

EMC TEST REPORT for Bluetooth Device

No. 150301602SHA-001

Applicant : Ningbo Desa Electrical Appliance Manufacturing Co., Ltd
Industrial Estate Fuhai Town, Cixi, Zhejiang, China

Manufacturer : Ningbo Desa Electrical Appliance Manufacturing Co., Ltd
Industrial Estate Fuhai Town, Cixi, Zhejiang, China

Equipment : Quartz Infrared Portable Heater

Type/Model : GD9315BCW-FPR/XXX

SUMMARY

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

47CFR Part 15 (2014): Radio Frequency Devices

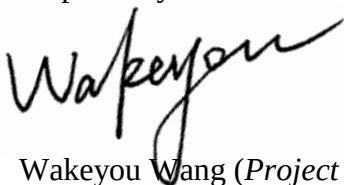
ANSI C63.4 (2003): American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

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 and Information for the Certification of Radiocommunication Equipment

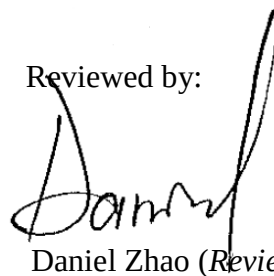
Date of issue: April 12, 2015

Prepared by:



Wakeyou Wang (Project Engineer)

Reviewed by:



Daniel Zhao (Reviewer)



Description of Test Facility

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

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

Name of contact: Jonny Jing
Tel: +86 21 61278271
Fax: +86 21 54262353

Content

SUMMARY.....	1
DESCRIPTION OF TEST FACILITY.....	2
1. GENERAL INFORMATION	5
1.1 Applicant Information.....	5
1.2 Identification of the EUT	5
1.3 Technical specification	5
1.4 Mode of operation during the test / Test peripherals used.....	6
1.5 Frequency Hopping System Requirement	6
2. TEST SPECIFICATION	8
2.1 Instrument list	8
2.2 Test Standard	8
2.3 Test Summary	9
3. 20 dB BANDWIDTH.....	10
3.1 Limit.....	10
3.2 Test Configuration	10
3.3 Test Procedure and test setup.....	10
3.4 Test Protocol	11
4. CARRIER FREQUENCY SEPARATION	17
4.1 Limit.....	17
4.2 Test Configuration	17
4.3 Test Procedure and test setup.....	17
4.4 Test Protocol	18
5. MAXIMUM PEAK OUTPUT POWER	24
5.1 Test limit	24
5.2 Test Configuration	24
5.3 Test procedure and test setup.....	24
5.4 Test protocol	25
6. RADIATED SPURIOUS EMISSIONS.....	26
6.1 Test limit	26
6.2 Test Configuration	26
6.3 Test procedure and test setup.....	27
6.4 Test protocol	28
7. BAND EDGE EMISSION	32
7.1 Limit.....	32
7.2 Test Configuration	32
7.3 Test procedure and test setup.....	32
7.4 Test protocol	33
8. POWER LINE CONDUCTED EMISSION	42
8.1 Limit.....	42
8.2 Test configuration	42
EMI receiver	42
8.3 Test procedure and test set up.....	43
8.4 Test protocol	44
9. NUMBER OF HOPPING FREQUENCIES.....	45
9.1 Limit.....	45
9.2 Test Configuration	45

9.3 Test procedure and test setup	45
9.4 Test protocol	46
10. DWELL TIME	52
10.1 Limit.....	52
10.2 Test Configuration	52
10.3 Test procedure and test setup	52
10.4 Test protocol	53
11. OCCUPIED BANDWIDTH	56
11.1 Test limit	56
11.2 Test Configuration	56
11.3 Test procedure and test setup	56
11.4 Test protocol	57



1. General Information

1.1 Applicant Information

Applicant: Ningbo Desa Electrical Appliance Manufacturing Co., Ltd
Industrial Estate Fuhai Town, Cixi, Zhejiang, China

Name of contact: Jerry Shen

Tel: 86-574-58971324

Fax: 86-574-58971329

Manufacturer: Ningbo Desa Electrical Appliance Manufacturing Co., Ltd
Industrial Estate Fuhai Town, Cixi, Zhejiang, China

Sample received date : March 23, 2015

Sample Identification No : /

Date of test : March 23, 2015 ~ April 5, 2015

1.2 Identification of the EUT

Equipment: Quartz Infrared Portable Heater

Type/model: GD9315BCW-FPR/XXX

FCC ID: 2AEHAGD9315BCW-FPR

IC: /

1.3 Technical specification

Operation Frequency Band: 2402 - 2480 MHz

Modulation: GFSK, Pi/4 DQPSK, 8DQPSK

Gain of Antenna: PCB antenna, 1.2dBi

Rating: 120V ac, 60Hz, 1500W

Description of EUT: The EUT is a Portable Heater containing Bluetooth modules.

Channel Description: The channel spacing is 1MHz.

1.4 Mode of operation during the test / Test peripherals used

While testing transmitting mode of EUT, the internal modulation was applied.

Test software setting: Default power setting among the software *UartAssist.exe*.

Test peripherals used:

Item No	Description	Band and Model	S/No
1	Laptop computer	HP ProBook 6470b	NA

Test mode:

Mode 1: Hopping off, GFSK_DH5

Mode 2: Hopping off, Pi/4 DQPSK_DH5

Mode 3: Hopping off, 8DPSK_DH5

Mode 4: Hopping on, GFSK_DH5

Mode 5: Hopping on, Pi/4 DQPSK_DH5

Mode 6: Hopping on, 8DPSK_DH5

Test Channel:

Channel	Frequency (MHz)
L	2402
M	2441
H	2480

1.5 Frequency Hopping System Requirement

☒ Compliance for Section 15.247 (a)(1), (g), (h) requirement

The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

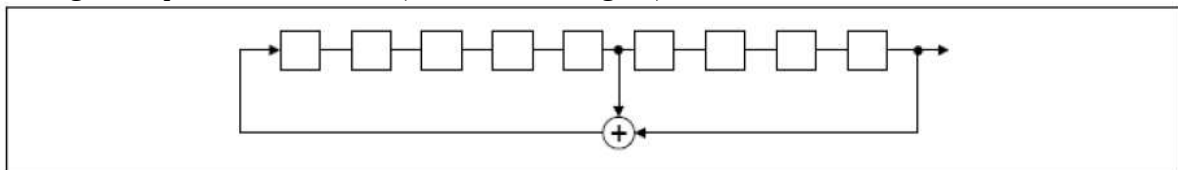
The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hop sets to avoid hopping on occupied channels is

permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

☒ Compliance for Section 15.247 (a)(1)

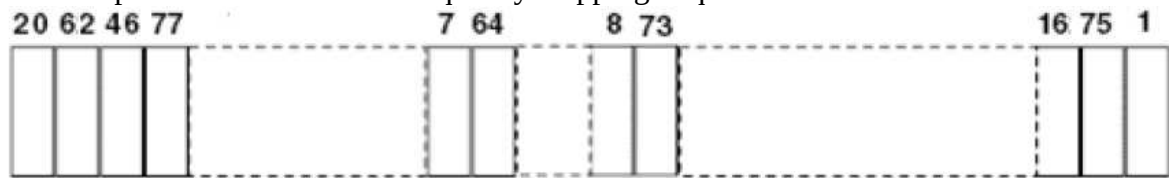
According to Bluetooth Core Specification, the pseudorandom sequence may be generated in a ninestage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized with nine ones.

- Number of shift register stages: 9
- Length of pseudo-random sequence: $2^9 - 1 = 511$ bits
- Longest sequence of zeros: 8 (non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:



Each frequency used equally on the average by each transmitter.

According to Bluetooth Core Specification, Bluetooth receivers are designed to have input and IF bandwidths that match the hopping channel bandwidths of any Bluetooth transmitters and shift frequencies in synchronization with the transmitted signals.

☒ Compliance for section 15.247(g)

According to Bluetooth Core Specification, the Bluetooth system transmits the packet with the pseudorandom hopping frequency with a continuous data and the short burst transmission from the Bluetooth system is also transmitted under the frequency hopping system with the pseudorandom hopping frequency system.

☒ Compliance for section 15.247(h)

According to Bluetooth Core specification, the Bluetooth system incorporates with an adaptive system to detect other user within the spectrum band so that it individually and independently to avoid hopping on the occupied channels.

According to the Bluetooth Core specification, the Bluetooth system is designed not have the ability to coordinate with other FHSS System in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitter.

2. Test Specification

2.1 Instrument list

Equipment	Type	Manu.	Internal no.	Cal. Date	Due date
Test Receiver	ESCS 30	R&S	EC 2107	2014-10-21	2015-10-20
Test Receiver	ESIB 26	R&S	EC 3045	2014-10-20	2015-10-19
A.M.N.	ESH2-Z5	R&S	EC 3119	2015-1-9	2016-1-8
Bilog Antenna	CBL 6112D	TESEQ	EC 4206	2013-4-28	2015-4-27
Horn antenna	HF 906	R&S	EC 3049	2013-4-28	2015-4-27
Pre-amplifier	Pre-amp 18	R&S	EC 3222	2014-4-12	2015-4-11
Semi-anechoic chamber	-	Albatross project	EC 3048	2014-5-12	2015-5-11
High Pass Filter	WHKX 1.0/15G-10SS	Wainwright	EC4297-1	2015-1-8	2016-1-7
Power sensor / Power meter	N1911A/N1921A	Agilent	EC4318	2014-04-12	2015-04-11
Loop Antenna	FMZB 1516	SCHWARZB ECK	/	2014-11-29	2015-11-28
Temperature Camber	SETH-E	tayasaf	EC4315	2014-4-9	2015-4-9
Spectrum analyzer	E7402A	Agilent	EC2254	2014-08-16	2015-08-15

2.2 Test Standard

47CFR Part 15 (2014)
 RSS-210 Issue 8 (December 2010)
 RSS-Gen Issue 4 (November 2014)
 ANSI C63.4: 2003
 DA 00-705 (March 30, 2000)

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
Band Edge Emission	15.247(d)	RSS-210 Issue 8 Annex 8	Pass
Power line conducted emission	15.207	RSS-Gen Clause 8.8	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 Clause 6.6	NA

Note: "NA" means "not applied".

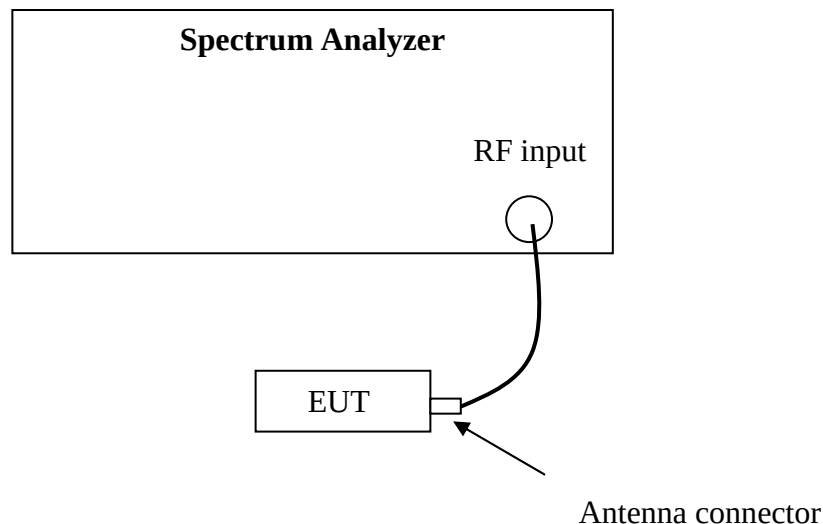
3. 20 dB Bandwidth

Test result: **Tested**

3.1 Limit

- ☐ Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 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.

3.2 Test Configuration



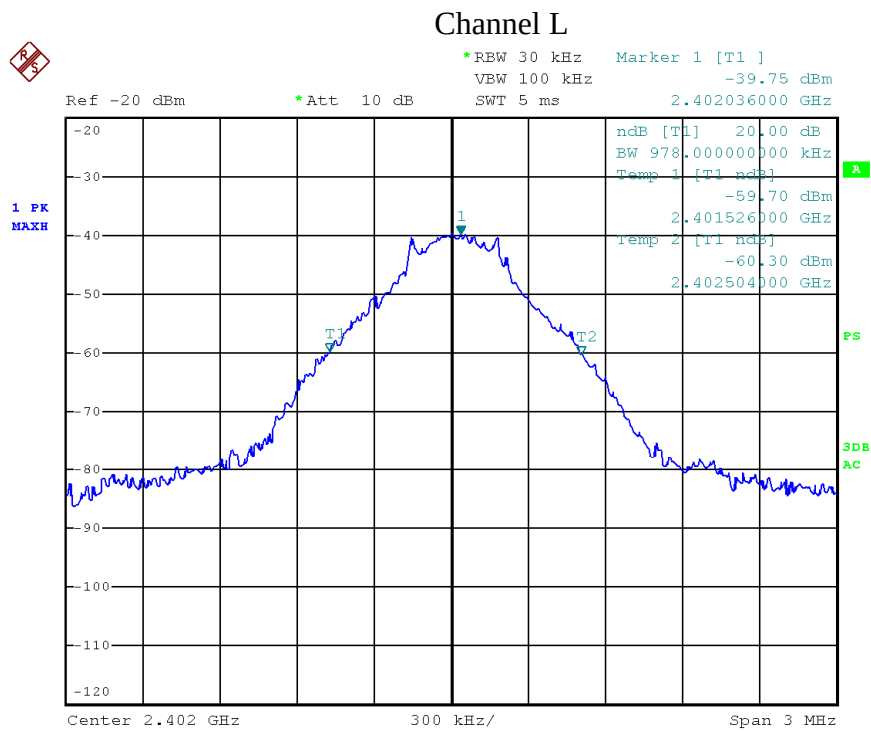
3.3 Test Procedure and test setup

The 20 bandwidth per FCC § 15.247(a)(1) is measured using the Spectrum Analyzer with Span = approximately 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

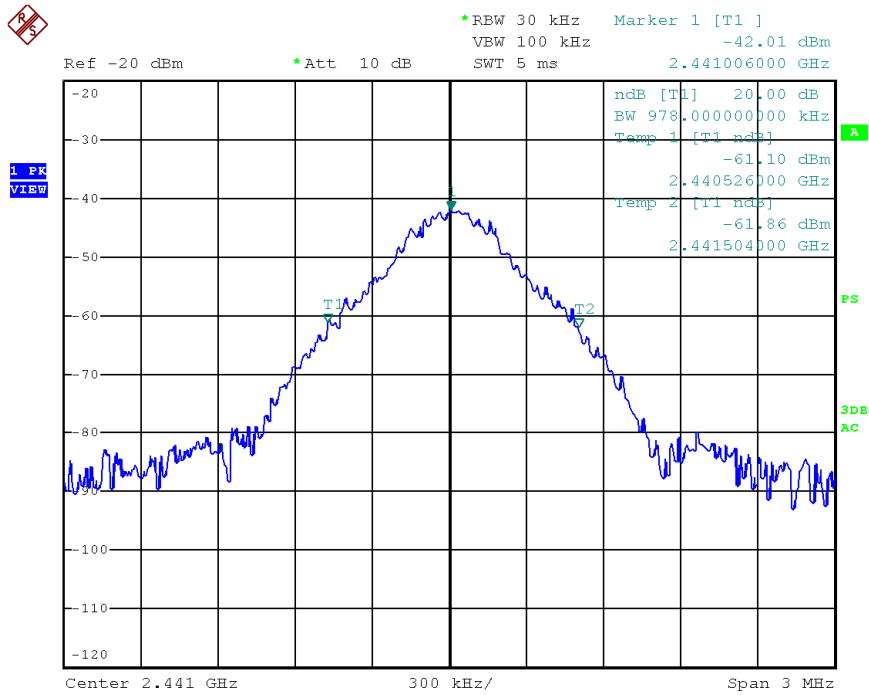
Temperature : 25°C
Relative Humidity : 55 %

Mode	CH	20dB Bandwidth (kHz)
1	L	978
	M	978
	H	848



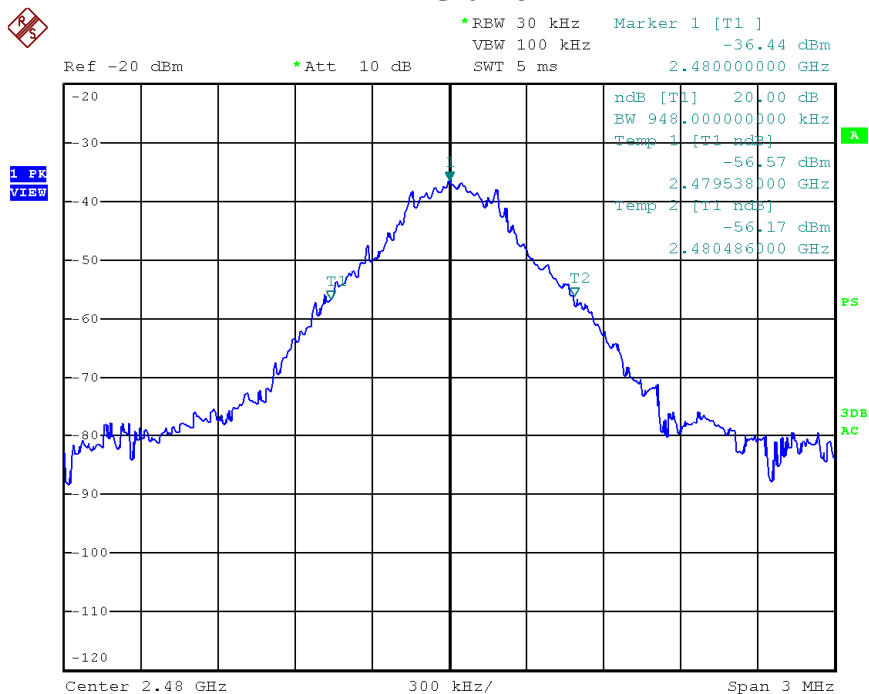
Date: 24.MAR.2015 16:01:00

Channel M



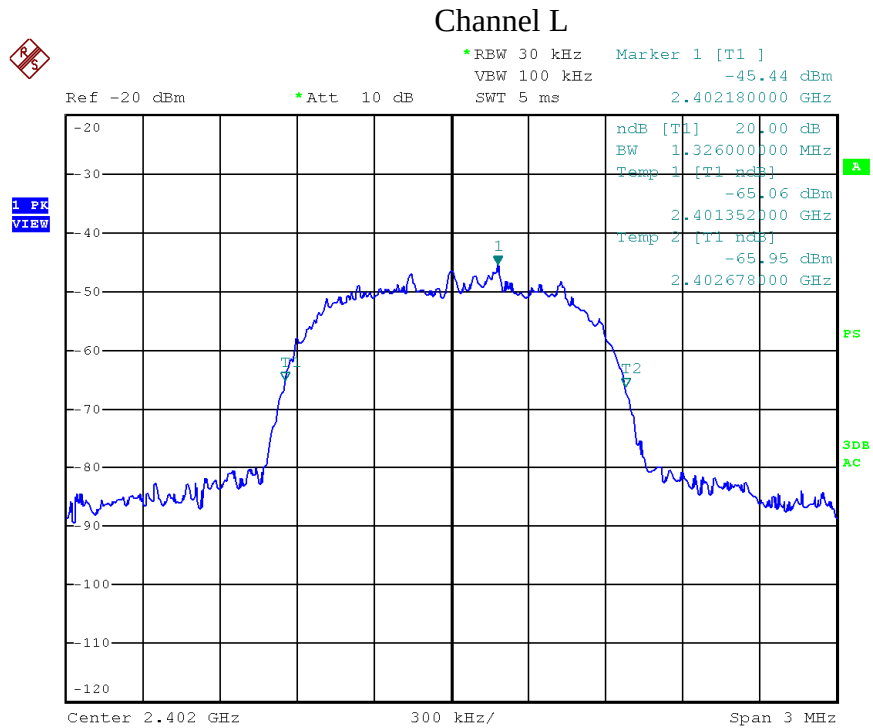
Date: 24.MAR.2015 16:02:04

Channel H



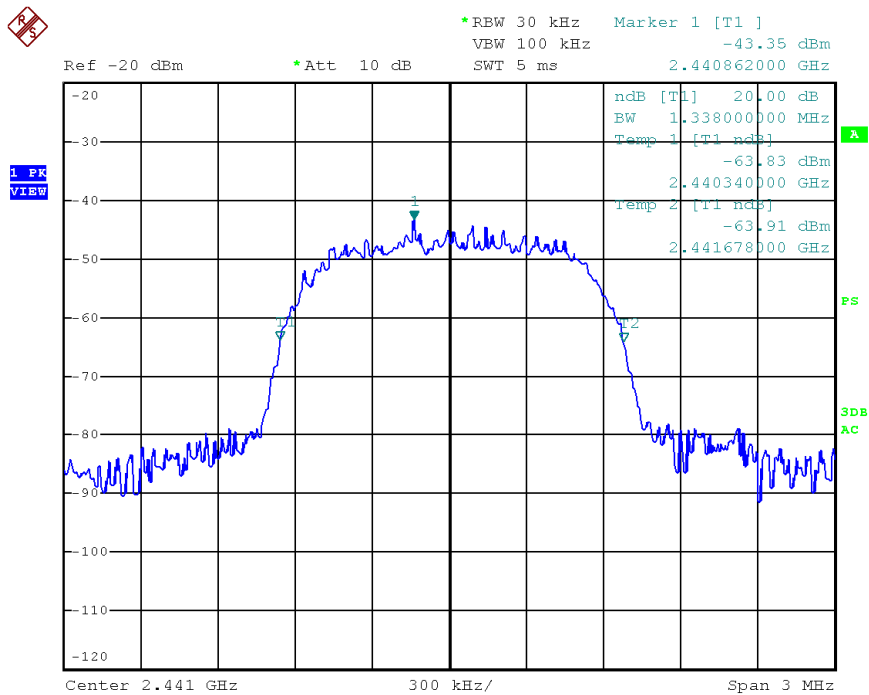
Date: 24.MAR.2015 16:02:35

Mode	CH	20dB Bandwidth (kHz)
2	L	1326
	M	1338
	H	1302



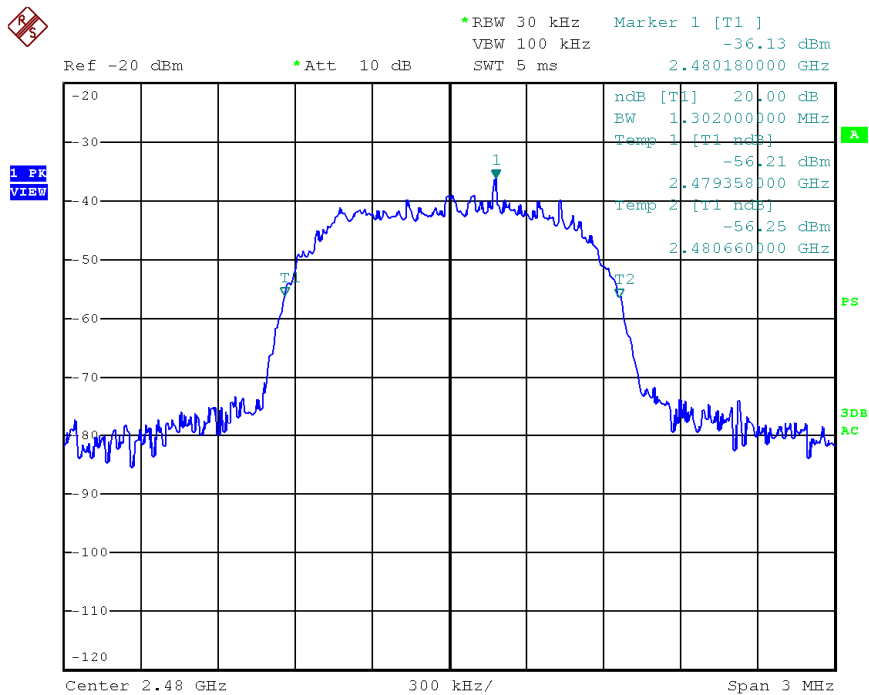
Date: 24.MAR.2015 16:03:50

Channel M



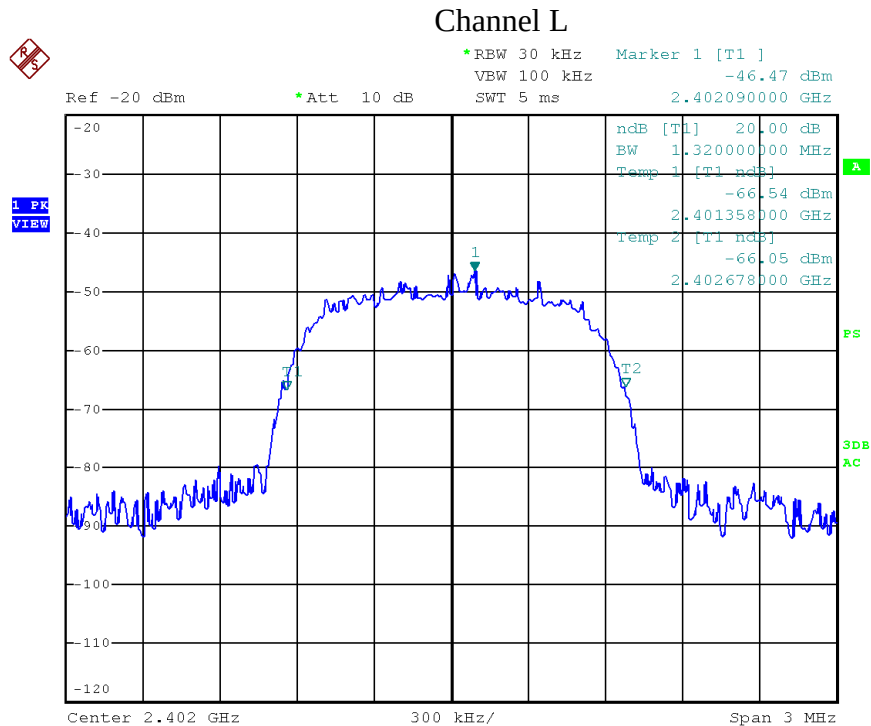
Date: 24.MAR.2015 16:04:40

Channel H



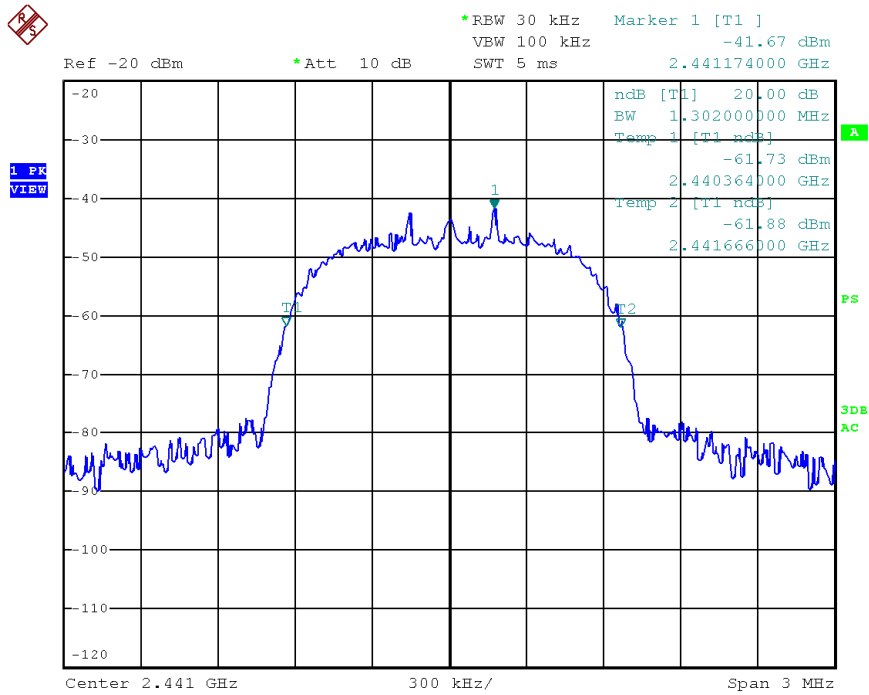
Date: 24.MAR.2015 16:05:45

Mode	CH	20dB Bandwidth (kHz)
3	L	1320
	M	1302
	H	1332



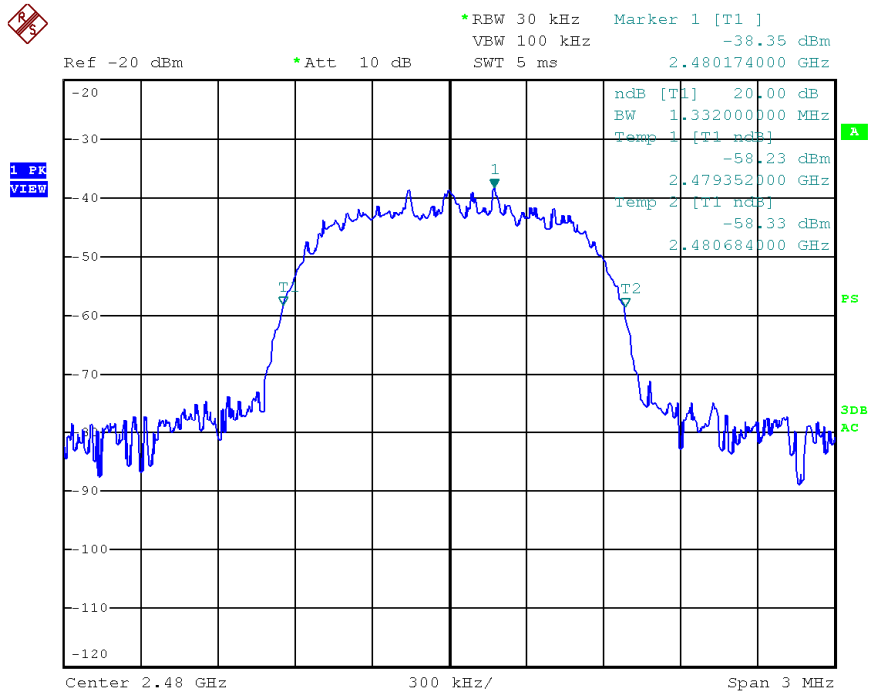
Date: 24.MAR.2015 16:06:23

Channel M



Date: 24.MAR.2015 16:07:54

Channel H



Date: 24.MAR.2015 16:08:30

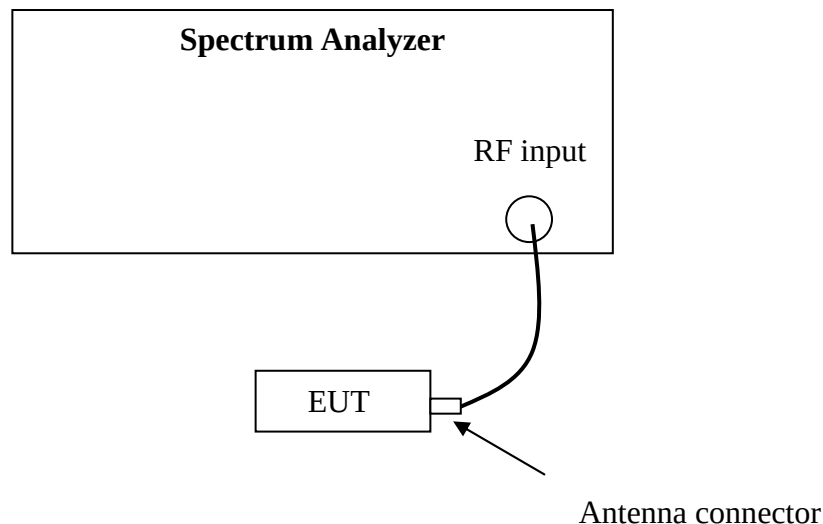
4. Carrier Frequency Separation

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.

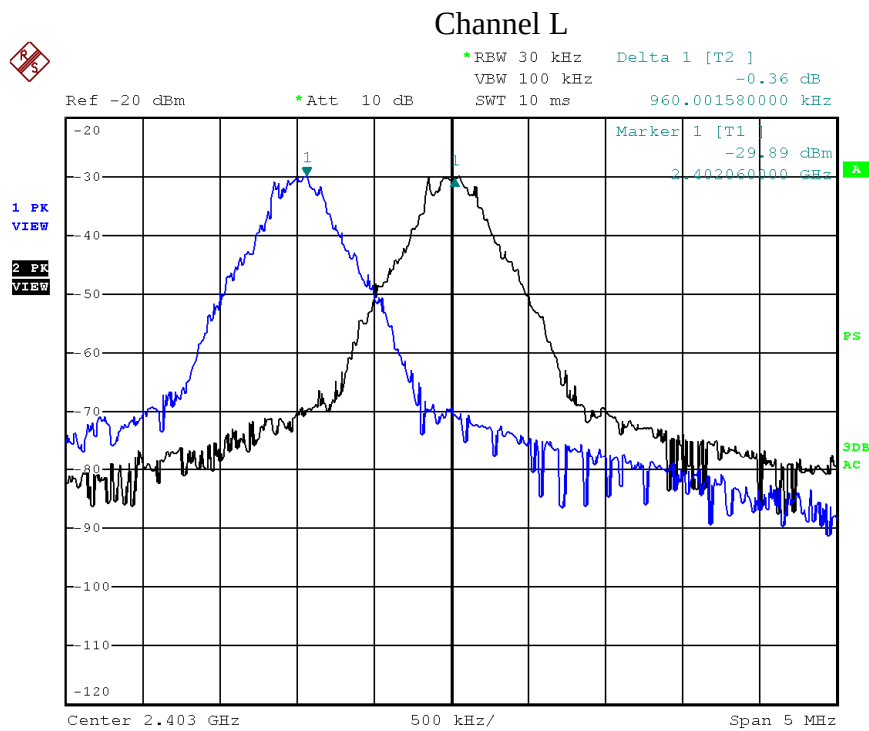
The test was performed at 3 channels (lowest, middle and highest channel).

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

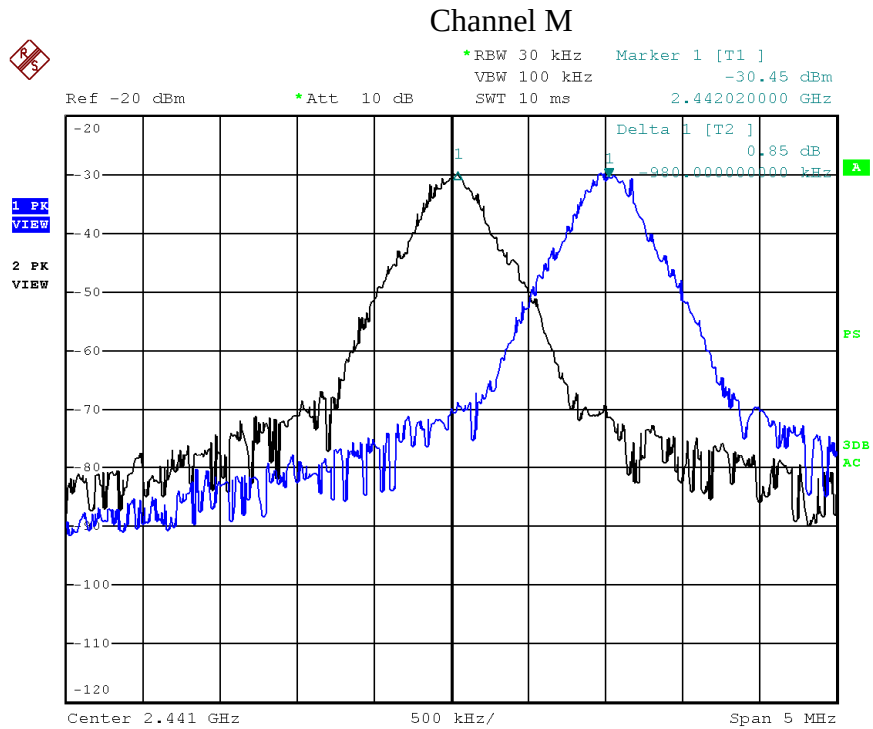
4.4 Test Protocol

Temperature : 25°C
Relative Humidity : 55 %

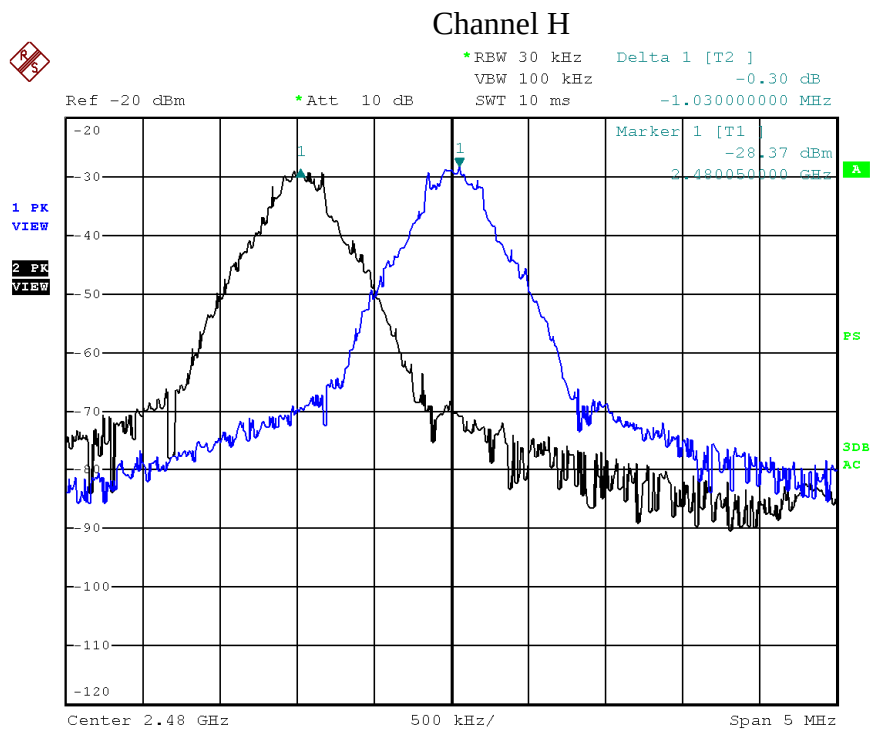
Mode	CH	Frequency Separation (kHz)	Limit (kHz)
1	L	960	$\geq 2/3$ of 20dB BW
	M	980	$\geq 2/3$ of 20dB BW
	H	1030	$\geq 2/3$ of 20dB BW



Date: 24.MAR.2015 16:16:39

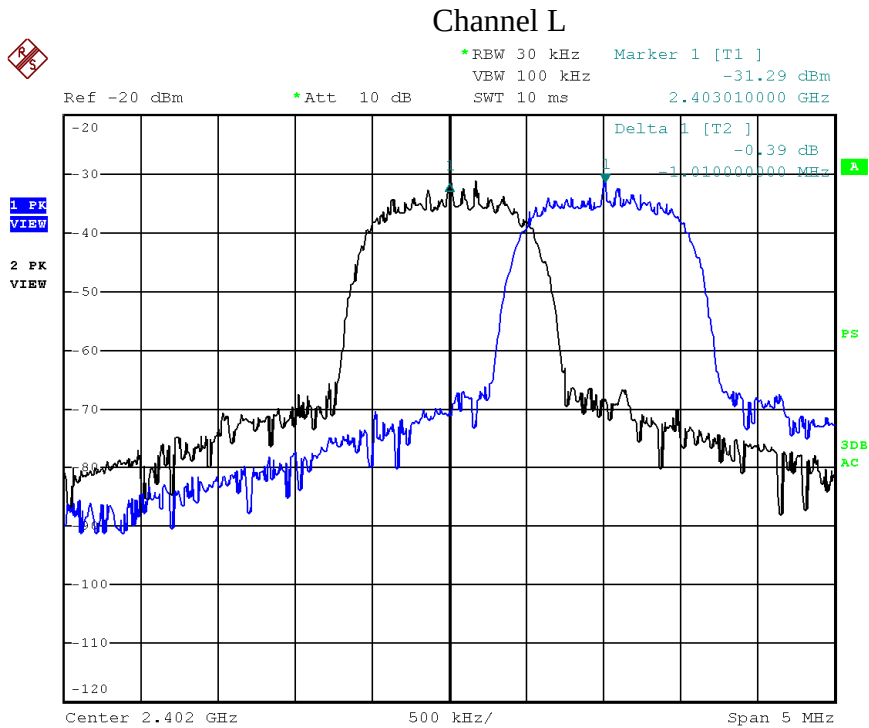


Date: 24.MAR.2015 16:18:02

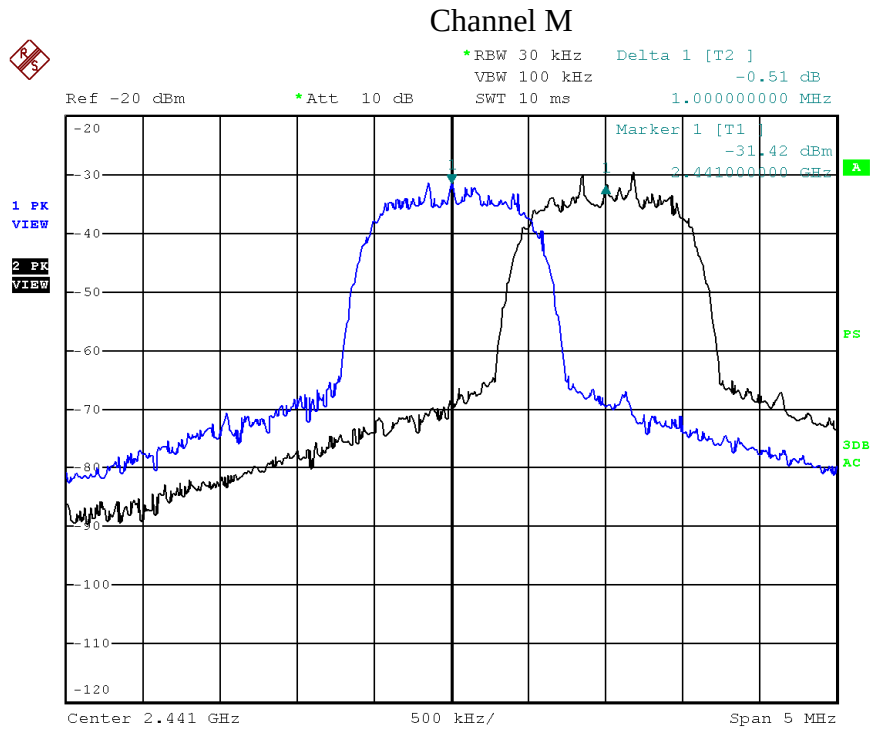


Date: 24.MAR.2015 16:19:10

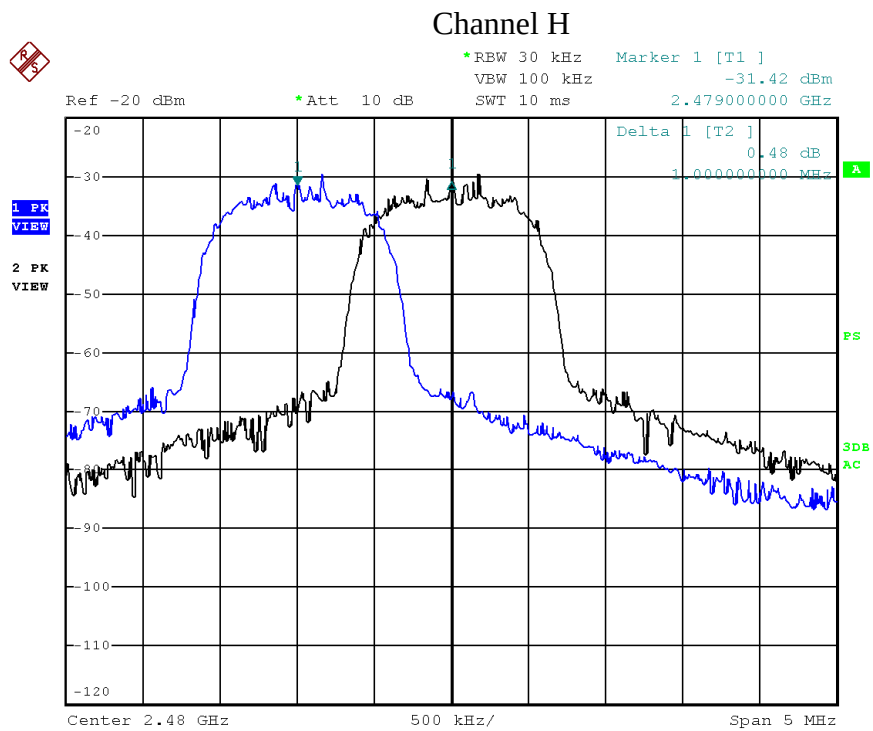
Mode	CH	Frequency Separation (kHz)	Limit (kHz)
2	L	1010	$\geq 2/3$ of 20dB BW
	M	1000	$\geq 2/3$ of 20dB BW
	H	1000	$\geq 2/3$ of 20dB BW



Date: 24.MAR.2015 16:24:24

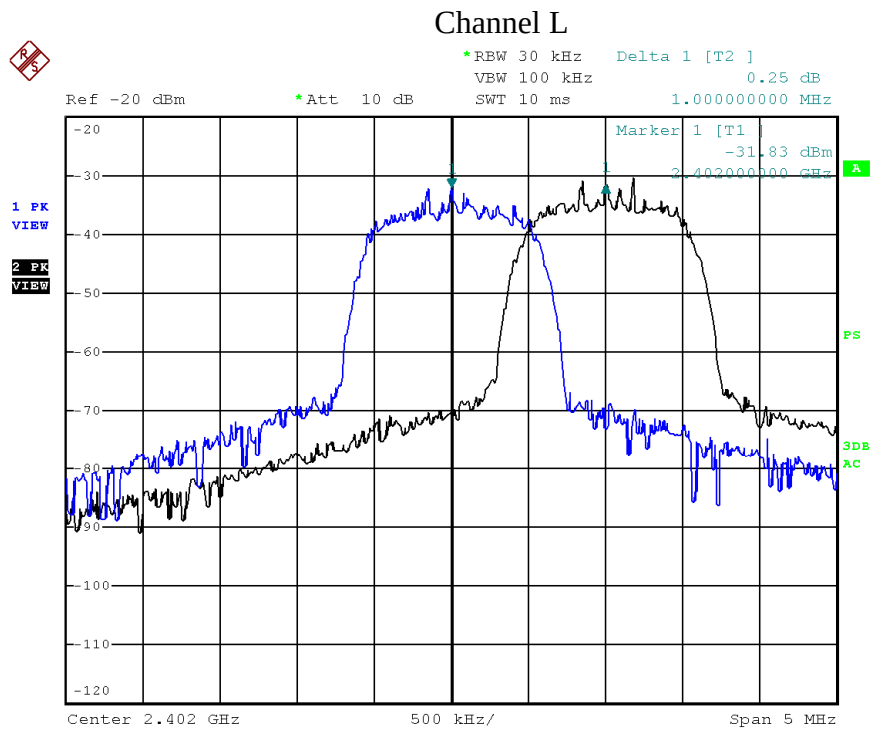


Date: 24.MAR.2015 16:27:42

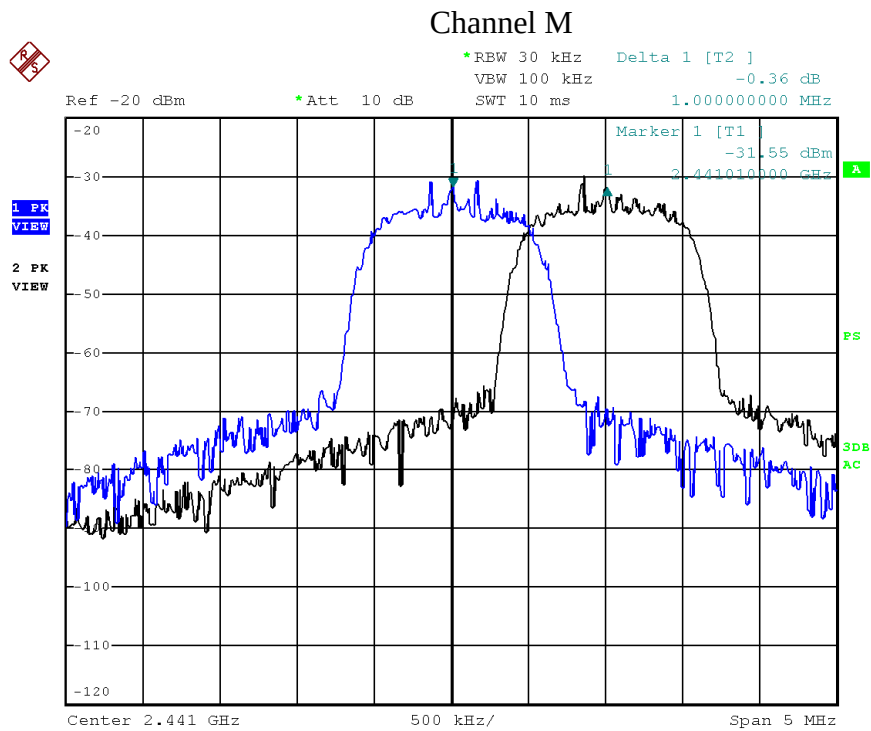


Date: 24.MAR.2015 16:31:32

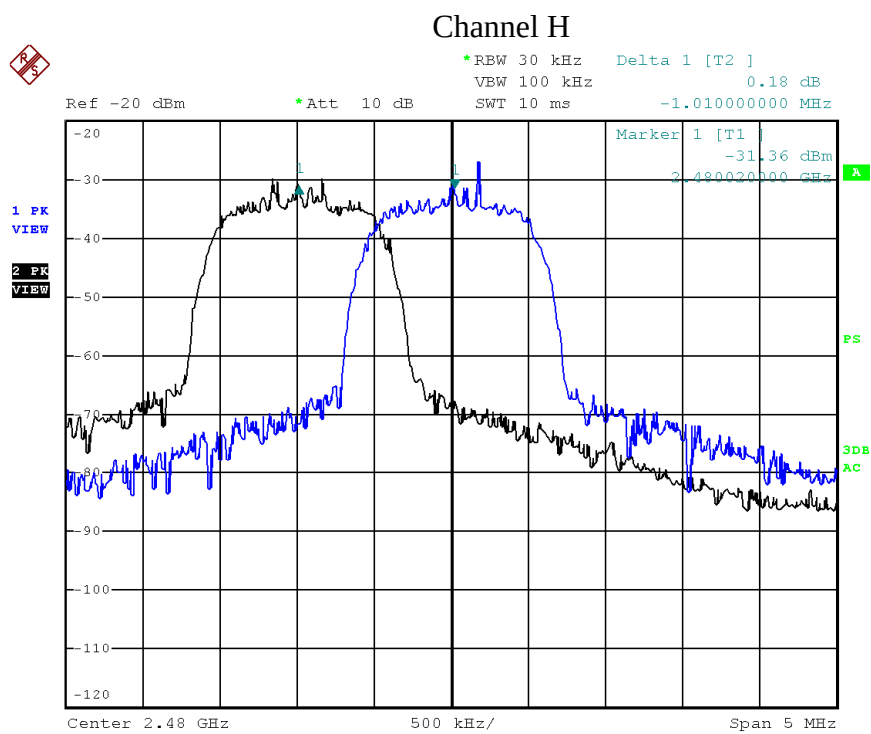
Mode	CH	Frequency Separation (kHz)	Limit (kHz)
3	L	1000	$\geq 2/3$ of 20dB BW
	M	1000	$\geq 2/3$ of 20dB BW
	H	1010	$\geq 2/3$ of 20dB BW



Date: 24.MAR.2015 16:35:40



Date: 24.MAR.2015 16:40:56



Date: 24.MAR.2015 16:44:38

5. Maximum peak output power

Test result: Pass

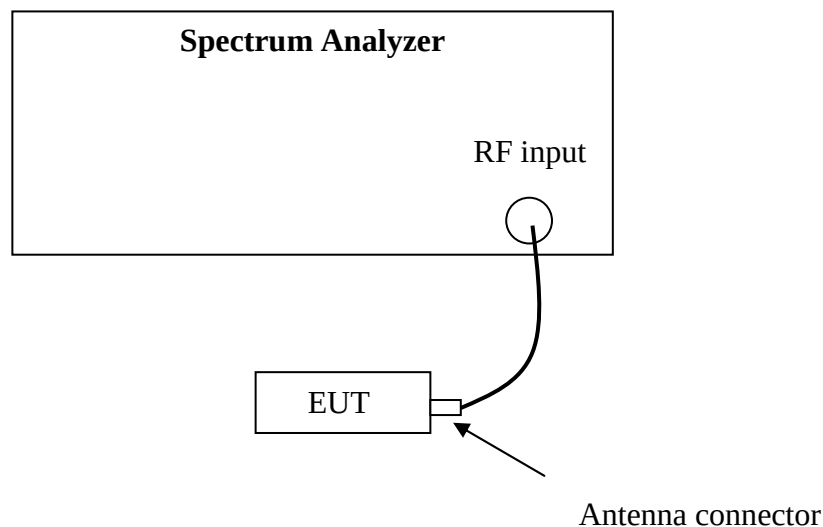
5.1 Test limit

☐ 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 by setting the Spectrum Analyzer as RBW = 1MHz, VBW = 3MHz, Sweep = auto, Detector = peak, Trace = max hold.

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

The test method is following DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems).

5.4 Test protocol

Temperature : 25 °C
Relative Humidity : 55 %

Mode	CH	Conducted Power (dBm)	Limit (dBm)
1	L	1.10	21
	M	0.80	21
	H	0.70	21

Mode	CH	Conducted Power (dBm)	Limit (dBm)
2	L	0.40	21
	M	0.10	21
	H	-0.30	21

Mode	CH	Conducted Power (dBm)	Limit (dBm)
3	L	0.30	21
	M	-0.10	21
	H	-0.40	21

6. Radiated Spurious Emissions

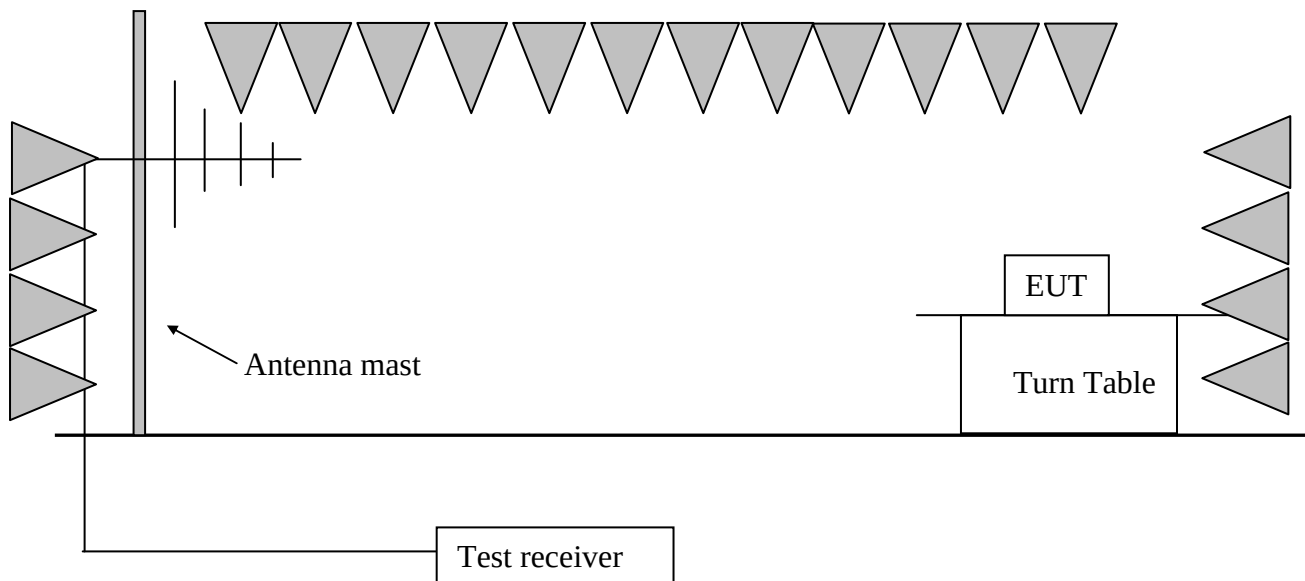
Test result: **PASS**

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 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

Mode 1

CH	Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	V	2402.00	31.20	95.40	/	/	PK
	V	70.82	8.90	35.60	40.00	4.40	PK
	V	175.79	12.80	40.10	43.50	3.40	PK
	V	399.33	18.90	36.00	46.00	10.00	PK
	H	461.54	19.50	30.40	46.00	15.60	PK
	V	2390.00	31.20	52.20	54.00	1.80	PK
	H	3196.39	-8.20	52.90	54.00	1.10	PK
	V	4795.59	-3.60	41.90	54.00	12.10	PK
	V	7206.00	-2.60	43.70	54.00	10.30	PK
M	V	2440.90	31.20	95.10	/	/	PK
	V	70.82	8.90	35.60	40.00	4.40	PK
	V	175.79	12.80	40.10	43.50	3.40	PK
	V	399.33	18.90	36.00	46.00	10.00	PK
	H	461.54	19.50	30.40	46.00	15.60	PK
	H	3252.50	-8.00	52.40	54.00	1.60	PK
	V	4882.00	-10.8	40.30	54.00	13.70	PK
	V	7323.00	-2.90	42.60	54.00	11.40	PK
H	V	2479.90	31.20	94.70	/	/	PK
	V	70.82	8.90	35.60	40.00	4.40	PK
	V	175.79	12.80	40.10	43.50	3.40	PK
	V	399.33	18.90	36.00	46.00	10.00	PK
	H	461.54	19.50	30.40	46.00	15.60	PK
	V	2483.50	31.20	67.20	74.00	6.80	PK
	V	2483.50	31.20	50.20	54.00	3.80	AV
	H	3294.58	-7.80	53.10	54.00	0.90	PK
	V	4960.00	-10.50	41.20	54.00	12.80	PK
	H	7440.00	-3.00	43.10	54.00	10.90	PK

Mode 2

CH	Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	V	2402.00	31.20	95.10	/	/	PK
	V	70.82	8.90	35.60	40.00	4.40	PK
	V	175.79	12.80	40.10	43.50	3.40	PK
	V	399.33	18.90	36.00	46.00	10.00	PK
	H	461.54	19.50	30.40	46.00	15.60	PK
	V	2390.00	31.20	52.00	54.00	2.00	PK
	H	3196.39	-8.20	52.80	54.00	1.20	PK
	V	4795.59	-3.60	41.70	54.00	12.30	PK
	V	7206.00	-2.60	43.60	54.00	10.40	PK
M	V	2440.90	31.20	94.70	/	/	PK
	V	70.82	8.90	35.60	40.00	4.40	PK
	V	175.79	12.80	40.10	43.50	3.40	PK
	V	399.33	18.90	36.00	46.00	10.00	PK
	H	461.54	19.50	30.40	46.00	15.60	PK
	H	3252.50	-8.00	52.10	54.00	1.90	PK
	V	4882.00	-10.8	40.40	54.00	13.60	PK
	V	7323.00	-2.90	42.50	54.00	11.50	PK
H	V	2479.90	31.20	94.40	/	/	PK
	V	70.82	8.90	35.60	40.00	4.40	PK
	V	175.79	12.80	40.10	43.50	3.40	PK
	V	399.33	18.90	36.00	46.00	10.00	PK
	H	461.54	19.50	30.40	46.00	15.60	PK
	V	2483.50	31.20	68.10	74.00	5.90	PK
	V	2483.50	31.20	50.50	54.00	3.50	AV
	H	3294.58	-7.80	53.10	54.00	0.90	PK
	V	4960.00	-10.50	41.30	54.00	12.70	PK
	H	7440.00	-3.00	43.20	54.00	10.80	PK

Mode 3

CH	Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	V	2402.00	31.20	95.00	/	/	PK
	V	70.82	8.90	35.60	40.00	4.40	PK
	V	175.79	12.80	40.10	43.50	3.40	PK
	V	399.33	18.90	36.00	46.00	10.00	PK
	H	461.54	19.50	30.40	46.00	15.60	PK
	V	2390.00	31.20	52.00	54.00	2.00	PK
	H	3196.39	-8.20	53.10	54.00	0.90	PK
	V	4795.59	-3.60	41.60	54.00	12.40	PK
	V	7206.00	-2.60	43.60	54.00	10.40	PK
M	V	2440.90	31.20	94.80	/	/	PK
	V	70.82	8.90	35.60	40.00	4.40	PK
	V	175.79	12.80	40.10	43.50	3.40	PK
	V	399.33	18.90	36.00	46.00	10.00	PK
	H	461.54	19.50	30.40	46.00	15.60	PK
	H	3252.50	-8.00	52.30	54.00	1.70	PK
	V	4882.00	-10.8	40.50	54.00	13.50	PK
	V	7323.00	-2.90	42.70	54.00	11.30	PK
H	V	2479.90	31.20	94.50	/	/	PK
	V	70.82	8.90	35.60	40.00	4.40	PK
	V	175.79	12.80	40.10	43.50	3.40	PK
	V	399.33	18.90	36.00	46.00	10.00	PK
	H	461.54	19.50	30.40	46.00	15.60	PK
	V	2483.50	31.20	68.20	74.00	5.80	PK
	V	2483.50	31.20	50.70	54.00	3.30	AV
	H	3294.58	-7.80	52.50	54.00	1.50	PK
	V	4960.00	-10.50	41.40	54.00	12.60	PK
	H	7440.00	-3.00	43.10	54.00	10.90	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

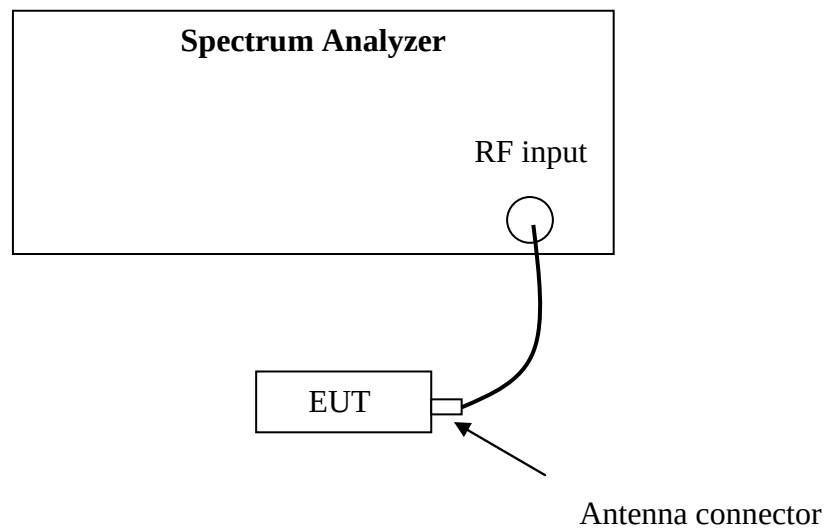
7. Band Edge Emission

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

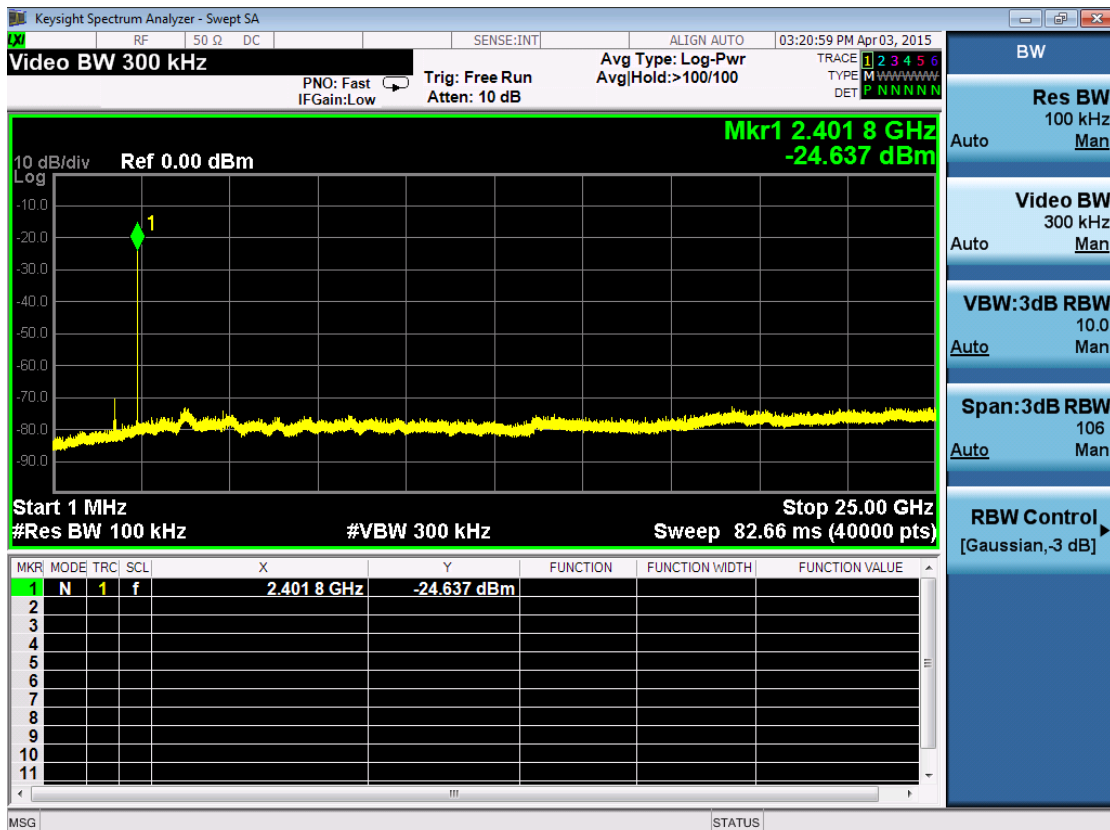
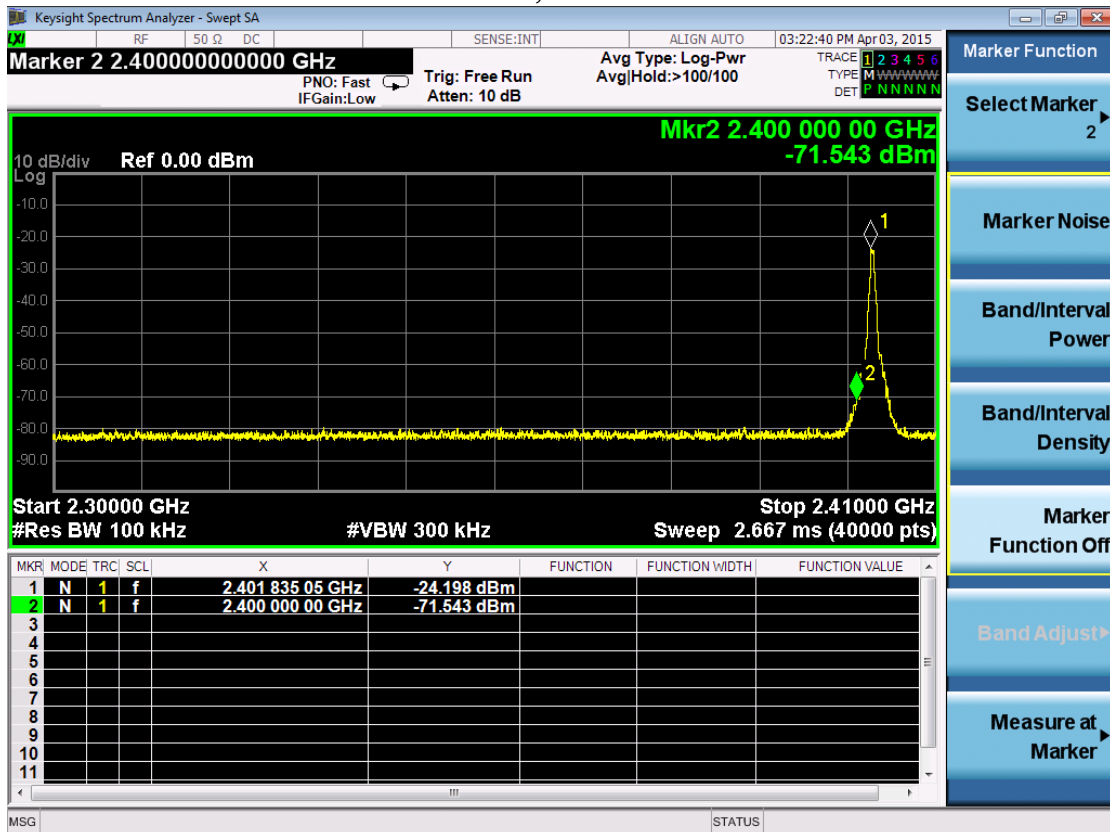
The Band Edge Emissions per FCC § 15.247(d) is measured using the Spectrum Analyzer with Span wide enough capturing all spurious from the lowest emission frequency of the EUT up to 10th harmonics, RBW = 100kHz, VBW ≥ RBW, Sweep = auto, Detector = peak, Trace = max hold.

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

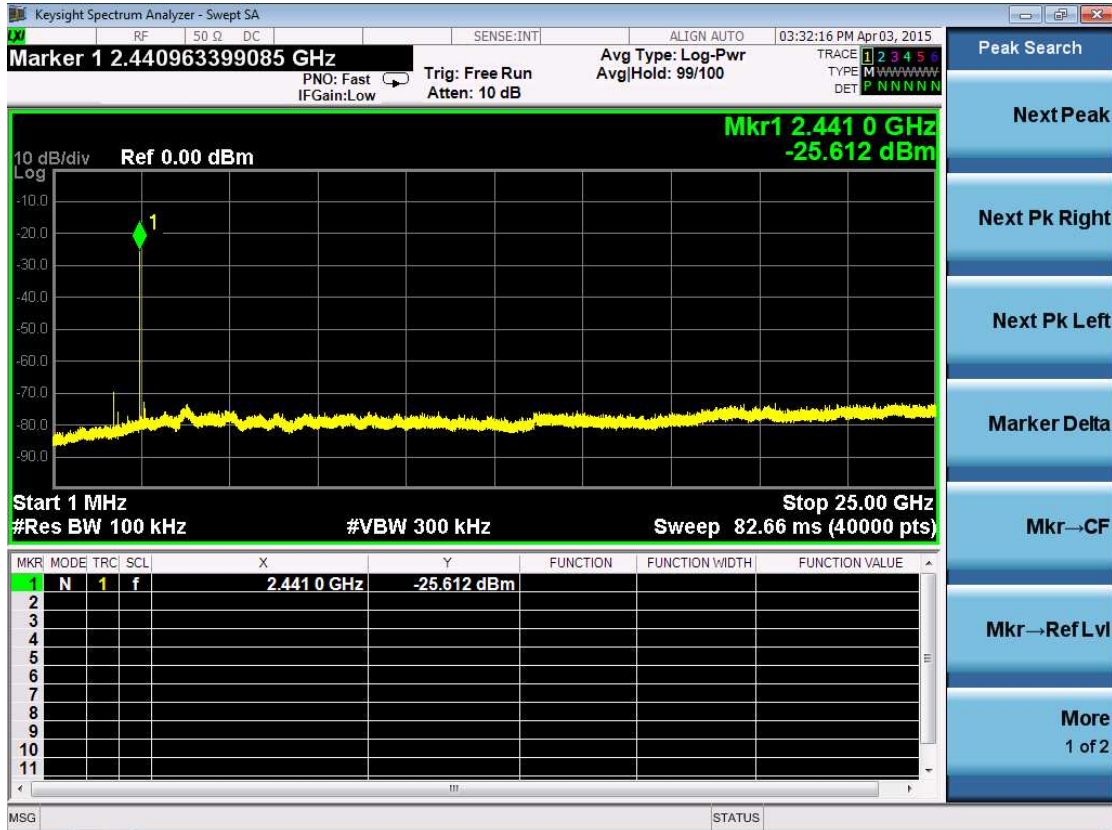
The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems)

7.4 Test protocol

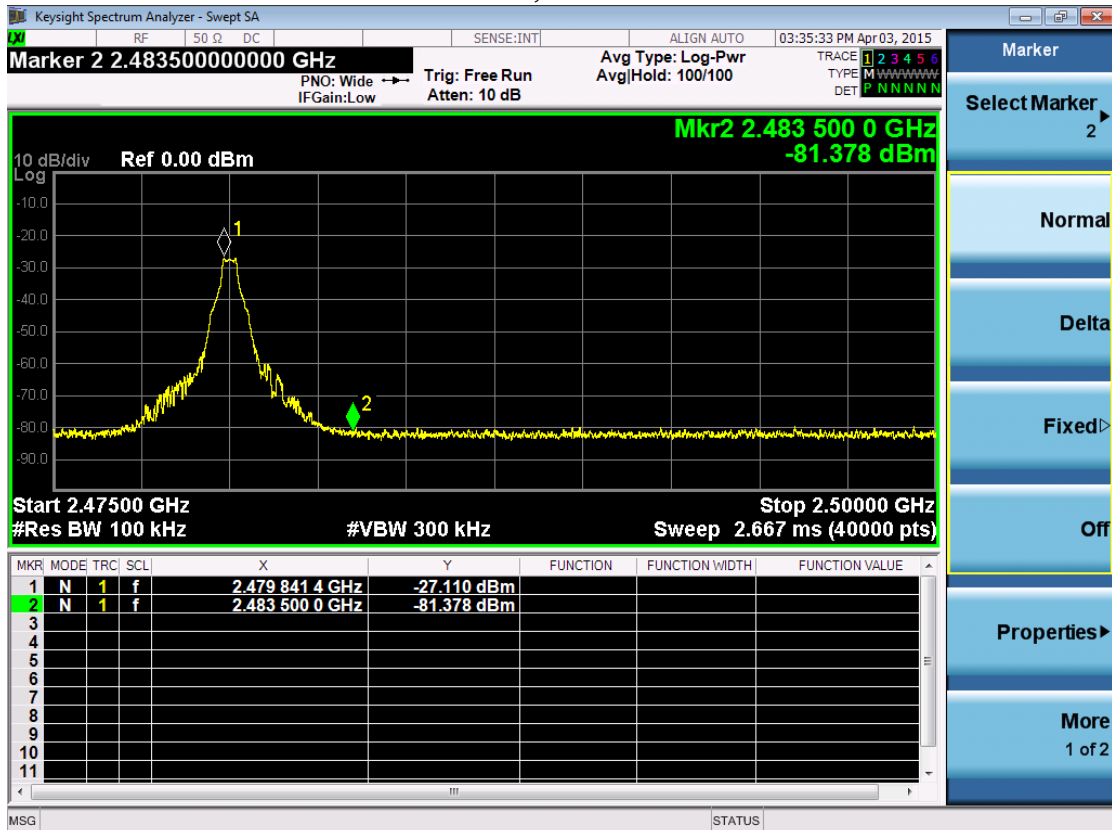
Mode 1, Channel L

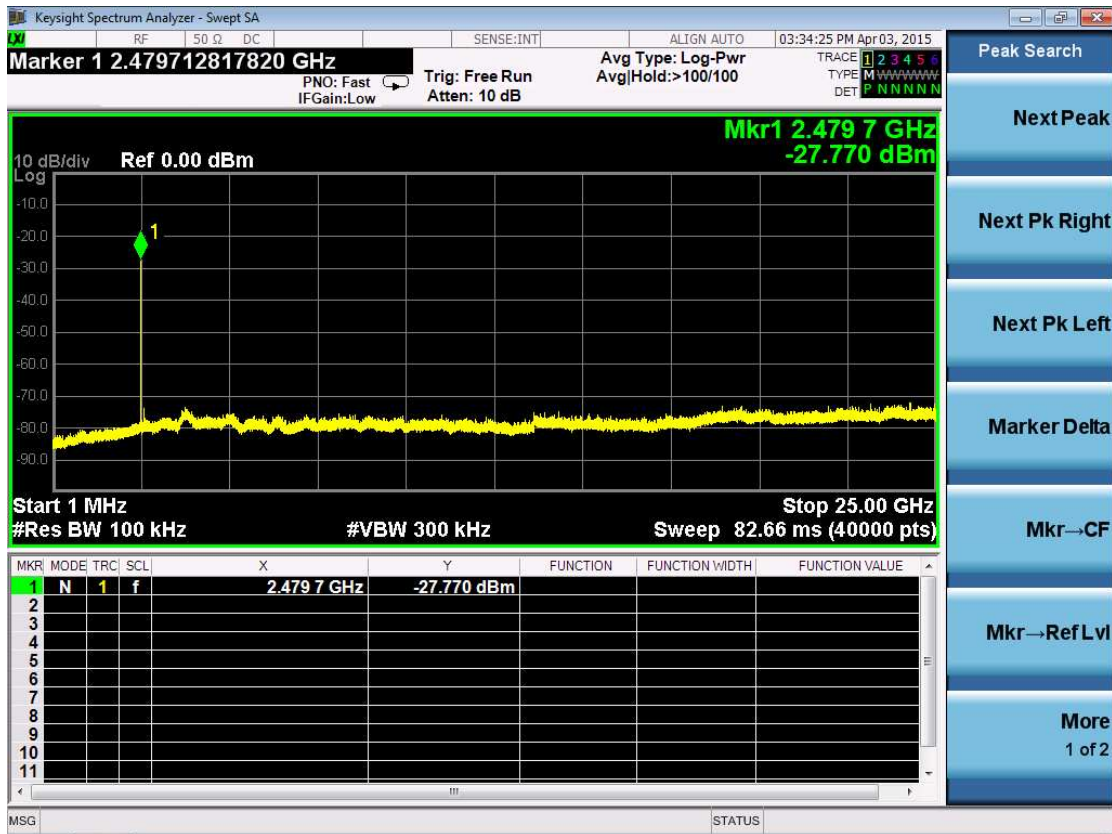


Mode 1, Channel M



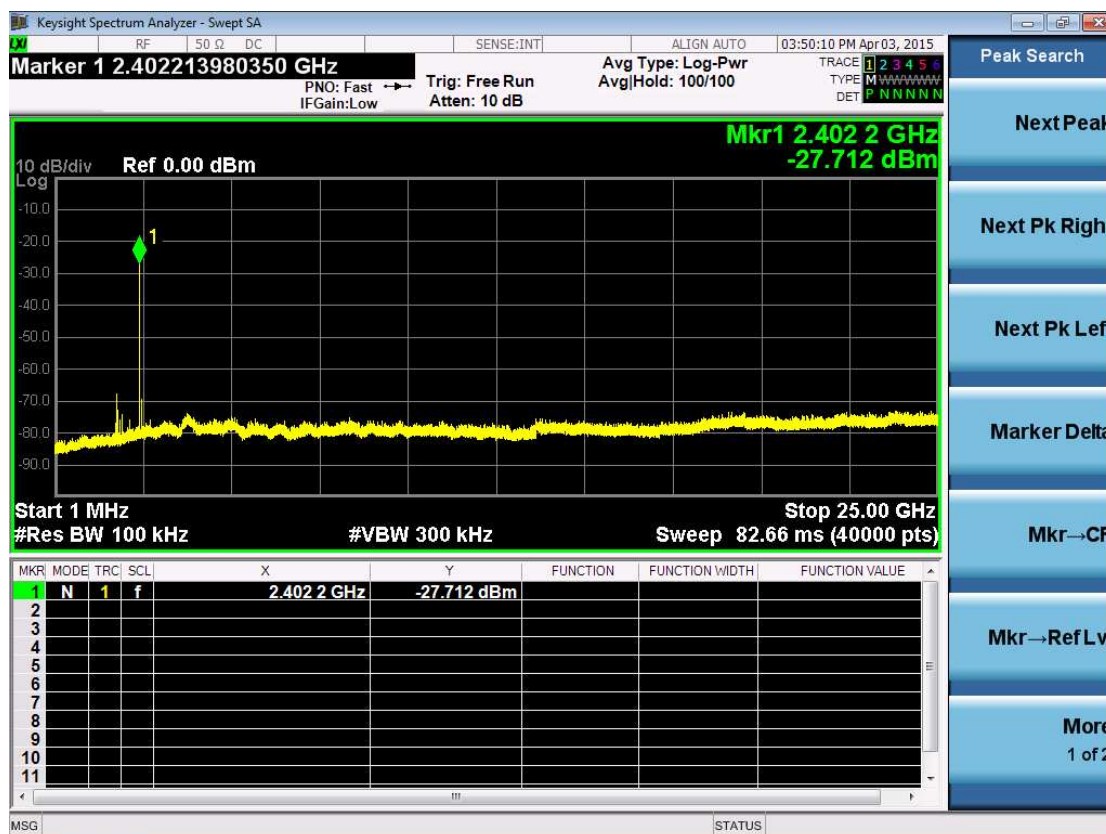
Mode 1, Channel H



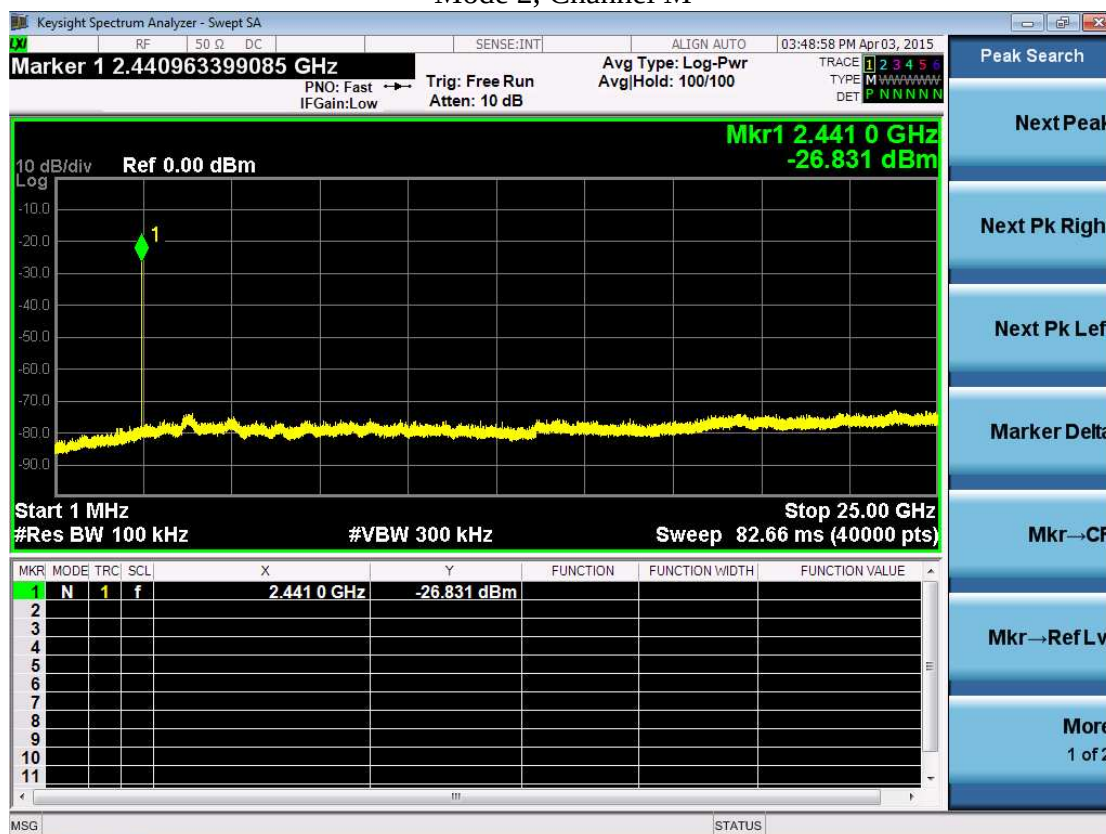


Mode 2, Channel L

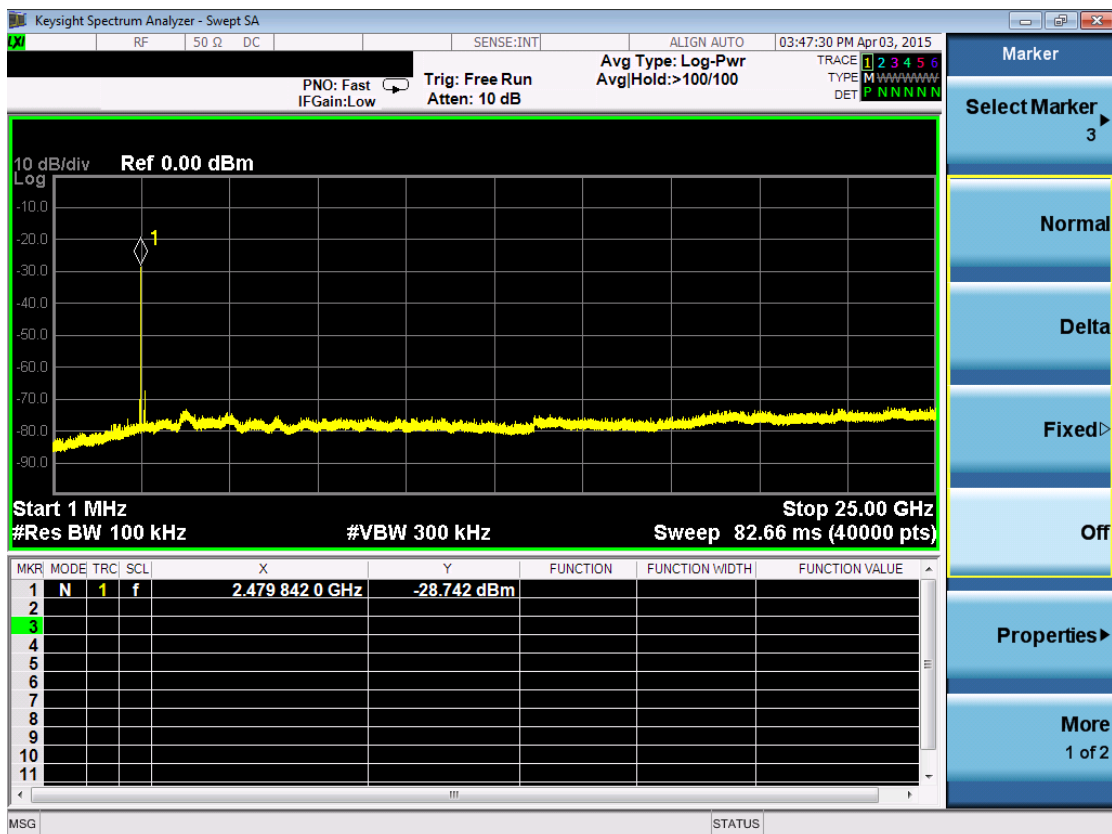
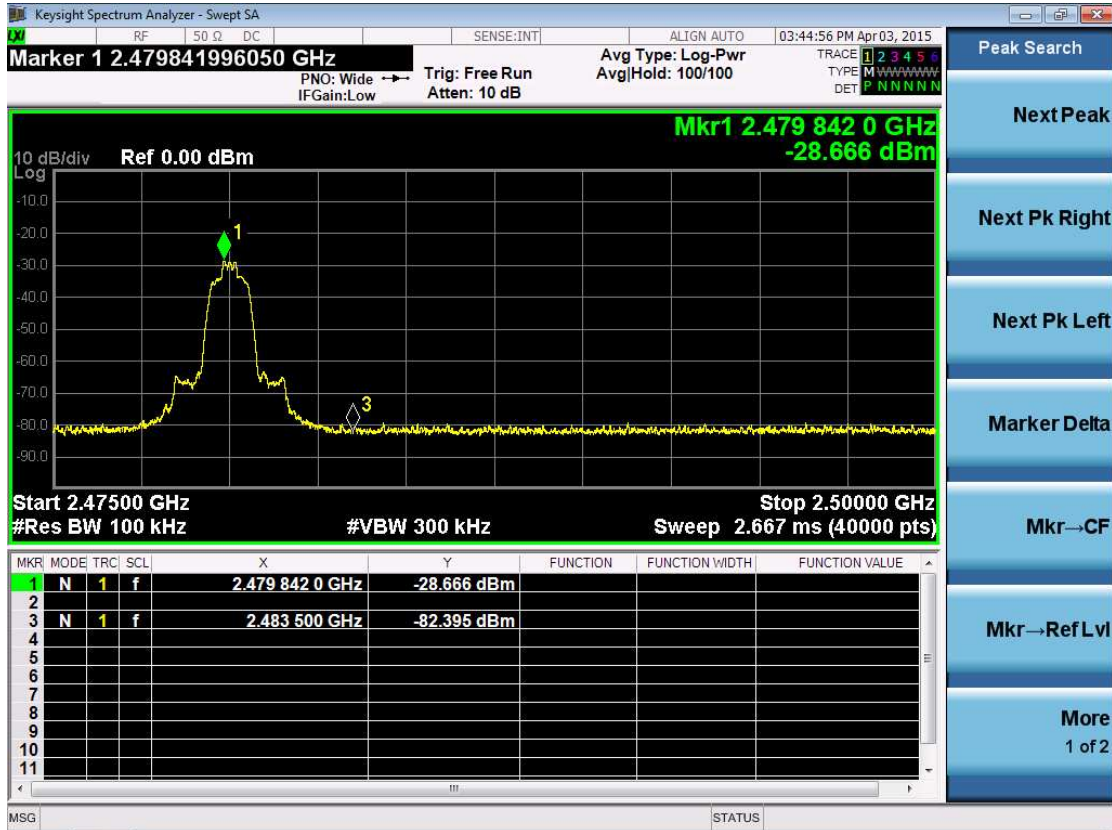




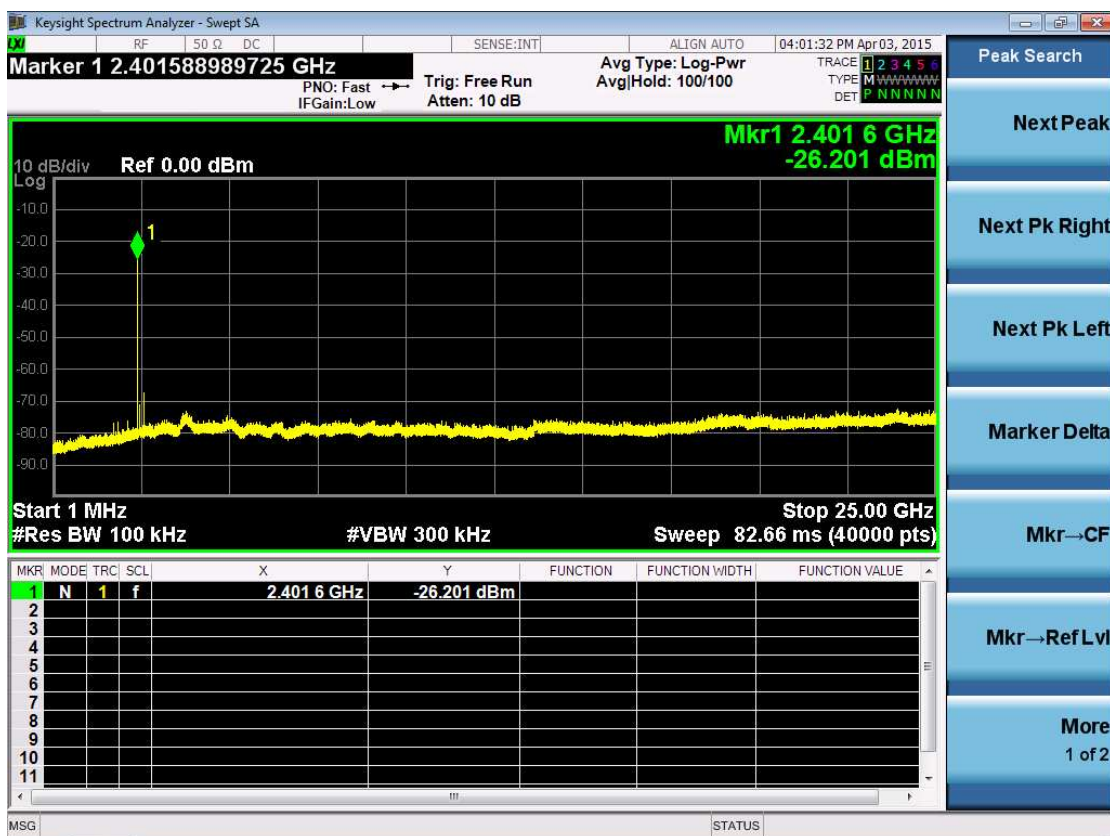
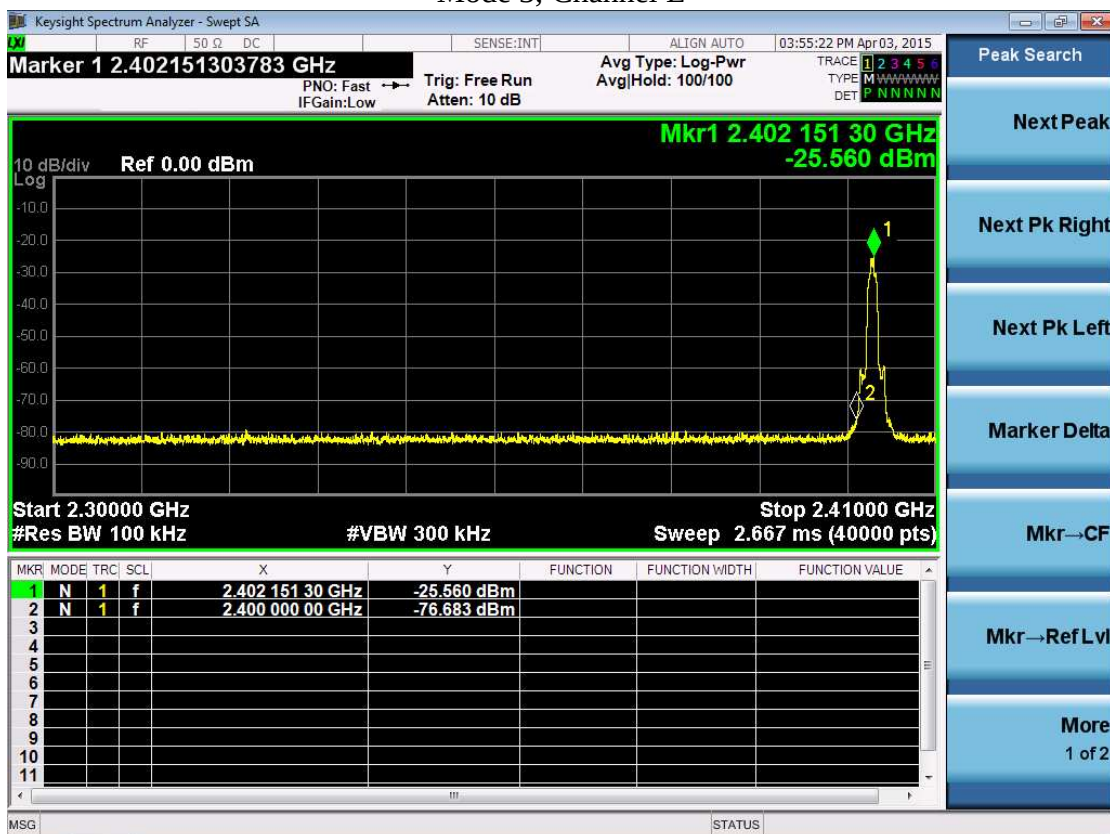
Mode 2, Channel M



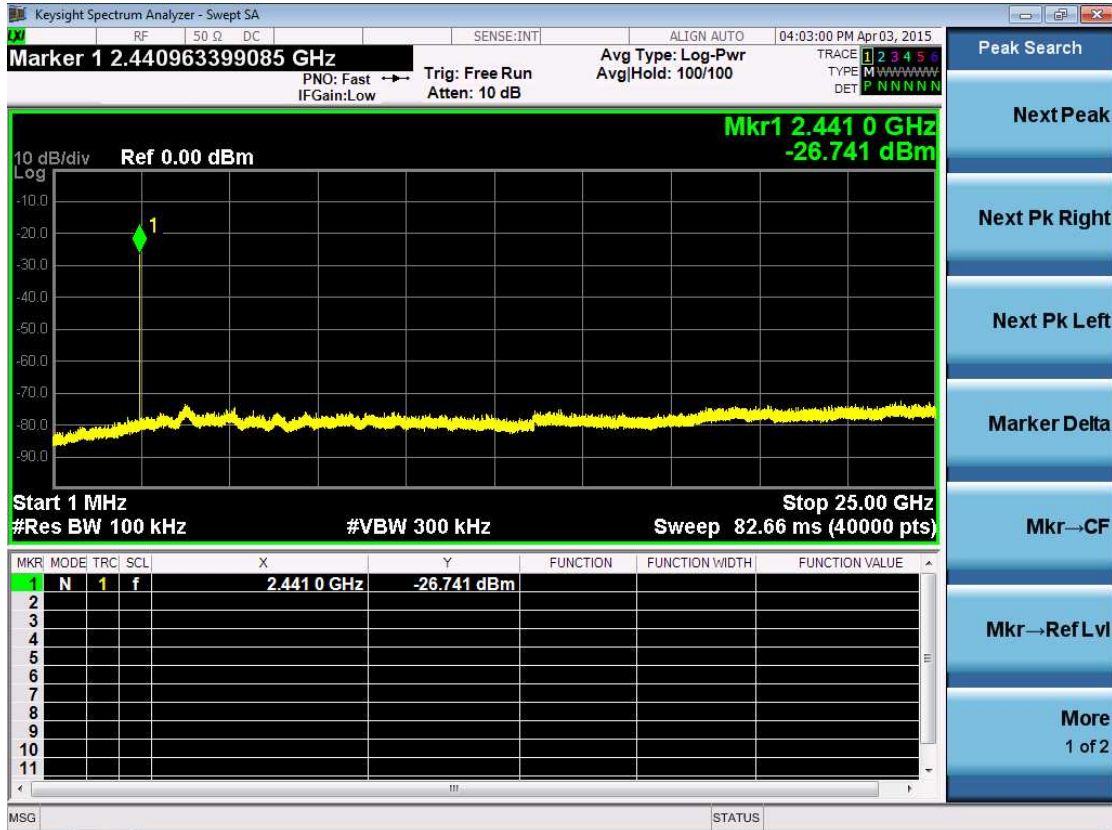
Mode 2, Channel H



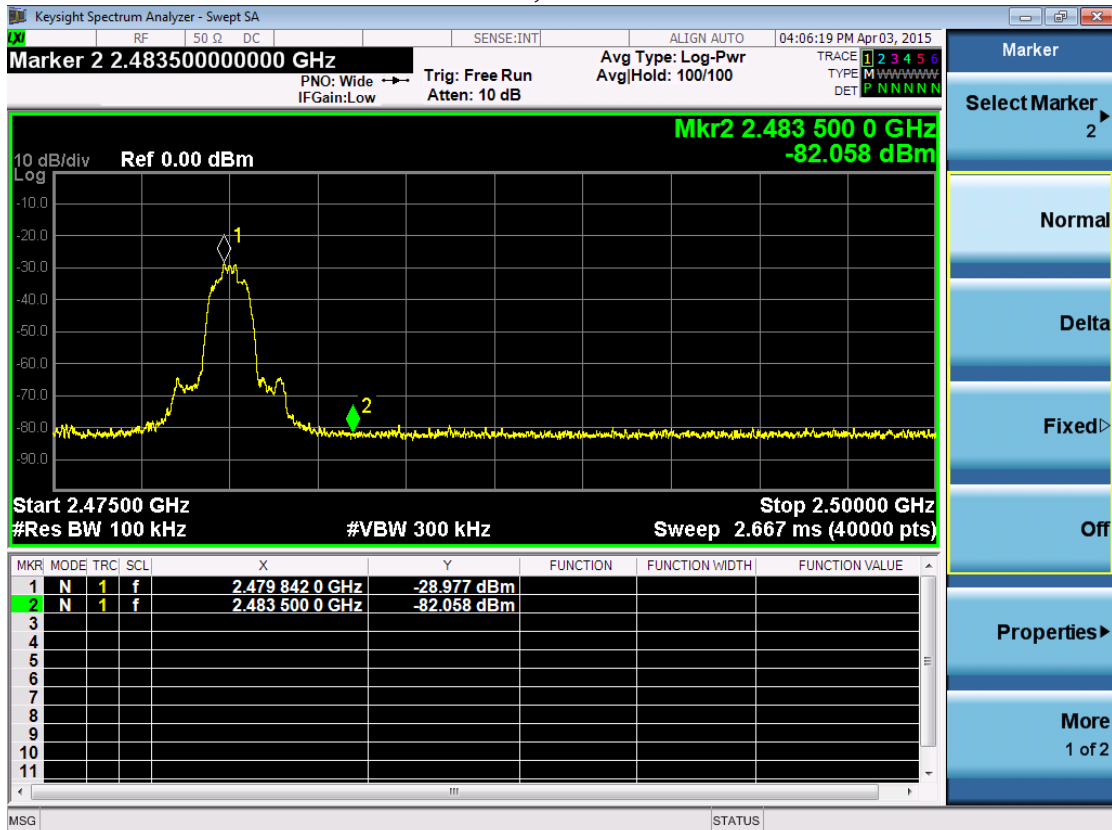
Mode 3, Channel L

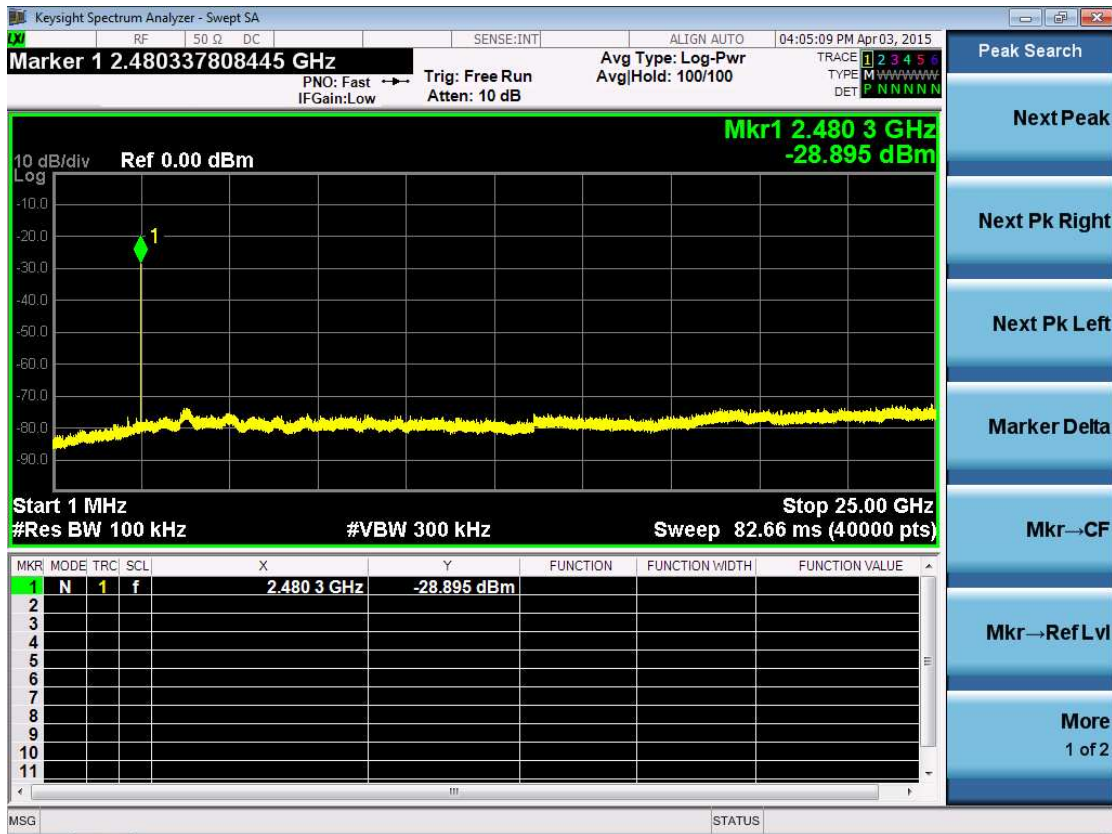


Mode 3, Channel M

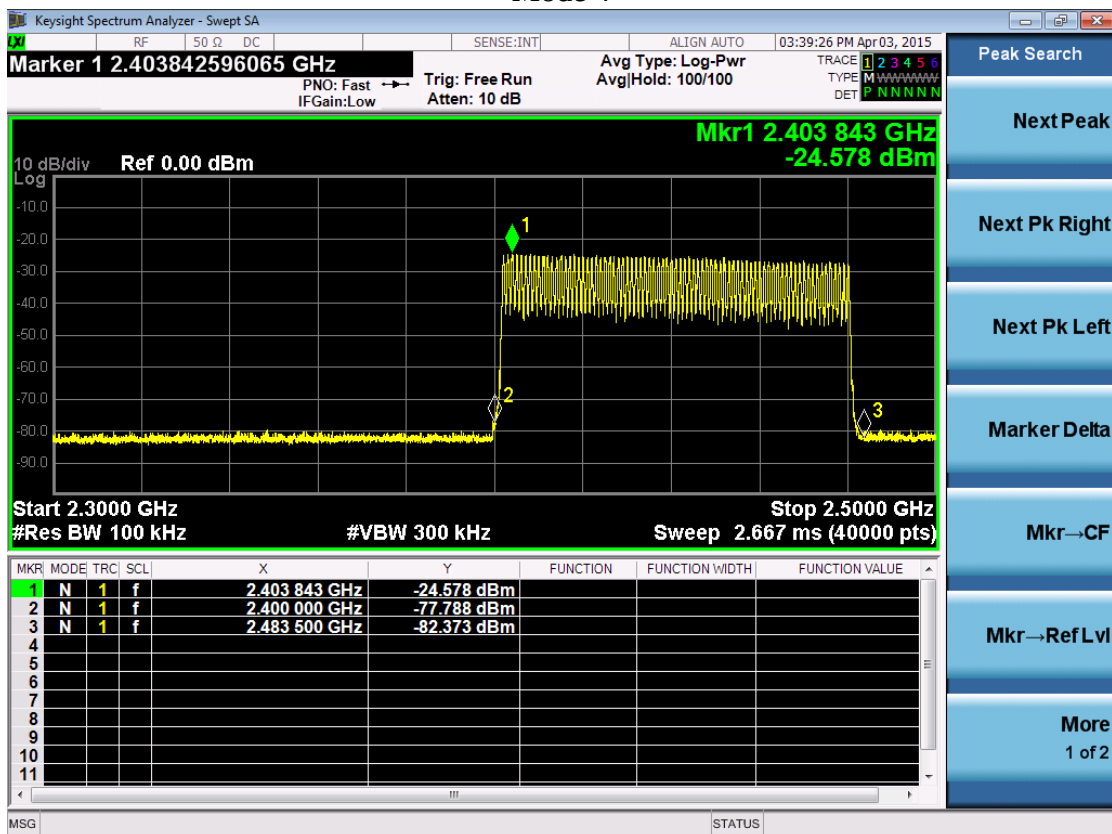


Mode 3, Channel H

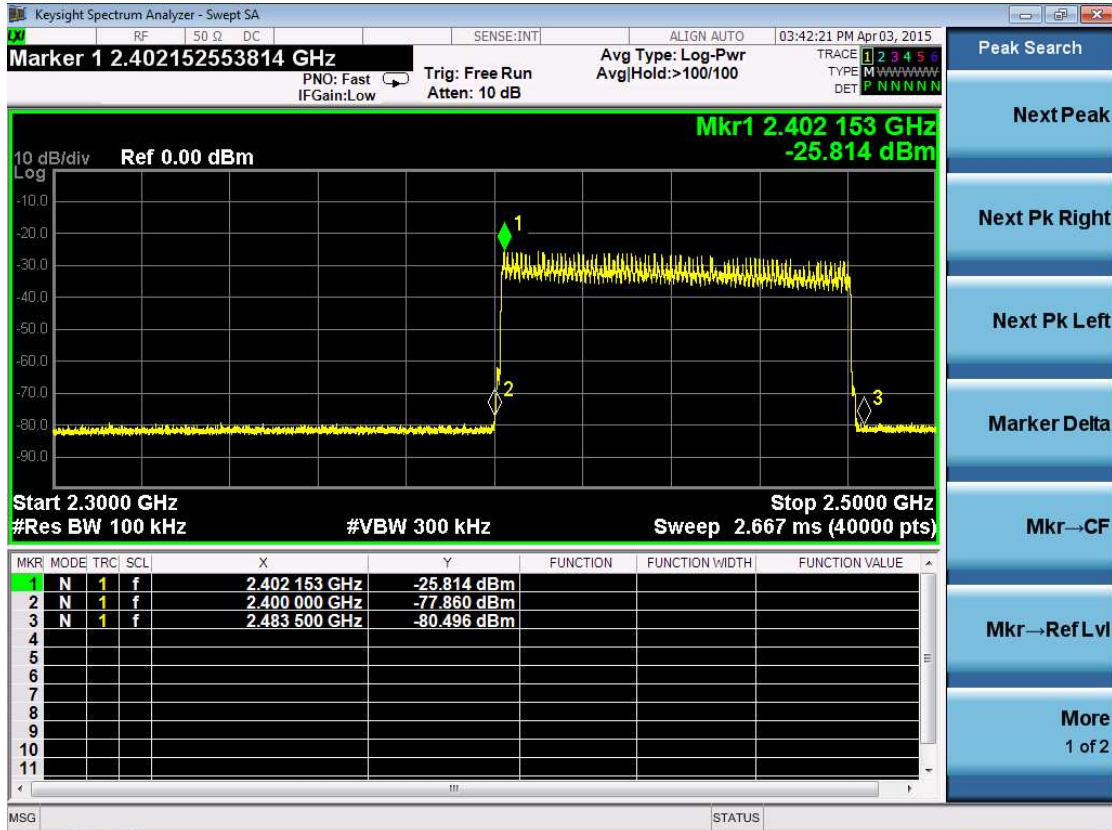




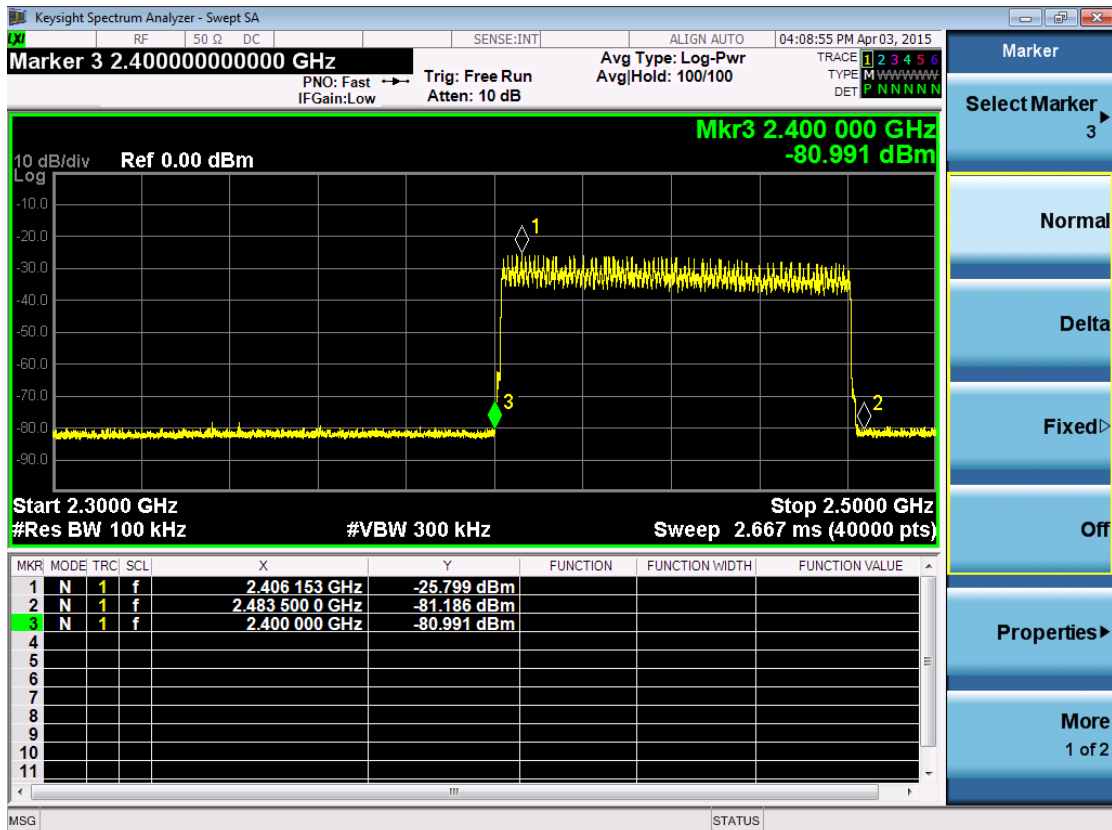
Mode 4



Mode 5



Mode 6



8. Power line conducted emission

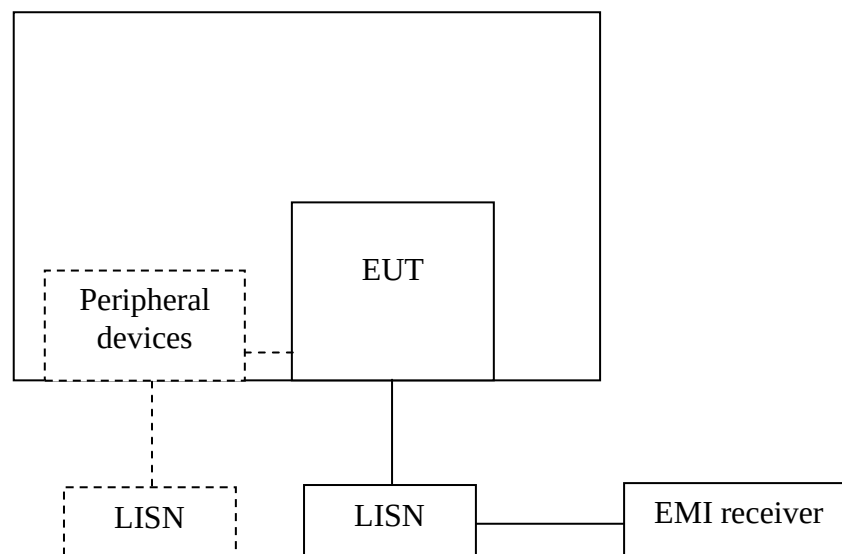
Test result: Pass

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

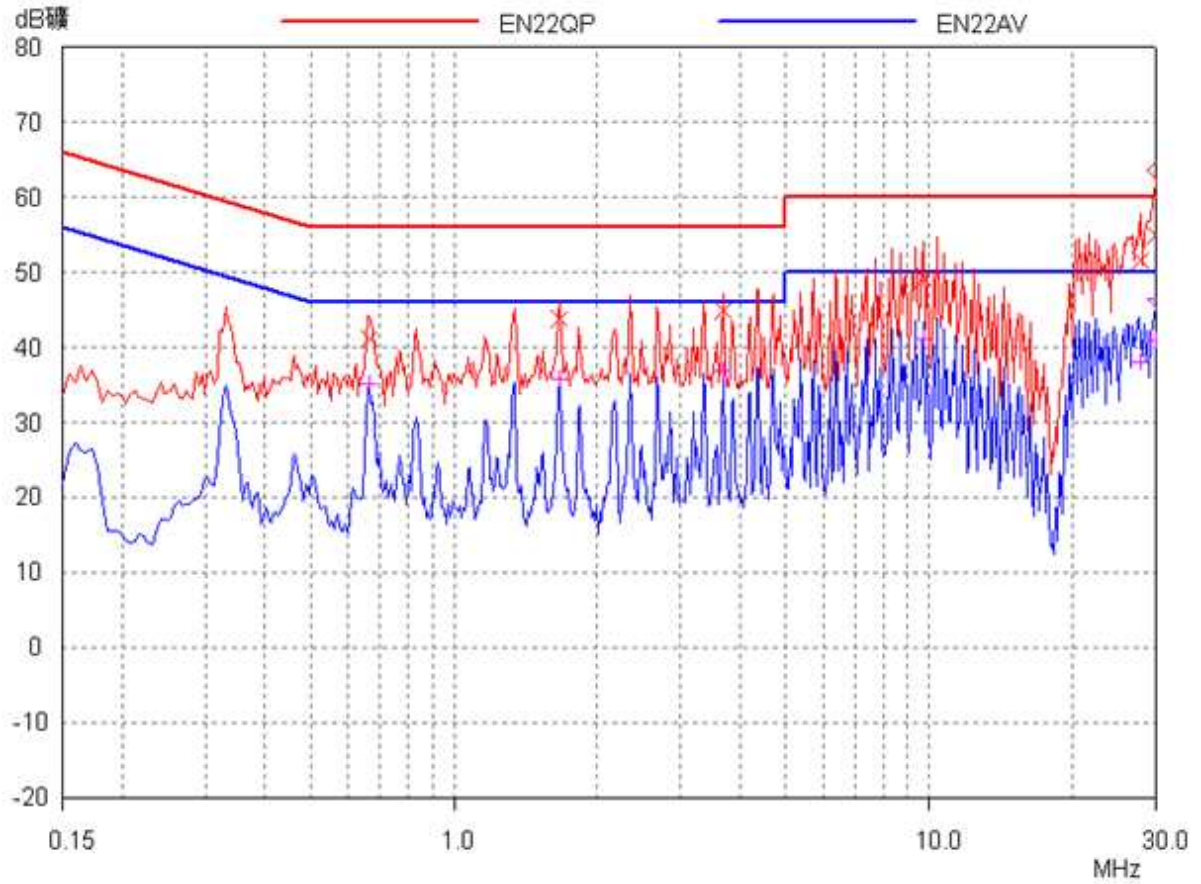
☐ For floor standing equipment, wooden support is 0.1m height rack.

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 $50\Omega/50\mu\text{H}$ coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a $50\Omega/50\mu\text{H}$ coupling impedance with 50Ω termination.

Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4 on conducted measurement. The bandwidth of the test receiver is set at 9 kHz.

8.4 Test protocol



Frequency	Correct Factor (dB)	Corrected Reading (dBuV)		Limit (dBuV)		Margin (dB)	
		QP	AV	QP	AV	QP	AV
0.66 (N)	3.00	41.20	35.18	56.00	46.00	14.80	10.82
1.67 (N)	3.00	43.80	35.86	56.00	46.00	12.20	10.14
3.66 (L)	3.00	44.82	37.01	56.00	46.00	11.18	8.99
9.66 (N)	3.00	49.08	41.07	60.00	50.00	10.92	8.93
27.83 (L)	3.00	51.57	38.00	60.00	50.00	8.43	12.00
29.83 (L)	3.00	54.82	41.01	60.00	50.00	5.18	8.99
Remark: 1. Correction Factor (dB) = LISN Factor (dB) + Cable Loss (dB). 2. Margin (dB) = Limit - Corrected Reading.							

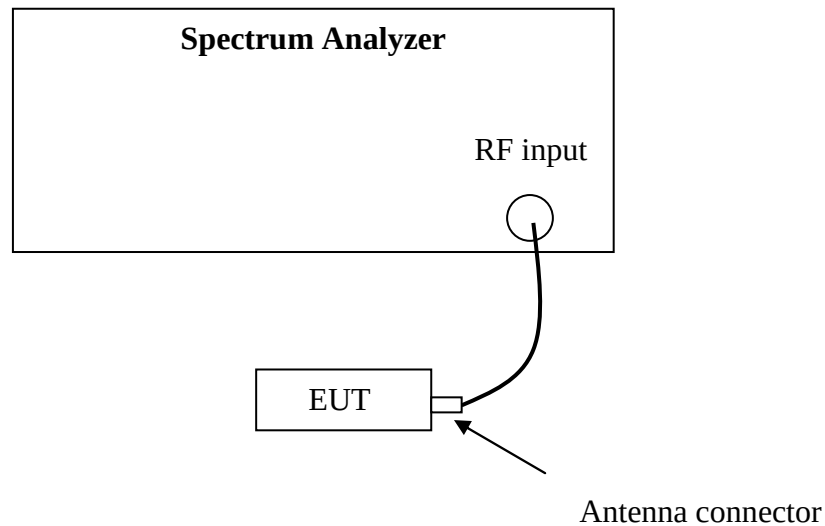
9. Number of Hopping Frequencies

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

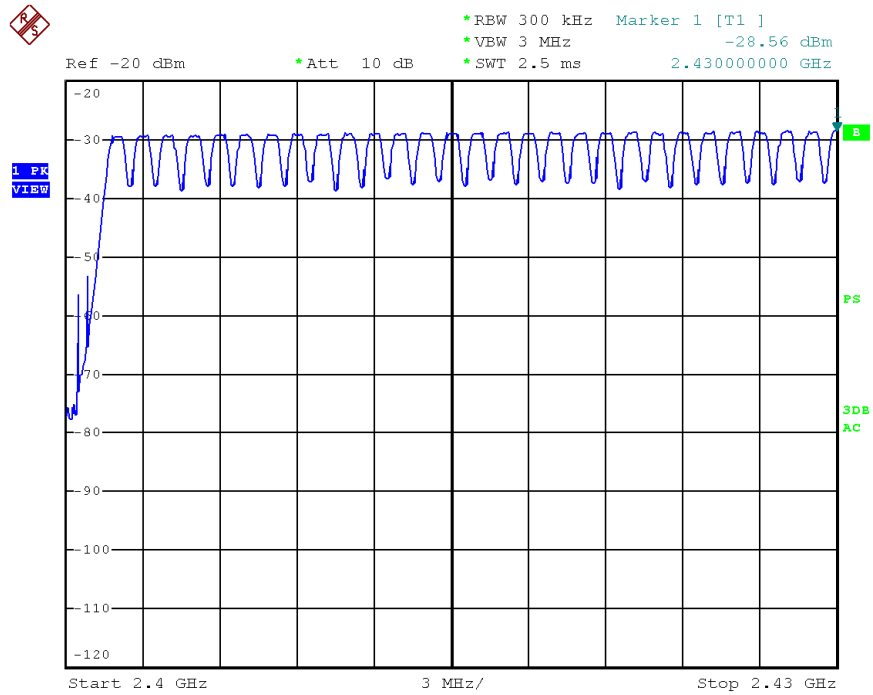


9.3 Test procedure and test setup

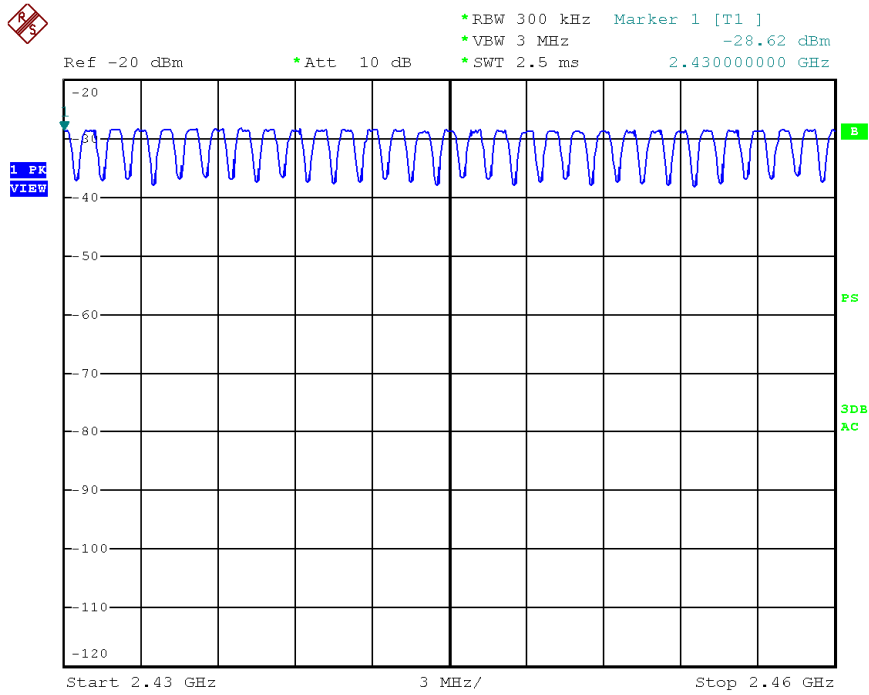
The channel number per FCC §15.247(a)(1)(iii) is measured using the Spectrum Analyzer with RBW=1MHz, VBW $\geq$ RBW, Sweep = auto, Detector = peak, Trace = max hold. The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems).

9.4 Test protocol

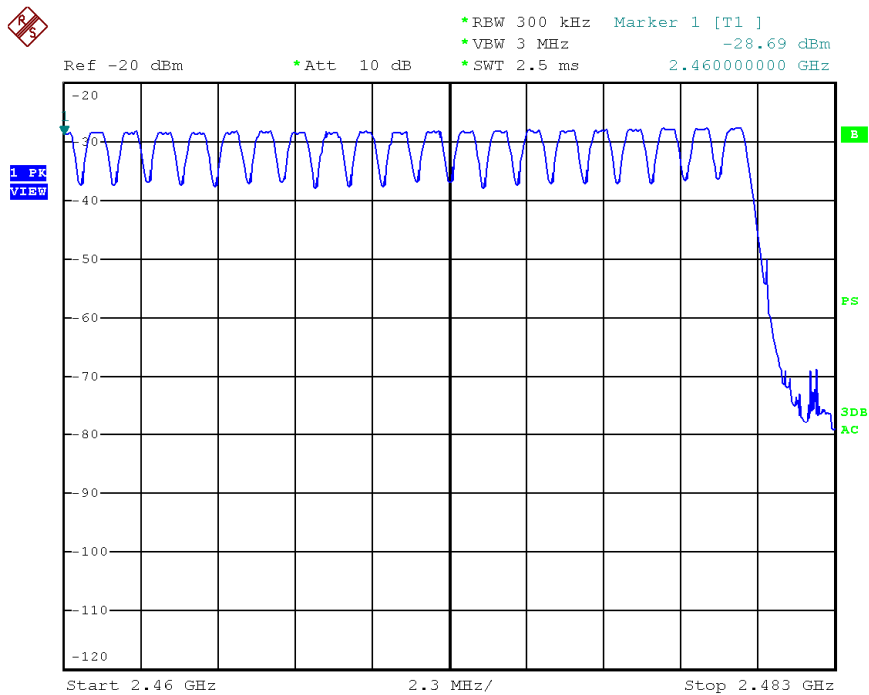
Mode	Channel Number	Limit
4	79	≥ 15



Date: 24.MAR.2015 18:21:34

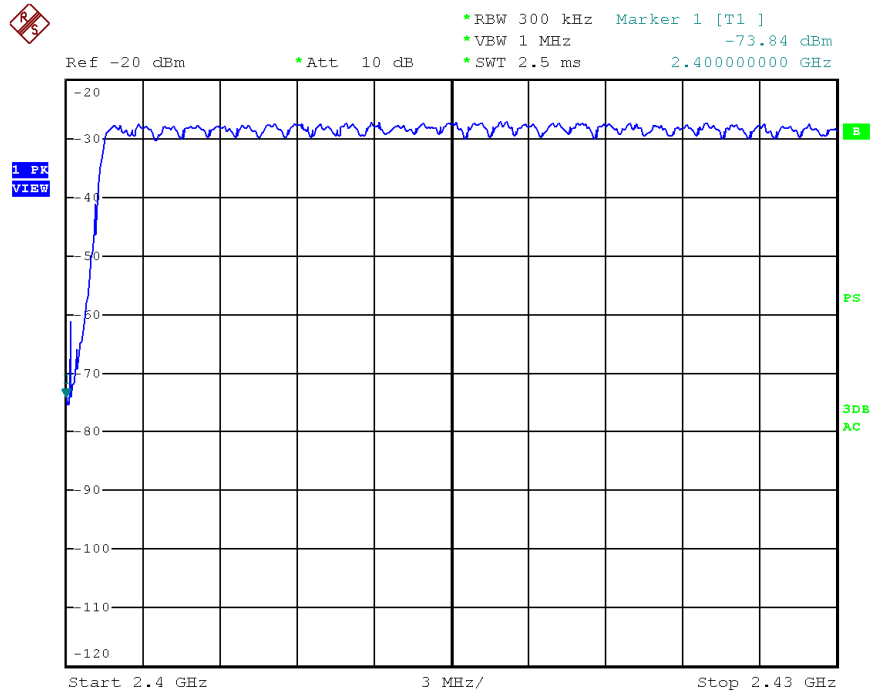


Date: 24.MAR.2015 18:23:28

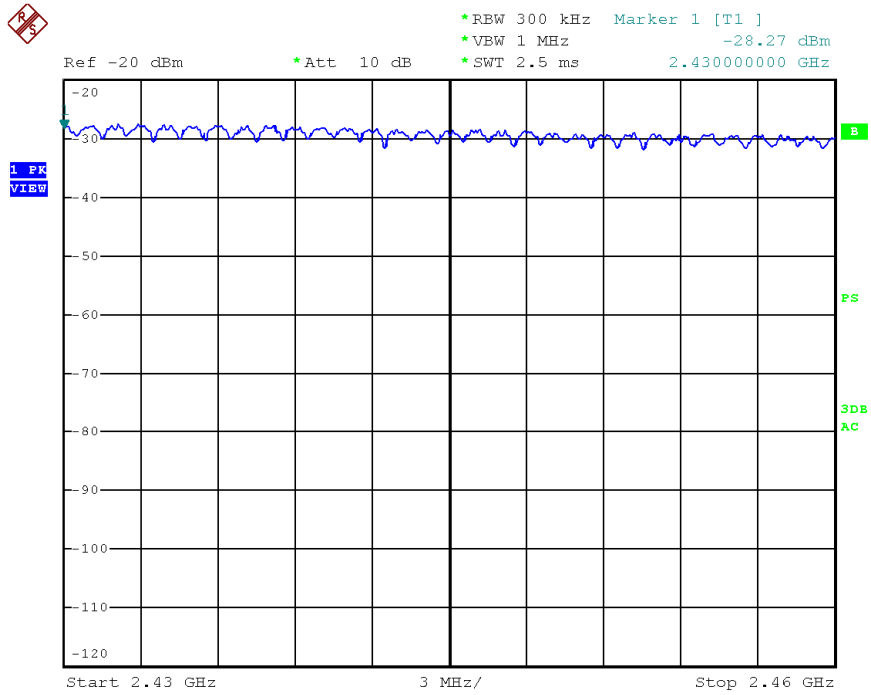


Date: 24.MAR.2015 18:25:10

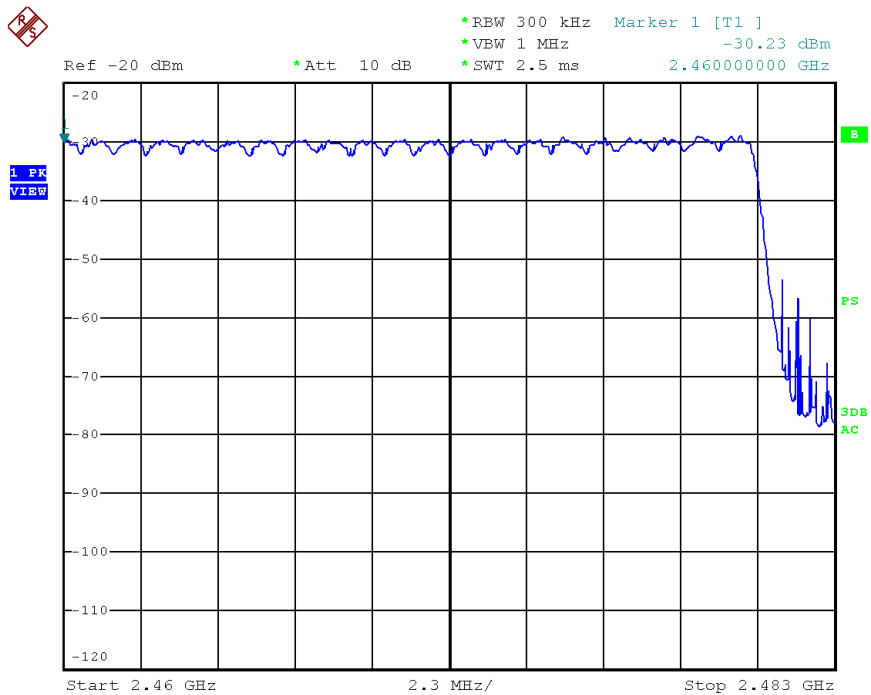
Mode	Channel Number	Limit
5	79	≥ 15



Date: 24.MAR.2015 17:58:02

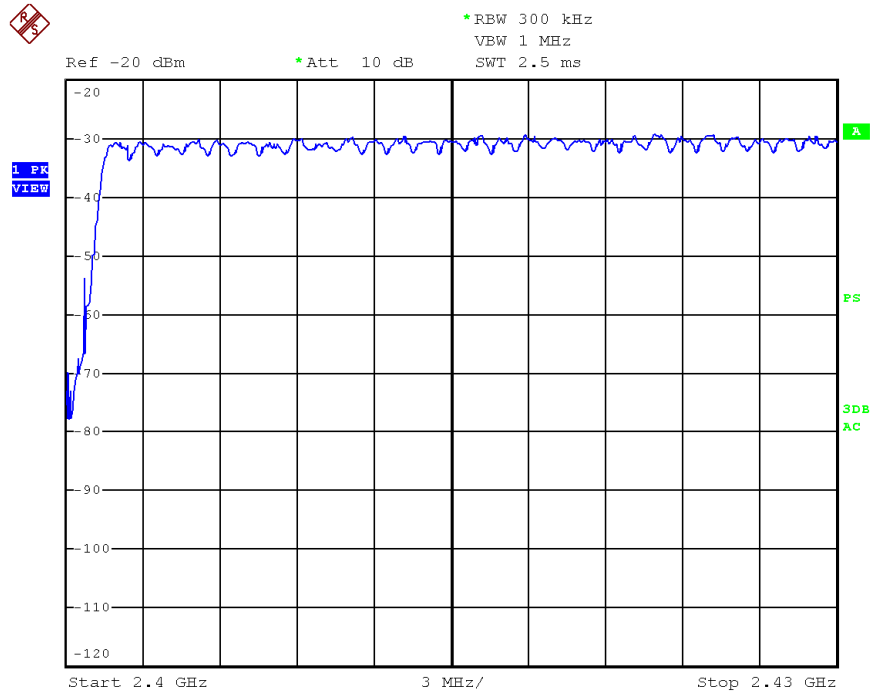


Date: 24.MAR.2015 18:00:33

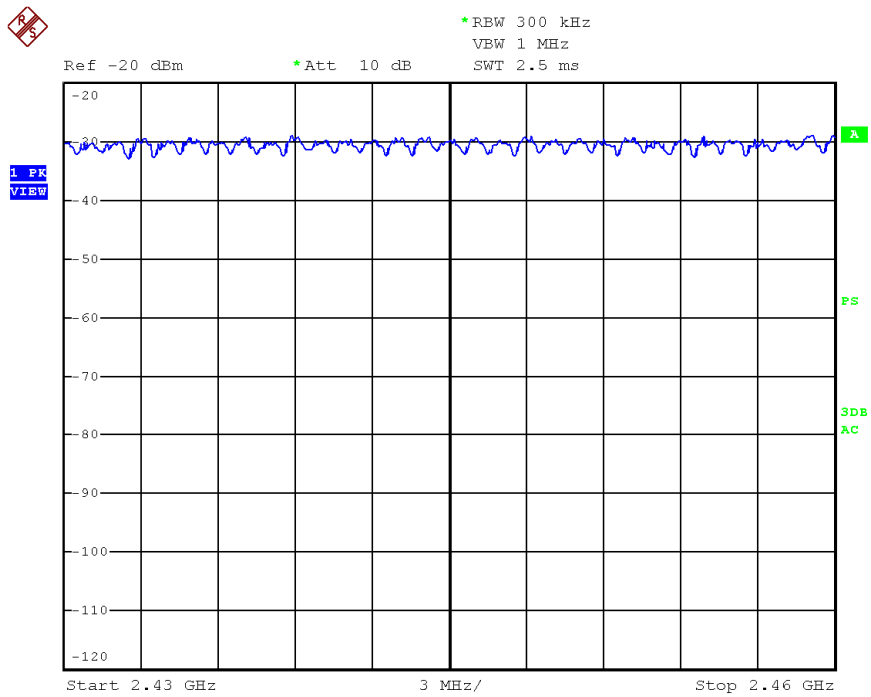


Date: 24.MAR.2015 18:02:00

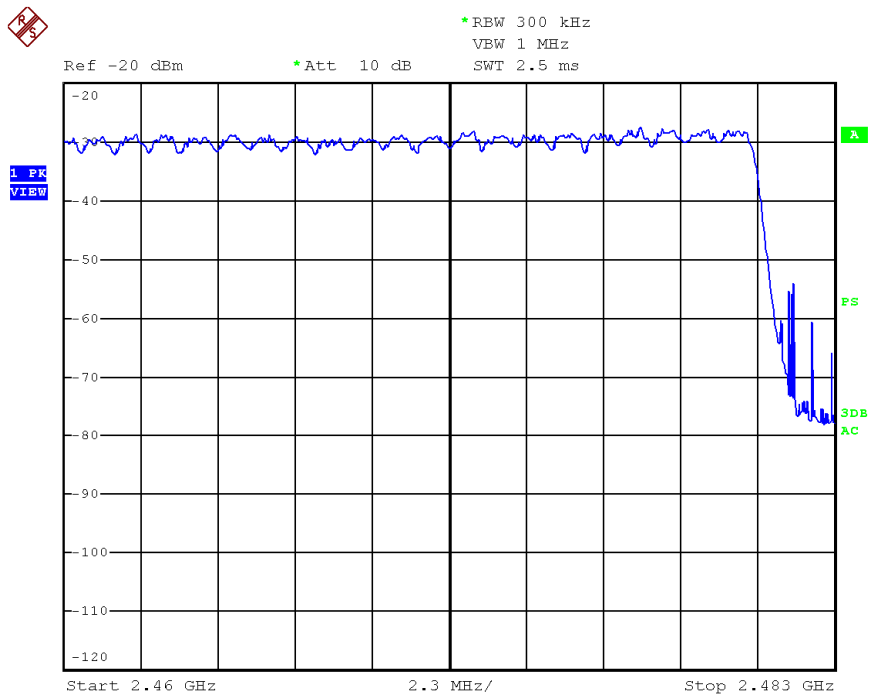
Mode	Channel Number	Limit
6	79	≥ 15



Date: 24.MAR.2015 17:25:37



Date: 24.MAR.2015 17:26:15



Date: 24.MAR.2015 17:27:01

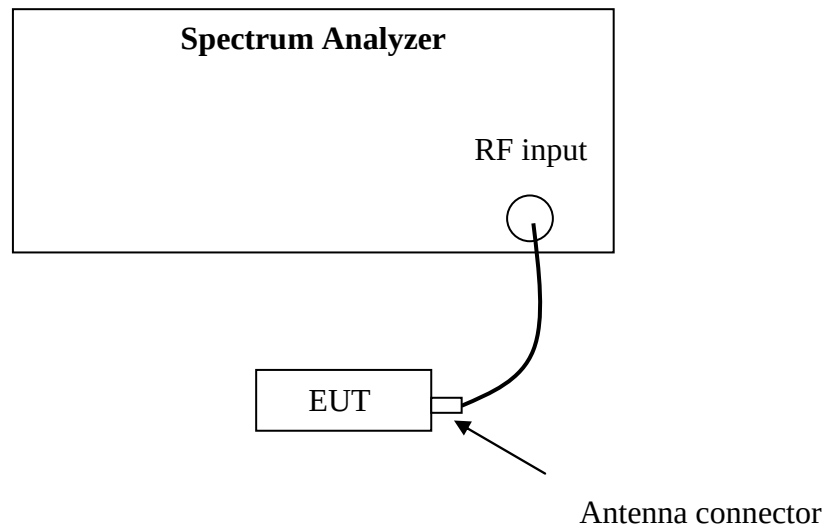
10. Dwell Time

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).

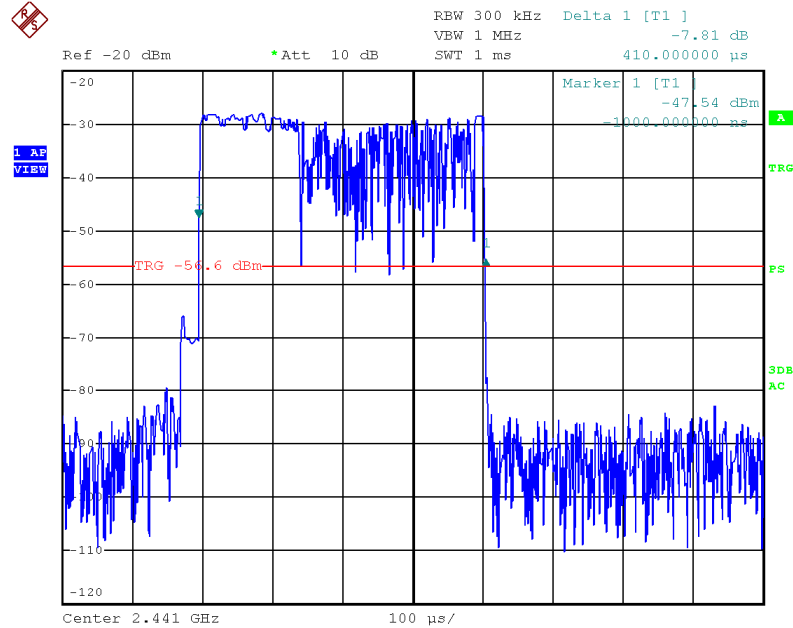
10.4 Test protocol

Channel	Mode	Time of Occupancy (ms)	Limit (ms)
M	8DPSK_DH1	131.2	≤400

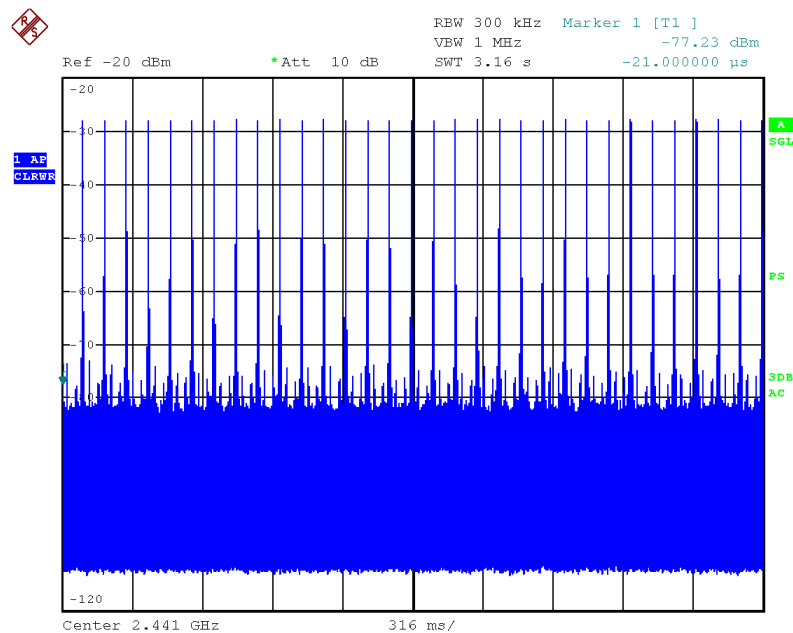
Dwell time for single hop: 0.41ms; Hopping numbers within 1sec: 32hops/3.16s;

Test Time Period: $0.4 \times 79 = 31.6\text{sec}$;

The Maximum Occupancy Time within 31.6s: $0.41 \times (32/3.16) \times 31.6 = 131.2\text{ms}$



Date: 24.MAR.2015 17:37:16



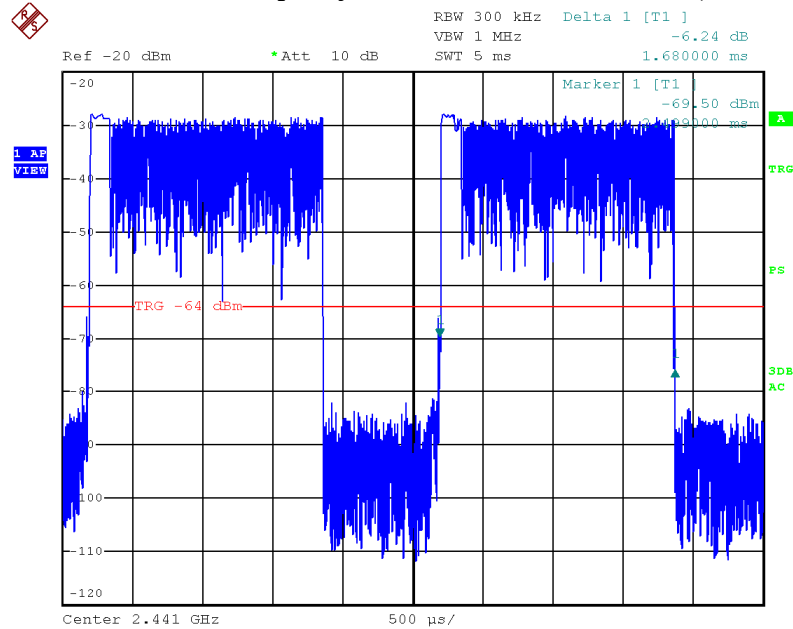
Date: 24.MAR.2015 17:41:47

Channel	Mode	Time of Occupancy (ms)	Limit (ms)
M	8DPSK_DH3	268.8	≤400

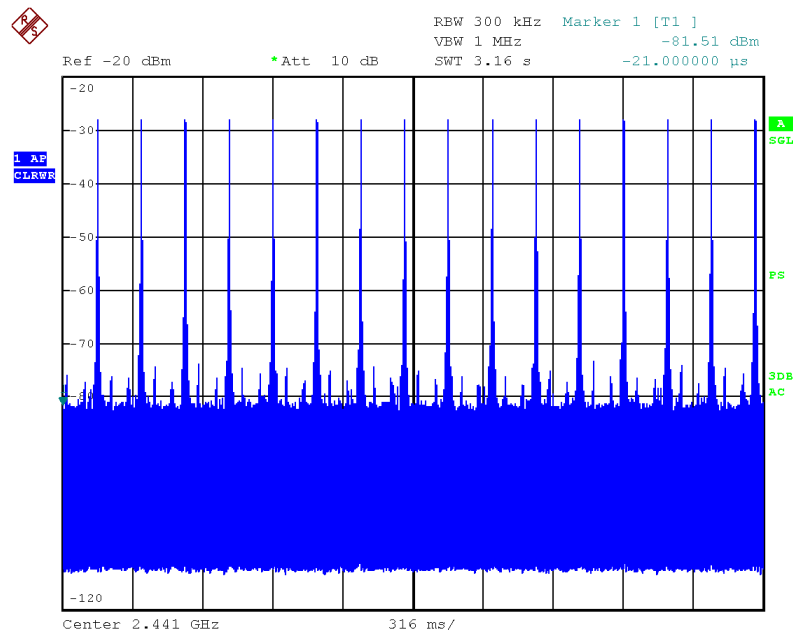
Dwell time for single hop: 1.68ms; Hopping numbers within 1sec: 16hops/3.16s;

Test Time Period: $0.4 \times 79 = 31.6\text{sec}$;

The Maximum Occupancy Time within 31.6s: $1.68 \times (16/3.16) \times 31.6 = 268.8\text{ms}$



Date: 24.MAR.2015 17:38:38



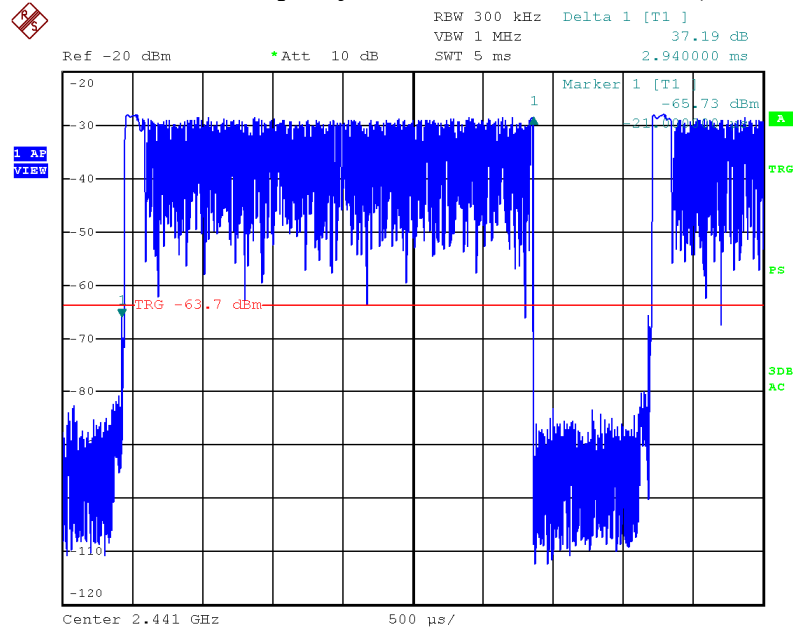
Date: 24.MAR.2015 17:42:31

Channel	Mode	Time of Occupancy (ms)	Limit (ms)
M	8DPSK_DH5	323.4	≤400

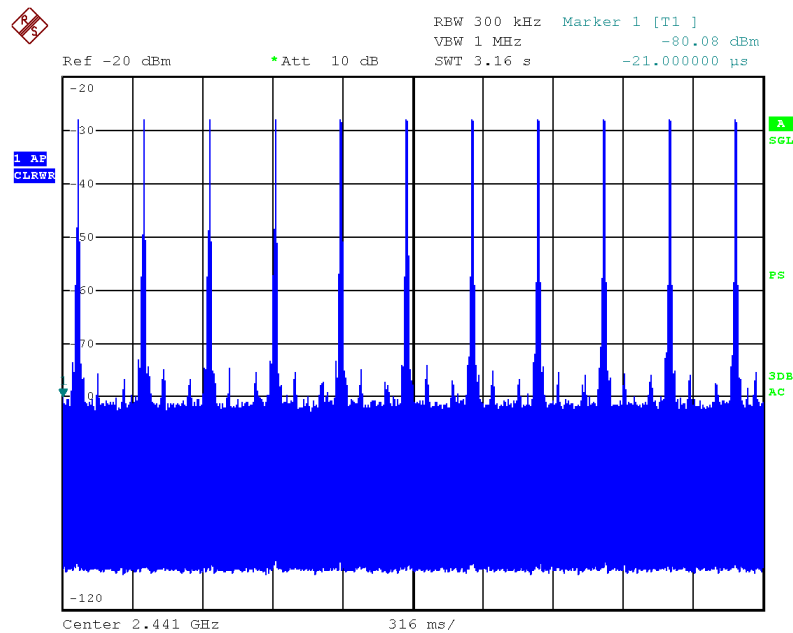
Dwell time for single hop: 2.94ms; Hopping numbers within 1sec: 11hops/3.16s;

Test Time Period: $0.4 \times 79 = 31.6\text{sec}$;

The Maximum Occupancy Time within 31.6s: $2.94 \times (11/3.16) \times 31.6 = 323.4\text{ms}$



Date: 24.MAR.2015 17:39:52



Date: 24.MAR.2015 17:43:07

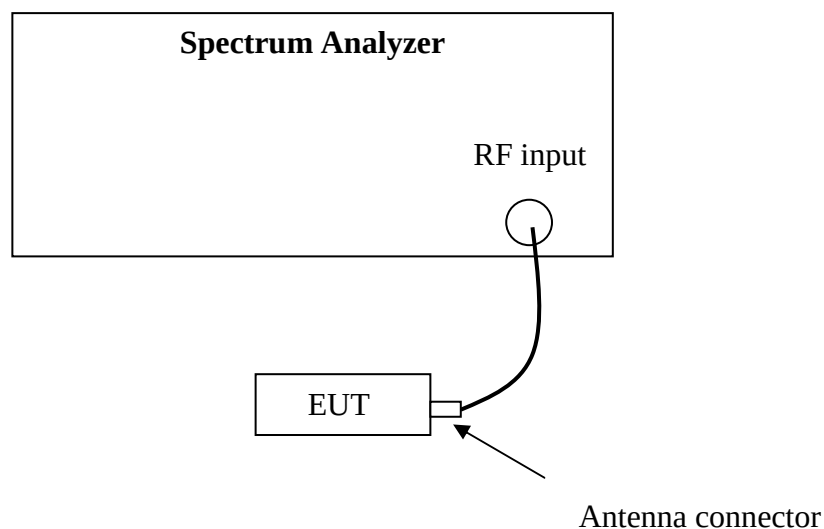
11. Occupied Bandwidth

Test Status: NA

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 : °C
Relative Humidity : %

Mode	CH	Occupied Bandwidth (kHz)
1	L	/
	M	/
	H	/

Mode	CH	Occupied Bandwidth (kHz)
2	L	/
	M	/
	H	/

Mode	CH	Occupied Bandwidth (kHz)
3	L	/
	M	/
	H	/