

FCC Part 15C Measurement and Test Report

For

ASK PROXIMA CO., LIMITED

Room 3, 21/F., Far East Consortium Building, 121 Des Voeux Road, Central,

Hong Kong

FCC ID: 2AALLWPJ2530R

FCC Rule(s):	<u>FCC Part 15.249</u>
Product Description:	<u>Zigbee Router</u>
Tested Model:	<u>WPJ2530R</u>
Report No.:	<u>STR13128115I</u>
Tested Date:	<u>2013-12-10 to 2014-01-10</u>
Issued Date:	<u>2014-01-13</u>
Tested By:	<u>Daniel Liu / Engineer</u>
Reviewed By:	<u>Lahm Peng / EMC Manager</u>
Approved & Authorized By:	<u>Jandy so / PSQ Manager</u>
Prepared By:	

Daniel Liu
Lahm peng
Jandyso

Shenzhen SEM.Test Technology Co., Ltd.

1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road,
Bao'an District, Shenzhen, P.R.C. (518101)

Tel.: +86-755-33663308 Fax.: +86-755-33663309 Website: www.semtest.com.cn

Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Shenzhen SEM.Test Technology Co., Ltd.

TABLE OF CONTENTS

1. GENERAL INFORMATION.....	3
1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT).....	3
1.2 TEST STANDARDS.....	4
1.3 TEST METHODOLOGY.....	4
1.4 TEST FACILITY.....	4
1.5 EUT SETUP AND TEST MODE.....	5
2. SUMMARY OF TEST RESULTS	6
3. ANTENNA REQUIREMENTS.....	7
3.1 STANDARD APPLICABLE.....	7
3.2 TEST RESULT.....	7
4. RADIATED EMISSIONS.....	8
4.1 MEASUREMENT UNCERTAINTY	8
4.2 STANDARD APPLICABLE.....	8
4.3 TEST EQUIPMENT LIST AND DETAILS	8
4.4 TEST PROCEDURE.....	9
4.5 CORRECTED AMPLITUDE & MARGIN CALCULATION.....	9
4.6 ENVIRONMENTAL CONDITIONS	10
4.7 SUMMARY OF TEST RESULTS/PLOTS	10
5. OUT OF BAND EMISSIONS.....	14
5.1 STANDARD APPLICABLE.....	14
5.2 TEST EQUIPMENT LIST AND DETAILS	14
5.3 TEST PROCEDURE.....	14
5.4 ENVIRONMENTAL CONDITIONS	14
5.5 SUMMARY OF TEST RESULTS/PLOTS	14
6. EMISSION BANDWIDTH.....	17
6.1 STANDARD APPLICABLE.....	17
6.2 TEST EQUIPMENT LIST AND DETAILS	17
6.3 TEST PROCEDURE.....	17
6.4 ENVIRONMENTAL CONDITIONS	17
6.5 SUMMARY OF TEST RESULTS/PLOTS	17
7. CONDUCTED EMISSIONS	19
7.1 MEASUREMENT UNCERTAINTY	19
7.2 TEST EQUIPMENT LIST AND DETAILS	19
7.3 TEST PROCEDURE.....	19
7.4 BASIC TEST SETUP BLOCK DIAGRAM.....	19
7.5 ENVIRONMENTAL CONDITIONS	20
7.6 TEST RECEIVER SETUP	20
7.7 SUMMARY OF TEST RESULTS/PLOTS	20
7.8 CONDUCTED EMISSIONS TEST DATA.....	20

1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: ASK PROXIMA CO., LIMITED
Address of applicant: Room 3, 21/F., Far East Consortium Building, 121
Des Voeux Road, Central, Hong Kong
Manufacturer: ASK PROXIMA CO., LIMITED
Address of manufacturer: Room 3, 21/F., Far East Consortium Building, 121
Des Voeux Road, Central, Hong Kong

General Description of EUT	
Product Name:	Zigbee Router
Trade Name:	/
Model No.:	WPJ2530R
Adding Model(s):	/
Rated Voltage:	DC 3.3V
Note: The test data is gathered from a production sample, provided by the manufacturer.	

Technical Characteristics of EUT	
Frequency Range:	2460MHz
Max. Field Strength:	98.65 dBuV/m
Data Rate:	250kbps
Modulation:	DSSS, OQPSK
Quantity of Channels:	1
Channel Separation:	/
Antenna Type:	SMA-reverse Antenna
Antenna Gain:	5 dBi
Lowest Internal Frequency of EUT:	32 MHz
Device Category:	Fixed Device

1.2 Test Standards

The following report is prepared on behalf of the ASK PROXIMA CO., LIMITED in accordance with FCC Part 15, Subpart B, Subpart C, and section 15.107, 15.203, 15.205, 15.207, 15.209 and 15.249 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.107, 15.203, 15.205, 15.207, 15.209 and 15.249 of the Federal Communication Commissions rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which results in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

1.4 Test Facility

FCC – Registration No.: 934118

Shenzhen SEM.Test Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files and the Registration is 934118.

Industry Canada (IC) Registration No.: 11464A

The 3m Semi-anechoic chamber of Shenzhen SEM.Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

CNAS Registration No.: L4062

Shenzhen SEM.Test Technology Co., Ltd. is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L4062. All measurement facilities used to collect the measurement data are located at 1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road, Bao'an District, Shenzhen, P.R.C (518101).

1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	Transmitting	2460 MHz

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
Projector	ASK	LCWXN200	/

2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§ 15.203	Antenna Requirement	Compliant
§15.205	Restricted Band of Operation	Compliant
§ 15.207(a)	Conducted Emission	Compliant
§ 15.209(a)(f)	Radiated Supirous Emissions	Compliant
§15.249(a)	Field Strength of Emissions	Compliant
§15.249(d)	Out of Band Emission	Compliant
§15.215 (c)	Emission Bandwidth	Compliant

3. Antenna Requirements

3.1 Standard Applicable

According to FCC Part 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

3.2 Test Result

This product has a SMA-reverse antenna, fulfill the requirement of this section.

4. Radiated Emissions

4.1 Measurement Uncertainty

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement is ± 5.10 dB.

4.2 Standard Applicable

According to §15.249(a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency	Field strength of fundamental (milli-volts/meter)	Field strength of Harmonics (micro-volts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

4.3 Test Equipment List and Details

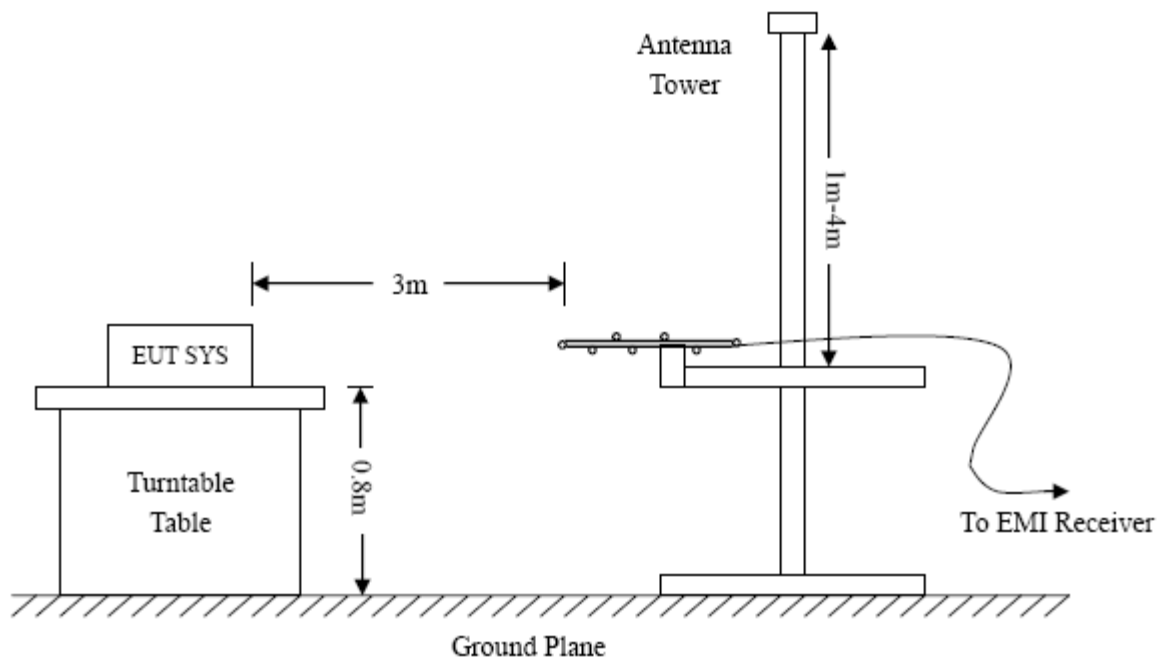
Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2013-05-07	2014-05-06
EMI Test Receiver	R&S	ESVB	825471/005	2013-05-07	2014-05-06
Pre-amplifier	Agilent	8447F	3113A06717	2013-05-07	2014-05-06
Pre-amplifier	Compliance Direction	PAP-0118	24002	2013-05-07	2014-05-06
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2013-04-20	2014-04-19
Horn Antenna	ETS	3117	00086197	2013-04-20	2014-04-19
Horn Antenna	ETS	3116B	00088203	2013-04-20	2014-04-19
Loop Antenna	SCHWARZECK	HFRA 5165	9365	2013-04-20	2014-04-19

4.4 Test Procedure

The setup of EUT is according with per ANSI C63.4-2003 measurement procedure. The specification used was with the FCC Part 15.205 15.249(a) and FCC Part 15.209 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.



Frequency :9kHz-30MHz

RBW=10KHz,

VBW =30KHz

Sweep time= Auto

Trace = max hold

Detector function = peak

Frequency :30MHz-1GHz

RBW=120KHz,

VBW=300KHz

Sweep time= Auto

Trace = max hold

Detector function = peak, QP

Frequency :Above 1GHz

RBW=1MHz,

VBW=3MHz(Peak), 10Hz(AV)

Sweep time= Auto

Trace = max hold

Detector function = peak, AV

4.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Ant. Factor} + \text{Cable Loss} - \text{Ampl. Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dBμV means the emission is 6dBμV below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15C Limit}$$

4.6 Environmental Conditions

Temperature:	24 °C
Relative Humidity:	60 %
ATM Pressure:	1012 mbar

4.7 Summary of Test Results/Plots

According to the data below, the FCC Part 15.205, 15.209 and 15.249 standards, and had the worst margin of:

Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.

Plot of Radiated Emissions Test Data (30MHz to 1GHz)

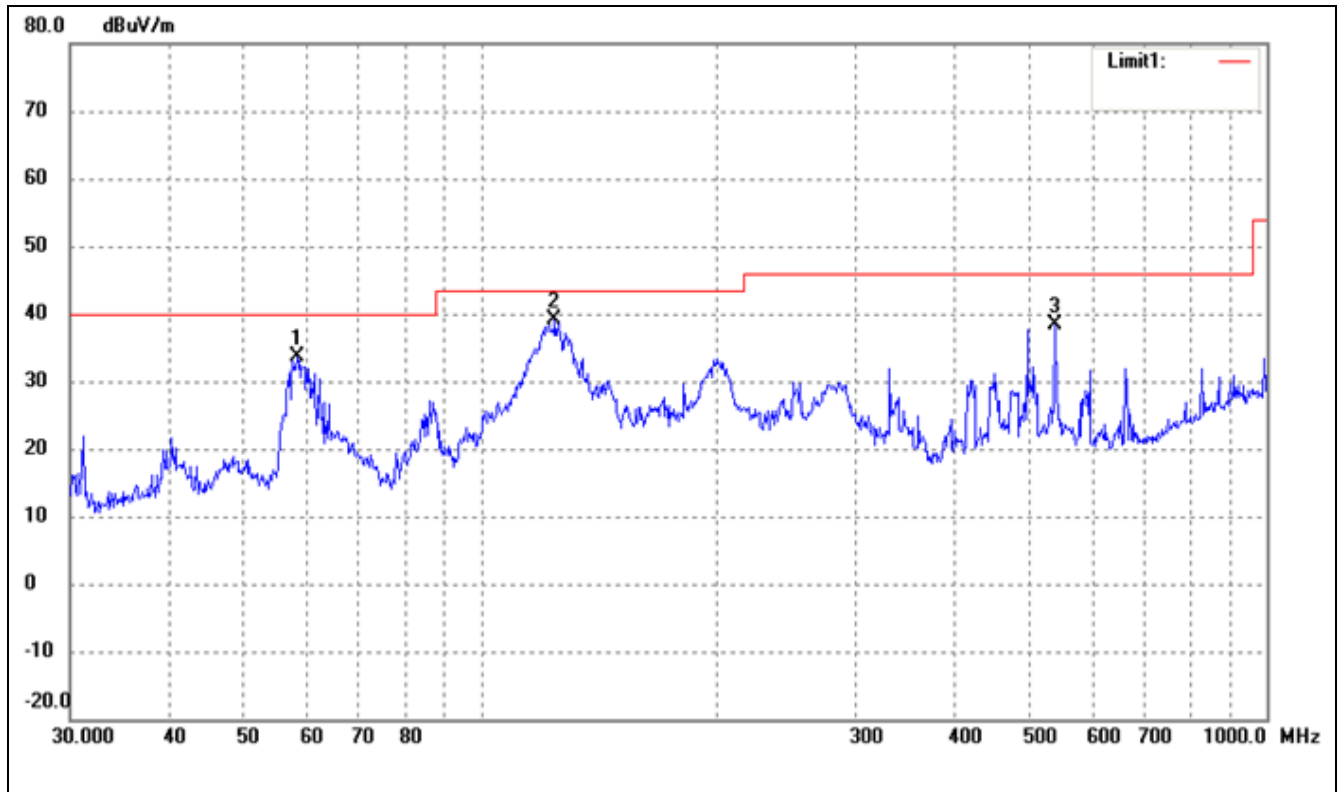
EUT: Zigbee Router

Tested Model: WPJ2530R

Operating Condition: Transmitting (2460MHz)

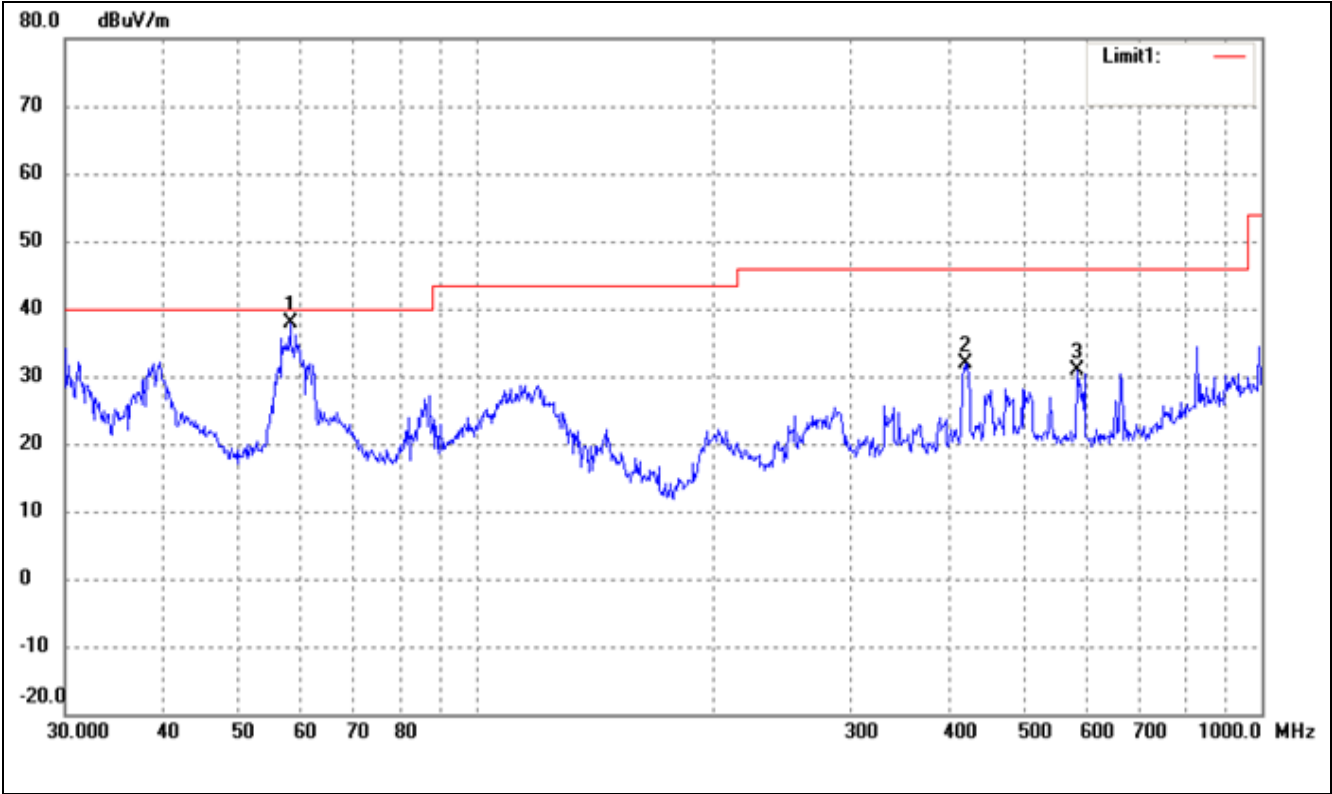
Comment: DC 3.3V by the host

Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	58.4074	42.38	-8.65	33.73	40.00	-6.27	264	100	peak
2	124.1330	51.06	-11.88	39.18	43.50	-4.32	113	200	peak
3	537.5891	39.69	-1.30	38.39	46.00	-7.61	287	100	peak

Test Specification: Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	57.9993	46.46	-8.55	37.91	40.00	-2.09	234	100	peak
2	420.5803	34.44	-2.46	31.98	46.00	-14.02	118	100	peak
3	582.7425	30.11	0.79	30.90	46.00	-15.10	164	100	peak

Spurious Emissions Above 1GHz

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2460MHz							
2460	100.80	-3.37	97.43	114	-16.57	H	PK
2460	91.95	-3.38	88.57	94	-5.43	H	AV
4920	65.84	0.71	66.55	74	-7.45	H	PK
4920	49.41	0.71	50.12	54	-3.88	H	AV
7380	45.48	3.82	49.30	74	-24.70	H	PK
7380	27.09	3.82	30.91	54	-23.09	H	AV
2460	102.02	-3.37	98.65	114	-15.35	V	PK
2460	92.62	-3.38	89.24	94	-4.76	V	AV
4920	66.01	0.71	66.72	74	-7.28	V	PK
4920	47.44	0.71	48.15	54	-5.85	V	AV
7380	43.18	3.82	47.00	74	-27.00	V	PK
7380	25.87	3.82	29.69	54	-24.31	V	AV

Note: Testing is carried out with frequency rang 30MHz to the tenth harmonics, which above 5th Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

5. Out of Band Emissions

5.1 Standard Applicable

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

5.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2013-05-07	2014-05-06
EMI Test Receiver	R&S	ESVB	825471/005	2013-05-07	2014-05-06
Pre-amplifier	Agilent	8447F	3113A06717	2013-05-07	2014-05-06
Pre-amplifier	Compliance Direction	PAP-0118	24002	2013-05-07	2014-05-06
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2013-04-20	2014-04-19
Horn Antenna	ETS	3117	00086197	2013-04-20	2014-04-19
Horn Antenna	ETS	3116B	00088203	2013-04-20	2014-04-19
Loop Antenna	SCHWARZECK	HFRA 5165	9365	2013-04-20	2014-04-19

5.3 Test Procedure

As the radiation test, set the Lowest and Highest Transmitting Channel, observed the outside band of 2400MHz to 2483.5MHz, than mark the higher-level emission for comparing with the FCC rules.

5.4 Environmental Conditions

Temperature:	24 °C
Relative Humidity:	60 %
ATM Pressure:	1012 mbar

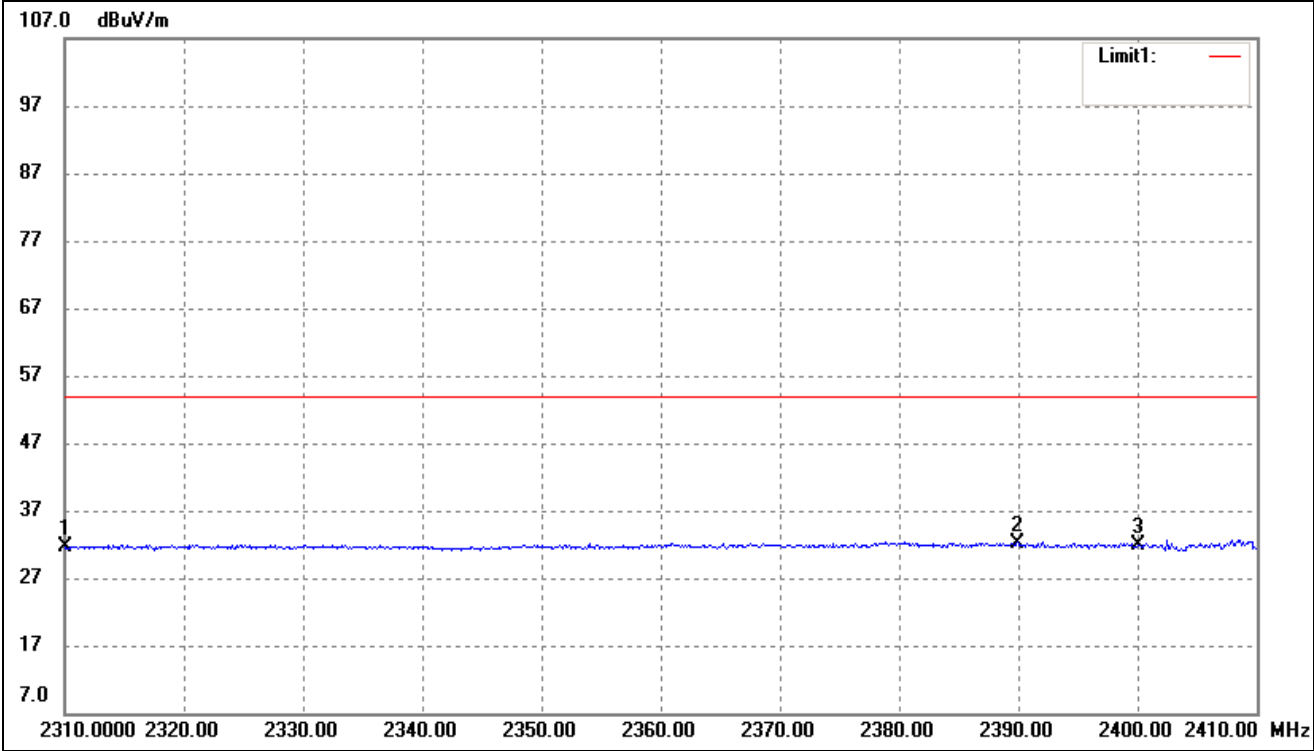
5.5 Summary of Test Results/Plots

Frequency	Limit	Result
MHz	dBuV / dBc	
2310.000	<54 dBuV	Pass
2390.000	<54 dBuV	Pass
2400.000	<54 dBuV	Pass
2483.500	<54 dBuV	Pass
2500.000	<54 dBuV	Pass

The edge emissions are below the FCC 15.209 Limits or complies with the 15.249 requirements.

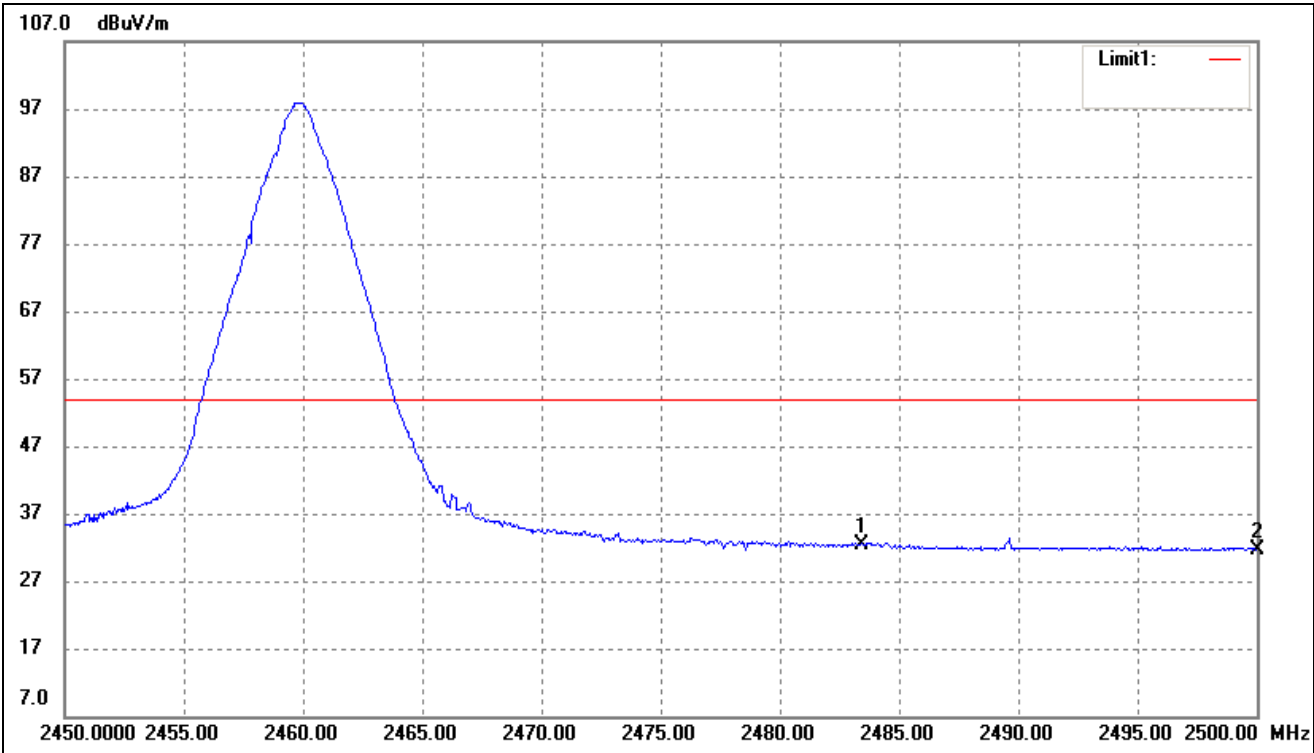
Please refer to the test plots as below.

Bandedge (Radiated)
Lowest Bandedge



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2310.000	35.30	-3.71	31.59	54.00	-22.41	Ave Detector
	2310.000	47.09	-3.71	43.38	74.00	-30.62	Peak Detector
2	2390.000	35.73	-3.54	32.19	54.00	-21.81	Ave Detector
	2390.000	48.56	-3.54	45.02	74.00	-28.98	Peak Detector
3	2400.000	35.43	-3.51	31.92	54.00	-22.08	Ave Detector
	2400.000	47.97	-3.51	44.46	74.00	-29.54	Peak Detector

Highest Bandedge



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	35.62	-3.33	32.29	54.00	-21.71	Ave Detector
	2483.500	48.42	-3.33	45.09	74.00	-28.91	Peak Detector
2	2500.000	35.01	-3.28	31.73	54.00	-22.27	Ave Detector
	2500.000	48.11	-3.28	44.83	74.00	-29.17	Peak Detector

6. Emission Bandwidth

6.1 Standard Applicable

According to 15.215 (c), intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

6.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Agilent	E4402B	US41192821	2013-05-07	2014-05-06
Attenuator	ATTEN	ATS100-4-20	/	2013-05-07	2014-05-06

6.3 Test Procedure

According to the ANSI 63.4-2003, the emission bandwidth test method as follows.

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

Set span = 1MHz, centered on a transmitting channel

RBW $\geq$ 1% 20dB Bandwidth, VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

All the trace to stabilize, use the marker-to-peak function to set the marker to the peak of the emission, use the marker-delta function to measure and record the 20dB down and 99% bandwidth of the emission.

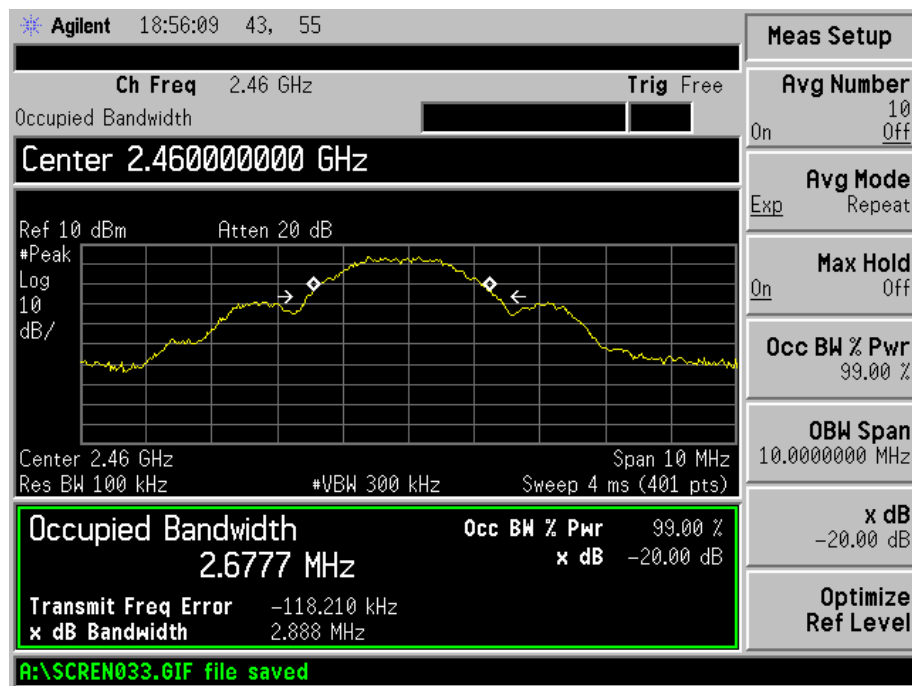
6.4 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

6.5 Summary of Test Results/Plots

Frequency MHz	20dB Bandwidth kHz	99% Bandwidth kHz
2460	2888.0	2677.7

Please refer to the following test plots



7. Conducted Emissions

7.1 Measurement Uncertainty

Base on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement is ± 2.88 dB.

7.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2013-05-07	2014-05-06
L.I.S.N	Schwarz beck	NSLK8126	8126-224	2013-05-07	2014-05-06
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2013-05-07	2014-05-06

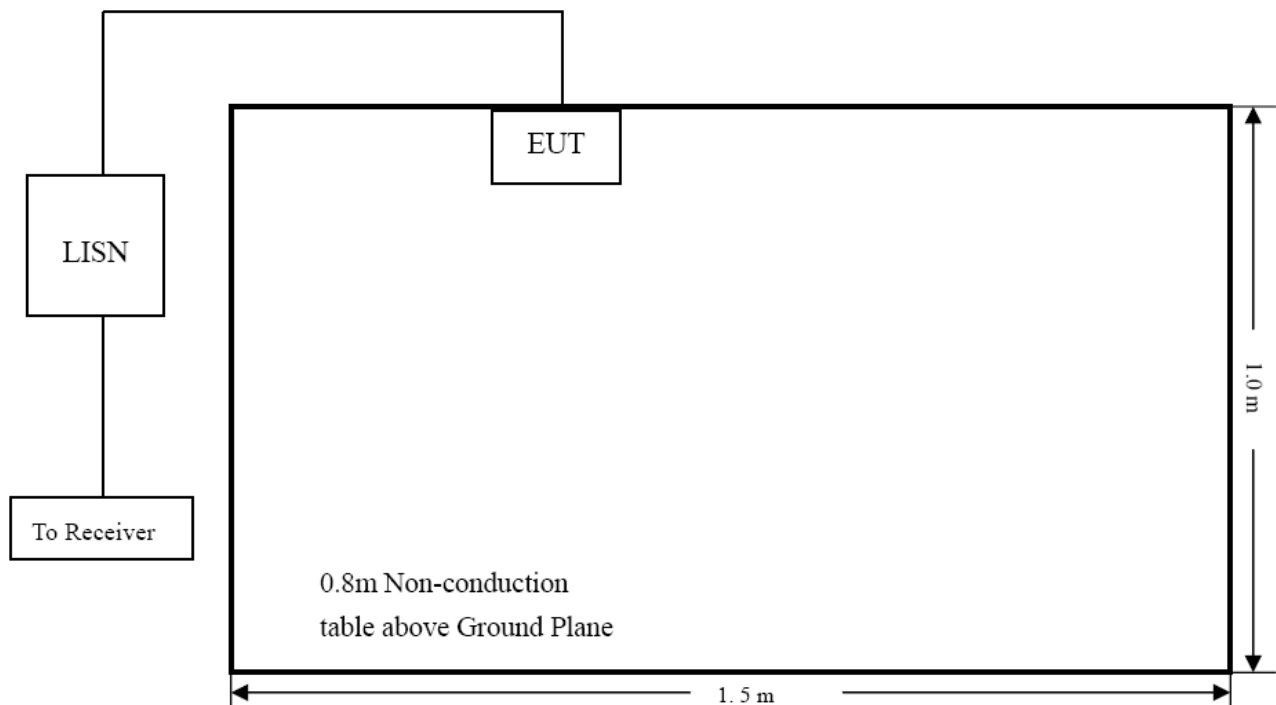
7.3 Test Procedure

The setup of EUT is according with per ANSI C63.4-2003 measurement procedure. The specification used was with the FCC Part 15.207 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

7.4 Basic Test Setup Block Diagram



7.5 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

7.6 Test Receiver Setup

During the conducted emission test, the test receiver was set with the following configurations:

Start Frequency 150 kHz
Stop Frequency..... 30 MHz
Sweep Speed Auto
IF Bandwidth..... 10 kHz
Quasi-Peak Adapter Bandwidth 9 kHz
Quasi-Peak Adapter Mode Normal

7.7 Summary of Test Results/Plots

According to the data in section 12.8, the EUT complied with the FCC Part 15.207 Conducted margin for a Class B device, with the *worst* margin reading of:

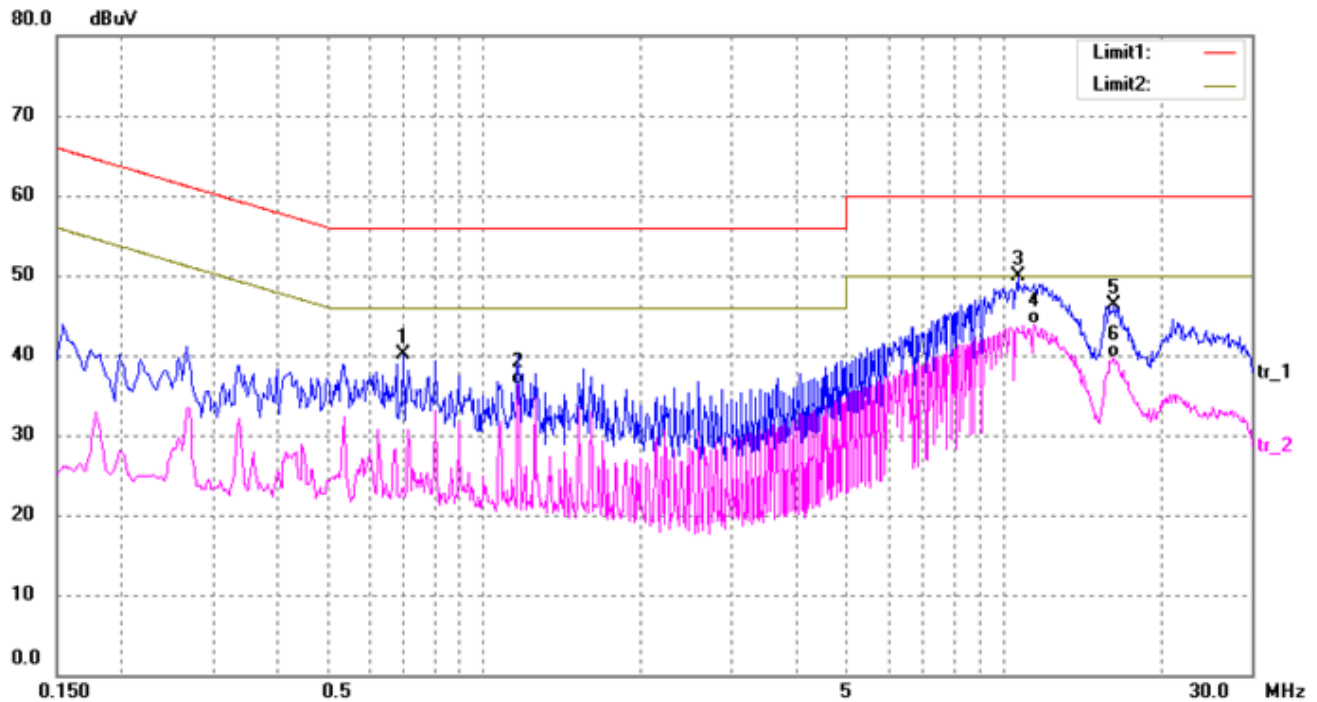
-5.91 dB at 11.7780 MHz in the Line mode, AV detector, 0.15-30MHz

7.8 Conducted Emissions Test Data

Plot of Conducted Emissions Test Data

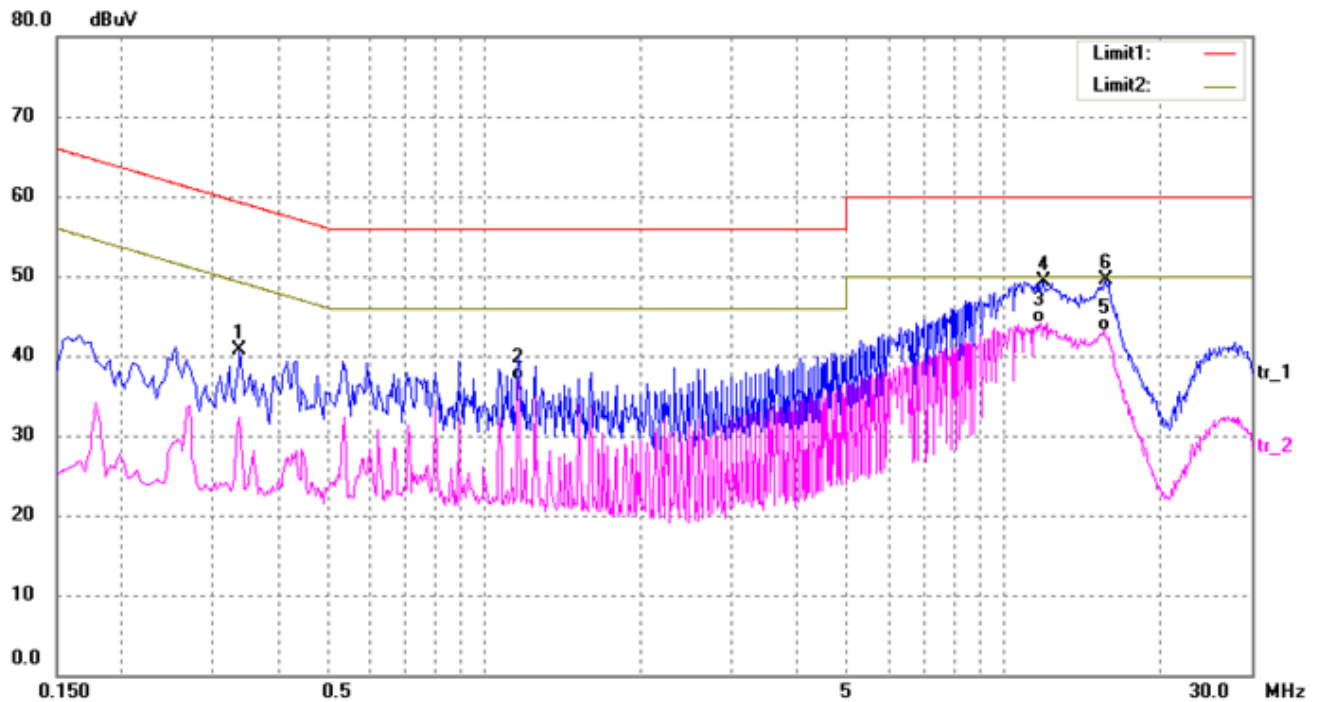
EUT: Zigbee Router
 Tested Model: WPJ2530R
 Operating Condition: Transmitting
 Comment: AC120V/60Hz; DC 3.3V by the host

Test Specification: Neutral



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.6980	30.47	9.70	40.17	56.00	-15.83	peak
2	1.1620	26.22	10.00	36.22	46.00	-9.78	AVG
3	10.6460	39.76	10.13	49.89	60.00	-10.11	peak
4	11.4460	33.54	10.29	43.83	50.00	-6.17	AVG
5	16.3700	35.00	11.27	46.27	60.00	-13.73	peak
6	16.3700	28.51	11.27	39.78	50.00	-10.22	AVG

Test Specification: Line



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.3380	31.30	9.50	40.80	59.25	-18.45	peak
2	1.1620	26.81	10.00	36.81	46.00	-9.19	AVG
3*	11.7780	33.73	10.36	44.09	50.00	-5.91	AVG
4	11.9780	38.97	10.40	49.37	60.00	-10.63	peak
5	15.5700	32.09	11.11	43.20	50.00	-6.80	AVG
6	15.7700	38.28	11.15	49.43	60.00	-10.57	peak

***** END OF REPORT *****