



Test report no. : 161417-6

Item tested : KX-TG7641

**Type of equipment : UPCS Base Station
with Bluetooth Transceiver**

FCC ID : ACJ96NKX-TG7641

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

8 December 2010

Authorized by :

G. Suhantakumar
Technical Verificator

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1 GENERAL INFORMATION

1.1 Testhouse Info

Name : Nemko AS
Address : Nemko Kjeller
Instituttveien 6, Box 96
NO-2007 Kjeller, NORWAY
Telephone : +47 64 84 57 00
Fax : +47 64 84 57 05
E-mail: comlab@nemko.com
FCC test firm registration # : 994405
IC OATS registration # : 2040D-1
Total Number of Pages: 31

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
Fax : +81-92-477-1487

Contact:

Name : Mr. Junji Sumi
Telephone : +81 92 477 1405
E-mail : sumi.junji@jp.panasonic.com

1.3 Responsible Manufacturer (if other than client)

Name : /
Address : /

2 Test Information

2.1 Tested Item

Name :	Panasonic
FCC ID :	ACJ96NKX-TG7641
Model/version :	KX-TG7641
Serial number :	/
Hardware identity and/or version:	/
Software identity and/or version :	/
Frequency Range :	2402 – 2480 MHz
Number of Channels :	From 79 to 20 (adaptive)
Operating Modes :	Frequency Hopping Spread Spectrum
Type of Modulation :	Digital (GFSK)
Rated Output Power :	1 mW Peak
Type of Power Supply :	Power Adaptors: PNLV226(FW) and PNLV226(UC)
Antenna Connector :	No (Integral antennas)
Number of Antennas :	1
Antenna Diversity Supported :	No
Desktop Charger :	None

2.2 Description of Tested Device(s)

The tested equipment is a Bluetooth Transceiver that is integrated into a DECT base station.

The BT module in the KX-TG7641 is identical to the BT part in the KX-TG6581 (previously certified under FCC ID: ACJ96NKX-TG6581).

This test report covers only the Radiated part of the Bluetooth Transceiver, the UPCS part is covered by Nemko test report no. 161417-4. The conducted tests are covered by Nemko Test report no. 141532-2.

The tested equipment has integral antennas only.

2.3 Theory of Operation

The tested EUT is a Frequency Hopping Transmitter that uses the Bluetooth protocols.

This version of Bluetooth normally uses all 79 BT channels, but will exclude channels or shift to 20 channels if interference is detected. When 20 channels are used they can be either in the lower, middle or upper part of the 2.4 GHz frequency band, depending on the interference.

2.4 Exposure Evaluation

The EUT is designed to be fixed to a wall etc. 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 mobile or fixed device. MPE Calculation at 20cm satisfying FCC requirements is submitted as a separate document.

The EUT is exempted from RF Exposure Evaluation to Industry Canada SAR requirements since the output power is below the limit in RSS-102 Issue 4, clause 2.5.2 for General Public Use.

2.5 Test Environment

2.5.1 Normal test condition

Temperature:	20 - 24 °C
Relative humidity:	20 - 50 %
Normal test voltage:	120 V AC

The values are the limit registered during the test period.

2.6 Test Period

Item received date:	2010-11-04
Test period :	from 2010-11-18 to 2010-12-07

3 TEST REPORT SUMMARY

3.1 General

Manufacturer: Panasonic
Model No.: KX-TG7641
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.

All 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 3m and 1m.

☒ 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 #: 161417-6

TESTED BY: Frode Sveinsen
Frode Sveinsen, Test engineer

DATE: 8 December 2010

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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 ¹
Antenna Requirement	15.203	7.1.4 (RSS-GEN)	Complies
Power Line Conducted Emission	15.107(a) 15.207(a)	7.2.2 (RSS-GEN)	Complies
Channel Separation	15.247(a)(1)	A8.1	Complies ¹
Pseudorandom Hopping Algorithm	15.247(a)(1)	A8.1	Complies ¹
Time of Occupancy	15.247(a)(1)(iii)	A8.1	Complies ¹
Occupied Bandwidth	15.247(a)(1)	A8.1	Complies ¹
Minimum 20 dB Bandwidth	15.247(a)(2)	A8.2	Complies ¹
Peak Power Output	15.247(b)	A8.4	Complies
Power Spectral Density	15.247(d)	A8.2	N/A ³
Spurious Emissions (Antenna Conducted)	15.247(c)	A8.5	Complies ¹
Spurious Emissions (Radiated)	15.247(c) 15.109(a) 15.209(a)	A8.5	Complies

¹ Covered by Nemko test report no. 141532-2

³ Not applicable for Frequency Hopping devices

3.3 Description of modification for Modification Filing

Not applicable.

3.4 Comments

This test covered only radiated tests since the BT module is identical to the previously certified BT module in Panasonic model KX-TG6581. All conducted tests are covered by Nemko test report no. 141532-2.

This test report covers only the Bluetooth module of the tested device. The DECT part is covered by Nemko test report no. 161417-4.

The measurements were done with the EUT powered by 120 V AC. It was checked that power variations between 85% and 115% did not have any influence on the measurements.

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: 18 Nov 2010

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

Test Results: Complies

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

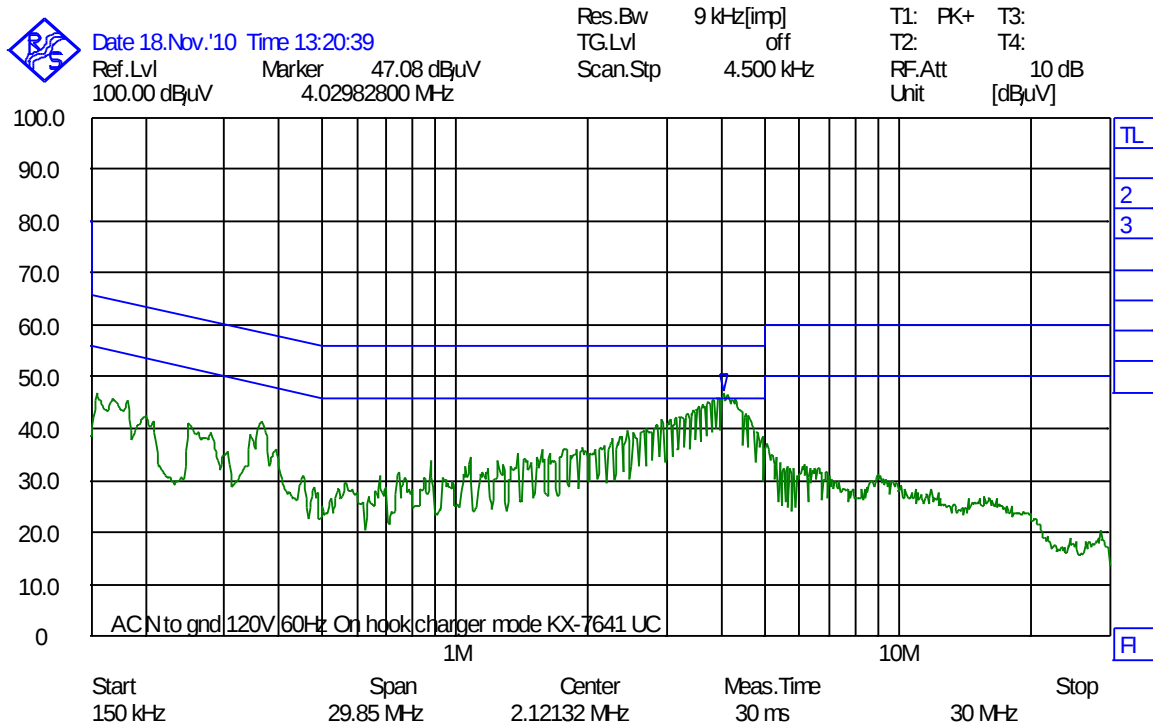
Highest measured value (L1 and N):

AC Adaptor PNLV226(UC):

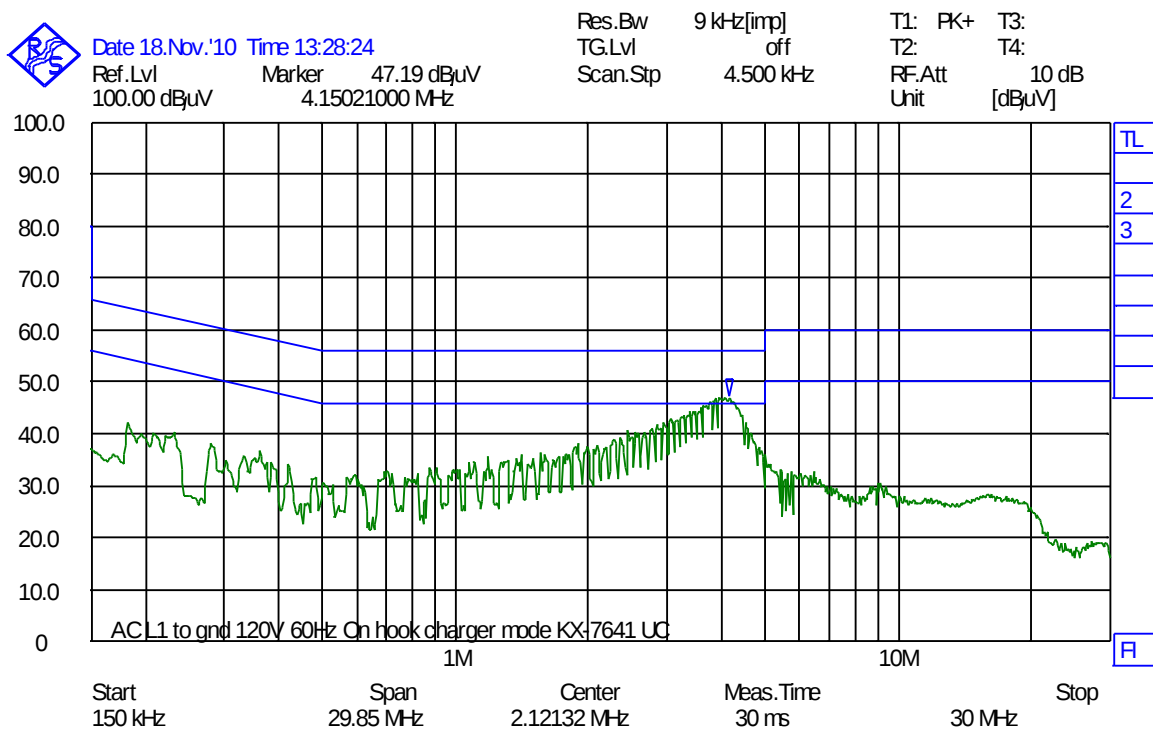
Frequency	Detector	Measured value	Limit	Margin
KHz	Peak/QP/AV	dB μ V	dB μ V	dB
4150	QP	42.5	56	13.5
	AV	29.0	46	17.0
4029.8	QP	40.5	56	15.5
	AV	27.9	46	18.1

AC Adaptor PNLV226(FW):

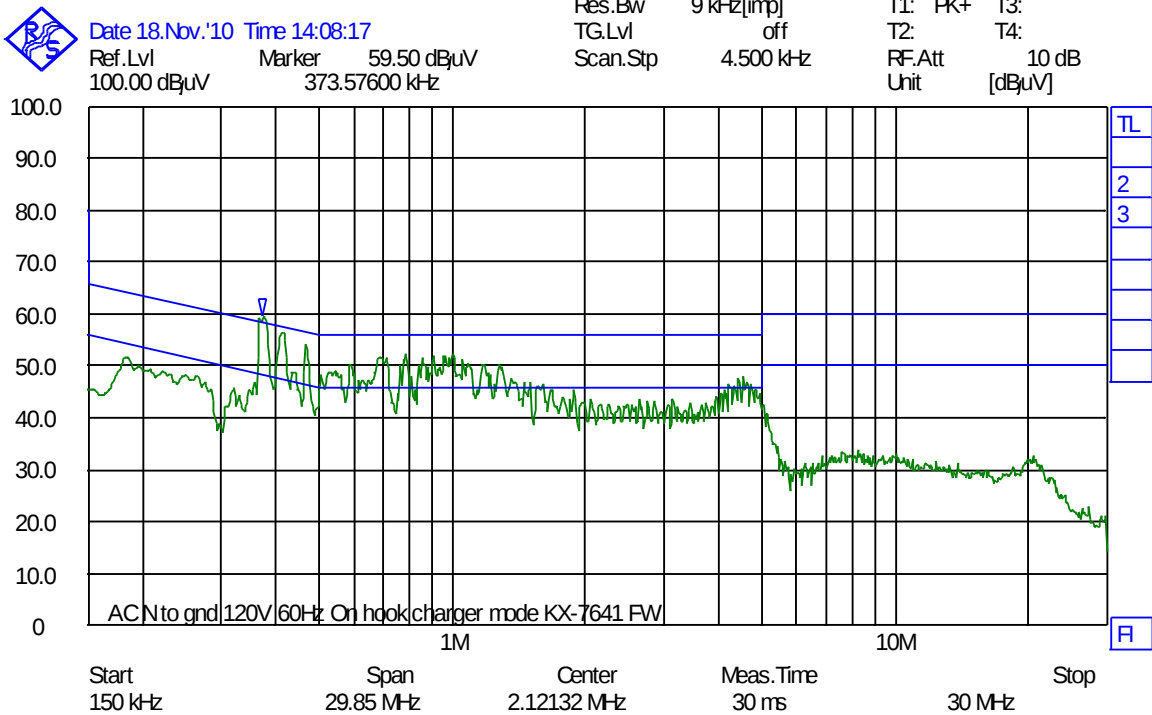
Frequency	Detector	Measured value	Limit	Margin
KHz	Peak/QP/AV	dBμV	dBμV	dB
373.576	QP	56.1	58.4	2.3
	AV	39.0	48.4	9.4
410.475	QP	54.4	57.6	3.2
	AV	44.0	47.6	3.6
464.491	QP	51.6	56.6	5.0
	AV	36.0	46.6	10.6
998.501	QP	48.9	56	7.1
	AV	36.0	46	10.0
364.882	QP	54.7	58.6	3.9
	AV	41.3	48.6	7.3
391.591	QP	47.5	58.0	10.5
	AV	31.5	48.0	16.5
400.922	QP	51.4	57.8	6.4
	AV	34.9	47.8	13.0
775.194	QP	44.5	56	11.5
	AV	31.3	46	14.7
396.229	QP	53.9	57.9	4.0
	AV	37.4	47.9	10.5
789.006	QP	43.5	56	12.5
	AV	28.8	46	17.2
822.2	QP	45.0	56	11.0
	AV	31.0	46	15.0
554.215	QP	45.9	56	10.1
	AV	34.0	46	12.0
958.19	QP	46.2	56	9.8
	AV	34.4	46	11.6



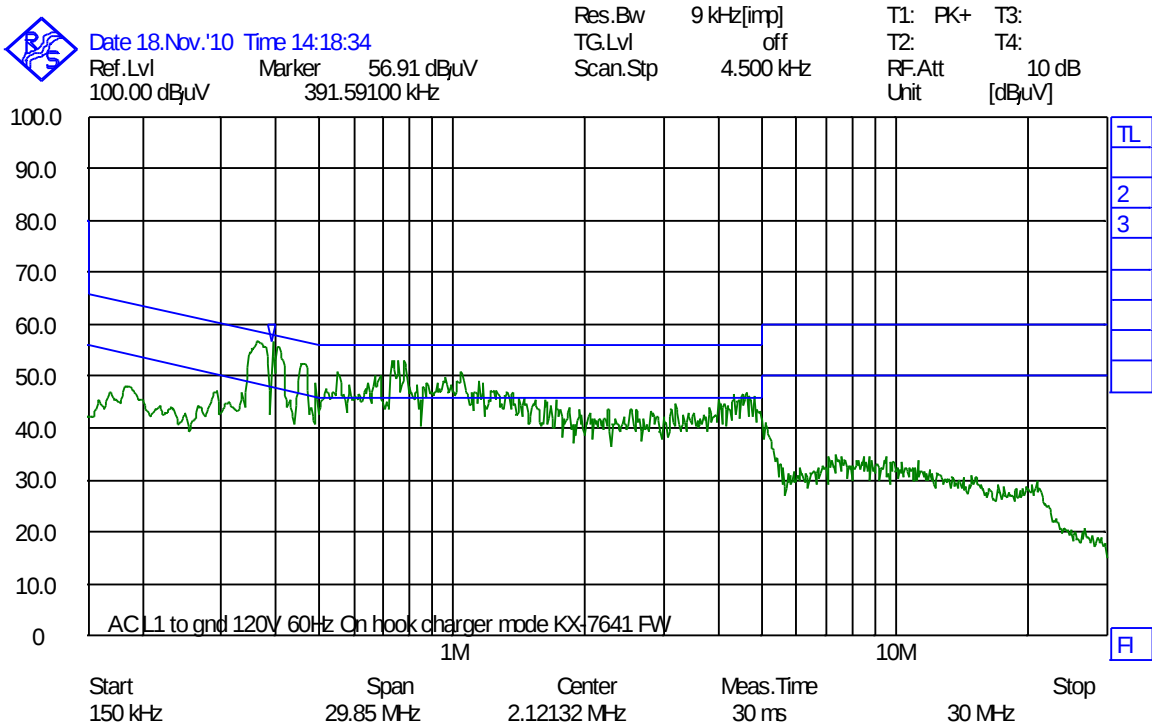
Phase N, AC Adaptor PNLV226(UC)



Phase L1, AC Adaptor PNLV226(UC)



Phase N, AC Adaptor PNLV226(FW)



Phase L1, AC Adaptor PNLV226(FW)

4.2 Peak Power Output

Para. No.: 15.247 (b)

Test Performed By: Frode Sveinsen	Date of Test: 18-20 Jan 2010 7 Dec 2010
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Test Results: Complies

Measurement Data:

Maximum Conducted Peak Output Power, Watts

RF channel	0	39	79
Measured value	0.0012	0.0012	0.0011

Maximum EIRP, Watts

RF channel	0	39	79
Measured EIRP	0.0013	0.0015	0.0020
Antenna gain dB	0.3	0.9	2.6

Conducted values are from Nemko report no. 141532-2.

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

The EIRP is calculated from measured field strength by the formula in DA00-705.

See attached graph.

Detachable antenna?

☐ Yes ☒ No

If detachable, is the antenna connector non-standard?

☐ Yes ☐ No

Type of antenna connector: N/A

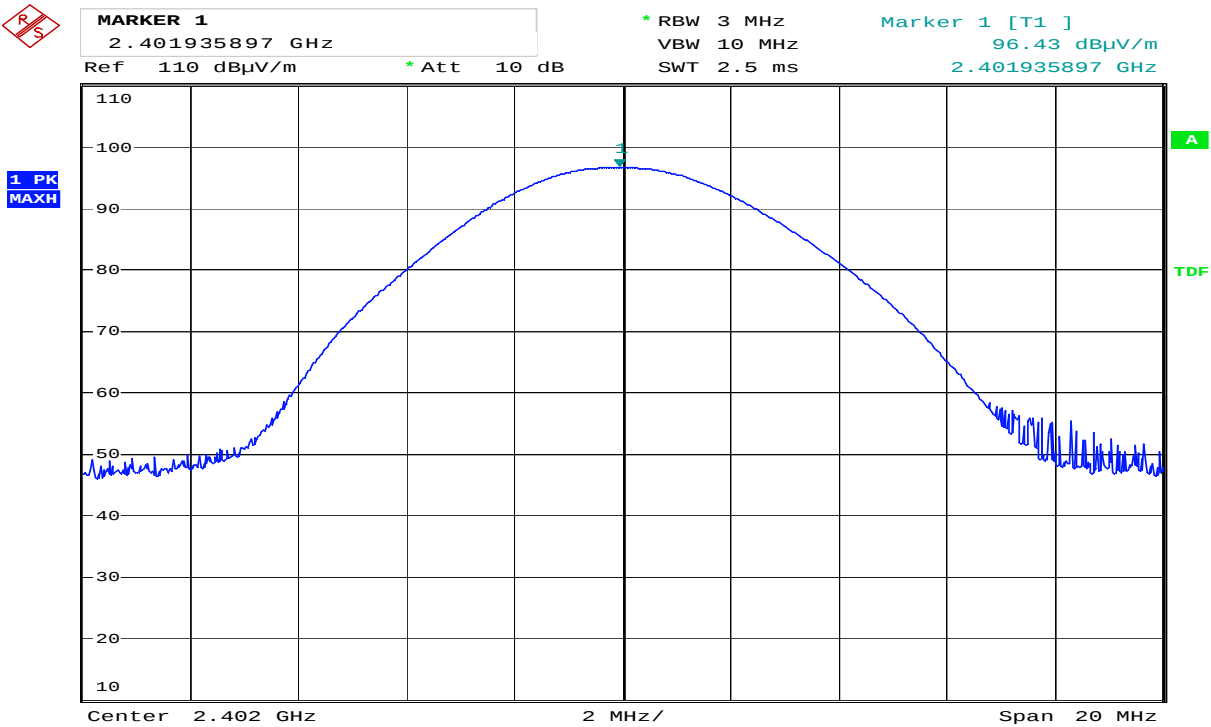
Requirements:

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

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

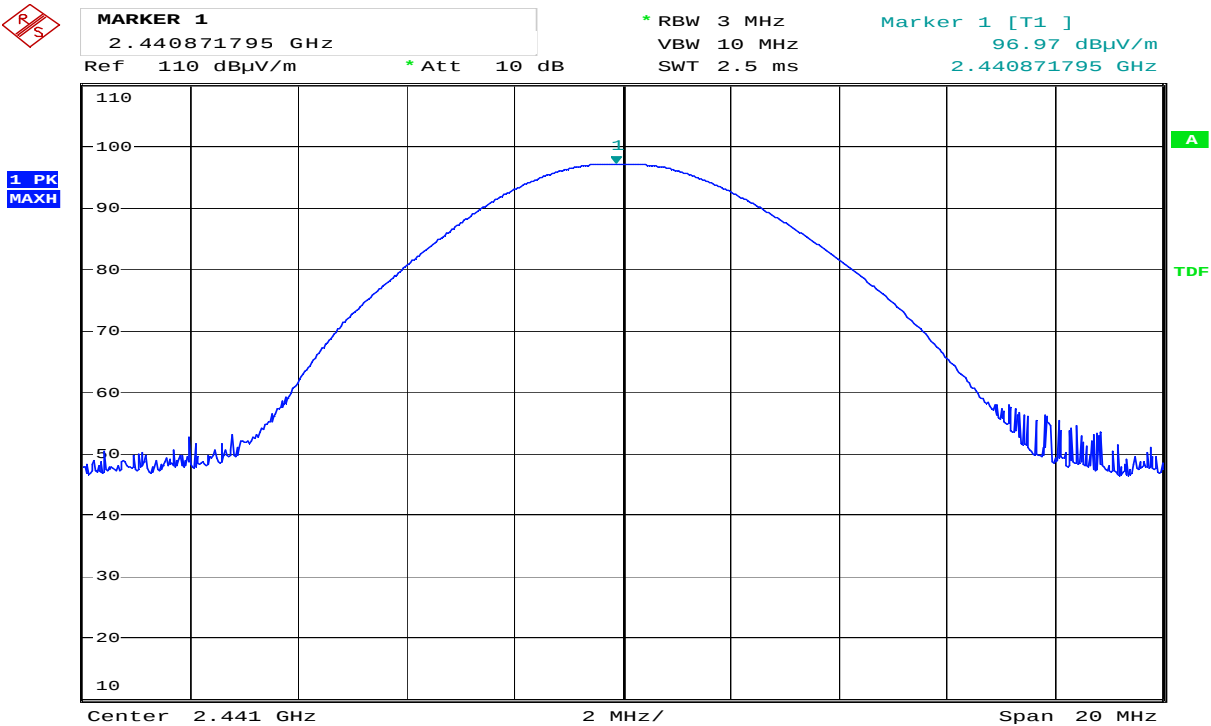
For all other frequency hopping systems in the 2400 - 2483.5 MHz band: 0.125 Watts

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.



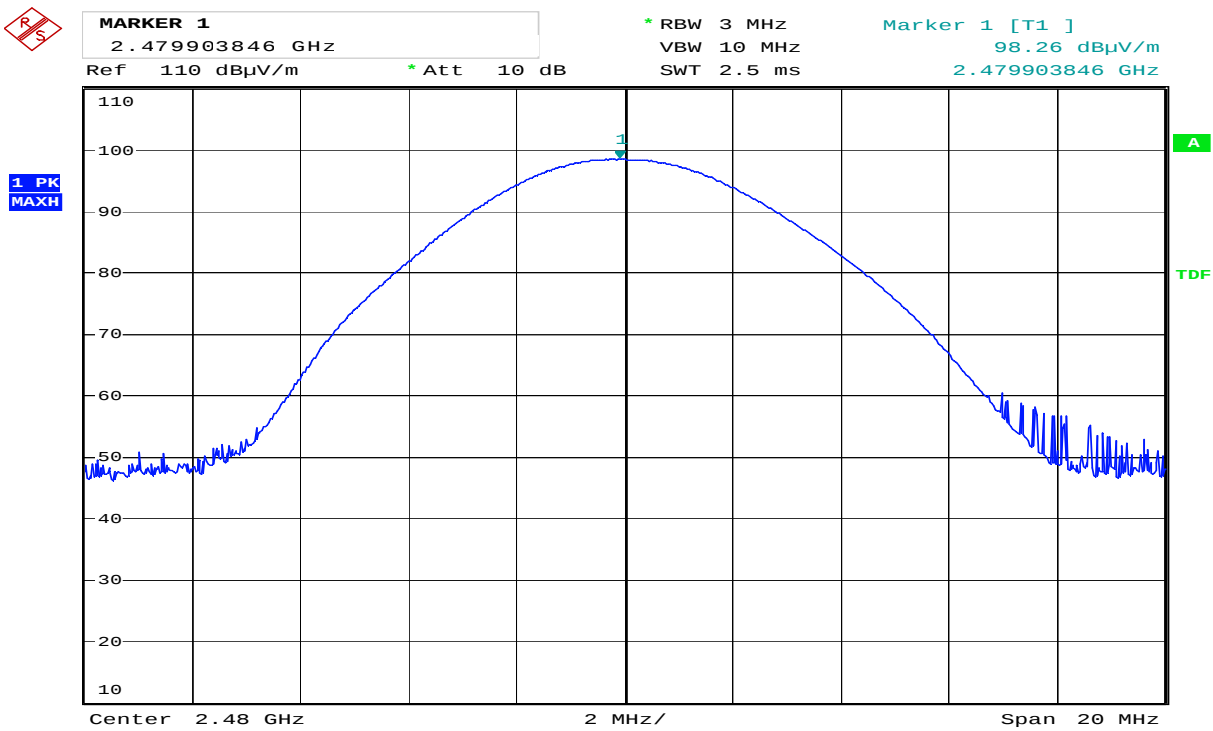
Date: 7.DEC.2010 20:39:30

Radiated Output Power, 2402 MHz



Date: 7.DEC.2010 20:37:27

Radiated Output Power, 2441 MHz



Date: 7.DEC.2010 20:34:23

Radiated Output Power, 2480 MHz

4.3 Spurious Emissions (Radiated)

Para. No.: 15.247 (c)

Test Performed By: Frode Sveinsen	Date of Test: 30 Nov 2010
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Test Results: Complies

Measurement Data:

Radiated Emissions, 1-25 GHz, Peak

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	Dist. corr. factor	Field strength, Peak Detector, 3m	Duty cycle corr. factor	Limit	Margin
GHz	L,M,H	dB	dB μ V/m	dB	dB μ V/m	dB
4804	L	0	56.1	20	74	17.9
4880	M	0	56.1	20	74	17.9
4960	H	0	55.9	20	74	18.1
Other freqs	L,M,H	0	None detected	20	74	>20

Average Detector:

Frequency	RF channel	Dist. corr. factor	Field strength, Peak Detector, 3m	Duty cycle corr. factor	Limit	Margin
GHz	L,M,H	dB	dB μ V/m	dB	dB μ V/m	dB
4804	L	0	36.1	20	54	17.9
4880	M	0	36.1	20	54	17.9
4960	H	0	35.9	20	54	18.1
Other freqs	L,M,H	/	None detected	20	54	>20

Average Detector values are calculated from Peak values by Duty Cycle Correction Factor.

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

See plots.

Calculated Band-edge Power, Peak Detector

Frequency	Power below nearest channel, dBc		Limit	Margin
GHz	Hopping Off	Hopping On	dB	dB
2.39	42.9	43.4	74	30.6
2.4835	57.5	56.5	74	16.5

Calculated Radiated Band-edge Power, Average Detector

Frequency	Power below nearest channel, dBc		Limit	Margin
GHz	Hopping Off	Hopping On	dB	dB
2.4835	37.5	36.5	54	16.5

The Band Edge values are calculated subtracting the Marker Delta values (dBc) from Nemko test report no. 141532-2 from the Radiated Power values measured in this report.

See plots.

Duty Cycle Correction Factor Calculation:

See also Para 4.4 Occupancy Time.

RF duty cycle: Calculation according to RF burst Para 15.35 (c)

DH5 slots: 5 slots TX and 1 slot RX -> 5x0.625ms per frame -> frame length is 6x0.625ms = 3.75ms

Minimum number of hopping carriers: 20 -> The frame is repeated on the same channel every 74.5ms.

DC Correction factor = $-20 \times \log((5 \times 0.625\text{ms}) / 74.5\text{ms}) = 27.5 \text{ dB}$

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

This value is used to calculating the Peak Limit for radiated emissions above 1 GHz. The Peak Limit is the Average Limit (54 dBμV/m) plus the Duty Cycle Correction Factor, i.e. the Peak Limit is 74 dBμV/m when the DC Correction Factor is 20 dB.

Radiated emissions 30 – 1000 MHz.

Detector: Quasi Peak

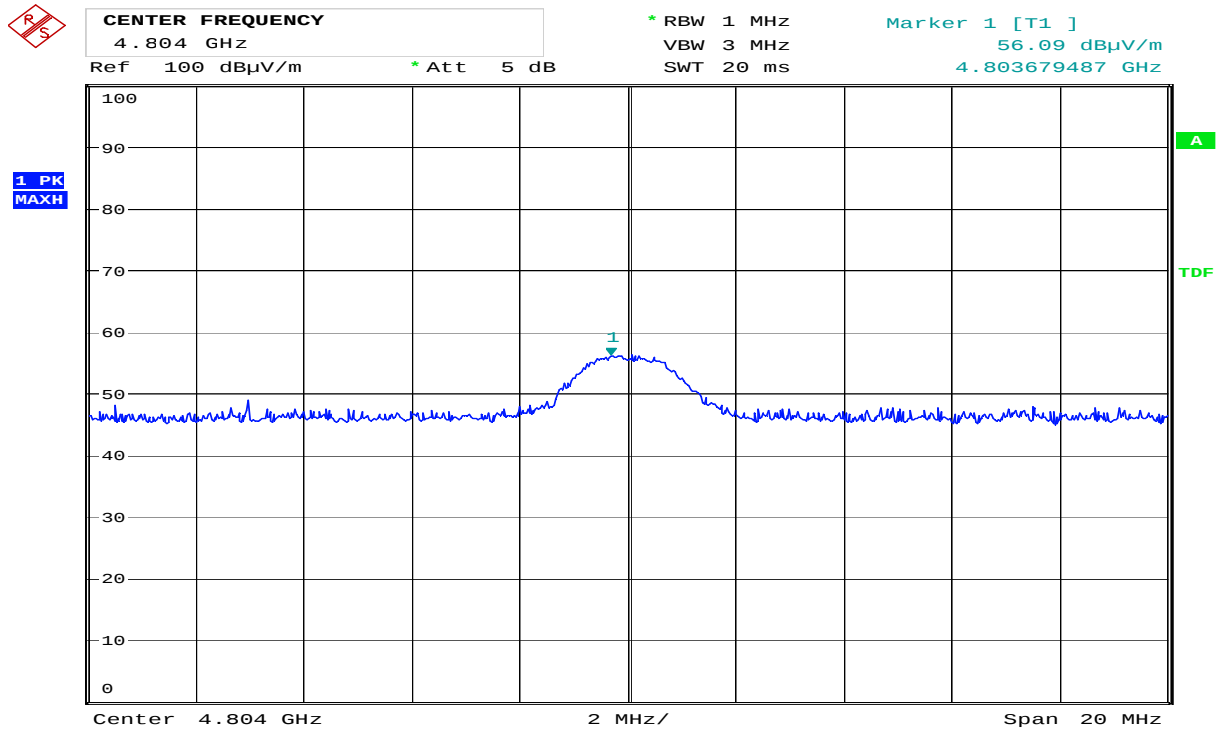
Measuring distance: 3m

Quasi Peak Det., AC Adaptor PNLV226(FW):

Frequency MHz	Dist. corr. Factor dB	Field strength @3m QP Det., dBµV/m	Limit dBµV/m	Margin dB
41.5	0	31.8	40	8.2
44.95	0	29.6	40	10.4
54.5	0	20.8	40	19.2
55.25	0	22.3	40	17.7
82.83	0	20.0	40	20.0
83.05	0	19.6	40	20.4
161.3	0	18.2	43.5	25.3
166.1	0	17.8	43.5	25.7
747	0	27.2	46	18.8
885.95	0	24.9	46	21.1

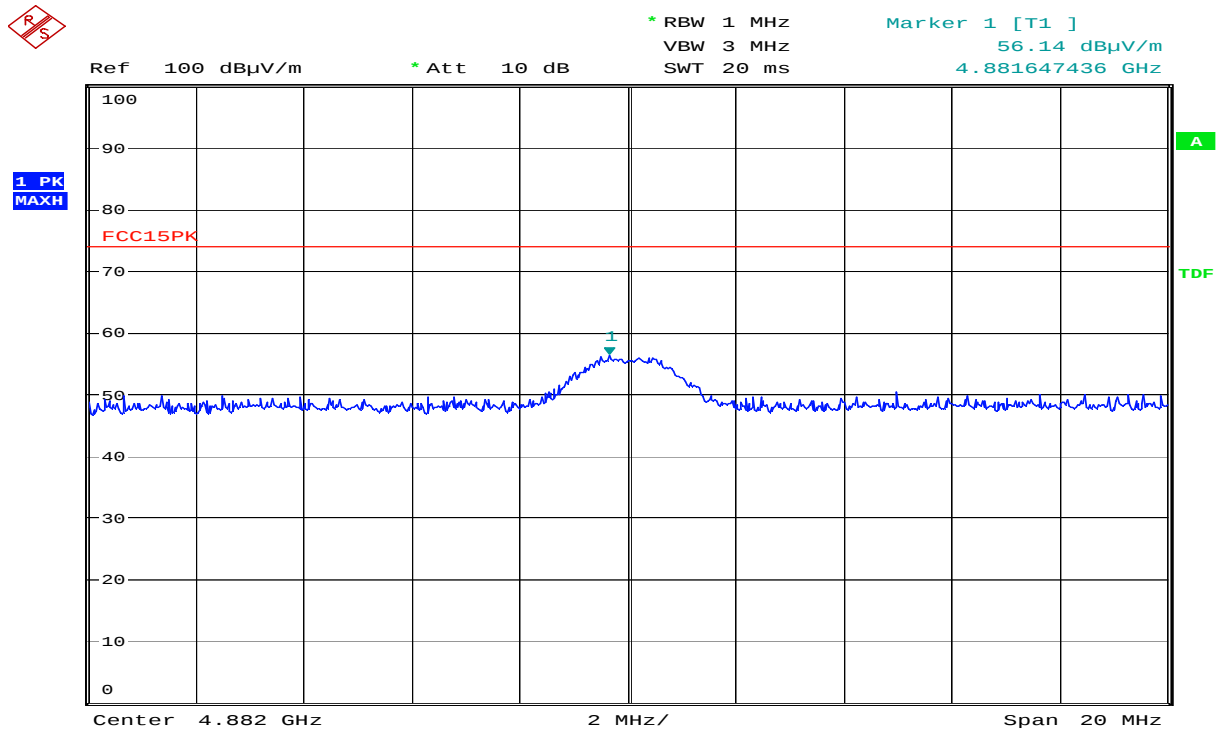
Quasi Peak Det., AC Adaptor PNLV226(UC):

Frequency MHz	Dist. corr. Factor dB	Field strength @3m QP Det., dBµV/m	Limit dBµV/m	Margin dB
41.5	0	32.8	40	7.2
51.9	0	25.2	40	14.8
83.0	0	19.2	40	20.8
124.5	0	16.7	43.5	26.8
166.1	0	16.1	43.5	27.4
746.2	0	29.1	46	16.9



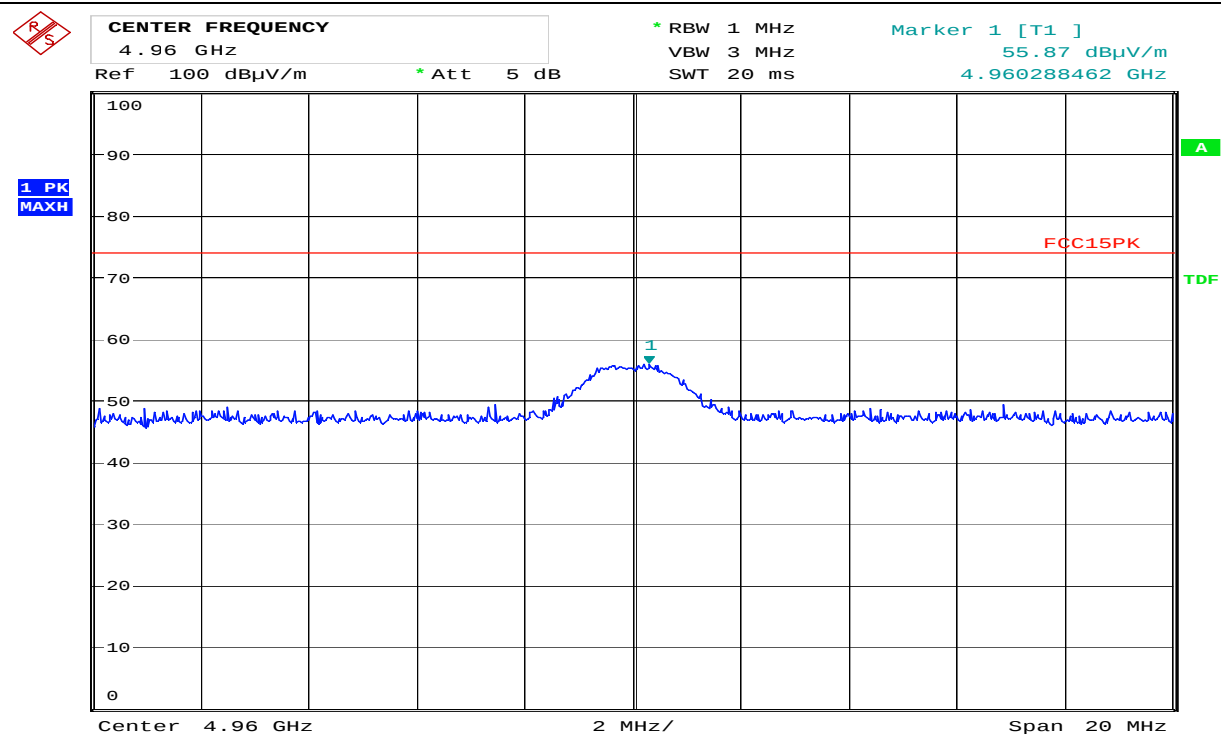
Date: 30.NOV.2010 16:19:33

Radiated emissions, 2nd harmonic, ch00



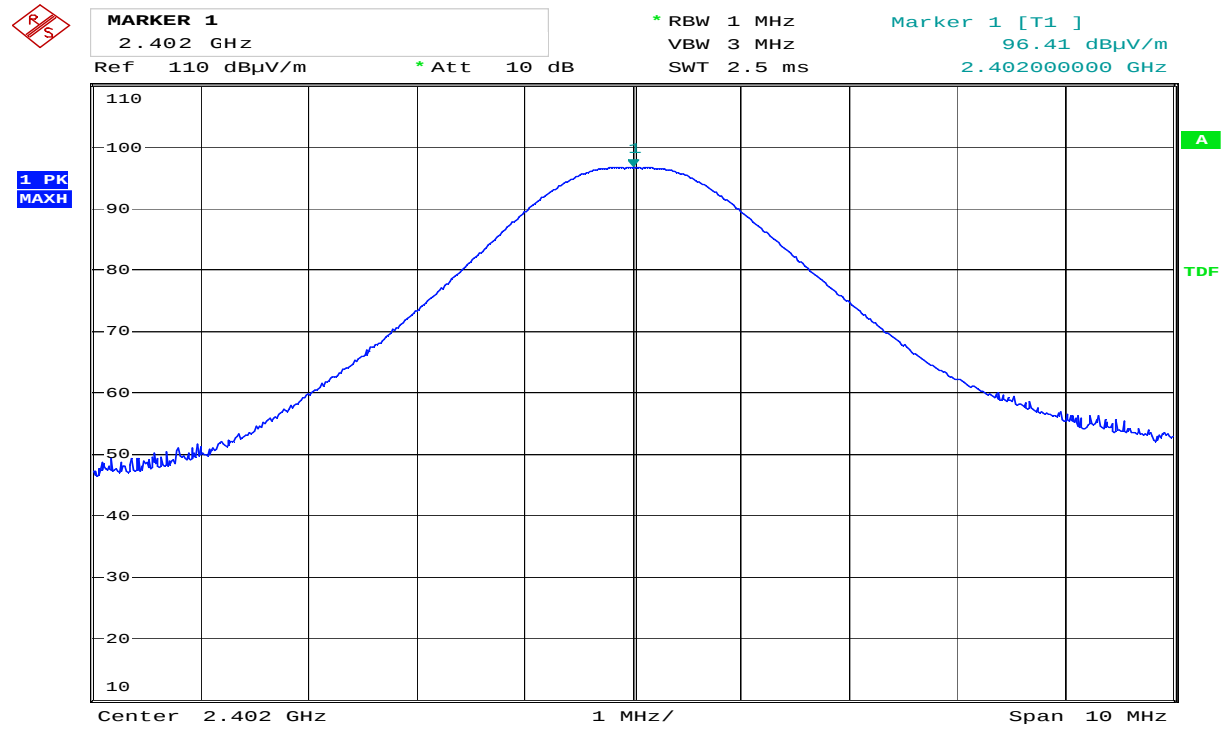
Date: 30.NOV.2010 16:49:13

Radiated emissions, 2nd harmonic, ch39



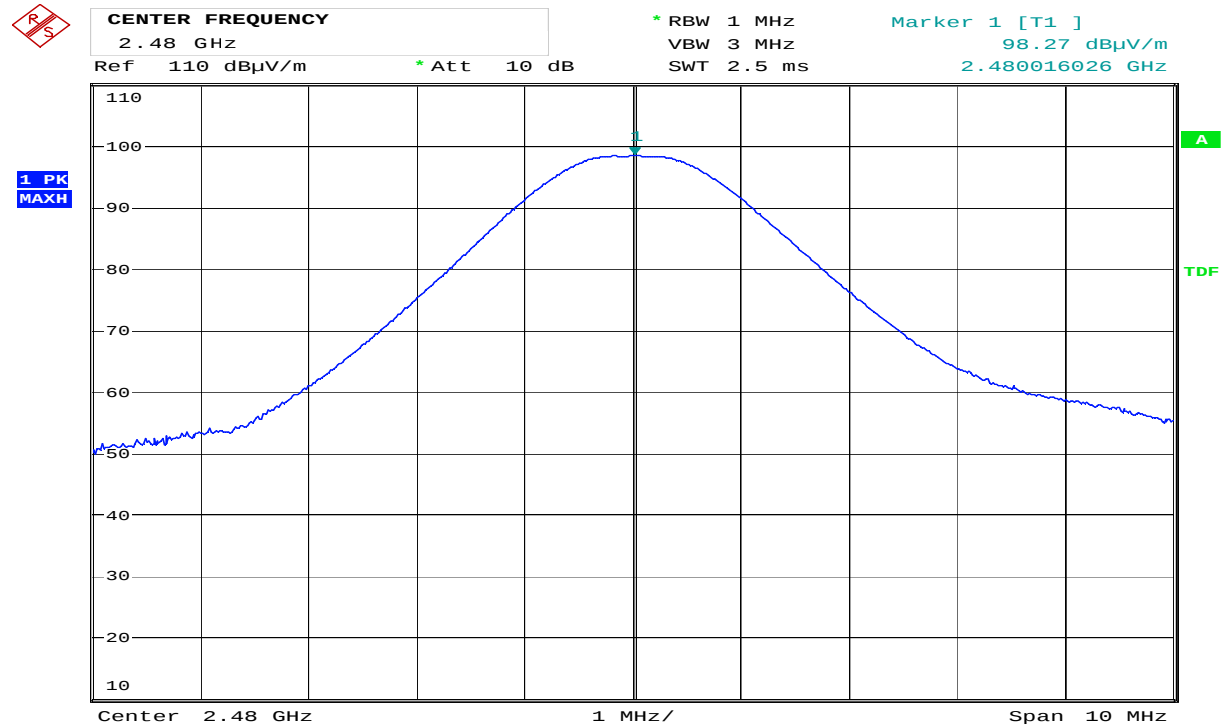
Date: 30.NOV.2010 16:03:32

Radiated emissions, 2nd harmonic, ch78



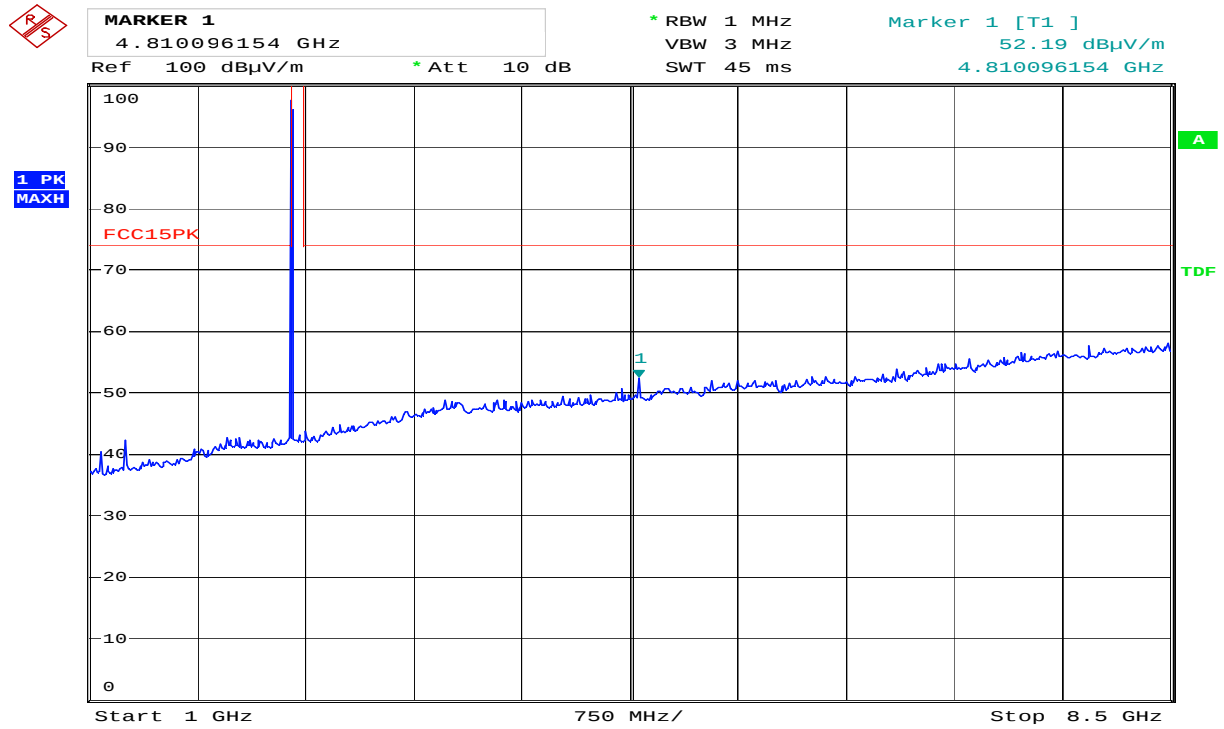
Date: 7.DEC.2010 20:40:01

Band Edge, Lower, Power Measurement



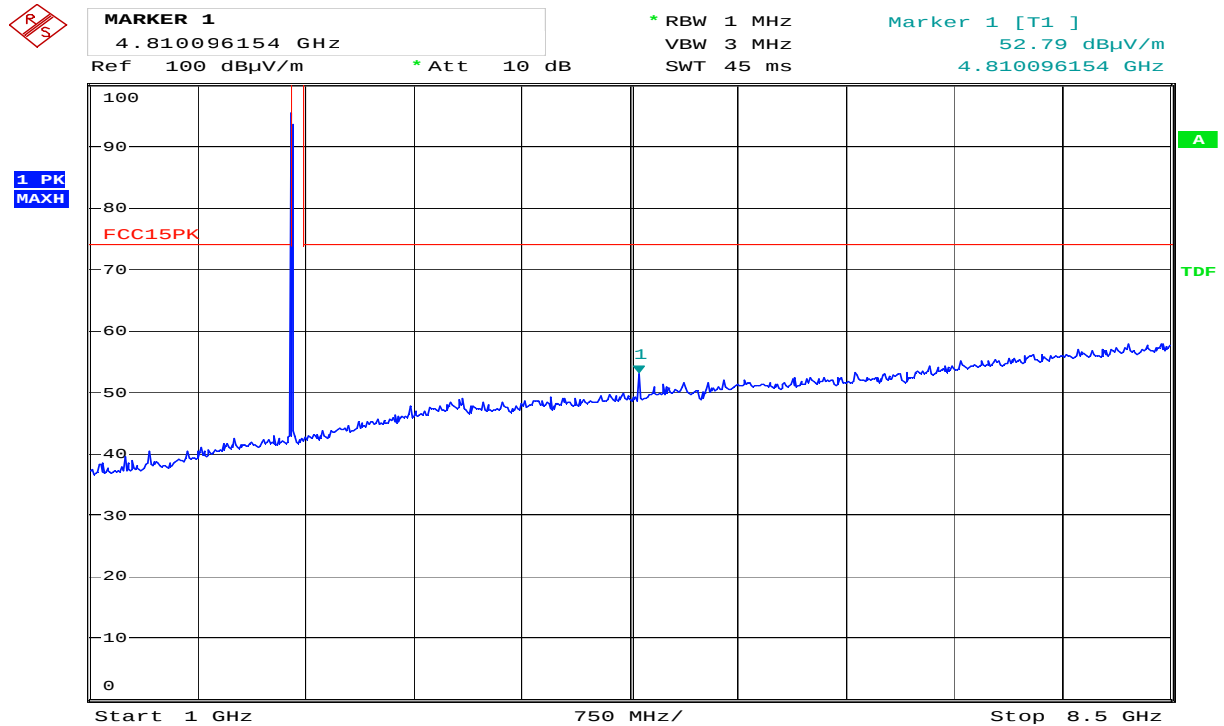
Date: 7.DEC.2010 20:33:15

Band Edge, Upper, Power Measurement



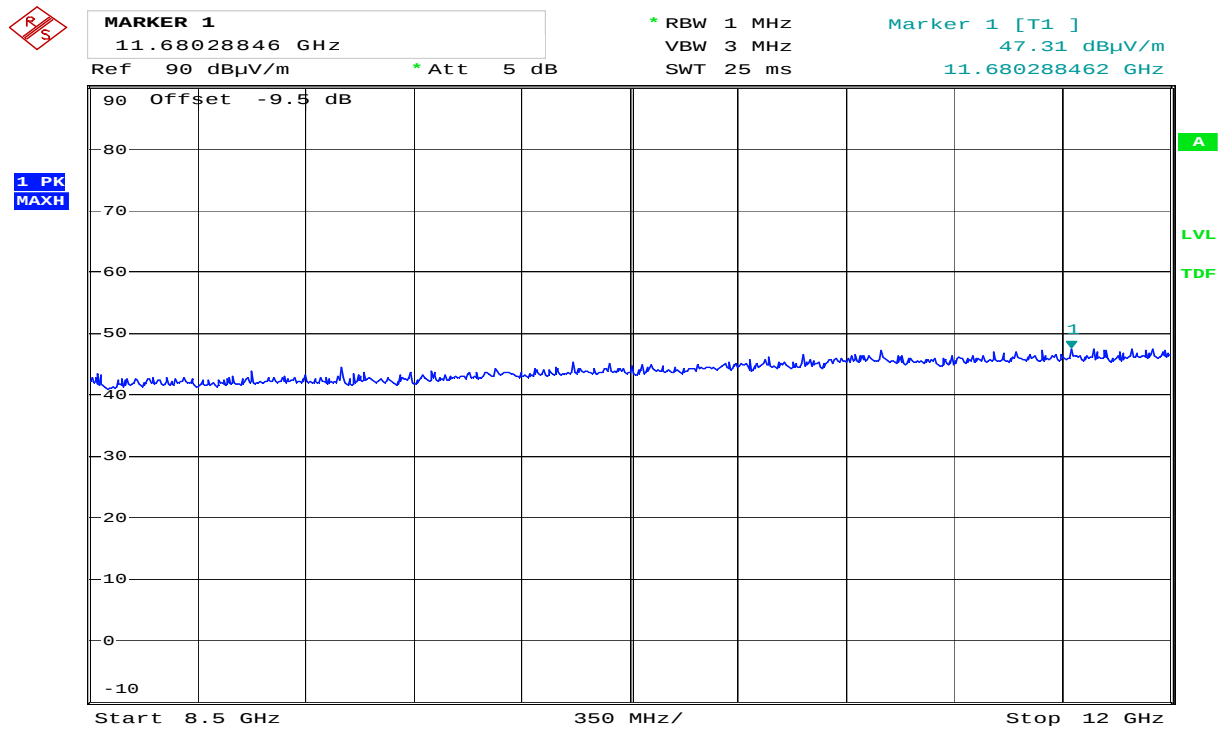
Date: 30.NOV.2010 16:37:19

Spurious emissions, 1 – 8.5 GHz, VP



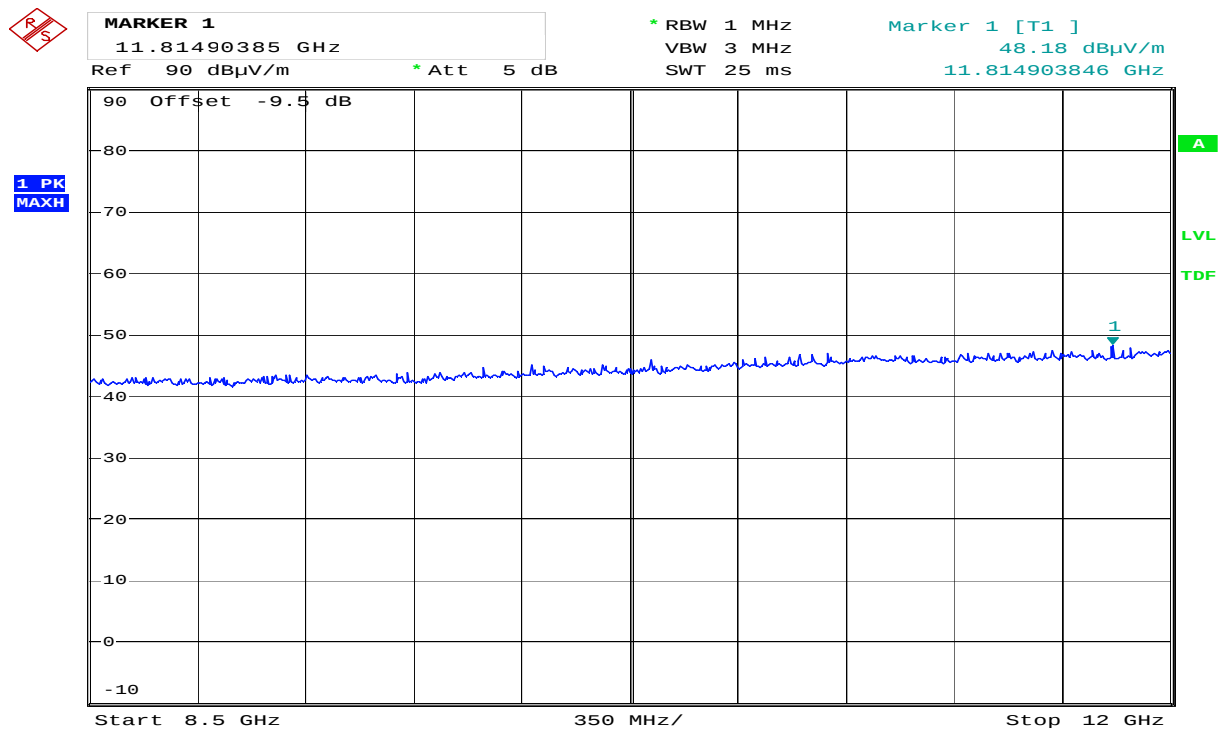
Date: 30.NOV.2010 16:33:57

Spurious emissions, 1 – 8.5 GHz, HP



Date: 30.NOV.2010 17:00:16

Spurious emissions, 8.5 – 12 GHz, VP, 1m



Date: 30.NOV.2010 17:04:41

Spurious emissions, 8.5 – 12 GHz, HP, 1m

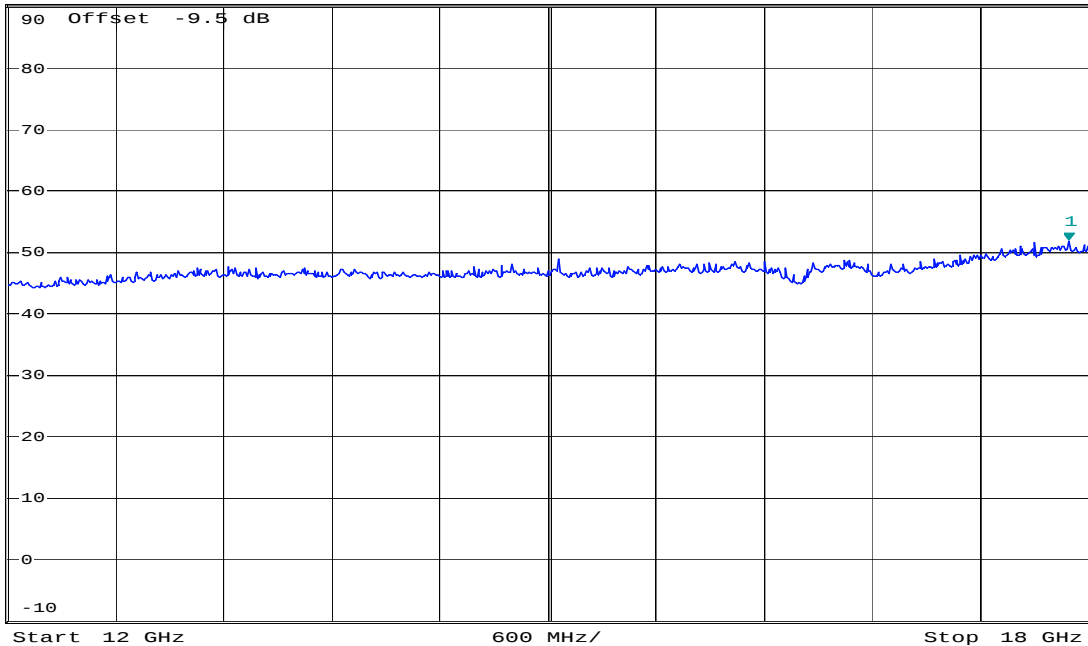


MARKER 1
 17.89423077 GHz
 Ref 90 dBμV/m * Att 0 dB

* RBW 1 MHz
 VBW 3 MHz
 SWT 35 ms

Marker 1 [T1]
 51.57 dBμV/m
 17.894230769 GHz

1 PK
MAXH



Date: 30.NOV.2010 17:13:03

Spurious emissions, 12 – 18 GHz, VP, 1m

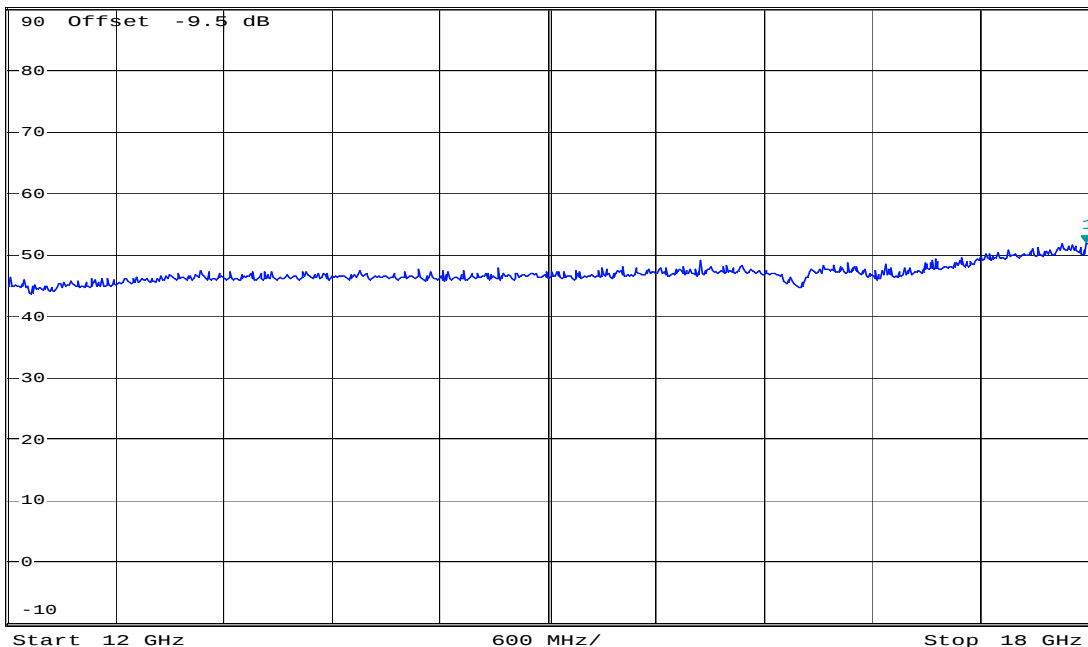


MARKER 1
 17.99038462 GHz
 Ref 90 dBμV/m * Att 0 dB

* RBW 1 MHz
 VBW 3 MHz
 SWT 35 ms

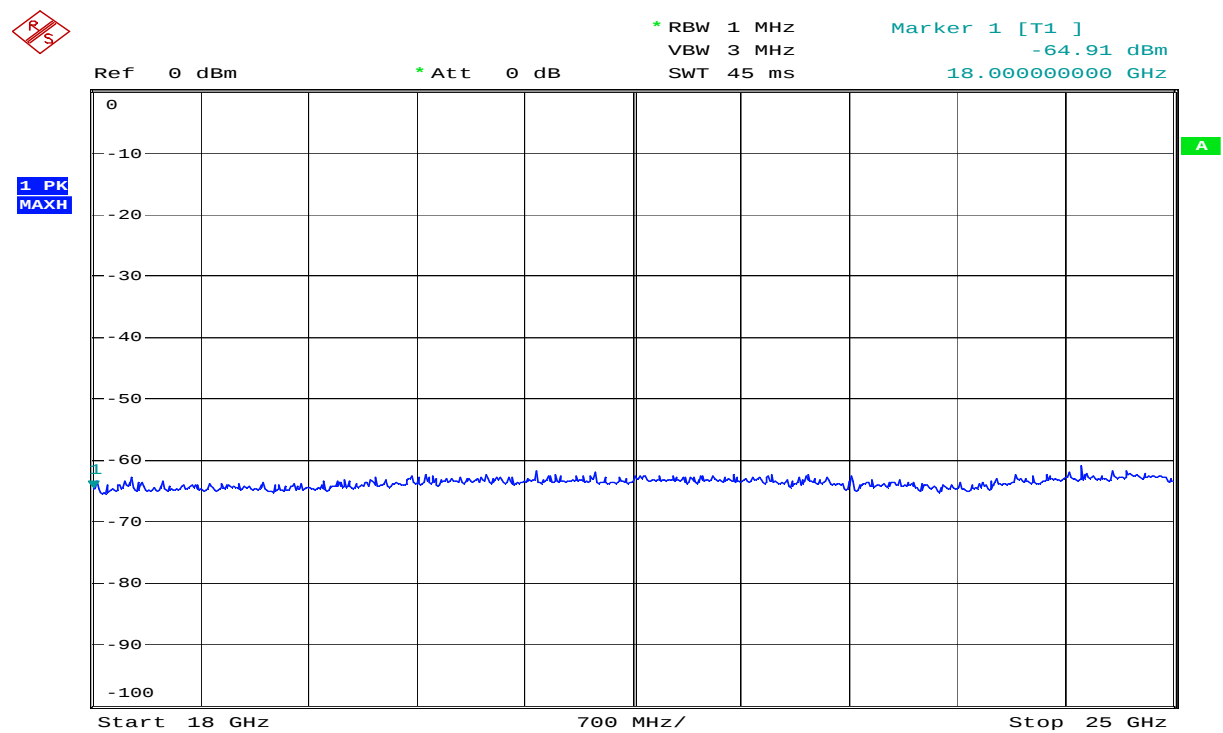
Marker 1 [T1]
 51.76 dBμV/m
 17.990384615 GHz

1 PK
MAXH



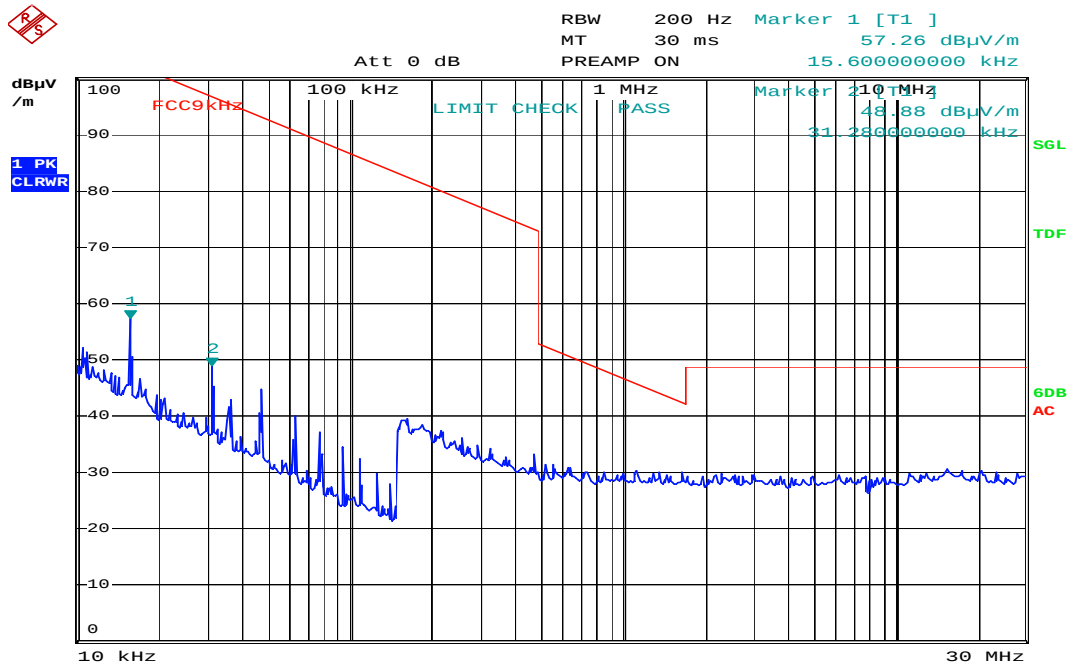
Date: 30.NOV.2010 17:15:00

Spurious emissions, 12 – 18 GHz, HP, 1m



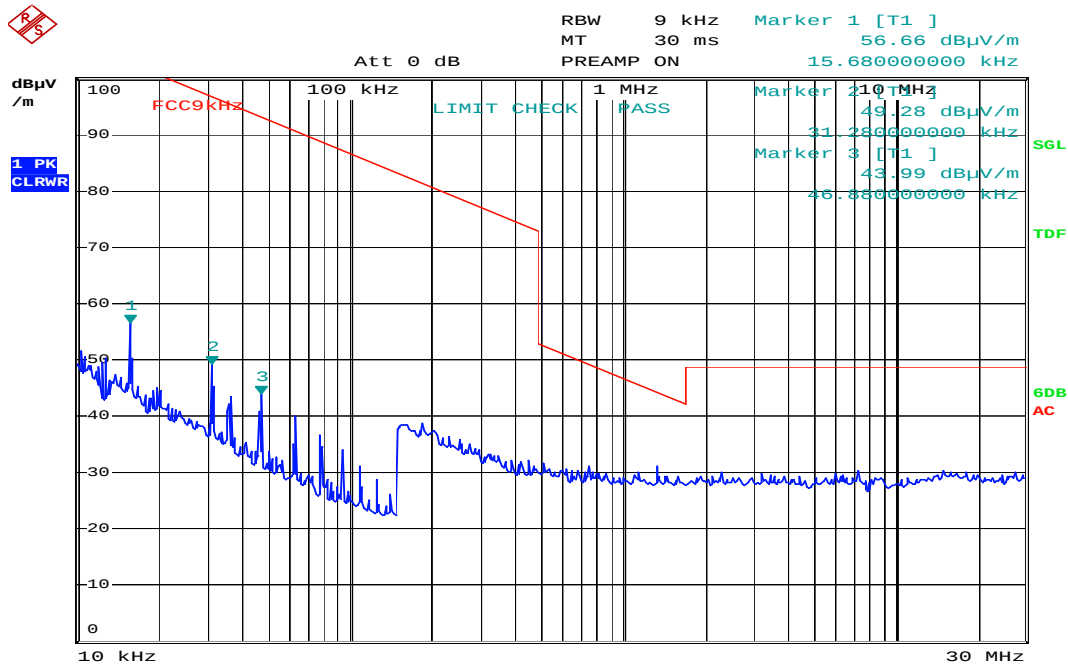
Date: 30.NOV.2010 17:28:32

Spurious emissions, pre-scan 18 – 25 GHz



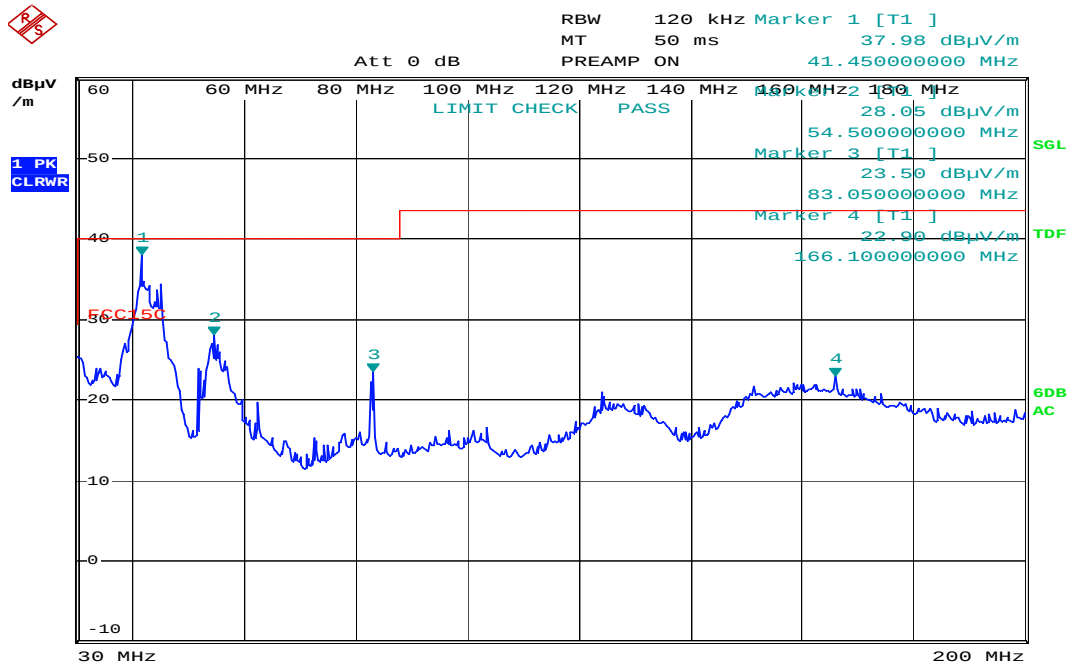
Date: 7.DEC.2010 17:15:45

10 kHz - 30MHz, PNLV226(UC)



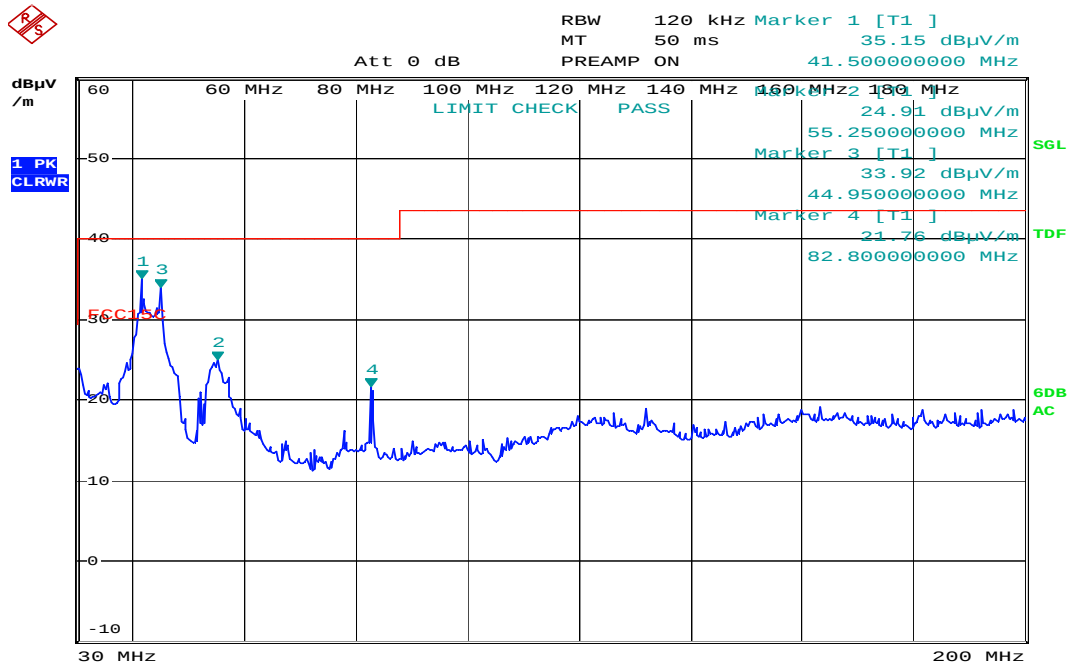
Date: 7.DEC.2010 17:33:21

10 kHz - 30MHz, PNLV226(FW)



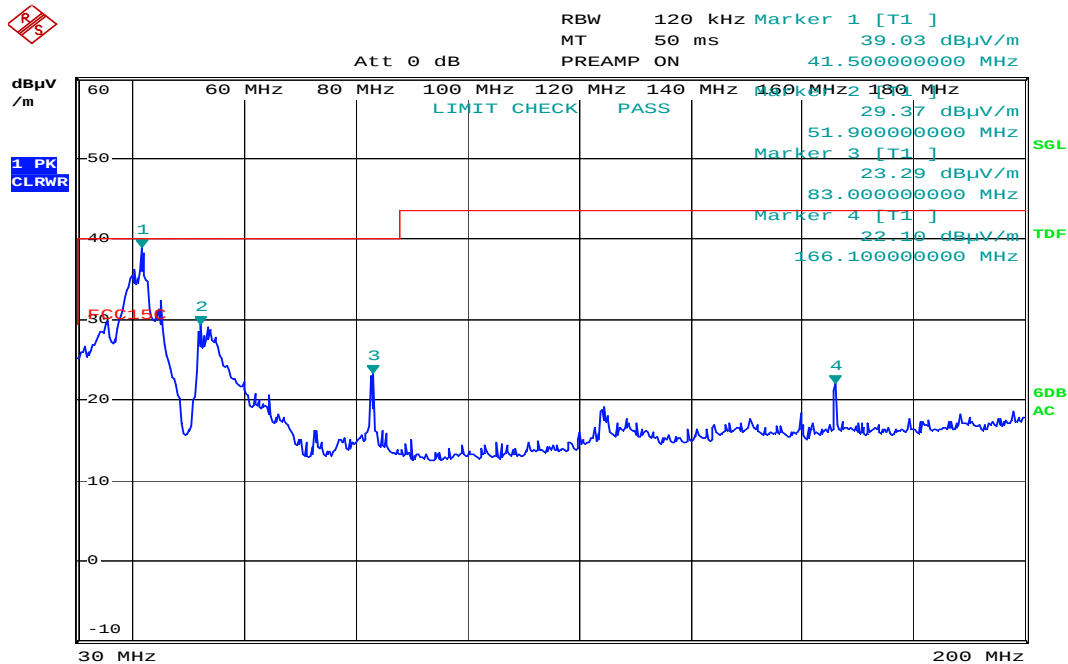
Date: 30.NOV.2010 13:19:08

VP, 30 - 200MHz, PNLV226(FW)



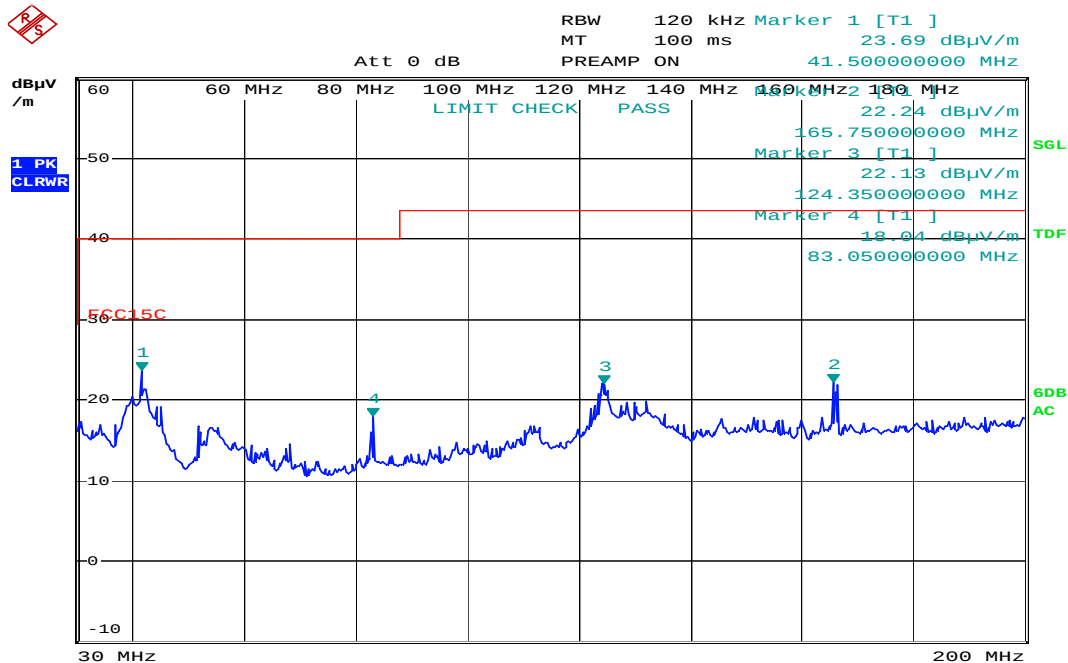
Date: 30.NOV.2010 13:35:17

HP, 30 - 200MHz, PNLV226(FW)



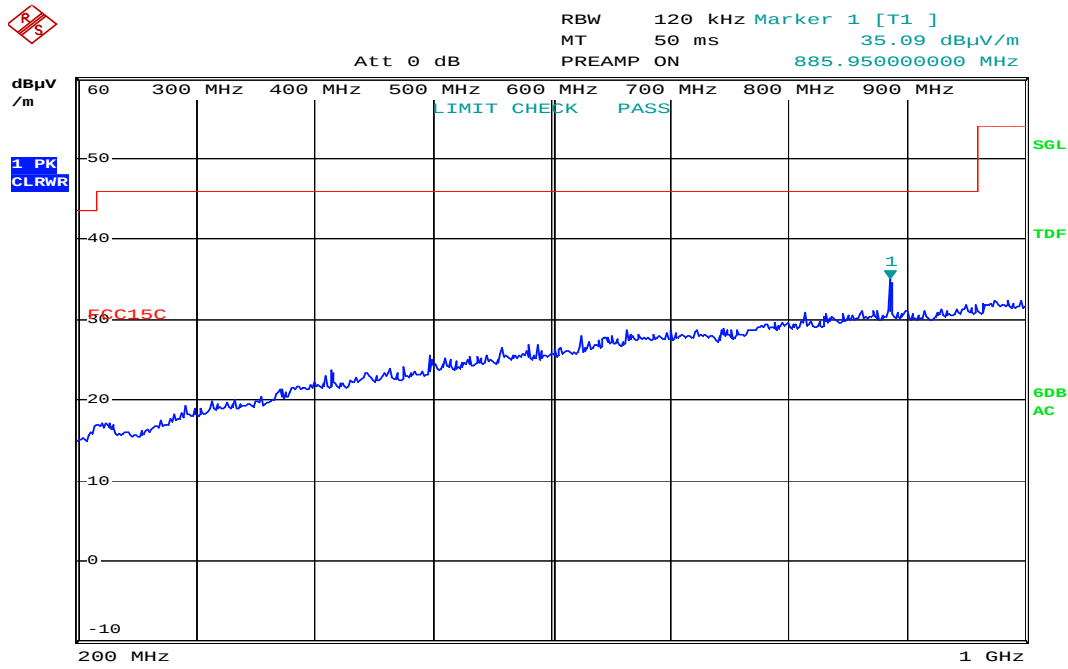
Date: 30.NOV.2010 12:47:19

VP, 30 - 200MHz, PNLV226(UC)



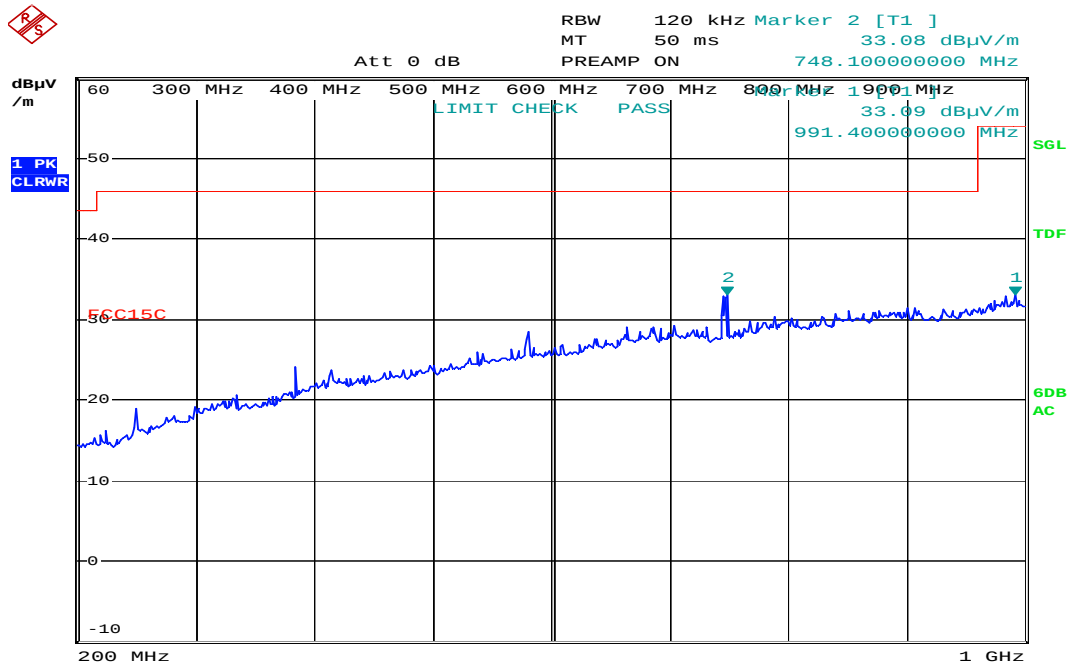
Date: 30.NOV.2010 13:05:40

HP, 30 - 200MHz, PNLV226(UC)



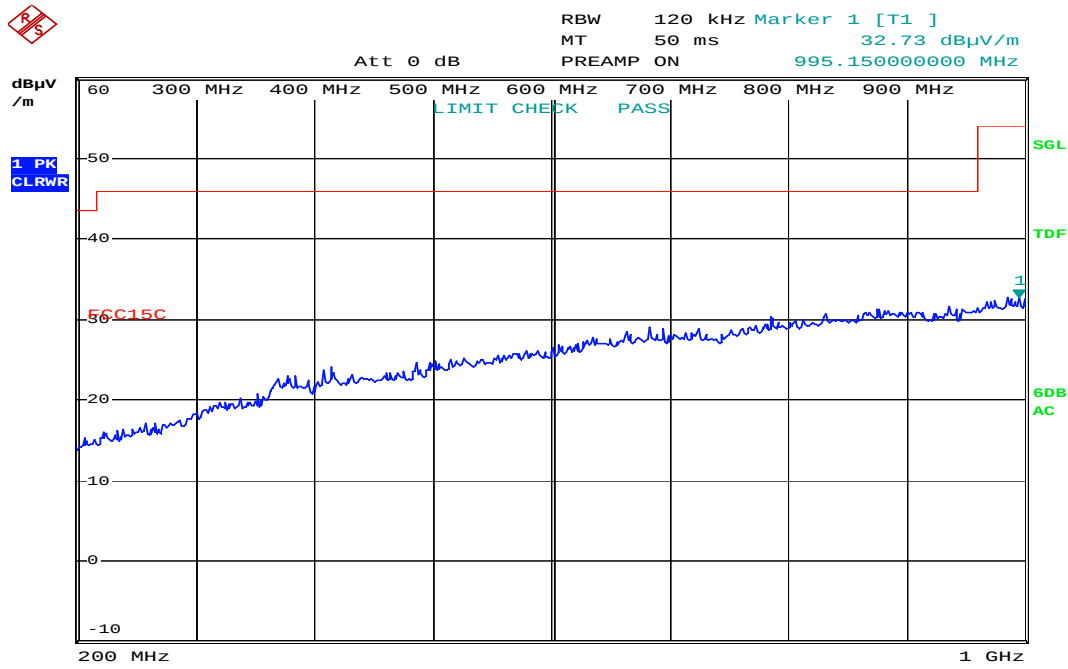
Date: 30.NOV.2010 11:33:37

VP, 200 - 1000MHz, PNLV226(FW)



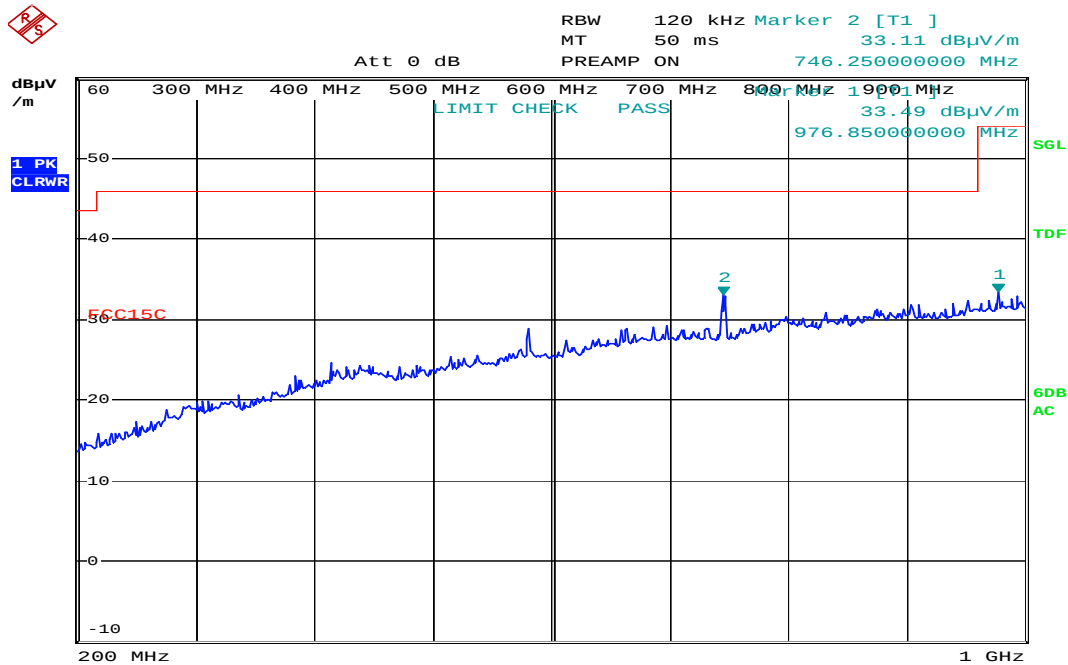
Date: 30.NOV.2010 11:51:18

HP, 200 - 1000MHz, PNLV226(FW)



Date: 30.NOV.2010 12:13:40

VP, 200 - 1000MHz, PNLV226(UC)



Date: 30.NOV.2010 12:28:51

HP, 200 - 1000MHz, PNLV226(UC)

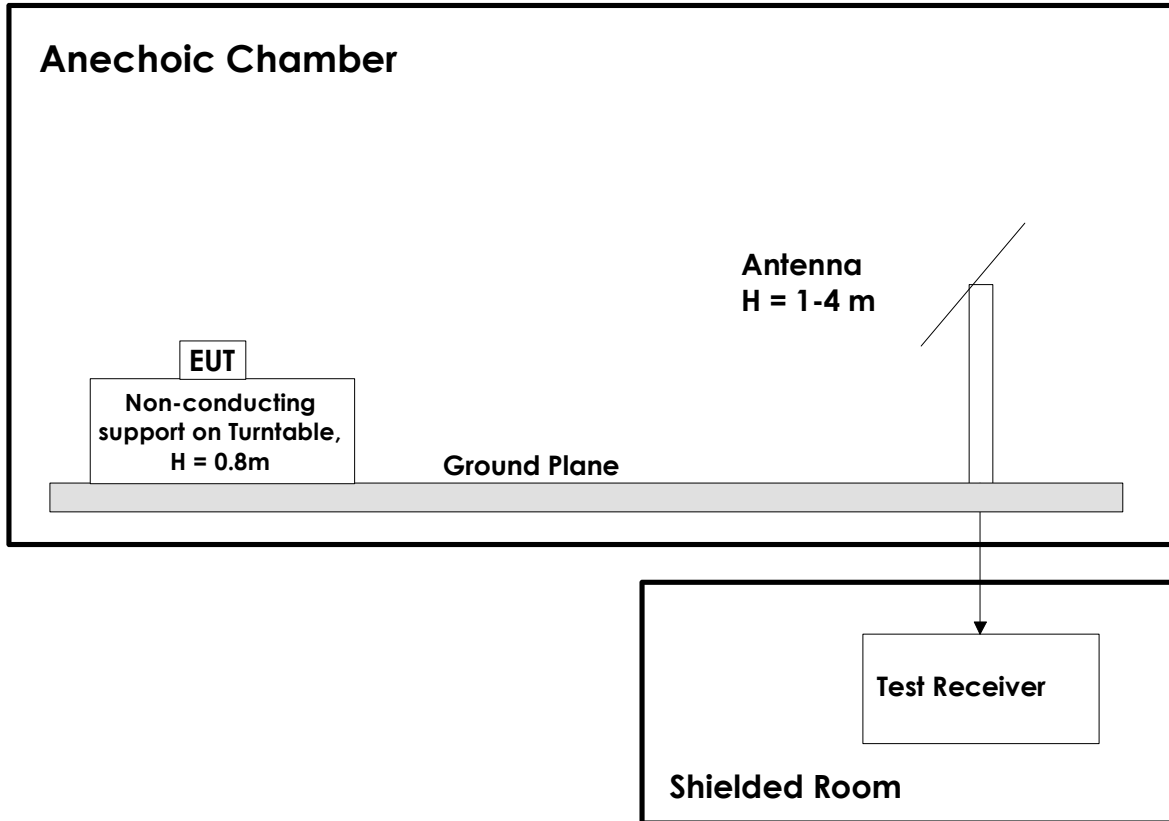
5 LIST OF TEST EQUIPMENT

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	2010.09.28	2012.09.28
2	ESAI	Measuring Receiver	Rohde & Schwarz	LR 1090	2010.03.04	2012.03.04
3	6810.17B	Attenuator	Suhner	LR1212	2010.09.15	2012.09.15
4	ESH3-Z5	Two Line V-Network	Rohde & Schwarz	LR 1076	2009.10.22	2011.10.22
5	80S	Signal Generator	Powertron	LT 502	Cal b4 use	
6	6812B	AC Power Source	Agilent	LR 1515	2010.04.13	2011.04.13
7	ESH3-Z2	Pulse Limiter	Rohde & Schwarz	LR 1074	2010.03.03	2012.03.03
8	ESCI	Measuring Receiver	Rohde & Schwarz	N-4259	2010.11.03	2011.11.03
9	HK116	Biconical Antenna	Rohde & Schwarz	LR 1260	2010.05.12	2013.05.12
10	HL223	Log Period Antenna	Rohde & Schwarz	LR 1261	2010.05.12	2013.05.12
11	3115	Horn Antenna	EMCO	LR 1330	2010.08.05	2013.08.05
12	8449A	Pre-amplifier	Hewlett Packard	LR 1322	2009.08.04	2011.08.04
14	HFH2-Z2	Loop Antenna	Rohde & Schwarz	LR 285	2010-10-08	2013-10-08

6 Block Diagrams

6.1 Test Site Radiated Emission



6.2 Power Line Conducted Emission

