

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

Product Name: Wireless Palm Style Keyboard with Touchpad
Brand Name: ORtek
Model No.: PKB-1720A, VP6364, VP6366
Model Difference: For different client
FCC ID: GM8PKB1720A
Report No.: ER/2014/70125
Issue Date: Aug. 28, 2014
FCC Rule Part: §15.249
Prepared for: ORtek Technology Inc.
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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 Description: Wireless Palm Style Keyboard with Touchpad

Brand Name: ORtek

Model No.: PKB-1720A, VP6364, VP6366

Model Difference: For different client

FCC ID: GM8PKB1720A

File Number: ER/2014/70125

Date of test: Aug. 05, 2014 ~ Aug. 28, 2014

Date of EUT Received: Aug. 05, 2014

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:	<u>Nick Lin</u>	Date:	<u>Aug. 28, 2014</u>
	<u>Nick Lin / Engineer</u>		
Prepared By:	<u>Julia Chang</u>	Date:	<u>Aug. 28, 2014</u>
	<u>Julia Chang / Clerk</u>		
Approved By:	<u>Jim Chang</u>	Date:	<u>Aug. 28, 2014</u>
	<u>Jim Chang / Supervisor</u>		

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Version

Version No.	Date	Description
00	Aug. 28, 2014	Initial creation of document

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1. GENERAL INFORMATION

1.1. Product Description

General:

Product Name:	Wireless Palm Style Keyboard with Touchpad
Brand Name:	ORtek
Model No.:	PKB-1720A, VP6364, VP6366
Model Difference:	For different client
Transmit Power	88.06dBuV/m at 3m.
Operation Frequency:	2408 – 2474MHz
Channel Number:	34 channels
Channel Space:	2MHz
Modulation Type:	FSK
Hardware Version:	1.0
Software Version:	1.0
Power Supply:	3Vdc from AA alkaline Batteries x 2
Antenna Designation:	Printed Antenna, Gain: 2.23dBi

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

This submittal(s) (test report) is intended for **FCC ID: GM8PKB1720A** 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: 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

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 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 and the measurement procedure 7.3 in ANSI 63.4:2009 & 6.2.2 is followed to carry out the test. The CISPR Quasi-Peak and Average detector mode is employed according to §15.107

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 – 24.25GHz	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 and 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 § 15.205
 4. Emission spurious frequency which appearing within the Restricted Bands specified in provision of § 15.205, then the general radiated emission limits in § 15.209 apply.

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2.5. Configuration of Tested System

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

EUT

Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	N/A	N/A	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(e)	20dB band width Measurement	Compliant

4. DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition.
The EUT is staying in continuous transmitting mode.

Channel Low (2408MHz), Channel Mid (2440MHz), Channel High: (2474MHz) and Standby mode were chosen for full testing.

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

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5. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
20dB Bandwidth	+/- 123.36 Hz
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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6. CONDUCTED EMISSIONS TEST

6.1 Standard Applicable:

According to §15.207, frequency range within 150kHz to 30MHz shall not exceed the Limit table as below.

Frequency range MHz	Limits dB(uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Note 1.The lower limit shall apply at the transition frequencies 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

6.2 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI7	100760	05/26/2014	05/25/2015
LISN	Rolf-Heine	NNB-2/16Z	99012	03/26/2014	03/25/2015
LISN	FCC	FCC-LISN-50/250-25-2-01	04034	03/19/2014	03/18/2015
Coaxial Cables	N/A	WK CE Cable	N/A	11/26/2013	11/25/2014

6.3 EUT Setup:

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.4:2009
2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
3. The LISN was connected with 120Vac/60Hz power source.

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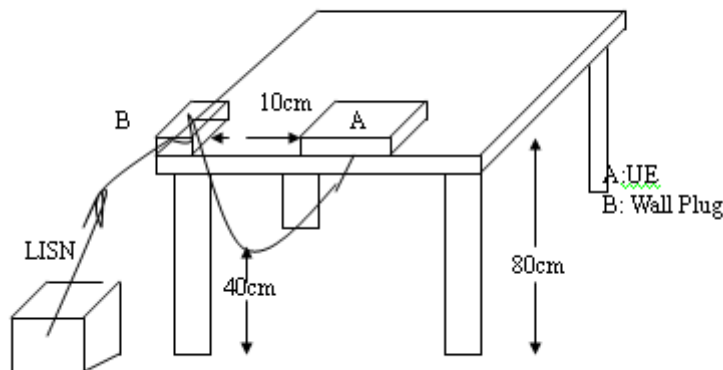
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6.4. Test SET-UP (Block Diagram of Configuration)



6.5. Measurement Procedure:

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

6.6. Measurement Result:

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 turn table which is 0.8m 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 of the interest measured were complete.

Auxiliary Procedure (Setting on Spectrum to capture the reading of emission level):

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW \geq RBW

Sweep = auto

Detector function = peak

Trace = max hold

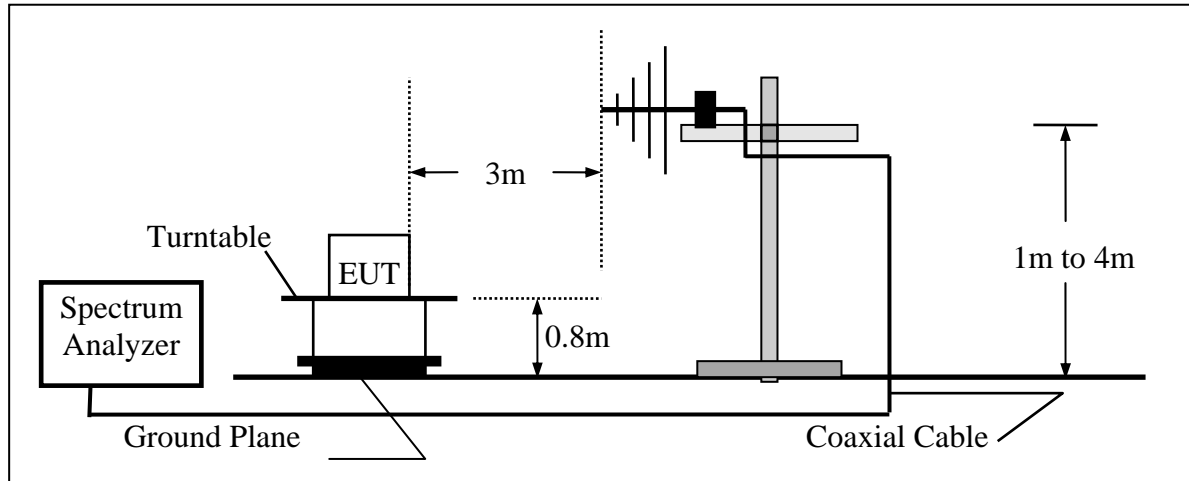
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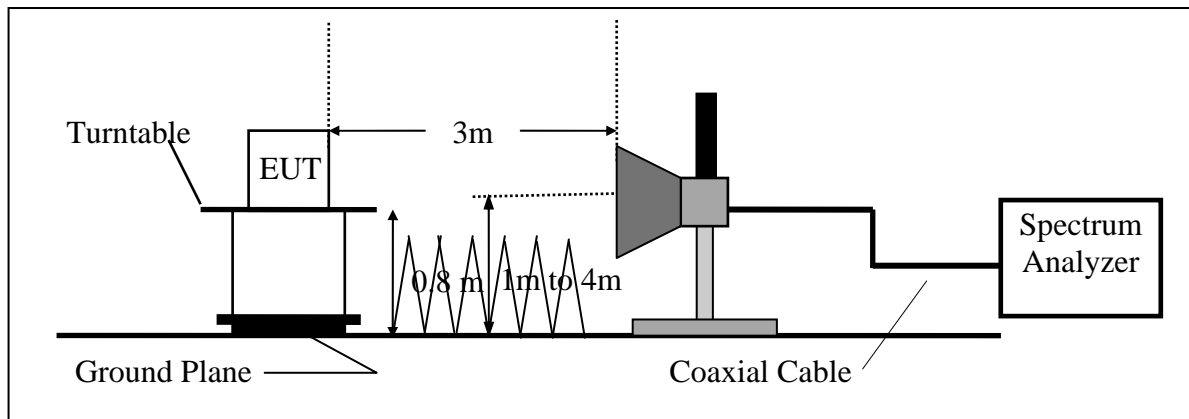
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7.2. Test SET-UP (Block Diagram of Configuration)

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



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



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7.1 Measurement Equipment Used:

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI7	100760	05/26/2014	05/25/2015
Spectrum Analyzer	Agilent	E4446A	MY51100003	05/19/2014	05/18/2015
EXA Spectrum Analyzer	Agilent	N9010A	MY50420195	01/20/2014	01/19/2015
Spectrum Analyzer	R&S	FSV-30	101398	10/22/2013	10/21/2014
Loop Antenna	ETS.LINDGREN	6502	00148045	07/03/2014	07/02/2015
Bilog Antenna	SCHWAZBECK	VULB9168	378	01/02/2014	01/01/2015
Horn antenna	ETS.LINDGREN	3117	123995	05/19/2014	05/18/2015
Horn Antenna	Schwarzbeck	BBHA9170	184	01/23/2014	01/22/2015
Pre-Amplifier	Agilent	8447D	2944A07676	01/03/2014	01/02/2015
Pre-Amplifier	Agilent	8449B	3008A00578	01/03/2014	01/02/2015
Pre-Amplifier	EMC Instruments Corp.	EMC184045	980135	01/24/2014	01/23/2015
Filter 2400-2483.5 MHz	EWT	EWT-14-0166	M2	02/27/2014	02/26/2015
Attenuator	Mini-Circuit	BW-S10W2+	004	02/27/2014	02/26/2015
Turn Table	HD	DT420	N/A	N.C.R	N.C.R
Antenna Tower	HD	MA240-N	240/657	N.C.R	N.C.R
Controller	HD	HD100	N/A	N.C.R	N.C.R
Low Loss Cable	Huber Suhner	966_Rx	9	01/03/2014	01/02/2015
3m Site NSA	SGS	966 chamber	N/A	07/15/2014	07/14/2015

7.2 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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7.3 Measurement Result

Radiated Spurious Emission Measurement Result (MAIN)

Operation Band	:2.4G	Test Date	:2014-08-14
Fundamental Frequency	:2408 MHz	Temp./Humi.	:23 deg_C/61 RH
Operation Mode	:MAIN LOW	Engineer	:Curry
EUT Pol.	:H Plane	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.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2407.58	F	Average	80.09	2.56	82.65	94.00	-11.35
2407.58	F	Peak	82.41	2.56	84.97	114.00	-29.03

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Operation Band	:2.4G	Test Date	:2014-08-14
Fundamental Frequency	:2408 MHz	Temp./Humi.	:23 deg_C/61 RH
Operation Mode	:MAIN LOW	Engineer	:Curry
EUT Pol.	:H Plane	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.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2407.47	F	Average	83.28	2.56	85.84	94.00	-8.16
2407.47	F	Peak	85.50	2.56	88.06	114.00	-25.94

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Operation Band	:2.4G	Test Date	:2014-08-14
Fundamental Frequency	:2440 MHz	Temp./Humi.	:23 deg_C/61 RH
Operation Mode	:MAIN MID	Engineer	:Curry
EUT Pol.	:H Plane	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.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	dB
		PK/QP/AV	dBμV		dBμV/m	dBμV/m	
2439.57	F	Average	77.91	2.74	80.65	94.00	-13.35
2439.57	F	Peak	80.36	2.74	83.10	114.00	-30.90

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Operation Band	:2.4G	Test Date	:2014-08-14
Fundamental Frequency	:2440 MHz	Temp./Humi.	:23 deg_C/61 RH
Operation Mode	:MAIN MID	Engineer	:Curry
EUT Pol.	:H Plane	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.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2439.48	F	Average	82.54	2.74	85.28	94.00	-8.72
2439.48	F	Peak	84.82	2.74	87.56	114.00	-26.44

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Operation Band	:2.4G	Test Date	:2014-08-14
Fundamental Frequency	:2474 MHz	Temp./Humi.	:23 deg_C/61 RH
Operation Mode	:MAIN HIGH	Engineer	:Curry
EUT Pol.	:H Plane	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.	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
2473.53	F	Average	77.61	2.82	80.43	94.00	-13.57
2473.53	F	Peak	79.86	2.82	82.68	114.00	-31.32

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Operation Band	:2.4G	Test Date	:2014-08-14
Fundamental Frequency	:2474 MHz	Temp./Humi.	:23 deg_C/61 RH
Operation Mode	:MAIN HIGH	Engineer	:Curry
EUT Pol.	:H Plane	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.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2473.55	F	Average	82.38	2.82	85.20	94.00	-8.80
2473.55	F	Peak	84.64	2.82	87.46	114.00	-26.54

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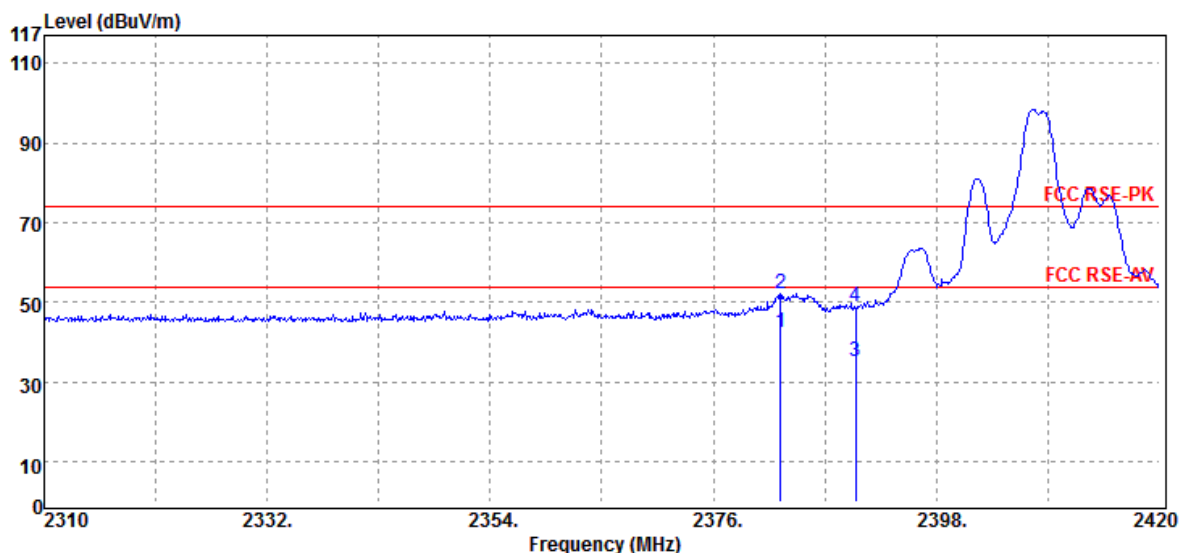
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Radiated Spurious Emission Measurement Result

Operation Band	:2.4G	Test Date	:2014-08-14
Fundamental Frequency	:2408 MHz	Temp./Humi.	:23 deg_C/61 RH
Operation Mode	:Band Edge LOW	Engineer	:Curry
EUT Pol.	:H Plane	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.

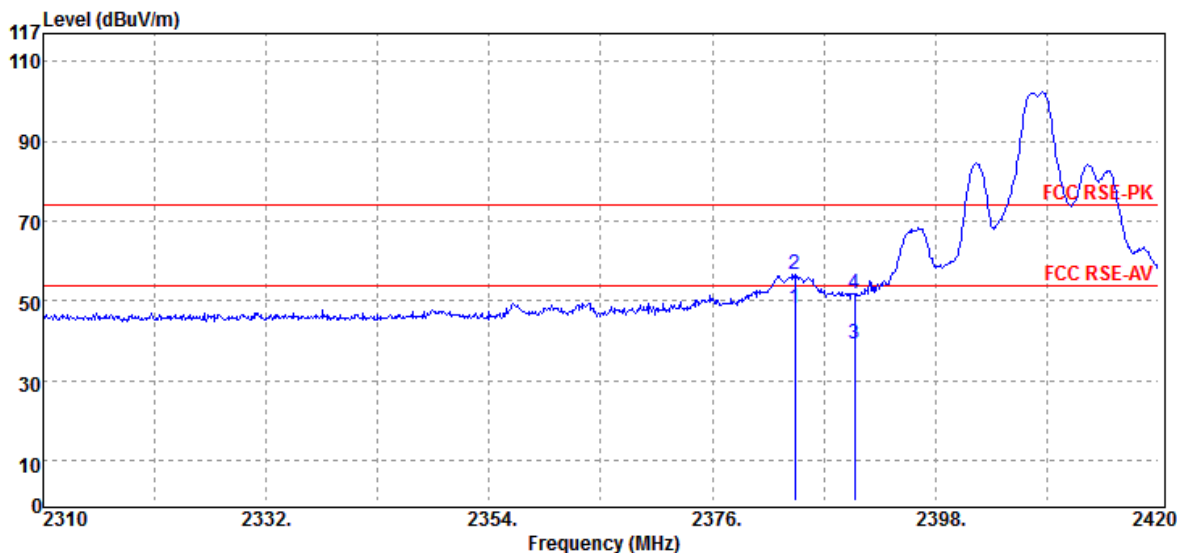
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	
		PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2382.60	S	Average	40.24	2.44	42.68	54.00	-11.32
2382.60	S	Peak	49.69	2.44	52.13	74.00	-21.87
2390.00	E	Average	32.82	2.48	35.30	54.00	-18.70
2390.00	E	Peak	46.33	2.48	48.81	74.00	-25.19

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Operation Band	:2.4G	Test Date	:2014-08-14
Fundamental Frequency	:2408 MHz	Temp./Humi.	:23 deg_C/61 RH
Operation Mode	:Band Edge LOW	Engineer	:Curry
EUT Pol.	:H Plane	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		FS	@3m	
		PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2384.14	S	Average	45.66	2.44	48.10	54.00	-5.90
2384.14	S	Peak	54.20	2.44	56.64	74.00	-17.36
2390.00	E	Average	36.68	2.48	39.16	54.00	-14.84
2390.00	E	Peak	49.47	2.48	51.95	74.00	-22.05

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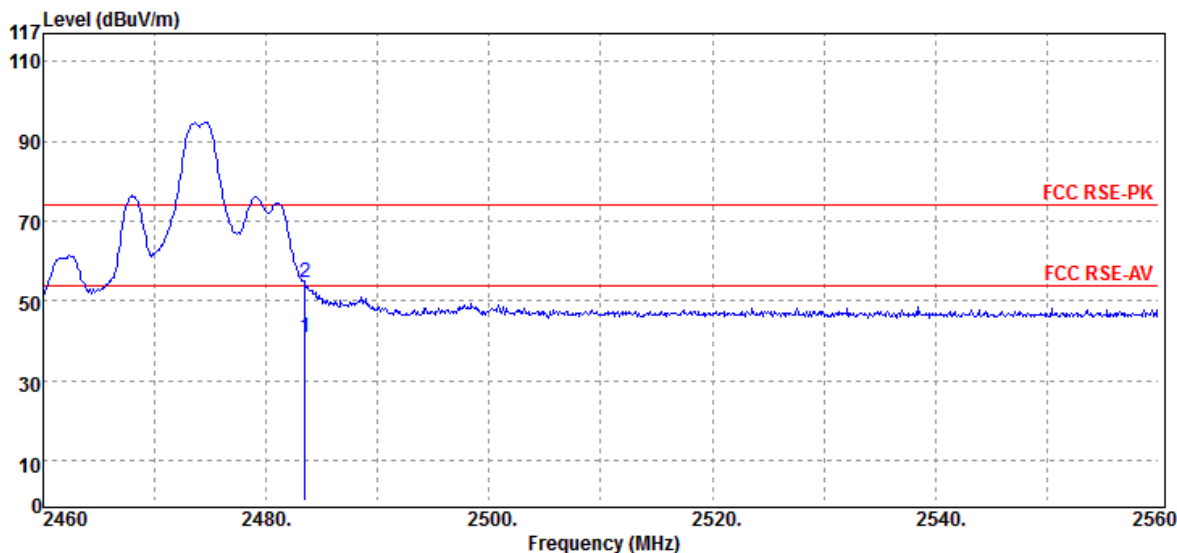
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Operation Band :2.4G
 Fundamental Frequency :2474 MHz
 Operation Mode :Band Edge HIGH
 EUT Pol. :H Plane

Test Date :2014-08-14
 Temp./Humi. :23 deg_C/61 RH
 Engineer :Curry
 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		FS	@3m	
		PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Average	38.13	2.84	40.97	54.00	-13.03
2483.50	E	Peak	51.69	2.84	54.53	74.00	-19.47

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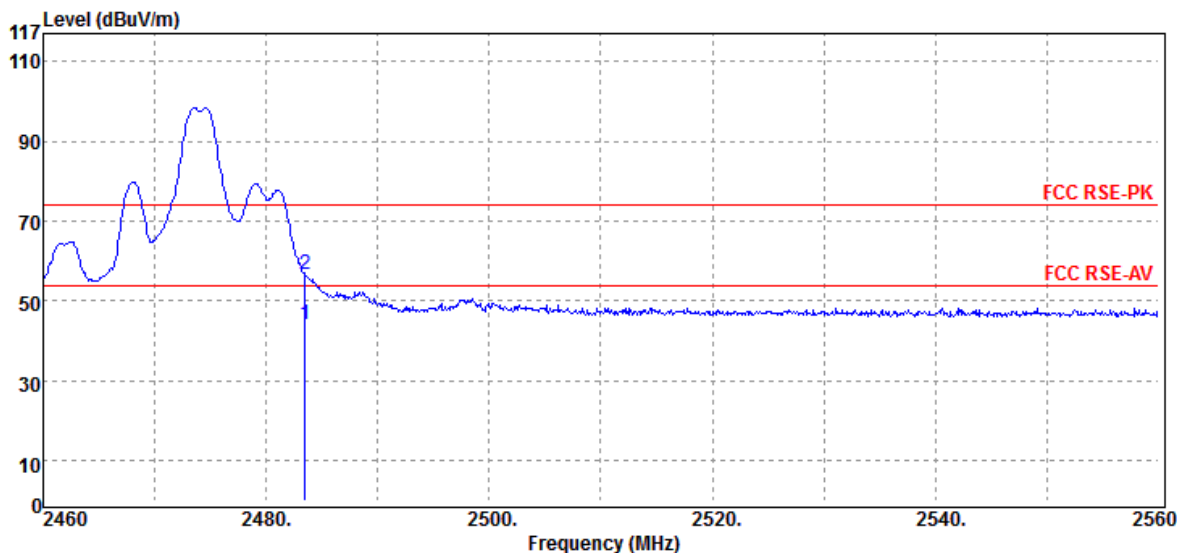
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Operation Band :2.4G
 Fundamental Frequency :2474 MHz
 Operation Mode :Band Edge HIGH
 EUT Pol. :H Plane

Test Date :2014-08-14
 Temp./Humi. :23 deg_C/61 RH
 Engineer :Curry
 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		FS	@3m	
		PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Average	41.11	2.84	43.95	54.00	-10.05
2483.50	E	Peak	53.93	2.84	56.77	74.00	-17.23

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Radiated Spurious Emission Measurement Result

Operation Band	:2.4G	Test Date	:2014-08-14
Fundamental Frequency	:2408 MHz	Temp./Humi.	:23 deg_C/61 RH
Operation Mode	:TX LOW	Engineer	:Curry
EUT Pol.	:H Plane	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.	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
71.71	S	Peak	37.02	-15.54	21.48	40.00	-18.52
154.16	S	Peak	27.82	-12.55	15.27	43.50	-28.23
286.08	S	Peak	29.70	-11.51	18.19	46.00	-27.81
515.97	S	Peak	31.26	-7.31	23.95	46.00	-22.05
762.35	S	Peak	28.02	-2.56	25.46	46.00	-20.54
919.49	S	Peak	27.88	-0.27	27.61	46.00	-18.39
4816.00	H	Average	37.06	6.82	43.88	54.00	-10.12
4816.00	H	Peak	45.73	6.82	52.55	74.00	-21.45
7224.00	H	---					
9632.00	H	---					
12040.00	H	---					
14448.00	H	---					
16856.00	H	---					
19264.00	H	---					
21672.00	H	---					
24080.00	H	---					

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Operation Band	:2.4G	Test Date	:2014-08-14
Fundamental Frequency	:2408 MHz	Temp./Humi.	:23 deg_C/61 RH
Operation Mode	:TX LOW	Engineer	:Curry
EUT Pol.	:H Plane	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.	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
31.94	S	Peak	31.53	-13.88	17.65	40.00	-22.35
157.07	S	Peak	27.33	-12.44	14.89	43.50	-28.61
381.14	S	Peak	28.18	-9.44	18.74	46.00	-27.26
564.47	S	Peak	31.81	-6.17	25.64	46.00	-20.36
779.81	S	Peak	29.94	-2.66	27.28	46.00	-18.72
941.80	S	Peak	27.62	0.16	27.78	46.00	-18.22
4816.00	H	Average	37.49	6.82	44.31	54.00	-9.69
4816.00	H	Peak	46.18	6.82	53.00	74.00	-21.00
7224.00	H	---					
9632.00	H	---					
12040.00	H	---					
14448.00	H	---					
16856.00	H	---					
19264.00	H	---					
21672.00	H	---					
24080.00	H	---					

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Operation Band	:2.4G	Test Date	:2014-08-14
Fundamental Frequency	:2440 MHz	Temp./Humi.	:23 deg_C/61 RH
Operation Mode	:TX MID	Engineer	:Curry
EUT Pol.	:H Plane	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.	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
71.71	S	Peak	36.66	-15.54	21.12	40.00	-18.88
150.28	S	Peak	28.12	-12.69	15.43	43.50	-28.07
286.08	S	Peak	29.32	-11.51	17.81	46.00	-28.19
450.01	S	Peak	29.74	-8.22	21.52	46.00	-24.48
721.61	S	Peak	29.47	-4.05	25.42	46.00	-20.58
940.83	S	Peak	28.52	0.14	28.66	46.00	-17.34
4880.00	H	Average	36.36	6.92	43.28	54.00	-10.72
4880.00	H	Peak	46.22	6.92	53.14	74.00	-20.86
7320.00	H	---					
9760.00	H	---					
12200.00	H	---					
14640.00	H	---					
17080.00	H	---					
19520.00	H	---					
21960.00	H	---					
24400.00	H	---					

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Operation Band	:2.4G	Test Date	:2014-08-14
Fundamental Frequency	:2440 MHz	Temp./Humi.	:23 deg_C/61 RH
Operation Mode	:TX MID	Engineer	:Curry
EUT Pol.	:H Plane	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.	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
31.94	S	Peak	32.01	-13.88	18.13	40.00	-21.87
160.95	S	Peak	27.69	-12.39	15.30	43.50	-28.20
468.44	S	Peak	31.64	-7.74	23.90	46.00	-22.10
564.47	S	Peak	31.92	-6.17	25.75	46.00	-20.25
683.78	S	Peak	29.19	-3.63	25.56	46.00	-20.44
920.46	S	Peak	28.45	-0.25	28.20	46.00	-17.80
4880.00	H	Average	36.99	6.92	43.91	54.00	-10.09
4880.00	H	Peak	46.43	6.92	53.35	74.00	-20.65
7320.00	H	---					
9760.00	H	---					
12200.00	H	---					
14640.00	H	---					
17080.00	H	---					
19520.00	H	---					
21960.00	H	---					
24400.00	H	---					

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Operation Band	:2.4G	Test Date	:2014-08-14
Fundamental Frequency	:2474 MHz	Temp./Humi.	:23 deg_C/61 RH
Operation Mode	:TX HIGH	Engineer	:Curry
EUT Pol.	:H Plane	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.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	dB
		PK/QP/AV	dBμV		dBμV/m	dBμV/m	
71.71	S	Peak	36.80	-15.54	21.26	40.00	-18.74
128.94	S	Peak	30.00	-14.25	15.75	43.50	-27.75
450.01	S	Peak	30.83	-8.22	22.61	46.00	-23.39
587.75	S	Peak	29.48	-5.01	24.47	46.00	-21.53
754.59	S	Peak	28.22	-2.49	25.73	46.00	-20.27
957.32	S	Peak	28.89	0.33	29.22	46.00	-16.78
4948.00	H	Average	36.31	7.05	43.36	54.00	-10.64
4948.00	H	Peak	46.03	7.05	53.08	74.00	-20.92
7422.00	H	---					
9896.00	H	---					
12370.00	H	---					
14844.00	H	---					
17318.00	H	---					
19792.00	H	---					
22266.00	H	---					
24740.00	H	---					

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Operation Band	:2.4G	Test Date	:2014-08-14
Fundamental Frequency	:2474 MHz	Temp./Humi.	:23 deg_C/61 RH
Operation Mode	:TX HIGH	Engineer	:Curry
EUT Pol.	:H Plane	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.	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
31.94	S	Peak	31.88	-13.88	18.00	40.00	-22.00
167.74	S	Peak	27.93	-12.80	15.13	43.50	-28.37
336.52	S	Peak	29.04	-10.54	18.50	46.00	-27.50
564.47	S	Peak	31.37	-6.17	25.20	46.00	-20.80
779.81	S	Peak	29.84	-2.66	27.18	46.00	-18.82
935.01	S	Peak	27.71	0.03	27.74	46.00	-18.26
4948.00	H	Average	37.31	7.05	44.36	54.00	-9.64
4948.00	H	Peak	46.64	7.05	53.69	74.00	-20.31
7422.00	H	---					
9896.00	H	---					
12370.00	H	---					
14844.00	H	---					
17318.00	H	---					
19792.00	H	---					
22266.00	H	---					
24740.00	H	---					

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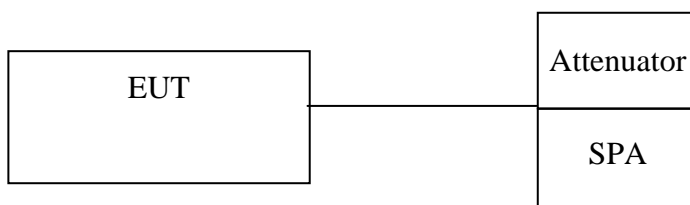
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8. 20 dB BAND WIDTH MEASUREMENT

8.1 Measurement Procedure

- 1 Place the EUT on the table and set it in transmitting mode.
- 2 Set the spectrum analyzer Frequency = fundamental frequency, RBW=100 kHz, VBW = 300 kHz, Span= 5MHz, Sweep=auto, and Max hold for 20dB test.
- 3 Mark the max reading.
- 4 Repeat above procedures until all frequency measured were complete.

8.2. Test SET-UP (Block Diagram of Configuration)



8.3. Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter	Anritsu	ML2495A	1005007	01/13/2014	01/12/2015
Power Sensor	Anritsu	MA2411B	917032	01/13/2014	01/12/2015
Spectrum Analyzer	Agilent	E4446A	MY51100003	05/19/2014	05/18/2015
Spectrum Analyzer	Agilent	E4440A	MY45304525	03/08/2014	03/07/2015
DC Block	Mini-Circuits	BLK-18-S+	1	02/27/2014	02/26/2015
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/03/2014	01/02/2015
Attenuator	Mini-Circuit	BW-S10W2+	002	02/27/2014	02/26/2015
Splitter	Agilent	11636B	N/A	02/27/2014	02/26/2015

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8.4. Measurement Results:

20dB Bandwidth:

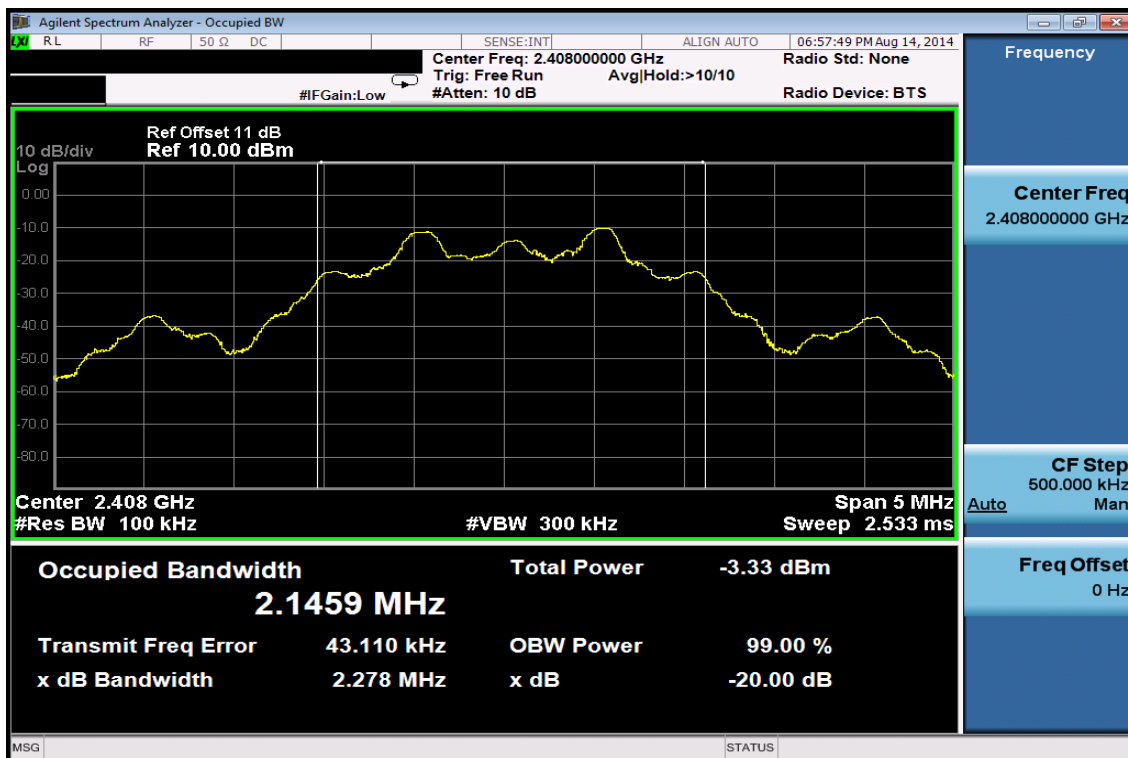
Frequency MHz	20dB Bandwidth (MHz)
2408	2.278
2440	2.290
2474	2.236

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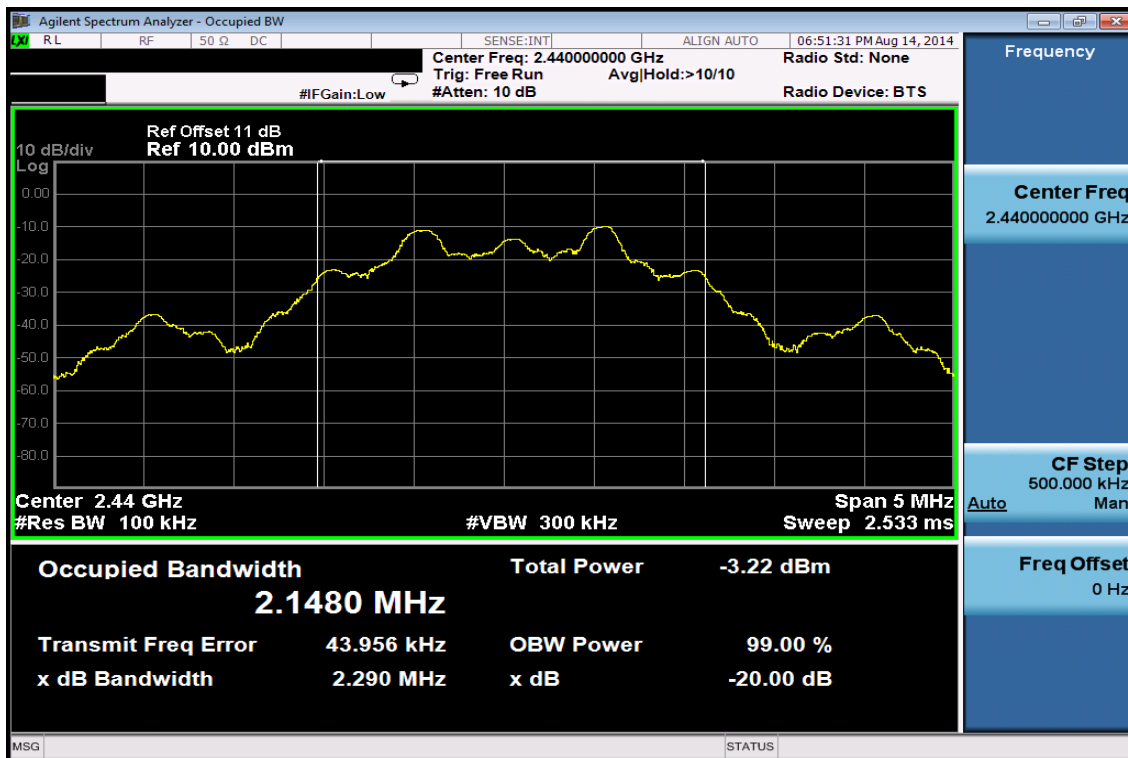
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20dB Bandwidth Test Data CH-Low



20dB Bandwidth Test Data CH-Mid



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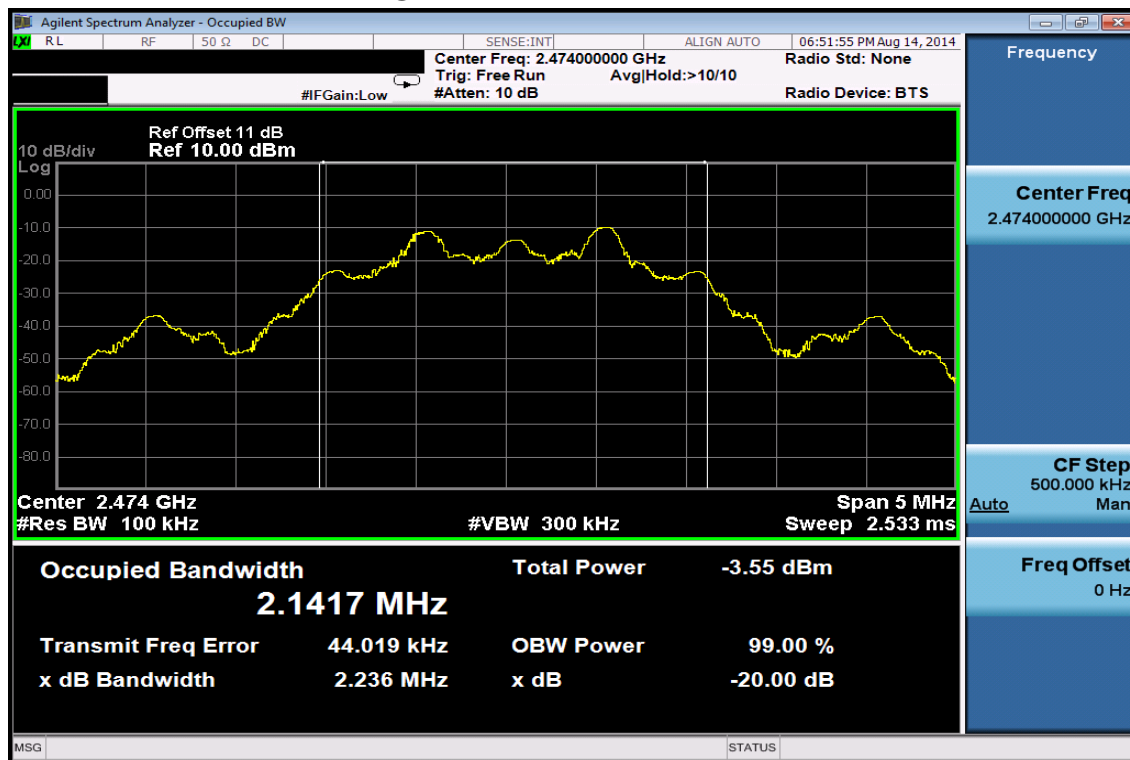
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20dB Bandwidth Test Data CH- High

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