

# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

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

**Product Name:** DxPatch Receiver

**Brand Name:** ApoDx

**Model No.:** 8ZPG

**Model Difference:** N/A

**FCC ID:** 2AF6P8ZPG

**Report No.:** ER/2016/30122-02

**Issue Date:** Sep. 02, 2019

**FCC Rule Part:** §15.249

**Prepared for:** ApoDx Technology, Inc.  
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**Prepared by:** SGS Taiwan Ltd.  
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## VERIFICATION OF COMPLIANCE

**Applicant:** ApoDx Technology, Inc.  
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11503, Taiwan(R.O.C.)

**Product Name:** DxPatch Receiver

**Brand Name:** ApoDx

**Model No.:** 8ZPG

**Model Difference:** N/A

**FCC ID:** 2AF6P8ZPG

**File Number:** ER/2016/30122-02

**Date of test:** Feb. 17, 2016 ~ May. 23, 2016

**Date of EUT Received:** Feb. 17, 2016

**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:** Marcus Tseng **Date:** Sep. 02, 2019

Marcus Tseng / Sr. Engineer

**Prepared By:** Yuri Tsai **Date:** Sep. 02, 2019

Yuri Tsai / Clerk

**Approved By:** Jim Chang **Date:** Sep. 02, 2019

Jim Chang / Asst. Manager

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## Revision History

Report Number	Revision	Description	Effectuated Page	Issue Date	Revised By
ER/2016/30122	Rev.00	Initial creation of document	All	May. 23, 2016	Yuri Tsai
ER/2016/30122-02	Rev.01	Add section 1.6 remark and conduction data updated	7,17~18	Sep. 02, 2019	Yuri Tsai

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# 1 GENERAL INFORMATION

## 1.1 Product Description

General:

Product Name:	DxPatch Receiver
Brand Name:	ApoDx
Model No.:	8ZPG
Model Difference:	N/A
Hardware Version:	N/A
Software Version:	N/A
Operation Frequency:	2402MHz ~ 2430MHz
Channel number:	29 channels
Channel space:	1MHz
Modulation Type:	GFSK
Power Supply:	5Vdc from USB port
Antenna Designation:	Dipole Antenna, Peak Gain: 1.97dBi

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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 composite system is compliance with FCC Subpart B is authorized under the certification procedure.

## 1.3 Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803 (TAF code 0513)

FCC Designation Number: TW0001

## 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.

## 1.6 Remarks

The original test report ER/2016/30122 will be withdrawn with this test report ER/2016/30122-02 and is no longer valid when the withdrawal occurred.

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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 plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz. 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 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

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

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

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 as below, whichever is the lesser attenuation.

Frequency (MHz)	Field strength $\mu\text{V/m}$	Distance (m)	Field strength at 3m $\text{dB}\mu\text{V/m}$
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

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.

- Re- mark:
1. Emission level in  $\text{dB}\mu\text{V/m}=20 \log (\mu\text{V/m})$
  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 and RSS-Gen  $\xi$  8.10
  4. Emission spurious frequency which appearing within the Restricted Bands specified in provision of  $\xi$  15.205 and RSS-Gen  $\xi$  8.10, then the general radiated emission limits in  $\xi$  15.209 and RSS-Gen  $\xi$  8.9 apply.

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## 2.6 Configuration of Tested System

Fig. 2-1 Radiated Emission Configuration

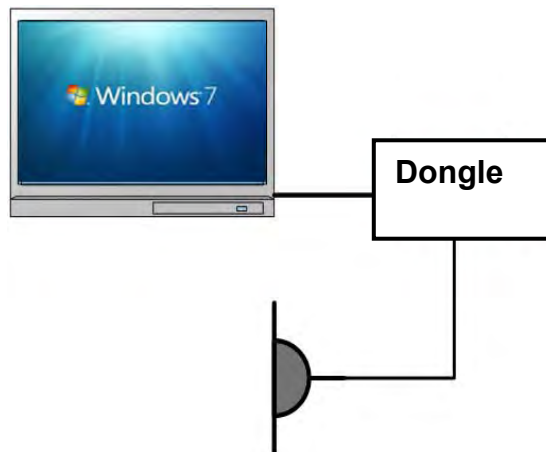


Fig. 2-2 Conducted (Antenna Port) Configuration

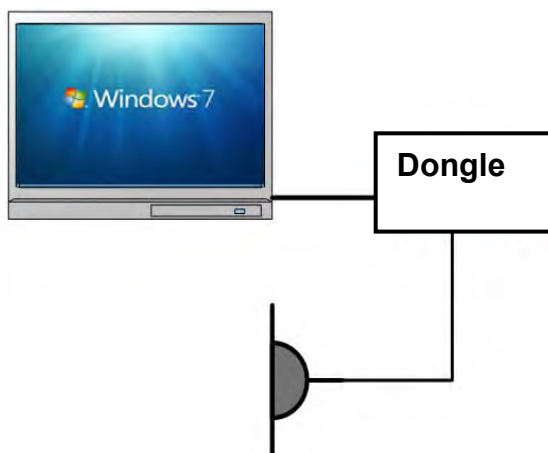


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	2.4GHz Wireless Test Software	N/A	N/A	N/A	N/A	N/A
2.	Notebook	Lenovo	L412	LR-957X7	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	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

29 channels are provided.

Channel	Frequency	Channel	Frequency
0	2402	15	2417
1	2403	16	2418
2	2404	17	2419
3	2405	18	2420
4	2406	19	2421
5	2407	20	2422
6	2408	21	2423
7	2409	22	2424
8	2410	23	2425
9	2411	24	2426
10	2412	25	2427
11	2413	26	2428
12	2414	27	2429
13	2415	28	2430
14	2416		

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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
2.4G	0~29	1, 13, 28	GFSK	N/A	MAIN
RADIATED EMISSION TEST (ABOVE 1 GHz)					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
2.4G	0~29	1, 13, 28	GFSK	N/A	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 2.4GHz Wireless Transmitter for channel Low, Mid and High, the worst case H position was reported.

### ANTENNA PORT CONDUCTED MEASUREMENT:

CONDUCTED TEST					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
2.4G	0~29	1, 13, 28	GFSK	N/A	MAIN

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## 5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
20dB & 99% Bandwidth	+/- 51.33 Hz
100 kHz Bandwidth Of Frequency Band Edges	+/- 0.84 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> )	9kHz – 30MHz: +/- 2.87 dB
	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> )	9kHz – 30MHz: +/- 2.87 dB
	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:

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	ESCI7	100760	05/04/2015	05/03/2016
LISN	SCHWARZBECK	NSLK 8127	8127-649	05/15/2015	05/14/2016
LISN	FCC	FCC-LISN-50/25 0-25-2-01	4034	03/13/2015	03/12/2016
Coaxial Cables	N/A	WK CE Cable	N/A	11/26/2015	11/25/2016

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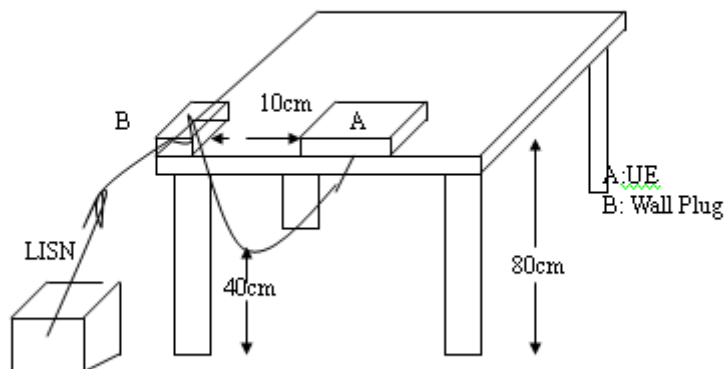
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## 6.4 Test SET-UP (Block Diagram of Configuration)



## 6.5 Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plane.
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:

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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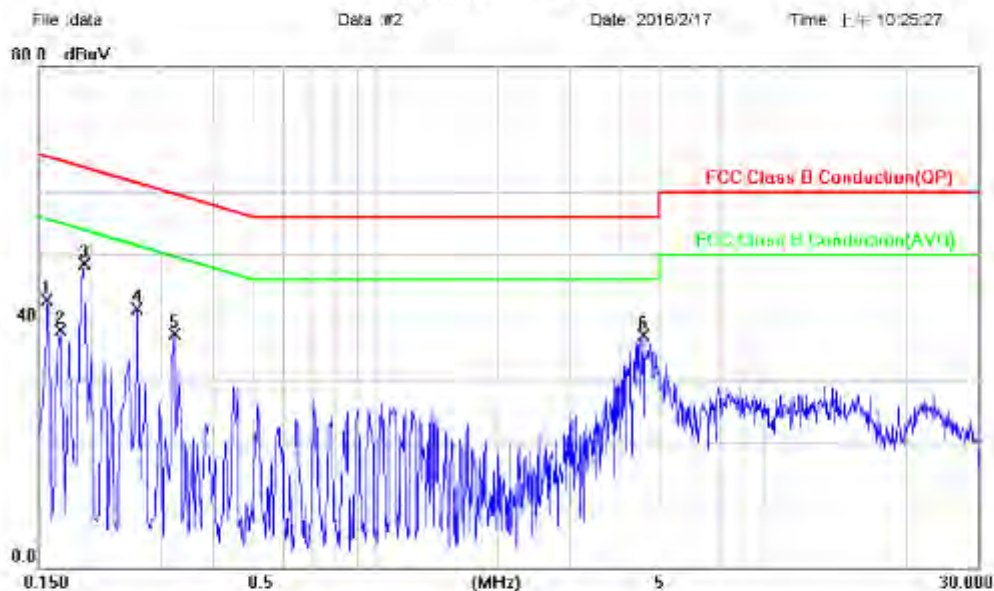
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Operation Mode:	operation mode			Test Date:	2016/02/17
Temperature:	26 °C	Humidity:	60%	Test By:	Tin
Model No.:				Probe:	L1 / N

Site: Conduction Room Phase: **L1** Temperature: 25 °C  
Limit: FCC Class B Conduction(QP) Power: AC 120V/60Hz Humidity: 55 %  
Mode: Operation 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	42.65	0.03	42.68	65.57	-22.89	peak	
2		0.1700	37.88	0.03	37.91	64.96	-27.05	peak	
3	*	0.1940	48.41	0.03	48.44	63.86	-15.42	peak	
4		0.2620	41.33	0.03	41.36	61.37	-20.01	peak	
5		0.3220	37.29	0.03	37.32	59.66	-22.34	peak	
6		4.5380	36.90	0.18	37.08	56.00	-18.92	peak	

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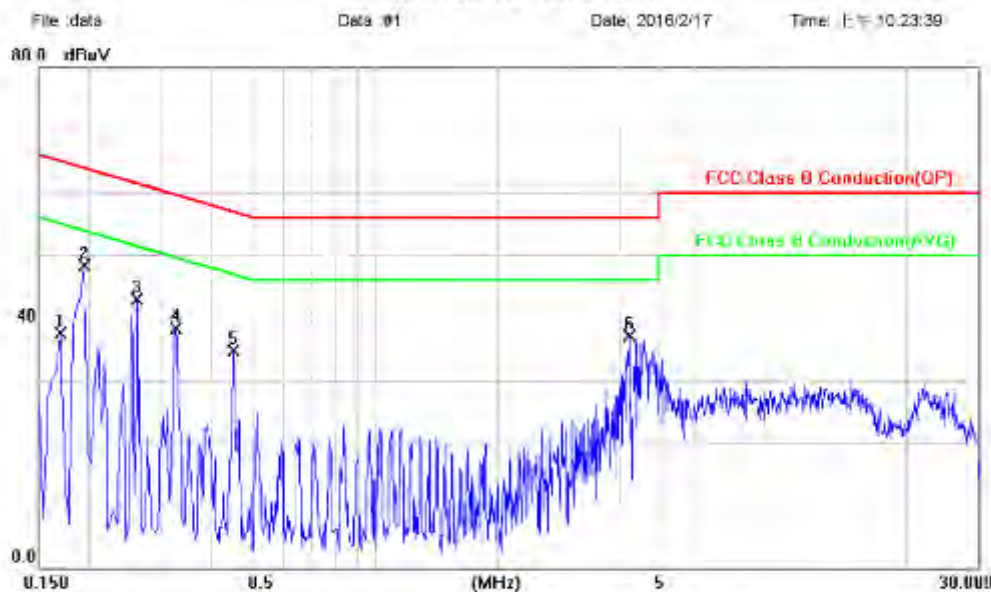
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Site: Conduction Room  
Limit: FCC Class B Conduction(QP)  
Mode: Operation mode  
Note:

Phase: **N**  
Power: AC 120V/60Hz  
Temperature: 25 °C  
Humidity: 85 %

## Conducted Emission



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1700	37.46	0.03	37.49	54.96	-27.47	peak	
2	*	0.1940	48.30	0.03	48.33	63.86	-15.53	peak	
3		0.2620	42.89	0.03	42.92	61.37	-18.45	peak	
4		0.3260	38.30	0.03	38.33	59.55	-21.22	peak	
5		0.4500	34.77	0.03	34.80	58.88	-22.08	peak	
6		4.1940	36.92	0.16	37.08	56.00	-18.92	peak	

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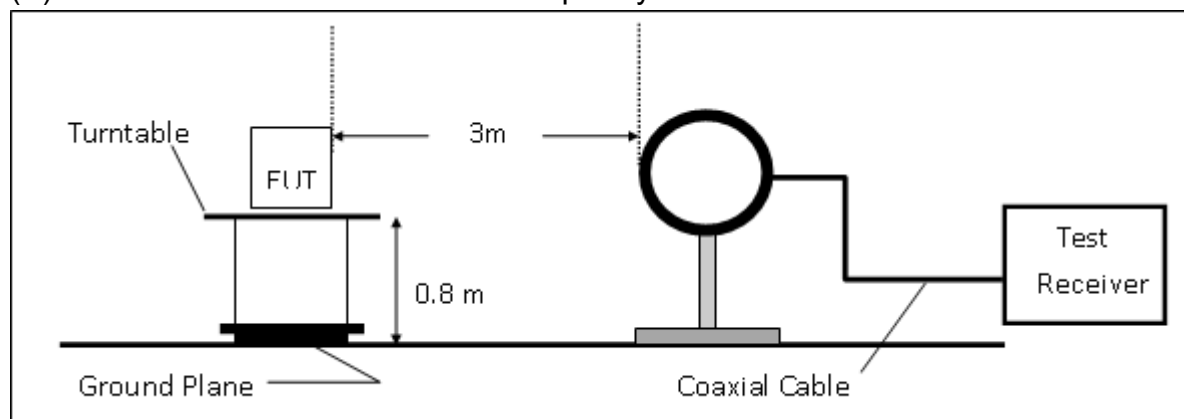
## 7 Radiated Emission Test

### 7.1. Measurement Procedure

1. The EUT was placed on a turn table with 0.8m for frequency < 1GHz and 1.5m for frequency > 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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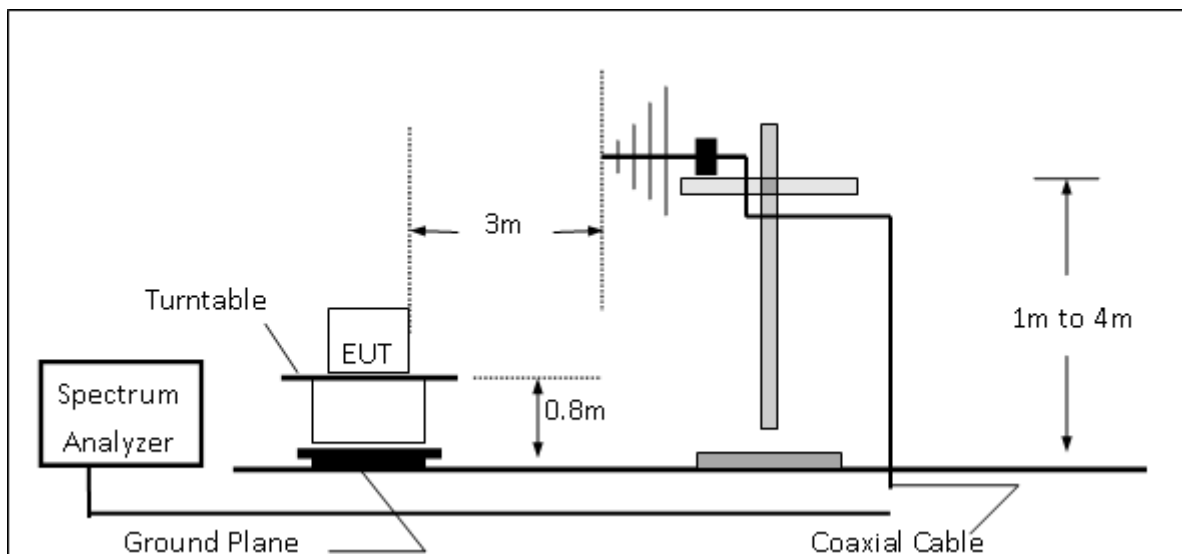
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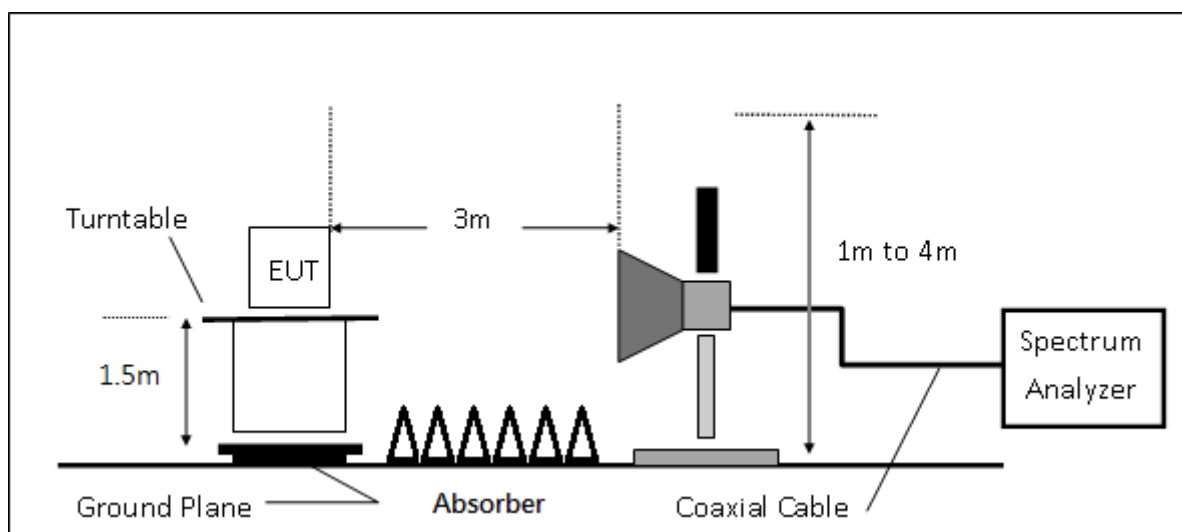
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## (B) Radiated Emission Test Set-Up, Frequency form 30MHz to 1000MHz



## (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	ESCI7	100760	05/10/2016	05/09/2017
Spectrum Analyzer	Agilent	E4446A	MY51100003	01/29/2016	01/28/2017
Loop Antenna	ETS.LINDGREN	6502	148045	09/07/2015	09/06/2016
Bilog Antenna	SCHWAZBECK	VULB9168	378	12/14/2015	12/13/2016
Horn antenna	Schwarzbeck	BBHA9120D	1441	08/10/2015	08/09/2016
Pre-Amplifier	Agilent	8447D	2944A07676	01/02/2016	01/01/2017
Pre-Amplifier	EMC Instruments Corp.	EMC0126530	980038	01/02/2016	01/01/2017
Turn Table	HD	DT420	N/A	N.C.R	N.C.R
Antenna Tower	ChamPro	AM-BS-4500-B	060776-ABS	N.C.R	N.C.R
Controller	ChamPro	EM1000	60776	N.C.R	N.C.R
Low Loss Cable	Huber Suhner	966_RX	9	01/02/2016	01/01/2017
3m Site NSA	SGS	966 chamber	N/A	07/02/2015	07/01/2016
Low Loss Cable	Huber Suhner	966 TX	1	01/02/2016	01/01/2017

Note: N.C.R refers to Not Calibrated Required

### 7.4. 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(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.

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## 7.5. Measurement Result

### Radiated Spurious Emission Measurement Result

Operation Mode :	2.4G	Test Date :	05/16/2016
Fundamental Frequency :	2402 MHz	Temp. / Humi. :	23.2 deg_C / 60 RH
Operation Band :	Main CH LOW	Test Engineer :	Edward
EUT Pol. :	H Plane	Measurement Antenna Pol. :	VERTICAL

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dBμV/m	dB	dBμV/m	dBμV/m	dB
2402.22	F	Average	70.13	71.90	-1.77	94.00	-23.87
2402.22	F	Peak	91.90	93.67	-1.77	114.00	-22.10

Operation Mode :	2.4G	Test Date :	05/16/2016
Fundamental Frequency :	2402 MHz	Temp. / Humi. :	23.2 deg_C / 60 RH
Operation Band :	Main CH LOW	Test Engineer :	Edward
EUT Pol. :	H Plane	Measurement Antenna Pol. :	HORIZONTAL

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dBμV/m	dB	dBμV/m	dBμV/m	dB
2402.22	F	Average	57.37	59.14	-1.77	94.00	-36.63
2402.22	F	Peak	79.14	80.91	-1.77	114.00	-34.86

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Operation Mode :	2.4G	Test Date :	05/16/2016
Fundamental Frequency :	2415 MHz	Temp. / Humi. :	23.2 deg_C / 60 RH
Operation Band :	Main CH MID	Test Engineer :	Edward
EUT Pol. :	H Plane	Measurement Antenna Pol. :	VERTICAL

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV/m	dB	dBμV/m	dBμV/m	dB
2415.20	F	Average	69.86	71.59	-1.73	94.00	-24.14
2415.20	F	Peak	91.59	93.33	-1.73	114.00	-22.41

Operation Mode :	2.4G	Test Date :	05/16/2016
Fundamental Frequency :	2415 MHz	Temp. / Humi. :	23.2 deg_C / 60 RH
Operation Band :	Main CH MID	Test Engineer :	Edward
EUT Pol. :	H Plane	Measurement Antenna Pol. :	HORIZONTAL

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV/m	dB	dBμV/m	dBμV/m	dB
2415.18	F	Average	57.55	59.28	-1.73	94.00	-36.45
2415.18	F	Peak	79.28	81.02	-1.73	114.00	-34.72

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Operation Mode :	2.4G	Test Date :	05/16/2016
Fundamental Frequency :	2430 MHz	Temp. / Humi. :	23.2 deg_C / 60 RH
Operation Band :	Main CH HIGH	Test Engineer :	Edward
EUT Pol. :	H Plane	Measurement Antenna Pol. :	VERTICAL

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV/m	dB	dBμV/m	dBμV/m	dB
2430.21	F	Average	70.13	71.82	-1.69	94.00	-23.87
2430.21	F	Peak	91.82	93.52	-1.69	114.00	-22.18

Operation Mode :	2.4G	Test Date :	05/16/2016
Fundamental Frequency :	2430 MHz	Temp. / Humi. :	23.2 deg_C / 60 RH
Operation Band :	Main CH HIGH	Test Engineer :	Edward
EUT Pol. :	H Plane	Measurement Antenna Pol. :	HORIZONTAL

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV/m	dB	dBμV/m	dBμV/m	dB
2430.19	F	Average	57.69	59.38	-1.69	94.00	-36.31
2430.19	F	Peak	79.38	81.07	-1.69	114.00	-34.62

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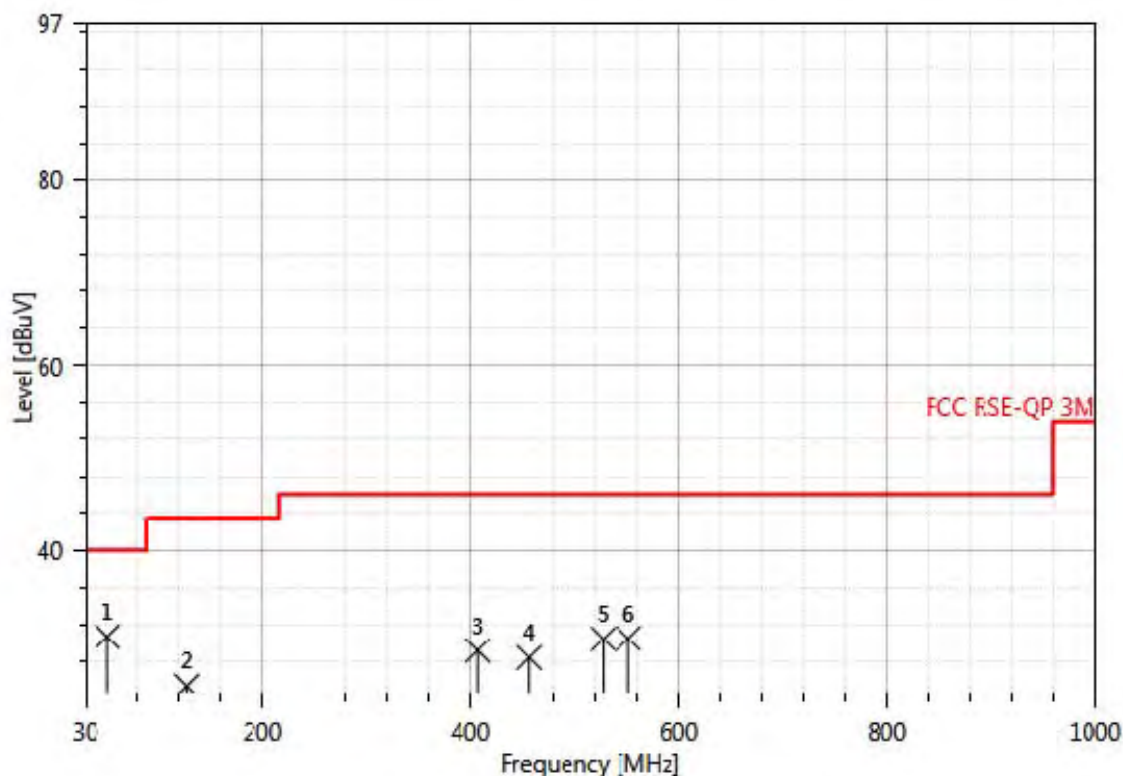
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## Radiated Spurious Emission Measurement Result (Below 1GHz)

Operation Mode :	2.4G	Test Date :	05/16/2016
Fundamental Frequency :	2402 MHz	Temp. / Humi. :	23.2 deg_C / 60 RH
Operation Band :	Tx CH LOW	Test Engineer :	Edward
EUT Pol. :	H Plane	Measurement Antenna Pol. :	VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV/m	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
51.34	S	Peak	30.69	38.44	-7.74	40.00	-9.31
127.00	S	Peak	25.40	35.17	-9.77	43.50	-18.10
407.33	S	Peak	29.21	32.71	-3.51	46.00	-16.79
456.80	S	Peak	28.44	31.09	-2.65	46.00	-17.56
527.61	S	Peak	30.44	31.76	-1.32	46.00	-15.56
551.86	S	Peak	30.50	32.13	-1.63	46.00	-15.50

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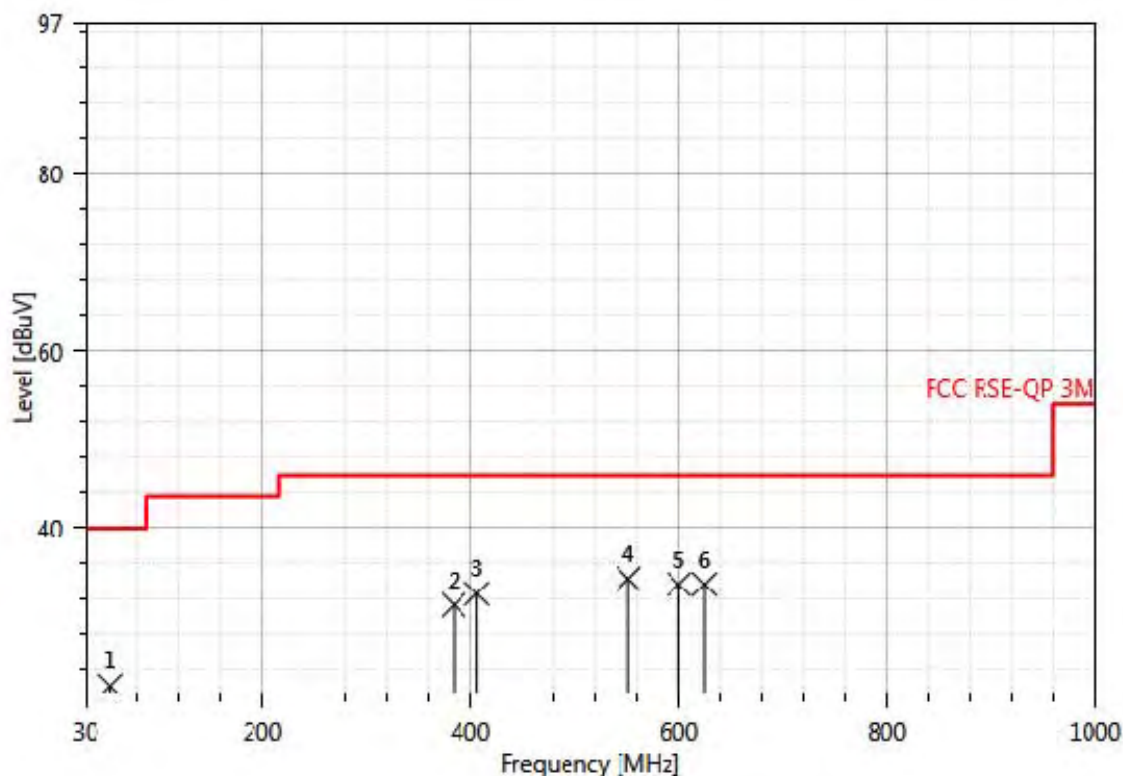
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Operation Mode :	2.4G	Test Date :	05/16/2016
Fundamental Frequency :	2402 MHz	Temp. / Humi. :	23.2 deg_C / 60 RH
Operation Band :	Tx CH LOW	Test Engineer :	Edward
EUT Pol. :	H Plane	Measurement Antenna Pol. :	HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV/m	dB	dBμV/m	dBμV/m	dB
54.25	S	Peak	22.18	30.00	-7.82	40.00	-17.82
384.05	S	Peak	31.30	35.65	-4.35	46.00	-14.70
406.36	S	Peak	32.58	36.17	-3.59	46.00	-13.42
551.86	S	Peak	34.26	35.88	-1.63	46.00	-11.74
600.36	S	Peak	33.64	33.77	-0.13	46.00	-12.36
624.61	S	Peak	33.64	33.49	0.15	46.00	-12.36

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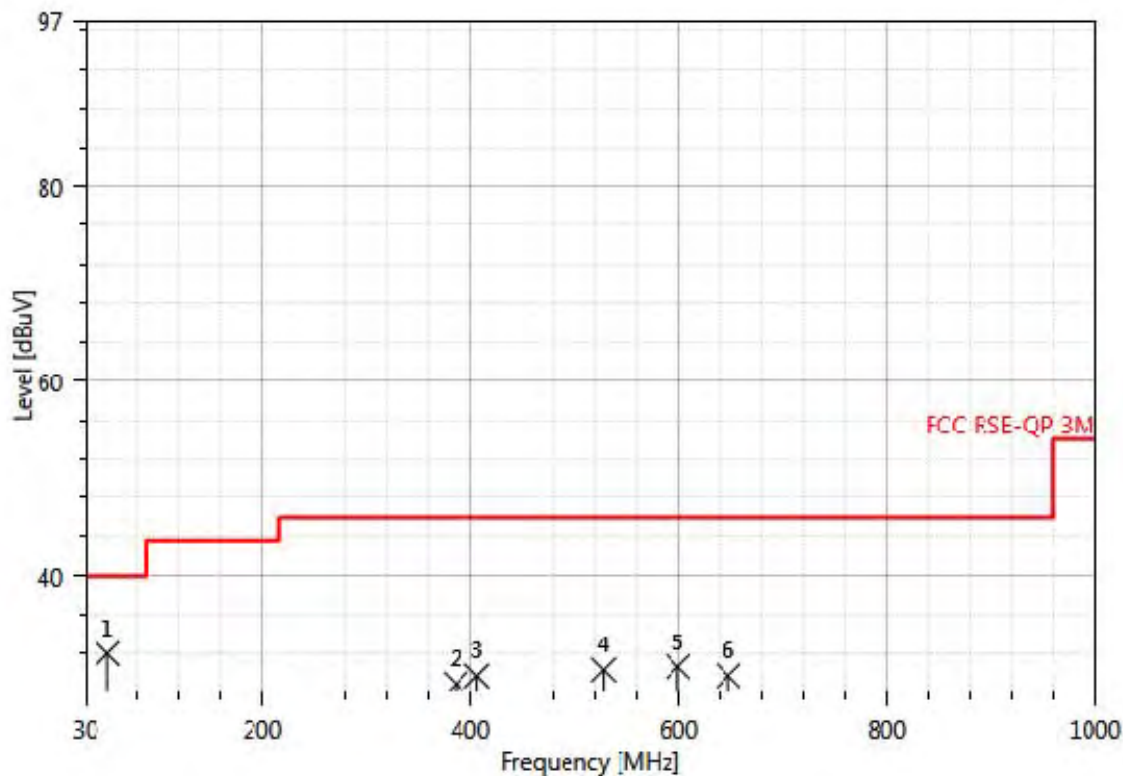
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Operation Mode :	2.4G	Test Date :	05/16/2016
Fundamental Frequency :	2415 MHz	Temp. / Humi. :	23.2 deg_C / 60 RH
Operation Band :	Tx CH MID	Test Engineer :	Edward
EUT Pol. :	H Plane	Measurement Antenna Pol. :	VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV/m	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
51.34	S	Peak	31.97	39.71	-7.74	40.00	-8.03
385.99	S	Peak	28.89	33.20	-4.30	46.00	-17.11
406.36	S	Peak	29.72	33.31	-3.59	46.00	-16.28
527.61	S	Peak	30.32	31.64	-1.32	46.00	-15.68
599.39	S	Peak	30.65	30.93	-0.28	46.00	-15.35
647.89	S	Peak	29.74	29.31	0.43	46.00	-16.26

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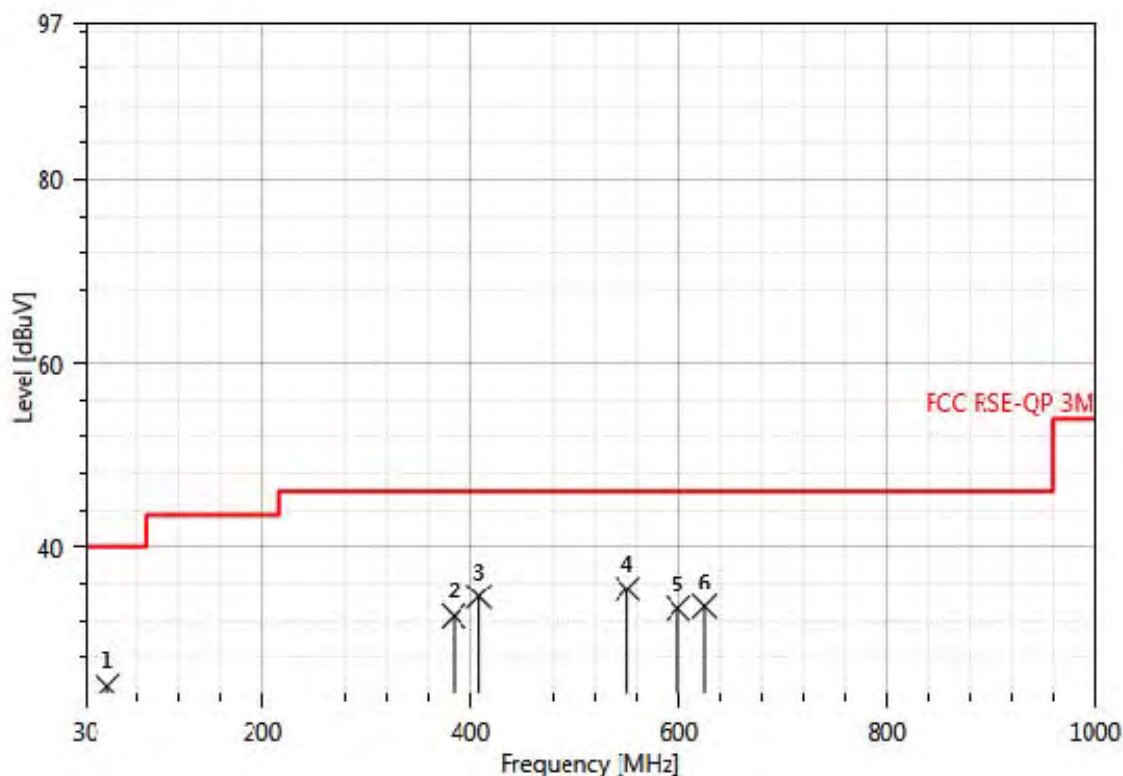
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Operation Mode :	2.4G	Test Date :	05/16/2016
Fundamental Frequency :	2415 MHz	Temp. / Humi. :	23.2 deg_C / 60 RH
Operation Band :	Tx CH MID	Test Engineer :	Edward
EUT Pol. :	H Plane	Measurement Antenna Pol. :	HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV/m	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
51.34	S	Peak	24.94	32.68	-7.74	40.00	-15.06
384.05	S	Peak	32.53	36.87	-4.35	46.00	-13.47
408.30	S	Peak	34.62	38.16	-3.53	46.00	-11.38
550.89	S	Peak	35.46	37.22	-1.77	46.00	-10.54
599.39	S	Peak	33.34	33.62	-0.28	46.00	-12.66
624.61	S	Peak	33.54	33.39	0.15	46.00	-12.46

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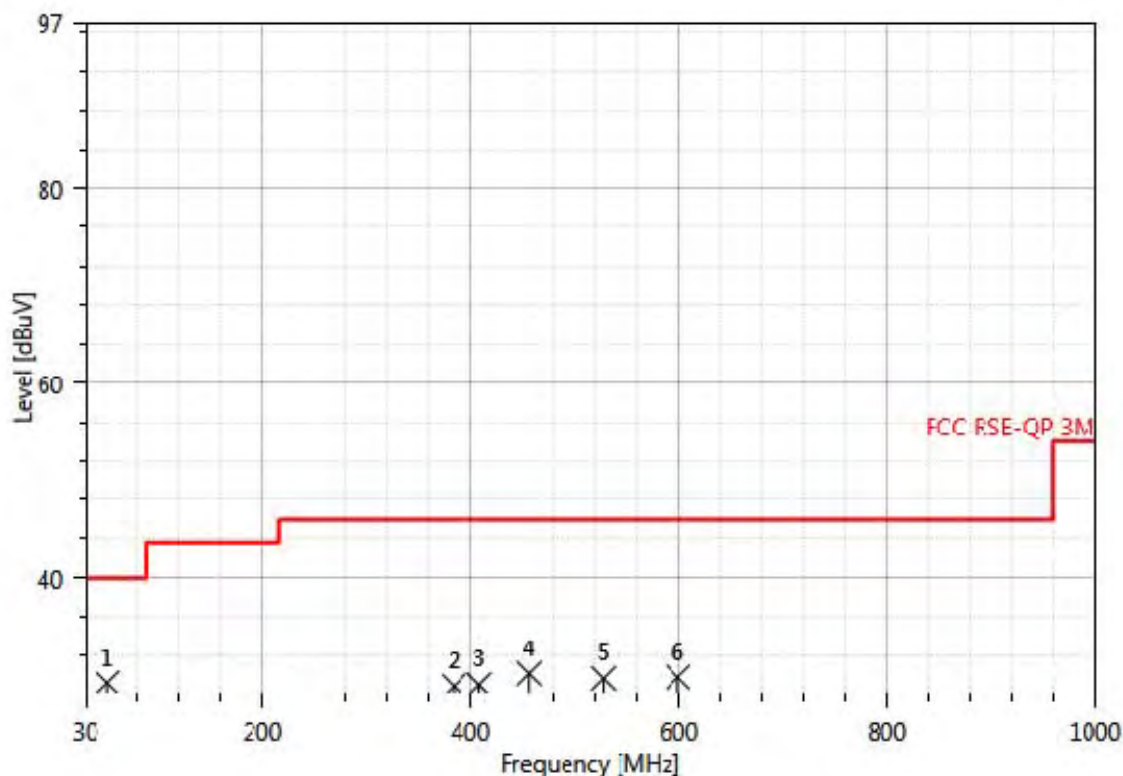
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Fundamental Frequency :	2430 MHz	Temp. / Humi. :	23.2 deg_C / 60 RH
Operation Band :	Tx CH HIGH	Test Engineer :	Edward
EUT Pol. :	H Plane	Measurement Antenna Pol. :	VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBuV/m	dB	dBuV/m	dBuV/m	dB
51.34	S	Peak	29.22	36.96	-7.74	40.00	-10.78
384.05	S	Peak	28.89	33.24	-4.35	46.00	-17.11
408.30	S	Peak	29.04	32.58	-3.53	46.00	-16.96
456.80	S	Peak	30.17	32.83	-2.65	46.00	-15.83
527.61	S	Peak	29.67	30.99	-1.32	46.00	-16.33
599.39	S	Peak	29.80	30.08	-0.28	46.00	-16.20

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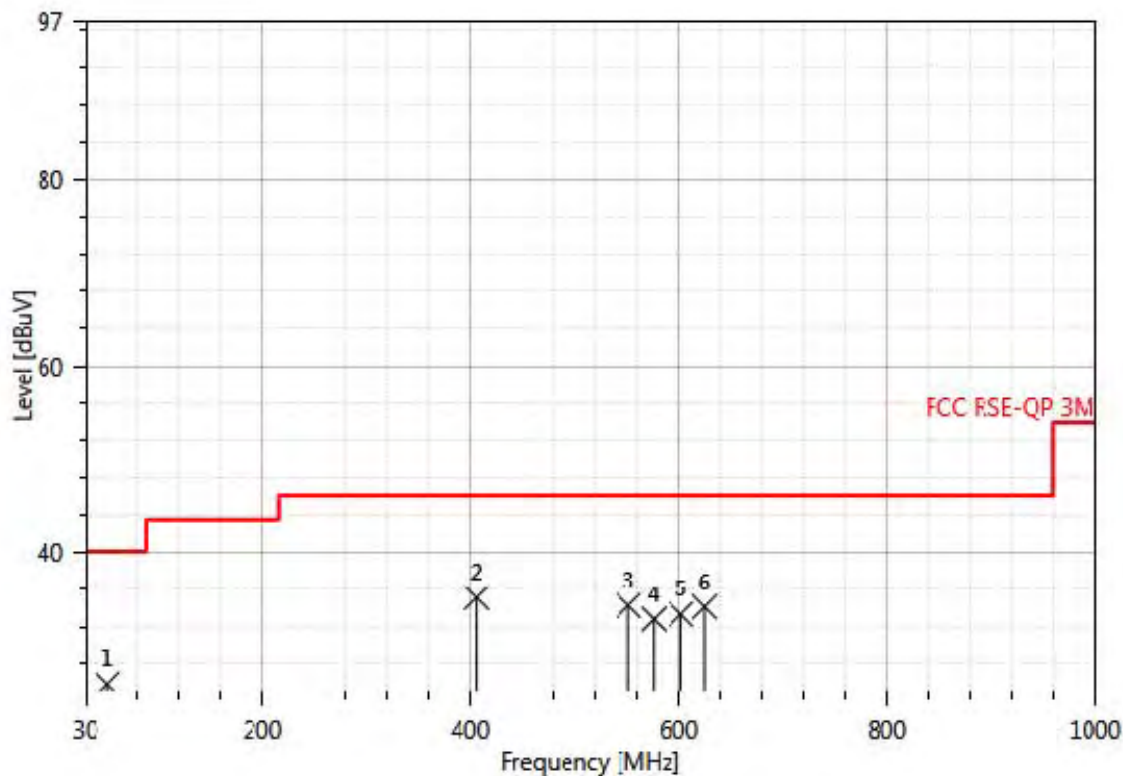
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Fundamental Frequency :	2430 MHz	Temp. / Humi. :	23.2 deg_C / 60 RH
Operation Band :	Tx CH HIGH	Test Engineer :	Edward
EUT Pol. :	H Plane	Measurement Antenna Pol. :	HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV/m	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
51.34	S	Peak	25.87	33.61	-7.74	40.00	-14.13
406.36	S	Peak	35.10	38.69	-3.59	46.00	-10.90
551.86	S	Peak	34.27	35.90	-1.63	46.00	-11.73
576.11	S	Peak	32.83	33.48	-0.64	46.00	-13.17
602.30	S	Peak	33.35	33.29	0.05	46.00	-12.65
624.61	S	Peak	34.13	33.98	0.15	46.00	-11.87

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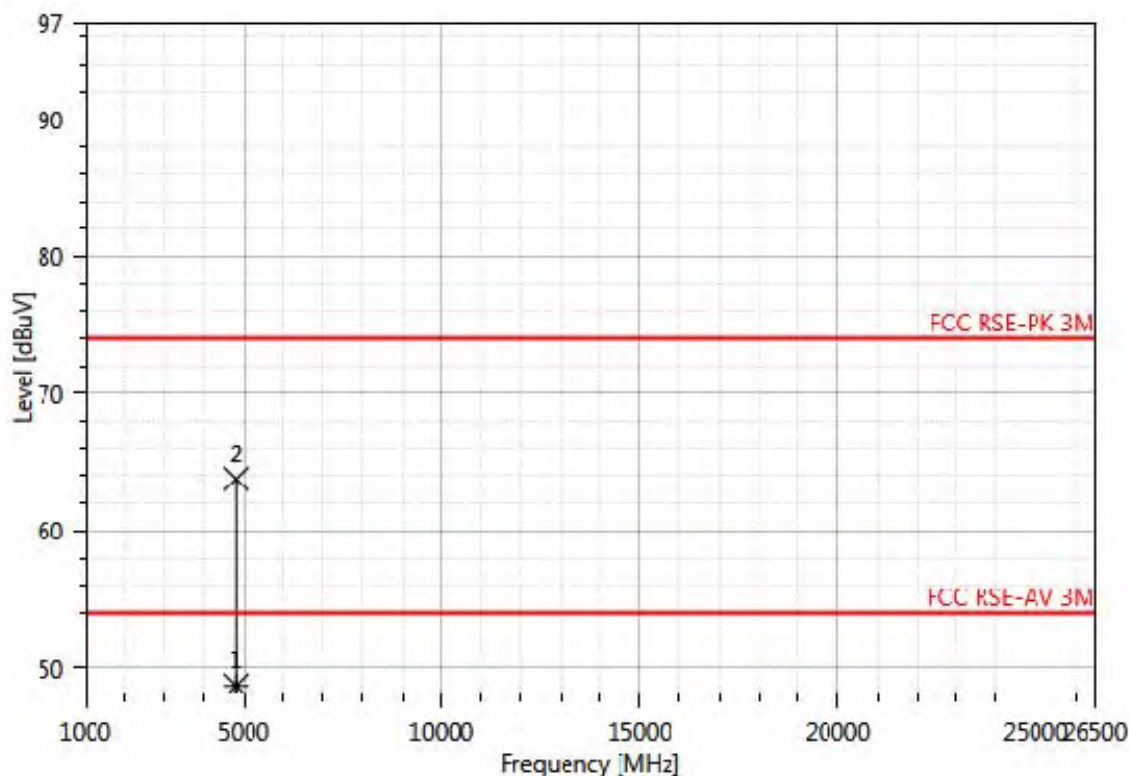
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## Radiated Spurious Emission Measurement Result (Above 1GHz)

Operation Mode :	2.4G	Test Date :	05/16/2016
Fundamental Frequency :	2402 MHz	Temp. / Humi. :	23.2 deg_C / 60 RH
Operation Band :	Tx CH LOW	Test Engineer :	Edward
EUT Pol. :	H Plane	Measurement Antenna Pol. :	VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	dB
		PK/QP/AV	dBuV/m		dBuV/m	dBuV/m	
4804.00	H	Average	48.70	43.78	4.92	54.00	-5.30
4804.00	H	Peak	63.78	58.86	4.92	74.00	-10.22

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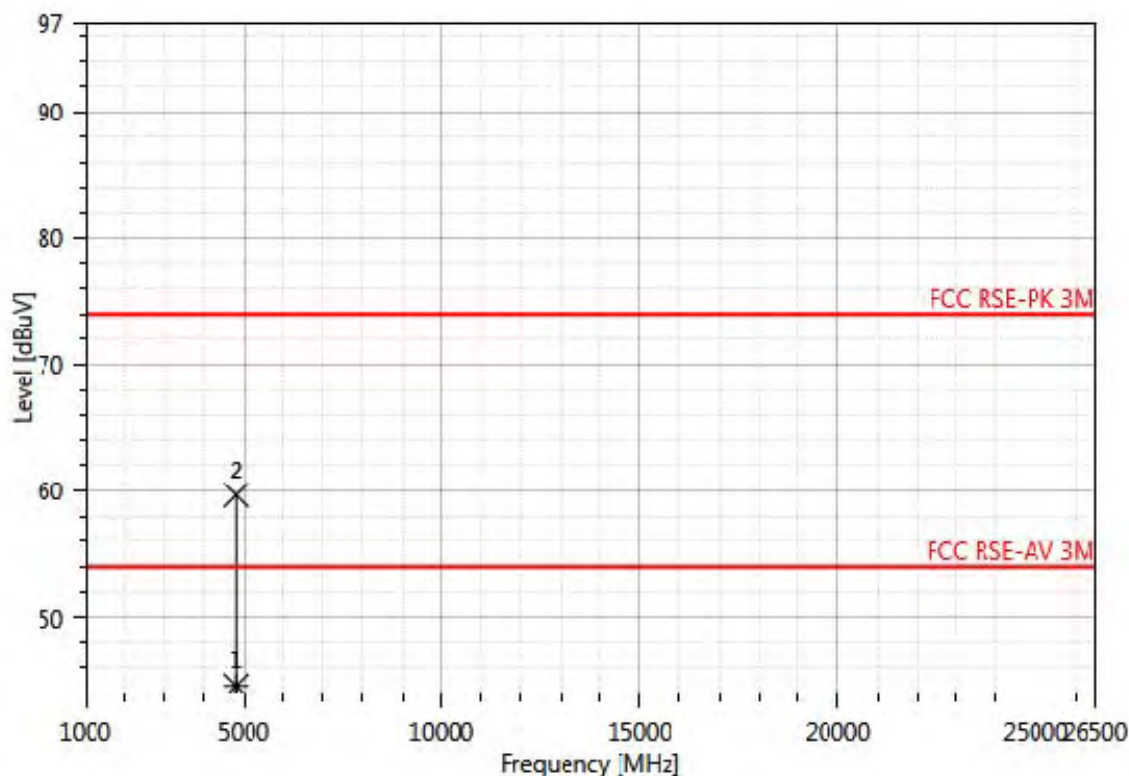
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Operation Mode :	2.4G	Test Date :	05/16/2016
Fundamental Frequency :	2402 MHz	Temp. / Humi. :	23.2 deg_C / 60 RH
Operation Band :	Tx CH LOW	Test Engineer :	Edward
EUT Pol. :	H Plane	Measurement Antenna Pol. :	HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	dB
		PK/QP/AV	dBuV/m		dBuV/m	dBuV/m	
4804.00	H	Average	44.60	39.68	4.92	54.00	-9.40
4804.00	H	Peak	59.68	54.75	4.92	74.00	-14.32

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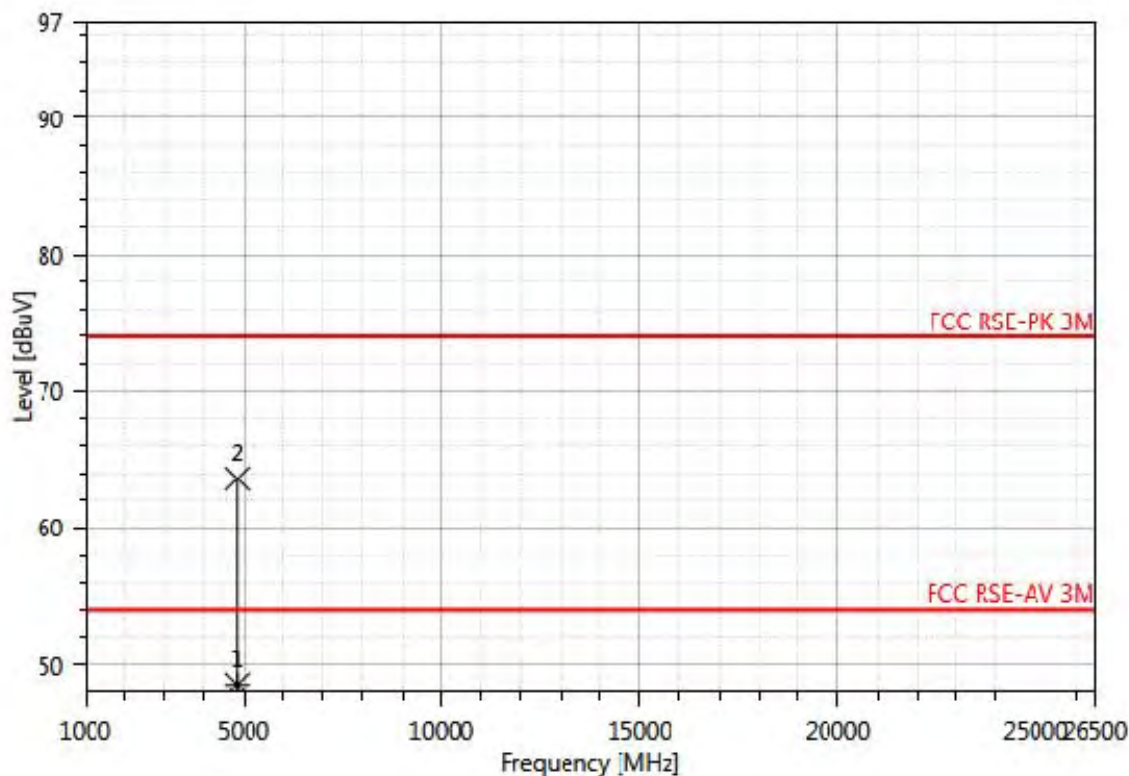
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Operation Mode :	2.4G	Test Date :	05/16/2016
Fundamental Frequency :	2415 MHz	Temp. / Humi. :	23.2 deg_C / 60 RH
Operation Band :	Tx CH MID	Test Engineer :	Edward
EUT Pol. :	H Plane	Measurement Antenna Pol. :	VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	
		PK/QP/AV	dBμV/m	dB	dBμV/m	dBμV/m	dB
4830.00	H	Average	48.54	43.59	4.95	54.00	-5.46
4830.00	H	Peak	63.59	58.64	4.95	74.00	-10.41

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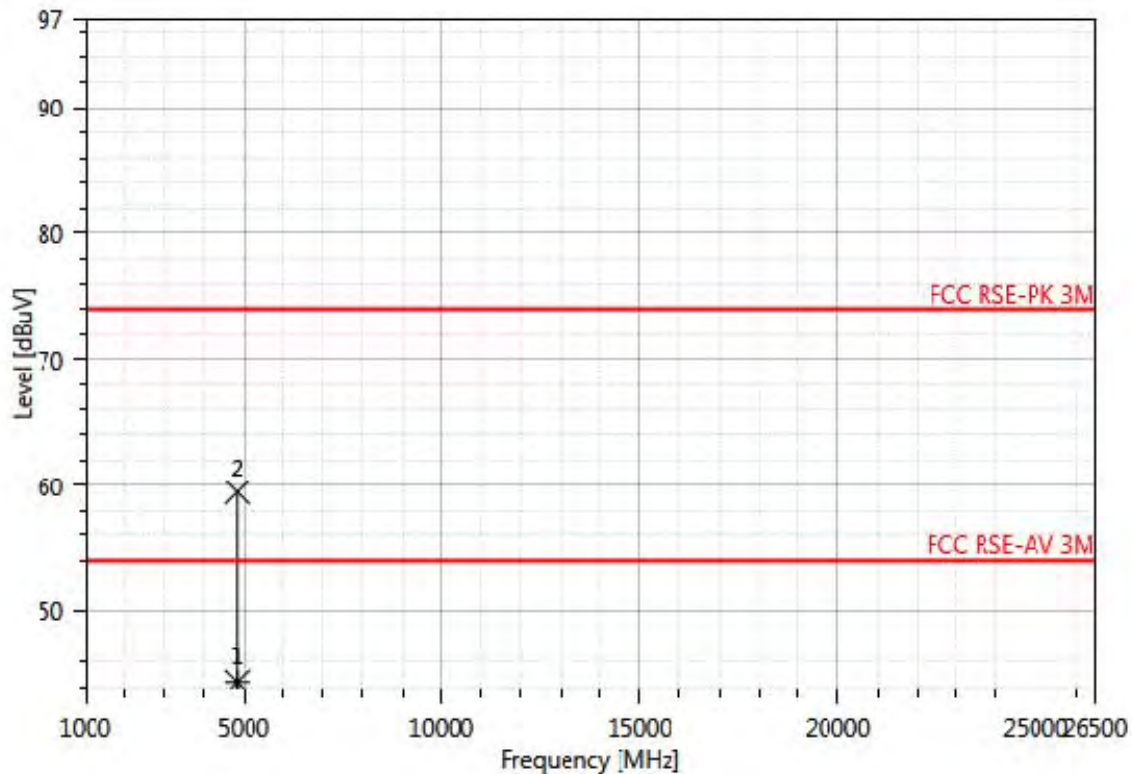
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Fundamental Frequency :	2415 MHz	Temp. / Humi. :	23.2 deg_C / 60 RH
Operation Band :	Tx CH MID	Test Engineer :	Edward
EUT Pol. :	H Plane	Measurement Antenna Pol. :	HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	dB
		PK/QP/AV	dBuV/m		dBuV/m	dBuV/m	
4830.00	H	Average	44.40	39.45	4.95	54.00	-9.60
4830.00	H	Peak	59.45	54.50	4.95	74.00	-14.55

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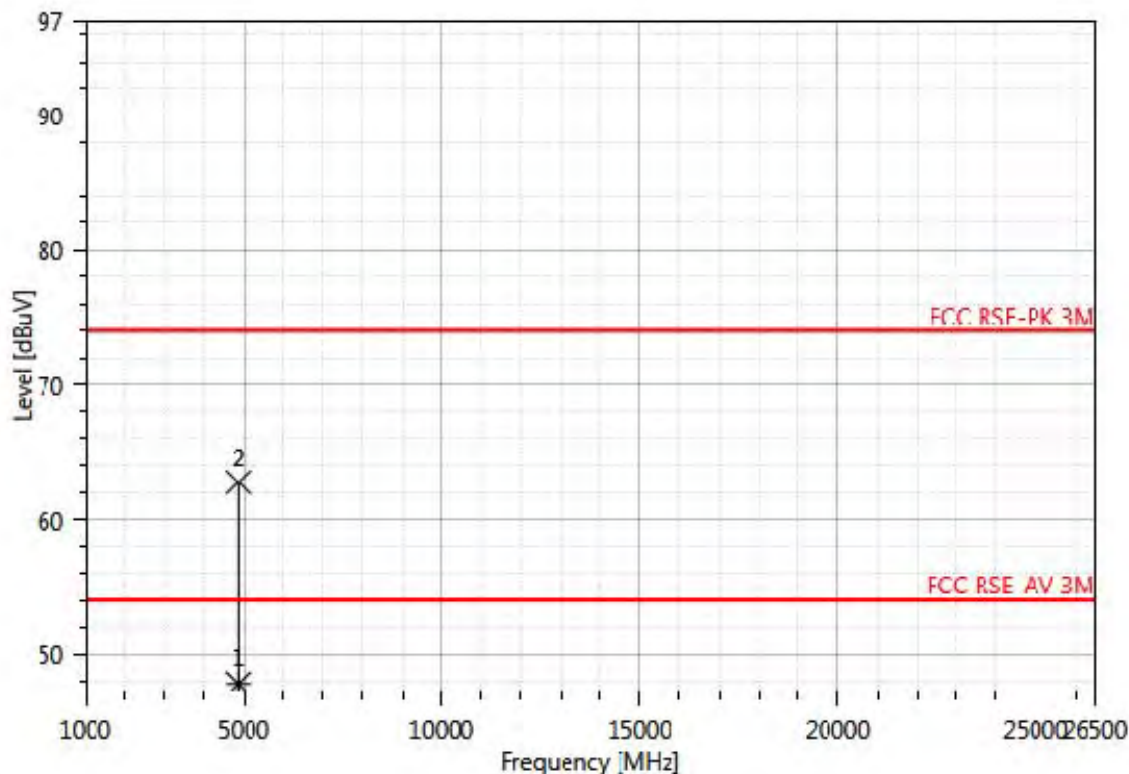
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Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	dB
		PK/QP/AV	dBuV/m		dBuV/m	dBuV/m	
4860.00	H	Average	47.82	42.77	5.05	54.00	-6.18
4860.00	H	Peak	62.77	57.72	5.05	74.00	-11.23

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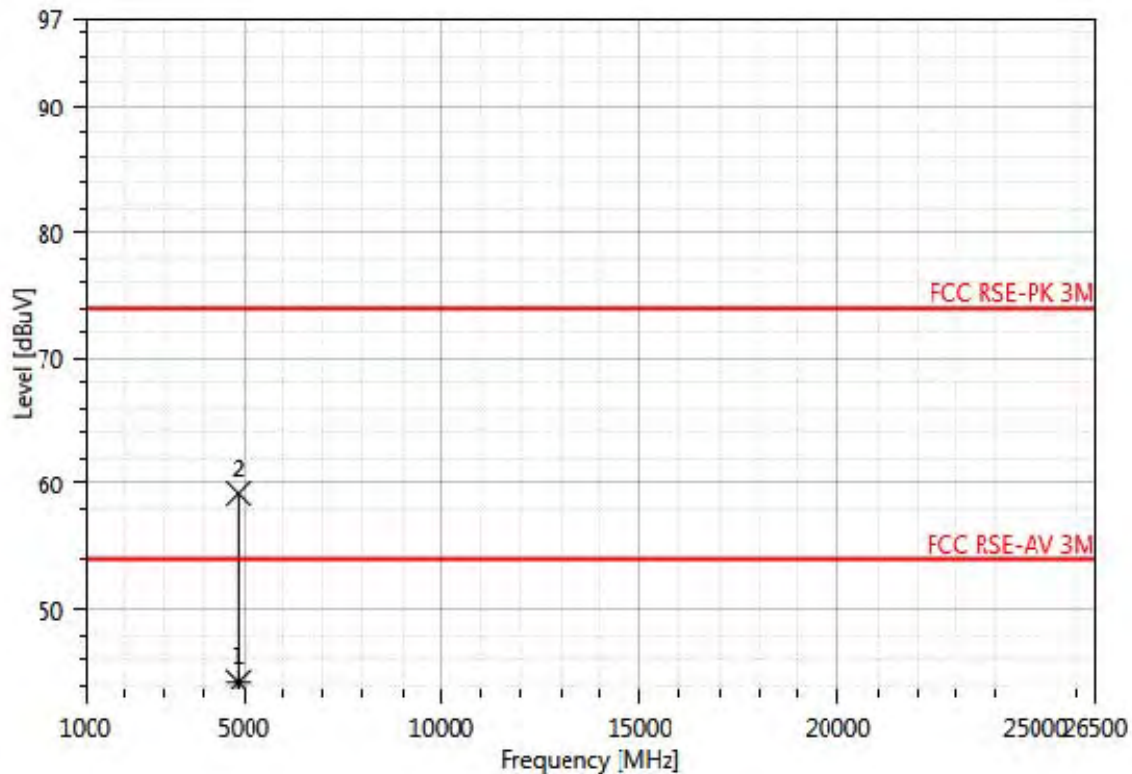
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Operation Band :	Tx CH HIGH	Test Engineer :	Edward
EUT Pol. :	H Plane	Measurement Antenna Pol. :	HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	dB
		PK/QP/AV	dBuV/m		dBuV/m	dBuV/m	
4860.00	H	Average	44.24	39.19	5.05	54.00	-9.76
4860.00	H	Peak	59.19	54.14	5.05	74.00	-14.81

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## 8 20 dB Bandwidth Measurement

### 8.1 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set ETU normal operating mode.
3. Set SPA Center Frequency = fundamental frequency, RBW = 100kHz, VBW = 300kHz, Span = 5MHz.
4. Set SPA Max hold. Mark peak, -20dB.

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

Refer to section 7.2 for the plot.

### 8.3 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter	Anritsu	ML2495A	1005007	12/09/2015	12/08/2016
Power Sensor	Anritsu	MA2411B	917032	12/09/2015	12/08/2016
EXA Spectrum Analyzer	Agilent	N9030A	MY53120760	02/26/2016	02/25/2017
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2016	01/01/2017
Coaxial Cable	HU-BER+SUHNE R	SUCOFLEX 102	23670/2	01/02/2016	01/01/2017
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2016	01/01/2017
Splitter	Agilent	11636B	N/A	01/02/2016	01/01/2017
DC Power Supply	Agilent	E3640A	MY52410006	11/05/2015	11/04/2016
Temperature Chamber	TERCHY	MHG-120LF	911009	05/17/2016	05/16/2017

### 8.4 Measurement Results:

2.402GHz = 736.5kHz

2.415GHz = 770.6kHz

2.430GHz = 743.9kHz

Refer to attached data chart.

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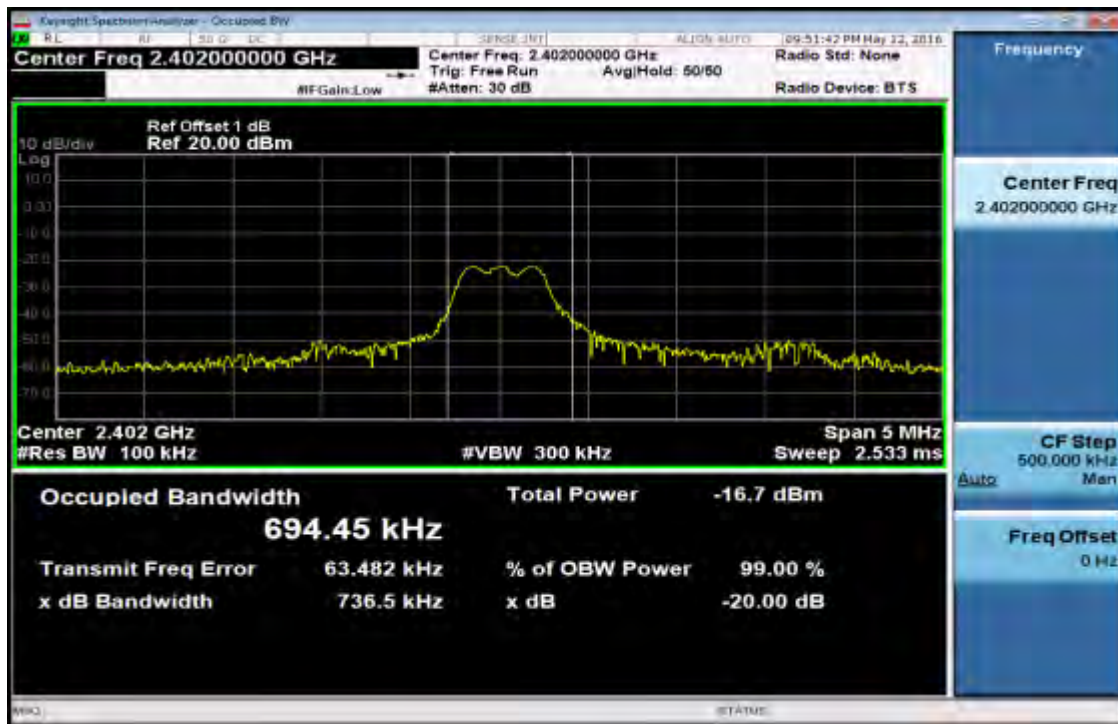
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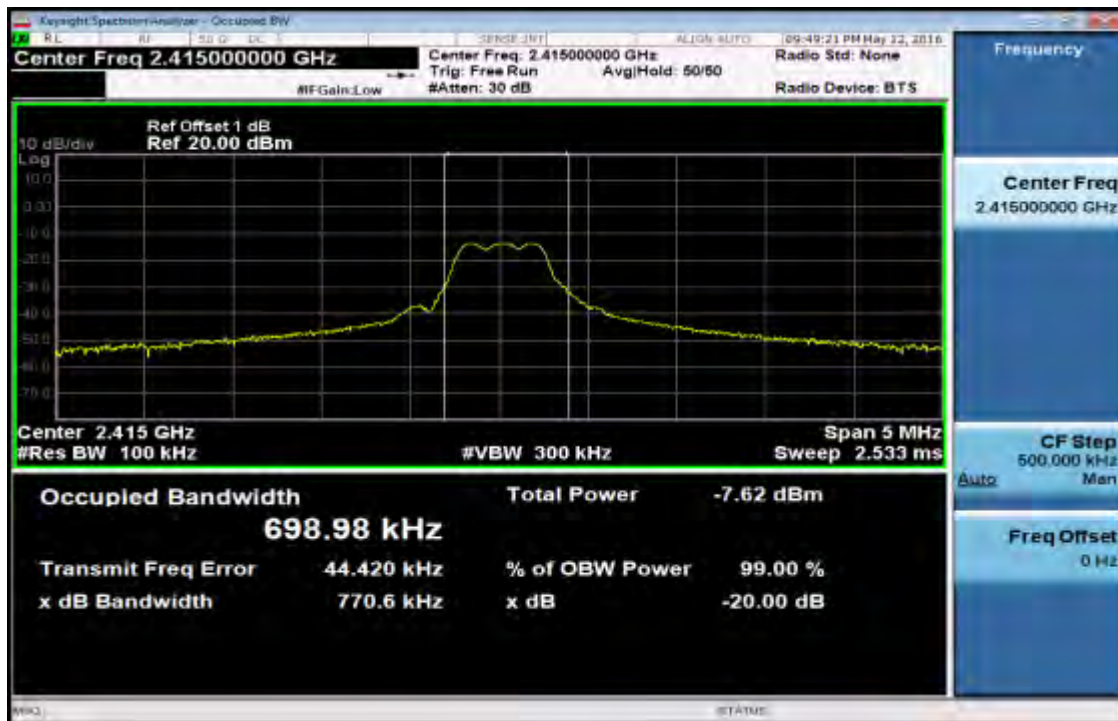
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## 20dB Bandwidth Test Plot (2.402GHz)



## 20dB Bandwidth Test Plot (2.415GHz)



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## 20dB Bandwidth Test Plot (2.430GHz)



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## 9 Antenna Requirement

### 9.1 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.

### 9.2 Antenna Connected Construction:

An embedded-in antenna design is used.

The antenna is designed as permanently 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.

*~ End of Report ~*

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