

## ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

### INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT AND INDUSTRY CANADA RSS 247 CLASS II & IV PC REPORT

OF

**Product Name:** 802.11a/b/g/n/ac + BT4.1 M.2 2230 Type Card  
**Brand Name:** Qualcomm Atheros  
**Model No.:** QCNFA344A  
**Model Difference:** N/A  
**FCC ID:** PPD-QCNFA344AH  
**IC:** 4104A-QCNFA344A  
**Report No.:** E2/2017/B0027  
**Issue Date:** Dec. 27, 2017  
**FCC Rule Part:** §15.247, Cat: DSS  
**IC Rule:** RSS-247 issue 2 :2017  
**Prepared for:** Qualcomm Atheros, Inc.  
1700 Technology Drive, San Jose, CA  
95110  
**Prepared by:** SGS Taiwan Ltd.  
Electronics & Communication Laboratory  
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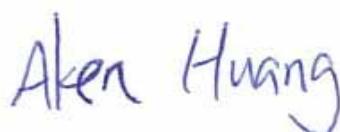
## VERIFICATION OF COMPLIANCE

**Applicant:** Qualcomm Atheros, Inc.  
1700 Technology Drive, San Jose, CA 95110  
**Product Name:** 802.11a/b/g/n/ac + BT4.1 M.2 2230 Type Card  
**Brand Name:** Qualcomm Atheros  
**Model No.:** QCNFA344A  
**Model Difference:** N/A  
**FCC ID:** PPD-QCNFA344AH  
**IC:** 4104A-QCNFA344A  
**File Number:** E2/2017/B0027  
**Date of test:** Oct. 21, 2017 ~ Dec. 27, 2017  
**Date of EUT Received:** Oct. 21, 2017

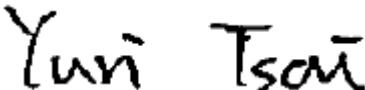
**We hereby certify that:**

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.

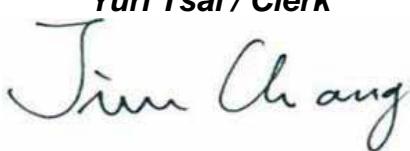
The test results of this report relate only to the tested sample identified in this report.

**Test By:****Date:**

Dec. 27, 2017

*Aken Huang / Engineer***Prepared By:****Date:**

Dec. 27, 2017

*Yuri Tsai / Clerk***Approved****By:****Date:**

Dec. 27, 2017

*Jim Chang / Asst. Manager*

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## Revision History

Report Number	Revision	Description	Issue Date
E2/2017/B0027	Rev.00	Initial creation of document	Dec. 27, 2017

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# 1 GENERAL INFORMATION

## 1.1 Product description

General:

Product Name of Host:	Notebook Computer	
Brand Name:		
Marketing Name of Host:	SF315-41, SF315-41G	
Model No. of Host:	N17P4	
Model Difference:	N/A	
Hardware Version:	REV:1.1	
Software Version:	Win 10	
Model No. of BT/WLAN Module:	QCNFA344A	
Module FCC ID:	PPD-QCNFA344AH	
Module IC:	4104A-QCNFA344A	
Scope:	The test report covers the radiated emissions requirements of the standards referenced in the report to allow system level approval of the module in this specific host.	
Class II & Class IV Permissive change:	802.11a/b/g/n/ac + BT4.1 M.2 2230 Type Card INSTALLED IN Notebook Computer	
Power Supply:	15.20Vdc from Rechargeable Li-polymer Battery Pack or 19V by AC/DC Power Adapter	
	Battery:	Model No.: AC14B8K, Supplier: LG
	Adapter:	Model No.: A11-065N1A, Supplier: Chicony

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### Bluetooth\_BR+EDR:

Bluetooth Version	V4.0 dual mode
Channel number:	79 channels
Modulation type:	GFSK + $\pi/4$ DQPSK + 8DPSK
Transmit Power:	8.45dBm
Type of Emission:	BR: 942KG1D, EDR: 1M23F1D
Frequency Range:	2.402GHz – 2.480GHz
Antenna Designation:	PIFA Antenna, Supplier: Wistron Corporation P/N: 81EAAL15.GGN, Gain: -0.75dBi (Aux)

## 1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247

FCC Public Notice DA 00-705 Measurement Guidelines

ANSI C63.10:2013

Canada RSS-247 issue 2: 2017

Canada RSS-Gen issue 4: 2014

#### 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.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333 (TAF code 0513)

FCC Registration Numbers are: 735305

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 placed on a turn table which is 0.8 m above ground plan. 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 placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plan. 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 Configuration of Tested System

Fig. 2-1 Configuration of Tested System



Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	BT Test Software	N/A	N/A	N/A	N/A	N/A

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### 3 SUMMARY OF TEST RESULTS

FCC Rules	IC Rules	Description Of Test	Result
§15.247(b) (3)	RSS-247 §5.4 (2)	Peak Output Power	Compliant
§15.247(d)	RSS-247 §5.5	Radiated Spurious Emission	Compliant
§15.203 §15.247(b)	-	Antenna Requirement	Compliant

### 4 DESCRIPTION OF TEST MODES

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

79 channels are provided for Bluetooth

CH	FREQUENCY	CH	FREQUENCY	CH	FREQUENCY	CH	FREQUENCY
0	2402 MHz	20	2422 MHz	40	2442 MHz	70	2462 MHz
1	2403 MHz	21	2423 MHz	41	2443 MHz	71	2463 MHz
2	2404 MHz	22	2424 MHz	42	2444 MHz	72	2464 MHz
3	2405 MHz	23	2425 MHz	43	2445 MHz	73	2465 MHz
4	2406 MHz	24	2426 MHz	44	2446 MHz	74	2466 MHz
5	2407 MHz	25	2427 MHz	45	2447 MHz	75	2467 MHz
6	2408 MHz	26	2428 MHz	46	2448 MHz	76	2468 MHz
7	2409 MHz	27	2429 MHz	47	2449 MHz	77	2469 MHz
8	2410 MHz	28	2430 MHz	48	2450 MHz	78	2470 MHz
9	2411 MHz	29	2431 MHz	49	2451 MHz	79	2471 MHz
10	2412 MHz	30	2432 MHz	50	2452 MHz	70	2472 MHz
11	2413 MHz	31	2433 MHz	51	2453 MHz	71	2473 MHz
12	2414 MHz	32	2434 MHz	52	2454 MHz	72	2474 MHz
13	2415 MHz	33	2435 MHz	53	2455 MHz	73	2475 MHz
14	2416 MHz	34	2436 MHz	54	2456 MHz	74	2476 MHz
15	2417 MHz	35	2437 MHz	55	2457 MHz	75	2477 MHz
16	2418 MHz	36	2438 MHz	56	2458 MHz	76	2478 MHz
17	2419 MHz	37	2439 MHz	57	2459 MHz	77	2479 MHz
18	2420 MHz	38	2440 MHz	58	2460 MHz	78	2480 MHz
19	2421 MHz	39	2441 MHz	59	2461 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.
- 3 Investigation has been done on all the possible configurations for searching the worst case.

Radiated Emission Test (ABOVE 1 GHz) (Worst case)				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	PACKET TYPE
Bluetooth	0 to 78	0,39,78	GFSK	DH5

**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 Transmitter for channel Low, Mid and High, the worst case H position was reported.

## ANTENNA PORT CONDUCTED MEASUREMENT:

CONDUCTED TEST					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
Bluetooth	0 to 78	0,39,78	GFSK	1	Aux

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## 5 ASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
Peak Output Power	+/- 0.84 dB
20dB Bandwidth	+/- 51.33 Hz
100 KHz Bandwidth Of Frequency Band Edges	+/- 0.84 dB
Frequency Separation	+/- 51.33 Hz
Number of hopping frequency	+/- 51.33 Hz
Time of Occupancy	+/- 51.33 Hz
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, AC= +/- 0.2%

Radiated Spurious Emission:

Measurement uncertainty (Polarization : <b>Vertical</b> )	9kHz-30MHz: +/- 2.87dB
	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: +/- 2.87dB
	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 PEAK OUTPUT POWER MEASUREMENT

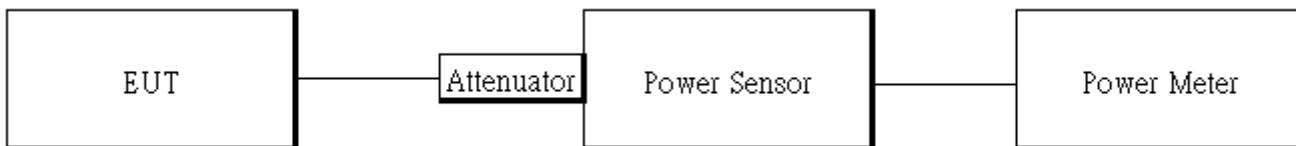
### 6.1 Standard Applicable

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, The Limit: 1Watt. For all other frequency hopping systems in the 2400 – 2483.5MHz band: The Limit: 0.125 Watts. The power limit for 1Mbps is 1watt, and 2Mbps, 3Mbps and AFH mode are 0.125 watts.

### 6.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010A	MY51440113	06/20/2017	06/19/2018
Power Meter	Anritsu	ML2496A	1326001	06/23/2017	06/22/2018
Power Sensor	Anritsu	MA2411B	1315048	06/23/2017	06/22/2018
Power Sensor	Anritsu	MA2411B	1315049	06/23/2017	06/22/2018
Coaxial Cable 30cm	WOKEN	00100A1F1A195C	RF01	12/12/2016	12/11/2017
DC Block	PASTERNACK	PE8210	RF29	12/12/2016	12/11/2017
Splitter	RF-LAMBAD	RFLT2W1G18G	RF35	12/12/2016	12/11/2017
Attenuator	WOKEN	218FS-10	RF23	12/12/2016	12/11/2017
DC Power Supply	Agilent	E3640A	MY53140006	05/02/2017	05/01/2018

### 6.3 Test Set-up:



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## 6.4 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter or spectrum. (Max Hold, Detector = Peak, RBW >=20dB bandwidth)
4. Record the max. reading.
5. Repeat above procedures until all default test channel is completed.

### Power Meter:

It is used as the auxiliary test equipment to conduct the output power measurement.

1. Record the max. Reading as observed from Power Meter.
2. Repeat above procedures until all test default channel measured was complete.

## 6.5 Measurement Result:

### BR mode (GFSK) (Peak):

Frequency (MHz)	Reading Power (dBm)	Output Power (W)	Limit (W)
2402.00	6.28	0.00425	0.125
2441.00	7.08	0.00511	0.125
2480.00	<b>7.23</b>	0.00528	0.125

### BR mode (GFSK) (Average):

Frequency (MHz)	Reading Power (dBm)	Output Power (W)	Limit (W)
2402.00	4.82	0.00303	0.125
2441.00	<b>5.22</b>	0.00333	0.125
2480.00	4.98	0.00315	0.125

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**EDR mode ( $\pi/4$ DQPSK) (Peak):**

Frequency (MHz)	Reading Power (dBm)	Output Power (W)	Limit (W)
2402.00	7.51	0.00564	0.125
2441.00	8.31	0.00678	0.125
2480.00	<b>8.45</b>	0.00700	0.125

**EDR mode ( $\pi/4$ DQPSK) (Average):**

Frequency (MHz)	Reading Power (dBm)	Output Power (W)	Limit (W)
2402.00	3.54	0.00226	0.125
2441.00	<b>3.83</b>	0.00242	0.125
2480.00	3.61	0.00230	0.125

**EDR mode (8DPSK) (Peak):**

Frequency (MHz)	Reading Power (dBm)	Output Power (W)	Limit (W)
2402.00	7.09	0.00512	0.125
2441.00	7.89	0.00615	0.125
2480.00	<b>8.02</b>	0.00634	0.125

**EDR mode (8DPSK) (Average):**

Frequency (MHz)	Reading Power (dBm)	Output Power (W)	Limit (W)
2402.00	2.40	0.00174	0.125
2441.00	<b>2.81</b>	0.00191	0.125
2480.00	2.64	0.00184	0.125

**\*Note: Measured by power meter, cable loss as 11dB that offsets on the power meter.**

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## 7 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

### 7.1 Standard Applicable

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands must also comply with the §15.209 limit as below.

And according to §15.33(a) (1), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

Frequency (MHz)	Field strength (microvolts/meter)	Distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

**Note:**

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dB $\mu$ V/m) = 20 log Emission level (dB $\mu$ V/m)

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## 7.2 Measurement Equipment Used

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESU 40	100363	04/18/2017	04/17/2018
Loop Antenna	ETS-Lindgren	6502	00143303	12/23/2016	12/22/2017
Broadband Antenna	TESEQ	CBL 6112D	35240	11/03/2017	11/02/2018
Horn Antenna	ETS-Lindgren	3117	00143272	12/15/2016	12/16/2017
Horn Antenna	Schwarzbeck	BBHA9170	185	08/01/2017	07/31/2018
Pre Amplifier	EMC Instruments	EMC330	980096	12/12/2016	12/11/2017
Pre Amplifier	EMC Instruments	EMC0011830	980199	12/12/2016	12/11/2017
Pre Amplifier	R&S	SCU-18	10204	12/12/2016	12/11/2017
Pre Amplifier	R&S	SCU-26	100780	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	RG 214/U	966Rx 9K-30M	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	RG 214/U SUCOFLEX 104	966Rx 30M-3G	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Rx 1G-18G	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	mini 141-12 SUCOFLEX 104	966Rx 18G-40G	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Tx 30M-18G	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	966Tx 18G-40G	12/12/2016	12/11/2017
Attenuator	WOKEN	218FS-10	RF27	12/12/2016	12/11/2017
Site NSA	SGS	966 Chamber C	SAC-C	03/02/2017	03/01/2018
Site VSWR	SGS	966 Chamber C	SAC-C	03/02/2017	03/01/2018
DC Power Supply	HOLA	DP-3003	D7070035	05/04/2017	05/03/2018
Controller	MF	MF-7802	N/A	N.C.R.	N.C.R.
Antenna Master	MF	N/A	N/A	N.C.R.	N.C.R.
Turn Table	MF	N/A	N/A	N.C.R.	N.C.R.
Test Software	World-Pallas	Dr. E	V 3.0 Lite	N.C.R.	N.C.R.

**NOTE:** N.C.R refers to Not Calibrated Required.

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Loop Antenna	ETS-Lindgren	6502	00143303	12/23/2017	12/22/2018
Horn Antenna	ETS-Lindgren	3117	00143272	12/15/2017	12/16/2018
Pre Amplifier	EMC Instruments	EMC330	980096	12/24/2017	12/23/2018
Pre Amplifier	EMC Instruments	EMC0011830	980199	12/24/2017	12/23/2018
Pre Amplifier	R&S	SCU-18	10204	12/24/2017	12/23/2018
Pre Amplifier	R&S	SCU-26	100780	12/24/2017	12/23/2018
Coaxial Cable	Huber+Suhner	RG 214/U	966Rx 9K-30M	12/24/2017	12/23/2018
Coaxial Cable	Huber+Suhner	RG 214/U SUCOFLEX 104	966Rx 30M-3G	12/24/2017	12/23/2018
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Rx 1G-18G	12/24/2017	12/23/2018
Coaxial Cable	Huber+Suhner	mini 141-12 SUCOFLEX 104	966Rx 18G-40G	12/24/2017	12/23/2018
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Tx 30M-18G	12/24/2017	12/23/2018
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	966Tx 18G-40G	12/24/2017	12/23/2018
Attenuator	WOKEN	218FS-10	RF27	12/24/2017	12/23/2018

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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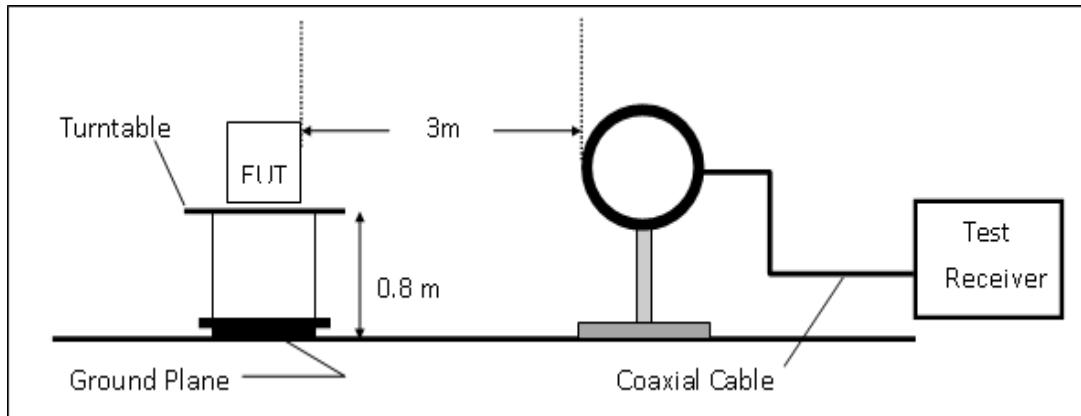
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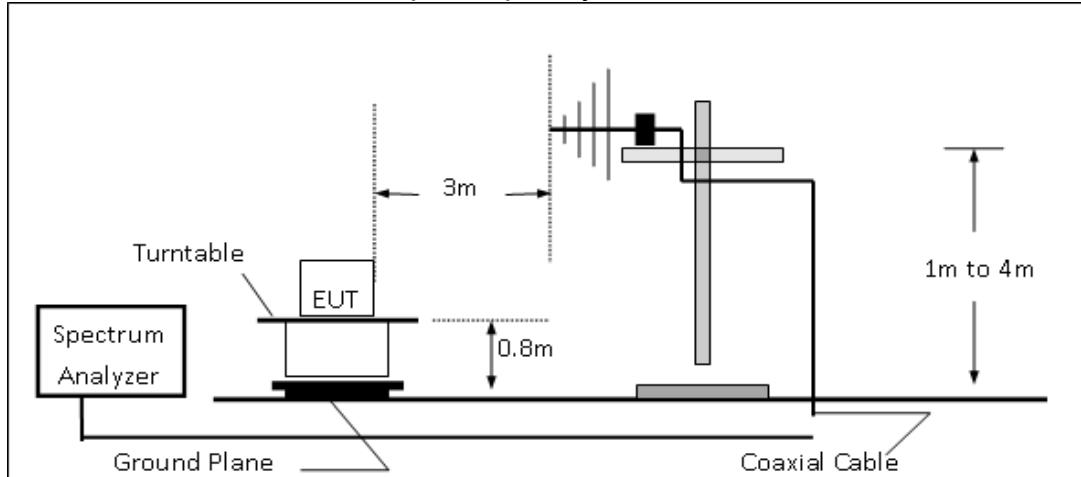
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### 7.3 Test SET-UP

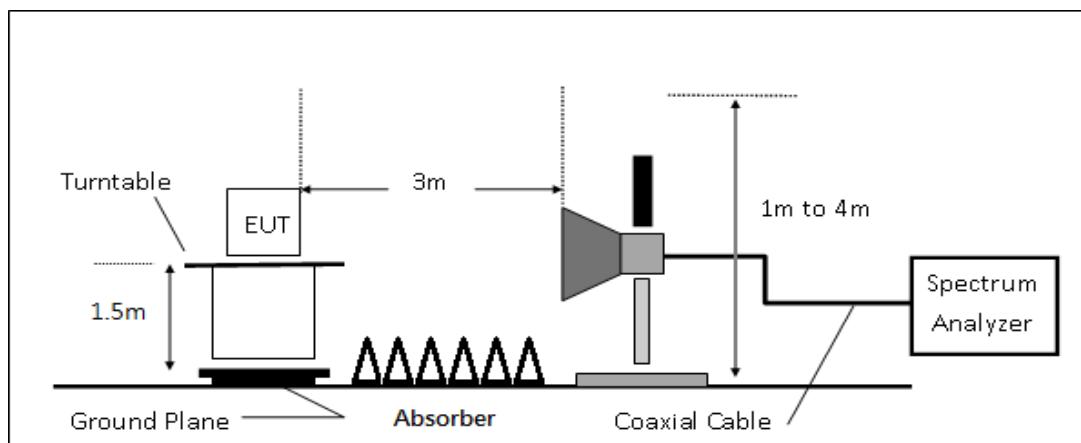
#### (A) Radiated Emission Test Set-UP Frequency Below 30MHz.



#### (B) Radiated Emission Test Set-UP, Frequency from 30MHz to 1000MHz



#### (C) Radiated Emission Test Set-UP Frequency Over 1 GHz



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## 7.4 Measurement Procedure

### Radiated Emission

1. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
2. The EUT was placed on a turn table with 0.8m for frequency < 1GHz and 1.5m for frequency > 1GHz above ground plan.
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. Use the follow spectrum analyzer setting:
  - (1) Span = wide enough to fully capture the emission being measured
  - (2) RBW = 1 MHz for  $f \geq 1$  GHz, 100 kHz for  $f < 1$  GHz, VBW  $\geq$  RBW, Sweep = auto, Detector function = peak, Trace = max hold
  - (3) For average measurement: use duty cycle correction factor method per 15.35(c)  
Duty Cycle = On time/100 milliseconds  
On time =  $N1 \cdot L1 = N2 \cdot L2 + \dots + N(n-1) \cdot L(n-1) + N(n) \cdot L(n)$   
Where N1 is number of type 1 pulses, L1 is length of type 1 pulses, etc.  
Average Emission Level = Peak Emission Level +  $20 \cdot \log_{10}$  (duty Cycle)
6. 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.
7. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
8. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
9. Repeat above procedures until all frequency of the interest measured were complete.

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## 7.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

The limit of the emission level is expressed in dB $\mu$ V/m, which converts  $20 \times \log(\mu\text{V}/\text{m})$

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/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.

## 7.6 Test Results of Radiated Spurious Emissions from 9 KHz to 30 MHz

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit per 15.31(o) was not reported.

## 7.7 Measurement Result

Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

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台灣檢驗科技股份有限公司

t (886-2) 2299-3279

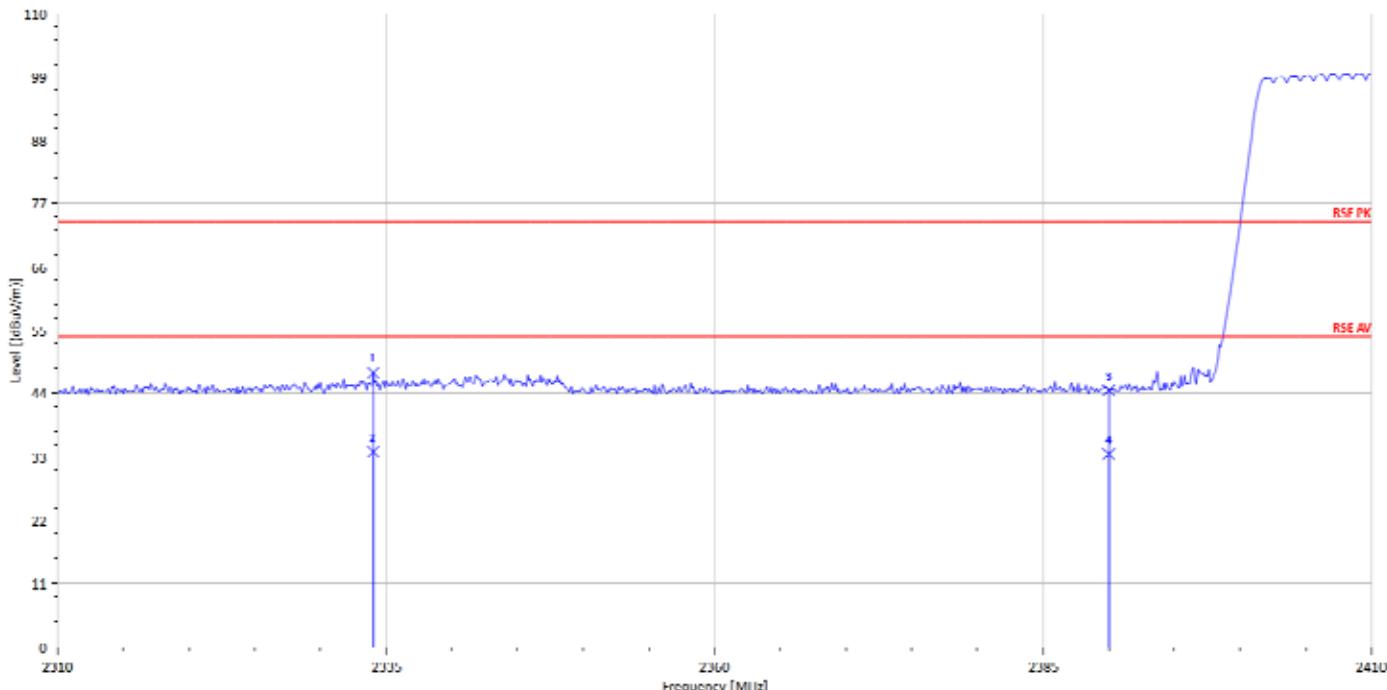
f (886-2) 2298-0488

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## Radiated Band Edge Measurement Result: (Hopping Mode)

Operation Mode : BT BR Hopping Test Date : 2017/12/27  
 Fundamental Frequency : 2402 MHz Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : BE CH Low Test Engineer : Ashton  
 EUT Pol. : H Measurement Antenna Pol. : Vertical



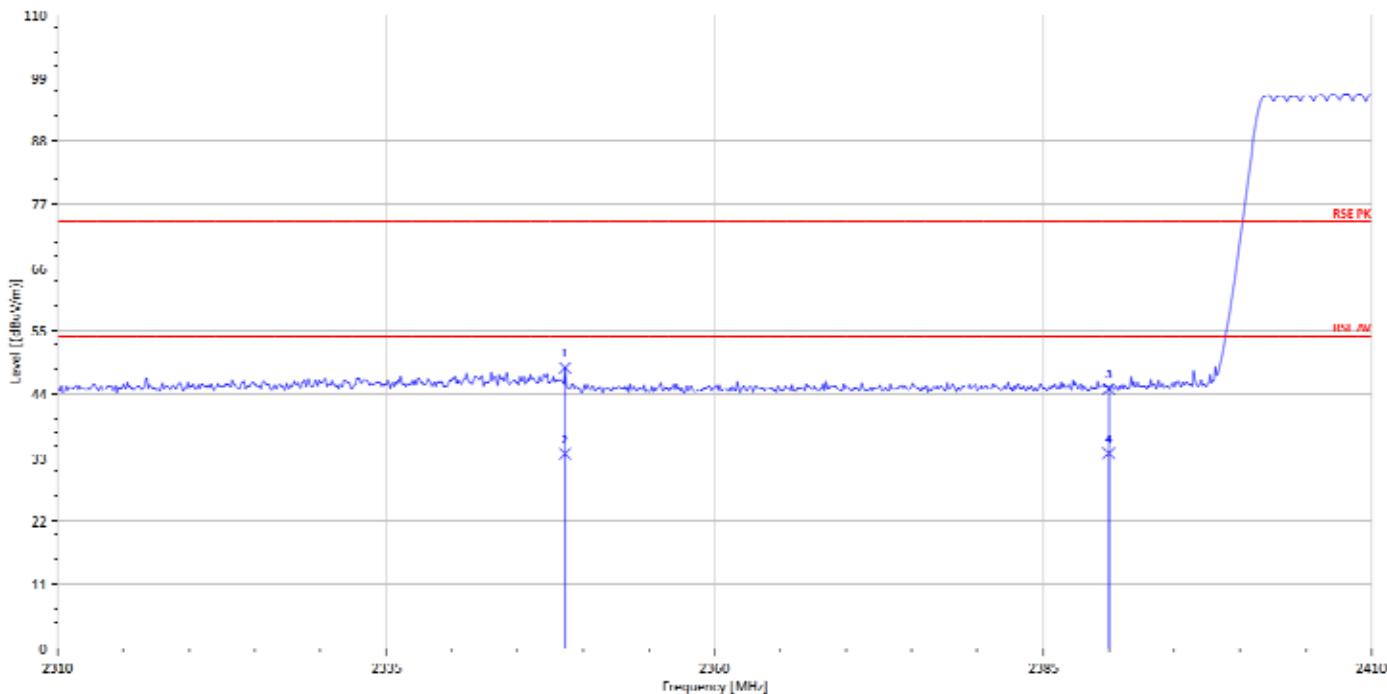
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2334.00	S	Peak	46.89	0.70	47.59	74	-26.41
2334.00	S	Average	33.21	0.70	33.91	54	-20.09
2390.00	E	Peak	43.61	0.92	44.54	74	-29.46
2390.00	E	Average	32.58	0.92	33.50	54	-20.50

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Operation Mode : BT BR Hopping Test Date : 2017/12/27  
 Fundamental Frequency : 2402 MHz Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : BE CH Low Test Engineer : Ashton  
 EUT Pol. : H Measurement Antenna Pol. : Horizontal



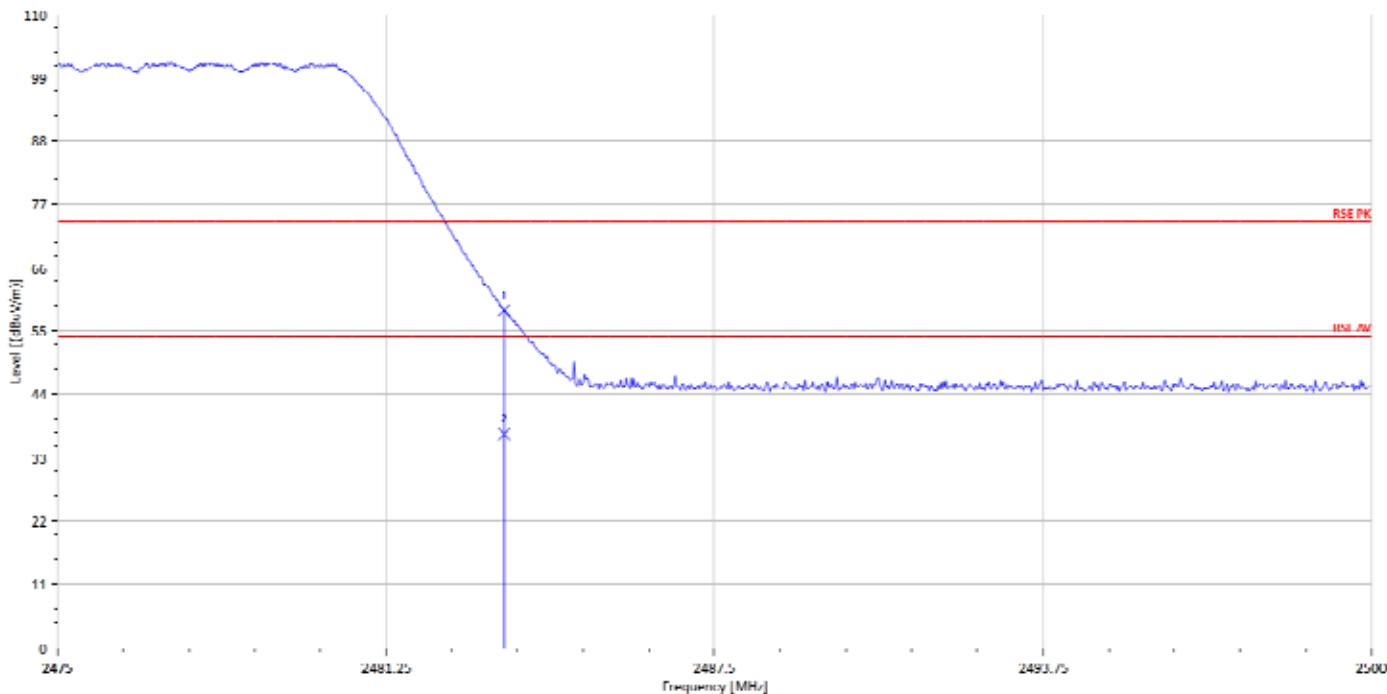
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2348.60	S	Peak	47.94	0.73	48.66	74	-25.34
2348.60	S	Average	33.03	0.73	33.76	54	-20.24
2390.00	E	Peak	44.03	0.92	44.95	74	-29.05
2390.00	E	Average	32.90	0.92	33.82	54	-20.18

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Operation Mode : BT BR Hopping      Test Date : 2017/12/27  
 Fundamental Frequency : 2480 MHz      Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : BE CH High      Test Engineer : Ashton  
 EUT Pol. : H      Measurement Antenna Pol. : Vertical



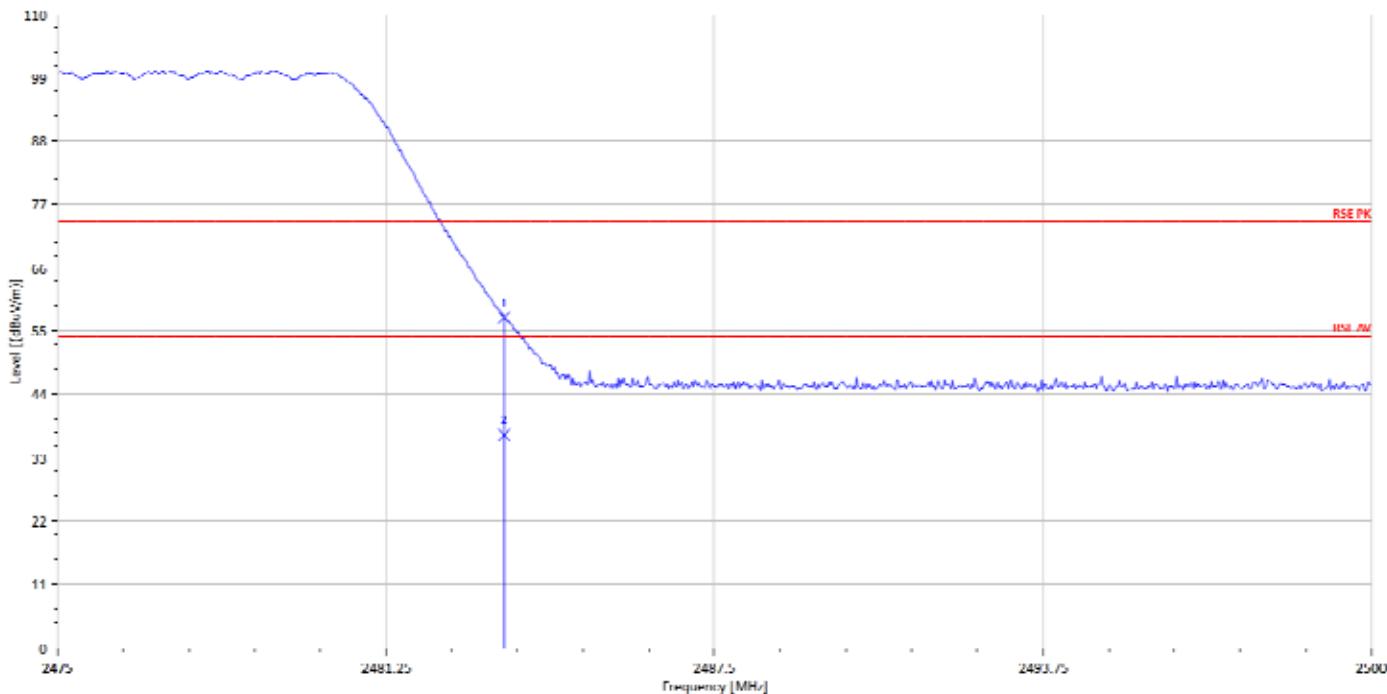
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2483.50	E	Peak	57.45	1.16	58.61	74	-15.39
2483.50	E	Average	35.99	1.16	37.15	54	-16.85

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Operation Mode : BT BR Hopping Test Date : 2017/12/27  
 Fundamental Frequency : 2480 MHz Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : BE CH High Test Engineer : Ashton  
 EUT Pol. : H Measurement Antenna Pol. : Horizontal



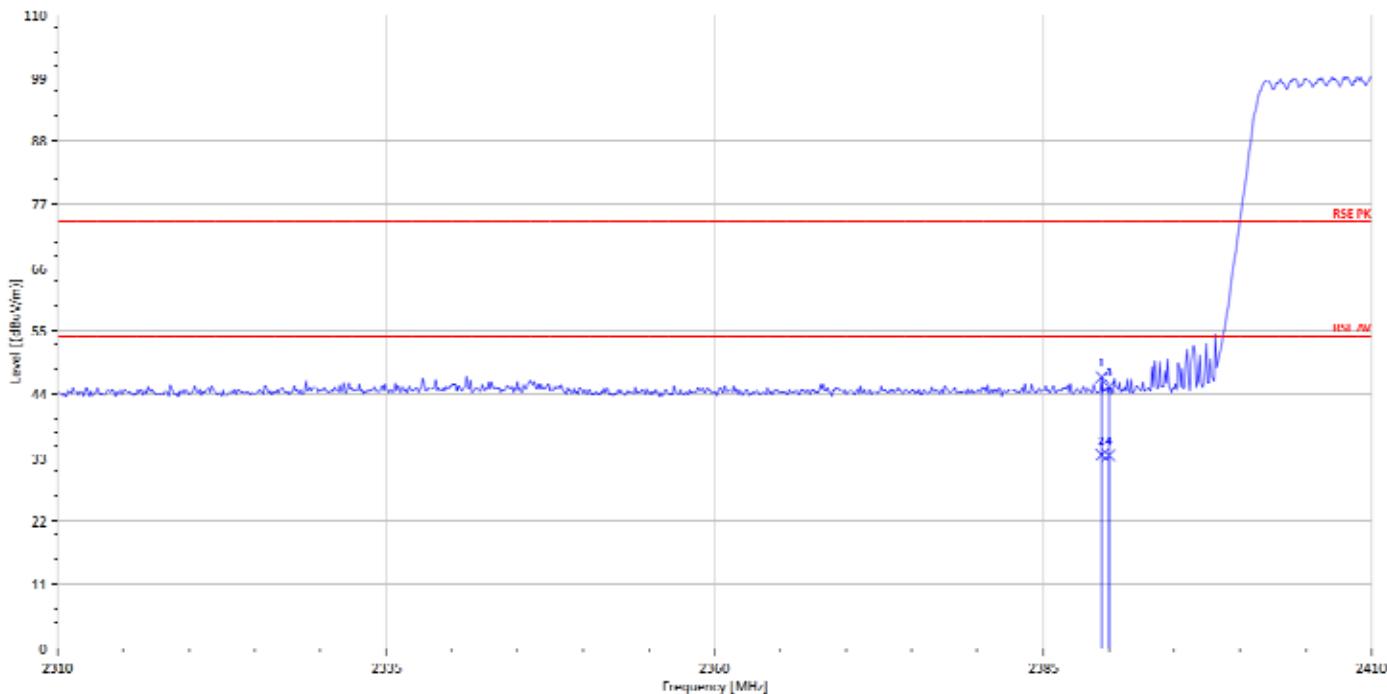
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2483.50	E	Peak	56.19	1.16	57.35	74	-16.65
2483.50	E	Average	35.82	1.16	36.98	54	-17.02

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Operation Mode : BT EDR Hopping      Test Date : 2017/12/27  
 Fundamental Frequency : 2402 MHz      Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : BE CH Low      Test Engineer : Ashton  
 EUT Pol. : H      Measurement Antenna Pol. : Vertical



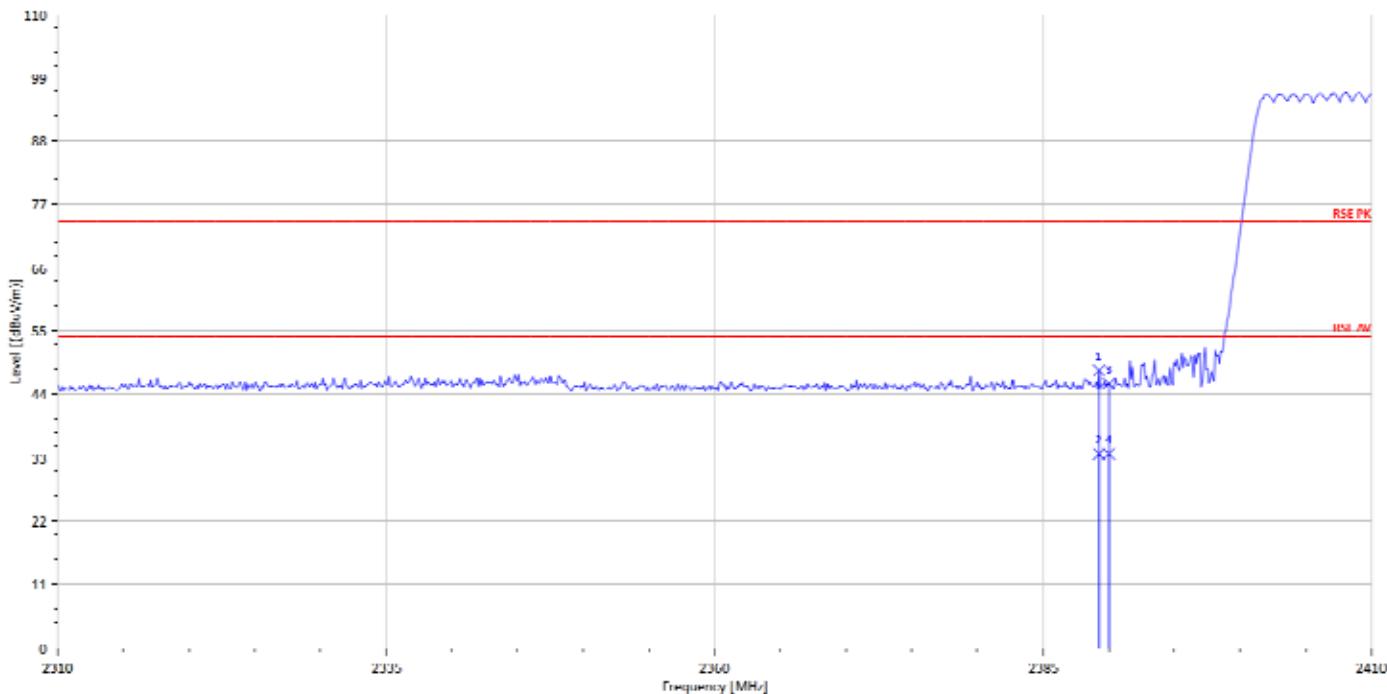
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB <sub>u</sub> V	Factor dB	Actual FS dB <sub>u</sub> V/m	Limit @3m dB <sub>u</sub> V/m	Margin dB
2389.50	S	Peak	46.12	0.92	47.04	74	-26.96
2389.50	S	Average	32.64	0.92	33.56	54	-20.44
2390.00	E	Peak	44.46	0.92	45.38	74	-28.62
2390.00	E	Average	32.54	0.92	33.46	54	-20.54

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Operation Mode : BT EDR Hopping      Test Date : 2017/12/27  
 Fundamental Frequency : 2402 MHz      Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : BE CH Low      Test Engineer : Ashton  
 EUT Pol. : H      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
2389.30	S	Peak	47.28	0.91	48.19	74	-25.81
2389.30	S	Average	32.80	0.91	33.71	54	-20.29
2390.00	E	Peak	44.95	0.92	45.87	74	-28.13
2390.00	E	Average	32.82	0.92	33.74	54	-20.26

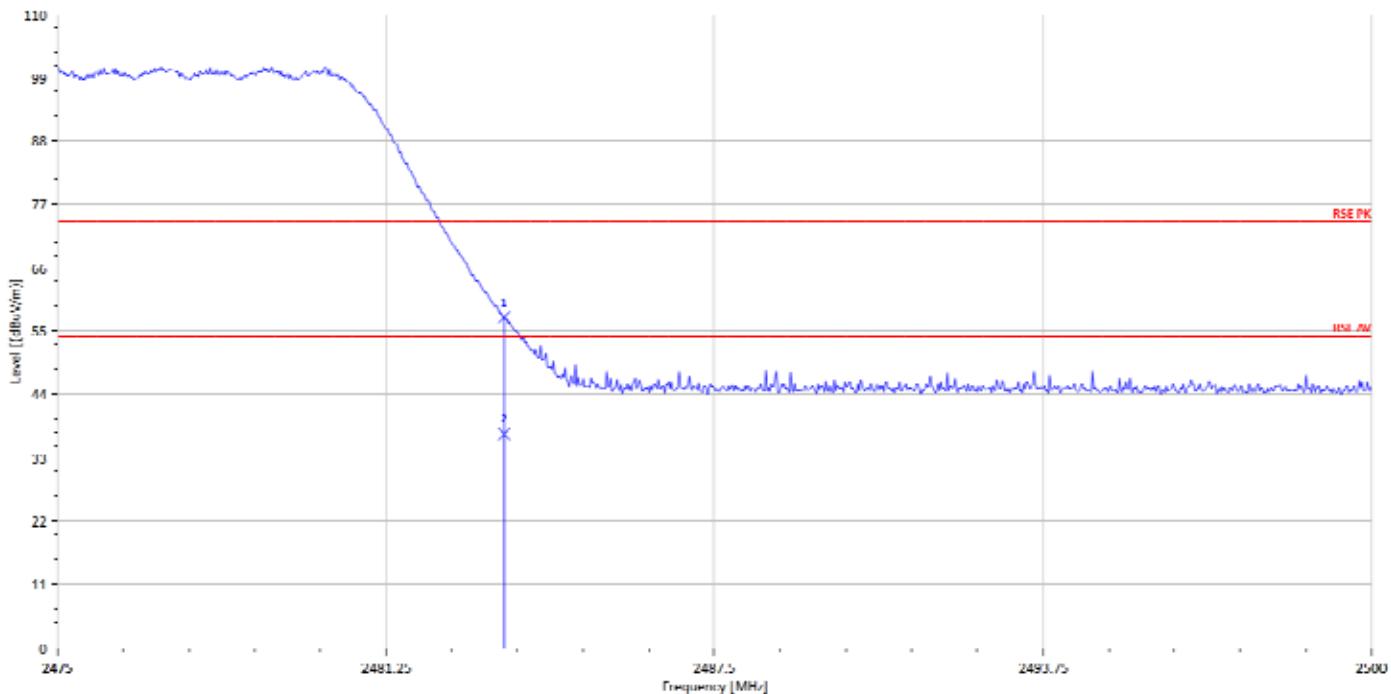
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Operation Mode : BT EDR Hopping  
 Fundamental Frequency : 2480 MHz  
 Operation Band : BE CH High  
 EUT Pol. : H

Test Date : 2017/12/27  
 Temp. / Humi. : 22.7deg\_C/57RH  
 Test Engineer : Ashton  
 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	Margin dB
2483.50	E	Peak	56.21	1.16	57.37	74	-16.63
2483.50	E	Average	35.99	1.16	37.15	54	-16.85

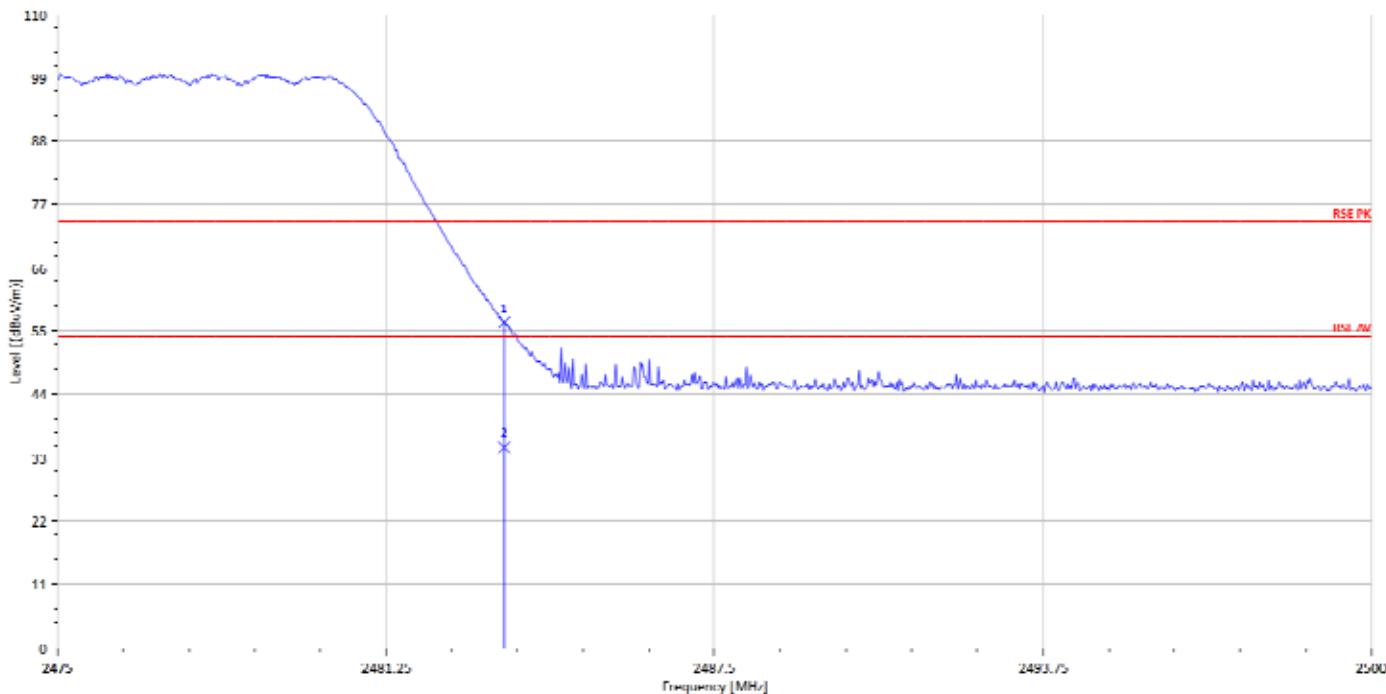
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Operation Mode : BT EDR Hopping  
 Fundamental Frequency : 2480 MHz  
 Operation Band : BE CH High  
 EUT Pol. : H

Test Date : 2017/12/27  
 Temp. / Humi. : 22.7deg\_C/57RH  
 Test Engineer : Ashton  
 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	Margin dB
2483.50	E	Peak	55.31	1.16	56.47	74	-17.53
2483.50	E	Average	33.67	1.16	34.83	54	-19.17

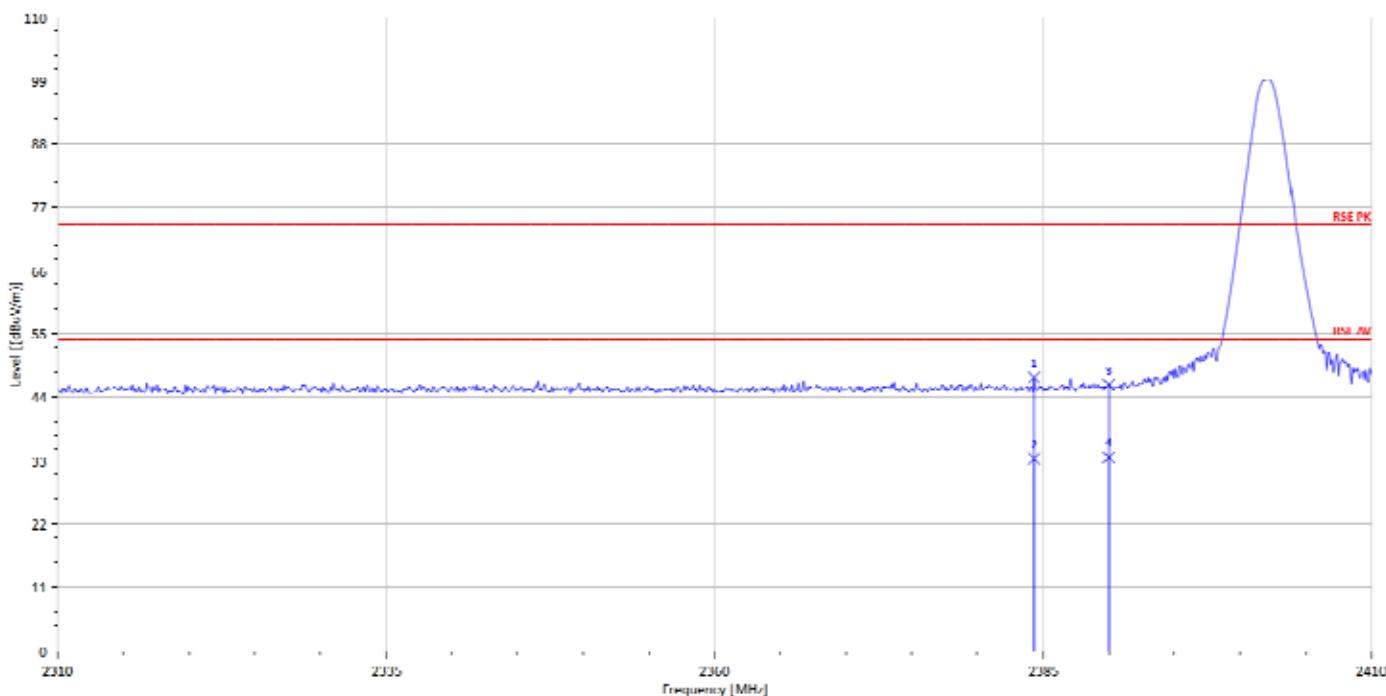
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**Radiated Emission – Band Edge (Non-Hopping Mode):**

Operation Mode : BT BR      Test Date : 2017/12/27  
 Fundamental Frequency : 2402 MHz      Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : BE CH Low      Test Engineer : Ashton  
 EUT Pol. : H      Measurement Antenna Pol. : Vertical



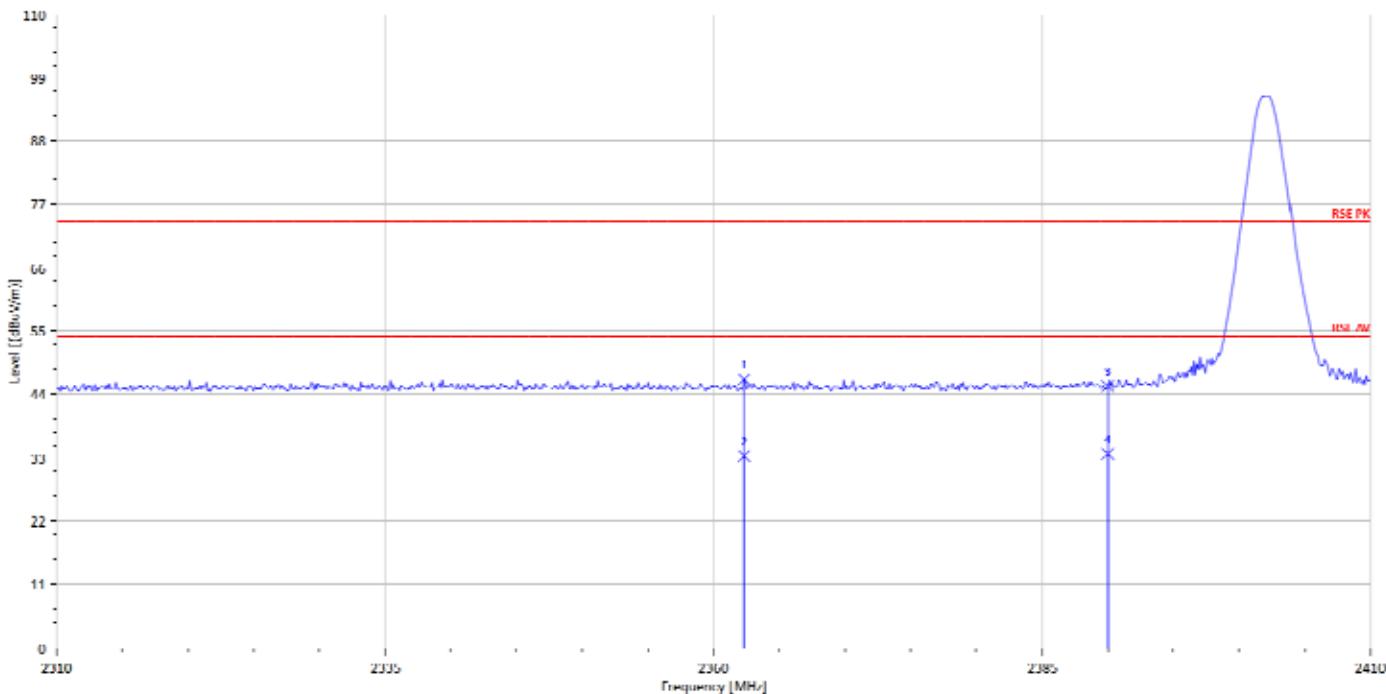
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2384.30	S	Peak	46.64	0.84	47.48	74	-26.52
2384.30	S	Average	32.58	0.84	33.42	54	-20.58
2390.00	E	Peak	45.30	0.92	46.23	74	-27.77
2390.00	E	Average	32.72	0.92	33.64	54	-20.36

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Operation Mode : BT BR Test Date : 2017/12/27  
 Fundamental Frequency : 2402 MHz Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : BE CH Low Test Engineer : Ashton  
 EUT Pol. : H Measurement Antenna Pol. : Horizontal



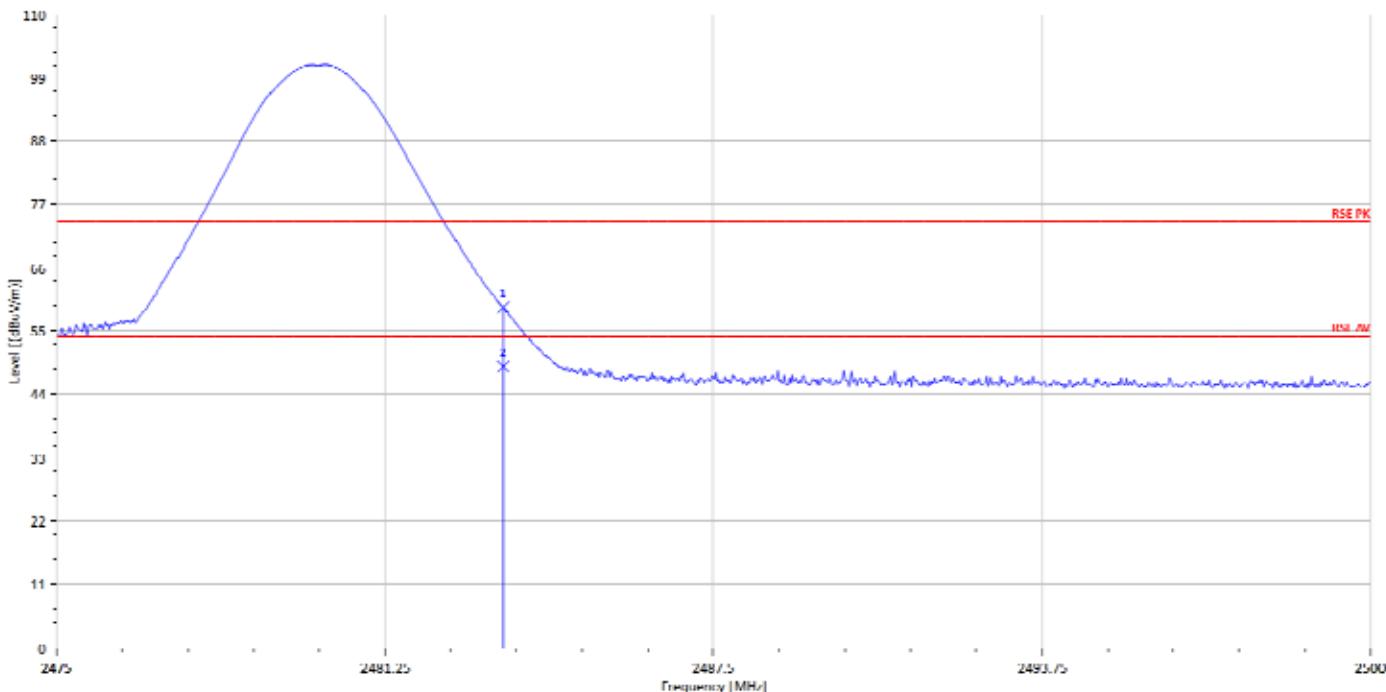
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2362.30	S	Peak	45.95	0.70	46.65	74	-27.35
2362.30	S	Average	32.67	0.70	33.37	54	-20.63
2390.00	E	Peak	44.51	0.92	45.44	74	-28.56
2390.00	E	Average	32.82	0.92	33.74	54	-20.26

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Operation Mode : BT BR      Test Date : 2017/12/27  
 Fundamental Frequency : 2480 MHz      Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : BE CH High      Test Engineer : Ashton  
 EUT Pol. : H      Measurement Antenna Pol. : Vertical



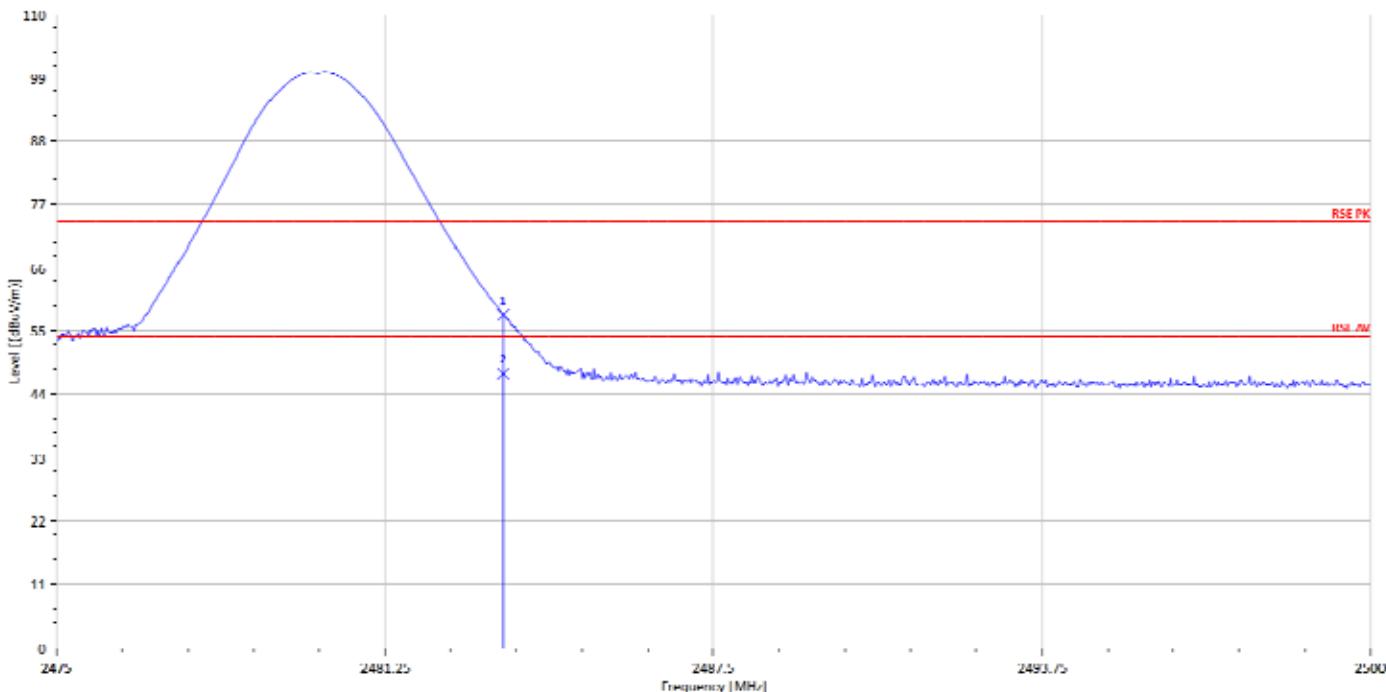
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2483.50	E	Peak	57.94	1.16	59.10	74	-14.90
2483.50	E	Average	47.72	1.16	48.88	54	-5.12

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Operation Mode : BT BR      Test Date : 2017/12/27  
 Fundamental Frequency : 2480 MHz      Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : BE CH High      Test Engineer : Ashton  
 EUT Pol. : H      Measurement Antenna Pol. : Horizontal



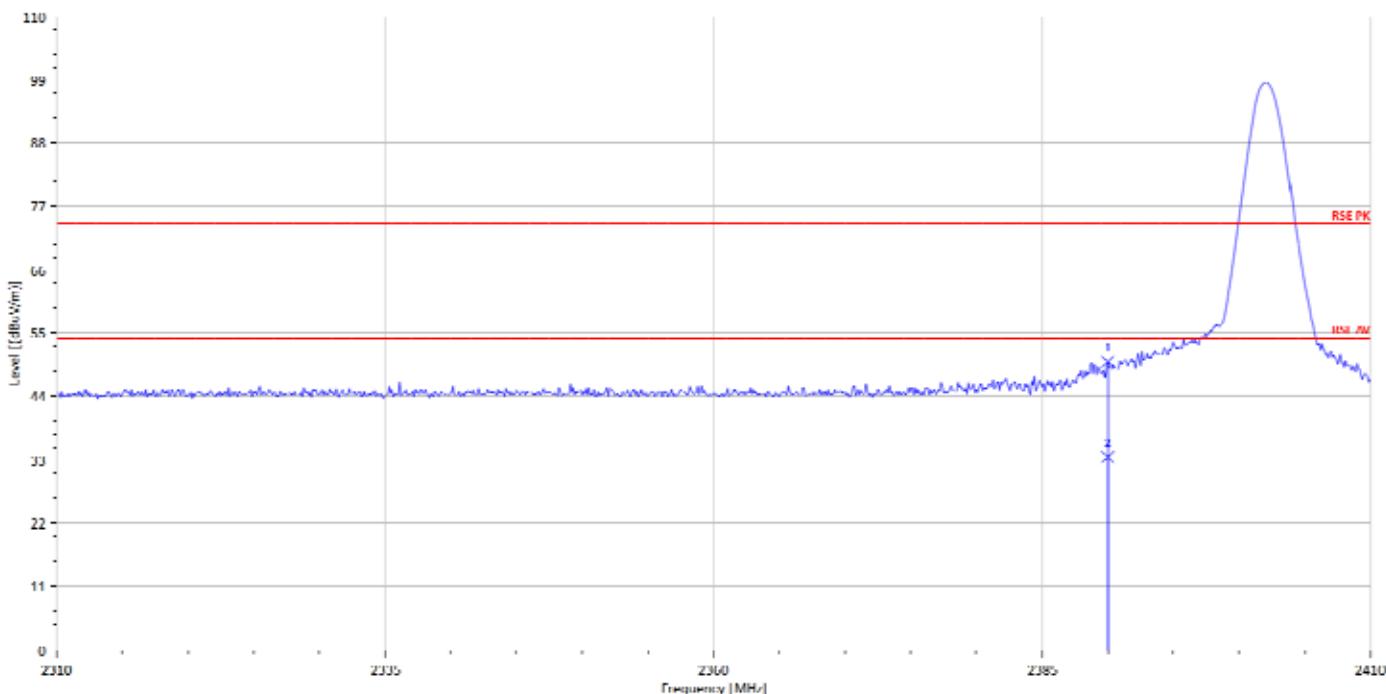
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2483.50	E	Peak	56.63	1.16	57.79	74	-16.21
2483.50	E	Average	46.46	1.16	47.62	54	-6.38

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Operation Mode : BT EDR Test Date : 2017/12/27  
 Fundamental Frequency : 2402 MHz Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : BE CH Low Test Engineer : Ashton  
 EUT Pol. : H Measurement Antenna Pol. : Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
2390.00	E	Peak	49.17	0.92	50.09	74	-23.91
2390.00	E	Average	32.59	0.92	33.51	54	-20.49

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Operation Mode : BT EDR Test Date : 2017/12/27  
 Fundamental Frequency : 2402 MHz Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : BE CH Low Test Engineer : Ashton  
 EUT Pol. : H Measurement Antenna Pol. : Horizontal



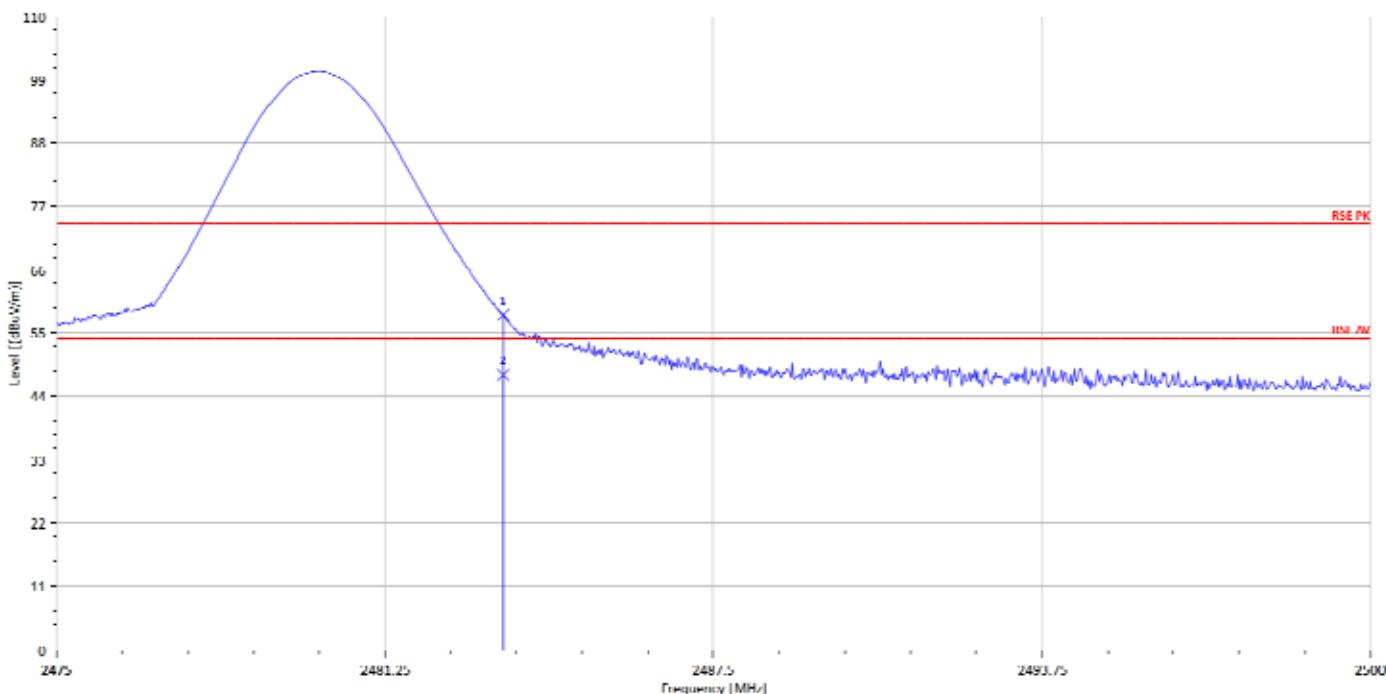
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2389.10	S	Peak	49.16	0.91	50.07	74	-23.93
2389.10	S	Average	32.86	0.91	33.77	54	-20.23
2390.00	E	Peak	48.84	0.92	49.77	74	-24.23
2390.00	E	Average	32.89	0.92	33.81	54	-20.19

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Operation Mode : BT EDR Test Date : 2017/12/27  
 Fundamental Frequency : 2480 MHz Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : BE CH High Test Engineer : Ashton  
 EUT Pol. : H Measurement Antenna Pol. : Vertical



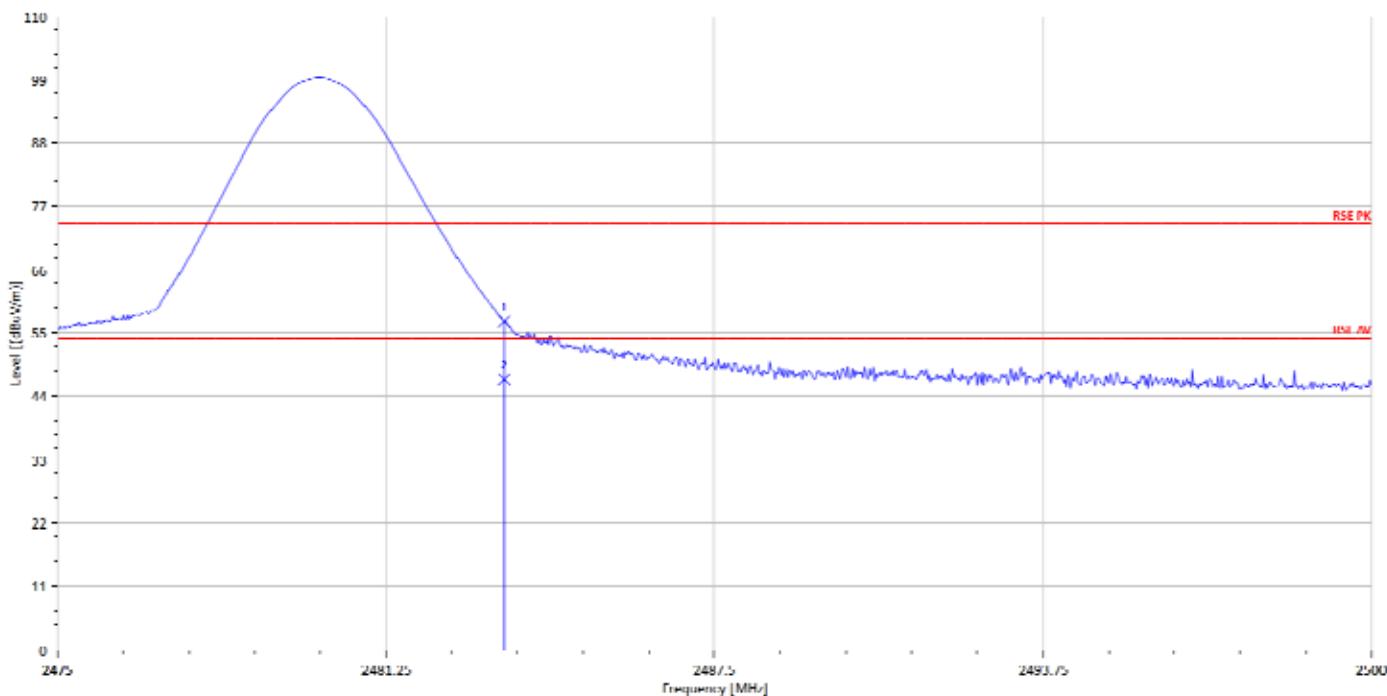
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
2483.50	E	Peak	56.99	1.16	58.15	74	-15.85
2483.50	E	Average	46.61	1.16	47.77	54	-6.23

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Operation Mode : BT EDR      Test Date : 2017/12/27  
 Fundamental Frequency : 2480 MHz      Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : BE CH High      Test Engineer : Ashton  
 EUT Pol. : H      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	Margin dB
2483.50	E	Peak	55.84	1.16	57.00	74	-17.00
2483.50	E	Average	45.84	1.16	47.00	54	-7.00

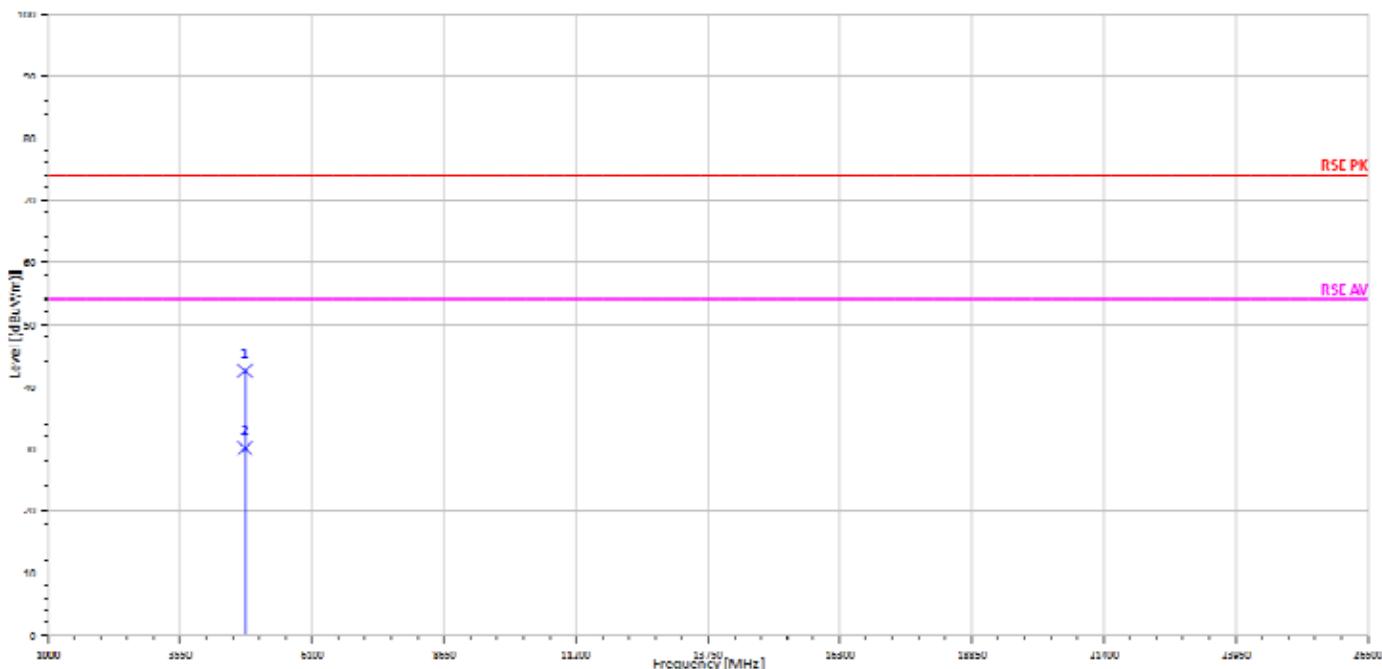
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**Radiated Spurious Emission Measurement Result (Above 1GHz) (Worst Case):**

Operation Mode : BT EDR Test Date : 2017/11/21  
Fundamental Frequency : 2402 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : Tx CH Low Test Engineer : Ashton  
EUT Pol. : H Measurement Antenna Pol. : Vertical



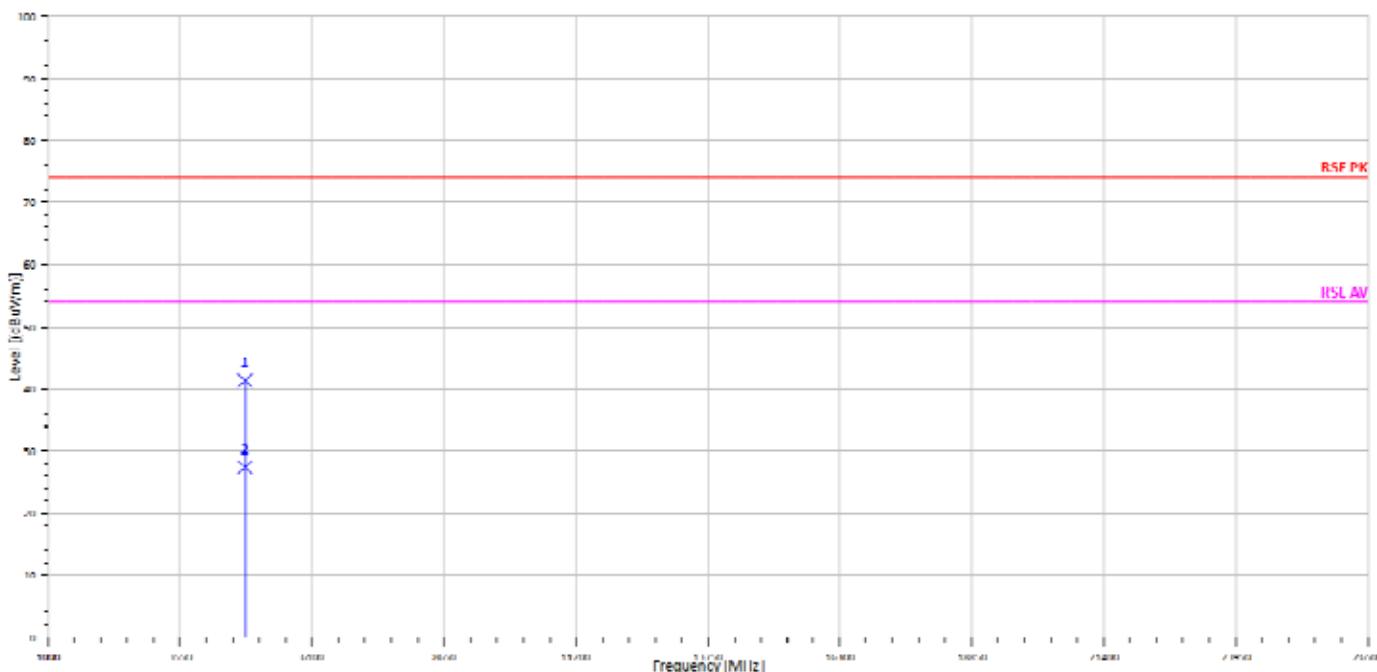
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB <sub>μ</sub> V	Factor dB	Actual FS dB <sub>μ</sub> V/m	Limit @3m dB <sub>μ</sub> V/m	Margin dB
4804.00	H	Peak	43.66	-1.16	42.50	74	-31.50
4804.00	H	Average	31.20	-1.16	30.04	54	-23.96

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Operation Mode : BT EDR      Test Date : 2017/11/21  
 Fundamental Frequency : 2402 MHz      Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : Tx CH Low      Test Engineer : Ashton  
 EUT Pol. : H      Measurement Antenna Pol. : Horizontal



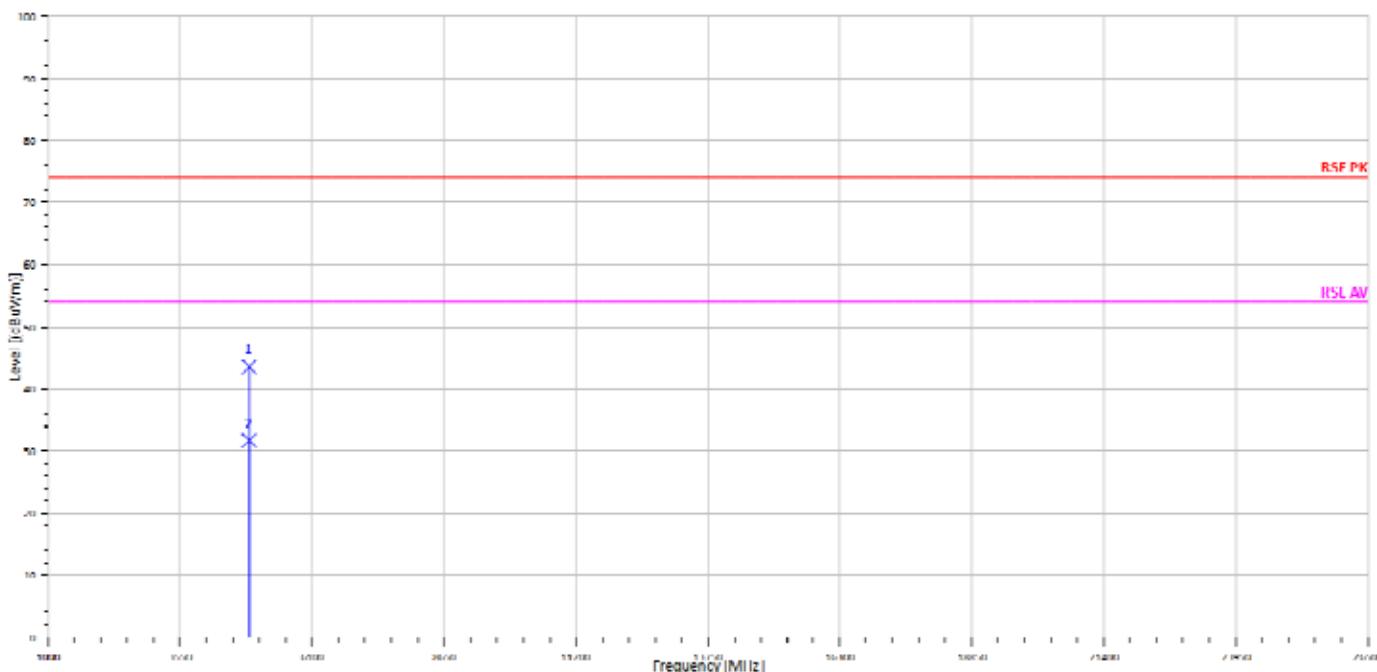
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
4804.00	H	Peak	42.50	-1.16	41.34	74	-32.66
4804.00	H	Average	28.53	-1.16	27.37	54	-26.63

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Operation Mode : BT EDR      Test Date : 2017/11/21  
 Fundamental Frequency : 2441 MHz      Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : Tx CH Mid      Test Engineer : Ashton  
 EUT Pol. : H      Measurement Antenna Pol. : Vertical



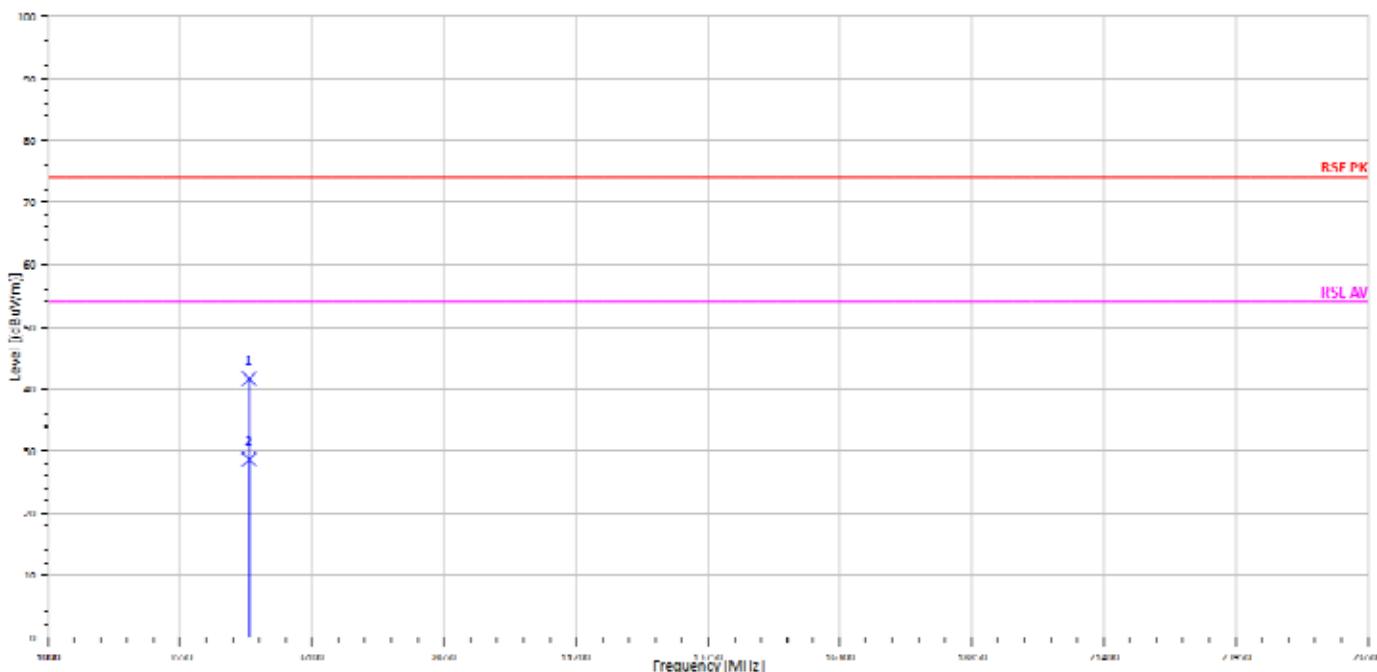
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
4882.00	H	Peak	44.23	-0.70	43.53	74	-30.47
4882.00	H	Peak	32.37	-0.70	31.67	74	-42.33

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Operation Mode : BT EDR      Test Date : 2017/11/21  
 Fundamental Frequency : 2441 MHz      Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : Tx CH Mid      Test Engineer : Ashton  
 EUT Pol. : H      Measurement Antenna Pol. : Horizontal



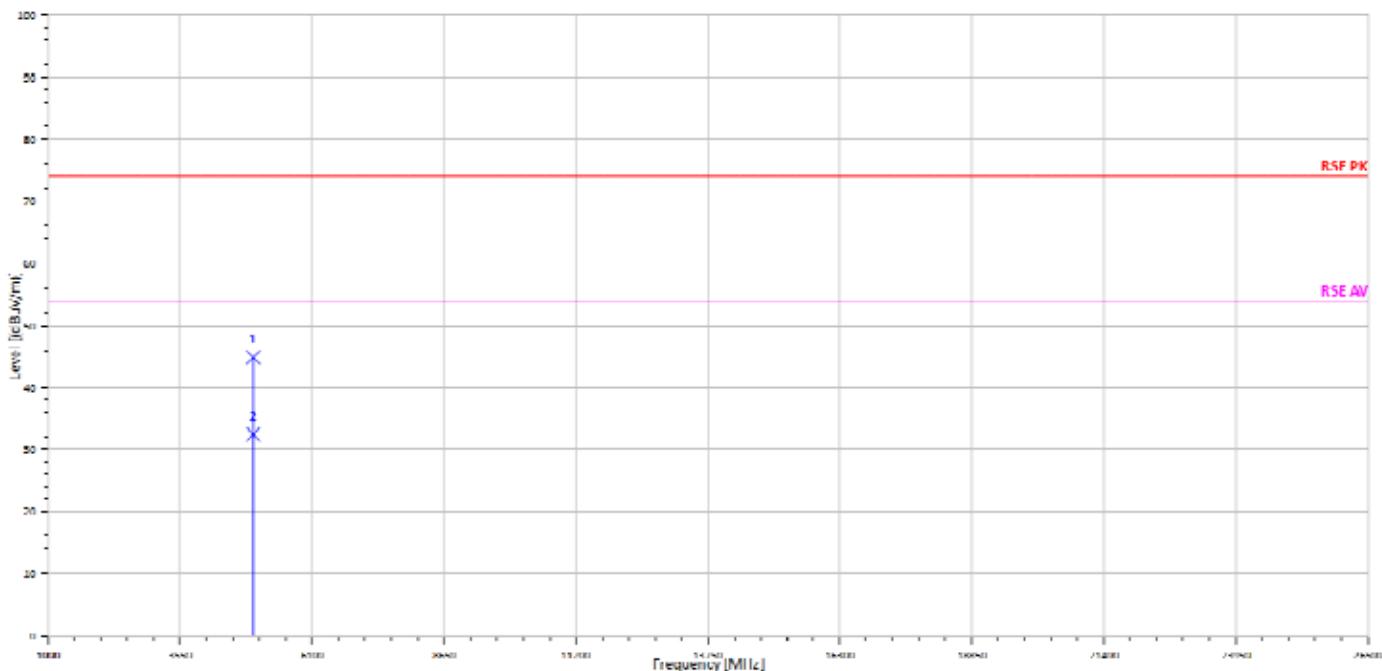
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
4882.00	H	Peak	42.35	-0.70	41.65	74	-32.35
4882.00	H	Average	29.37	-0.70	28.67	54	-25.33

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Operation Mode : BT EDR      Test Date : 2017/11/21  
 Fundamental Frequency : 2480 MHz      Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : Tx CH High      Test Engineer : Ashton  
 EUT Pol. : H      Measurement Antenna Pol. : Vertical



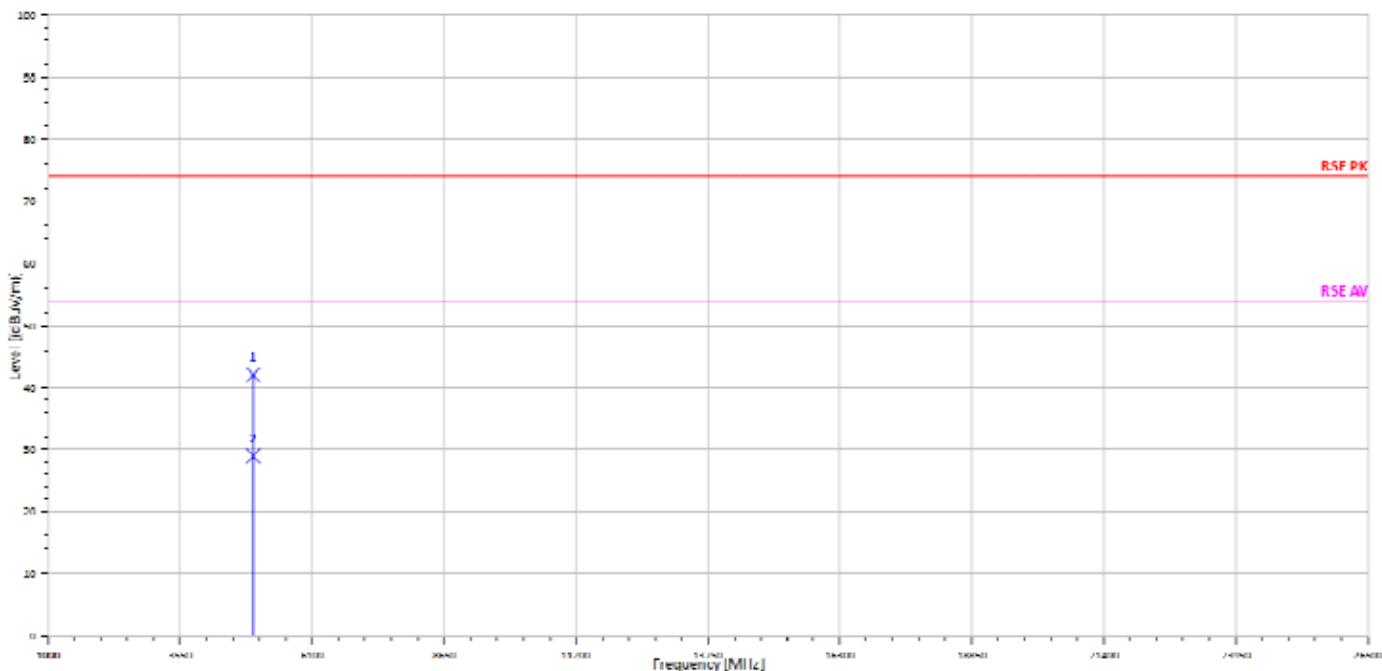
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4960.00	H	Peak	45.53	-0.66	44.87	74	-29.13
4960.00	H	Average	33.11	-0.66	32.45	54	-21.55

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 Fundamental Frequency : 2480 MHz      Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : Tx CH High      Test Engineer : Ashton  
 EUT Pol. : H      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
4960.00	H	Peak	42.69	-0.66	42.03	74	-31.97
4960.00	H	Average	29.59	-0.66	28.93	54	-25.07

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## 8 ANTENNA REQUIREMENT

### 8.1 Standard Applicable

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

If the transmitting antenna is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi.

### 8.2 Antenna Connected Construction

An embedded-in antenna design is used.

Please see EUT photo and antenna spec. for details.

The antenna gain is less than 6dBi. Therefore, it is not necessary to reduce maximum output power limit.

*~ End of Report ~*

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