



Radio test report 99761931

based on:

- FCC Part 15 Subpart C, sections 15.209 and 15.249 (10-1-05 Edition)
- RSS-210, Issue 6 (Sept. 2005 edition)

Cordless Mouse
Logitech
M-RBU126

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This report comprises of four modules. The total number of pages is: 19

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 17025:1999. 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.

Ordering party:

Company name : Logitech Europe S.A.
Address : Z.I. Moulin du Choc D
Zipcode : 1122
City/town : Romanel sur Morges
Country : Switzerland
Date of order : 2 June 2006

2 Product

A sample of the following product was submitted for testing:

Product description	: Cordless Mouse
Manufacturer	: LOGITECH Technolory Co., LTD
Trade mark	: Logitech
Type designation	: M-RBU126
FCC ID	: DZL202251
Hardware version	: --
Serial number	: --
Software release	: --

3 Test schedule

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

Tests were carried out at the following location:

- Telefication, Zevenaar

The samples of the product were received on:

- 6 June 2006

Tests were carried out from:

- 19 June 2006 to 29 June 2006

4 Product documentation

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

Description:	Date:	Identification:
Product description	June 2006	M-RBU126_Description_GB.doc
Circuit diagrams	5 May 2006	SCH-222251-0000
Parts list	8 June 2006	M-RBU126 BOM_revA0.xls
PCB layout drawings Main PCB	31 May 2006	Madeira M-RBU126 Rev A0
Testing indications	2 June 2006	Testing indications for the Cordless Optical Mouse M-RBU126.doc

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

5 Observations and comments

The M-RBU126 is a wireless mouse. A sample with special firmware was supplied to be able to test the radio parameters. It is also possible to set the transmit power approximately 6 dB lower. In this reduced power mode, the M-RBU126 also complies to all required paragraphs.

A reservation was made to perform radiated emission measurement on the following Open Area Test Site:

TNO Electronic Products & Services (EPS) B.V
Smidshornerweg 18
9822 TL Niekerk
The Netherlands

FCC listed : 90828
Industry Canada : IC3501

Since the exploratory measurements revealed no emissions in the frequency range 30 - 1000 MHz, the final measurements on the Open Area Test Site, as listed above, were judged unnecessary. Refer to chapter 2.2 “*Field strength of unwanted emissions 30 - 1000 MHz*” for details.

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(s):

INTENTIONAL RADIATOR OPERATING IN THE FREQUENCY BAND 2400 - 2483.5 MHz

The sample was tested according to the following specification(s):

FCC Part 15 Subpart C, section 15.209 and 15.249 (10-1-05 Edition);
RSS-210, Issue 6 (Sept. 2005 edition).

8 Conclusions

The samples 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 does not accept any responsibility for the results stated in this test report, with respect to the properties of product items not involved in these tests.

All tests are performed by:

name : S. J. van Spijker

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 : 20 July 2006

name : J.P. van de Poll

function : Co-ordinator Test Group

signature : 

Test results module

1 General information

1.1 Equipment information

Rated RF output power	n.a., integral antenna
Rated radiated RF power	-1 dBm
Operating frequency range	2402 MHz to 2479 MHz (24 channels)
Modulation	GFSK
Modulation bit rate	1 Mbits/s
ITU emission class	1M00F1D
FCC ID	DZL202251

2 Emission tests

2.1 Field strength of intentional signal

Compliance standard : FCC part 15, subpart C, section 15.249 (a) & (e)
RSS-210 (Issue 6, Sept 2005) section A2.9
Method of test : ANSI C63.4-2003, sections 5.5 & 8.2.4
RSS-GEN (Issue 1, Sept 2005) section 4.6

Test results :

average field strength:

Frequency (MHz)	Test result @ 3 m distance (dB μ V/m) (AV)	Polarisation	Limit (dB μ V/m)
2.402	79.7	H	93.98
2.402	73.7	V	93.98
2.448	79.0	H	93.98
2.448	78.5	V	93.98
2.479	80.9	H	93.98
2.479	77.0	V	93.98

peak field strength:

Frequency (MHz)	Test result @ 3 m distance (dB μ V/m) (PK)	Test result dBm EIRP	Polarisation	Limit (dB μ V/m)
2.402	92.7	-2.5	H	113.98
2.402	86.7	-8.5	V	113.98
2.448	92.0	-3.17	H	113.98
2.448	91.5	-3.67	V	113.98
2.479	93.9	-1.33	H	113.98
2.479	90.0	-5.17	V	113.98

Note: Only peak power was measured. The formula for conversion from power to field strength is:

$$FS \text{ (dB}\mu\text{V/m)} = \text{EIRP (dBm)} + 95.2 \text{ dB}$$

The average field strength can be calculated by the following formula:

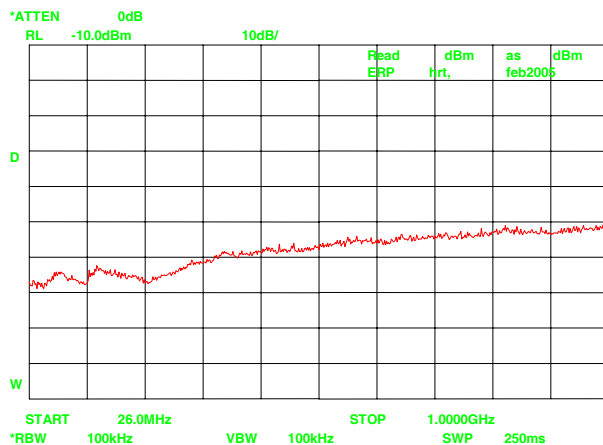
$$FS_{\text{average}} \text{ (dB}\mu\text{V/m)} = FS_{\text{peak}} \text{ (dB}\mu\text{V/m)} - 10 \log (1/x) \text{ where } x \text{ is the dutycycle (in this case 0.05).}$$

Measurement uncertainty	+4.5/-6.1 dB
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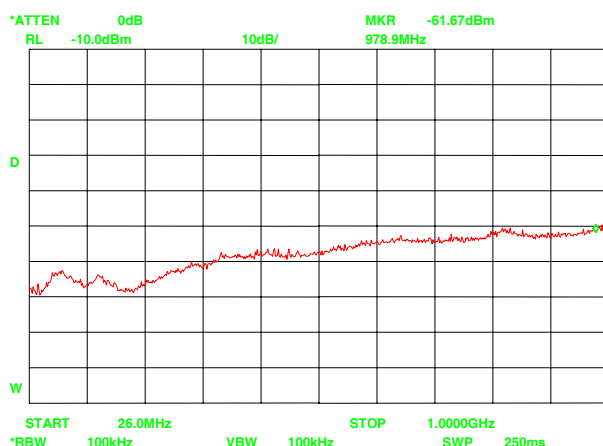
2.2 Field strength of unwanted emissions 30 - 1000 MHz

Compliance standard	:	FCC part 15, subpart C, section 15.209 (a) RSS-GEN (Issue 1, Sept 2005) section 4.7 RSS-210 (Issue 6, Sept 2005) sections 2.6 & A2.9
Method of test	:	ANSI C63.4-2003, sections 5.5, 8.2.3, 8.2.4 & 8.3.1.2; FCC part 15, subpart A, section 15.31(m), 15.33, 15.35.
EUT condition	:	2448 MHz channel
Test results	:	

Exploratory measurements of unwanted emissions 30 - 1000 MHz



pre-scan data 30 - 1000 MHz Horizontal



pre-scan data 30 - 1000 MHz Vertical

No unwanted emissions in the frequency range 30 - 1000 MHz were detected during the exploratory measurements. Accordingly, measurements on an Open Area Test Site were judged unnecessary.

Measurement uncertainty: N/A

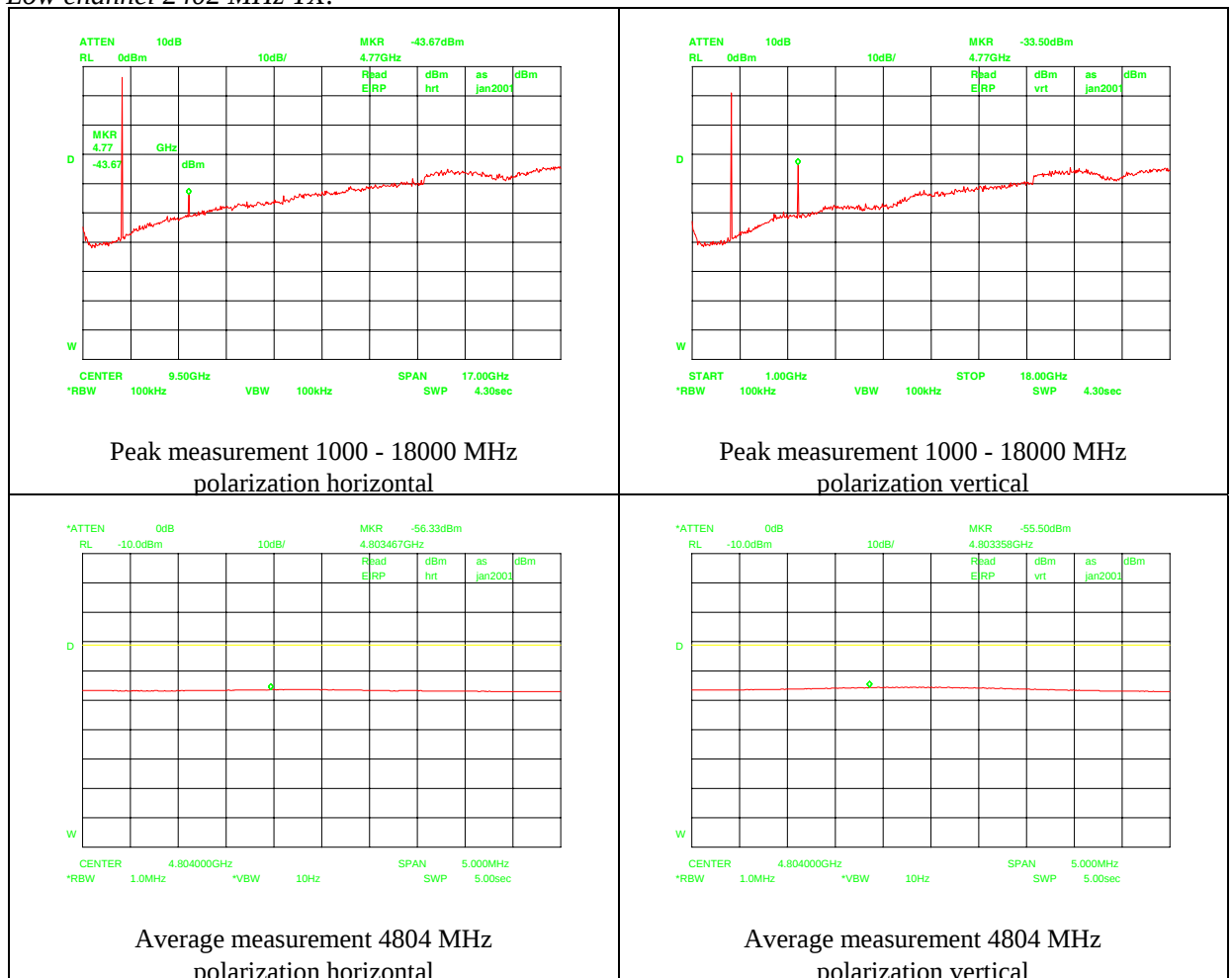
2.3 Field strength of unwanted emissions > 1000 MHz

Compliance standard : FCC part 15, subpart C, section 15.205 (a), (b) & (c), 15.209 (a) & 15.249 (a) & (e)
RSS-GEN (Issue 1, Sept 2005) section 4.7
RSS-210 (Issue 6, Sept 2005) section A2.9

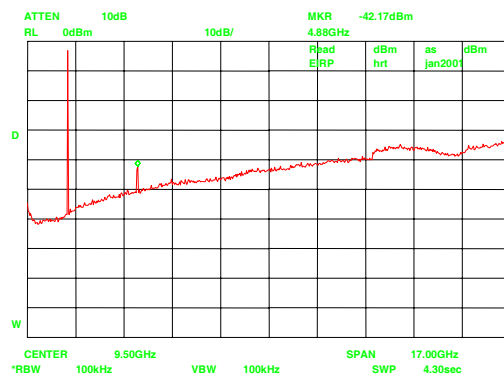
Method of test : ANSI C63.4-2003, sections 5.5, 8.2.3, 8.2.4 & 8.3.1.2;
FCC part 15, subpart A, section 15.31(m), 15.33, 15.35.
RSS-GEN (Issue 1, Sept 2005) section 4.7

Test results :

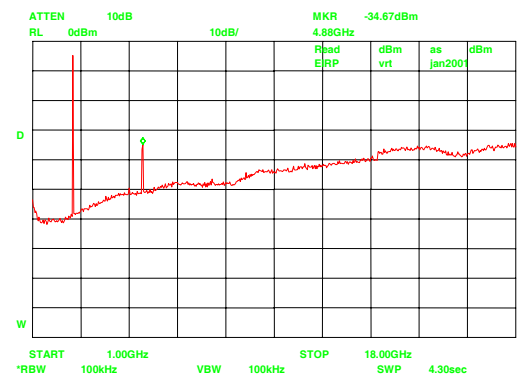
Low channel 2402 MHz TX:



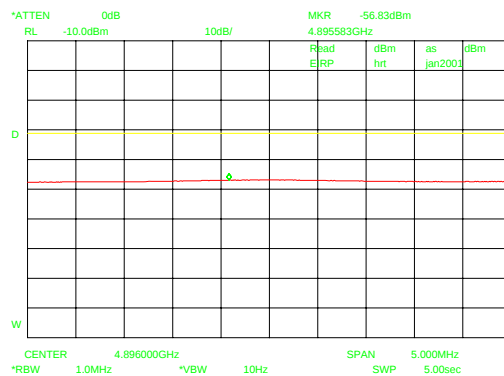
Mid channel 2448 MHz TX



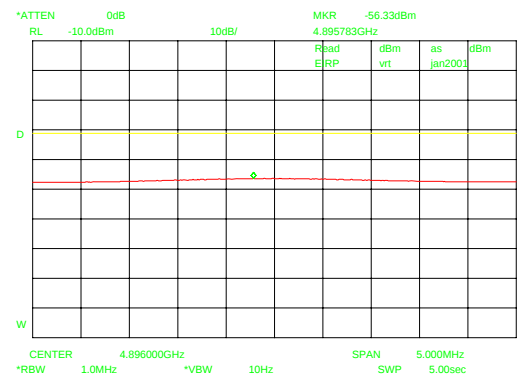
Peak measurement 1000 - 18000 MHz
polarization horizontal



Peak measurement 1000 - 18000 MHz
polarization vertical

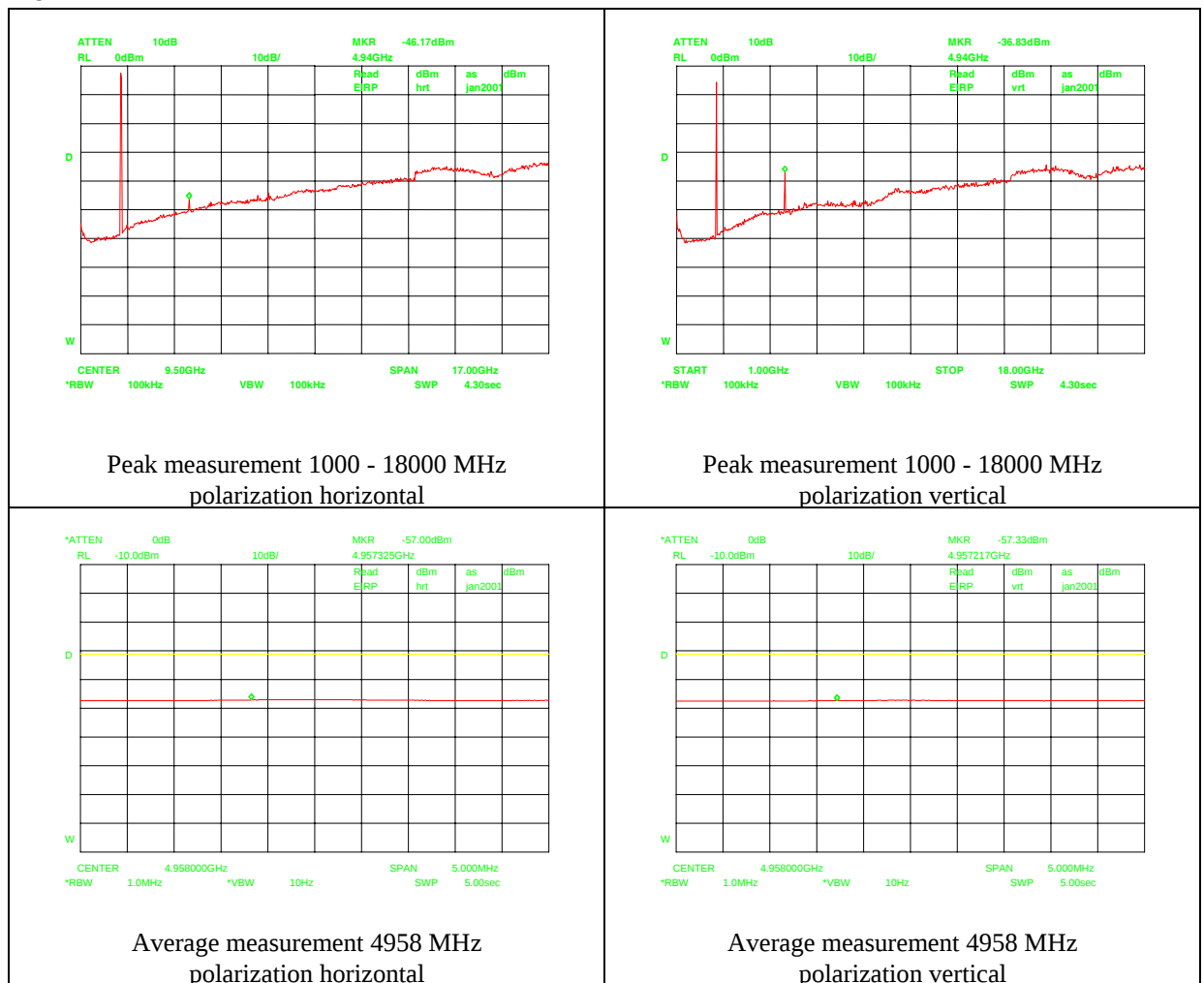


Average measurement 4896 MHz
polarization horizontal



Average measurement 4896 MHz
polarization vertical

High channel 2479 MHz TX:



Peak field strength of harmonics

Frequency (GHz)	Test result @ 3 m distance (dB μ V/m) (PK)	Polarisation	Limit (dB μ V/m)
4.77	51.58	H	74
4.77	61.75	V	74
4.88	53.08	H	74
4.88	60.58	V	74
4.94	49.08	H	74
4.94	58.42	V	74

Average field strength of harmonics

Frequency (GHz)	Test result @ 3 m distance (dB μ V/m) (AV)	Polarisation	Limit (dB μ V/m)
4.77	38.87	H	54
4.77	39.7	V	54
4.88	38.37	H	54
4.88	38.87	V	54
4.94	38.2	H	54
4.94	37.87	V	54

In the frequency band from 30 MHz to 18 GHz, only harmonics were found.
Above 18 GHz, no spurious components were found at all.

All found spurious emissions are harmonics and fall within a restricted band (4.5 – 5.15 GHz).
The field strengths of these emissions are below the limit of 15.209.

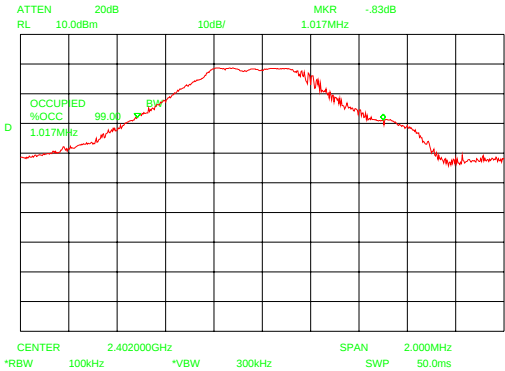
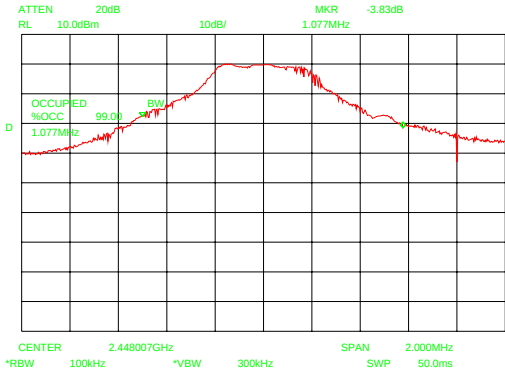
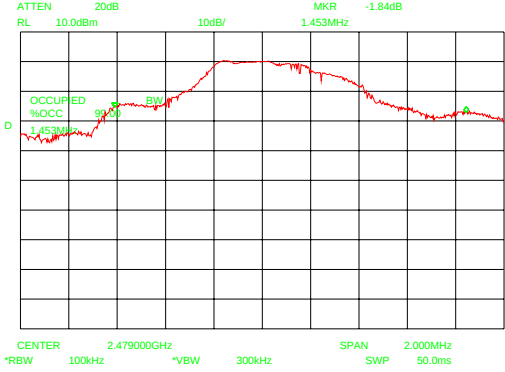
Measurement uncertainty	+4.5/-6.1 dB
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3 Bandwidth measurements

3.1 Occupied Bandwidth

Method of test : RSS-GEN (Issue 1, Sept 2005) section 4.4.1

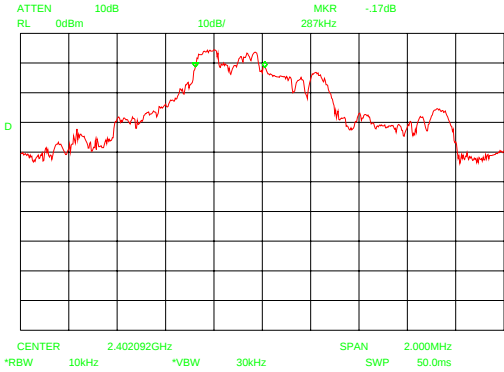
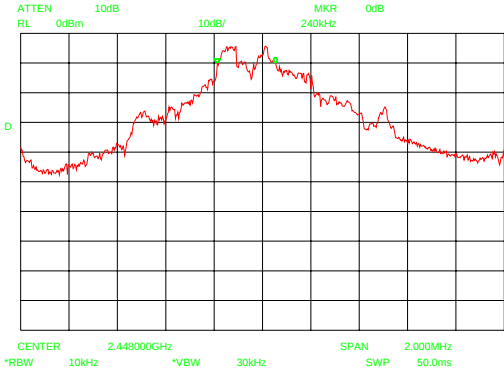
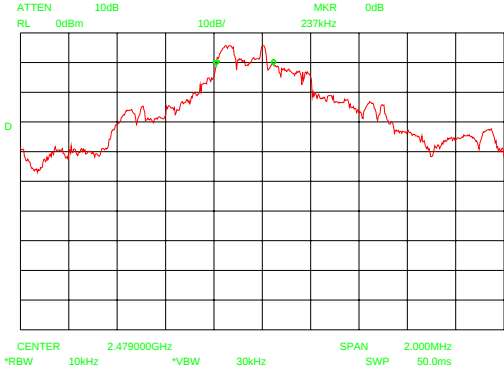
Test results :

 Low channel (2402 MHz) Occupied bandwidth: 1.017 MHz	 Middle channel (2448 MHz) Occupied bandwidth: 1.077 MHz
 High channel (2479 MHz) Occupied bandwidth: 1.453 MHz	
Measurement uncertainty	± 196 kHz

3.2 6dB Bandwidth

Method of test : RSS-GEN (Issue 1, Sept 2005) section 4.4.2

Test results :

	
Low channel (2402 MHz) 6 dB bandwidth: 287 kHz	Middle channel (2448 MHz) 6 dB bandwidth: 240 kHz.
	
High channel (2479 MHz) 6 dB bandwidth: 237 kHz	
Measurement uncertainty	± 196 kHz

4 Frequency stability

Compliance standard : RSS-210 (Issue 6, Sept 2005) section 2.1
Method of test : RSS-GEN (Issue 1, Sept 2005) section 4.5

Test results :

Temperature	Supply voltage	Measured Frequency (MHz)		
		Low channel	Mid channel	High channel
-30	1.5 V	2402.029800	2448.031940	2479.032940
20	0.9 V	2402.044130	2448.044980	2479.045610
	1.5 V	2402.044140	2448.044975	2479.045590
50	1.5 V	2402.031290	2448.031870	2479.032110
Measurement uncertainty		+/- 2 kHz		

Under extreme conditions the equipment must remain in the assigned band.

With a 99 % occupied bandwidth of 1.017 MHz in the lowest channel (2402 MHz) and 1.453 MHz in the highest channel (2479 MHz) the signal remains in the band of 2400 – 2483.5 MHz.

Used test equipment module

Description	ID / SN	Manufacturer	Model
Spectrum Analyzer	TE 00481	Hewlett Packard	HP8563E
RF Pre-amplifier up to 1000 MHz	TE 00098	Rohde & Schwarz	ESV-Z3
RF Pre-amplifier 1 - 26.5 GHz	TE 00093	Hewlett Packard	HP8449B
Biconilog antenna	TE 00700	Emco	3143
Horn Antenna	TE 00532	Emco	3115
Horn Antenna	TE 00533	Emco	3116
Anechoic Chamber	TE01064	Euroshield	RFD-F-100
Digital Thermometer	TE 00388	Fluke	Fluke 51
Antenna tower	--	HD	AS 620p
Turntable	--	HD	DS 412
Turntable controller	--	HD	HD 050
Climate chamber	TE 00741	CTS	C40-350

Cross reference table

Transmitter	
CNR RSS-210 Issue 6	FCC 47 CFR Ch. 1 part 15, subpart C (10-1-04 Edition)
A2.9	§ 15.209 & § 15.249