

Radio test report 20103223301

based on:

- FCC part 15; subpart C; section 15.247 (ed. 10-1-09);
FCC part 15, subpart B, section 15.109 (ed. 10-1-09);
IC RSS 210, Annex 8 (issue 7)

UHF EPC Gen 2 RFID Reader
NEDAP
UPASS-REACH

Contents

MAIN MODULE.....	3
1.....INTRODUCTION	3
2.....PRODUCT	4
3.....TEST SCHEDULE	4
4.....PRODUCT DOCUMENTATION.....	5
5.....OBSERVATIONS AND COMMENTS	5
6.....MODIFICATIONS TO THE SAMPLE.....	5
7.....SUMMARY.....	5
8.....CONCLUSIONS	6
TEST RESULTS MODULE.....	7
1.....GENERAL INFORMATION	7
1.1 Equipment information	7
1.2 Tested channels.....	7
2.....EMISSION TESTS	8
2.1 Carrier frequency separation.....	8
2.2 Number of hopping frequencies.....	9
2.3 Average time of occupancy.....	10
2.4 20 dB bandwidth.....	12
2.5 Maximum output power.....	14
2.6 Band edge compliance	16
2.7 Tx unwanted emissions attenuation (radiated, 0.03 – 1 GHz)	18
2.8 Tx unwanted emissions attenuation (radiated, 1 – 10 GHz)	20
2.9 Tx unwanted emissions in the restricted bands	22
2.10 Rx unwanted emissions (radiated, 0.03 – 1 GHz).....	23
2.11 Rx unwanted emissions (radiated, > 1GHz).....	25
USED TEST EQUIPMENT MODULE.....	27
CROSS REFERENCE TABLE.....	28

This report comprises of three modules. The total number of pages is: 28

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.

Ordering party:

Company name : N.V. Nederlandsche Apparatenfabriek Nedap
Address : 2e Parallelweg
Zipcode : 7141 DC
City/town : Groenlo
Country : The Netherlands
Date of order : 25 February 2010

2 Product

A sample of the following product was submitted for testing:

Product description	: UHF EPC Gen 2 RFID Reader
Manufacturer	: N.V. Nederlandsche Apparatenfabriek Nedap
Trade mark	: NEDAP
Type designation	: UPASS-REACH
FCC ID	: CGDUPASS-REACH
IC ID	: 1444A-UPASSRCH
Hardware version	: A02
Serial number	: --
Firmware release	: 2.04

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 sample of the product is received on:

- 19 April 2010

Tests are carried out between:

- 19 April 2010 and 12 May 2010

4 Product documentation

For production of this report the following product documentation has been used:

Description:	Date:	Identification:
Pseudorandom hop sequence selection	5/11/2010	PseudoRandomHopSequenceSelection_μPASS reach.pdf
Operational description μPASS Reach	5/4/2010	OperationalDescription_uPASS Reach.pdf
UHF Dipole region 2&3 T1092056_A03	5/4/2010	OperationalDescription_UHF_Dipole_Region_2&3.pdf
R902DRM Summary datasheet	Jan. 2010	IDS Microchip AG
Block diagram	12/01/2010	NEDAP dwg. no. 1092040

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 equipment under test (EUT) is intended for vertical mount position. All tests are performed with the EUT in this position.

For compliance testing use has been made of a software tool named “Nedap AVI UHF Tool, version 2.3”. This tool provided settings for continuous transmit on one channel, intermittent transmit on one channel, frequency hopping and channel frequency.

6 Modifications to the sample

No modifications are 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 902 - 928 MHz

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

FCC part 15; subpart C; section 15.247 (ed. 10-1-09); FCC part 15, subpart B, section 15.109 (ed. 10-1-09); IC RSS 210, Annex 8 (issue 7)

8 Conclusions

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

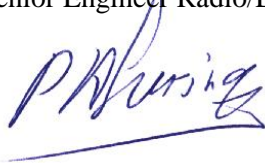
The results of the tests as stated in this report, are exclusively applicable to the product item as identified in this report. Telefication accepts no responsibility for any stated properties of product items in this test report, which are not supported by the tests as specified in section 7 "Summary".

All tests are performed by:

name : ing. P.A. Suringa

function : Senior Engineer Radio/EMC

signature :



Review of test report by:

name : G.J. Gort

function : Senior Test Engineer

signature :



The above conclusions have been verified by the following signatory:

Date : 17 May 2010

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

function : Manager Laboratory

signature :



Test results module

1 General information

1.1 Equipment information

Type of equipment	Spread spectrum transceiver
Modulation	ASK
Spreading type	FHSS
Number of hopping channels	50
Operating frequency range	902 -928 MHz
Rated radiated power	1 Watt
Type of antenna	Dipole, horizontally polarized
Antenna gain	approx. 6.5 dBi

1.2 Tested channels

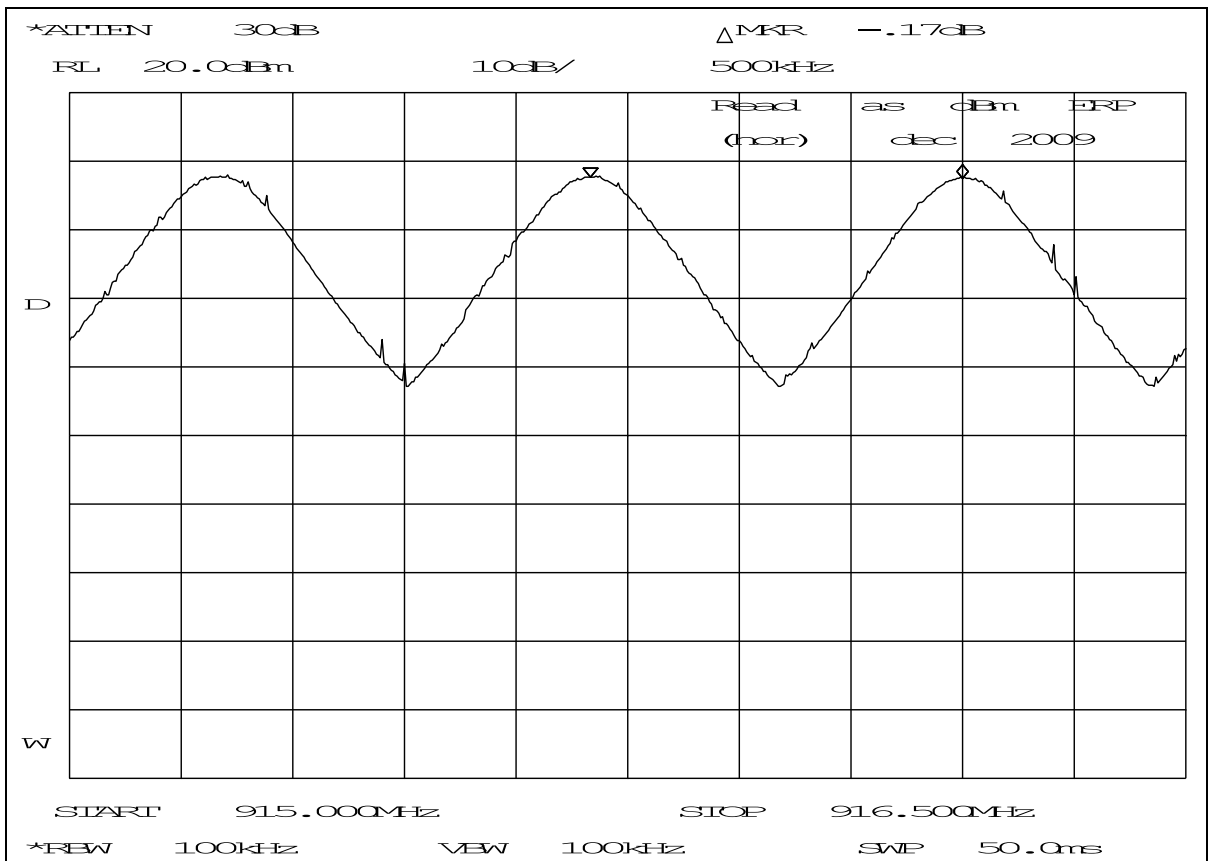
	Tx	Rx
Channel 1 (MHz)	902.7	902.7
Channel 2 (MHz)	915.2	915.2
Channel 3 (MHz)	927.2	927.2

2 Emission tests

2.1 Carrier frequency separation

Compliance standard : FCC part 15, subpart C, section 15.247 (a) (1)
 Method of test : FCC Public Notice DA 00-705
 Ambient temperature : 23 °C
 Relative humidity : 23 %

Test result :



Measurement uncertainty: +/- 2.9 kHz

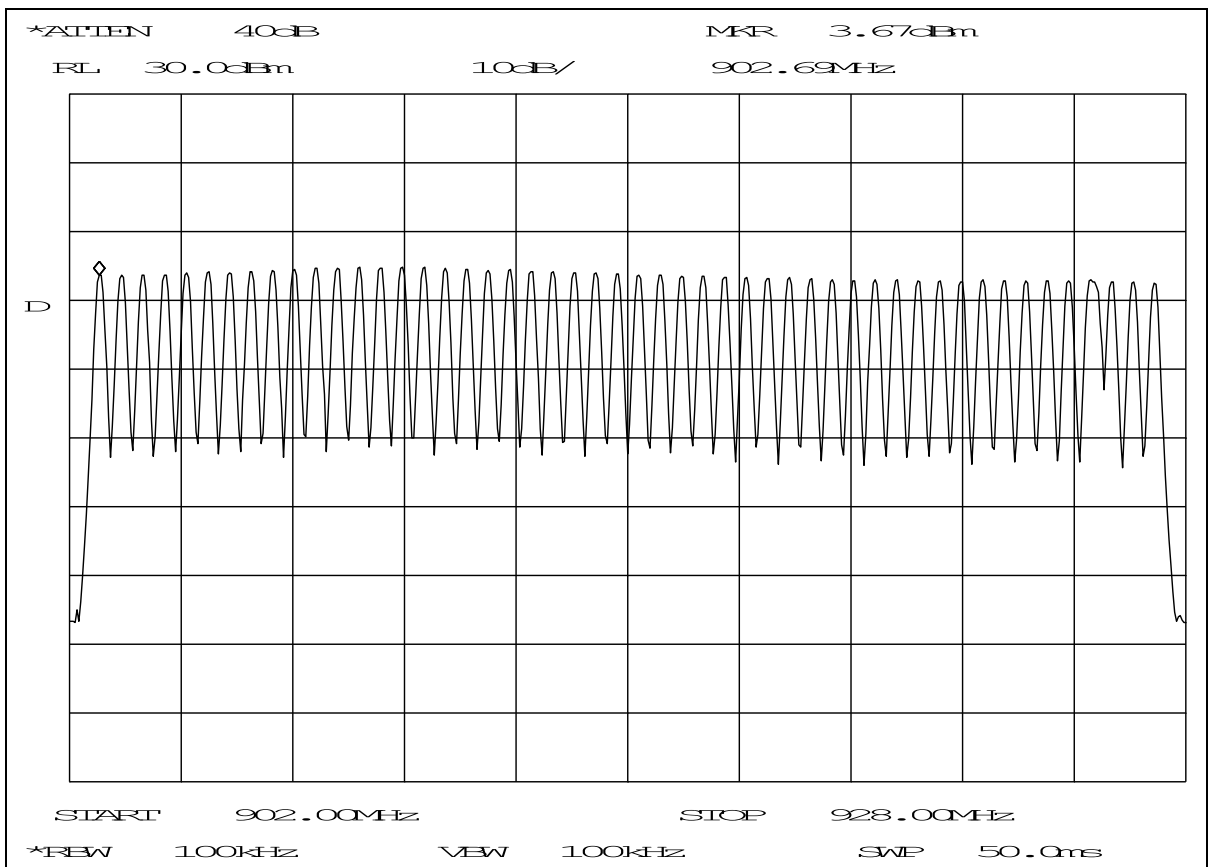
Limit:

Carrier frequency separation	At least 25 kHz or the 20 dB bandwidth , whichever is greater
------------------------------	---

2.2 Number of hopping frequencies

Compliance standard : FCC part 15, subpart C, section 15.247 (a) (1) (i)
 Method of test : FCC Public Notice DA 00-705
 Ambient temperature : 23 °C
 Relative humidity : 23 %

Test result :



No. of hopping frequencies: 50

Measurement uncertainty: not applicable

Limit:

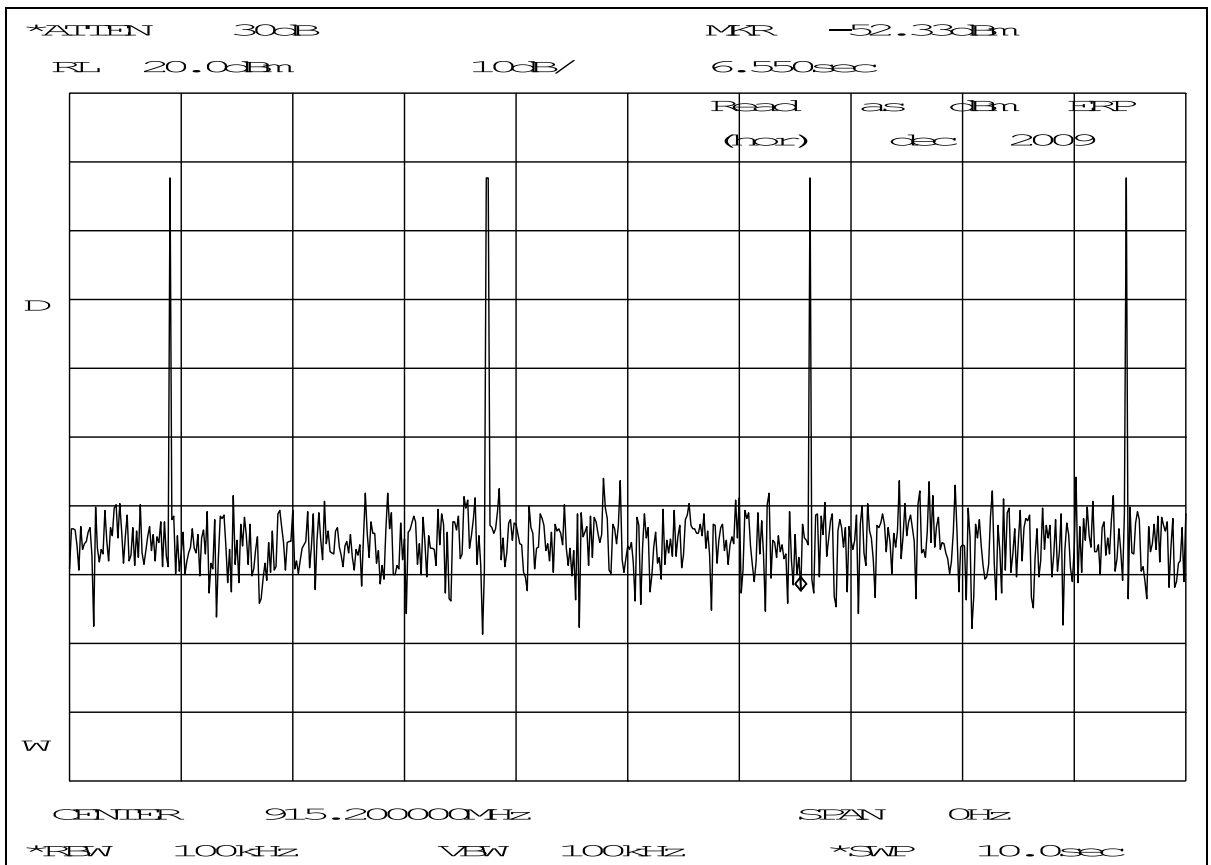
Number of hopping frequencies	If the 20 dB bandwidth of the hopping channel is less than 250 kHz: at least 50. If the 20 dB bandwidth of the hopping channel is 250 kHz or greater: at least 25
-------------------------------	--

2.3 Average time of occupancy

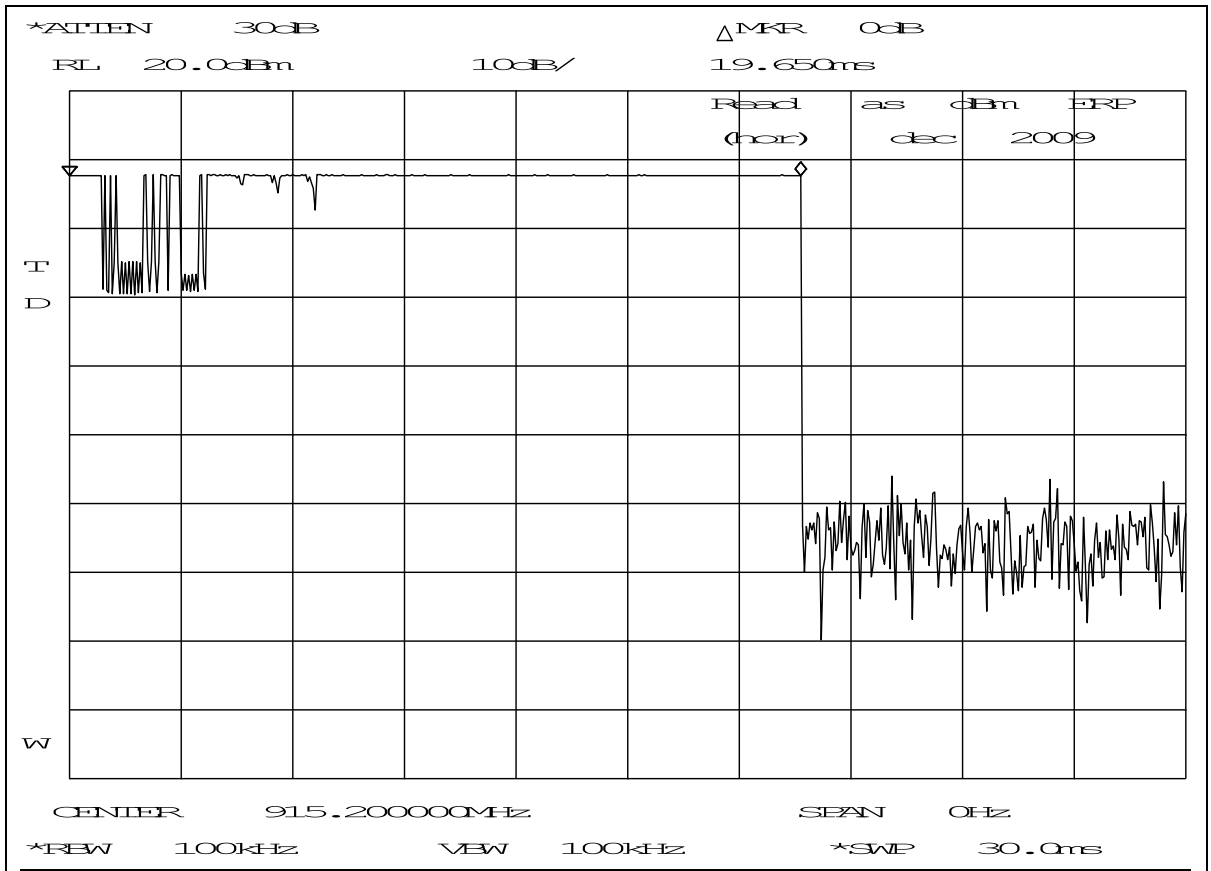
Compliance standard : FCC part 15, subpart C, section 15.247 (a) (1) (i)
 Method of test : FCC Public Notice DA 00-705
 Ambient temperature : 23 °C
 Relative humidity : 23 %

Test result :

Plot 1: No. of hops in 10 sec.



Plot 2: dwell time of 1 hop



Calculation:

Average time of occupancy = no. of hops in 10 sec. * dwell time of one hop = 4 * 19.65 msec. = 78.6 msec.

Measurement uncertainty: +/- 0.34 msec.

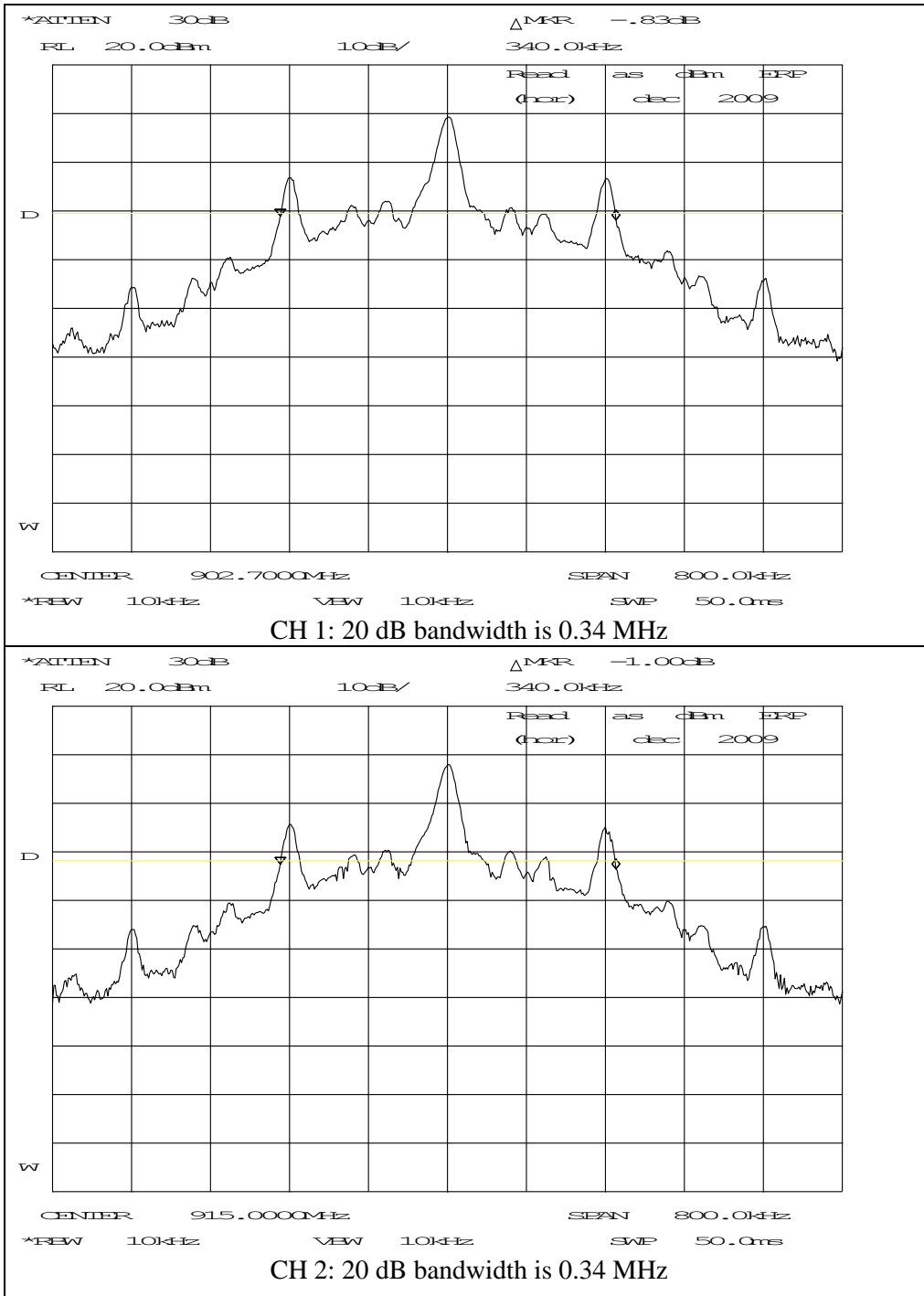
Limit:

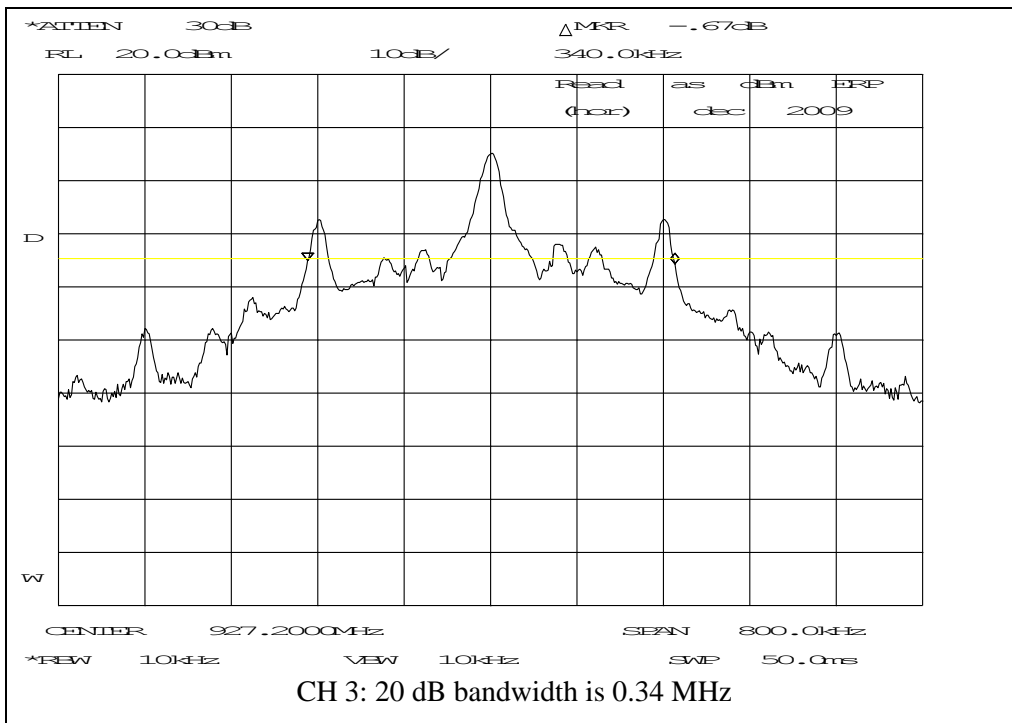
Average time of occupancy	If the 20 dB bandwidth of the hopping channel is less than 250 kHz: ≤ 400 msec. in a 20 sec. period If the 20 dB bandwidth of the hopping channel is 250 kHz or greater: ≤ 400 msec. in a 10 sec. period
---------------------------	---

2.4 20 dB bandwidth

Compliance standard : FCC part 15, subpart C, section 15.247 (a) (1) (i)
 Method of test : FCC Public Notice DA 00-705
 Ambient temperature : 23 °C
 Relative humidity : 23 %

Test result :





Measurement uncertainty: +/- 230 Hz

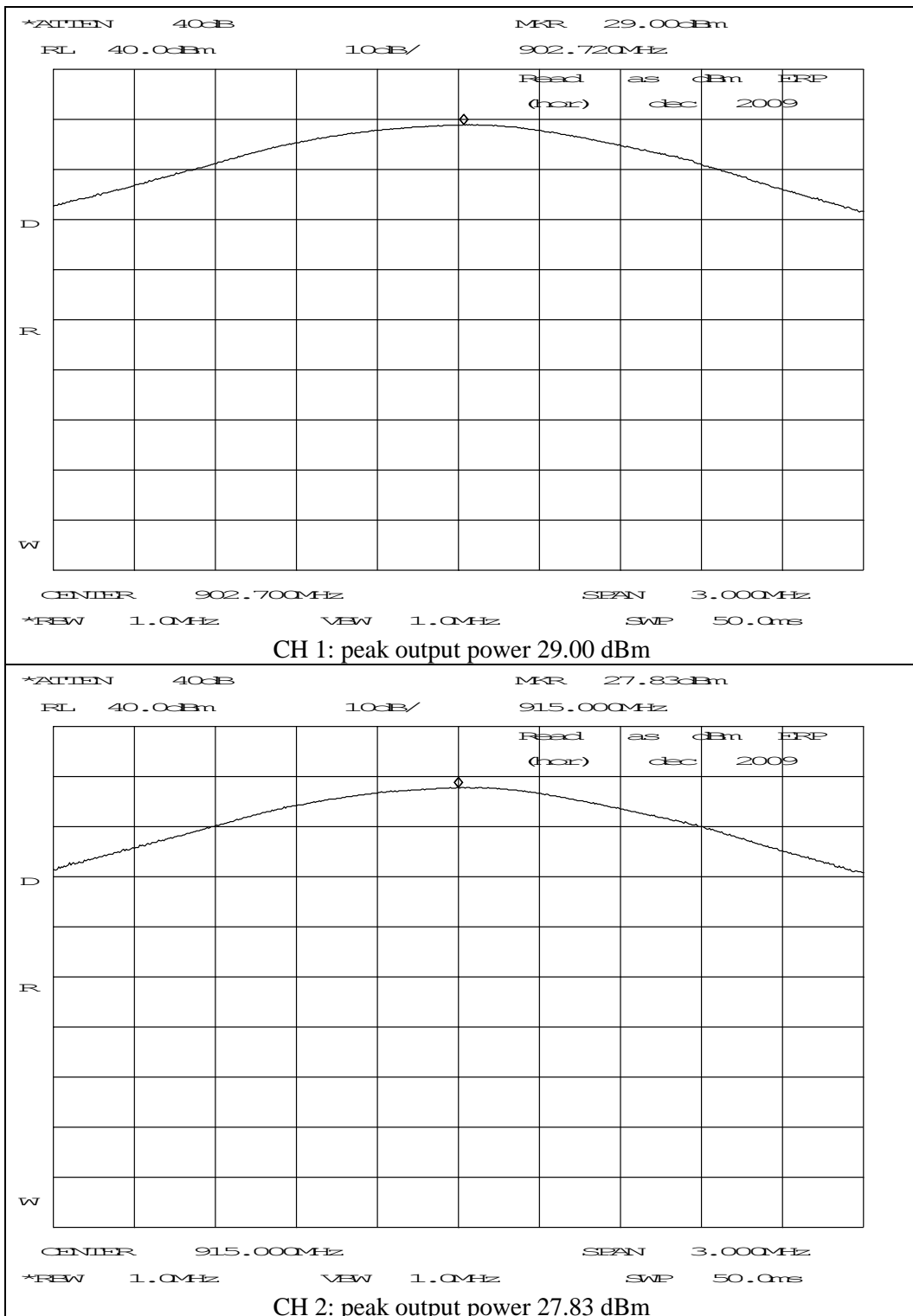
Limit:

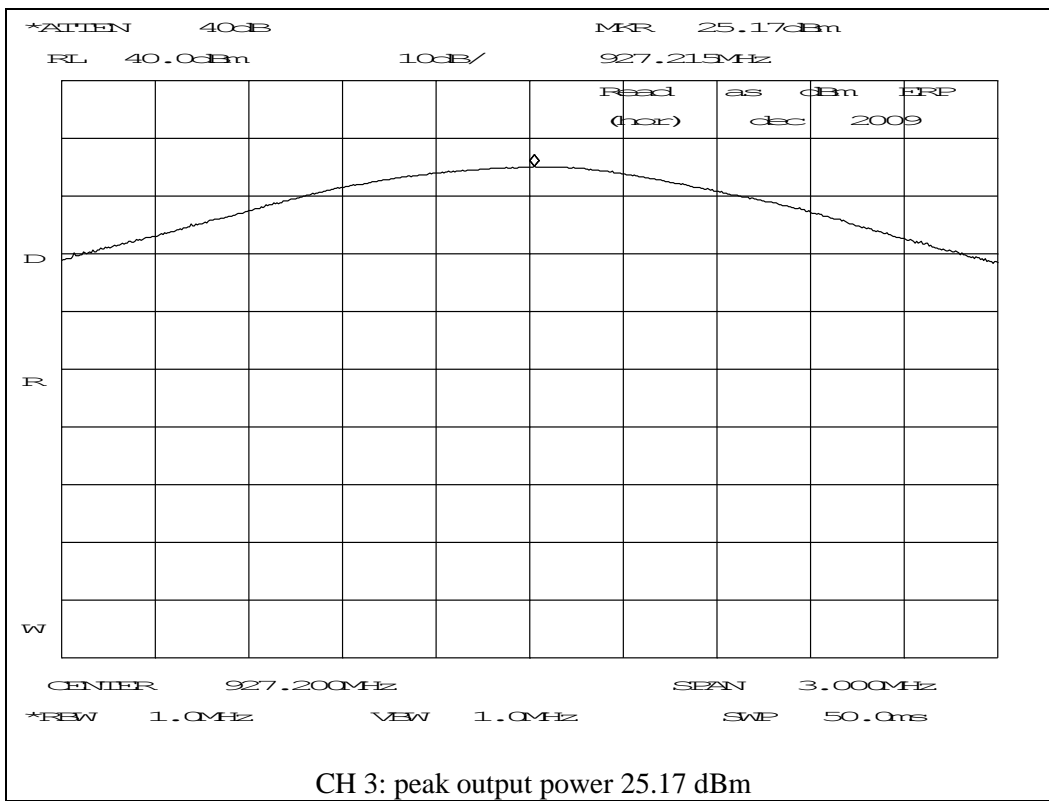
20 dB bandwidth	≤ 500 kHz
-----------------	-----------

2.5 Maximum output power

Compliance standard : FCC part 15, subpart C, section 15.247 (b) (2), (4)
 Method of test : FCC Public Notice DA 00-705, alternative test procedures
 Ambient temperature : 23 °C
 Relative humidity : 23 %

Test results :





Measurement uncertainty: + 2.6 /- 3.3 dB

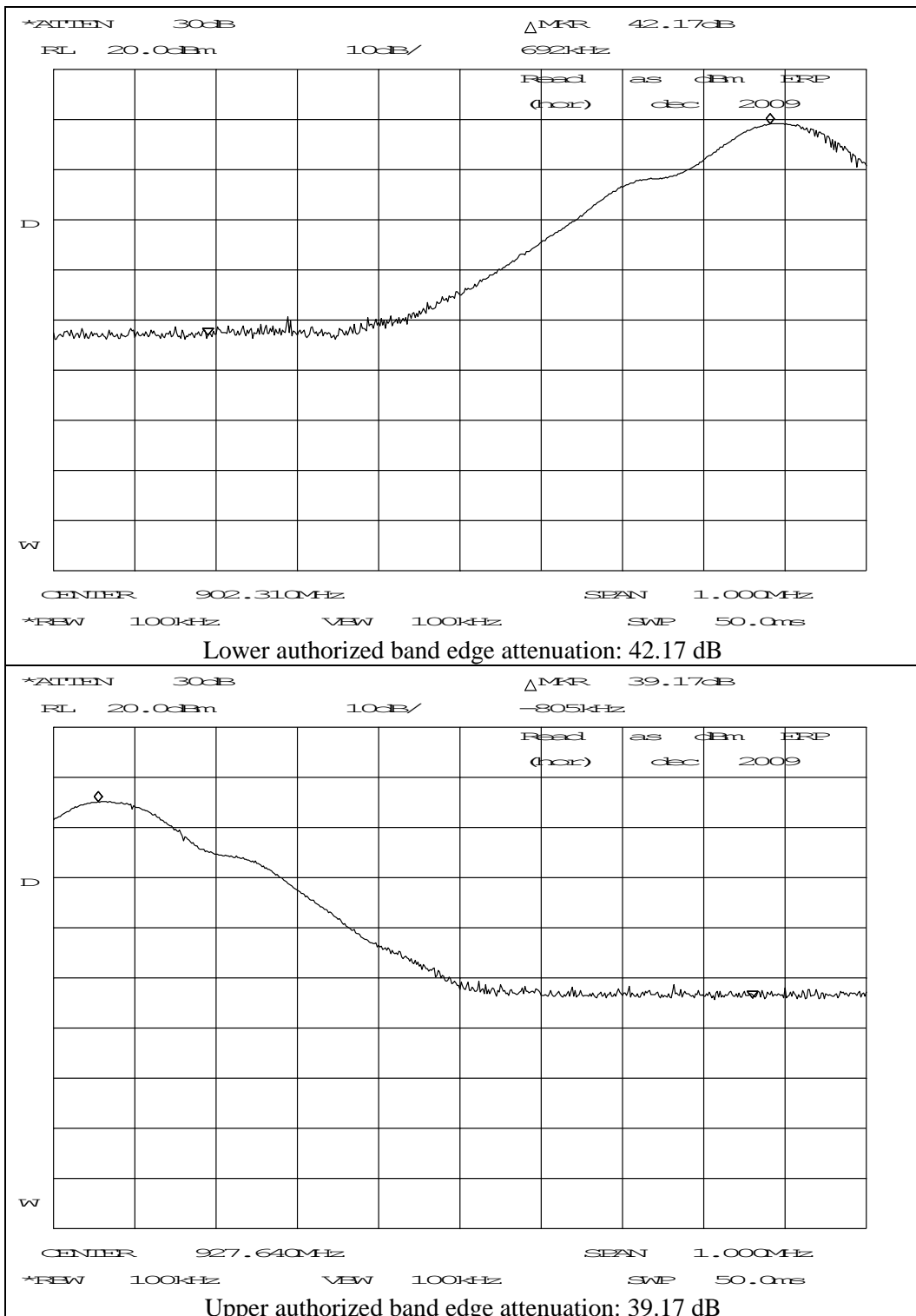
Limit:

Maximum radiated output power	≤ 36 dBm
-------------------------------	---------------

2.6 Band edge compliance

Compliance standard : FCC part 15, subpart C, section 15.247 (d)
 Method of test : FCC Public Notice DA 00-705, alternative test procedures
 Ambient temperature : 23 °C
 Relative humidity : 23 %

Test results :



Measurement uncertainty: + 2.6 /- 3.3 dB

Limit:

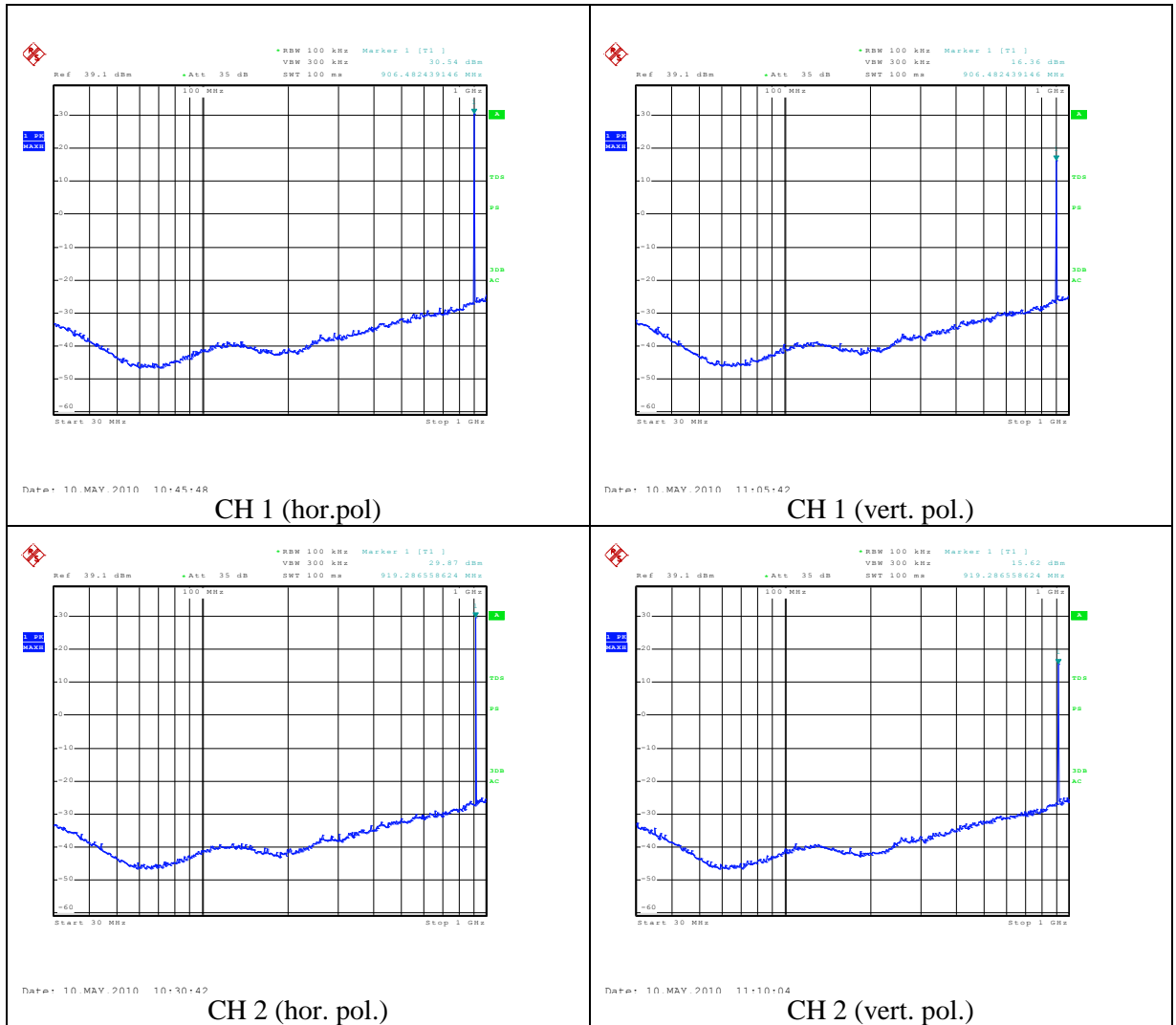
Authorized band edge attenuation	≥ 20 dB
----------------------------------	--------------

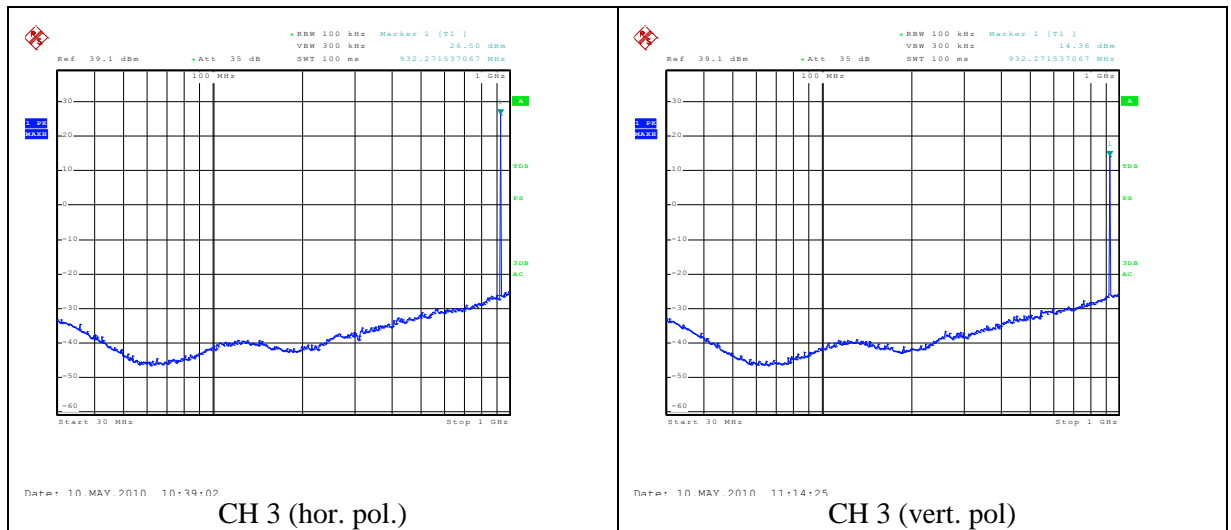
Test results module

2.7 Tx unwanted emissions attenuation (radiated, 0.03 – 1 GHz)

Compliance standard : FCC part 15, subpart C, section 15.247(d)
 Method of test : FCC Public Notice DA 00-705, alternative test procedures
 Ambient temperature : 23 °C
 Relative humidity : 23 %

Test results :
 (units in dBm eirp)





Measurement uncertainty:

Horizontal polarization	
30 – 200 MHz	4.5 dB
200 – 1000 MHz	3.6 dB
Vertical polarization	
30 – 200 MHz	5.4 dB
200 – 1000 MHz	4.6 dB

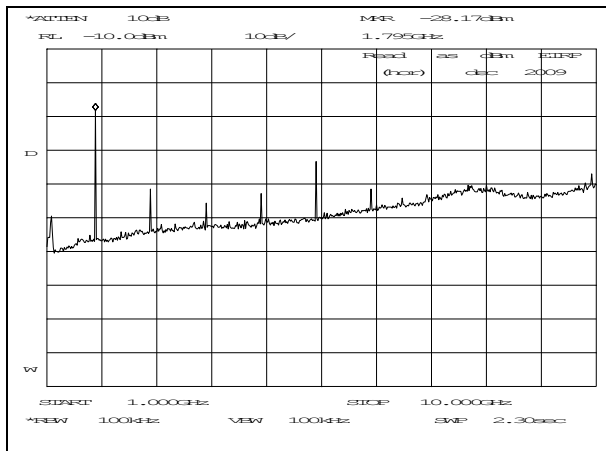
Limit:

In any 100 kHz bandwidth	at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz bandwidth.
--------------------------	--

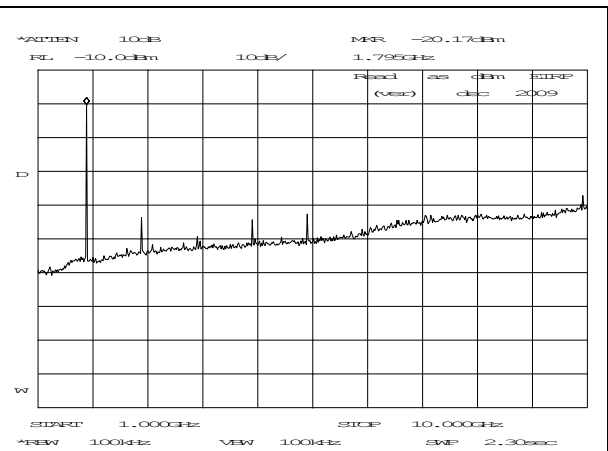
2.8 Tx unwanted emissions attenuation (radiated, 1 – 10 GHz)

Compliance standard : FCC part 15, subpart C, section 15.247(d)
 Method of test : FCC Public Notice DA 00-705, alternative test procedures
 Ambient temperature : 23 °C
 Relative humidity : 23 %

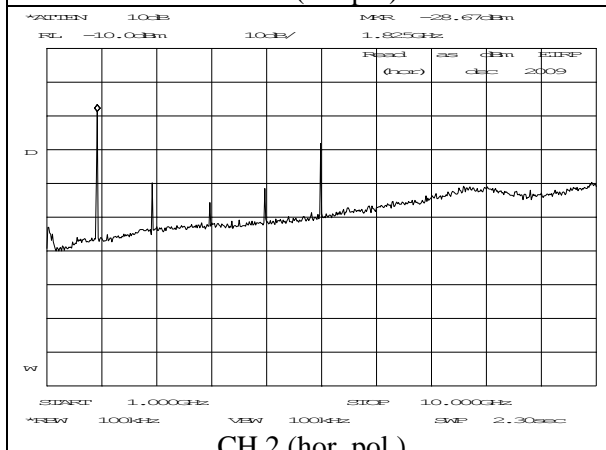
Test results :
 (units in dBm eirp)



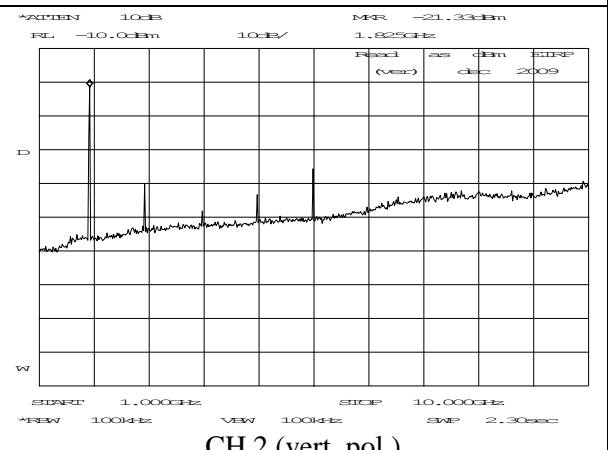
CH 1 (hor. pol.)



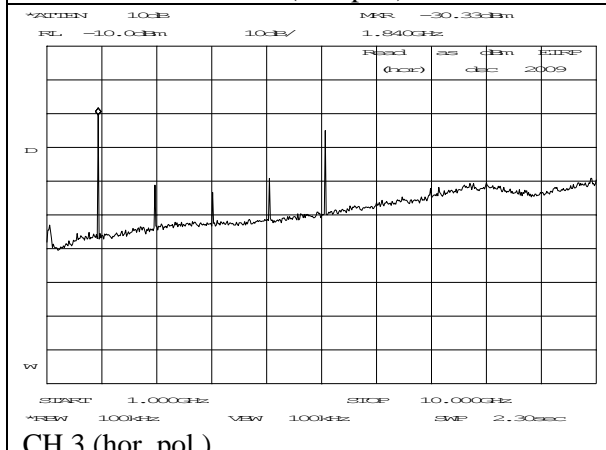
CH 1 (vert. pol.)



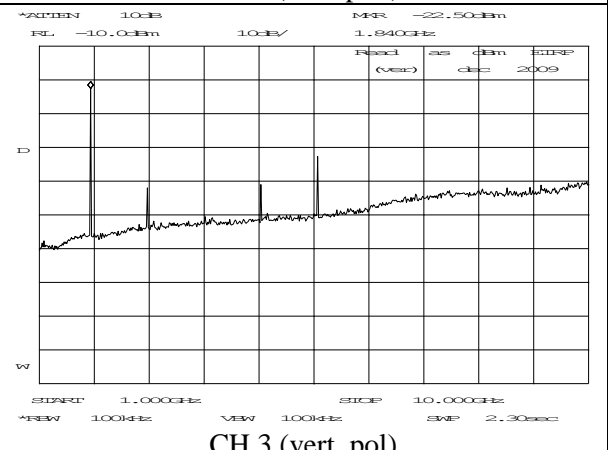
CH 2 (hor. pol.)



CH 2 (vert. pol.)



CH 3 (hor. pol.)



CH 3 (vert. pol.)

Measurement uncertainty: + 4.5/- 6.1 dB

Limit:

In any 100 kHz bandwidth	at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz bandwidth.
--------------------------	--

2.9 Tx unwanted emissions in the restricted bands

Compliance standard : FCC part 15, subpart C, section 15.247(d)
 Method of test : FCC Public Notice DA 00-705, alternative test procedures
 Ambient temperature : 23 °C
 Relative humidity : 23 %

Test results :

Frequency (MHz)	Test results peak (dBm eirp)		Average factor (dB) ⁺⁾	Test results average (dBm eirp)		Resolution bandwidth (kHz)	Average Limit (dBm eirp) ^{*)}	Peak limit (dBm eirp)
	V	H		V	H			
2708.1	-48.3	-48.8	-14.0	-62.3	-62.8	1000	-41.2	-21.2
2745	-46.5	-46.7	-14.0	-60.5	-60.7	1000	-41.2	-21.2
2781.6	-47.0	-47.7	-14.0	-61.0	-61.7	1000	-41.2	-21.2
3610.8	-50.2	-48.3	-14.0	-64.2	-62.3	1000	-41.2	-21.2
3660	-50.0	-49.8	-14.0	-64.0	-63.8	1000	-41.2	-21.2
3708.8	-53.2	-49.0	-14.0	-67.2	-63.0	1000	-41.2	-21.2
4513.5	-48	-47.7	-14.0	-62.0	-61.7	1000	-41.2	-21.2
4575	-47.3	-47.0	-14.0	-61.3	-61.0	1000	-41.2	-21.2
4636	-45.7	-45.7	-14.0	-59.7	-59.7	1000	-41.2	-21.2
5416.2	-46.3	-42	-14.0	-60.3	-56.0	1000	-41.2	-21.2
7320	≤-45.2	≤-44.2	-14.0	≤-59.2	≤-58.2	1000	-41.2	-21.2
7417.6	≤45.0	≤-43.5	-14.0	≤-59.0	≤-57.5	1000	-41.2	-21.2
8124.3	≤-45.5	≤-43.7	-14.0	≤-59.5	≤-57.7	1000	-41.2	-21.2
8235	≤-44.7	≤-42.5	-14.0	≤-58.7	≤-56.5	1000	-41.2	-21.2
8344.8	≤-44.7	≤-42.5	-14.0	≤-58.7	≤-56.5	1000	-41.2	-21.2

^{*)} derived from the expression $EIRP_{dBm} = E_{dB\mu V/m} - 95.2_{dB}$
 (Max. field strength at band edge: 500 μV/m @ 3 m distance (equivalent to 54 dBμV/m))

⁺⁾ An average factor of 20log (20 ms/100 ms) is applied to obtain the average value of the emissions.

Measurement uncertainty: +4.5 / -6.1 dB

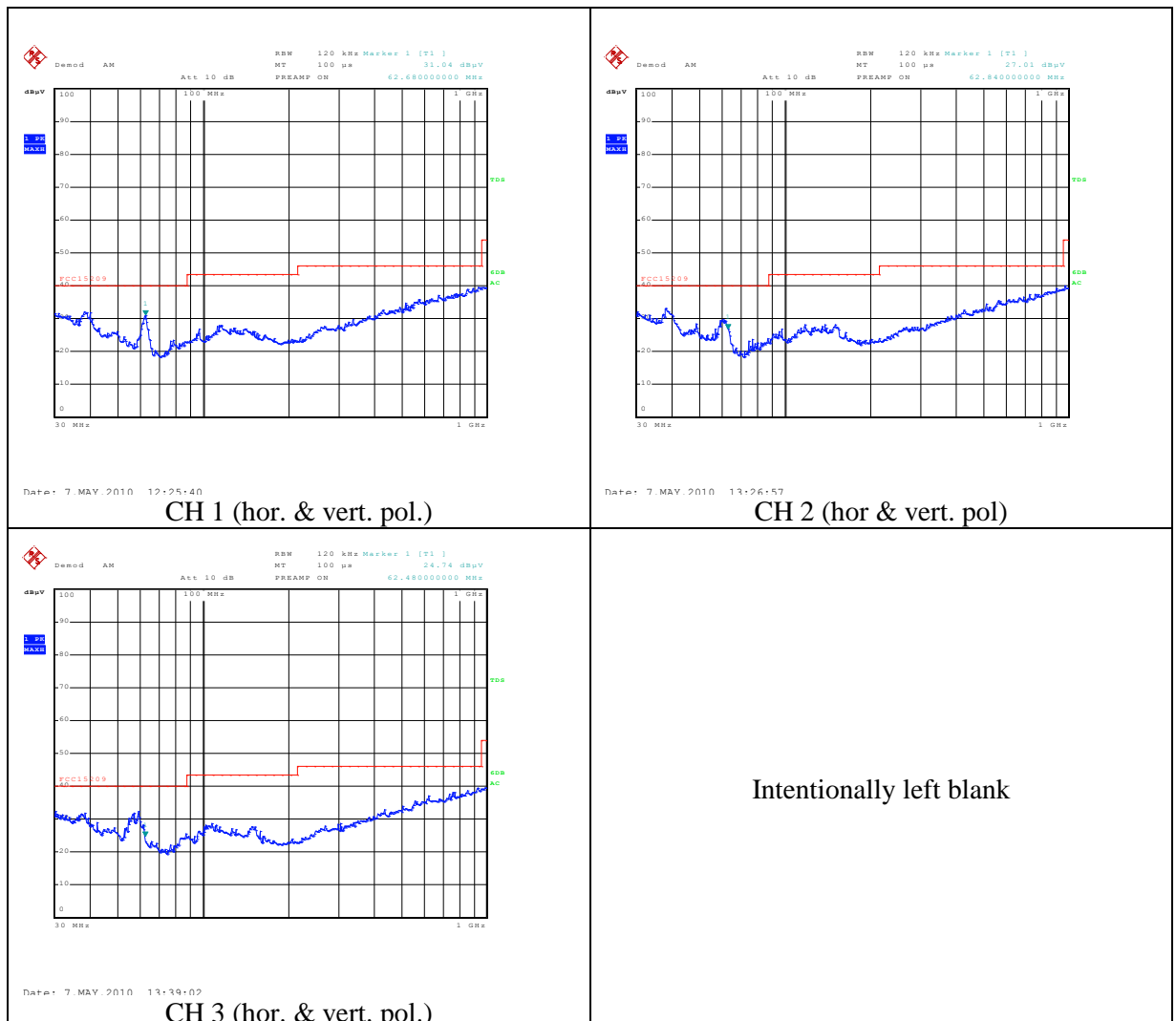
Limit:

Field strength in the restricted bands	See table above
--	-----------------

2.10 Rx unwanted emissions (radiated, 0.03 – 1 GHz)

Compliance standard : FCC part 15, subpart B, section 15.109
 Method of test : ANSI C63.10-2009, section 6.5.4.2
 Ambient temperature : 23 °C
 Relative humidity : 23 %

Test results :
 (units in dB μ V/m)



Measurement uncertainty:

Horizontal polarization	
30 – 200 MHz	4.5 dB
200 – 1000 MHz	3.6 dB
Vertical polarization	
30 – 200 MHz	5.4 dB
200 – 1000 MHz	4.6 dB

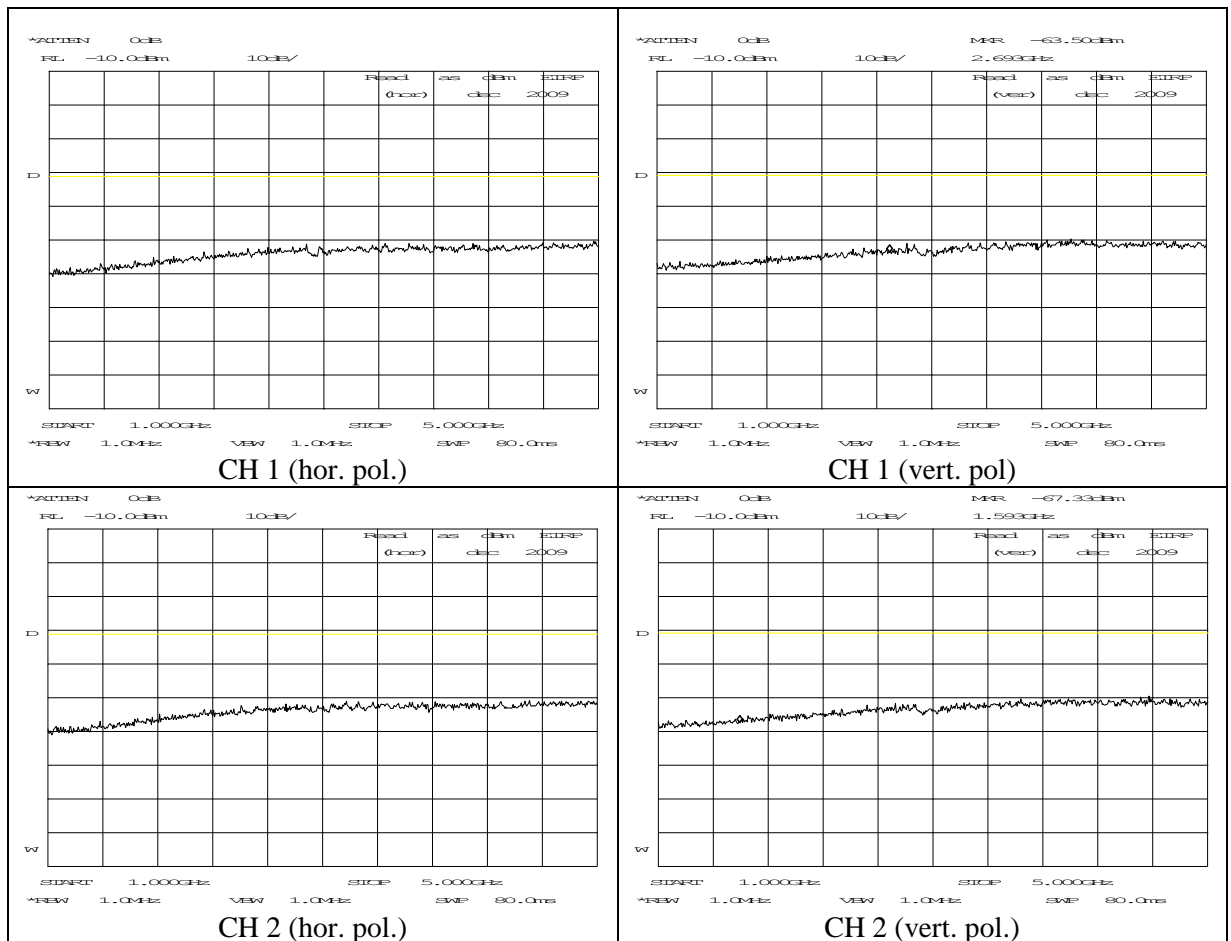
Limit:

Field strength at 3 meter distance	30 – 88 MHz: ≤ 40 dB μ V/m; 88 – 216 MHz: ≤ 43.5 dB μ V/m; 216 – 960 MHz: ≤ 46 dB μ V/m; Above 960 MHz: ≤ 54 dB μ V/m
------------------------------------	--

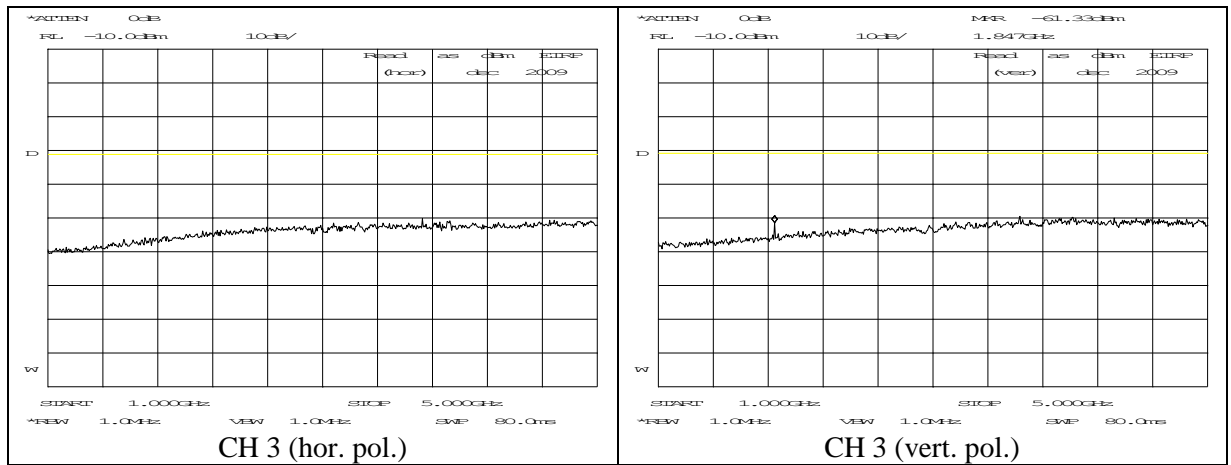
2.11 Rx unwanted emissions (radiated, > 1GHz)

Compliance standard : FCC part 15, subpart B, section 15.109
 Method of test : ANSI C63.10-2009: section 6.6
 Ambient temperature : 23 °C
 Relative humidity : 23 %

Test results :
 (units in dBm eirp)



Test results module



Measurement uncertainty: +4.5 / -6.1 dB

Limit:

Radiated power	Above 1 GHz: ≤ -41.2 dBm eirp ^{*)}
----------------	--

^{*)} derived from the expression $EIRP_{dBm} = E_{dB\mu V/m} - 95.2_{dB}$
(Max. field strength at band edge: 500 $\mu V/m$ @ 3 m distance (equivalent to 54 dB $\mu V/m$))

Used test equipment module

Description	Telef. ID	Manufacturer	Model	Used at par.
Spectrum analyzer	TE 00359	Hewlett Packard	8563E	All, except 2.7 & 2.10
Pre amplifier	TE 00092	Hewlett Packard	8449B	2.8, 2.11
Horn antenna	TE 00531	EMCO	3115	2.8, 2.11
Anechoic chamber	TE 01064	Euroshield	RFD-F-100	All, except 2.7 & 2.10
Semi anechoic chamber	TE 00861	Comtest	--	2.7, 2.10
EMI test receiver	TE 00481	Rohde & Schwarz	ESCI	2.7, 2.10
Biconilog	TE 00967	Chase	CBL6112A	2.7, 2.10
Pre amplifer	TE 00098	Rohde & Schwarz	ESV-Z3	2.5, 2.6
Biconilog	TE 00700	EMCO	3143	2.1, 2.2, 2.3, 2.4, 2.5, 2.6
Attenuator, 10 dB	TE 00404	Hewlett Packard	8491A	2.5

Cross reference table

Transmitter	
IC RSS-210 Issue 7, Annex 8	FCC 47 CFR Ch. 1 part 15, subpart C (10-1-09 Edition)
A8.1 (b)	§ 15.247 (a) (1)
A8.1 (c)	§ 15.247 (a) (1) (i)
A8.4 (1)	§ 15.247 (b) (2), (4)
A8.5	§ 15.247 (d)
Receiver	
IC RSS-Gen Issue 2	FCC 47 CFR Ch. 1 part 15, subpart B (10-1-09 Edition)
§ 7.2.3	§ 15.109