

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

Product Name: TQi Transmitter, Traxxas Link enabled, 2.4GHz high output, X-channel (X is replaced by 2, 3, or 4 depending on model)

Brand Name: TRAXXAS

Model No.: 6530, 6530A, 6507R, 6529, 6529A, 6528, 6528A, 6509R

Model Difference: Enclosure difference, please see page 7 for more detail

FCC ID: XVE-TRX1017

Report No.: ER/2015/60038

Issue Date: Jul. 07, 2015

FCC Rule Part: §15.249

Prepared for: Traxxas LP
6250 Traxxas Way, McKinney, TX 75070, USA
SGS Taiwan Ltd.

Prepared by: Electronics & Communication Laboratory
No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803



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VERIFICATION OF COMPLIANCE

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

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FCC ID: XVE-TRX1017

File Number: ER/2015/60038

Date of test: Jun. 12, 2015 ~ Jul. 07, 2015

Date of EUT Received: Jun. 12, 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:

Jul. 07, 2015

Marcus Tseng / Engineer

Prepared By:

Tiffany Kao

Date:

Jul. 07, 2015

Tiffany Kao / Clerk

Approved By:

Jim Chang

Date:

Jul. 07, 2015

Jim Chang / Asst. Manager

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Revision History

Report Number	Revision	Description	Issue Date
ER/2015/60038	Rev.00	Initial creation of document	Jul. 07, 2015

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1. GENERAL INFORMATION

1.1. Product Description

General:

Product Name:	TQi Transmitter, Traxxas Link enabled, 2.4GHz high output, X-channel (X is replaced by 2, 3, or 4 depending on model)
Brand Name:	TRAXXAS
Model No.:	6530, 6530A, 6507R, 6529, 6529A, 6528, 6528A, 6509R
Model Difference:	Enclosure difference, please see below for more detail
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:	2406~2453MHz
Transmit Power	114.00 dBuV/m
Channel number:	48 channels
Channel space:	1MHz
Modulation Type:	DSSS
Power Supply:	DC 6V from AA Batteries*4
Antenna Designation:	Attached Dipole Antenna, Gain: 0dBi

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Model Difference

Model No.	6530/ 6530A	6507R	6529 / 6529A	6528 /6528A	6509R
	main- 4 Channel (4 control switches)		series- 3 Channel (3 control switches)	series- 2 Channel (2 control switches)	
					

1.2. Product Feature of Equipment Under Test

The equipment under Test (Hereafter Called: EUT) is supporting, 2.4GHz function features, and below is details of information.

Product Feature	
Product Name:	TQi Transmitter, Traxxas Link enabled, 2.4GHz high output, X-channel (X is replaced by 2, 3, or 4 depending on model)
Brand Name:	TRAXXAS
Model No.:	6530, 6530A, 6507R, 6529, 6529A, 6528, 6528A, 6509R
Model Difference:	Enclosure difference, please see page 7 for more detail
FCC ID	XVE-TRX1017
2.4G Specification	2406~2453MHz

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

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1.3. Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.249

ANSI C63.10:2013

Note:

1. All test items have been performed and record as per the above standards.

1.4. 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-05.

1.5. Special Accessories

There is no special accessory used while test was conducted.

1.6. Equipment Modifications

There was no modification incorporated into the EUT.

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2. SYSTEM TEST CONFIGURATION

2.1. EUT Configuration

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

2.2. EUT Exercise

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

2.3. Test Procedure

2.3.1 Conducted Emissions

The EUT is 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 and attenuator factor.

Following shows an offset computation example with cable loss 1 dB and 10 dB attenuator.

Offset = RF cable loss (dB)+ attenuation factor(dB) =1+10=11(dB)

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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 $\mu\text{V/m}$	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 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 $\text{dB}\mu\text{V/m}=20 \log (\mu\text{V/m})$
- : 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 ξ 15.205
 - 4. Emission spurious frequency which appearing within the Restricted Bands specified in provision of ξ 15.205, then the general radiated emission limits in ξ 15.209 apply.

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2.6. Configuration of Tested System

Fig. 2-1 Configuration



Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	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 band width Measurement	Compliant

4. DESCRIPTION OF TEST MODES

4.1 Operated in 2400 ~ 2483.5MHz Band

48 channels are provided.

CH	FREQUENCY	CH	FREQUENCY	CH	FREQUENCY
4	2406 MHz	24	2426 MHz	44	2446 MHz
5	2407 MHz	25	2427 MHz	45	2447 MHz
6	2408 MHz	26	2428 MHz	46	2448 MHz
7	2409 MHz	27	2429 MHz	47	2449 MHz
8	2410 MHz	28	2430 MHz	48	2450 MHz
9	2411 MHz	29	2431 MHz	49	2451 MHz
10	2412 MHz	30	2432 MHz	50	2452 MHz
11	2413 MHz	31	2433 MHz	51	2453 MHz
12	2414 MHz	32	2434 MHz		
13	2415 MHz	33	2435 MHz		
14	2416 MHz	34	2436 MHz		
15	2417 MHz	35	2437 MHz		
16	2418 MHz	36	2438 MHz		
17	2419 MHz	37	2439 MHz		
18	2420 MHz	38	2440 MHz		
19	2421 MHz	39	2441 MHz		
20	2422 MHz	40	2442 MHz		
21	2423 MHz	41	2443 MHz		
22	2424 MHz	42	2444 MHz		
23	2425 MHz	43	2445 MHz		

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4.2 The Worst Test Modes and Channel Details

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

RADIATED EMISSION TEST:

RADIATED EMISSION TEST (BELOW 1 GHz)					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
2.4G	4 to 51	4, 27, 51	DSSS	N/A	MAIN
RADIATED EMISSION TEST (ABOVE 1 GHz)					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
2.4G	4 to 51	4, 27, 51	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 Bluetooth LE 4.1 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	DATA RATE (Mbps)	ANTENNA PORT
2.4G	4 to 51	4, 27, 51	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 : Vertical)	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

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

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

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6. CONDUCTED EMISSIONS TEST

6.1 Measurement Procedure:

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

6.2 Test SET-UP (Block Diagram of Configuration)

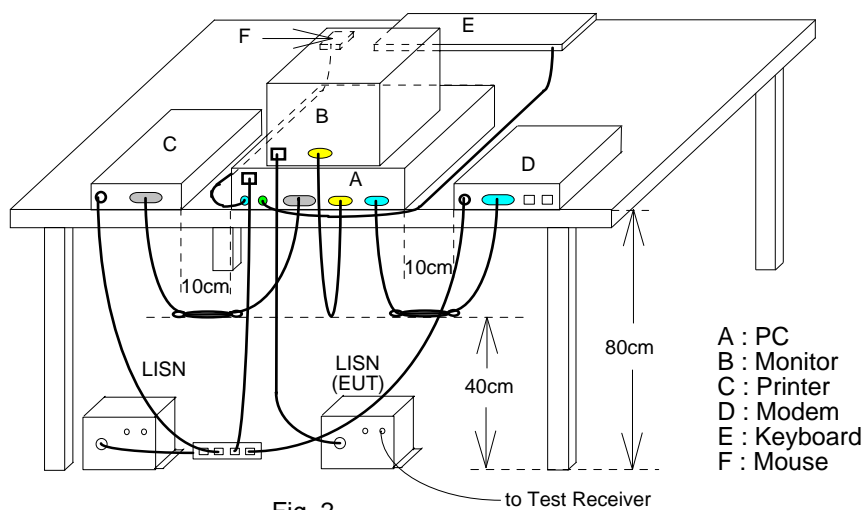


Fig. 2

6.3 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESC17	100760	03/05/2016	03/05/2016
LISN	SCHWARZ BECK	NSLK 8127	8127-649	05/14/2016	05/14/2016
LISN	FCC	FCC-LISN-50/250-25-2-01	04034	03/12/2016	03/12/2016
Coaxial Cables	N/A	WK CE Cable	N/A	11/25/2015	11/25/2015
EMI Test Receiver	R&S	ESC17	100760	03/05/2016	03/05/2016

6.4 Measurement Result:

N/A, EUT powered from AA batteries.

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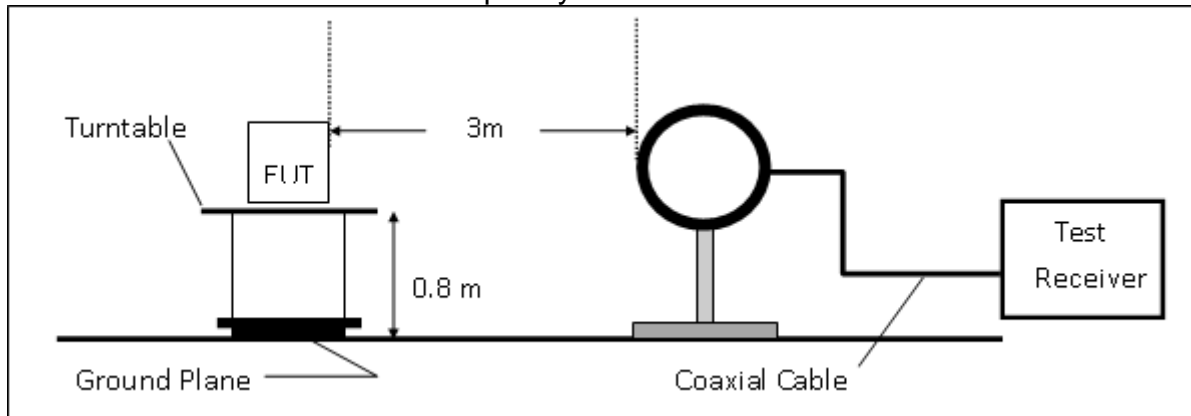
7. RADIATED EMISSION TEST

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.

7.2 Test SET-UP (Block Diagram of Configuration)

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



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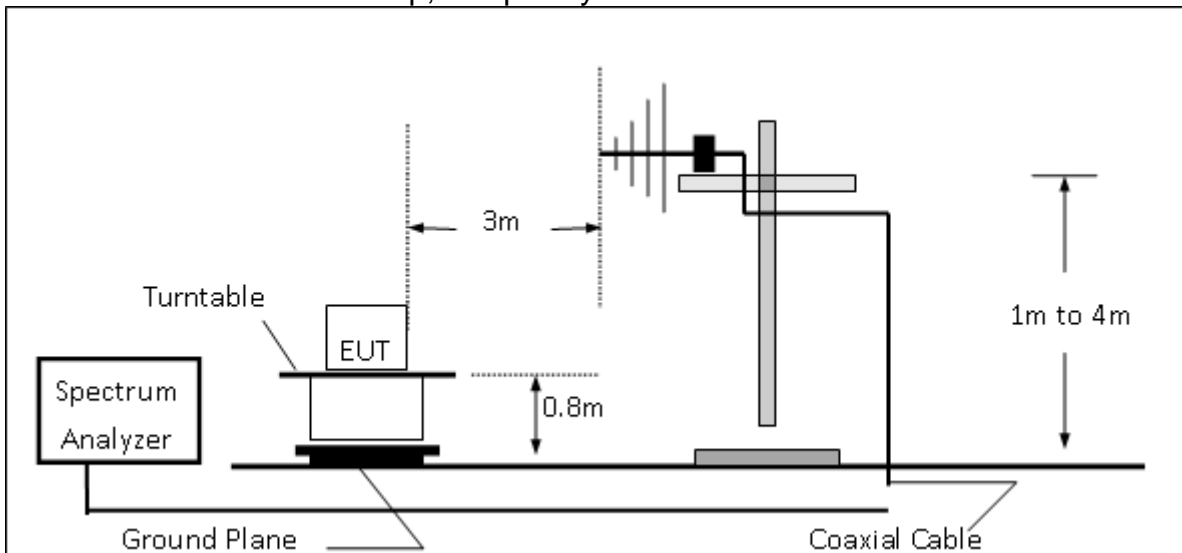
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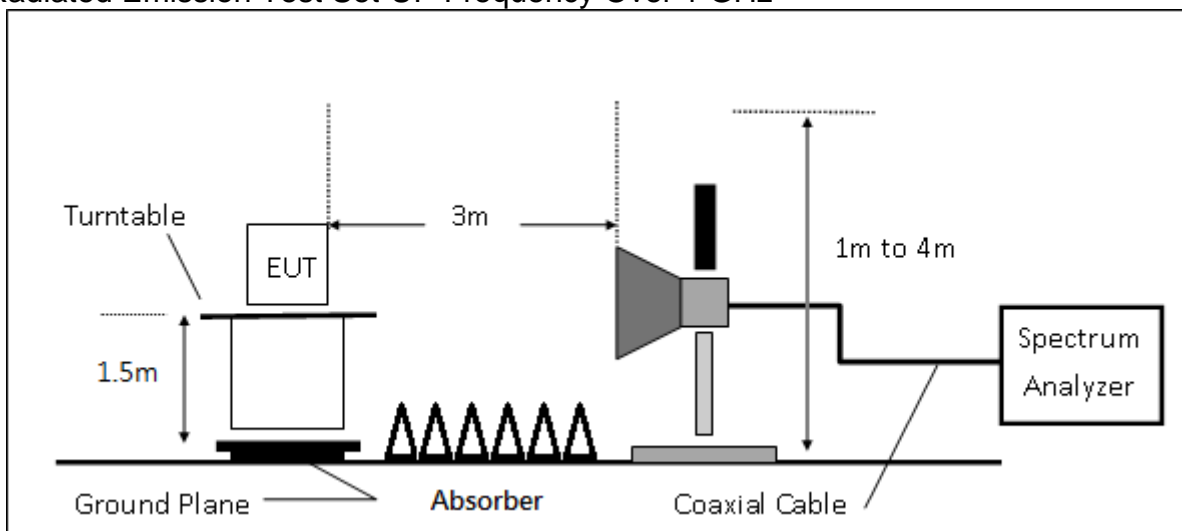
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(B) Radiated Emission Test Set-Up, Frequency form 30MHz to 1000MHz



(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-14-016 6	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	HD	MA240-N	240/657	N.C.R	N.C.R
Controller	HD	HD100	N/A	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	07/15/2014	07/14/2015

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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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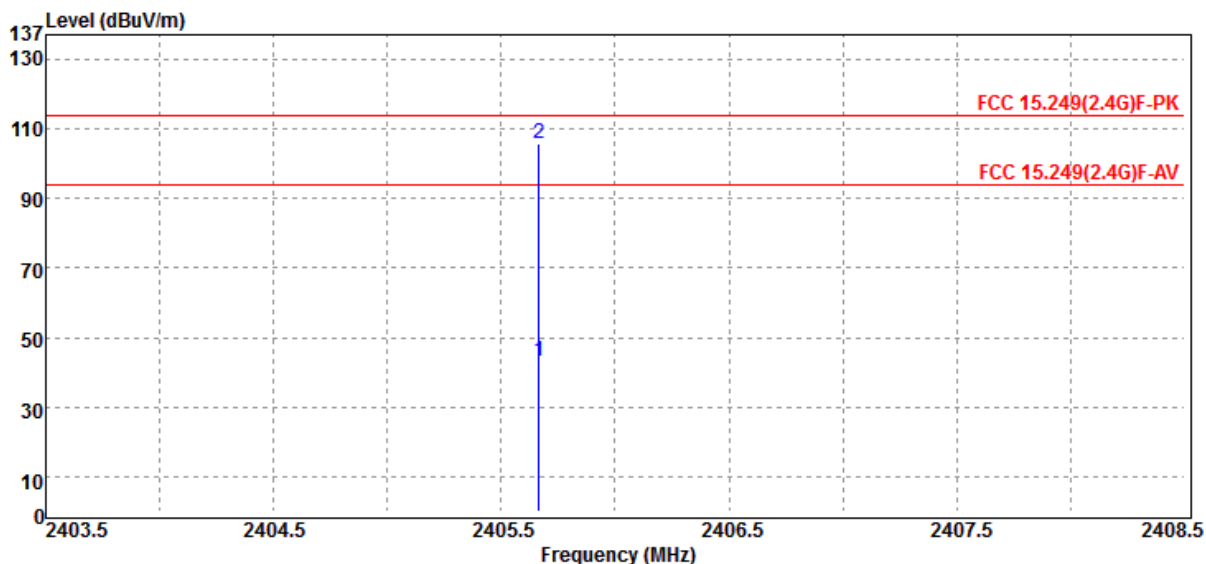
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7.5 Measurement Result

Radiated Spurious Emission Measurement Result (Main)

Operation Band	:2.4G	Test Date	:2015-06-22
Fundamental Frequency	:2406 MHz	Temp./Humi.	:21 deg_C/62 RH
Operation Mode	:MAIN LOW	Engineer	:Curry
EUT Pol.	:E1 Plane	Measurement Antenna Pol.	:VERTICAL

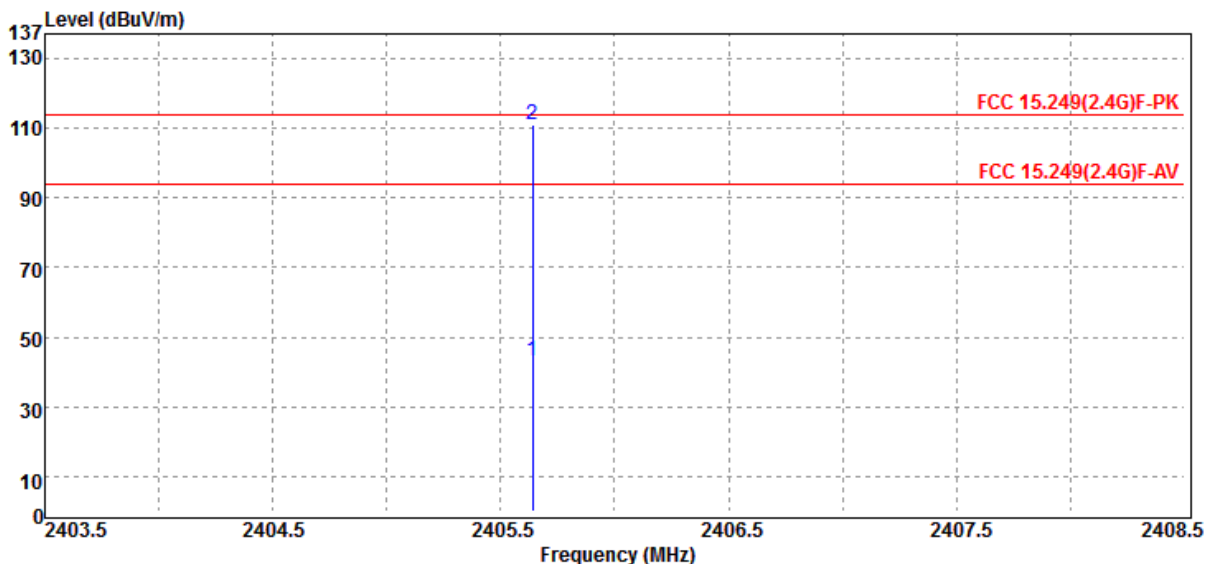


Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2405.67	F	Average	38.24	4.87	43.11	94.00	-50.89
2405.67	F	Peak	100.61	4.87	105.48	114.00	-8.52

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Operation Band	:2.4G	Test Date	:2015-06-22
Fundamental Frequency	:2406 MHz	Temp./Humi.	:21 deg_C/62 RH
Operation Mode	:MAIN LOW	Engineer	:Curry
EUT Pol.	:E1 Plane	Measurement Antenna Pol.	:HORIZONTAL

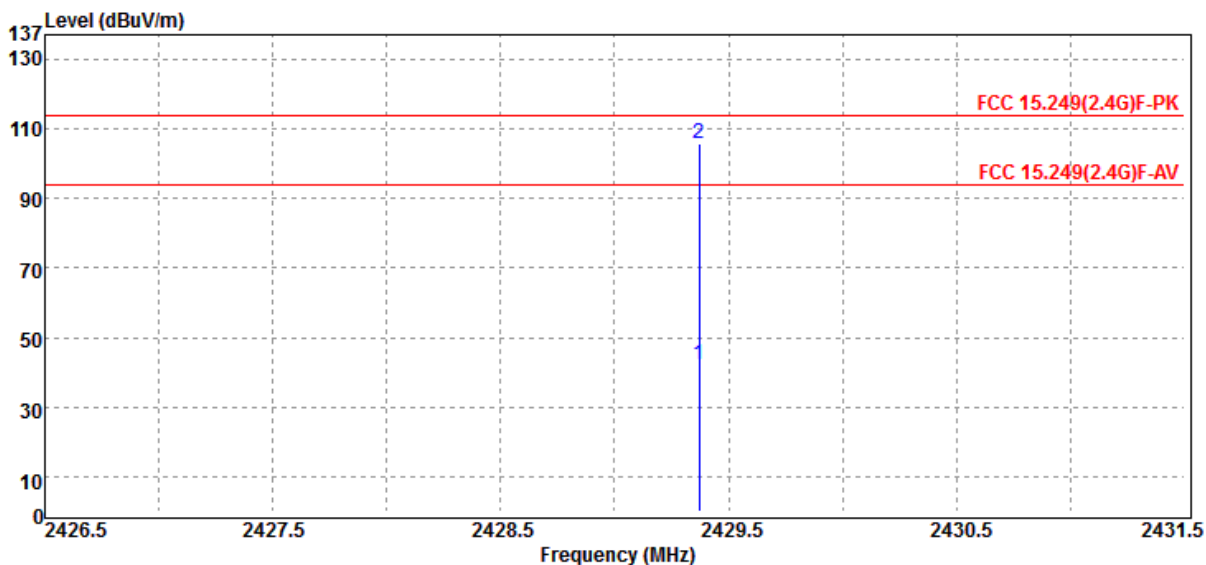


Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2405.64	F	Average	38.19	4.87	43.06	94.00	-50.94
2405.64	F	Peak	106.19	4.87	111.06	114.00	-2.94

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Operation Band	:2.4G	Test Date	:2015-06-22
Fundamental Frequency	:2429 MHz	Temp./Humi.	:22.1 deg_C/60 RH
Operation Mode	:MAIN MID	Engineer	:Curry
EUT Pol.	:E1 Plane	Measurement Antenna Pol.	:VERTICAL

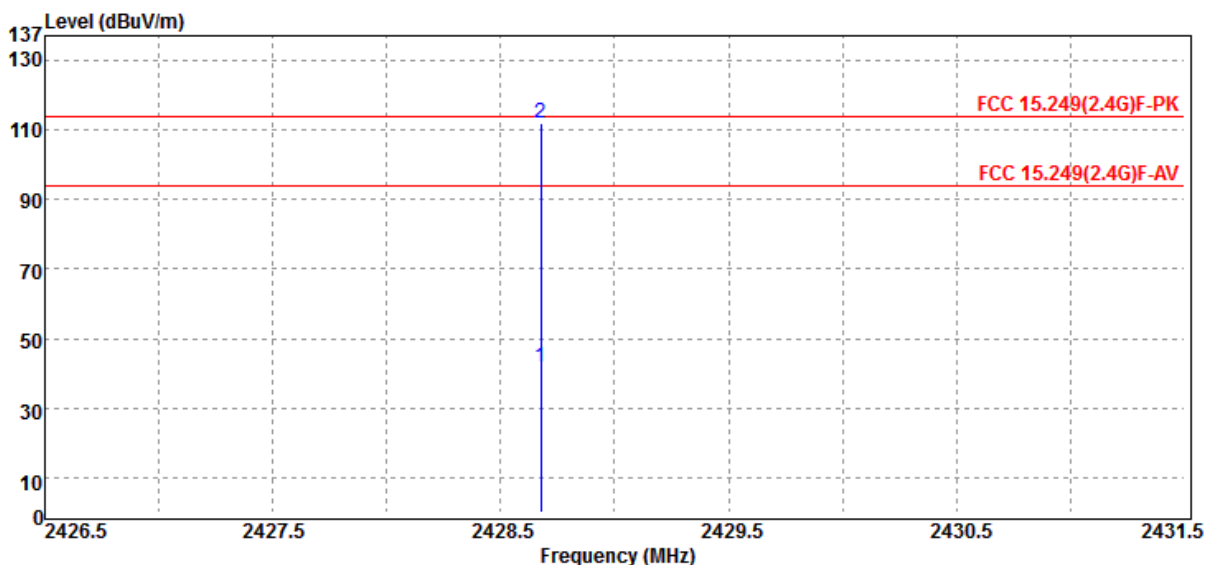


Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBuV	dB	dBuV/m	dBuV/m	dB
2429.37	F	Average	37.01	5.00	42.01	94.00	-51.99
2429.37	F	Peak	100.75	5.00	105.75	114.00	-8.25

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Operation Band	:2.4G	Test Date	:2015-06-22
Fundamental Frequency	:2429 MHz	Temp./Humi.	:22.1 deg_C/60 RH
Operation Mode	:MAIN MID	Engineer	:Curry
EUT Pol.	:E1 Plane	Measurement Antenna Pol.	:HORIZONTAL

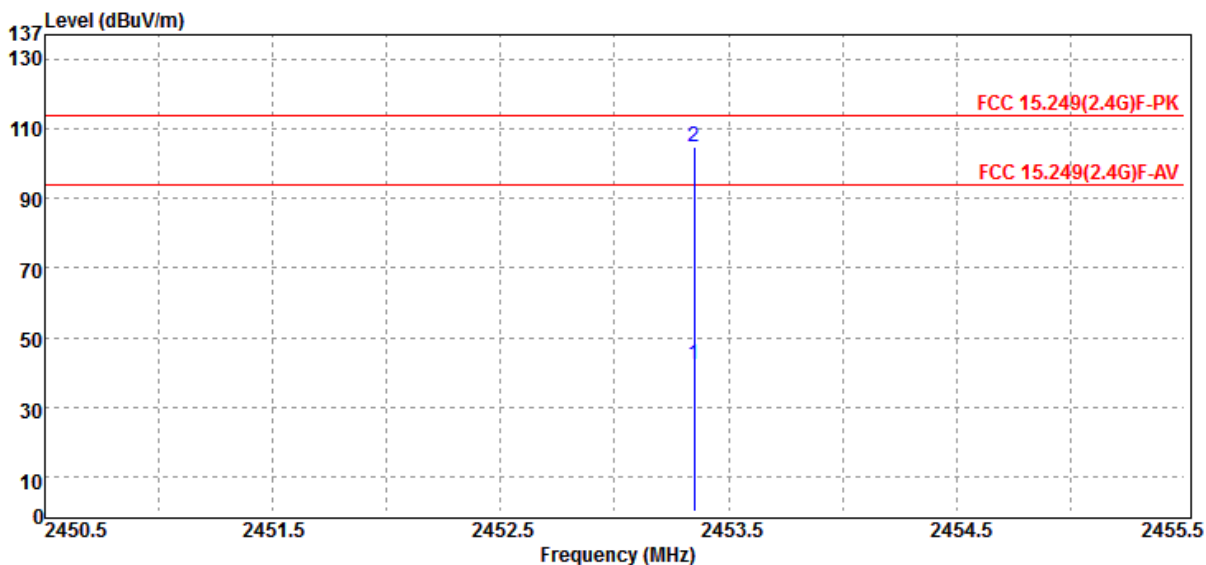


Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
2428.68	F	Average	36.71	4.99	41.70	94.00	-52.30
2428.68	F	Peak	106.93	4.99	111.92	114.00	-2.08

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Operation Band	:2.4G	Test Date	:2015-06-22
Fundamental Frequency	:2453 MHz	Temp./Humi.	:22.1 deg_C/60 RH
Operation Mode	:MAIN HIGH	Engineer	:Curry
EUT Pol.	:E1 Plane	Measurement Antenna Pol.	:VERTICAL

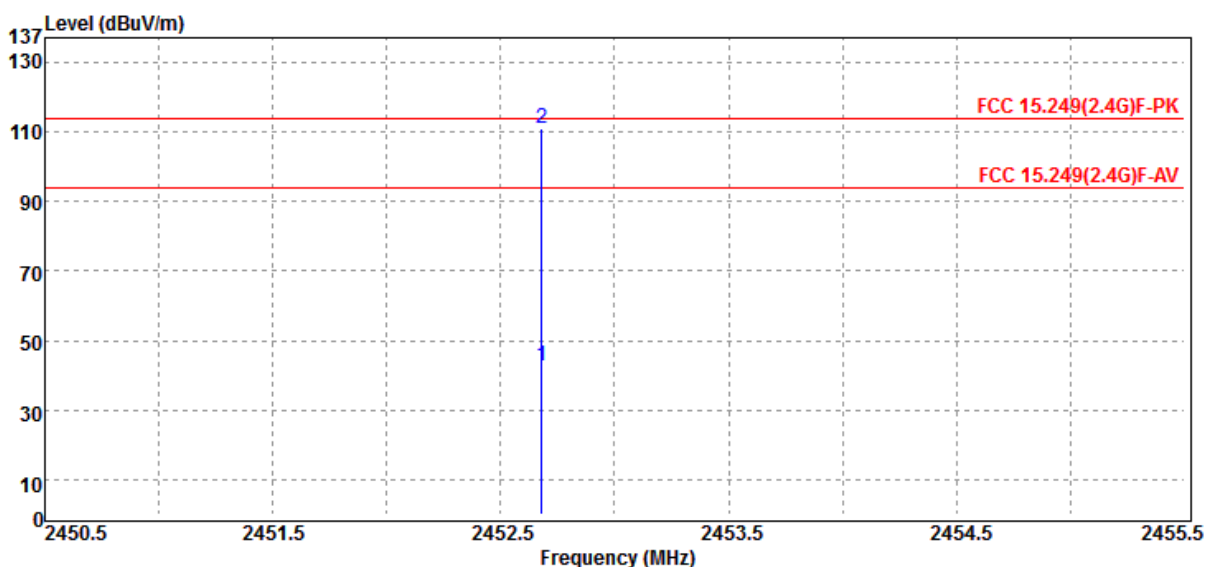


Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
2453.35	F	Average	37.02	5.21	42.23	94.00	-51.77
2453.35	F	Peak	99.78	5.21	104.99	114.00	-9.01

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Operation Band	:2.4G	Test Date	:2015-06-22
Fundamental Frequency	:2453 MHz	Temp./Humi.	:22.1 deg_C/60 RH
Operation Mode	:MAIN HIGH	Engineer	:Curry
EUT Pol.	:E1 Plane	Measurement Antenna Pol.	:HORIZONTAL



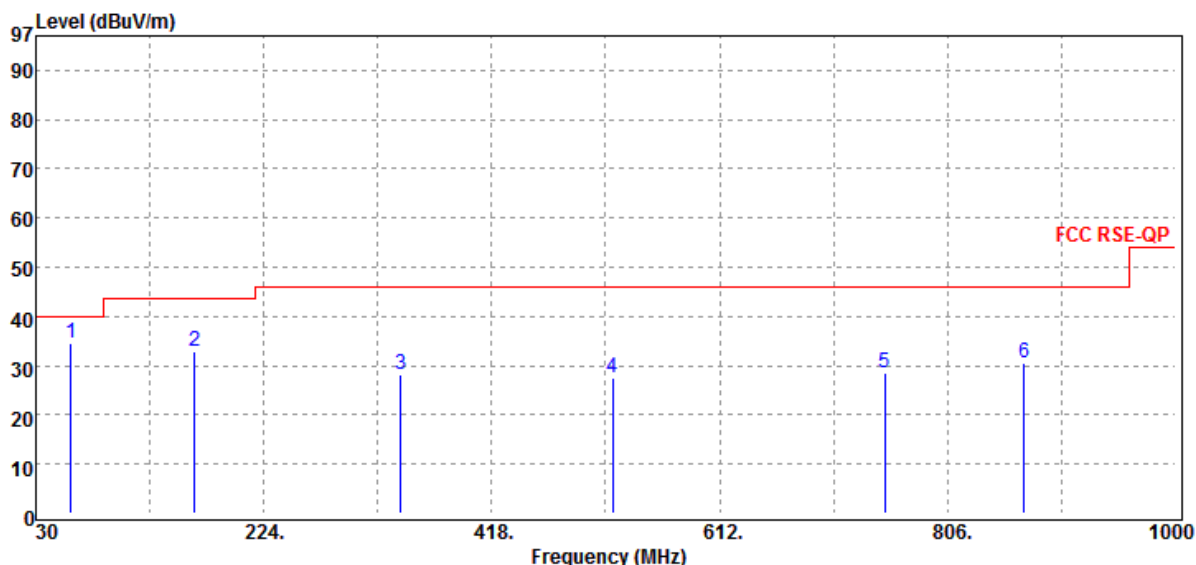
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2452.68	F	Average	37.48	5.20	42.68	94.00	-51.32
2452.68	F	Peak	105.78	5.20	110.98	114.00	-3.02

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Radiated Spurious Emission Measurement Result For Frequency from 30MHz to 1000MHz

Operation Band	:2.4G	Test Date	:2015-06-23
Fundamental Frequency	:2406 MHz	Temp./Humi.	:21 deg_C/62 RH
Operation Mode	:TX LOW	Engineer	:Curry
EUT Pol.	:E1 Plane	Measurement Antenna Pol.	:VERTICAL

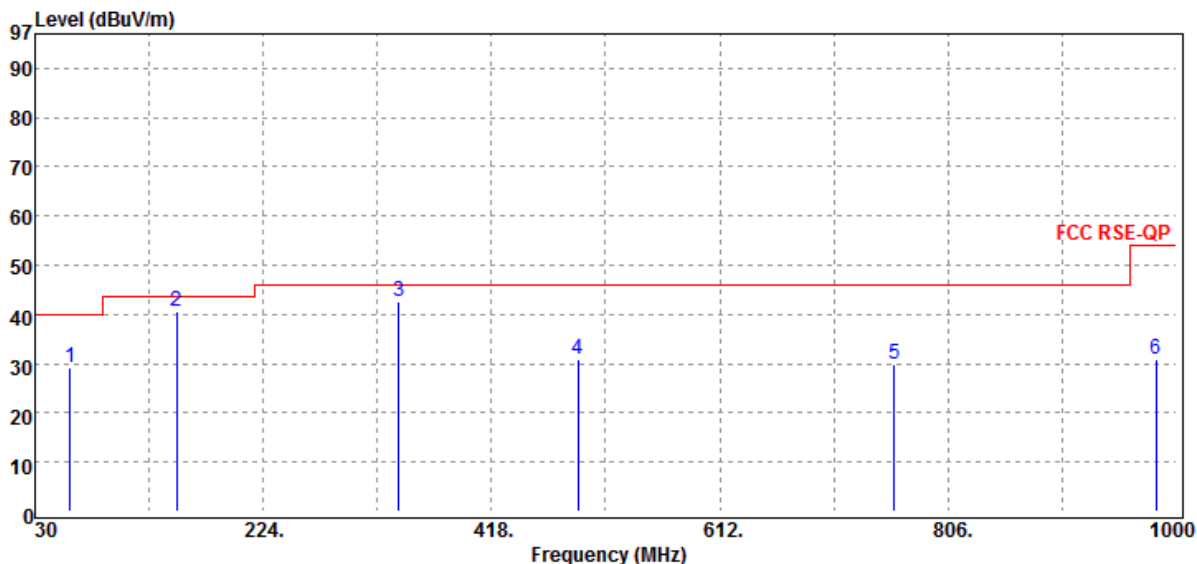


Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
60.07	S	Peak	44.41	-9.99	34.42	40.00	-5.58
164.83	S	Peak	41.57	-8.58	32.99	43.50	-10.51
340.40	S	Peak	35.00	-6.88	28.12	46.00	-17.88
520.82	S	Peak	31.63	-3.97	27.66	46.00	-18.34
752.65	S	Peak	27.05	1.35	28.40	46.00	-17.60
870.99	S	Peak	27.20	3.28	30.48	46.00	-15.52

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Operation Band	:2.4G	Test Date	:2015-06-23
Fundamental Frequency	:2406 MHz	Temp./Humi.	:21 deg_C/62 RH
Operation Mode	:TX LOW	Engineer	:Curry
EUT Pol.	:E1 Plane	Measurement Antenna Pol.	:HORIZONTAL

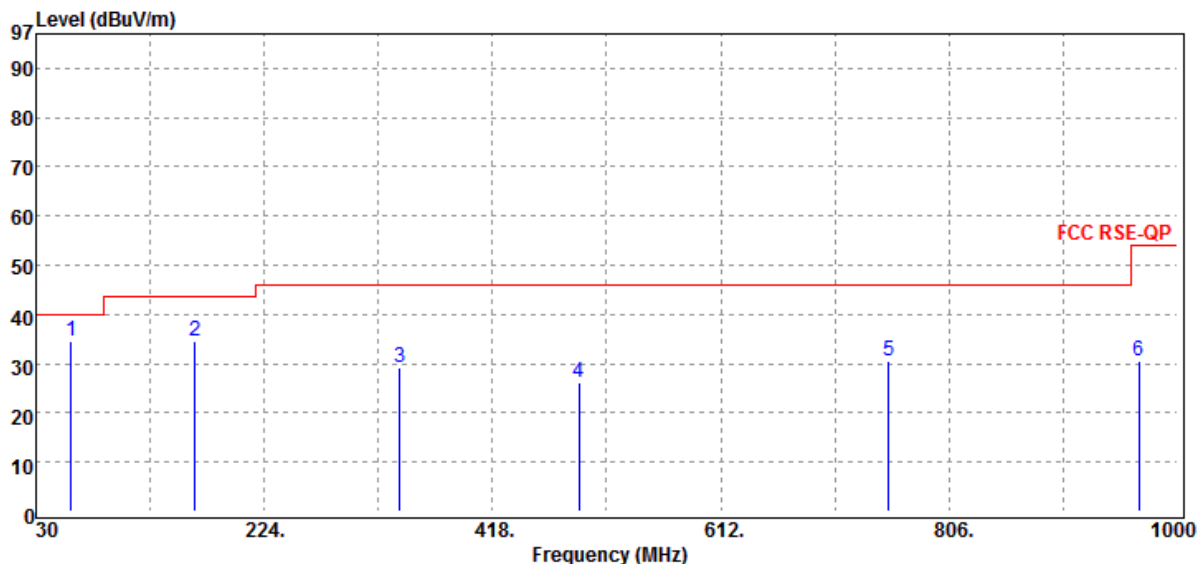


Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
60.07	S	Peak	39.14	-9.99	29.15	40.00	-10.85
150.28	S	Peak	49.53	-8.99	40.54	43.50	-2.96
339.43	S	Peak	49.41	-6.89	42.52	46.00	-3.48
491.72	S	Peak	34.59	-3.86	30.73	46.00	-15.27
760.41	S	Peak	27.67	2.11	29.78	46.00	-16.22
982.54	S	Peak	26.79	3.97	30.76	54.00	-23.24

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Operation Band	:2.4G	Test Date	:2015-06-23
Fundamental Frequency	:2429 MHz	Temp./Humi.	:21 deg_C/62 RH
Operation Mode	:TX MID	Engineer	:Curry
EUT Pol.	:E1 Plane	Measurement Antenna Pol.	:VERTICAL

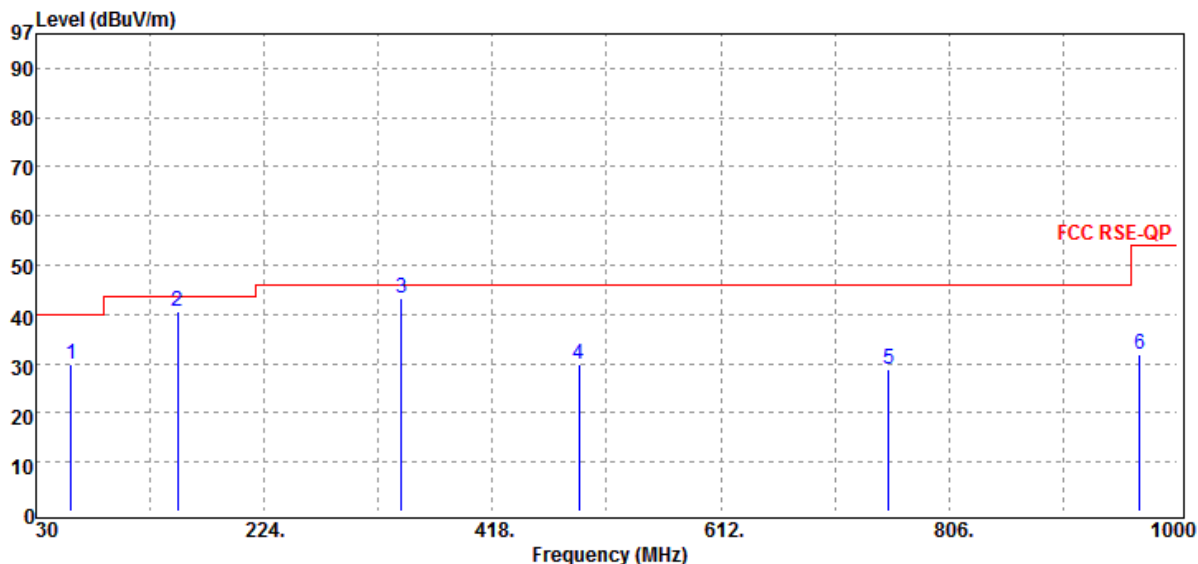


Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
60.07	S	Peak	44.72	-9.99	34.73	40.00	-5.27
164.83	S	Peak	43.06	-8.58	34.48	43.50	-9.02
339.43	S	Peak	36.10	-6.89	29.21	46.00	-16.79
491.72	S	Peak	30.17	-3.86	26.31	46.00	-19.69
754.59	S	Peak	29.06	1.56	30.62	46.00	-15.38
967.02	S	Peak	26.33	4.23	30.56	54.00	-23.44

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Operation Band	:2.4G	Test Date	:2015-06-23
Fundamental Frequency	:2429 MHz	Temp./Humi.	:21 deg_C/62 RH
Operation Mode	:TX MID	Engineer	:Curry
EUT Pol.	:E1 Plane	Measurement Antenna Pol.	:HORIZONTAL

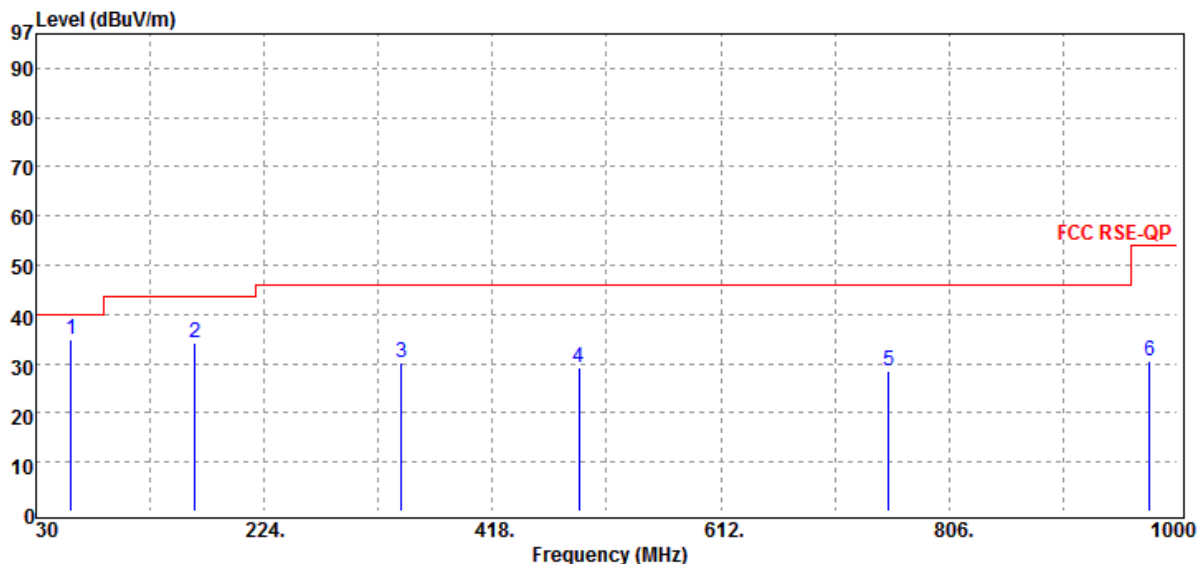


Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
60.07	S	Peak	39.90	-9.99	29.91	40.00	-10.09
150.28	S	Peak	49.67	-8.99	40.68	43.50	-2.82
340.40	S	Peak	50.19	-6.88	43.31	46.00	-2.69
491.72	S	Peak	33.63	-3.86	29.77	46.00	-16.23
754.59	S	Peak	27.19	1.56	28.75	46.00	-17.25
967.99	S	Peak	27.51	4.24	31.75	54.00	-22.25

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Operation Band	:2.4G	Test Date	:2015-06-23
Fundamental Frequency	:2453 MHz	Temp./Humi.	:21 deg_C/62 RH
Operation Mode	:TX HIGH	Engineer	:Curry
EUT Pol.	:E1 Plane	Measurement Antenna Pol.	:VERTICAL

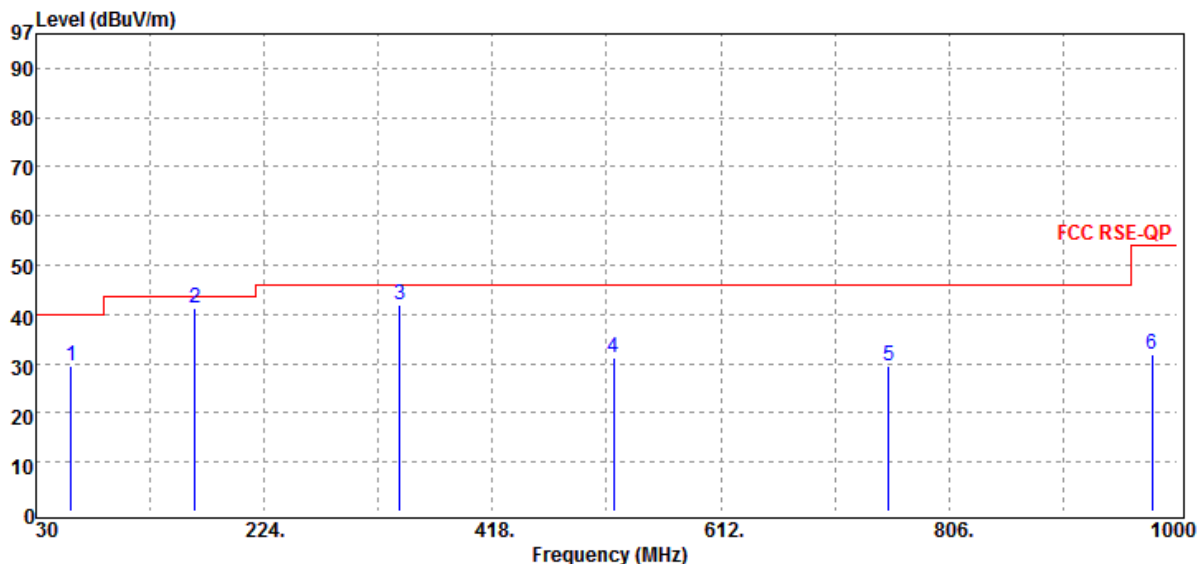


Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
60.07	S	Peak	44.84	-9.99	34.85	40.00	-5.15
164.83	S	Peak	42.83	-8.58	34.25	43.50	-9.25
340.40	S	Peak	37.25	-6.88	30.37	46.00	-15.63
491.72	S	Peak	32.99	-3.86	29.13	46.00	-16.87
754.59	S	Peak	26.94	1.56	28.50	46.00	-17.50
976.72	S	Peak	26.43	4.12	30.55	54.00	-23.45

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Operation Band	:2.4G	Test Date	:2015-06-23
Fundamental Frequency	:2453 MHz	Temp./Humi.	:21 deg_C/62 RH
Operation Mode	:TX HIGH	Engineer	:Curry
EUT Pol.	:E1 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
60.07	S	Peak	39.42	-9.99	29.43	40.00	-10.57
164.83	S	Peak	49.84	-8.58	41.26	43.50	-2.24
339.43	S	Peak	48.71	-6.89	41.82	46.00	-4.18
520.82	S	Peak	35.08	-3.97	31.11	46.00	-14.89
754.59	S	Peak	27.84	1.56	29.40	46.00	-16.60
978.66	S	Peak	27.74	4.13	31.87	54.00	-22.13

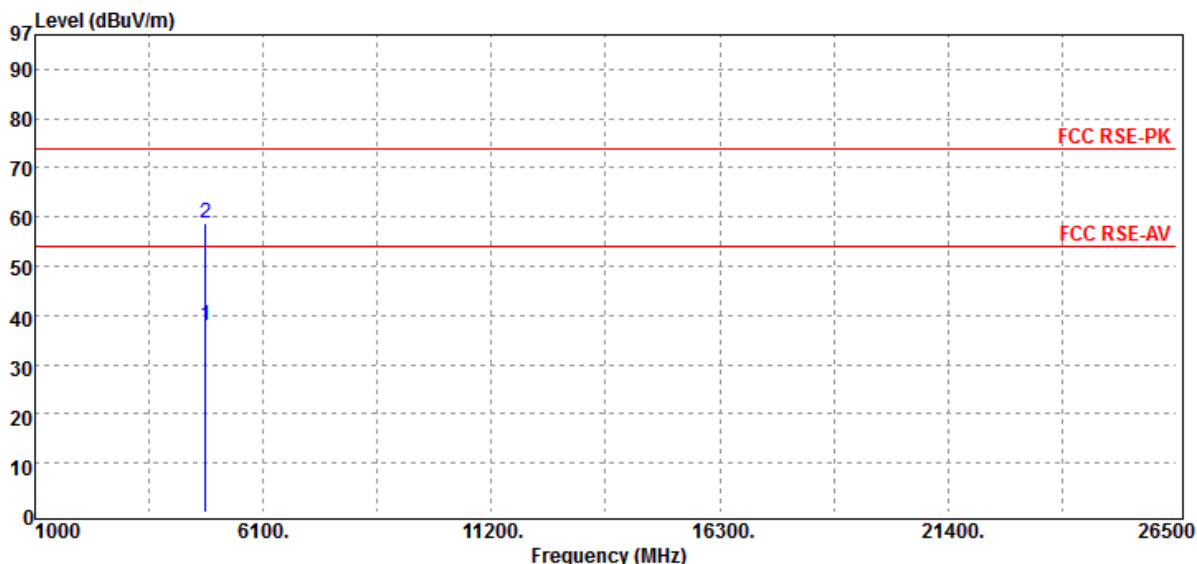
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Radiated Spurious Emission Measurement Result

For Frequency above 1GHz

Operation Band	:2.4G	Test Date	:2015-06-22
Fundamental Frequency	:2406 MHz	Temp./Humi.	:22.1 deg_C/60 RH
Operation Mode	:TX LOW	Engineer	:Curry
EUT Pol.	:E1 Plane	Measurement Antenna Pol.	:VERTICAL

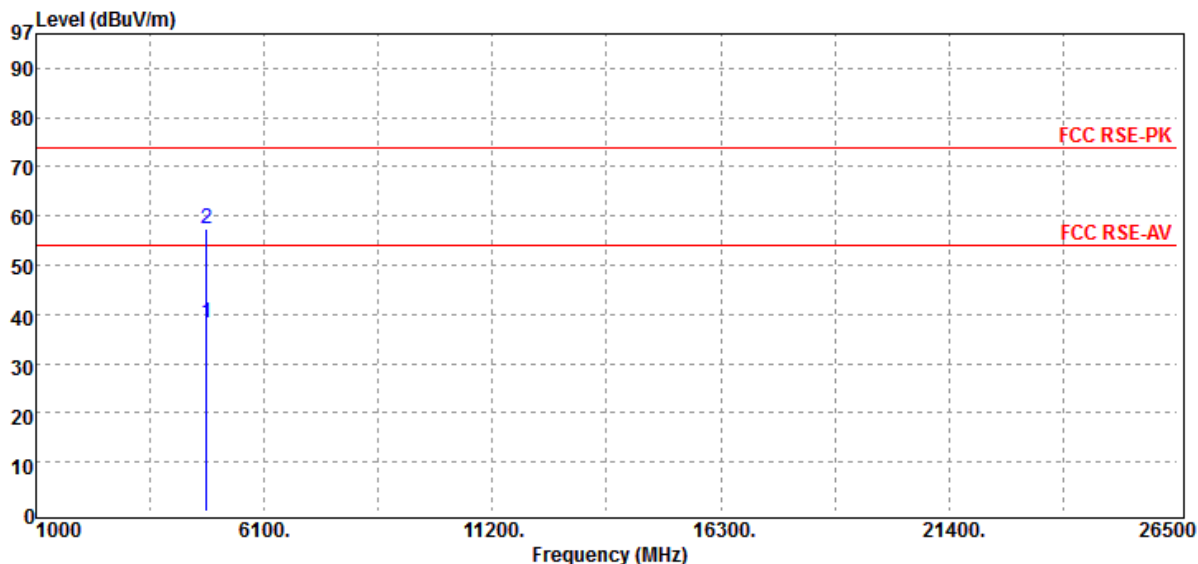


Freq. MHz	Detector Mode	Note F/H/E/S	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
4812.00	H	Average	28.79	9.08	37.87	54.00	-16.13
4812.00	H	Peak	49.74	9.08	58.82	74.00	-15.18

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Operation Band	:2.4G	Test Date	:2015-06-22
Fundamental Frequency	:2406 MHz	Temp./Humi.	:22.1 deg_C/60 RH
Operation Mode	:TX LOW	Engineer	:Curry
EUT Pol.	:E1 Plane	Measurement Antenna Pol.	:HORIZONTAL

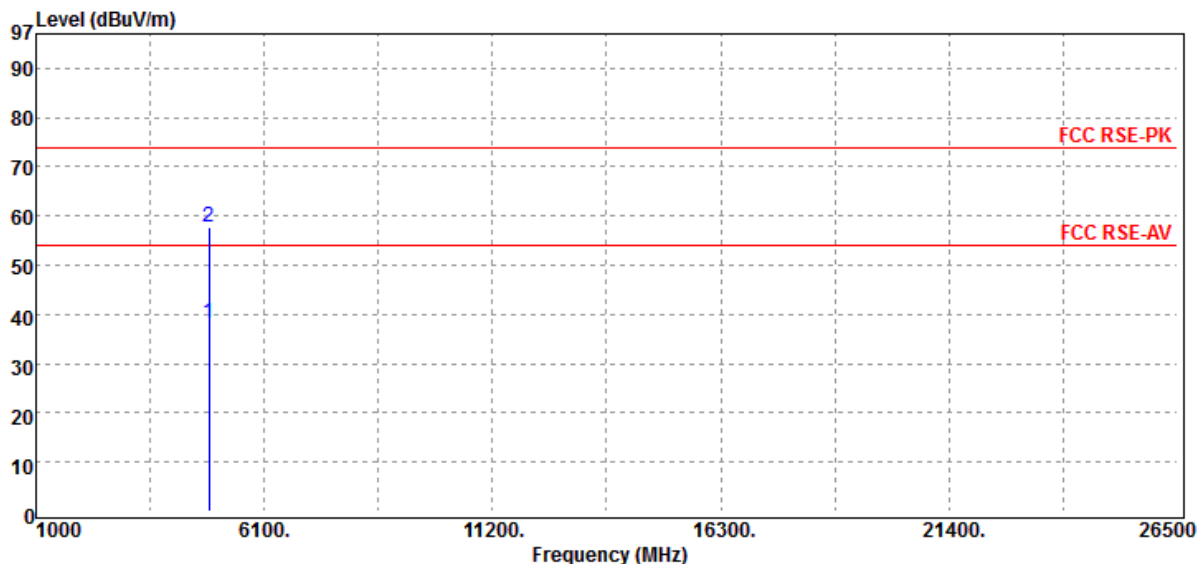


Freq. MHz	Detector Mode PK/QP/AV	Note F/H/E/S	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
4812.00	H	Average	29.08	9.08	38.16	54.00	-15.84
4812.00	H	Peak	48.15	9.08	57.23	74.00	-16.77

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Operation Band	:2.4G	Test Date	:2015-06-22
Fundamental Frequency	:2429 MHz	Temp./Humi.	:22.1 deg_C/60 RH
Operation Mode	:TX MID	Engineer	:Curry
EUT Pol.	:E1 Plane	Measurement Antenna Pol.	:VERTICAL

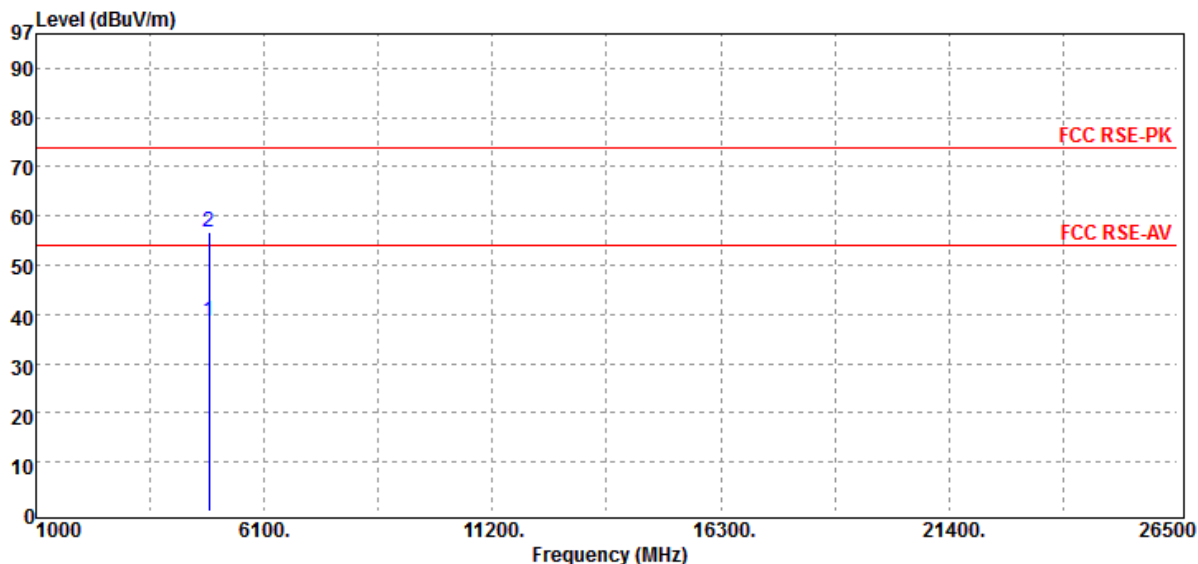


Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	F/H/E/S	Reading Level	dB	FS	@3m	dB
MHz	PK/QP/AV	F/H/E/S	dB μ V	dB	dB μ V/m	dB μ V/m	dB
4858.00	H	Average	28.96	9.33	38.29	54.00	-15.71
4858.00	H	Peak	48.52	9.33	57.85	74.00	-16.15

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Operation Band	:2.4G	Test Date	:2015-06-22
Fundamental Frequency	:2429 MHz	Temp./Humi.	:22.1 deg_C/60 RH
Operation Mode	:TX MID	Engineer	:Curry
EUT Pol.	:E1 Plane	Measurement Antenna Pol.	:HORIZONTAL

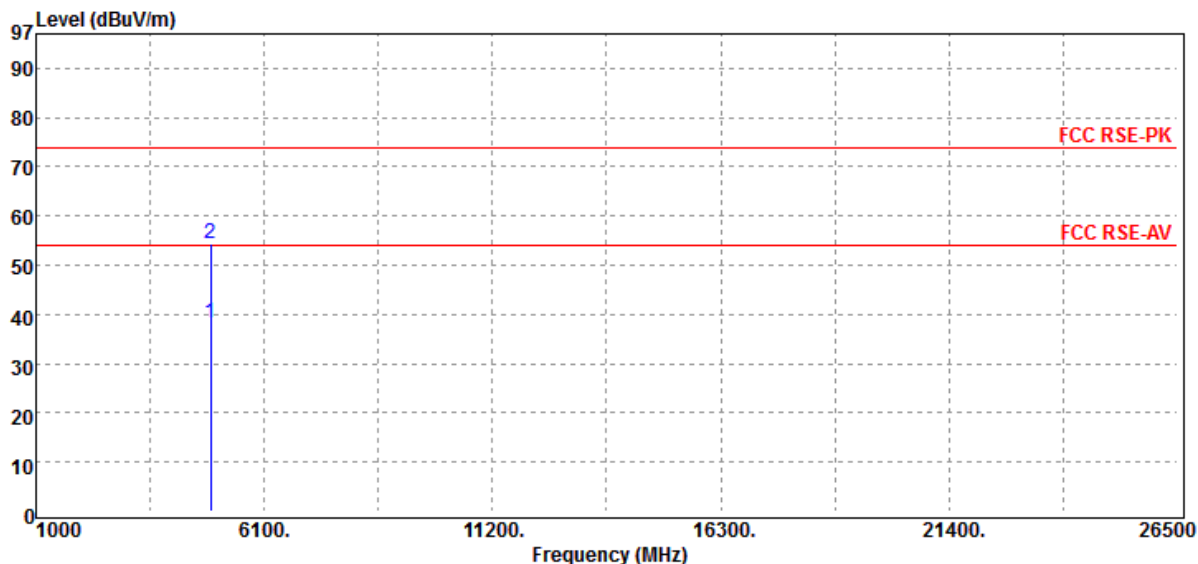


Freq. MHz	Detector Mode	Note F/H/E/S	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
4858.00	H	Average	29.14	9.33	38.47	54.00	-15.53
4858.00	H	Peak	47.56	9.33	56.89	74.00	-17.11

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Operation Band	:2.4G	Test Date	:2015-06-22
Fundamental Frequency	:2453 MHz	Temp./Humi.	:22.1 deg_C/60 RH
Operation Mode	:TX HIGH	Engineer	:Curry
EUT Pol.	:E1 Plane	Measurement Antenna Pol.	:VERTICAL

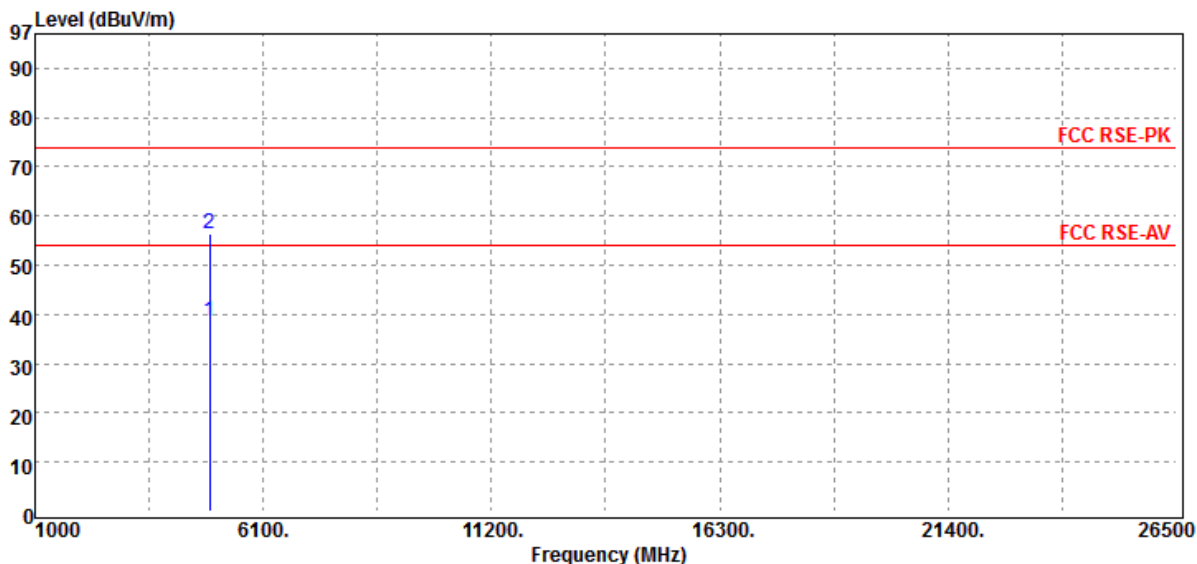


Freq. MHz	Detector Mode	Note	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
4906.00	H	Average	28.83	9.34	38.17	54.00	-15.83
4906.00	H	Peak	45.18	9.34	54.52	74.00	-19.48

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Operation Band	:2.4G	Test Date	:2015-06-22
Fundamental Frequency	:2453 MHz	Temp./Humi.	:22.1 deg_C/60 RH
Operation Mode	:TX HIGH	Engineer	:Curry
EUT Pol.	:E1 Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq. MHz	Detector Mode PK/QP/AV	Note F/H/E/S	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
4906.00	H	Average	29.12	9.34	38.46	54.00	-15.54
4906.00	H	Peak	46.92	9.34	56.26	74.00	-17.74

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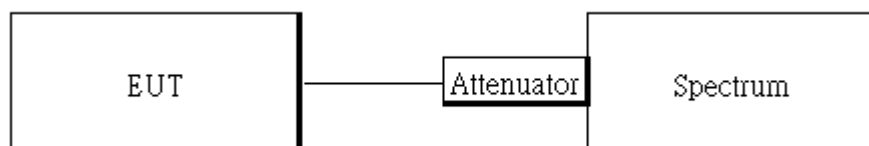
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8. 20 dB BAND WIDTH MEASUREMENT

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:

2406 Channel = 1.436MHz
 2429 Channel = 1.529MHz
 2453 Channel = 1.577MHz

Refer to attached data chart.

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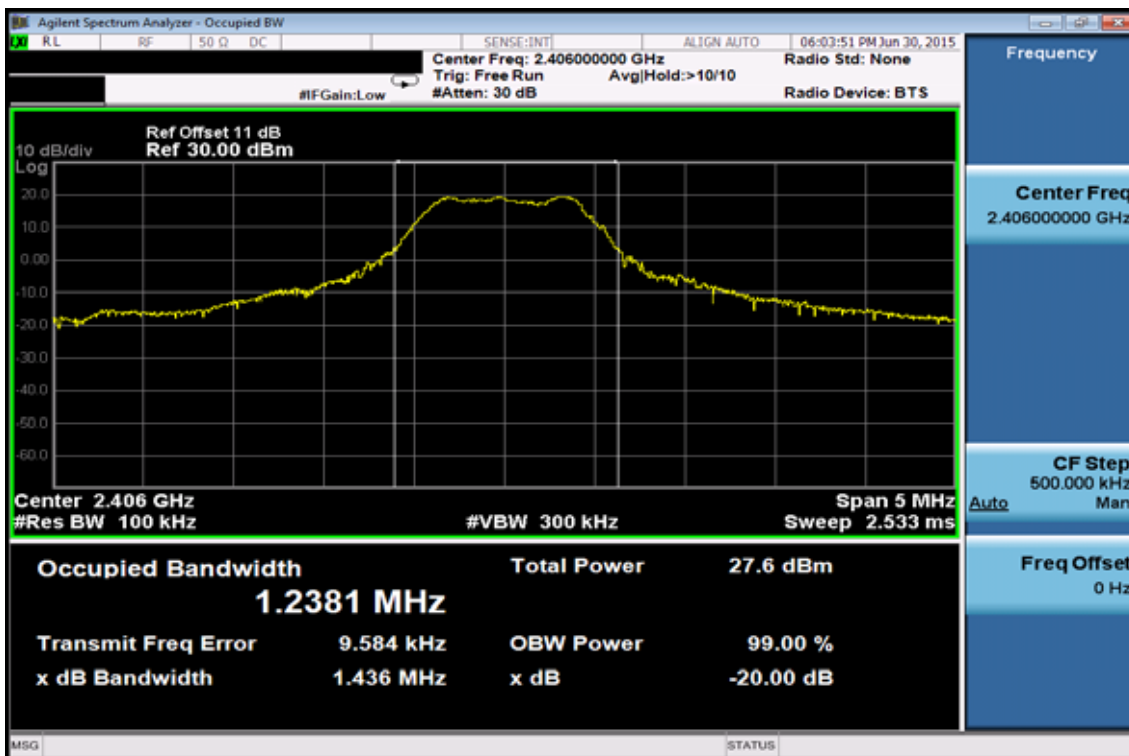
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f (886-2) 2298-0488

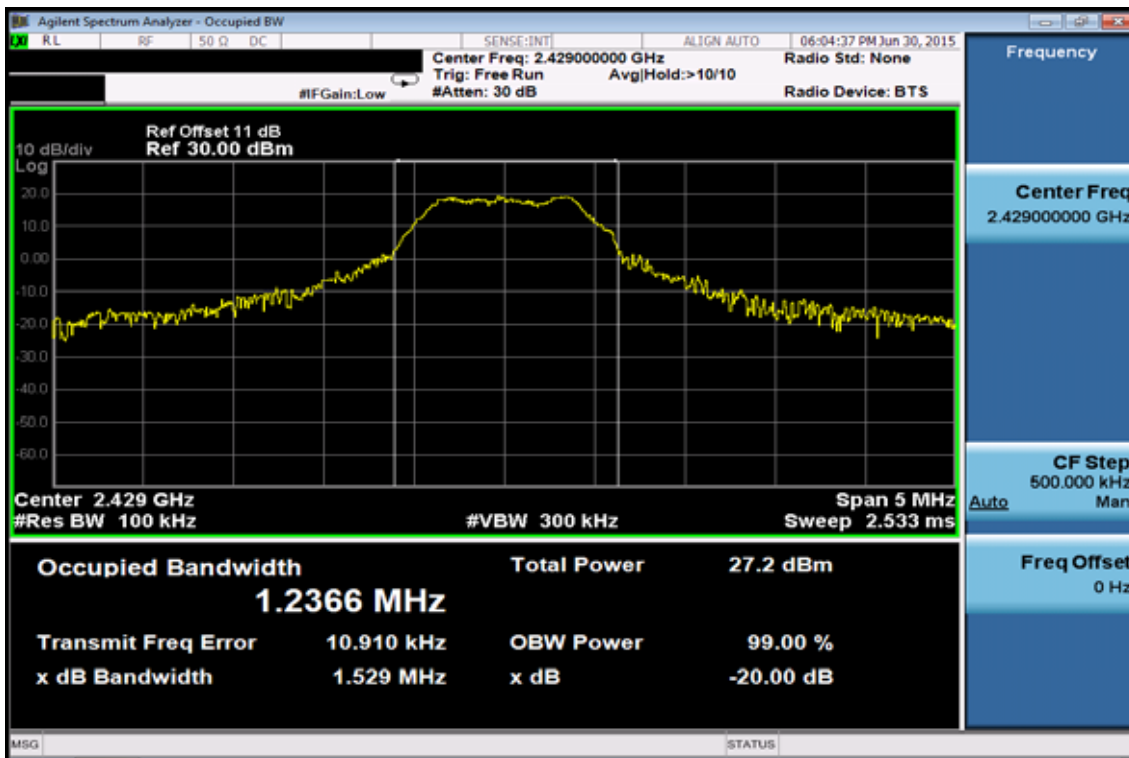
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20dB Bandwidth Test Data CH-Low



20dB Bandwidth Test Data CH-Mid



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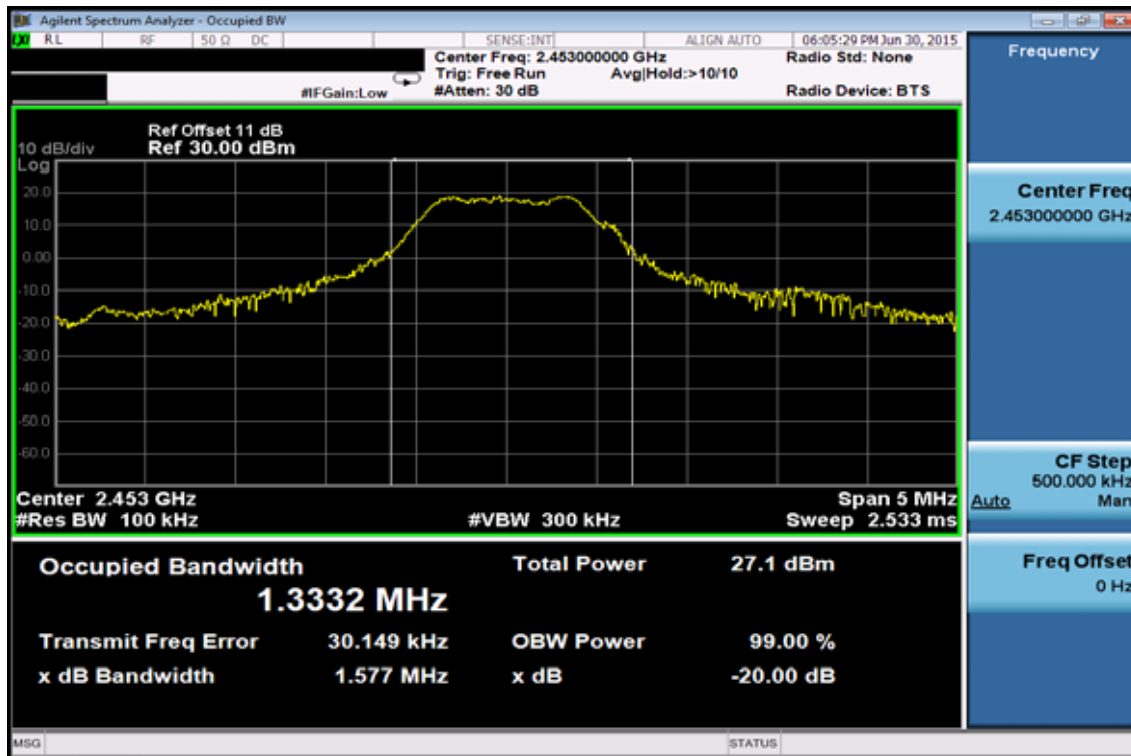
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20dB Bandwidth Test Data CH-High



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