EMC TEST REPORT for Intentional Radiator

No. 140301805SHA-001

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 ~ August 1, 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
Bluetooth mode:	Bluetooth 3.0
Modulation:	GFSK, π/4 DQPSK, 8DPSK
Technology:	GFSK is different from π/4DQPSK and 8DPSK. 8DPSK is similar with π/4DQPSK but more complex, and with a bigger data rate. After the pretest, the modulation of GFSK and 8DPSK were chosen to perform the tests as representative.
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 79 channels in all. The designed channel spacing is 1MHz.

Channel Identifier	Frequency (MHz)
low	2402
middle	2441
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
20 dB Bandwidth	15.247(a)(1)	RSS-210 Issue 8 Annex 8	Tested
Carrier Frequency Separation	15.247(a)(1)	RSS-210 Issue 8 Annex 8	Pass
Output power	15.247(b)(1)	RSS-210 Issue 8 Annex 8	Pass
Radiated Spurious Emissions	15.205 & 15.209	RSS-210 Issue 8 Clause 2	Pass
Conducted Spurious Emissions & Band Edge	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
Number of Hopping Frequencies	15.247(a)(1)(iii)	RSS-210 Issue 8 Annex 8	Pass
Dwell time	15.247(a)(1)(iii)	RSS-210 Issue 8 Annex 8	Pass
Occupied bandwidth	-	RSS-Gen Issue 3 Clause 4.6.1	Tested
Spurious emission for receiver	15B	RSS-310 Issue 3 Clause 3.1	NA

Note: “NA” means “not applied”.

3. 20 dB Bandwidth

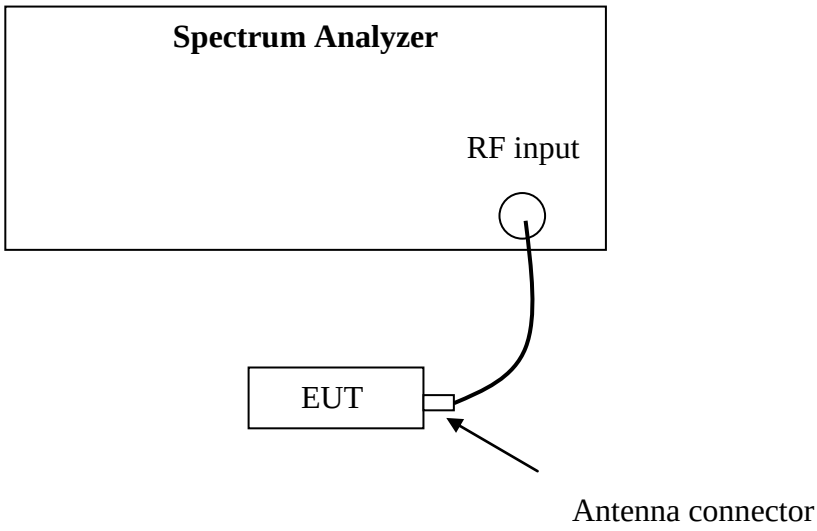
Test result: Tested

3.1 Limit

☐ Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

☒ Frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125mW.

3.2 Test Configuration



3.3 Test Procedure and test setup

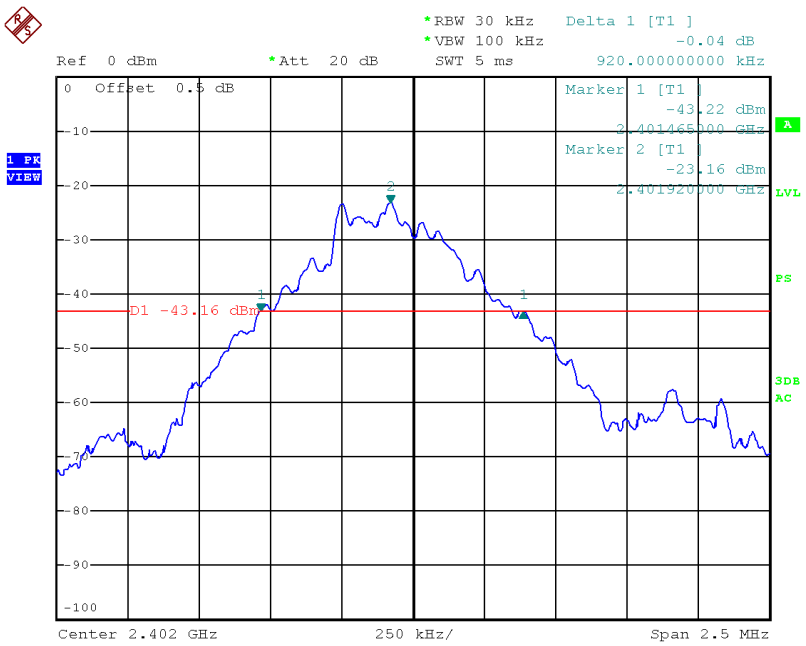
The 20 bandwidth per FCC § 15.247(a)(1) is measured using the Spectrum Analyzer with Span = 2 to 3 times the 20 dB bandwidth, RBW≥1% of the 20 dB bandwidth, VBW≥RBW, Sweep = auto, Detector = peak, Trace = max hold.
The test was performed at 3 channels (lowest, middle and highest channel).
The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems)

3.4 Test Protocol

Temperature : 22°C
Relative Humidity : 52 %

Modulation	CH	Bandwidth (kHz)	Two-thirds of Bandwidth (kHz)
GFSK	L	920.00	613.33
	M	885.00	590.00
	H	885.00	590.00

Channel L



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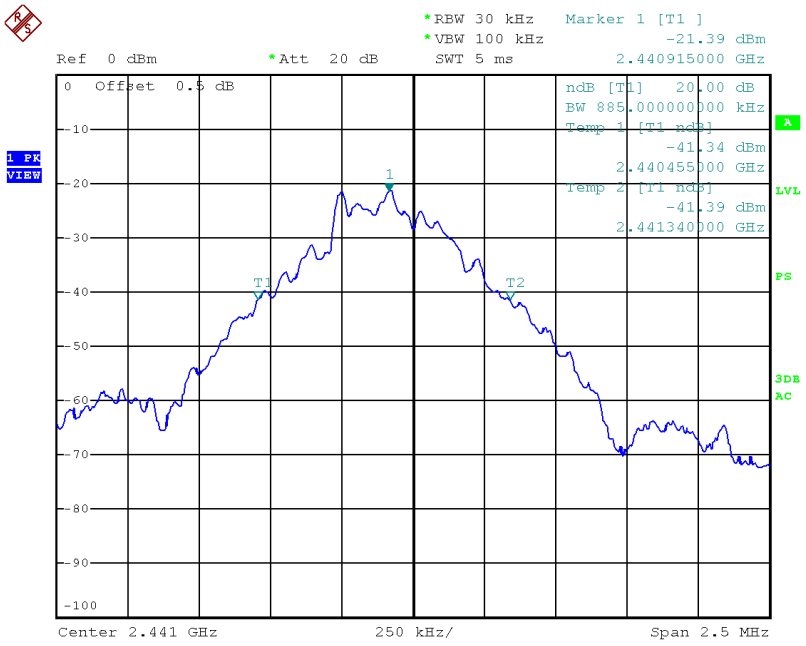
Channel M



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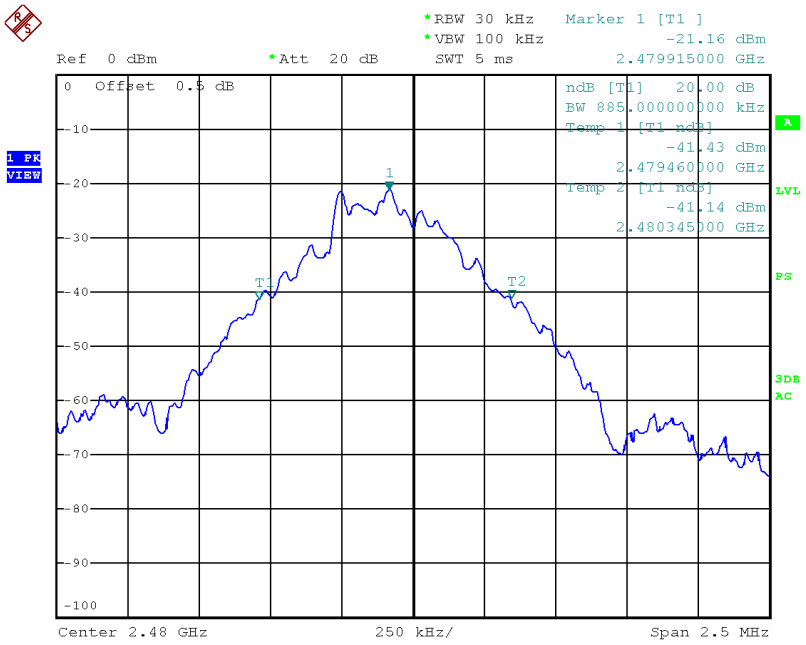
Channel H



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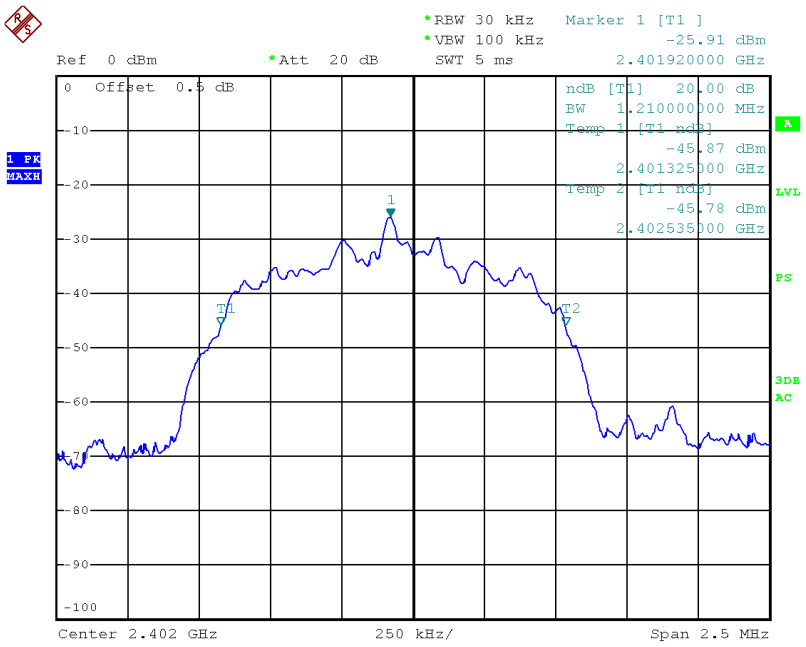
Modulation	CH	Bandwidth (kHz)	Two-thirds of Bandwidth (kHz)
8DPSK	L	1210.00	806.67
	M	1215.00	810.00
	H	1215.00	810.00

Channel L



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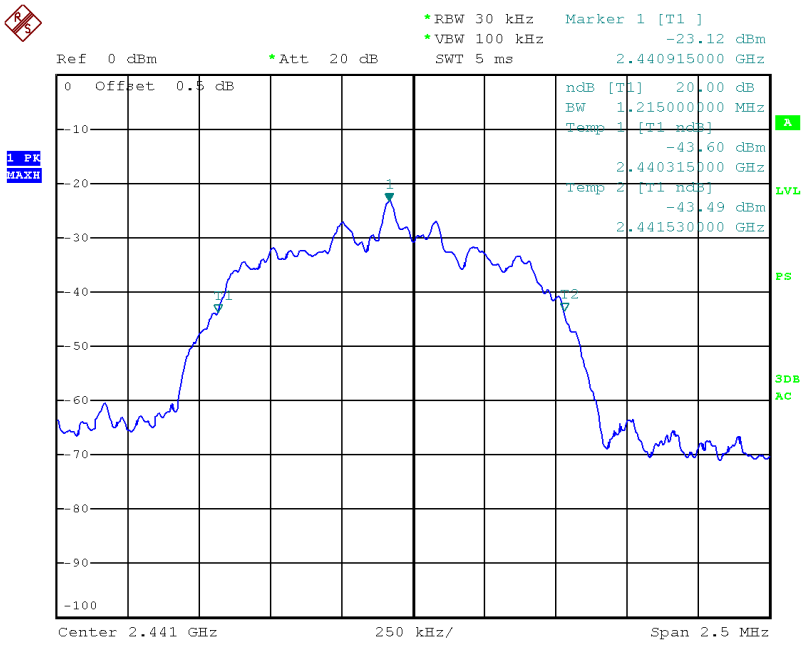
Channel M



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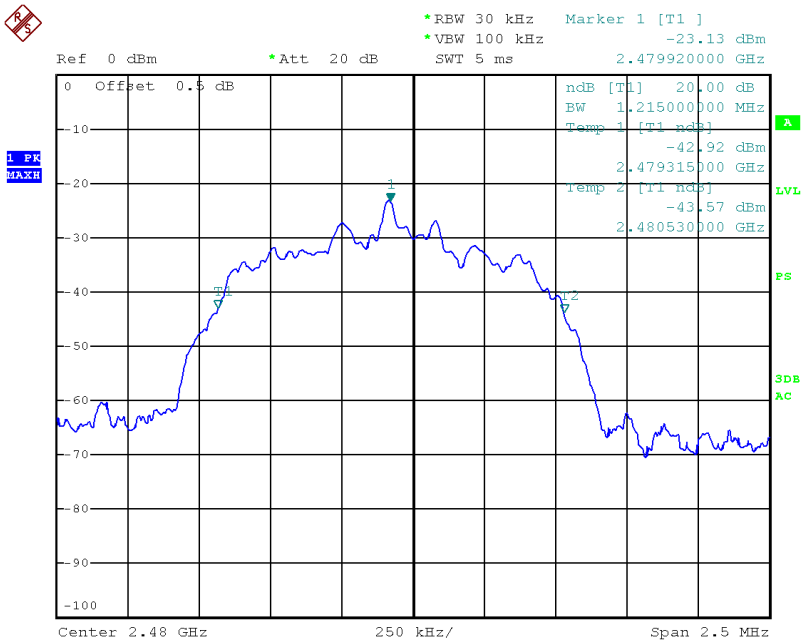
Channel H



Date: 30.JUL.2014 14:55:04

4. Carrier Frequency Separation

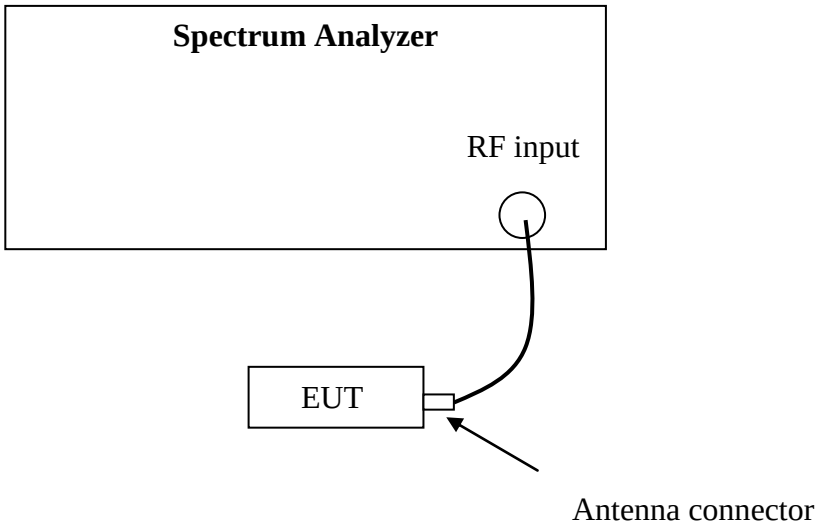
Test result: Pass

4.1 Limit

☐ Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

☒ Frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125mW.

4.2 Test Configuration



4.3 Test Procedure and test setup

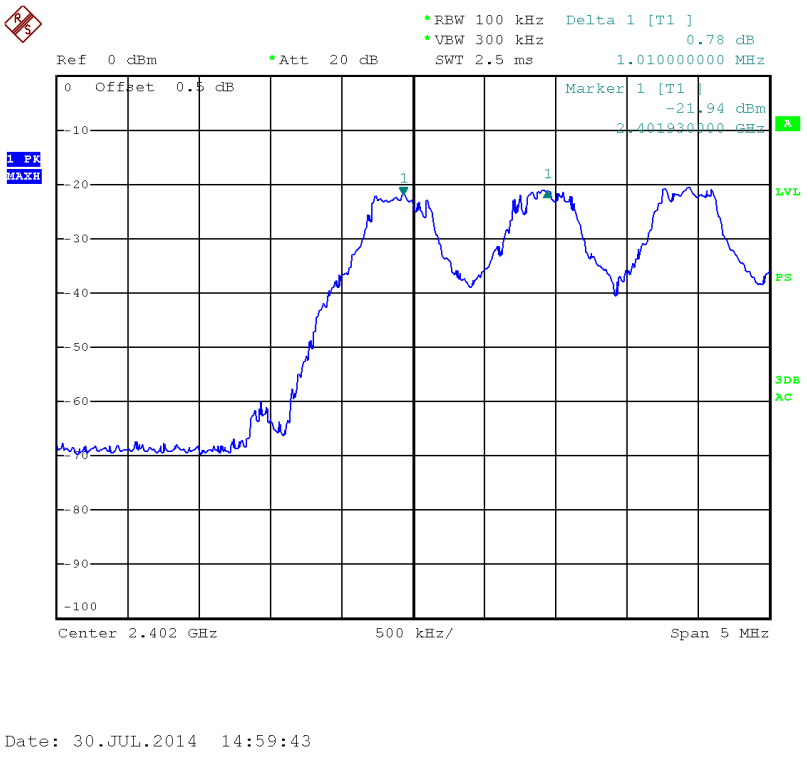
The Carrier Frequency Separation per FCC § 15.247(a)(1) is measured using the Spectrum Analyzer with Span can capture two adjacent channels, RBW≥1% of the span, VBW≥RBW, Sweep = auto, Detector = peak, Trace = max hold.
The test was performed at 3 channels (lowest, middle and highest channel).
The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems)

4.4 Test Protocol

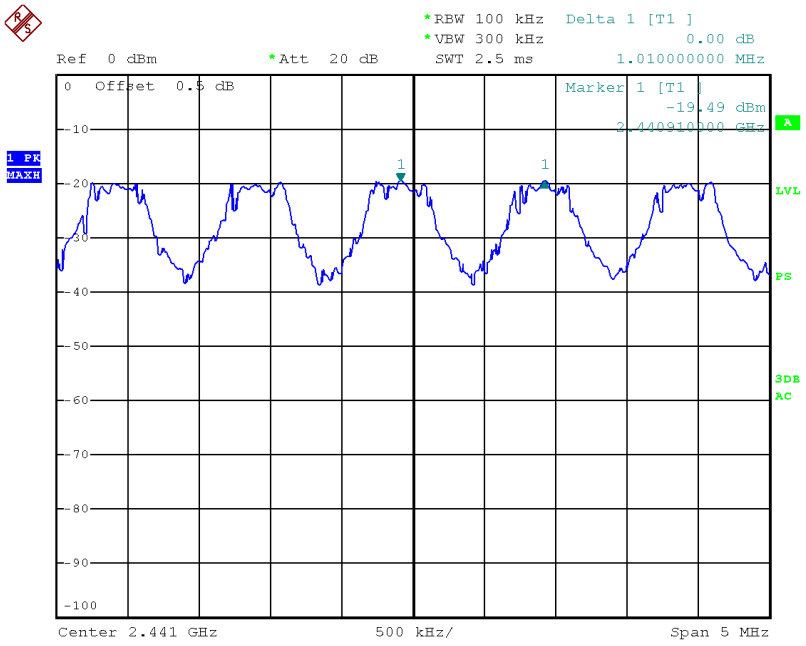
Temperature : 22°C
Relative Humidity : 52 %

Mode	CH	Frequency Separation (kHz)	Limit (kHz)
GFSK	L	1010.00	≥ 613.00
	M	1010.00	≥ 590.00
	H	1000.00	≥ 590.00

Channel L



Channel M



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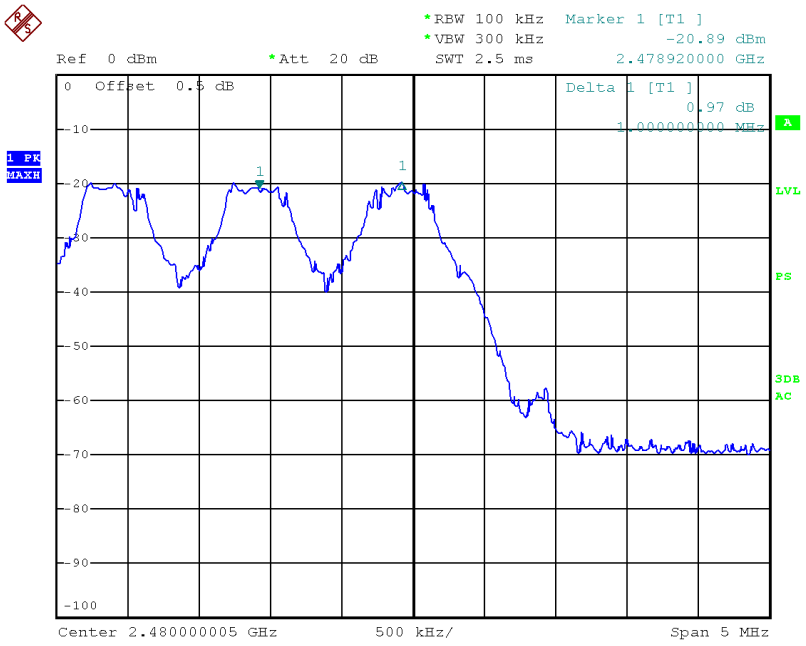
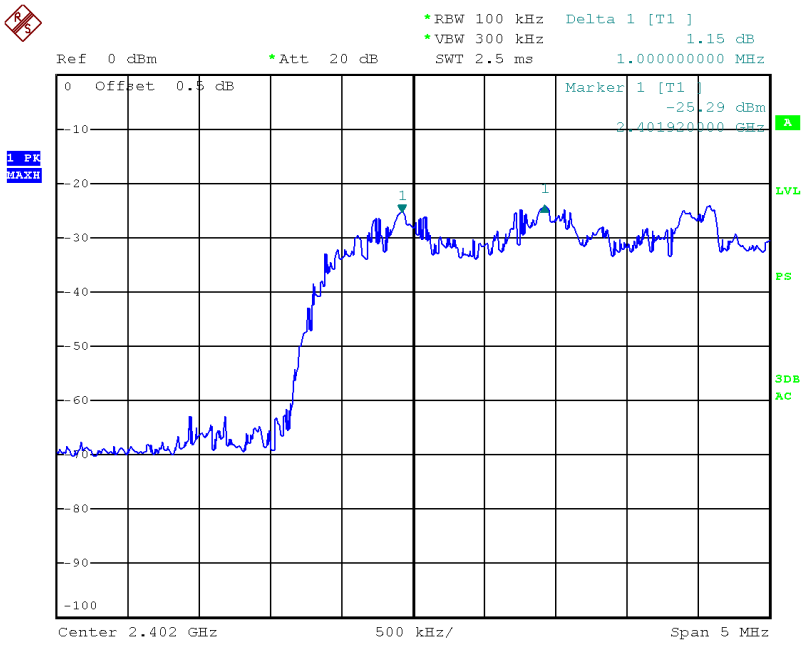
Channel H



Date: 30.JUL.2014 15:03:36

Mode	CH	Frequency Separation (kHz)	Limit (kHz)
8DPSK	L	1000.00	≥ 806.67
	M	1000.00	≥ 810.00
	H	1020.00	≥ 810.00

Channel L



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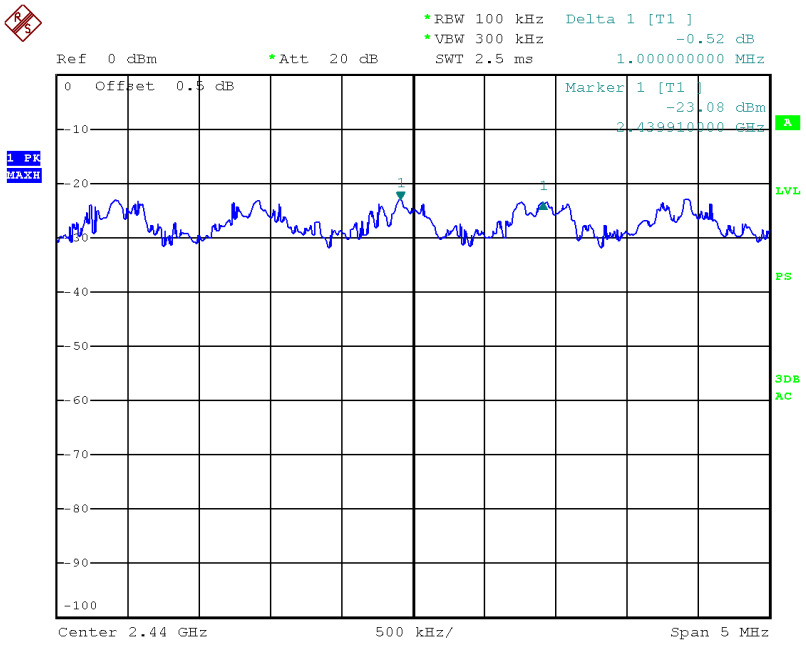
Channel M



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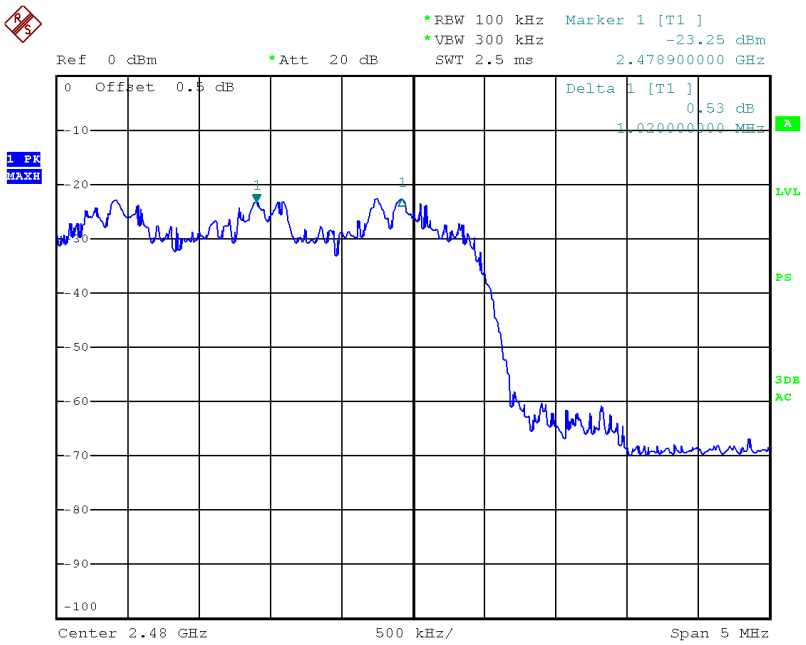
Channel H



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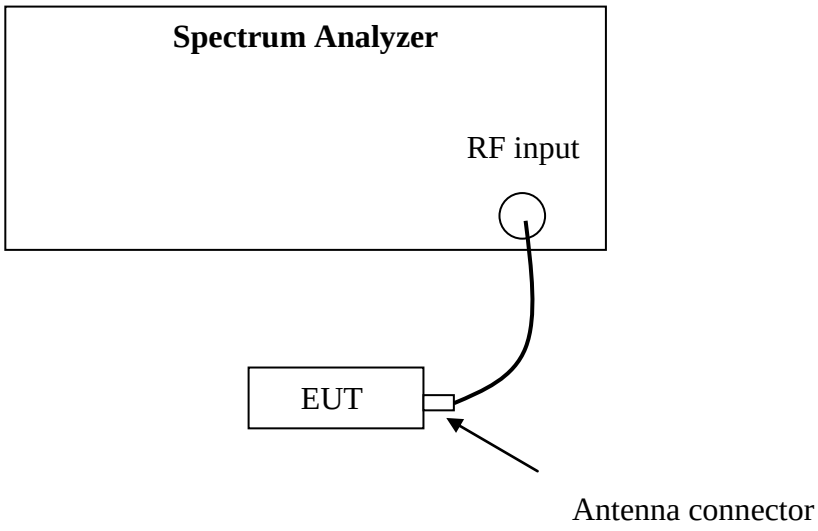
5. Maximum peak output power

Test result: Pass

5.1 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.

5.2 Test Configuration



5.3 Test procedure and test setup

The power output per FCC § 15.247(b) is measured using the Spectrum Analyzer with Span = 5 times the 20 dB bandwidth, RBW≥ the 20 dB bandwidth, VBW≥RBW, Sweep = auto, Detector = peak, Trace = max hold.
The test was performed at 3 channels (lowest, middle and highest channel).
The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems)

5.4 Test protocol

Temperature : 22 °C
Relative Humidity : 54 %

Mode	CH	Cable loss (dB)	Corrected reading (dBm)	Limit (dBm)
GFSK	L	0.50	-1.70	≤21.00
	M	0.50	-0.80	
	H	0.50	-3.00	

Conclusion: The maximum EIRP = -0.80dBm+0dBi = 0.83mW which is lower than the limit of 4W listed in RSS-210.

Mode	CH	Cable loss (dB)	Corrected reading (dBm)	Limit (dBm)
8DPSK	L	0.50	-5.00	≤21.00
	M	0.50	-3.10	
	H	0.50	-5.50	

Conclusion: The maximum EIRP = -3.10dBm+0dBi = 0.49mW which is lower than the limit of 4W listed in RSS-210.

6. Radiated Spurious Emissions

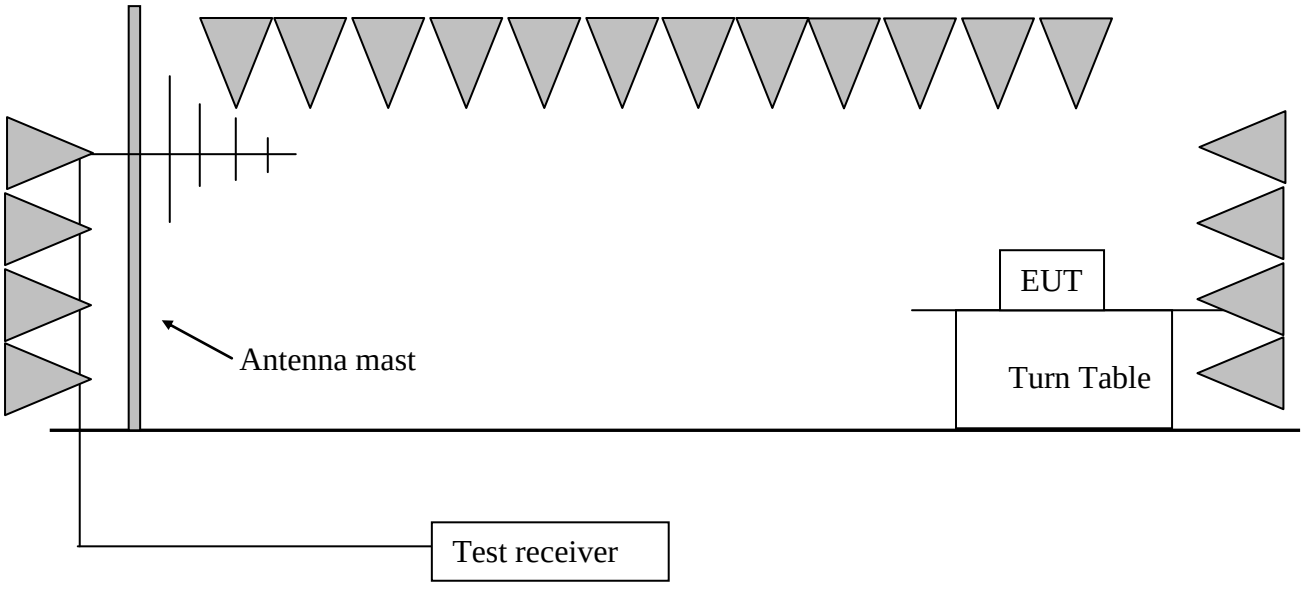
Test result: PASS

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 DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems)

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);

If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”.

6.4 Test protocol

Model of NX-WRW-6:

GFSK Modulation

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	2402.10	34.50	93.53	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	2388.85	34.40	52.50	74.00	21.50	PK
	H	2487.20	34.70	51.40	74.00	22.60	PK
	H	4804.18	-3.60	53.80	74.00	20.20	PK
M	H	2441.20	34.60	94.43	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	2378.35	34.40	51.50	74.00	22.50	PK
	H	2486.64	34.70	51.80	74.00	22.20	PK
	H	4882.67	-3.30	52.60	74.00	21.40	PK
H	H	2480.40	34.70	92.23	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	2383.45	34.40	51.50	74.00	22.50	PK
	H	2485.20	34.70	53.40	74.00	20.60	PK
	H	4960.85	-3.10	53.30	74.00	20.70	PK

8DPSK Modulation:

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	2402.10	34.50	90.23	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	2386.35	34.40	52.67	74.00	21.33	PK
	H	2488.20	34.70	51.20	74.00	22.80	PK
	H	4804.18	-3.60	52.35	74.00	21.65	PK
M	H	2441.20	34.60	92.13	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	2372.53	34.40	51.32	74.00	22.68	PK
	H	2485.16	34.70	51.65	74.00	22.35	PK
	H	4882.77	-3.30	52.25	74.00	21.75	PK
H	H	2480.40	34.70	89.73	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	2381.67	34.40	51.27	74.00	22.73	PK
	H	2484.18	34.70	53.12	74.00	20.88	PK
	H	4960.54	-3.10	52.80	74.00	21.20	PK

Model of NX-WRW-5:

GFSK Modulation

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	2402.10	34.50	93.53	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	2388.85	34.40	52.50	74.00	21.50	PK
	H	2487.20	34.70	51.40	74.00	22.60	PK
	H	4804.18	-3.60	53.80	74.00	20.20	PK
M	H	2441.20	34.60	94.43	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	2378.35	34.40	51.50	74.00	22.50	PK
	H	2486.64	34.70	51.80	74.00	22.20	PK
	H	4882.67	-3.30	52.60	74.00	21.40	PK
H	H	2480.40	34.70	92.23	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	2383.45	34.40	51.50	74.00	22.50	PK
	H	2485.20	34.70	53.40	74.00	20.60	PK
	H	4960.85	-3.10	53.30	74.00	20.70	PK

8DPSK Modulation:

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	2402.10	34.50	90.23	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	2386.35	34.40	52.67	74.00	21.33	PK
	H	2488.20	34.70	51.20	74.00	22.80	PK
	H	4804.18	-3.60	52.35	74.00	21.65	PK
M	H	2441.20	34.60	92.13	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	2372.53	34.40	51.32	74.00	22.68	PK
	H	2485.16	34.70	51.65	74.00	22.35	PK
	H	4882.77	-3.30	52.25	74.00	21.75	PK
H	H	2480.40	34.70	89.73	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	2381.67	34.40	51.27	74.00	22.73	PK
	H	2484.18	34.70	53.12	74.00	20.88	PK
	H	4960.54	-3.10	52.80	74.00	21.20	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

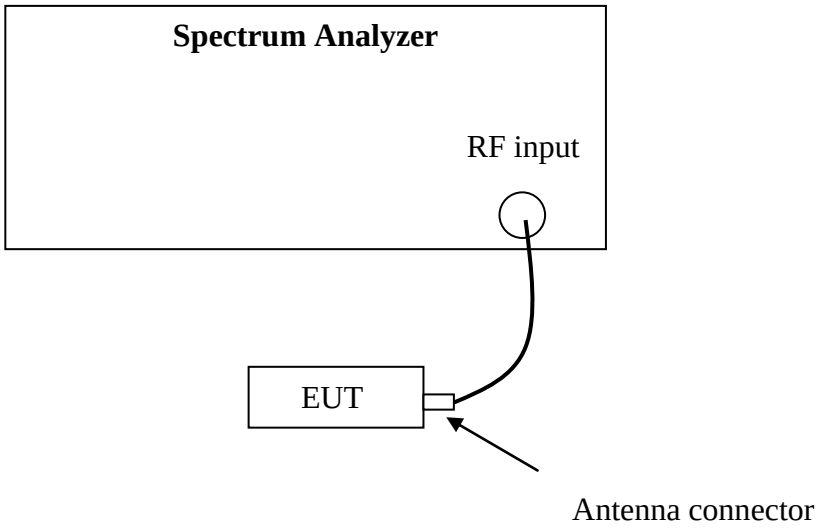
7. Conducted Spurious Emissions & Band Edge

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

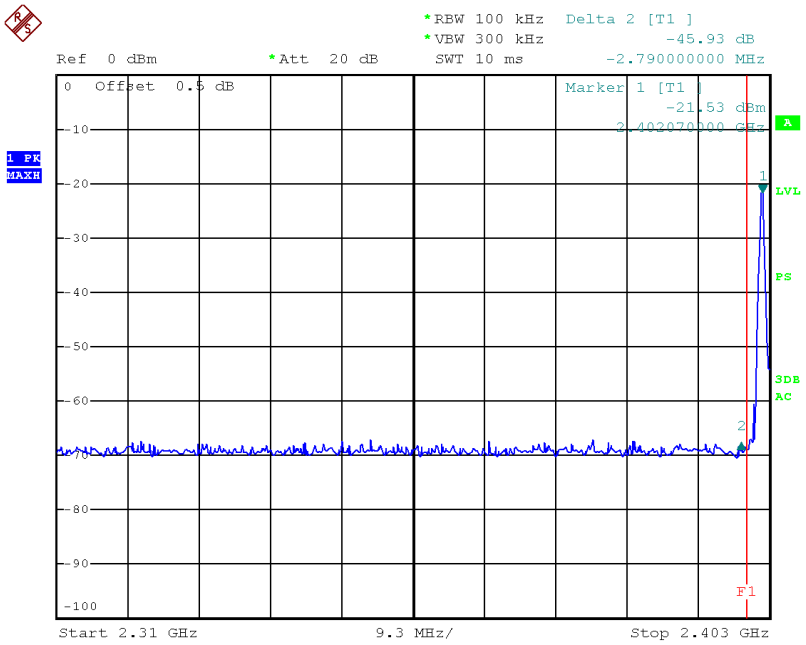
The Conducted Spurious Emissions per FCC § 15.247(d) is measured using the Spectrum Analyzer with Span wide enough capturing all spurious from the lowest emission frequency of the EUT up to 10th harmonics, RBW = 100kHz, VBW≥RBW, Sweep = auto, Detector = peak, Trace = max hold.
The test was performed at 3 channels (lowest, middle and highest channel).
The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems)

7.4 Test protocol

Modulation	CH	The most restrict Attenuation outside band (dB)	Limit (dB)
GFSK	L	45.93	≥20
	M	47.62	
	H	46.65	

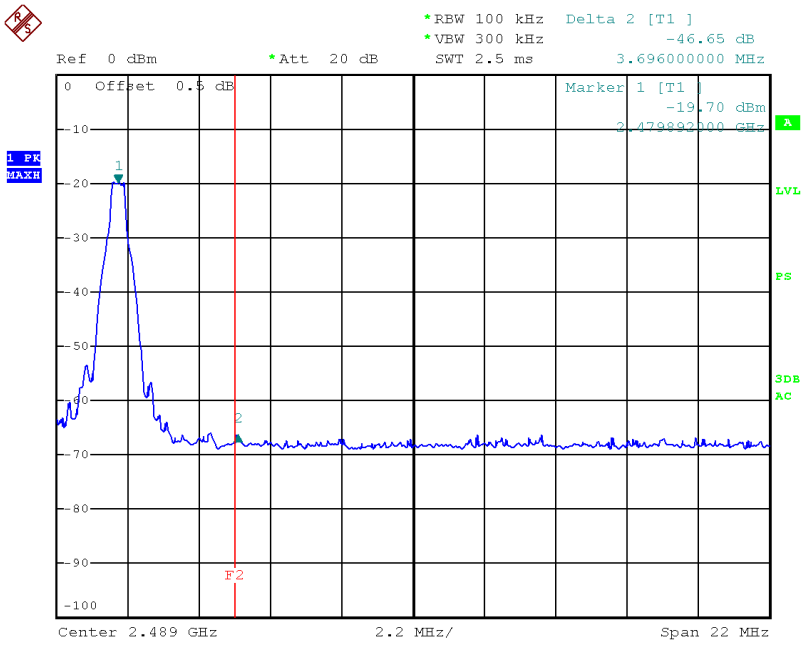
Note: The test was performed from 9 kHz to 26 GHz and the worst data is listed here.

Channel L



Date: 30.JUL.2014 15:20:03

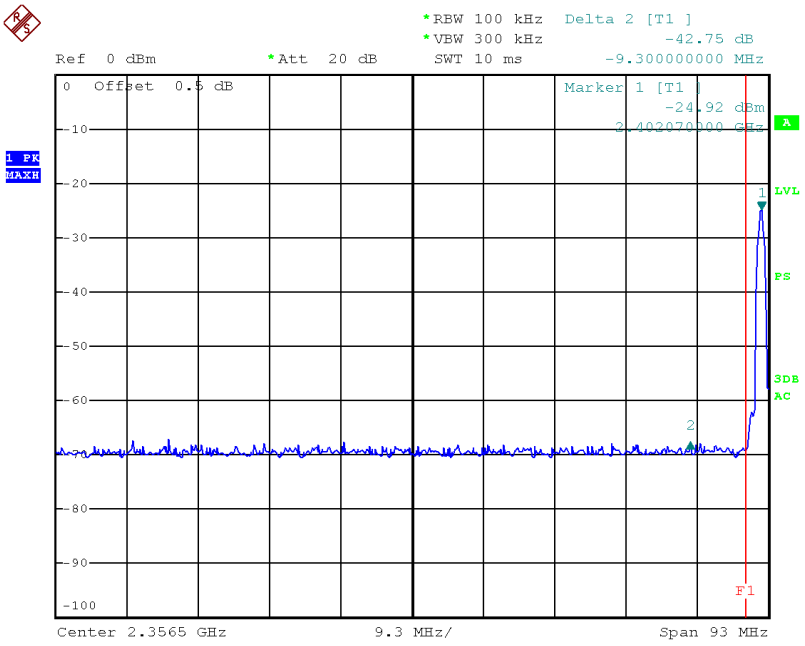
Channel H



Modulation	CH	The most restrict Attenuation outside band (dB)	Limit (dB)
8DPSK	L	42.75	≥20
	M	44.29	
	H	45.06	

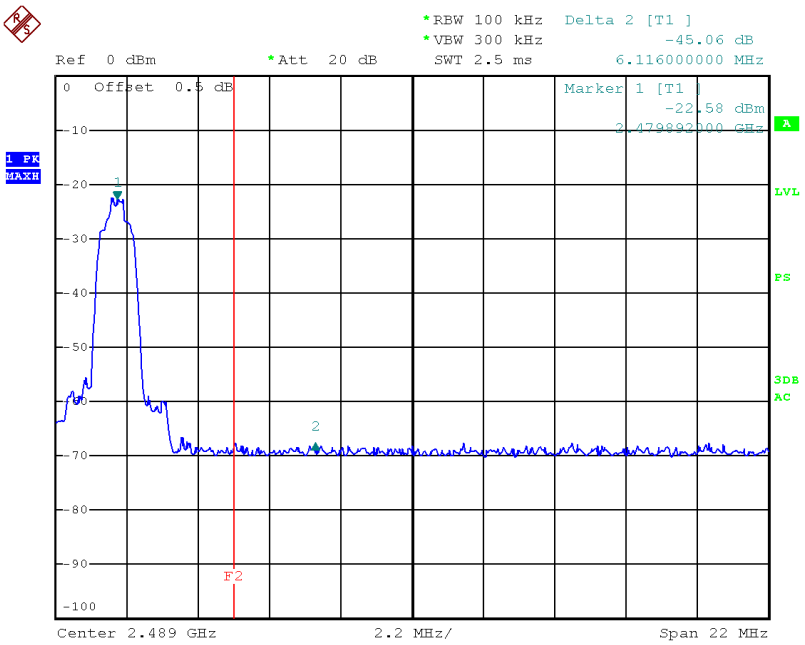
Note: The test was performed from 9 kHz to 26 GHz and the worst data is listed here.

Channel L



Date: 30.JUL.2014 15:43:38

Channel H



Date: 30.JUL.2014 15:38:25

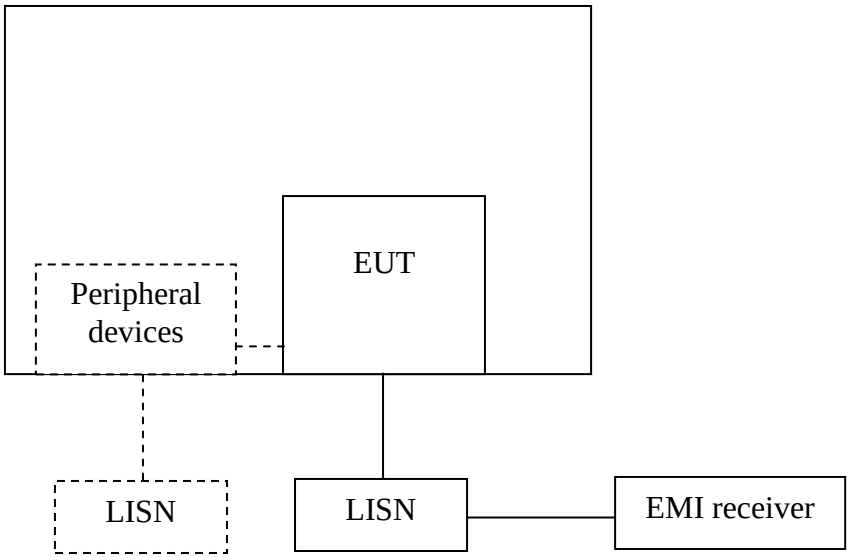
8. Power line conducted emission

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

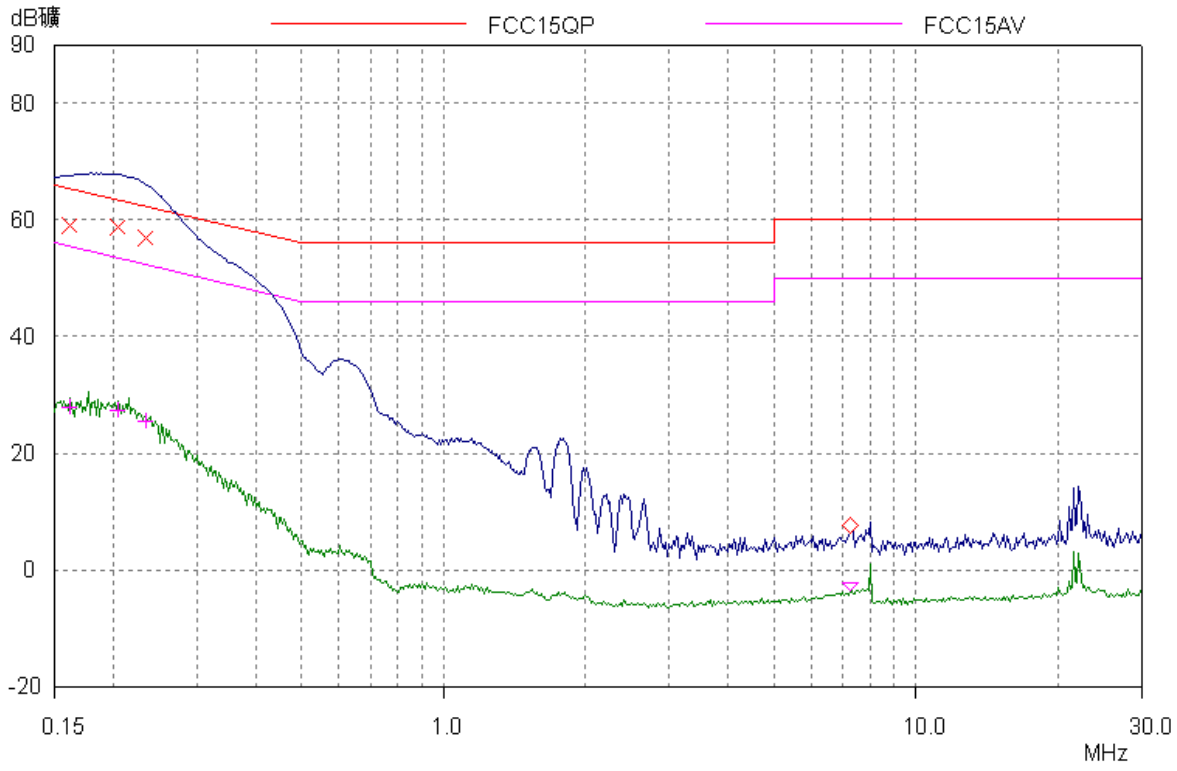
☐ For floor standing equipment, wooden support is 0.12m height rack.

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.
The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems)

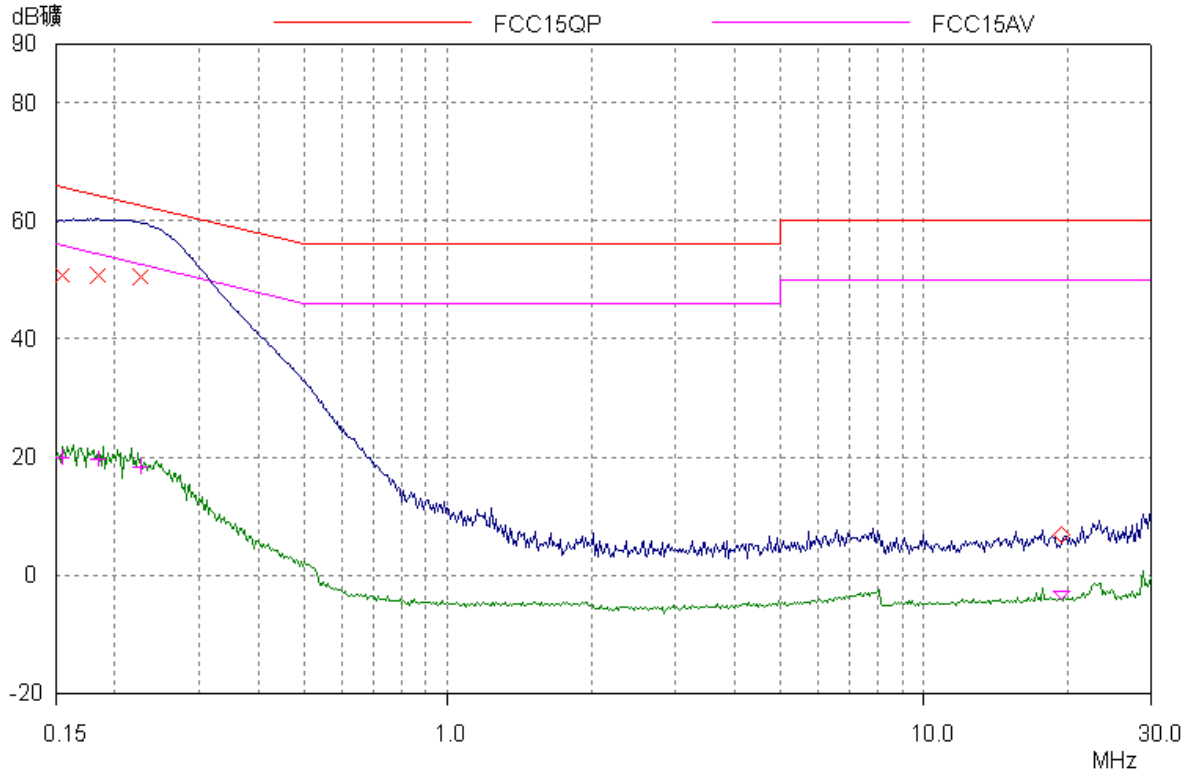
8.4 Test protocol

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.							

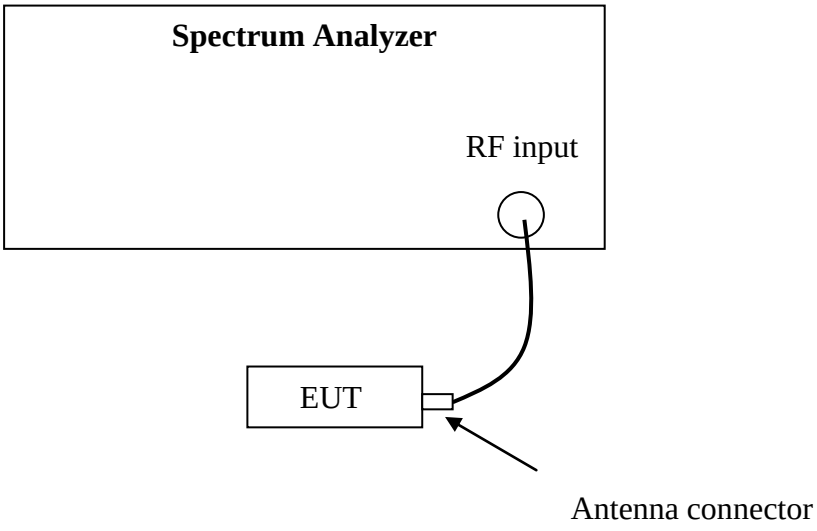
9. Number of Hopping Frequencies

Test result: **Pass**

9.1 Limit

Number of Hopping Frequencies in the 2400-2483.5 MHz band shall use at least 15 channels.

9.2 Test Configuration

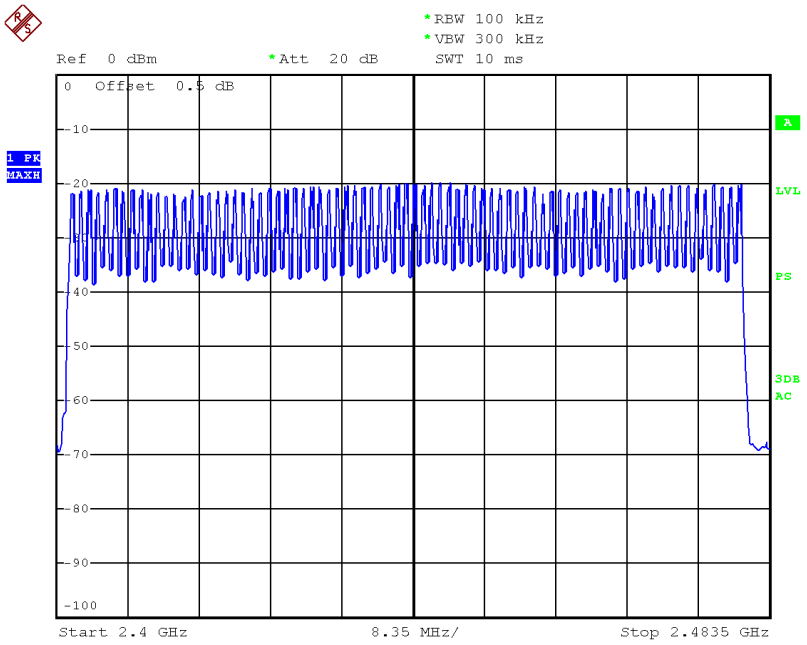


9.3 Test procedure and test setup

The channel number per FCC §15.247(a)(1)(iii) is measured using the Spectrum Analyzer with RBW=100kHz, VBW≥RBW, Sweep = auto, Detector = peak, Trace = max hold. The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems).

9.4 Test protocol

Channel Number	Limit
79	≥15



Date: 30.JUL.2014 16:05:57

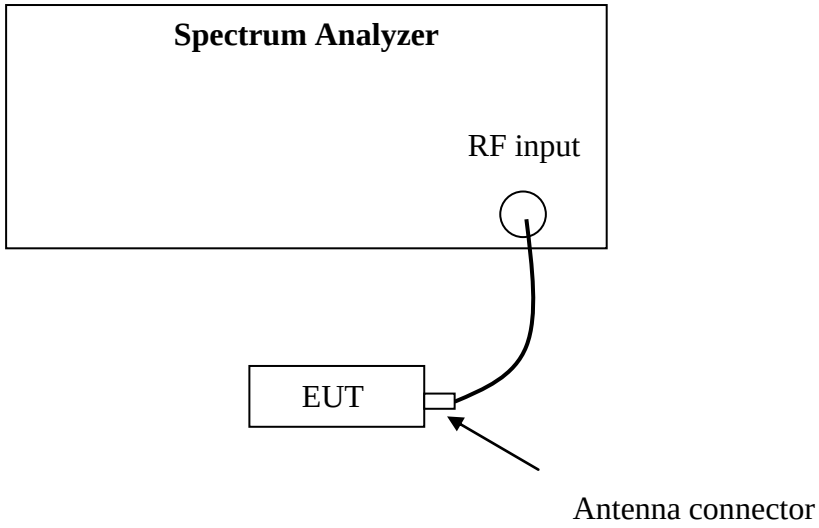
10. Dwell Time

Test result: **Pass**

10.1 Limit

The dwell time 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

Dwell time per FCC § 15.247(a)(1)(iii) is measured using the Spectrum Analyzer with Span = 0, RBW=1MHz, VBW≥RBW, Sweep can capture the entire dwell time, Detector = peak, Trace = max hold.
The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems).

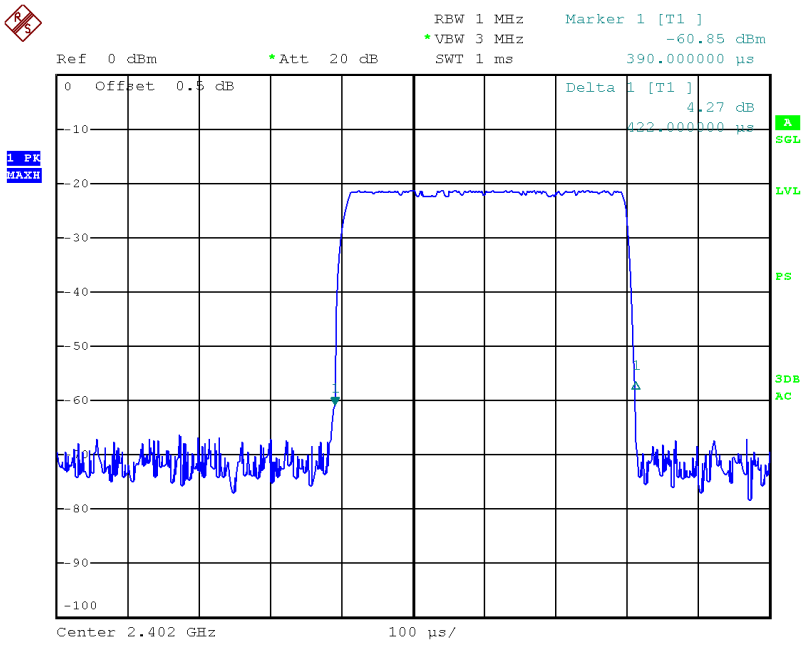
10.4 Test protocol

Packet	Occupancy time for single hop (ms) **O**	CH	Real observed period (s) **P**	Hops among Observed period **I**	Dwell time (ms) **T**	Limit (s)
DH1	0.422	L	3.16	32	135.04	≤0.4
		M	3.16	32	135.04	
		H	3.16	32	135.04	
DH3	1.694	L	3.16	16	271.04	
		M	3.16	16	271.04	
		H	3.16	16	271.04	
DH5	2.934	L	3.16	11	322.74	
		M	3.16	11	322.74	
		H	3.16	11	322.74	

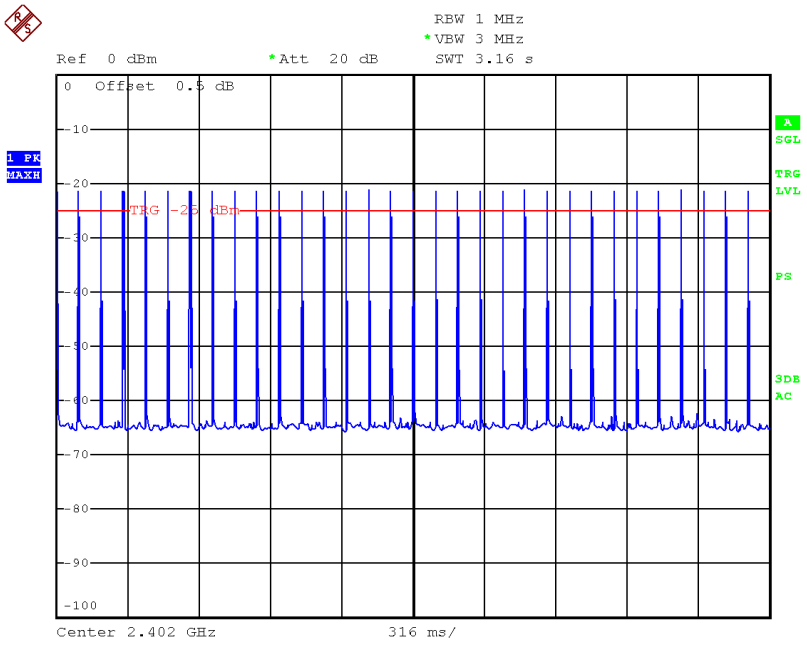
Remark: 1. There are 79 channels in all. So the complete observed period P = 0.4 * 79 = 31.6 s.

2. Average time of occupancy **T = O *I * 31.6 / P**

DH1

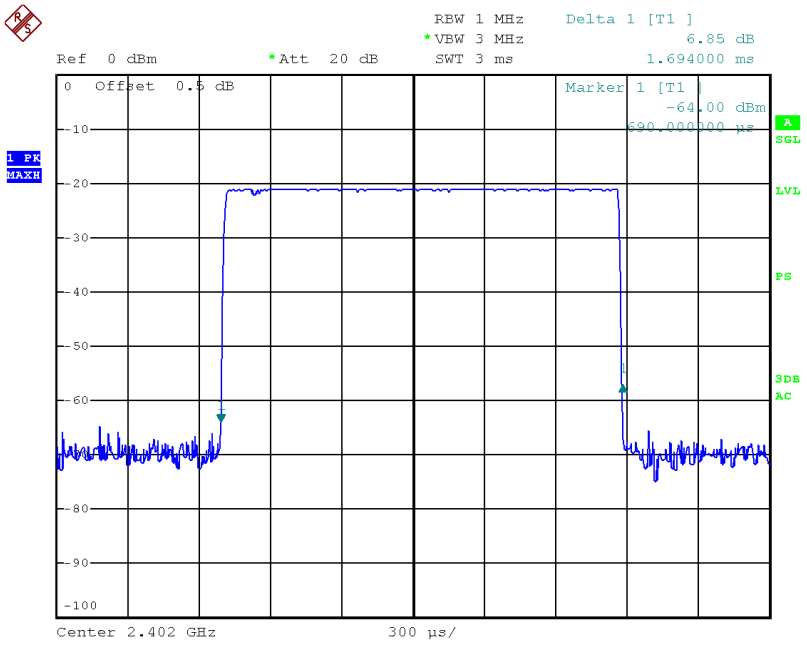


Date: 30.JUL.2014 16:25:29

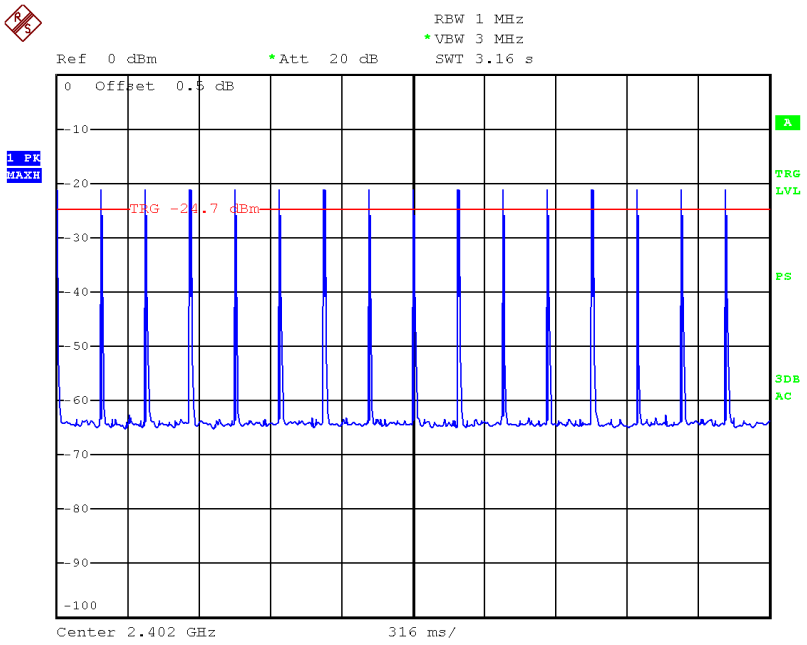


Date: 30.JUL.2014 16:30:44

DH3

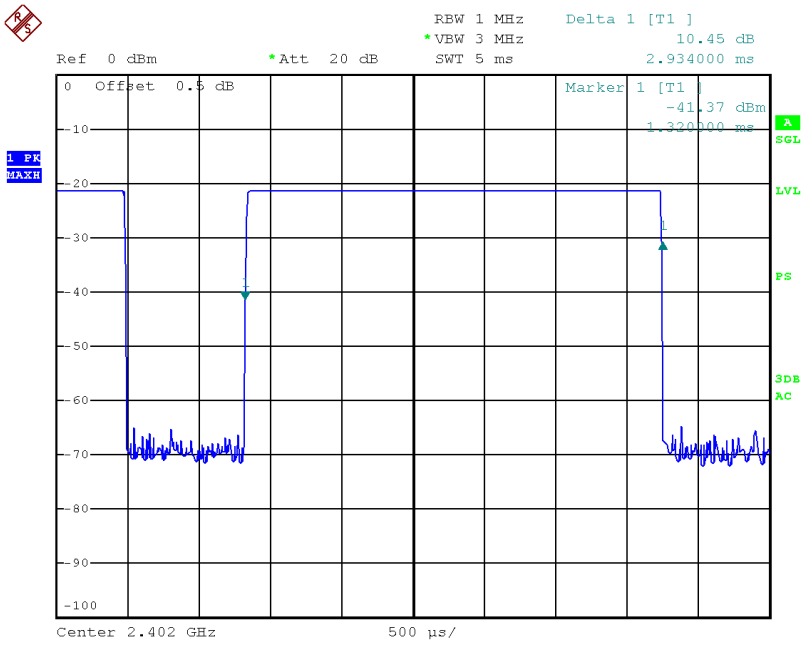


Date: 30.JUL.2014 16:26:51

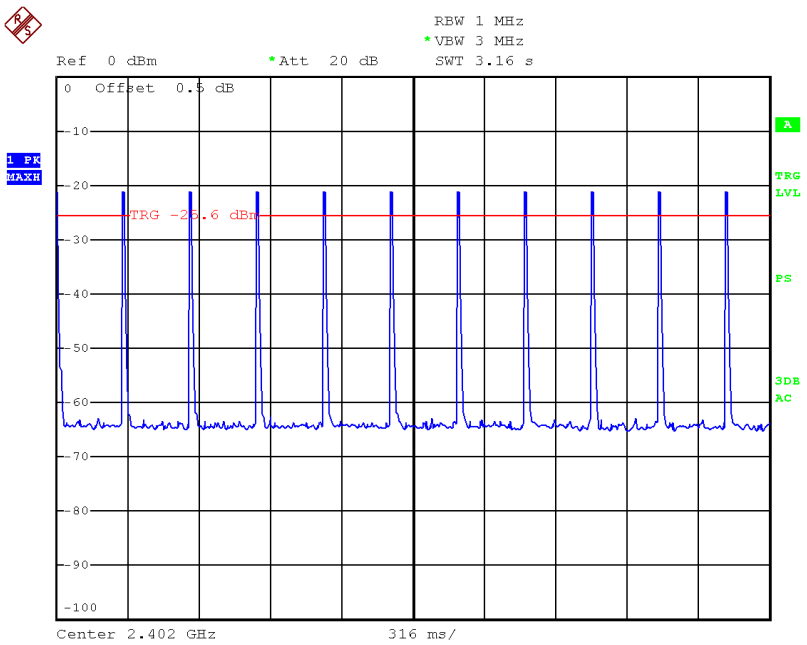


Date: 30.JUL.2014 16:35:05

DH5



Date: 30.JUL.2014 16:28:08



Date: 30.JUL.2014 16:36:15

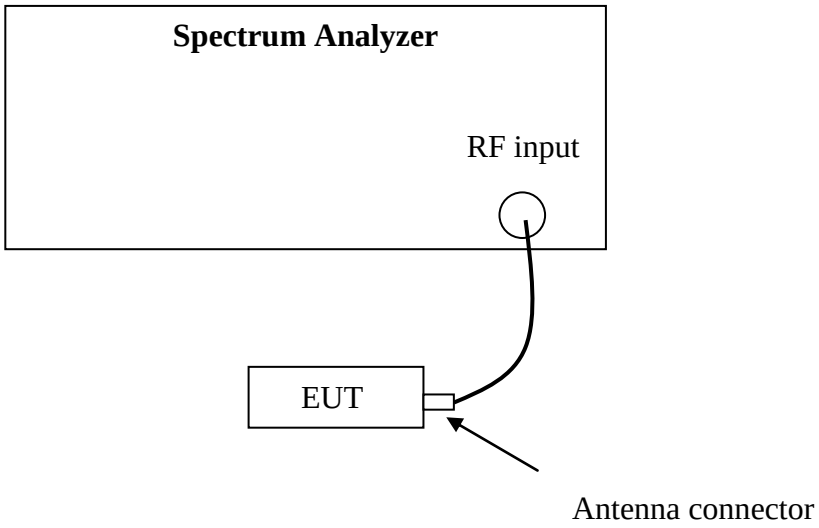
11. Occupied Bandwidth

Test Status: Tested

11.1 Test limit

None

11.2 Test Configuration



11.3 Test procedure and test setup

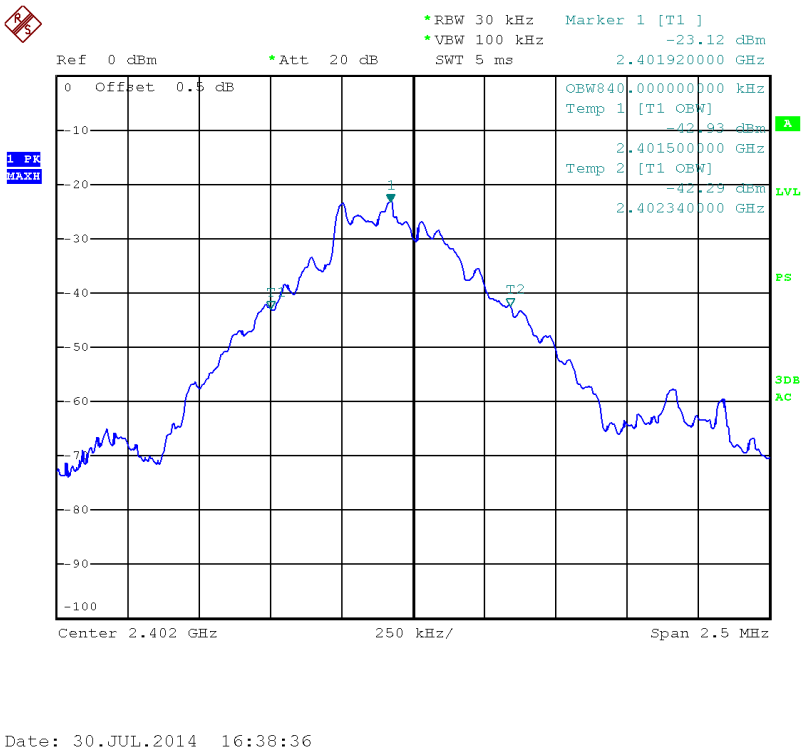
The occupied bandwidth per RSS-Gen Issue 3 Clause 4.6.1 was measured using the Spectrum Analyzer with the RBW close to 1% of the selected span, VBW = 3 * RBW Detector = Sample, Sweep = Auto.

11.4 Test protocol

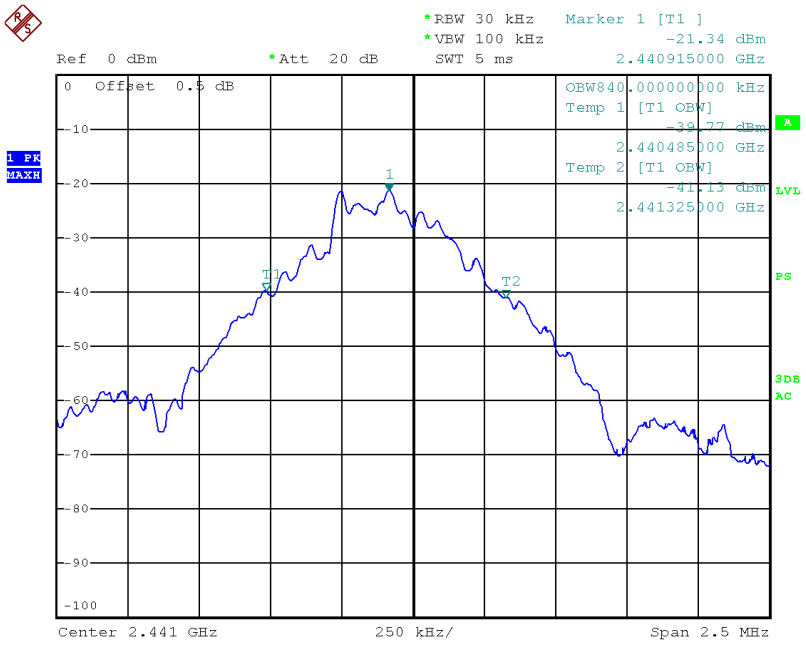
Temperature : 22 °C
Relative Humidity : 52 %

Modulation	Channel	99% Occupied Bandwidth (kHz)
GFSK	L	840.00
	M	840.00
	H	840.00

Channel L

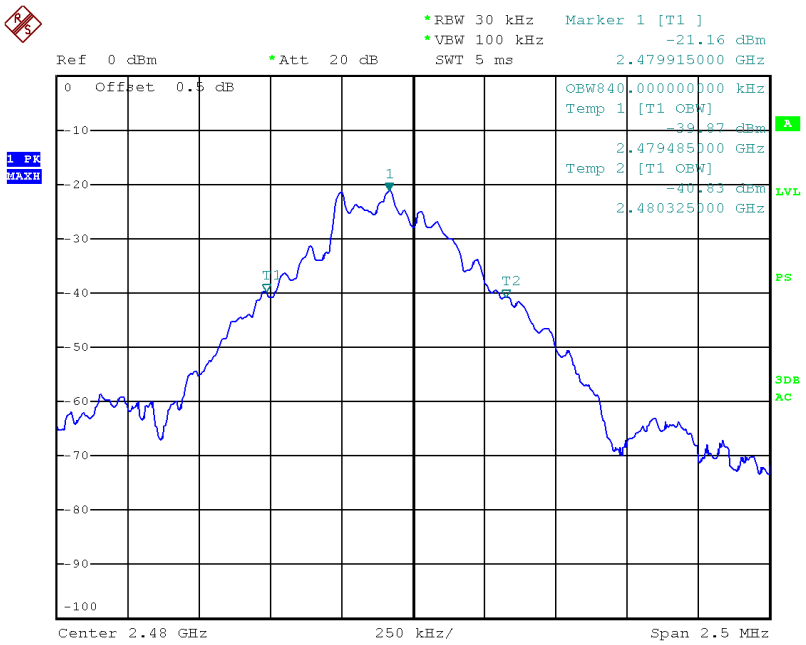


Channel M



Date: 30.JUL.2014 16:39:41

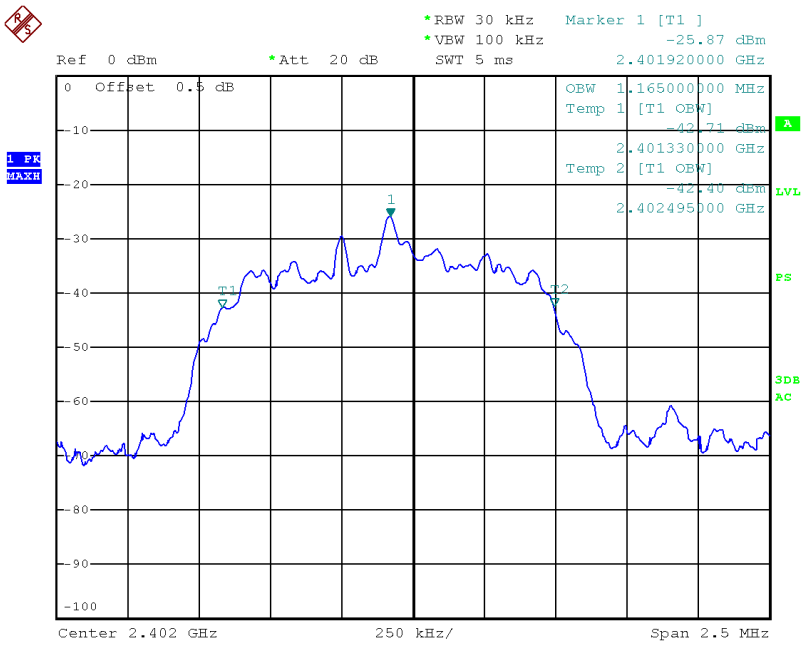
Channel H



Date: 30.JUL.2014 16:40:04

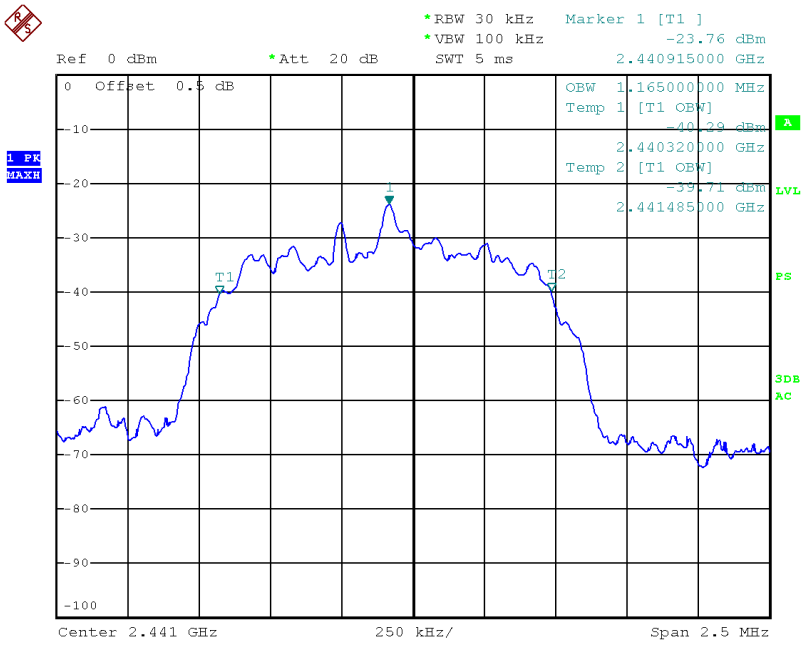
Modulation	Channel	99% Occupied Bandwidth (kHz)
π /4DQPSK	L	1165
	M	1165
	H	1165

Channel L



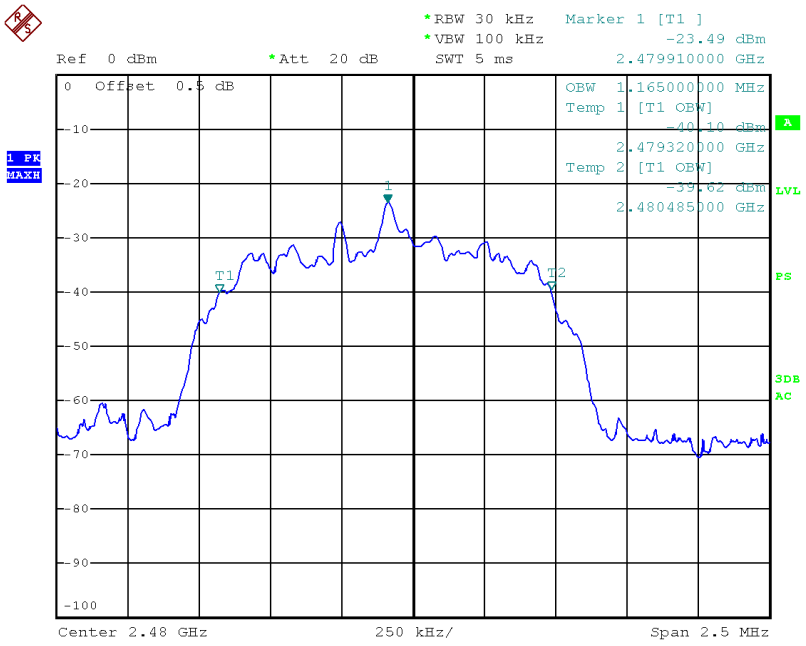
Date: 30.JUL.2014 16:42:32

Channel M



Date: 30.JUL.2014 16:41:50

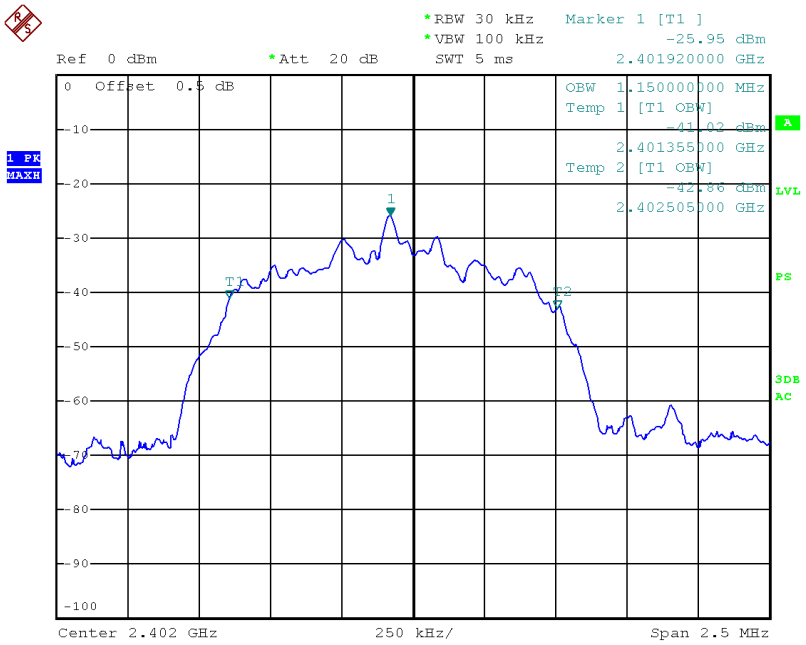
Channel H



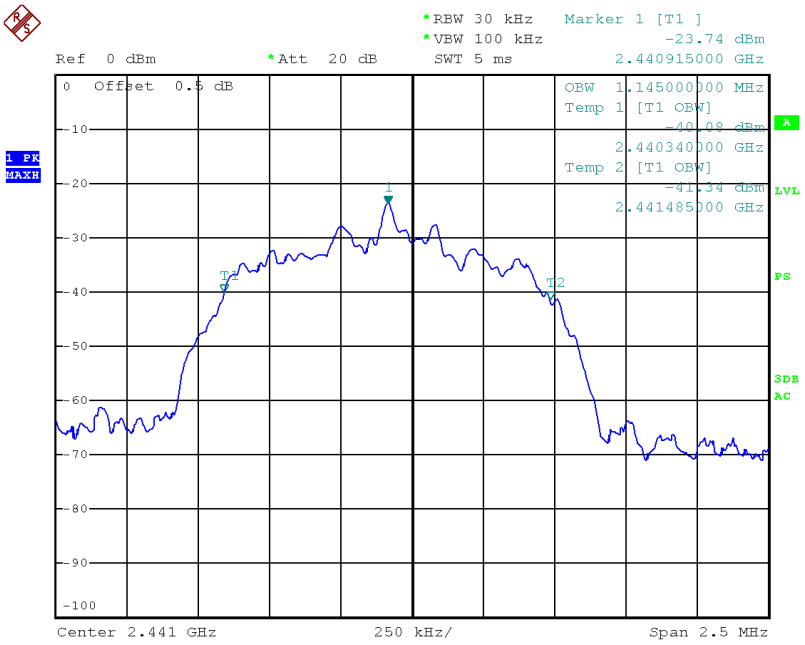
Date: 30.JUL.2014 16:41:02

Modulation	Channel	99% Occupied Bandwidth (kHz)
8DPSK	L	1150
	M	1145
	H	1165

Channel L

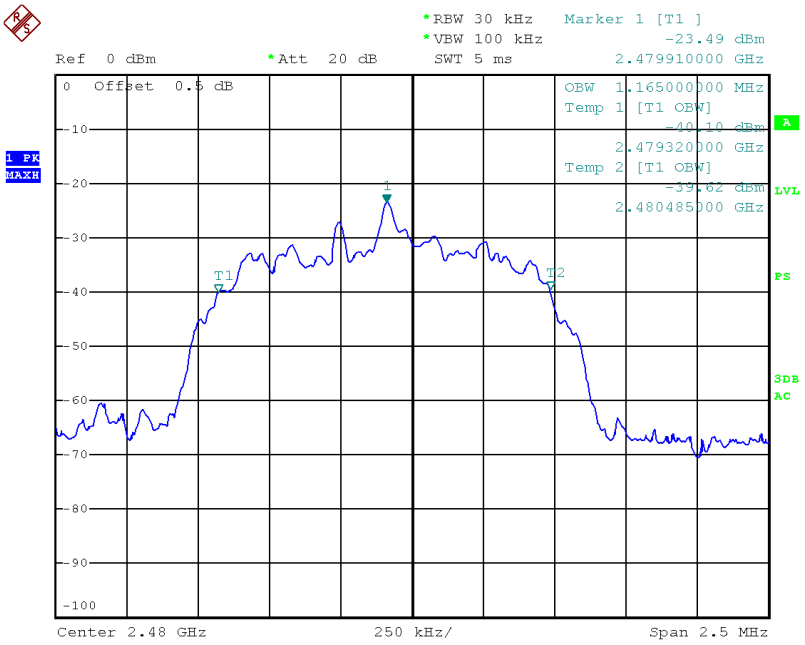


Channel M



Date: 30.JUL.2014 16:44:39

Channel H



Date: 30.JUL.2014 16:41:07

12. Spurious emission for receiver

Test result: **NA**

12.1 Test limit

The spurious emission shall test through 3 times tuneable or local oscillator frequency whichever is the higher, without exceeding 40 GHz.

☐ If a conducted measurement is made, no spurious output signals appearing at the antenna terminals shall exceed 2nW per any 4 kHz spurious frequency in the band 30-1000 MHz, or 5nW above 1 GHz.

☐ If a radiated measurement is made, all spurious emissions shall comply with the limits of Table 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

12.2 Test Configuration

Please refer to clause 6.2

12.3 Test procedure and test setup

Please refer to clause 6.3.

12.4 Test protocol

Polarization	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-

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,
Original Receiver Reading = 10dBuV.
Then Correct Factor = 30.20 + 2.00 = 32.20dB/m; Corrected Reading = 10dBuV + 32.20dB/m = 42.20dBuV/m
Assuming limit = 54dBuV/m, Corrected Reading = 42.20dBuV/m, then Margin = 54 -42.20 = 11.80dBuV/m