

# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

## INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

**Product Name:** izooca bridge  
**Brand Name:** izooca  
**Model No.:** 00638  
**Model Difference:** N/A  
**FCC ID:** 2AFGM00638  
**Report No.:** E2/2015/70012  
**Issue Date:** Aug. 05, 2015  
**FCC Rule Part:** §15.247, Cat: DTS  
**Prepared for:** Azooca Inc  
368 S. Cheryl Lane, City of Industry, CA  
91789  
SGS Taiwan Ltd.  
**Prepared by:** Electronics & Communication Laboratory  
No.2, Keji 1st Rd., Guishan District,  
Taoyuan City, Taiwan 333



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## VERIFICATION OF COMPLIANCE

**Applicant:** Azooca Inc  
368 S. Cheryl Lane, City of Industry, CA 91789

**Product Name:** izooca bridge

**Brand Name:** izooca

**Model No.:** 00638

**Model Difference:** N/A

**FCC ID:** 2AFGM00638

**Report Number:** E2/2015/70012

**Date of test:** Jul. 15, 2015 ~ Aug. 05, 2015

**Date of EUT Received:** Jul. 15, 2015

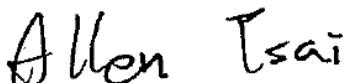
**We hereby certify that:**

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

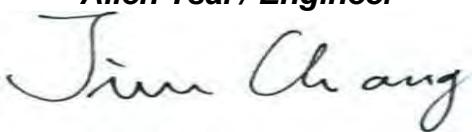
The test results of this report relate only to the tested sample identified in this report.

**Test By:****Date**

Aug. 05, 2015

**Jerry Lu / Engineer****Prepared By:****Date**

Aug. 05, 2015

**Allen Tsai / Engineer****Approved By:****Date**

Aug. 05, 2015

**Jim Chang / Asst. Manager**

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## Revision History

Report Number	Revision	Description	Issue Date
E2/2015/70012	Rev.00	Initial creation of document	Aug. 05, 2015

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## 1 GENERAL INFORMATION

### 1.1 Product Description

General:

Product Name:	izooca bridge	
Brand Name:	izooca	
Model No.:	00638	
Model Difference:	N/A	
Product SW/HW version:	V1.32 / V2R1	
Radio SW/HW version:	N/A	
Test SW Version:	N/A	
RF power setting in TEST SW:	N/A	
Micro USB Cable:	Model No.: USB AM TO MICRO B Supplier: Future Technology	
RFID Tag	Model No.: RFD0106 Supplier: Li-Hong	
Power Supply:	3.8Vdc from Rechargeable Li-polymer Battery or 5Vdc from USB Port.	
	Battery:	Model No.: ICR18650-22F, Supplier: SAMSUNG.

Bluetooth Low Energy:

Frequency Range:	2402 – 2480MHz	
Bluetooth Version:	V4.0 single mode	
Channel number:	40 channels	
Modulation type:	GFSK	
Transmit Power:	1.71 dBm	
Antenna Designation:	PCB Wire Antenna, Gain: 2.26dBi	

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## 1.2 Product Feature of Equipment Under Test

The equipment under Test (Hereafter Called: EUT) is Izooca bridge supporting Bluetooth with RFID features, and below is details of information.

Product Feature	
Product Name:	izooca bridge
Brand Name:	izooca
Model No.:	00638
Model Difference:	N/A
FCC ID:	2AFGM00638
Bluetooth Version	V4.0 single mode
RFID Specification	RFID

**Note:** The above EUT information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

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### 1.3 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247

FCC KDB 558074 D01 DTS Meas. Guidance V03r02

ANSI C63.10:2013

Note:

1. All test items have been performed and record as per the above standards.
2. The composite system is compliance with FCC Subpart B is authorized under the certification procedure.
3. The EUT was placed 1.5m height for frequency above 1GHz in accordance with ANSI C63.10:2013.

### 1.4 Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan. (TAF code 0513)

FCC Registration Numbers are: 628985

Canada Registration Number: 4620A-5.

### 1.5 Special Accessories

There are no special accessories used while test was conducted.

### 1.6 Equipment Modifications

There was no modification incorporated into the EUT.

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## 2 SYSTEM TEST CONFIGURATION

### 2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

### 2.2 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

### 2.3 Test Procedure

#### 2.3.1 Conducted Emissions

The EUT is placed on a turn table which is 0.8 m above ground plan. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz,. The CISPR Quasi-Peak and Average detector mode is employed according to §15.207. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

#### 2.3.2 Radiated Emissions

The EUT is placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plan. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

### 2.4 Measurement Results Explanation Example

#### For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

#### Note:

The spectrum analyzer offset is derived from RF cable loss 1.6dB.

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## 2.5 Configuration of Tested System

Fig. 2-1 Radiated Emission



Fig. 2-2 Conducted (Antenna Port) Configuration

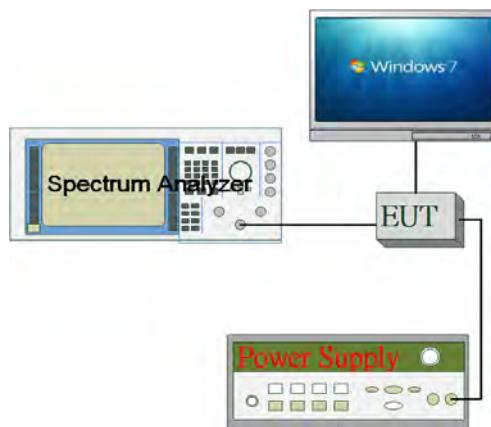


Table 2-1 Equipment Used in Tested System

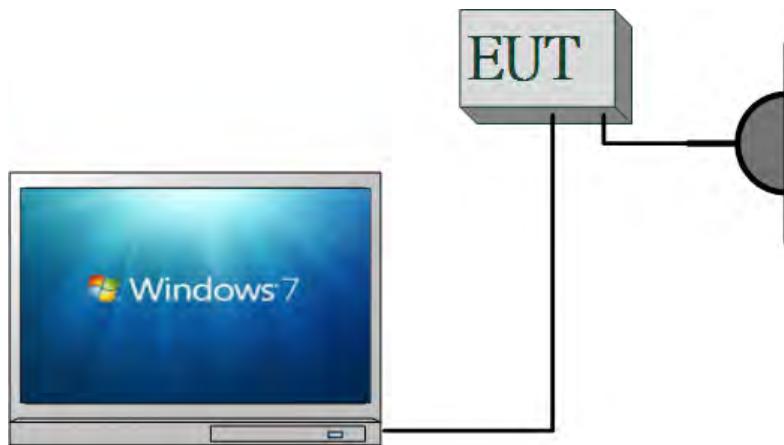
Item	Equipment	Mfr/Brand	Model/Model No.	Series No.	Data Cable	Power Cord
1.	BT Test Software	N/A	N/A	N/A	N/A	N/A
2.	Notebook	Lenovo	L430	R9-YYG88	shielded	Un-shielded
3.	DC Power supply	Agilent	E3640A	MY53140006	N/A	Un-shielded

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**Fig. 2-3 AC Power Line Conducted Emission****Table 2-2 Equipment Used in Tested System**

Item	Equipment	Mfr/Brand	Model/Model No.	Series No.	Data Cable	Power Cord
1.	BT Test Software	N/A	N/A	N/A	N/A	N/A
2.	Notebook	Lenovo	L430	R9-YYG88	shielded	Un-shielded

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### 3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Emission	Compliant
§15.247(b) (3)	Peak Output Power	Compliant
§15.247(a)(2)	6dB Bandwidth	Compliant
§15.247(d)	Conducted Band Edge and Spurious Emission	Compliant
§15.247(d)	Radiated Band Edge and Spurious Emission	Compliant
§15.247(e)	Peak Power Density	Compliant
§15.203 §15.247(b)	Antenna Requirement	Compliant

### 4 DESCRIPTION OF TEST MODES

#### 4.1 Operated in 2400 ~ 2483.5MHz Band

40 channels are provided for Bluetooth LE

CHANNEL	FREQUEN-CY	CHANNEL	FREQUEN-CY	CHANNEL	FREQUEN-CY
0	2402 MHz	14	2430 MHz	28	2458 MHz
1	2404 MHz	15	2432 MHz	29	2460 MHz
2	2406 MHz	16	2434 MHz	30	2462 MHz
3	2408 MHz	17	2436 MHz	31	2464 MHz
4	2410 MHz	18	2438 MHz	32	2466 MHz
5	2412 MHz	19	2440 MHz	33	2468 MHz
6	2414 MHz	20	2442 MHz	34	2470 MHz
7	2416MHz	21	2444 MHz	35	2472 MHz
8	2418 MHz	22	2446 MHz	36	2474 MHz
9	2420 MHz	23	2448 MHz	37	2476 MHz
10	2422 MHz	24	2450 MHz	38	2478 MHz
11	2424 MHz	25	2452 MHz	39	2480 MHz
12	2426 MHz	26	2454 MHz		
13	2428 MHz	27	2456 MHz		

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## 4.2 The Worst Test Modes and Channel Details

1. The EUT has been tested under operating condition.
2. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

### RADIATED EMISSION TEST:

RADIATED EMISSION TEST (BELOW 1 GHz)					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
Bluetooth LE	0 to 39	0,20,39	GFSK	1.0	MAIN
RADIATED EMISSION TEST (ABOVE 1 GHz)					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
Bluetooth LE	0 to 39	0,20,39	GFSK	1.0	MAIN

#### Note:

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for Bluetooth LE Transmitter for channel Low, Mid and High, the worst case E2 position was reported.

### ANTENNA PORT CONDUCTED MEASUREMENT:

CONDUCTED TEST					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
Bluetooth LE	0 to 39	0,20,39	GFSK	1.0	MAIN

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## 5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
Peak Output Power	+/- 0.84 dB
6dB Bandwidth	+/- 51.33 Hz
100 kHz Bandwidth Of Frequency Band Edges	+/- 0.84 dB
Peak Power Density	+/- 1.3 dB
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, AC= +/- 0.2%

Radiated Spurious Emission:

Measurement uncertainty (Polarization : <b>Vertical</b> )	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

Measurement uncertainty (Polarization : <b>Horizontal</b> )	30MHz - 167MHz: +/- 4.22dB
	167MHz -500MHz: +/- 3.44dB
	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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## 6 CONDUCTED EMISSION TEST

### 6.1 Standard Applicable:

According to §15.207, frequency range within 150kHz to 30MHz shall not exceed the Limit table as below.

Frequency range MHz	Limits dB(uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

**Note**

- 1.The lower limit shall apply at the transition frequencies
- 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

### 6.2 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESU 40	100363	04/09/2015	04/08/2016
Coaxial Cables	N/A	N30N30-1042-150 cm	N/A	01/06/2015	01/07/2016
LISN	Schwarzbeck	NSLK 8127	8127-648	06/09/2015	06/08/2016
LISN	Rolf-Heine	NNB-2/16Z	99012	03/04/2015	03/03/2016
Test Software	Farad	EZ-EMC	Ver. SGS-03A2	N.C.R.	N.C.R.

### 6.3 EUT Setup:

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10:2013.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
3. The LISN was connected with 120Vac/60Hz power source.

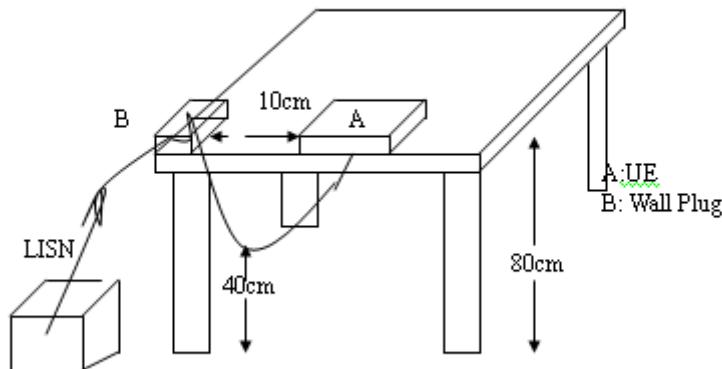
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## 6.4 Test SET-UP (Block Diagram of Configuration)



## 6.5 Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plan.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all phases of power being supplied by given UE are completed

## 6.6 Measurement Result:

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

Note: Refer to next page for measurement data and plots.

Note2: The \* reveals the worst-case results that closet to the limit

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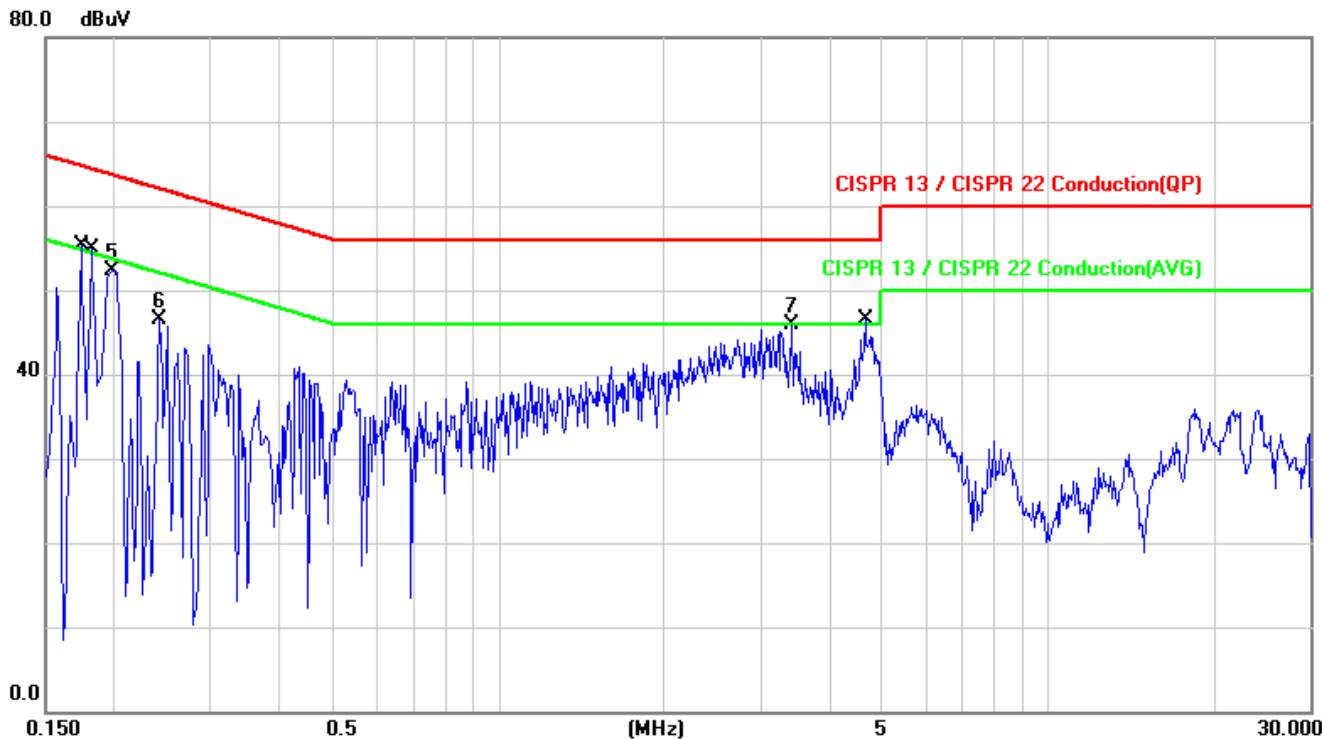
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## AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation mode			Test Date:	Jun. 31, 2015
Temperature:	25	Humidity:		Test By:	Ashton
Model No.:	N/A			Phase:	L1



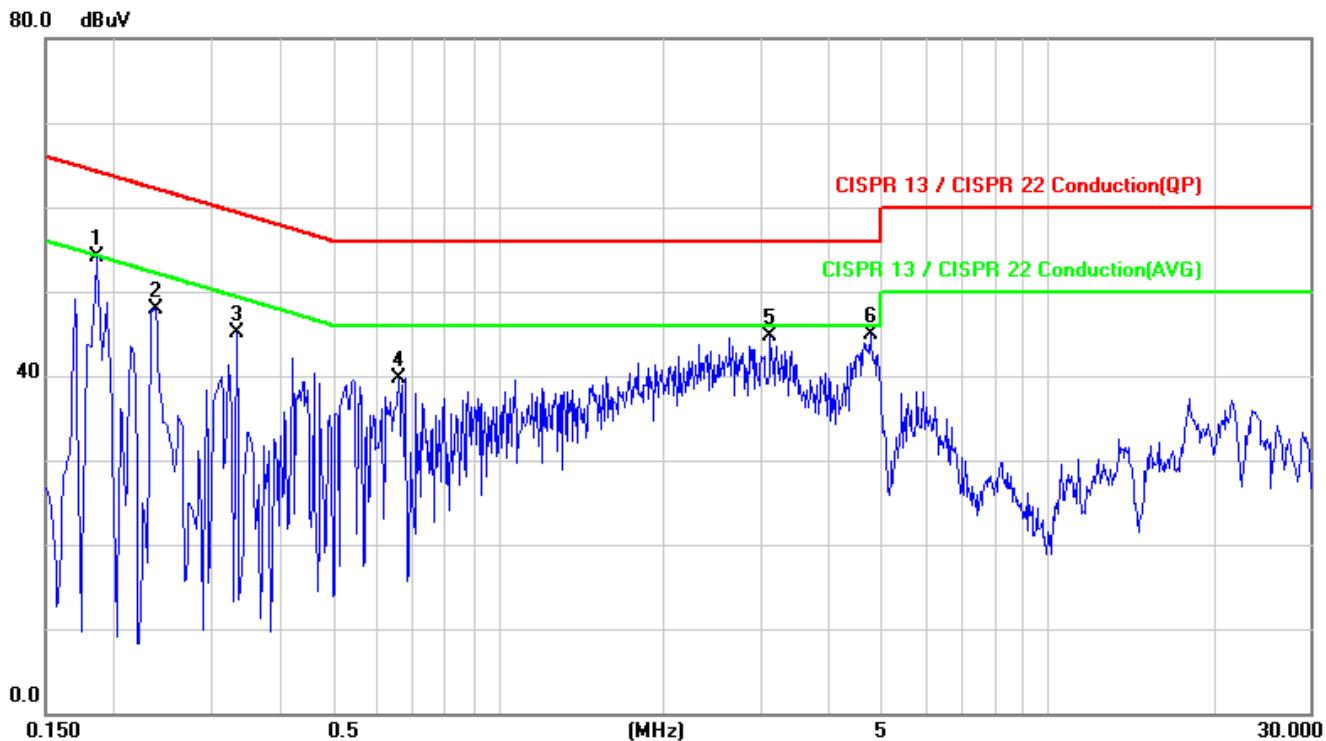
No.	Mk.	Freq. (MHz)	Reading dBuV	Factor (dB)	Measurement dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1740	51.40	0.08	51.48	64.77	-13.29	QP	
2		0.1740	33.20	0.08	33.28	54.77	-21.49	AVG	
3		0.1820	52.10	0.08	52.18	64.39	-12.21	QP	
4		0.1820	38.10	0.08	38.18	54.39	-16.21	AVG	
5		0.1980	52.30	0.07	52.37	63.69	-11.32	peak	
6		0.2420	46.47	0.09	46.56	62.03	-15.47	peak	
7	*	3.4300	45.30	0.60	45.90	56.00	-10.10	peak	
8		4.6660	40.30	0.62	40.92	56.00	-15.08	QP	
9		4.6660	32.40	0.62	33.02	46.00	-12.98	AVG	

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Operation Mode:	Operation mode			Test Date:	Jun. 31, 2015
Temperature:	25			Humidity:	56 %
Model No.:	N/A			Test By:	Ashton
				Phase:	N



No.	Mk.	Freq. (MHz)	Reading dBuV	Factor (dB)	Measurement dBuV	Limit dBuV	Over (dB)	Detector	Comment
1	*	0.1860	53.90	0.13	54.03	64.21	-10.18	peak	
2		0.2380	47.68	0.15	47.83	62.17	-14.34	peak	
3		0.3340	44.99	0.19	45.18	59.35	-14.17	peak	
4		0.6580	39.43	0.33	39.76	56.00	-16.24	peak	
5		3.1340	43.99	0.65	44.64	56.00	-11.36	peak	
6		4.7540	44.16	0.67	44.83	56.00	-11.17	peak	

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## 7 PEAK OUTPUT POWER MEASUREMENT

### 7.1 Standard Applicable:

For systems using digital modulation in the 2400-2483.5 MHz bands, the limit for peak output power is 1Watt.

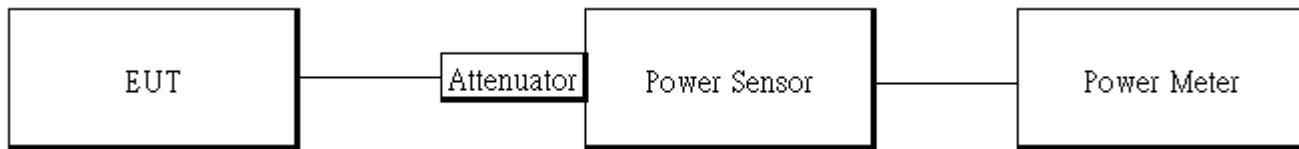
If the transmitting antenna of directional gain greater than 6dBi are used the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the Antenna exceeds 6dBi.

In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of Antenna exceeds 6dBi.

### 7.2 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY53400256	10/15/2014	10/14/2015
DC Block	PASTERNACK	PE8210	RF29	12/19/2014	12/18/2015
Splitter	RF-LAMBAD	RFLT2W1G18 G	RF35	12/19/2014	12/18/2015
Attenuator	WOKEN	218FS-10	RF23	12/19/2014	12/18/2015
DC Power Supply	Agilent	E3640A	MY53140006	05/04/2015	05/03/2016

### 7.3 Test Set-up:



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## 7.4 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance V03r02.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter.

### Power Meter:

It is used as the auxiliary test equipment to conduct the output power measurement.

4. Record the max. Reading as observed from Power Meter.
5. Repeat above procedures until all test default channel measured was complete.

### Duty Factor:

	Duty Cycle	Duty Factor (dB)
Bluetooth LE	100%	0



Duty Cycle Factor:  $10 * \log (1/1) = 0$

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## 7.5 Measurement Result:

### BT4.0 mode:

CH	Frequency (MHz)	Peak Power Out- put(dBm)	Required Limit
0	2402	1.71	1 Watt = 30 dBm
20	2442	1.42	1 Watt = 30 dBm
39	2480	1.07	1 Watt = 30 dBm

Max. Rated Avg. Power + Max. Tolerance ( $\pm 0.23$ dBm): 0.23 dBm

CH	Frequency (MHz)	Average Power Output(dBm)	Required Limit
0	2402	0.23	1 Watt = 30 dBm
20	2442	-0.37	1 Watt = 30 dBm
39	2480	-0.74	1 Watt = 30 dBm

\*Note: Measured by power meter, **as cable loss+ Duty cycle factor that offsets on the power meter**

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## 8 6dB BANDWIDTH

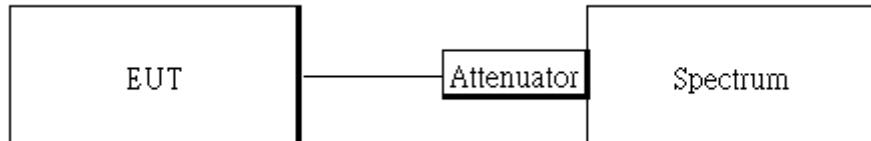
### 8.1 Standard Applicable

The minimum 6 dB bandwidth shall be at least 500 kHz .

### 8.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY53400256	10/15/2014	10/14/2015
DC Block	PASTERNACK	PE8210	RF29	12/19/2014	12/18/2015
Splitter	RF-LAMBAD	RFLT2W1G18 G	RF35	12/19/2014	12/18/2015
Attenuator	WOKEN	218FS-10	RF23	12/19/2014	12/18/2015
DC Power Supply	Agilent	E3640A	MY53140006	05/04/2015	05/03/2016

### 8.3 Test Set-up:



### 8.4 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance V03r02.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
4. Set the spectrum analyzer as RBW = 100 kHz, VBW = 3\*RBW, Span = 5MHz, Detector=Peak, Sweep=auto.
5. Mark the peak frequency and -6dB (upper and lower) frequency.
6. Repeat above procedures until all test default channel measured were complete.

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## 8.5 Measurement Result:

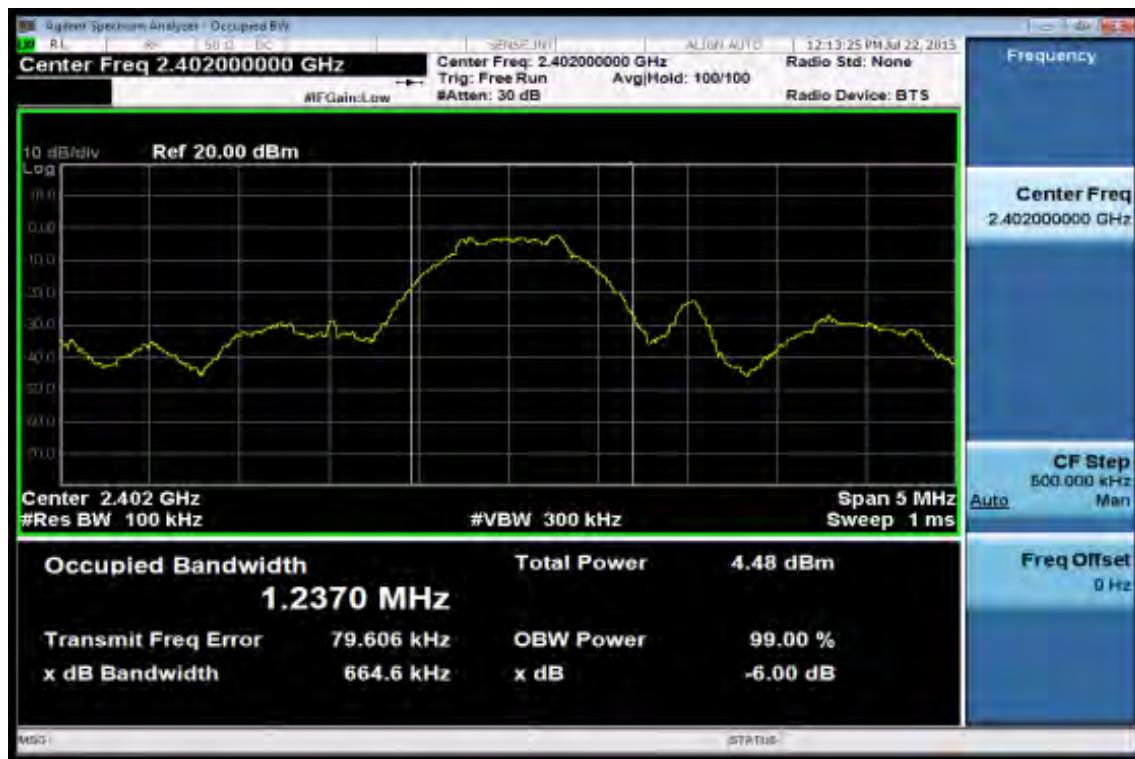
### BT4.0 mode

Frequency (MHz)	6dB Band-width (kHz)	Limit (kHz)	Result
2402	664.6	> 500	PASS
2442	681.0	> 500	PASS
2480	677.2	> 500	PASS

Note: Refer to next page for plots.

### BT4.0 mode

#### 6dB Band Width Test Data CH-Low

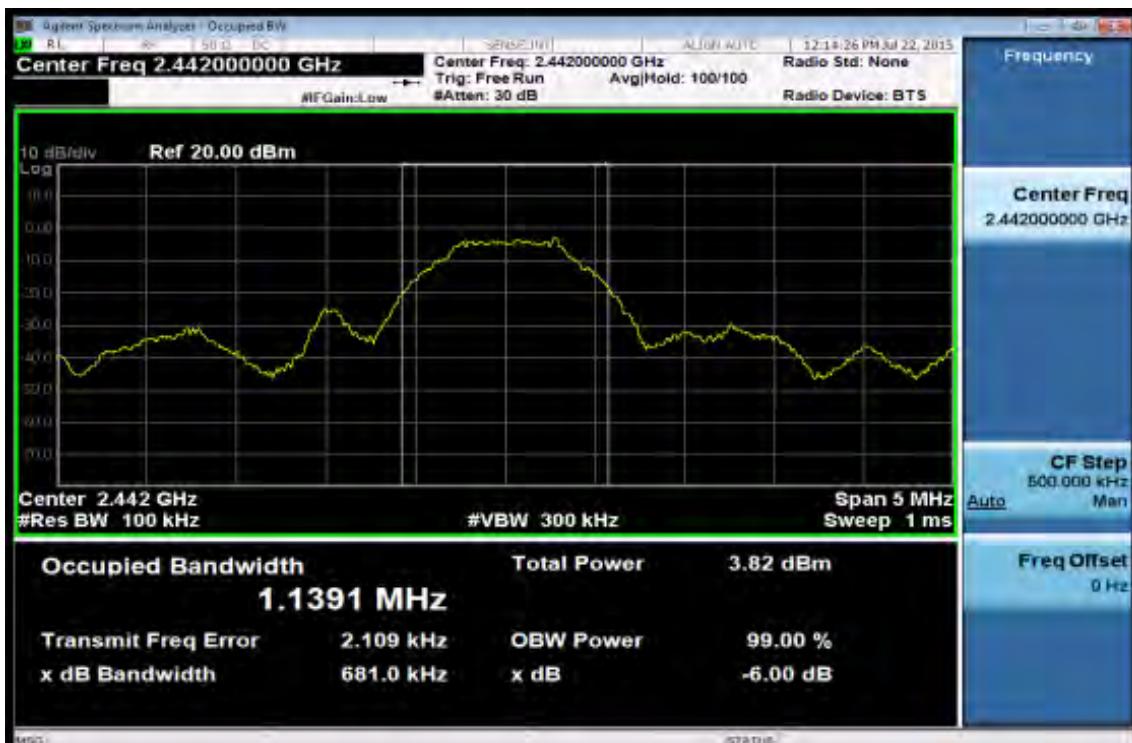


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## 6dB Band Width Test Data CH-Mid



## 6dB Band Width Test Data CH-High



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## 9 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

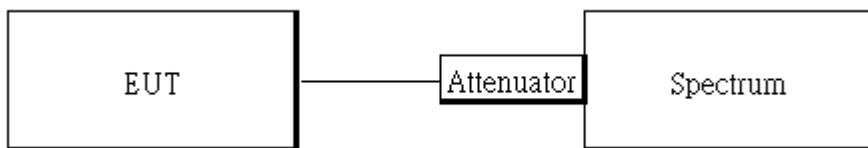
### 9.1 Standard Applicable

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. 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).

### 9.2 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY53400256	10/15/2014	10/14/2015
DC Block	PASTERNACK	PE8210	RF29	12/19/2014	12/18/2015
Splitter	RF-LAMBAD	RFLT2W1G18 G	RF35	12/19/2014	12/18/2015
Attenuator	WOKEN	218FS-10	RF23	12/19/2014	12/18/2015
DC Power Supply	Agilent	E3640A	MY53140006	05/04/2015	05/03/2016

### 9.3 Test SET-UP:



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### 9.3.1 Measurement Procedure

#### Conducted Band Edge:

1. To connect Antenna Port of EUT to Spectrum.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance V03r02.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
4. Set start to edge frequency, and stop frequency of spectrum analyzer so as to encompass the spectrum to be examined.
5. Set the spectrum analyzer as RBW=100kHz, VBW=300kHz, Detector = Peak, Sweep = auto
6. Mark the highest reading of the emission as the reference level measurement.
7. Set DL as the limit = reading on marker 1 – 20dBm
8. Marker on frequency, 2.3999GHz and 2.4836GHz, and examine shall 100 kHz immediately outside the authorized (2400~2483.5) be attenuated by 20dB at least relative to the maximum emission of power.
9. Repeat above procedures until all default test channel (low, middle, and high) was complete.

#### Conducted Spurious Emission:

1. To connect Antenna Port of EUT to Spectrum.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance V03r02.
3. Set RBW = 100K & VBW  $\geq$ 300K, Detector =Peak, Sweep = Auto
4. Allow trace to fully stabilize.
5. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
6. Repeat above procedures until all default test channel measured were complete.

### 9.3.2 Measurement Result

Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

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## BT4.0 mode

## Band Edges Test Data CH-Low



## Band Edges Test Data CH-High



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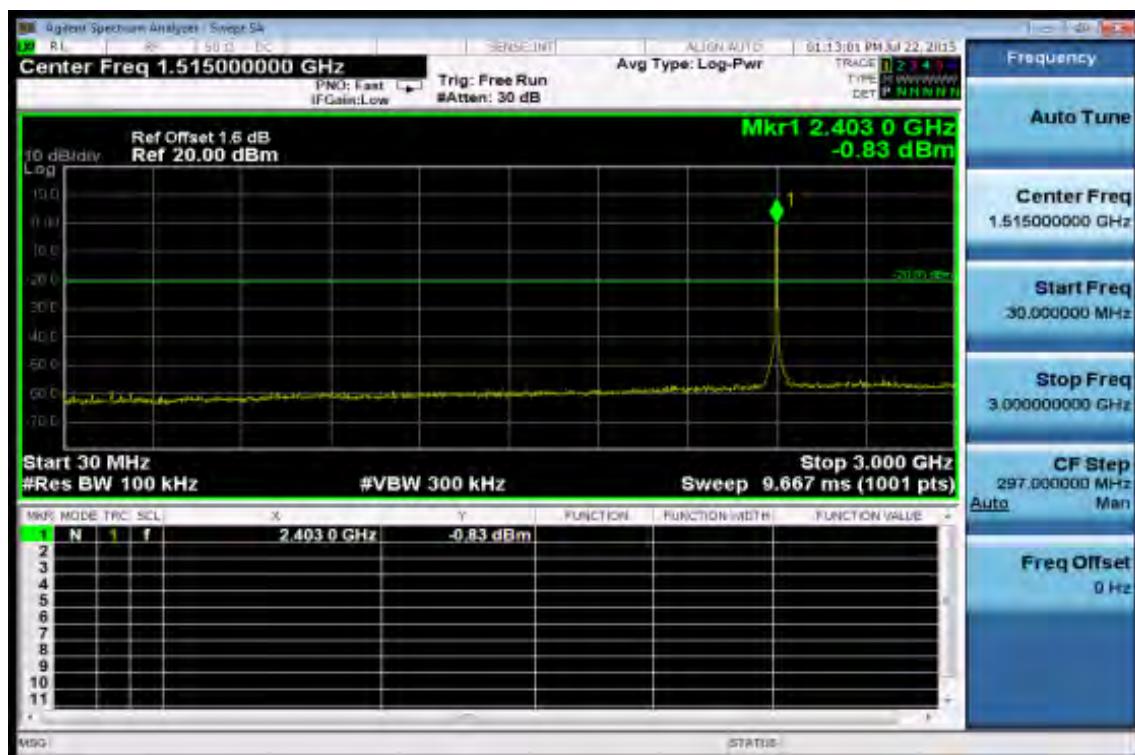
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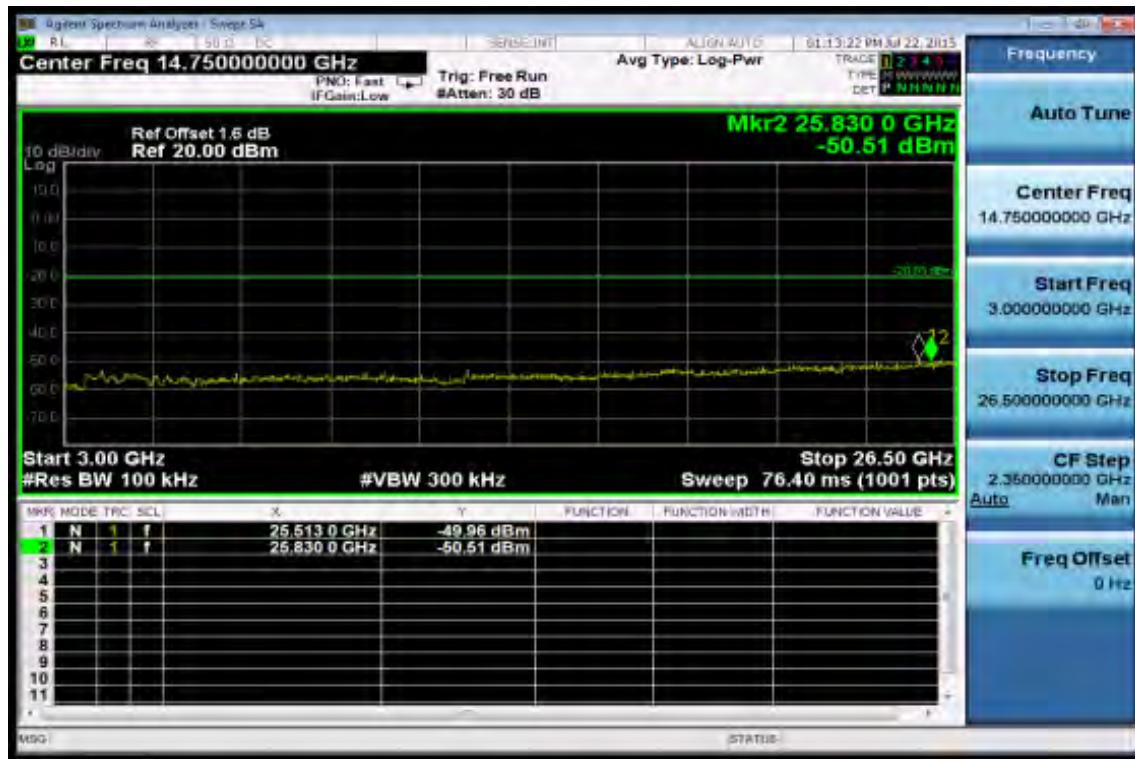
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## Conducted Spurious Emission Measurement Result

### CH-Low 30MHz – 3GHz



### CH-Low 3GHz – 26.5GHz



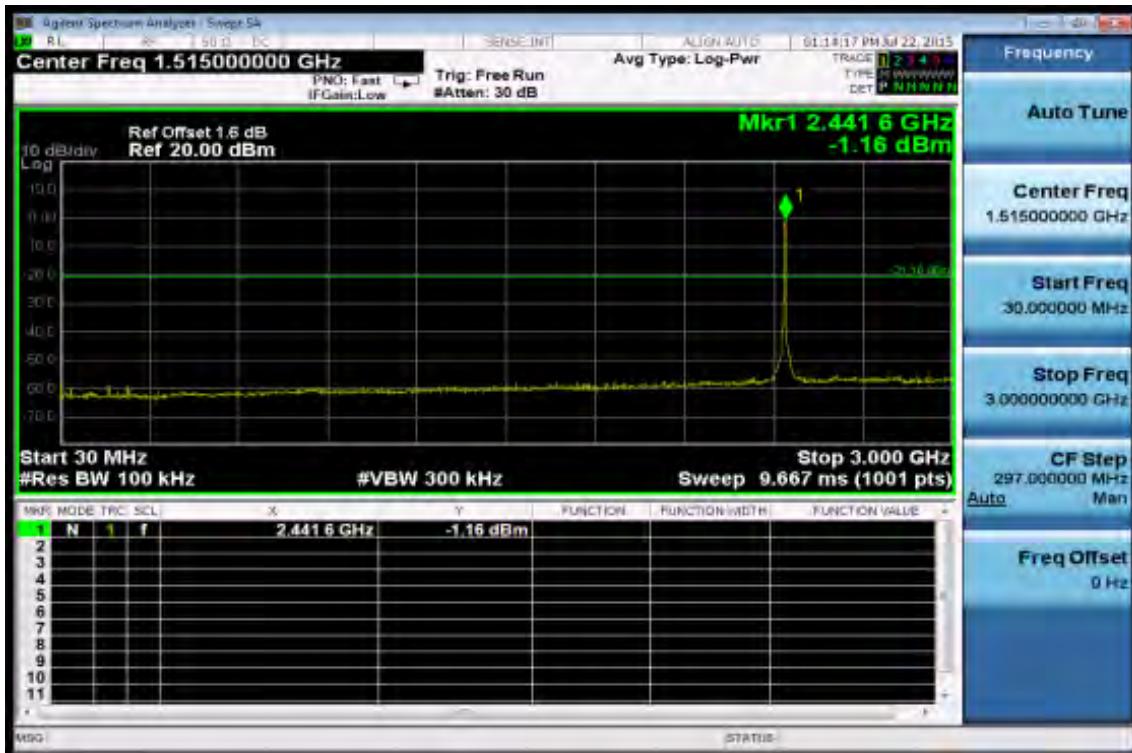
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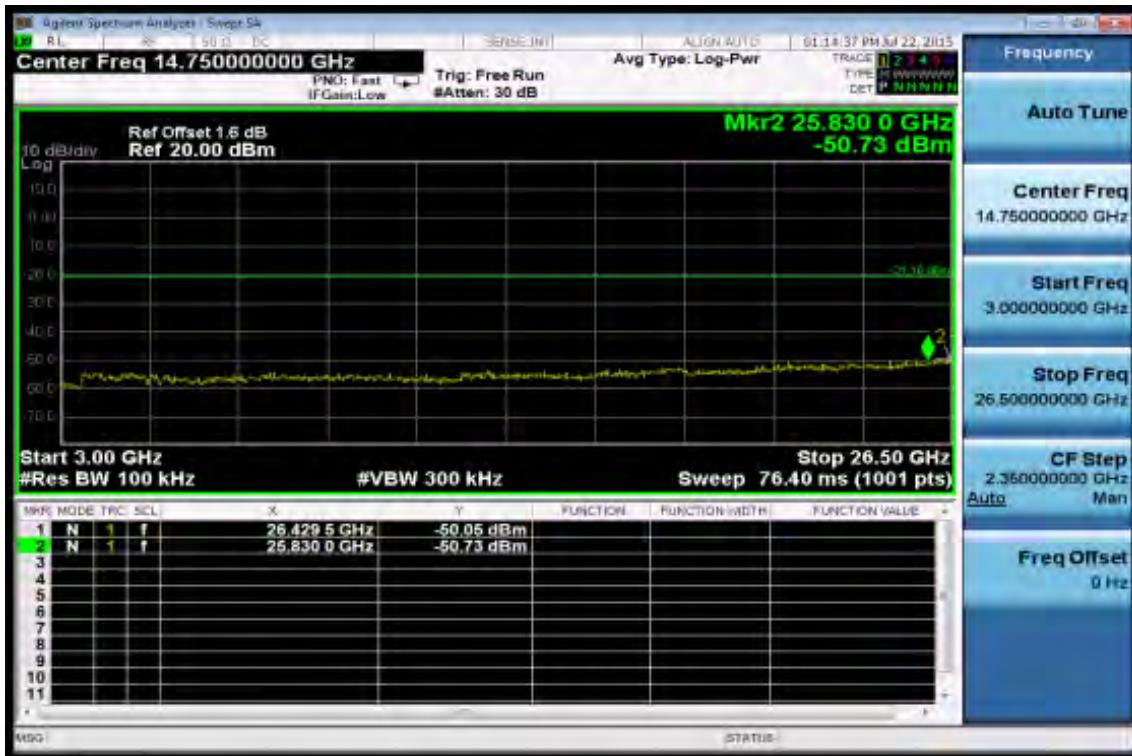
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## CH-Mid 30MHz – 3GHz



## CH-Mid 3GHz – 26.5GHz



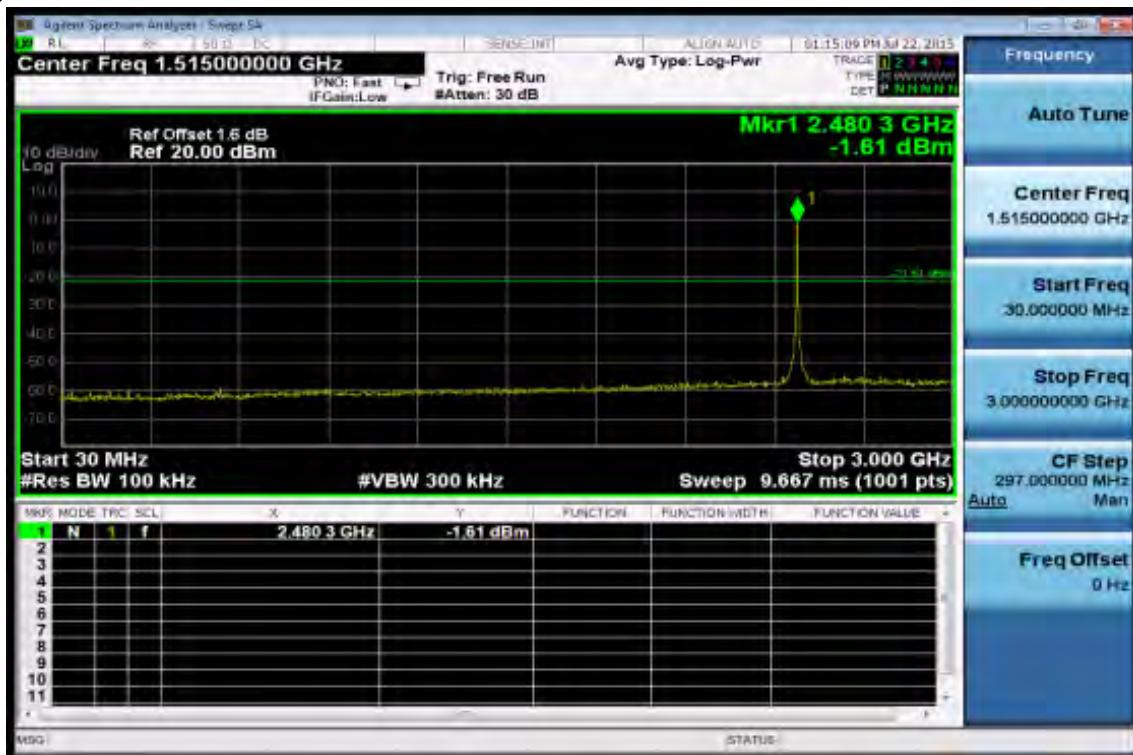
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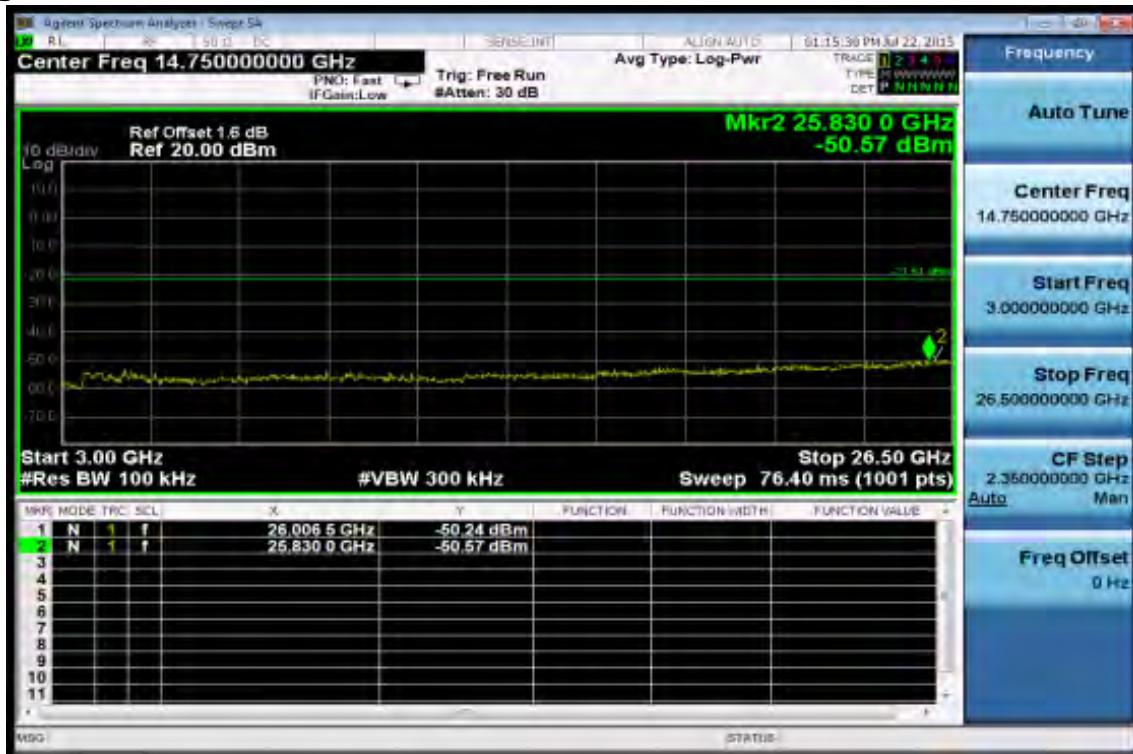
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## CH-High 30MHz – 3GHz



## CH- High 3GHz – 26.5GHz



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## 10 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

### 10.1 Standard Applicable

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. In addition, radiated emissions which fall in the restricted bands must also comply with the §15.209 limit as below.

And according to §15.33(a) (1), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

Frequency (MHz)	Field strength (microvolts/meter)	Distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

**Note:**

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dB $\mu$ V/m) = 20 log Emission level (dB $\mu$ V/m)

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## 10.2 Measurement Equipment Used

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESU 40	100363	04/09/2015	04/08/2016
Loop Antenna	ETS-Lindgren	6502	00143303	12/09/2014	12/08/2015
Broadband Antenna	TESEQ	CBL 6112D	35240	12/05/2014	12/04/2015
Horn Antenna	ETS-Lindgren	3117	00143272	12/08/2014	12/07/2015
Horn Antenna	ETS-Lindgren	3160-09	00117911	11/13/2014	11/12/2015
Horn Antenna	ETS-Lindgren	3160-10	00117783	11/13/2014	11/12/2015
Pre Amplifier	EMC Instruments	EMC330	980096	12/19/2014	12/18/2015
Pre Amplifier	EMC Instruments	EMC0011830	980199	12/19/2014	12/18/2015
Pre Amplifier	R&S	SCU-18	10204	12/19/2014	12/18/2015
Pre Amplifier	R&S	SCU-26	100780	12/19/2014	12/18/2015
Coaxial Cable	Huber+Suhner	RG 214/U	966Rx 9K-30M	12/19/2014	12/18/2015
Coaxial Cable	Huber+Suhner	RG 214/U SUCOFLEX 104	966Rx 30M-3G	12/19/2014	12/18/2015
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Rx 1G-18G	12/19/2014	12/18/2015
Coaxial Cable	Huber+Suhner	mini 141-12 SUCOFLEX 104	966Rx 18G-40G	12/19/2014	12/18/2015
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Tx 30M-18G	12/19/2014	12/18/2015
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	966Tx 18G-40G	12/19/2014	12/18/2015
Attenuator	WOKEN	218FS-10	RF27	12/19/2014	12/18/2015
Site NSA	SGS	966 Cham- ber C	SAC-C	03/04/2015	03/03/2016
Site VSWR	SGS	966 Cham- ber C	SAC-C	03/04/2015	03/03/2016
DC Power Supply	HOLA	DP-3003	D7070035	05/04/2015	05/03/2016
Controller	MF	MF-7802	N/A	N.C.R.	N.C.R.
Antenna Master	MF	N/A	N/A	N.C.R.	N.C.R.
Turn Table	MF	N/A	N/A	N.C.R.	N.C.R.
Test Software	World-Pallas	Dr. E	V 3.0 Lite	N.C.R.	N.C.R.

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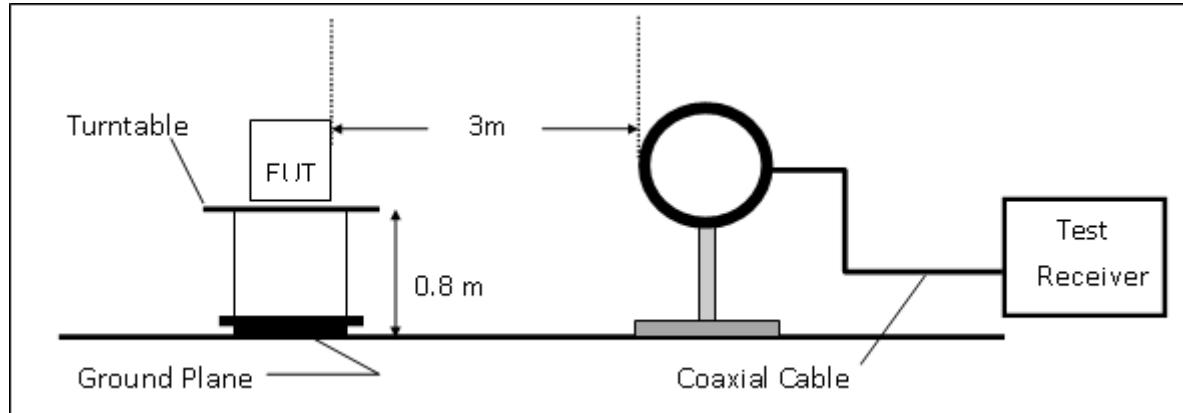
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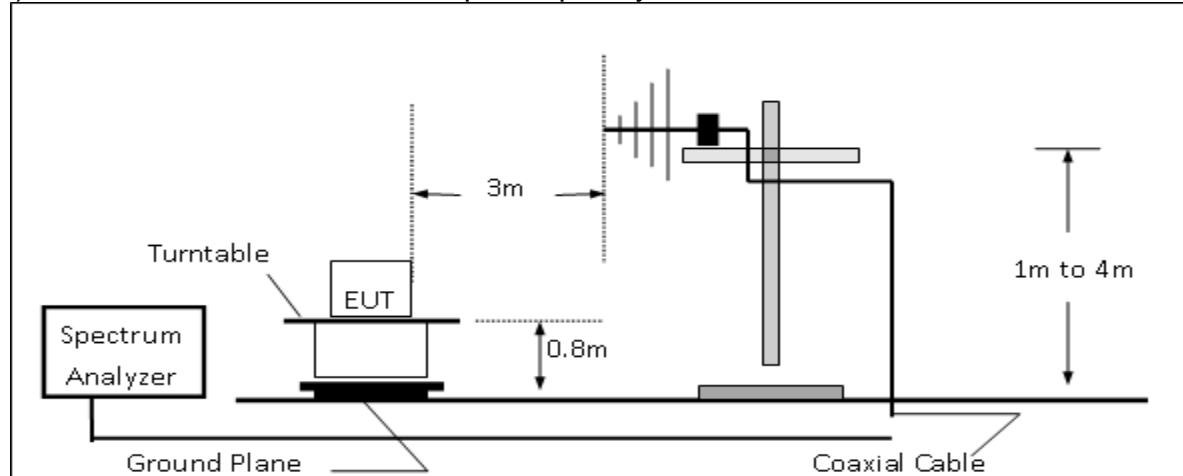
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### 10.3 Test SET-UP

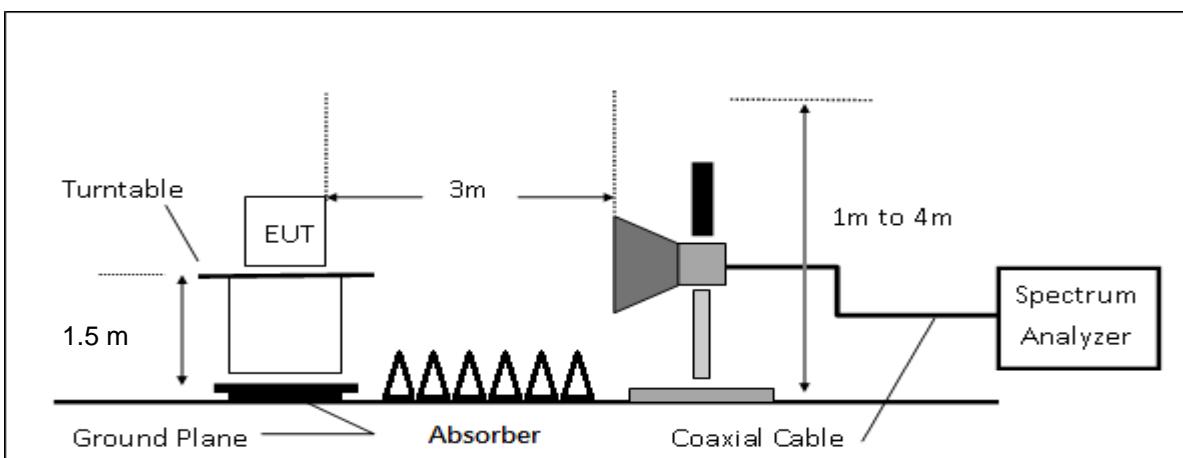
#### (A) Radiated Emission Test Set-UP Frequency Below 30MHz.



#### (B) Radiated Emission Test Set-UP, Frequency from 30MHz to 1000MHz



#### (C) Radiated Emission Test Set-UP Frequency Over 1 GHz



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## 10.4 Measurement Procedure

1. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance V03r02.
2. The EUT was placed on a turn table with 0.8m for frequency < 1GHz and 0.8m for frequency > 1GHz above ground plan.
3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
5. Set the spectrum analyzer as RBW=120 kHz and VBW=300 kHz for Peak Detector (PK) and Quasi-peak (QP) at frequency below 1 GHz.
6. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Peak Detector at frequency above 1 GHz.
7. Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW  $\geq$  1/T (Duty cycle < 98%) for Average Detector at frequency above 1 GHz.
8. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.
9. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
10. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. On spectrum, change spectrum mode in linear display mode, and reduce VBW = 10Hz if average reading is measured.
11. Repeat above procedures until all default test channel measured were complete.

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## 10.5 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	

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)

### Note :

“F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

## 10.6 Test Results of Radiated Spurious Emissions from 9 kHz to 30 MHz

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit per 15.31(o) was not reported.

## 10.7 Measurement Result:

Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

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**Radiated Band Edge Measurement Result (BT4.0 mode)**

Operation Band :BT4.0 Test Date :2015-08-03  
 Fundamental Frequency :2402 MHz Temp./Humi. : 26.5deg\_C/50RH  
 Operation Mode :Band Edge LOW Engineer :Vito  
 EUT Pol. :E2 Plan Measurement Antenna Pol. :VERTICAL

Freq.	Note	Detector	Spectrum		Factor	Actual	Limit	Margin
			Mode	Reading Level				
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB	
2390.00	E	Peak	44.16	6.62	50.77	74	-23.23	
2390.00	E	Average	33.52	6.62	40.14	54	-13.86	

Operation Band :BT4.0 Test Date :2015-06-15  
 Fundamental Frequency :2402 MHz Temp./Humi. :22.7 deg\_C /57 RH  
 Operation Mode :Band Edge LOW Engineer :Vito  
 EUT Pol. :E2 Plan Measurement Antenna Pol. :HORIZONTAL

Freq.	Note	Detector	Spectrum		Factor	Actual	Limit	Margin
			Mode	Reading Level				
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB	
2390.00	E	Peak	43.58	6.62	50.20	74	-23.80	
2390.00	E	Average	33.60	6.62	40.22	54	-13.78	

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Operation Band :BT4.0 Test Date :2015-06-15  
 Fundamental Frequency :2480 MHz Temp./Humi. :22.7 deg\_C /57 RH  
 Operation Mode : Band Edge HIGH Engineer :Vito  
 EUT Pol. :E2 Plan Measurement Antenna Pol. :VERTICAL

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level		Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
			Peak	Average				
2483.50	E	Peak	55.45	6.96	62.41	74	-11.59	
2483.50	E	Average	44.97	6.96	51.93	54	-2.07	

Operation Band :BT4.0 Test Date :2015-06-15  
 Fundamental Frequency :2480 MHz Temp./Humi. :22.7 deg\_C /57 RH  
 Operation Mode : Band Edge HIGH Engineer :Vito  
 EUT Pol. :E2 Plan Measurement Antenna Pol. :HORIZONTAL

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level		Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
			Peak	Average				
2483.50	E	Peak	55.55	6.96	62.51	74	-11.49	
2483.50	E	Average	45.02	6.96	51.98	54	-2.02	

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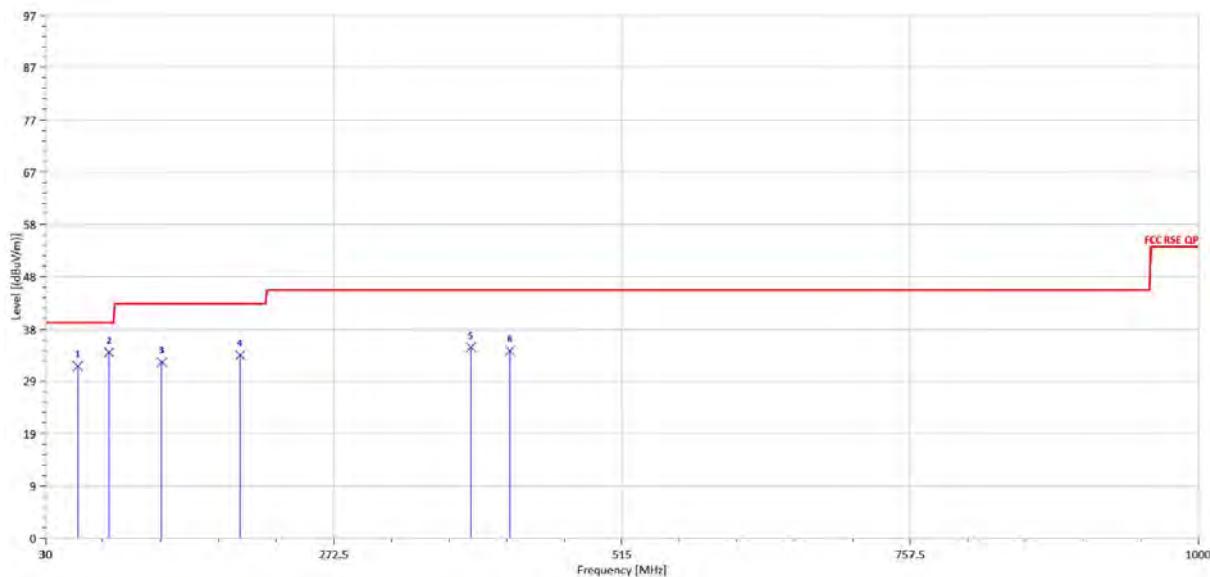
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## Radiated Spurious Emission Measurement Result (BT4.0 mode) For Frequency form 30MHz to 1000MHz

Operation Band :BT4.0  
 Fundamental Frequency :2402 MHz  
 Operation Mode :TX LOW  
 EUT Pol. :E2 Plan

Test Date :2015-06-15  
 Temp./Humi. :22.7 deg\_C /57 RH  
 Engineer :Vito  
 Measurement Antenna Pol. :VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level		Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
			Reading	Level dBμV				
57.16	S	Peak	59.58	-27.61	31.97	40.00	-8.03	
83.35	S	Peak	60.97	-26.46	34.51	40.00	-5.49	
127.97	S	Peak	54.03	-21.34	32.69	43.50	-10.81	
193.93	S	Peak	57.86	-23.82	34.04	43.50	-9.46	
387.93	S	Peak	51.74	-16.28	35.46	46.00	-10.54	
420.91	S	Peak	50.22	-15.39	34.83	46.00	-11.17	

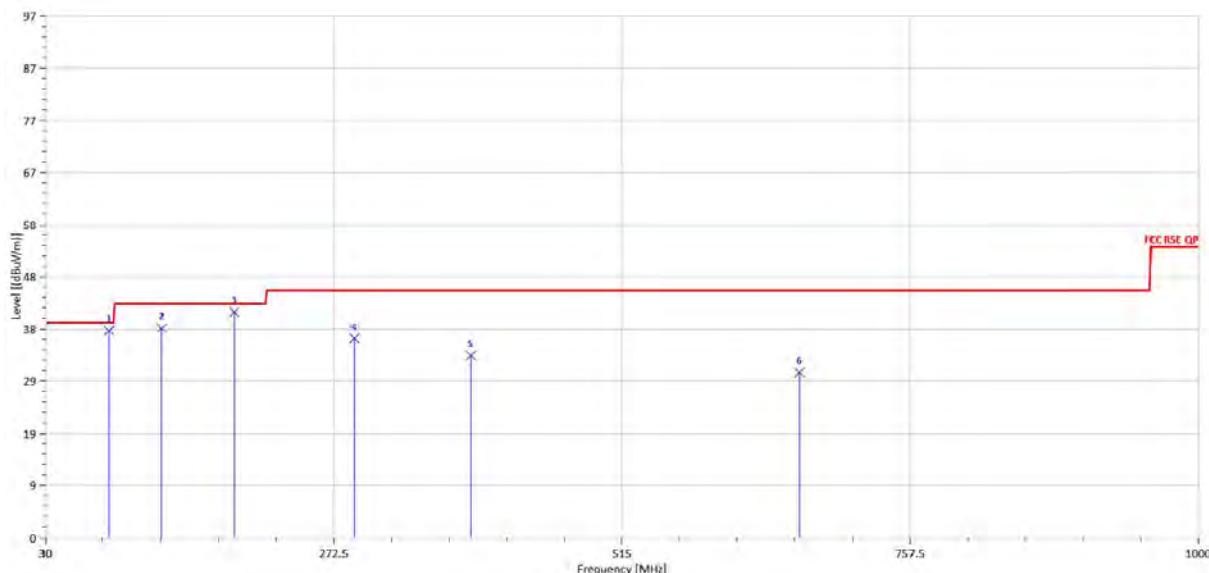
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Operation Band :BT4.0  
 Fundamental Frequency :2402 MHz  
 Operation Mode :TX LOW  
 EUT Pol. :E2 Plan

Test Date :2015-06-15  
 Temp./Humi. :22.7 deg\_C /57 RH  
 Engineer :Vito  
 Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum		Factor	Actual FS	Limit @3m	Margin
			PK/QP/AV	Reading Level dBµV				
83.35	S	Peak	64.94	-26.46	38.48	40.00	-1.52	
127.97	S	Peak	60.29	-21.34	38.95	43.50	-4.55	
189.08	S	Peak	66.14	-24.19	41.95	43.50	-1.55	
289.96	S	Peak	56.38	-19.39	36.99	46.00	-9.01	
387.93	S	Peak	50.07	-16.28	33.79	46.00	-12.21	
664.38	S	Peak	42.34	-11.66	30.68	46.00	-15.32	

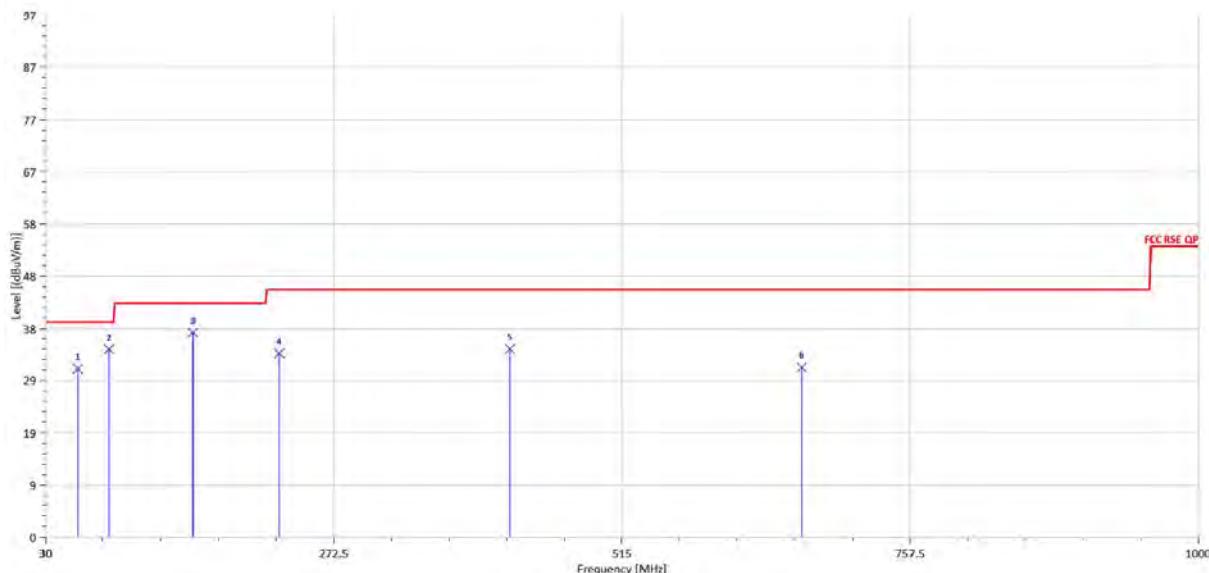
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Operation Band :BT4.0  
 Fundamental Frequency :2442 MHz  
 Operation Mode :TX MID  
 EUT Pol. :E2 Plan

Test Date :2015-06-15  
 Temp./Humi. :22.7 deg\_C /57 RH  
 Engineer :Vito  
 Measurement Antenna Pol. :VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum		Factor	Actual FS dB <sup>μ</sup> V/m	Limit @3m dB <sup>μ</sup> V/m	Margin dB
			Reading	Level dB <sup>μ</sup> V				
57.16	S	Peak	58.85	-27.61	31.24	40.00	-8.76	
83.35	S	Peak	61.30	-26.46	34.85	40.00	-5.15	
154.16	S	Peak	60.82	-22.80	38.02	43.50	-5.48	
226.91	S	Peak	56.62	-22.53	34.09	46.00	-11.91	
420.91	S	Peak	50.29	-15.39	34.90	46.00	-11.10	
666.32	S	Peak	43.13	-11.65	31.48	46.00	-14.52	

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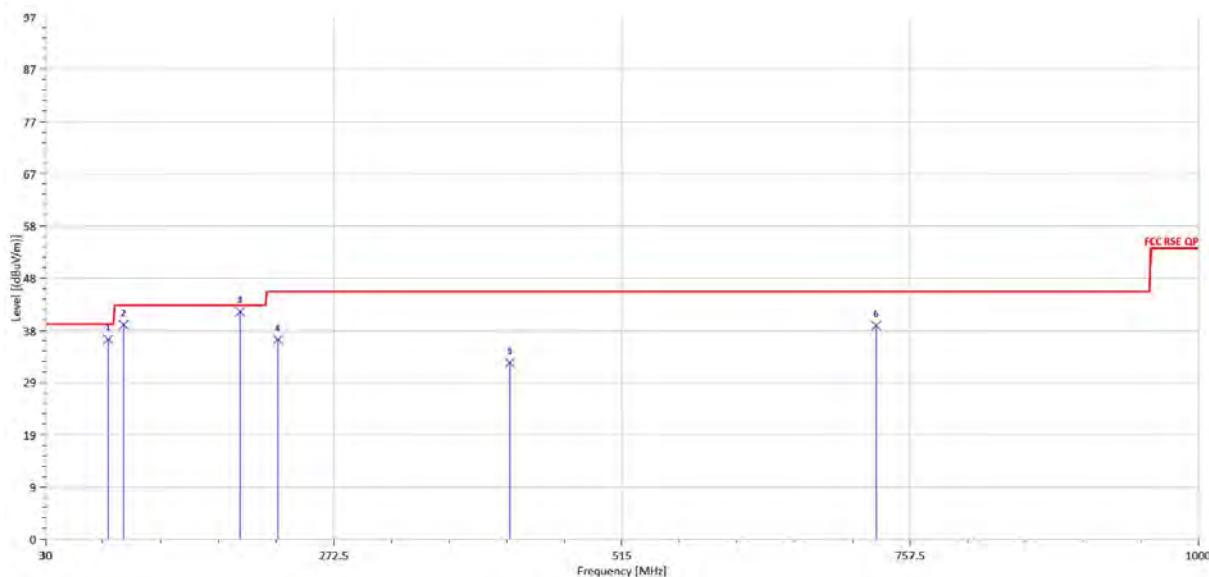
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Operation Band :BT4.0  
 Fundamental Frequency :2442 MHz  
 Operation Mode :TX MID  
 EUT Pol. :E2 Plan

Test Date :2015-06-15  
 Temp./Humi. :22.7 deg\_C /57 RH  
 Engineer :Vito  
 Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum		Factor	Actual FS	Limit @3m	Margin
			PK/QP/AV	Reading Level dB $\mu$ V				
82.76	S	Peak	63.67	-26.54	37.14	40.00	-2.86	
95.96	S	Peak	64.45	-24.54	39.91	43.50	-3.59	
193.93	S	Peak	66.13	-23.82	42.31	43.50	-1.19	
225.94	S	Peak	59.68	-22.60	37.08	46.00	-8.92	
420.91	S	Peak	48.10	-15.39	32.71	46.00	-13.29	
729.37	S	Peak	50.39	-10.66	39.73	46.00	-6.27	

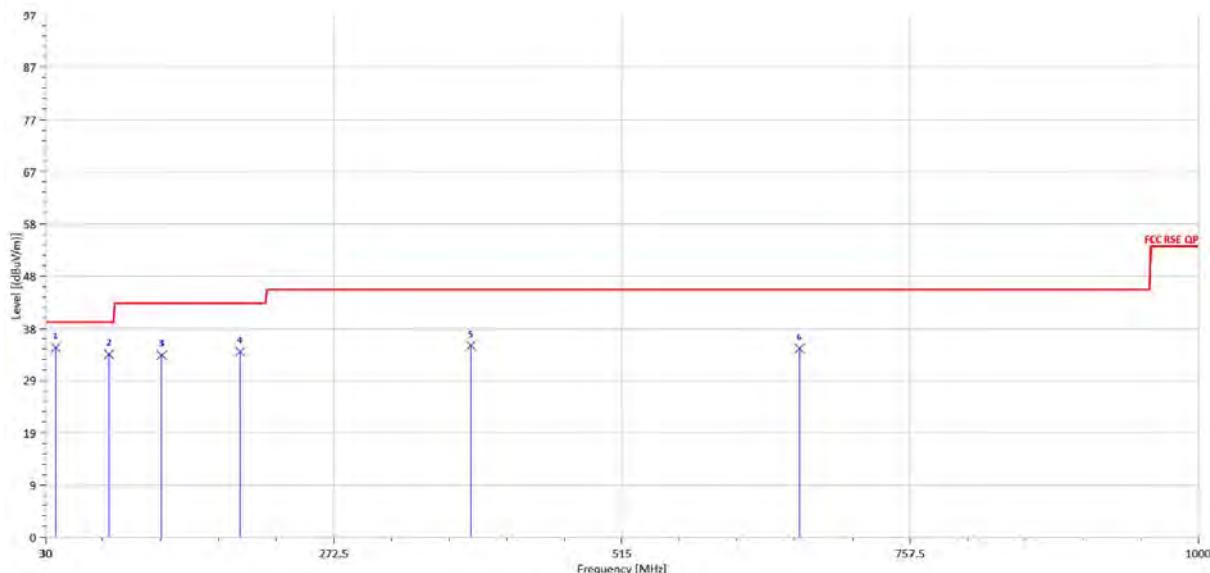
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Operation Band :BT4.0  
 Fundamental Frequency :2480 MHz  
 Operation Mode :TX HIGH  
 EUT Pol. :E2 Plan

Test Date :2015-06-15  
 Temp./Humi. :22.7 deg\_C /57 RH  
 Engineer :Vito  
 Measurement Antenna Pol. :VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum		Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
			Reading	Level dB $\mu$ V				
38.73	S	Peak	53.37	-18.19	35.18	40.00	-4.82	
83.35	S	Peak	60.37	-26.46	33.91	40.00	-6.09	
127.97	S	Peak	55.08	-21.34	33.74	43.50	-9.76	
193.93	S	Peak	58.20	-23.82	34.38	43.50	-9.12	
387.93	S	Peak	51.78	-16.28	35.50	46.00	-10.50	
664.38	S	Peak	46.66	-11.66	35.00	46.00	-11.00	

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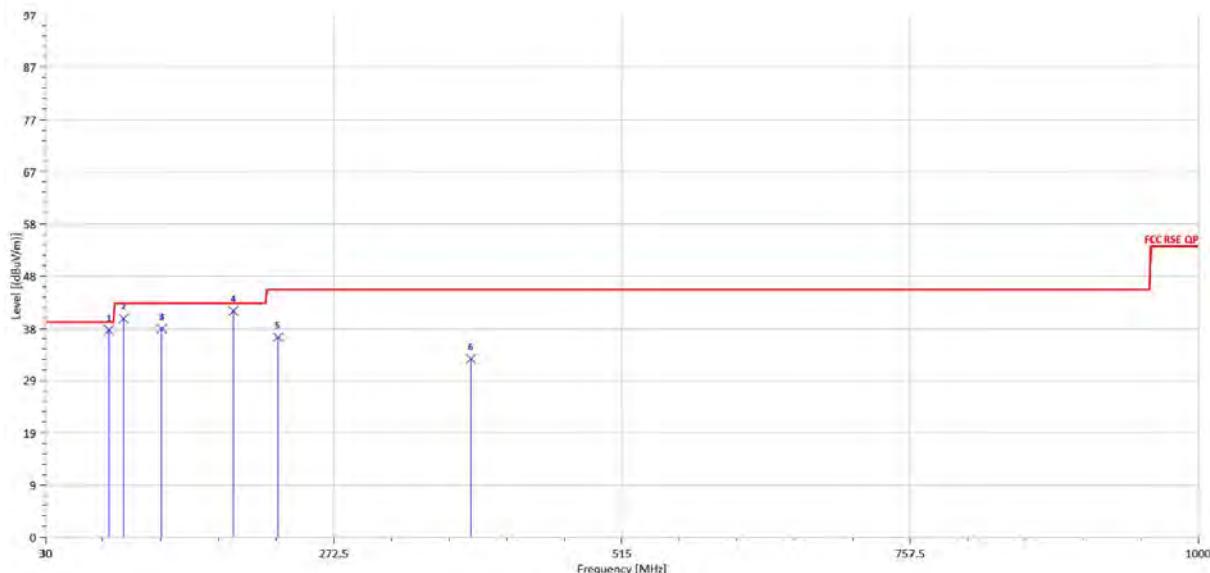
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Operation Band :BT4.0  
 Fundamental Frequency :2480 MHz  
 Operation Mode :TX HIGH  
 EUT Pol. :E2 Plan

Test Date :2015-06-15  
 Temp./Humi. :22.7 deg\_C /57 RH  
 Engineer :Vito  
 Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum		Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
			Reading	Level dB $\mu$ V				
83.35	S	Peak	64.99	-26.46	38.53	40.00	-1.47	
95.96	S	Peak	65.20	-24.54	40.66	43.50	-2.84	
127.97	S	Peak	60.16	-21.34	38.82	43.50	-4.68	
188.11	S	Peak	66.28	-24.22	42.06	43.50	-1.44	
225.94	S	Peak	59.76	-22.60	37.16	46.00	-8.84	
387.93	S	Peak	49.34	-16.28	33.07	46.00	-12.93	

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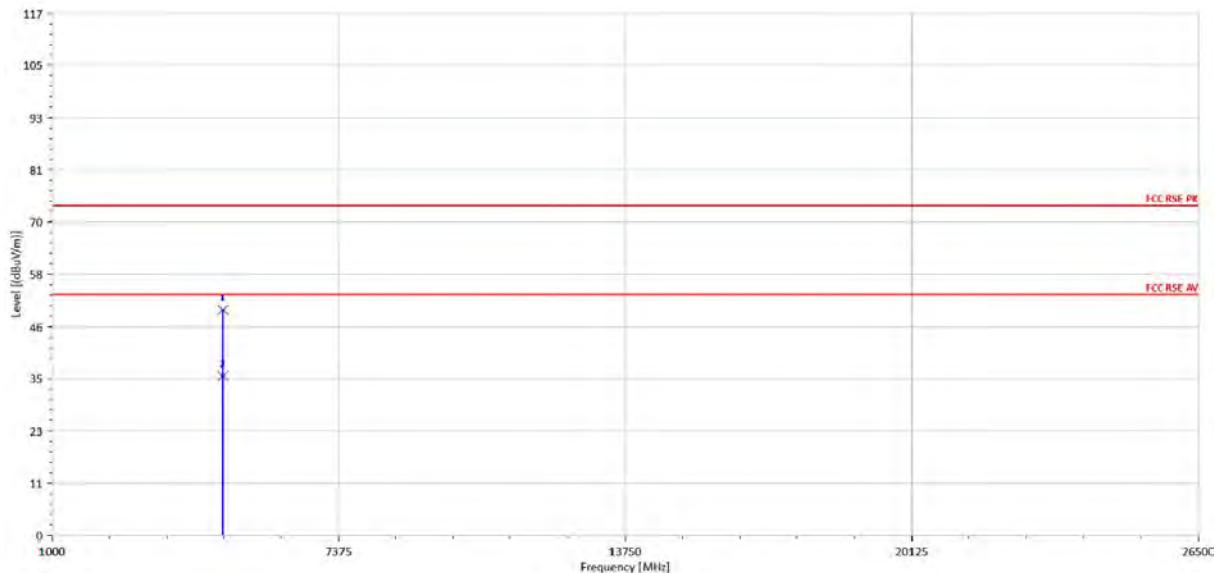
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## Radiated Spurious Emission Measurement Result (BT4.0 mode)

### For Frequency above 1GHz

Operation Band :BT4.0  
 Fundamental Frequency :2402 MHz  
 Operation Mode :TX LOW  
 EUT Pol. :E2 Plan

Test Date :2015-06-15  
 Temp./Humi. :22.7 deg\_C /57 RH  
 Engineer :Vito  
 Measurement Antenna Pol. :VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit	Margin
						@3m	
PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB		
4804.00	H	Peak	39.57	10.98	50.55	74.00	-23.45
4804.00	H	Average	24.67	10.98	35.65	54.00	-18.35

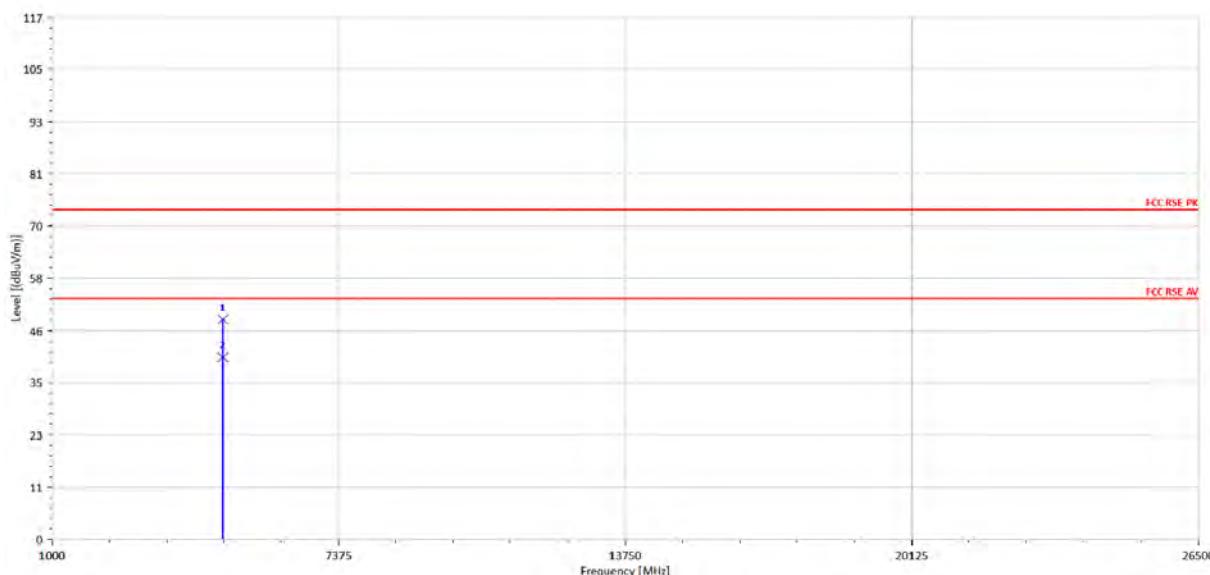
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Operation Band :BT4.0  
 Fundamental Frequency :2402 MHz  
 Operation Mode :TX LOW  
 EUT Pol. :E2 Plan

Test Date :2015-06-15  
 Temp./Humi. :22.7 deg\_C /57 RH  
 Engineer :Vito  
 Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level		Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
			PK/QP/AV	dB $\mu$ V				
4804.00	H	Peak	PK	38.32	10.98	49.29	74.00	-24.71
4804.00	H	Average	QP	29.85	10.98	40.83	54.00	-13.17

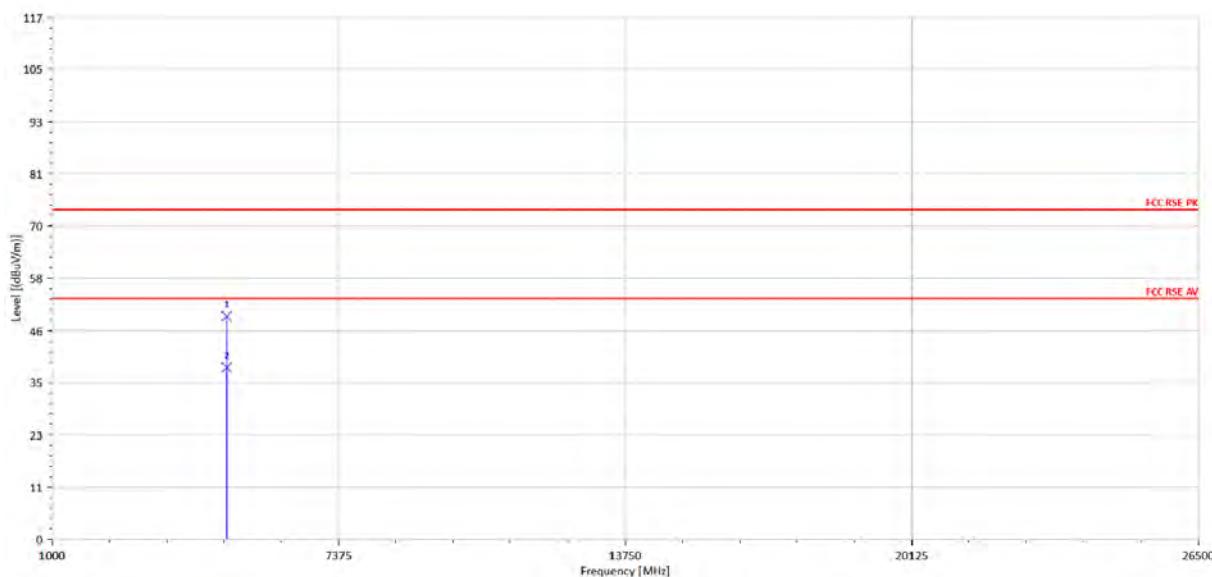
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Operation Band :BT4.0  
 Fundamental Frequency :2442 MHz  
 Operation Mode :TX MID  
 EUT Pol. :E2 Plan

Test Date :2015-06-15  
 Temp./Humi. :22.7 deg\_C /57 RH  
 Engineer :Vito  
 Measurement Antenna Pol. :VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level		Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
			PK/QP/AV	dB $\mu$ V				
4884.00	H	Peak	PK	39.10	10.92	50.02	74.00	-23.98
4884.00	H	Average	QP	27.66	10.92	38.58	54.00	-15.42

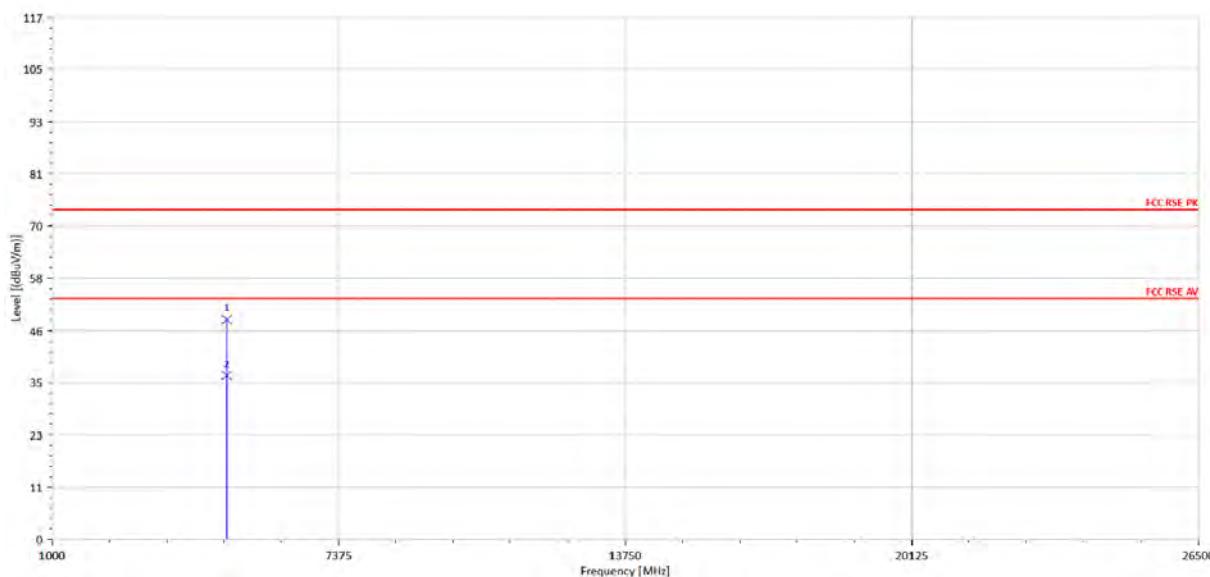
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Operation Band :BT4.0  
 Fundamental Frequency :2442 MHz  
 Operation Mode :TX MID  
 EUT Pol. :E2 Plan

Test Date :2015-06-15  
 Temp./Humi. :22.7 deg\_C /57 RH  
 Engineer :Vito  
 Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level		Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
			PK/QP/AV	dB $\mu$ V				
4884.00	H	Peak	38.33		10.92	49.25	74.00	-24.75
4884.00	H	Average	25.78		10.92	36.70	54.00	-17.30

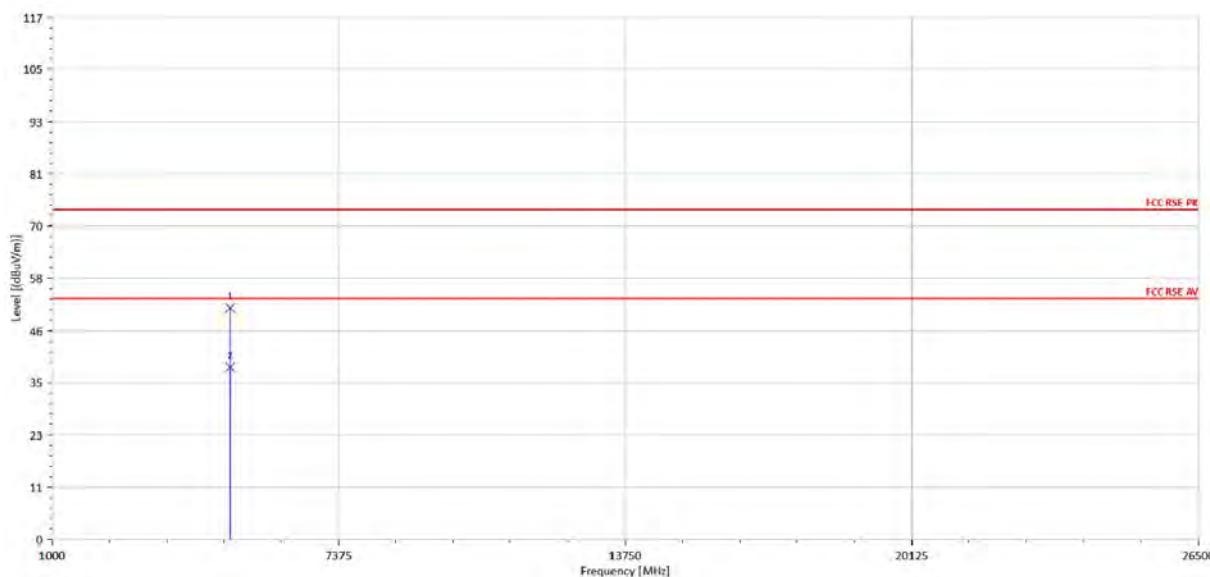
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Operation Band :BT4.0  
 Fundamental Frequency :2480 MHz  
 Operation Mode :TX HIGH  
 EUT Pol. :E2 Plan

Test Date :2015-06-15  
 Temp./Humi. :22.7 deg\_C /57 RH  
 Engineer :Vito  
 Measurement Antenna Pol. :VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level		Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
			PK/QP/AV	dBμV				
4960.00	H	Peak		40.88	10.99	51.87	74.00	-22.13
4960.00	H	Average		27.63	10.99	38.62	54.00	-15.38

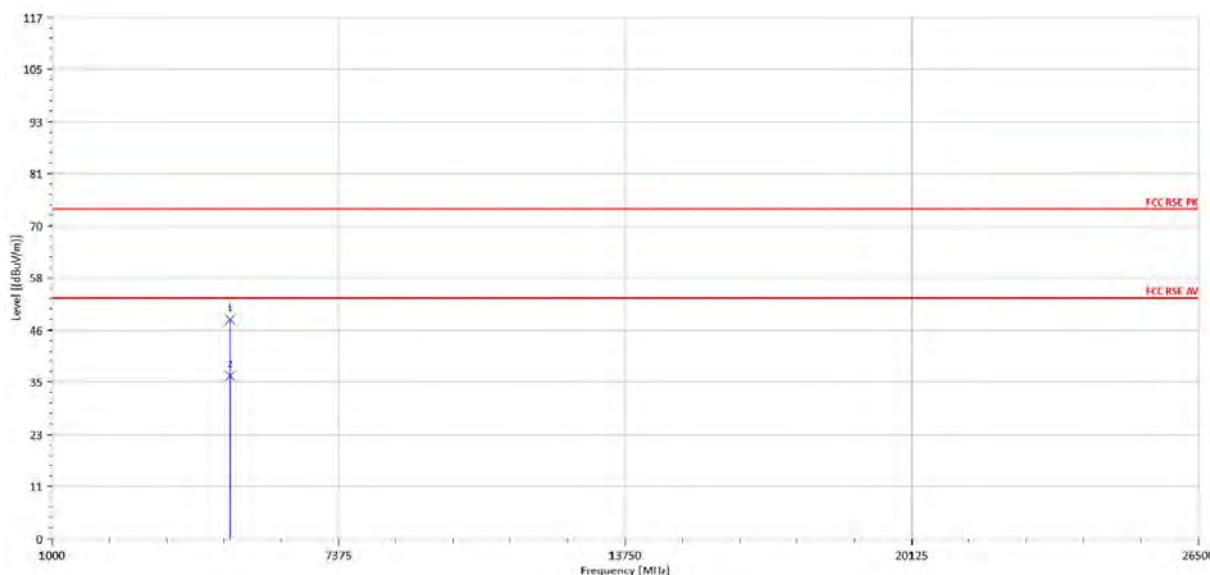
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Operation Band :BT4.0  
 Fundamental Frequency :2480 MHz  
 Operation Mode :TX HIGH  
 EUT Pol. :E2 Plan

Test Date :2015-06-15  
 Temp./Humi. :22.7 deg\_C /57 RH  
 Engineer :Vito  
 Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level		Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
			PK/QP/AV	dB $\mu$ V				
4960.00	H	Peak	38.17	38.17	10.99	49.16	74.00	-24.84
4960.00	H	Average	25.47	25.47	10.99	36.46	54.00	-17.54

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## 11 PEAK POWER SPECTRAL DENSITY

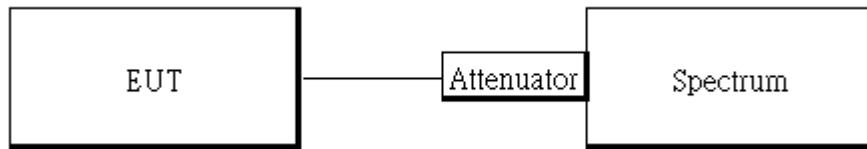
### 11.1 Standard Applicable:

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

### 11.2 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY53400256	10/15/2014	10/14/2015
DC Block	PASTERNACK	PE8210	RF29	12/19/2014	12/18/2015
Splitter	RF-LAMBAD	RFLT2W1G18 G	RF35	12/19/2014	12/18/2015
Attenuator	WOKEN	218FS-10	RF23	12/19/2014	12/18/2015
DC Power Supply	Agilent	E3640A	MY53140006	05/04/2015	05/03/2016

### 11.3 Test Set-up:



### 11.4 Measurement Procedure:

1. Set analyzer center frequency to DTS channel center frequency.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance V03r02.
3. Set the span to 1.5 times the DTS channel bandwidth.
4. Set the RBW  $\geq$  3 kHz.
5. Set the VBW  $\geq$  3 x RBW.
6. Set the detector = peak.
7. Set the sweep time = auto couple.
8. Set the trace mode = max hold.
9. Allow trace to fully stabilize.
10. Use the peak marker function to determine the maximum amplitude level.
11. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

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## 11.5 Measurement Result:

### BT4.0 mode

Frequency MHz	RF Power Density (dBm)	Limit (dBm)	Result
2402	-11.85	8	PASS
2442	-11.94	8	PASS
2480	-12.52	8	PASS

*Note: Refer to next page for plots.*

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f (886-2) 2298-0488

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## BT4.0 mode

## Power Spectral Density Test Plot (CH-Low)



## Power Spectral Density Test Plot (CH-Mid)



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## Power Spectral Density Test Plot (CH-High)



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## 12 ANTENNA REQUIREMENT

### 12.1 Standard Applicable:

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

If the transmitting antenna is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi.

In case of point-to-point operation, the power shall be reduced by the one dB for every 3 dB that the directional gain of antenna exceeds 6dBi.

### 12.2 Antenna Connected Construction:

The antenna is designed as permanent attached and no consideration of replacement. Please see EUT photo and antenna spec. for details.

The antenna gain is less than 6dBi. Therefore, it is not necessary to reduce maximum output power limit.

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台灣檢驗科技股份有限公司

t (886-2) 2299-3279

f (886-2) 2298-0488

[www.tw.sgs.com](http://www.tw.sgs.com)

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