EMC TEST REPORT for Intentional Radiator

No. 140301805SHA-002

Applicant	: Jiaxing Meisheng Electronics Co., Ltd No. 38 Liansheng Road, Dayun Economic Development District, Jiashan, Zhejiang, China
Manufacturer	: Jiaxing Meisheng Electronics Co., Ltd No. 38 Liansheng Road, Dayun Economic Development District, Jiashan, Zhejiang, China
Equipment	: Active speaker
Type/Model	: NX-WRW-6, NX-WRW-5

SUMMARY

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

47CFR Part 15 (2013): 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 4 (November 2014): General Requirements for Compliance of Radio Apparatus

Date of issue: November 28, 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:	Jiaxing Meisheng Electronics Co., Ltd No. 38 Liansheng Road, Dayun Economic Development District, Jiashan, Zhejiang, China
Name of contact:	Vivian JIN
Tel:	86 573 84681637
Fax:	86 573 84669679
Manufacturer:	Jiaxing Meisheng Electronics Co., Ltd No. 38 Liansheng Road, Dayun Economic Development District, Jiashan, Zhejiang, China

Sample received date	:	July 1, 2014
Date of test	:	July 1, 2014 ~ July 10, 2014

1.2 Identification of the EUT

Equipment:	Active speaker
Type/model:	NX-WRW-6, NX-WRW-5
FCC ID:	2ACMF-MSGABT
IC:	12102A- MSGABT

1.3 Technical specification

Operation Frequency Band:	2402 - 2480 MHz
Protocol:	Bluetooth 4.0 LE
Modulation:	GFSK
Antenna Designation:	PIFA antenna
Gain of Antenna:	0dBi
Rating:	120V~, 60Hz
Description of EUT:	EUT is an Active speaker, and has two models. They have the same RF module. They have the similar electrical circuit and function, but with different appearance and PCB layout. The model of NX-WRW-6 was chosen to perform the full tests and the model of NX-WRW-5 was chosen to perform the Radiated Spurious Emissions and Power line conducted emission.
Channel Description:	There are 40 channels in all. The designed channel spacing is 2MHz.

Channel Identifier	Frequency (MHz)
low	2402
middle	2440
high	2480

1.4 Mode of operation during the test / Test peripherals used

While testing the transmitter mode of the EUT, the internal modulation is applied.
All the functions of the host device except the BT module were set on stand-by mode.

The audio input L & N was connected to Audio Analyser which was put outside the chamber.

Test peripherals used:

Item No	Description	Band and Model	Manufacturer
1	Audio Analyser	UP300	R&S
2	AV line	-	-

2. Test Specification

2.1 Instrument list

Equipment	Type	Manu.	Internal no.	Cal. Date	Due date
Test Receiver	ESCS 30	R&S	EC 2107	2013-10-21	2014-10-20
Test Receiver	ESIB 26	R&S	EC 3045	2013-10-20	2014-10-19
Test Receiver	ESCI 7	R&S	EC4501	2013-12-25	2014-12-24
A.M.N.	ESH2-Z5	R&S	EC 3119	2014-01-09	2015-01-08
A.M.N.	ENV 216	R&S	EC 3393	2013-08-09	2014-08-08
A.M.N.	ENV 216	R&S	EC 3394	2013-08-09	2014-08-08
A.M.N.	ENV4200	R&S	EC3558	2013-08-09	2014-08-08
Ultra-broadband antenna	HL 562	R&S	EC 3046-1	2014-05-16	2015-05-14
Bilog Antenna	CBL 6112D	TESEQ	EC 4206	2014-04-28	2015-04-27
Horn antenna	HF 906	R&S	EC 3049	2014-04-28	2015-04-27
Horn antenna	3117	ETS	EC 4792-1	2014-04-17	2015-04-16
Horn antenna	HAP18-26W		EC 4792-3	2014-04-10	2015-04-09
Pre-amplifier	Pre-amp 18	R&S	EC 3222	2014-04-12	2015-04-11
Pre-amplifier	Tpa0118-40	R&S	EC 4792-2	2014-04-12	2015-04-11
Semi-anechoic chamber	-	Albatross project	EC 3048	2014-05-12	2015-05-11
Fully-anechoic chamber	-	Albatross project	EC 3047	2014-05-12	2015-05-11
High Pass Filter	WHKX 1.0/15G-10SS	Wainwright	EC4297-1	2014-01-08	2015-01-07
High Pass Filter	WHKX 2.8/18G-12SS	Wainwright	EC4297-2	2014-01-08	2015-01-07
High Pass Filter	WHKX 7.0/1.8G-8SS	Wainwright	EC4297-3	2014-01-08	2015-01-07
Band Reject Filter	WRCGV 2400/2483-2390/2493-35/10SS	Wainwright	EC4297-4	2014-01-08	2015-01-07

2.2 Test Standard

47CFR Part 15 (2013)
ANSI C63.4: 2003
RSS-210 Issue 8 (December 2010)
RSS-Gen Issue 4 (November 2014)

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
Occupied bandwidth	-	RSS-Gen Issue 3 Clause 4.6.1	Tested

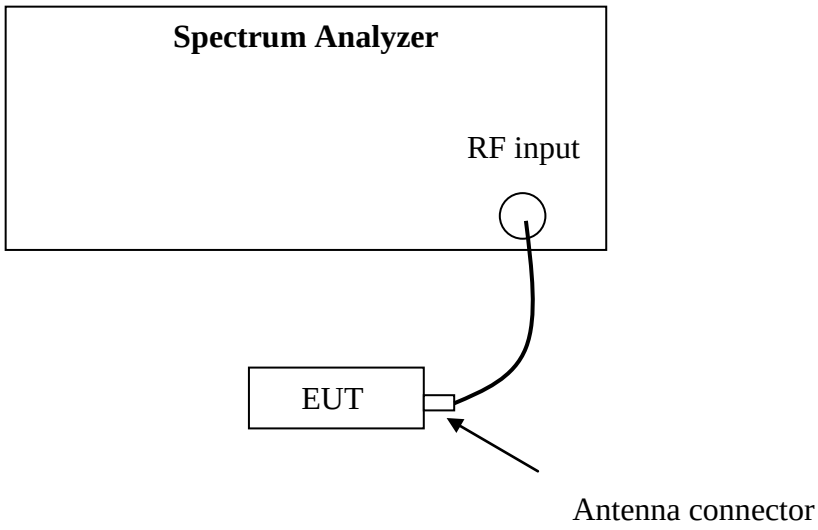
3. Minimum 6dB Bandwidth

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

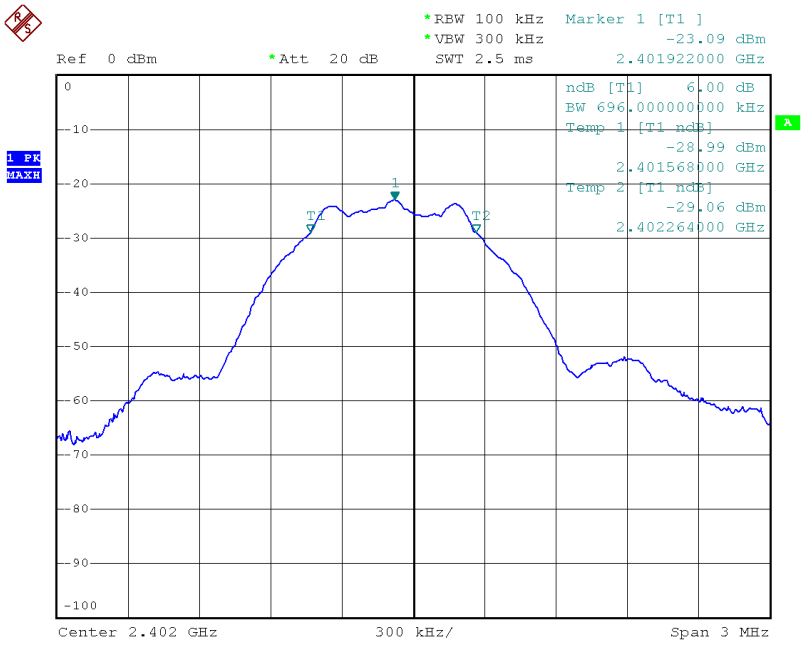
The minimum 6dB bandwidth per FCC §15.247(a)(2) is measured using the Spectrum Analyzer according to DTS test procedure of "KDB558074 D01 DTS Meas Guidance v03r02" for compliance to FCC 47CFR 15.247 requirements.

3.4 Test Protocol

Temperature : 22°C
Relative Humidity : 52%

CH	Bandwidth (kHz)	Limit (MHz)
L	696.00	⩾0.5
M	696.00	
H	690.00	

Channel L



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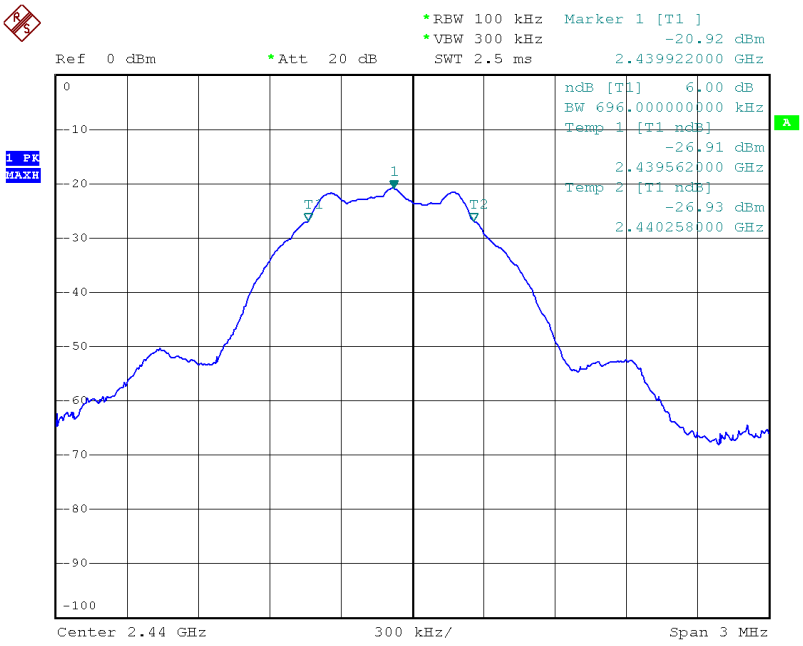

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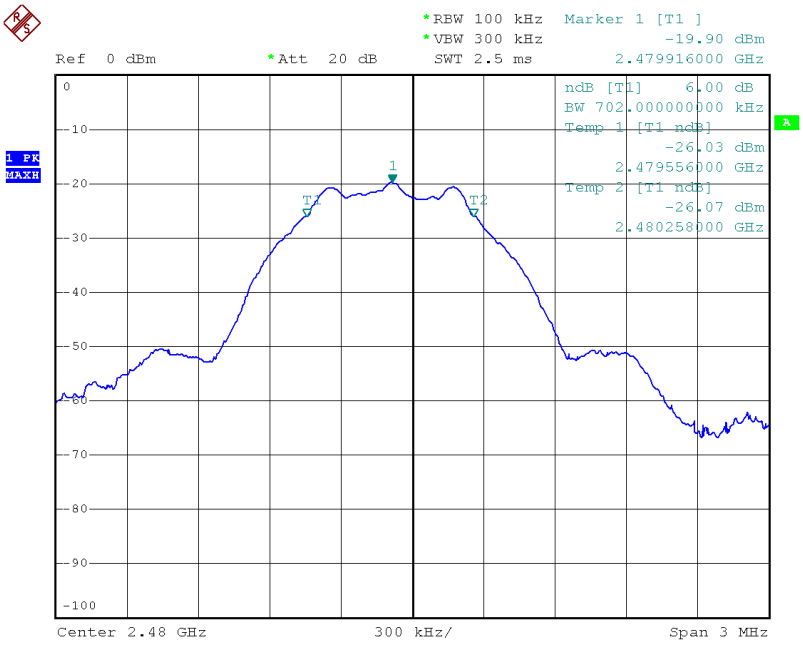
Channel H



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4. Maximum peak output power

Test result: Pass

4.1 Test limit

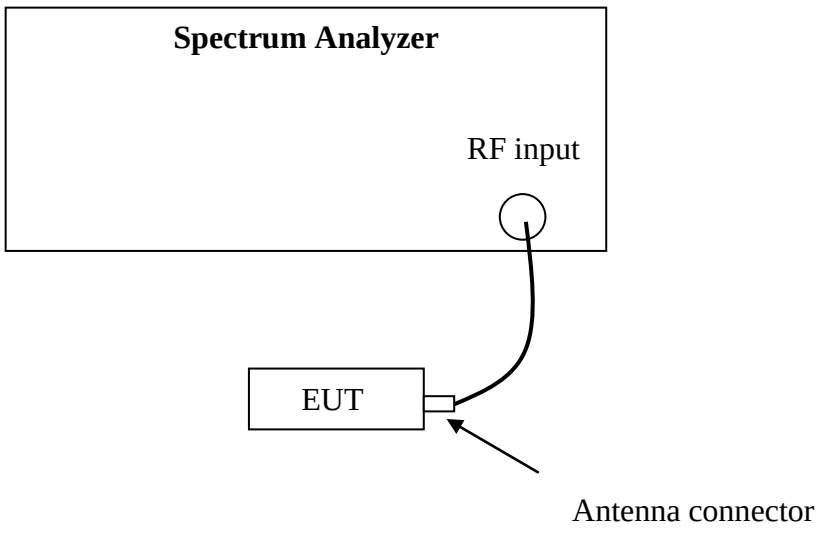
☐ For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt

☐ 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 v03r02" for compliance to FCC 47CFR 15.247 requirements (clause 9.1.2).

4.4 Test protocol

Temperature : 22 °C
Relative Humidity: 52 %

CH	Maximum peak output power (dBm)	Limit (dBm)
L	-0.91	≤30
M	-0.52	
H	0.19	

Conclusion: The maximum EIRP = 0.19dBm + 0dBi = 1.04mW which is lower than the limit listed in RSS-210.

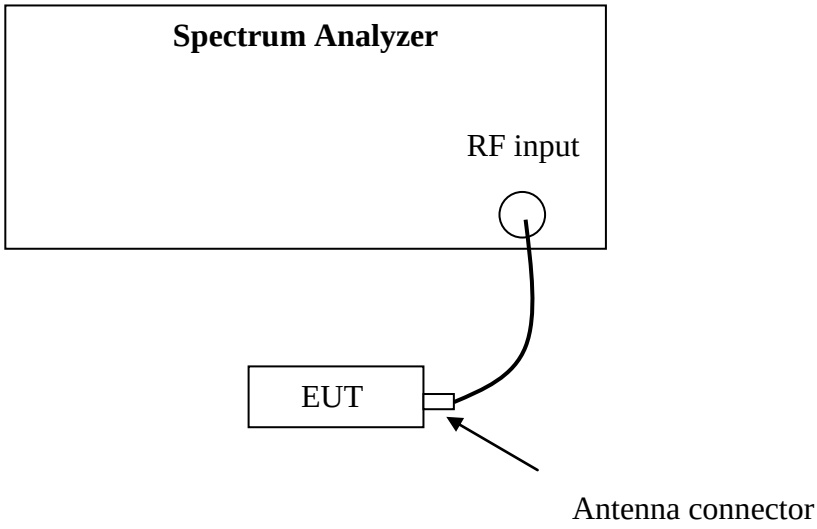
5. Power spectrum density

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

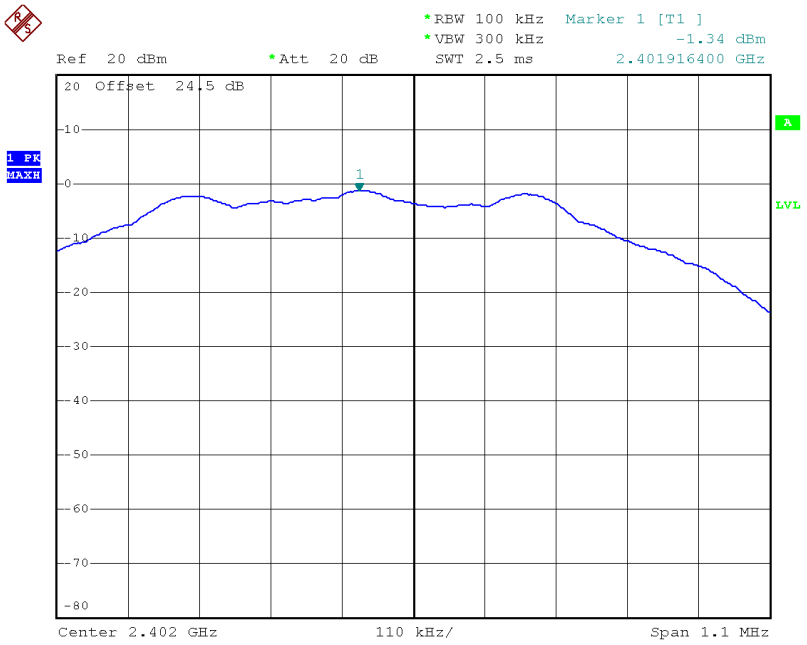
The power output per FCC §15.247(e) was tested according to DTS test procedure of "KDB558074 D01 DTS Meas Guidance v03r02" (clause 10.2) for compliance to FCC 47CFR 15.247 requirements.

5.4 Test Protocol

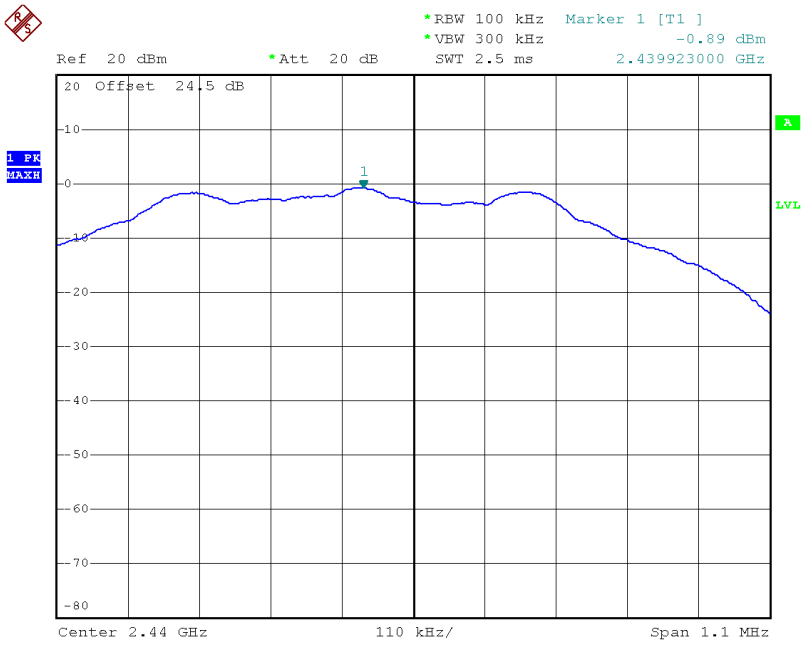
Temperature : 22 °C
Relative Humidity: 52 %

CH	Spectrum Density (dBm)	RBW used for test (kHz)	Limit (dBm)
L	-1.34	100	≤8.00
M	-0.89	100	
H	0.09	100	

Channel L



Channel M



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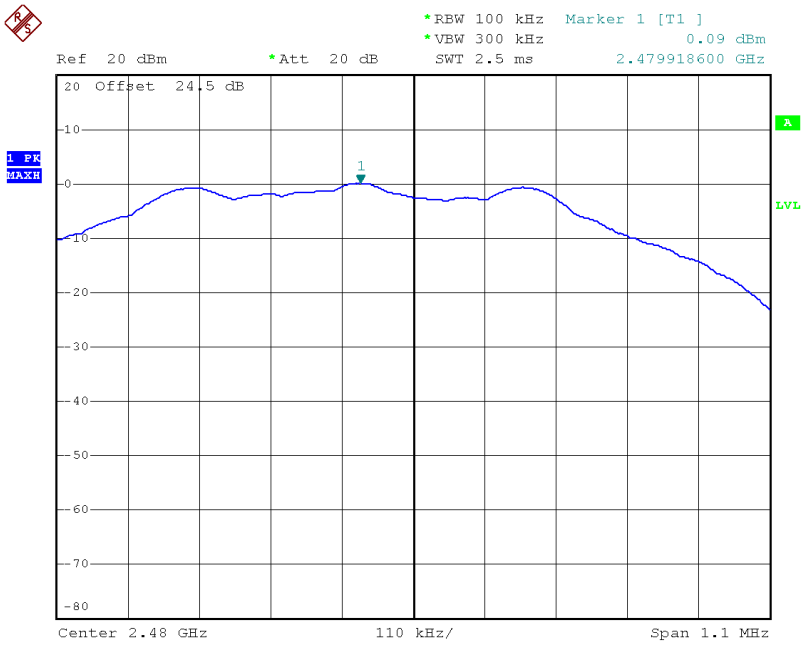
Channel H



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6. Radiated emission

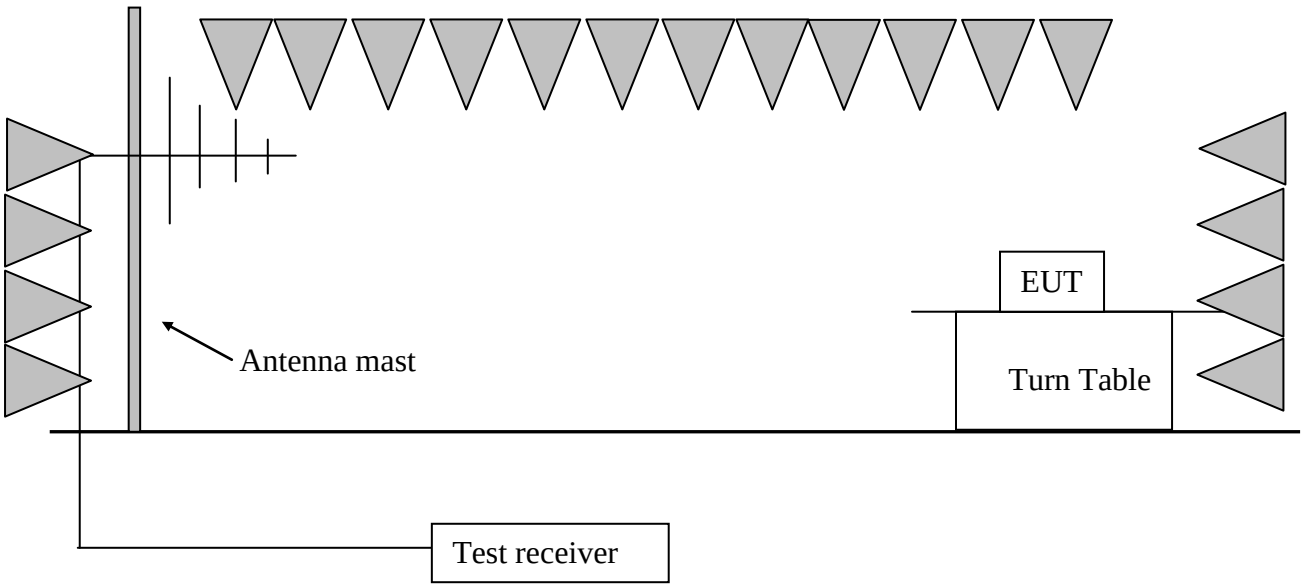
Test result: PASS

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 v03r02” (clause 10.2) for compliance to FCC 47CFR 15.247 requirements.

6.4 Test protocol

Model of NX-WRW-6:

EUT was tested with all the directions and the worst data was listed as below:

CH	Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2402.30	34.50	94.32	Fundamental	/	PK
	H	59.16	8.40	34.30	40.00	5.70	QP
	H	412.95	19.30	39.30	46.00	6.70	QP
	H	2385.85	34.40	52.30	74.00	21.70	PK
	H	2486.20	34.70	51.60	74.00	22.40	PK
	H	4804.50	-3.60	52.50	74.00	21.50	PK
M	H	2440.40	34.60	94.71	Fundamental	/	PK
	H	59.16	8.40	34.30	40.00	5.70	QP
	H	412.95	19.30	39.30	46.00	6.70	QP
	H	2381.35	34.40	52.10	74.00	21.90	PK
	H	2488.64	34.70	51.60	74.00	22.40	PK
	H	4880.60	-3.30	52.60	74.00	21.40	PK
H	H	2480.50	34.70	95.42	Fundamental	/	PK
	H	59.16	8.40	34.30	40.00	5.70	QP
	H	412.95	19.30	39.30	46.00	6.70	QP
	H	2386.45	34.40	51.80	74.00	22.20	PK
	H	2485.15	34.70	53.10	74.00	20.90	PK
	H	4960.80	-3.10	53.30	74.00	20.70	PK

Model of NX-WRW-5:

EUT was tested with all the directions and the worst data was listed as below:

CH	Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2402.30	34.50	94.32	Fundamental	/	PK
	V	69.20	9.40	33.30	40.00	6.70	QP
	V	413.51	19.30	43.90	46.00	2.10	QP
	H	2385.85	34.40	52.30	74.00	21.70	PK
	H	2486.20	34.70	51.60	74.00	22.40	PK
	H	4804.50	-3.60	52.50	74.00	21.50	PK
M	H	2440.40	34.60	94.71	Fundamental	/	PK
	V	69.20	9.40	33.30	40.00	6.70	QP
	V	413.51	19.30	43.90	46.00	2.10	QP
	H	2381.35	34.40	52.10	74.00	21.90	PK
	H	2488.64	34.70	51.60	74.00	22.40	PK
	H	4880.60	-3.30	52.60	74.00	21.40	PK
H	H	2480.50	34.70	95.42	Fundamental	/	PK
	V	69.20	9.40	33.30	40.00	6.70	QP
	V	413.51	19.30	43.90	46.00	2.10	QP
	H	2386.45	34.40	51.80	74.00	22.20	PK
	H	2485.15	34.70	53.10	74.00	20.90	PK
	H	4960.80	-3.10	53.30	74.00	20.70	PK

Remark: 1. For fundamental emission, no amplifier is employed.
2. Correct Factor = Antenna Factor + Cable Loss (-Amplifier, is employed)
3. Corrected Reading = Original Receiver Reading + Correct Factor
4. Margin = limit – Corrected Reading
5. If the PK reading is lower than AV limit, the AV test can be elided.
6. The 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

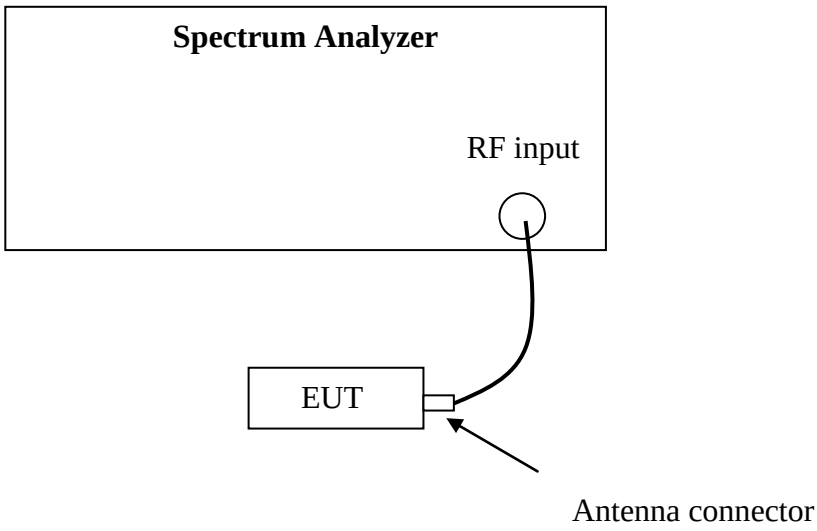
7. Emission outside the frequency Band

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

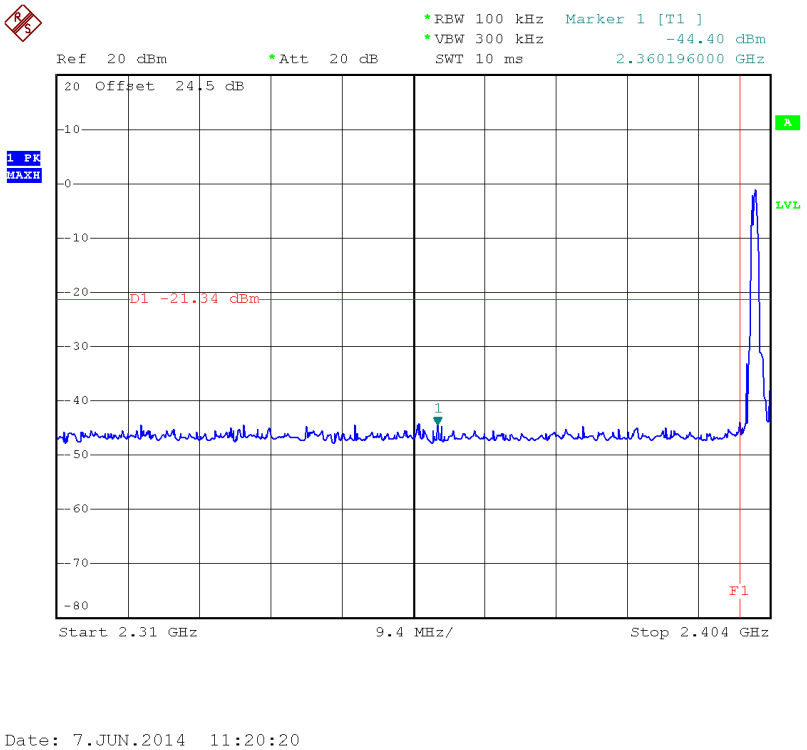
The Emission outside the frequency Band per FCC §15.247(d) is measured using the Spectrum Analyzer with the resolutions bandwidth set at 100kHz, the video bandwidth set at 300kHz, and the SPAN>>RBW.
The EUT was tested according to DTS test procedure of "KDB558074 D01 DTS Meas Guidance v03r02" (clause 11.0) for compliance to FCC 47CFR 15.247 requirements.

7.4 Test protocol

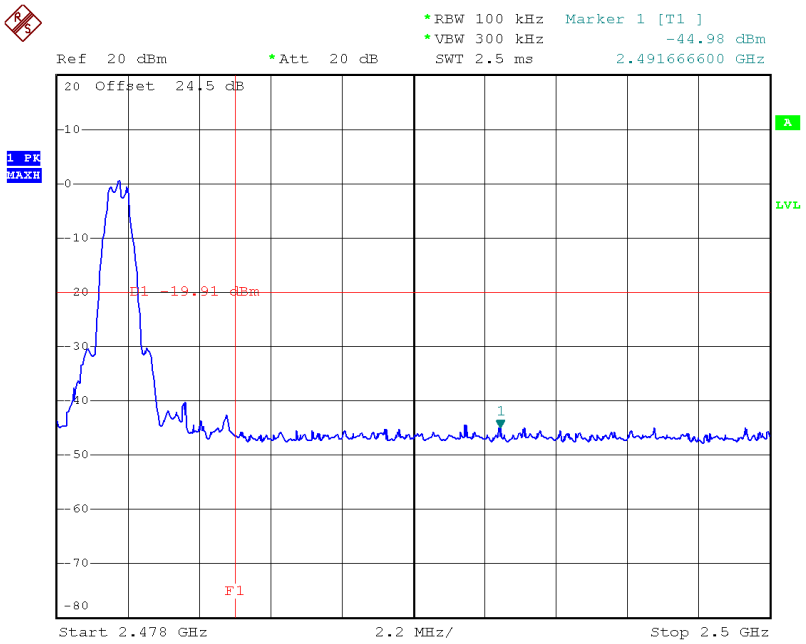
CH	Max PSD among band (dBm)	The most restrict Attenuation outside band (dB)	Limit (dB)
L	-1.34	44.40	≥20
M	-0.89	44.79	
H	0.09	44.98	

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

Channel L



Channel H



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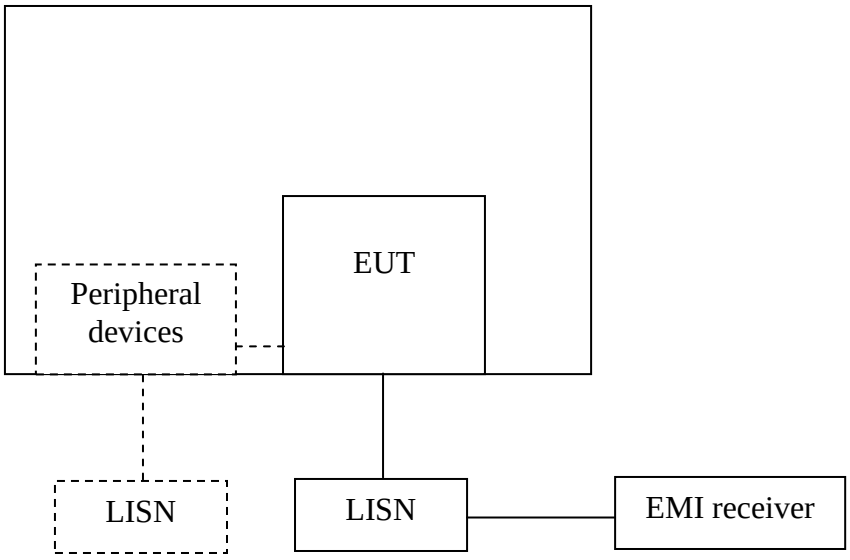
8. Power line conducted emission

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



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

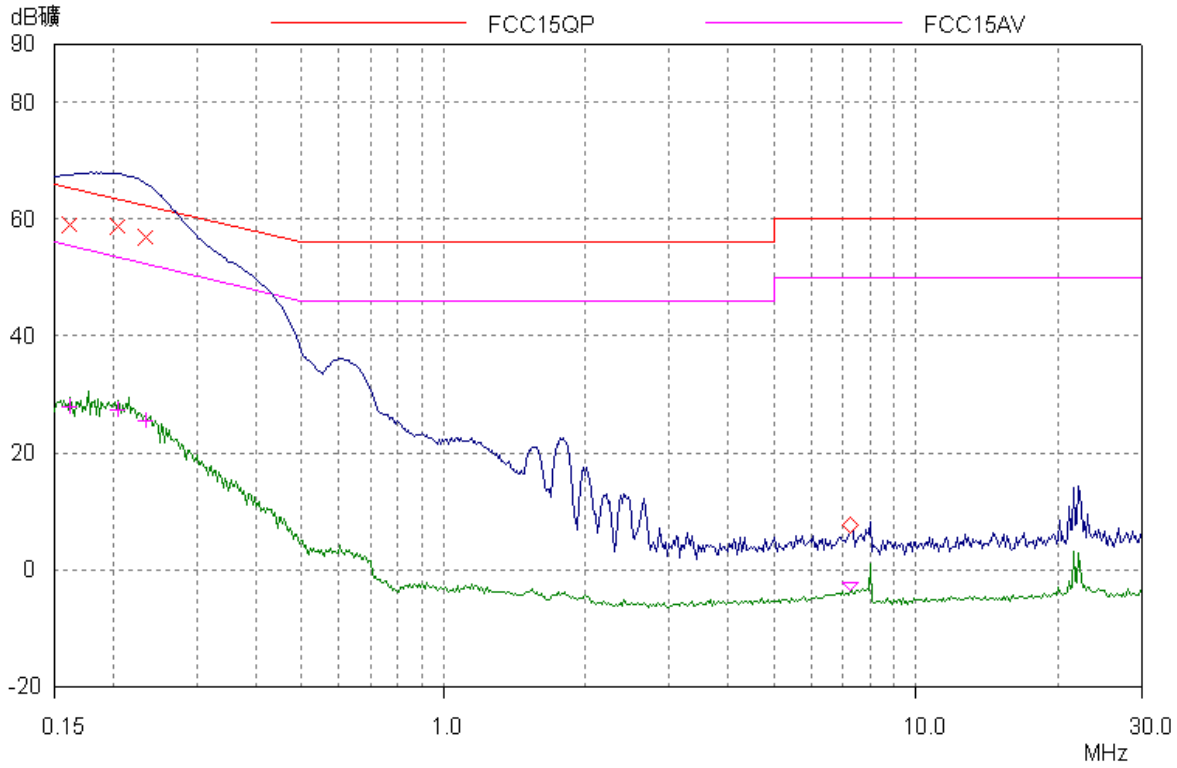
☐ For floor standing equipment, wooden support is 0.1m height rack.

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.

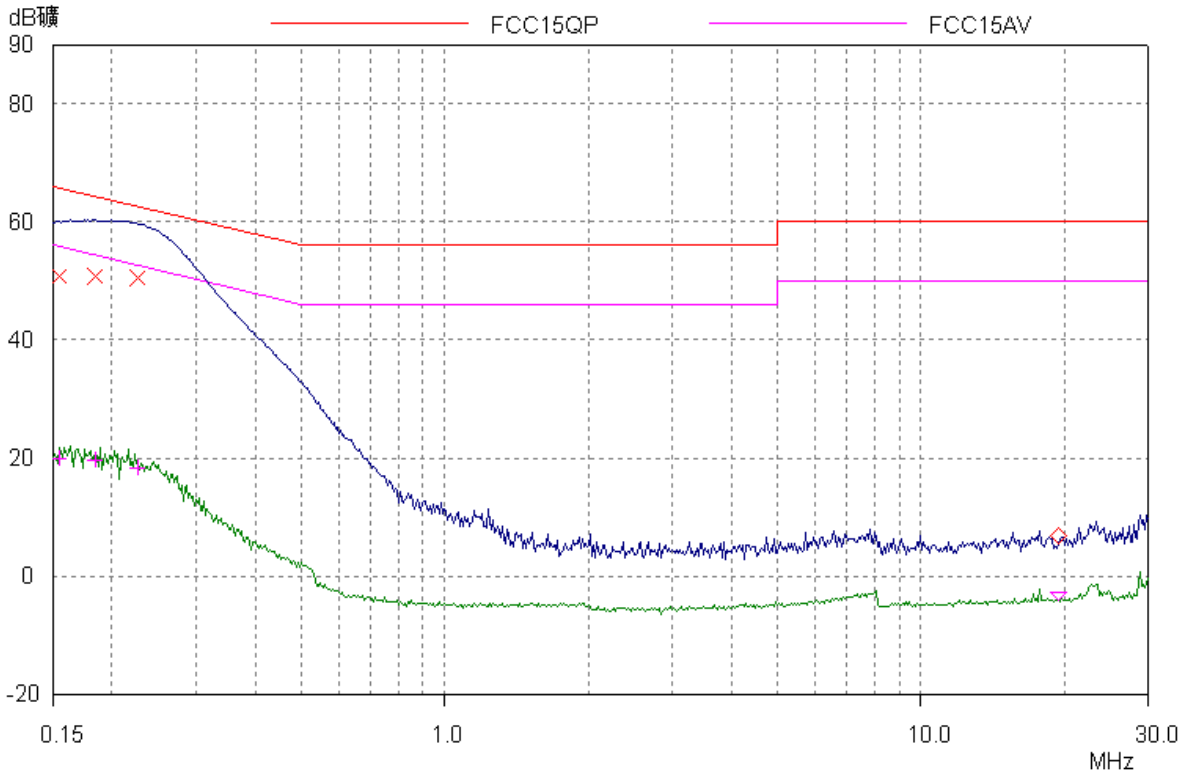
8.4 Test protocol

Model of NX-WRW-6:



Frequency	Correct Factor (dB)	Corrected Reading (dBuV) QP	AV	Limit (dBuV) QP	AV	Margin (dB) QP	AV
0.16(L)	0.45	58.81	27.85	65.40	55.40	6.49	27.55
0.20(L)	0.47	58.67	27.24	63.48	53.48	4.81	26.24
0.23(L)	0.48	56.97	25.48	62.35	52.35	5.38	26.87
0.17(N)	0.45	59.40	28.26	64.91	54.91	5.51	26.65
0.21(N)	0.48	58.82	27.38	63.35	53.35	4.53	25.97
0.23(N)	0.48	57.19	26.62	62.42	52.42	5.23	25.80
Remark: 1. Correction Factor (dB) = LISN Factor (dB) + Cable Loss (dB). 2. Margin (dB) = Limit - Corrected Reading.							

Model of NX-WRW-5:



Frequency	Correct Factor (dB)	Corrected Reading (dBuV) QP	AV	Limit (dBuV) QP	AV	Margin (dB) QP	AV
0.15(L)	0.45	50.82	19.92	65.80	55.80	14.98	35.88
0.20(L)	0.47	50.82	19.50	64.34	55.34	13.62	34.84
0.23(L)	0.48	50.42	18.37	62.62	52.62	12.20	34.25
0.17(N)	0.45	50.72	19.87	65.77	55.77	15.05	35.90
0.21(N)	0.48	50.71	19.01	63.58	53.58	12.87	34.57
0.23(N)	0.48	50.03	18.00	62.42	52.42	12.39	34.42
Remark: 1. Correction Factor (dB) = LISN Factor (dB) + Cable Loss (dB). 2. Margin (dB) = Limit - Corrected Reading.							

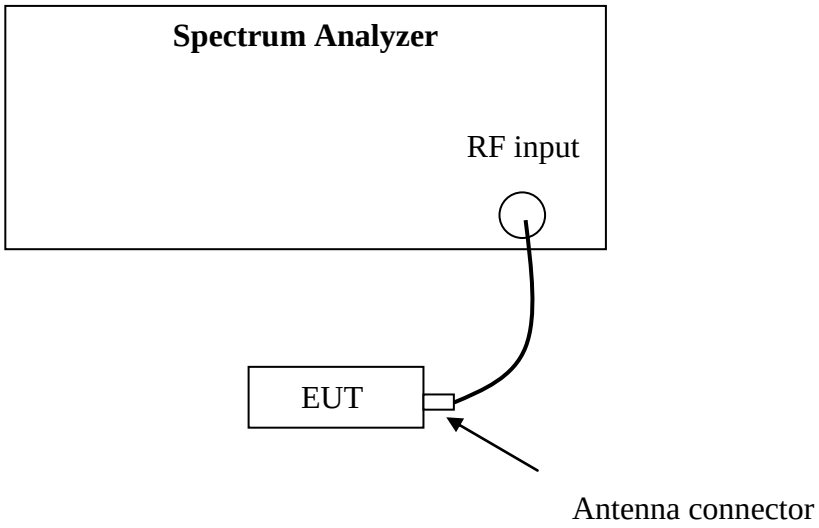
9. Occupied Bandwidth

Test Status: Tested

9.1 Test limit

None

9.2 Test Configuration



9.3 Test procedure and test setup

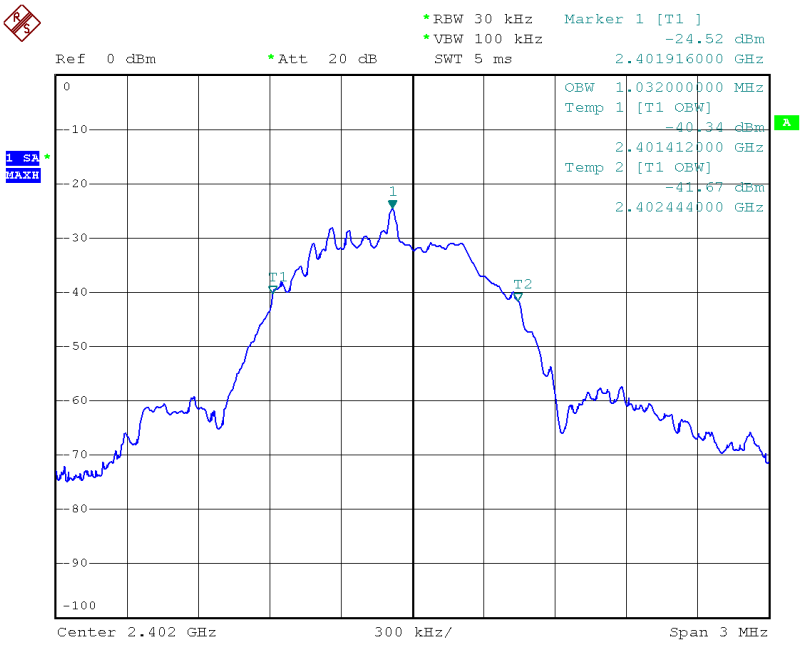
The occupied bandwidth per RSS-Gen Issue 3 Clause 4.6.1 was measured using the Spectrum Analyzer.

9.4 Test protocol

Temperature : 22 °C
Relative Humidity : 52 %

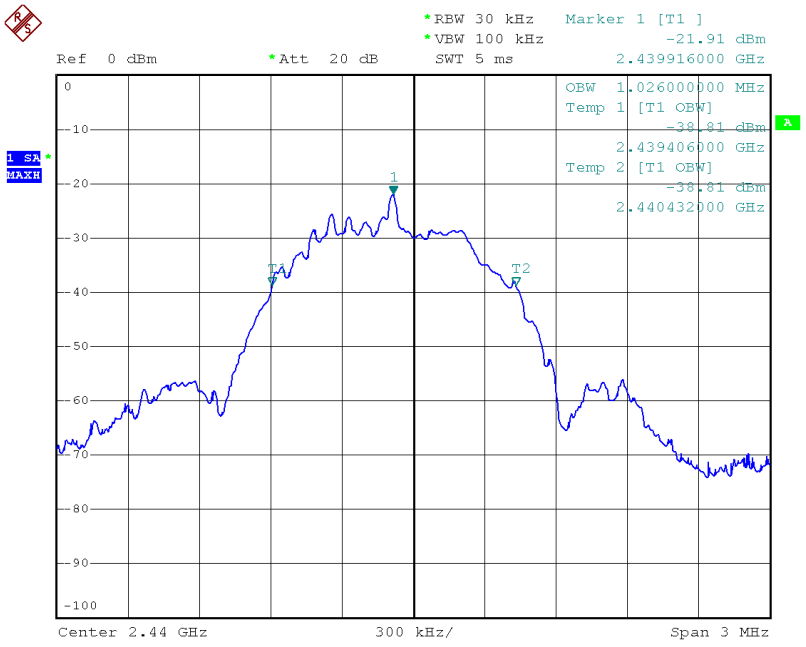
CH	99% Bandwidth (kHz)
L	1032.00
M	1026.00
H	1026.00

Channel L



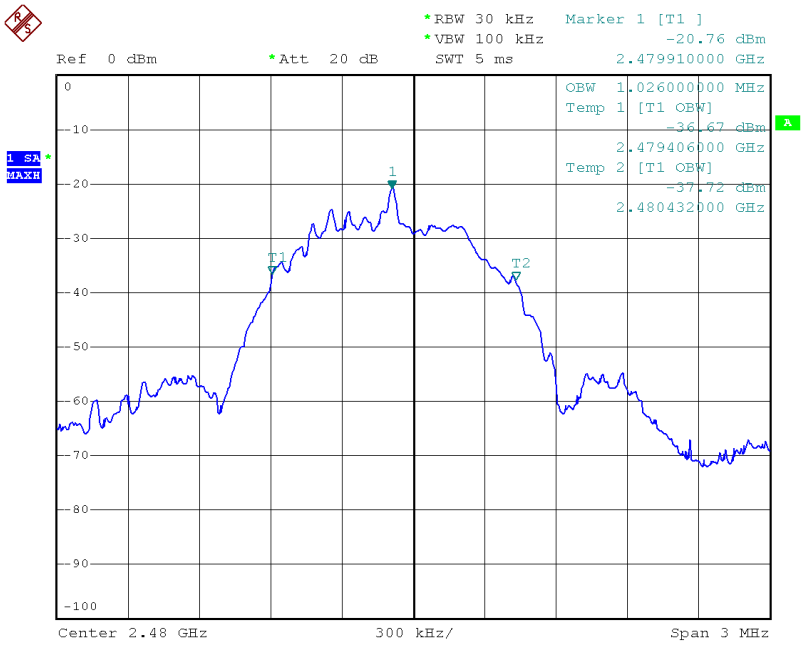
Date: 7.JUN.2014 10:53:44

Channel M



Date: 7.JUN.2014 10:53:05

Channel H



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