

# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

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

OF

**Product Name:** HQR05 2.4GHz Receiver  
**Brand Name:** TRAXXAS  
**Model No.:** 0982, 7992  
**Model Difference:** Retail packaging  
**FCC ID:** XVE-TRX1020  
**Report No.:** ER/2015/A0067  
**Issue Date:** Apr. 22, 2016  
**FCC Rule Part:** §15.249  
**Prepared for:** Traxxas LP  
 6250 Traxxas Way, McKinney, TX 75070, USA  
 SGS Taiwan Ltd.  
 Electronics & Communication Laboratory  
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## VERIFICATION OF COMPLIANCE

**Applicant:** Traxxas LP  
6250 Traxxas Way, McKinney, TX 75070, USA

**Product Description:** HQR05 2.4GHz Receiver

**Brand Name:** TRAXXAS

**Model No.:** 0982, 7992

**Model Difference:** Retail packaging

**FCC ID:** XVE-TRX1020

**File Number:** ER/2015/A0067

**Date of test:** Sep. 11, 2015 ~ Apr. 20, 2016

**Date of EUT Received:** Sep. 11, 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:**

*Marcus Tseng*

**Date:**

Apr. 22, 2016

**Marcus Tseng / Sr. Engineer**

**Prepared By:**

*Violetta Tang*

**Date:**

Apr. 22, 2016

**Violetta Tang / Clerk**

**Approved By:**

*Jim Chang*

**Date:**

Apr. 22, 2016

**Jim Chang / Asst. Manager**

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## Revision History

Report Number	Revision	Description	Issue Date
ER/2015/A0067	Rev.00	Initial creation of document	Apr. 22, 2016

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## 1. GENERAL INFORMATION

### 1.1. Product Description

General:

Product Name:	HQR05 2.4GHz Receiver
Brand Name:	TRAXXAS
Model No.:	0982, 7992
Model Difference:	Retail packaging
Product SW/HW version:	N/A
Radio SW/HW version:	N/A
Test SW Version:	N/A
RF power setting in TEST SW:	N/A
Operation Frequency:	2402~2480MHz
Transmit Power	99.35dBuV/m (Peak)
Channel number:	79 channels
Channel space:	1MHz
Modulation Type:	DSSS
Power Supply:	5Vdc
Host:	Model No.: 7908 & 7909, Supplier: Traxxas LP
Antenna Designation:	A, Attached Dipole Antenna, Antenna Gain: 1.64dBi B, Attached Dipole Antenna, Antenna Gain: 3.62dBi

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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.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan. (TAF code 0513)

FCC Registration Numbers are: 990257 (Wugu)

Canada Registration Number: 4620A-5.

## 1.4. Special Accessories

There is no special accessory 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

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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 of Tested System



Table 2-1 Support Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	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	Conducted Emission	N/A
§15.249(a)(d)(e)	Field Strength Measurement (TX and RX)	Compliant
§15.215(c)	20dB Bandwidth Measurement	Compliant

### 4. DESCRIPTION OF TEST MODES

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

79 channels are provided.

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
1	2402MHz	28	2429MHz	55	2456MHz
2	2403MHz	29	2430MHz	56	2457MHz
3	2404MHz	30	2431MHz	57	2458MHz
4	2405MHz	31	2432MHz	58	2459MHz
5	2406MHz	32	2433MHz	59	2460MHz
6	2407MHz	33	2434MHz	60	2461MHz
7	2408MHz	34	2435MHz	61	2462MHz
8	2409MHz	35	2436MHz	62	2463MHz
9	2410MHz	36	2437MHz	63	2464MHz
10	2411MHz	37	2438MHz	64	2465MHz
11	2412MHz	38	2439MHz	65	2466MHz
12	2413MHz	39	2440MHz	66	2467MHz
13	2414MHz	40	2441MHz	67	2468MHz
14	2415MHz	41	2442MHz	68	2469MHz
15	2416MHz	42	2443MHz	69	2470MHz
16	2417MHz	43	2444MHz	70	2471MHz
17	2418MHz	44	2445MHz	71	2472MHz
18	2419MHz	45	2446MHz	72	2473MHz
19	2420MHz	46	2447MHz	73	2474MHz
20	2421MHz	47	2448MHz	74	2475MHz
21	2422MHz	48	2449MHz	75	2476MHz
22	2423MHz	49	2450MHz	76	2477MHz
23	2424MHz	50	2451MHz	77	2478MHz
24	2425MHz	51	2452MHz	78	2479MHz
25	2426MHz	52	2453MHz	79	2480MHz
26	2427MHz	53	2454MHz		
27	2428MHz	54	2455MHz		

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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	1 to 79	1, 40, 79	DSSS	N/A	MAIN
RADIATED EMISSION TEST (ABOVE 1 GHz)					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
2.4G	1 to 79	1, 40, 79	DSSS	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 Wireless 2.4G Transmitter for channel Low, Mid and High, the worst case E2 position was reported.

**ANTENNA PORT CONDUCTED MEASUREMENT:**

CONDUCTED TEST					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
2.4G	1 to 79	1, 40, 79	DSSS	N/A	MAIN

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## 5. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
20dB Bandwidth	+/- 123.36 Hz
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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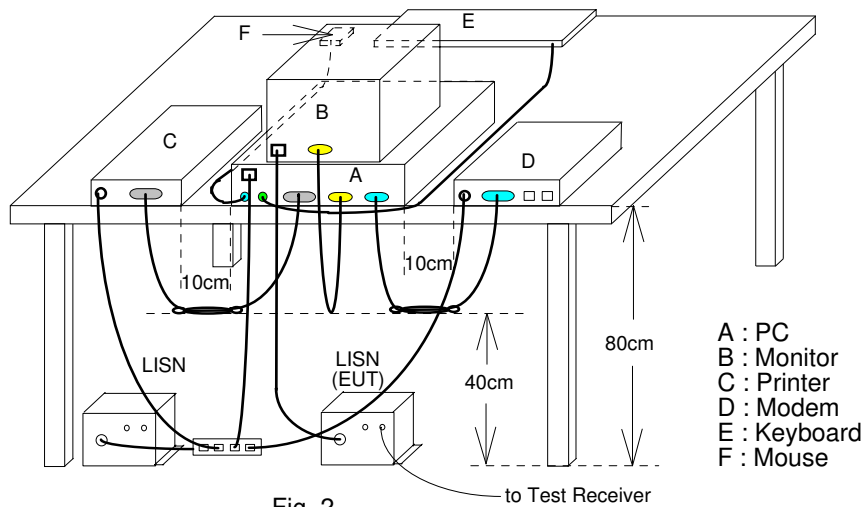
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## 6. CONDUCTED EMISSIONS TEST

### 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)



### 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	ESC17	100760	05/04/2015	05/03/2016
LISN	SCHWARZB ECK	NSLK 8127	8127-649	05/15/2015	05/14/2016
LISN	FCC	FCC-LISN-50/250- 25-2-01	04034	03/13/2015	03/12/2016
Coaxial Cables	N/A	WK CE Cable	N/A	11/26/2014	11/25/2015

### 6.4 Measurement Result:

N/A, this device is powered by battery.

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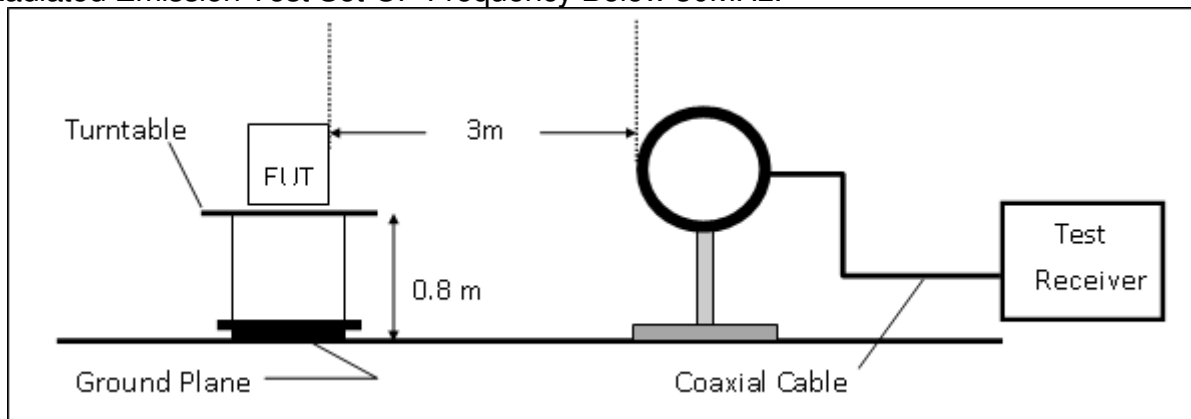
## 7. RADIATED EMISSION TEST

### 7.1 Measurement Procedure

1. The EUT was placed on a turntable that is 150cm 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.
5. Test setting for fundamental emission: RBW=2MHz;VBW=6MHz.

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

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



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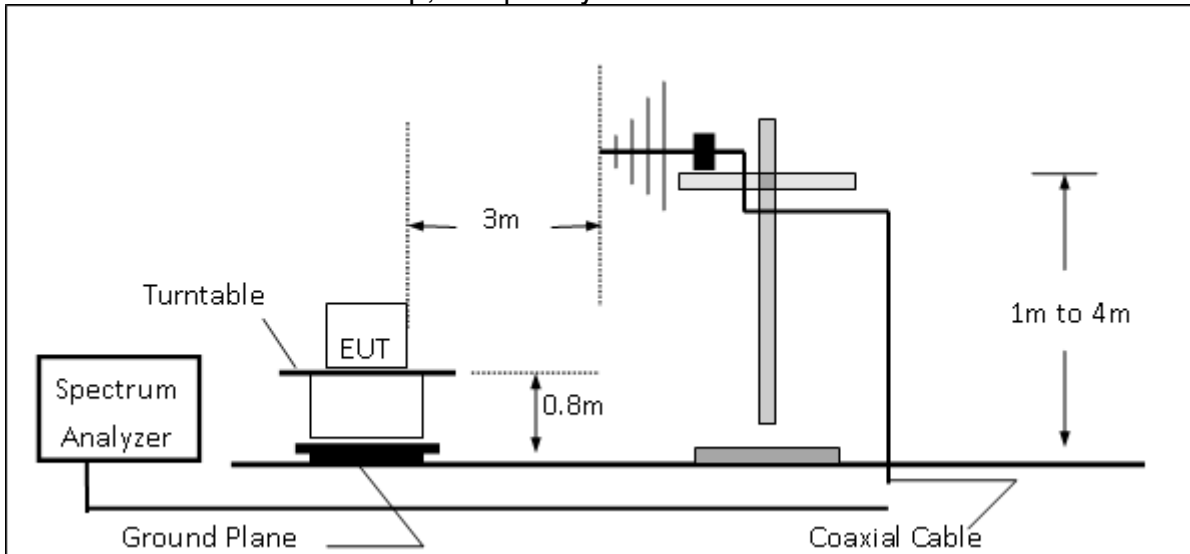
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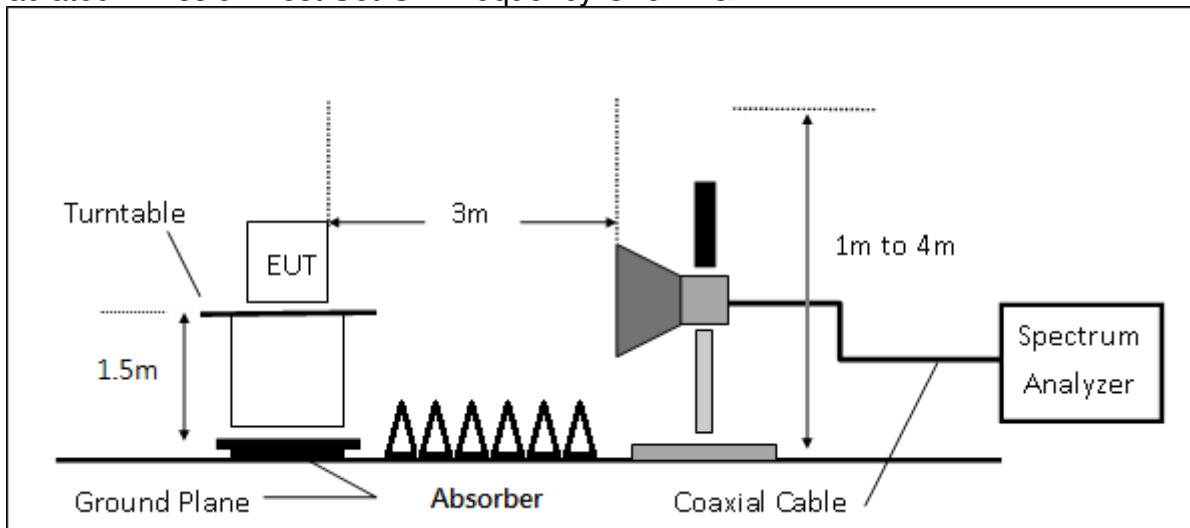
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(B) Radiated Emission Test Set-Up, Frequency form 30MHz to 1000MHz



(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	05/04/2015	05/03/2016
Spectrum Analyzer	Agilent	E4446A	MY51100003	01/29/2015	01/28/2016
EXA Spectrum Analyzer	Agilent	N9010A	MY50420195	12/22/2014	12/21/2015
Spectrum Analyzer	R&S	FSV-30	101398	10/07/2014	10/06/2015
Loop Antenna	ETS.LINDGREN	6502	00143303	12/9/2014	12/08/2015
Bilog Antenna	SCHWAZBECK	VULB9168	378	12/23/2014	12/22/2015
Horn antenna	ETS.LINDGREN	3117	123995	05/05/2015	05/04/2016
Horn Antenna	Schwarzbeck	BBHA9170	184	12/25/2014	12/24/2015
Pre-Amplifier	Agilent	8447D	2944A07676	01/02/2015	01/01/2016
Pre-Amplifier	Agilent	8449B	3008A00578	01/02/2015	01/01/2016
Pre-Amplifier	EMC Instruments Corp.	EMC184045	980135	01/02/2015	01/01/2016
Filter 2400-2483.5 MHz	EWT	EWT-14-0166	M2	01/02/2015	01/01/2016
Attenuator	Mini-Circuit	BW-S10W2+	004	01/02/2015	01/01/2016
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	060776	N.C.R	N.C.R
Low Loss Cable	Huber Suhner	966_Rx	9	01/02/2015	01/01/2016
3m Site NSA	SGS	966 chamber	N/A	07/01/2015	06/30/2016

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4446A	MY51100003	01/29/2016	01/28/2017
Loop Antenna	ETS.LINDGREN	6502	00143303	09/07/2015	09/06/2016
Bilog Antenna	SCHWAZBECK	VULB9168	378	12/14/2015	12/13/2016
Pre-Amplifier	Agilent	8447D	2944A07676	01/02/2016	01/01/2017
Pre-Amplifier	EMC	EMC0126530	980038	01/02/2016	01/01/2017
Low Loss Cable	Huber Suhner	966_Rx	9	01/02/2016	01/01/2017

*Note: The measurement was taken place with the long duration of the time, and additional equipment list as shown above indicate those equipment of which has been subject to undertake the calibration in intermediate period of time of the measurement.*

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#### 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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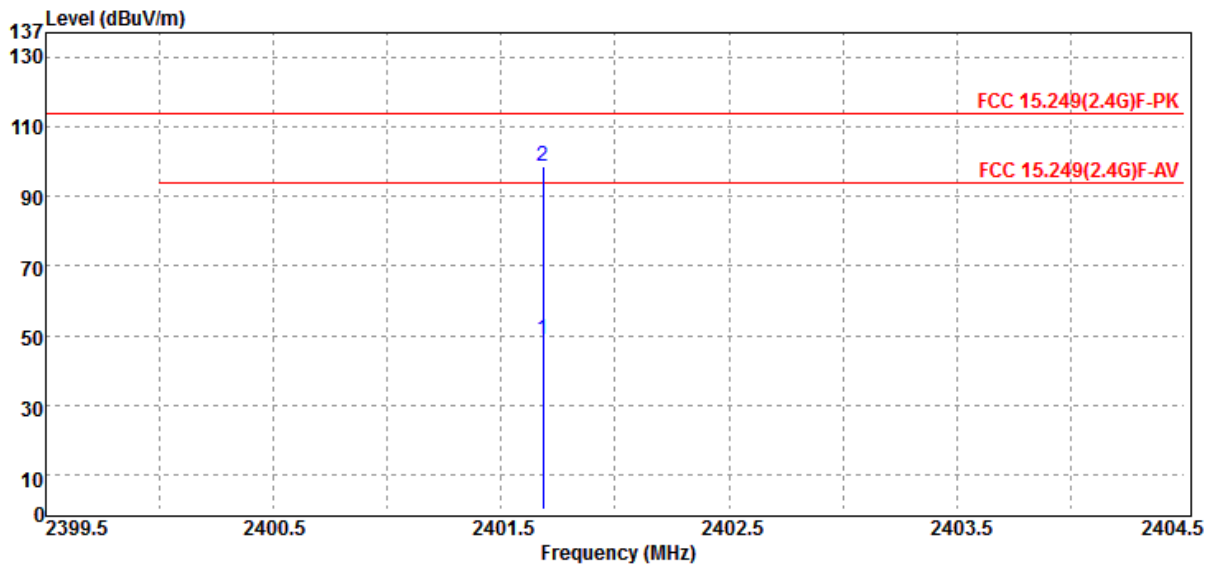
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## 7.5 Measurement Result

### Radiated Spurious Emission Measurement Result (Main)

Operation Band	:FCC 2.4G	Test Date	:2016-04-20
Fundamental Frequency	:2402 MHz	Temp./Humi.	:23 deg_C/60 RH
Operation Mode	:MAIN LOW	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Safe Margin dB
2401.69	F	Average	46.13	2.70	48.83	94.00	-45.17
2401.69	F	Peak	95.99	2.70	98.69	114.00	-15.31

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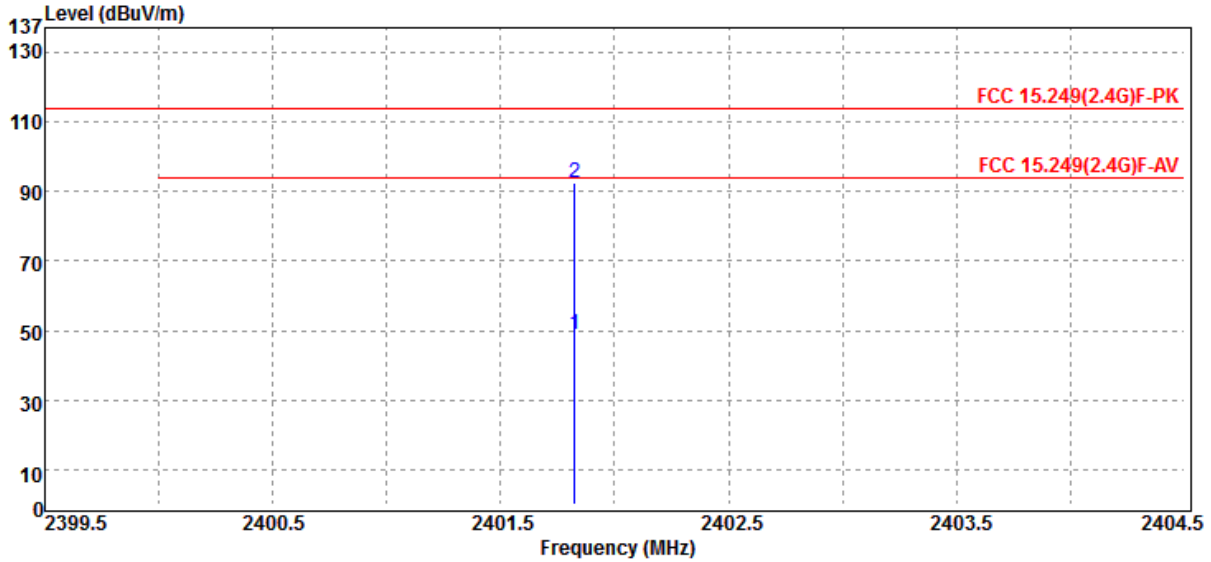
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Operation Band	:FCC 2.4G	Test Date	:2016-04-20
Fundamental Frequency	:2402 MHz	Temp./Humi.	:23 deg_C/60 RH
Operation Mode	:MAIN LOW	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

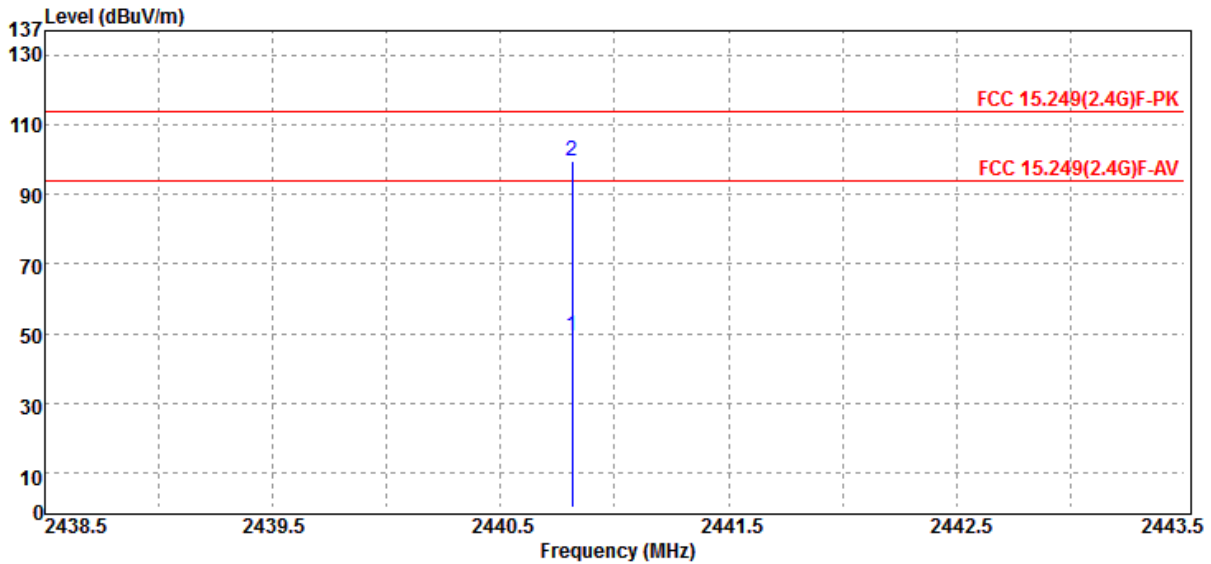


Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2401.83	F	Average	46.10	2.70	48.80	94.00	-45.20
2401.83	F	Peak	89.76	2.70	92.46	114.00	-21.54

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Operation Band	:FCC 2.4G	Test Date	:2016-04-20
Fundamental Frequency	:2441 MHz	Temp./Humi.	:23 deg_C/60 RH
Operation Mode	:MAIN MID	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Safe Margin dB
2440.82	F	Average	46.18	2.92	49.10	94.00	-44.90
2440.82	F	Peak	96.43	2.92	<b>99.35</b>	114.00	-14.65

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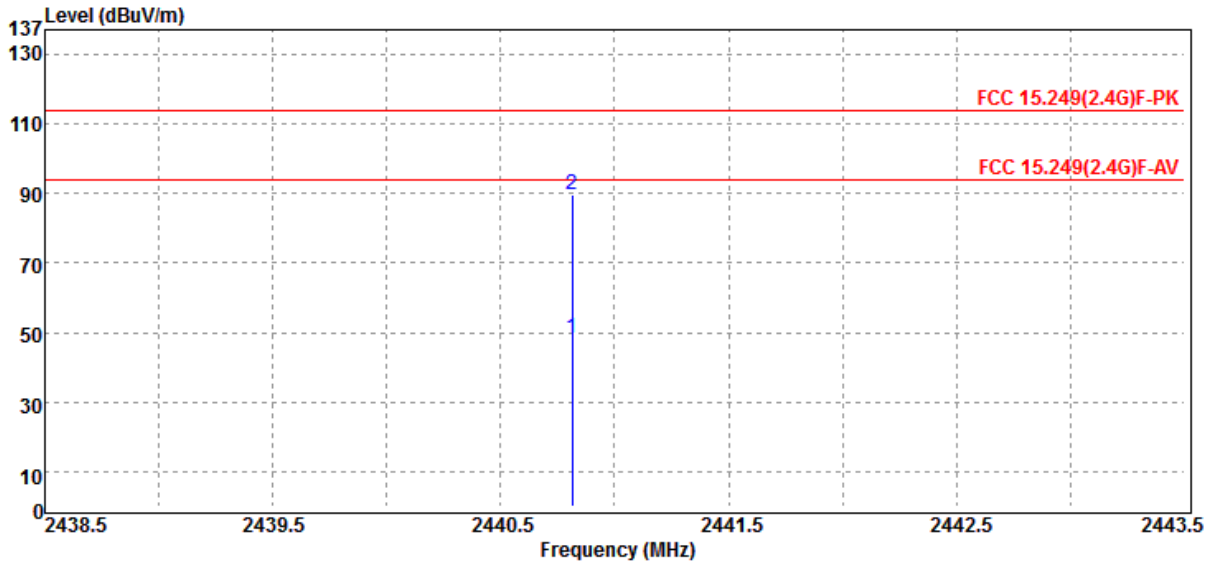
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Operation Band	:FCC 2.4G	Test Date	:2016-04-20
Fundamental Frequency	:2441 MHz	Temp./Humi.	:23 deg_C/60 RH
Operation Mode	:MAIN MID	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Safe Margin dB
2440.82	F	Average	45.36	2.92	48.28	94.00	-45.72
2440.82	F	Peak	86.90	2.92	89.82	114.00	-24.18

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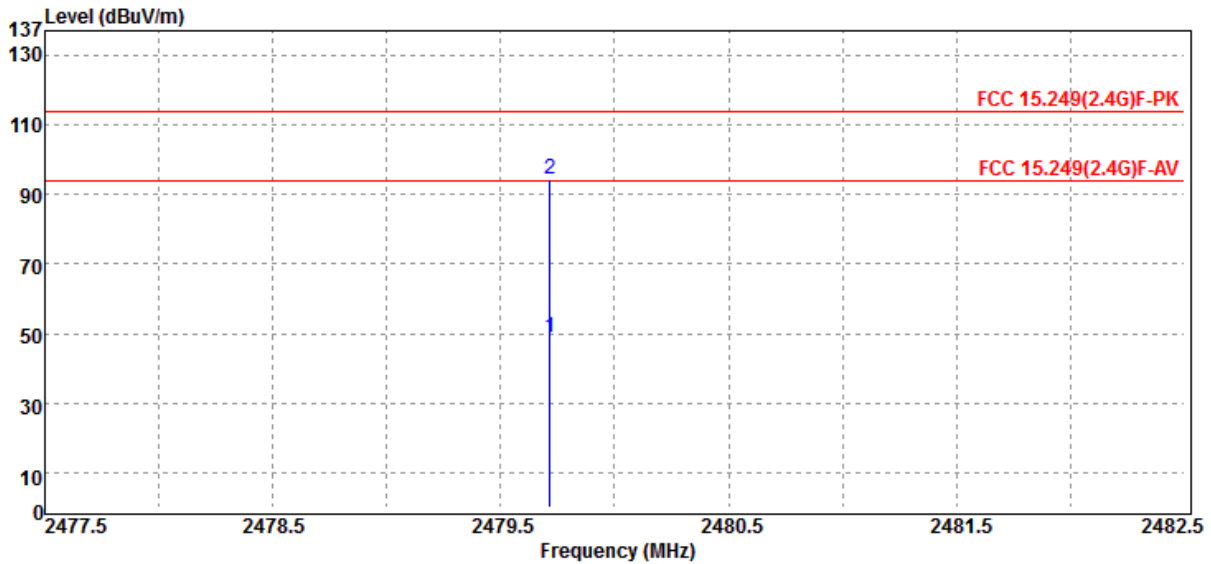
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Operation Band	:FCC 2.4G	Test Date	:2016-04-20
Fundamental Frequency	:2480 MHz	Temp./Humi.	:23 deg_C/60 RH
Operation Mode	:MAIN HIGH	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Safe Margin dB
2479.72	F	Average	45.83	3.07	48.90	94.00	-45.10
2479.72	F	Peak	91.29	3.07	94.36	114.00	-19.64

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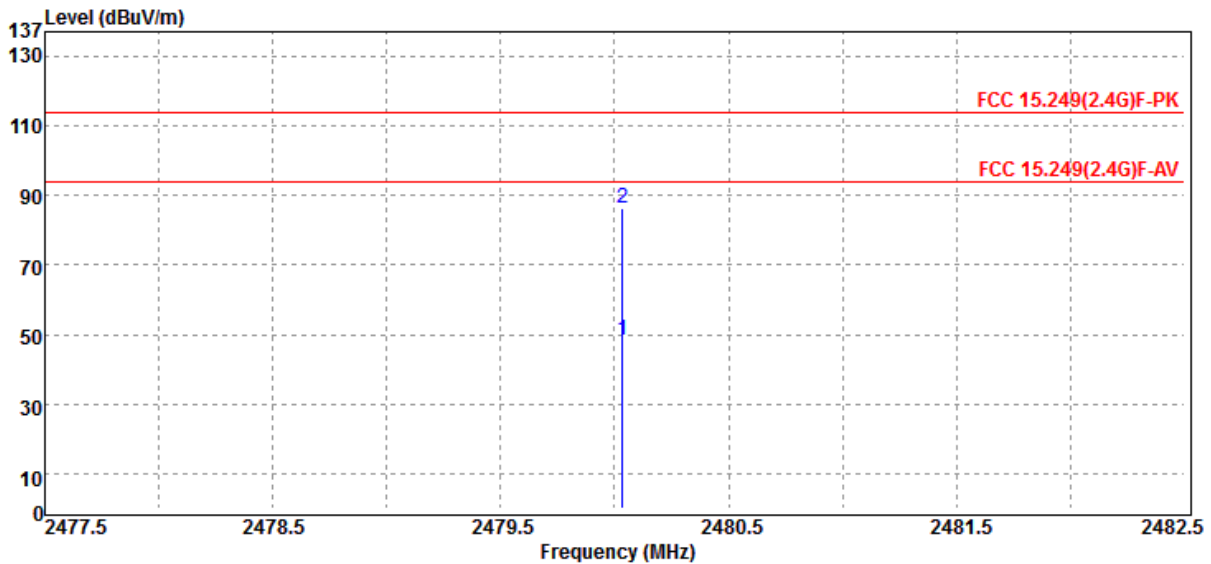
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Operation Band	:FCC 2.4G	Test Date	:2016-04-20
Fundamental Frequency	:2480 MHz	Temp./Humi.	:23 deg_C/60 RH
Operation Mode	:MAIN HIGH	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Safe Margin dB
2480.04	F	Average	45.20	3.08	48.28	94.00	-45.72
2480.04	F	Peak	83.08	3.08	86.16	114.00	-27.84

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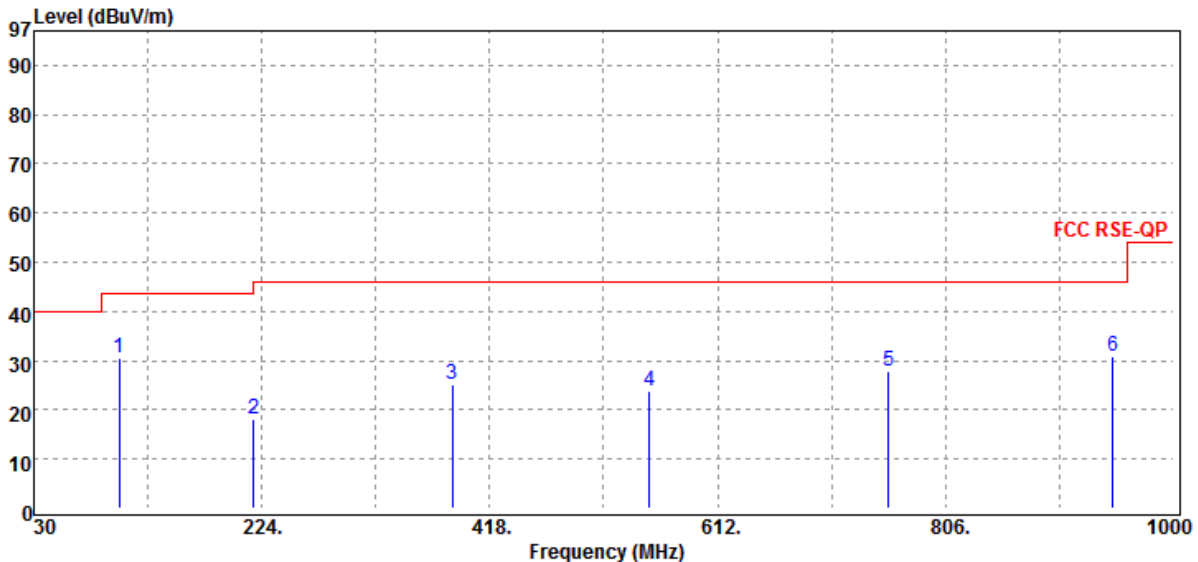
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### Radiated Spurious Emission Measurement Result For Frequency form 30MHz to 1000MHz

Operation Band	:FCC 2.4G	Test Date	:2015-10-16
Fundamental Frequency	:2402 MHz	Temp./Humi.	:23 deg_C/60 RH
Operation Mode	:TX LOW	Engineer	:Tin
EUT Pol.	:E2 Plane	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	44.38	-13.70	30.68	43.50	-12.82
217.21	S	Peak	29.26	-11.14	18.12	46.00	-27.88
385.99	S	Peak	31.31	-6.22	25.09	46.00	-20.91
553.80	S	Peak	27.94	-4.00	23.94	46.00	-22.06
757.50	S	Peak	26.86	0.97	27.83	46.00	-18.17
948.59	S	Peak	27.49	3.23	30.72	46.00	-15.28

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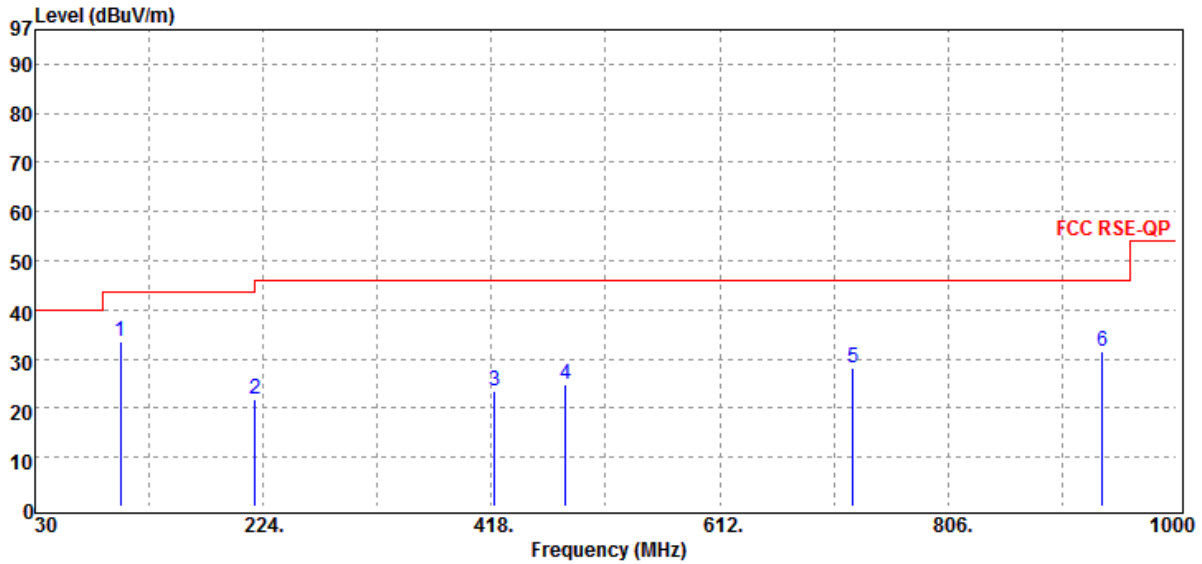
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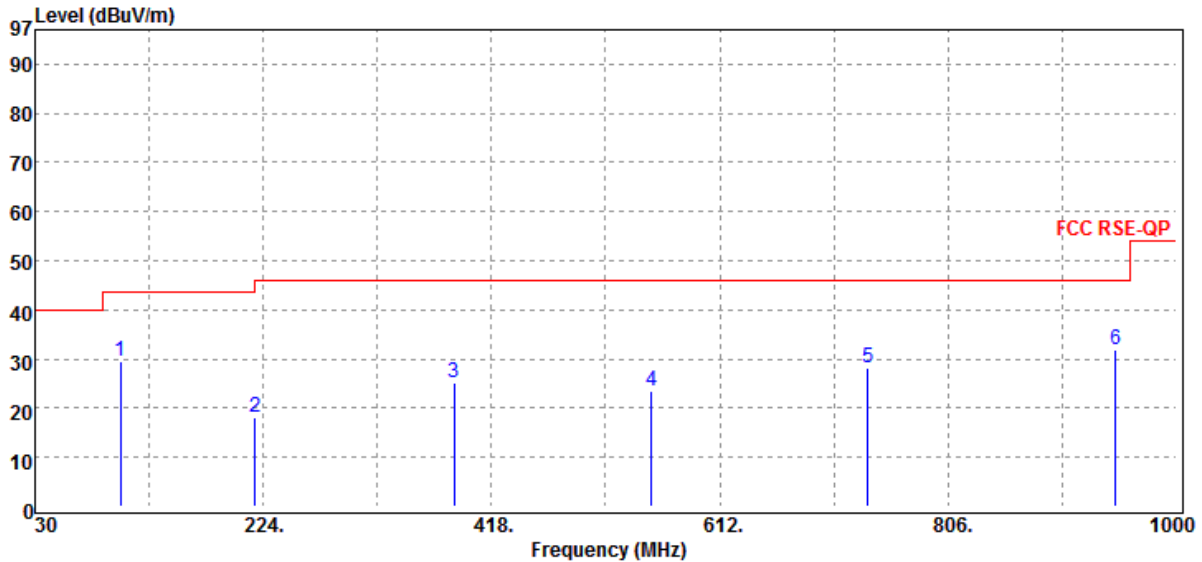
Operation Band	:FCC 2.4G	Test Date	:2015-10-16
Fundamental Frequency	:2402 MHz	Temp./Humi.	:23 deg_C/60 RH
Operation Mode	:TX LOW	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	dB
		PK/QP/AV	dBuV		dBuV/m	dBuV/m	
102.75	S	Peak	47.19	-13.70	33.49	43.50	-10.01
217.21	S	Peak	32.87	-11.14	21.73	46.00	-24.27
420.91	S	Peak	29.28	-5.67	23.61	46.00	-22.39
481.05	S	Peak	29.54	-4.55	24.99	46.00	-21.01
725.49	S	Peak	29.17	-1.02	28.15	46.00	-17.85
936.95	S	Peak	28.78	2.87	31.65	46.00	-14.35

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Operation Band	:FCC 2.4G	Test Date	:2015-10-16
Fundamental Frequency	:2441 MHz	Temp./Humi.	:23 deg_C/60 RH
Operation Mode	:TX MID	Engineer	:Tin
EUT Pol.	:E2 Plane	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	43.40	-13.70	29.70	43.50	-13.80
217.21	S	Peak	29.37	-11.14	18.23	46.00	-27.77
385.99	S	Peak	31.45	-6.22	25.23	46.00	-20.77
553.80	S	Peak	27.56	-4.00	23.56	46.00	-22.44
738.10	S	Peak	28.62	-0.52	28.10	46.00	-17.90
948.59	S	Peak	28.78	3.23	32.01	46.00	-13.99

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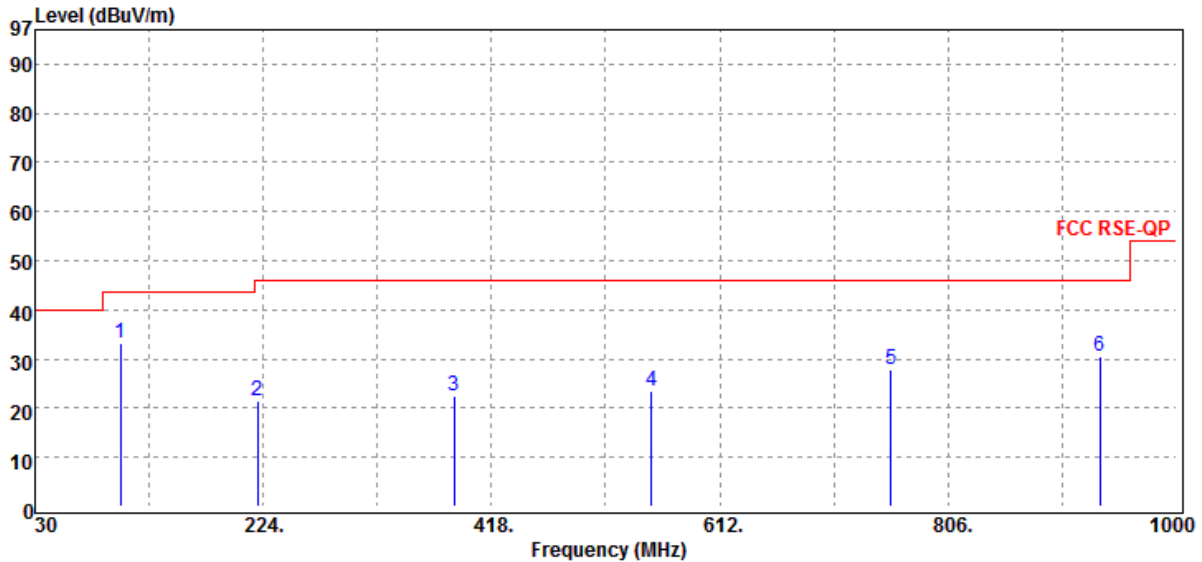
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Operation Band	:FCC 2.4G	Test Date	:2015-10-16
Fundamental Frequency	:2441 MHz	Temp./Humi.	:23 deg_C/60 RH
Operation Mode	:TX MID	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL



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
102.75	S	Peak	47.03	-13.70	33.33	43.50	-10.17
219.15	S	Peak	32.66	-11.16	21.50	46.00	-24.50
385.99	S	Peak	28.65	-6.22	22.43	46.00	-23.57
553.80	S	Peak	27.54	-4.00	23.54	46.00	-22.46
757.50	S	Peak	26.88	0.97	27.85	46.00	-18.15
935.01	S	Peak	27.86	2.83	30.69	46.00	-15.31

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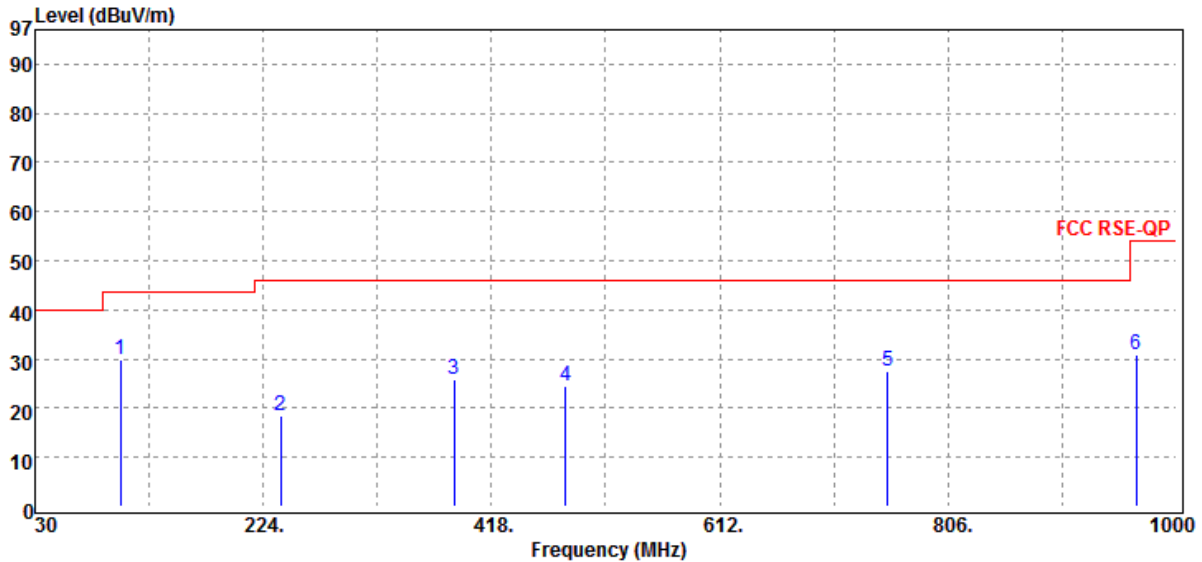
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Operation Band	:FCC 2.4G	Test Date	:2015-10-16
Fundamental Frequency	:2480 MHz	Temp./Humi.	:23 deg_C/60 RH
Operation Mode	:TX HIGH	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	dB
		PK/QP/AV	dBμV		dBμV/m	dBμV/m	
102.75	S	Peak	43.71	-13.70	30.01	43.50	-13.49
238.55	S	Peak	28.72	-10.35	18.37	46.00	-27.63
385.99	S	Peak	31.99	-6.22	25.77	46.00	-20.23
481.05	S	Peak	28.97	-4.55	24.42	46.00	-21.58
754.59	S	Peak	26.96	0.73	27.69	46.00	-18.31
966.05	S	Peak	27.13	3.67	30.80	54.00	-23.20

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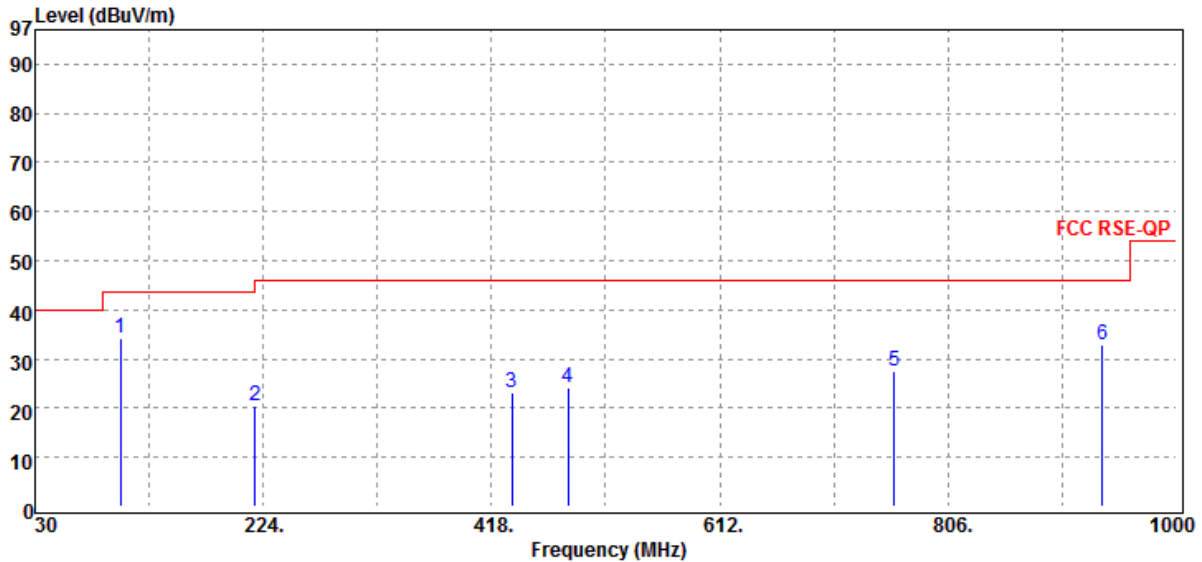
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Operation Band	:FCC 2.4G	Test Date	:2015-10-16
Fundamental Frequency	:2480 MHz	Temp./Humi.	:23 deg_C/60 RH
Operation Mode	:TX HIGH	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL



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
102.75	S	Peak	48.00	-13.70	34.30	43.50	-9.20
217.21	S	Peak	31.77	-11.14	20.63	46.00	-25.37
435.46	S	Peak	29.08	-5.84	23.24	46.00	-22.76
482.99	S	Peak	28.73	-4.46	24.27	46.00	-21.73
760.41	S	Peak	26.33	1.11	27.44	46.00	-18.56
936.95	S	Peak	30.08	2.87	32.95	46.00	-13.05

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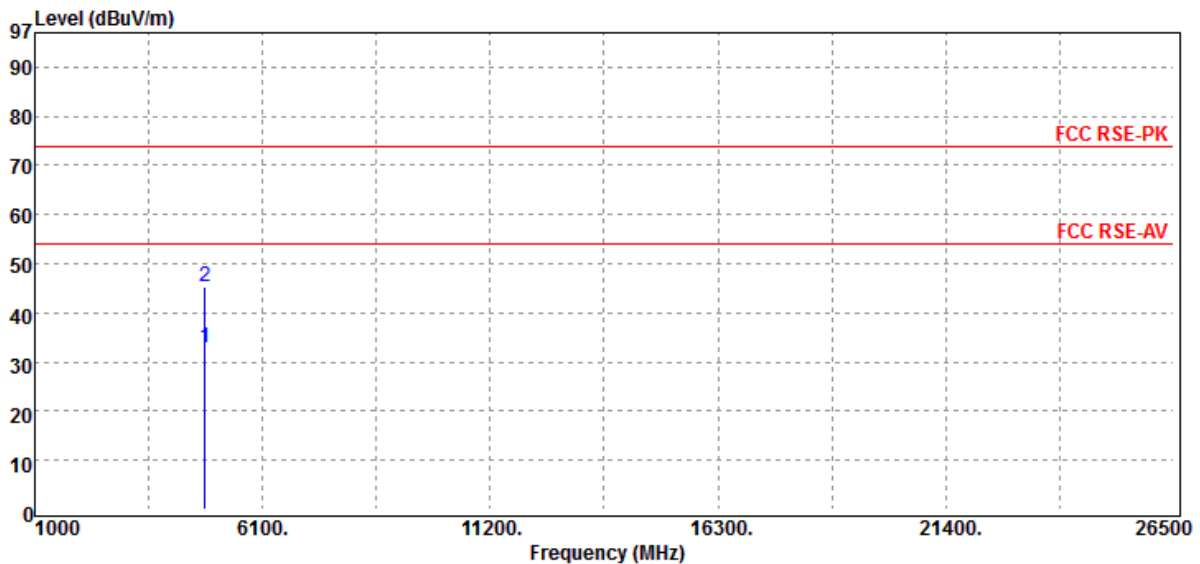
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### Radiated Spurious Emission Measurement Result For Frequency above 1GHz

Operation Band	:FCC 2.4G	Test Date	:2015-10-16
Fundamental Frequency	:2402 MHz	Temp./Humi.	:23 deg_C/60 RH
Operation Mode	:TX LOW	Engineer	:Tin
EUT Pol.	:E2 Plane	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
4804.00	H	Average	23.50	9.56	33.06	54.00	-20.94
4804.00	H	Peak	35.91	9.56	45.47	74.00	-28.53

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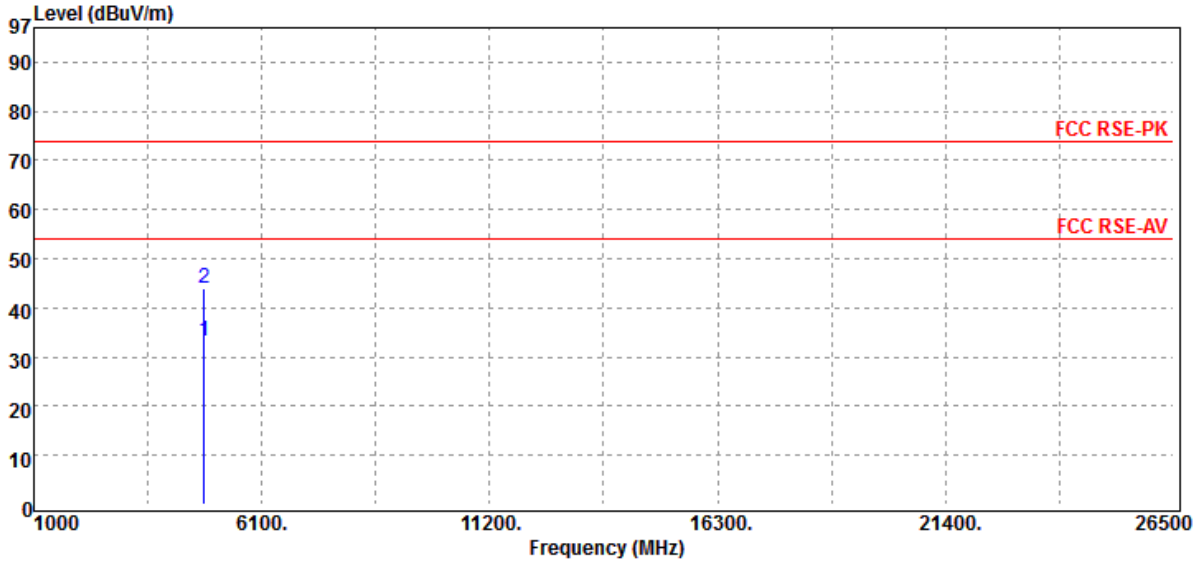
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Operation Band	:FCC 2.4G	Test Date	:2015-10-16
Fundamental Frequency	:2402 MHz	Temp./Humi.	:23 deg_C/60 RH
Operation Mode	:TX LOW	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL



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
4804.00	H	Average	23.72	9.56	33.28	54.00	-20.72
4804.00	H	Peak	34.30	9.56	43.86	74.00	-30.14

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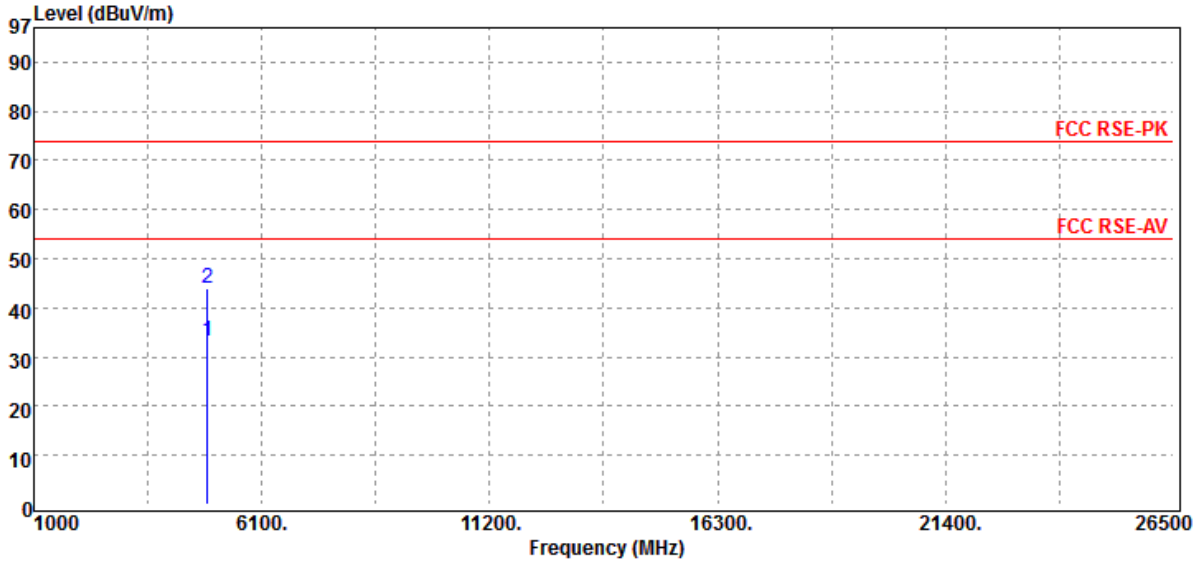
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Operation Band	:FCC 2.4G	Test Date	:2015-10-16
Fundamental Frequency	:2441 MHz	Temp./Humi.	:23 deg_C/60 RH
Operation Mode	:TX MID	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL



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
4882.00	H	Average	23.46	9.85	33.31	54.00	-20.69
4882.00	H	Peak	33.96	9.85	43.81	74.00	-30.19

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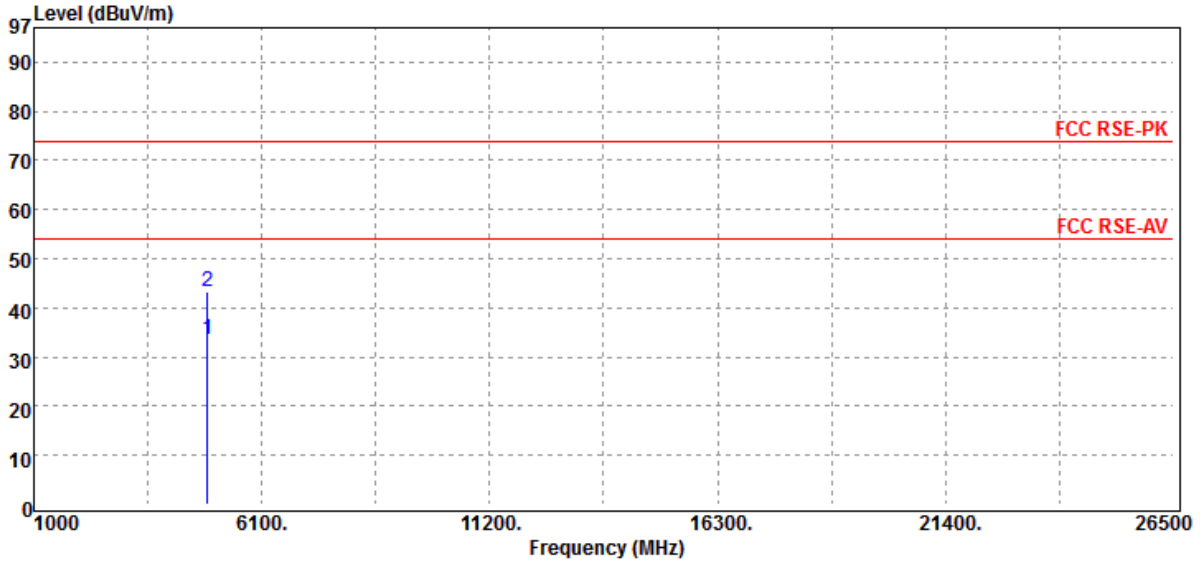
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Operation Band	:FCC 2.4G	Test Date	:2015-10-16
Fundamental Frequency	:2441 MHz	Temp./Humi.	:23 deg_C/60 RH
Operation Mode	:TX MID	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL



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
4882.00	H	Average	23.59	9.85	33.44	54.00	-20.56
4882.00	H	Peak	33.55	9.85	43.40	74.00	-30.60

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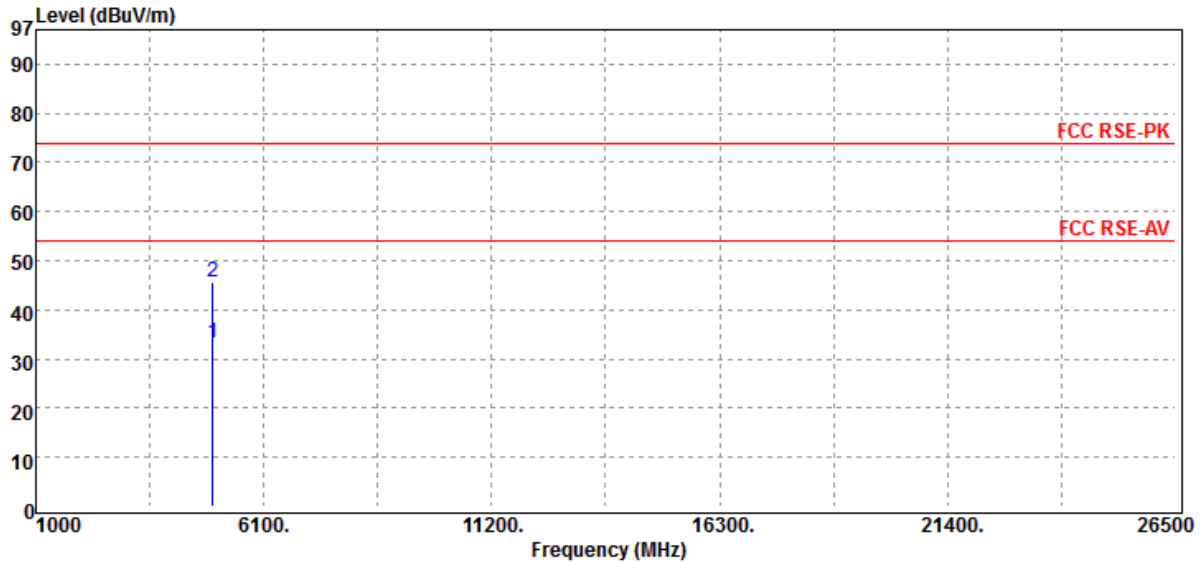
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Operation Band	:FCC 2.4G	Test Date	:2015-10-16
Fundamental Frequency	:2480 MHz	Temp./Humi.	:23 deg_C/60 RH
Operation Mode	:TX HIGH	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL



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
4960.00	H	Average	23.52	9.86	33.38	54.00	-20.62
4960.00	H	Peak	35.83	9.86	45.69	74.00	-28.31

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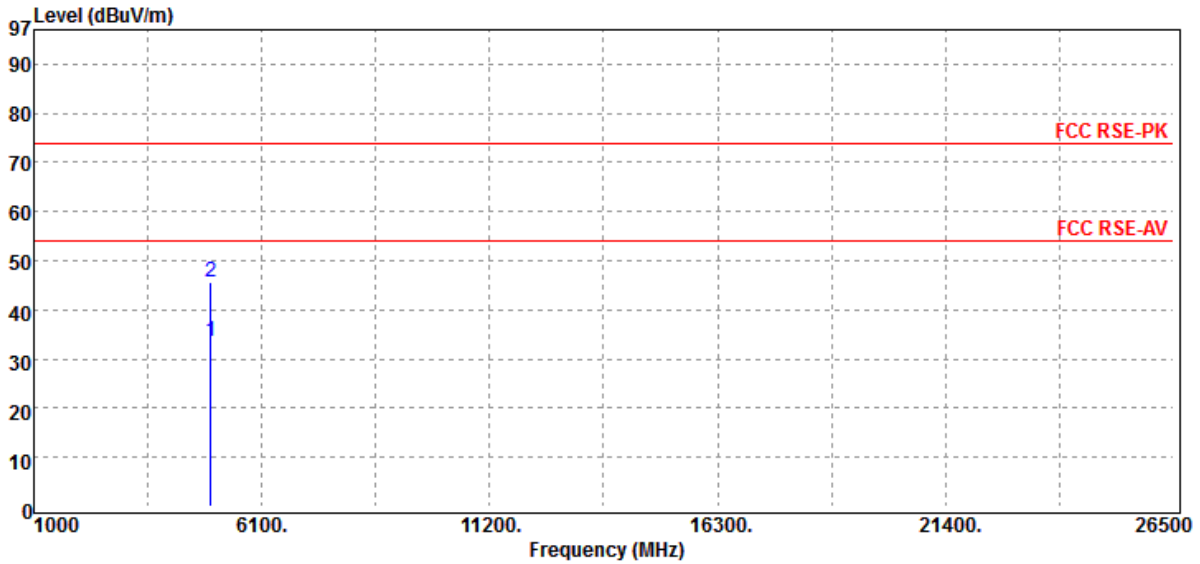
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EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL



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
4960.00	H	Average	23.68	9.86	33.54	54.00	-20.46
4960.00	H	Peak	35.84	9.86	45.70	74.00	-28.30

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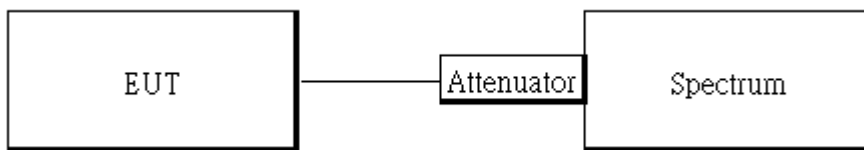
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## 8. 20dB BANDWIDTH MEASUREMENT

### 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=100kHz 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.
Power Meter	Anritsu	ML2495A	1005007	12/20/2014	12/19/2015
Power Sensor	Anritsu	MA2411B	917032	12/20/2014	12/19/2015
Spectrum Analyzer	Agilent	E4446A	MY51100003	01/29/2015	01/28/2016
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/02/2015	01/01/2016
Spectrum Analyzer	Agilent	E4440A	MY45304525	05/05/2015	05/04/2016
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2015	01/01/2016
Attenuator	Mini-Circuit	BW-S10W2+	002	01/02/2015	01/01/2016
Splitter	Agilent	11636B	N/A	01/02/2015	01/01/2016

### 8.4 Measurement Results:

2402 Channel = 1.449MHz

2441 Channel = 1.609MHz

2480 Channel = 1.523MHz

Refer to attached data chart.

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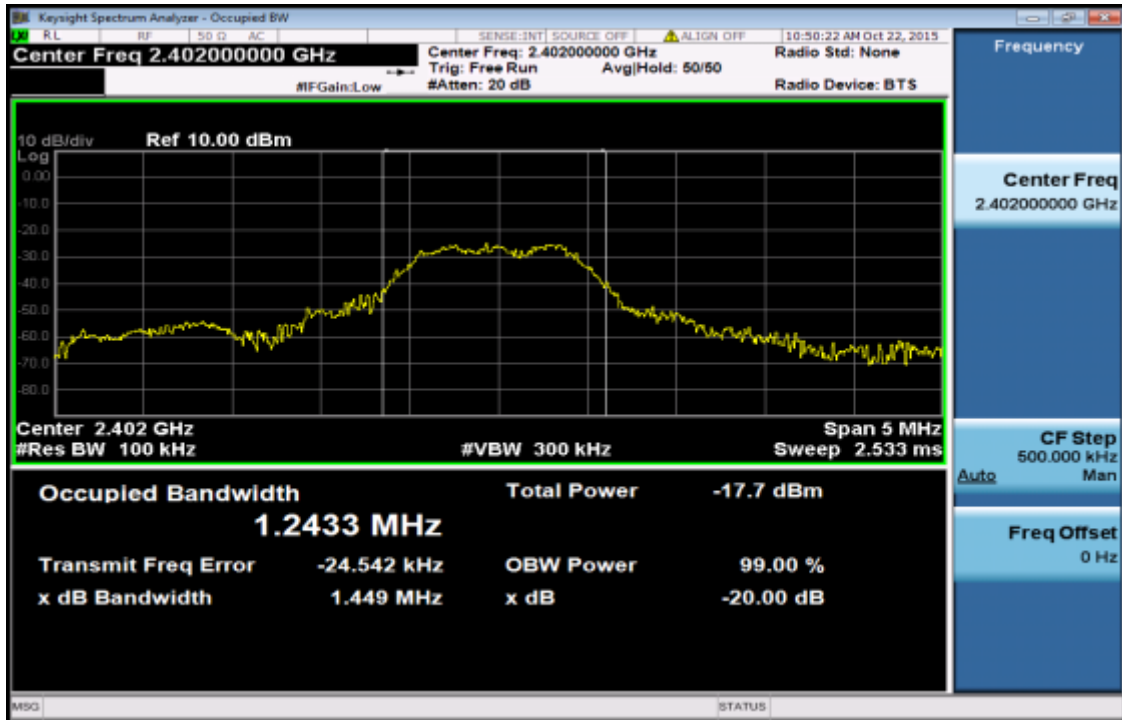
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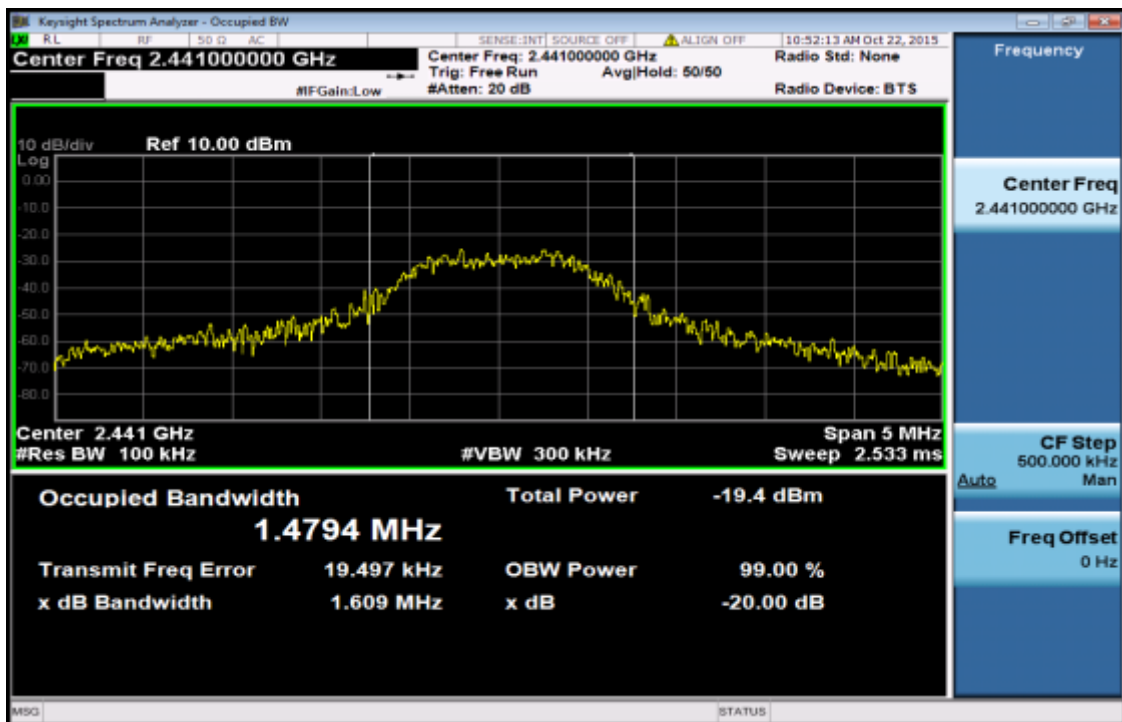
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### 20dB Bandwidth Test Data CH-Low



### 20dB Bandwidth Test Data CH-Mid



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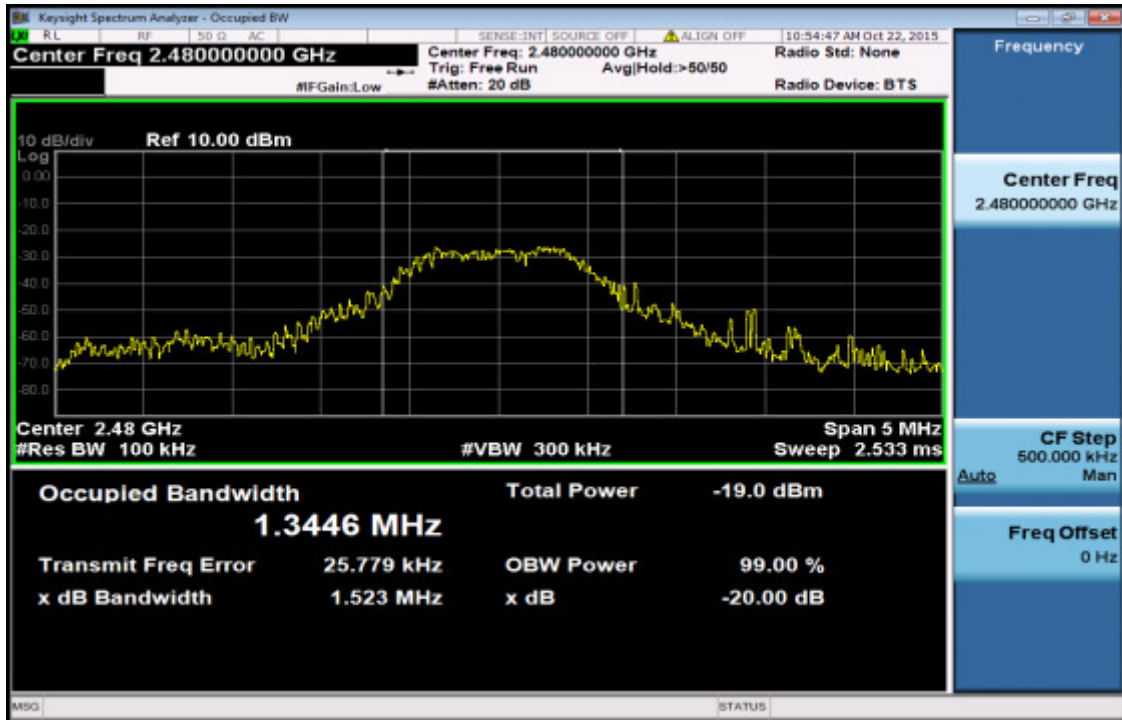
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### 20dB Bandwidth Test Data CH-High



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