

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

Product Name: 2.4 GHz Wireless Keypad

Brand Name: ORtek

Model No.: WKP-3290

Model Difference: N/A

FCC ID: GM8WKP3290

Report No.: E2/2013/B0024

Issue Date: Dec. 24, 2013

FCC Rule Part: §15.249

Prepared for: ORtek Technology Inc.
13F, Number 150, Jian-Yi Rd. , Zhonghe Dist.,
New Taipei City, Taiwan, R.O.C.

Prepared by: SGS Taiwan Ltd.
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VERIFICATION OF COMPLIANCE

Applicant: ORtek Technology Inc.
 13F, Number 150, Jian-Yi Rd. , Zhonghe Dist., New Taipei City, Taiwan,
 R.O.C.

Product Name: 2.4 GHz Wireless Keypad

Brand Name: ORtek

Model No.: WKP-3290

Model Difference: N/A

FCC ID: GM8WKP3290

File Number: E2/2013/B0024




Date of test: Nov. 14, 2013 ~ Dec. 16, 2013

Date of EUT Received: Nov. 14, 2013

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 C63.4 2009 and 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 15.249.

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

Test By:	 <hr/> <i>Jazz Huang / Sr. Engineer</i>	Date:	Dec. 24, 2013
Prepared By:	 <hr/> <i>Violetta Tang / Clerk</i>	Date:	Dec. 24, 2013
Approved By:	 <hr/> <i>Jim Chang / Supervisor</i>	Date:	Dec. 24, 2013

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Version

Version No.	Date	Description
00	Dec. 24, 2013	Initial creation of document

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1. GENERAL INFORMATION

1.1 Product Description

Product Name:	2.4 GHz Wireless Keypad	
Brand Name:	ORtek	
Model No.:	WKP-3290	
Model Difference:	N/A	
Transmit Power	94.93dBuV/m	
Operation Frequency:	2408 ~ 2474MHz	
Channel number:	34 channels	
Channel space:	2MHz	
Modulation Type:	FSK	
Hardware Version:	Keyboard:1.0	
Software Version:	Keyboard:1.0	
Power Supply:	1.5Vdc from AAA battery*1	
	Battery:	Model No.: N/A, Supplier: N/A
Antenna Designation:	Printed Antenna	

This report complies with FCC 15.249

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1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: **GM8WKP3290** filing to comply with Section 15.249 of the FCC Part 15, Subpart C Rules.

1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 2009. Radiated testing was performed at an antenna to EUT distance 3 meters.

1.4 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 is: 990257, Canada Registration Number: 4620A-4.

The 10 m Open Area Test Sites located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No. 29, Pau-Tou-Tsuo Valley Chia-Pau Tsuen, Linkou Hsiang, Taipei county, which is constructed and calibrated to meet the CISPR 22/EN 55022 requirements. SGS Site No. 1(3 &10 meters) and FCC Registration Number: 94644.

1.5 Special Accessories

There is no special accessory 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

The Transmitter was operated in the engineering operating mode. The TX frequency was fixed which was for the purpose of the measurements.

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. 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 which is 0.8 m above ground plane. 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 according to the requirements in Section 8 and 13 of ANSI C63.4-2009.

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2.4 Limitation

(1) Conducted Emission

According to section 15.207(a) Conducted Emission Limits is as following.

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 – 0.5	66 - 56	56 - 46
0.5 – 5	56	46
5 - 30	60	50

(2) Radiated Emission 15.249(a)

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following.

Frequency (MHz)	Field strength of Fundamental	Field strength of Harmonics	Distance (m)
902 – 928	50 mV/m (94dBuV/m)	500 uV/m (54dBuV/m)	3
2400 – 2483.5	50 mV/m (94dBuV/m)	500 uV/m (54dBuV/m)	3
5725 – 5875	50 mV/m (94dBuV/m)	500 uV/m (54dBuV/m)	3
24.0 – 24.25 GHz	250 mV/m (107.95dBuV/m)	2500 uV/m (67.95dBuV/m)	3

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(3) Radiated Emission 15.249 (d)

Emission Radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in Section 15.209 as below, whichever is the lesser attenuation.

Frequency (MHz)	Field strength $\mu\text{V/m}$	Distance (m)	Field strength at 3m $\text{dB}\mu\text{V/m}$
1.705-30	30	30	69.54
30-88	100	3	40
88-216	150	3	43.5
216-960	200	3	46
Above 960	500	3	54

(4) Radiated Emission 15.249(e)

For frequencies above 1000MHz, the above field strength limits are based on average limits. The peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20dB under any condition of modulation.

- Remark:
1. Emission level in $\text{dB}\mu\text{V/m} = 20 \log (\mu\text{V/m})$
 2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
 3. Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of ξ 15.205
 4. Emission spurious frequency which appearing within the Restricted Bands specified in provision of ξ 15.205, then the general radiated emission limits in ξ 15.209 apply.

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2.5 Configuration of Tested System

Fig. 2-1 Configuration

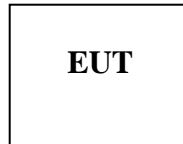


Table 2-2 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.
1.	N/A	N/A	N/A	N/A

Note: All the above equipment/cables were placed in worse case positions to maximize emission signals during emission test.

Grounding: Grounding was in accordance with the manufacturer's requirements and conditions for the intended use.

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3. Summary of Test Results

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Emission	N/A
§15.249(a)(e)	Radiated Emission	Compliant
§15.249(d)	20dB bandwidth Measurement	Compliant

4. Description of test modes

The EUT has been tested under operating condition.

The EUT is staying in continuous transmitting mode.

Channel lowest (2408MHz), Mid (2440MHz), Highest (2474MHz) and Standby modes were chosen for full testing.

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5. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
20dB Bandwidth	+/- 123.36 Hz
100 KHz Bandwidth Of Frequency Band Edges	+/- 1.55 dB
Temperature	+/- 0.8 °C
Humidity	+/- 4.7 %
DC / AC Power Source	DC= +/- 1%, 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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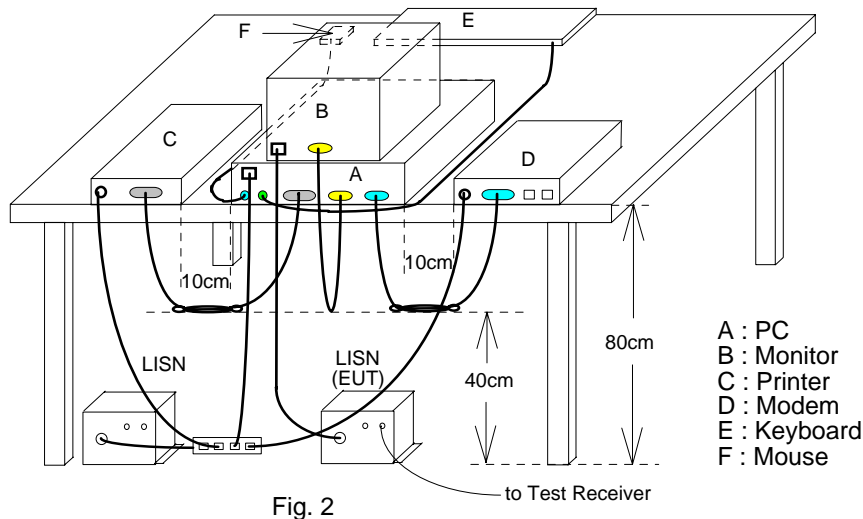
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6. Conducted Emissions Test

6.1 Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

6.2 Test SET-UP (Block Diagram of Configuration)



6.3 Measurement Equipment Used:

SGS Conducted Emission Test Site No.A					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
EMI Test Receiver	R&S	ESCI 7	100924	05/10/2013	05/09/2014
Coaxial Cables	N/A	N30N30-1042-150cm	N/A	02/07/2013	02/06/2014
LISN	SCHWARZBECK	NSLK 8127	8127-648	06/17/2012	06/16/2014
Pulse Limit	narda	PL01	1110X30602	08/14/2013	08/13/2014
Test Software	Farad	EZ-EMC	Ver. SGS-03A1	N.C.R.	N.C.R.

6.4 Measurement Result:

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

Test Result: N/A, this device is powered by battery.

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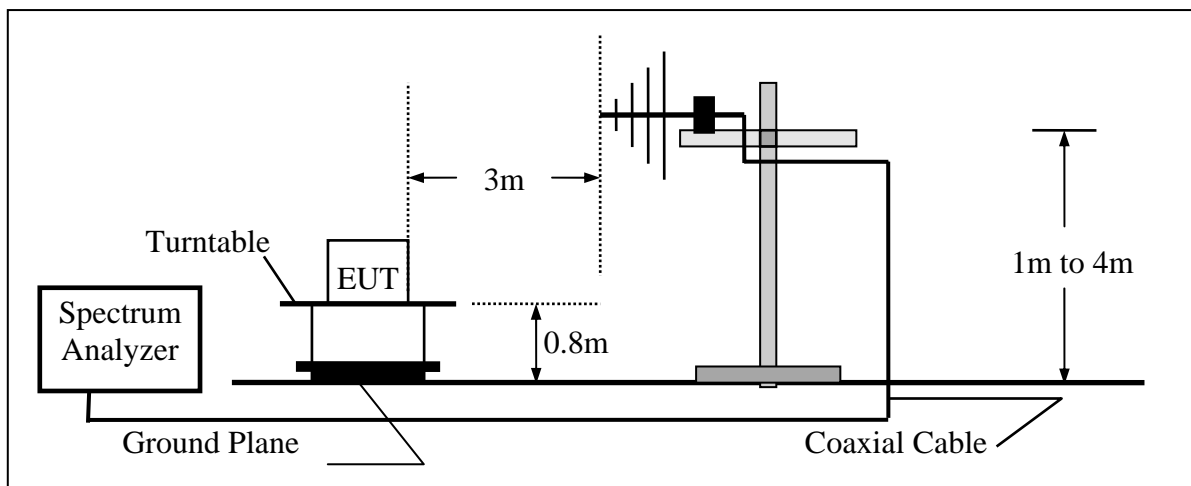
7. Radiated Emission Test

7.1 Measurement Procedure

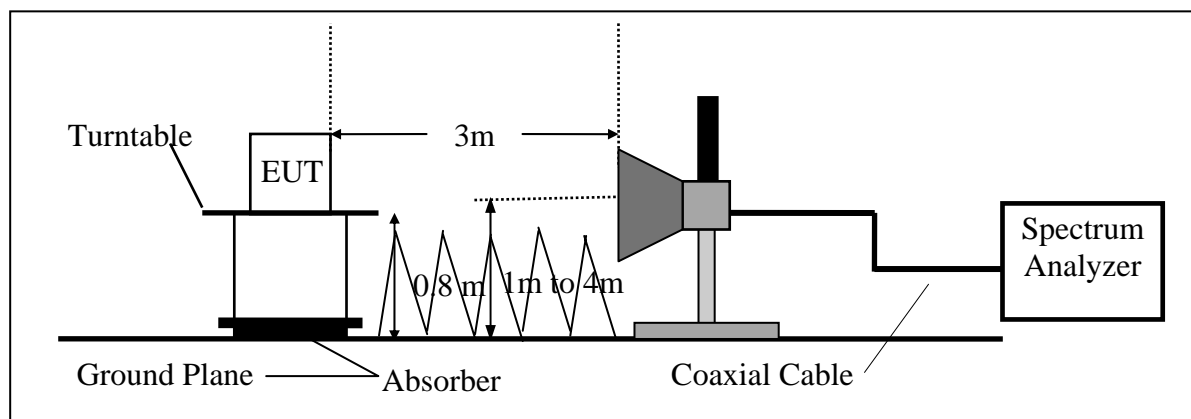
1. The EUT was placed on a turntable that is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measured were complete.

7.2 Test SET-UP (Block Diagram of Configuration)

(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 Equipment Used:

SGS SAC Chamber No.C (FCC)					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
EMI Test Receiver	R&S	ESU 40	100363	01/30/2013	01/29/2014
Broadband Antenna	TESEQ	CBL 6112D	35240	02/04/2013	02/03/2014
Horn Antenna	ETS-Lindgren	3117	00143272	01/16/2013	01/15/2014
Horn Antenna	ETS-Lindgren	3160-09	00117911	02/14/2013	02/13/2014
Pre-Amplifier	R&S	SCU-18	10203	01/21/2013	01/20/2014
Pre-Amplifier	EM Electronics Corp.	EMC330	980096	01/04/2013	01/03/2014
Pre-Amplifier	EM Electronics Corp.	EMC184045	980135	01/28/2013	01/27/2014
Coaxial Cable	Huber+Suhner	SAC-C TX-30M-1GHz	TX1	04/22/2013	04/21/2014
Coaxial Cable	Huber+Suhner	SAC-C TX-1-26.5GHz	TX2	04/22/2013	04/21/2014
Coaxial Cable	Huber+Suhner	SAC-C RX-150k-30MHz	RX1	04/22/2013	04/21/2014
Coaxial Cable	Huber+Suhner	SAC-C RX-30M-1GHz	RX2	04/22/2013	04/21/2014
Coaxial Cable	Huber+Suhner	SAC-C RX-1-26.5GHz	RX3	04/22/2013	04/21/2014
Controller	Chance Most	886	N/A	N.C.R.	N.C.R.
Antenna Master	Chance Most	N/A	N/A	N.C.R.	N.C.R.
Turn Table	Chance Most	N/A	N/A	N.C.R.	N.C.R.
Filter Bank	R&S	TS8996	SCIN.EMC.1023.12	04/22/2013	04/21/2014
Test Software	World-Pallas	Dr. E	V 3.0 Lite	N.C.R.	N.C.R.

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	

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7.6 Measurement Result

Radiated Spurious Emission Measurement Result (MAIN)

Operation Band	:2.4G	Test Date	:2013-12-16
Fundamental Frequency	:2408 MHz	Temp./Humi.	:22 deg_C / 52 RH
Operation Mode	:MAIN LOW	Engineer	:Vito
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

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.

“---“ : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV/m	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Safe Margin dB
2407.52	F	F	91.47	-5.00	86.48	114.00	-27.52
2407.52	F	F	88.49	-5.00	83.49	94.00	-10.51

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Operation Band	:2.4G	Test Date	:2013-12-16
Fundamental Frequency	:2408 MHz	Temp./Humi.	:22 deg_C / 52 RH
Operation Mode	:MAIN LOW	Engineer	:Vito
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

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.

“---” : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV/m	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Safe Margin dB
2408.57	F	Peak	97.08	-4.99	92.09	114.00	-21.91
2408.57	F	Average	93.83	-4.99	88.84	94.00	-5.16

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Operation Band	:2.4G	Test Date	:2013-12-16
Fundamental Frequency	:2440 GHz	Temp./Humi.	:22 deg_C / 52 RH
Operation Mode	:MAIN MID	Engineer	:Vito
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

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.

“---“ : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV/m	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Safe Margin dB
2440.36	F	Peak	93.39	-4.89	88.50	114.00	-25.50
2440.36	F	Average	89.48	-4.89	84.59	94.00	-9.41

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Operation Band	:2.4G	Test Date	:2013-12-16
Fundamental Frequency	:2440 GHz	Temp./Humi.	:22 deg_C / 52 RH
Operation Mode	:MAIN MID	Engineer	:Vito
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

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.

“---“ : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV/m	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Safe Margin dB
2440.49	F	Peak	97.97	-4.89	93.08	114.00	-20.92
2440.49	F	Average	94.31	-4.89	89.42	94.00	-4.58

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Operation Band	:2.4G	Test Date	:2013-12-16
Fundamental Frequency	:2474 MHz	Temp./Humi.	:22 deg_C / 52 RH
Operation Mode	:MAIN HIGH	Engineer	:Vito
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

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.

“---“ : denotes Noise Floor.

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	Safe Margin dB
2473.42	F	Peak	94.01	-4.79	89.21	114.00	-24.79
2473.42	F	Average	90.54	-4.79	85.75	94.00	-8.25

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Operation Band	:2.4G	Test Date	:2013-12-16
Fundamental Frequency	:2474 MHz	Temp./Humi.	:22 deg_C / 52 RH
Operation Mode	:MAIN HIGH	Engineer	:Vito
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

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.

“---“ : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV/m	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Safe Margin dB
2474.54	F	Peak	99.72	-4.79	94.93	114.00	-19.07
2474.54	F	Average	96.51	-4.79	91.72	94.00	-2.28

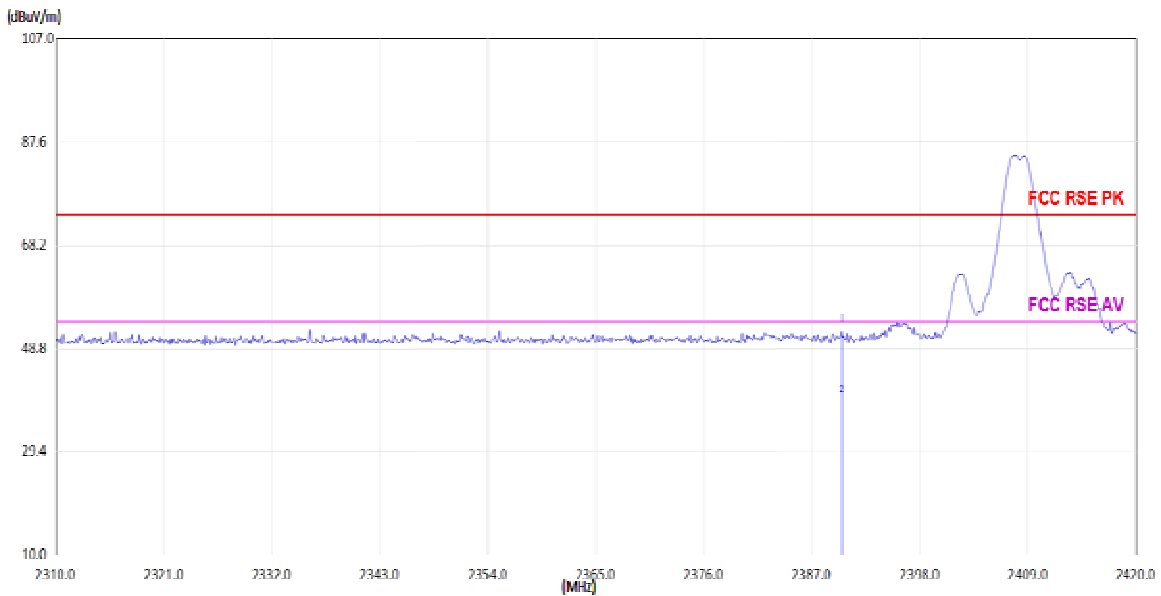
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Radiated Spurious Emission Measurement Result

Operation Band	:2.4G	Test Date	:2013-12-13
Fundamental Frequency	:2408 MHz	Temp./Humi.	:22 deg_C / 52 RH
Operation Mode	:BANDEDGE LOW	Engineer	:Vito
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL



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.

“---“ : denotes Noise Floor.

The trace on RE (radiation emission) plot is as colored blue, and the detection manner we’ve employed is peak detector.

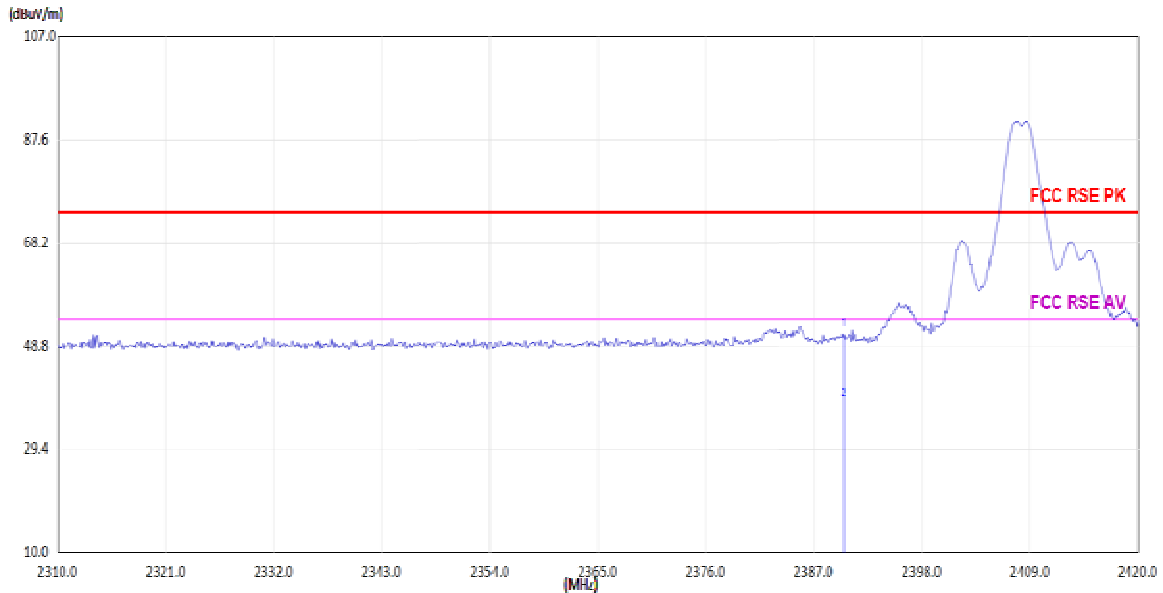
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	dB
		PK/QP/AV	dBμV/m		dBμV/m	dBμV/m	
2390.00	E	Peak	56.84	-5.06	51.78	74.00	-22.22
2390.00	E	Average	43.58	-5.06	38.52	54.00	-15.48

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Operation Band	:2.4G	Test Date	:2013-12-13
Fundamental Frequency	:2408 MHz	Temp./Humi.	:22 deg_C / 52 RH
Operation Mode	:BANDEDGE LOW	Engineer	:Vito
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL



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.

“---” : denotes Noise Floor.

The trace on RE (radiation emission) plot is as colored blue, and the detection manner we’ve employed is peak detector.

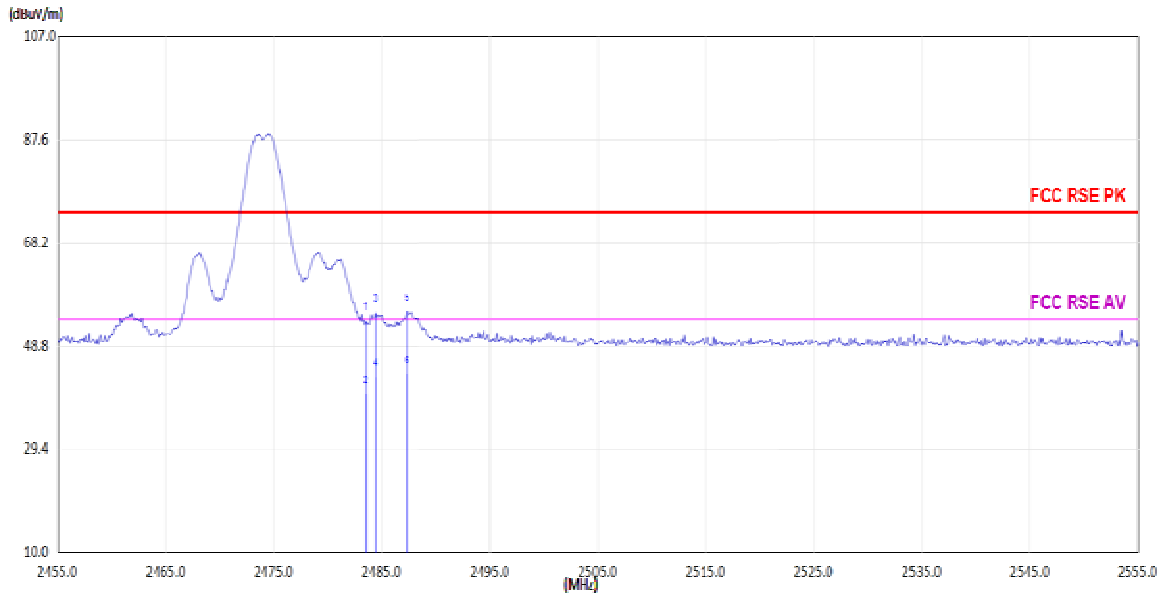
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	dB
		PK/QP/AV	dBµV/m		dBµV/m	dBµV/m	
2390.00	E	Peak	55.60	-5.06	50.54	74.00	-23.46
2390.00	E	Average	42.39	-5.06	37.33	54.00	-16.67

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Operation Band	:2.4G	Test Date	:2013-12-13
Fundamental Frequency	:2474 MHz	Temp./Humi.	:22 deg_C / 52 RH
Operation Mode	:BANDEDGE HIGH	Engineer	:Vito
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL



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.

“---“ : denotes Noise Floor.

The trace on RE (radiation emission) plot is as colored blue, and the detection manner we’ve employed is peak detector.

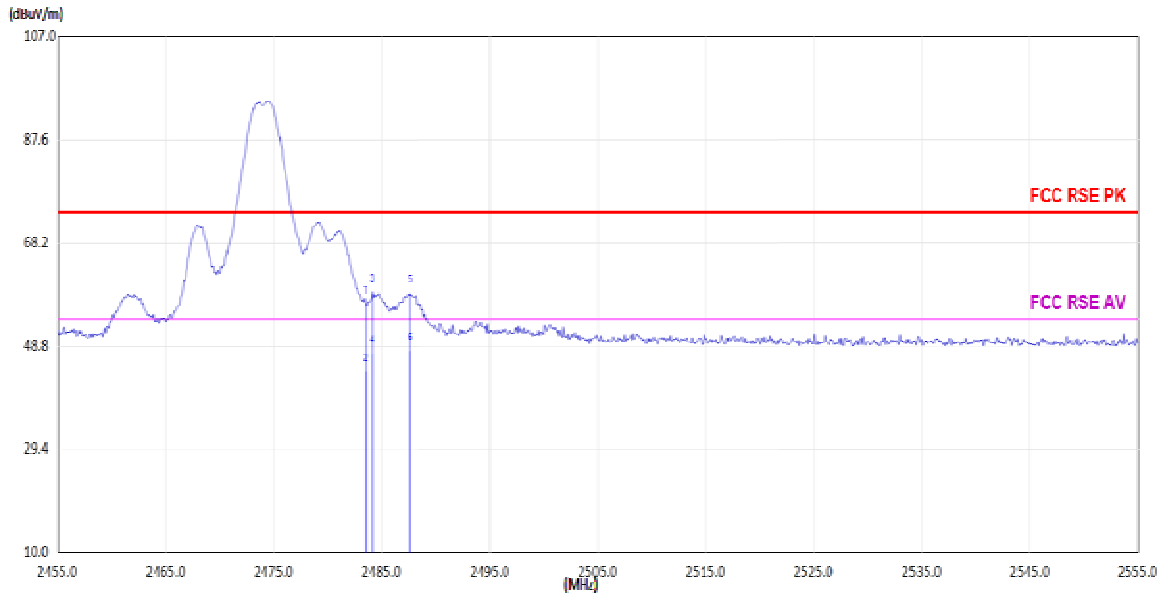
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV/m	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2483.50	E	Peak	58.33	-4.76	53.57	74.00	-20.43
2483.50	E	Average	44.56	-4.76	39.80	54.00	-14.20
2484.40	S	Peak	59.90	-4.76	55.14	74.00	-18.86
2484.40	S	Average	47.75	-4.76	42.99	54.00	-11.01
2487.30	S	Peak	60.01	-4.75	55.26	74.00	-18.74
2487.30	S	Average	48.31	-4.75	43.56	54.00	-10.44

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Operation Band	:2.4G	Test Date	:2013-12-13
Fundamental Frequency	:2474 MHz	Temp./Humi.	:22 deg_C / 52 RH
Operation Mode	:BANDEDGE HIGH	Engineer	:Vito
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL



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.

“---“ : denotes Noise Floor.

The trace on RE (radiation emission) plot is as colored blue, and the detection manner we’ve employed is peak detector.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	dB
		PK/QP/AV	dBµV/m		dBµV/m	dBµV/m	
2483.50	E	Peak	61.55	-4.76	56.79	74.00	-17.21
2483.50	E	Average	48.81	-4.76	44.05	54.00	-9.95
2484.10	S	Peak	63.72	-4.76	58.96	74.00	-15.04
2484.10	S	Average	52.19	-4.76	47.43	54.00	-6.57
2487.60	S	Peak	63.50	-4.75	58.75	74.00	-15.25
2487.60	S	Average	52.61	-4.75	47.86	54.00	-6.14

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Radiated Spurious Emission Measurement Result

Operation Band	:2.4G	Test Date	:2013-12-13
Fundamental Frequency	:2408 MHz	Temp./Humi.	:22 deg_C / 52 RH
Operation Mode	:TX LOW	Engineer	:Vito
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

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.

“---” : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV/m	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
47.46	S	Peak	51.08	-25.34	25.74	40.00	-14.26
55.22	S	Peak	55.70	-27.98	27.72	40.00	-12.28
69.77	S	Peak	50.59	-28.61	21.98	40.00	-18.02
147.37	S	Peak	49.25	-22.52	26.73	43.50	-16.77
299.66	S	Peak	49.72	-19.05	30.67	46.00	-15.33
600.36	S	Peak	38.44	-12.32	26.12	46.00	-19.88
4816.00	H	Peak	49.31	0.38	49.68	74.00	-24.32
4816.00	H	Average	40.54	0.38	40.92	54.00	-13.08
7224.00	H	Peak	43.30	4.71	48.00	74.00	-26.00
7224.00	H	Average	34.30	4.71	39.01	54.00	-15.00
9632.00	H	Peak	-	-	-	-	-
12040.00	H	Peak	-	-	-	-	-
14448.00	H	Peak	-	-	-	-	-
16856.00	H	Peak	-	-	-	-	-
19264.00	H	Peak	-	-	-	-	-
21672.00	H	Peak	-	-	-	-	-
24080.00	H	Peak	-	-	-	-	-

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Operation Band	:2.4G	Test Date	:2013-12-13
Fundamental Frequency	:2408 MHz	Temp./Humi.	:22 deg_C / 52 RH
Operation Mode	:TX LOW	Engineer	:Vito
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

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.

“---” : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV/m	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
135.73	S	Peak	48.49	-21.79	26.70	43.50	-16.80
149.31	S	Peak	49.86	-22.75	27.11	43.50	-16.39
299.66	S	Peak	51.64	-19.05	32.59	46.00	-13.41
600.36	S	Peak	39.36	-12.32	27.04	46.00	-18.96
780.78	S	Peak	40.41	-10.40	30.01	46.00	-15.99
804.06	S	Peak	39.47	-9.95	29.52	46.00	-16.48
4816.00	H	Peak	53.16	0.38	53.54	74.00	-20.46
4816.00	H	Average	45.09	0.38	45.47	54.00	-8.53
7224.00	H	Peak	44.74	4.71	49.45	74.00	-24.55
7224.00	H	Average	35.83	4.71	40.54	54.00	-13.47
9632.00	H	Peak	-	-	-	-	-
12040.00	H	Peak	-	-	-	-	-
14448.00	H	Peak	-	-	-	-	-
16856.00	H	Peak	-	-	-	-	-
19264.00	H	Peak	-	-	-	-	-
21672.00	H	Peak	-	-	-	-	-
24080.00	H	Peak	-	-	-	-	-

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Operation Band	:2.4G	Test Date	:2013-12-13
Fundamental Frequency	:2440 MHz	Temp./Humi.	:22 deg_C / 52 RH
Operation Mode	:TX MID	Engineer	:Vito
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

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.

“---“ : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV/m	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
47.46	S	Peak	49.67	-25.34	24.33	40.00	-15.67
55.22	S	Peak	51.30	-27.98	23.32	40.00	-16.68
101.78	S	Peak	48.73	-22.93	25.80	43.50	-17.70
134.76	S	Peak	42.17	-21.71	20.46	43.50	-23.04
311.30	S	Peak	40.99	-18.65	22.34	46.00	-23.66
436.43	S	Peak	43.99	-15.37	28.62	46.00	-17.38
4880.00	H	Peak	48.94	0.41	49.35	74.00	-24.65
4880.00	H	Average	40.14	0.41	40.55	54.00	-13.45
7320.00	H	Peak	44.02	4.86	48.88	74.00	-25.12
7320.00	H	Average	35.59	4.86	40.45	54.00	-13.55
9760.00	H	Peak	-	-	-	-	-
12200.00	H	Peak	-	-	-	-	-
14640.00	H	Peak	-	-	-	-	-
17080.00	H	Peak	-	-	-	-	-
19520.00	H	Peak	-	-	-	-	-
21960.00	H	Peak	-	-	-	-	-
24400.00	H	Peak	-	-	-	-	-

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Operation Band	:2.4G	Test Date	:2013-12-13
Fundamental Frequency	:2440 MHz	Temp./Humi.	:22 deg_C / 52 RH
Operation Mode	:TX MID	Engineer	:Vito
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

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.

“---” : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV/m	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
135.73	S	Peak	46.94	-21.79	25.15	43.50	-18.35
149.31	S	Peak	48.15	-22.75	25.40	43.50	-18.10
232.73	S	Peak	46.07	-22.41	23.66	46.00	-22.34
299.66	S	Peak	51.46	-19.05	32.41	46.00	-13.59
756.53	S	Peak	40.45	-10.43	30.02	46.00	-15.98
780.78	S	Peak	40.16	-10.40	29.76	46.00	-16.24
4880.00	H	Peak	53.64	0.41	54.05	74.00	-19.95
4880.00	H	Average	45.99	0.41	46.40	54.00	-7.60
7320.00	H	Peak	44.24	4.85	49.09	74.00	-24.91
7320.00	H	Average	35.07	4.85	39.92	54.00	-14.08
9760.00	H	Peak	-	-	-	-	-
12200.00	H	Peak	-	-	-	-	-
14640.00	H	Peak	-	-	-	-	-
17080.00	H	Peak	-	-	-	-	-
19520.00	H	Peak	-	-	-	-	-
21960.00	H	Peak	-	-	-	-	-
24400.00	H	Peak	-	-	-	-	-

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Operation Band	:2.4G	Test Date	:2013-12-13
Fundamental Frequency	:2474 MHz	Temp./Humi.	:22 deg_C / 52 RH
Operation Mode	:TX HIGH	Engineer	:Vito
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

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.

“---” : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV/m	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
47.46	S	Peak	50.77	-25.34	25.44	40.00	-14.56
55.22	S	Peak	53.45	-27.98	25.47	40.00	-14.53
101.78	S	Peak	48.78	-22.93	25.85	43.50	-17.65
149.31	S	Peak	46.81	-22.75	24.06	43.50	-19.44
299.66	S	Peak	48.70	-19.05	29.65	46.00	-16.35
788.54	S	Peak	34.78	-10.00	24.79	46.00	-21.21
4948.00	H	Peak	49.71	0.58	50.29	74.00	-23.71
4948.00	H	Average	39.84	0.58	40.42	54.00	-13.58
7422.00	H	Peak	44.85	5.02	49.87	74.00	-24.13
7422.00	H	Average	34.63	5.02	39.65	54.00	-14.35
9896.00	H	Peak	-	-	-	-	-
12370.00	H	Peak	-	-	-	-	-
14844.00	H	Peak	-	-	-	-	-
17318.00	H	Peak	-	-	-	-	-
19792.00	H	Peak	-	-	-	-	-
22266.00	H	Peak	-	-	-	-	-
24740.00	H	Peak	-	-	-	-	-

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Operation Band	:2.4G	Test Date	:2013-12-13
Fundamental Frequency	:2474 MHz	Temp./Humi.	:22 deg_C / 52 RH
Operation Mode	:TX HIGH	Engineer	:Vito
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

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.

“---” : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV/m	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
134.76	S	Peak	46.34	-21.71	24.63	43.50	-18.87
149.31	S	Peak	48.05	-22.75	25.30	43.50	-18.20
232.73	S	Peak	46.33	-22.41	23.92	46.00	-22.08
281.23	S	Peak	45.75	-19.54	26.21	46.00	-19.79
299.66	S	Peak	50.42	-19.05	31.37	46.00	-14.63
780.78	S	Peak	40.53	-10.40	30.13	46.00	-15.87
4948.00	H	Peak	54.42	0.58	55.00	74.00	-19.00
4948.00	H	Average	45.82	0.58	46.40	54.00	-7.60
7422.00	H	Peak	44.36	5.02	49.38	74.00	-24.62
7422.00	H	Average	34.34	5.02	39.36	54.00	-14.64
9896.00	H	Peak	-	-	-	-	-
12370.00	H	Peak	-	-	-	-	-
14844.00	H	Peak	-	-	-	-	-
17318.00	H	Peak	-	-	-	-	-
19792.00	H	Peak	-	-	-	-	-
22266.00	H	Peak	-	-	-	-	-
24740.00	H	Peak	-	-	-	-	-

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8. 20 dB Bandwidth Measurement

8.1 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set ETU normal operating mode.
3. Set SPA Center Frequency = fundamental frequency, RBW = 100kHz, VBW = 300kHz, Span = 5MHz.
4. Set SPA Max hold. Mark peak, -20dB.

8.2 Test SET-UP (Block Diagram of Configuration)

Refer to section 7.2 for the plot.

8.3 Measurement Equipment Used:

SGS Conducted Room(ALL)					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Spectrum Analyzer	Agilent	N9010A	MY51440121	02/13/2012	02/12/2014
Power Meter	Anritsu	ML2496A	1326001	06/28/2013	06/27/2014
Power Sensor	Anritsu	MA2411B	917032	02/08/2012	02/07/2014
DC Power Supply	HOLA	DP-3003	001	N.C.R.	N.C.R.
Coaxial Cable	WOKEN	conducted #2	001	12/21/2012	12/20/2013
DC Block	Mini-Circuits	BLK-18-S+	002	12/21/2012	12/20/2013
Splitter	RF-LAMBAD	RFLT2W1G18G	11-JSPF412-018	12/21/2012	12/20/2013
Attenuator	Mini-Circuits	BW-S10W2+	002	12/21/2012	12/20/2013
Temperature Chamber	TERCHY	MHK-120LK	1020582	06/20/2013	06/19/2014

8.4 Measurement Results:

2.408GHz = 2.323MHz

2.440GHz = 2.331MHz

2.474GHz = 2.303MHz

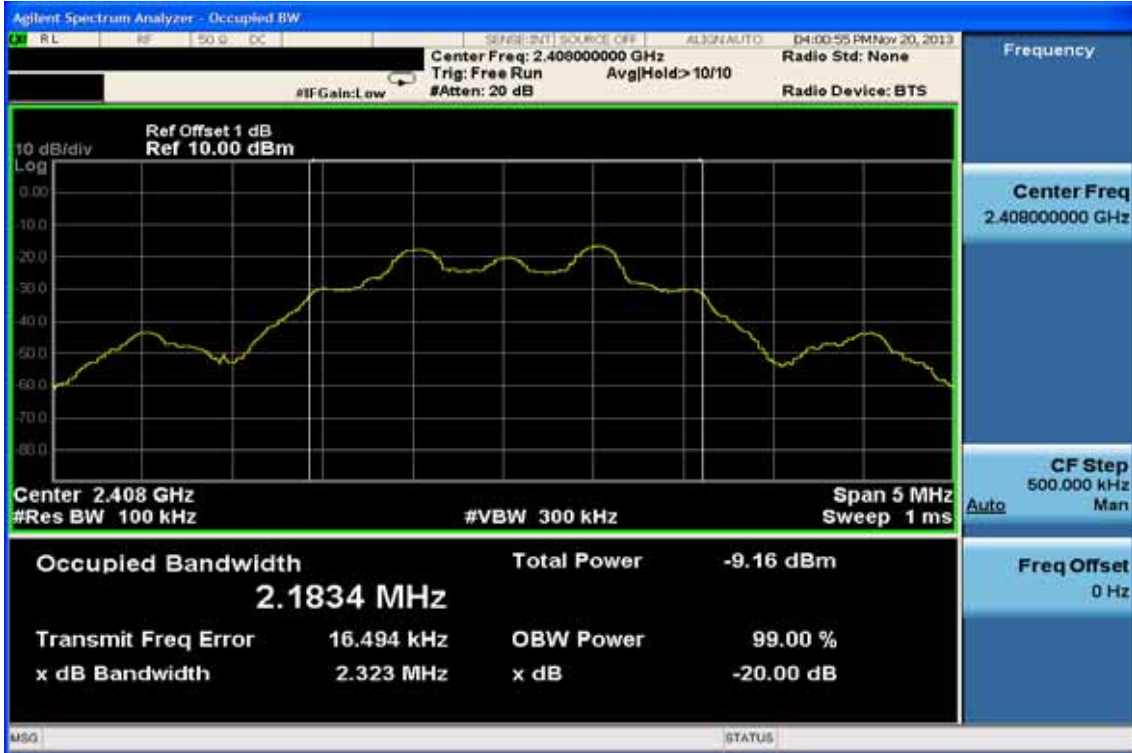
Refer to attached data chart.

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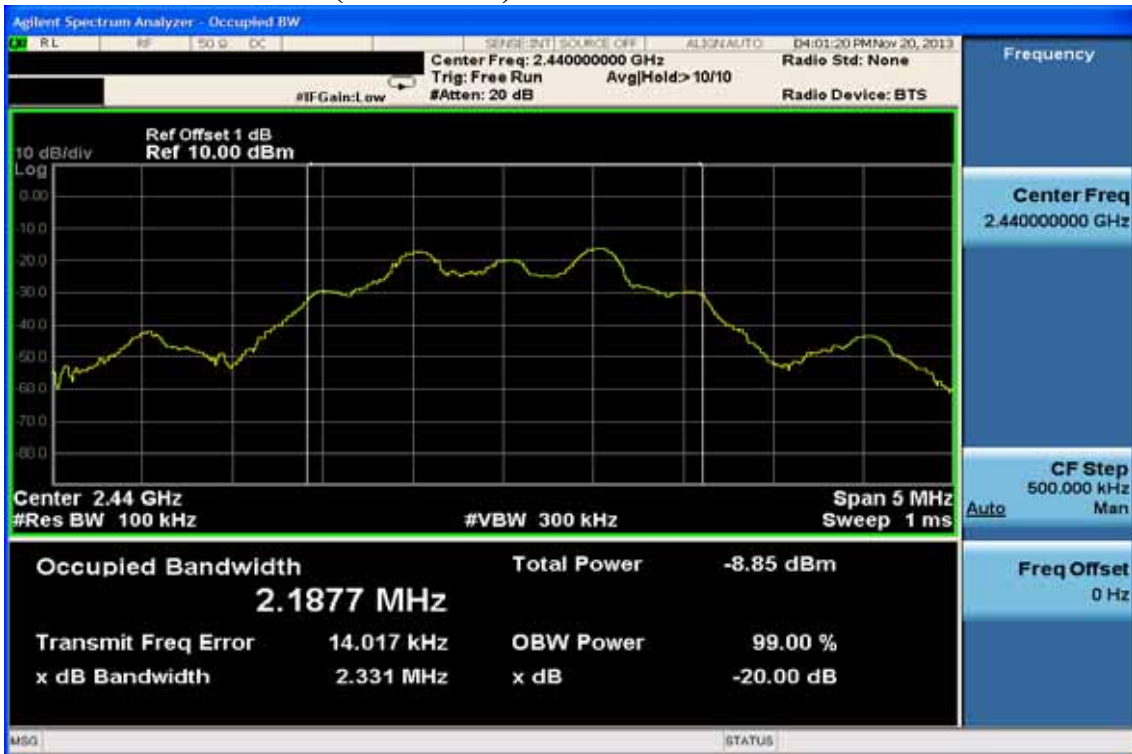
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20dB Bandwidth Test Plot (2.408GHz)



20dB Bandwidth Test Plot (2.440GHz)

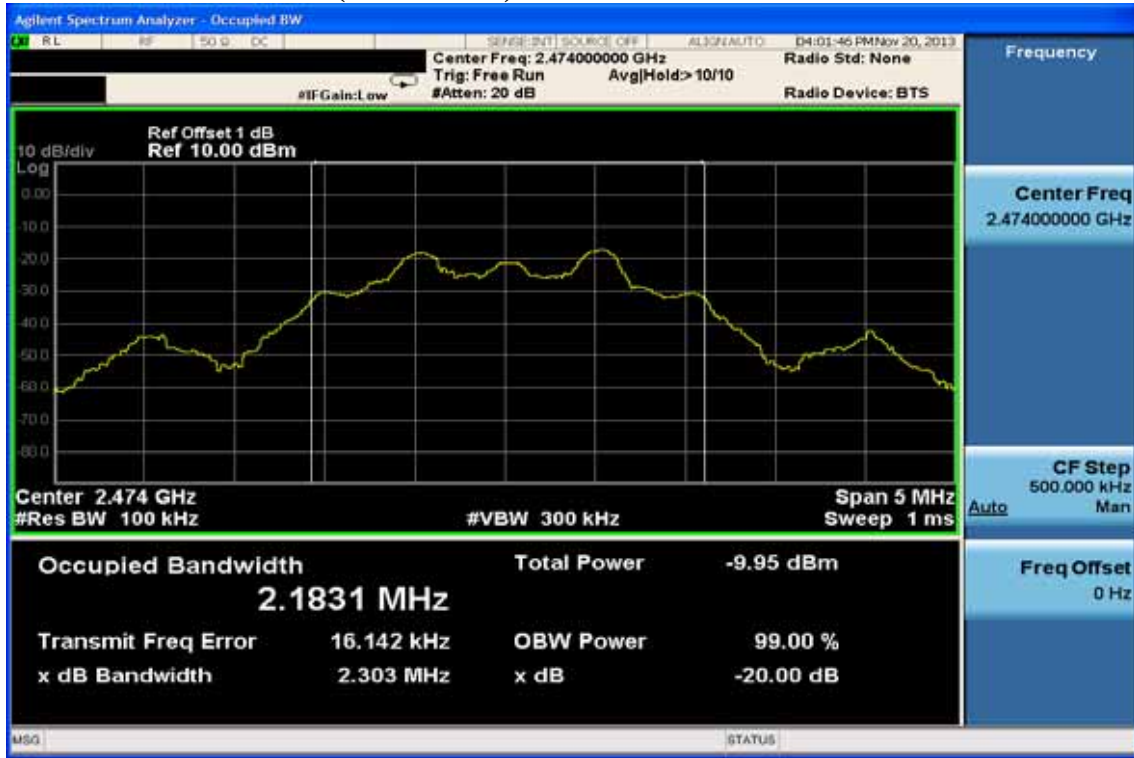


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20dB Bandwidth Test Plot (2.474GHz)



~ End of Report ~

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