EMC TEST REPORT for Intentional Radiator

No. SH12080219-001

Applicant	: MXchip Information Technology (Shanghai) Co., Ltd. Floor 2, Building 9, Lane 271, Qianyang Rd, Shanghai, China
Manufacturer	: MXchip Information Technology (Shanghai) Co., Ltd. Floor 2, Building 9, Lane 271, Qianyang Rd, Shanghai, China
Equipment	: Wi-Fi Module
Type/Model	: EMW3280

SUMMARY

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

47CFR Part 15 (2010): Radio Frequency Devices, Subpart C—Intentional Radiators

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: Sep 29, 2012

Prepared by: Reviewed by:

Wakeyou Wang (*Project Engineer*) Daniel Zhao (*Reviewer*)

Description of Test Facility

Name: Intertek Testing Services Limited Shanghai
Address: Building No.86, 1198 Qinzhou Road(North), Shanghai 200233, P.R. China

FCC Registration Number: 236597
IC Assigned Code: 2042B-1

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Content

1. General Information

1.1 Applicant Information

Applicant	:	MXchip Information Technology (Shanghai) Co., Ltd. Floor 2, Building 9, Lane 271, Qianyang Rd, Shanghai, China
Name of contact	:	Mr. Li Yang
Telephone	:	86 21 52709556*828
Telefax	:	86 21 52709556*818
Manufacturer	:	MXchip Information Technology (Shanghai) Co., Ltd. Floor 2, Building 9, Lane 271, Qianyang Rd, Shanghai, China
Data of sample received	:	Aug 3, 2012
Date of test	:	Aug 3, 2012 – Sep 15, 2012

1.2 Identification of the EUT

Equipment:	Wi-Fi Module
Type/model:	EMW3280
FCC ID:	P53-EMW3280
IC:	/

1.3 Technical specification

Operation Frequency Band:	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:	PCB antenna, 2.1dBi max. External antenna, 3.5dBi max.
Rating:	DC 3.3V (powered by laptop indirectly with input: 100-240V, 50/60Hz)
Description of EUT:	There is one model only. The EUT supports 802.11b/g/n and contains 1 antenna only (1T1R).
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 continuous transmission was applied.
The EUT was set up and tested in three axes (X, Y and Z). The three axes were tested one by one while the test receiver worked as “max hold” continuously and the highest reading among the whole test procedure was recorded.

The power level is set as “18” for 802.11b mode and “15” for 802.11g/n mode which is showed in the control software (name: Dut labtool; Version: 1.0.7.07).

Test peripherals used:

Item No	Description	Band and Model	S/No
1	Laptop computer	HP, ProBook 6450b	NA
2	Laptop computer	Lenovo, E325	NA

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

2. Test Specification

2.1 Instrument list

Equipment	Type	Manu.	Internal no.	Cal. Date	Due date
Test Receiver	ESIB 26	R&S	EC 3045	2011-10-21	2012-10-20
Semi-anechoic chamber	-	Albatross project	EC 3048	2012-5-12	2013-5-11
Bilog Antenna	CBL 6112D	TESEQ	EC 4206	2011-5-16	2013-5-15
Horn antenna	HF 906	R&S	EC 3049	2011-5-13	2013-5-12
Pre-amplifier	Pre-amp 18	R&S	EC 3222	2012-4-10	2014-4-9
Test Receiver	ESCS 30	R&S	EC 2107	2011-10-21	2012-10-20
A.M.N.	ESH2-Z5	R&S	EC 3119	2012-1-9	2013-1-8
A.M.N.	ESH3-Z5	R&S	EC 2109	2012-1-10	2013-1-9
High Pass Filter	WHKX 1.0/15G-10SS	Wainwright	EC4297-1	2012-2-8	2013-2-7
High Pass Filter	WHKX 2.8/18G-12SS	Wainwright	EC4297-2	2012-2-8	2013-2-7
High Pass Filter	WHKX 7.0/1.8G-8SS	Wainwright	EC4297-3	2012-2-8	2013-2-7
Band Reject Filter	WRCGV 2400/2483-2390/2493-35/10SS	Wainwright	EC4297-4	2012-2-8	2013-2-7
Test Receiver	FSV40	R&S	/	2011-10-21	2012-10-20
Preamplifier	AP-025C	Quietek	QT-AP003	2011-11-25	2012-11-24
Preamplifier	AP-180C	Quietek	CHM-0602013	2011-11-25	2012-11-24
Broad-Band Horn Antenna	BBHA9120D	Schwarzbeck	496	2011-11-25	2012-11-24
Broad-Band Horn Antenna	BBHA9170	Schwarzbeck	294	2011-11-25	2012-11-24

2.2 Test Standard

47CFR Part 15 (2010)
ANSIC63.4 (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 Limited.

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
Channel number of hopping system	15.247(a)(1)(iii)	RSS-210 Issue 8 Annex 8	NA
Average time of occupancy in any channel	15.247(a)(1)(iii)	RSS-210 Issue 8 Annex 8	NA
Occupied bandwidth	-	RSS-Gen Issue 3 Clause 4.6.1	Tested
Conducted emission	15B	-	NA
Radiated emission	15B	-	NA

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 Level (dBm)
802.11b	1	M	**24.15**
	2	M	22.99
	5.5	M	21.62
	11	M	21.35
802.11g	6	M	**23.15**
	9	M	23.05
	12	M	22.98
	18	M	23.09
	24	M	22.44
	36	M	22.70
	48	M	22.75
	54	M	22.67
802.11n, HT20	6.5	M	**22.84**
	13	M	22.78
	19.5	M	22.82
	26	M	22.84
	39	M	22.81
	52	M	22.84
	58.5	M	22.83
	65	M	22.82

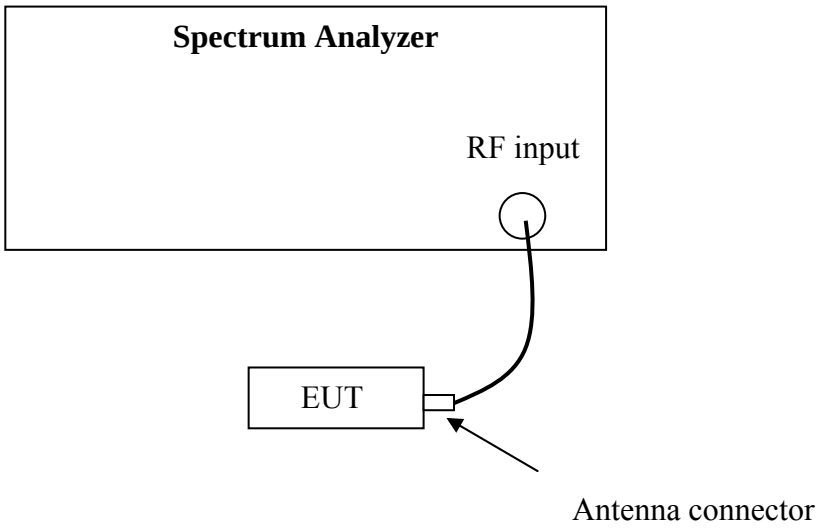
3. Minimum 6dB Bandwidth

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 v01" for compliance to FCC 47CFR 15.247 requirements.

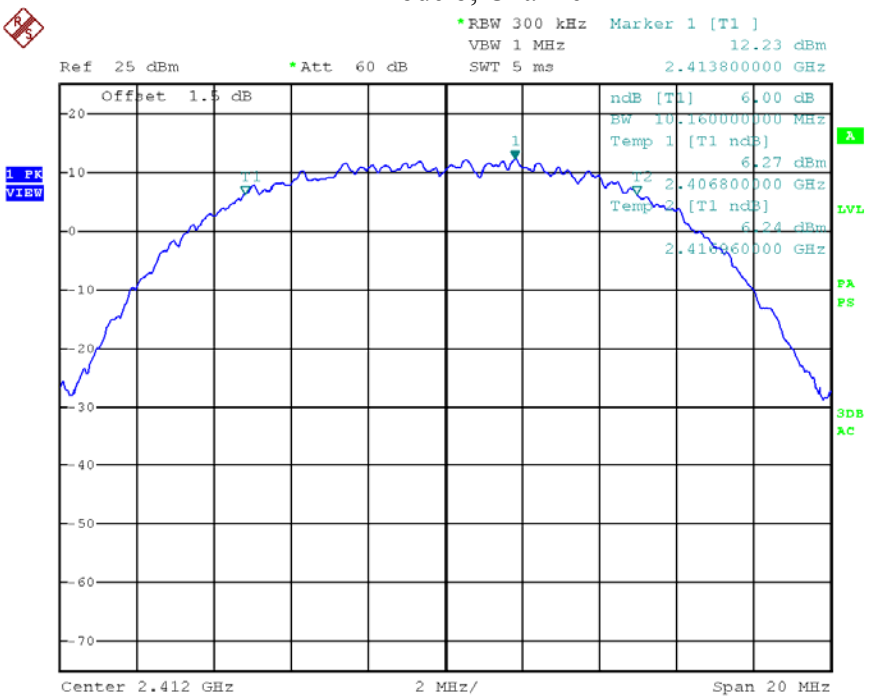
3.4 Test Protocol

Temperature : 22°C

Relative Humidity : 43%

Mode	CH	Bandwidth (MHz)	Limit (MHz)
11b	L	10.16	⩾0.5
	M	10.20	
	H	10.16	
11g	L	16.70	
	M	16.70	
	H	16.68	
11n, HT20	L	17.80	
	M	17.84	
	H	17.84	

Mode b, Channel L



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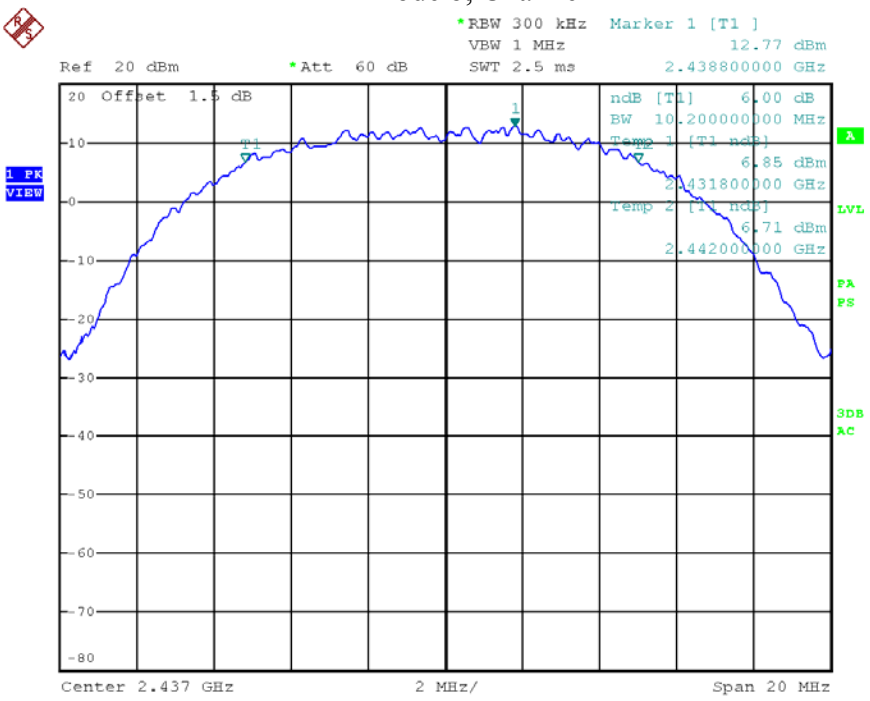

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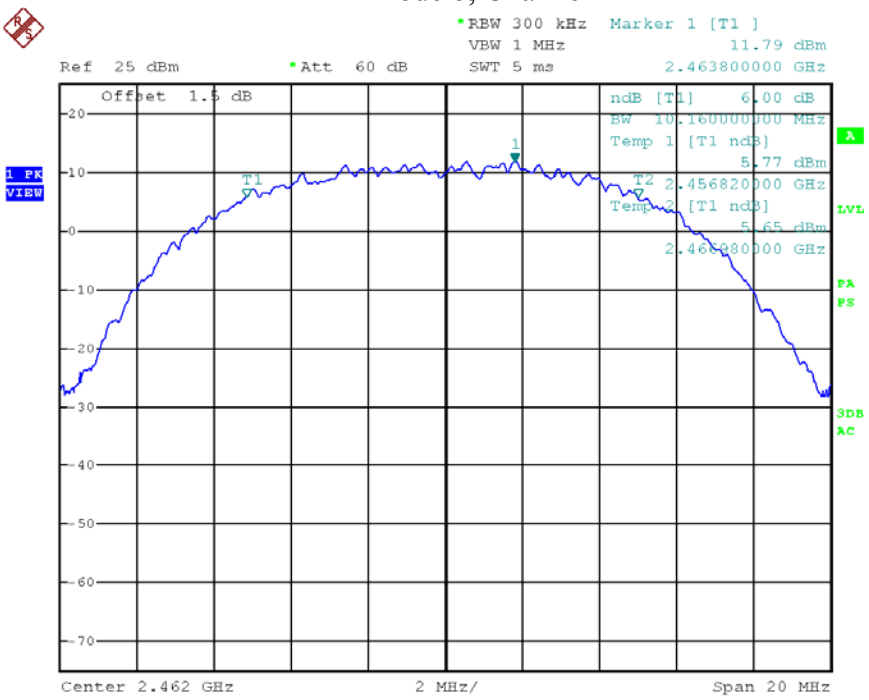

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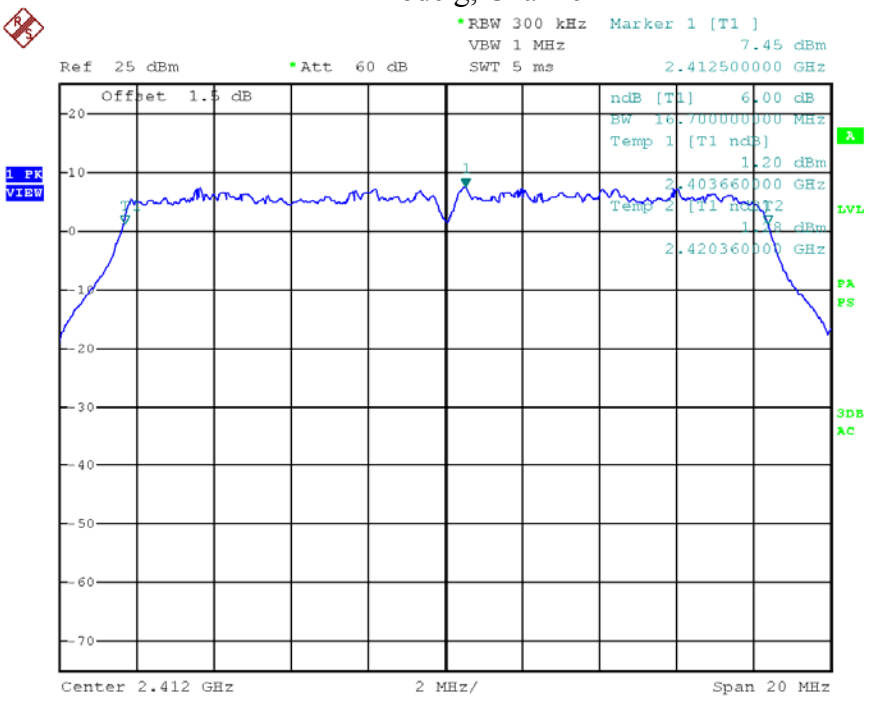
Mode g, Channel L



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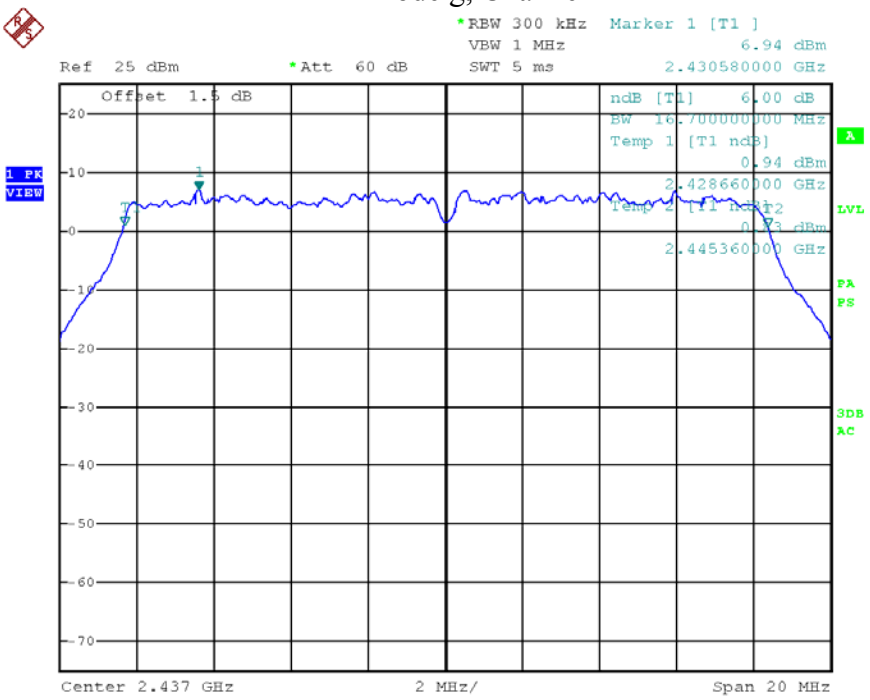

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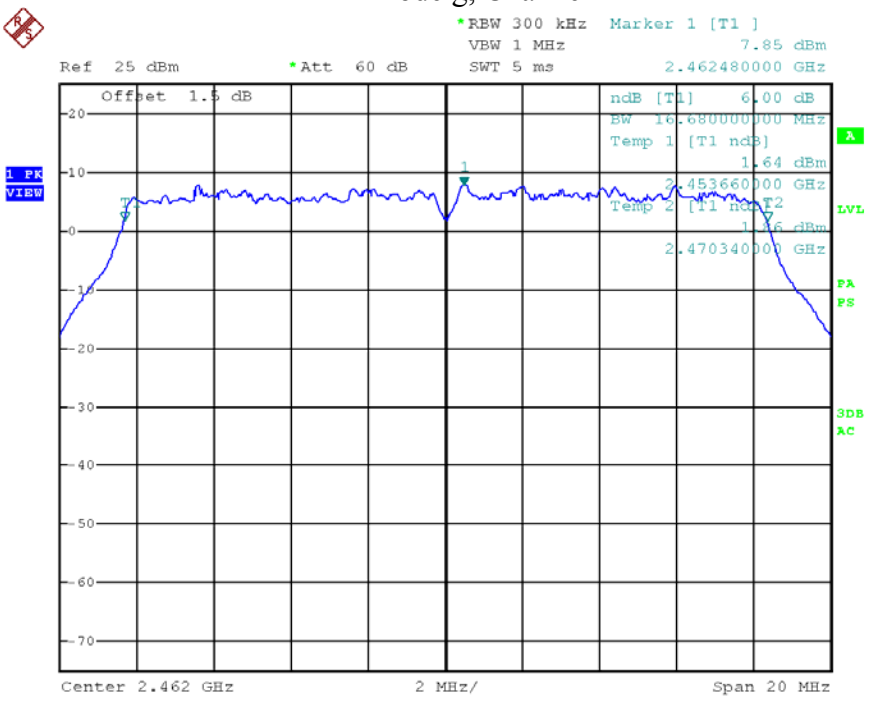

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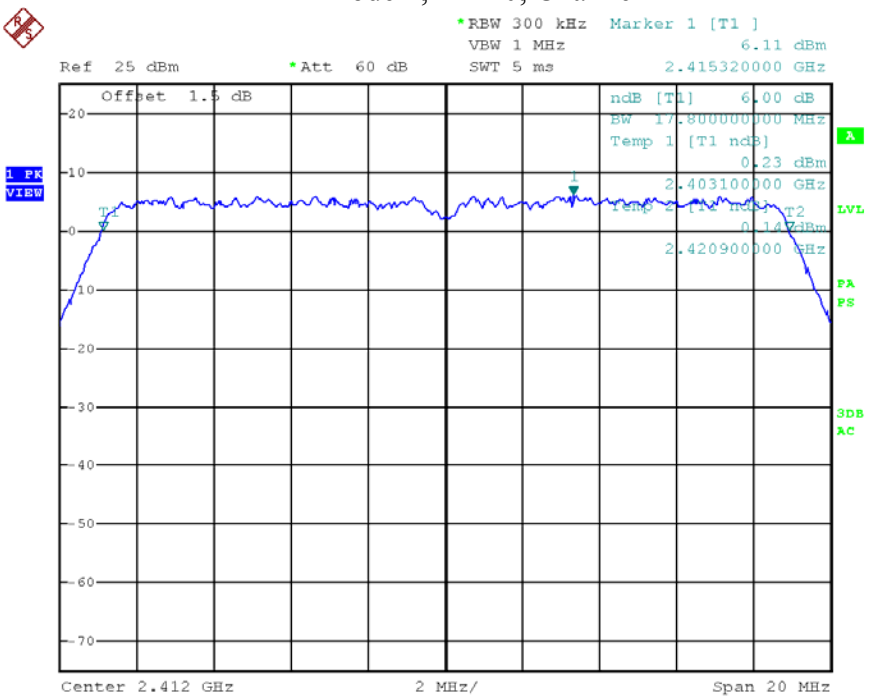
Mode n, HT 20, Channel L



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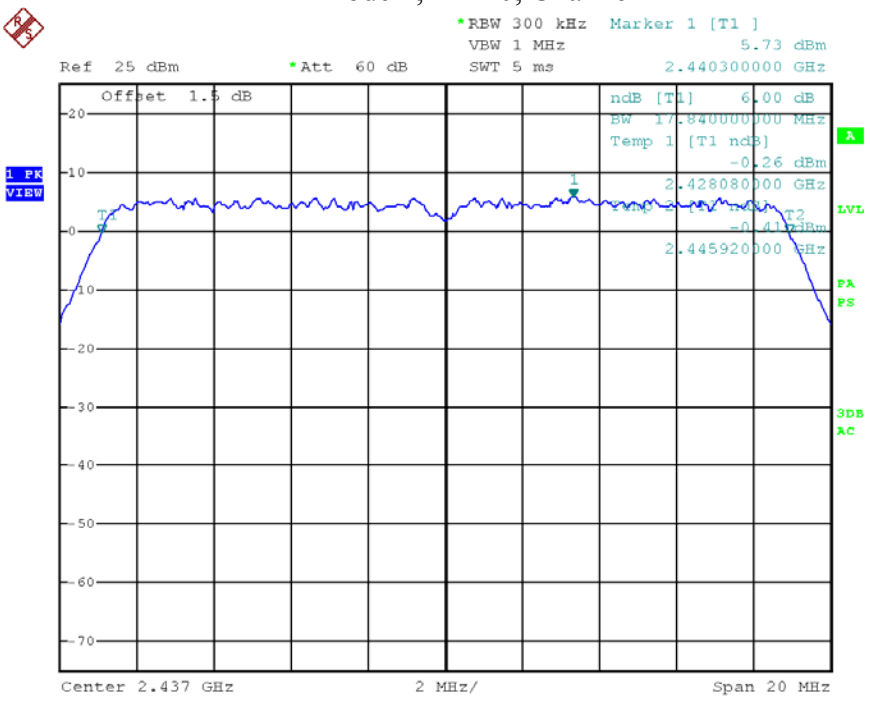
Mode n, HT 20, Channel M



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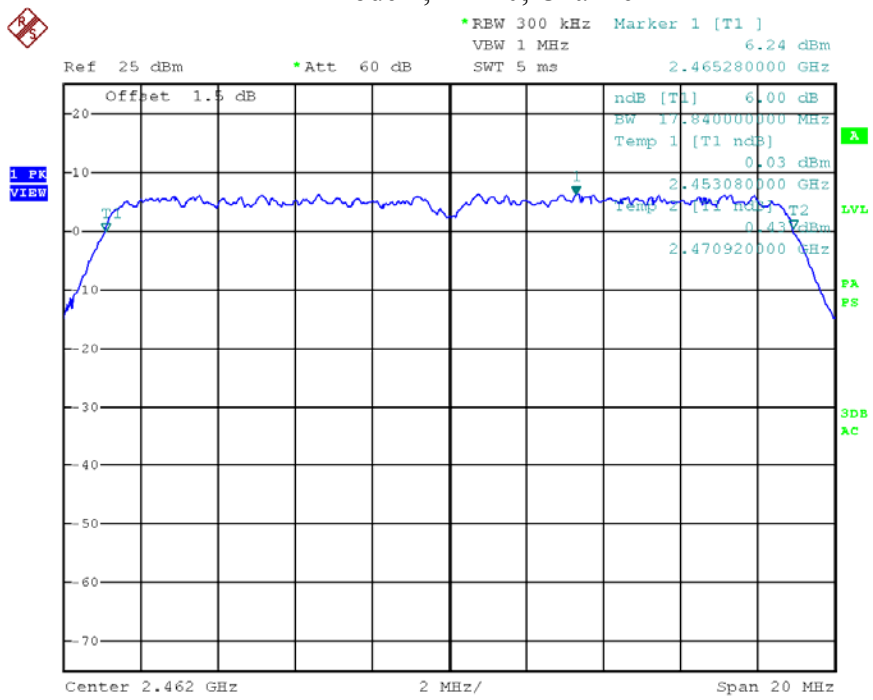

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4. Maximum peak output power

Test result: Pass

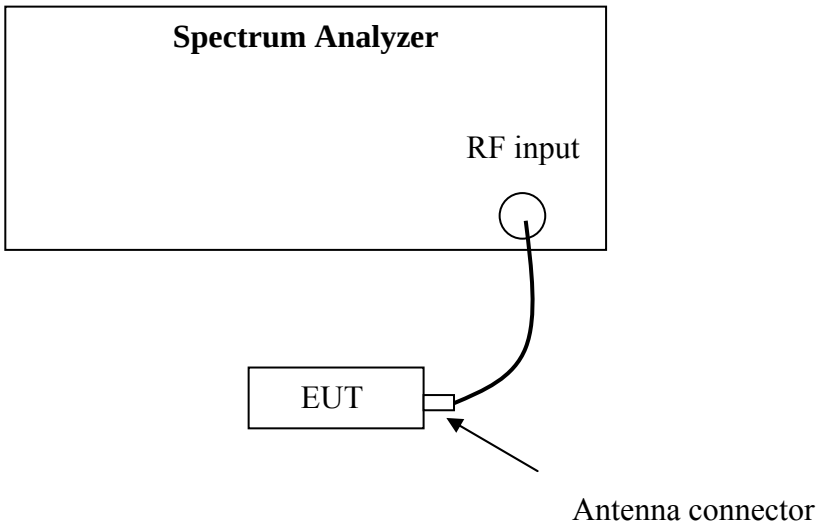
4.1 Test limit

☐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
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.

☒For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

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 v01" for compliance to FCC 47CFR 15.247 requirements (Measurement Procedure PK2).

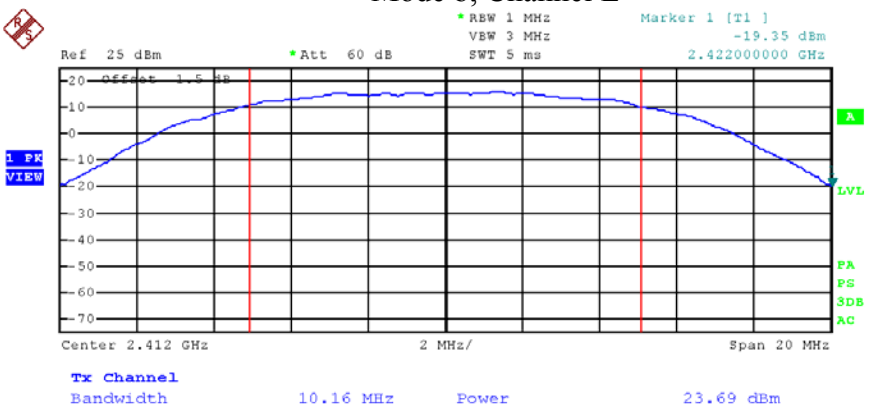
4.4 Test protocol

Temperature : 22 °C

Relative Humidity: 43 %

Mode	CH	Conducted Power (dBm)	Limit (dBm)
11b	L	23.69	≤30
	M	24.15	
	H	23.84	
11g	L	23.68	
	M	23.15	
	H	23.83	
11n, HT20	L	23.52	
	M	22.84	
	H	23.40	

Mode b, Channel L



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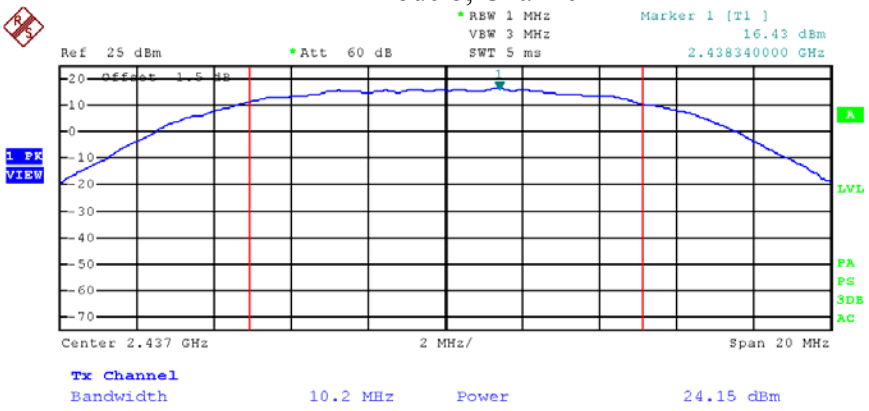
Mode b, Channel M



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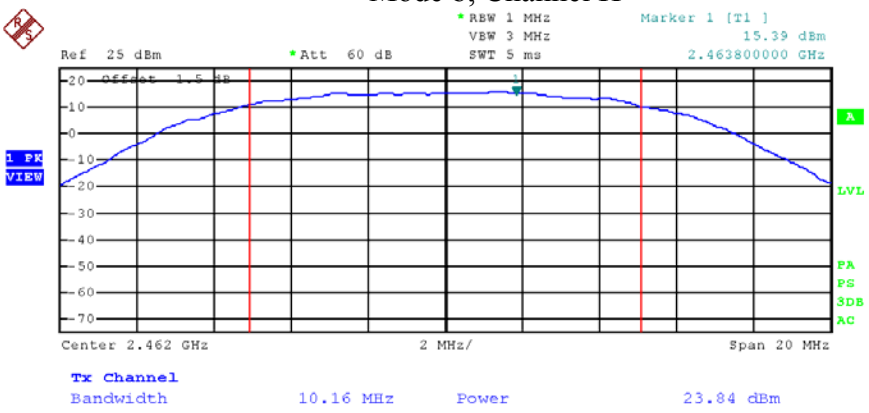
Mode b, Channel H



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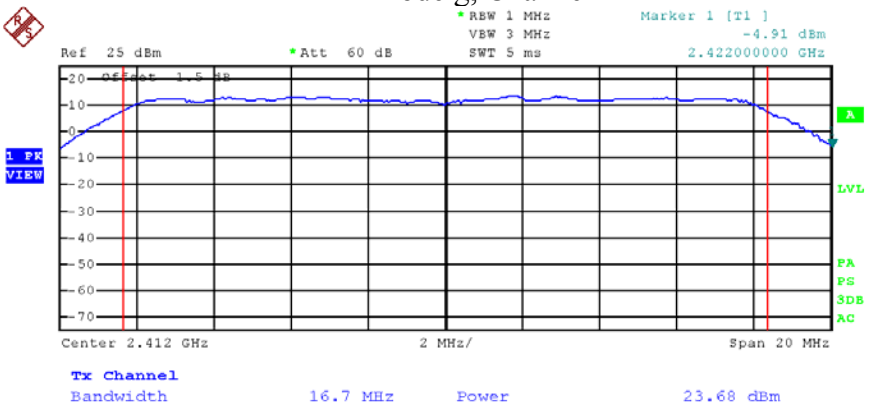
Mode g, Channel L



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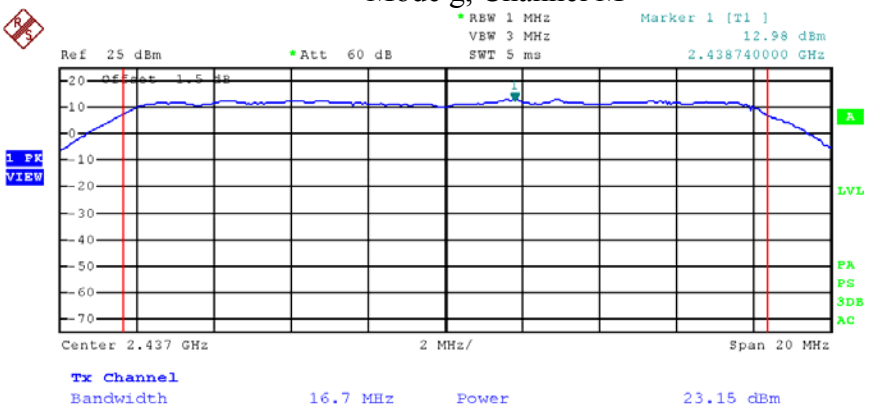
Mode g, Channel M



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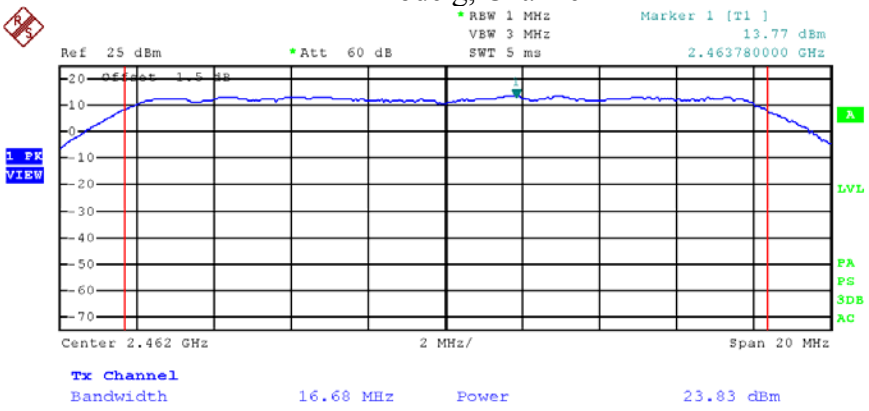
Mode g, Channel H



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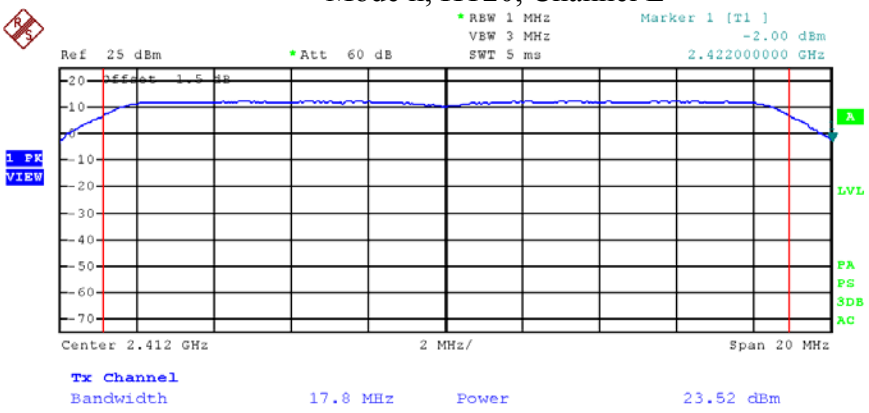

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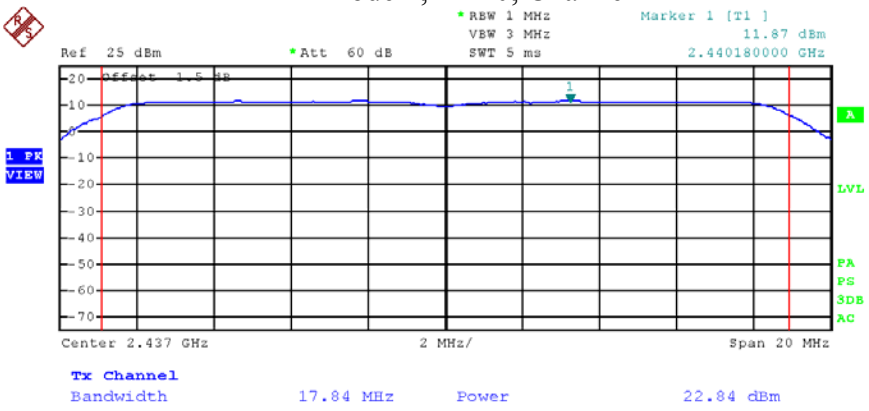

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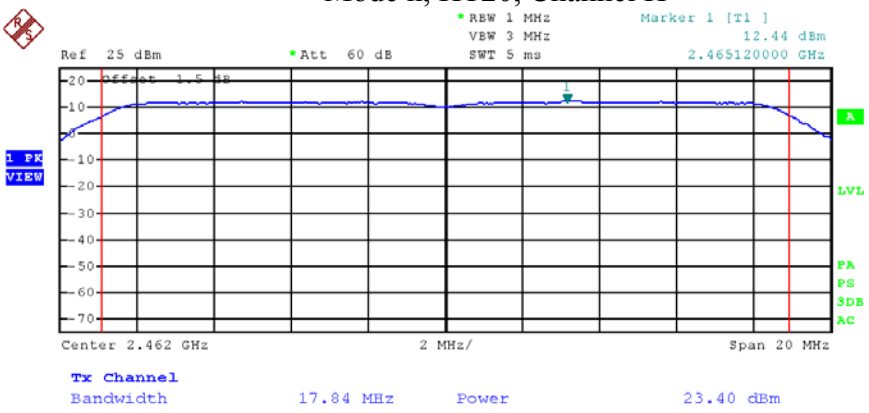
Mode n, HT20, Channel H



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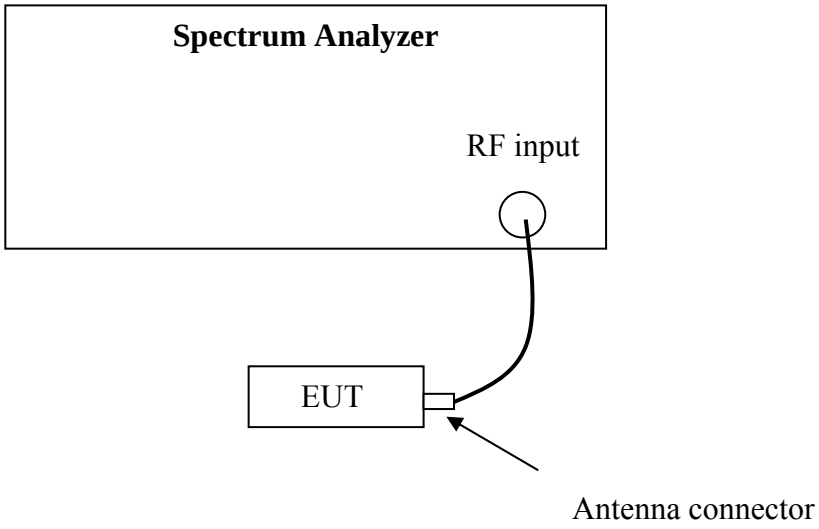
5. Power spectrum density

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 v01" for compliance to FCC 47CFR 15.247 requirements.

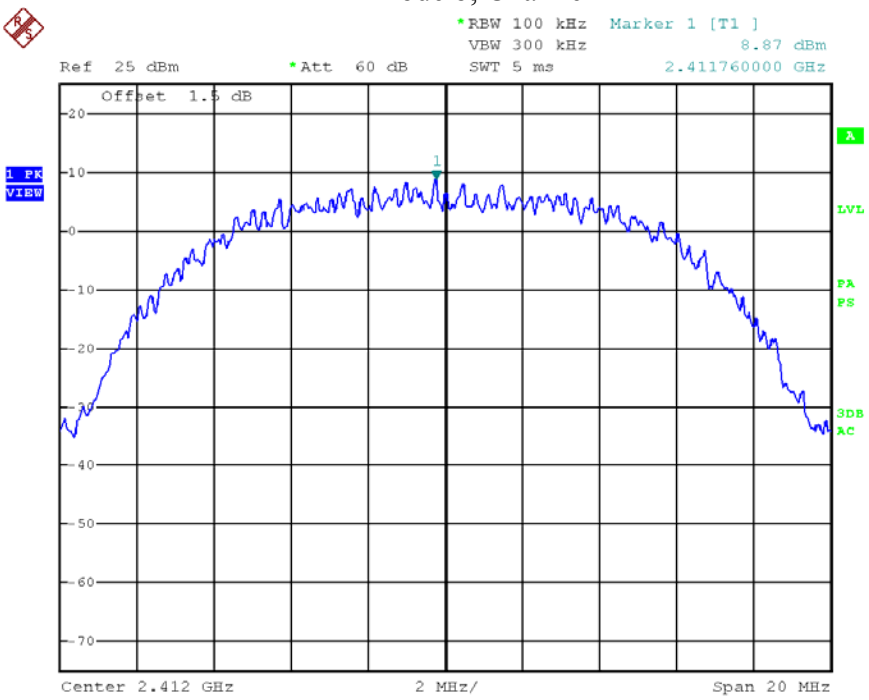
5.4 Test Protocol

Temperature : 22 °C
Relative Humidity: 43 %

Mode	CH	Power Density (dBm/100kHz)	Power Density (dBm/3kHz)	Limit (dBm/3kHz)
11b	L	8.87	-6.33	≤8
	M	8.91	-6.29	
	H	8.53	-6.67	
11g	L	2.86	-12.34	
	M	2.18	-13.02	
	H	2.82	-12.38	
11n, HT20	L	1.39	-13.81	
	M	0.98	-14.22	
	H	1.31	-13.89	

Note: power spectrum density of 3kHz is -15.20dB lower than that of 100kHz.

Mode b, Channel L



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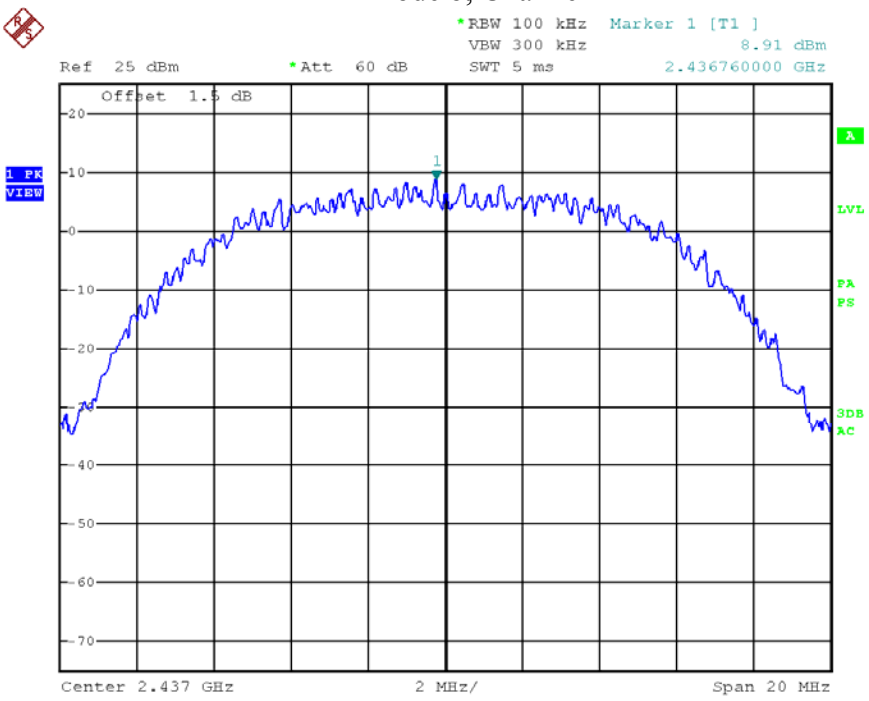

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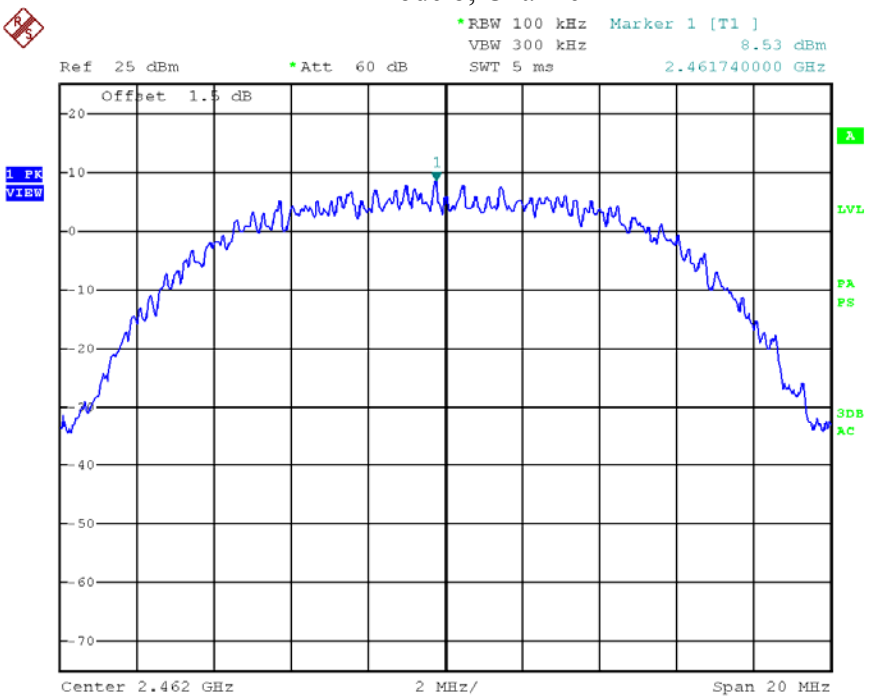
Mode b, Channel H



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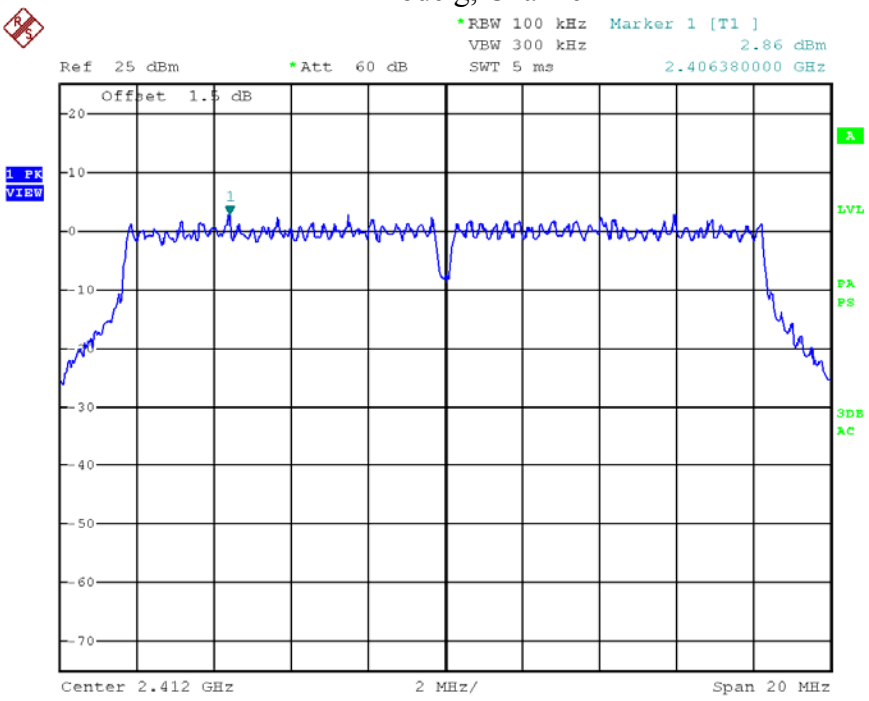

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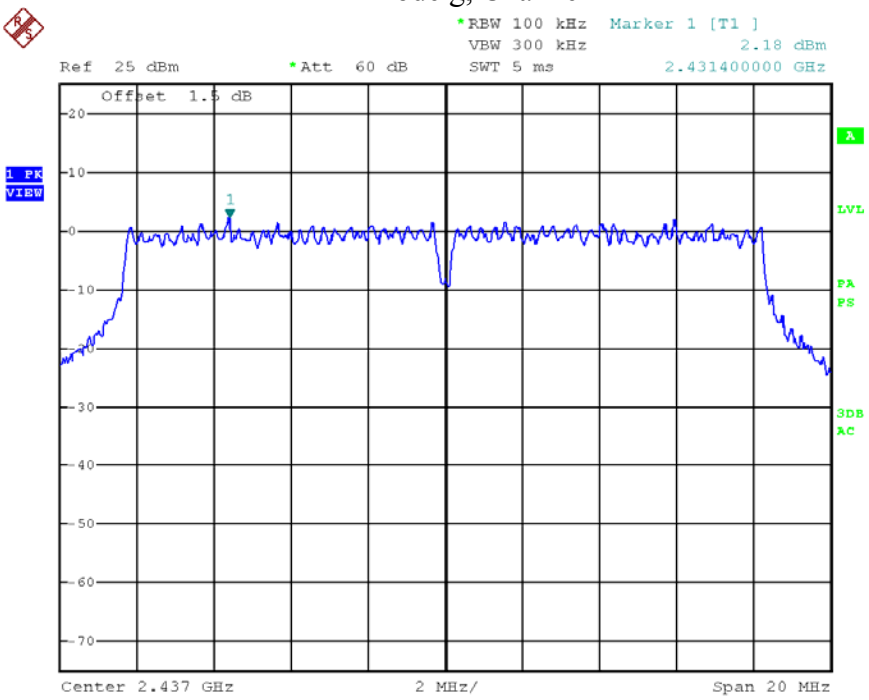

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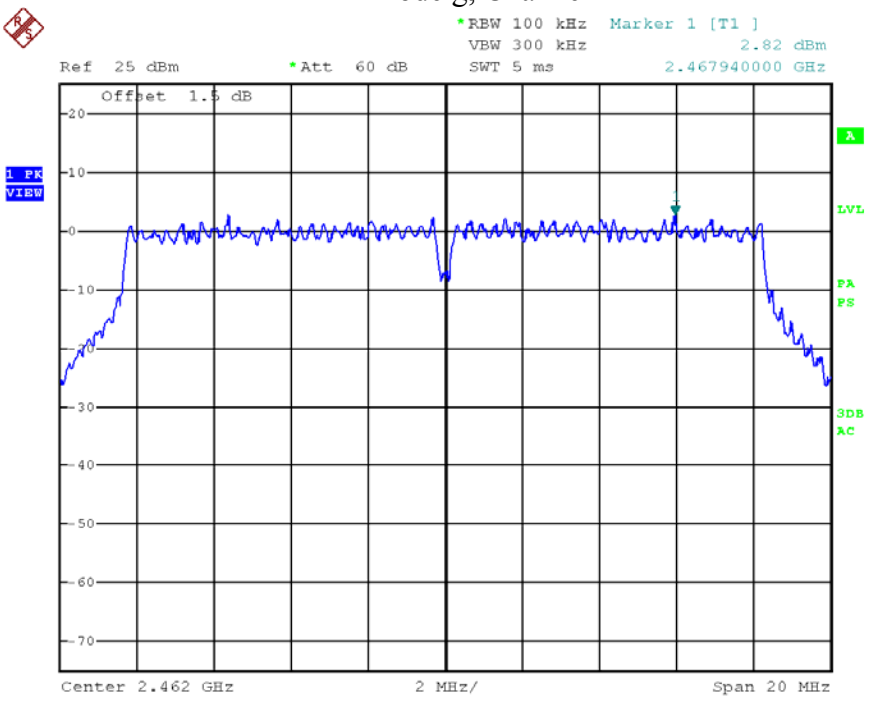

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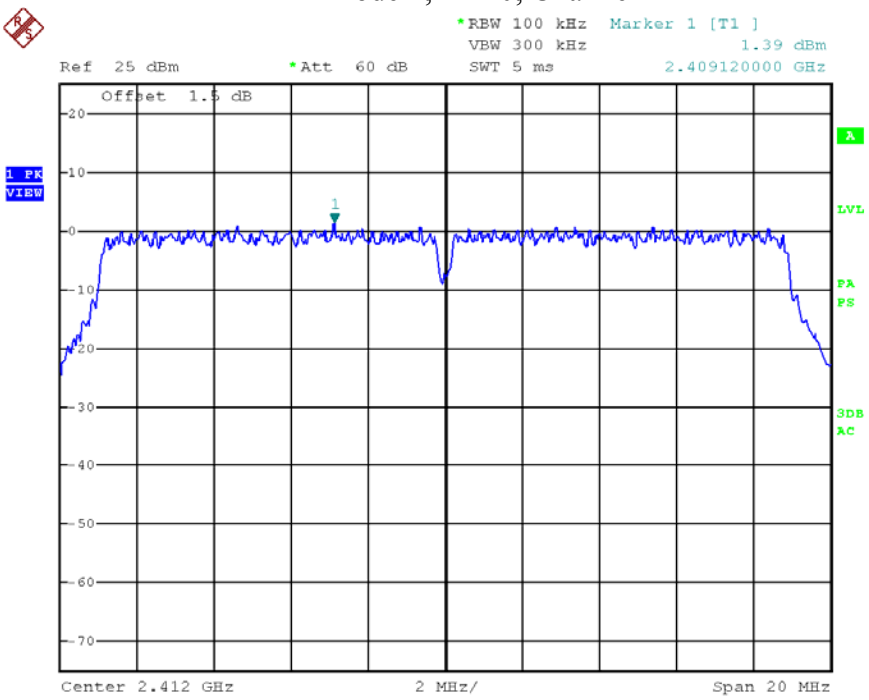
Mode n, HT20, Channel L



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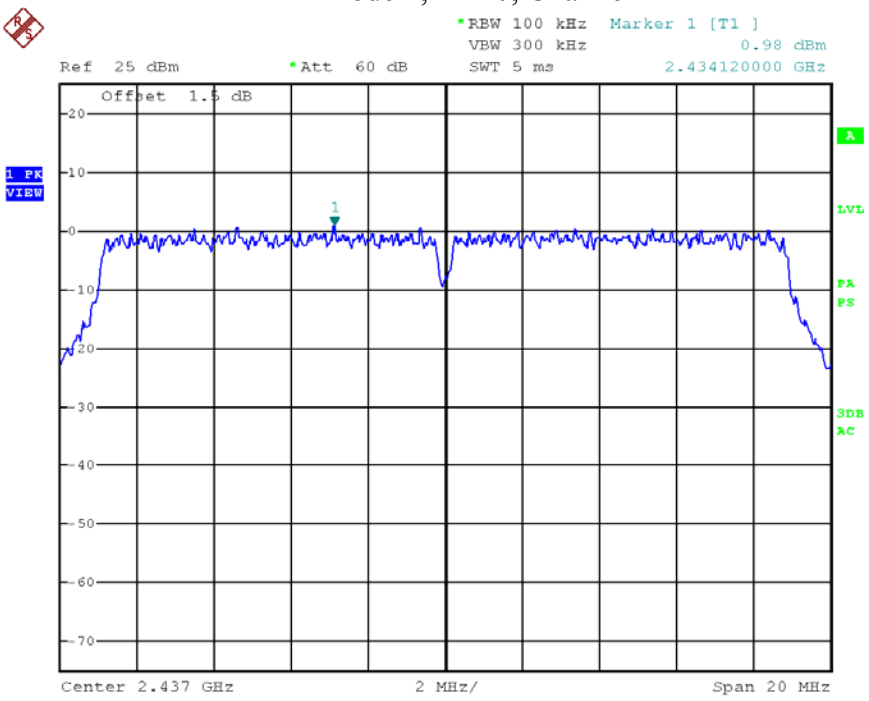
Mode n, HT20, Channel M



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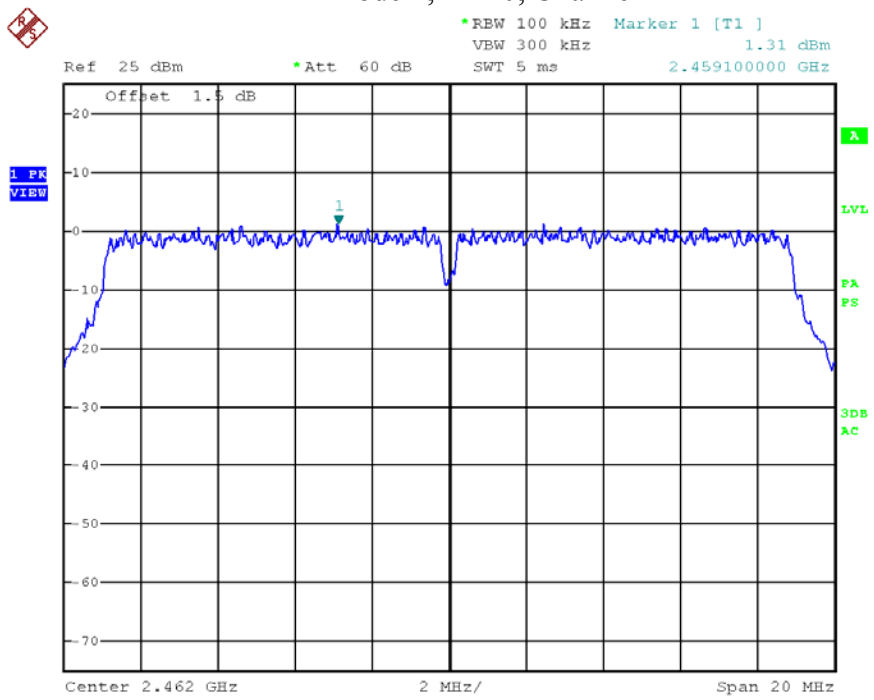

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6. Spurious emission

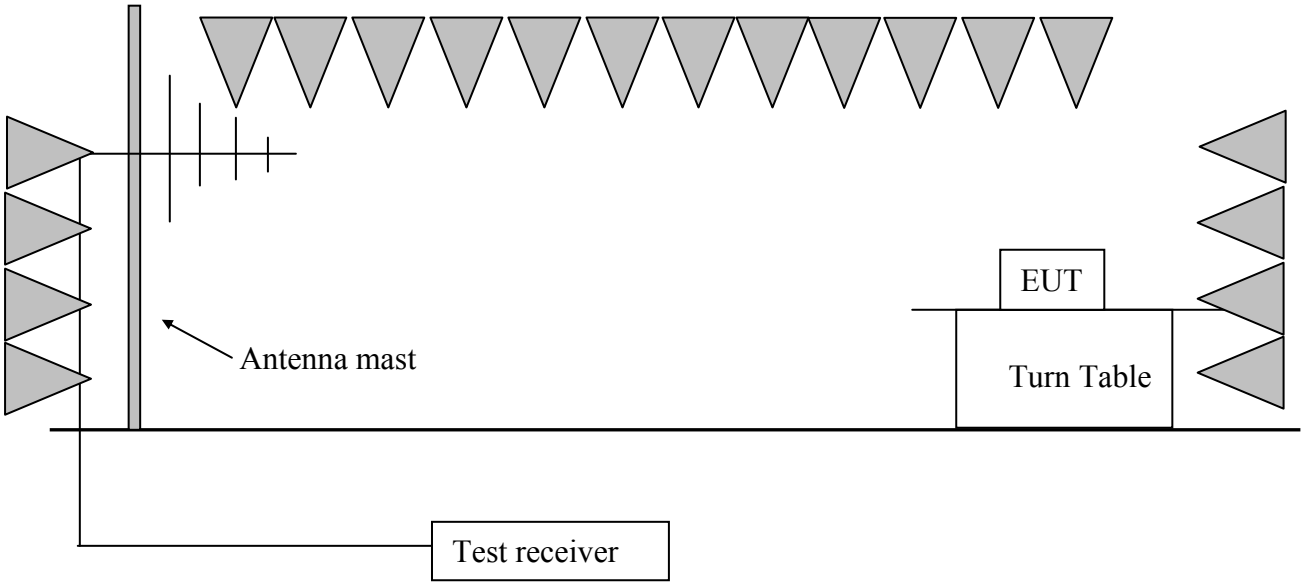
Test result: PASS

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 v01” for compliance to FCC 47CFR 15.247 requirements.

The radiated emission was measured using the Spectrum Analyzer with the resolutions bandwidth set as:

RBW = 100kHz, VBW = 300kHz (30MHz-1GHz)
RBW = 1MHz, VBW = 3MHz (>1GHz for PK);
RBW = 1MHz, VBW = 10Hz (>1GHz for AV);

6.4 Test protocol

External antenna, 802.11b mode

CH	Polarization	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2413.57	34.10	116.70	Fundamental	/	PK
	V	45.55	12.80	35.10	40.00	4.90	PK
	H	84.43	10.90	31.30	40.00	9.70	PK
	H	156.35	13.70	34.30	43.50	9.20	PK
	V	179.68	12.30	32.30	43.50	11.20	PK
	H	195.23	12.70	35.00	43.50	8.50	PK
	H	249.66	13.20	39.30	46.00	6.70	PK
	H	376.01	17.80	37.60	46.00	8.40	PK
	H	624.83	21.60	41.30	46.00	4.70	PK
	H	2386.15	34.00	65.10	74.00	8.90	PK
	H	2387.76	34.00	51.00	54.00	3.00	AV
	H	4826.35	-0.60	48.10	54.00	5.90	PK
M	H	2438.95	34.10	116.90	Fundamental	/	PK
	V	45.55	12.80	35.10	40.00	4.90	PK
	H	84.43	10.90	31.30	40.00	9.70	PK
	H	156.35	13.70	34.30	43.50	9.20	PK
	V	179.68	12.30	32.30	43.50	11.20	PK
	H	195.23	12.70	35.00	43.50	8.50	PK
	H	249.66	13.20	39.30	46.00	6.70	PK
	H	376.01	17.80	37.60	46.00	8.40	PK
	H	624.83	21.60	41.30	46.00	4.70	PK
	H	4878.54	-0.40	50.80	54.00	3.20	PK
H	H	2463.53	34.10	116.30	Fundamental	/	PK
	V	45.55	12.80	35.10	40.00	4.90	PK
	H	84.43	10.90	31.30	40.00	9.70	PK
	H	156.35	13.70	34.30	43.50	9.20	PK

	V	179.68	12.30	32.30	43.50	11.20	PK
	H	195.23	12.70	35.00	43.50	8.50	PK
	H	249.66	13.20	39.30	46.00	6.70	PK
	H	376.01	17.80	37.60	46.00	8.40	PK
	H	624.83	21.60	41.30	46.00	4.70	PK
	H	2483.50	-7.60	61.20	74.00	12.80	PK
	H	2483.50	-7.60	47.00	54.00	7.00	PK
	H	4922.16	-0.10	50.50	54.00	3.50	PK

External antenna, 802.11g mode

CH	Polarization	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2414.19	34.10	114.20	Fundamental	/	PK
	V	45.55	12.80	35.10	40.00	4.90	PK
	H	84.43	10.90	31.30	40.00	9.70	PK
	H	156.35	13.70	34.30	43.50	9.20	PK
	V	179.68	12.30	32.30	43.50	11.20	PK
	H	195.23	12.70	35.00	43.50	8.50	PK
	H	249.66	13.20	39.30	46.00	6.70	PK
	H	376.01	17.80	37.60	46.00	8.40	PK
	H	624.83	21.60	41.30	46.00	4.70	PK
	H	2386.43	34.00	64.80	74.00	9.20	PK
	H	2387.72	34.00	49.70	54.00	5.10	AV
	H	4826.19	-0.60	47.60	54.00	6.40	PK
M	H	2438.41	34.10	113.70	Fundamental	/	PK
	V	45.55	12.80	35.10	40.00	4.90	PK
	H	84.43	10.90	31.30	40.00	9.70	PK
	H	156.35	13.70	34.30	43.50	9.20	PK
	V	179.68	12.30	32.30	43.50	11.20	PK
	H	195.23	12.70	35.00	43.50	8.50	PK

	H	249.66	13.20	39.30	46.00	6.70	PK
	H	376.01	17.80	37.60	46.00	8.40	PK
	H	624.83	21.60	41.30	46.00	4.70	PK
	H	4879.28	-0.40	50.20	54.00	3.80	PK
H	H	2464.97	34.10	113.30	Fundamental	/	PK
	V	45.55	12.80	35.10	40.00	4.90	PK
	H	84.43	10.90	31.30	40.00	9.70	PK
	H	156.35	13.70	34.30	43.50	9.20	PK
	V	179.68	12.30	32.30	43.50	11.20	PK
	H	195.23	12.70	35.00	43.50	8.50	PK
	H	249.66	13.20	39.30	46.00	6.70	PK
	H	376.01	17.80	37.60	46.00	8.40	PK
	H	624.83	21.60	41.30	46.00	4.70	PK
	H	2483.50	-7.60	61.00	74.00	13.00	PK
	H	2483.50	-7.60	46.80	54.00	7.20	PK
	H	4923.68	-0.10	50.50	54.00	3.50	PK

External antenna, 802.11n mode

CH	Polarization	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2414.30	34.10	113.60	Fundamental	/	PK
	V	45.55	12.80	35.10	40.00	4.90	PK
	H	84.43	10.90	31.30	40.00	9.70	PK
	H	156.35	13.70	34.30	43.50	9.20	PK
	V	179.68	12.30	32.30	43.50	11.20	PK
	H	195.23	12.70	35.00	43.50	8.50	PK
	H	249.66	13.20	39.30	46.00	6.70	PK
	H	376.01	17.80	37.60	46.00	8.40	PK
	H	624.83	21.60	41.30	46.00	4.70	PK
	H	2386.49	34.00	64.60	74.00	9.40	PK

	H	2387.71	34.00	49.80	54.00	5.20	AV
	H	4826.19	-0.60	47.60	54.00	6.40	PK
M	H	2439.02	34.10	113.50	Fundamental	/	PK
	V	45.55	12.80	35.10	40.00	4.90	PK
	H	84.43	10.90	31.30	40.00	9.70	PK
	H	156.35	13.70	34.30	43.50	9.20	PK
	V	179.68	12.30	32.30	43.50	11.20	PK
	H	195.23	12.70	35.00	43.50	8.50	PK
	H	249.66	13.20	39.30	46.00	6.70	PK
	H	376.01	17.80	37.60	46.00	8.40	PK
	H	624.83	21.60	41.30	46.00	4.70	PK
	H	4879.03	-0.40	50.00	54.00	4.00	PK
H	H	2464.22	34.10	113.50	Fundamental	/	PK
	V	45.55	12.80	35.10	40.00	4.90	PK
	H	84.43	10.90	31.30	40.00	9.70	PK
	H	156.35	13.70	34.30	43.50	9.20	PK
	V	179.68	12.30	32.30	43.50	11.20	PK
	H	195.23	12.70	35.00	43.50	8.50	PK
	H	249.66	13.20	39.30	46.00	6.70	PK
	H	376.01	17.80	37.60	46.00	8.40	PK
	H	624.83	21.60	41.30	46.00	4.70	PK
	H	2483.50	-7.60	61.10	74.00	12.90	PK
	H	2483.50	-7.60	46.40	54.00	7.60	PK
	H	4923.25	-0.10	50.40	54.00	3.60	PK

PCB antenna (802.11b mode, as the highest power setting, was chosen to perform test as representative)

CH	Polarization	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2413.83	34.10	114.10	Fundamental	/	PK
	V	45.55	12.80	35.30	40.00	4.70	PK
	H	84.43	10.90	31.00	40.00	10.00	PK
	H	156.35	13.70	34.60	43.50	9.50	PK
	V	179.68	12.30	32.30	43.50	11.20	PK
	H	195.23	12.70	35.20	43.50	8.30	PK
	H	249.62	13.20	39.50	46.00	6.50	PK
	H	376.01	17.80	37.60	46.00	8.40	PK
	H	624.83	21.60	41.80	46.00	4.20	PK
	H	2386.22	34.00	64.20	74.00	9.80	PK
	H	2387.76	34.00	50.30	54.00	3.70	AV
	H	4826.35	-0.60	47.80	54.00	6.20	PK
M	H	2438.26	34.10	114.40	Fundamental	/	PK
	V	45.55	12.80	35.30	40.00	4.70	PK
	H	84.43	10.90	31.00	40.00	10.00	PK
	H	156.35	13.70	34.60	43.50	9.50	PK
	V	179.68	12.30	32.30	43.50	11.20	PK
	H	195.23	12.70	35.20	43.50	8.30	PK
	H	249.62	13.20	39.50	46.00	6.50	PK
	H	376.01	17.80	37.60	46.00	8.40	PK
	H	624.83	21.60	41.80	46.00	4.20	PK
	H	4878.54	-0.40	50.50	54.00	3.50	PK
H	H	2463.80	34.10	113.90	Fundamental	/	PK
	V	45.55	12.80	35.30	40.00	4.70	PK
	H	84.43	10.90	31.00	40.00	10.00	PK
	H	156.35	13.70	34.60	43.50	9.50	PK
	V	179.68	12.30	32.30	43.50	11.20	PK

	H	195.23	12.70	35.20	43.50	8.30	PK
	H	249.62	13.20	39.50	46.00	6.50	PK
	H	376.01	17.80	37.60	46.00	8.40	PK
	H	624.83	21.60	41.80	46.00	4.20	PK
	H	2483.50	-7.60	60.60	74.00	13.40	PK
	H	2483.50	-7.60	46.80	54.00	7.20	PK
	H	4922.16	-0.10	50.80	54.00	3.20	PK

Remark: 1. Correct Factor = Antenna Factor + Cable Loss (-Amplifier, is employed)
2. Corrected Reading = Original Receiver Reading + Correct Factor
3. Margin = limit – Corrected Reading
4. If the PK reading is lower than AV limit, the AV test can be elided.
5. The spurious emission was conducted from 30MHz to 25GHz.

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

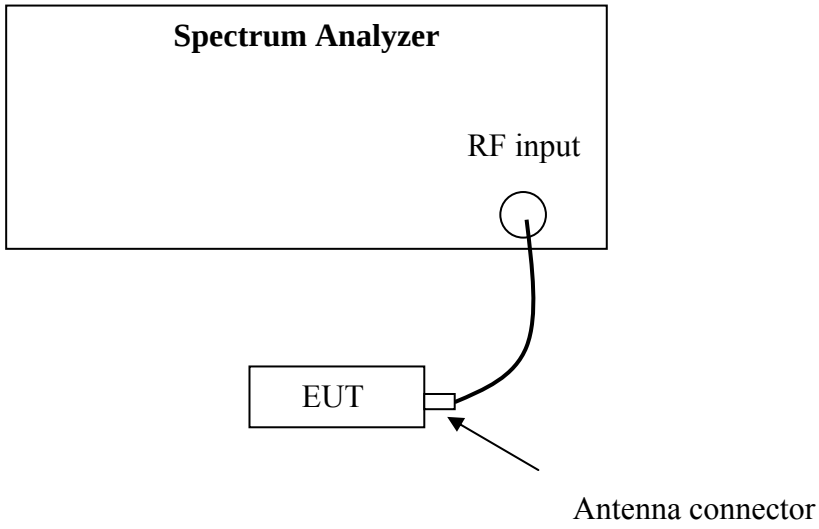
7. Emission outside the frequency Band

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

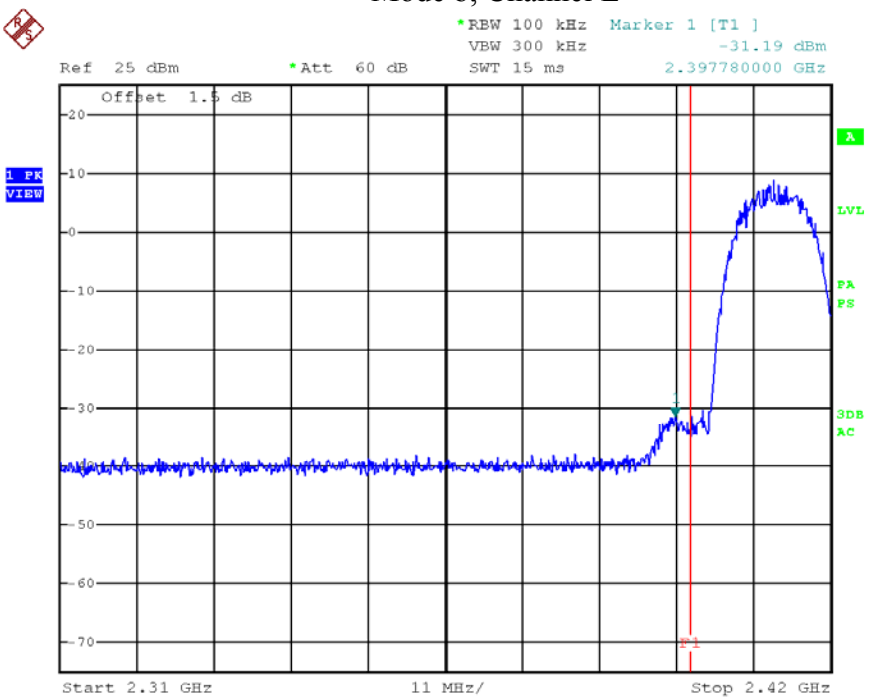
The Emission outside the frequency Band per FCC §15.247(d) is measured using the Spectrum Analyzer with the resolutions bandwidth set at 100kHz, the video bandwidth set at 300kHz, and the SPAN>>RBW.
The EUT was tested according to DTS test procedure of "KDB558074 D01 DTS Meas Guidance v01" for compliance to FCC 47CFR 15.247 requirements.

7.4 Test protocol

Mode	CH	Max reading among band (dBm)	The most restrict Attenuation outside band (dB)	Limit (dB)
11b	L	8.87	31.19	≥20
	M	8.91	39.06	
	H	8.53	37.48	
11g	L	2.86	29.58	
	M	2.18	38.97	
	H	2.82	35.80	
11n, HT20	L	1.39	31.34	
	M	0.98	39.86	
	H	1.31	34.47	

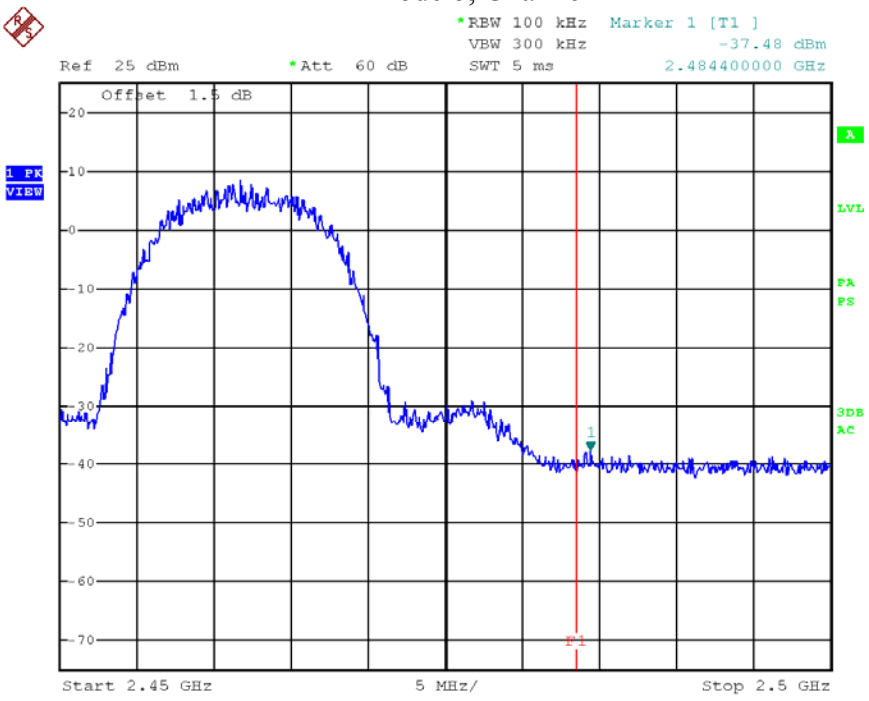
Note: the conducted spurious emission is performed from 9kHz to 25GHz.

Mode b, Channel L



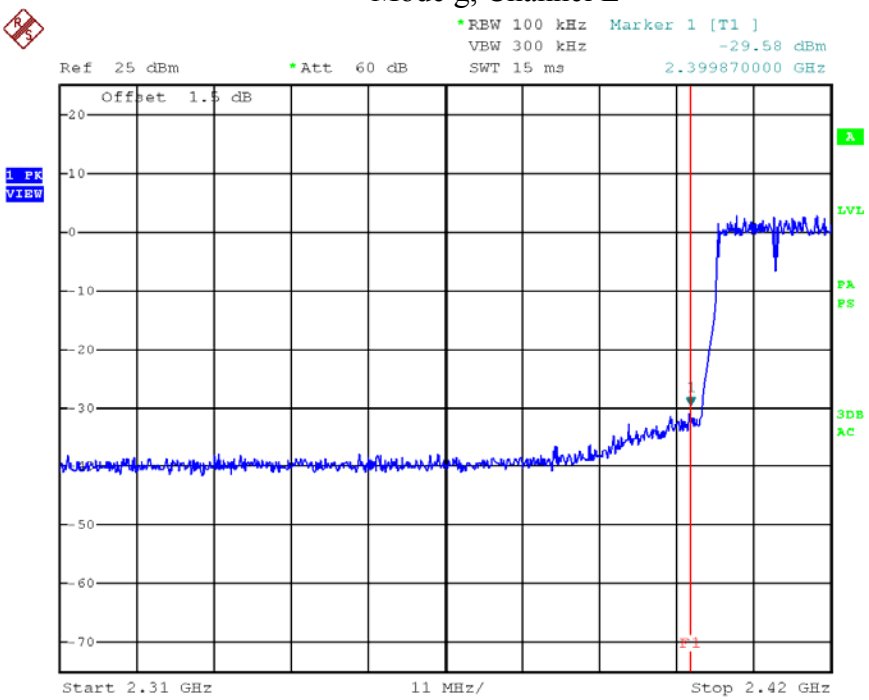
Date: 20.AUG.2012 14:46:15

Mode b, Channel H



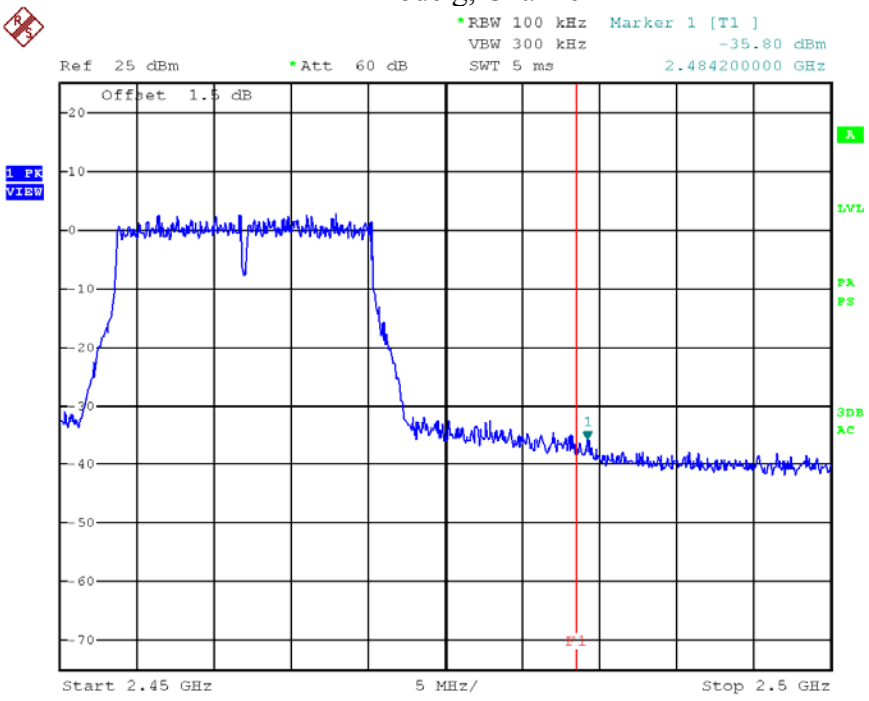
Date: 20.AUG.2012 14:54:36

Mode g, Channel L



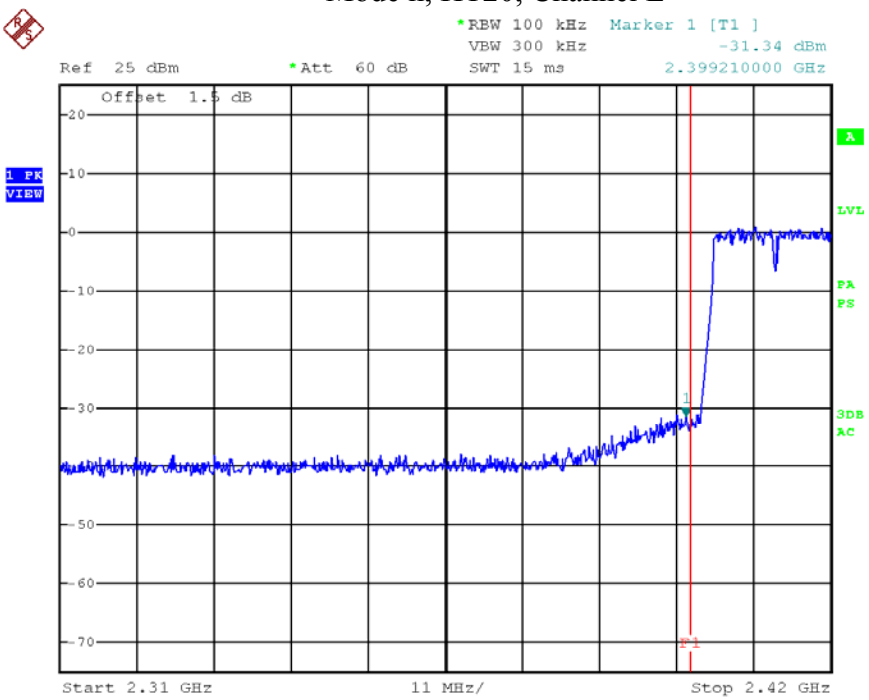
Date: 20.AUG.2012 14:56:39

Mode g, Channel H



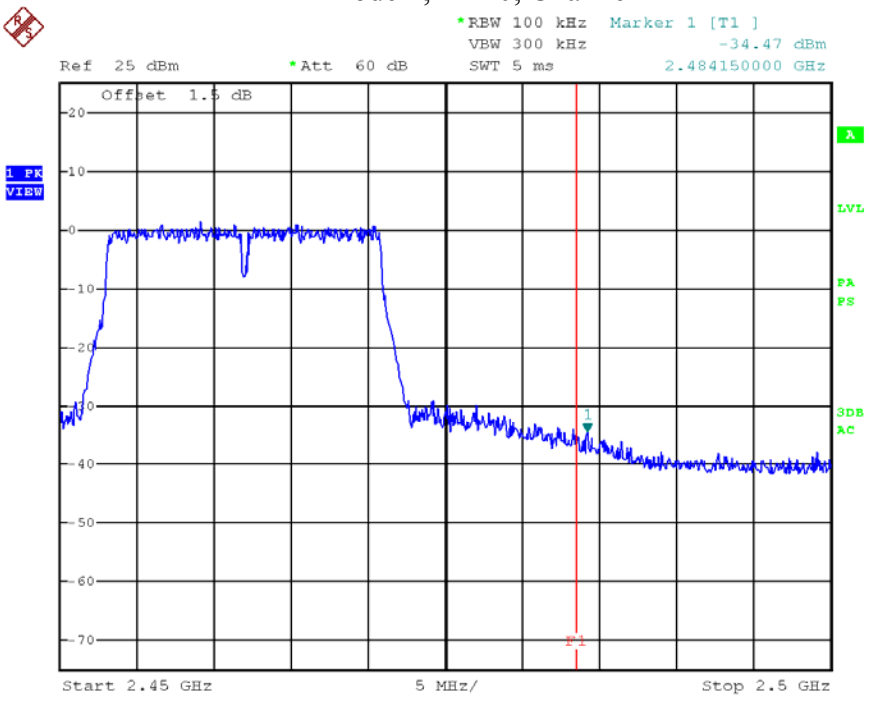
Date: 20.AUG.2012 14:58:34

Mode n, HT20, Channel L



Date: 20.AUG.2012 14:57:19

Mode n, HT20, Channel H



Date: 20.AUG.2012 14:59:45

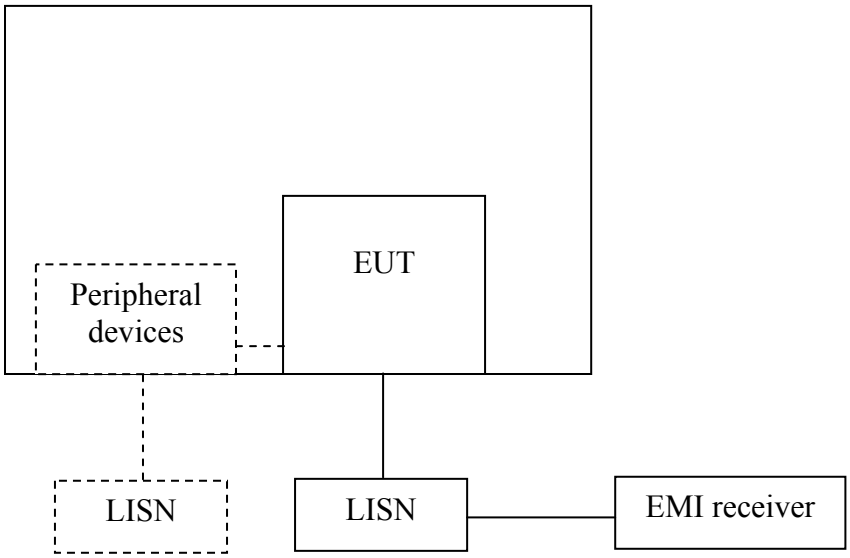
8. Power Line Conducted emission

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



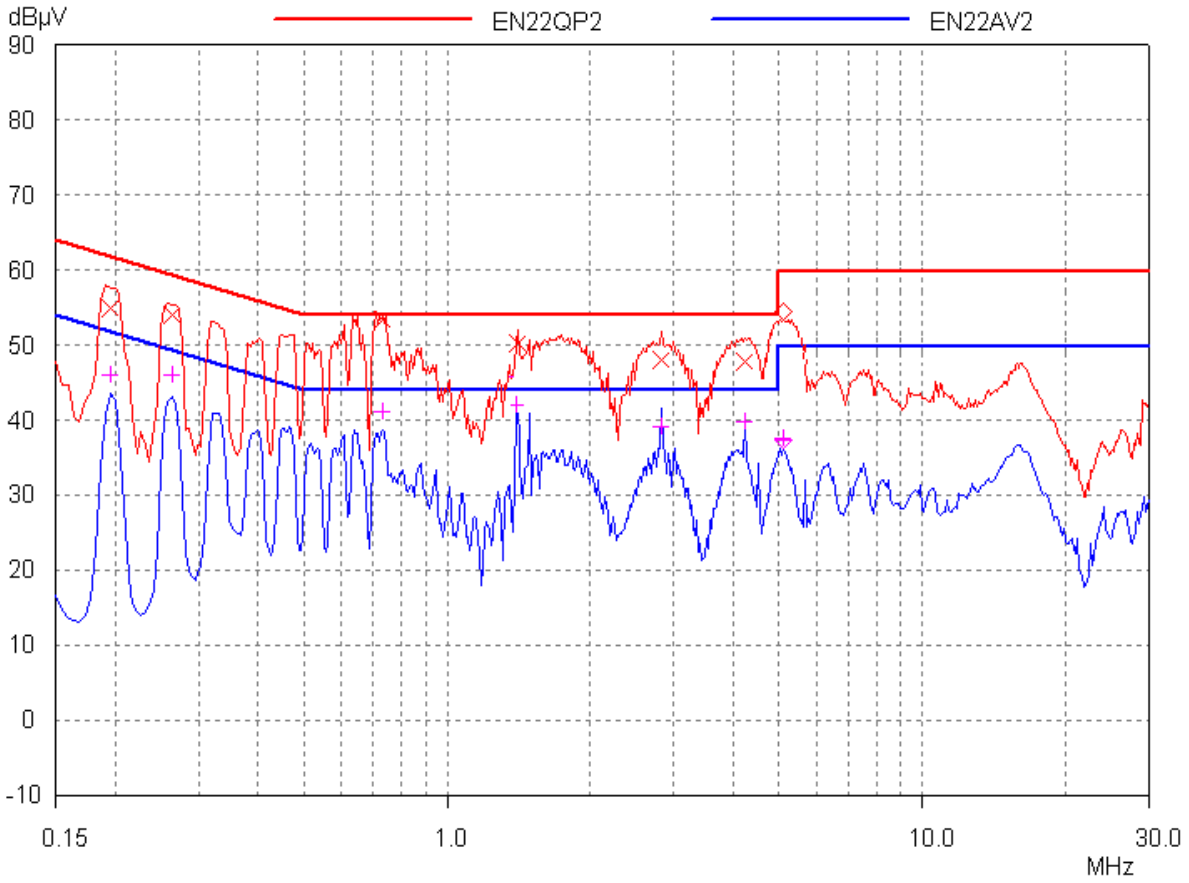
☒ For table top equipment, wooden support is 0.8m height table

☐ 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	LISN Factor (dB)	Cable Loss (dB)	Corrected Reading (dBuV) QP	AV	Limit (dBuV) QP	AV	Margin (dB) QP	AV
0.20 (N)	2.70	0.30	54.81	45.91	63.82	53.82	9.01	7.91
0.26 (N)	2.70	0.30	54.01	46.00	61.35	51.35	7.34	5.35
0.73 (L)	2.70	0.30	53.39	41.13	56.00	46.00	2.61	4.87
1.41 (L)	2.70	0.30	50.26	44.68	56.00	46.00	5.74	1.32
2.81 (N)	2.70	0.30	48.05	39.19	56.00	46.00	7.95	6.84
4.22 (L)	2.70	0.30	47.71	39.79	56.00	46.00	8.29	6.21
Remark: 1. Corrected Reading = LISN Factor (dB) + Cable Loss (dB) + receiver reading. 2. Margin (dB) = Limit - Corrected Reading.								

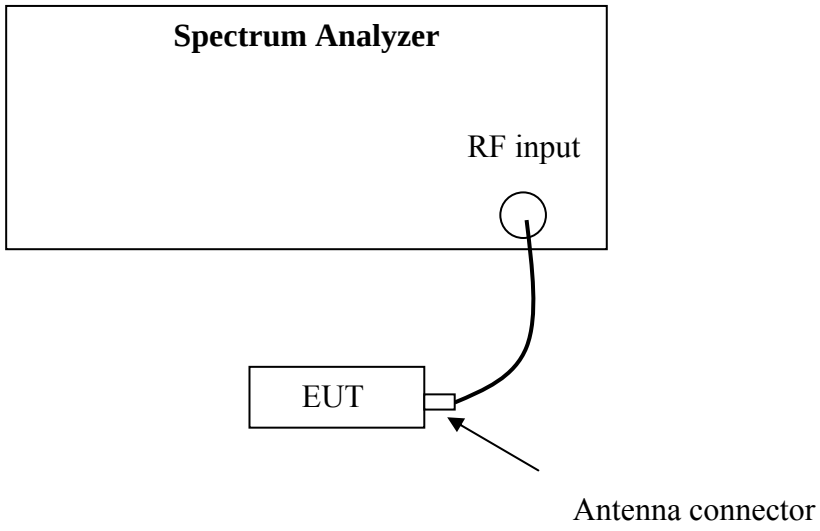
9. Channel Number of hopping system

Test result: **NA**

9.1 Limit

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

9.2 Test Configuration



9.3 Test procedure and test setup

The channel number per FCC §15.247(a)(1)(iii) is measured using the Spectrum Analyzer with the resolutions bandwidth set at 100kHz, the video bandwidth set at 300kHz, and the SPAN>>RBW.
The RF passband of the EUT was divided into 3 appropriate bands to test.

9.4 Test protocol

Channel Number	Limit
-	≥15

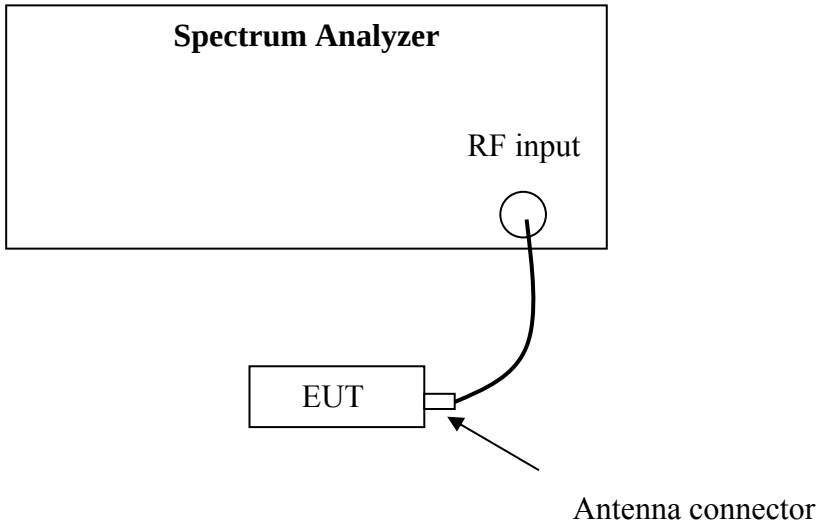
10. Average time of occupancy in any channel

Test result: **NA**

10.1 Limit

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

10.2 Test Configuration



10.3 Test procedure and test setup

Average time of occupancy in any channel per FCC § 15.247(a)(1)(iii)
is measured using the Spectrum Analyzer with the resolutions bandwidth set at 100kHz, the video bandwidth set at 300kHz, and the SPAN set to be 0Hz to test in time domain. The test is performed at the middle channel.

10.4 Test protocol

Packet	Observed period (s) **P**	Time of occupancy for single hopping (ms) **O**	Hops among the interval of 3.6 s **I**	Average time of occupancy (s) **T**	Limit (s)
Packet Type 4	-	-	-	-	≤0.4
Packet Type 11	-	-	-	-	≤0.4
Packet Type 15	-	-	-	-	≤0.4

Remark: 1. There are 79 channels in all. So the observed period P = 0.4 * 79 = 31.6 s.
2. Average time of occupancy **T = O *I * P / 3.6**

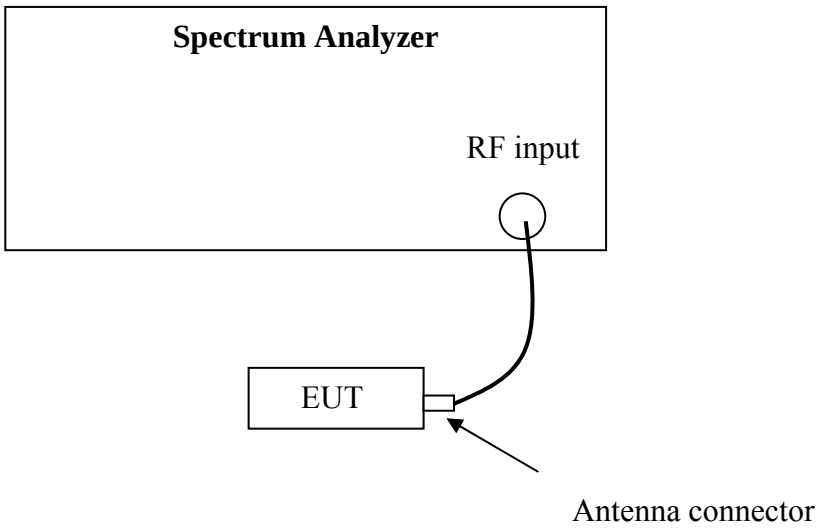
11. Occupied Bandwidth

Test Status: Tested

11.1 Test limit

None

11.2 Test Configuration



11.3 Test procedure and test setup

The occupied bandwidth was measured using the Spectrum Analyzer.

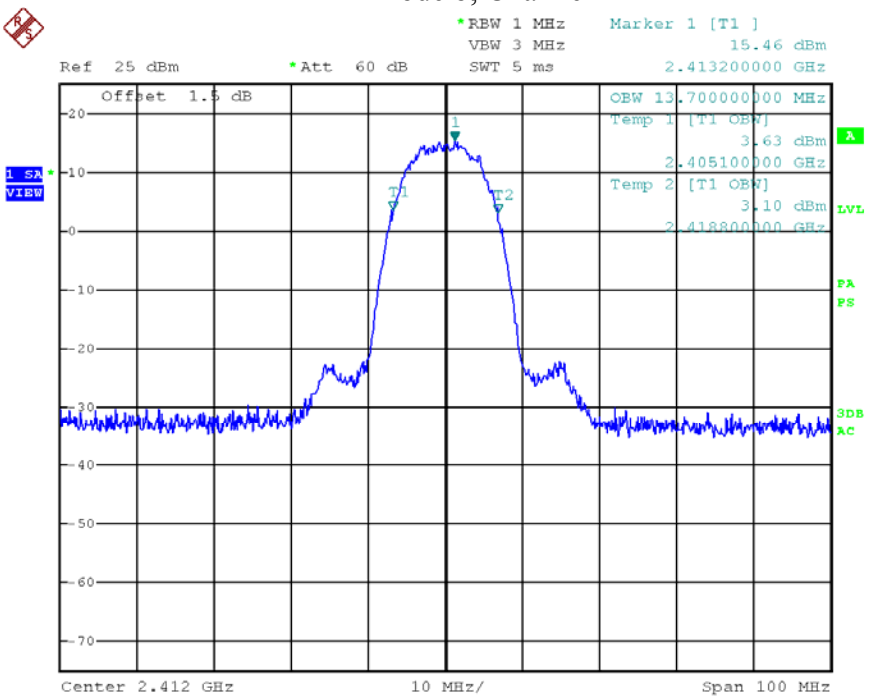
11.4 Test protocol

Temperature : 22 °C

Relative Humidity : 43 %

Mode	CH	99% Bandwidth (MHz)
11b	L	13.70
	M	13.90
	H	13.90
11g	L	17.80
	M	17.90
	H	17.80
11n, HT20	L	18.50
	M	18.60
	H	18.60

Mode b, Channel L



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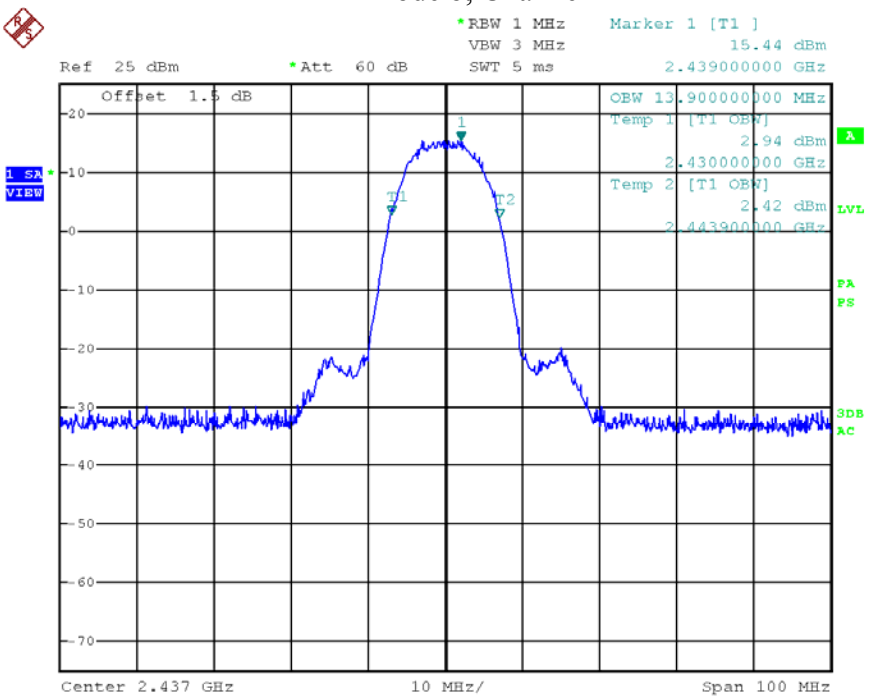
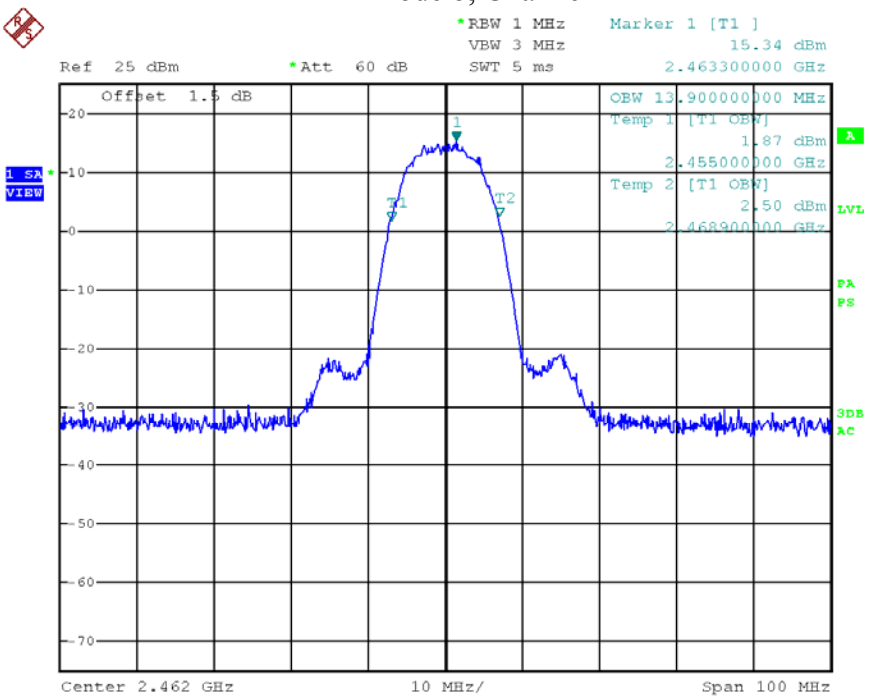
Mode b, Channel M



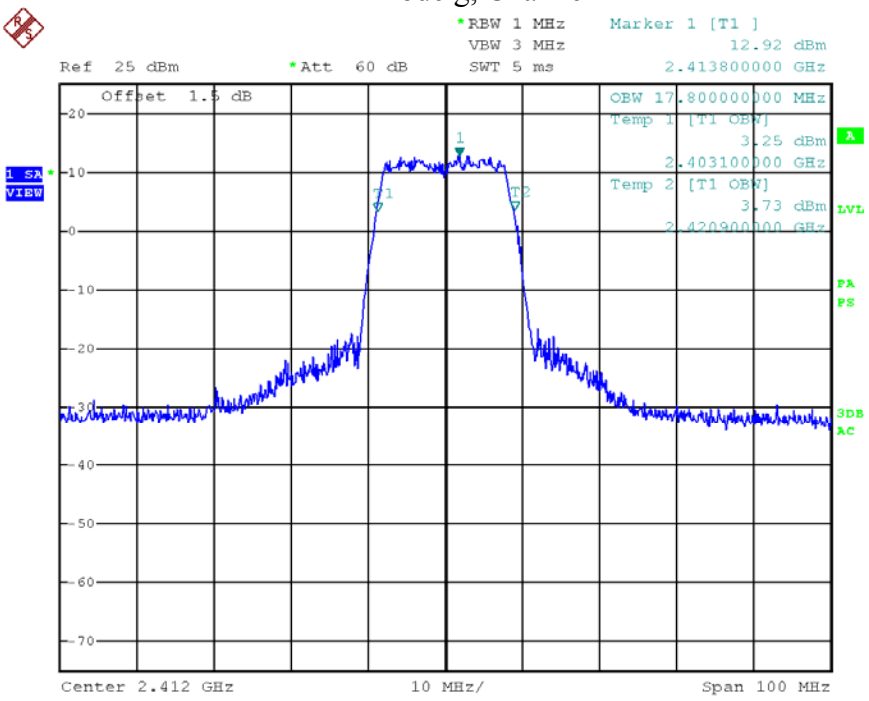
Date: 20.AUG.2012 15:05:20

Mode b, Channel H



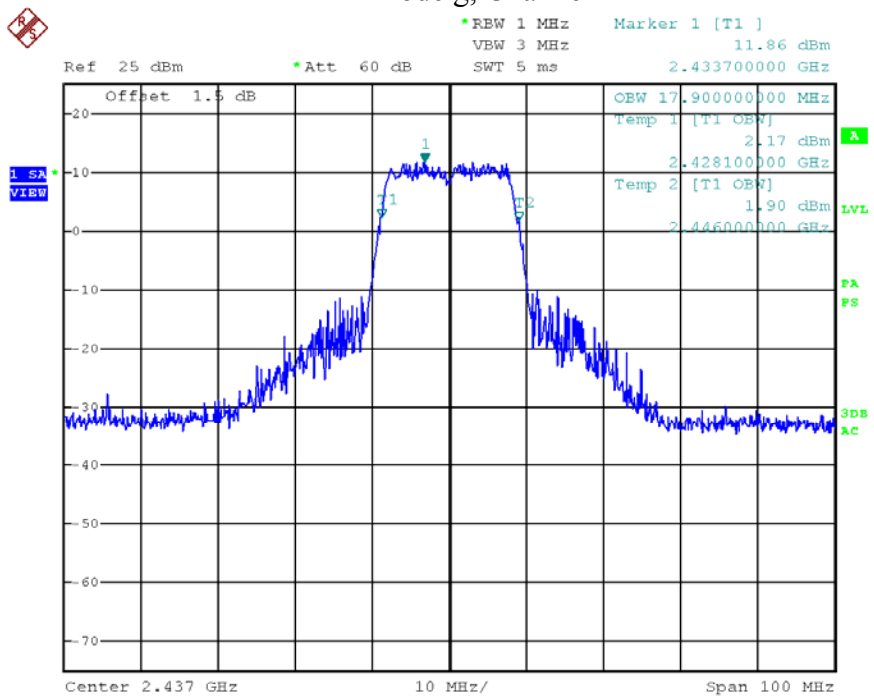
Date: 20.AUG.2012 15:06:00

Mode g, Channel L



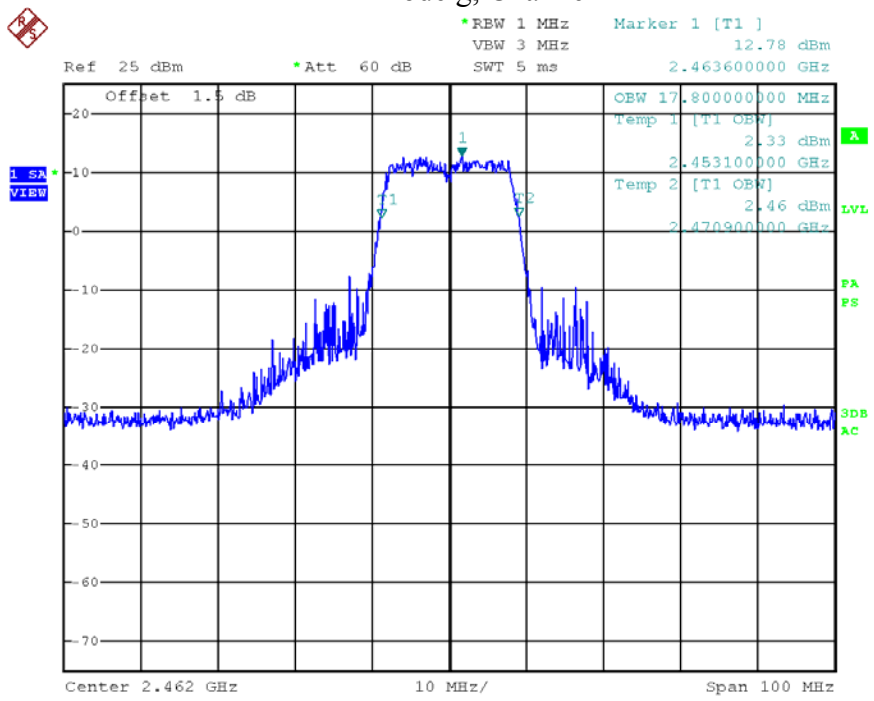
Date: 20.AUG.2012 15:07:06

Mode g, Channel M



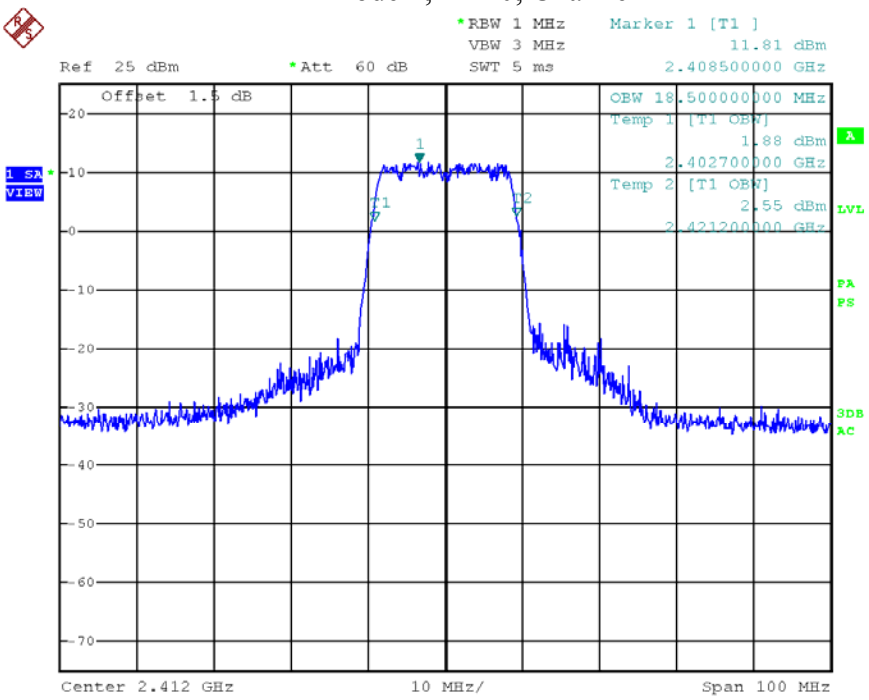
Date: 20.AUG.2012 15:08:20

Mode g, Channel H



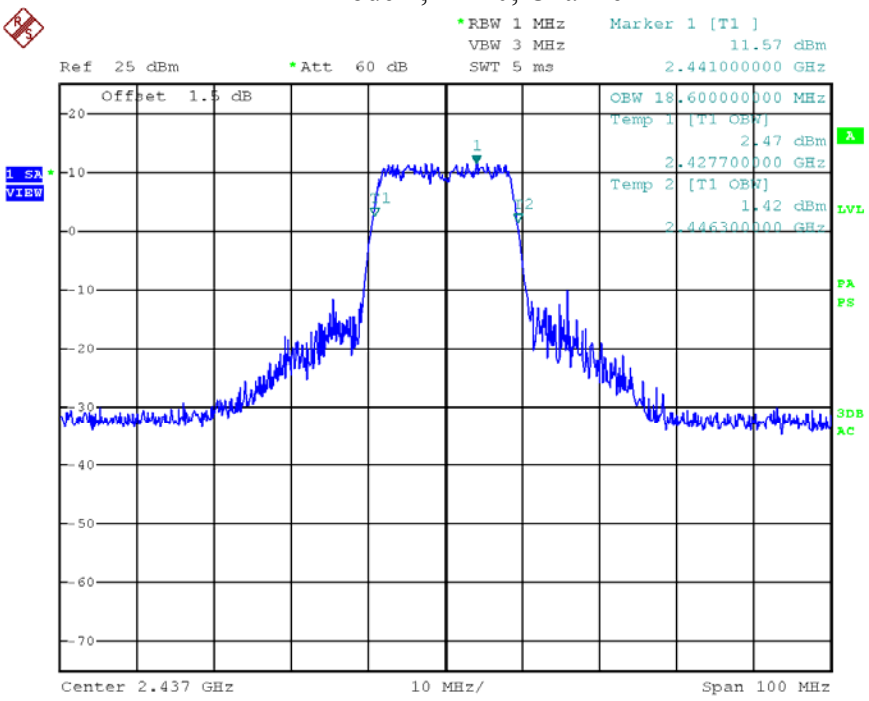
Date: 20.AUG.2012 15:09:31

Mode n, HT20, Channel L



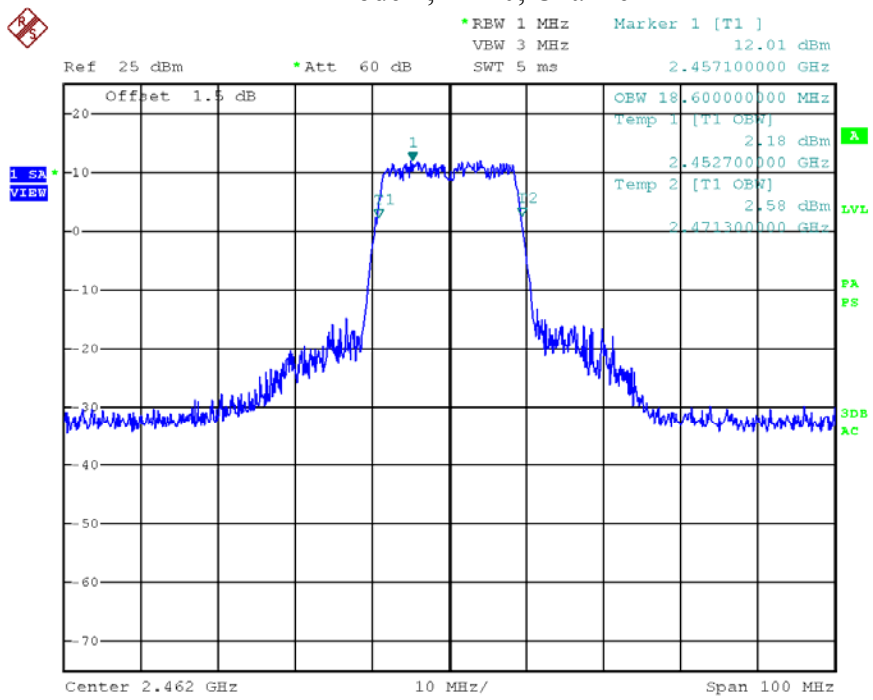
Date: 20.AUG.2012 15:07:34

Mode n, HT20, Channel M



Date: 20.AUG.2012 15:08:50

Mode n, HT20, Channel H



Date: 20.AUG.2012 15:10:01

12. Conducted emission for Unintentional Radiator

Test result: NA

12.1 Limits

12.1.1 Limits for conducted disturbance voltage at the mains ports of class A device

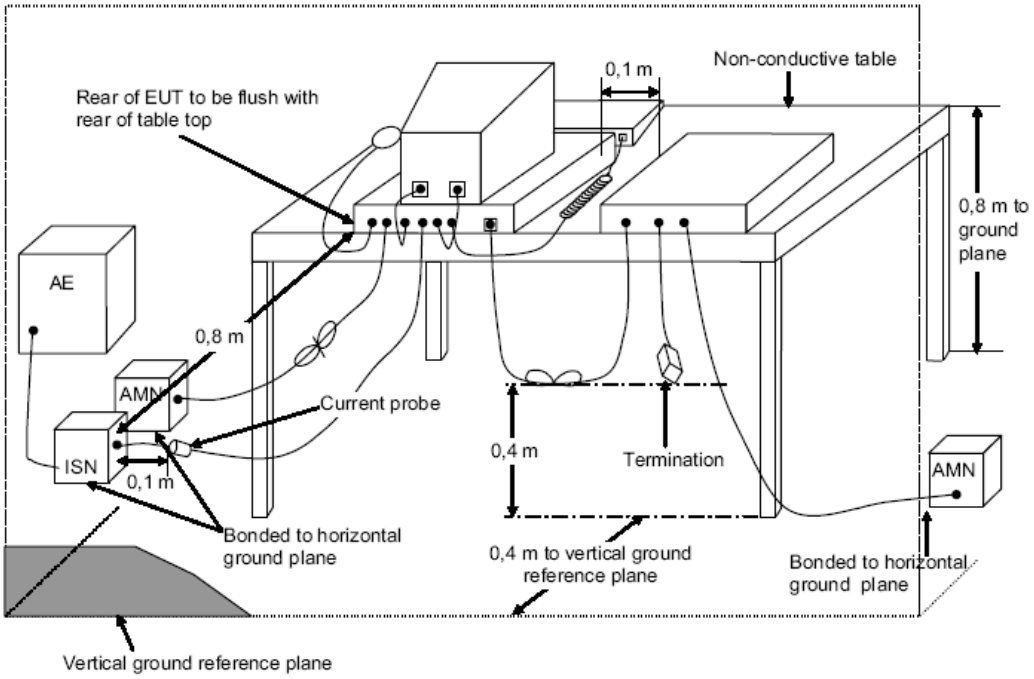
Frequency range (MHz)	Limits dB(μV) Quasi-peak	Average
0.15 ~ 0.5	79	66
0.5 ~ 30	73	60
Note: If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.		

12.1.2 Limits for conducted disturbance voltage at the mains ports of class B device

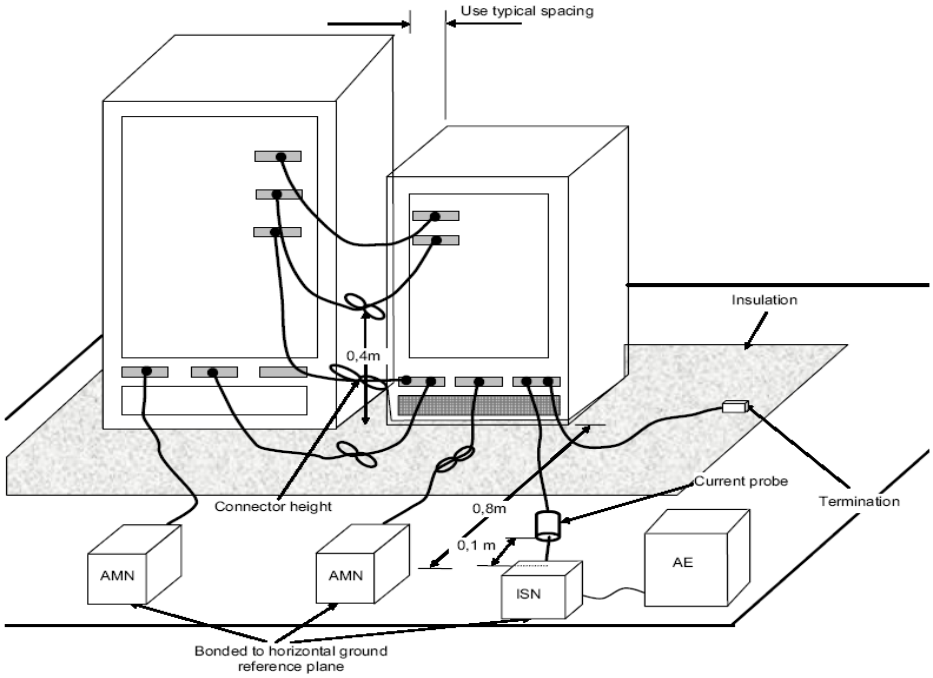
Frequency range (MHz)	Limits dB(μV) Quasi-peak	Average
0.15 ~ 0.5	66 ~ 56 *	56 ~ 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50
Note: 1. * Means the limit decreasing linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz 2. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.		

12.2 Test setup

☐ For table top equipment



☐ For floor standing equipment



12.3 Test Setup and Test Procedure

Measurement was performed in shielded room, and instruments used were following clause 4 and clause 5 of ANSI 63.4.
Detailed test procedure was following clause 7.2 of ANSI 63.4.
EUT arrangement and operation conditions were according to clause 6 and clause 7 of ANSI 63.4.
Frequency range 150kHz – 30MHz was checked and EMI receiver measurement bandwidth was set to 9 kHz.

12.4 Test Protocol

Temperature : °C
Relative Humidity : %

Frequency	LISN Factor (dB)	Cable Loss (dB)	Corrected Reading (dBuV)		Limit (dBuV)		Margin (dB)	
			QP	AV	QP	AV	QP	AV
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
Remark: 1. Corrected Reading = LISN Factor (dB) + Cable Loss (dB) + receiver reading. 2. Margin (dB) = Limit - Corrected Reading.								

13. Radiated emission for Unintentional Radiator

Test result: NA

13.1 Radiated emission limits

13.1.1 Limits for radiated disturbance of class A device

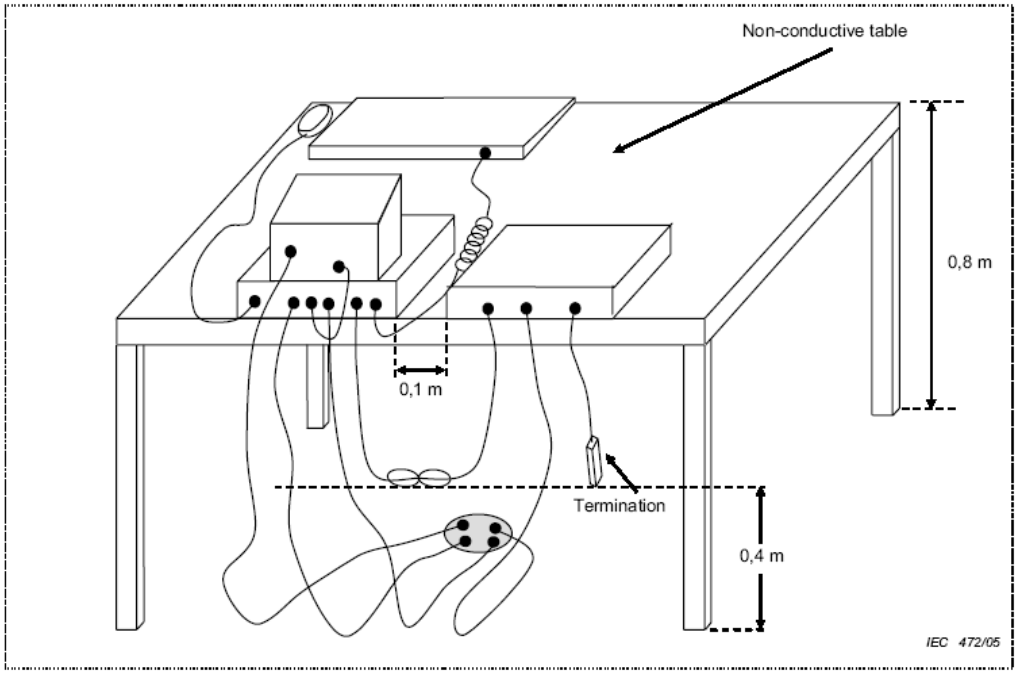
Frequency (MHz)	Permitted limit in dBμV/m (Quasi-peak) of Measurement Distance 10m
30 – 88	39
88 – 216	43.5
216 – 960	46.4
Above 960	49.5
Note: for the measurement distance other than 3m and 10m, the limit is varied according to 20dB/10 decades.	

13.1.1 Limits for radiated disturbance of class B device

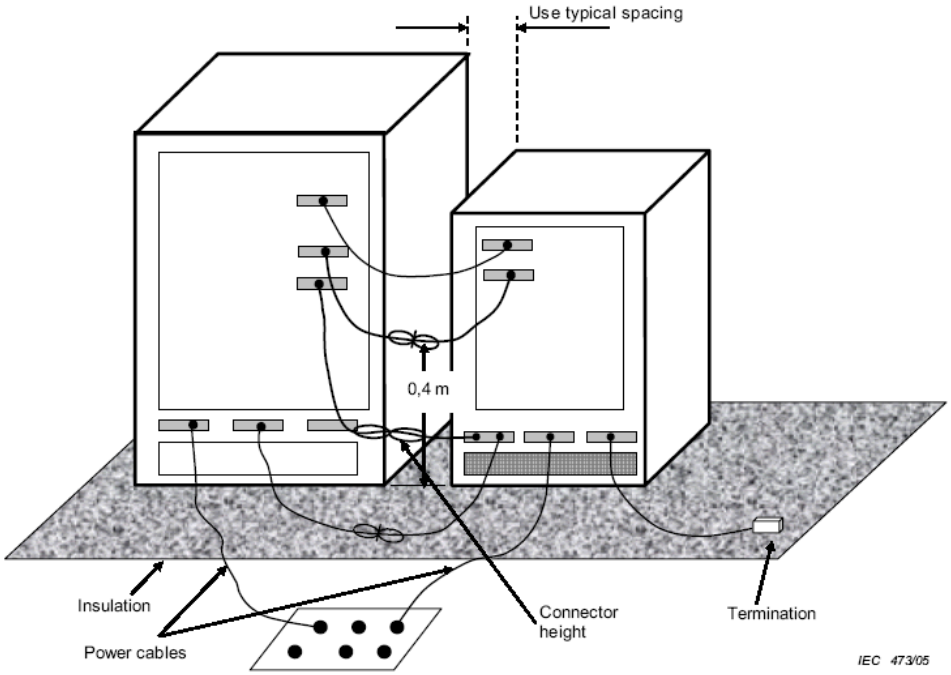
Frequency (MHz)	Permitted limit in dBμV/m (Quasi-peak) of Measurement Distance 3m
30 – 88	40.0
88 – 216	43.5
216 – 960	46.0
Above 960	54.0
Note: for the measurement distance other than 3m and 10m, the limit is varied according to 20dB/10 decades.	

13.2 Block diagram and test set up

☐ For table top equipment



☐ For floor standing equipment



13.3 Test Setup and Test Procedure

The measurement was performed in a semi-anechoic chamber.
The distance from EUT to receiving antenna is **3** meter.
Measurement was performed according to clause 4 and clause 5 of ANSI 63.4.
Test procedure was according to clause 8.3 of ANSI 63.4.
EUT arrangement and operate condition were according to clause 6 and clause 8 of ANSI 63.4.
The required measurement frequency range was checked.

Highest operating frequency (MHz)	Upper frequency of measurement range (MHz)
☐ Below 1.705	30
☐ 1.705–108	1000
☐ 108–500	2000
☐ 500–1000	5000
☐ Above 1000	5th harmonic o or 40 GHz which is lower.

13.4 Test Protocol

Temperature : °C
Relative Humidity : %

Ant	Frequency (MHz)	Emission level (dBμV/m)	Transducer (dB/m)	Limits (dBμV/m)	Margin (dB)	Detector
H	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
V	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-

Remark: 1. Transducer = Antenna Factor + Cable Loss (-Amplifier, is employed)
2. Corrected Reading = Original Receiver Reading + Transducer
3. Margin = limit – Corrected Reading
4. The test is performed from 30MHz to 10GHz.
5. For the frequency points assessed with QP detector, it has been confirmed the pulse-repetition frequency of their emission is higher than 20 Hz.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10dBuV.
Then Transducer = 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