EMC TEST REPORT for Intentional Radiator (Wi-Fi Function)

No. 130800579SHA-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	: 2.0 Sound Unit
Type/Model	: Montana Sound Unit

SUMMARY

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

47CFR Part 15 (2012): Radio Frequency Devices

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

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

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

Date of issue: January 7, 2014

Prepared by: Reviewed by:

Nemo Li (*Project Engineer*) Daniel Zhao (*Reviewer*)

Description of Test Facility

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IC Assigned Code: 2042B-1

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Content

1. General Information

1.1 Applicant Information

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
Sample received date	:	December 9, 2014
Date of test	:	December 9, 2014 ~ December 30, 2014

1.2 Identification of the EUT

Equipment:	2.0 Sound Unit
Type/model:	Montana Sound Unit
FCC ID:	XCO-SOUNDUNIT
IC:	7756A-SOUNDUNIT

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:	Pole antenna, 2.0dBi max
Rating:	115/230V~, 50/60Hz, MAX. 250W, Class II
Description of EUT:	The EUT is a wireless audio device. There are two antenna chains. Only one antenna can work at the same time. Both were assessed and the worse one was listed in this report.
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 6280 Pro Microtower

2. Test Specification

2.1 Instrument list

Test Receiver	ESIB 26	R&S	EC 3045	2013-10-20	2014-10-19
Semi-anechoic chamber	-	Albatross project	EC 3048	2013-5-12	2014-5-11
Bilog Antenna	CBL 6112D	TESEQ	EC 4206	2013-4-28	2015-4-27
Horn antenna	HF 906	R&S	EC 3049	2013-4-28	2015-4-27
Horn antenna	3117	ETS	EC 4792-1	2012-4-17	2014-4-16
Pre-amplifier	Pre-amp 18	R&S	EC 3222	2013-4-12	2014-4-11
Pre-amplifier	Tpa0118-40	R&S	EC 4792-2	2013-4-12	2014-4-11
Test Receiver	ESCS 30	R&S	EC 2107	2013-10-21	2014-10-20
A.M.N.	ESH2-Z5	R&S	EC 3119	2013-1-9	2014-1-8
A.M.N.	ENV 216	R&S	EC 3394	2013-8-9	2014-8-8
High Pass Filter	WHKX 1.0/15G-10SS	Wainwright	EC4297-1	2013-1-9	2014-1-8
High Pass Filter	WHKX 2.8/18G-12SS	Wainwright	EC4297-2	2013-4-12	2014-4-11
High Pass Filter	WHKX 7.0/1.8G-8SS	Wainwright	EC4297-3	2013-1-9	2014-1-8
Band Reject Filter	WRCGV 2400/2483-2390/2493-35/10SS	Wainwright	EC4297-4	2013-1-9	2014-1-8
Test Receiver	FSP40	R&S	/	2013-10-15	2014-10-14
Test Receiver	ESCI 7	R&S	EC4501	2013-12-13	2014-12-12
Power sensor / Power meter	N1911A/N1921A	Agilent	EC4318	2013-04-12	2014-04-11

2.2 Test Standard

47CFR Part 15 (2012)
ANSI C63.4 (2003)
RSS-210 Issue 8 (December 2010)
RSS-Gen Issue 3 (December 2010)

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.

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

2.4 Data rate VS power

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

Mode	Data Rate (Mbps)	CH	Power of chain 1 (dBm)	Power of chain 2 (dBm)
802.11b	1	M	17.87	17.23
	2	M	17.85	17.25
	5.5	M	17.76	17.21
	11	M	17.35	17.17
802.11g	6	M	22.43	21.95
	9	M	22.40	21.90
	12	M	22.18	21.69
	18	M	22.03	21.57
	24	M	21.95	21.59
	36	M	21.93	21.46
	48	M	20.9	20.28
	54	M	20.25	19.72

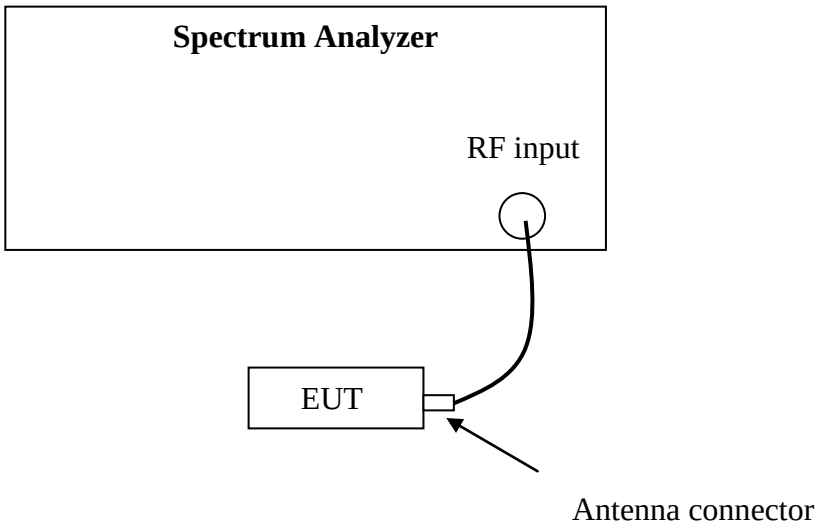
3. Minimum 6dB Bandwidth

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

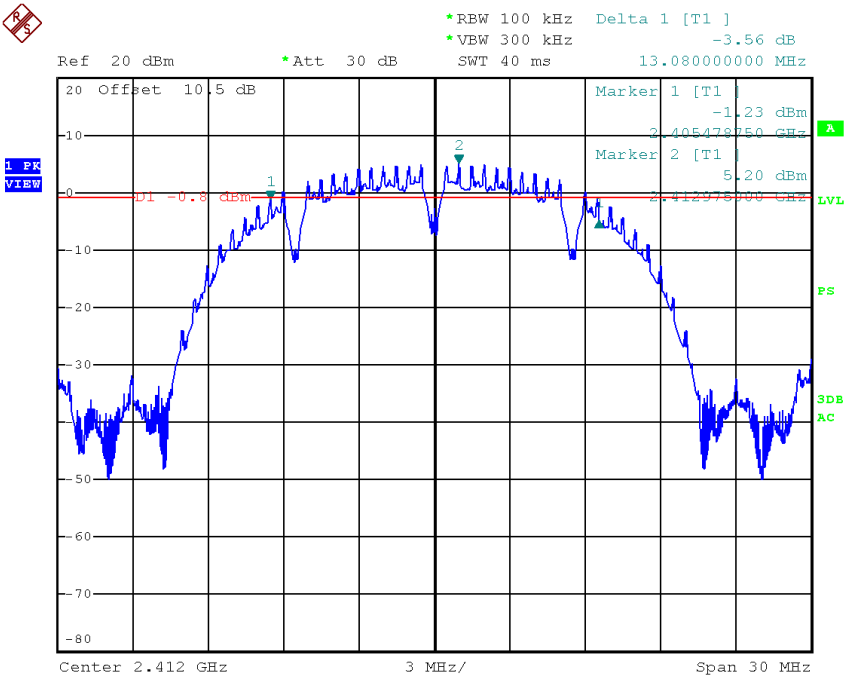
The minimum 6dB bandwidth per FCC §15.247(a)(2) is measured using the Spectrum Analyzer according to DTS test procedure of "KDB558074 D01 DTS Meas Guidance v03r01" for compliance to FCC 47CFR 15.247 requirements.

3.4 Test Protocol

Temperature : 25°C
Relative Humidity : 55%

Mode	CH	Bandwidth (MHz)	Limit (MHz)
802.11b	L	13.08	⩾0.5
	M	13.08	
	H	13.08	

Channel L



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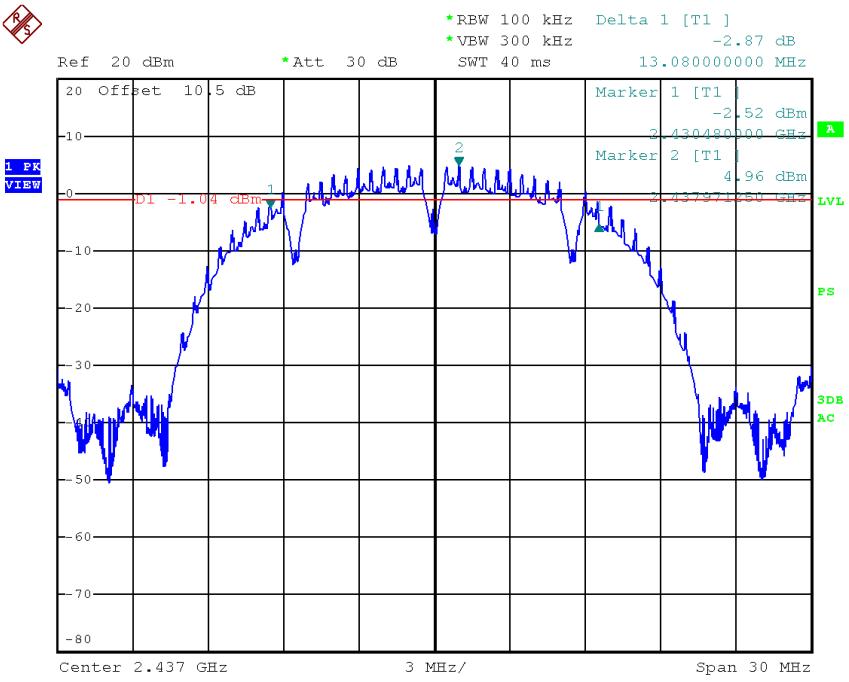

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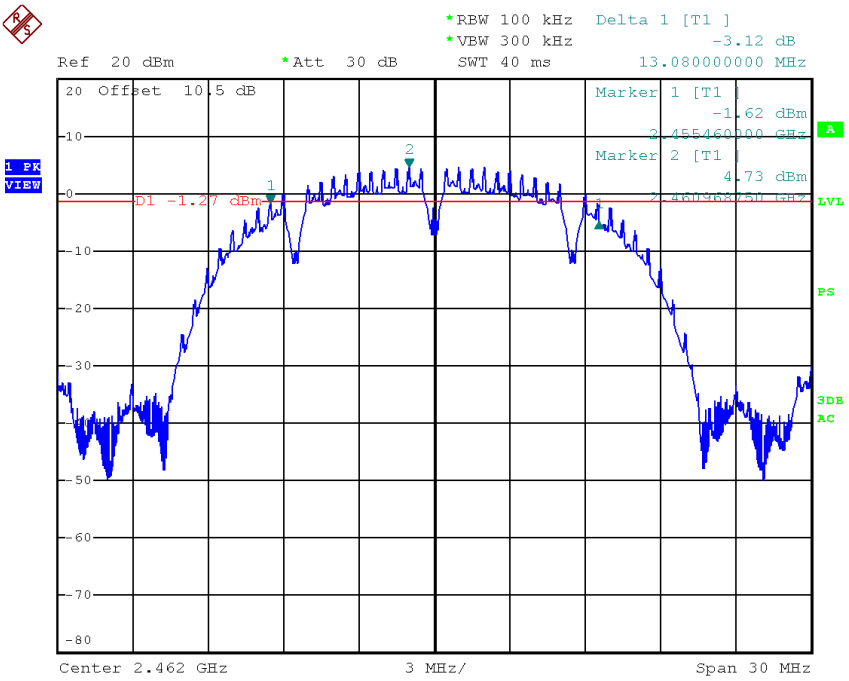

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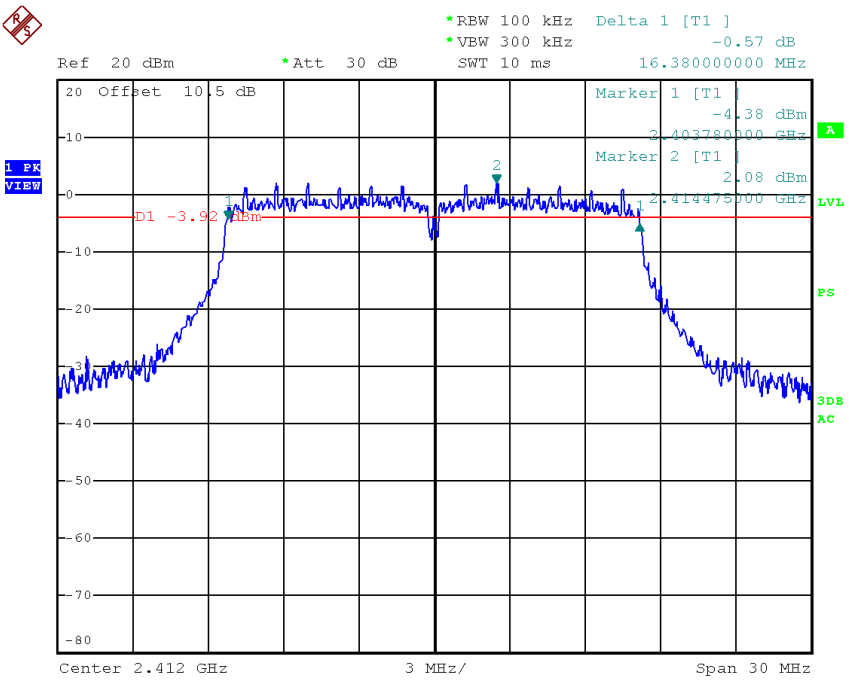
Mode	CH	Bandwidth (MHz)	Limit (MHz)
802.11g	L	16.38	⩾0.5
	M	16.41	
	H	16.38	

Channel L



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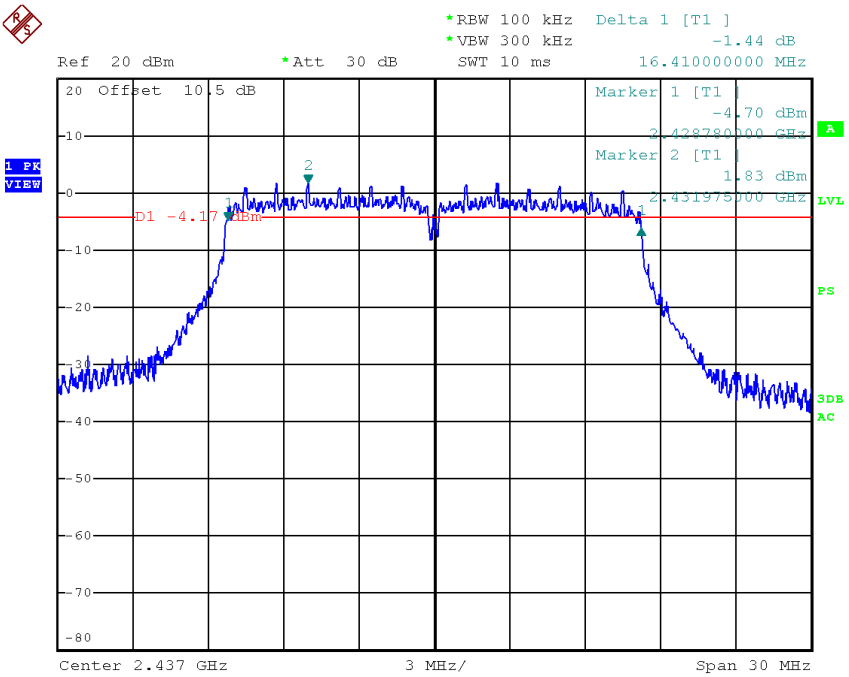
Channel M



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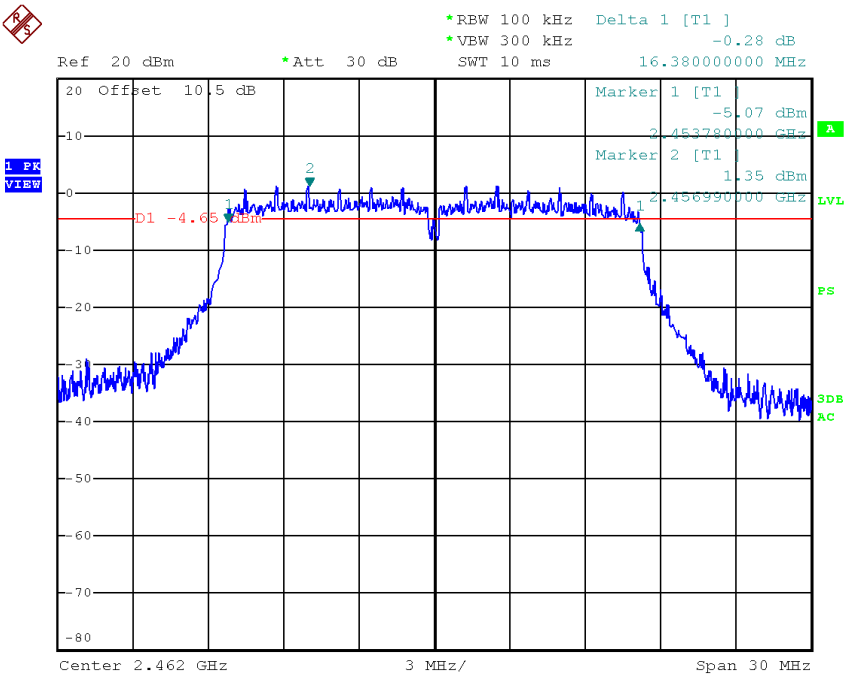
Channel H



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4. Maximum peak output power

Test result: Pass

4.1 Test limit

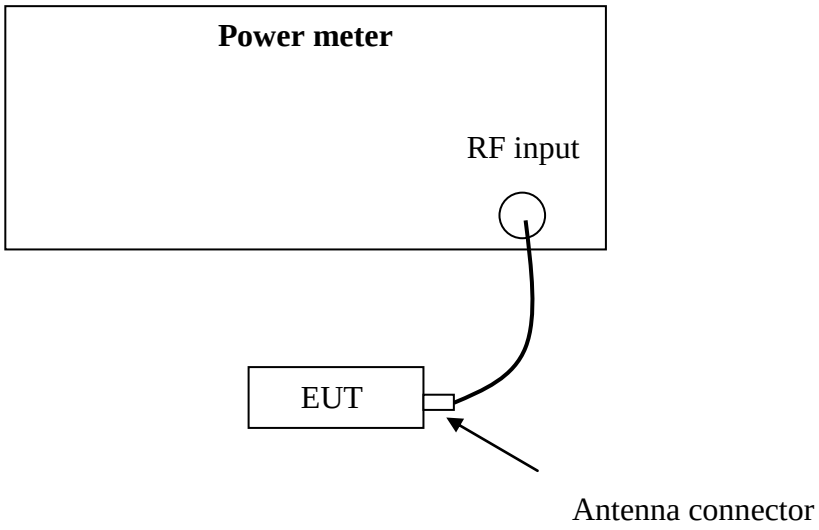
☐ For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt

☐ 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	CH	Cable loss (dB)	Conducted Power (dBm)	Limit (dBm)
802.11b	L	0.50	17.70	≤30
	M	0.50	17.87	
	H	0.50	17.85	

Mode	CH	Cable loss (dB)	Conducted Power (dBm)	Limit (dBm)
802.11g	L	0.50	22.36	≤30
	M	0.50	22.43	
	H	0.50	22.35	

The maximum EIRP of the EUT = 22.43dBm + 2.00dBi = 24.43dBm = 0.277W which is lower than the EIRP limit of RSS-210.

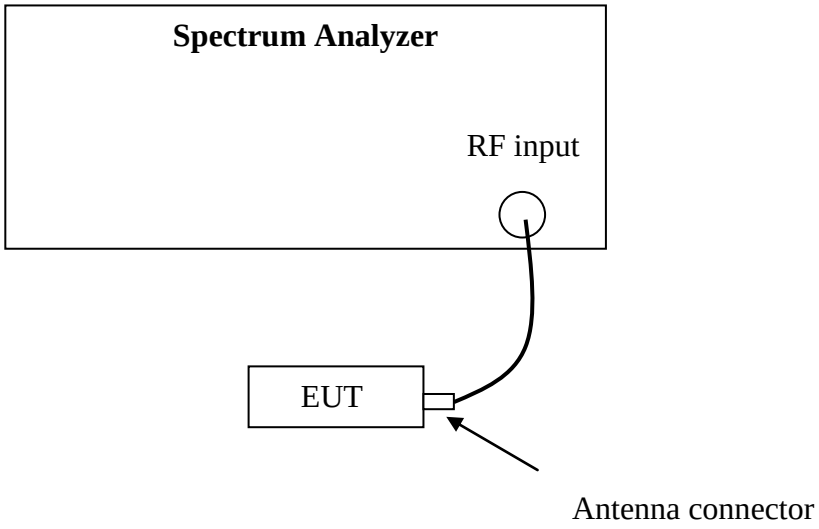
5. Power spectrum density

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

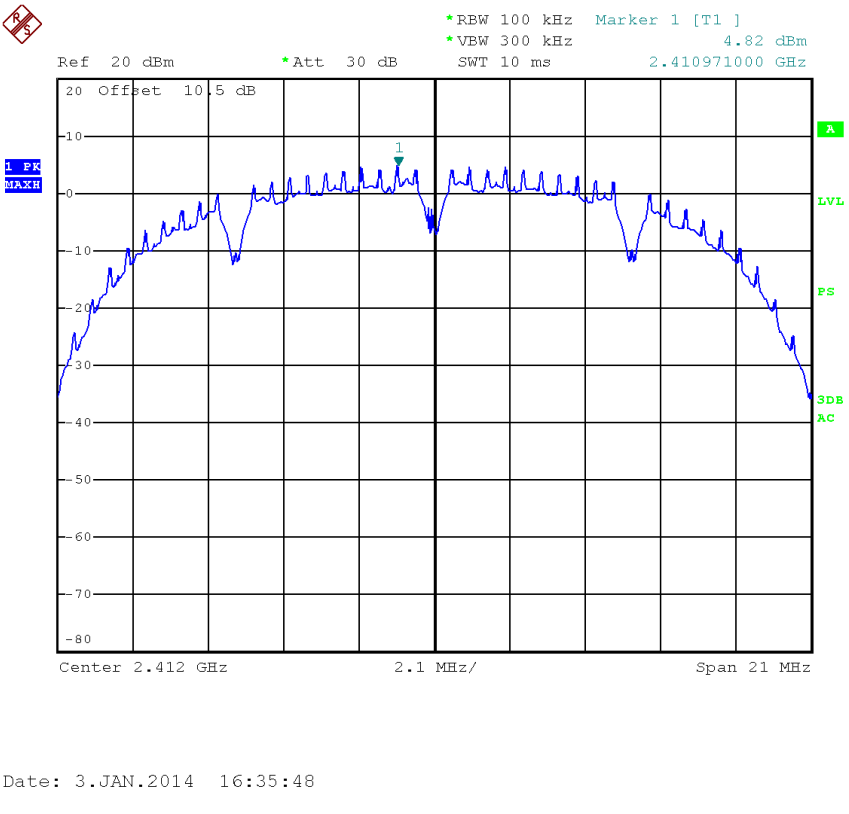
The power output per FCC §15.247(e) was tested according to DTS test procedure of "KDB558074 D01 DTS Meas Guidance v03r01" (clause 10.2) for compliance to FCC 47CFR 15.247 requirements.

5.4 Test Protocol

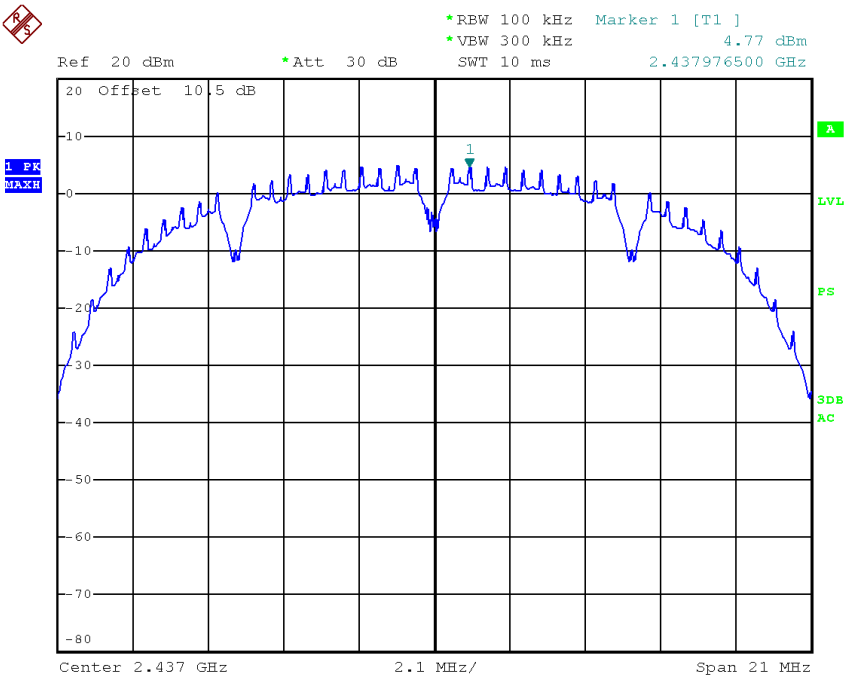
Temperature : 25 °C
Relative Humidity: 55 %

Mode	CH	Cable loss (dB)	Spectrum Density (dBm/100kHz)	Limit (dBm/3kHz)
802.11b	L	0.50	4.82	≤8.00
	M	0.50	4.77	
	H	0.50	4.72	

Channel L



Channel M



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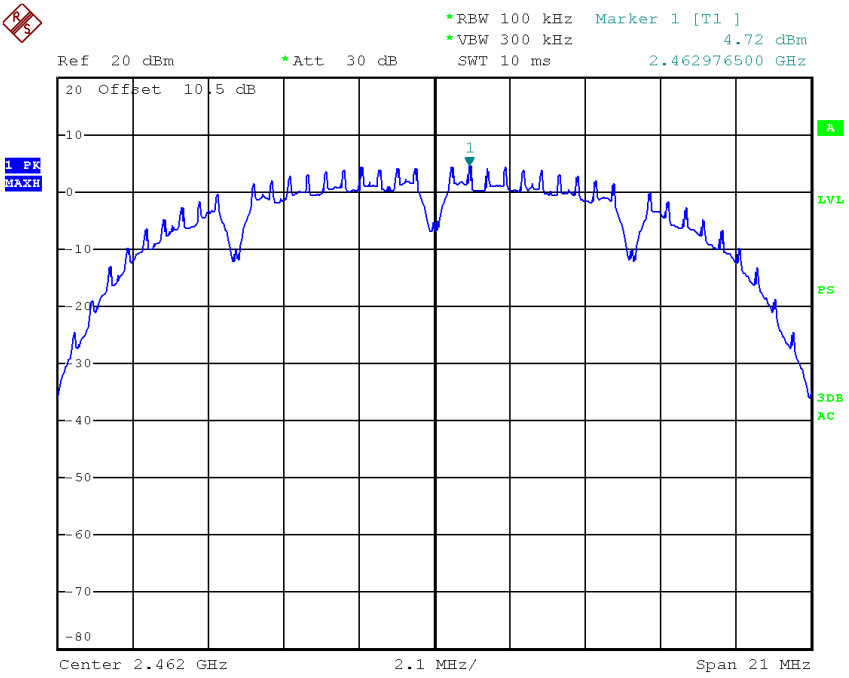
Channel H



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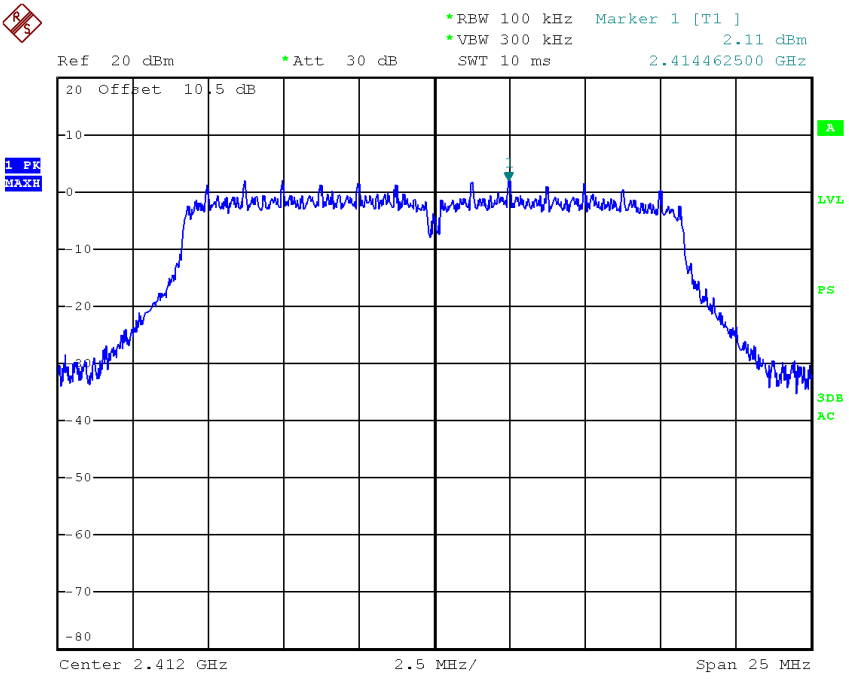
Mode	CH	Cable loss (dB)	Spectrum Density (dBm/100kHz)	Limit (dBm/3kHz)
802.11g	L	0.50	2.11	≤8.00
	M	0.50	1.82	
	H	0.50	1.55	

Channel L



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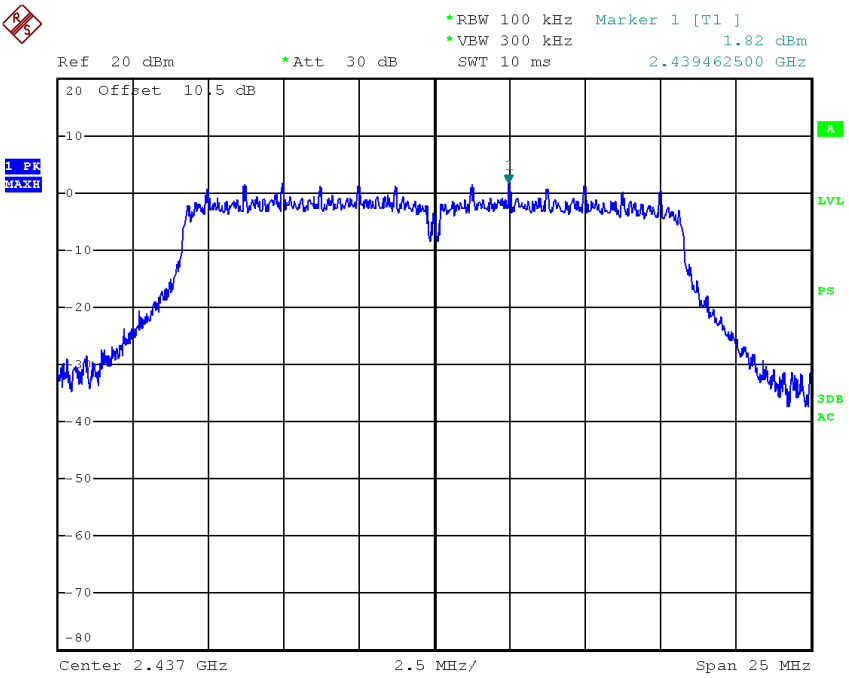
Channel M



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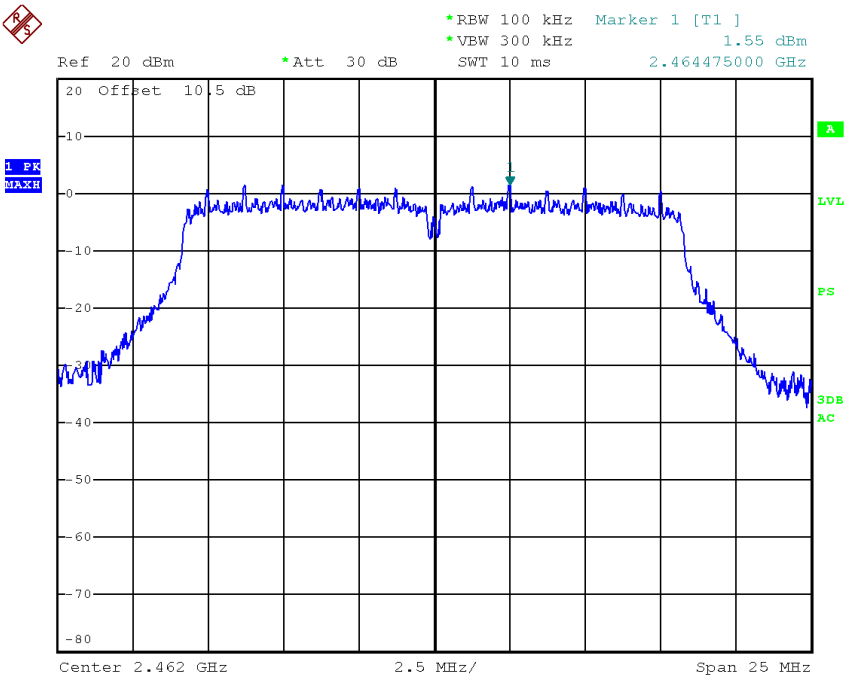
Channel H



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6. Radiated emission

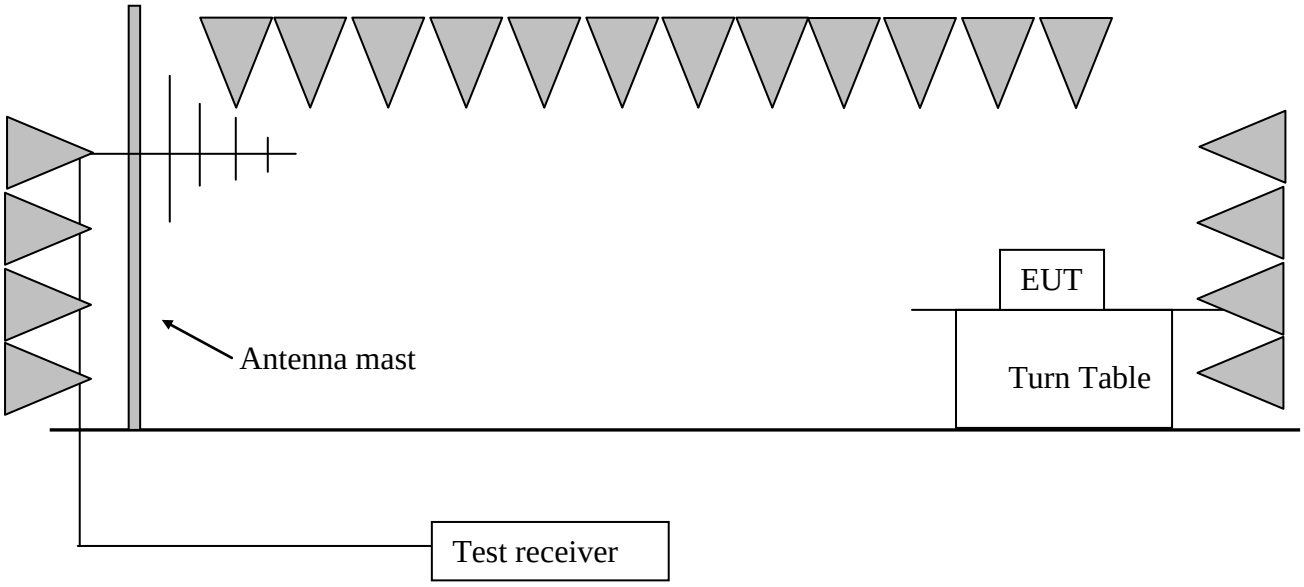
Test result: PASS

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



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.

6.4 Test protocol

Mode 802.11b

CH	Polarization	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	V	2414.83	34.10	113.90	Fundamental	/	PK
	H	221.23	12.4	38.30	43.50	5.20	QP
	V	43.61	13.7	37.30	40.00	2.70	QP
	V	174.14	12.70	39.00	43.50	4.50	QP
	V	2389.86	34.00	73.09	74.00	0.91	PK
	V	2385.32	34.00	50.82	54.00	3.18	AV
	V	2484.13	34.50	63.73	74.00	10.27	PK
	V	2484.13	34.50	50.89	54.00	3.11	AV
M	H	2438.06	34.20	113.50	Fundamental	/	PK
	H	221.23	12.4	38.30	43.50	5.20	QP
	V	43.61	13.7	37.30	40.00	2.70	QP
	V	174.14	12.70	39.00	43.50	4.50	QP
	V	2336.88	34.00	67.59	74.00	6.41	PK
	V	2336.88	34.00	48.26	54.00	5.74	AV
	V	2486.97	34.50	67.37	74.00	6.63	PK
	V	2486.97	34.50	49.40	54.00	4.60	AV
H	H	2462.93	34.40	112.90	Fundamental	/	PK
	H	221.23	12.4	38.30	43.50	5.20	QP
	V	43.61	13.7	37.30	40.00	2.70	QP
	V	174.14	12.70	39.00	43.50	4.50	QP
	V	2362.00	34.00	61.77	74.00	12.23	PK
	V	2362.00	34.00	47.00	54.00	7.00	AV
	V	2483.70	34.50	71.50	74.00	2.50	PK
	V	2483.70	34.50	47.90	54.00	6.10	AV

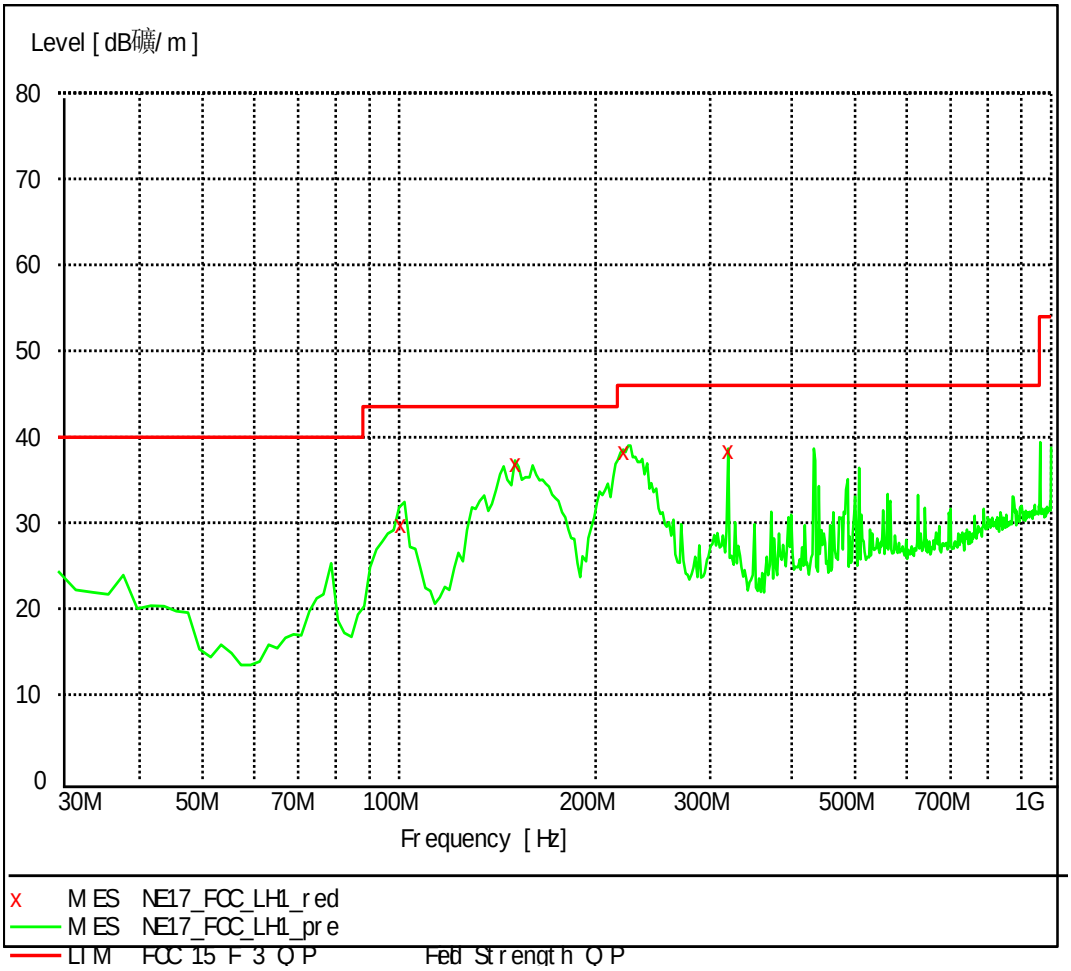
Mode 802.11g

CH	Polarization	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	V	2406.81	34.10	115.00	Fundamental	/	PK
	H	221.23	12.4	38.30	43.50	5.20	QP
	V	43.61	13.7	37.30	40.00	2.70	QP
	V	174.14	12.70	39.00	43.50	4.50	QP
	V	2389.84	34.00	63.77	74.00	10.23	PK
	V	2390.00	34.00	49.00	54.00	5.00	AV
	V	2485.51	34.50	73.50	74.00	0.50	PK
	V	2485.51	34.50	49.90	54.00	4.10	AV
M	H	2436.25	34.20	114.50	Fundamental	/	PK
	H	221.23	12.4	38.30	43.50	5.20	QP
	V	43.61	13.7	37.30	40.00	2.70	QP
	V	174.14	12.70	39.00	43.50	4.50	QP
	V	2374.64	34.00	65.23	74.00	8.77	PK
	V	2374.64	34.00	51.90	54.00	2.10	AV
	V	2499.54	34.50	63.48	74.00	10.52	PK
	V	2499.54	34.50	50.36	54.00	3.64	AV
H	H	2462.93	34.40	114.00	Fundamental	/	PK
	H	221.23	12.4	38.30	43.50	5.20	QP
	V	43.61	13.7	37.30	40.00	2.70	QP
	V	174.14	12.70	39.00	43.50	4.50	QP
	V	2339.92	34.00	64.01	74.00	9.99	PK
	V	2339.92	34.00	52.07	54.00	1.93	AV
	V	2483.57	34.50	70.98	74.00	3.02	PK
	V	2483.57	34.50	49.63	54.00	4.37	AV

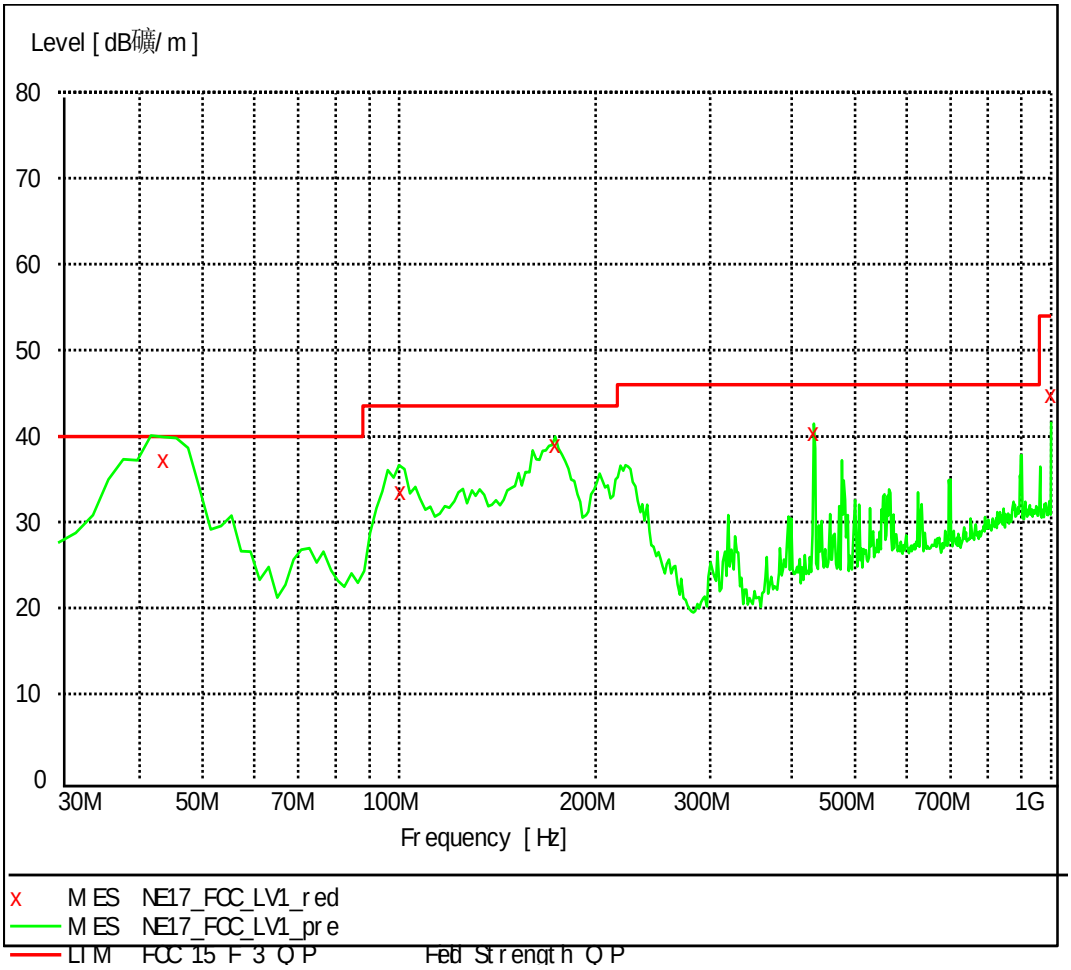
Remark: 1. Correct Factor = Antenna Factor + Cable Loss (-Amplifier, is employed)
2. Corrected Reading = Original Receiver Reading + Correct Factor
3. Margin = limit – Corrected Reading

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

Horizontal



Vertical


Level [dBµV/ m]
80
70
60
50
40
30
20
10
0
30M
50M
70M
100M
200M
300M
500M
700M
1G
Frequency [Hz]
MES NE17_FCC_LV1_red
MES NE17_FCC_LV1_pre
LIM FCC 15 F 3 QP
Field Strength QP

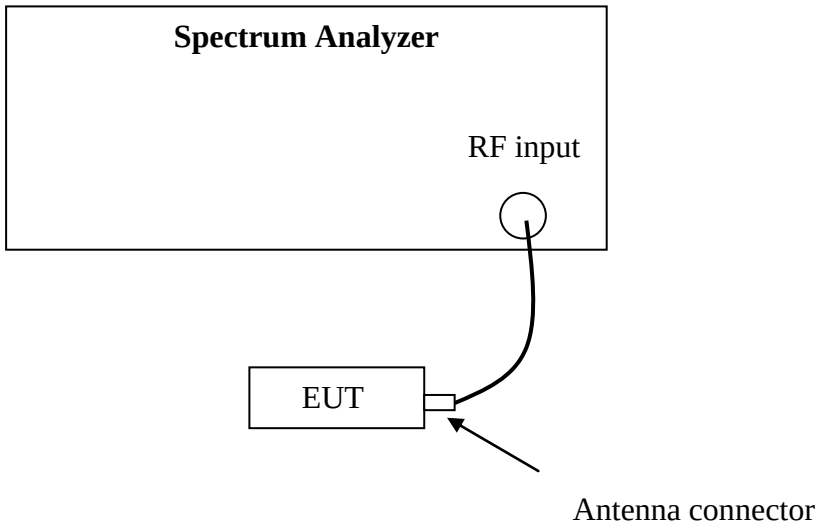
7. Emission outside the frequency Band

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



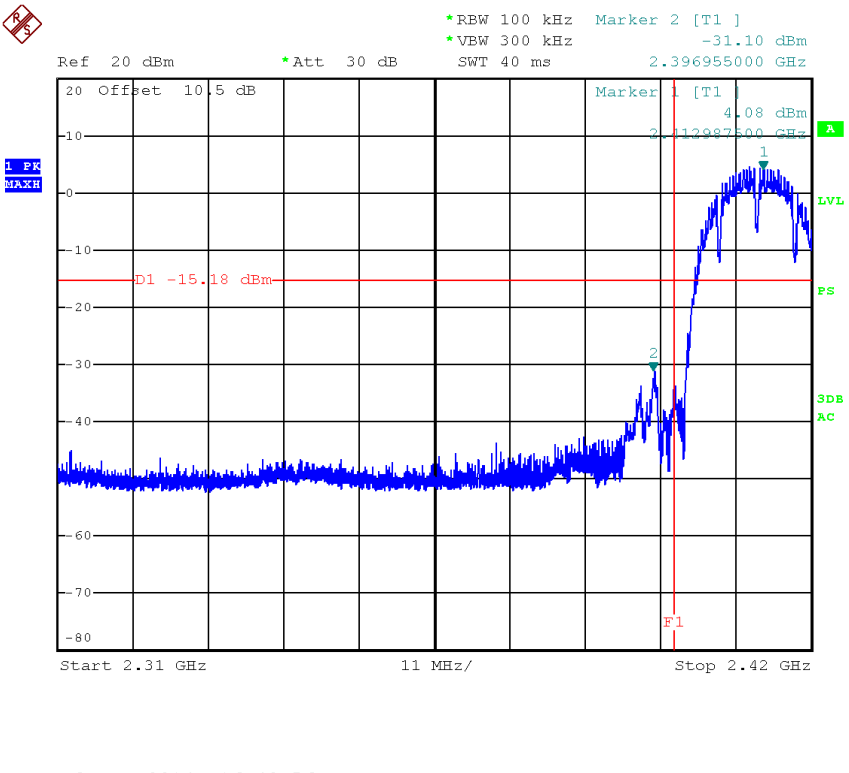
7.3 Test procedure and test setup

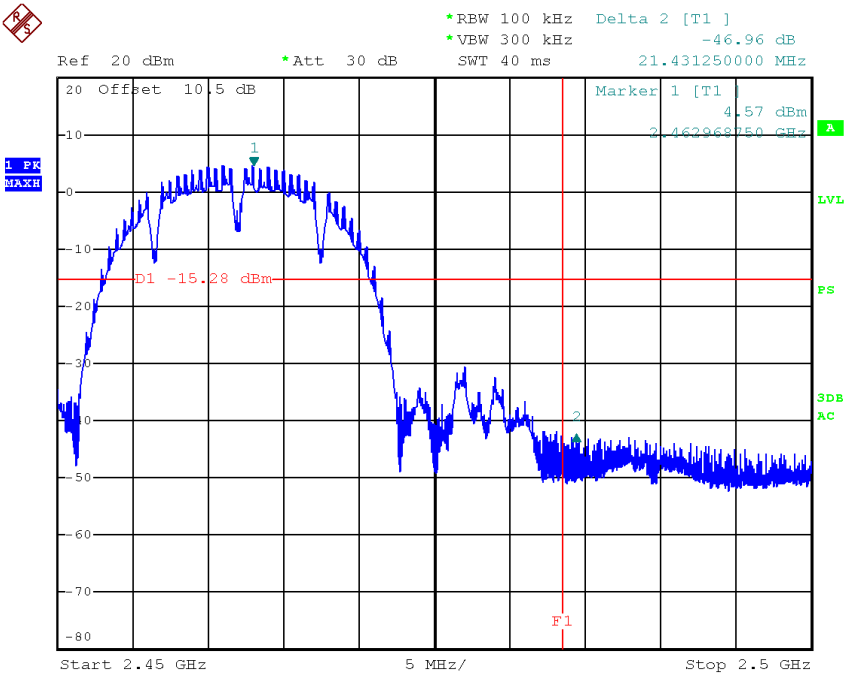
The Emission outside the frequency Band per FCC §15.247(d) is measured using the Spectrum Analyzer with the resolutions bandwidth set at 100kHz, the video bandwidth set at 300kHz, and the SPAN>>RBW.
The EUT was tested according to DTS test procedure of "KDB558074 D01 DTS Meas Guidance v03r01" (clause 11.0) for compliance to FCC 47CFR 15.247 requirements.

7.4 Test protocol

Mode	CH	Max PSD among band (dBm)	The most restrict Attenuation outside band (dB)	Limit (dB)
802.11b	L	4.82	35.92	≥20
	M	4.77	46.85	
	H	4.72	47.01	

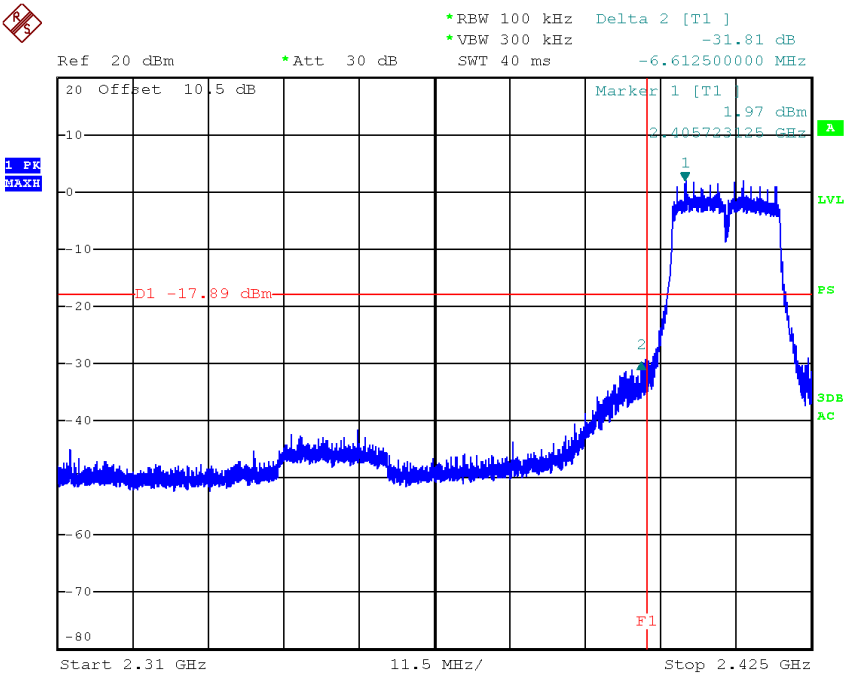
Note: The test was performed from 9kHz to 26GHz and the graph of band edge emission is listed below.



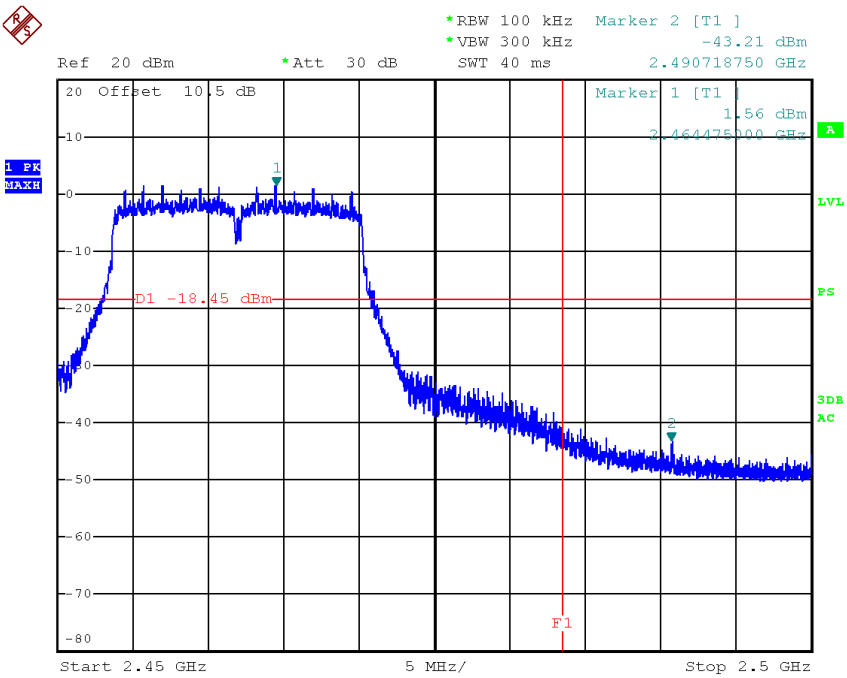


Mode	CH	Max PSD among band (dBm)	The most restrict Attenuation outside band (dB)	Limit (dB)
802.11g	L	2.11	31.95	≥20
	M	1.82	42.65	
	H	1.55	44.76	

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



Date: 3.JAN.2014 16:55:45



Date: 3.JAN.2014 17:03:29

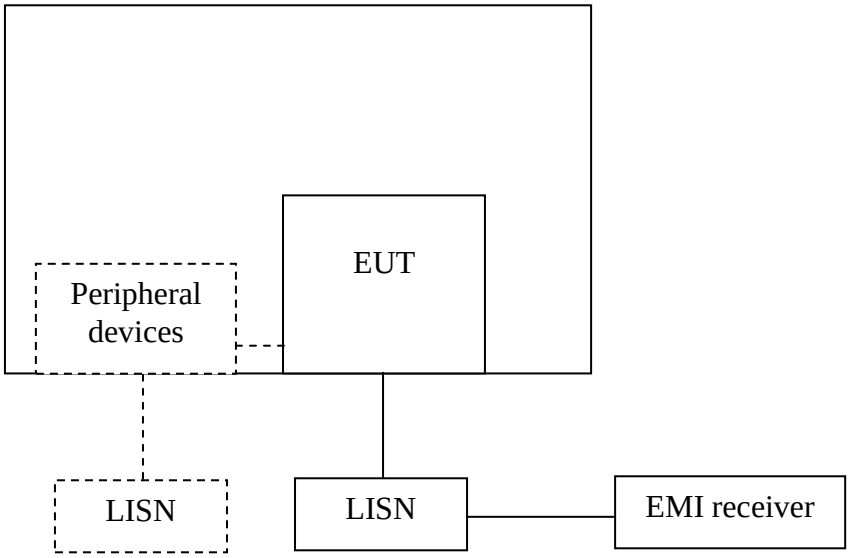
8. Power line conducted emission

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



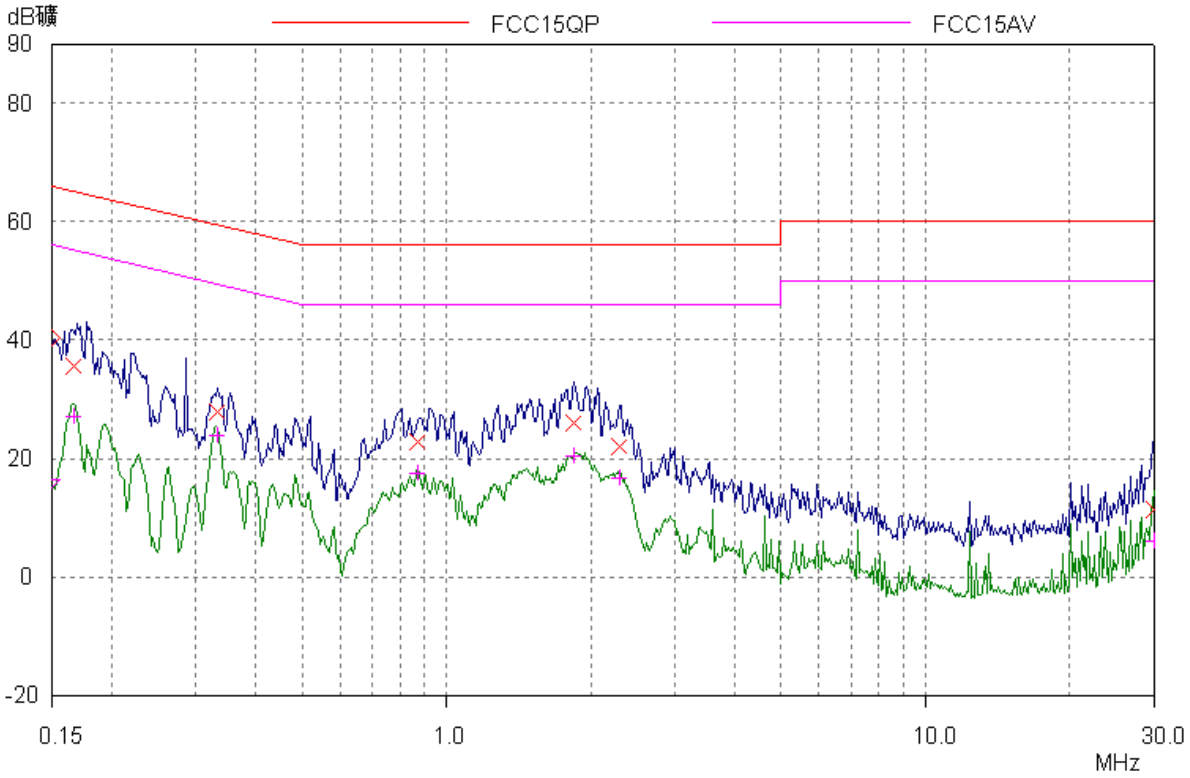
☒ For table top equipment, wooden support is 0.8m height table

☐ For floor standing equipment, wooden support is 0.1m height rack.

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 50Ω/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50Ω/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



Frequency	Correct Factor (dB)	Corrected Reading (dBuV) QP	AV	Limit (dBuV) QP	AV	Margin (dB) QP	AV
0.17(N)	0.27	35.51	27.07	65.14	55.14	59.63	28.07
0.33(N)	0.25	27.90	23.93	59.44	49.44	31.54	25.51
0.87(N)	0.18	22.94	17.41	56.00	46.00	33.06	28.59
1.83(N)	0.17	25.93	20.49	56.00	46.00	30.07	25.51
2.28(N)	0.23	21.91	16.80	56.00	50.00	34.09	29.20
0.26(L)	0.24	32.59	27.40	61.42	51.42	28.83	24.02
Remark: 1. Correction Factor (dB) = LISN Factor (dB) + Cable Loss (dB). 2. Margin (dB) = Limit - Corrected Reading.							

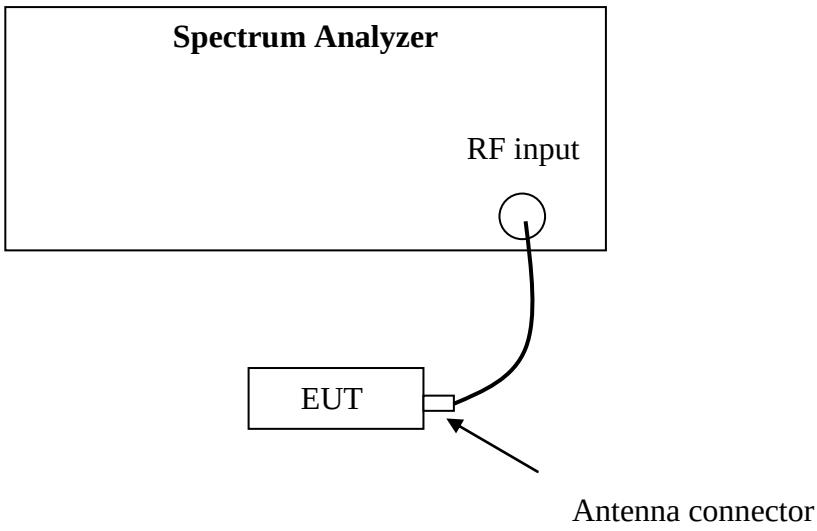
9. Occupied Bandwidth

Test Status: Tested

9.1 Test limit

None

9.2 Test Configuration



9.3 Test procedure and test setup

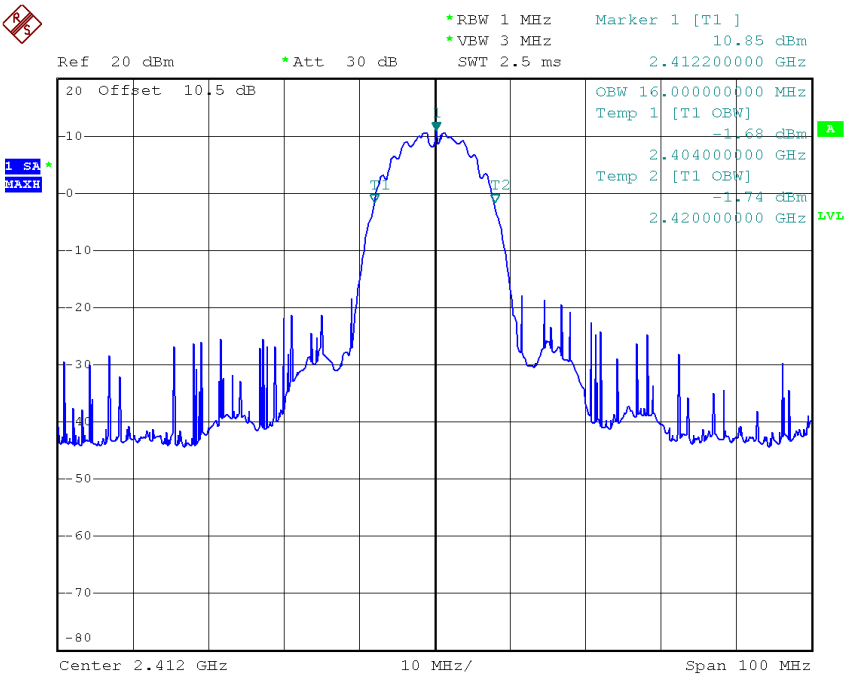
The occupied bandwidth per RSS-Gen Issue 3 Clause 4.6.1 was measured using the Spectrum Analyzer.

9.4 Test protocol

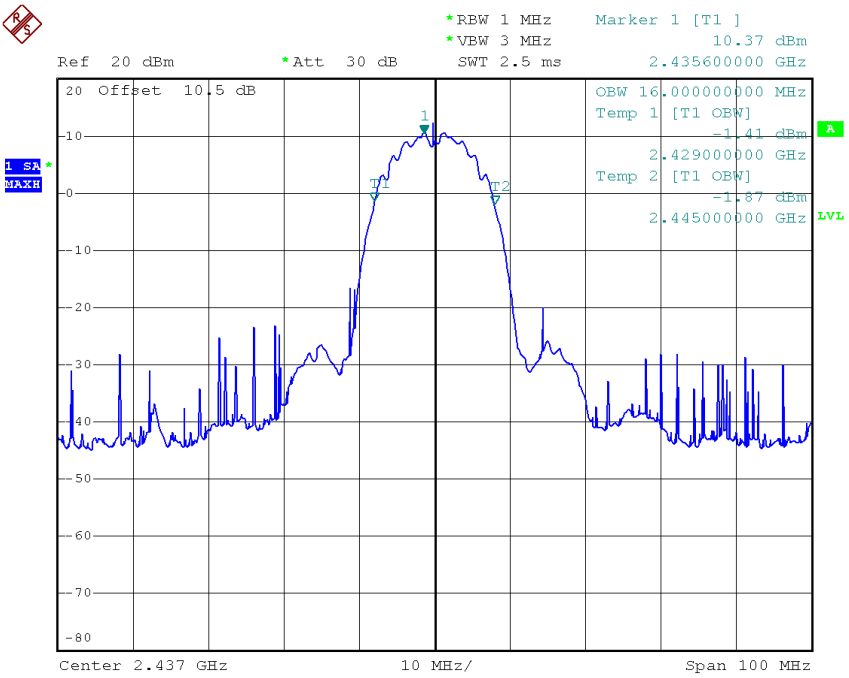
Temperature : 25 °C
Relative Humidity : 55 %

Mode	CH	99% Bandwidth (MHz)
802.11b	L	16.00
	M	16.00
	H	16.00

Channel L

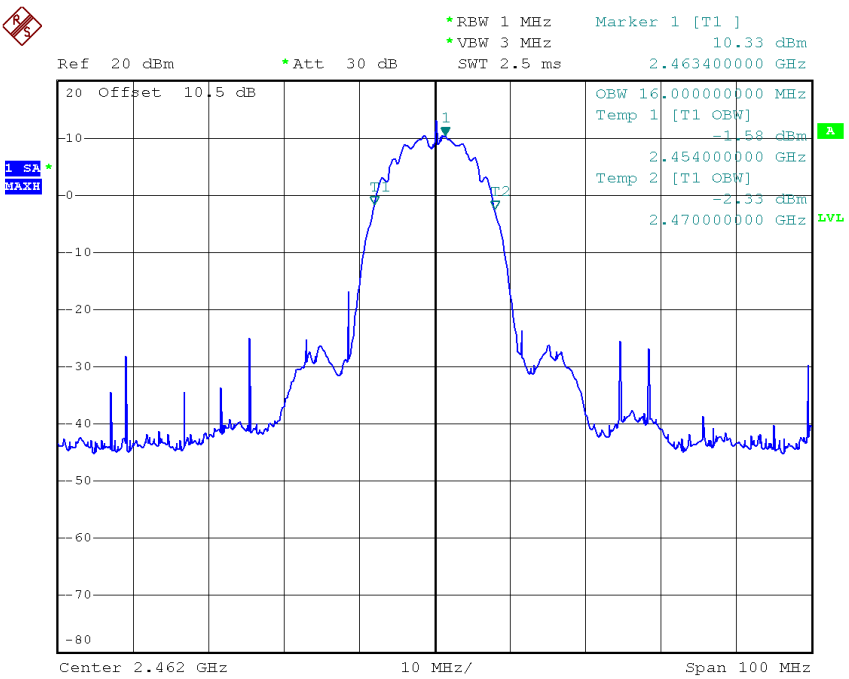


Channel M



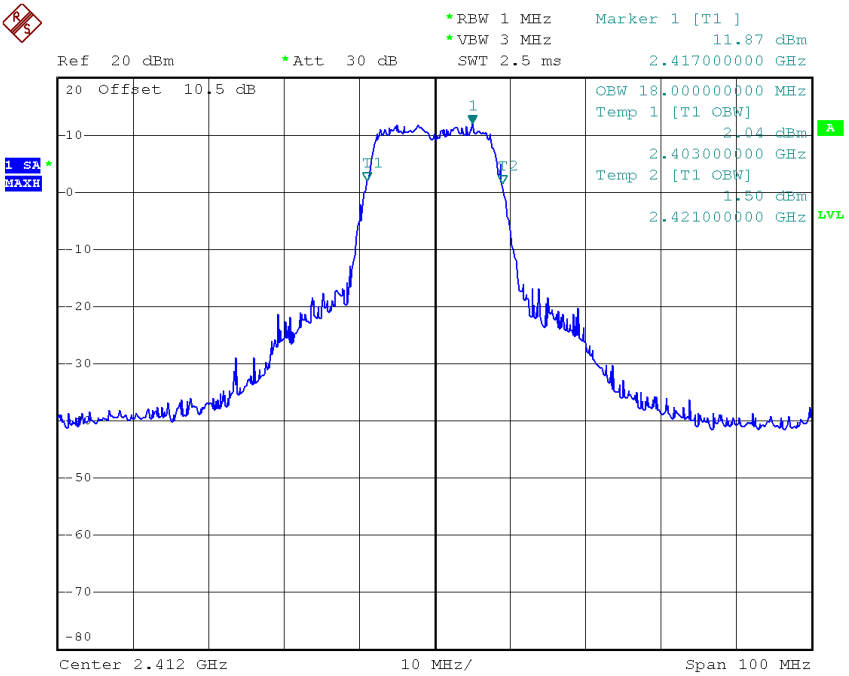
Date: 8.JAN.2014 14:52:18

Channel H



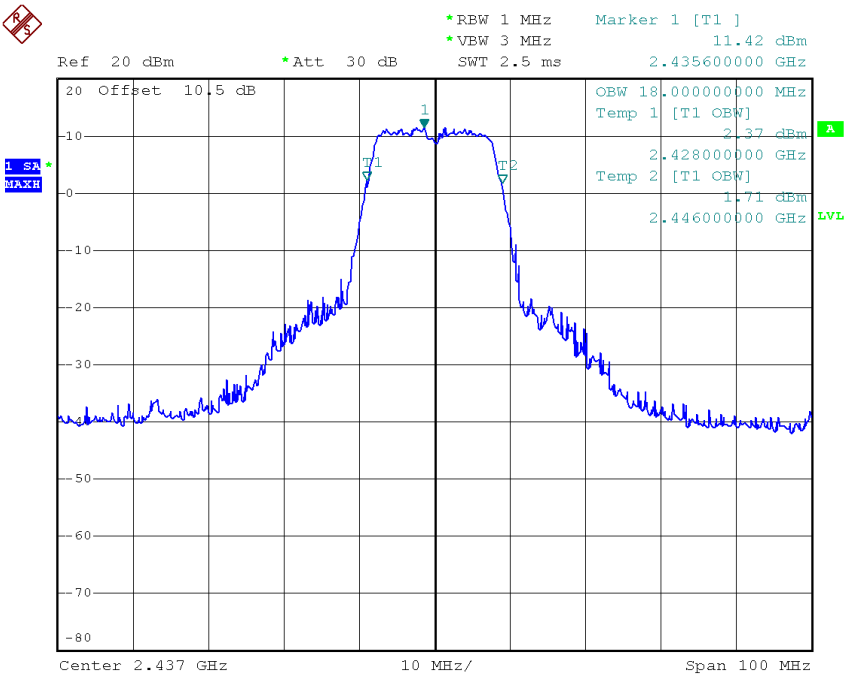
Mode	CH	99% Bandwidth (MHz)
802.11g	L	18.00
	M	18.00
	H	18.00

Channel L



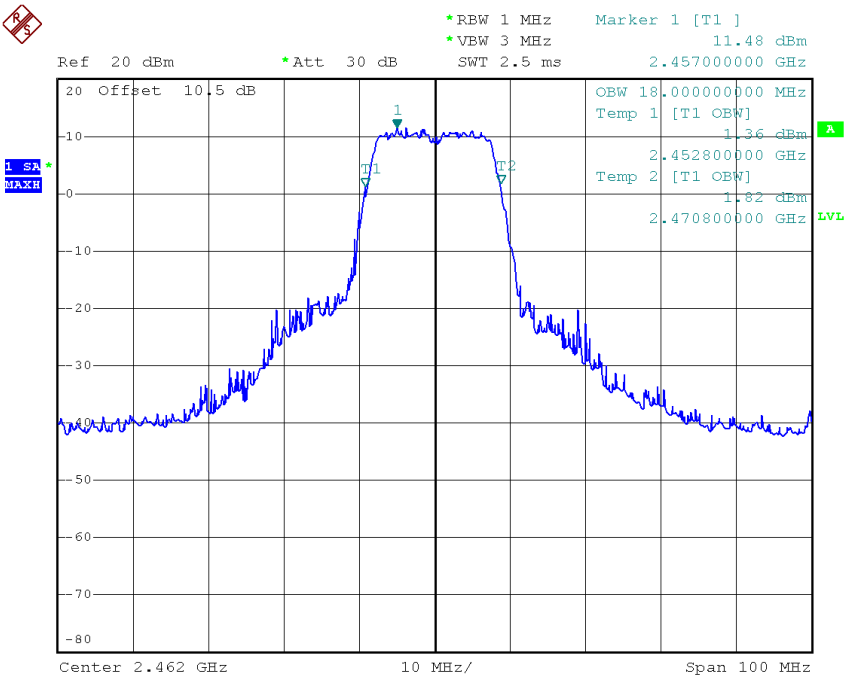
Date: 8.JAN.2014 14:54:30

Channel M



Date: 8.JAN.2014 14:55:17

Channel H



Date: 8.JAN.2014 14:56:10