



Test report no. : 162018-4

Item tested : RC2412HP-CT

**Type of equipment : IEEE 802.15.4,
2.4 GHz Evaluation Module**

FCC ID : Y2NRC24XXHP

Client : Radiocrafts AS

FCC Part 15.247
Digital Transmission System

RSS-210 Issue 8 & RSS Gen Issue 3
Low Power Licence-Exempt
Radio communication Devices

6 April 2011

Authorized by :

A handwritten signature in blue ink, reading 'Frode Sveinsen'.

Frode Sveinsen
Technical Verificator

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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
Email: comlab@nemko.no
FCC test firm : 994405
IC OATS : 2040D-1
Total Number of Pages: 76

1.2 Client Information

Name : Radiocrafts AS
Address : Sandakerveien 64,
0484 Oslo, Norway
Telephone : +47 40 00 51 95
Fax : --

Contact:

Name : Ørjan Nottveit
Telephone : +47 40 00 51 95
E-mail : radiocrafts@radiocrafts.com

1.3 Manufacturer

Same as client

2 Test Information

2.1 Test Item

Name :	Radiocrafts
Model/version :	RC2412HP-CT
Serial number :	-
Hardware identity and/or version:	-
Software identity and/or version :	-
Frequency Range :	2405 – 2480 MHz
Number of Channels :	16
Operating Modes :	TX & RX
Type of Modulation :	DSSS/O-QPSK
Emissions Designator :	G1D
User Frequency Adjustment :	None, Software controlled
Rated Output Power :	100 mW
Type of Power Supply :	3.6 V DC
Antenna Connector :	Reversed SMA
Antenna type:	-
Antenna Diversity Supported :	None

Theory of Operation

The RC24xxHP RF-transceiver module for the 2.4 GHz ISM band. It is based on a system-on-chip device . The physical layer of the radio is according to IEEE 802.15.4 with Direct Sequence Spread Spectrum(DSSS) and offset- QPSK modulation. The program is stored in flash and the temporary variables in the SW is stored in RAM.

2.2 Test Environment

2.2.1 Normal test condition

Temperature: 20 - 22 °C

Relative humidity: 20 - 40 %

Normal test voltage: 3.6 V DC

The values are the limit registered during the test period.

2.3 Test Period

Item received date: 2010-12-09

Test period : from 2010-12-09 to 2011-01-27 & 2011-03-16

3 TEST REPORT SUMMARY

3.1 General

Manufacturer: Radiocrafts AS

Model No.: RC2412HP-CT

Serial No.: -

All measurements are traceable to national standards.

The tests were conducted for the purpose of demonstrating compliance with FCC CFR 47 Part 15.247.

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

☒ New Submission

☒ Production Unit

☐ Class II Permissive Change

☐ Pre-production Unit

DTS Equipment Code

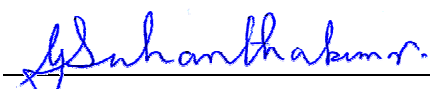
☐ Family Listing

THIS TEST REPORT RELATES ONLY TO THE ITEM (S) TESTED.

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



TEST REPORT #: 162018-4

TESTED BY: 
G.Suwanthakumar, Test engineer

DATE: 2011-04-01

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This test report applies only to the items and configurations tested.

3.2 Test Summary

Name of test	FCC Part 15 ref.	RSS-210 Issue 8 & RSS Gen Issue 3	Result
Supply voltage variations	15.31 (e)	8 (RSS-GEN)	Complies ²
Number of operating frequencies	15.31 (m)	A8.1	Complies
Power-line Conducted Emissions (Receiver)	15.107(a)	7.2.2 (RSS-GEN)	Complies
Radiated Emissions limits (receiver)	15.109(a)	6 (RSS-GEN)	ref. 15.209(a)
Antenna requirement	15.203	7.1.4 (RSS-GEN)	Complies ¹
Radiated emissions limits for restricted bands	15.205(a)		Complies
Power Line Conducted Emissions	15.207(a)	7.2.2 (RSS-GEN)	Complies
Radiated emission limits	15.209(a)	A8.5	Complies
Bandwidth	15.247(a)(2)	A8.2	Complies
Peak Power Output	15.247(b)(3)	A8.4	Complies
Power Spectral Density	15.247(d)	A8.2	Complies
Out-of-band emissions (Antenna Conducted)	15.247(c)	A8.5	Complies ¹
Out-of-band emissions (Radiated)	15.247(c)	A8.5	Complies
Lower band edge radiated emission	15.247(c)	A8.5	Complies
Upper band edge radiated emission	15.247(c)	A8.5	Complies

¹ standard SMA connector (for laboratory use).

² The power is taken from extern power supply.

3.3 Description of modification for Modification Filing

Not applicable.

3.4 Comments

The channels are selected with a computer connected to the EUT. The computer is only used for selection of channels. The measurements are performed at channels near top Ch 26, near middle Ch 18 and near bottom Ch 11. And the output level is set to maximum in the software. The EUT complies at these channels.

During radiated tests the selection of channels are done by manufacturer outside the test chamber..

The radiated measurements are tested on three axis.

An antenna connector is used only for making conducted RF measurements for evaluation purposes.

Power supply variation within manufacturer specified range 2.7 – 3.6V DC has no influence on measured values in this test report.

All radiated measurements are done with antenna type “Antenova Titanis”. This is the high gain antenna.

3.5 Family List Rationale

Not Applicable.

4 TEST RESULTS

4.1 Power-line Conducted Emissions

Para. No.: 15.207 (a)

Test Performed By: G.Suwanthakumar

Date of Test: 10-Dec-2010

Test Results: **Complies.**

Measurement Data: **Peak detector was used.**

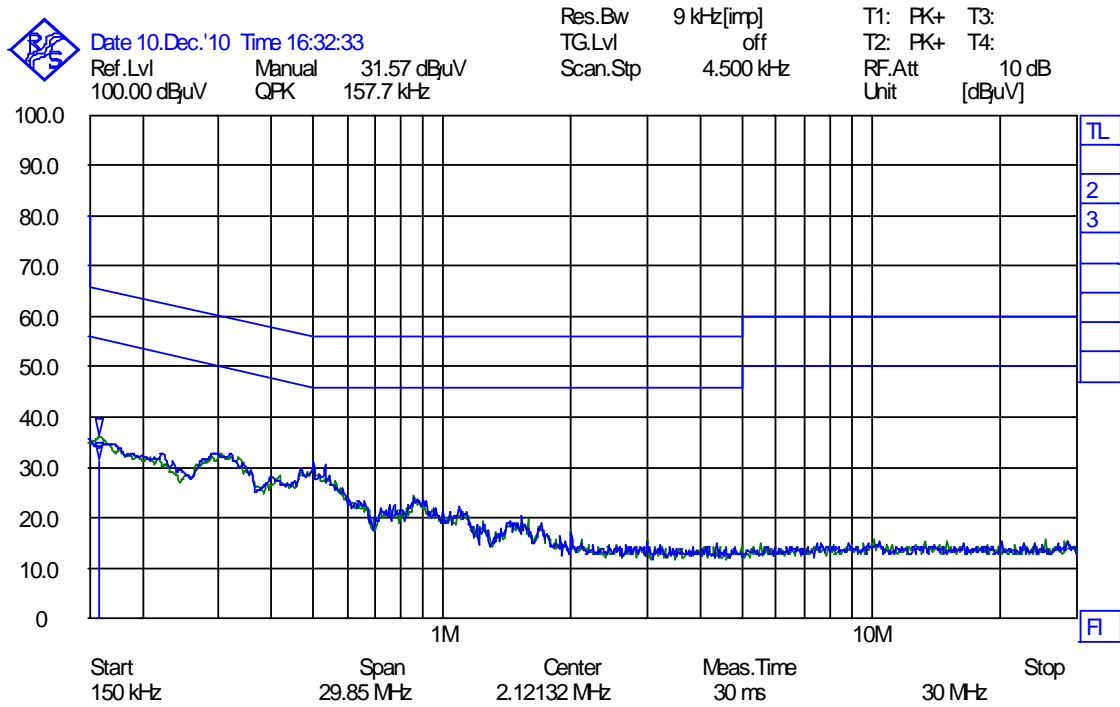
External DC power supply used- Type Oltronix B32-10R

The measured peak values are below the Quasi-Peak and Average limit

Highest measured value (L1 and N):

Frequency	Detector	Measured value	Limit	Margin
MHz	QP/AV	dB μ V	dB μ V	dB
0,157	QP	31.57	65.6	34.03
0,157	AV	20.30	55.6	35.30

See the attached graphs for peak scan..



L1 & N polarity - power line conducted emission

4.2 Minimum 6 dB Bandwidth

Para. No.: 15.247 (a)(2)

Test Performed By: G.Suwanthakumar

Date of Test: 09-Dec-2010

Test Results: Complies

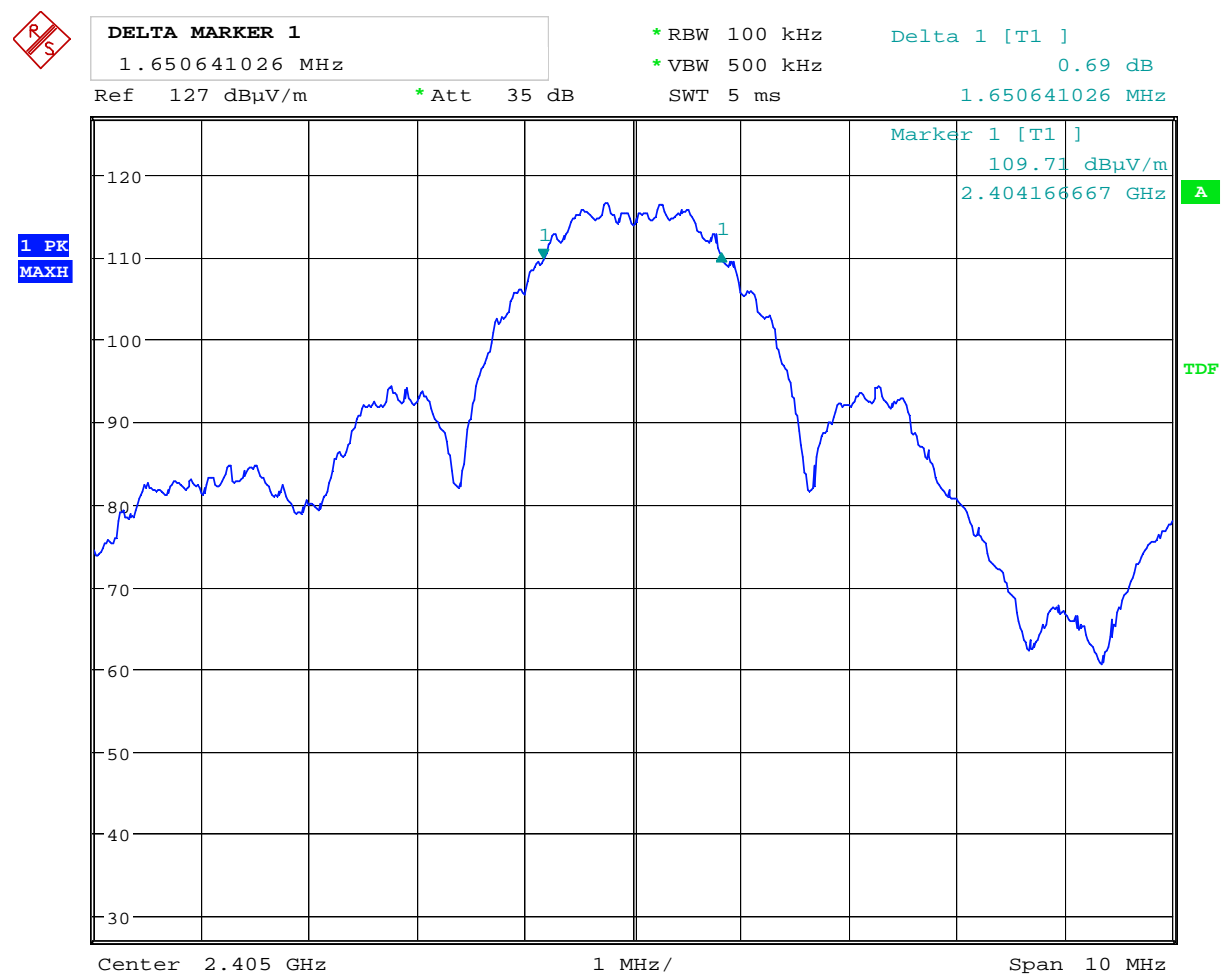
Measurement Data:

6 dB Bandwidth (MHz)		
Ch 11 2405MHz	Ch 18 2440MHz	Ch 26 2480MHz
1.65	1.63	1.67

Power supply variation within manufacturer specified range 2.7 – 3.6V DC has no influence on measured value

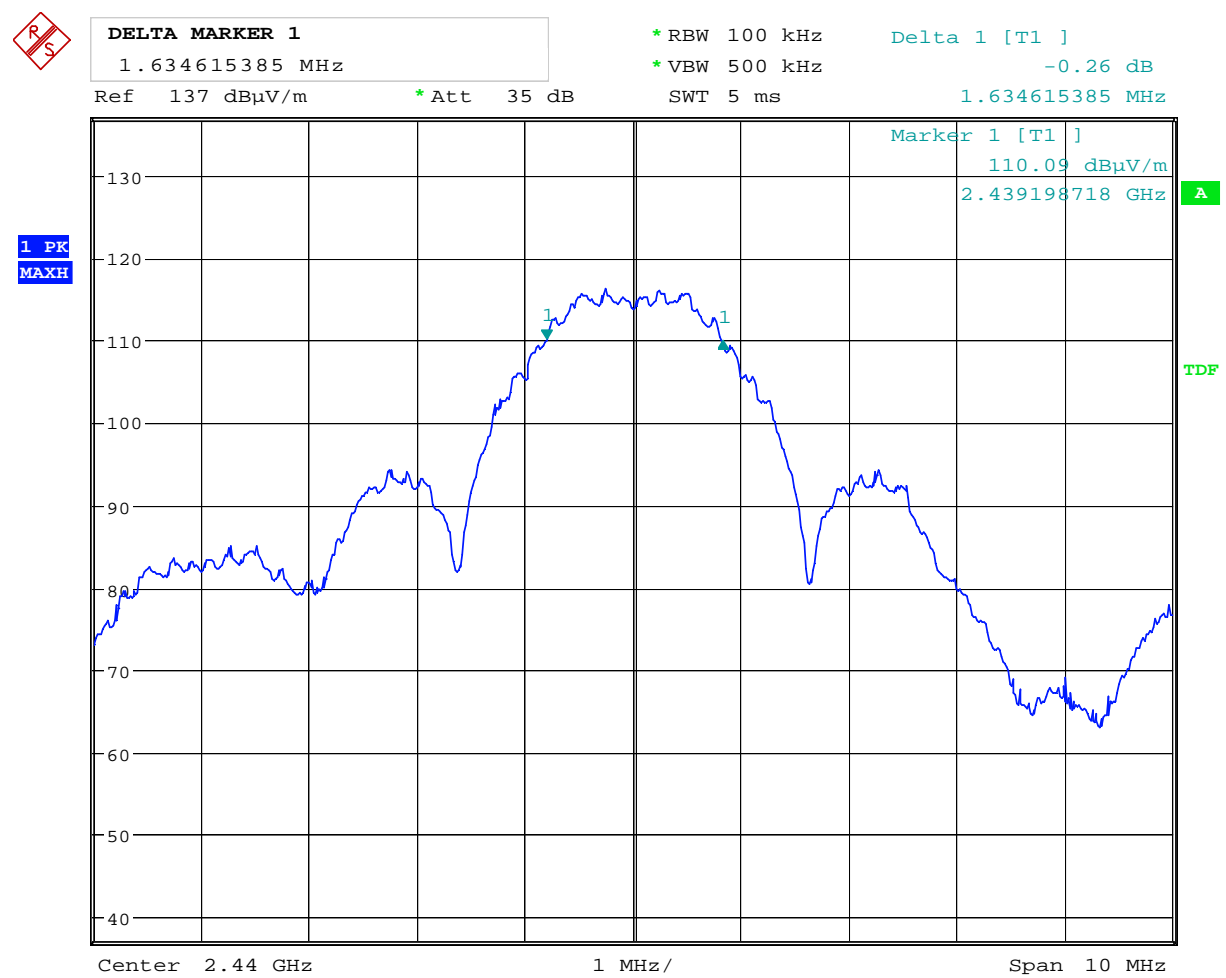
Requirements:

For Digital Transmission Systems in the 2400-2483.5 MHz band the minimum 6 dB bandwidth shall be at least 500 KHz.



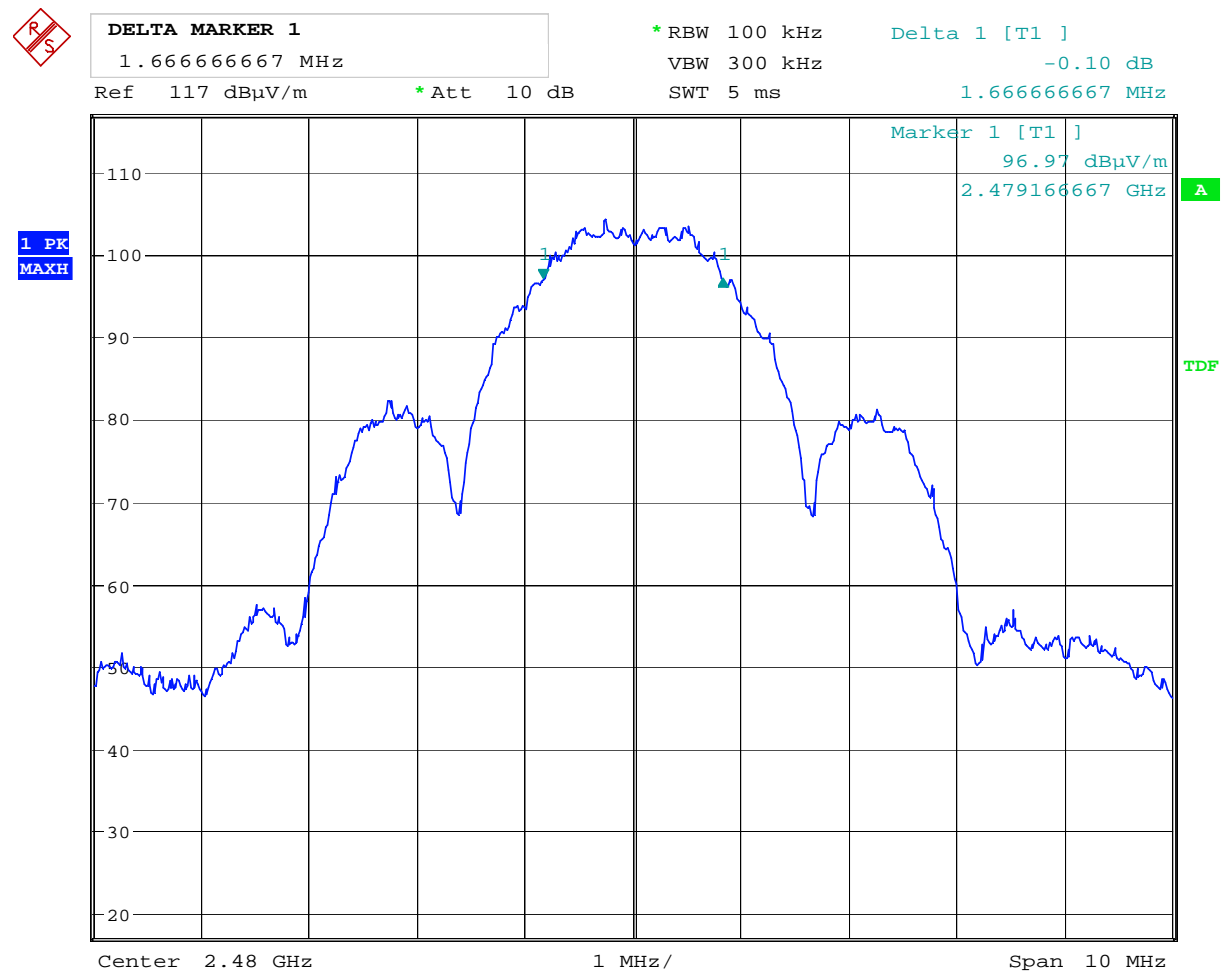
Date: 8.DEC.2010 10:36:45

Ch11 – 6 dB bandwidth – 1.65MHz



Date: 8.DEC.2010 10:01:50

Ch18 – 6 dB bandwidth – 1.63MHz



Date: 8.DEC.2010 11:56:57

CH26 – 6 dB bandwidth – 1.67MHz

4.3 20 dB Bandwidth

Para. No.: RSS-Gen

Test Performed By: G.Suwanthakumar

Date of Test: 16-Mar-2011

Test Results: Complies

Measurement Data:

20 dB Bandwidth (MHz)		
Ch 11 2405MHz	Ch 18 2440MHz	Ch 26 2480MHz
2.85	2.80	2.79

Power supply variation within manufacturer specified range 2.7 – 3.6V DC has no influence on measured value

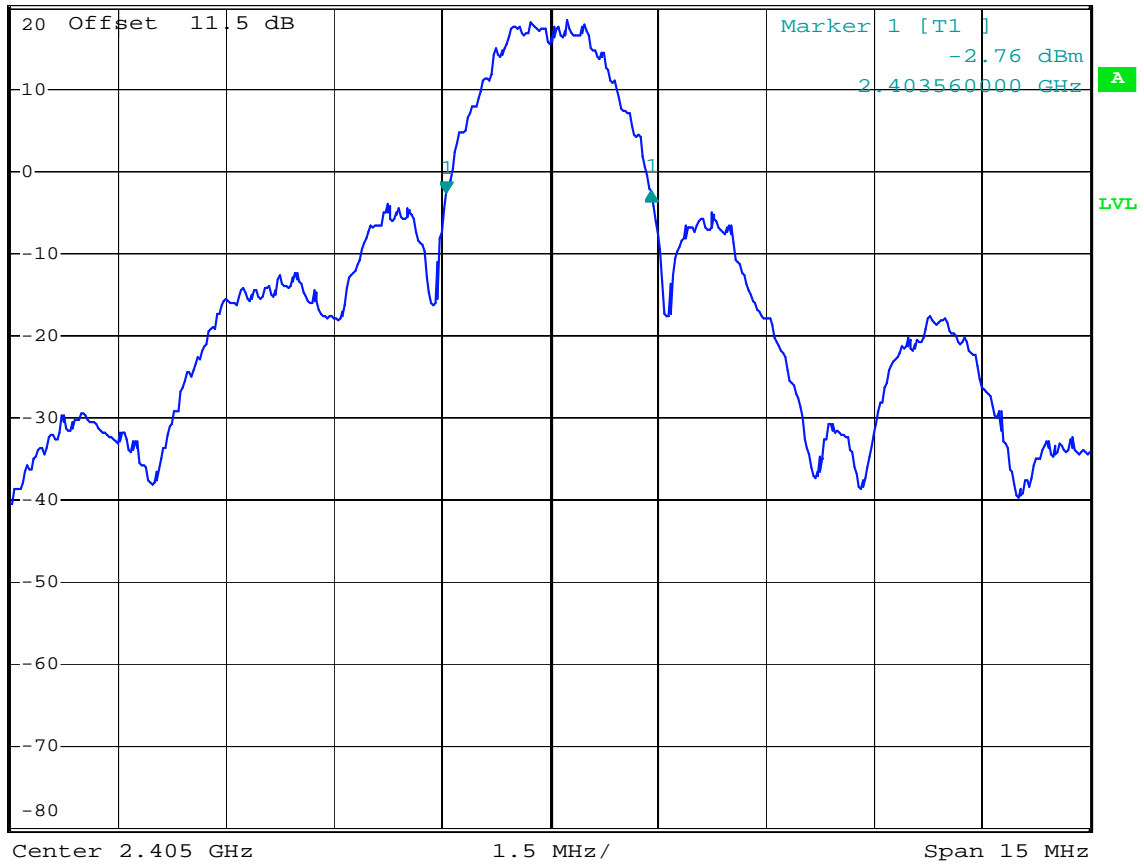
Requirements:

For information only



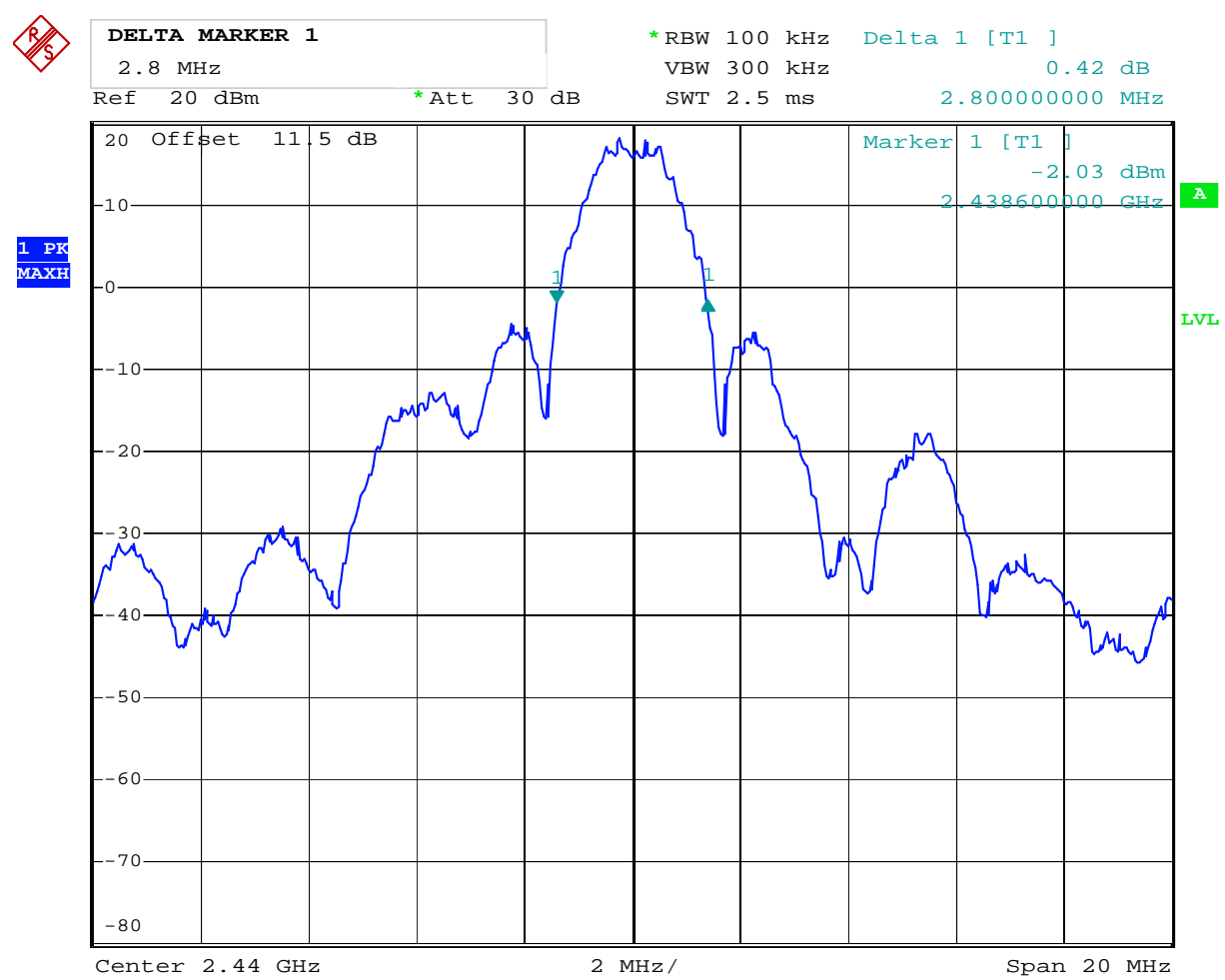
*RBW 100 kHz Delta 1 [T1]
 VBW 300 kHz 0.20 dB
 Ref 20 dBm *Att 30 dB SWT 2.5 ms 2.850000000 MHz

1 PK
VIEW



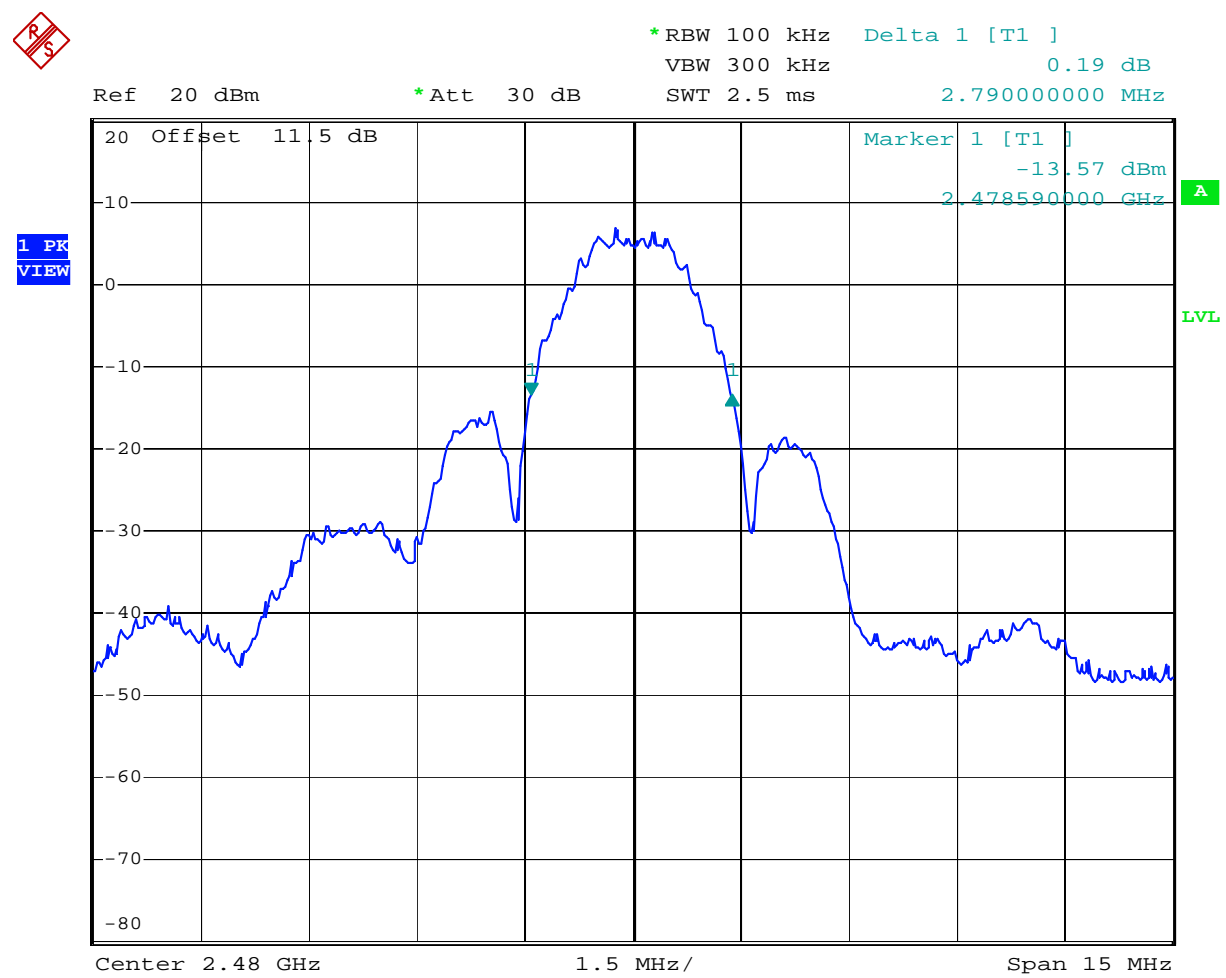
Date: 15.MAR.2011 10:28:18

CH26 – 20 dB bandwidth – 2.85MHz



Date: 15.MAR.2011 10:24:21

CH19 – 20 dB bandwidth – 2.80MHz



Date: 15.MAR.2011 10:29:38

CH26 – 20 dB bandwidth – 2.79MHz

4.4 Peak Power Output

Para. No.: 15.247 (b)

Test Performed By: G.Suhandhakumar

Date of Test: 09-Dec-2010

Test Results: Complies

Measurement Data:

Maximum Conducted Peak Output Power

RF channel	Ch 11	Ch 18	Ch 26
Measured value (dBm)	22.32	21.62	10.60

Maximum Field strength

RF channel	Ch 11	Ch 18	Ch 26
VP: Measured value (dBμV/m)	120.03	119.86	107.83
HP: Measured value (dBμV/m)	117.21	117.07	100.58

Maximum EIRP

RF channel	Ch 11	Ch 18	Ch 26
Measured EIRP (dBm)	21.48	20.96	10.57
Antenna gain dBi	-0.84	-0.66	-0.03

Substitution:

Frequency MHz	Measured value dBm	Subst. Gen. (incl. corr.) dBm	Attenuator and Cable dB	Gain Subst. Antenna dB	Result dBm
2405	-21.07	26.72	-13.64	8.4	21.48
2440	-21.87	26.16	-13.80	8.6	20.96
2480	-33.97	15.53	-13.96	9.0	10.57

Result dBm = (Subst.Gen. + (Attenuator + Cable) + Antenna Gain)

Antenna gain = (EIRP-Conducted Power) dBi

The EIRP is measured using substitution method. The maximum eirp is obtained at Vertical polarization.

Detachable antenna?

☒ Yes ☐ No

If detachable, is the antenna connector non-standard?

☒ Yes ☐ No

Reversed SMA connector

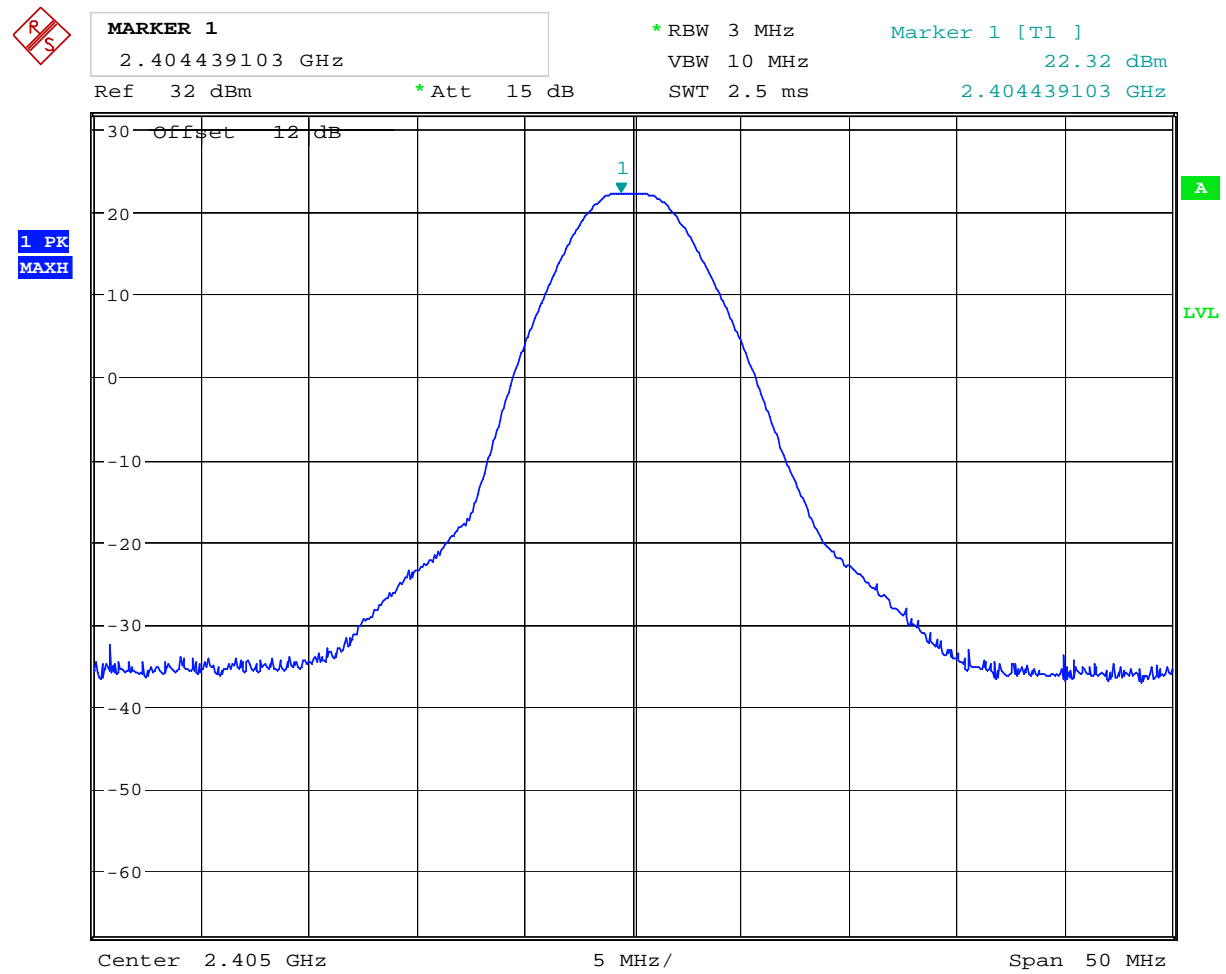
Power supply variation within manufacturer specified range 2.7 – 3.6V DC has no influence on measured values

Requirements:

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

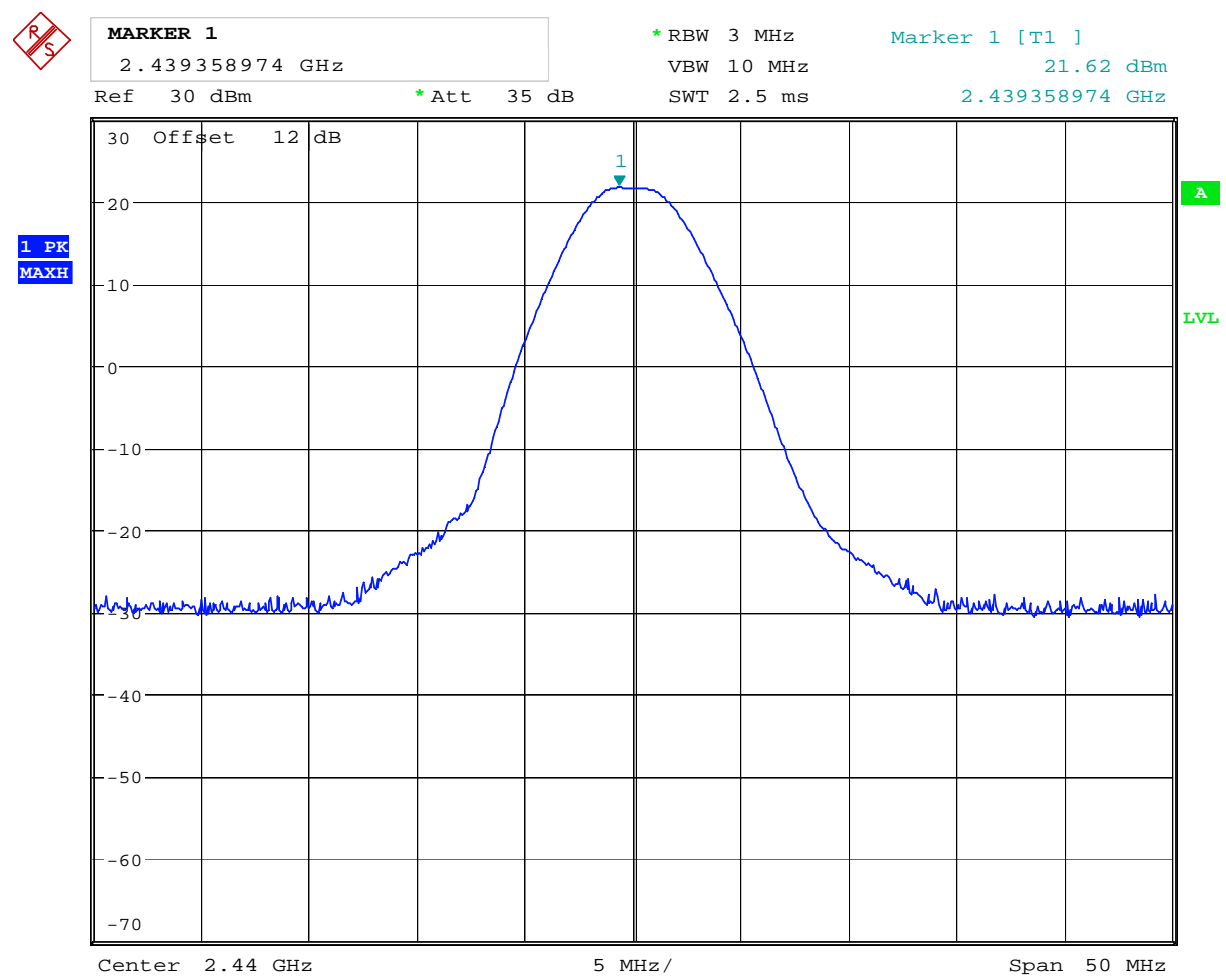
For Digital Transmission Systems in the 2400 - 2483.5 MHz band: 1 Watt

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.



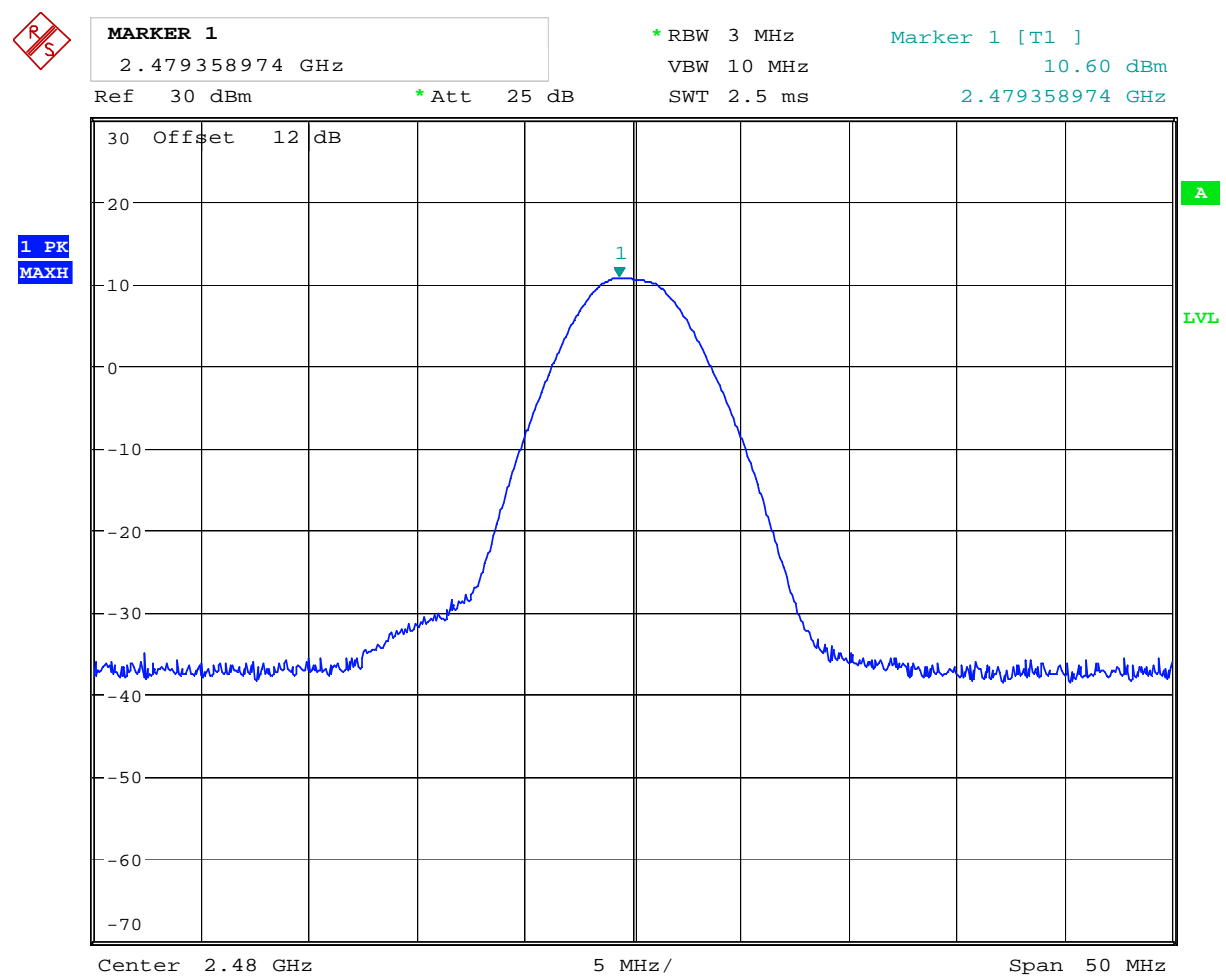
Date: 10.DEC.2010 10:47:04

Conducted power – Ch11



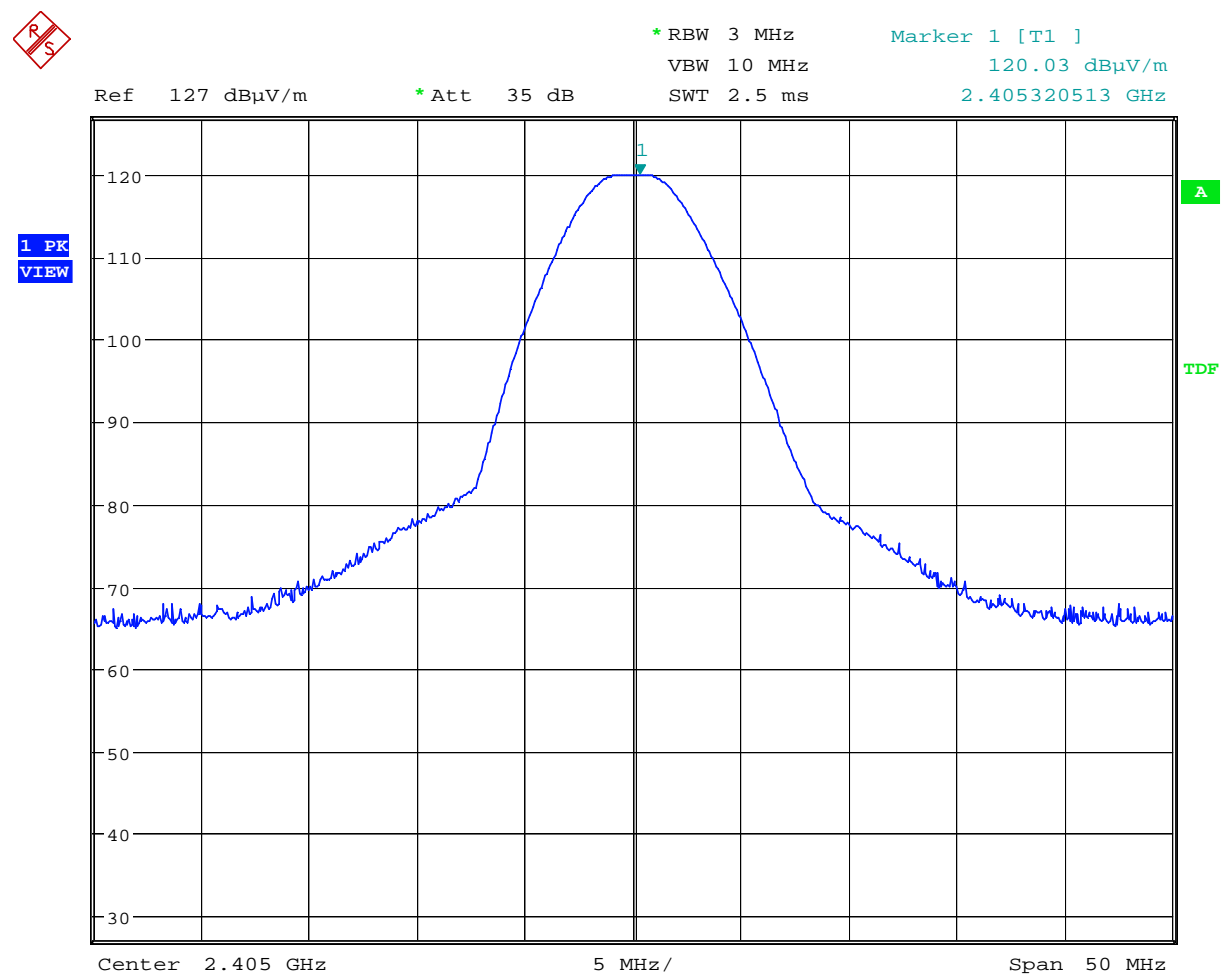
Date: 10.DEC.2010 11:09:35

Conducted power – ch18



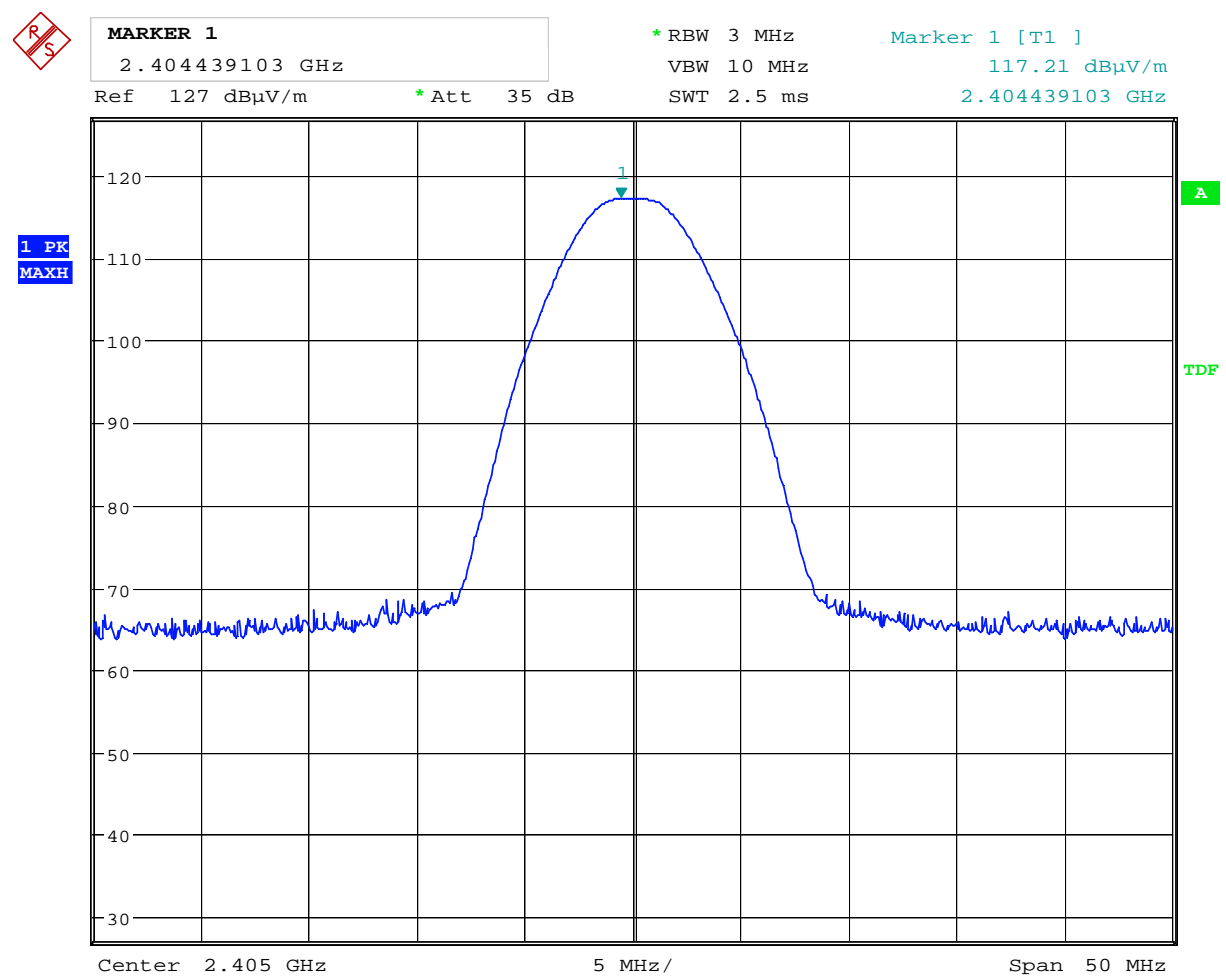
Date: 10.DEC.2010 11:23:18

Conducted power – ch26



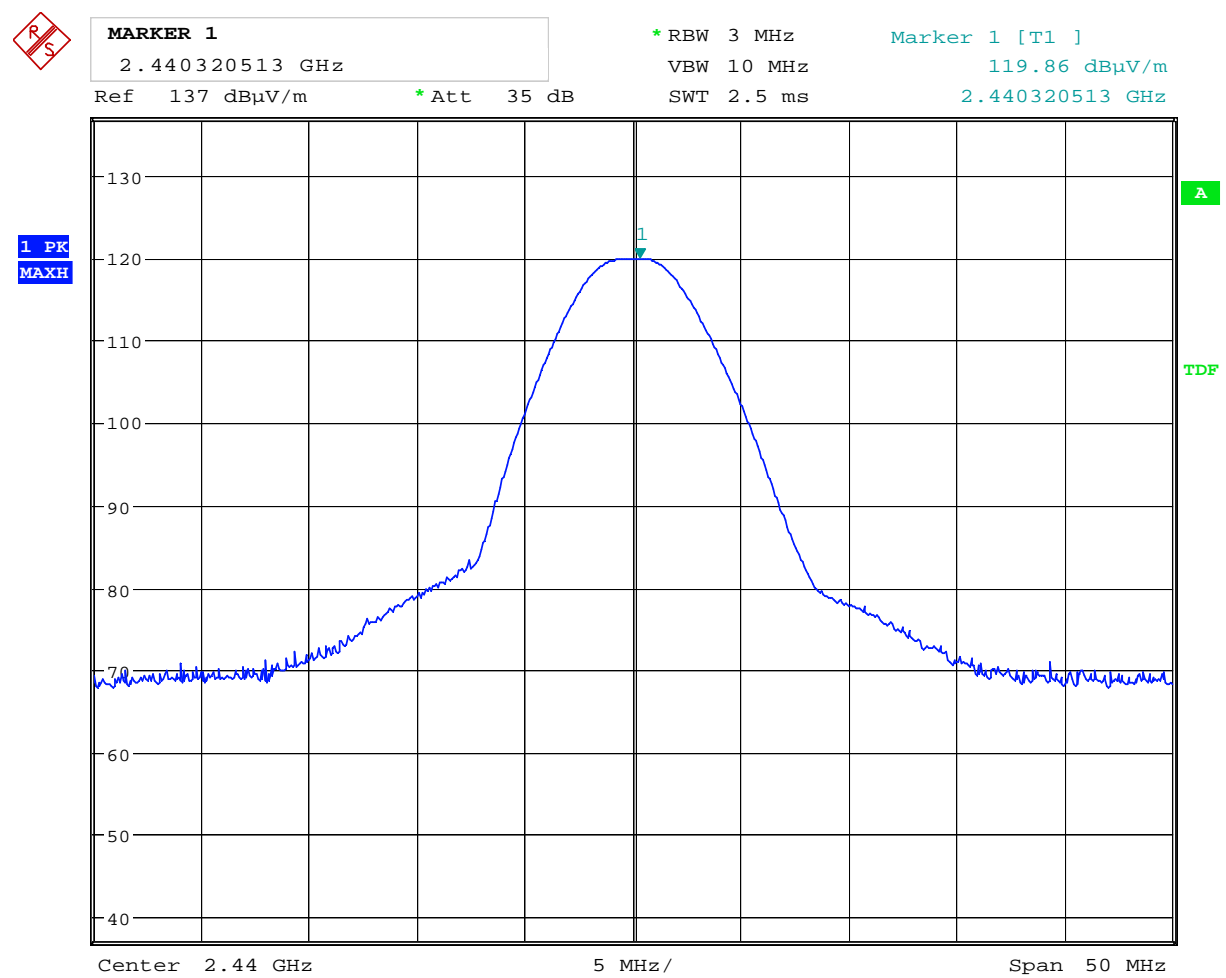
Date: 8.DEC.2010 10:34:41

VP: Ch11 – Field strength



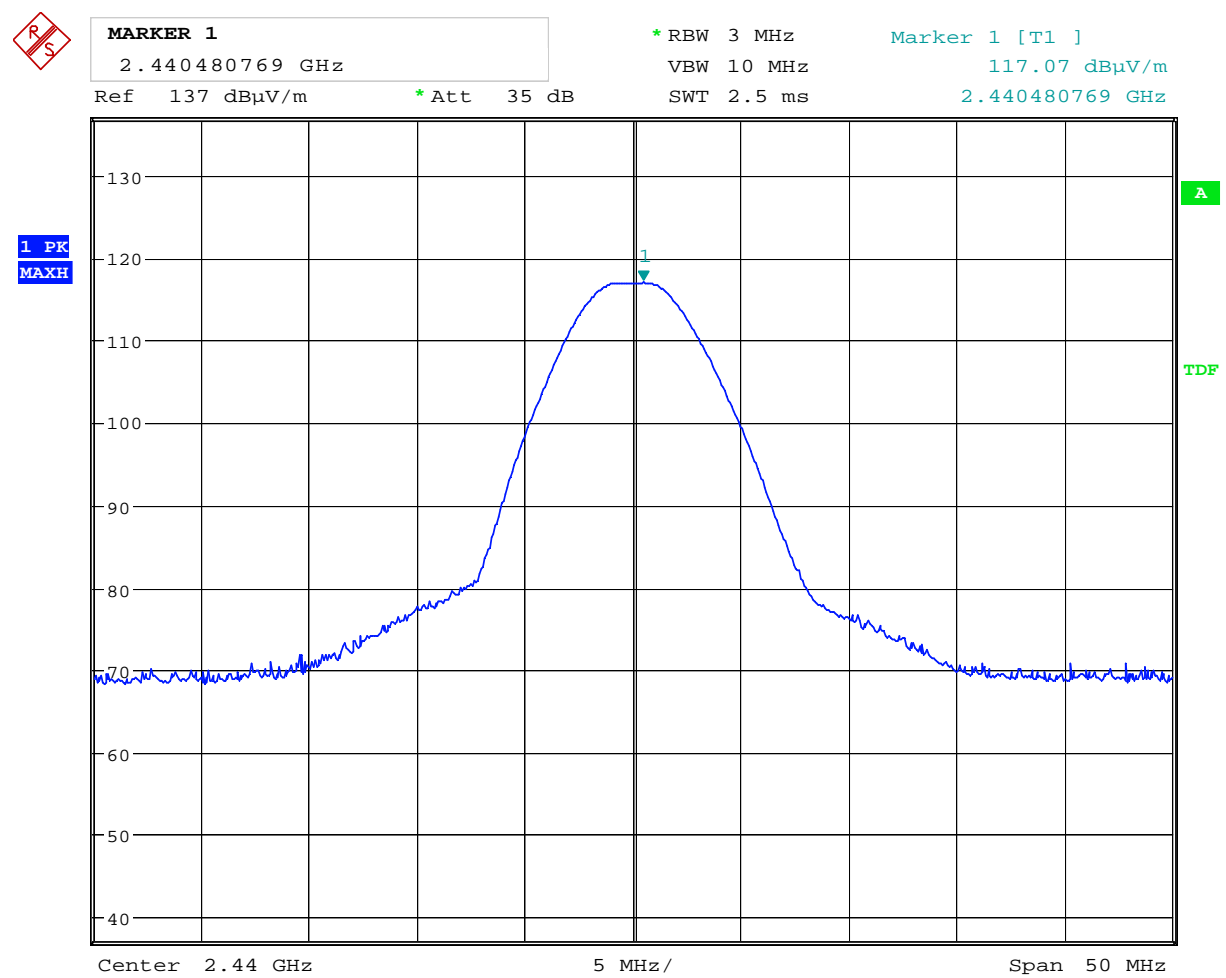
Date: 8.DEC.2010 11:02:49

HP: Ch11 – Field strength



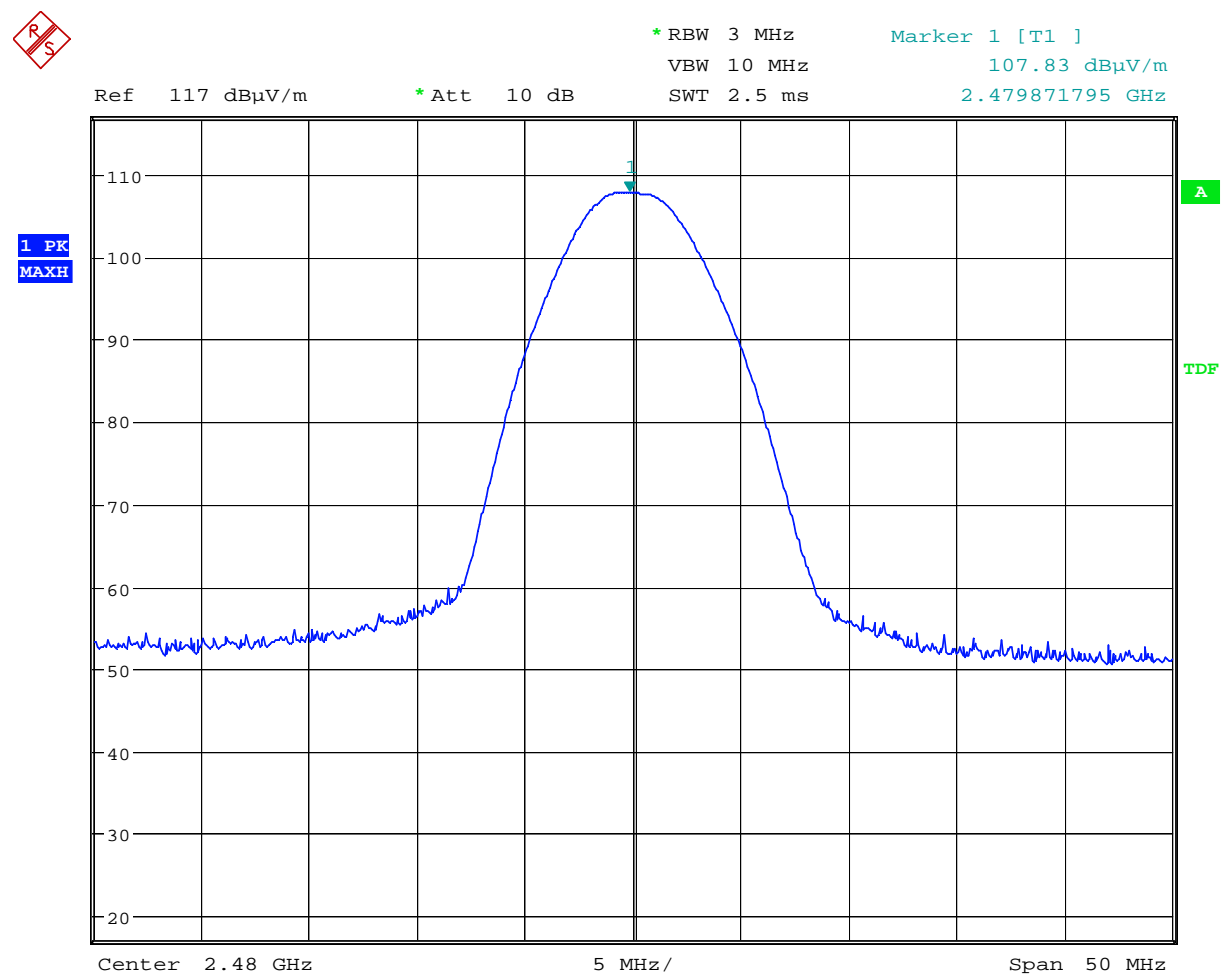
Date: 8.DEC.2010 09:58:36

VP: Ch18 – Field strength



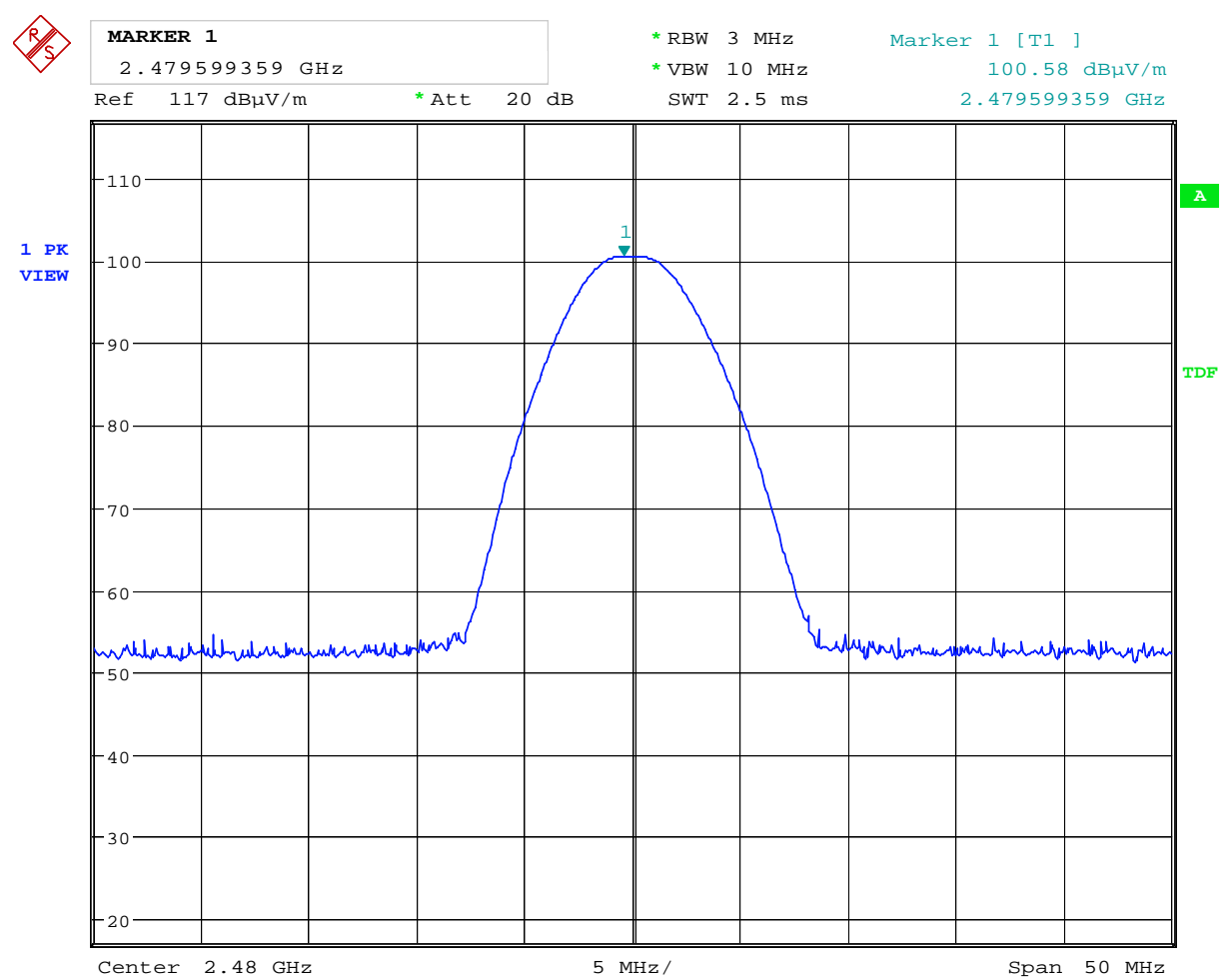
Date: 8.DEC.2010 10:06:08

HP: Ch18 – Field strength



Date: 8.DEC.2010 11:53:29

VP: Ch26 – Field strength



Date: 8.DEC.2010 12:00:54

HP: Ch26 – Field strength

4.5 Spurious Emissions (Radiated)

Para. No.: 15.247 (c)

Test Performed By: G.Suwanthakumar

Date of Test: 10.12.2010

Test Results: Complies

Measurement Data:

Lower Band-edge radiated measurements

Frequency	Power below nearest channel, dB	Limit	Margin
GHz	RF ch 11 DSS	dB	dB
2.39	64.58	-20	44.58

Band-edge field strength 2.39 GHz:

Marker Delta 100kHz RBW: 64.58dB

Peak Field Strength 119.93– 64.58 = 55.35 dB μ V/m

Average Field Strength: 55.35 dB μ V/m – 11* dB = 44.35 dB μ V/m

* duty cycle correction

Upper Band-edge radiated measurements

Frequency	Power below nearest channel, dB	Limit	Margin
GHz	RF ch 26 DSS	dB	dB
2.4835	46.98	-20	26.98

Band-edge field strength 2.4835 GHz:

Marker Delta 100kHz RBW: 46.98 dB

Peak Field Strength: 107.75– 46.98 = 60.77 dB μ V/m

Average Field Strength: 60.77 dB μ V/m – 11* dB = 49.77 dB μ V/m

* maximum duty cycle correction according to manufacturer is 11dB

Tested item's transmission is with 100% duty cycle

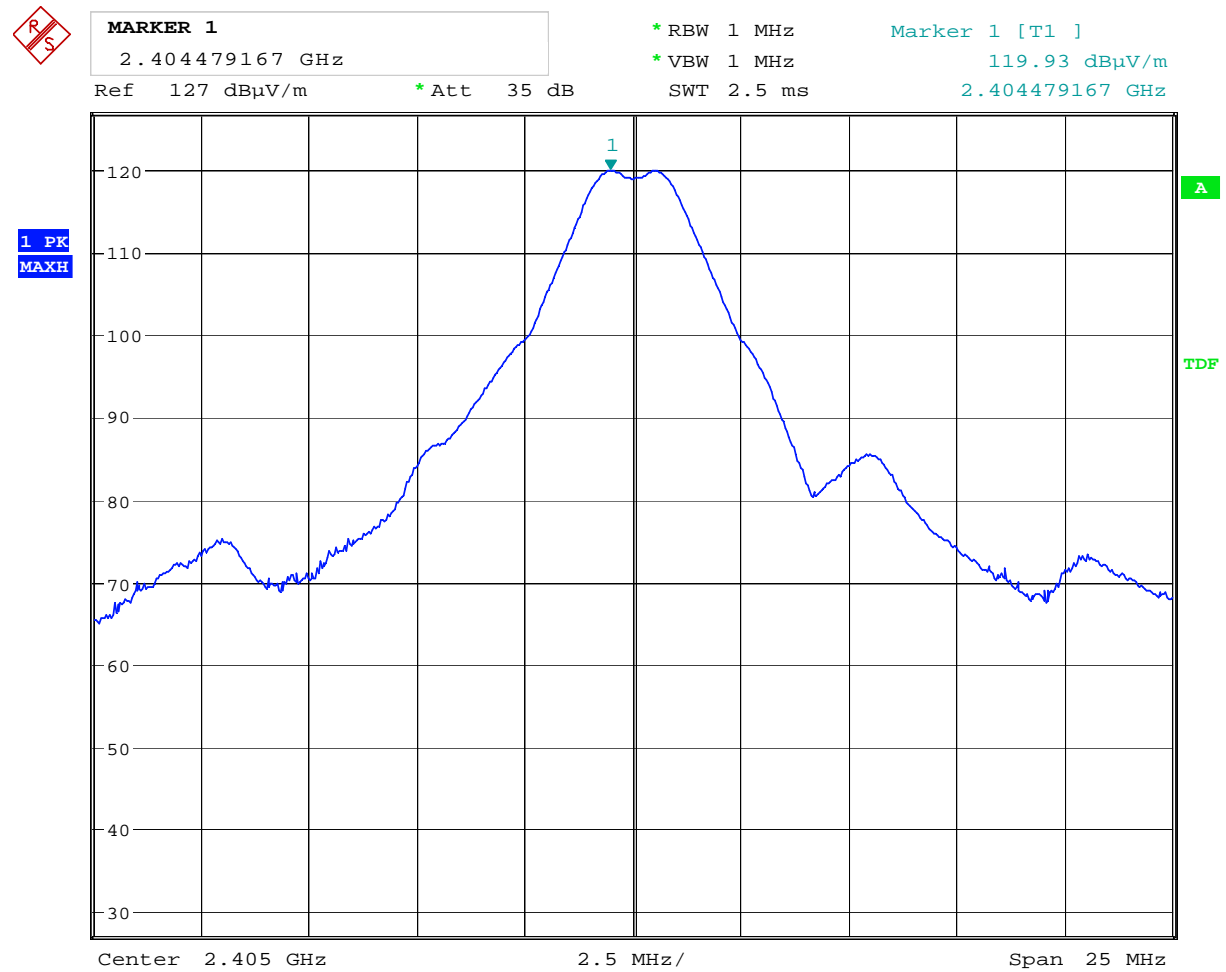
RF conducted emissions 9kHz to 25 GHz

Maximum RF level outside operating band:

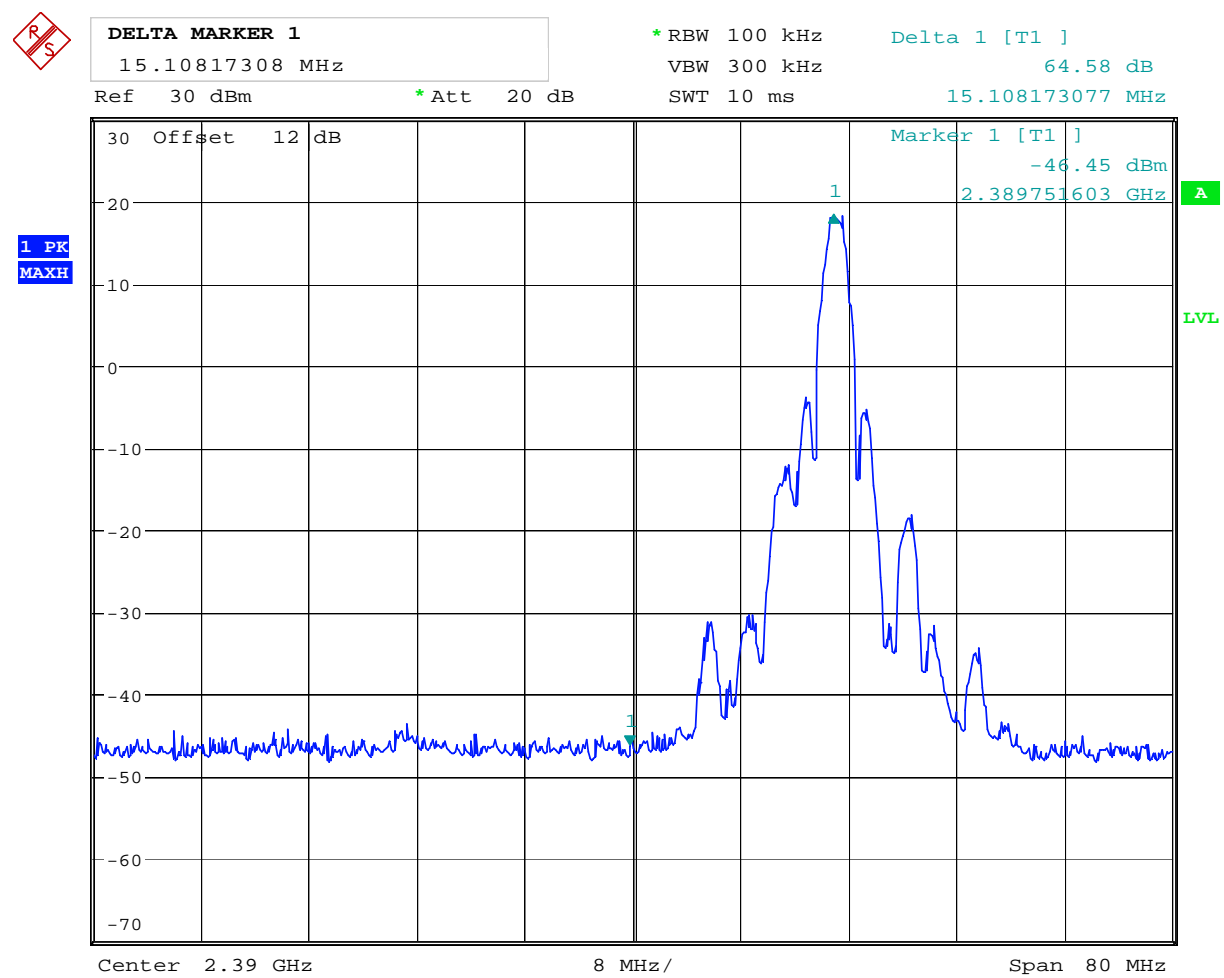
RF ch 11: 35.58 dBC, margin > 15 dB

RF ch 18: 36.75 dBC, margin > 16 dB

RF ch 26: 54.22 dBC, margin > 30 dB

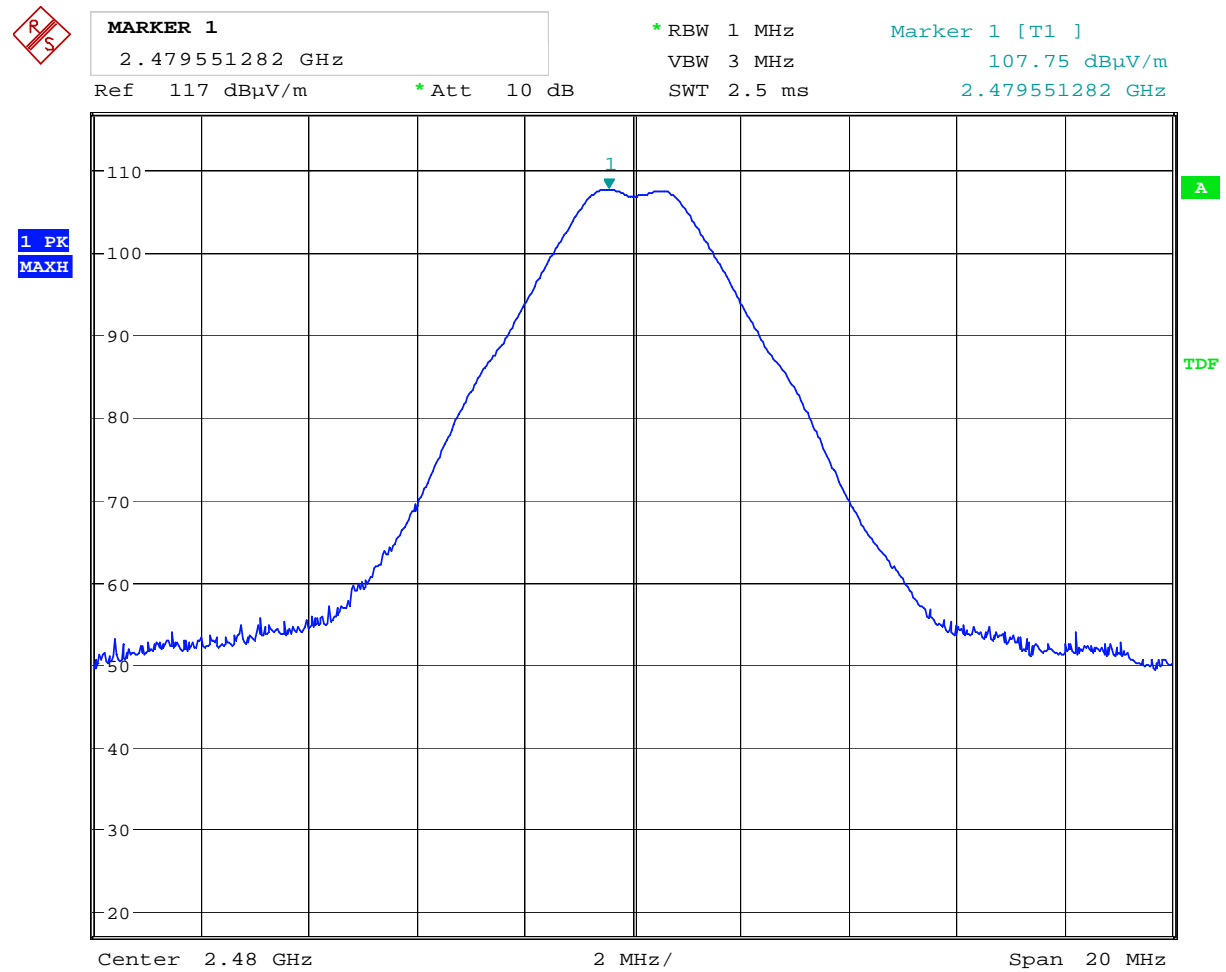


Date: 8.DEC.2010 10:37:45

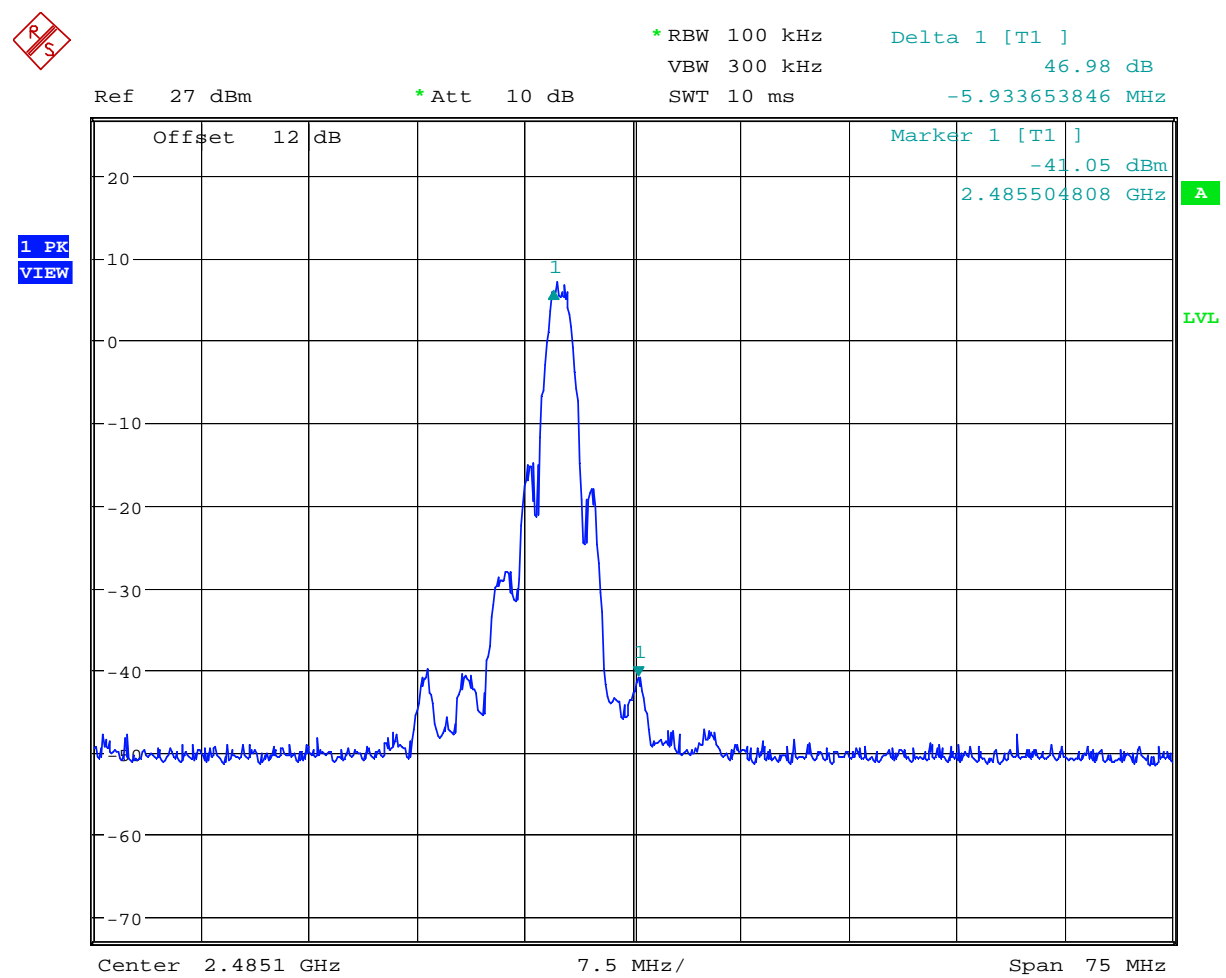


Date: 10.DEC.2010 14:13:44

Ch11 – Lower-band-edge – Delta-marker

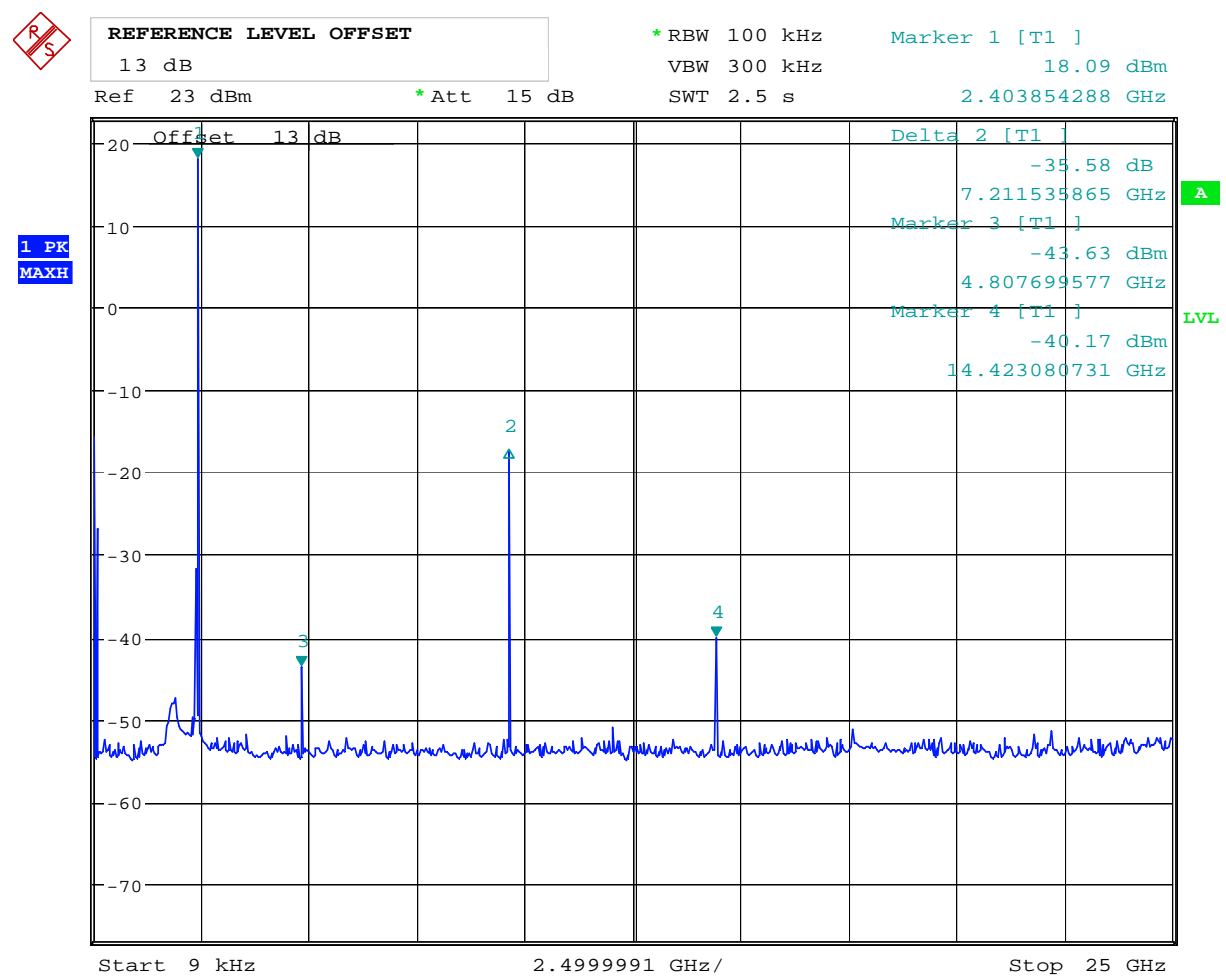


Date: 8.DEC.2010 11:54:16



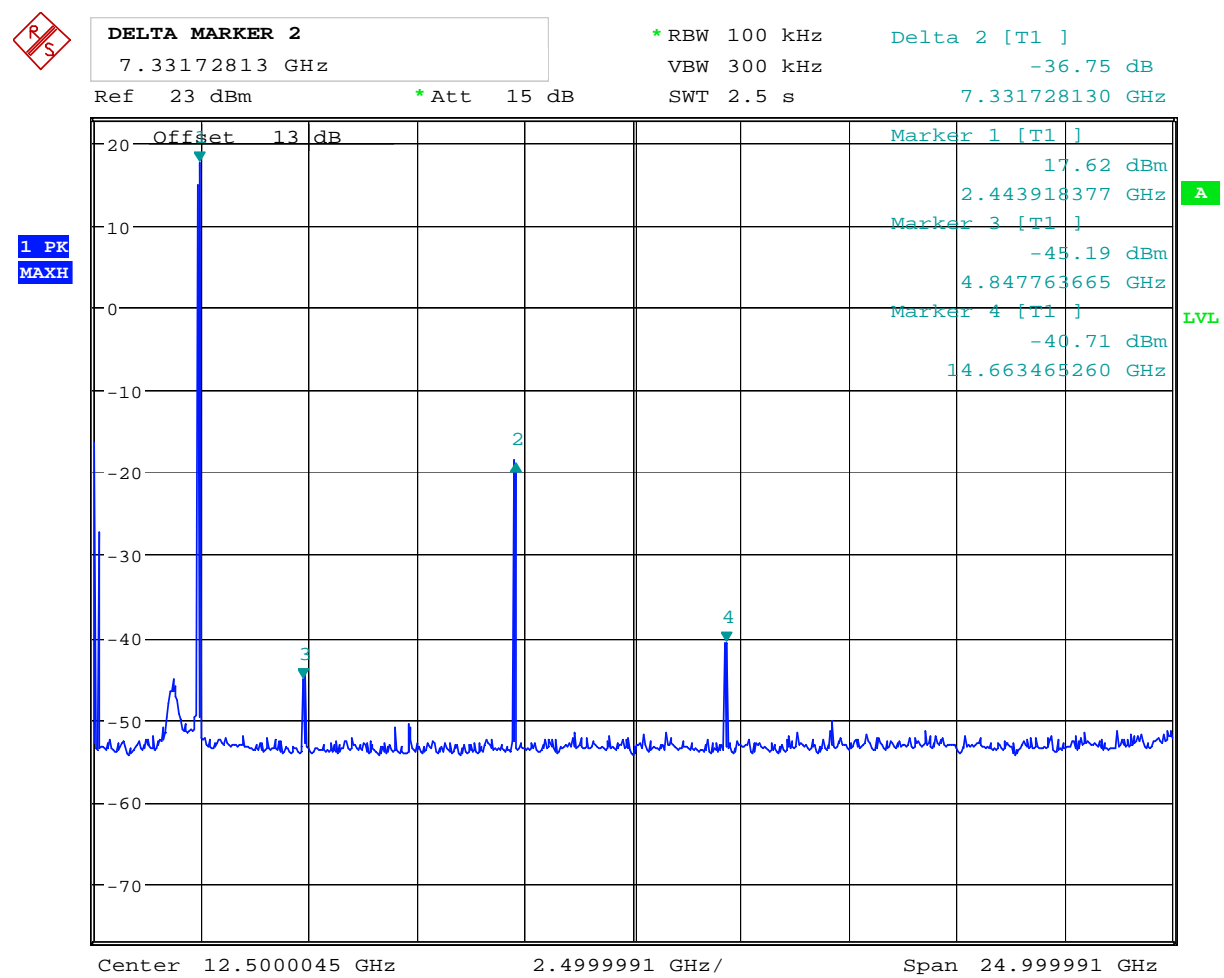
Date: 10.DEC.2010 14:31:06

Ch26 – Upper-band-edge – Delta-Marker



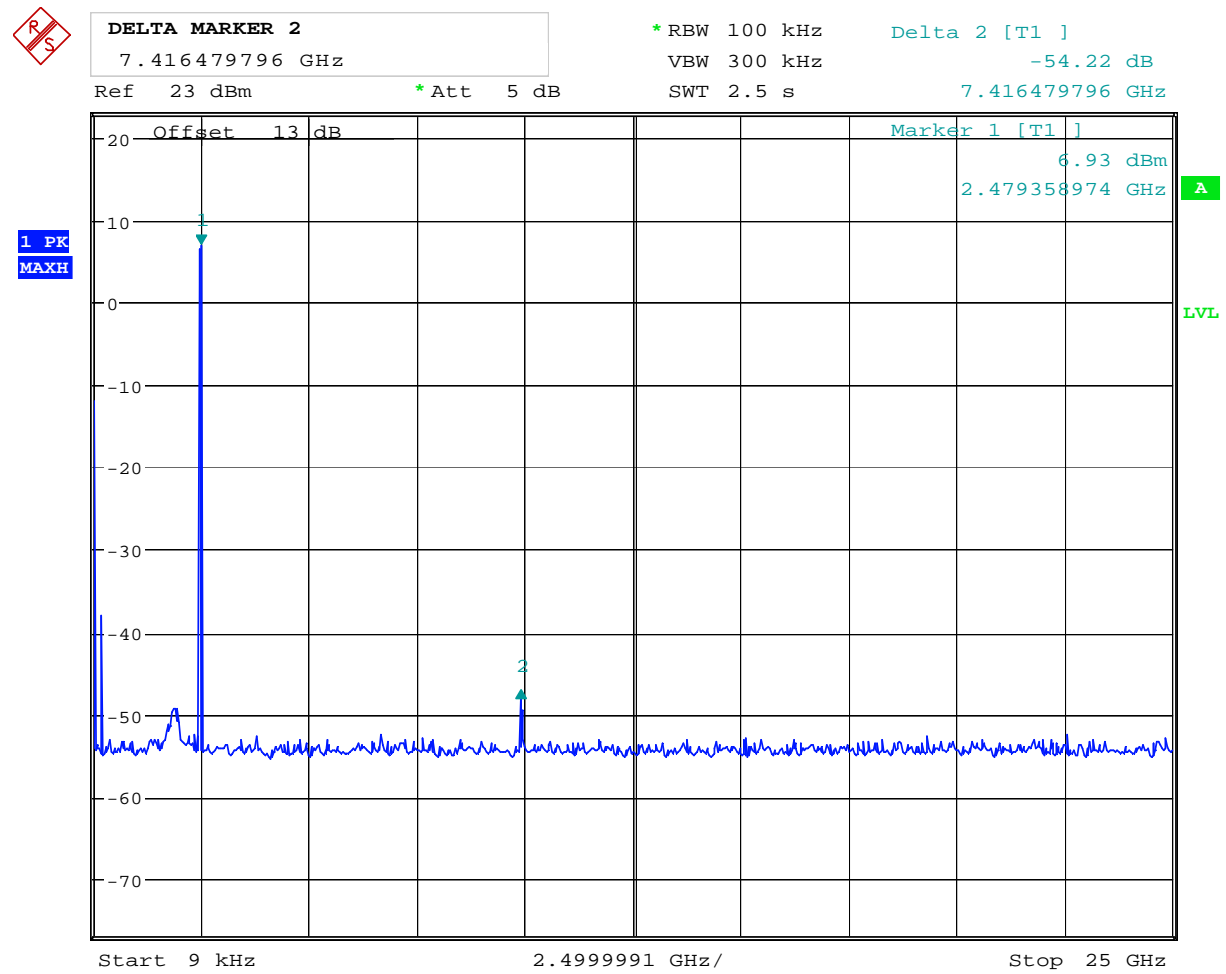
Date: 10.DEC.2010 11:04:05

Ch11 – Conducted Spurious – 9kHz – 25GHz



Date: 10.DEC.2010 11:08:37

Ch19 – Conducted Spurious – 9kHz – 25GHz



Date: 10.DEC.2010 11:26:09

Ch26 – Conducted Spurious – 9kHz – 25GHz

Duty Cycle Calculation:

Manufacturer statement:

IEEE 802.15.4-2003 are used for application with low power consumption and in normal operation mode the TX duty cycle is much less than 1 %.

However, calculation have been made to show the maximum theoretical TX on time is 27%. This is based on max length packet of 127 bytes + preamble/sync. (4,256 ms per packet).

With up to 6,3 packets per 100ms this render max duty cycle of 27%.

Hence this approval is based on ZigBee or any other protocols ensuring max TX duty cycle of 27%

$$\text{Duty Cycle Correction Factor} = 20 \log (27/100) = 11 \text{ dB}$$

Radiated Emissions with antenna, 1-25 GHz, peak

1-8 GHz measured at a distance of 3m, 9-25 GHz measured at 1m.

Measured with Peak Detector

Frequency	RF channel	Dist. corr. factor	Field strength, Peak	Duty cycle corr. factor	Limit	Margin
GHz	11-26	dB	dB μ V/m	dB	dB μ V/m	dB
4.811	11	0	57.24	-	74	16.76
4.881	18	0	55.73	-	74	18.27
4.960	26	0	62.41	-	74	11.59
7,215	11	0	54.53	-	74	19.47
7,32	18	0	56.48	-	74	17.52
7,44	26	0	57.36	-	74	16.64
12,025	11	*	60	-	74	14
12,2	18	*	58.67	-	74	15.33
12,4	26	*	None detected	-	74	-
14,43	11	*	53.57	-	74	20.43
14,64	18	*	61.21	-	74	12.79
14,88	26	*	None detected	-	74	-
18 - 25	11,18,26	0	None detected	-	-	-

* corrected on the plot , -9.5dB

Non-restricted band spurious emission , Radiated – Peak detector

Frequency	RF channel	Dist. corr. factor	Field strength, Peak	Field strength of desired frequency	Limit	Margin
GHz	11-26	dB	dB μ V/m	dB μ V/m	dB	dB
9.62	11	*	53.53	120.03	> 20	66.5
9.76	18	*	59.92	119.86	> 20	59.94
9.92	26	*	None detected	107.83	> 20	-
16.835	11	*	51.29	120.03	> 20	68.74
17.08	18	*	50.15	119.86	> 20	69.71
17.36	26	*	None detected	107.83	> 20	-

Radiated emissions with antenna, 1- 25 GHz, Average Detector

Frequency	RF channel	Dist. corr. factor	Duty cycle corr. factor	Field strength, Peak	Limit	Margin
GHz	11-26	dB	dB	dBμV/m	dBμV/m	dB
4.811	11	0	11	46.24	54	7.76
4.881	18	0	11	44.73	54	9.27
4.960	26	0	11	51.41	54	2.59
7,215	11	0	11	43.53	54	10.47
7,32	18	0	11	45.48	54	8.52
7,44	26	0	11	46.36	54	7.64
12,025	11	*	11	49	54	5
12,2	18	*	11	47.67	54	6.33
12,4	26	*	11	None detected	54	-
14,43	11	*	11	42.57	54	11.43
14,64	18	*	11	50.21	54	3,79
14,88	26	*	11	None detected	54	-
18 - 25	11,18,26	0	11	None detected	-	-

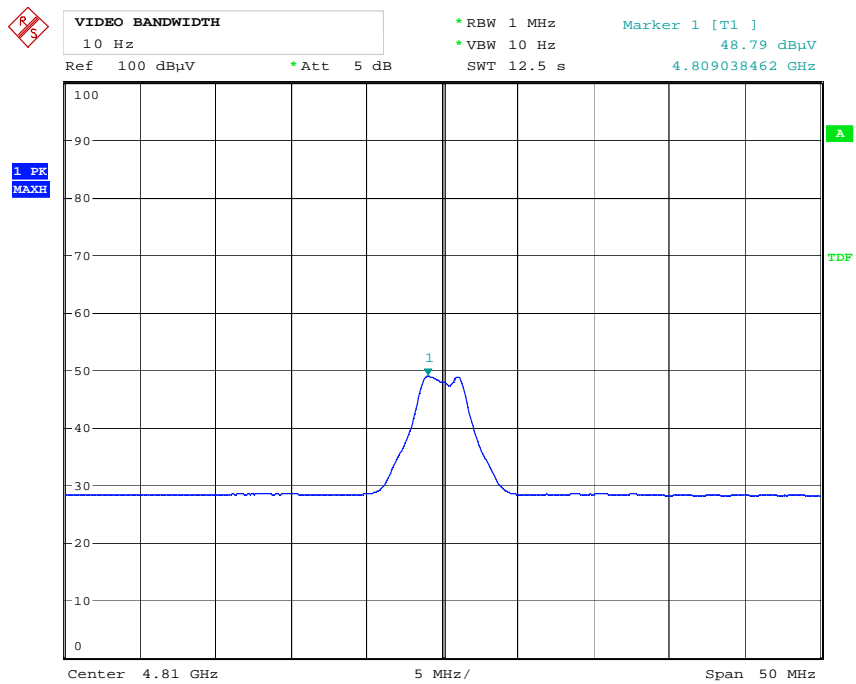
* corrected on the plot , -9.5dB The maximum is observed in vertical polarization

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

Restricted bands according to part 15.205 : 2310 – 2390 MHz ,483.5 – 2500 MHz, 7.250 – 7.750 GHz , 10.6 - 12.7 GHz , 14.47 - 14.5GHz and 15.35 - 16.2 GHz

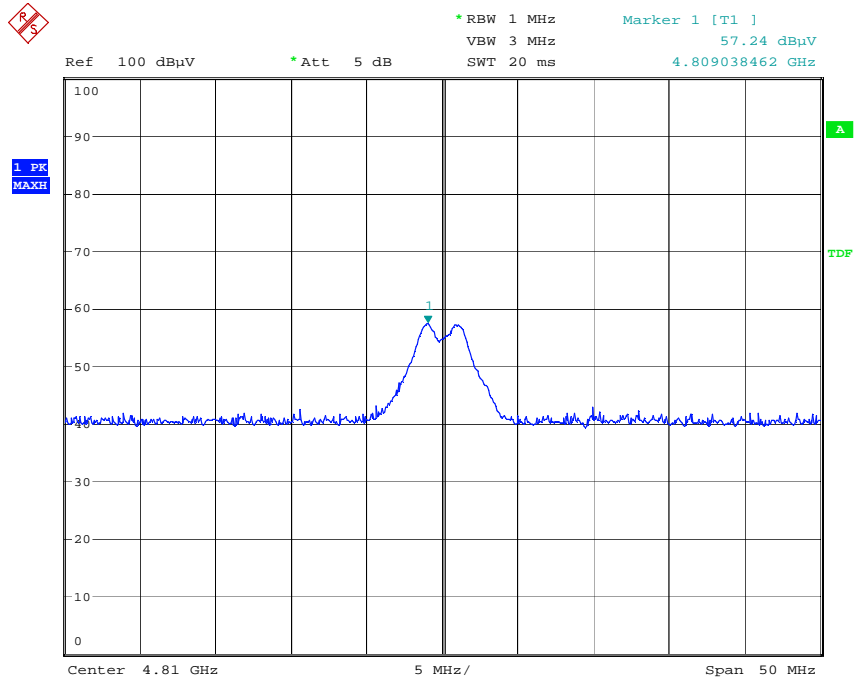
Requirement:

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, 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) (see §15.205(c)).



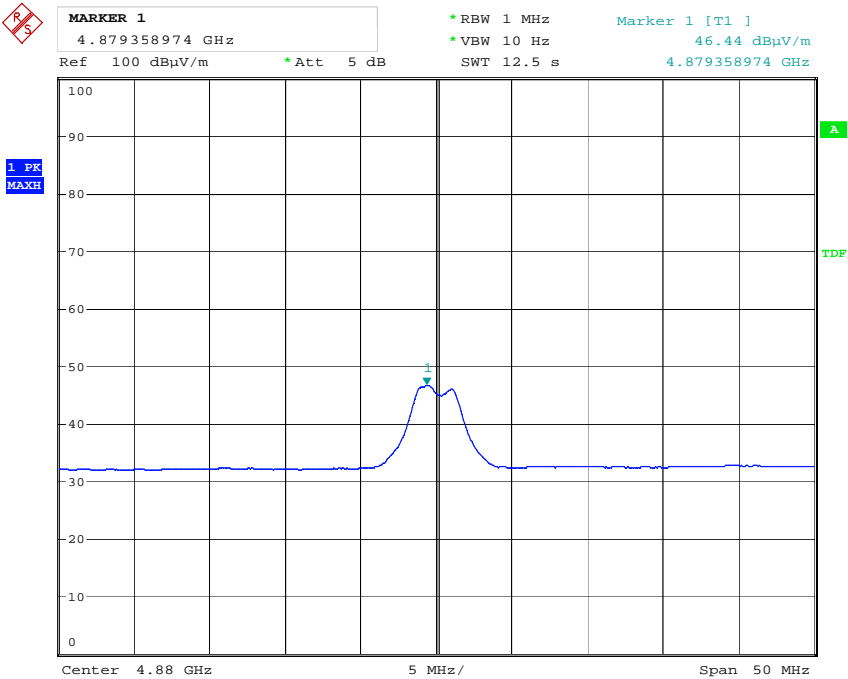
Date: 8.DEC.2010 14:03:21

Ch11 – 2nd harmonic- VBW 10Hz



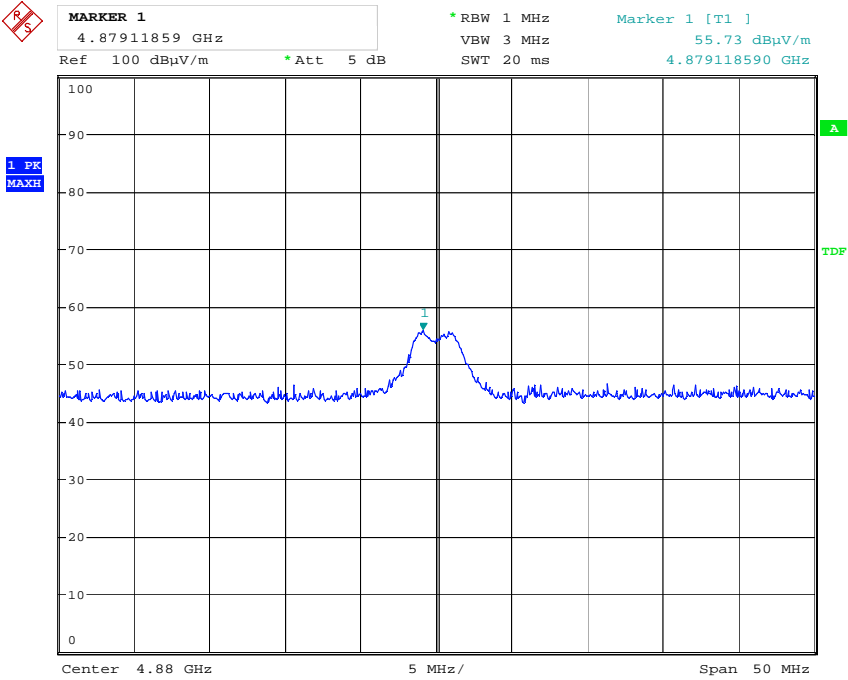
Date: 8.DEC.2010 14:02:27

Ch11 – 2nd harmonic- VBW 1MHz



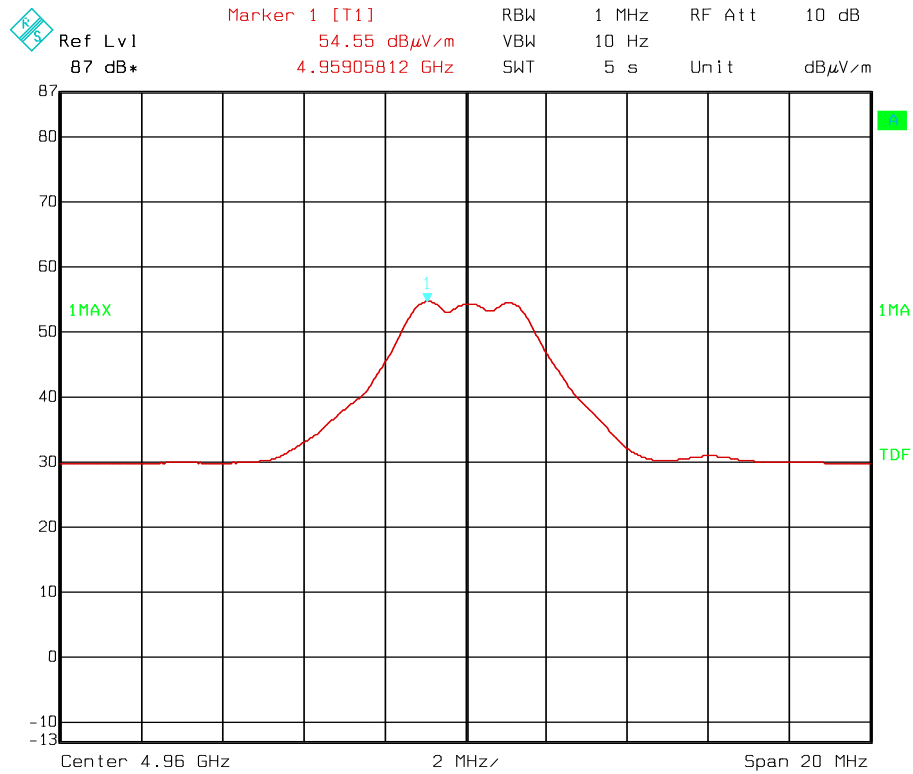
Date: 8.DEC.2010 13:55:14

Ch18 – 2nd Harmonic- VBW 10Hz



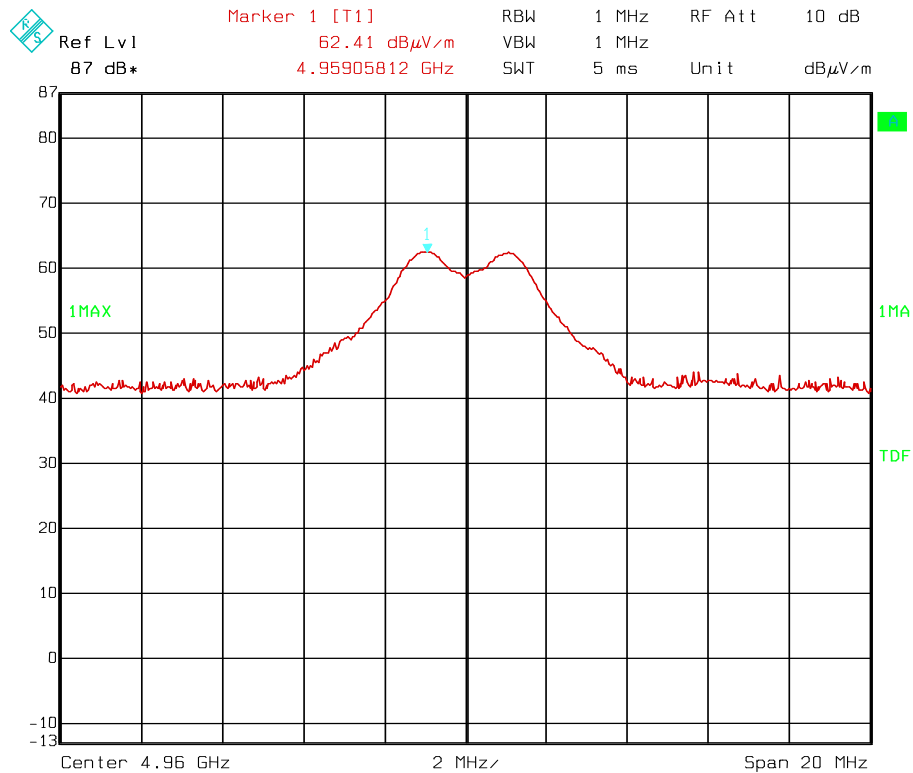
Date: 8.DEC.2010 13:54:29

Ch18 – 2nd harmonic- VBW 1MHz



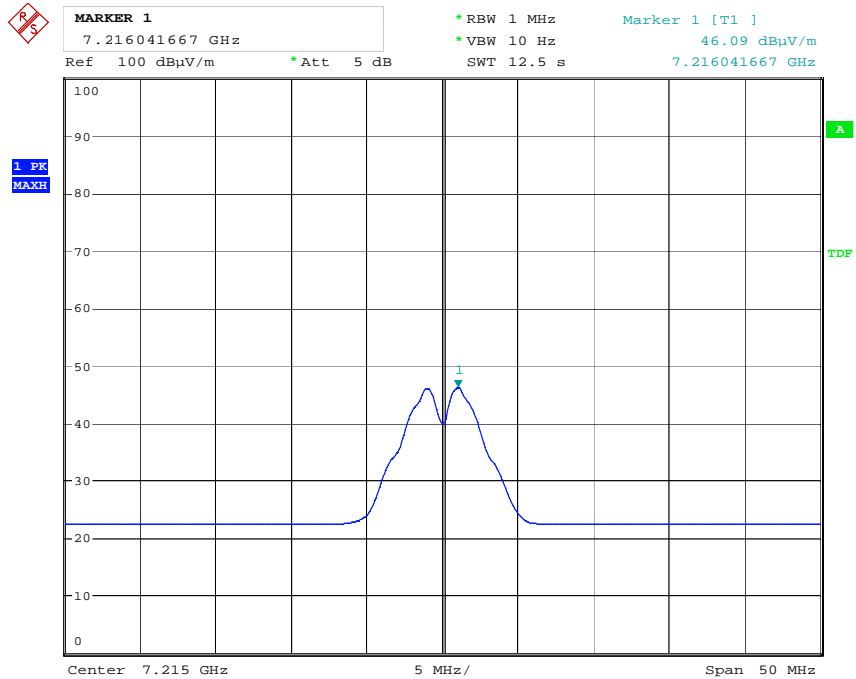
Date: 27.JAN.2011 11:02:52

Ch26 – 2nd Harmonic – VBW 10Hz



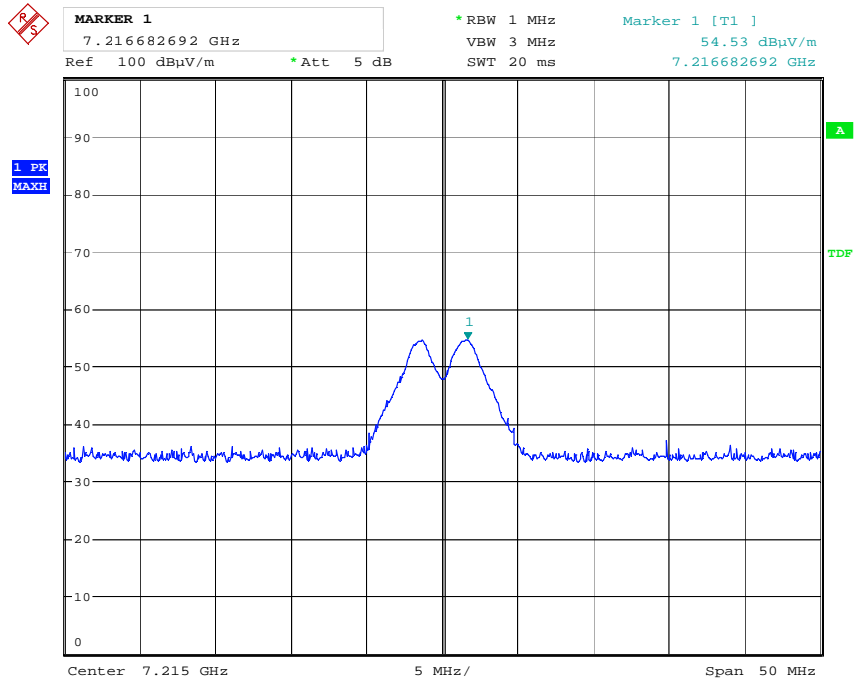
Date: 27.JAN.2011 11:01:23

Ch26 – 2nd harmonic- VBW 1MHz



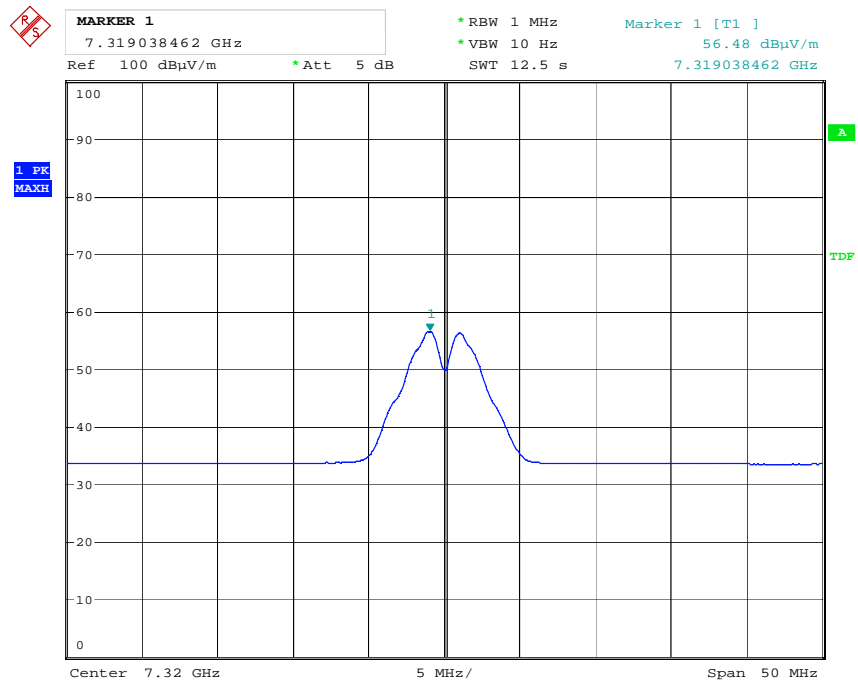
Date: 8.DEC.2010 14:05:23

Ch11 – 3rd Harmonic – VBW 10Hz



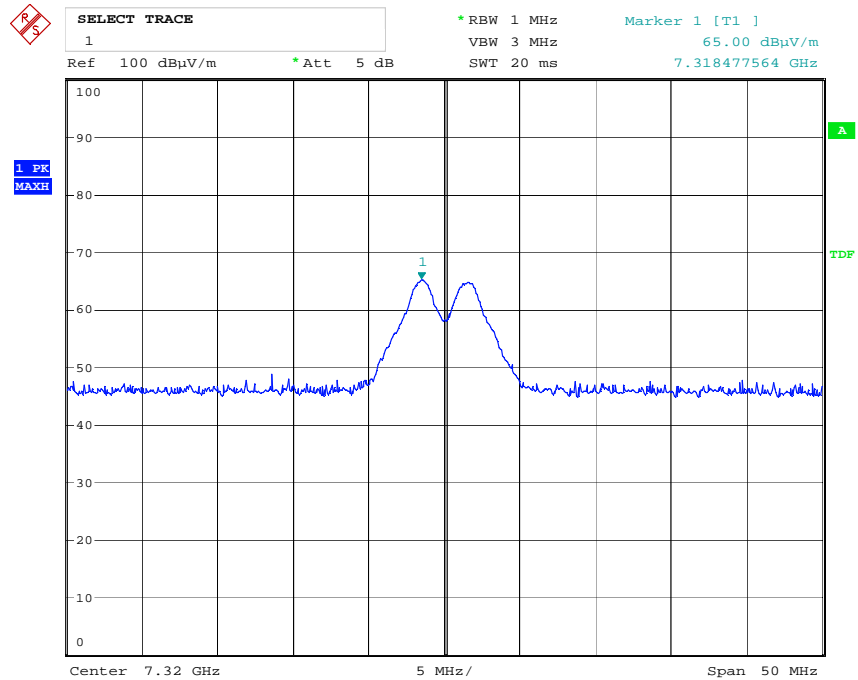
Date: 8.DEC.2010 14:05:46

Ch11 – 3rd Harmonic – VBW 1MHz



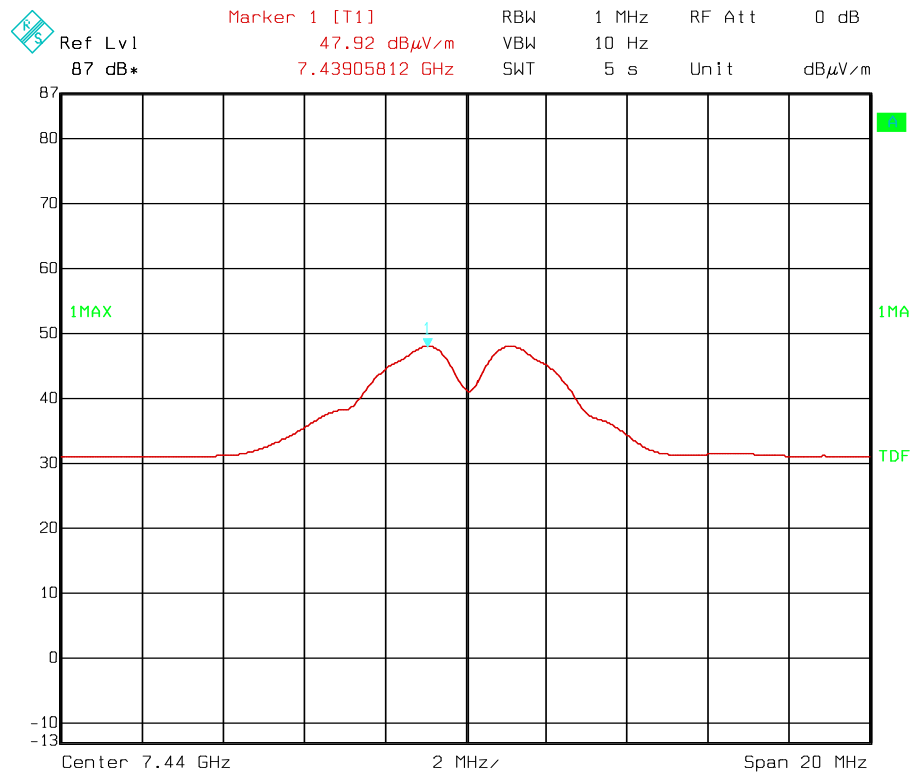
Date: 8.DEC.2010 13:49:06

Ch18 – 3rd Harmonic – VBW 10Hz



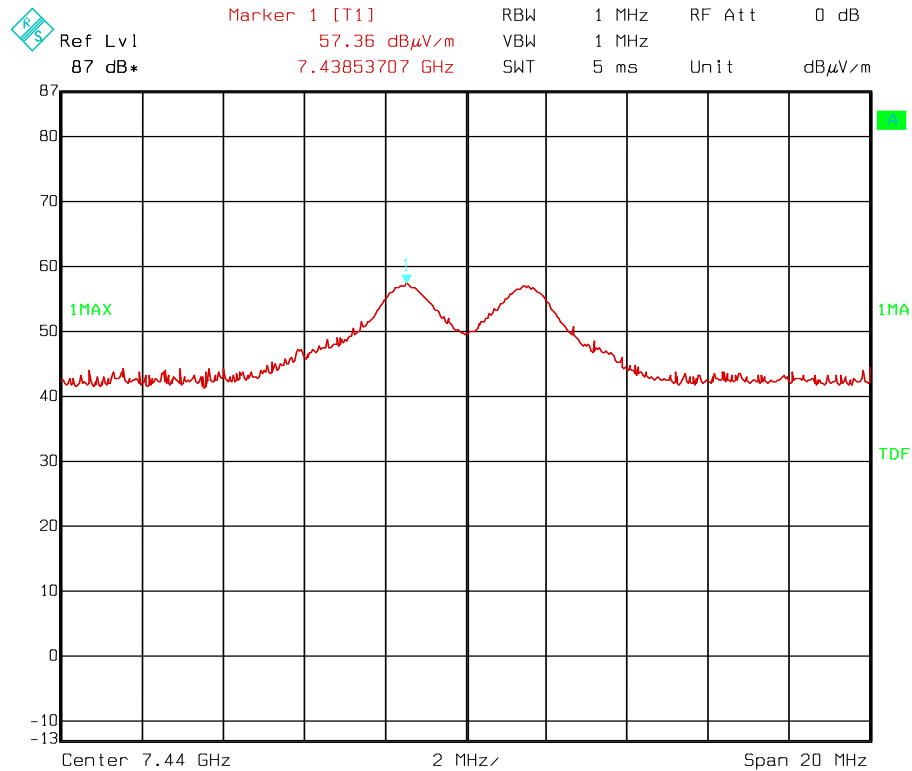
Date: 8.DEC.2010 13:49:35

Ch18 – 3rd Harmonic – VBW 1MHz



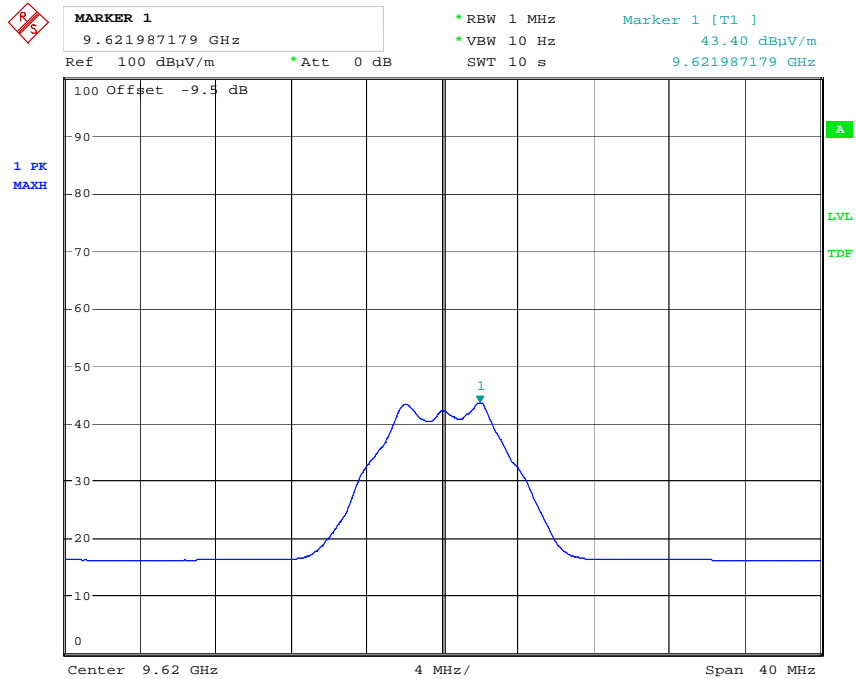
Date: 27.JAN.2011 11:09:54

Ch26 – 3rd Harmonic – VBW 10Hz



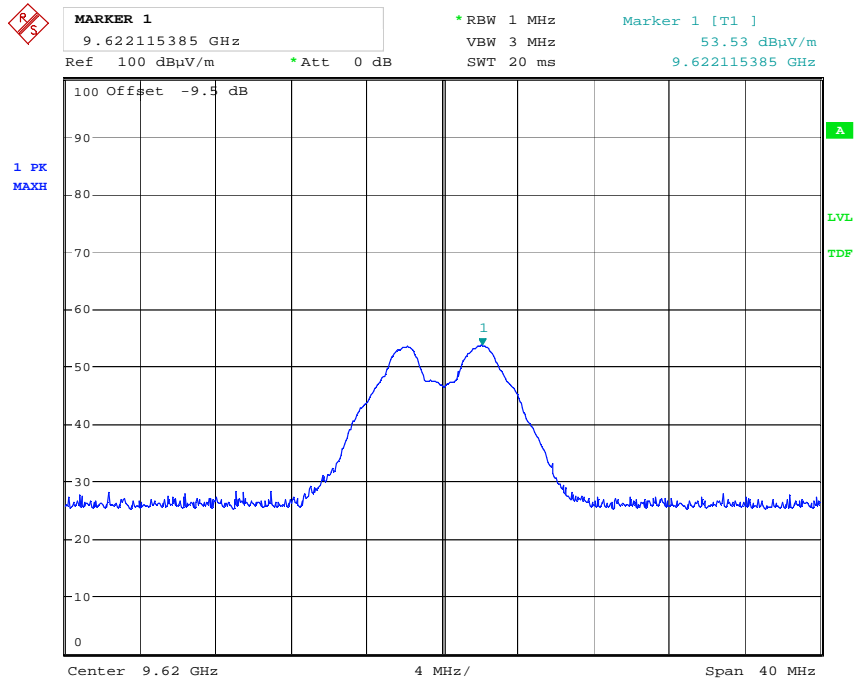
Date: 27.JAN.2011 11:09:10

Ch26 – 3rd Harmonic – VBW 1MHz



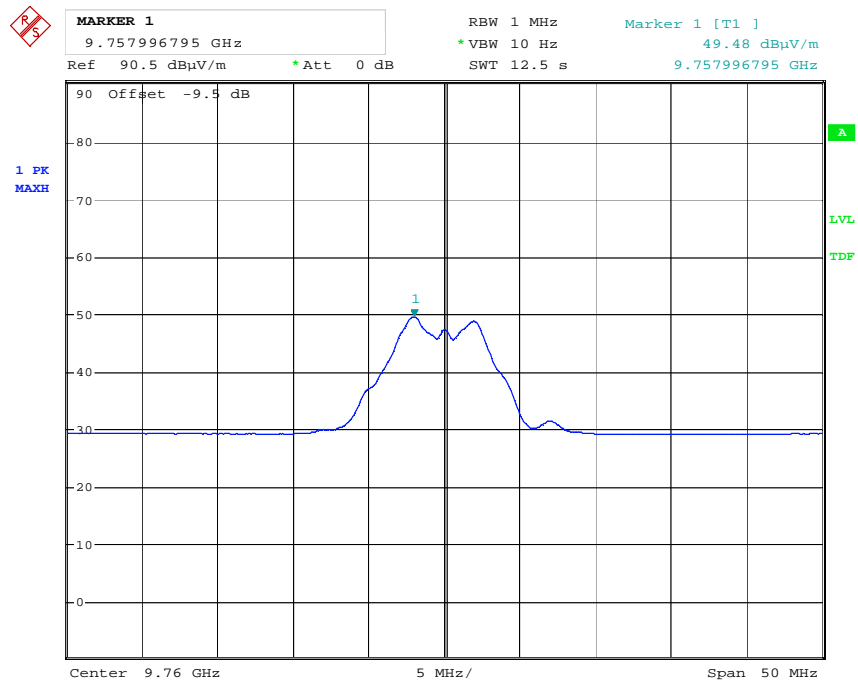
Date: 9.DEC.2010 10:15:41

Ch11 – 4th Harmonic – VBW 10Hz



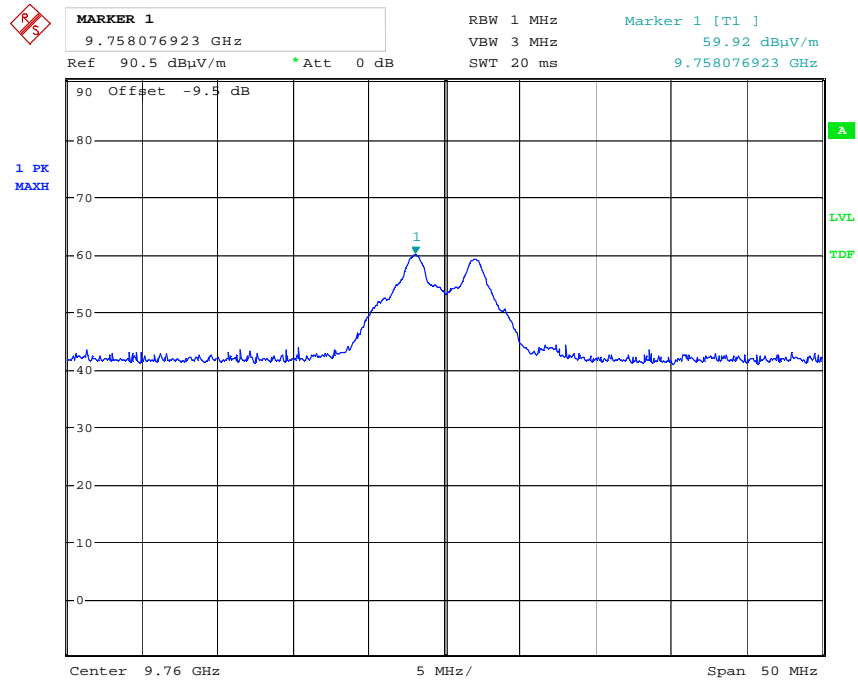
Date: 9.DEC.2010 10:15:00

Ch11 – 4th Harmonic – VBW 1MHz



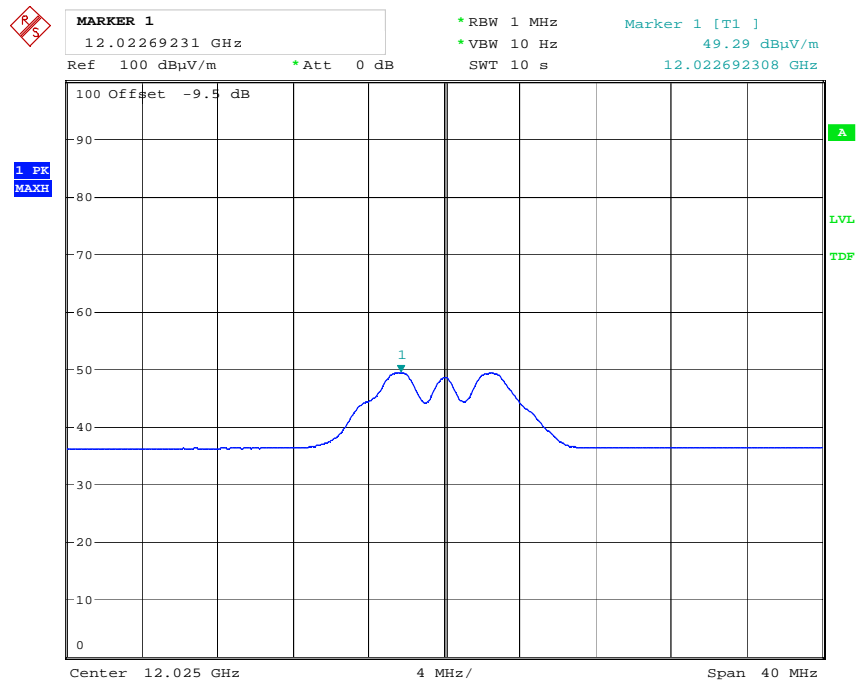
Date: 3.JAN.2011 11:46:25

Ch18 – 4th Harmonic – VBW 10Hz



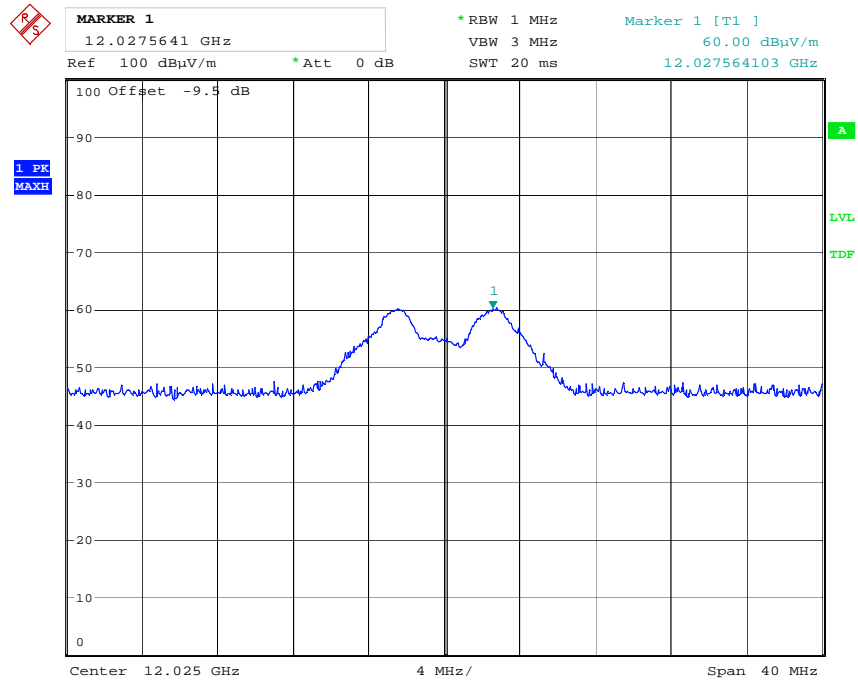
Date: 3.JAN.2011 11:45:18

Ch18 – 4th Harmonic – VBW 1MHz



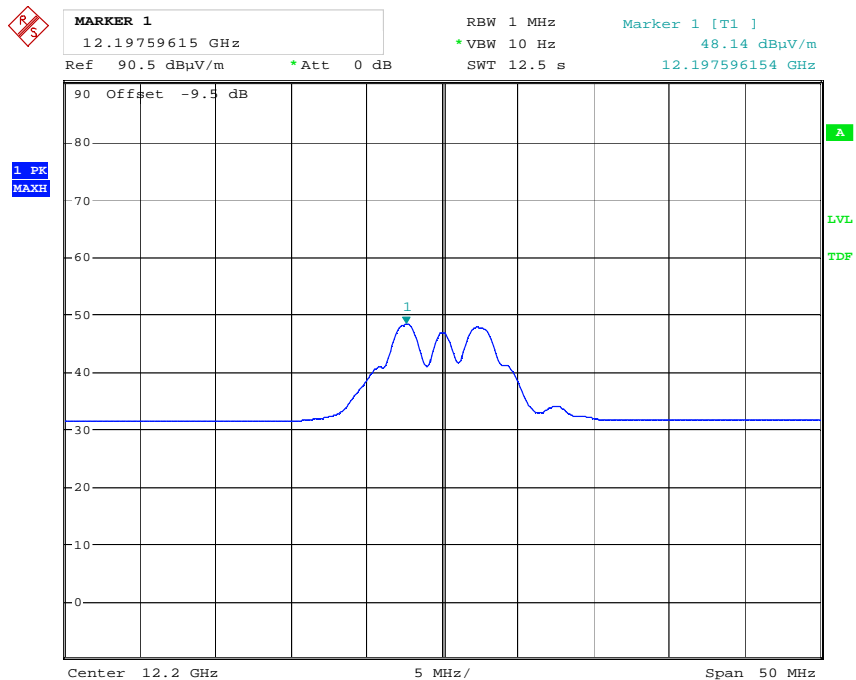
Date: 9.DEC.2010 10:12:31

Ch11 – 5th Harmonic – VBW 10Hz



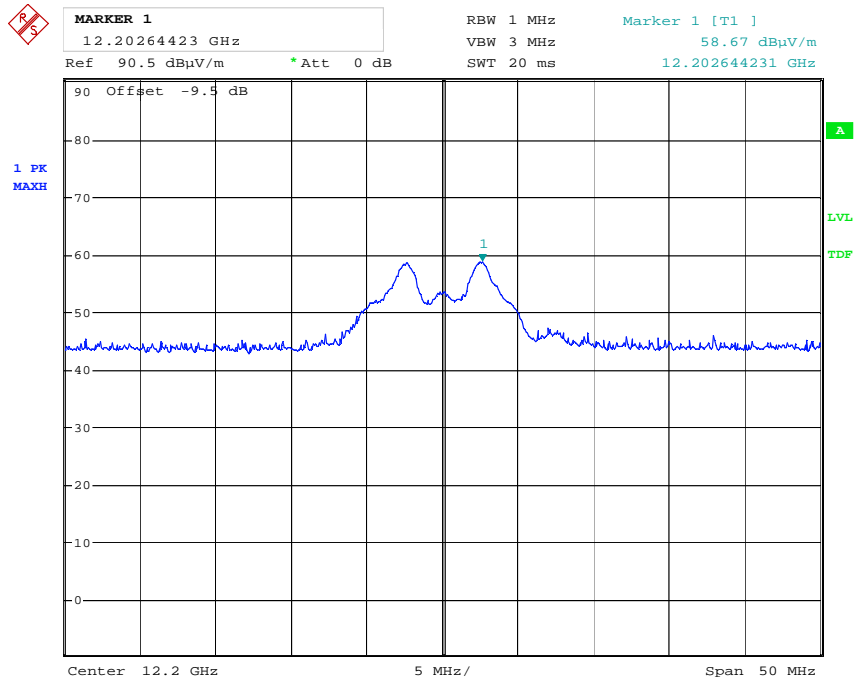
Date: 9.DEC.2010 10:11:54

Ch18 – 5th Harmonic – VBW 1MHz



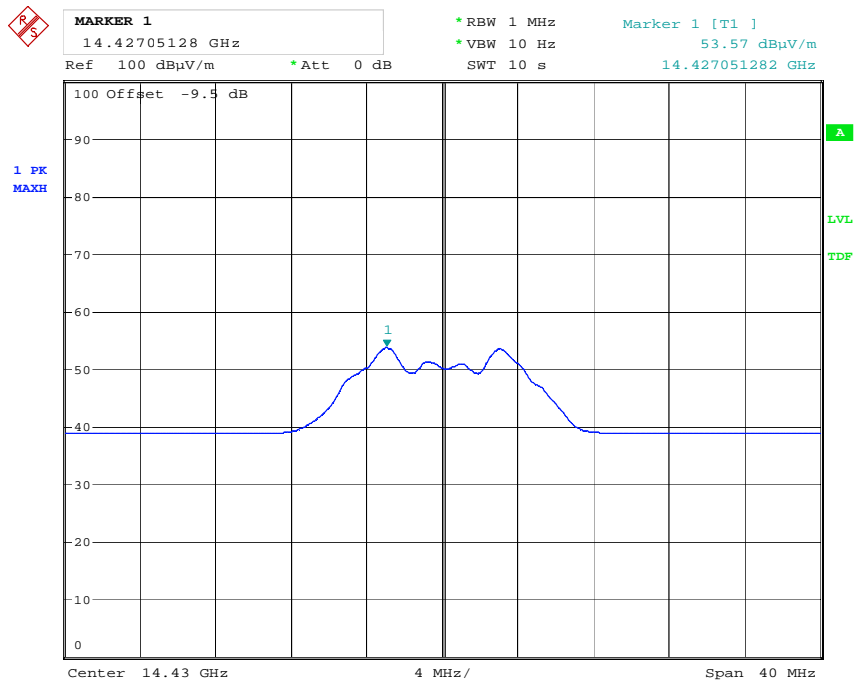
Date: 3.JAN.2011 12:36:45

Ch18 – 5th Harmonic – VBW 10Hz



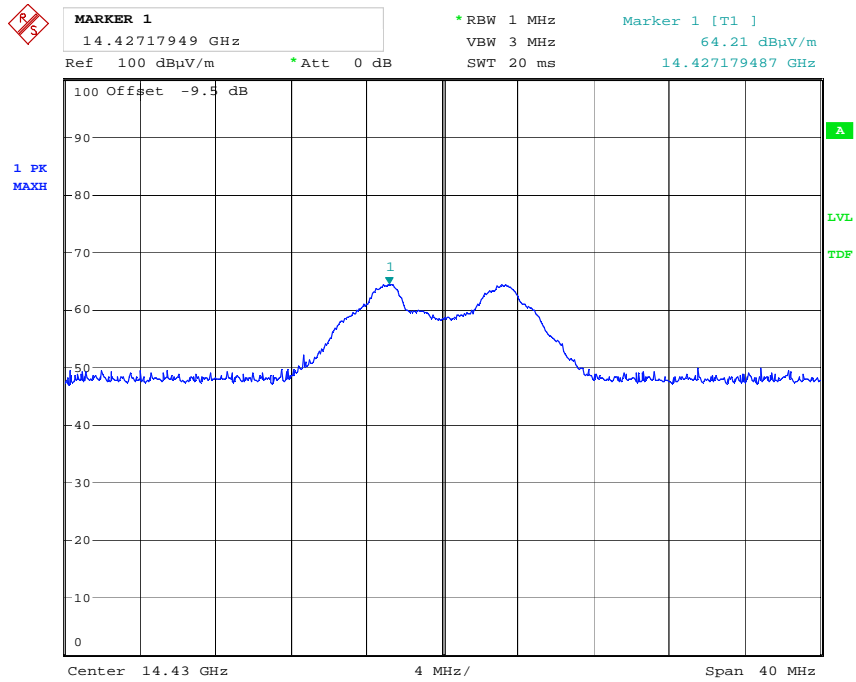
Date: 3.JAN.2011 12:35:41

Ch18 – 5th Harmonic – VBW 1MHz



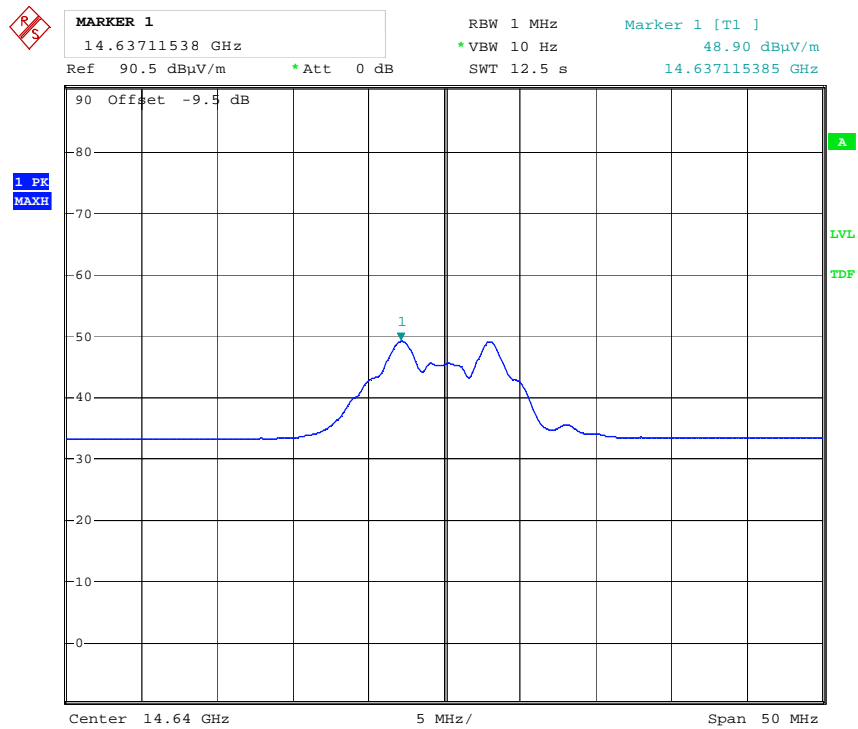
Date: 9.DEC.2010 10:10:25

Ch11 – 6th Harmonic – VBW 10Hz



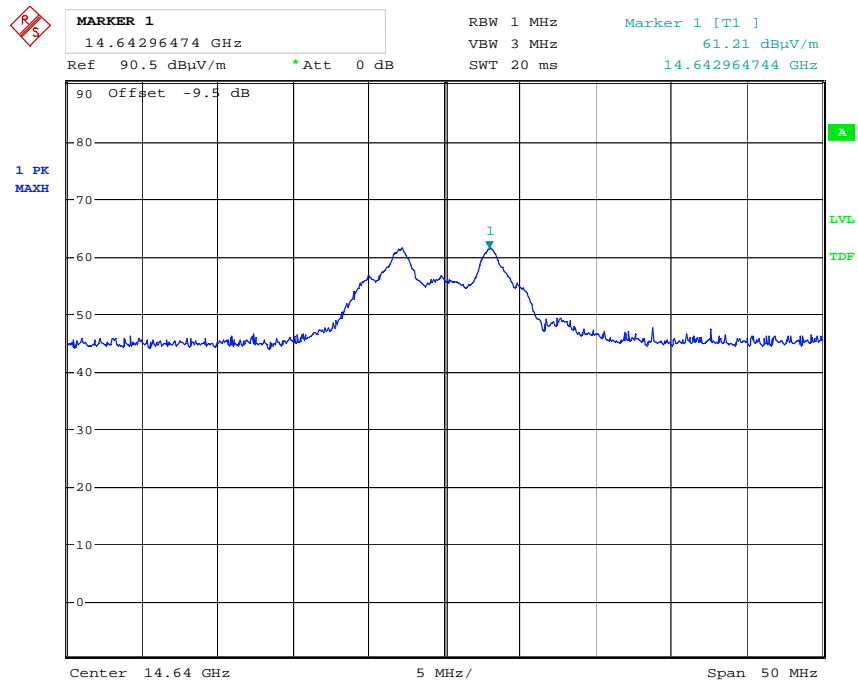
Date: 9.DEC.2010 10:09:42

Ch11 – 6th Harmonic – VBW 1MHz



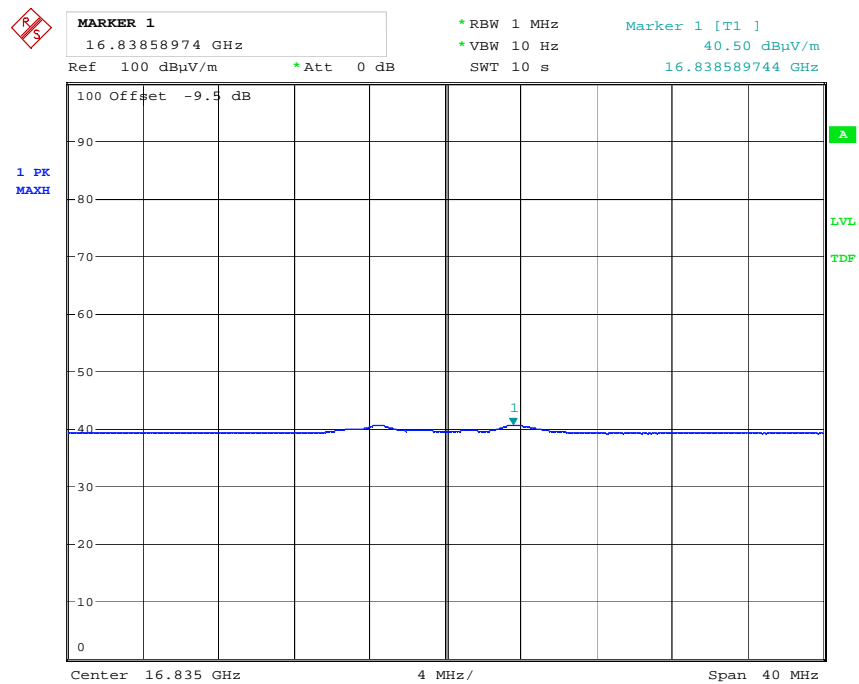
Date: 3.JAN.2011 12:38:46

Ch18 – 6th Harmonic – VBW 10Hz



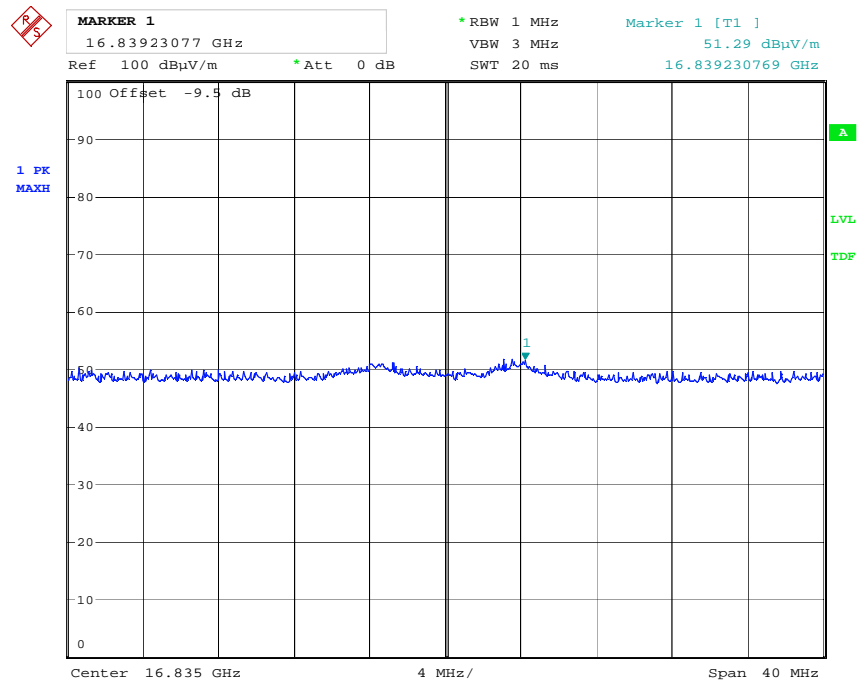
Date: 3.JAN.2011 12:40:30

Ch18 – 6th Harmonic – VBW 1MHz



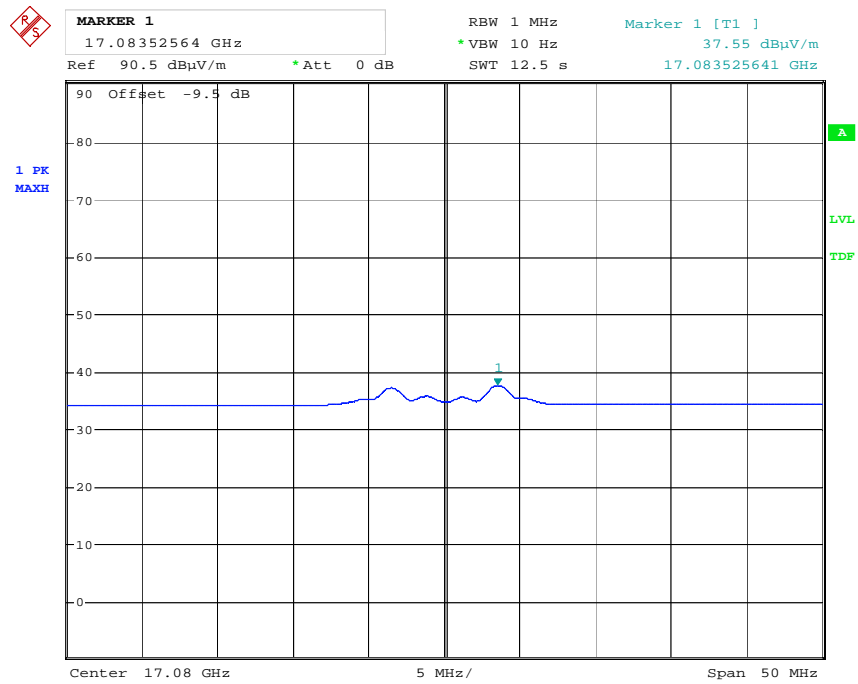
Date: 9.DEC.2010 10:07:48

Ch11 – 7th Harmonic – VBW 10Hz



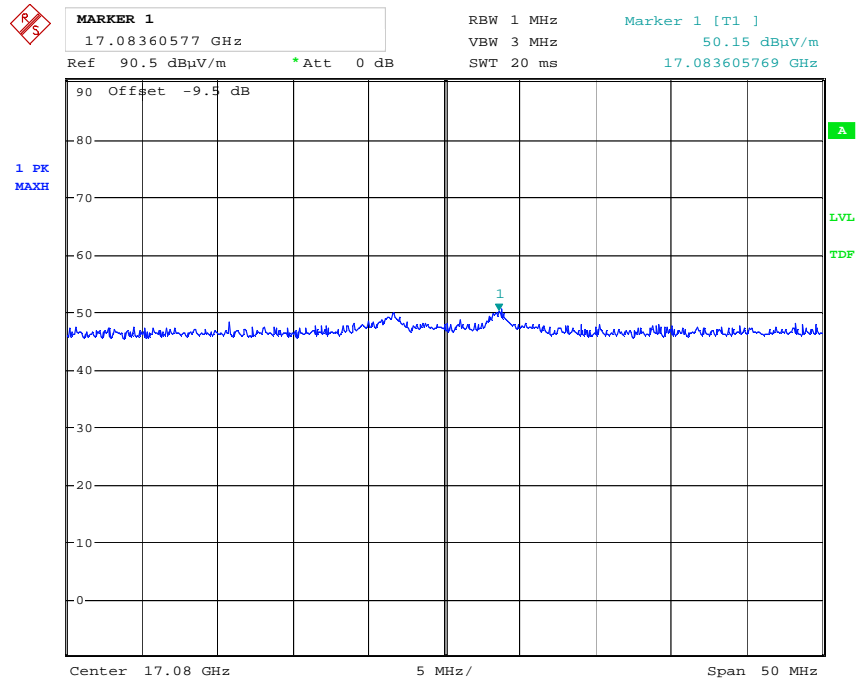
Date: 9.DEC.2010 10:06:54

Ch11 – 7th Harmonic – VBW 1MHz



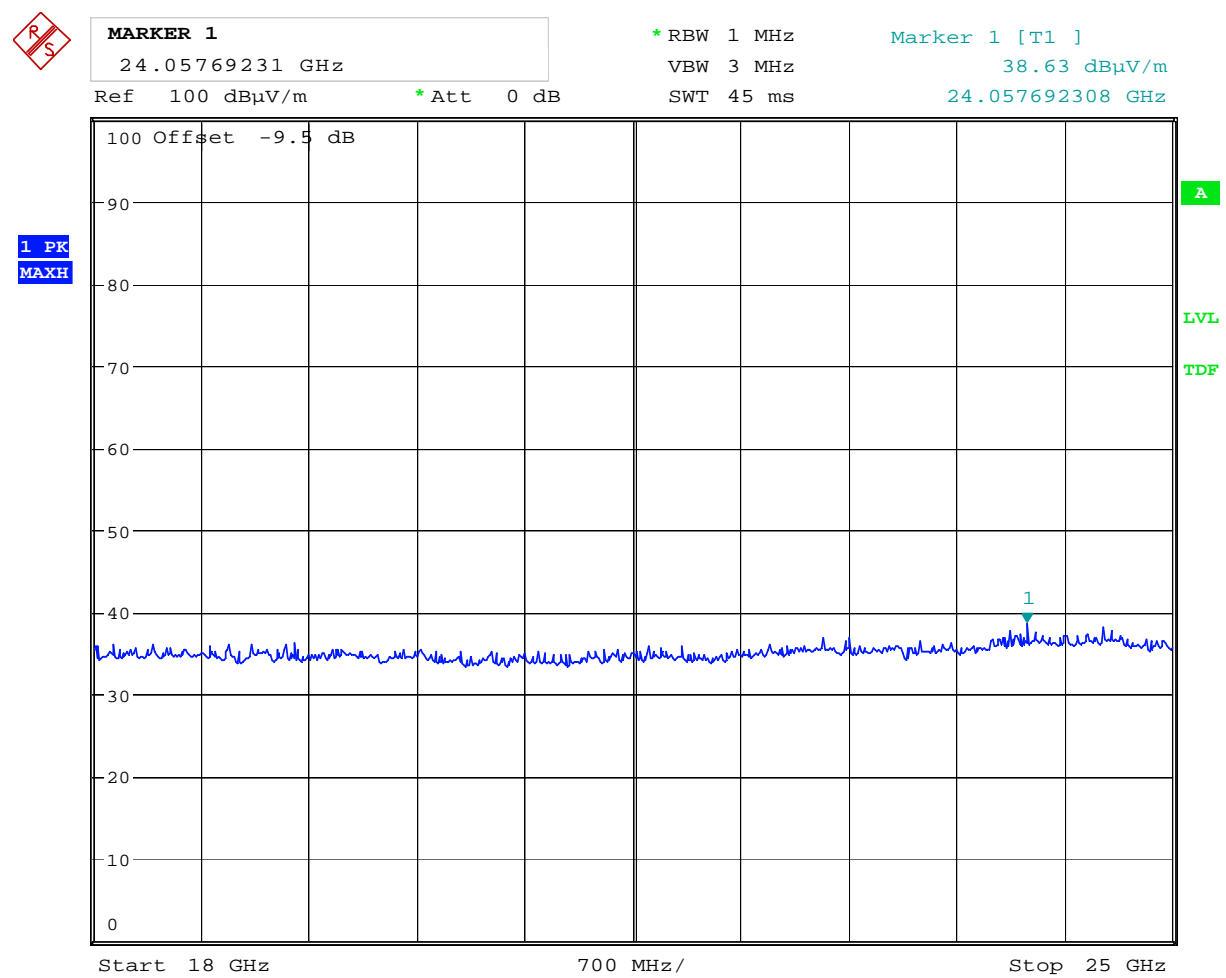
Date: 3.JAN.2011 12:42:21

Ch18 – 7th Harmonic – VBW 10Hz



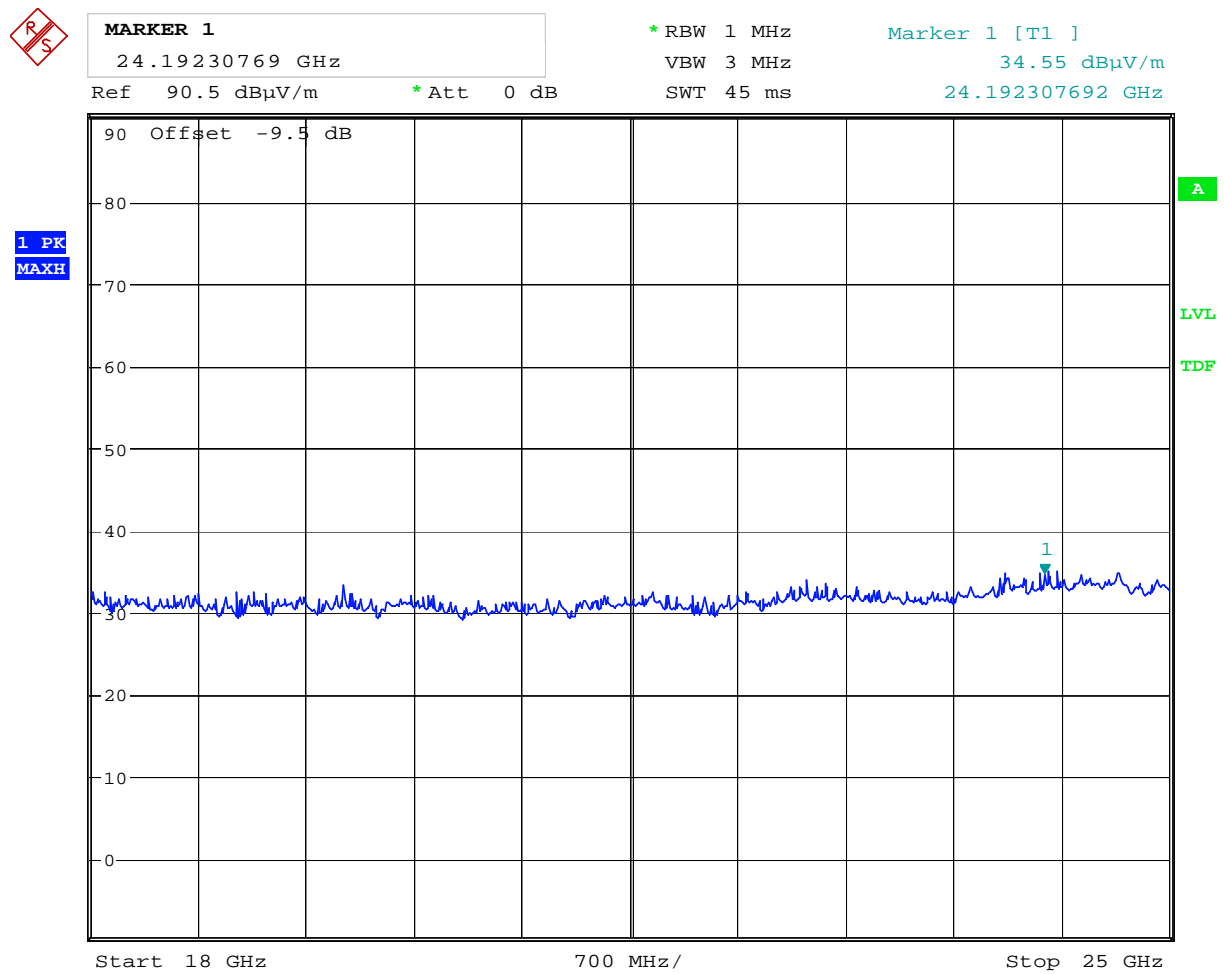
Date: 3.JAN.2011 12:41:32

Ch18 – 7th Harmonic – VBW 1MHz



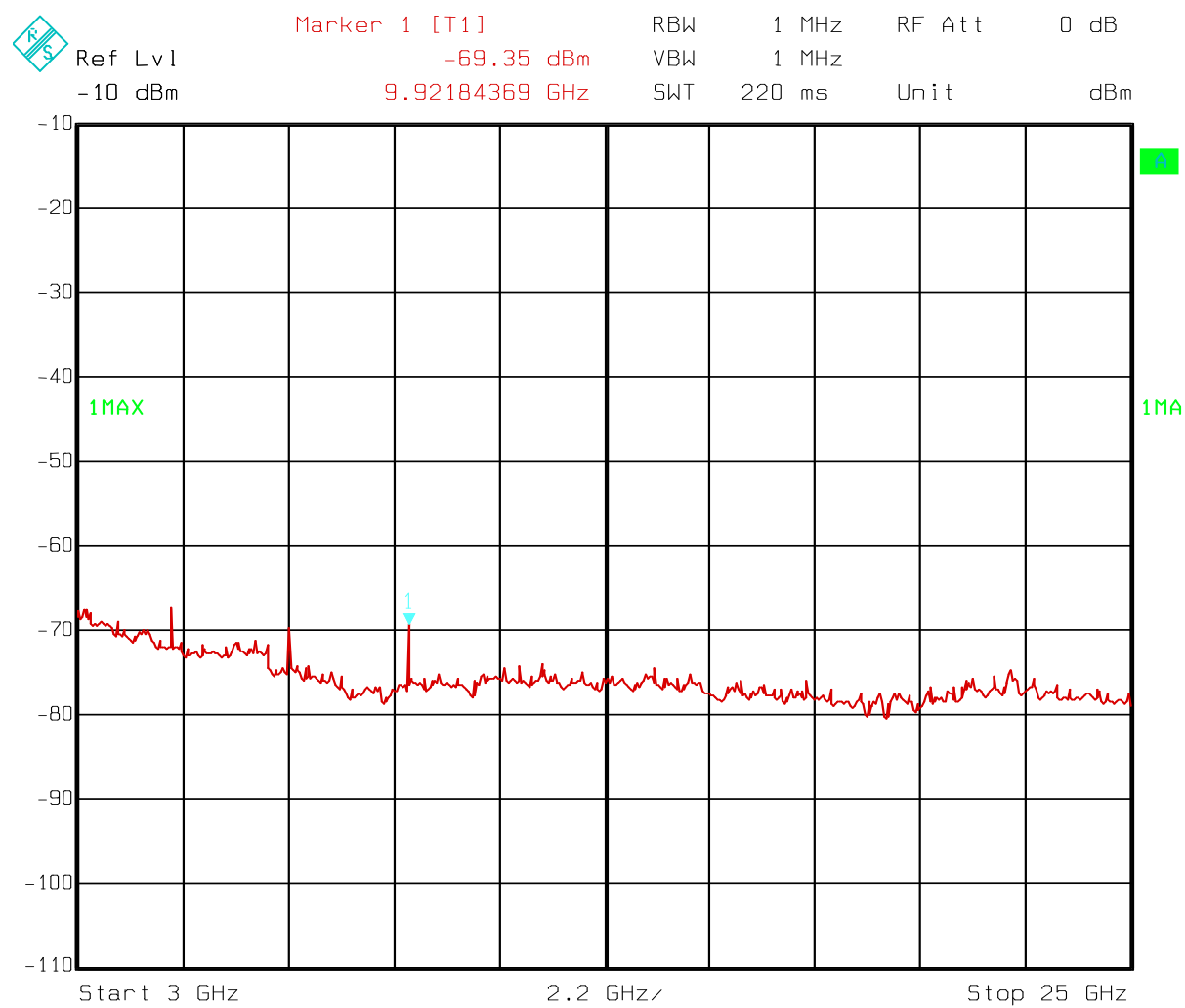
Date: 9.DEC.2010 09:59:30

CH 11 pre-view scan 18 - 25GHz



Date: 3.JAN.2011 12:50:16

Ch18 pre-view scan 18 - 25GHz



Date: 27.JAN.2011 11:58:10

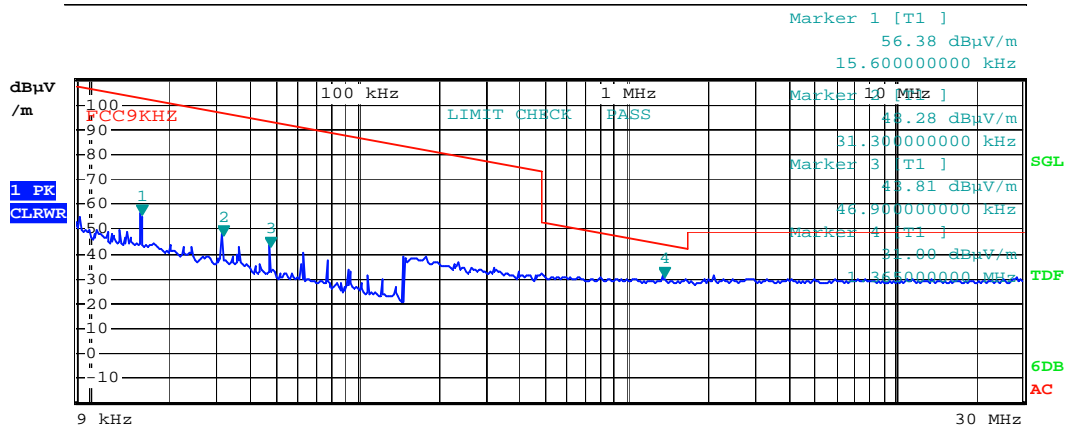
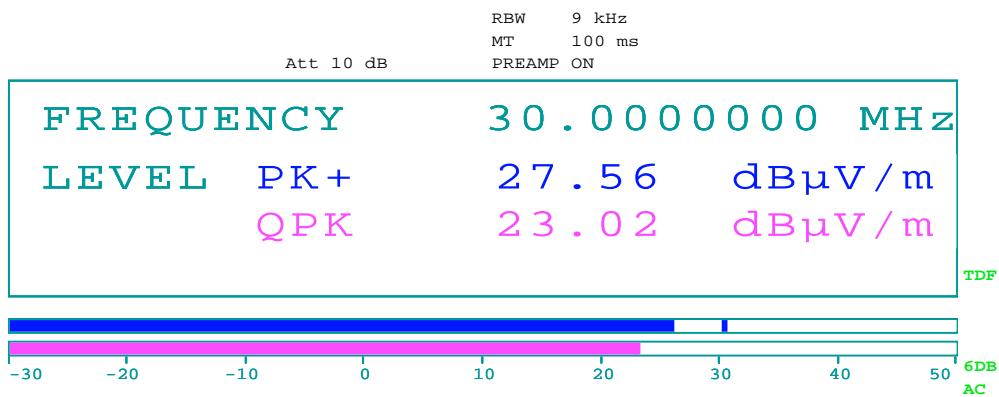
Ch26 Pre-view scan 3 – 25GHz

Radiated emissions 9kHz - 30 MHz.

Detector: Quasi-Peak

Measuring distance 10 m.

Frequency	Operational condition	Field strength	Measuring distance	Limit FCC15.209	Margin
MHz		dBµV/m	m	dBµV/m	dB
30	TX on	23.02	10	48.6	25.58



Date: 10.DEC.2010 08:46:42

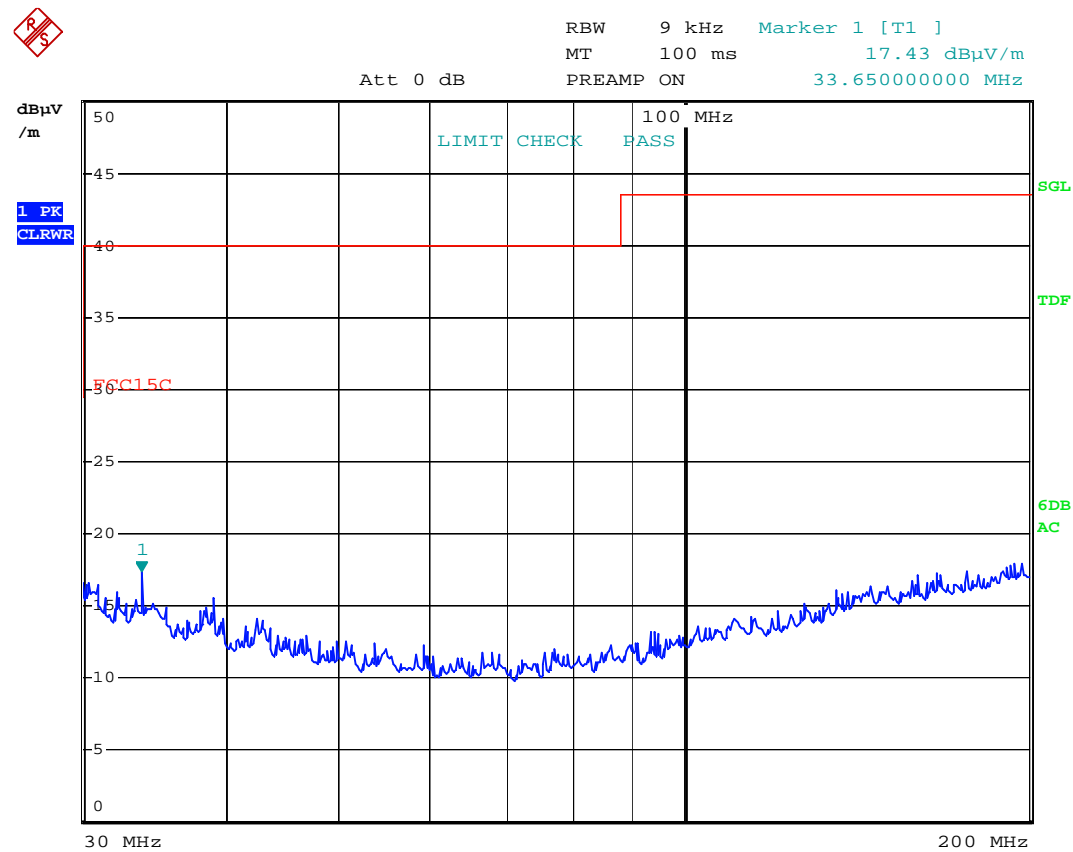
9kHz - 30MHz

Radiated emissions 30 – 1000 MHz.

Detector: Quasi-Peak

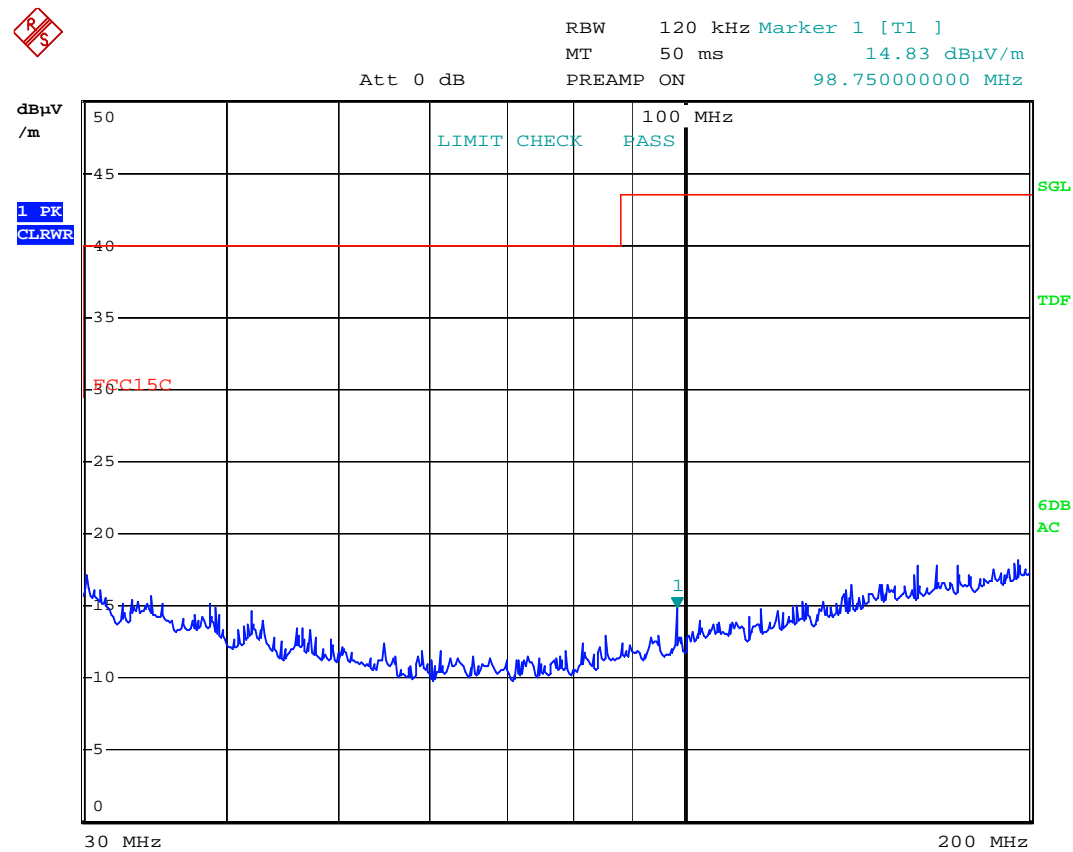
Measuring distance 3 m.

Frequency	Operational condition	Field strength	Measuring distance	Polarization	Limit FCC15.209	Margin
MHz		dB μ V/m	m	-	dB μ V/m	dB
33.65	TX ON	17.43	3	VP	40	22.57
98.75	TX ON	14.83	3	HP	43.5	28.67
500	TX ON	13.65	3	VP	46	32.35
980	TX on	20.30	3	HP	54	33.7



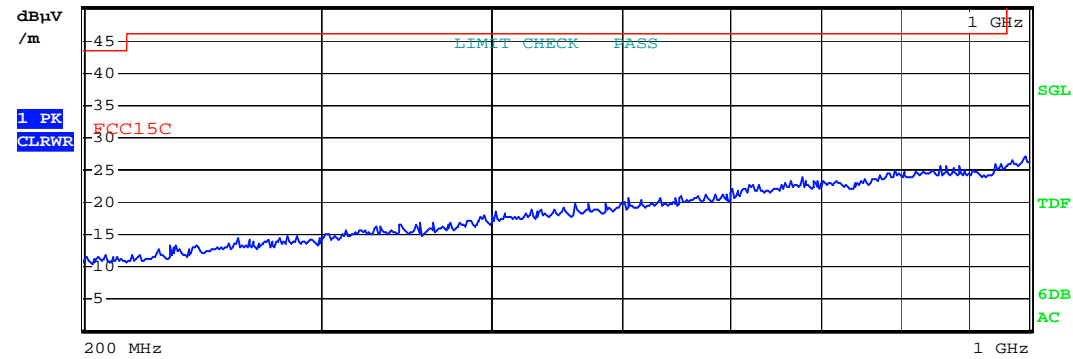
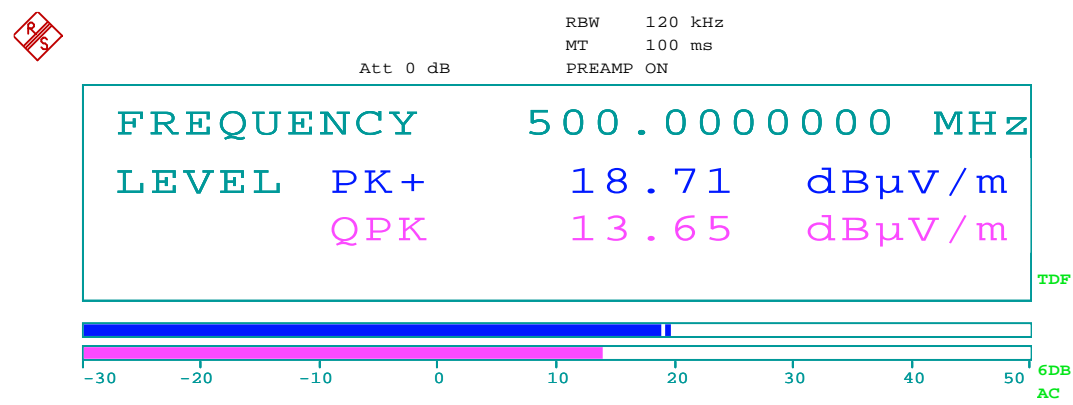
Date: 8.DEC.2010 13:33:15

VP – 30 – 200 MHz



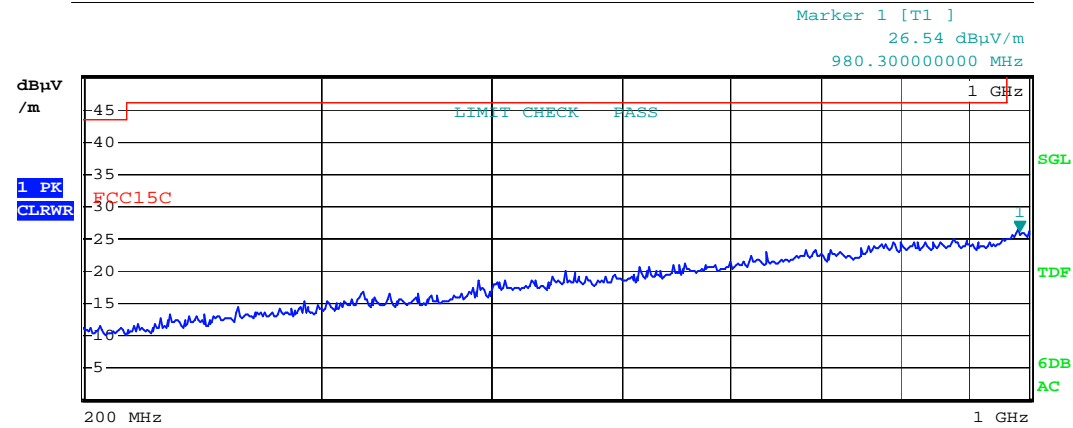
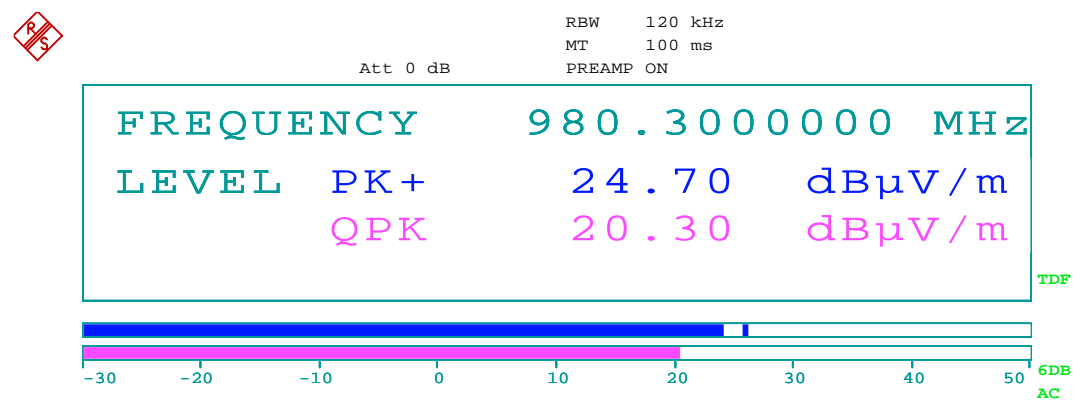
Date: 8.DEC.2010 13:39:49

HP – 30 – 200MHz



Date: 8.DEC.2010 14:01:39

VP – 200 – 1000GHz



Date: 8.DEC.2010 14:09:48

HP 200 – 1000MHz

4.6 Receiver Spurious Emissions (Radiated)

Para. No.: RSS-Gen (6)

Test Performed By: G.Suwanthakumar

Date of Test: 16.03.2011

Test Results: Complies

Measurement Data:

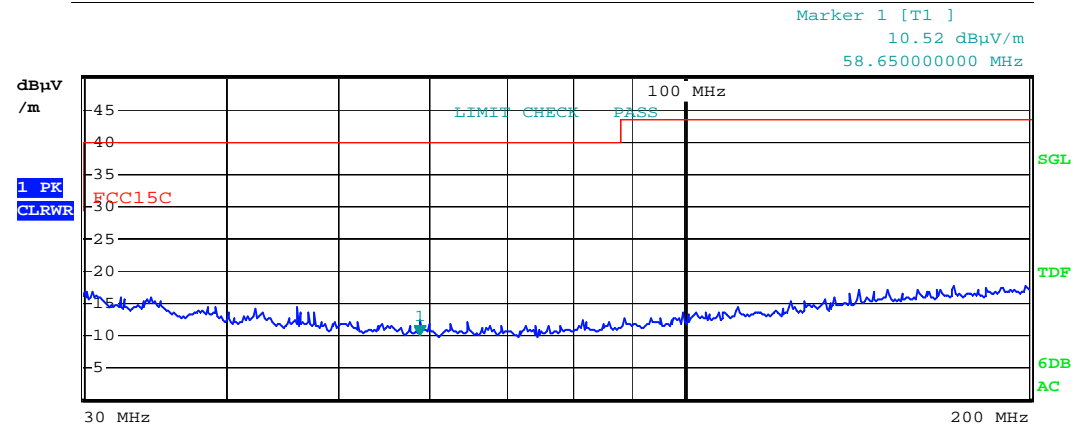
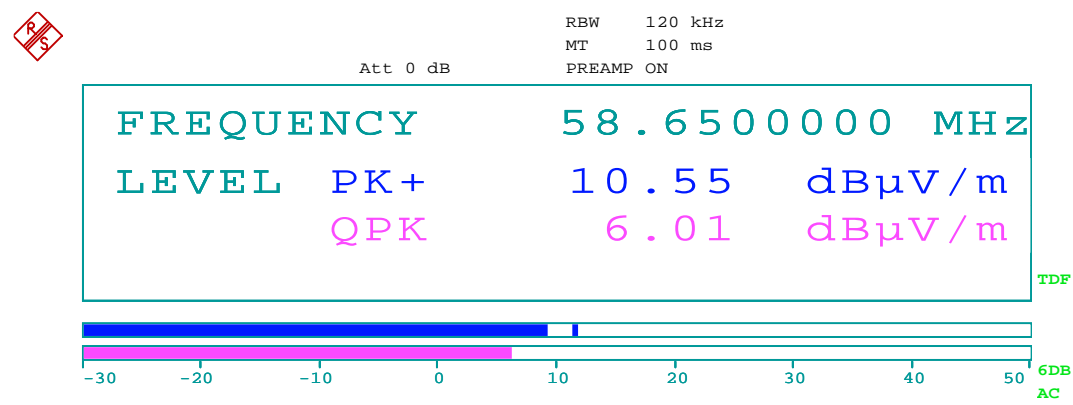
Radiated Emissions with antenna, 30MHz - 25 GHz, peak

30 - 1000MHz measured at 10m, 1-25 GHz measured at 1m (only pre-view).

Measured with Peak Detector

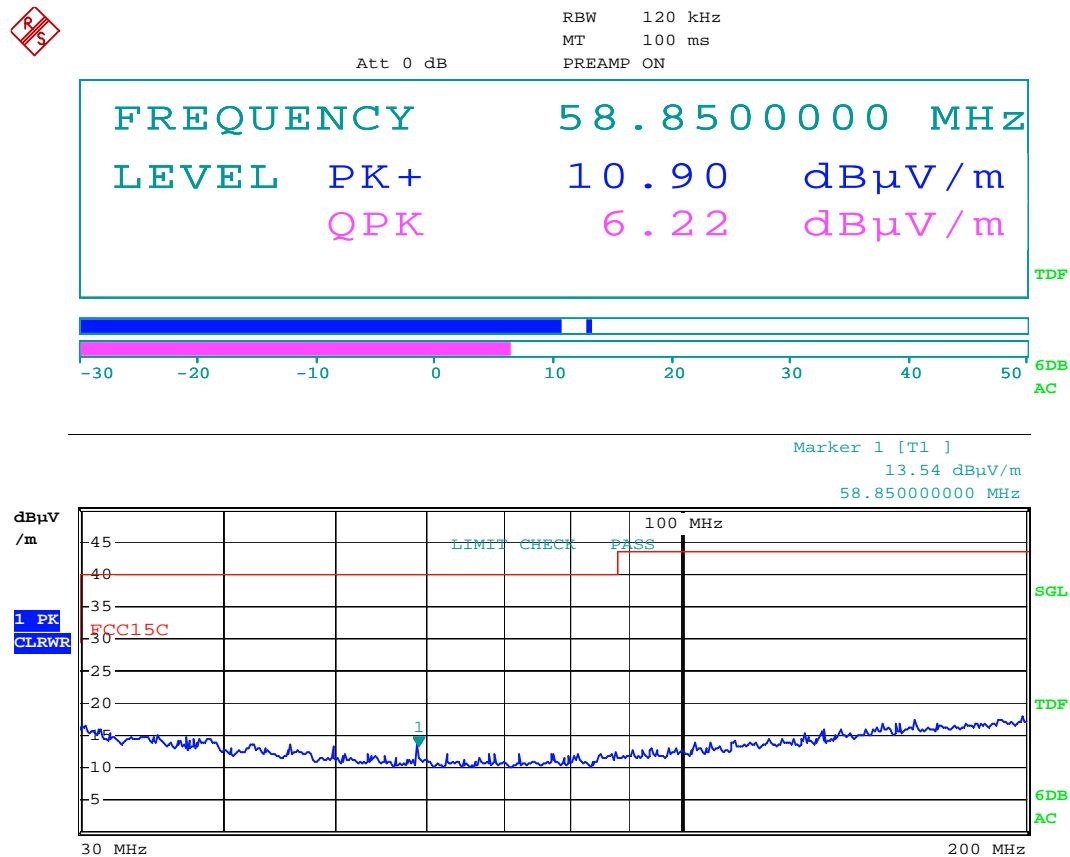
Frequency	RF channel	Dist. corr. factor	Field strength, Peak, 3m	Duty cycle corr. factor	Limit	Margin
GHz	11-26	dB	dB μ V/m	dB	dB μ V/m	dB
0.030 – 0.088	7	0	< 10	-	40	> 30
0.088 – 0.216	7	0	< 10	-	43	> 30
0.216 – 0.960	7	0	< 25	-	46	> 20
1 – 25	7	0	None detected	-	54	-

No VCO leakage detected from the receiver.



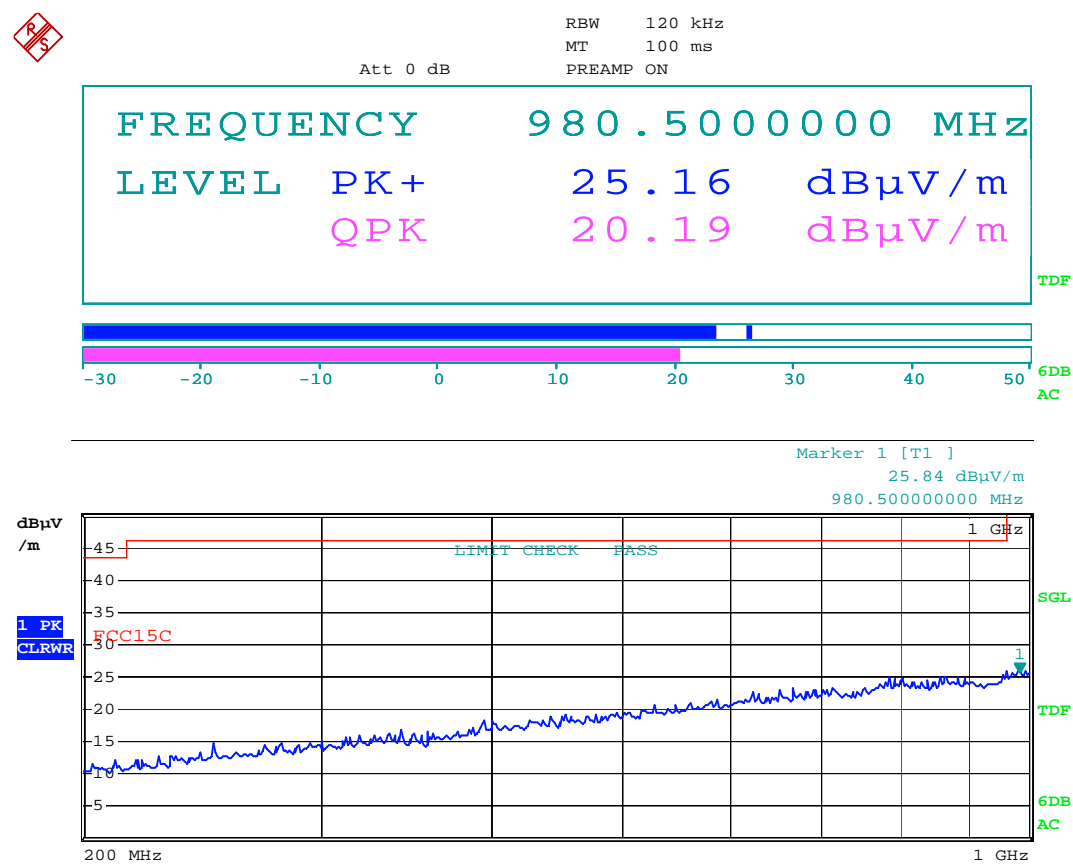
Date: 8.DEC.2010 14:42:38

RX: HP, 30 - 200MHz



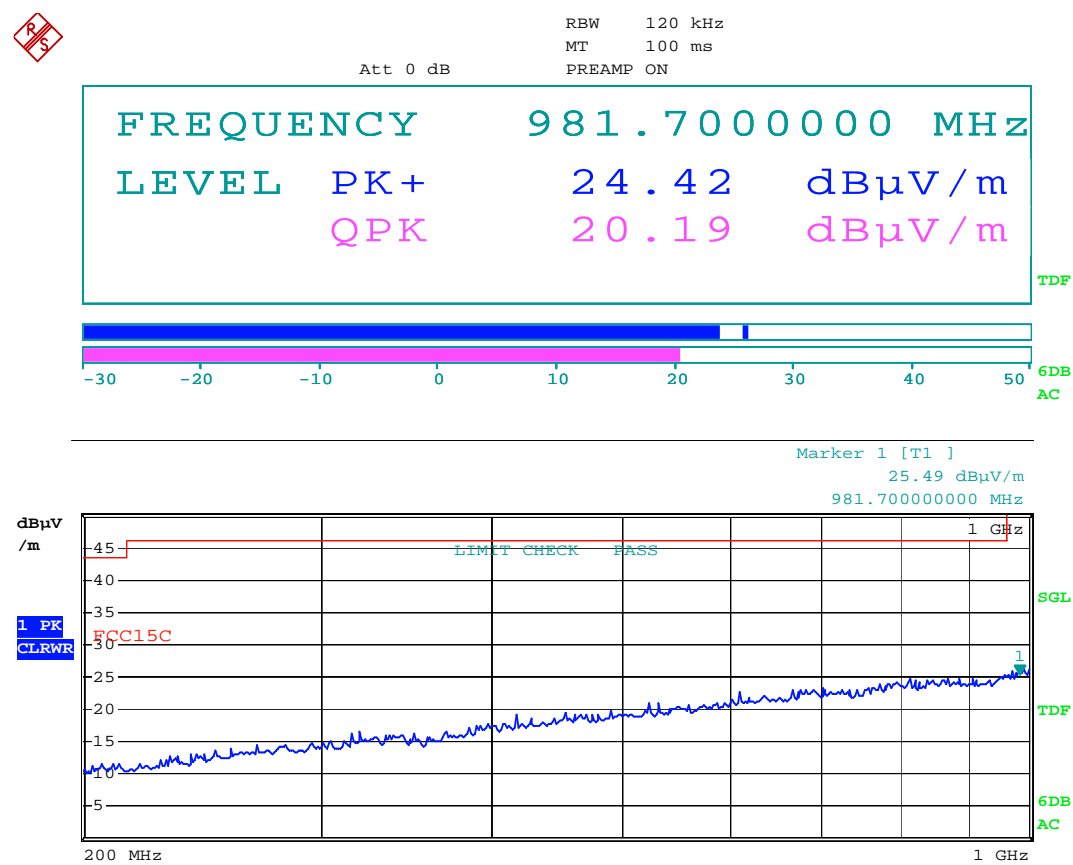
Date: 8.DEC.2010 14:34:44

RX: VP, 30 - 200MHz



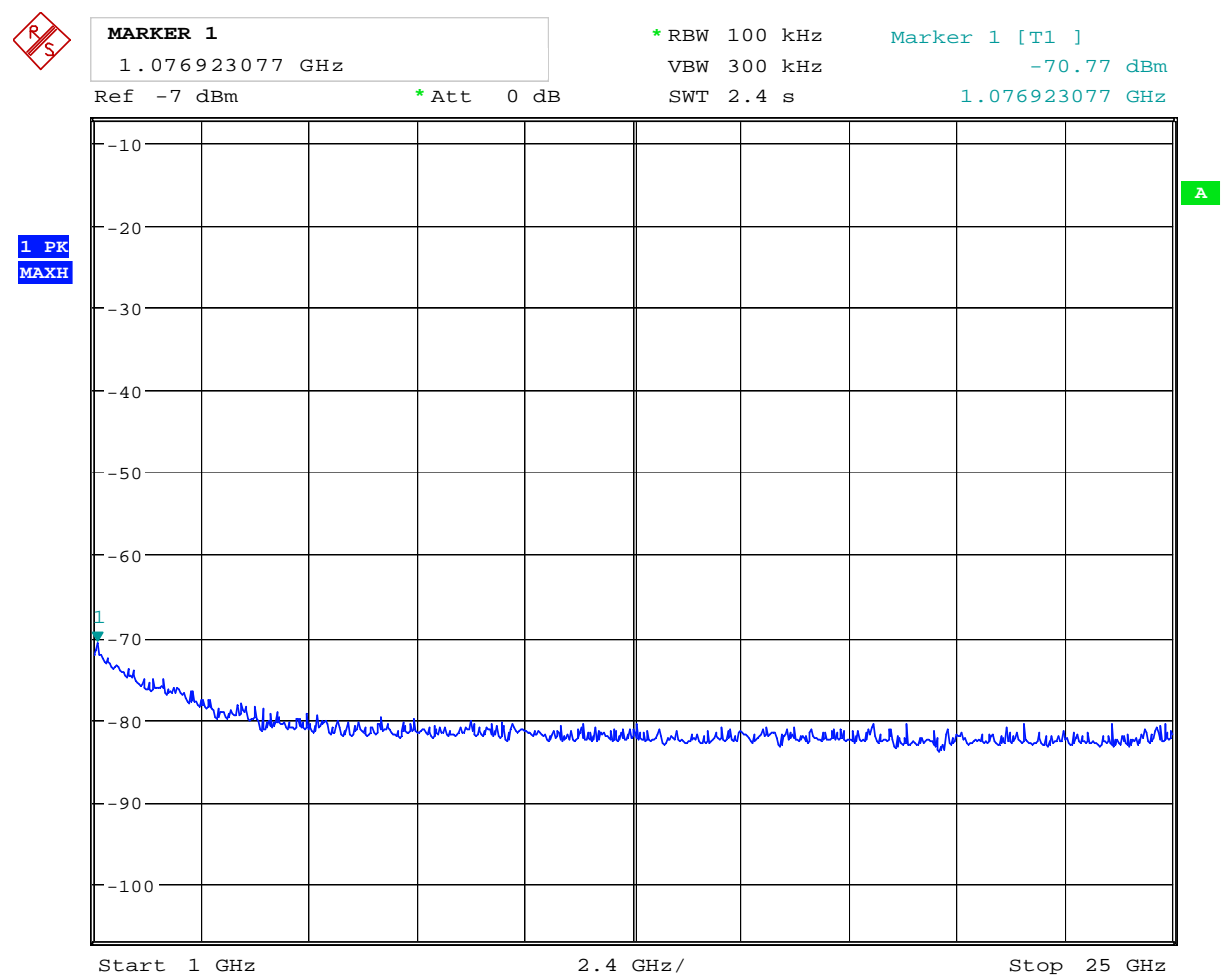
Date: 8.DEC.2010 14:18:03

RX: HP, 200 - 1000MHz



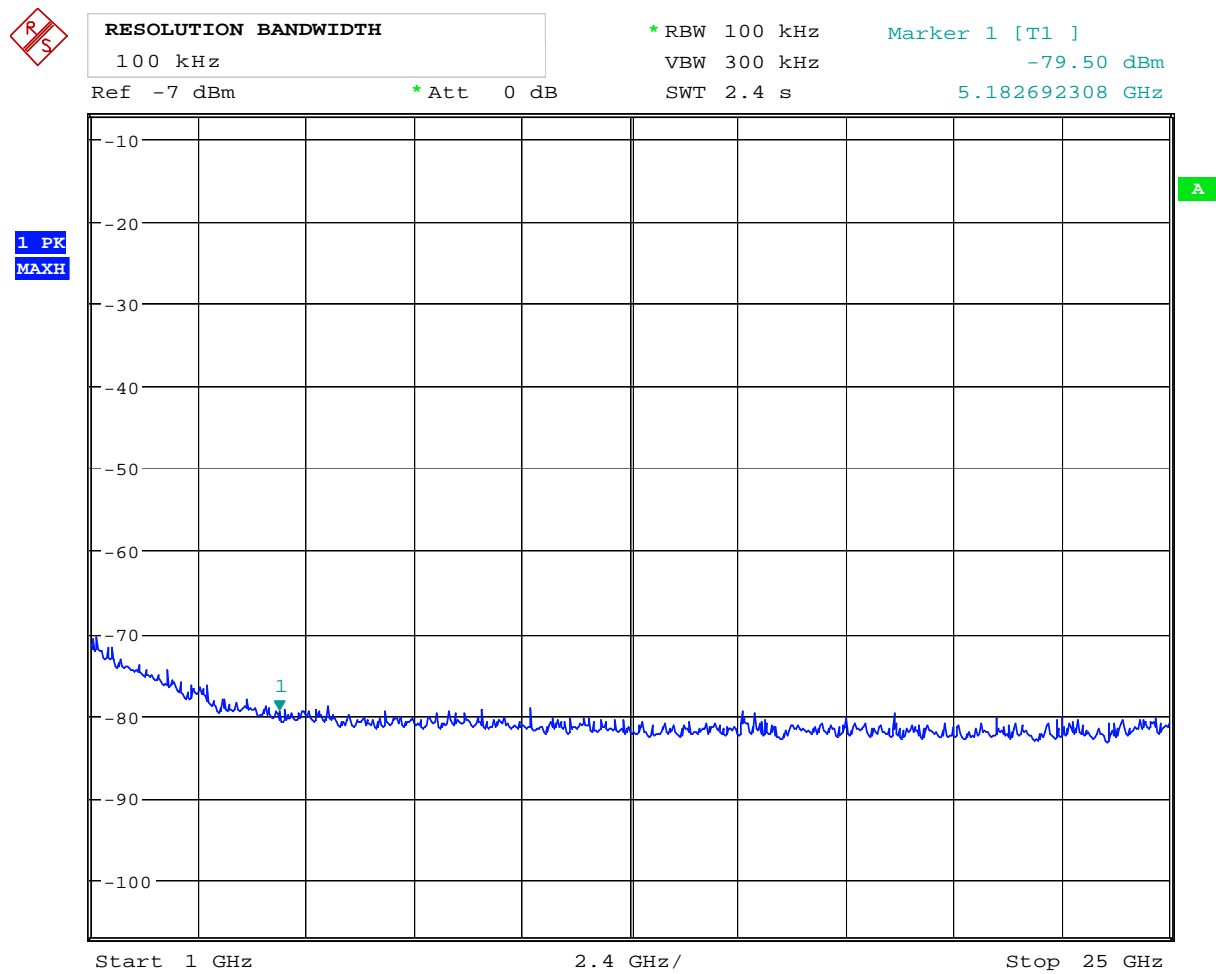
Date: 8.DEC.2010 14:25:28

RX: VP, 200 - 1000MHz



Date: 8.DEC.2010 15:38:35

RX: HP , 1 – 25GHz (Pre-view scan only)



Date: 8.DEC.2010 15:38:00

RX: VP , 1 – 25GHz (Pre-view scan only)

4.7 Power Spectral Density (PSD)

Para. No.: 15.247 (d)

Test Performed By: G.Suwanthakumar

Date of Test: 10-Dec-2010

Test Results: Passed

Measured and Calculated Data:

Measured Conducted Values:

Ch11 - Lower Channel:

$$\text{PSD} = 35 - 38.38 \text{ dBm/Hz} = -3.38 \text{ dBm}$$

Ch18 - Middle Channel:

$$\text{PSD} = 35 - 38.63 \text{ dBm/Hz} = -3.63 \text{ dBm}$$

Ch 26 - Upper Channel:

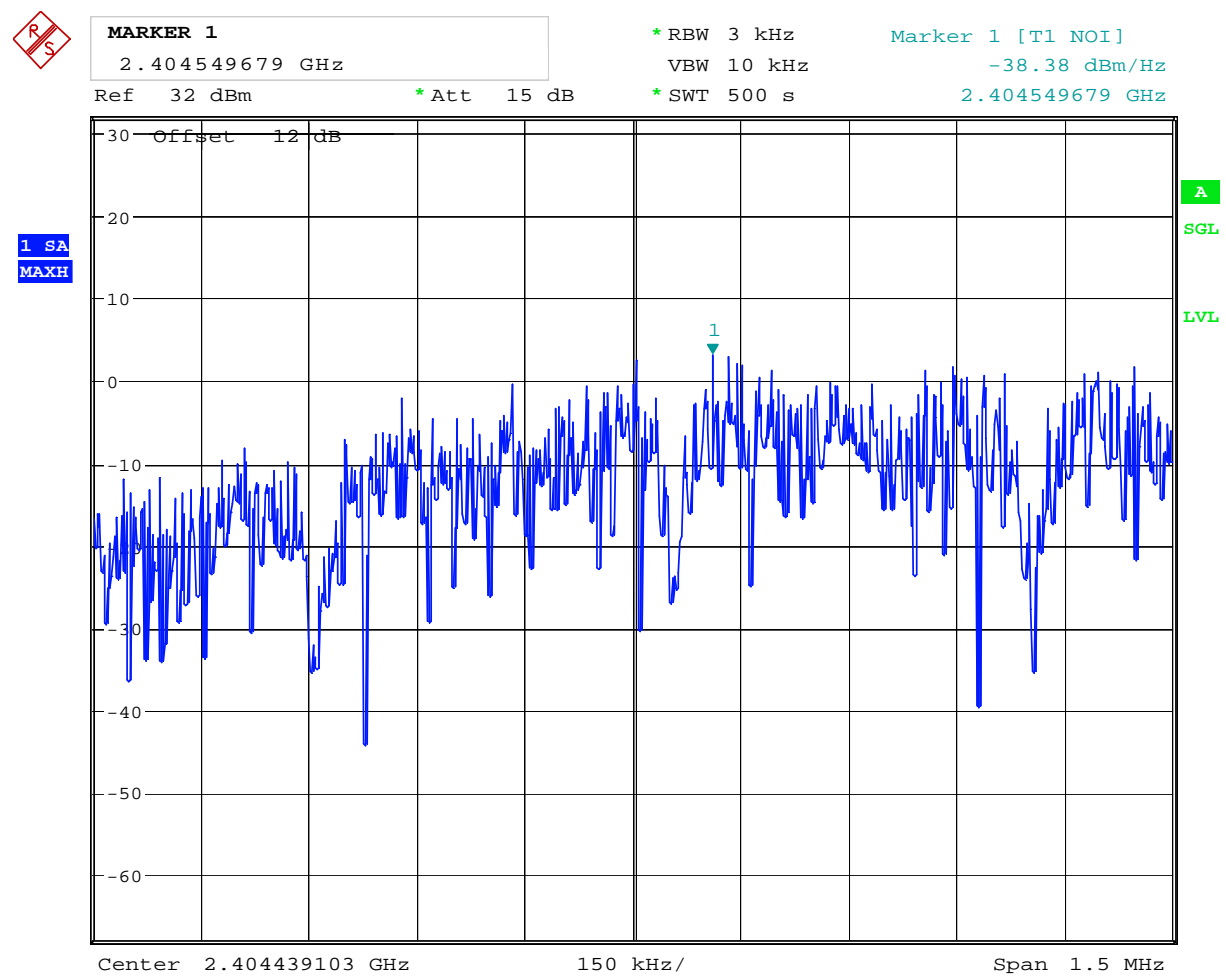
$$\text{PSD} = 35 - 51.10 \text{ dBm/Hz} = -16.1 \text{ dBm}$$

The spectrum line spacing is less than 3kHz, therefore used noise power density and corrected with 35 dB for 3kHz

Requirements:

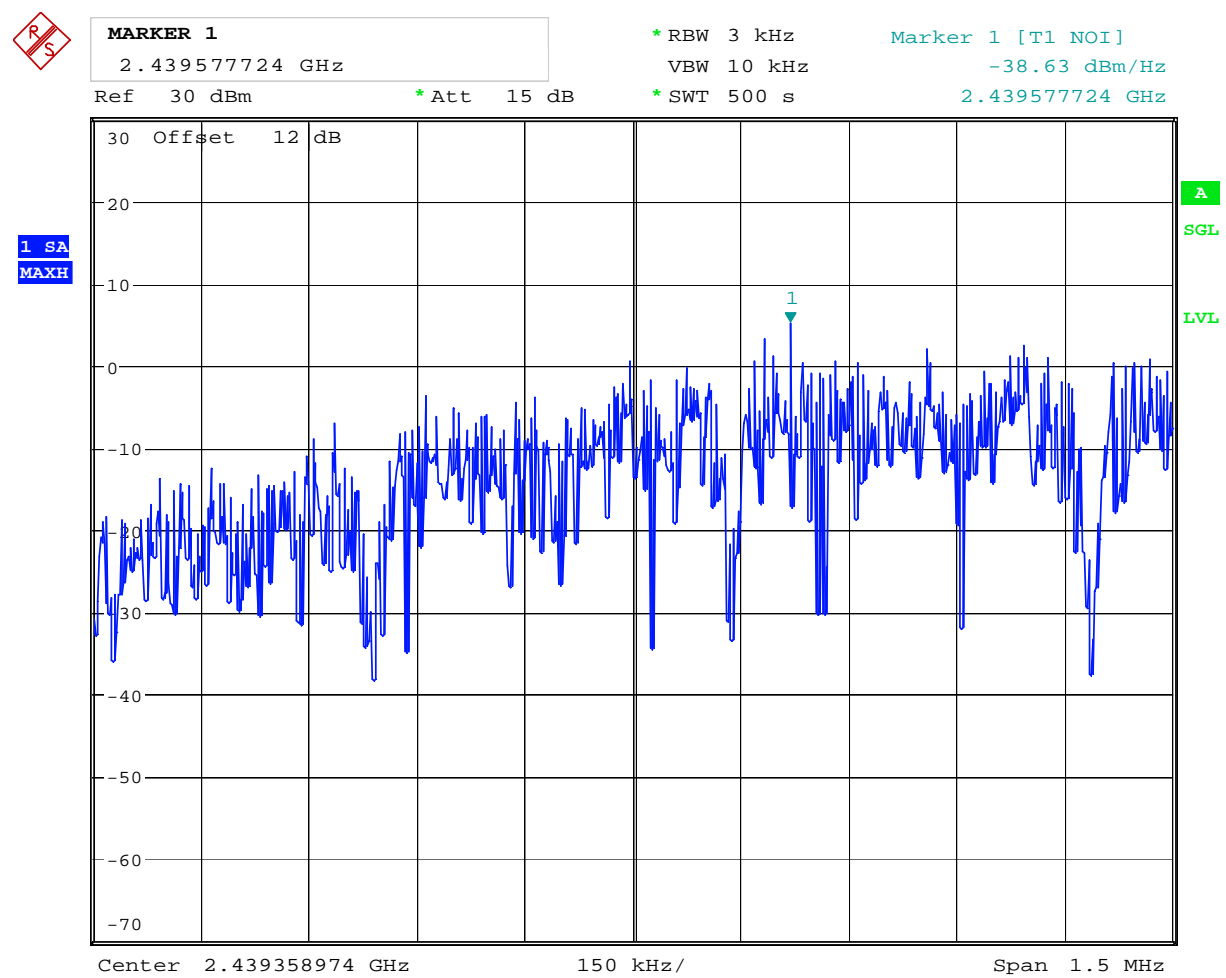
The Power Spectral Density of a Digital Transmission System shall be no greater than +8 dBm in any 3 kHz band

No requirements for Frequency Hopping Systems.



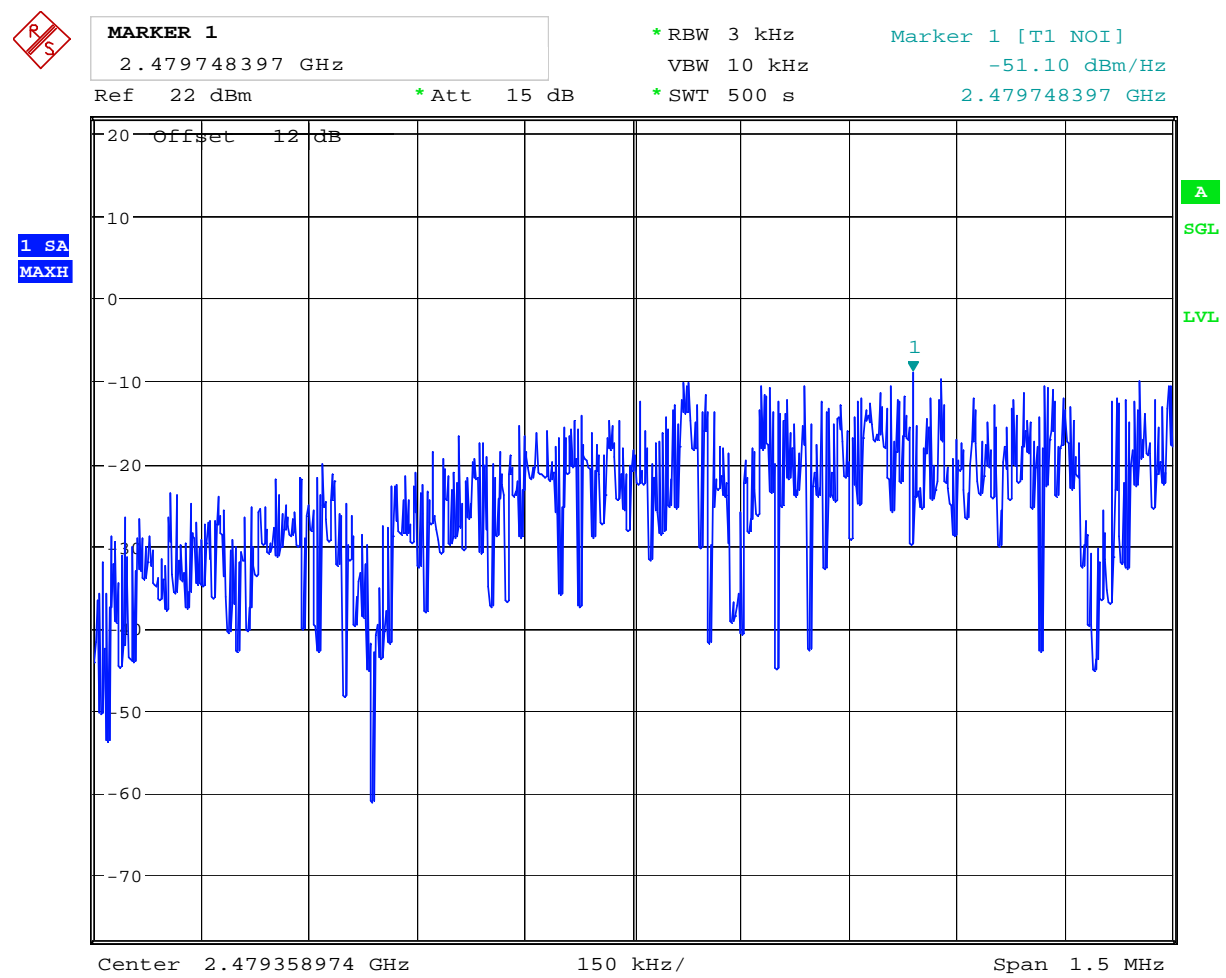
Date: 10.DEC.2010 10:57:45

Ch11 – Power Density – Conducted measurement



Date: 10.DEC.2010 11:19:50

Ch18 – Power Density – Conducted measurement



Date: 10.DEC.2010 11:38:08

Ch26 – Power Density – Conducted measurement

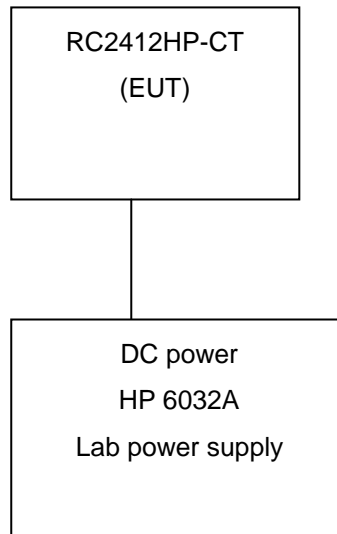
5 LIST OF TEST EQUIPMENT

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.	FSU26	Spectrum Analyzer	Rohde & Schwarz	LR 1504	28.09.2010	28.09.2011
2.	ESCI	EMI Receiver	Rohde & Schwarz	N 4259	09.09.2010	09.09.2011
3.	FSEK 1088,3494,30	Spectrum Analyzer	R&S	1337	15.12.2010	15.12.2011
4.	U2000A	USB power meter	Agilent Technology	LR 1523	15.01.2010	15.01.2011
5.	3115	Antenna horn	EMCO	LR 1330	05.08.2010	05.08.2013
6.	643	Antenna horn	Narda	LR 093	26.01.2009	26.01.2012
7.	642	Antenna horn	Narda	LR 220	26.01.2009	26.01.2012
8.	PM7320X	Antenna horn	Sivers lab	LR 103	26.01.2009	26.01.2012
9.	DBF-520-20	Antenna horn	Systron Donner	LR 101	26.01.2009	26.01.2012
10.	638	Antenna horn	Narda	LR 098	26.01.2009	26.01.2012
11.	Sucoflex 102E	Cable microwave	Suhner	LR 1370	-	-
12.	6032A	Power supply	HP	LR 1062	-	-
13.	77	Multimeter, Digital	Fluke	LR155	03.11.2010	03.11.2011
14.	8449B	Amplifier	Hewlett Packard	LR 1322	04.08.2009	04.08.2011
15.	HFH2-Z2	Antenna loop	Rohde and Schwarz	LR 285	08.10.2010	08.10.2013
16.	10855A	Amplifier	Hewlett Packard	LR 1445	04.08.2010	04.08.2011
17.	HL223	Antenna log.per	Rohde & Schwarz	LR 1261	19.05.2010	09.05.2013
18.	HK116	Antenna biconic	Rohde & Schwarz	LR 1260	19.05.2010	09.05.2013
19.	ESN	Test Receiver	Rohde & Schwarz	LR 1237	16.09.2010	06.09.2011
20.	ESH3-Z3	LISN	Rohde & Schwarz	LR 1076	22.10.2009	22.10.2011
21.	B32-10R	Power supply	Oltronix	LR 126	-	-
22.	ESAI	EMI Receiver	Rohde & Schwarz	LR 1090/1089	04.03.2010	04.03.2011
23.	ESH3-Z2	Pulse Limiter	Rohde & Schwarz	LR 1074	03.03.2010	03.03.2012

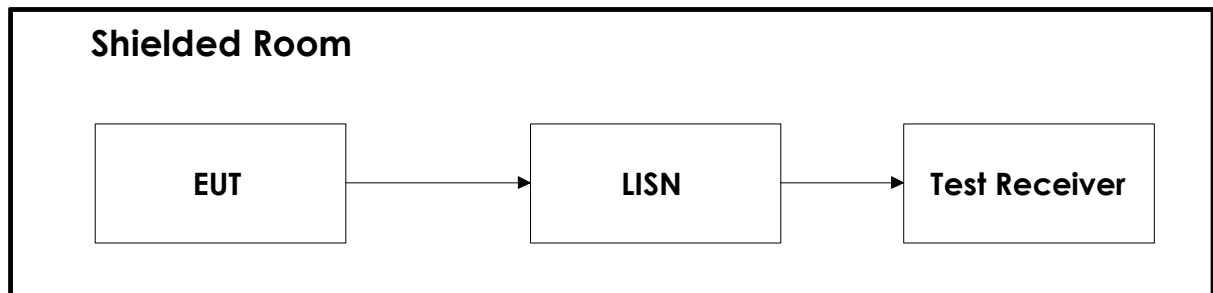
6 BLOCK DIAGRAM

6.1 System set up for radiated measurements



Test equipment: 1, 2, 3, 6, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18

6.2 Powerline Conducted Emission



Test equipment: 20,21,22,23

6.3 Test Site Radiated Emission

