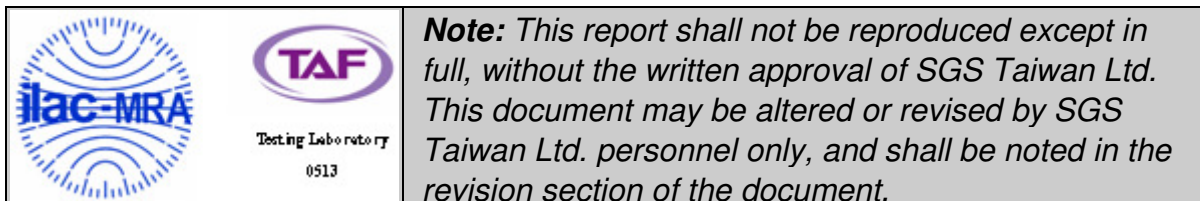


# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

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

OF

**Product Name:** Keyboard  
**Brand Name:** SAMSUNG  
**Model No.:** LM70G  
**Model Difference:** N/A  
**FCC ID:** O62-LM70G  
**Report No.:** E2/2016/B0067  
**Issue Date:** Dec. 23, 2016  
**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.  
 Electronics & Communication Laboratory  
 No.2, Keji 1st Rd., Guishan District, Taoyuan  
 City, Taiwan 333



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## VERIFICATION OF COMPLIANCE

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

**Product Name:** Keyboard

**Brand Name:** SAMSUNG

**Model No.:** LM70G

**Model Difference:** N/A

**FCC ID:** O62-LM70G

**File Number:** E2/2016/B0067

**Date of test:** Dec. 05. 2016 ~Dec. 20, 2016

**Date of EUT Received:** Dec. 05. 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:**

*Aken Huang*

**Date**

Dec. 23, 2016

**Aken Huang / Engineer**

**Prepared By:**

*Tiffany Kao*

**Date**

Dec. 23, 2016

**Tiffany Kao / Clerk**

**Approved By:**

*Jim Chang*

**Date**

Dec. 23, 2016

**Jim Chang / Asst. Manager**

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## Revision History

Report Number	Revision	Description	Issue Date
ER/2016/B0067	Rev.00	Initial creation of document	Dec. 23, 2016

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# 1 GENERAL INFORMATION

## 1.1 Product Description

General:

Product Name:	Keyboard
Brand Name:	SAMSUNG
Model No.:	LM70G
Model Difference:	N/A
Product SW/HW version:	N/A / N/A
Radio SW/HW version:	N/A / NA
Test SW Version:	N/A
RF power setting in TEST SW:	N/A
Power Supply:	3Vdc from AAA batteries*2

## 2.4GHz

Transmit Power	94.43dBuV/m (Peak)
Operation Frequency:	2403 ~ 2475MHz
Channel number:	73 channels
Channel space:	1MHz
Modulation Type:	GFSK
Antenna Designation:	PCB Antenna, Gain: 3.11 dBi

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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.

## 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: 735305

## 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.

#### Note:

The spectrum analyzer offset is derived from RF cable loss 1.4dB.

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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 $\mu\text{V}/\text{m}$	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

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 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 & Conducted (Antenna Port) Configuration



Fig. 2-2 Conducted (Antenna Port) Configuration

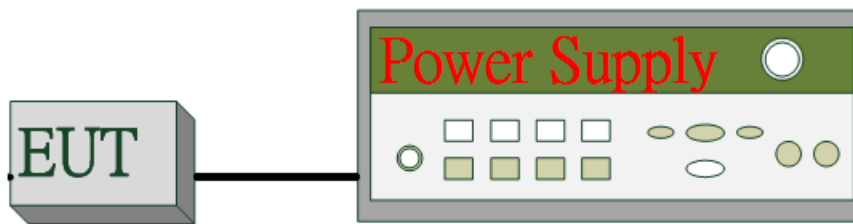


Table 2-1 Equipment Used in Tested System

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.	DC Power Supply	Agilent	E3640A	MY52410006	N/A	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
§15.249(a)(d)(e)	Radiated Emission	Compliant
§15.215(c)	20dB bandwidth Measurement	Compliant

### 4 DESCRIPTION OF TEST MODES

#### 4.1 Operated in 2405 ~ 2477MHz Band

73 channels are provided for 2.4GHz

CH	FREQUENCY	CH	FREQUENCY	CH	FREQUENCY	CH	FREQUENCY
1	2403 MHz	20	2422 MHz	39	2441 MHz	58	2460 MHz
2	2404 MHz	21	2423 MHz	40	2442 MHz	70	2462 MHz
3	2405 MHz	22	2424 MHz	41	2443 MHz	71	2463 MHz
4	2406 MHz	23	2425 MHz	42	2444 MHz	72	2464 MHz
5	2407 MHz	24	2426 MHz	43	2445 MHz	73	2465 MHz
6	2408 MHz	25	2427 MHz	44	2446 MHz	74	2466 MHz
7	2409 MHz	26	2428 MHz	45	2447 MHz	75	2467 MHz
8	2410 MHz	27	2429 MHz	46	2448 MHz	76	2468 MHz
9	2411 MHz	28	2430 MHz	47	2449 MHz	77	2469 MHz
10	2412 MHz	29	2431 MHz	48	2450 MHz	78	2470 MHz
11	2413 MHz	30	2432 MHz	49	2451 MHz	79	2471 MHz
12	2414 MHz	31	2433 MHz	50	2452 MHz	70	2472 MHz
13	2415 MHz	32	2434 MHz	51	2453 MHz	71	2473 MHz
14	2416 MHz	33	2435 MHz	52	2454 MHz	72	2474 MHz
15	2417 MHz	34	2436 MHz	53	2455 MHz	73	2475 MHz
16	2418 MHz	35	2437 MHz	54	2456 MHz		
17	2419 MHz	36	2438 MHz	55	2457 MHz		
18	2420 MHz	37	2439 MHz	56	2458 MHz		
19	2421 MHz	38	2440 MHz	57	2459 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	ANTENNA PORT
2.4G	1 to 73	1,38,73	GFSK	MAIN
RADIATED EMISSION TEST (ABOVE 1 GHz)				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	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 Bluetooth LE Transmitter for channel Low, Mid and High, the worst case E1 position was reported.

#### ANTENNA PORT CONDUCTED MEASUREMENT:

CONDUCTED TEST				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	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 & 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

- The lower limit shall apply at the transition frequencies
- 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	ESCI 7	100950	12/12/2016	12/11/2017
Coaxial Cables	N/A	N30N30-1042-1 50cm	N/A	02/07/2016	02/06/2017
LISN	Schwarzbeck	NSLK 8127	8127-648	03/11/2016	03/10/2017
Test Software	Farad	EZ-EMC	Ver. SGS-03A2	N.C.R.	N.C.R.

### 6.3 EUT Setup:

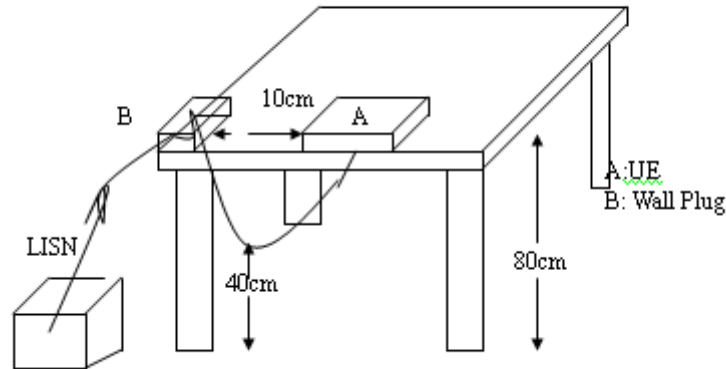
- The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10:2013.
- The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
- The LISN was connected with 120Vac/60Hz power source.

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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 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:

N/A, EUT powered from AAA batteries\*2.

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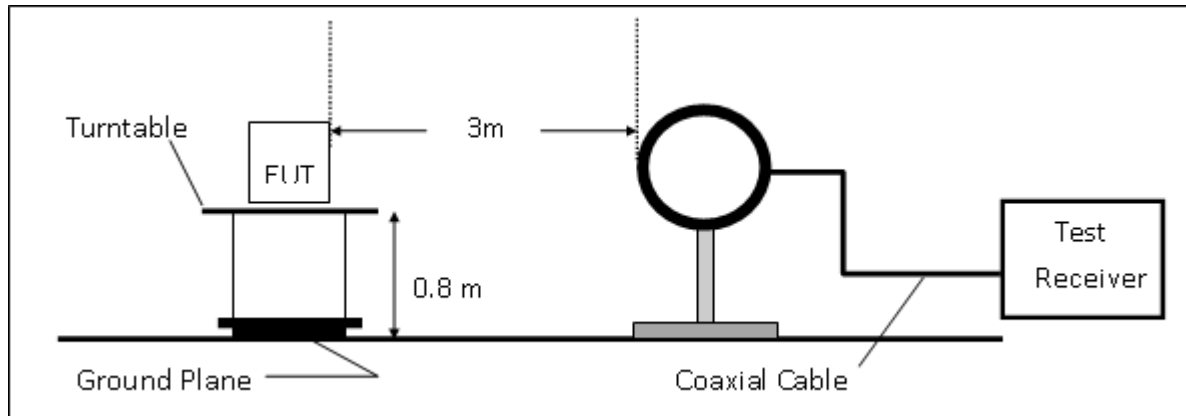
## 7 RADIATED EMISSION TEST

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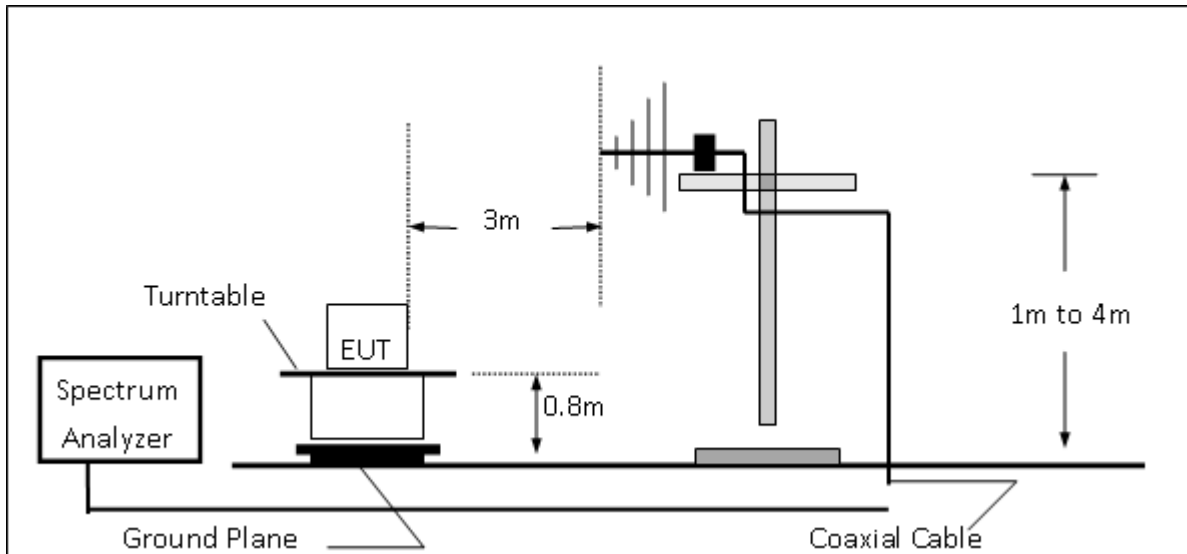
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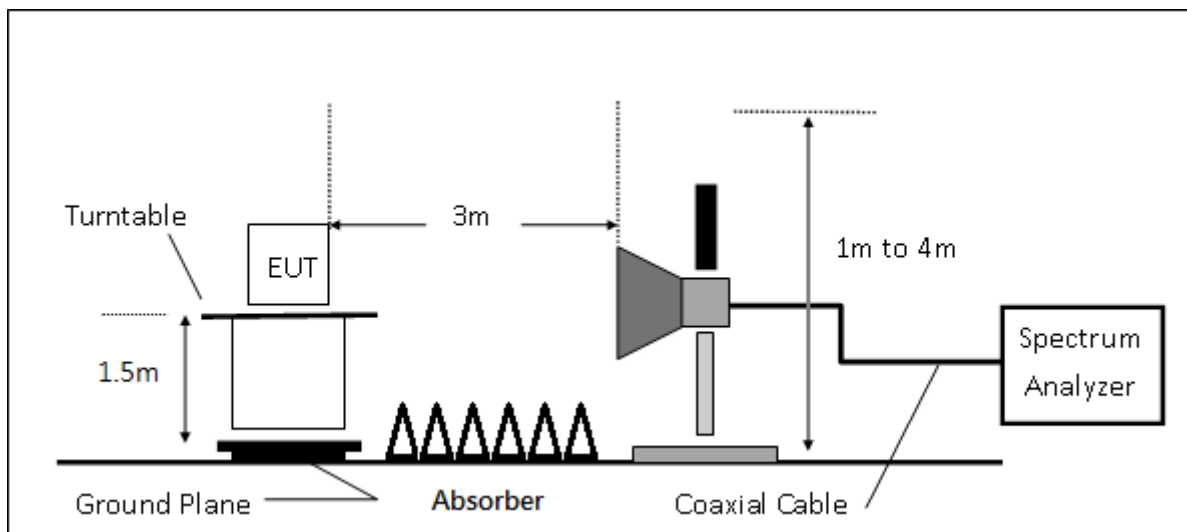
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(B) Radiated Emission Test Set-Up, Frequency form 30MHz to 1000MHz



(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	ESU 40	100363	04/12/2016	04/11/2017
Loop Antenna	ETS-Lindgren	6502	00143303	12/23/2015	12/22/2016
Broadband Antenna	TESEQ	CBL 6112D	35240	11/03/2016	11/02/2017
Horn Antenna	ETS-Lindgren	3117	00143272	12/16/2015	12/15/2016
Horn Antenna	Schwarzbeck	BBHA9170	185	07/24/2016	07/23/2017
Pre Amplifier	EMC Instruments	EMC330	980096	12/12/2016	12/11/2017
Pre Amplifier	EMC Instruments	EMC0011830	980199	12/12/2016	12/11/2017
Pre Amplifier	R&S	SCU-18	10204	12/12/2016	12/11/2017
Pre Amplifier	R&S	SCU-26	100780	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	RG 214/U	966Rx 9K-30M	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	RG 214/U SUCOFLEX 104	966Rx 30M-3G	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Rx 1G-18G	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	mini 141-12 SUCOFLEX 104	966Rx 18G-40G	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Tx 30M-18G	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	966Tx 18G-40G	12/12/2016	12/11/2017
Attenuator	WOKEN	218FS-10	RF27	12/12/2016	12/11/2017
Site NSA	SGS	966 Chamber C	SAC-C	03/04/2016	03/03/2017
Site VSWR	SGS	966 Chamber C	SAC-C	03/04/2016	03/03/2017
DC Power Supply	HOLA	DP-3003	D7070035	05/04/2016	05/03/2017
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.

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

### 7.4. Test Results of Radiated Spurious Emissions form 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.

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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	

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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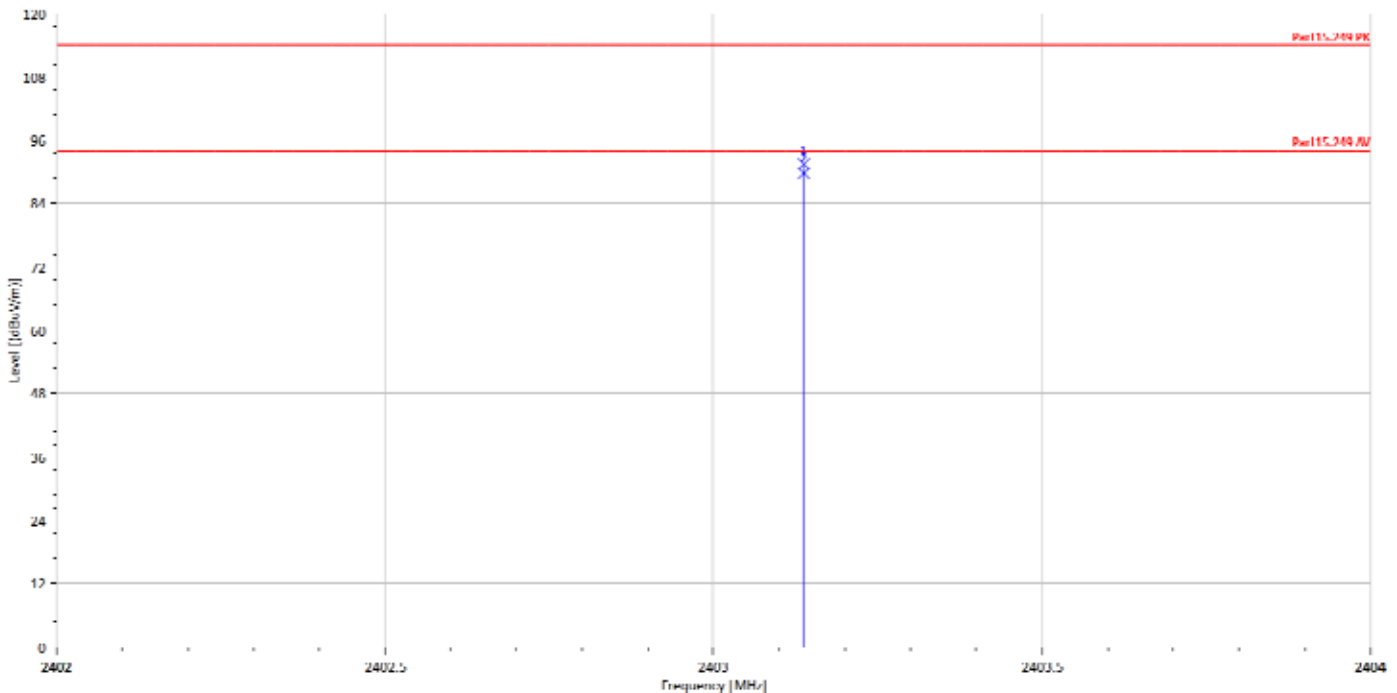
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## 7.6. Measurement Result

### Radiated Spurious Emission Measurement Result (MAIN)

Operation Mode :	2.4G	Test Date :	2016/12/8
Fundamental Frequency :	2403 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Main CH Low	Test Engineer :	Ashton
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
2403.14	F	Peak	90.50	1.02	91.52	114	-22.48
2403.14	F	Average	88.78	1.02	89.80	94	-4.20

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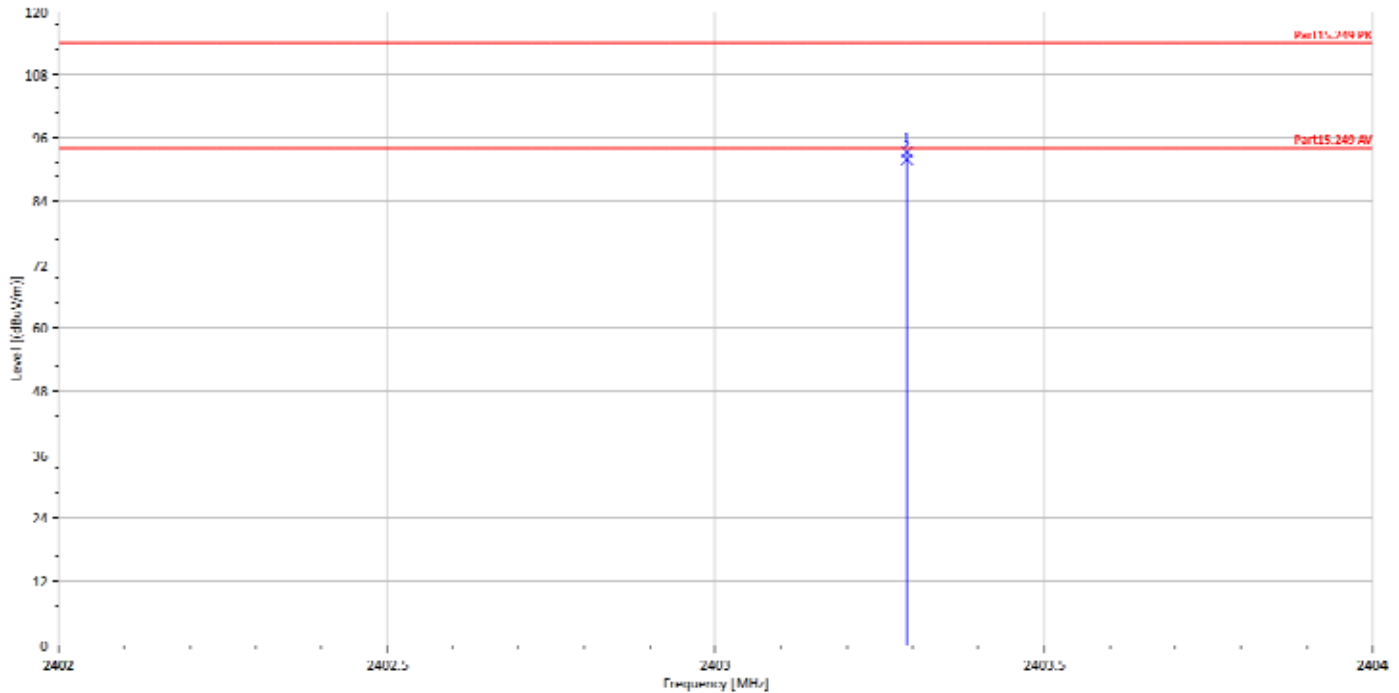
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Operation Mode : 2.4G Test Date : 2016/12/8  
 Fundamental Frequency : 2403 MHz Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : Main CH Low Test Engineer : Ashton  
 EUT Pol. : E2 Measurement Antenna Pol. : Horizontal



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
2403.29	F	Peak	92.24	1.02	93.27	114	-20.73
2403.29	F	Average	90.85	1.02	91.87	94	-2.13

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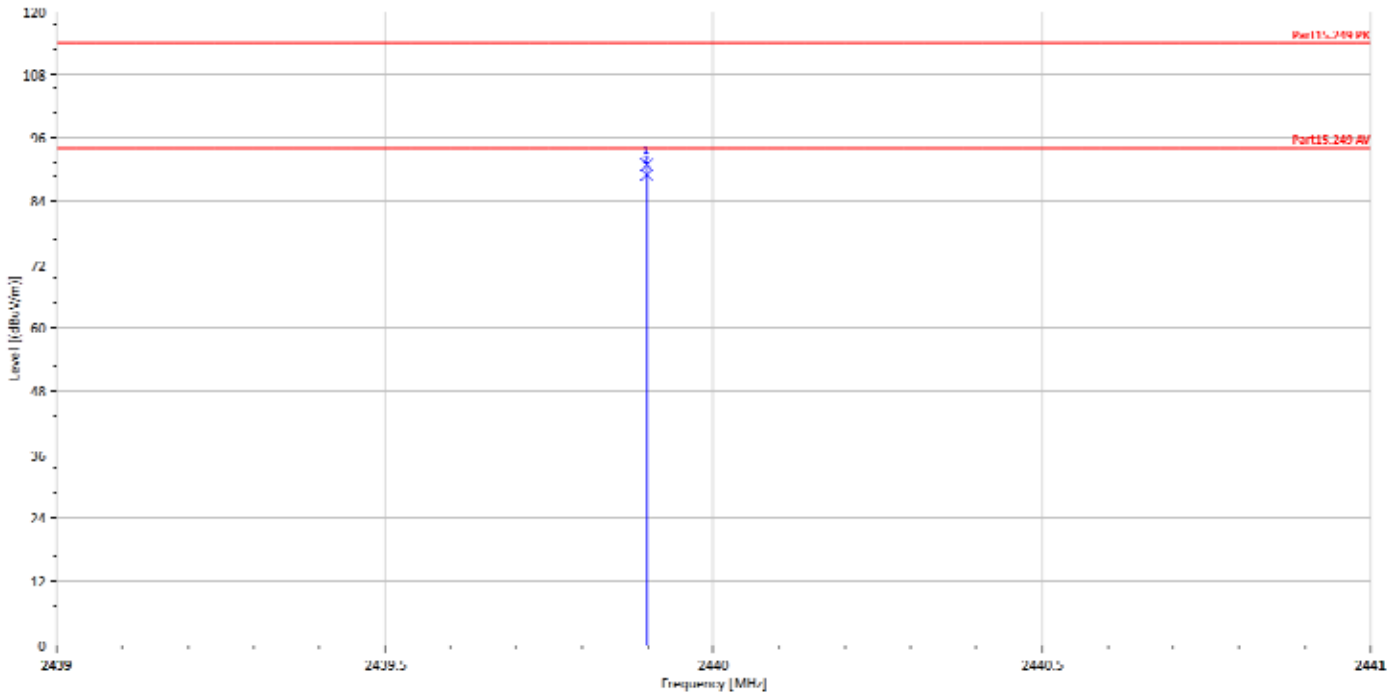
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Operation Mode :	2.4G	Test Date :	2016/12/8
Fundamental Frequency :	2440 MHz	Temp. / Humi. :	22.7 deg_C/57RH
Operation Band :	Main CH Mid	Test Engineer :	Ashton
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



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
2439.90	F	Peak	90.08	0.85	90.92	114	-23.08
2439.90	F	Average	88.26	0.85	89.11	94	-4.89

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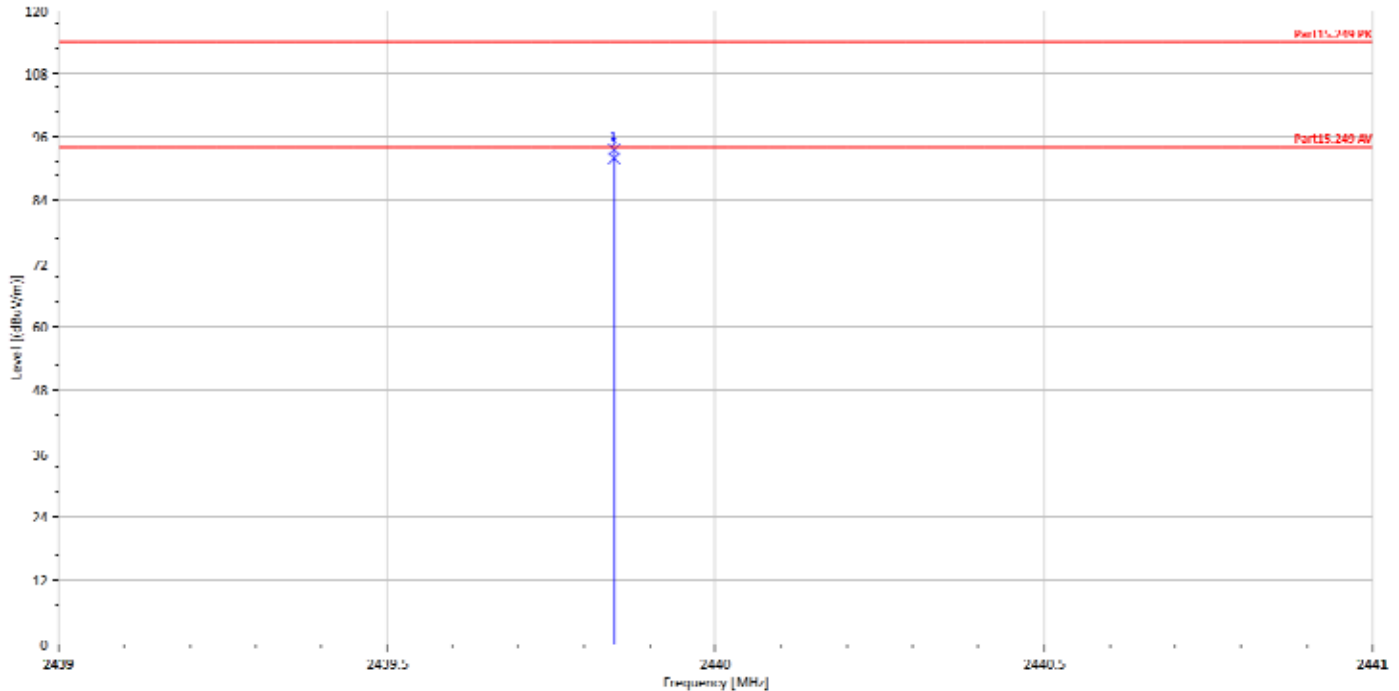
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Operation Mode : 2.4G Test Date : 2016/12/8  
 Fundamental Frequency : 2440 MHz Temp. / Humi. : 22.7 deg\_C/57RH  
 Operation Band : Main CH Mid Test Engineer : Ashton  
 EUT Pol. : E2 Measurement Antenna Pol. : Horizontal



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
2439.85	F	Peak	92.69	0.85	93.54	114	-20.46
2439.85	F	Average	91.06	0.85	91.91	94	-2.09

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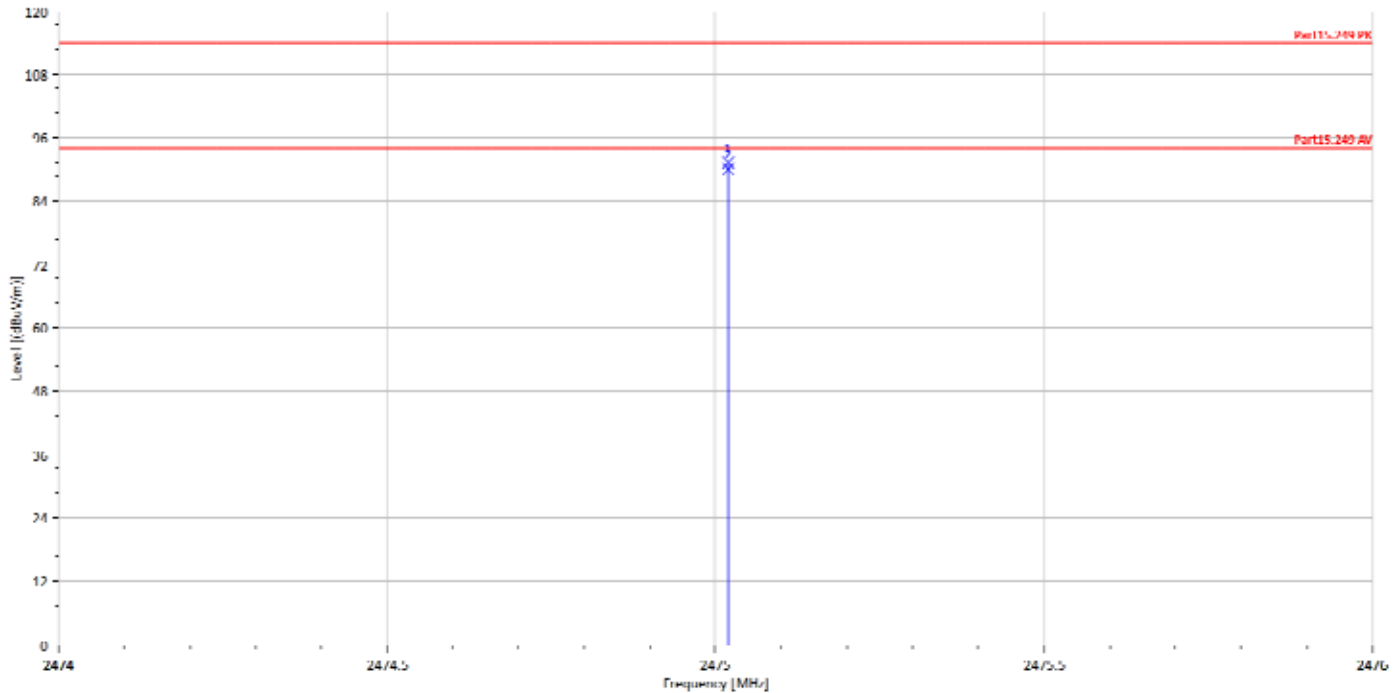
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Operation Mode : 2.4G Test Date : 2016/12/8  
 Fundamental Frequency : 2475 MHz Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : Main CH High Test Engineer : Ashton  
 EUT Pol. : E2 Measurement Antenna Pol. : Vertical



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
2475.02	F	Peak	90.14	1.15	91.29	114	-22.71
2475.02	F	Average	88.96	1.15	90.11	94	-3.89

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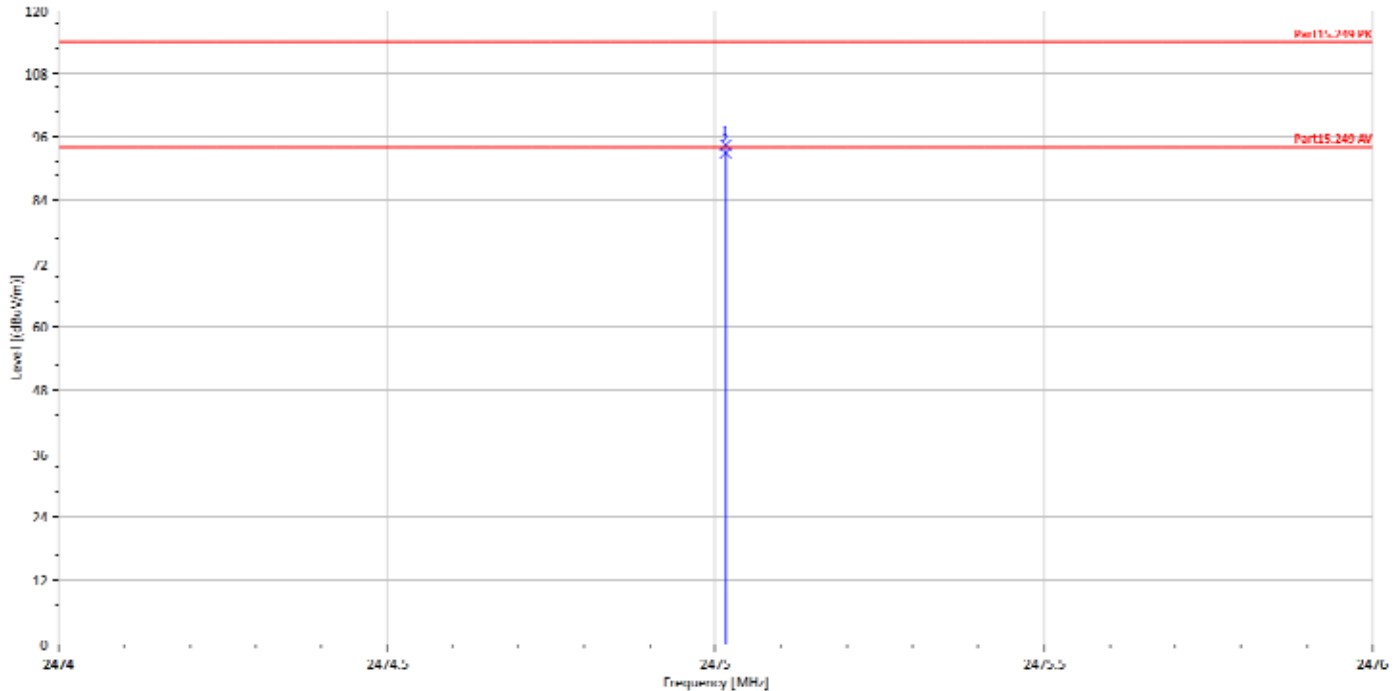
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Operation Mode :	2.4G	Test Date :	2016/12/8
Fundamental Frequency :	2475 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Main CH High	Test Engineer :	Ashton
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



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
2475.02	F	Peak	93.28	1.15	94.43	114	-19.57
2475.02	F	Average	91.77	1.15	92.92	94	-1.08

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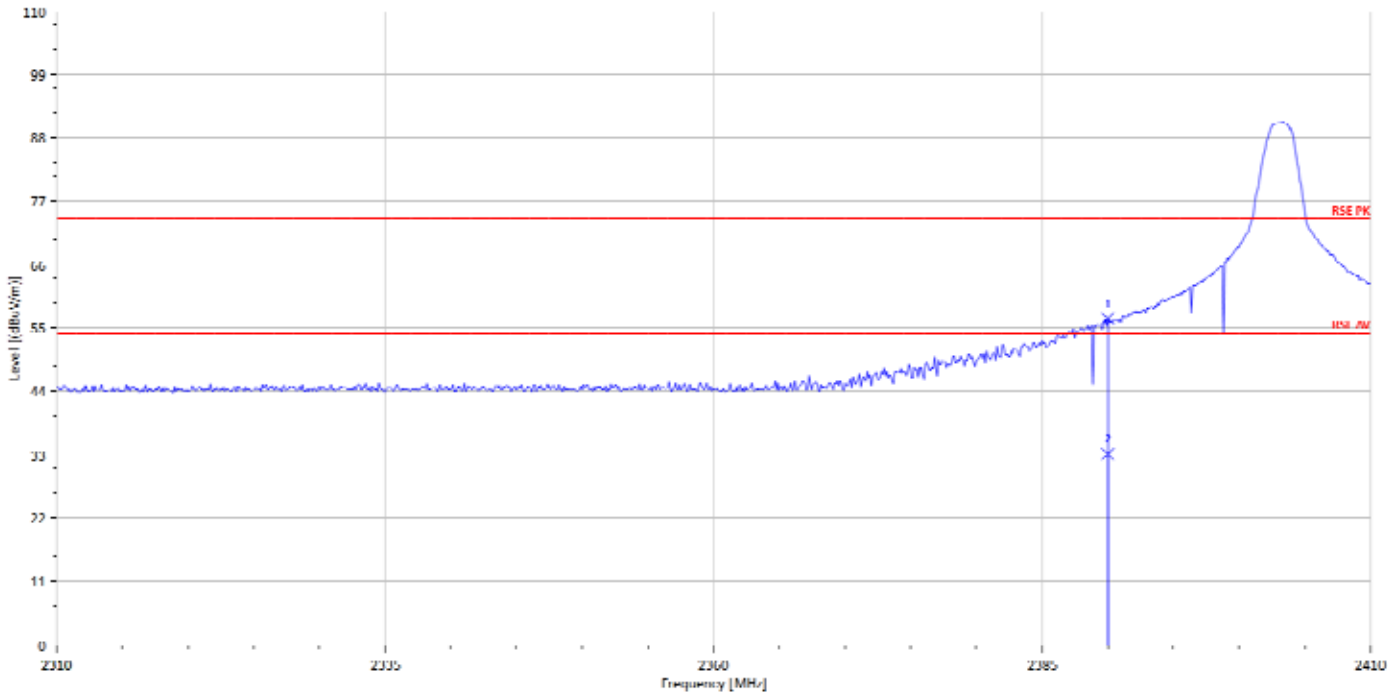
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### Radiated Spurious Emission Measurement Result

Operation Mode : 2.4G                      Test Date : 2016/12/8  
 Fundamental Frequency : 2403 MHz              Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : BE CH Low              Test Engineer : Ashton  
 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
2390.00	E	Peak	55.73	0.92	56.65	74	-17.35
2390.00	E	Average	32.24	0.92	33.16	54	-20.84

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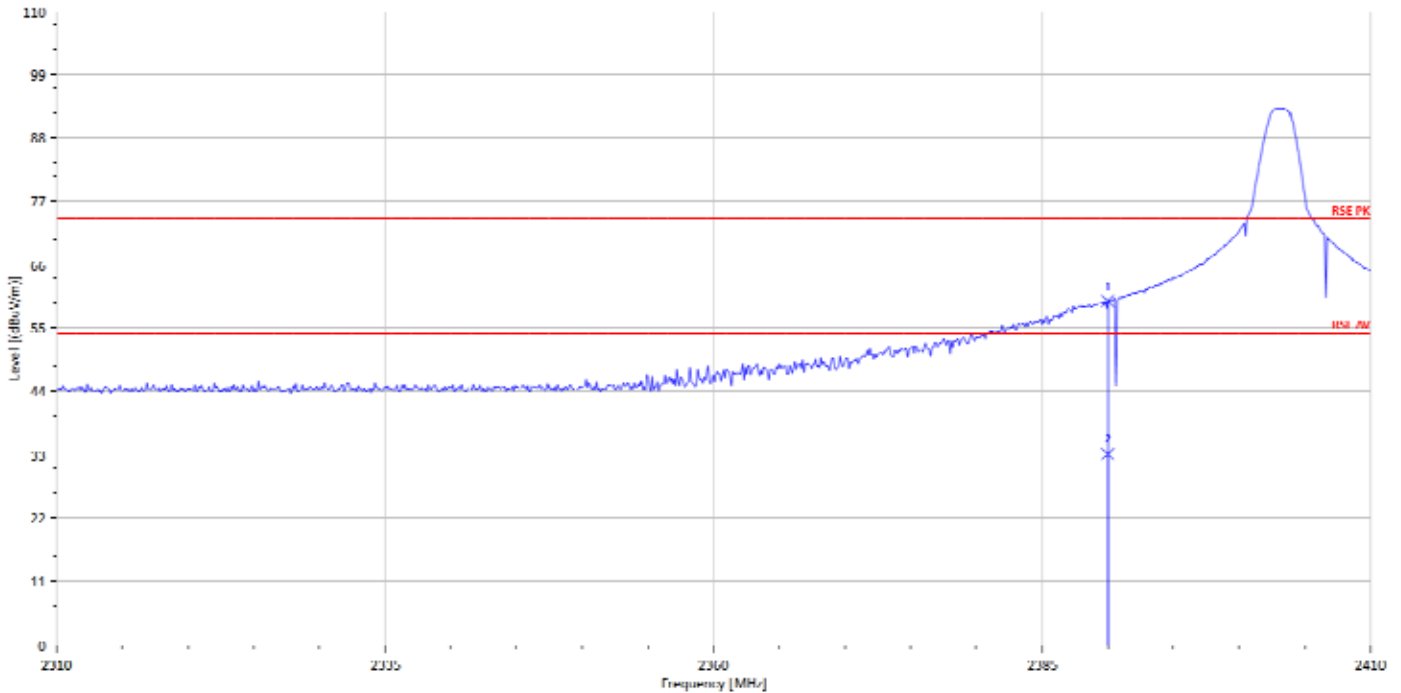
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Operation Mode : 2.4G                      Test Date : 2016/12/8  
 Fundamental Frequency : 2403 MHz              Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : BE CH Low              Test Engineer : Ashton  
 EUT Pol. : E2                      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
2390.00	E	Peak	58.79	0.92	59.71	74	-14.29
2390.00	E	Average	32.24	0.92	33.16	54	-20.84

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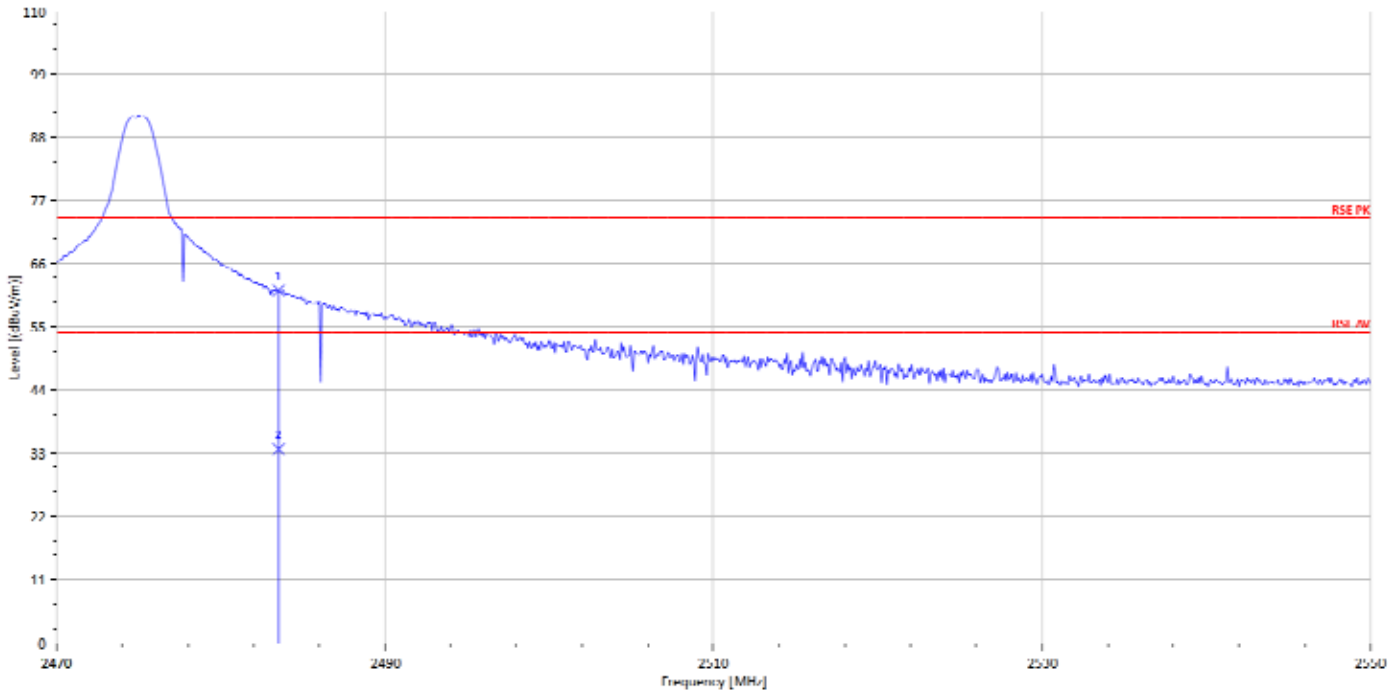
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Operation Mode :	2.4G	Test Date :	2016/12/8
Fundamental Frequency :	2475 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH High	Test Engineer :	Ashton
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
2483.50	E	Peak	60.24	1.16	61.40	74	-12.60
2483.50	E	Average	32.48	1.16	33.64	54	-20.36

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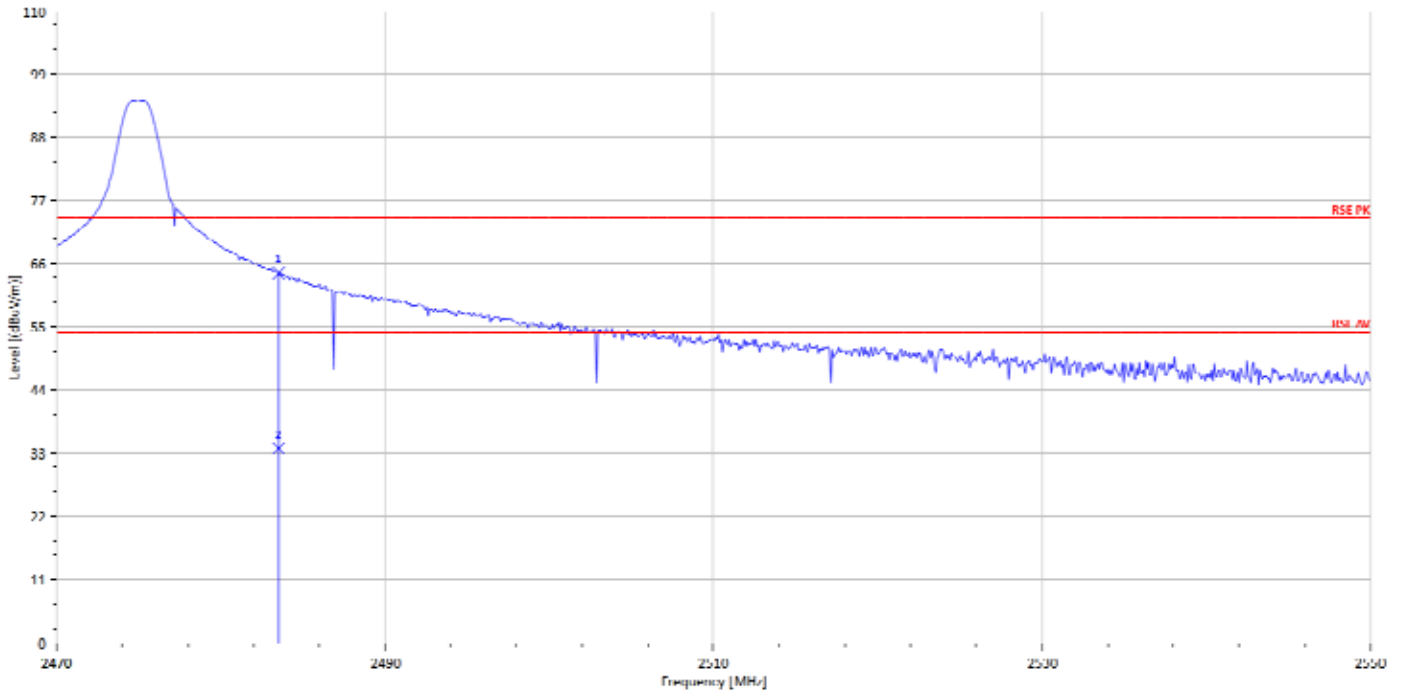
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Operation Mode :	2.4G	Test Date :	2016/12/8
Fundamental Frequency :	2475 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH High	Test Engineer :	Ashton
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



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
2483.50	E	Peak	63.18	1.16	64.34	74	-9.66
2483.50	E	Average	32.60	1.16	33.76	54	-20.24

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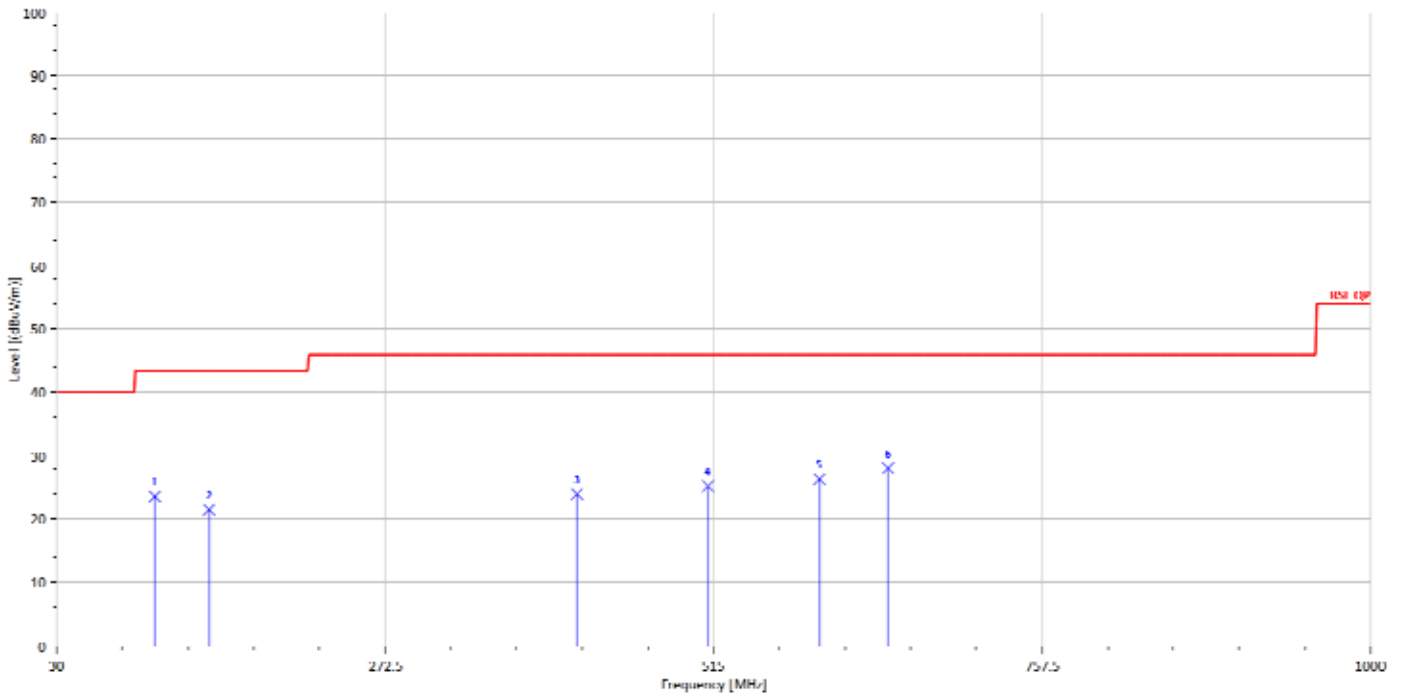
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## Radiated Spurious Emission Measurement Result For Frequency form 30MHz to 1000MHz

Operation Mode :	2.4G	Test Date :	2016/12/12
Fundamental Frequency :	2403 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Low	Test Engineer :	Ashton
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
102.75	S	Peak	40.93	-17.40	23.54	43.5	-19.96
142.52	S	Peak	37.71	-16.26	21.45	43.5	-22.05
414.12	S	Peak	33.15	-9.21	23.93	46	-22.07
511.12	S	Peak	32.69	-7.49	25.20	46	-20.80
593.57	S	Peak	32.17	-5.85	26.32	46	-19.68
644.01	S	Peak	33.15	-5.10	28.05	46	-17.95

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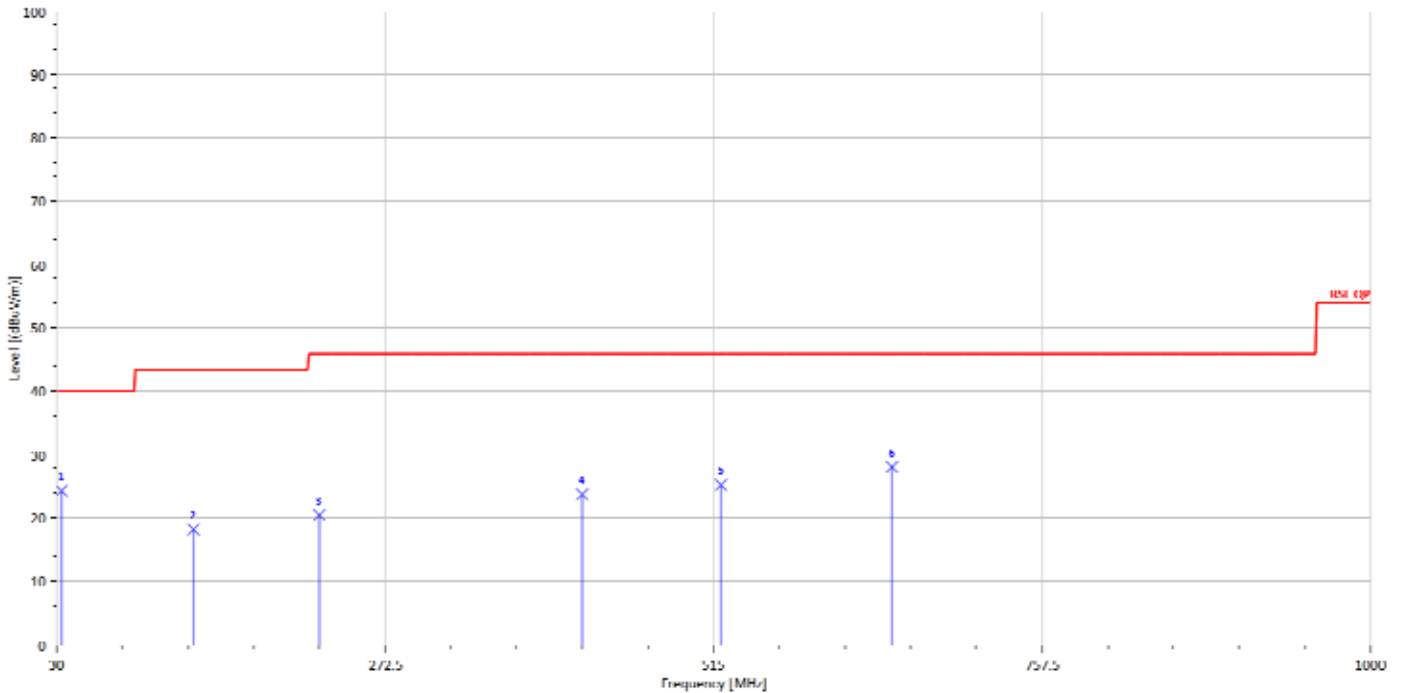
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Operation Mode : 2.4G Test Date : 2016/12/12  
 Fundamental Frequency : 2403 MHz Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : Tx CH Low Test Engineer : Ashton  
 EUT Pol. : E2 Measurement Antenna Pol. : Horizontal



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
33.88	S	Peak	33.56	-9.27	24.28	40	-15.72
130.88	S	Peak	33.84	-15.71	18.13	43.5	-25.37
224.00	S	Peak	37.21	-16.81	20.40	46	-25.60
418.00	S	Peak	32.62	-8.91	23.71	46	-22.29
520.82	S	Peak	32.57	-7.35	25.22	46	-20.78
646.92	S	Peak	33.01	-4.92	28.09	46	-17.91

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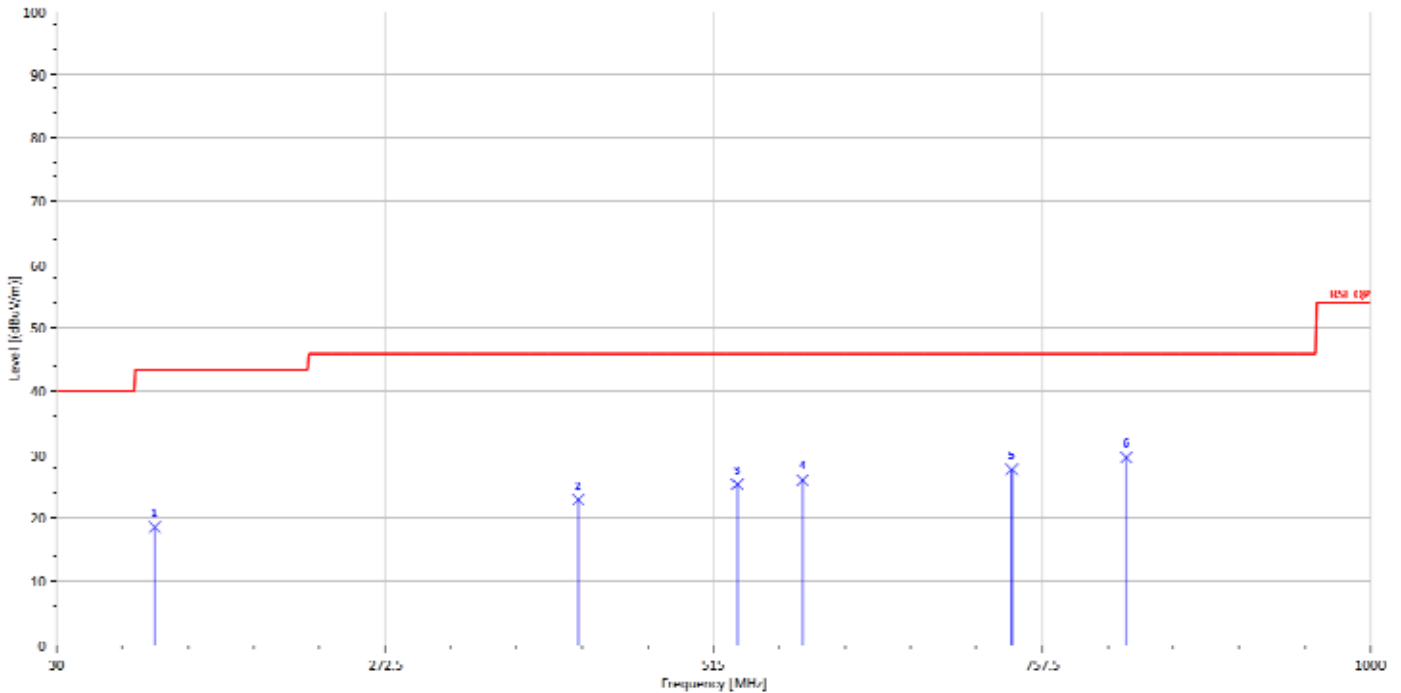
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Operation Mode : 2.4G Test Date : 2016/12/12  
 Fundamental Frequency : 2440 MHz Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : Tx CH Mid Test Engineer : Ashton  
 EUT Pol. : E2 Measurement Antenna Pol. : Vertical



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
102.75	S	Peak	35.90	-17.40	18.50	43.5	-25.00
415.09	S	Peak	31.99	-9.11	22.88	46	-23.12
532.46	S	Peak	32.41	-7.09	25.31	46	-20.69
580.96	S	Peak	32.08	-6.11	25.97	46	-20.03
735.19	S	Peak	32.22	-4.52	27.70	46	-18.30
819.58	S	Peak	32.57	-2.98	29.60	46	-16.40

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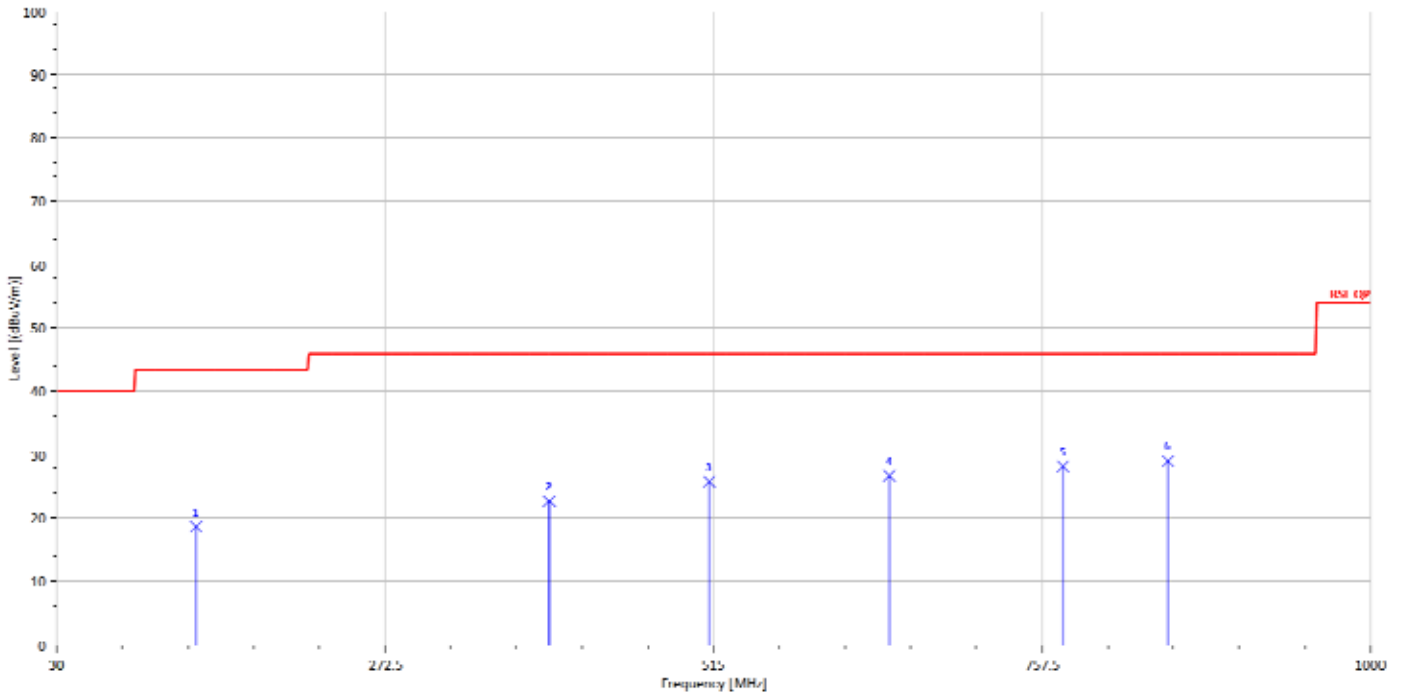
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Operation Mode : 2.4G Test Date : 2016/12/12  
 Fundamental Frequency : 2440 MHz Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : Tx CH Mid Test Engineer : Ashton  
 EUT Pol. : E2 Measurement Antenna Pol. : Horizontal



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
132.82	S	Peak	34.33	-15.76	18.57	43.5	-24.93
393.75	S	Peak	32.55	-9.91	22.64	46	-23.36
512.09	S	Peak	33.26	-7.51	25.75	46	-20.25
644.98	S	Peak	31.58	-4.88	26.69	46	-19.31
773.02	S	Peak	32.78	-4.59	28.20	46	-17.80
850.62	S	Peak	32.14	-3.11	29.03	46	-16.97

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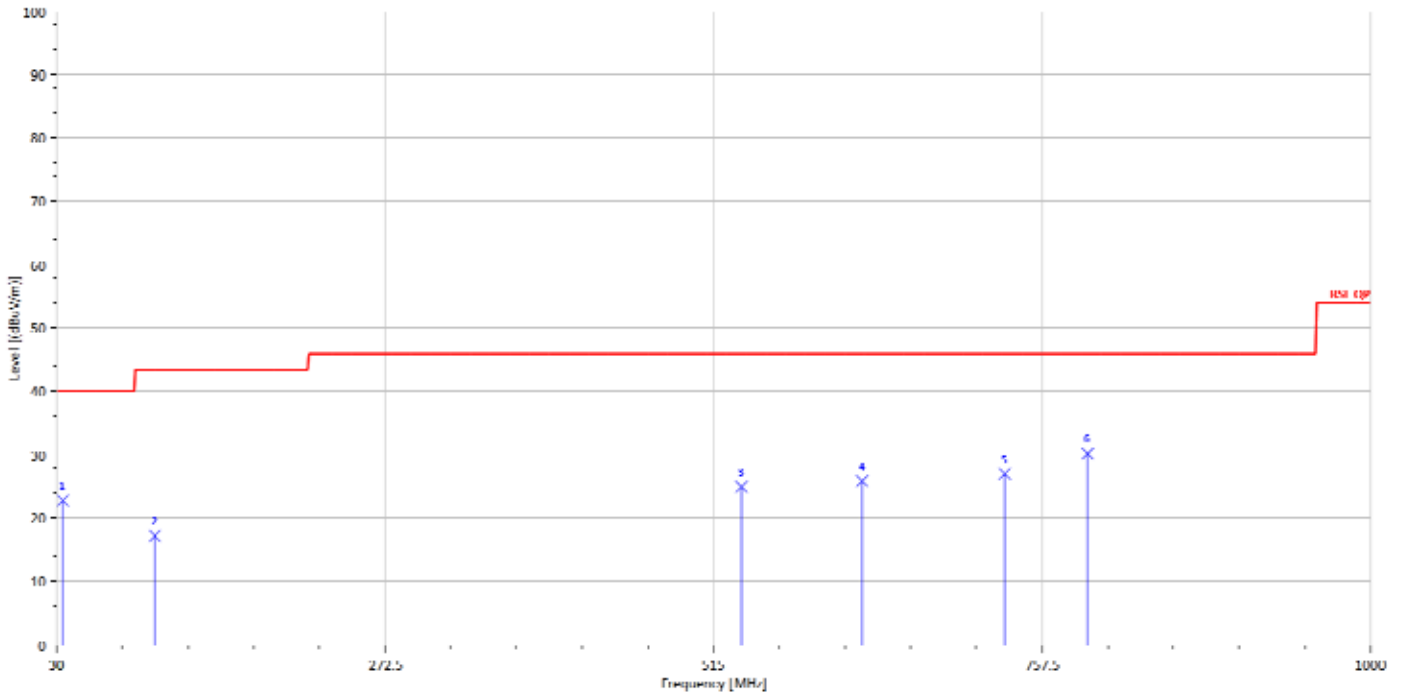
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Operation Mode : 2.4G Test Date : 2016/12/12  
 Fundamental Frequency : 2475 MHz Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : Tx CH High Test Engineer : Ashton  
 EUT Pol. : E2 Measurement Antenna Pol. : Vertical



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
34.85	S	Peak	32.52	-9.78	22.74	40	-17.26
102.75	S	Peak	34.57	-17.40	17.17	43.5	-26.33
535.37	S	Peak	32.36	-7.43	24.93	46	-21.07
624.61	S	Peak	31.96	-6.11	25.85	46	-20.15
730.34	S	Peak	31.67	-4.67	27.00	46	-19.00
791.45	S	Peak	34.37	-4.17	30.20	46	-15.80

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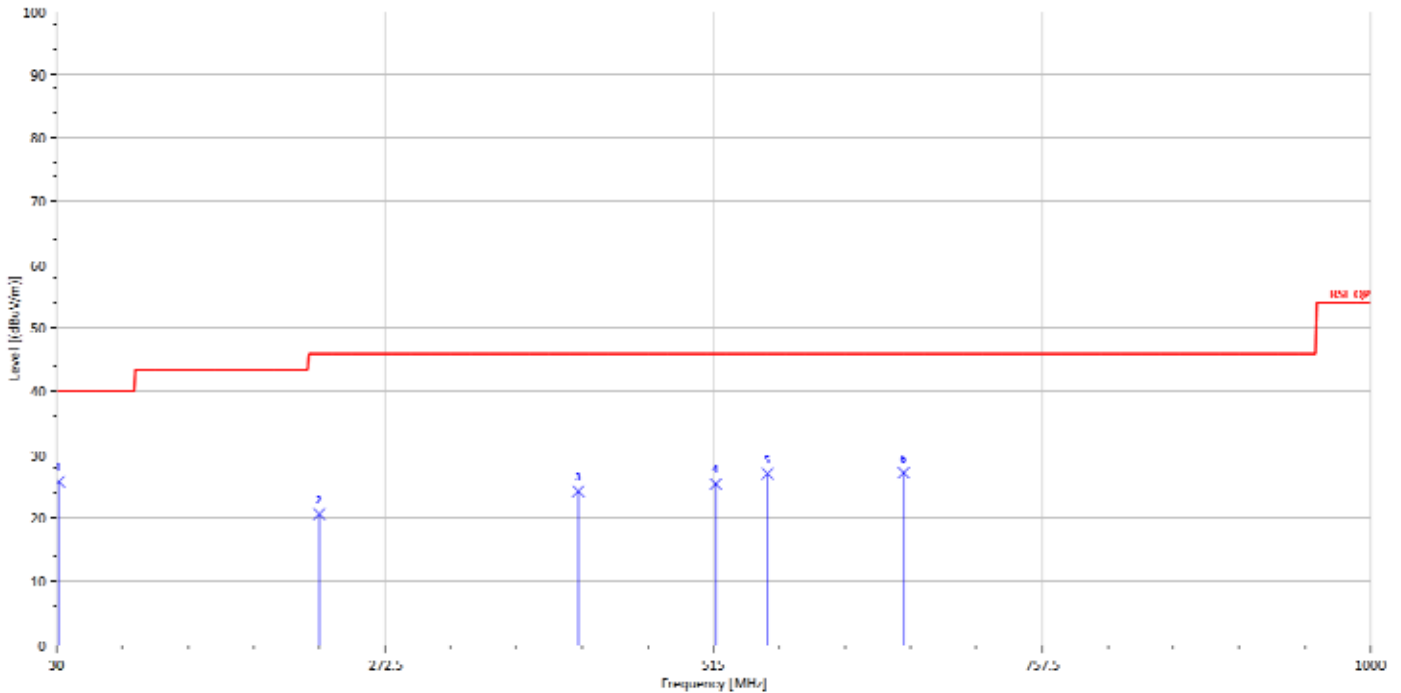
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Operation Mode : 2.4G Test Date : 2016/12/12  
 Fundamental Frequency : 2475 MHz Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : Tx CH High Test Engineer : Ashton  
 EUT Pol. : E2 Measurement Antenna Pol. : Horizontal



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	33.97	-8.22	25.75	40	-14.25
224.00	S	Peak	37.39	-16.81	20.58	46	-25.42
415.09	S	Peak	33.33	-9.11	24.21	46	-21.79
516.94	S	Peak	33.17	-7.79	25.37	46	-20.63
554.77	S	Peak	33.81	-6.79	27.02	46	-18.98
655.65	S	Peak	32.14	-4.99	27.15	46	-18.85

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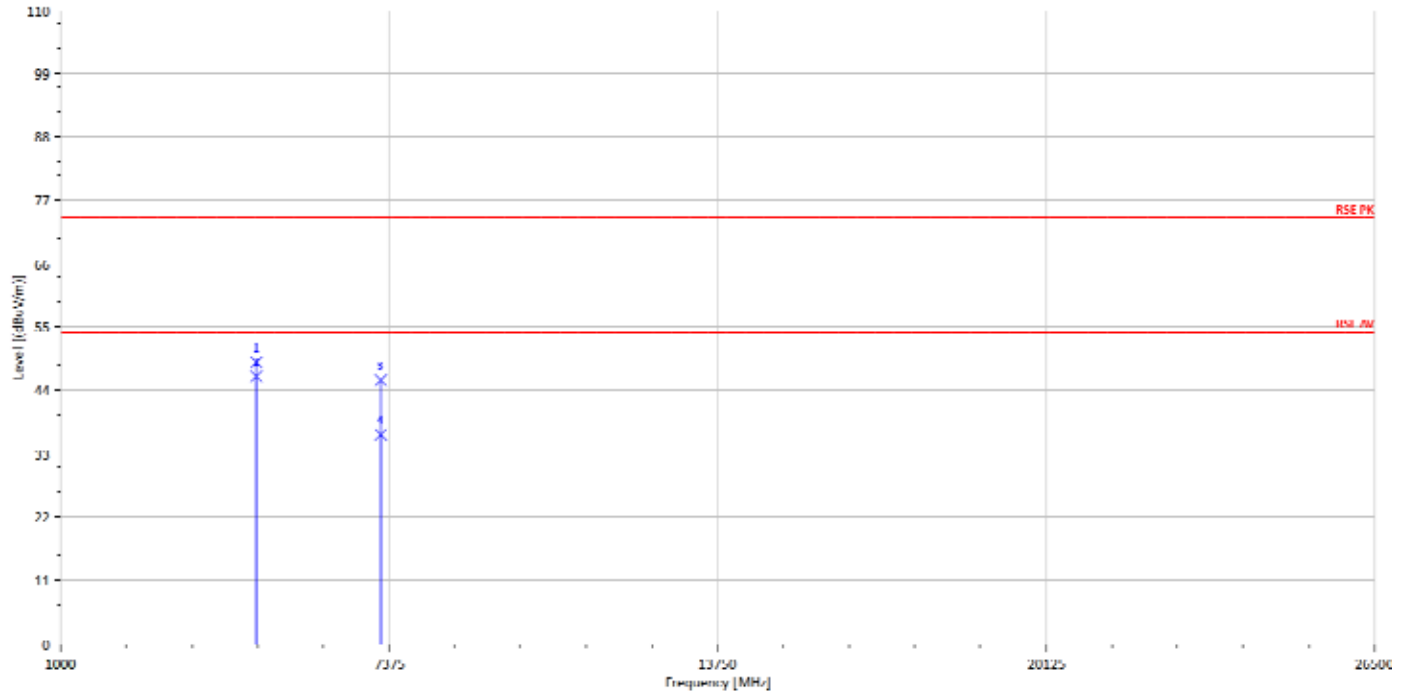
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Operation Mode : 2.4G                      Test Date : 2016/12/9  
 Fundamental Frequency : 2403 MHz      Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : Tx CH Low      Test Engineer : Ashton  
 EUT Pol. : E2                      Measurement Antenna 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
4806.00	H	Peak	41.25	7.67	48.92	74	-25.08
4806.00	H	Average	38.79	7.67	46.46	54	-7.54
7209.00	H	Peak	30.94	14.85	45.79	74	-28.21
7209.00	H	Average	21.37	14.85	36.22	54	-17.78

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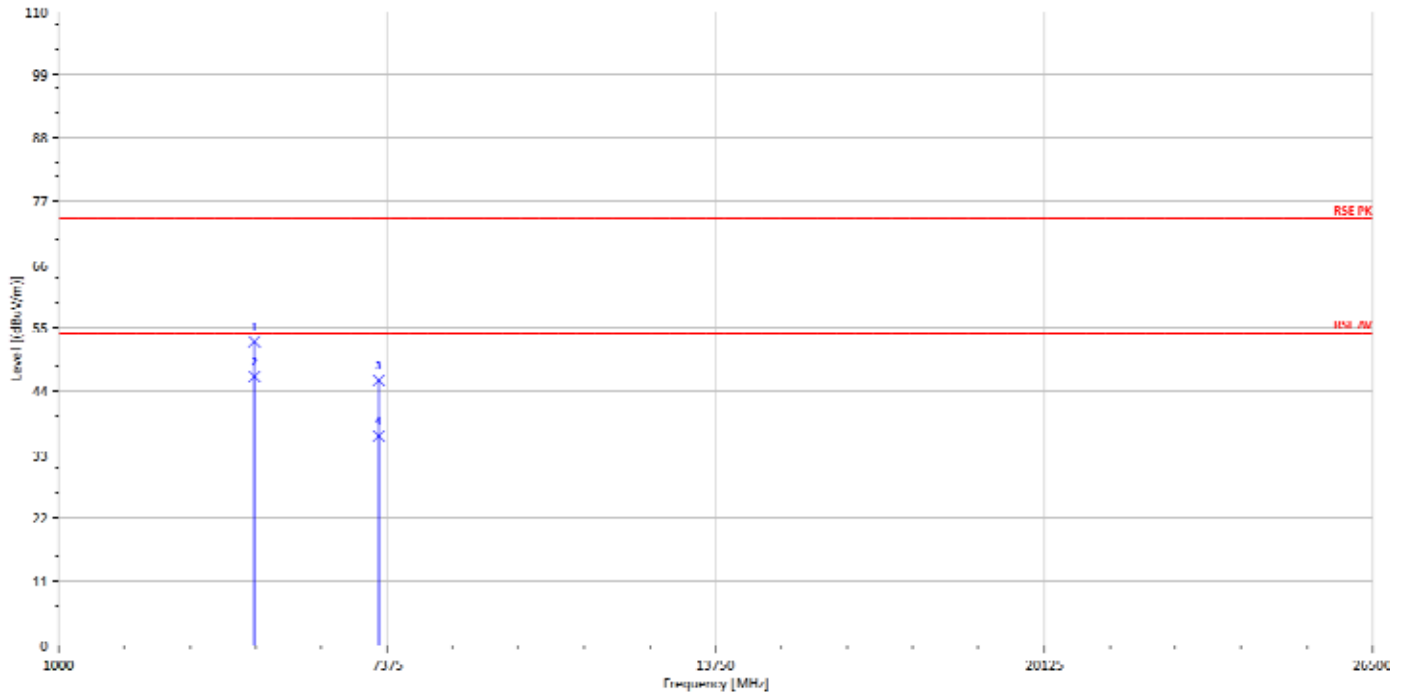
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 Fundamental Frequency : 2403 MHz Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : Tx CH Low Test Engineer : Ashton  
 EUT Pol. : E2 Measurement Antenna Pol. : Horizontal



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	44.90	7.67	52.57	74	-21.43
4806.00	H	Average	38.94	7.67	46.61	54	-7.39
7209.00	H	Peak	31.08	14.85	45.93	74	-28.07
7209.00	H	Average	21.31	14.85	36.16	54	-17.84

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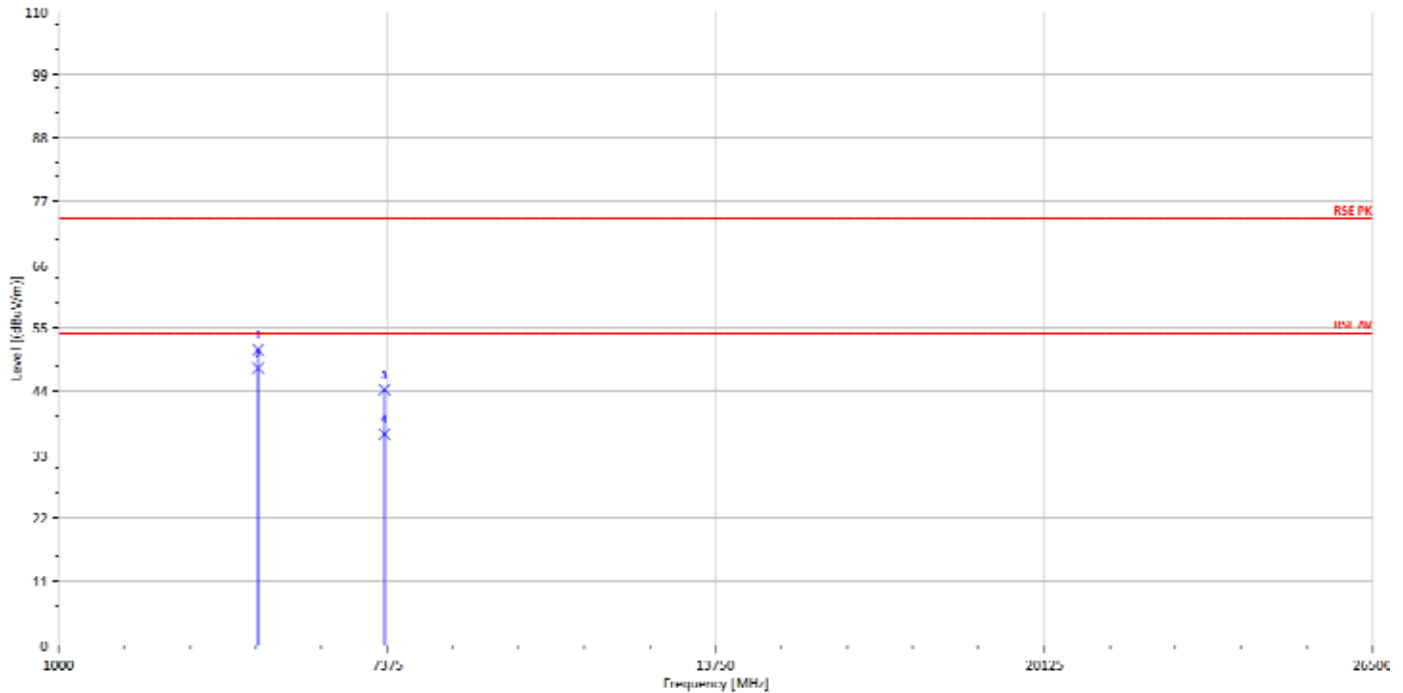
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 Fundamental Frequency : 2440 MHz Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : Tx CH Mid Test Engineer : Ashton  
 EUT Pol. : E2 Measurement Antenna Pol. : Vertical



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	43.41	7.78	51.19	74	-22.81
4880.00	H	Average	40.31	7.78	48.09	54	-5.91
7320.00	H	Peak	29.61	14.71	44.32	74	-29.68
7320.00	H	Average	21.79	14.71	36.50	54	-17.50

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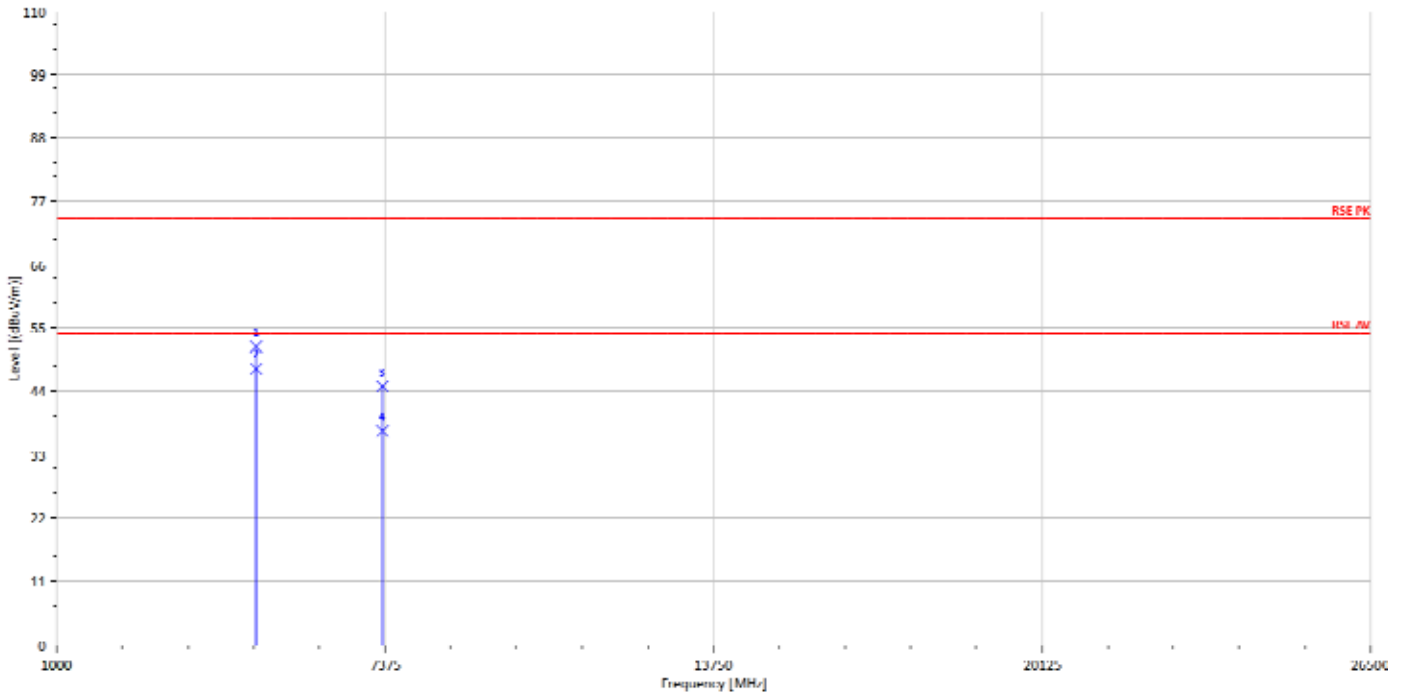
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 Fundamental Frequency : 2440 MHz Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : Tx CH Mid Test Engineer : Ashton  
 EUT Pol. : E2 Measurement Antenna Pol. : Horizontal



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	43.95	7.78	51.73	74	-22.27
4880.00	H	Average	40.16	7.78	47.94	54	-6.06
7320.00	H	Peak	30.18	14.71	44.89	74	-29.11
7320.00	H	Average	22.34	14.71	37.05	54	-16.95

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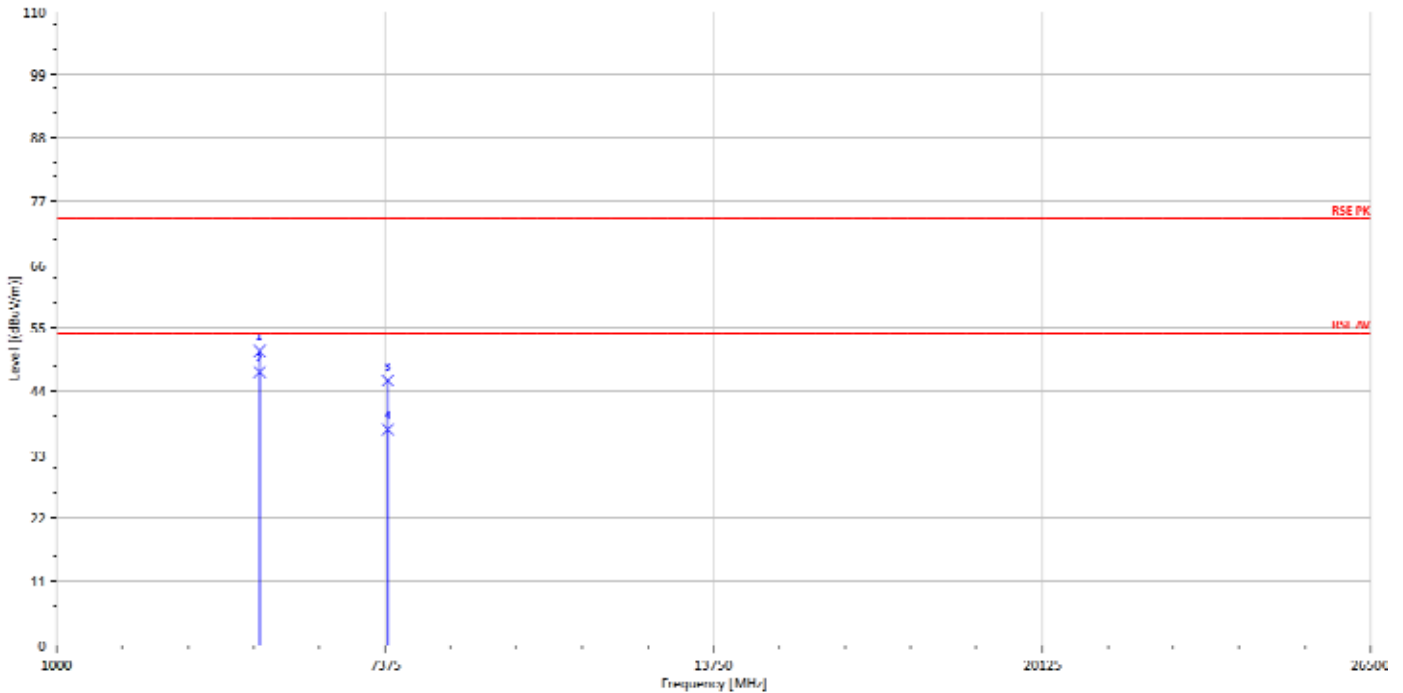
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Operation Mode :	2.4G	Test Date :	2016/12/9
Fundamental Frequency :	2475 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH High	Test Engineer :	Ashton
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



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
4950.00	H	Peak	43.21	7.78	50.99	74	-23.01
4950.00	H	Average	39.60	7.78	47.38	54	-6.62
7425.00	H	Peak	29.98	15.90	45.89	74	-28.11
7425.00	H	Average	21.40	15.90	37.30	54	-16.70

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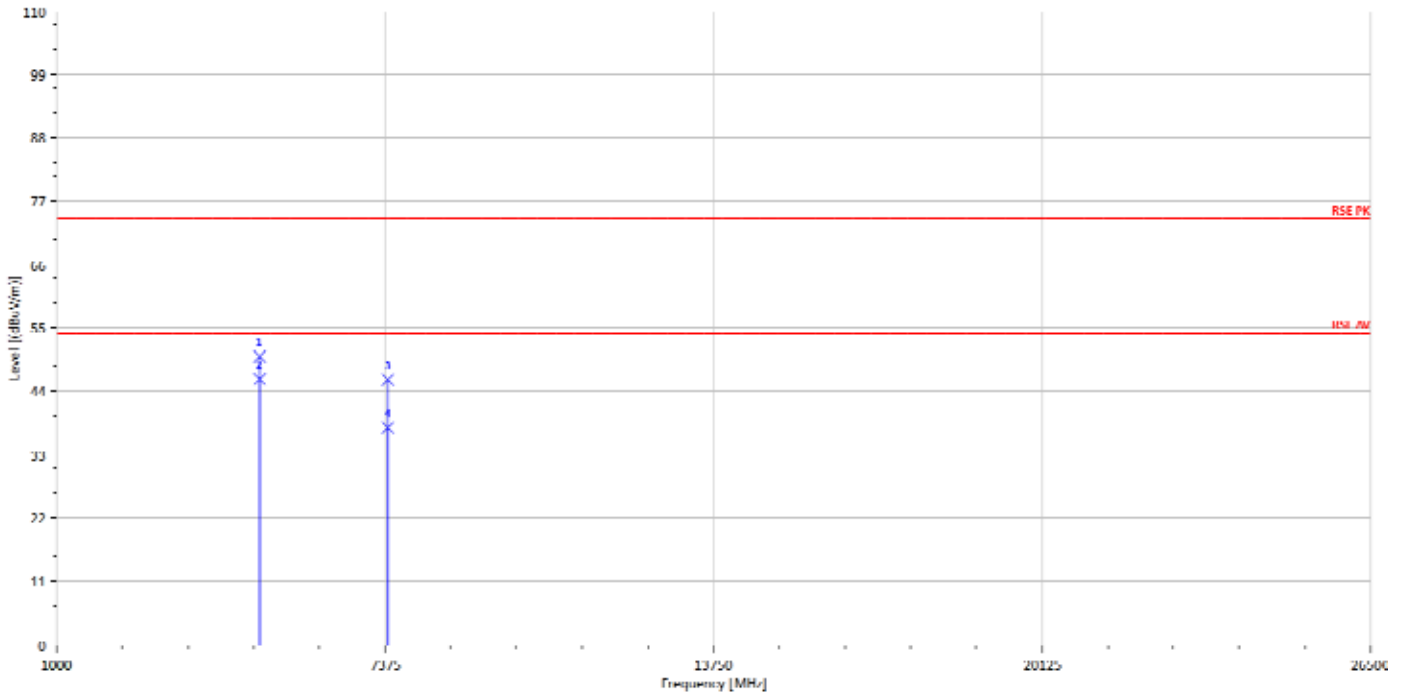
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Operation Mode : 2.4G Test Date : 2016/12/9  
 Fundamental Frequency : 2475 MHz Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : Tx CH High Test Engineer : Ashton  
 EUT Pol. : E2 Measurement Antenna Pol. : Horizontal



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
4950.00	H	Peak	42.31	7.78	50.09	74	-23.91
4950.00	H	Average	38.37	7.78	46.15	54	-7.85
7425.00	H	Peak	30.15	15.90	46.06	74	-27.94
7425.00	H	Average	21.73	15.90	37.63	54	-16.37

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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	12/20/2015	12/19/2016
Power Sensor	Anritsu	MA2411B	917032	12/20/2015	12/19/2016
Spectrum Analyzer	Agilent	E4446A	MY51100003	01/29/2016	01/28/2017
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/02/2016	01/01/2017
Spectrum Analyzer	Agilent	E4440A	MY45304525	05/05/2016	05/04/2017
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2016	01/01/2017
Attenuator	Mini-Circuit	BW-S10W2+	002	01/02/2016	01/01/2017
Splitter	Agilent	11636B	N/A	01/02/2016	01/01/2017

### 8.4 Measurement Results:

Frequency (MHz)	20dB Bandwidth (kHz)
2403	1748
2440	1735
2475	1766

Refer to attached data chart.

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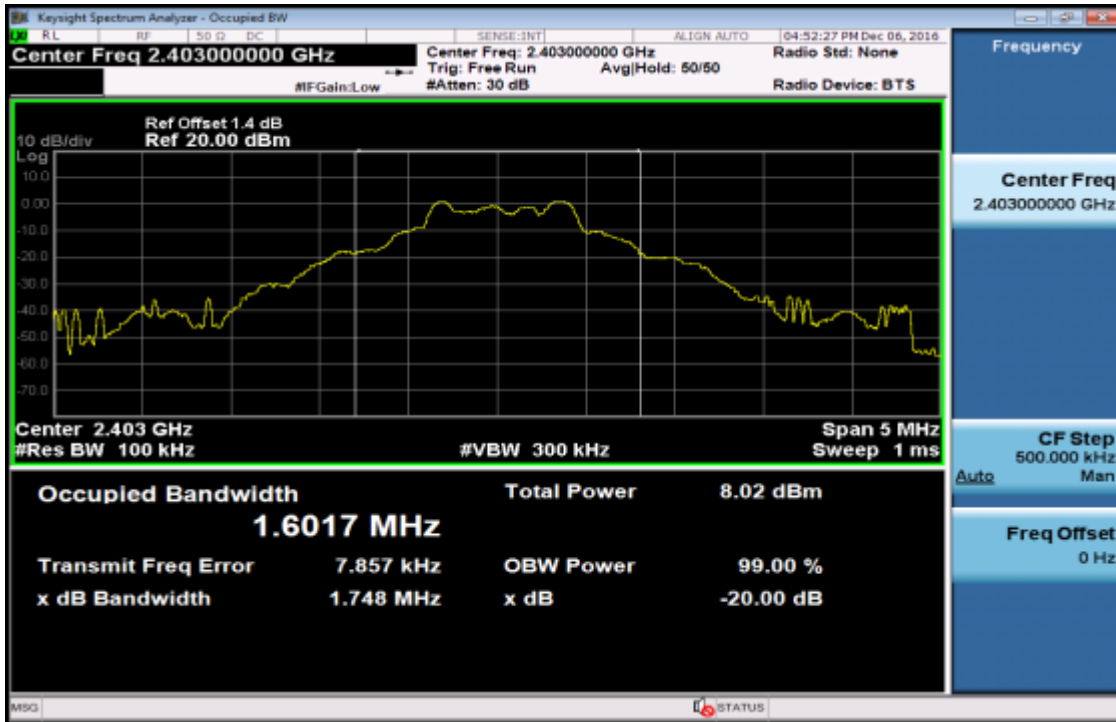
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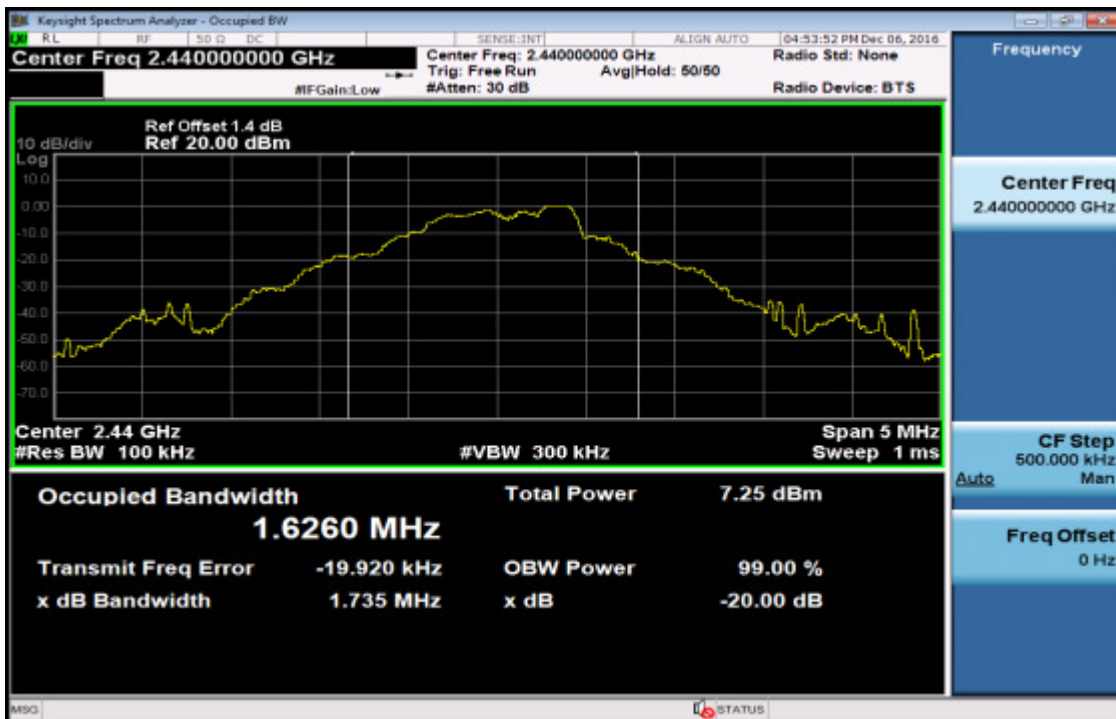
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## 2403MHz



## 2440MHz



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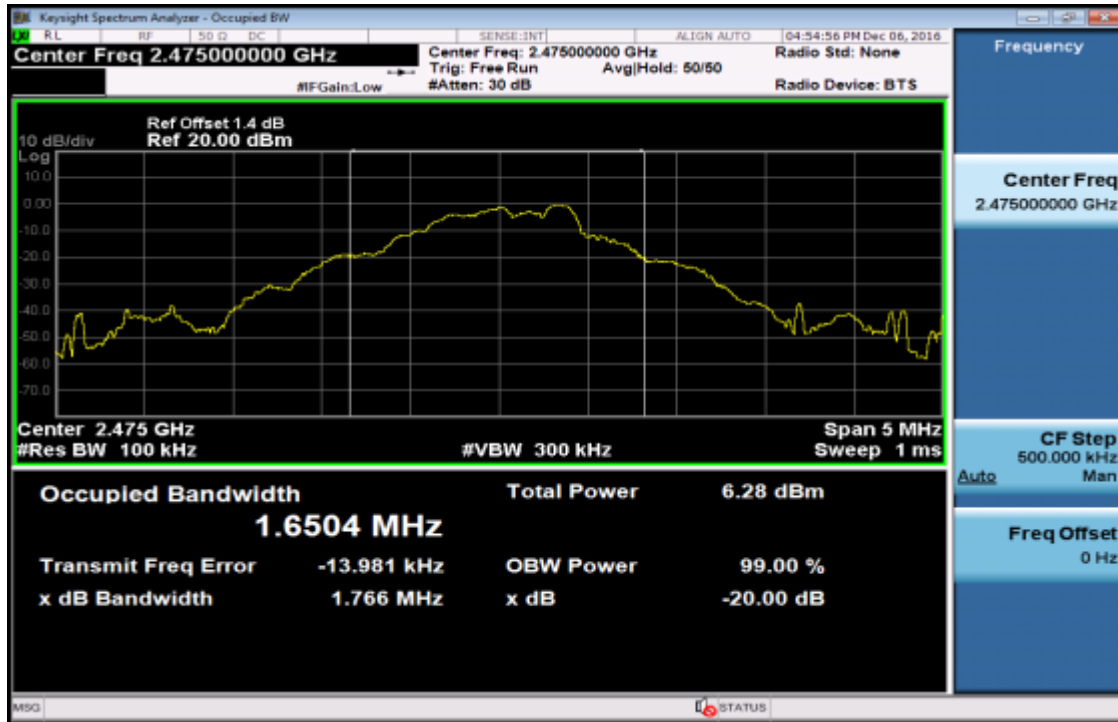
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## 2475MHz



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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.

### 9.2 Antenna Connected Construction:

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.

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