

Test report no. : 226119-2

Item tested : KX-TG7871

Type of equipment : BT integrated in UPCS Base

FCC ID : ACJ96NKX-TG7871

Client : Panasonic System Networks Co., Ltd.

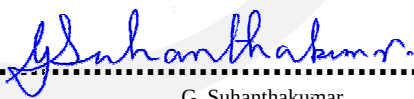
FCC Part 15.247

Frequency Hopping Transmitters /
Digital Transmission System

RSS-210, Issue 8

Low Power Licence-Exempt
Radiocommunication Devices

11 January 2013

Authorized by : 
G. Suhanthakumar
Technical Verificator

CONTENTS

1	GENERAL INFORMATION.....	3
1.1	Testhouse Info.....	3
1.2	Client Information	3
1.3	Responsible Manufacturer (if other than client).....	3
2	Test Information	4
2.1	Test Item.....	4
2.2	Test Environment	5
2.3	Test Period	5
2.4	Test Engineer(s)	5
2.5	Test Equipment	5
3	TEST REPORT SUMMARY	6
3.1	General.....	6
3.2	Test Summary	7
3.3	Description of modification for Modification Filing	7
3.4	Comments	7
3.5	Family List Rational	7
4	TEST RESULTS.....	8
4.1	Power Line Conducted Emissions.....	8
4.2	Channel Separation and 20dB Bandwidth.....	10
4.3	Pseudorandom Hopping Algorithm.....	14
4.4	Occupancy Time.....	15
4.5	Occupied Bandwidth.....	18
4.6	Peak Power Output	21
4.7	Spurious Emissions (Radiated)	25
5	LIST OF TEST EQUIPMENT	46
6	BLOCK DIAGRAM.....	47
6.1	Conducted Tests	47
6.2	Power Line Conducted Emission.....	47
6.3	Test Site Radiated Emission	47

1 GENERAL INFORMATION

1.1 Testhouse Info

Name : Nemko AS
Address : Nemko Kjeller
Instituttveien 6, Box 96
NO-2027 Kjeller, NORWAY
Telephone : +47 64 84 57 00
Fax : +47 64 84 57 05
E-mail: comlab@nemko.com
FCC test firm : 994405
IC OATS : 2040D-1
Total Number of Pages: 47

1.2 Client Information

Name : Panasonic System Networks Co., Ltd.
Address : 1-62, 4-chome Minoshima, Hakata-ku, Fukuoka, 812-8531, Japan
Telephone : +81-92-477-1405

Contact:

Name : Mr. Hirai Keisuke
Telephone : +81-92-477-1405
E-mail : hirai.keisuke@jp.panasonic.com

1.3 Responsible Manufacturer (if other than client)

Same as client.

2 Test Information

2.1 Test Item

Name :	Panasonic
FCC ID :	ACJ96NKX-TG7871
Industry Canada ID :	216A-KXTG7871
Model name :	KX-TG7871
Serial number :	/
Hardware identity and/or version:	PNLB2156xx
Software identity and/or version :	SW401
Tested to IC Radio Standard (RSS) :	RSS-210 Issue 8, RSS-GEN Issue 3
Test Site IC Reg. Number :	IC 2040D-1
Frequency Range :	2402 – 2480 MHz
Number of Channels :	79 RF Channels
Operating Modes :	FHSS
Type of Modulation :	Digital (GFSK)
User Frequency Adjustment :	None
Conducted Output Power :	0.0042 Watts (Peak)
Type of Power Supply :	AC Adaptor: PNLV234 (UC)
Antenna Connector :	None
Antenna Diversity Supported :	No
Number of Antennas :	1

Description of Test Item

The EUT is a Bluetooth transceiver integrated into a UPCS Base. The UPCS part is covered by a separate test report.

Exposure Evaluation

The EUT is designed to be mounted on a table or fixed to a wall, and the user manual contains text that it shall be mounted with a separation distance of at least 20cm from any persons. For the purposes of exposure evaluation this EUT is a fixed device.

The EUT is exempted from RF Exposure Evaluation to Industry Canada requirements since the output power complies with the power levels of section 2.5.2 of RSS-102 Issue 4.

2.2 Test Environment

2.2.1 Normal test condition

Temperature:	19.1 – 23.3 °C
Relative humidity:	20.1 – 43.9 %
Normal test voltage:	120 V AC

The values are the limit registered during the test period.

2.3 Test Period

Item received date: 2012-11-02
Test period : from 2012-12-04 to 2012-12-21

2.4 Test Engineer(s)

Frode Sveinsen / Tore Løvlien

2.5 Test Equipment

See list of test equipment in clause 6.

3 TEST REPORT SUMMARY

3.1 General

Manufacturer: Panasonic
Model No.: KX-TG7871
Serial No.: /

All measurements are traceable to national standards.

The tests were conducted for the purpose of demonstrating compliance with FCC CFR 47 Part 15, paragraph 15.247 and Industry Canada RSS-210 Issue 8.

Radiated tests were conducted in accordance with ANSI C63.4-2003 and ANSI C63.10-2009. The radiated tests were made in a semi-anechoic chamber at measuring distances of 3m and 10m.

A description of the test facility is on file with the FCC and Industry Canada.

☒ New Submission ☒ Production Unit
☐ Class II Permissive Change ☐ Pre-production Unit
DSS Equipment Code ☐ Family Listing

THIS TEST REPORT APPLIES ONLY TO THE ITEM(S) AND CONFIGURATIONS TESTED.

Deviations from, additions to, or exclusions from the test specifications are described in "Summary of Test Data".



TEST REPORT #: 226119-2

TESTED BY: Frode Sveinsen
Frode Sveinsen, Test engineer

DATE: 2 January 2013

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3.2 Test Summary

Name of test	FCC Part 15 reference	RSS-210 Issue 8 reference	Result
Supply Voltage Variations	15.31(e)	8 (RSS-GEN)	Complies
Number of Operating Frequencies	15.31(m)	A8.1	Complies
Antenna Requirement	15.203	7.1.4 (RSS-GEN)	Complies ¹
Power Line Conducted Emission	15.107(a) 15.207(a)	7.2.2 (RSS-GEN)	Complies
Channel Separation and 20 dB Bandwidth	15.247(a)(1)	A8.1	Complies
Pseudorandom Hopping Algorithm	15.247(a)(1)	A8.1	Complies
Time of Occupancy	15.247(a)(1)(iii)	A8.1	Complies
Occupied Bandwidth	15.247(a)(1)	A8.1	Complies
Minimum 6 dB Bandwidth	15.247(a)(2)	A8.2	N/A
Peak Power Output	15.247(b)	A8.4	Complies
Power Spectral Density	15.247(d)	A8.2	N/A
Spurious Emissions (Antenna Conducted)	15.247(c)	A8.5	Complies
Spurious Emissions (Radiated)	15.247(c) 15.109(a) 15.209(a)	A8.5	Complies

¹ The tested equipment has integrated antennas only.

3.3 Description of modification for Modification Filing

Not applicable.

3.4 Comments

All ports were populated during spurious emission measurements.

3.5 Family List Rational

Not Applicable.

4 TEST RESULTS

4.1 Power Line Conducted Emissions

Para. No.: 15.207 (a)

Test Performed By: Tore Løvlien

Date of Test: 21-Dec-2012

Measurement procedure: ANSI C63.4-2009 using 50 μ H/50 ohms LISN.

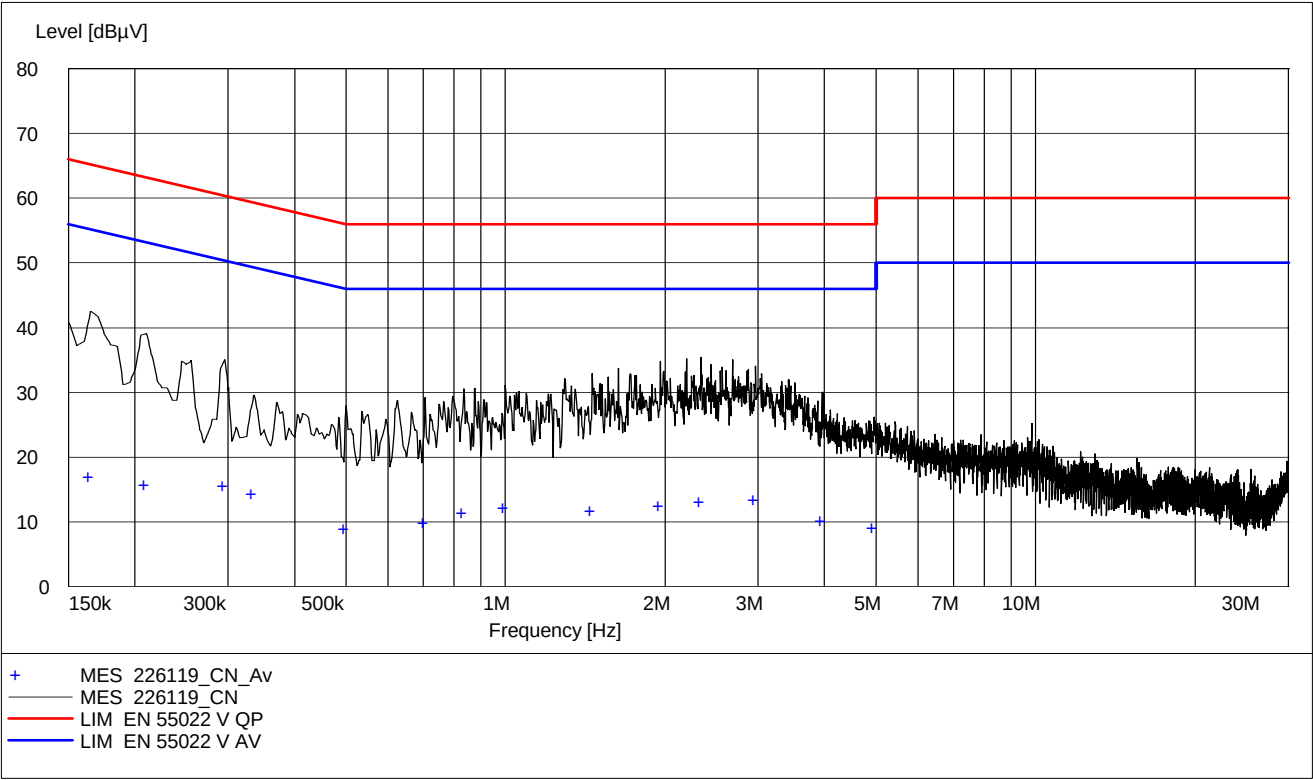
Test Results: Complies

Measurement Data: See attached graph, (Peak detector).

Highest measured value (L1 and N):

PNLV234 (UC):

Frequency [MHz]	Level [dBuV]	Af [dB]	Limit [dBuV]	Margin [dB]	Det	Position	Verdict [Pass/Fail]
0.165000	16.90	10.10	55.20	38.30	AV	L1	Pass
0.210000	15.80	10.10	53.20	37.40	AV	N	Pass
0.295000	15.60	10.10	50.40	34.80	AV	L1	Pass
0.335000	14.30	10.20	49.30	35.00	AV	N	Pass
0.500000	9.00	10.20	46.00	37.00	AV	L1	Pass
0.705000	9.90	10.20	46.00	36.10	AV	L1	Pass
0.835000	11.30	10.20	46.00	34.70	AV	L1	Pass
1.000000	12.20	10.20	46.00	33.80	AV	L1	Pass
1.460000	11.70	10.20	46.00	34.30	AV	L1	Pass
1.960000	12.50	10.20	46.00	33.50	AV	L1	Pass
2.340000	13.10	10.30	46.00	32.90	AV	L1	Pass
2.965000	13.40	10.30	46.00	32.60	AV	L1	Pass
3.960000	10.10	10.40	46.00	35.90	AV	L1	Pass
4.960000	9.10	10.40	46.00	36.90	AV	L1	Pass



PNLV234 (UC) (Plot shows worst case of Phase L1 and N)

4.2 Channel Separation and Occupied Bandwidth

Para. No.: 15.247 (a)(1)

Test Performed By: Frode Sveinsen

Date of Test: 11 Dec 2012

Test Results: **Complies**

Measurement Data: Channel Separation: 1.000 MHz

Occupied Bandwidth (kHz)			
	2402 MHz	2441 MHz	2480 MHz
Measured Value	863.1	866.1	866.1

See attached plots

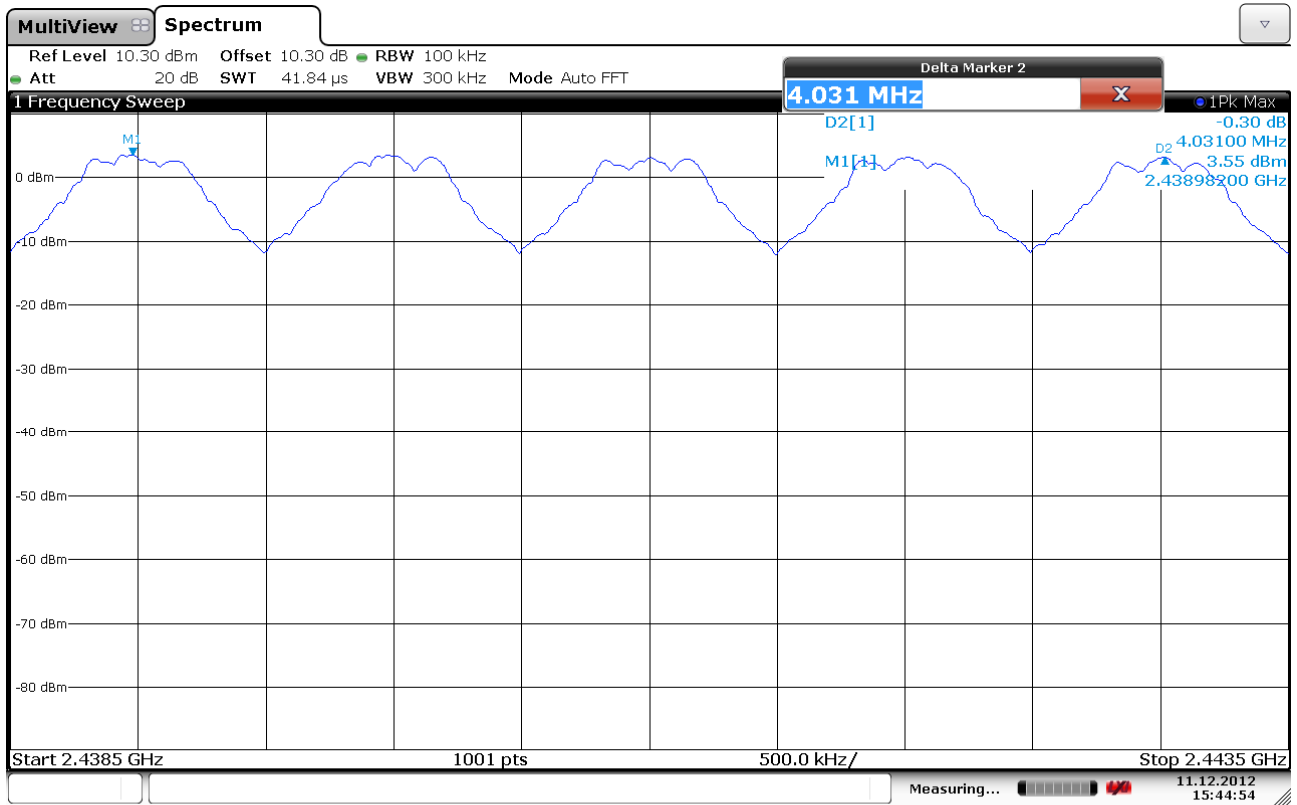
Channel Separation nominal value: 1.000 MHz.

Requirement:

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.

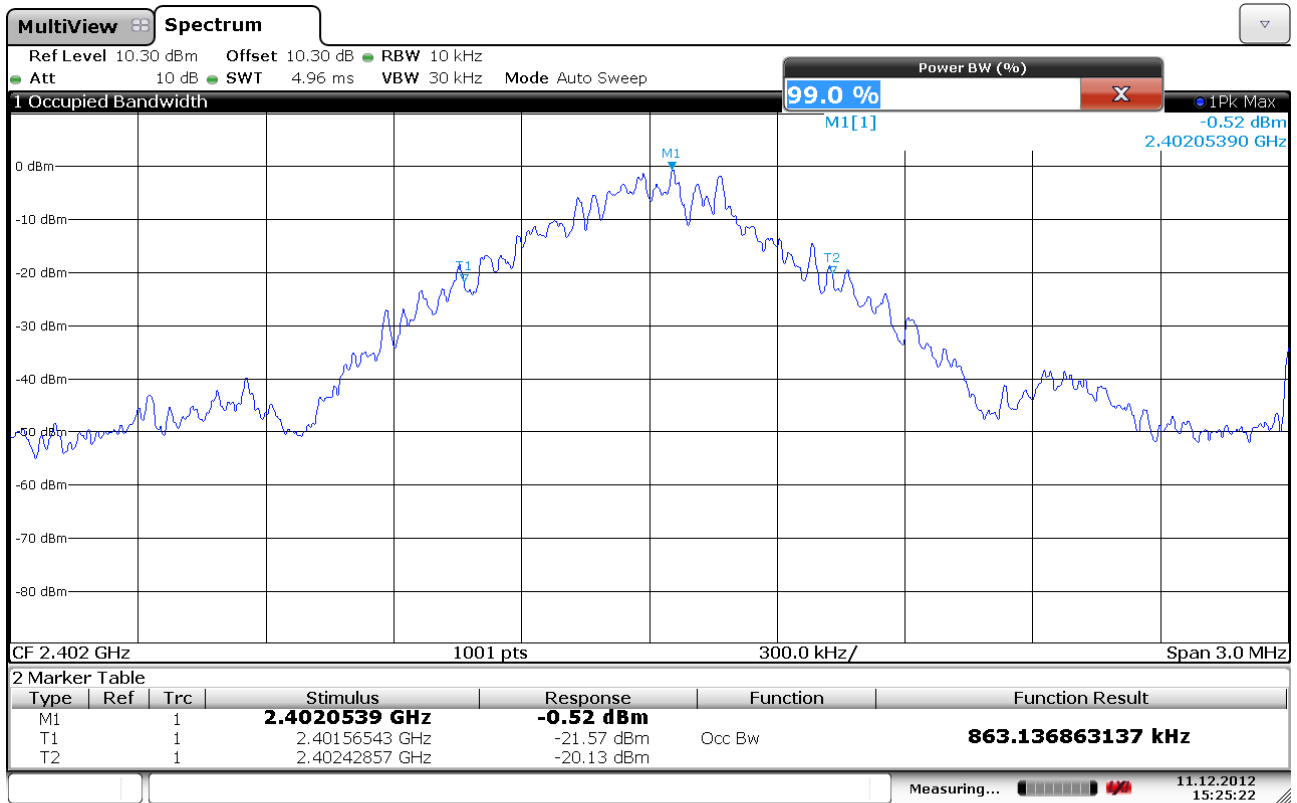
or:

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the system operates with an output power no greater than 125 mW.



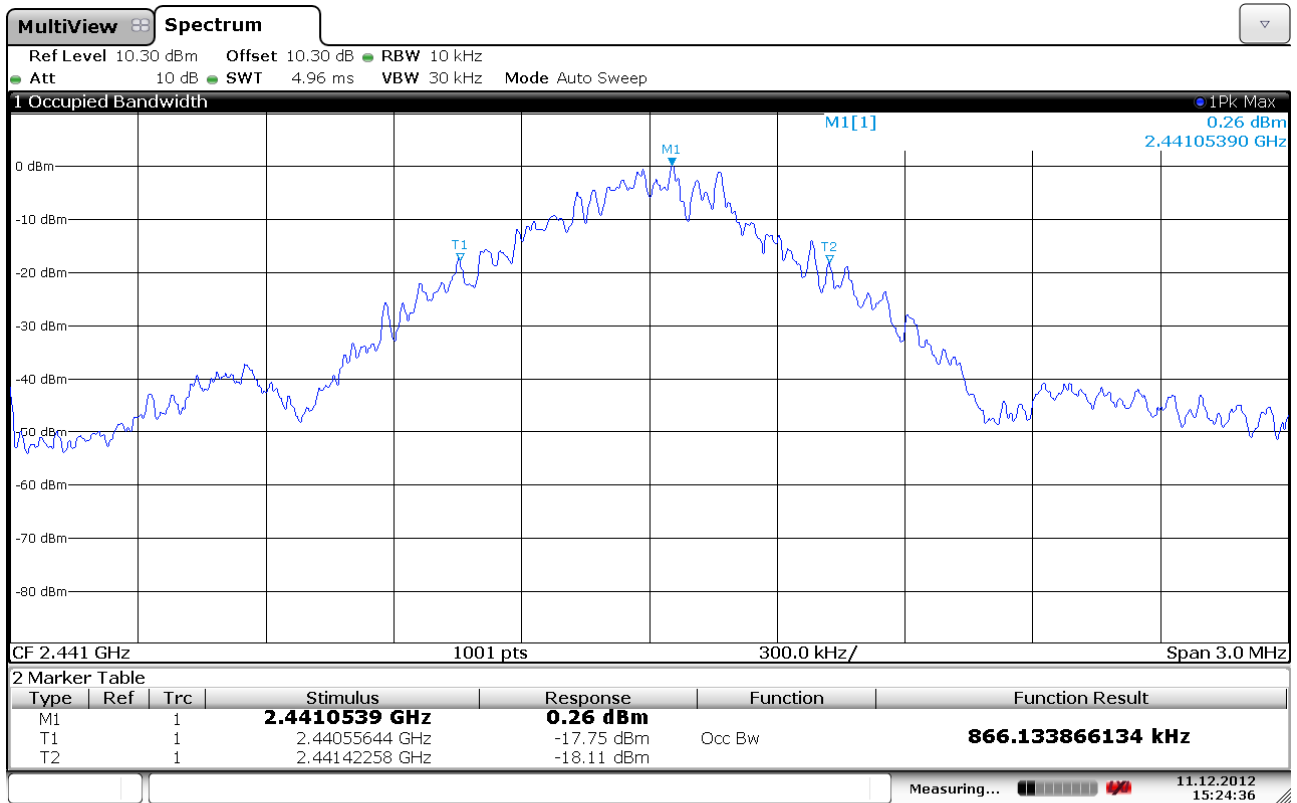
Date: 11.DEC.2012 15:44:54

Channel Separation



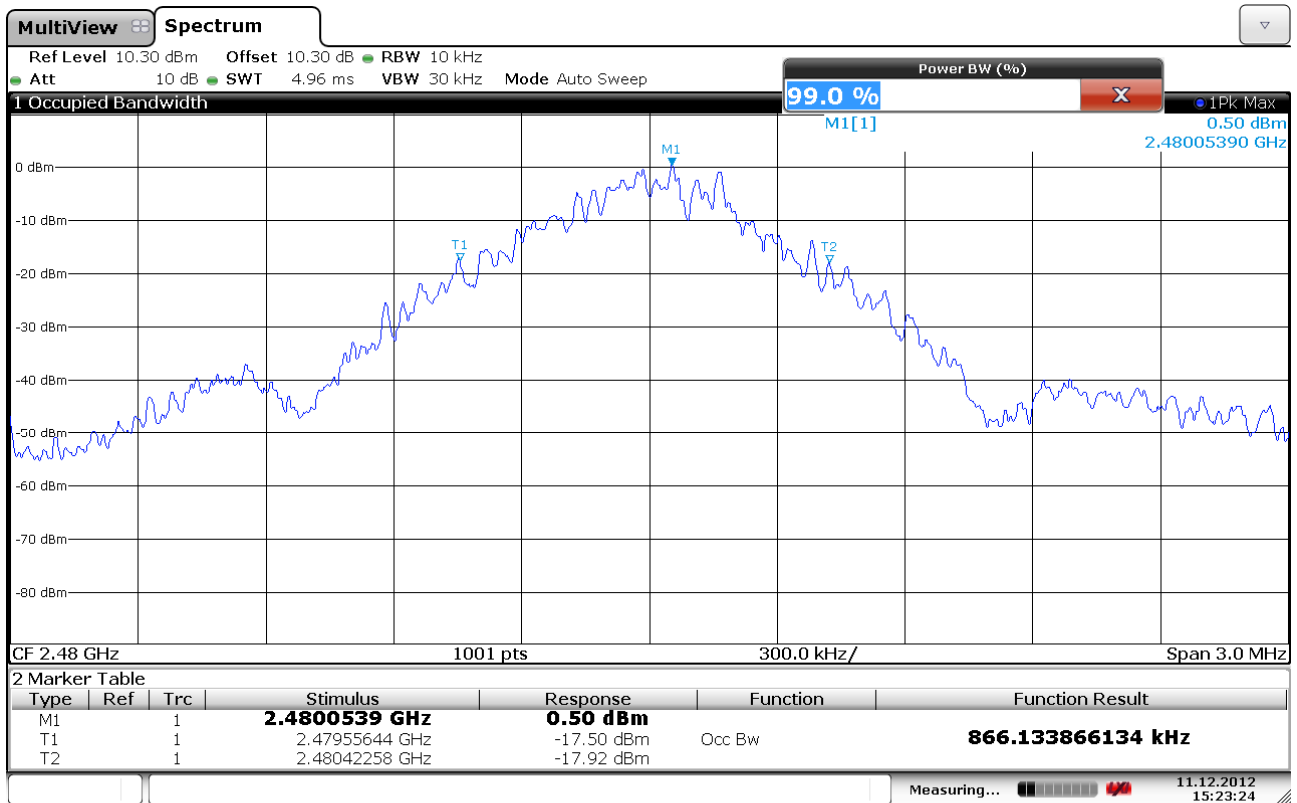
Date: 11.DEC.2012 15:25:22

99% Bandwidth, 2402 MHz



Date: 11.DEC.2012 15:24:36

99% Bandwidth, 2441 MHz



Date: 11.DEC.2012 15:23:24

99% Bandwidth, 2480 MHz

4.3 Pseudorandom Hopping Algorithm

Para. No.: 15.247 (a)(1)

Test Results: Complies

Measurement Data: /

Requirements:

The channel frequencies shall be selected from a pseudorandom ordered list of hopping frequencies. Each frequency must be used equally by the transmitter.

Base Table Hopping Sequence

To be described in manufacturer documentation.

4.4 Occupancy Time

Para. No.: 15.247 (a)(1)(iii)

Test Performed By: Frode Sveinsen

Date of Test: 11 Dec 2012

Test Results: **Complies**

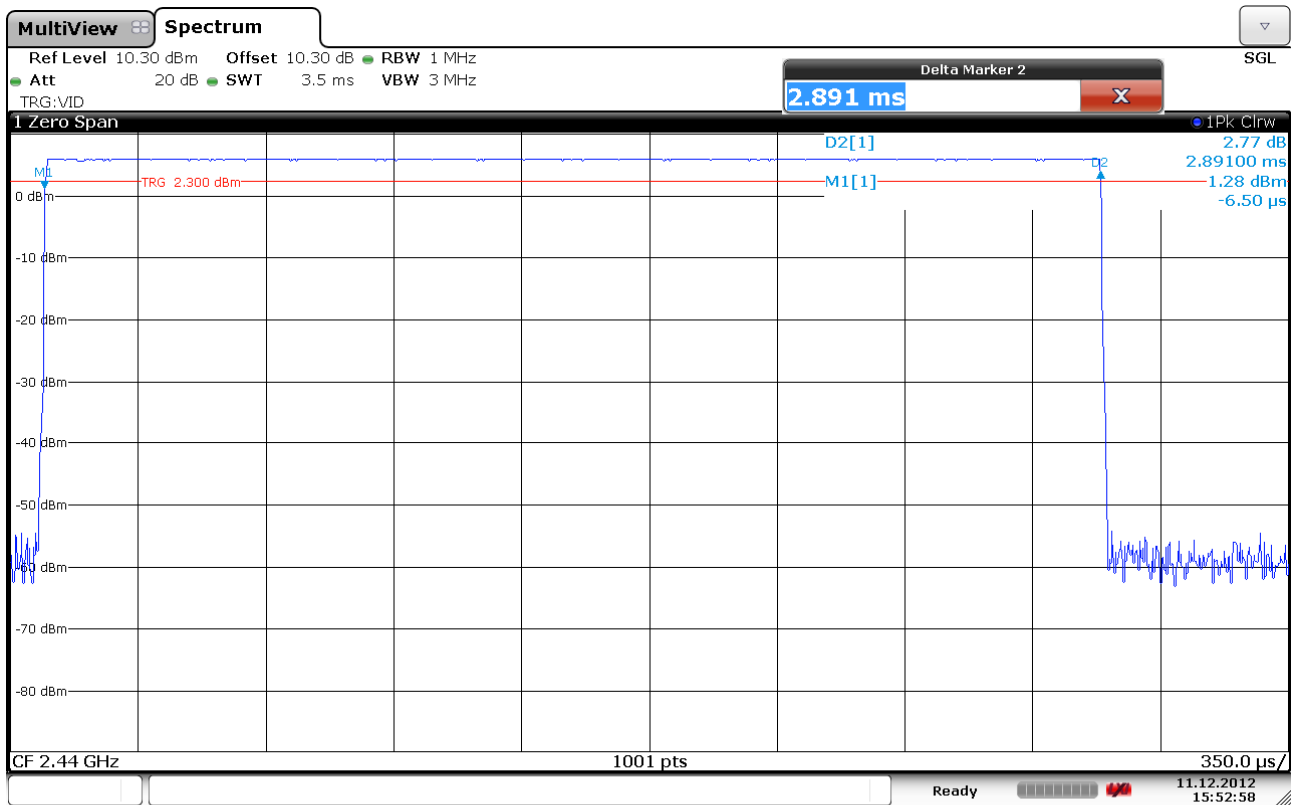
Measurement Data:

Number of RF channel: 79
RF burst pr channel: 2.89 ms
Time between each RF burst on same RF channel: $3.725 \times 79 = 294.275$ ms
Time of occupancy: $(2.89 \times 400 \times 79) / 294.275 = 0.3103$ s

See plot.

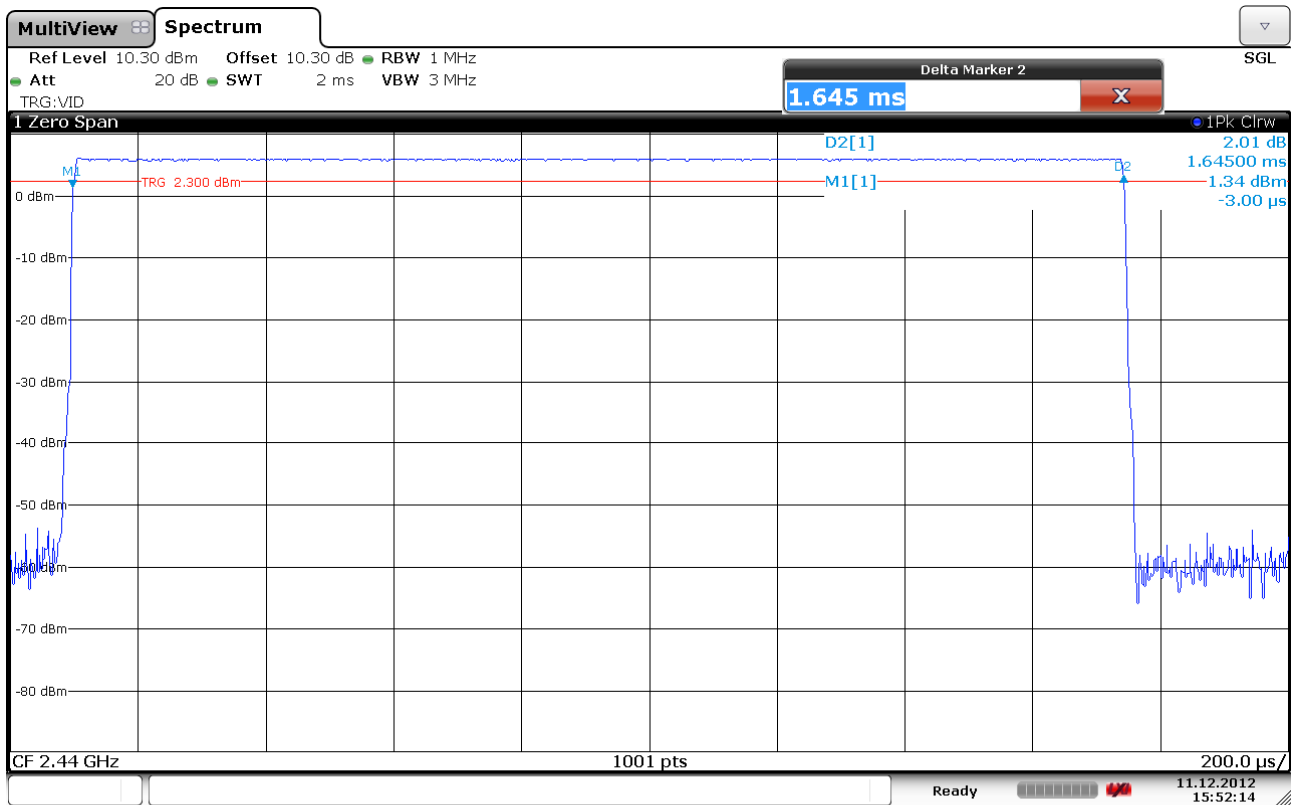
Requirements:

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.



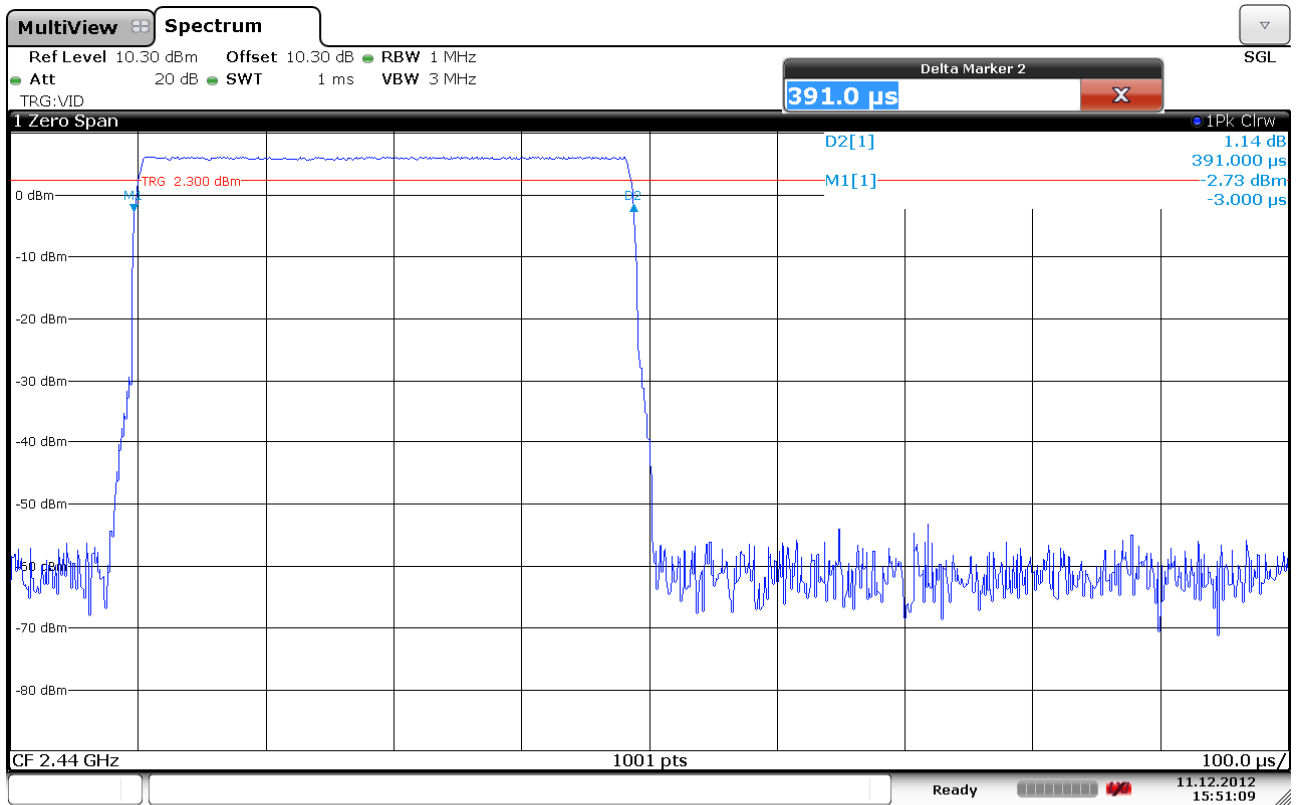
Date: 11.DEC.2012 15:52:58

Occupancy Time, DH5



Date: 11.DEC.2012 15:52:14

Occupancy Time, DH3



Date: 11.DEC.2012 15:51:09

Occupancy Time, DH1

4.5 Occupied Bandwidth

Para. No.: 15.247 (a)(1)(iii)

Test Performed By: Frode Sveinsen	Date of Test: 11 Dec 2012
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Test Results: Complies

Measurement Data: 20 or 79 RF channels in use

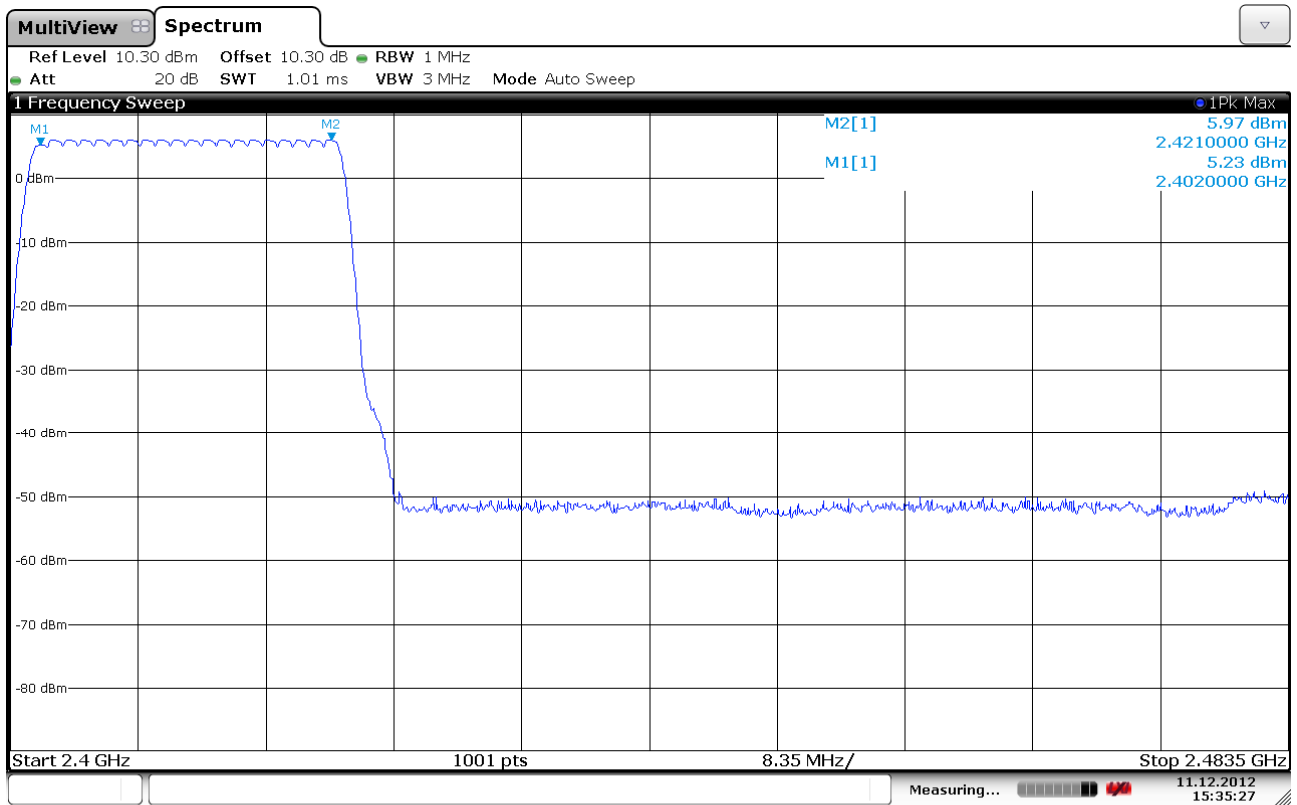
Channel Centre Frequencies:

The channels are centered at each full MHz from 2402 to 2480 MHz.

See plots.

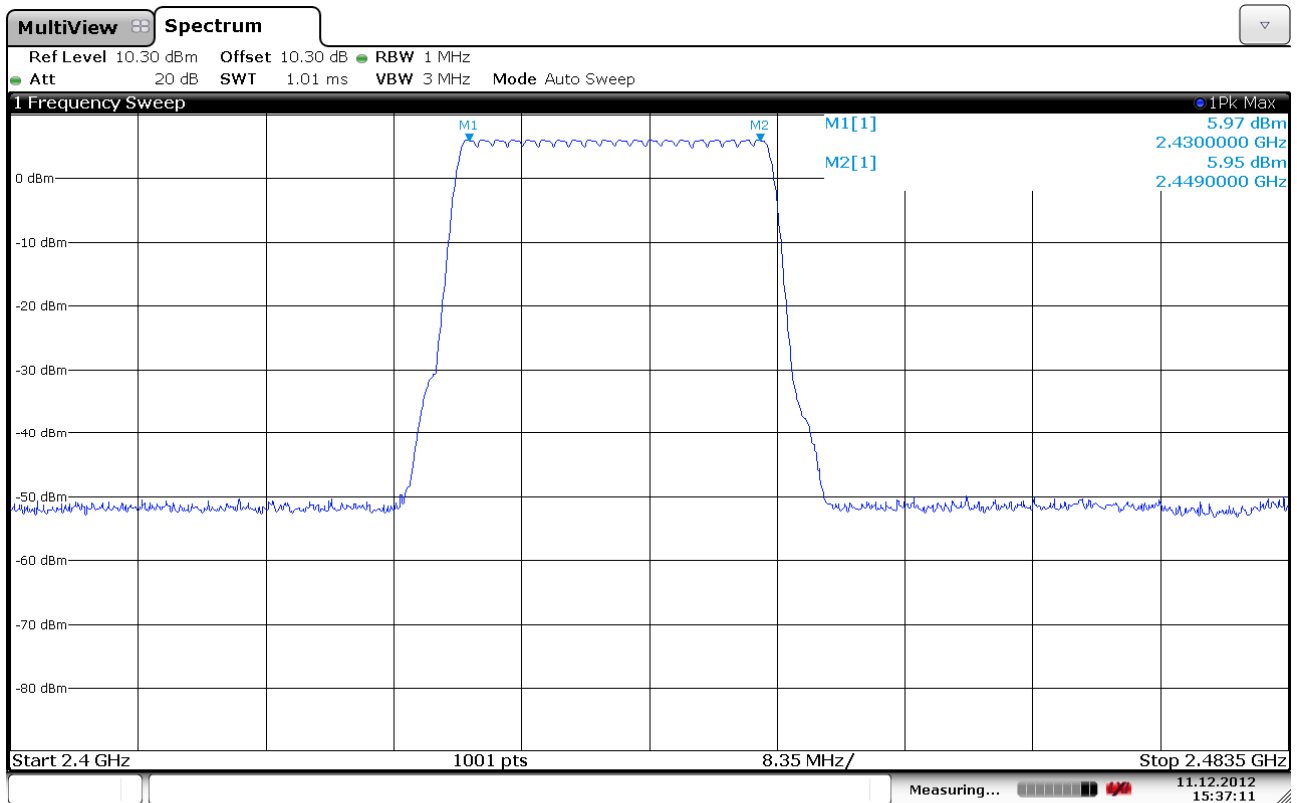
Requirements:

Frequency hopping systems in the 2400 - 2483.5 MHz band shall use at least 15 non-overlapping channels.
No requirements for bandwidth for this frequency band.



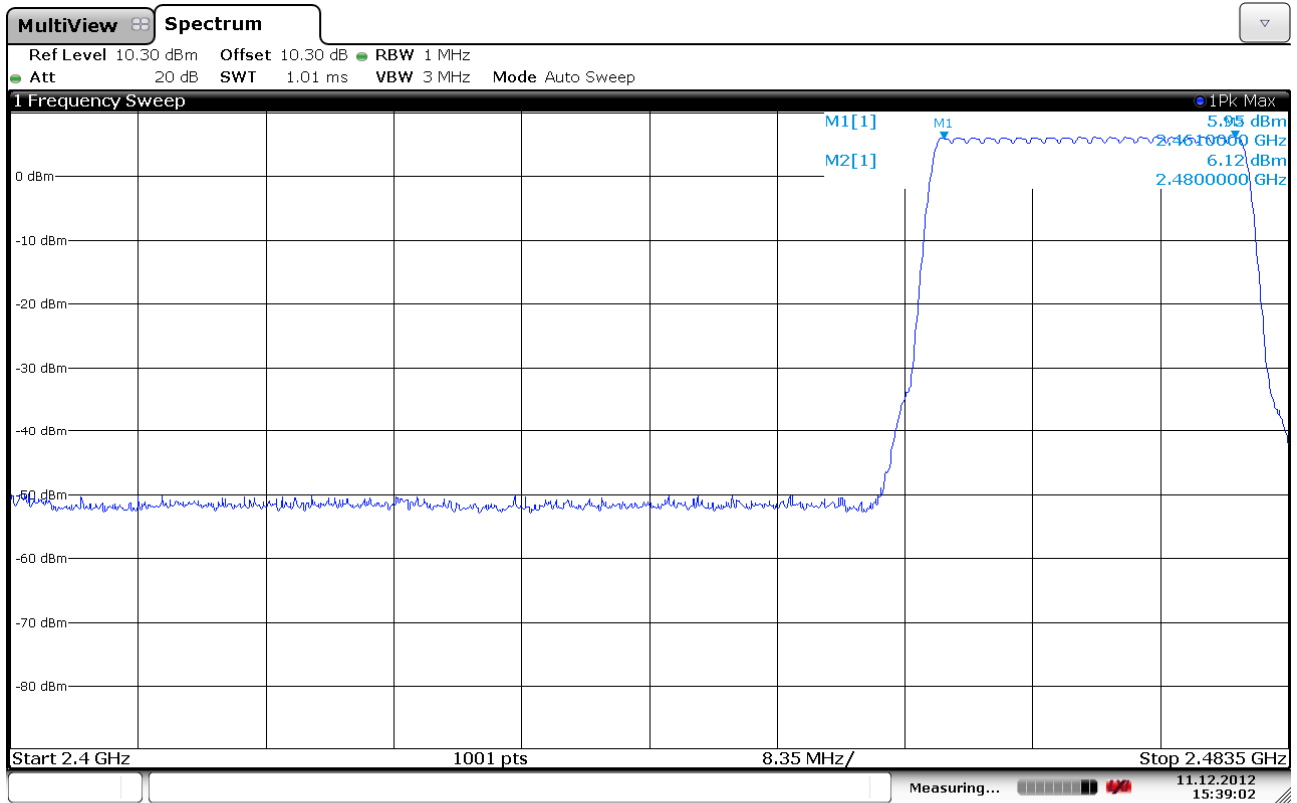
Date: 11.DEC.2012 15:35:27

RF Channels in use, Lower 20



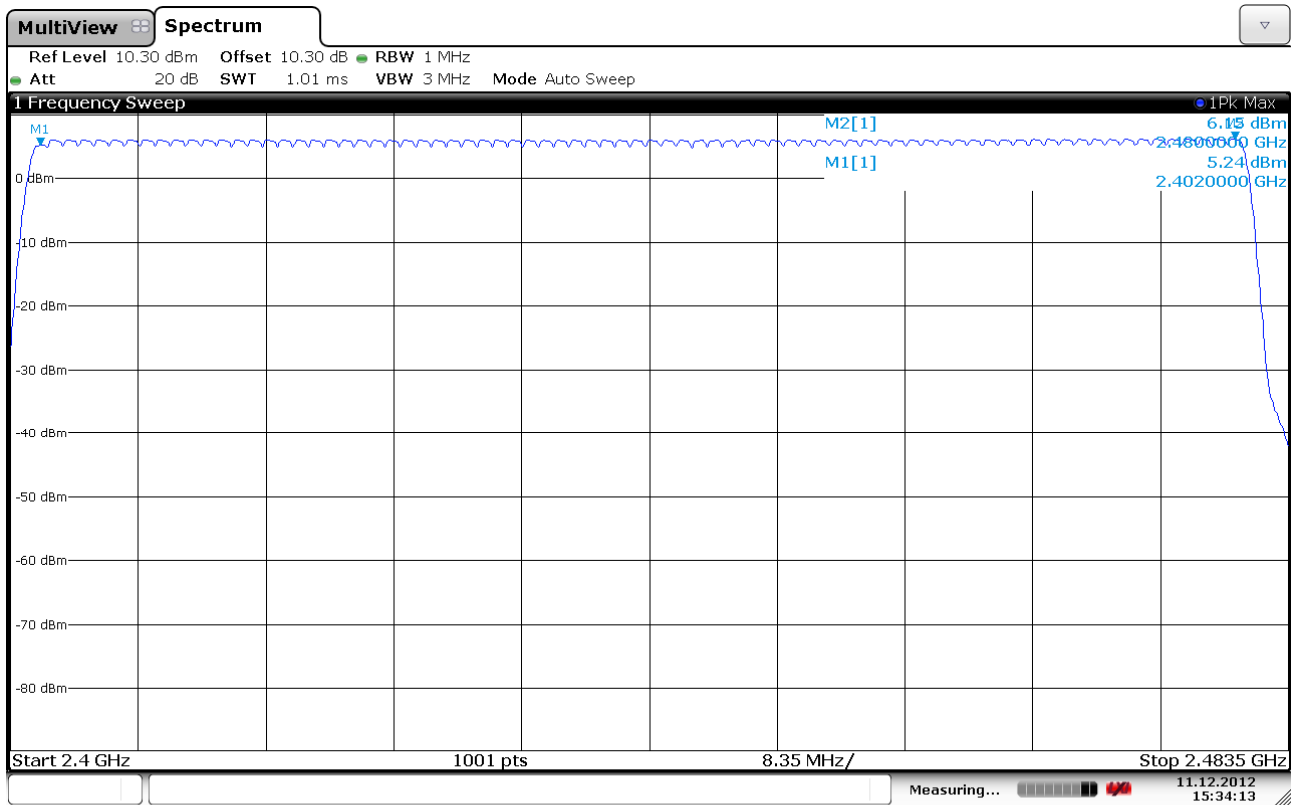
Date: 11.DEC.2012 15:37:12

RF Channels in use, Middle 20



Date: 11.DEC.2012 15:39:02

RF Channels in use, Upper 20



Date: 11.DEC.2012 15:34:13

RF Channels in use, Full Band

4.6 Peak Power Output

Para. No.: 15.247 (b)

Test Performed By: Frode Sveinsen	Date of Test: 11-12 Dec 2012
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Test Results: Complies

Measurement Data:

	2402 MHz	2441 MHz	2480 MHz
Peak Power (dBm)	5.5	6.0	6.2
Peak Power (Watts)	0.0035	0.0040	0.0042
Field Strength (dBµV/m)	101.3	102.4	103.0
EIRP, Calculated (Watts)	0.0041	0.0052	0.0059
Antenna gain (dBi)	0.6	1.2	1.5

Antenna gain = $10 \cdot \log(\text{EIRP} / \text{Conducted power})$ dBi

EIRP is calculated from measured field strength by the Free-Field Formula (See 558074 D01 Meas Guidance).

See attached graph.

Detachable antenna?

☐ Yes

☒ No

If detachable, is the antenna connector non-standard?

☐ Yes

☐ No

Type of antenna connector: N/A

Requirements:

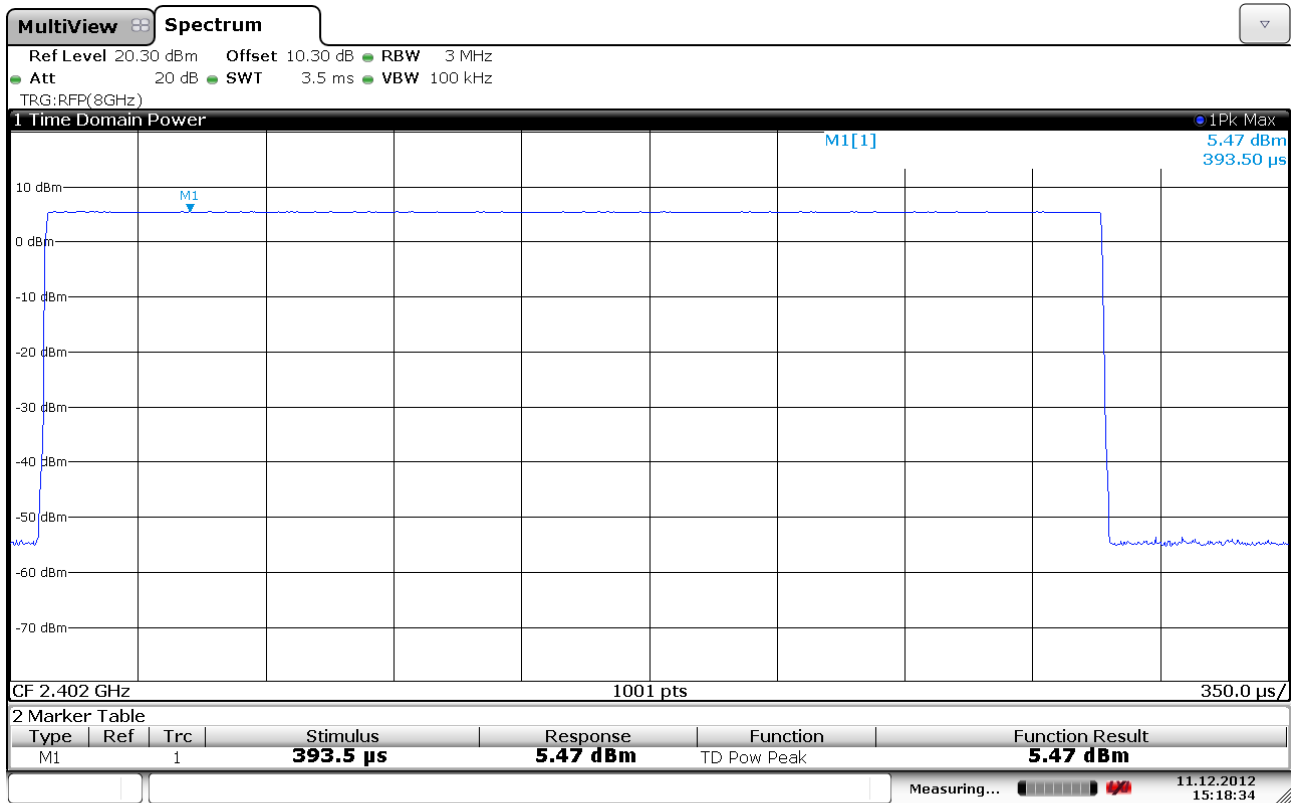
The maximum peak output power shall not exceed the following limits:

For frequency hopping systems employing at least 75 hopping channels: 1 Watt

For all other frequency hopping systems in the 2400 - 2483.5 MHz band: 0.125 Watts

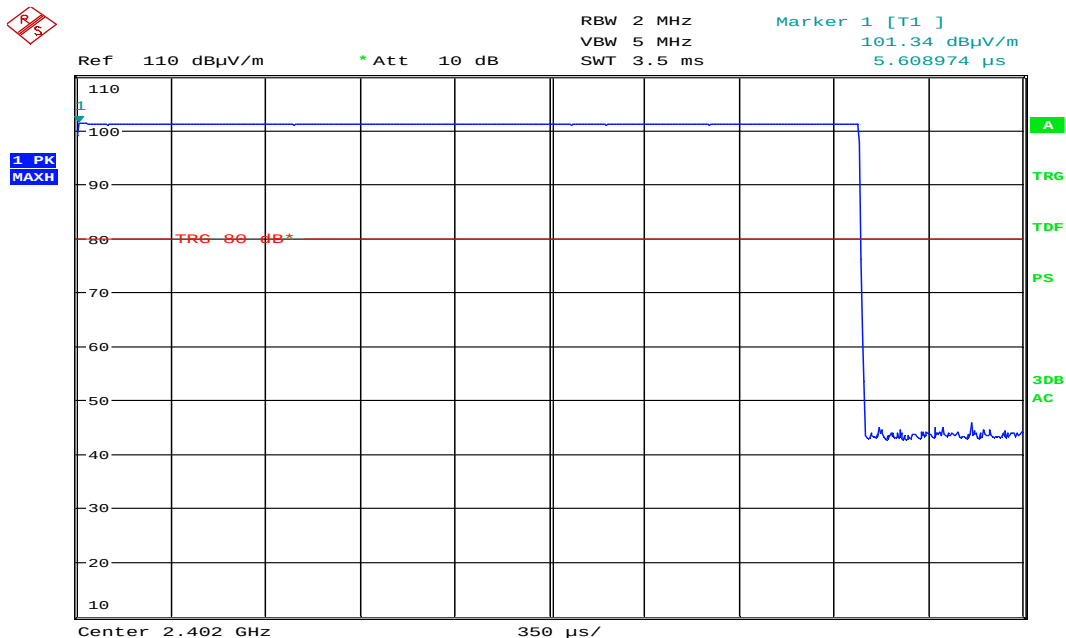
For Digital Transmission Systems in the 2400 - 2483.5 MHz band: 1 Watt

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power from the intentional radiator shall be reduced below the stated value above by the amount in dB that the directional gain of the antenna exceeds 6 dBi.



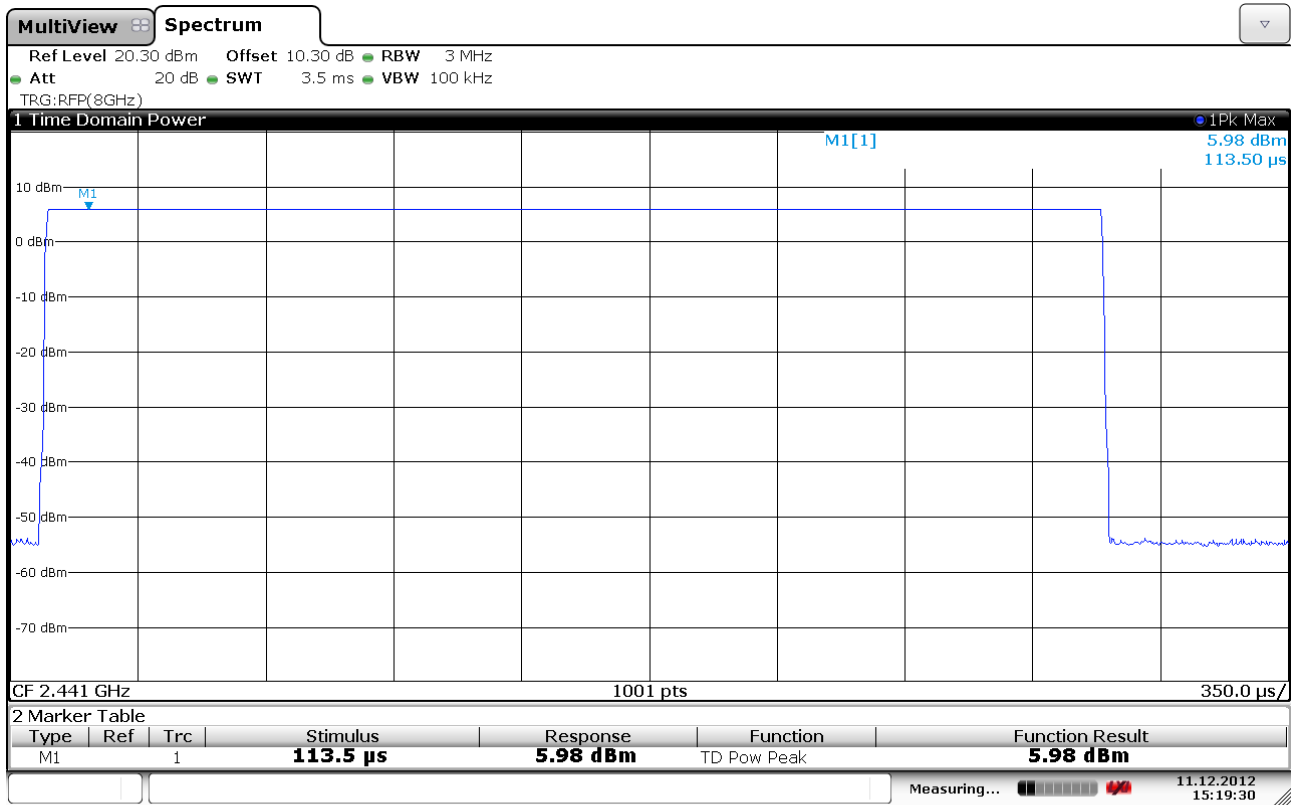
Date: 11.DEC.2012 15:18:34

Conducted Output Power, 2402MHz



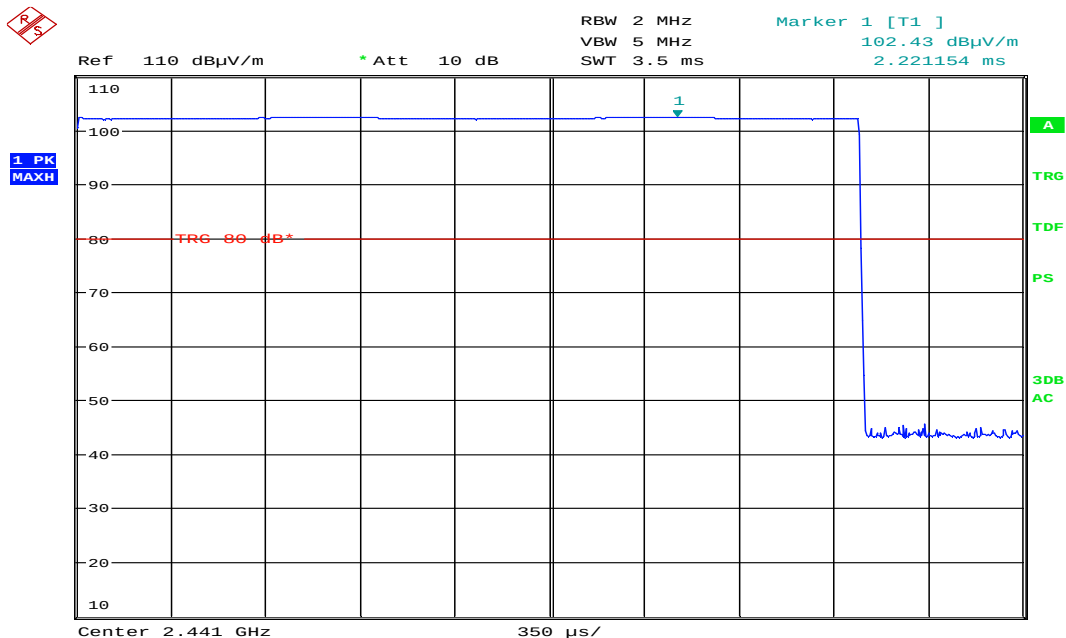
Date: 12.DEC.2012 11:11:12

Maximum Field Strength, 2402MHz (Max: EUT V, VP)



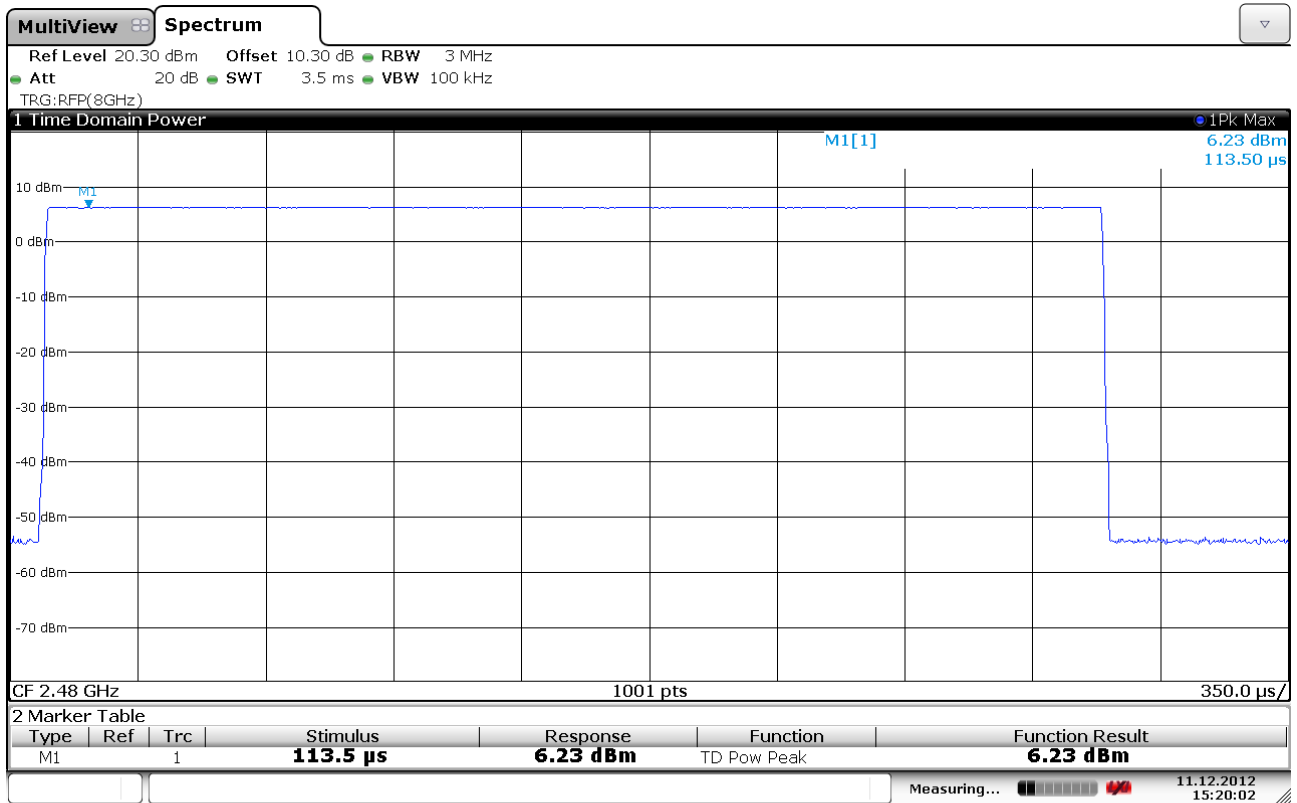
Date: 11.DEC.2012 15:19:30

Conducted Output Power, 2441MHz



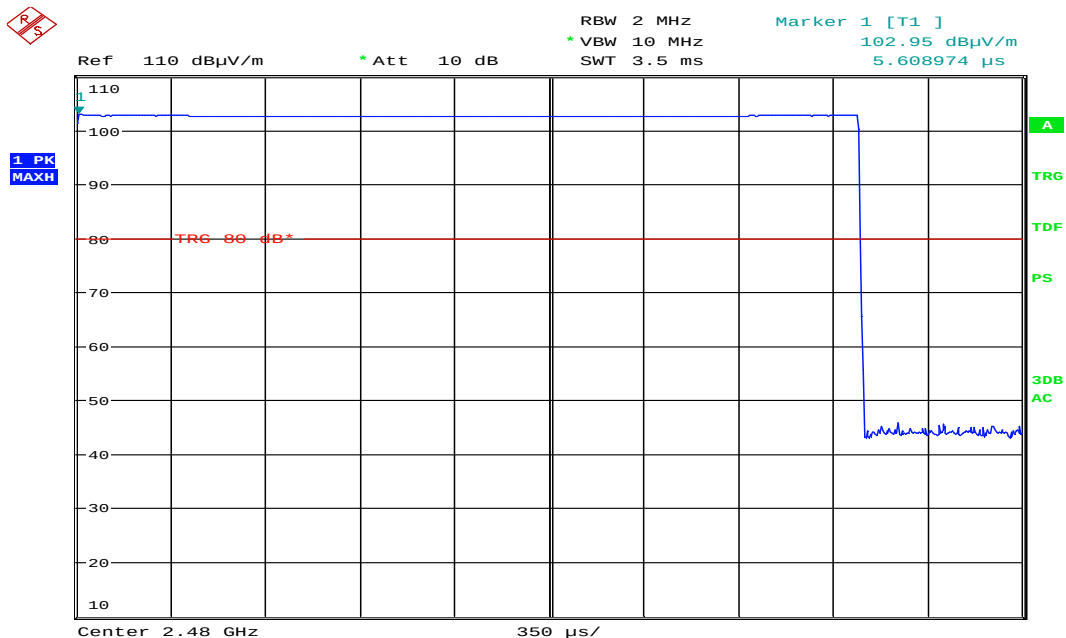
Date: 12.DEC.2012 11:03:59

Maximum Field Strength, 2441MHz (Max: EUT V, VP)



Date: 11.DEC.2012 15:20:02

Conducted Output Power, 2480MHz



Date: 12.DEC.2012 12:45:28

Maximum Field Strength, 2480MHz (Max: EUT V, VP)

4.7 Spurious Emissions (Radiated)

Para. No.: 15.247 (c)

Test Performed By: Frode Sveinsen	Date of Test: 11-12 Dec 2012
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Test Results: Complies

Measurement Data:

Band-edge, Peak Detector

Frequency	Field Strength, dBμV/m		Limit	Margin
GHz	Hopping Off	Hopping On	dB	dB
2.39	43.9	44.4	74	29.6
2.4835	61.1	60.2	74	12.9

Band-edge, Average Detector

Frequency	Field Strength, dBμV/m		Limit	Margin
GHz	Hopping Off	Hopping On	dB	dB
2.39	23.9	24.4	54	29.6
2.4835	41.1	40.2	54	12.9

See plots.

Maximum Duty Cycle Correction Factor according to Para 15.35 (b): 20 dB

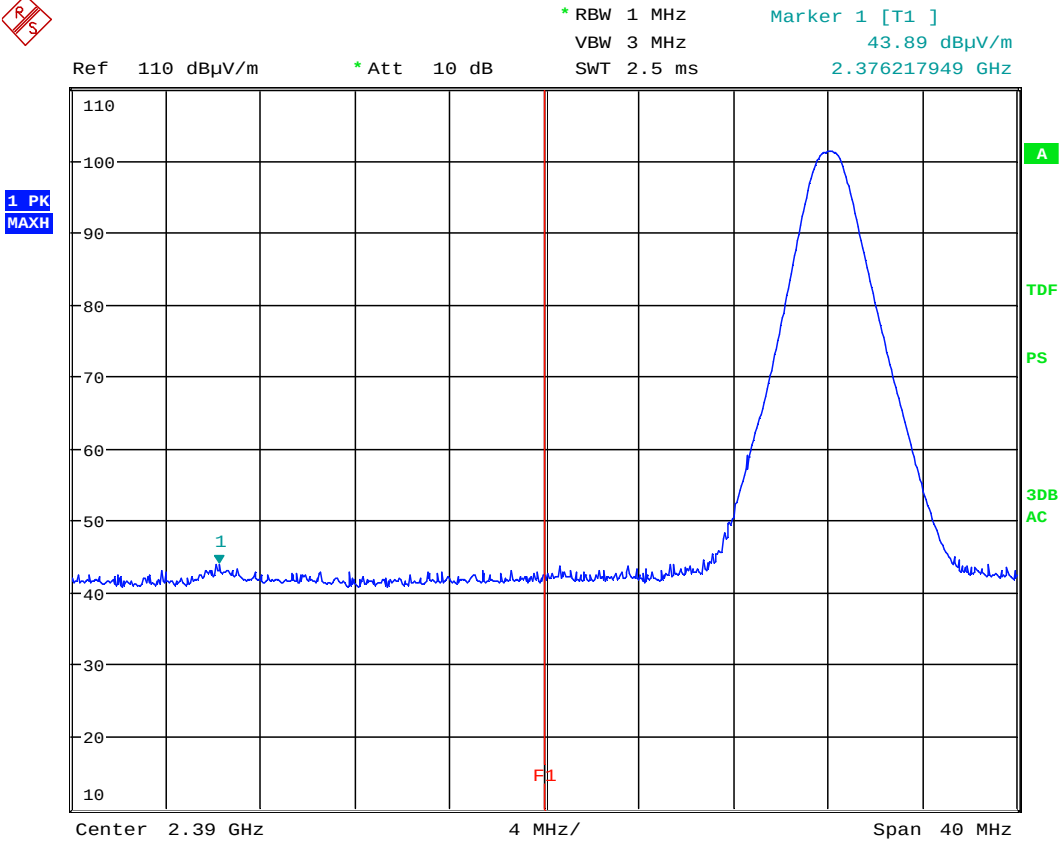
RF conducted power to 25 GHz see plots.

Maximum RF level outside operating band:

2402MHz: >40 dB/C, margin >20 dB

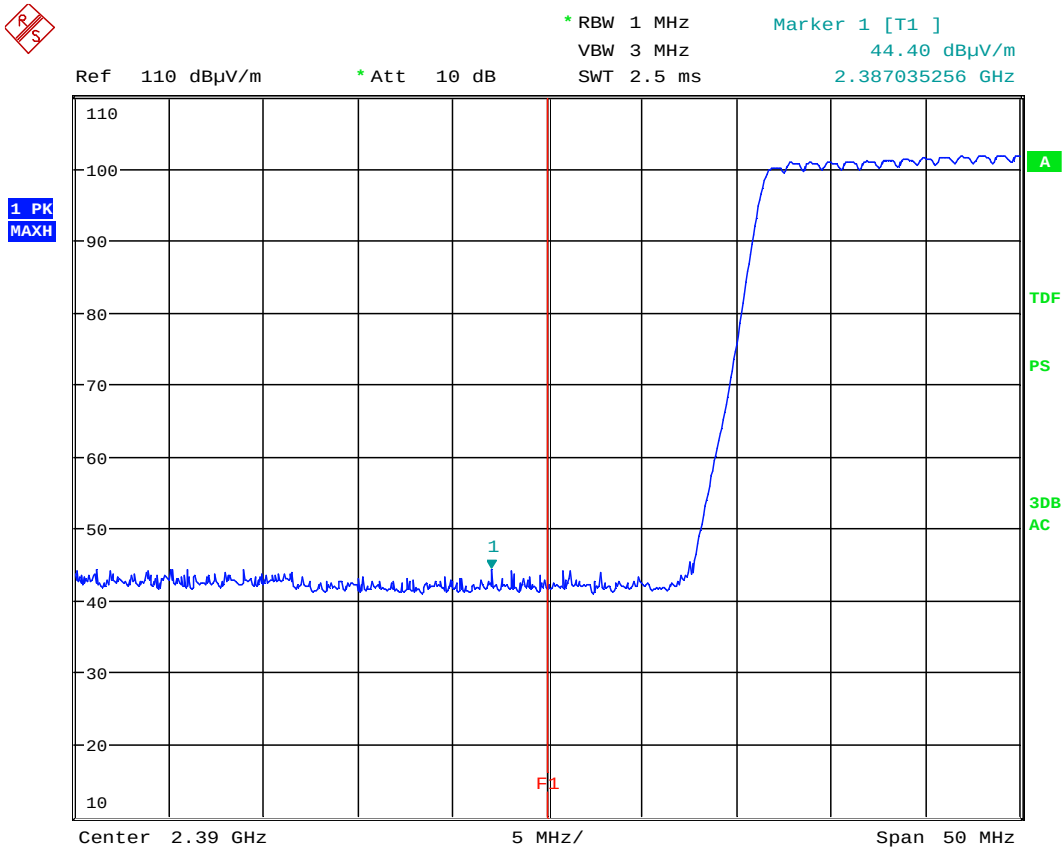
2441MHz: >40 dB/C, margin >20 dB

2480MHz: >40 dB/C, margin >20 dB



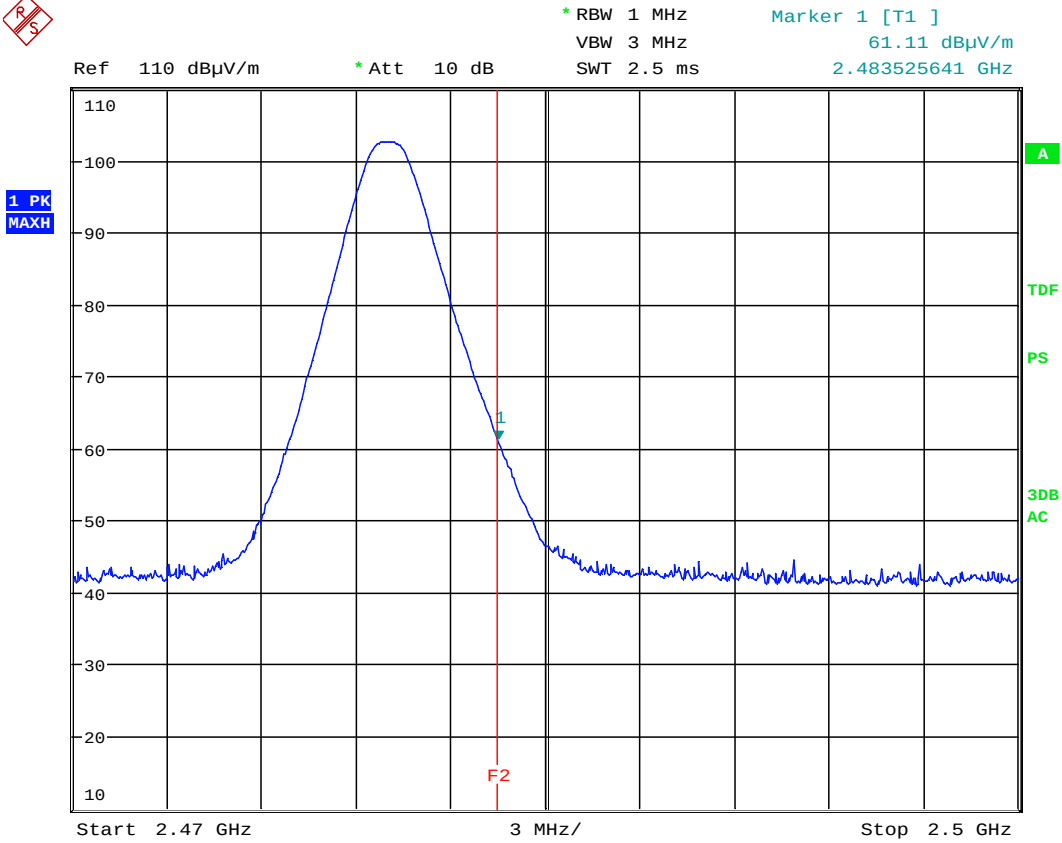
Date: 12.DEC.2012 11:13:01

Band Edge, Lower Channel, Hopping OFF



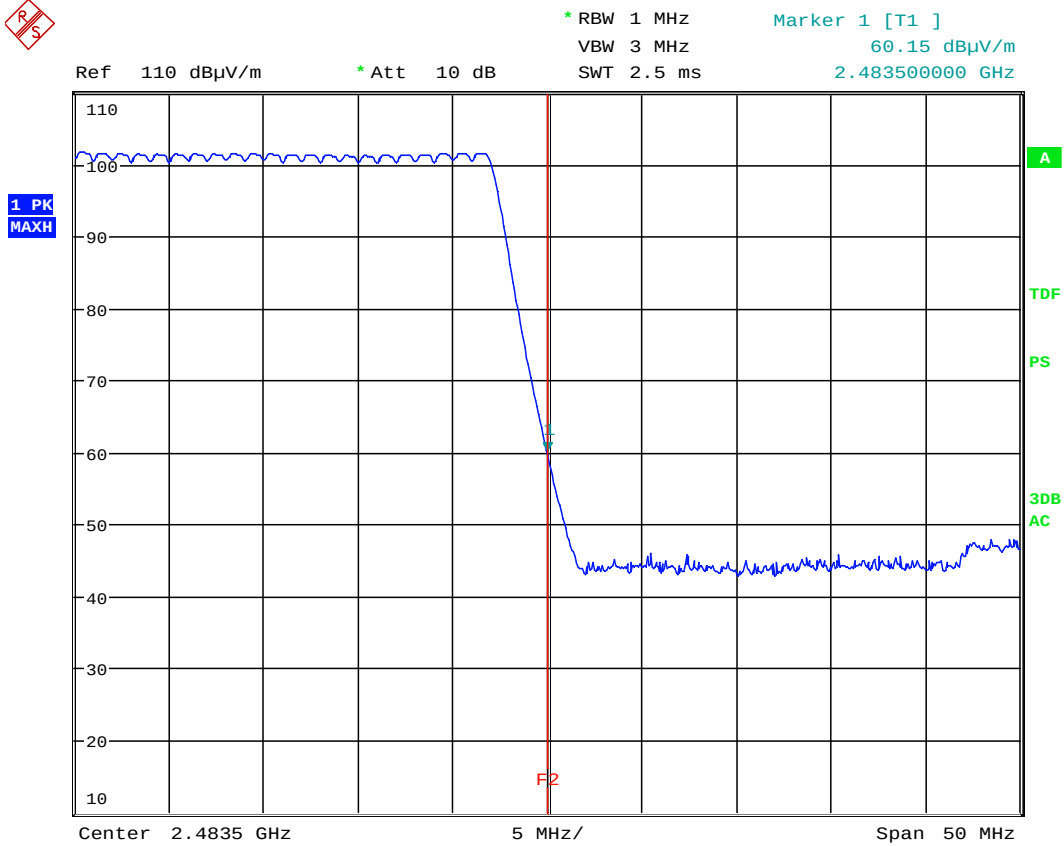
Date: 12.DEC.2012 14:18:31

Band Edge, Lower Channel, Hopping ON



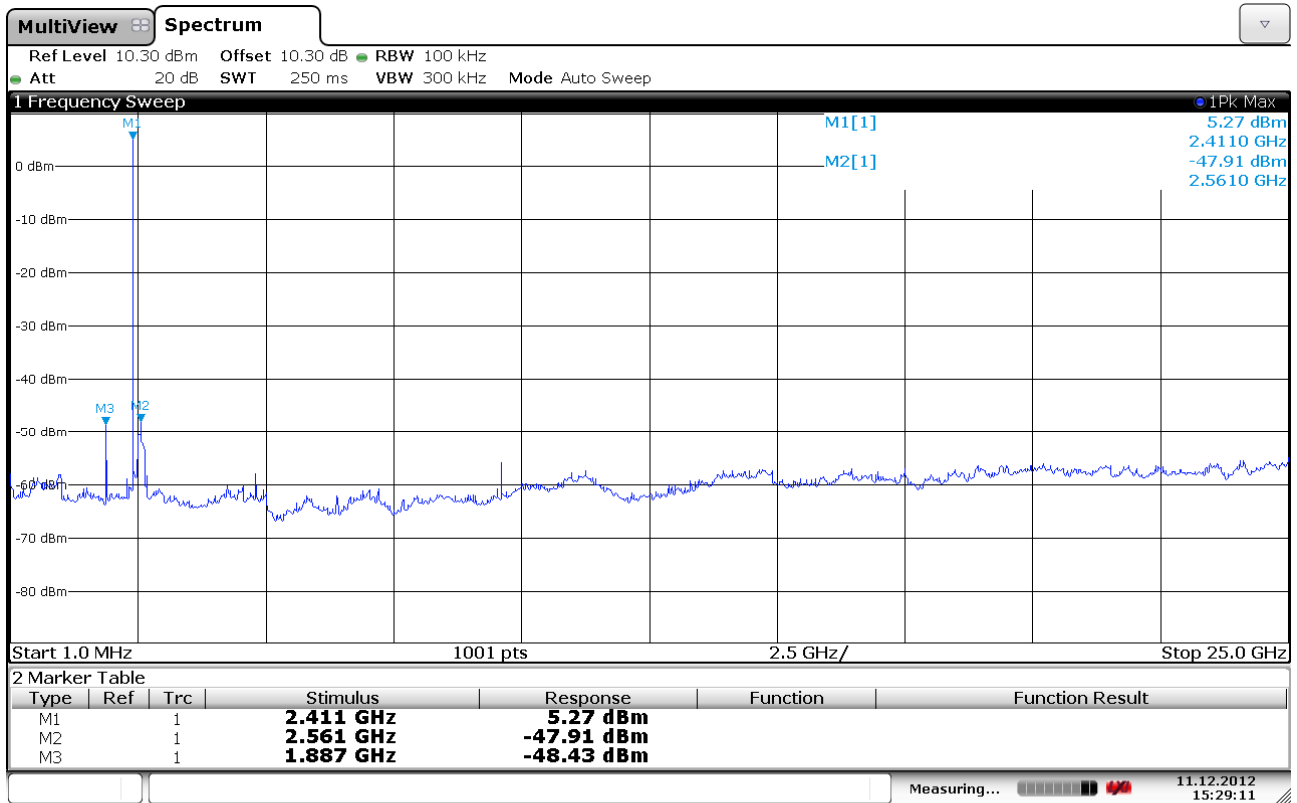
Date: 12.DEC.2012 12:54:30

Band Edge, Upper Channel, Hopping OFF



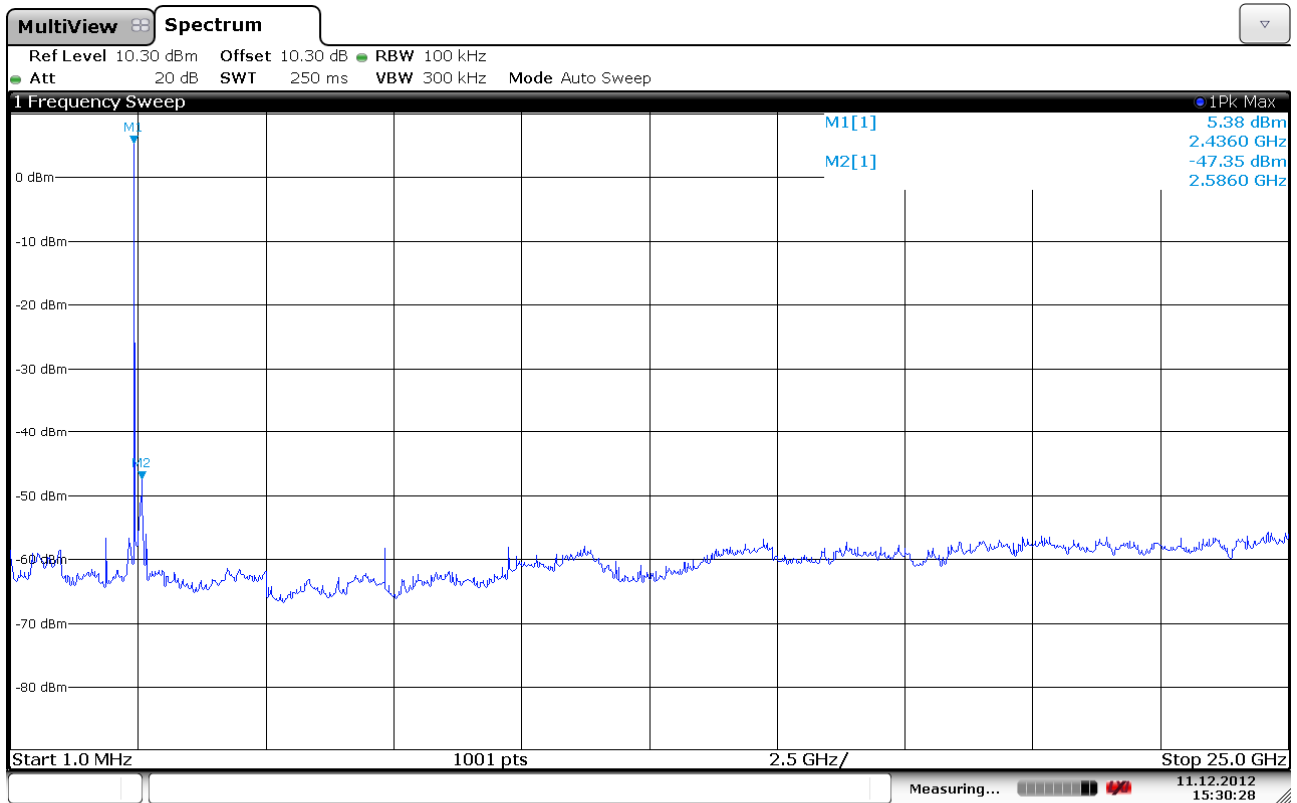
Date: 12.DEC.2012 14:19:51

Band Edge, Upper Channel, Hopping ON



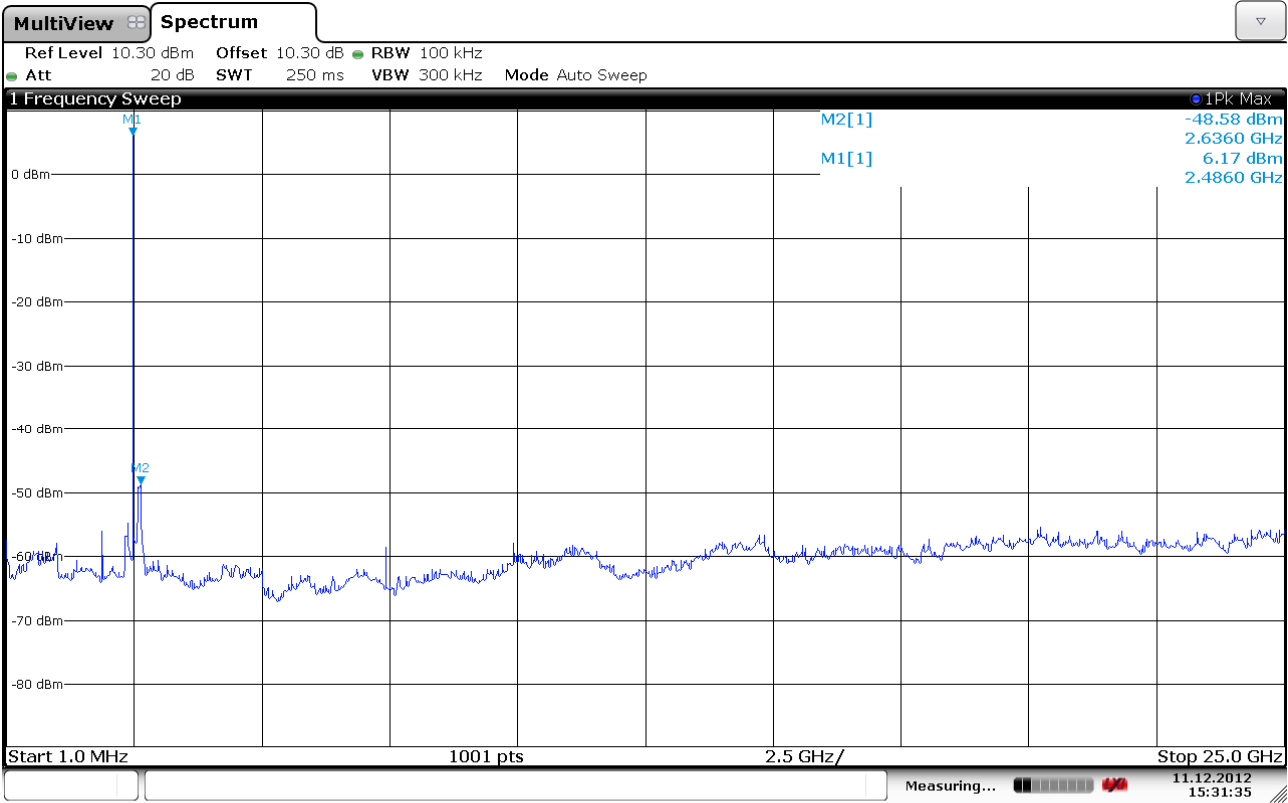
Date: 11.DEC.2012 15:29:11

Conducted Emissions, 2402 MHz, 1 - 25000 MHz



Date: 11.DEC.2012 15:30:28

Conducted Emissions, 2441 MHz, 1 - 25000 MHz



Date: 11.DEC.2012 15:31:35

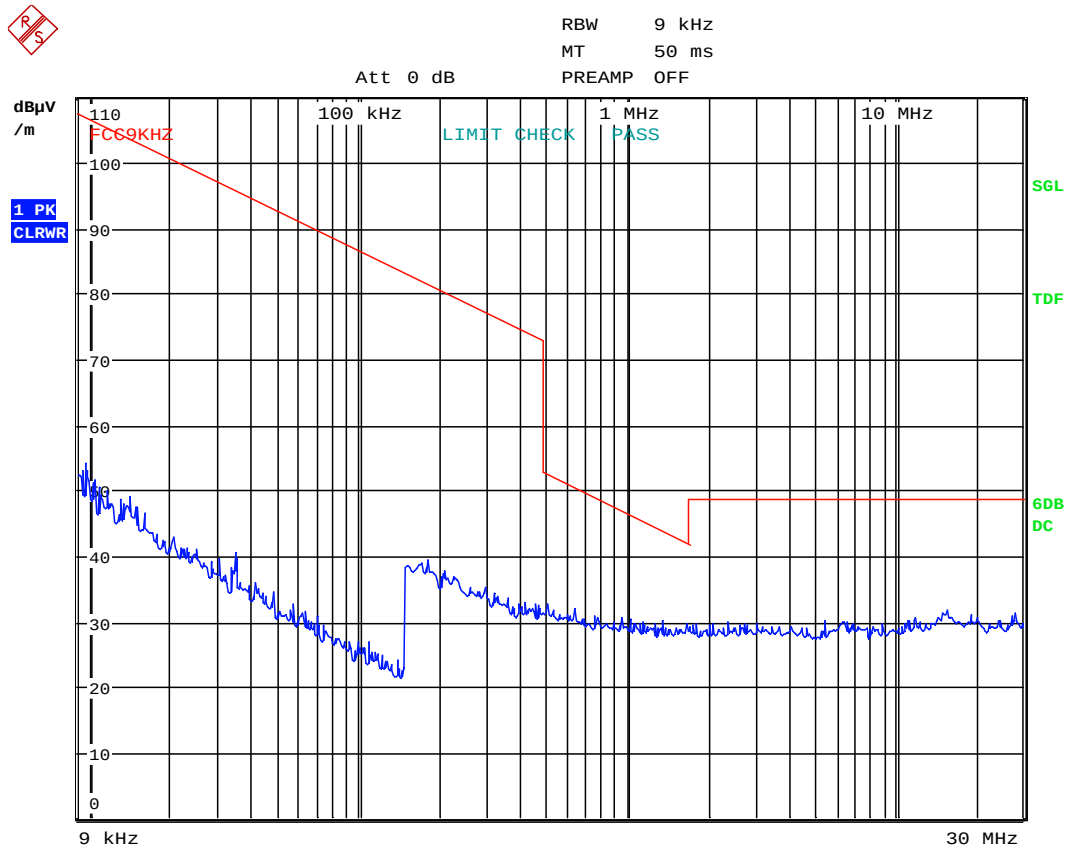
Conducted Emissions, 2480 MHz, 1 - 25000 MHz

Radiated emissions 9 kHz-30 MHz.

Measuring distance 10 m, measured with Peak detector.

No component detected, see plot.

Limit is converted to 10 m using 40 dB/decade according to 15.31 (f) (2).



Date: 12.DEC.2012 16:36:23

Radiated Emissions, 0.009 -30MHz

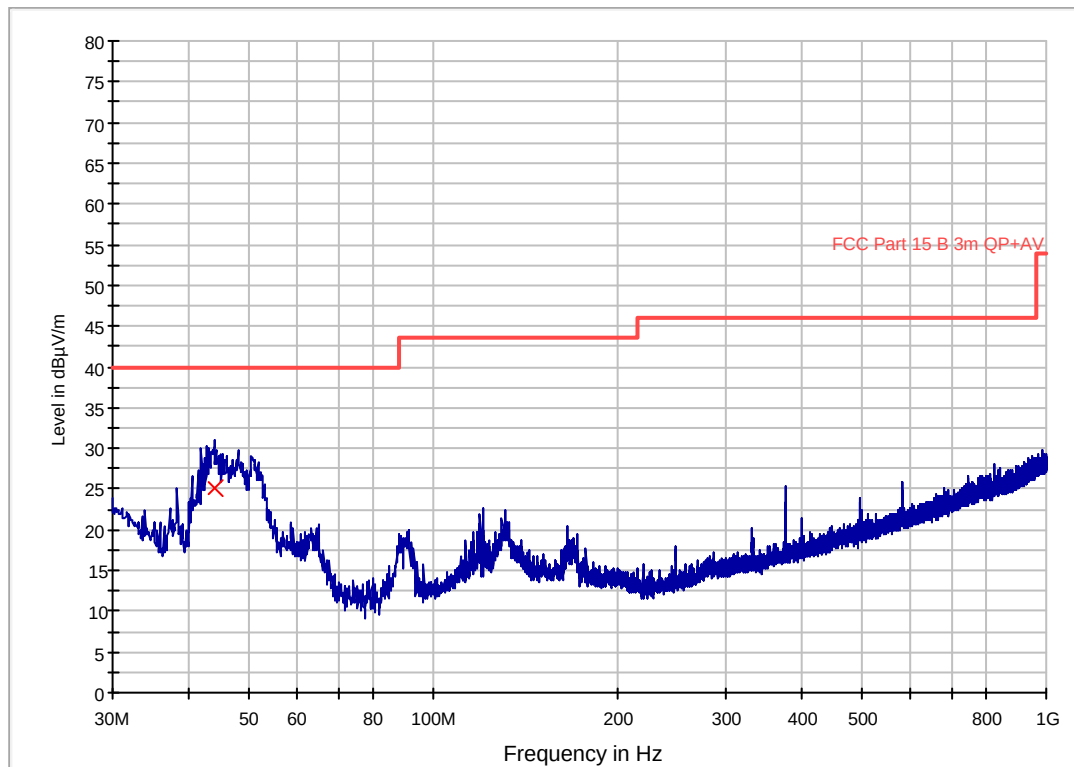
Radiated emission 30 – 1000 MHz.

Detector: Peak

Measuring distance: 3m

Frequency (MHz)	QuasiPeak (dBµV/m)	Bandwidth (kHz)	Polarization	Margin (dB)	Limit (dBµV/m)	Comment
43.972662	25.1	120.000	V	14.9	40.0	

FCC Pt15 Class B 30-1000M 3m



Radiated Emissions, 30 -1000MHz

Radiated Emissions, 1-25 GHz

Measuring distance: 3m (1 – 8.5 GHz)
 1m (8.5 – 18 GHz)

A pre-scan was performed above 18 GHz and no spurious emissions were detected.

Peak Detector:

Frequency	RF channel	Field strength, Peak Detector, 3m	Limit	Margin
GHz	L,M,H	dB μ V/m	dB μ V/m	dB
all freqs	L,M,H	None detected	74	>20

Average Detector:

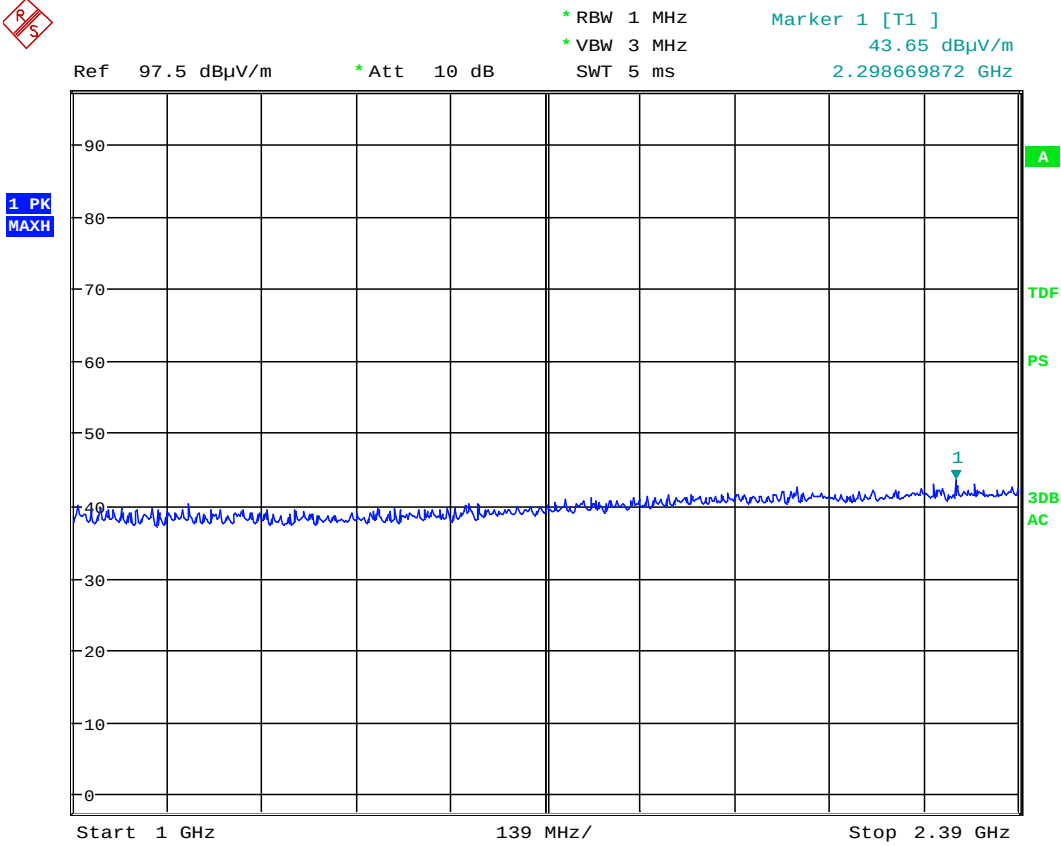
Frequency	RF channel	Field strength, Average Detector, 3m	Limit	Margin
GHz	L,M,H	dB μ V/m	dB μ V/m	dB
all freqs	L,M,H	None detected	54	>20

Average Detector values are calculated from Peak values by Duty Cycle Correction Factor (20 dB).

Antenna factor, amplifier gain and cable loss are included in spectrum analyzer “Transducer factor”.

Distance correction factor is included in the plots at 1m.

See plots.



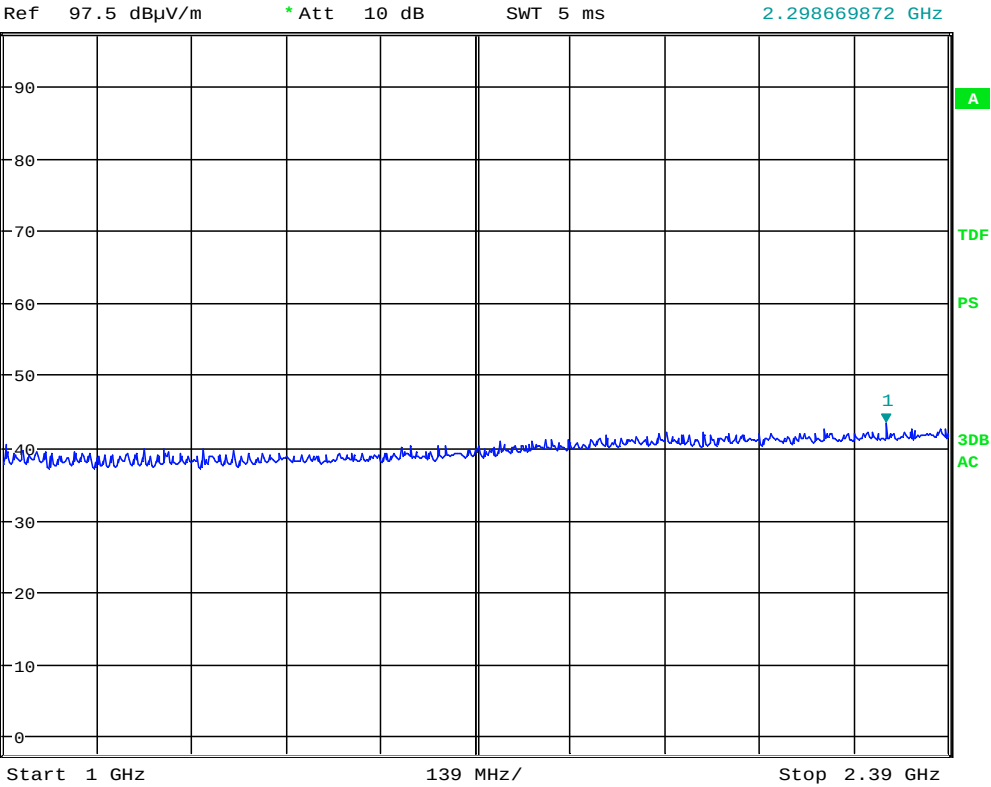
Date: 12.DEC.2012 11:16:10

Radiated Emissions, 1000 -2390MHz, VP



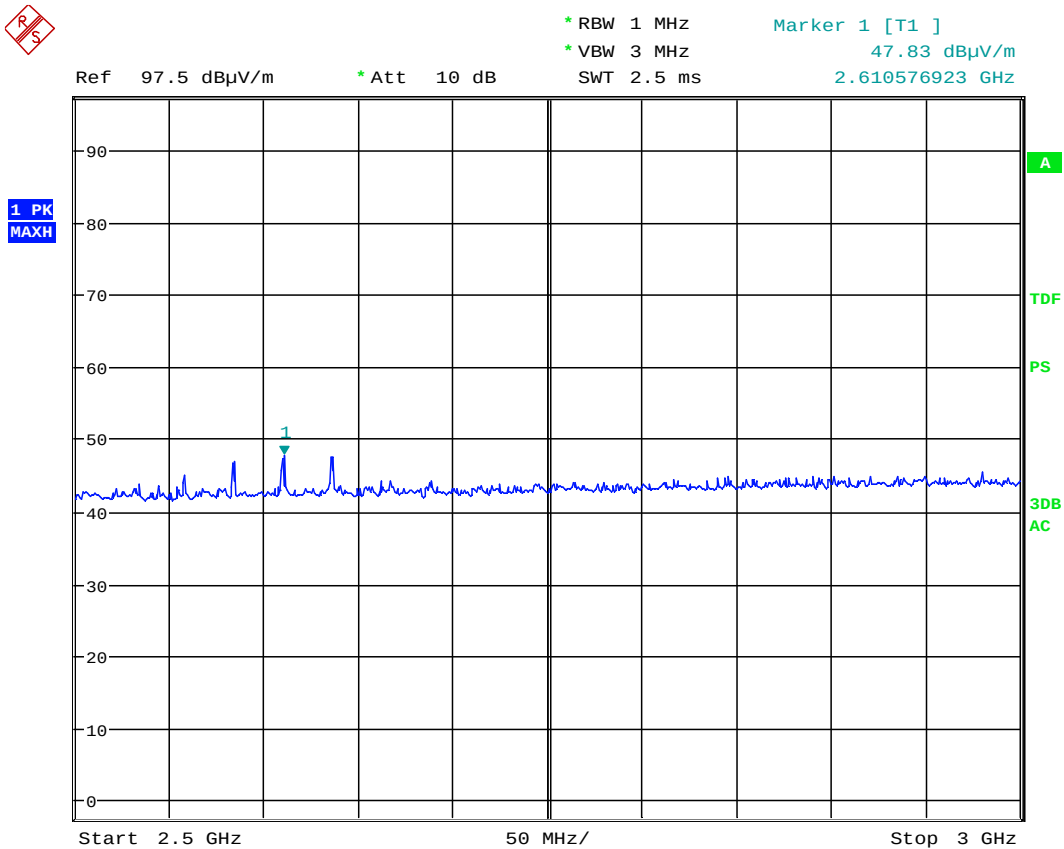
* RBW 1 MHz
* VBW 3 MHz
SWT 5 ms

Marker 1 [T1]
43.35 dBμV/m
2.298669872 GHz



Date: 12.DEC.2012 11:18:01

Radiated Emissions, 1000 -2390MHz, HP



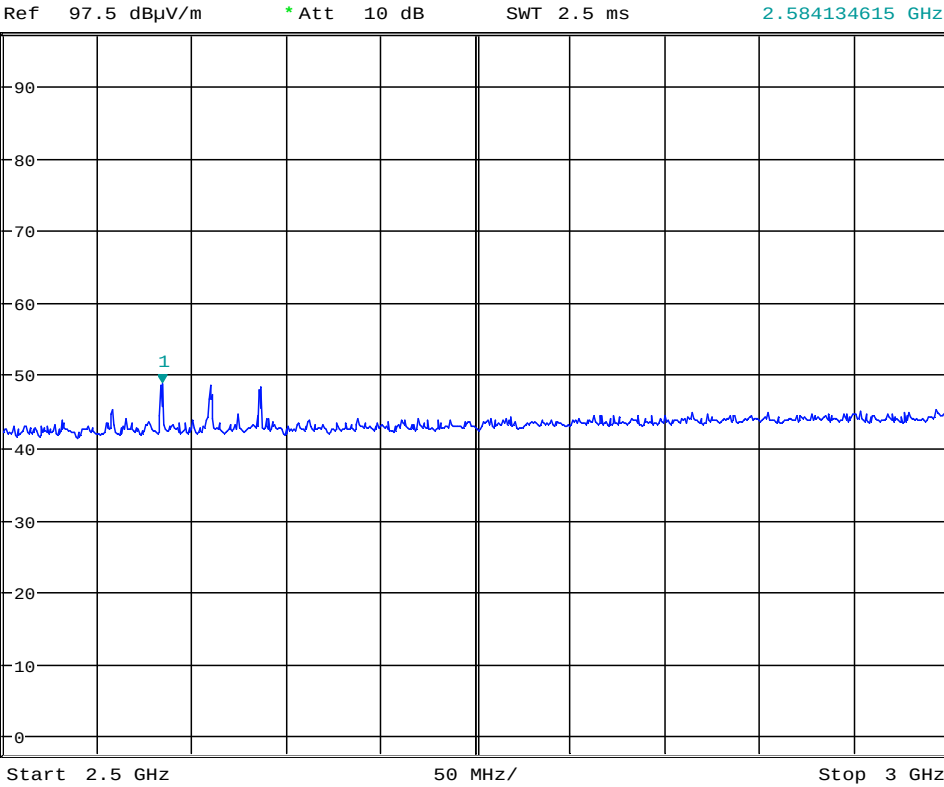
Date: 12.DEC.2012 12:57:52

Radiated Emissions, 2483.5 -3000MHz, VP



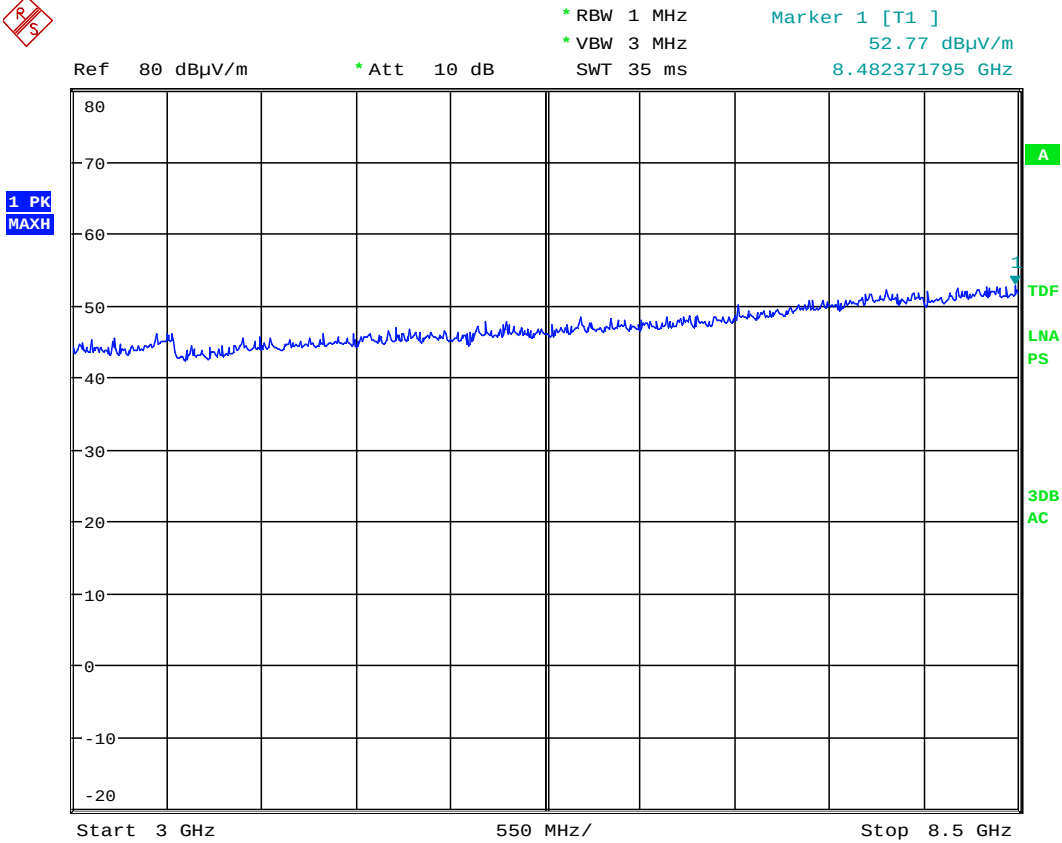
* RBW 1 MHz
* VBW 3 MHz
SWT 2.5 ms

Marker 1 [T1]
48.78 dBμV/m
2.584134615 GHz



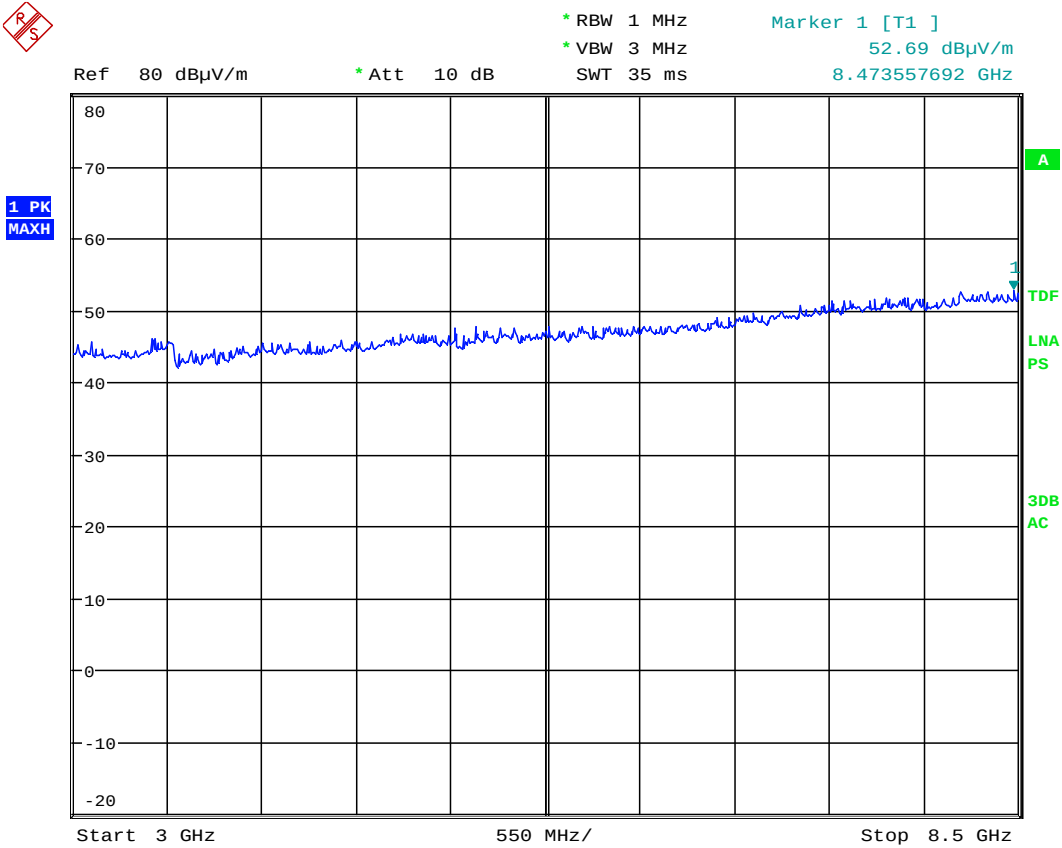
Date: 12.DEC.2012 12:59:42

Radiated Emissions, 2483.5 -3000MHz, HP



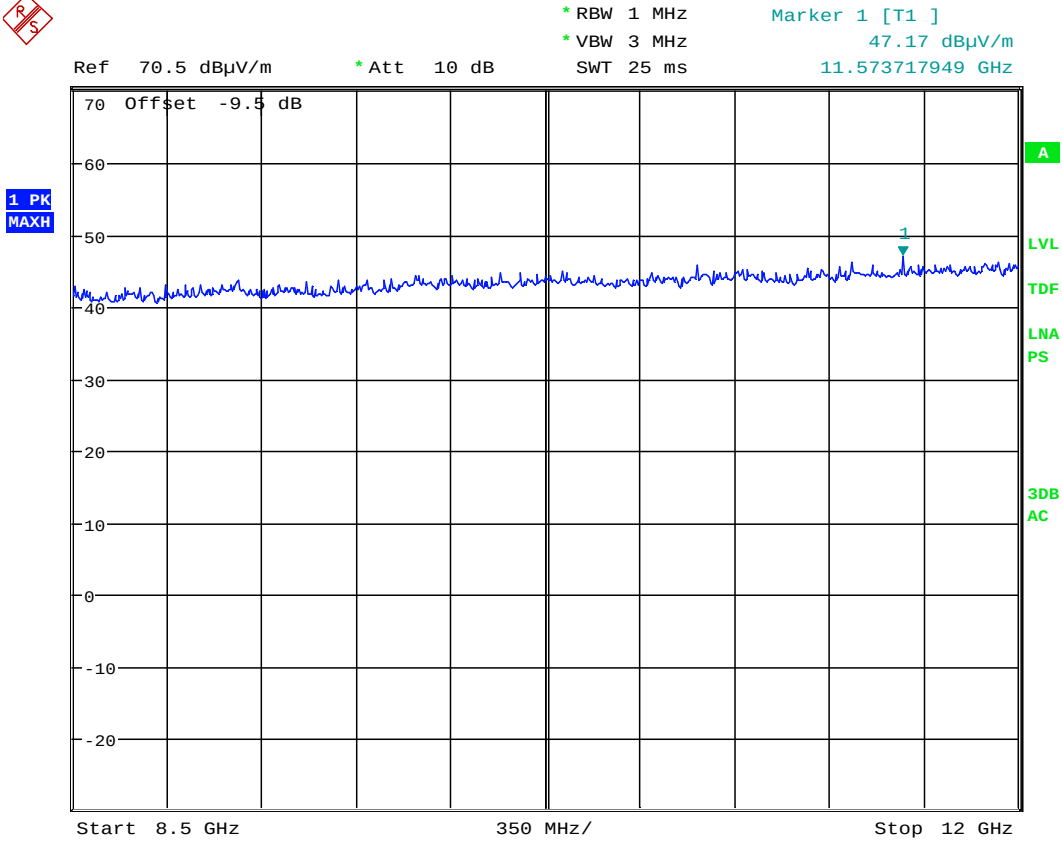
Date: 12.DEC.2012 14:44:15

Radiated Emissions, 3000 -8500MHz, VP



Date: 12.DEC.2012 14:45:57

Radiated Emissions, 3000 -8500MHz, HP

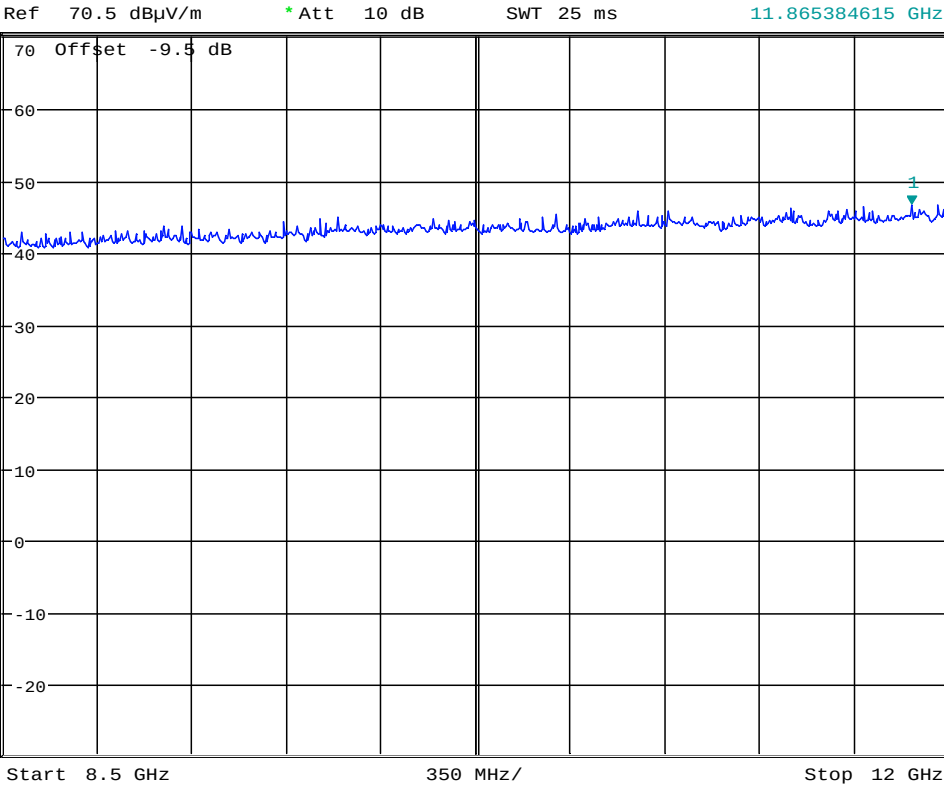


Date: 12.DEC.2012 15:25:37

Radiated Emissions, 8500 -12000MHz, VP, @1m

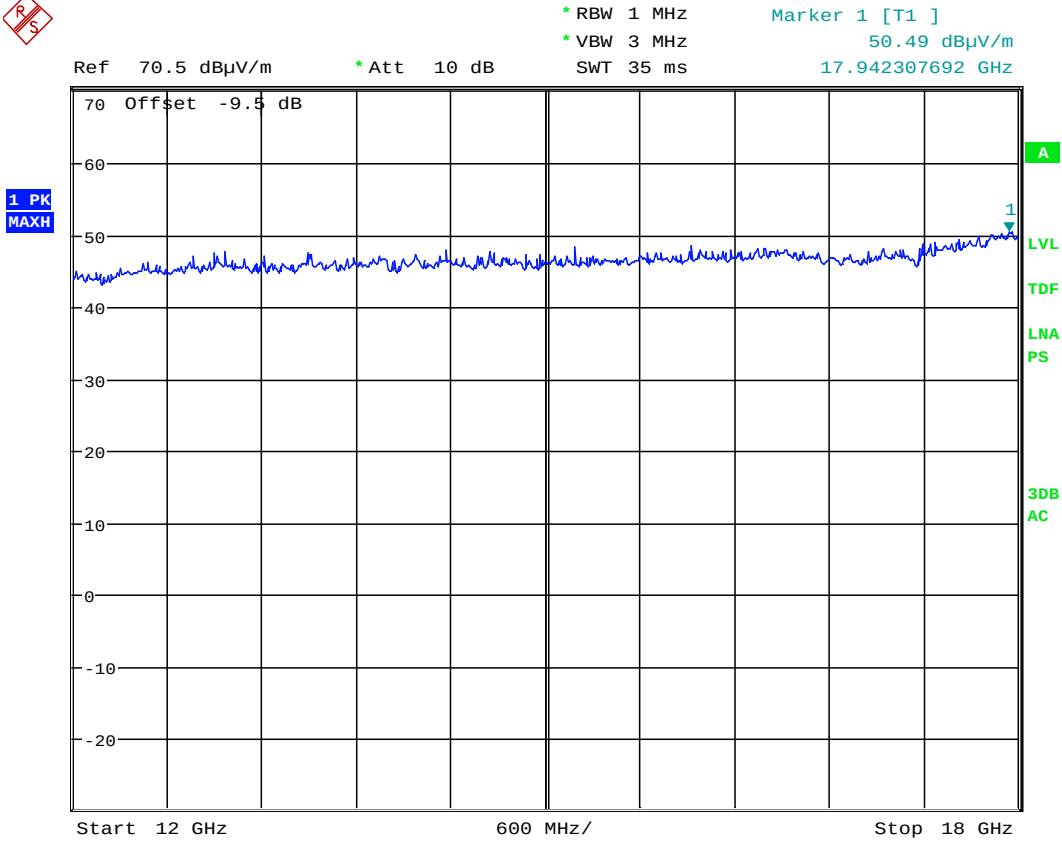


* RBW 1 MHz Marker 1 [T1]
* VBW 3 MHz 46.72 dBμV/m
SWT 25 ms 11.865384615 GHz



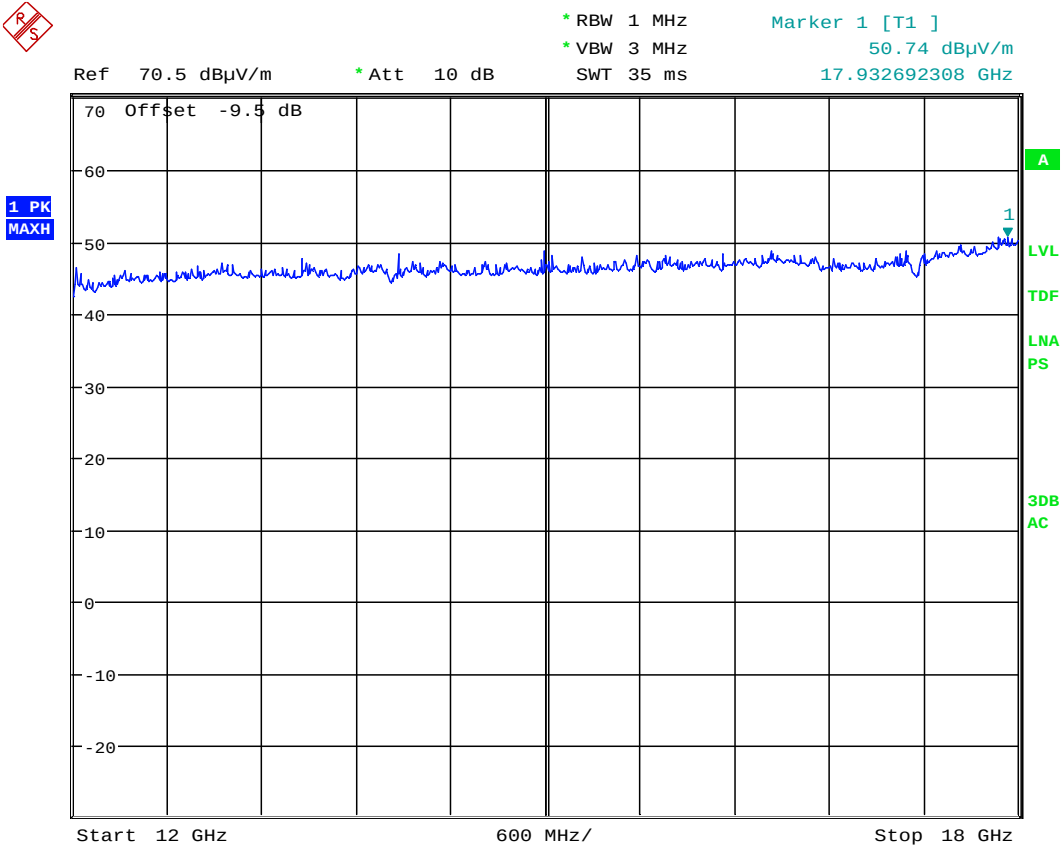
Date: 12.DEC.2012 15:27:18

Radiated Emissions, 8500 -12000MHz, HP, @1m



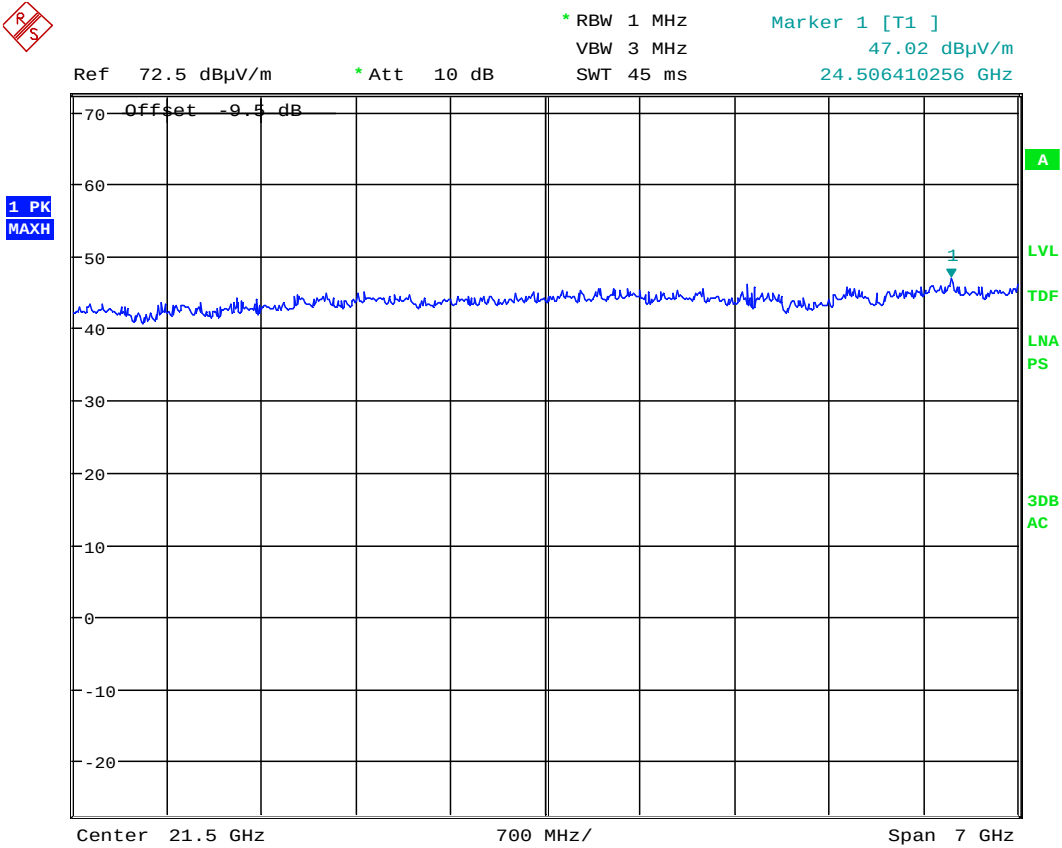
Date: 12.DEC.2012 15:31:39

Radiated Emissions, 12000 -18000MHz, VP, @1m



Date: 12.DEC.2012 15:33:20

Radiated Emissions, 12000 -18000MHz, HP, @1m



Date: 12.DEC.2012 16:47:21

Pre-scan, 18000 -25000MHz, @ approx. 10cm

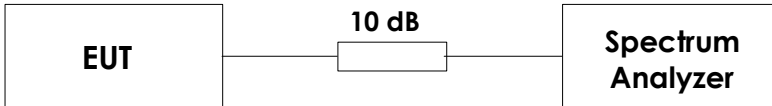
5 LIST OF TEST EQUIPMENT

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment and ancillaries are identified (numbered) by the Test Laboratory.

No.	Model number	Description	Manufacturer	Ref. no.	Cal. date	Cal. Due
1	FSW26	Spectrum Analyzer	Rohde & Schwarz	LR 1504	2012.06	2013.06
2	ESU40	Measuring Receiver	Rohde & Schwarz	LR 1639	2012.06	2013.06
3	4768-10	Attenuator	Narda	LR 1356	Cal b4 use	
4	ESH3-Z5	Two Line V-Network	Rohde & Schwarz	LR 1076	2011.11.03	2013.11.03
5	80S	Signal Generator	Powertron	LT 502	Cal b4 use	
6	6812B	AC Power Source	Agilent	LR 1515	2012.05.08	2013.05.08
7	ESH3-Z2	Pulse Limiter	Rohde & Schwarz	LR 285	2010.10.08	2013.10.08
8	ESHS10	Measuring Receiver	Rohde & Schwarz	N- 3528	2012.06	2013.06
9	JB3	BiLog Antenna	Sunol Sciences	N-4525	2012.10.11	2015.10.11
10	LNA6900	Preamplifier	Teseq	LR 1593	Cal b4 use	
11	3115	Horn Antenna	EMCO	LR 1330	2010.08.05	2013.08.05
12	8449B	Pre-amplifier	Hewlett Packard	LR 1322	2012-09	2013-09
14	HFH2-Z2	Loop Antenna	Rohde & Schwarz	LR 285	2010-10-08	2013-10-08
15	PM7320X	Antenna horn	Siverts lab	LR 103	2009.01.26	2014.01.26
16	DBF-520-20	Antenna horn	Systron Donner	LR 101	2009.01.26	2014.01.26
17	638	Antenna horn	Narda	LR 1480	2010.06.17	2015.06.17
18	Model 87 V	Multimeter	Fluke	N-4669	2012.09.05	2013.09.05

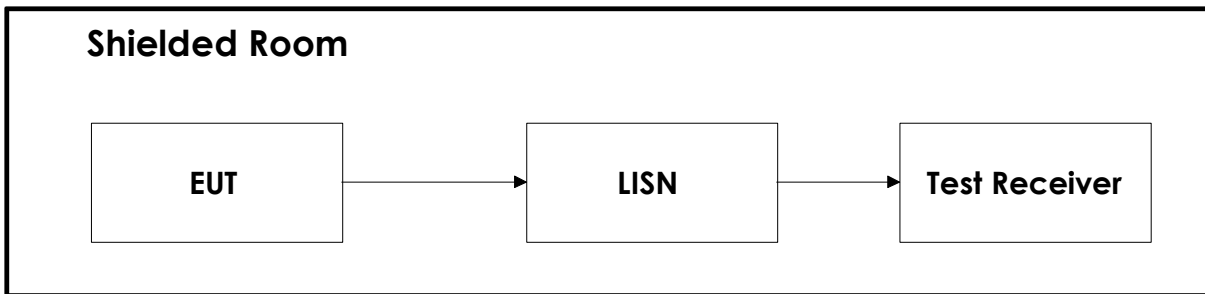
6 BLOCK DIAGRAM

6.1 Conducted Tests

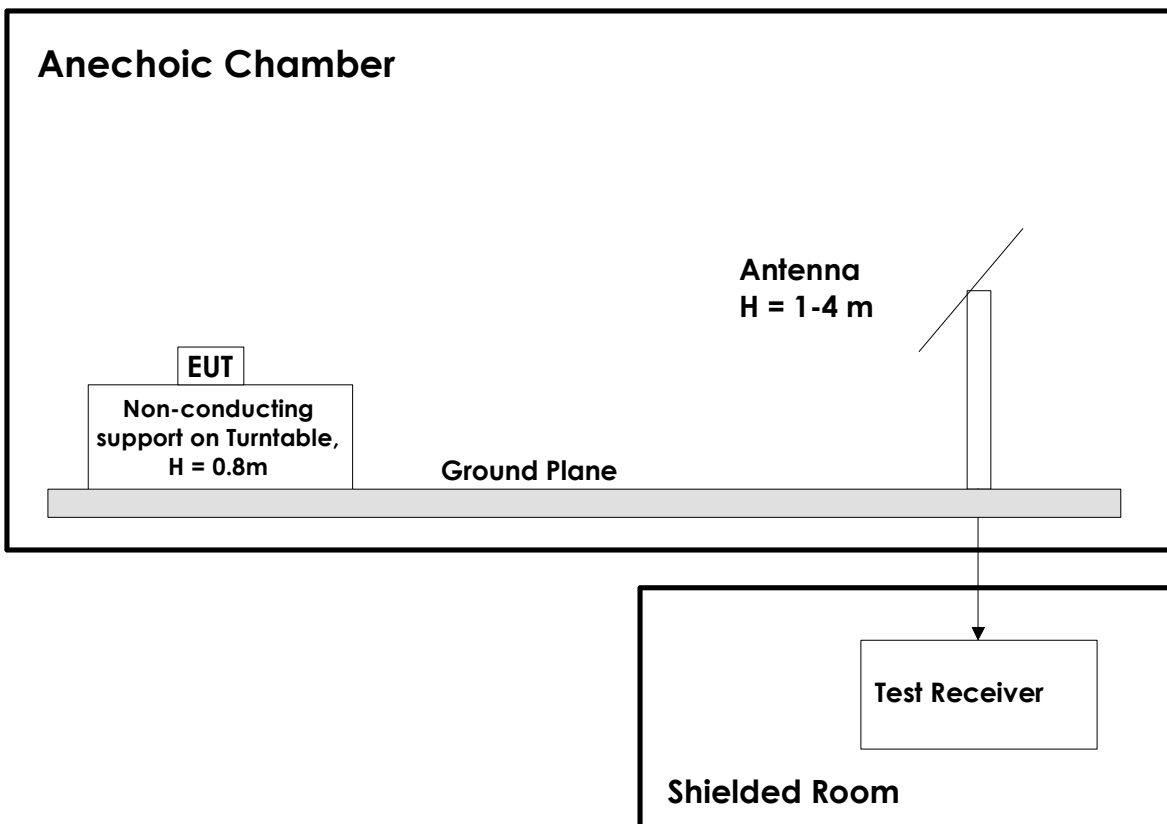


This setup is used for all measurements on 50 ohm antenna connector.

6.2 Power Line Conducted Emission



6.3 Test Site Radiated Emission



This test setup is used for all radiated emissions tests. For frequencies below 30 MHz the measuring distance is 10 m, for all other frequencies it is 3m or 1m. Emissions above 1 GHz were measured with a Spectrum Analyzer and Horn Antenna and with the preamplifier after the antenna. For measurements above 18 GHz the test receiver is moved inside the anechoic chamber and located next to the antenna to minimize the cable loss.