



## EMC TEST REPORT for Intentional Radiator

### No. 131200985SHA-001

Applicant : Kustom Musical Amplification INC.  
3015 Kustom Drive, Hebron, Kentucky, 41048 USA

Manufacturer : Hangzhou Samko Electronics Co., Ltd.  
No. 8, Jiaqi Road, Xianlin Street, Yuhang District,  
Hangzhou, 311122 China

Equipment : Power Amplifier

Type/Model : PW40BATBT, PA40BATBT

#### 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 3 (December 2010):** General Requirements and Information for the Certification of Radiocommunication Equipment

Date of issue: March 14, 2014

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Reviewed by:

Daniel Zhao (*Reviewer*)



**FCC ID: 2AAVGHMG1406A**  
**IC: 11349A-HMG1406A**

## **Description of Test Facility**

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## **1. General Information**

### **1.1 Applicant Information**

Applicant: Kustom Musical Amplification INC.  
3015 Kustom Drive, Hebron, Kentucky, 41048 USA

Name of contact: Fred J Conrad

Tel: 859-817-7164

Fax: 859-817-7199

Manufacturer: Hangzhou Samko Electronics Co., Ltd.  
No. 8, Jiaqi Road, Xianlin Street, Yuhang District,  
Hangzhou, 311122 China

Sample received date : March 10, 2014  
Date of test : March 10, 2014 ~ March 13, 2014

### **1.2 Identification of the EUT**

Equipment: Power Amplifier  
Type/model: PW40BATBT, PA40BATBT  
FCC ID: 2AAVGHMG1406A  
IC: 11349A-HMG1406A

### 1.3 Technical specification

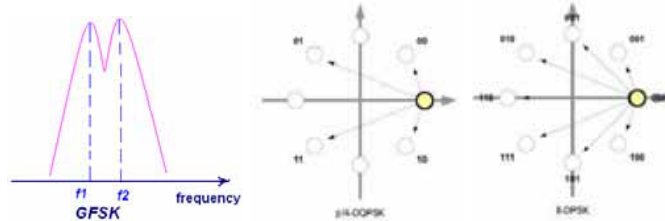
Operation Frequency Band:

2402 - 2480 MHz

Modulation:

GFSK,  $\pi/4$  DQPSK, 8DPSK

Technology:



GFSK is different from  $\pi/4$ DQPSK and 8DPSK.

8DPSK is similar with  $\pi/4$ DQPSK but more complex, and with a bigger data rate. So all tests except dwell time and number of hopping frequencies were performed with GFSK modulation and 8DPSK modulation for representative.

Antenna Designation:

PCB antenna, un-detachable

Gain of Antenna:

0dBi

Rating:

110-120V~, 60Hz

Description of EUT:

EUT is a Power Amplifier. It has two models and they are the same except the model name and brand name. Only the model of PW40BATBT was chosen to perform all the tests as representative.

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.



## 2. Test Specification

### 2.1 Instrument list

Equipment	Type	Manu.	Internal no.	Cal. Date	Due date
Test Receiver	ESIB 26	R&S	EC 3045	2013-10-21	2014-10-20
Semi-anechoic chamber	-	Albatross project	EC 3048	2013-5-21	2014-5-20
Bilog Antenna	CBL 6112D	TESEQ	EC 4206	2013-5-16	2014-5-15
Horn antenna	HF 906	R&S	EC 3049	2013-5-13	2014-5-12
Pre-amplifier	Pre-amp 18	R&S	EC 3222	2013-4-12	2014-4-11
Test Receiver	ESCS 30	R&S	EC 2107	2013-10-21	2014-10-20
A.M.N.	ESH2-Z5	R&S	EC 3119	2014-1-9	2015-1-8
A.M.N.	ESH3-Z5	R&S	EC 2109	2014-1-10	2015-1-9
High Pass Filter	WHKX 1.0/15G-10SS	Wainwright	EC4297-1	2014-2-8	2015-2-7
High Pass Filter	WHKX 2.8/18G-12SS	Wainwright	EC4297-2	2014-2-8	2015-2-7
High Pass Filter	WHKX 7.0/1.8G-8SS	Wainwright	EC4297-3	2014-2-8	2015-2-7
Band Reject Filter	WRCGV 2400/2483- 2390/2493- 35/10SS	Wainwright	EC4297-4	2014-2-8	2015-2-7
Test Receiver	FSV40	R&S	/	2013-10-21	2014-10-20
Preamplifier	AP-025C	Quietek	QT-AP003	2013-11-25	2014-11-24
Preamplifier	AP-180C	Quietek	CHM- 0602013	2013-11-25	2014-11-24
Broad-Band Horn Antenna	BBHA9120D	Schwarzbeck	496	2013-11-25	2014-11-24
Broad-Band Horn Antenna	BBHA9170	Schwarzbeck	294	2013-11-25	2014-11-24

### 2.2 Test Standard

47CFR Part 15 (2013)  
ANSI C63.4: 2003  
RSS-210 Issue 8 (December 2010)  
RSS-Gen Issue 3 (December 2010)



### 2.3 Test Summary

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

TEST ITEM	FCC REFERENCE	IC REFERENCE	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".



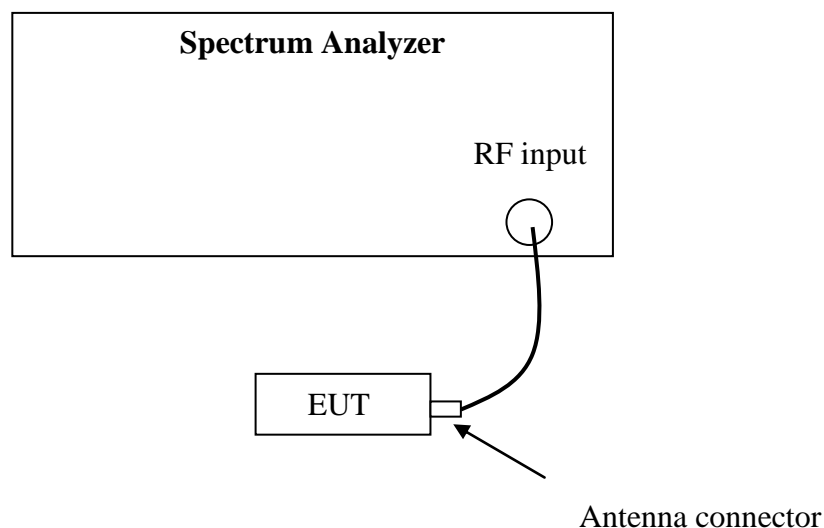
### 3. 20 dB Bandwidth

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,  $RBW \geq 1\%$  of the 20 dB bandwidth,  $VBW \geq RBW$ , Sweep = auto, Detector = peak, Trace = max hold.

The test was performed at 3 channels (lowest, middle and highest channel).

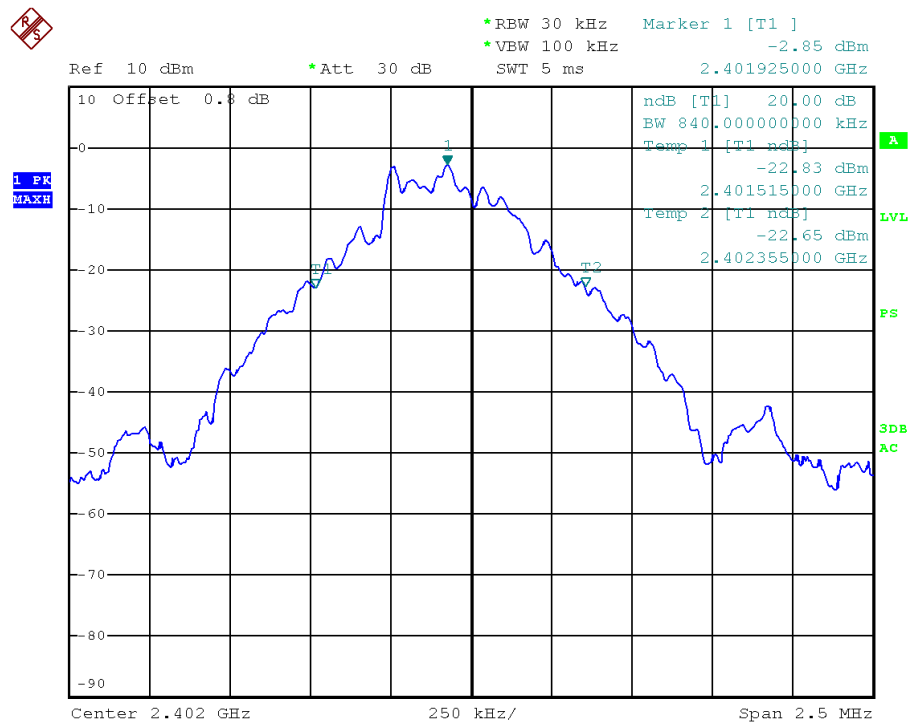
The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems)

### 3.4 Test Protocol

Temperature : 22°C  
Relative Humidity : 45 %

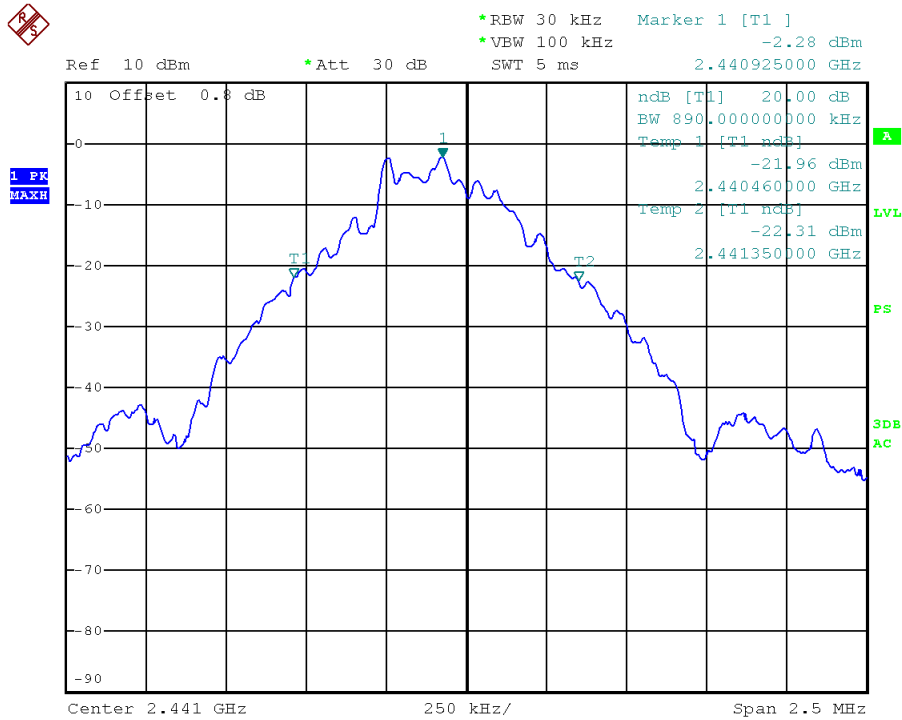
Modulation	CH	Bandwidth (kHz)	Two-thirds of Bandwidth (kHz)
GFSK	L	840.00	560.00
	M	890.00	593.33
	H	890.00	593.33

#### Channel L



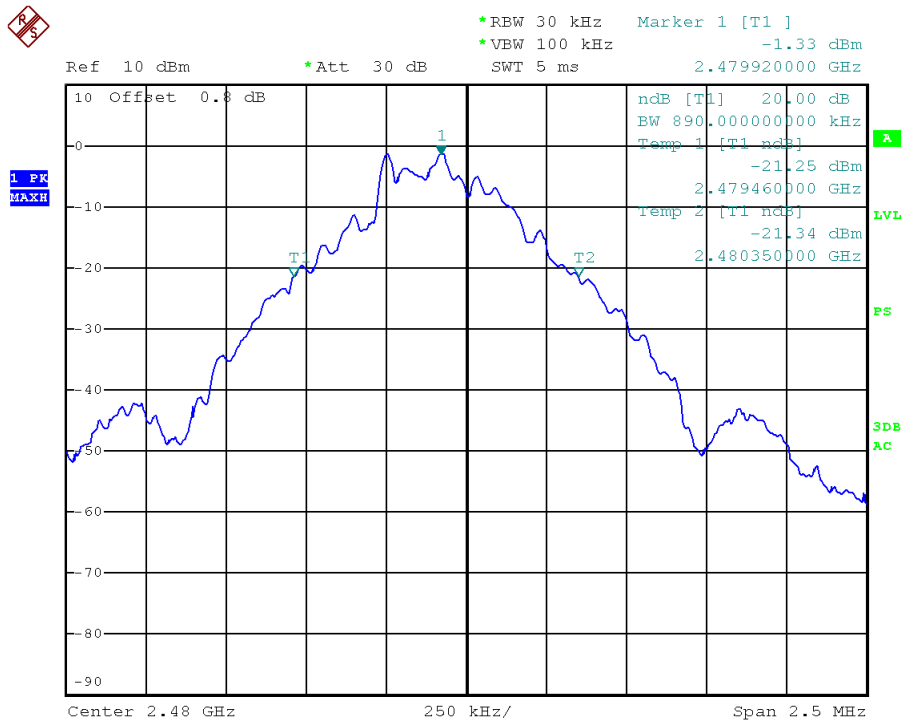
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### Channel M



Date: 13.MAR.2014 13:20:13

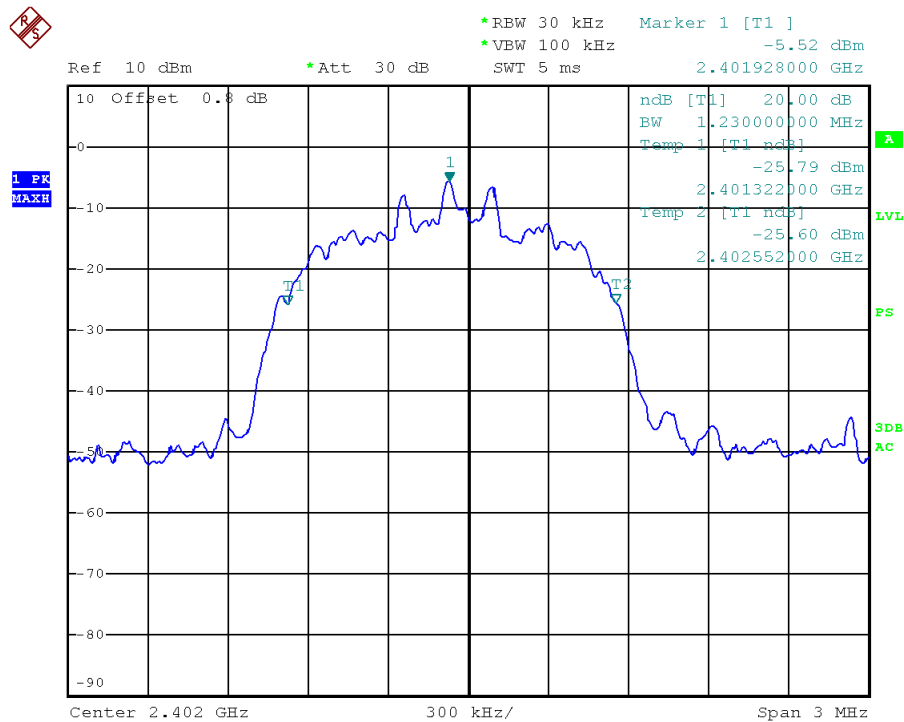
### Channel H



Date: 13.MAR.2014 13:21:03

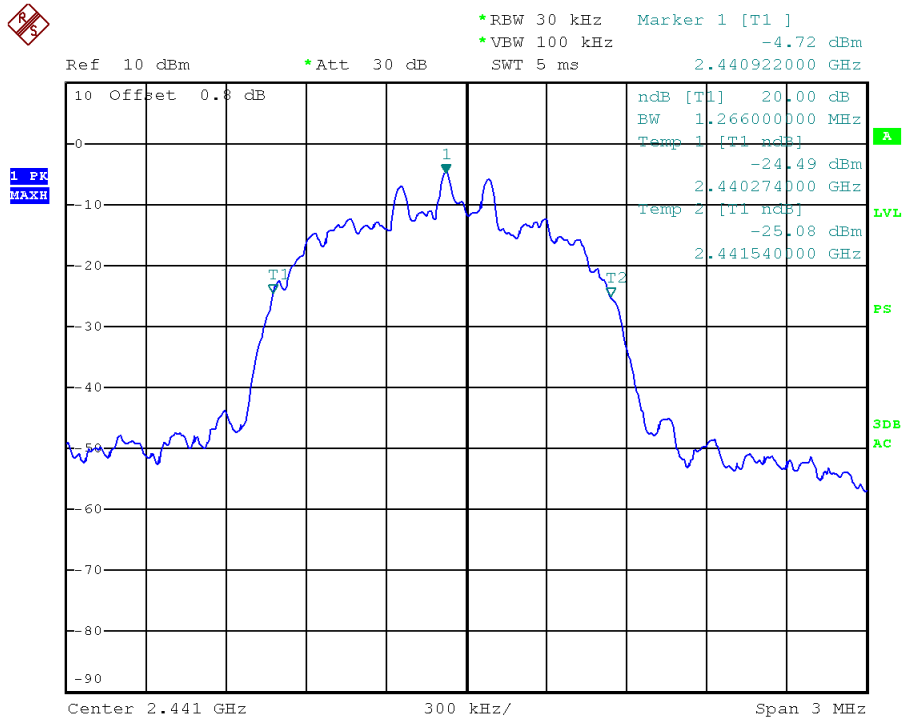
Modulation	CH	Bandwidth (kHz)	Two-thirds of Bandwidth (kHz)
8DPSK	L	1230.00	820.00
	M	1266.00	844.00
	H	1260.00	840.00

### Channel L



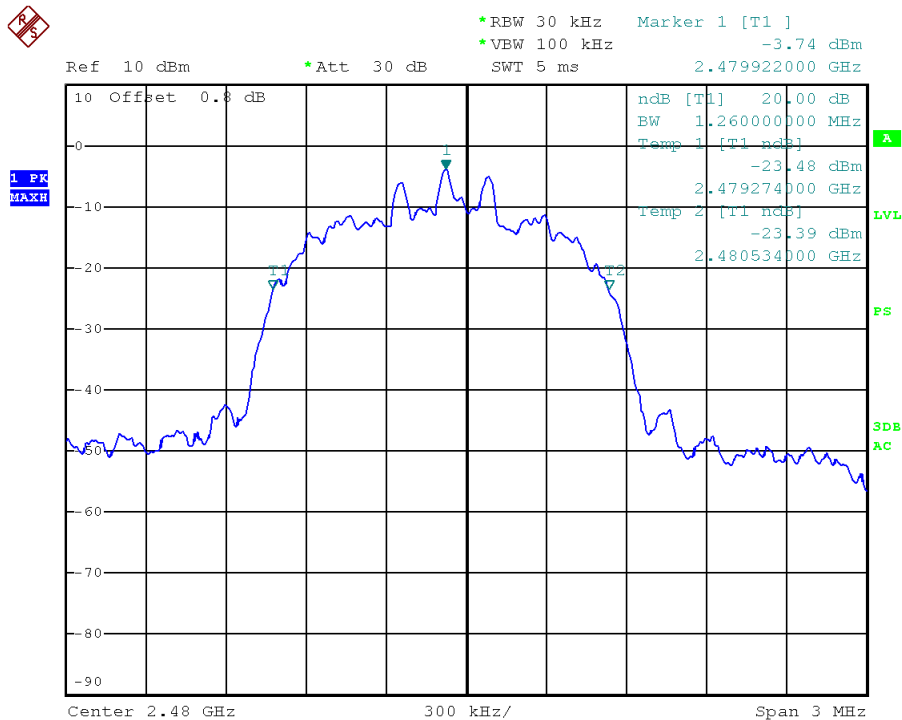
Date: 13.MAR.2014 13:26:29

### Channel M



Date: 13.MAR.2014 13:27:48

### Channel H



Date: 13.MAR.2014 13:28:34

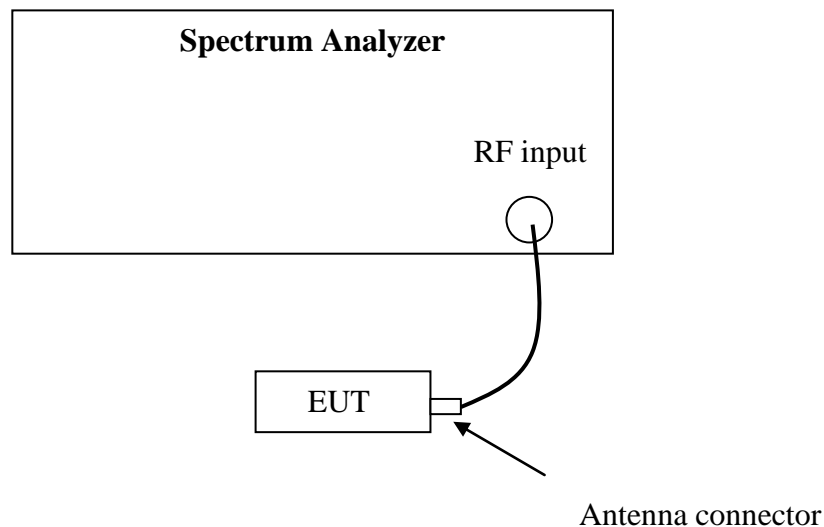
## 4. Carrier Frequency Separation

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,  $RBW \geq 1\%$  of the span,  $VBW \geq RBW$ , Sweep = auto, Detector = peak, Trace = max hold.

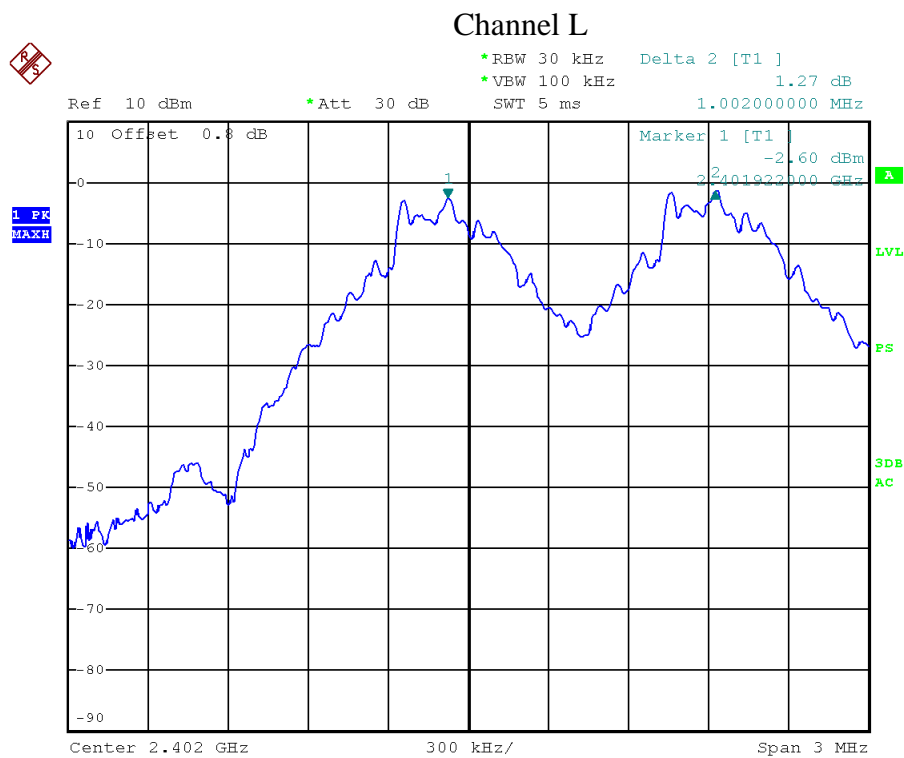
The test was performed at 3 channels (lowest, middle and highest channel).

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

#### 4.4 Test Protocol

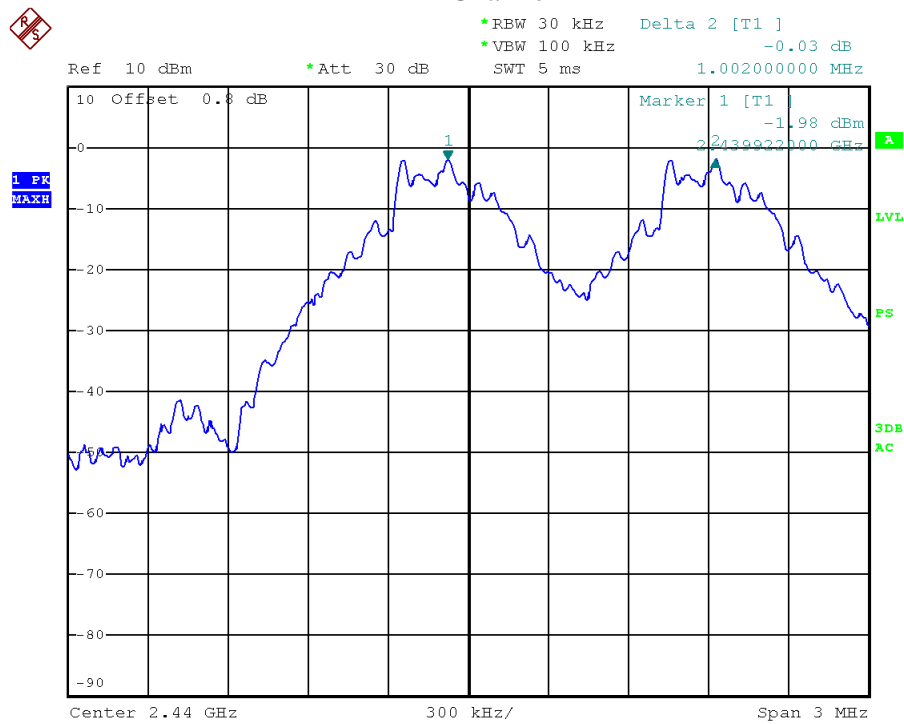
Temperature : 22°C  
 Relative Humidity : 45 %

Mode	CH	Frequency Separation (kHz)	Limit (kHz)
GFSK	L	1002.00	$\geq 560.00$
	M	1002.00	$\geq 593.33$
	H	1002.00	$\geq 593.33$



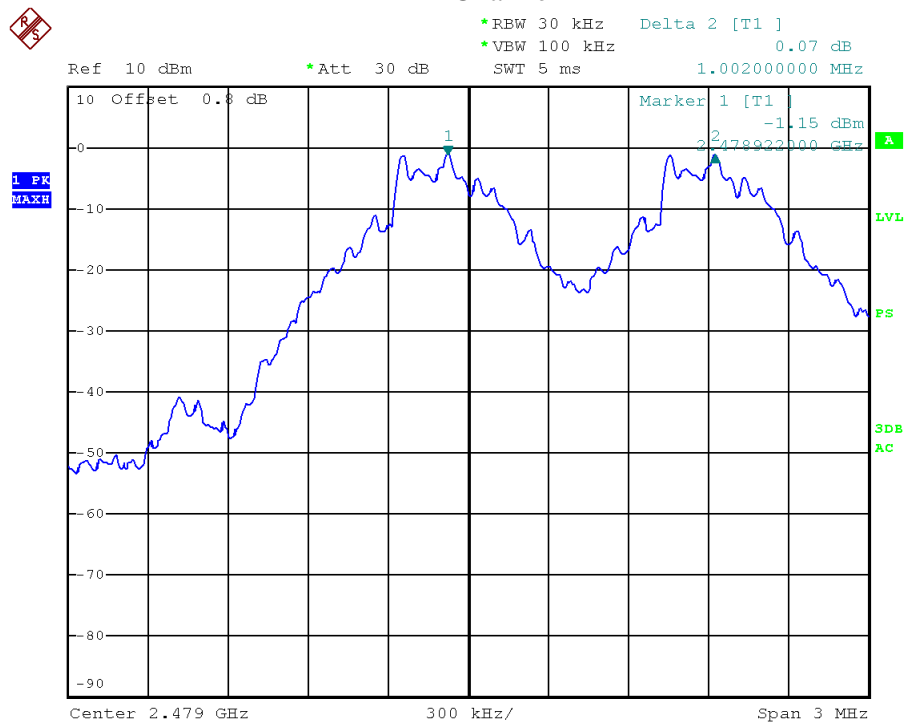
Date: 13.MAR.2014 13:44:56

### Channel M



Date: 13.MAR.2014 13:45:44

### Channel H

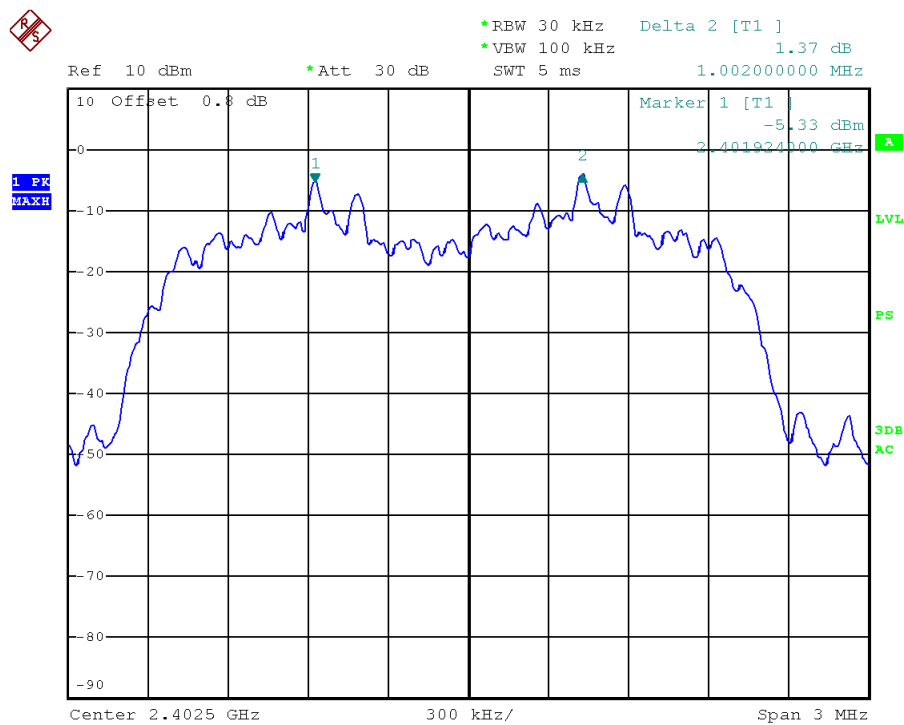


Date: 13.MAR.2014 13:46:25



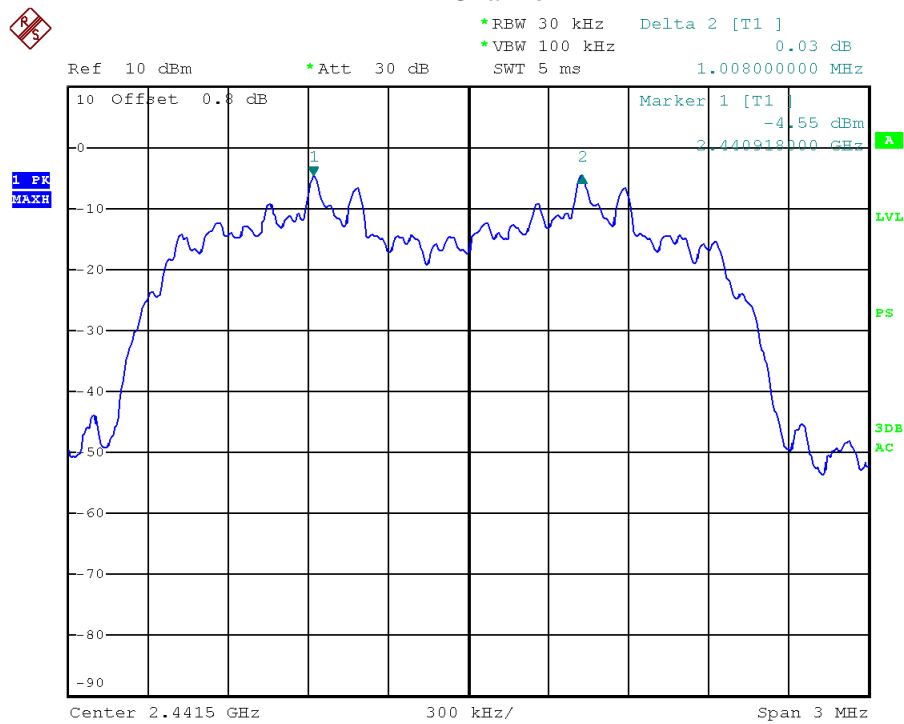
Mode	CH	Frequency Separation (kHz)	Limit (kHz)
8DPSK	L	1002.00	$\geq 820.00$
	M	1008.00	$\geq 844.00$
	H	1002.00	$\geq 840.00$

### Channel L



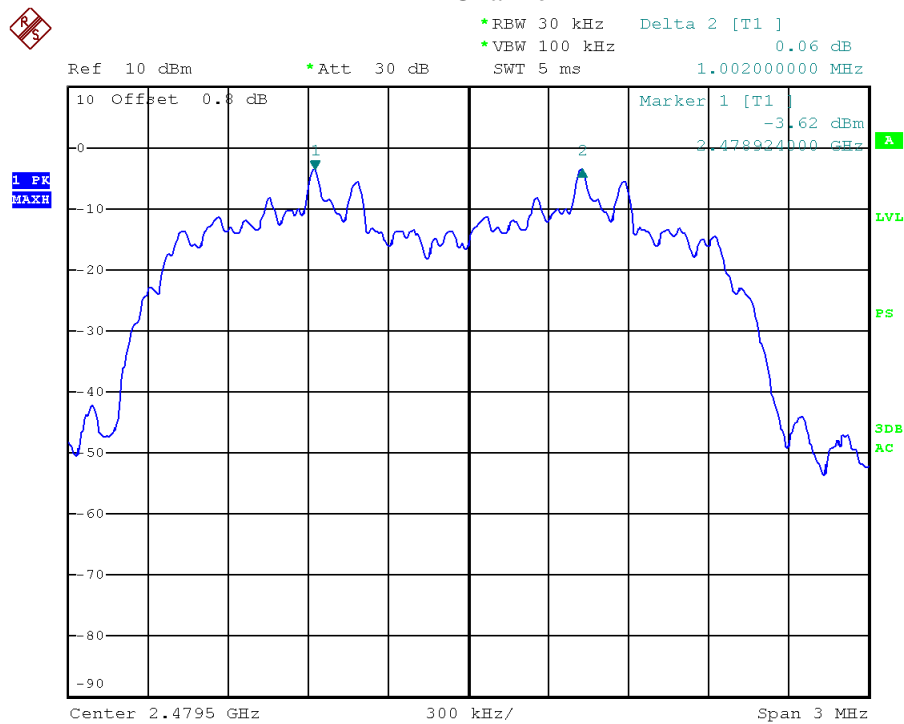
Date: 13.MAR.2014 13:54:16

### Channel M



Date: 13.MAR.2014 13:55:12

### Channel H



Date: 13.MAR.2014 13:55:56

## 5. Maximum peak output power

Test result: Pass

### 5.1 Test limit

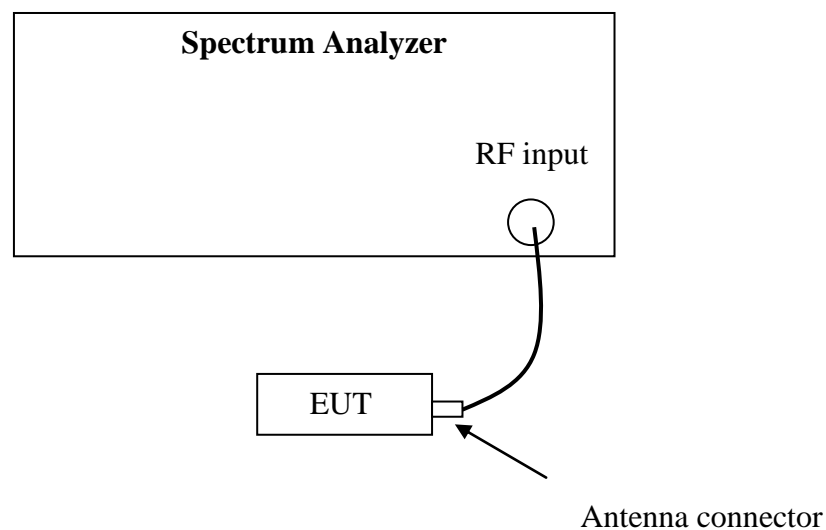
For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt

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,  $RBW \geq$  the 20 dB bandwidth,  $VBW \geq RBW$ , Sweep = auto, Detector = peak, Trace = max hold.

The test was performed at 3 channels (lowest, middle and highest channel).

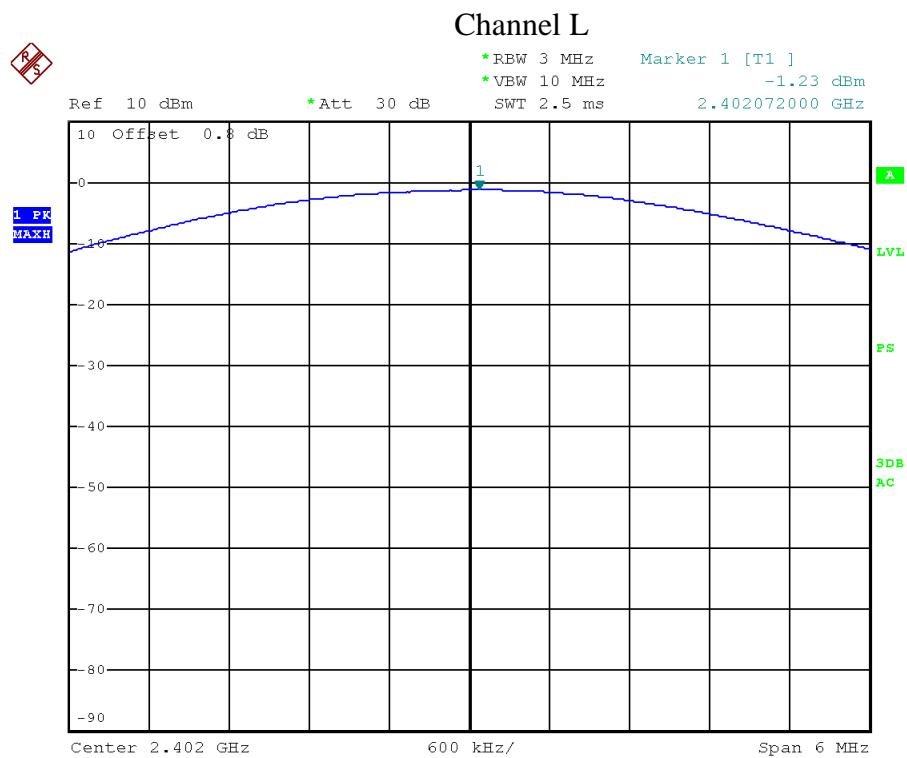
The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems)

#### 5.4 Test protocol

Temperature : 22 °C  
Relative Humidity : 45 %

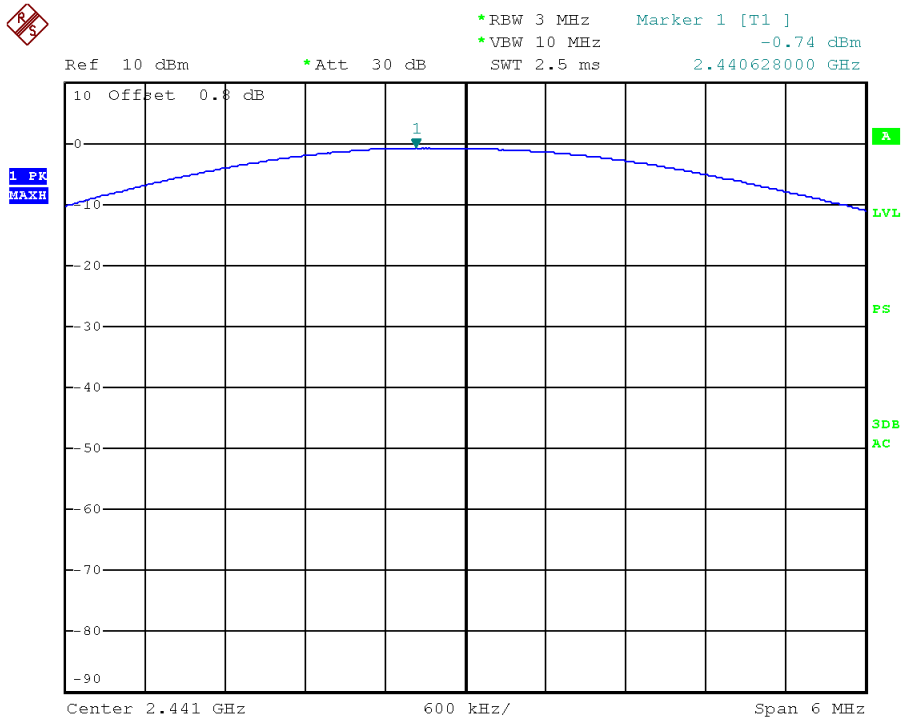
Mode	CH	Cable loss (dB)	Corrected reading (dBm)	Limit (dBm)
GFSK	L	0.80	-1.23	≤21.00
	M	0.80	-0.74	
	H	0.80	0.08	

**Conclusion:** The maximum EIRP = 0.08 = 1.019mW which is lower than the limit of 4W listed in RSS-210.



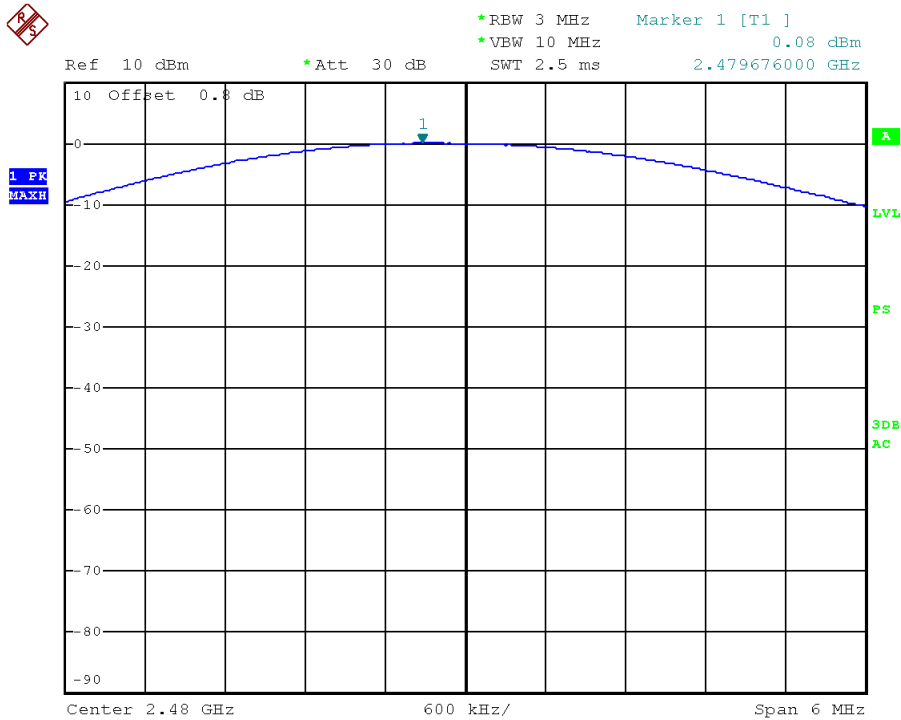
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**Channel M**



Date: 13.MAR.2014 14:02:13

**Channel H**

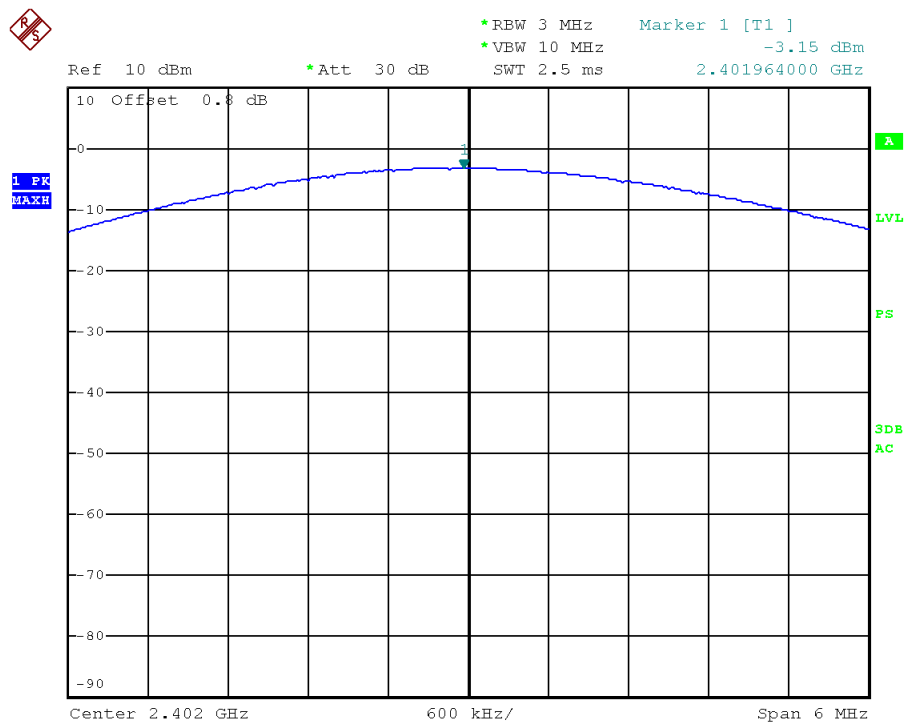


Date: 13.MAR.2014 14:02:33

Mode	CH	Cable loss (dB)	Corrected reading (dBm)	Limit (dBm)
8DPSK	L	0.80	-3.15	$\leq 21.00$
	M	0.80	-2.30	
	H	0.80	-1.35	

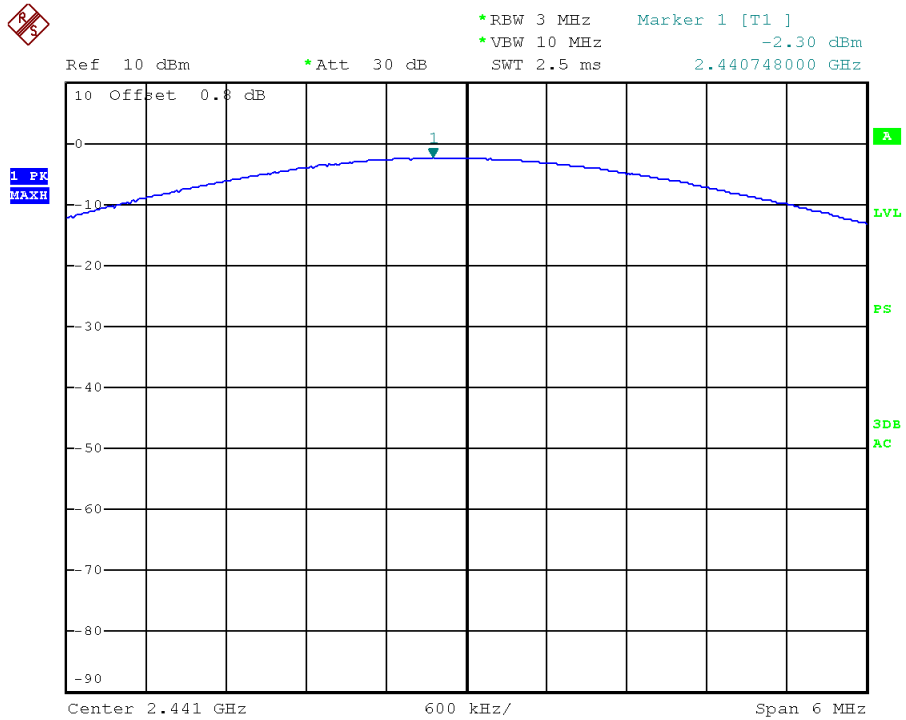
**Conclusion:** The maximum EIRP =  $-1.35 = 0.733\text{mW}$  which is lower than the limit of 4W listed in RSS-210.

### Channel L



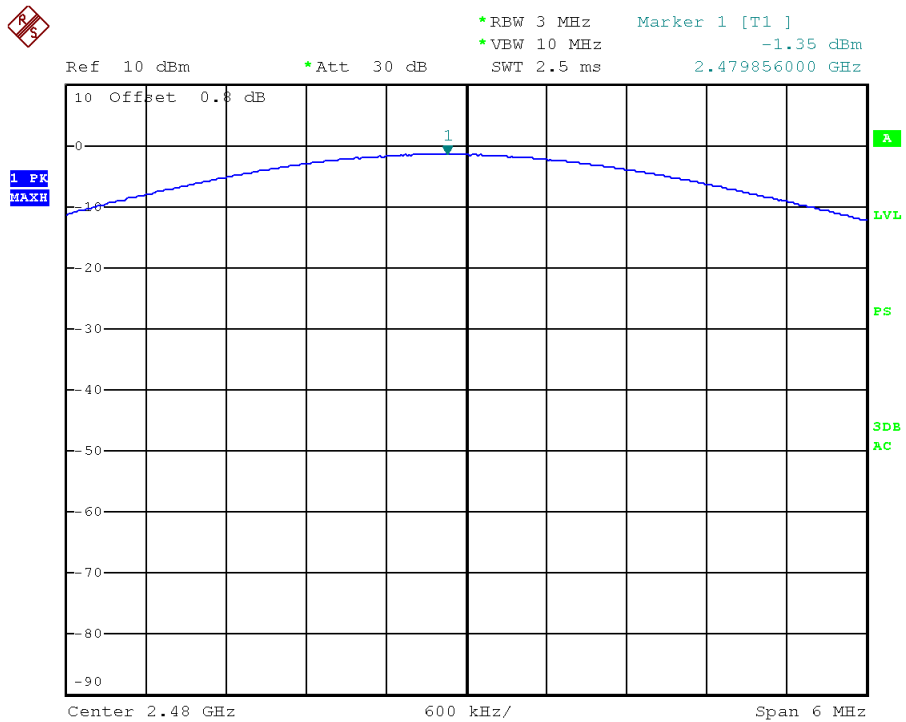
Date: 13.MAR.2014 14:04:52

### Channel M



Date: 13.MAR.2014 14:05:33

### Channel H



Date: 13.MAR.2014 14:06:00

## 6. Radiated Spurious Emissions

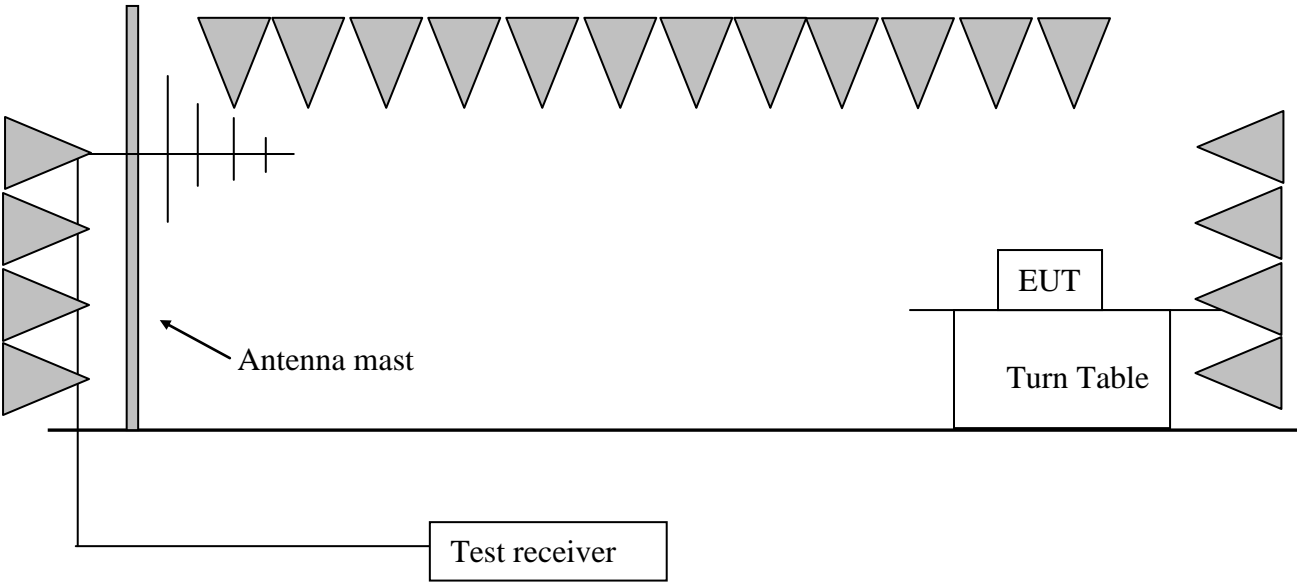
Test result: PASS

### 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

GFSK Modulation:

CH	Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2402.20	30.70	88.30	Fundamental	/	PK
	H	119.42	15.30	29.50	43.50	14.00	PK
	H	129.14	15.00	32.30	43.50	11.20	PK
	V	329.36	16.00	34.80	46.00	11.20	PK
	V	480.98	19.50	32.20	46.00	13.80	PK
	H	1599.19	-10.20	50.90	54.00	3.10	PK
	H	2390.00	-8.00	40.60	54.00	13.40	PK
	H	4806.18	-1.50	54.10	74.00	19.90	PK
	H	4805.87	-1.50	36.60	54.00	17.40	AV
M	H	2441.07	30.70	88.90	Fundamental	/	PK
	H	119.42	15.30	29.50	43.50	14.00	PK
	H	129.14	15.00	32.30	43.50	11.20	PK
	V	329.36	16.00	34.80	46.00	11.20	PK
	V	480.98	19.50	32.20	46.00	13.80	PK
	H	1625.25	-10.10	51.20	54.00	2.80	PK
	H	4885.77	-1.10	54.60	74.00	19.40	PK
	H	4885.23	-1.10	36.80	54.00	17.20	AV
H	H	2479.83	30.70	89.80	Fundamental	/	PK
	H	119.42	15.30	29.50	43.50	14.00	PK
	H	129.14	15.00	32.30	43.50	11.20	PK
	V	329.36	16.00	34.80	46.00	11.20	PK
	V	480.98	19.50	32.20	46.00	13.80	PK
	H	1651.30	-9.90	50.40	54.00	3.60	PK
	H	2483.50	-7.80	40.20	54.00	13.80	PK
	H	4961.54	-0.80	54.30	74.00	19.70	PK
	H	4960.79	-0.80	36.50	54.00	17.50	AV

8DPSK Modulation:

CH	Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2402.20	30.70	86.30	Fundamental	/	PK
	H	119.42	15.30	29.50	43.50	14.00	PK
	H	129.14	15.00	32.30	43.50	11.20	PK
	V	329.36	16.00	34.80	46.00	11.20	PK
	V	480.98	19.50	32.20	46.00	13.80	PK
	H	1599.19	-10.20	50.90	54.00	3.10	PK
	H	2390.00	-8.00	38.60	54.00	13.40	PK
	H	4806.18	-1.50	52.10	74.00	19.90	PK
	H	4805.87	-1.50	35.60	54.00	17.40	AV
M	H	2441.07	30.70	86.80	Fundamental	/	PK
	H	119.42	15.30	29.50	43.50	14.00	PK
	H	129.14	15.00	32.30	43.50	11.20	PK
	V	329.36	16.00	34.80	46.00	11.20	PK
	V	480.98	19.50	32.20	46.00	13.80	PK
	H	1625.25	-10.10	51.20	54.00	2.80	PK
	H	4885.77	-1.10	53.60	74.00	19.40	PK
	H	4885.23	-1.10	35.80	54.00	17.20	AV
H	H	2479.83	30.70	87.80	Fundamental	/	PK
	H	119.42	15.30	29.50	43.50	14.00	PK
	H	129.14	15.00	32.30	43.50	11.20	PK
	V	329.36	16.00	34.80	46.00	11.20	PK
	V	480.98	19.50	32.20	46.00	13.80	PK
	H	1651.30	-9.90	50.40	54.00	3.60	PK
	H	2483.50	-7.80	39.70	54.00	13.80	PK
	H	4961.54	-0.80	53.50	74.00	19.70	PK
	H	4960.79	-0.80	35.80	54.00	17.50	AV

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.

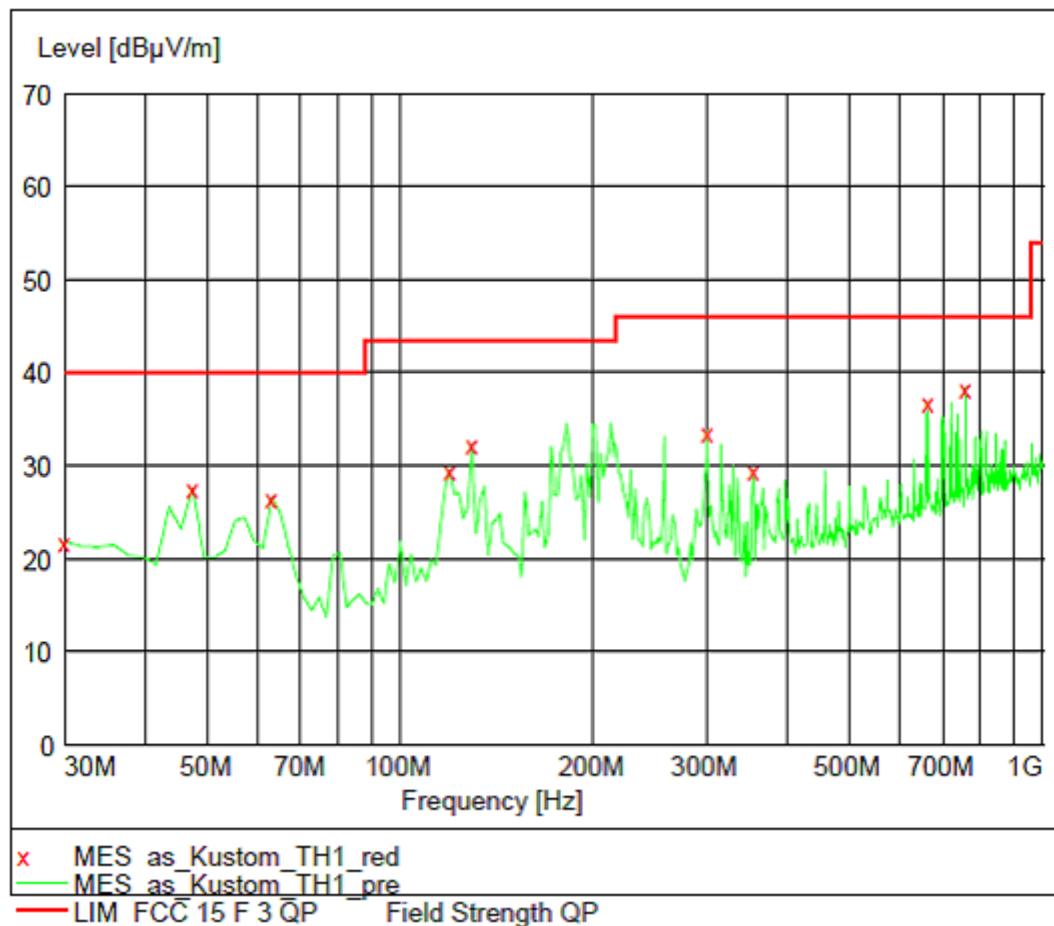
Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,

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

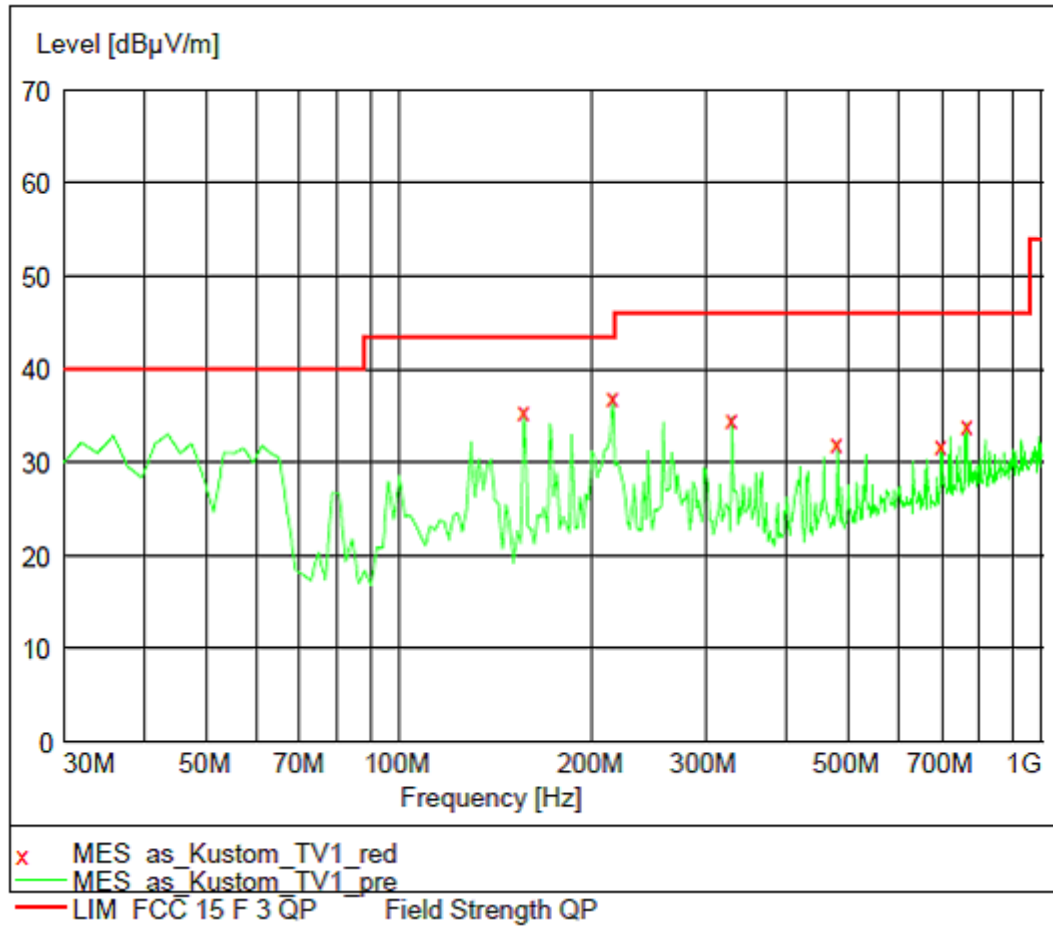
Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m; Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m

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

### Horizontal



Vertical



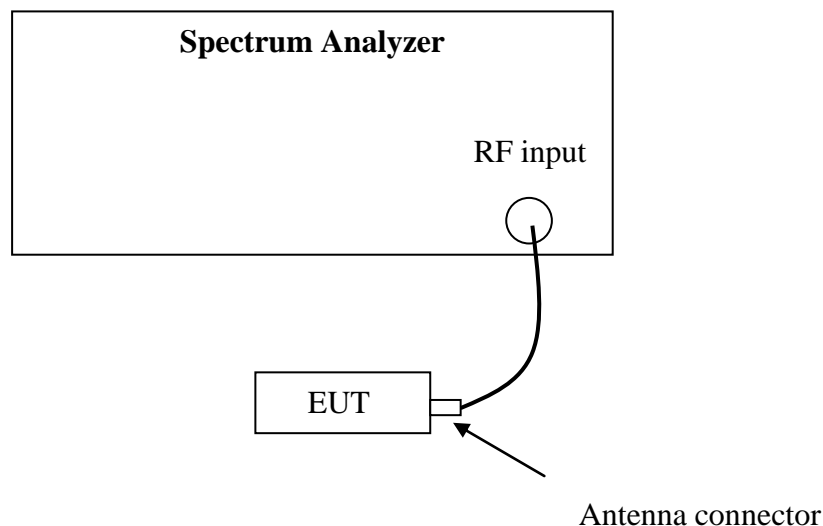
## 7. Conducted Spurious Emissions & Band Edge

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  $\geq$  RBW, Sweep = auto, Detector = peak, Trace = max hold.

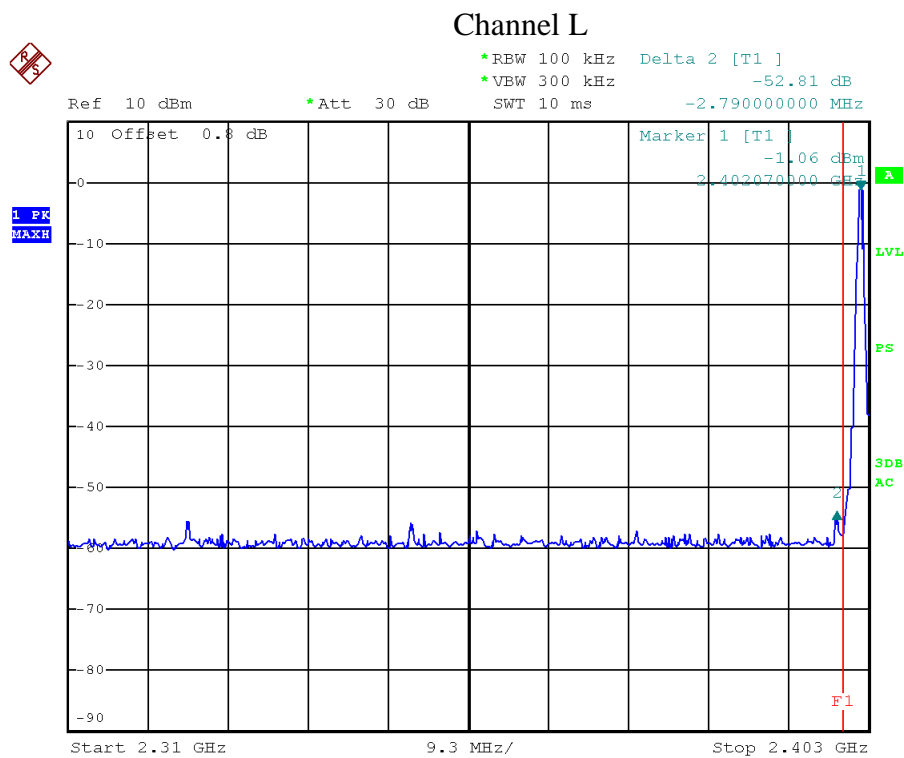
The test was performed at 3 channels (lowest, middle and highest channel).

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

## 7.4 Test protocol

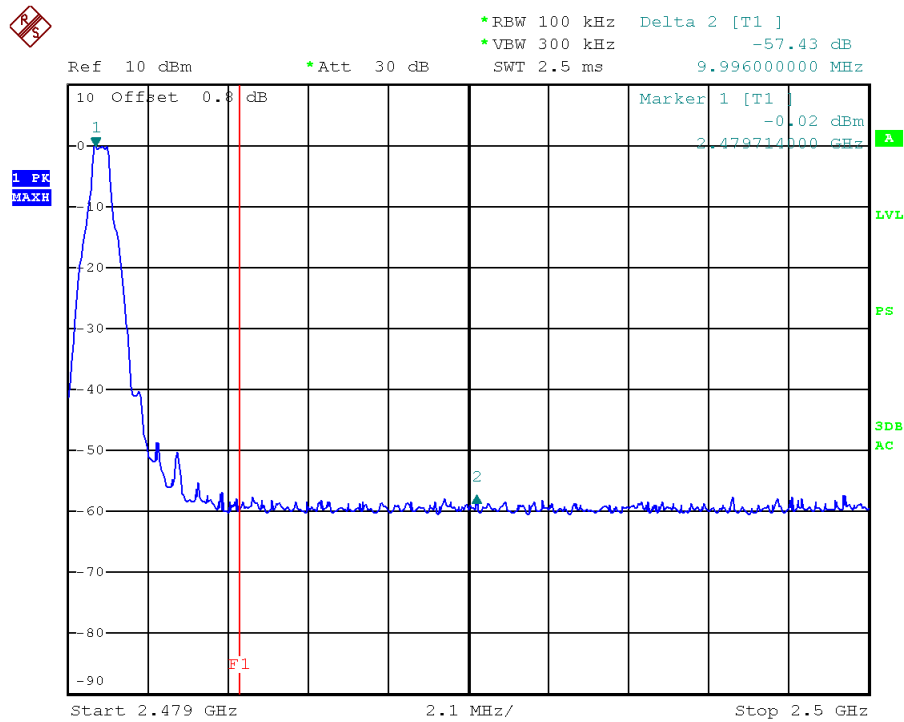
Model	CH	Max reading among band (dBm)	The most restrict Attenuation outside band (dB)	Limit (dB)
GFSK	L	-1.06	52.81	≥20
	M	-0.50	51.56	
	H	-0.02	57.43	

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



Date: 13.MAR.2014 14:11:08

### Channel H



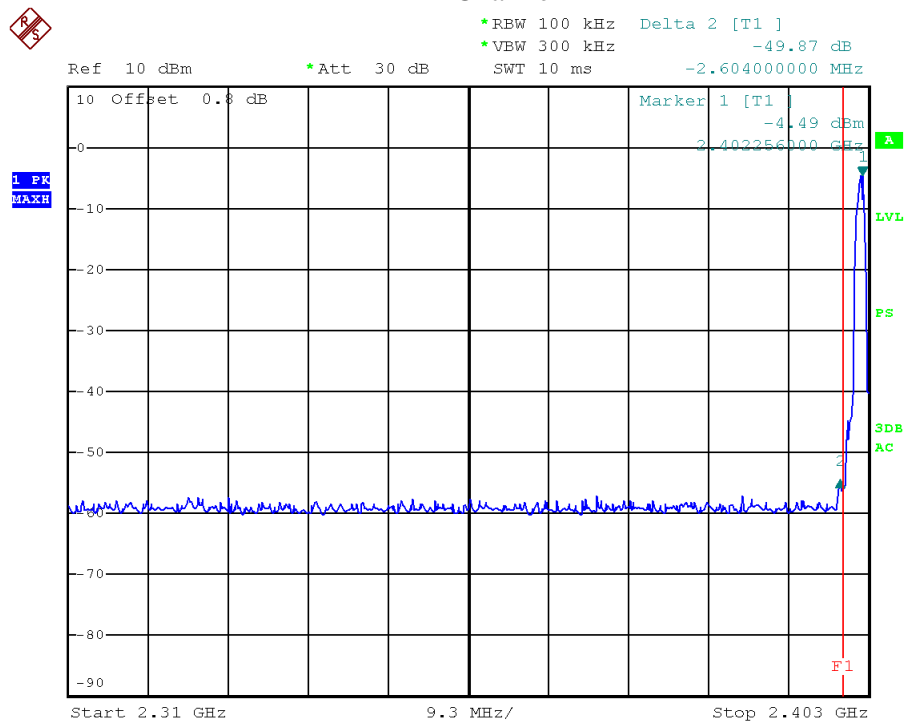
Date: 14.MAR.2014 10:09:26

Model	CH	Max reading among band (dBm)	The most restrict Attenuation outside band (dB)	Limit (dB)
8DPSK	L	-4.49	49.87	≥20
	M	-3.72	52.00	
	H	-2.96	54.81	

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

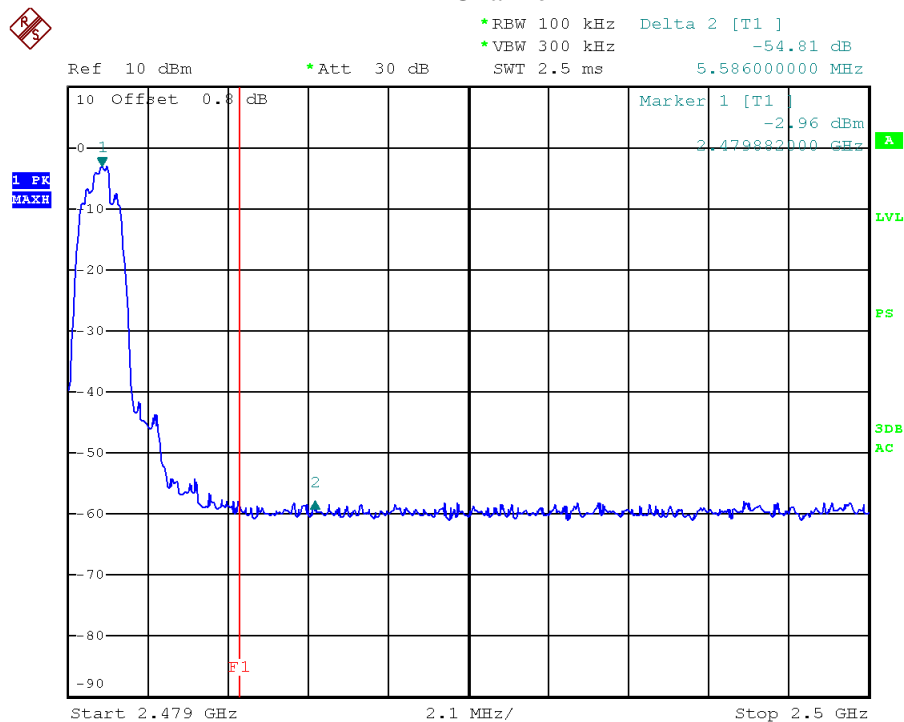


### Channel L



Date: 13.MAR.2014 14:15:12

### Channel H



Date: 13.MAR.2014 14:17:58

## 8. Power line conducted emission

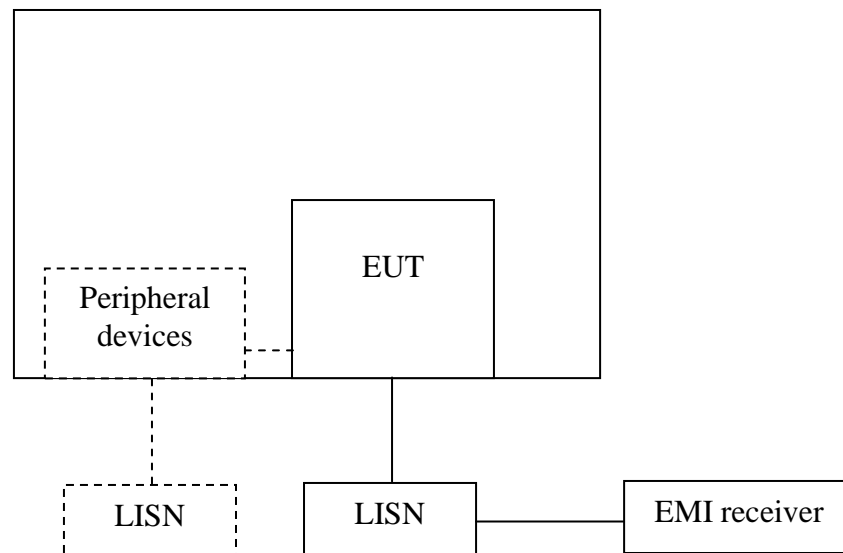
Test result: Pass

### 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.

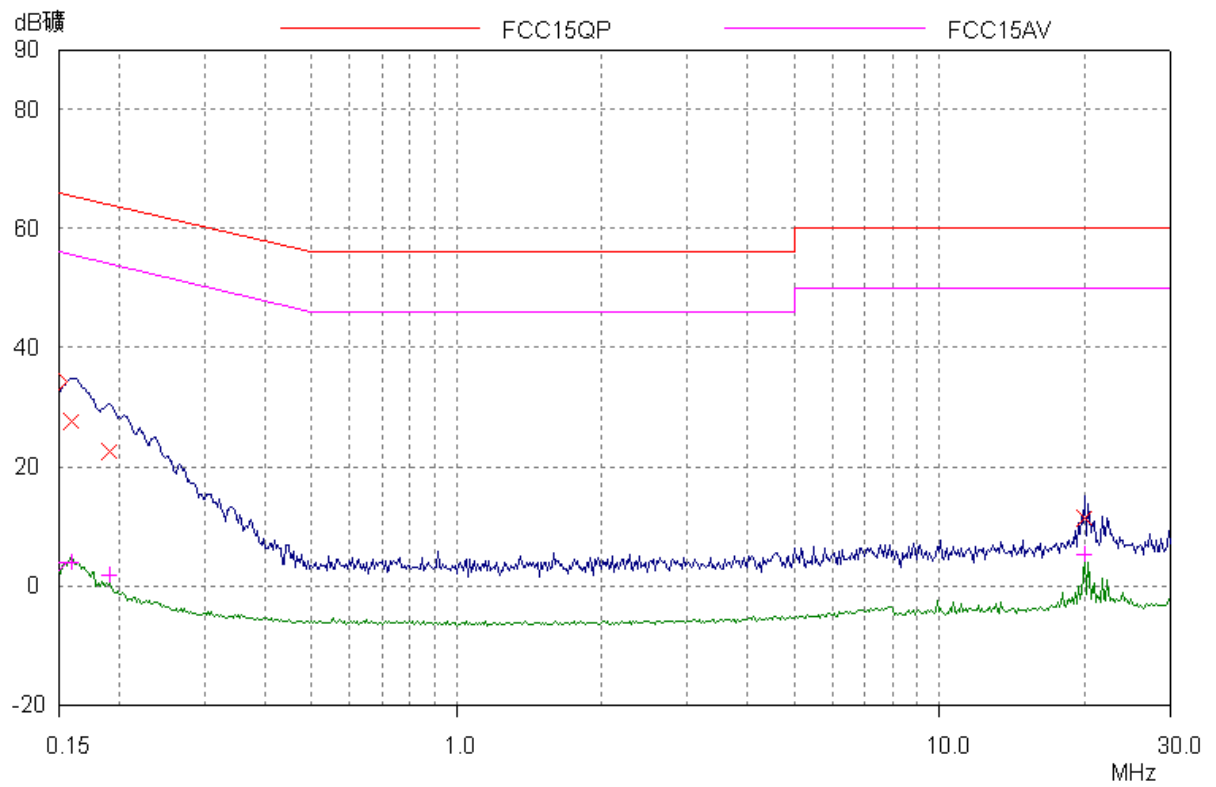
In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4 on conducted measurement.

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

Frequency	Correct Factor (dB)	Corrected Reading (dBuV)		Limit (dBuV)		Margin (dB)	
		QP	AV	QP	AV	QP	AV
0.15 (L)	0.27	27.65	3.99	65.54	55.54	37.89	51.55
0.19 (L)	0.14	22.49	1.68	64.01	54.01	41.52	52.33
19.87 (L)	0.94	11.41	5.30	60.00	50.00	48.59	44.70
0.16 (N)	0.27	27.53	4.04	65.54	55.54	38.01	51.50
0.19 (N)	0.14	22.26	1.68	64.01	54.01	41.75	52.33
19.87 (N)	0.94	9.75	5.40	60.00	50.00	50.25	44.60
Remark: 1. Correction Factor (dB) = LISN Factor (dB) + Cable Loss (dB). 2. Margin (dB) = Limit - Corrected Reading.							



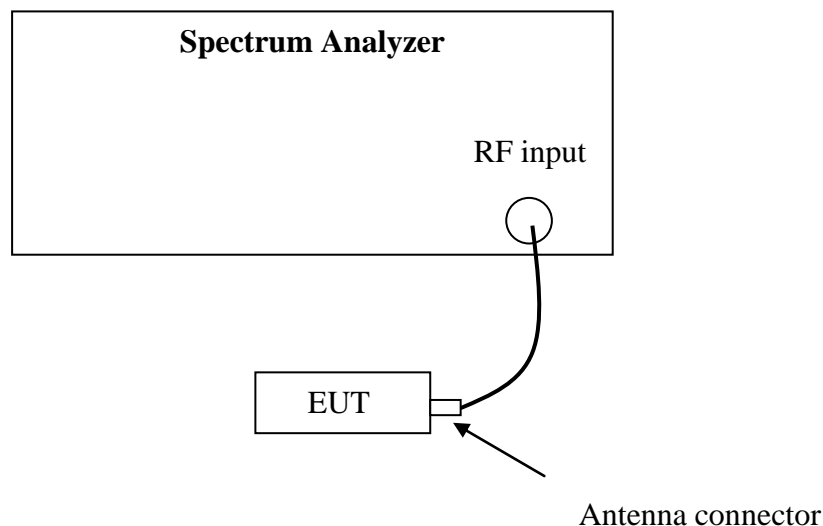
## **9. Number of Hopping Frequencies**

**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**

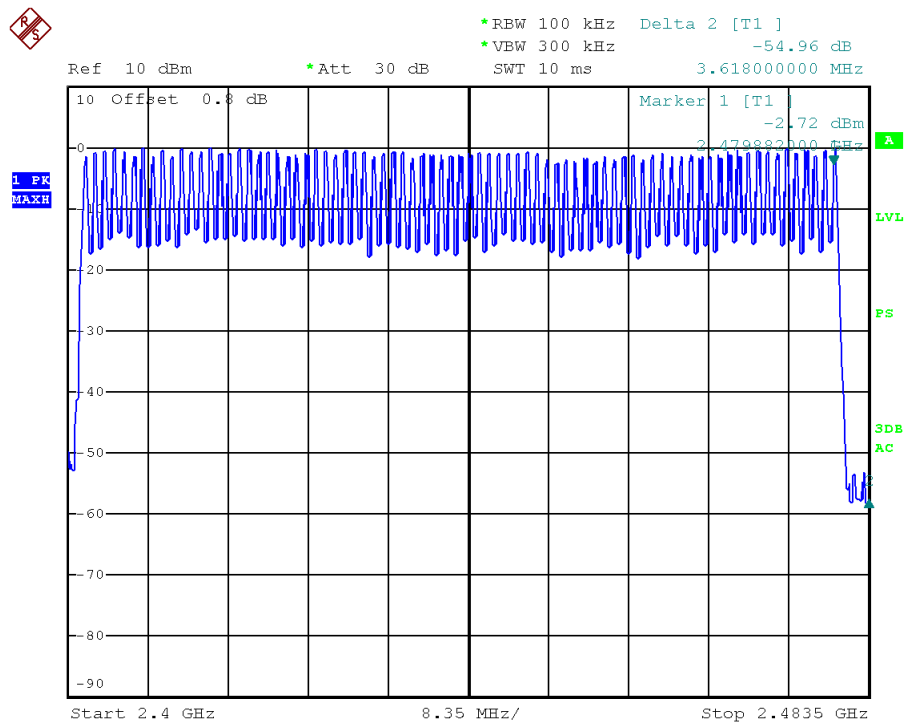


### **9.3 Test procedure and test setup**

The channel number per FCC §15.247(a)(1)(iii) is measured using the Spectrum Analyzer with RBW=100kHz, VBW $\geq$ 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	$\geq 15$



Date: 13.MAR.2014 14:23:06

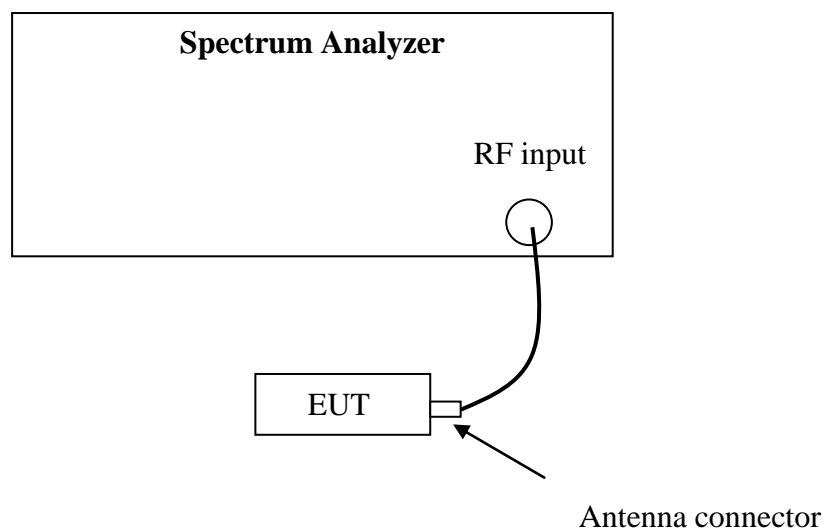
## 10. Dwell Time

**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 $\geq$ 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

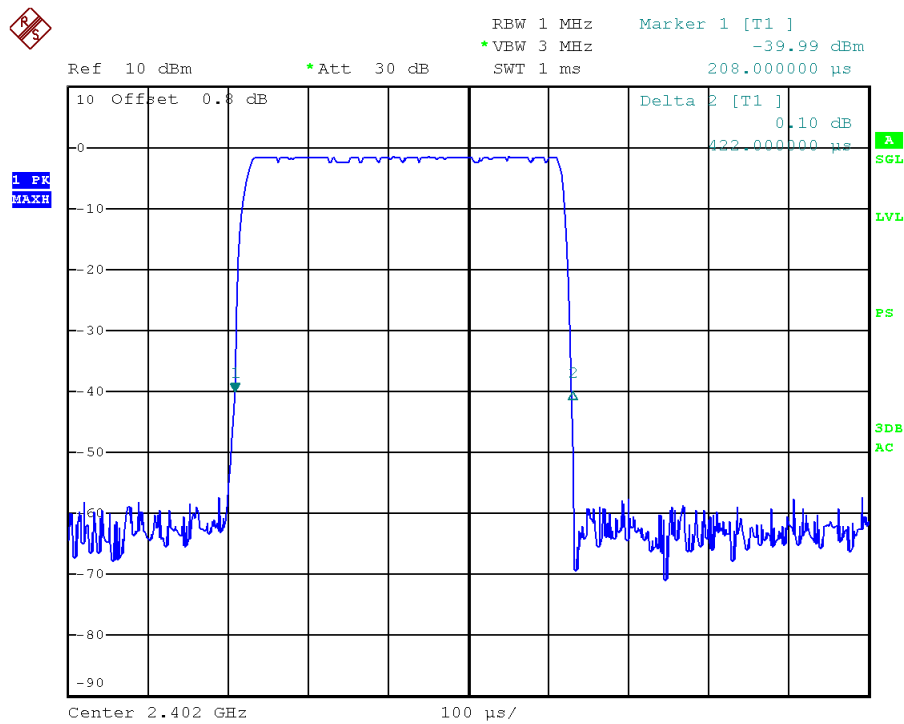
Packet	Occupancy time for single hop (ms) <b>O</b>	CH	Real observed period (s) <b>P</b>	Hops among Observed period <b>I</b>	Dwell time (s) <b>T</b>	Limit (s)
DH1	0.422	L	3.16	33	0.14	≤0.4
		M	3.16	33	0.14	
		H	3.16	33	0.14	
DH3	1.688	L	3.16	17	0.29	
		M	3.16	17	0.29	
		H	3.16	17	0.29	
DH5	2.924	L	3.16	11	0.32	
		M	3.16	11	0.32	
		H	3.16	11	0.32	

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  $T = O * I * 31.6 / P$

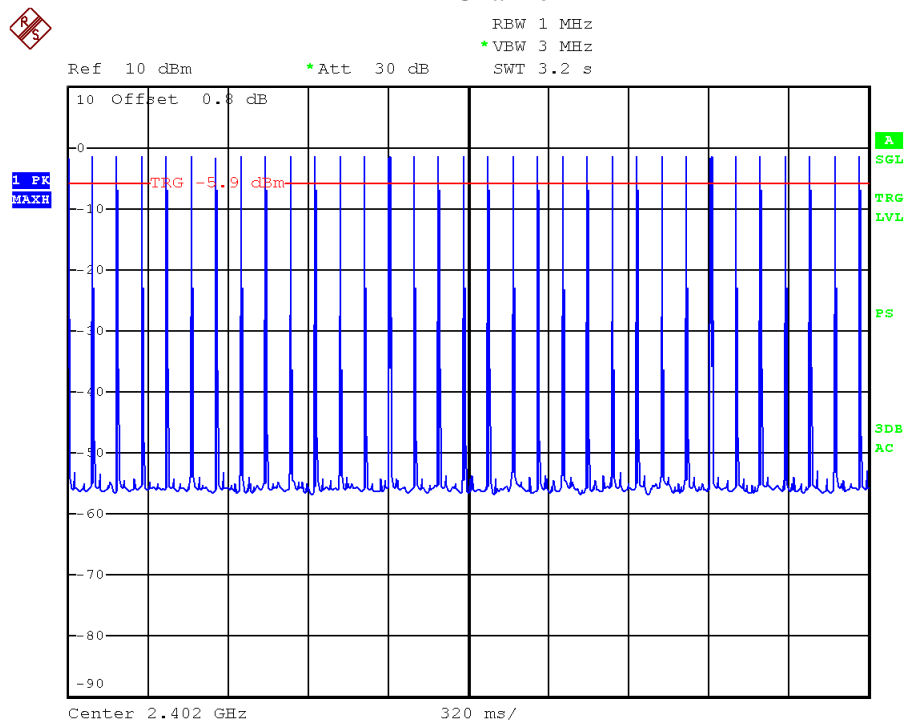


### DH1



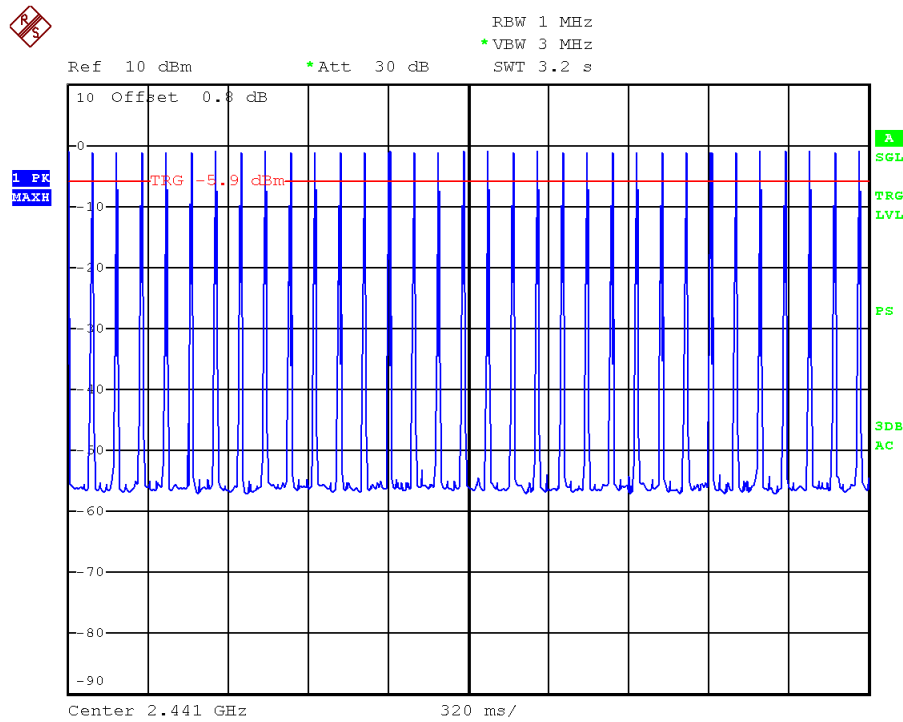
Date: 13.MAR.2014 14:28:26

### Channel L



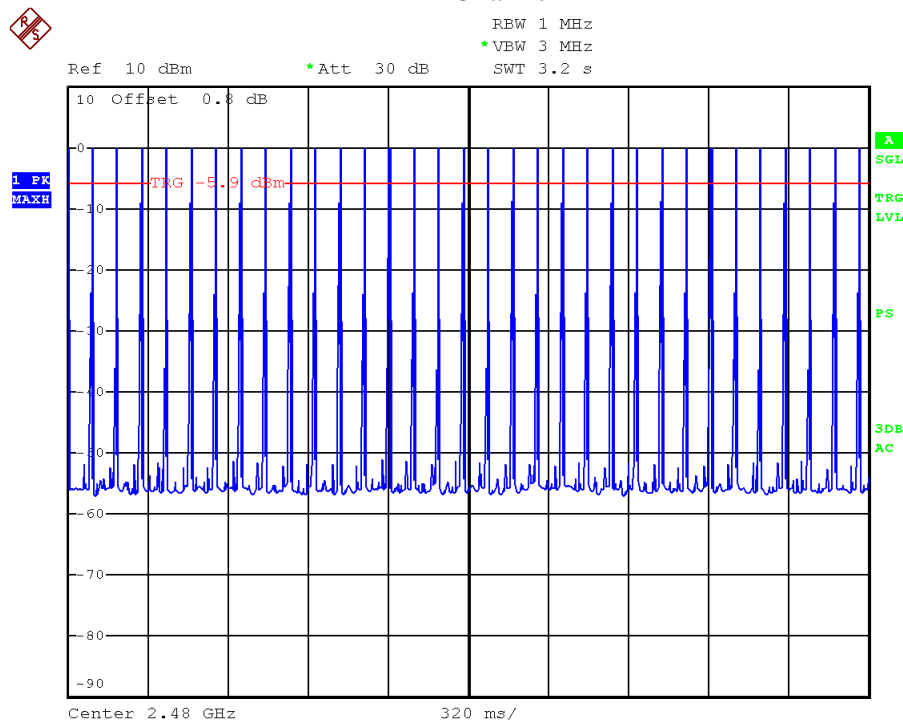
Date: 13.MAR.2014 15:01:08

### Channel M



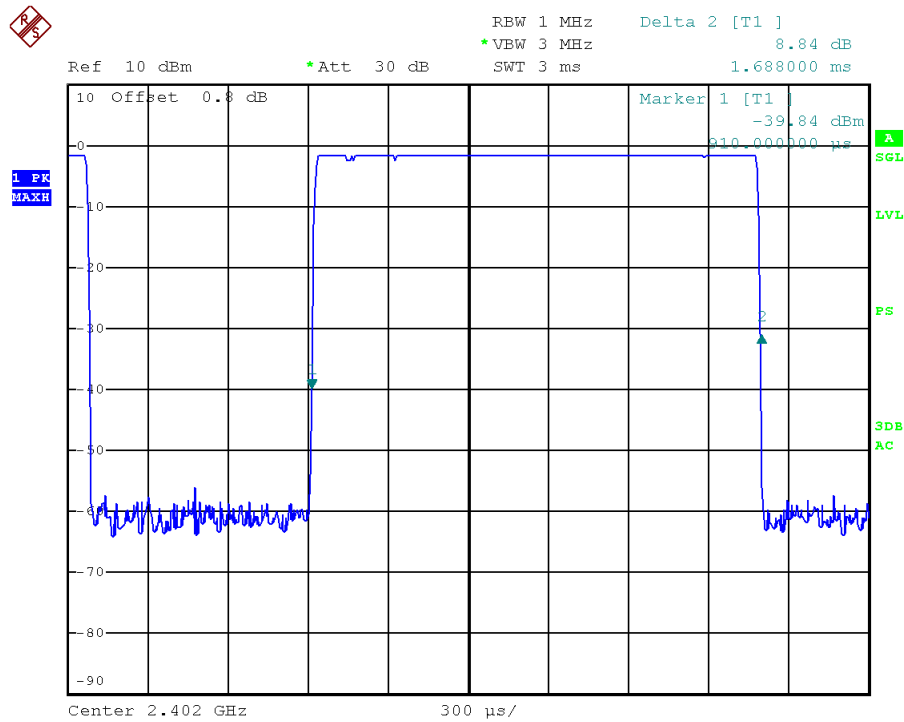
Date: 13.MAR.2014 15:01:30

### Channel H



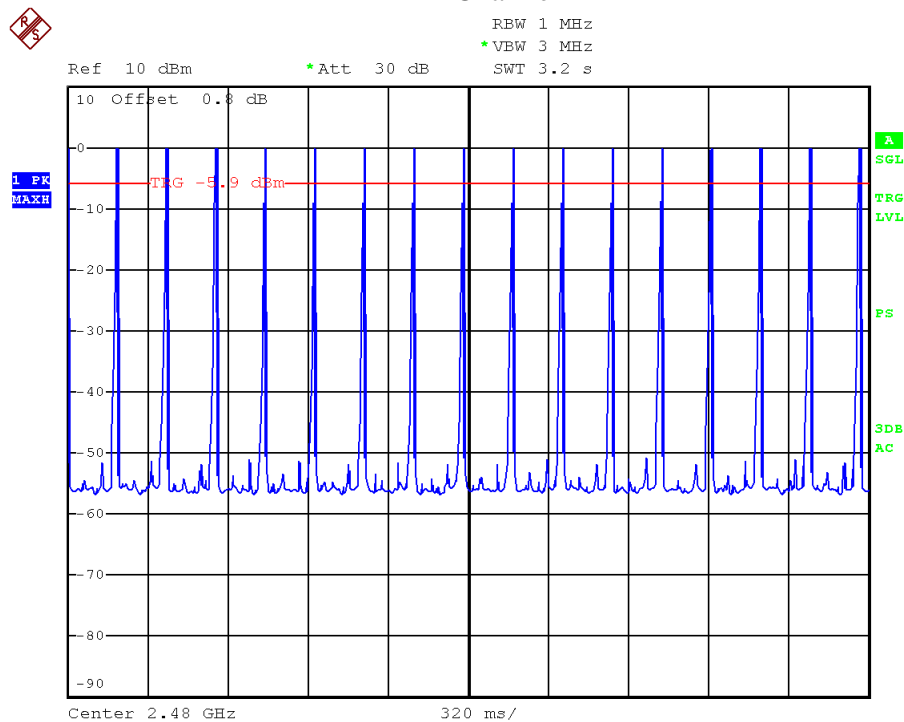
Date: 13.MAR.2014 15:01:54

### DH3



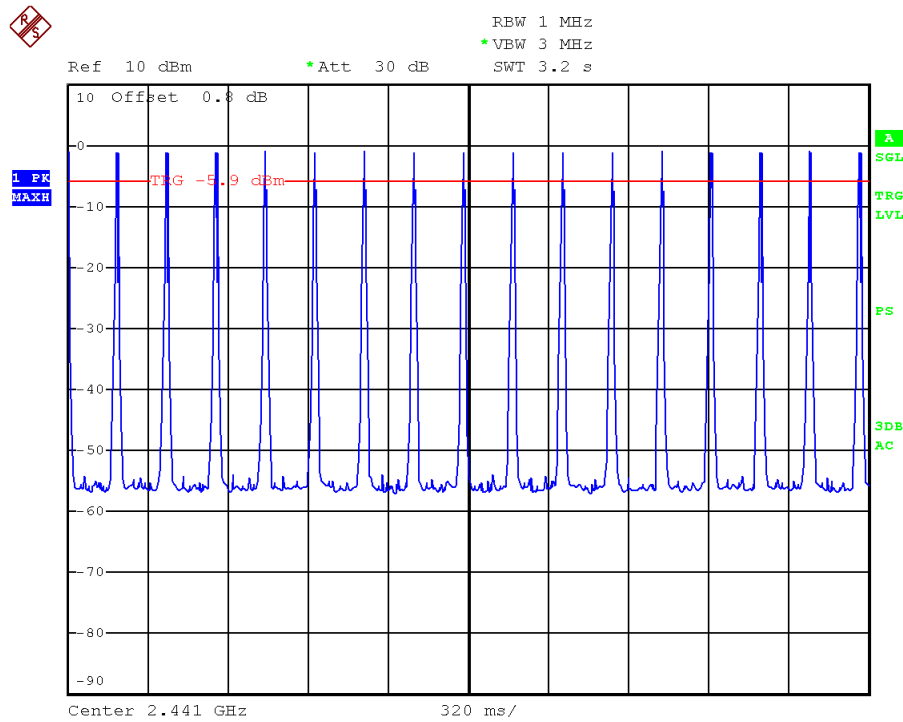
Date: 13.MAR.2014 14:30:16

### Channel L



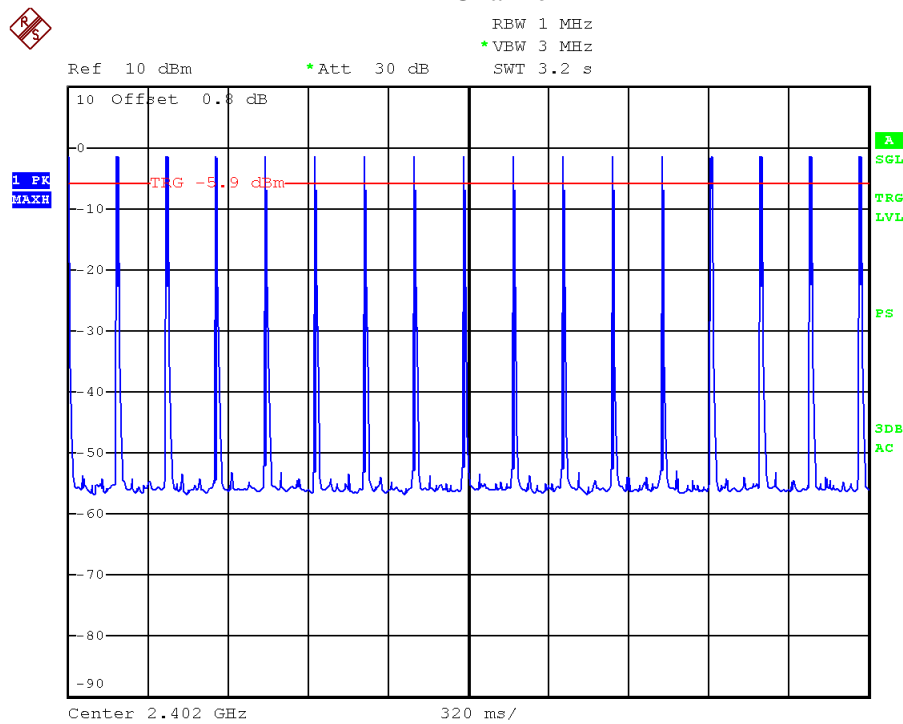
Date: 13.MAR.2014 15:02:52

### Channel M

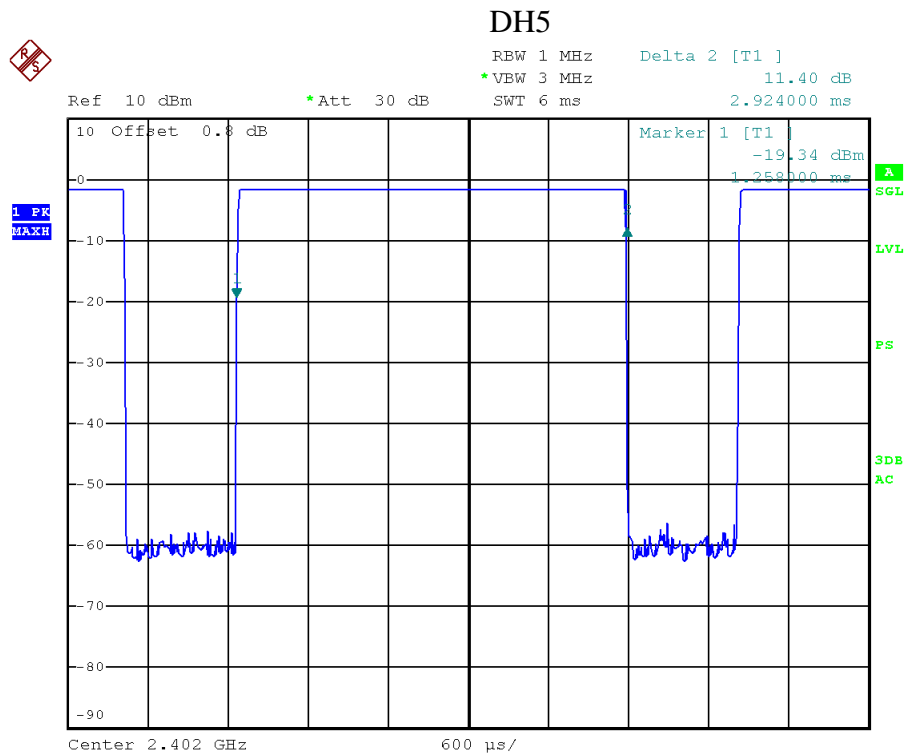


Date: 13.MAR.2014 15:03:43

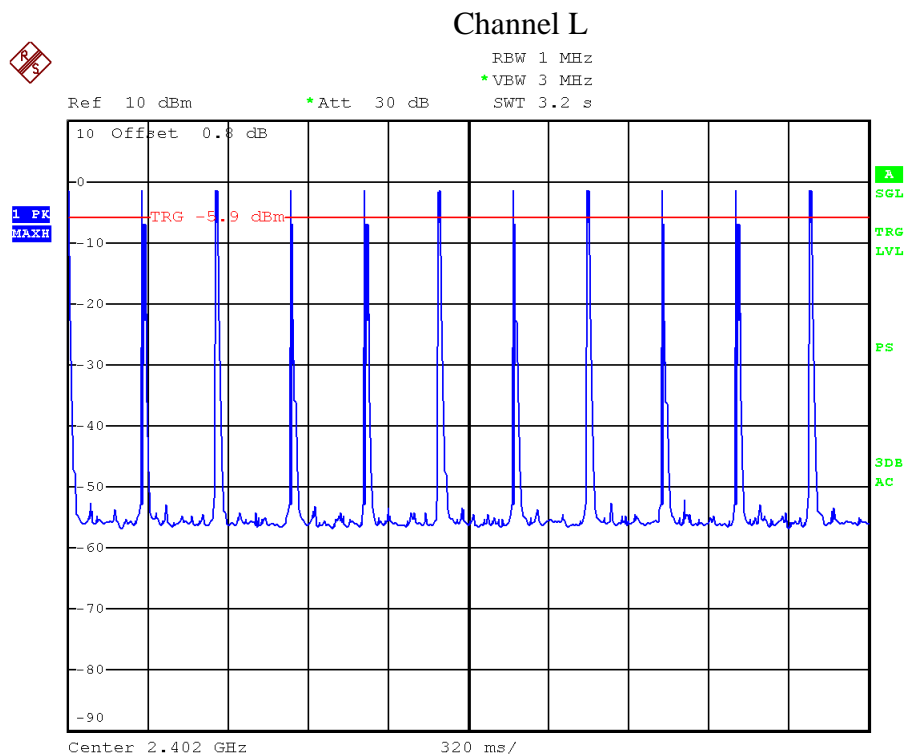
### Channel H



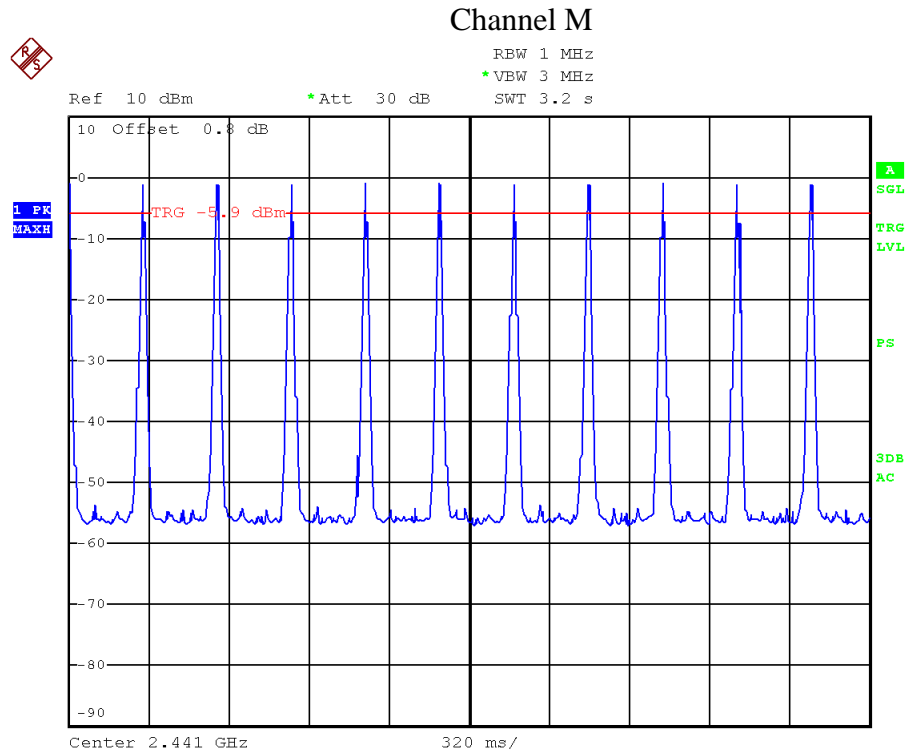
Date: 13.MAR.2014 15:03:59



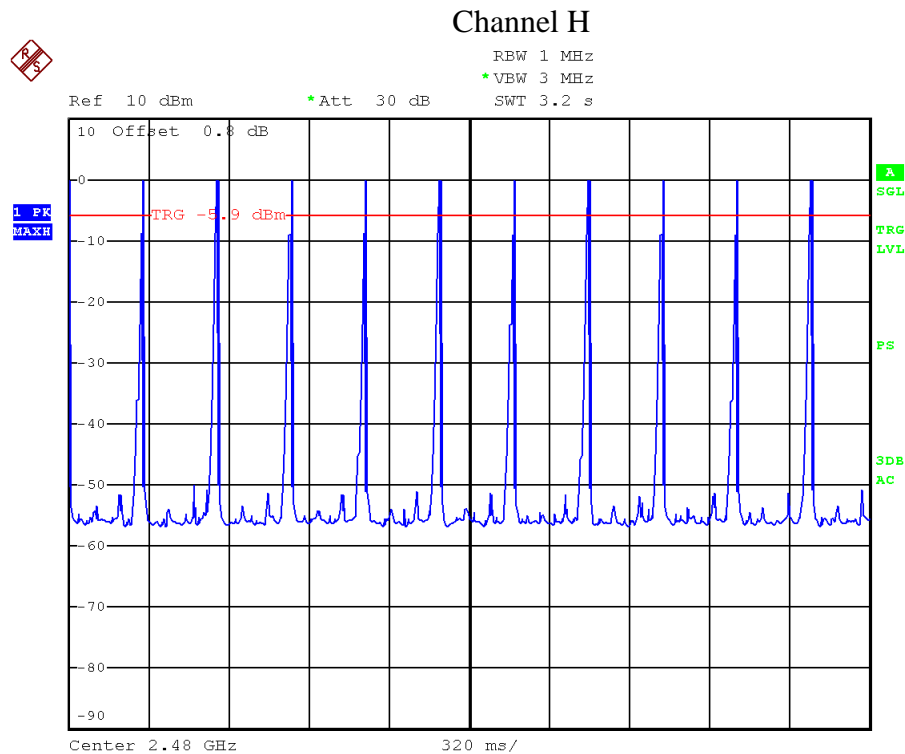
Date: 13.MAR.2014 14:32:35



Date: 13.MAR.2014 15:04:56



Date: 13.MAR.2014 15:05:16



Date: 13.MAR.2014 15:05:34

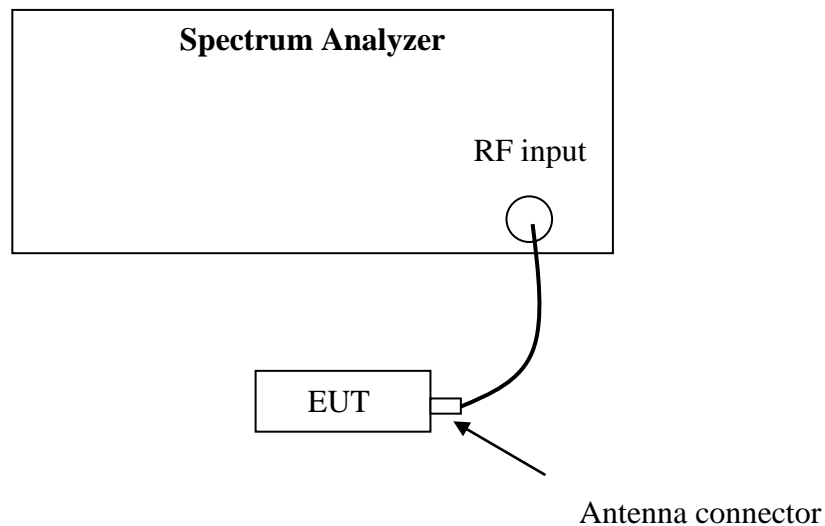
## 11. Occupied Bandwidth

**Test Status: Tested**

### 11.1 Test limit

None

### 11.2 Test Configuration



### 11.3 Test procedure and test setup

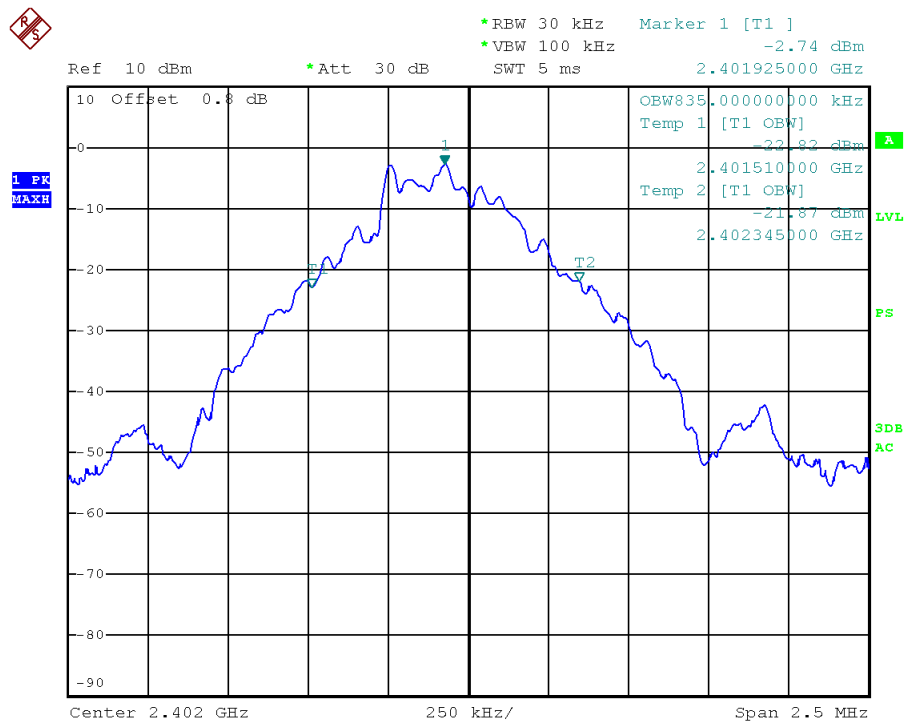
The occupied bandwidth per RSS-Gen Issue 3 Clause 4.6.1 was measured using the Spectrum Analyzer with the RBW close to 1% of the selected span,  $VBW = 3 * RBW$  Detector = Sample, Sweep = Auto.

## 11.4 Test protocol

Temperature : 22 °C  
Relative Humidity : 45 %

Modulation	Channel	Occupied Bandwidth (kHz)
GFSK	L	835.00
	M	840.00
	H	840.00

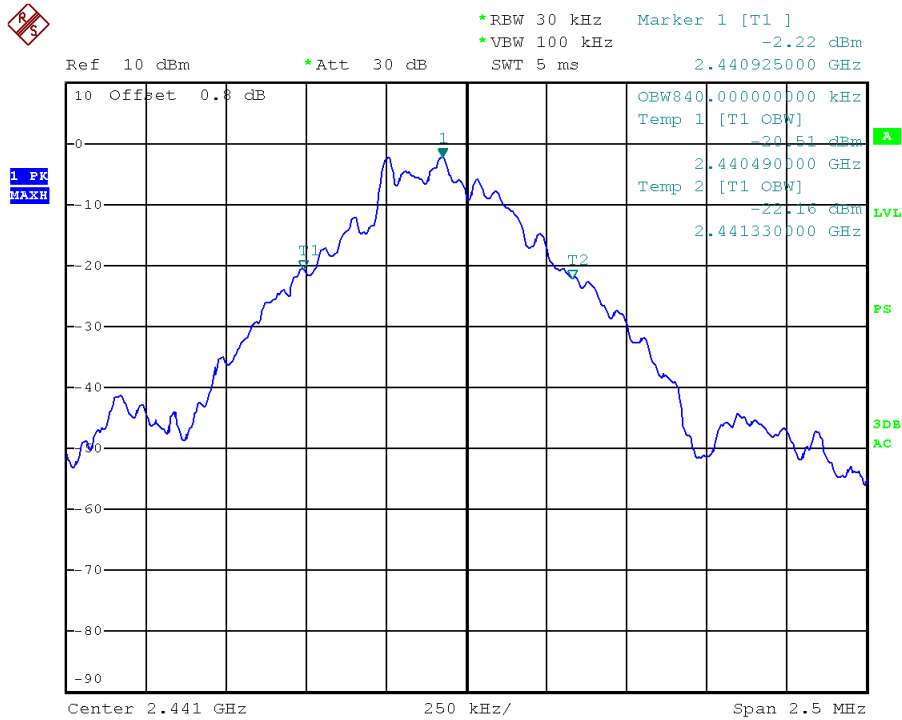
### Channel L



Date: 13.MAR.2014 13:32:50

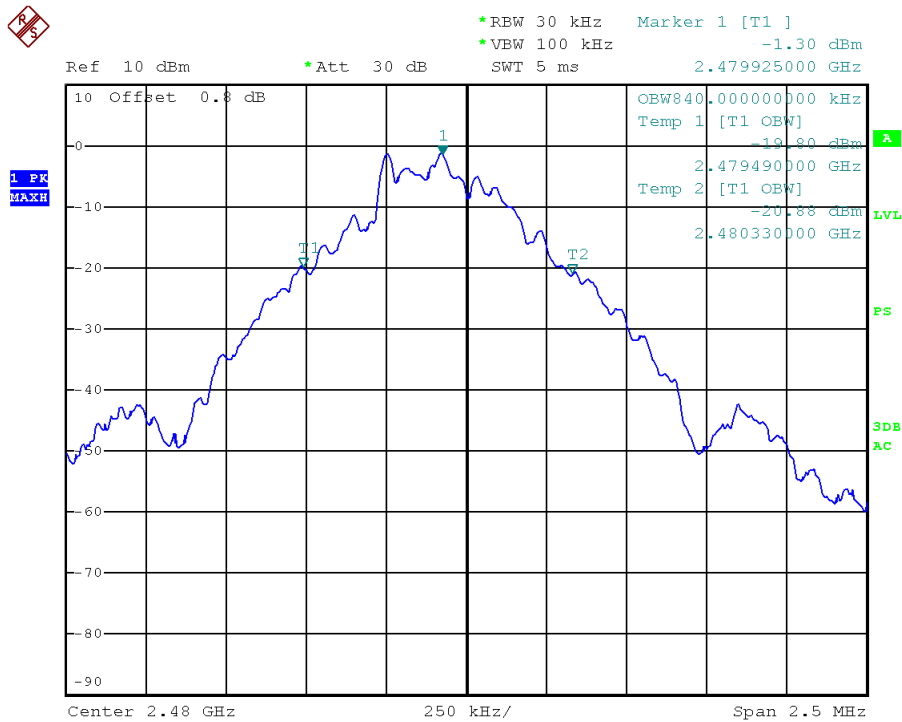


### Channel M



Date: 13.MAR.2014 13:33:34

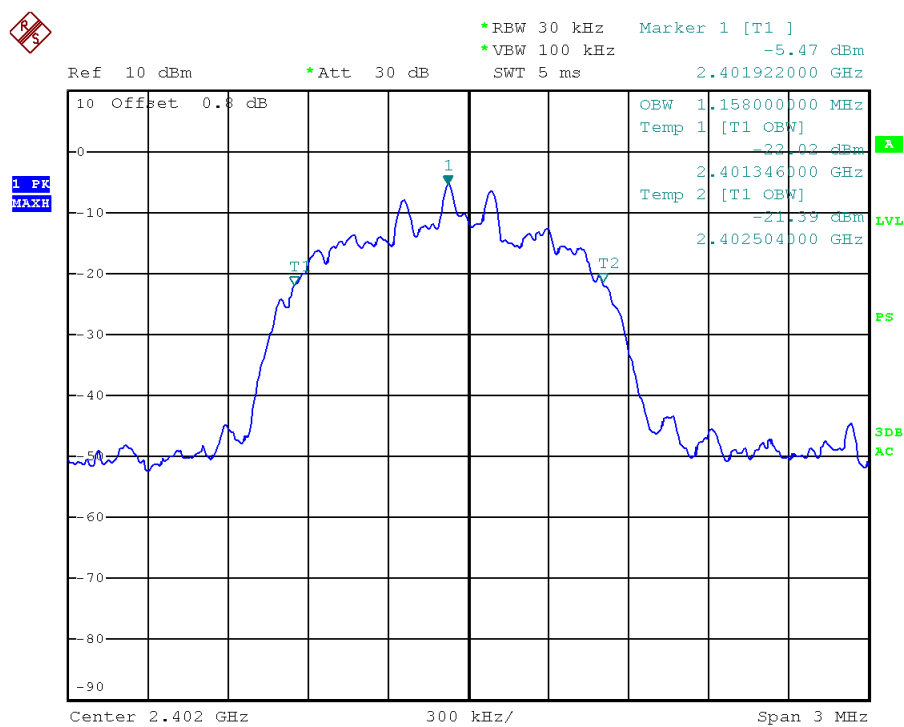
### Channel H



Date: 13.MAR.2014 13:34:00

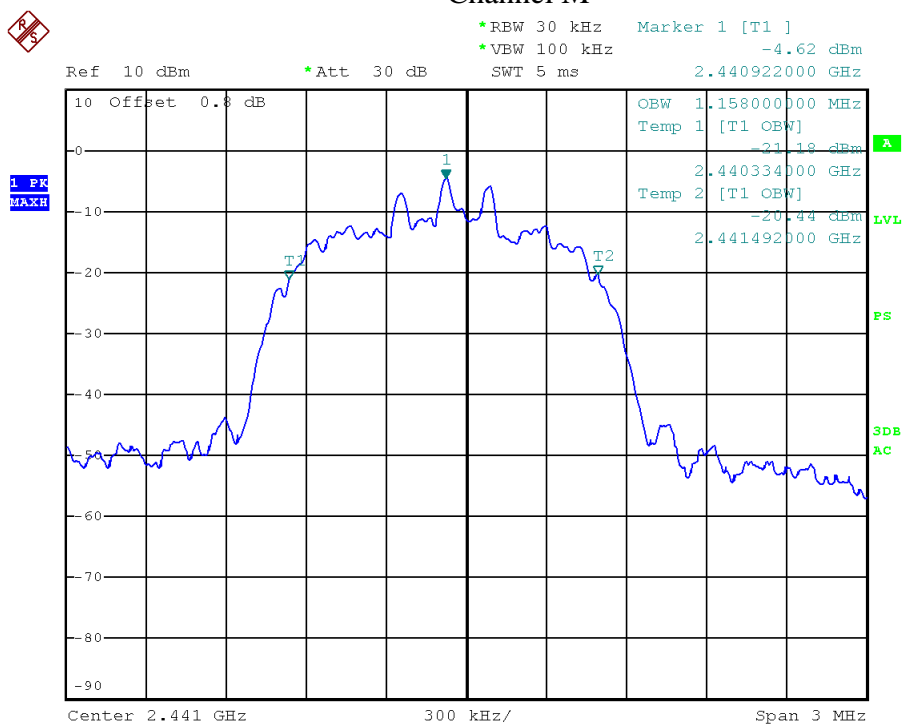
Modulation	Channel	Occupied Bandwidth (kHz)
8DPSK	L	1158.00
	M	1158.00
	H	1158.00

### Channel L



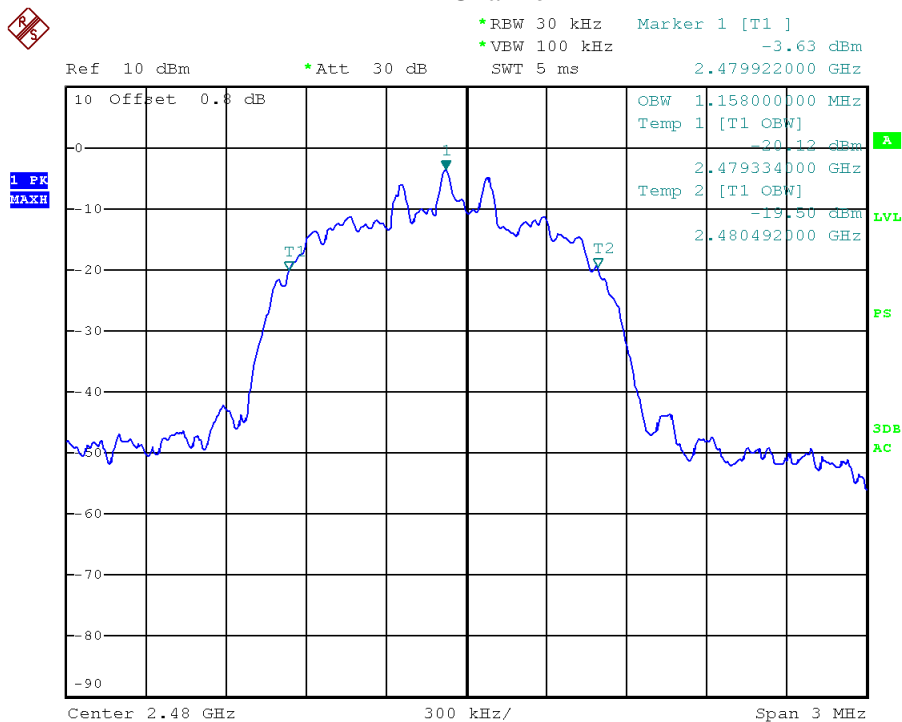
Date: 13.MAR.2014 13:37:34

## Channel M



Date: 13.MAR.2014 13:39:20

## Channel H



Date: 13.MAR.2014 13:40:14

## 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