

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C CLASS II PC REPORT

OF

Product Name: Otoscope
Brand Name: QOCA
Model No.: Q-tube-O
Model Difference: N/A
FCC ID: WS2-WG7831DELF
Report No.: E2/2016/30006
Issue Date: Mar. 30, 2016
FCC Rule Part: §15.247, Cat: DTS
Prepared for: Quanta Computer Inc.
 211 Wen Hwa 2nd Rd., Kueishan, Taoyuan
 33377, Taiwan
Prepared by: SGS Taiwan Ltd.
 Electronics & Communication Laboratory
 No.2, Keji 1st Rd., Guishan District,
 Taoyuan City, Taiwan 333



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t (886-2) 2299-3279

f (886-2) 2298-0488

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VERIFICATION OF COMPLIANCE

Applicant: Quanta Computer Inc.
211 Wen Hwa 2nd Rd., Kueishan, Taoyuan 33377, Taiwan

Product Name: Otoscope

Brand Name: QOCA

Model No.: Q-tube-O

Model Difference: N/A

FCC ID: WS2-WG7831DELF

Report Number: E2/2016/30006

Date of test: Mar. 01, 2016 ~ Mar. 25, 2015

Date of EUT Received: Mar. 01, 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:

Jazz Huang

Date

Mar. 30, 2016

Jazz Huang / Asst. Supervisor

Prepared By:

Allen Tsai

Date

Mar. 30, 2016

Allen Tsai / Engineer

Approved By:

Jim Chang

Date

Mar. 30, 2016

Jim Chang / Asst. Manager

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Revision History

Report Number	Revision	Description	Issue Date
E2/2016/30006	Rev.00	Initial creation of document	Mar. 30, 2016

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8.2	Antenna Connected Construction:	37
PHOTOGRAPHS OF SET UP		錯誤! 尚未定義書籤。
PHOTOGRAPHS OF EUT		錯誤! 尚未定義書籤。

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1 GENERAL INFORMATION

1.1 Product Description

General:

Product Name:	Otoscope	
Brand Name:	QOCA	
Marketing Name:	N/A	
Model No.:	Q-tube-O	
Model Difference:	N/A	
Software version:	N/A	
Hardware version:	N/A	
Model No. for BT/WLAN Module:	WG7831DELF	
Module FCC ID:	WS2-WG7831DELF	
Scope:	The test report covers the radiated emissions requirements of the standards referenced in the report to allow system level approval of the module in this specific host.	
Class II Permissive change:	Wireless module(WG7831DELF) is installed in a host of portable category.	
Power Supply:	3.7Vdc from battery, 5Vdc from adapter.	
	Battery:	Model No.:Q6T Supplier: Getac
	Adapter:	Model No.: MIL0502200U Supplier: TPT
	Charging Dock:	Model No.:N/A Supplier: N/A

Bluetooth Low Energy:

Frequency Range:	2402 – 2480MHz
Bluetooth Version:	V4.0 LE mode
Channel number:	40 channels
Modulation type:	GFSK
Transmit Power:	8.98 dBm
Antenna Designation:	PIFA Antenna Part No.: DQ6EP000200 (680-INNEP0002-A) Supplier: Inno Wave Technology Co.,Ltd. Gain: 2.35dBi

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1.2 Product Feature of Equipment Under Test

The equipment under Test (Hereafter Called: EUT) is supporting Wi-Fi 802.11b/g/n and Bluetooth features, and below is details of information.

Product Feature	
Product Name:	Otoscope
Brand Name:	QOCA
Marketing Name:	N/A
Model No.:	Q-tube-O
Model Difference:	N/A
FCC ID:	WS2-WG7831DELF
Wi-Fi Specification	802.11b/g/n
Bluetooth Version	V4.0 BLE

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

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1.3 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247

FCC KDB 558074 D01 DTS Meas. Guidance

ANSI C63.10:2013

Note:

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

1.4 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: 990257

IC Registration Numbers are: 4260A-5

1.5 Special Accessories

There are no special accessories used while test was conducted.

1.6 Equipment Modifications

There was no modification incorporated into the EUT.

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2 SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

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

2.2 EUT Exercise

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

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is placed on a turn table which is 0.8 m above ground plan. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz. The CISPR Quasi-Peak and Average detector mode is employed according to §15.207. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

2.3.2 Radiated Emissions

The EUT is placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plan. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

2.4 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

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2.5 Configuration of Tested System

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



Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	WLAN Test Software	DRTU	N/A	N/A	N/A	N/A
2.	Notebook	Lenovo	L440	R9-007LAZ	Shielded	Unshielded

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3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.247(b) (3)	Peak Output Power	Compliant
§15.247(d)	Radiated Band Edge and Spurious Emission	Compliant
§15.203 §15.247(b)	Antenna Requirement	Compliant

4 DESCRIPTION OF TEST MODES

4.1 Operated in 2400 ~ 2483.5MHz Band

40 channels are provided for Bluetooth LE

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	33	2468 MHz
6	2414 MHz	20	2442 MHz	34	2470 MHz
7	2416MHz	21	2444 MHz	35	2472 MHz
8	2418 MHz	22	2446 MHz	36	2474 MHz
9	2420 MHz	23	2448 MHz	37	2476 MHz
10	2422 MHz	24	2450 MHz	38	2478 MHz
11	2424 MHz	25	2452 MHz	39	2480 MHz
12	2426 MHz	26	2454 MHz		
13	2428 MHz	27	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:

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

Note:

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

ANTENNA PORT CONDUCTED MEASUREMENT:

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

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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 : Vertical)	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

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

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

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6 PEAK OUTPUT POWER MEASUREMENT

6.1 Standard Applicable:

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

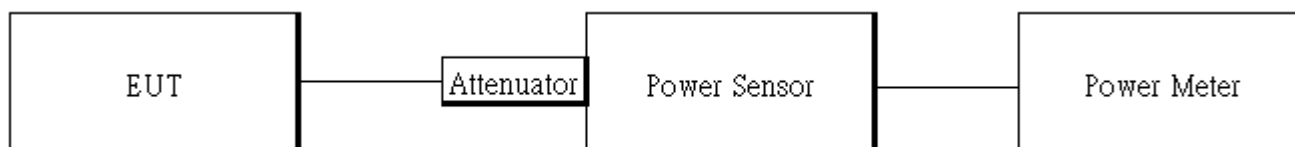
If the transmitting antenna of directional gain greater than 6dBi are used the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the Antenna exceeds 6dBi.

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.

6.2 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter	Anritsu	ML2495A	1005007	12/09/2015	12/08/2016
Power Sensor	Anritsu	MA2411B	917032	12/09/2015	12/08/2016
Spectrum Analyzer	Agilent	N9010A	MY50420195	12/21/2015	12/20/2016
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2016	01/01/2017
Coaxial Cable	HUBER+SUHNER	SUCOFLEX 102	23670/2	01/02/2016	01/01/2017
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2016	01/01/2017
Splitter	Agilent	11636B	N/A	01/02/2016	01/01/2017
DC Power Supply	Agilent	E3640A	MY52410006	11/05/2015	11/04/2016

6.3 Test Set-up:



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6.4 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows 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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6.5 Measurement Result:

BT4.0 mode:

BLE mode:

CH	Frequency (MHz)	Peak Power Output(dBm)	Required Limit
0	2402	8.98	1 Watt = 30 dBm
20	2442	8.72	1 Watt = 30 dBm
39	2480	8.52	1 Watt = 30 dBm

CH	Frequency (MHz)	Average Power Output(dBm)	Required Limit
0	2402	6.93	1 Watt = 30 dBm
20	2442	6.75	1 Watt = 30 dBm
39	2480	6.66	1 Watt = 30 dBm

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

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7 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

7.1 Standard Applicable

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

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

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

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBμV/m) = 20 log Emission level (dBμV/m)

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7.2 Measurement Equipment Used

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	Agilent	N9038A	MY52260216	11/16/2016	11/15/2016
Spectrum Analyzer	Keysight	N9010A	MY51440113	06/10/2015	06/09/2016
Loop Antenna	ETS-Lindgren	6502	143303	12/23/2015	12/22/2016
Broadband Antenna	SCHWAZBECK	VULB9168	9168-617	10/15/2015	10/14/2016
Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1341	05/21/2015	15/20/2016
Horn Antenna	Schwarzbeck	BBHA9170	BBHA9170-185	07/24/2015	07/23/2016
Pre Amplifier	EMC Instruments	EMC9135	980234	08/13/2015	08/12/2016
Pre Amplifier	EMC Instruments	EMC12630SE	980271	08/13/2015	08/12/2016
Pre Amplifier	EMC Instruments	EMC184045B	980135	10/27/2015	10/26/2016
Coaxial Cable	Huber+Suhner	RG 214/U	W21.01	08/13/2015	08/12/2016
Coaxial Cable	Huber+Suhner	RG 214/U	W22.01	08/13/2015	08/12/2016
Coaxial Cable	EMC Instruments	EMC106-SM-S M-2300	150702	08/13/2015	08/12/2016
Coaxial Cable	EMC Instruments	EMC106-SM-S M-7200	150703	08/13/2015	08/12/2016
Coaxial Cable	EMC Instruments	EMC106-SM-S M-2300	150701	08/13/2015	08/12/2016
Coaxial Cable	EMC Instruments	EMC106-SM-S M-9100	150704	08/13/2015	08/12/2016
Attenuator	WOKEN	218FS-10	RF27	12/12/2015	12/11/2016
Site NSA	SGS	966 Chamber D	SAC-D	07/09/2015	07/08/2016
Site VSWR	SGS	966 Chamber D	SAC-D	07/09/2015	07/08/2016
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.

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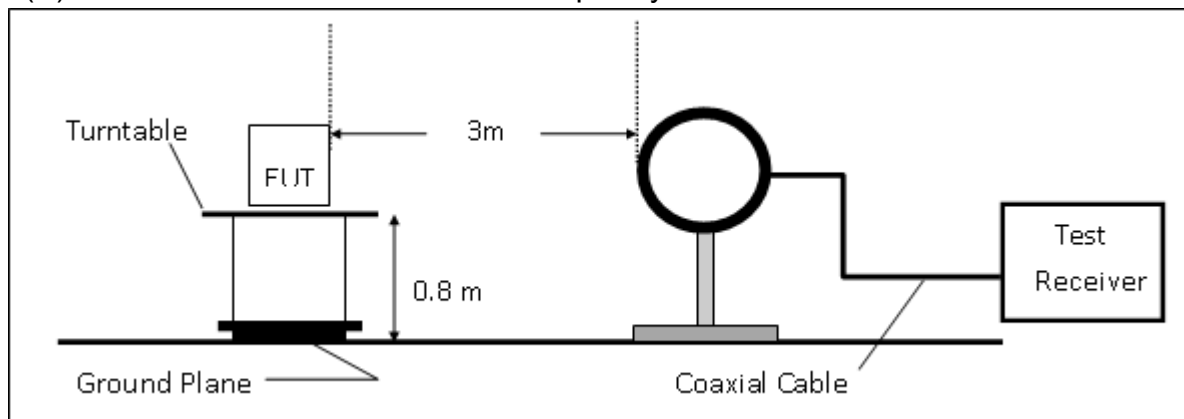
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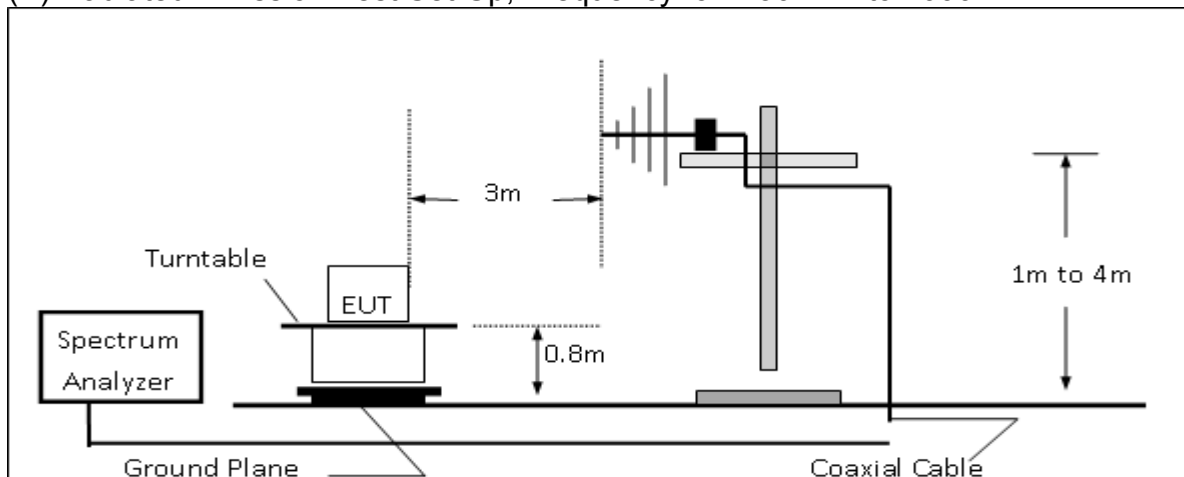
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7.3 Test SET-UP

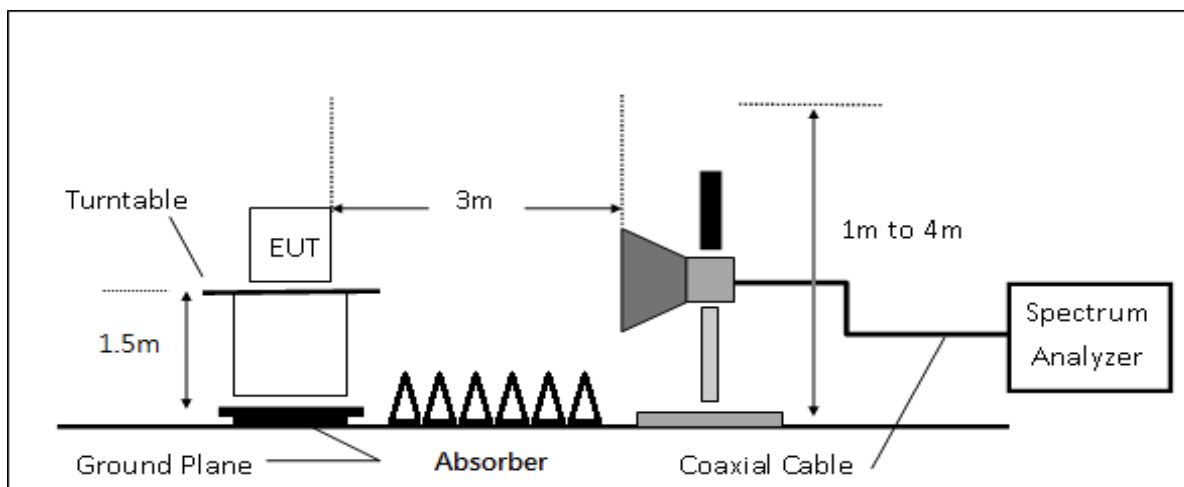
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



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



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



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7.4 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 0.8m 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 ≥ 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.

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7.5 Field Strength Calculation

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

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

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

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note :

“F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

7.6 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.

7.7 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)

Operation Mode :	BT4.0	Test Date :	2016/3/22
Fundamental Frequency :	2402 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH Low	Test Engineer :	Pony
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2376.50	S	Peak	50.74	5.61	56.34	74	-17.66
2376.50	S	Average	30.19	5.61	35.80	54	-18.20
2390.00	E	Peak	44.04	5.78	49.81	74	-24.19
2390.00	E	Average	30.17	5.78	35.95	54	-18.05

Operation Mode :	BT4.0	Test Date :	2016/3/22
Fundamental Frequency :	2402 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH Low	Test Engineer :	Pony
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2377.10	S	Peak	51.55	5.61	57.16	74	-16.84
2377.10	S	Average	30.37	5.61	35.98	54	-18.02
2390.00	E	Peak	45.51	5.78	51.29	74	-22.71
2390.00	E	Average	30.44	5.78	36.22	54	-17.78

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Operation Mode :	BT4.0	Test Date :	2016/3/22
Fundamental Frequency :	2480 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH High	Test Engineer :	Pony
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Peak	53.75	5.88	59.63	74	-14.37
2483.50	E	Average	44.14	5.88	50.02	54	-3.98

Operation Mode :	BT4.0	Test Date :	2016/3/22
Fundamental Frequency :	2480 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH High	Test Engineer :	Pony
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Peak	54.28	5.88	60.17	74	-13.83
2483.50	E	Average	43.97	5.88	49.85	54	-4.15

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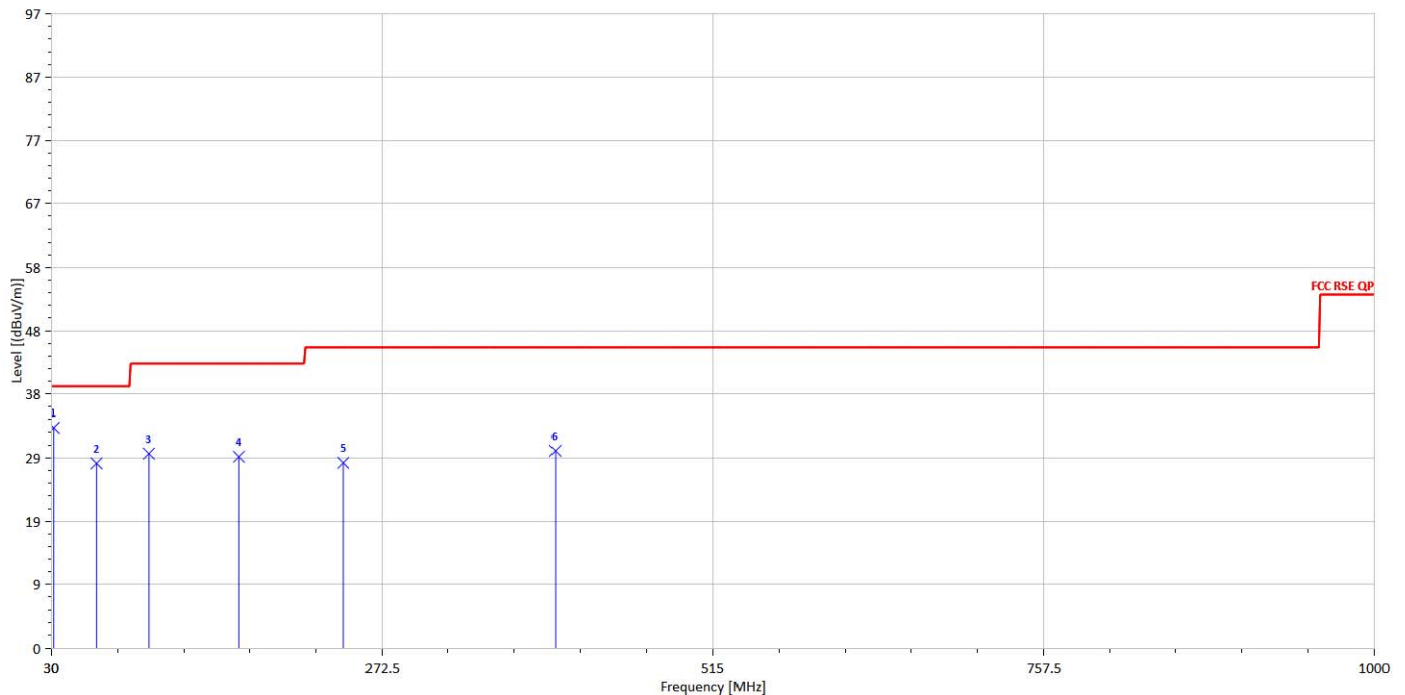
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Radiated Spurious Emission Measurement Result (BT4.0 mode) For Frequency from 30MHz to 1000MHz

Operation Mode :	BT4.0	Test Date :	2016/3/22
Fundamental Frequency :	2402 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Low	Test Engineer :	Pony
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
31.94	S	Peak	41.92	-8.22	33.70	40	-6.30
62.98	S	Peak	50.78	-22.56	28.23	40	-11.77
101.78	S	Peak	47.25	-17.52	29.72	43.5	-13.78
167.74	S	Peak	47.30	-18.06	29.24	43.5	-14.26
244.37	S	Peak	43.35	-15.04	28.31	46	-17.69
399.57	S	Peak	39.90	-9.73	30.16	46	-15.84

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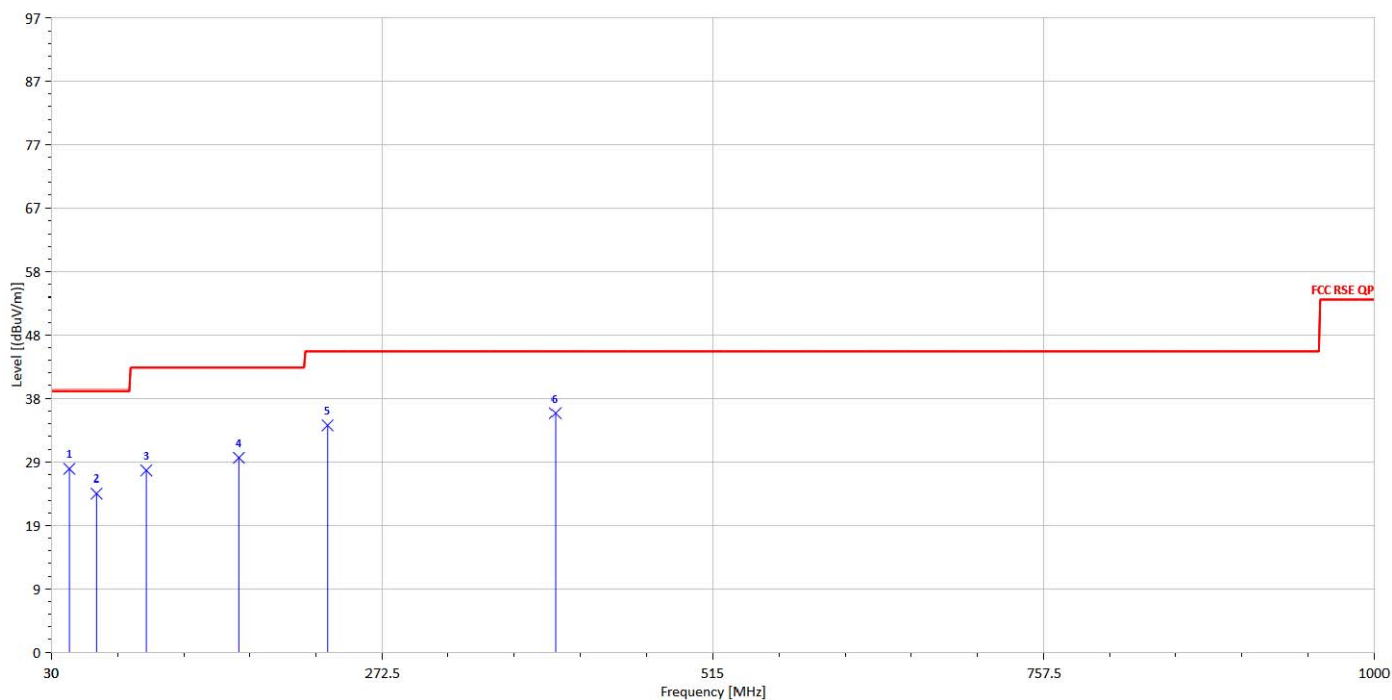
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Operation Mode : BT4.0 Test Date : 2016/3/22
Fundamental Frequency : 2402 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : Tx CH Low Test Engineer : Pony
EUT Pol. : H Measurement Antenna Pol. : Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
43.58	S	Peak	43.36	-15.35	28.01	40	-11.99
62.98	S	Peak	46.89	-22.56	24.33	40	-15.67
99.84	S	Peak	45.53	-17.77	27.76	43.5	-15.74
167.74	S	Peak	47.77	-18.06	29.72	43.5	-13.78
232.73	S	Peak	50.71	-15.99	34.72	46	-11.28
399.57	S	Peak	46.33	-9.73	36.60	46	-9.40

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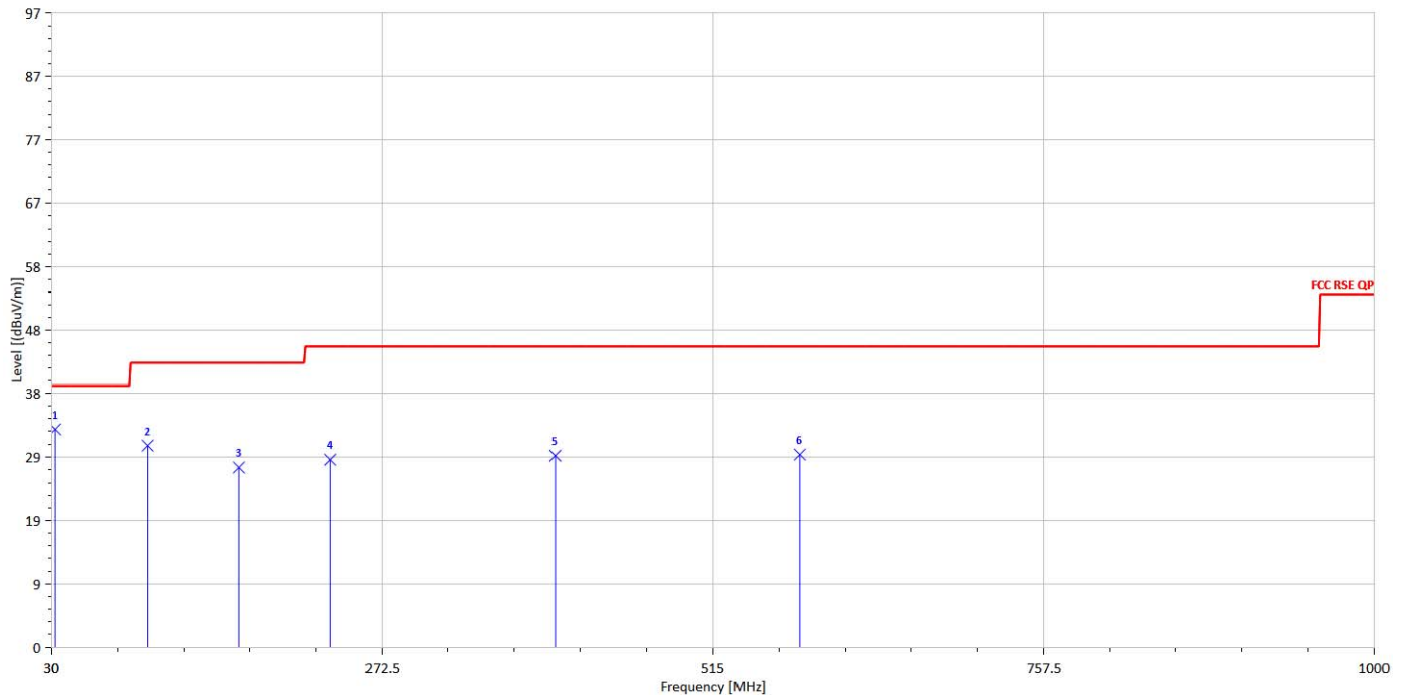
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Operation Mode : BT4.0 Test Date : 2016/3/22
Fundamental Frequency : 2442 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : Tx CH Mid Test Engineer : Pony
EUT Pol. : H Measurement Antenna Pol. : Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
32.91	S	Peak	42.06	-8.75	33.32	40	-6.68
100.81	S	Peak	48.45	-17.64	30.81	43.5	-12.69
167.74	S	Peak	45.50	-18.06	27.44	43.5	-16.06
234.67	S	Peak	44.50	-15.87	28.64	46	-17.36
399.57	S	Peak	38.99	-9.73	29.26	46	-16.74
579.02	S	Peak	35.81	-6.38	29.43	46	-16.57

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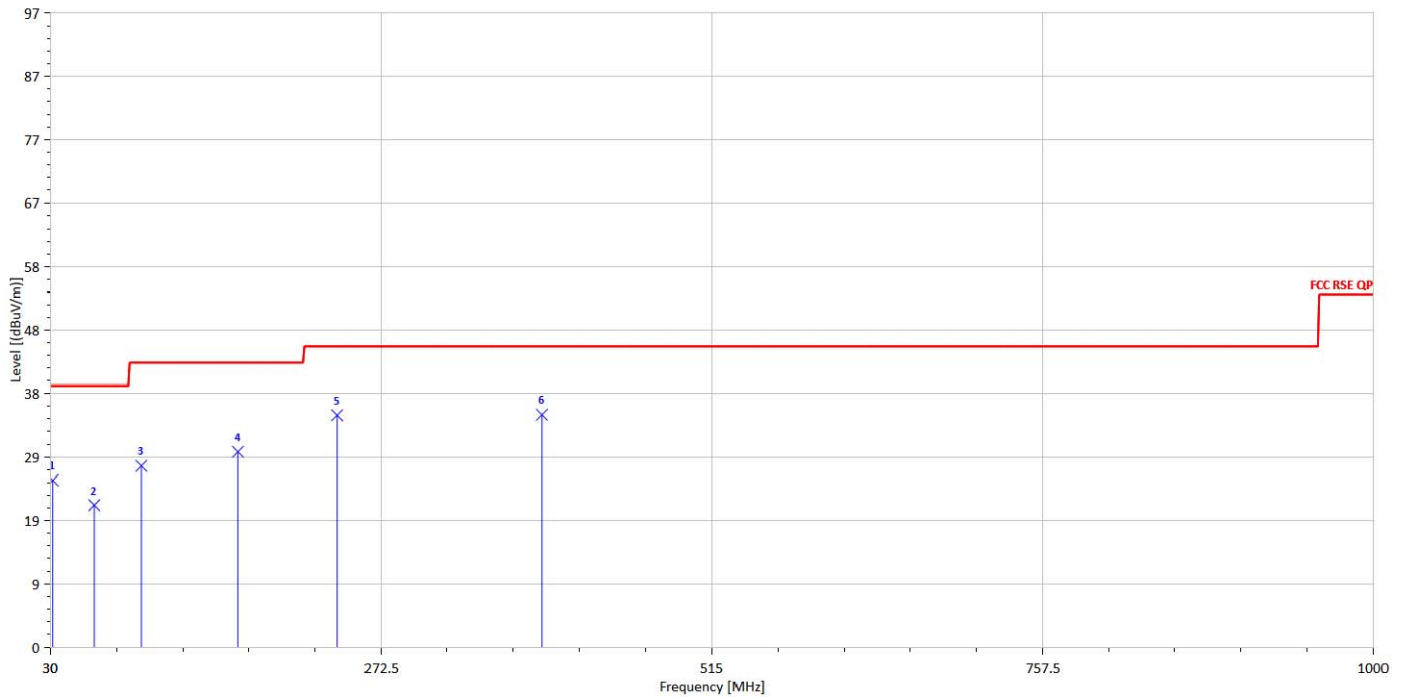
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Operation Mode : BT4.0 Test Date : 2016/3/22
Fundamental Frequency : 2442 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : Tx CH Mid Test Engineer : Pony
EUT Pol. : H Measurement Antenna Pol. : Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
31.94	S	Peak	33.78	-8.22	25.56	40	-14.44
62.01	S	Peak	44.47	-22.71	21.76	40	-18.24
96.93	S	Peak	45.98	-18.27	27.71	43.5	-15.79
167.74	S	Peak	47.93	-18.06	29.87	43.5	-13.63
240.49	S	Peak	50.72	-15.21	35.51	46	-10.49
390.84	S	Peak	45.65	-10.07	35.58	46	-10.42

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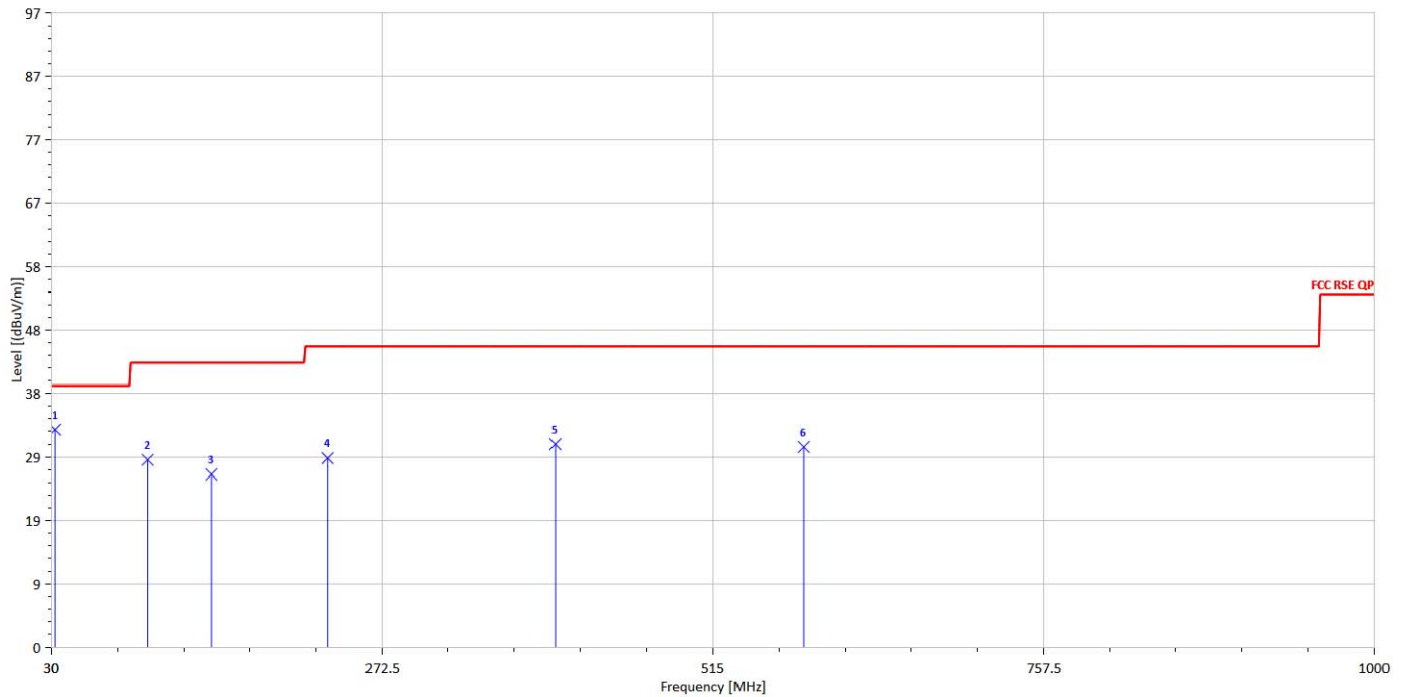
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Operation Mode : BT4.0 Test Date : 2016/3/22
Fundamental Frequency : 2480 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : Tx CH High Test Engineer : Pony
EUT Pol. : H Measurement Antenna Pol. : Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
32.91	S	Peak	42.02	-8.75	33.27	40	-6.73
100.81	S	Peak	46.29	-17.64	28.65	43.5	-14.85
147.37	S	Peak	43.07	-16.63	26.44	43.5	-17.06
232.73	S	Peak	44.89	-15.99	28.90	46	-17.10
399.57	S	Peak	40.77	-9.73	31.04	46	-14.96
581.93	S	Peak	36.78	-6.17	30.61	46	-15.39

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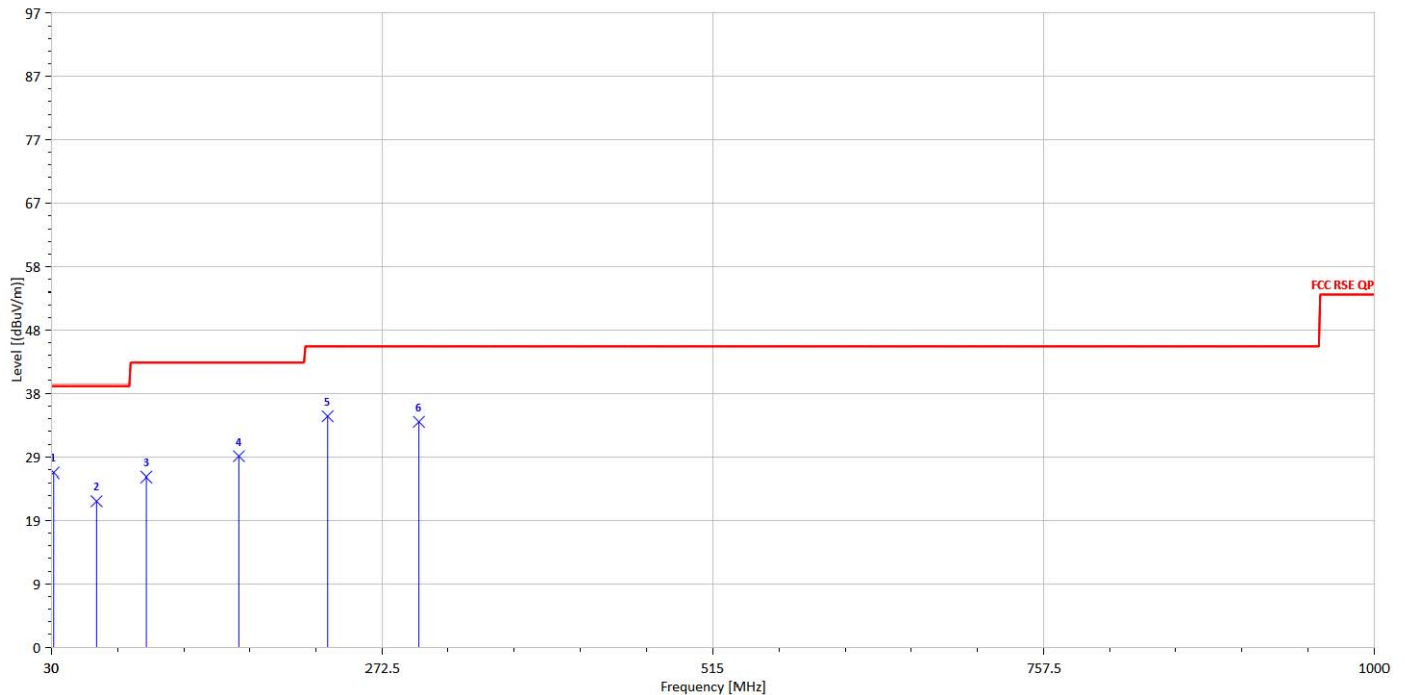
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Operation Mode : BT4.0 Test Date : 2016/3/22
Fundamental Frequency : 2480 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : Tx CH High Test Engineer : Pony
EUT Pol. : H Measurement Antenna Pol. : Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
31.94	S	Peak	34.90	-8.22	26.68	40	-13.32
62.98	S	Peak	44.94	-22.56	22.38	40	-17.62
99.84	S	Peak	43.81	-17.77	26.04	43.5	-17.46
167.74	S	Peak	47.24	-18.06	29.18	43.5	-14.32
232.73	S	Peak	51.34	-15.99	35.35	46	-10.65
299.66	S	Peak	47.60	-13.11	34.49	46	-11.51

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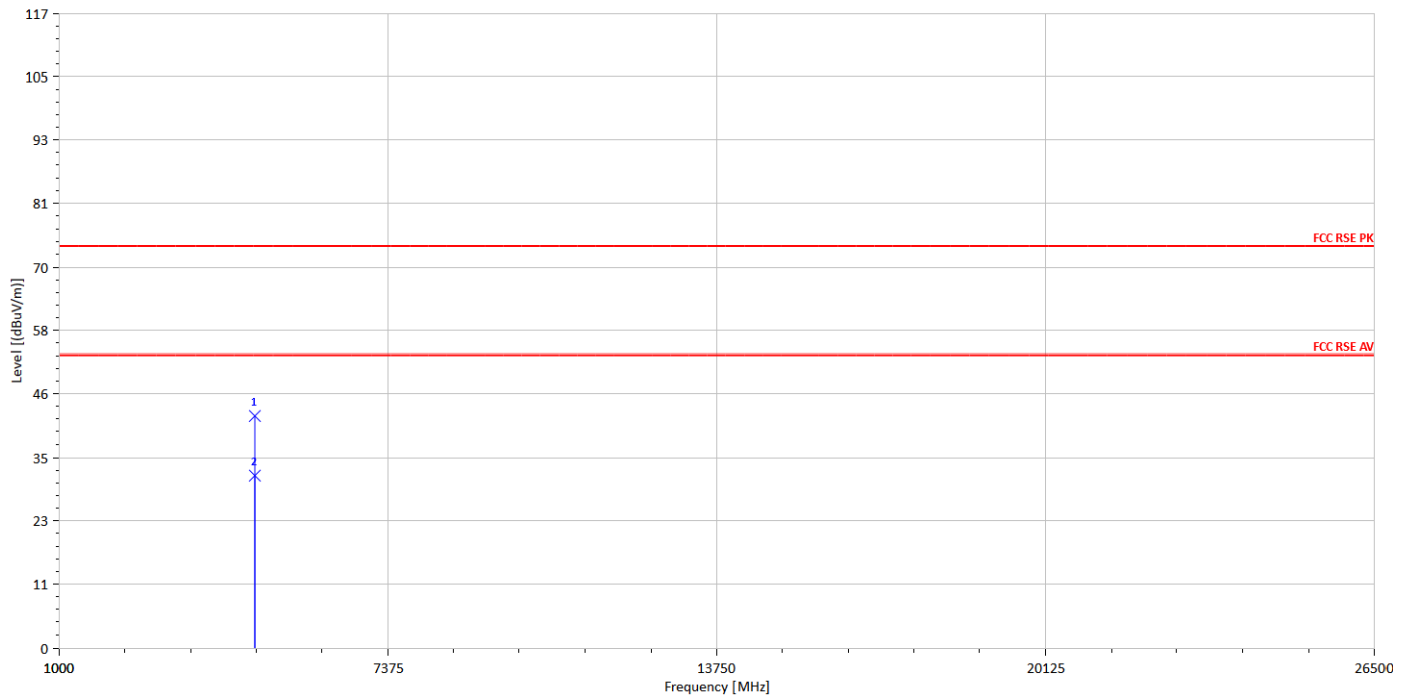
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Radiated Spurious Emission Measurement Result (BT4.0 mode) For Frequency above 1GHz

Operation Mode :	BT4.0	Test Date :	2016/3/22
Fundamental Frequency :	2402 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Low	Test Engineer :	Pony
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	
		PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4804.00	H	Peak	32.14	10.55	42.69	74	-31.31
4804.00	H	Average	21.21	10.55	31.76	54	-22.24

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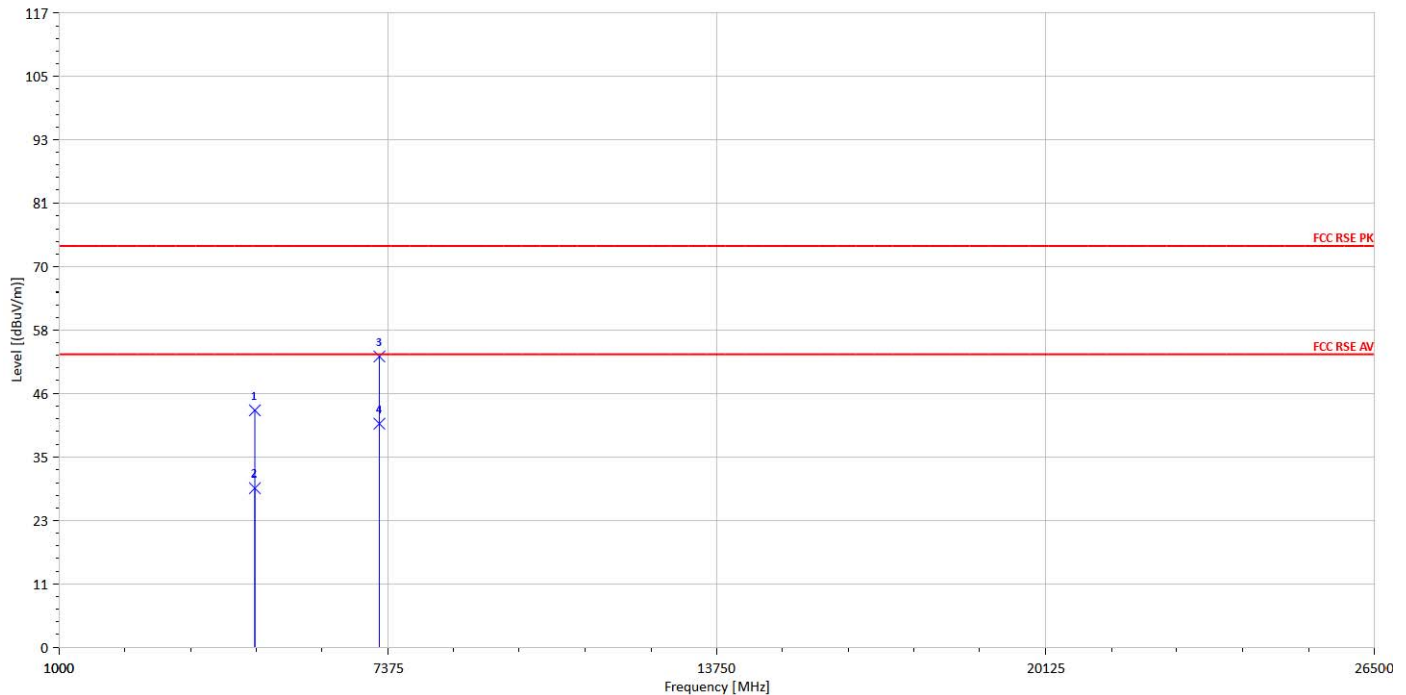
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Operation Mode : BT4.0 Test Date : 2016/3/22
Fundamental Frequency : 2402 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : Tx CH Low Test Engineer : Pony
EUT Pol. : H Measurement Antenna Pol. : Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
4804.00	H	Peak	33.19	10.55	43.74	74	-30.26
4804.00	H	Average	18.87	10.55	29.42	54	-24.58
7206.00	H	Peak	38.91	14.69	53.60	74	-20.40
7206.00	H	Average	26.57	14.69	41.26	54	-12.74

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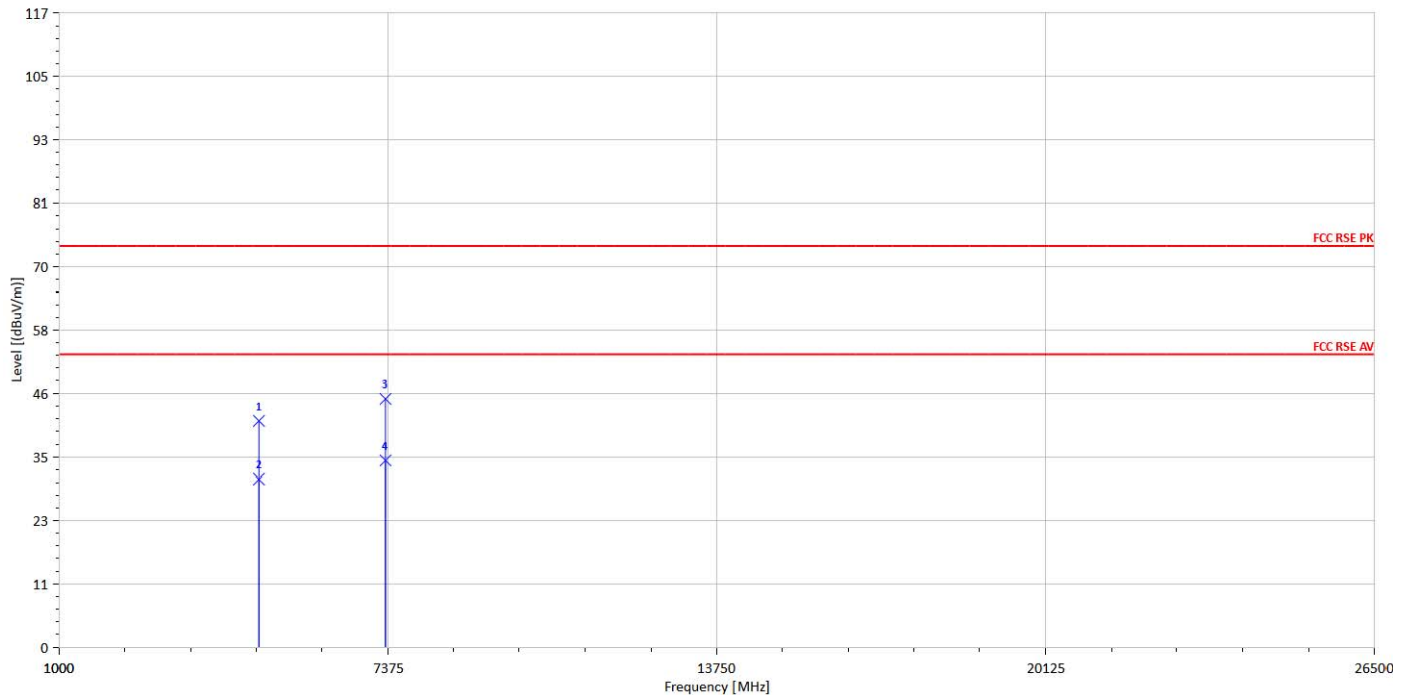
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Operation Mode : BT4.0 Test Date : 2016/3/22
Fundamental Frequency : 2442 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : Tx CH Mid Test Engineer : Pony
EUT Pol. : H Measurement Antenna Pol. : Vertical



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	
		PK/QP/AV	dBuV	dB	dBuV/m	dBuV/m	dB
4884.00	H	Peak	31.43	10.35	41.78	74	-32.22
4884.00	H	Average	20.67	10.35	31.02	54	-22.98
7326.00	H	Peak	31.60	14.28	45.88	74	-28.12
7326.00	H	Average	20.15	14.28	34.43	54	-19.57

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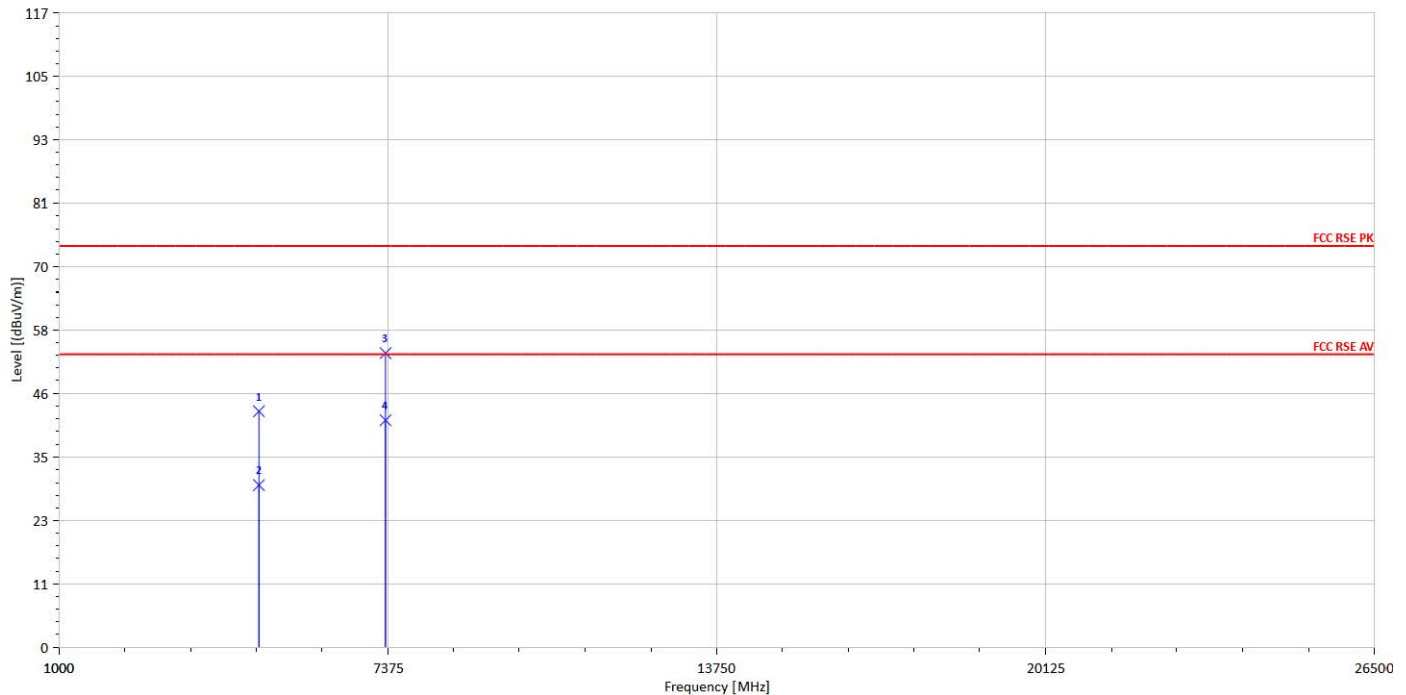
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Operation Mode : BT4.0 Test Date : 2016/3/22
Fundamental Frequency : 2442 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : Tx CH Mid Test Engineer : Pony
EUT Pol. : H Measurement Antenna Pol. : Horizontal



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	
		PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4884.00	H	Peak	33.23	10.35	43.58	74	-30.42
4884.00	H	Average	19.64	10.35	29.99	54	-24.01
7326.00	H	Peak	39.94	14.28	54.22	74	-19.78
7326.00	H	Average	27.62	14.28	41.90	54	-12.10

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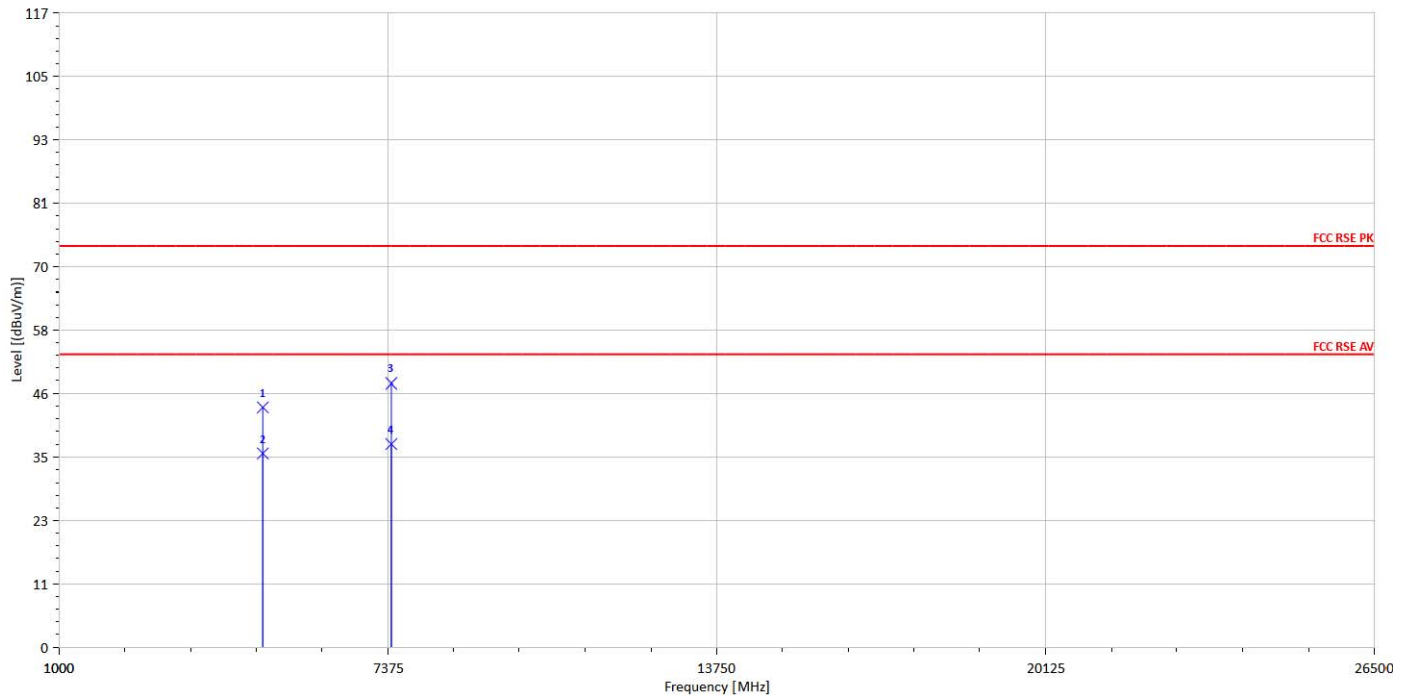
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Operation Mode :	BT4.0	Test Date :	2016/3/22
Fundamental Frequency :	2480 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH High	Test Engineer :	Pony
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4960.00	H	Peak	34.03	10.27	44.30	74	-29.70
4960.00	H	Average	25.45	10.27	35.72	54	-18.28
7440.00	H	Peak	34.00	14.67	48.67	74	-25.33
7440.00	H	Average	22.80	14.67	37.47	54	-16.53

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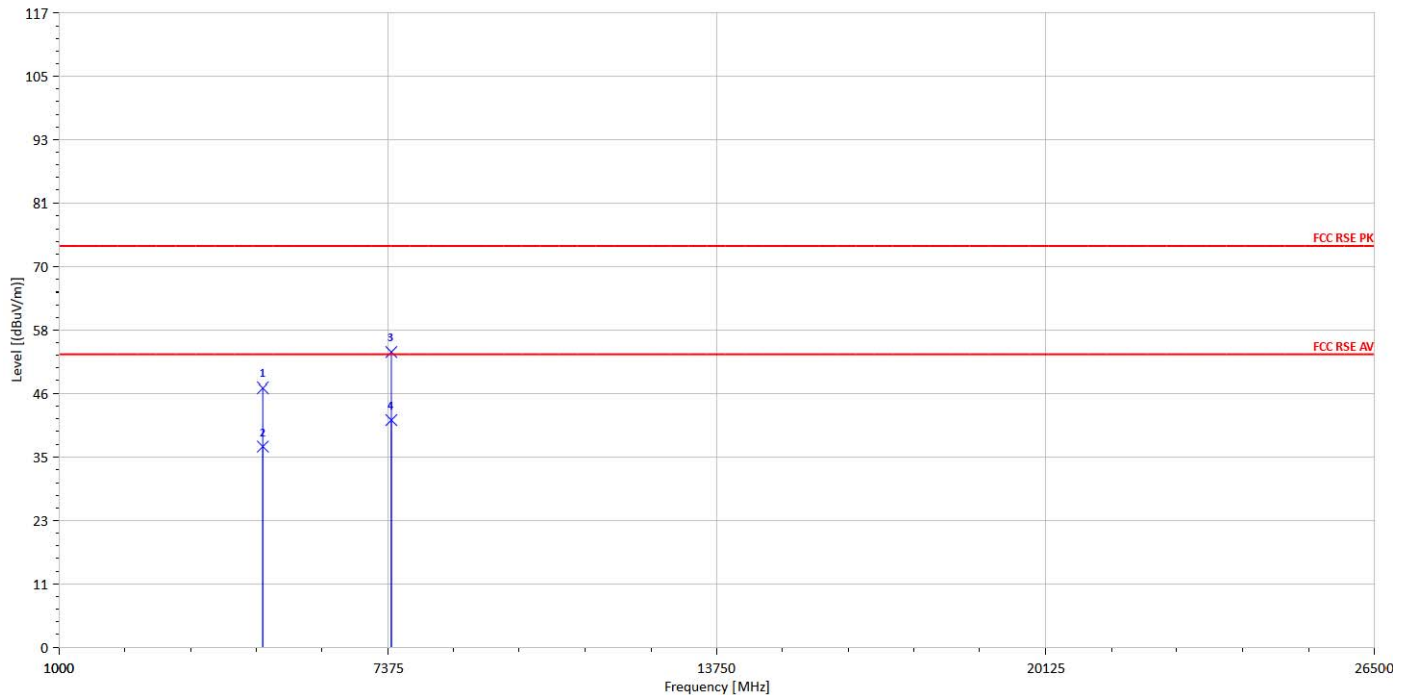
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Operation Mode : BT4.0 Test Date : 2016/3/22
Fundamental Frequency : 2480 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : Tx CH High Test Engineer : Pony
EUT Pol. : H Measurement Antenna Pol. : Horizontal



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4960.00	S	Peak	37.60	10.27	47.87	74	-26.13
4960.00	S	Average	26.73	10.27	37.00	54	-17.00
7440.00	S	Peak	39.76	14.67	54.43	74	-19.57
7440.00	S	Average	27.26	14.67	41.93	54	-12.07

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8 ANTENNA REQUIREMENT

8.1 Standard Applicable:

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

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

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.

8.2 Antenna Connected Construction:

An embedded-in antenna design is used.

The antenna connector is designed with unique type RF connector and 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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