

## ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

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

OF

Raytac Corporation

**Applicant:** 5F, No.3, Jiankang Rd., Zhonghe Dist., New Taipei City, 235, Taiwan

**Product Name:** Bluetooth Low Energy & IEEE 802.15.4 Combo Module

**Brand Name:** Raytac

**Model No.:** MDBT50Q, MDBT50Q-1M, MDBT50Q-P1M, MDBT50Q-U1M

**Model Difference:** Different Antenna Type

**FCC ID:** SH6MDBT50Q

**Report Number:** E2/2018/50091

**FCC Rule Part:** §15.247, Cat: DTS

**Issue Date:** Jul. 05, 2018

**Date of Test:** May 31, 2018 ~ Jun. 28, 2018

**Date of EUT Received:** May 31, 2018

**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.

**Tested By:**

Vito Pei / Sr. Engineer



**Approved By:**

Jim Chang / Manager



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## Revision History

Report Number	Revision	Description	Effectuated Page	Issue Date	Revised By
E2/2018/50091	Rev.00	Initial creation of document	All	Jul. 05, 2018	Violetta Tang

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## 1 GENERAL INFORMATION

### 1.1 Product Description

General:

Product Name:	Bluetooth Low Energy & IEEE 802.15.4 Combo Module
Brand Name:	Raytac
Model No.:	MDBT50Q, MDBT50Q-1M, MDBT50Q-P1M, MDBT50Q-U1M
Model Difference:	Different Antenna Type
Software version:	N/A
Hardware version:	N/A
Power Supply:	3.3V from DC Power Supply

Bluetooth Low Energy:

Bluetooth Version:	Bluetooth V5.0 LE single mode
Channel number:	40 channels
Modulation type:	GFSK
Transmit Power:	8.03dBm (BLE) (Peak) / 8.19dBm (V5.0) (Peak)
Frequency Range:	2402 – 2480MHz
Antenna Designation:	<p>Internal</p> <p>1. Chip Antenna, Gain: -0.65dBi Model No.: MDBT50Q; Supplier: Raytac</p> <p>2. PCB Antenna, Gain: 0.41dBi Model No.: MDBT50Q-P; Supplier: Raytac</p> <p>External</p> <p>1. UFL Antenna, Gain: 5dBi Model No.: RFA-02-5-F17H170100B; Supplier: Aristotle</p> <p>2. UFL Antenna, Gain: 2.14dBi Model No.: ANTX100ETHAB24553; Supplier: YAGEO</p> <p>3. PCB Antenna, Gain: 2.2dBi Model No.: ANTX100P011B24003; Supplier: YAGEO</p> <p>4. PCB Antenna, Gain: 3.3dBi Model No.: ANTX100P111B24003; Supplier: YAGEO</p>

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## 1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247

FCC KDB 558074 D01 DTS Meas. Guidance v04.

ANSI C63.10:2013

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 Number and Designation number are: 735305 / TW0002

## 1.4 Special Accessories

There are no special accessories used while test was conducted.

## 1.5 Equipment Modifications

There was no modification incorporated into the EUT.

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## 2 SYSTEM TEST CONFIGURATION

### 2.1 EUT Configuration

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

### 2.2 EUT Exercise

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

### 2.3 Test Procedure

#### 2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground 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 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 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 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 + attenuator.

Total offset = 10.6dB.

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## 2.5 Configuration of Tested System

Fig. 2-1 Conducted (Antenna Port) & Radiated Emission Configuration

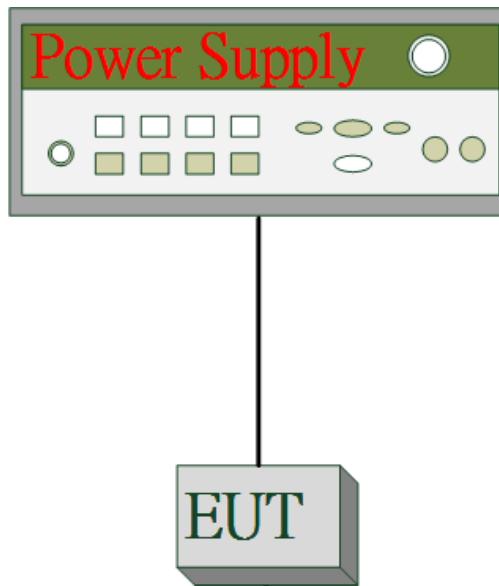


Table 2-1 Equipment Used in Tested System

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.	DC Power Supply	Agilent	E3640A	MY53130054	N/A	Un-shielded

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### 3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Emission	N/A
§15.247(b) (3)	Peak Output Power	Compliant
§15.247(a)(2)	6dB Bandwidth	Compliant
§15.247(d)	Conducted Band Edge and Spurious Emission	Compliant
§15.247(d)	Radiated Band Edge and Spurious Emission	Compliant
§15.247(e)	Peak Power Density	Compliant
§15.203 §15.247(b)	Antenna Requirement	Compliant

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## 4 DESCRIPTION OF TEST MODES

### 4.1 Operated in 2400 ~ 2483.5MHz Band

40 channels are provided for Bluetooth LE

ITEM	FREQUENCY	ITEM	FREQUENCY	ITEM	FREQUENCY
1	2402 MHz	15	2430 MHz	29	2458 MHz
2	2404 MHz	16	2432 MHz	30	2460 MHz
3	2406 MHz	17	2434 MHz	31	2462 MHz
4	2408 MHz	18	2436 MHz	32	2464 MHz
5	2410 MHz	19	2438 MHz	33	2466 MHz
6	2412 MHz	20	2440 MHz	34	2468 MHz
7	2414 MHz	21	2442 MHz	35	2470 MHz
8	2416MHz	22	2444 MHz	36	2472 MHz
9	2418 MHz	23	2446 MHz	37	2474 MHz
10	2420 MHz	24	2448 MHz	38	2476 MHz
11	2422 MHz	25	2450 MHz	39	2478 MHz
12	2424 MHz	26	2452 MHz	40	2480 MHz
13	2426 MHz	27	2454 MHz		
14	2428 MHz	28	2456 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:

MODE	AVAILABLE FREQUENCY (MHz)	TESTED FREQUENCY (MHz)	MODULATION	DATA RATE (Mbps)	Antenna Type
<b>RADIATED EMISSION TEST (BELOW 1 GHz)</b>					
Bluetooth LE	2402 to 2480	2402, 2442, 2480	GFSK	1	Internal (Chip & PCB) External (UFL 1 & PCB 2)
Bluetooth LE	2402 to 2480	2402, 2442, 2480	GFSK	2	Internal (Chip & PCB) External (UFL 1 & PCB 2)
<b>RADIATED EMISSION TEST (ABOVE 1 GHz)</b>					
Bluetooth LE	2402 to 2480	2402, 2442, 2480	GFSK	1	Internal (Chip & PCB) External (UFL 1 & PCB 2)
Bluetooth LE	2402 to 2480	2402, 2442, 2480	GFSK	2	Internal (Chip & PCB) External (UFL 1 & PCB 2)

#### Note:

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

#### ANTENNA PORT CONDUCTED MEASUREMENT:

<b>CONDUCTED TEST</b>				
MODE	AVAILABLE FREQUENCY (MHz)	TESTED FREQUENCY (MHz)	MODULATION	DATA RATE (Mbps)
Bluetooth LE	2402 to 2480	2402, 2442, 2480	GFSK	1
Bluetooth LE	2402 to 2480	2402, 2442, 2480	GFSK	2

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## 5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
Peak Output Power	+/- 0.84 dB
6dB Bandwidth	+/- 51.33 Hz
100 KHz Bandwidth Of Frequency Band Edges	+/- 0.84 dB
Peak Power Density	+/- 1.3 dB
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, AC= +/- 0.2%

Radiated Spurious Emission:

Measurement uncertainty (Polarization : <b>Vertical</b> )	9kHz – 30MHz: +/- 2.87 dB
	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

Measurement uncertainty (Polarization : <b>Horizontal</b> )	9kHz – 30MHz: +/- 2.87 dB
	30MHz - 167MHz: +/- 4.22dB
	167MHz -500MHz: +/- 3.44dB
	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

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

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## 6 CONDUCTED EMISSION TEST

### 6.1 Standard Applicable:

Frequency range within 150kHz to 30MHz shall not exceed the Limit table as below.

Frequency range MHz	Limits dB(uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

**Note**

1. The lower limit shall apply at the transition frequencies
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

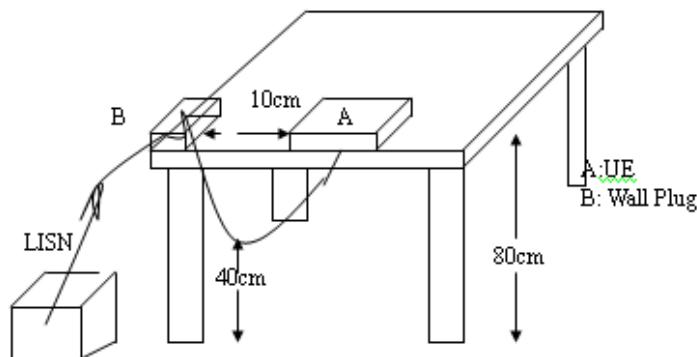
### 6.2 Measurement Equipment Used:

N/A, This device is powered by 3.3V DC Power Supply.

### 6.3 EUT Setup:

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

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



### 6.5 Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plan.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all phases of power being supplied by given UE are completed

### 6.6 Measurement Result:

N/A, This device is powered by 3.3V DC Power Supply.

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## 7 PEAK OUTPUT POWER MEASUREMENT

### 7.1 Standard Applicable:

For systems using digital modulation in the 2400-2483.5 MHz bands, the limit for peak output power is 1Watt.

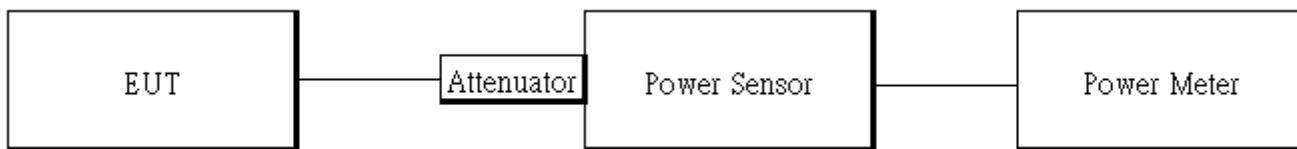
If the transmitting antenna of directional gain greater than 6dBi are used the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the Antenna exceeds 6dBi.

In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of Antenna exceeds 6dBi.

### 7.2 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter	Anritsu	ML2496A	1326001	2017/07/26	2018/07/25
Power Sensor	Anritsu	MA2411B	1315048	2017/07/26	2018/07/25
Power Sensor	Anritsu	MA2411B	1315049	2017/07/26	2018/07/25
DC Power Supply	Agilent	E3640A	MY53130054	2017/09/04	2018/09/03
Attenuator	Marvelous	MVE2213-10	RF30	2017/12/26	2018/12/25

### 7.3 Test Set-up:



### 7.4 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter.

#### Power Meter:

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

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

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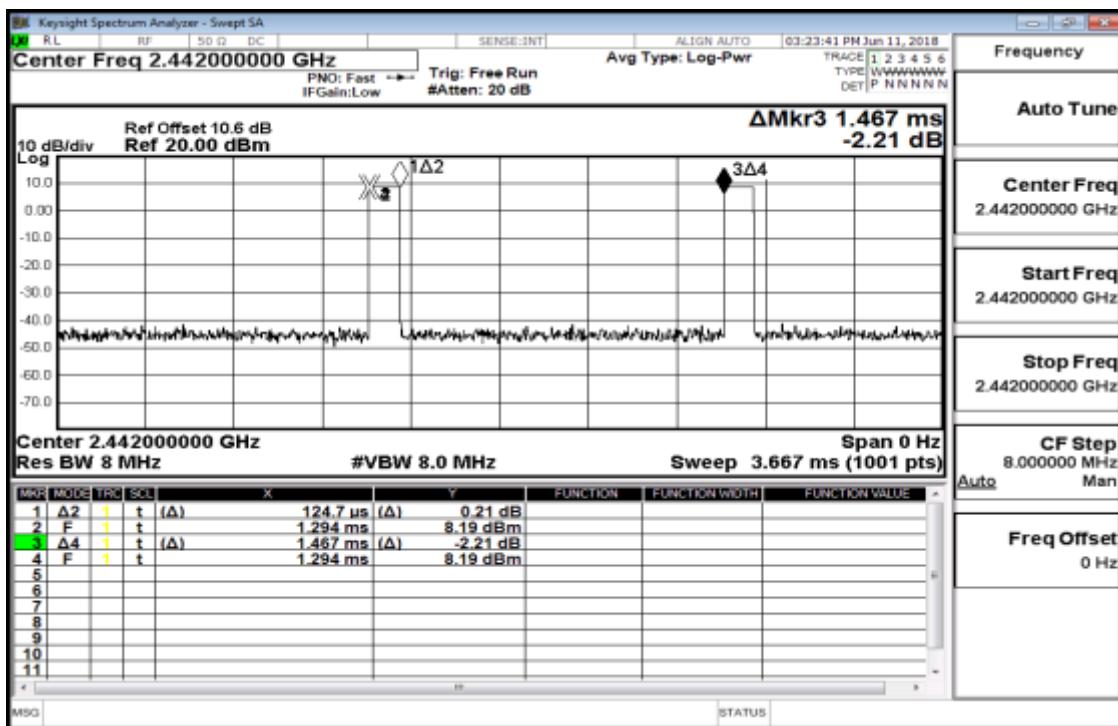
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**Formula:**

$$\text{Duty Cycle} = \text{Ton} / (\text{Ton} + \text{Toff})$$

**Duty Factor:****BLE Mode**

	Duty Cycle (%)	Duty Factor (dB)	1/T (kHz)	VBW setting (kHz)
BLE	8.50	10.71	8.02	9.00



$$\text{Duty Cycle Factor: } 10 \times \log(1/(8.5/100)) = 10.71$$

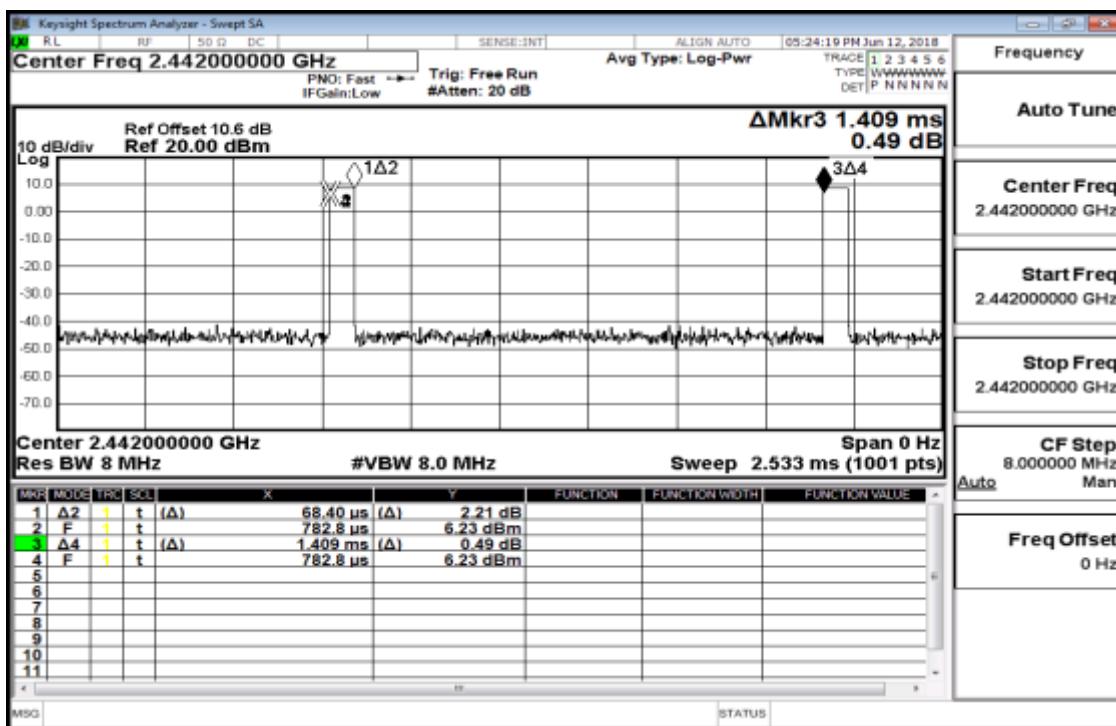
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## BT 5.0 Mode

	Duty Cycle (%)	Duty Factor (dB)	1/T (kHz)	VBW setting (kHz)
BT 5.0	4.86	13.13	14.62	15.00



Duty Cycle Factor:  $10 \times \log(1/(4.86/100)) = 13.13$

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## 7.5 Measurement Result:

### BLE mode:

CH	Frequency (MHz)	Peak Power Output (dBm)	Required Limit
0	2402	7.79	1 Watt = 30 dBm
20	2442	7.92	1 Watt = 30 dBm
39	2480	<b>8.03</b>	1 Watt = 30 dBm

### BLE mode:

CH	Frequency (MHz)	Max. Avg. Output include tune up tolerance Power (dBm)	Required Limit
0	2402	7.66	1 Watt = 30 dBm
20	2442	7.85	1 Watt = 30 dBm
39	2480	7.90	1 Watt = 30 dBm

\*Note: Measured by power meter, cable loss as 10.6 dB that offsets on the power meter in Peak

\*Note: Measured by power meter, **as cable loss+ Duty cycle factor that offsets on the power meter**

\*Note: Max. Output include tune up tolerance Power is average power

### BT 5.0 mode:

CH	Frequency (MHz)	Peak Power Output (dBm)	Required Limit
0	2402	7.93	1 Watt = 30 dBm
20	2442	8.09	1 Watt = 30 dBm
39	2480	<b>8.19</b>	1 Watt = 30 dBm

### BT 5.0 mode:

CH	Frequency (MHz)	Max. Avg. Output include tune up tolerance Power (dBm)	Required Limit
0	2402	7.97	1 Watt = 30 dBm
20	2442	8.45	1 Watt = 30 dBm
39	2480	8.37	1 Watt = 30 dBm

\*Note: Measured by power meter, cable loss as 10.6 dB that offsets on the power meter in Peak

\*Note: Measured by power meter, **as cable loss+ Duty cycle factor that offsets on the power meter**

\*Note: Max. Output include tune up tolerance Power is average power

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## 8 6DB BANDWIDTH MEASUREMENT

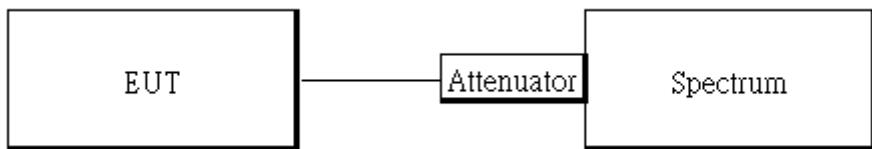
### 8.1 Standard Applicable

The minimum 6 dB bandwidth shall be at least 500 kHz.

### 8.2 Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
DC Power Supply	Agilent	E3640A	MY53130054	2017/09/04	2018/09/03
Attenuator	Marvelous	MVE2213-10	RF30	2017/12/26	2018/12/25
Spectrum Analyzer	Agilent	N9010A	MY51440113	2017/06/21	2018/06/20

### 8.3 Test Set-up:



### 8.4 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
4. For 6dB Bandwidth:

Set the spectrum analyzer as RBW=100 kHz, VBW= 3\*RBW, Span = 5MHz, Detector=Peak, Sweep=auto.

5. Mark the peak frequency and -6dB (upper and lower) frequency.

6. For 99% Bandwidth:

Set the spectrum analyzer as RBW=1%, VBW=3\*RBW, Span = 2MHz, Detector=Sample, Sweep=auto.

7. Turn on the 99% bandwidth function, max reading.

8. Repeat above procedures until all test default channel is completed

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## 8.5 Measurement Result:

### BLE mode

Frequency (MHz)	6dB BW (MHz)	BW (MHz)	Result
2402	0.688	> 0.5	PASS
2442	0.67	> 0.5	PASS
2480	0.721	> 0.5	PASS

### BT 5.0 mode

Frequency (MHz)	6dB BW (MHz)	BW (MHz)	Result
2402	1.191	> 0.5	PASS
2442	1.197	> 0.5	PASS
2480	1.2	> 0.5	PASS

*Note: Refer to next page for plots.*

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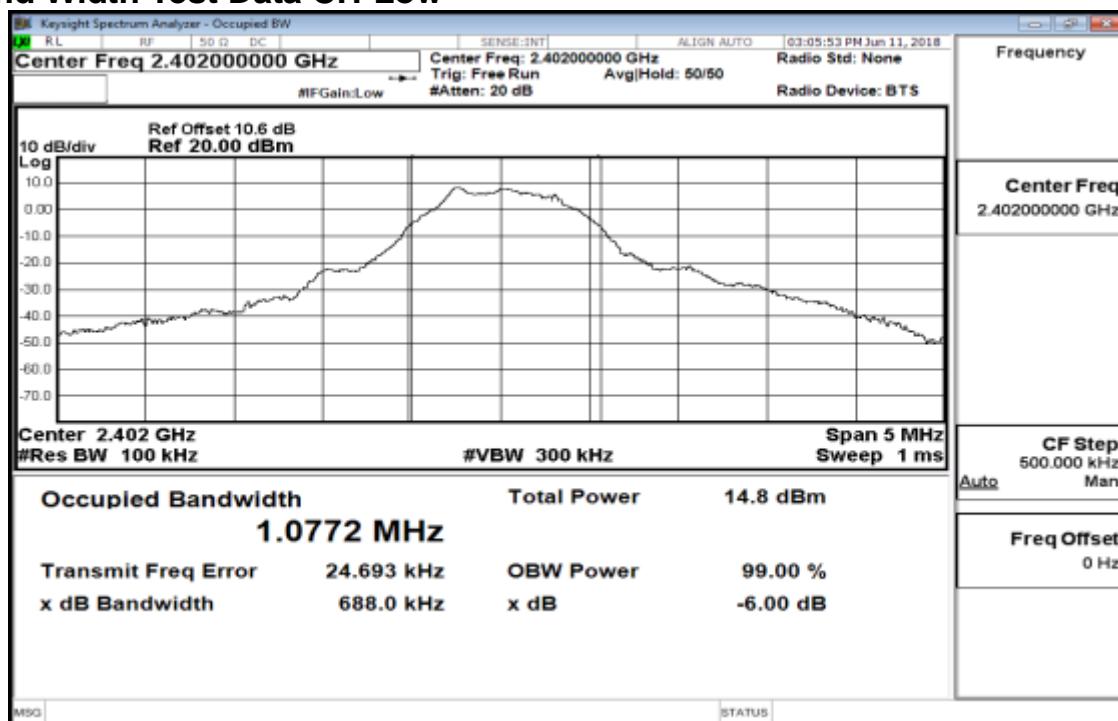
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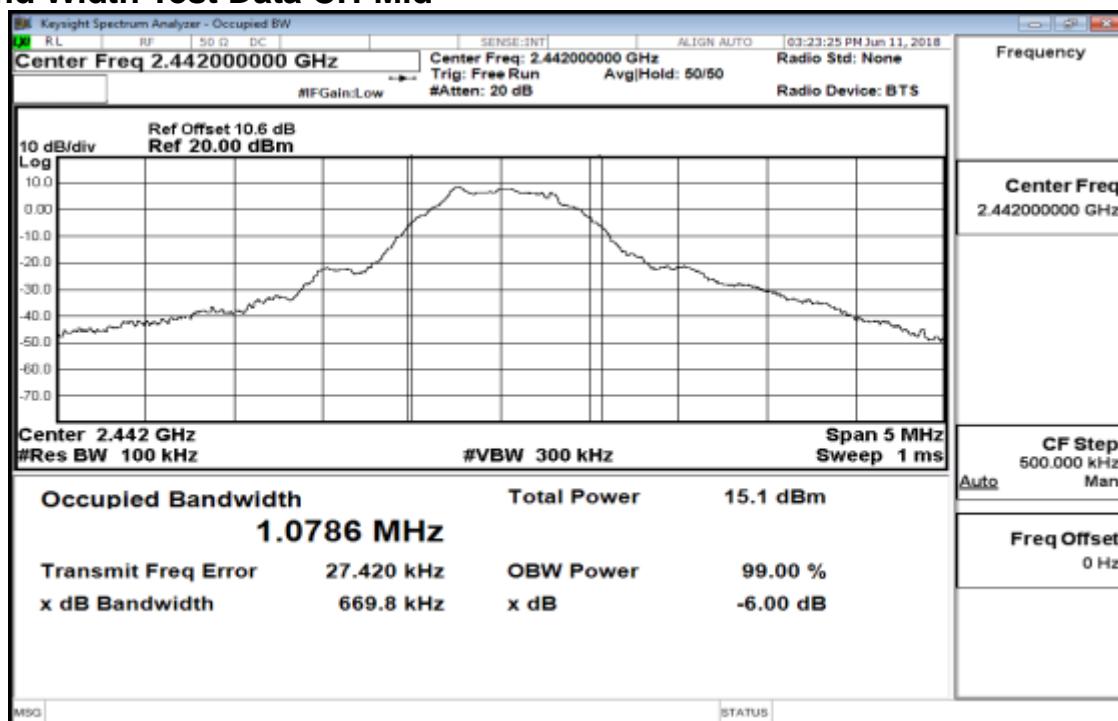
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## BLE mode

## 6dB Band Width Test Data CH-Low



## 6dB Band Width Test Data CH-Mid

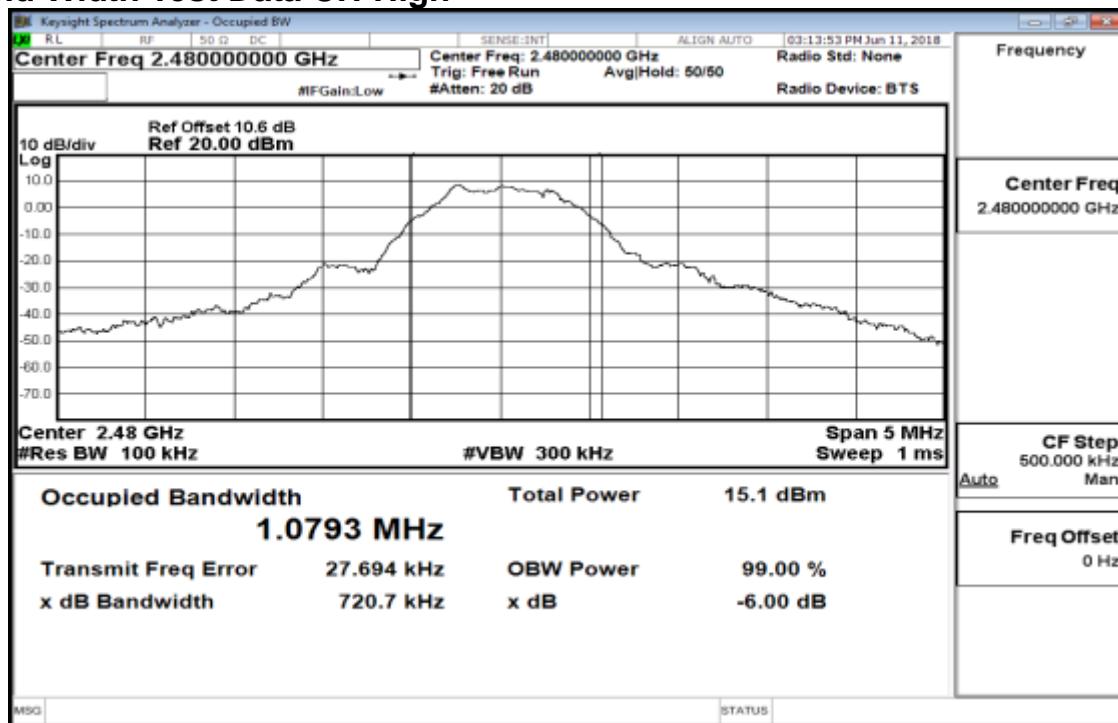


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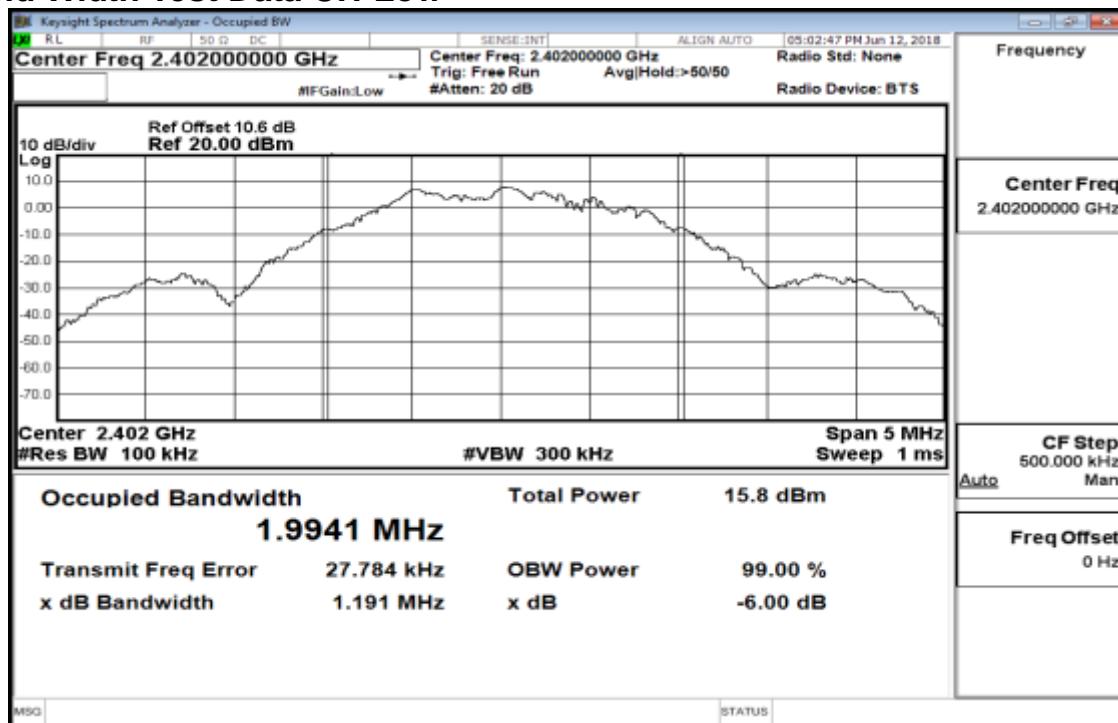
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## 6dB Band Width Test Data CH-High



## BT 5.0 mode

## 6dB Band Width Test Data CH-Low

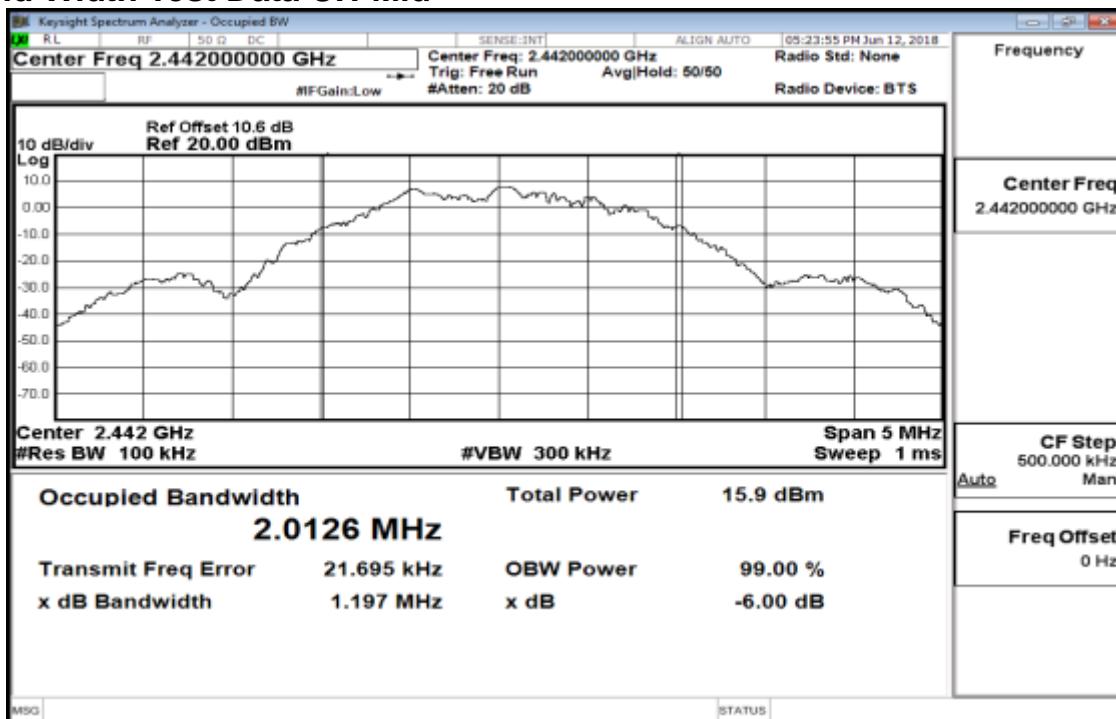


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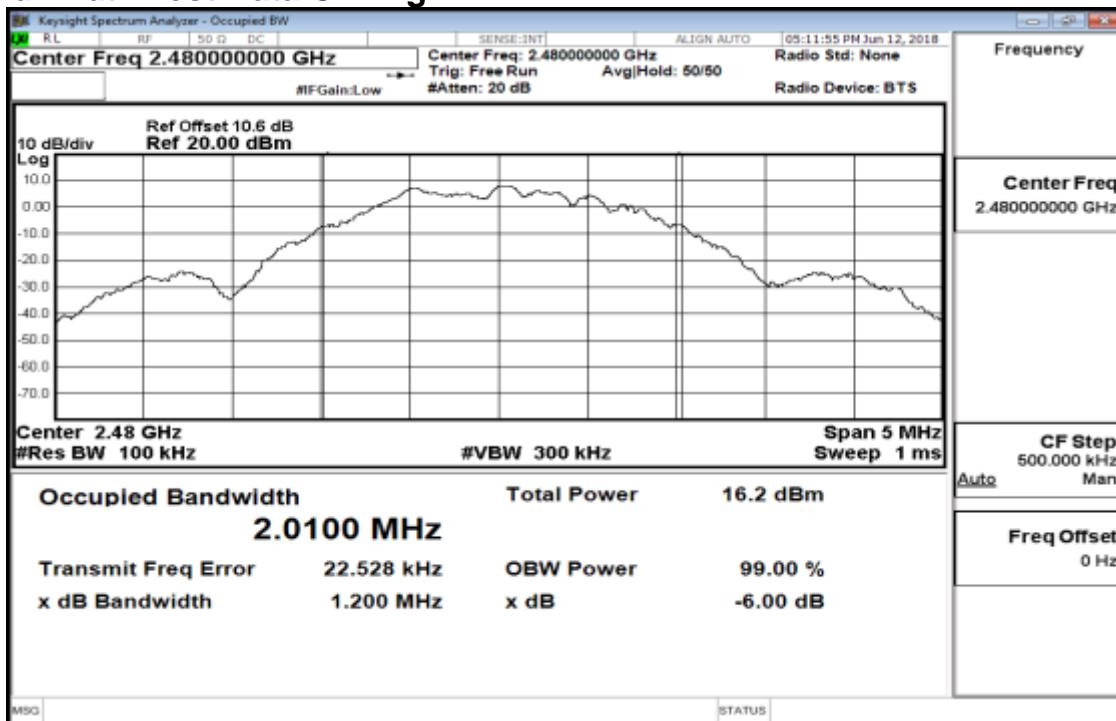
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## 6dB Band Width Test Data CH-Mid



## 6dB Band Width Test Data CH-High



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## 9 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

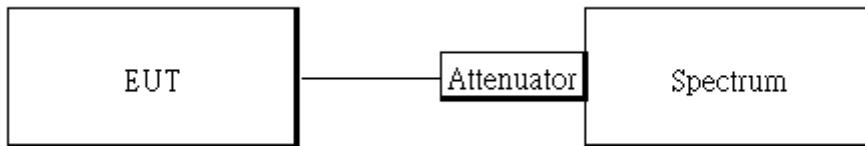
### 9.1 Standard Applicable

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, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

### 9.2 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
DC Power Supply	Agilent	E3640A	MY53130054	2017/09/04	2018/09/03
Attenuator	Marvelous	MVE2213-10	RF30	2017/12/26	2018/12/25
Spectrum Analyzer	Agilent	N9010A	MY51440113	2017/06/21	2018/06/20

### 9.3 Test SET-UP:



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## 9.4 Measurement Procedure

### Reference Level of Emission Limit:

1. Set analyzer center frequency to DTS channel center frequency.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
3. Set the span to 1.5 times the DTS channel bandwidth.
4. Set the RBW = 100kHz & VBW = 300 kHz.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.

### Conducted Band Edge:

1. To connect Antenna Port of EUT to Spectrum.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
4. Set start to edge frequency, and stop frequency of spectrum analyzer so as to encompass the spectrum to be examined.
5. Set the spectrum analyzer as RBW=100 kHz, VBW=300 kHz, Detector = Peak, Sweep = auto
6. Mark the highest reading of the emission as the reference level measurement.
7. Marker on frequency, 2.3999GHz and 2.4836GHz, and examine shall 100 kHz immediately outside the authorized (2400~2483.5) be attenuated by 20dB at least relative to the maximum emission of power.
8. Repeat above procedures until all default test channel (low, middle, and high) was complete.

### Conducted Spurious Emission:

1. To connect Antenna Port of EUT to Spectrum.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
3. Set RBW = 100 kHz & VBW=300 kHz, Detector =Peak, Sweep = Auto
4. Allow trace to fully stabilize.
5. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
6. Repeat above procedures until all default test channel measured were complete.

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f (886-2) 2298-0488

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## 9.5 Measurement Result

### BLE Mode

#### Reference Level of Limit

Frequency (MHz)	RF Power Density (dBm)	Reference Level of Limit = PSD - 20dB (dBm)
2402	8.18	-11.82
2480	8.38	-11.62

*NOTE: cable loss as 10.6dB that offsets in the spectrum*

*NOTE: Refer to next page for plots.*

### BT 5.0 Mode

#### Reference Level of Limit

Frequency (MHz)	RF Power Density (dBm)	Reference Level of Limit = PSD - 20dB (dBm)
2402	7.86	-12.14
2480	8.09	-11.91

*NOTE: cable loss as 10.6dB that offsets in the spectrum*

*NOTE: Refer to next page for plots.*

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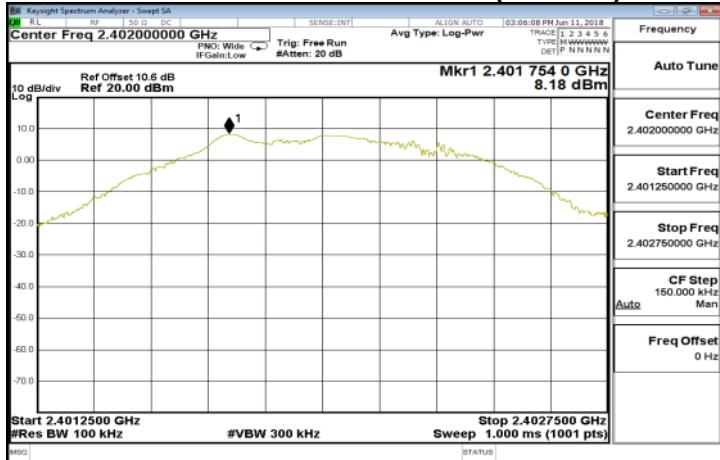
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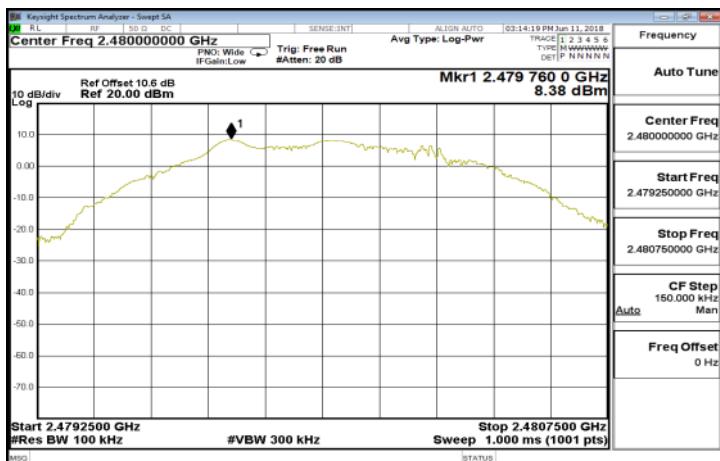


## BLE Mode

### Reference Level of Emission Limit (CH-Low)

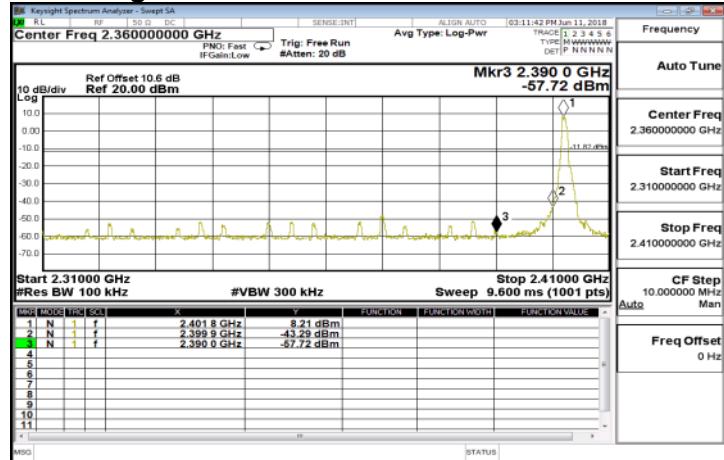


### Reference Level of Emission Limit (CH-High)

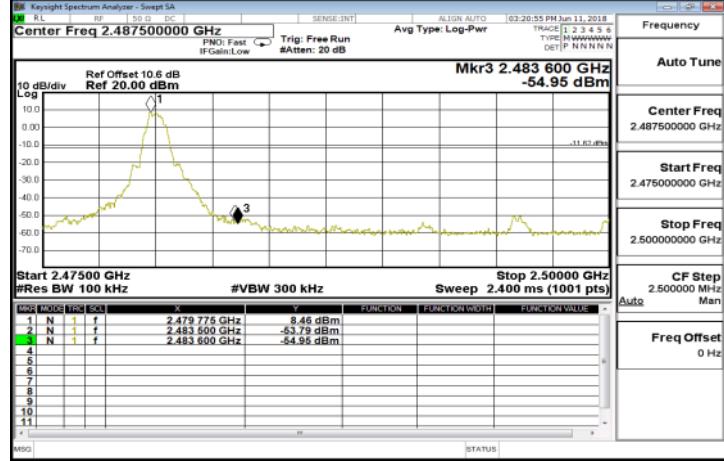


## BLE Mode

### Band Edges Test Data CH-Low



### Band Edges Test Data CH-High



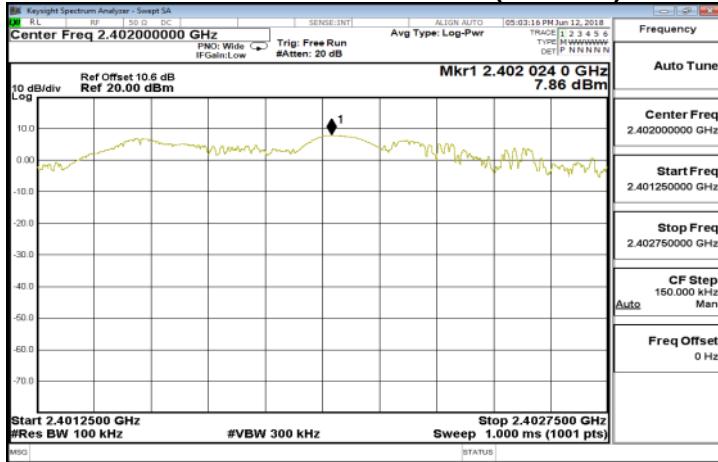
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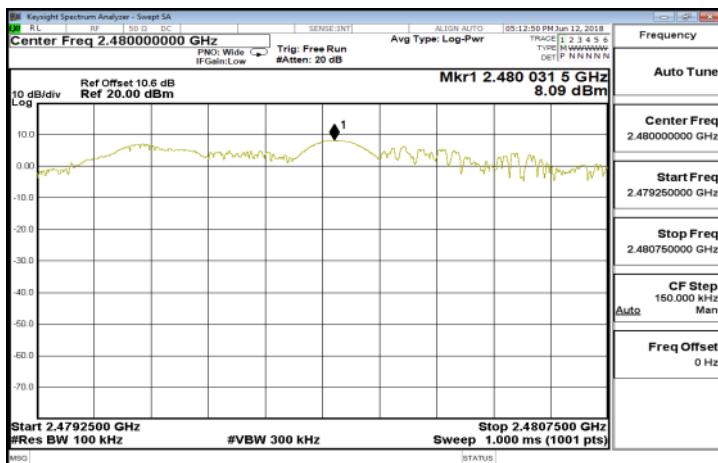
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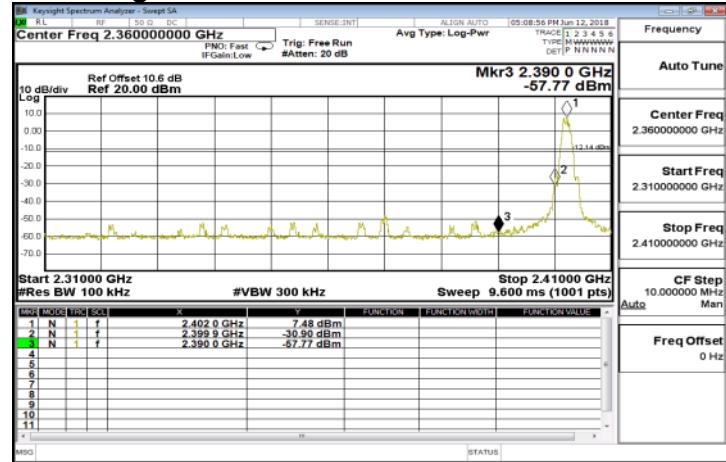
## BT 5.0 Mode Reference Level of Emission Limit (CH-Low)



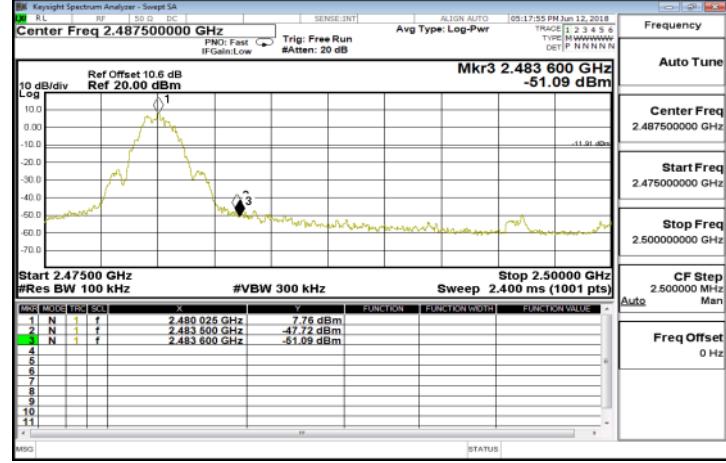
## Reference Level of Emission Limit (CH-High)



## BT 5.0 Mode Band Edges Test Data CH-Low



## Band Edges Test Data CH-High



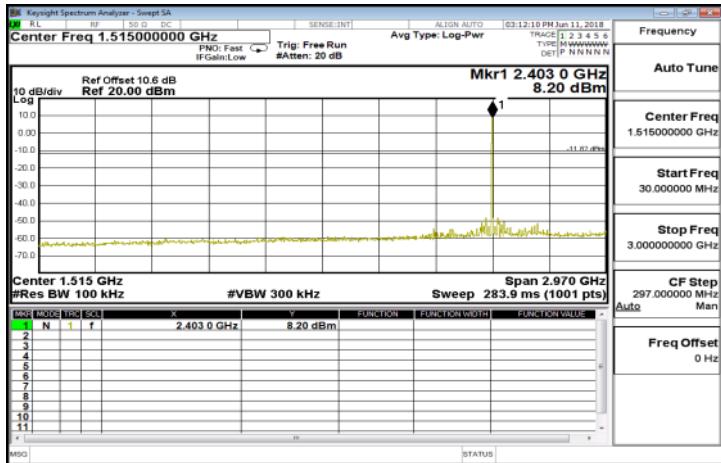
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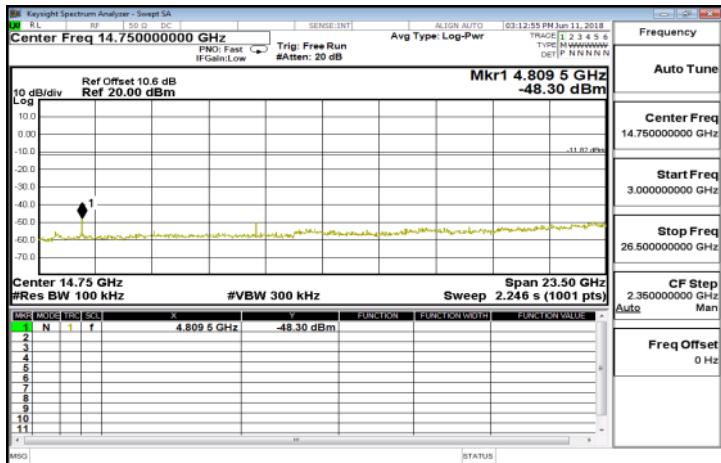
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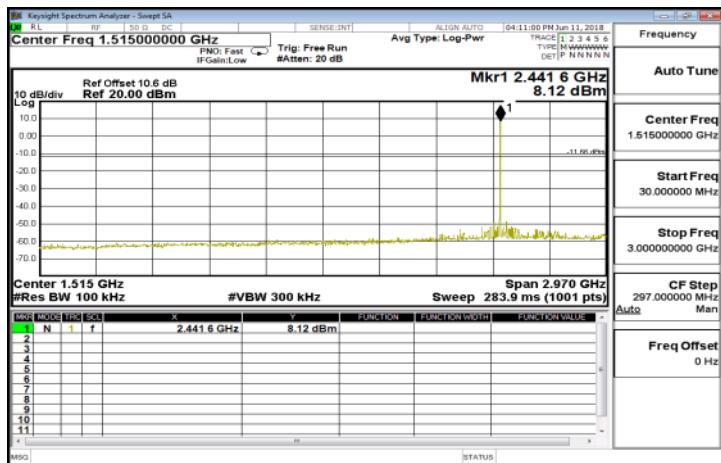
Conducted Spurious Emission Measurement Result  
BLE Mode  
CH-Low 30MHz – 3GHz



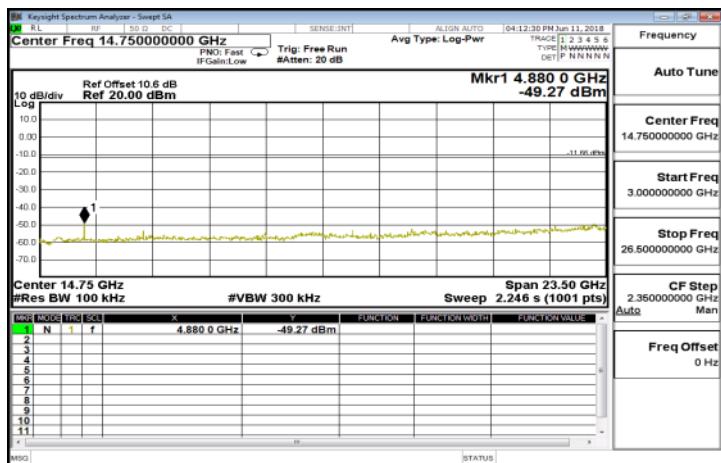
CH-Low 3GHz – 26.5GHz



CH-Mid 30MHz – 3GHz



CH-Mid 3GHz – 26.5GHz



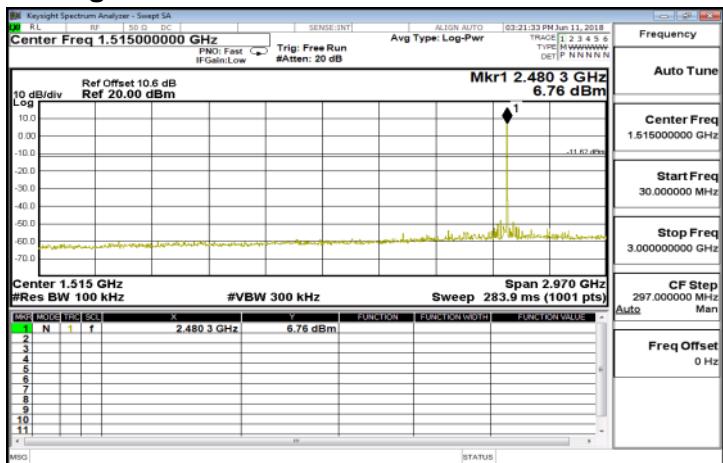
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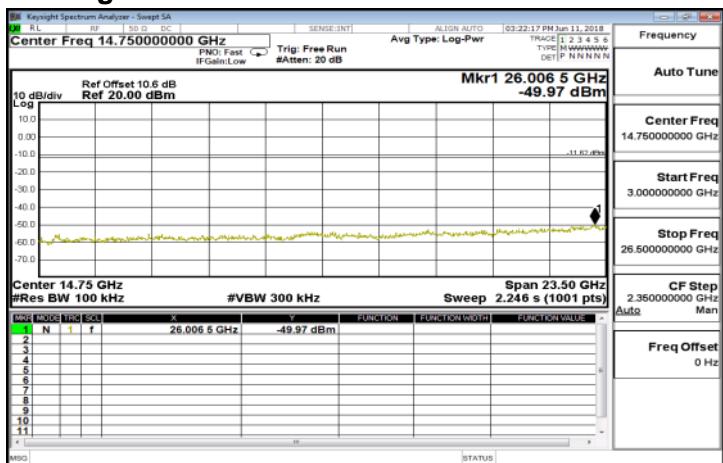
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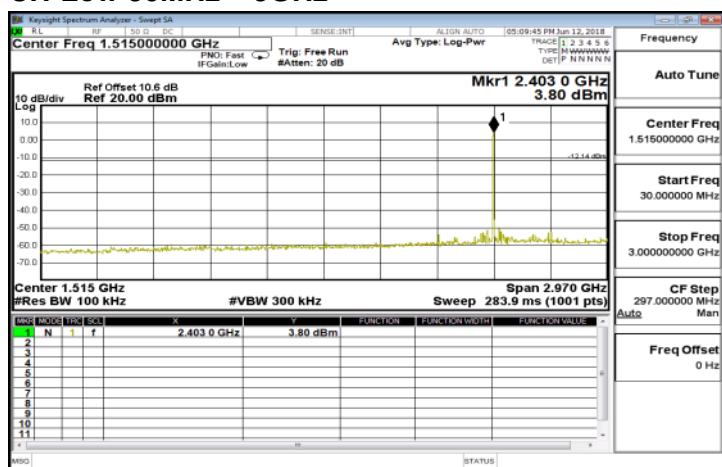
## CH-High 30MHz – 3GHz



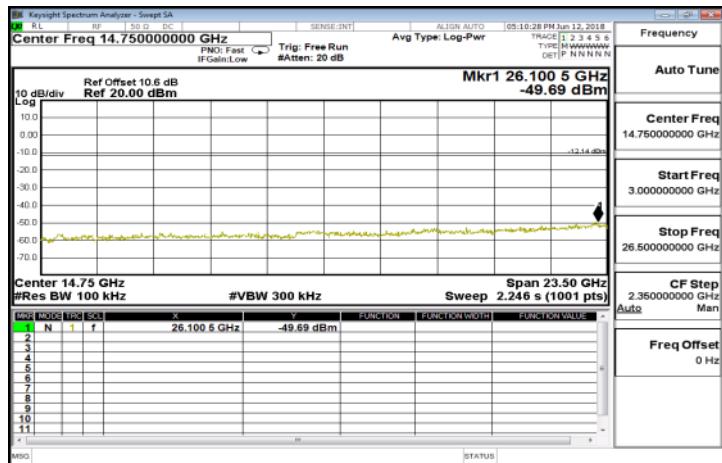
## CH- High 3GHz – 26.5GHz



## BT5.0 Mode CH-Low 30MHz – 3GHz



## CH-Low 3GHz – 26.5GHz



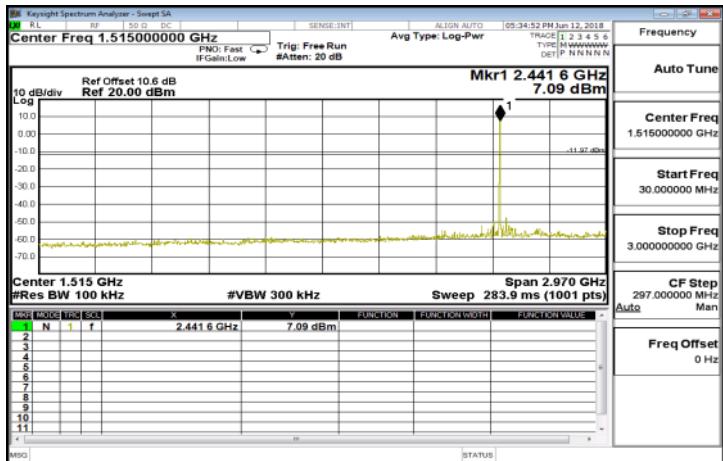
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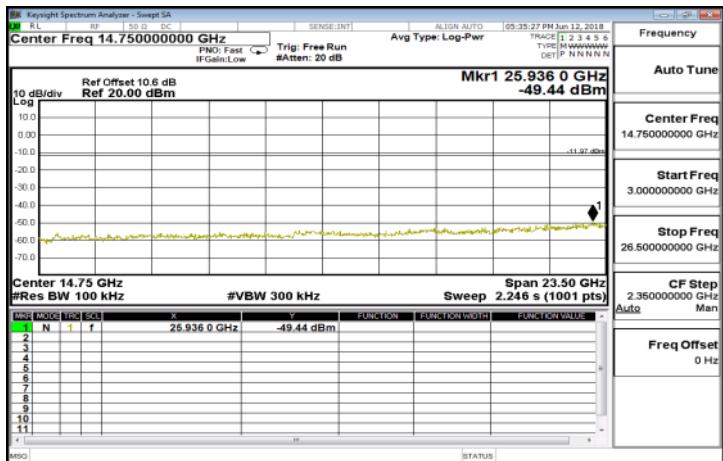
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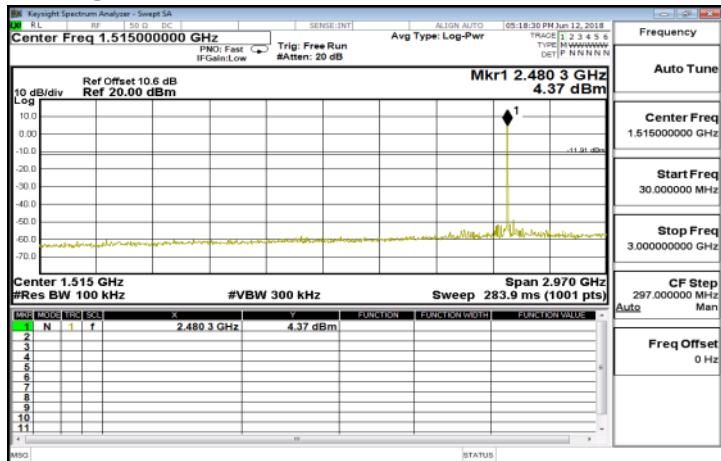
## CH-Mid 30MHz – 3GHz



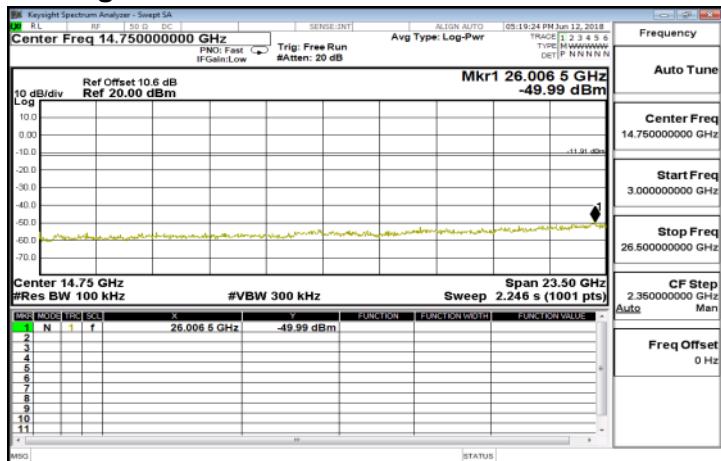
## CH-Mid 3GHz – 26.5GHz



## CH-High 30MHz – 3GHz



## CH-High 3GHz – 26.5GHz



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## 10 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

### 10.1 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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## 10.2 Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Broadband Antenna	SCHWAZBECK	VULB 9168	9168-617	2017/10/27	2018/10/26
Horn Antenna	Schwarzbeck	BBHA9120D	1341	2018/06/07	2019/06/06
Loop Antenna	ETS.LINDGREN	6502	148045	2017/09/26	2018/09/25
3m Site NSA	SGS	966 chamber D	N/A	2017/07/06	2018/07/05
EMI Test Receiver	R&S	ESU 40	100363	2018/04/11	2019/04/10
DC Power Supply	DHA	DPS-3003	9411005787	2017/08/14	2018/08/13
Pre-Amplifier	EMC Instruments	EMC184045B	980135	2017/10/27	2018/10/26
Pre-Amplifier	EMC Instruments	EMC9135	980234	2017/12/26	2018/12/25
Pre-Amplifier	EMC Instruments	EMC12630SE	980271	2017/12/26	2018/12/25
Attenuator	Marvelous	WATT-218FS-10	RF246	2017/12/26	2018/12/25
Highpass Filter	Micro Tronics	BRM50701-01	G008	2017/12/26	2018/12/25
Coaxial Cable	Huber Suhner	EMC106-SM-SM-7200	150703	2017/12/26	2018/12/25
Coaxial Cable	Huber Suhner	RG 214/U	W22.03	2017/12/26	2018/12/25

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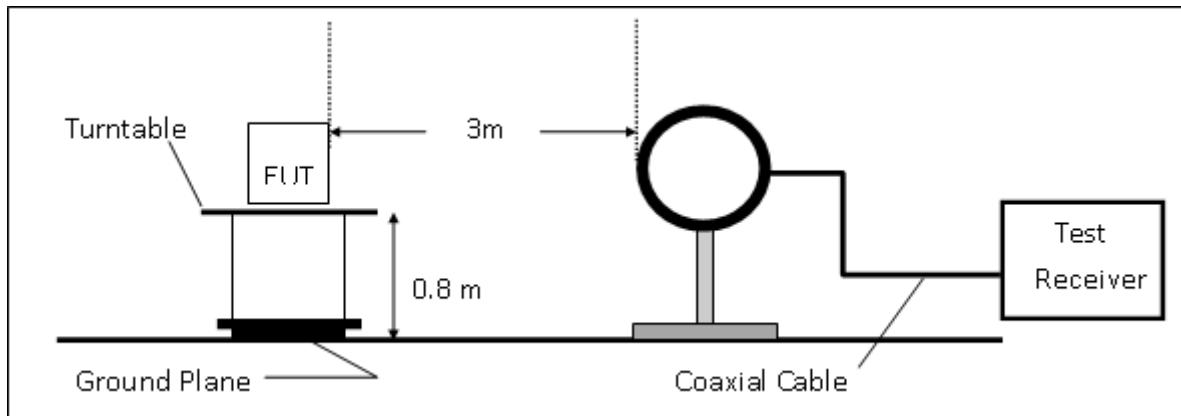
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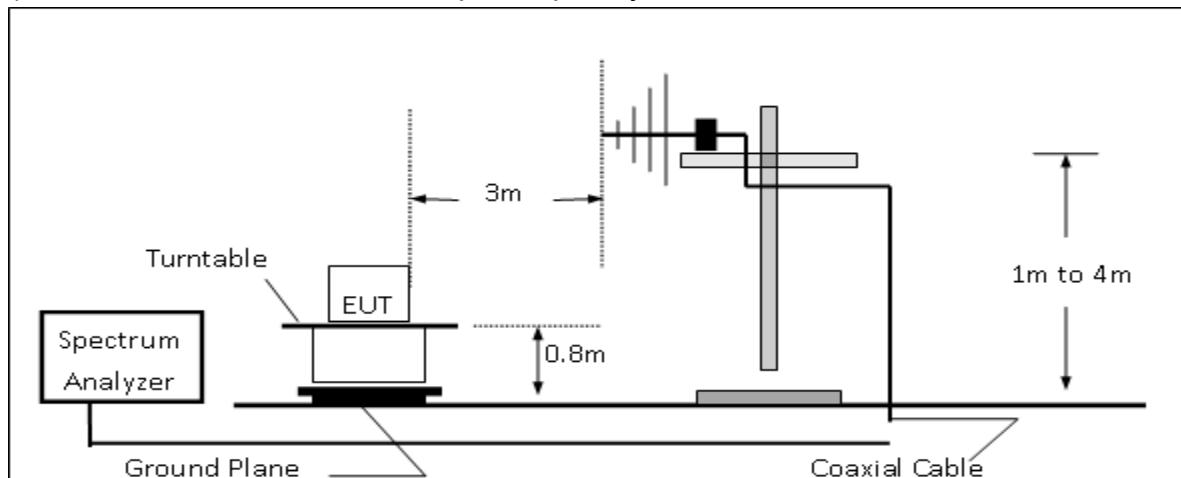
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### 10.3 Test SET-UP

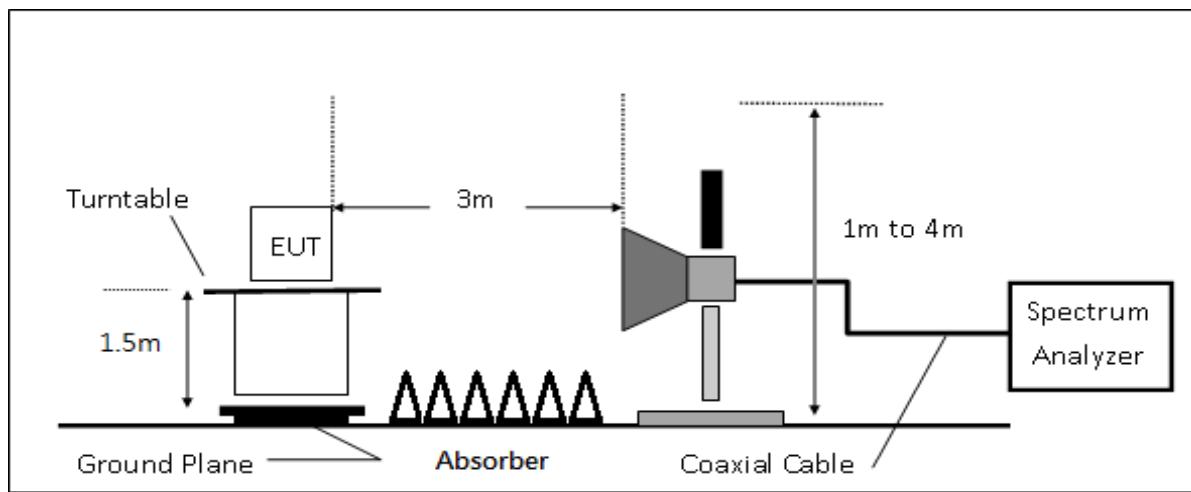
#### (A) Radiated Emission Test Set-UP Frequency Below 30MHz.



#### (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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## 10.4 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 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. Set the spectrum analyzer as RBW=120 kHz and VBW=300 kHz for Peak Detector (PK) and Quasi-peak (QP) at frequency below 1 GHz.
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  $\geq$  1/T (Duty cycle < 98%) for Average Detector at frequency above 1 GHz.
8. 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.
9. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
10. 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.
11. Repeat above procedures until all default test channel measured were complete.

## 10.5 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:

$$FS = RA + AF - AG$$

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

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)

## 10.6 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.

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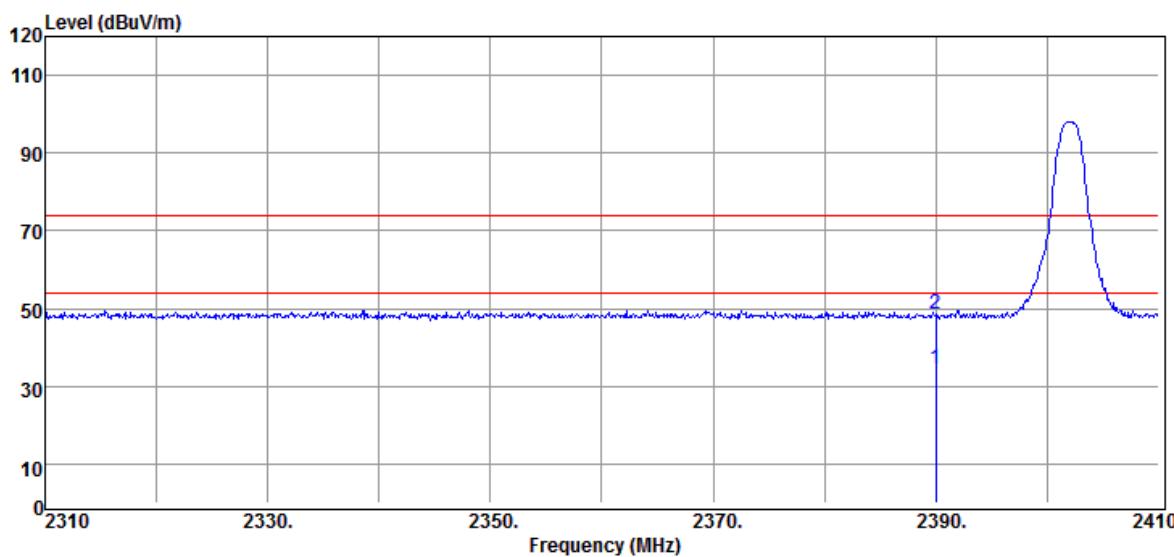
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**10.7 Measurement Result:****Radiated Band Edge Measurement Result****\*Internal Chip Antenna\_BLE**

Operation Mode	:BLE	Test Date	:2018-06-11
Test Mode	:BE CH Low	Temp./Humi.	:25/60
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:2402 MHz	Engineer	:Jerry



Freq. MHz	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
2390.00	Average	40.05	-5.57	34.48	54.00	-19.52
2390.00	Peak	54.23	-5.57	48.66	74.00	-25.34

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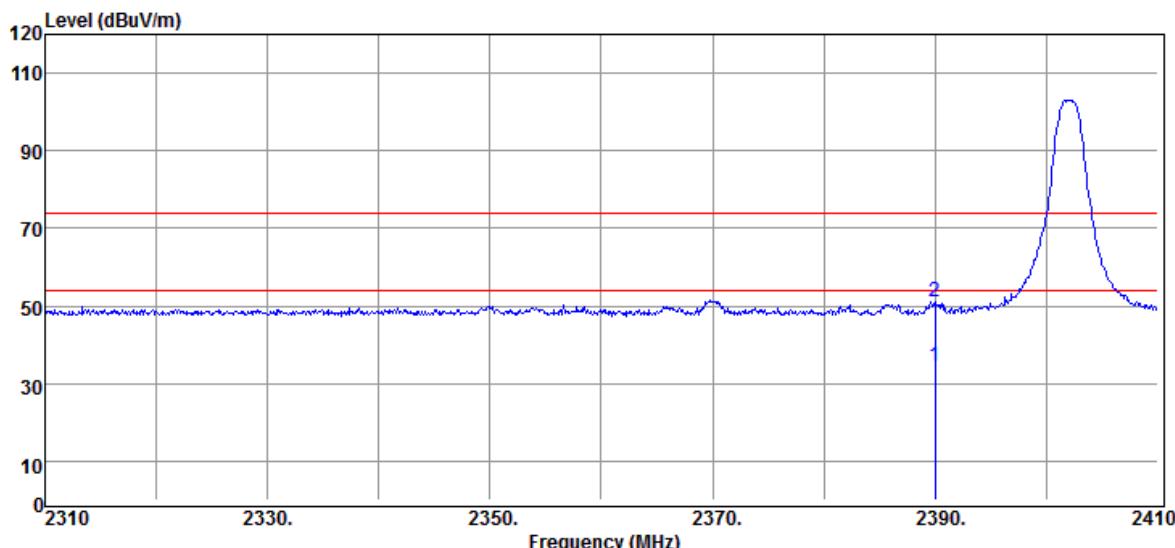
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Operation Mode :BLE  
 Test Mode :BE CH Low  
 EUT Pol :E2 Plan  
 Test Channel :2402 MHz

Test Date :2018-06-11  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
2390.00	Average	40.11	-5.57	34.54	54.00	-19.46
2390.00	Peak	56.72	-5.57	51.15	74.00	-22.85

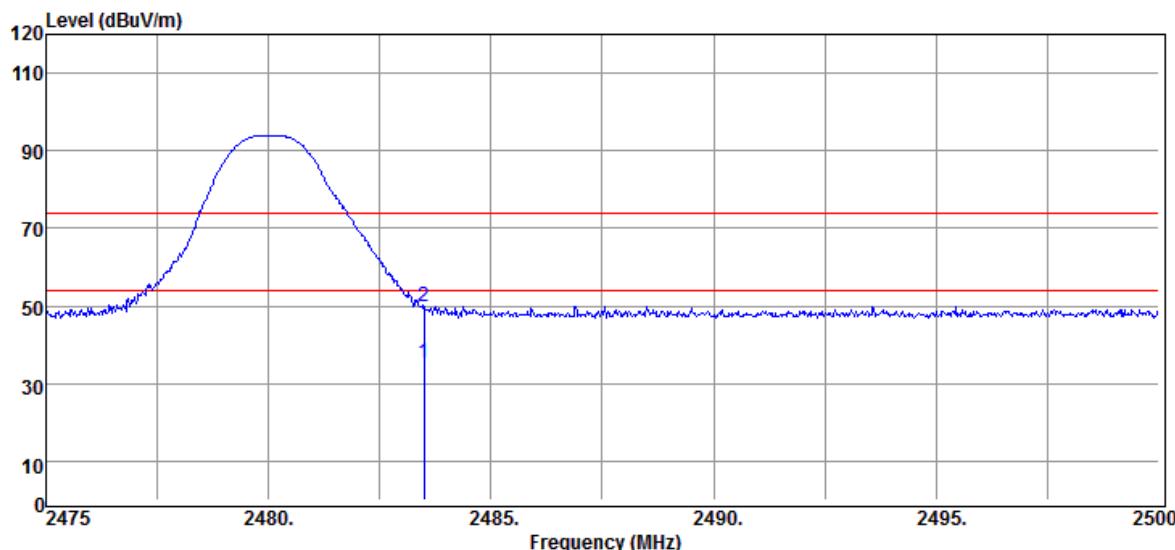
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Operation Mode :BLE  
 Test Mode :BE CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-11  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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	Average	40.27	-4.90	35.37	54.00	-18.63
2483.50	Peak	54.57	-4.90	49.67	74.00	-24.33

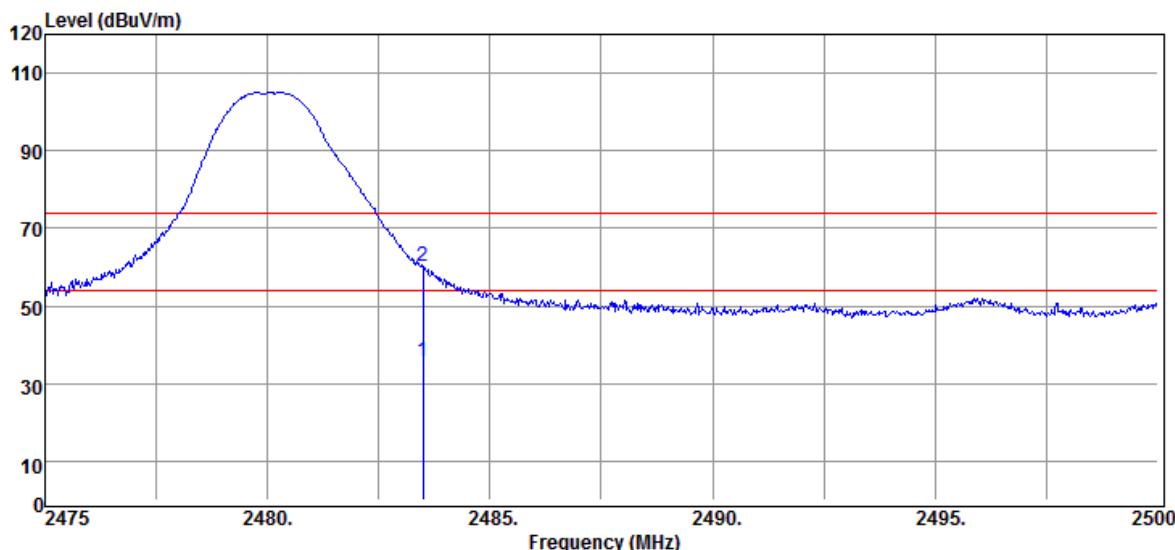
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Operation Mode :BLE  
 Test Mode :BE CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-11  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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	Average	40.81	-4.90	35.91	54.00	-18.09
2483.50	Peak	64.91	-4.90	60.01	74.00	-13.99

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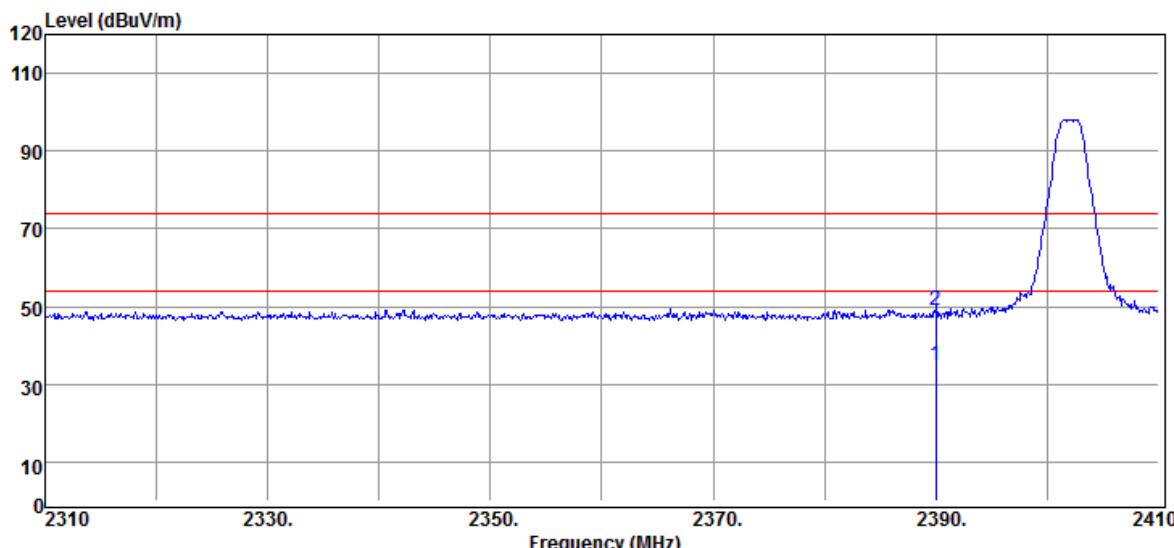
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**\*Internal Chip Antenna\_BT 5.0**

Operation Mode	:BT5.0	Test Date	:2018-06-11
Test Mode	:BE CH Low	Temp./Humi.	:25/60
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:2402 MHz	Engineer	:Jerry



Freq. MHz	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
2390.00	Average	40.25	-5.57	34.68	54.00	-19.32
2390.00	Peak	54.72	-5.57	49.15	74.00	-24.85

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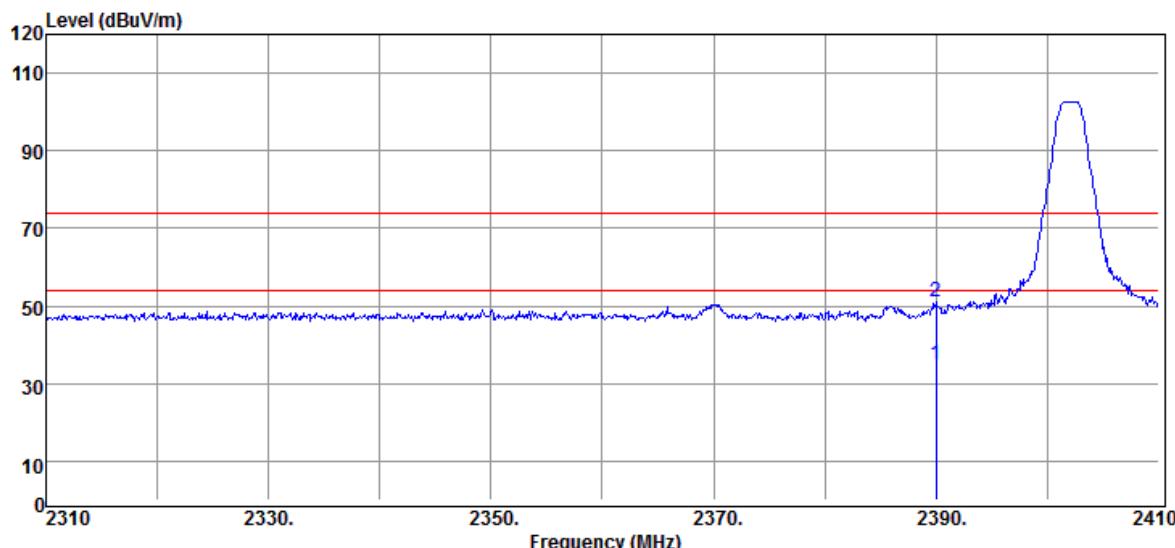
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Operation Mode :BT5.0  
 Test Mode :BE CH Low  
 EUT Pol :E2 Plan  
 Test Channel :2402 MHz  
 Test Date :2018-06-11  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
2390.00	Average	40.25	-5.57	34.68	54.00	-19.32
2390.00	Peak	56.63	-5.57	51.06	74.00	-22.94

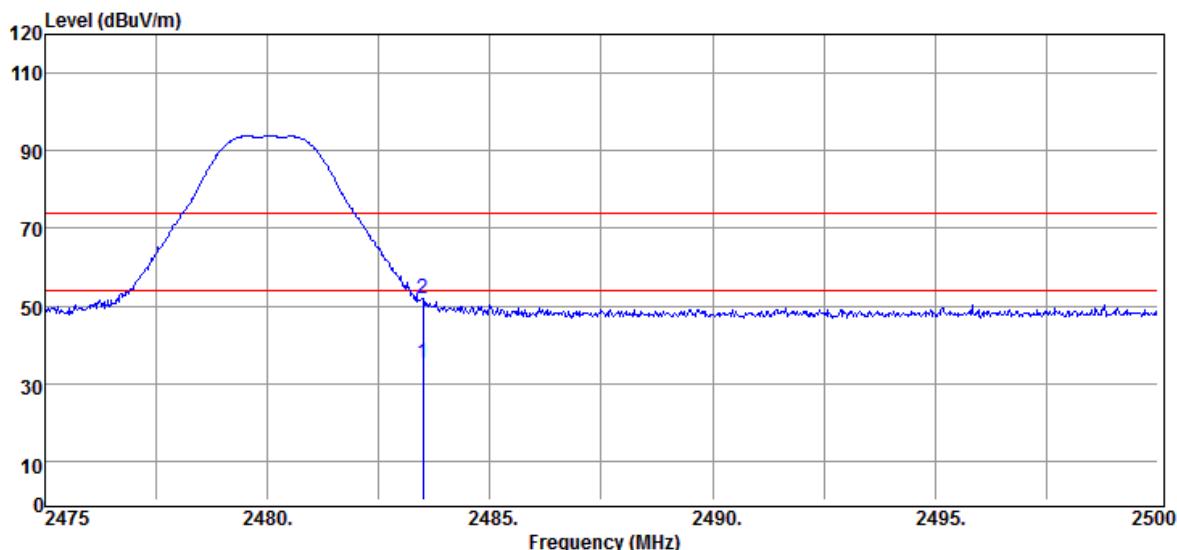
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Operation Mode :BT5.0  
 Test Mode :BE CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-11  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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	Average	40.35	-4.90	35.45	54.00	-18.55
2483.50	Peak	56.67	-4.90	51.77	74.00	-22.23

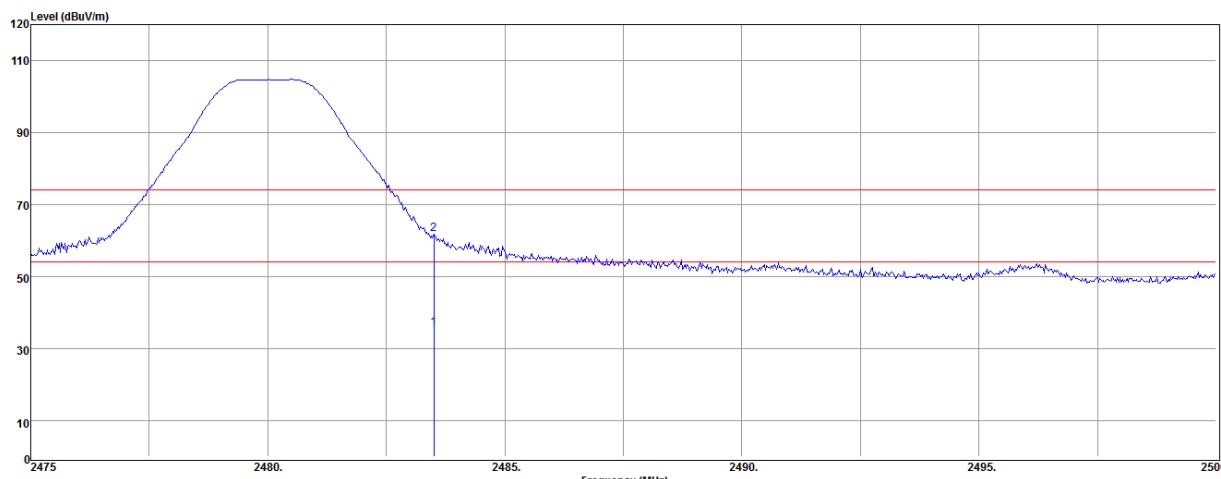
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Operation Mode :BT5.0  
 Test Mode :BE CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-11  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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	Average	40.50	-4.90	35.60	54.00	-18.40
2483.50	Peak	66.66	-4.90	61.76	74.00	-12.24

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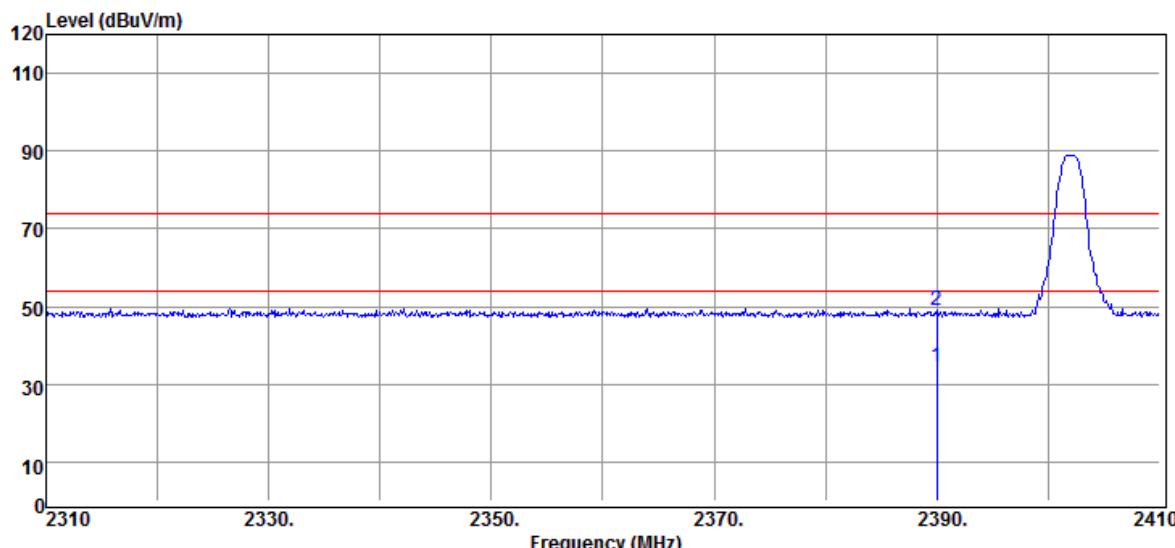
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**\*Internal PCB Antenna\_BLE**

Operation Mode	:BLE	Test Date	:2018-06-12
Test Mode	:BE CH Low	Temp./Humi.	:25/60
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:2402 MHz	Engineer	:Jerry



Freq. MHz	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
2390.00	Average	39.89	-5.57	34.32	54.00	-19.68
2390.00	Peak	54.76	-5.57	49.19	74.00	-24.81

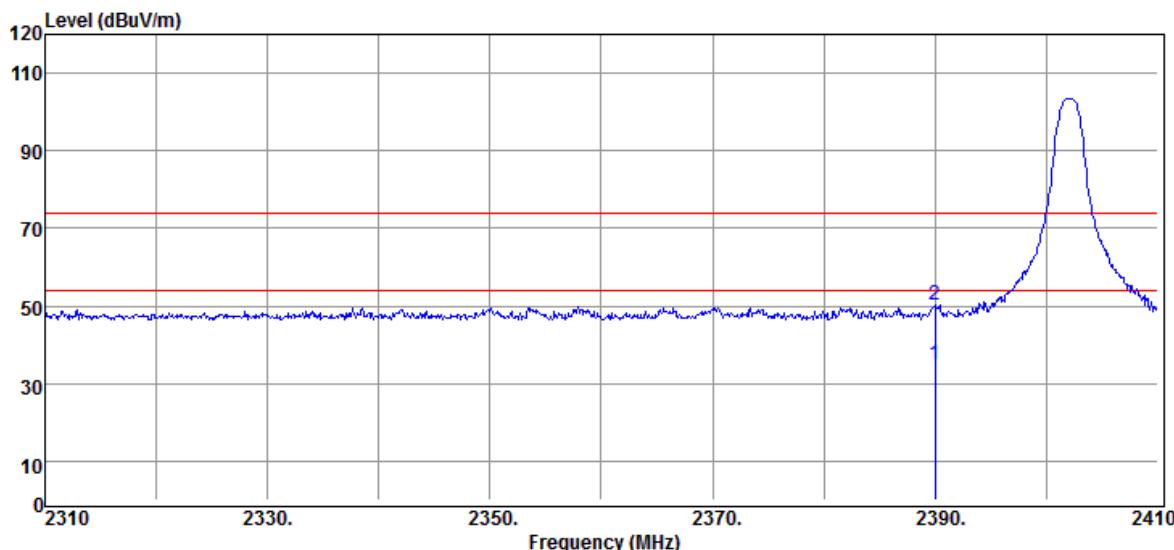
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Operation Mode :BLE  
 Test Mode :BE CH Low  
 EUT Pol :E2 Plan  
 Test Channel :2402 MHz

Test Date :2018-06-12  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
2390.00	Average	40.36	-5.57	34.79	54.00	-19.21
2390.00	Peak	55.72	-5.57	50.15	74.00	-23.85

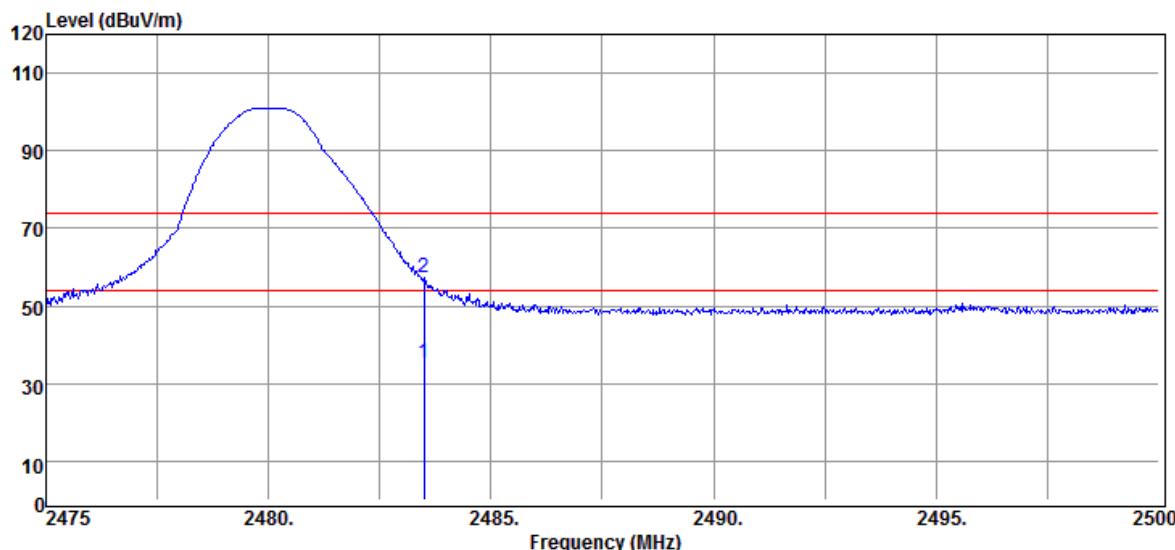
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Operation Mode :BLE  
 Test Mode :BE CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-12  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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	Average	40.23	-4.90	35.33	54.00	-18.67
2483.50	Peak	62.15	-4.90	57.25	74.00	-16.75

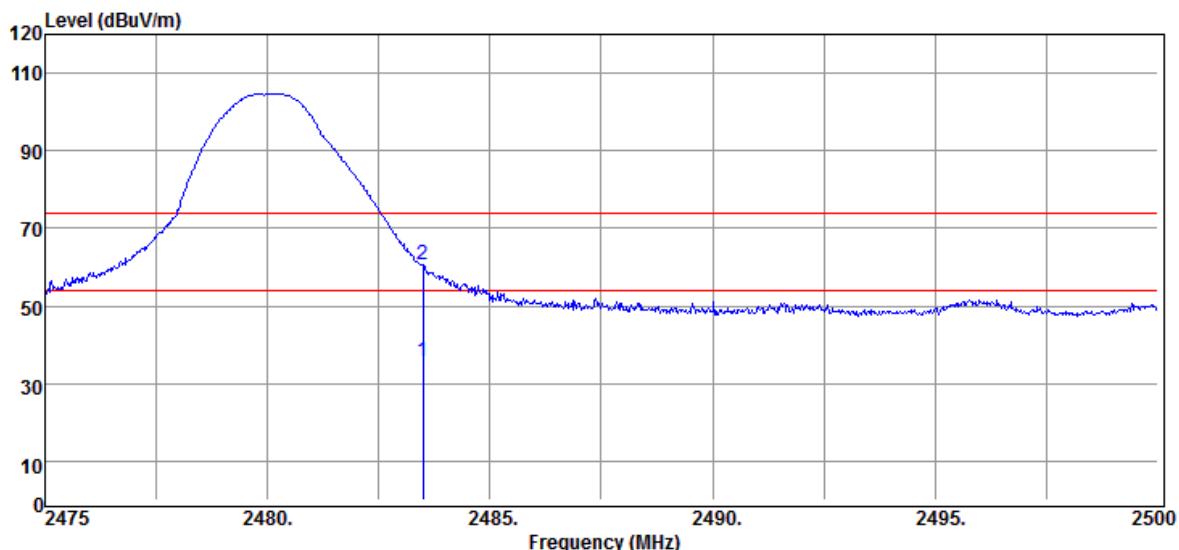
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Operation Mode :BLE  
 Test Mode :BE CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-12  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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	Average	40.62	-4.90	35.72	54.00	-18.28
2483.50	Peak	65.35	-4.90	60.45	74.00	-13.55

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台灣檢驗科技股份有限公司

t (886-2) 2299-3279

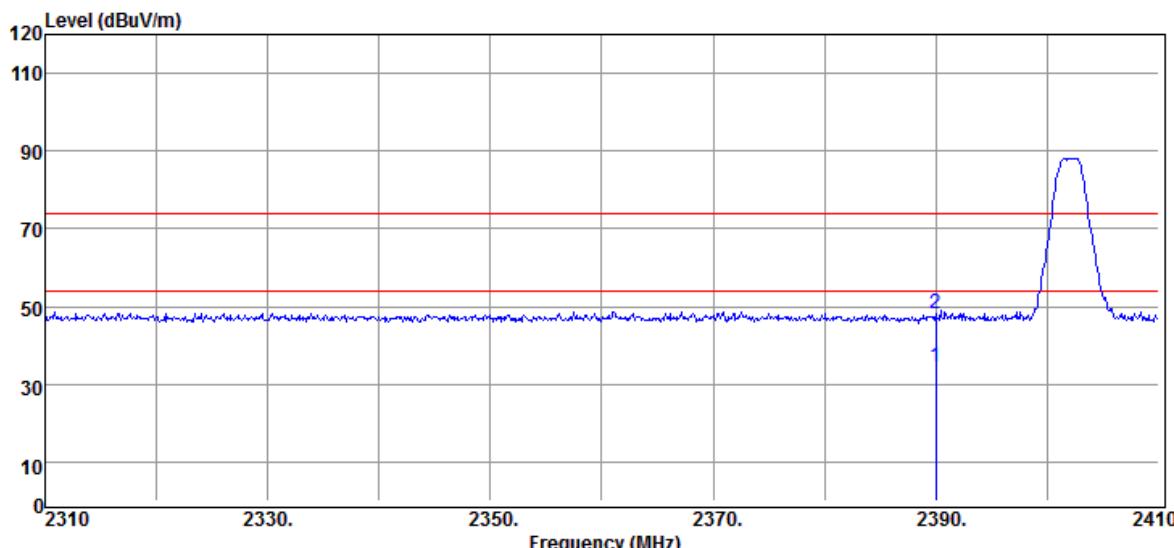
f (886-2) 2298-0488

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**\*Internal PCB Antenna\_BT 5.0**

Operation Mode	:BT5.0	Test Date	:2018-06-12
Test Mode	:BE CH Low	Temp./Humi.	:25/60
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:2402 MHz	Engineer	:Jerry



Freq. MHz	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
2390.00	Average	40.10	-5.57	34.53	54.00	-19.47
2390.00	Peak	53.89	-5.57	48.32	74.00	-25.68

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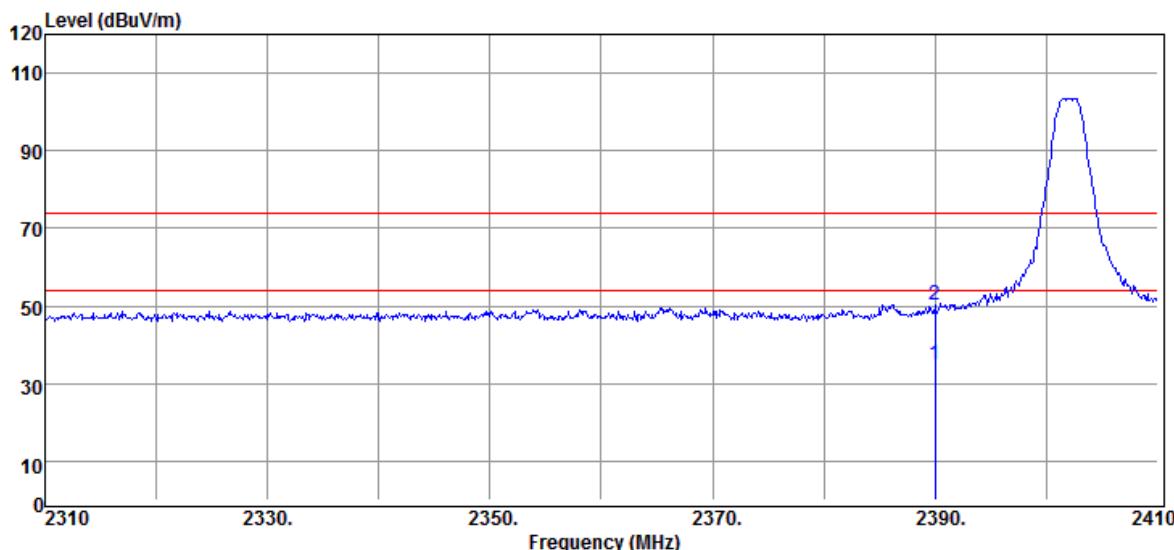
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Operation Mode :BT5.0  
 Test Mode :BE CH Low  
 EUT Pol :E2 Plan  
 Test Channel :2402 MHz

Test Date :2018-06-12  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
2390.00	Average	40.28	-5.57	34.71	54.00	-19.29
2390.00	Peak	55.68	-5.57	50.11	74.00	-23.89

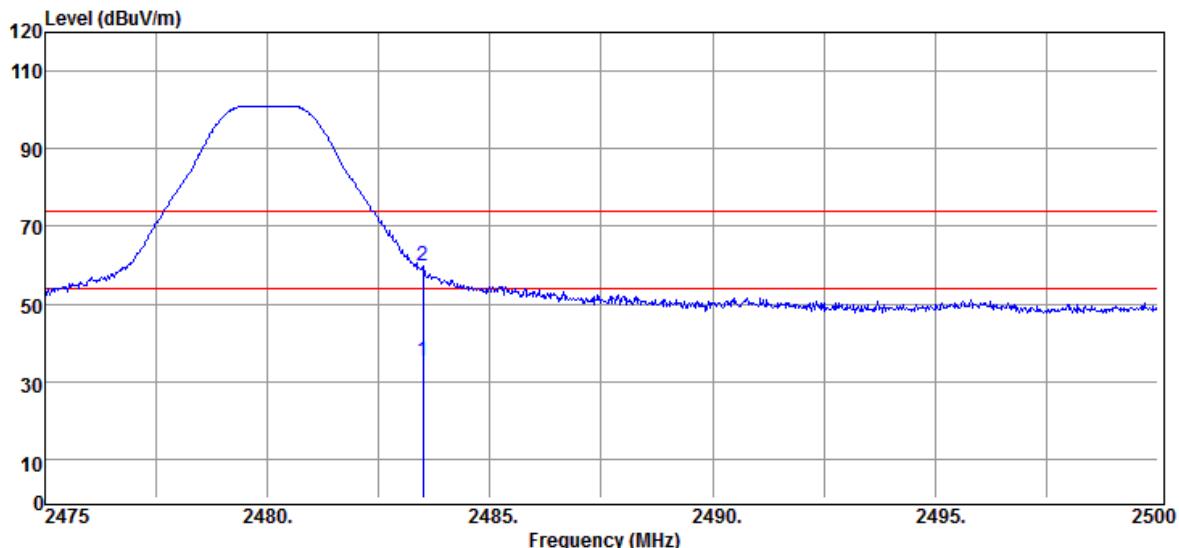
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Operation Mode :BT5.0  
 Test Mode :BE CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-12  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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	Average	40.30	-4.90	35.40	54.00	-18.60
2483.50	Peak	64.71	-4.90	59.81	74.00	-14.19

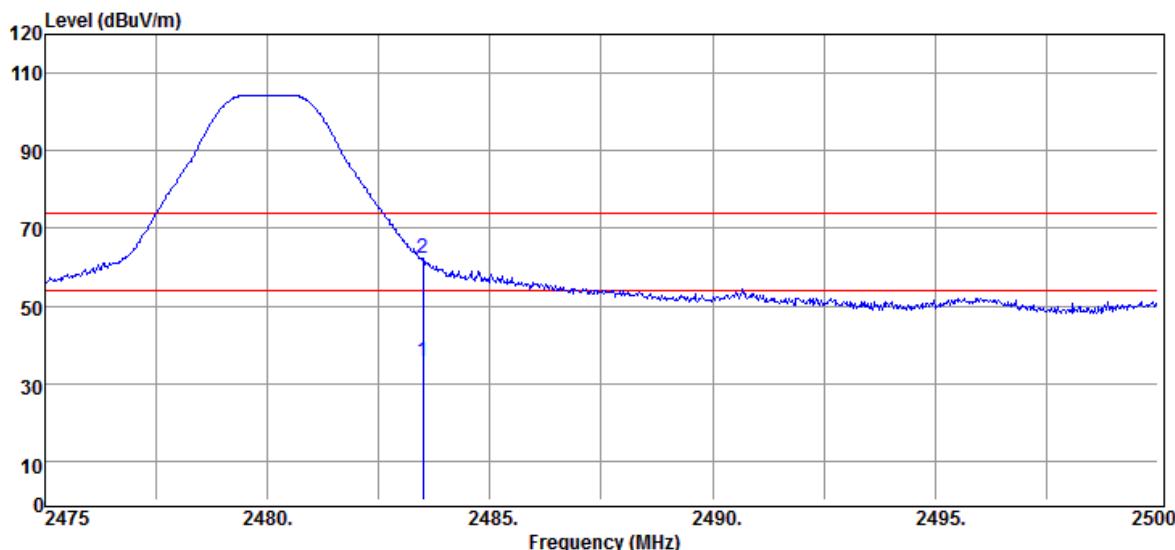
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Operation Mode :BT5.0  
 Test Mode :BE CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-12  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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	Average	40.64	-4.90	35.74	54.00	-18.26
2483.50	Peak	67.21	-4.90	62.31	74.00	-11.69

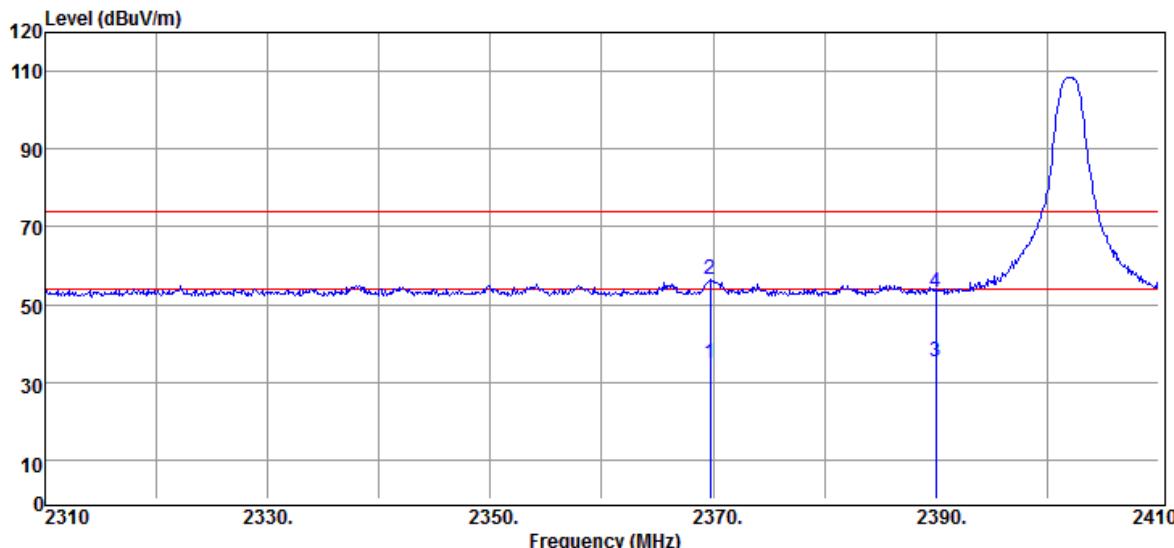
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## \*External UFL Antenna\_BLE

Operation Mode	:BLE	Test Date	:2018-06-14
Test Mode	:BE CH Low	Temp./Humi.	:25/60
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:2402 MHz	Engineer	:Jerry



Freq. MHz	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
2369.70	Average	40.56	-5.57	34.99	54.00	-19.01
2369.70	Peak	62.17	-5.57	56.60	74.00	-17.40
2390.00	Average	40.90	-5.57	35.33	54.00	-18.67
2390.00	Peak	58.92	-5.57	53.35	74.00	-20.65

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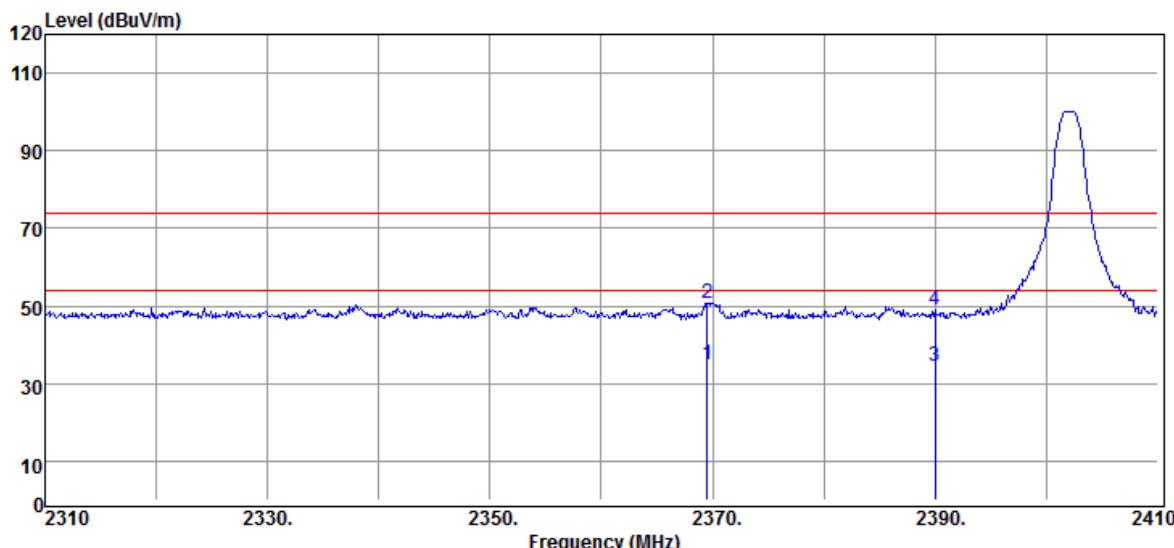
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Operation Mode :BLE  
 Test Mode :BE CH Low  
 EUT Pol :E2 Plan  
 Test Channel :2402 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
2369.50	Average	40.59	-5.56	35.03	54.00	-18.97
2369.50	Peak	56.27	-5.56	50.71	74.00	-23.29
2390.00	Average	39.87	-5.57	34.30	54.00	-19.70
2390.00	Peak	54.49	-5.57	48.92	74.00	-25.08

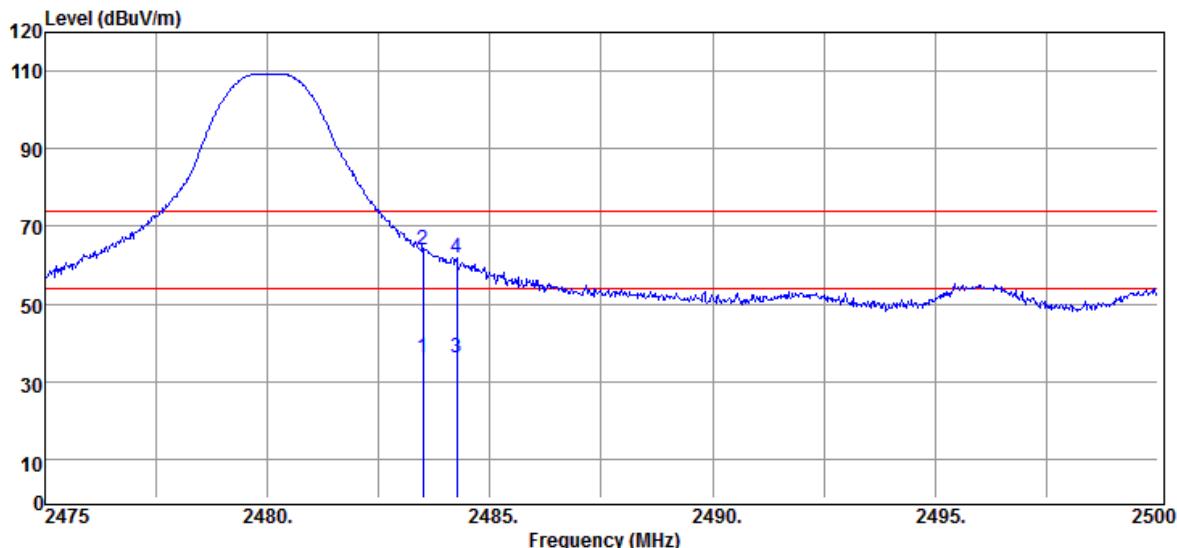
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Operation Mode :BLE  
 Test Mode :BE CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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	Average	41.19	-4.90	36.29	54.00	-17.71
2483.50	Peak	69.02	-4.90	64.12	74.00	-9.88
2484.25	Average	41.18	-4.90	36.28	54.00	-17.72
2484.25	Peak	66.92	-4.90	62.02	74.00	-11.98

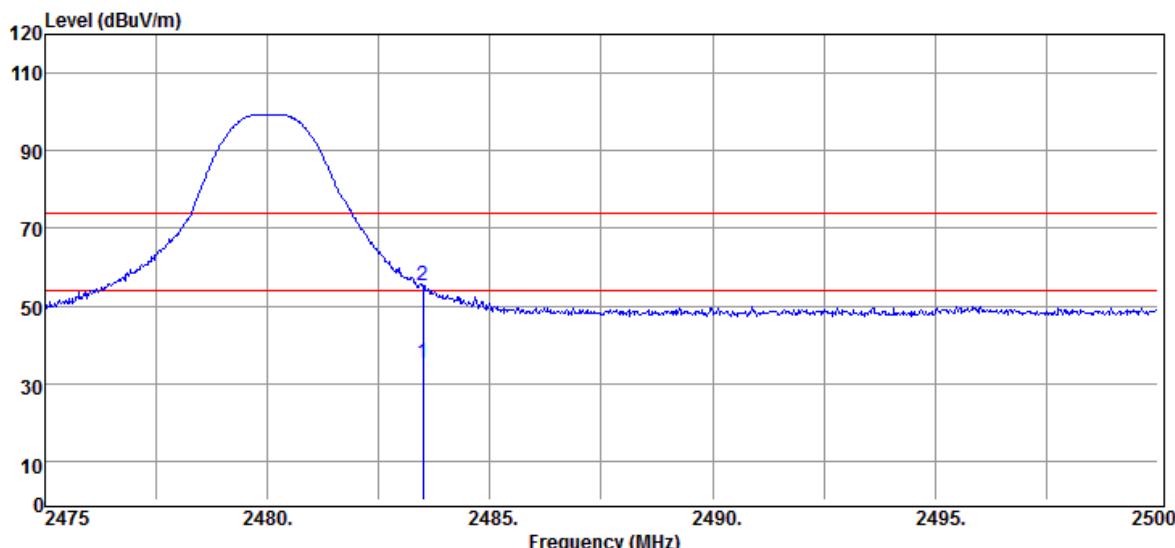
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Operation Mode :BLE  
 Test Mode :BE CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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	Average	40.39	-4.90	35.49	54.00	-18.51
2483.50	Peak	60.28	-4.90	55.38	74.00	-18.62

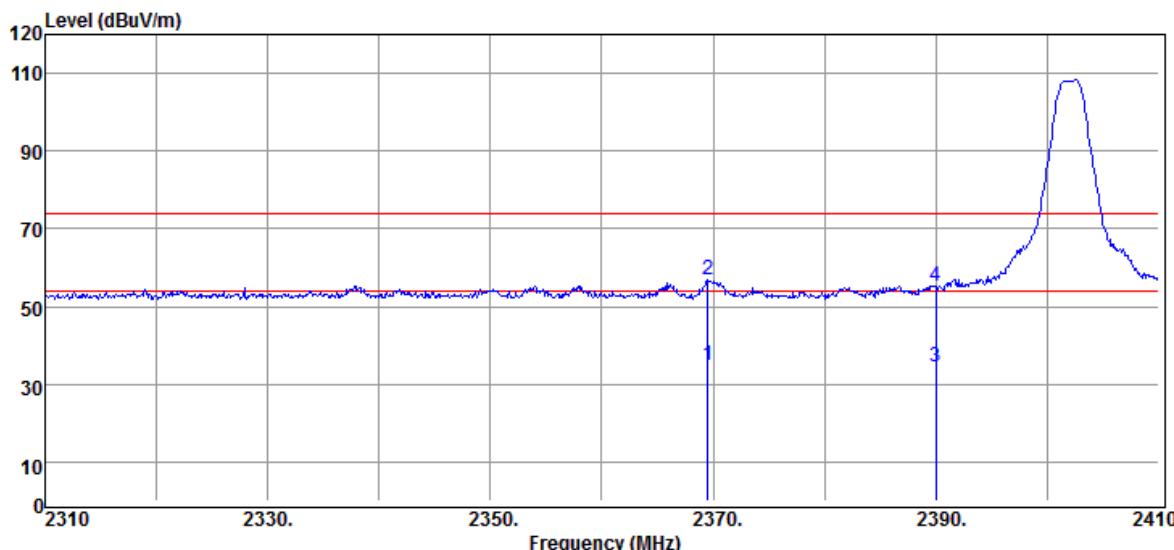
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**\*External UFL Antenna\_BT 5.0**

Operation Mode	:BT5.0	Test Date	:2018-06-14
Test Mode	:BE CH Low	Temp./Humi.	:25/60
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:2402 MHz	Engineer	:Jerry



Freq. MHz	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
2369.50	Average	40.37	-5.56	34.81	54.00	-19.19
2369.50	Peak	62.46	-5.56	56.90	74.00	-17.10
2390.00	Average	40.06	-5.57	34.49	54.00	-19.51
2390.00	Peak	60.96	-5.57	55.39	74.00	-18.61

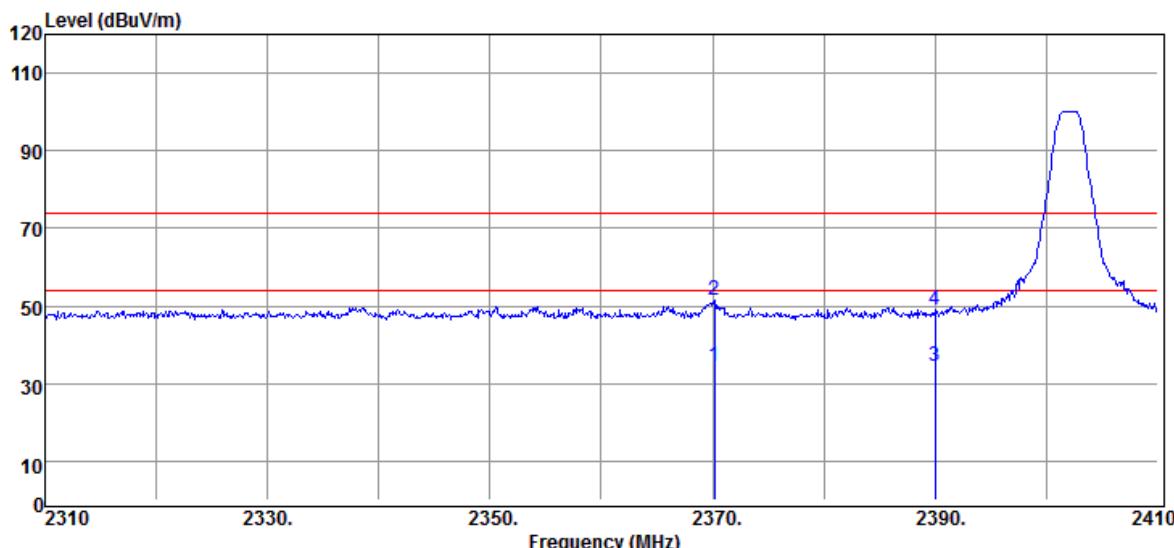
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SGS Taiwan Ltd. | No.134,WuKungRoad,NewTaipeiIndustrialPark,WukuDistrict,NewTaipeiCity,Taiwan24803/新北市五股區新北產業園區五工路134號

Operation Mode :BT5.0  
 Test Mode :BE CH Low  
 EUT Pol :E2 Plan  
 Test Channel :2402 MHz  
 Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
2370.20	Average	40.16	-5.57	34.59	54.00	-19.41
2370.20	Peak	56.86	-5.57	51.29	74.00	-22.71
2390.00	Average	39.87	-5.57	34.30	54.00	-19.70
2390.00	Peak	54.39	-5.57	48.82	74.00	-25.18

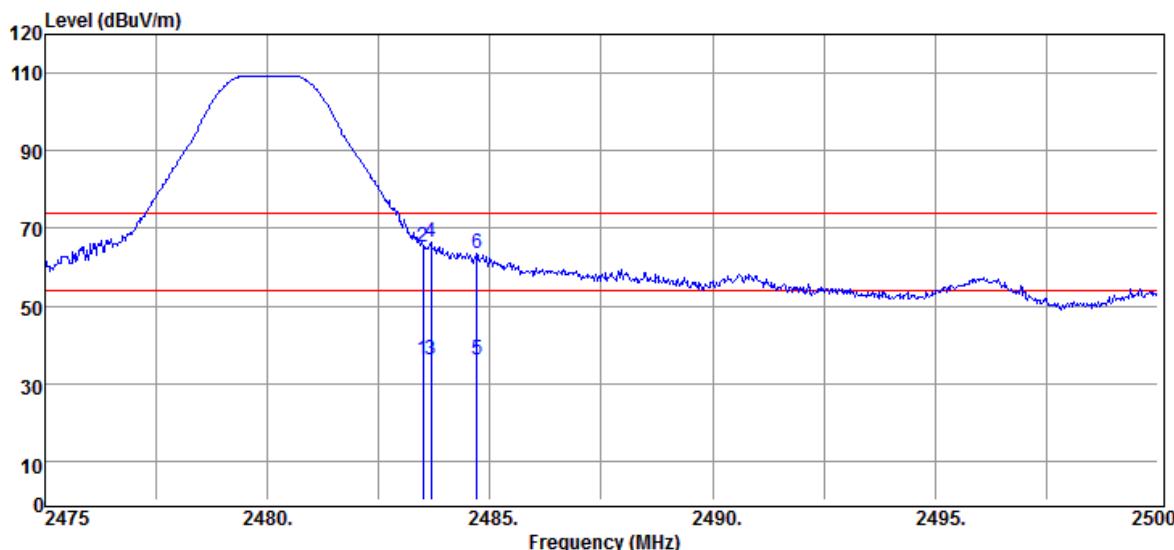
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Operation Mode :BT5.0  
 Test Mode :BE CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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	Average	41.01	-4.90	36.11	54.00	-17.89
2483.50	Peak	70.16	-4.90	65.26	74.00	-8.74
2483.68	Average	41.19	-4.90	36.29	54.00	-17.71
2483.68	Peak	71.19	-4.90	66.29	74.00	-7.71
2484.70	Average	40.90	-4.90	36.00	54.00	-18.00
2484.70	Peak	68.26	-4.90	63.36	74.00	-10.64

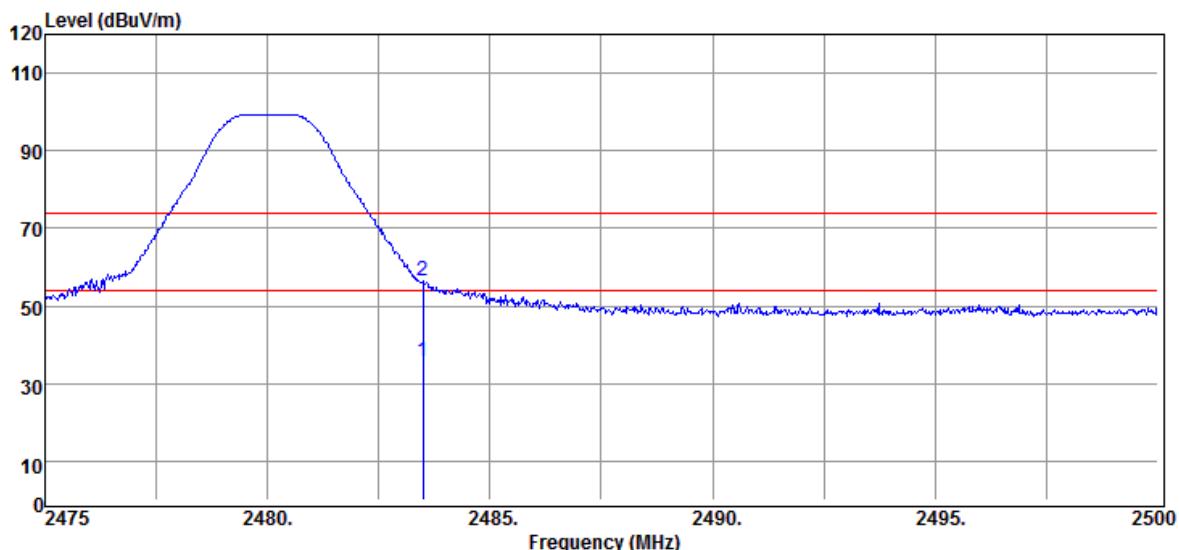
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Operation Mode :BT5.0  
 Test Mode :BE CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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	Average	40.59	-4.90	35.69	54.00	-18.31
2483.50	Peak	61.37	-4.90	56.47	74.00	-17.53

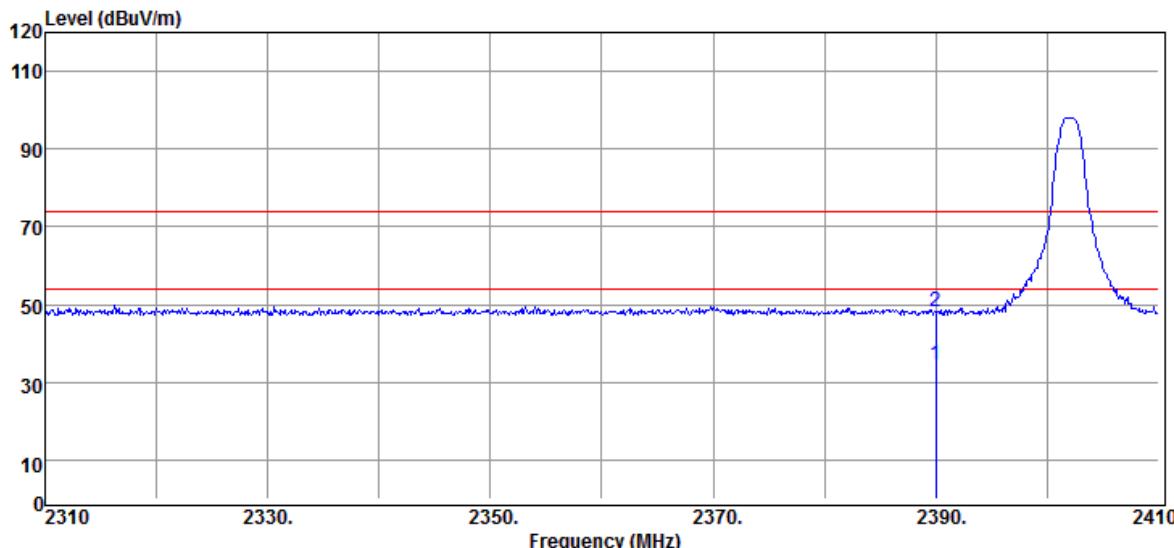
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**\*External PCB Antenna\_BLE**

Operation Mode	:BLE	Test Date	:2018-06-13
Test Mode	:BE CH Low	Temp./Humi.	:25/60
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:2402 MHz	Engineer	:Jerry



Freq. MHz	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
2390.00	Average	40.08	-5.57	34.51	54.00	-19.49
2390.00	Peak	53.81	-5.57	48.24	74.00	-25.76

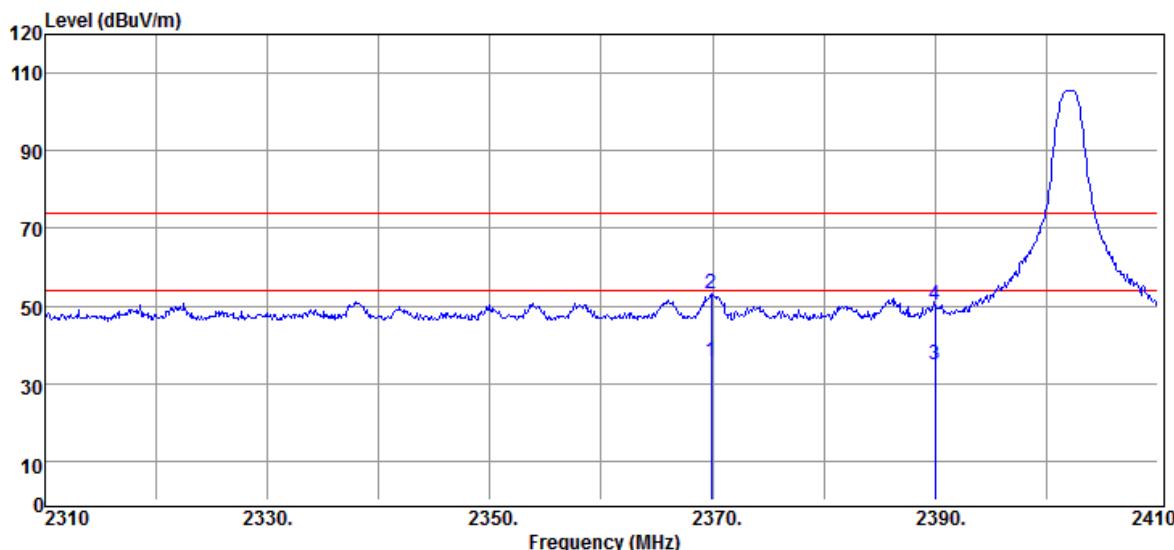
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Operation Mode :BLE  
 Test Mode :BE CH Low  
 EUT Pol :E2 Plan  
 Test Channel :2402 MHz

Test Date :2018-06-13  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
2369.90	Average	41.20	-5.57	35.63	54.00	-18.37
2369.90	Peak	58.81	-5.57	53.24	74.00	-20.76
2390.00	Average	40.50	-5.57	34.93	54.00	-19.07
2390.00	Peak	55.92	-5.57	50.35	74.00	-23.65

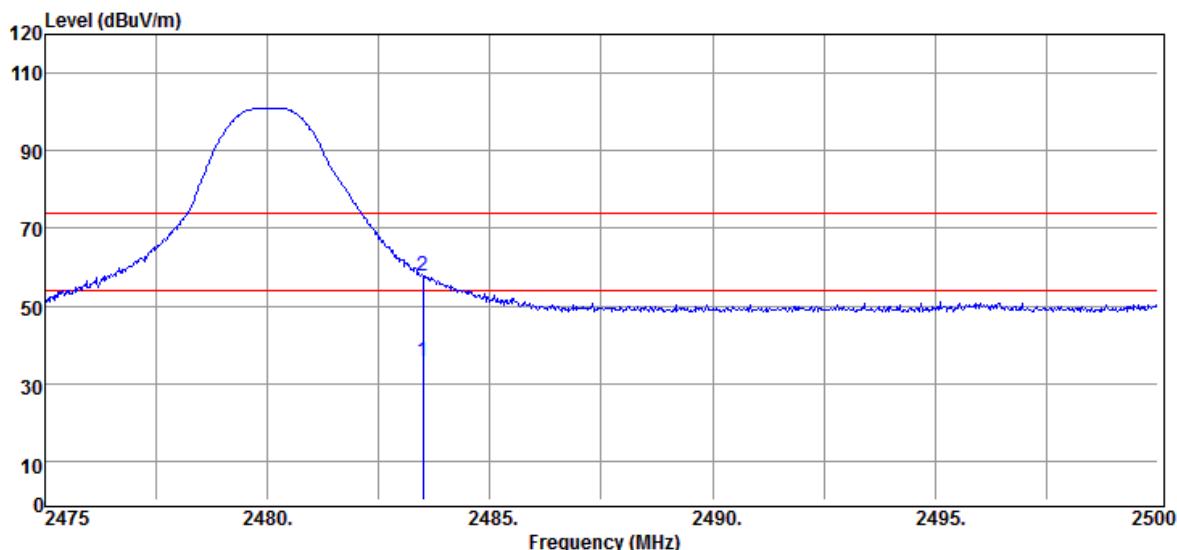
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Operation Mode :BLE  
 Test Mode :BE CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-13  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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	Average	40.56	-4.90	35.66	54.00	-18.34
2483.50	Peak	62.76	-4.90	57.86	74.00	-16.14

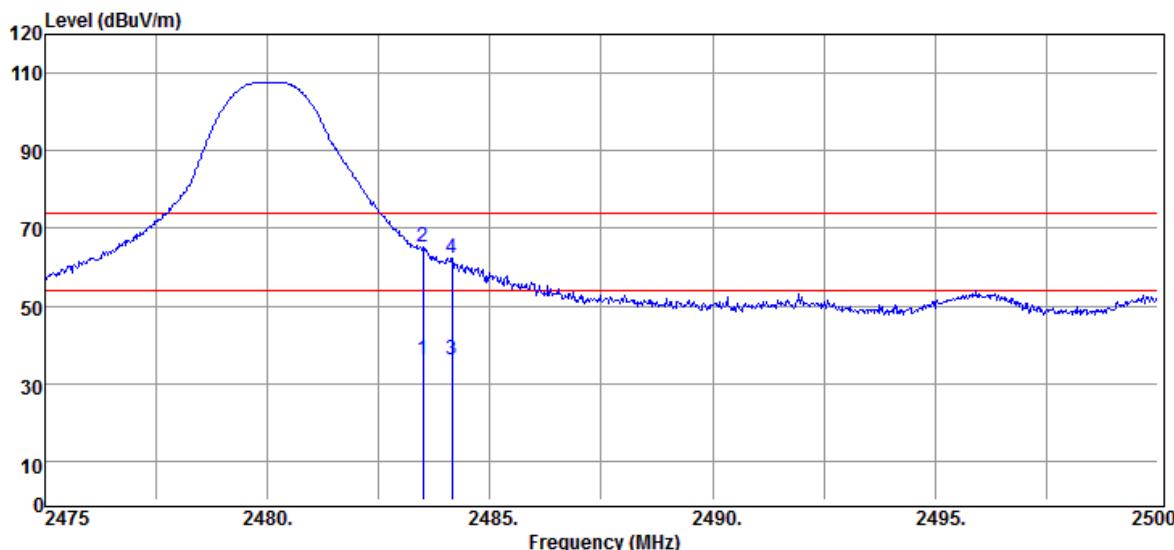
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Operation Mode :BLE  
 Test Mode :BE CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-13  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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	Average	41.13	-4.90	36.23	54.00	-17.77
2483.50	Peak	69.98	-4.90	65.08	74.00	-8.92
2484.15	Average	41.08	-4.90	36.18	54.00	-17.82
2484.15	Peak	67.34	-4.90	62.44	74.00	-11.56

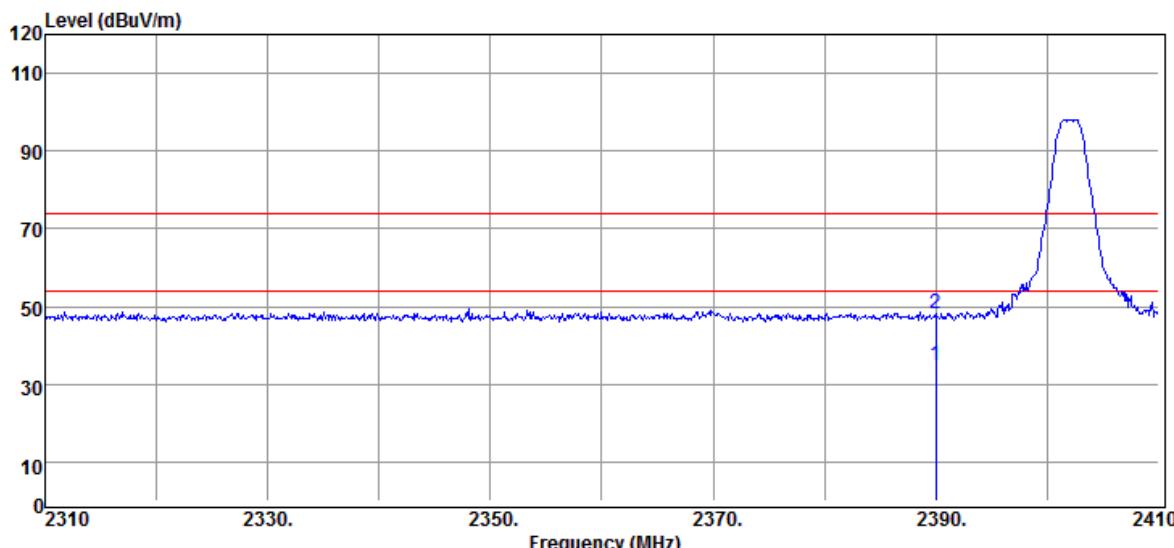
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**\*External PCB Antenna\_BT 5.0**

Operation Mode	:BT5.0	Test Date	:2018-06-13
Test Mode	:BE CH Low	Temp./Humi.	:25/60
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:2402 MHz	Engineer	:Jerry



Freq. MHz	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
2390.00	Average	40.30	-5.57	34.73	54.00	-19.27
2390.00	Peak	53.84	-5.57	48.27	74.00	-25.73

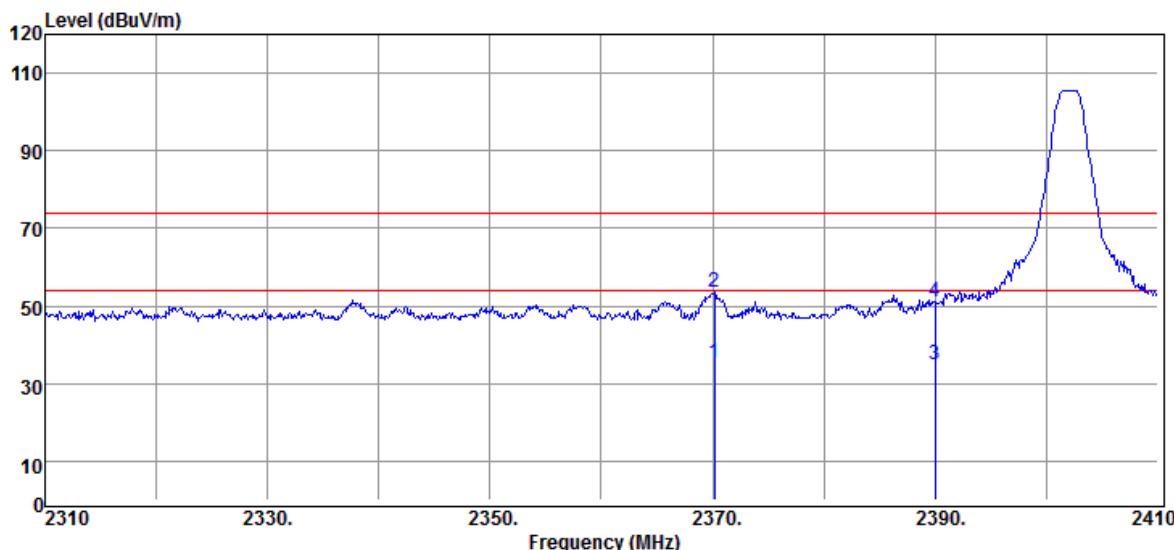
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Operation Mode :BT5.0  
 Test Mode :BE CH Low  
 EUT Pol :E2 Plan  
 Test Channel :2402 MHz

Test Date :2018-06-13  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
2370.20	Average	40.69	-5.57	35.12	54.00	-18.88
2370.20	Peak	58.94	-5.57	53.37	74.00	-20.63
2390.00	Average	40.38	-5.57	34.81	54.00	-19.19
2390.00	Peak	56.68	-5.57	51.11	74.00	-22.89

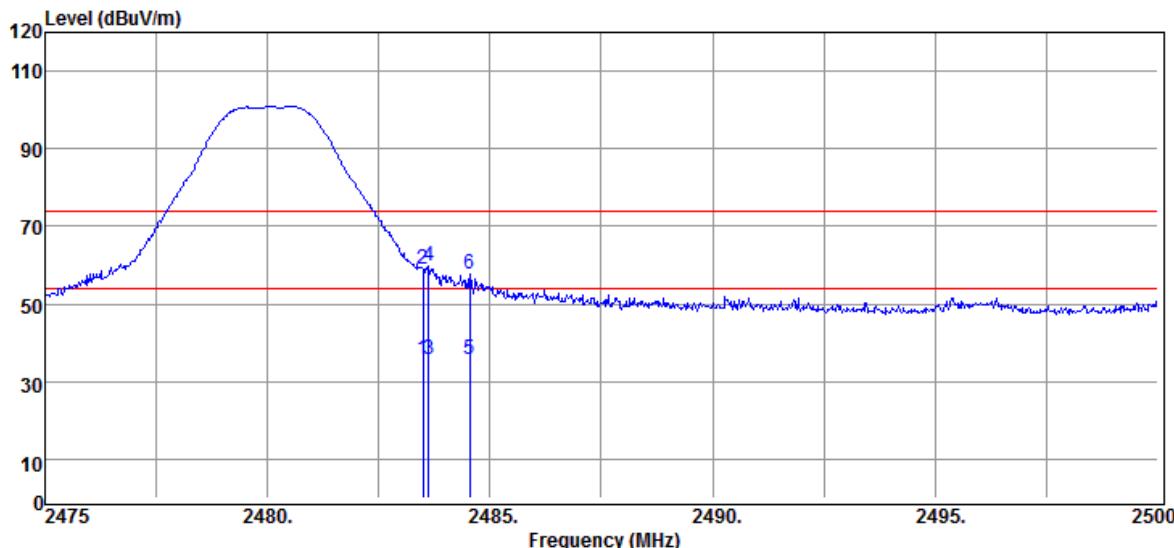
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Operation Mode :BT5.0  
 Test Mode :BE CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-13  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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	Average	40.79	-4.90	35.89	54.00	-18.11
2483.50	Peak	63.99	-4.90	59.09	74.00	-14.91
2483.63	Average	40.76	-4.90	35.86	54.00	-18.14
2483.63	Peak	64.62	-4.90	59.72	74.00	-14.28
2484.55	Average	40.63	-4.90	35.73	54.00	-18.27
2484.55	Peak	62.80	-4.90	57.90	74.00	-16.10

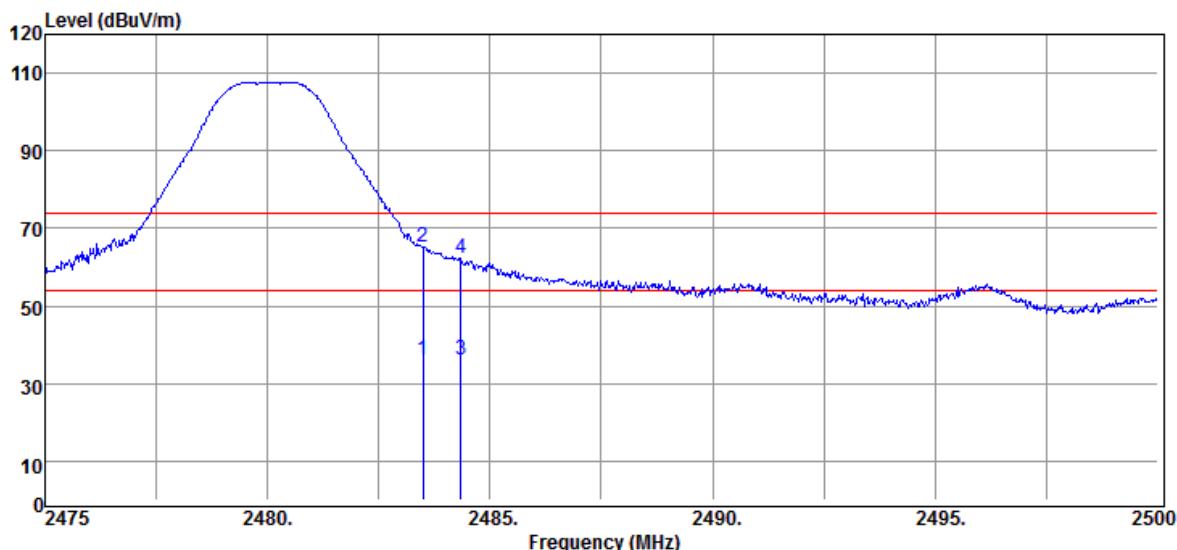
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Operation Mode :BT5.0  
 Test Mode :BE CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-13  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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	Average	41.03	-4.90	36.13	54.00	-17.87
2483.50	Peak	69.92	-4.90	65.02	74.00	-8.98
2484.35	Average	40.87	-4.90	35.97	54.00	-18.03
2484.35	Peak	67.30	-4.90	62.40	74.00	-11.60

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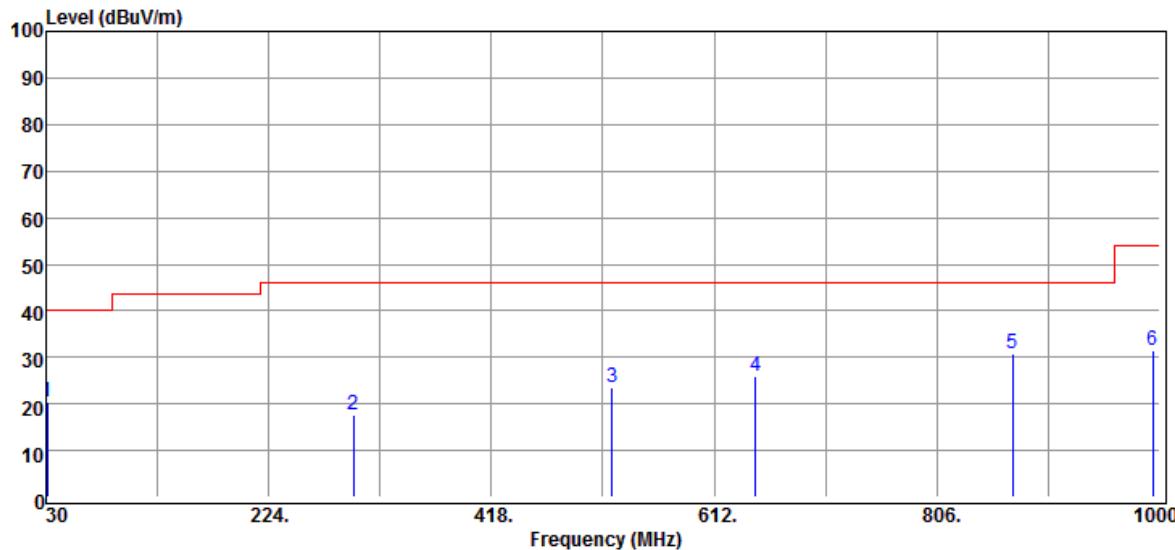
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## Radiated Spurious Emission Measurement Result For Frequency from 30MHz to 1000MHz

### \*Internal Chip Antenna\_BLE

Operation Mode	:BLE	Test Date	:2018-06-14
Test Mode	:Tx CH Low	Temp./Humi.	:25/60
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:2402 MHz	Engineer	:Jerry



Freq. MHz	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
30.97	Peak	39.06	-18.64	20.42	40.00	-19.58
297.72	Peak	32.99	-15.42	17.57	46.00	-28.43
522.76	Peak	34.07	-10.46	23.61	46.00	-22.39
647.89	Peak	34.43	-8.53	25.90	46.00	-20.10
871.96	Peak	35.64	-4.96	30.68	46.00	-15.32
994.18	Peak	35.26	-3.83	31.43	54.00	-22.57

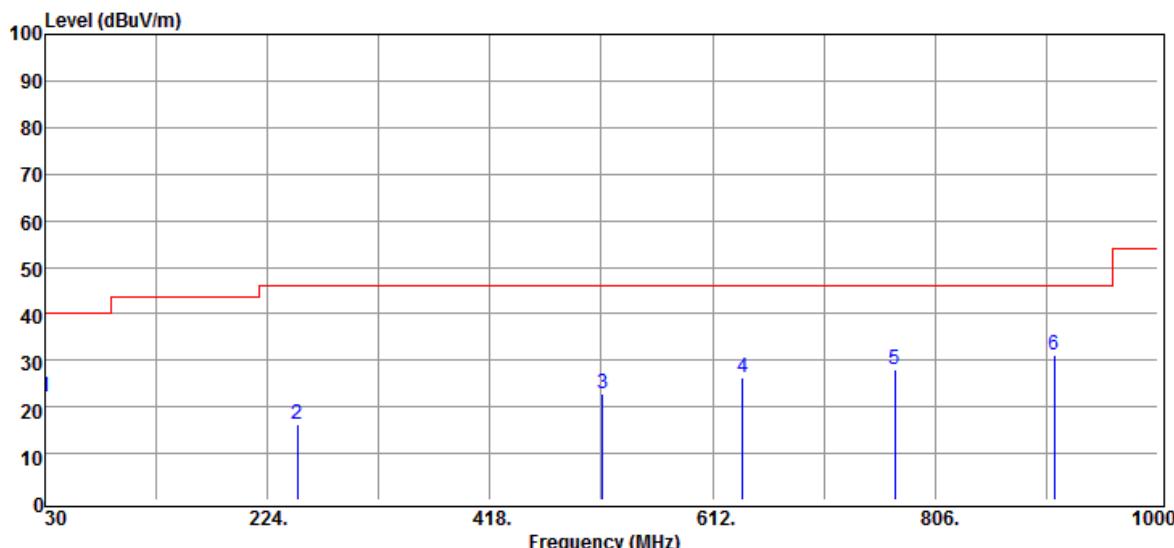
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Operation Mode :BLE  
 Test Mode :Tx CH Low  
 EUT Pol :E2 Plan  
 Test Channel :2402 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
30.00	Peak	39.33	-17.05	22.28	40.00	-17.72
250.19	Peak	33.20	-16.91	16.29	46.00	-29.71
515.97	Peak	33.55	-10.80	22.75	46.00	-23.25
638.19	Peak	34.32	-8.12	26.20	46.00	-19.80
771.08	Peak	34.99	-6.92	28.07	46.00	-17.93
909.79	Peak	35.83	-4.68	31.15	46.00	-14.85

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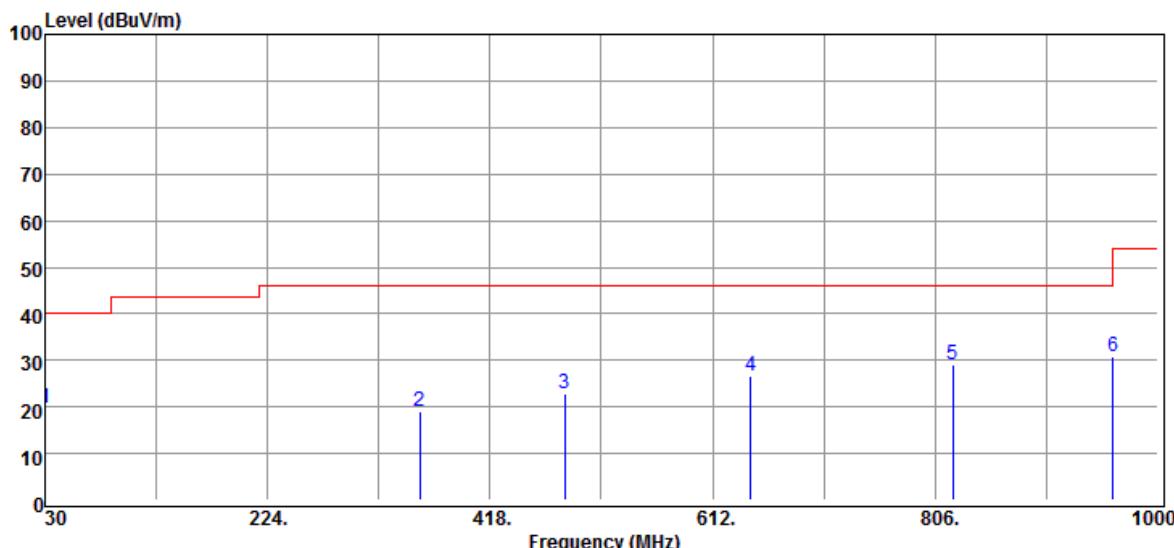
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Operation Mode :BLE  
 Test Mode :Tx CH Mid  
 EUT Pol :E2 Plan  
 Test Channel :2442 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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
30.00	Peak	38.52	-18.75	19.77	40.00	-20.23
356.89	Peak	32.92	-13.81	19.11	46.00	-26.89
482.99	Peak	33.87	-11.05	22.82	46.00	-23.18
644.98	Peak	35.14	-8.38	26.76	46.00	-19.24
821.52	Peak	35.25	-6.09	29.16	46.00	-16.84
961.20	Peak	34.77	-3.99	30.78	54.00	-23.22

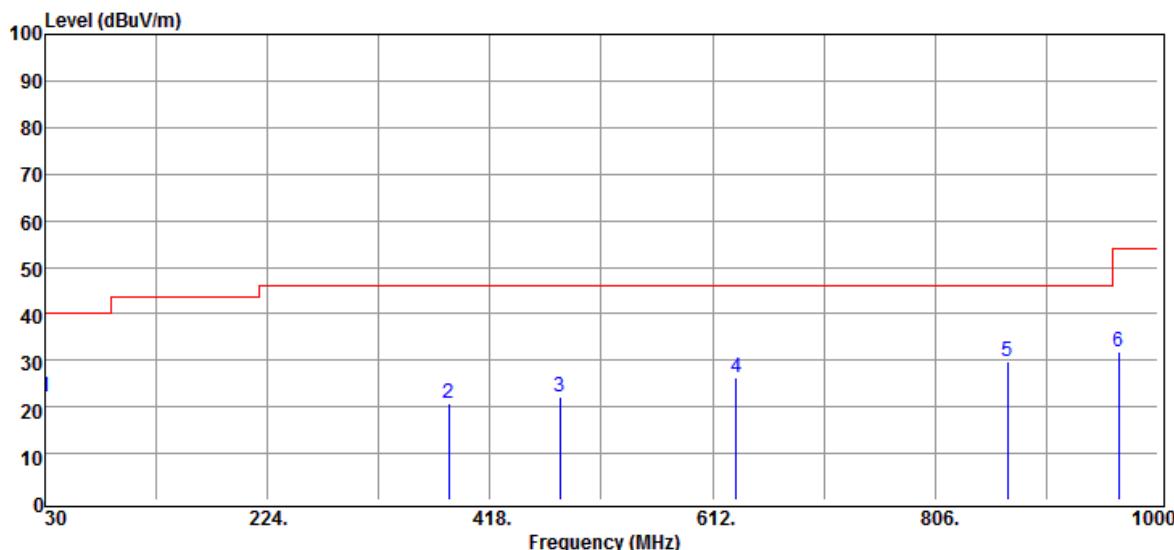
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Operation Mode :BLE  
 Test Mode :Tx CH Mid  
 EUT Pol :E2 Plan  
 Test Channel :2442 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
30.00	Peak	39.25	-17.05	22.20	40.00	-17.80
382.11	Peak	33.77	-13.17	20.60	46.00	-25.40
479.11	Peak	33.33	-11.07	22.26	46.00	-23.74
632.37	Peak	34.37	-8.12	26.25	46.00	-19.75
869.05	Peak	34.83	-4.90	29.93	46.00	-16.07
966.05	Peak	35.48	-3.60	31.88	54.00	-22.12

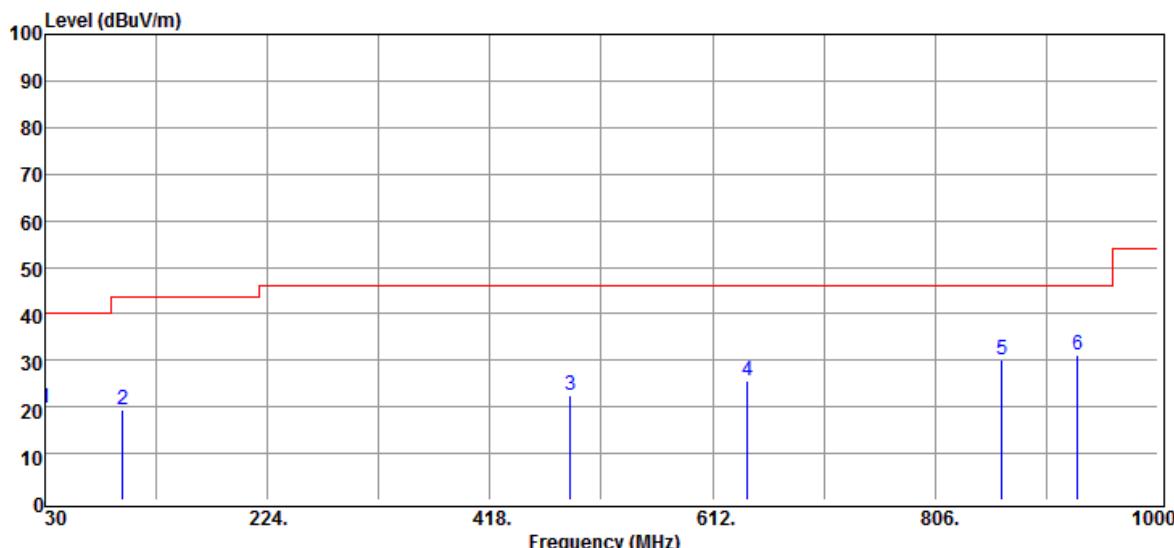
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Operation Mode :BLE  
 Test Mode :Tx CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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
30.00	Peak	38.46	-18.75	19.71	40.00	-20.29
97.90	Peak	41.10	-21.78	19.32	43.50	-24.18
487.84	Peak	33.69	-11.08	22.61	46.00	-23.39
642.07	Peak	33.84	-8.24	25.60	46.00	-20.40
864.20	Peak	35.34	-5.18	30.16	46.00	-15.84
930.16	Peak	35.68	-4.42	31.26	46.00	-14.74

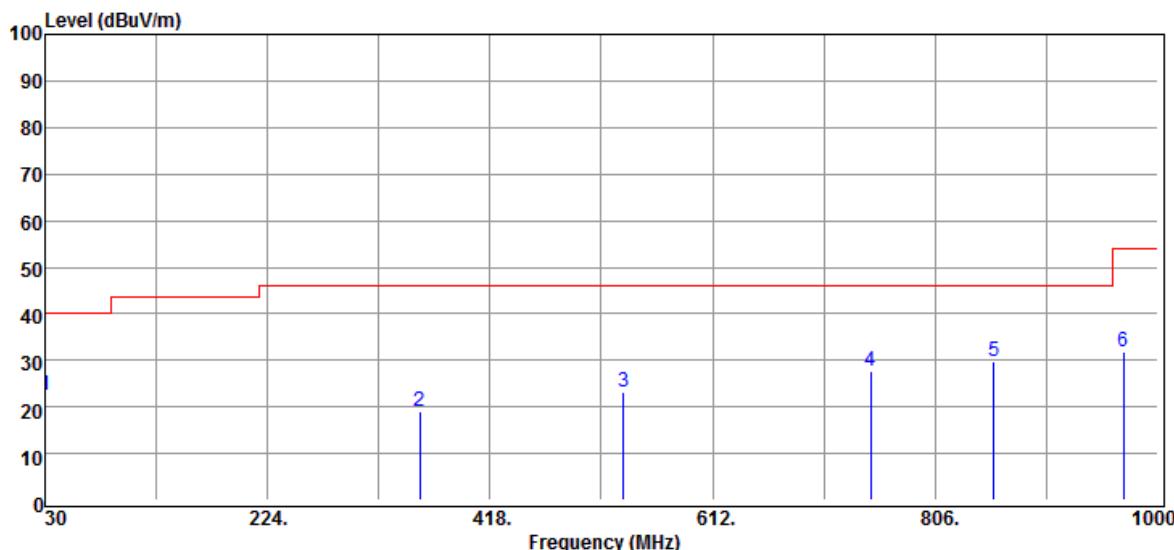
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Operation Mode :BLE  
 Test Mode :Tx CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
30.00	Peak	39.51	-17.05	22.46	40.00	-17.54
356.89	Peak	32.74	-13.81	18.93	46.00	-27.07
534.40	Peak	33.20	-10.02	23.18	46.00	-22.82
749.74	Peak	34.35	-6.78	27.57	46.00	-18.43
857.41	Peak	35.21	-5.51	29.70	46.00	-16.30
969.93	Peak	35.07	-3.30	31.77	54.00	-22.23

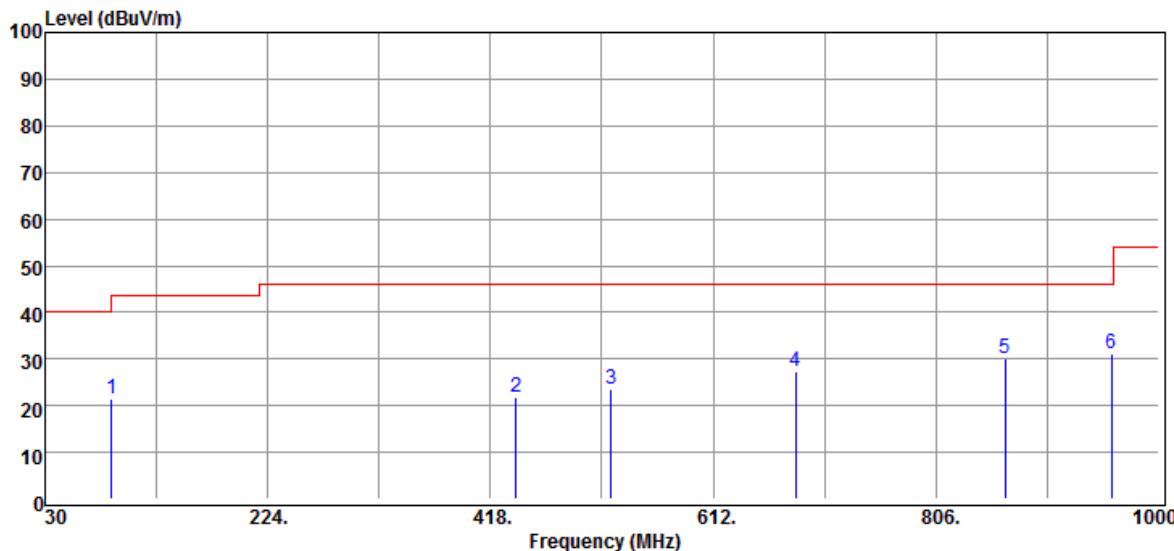
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**\*Internal Chip Antenna\_\_BT 5.0**

Operation Mode	:BT5.0	Test Date	:2018-06-14
Test Mode	:Tx CH Low	Temp./Humi.	:25/60
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:2402 MHz	Engineer	:Jerry



Freq. MHz	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
88.20	Peak	44.17	-22.68	21.49	43.50	-22.01
440.31	Peak	33.62	-11.73	21.89	46.00	-24.11
522.76	Peak	34.00	-10.46	23.54	46.00	-22.46
683.78	Peak	34.95	-7.70	27.25	46.00	-18.75
866.14	Peak	35.28	-5.06	30.22	46.00	-15.78
959.26	Peak	35.18	-4.13	31.05	46.00	-14.95

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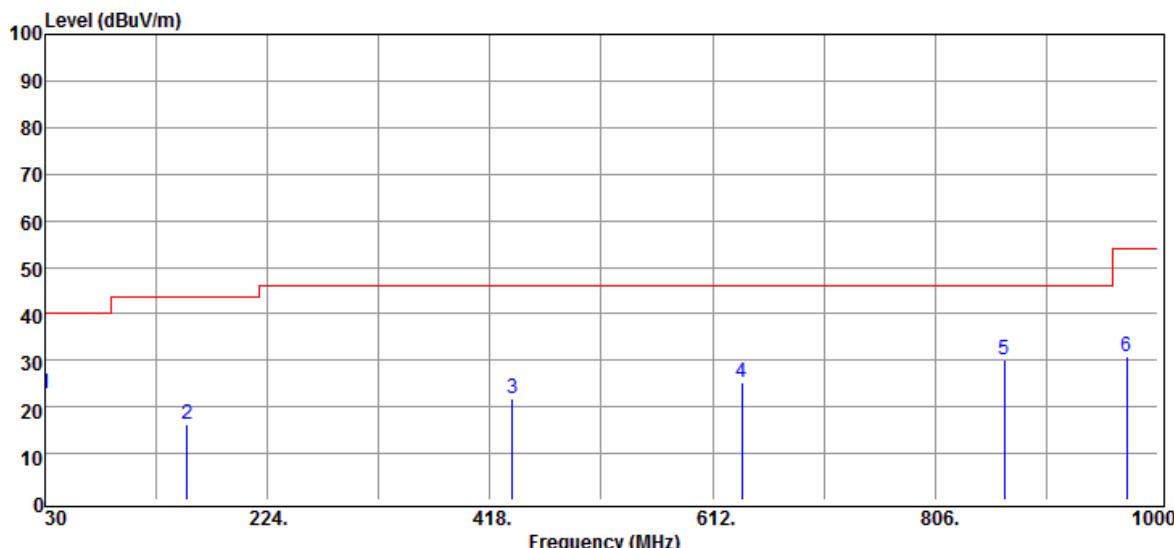
f (886-2) 2298-0488

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Operation Mode :BT5.0  
 Test Mode :Tx CH Low  
 EUT Pol :E2 Plan  
 Test Channel :2402 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
30.00	Peak	39.98	-17.05	22.93	40.00	-17.07
154.16	Peak	32.46	-16.17	16.29	43.50	-27.21
437.40	Peak	33.64	-11.80	21.84	46.00	-24.16
637.22	Peak	33.50	-8.12	25.38	46.00	-20.62
866.14	Peak	35.12	-5.06	30.06	46.00	-15.94
972.84	Peak	34.10	-3.34	30.76	54.00	-23.24

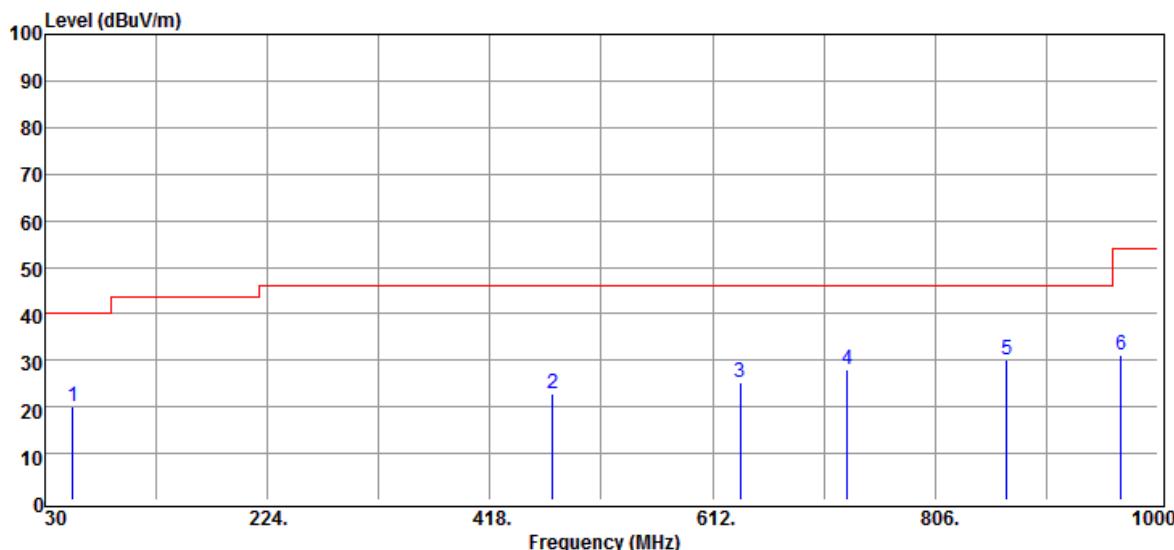
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Operation Mode :BT5.0  
 Test Mode :Tx CH Mid  
 EUT Pol :E2 Plan  
 Test Channel :2442 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



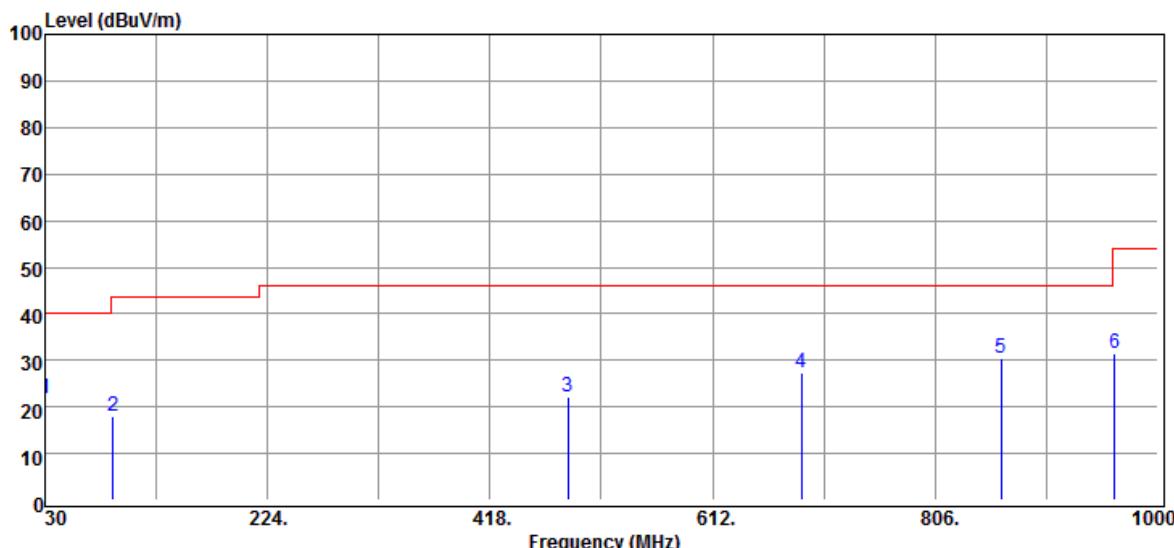
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
54.25	Peak	37.12	-17.19	19.93	40.00	-20.07
472.32	Peak	34.12	-11.27	22.85	46.00	-23.15
636.25	Peak	33.46	-8.13	25.33	46.00	-20.67
729.37	Peak	35.28	-7.30	27.98	46.00	-18.02
868.08	Peak	35.19	-4.95	30.24	46.00	-15.76
967.99	Peak	34.71	-3.45	31.26	54.00	-22.74

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Operation Mode :BT5.0  
 Test Mode :Tx CH Mid  
 EUT Pol :E2 Plan  
 Test Channel :2442 MHz  
 Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
30.00	Peak	38.95	-17.05	21.90	40.00	-18.10
89.17	Peak	44.17	-26.13	18.04	43.50	-25.46
485.90	Peak	33.29	-11.07	22.22	46.00	-23.78
689.60	Peak	34.88	-7.43	27.45	46.00	-18.55
863.23	Peak	35.52	-5.23	30.29	46.00	-15.71
962.17	Peak	35.43	-3.92	31.51	54.00	-22.49

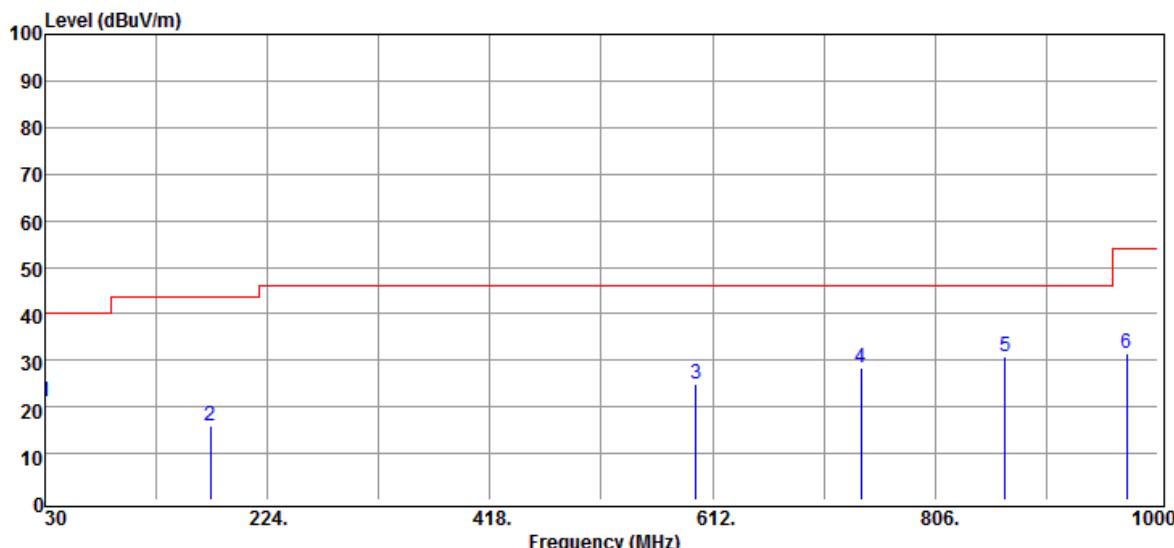
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Operation Mode :BT5.0  
 Test Mode :Tx CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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
30.00	Peak	39.93	-18.75	21.18	40.00	-18.82
174.53	Peak	32.73	-16.88	15.85	43.50	-27.65
597.45	Peak	33.97	-9.02	24.95	46.00	-21.05
741.01	Peak	35.36	-6.93	28.43	46.00	-17.57
867.11	Peak	35.82	-5.01	30.81	46.00	-15.19
972.84	Peak	34.69	-3.34	31.35	54.00	-22.65

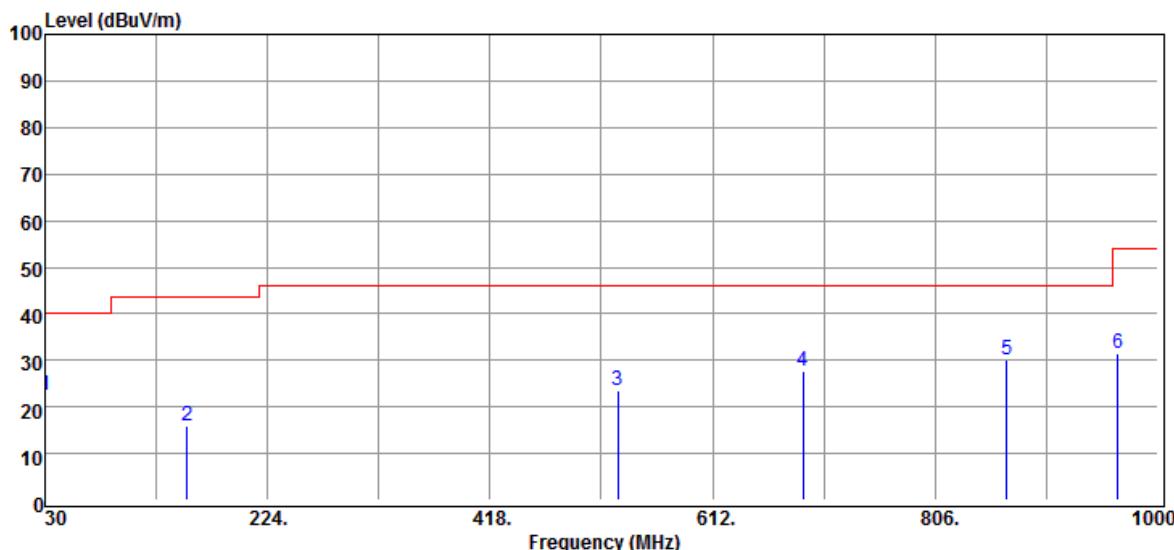
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Operation Mode :BT5.0  
 Test Mode :Tx CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
30.00	Peak	39.62	-17.05	22.57	40.00	-17.43
154.16	Peak	32.07	-16.17	15.90	43.50	-27.60
529.55	Peak	33.70	-10.05	23.65	46.00	-22.35
690.57	Peak	35.01	-7.41	27.60	46.00	-18.40
868.08	Peak	35.00	-4.95	30.05	46.00	-15.95
965.08	Peak	35.31	-3.68	31.63	54.00	-22.37

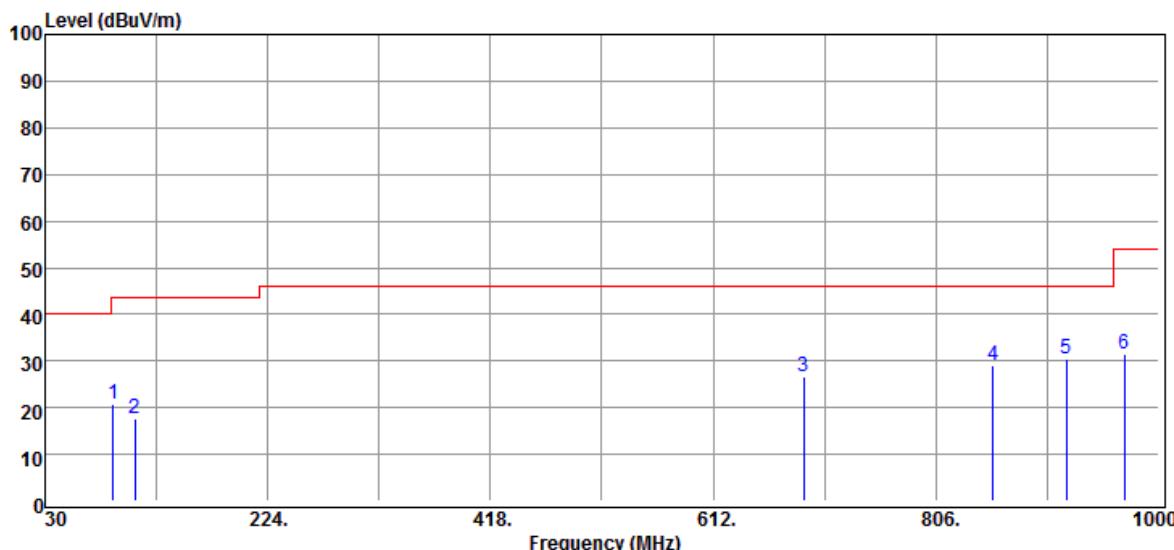
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**\*Internal PCB Antenna\_BLE**

Operation Mode	:BLE	Test Date	:2018-06-14
Test Mode	:Tx CH Low	Temp./Humi.	:25/60
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:2402 MHz	Engineer	:Jerry



Freq. MHz	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
89.17	Peak	43.54	-22.83	20.71	43.50	-22.79
108.57	Peak	37.59	-20.05	17.54	43.50	-25.96
690.57	Peak	34.15	-7.41	26.74	46.00	-19.26
855.47	Peak	34.63	-5.58	29.05	46.00	-16.95
919.49	Peak	34.89	-4.42	30.47	46.00	-15.53
969.93	Peak	34.87	-3.30	31.57	54.00	-22.43

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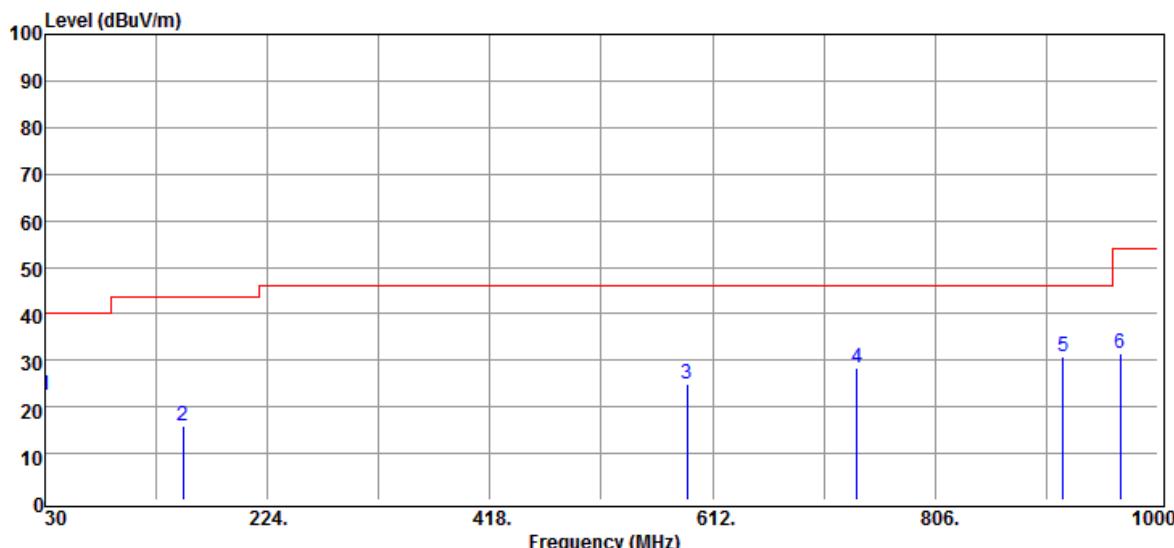
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Operation Mode :BLE  
 Test Mode :Tx CH Low  
 EUT Pol :E2 Plan  
 Test Channel :2402 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
30.00	Peak	39.49	-17.05	22.44	40.00	-17.56
150.28	Peak	31.96	-16.15	15.81	43.50	-27.69
589.69	Peak	33.74	-8.73	25.01	46.00	-20.99
738.10	Peak	35.25	-7.02	28.23	46.00	-17.77
917.55	Peak	35.15	-4.47	30.68	46.00	-15.32
967.02	Peak	35.03	-3.53	31.50	54.00	-22.50

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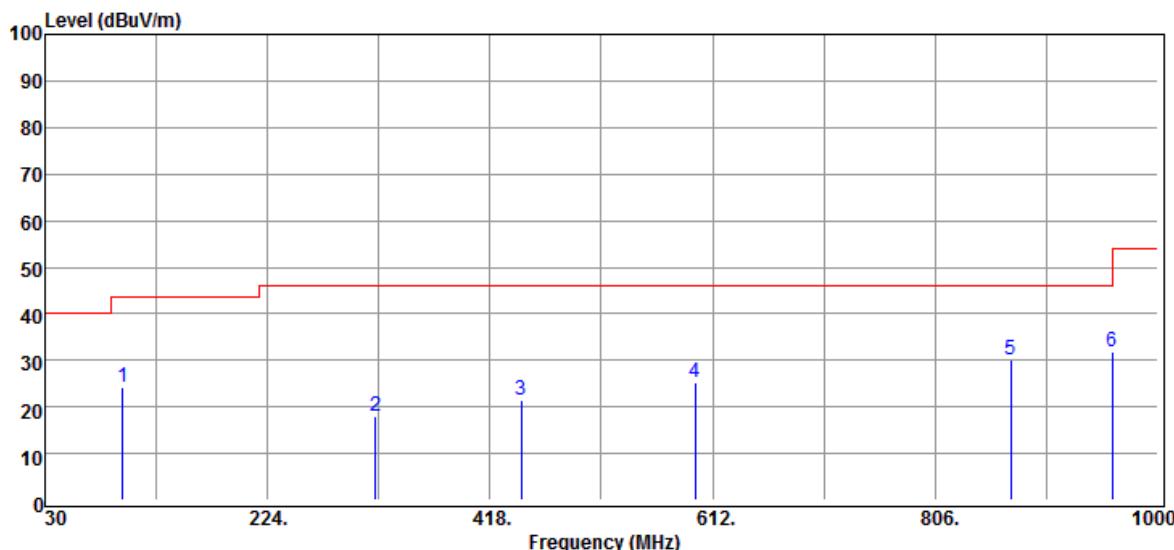
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Operation Mode :BLE  
 Test Mode :Tx CH Mid  
 EUT Pol :E2 Plan  
 Test Channel :2442 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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
97.90	Peak	46.13	-21.78	24.35	43.50	-19.15
318.09	Peak	32.89	-14.82	18.07	46.00	-27.93
445.16	Peak	33.05	-11.74	21.31	46.00	-24.69
596.48	Peak	34.33	-8.98	25.35	46.00	-20.65
871.96	Peak	35.18	-4.96	30.22	46.00	-15.78
960.23	Peak	35.97	-4.07	31.90	54.00	-22.10

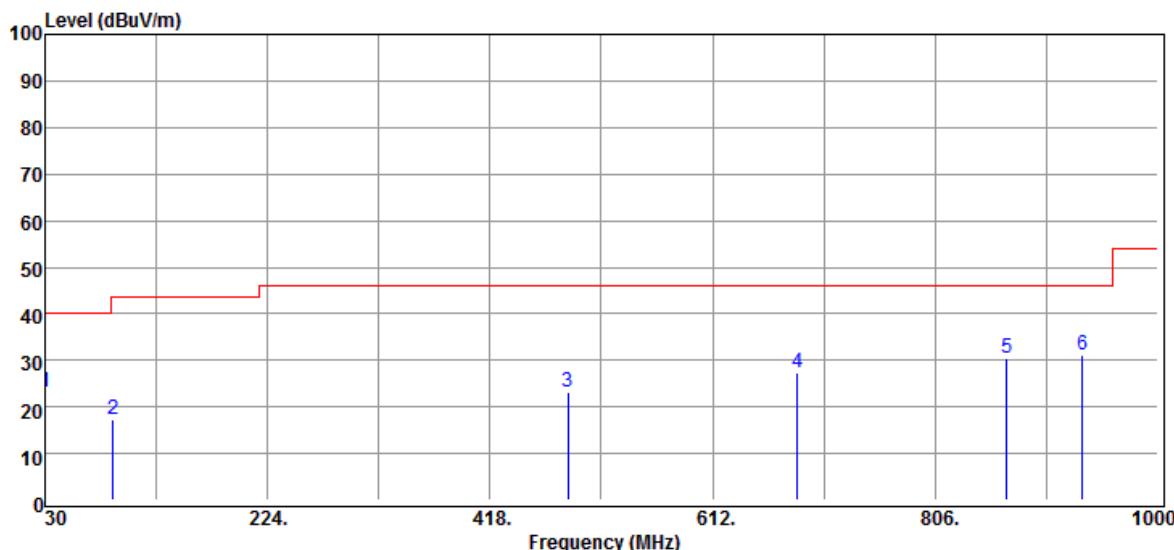
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Operation Mode :BLE  
 Test Mode :Tx CH Mid  
 EUT Pol :E2 Plan  
 Test Channel :2442 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
30.00	Peak	40.12	-17.05	23.07	40.00	-16.93
89.17	Peak	43.50	-26.13	17.37	43.50	-26.13
485.90	Peak	34.08	-11.07	23.01	46.00	-22.99
685.72	Peak	35.06	-7.60	27.46	46.00	-18.54
868.08	Peak	35.49	-4.95	30.54	46.00	-15.46
934.04	Peak	35.46	-4.48	30.98	46.00	-15.02

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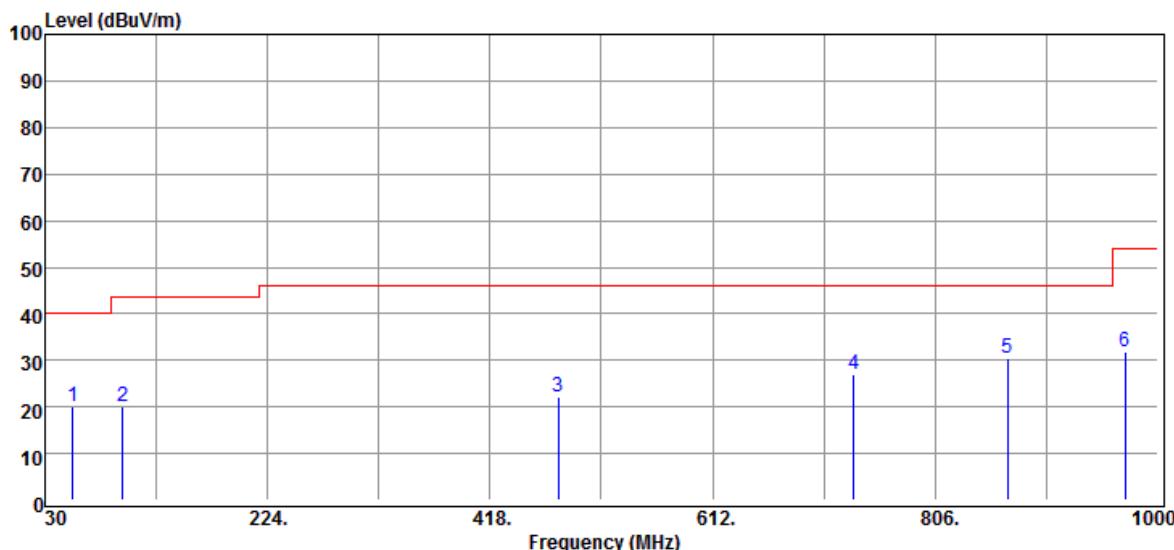
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Operation Mode :BLE  
 Test Mode :Tx CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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
54.25	Peak	37.26	-17.19	20.07	40.00	-19.93
97.90	Peak	41.99	-21.78	20.21	43.50	-23.29
477.17	Peak	33.40	-11.13	22.27	46.00	-23.73
735.19	Peak	34.26	-7.11	27.15	46.00	-18.85
869.05	Peak	35.41	-4.90	30.51	46.00	-15.49
971.87	Peak	35.19	-3.33	31.86	54.00	-22.14

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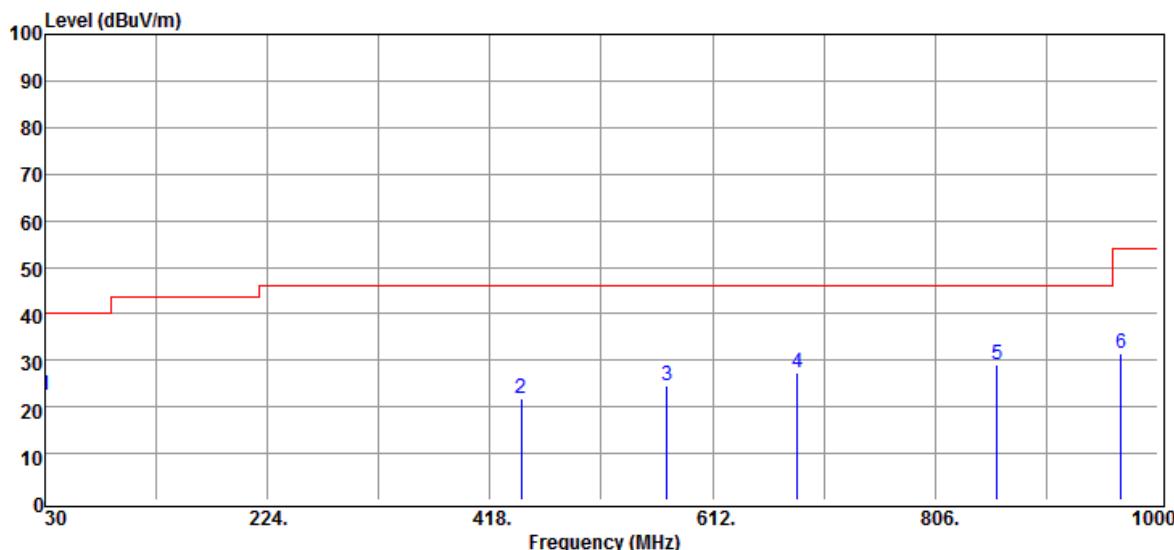
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Operation Mode :BLE  
 Test Mode :Tx CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
30.00	Peak	39.54	-17.05	22.49	40.00	-17.51
445.16	Peak	33.50	-11.74	21.76	46.00	-24.24
572.23	Peak	34.08	-9.46	24.62	46.00	-21.38
685.72	Peak	35.05	-7.60	27.45	46.00	-18.55
860.32	Peak	34.43	-5.40	29.03	46.00	-16.97
967.99	Peak	34.96	-3.45	31.51	54.00	-22.49

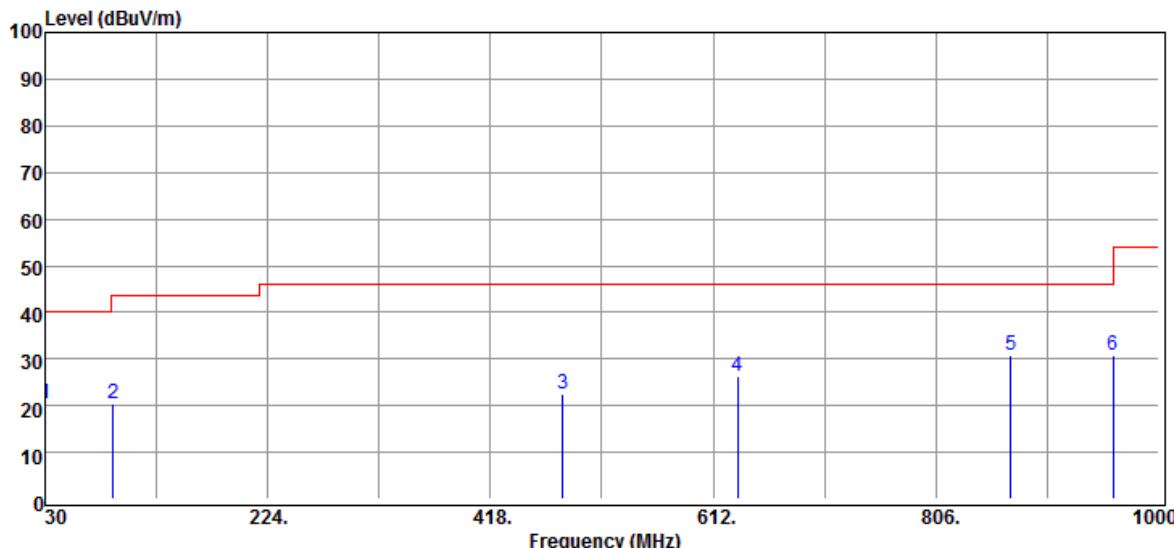
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**\*Internal PCB Antenna\_BT 5.0**

Operation Mode	:BT5.0	Test Date	:2018-06-14
Test Mode	:Tx CH Low	Temp./Humi.	:25/60
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:2402 MHz	Engineer	:Jerry



Freq. MHz	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
30.00	Peak	39.10	-18.75	20.35	40.00	-19.65
89.17	Peak	43.16	-22.83	20.33	43.50	-23.17
481.05	Peak	33.45	-11.04	22.41	46.00	-23.59
633.34	Peak	34.51	-8.12	26.39	46.00	-19.61
870.99	Peak	35.61	-4.90	30.71	46.00	-15.29
960.23	Peak	34.90	-4.07	30.83	54.00	-23.17

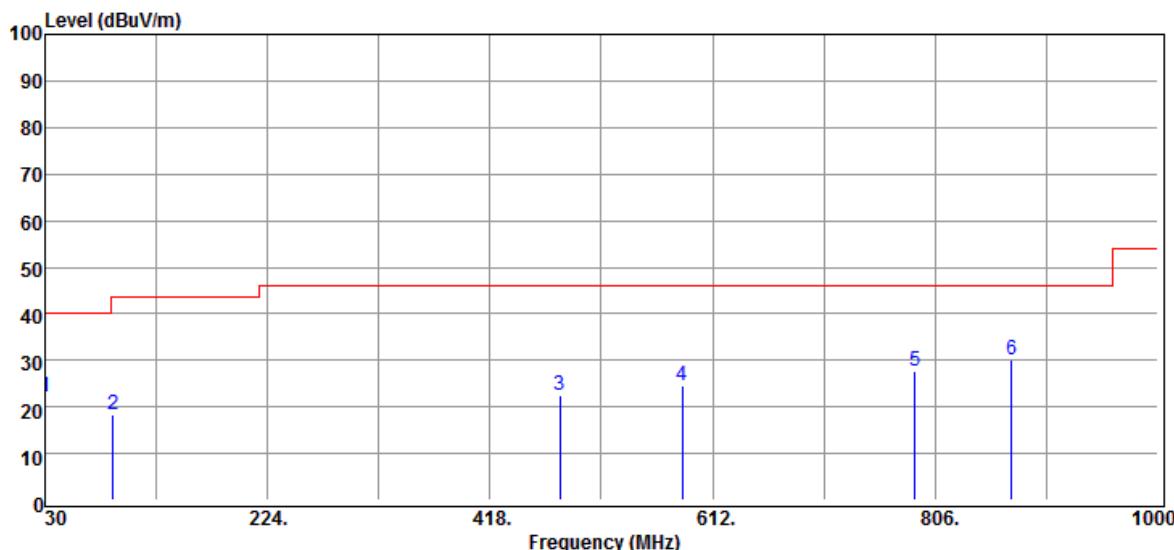
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Operation Mode :BT5.0  
 Test Mode :Tx CH Low  
 EUT Pol :E2 Plan  
 Test Channel :2402 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



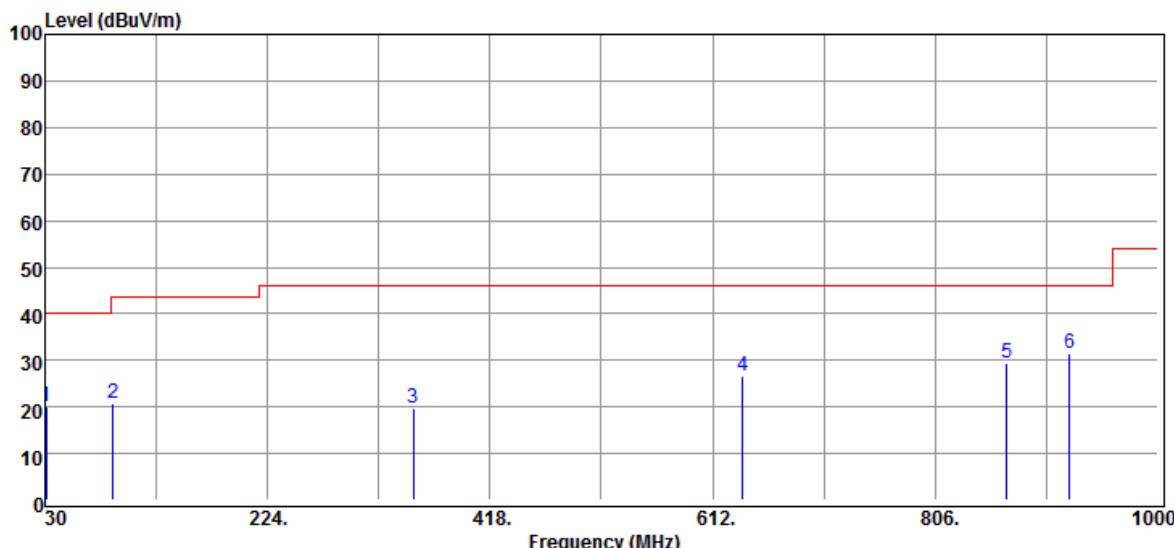
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
30.00	Peak	39.32	-17.05	22.27	40.00	-17.73
89.17	Peak	44.37	-26.13	18.24	43.50	-25.26
479.11	Peak	33.61	-11.07	22.54	46.00	-23.46
585.81	Peak	33.53	-8.81	24.72	46.00	-21.28
788.54	Peak	34.54	-6.96	27.58	46.00	-18.42
872.93	Peak	35.28	-5.02	30.26	46.00	-15.74

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Operation Mode :BT5.0  
 Test Mode :Tx CH Mid  
 EUT Pol :E2 Plan  
 Test Channel :2442 MHz  
 Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



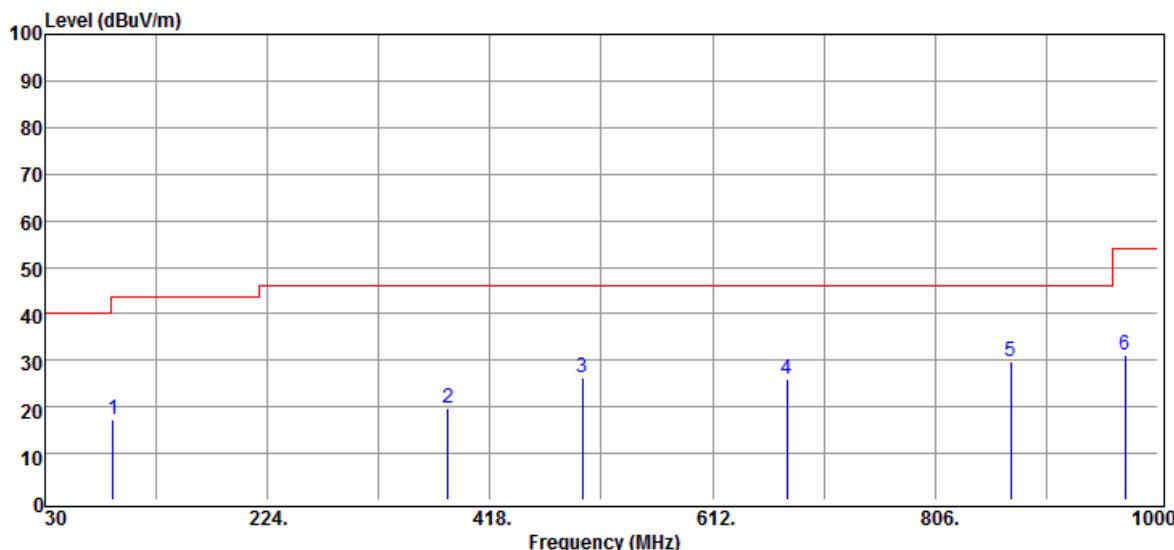
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
30.97	Peak	38.71	-18.64	20.07	40.00	-19.93
89.17	Peak	43.48	-22.83	20.65	43.50	-22.85
351.07	Peak	33.76	-13.93	19.83	46.00	-26.17
638.19	Peak	34.76	-8.12	26.64	46.00	-19.36
868.08	Peak	34.21	-4.95	29.26	46.00	-16.74
923.37	Peak	35.96	-4.42	31.54	46.00	-14.46

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Operation Mode :BT5.0  
 Test Mode :Tx CH Mid  
 EUT Pol :E2 Plan  
 Test Channel :2442 MHz  
 Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
89.17	Peak	43.41	-26.13	17.28	43.50	-26.22
381.14	Peak	32.92	-13.18	19.74	46.00	-26.26
498.51	Peak	37.42	-11.12	26.30	46.00	-19.70
676.99	Peak	34.11	-8.10	26.01	46.00	-19.99
871.96	Peak	34.64	-4.96	29.68	46.00	-16.32
971.87	Peak	34.38	-3.33	31.05	54.00	-22.95

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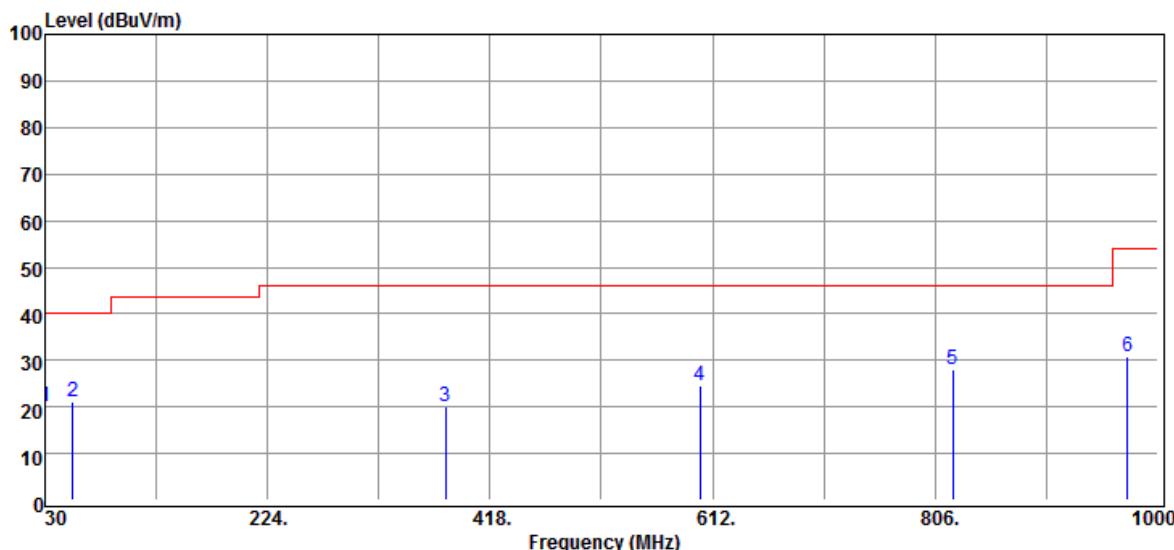
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Operation Mode :BT5.0  
 Test Mode :Tx CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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
30.00	Peak	38.77	-18.75	20.02	40.00	-19.98
54.25	Peak	38.26	-17.19	21.07	40.00	-18.93
379.20	Peak	33.23	-13.22	20.01	46.00	-25.99
601.33	Peak	33.82	-9.19	24.63	46.00	-21.37
821.52	Peak	34.08	-6.09	27.99	46.00	-18.01
973.81	Peak	34.04	-3.36	30.68	54.00	-23.32

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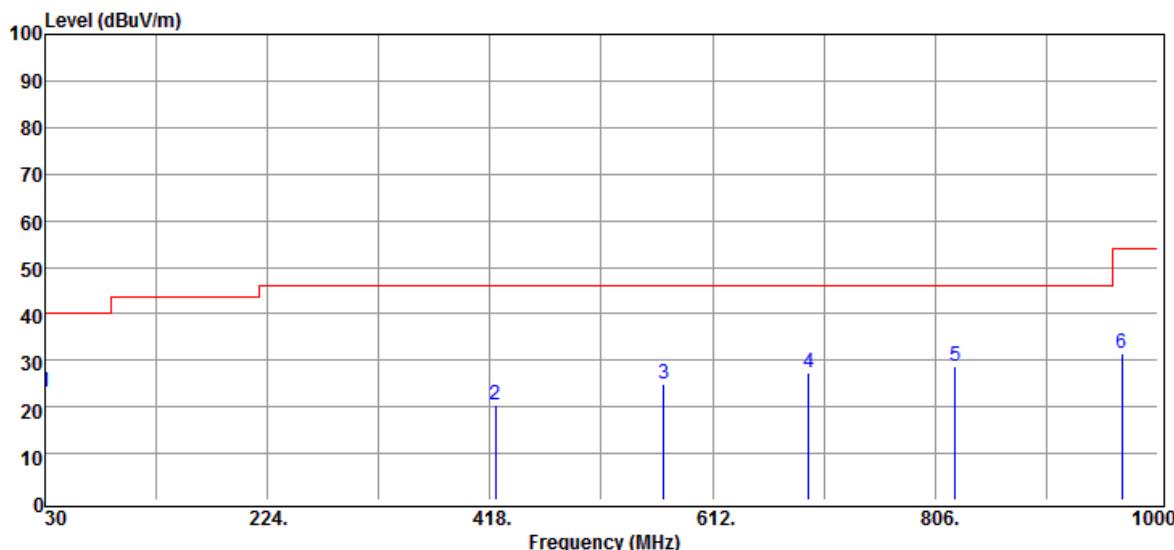
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Operation Mode :BT5.0  
 Test Mode :Tx CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
30.00	Peak	40.18	-17.05	23.13	40.00	-16.87
422.85	Peak	32.47	-12.17	20.30	46.00	-25.70
569.32	Peak	34.51	-9.65	24.86	46.00	-21.14
695.42	Peak	34.78	-7.53	27.25	46.00	-18.75
823.46	Peak	34.89	-6.16	28.73	46.00	-17.27
968.96	Peak	34.83	-3.38	31.45	54.00	-22.55

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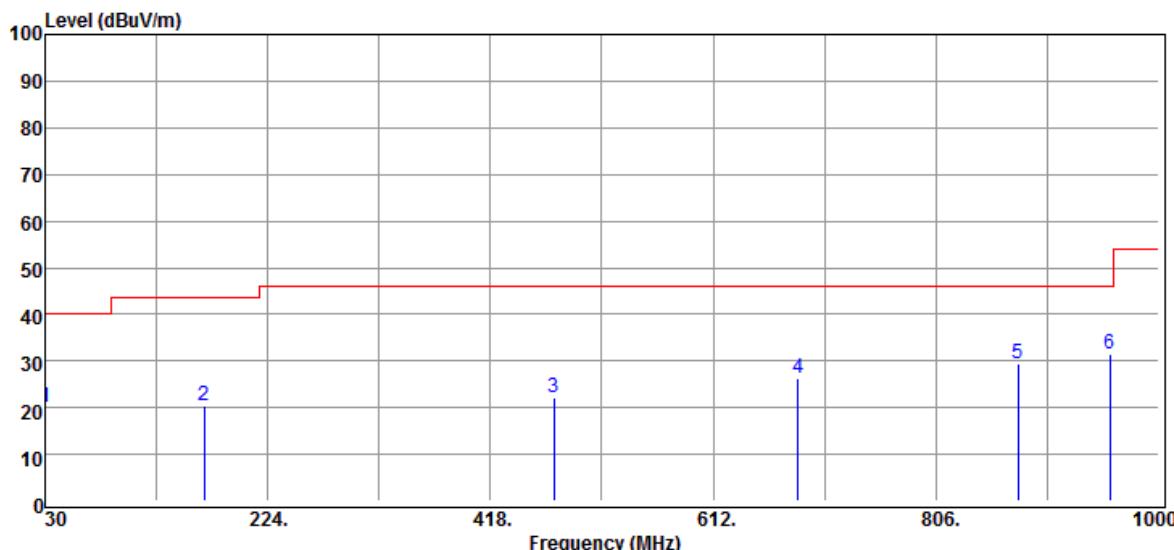
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## \*External UFL Antenna\_\_BLE

Operation Mode	:BLE	Test Date	:2018-06-14
Test Mode	:Tx CH Low	Temp./Humi.	:25/60
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:2402 MHz	Engineer	:Jerry



Freq. MHz	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
30.00	Peak	38.97	-18.75	20.22	40.00	-19.78
168.71	Peak	36.82	-16.45	20.37	43.50	-23.13
473.29	Peak	33.39	-11.25	22.14	46.00	-23.86
685.72	Peak	33.77	-7.60	26.17	46.00	-19.83
877.78	Peak	34.66	-5.32	29.34	46.00	-16.66
957.32	Peak	35.57	-4.25	31.32	46.00	-14.68

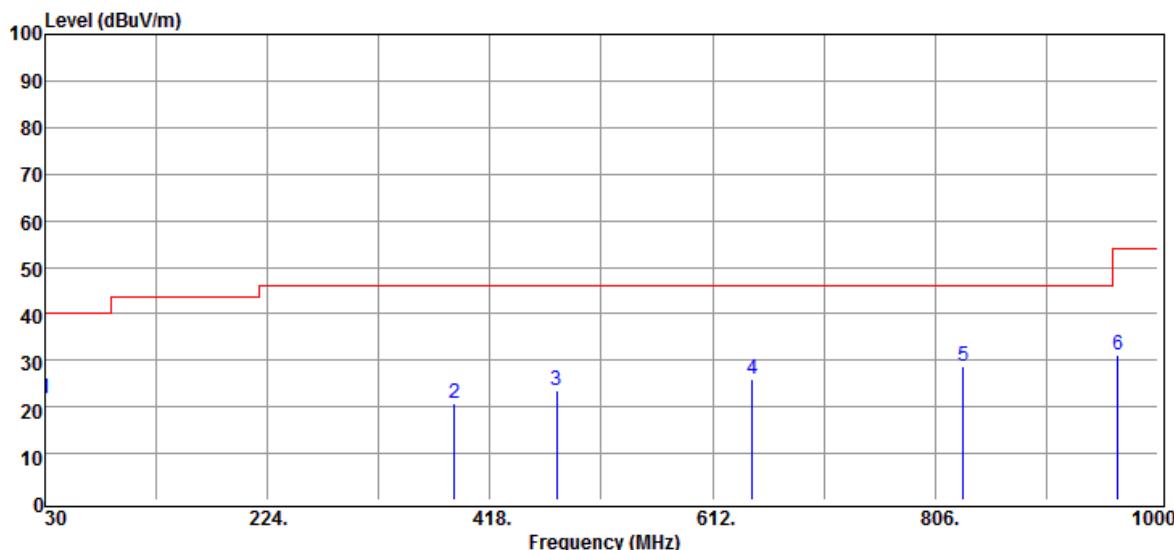
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Operation Mode :BLE  
 Test Mode :Tx CH Low  
 EUT Pol :E2 Plan  
 Test Channel :2402 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
30.00	Peak	38.75	-17.05	21.70	40.00	-18.30
386.96	Peak	33.86	-13.10	20.76	46.00	-25.24
476.20	Peak	34.75	-11.16	23.59	46.00	-22.41
646.92	Peak	34.45	-8.47	25.98	46.00	-20.02
830.25	Peak	34.96	-6.38	28.58	46.00	-17.42
965.08	Peak	34.91	-3.68	31.23	54.00	-22.77

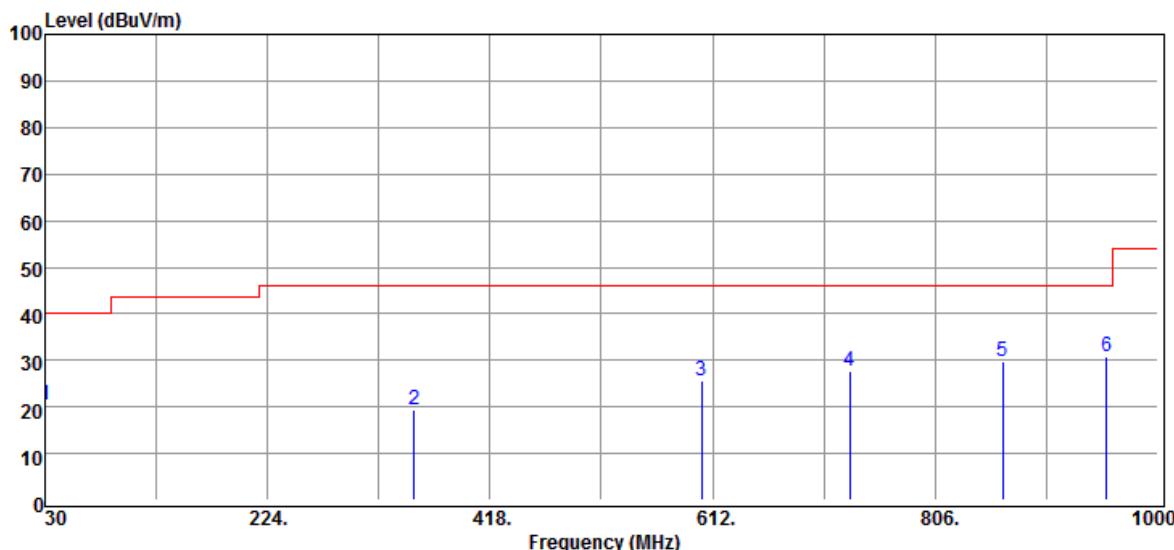
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Operation Mode :BLE  
 Test Mode :Tx CH Mid  
 EUT Pol :E2 Plan  
 Test Channel :2442 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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
30.00	Peak	39.00	-18.75	20.25	40.00	-19.75
352.04	Peak	33.17	-13.91	19.26	46.00	-26.74
602.30	Peak	34.90	-9.24	25.66	46.00	-20.34
731.31	Peak	34.90	-7.24	27.66	46.00	-18.34
865.17	Peak	34.89	-5.12	29.77	46.00	-16.23
955.38	Peak	35.19	-4.37	30.82	46.00	-15.18

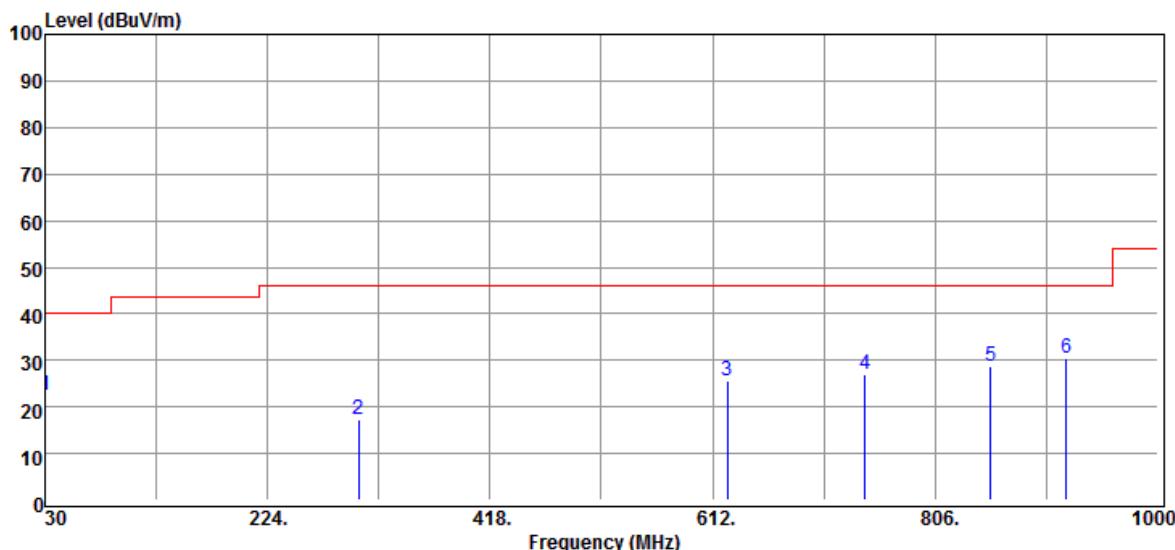
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Operation Mode :BLE  
 Test Mode :Tx CH Mid  
 EUT Pol :E2 Plan  
 Test Channel :2442 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
30.00	Peak	39.42	-17.05	22.37	40.00	-17.63
303.54	Peak	32.73	-15.60	17.13	46.00	-28.87
624.61	Peak	34.28	-8.57	25.71	46.00	-20.29
744.89	Peak	33.90	-6.87	27.03	46.00	-18.97
854.50	Peak	34.17	-5.60	28.57	46.00	-17.43
920.46	Peak	35.00	-4.41	30.59	46.00	-15.41

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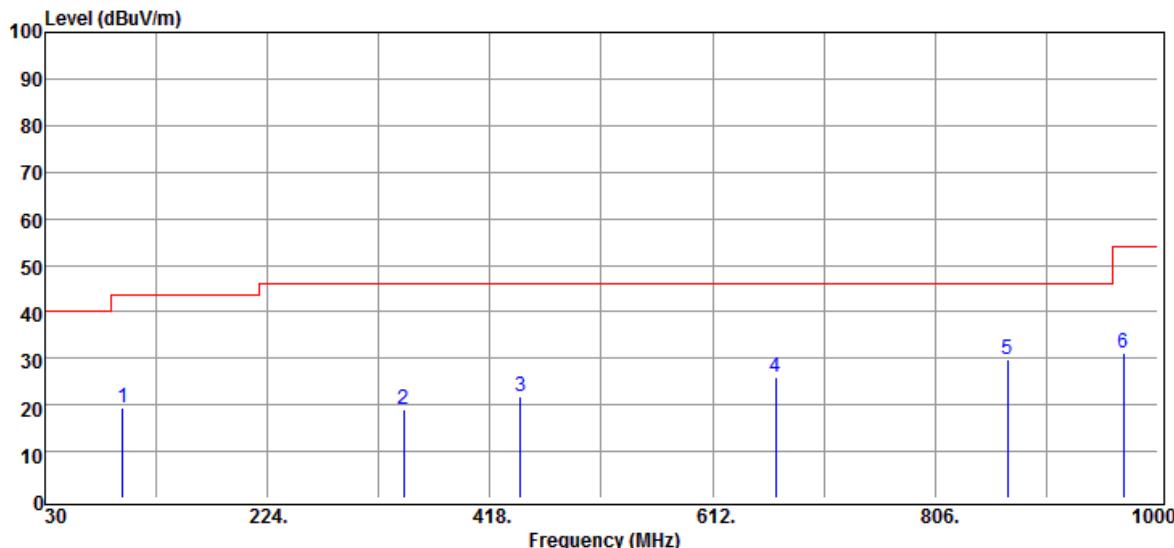
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Operation Mode :BLE  
 Test Mode :Tx CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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
97.90	Peak	41.23	-21.78	19.45	43.50	-24.05
342.34	Peak	33.19	-14.24	18.95	46.00	-27.05
444.19	Peak	33.49	-11.74	21.75	46.00	-24.25
667.29	Peak	34.51	-8.70	25.81	46.00	-20.19
869.05	Peak	34.66	-4.90	29.76	46.00	-16.24
969.93	Peak	34.43	-3.30	31.13	54.00	-22.87

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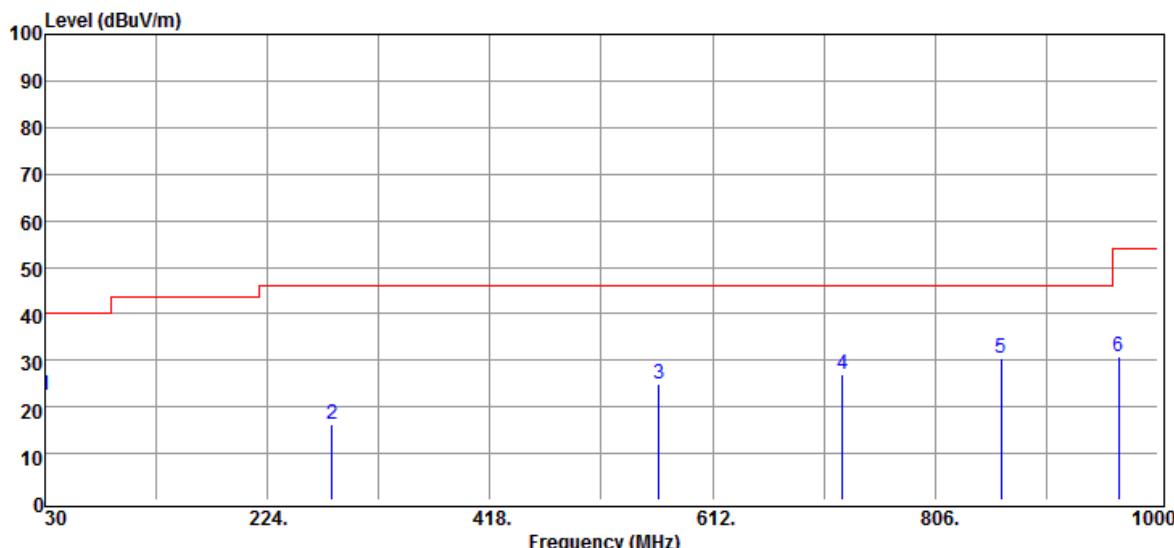
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Operation Mode :BLE  
 Test Mode :Tx CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
30.00	Peak	39.51	-17.05	22.46	40.00	-17.54
280.26	Peak	31.96	-15.84	16.12	46.00	-29.88
565.44	Peak	34.71	-9.91	24.80	46.00	-21.20
725.49	Peak	34.37	-7.50	26.87	46.00	-19.13
863.23	Peak	35.70	-5.23	30.47	46.00	-15.53
966.05	Peak	34.51	-3.60	30.91	54.00	-23.09

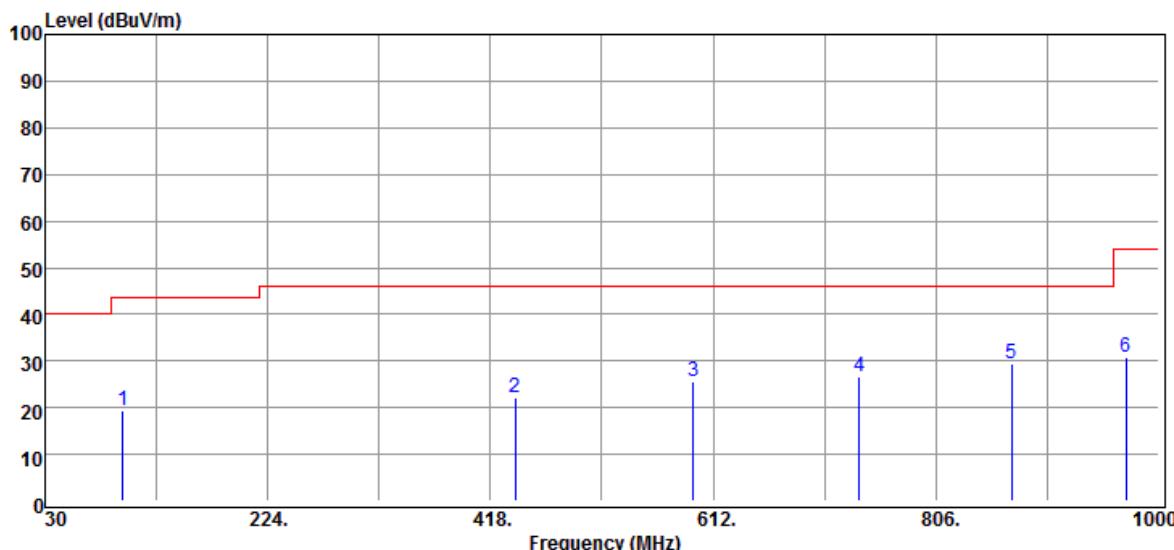
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Operation Mode	:BT5.0	Test Date	:2018-06-14
Test Mode	:Tx CH Low	Temp./Humi.	:25/60
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:2402 MHz	Engineer	:Jerry



Freq. MHz	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
97.90	Peak	41.11	-21.78	19.33	43.50	-24.17
439.34	Peak	33.72	-11.74	21.98	46.00	-24.02
594.54	Peak	34.42	-8.90	25.52	46.00	-20.48
739.07	Peak	33.78	-6.99	26.79	46.00	-19.21
871.96	Peak	34.53	-4.96	29.57	46.00	-16.43
971.87	Peak	34.19	-3.33	30.86	54.00	-23.14

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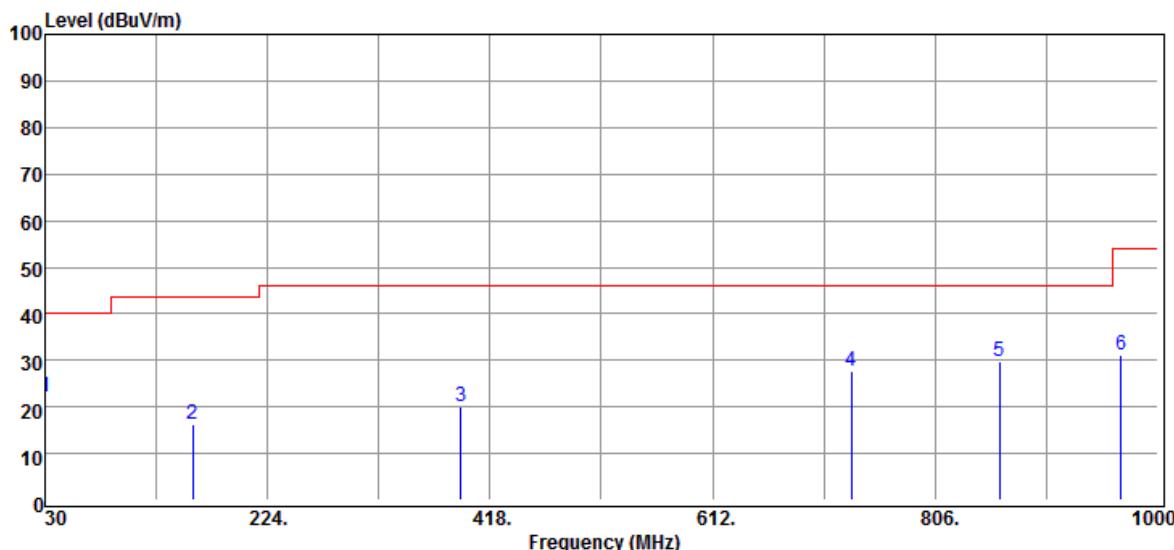
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Operation Mode :BT5.0  
 Test Mode :Tx CH Low  
 EUT Pol :E2 Plan  
 Test Channel :2402 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



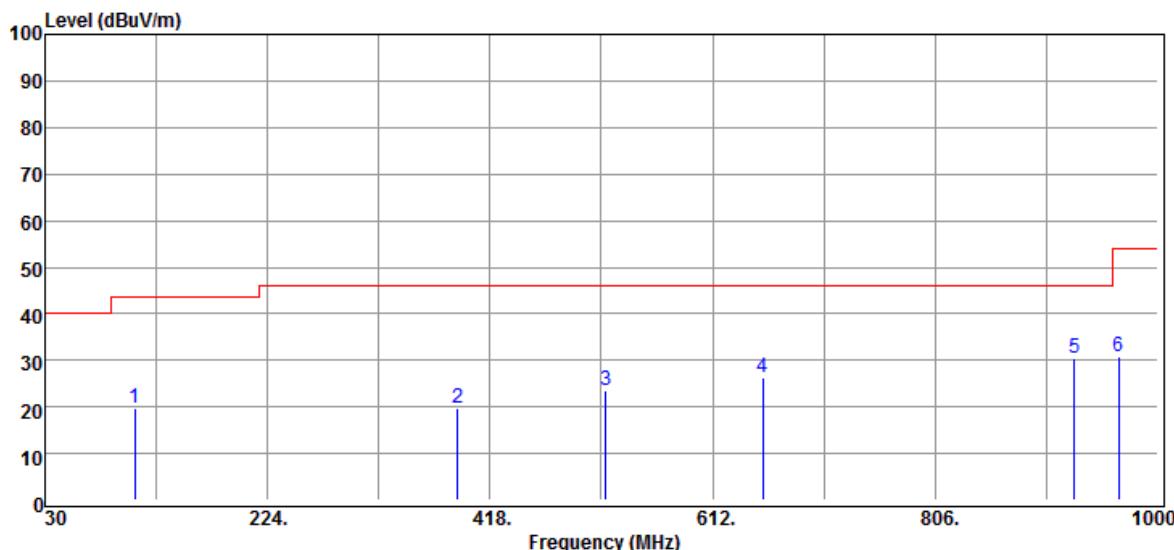
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
30.00	Peak	39.09	-17.05	22.04	40.00	-17.96
159.01	Peak	32.35	-16.19	16.16	43.50	-27.34
392.78	Peak	33.10	-12.98	20.12	46.00	-25.88
733.25	Peak	34.74	-7.17	27.57	46.00	-18.43
862.26	Peak	35.09	-5.29	29.80	46.00	-16.20
967.99	Peak	34.51	-3.45	31.06	54.00	-22.94

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Operation Mode :BT5.0  
 Test Mode :Tx CH Mid  
 EUT Pol :E2 Plan  
 Test Channel :2442 MHz  
 Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



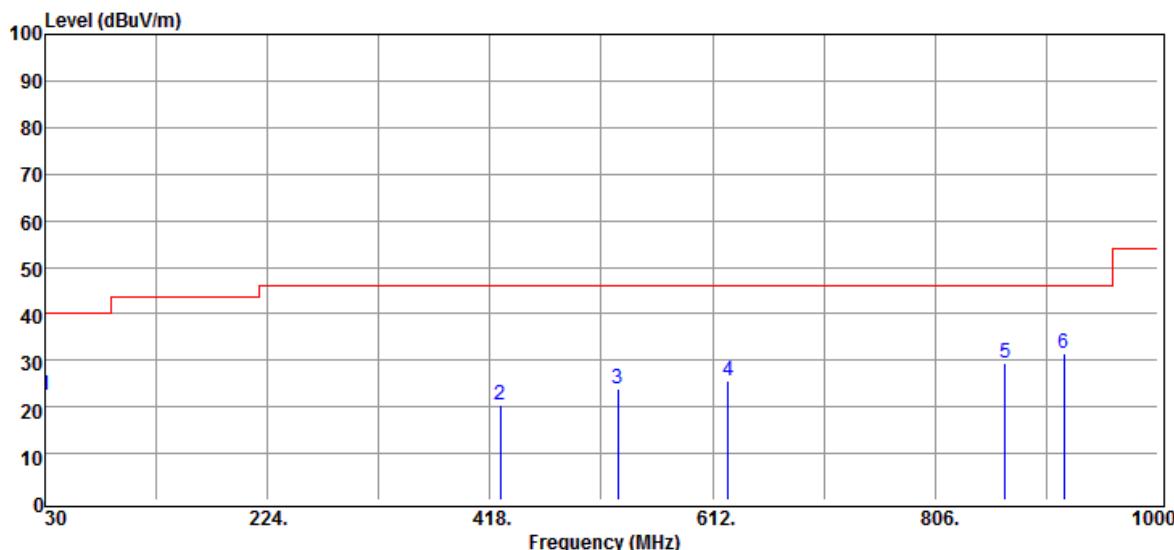
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
108.57	Peak	39.62	-20.05	19.57	43.50	-23.93
389.87	Peak	32.91	-13.05	19.86	46.00	-26.14
518.88	Peak	34.09	-10.68	23.41	46.00	-22.59
655.65	Peak	35.24	-8.77	26.47	46.00	-19.53
927.25	Peak	34.92	-4.41	30.51	46.00	-15.49
966.05	Peak	34.37	-3.60	30.77	54.00	-23.23

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Operation Mode :BT5.0  
 Test Mode :Tx CH Mid  
 EUT Pol :E2 Plan  
 Test Channel :2442 MHz  
 Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
30.00	Peak	39.45	-17.05	22.40	40.00	-17.60
426.73	Peak	32.62	-12.09	20.53	46.00	-25.47
529.55	Peak	33.84	-10.05	23.79	46.00	-22.21
625.58	Peak	33.95	-8.49	25.46	46.00	-20.54
867.11	Peak	34.27	-5.01	29.26	46.00	-16.74
918.52	Peak	35.83	-4.45	31.38	46.00	-14.62

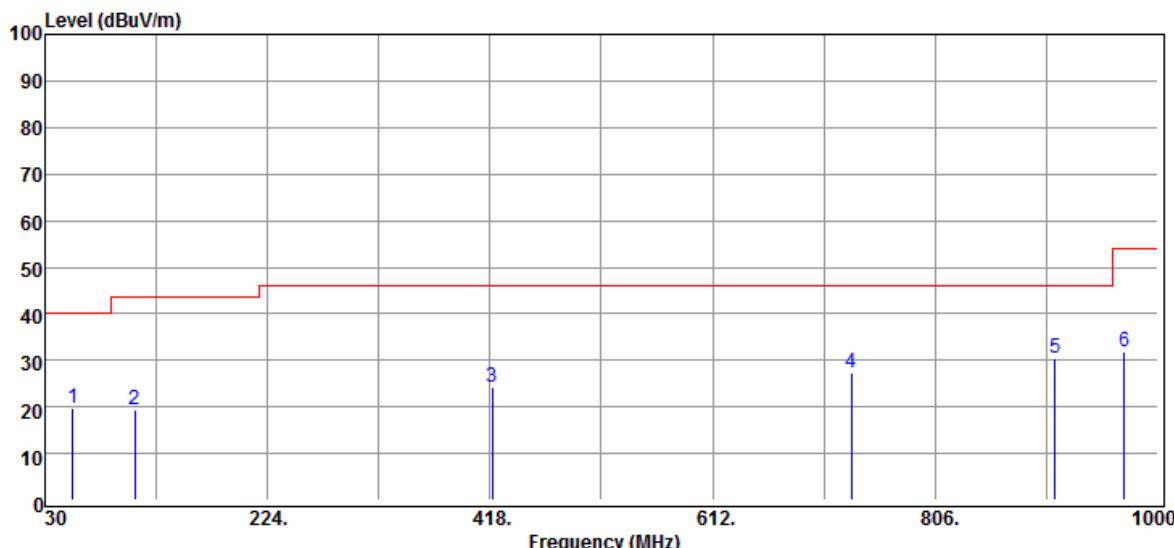
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Operation Mode :BT5.0  
 Test Mode :Tx CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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
54.25	Peak	36.85	-17.19	19.66	40.00	-20.34
108.57	Peak	39.41	-20.05	19.36	43.50	-24.14
419.94	Peak	36.48	-12.24	24.24	46.00	-21.76
733.25	Peak	34.54	-7.17	27.37	46.00	-18.63
910.76	Peak	34.94	-4.65	30.29	46.00	-15.71
970.90	Peak	35.03	-3.31	31.72	54.00	-22.28

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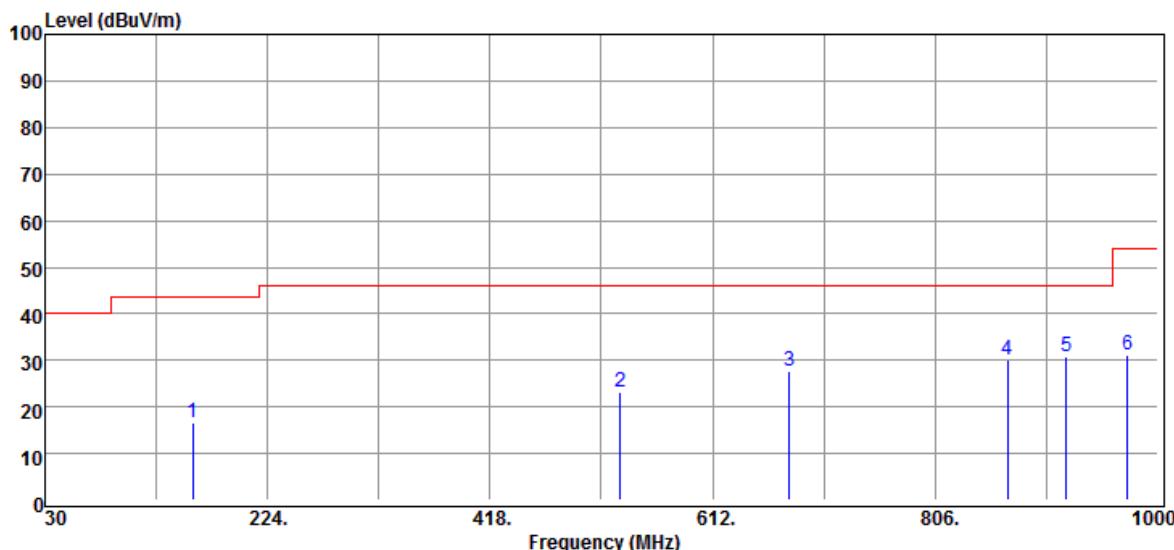
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Operation Mode :BT5.0  
 Test Mode :Tx CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
159.01	Peak	32.97	-16.19	16.78	43.50	-26.72
531.49	Peak	33.19	-10.02	23.17	46.00	-22.83
678.93	Peak	35.65	-7.95	27.70	46.00	-18.30
869.05	Peak	34.86	-4.90	29.96	46.00	-16.04
920.46	Peak	35.31	-4.41	30.90	46.00	-15.10
973.81	Peak	34.36	-3.36	31.00	54.00	-23.00

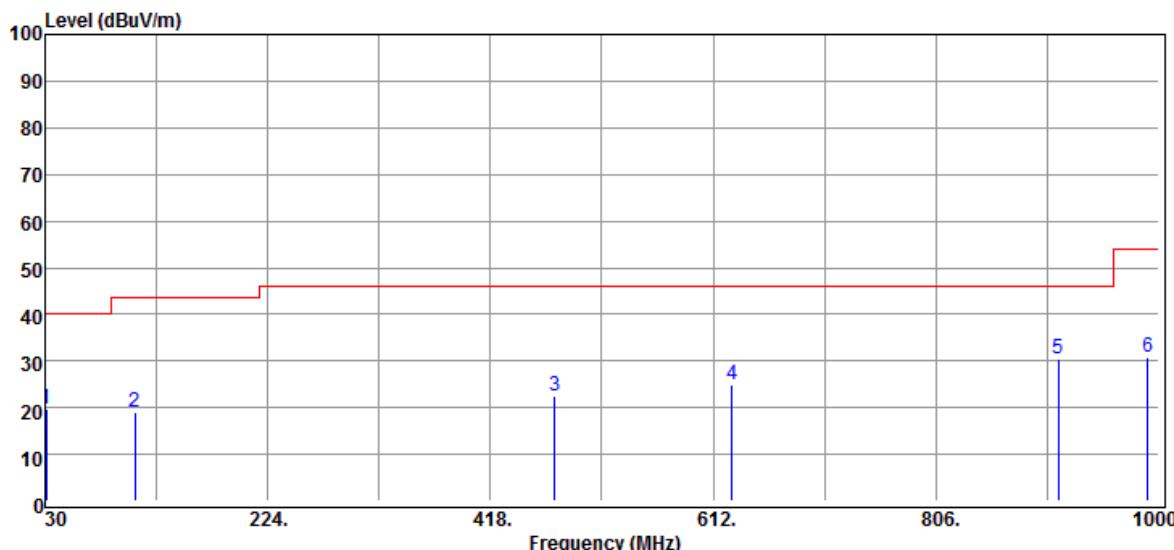
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## \*External PCB Antenna\_\_BLE

Operation Mode	:BLE	Test Date	:2018-06-14
Test Mode	:Tx CH Low	Temp./Humi.	:25/60
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:2402 MHz	Engineer	:Jerry



Freq. MHz	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
30.97	Peak	38.31	-18.64	19.67	40.00	-20.33
108.57	Peak	39.10	-20.05	19.05	43.50	-24.45
474.26	Peak	33.59	-11.22	22.37	46.00	-23.63
628.49	Peak	33.14	-8.24	24.90	46.00	-21.10
912.70	Peak	35.06	-4.59	30.47	46.00	-15.53
990.30	Peak	34.83	-3.87	30.96	54.00	-23.04

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.

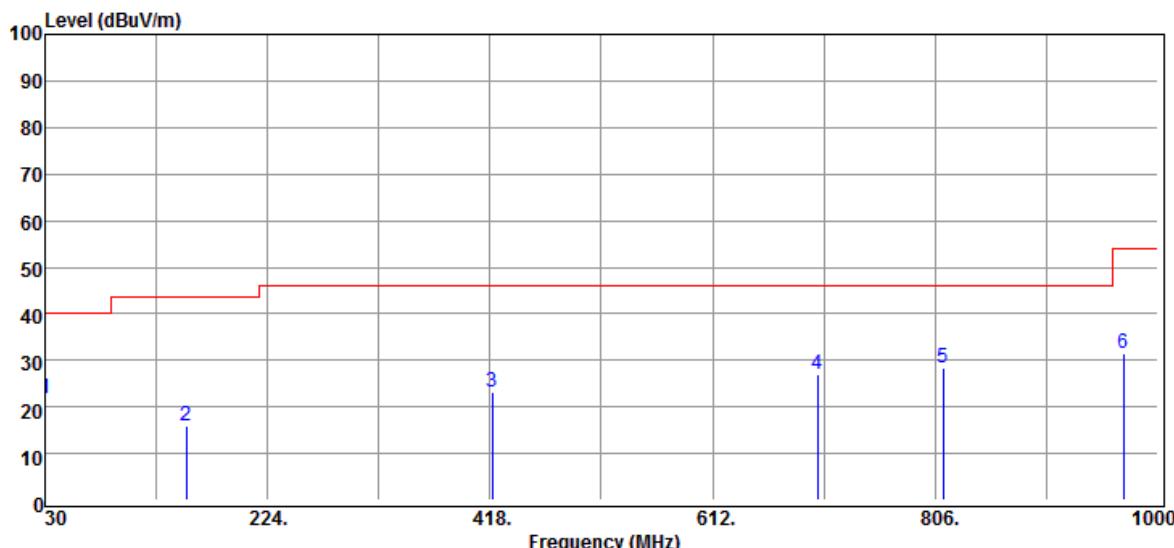
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Operation Mode :BLE  
 Test Mode :Tx CH Low  
 EUT Pol :E2 Plan  
 Test Channel :2402 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
30.00	Peak	38.83	-17.05	21.78	40.00	-18.22
153.19	Peak	32.24	-16.17	16.07	43.50	-27.43
419.94	Peak	35.43	-12.24	23.19	46.00	-22.81
703.18	Peak	34.74	-7.77	26.97	46.00	-19.03
812.79	Peak	34.46	-5.97	28.49	46.00	-17.51
969.93	Peak	34.71	-3.30	31.41	54.00	-22.59

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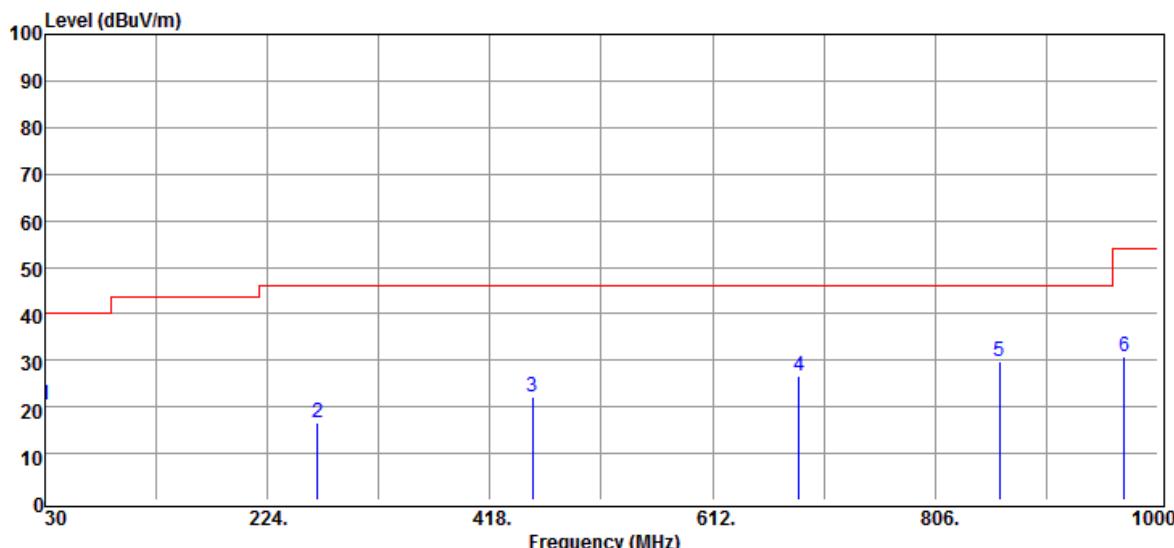
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Operation Mode :BLE  
 Test Mode :Tx CH Mid  
 EUT Pol :E2 Plan  
 Test Channel :2442 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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
30.00	Peak	39.12	-18.75	20.37	40.00	-19.63
267.65	Peak	32.84	-16.34	16.50	46.00	-29.50
454.86	Peak	33.74	-11.74	22.00	46.00	-24.00
687.66	Peak	34.18	-7.51	26.67	46.00	-19.33
862.26	Peak	34.88	-5.29	29.59	46.00	-16.41
970.90	Peak	34.11	-3.31	30.80	54.00	-23.20

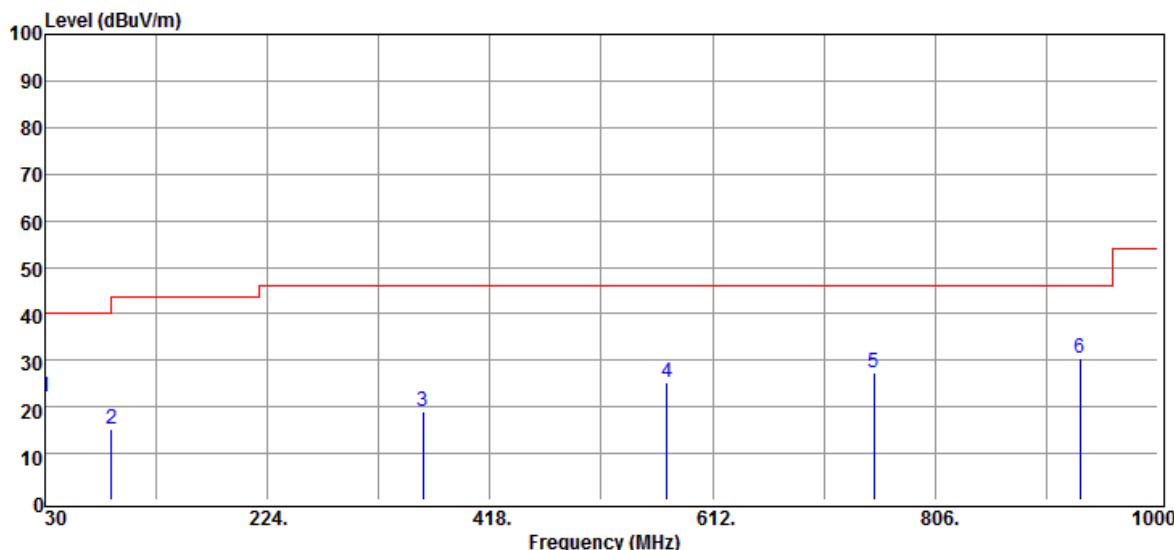
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Operation Mode :BLE  
 Test Mode :Tx CH Mid  
 EUT Pol :E2 Plan  
 Test Channel :2442 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
30.00	Peak	39.26	-17.05	22.21	40.00	-17.79
88.20	Peak	40.81	-25.63	15.18	43.50	-28.32
359.80	Peak	32.89	-13.76	19.13	46.00	-26.87
572.23	Peak	34.87	-9.46	25.41	46.00	-20.59
752.65	Peak	34.27	-6.78	27.49	46.00	-18.51
932.10	Peak	34.76	-4.45	30.31	46.00	-15.69

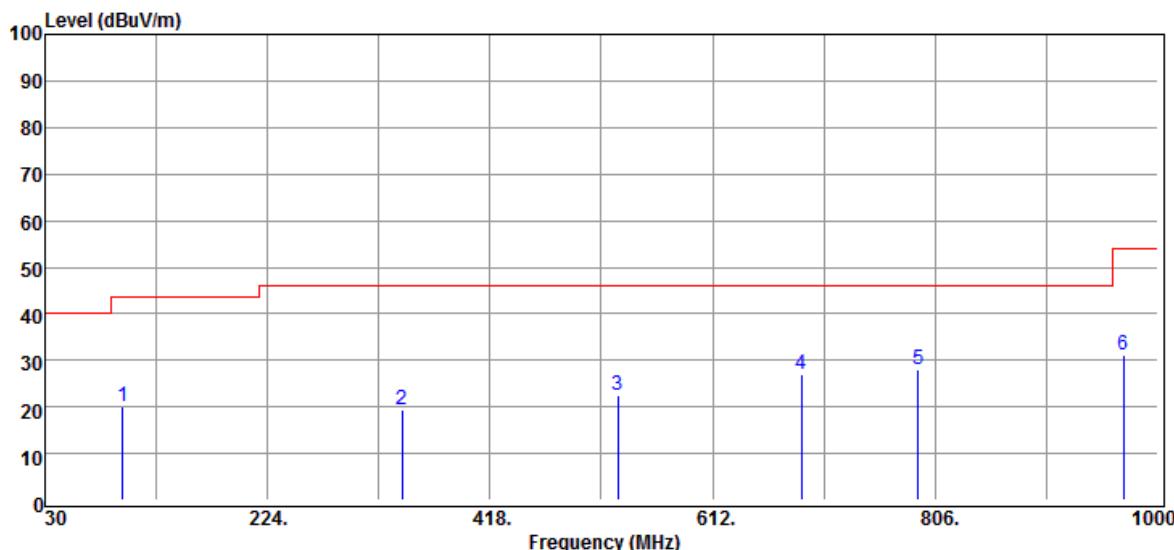
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Operation Mode :BLE  
 Test Mode :Tx CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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
97.90	Peak	41.96	-21.78	20.18	43.50	-23.32
341.37	Peak	33.49	-14.29	19.20	46.00	-26.80
529.55	Peak	32.67	-10.05	22.62	46.00	-23.38
689.60	Peak	34.37	-7.43	26.94	46.00	-19.06
791.45	Peak	34.86	-6.86	28.00	46.00	-18.00
969.93	Peak	34.30	-3.30	31.00	54.00	-23.00

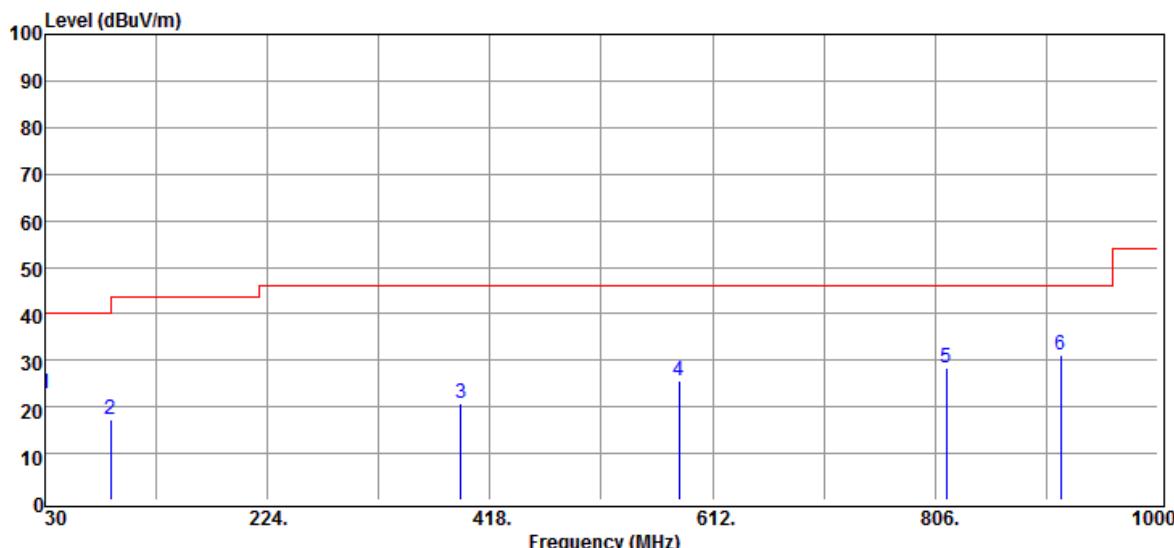
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Operation Mode :BLE  
 Test Mode :Tx CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
30.00	Peak	39.81	-17.05	22.76	40.00	-17.24
87.23	Peak	42.59	-25.15	17.44	40.00	-22.56
392.78	Peak	33.80	-12.98	20.82	46.00	-25.18
582.90	Peak	34.53	-8.89	25.64	46.00	-20.36
815.70	Peak	34.45	-6.00	28.45	46.00	-17.55
915.61	Peak	35.64	-4.52	31.12	46.00	-14.88

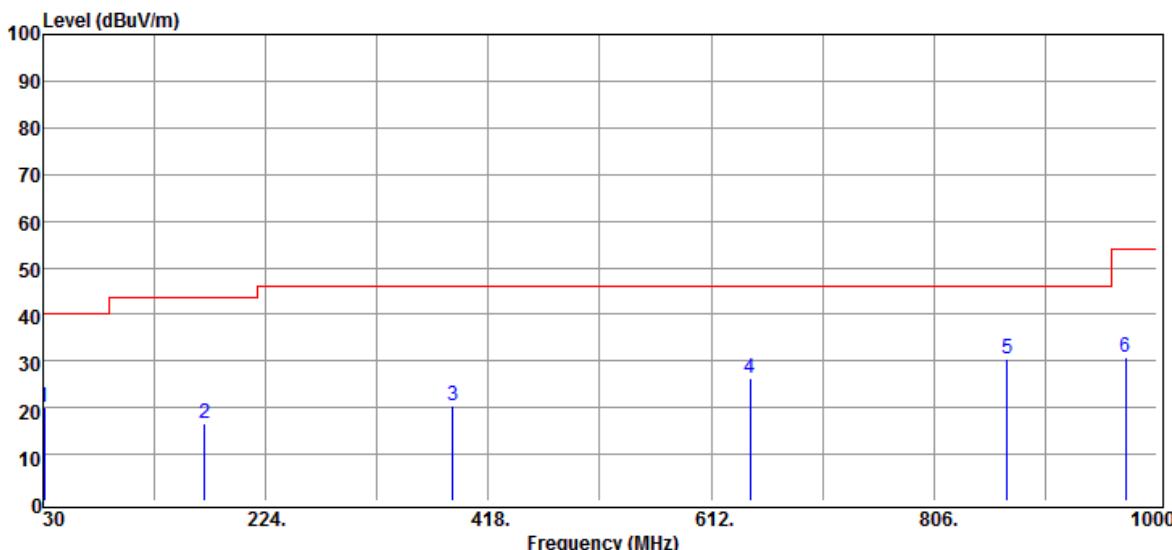
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## \*External PCB Antenna\_\_BT 5.0

Operation Mode	:BT5.0	Test Date	:2018-06-14
Test Mode	:Tx CH Low	Temp./Humi.	:25/60
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:2402 MHz	Engineer	:Jerry



Freq. MHz	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
30.97	Peak	38.84	-18.64	20.20	40.00	-19.80
170.65	Peak	33.05	-16.55	16.50	43.50	-27.00
386.96	Peak	33.59	-13.10	20.49	46.00	-25.51
645.95	Peak	34.74	-8.43	26.31	46.00	-19.69
870.02	Peak	35.30	-4.84	30.46	46.00	-15.54
972.84	Peak	34.23	-3.34	30.89	54.00	-23.11

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台灣檢驗科技股份有限公司

t (886-2) 2299-3279

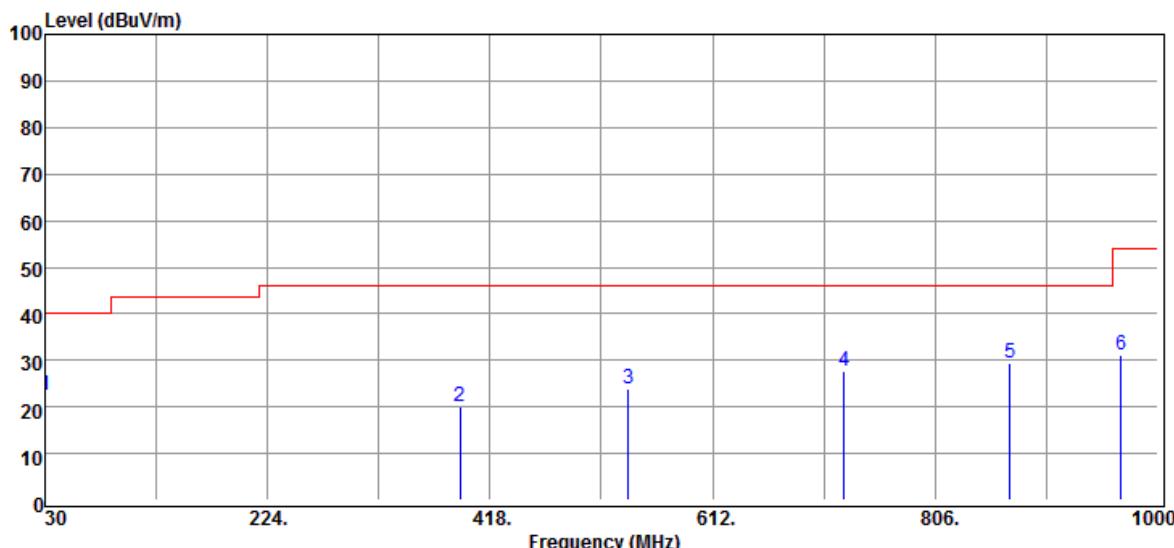
f (886-2) 2298-0488

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Member of SGS Group

Operation Mode :BT5.0  
 Test Mode :Tx CH Low  
 EUT Pol :E2 Plan  
 Test Channel :2402 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
30.00	Peak	39.39	-17.05	22.34	40.00	-17.66
391.81	Peak	33.09	-13.00	20.09	46.00	-25.91
538.28	Peak	33.80	-10.01	23.79	46.00	-22.21
726.46	Peak	35.27	-7.45	27.82	46.00	-18.18
870.99	Peak	34.44	-4.90	29.54	46.00	-16.46
967.99	Peak	34.56	-3.45	31.11	54.00	-22.89

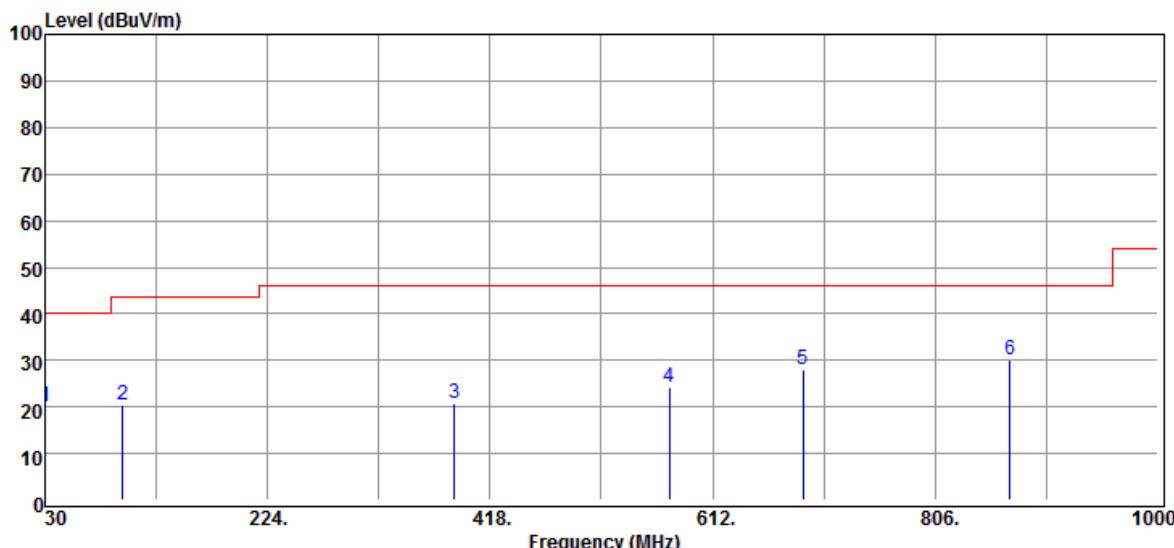
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Operation Mode :BT5.0 Test Date :2018-06-14  
 Test Mode :Tx CH Mid Temp./Humi. :25/60  
 EUT Pol :E2 Plan Antenna Pol. :VERTICAL  
 Test Channel :2442 MHz Engineer :Jerry



Freq. MHz	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
30.00	Peak	38.85	-18.75	20.10	40.00	-19.90
97.90	Peak	42.20	-21.78	20.42	43.50	-23.08
386.96	Peak	33.78	-13.10	20.68	46.00	-25.32
574.17	Peak	33.50	-9.33	24.17	46.00	-21.83
690.57	Peak	35.57	-7.41	28.16	46.00	-17.84
870.99	Peak	35.06	-4.90	30.16	46.00	-15.84

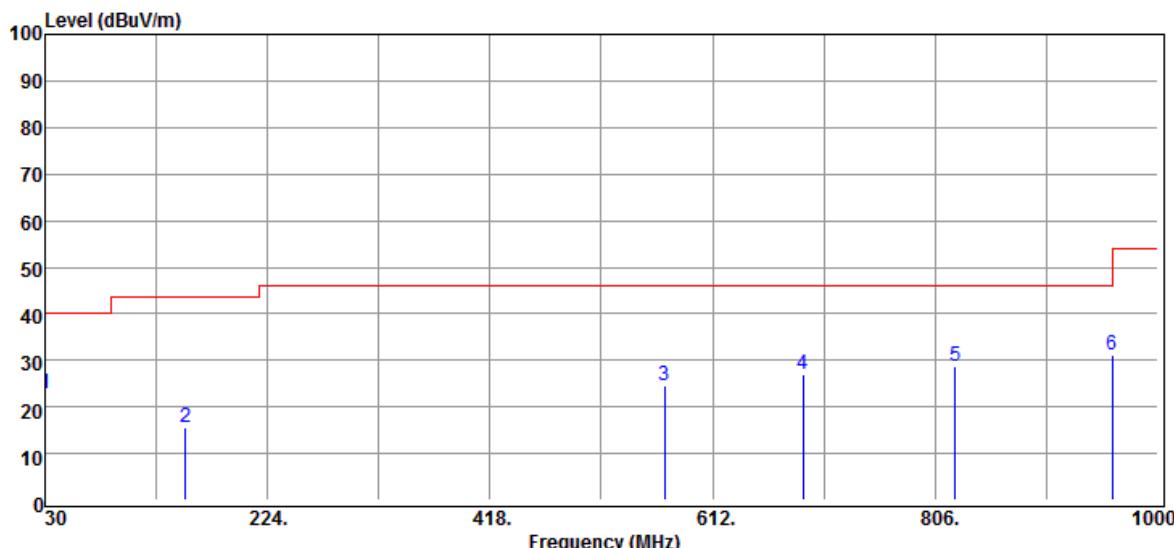
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Operation Mode :BT5.0  
 Test Mode :Tx CH Mid  
 EUT Pol :E2 Plan  
 Test Channel :2442 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
30.00	Peak	39.87	-17.05	22.82	40.00	-17.18
152.22	Peak	31.75	-16.16	15.59	43.50	-27.91
570.29	Peak	34.08	-9.60	24.48	46.00	-21.52
690.57	Peak	34.34	-7.41	26.93	46.00	-19.07
823.46	Peak	34.98	-6.16	28.82	46.00	-17.18
960.23	Peak	35.20	-4.07	31.13	54.00	-22.87

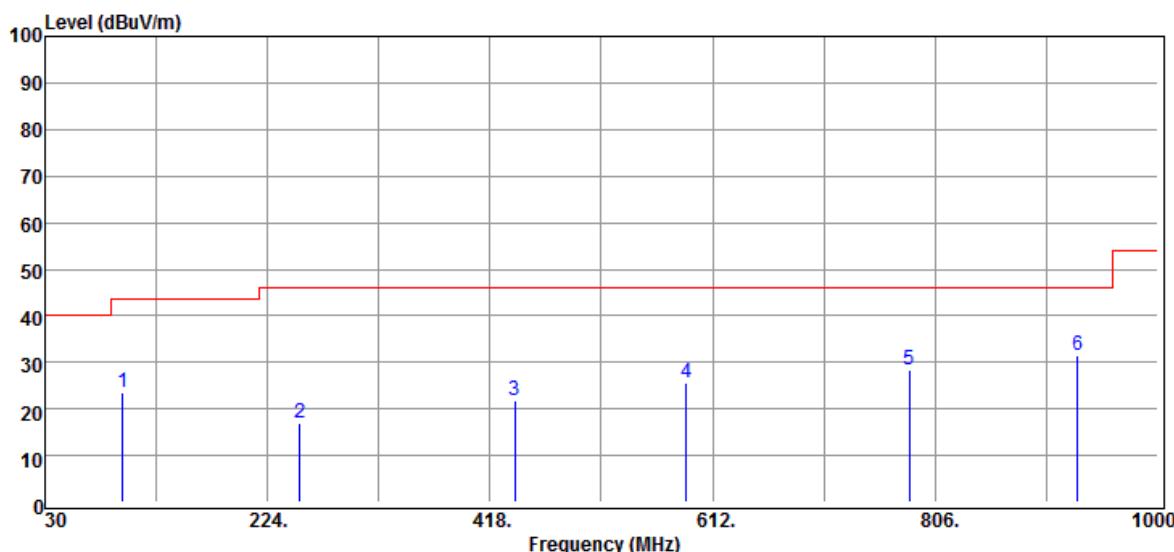
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Operation Mode :BT5.0  
 Test Mode :Tx CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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
97.90	Peak	45.45	-21.78	23.67	43.50	-19.83
252.13	Peak	33.65	-16.81	16.84	46.00	-29.16
439.34	Peak	33.54	-11.74	21.80	46.00	-24.20
588.72	Peak	34.22	-8.75	25.47	46.00	-20.53
783.69	Peak	35.54	-7.04	28.50	46.00	-17.50
930.16	Peak	35.82	-4.42	31.40	46.00	-14.60

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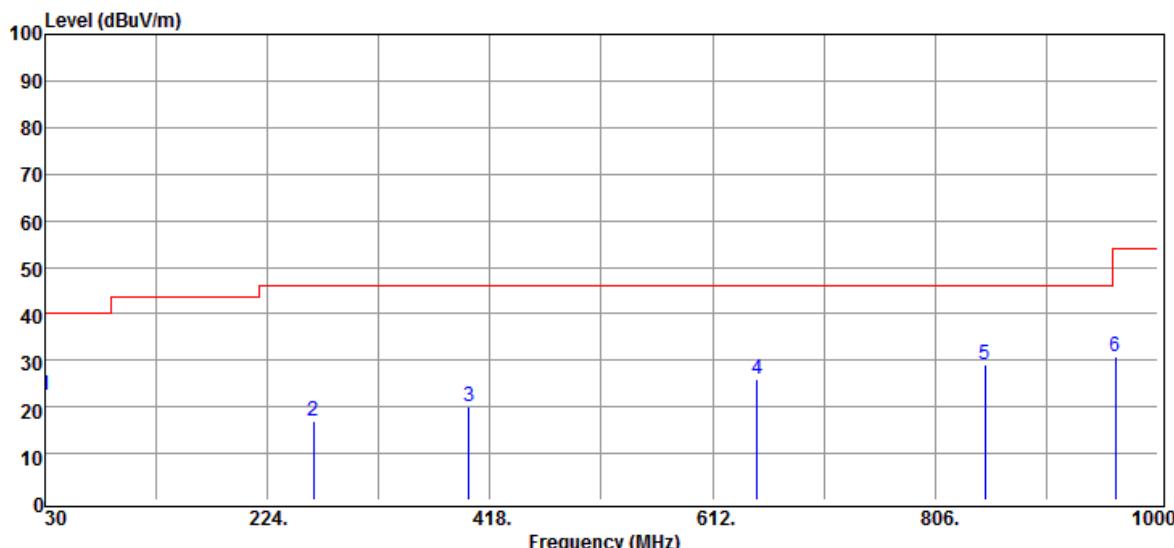
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Operation Mode :BT5.0  
 Test Mode :Tx CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
30.00	Peak	39.58	-17.05	22.53	40.00	-17.47
263.77	Peak	33.36	-16.51	16.85	46.00	-29.15
399.57	Peak	32.88	-12.79	20.09	46.00	-25.91
650.80	Peak	34.70	-8.65	26.05	46.00	-19.95
849.65	Peak	34.93	-5.77	29.16	46.00	-16.84
963.14	Peak	34.75	-3.84	30.91	54.00	-23.09

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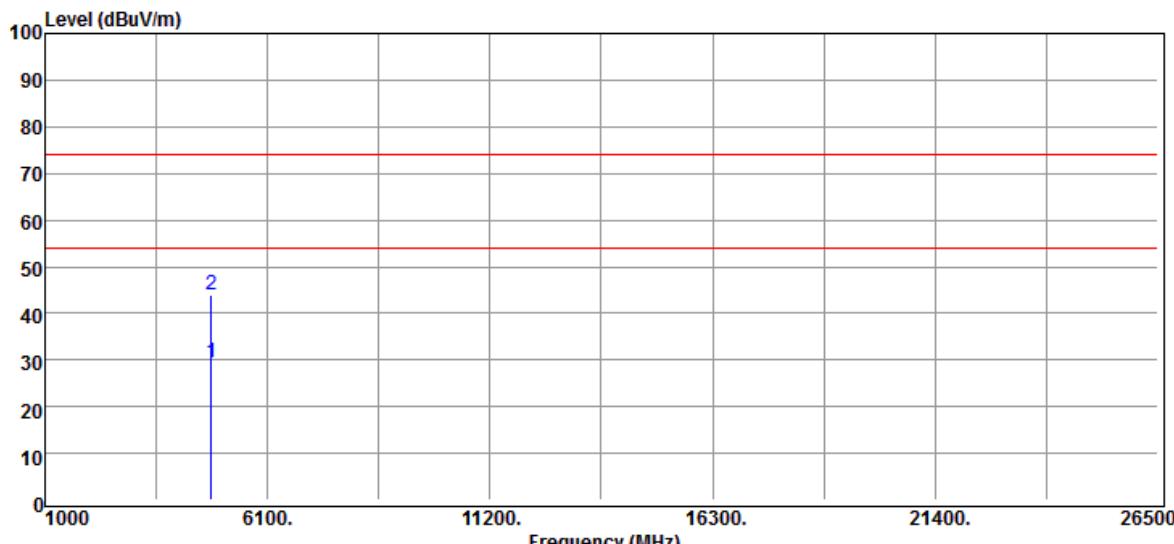
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## Radiated Spurious Emission Measurement Result For Frequency above 1GHz

### \*Internal Chip Antenna\_BLE

Operation Mode	:BLE	Test Date	:2018-06-11
Test Mode	:Tx CH Low	Temp./Humi.	:25/60
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:2402 MHz	Engineer	:Jerry



Freq. MHz	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
4804.00	Average	29.26	0.27	29.53	54.00	-24.47
4804.00	Peak	43.75	0.27	44.02	74.00	-29.98

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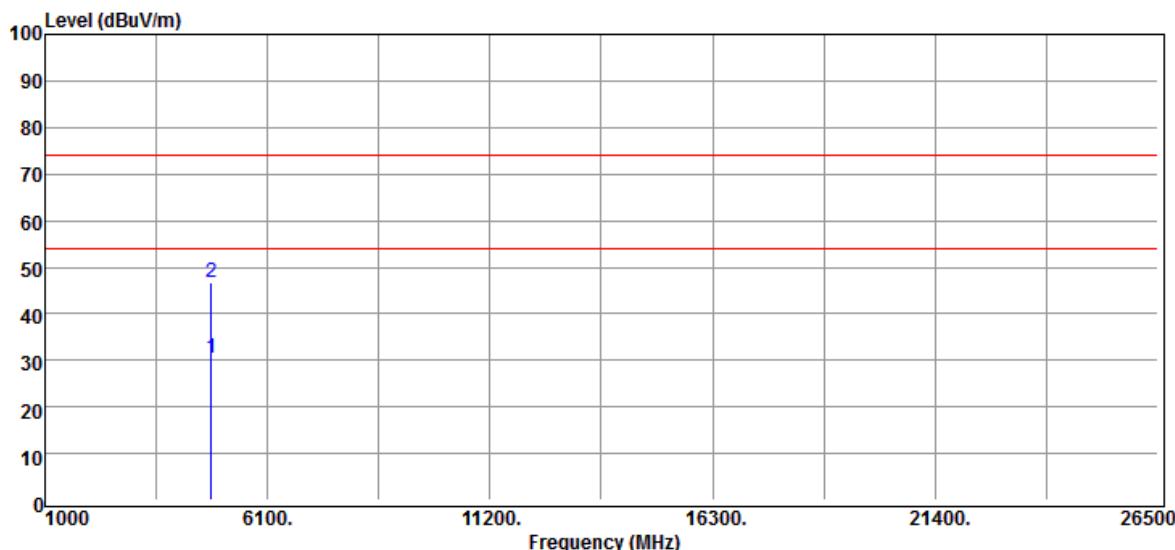
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Operation Mode :BLE  
 Test Mode :Tx CH Low  
 EUT Pol :E2 Plan  
 Test Channel :2402 MHz

Test Date :2018-06-11  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
4804.00	Average	30.21	0.27	30.48	54.00	-23.52
4804.00	Peak	46.43	0.27	46.70	74.00	-27.30

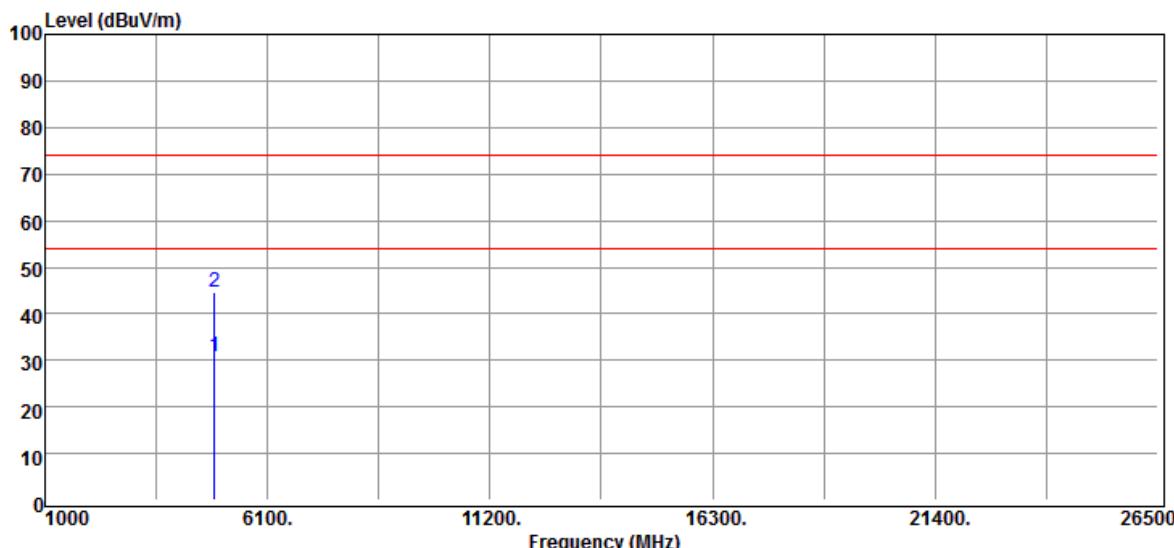
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Operation Mode :BLE  
 Test Mode :Tx CH Mid  
 EUT Pol :E2 Plan  
 Test Channel :2442 MHz

Test Date :2018-06-11  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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
4884.00	Average	30.03	0.71	30.74	54.00	-23.26
4884.00	Peak	43.97	0.71	44.68	74.00	-29.32

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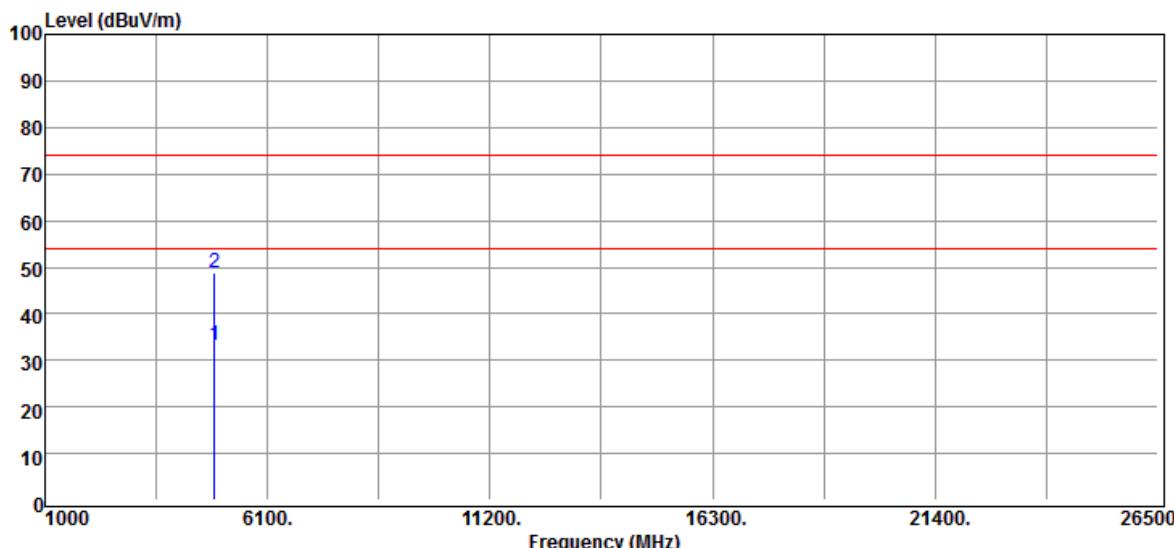
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Operation Mode :BLE  
 Test Mode :Tx CH Mid  
 EUT Pol :E2 Plan  
 Test Channel :2442 MHz

Test Date :2018-06-11  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
4884.00	Average	32.36	0.71	33.07	54.00	-20.93
4884.00	Peak	47.94	0.71	48.65	74.00	-25.35

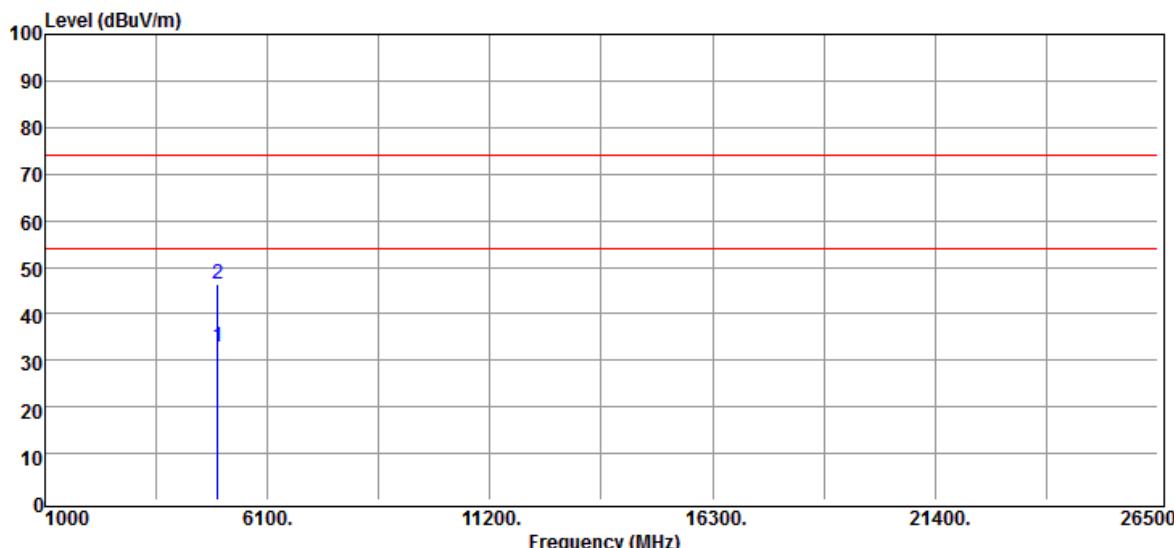
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Operation Mode :BLE  
 Test Mode :Tx CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-11  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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	Average	31.53	1.24	32.77	54.00	-21.23
4960.00	Peak	45.23	1.24	46.47	74.00	-27.53

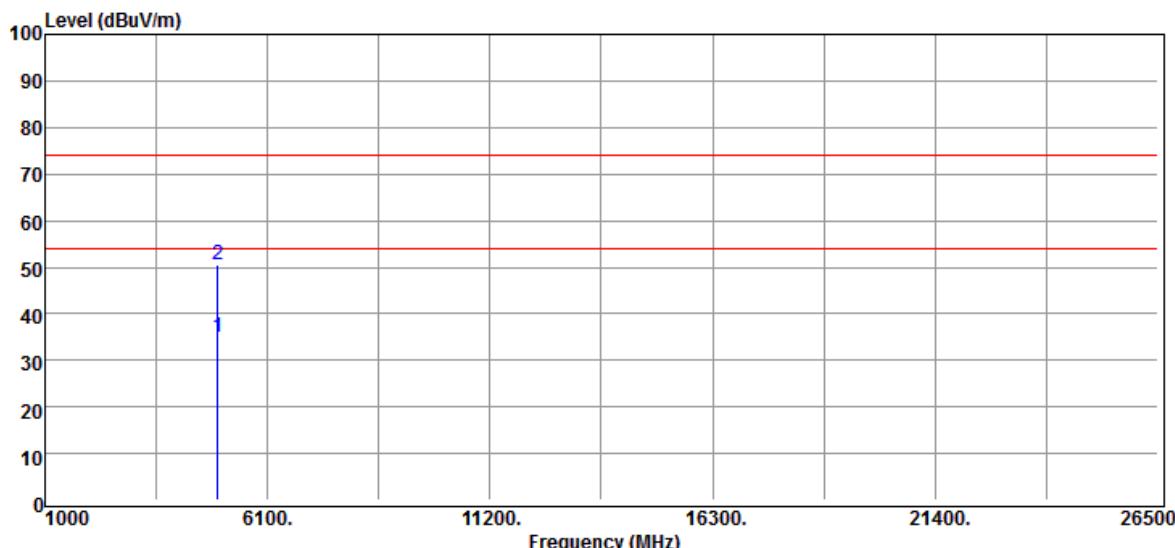
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Operation Mode :BLE  
 Test Mode :Tx CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-11  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB <sub>uV</sub>	Factor dB	Actual FS dB <sub>uV/m</sub>	Limit @3m dB <sub>uV/m</sub>	Margin dB
4962.00	Average	33.60	1.25	34.85	54.00	-19.15
4962.00	Peak	49.36	1.25	50.61	74.00	-23.39

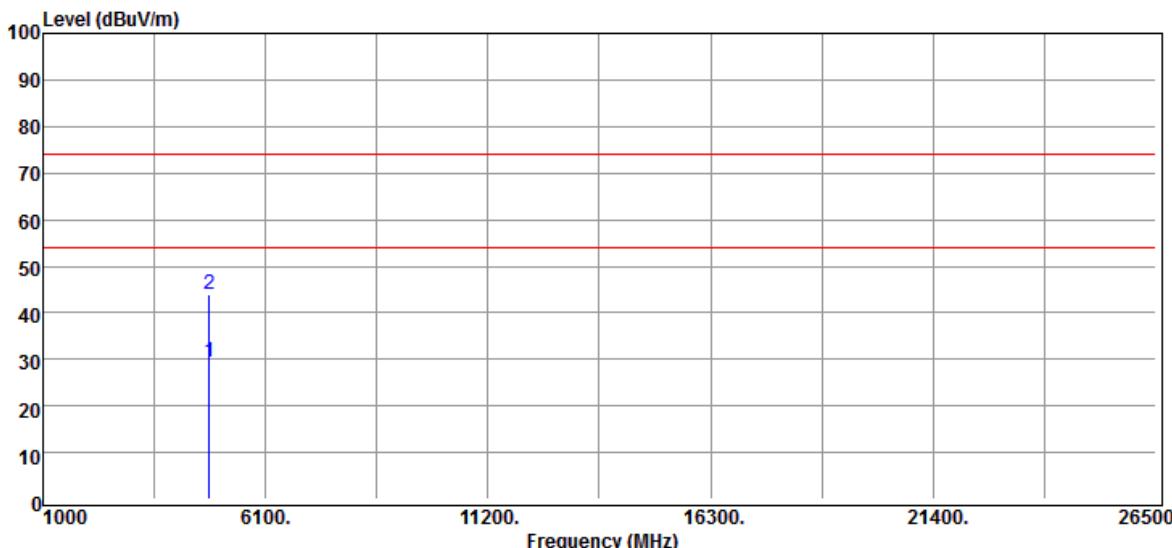
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**\*Internal Chip Antenna\_BT 5.0**

Operation Mode	:BT5.0	Test Date	:2018-06-11
Test Mode	:Tx CH Low	Temp./Humi.	:25/60
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:2402 MHz	Engineer	:Jerry



Freq. MHz	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
4804.00	Average	29.12	0.27	29.39	54.00	-24.61
4804.00	Peak	43.68	0.27	43.95	74.00	-30.05

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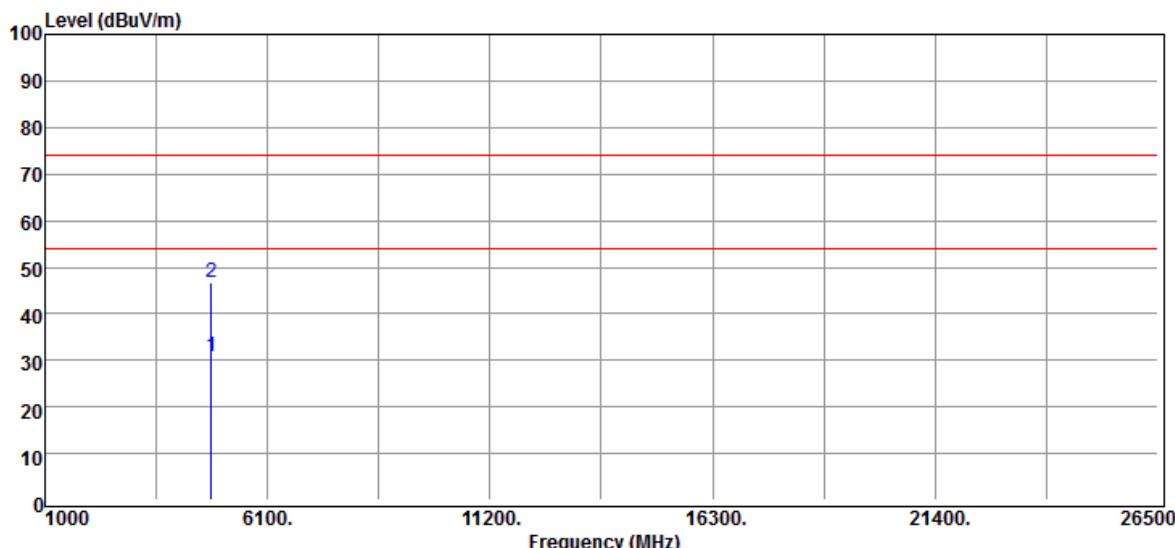
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Operation Mode :BT5.0  
 Test Mode :Tx CH Low  
 EUT Pol :E2 Plan  
 Test Channel :2402 MHz

Test Date :2018-06-11  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



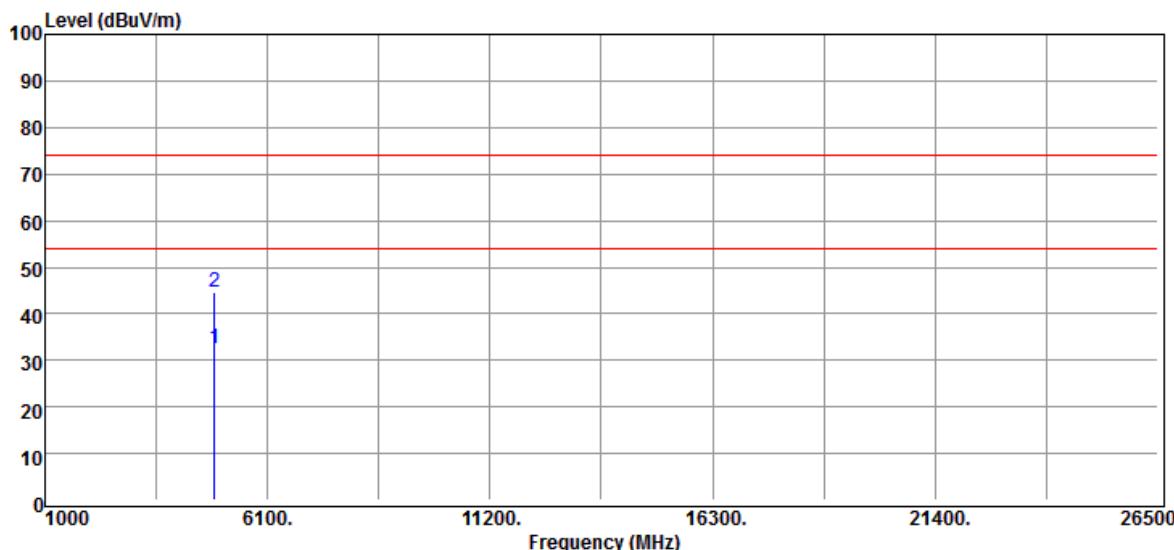
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
4804.00	Average	30.53	0.27	30.80	54.00	-23.20
4804.00	Peak	46.53	0.27	46.80	74.00	-27.20

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Operation Mode :BT5.0  
 Test Mode :Tx CH Mid  
 EUT Pol :E2 Plan  
 Test Channel :2442 MHz  
 Test Date :2018-06-11  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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
4884.00	Average	31.70	0.71	32.41	54.00	-21.59
4884.00	Peak	44.00	0.71	44.71	74.00	-29.29

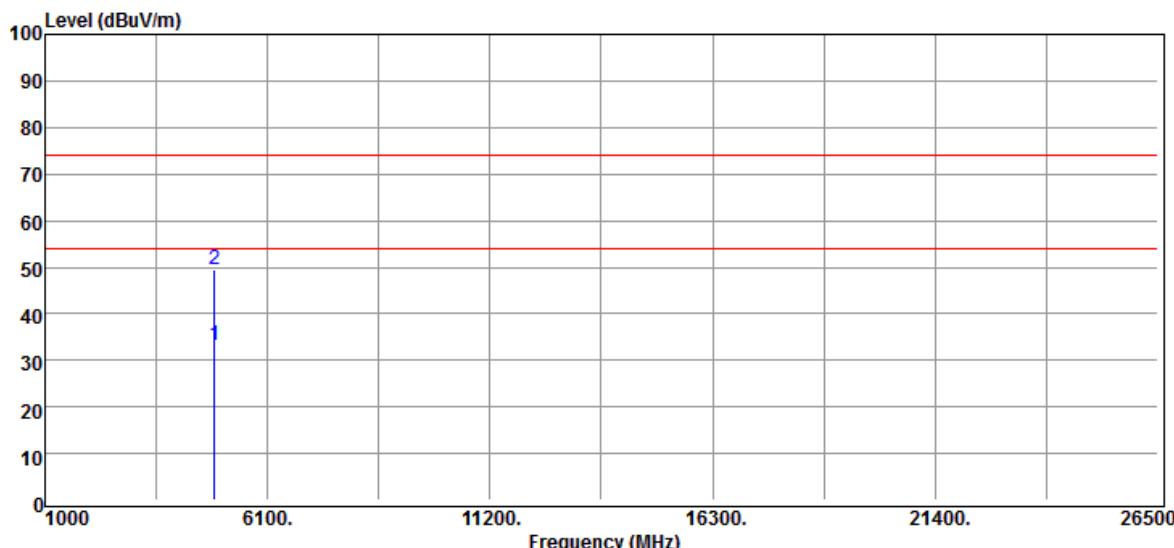
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Operation Mode :BT5.0  
 Test Mode :Tx CH Mid  
 EUT Pol :E2 Plan  
 Test Channel :2442 MHz

Test Date :2018-06-11  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
4884.00	Average	32.38	0.71	33.09	54.00	-20.91
4884.00	Peak	48.70	0.71	49.41	74.00	-24.59

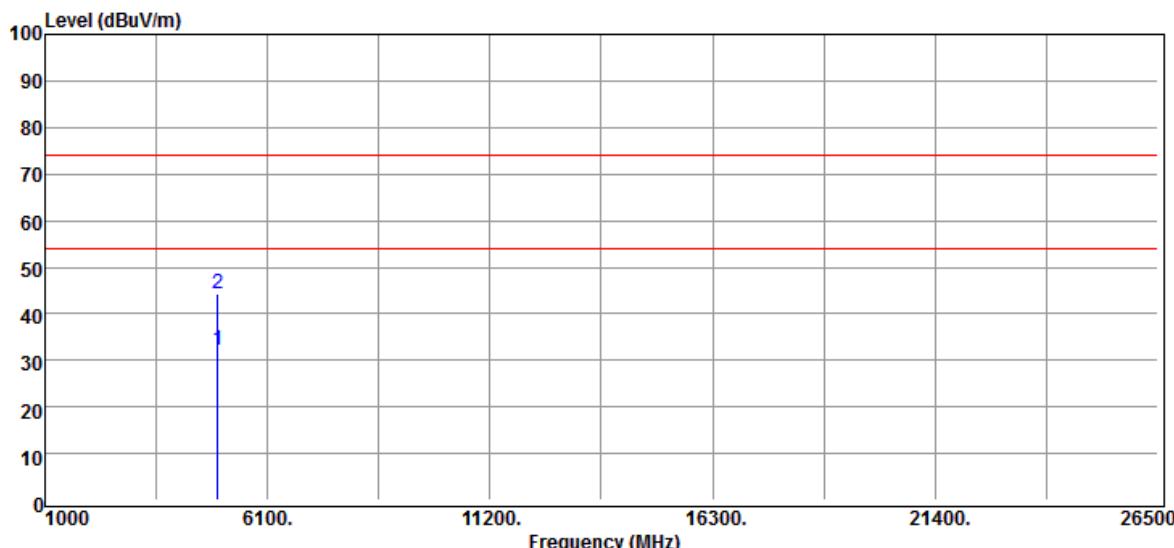
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Operation Mode :BT5.0  
 Test Mode :Tx CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-11  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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	Average	31.06	1.24	32.30	54.00	-21.70
4960.00	Peak	43.11	1.24	44.35	74.00	-29.65

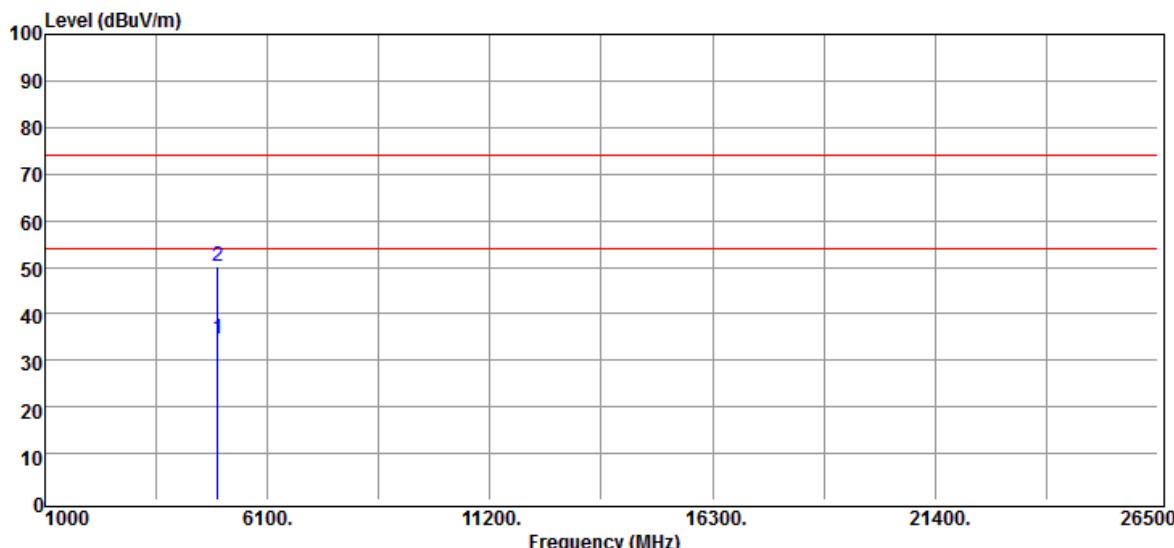
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Operation Mode :BT5.0  
 Test Mode :Tx CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-11  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB <sub>uV</sub>	Factor dB	Actual FS dB <sub>uV/m</sub>	Limit @3m dB <sub>uV/m</sub>	Margin dB
4960.00	Average	33.37	1.24	34.61	54.00	-19.39
4960.00	Peak	48.82	1.24	50.06	74.00	-23.94

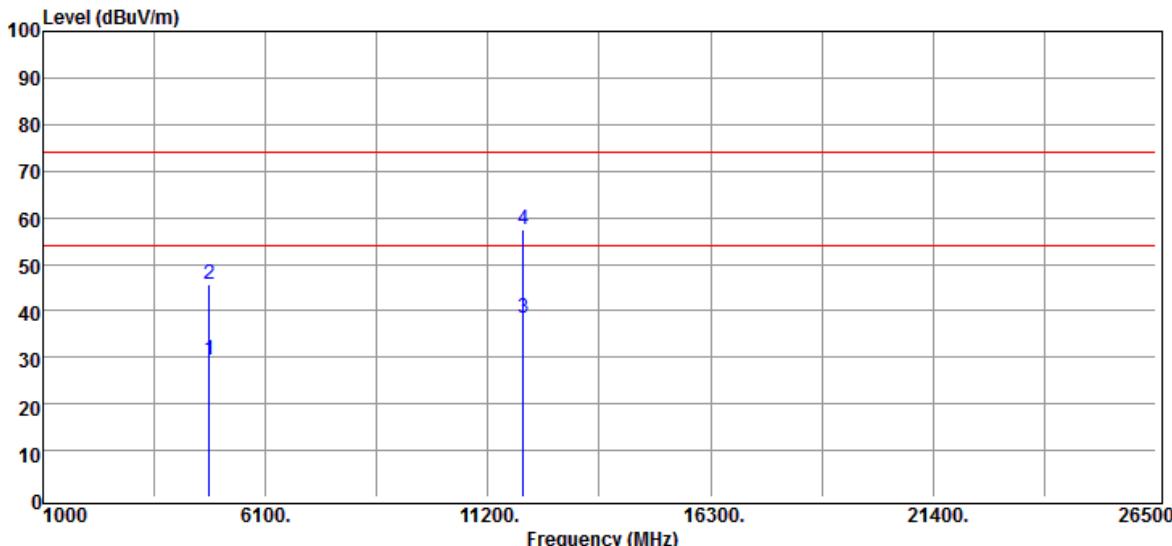
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## \*Internal PCB Antenna\_BLE

Operation Mode	:BLE	Test Date	:2018-06-12
Test Mode	:Tx CH Low	Temp./Humi.	:25/60
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:2402 MHz	Engineer	:Jerry



Freq. MHz	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
4804.00	Average	29.20	0.27	29.47	54.00	-24.53
4804.00	Peak	45.55	0.27	45.82	74.00	-28.18
12010.00	Average	26.32	11.95	38.27	54.00	-15.73
12010.00	Peak	45.59	11.95	57.54	74.00	-16.46

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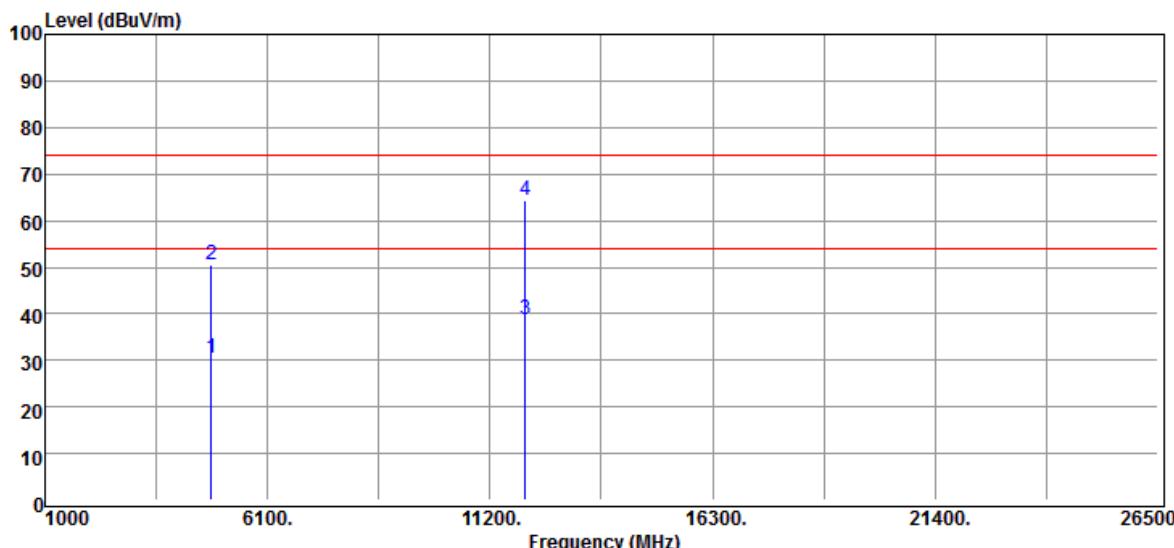
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Operation Mode :BLE  
 Test Mode :Tx CH Low  
 EUT Pol :E2 Plan  
 Test Channel :2402 MHz

Test Date :2018-06-12  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
4804.00	Average	30.10	0.27	30.37	54.00	-23.63
4804.00	Peak	50.29	0.27	50.56	74.00	-23.44
12010.00	Average	26.89	11.95	38.84	54.00	-15.16
12010.00	Peak	52.29	11.95	64.24	74.00	-9.76

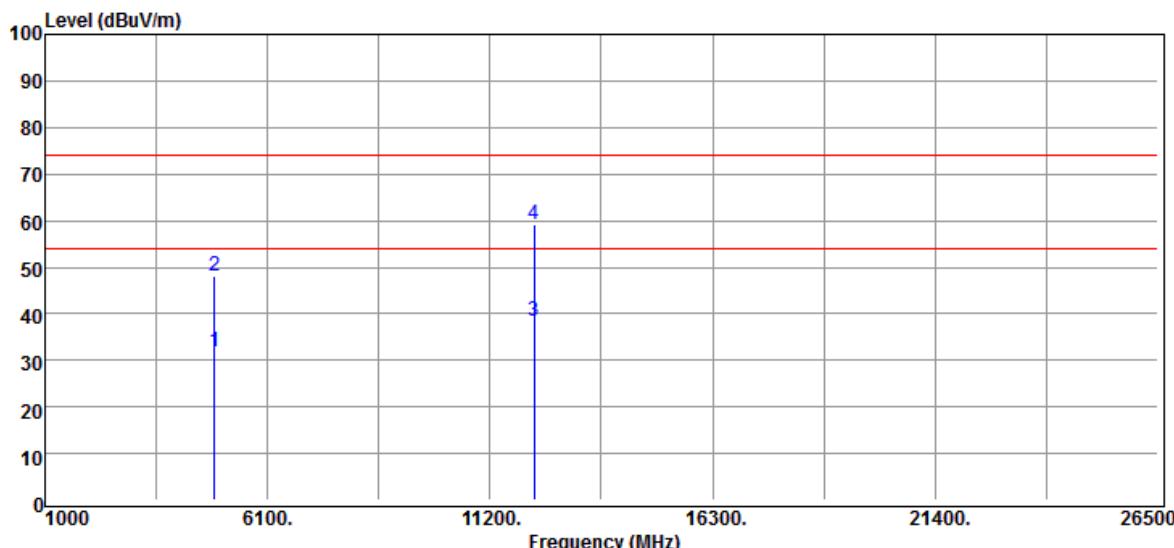
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Operation Mode :BLE  
 Test Mode :Tx CH Mid  
 EUT Pol :E2 Plan  
 Test Channel :2442 MHz

Test Date :2018-06-12  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB <sub>uV</sub>	Factor dB	Actual FS dB <sub>uV/m</sub>	Limit @3m dB <sub>uV/m</sub>	Margin dB
4884.00	Average	31.26	0.71	31.97	54.00	-22.03
4884.00	Peak	47.34	0.71	48.05	74.00	-25.95
12210.00	Average	27.32	11.02	38.34	54.00	-15.66
12210.00	Peak	48.02	11.02	59.04	74.00	-14.96

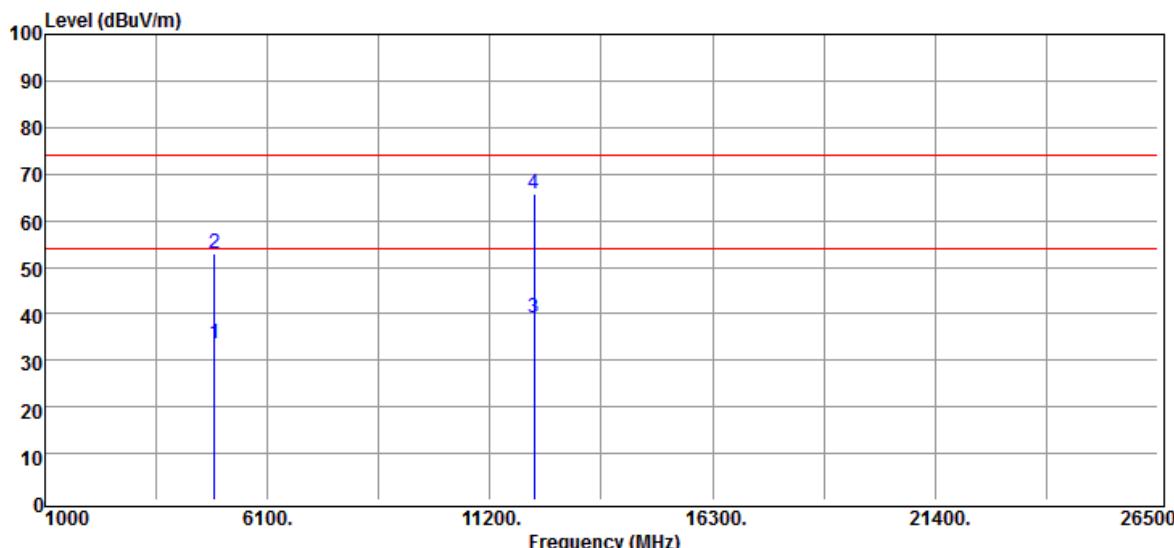
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Operation Mode :BLE  
 Test Mode :Tx CH Mid  
 EUT Pol :E2 Plan  
 Test Channel :2442 MHz

Test Date :2018-06-12  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB <sub>uV</sub>	Factor dB	Actual FS dB <sub>uV/m</sub>	Limit @3m dB <sub>uV/m</sub>	Margin dB
4884.00	Average	32.69	0.71	33.40	54.00	-20.60
4884.00	Peak	52.30	0.71	53.01	74.00	-20.99
12210.00	Average	28.12	11.02	39.14	54.00	-14.86
12210.00	Peak	54.69	11.02	65.71	74.00	-8.29

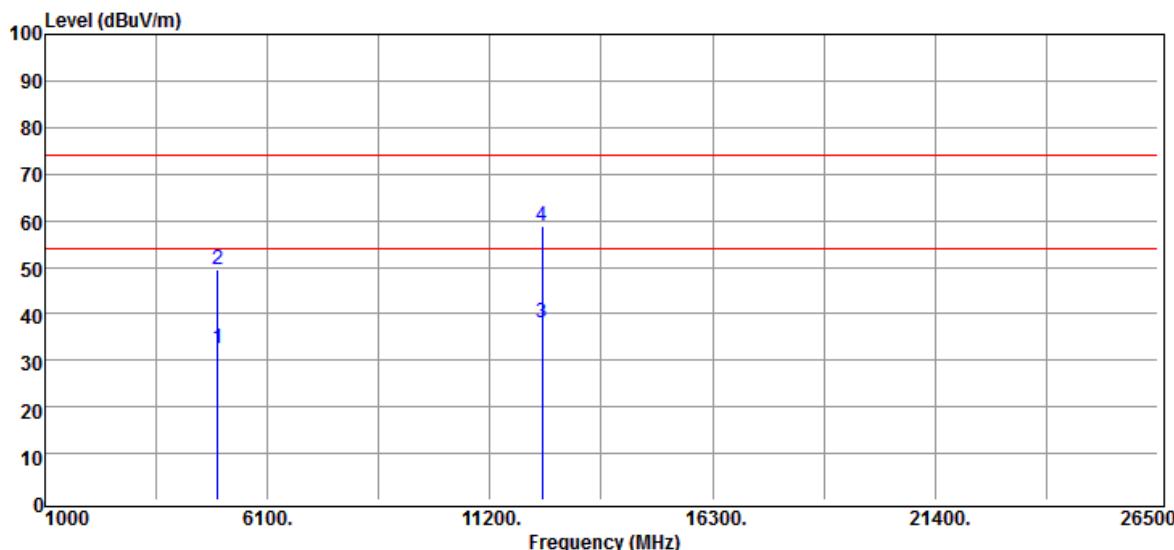
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Operation Mode :BLE  
 Test Mode :Tx CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-12  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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	Average	31.23	1.24	32.47	54.00	-21.53
4960.00	Peak	48.25	1.24	49.49	74.00	-24.51
12400.00	Average	27.68	10.30	37.98	54.00	-16.02
12400.00	Peak	48.59	10.30	58.89	74.00	-15.11

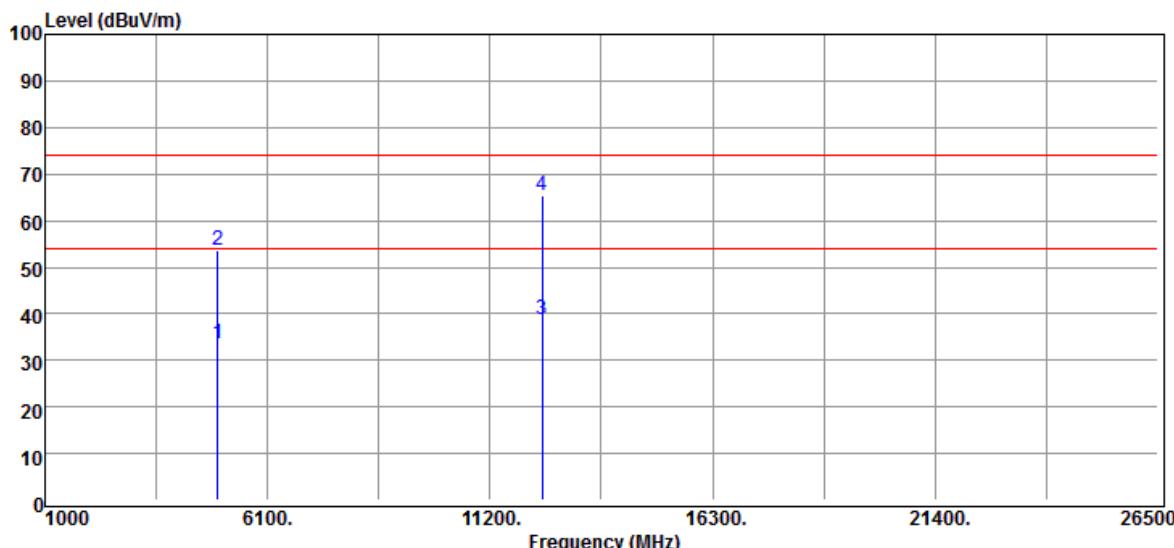
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Operation Mode :BLE  
 Test Mode :Tx CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-12  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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	Average	32.38	1.24	33.62	54.00	-20.38
4960.00	Peak	52.37	1.24	53.61	74.00	-20.39
12400.00	Average	28.30	10.30	38.60	54.00	-15.40
12400.00	Peak	55.10	10.30	65.40	74.00	-8.60

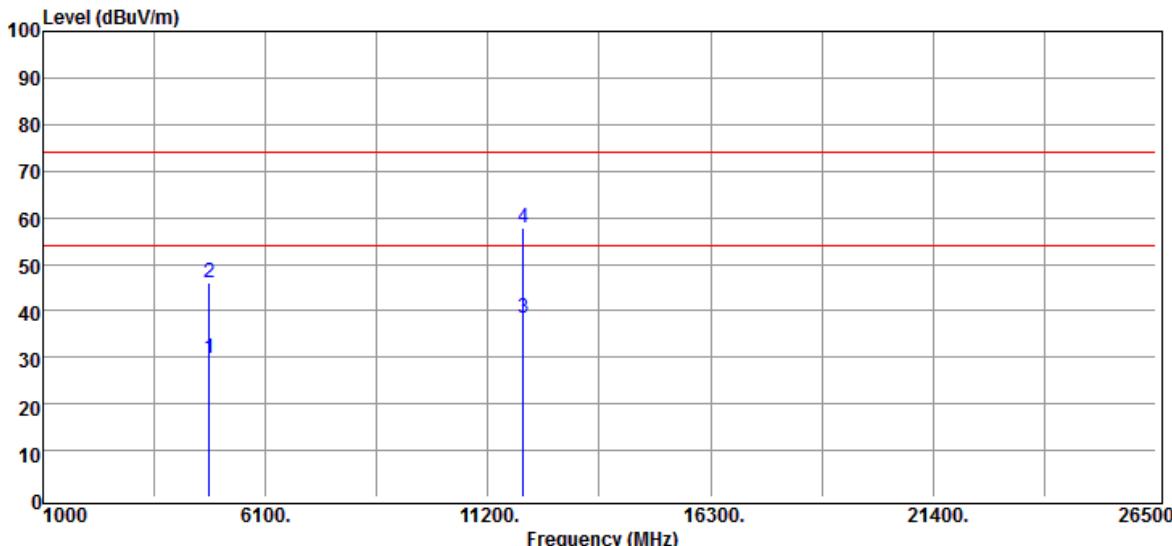
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## \*Internal PCB Antenna\_BT 5.0

Operation Mode	:BT5.0	Test Date	:2018-06-12
Test Mode	:Tx CH Low	Temp./Humi.	:25/60
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:2402 MHz	Engineer	:Jerry



Freq. MHz	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
4804.00	Average	29.39	0.27	29.66	54.00	-24.34
4804.00	Peak	45.87	0.27	46.14	74.00	-27.86
12010.00	Average	26.59	11.95	38.54	54.00	-15.46
12010.00	Peak	45.67	11.95	57.62	74.00	-16.38

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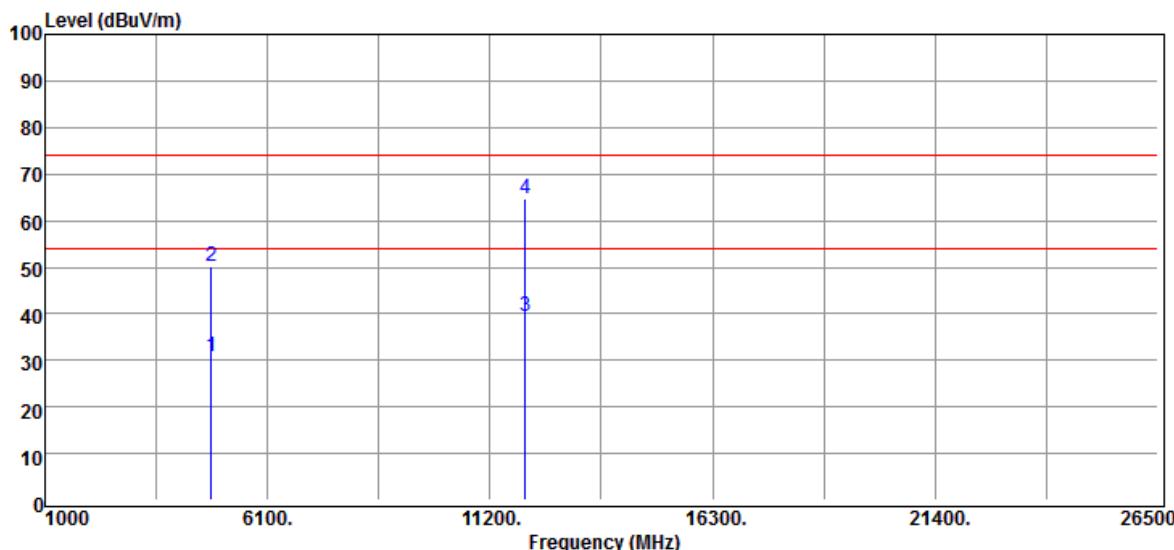
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Operation Mode :BT5.0  
 Test Mode :Tx CH Low  
 EUT Pol :E2 Plan  
 Test Channel :2402 MHz

Test Date :2018-06-12  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB <sub>uV</sub>	Factor dB	Actual FS dB <sub>uV/m</sub>	Limit @3m dB <sub>uV/m</sub>	Margin dB
4804.00	Average	30.69	0.27	30.96	54.00	-23.04
4804.00	Peak	49.98	0.27	50.25	74.00	-23.75
12010.00	Average	27.33	11.95	39.28	54.00	-14.72
12010.00	Peak	52.76	11.95	64.71	74.00	-9.29

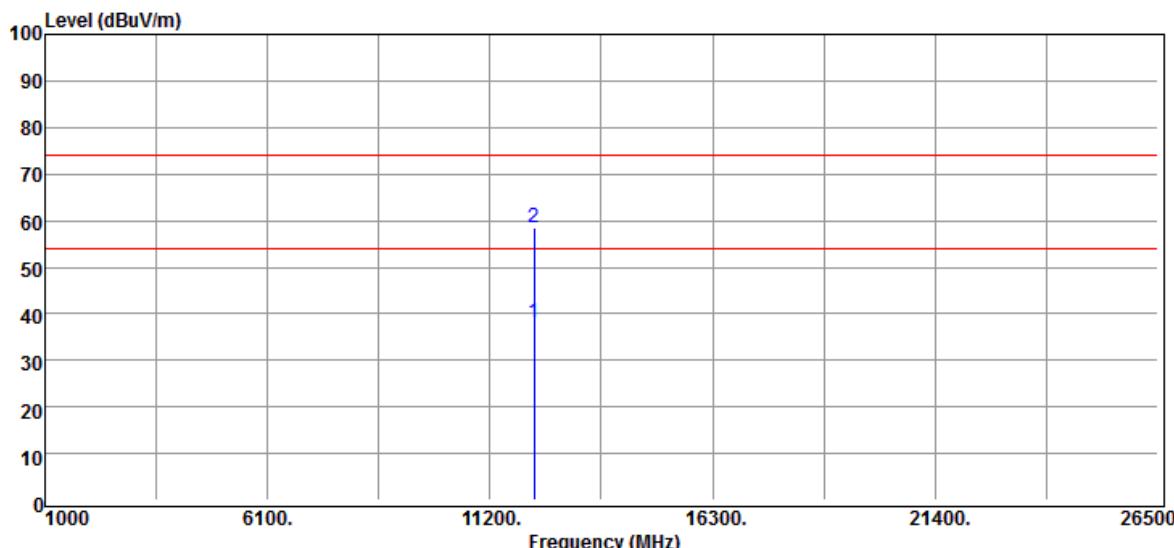
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Operation Mode :BT5.0  
 Test Mode :Tx CH Mid  
 EUT Pol :E2 Plan  
 Test Channel :2442 MHz

Test Date :2018-06-12  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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
12210.00	Average	27.15	11.02	38.17	54.00	-15.83
12210.00	Peak	47.38	11.02	58.40	74.00	-15.60

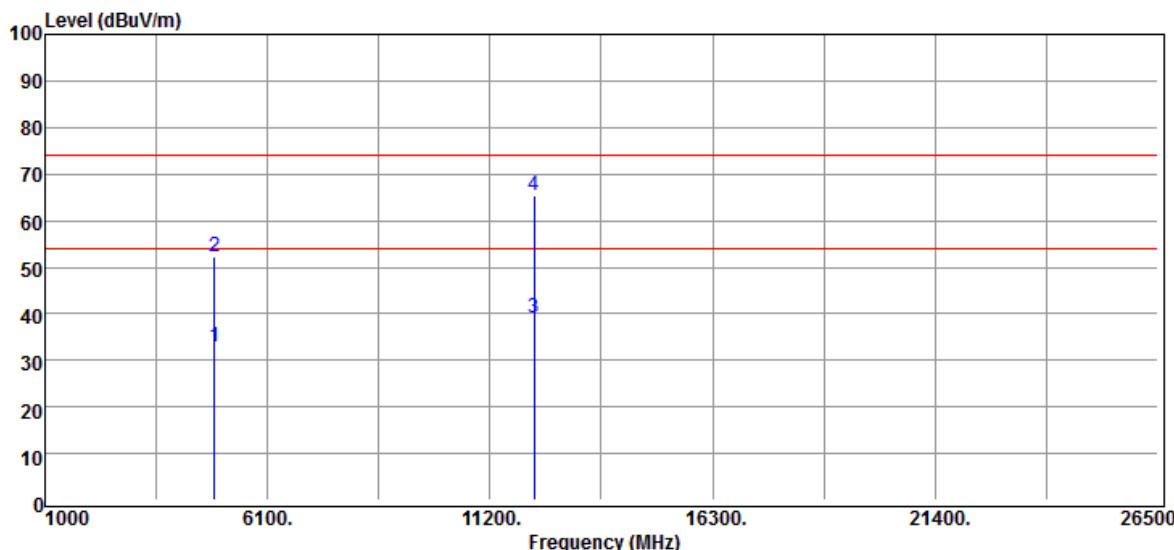
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Operation Mode :BT5.0  
 Test Mode :Tx CH Mid  
 EUT Pol :E2 Plan  
 Test Channel :2442 MHz

Test Date :2018-06-12  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB <sub>uV</sub>	Factor dB	Actual FS dB <sub>uV/m</sub>	Limit @3m dB <sub>uV/m</sub>	Margin dB
4884.00	Average	32.11	0.71	32.82	54.00	-21.18
4884.00	Peak	51.38	0.71	52.09	74.00	-21.91
12210.00	Average	27.99	11.02	39.01	54.00	-14.99
12210.00	Peak	54.38	11.02	65.40	74.00	-8.60

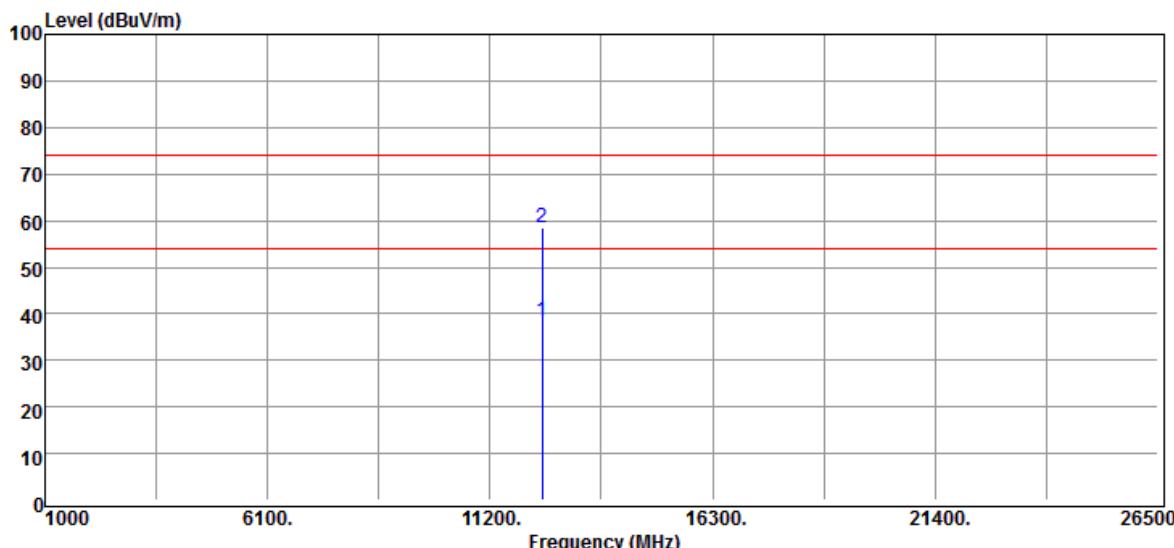
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Operation Mode :BT5.0  
 Test Mode :Tx CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-12  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB <sub>uV</sub>	Factor dB	Actual FS dB <sub>uV/m</sub>	Limit @3m dB <sub>uV/m</sub>	Margin dB
12400.00	Average	27.99	10.30	38.29	54.00	-15.71
12400.00	Peak	48.10	10.30	58.40	74.00	-15.60

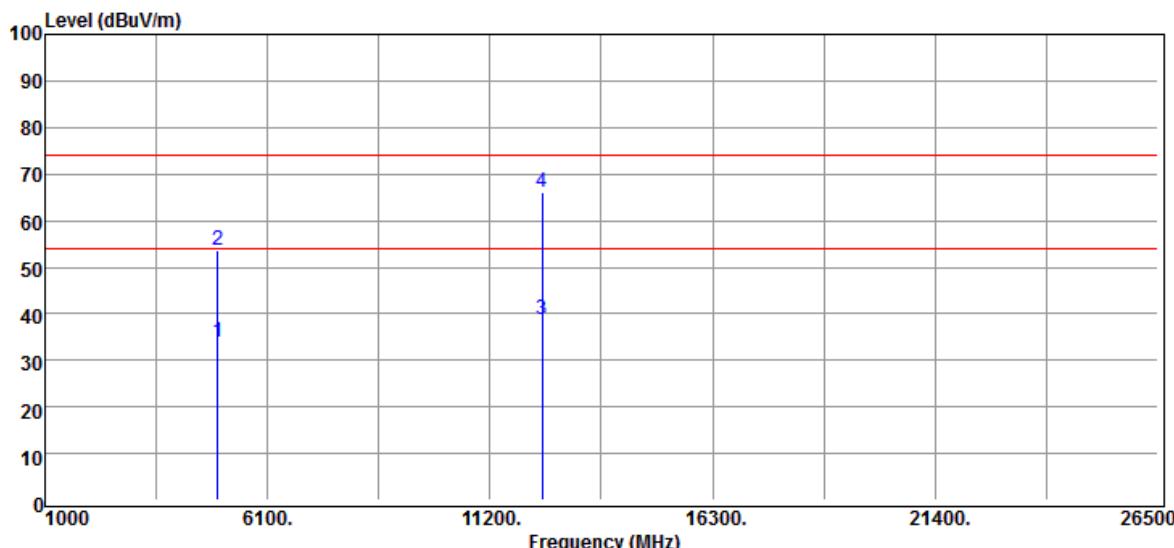
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Operation Mode :BT5.0  
 Test Mode :Tx CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-12  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB <sub>uV</sub>	Factor dB	Actual FS dB <sub>uV/m</sub>	Limit @3m dB <sub>uV/m</sub>	Margin dB
4960.00	Average	32.68	1.24	33.92	54.00	-20.08
4960.00	Peak	52.55	1.24	53.79	74.00	-20.21
12400.00	Average	28.31	10.30	38.61	54.00	-15.39
12400.00	Peak	55.66	10.30	65.96	74.00	-8.04

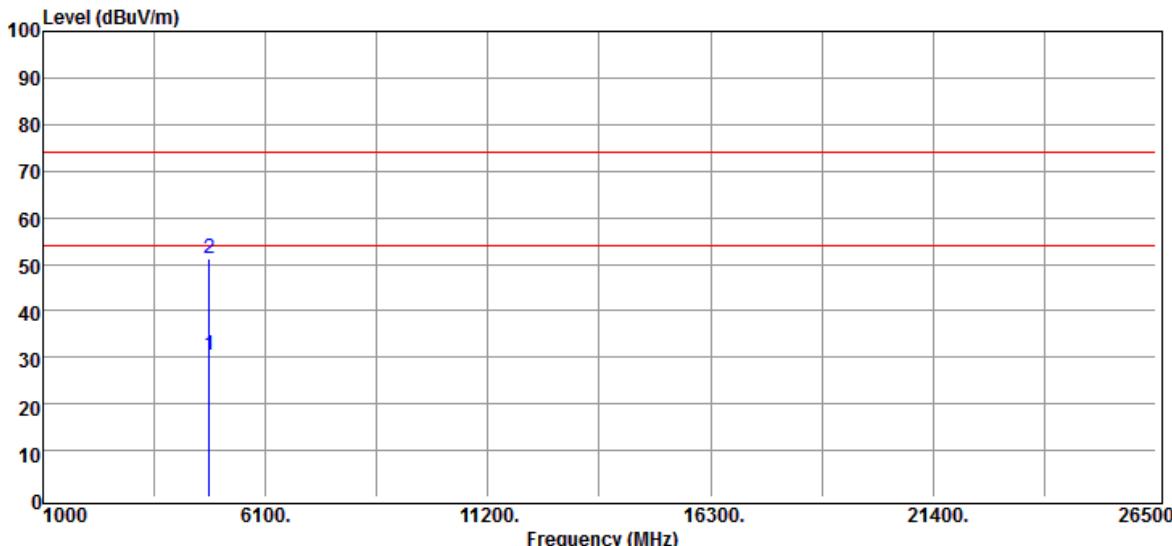
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## \*External UFL Antenna\_BLE

Operation Mode	:BLE	Test Date	:2018-06-14
Test Mode	:Tx CH Low	Temp./Humi.	:25/60
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:2402 MHz	Engineer	:Jerry



Freq. MHz	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
4804.00	Average	30.32	0.27	30.59	54.00	-23.41
4804.00	Peak	50.82	0.27	51.09	74.00	-22.91

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.

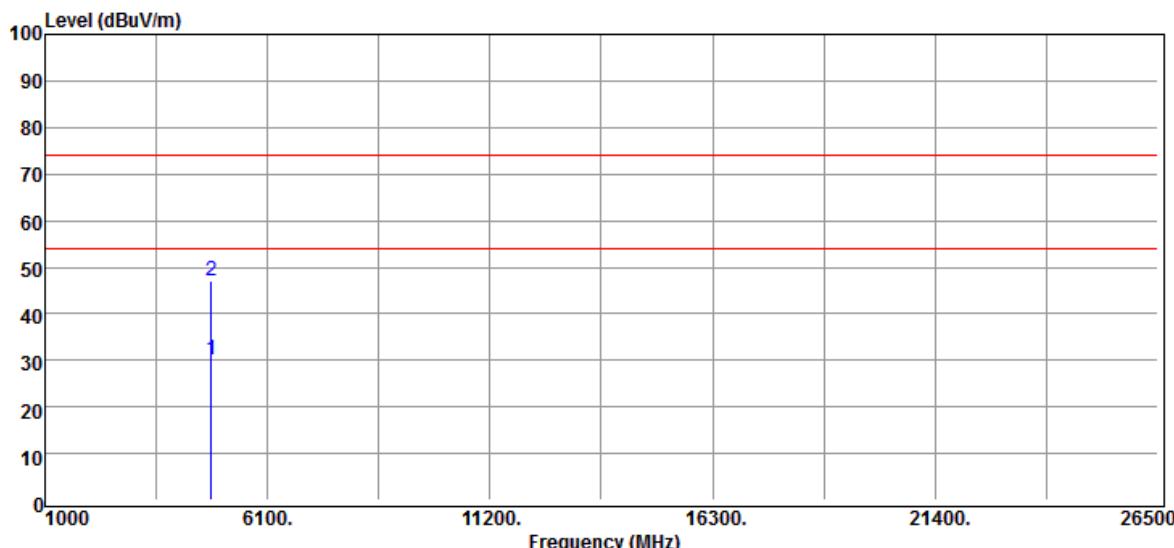
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Operation Mode :BLE  
 Test Mode :Tx CH Low  
 EUT Pol :E2 Plan  
 Test Channel :2402 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
4804.00	Average	29.76	0.27	30.03	54.00	-23.97
4804.00	Peak	46.75	0.27	47.02	74.00	-26.98

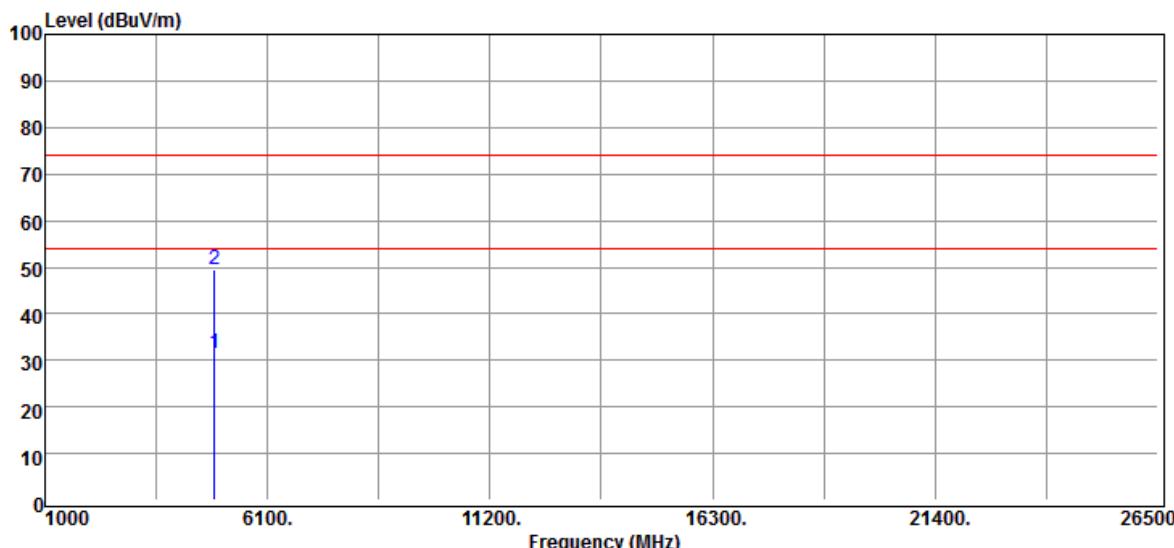
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Operation Mode :BLE  
 Test Mode :Tx CH Mid  
 EUT Pol :E2 Plan  
 Test Channel :2442 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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
4884.00	Average	30.68	0.71	31.39	54.00	-22.61
4884.00	Peak	48.78	0.71	49.49	74.00	-24.51

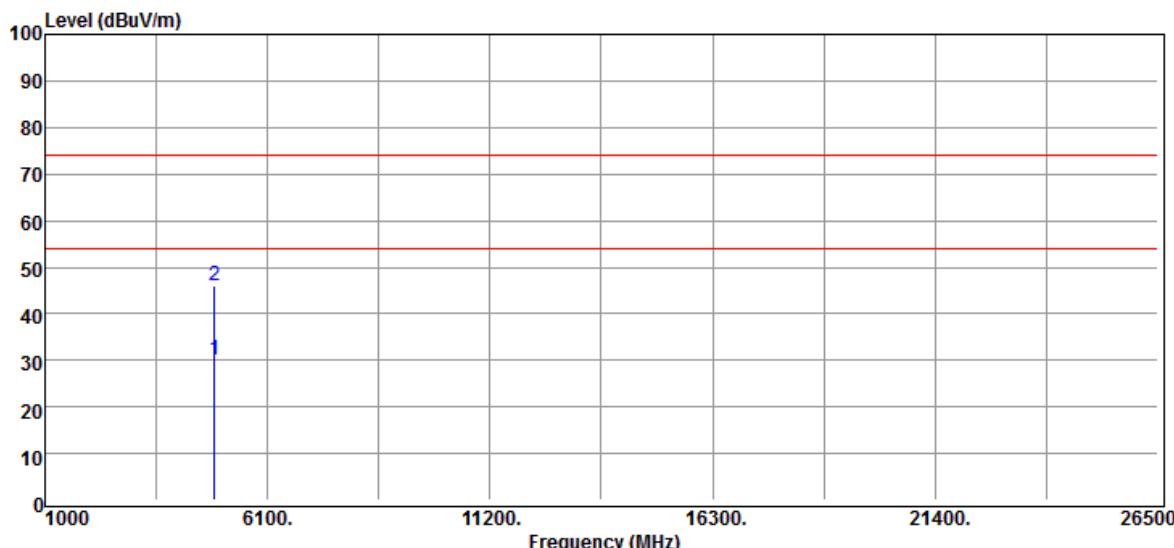
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Operation Mode :BLE  
 Test Mode :Tx CH Mid  
 EUT Pol :E2 Plan  
 Test Channel :2442 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
4884.00	Average	29.36	0.71	30.07	54.00	-23.93
4884.00	Peak	45.22	0.71	45.93	74.00	-28.07

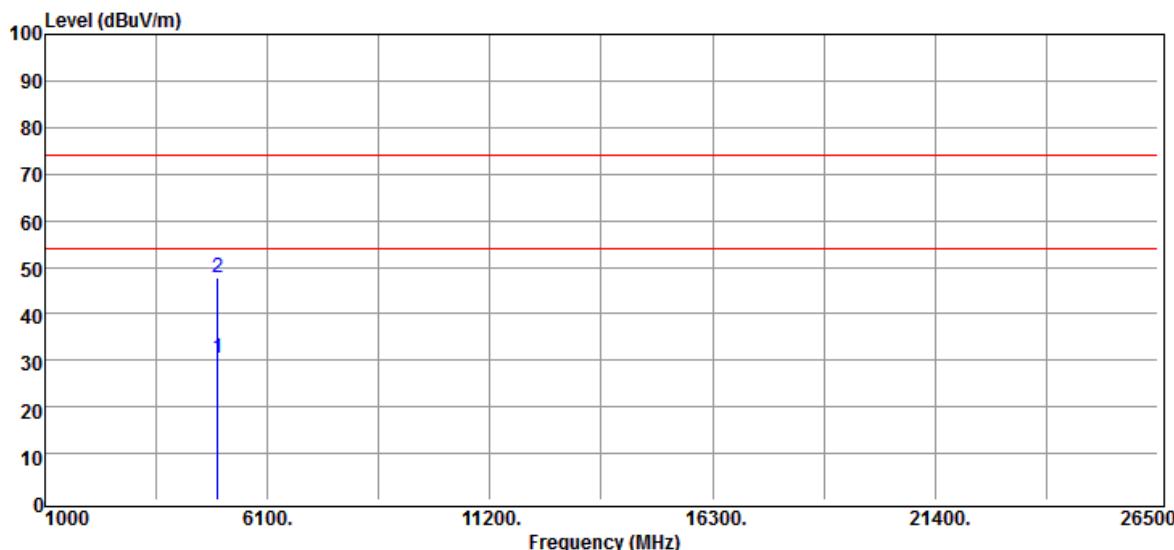
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Operation Mode :BLE  
 Test Mode :Tx CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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	Average	29.32	1.24	30.56	54.00	-23.44
4960.00	Peak	46.35	1.24	47.59	74.00	-26.41

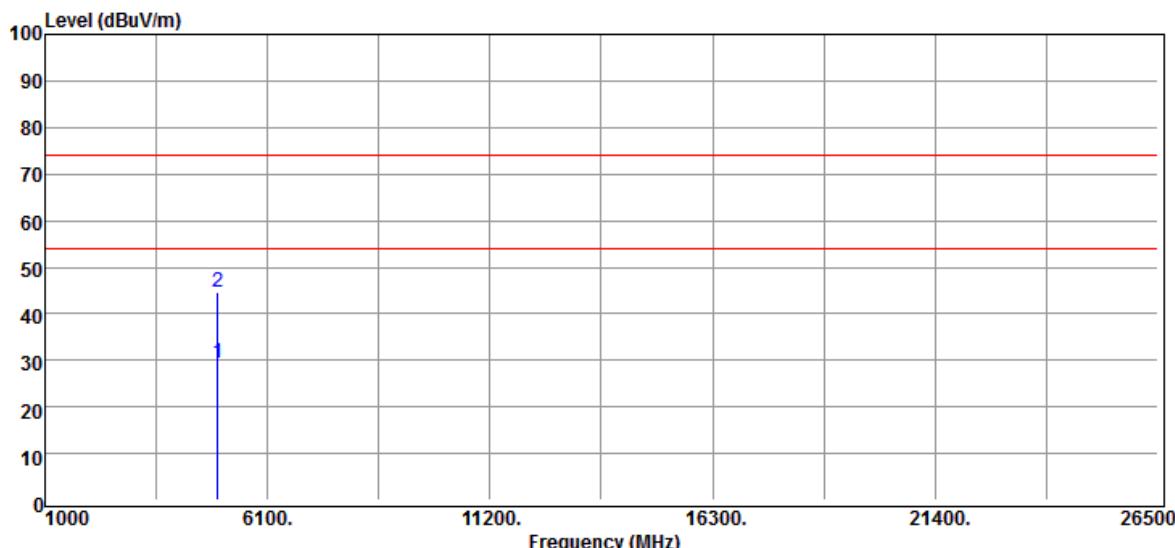
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Operation Mode :BLE  
 Test Mode :Tx CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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	Average	28.06	1.24	29.30	54.00	-24.70
4960.00	Peak	43.37	1.24	44.61	74.00	-29.39

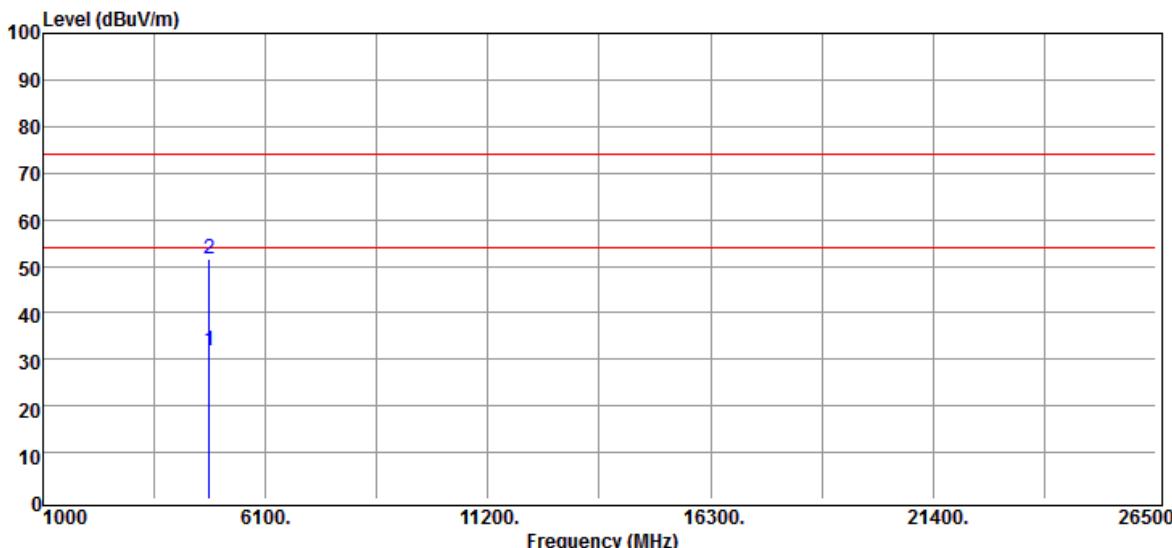
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## \*External UFL Antenna\_BT 5.0

Operation Mode	:BT5.0	Test Date	:2018-06-14
Test Mode	:Tx CH Low	Temp./Humi.	:25/60
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:2402 MHz	Engineer	:Jerry



Freq. MHz	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
4804.00	Average	31.65	0.27	31.92	54.00	-22.08
4804.00	Peak	51.12	0.27	51.39	74.00	-22.61

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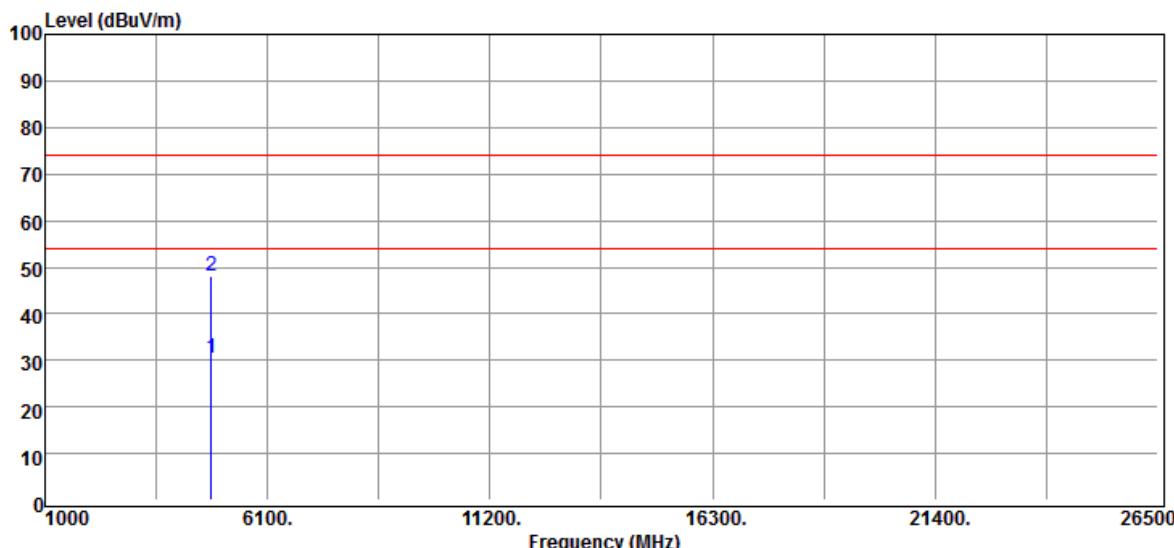
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Operation Mode :BT5.0  
 Test Mode :Tx CH Low  
 EUT Pol :E2 Plan  
 Test Channel :2402 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB <sub>uV</sub>	Factor dB	Actual FS dB <sub>uV/m</sub>	Limit @3m dB <sub>uV/m</sub>	Margin dB
4804.00	Average	30.12	0.27	30.39	54.00	-23.61
4804.00	Peak	47.83	0.27	48.10	74.00	-25.90

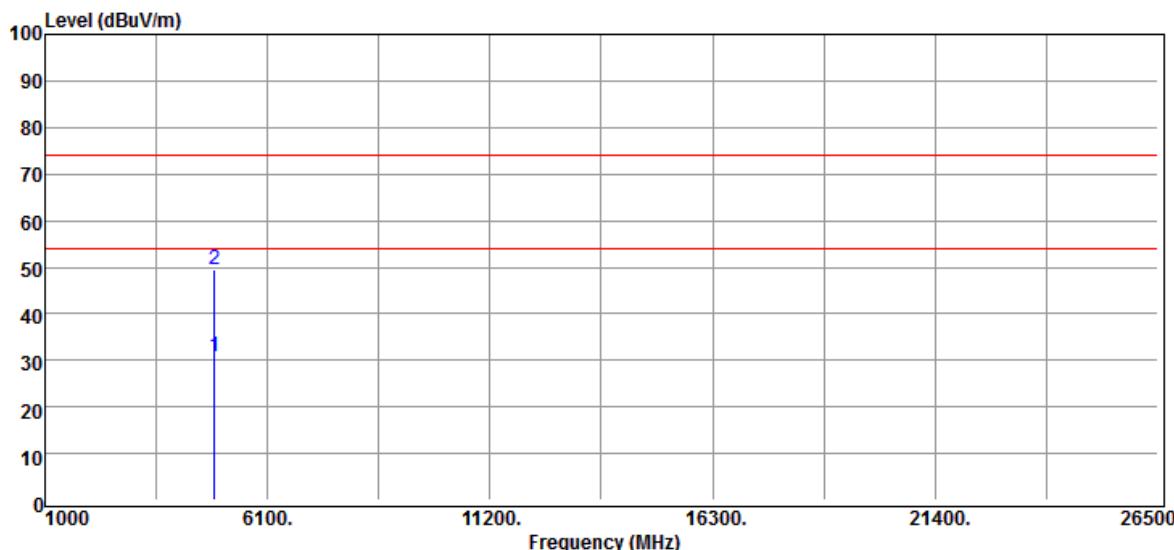
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Operation Mode :BT5.0  
 Test Mode :Tx CH Mid  
 EUT Pol :E2 Plan  
 Test Channel :2442 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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
4884.00	Average	30.22	0.71	30.93	54.00	-23.07
4884.00	Peak	48.66	0.71	49.37	74.00	-24.63

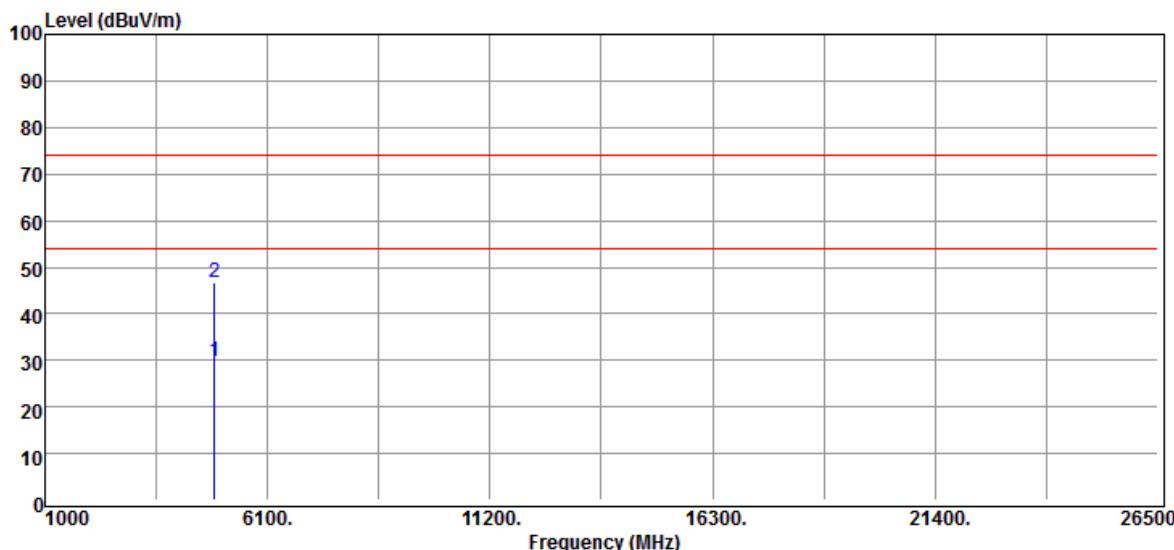
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Operation Mode :BT5.0  
 Test Mode :Tx CH Mid  
 EUT Pol :E2 Plan  
 Test Channel :2442 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
4884.00	Average	29.22	0.71	29.93	54.00	-24.07
4884.00	Peak	46.12	0.71	46.83	74.00	-27.17

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t (886-2) 2299-3279

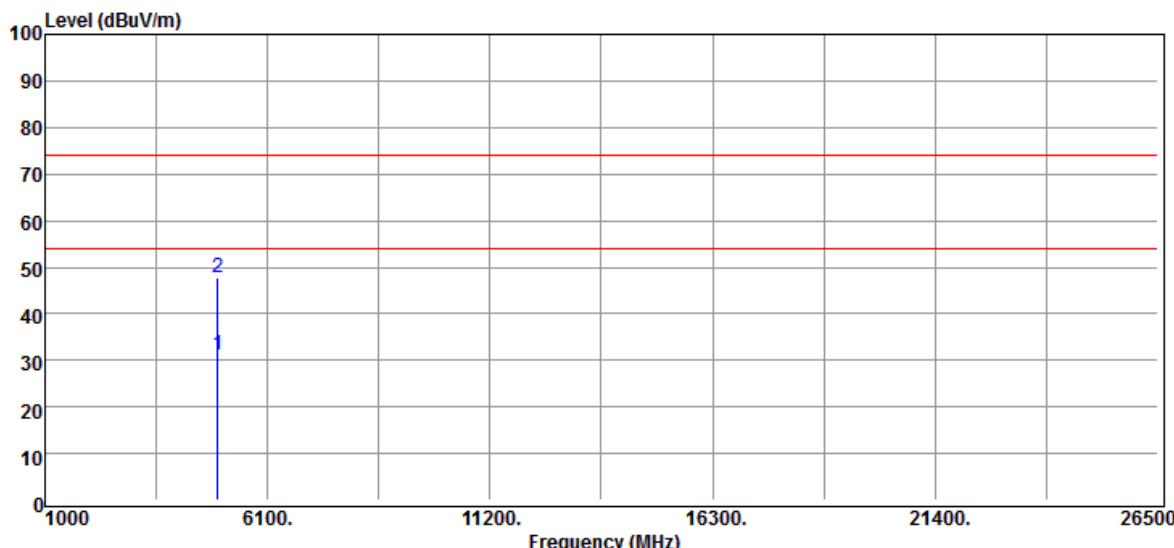
f (886-2) 2298-0488

[www.tw.sgs.com](http://www.tw.sgs.com)

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Operation Mode :BT5.0  
 Test Mode :Tx CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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	Average	29.75	1.24	30.99	54.00	-23.01
4960.00	Peak	46.40	1.24	47.64	74.00	-26.36

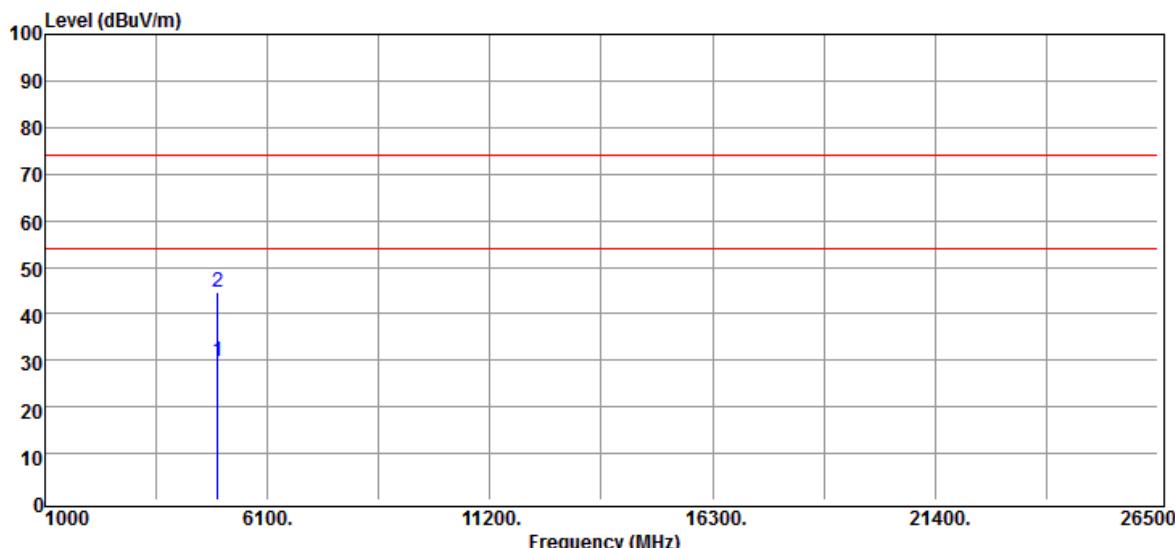
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Operation Mode :BT5.0  
 Test Mode :Tx CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-14  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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	Average	28.53	1.24	29.77	54.00	-24.23
4960.00	Peak	43.37	1.24	44.61	74.00	-29.39

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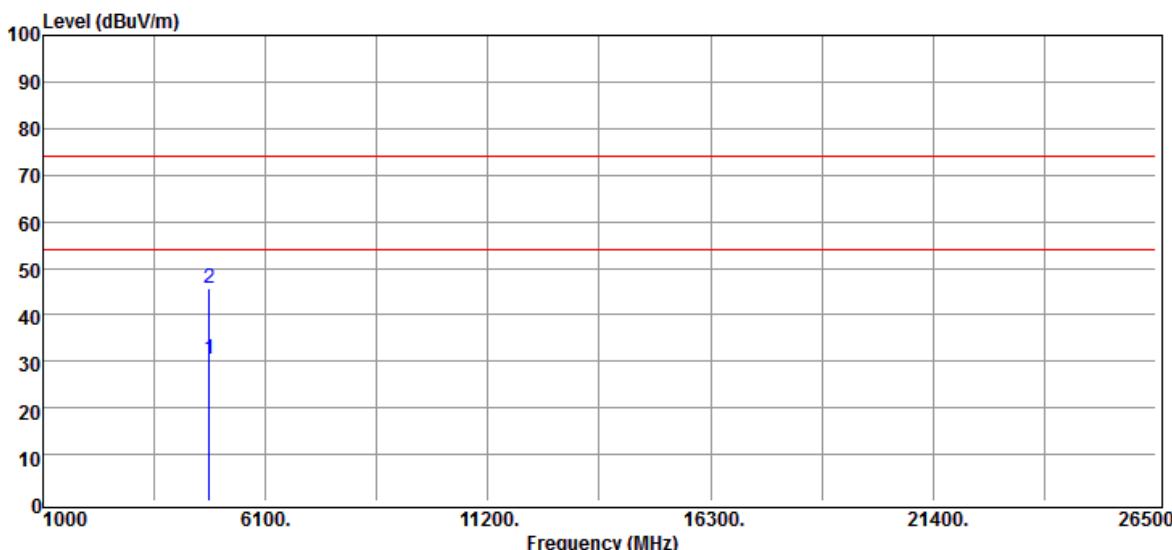
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**\*External PCB Antenna\_BLE**

Operation Mode	:BLE	Test Date	:2018-06-13
Test Mode	:Tx CH Low	Temp./Humi.	:25/60
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:2402 MHz	Engineer	:Jerry



Freq. MHz	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
4804.00	Average	30.33	0.27	30.60	54.00	-23.40
4804.00	Peak	45.37	0.27	45.64	74.00	-28.36

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.

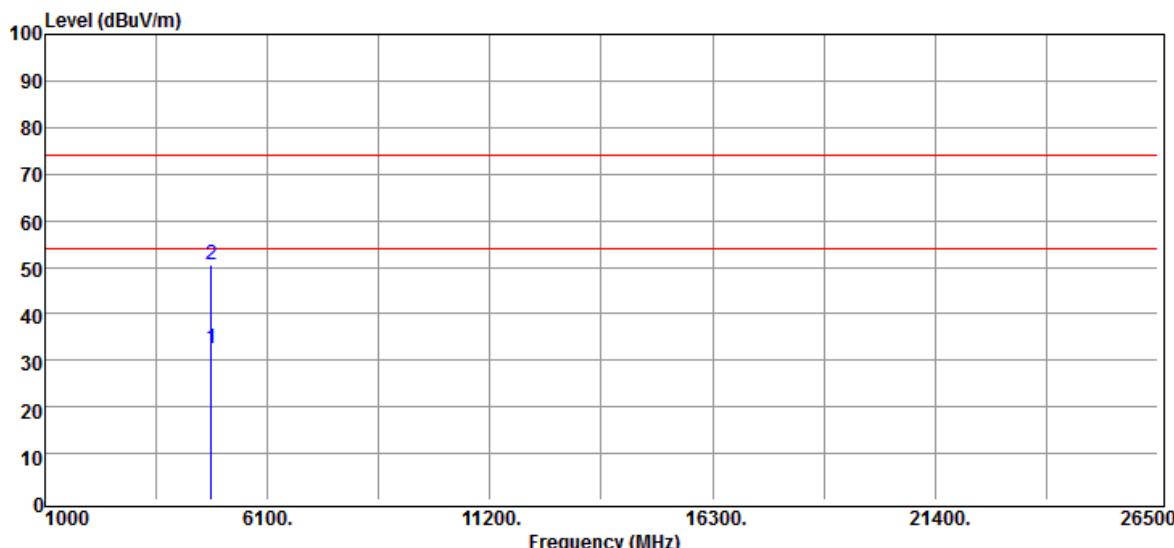
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Operation Mode :BLE  
 Test Mode :Tx CH Low  
 EUT Pol :E2 Plan  
 Test Channel :2402 MHz

Test Date :2018-06-13  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB <sub>uV</sub>	Factor dB	Actual FS dB <sub>uV/m</sub>	Limit @3m dB <sub>uV/m</sub>	Margin dB
4804.00	Average	32.38	0.27	32.65	54.00	-21.35
4804.00	Peak	50.25	0.27	50.52	74.00	-23.48

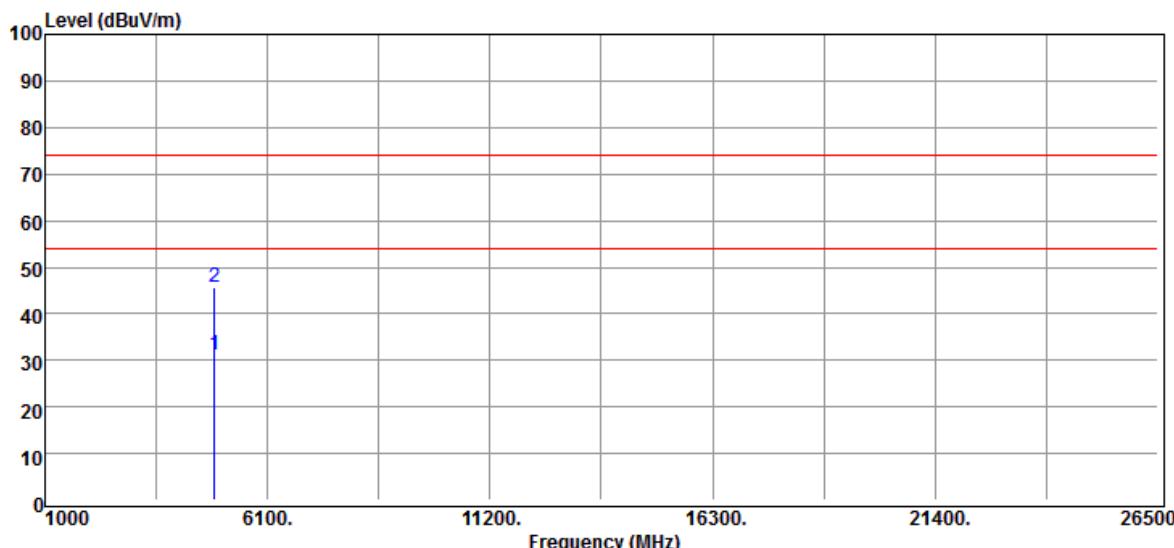
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Operation Mode :BLE  
 Test Mode :Tx CH Mid  
 EUT Pol :E2 Plan  
 Test Channel :2442 MHz

Test Date :2018-06-13  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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
4884.00	Average	30.39	0.71	31.10	54.00	-22.90
4884.00	Peak	45.04	0.71	45.75	74.00	-28.25

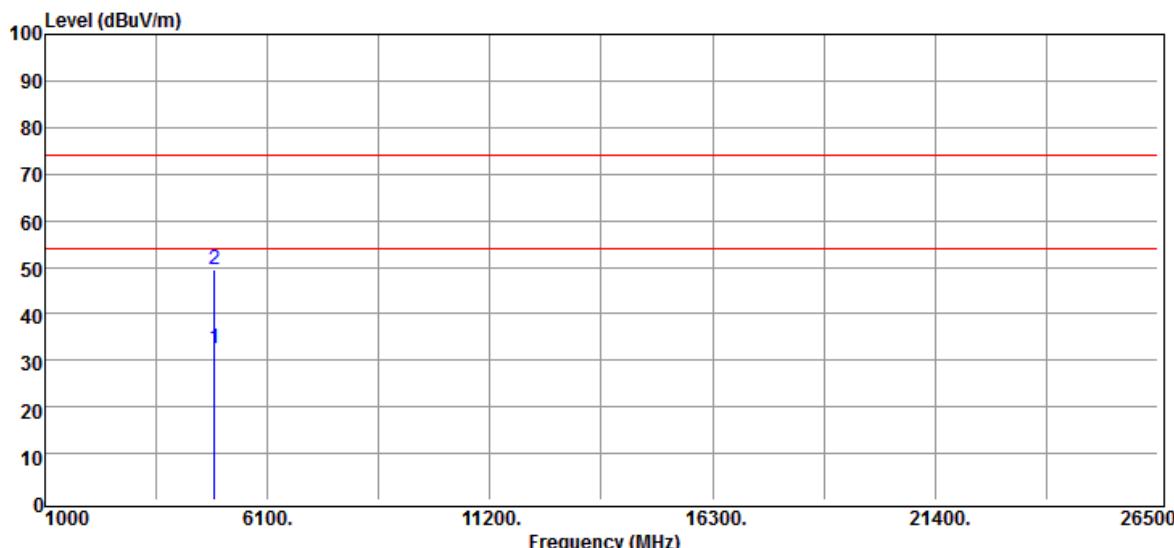
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Operation Mode :BLE  
 Test Mode :Tx CH Mid  
 EUT Pol :E2 Plan  
 Test Channel :2442 MHz

Test Date :2018-06-13  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB <sub>uV</sub>	Factor dB	Actual FS dB <sub>uV/m</sub>	Limit @3m dB <sub>uV/m</sub>	Margin dB
4884.00	Average	31.71	0.71	32.42	54.00	-21.58
4884.00	Peak	48.73	0.71	49.44	74.00	-24.56

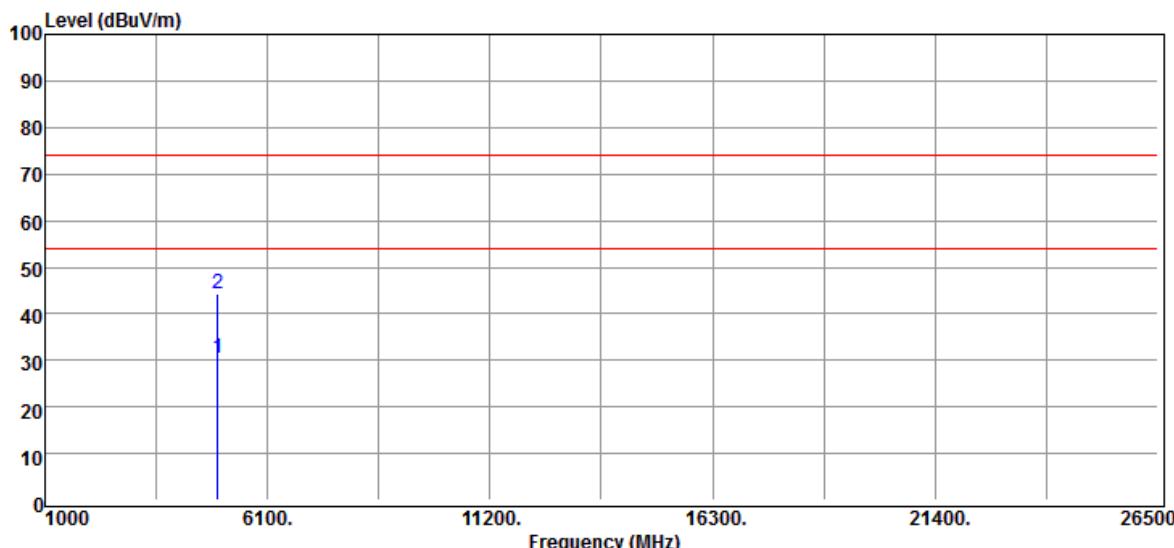
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Operation Mode :BLE  
 Test Mode :Tx CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-13  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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	Average	29.28	1.24	30.52	54.00	-23.48
4960.00	Peak	43.12	1.24	44.36	74.00	-29.64

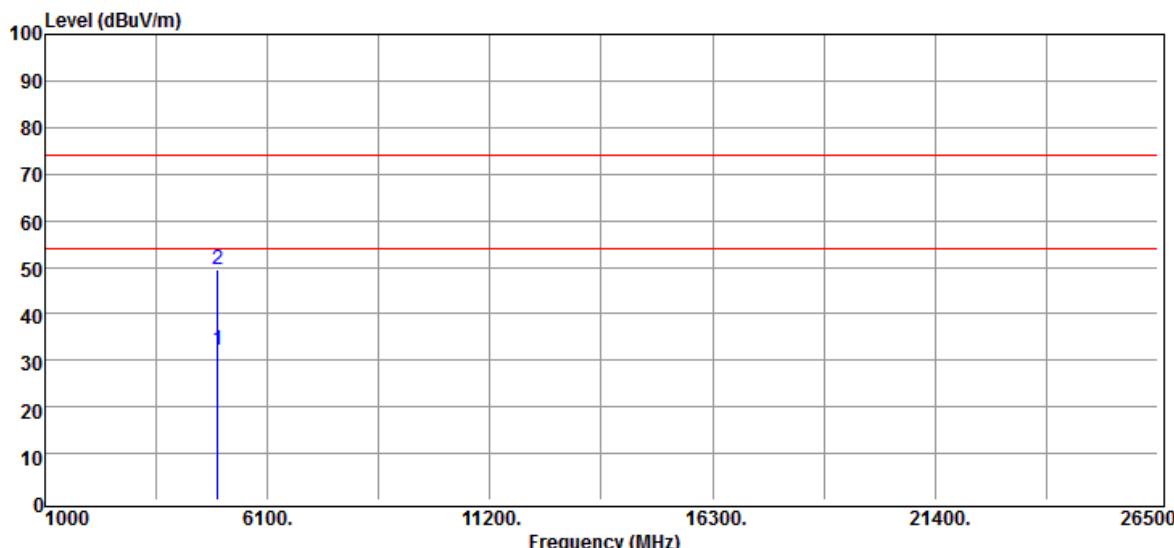
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Operation Mode :BLE  
 Test Mode :Tx CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-13  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB <sub>uV</sub>	Factor dB	Actual FS dB <sub>uV/m</sub>	Limit @3m dB <sub>uV/m</sub>	Margin dB
4960.00	Average	31.05	1.24	32.29	54.00	-21.71
4960.00	Peak	48.19	1.24	49.43	74.00	-24.57

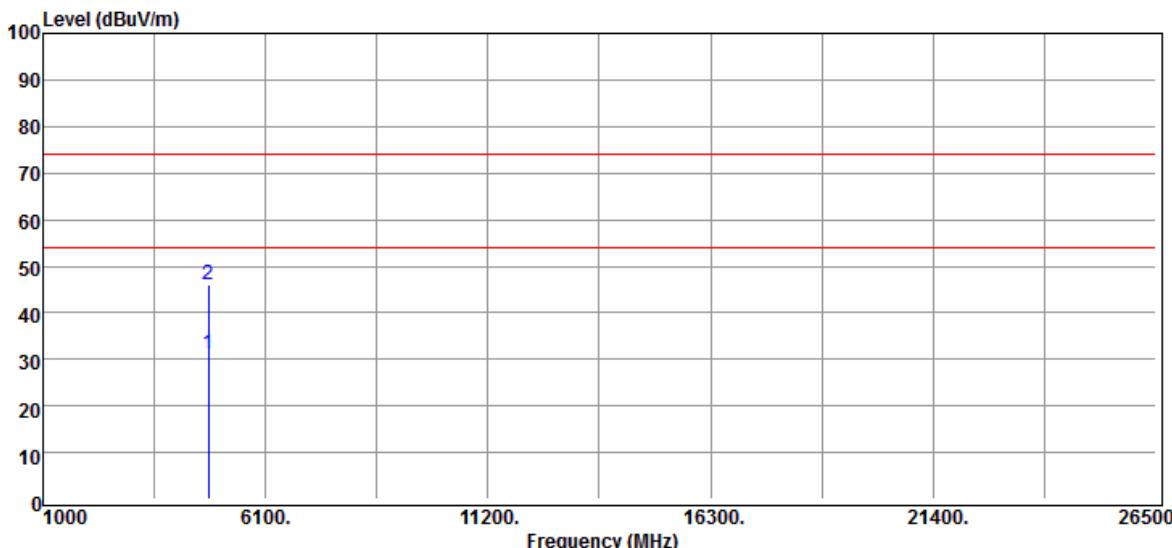
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## \*External PCB Antenna\_BT 5.0

Operation Mode	:BT5.0	Test Date	:2018-06-13
Test Mode	:Tx CH Low	Temp./Humi.	:25/60
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:2402 MHz	Engineer	:Jerry



Freq. MHz	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
4801.00	Average	30.91	0.24	31.15	54.00	-22.85
4801.00	Peak	45.88	0.24	46.12	74.00	-27.88

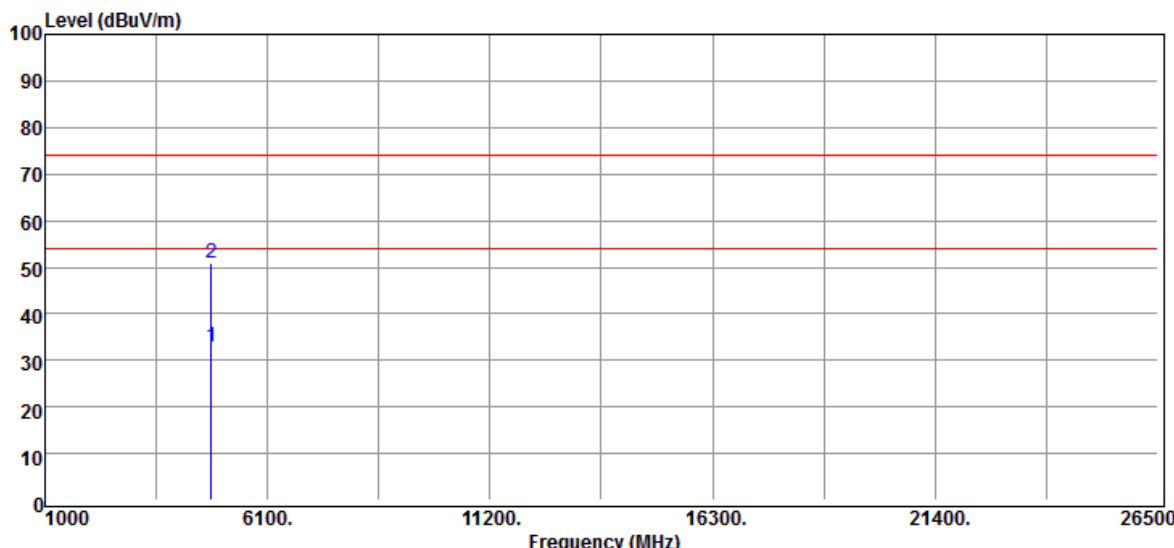
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Operation Mode :BT5.0  
 Test Mode :Tx CH Low  
 EUT Pol :E2 Plan  
 Test Channel :2402 MHz

Test Date :2018-06-13  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB <sub>uV</sub>	Factor dB	Actual FS dB <sub>uV/m</sub>	Limit @3m dB <sub>uV/m</sub>	Margin dB
4804.00	Average	32.58	0.27	32.85	54.00	-21.15
4804.00	Peak	50.67	0.27	50.94	74.00	-23.06

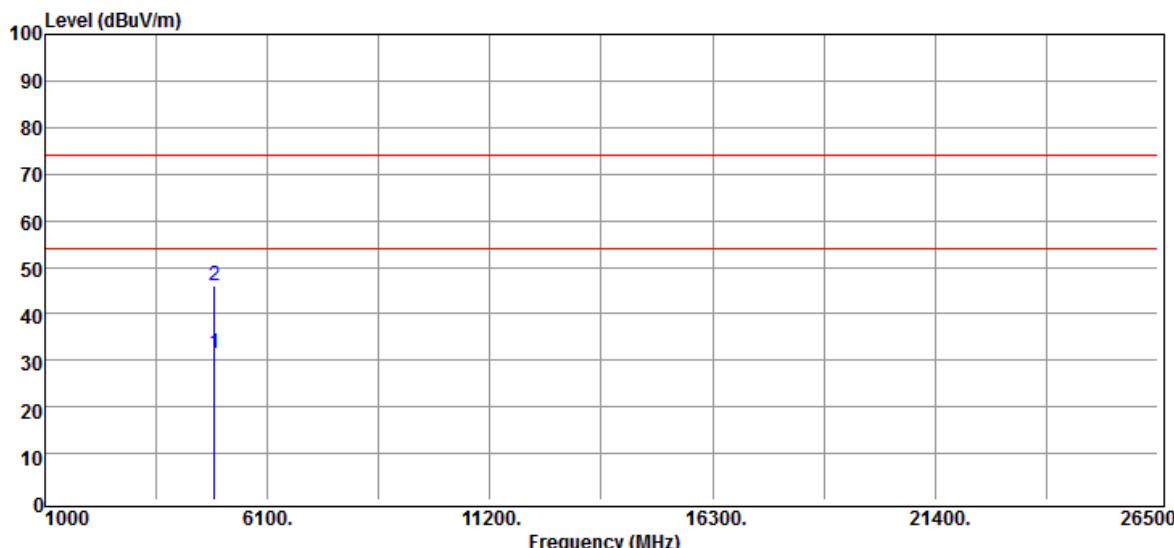
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Operation Mode :BT5.0  
 Test Mode :Tx CH Mid  
 EUT Pol :E2 Plan  
 Test Channel :2442 MHz

Test Date :2018-06-13  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB <sub>BuV</sub>	Factor dB	Actual FS dB <sub>BuV/m</sub>	Limit @3m dB <sub>BuV/m</sub>	Margin dB
4884.00	Average	30.90	0.71	31.61	54.00	-22.39
4884.00	Peak	45.18	0.71	45.89	74.00	-28.11

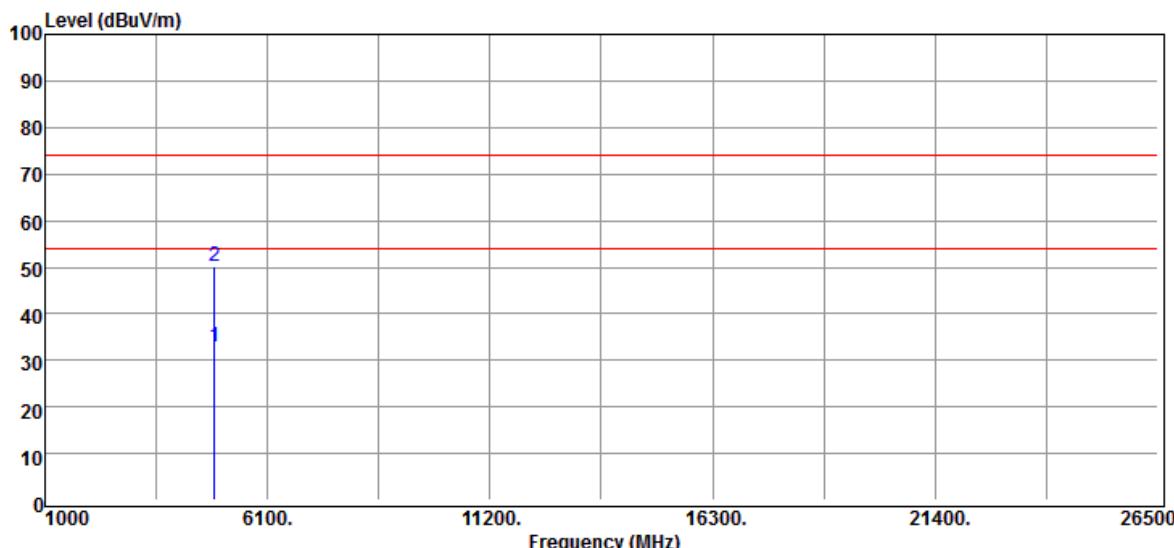
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Operation Mode :BT5.0  
 Test Mode :Tx CH Mid  
 EUT Pol :E2 Plan  
 Test Channel :2442 MHz

Test Date :2018-06-13  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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
4884.00	Average	32.14	0.71	32.85	54.00	-21.15
4884.00	Peak	49.33	0.71	50.04	74.00	-23.96

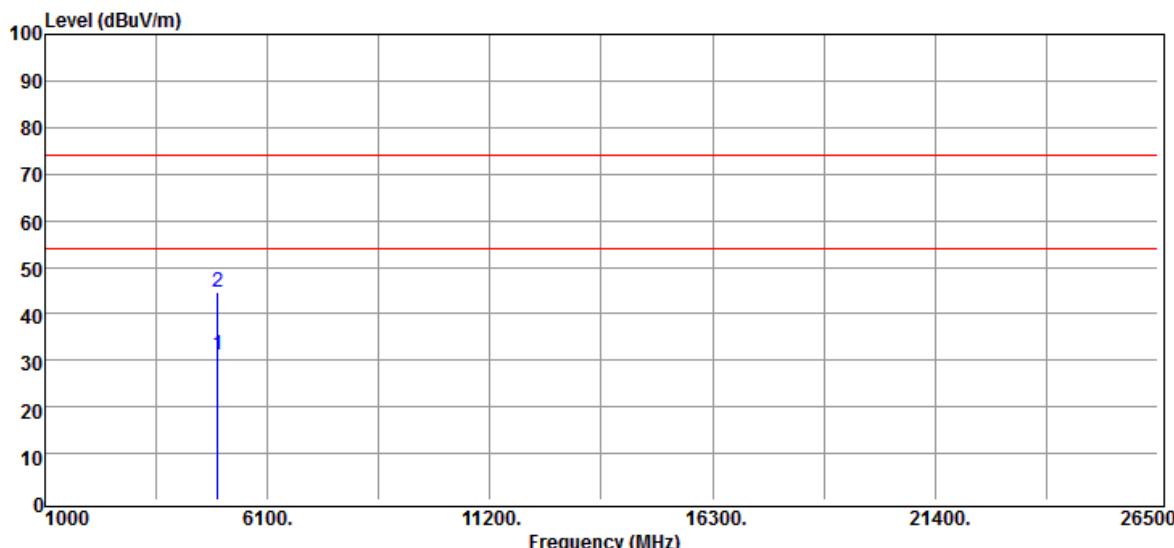
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Operation Mode :BT5.0  
 Test Mode :Tx CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-13  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Jerry



Freq. MHz	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	Average	29.75	1.24	30.99	54.00	-23.01
4960.00	Peak	43.25	1.24	44.49	74.00	-29.51

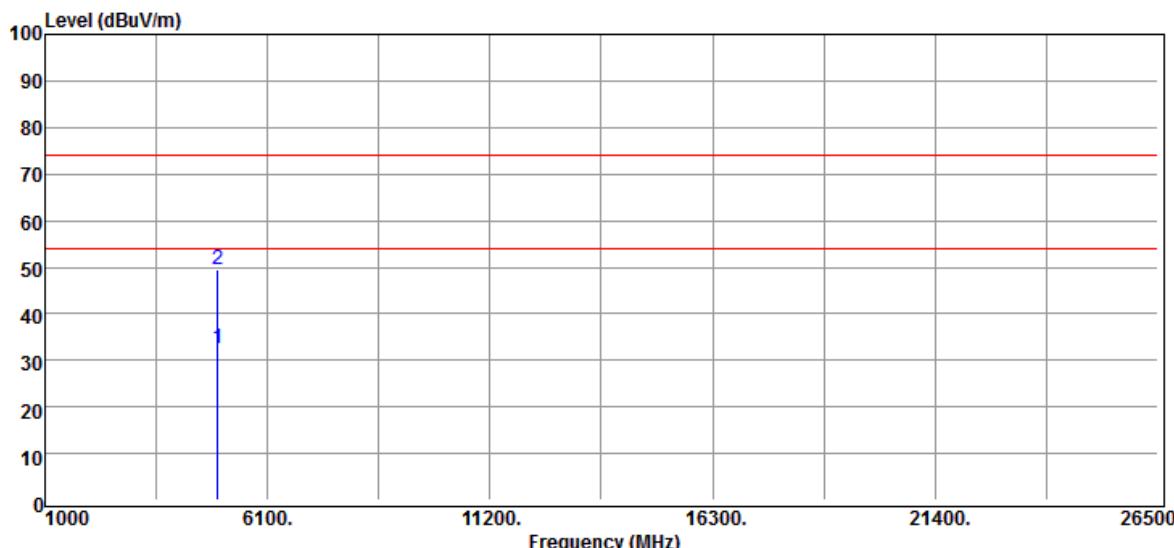
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Operation Mode :BT5.0  
 Test Mode :Tx CH High  
 EUT Pol :E2 Plan  
 Test Channel :2480 MHz

Test Date :2018-06-13  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Jerry



Freq. MHz	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	Average	31.21	1.24	32.45	54.00	-21.55
4960.00	Peak	48.22	1.24	49.46	74.00	-24.54

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## 11 PEAK POWER SPECTRAL DENSITY

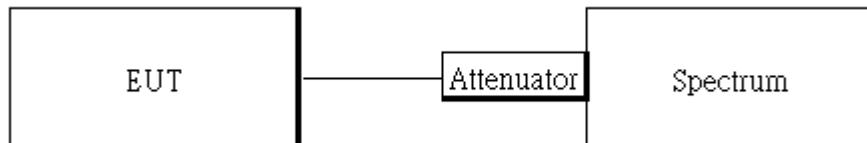
### 11.1 Standard Applicable:

The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

### 11.2 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
DC Power Supply	Agilent	E3640A	MY53130054	2017/09/04	2018/09/03
Attenuator	Marvelous	MVE2213-10	RF30	2017/12/26	2018/12/25
Spectrum Analyzer	Agilent	N9010A	MY51440113	2017/06/21	2018/06/20

### 11.3 Test Set-up:



### 11.4 Measurement Procedure:

1. Set analyzer center frequency to DTS channel center frequency.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
3. Set the span to 1.5 times the DTS channel bandwidth.
4. Set the RBW = 3 kHz. & the VBW = 10 kHz
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.

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f (886-2) 2298-0488

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## 11.5 Measurement Result:

### BLE mode

Frequency (MHz)	RF Power Density (dBm)	Maximum Limit (dBm)	Result
2402	-7.51	8	PASS
2442	-7.04	8	PASS
2480	-7.21	8	PASS

*NOTE: cable loss as 10.6dB that offsets in the spectrum*

### BT 5.0 mode

Frequency (MHz)	RF Power Density (dBm)	Maximum Limit (dBm)	Result
2402	-11.31	8	PASS
2442	-9.98	8	PASS
2480	-10.60	8	PASS

*NOTE: cable loss as 10.6dB that offsets in the spectrum*

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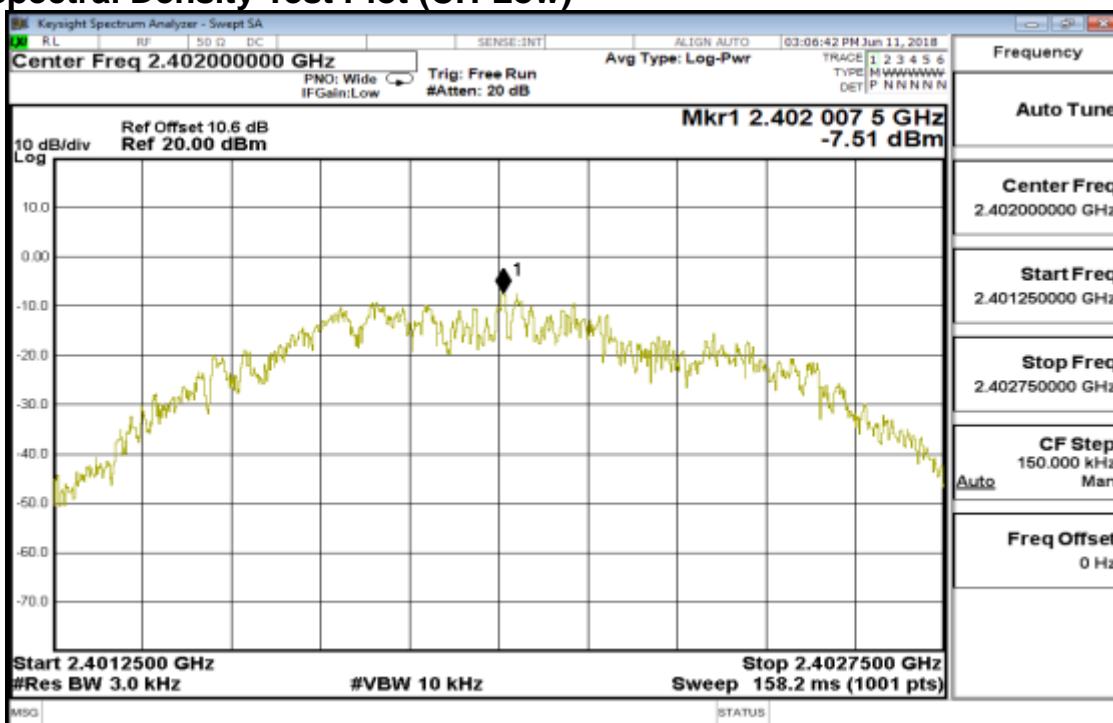
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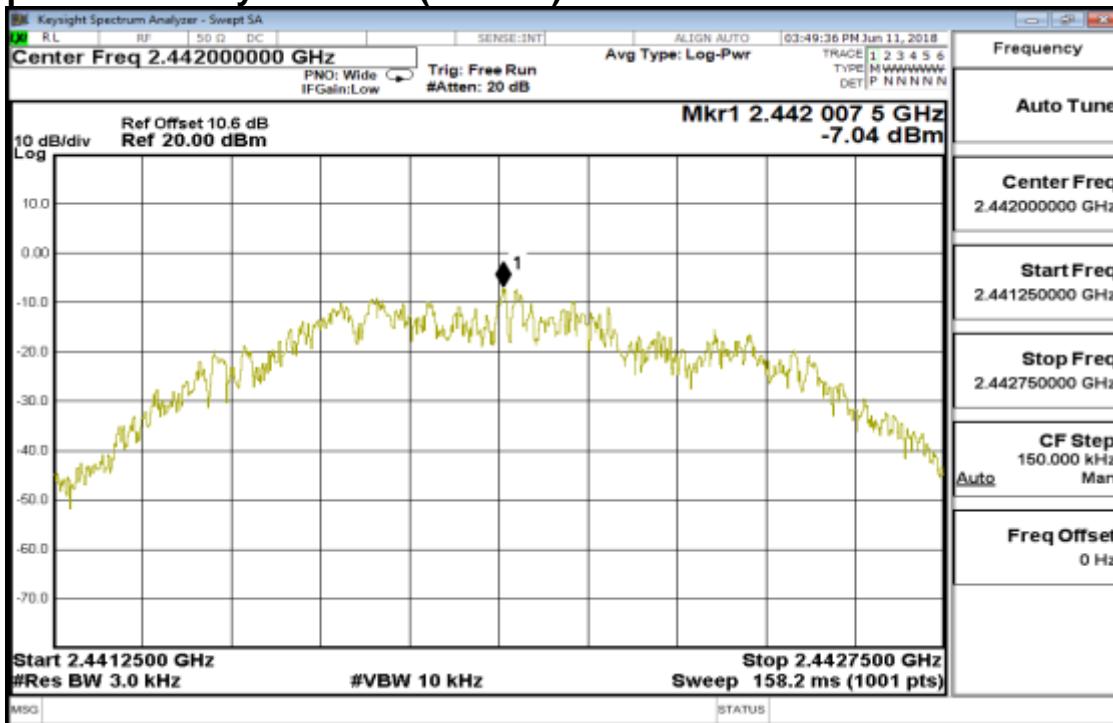
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## BLE mode

## Power Spectral Density Test Plot (CH-Low)



## Power Spectral Density Test Plot (CH-Mid)

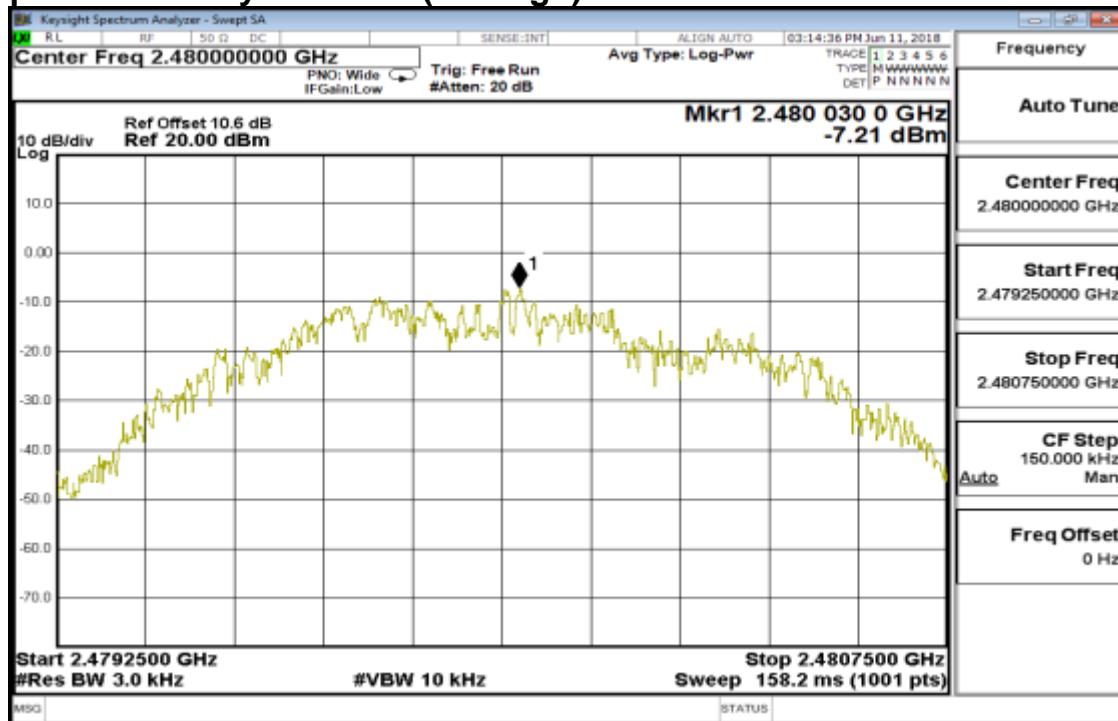


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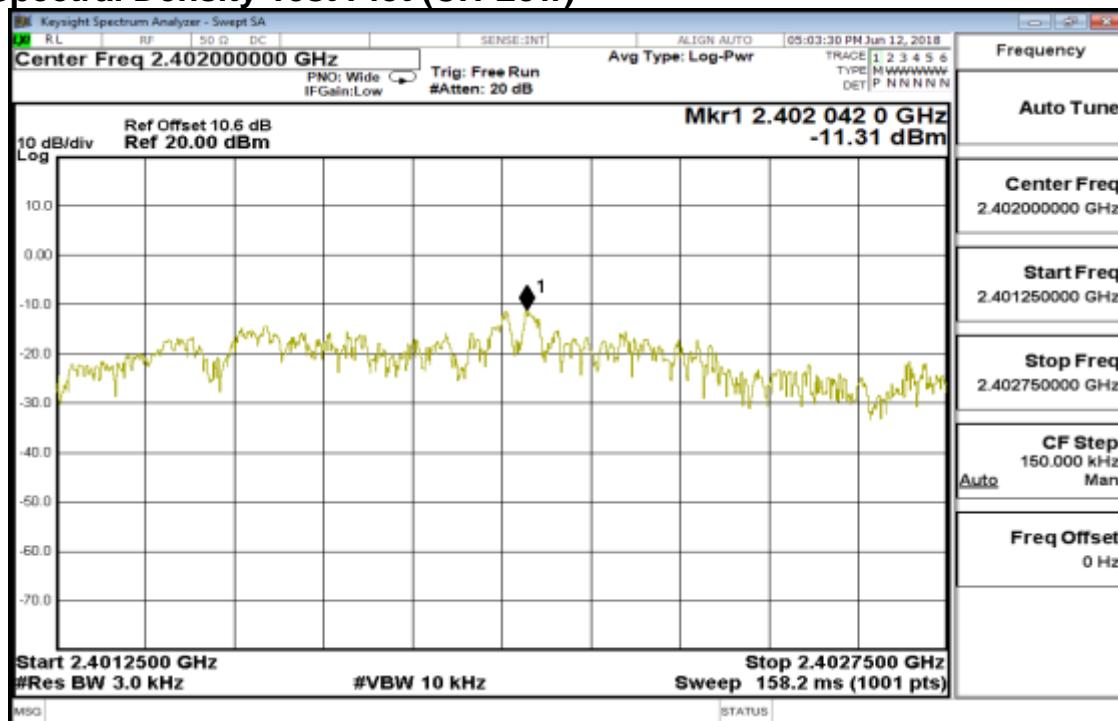
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## Power Spectral Density Test Plot (CH-High)



## BT 5.0 mode

## Power Spectral Density Test Plot (CH-Low)



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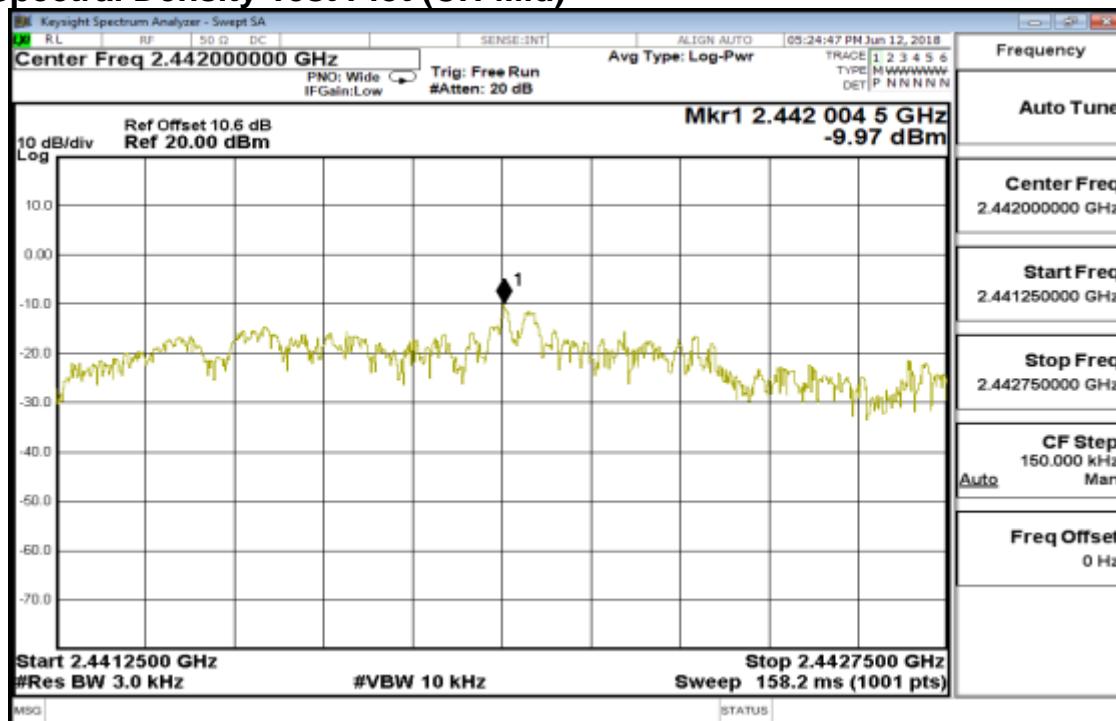
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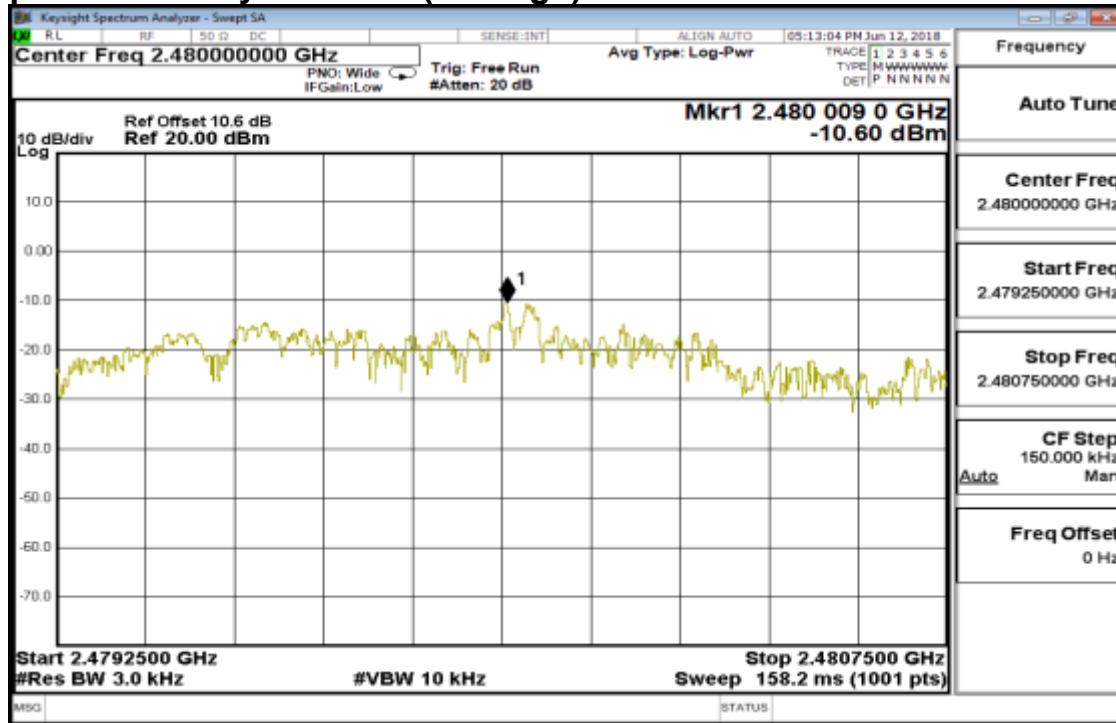
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## Power Spectral Density Test Plot (CH-Mid)



## Power Spectral Density Test Plot (CH-High)



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## 12 ANTENNA REQUIREMENT

### 12.1 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.

In case of point-to-point operation, the power shall be reduced by the one dB for every 3 dB that the directional gain of antenna exceeds 6dBi.

### 12.2 Antenna Connected Construction:

The antenna is designed with unique RF connector / as permanently attached and no consideration of replacement. Please see EUT photo for details.

*~ End of Report ~*

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