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## ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

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

DFBM-NQ620-DT0R **Product Name:** 

**Brand Name:** Delta

**Marketing Name:** DFBM-NQ620-DT0R

> DFBM-NQ620-DT0R, DFBM-NQ620-DT0R,

DFBM-NQ621-DT0R, DFBM-NQ622-DT0R, Model No.: DFBM-NQ624-DT0R, DFBM-NQ623-DT0R.

DFBM-NQ625-DT0R

DFBM-NQ620-DT0R: With Chip Antenna /

**External Antenna** 

DFBM-NQ620-DT0R, DFBM-NQ622-DT0R, **Model Difference:** 

DFBM-NQ624-DT0R: With Chip Antenna DFBM-NQ621-DT0R, DFBM-NQ623-DT0R, DFBM-NQ625-DT0R: With External Antenna

FCC ID: H79DFBM-NQ62X

**Report No.:** E2/2016/70033

**Issue Date:** Aug. 10, 2016

**FCC Rule Part:** §15.247, Cat: DTS

**Delta Electronics Incorporated** 

**Prepared for:** 3 Tungyuan Road Chungli Industrial Zone

**Taoyuan County Taiwan 32063** 

SGS Taiwan Ltd.

**Electronics & Communication Laboratory** Prepared by:

No.2, Keji 1st Rd., Guishan District,

Taoyuan City, Taiwan 333



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### VERIFICATION OF COMPLIANCE

**Delta Electronics Incorporated** 

Applicant: 3 Tungyuan Road Chungli Industrial Zone Taoyuan County Taiwan

32063

**Product Name:** DFBM-NQ620-DT0R

**Brand Name:** Delta

**Marketing Name:** DFBM-NQ620-DT0R

DFBM-NQ620-DT0R, DFBM-NQ620-DT0R, DFBM-NQ621-DT0R,

Model No.: DFBM-NQ622-DT0R, DFBM-NQ623-DT0R, DFBM-NQ624-DT0R,

DFBM-NQ625-DT0R

DFBM-NQ620-DT0R: With Chip Antenna / External Antenna

DFBM-NQ622-DT0R, DFBM-NQ620-DT0R, DFBM-NQ624-DT0R:

**Model Difference:** With Chip Antenna

> DFBM-NQ621-DT0R. DFBM-NQ623-DT0R. DFBM-NQ625-DT0R:

With External Antenna

FCC ID: H79DFBM-NQ62X

**Report Number:** E2/2016/70033

Date of test: Jul. 12, 2016 ~ Jul. 29, 2016

Date of EUT Received: Jul. 12, 2016

### We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

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

Test By:	Jerry Lu	Date _	Aug. 10, 2016
Prepared By:	Jerry Lu/Sr. Engineer Utoletta Tang	Date	Aug. 10, 2016
Approved By:	Violetta Tang / Clerk  Jim Ch any	Date	Aug. 10, 2016

Jim Chang / Asst. Manager

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# **Revision History**

Report Number	Revision	Description	Issue Date
E2/2016/70033	Rev.00	Initial creation of document	Aug. 10, 2016

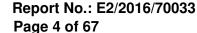
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#### **GENERAL INFORMATION**

### 1.1 Product Description

#### General:

Product Name:	DFBM-NQ620-DT0R
Brand Name:	Delta
Marketing Name:	DFBM-NQ620-DT0R
Model No.:	DFBM-NQ620-DT0R, DFBM-NQ620-DT0R, DFBM-NQ621-DT0R, DFBM-NQ622-DT0R, DFBM-NQ623-DT0R, DFBM-NQ625-DT0R
Model Difference:	DFBM-NQ620-DT0R: With Chip Antenna / External Antenna DFBM-NQ620-DT0R, DFBM-NQ622-DT0R, DFBM-NQ624-DT0R: With Chip Antenna DFBM-NQ621-DT0R, DFBM-NQ623-DT0R, DFBM-NQ625-DT0R: With External Antenna
Software version:	EVT
Hardware version:	EVT
Power Supply:	3.3Vdc

### Bluetooth Low Energy:

Frequency Range:	2402 – 2480MHz	
Bluetooth Version:	BT V4.2 single mode	
Channel number:	40 channels	
Modulation type:	GFSK	
Transmit Power:	3.28dBm (Peak)	
Antenna Designation:	Chip Antenna, Antenna Gain: 2dBi Part No.: RFANT3216120A5T, Supplier: Walsin External Dipole Antenna, Antenna Gain: 2dBi Part No.: RFDPA870900SMAB801, Supplier: Walsin	

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Note: For more details of antenna spec, please refer to following list.

Туре	Vendor Name Part No.		Antenna Peak Gain (dBi)
	Walsin	RFDPA870900SMAB801	2
External Dipole Antenna	Wellshow	AR007WSW01A03	2
	WHA YU INDUSTRIAL	C529-510379-A	1.8
	Walsin	RFANT3216120A5T	2
Chip Antenna	ACX	AT3216-B2R7HAAT/LF	0.5
	PULSE	W3008	1.7

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### Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247

FCC KDB 558074 D01 DTS Meas. Guidance

ANSI C63.10:2013

#### Note:

- All test items have been performed and record as per the above standards.
- The composite system is compliance with FCC Subpart B is authorized under a DoC procedure.

### **Test Facility**

SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333 (TAF code 0513)

FCC Registration Numbers are: 735305

### **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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#### SYSTEM TEST CONFIGURATION

### **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 hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

### **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 0.9dB.

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### **Configuration of Tested System**

Fig. 2-1 Configuration of Radiated Emission & Conducted Emission Tested System



**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	Notebook	Lenovo	L420	LR-6MEX0	N/A	N/A

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### **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

#### **DESCRIPTION OF TEST MODES**

### Operated in 2400 ~ 2483.5MHz Band

40 channels are provided for Bluetooth LE

To differ the diff provided for Bladeout 122						
CHANNEL	FREQUENCY	CHANNEL	FREQUENCY	CHANNEL	FREQUENCY	
0	2402 MHz	14	2430 MHz	28	2458 MHz	
1	2404 MHz	15	2432 MHz	29	2460 MHz	
2	2406 MHz	16	2434 MHz	30	2462 MHz	
3	2408 MHz	17	2436 MHz	31	2464 MHz	
4	2410 MHz	18	2438 MHz	32	2466 MHz	
5	2412 MHz	19	2440 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:**

HADIATED EMILOSION TEST:						
RADIATED EMISSION TEST (BELOW 1 GHz)						
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)		
Bluetooth LE	0 to 39	0,20,39	GFSK	1		
RADIATED EMISSION TEST (ABOVE 1 GHz)						
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)		
Bluetooth LE	0 to 39	0,20,39	GFSK	1		

#### 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.

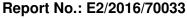
#### ANTENNA PORT CONDUCTED MEASUREMENT:

CONDUCTED TEST					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	
Bluetooth LE	0 to 39	0,20,39	GFSK	1	

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#### **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:

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

Management	9kHz – 30MHz: +/- 2.87 dB
	30MHz - 167MHz: +/- 4.22dB
Measurement uncertainty (Polarization : <b>Horizontal</b> )	167MHz -500MHz: +/- 3.44dB
(Folalization : Horizontal)	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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#### **CONDUCTED EMISSION TEST**

### **Standard Applicable:**

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

Frequency range	Limits dB(uV)			
MHz	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:

Conducted Emission Test Site						
EQUIPMENT MFR MODEL SERIAL LAST						
TYPE		NUMBER	NUMBER	CAL.		
EMI Test Receiver	R&S	ESCI 7	100950	12/12/2015	12/11/2016	
Coaxial Cables	N/A	N30N30-1042-150 cm	N/A	02/07/2016	02/06/2017	
LISN	Schwarzbeck	NSLK 8127	8127-648	03/11/2016	03/10/2017	
Test Software	Farad	EZ-EMC	Ver. SGS-03A2	N.C.R.	N.C.R.	

#### 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.

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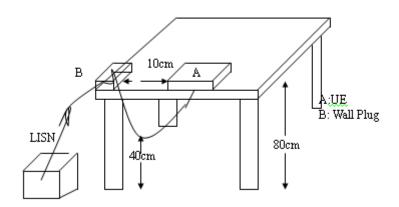
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### Test SET-UP (Block Diagram of Configuration)



#### 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, the device is powered by DC 3.3V.

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#### PEAK OUTPUT POWER MEASUREMENT

### **Standard Applicable:**

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

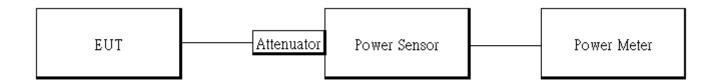
If the transmitting antenna of directional gain greater than 6dBi are used the peak output power form the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the Antenna exceeds 6dBi.

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.

### **Measurement Equipment Used:**

Conducted Emission Test Site						
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.	
TYPE		NUMBER	NUMBER	CAL.		
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2016	04/13/2017	
Power Meter	Anritsu	ML2496A	1326001	06/23/2016	06/22/2017	
Power Sensor	Anritsu	MA2411B	1315048	06/23/2016	06/22/2017	
Power Sensor	Anritsu	MA2411B	1315049	06/23/2016	06/22/2017	
Coaxial Cable 30cm	WOKEN	00100A1F1A195C	RF01	12/12/2015	12/11/2016	
DC Block	PASTERNACK	PE8210	RF29	12/12/2015	12/11/2016	
Splitter	RF-LAMBAD	RFLT2W1G18G	RF35	12/12/2015	12/11/2016	
Attenuator	WOKEN	218FS-10	RF23	12/12/2015	12/11/2016	
DC Power Supply	Agilent	E3640A	MY53140006	05/04/2016	05/03/2017	

#### 7.3 Test Set-up:



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#### 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.

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

### **Duty Factor:**

	Duty Cycle (%)	Duty Factor (dB)
BLE	63.41	1.98

Duty Cycle Factor:10\*log(1/63.41/100)=1.98

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#### 7.5 Measurement Result:

#### BLE mode:

СН	Frequency (MHz)	Peak Power Output (dBm)	Required Limit				
0	2402	2.73	1 Watt = 30 dBm				
20	2442	3.28	1 Watt = 30 dBm				
39	2480	3.15	1 Watt = 30 dBm				

#### Tune up tolerance ± dBm

СН	Frequency (MHz)	Max. Output include tune up tolerance Power (dBm)	Required Limit
0	2402	0.74	1 Watt = 30 dBm
20	2442	1.25	1 Watt = 30 dBm
39	2480	1.08	1 Watt = 30 dBm

\*Note: Measured by power meter, cable loss as 0.9 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

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### 6dB BANDWIDTH MEASUREMENT

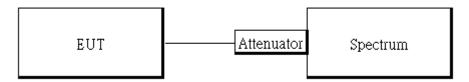
### **Standard Applicable**

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

### 8.2 Measurement Equipment Used

Conducted Emission Test Site						
EQUIPMENT MFR MODEL SERIAL LAST CAL DUE						
TYPE		NUMBER	NUMBER	CAL.		
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2016	04/13/2017	
DC Block	PASTERNACK	PE8210	RF29	12/12/2015	12/11/2016	
Attenuator	WOKEN	218FS-10	RF23	12/12/2015	12/11/2016	
DC Power Supply	Agilent	E3640A	MY53140006	05/04/2016	05/03/2017	

### 8.3 Test Set-up:



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#### 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,

- 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

#### 8.5 **Measurement Result:**

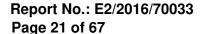
**BLE** mode

Frequency (MHz)	6dB Bandwidth (MHz)	Bandwidth (MHz)	Result
2402	0.7083	> 0.5	PASS
2442	0.715	> 0.5	PASS
2480	0.7064	> 0.5	PASS

Note: Refer to next page for plots.

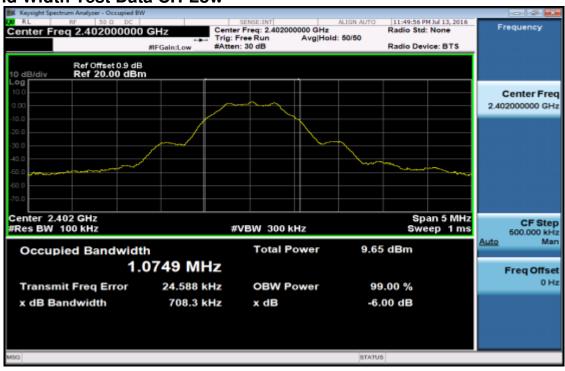
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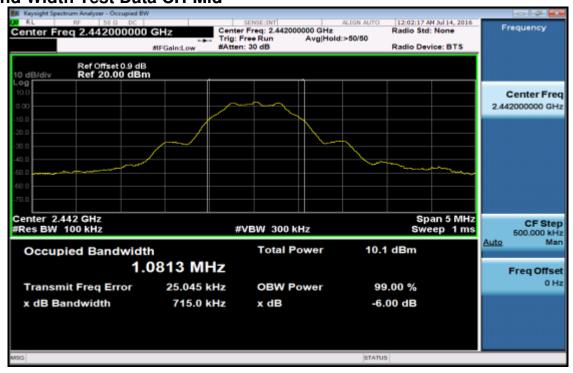




### BT4.0 mode 6dB Band Width Test Data CH-Low



### 6dB Band Width Test Data CH-Mid



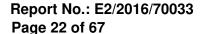
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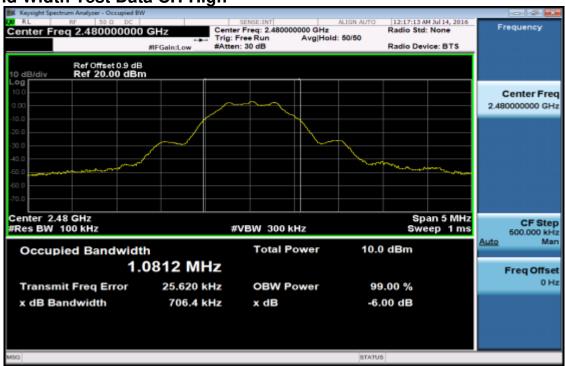
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f (886-2) 2298-0488





6dB Band Width Test Data CH-High



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#### CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

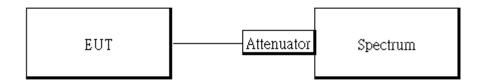
#### Standard Applicable

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).

### **Measurement Equipment Used:**

Conducted Emission Test Site					
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.
TYPE		NUMBER	NUMBER	CAL.	
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2016	04/13/2017
DC Block	PASTERNACK	PE8210	RF29	12/12/2015	12/11/2016
Attenuator	WOKEN	218FS-10	RF23	12/12/2015	12/11/2016
DC Power Supply	Agilent	E3640A	MY53140006	05/04/2016	05/03/2017

#### Test SET-UP:



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#### 9.4 Measurement Procedure

#### **Conducted Band Edge:**

- 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. Set DL as the limit = reading on marker 1 20dBm
- 8. 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.
- 9. Repeat above procedures until all default test channel (low, middle, and high) was complete.

#### **Conducted Spurious Emission:**

- 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.

#### 9.5 Measurement Result

#### Note:

- 1. Refer to next page spectrum analyzer data chart and tabular data sheets.
- 2. For restricted Band Edge Limit, please refer to section 11.5 of this report for measurement result.

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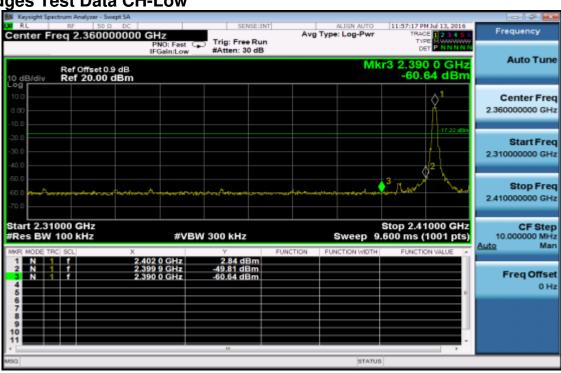
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BT4.0 mode

**Band Edges Test Data CH-Low** 



**Band Edges Test Data CH-High** 



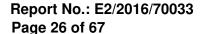
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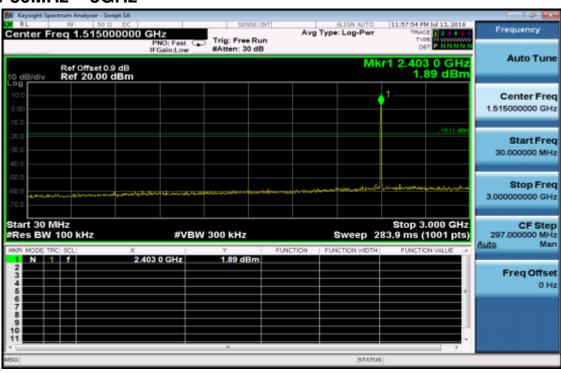
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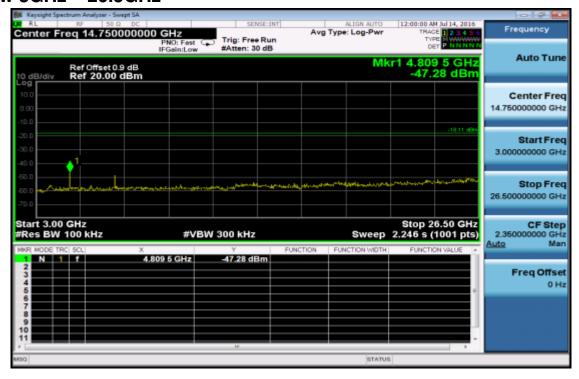




## **Conducted Spurious Emission Measurement Result** CH-Low 30MHz - 3GHz



### CH-Low 3GHz - 26.5GHz



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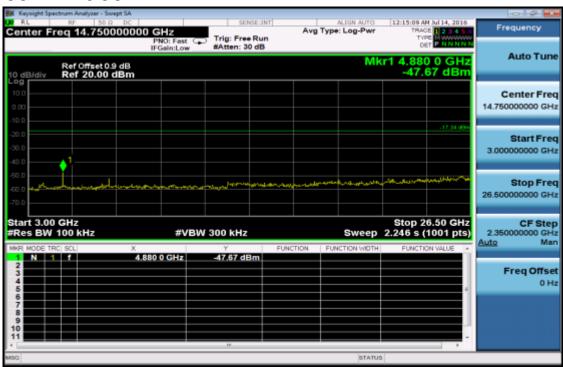
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#### CH-Mid 30MHz - 3GHz



### CH-Mid 3GHz - 26.5GHz



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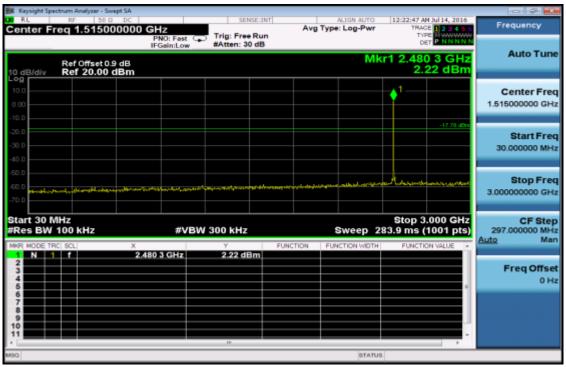
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f (886-2) 2298-0488

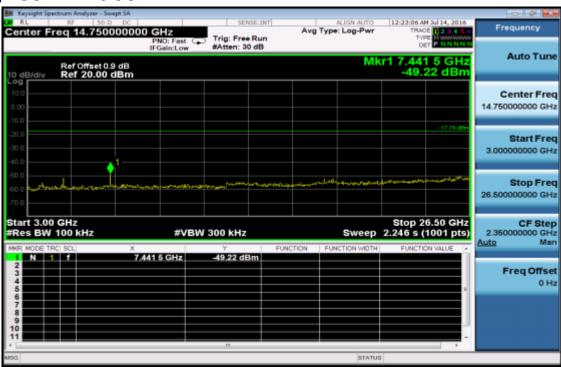
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### CH-High 30MHz - 3GHz



# 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 (dBμV/m) = 20 log Emission level (dBμV/m)

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### 10.2 Measurement Equipment Used

SGS 966 Chamber No.C							
EQUIPMENT	MFR MODEL		SERIAL	LAST	CAL DUE.		
TYPE		NUMBER	NUMBER	CAL.			
EMI Test Receiver	R&S	ESU 40	100363	04/12/2016	04/11/2017		
Loop Antenna	ETS-Lindgren	6502	00143303	12/23/2015	12/22/2016		
Broadband Antenna	TESEQ	CBL 6112D	35240	10/28/2015	10/27/2016		
Horn Antenna	ETS-Lindgren	3117	00143272	12/16/2015	12/15/2016		
Horn Antenna	Schwarzbeck	BBHA9170	185	07/18/2016	07/17/2017		
Pre Amplifier	EMC Instruments	EMC330	980096	12/12/2015	12/11/2016		
Pre Amplifier	EMC Instruments	EMC0011830	980199	12/12/2015	12/11/2016		
Pre Amplifier	R&S	SCU-18	10204	12/12/2015	12/11/2016		
Pre Amplifier	R&S	SCU-26	100780	12/12/2015	12/11/2016		
Coaxial Cable	Huber+Suhner	RG 214/U	966Rx 9K-30M	12/12/2015	12/11/2016		
Coaxial Cable	Huber+Suhner	RG 214/U SUCOFLEX 104	966Rx 30M-3G	12/12/2015	12/11/2016		
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Rx 1G-18G	12/12/2015	12/11/2016		
Coaxial Cable	Huber+Suhner	mini 141-12 SUCOFLEX 104	966Rx 18G-40G	12/12/2015	12/11/2016		
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Tx 30M-18G	12/12/2015	12/11/2016		
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	966Tx 18G-40G	12/12/2015	12/11/2016		
Attenuator	WOKEN	218FS-10	RF27	12/12/2015	12/11/2016		
Site NSA	SGS	966 Chamber C	SAC-C	03/04/2016	03/03/2017		
Site VSWR	SGS	966 Chamber C	SAC-C	03/04/2016	03/03/2017		
DC Power Supply	HOLA	DP-3003	D7070035	05/04/2016	05/03/2017		
Controller	MF	MF-7802	N/A	N.C.R.	N.C.R.		
Antenna Master	MF	N/A	N/A	N.C.R.	N.C.R.		
Turn Table	MF	N/A	N/A	N.C.R.	N.C.R.		
Test Software	World-Pallas	Dr. E	V 3.0 Lite	N.C.R.	N.C.R.		

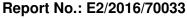
NOTE: N.C.R refers to Not Calibrated Required.

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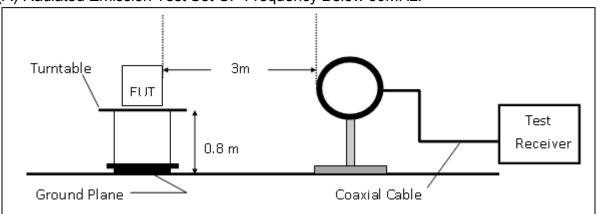




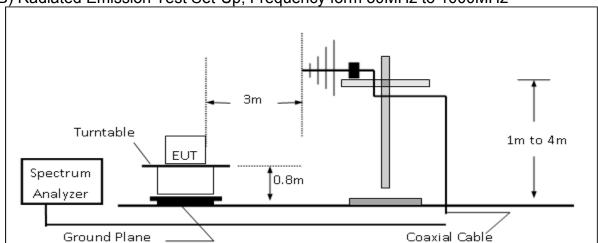
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#### 10.3 Test SET-UP

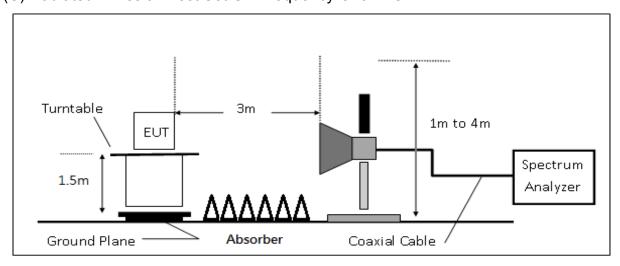
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



(B) Radiated Emission Test Set-Up, Frequency form 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.
- The EUT was placed on a turn table with 0.8m for frequency< 1GHz and 0.8m for frequen-2. cy> 1GHz above ground plan.
- The turn table shall rotate 360 degrees to determine the position of maximum emission level. 3.
- EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the 4. 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 ≥ 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 compli-
- 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.

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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### 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 + CL - AG

Where	<u> </u>	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(dBµV/m) + Cable Loss(dB) – Pre Amplifier Gain(dB)

#### Note:

"F": denotes Fundamental Frequency.; "H": denotes Harmonic Frequency.

"E": denotes Band Edge Frequency.; "S": denotes Spurious Frequency.

### 10.6 Test Results of Radiated Spurious Emissions form 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.

#### 10.7 Measurement Result:

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

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### Radiated Band Edge Measurement Result (BT4.0 mode) \*External Antenna

Operation Mode: BT 4.0 Test Date: 2016/7/22

Fundamental Frequency: 2402 MHz Temp. / Humi.: 22.7deg\_C/57RH

Operation Band: BE CH Low Test Engineer: Ashton EUT Pol.: Measurement Antenna Pol.: Vertical E2

Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dΒμV/m	dBμV/m	dB
2390.00	Е	Peak	47.22	0.92	48.15	74	-25.85
2390.00	E	Average	32.65	0.92	33.57	54	-20.43

Operation Mode: BT 4.0 Test Date: 2016/7/22

Fundamental Frequency: 2402 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: BE CH Low Test Engineer: Ashton EUT Pol.: E2 Measurement Antenna Pol.: Horizontal

Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin	
		Mode	Reading Level		FS	@3m		
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB	
2390.00	Е	Peak	44.74	0.92	45.66	74	-28.34	
2390.00	E	Average	32.58	0.92	33.50	54	-20.50	

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Operation Mode: BT 4.0 Test Date: 2016/7/22

Fundamental Frequency: 2480 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: BE CH High Test Engineer: Ashton Measurement Antenna Pol.: EUT Pol.: E2 Vertical

	Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
	MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
-	2483.50	E	Peak	58.32	1.16	59.48	74	-14.52
	2483.50	E	Average	43.15	1.16	44.31	54	-9.69

Operation Mode: BT 4.0 Test Date: 2016/7/22

Fundamental Frequency: 2480 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: BE CH High Test Engineer: Ashton EUT Pol.: Measurement Antenna Pol.: E2 Horizontal

	Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
	MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dΒμV/m	dB
-	2483.50	Е	Peak	56.42	1.16	57.58	74	-16.42
	2483.50	Е	Average	42.57	1.16	43.73	54	-10.27

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#### \*Chip Antenna

Operation Mode: BT 4.0 Test Date: 2016/8/3

Fundamental Frequency: 2402 MHz Temp. / Humi.: 22.7deg\_C/57RH

Operation Band: Test Engineer: BE CH Low Ashton EUT Pol.: Measurement Antenna Pol.: Vertical E2

Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dΒμV/m	dBµV/m	dB
2390.00	E	Peak	45.46	0.92	46.38	74	-27.62
2390.00	E	Average	32.77	0.92	33.69	54	-20.31

Operation Mode: BT 4.0 Test Date: 2016/8/3

Fundamental Frequency: 2402 MHz Temp. / Humi.: 22.7deg\_C/57RH

Operation Band: BE CH Low Test Engineer: Ashton EUT Pol.: E2 Measurement Antenna Pol.: Horizontal

Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin	
		Mode	Reading Level		FS	@3m		
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB	
2390.00	E	Peak	45.00	0.92	45.92	74	-28.08	_
2390.00	E	Average	32.58	0.92	33.50	54	-20.50	

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Operation Mode: BT 4.0 Test Date: 2016/8/3

Fundamental Frequency: 2480 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: BE CH High Test Engineer: Ashton Measurement Antenna Pol.: EUT Pol.: E2 Vertical

	Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin	
	MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB	
-	2483.50	E	Peak	51.15	1.16	52.31	74	-21.69	•
	2483.50	Е	Average	38.16	1.16	39.32	54	-14.68	

Operation Mode: BT 4.0 Test Date: 2016/8/3

Fundamental Frequency: 2480 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: BE CH High Test Engineer: Ashton EUT Pol.: Measurement Antenna Pol.: E2 Horizontal

	Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
			Mode	Reading Level		FS	@3m	
	MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
Ī	2483.50	E	Peak	54.22	1.16	55.38	74	-18.62
	2483.50	Е	Average	41.34	1.16	42.50	54	-11.50

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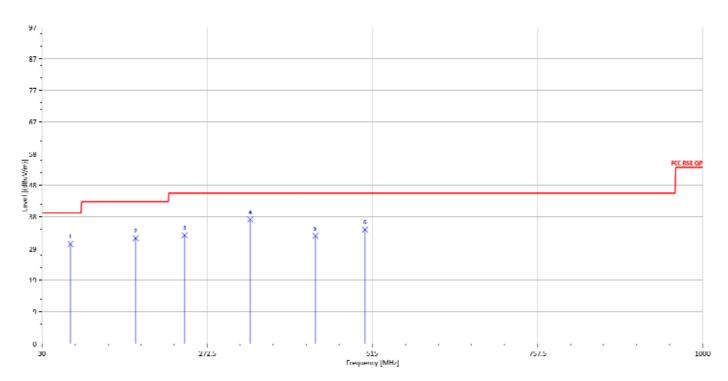
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# Radiated Spurious Emission Measurement Result (BT4.0 mode) \* External Antenna For Frequency form 30MHz to 1000MHz

Operation Mode: BT 4.0 Test Date: 2016/7/22

Fundamental Frequency: Temp. / Humi.: 2402 MHz 22.7deg\_C/57RH

Operation Band: TX CH Low Test Engineer: Ashton EUT Pol.: E2 Measurement Antenna Pol.: Vertical



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
71.71	S	Peak	52.10	-21.65	30.45	40	-9.55
167.74	S	Peak	50.26	-18.06	32.21	43.5	-11.29
239.52	S	Peak	48.39	-15.28	33.10	46	-12.90
335.55	S	Peak	49.87	-11.88	37.99	46	-8.01
431.58	S	Peak	42.33	-9.39	32.94	46	-13.06
504.33	S	Peak	42.75	-7.86	34.90	46	-11.10

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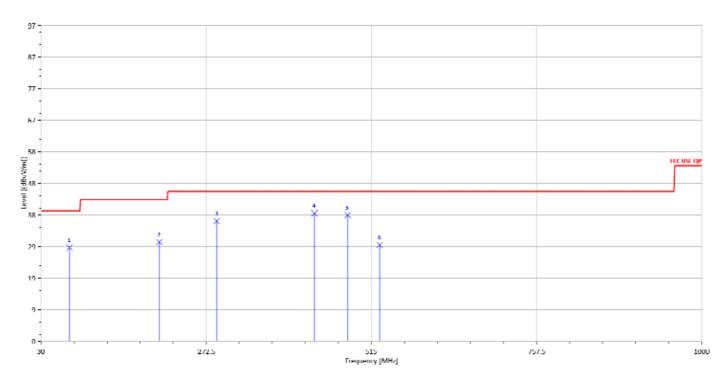


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Operation Mode: BT 4.0 Test Date: 2016/7/22

Fundamental Frequency: 2402 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: TX CH Low Test Engineer: Ashton EUT Pol.: E2 Measurement Antenna Pol.: Horizontal



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dΒμV/m	dB
71.71	S	Peak	50.42	-21.65	28.77	40	-11.23
203.63	S	Peak	47.76	-17.34	30.43	43.5	-13.07
288.02	S	Peak	50.28	-13.34	36.93	46	-9.07
431.58	S	Peak	48.74	-9.39	39.35	46	-6.65
480.08	S	Peak	46.63	-7.81	38.83	46	-7.17
527.61	S	Peak	37.13	-7.58	29.55	46	-16.45

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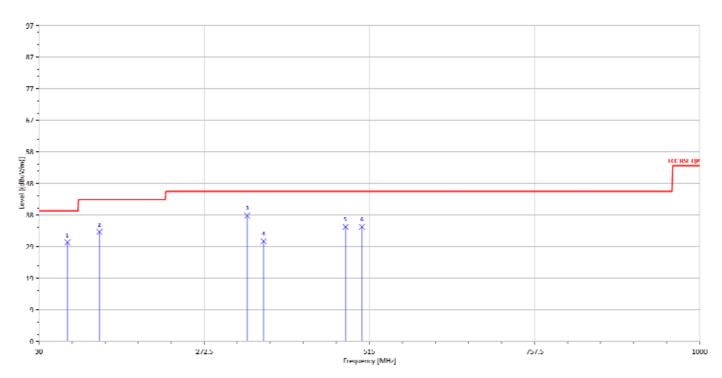


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Operation Mode: BT 4.0 Test Date: 2016/7/22

Fundamental Frequency: 2442 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: TX CH Mid Test Engineer: Ashton EUT Pol.: E2 Measurement Antenna Pol.: Vertical



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dΒμV/m	dB
71.71	S	Peak	51.99	-21.65	30.34	40	-9.66
119.24	S	Peak	49.48	-15.88	33.61	43.5	-9.89
335.55	S	Peak	50.50	-11.88	38.62	46	-7.38
359.80	S	Peak	41.90	-11.20	30.70	46	-15.30
480.08	S	Peak	42.96	-7.81	35.15	46	-10.85
504.33	S	Peak	43.02	-7.86	35.17	46	-10.83

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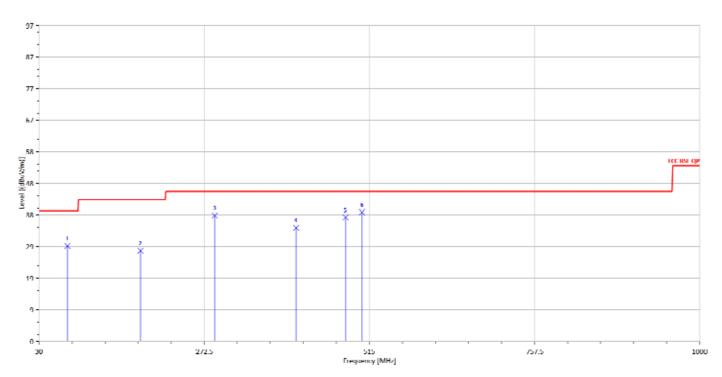


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Operation Mode: BT 4.0 Test Date: 2016/7/22

Fundamental Frequency: 2442 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: TX CH Mid Test Engineer: Ashton EUT Pol.: E2 Measurement Antenna Pol.: Horizontal



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dΒμV/m	dB
71.71	S	Peak	50.86	-21.65	29.21	40	-10.79
179.38	S	Peak	46.47	-18.71	27.77	43.5	-15.73
288.02	S	Peak	51.98	-13.34	38.64	46	-7.36
407.33	S	Peak	44.03	-9.16	34.86	46	-11.14
480.08	S	Peak	45.89	-7.81	38.08	46	-7.92
504.33	S	Peak	47.52	-7.86	39.66	46	-6.34

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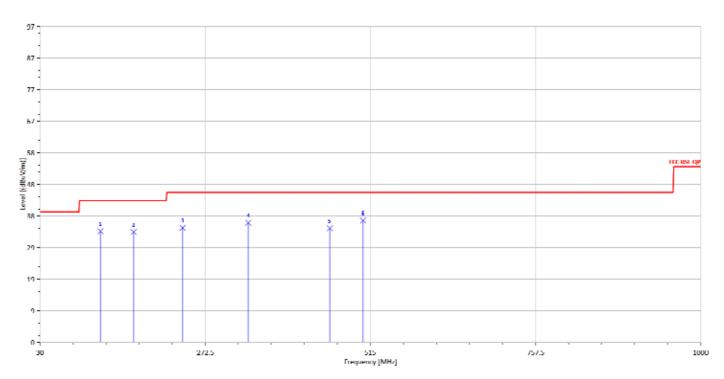


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Operation Mode: BT 4.0 Test Date: 2016/7/22

Fundamental Frequency: 2480 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: TX CH High Test Engineer: **Ashton** EUT Pol.: E2 Measurement Antenna Pol.: Vertical



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBμV/m	dB
119.24	S	Peak	49.99	-15.88	34.12	43.5	-9.38
167.74	S	Peak	51.95	-18.06	33.89	43.5	-9.61
239.52	S	Peak	50.43	-15.28	35.15	46	-10.85
335.55	S	Peak	48.62	-11.88	36.74	46	-9.26
455.83	S	Peak	43.45	-8.43	35.01	46	-10.99
504.33	S	Peak	45.32	-7.86	37.46	46	-8.54

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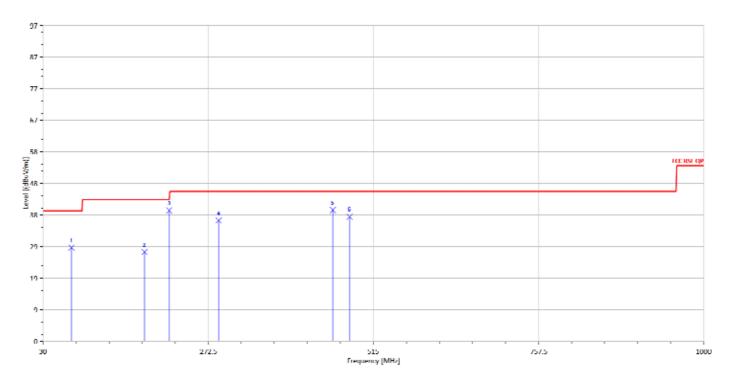


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Operation Mode: BT 4.0 Test Date: 2016/7/22

Fundamental Frequency: 2480 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: TX CH High Test Engineer: **Ashton** EUT Pol.: E2 Measurement Antenna Pol.: Horizontal



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dΒμV/m	dBμV/m	dB
71.71	S	Peak	50.36	-21.65	28.71	40	-11.29
179.38	S	Peak	46.06	-18.71	27.36	43.5	-16.14
215.27	S	Peak	57.30	-17.14	40.16	43.5	-3.34
288.02	S	Peak	50.48	-13.34	37.14	46	-8.86
455.83	S	Peak	48.73	-8.43	40.30	46	-5.70
480.08	S	Peak	46.07	-7.81	38.26	46	-7.74

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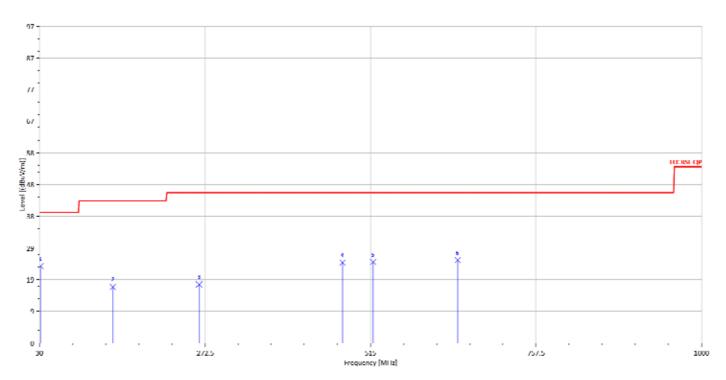
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# \*Chip Antenna

Operation Mode: BT 4.0 Test Date: 2016/8/3

Temp. / Humi.: Fundamental Frequency: 2402 MHz 22.7deg\_C/57RH

Operation Band: Test Engineer: TX CH Low Ashton EUT Pol.: E2 Measurement Antenna Pol.: Vertical



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dΒμV/m	dΒμV/m	dB
31.94	S	Peak	31.78	-8.22	23.56	40	-16.44
137.67	S	Peak	33.14	-15.94	17.20	43.5	-26.30
263.77	S	Peak	31.78	-13.80	17.98	46	-28.02
474.26	S	Peak	32.71	-8.09	24.63	46	-21.37
518.88	S	Peak	32.21	-7.40	24.82	46	-21.18
643.04	S	Peak	30.49	-5.09	25.40	46	-20.60

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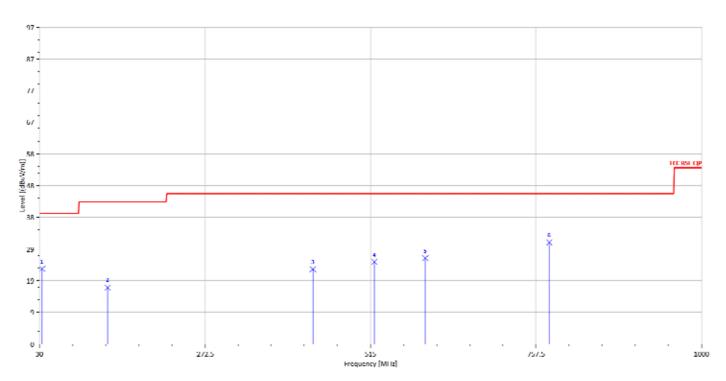


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Operation Mode: BT 4.0 Test Date: 2016/8/3

Fundamental Frequency: 2402 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: Test Engineer: TX CH Low Ashton EUT Pol.: Measurement Antenna Pol.: E2 Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dΒμV/m	dB
33.88	S	Peak	32.30	-9.27	23.03	40	-16.97
129.91	S	Peak	33.01	-15.67	17.34	43.5	-26.16
430.61	S	Peak	32.28	-9.39	22.90	46	-23.10
520.82	S	Peak	32.52	-7.35	25.17	46	-20.83
595.51	S	Peak	32.33	-6.01	26.33	46	-19.67
776.90	S	Peak	35.86	-4.77	31.10	46	-14.90

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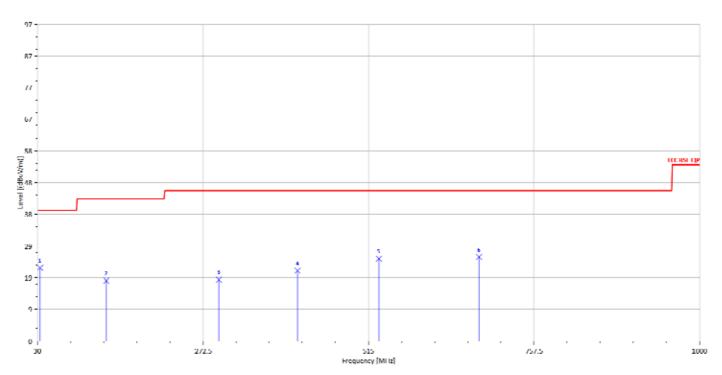


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Operation Mode: BT 4.0 Test Date: 2016/8/3

Fundamental Frequency: 2442 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: Test Engineer: TX CH Mid Ashton EUT Pol.: E2 Measurement Antenna Pol.: Vertical



Freq.	Note	Detector	Spe ctum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dΒμV/m	dB
33.88	S	Peak	31.67	-9.27	22.40	40	-17.60
130.88	S	Peak	34.17	-15.71	18.47	43.5	-25.03
295.78	S	Peak	31.96	-13.16	18.79	46	-27.21
411.21	S	Peak	30.70	-9.19	21.51	46	-24.49
530.52	S	Peak	32.42	-7.20	25.22	46	-20.78
676.99	S	Peak	30.94	-5.17	25.77	46	-20.23

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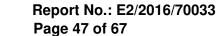
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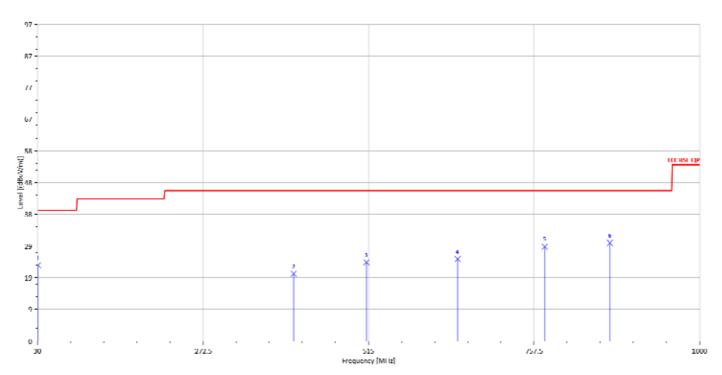
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Operation Mode: BT 4.0 Test Date: 2016/8/3

Fundamental Frequency: 2442 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: Test Engineer: TX CH Mid Ashton EUT Pol.: E2 Measurement Antenna Pol.: Horizontal



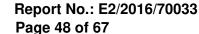
Freq.	Note	Detector	Spe ctum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
30.97	S	Peak	30.90	-7.70	23.20	40	-16.80
405.39	S	Peak	30.15	-9.60	20.56	46	-25.44
512.09	S	Peak	31.62	-7.51	24.11	46	-21.89
645.95	S	Peak	29.91	-4.79	25.12	46	-20.88
773.02	S	Peak	33.51	-4.59	28.92	46	-17.08
869.05	S	Peak	33.03	-2.98	30.06	46	-15.94

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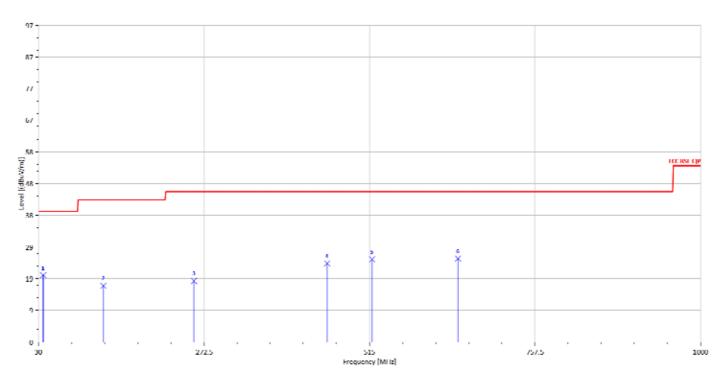




Operation Mode: BT 4.0 Test Date: 2016/8/3

Fundamental Frequency: 2480 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: TX CH High Test Engineer: **Ashton** EUT Pol.: E2 Measurement Antenna Pol.: Vertical



Freq.	Note	Detector	Spe ctum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
36.79	S	Peak	31.35	-10.93	20.42	40	-19.58
125.06	S	Peak	32.96	-15.68	17.28	43.5	-26.22
257.95	S	Peak	32.55	-13.86	18.69	46	-27.31
452.92	S	Peak	32.69	-8.60	24.09	46	-21.91
518.88	S	Peak	32.73	-7.40	25.34	46	-20.66
644.98	S	Peak	30.47	-4.88	25.59	46	-20.41

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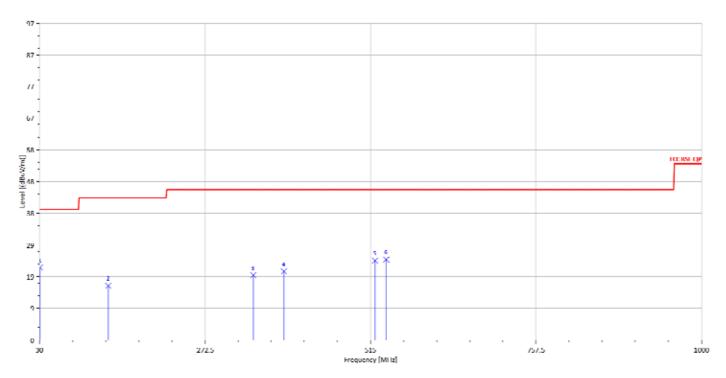


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Operation Mode: BT 4.0 Test Date: 2016/8/3

Fundamental Frequency: 2480 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: TX CH High Test Engineer: **Ashton** EUT Pol.: E2 Measurement Antenna Pol.: Horizontal



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
30.97	S	Peak	29.87	-7.70	22.16	40	-17.84
130.88	S	Peak	32.37	-15.71	16.66	43.5	-26.84
343.31	S	Peak	31.43	-11.61	19.82	46	-26.18
387.93	S	Peak	31.08	-10.09	20.99	46	-25.01
521.79	S	Peak	31.57	-7.26	24.31	46	-21.69
538.28	S	Peak	32.03	-7.37	24.66	46	-21.34

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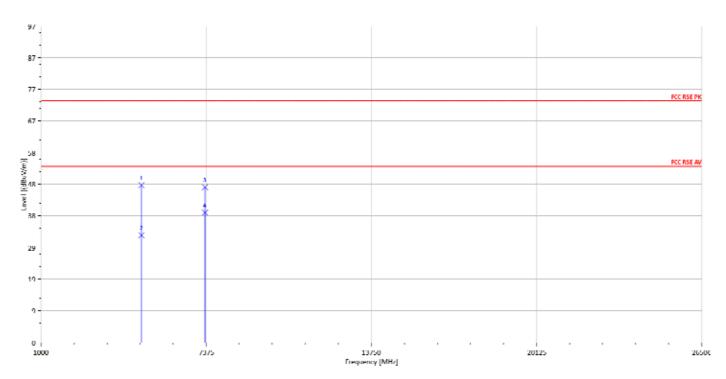
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# Radiated Spurious Emission Measurement Result (BT4.0 mode) \* External Antenna For Frequency above 1GHz

Operation Mode: BT 4.0 Test Date: 2016/7/22

Fundamental Frequency: 2402 MHz Temp. / Humi.: 22.7deg\_C/57RH

Operation Band: TX CH Low Test Engineer: Ashton EUT Pol.: E2 Measurement Antenna Pol.: Vertical



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
4804.00	Н	Peak	40.64	7.66	48.30	74	-25.70
4804.00	Н	Average	33.54	7.66	41.20	54	-12.80
7206.00	Н	Peak	35.76	14.95	50.71	74	-23.29
7206.00	Н	Average	26.34	14.95	41.29	54	-12.71

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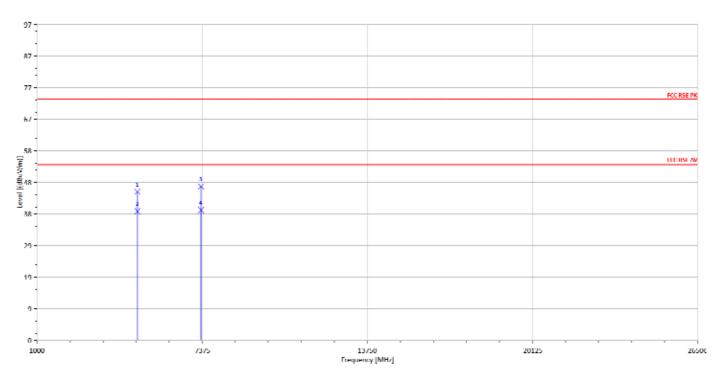


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Operation Mode: BT 4.0 Test Date: 2016/7/22

Fundamental Frequency: 2402 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: TX CH Low Test Engineer: Ashton EUT Pol.: E2 Measurement Antenna Pol.: Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
4804.00	Н	Peak	37.01	7.66	44.67	74	-29.33
4804.00	Н	Average	31.27	7.66	38.93	54	-15.07
7206.00	Н	Peak	35.03	14.95	49.98	74	-24.02
7206.00	Н	Average	25.88	14.95	40.83	54	-13.17

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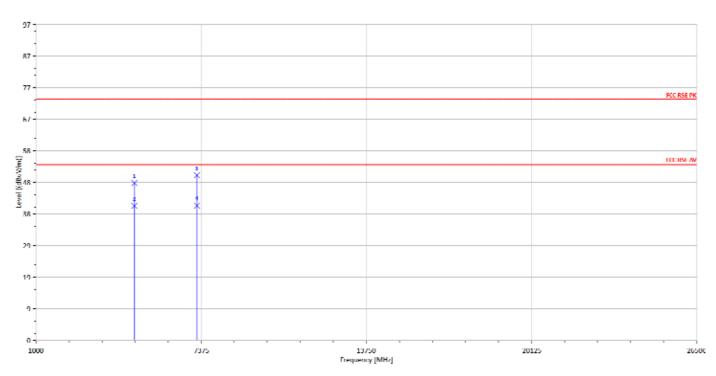


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Operation Mode: BT 4.0 Test Date: 2016/7/22

Fundamental Frequency: 2442 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: TX CH Mid Test Engineer: Ashton EUT Pol.: E2 Measurement Antenna Pol.: Vertical



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
4884.00	Н	Peak	40.58	7.62	48.20	74	-25.80
4884.00	Н	Average	25.20	7.62	32.82	54	-21.18
7326.00	Н	Peak	32.76	14.80	47.56	74	-26.44
7326.00	Н	Average	25.04	14.80	39.84	54	-14.16

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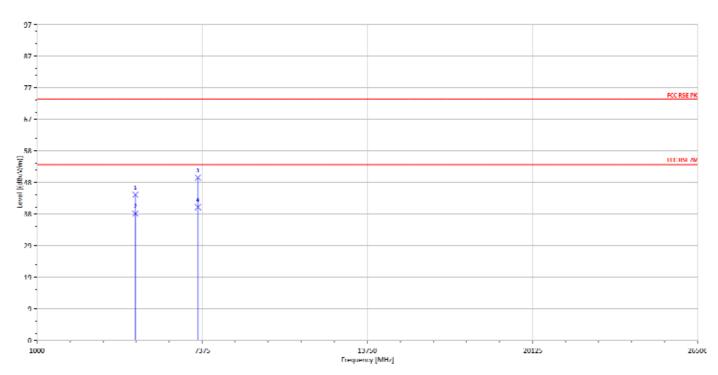


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Operation Mode: BT 4.0 Test Date: 2016/7/22

Fundamental Frequency: 2442 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: TX CH Mid Test Engineer: Ashton EUT Pol.: E2 Measurement Antenna Pol.: Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
4884.00	Н	Peak	37.96	7.62	45.58	74	-28.42
4884.00	Н	Average	32.01	7.62	39.63	54	-14.37
7326.00	Н	Peak	32.43	14.80	47.23	74	-26.77
7326.00	Н	Average	25.19	14.80	39.99	54	-14.01

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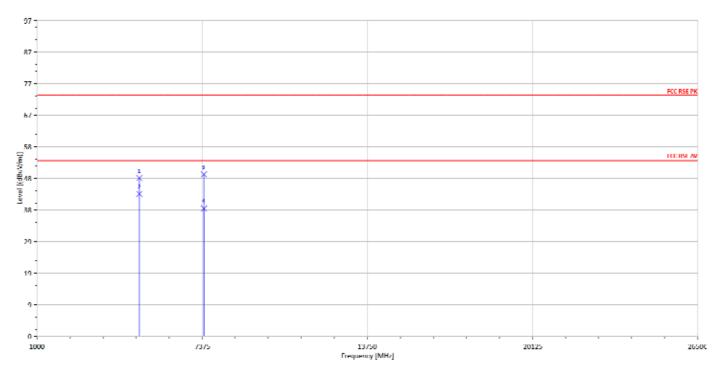


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Operation Mode: BT 4.0 Test Date: 2016/7/22

Fundamental Frequency: 2480 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: TX CH High Test Engineer: **Ashton** EUT Pol.: E2 Measurement Antenna Pol.: Vertical



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
4960.00	Н	Peak	40.91	7.69	48.60	74	-25.40
4960.00	Н	Average	36.01	7.69	43.70	54	-10.30
7440.00	Н	Peak	34.31	15.43	49.74	74	-24.26
7440.00	Н	Average	23.82	15.43	39.25	54	-14.75

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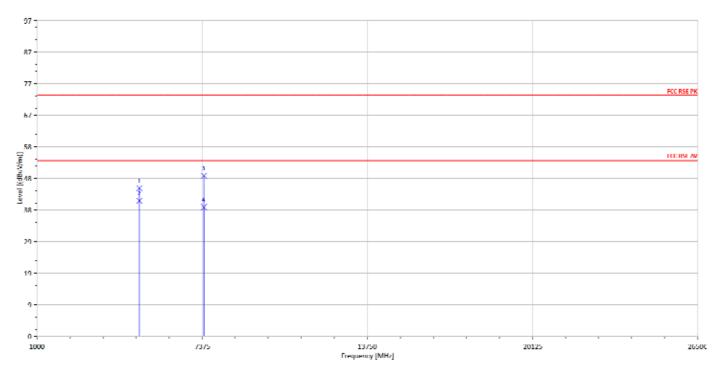


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Operation Mode: BT 4.0 Test Date: 2016/7/22

Fundamental Frequency: 2480 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: TX CH High Test Engineer: **Ashton** EUT Pol.: E2 Measurement Antenna Pol.: Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dΒμV/m	dB
4960.00	Н	Peak	37.76	7.69	45.45	74	-28.55
4960.00	Н	Average	33.86	7.69	41.55	54	-12.45
7440.00	Н	Peak	33.91	15.43	49.34	74	-24.66
7440.00	Н	Average	24.23	15.43	39.66	54	-14.34

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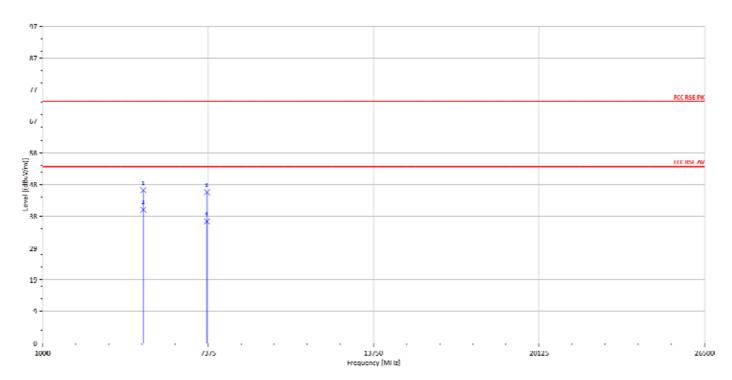
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### \*Chip Antenna

Operation Mode: BT 4.0 Test Date: 2016/8/3

Fundamental Frequency: 2402 MHz Temp. / Humi.: 22.7deg\_C/57RH

Operation Band: Test Engineer: TX CH Low Ashton EUT Pol.: Measurement Antenna Pol.: Vertical E2



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
4804.00	Н	Peak	36.97	10.55	47.52	74	-26.48
4804.00	Н	Average	29.19	10.55	39.74	54	-14.26
7206.00	Н	Peak	32.16	14.69	46.85	74	-27.15
7206.00	Н	Average	23.41	14.69	38.10	54	-15.90

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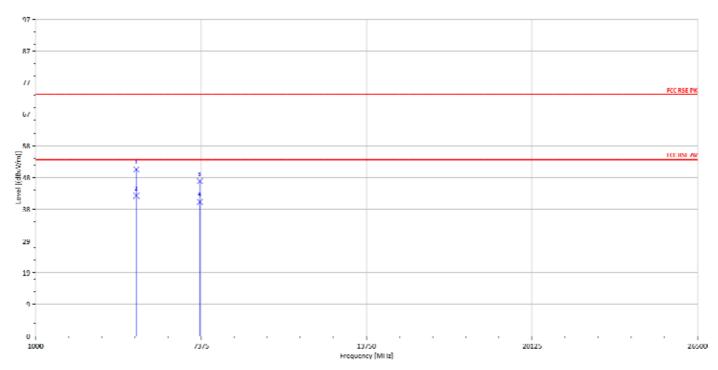


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Operation Mode: BT 4.0 Test Date: 2016/8/3

Fundamental Frequency: 2402 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: TX CH Low Test Engineer: Ashton EUT Pol.: E2 Measurement Antenna Pol.: Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
4804.00	Н	Peak	41.47	10.55	52.03	74	-21.97
4804.00	Н	Average	32.05	10.55	42.60	54	-11.40
7206.00	Н	Peak	33.95	14.69	48.64	74	-25.36
7206.00	Н	Average	24.58	14.69	39.27	54	-14.73

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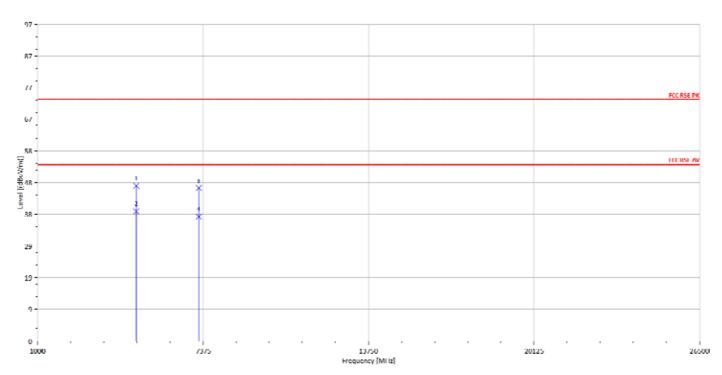


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Operation Mode: BT 4.0 Test Date: 2016/8/3

Fundamental Frequency: 2442 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: TX CH Mid Test Engineer: Ashton EUT Pol.: E2 Measurement Antenna Pol.: Vertical



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
4884.00	Н	Peak	36.42	10.35	46.77	74	-27.23
4884.00	Н	Average	30.51	10.35	40.86	54	-13.14
7326.00	Н	Peak	31.88	14.28	46.16	74	-27.84
7326.00	Н	Average	22.95	14.28	37.23	54	-16.77

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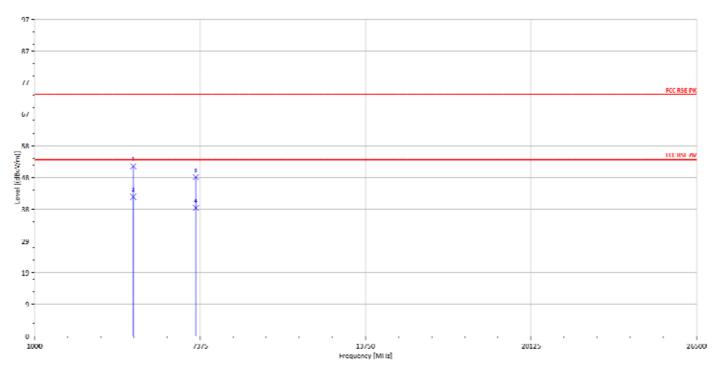


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Operation Mode: BT 4.0 Test Date: 2016/8/3

Fundamental Frequency: 2442 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: TX CH Mid Test Engineer: Ashton EUT Pol.: E2 Measurement Antenna Pol.: Horizontal



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
1711 12	1711/12/0	T IV/QL/AV	αυμν	uD_	αυμν/ιιι	αυμν/ιιι	
4884.00	Н	Peak	40.71	10.35	51.06	74	-22.94
4884.00	Н	Average	32.57	10.35	42.92	54	-11.08
7326.00	Н	Peak	33.12	14.28	47.40	74	-26.60
7326.00	Н	Average	26.85	14.28	41.13	54	-12.87

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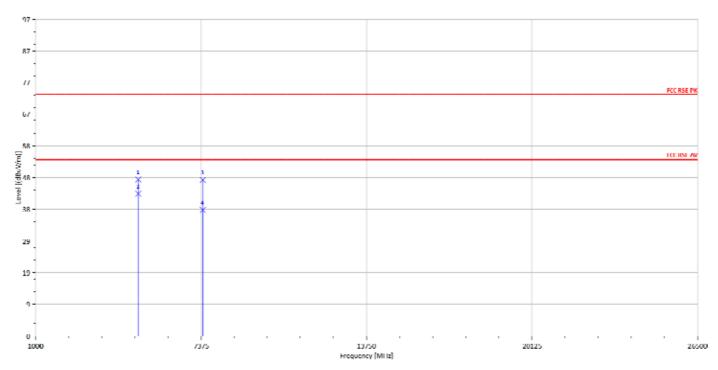


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Operation Mode: BT 4.0 Test Date: 2016/8/3

Fundamental Frequency: 2480 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: TX CH High Test Engineer: **Ashton** EUT Pol.: E2 Measurement Antenna Pol.: Vertical



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
4960.00	Н	Peak	37.65	10.27	47.92	74	-26.08
4960.00	Н	Average	33.22	10.27	43.49	54	-10.51
7440.00	Н	Peak	33.11	14.67	47.77	74	-26.23
7440.00	Н	Average	23.95	14.67	38.62	54	-15.38

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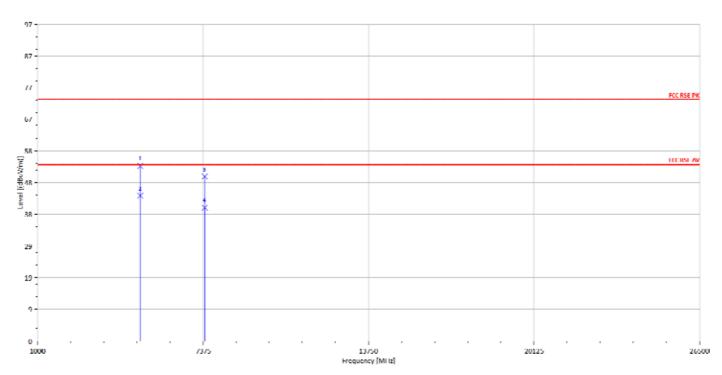


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Operation Mode: BT 4.0 Test Date: 2016/8/3

Fundamental Frequency: 2480 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: TX CH High Test Engineer: **Ashton** EUT Pol.: E2 Measurement Antenna Pol.: Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
4960.00	Н	Peak	43.36	10.27	53.62	74	-20.38
4960.00	Н	Average	34.16	10.27	44.43	54	-9.57
7440.00	Н	Peak	35.74	14.67	50.40	74	-23.60
7440.00	Н	Average	26.21	14.67	40.88	54	-13.12

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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:

Conducted Emission Test Site					
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.
TYPE		NUMBER	NUMBER	CAL.	
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2016	04/13/2017
DC Block	PASTERNACK	PE8210	RF29	12/12/2015	12/11/2016
Attenuator	WOKEN	218FS-10	RF23	12/12/2015	12/11/2016
DC Power Supply	Agilent	E3640A	MY53140006	05/04/2016	05/03/2017

# 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. For defining Restricted Band Edge Limit: Set the RBW = 100kHz & VBW = 300 kHz.
- 6. Detector = peak.
- 7. Sweep time = auto couple.
- 8. Trace mode = max hold.
- 9. Allow trace to fully stabilize.
- 10. Use the peak marker function to determine the maximum amplitude level.

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#### 11.5 Measurement Result:

### RI F mode

Frequency (MHz)	RF Power Density (dBm)	Maximum Limit (dBm)	Result
2402	-12.57	8	PASS
2442	-12.31	8	PASS
2480	-12.38	8	PASS

**Band Edge Limit** 

Frequency (MHz)	RF Power Density (dBm)	Maximum Limit (dBm)	
2402	2.78	-17.22	
2480	3.16	-16.84	

NOTE: cable loss as 0.9dB that offsets in the spectrum

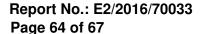
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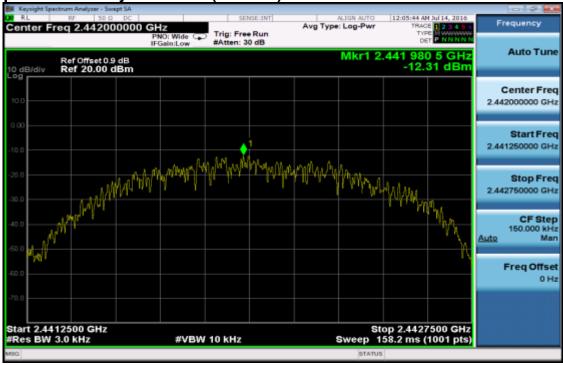


BT4.0 mode

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



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



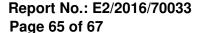
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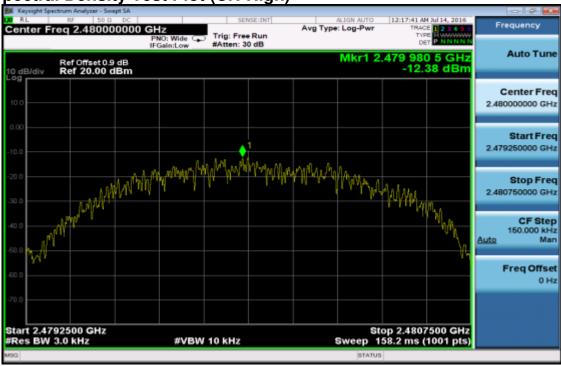
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**Power Spectral Density Test Plot (CH-High)** 



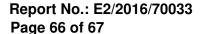
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Power Spectral Density for Band Edge Limit (CH-Low)



Power Spectral Density for Band Edge Limit (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:

An embedded-in and external antenna design is used.

The antenna is designed as permanently attached and has no consideration of replacement. Please see EUT photo and antenna spec. for details.

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

~ End of Report ~

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