

# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

## INTENTIONAL RADIATOR CERTIFICATION REFERENCING TEST DATA ACROSS SEPARATE EQUIPMENT VERIFICATION

OF

**Product Name:** Smart Phone  
**FCC ID:** APYHRO00253  
**Report No.:** ER/2017/A0041  
**Issue Date:** Nov. 08, 2017  
**FCC Rule Part:** §15.247, Cat: DSS & DTS  
 § 2 , 24E  
 Sharp Corporation, IoT Communication B.U.  
**Prepared for:** 2-13-1, Hachihonmatsu-lida, Higashi-hiroshima-shi, Hiroshima 739-0192, Japan  
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 SGS Taiwan Ltd.  
**Prepared by:** Electronics & Communication Laboratory  
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## VERIFICATION OF COMPLIANCE

Sharp Corporation, IoT Communication B.U.

**Applicant:** 2-13-1, Hachihonmatsu-lida, Higashi-hiroshima-shi, Hiroshima  
739-0192, Japan

**Manufacturer:** Sharp Corporation  
1 Takumi-cho, Sakai-ku, Sakai-Shi, Osaka 590-8522, Japan

**Product Name:** Smart Phone

**FCC ID:** APYHRO00253

**File Number:** ER/2017/A0041

**Date of test:** Oct. 19, 2017

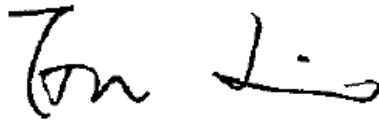
**Date of EUT Received:** Oct. 13, 2017

### We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. 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:**

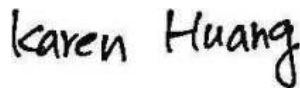


**Date:**

Nov. 08, 2017

*Tin Lin / Engineer*

**Prepared By:**



**Date:**

Nov. 08, 2017

*Karen Huang / Clerk*

**Approved By:**



**Date:**

Nov. 08, 2017

*Jim Chang / Asst. Manager*

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## Revision History

Report Number	Revision	Description	Issue Date
ER/2017/A0041	Rev.00	Initial creation of document	Nov. 08, 2017

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# 1 GENERAL INFORMATION

## 1.1 Product description

General:

Product Name:	Smart Phone	
Hardware Version:	PVT	
Software Version:	A920A	
Power Supply:	3.85V from Rechargeable Li-ion Battery	
	Battery:	Mode No.: UBATIA283AFN2, Supplier: SCUD(FUJIAN) Electronics Co., Ltd.

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## 1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247

FCC KDB 558074 D01 v04 DTS Meas. Guidance

ANSI C63.10:2013

FCC 47 CFR Part 2, 24

ANSI/TIA-603-E-2016

KDB971168 D01 v02r02 Power Meas license Digital System

KDB941225 D01 v03r01 of the Output power Procedure of (SAR Measurement Procedures for 3G Devices, WCDMA / HSPA) was used for EUT and Base station setting.

TS 151 010-1 is used to set, and measure the output power.

Note: 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 24803

(TAF code 0513)

FCC Registration Number and Designation number are: 509634 / TW0001

## 1.4 Special Accessories

There are no special accessories used while test was conducted.

## 1.5 Equipment Modifications

There was no modification incorporated into the EUT.

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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 Radiated Emissions for DSS & DTS

The EUT is a placed on as turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m 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 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.

#### 2.3.2 Radiated Emissions (ERP/EIRP) for PCE

According to measurement procured TIA/EIA 603C, The EUT is a placed on as turn table which is 0.8 m above ground plane. 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 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 according to the requirements in Section 8 and 13.

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## 2.4 Configuration of Tested System

Fig. 2-1 Radiated Emission Configuration (BT & BLE & WLAN)



Fig. 2-2 Radiated Emission Configuration (WWAN)

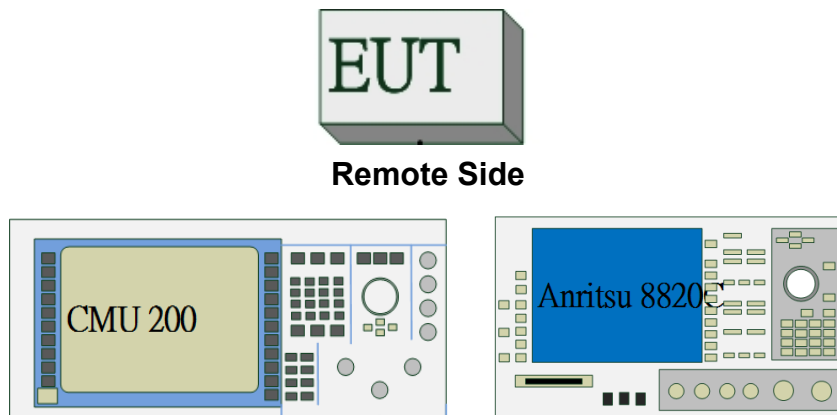


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	Bluetooth Test Software	N/A	N/A	N/A	N/A	N/A
2.	WLAN Test Software	N/A	N/A	N/A	N/A	N/A
3.	Notebook	Lenovo	L430	P0000081	Shielded	Unshielded
4.	Universal Radio Communication Tester	R&S	CMU200	102189	shielded	Un-shielded
5.	Universal Radio Communication Tester	Anritsu	MT8820C	6200307563	shielded	Un-shielded

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### 3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.247(d)	Radiated Spurious Emission	Compliant
§2.1053 §24.238(a)	Field Strength of Spurious Radiation	Compliant

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## 4 DESCRIPTION OF TEST MODES

### 4.1 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.
3. Investigation has been done base on the worst case of original FCC ID: APYHRO00251 for DSS, DTS and PCE (2G).

#### RADIATED EMISSION TEST:

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	Worst Case Position H / E1 / E2
Bluetooth	0 to 78	0,39,78	8-DPSK	3DH5	H
Bluetooth LE	0 to 39	0,19,39	GFSK	1	H
802.11b	1 to 11	1, 6, 11	DSSS	1	H
802.11g	1 to 11	1, 6, 11	OFDM	6	H
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	MCS 0	H

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	Worst Case Position H / E1 / E2
GPRS 1900	512 to 810	512, 661, 810	H

#### Note:

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for BT, BLE, WLAN and WWAN Transmitter for channel Low, Mid and High, the worst case position was reported.

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## 5 MEASUREMENT UNCERTAINTY

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 RADIATED SPURIOUS EMISSION MEASUREMENT

### 6.1 Measurement Equipment Used:

SGS SAC-III					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
EMI Test Receiver	R&S	ESC17	100760	05/11/2017	05/10/2018
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/25/2017	04/24/2018
Loop Antenna	ETS-Lindgren	6502	148045	09/20/2017	09/19/2018
Bilog Antenna	SCHWAZBECK	VULB9168	378	12/19/2016	12/18/2017
Horn Antenna	Schwarzbeck	BBHA9120D	1441	08/04/2017	08/03/2018
Pre-Amplifier	Agilent	8447D	2944A07676	01/03/2017	01/02/2018
Pre-Amplifier	EMC Instruments Corp.	EMC0126530	980038	01/03/2017	01/02/2018
Turn Table	HD	DT420	N/A	N.C.R	N.C.R
Antenna Tower	ChamPro	AM-BS-4500-B	060776-ABS	N.C.R	N.C.R
Controller	ChamPro	EM1000	60776	N.C.R	N.C.R
Low Loss Cable	Huber Suhner	966_RX	9	01/05/2017	01/04/2018
3m Site NSA	SGS	966 chamber	N/A	07/01/2017	06/30/2018
Low Loss Cable	Huber Suhner	966 TX	1	01/05/2017	01/04/2018
Horn Antenna	Schwarzbeck	BBHA9170	184	12/12/2016	12/11/2017
Pre-Amplifier	EMC Instruments Corp.	EMC184045	980135	01/05/2017	01/04/2018

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

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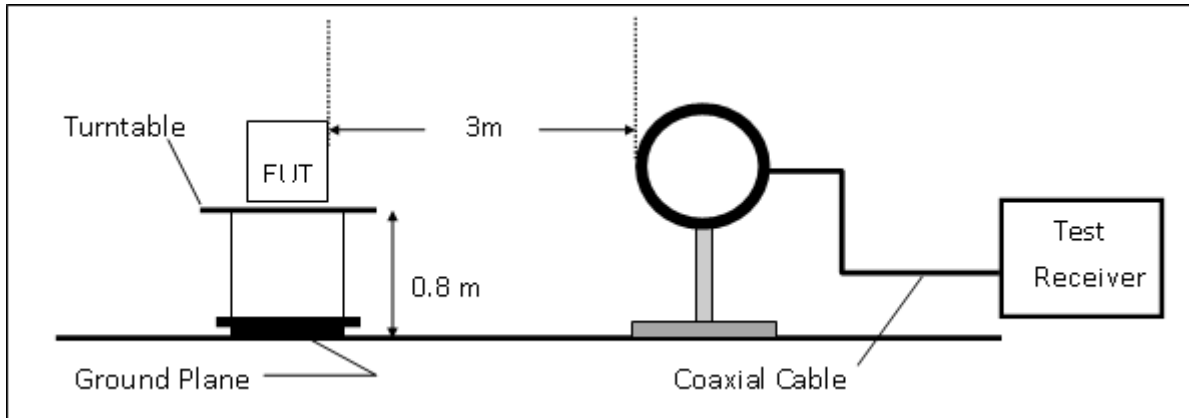
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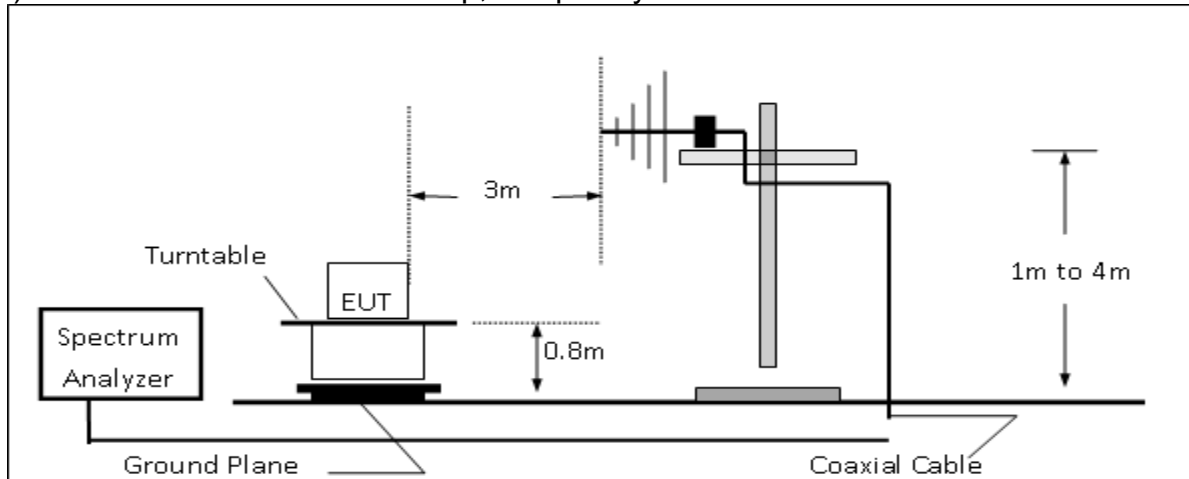
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## 6.2 Test SET-UP

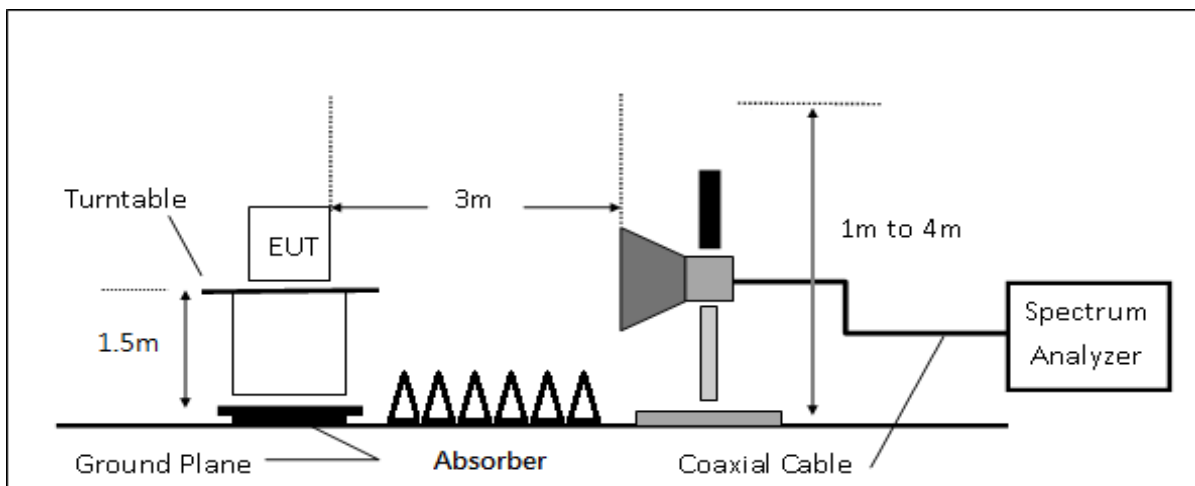
(A) Radiated Emission Test Set-Up Frequency Below 30MHz.



(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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### 6.3 Measurement Procedure

1. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
2. The EUT was placed on a turn table with 1.5m for frequency > 1GHz above ground plane.
3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
5. When 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.
6. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Peak Detector at frequency above 1 GHz.
7. Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW ≥ 1/T (Duty cycle < 98%) for Average Detector at frequency above 1 GHz.
8. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
9. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. On spectrum, change spectrum mode in linear display mode, and reduce VBW = 10Hz if average reading is measured.
10. Repeat above procedures until all default test channel measured were complete.

### 6.4 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.

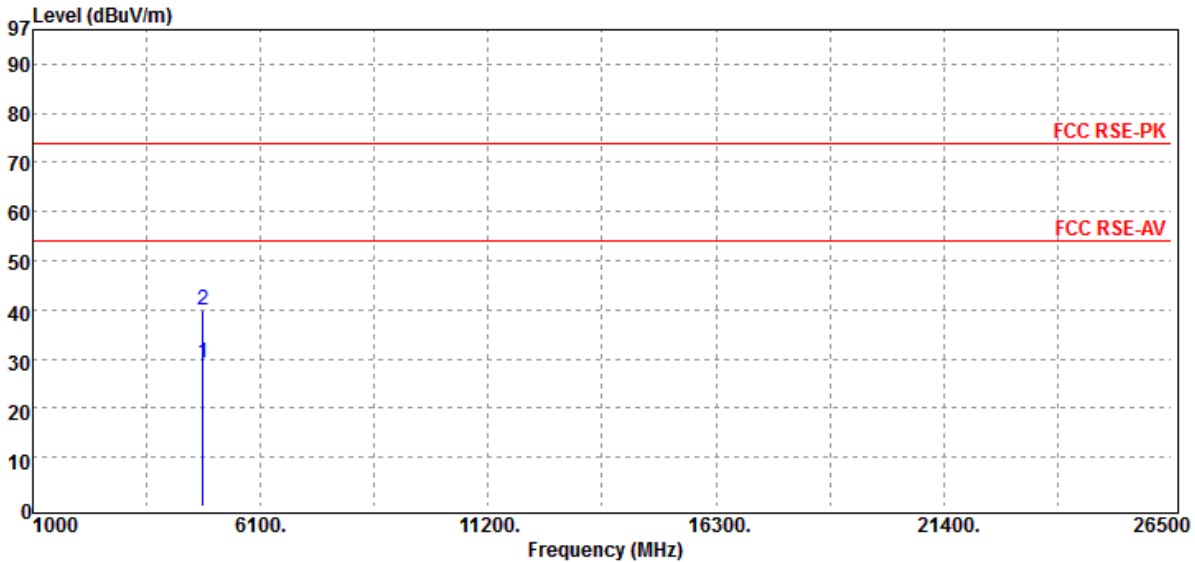
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### 6.5 Measurement Result

Operation Band	:EDR(3M)	Test Date	:2017-10-19
Fundamental Frequency	:2402 MHz	Temp./Humi.	:22 deg_C / 61 RH
Operation Mode	:Tx CH LOW	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



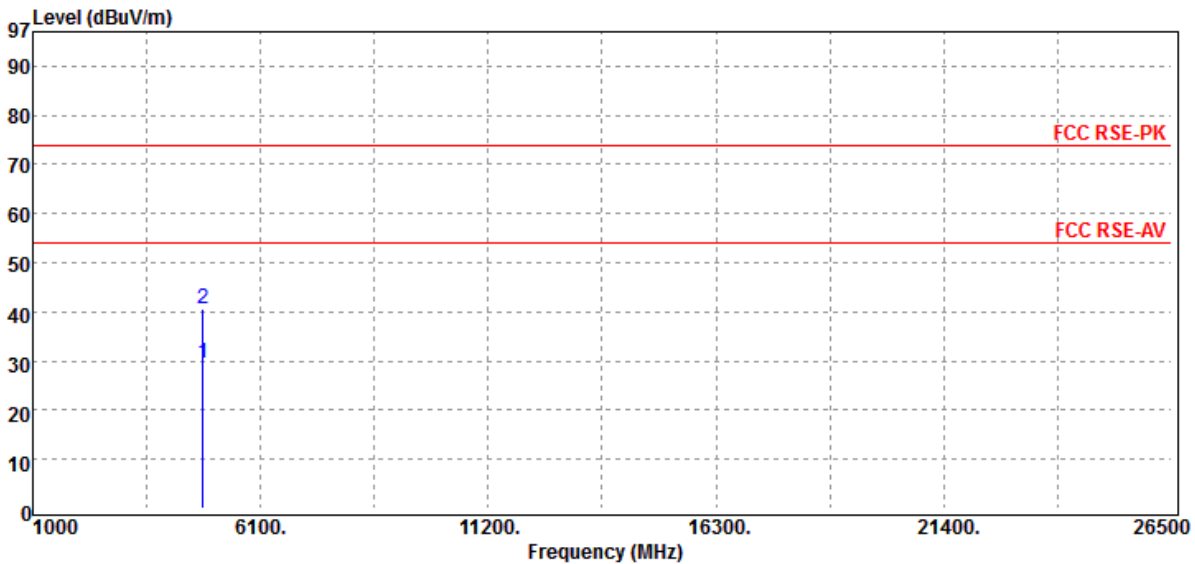
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
4804.00	H	Average	24.33	4.92	29.25	54.00	-24.75
4804.00	H	Peak	35.13	4.92	40.05	74.00	-33.95

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Operation Band	:EDR(3M)	Test Date	:2017-10-19
Fundamental Frequency	:2402 MHz	Temp./Humi.	:22 deg_C / 61 RH
Operation Mode	:Tx CH LOW	Engineer	:Tin
EUT Pol.	:H 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
4804.00	H	Average	24.59	4.92	29.51	54.00	-24.49
4804.00	H	Peak	35.55	4.92	40.47	74.00	-33.53

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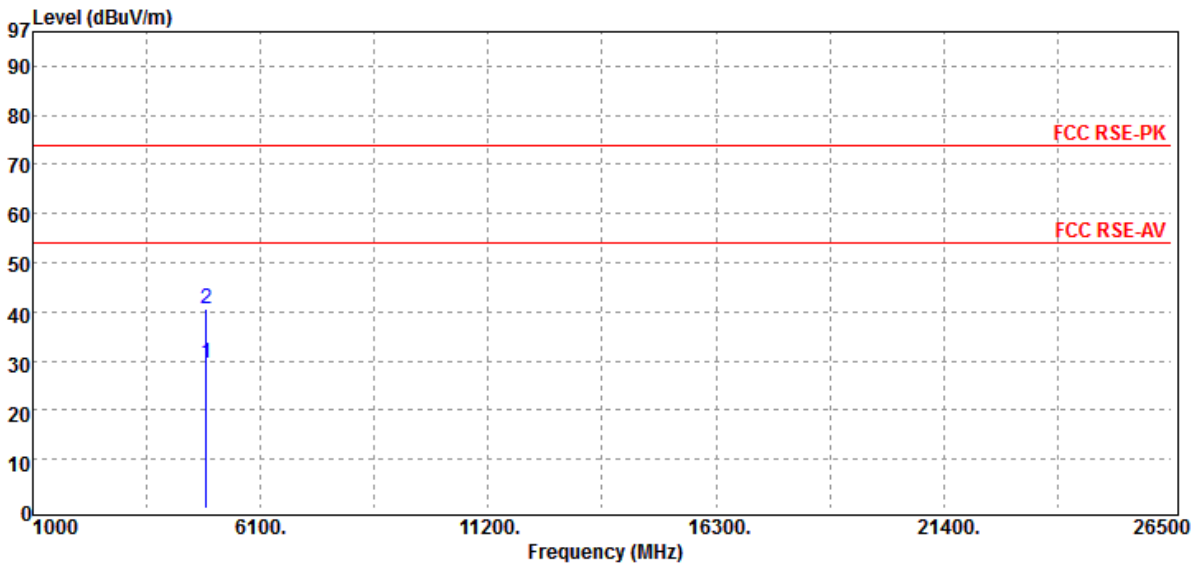
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Operation Band	:EDR(3M)	Test Date	:2017-10-19
Fundamental Frequency	:2441 MHz	Temp./Humi.	:22 deg_C / 61 RH
Operation Mode	:Tx CH MID	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
4882.00	H	Average	24.24	5.18	29.42	54.00	-24.58
4882.00	H	Peak	35.47	5.18	40.65	74.00	-33.35

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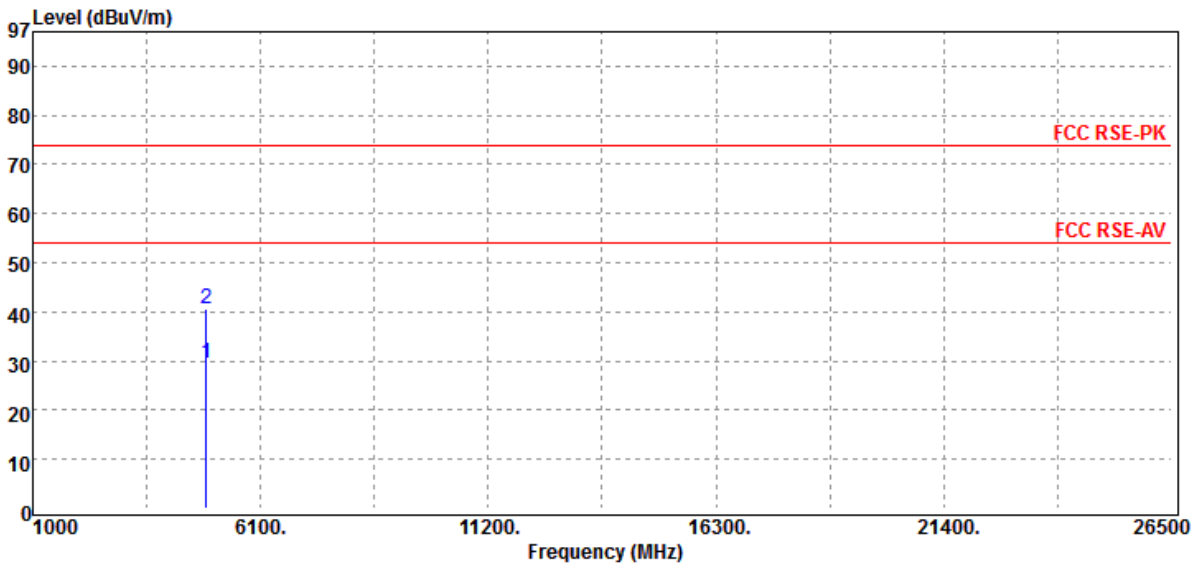
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Operation Band	:EDR(3M)	Test Date	:2017-10-19
Fundamental Frequency	:2441 MHz	Temp./Humi.	:22 deg_C / 61 RH
Operation Mode	:Tx CH MID	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4882.00	H	Average	24.47	5.18	29.65	54.00	-24.35
4882.00	H	Peak	35.41	5.18	40.59	74.00	-33.41

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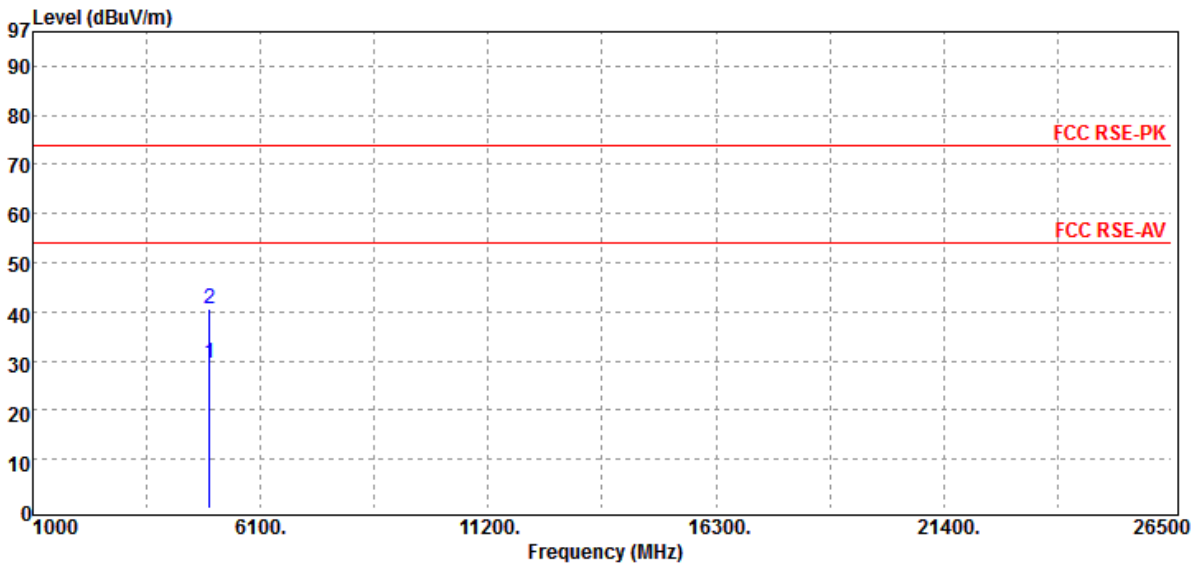
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Operation Band	:EDR(3M)	Test Date	:2017-10-19
Fundamental Frequency	:2480 MHz	Temp./Humi.	:22 deg_C / 61 RH
Operation Mode	:Tx CH HIGH	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	Margin
		PK/QP/AV	dB $\mu$ V		dB $\mu$ V/m	dB $\mu$ V/m	dB
4960.00	H	Average	24.31	5.29	29.60	54.00	-24.40
4960.00	H	Peak	35.18	5.29	40.47	74.00	-33.53

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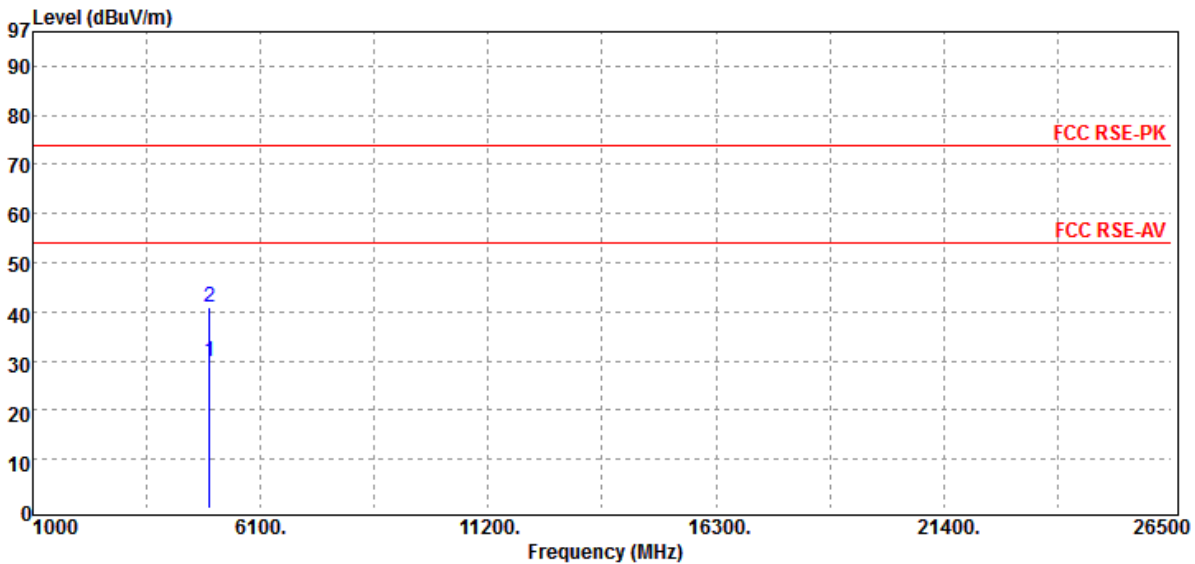
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Operation Band	:EDR(3M)	Test Date	:2017-10-19
Fundamental Frequency	:2480 MHz	Temp./Humi.	:22 deg_C / 61 RH
Operation Mode	:Tx CH HIGH	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
4960.00	H	Average	24.52	5.29	29.81	54.00	-24.19
4960.00	H	Peak	35.67	5.29	40.96	74.00	-33.04

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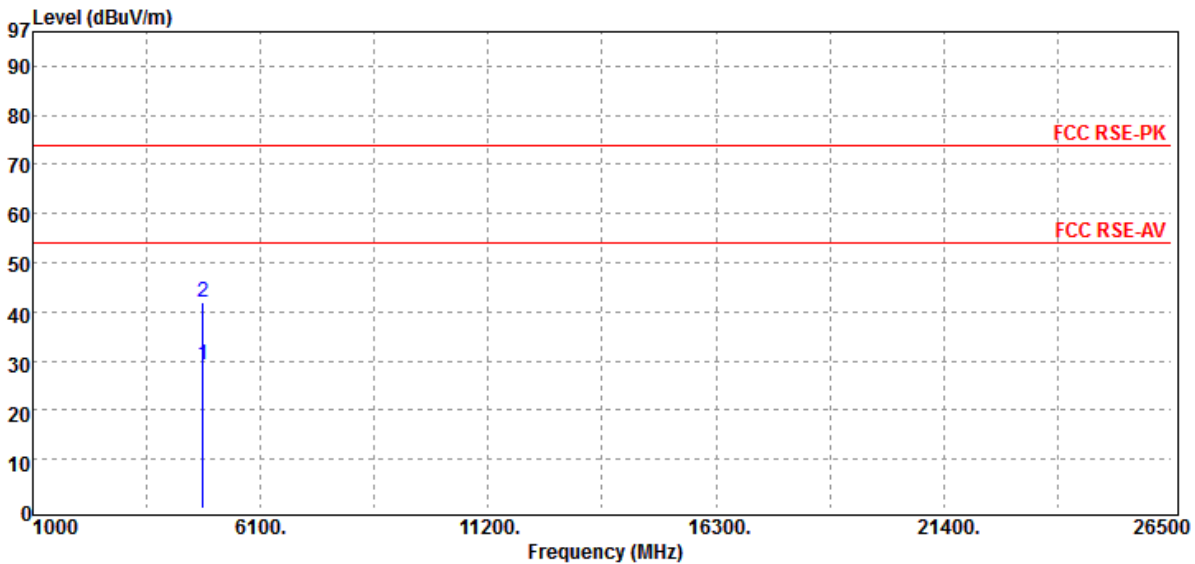
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Operation Band	:BLE	Test Date	:2017-10-19
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Operation Mode	:Tx CH LOW	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	Margin
		PK/QP/AV	dB $\mu$ V		dB $\mu$ V/m	dB $\mu$ V/m	dB
4804.00	H	Average	24.22	4.92	29.14	54.00	-24.86
4804.00	H	Peak	37.02	4.92	41.94	74.00	-32.06

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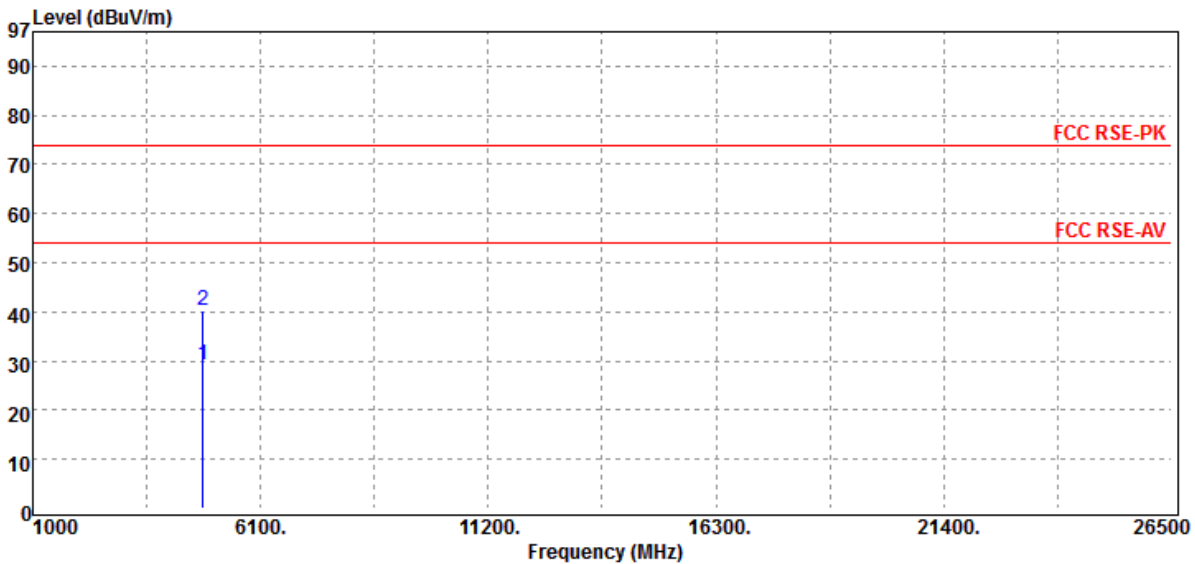
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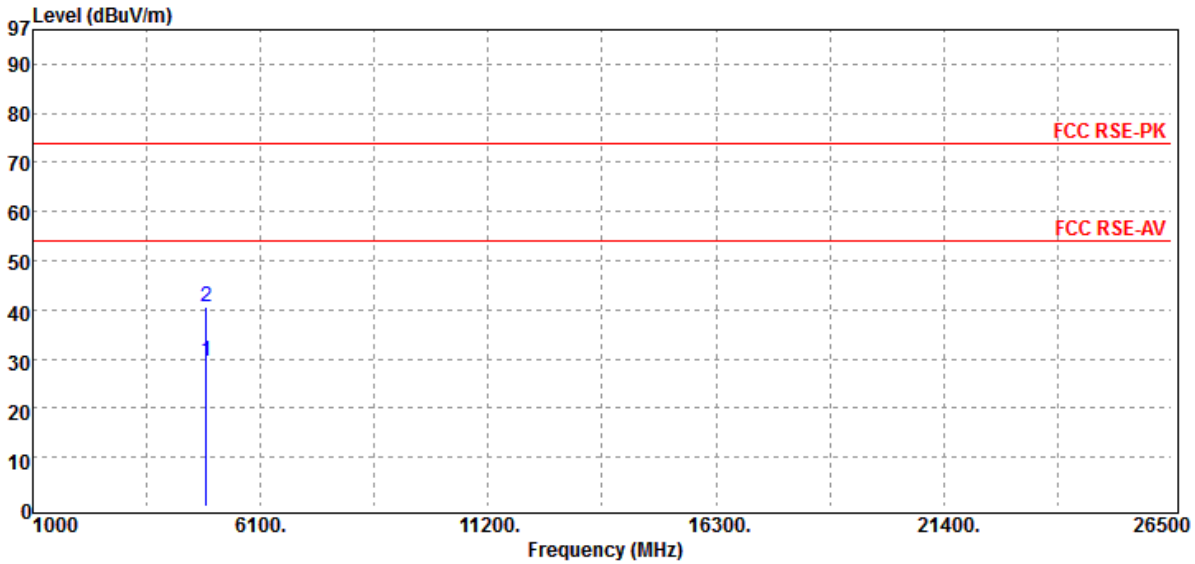
Operation Band	:BLE	Test Date	:2017-10-19
Fundamental Frequency	:2402 MHz	Temp./Humi.	:22 deg_C / 61 RH
Operation Mode	:Tx CH LOW	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
4804.00	H	Average	24.37	4.92	29.29	54.00	-24.71
4804.00	H	Peak	35.30	4.92	40.22	74.00	-33.78

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Operation Band	:BLE	Test Date	:2017-10-19
Fundamental Frequency	:2440 MHz	Temp./Humi.	:22 deg_C / 61 RH
Operation Mode	:Tx CH MID	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	Margin
		PK/QP/AV	dB $\mu$ V		dB $\mu$ V/m	dB $\mu$ V/m	dB
4880.00	H	Average	24.29	5.17	29.46	54.00	-24.54
4880.00	H	Peak	35.40	5.17	40.57	74.00	-33.43

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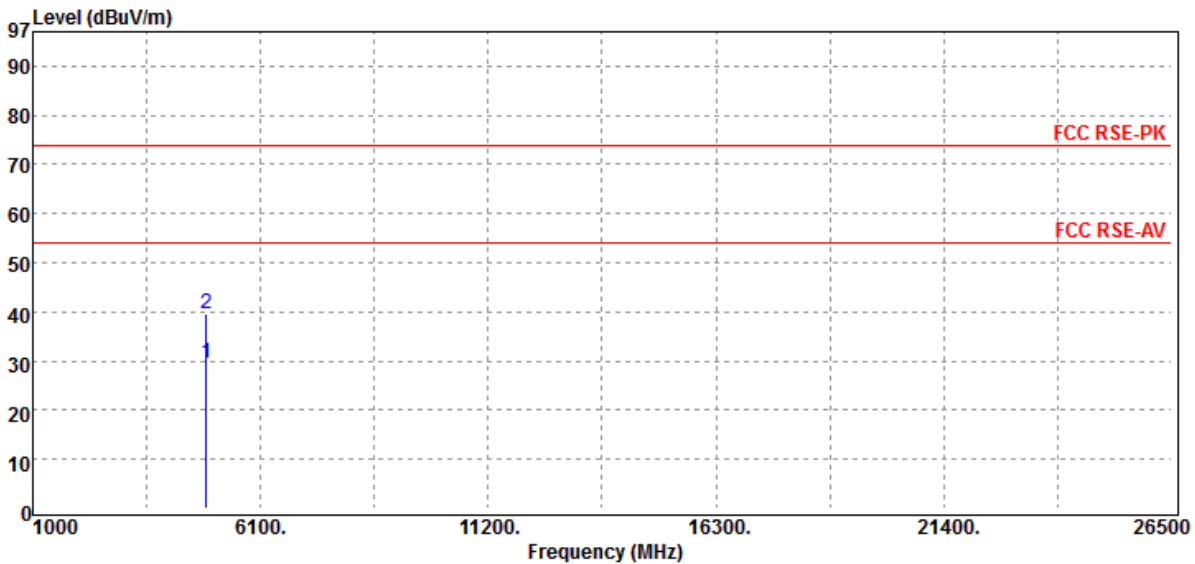
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Operation Band	:BLE	Test Date	:2017-10-19
Fundamental Frequency	:2440 MHz	Temp./Humi.	:22 deg_C / 61 RH
Operation Mode	:Tx CH MID	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4880.00	H	Average	24.35	5.17	29.52	54.00	-24.48
4880.00	H	Peak	34.49	5.17	39.66	74.00	-34.34

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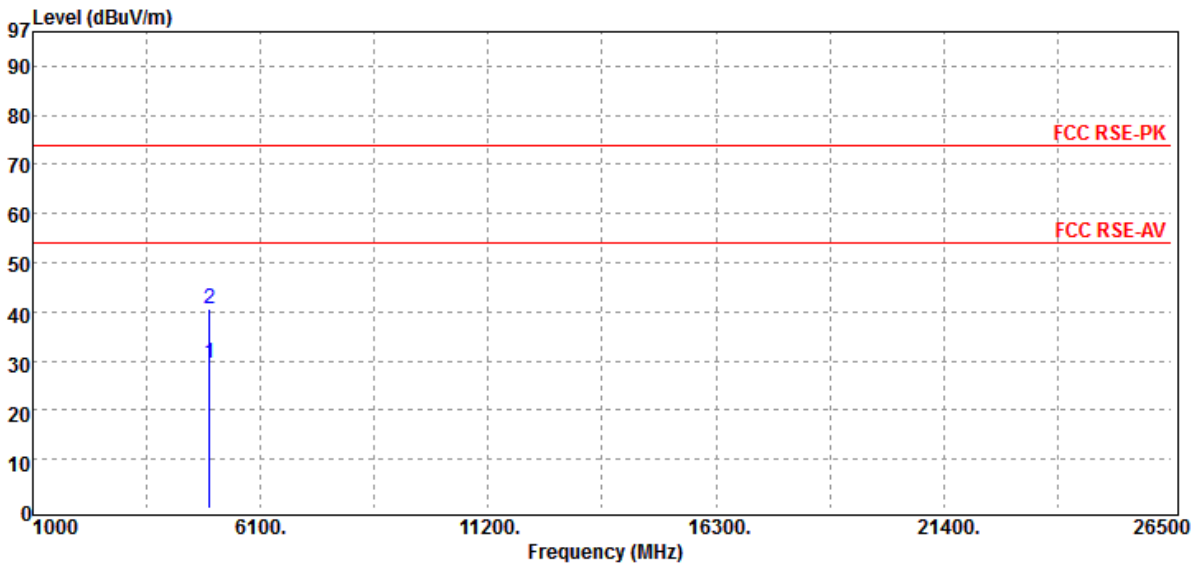
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Operation Band	:BLE	Test Date	:2017-10-19
Fundamental Frequency	:2480 MHz	Temp./Humi.	:22 deg_C / 61 RH
Operation Mode	:Tx CH HIGH	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4960.00	H	Average	24.40	5.29	29.69	54.00	-24.31
4960.00	H	Peak	35.45	5.29	40.74	74.00	-33.26

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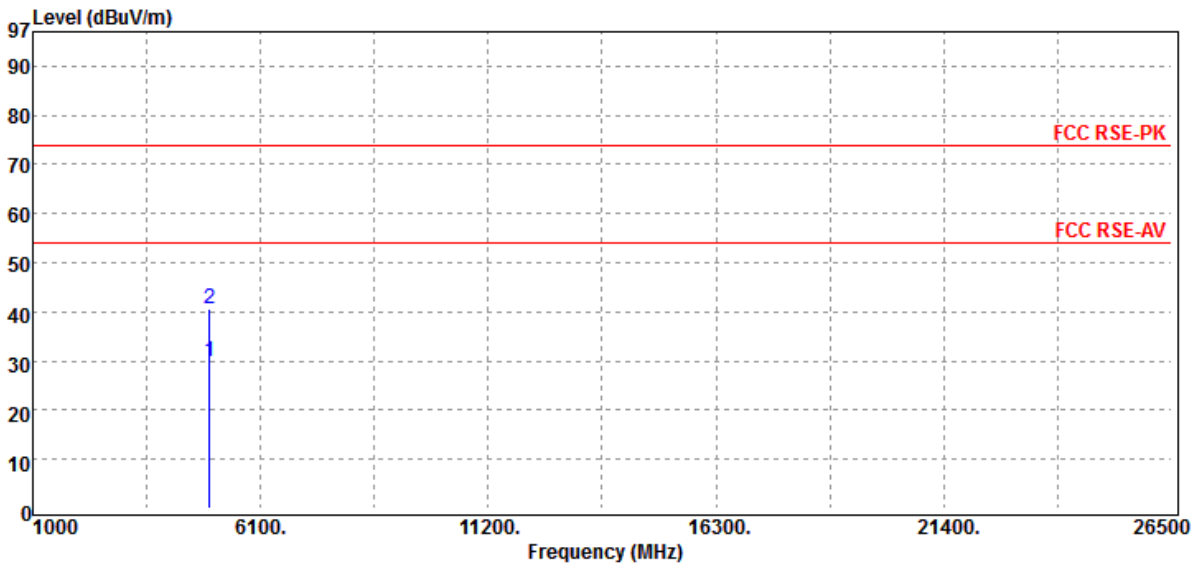
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Operation Band	:BLE	Test Date	:2017-10-19
Fundamental Frequency	:2480 MHz	Temp./Humi.	:22 deg_C / 61 RH
Operation Mode	:Tx CH HIGH	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4960.00	H	Average	24.56	5.29	29.85	54.00	-24.15
4960.00	H	Peak	35.22	5.29	40.51	74.00	-33.49

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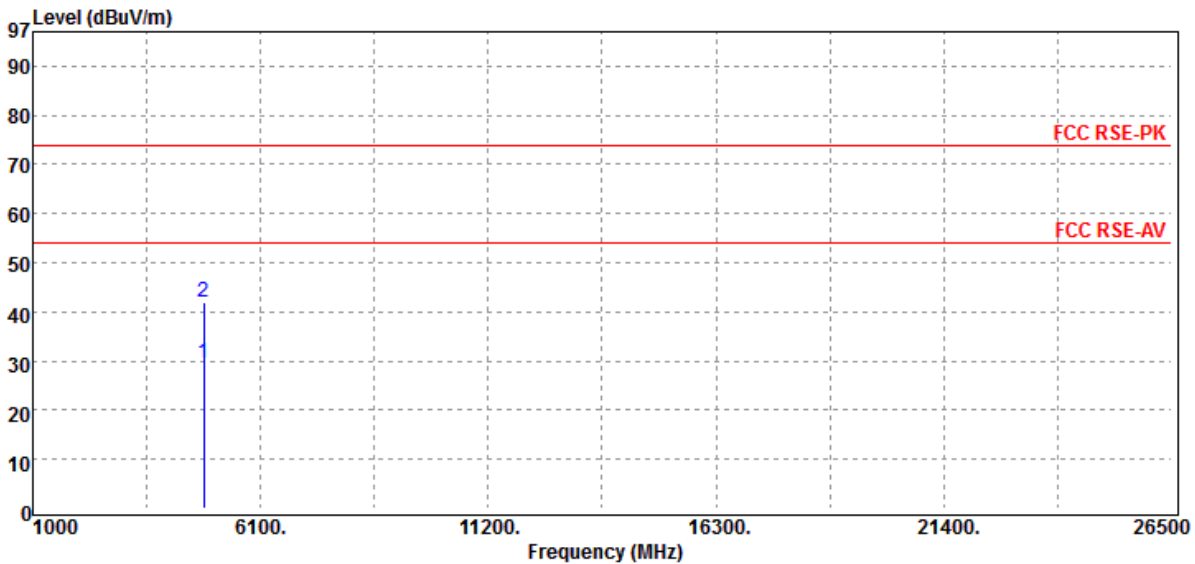
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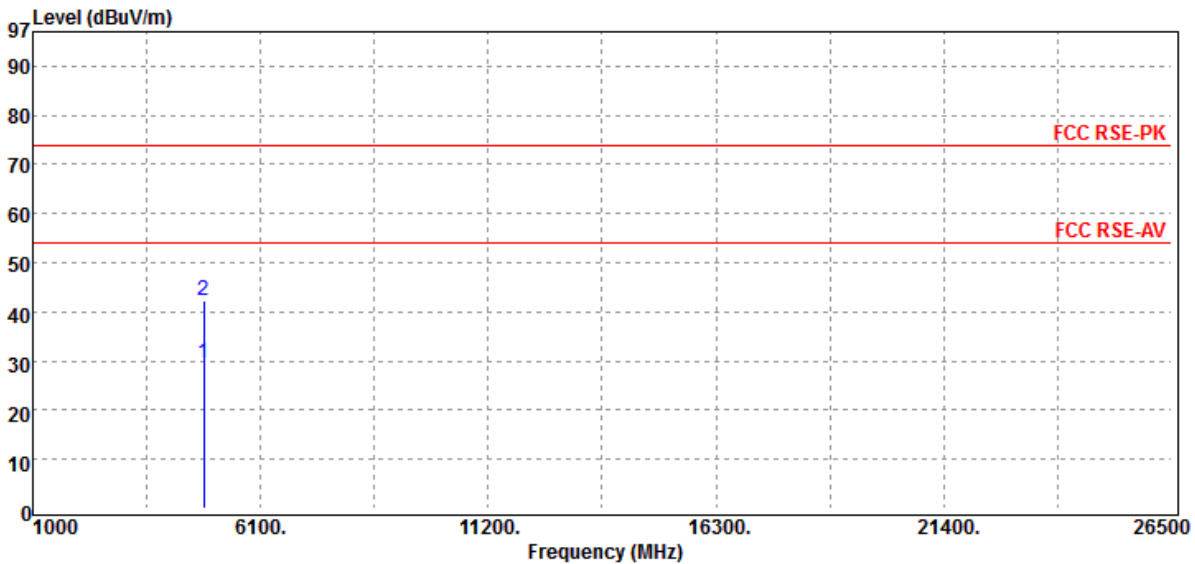
Operation Band	:802.11b	Test Date	:2017-10-19
Fundamental Frequency	:2412 MHz	Temp./Humi.	:22 deg_C / 61 RH
Operation Mode	:Tx CH LOW	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4824.00	H	Average	24.56	4.93	29.49	54.00	-24.51
4824.00	H	Peak	36.93	4.93	41.86	74.00	-32.14

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Operation Band	:802.11b	Test Date	:2017-10-19
Fundamental Frequency	:2412 MHz	Temp./Humi.	:22 deg_C / 61 RH
Operation Mode	:Tx CH LOW	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



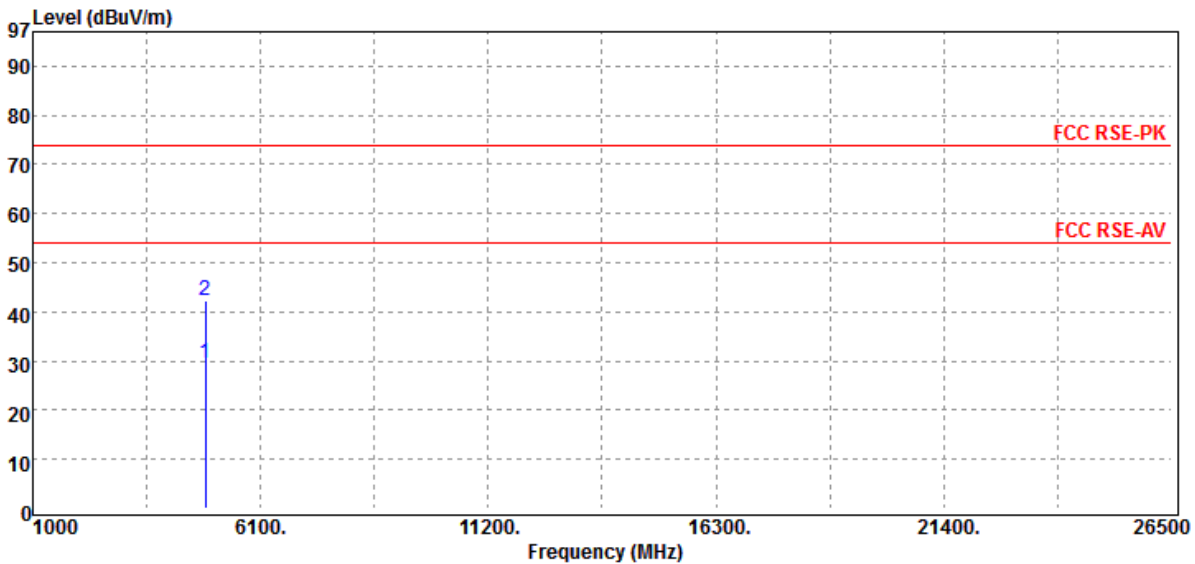
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
4824.00	H	Average	24.62	4.93	29.55	54.00	-24.45
4824.00	H	Peak	37.38	4.93	42.31	74.00	-31.69

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Operation Band	:802.11b	Test Date	:2017-10-19
Fundamental Frequency	:2437 MHz	Temp./Humi.	:22 deg_C / 61 RH
Operation Mode	:Tx CH MID	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	Margin
		PK/QP/AV	dB $\mu$ V		dB $\mu$ V/m	dB $\mu$ V/m	dB
4874.00	H	Average	24.30	5.13	29.43	54.00	-24.57
4874.00	H	Peak	37.16	5.13	42.29	74.00	-31.71

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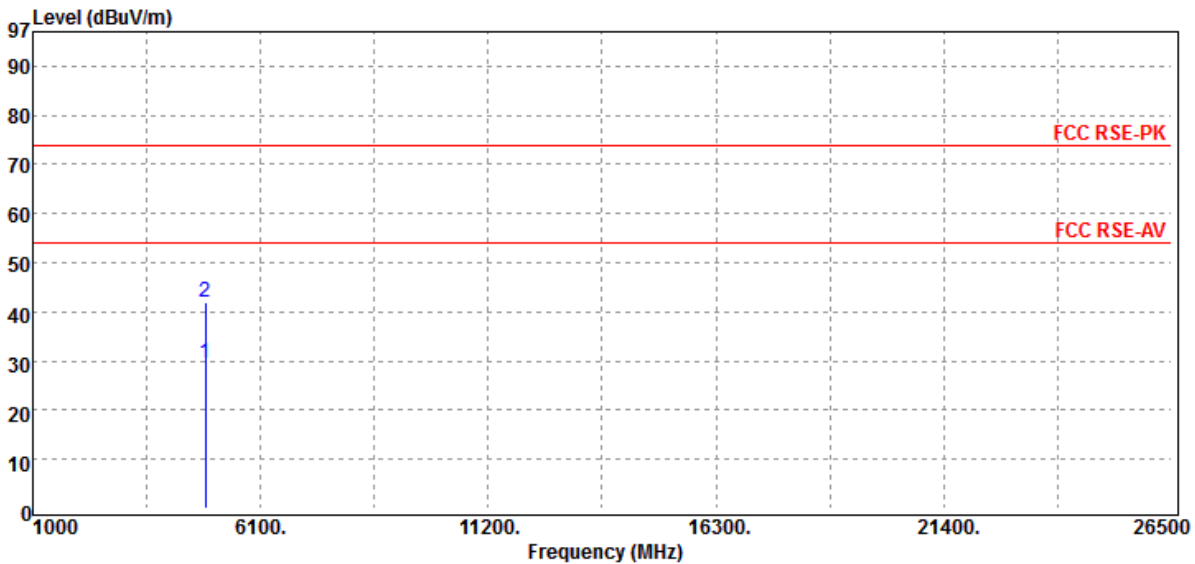
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Operation Band	:802.11b	Test Date	:2017-10-19
Fundamental Frequency	:2437 MHz	Temp./Humi.	:22 deg_C / 61 RH
Operation Mode	:Tx CH MID	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



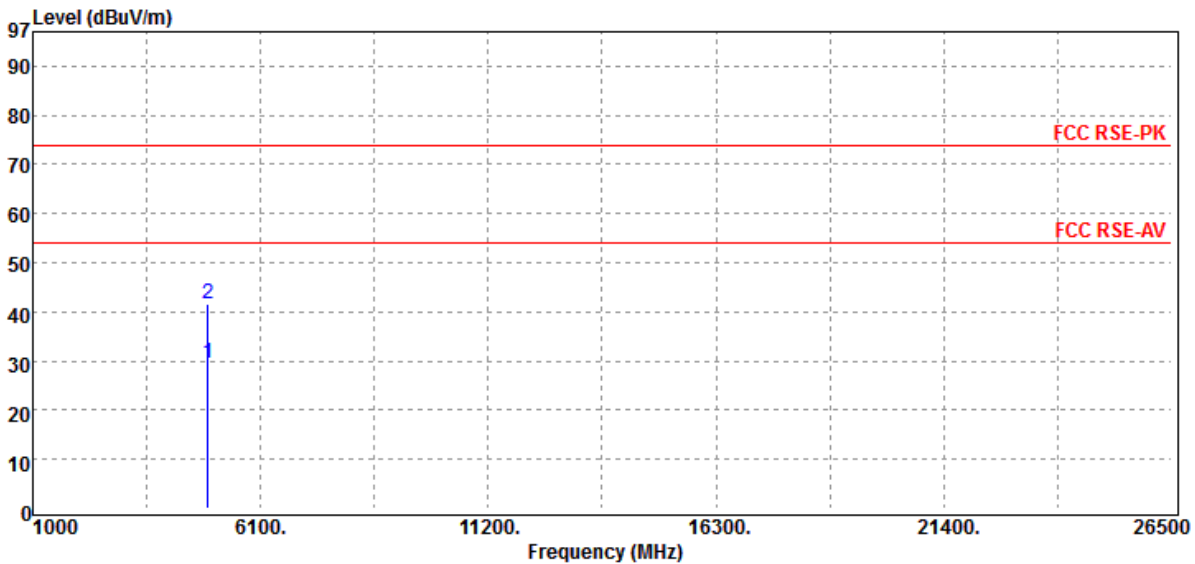
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4874.00	H	Average	24.44	5.13	29.57	54.00	-24.43
4874.00	H	Peak	36.69	5.13	41.82	74.00	-32.18

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Operation Band	:802.11b	Test Date	:2017-10-19
Fundamental Frequency	:2462 MHz	Temp./Humi.	:22 deg_C / 61 RH
Operation Mode	:Tx CH HIGH	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	Margin
		PK/QP/AV	dBμV		dBμV/m	dBμV/m	dB
4924.00	H	Average	24.37	5.25	29.62	54.00	-24.38
4924.00	H	Peak	36.29	5.25	41.54	74.00	-32.46

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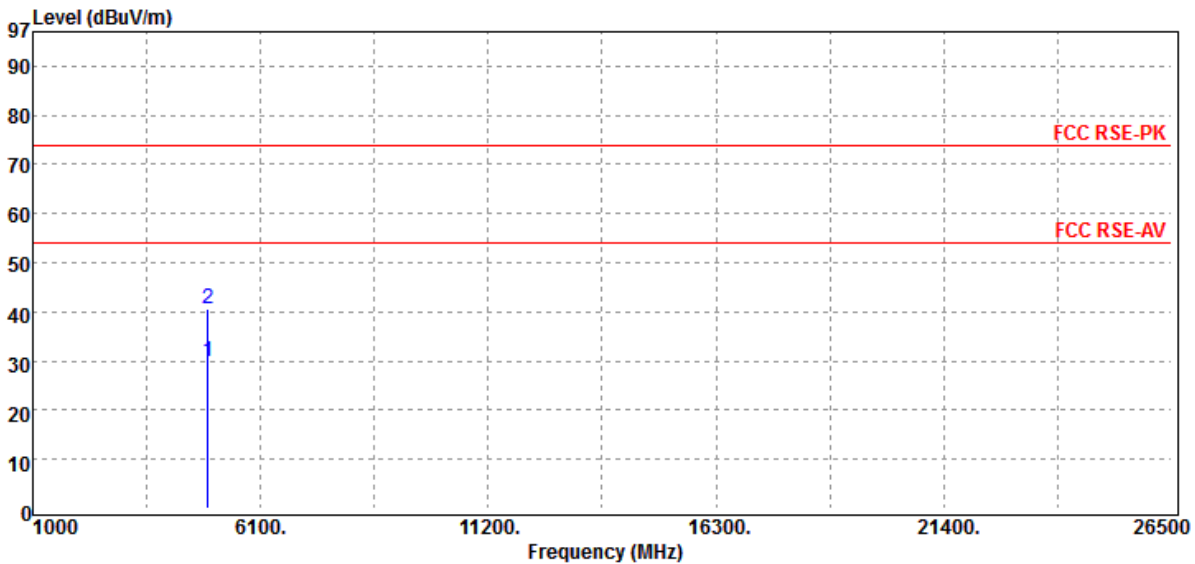
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Operation Band	:802.11b	Test Date	:2017-10-19
Fundamental Frequency	:2462 MHz	Temp./Humi.	:22 deg_C / 61 RH
Operation Mode	:Tx CH HIGH	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level d $\mu$ V	Factor dB	Actual FS d $\mu$ V/m	Limit @3m d $\mu$ V/m	Safe Margin dB
4924.00	H	Average	24.48	5.25	29.73	54.00	-24.27
4924.00	H	Peak	35.47	5.25	40.72	74.00	-33.28

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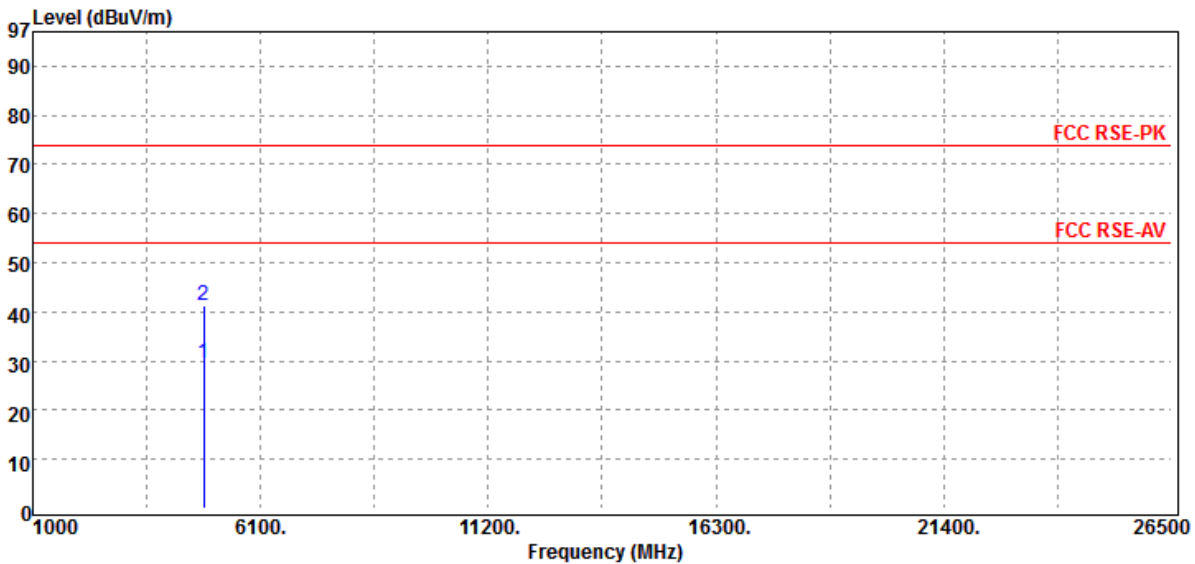
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Operation Band	:802.11g	Test Date	:2017-10-19
Fundamental Frequency	:2412 MHz	Temp./Humi.	:22 deg_C / 61 RH
Operation Mode	:Tx CH LOW	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



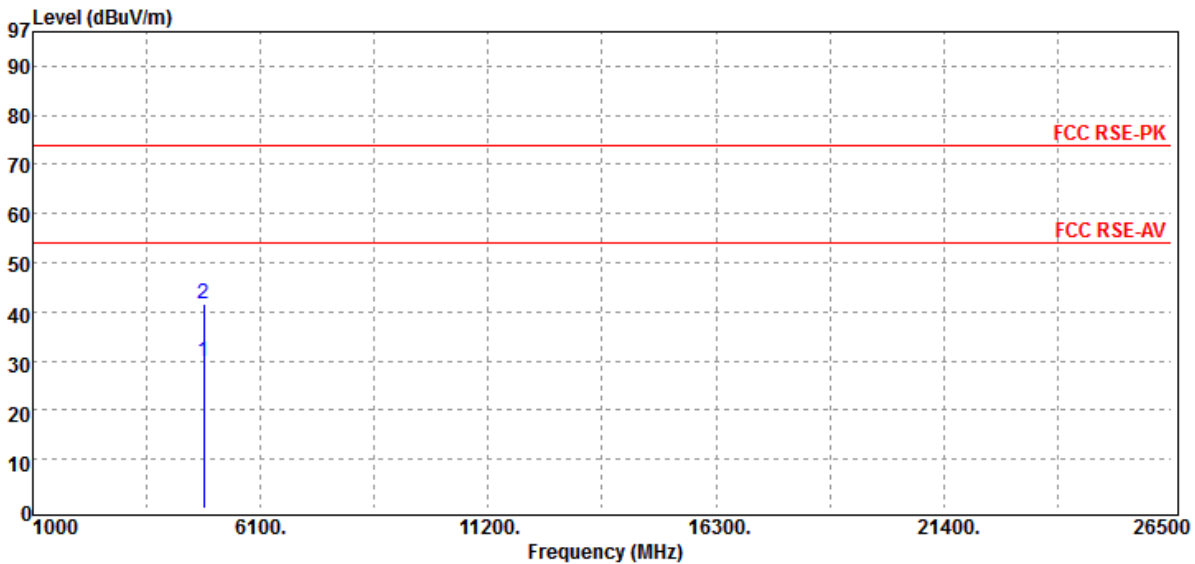
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
4824.00	H	Average	24.71	4.93	29.64	54.00	-24.36
4824.00	H	Peak	36.44	4.93	41.37	74.00	-32.63

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Operation Band	:802.11g	Test Date	:2017-10-19
Fundamental Frequency	:2412 MHz	Temp./Humi.	:22 deg_C / 61 RH
Operation Mode	:Tx CH LOW	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



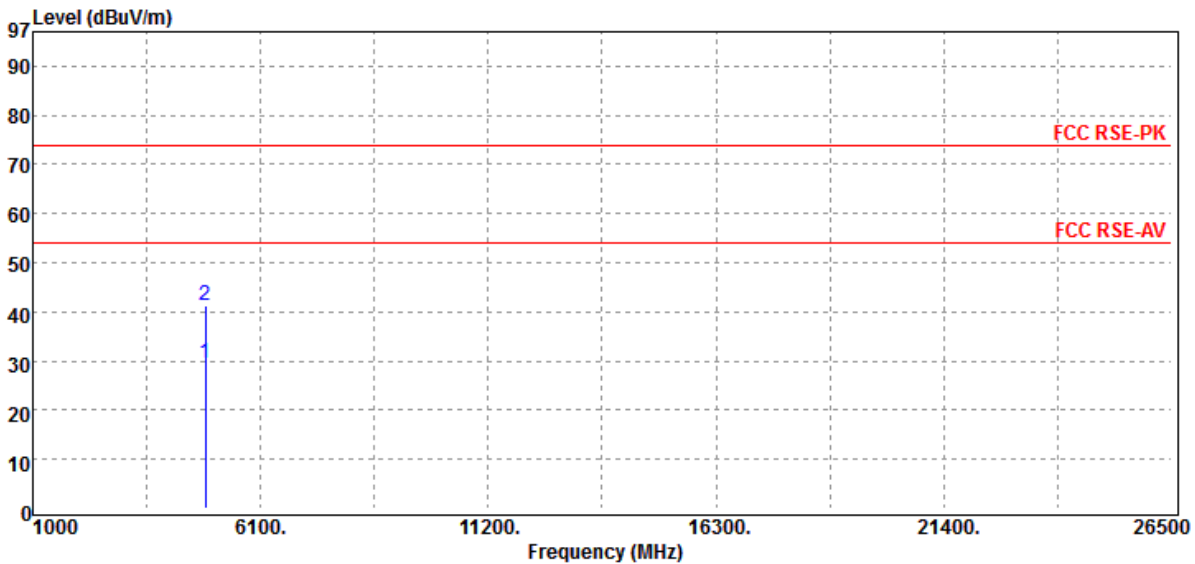
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	Margin
		PK/QP/AV	dB $\mu$ V		dB $\mu$ V/m	dB $\mu$ V/m	dB
4824.00	H	Average	24.89	4.93	29.82	54.00	-24.18
4824.00	H	Peak	36.75	4.93	41.68	74.00	-32.32

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Operation Band	:802.11g	Test Date	:2017-10-19
Fundamental Frequency	:2437 MHz	Temp./Humi.	:22 deg_C / 61 RH
Operation Mode	:Tx CH MID	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	Margin
		PK/QP/AV	dB $\mu$ V		dB $\mu$ V/m	dB $\mu$ V/m	dB
4874.00	H	Average	24.35	5.13	29.48	54.00	-24.52
4874.00	H	Peak	36.08	5.13	41.21	74.00	-32.79

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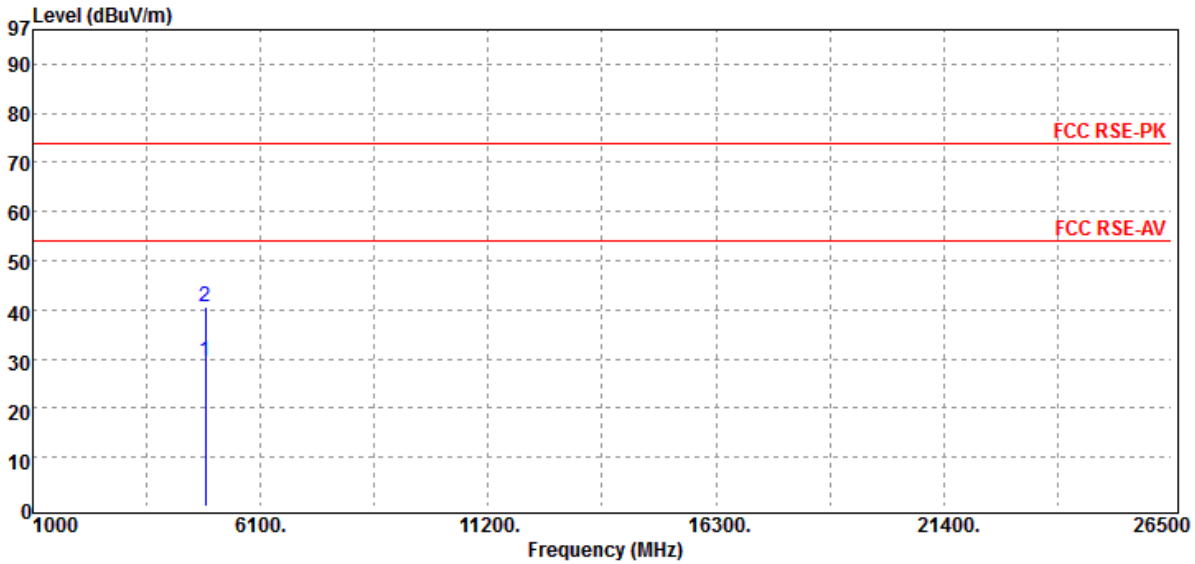
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Operation Band	:802.11g	Test Date	:2017-10-19
Fundamental Frequency	:2437 MHz	Temp./Humi.	:22 deg_C / 61 RH
Operation Mode	:Tx CH MID	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4874.00	H	Average	24.42	5.13	29.55	54.00	-24.45
4874.00	H	Peak	35.55	5.13	40.68	74.00	-33.32

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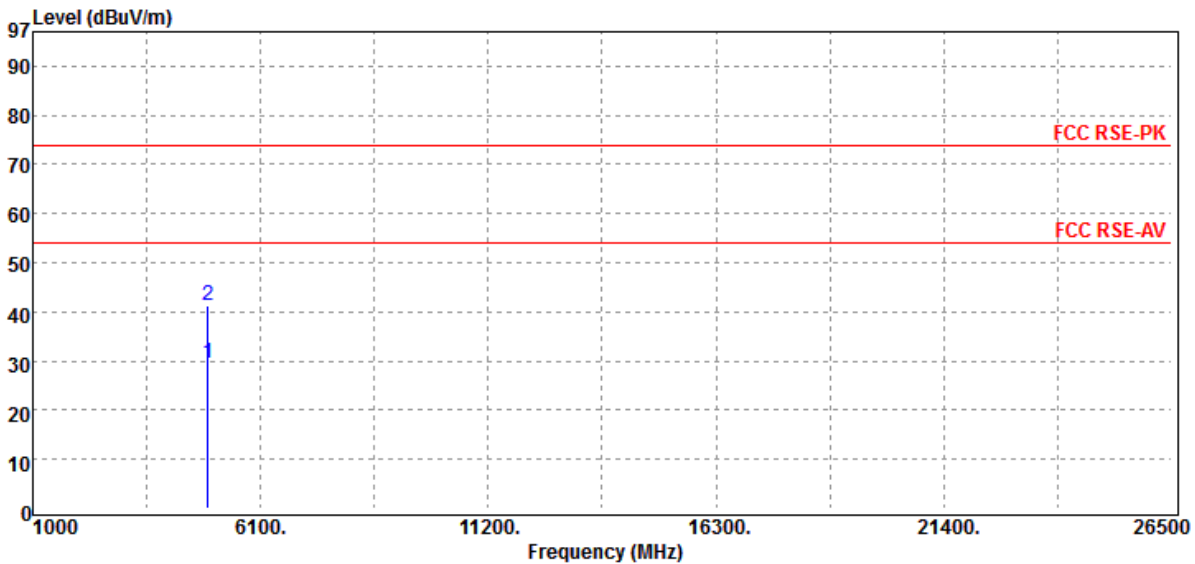
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Operation Band	:802.11g	Test Date	:2017-10-19
Fundamental Frequency	:2462 MHz	Temp./Humi.	:22 deg_C / 61 RH
Operation Mode	:Tx CH HIGH	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	Margin
		PK/QP/AV	dB $\mu$ V		dB $\mu$ V/m	dB $\mu$ V/m	dB
4924.00	H	Average	24.31	5.25	29.56	54.00	-24.44
4924.00	H	Peak	36.19	5.25	41.44	74.00	-32.56

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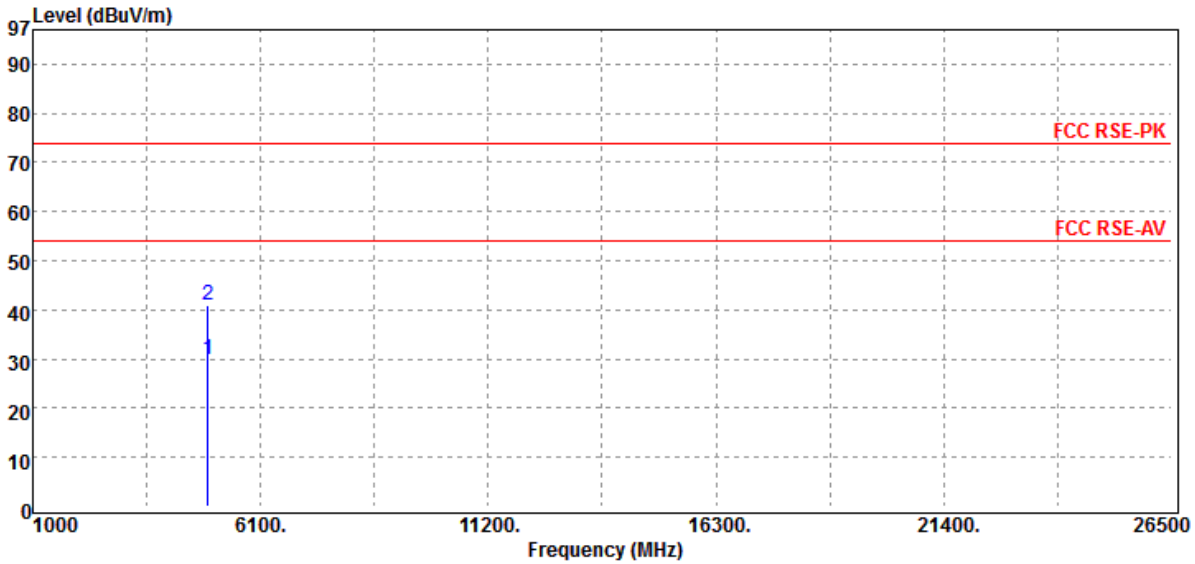
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Operation Band	:802.11g	Test Date	:2017-10-19
Fundamental Frequency	:2462 MHz	Temp./Humi.	:22 deg_C / 61 RH
Operation Mode	:Tx CH HIGH	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4924.00	H	Average	24.49	5.25	29.74	54.00	-24.26
4924.00	H	Peak	35.81	5.25	41.06	74.00	-32.94

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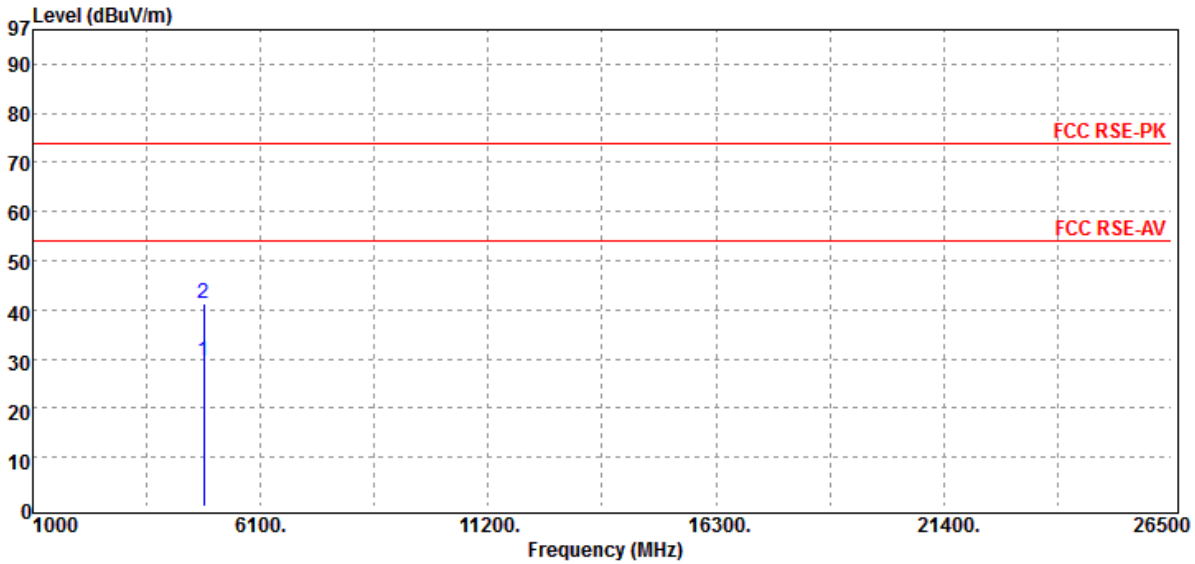
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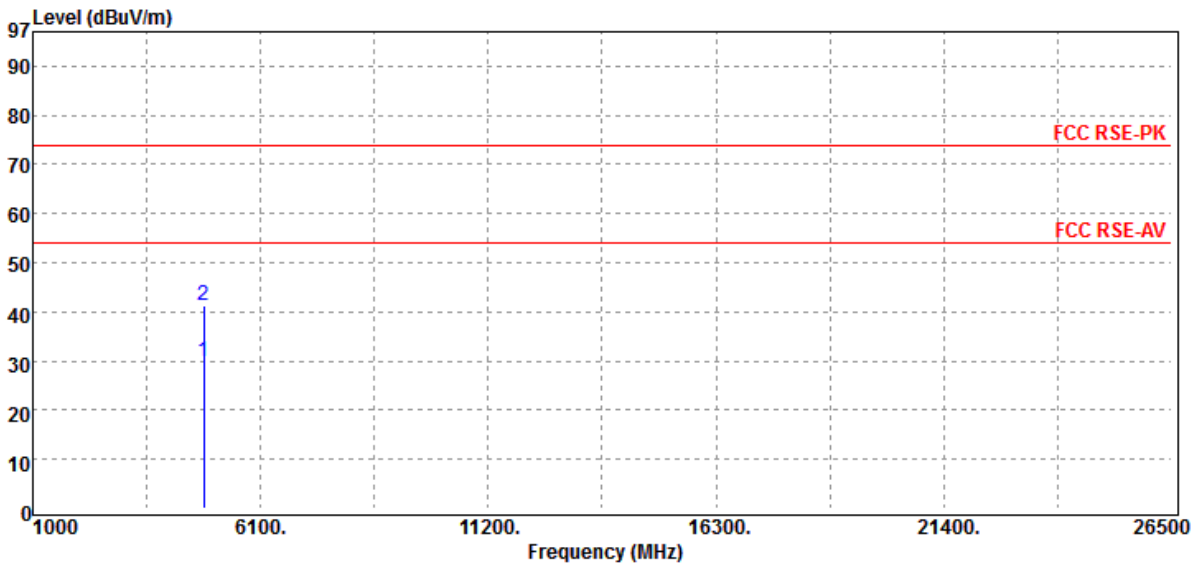
Operation Band	:802.11n20	Test Date	:2017-10-19
Fundamental Frequency	:2412 MHz	Temp./Humi.	:22 deg_C / 61 RH
Operation Mode	:Tx CH LOW	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
4824.00	H	Average	24.70	4.93	29.63	54.00	-24.37
4824.00	H	Peak	36.30	4.93	41.23	74.00	-32.77

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Operation Band	:802.11n20	Test Date	:2017-10-19
Fundamental Frequency	:2412 MHz	Temp./Humi.	:22 deg_C / 61 RH
Operation Mode	:Tx CH LOW	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL

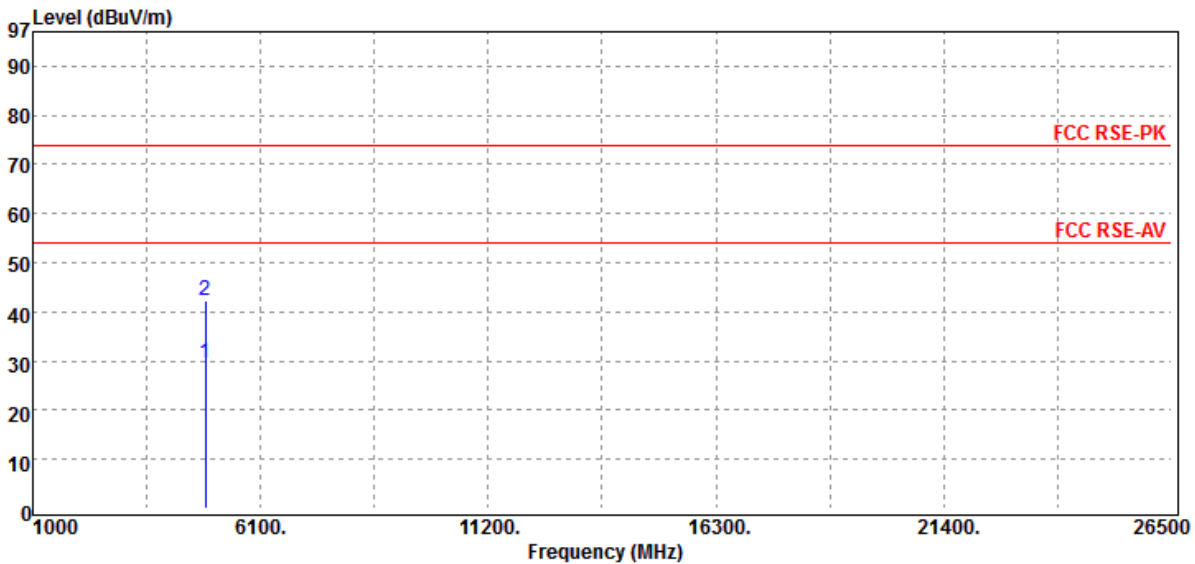


Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
4824.00	H	Average	24.82	4.93	29.75	54.00	-24.25
4824.00	H	Peak	36.34	4.93	41.27	74.00	-32.73

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Operation Band	:802.11n20	Test Date	:2017-10-19
Fundamental Frequency	:2437 MHz	Temp./Humi.	:22 deg_C / 61 RH
Operation Mode	:Tx CH MID	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



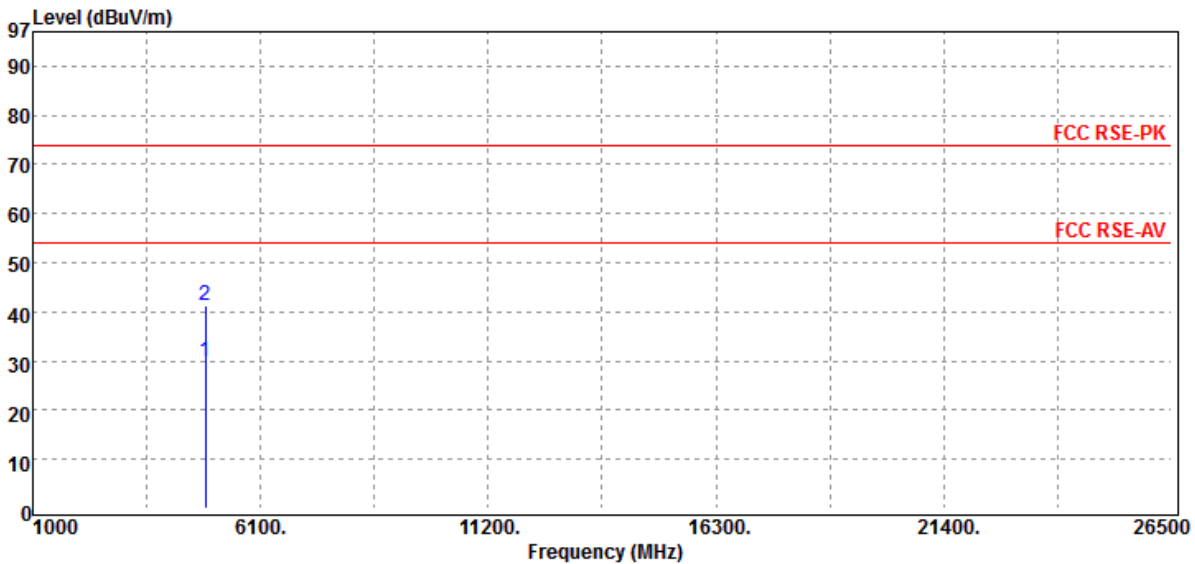
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	Margin
		PK/QP/AV	dBμV		dBμV/m	dBμV/m	dB
4874.00	H	Average	24.37	5.13	29.50	54.00	-24.50
4874.00	H	Peak	37.24	5.13	42.37	74.00	-31.63

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Operation Band	:802.11n20	Test Date	:2017-10-19
Fundamental Frequency	:2437 MHz	Temp./Humi.	:22 deg_C / 61 RH
Operation Mode	:Tx CH MID	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	Margin
		PK/QP/AV	dB $\mu$ V		dB $\mu$ V/m	dB $\mu$ V/m	dB
4874.00	H	Average	24.70	5.13	29.83	54.00	-24.17
4874.00	H	Peak	36.30	5.13	41.43	74.00	-32.57

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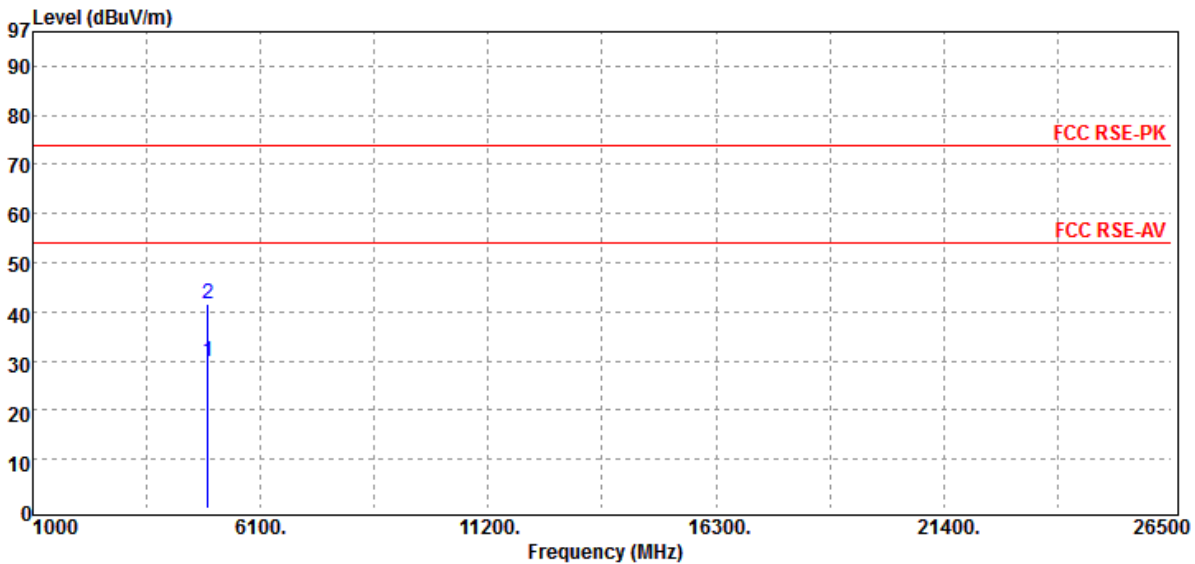
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Operation Band	:802.11n20	Test Date	:2017-10-19
Fundamental Frequency	:2462 MHz	Temp./Humi.	:22 deg_C / 61 RH
Operation Mode	:Tx CH HIGH	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	Margin
		PK/QP/AV	dBμV		dBμV/m	dBμV/m	dB
4924.00	H	Average	24.67	5.25	29.92	54.00	-24.08
4924.00	H	Peak	36.36	5.25	41.61	74.00	-32.39

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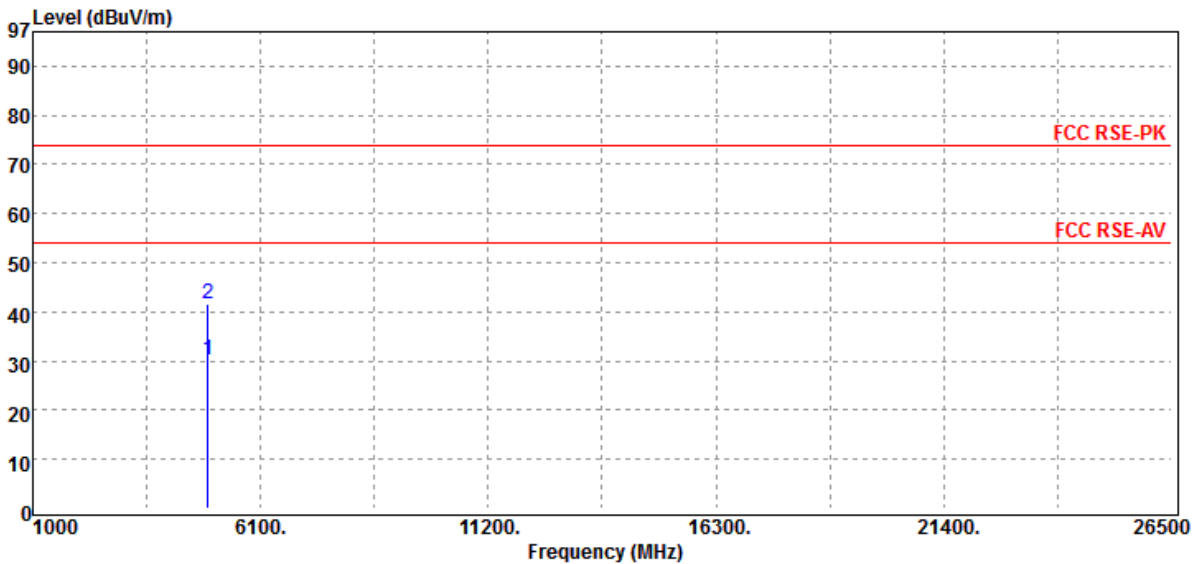
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Operation Band	:802.11n20	Test Date	:2017-10-19
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Operation Mode	:Tx CH HIGH	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
4924.00	H	Average	24.79	5.25	30.04	54.00	-23.96
4924.00	H	Peak	36.47	5.25	41.72	74.00	-32.28

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## 7 FIELD STRENGTH OF SPURIOUS RADIATION MEASUREMENT

### 7.1 Standard Applicable

According to FCC §2.1053,

FCC §24.238(a), the magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under the conditions specified in the instruction manual and/ or alignment procedure, shall not be less than  $43 + 10 \log$  (mean output power in watts) dBc below the mean power output outside a license's frequency block (-13dBm).

**Table 2 — Unwanted Emissions for Mobile, Portable and Low-Power Fixed Subscriber Equipment**

Frequency (MHz)	Attenuation (dB)
<2200	$43 + 10 \log_{10}(p)$
2200 - 2288	$70 + 10 \log_{10}(p)$
2288 - 2292	$67 + 10 \log_{10}(p)$
2292 - 2296	$61 + 10 \log_{10}(p)$
2296 - 2300	$55 + 10 \log_{10}(p)$
2300 - 2305	$43 + 10 \log_{10}(p)$
2305 - 2320	$43 + 10 \log_{10}(p)$ <sup>Note</sup>
2320 - 2324	$55 + 10 \log_{10}(p)$
2324 - 2328	$61 + 10 \log_{10}(p)$
2328 - 2337	$67 + 10 \log_{10}(p)$
2337 - 2341	$61 + 10 \log_{10}(p)$
2341 - 2345	$55 + 10 \log_{10}(p)$
2345 - 2360	$43 + 10 \log_{10}(p)$ <sup>Note</sup>
2360 - 2365	$43 + 10 \log_{10}(p)$
2365 - 2395	$70 + 10 \log_{10}(p)$
>2395	$43 + 10 \log_{10}(p)$

**Note:** Measured at the edges of the highest and lowest frequency range(s) in which the equipment is designed to operate. See Section 5.2 for the permitted frequency ranges for various equipment types.

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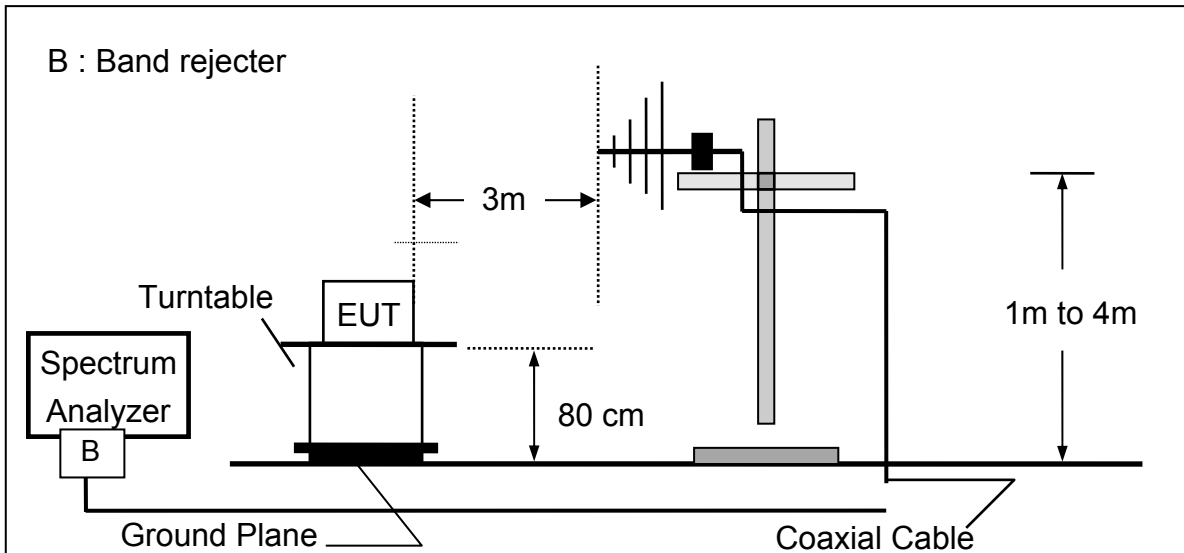
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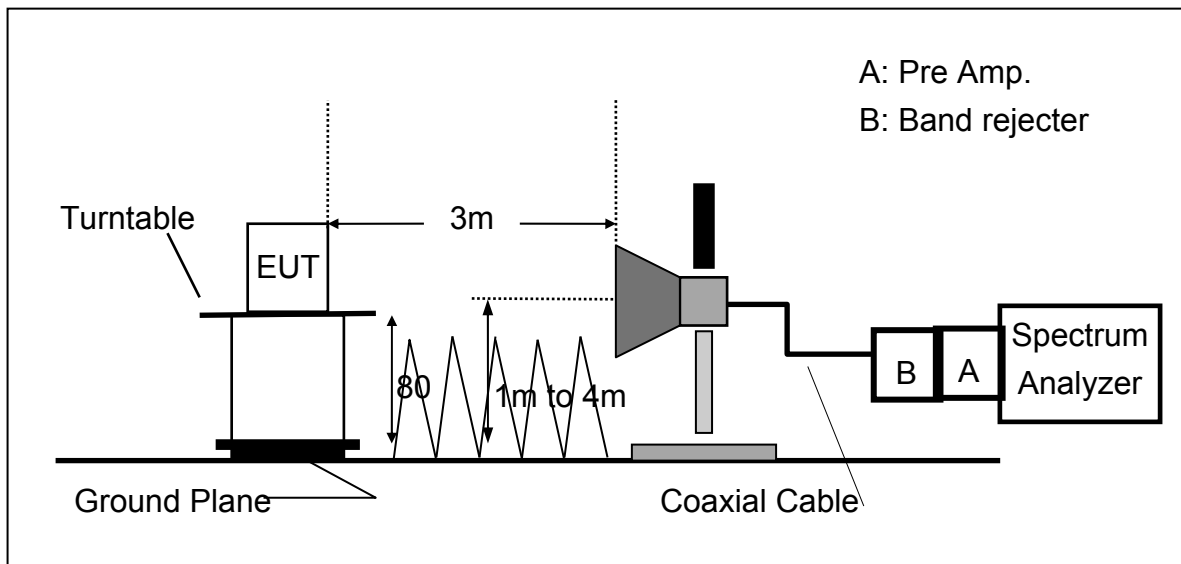
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## 7.2 EUT Setup

### Radiated Emission Test Set-Up, Frequency Below 1000MHz



### Radiated Emission Test Set-UP Frequency Over 1 GHz



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### 7.3 Measurement Procedure:

The EUT was placed on a non-conductive; the measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

The frequency range up to tenth harmonic was investigated for each of three fundamental frequencies (low, middle and high channels). Once spurious emission was identified, the power of the emission was determined using the substitution method.

The spurious emissions attenuation was calculated as the difference between radiated power at the fundamental frequency and the spurious emissions frequency.

$$\text{ERP (dBm)} = \text{SG Level(dBm)} + \text{Antenna Gain(dBd)} + \text{Cable Loss(dB)}$$

$$\text{EIRP (dBm)} = \text{SG Level(dBm)} + \text{Antenna Gain(dBi)} + \text{Cable Loss(dB)}$$

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.  
 “E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.  
 “---” : denotes Noise Floor.

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#### 7.4 Measurement Equipment Used:

ERP, EIRP MEASUREMENT EQUIPMENT List 966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI7	100760	05/11/2017	05/10/2018
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/25/2017	04/24/2018
Loop Antenna	ETS-Lindgren	6502	148045	09/20/2017	09/19/2018
Bilog Antenna	SCHWAZBECK	VULB9168	378	12/19/2016	12/18/2017
Horn Antenna	Schwarzbeck	BBHA9120D	1441	08/04/2017	08/03/2018
Pre-Amplifier	Agilent	8447D	2944A07676	01/03/2017	01/02/2018
Pre-Amplifier	EMC Instruments Corp.	EMC0126530	980038	01/03/2017	01/02/2018
Turn Table	HD	DT420	N/A	N.C.R	N.C.R
Antenna Tower	ChamPro	AM-BS-4500-B	060776-ABS	N.C.R	N.C.R
Controller	ChamPro	EM1000	60776	N.C.R	N.C.R
Low Loss Cable	Huber Suhner	966_RX	9	01/05/2017	01/04/2018
3m Site NSA	SGS	966 chamber	N/A	07/01/2017	06/30/2018
Low Loss Cable	Huber Suhner	966 TX	1	01/05/2017	01/04/2018
Horn Antenna	Schwarzbeck	BBHA9170	184	12/12/2016	12/11/2017
Pre-Amplifier	EMC Instruments Corp.	EMC184045	980135	01/05/2017	01/04/2018
EMI Test Receiver	R&S	ESCI7	100760	05/11/2017	05/10/2018
Radio Communication Analyzer	R&S	CMU200	102189	02/11/2017	02/10/2018
Radio Communication Analyzer	Anritsu	MT8820C	6201465317	01/03/2017	01/02/2018

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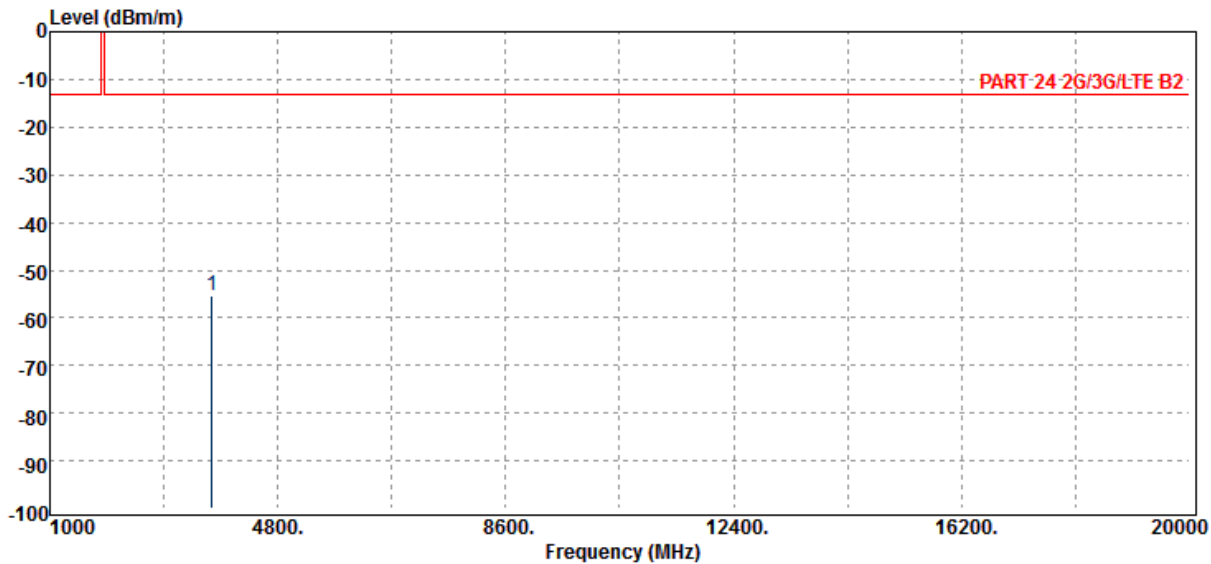
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### 7.5 Measurement Result:

Operation Band	:GPRS 1900	Temp./Humi.	:22 deg_C / 62 RH
Fundamental Frequency	:1850.2 MHz	Engineer	:Tin
Operation Mode	:Tx CH LOW		
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	Note F/H/E/S	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBi	Cable Loss dB	Limit dBm	Margin dB
3700.40	H	-55.27	-61.13	12.44	-6.58	-13.00	-42.27

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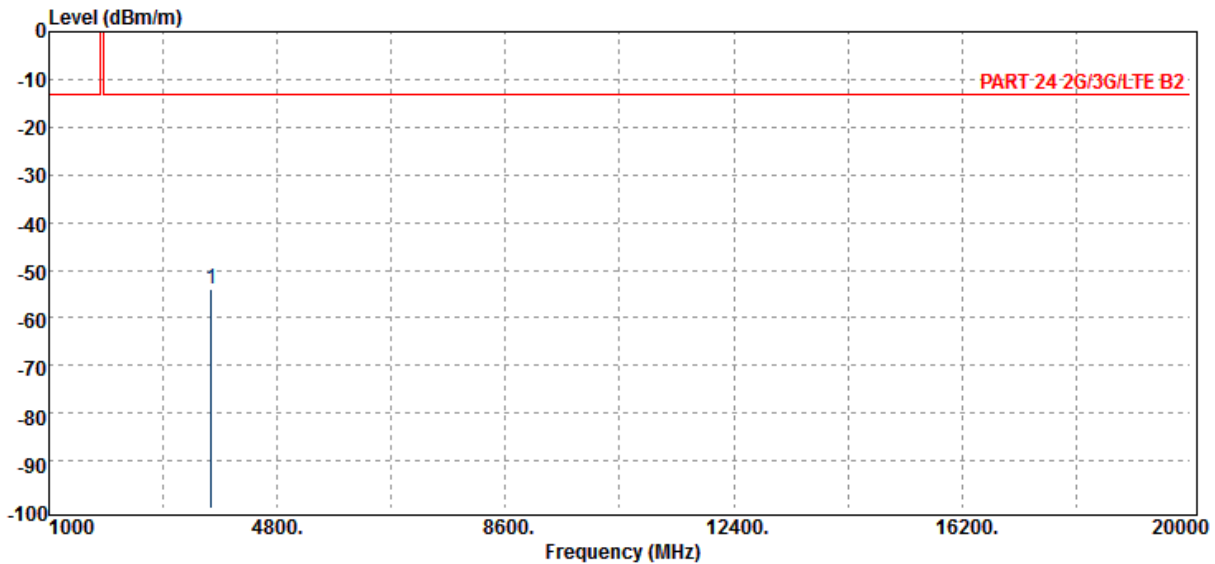
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Fundamental Frequency	:1850.2 MHz	Engineer	:Tin
Operation Mode	:Tx CH LOW		
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq. MHz	Note F/H/E/S	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBi	Cable Loss dB	Limit dBm	Margin dB
3700.40	H	-54.11	-59.97	12.44	-6.58	-13.00	-41.11

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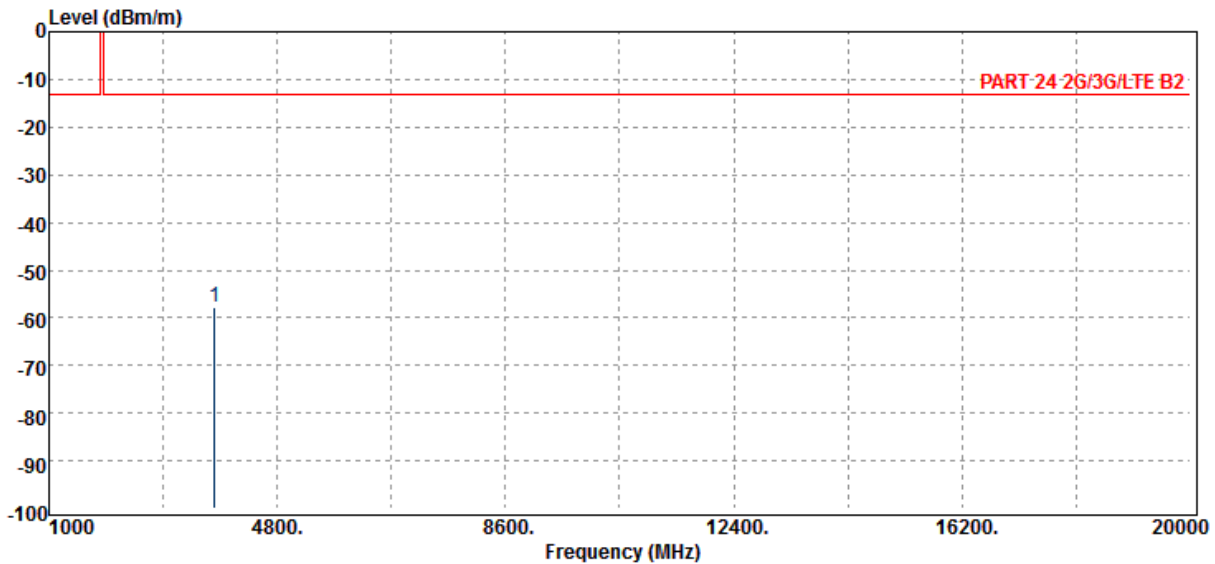
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Operation Band	:GPRS 1900	Temp./Humi.	:22 deg_C / 62 RH
Fundamental Frequency	:1880 MHz	Engineer	:Tin
Operation Mode	:Tx CH MID		
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	Note F/H/E/S	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBi	Cable Loss dB	Limit dBm	Margin dB
3760.00	H	-57.63	-63.49	12.45	-6.60	-13.00	-44.63

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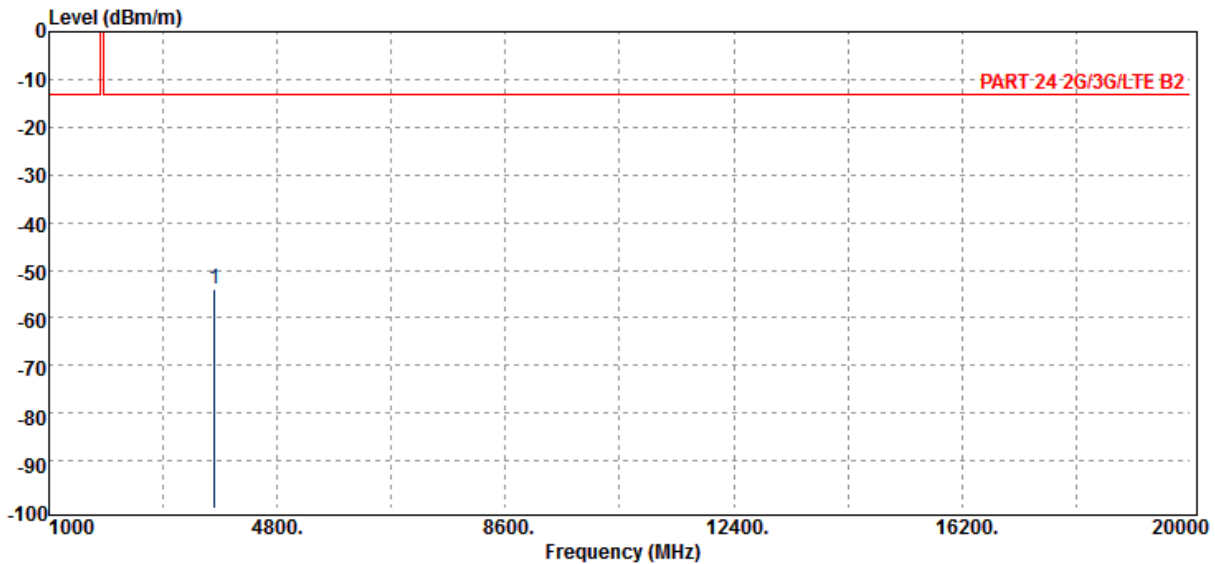
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Fundamental Frequency	:1880 MHz	Engineer	:Tin
Operation Mode	:Tx CH MID		
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq. MHz	Note F/H/E/S	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBi	Cable Loss dB	Limit dBm	Margin dB
3760.00	H	-53.86	-59.71	12.45	-6.60	-13.00	-40.86

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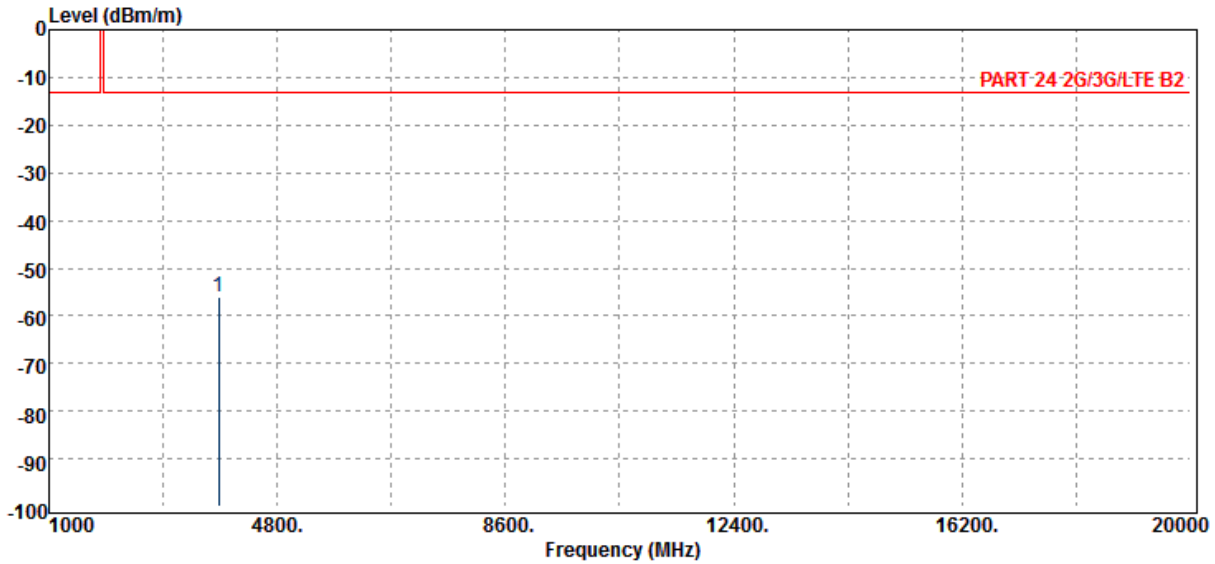
t (886-2) 2299-3279

f (886-2) 2298-0488

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Operation Band	:GPRS 1900	Temp./Humi.	:22 deg_C / 62 RH
Fundamental Frequency	:1909.8 MHz	Engineer	:Tin
Operation Mode	:Tx CH HIGH		
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	Note F/H/E/S	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBi	Cable Loss dB	Limit dBm	Margin dB
3819.60	H	-56.12	-61.94	12.47	-6.65	-13.00	-43.12

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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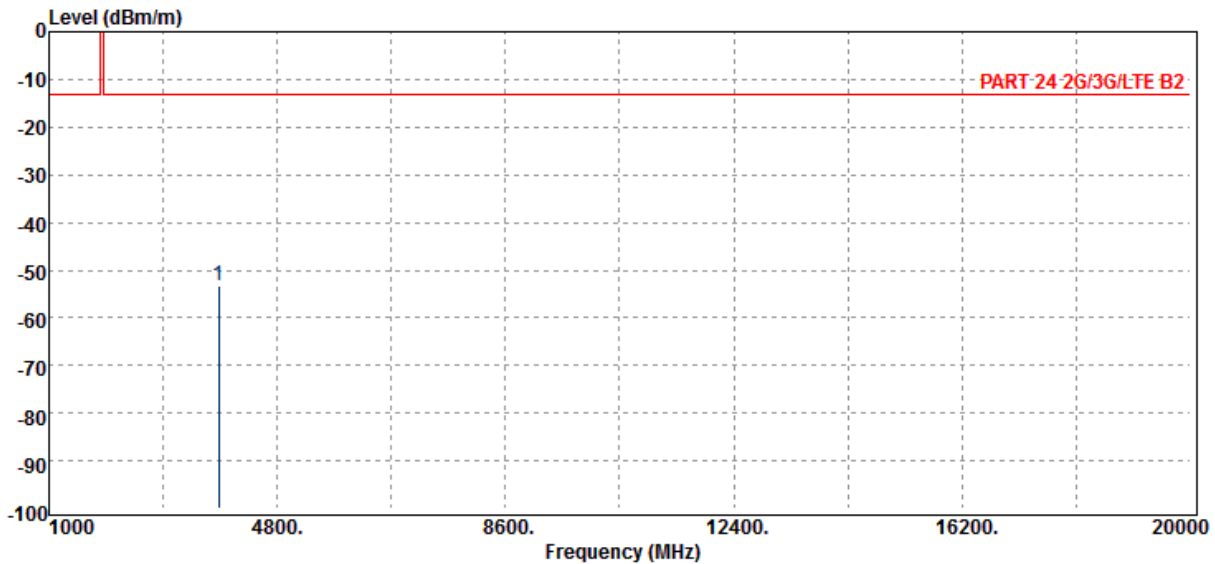
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Operation Band	:GPRS 1900	Temp./Humi.	:22 deg_C / 62 RH
Fundamental Frequency	:1909.8 MHz	Engineer	:Tin
Operation Mode	:Tx CH HIGH		
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq. MHz	Note F/H/E/S	ERP/EIRP dBm	SG Output Level dBm	Antenna Gain dBi	Cable Loss dB	Limit dBm	Margin dB
3819.60	H	-53.16	-58.98	12.47	-6.65	-13.00	-40.16

~ End of Report ~

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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