

# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

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

OF

**Product Name:** Dongle  
**Brand Name:** HP  
**Model No.:** DHN1  
**Model Difference:** N/A  
**FCC ID:** O62-DHN1  
**Report No.:** E2/2015/80053  
**Issue Date:** Sep. 15, 2015  
**FCC Rule Part:** §15.249  
**Prepared for:** Darfon Electronics Corp.  
 167, Shanying Road, Gueishan, Taoyuan  
 33341, Taiwan, R.O.C.  
**Prepared by:** SGS Taiwan Ltd.  
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**VERIFICATION OF COMPLIANCE**

**Applicant:** Darfon Electronics Corp.  
 167, Shanying Road, Gueishan, Taoyuan 33341, Taiwan, R.O.C.

**Product Name:** Dongle

**Brand Name:** HP

**Model No.:** DHN1

**Model Difference:** N/A

**FCC ID:** O62-DHN1

**File Number:** E2/2015/80053

**Date of test:** Aug. 20, 2015 ~ Oct. 06, 2015

**Date of EUT Received:** Aug. 20, 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:** *Aken Huang* **Date:** Oct. 06, 2015

**Aken Huang / Engineer**

**Prepared By:** *Violetta Tang* **Date:** Oct. 06, 2015

**Violetta Tang / Clerk**

**Approved By:** *Jim Chang* **Date:** Oct. 06, 2015

**Jim Chang / Asst. Manager**

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### Revision History

Report Number	Revision	Description	Issue Date
E2/2015/80052	Rev.00	Initial creation of document	Oct. 06, 2015

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# 1. GENERAL INFORMATION

## 1.1 Product Description

Product Name:	Dongle
Brand Name:	HP
Model No.:	DHN1
Model Difference:	N/A
Transmit Power	93.00dBuV/m
Operation Frequency:	2403MHz - 2475MHz
Channel number:	73 Channels
Channel space:	1MHz
Modulation Type:	GFSK
Hardware Version:	Rev01
Software Version:	V3310
Power Supply:	5V from USB port
Antenna Designation:	PCB Antenna, Gain: -1.54dBi

This report complies with FCC 15.249

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## 1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.249

ANSI C63.10:2013

Note:

1. All test items have been performed and record as per the above standards.
2. The EUT is compliance with FCC Subpart B is authorized under the certification procedure.

## 1.3 Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd.,  
Guishan District, Taoyuan City, Taiwan 333. (TAF code 0513)

FCC Registration Numbers are: 628985 (Hwaya)

Canada Registration Number: 4620A-5.

## 1.4 Special Accessories

There are no special accessories used while test was conducted.

## 1.5 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 a placed on as turn table which is 0.8 m above ground plane. 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 a placed on as turn table. For emissions testing at or below 1 GHz, the table height shall be 80 cm above the reference ground plane. 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.

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**2.5 Limitation**

**(1) Conducted Emission**

According to section 15.207(a) Conducted Emission Limits is as following.

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 – 0.5	66 - 56	56 - 46
0.5 – 5	56	46
5 - 30	60	50

**(2) Radiated Emission 15.249(a)**

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following.

Frequency (MHz)	Field strength of Fundamental	Field strength of Harmonics	Distance (m)
902 – 928	50 mV/m (94dBuV/m)	500 uV/m (54dBuV/m)	3
2400 – 2483.5	50 mV/m (94dBuV/m)	500 uV/m (54dBuV/m)	3
5725 – 5875	50 mV/m (94dBuV/m)	500 uV/m (54dBuV/m)	3
24.0 – 24.25 GHz	250 mV/m (107.95dBuV/m)	2500 uV/m (67.95dBuV/m)	3

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**(3) Radiated Emission 15.249 (d)**

Emission Radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in Section 15.209 as below, whichever is the lesser attenuation.

Frequency (MHz)	Field strength $\mu\text{V}/\text{m}$	Distance (m)	Field strength at 3m $\text{dB}\mu\text{V}/\text{m}$
1.705-30	30	30	69.54
30-88	100	3	40
88-216	150	3	43.5
216-960	200	3	46
Above 960	500	3	54

**(4) Radiated Emission 15.249(e)**

For frequencies above 1000MHz, the above field strength limits are based on average limits. The peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20dB under any condition of modulation.

- Remark 1. Emission level in  $\text{dB}\mu\text{V}/\text{m} = 20 \log (\mu\text{V}/\text{m})$
- : 2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
  - 3. Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of  $\xi$  15.205
  - 4. Emission spurious frequency which appearing within the Restricted Bands specified in provision of  $\xi$  15.205, then the general radiated emission limits in  $\xi$  15.209 apply.

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## 2.6 Configuration of Tested System

Fig. 2-1 Configuration

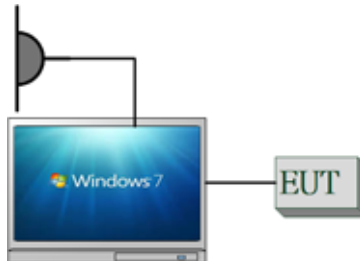


Table 2-2 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	2.4G Test Software	N/A	N/A	N/A	N/A	N/A

**Note:** All the above equipment/cables were placed in worse case positions to maximize emission signals during emission test.

**Grounding:** Grounding was in accordance with the manufacturer’s requirements and conditions for the intended use.

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### 3. Summary of Test Results

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Emission	N/A
§15.249(a) (d) (e)	Radiated Emission	Compliant
§15.215(c)	20dB Bandwidth Measurement	Compliant

### 4. Description of test modes

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

73 channels are provided.

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
1	2403MHz	26	2428MHz	51	2453MHz
2	2414MHz	27	2429MHz	52	2454MHz
3	2405MHz	28	2430MHz	53	2455MHz
4	2406MHz	29	2431MHz	54	2456MHz
5	2407MHz	30	2432MHz	55	2457MHz
6	2408MHz	31	2433MHz	56	2458MHz
7	2409MHz	32	2434MHz	57	2459MHz
8	2410MHz	33	2435MHz	58	2460MHz
9	2411MHz	34	2436MHz	59	2461MHz
10	2412MHz	35	2437MHz	60	2462MHz
11	2413MHz	36	2438MHz	61	2463MHz
12	2414MHz	37	2439MHz	62	2464MHz
13	2415MHz	38	2440MHz	63	2465MHz
14	2416MHz	39	2441MHz	64	2466MHz
15	2417MHz	40	2442MHz	65	2467MHz
16	2418MHz	41	2443MHz	66	2468MHz
17	2419MHz	42	2444MHz	67	2469MHz
18	2420MHz	43	2445MHz	68	2470MHz
19	2421MHz	44	2446MHz	69	2471MHz
20	2422MHz	45	2447MHz	70	2472MHz
21	2423MHz	46	2448MHz	71	2473MHz
22	2424MHz	47	2449MHz	72	2474MHz
23	2425MHz	48	2450MHz	73	2475MHz
24	2426MHz	49	2451MHz		
25	2427MHz	50	2452MHz		

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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	PACKET TYPE	ANTENNA PORT
2.4G	1 to 73	1,38,73	GFSK	---	MAIN
RADIATED EMISSION TEST (ABOVE 1 GHz)					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	PACKET TYPE	ANTENNA PORT
2.4G	1 to 73	1,38,73	GFSK	---	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 General Wireless 2.4GHz 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	PACKET TYPE	ANTENNA PORT
2.4G	1 to 73	1,38,73	GFSK	---	MAIN

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## 5. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
20dB Bandwidth	+/- 123.36 Hz
100 KHz Bandwidth Of Frequency Band Edges	+/- 1.55 dB
Temperature	+/- 0.8 °C
Humidity	+/- 4.7 %
DC / AC Power Source	DC= +/- 1%, 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 Emissions Test

### 6.1 Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

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

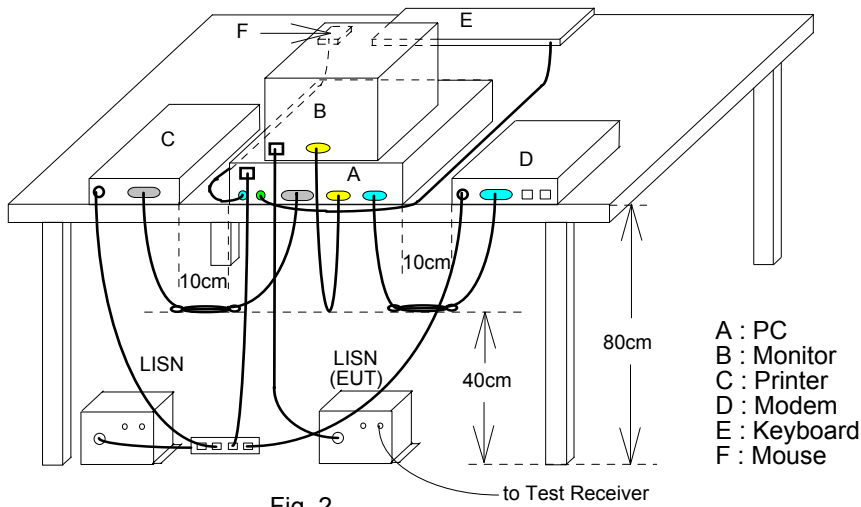


Fig. 2

### 6.3 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI 7	100950	12/12/2014	12/11/2015
Coaxial Cables	N/A	N30N30-1042-15 0cm	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.

### 6.4 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.

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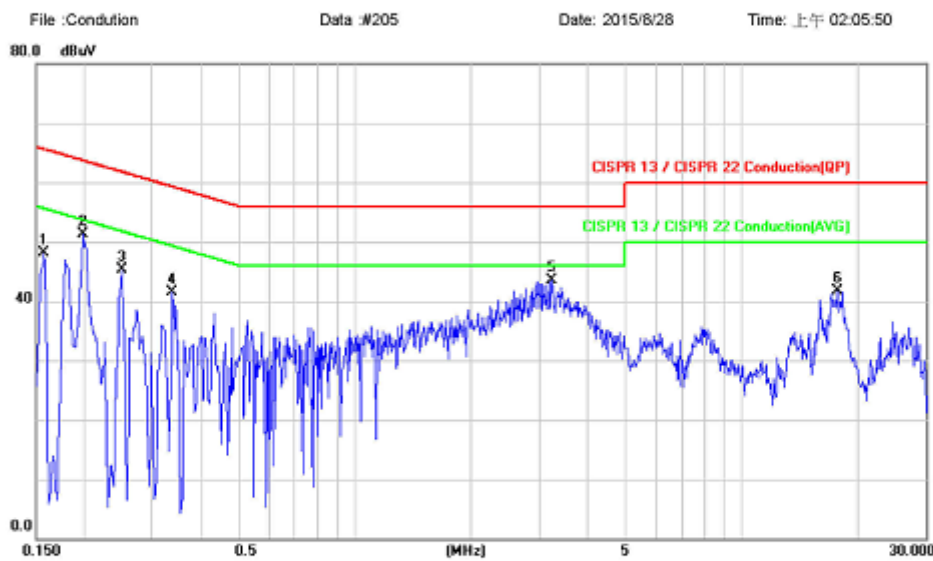
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## AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation mode	Test Date:	Aug. 28, 2015
Temperature:	26	Humidity:	54 %
		Test By:	Aken
		Phase:	L1 / N

Site : Conduction Room                      Phase: **L1**                      Temperature: 24 °C  
 Limit: CISPR 13 / CISPR 22 Conduction(QP)      Power: AC 120V/80Hz              Humidity: 71 %  
 Mode:  
 Note:

### Conducted Emission



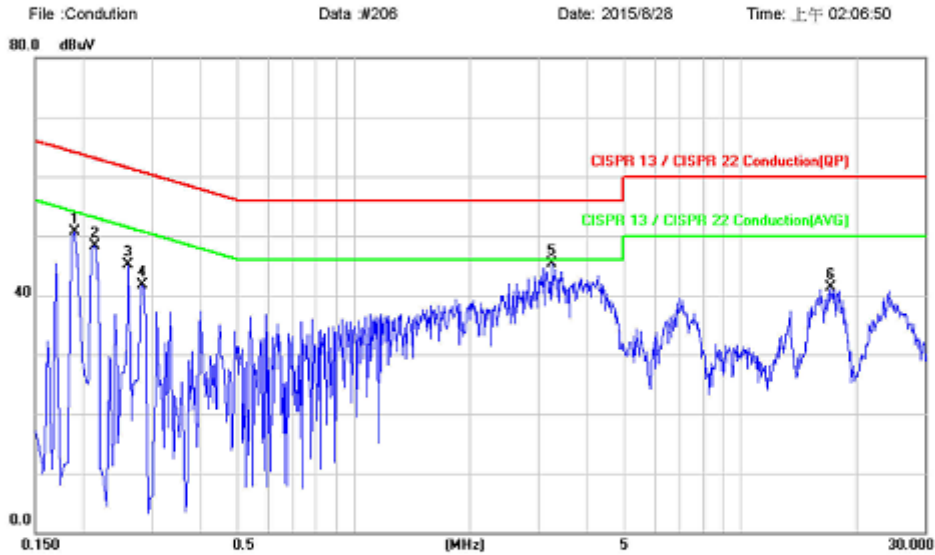
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
	1	0.1580	48.07	0.08	48.15	65.57	-17.42	peak	
	2 *	0.1980	51.17	0.07	51.24	63.69	-12.45	peak	
	3	0.2500	45.12	0.09	45.21	61.76	-16.55	peak	
	4	0.3380	41.39	0.14	41.53	59.25	-17.72	peak	
	5	3.2340	42.94	0.60	43.54	56.00	-12.46	peak	
	6	17.7380	41.06	0.58	41.64	60.00	-18.36	peak	

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Site : Conduction Room Phase: N Temperature: 24 °C  
 Limit: CISPR 13 / CISPR 22 Conduction(QP) Power: AC 120V/60Hz Humidity: 71 %  
 Mode:  
 Note:

**Conducted Emission**



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1900	50.65	0.13	50.78	64.04	-13.26	peak	
2		0.2140	48.22	0.14	48.36	63.05	-14.69	peak	
3		0.2620	44.86	0.16	45.02	61.37	-16.35	peak	
4		0.2860	41.62	0.17	41.79	60.64	-18.85	peak	
5 *		3.2460	44.59	0.65	45.24	56.00	-10.76	peak	
6		17.1940	40.66	0.63	41.29	60.00	-18.71	peak	

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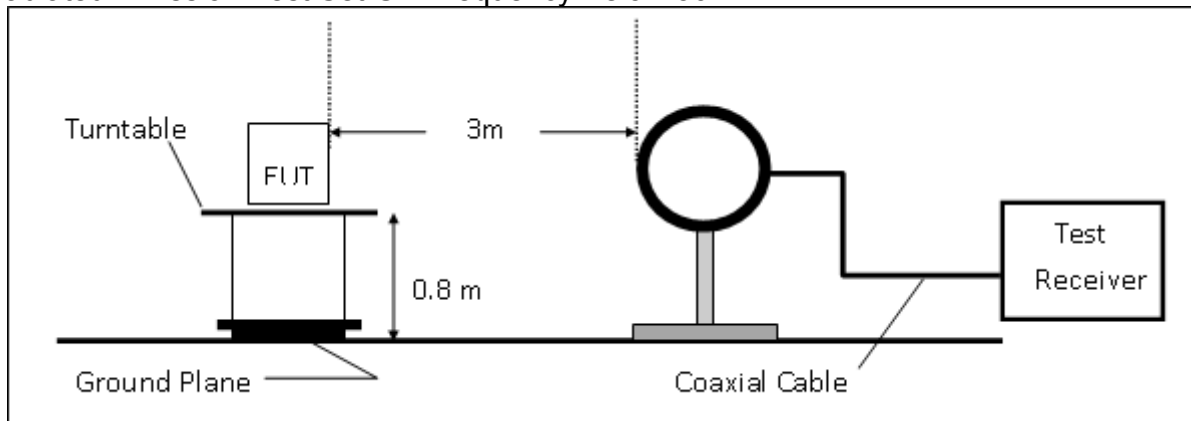
## 7. Radiated Emission Test

### 7.1 Measurement Procedure

1. The EUT was placed on a turntable that is 0.8m (below 1GHz) / 1.5m (above 1GHz) above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
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 measured were complete.

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

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

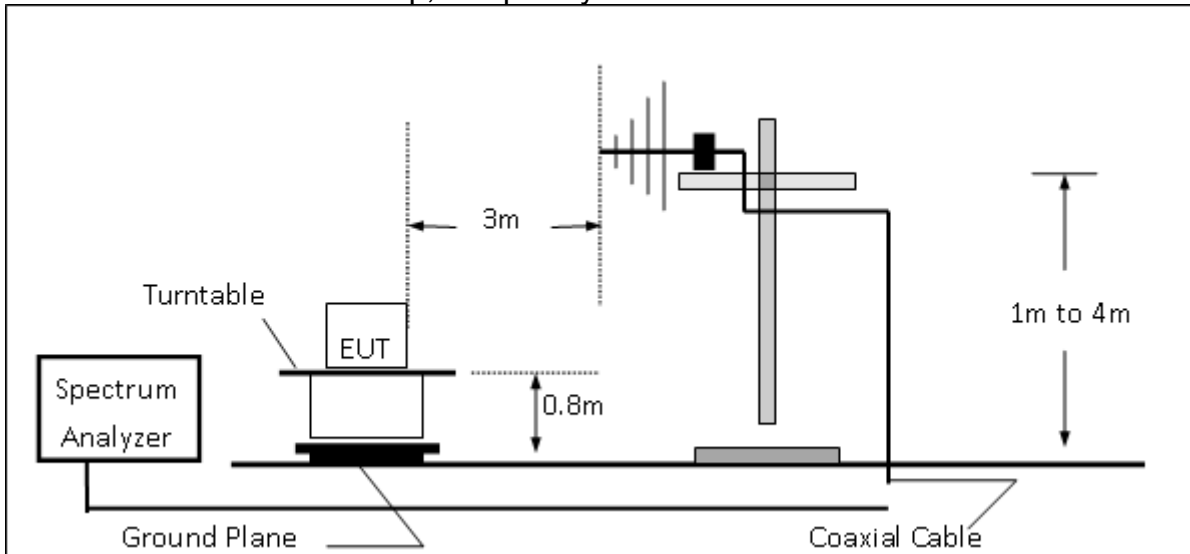


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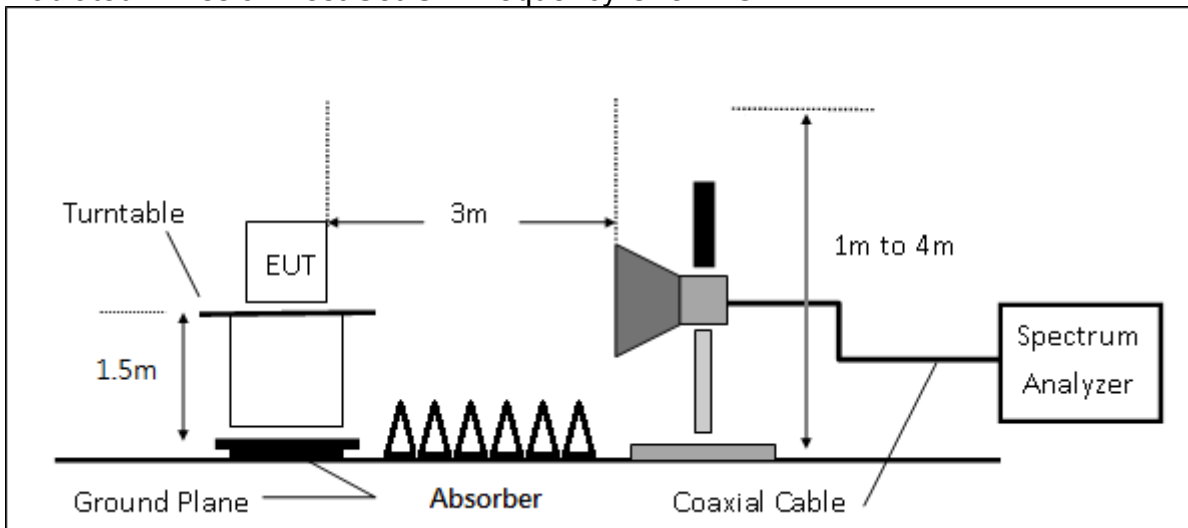
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(B) Radiated Emission Test Set-Up, Frequency from 30MHz to 1000MHz



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



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7.3 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 Chamber C	SAC-C	03/04/2015	03/03/2016
Site VSWR	SGS	966 Chamber 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.

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### 7.5 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	

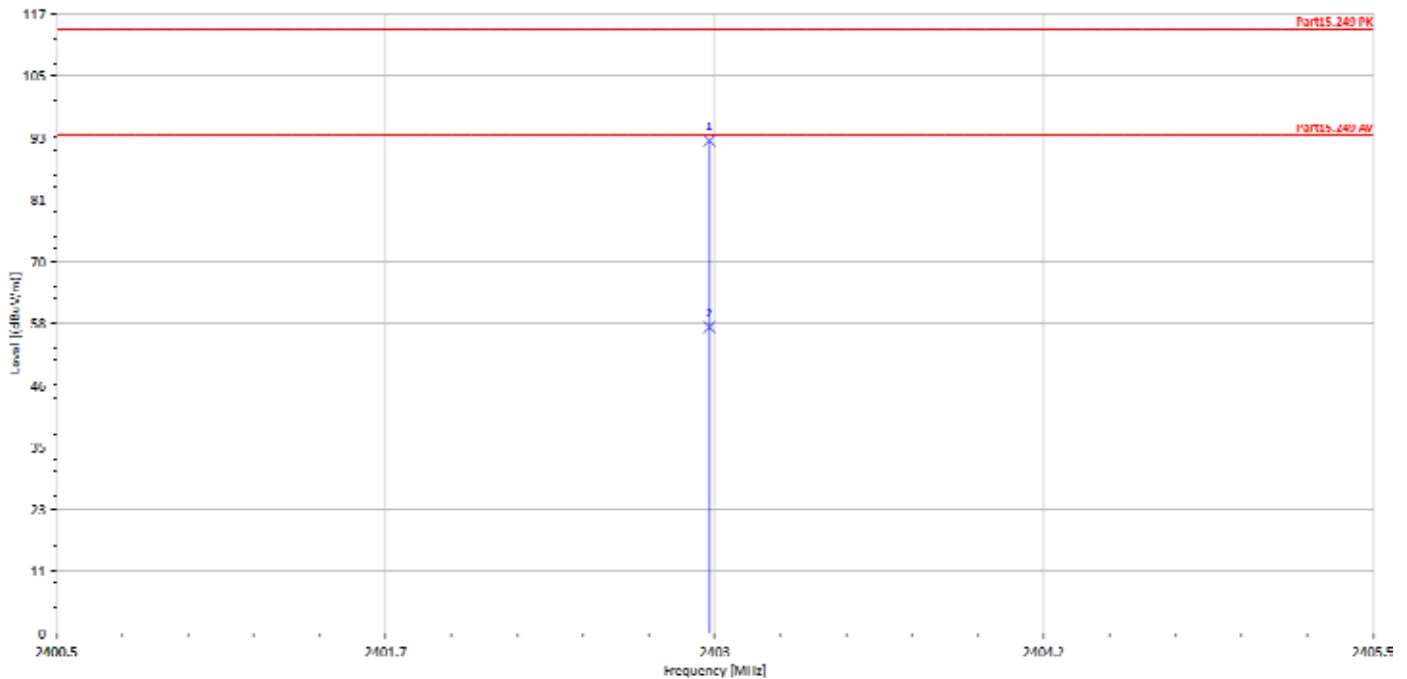
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## 7.6 Measurement Result Radiated Spurious Emission Measurement Result (MAIN)

Operation Mode : 2.4G                      Test Date : 2015/8/28  
 Fundamental Frequency : 2403 MHz      Temp. / Humi. : 26.4deg\_C/47RH  
 Operation Band : Main                      Test Engineer : Vito  
 EUT Pol. : E2                                  Measurement Antenna Pol. : Vertical

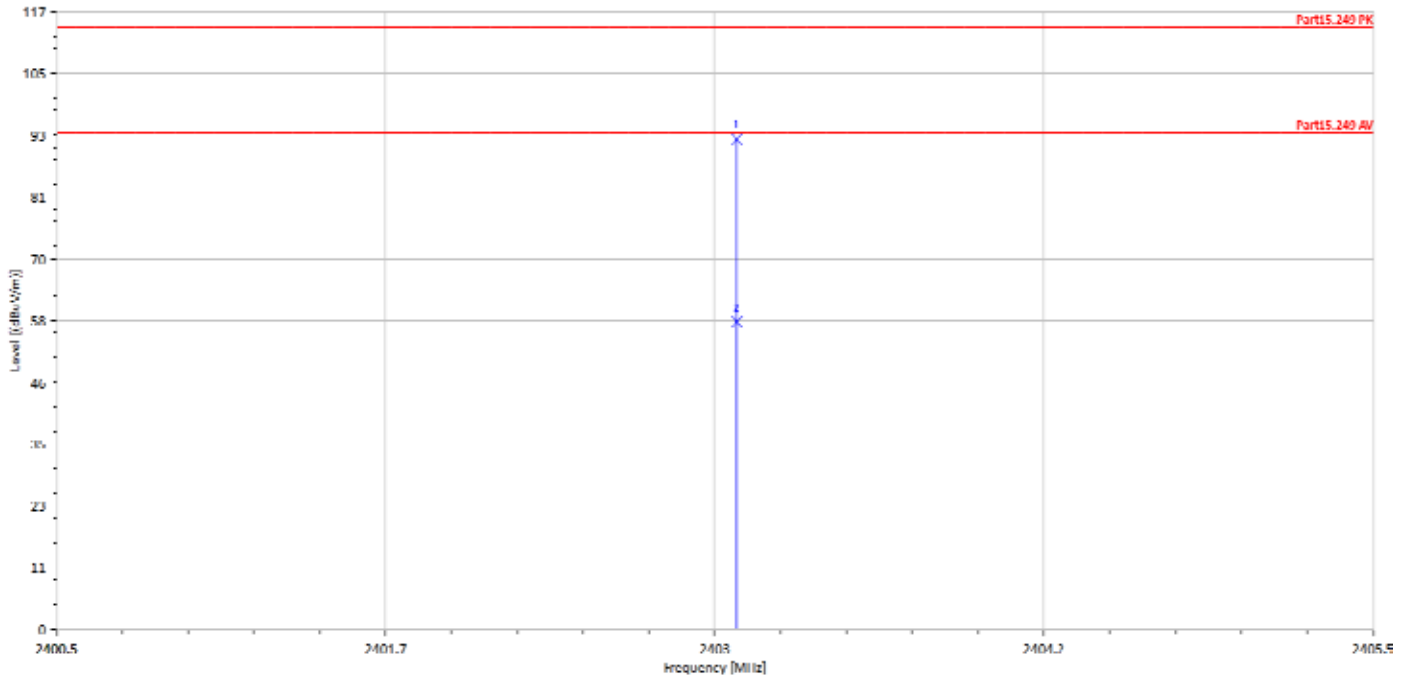


Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2402.98	F	Peak	86.35	6.65	93.00	114	-21.01
2402.98	F	Average	51.12	6.65	57.77	94	-36.23

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Operation Mode :	2.4G	Test Date :	2015/8/28
Fundamental Frequency :	2403 MHz	Temp. / Humi. :	26.4deg_C/47RH
Operation Band :	Main	Test Engineer :	Vito
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal

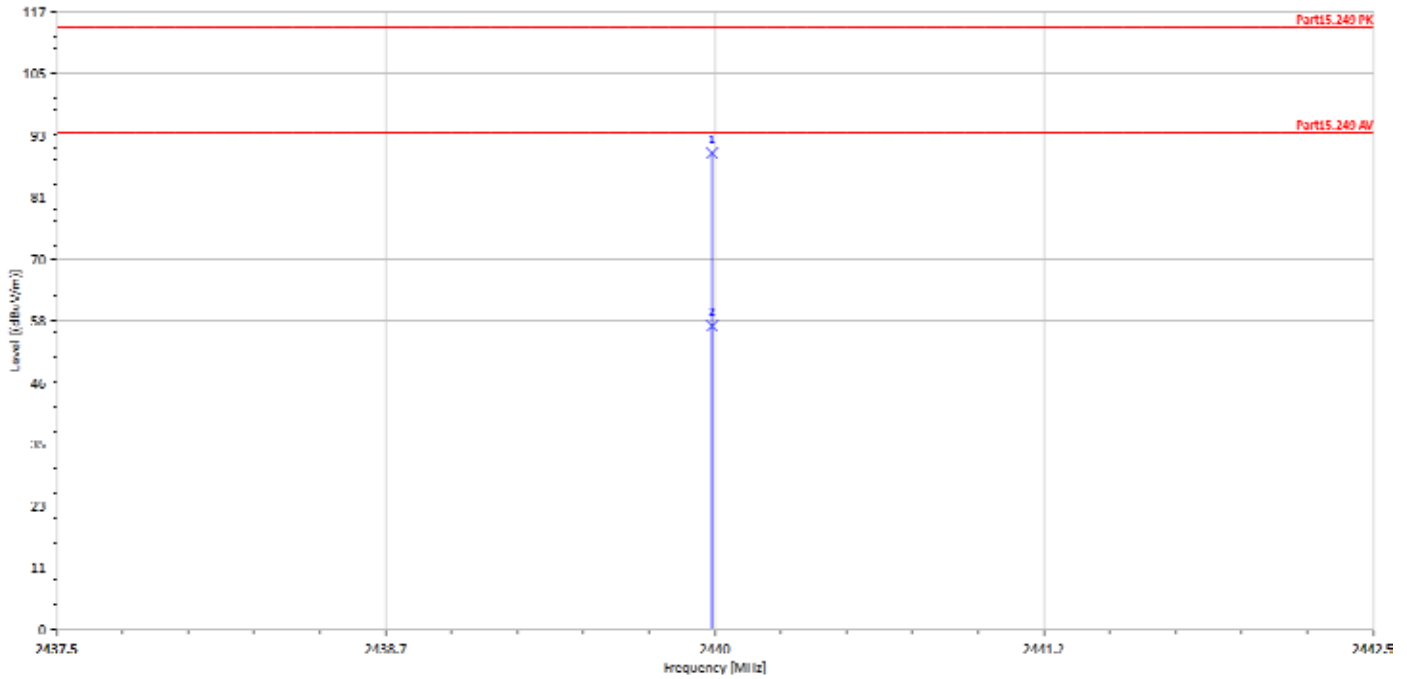


Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2403.09	F	Peak	86.17	6.65	92.82	114	-21.18
2403.09	F	Average	51.64	6.65	58.29	94	-35.71

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Operation Mode : 2.4G Test Date : 2015/8/28  
 Fundamental Frequency : 2440 MHz Temp. / Humi. : 26.4deg\_C/47RH  
 Operation Band : Main Test Engineer : Vito  
 EUT Pol. : E2 Measurement Antenna Pol. : Vertical

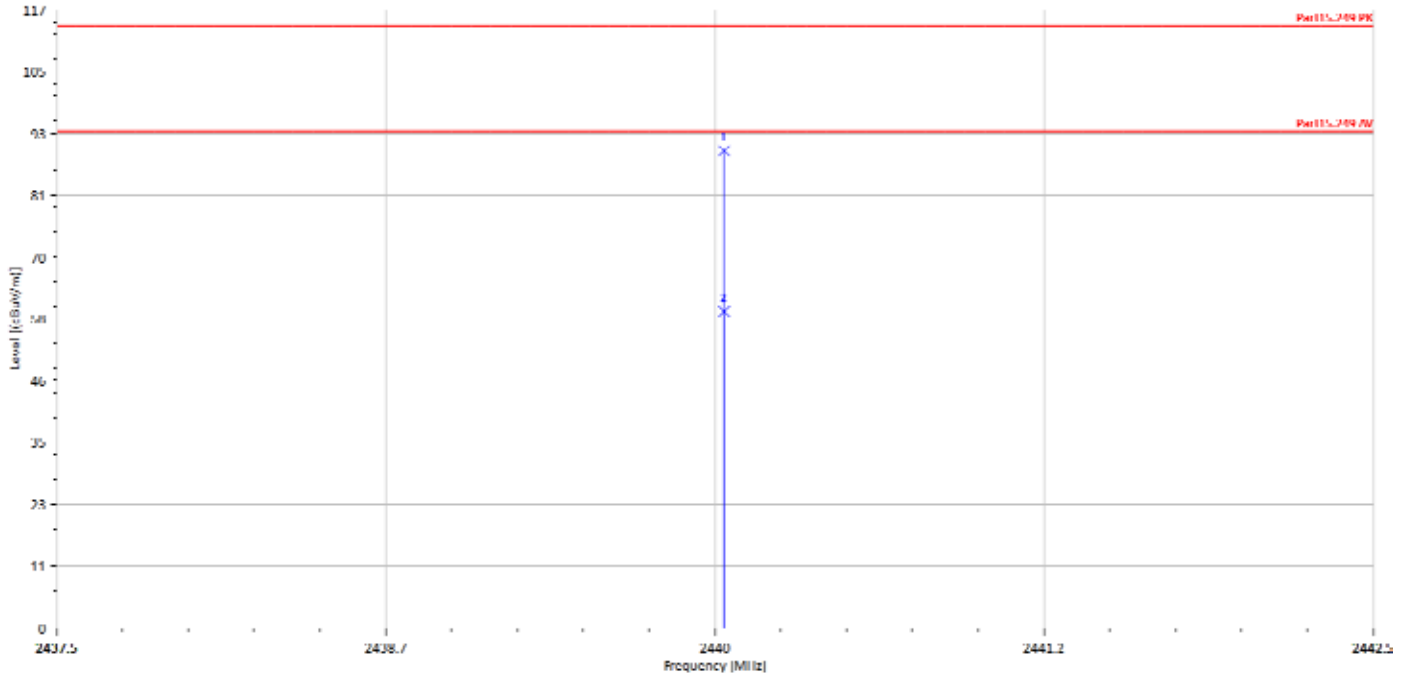


Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2439.99	F	Peak	83.42	6.83	90.24	114	-23.76
2439.99	F	Average	50.68	6.83	57.51	94	-36.49

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Operation Mode : 2.4G Test Date : 2015/8/28  
 Fundamental Frequency : 2440 MHz Temp. / Humi. : 26.4deg\_C/47RH  
 Operation Band : Main Test Engineer : Vito  
 EUT Pol. : E2 Measurement Antenna Pol. : Horizontal



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2440.04	F	Peak	83.41	6.83	90.24	114	-23.76
2440.04	F	Average	53.10	6.83	59.93	94	-34.07

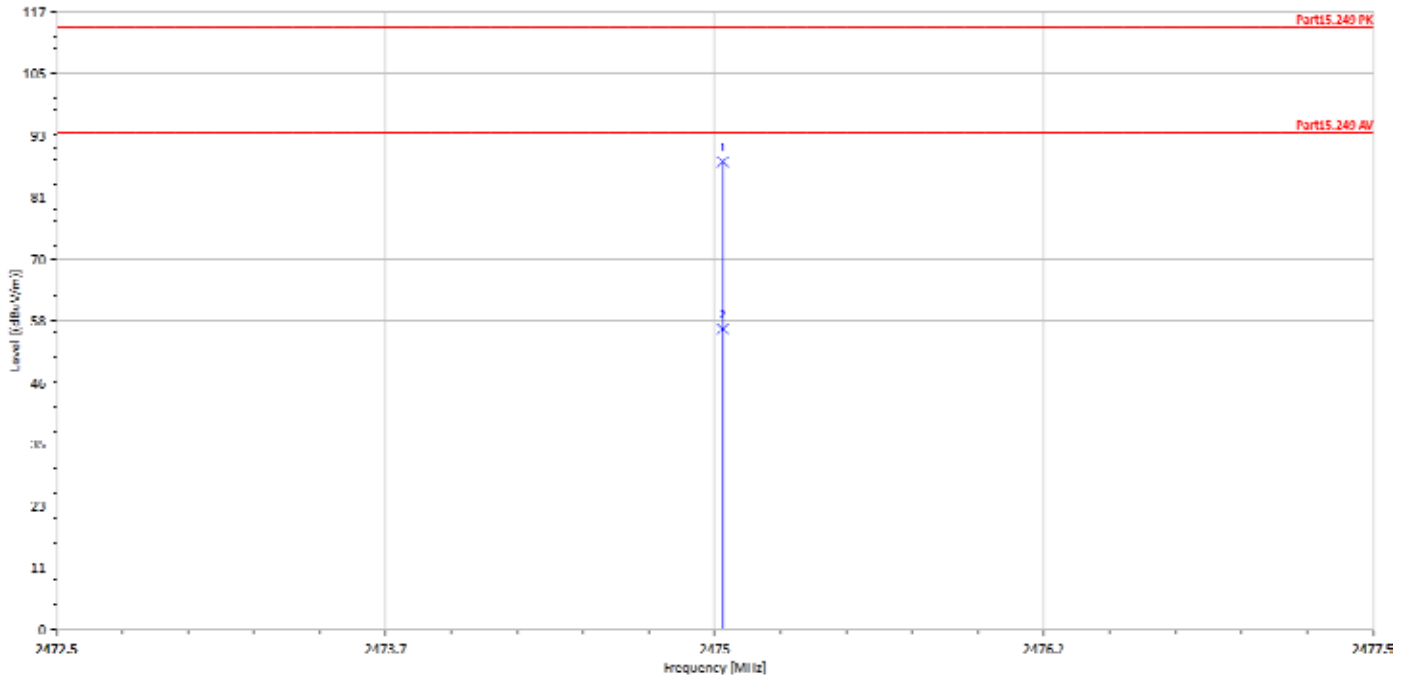
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Operation Mode :	2.4G	Test Date :	2015/8/28
Fundamental Frequency :	2475 MHz	Temp. / Humi. :	26.4deg_C/47RH
Operation Band :	Main	Test Engineer :	Vito
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



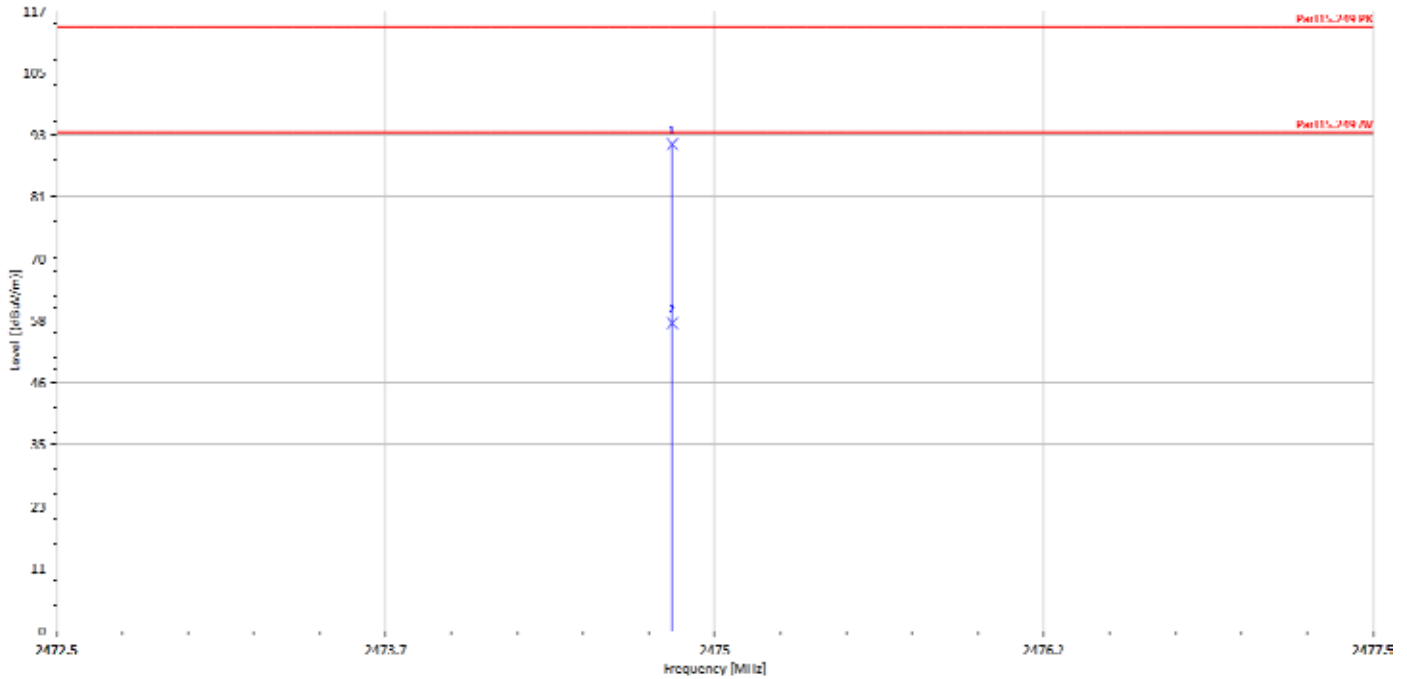
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2475.03	F	Peak	81.57	6.94	88.51	114	-25.49
2475.03	F	Average	49.97	6.94	56.91	94	-37.09

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Operation Mode : 2.4G Test Date : 2015/8/28  
 Fundamental Frequency : 2475 MHz Temp. / Humi. : 26.4deg\_C/47RH  
 Operation Band : Main Test Engineer : Vito  
 EUT Pol. : E2 Measurement Antenna Pol. : Horizontal



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2474.89	F	Peak	82.21	6.94	89.15	114	-24.85
2474.89	F	Average	49.38	6.94	56.32	94	-37.68

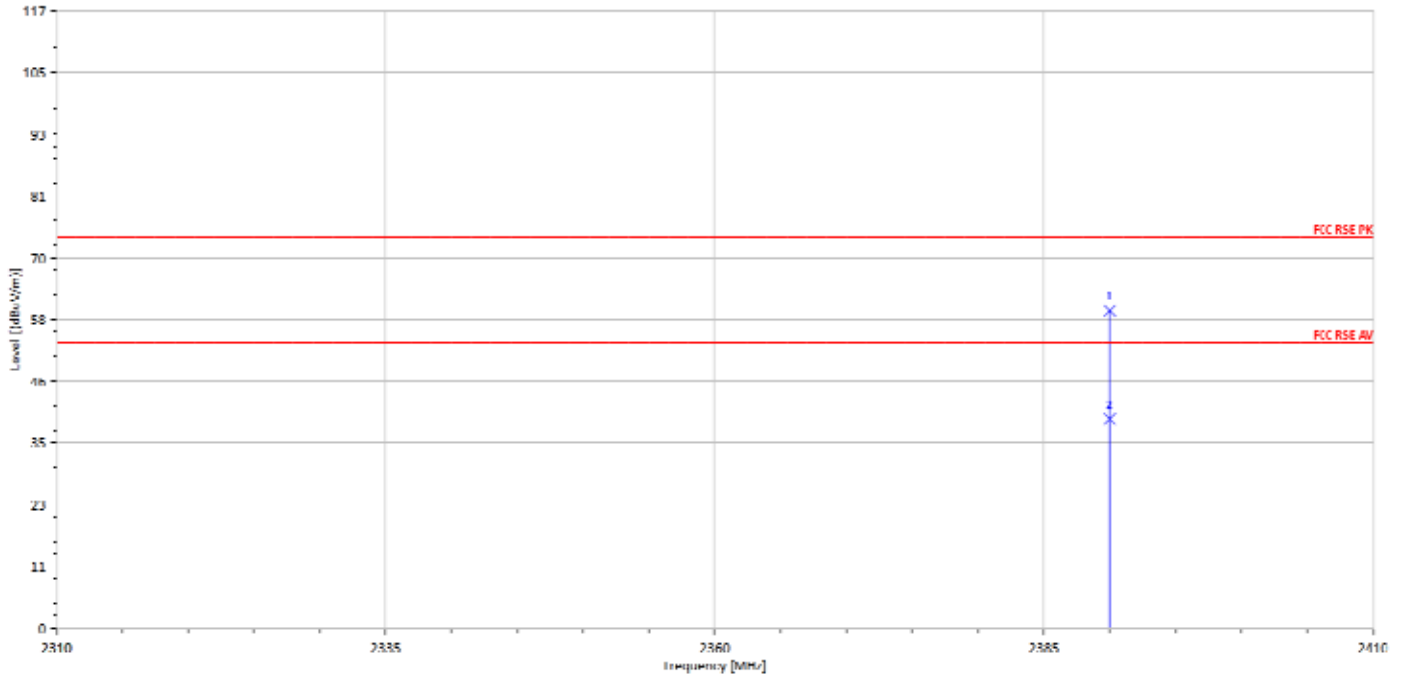
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**Radiated Spurious Emission Measurement Result**

Operation Mode : 2.4G Test Date : 2015/8/28  
 Fundamental Frequency : 2403 MHz Temp. / Humi. : 26.4deg\_C/47RH  
 Operation Band : BE CH LOW Test Engineer : Vito  
 EUT Pol. : E2 Measurement Antenna Pol. : Vertical



Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.

“---” : denotes Noise Floor.

The trace on RE (radiation emission) plot is as colored blue, and the detection manner we’ve employed is peak detector.

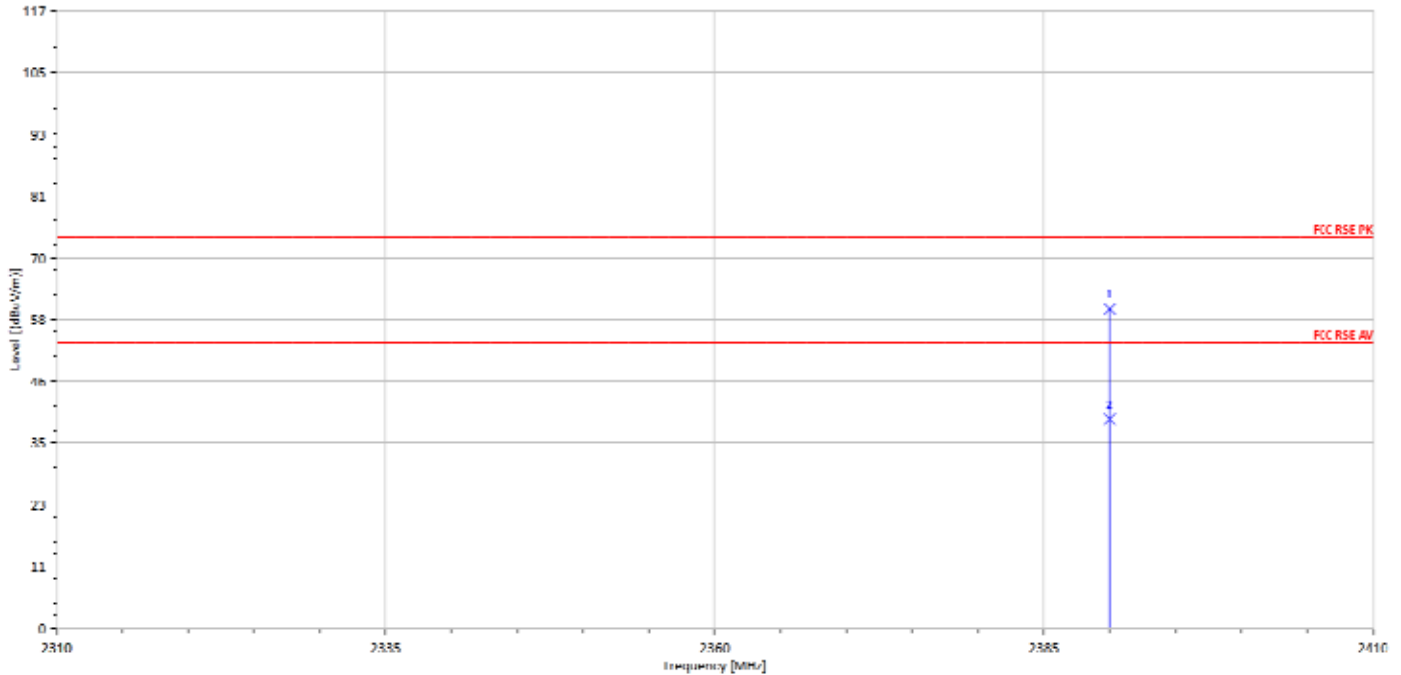
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	E	Peak	53.58	6.62	60.19	74	-13.81
2390.00	E	Average	33.02	6.62	39.64	54	-14.36

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Operation Mode : 2.4G Test Date : 2015/8/28  
 Fundamental Frequency : 2403 MHz Temp. / Humi. : 26.4deg\_C/47RH  
 Operation Band : BE CH LOW Test Engineer : Vito  
 EUT Pol. : E2 Measurement Antenna Pol. : Horizontal



Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.

“---” : denotes Noise Floor.

The trace on RE (radiation emission) plot is as colored blue, and the detection manner we’ve employed is peak detector.

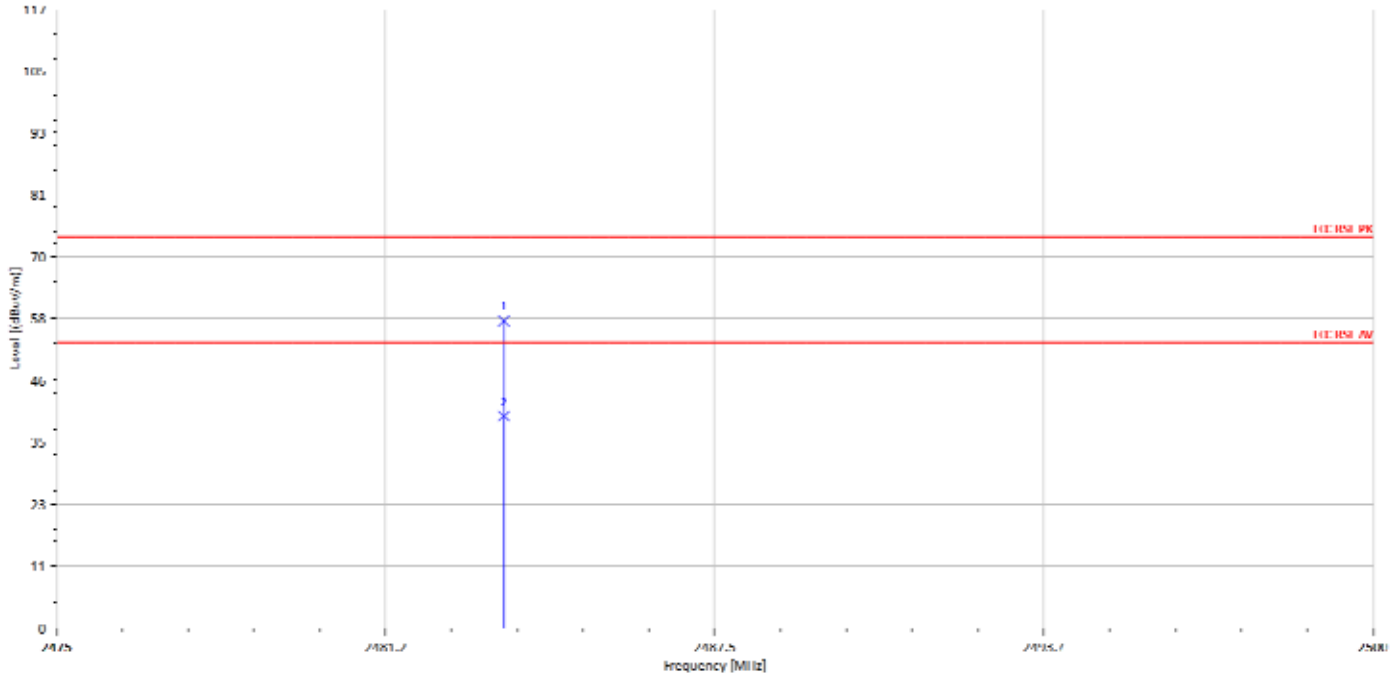
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	E	Peak	53.87	6.62	60.49	74	-13.51
2390.00	E	Average	33.00	6.62	39.62	54	-14.38

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Operation Mode :	2.4G	Test Date :	2015/8/28
Fundamental Frequency :	2475 MHz	Temp. / Humi. :	26.4deg_C/47RH
Operation Band :	BE CH HIGH	Test Engineer :	Vito
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Actual FS(dBµV/m) = SPA. Reading level(dBµV) + Factor(dB)

Factor(dB) = Antenna Factor(dBµV/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.

“---” : denotes Noise Floor.

The trace on RE (radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

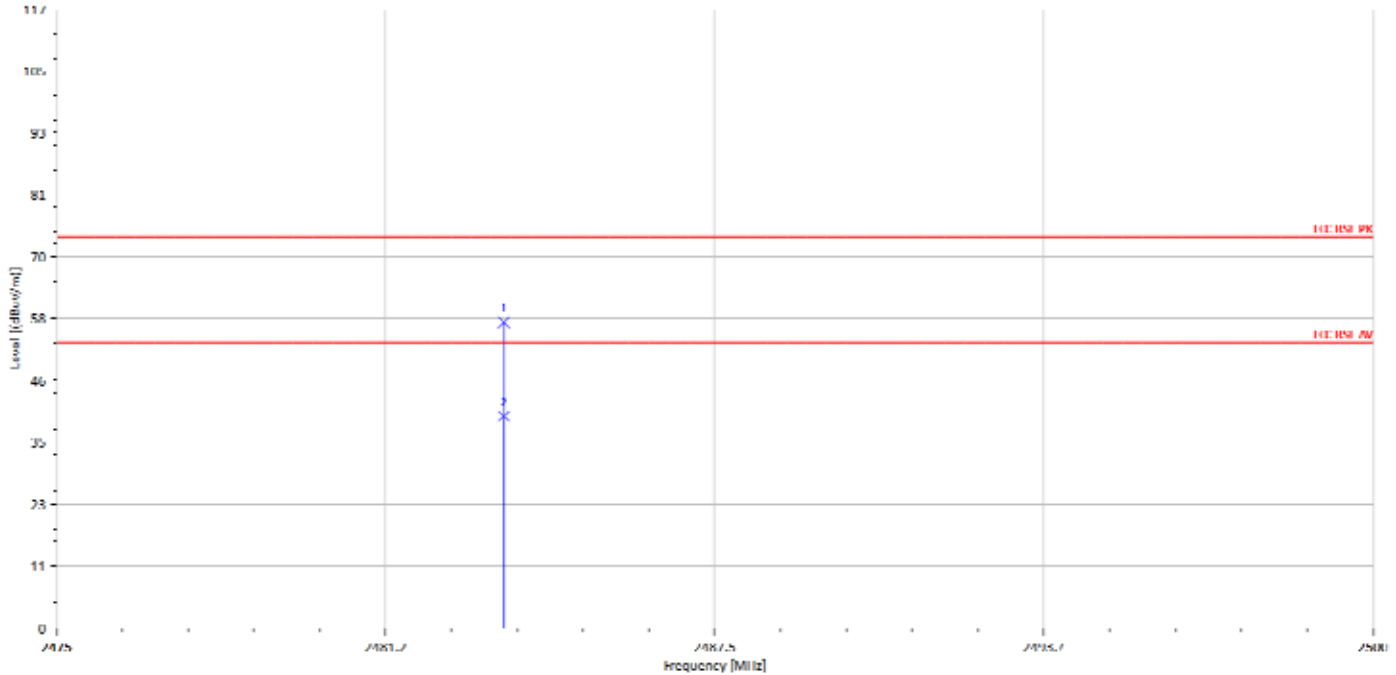
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	E	Peak	51.02	6.96	57.99	74	-16.01
2483.50	E	Average	33.06	6.96	40.02	54	-13.98

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Operation Mode :	2.4G	Test Date :	2015/8/28
Fundamental Frequency :	2475 MHz	Temp. / Humi. :	26.4deg_C/47RH
Operation Band :	BE CH HIGH	Test Engineer :	Vito
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.

“---” : denotes Noise Floor.

The trace on RE (radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Peak	50.77	6.96	57.73	74	-16.27
2483.50	E	Average	33.04	6.96	40.00	54	-14.00

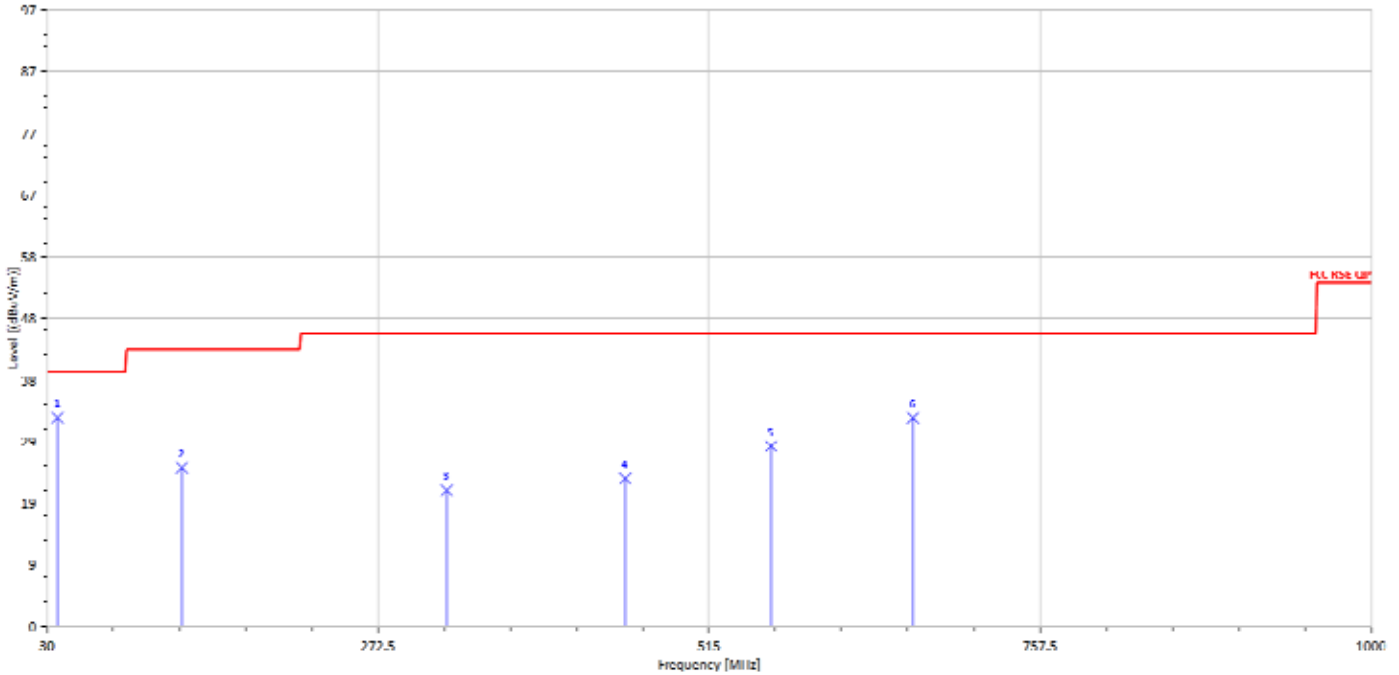
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**Radiated Spurious Emission Measurement Result  
 For Frequency form 30MHz to 1000MHz**

Operation Mode :	2.4G	Test Date :	2015/8/28
Fundamental Frequency :	2403 MHz	Temp. / Humi. :	26.4deg_C/47RH
Operation Band :	TX CH LOW	Test Engineer :	Vito
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



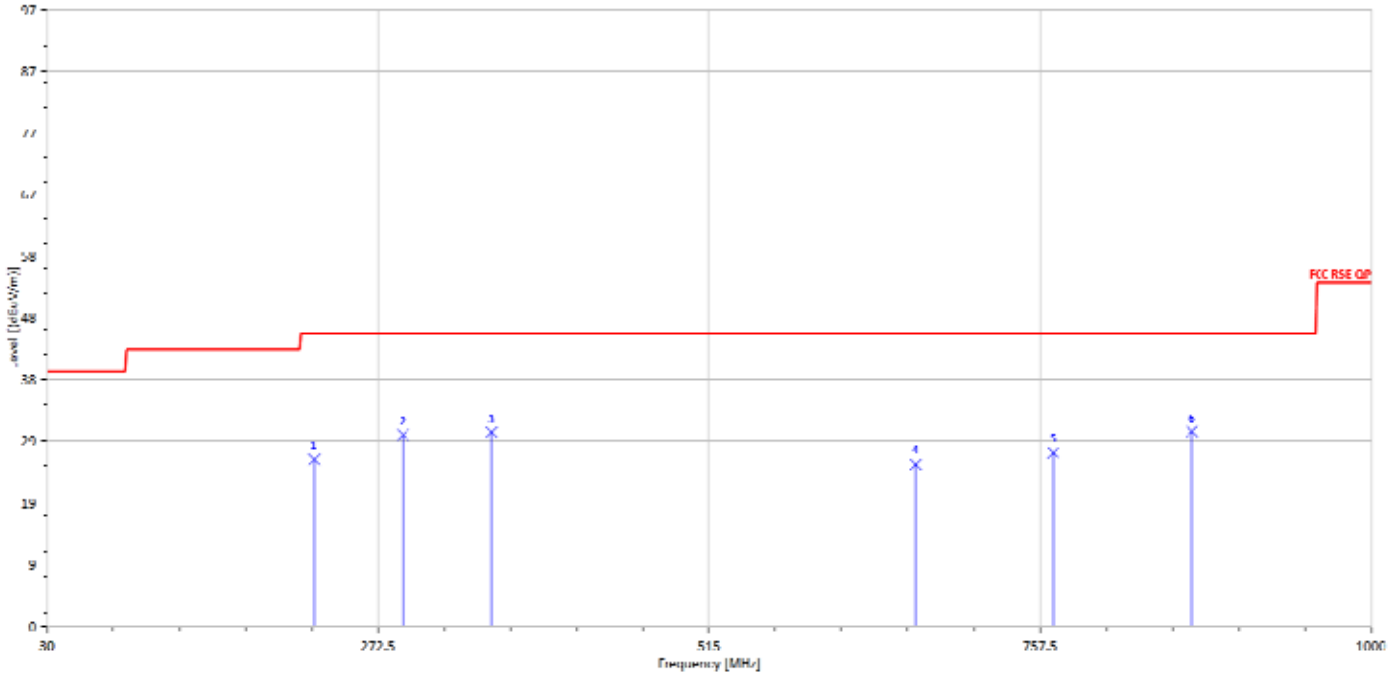
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
37.76	S	Peak	50.38	-17.57	32.81	40	-7.20
128.94	S	Peak	46.27	-21.34	24.93	43.5	-18.57
322.94	S	Peak	40.00	-18.55	21.44	46	-24.56
453.89	S	Peak	38.08	-14.80	23.27	46	-22.73
560.59	S	Peak	41.17	-12.86	28.31	46	-17.69
664.38	S	Peak	44.45	-11.66	32.78	46	-13.22

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Operation Mode : 2.4G                      Test Date : 2015/8/28  
 Fundamental Frequency : 2403 MHz              Temp. / Humi. : 26.4deg\_C/47RH  
 Operation Band : TX CH LOW              Test Engineer : Vito  
 EUT Pol. : E2                      Measurement Antenna Pol. : Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
225.94	S	Peak	48.81	-22.60	26.21	46	-19.79
290.93	S	Peak	49.39	-19.38	30.00	46	-16.00
355.92	S	Peak	47.71	-17.29	30.41	46	-15.59
666.32	S	Peak	37.07	-11.65	25.41	46	-20.59
767.20	S	Peak	37.26	-10.01	27.25	46	-18.75
869.05	S	Peak	38.83	-8.28	30.55	46	-15.45

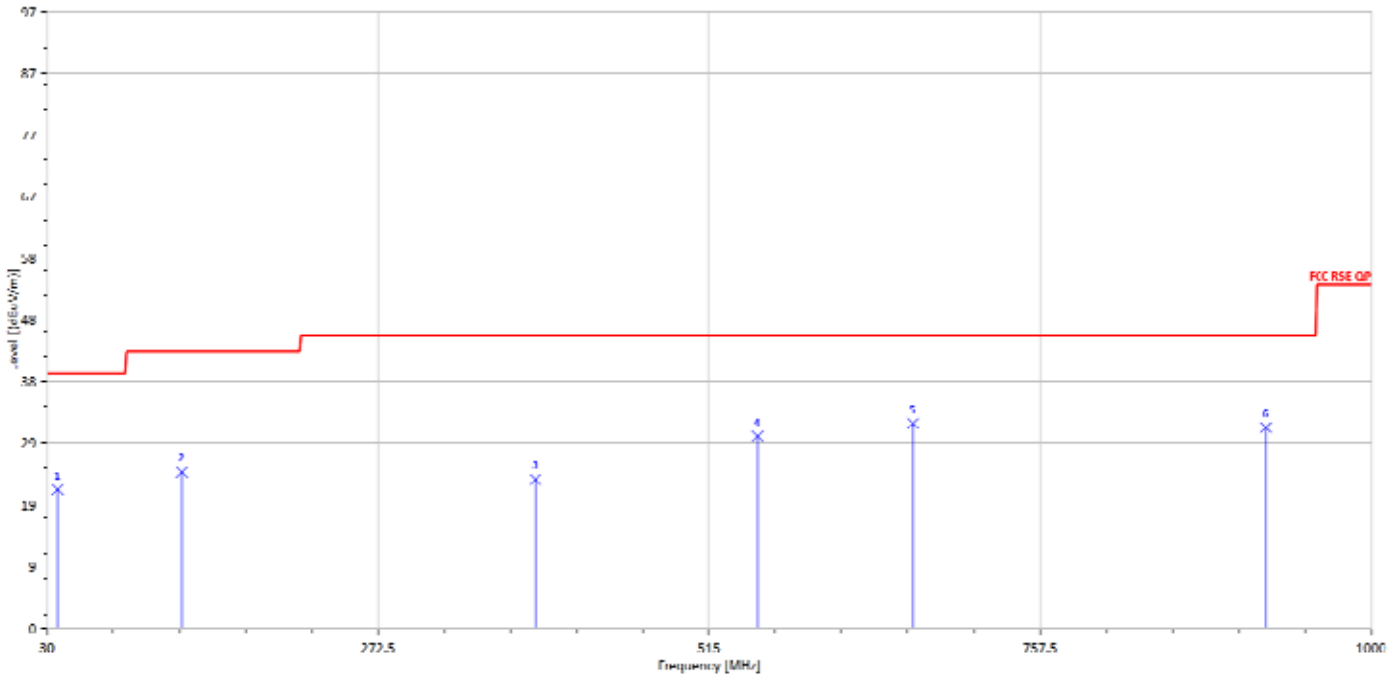
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Operation Mode : 2.4G      Test Date : 2015/8/28  
 Fundamental Frequency : 2440 MHz      Temp. / Humi. : 26.4deg\_C/47RH  
 Operation Band : TX CH MID      Test Engineer : Vito  
 EUT Pol. : E2      Measurement Antenna Pol. : Vertical



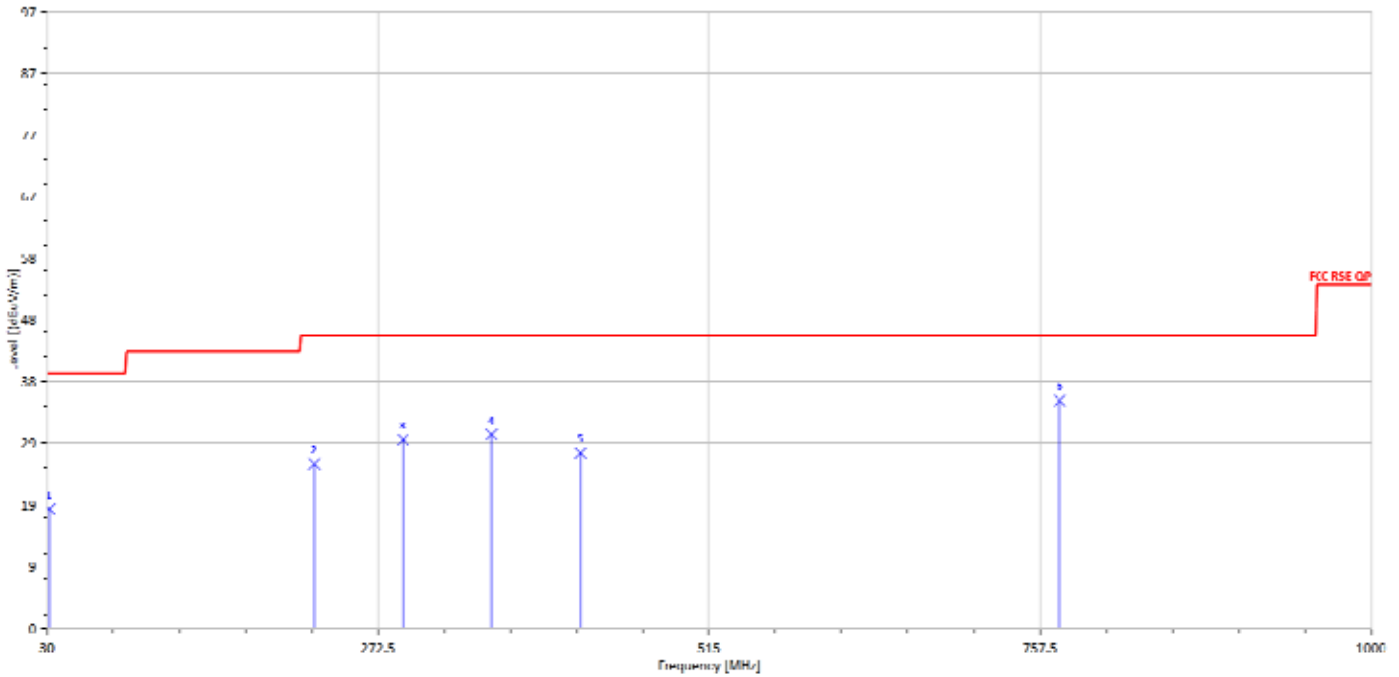
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
37.76	S	Peak	39.31	-17.57	21.74	40	-18.26
128.94	S	Peak	45.90	-21.34	24.56	43.5	-18.94
387.93	S	Peak	39.64	-16.28	23.37	46	-22.63
550.89	S	Peak	43.36	-13.24	30.12	46	-15.88
664.38	S	Peak	43.84	-11.66	32.18	46	-13.82
923.37	S	Peak	39.10	-7.56	31.54	46	-14.46

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Operation Mode : 2.4G      Test Date : 2015/8/28  
 Fundamental Frequency : 2440 MHz      Temp. / Humi. : 26.4deg\_C/47RH  
 Operation Band : TX CH MID      Test Engineer : Vito  
 EUT Pol. : E2      Measurement Antenna Pol. : Horizontal



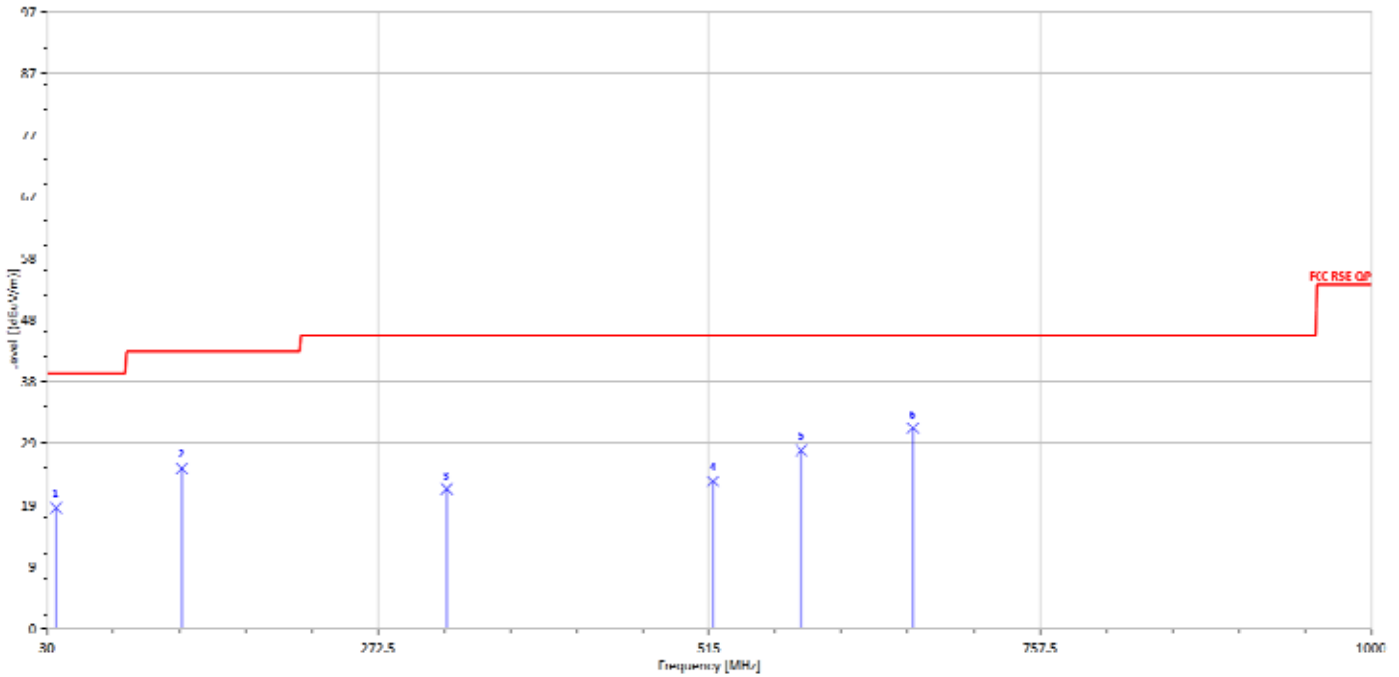
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
31.94	S	Peak	32.85	-14.17	18.69	40	-21.31
225.94	S	Peak	48.42	-22.60	25.82	46	-20.18
290.93	S	Peak	48.97	-19.38	29.58	46	-16.42
355.92	S	Peak	47.69	-17.29	30.40	46	-15.60
420.91	S	Peak	42.90	-15.39	27.51	46	-18.49
772.05	S	Peak	46.01	-10.23	35.77	46	-10.23

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Operation Mode : 2.4G Test Date : 2015/8/28  
 Fundamental Frequency : 2475 MHz Temp. / Humi. : 26.4deg\_C/47RH  
 Operation Band : TX CH HIGH Test Engineer : Vito  
 EUT Pol. : E2 Measurement Antenna Pol. : Vertical



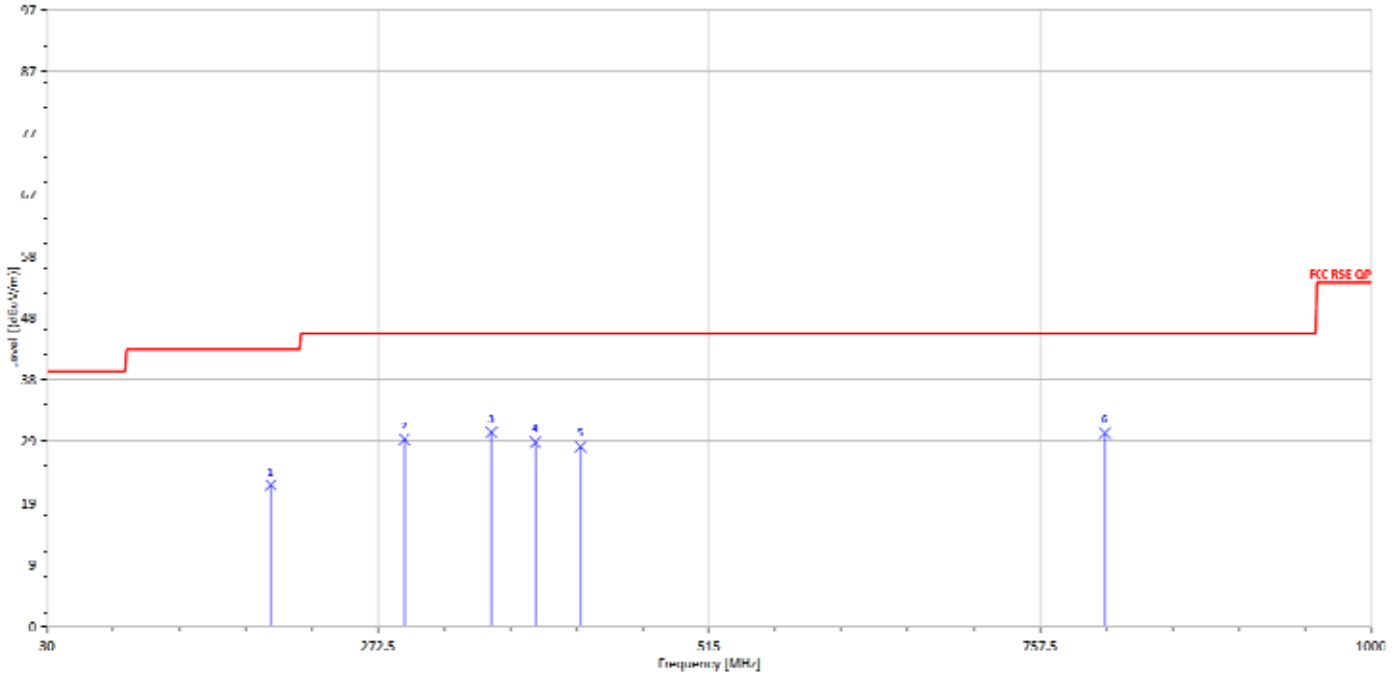
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
36.79	S	Peak	35.85	-16.96	18.89	40	-21.11
128.94	S	Peak	46.46	-21.34	25.12	43.5	-18.38
322.94	S	Peak	40.37	-18.55	21.82	46	-24.18
517.91	S	Peak	36.68	-13.60	23.07	46	-22.93
582.90	S	Peak	40.37	-12.45	27.92	46	-18.08
664.38	S	Peak	43.12	-11.66	31.45	46	-14.55

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 Operation Band : TX CH HIGH Test Engineer : Vito  
 EUT Pol. : E2 Measurement Antenna Pol. : Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
193.93	S	Peak	45.96	-23.82	22.14	43.5	-21.36
291.90	S	Peak	48.71	-19.38	29.33	46	-16.67
355.92	S	Peak	47.69	-17.29	30.40	46	-15.60
387.93	S	Peak	45.14	-16.28	28.86	46	-17.14
420.91	S	Peak	43.58	-15.39	28.19	46	-17.81
805.03	S	Peak	39.43	-9.13	30.29	46	-15.71

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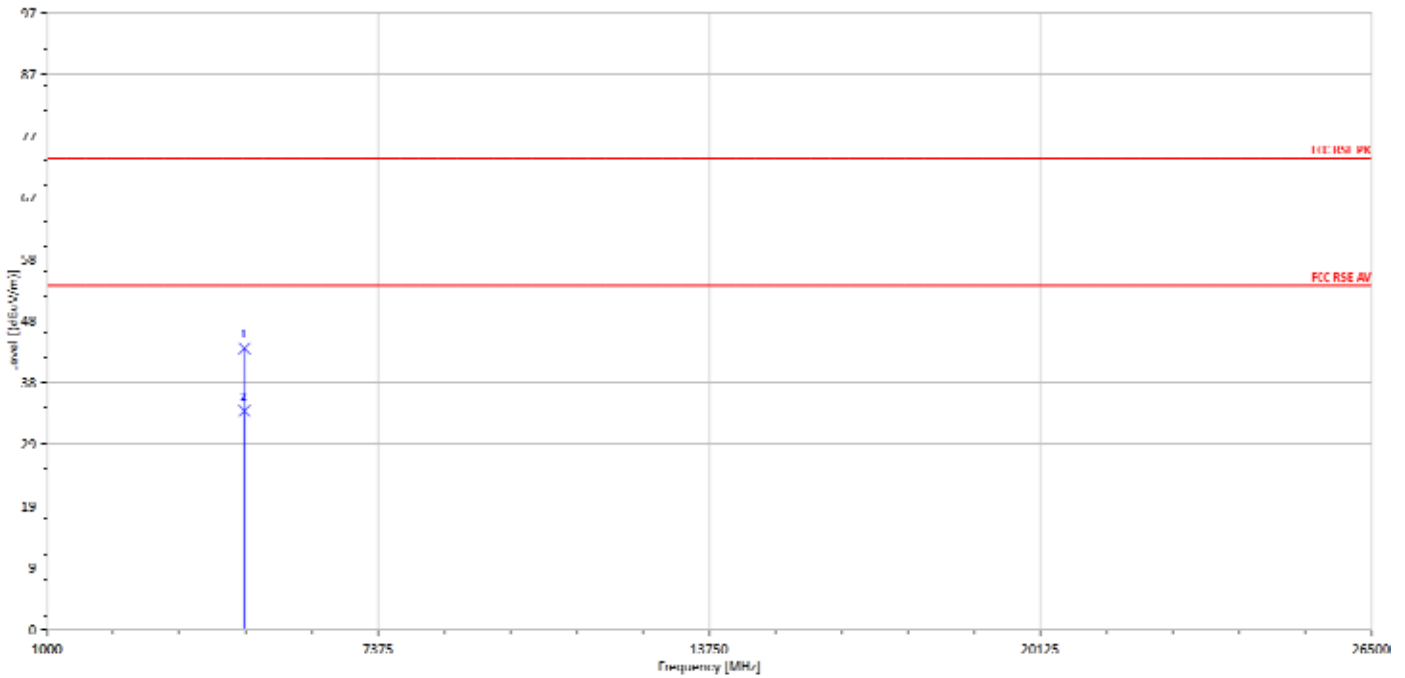
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### Radiated Spurious Emission Measurement Result

#### For Frequency above 1GHz

Operation Mode :	2.4G	Test Date :	2015/8/28
Fundamental Frequency :	2403 MHz	Temp. / Humi. :	26.4deg_C/47RH
Operation Band :	TX CH LOW	Test Engineer :	Vito
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



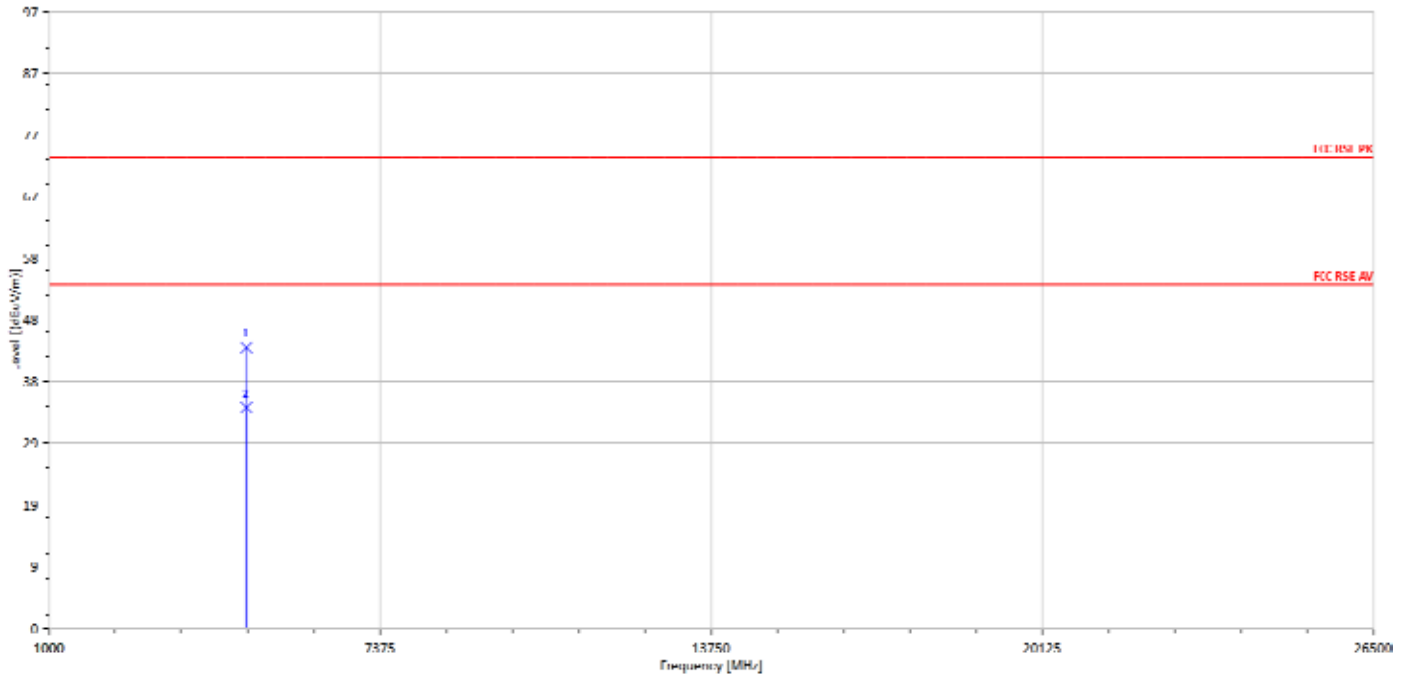
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4806.00	H	Peak	33.17	10.98	44.16	74	-29.84
4806.00	H	Average	23.35	10.98	34.33	54	-19.67

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Operation Mode : 2.4G Test Date : 2015/8/28  
 Fundamental Frequency : 2403 MHz Temp. / Humi. : 26.4deg\_C/47RH  
 Operation Band : TX CH LOW Test Engineer : Vito  
 EUT Pol. : E2 Measurement Antenna Pol. : Horizontal



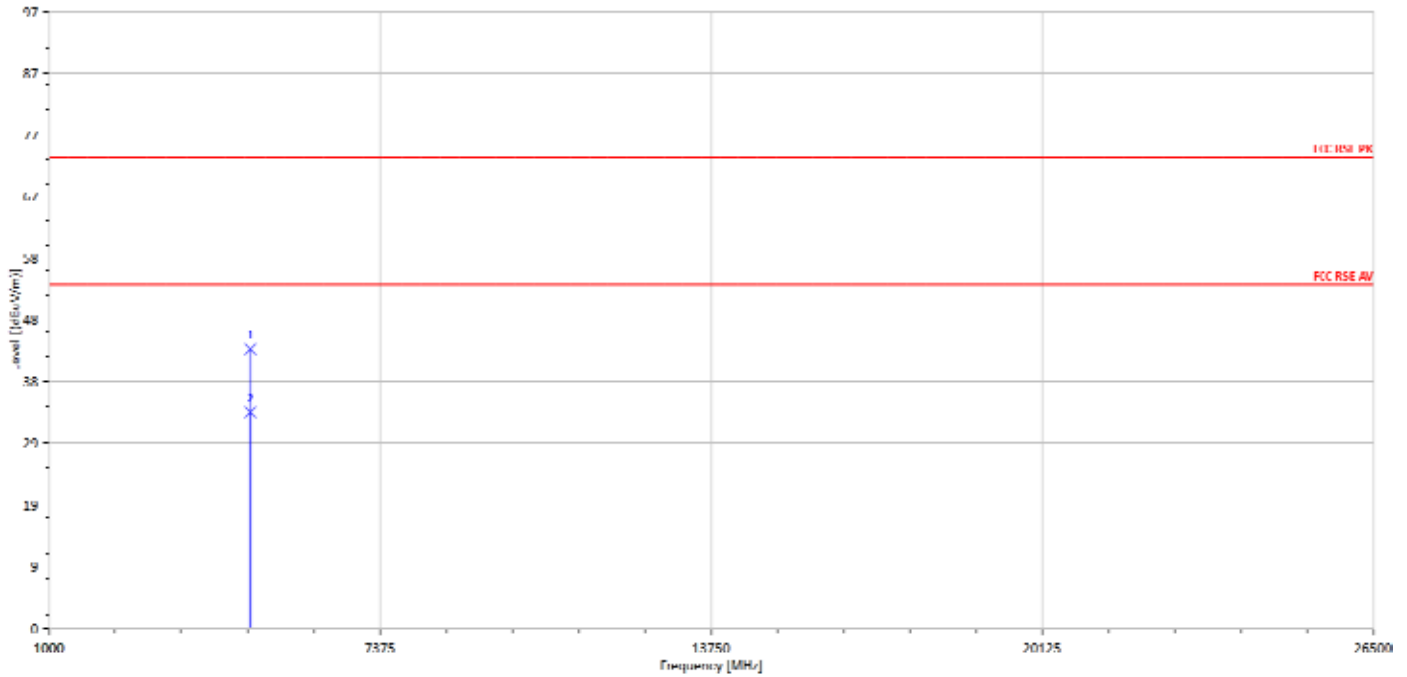
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4806.00	H	Peak	33.14	10.98	44.13	74	-29.87
4806.00	H	Average	23.72	10.98	34.70	54	-19.30

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Operation Mode : 2.4G Test Date : 2015/8/28  
 Fundamental Frequency : 2440 MHz Temp. / Humi. : 26.4deg\_C/47RH  
 Operation Band : TX CH MID Test Engineer : Vito  
 EUT Pol. : E2 Measurement Antenna Pol. : Vertical



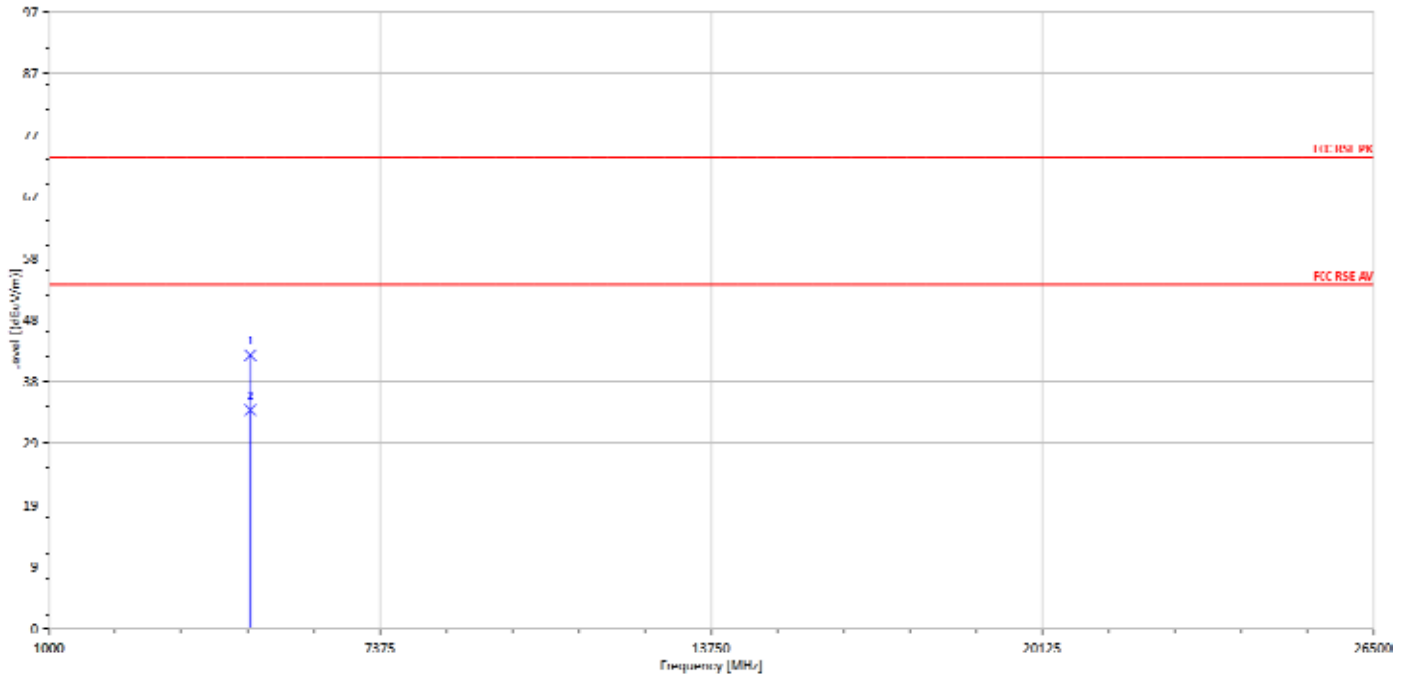
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4880.00	H	Peak	32.99	10.90	43.89	74	-30.11
4880.00	H	Average	23.08	10.90	33.98	54	-20.02

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Operation Mode : 2.4G Test Date : 2015/8/28  
 Fundamental Frequency : 2440 MHz Temp. / Humi. : 26.4deg\_C/47RH  
 Operation Band : TX CH MID Test Engineer : Vito  
 EUT Pol. : E2 Measurement Antenna Pol. : Horizontal



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4880.00	H	Peak	32.03	10.90	42.94	74	-31.06
4880.00	H	Average	23.41	10.90	34.31	54	-19.69

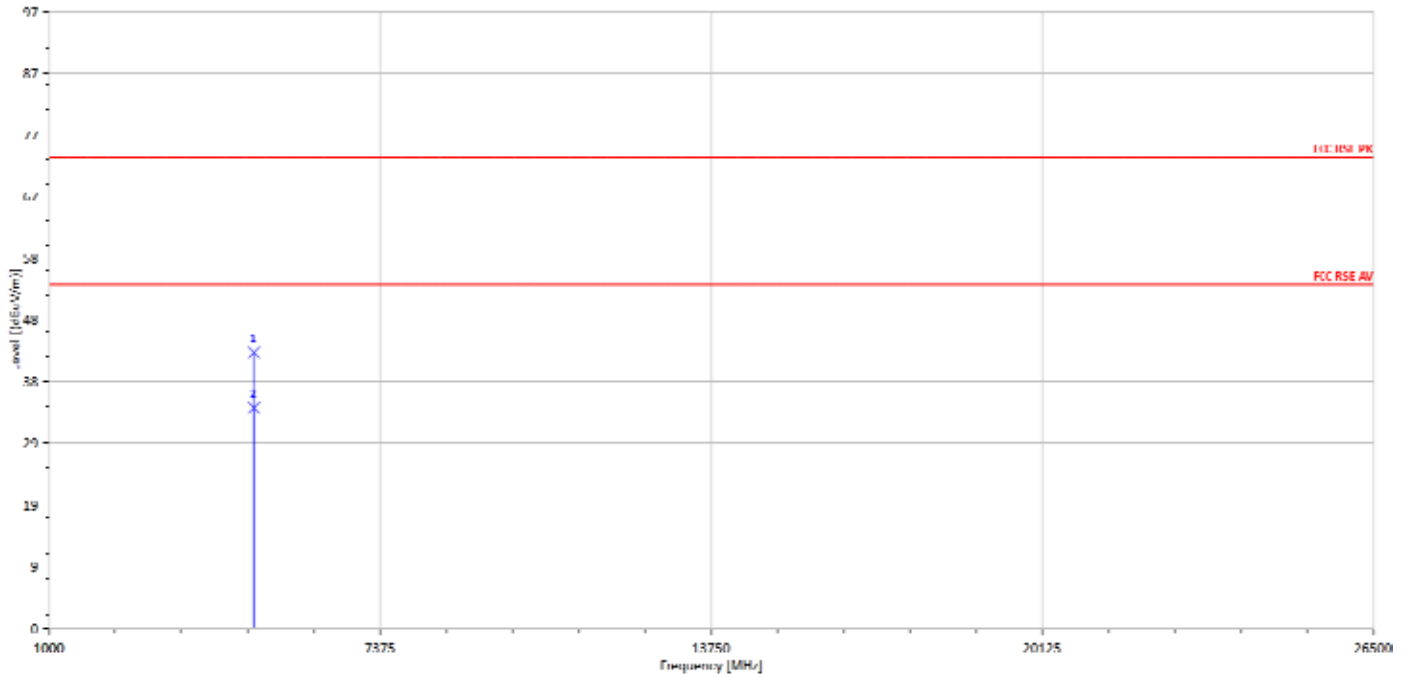
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Operation Mode : 2.4G Test Date : 2015/8/28  
 Fundamental Frequency : 2475 MHz Temp. / Humi. : 26.4deg\_C/47RH  
 Operation Band : TX CH HIGH Test Engineer : Vito  
 EUT Pol. : E2 Measurement Antenna Pol. : Vertical



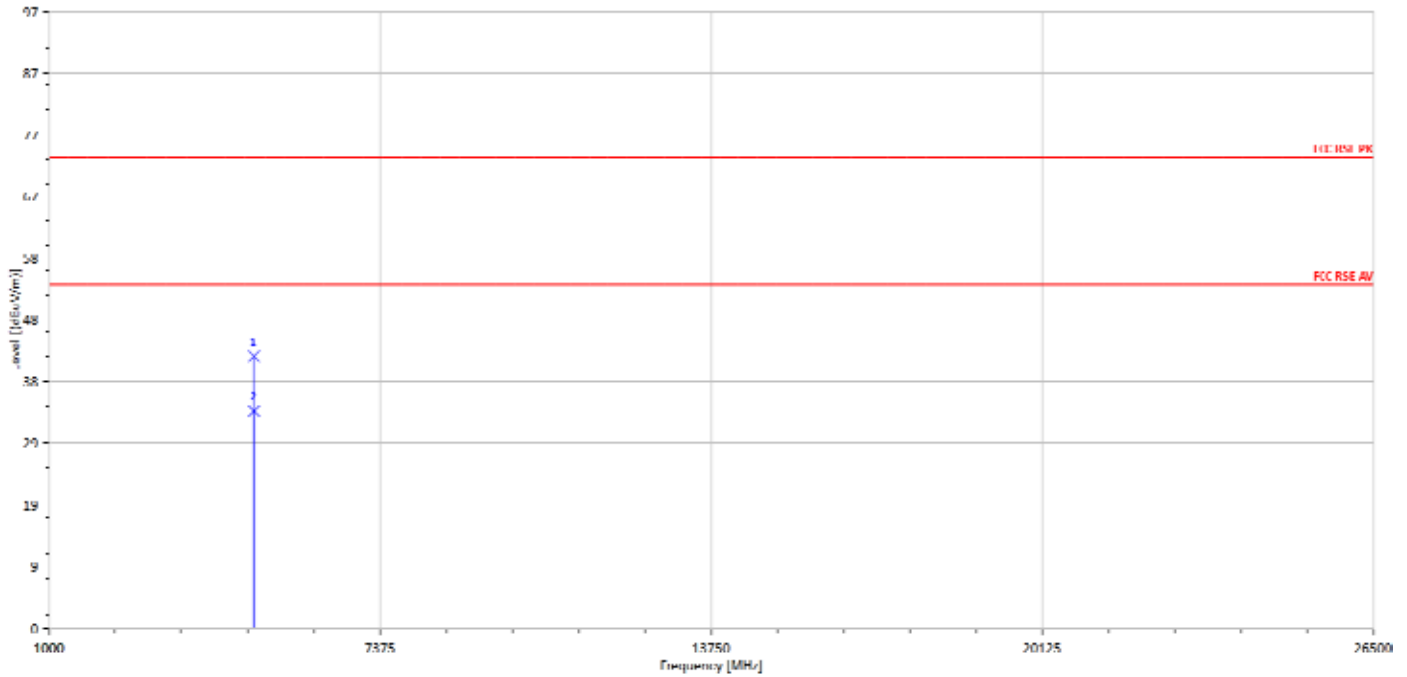
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4950.00	H	Peak	32.39	10.96	43.35	74	-30.65
4950.00	H	Average	23.68	10.96	34.64	54	-19.36

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 Fundamental Frequency : 2475 MHz Temp. / Humi. : 26.4deg\_C/47RH  
 Operation Band : TX CH HIGH Test Engineer : Vito  
 EUT Pol. : E2 Measurement Antenna Pol. : Horizontal



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4950.00	H	Peak	31.80	10.96	42.76	74	-31.24
4950.00	H	Average	23.19	10.96	34.15	54	-19.85

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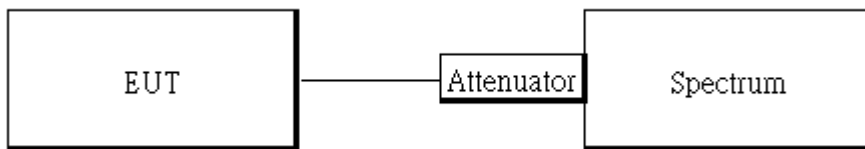
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## 8. 20 dB Bandwidth Measurement

### 8.1 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW=20kHz of the approximate emission bandwidth, VBW = 3 times RBW, Span= approximately 20dB below the peak level. Sweep=auto
4. Repeat above procedures until all frequency measured were complete.

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



### 8.3 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
Power Meter	Anritsu	ML2496A	1326001	06/23/2015	06/22/2016
Power Sensor	Anritsu	MA2411B	1315048	06/23/2015	06/22/2016
Power Sensor	Anritsu	MA2411B	1315049	06/23/2015	06/22/2016
Coaxial Cable 30cm	WOKEN	00100A1F1A195 C	RF01	12/19/2014	12/18/2015
DC Block	PASTERNAK	PE8210	RF29	12/19/2014	12/18/2015
Splitter	RF-LAMBAD	RFLT2W1G18G	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

### 8.4 Measurement Results:

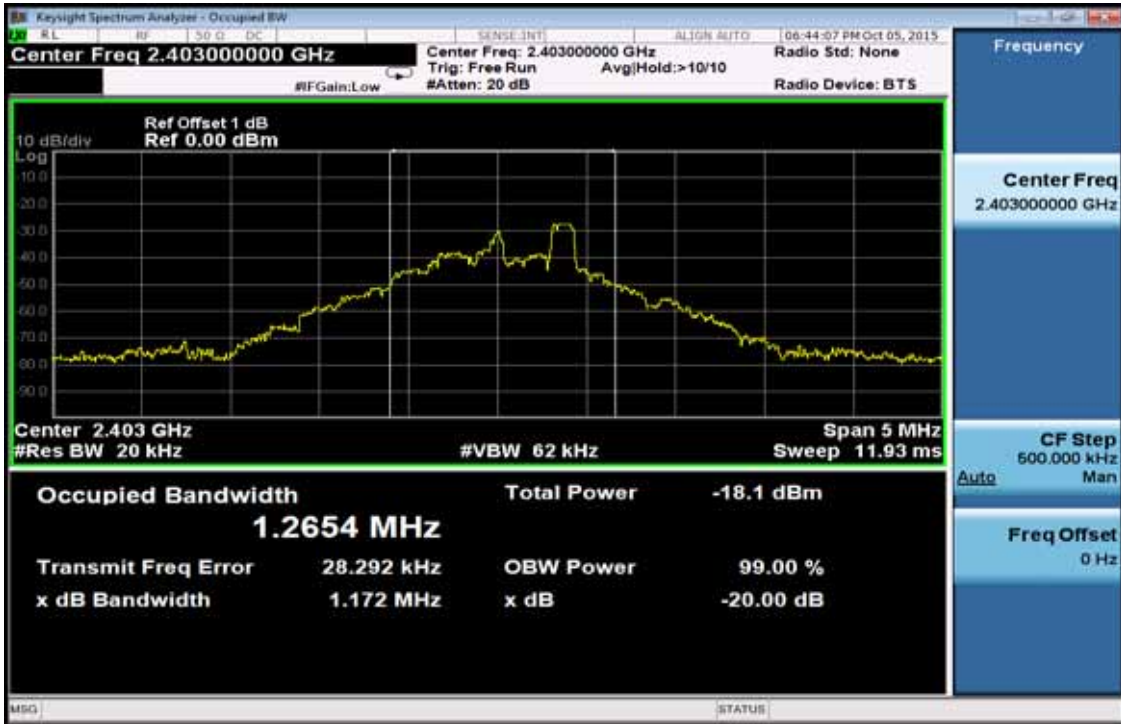
2.403GHz = 1.172MHz  
 2.440GHz = 1.147MHz  
 2.475GHz = 1.147MHz

Refer to attached data chart.

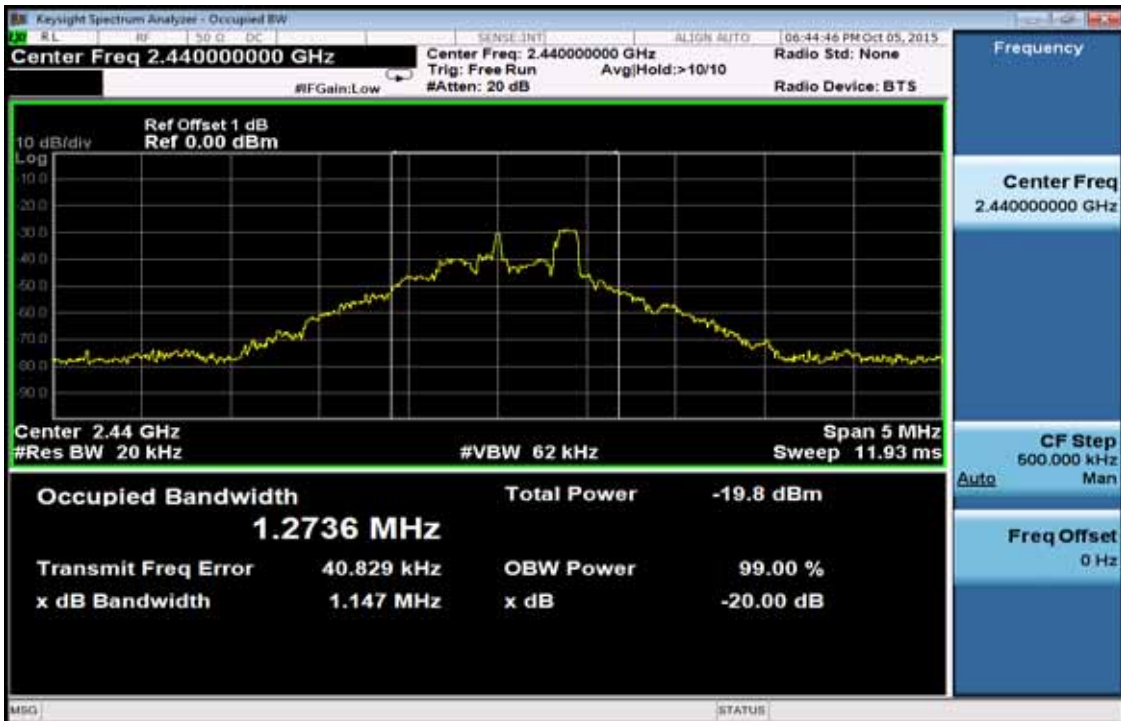
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### 20dB Bandwidth Test Plot CH-Low



### 20dB Bandwidth Test Plot CH-Mid



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### 20dB Bandwidth Test Plot CH-High



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