

EMC TEST REPORT for Intentional Radiator (Wi-Fi Function) No. 140901079SHA-001

Applicant : Hansong (Nanjing) Technology Ltd.

8th Kangping Road, Jiangning Economy and Technology

Development Zone, Nanjing, 211106, China.

Manufacturer : Hansong (Nanjing) Technology Ltd.

8th Kangping Road, Jiangning Economy and Technology

Development Zone, Nanjing, 211106, China.

Equipment : Wireless Speaker

Type/Model : Zemi Aria

SUMMARY

The equipment complies with the requirements according to the following standard(s):

47CFR Part 15 (2013): Radio Frequency Devices

ANSI C63.4 (2009): 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

RSS-210 Issue 8 (December 2010): Low-power Licence-exempt Radio communication Devices (All Frequency Bands): Category I Equipment

RSS-Gen Issue 3 (December 2010): General Requirements and Information for the Certification of Radio communication Equipment

Date of issue: Nov 06, 2014

Prepared by: Reviewed by:

Jesse Xu (*Project Engineer*) Daniel Zhao (*Reviewer*)





Description of Test Facility

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1. General Information

1.1 Applicant Information

Applicant: Hansong (Nanjing) Technology Ltd.

8th Kangping Road, Jiangning Economy and Technology

Development Zone, Nanjing, 211106, China.

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Manufacturer: Hansong (Nanjing) Technology Ltd.

8th Kangping Road, Jiangning Economy and Technology

Development Zone, Nanjing, 211106, China.

Sample received date : Oct 08, 2014

Sample Identification No : *0141008-30-001*

Date of test : Oct 10, 2014 ~ Oct 25, 2014

1.2 Identification of the EUT

Equipment: Wireless Speaker

Type/model: Zemi Aria

FCC ID: XCO-ZEMIARIA

IC: 7756A-ZEMIARIA





1.3 Technical specification

Frequency Range: 2412 - 2462 MHz

Modulation: DBPSK @1Mbps

DQPSK@2Mbp CCK@5.5/11Mbps BPSK@6/9 Mbps QPSK@12/18Mbps 16-QAM@24Mbps

64-QAM@48/54Mpb and above

Gain of Antenna: Internal antenna, 2.0dBi max

Rating: AC 100-240V~ 50/60Hz 125W

Description of EUT: The EUT is a wireless audio device. It contains Both Wi-

Fi and Bluetooth functions. Among this report, only Wi-Fi function was assessed. There are two antenna chains. we test them and list the worse case in this report. The test SW is "HyperTerminal" with it can configure the

test channel.

Channel Description: The channel spacing is 5MHz.

1.4 Mode of operation during the test / Test peripherals used

While testing transmitting mode of EUT, the internal modulation and continuously transmission was applied.

The lowest, middle and highest channel were tested as representatives (2412MHz, 2437MHz and 2462MHz).

Test Peripherals:

PC: HP Compaq 6730b SW: HyperTerminal



2. Test Specification

2.1 Instrument list

Equipment	Type	Manu.	Internal no.	Cal. Date	Due date
Semi-	-	Albatross	EC 3048	2014-5-12	2015-5-11
anechoic		project			
chamber					
Test Receiver	ESCS 30	R&S	EC 2107	2013-10-21	2014-10-20
A.M.N.	ESH2-Z5	R&S	EC 3119	2014-1-9	2015-1-8
A.M.N.	ENV4200	R&S	EC3558	2014-8-11	2015-8-10
High Pass	WHKX 1.0/15G-	Wainwright	EC4297-1	2014-1-9	2015-1-8
Filter	10SS				
High Pass	WHKX 2.8/18G-	Wainwright	EC4297-2	2014-1-9	2015-1-8
Filter	12SS				
High Pass	WHKX	Wainwright	EC4297-3	2014-1-9	2015-1-8
Filter	7.0/1.8G-8SS				
Band Reject	WRCGV	Wainwright	EC4297-4	2014-1-9	2015-1-8
Filter	2400/2483-				
	2390/2493-				
	35/10SS				
Test Receiver	FSV40	R&S	/	2013-10-21	2014-10-20
Pre-amplifier	Pre-amp 18	R&S	EC 3222	2014-4-12	2015-4-11
Pre-amplifier	Tpa0118-40	R&S	EC 4792-2	2014-4-12	2015-4-11
Horn antenna	HF 906	R&S	EC 3049	2014-5-13	2016-5-12
Horn antenna	3117	ETS	EC 4792-1	2014-4-17	2016-4-16
Horn antenna	HAP18-26W		EC 4792-3	2014-4-10	2016-4-9
Bilog Antenna	CBL 6112D	TESEQ	EC 4206	2014-5-16	2016-5-15
Test Receiver	ESCS 30	R&S	EC 2107	2013-10-21	2014-10-20
Test Receiver	ESIB 26	R&S	EC 3045	2013-10-21	2014-10-20
Test Receiver	ESCI 7	R&S	EC4501	2013-12-13	2014-12-12
Loop antenna	9230-1/92291-1	Schwarzbeck	086814/084814	2013-12-16	2014-12-15

2.2 Test Standard

47CFR Part 15 (2013) ANSI C63.4 (2009) RSS-210 Issue 8 (December 2010) RSS-Gen Issue 3 (December 2010) KDB 558074 DTS



2.3 Test Summary

This report applies to tested sample only. This report shall not be reproduced in part without written approval of Intertek Testing Service Shanghai Limited.

TEST ITEM	FCC REFERANCE	IC REFERANCE	RESULT
Minimum 6dB Bandwidth	15.247(a)(2)	RSS-210 Issue 8	Pass
		Annex 8	
Maximum peak output power	15.247(b)	RSS-210 Issue 8	Pass
		Annex 8	
Power spectrum density	15.247(e)	RSS-210 Issue 8	Pass
		Annex 8	
Radiated emission	15.205 & 15.209	RSS-210 Issue 8	Pass
		Clause 2	
Emission outside the	15.247(d)	RSS-210 Issue 8	Pass
frequency band		Annex 8	
Power line conducted emission	15.207	RSS-Gen Issue 3	Pass
		Clause 7.2.4	
Occupied bandwidth	-	RSS-Gen Issue 3	Tested
		Clause 4.6.1	



2.4 Data rate VS power

The date rate with highest power level for each mode was chosen to perform test as

representative:

representative:	Data Data		D
Mode	Data Rate	СН	Power of chain
	(Mbps)		(dBm)
	1	М	16.45
802.11b	2	M	15.53
002.110	5.5	M	15.37
	11	M	15.65
	6	M	20.24
	9	M	19.60
	12	M	19.02
802.11g	18	M	19.91
002.11g	24	M	19.87
	36	M	19.09
	48	M	19.21
	54	M	19.02



FCC ID: XCO-ZEMIARIA IC: 7756A-ZEMIARIA

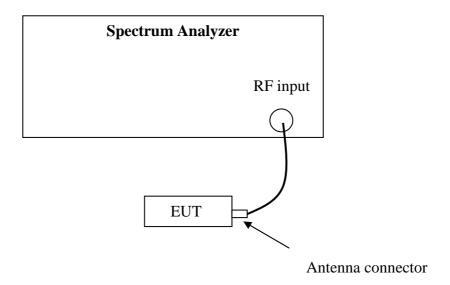
3. Minimum 6dB Bandwidth

Test result: PASS

3.1 Limit

For systems using digital modulation techniques that may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz bands, the minimum 6 dB bandwidth shall be at least 500 kHz.

3.2 Test Configuration



3.3 Test Procedure and test setup

The minimum 6dB bandwidth per FCC §15.247(a)(2) is measured using the Spectrum Analyzer according to DTS test procedure of "KDB558074 D01 DTS Meas Guidance v03r01" for compliance to FCC 47CFR 15.247 requirements.

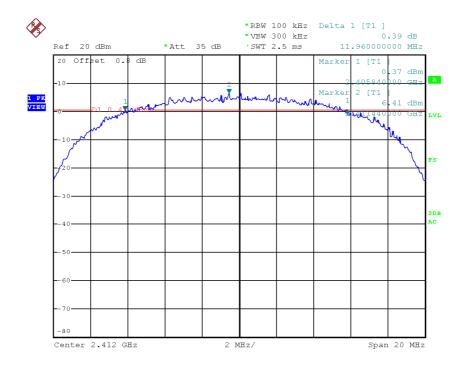


3.4 Test Protocol

Temperature : 25°C Relative Humidity : 55%

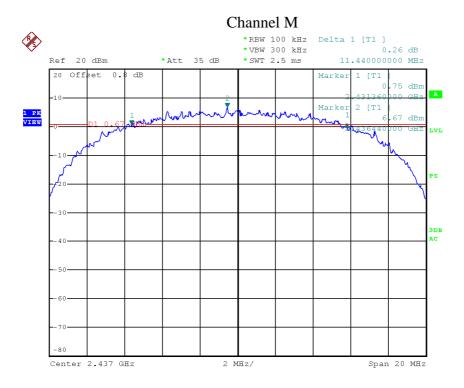
Mode	СН	Bandwidth (MHz)	Limit (MHz)
	L	11.96	
802.11b	M	12.24	≥0.5
	Н	12.59	

Channel L



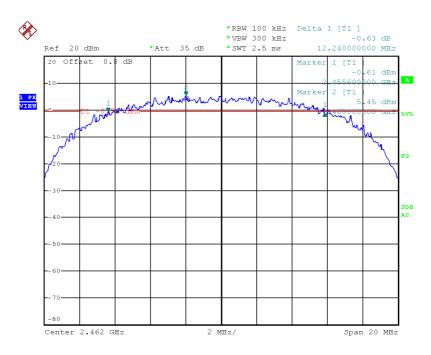
Date: 27.0CT.2014 12:33:31





Date: 27.0CT.2014 12:36:50

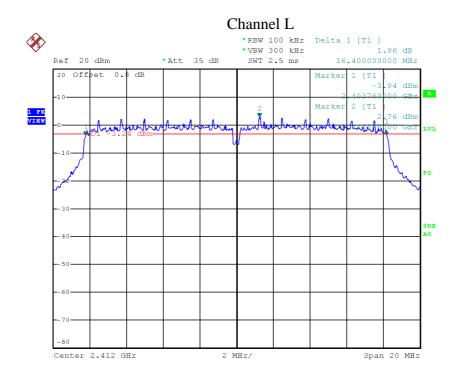
Channel H



Date: 27.OCT.2014 12:39:09

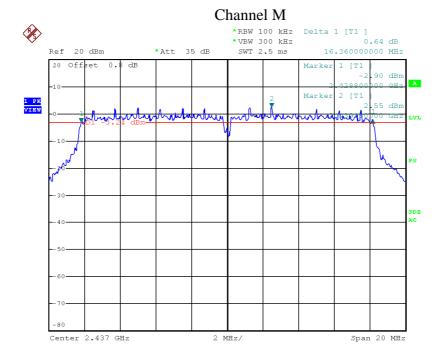


Mode	СН	Bandwidth (MHz)	Limit (MHz)
	L	16.40	
802.11g	M	16.36	≥0.5
	Н	16.44	

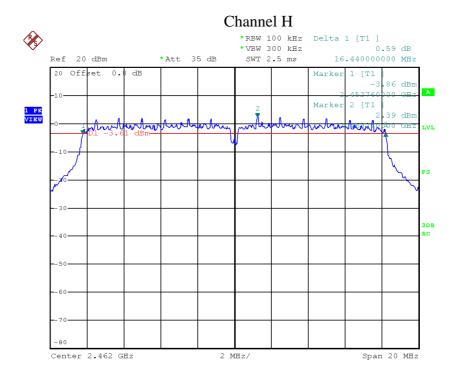


Date: 27.0CT.2014 13:53:10





Date: 27.0CT.2014 13:55:30



Date: 27.0CT.2014 13:51:32



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4. Maximum peak output power

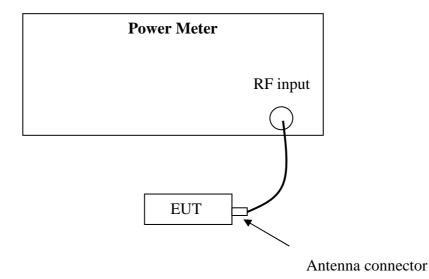
Test result: Pass

4.1 Test limit

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at
least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-
5850 MHz band: 1 watt
For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts
For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and
5725-5850 MHz bands: 1 Watt.

If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

4.2 Test Configuration



4.3 Test procedure and test setup

The EUT was tested according to DTS test procedure of "KDB558074 D01 DTS Meas Guidance v03r01" for compliance to FCC 47CFR 15.247 requirements (clause 9.1.2).



4.4 Test protocol

Temperature : 25 °C Relative Humidity : 55 %

Mode	СН	Cable loss (dB)	Conducted Power (dBm)	Limit (dBm)
	L	0.5	16.28	
802.11b	M	0.5	16.41	≤30
	Н	0.5	16.35	

Mode	СН	Cable loss (dB)	Conducted Power (dBm)	Limit (dBm)
	L	0.5	20.11	
802.11g	M	0.5	20.02	≤30
	Н	0.5	20.05	

The maximum EIRP of the EUT = 20.11dBm + 2.00dBi = 22.11dBm = 0.162W which is lower than the EIRP limit of RSS-210.



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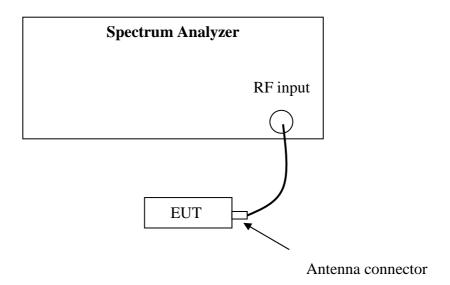
5. Power spectrum density

Test result: Pass

5.1 Test limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

5.2 Test Configuration



5.3 Test procedure and test setup

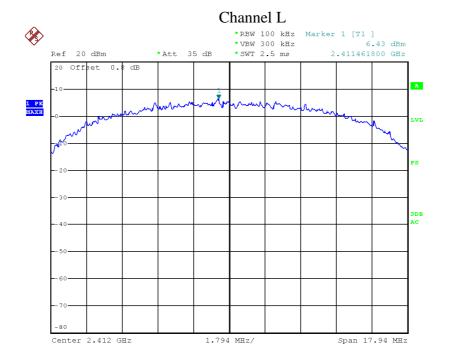
The power output per FCC §15.247(e) was tested according to DTS test procedure of "KDB558074 D01 DTS Meas Guidance v03r01" (clause 10.2) for compliance to FCC 47CFR 15.247 requirements.



5.4 Test Protocol

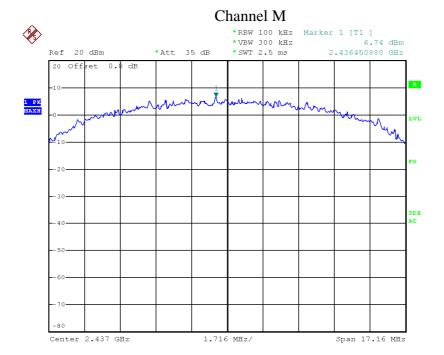
Temperature : 25 °C Relative Humidity: 55 %

Mode	СН	Cable loss (dB)	Spectrum Density (dBm/100kHz)	Limit (dBm/3kHz)
	L	0.5	6.43	
802.11b	M	0.5	6.74	≤8.00
	Н	0.5	6.60	



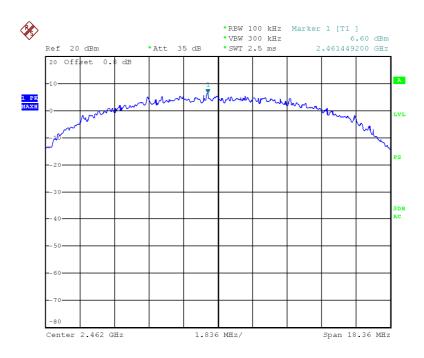
Date: 27.0CT.2014 12:52:19





Date: 27.0CT.2014 12:53:53

Channel H

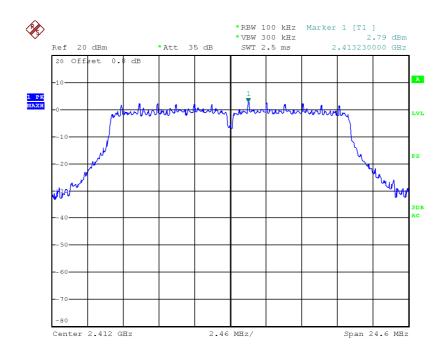


Date: 27.0CT.2014 12:55:20



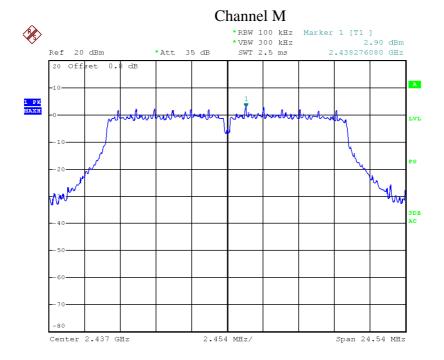
Mode	СН	Cable loss (dB)	Spectrum Density (dBm/100kHz)	Limit (dBm/3kHz)
	L	0.5	2.79	
802.11g	M	0.5	2.90	≤8.00
	Н	0.5	2.63	

Channel L



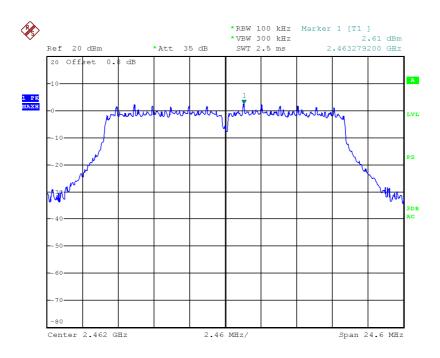
Date: 27.0CT.2014 14:02:19





Date: 27.0CT.2014 14:01:02

Channel H



Date: 27.0CT.2014 13:59:14



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6. Radiated emission

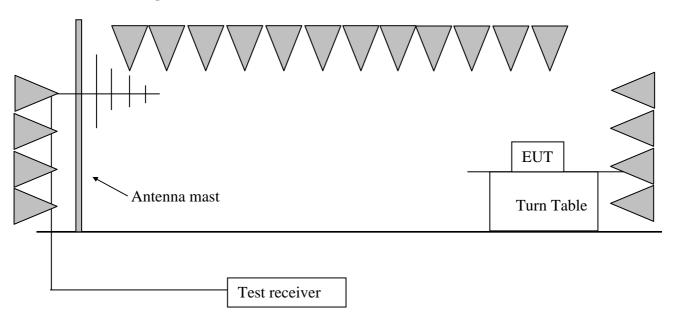
Test result: PASS

6.1 Test limit

The 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) showed as below:

Frequency (MHz)	Field Strength (dBuV/m)	Measurement Distance (m)
30 - 88	40.0	3
88 - 216	43.5	3
216 - 960	46.0	3
Above 960	54.0	3

6.2 Test Configuration





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6.3 Test procedure and test setup

The measurement was applied in a semi-anechoic chamber. While testing for spurious emission higher than 1GHz, if applied, the pre-amplifier would be equipped just at the output terminal of the antenna.

The EUT and simulators were placed on a 0.8m high wooden turntable above the horizontal metal ground plane. The turn table rotated 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna which was mounted on an antenna mast. The antenna moved up and down between from 1meter to 4 meters to find out the maximum emission level.

The EUT was tested according to DTS test procedure of KDB558074 D01 DTS "Meas Guidance v03r01" (clause 10.2) for compliance to FCC 47CFR 15.247 requirements.

Measured frequency: 9KHz~25GHz

Notes: The low frequency which started from 9KHz to 30MHz,was pre-scanned and result which was 20dB lower than the limit line per 15.31(o) was not reported. The 802.11 b mode was reported as representatives from 30MHz to 1GHz. Detail test result as below.

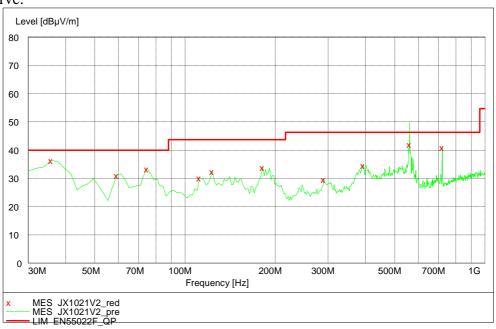


6.4 Test protocol

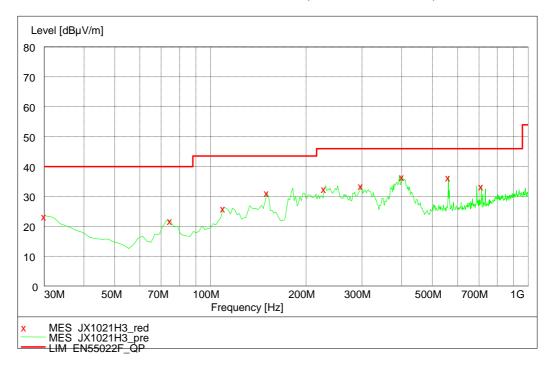
Temperature: 23 °C Relative humidity: 54%

Polarization: Vertical (802.11b Channel L)

Test Curve:



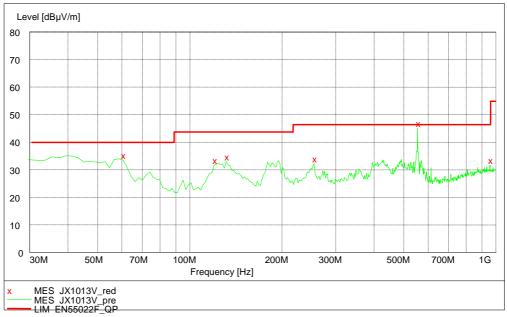
Polarization: Horizontal (802.11b Channel L)



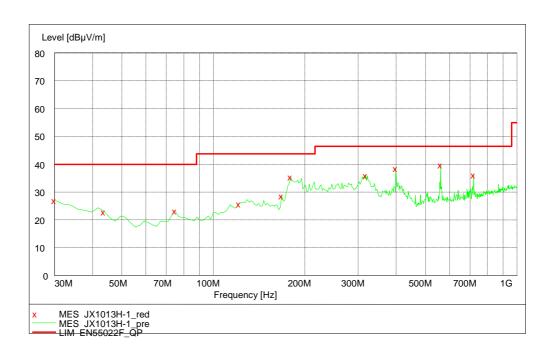


Polarization: Vertical(802.11b Channel M)

Test Curve:



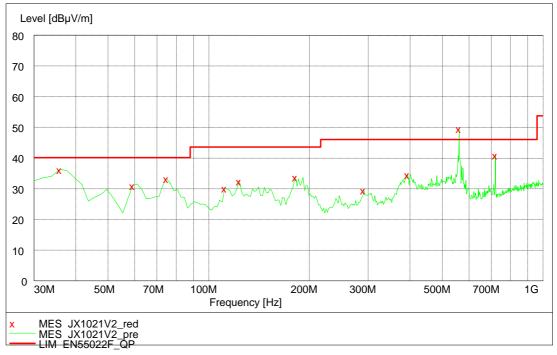
Polarization: Horizontal(802.11b Channel M)



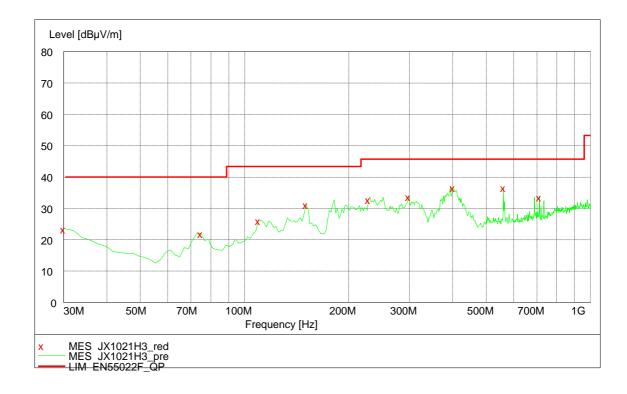


Polarization: Vertical(802.11b Channel H)

Test Curve:



Polarization: Horizontal(802.11b Channel H)





Mode 802.11b

СН	Polarization	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
	Н	2414.82	34.10	104.40	Fundamental	/	PK
	Н	400.04	15.10	38.12	46.00	7.88	PK
	Н	560.12	19.70	37.20	46.00	8.80	PK
	Н	2314.22	33.30	62.80	74.00	11.20	PK
	Н	2314.22	33.30	51.50	54.00	2.50	AV
	Н	2389.78	34.00	51.80	74.00	22.20	PK
L	Н	4983.96	-3.20	42.60	54.00	31.40	PK
	V	36.66	12.20	36.90	40.00	3.10	PK
	V	75.01	20.00	32.50	40.00	7.50	PK
	V	714.05	23.12	39.94	46.50	6.56	PK
	V	2218.43	33.70	62.50	74.00	11.50	PK
	V	2218.43	33.70	41.50	54.00	12.50	AV
	V	4983.96	-3.20	43.00	54.00	11.00	PK
	Н	2438.87	34.20	101.10	Fundamental	/	PK
	Н	400.04	15.10	38.12	46.00	7.88	PK
	Н	560.12	19.70	37.20	46.00	8.80	PK
	Н	2424.40	-4.90	52.70	74.00	22.30	PK
	Н	2485.96	-3.2	51.60	74.00	22.40	PK
M	V	36.66	12.20	36.90	40.00	3.10	PK
	V	75.01	20.00	32.50	40.00	7.50	PK
	V	714.05	23.12	39.94	46.50	6.56	PK
	V	4202.40	-4.90	36.70	74.00	37.30	PK
	V	4983.96	-3.2	38.60	74.00	36.40	PK
	V	7311.00	6.70	43.60	74.00	30.40	PK
	Н	2462.32	34.40	107.40	Fundamental	/	PK
Н	Н	400.04	15.10	38.12	46.00	7.88	PK
	Н	560.12	19.70	37.20	46.00	8.80	PK



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Н	2494.18	33.20	62.70	74.00	11.30	PK
Н	2494.18	33.20	41.70	54.00	12.30	AV
Н	4052.10	-5.20	39.80	74.00	34.20	PK
Н	2484.61	34.50	61.00	74.00	13.70	PK
Н	2484.61	34.50	39.00	54.00	15.00	AV
V	36.66	12.20	36.90	40.00	3.10	PK
V	75.01	20.00	32.50	40.00	7.50	PK
V	714.05	23.12	39.94	46.50	6.56	PK
V	2388.45	32.44	62.00	74.00	12.00	PK
V	2388.45	32.44	46.10	54.00	7.90	AV
V	3961.92	-5.5	41.00	74.00	33.00	PK

Mode 802.11g

СН	Polarization	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
	Н	2414.81	34.10	107.30	Fundamental	/	PK
	Н	118.45	18.91	32.48	43.50	11.02	PK
	Н	2436.22	33.30	69.80	74.00	4.20	PK
	Н	2436.22	33.30	50.50	54.00	3.50	AV
L	Н	4983.96	-3.20	42.60	74.00	34.90	PK
	V	400.00	21.31	35.68	46.50	10.82	PK
	V	2370.43	33.70	62.50	74.00	11.50	PK
	V	2370.43	33.70	41.70	54.00	12.30	AV
	V	4983.96	-3.20	43.00	74.00	31.00	PK
	Н	2438.87	34.20	101.10	Fundamental	/	PK
	Н	118.45	18.91	32.48	43.50	11.02	PK
	Н	4202.40	-4.90	37.70	74.00	36.70	PK
M	Н	4983.96	-3.2	39.60	74.00	34.40	PK
	V	400.00	21.31	35.68	46.50	10.82	PK
	V	4202.40	-4.90	34.70	74.00	39.30	PK
	V	4983.96	-3.2	38.60	74.00	35.40	PK



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	Н	2466.93	34.40	107.40	Fundamental	/	PK
	Н	118.45	18.91	32.48	43.50	11.02	PK
	Н	2418.43	33.80	62.50	74.00	11.50	PK
	Н	2418.43	33.80	51.10	54.00	3.90	AV
H	Н	4052.10	-5.20	39.80	74.00	34.20	PK
П	Н	2484.61	34.50	61.00	74.00	13.70	PK
	Н	2484.61	34.50	49.00	54.00	5.00	AV
	V	400.00	21.31	35.68	46.50	10.82	PK
	V	4388.45	32.44	52.00	74.00	22.00	PK
	V	4388.45	32.44	36.10	54.00	17.90	AV

Remark: 1. Correct Factor = Antenna Factor + Cable Loss (-Amplifier, is employed)

- 2. Corrected Reading = Original Receiver Reading + Correct Factor
- 3. Margin = limit Corrected Reading

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,

Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10dBuV.

Then Correct Factor = 30.20 + 2.00 - 32.00 = 0.20dB/m; Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m

Assuming limit = 54dBuV/m, Corrected Reading = 10.20dBuV/m, then Margin = 54-10.20=43.80dBuV/m



FCC ID: XCO-ZEMIARIA IC: 7756A-ZEMIARIA

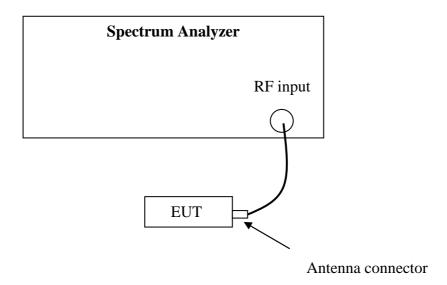
7. **Emission outside the frequency Band**

Test result: PASS

7.1 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

7.2 Test Configuration



7.3 Test procedure and test setup

The Emission outside the frequency Band per FCC §15.247(d) is measured using the Spectrum Analyzer with the resolutions bandwidth set at 100kHz, the video bandwidth set at 300kHz, and the SPAN>>RBW.

The EUT was tested according to DTS test procedure of "KDB558074 D01 DTS Meas Guidance v03r01" (clause 11.0) for compliance to FCC 47CFR 15.247 requirements.

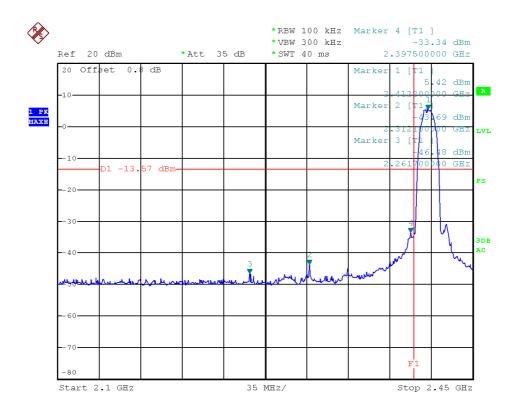


7.4 Test protocol

Mode	СН	Max reading among band (dBm)	The most restrict Attenuation outside band (dB)	Limit (dB)
802.11b	L	7.19	33.34	≥20
33=1116	Н	6.58	42.41	

Note: The test was performed from 9kHz to 26GHz and the graph of band edge emission is listed below.

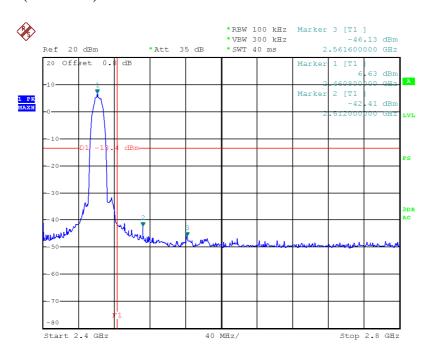
802.11b Channel 01 (2412MHz) Reference Level: 6.43dBm



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Channel 11 (2462MHz) Reference Level: 6.60dBm



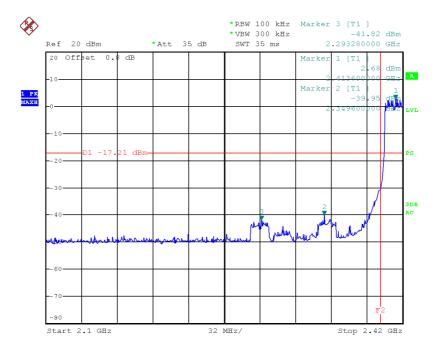
Date: 27.0CT.2014 13:20:20



Mode	СН	Max reading among band (dBm)	The most restrict Attenuation outside band (dB)	Limit (dB)
802.11g	L	7.19	39.95	≥20
0021118	Н	6.58	41.70	

Note: The test was performed from 9kHz to 26GHz and the graph of band edge emission is listed below.

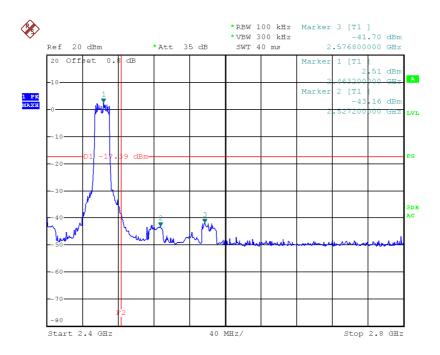
802.11g Channel 01 (2412MHz) Reference Level: 2.79dBm



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Channel 11 (2462MHz) Reference Level: 2.61dBm



Date: 27.0CT.2014 14:11:29



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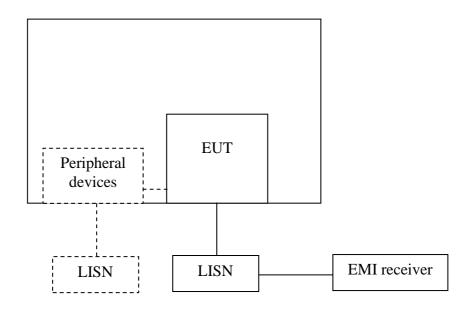
8. Power line conducted emission

Test result: Pass

8.1 Limit

Frequency of Emission (MHz)	Conducted Limit (dBuV)				
	QP	AV			
0.15-0.5	66 to 56*	56 to 46 *			
0.5-5	56	46			
5-30	60	50			
* Decreases with the logarithm of the frequency.					

8.2 Test configuration



- \square For table top equipment, wooden support is 0.8m height table
- For floor standing equipment, wooden support is 0.1m height rack.



FCC ID: XCO-ZEMIARIA IC: 7756A-ZEMIARIA

8.3 Test procedure and test set up

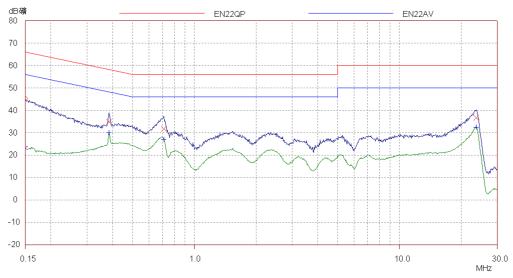
The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a $50\Omega/50uH$ coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a $50\Omega/50uH$ coupling impedance with 50Ω termination.

Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4 on conducted measurement. The bandwidth of the test receiver is set at 9 kHz.

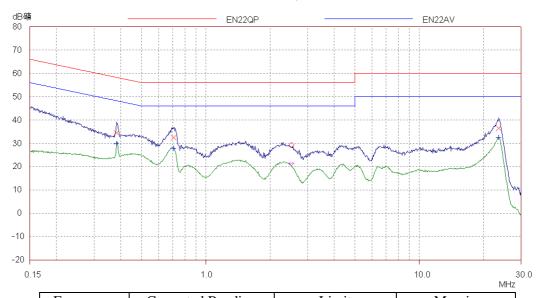


8.4 Test protocol

L-Line



N-Line



TVII IZ						
Frequency	Corrected Reading (dBuV)		(dBuV) (dBuV)		Margin (dB)	
	QP	AV	QP	AV	QP	AV
0.38 (N)	34.42	29.83	58.24	48.24	23.82	18.41
0.70 (N)	34.52	27.87	56.00	46.00	23.48	18.13
23.49 (N)	36.55	32.35	60.00	50.00	23.45	17.65
0.38 (L)	34.86	29.95	58.21	48.21	23.35	18.26
0.70 (L)	31.78	26.81	56.00	46.00	24.22	19.19
23.58 (L)	36.60	32.44	60.00	50.00	23.40	17.56



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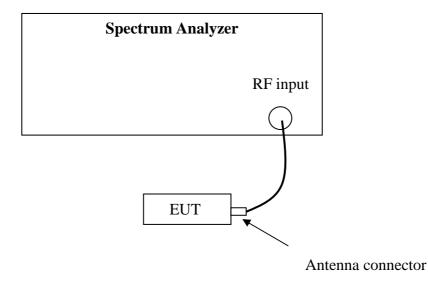
9. Occupied Bandwidth

Test Status: Tested

9.1 Test limit

None

9.2 Test Configuration



9.3 Test procedure and test setup

The occupied bandwidth per RSS-Gen Issue 3 Clause 4.6.1 was measured using the Spectrum Analyzer.

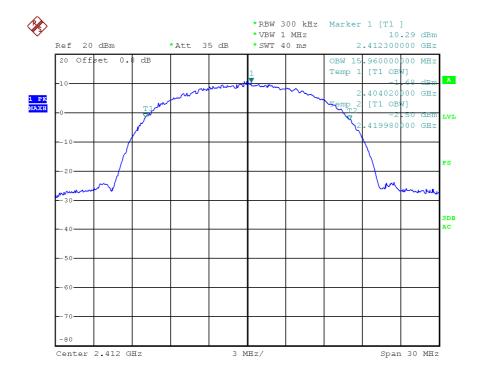


9.4 Test protocol

Temperature : 25 °C Relative Humidity : 55 %

Mode	СН	99% Bandwidth (MHz)
	L	15.96
802.11b	М	15.96
	Н	16.02

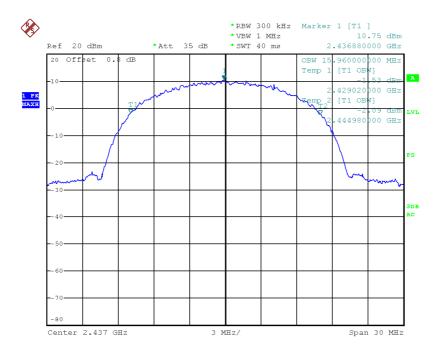
Channel L



Date: 27.0CT.2014 13:26:30

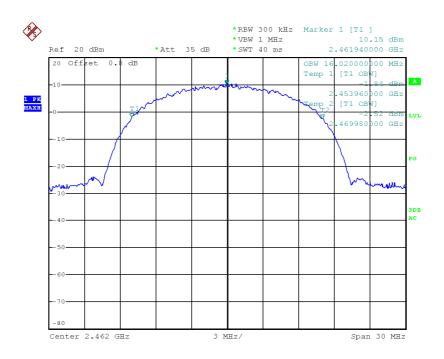


Channel M



Date: 27.0CT.2014 13:28:40

Channel H

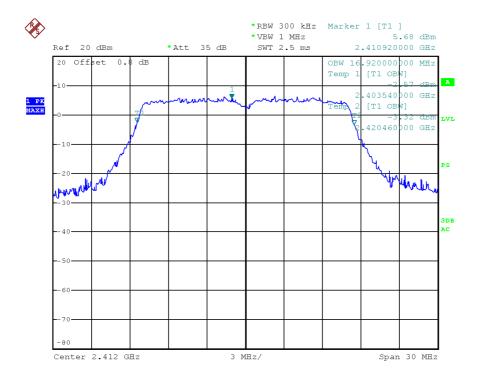


Date: 27.0CT.2014 13:27:56



Mode	СН	99% Bandwidth
Mode		(MHz)
	L	16.92
802.11g	M	16.98
	Н	16.98

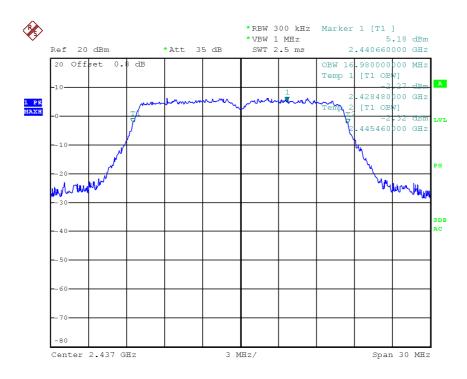
Channel L



Date: 27.0CT.2014 14:14:16

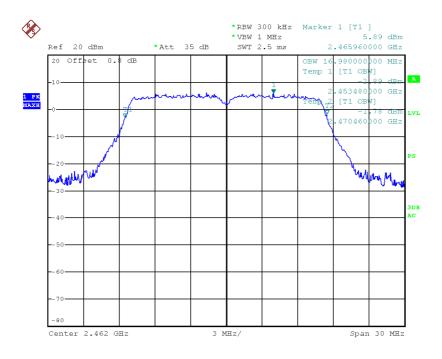


Channel M



Date: 27.0CT.2014 14:15:02

Channel H



Date: 27.0CT.2014 14:13:25