBW and 100KHz VBW.

LIMIT

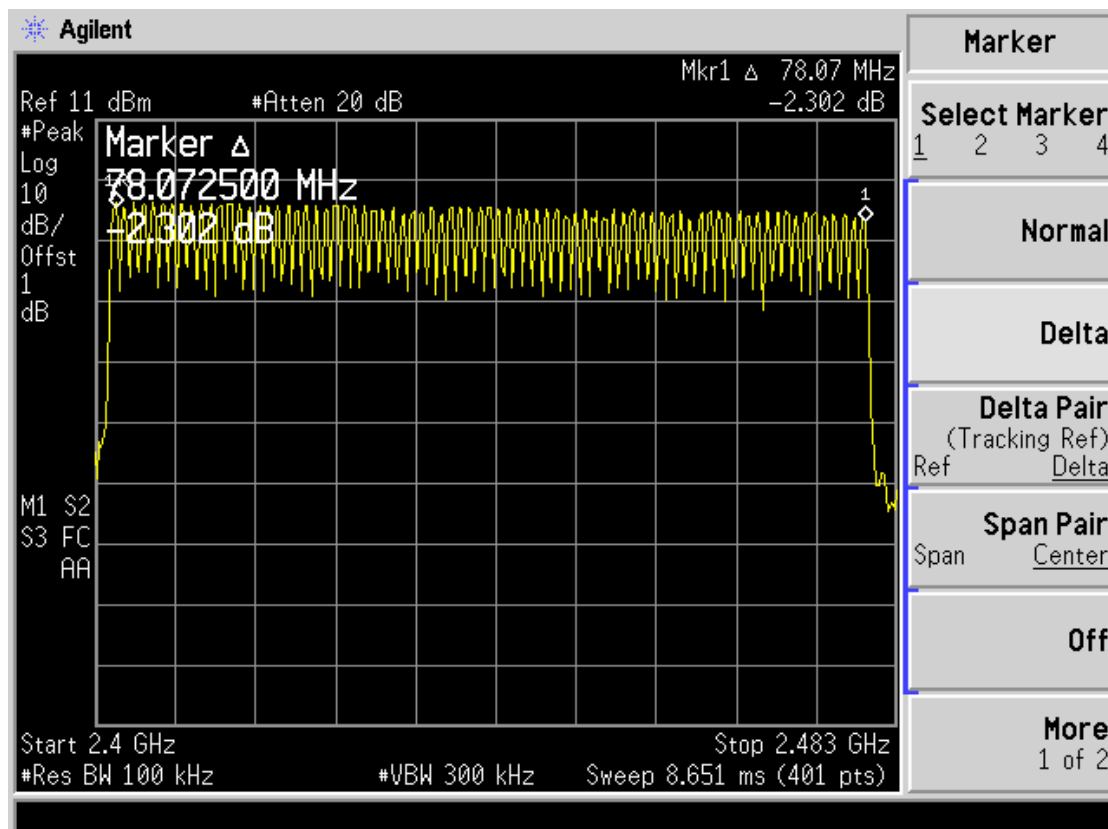
Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

TEST RESULTS

BDR Mode:

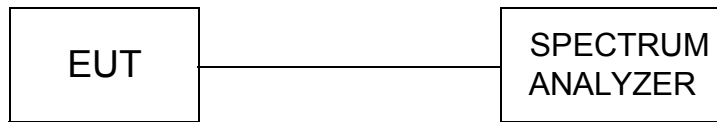
Hopping Channel Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	79	≥15

Photos of Number of hopping channel Measurement(BDR Mode)



4.8. Time Of Occupancy(Dwell Time)

TEST CONFIGURATION



TEST PROCEDURE

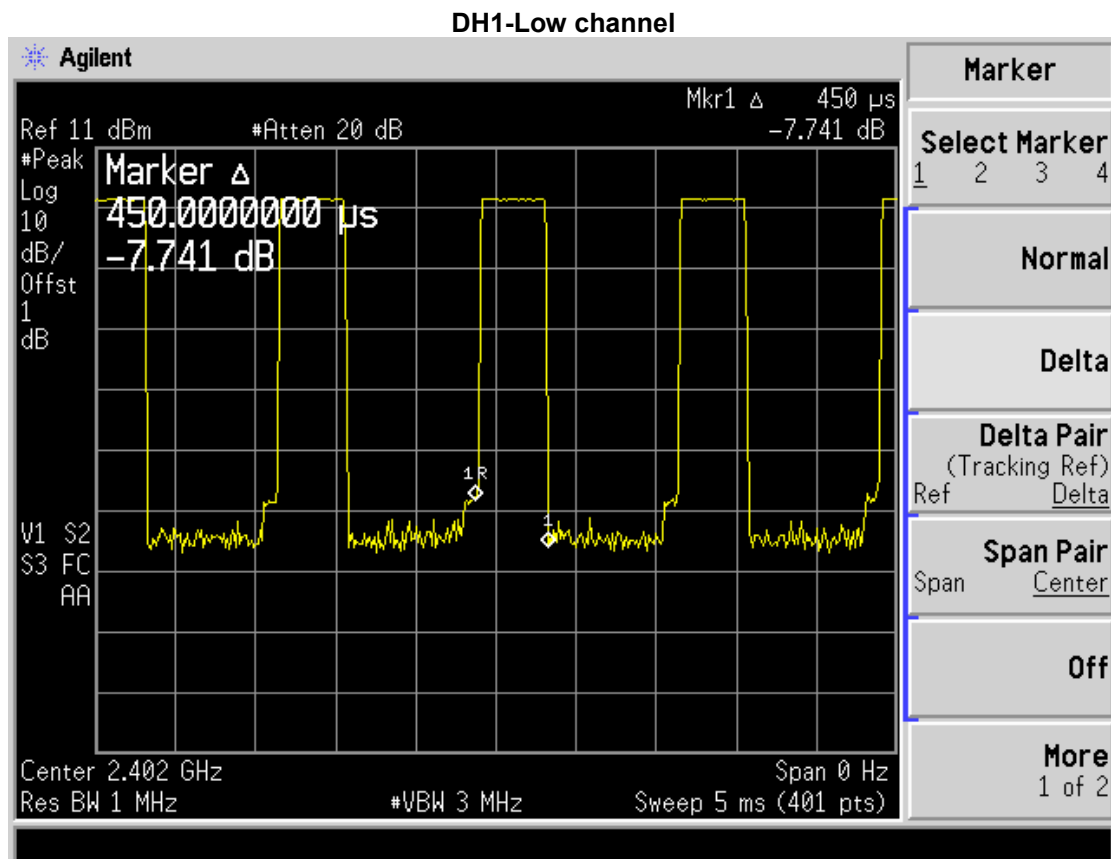
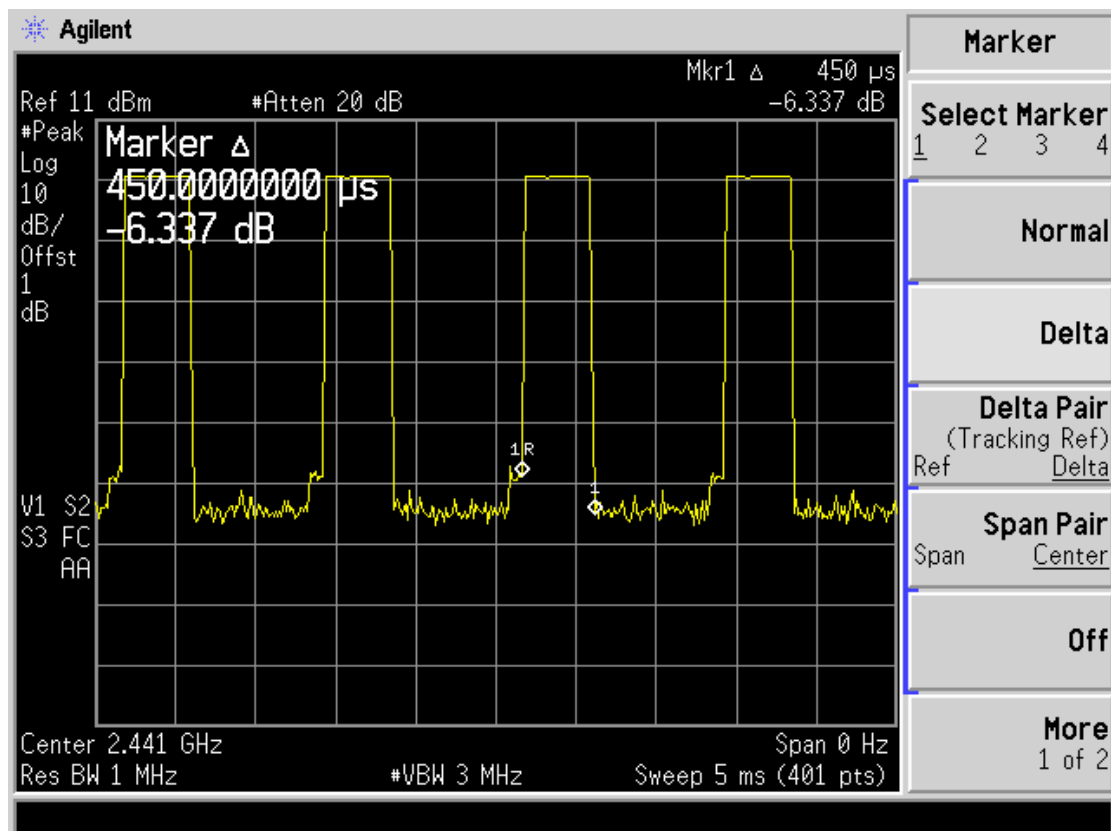
The transmitter output was connected to the spectrum analyzer through an attenuator. Set center frequency of spectrum analyzer=operating frequency with 1MHz RBW and 3MHz VBW, Span 0Hz.

LIMIT

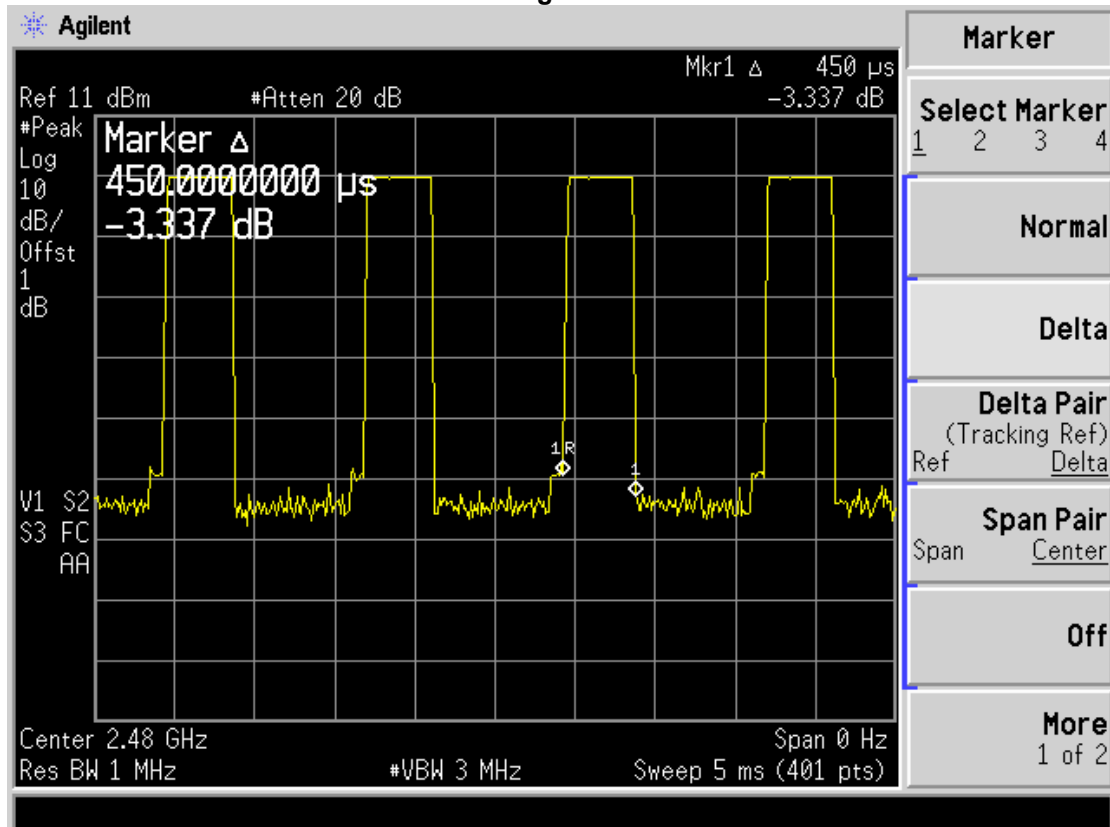
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a pe-riod of 0.4 seconds multiplied by the number of hopping channels employed.

TEST RESULTS

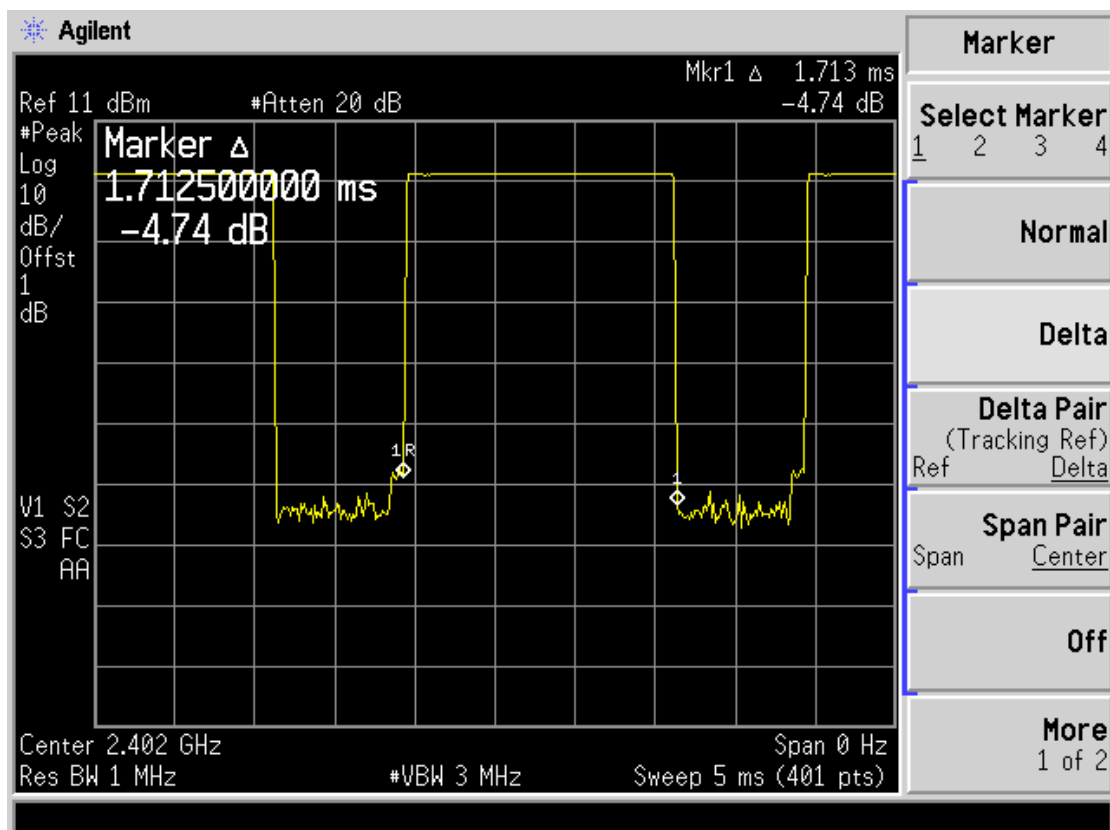
Mode	Channel	Pulse Width (ms)	Dwell Time (S)	Limit (S)	Result
DH 1	Low	0.450	0.144	0.4	Pass
	Middle	0.450	0.144	0.4	Pass
	High	0.450	0.144	0.4	Pass
	Note: Dwell time=Pulse time (ms) × (1600 ÷ 2 ÷ 79) ×31.6 Second				
DH 3	Low	1.7125	0.274	0.4	Pass
	Middle	1.7375	0.278	0.4	Pass
	High	1.7125	0.274	0.4	Pass
	Note: Dwell time=Pulse time (ms) × (1600 ÷ 4 ÷ 79) ×31.6 Second				
DH 5	Low	3.000	0.3200	0.4	Pass
	Middle	2.980	0.3179	0.4	Pass
	High	2.980	0.3179	0.4	Pass
	Note: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second				

Photos of Dwell time Measurement:**DH1-Middle channel**

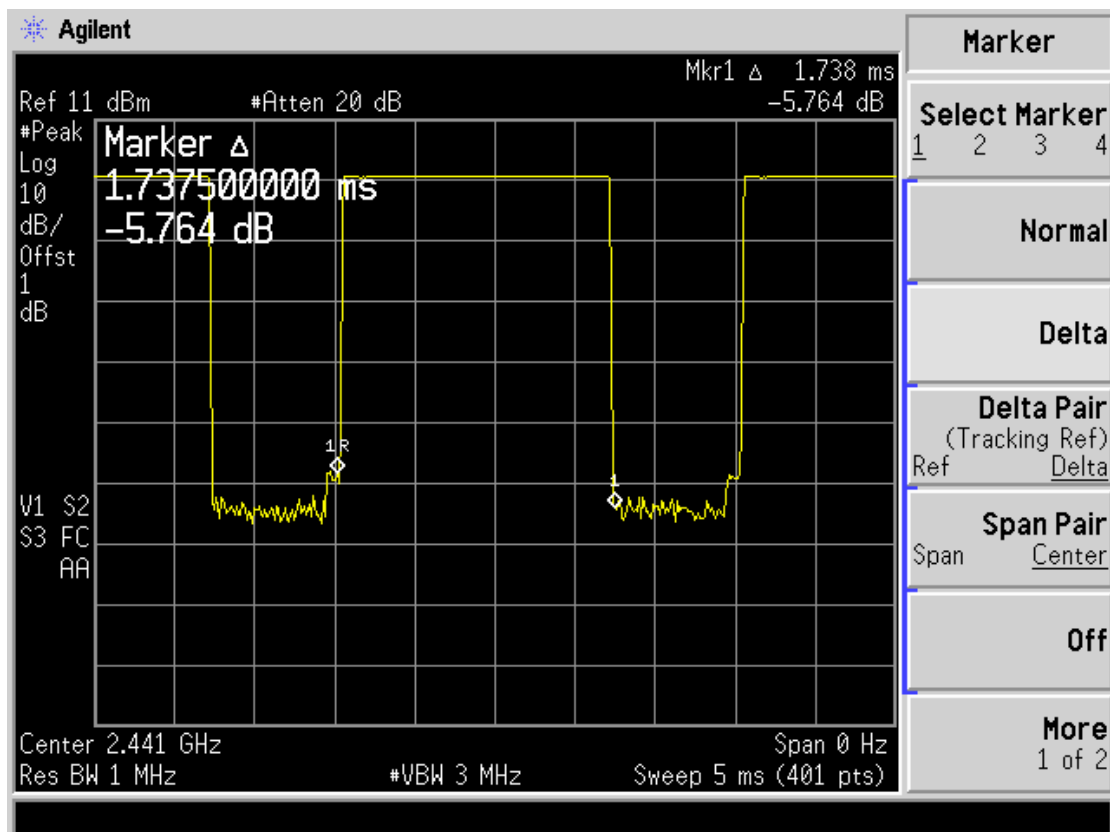
DH1-High channel



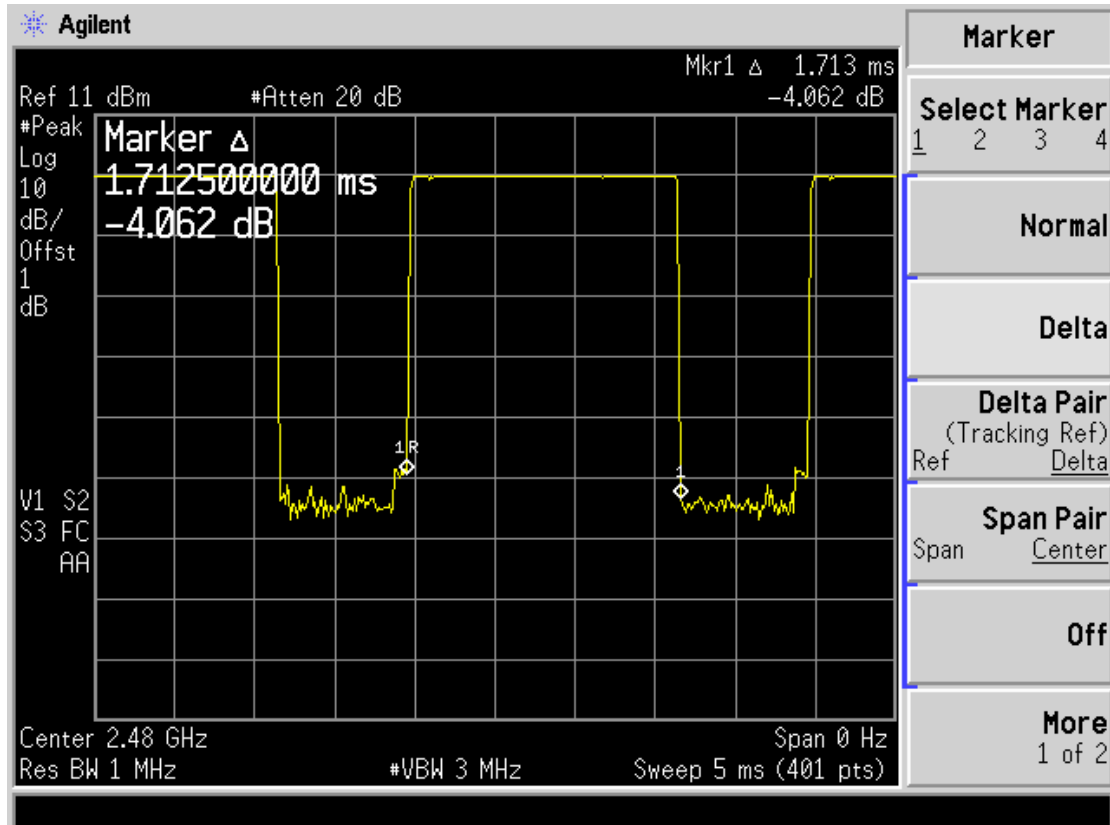
DH3-Low channel



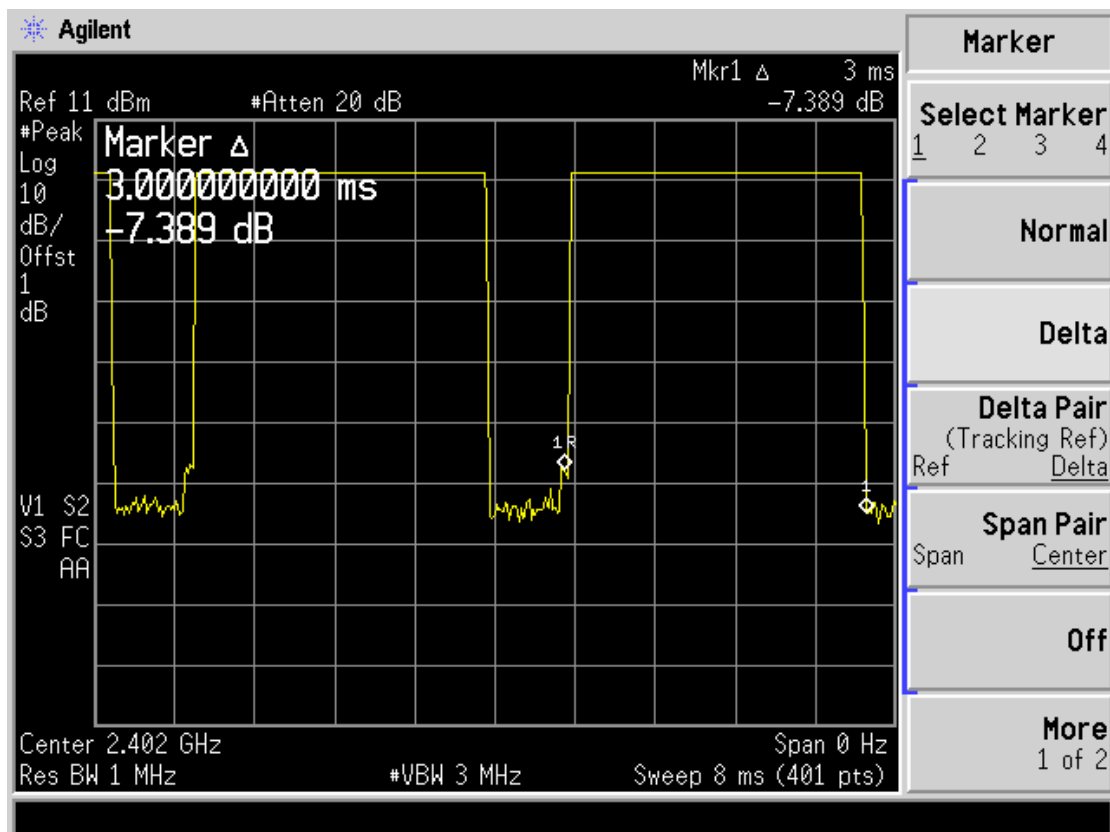
DH3-Middle channel



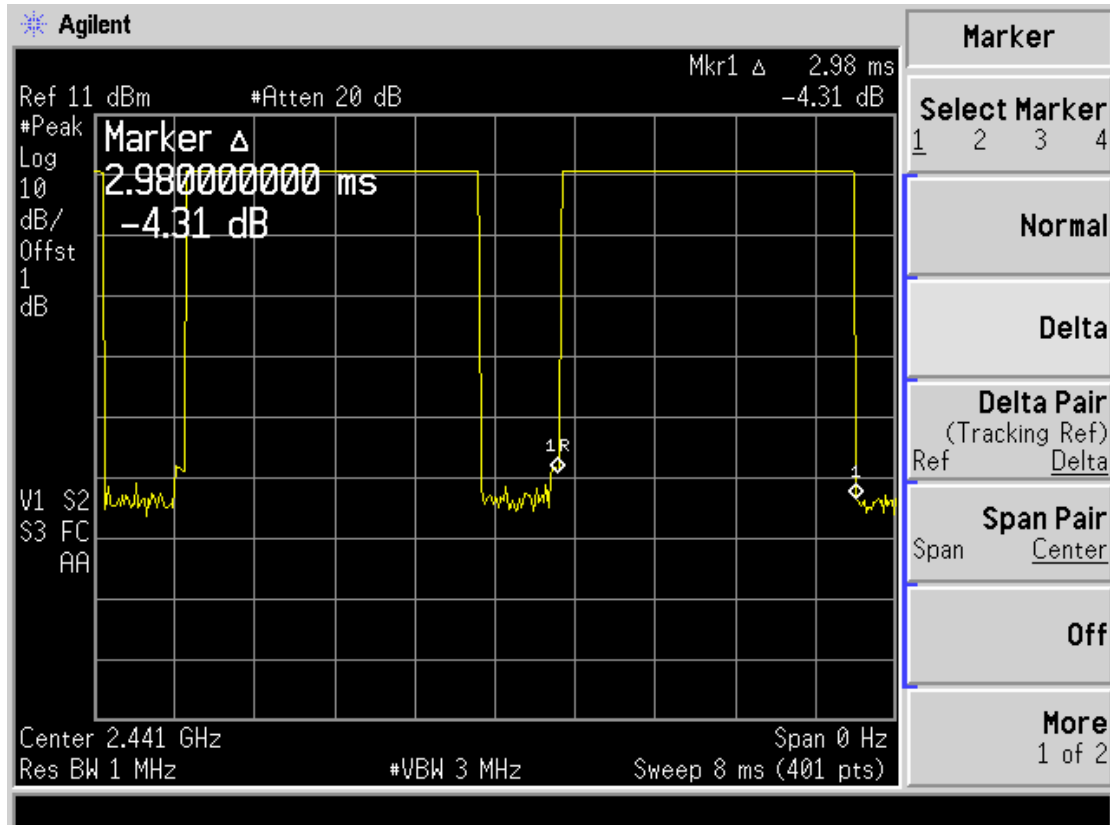
DH3-High channel

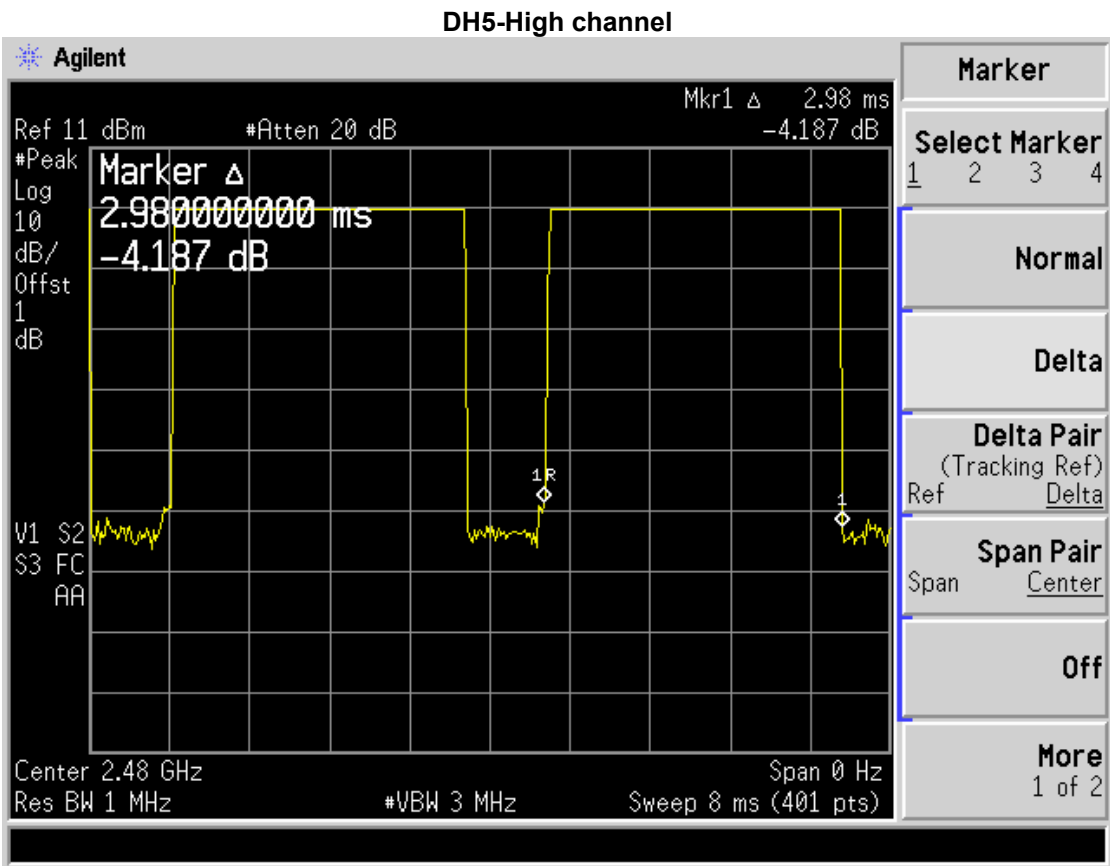


DH5-Low channel



DH5-Middle channel





4.9. 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.

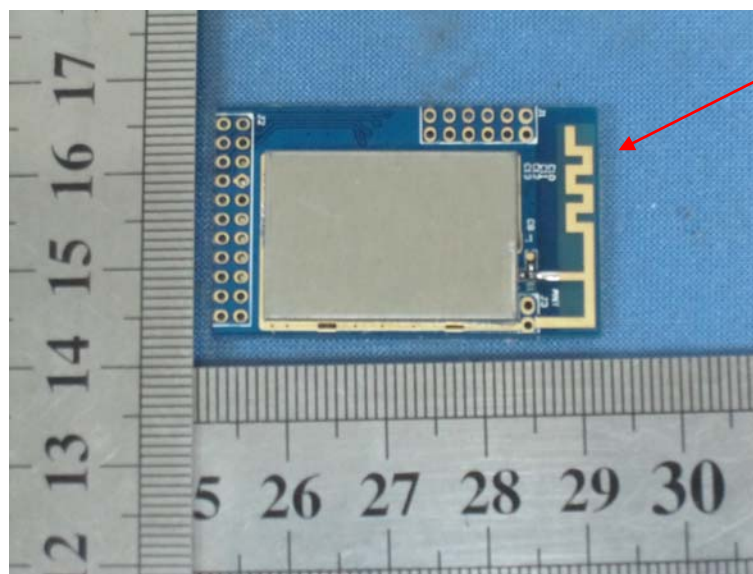
And according to FCC 47 CFR Section 15.247 (c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

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.

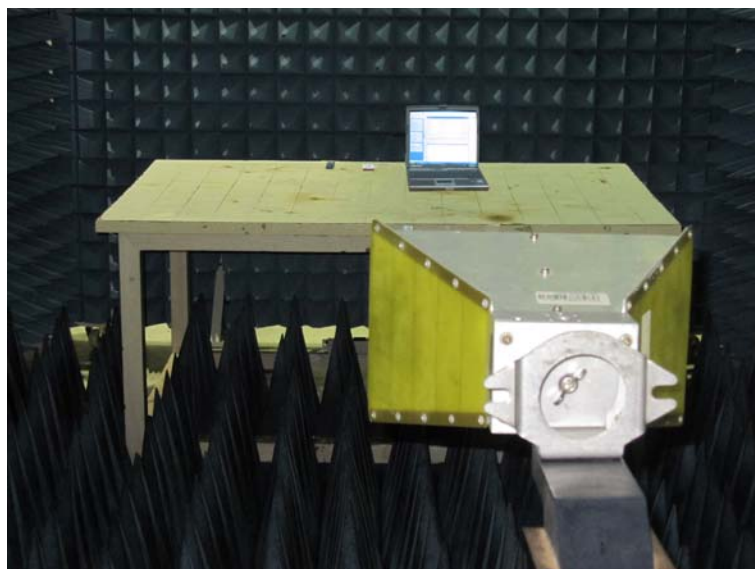
Antenna Connected Construction

The antenna used in this product is a PCB Antenna . please see the photos as following:

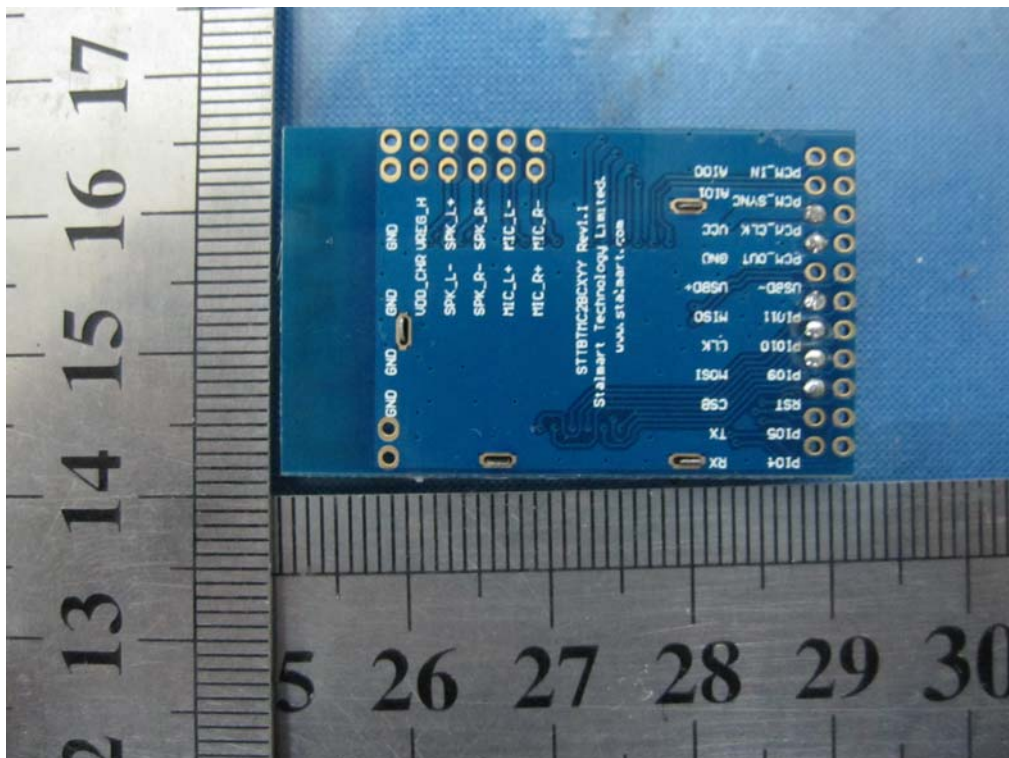
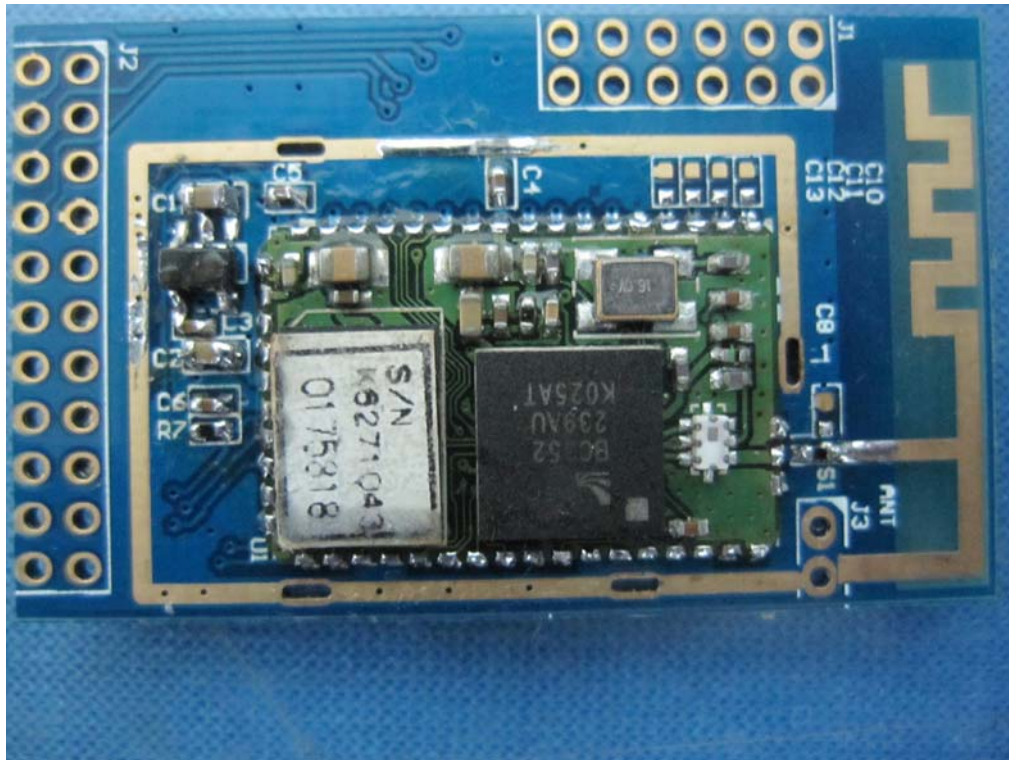


Antenna

5. Test Setup Photos of the EUT





Internal Photos

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