

Radio test report 20082590302 - rev 3.0

based on:

- FCC part 15, subpart B, sections 15.107 and 15.109 (10-1-08 edition)
- FCC part 15; subpart C; section 15.247 (10-1-08 edition)

Wireless System in Package Module
GreenPeak
CM09-CP-US

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This report comprises of three modules. The total number of pages is: 27

Main module

1 Introduction

This report contains the result of tests performed by:

Telefication B.V.
Edisonstraat 12a
6902 PK Zevenaar
The Netherlands

Telefication complies with the accreditation criteria for test laboratories as laid down in ISO/IEC 17025:2005. The accreditation covers the quality system of the laboratory as well as the specific activities as described in the authorized annex bearing the accreditation number L021 and is granted on 30 November 1990 by the Dutch Council For Accreditation (RvA: Raad voor Accreditatie). The contents of this test report, if reproduced, shall be copied in full, unless special consent in writing for reproduction in part is granted by Telefication. Copyright of this test report is reserved to Telefication.

Telefication is a accredited test firm under the EU-USA MRA with registration number NL0001.

Ordering party:

Company name : GreenPeak Technologies BV
Address : Catharijnesingel 40
Zipcode : 3511 GB
City/town : Utrecht
Country : The Netherlands
Date of order : 13 June 2008

2 Product

A sample of the following product was submitted for testing:

Product description	: Wireless System in Package Module
Manufacturer	: Netvox Technologies CO., LTD
Trade mark	: GreenPeak
Type designation	: CM09-CP-US
FCC ID	: XFXCM09US
Hardware version	: R1.05
Serial number	: B0000009
Software release	: --

Variant :

Product description	: Wireless System in Package Module
Manufacturer	: Netvox Technologies CO., LTD
Trade mark	: GreenPeak
Type designation	: CM09-XT-US
Hardware version	: R1.05
Serial number	: B0000001
Software release	: --

3 Test schedule

Tests are carried out in accordance with the specification detailed in chapter 7 “Summary” of this report.

Tests are carried out at the following location:

- Telefication, Zevenaar

The samples of the product were received on:

- 14 July 2008

Tests were carried out between:

- 17 July 2008 and 26 March 2009

4 Product documentation

For production of this report the following product documentation is used:

Description	Date	Identification
DB-03 hardware description	2007	12 pages
Operating Manual	2007	Test Software, 10 pages
Datasheet	2007	GreenPeak Lime CM09
PCB layout	--	GerbersPCB CM09 00574R1.00, 5 pages
Circuit diagram	13 July 2008	GP_P109_SCH_00584
Circuit diagram	13 July 2008	GP_P109_SCH_00582
Bill of materials	11 July 2008	CM-09-CP
Bill of materials	11 July 2008	CM-09-XT
PCB layout	--	GreenPeak development board

The above-mentioned documentation will be filed at Telefication for a period of 10 years following the issue of this report. .

5 Observations and comments

During the tests the GreenPeak CM09 communication module was mounted on a DB-03 development board. During the tests the PA-level was set as follows:

Channel 11: 21
Channel 18: 21
Channel 26: 3

There are two variants:

CM09-XT-US model with microwave coaxial connector and propriety LGA pcb footprint including RF-output pads

CM09-CP-US model with microwave coaxial connector and chip antenna, type 2450AT45A100 (gain of 3 dBi)

The CM09-XT-US will be supplied with the following types of external antennas:

ANT-24G-HL90-SMA antenna, 0 dBi gain, or a W1030 antenna, 2.0 dBi gain.

6 Modifications to the sample

No modifications were made to the sample.

7 Summary

The product is intended for use in the following application area:

INTENTIONAL RADIATOR OPERATING IN THE FREQUENCY BAND 2400 – 2483.5 MHz

The sample is tested according to the following specification:

FCC part 15, subpart B, sections 15.107 and 15.109 (10-1-08 edition)

FCC part 15; subpart C; section 15.247 (10-1-08 edition)

8 Conclusions

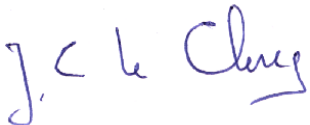
The sample of the product showed **NO NON-COMPLIANCES** to the specification stated in chapter 7 of this report.

The results of the tests as stated in this report, are exclusively applicable to the product items as identified in this test report. Telefication accepts no responsibility for any stated properties of product items in this test report, which are not supported by the tests as specified in chapter 7 "Summary".

All tests are performed by:

name : ing. J.C. le Clercq

function : Test Engineer

signature : 

Review of test report by:

name : ing. P.A. Suringa

function : Senior Engineer Radio/EMC

signature : 

The above conclusions have been verified by the following signatory:

Date : 25 september 2009

name : ing. P.A.J.M. Robben

function : Co-ordinator Test Group

signature : 

Test results module

1.1 Equipment information

Operating frequency range	2405 – 2480 MHz
Occupied bandwidth (calculated)	2.0 MHz
Rated RF power output	17.0 dBm
ITU emission class	2M00F1DFN
Antenna type	Chip antenna, type 2450AT45A100 (gain 3.0 dBi)
Antenna type	Monopole, type ANT-24G-WPJ-SMA gain 0.0 dBi)
Antenna type	Monopole, type W1030 (gain 2.0 dBi)

1.2 Tested channels

Channel 11	Channel 18	Channel 26
2405 MHz	2440 MHz	2480 MHz

1.3 Summary of test data

Name of test	Par. No.	Limit	Meas.	Result
Conducted limits	15.107	see section 2.1 of this test report	see section 2.1 of this test report	Complies
Radiated emission limits	15.109	see section 2.2 of this test report	see section 2.2 of this test report	Complies
Conducted limits	15.207	see section 2.1 of this test report	see section 2.1 of this test report	Complies
Radiated emission limits	15.209	see section 2.2 of this test report	see section 2.2 of this test report	Complies
Minimum 6 dB bandwidth	15.247(a)(2)	≥ 500 kHz	1.55 MHz	Complies
Maximum peak power output	15.247(b)(3)	30 dBm	16.20 dBm	Complies
Spurious emissions (radiated)	15.247(d)	> 20 dB below fundamental	≥ 40 dB below fundamental	Complies
Lower adjacent restricted band (edge) emissions	15.247(d)	< 54 dBuV/m / -41.2 dBm (average) and < 74 dBuV/m / -21.2 dBm (peak)	All measured levels with the peak detector below the average limit	Complies
Upper adjacent restricted band (edge) emissions	15.247(d)	< 54 dBuV/m / -41.2 dBm (average) and < 74 dBuV/m / -21.2 dBm (peak)	All measured levels with the peak detector are below the average limit	Complies
Emissions in non-adjacent restricted bands	15.247(d)	< 54 dBuV/m / -41.2 dBm (average) and < 74 dBuV/m / -21.2 dBm (peak)	All measured levels with the peak detector are below the average limit	Complies
Peak power spectral density	15.247(e)	8 dBm/3 kHz	-1.0 dBm/3 kHz	Complies

Where applicable/appropriate, a maximum peak antenna gain of 3 dBi has been taken into account during the measurements

2 Emission tests

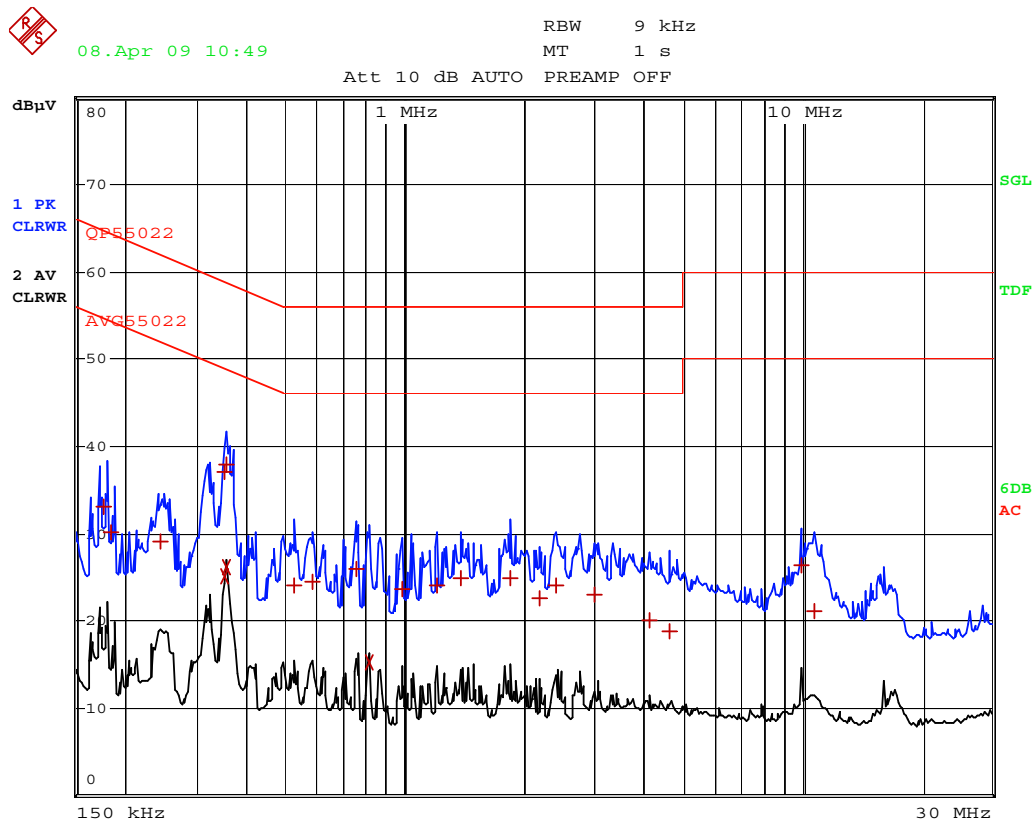
2.1 Powerline conducted emissions

Compliance standard : FCC part 15, subpart C, section 15.207
FCC part 15, subpart B, section 15.107
Ambient temperature : 24 °C
Relative humidity : 54 %
Test results :

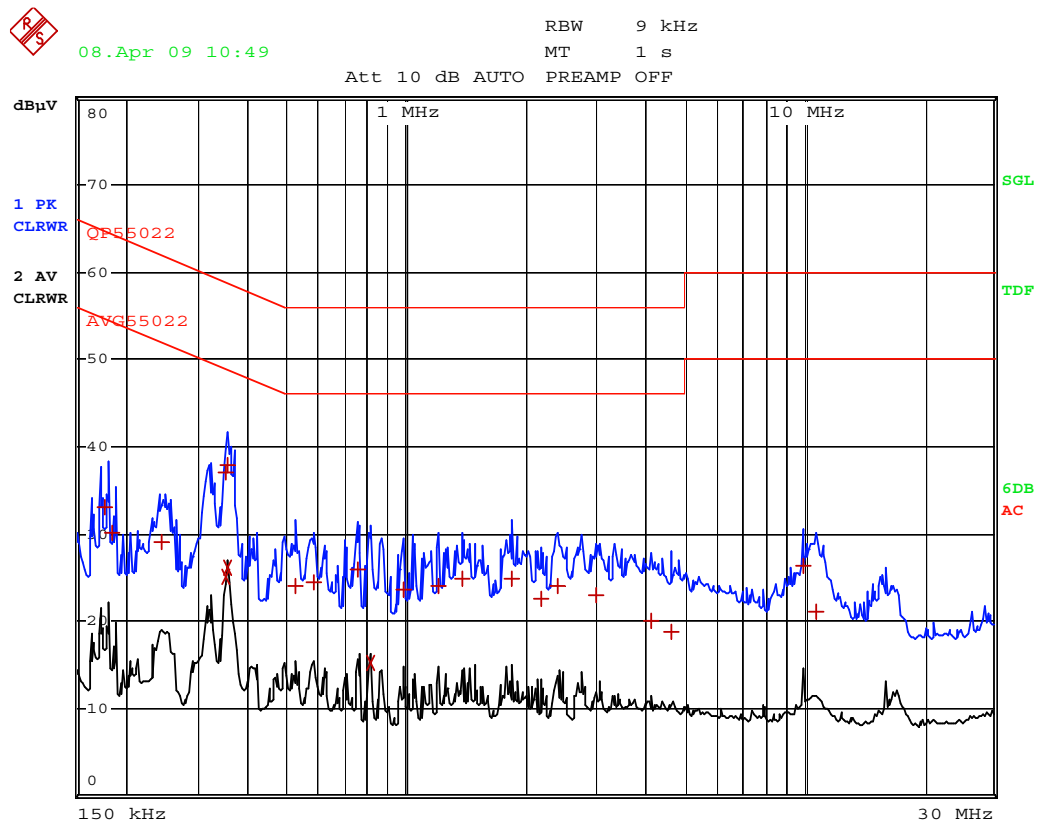
In the two following plots the (worst-case) results of the conducted emission tests at the 115 Volts AC mains connection terminals of the AC/DC power adapter to which the EUT was connected, carried out in accordance with 47 CFR Part 15.107 and 47 CFR Part 15.207 with the EUT operating in transmit and receive mode on channels 11 (2405 MHz), 18 (2440 MHz) and 26 (2480 MHz), may be found.

Worst-case results have been determined through pre-scans on all models (with all listed antennas where applicable). Final measurements have been done on type CM09-XT-US with W1030 antenna as being the worst case.

115 V_{ac} mains, neutral wire



115 V_{ac} mains, live wire



Limit : see plot

Measurement uncertainty: + 3.1/ -3.1 dB

2.2 Radiated emissions; general requirements

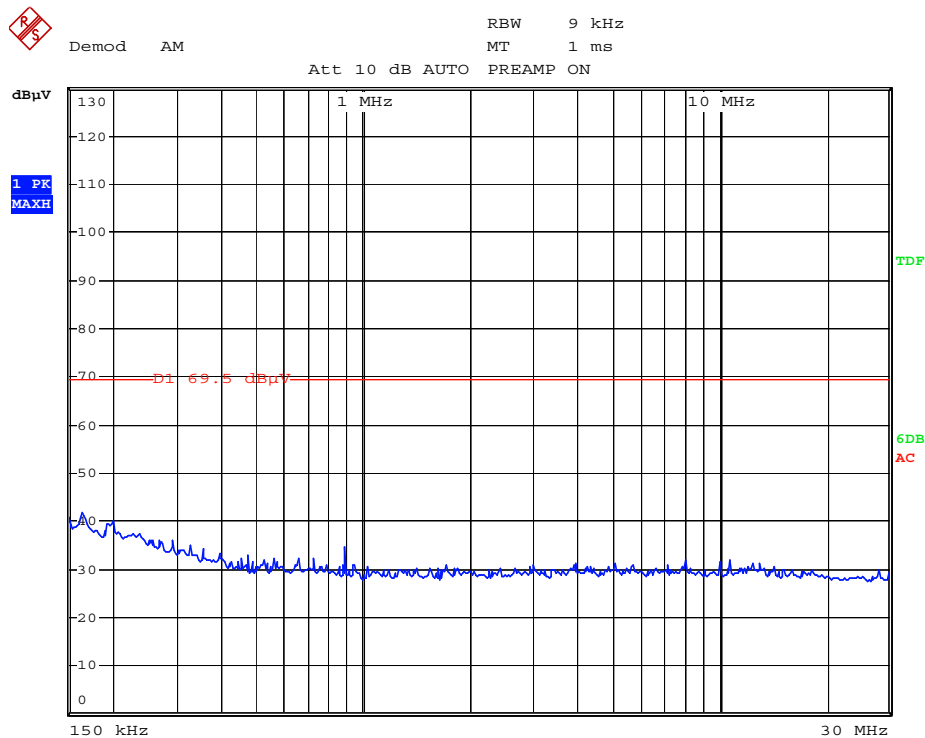
Compliance standard : FCC part 15, subpart C, section 15.209
FCC part 15, subpart B, section 15.109
Ambient temperature : 24 °C
Relative humidity : 54 %
Test results :

Below 1 GHz, all measured values of the spurious emissions with the detector in peak mode, are below the applicable limits, which are valid when using a quasi-peak/average detector. Therefore, all spurious emissions below 1 GHz have been measured with the peak detector only, unless otherwise noted.

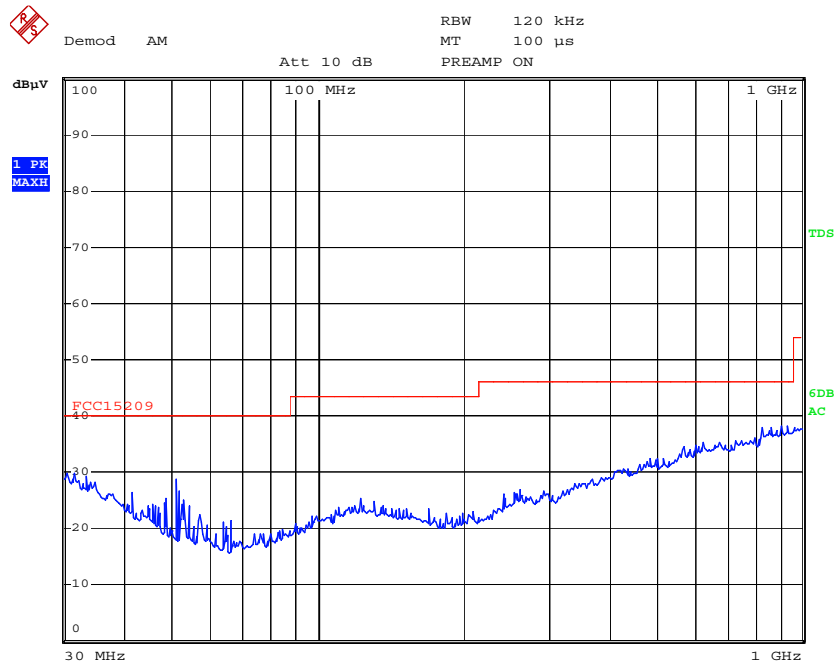
Above 1 GHz, all measured values of the spurious emissions with the detector in peak mode, are below the applicable limits, which are valid when using an average detector. Therefore, all spurious emissions above 1 GHz have been measured with the peak detector only, unless otherwise noted.

Worst-case results have been determined through pre-scans on all models (with all listed antennas where applicable). Final measurements have been done on type CM09-XT-US with W1030 antenna as being the worst case.

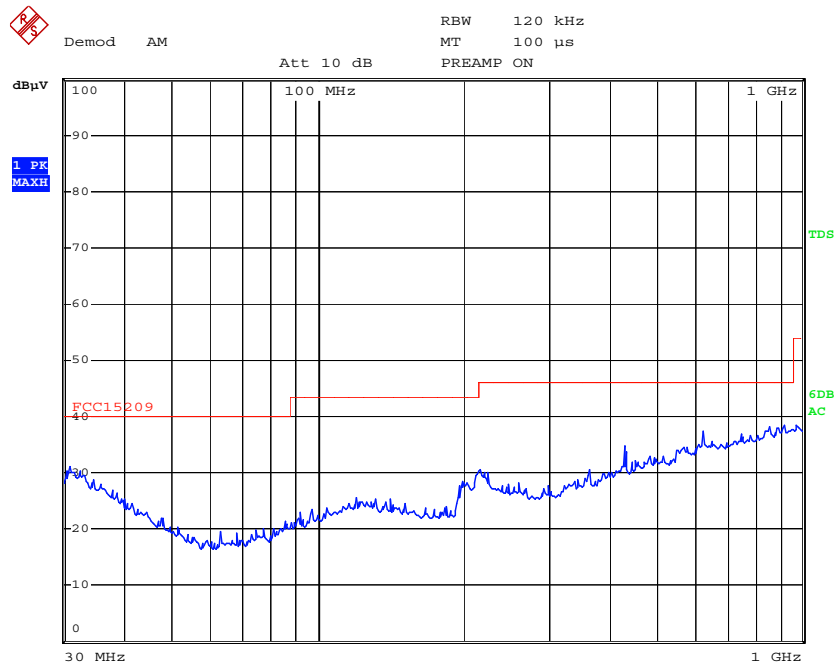
Frequency range: 150 kHz – 30 MHz (no emissions were detected below 150 kHz):



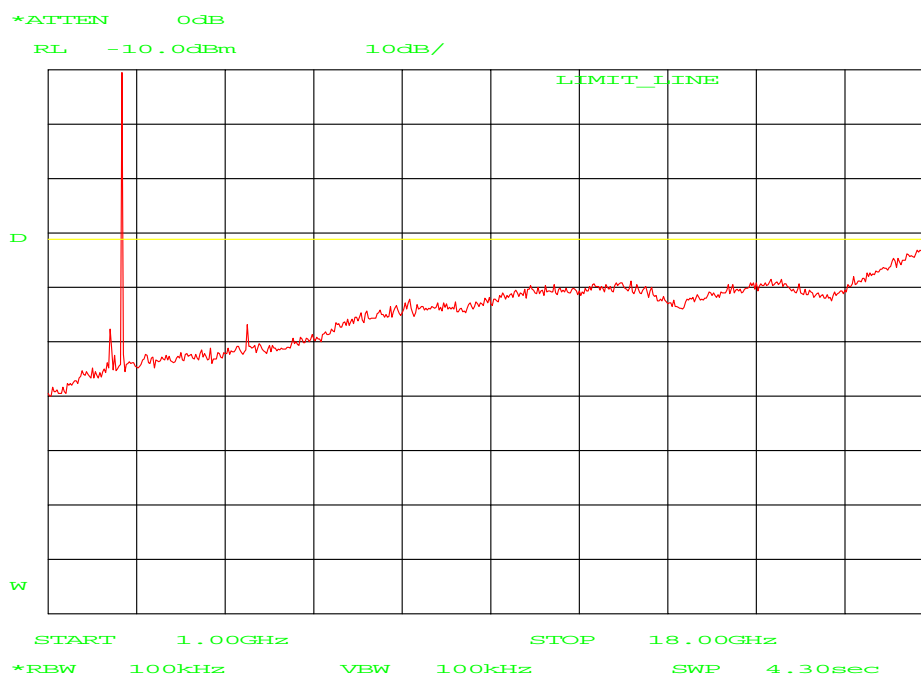
Vertical polarisation in the frequency range 30 MHz – 1 GHz:



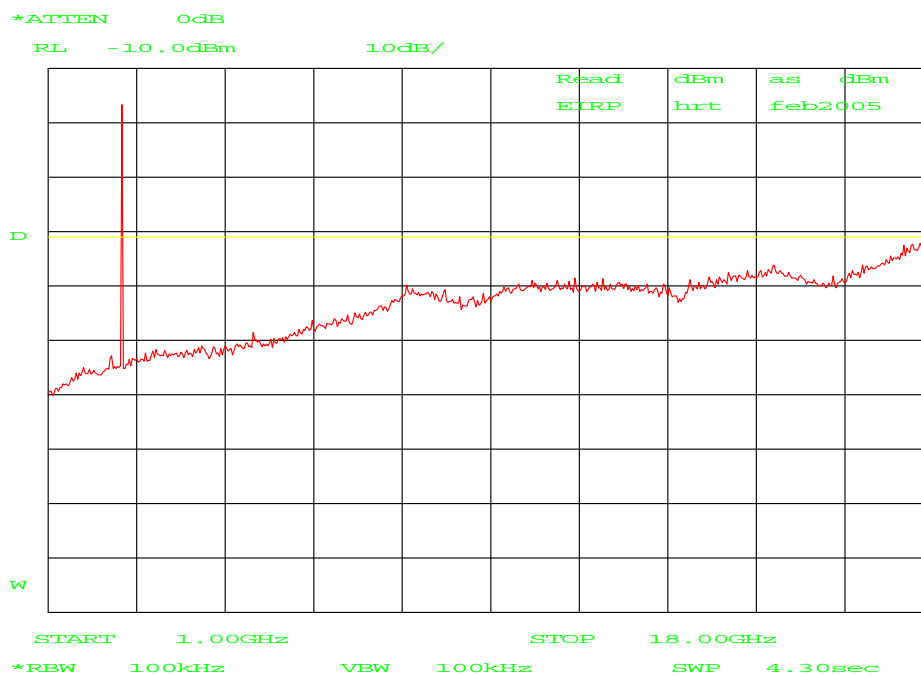
Horizontal polarisation in the frequency range 30 MHz – 1 GHz:



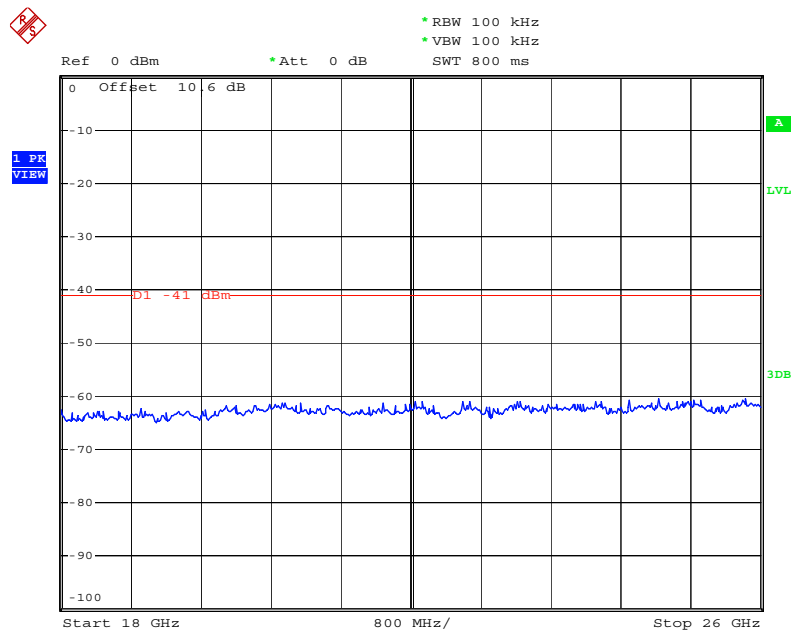
Vertical polarisation in the frequency range 1 GHz – 18 GHz:



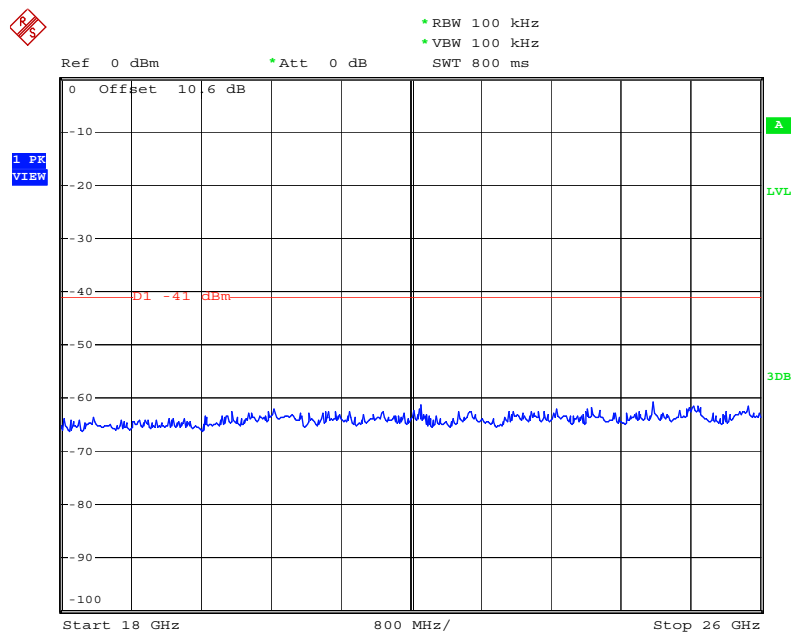
Horizontal polarisation in the frequency range 1 GHz – 18 GHz:



Vertical polarisation in the frequency range 18 GHz – 26 GHz:



Horizontal polarisation in the frequency range 18 GHz – 26 GHz:



Measurement uncertainty: + 2.6 / -3.3 dB (26 MHz-1000 MHz)
+4.5/-6.1 dB (1 GHz- 26 GHz)

Limit: see plot

2.3 Minimum 6 dB bandwidth

Compliance standard : FCC part 15, subpart C, section 15.247 (a)(2)
Method of test : KDB 558074

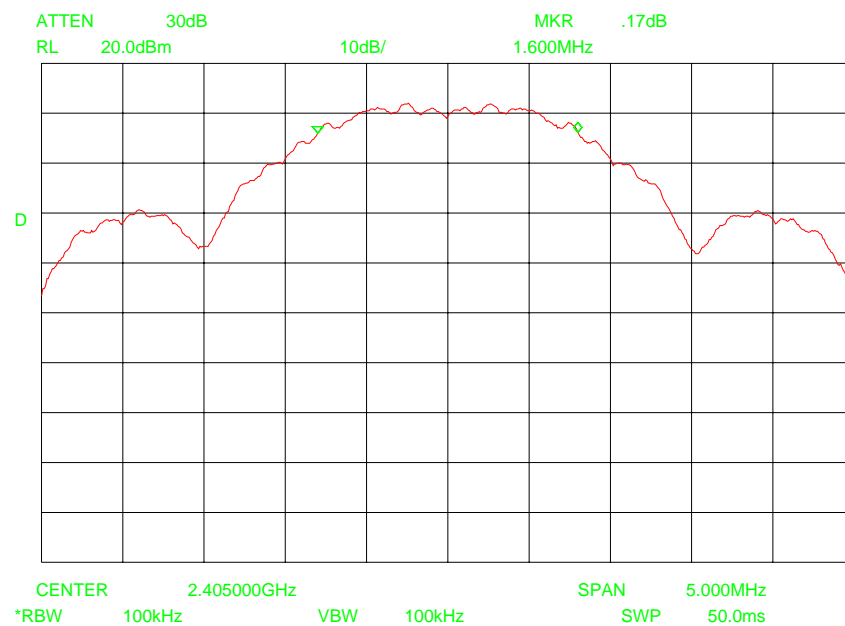
Ambient temperature : 24 °C
Relative humidity : 54 %

Peak antenna gain : 3 dBi

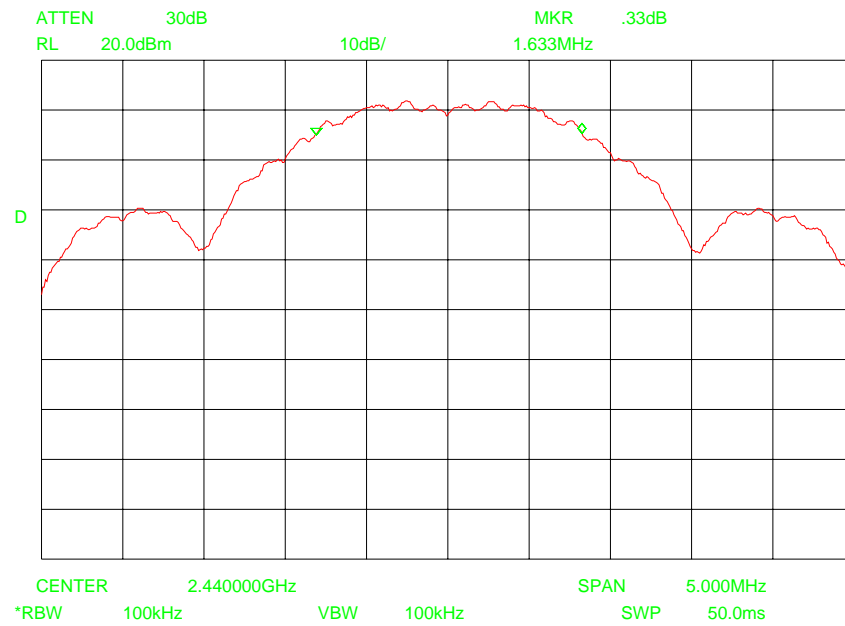
Test results : conducted measurement on antenna socket

Channel 11	Channel 18	Channel 26
1.600 MHz	1.633 MHz	1.550 MHz

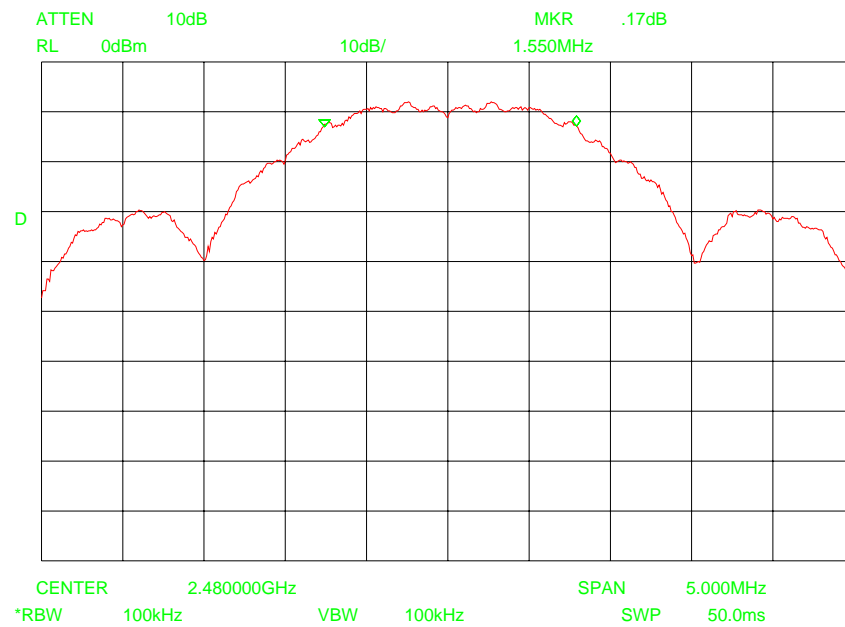
Channel 11:



Channel 18:



Channel 26:



Measurement uncertainty: + 23/- 23 kHz

2.4 Peak power output

Compliance standard : FCC part 15, subpart C, section 15.247 (b)(3)
Ambient temperature : 24 °C
Relative humidity : 54 %
Peak antenna gain : 3 dBi

Test results : conducted measurement on antenna socket,
no antenna gain included in test result.

Channel 11	Channel 18	Channel 26
15.3 dBm	16.2 dBm	-4.05 dBm

Measurement uncertainty: + 1.2 / -1.4 dB

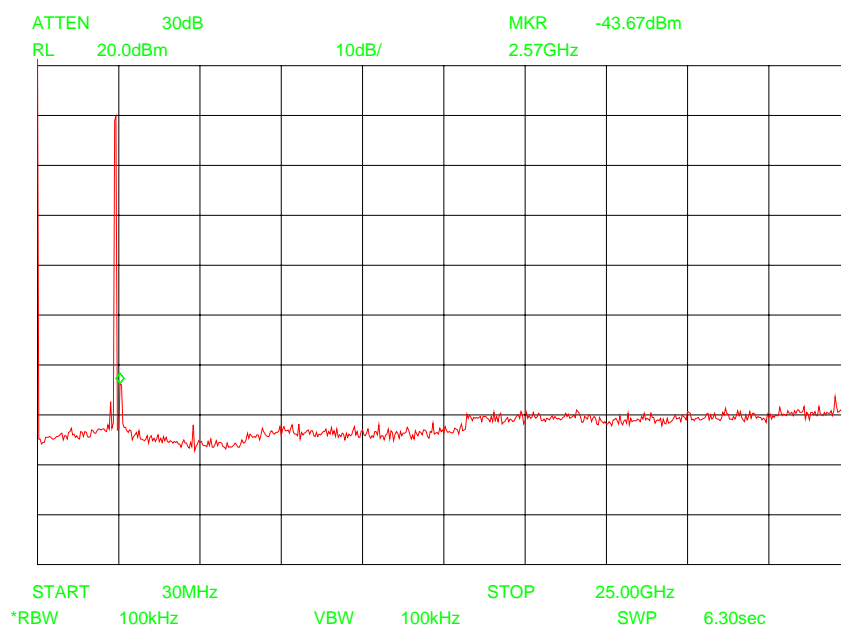
Limit: 30 dBm

2.5 Attenuation of unwanted emissions

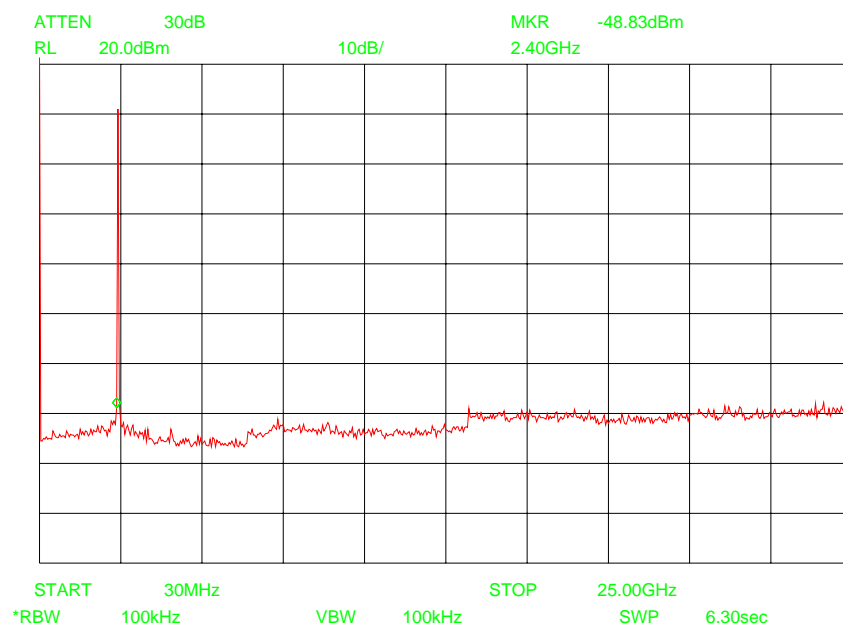
Compliance standard : FCC part 15, subpart C, section 15.247(d)
 Method of test : FCC part 15, subpart A, section 15.31(m), 15.33, 15.35.
 Ambient temperature : 24 °C
 Relative humidity : 54 %

Test results : conducted measurement on antenna socket

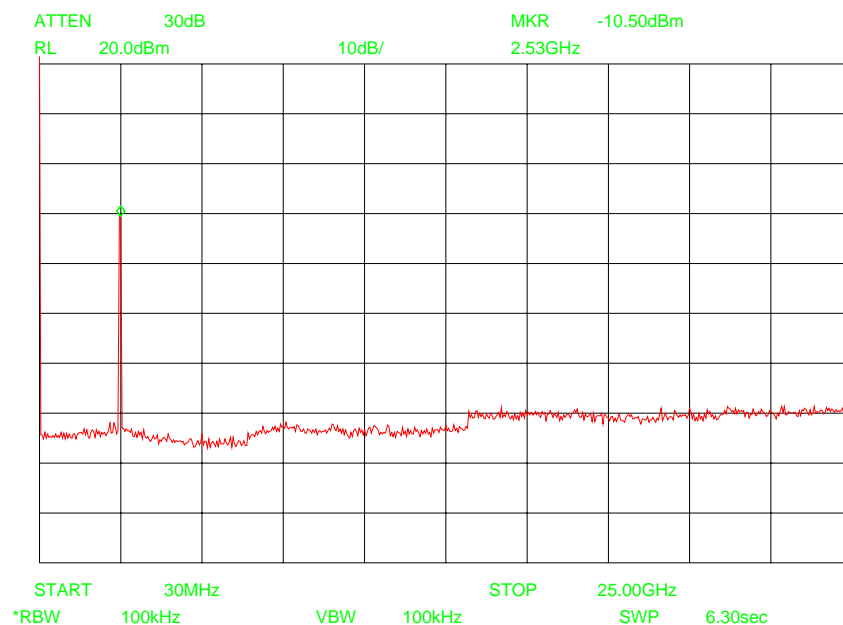
Channel 11:



Channel 18:



Channel 26:



No spurious emissions have been found in the frequency range .0.09 to 30 MHz

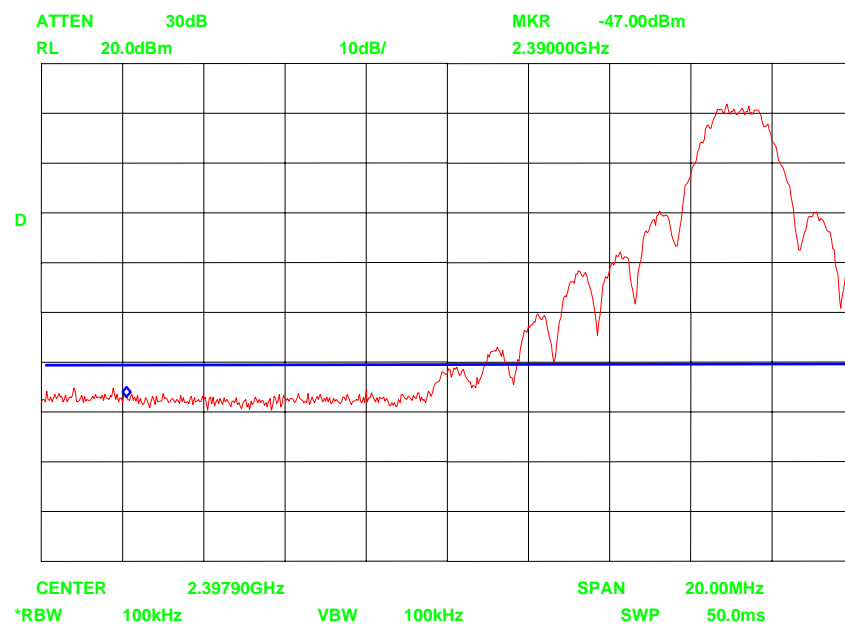
Limit : spurious signals > 20 dB below level of desired power

Measurement uncertainty : 0.03 – 2 GHz: +1.7 / -1.9 dB
 2 – 25 GHz +2.4 / -2.7 dB

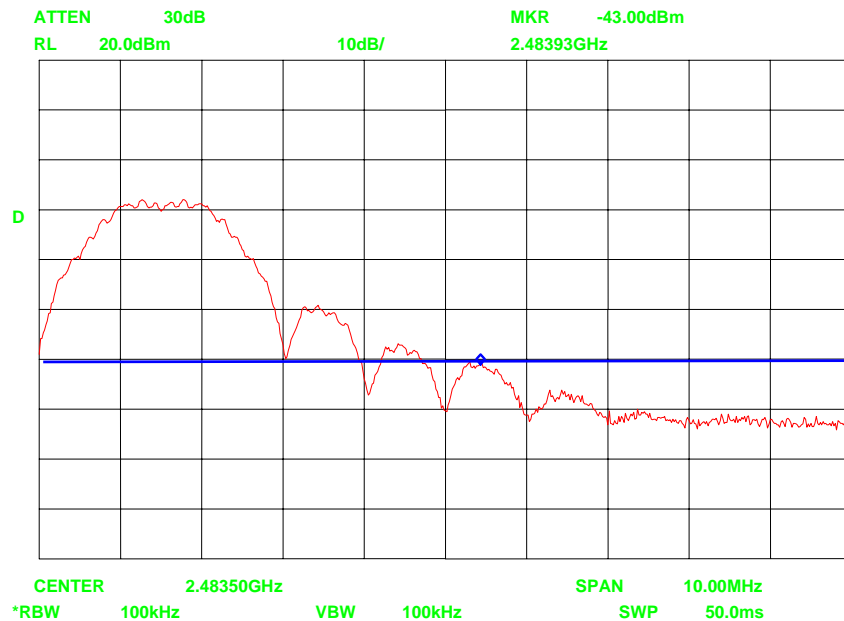
2.6 Attenuation of unwanted emissions in adjacent restricted bands

Compliance standard : FCC part 15, subpart C, section 15.247(d)
 Method of test : FCC Public Notice DA 00-705
 Ambient temperature : 24 °C
 Relative humidity : 54 %
 Peak antenna gain : 3 dBi
 Test results : conducted measurement on antenna socket

Lower restricted band, channel 11 (2310 MHz – 2390 MHz):



Higher restricted band, channel 26 (2483.5 MHz – 2500 MHz):



Restricted band (MHz)	Frequency (MHz)	Level (dBm, peak)	Limit (dBm, average)
2310 - 2390	2388.80	-46.0	-41.2
2310 - 2390	All other frequencies	< -47.0	-41.2
2483.5 - 2500	2483.93	-43.0	-41.2
2483.5 - 2500	All other frequencies	< -47.0	-41.2

All measured values with the detector in peak mode, are below the applicable limits, which are valid when using an average detector. See also section 2.5 of this test report.

No spurious emissions were found in the restricted bands 2310 - 2390 MHz and 2483.5 - 2500 MHz.

Measurement uncertainty: +2.4 dB / -2.7 dB

2.7 Attenuation of unwanted emissions in non-adjacent restricted bands

Compliance standard : FCC part 15, subpart C, section 15.247(d)
Method of test : FCC Public Notice DA 00-705

Ambient temperature : 24 °C
Relative humidity : 54 %

Peak antenna gain : 3 dBi

Test results : conducted measurement on antenna socket

Frequency (MHz)	Peak value (dB μ V/m)	Average value (dB μ V/m)
--	--	--
--	--	--
--	--	--
--	--	--
--	--	--

No unwanted emissions in non-adjacent restricted bands have been found.

Measurement uncertainty: not applicable

2.8 Peak power spectral density

Compliance standard : FCC part 15, subpart C, section 15.247 (e)
Method of test : FCC KDB Publication No. 558074

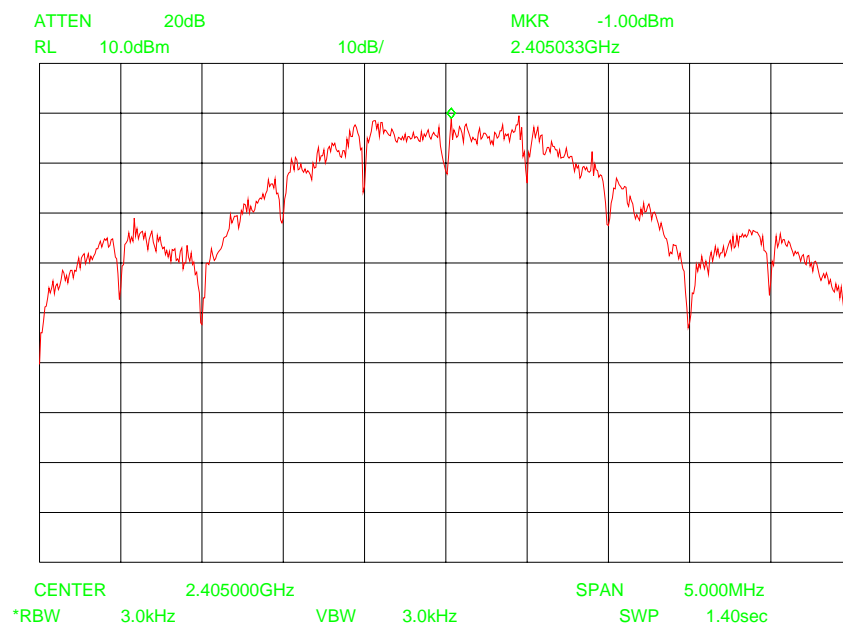
Ambient temperature : 24 °C
Relative humidity : 54 %

Peak antenna gain : 3 dBi

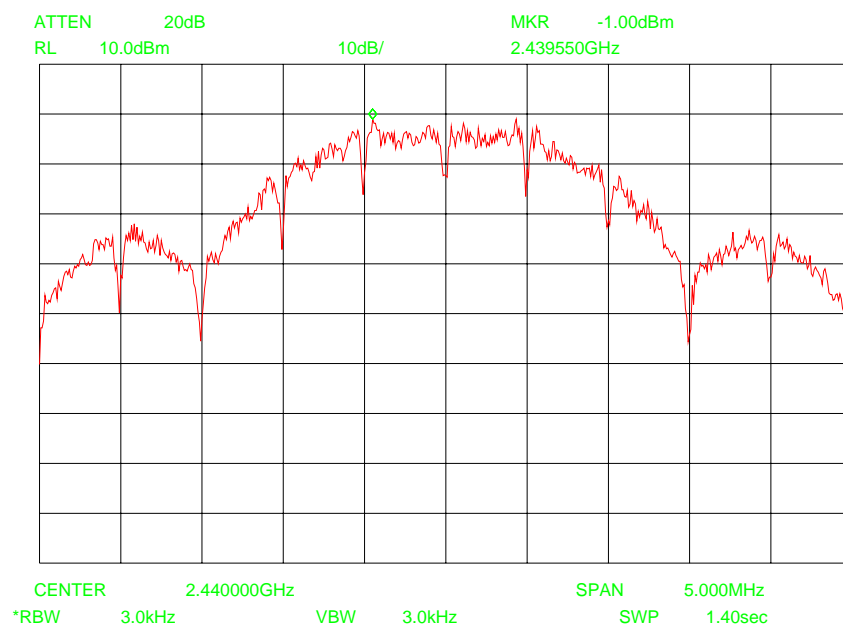
Test results : conducted measurement on antenna socket

Channel 11	Channel 18	Channel 26
-1.00 dBm/3 kHz	-1.00 dBm/3 kHz	-21.33 dBm/3 kHz

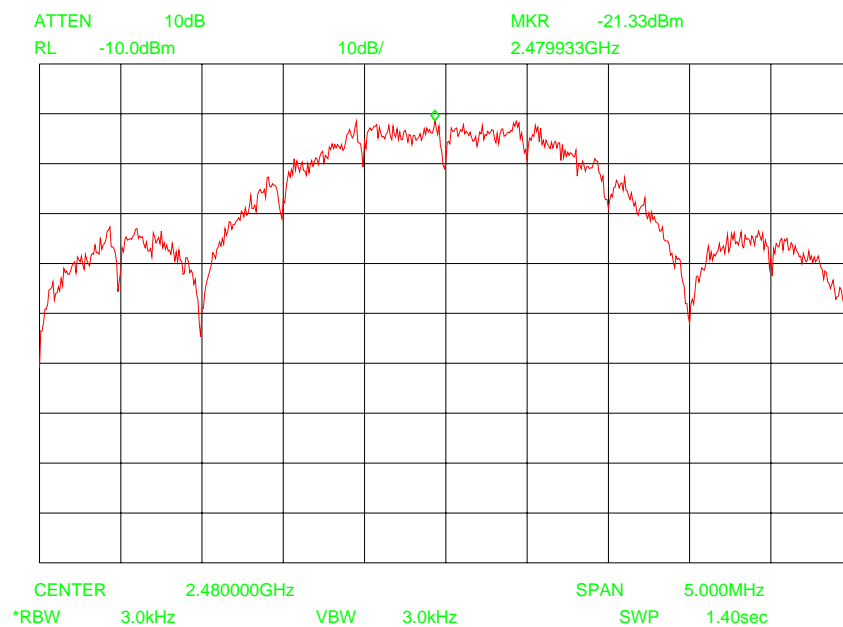
Channel 11:



Channel 18:



Channel 26:



Limit : max 8 dBm / 3 kHz

Measurement uncertainty : + 2.4/ -2.7 dB

Used test equipment module

Description	TE. ID	Manufacturer	Model	Used at par.
EMI test receiver	TE 11128	R & S	ESCI	2.2
Two line V-network	TE 00208	R & S	ESH3 Z5	2.2
Spectrum Analyzer	TE 00359	Hewlett Packard	HP 8563E	2.3, 2.4, 2.5, 2/6. 2.7, 2.8
Spectrum Analyzer	TE 11125	R & S	FSP	2.3
Power meter	TE 00489	Hewlett Packard	HP 437B	2.5
Power sensor	TE 00485	Hewlett Packard	HP 8481A	2.5
Anechoic chamber	TE 01064	Euroshield	RFD-F-100	2.3
Semi anechoic room	TE 00861	Comtest	--	2.3
Loop antenna	TE 00746	R & S	HFH2-Z2	2.3
Biconilog antenna	TE 00967	Chase	CBL6112A	2.3
Horn antenna	TE 00818	Flann		2.3
Temp/hum logger	TE 01114	MicroLog	EC 650	All
Laptop	--	Dell	--	All

Revision history

REVISION	DATE	REMARKS
1.0	6 May 2009	Change of Hardware version on page 4
2.0	8 June 2009	Correction misspelling GreenPeak and modification FCC ID
3.0	12 June 2009	Correction of title page, correction of layout on page 20, addition of statement on page 22.