

Report No.: ER/2014/90014-03 **Issue Date: Sep. 21, 2015** 

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## ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

# INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT AND INDUSTRY CANADA RSS-210 CLASS II PC REPORT

**Product Name:** Phonak TVLink II base **Marketing Name:** Phonak TVLink II base

**Brand Name:** Phonak

Model No.: Phonak TVLink II base

**Model Difference:** N/A

IC: 2262A-TVLINKII FCC ID: **KWC-TVLINKII Report No.:** ER/2014/90014-03

**Issue Date:** Sep. 21, 2015

**Rule Part:** §15.247, Cat: DSS

RSS-210 issue 8:2010, Annex 8

Prepared by: SGS Taiwan Ltd.

**Electronics & Communication Laboratory** 

No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan

24803

**FCC Prepared for:** Phonak Inc.

4520 Weaver Parkway, Warrenville 60555,

Illinois, United States.

**IC Prepared for:** Phonak Canada Ltd.

80 Courtneypark Dr W, Unit 1 Mississauga,

Ontario, Canada.



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### CERTIFICATION OF COMPLIANCE

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Illinois, United States.

**IC Applicant for:** Phonak Canada Ltd.

80 Courtneypark Dr W, Unit 1 Mississauga,

Ontario, Canada.

**Product Name:** Phonak TVLink II base **Marketing Name:** Phonak TVLink II base

**Brand Name:** Phonak

IC: 2262A-TVLINKII FCC ID: KWC-TVLINKII

**Model No.:** Phonak TVLink II base

**Model Difference:** N/A

File Number: ER/2014/90014-03

Date of test: Sep. 03, 2014 ~ Sep. 21, 2015

**Date of EUT Received:** Sep. 03, 2014

## We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (2009) and RSS-Gen. issue 3:2010, the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15C:2007, §15.247 and RSS-210 issue 8: 2010 Annex 8.

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

Test By:	Nick Lin	Date:	Sep. 21, 2015	
Prepared By:	Nick Lin / Engineer Karen Huang	Date:	Sep. 21, 2015	
Approved By:	Karen Huang / Clerk  Jim Chang / Asst. Manager	Date:	Sep. 21, 2015	

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### Version

Version No.	Date	Description
00	Sep. 21, 2015	Initial creation of document  Please refer to original report no.: ER/2014/90014.  Compared to previously approved product the following technical changes have been evaluated:  1. Change RF amplifier  Spot check on RF power output & Radiated Emission.

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### 1. GENERAL INFORMATION

## 1.1. Product Description

#### General:

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Product Name:	Phonak TVLink II base	
Marketing Name:	Phonak TVLink II base	
Brand Name: Phonak		
Model No.:	Phonak TVLink II base	
Model Difference:	N/A	
Hardware Version:	R2	
Software Version:	V1	
Power Supply:	5.0Vdc from Mini USB port	

#### Bluetooth:

	<u></u>		
Bluetooth Version:	V3.0		
Frequency Range:	2402 – 2480MHz		
Channel number:	79 channels		
Rated Power:	14.83dBm (Peak)		
Modulation type:	GFSK		
Antenna Designation:	Printed PCB Antenna; Gain:2.5dBi		
Type of Emission:	871KF7D (refer to test report ER/2014/90014)		

The EUT is compliance with Bluetooth V3.0 standard.

This test report applies for Bluetooth.

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#### 1.2. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: KWC-TVLINKII filing to comply with Section 15.247 of the FCC Part 15C, Subpart C Rules. And IC: 2262A-TVLINKII filing to comply with Industry Canada RSS-210 issue 8: 2010 Annex 8.

### **Test Methodology**

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4:2009. Radiated testing was performed at an antenna to EUT distance 3 meters. Tested in accordance with FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems

#### **Test Facility**

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei Country, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2009. FCC Registration Number: 990257. The address of SGS Taiwan Ltd. Electronics & Communication Laboratory 1F, No.134, Wukung Road New Taipei City TAIWAN 24803, Canada Registration Number: 4620A-5

The 10 m Open Area Test Sites located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd., Guishan Township, Taoyuan County, Taiwan which is constructed and calibrated to meet the CISPR 22/EN 55022 requirements. FCC Registration Number: 455997. The address of SGS Taiwan Ltd. Electronics & Communication Laboratory 1F, No.134, Wukung Road New Taipei City TAIWAN 24803,

IC Registration Number: 4620A-6.

#### 1.5. Special Accessories

Not available for this EUT intended for grant.

### **Equipment Modifications**

Not available for this EUT intended for grant.

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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

The EUT (Transmitter) was tested with a test program to fix the Tx/RX frequency that was for the purpose of the measurements. For more information please see test data and APPENDIX 1 for set-up photographs.

#### 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 plane. According to the requirements in Section 7.3.1 of ANSI C63.4-2009 and RSS-Gen: 2010. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and Average detector mode.

### 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 measure-ment antenna, according to the requirements in Section 8 and 13 of ANSI C63.4-2009 and DA 00-705.

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### 2.4. Configuration of Tested System

Fig. 2-1 Configuration of Tested System

**EUT** 

**Table 2-1 Equipment Used in Tested System** 

It	em	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
-	۱.	Bluetooth Test Software	N/A	N/A	N/A	N/A	N/A

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### 3. SUMMARY OF TEST RESULTS

FCC / IC Rules	Description Of Test	Result	
\$15.247(b)(1)/ RSS-210 issue 8,\$A8.4(2)	Peak Output Power	Compliant	
§15.247(d) RSS-210 issue 8,§A8.5	100 KHz Bandwidth Of Frequency Band Edges	Compliant	
\$15.247(c) RSS-Gen \$7.2.3 RSS-210 issue 8,\$A2.9	TX/RX Spurious Emission	Compliant	

### 4. DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition.

Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Channel low (2402MHz), mid (2441MHz) and high (2480MHz) with BR mode and DH5 highest data rate are chosen for full testing.

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### **MEASUREMENT UNCERTAINTY**

Test Items	Uncertainty	
AC Power Line Conducted Emission	+/- 2.586 dB	
Peak Output Power	+/- 1.55 dB	
20dB Bandwidth & 99% Power Bandwidth	+/- 123.36 Hz	
100 KHz Bandwidth Of Frequency Band Edges	+/- 1.55 dB	
Frequency Separation	+/- 123.36 Hz	
Number of hopping frequency	+/- 123.36 Hz	
Time of Occupancy	+/- 123.36 Hz	
Temperature	+/- 0.8 °C	
Humidity	+/- 4.7 %	
DC / AC Power Source	DC= +/- 1%, AC= +/- 0.2%	

Radiated Spurious Emission:

Rudiuca Sparious Emission.			
Measurement uncertainty (Polarization : Vertical)	30MHz - 180MHz: +/- 3.37dB		
	180MHz -417MHz: +/- 3.19dB		
	0.417GHz-1GHz: +/- 3.19dB		
(1 oranization : vertical)	1GHz - 18GHz: +/- 4.04dB		
	18GHz - 40GHz: +/- 4.04dB		

Measurement uncertainty (Polarization: <b>Horizontal</b> )	30MHz - 167MHz: +/- 4.22dB		
	167MHz -500MHz: +/- 3.44dB		
	0.5GHz-1GHz: +/- 3.39dB		
(1 olulization : 11011zolitai)	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:

According to §15.247(b)(1), For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, and all frequency hopping systems in the 5725-5850MHz band: 1Watt. For all other frequency hopping systems in the 2400 – 2483.5MHz band: 0.125 Watts.

According to RSS-210 issue 8,§A8.4(2), For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, the maximum conducted output power shall not exceed 1 W. For all other frequency hopping systems, the maximum peak conducted output power shall not exceed 0.125 W.

### **6.2.** Measurement Equipment Used:

Conducted Emission Test Site						
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.	
TYPE		NUMBER	NUMBER	CAL.		
Power Meter	Anritsu	ML2495A	1005007	12/20/2014	12/19/2015	
Power Sensor	Anritsu	MA2411B	917032	12/20/2014	12/19/2015	
Spectrum Analyzer	Agilent	E4446A	MY51100003	01/29/2015	01/28/2016	
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/02/2015	01/01/2016	
Spectrum Analyzer	Agilent	E4440A	MY45304525	05/05/2015	05/04/2016	
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2015	01/01/2016	
Attenuator	Mini-Circuit	BW-S10W2+	002	01/02/2015	01/01/2016	
Splitter	Agilent	11636B	N/A	01/02/2015	01/01/2016	

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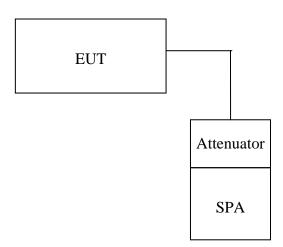
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### 6.3. Test Set-up:



#### **6.4.** Measurement Procedure:

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter or spectrum. (Max peak function, RBW> 20dB bandwidth, VBW>RBW)
- 3. Record the max. reading.
- 4. Repeat above procedures until all frequency measured were complete.

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#### 6.5. Measurement Result:

### BR mode (GFSK):

Frequency (MHz)	Reading Power (dBm)	Output Power (W)	Limit (W)
2402.00	14.83	0.03041	1
2441.00	13.33	0.02153	1
2480.00	11.93	0.01560	1

\*Offset: 1dB

\*Note: Measured by power meter

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#### 100KHz BANDWIDTH OF BAND EDGES MEASUREMENT

### 7.1. Standard Applicable:

According to §15.247(d), in any 100 KHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100KHz bandwidth within the band that contains the highest level of the desired power, 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).

According to RSS-210 issue 8,§A8.5, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced 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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 2 and 3 is not required. In addition, radiated emissions which fall in the restricted bands of Table 1 must also comply with the radiated emission limits specified in Tables 2 and 3.

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### 7.2. Measurement Equipment Used:

#### 7.2.1. Radiated emission:

966 Chamber					
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.
TYPE		NUMBER	NUMBER	CAL.	
EMI Test Receiver	R&S	ESCI7	100760	05/04/2015	05/03/2016
Spectrum Analyzer	Agilent	E4446A	MY51100003	01/29/2015	01/28/2016
EXA Spectrum  Analyzer	Agilent	N9010A	MY50420195	12/22/2014	12/21/2015
Spectrum Analyzer	R&S	FSV-30	101398	10/07/2014	10/06/2015
Loop Antenna	ETS.LINDGREN	6502	00143303	12/9/2014	12/08/2015
Bilog Antenna	SCHWAZBECK	VULB9168	378	12/23/2014	12/22/2015
Horn antenna	ETS.LINDGREN	3117	123995	05/05/2015	05/04/2016
Horn Antenna	Schwarzbeck	BBHA9170	184	12/25/2014	12/24/2015
Pre-Amplifier	Agilent	8447D	2944A07676	01/02/2015	01/01/2016
Pre-Amplifier	Agilent	8449B	3008A00578	01/02/2015	01/01/2016
Pre-Amplifier	EMC Instruments Corp.	EMC184045	980135	01/02/2015	01/01/2016
Filter 2400-2483.5 MHz	EWT	EWT-14-0166	M2	01/02/2015	01/01/2016
Attenuator	Mini-Circuit	BW-S10W2+	004	01/02/2015	01/01/2016
Turn Table	HD	DT420	N/A	N.C.R	N.C.R
Antenna Tower	ChamPro	AM-BS-4500-B	060776-ABS	N.C.R	N.C.R
Controller	ChamPro	EM1000	060776	N.C.R	N.C.R
Low Loss Cable	Huber Suhner	966_Rx	9	01/02/2015	01/01/2016
3m Site NSA	SGS	966 chamber	N/A	07/01/2015	06/30/2016

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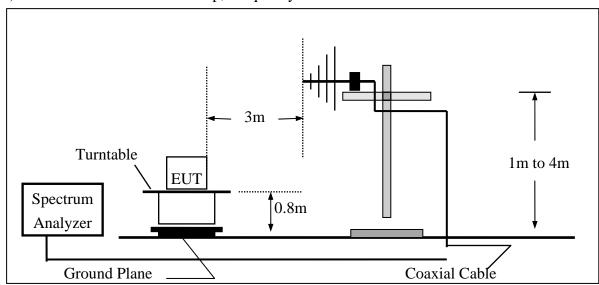
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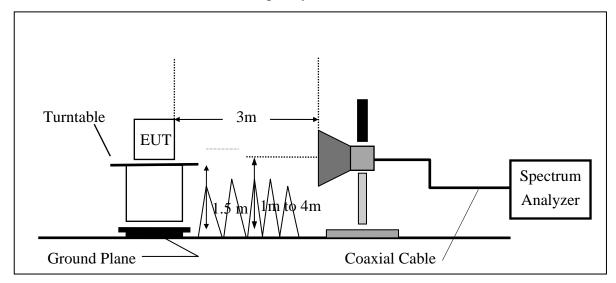
#### 7.3. Test SET-UP:

#### 7.3.1. Radiated emission:

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



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



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#### 7.4. Measurement Procedure:

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 3. Set center frequency of spectrum analyzer = operating frequency.
- 4. Set the spectrum analyzer as RBW, VBW=100KHz, Span=25MHz, Sweep = auto
- 5. Mark Peak, 2.390GHz and 2.4835GHz and record the max. level.
- 6. Repeat above procedures until all frequency measured were complete.

### 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	

#### 7.6. Measurement Result:

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

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Radiated Emission: (BR mode) (Hopping Mode)

**Operation Band** :BR+Hopping Test Date :2015-09-02 Fundamental Frequency :2402 MHz Temp./Humi. :23 deg\_C/62RH

Operation Mode :Bandedge LOW Engineer :Tin

EUT Pol. :E1 Plan Measurement Antenna Pol. :VERTICAL

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	$dB\mu V/m$	$dB\mu V/m$	dB
2390.00	E	Average	28.74	5.16	33.90	54.00	-20.10
2390.00	E	Peak	46.95	5.16	52.11	74.00	-21.89

**Operation Band** :BR+Hopping Test Date :2015-09-02 Fundamental Frequency :2402 MHz Temp./Humi. :23 deg\_C/62RH

Operation Mode :Bandedge LOW Engineer :Tin

EUT Pol. :E1 Plan Measurement Antenna Pol. :HORIZONTAL

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	$dB\mu V/m$	$dB\mu V/m$	dB
2390.00	E	Average	28.54	5.16	33.70	54.00	-20.30
2390.00	E	Peak	44.92	5.16	50.08	74.00	-23.92

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

 $Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$ 

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

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

"---": denotes Noise Floor.

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Operation Band :BR+Hopping Test Date :2014-09-12 **Fundamental Frequency** :2480 MHz Temp./Humi. :23 deg\_C/62RH

Operation Mode :Bandedge HIGH Engineer :Tin

EUT Pol. :E1 Plan :VERTICAL Measurement Antenna Pol.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Lev	vel	FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBμV/m	dB
2483.50	E	Average	28.90	6.01	34.91	54.00	-19.09
2483.50	E	Peak	49.04	6.01	55.05	74.00	-18.95
Operation Ba Fundamental Operation Mo EUT Pol.	Frequency	:BR+Hoppir :2480 MHz :Bandedge H :E1 Plan		Test Date Temp./Humi. Engineer Measurement A	ntenna Pol.	:2014-09-12 :23 deg_C/62 :Tin :HORIZON	2RH

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	$dB\mu V/m$	$dB\mu V/m$	dB
2483.50	E	Average	29.14	6.01	35.15	54.00	-18.85
2483.50	E	Peak	50.58	6.01	56.59	74.00	-17.41

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

 $Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$ 

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

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

"---": denotes Noise Floor.

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EUT Pol.

## FCC ID: KWC-TVLINKII IC: 2262A-TVLINKII

Report No.: ER/2014/90014-03 **Issue Date: Sep. 21, 2015** 

:HORIZONTAL

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Radiated Emission: (BR mode) (Non-Hopping Mode)

**Operation Band** Test Date :2015-09-02 :BR Fundamental Frequency :2402 MHz Temp./Humi. :23 deg\_C/62RH

Operation Mode :Bandedge LOW Engineer :Tin

EUT Pol. :E1 Plan Measurement Antenna Pol. :VERTICAL

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Lev	rel	FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	$dB\mu V/m$	dBµV/m	dB
2375.70	S	Average	31.92	5.13	37.05	54.00	-16.95
2375.70	S	Peak	50.46	5.13	55.59	74.00	-18.41
2390.00	E	Average	29.77	5.16	34.93	54.00	-19.07
2390.00	E	Peak	48.16	5.16	53.32	74.00	-20.68
Operation Bar Fundamental Operation Mo	Frequency	:BR :2402 MHz :Bandedge I		Test Date Temp./Humi. Engineer		:2015-09-02 :23 deg_C/62 :Tin	

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	$dB\mu V/m$	$dB\mu V/m$	dB
2375.80	S	Average	31.98	5.13	37.11	54.00	-16.89
2375.80	S	Peak	51.52	5.13	56.65	74.00	-17.35
2390.00	E	Average	29.16	5.16	34.32	54.00	-19.68
2390.00	E	Peak	48.73	5.16	53.89	74.00	-20.11

Measurement Antenna Pol.

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

:E1 Plan

 $Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$ 

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

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

"---": denotes Noise Floor.

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Report No.: ER/2014/90014-03 **Issue Date: Sep. 21, 2015** 

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Operation Band :BR Test Date :2015-09-02 Fundamental Frequency :2480 MHz Temp./Humi. :23 deg\_C/62RH

Operation Mode :Bandedge HIGH Engineer :Tin

EUT Pol. :E1 Plan Measurement Antenna Pol. :VERTICAL

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	$dB\mu V/m$	dBμV/m	dB
2483.50	E	Average	33.26	6.01	39.27	54.00	-14.73
2483.50	E	Peak	56.47	6.01	62.48	74.00	-11.52
Operation Ban	d	·BR	Tes	t Date		·2015-09-02	

Operation Band Fundamental Frequency :2480 MHz Temp./Humi. :23 deg\_C/62RH

Operation Mode :Bandedge HIGH Engineer

EUT Pol. :E1 Plan Measurement Antenna Pol. :HORIZONTAL

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	$dB\mu V/m$	$dB\mu V/m$	dB
2483.50	E	Average	33.69	6.01	39.70	54.00	-14.30
2483.50	E	Peak	59.12	6.01	65.13	74.00	-8.87

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

 $Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$ 

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

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

"---": denotes Noise Floor.

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Report No.: ER/2014/90014-03 Issue Date: Sep. 21, 2015

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### 8. SPURIOUS EMISSION TEST

### 8.1. Standard Applicable:

According to §15.247(c), all other emissions outside these bands shall not exceed the general radiated emission limits specified in §15.209(a). 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.

According to RSS-Gen §7.2.3 and RSS-210 issue 8,§A2.9, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced 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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 2 and 3 is not required. In addition, radiated emissions which fall in the restricted bands of Table 1 must also comply with the radiated emission limits specified in Tables 2 and 3.

### 8.2. Measurement Equipment Used:

#### 8.2.1. Radiated emission:

Refer to section 7.2.1 for details.

#### 8.3. Test SET-UP:

#### 8.3.1. Radiated emission:

Refer to section 8.3.1 for details.

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#### 8.4. Measurement Procedure:

- 1. The EUT was placed on a turn table which is 1.5m above ground plane.
- 2. 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 highest emissions.
- 4. 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.
- 5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 6. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 7. Repeat above procedures until all frequency measured were complete.

### 8.5. 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	

#### **8.6.** Measurement Result:

Note: Refer to next page.

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Report No.: ER/2014/90014-03 **Issue Date: Sep. 21, 2015** 

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# **Radiated Spurious Emission Measurement Result** (For frequency 30~1000MHz)

**Operation Band** Test Date :2015-09-02 :BR **Fundamental Frequency** :2402 MHz Temp./Humi. :23 deg\_C/62RH

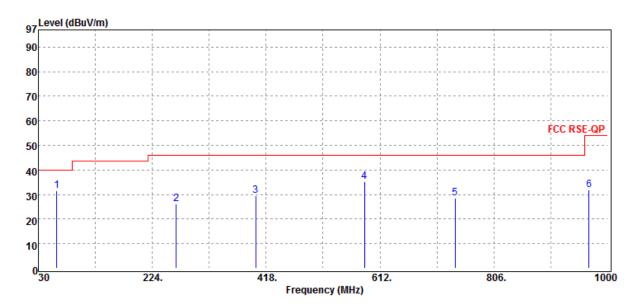
Operation Mode :TX LOW Engineer : Jerry EUT Pol. :E1 Plan Measurement Antenna Pol. :VERTICAL

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

 $Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$ 

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

"E": denotes Band Edge Frequency.; "S": denotes Spurious Frequency. "---": denotes Noise Floor.



Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
	Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	F/H/E/S	dΒμV	dB	$dB\mu V/m$	$dB\mu V/m$	dB
61.04	S	Peak	41.79	-10.33	31.46	40.00	-8.54
264.74	S	Peak	35.39	-9.30	26.09	46.00	-19.91
400.54	S	Peak	35.52	-6.00	29.52	46.00	-16.48
585.81	S	Peak	36.93	-1.68	35.25	46.00	-10.75
740.04	S	Peak	28.89	-0.41	28.48	46.00	-17.52
967.99	S	Peak	28.21	3.66	31.87	54.00	-22.13

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Operation Band :BR Test Date :2015-09-02 Fundamental Frequency :2402 MHz Temp./Humi. :23 deg\_C/62RH

Operation Mode Engineer :TX LOW : Jerry

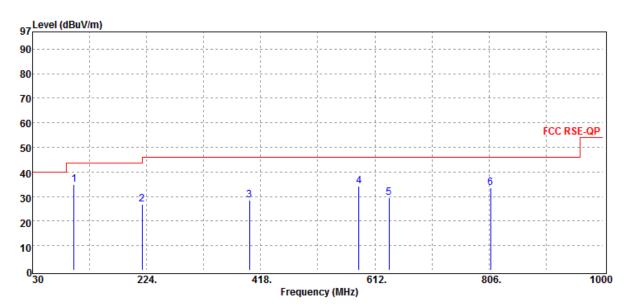
EUT Pol. :E1 Plan Measurement Antenna Pol. :HORIZONTAL

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

 $Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)$ 

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

"E": denotes Band Edge Frequency.; "S": denotes Spurious Frequency. "---": denotes Noise Floor.



Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin	
	Mode		Reading Level		FS	@3m		
MHz	PK/QP/AV	F/H/E/S	dΒμV	dB	$dB\mu V/m$	$dB\mu V/m$	dB	
100.81	S	Peak	48.95	-14.13	34.82	43.50	-8.68	
216.24	S	Peak	38.10	-11.13	26.97	46.00	-19.03	
398.60	S	Peak	34.60	-6.03	28.57	46.00	-17.43	
584.84	S	Peak	35.99	-1.75	34.24	46.00	-11.76	
636.25	S	Peak	31.79	-2.20	29.59	46.00	-16.41	
808.91	S	Peak	33.14	0.36	33.50	46.00	-12.50	

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Operation Band :BR Test Date :2015-09-02 Fundamental Frequency :2441 MHz Temp./Humi. :23 deg\_C/62RH

Operation Mode Engineer :TX MID : Jerry

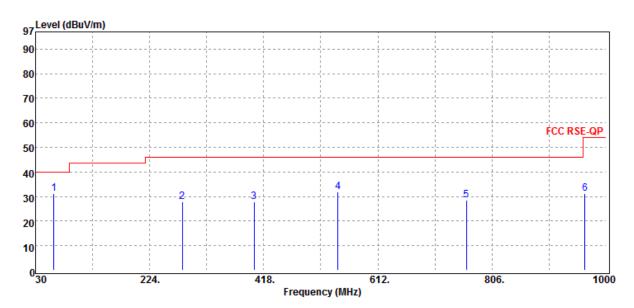
EUT Pol. :E1 Plan Measurement Antenna Pol. :VERTICAL

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

 $Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)$ 

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

"E": denotes Band Edge Frequency.; "S": denotes Spurious Frequency. "---": denotes Noise Floor.



Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
	Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	F/H/E/S	dΒμV	dB	$dB\mu V/m$	$dB\mu V/m$	dB
61.04	S	Peak	41.63	-10.33	31.30	40.00	-8.70
279.29	S	Peak	36.44	-8.42	28.02	46.00	-17.98
401.51	S	Peak	33.88	-5.98	27.90	46.00	-18.10
544.10	S	Peak	35.84	-4.01	31.83	46.00	-14.17
762.35	S	Peak	27.53	1.14	28.67	46.00	-17.33
964.11	S	Peak	27.65	3.69	31.34	54.00	-22.66

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Operation Band :BR Test Date :2015-09-02 **Fundamental Frequency** :2441 MHz Temp./Humi. :23 deg\_C/62RH

Operation Mode :TX MID Engineer : Jerry

EUT Pol. :E1 Plan Measurement Antenna Pol. :HORIZONTAL

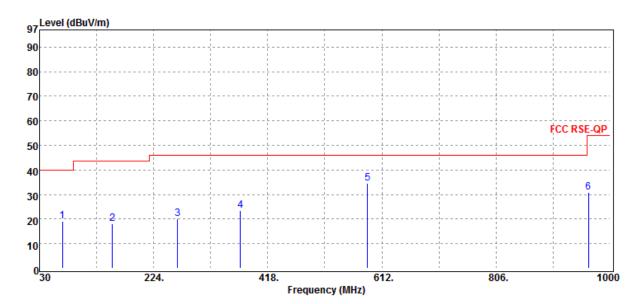
Actual  $FS(dB\mu V/m) = SPA$ . Reading level $(dB\mu V) + Factor(dB)$ 

 $Factor(dB) = Antenna \; Factor(dB\mu\,V/m) + Cable \; Loss(dB) - Pre\_Amplifier \; Gain(dB)$ 

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

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

"---": denotes Noise Floor.



Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
	Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	F/H/E/S	dΒμV	dB	$dB\mu V/m$	$dB\mu V/m$	dB
68.80	S	Peak	30.72	-11.50	19.22	40.00	-20.78
154.16	S	Peak	27.04	-9.07	17.97	43.50	-25.53
264.74	S	Peak	29.49	-9.30	20.19	46.00	-25.81
371.44	S	Peak	30.34	-6.76	23.58	46.00	-22.42
587.75	S	Peak	36.16	-1.60	34.56	46.00	-11.44
963.14	S	Peak	27.24	3.70	30.94	54.00	-23.06

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Operation Band :BR Test Date :2015-09-02 Fundamental Frequency :2480 MHz Temp./Humi. :23 deg\_C/62RH

Operation Mode Engineer :TX HIGH : Jerry

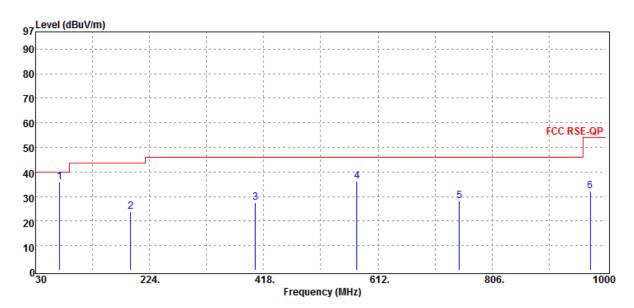
EUT Pol. :E1 Plan Measurement Antenna Pol. :VERTICAL

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

 $Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)$ 

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

"E": denotes Band Edge Frequency.; "S": denotes Spurious Frequency. "---": denotes Noise Floor.



Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin	
	Mode		Reading Level		FS	@3m		
MHz	PK/QP/AV	F/H/E/S	dΒμV	dB	$dB\mu V/m$	$dB\mu V/m$	dB	
70.74	S	Peak	47.79	-11.79	36.00	40.00	-4.00	
191.99	S	Peak	35.34	-11.65	23.69	43.50	-19.81	
403.45	S	Peak	33.39	-5.96	27.43	46.00	-18.57	
576.11	S	Peak	38.76	-2.49	36.27	46.00	-9.73	
750.71	S	Peak	27.71	0.34	28.05	46.00	-17.95	
972.84	S	Peak	28.60	3.56	32.16	54.00	-21.84	

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Report No.: ER/2014/90014-03 **Issue Date: Sep. 21, 2015** 

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Operation Band :BR Test Date :2015-09-02 **Fundamental Frequency** :2480 MHz Temp./Humi. :23 deg\_C/62RH

Operation Mode :TX HIGH Engineer : Jerry

EUT Pol. :E1 Plan Measurement Antenna Pol. :HORIZONTAL

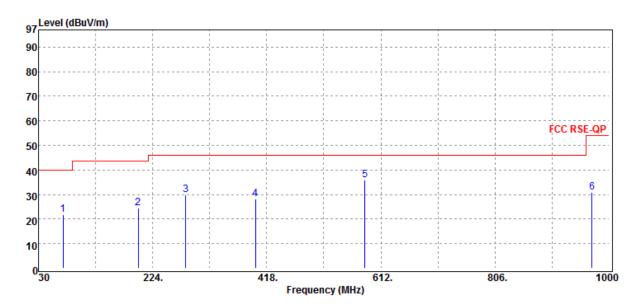
Actual  $FS(dB\mu V/m) = SPA$ . Reading level $(dB\mu V) + Factor(dB)$ 

 $Factor(dB) = Antenna \; Factor(dB\mu\,V/m) + Cable \; Loss(dB) - Pre\_Amplifier \; Gain(dB)$ 

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

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

"---": denotes Noise Floor.



Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
	Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	F/H/E/S	dΒμV	dB	$dB\mu V/m$	$dB\mu V/m$	dB
71.71	S	Peak	33.72	-11.95	21.77	40.00	-18.23
199.75	S	Peak	36.24	-11.79	24.45	43.50	-19.05
280.26	S	Peak	38.14	-8.38	29.76	46.00	-16.24
398.60	S	Peak	34.12	-6.03	28.09	46.00	-17.91
584.84	S	Peak	37.56	-1.75	35.81	46.00	-10.19
970.90	S	Peak	27.31	3.60	30.91	54.00	-23.09

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## (For frequency above 1000MHz)

**Operation Band** Test Date :2015-09-02 :BR **Fundamental Frequency** :2402 MHz Temp./Humi. :23 deg\_C/62RH

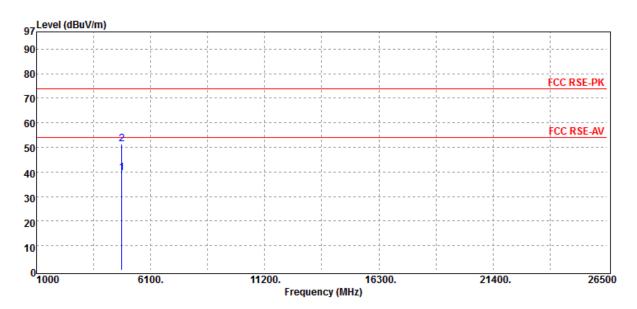
Operation Mode :TX LOW Engineer : Jerry EUT Pol. :E1 Plan Measurement Antenna Pol. :VERTICAL

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

 $Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$ 

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

"E": denotes Band Edge Frequency.; "S": denotes Spurious Frequency. "---": denotes Noise Floor.



Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
	Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	F/H/E/S	dΒμV	dB	$dB\mu V/m$	$dB\muV/m$	dB
4804.00	Н	Average	30.17	9.56	39.73	54.00	-14.27
4804.00	Н	Peak	41.84	9.56	51.40	74.00	-22.60

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Report No.: ER/2014/90014-03 **Issue Date: Sep. 21, 2015** 

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Operation Band :BR Test Date :2015-09-02 Fundamental Frequency :2402 MHz Temp./Humi. :23 deg\_C/62RH

Operation Mode :TX LOW Engineer : Jerry

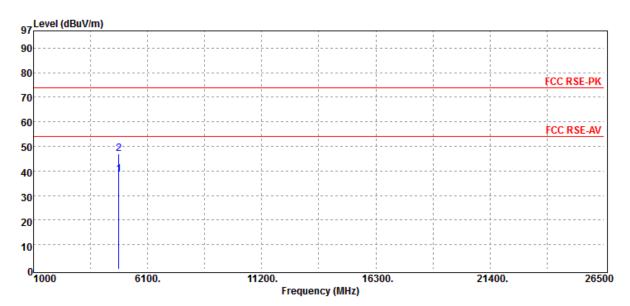
EUT Pol. :E1 Plan Measurement Antenna Pol. :HORIZONTAL

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

 $Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)$ 

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

"E": denotes Band Edge Frequency.; "S": denotes Spurious Frequency. "---": denotes Noise Floor.



Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
	Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	F/H/E/S	dΒμV	dB	$dB\mu V/m$	$dB\mu V/m$	dB
4804.00	Н	Average	28.97	9.56	38.53	54.00	-15.47
4804.00	Н	Peak	37.35	9.56	46.91	74.00	-27.09
	MHz 4804.00	Mode MHz PK/QP/AV  4804.00 H	Mode MHz PK/QP/AV F/H/E/S  4804.00 H Average	Mode Reading Level MHz PK/QP/AV F/H/E/S dBμV  4804.00 H Average 28.97	Mode Reading Level  MHz PK/QP/AV F/H/E/S dBμV dB  4804.00 H Average 28.97 9.56	Mode         Reading Level         FS           MHz         PK/QP/AV         F/H/E/S         dBμV         dB         dBμV/m           4804.00         H         Average         28.97         9.56         38.53	Mode         Reading Level         FS         @3m           MHz         PK/QP/AV         F/H/E/S         dBμV         dB         dBμV/m         dBμV/m           4804.00         H         Average         28.97         9.56         38.53         54.00

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Report No.: ER/2014/90014-03 **Issue Date: Sep. 21, 2015** 

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Operation Band :BR Test Date :2015-09-02 Fundamental Frequency :2441 MHz Temp./Humi. :23 deg\_C/62RH

Operation Mode :TX MID Engineer : Jerry

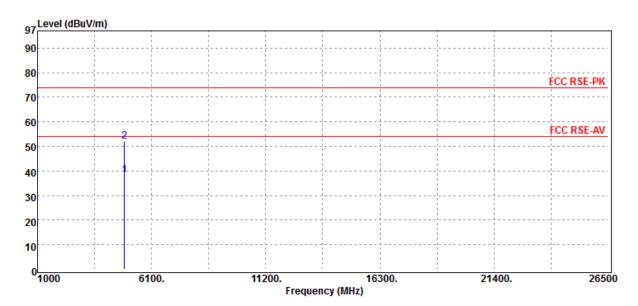
EUT Pol. :E1 Plan Measurement Antenna Pol. :VERTICAL

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

 $Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)$ 

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

"E": denotes Band Edge Frequency.; "S": denotes Spurious Frequency. "---": denotes Noise Floor.



Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
	Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	F/H/E/S	dΒμV	dB	$dB\mu V/m$	$dB\mu V/m$	dB
4882.00	Н	Average	28.56	9.85	38.41	54.00	-15.59
4882.00	Н	Peak	42.14	9.85	51.99	74.00	-22.01

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Operation Band :BR Test Date :2015-09-02 **Fundamental Frequency** :2441 MHz Temp./Humi. :23 deg\_C/62RH

Operation Mode :TX MID Engineer : Jerry

EUT Pol. :E1 Plan Measurement Antenna Pol. :HORIZONTAL

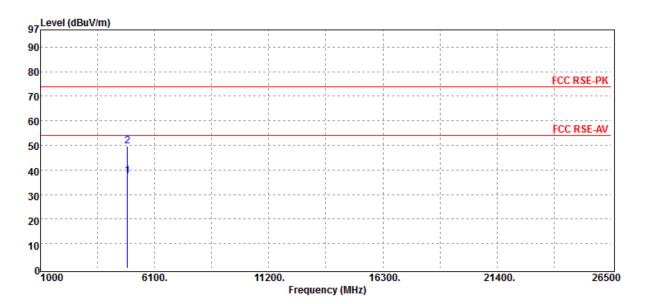
Actual  $FS(dB\mu V/m) = SPA$ . Reading level $(dB\mu V) + Factor(dB)$ 

 $Factor(dB) = Antenna \; Factor(dB\mu V/m) + Cable \; Loss(dB) - Pre\_Amplifier \; Gain(dB)$ 

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

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

"---": denotes Noise Floor.



Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
	Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	F/H/E/S	dΒμV	dB	$dB\mu V/m$	$dB\mu V/m$	dB
4882.00	Н	Average	27.74	9.85	37.59	54.00	-16.41
4882.00	Н	Peak	39.81	9.85	49.66	74.00	-24.34

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Operation Band :BR Test Date :2015-09-02 Fundamental Frequency :2480 MHz Temp./Humi. :23 deg\_C/62RH

Operation Mode :TX HIGH Engineer : Jerry

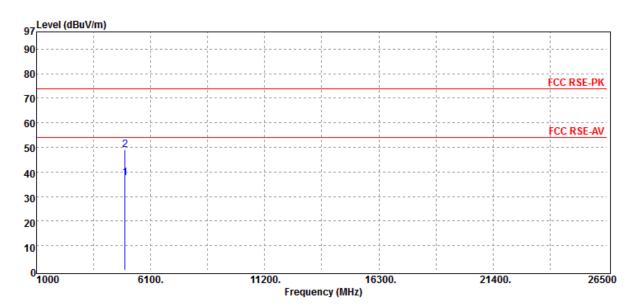
EUT Pol. :E1 Plan Measurement Antenna Pol. :VERTICAL

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

 $Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)$ 

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

"E": denotes Band Edge Frequency.; "S": denotes Spurious Frequency. "---": denotes Noise Floor.



Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin	
	Mode		Reading Level		FS	@3m		
MHz	PK/QP/AV	F/H/E/S	dΒμV	dB	$dB\mu V/m$	$dB\mu V/m$	dB	
4960.00	Н	Average	27.81	9.86	37.67	54.00	-16.33	
4960.00	Н	Peak	39.15	9.86	49.01	74.00	-24.99	

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Operation Band :BR Test Date :2015-09-02 **Fundamental Frequency** :2480 MHz Temp./Humi. :23 deg\_C/62RH

Operation Mode :TX MID Engineer : Jerry

EUT Pol. :E1 Plan Measurement Antenna Pol. :HORIZONTAL

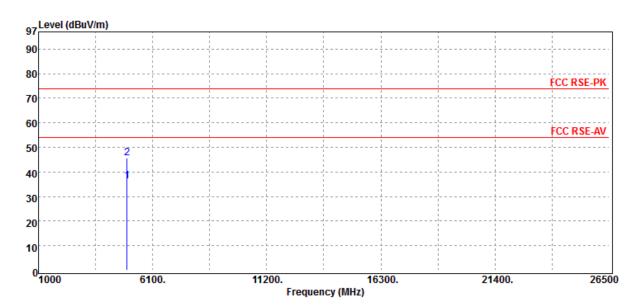
Actual  $FS(dB\mu V/m) = SPA$ . Reading level $(dB\mu V) + Factor(dB)$ 

 $Factor(dB) = Antenna \; Factor(dB\mu V/m) + Cable \; Loss(dB) - Pre\_Amplifier \; Gain(dB)$ 

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

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

"---": denotes Noise Floor.



Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
	Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	F/H/E/S	dΒμV	dB	$dB\mu V/m$	$dB\mu V/m$	dB
4960.00	Н	Average	26.25	9.86	36.11	54.00	-17.89
4960.00	Н	Peak	35.91	9.86	45.77	74.00	-28.23

~ End of Report ~

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