

Radio test report

99725930 - rev 2.0

based on:

- FCC Part 15 Subpart C, sections 15.209 and 15.247
(10-1-05 Edition)
- RSS-210, Issue 6 (Sept. 2005 edition)

Avalanche Beacon
Mammut
Pulse Barryvox

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This report comprises of three modules. The total number of pages is: 25

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	:	Ascom (Switzerland) Ltd.
Address	:	Eichtal
Zipcode	:	CH-8634
City/town	:	Hombrechtikon
Country	:	Switzerland
Date of order	:	9 March 2006

2 Product

A sample of the following product was submitted for testing:

Product description	:	Avalanche Beacon
Manufacturer	:	Ascom (Switzerland) Ltd.
Trade mark	:	Mammut
Type designation	:	Pulse Barryvox
FCC ID	:	UD9PULSE-B-462002
Hardware version	:	--
Serial number	:	0621912397 and 0621912398
Software release	:	R 1.60

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:

- 31 May 2006

Tests were carried out between:

- 14 June and 5 July 2006

4 Product documentation

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

Description:	Date:	Identification:
NBV Monitor 2 Manual	29/05/2006	New Barryvox NBV monitor manual version 0.1
Pulse Barryvox, Parameters	01/06/2006	--
Pulse Barryvox Short instructions for the test	31/05/2006	--
Schematics	30/05/2006	462010-00000_1SZ_001_00
PCB information	28/04/2006	46201-00000 topside (version 4) 46201-00000 bottomside (version 3)
Schematics	30/05/2006	462010-00000_1SZ_001_00

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 Pulse Barryvox is an avalanche beacon that transmits on 457 kHz and in the 902 - 928 MHz band.

This report only covers the tests on the frequency hopping transmitter and receiver in the 902 – 928 MHz band, however the receiver spurious measurement is performed with both receivers enabled (EUT in search-mode).

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 Niekirk
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 3.2 “*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):

DATA TRANSMISSION APPLICATION IN THE 902 - 928 MHz BAND

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

FCC Part 15 Subpart C, section 15.209 and 15.247 (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

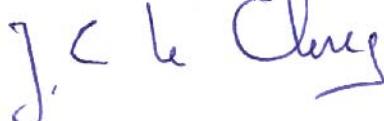
function : Test Engineer

signature : 

Review of test report by:

name : ing. J. C. le Clercq

function : Test Engineer

signature : 

The above conclusions have been verified by the following signatory:

Date : 28 September 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 (max -10 dBd)
Rated radiated RF power	0 dBm
Operating frequency range	915.89829 – 925.97441 MHz (50 hop frequencies)
Modulation	GFSK
Modulation bit rate	50 kbits/s
ITU emission class	217KF7D
Duty Cycle	0.81 %. (during testing, less in normal mode)
FCC ID	UD9PULSE-B-462002

1.2 Frequency test channels

	TX
Channel 1	915.89829 MHz
Channel 27	921.2448 MHz
Channel 50	925.97441 MHz

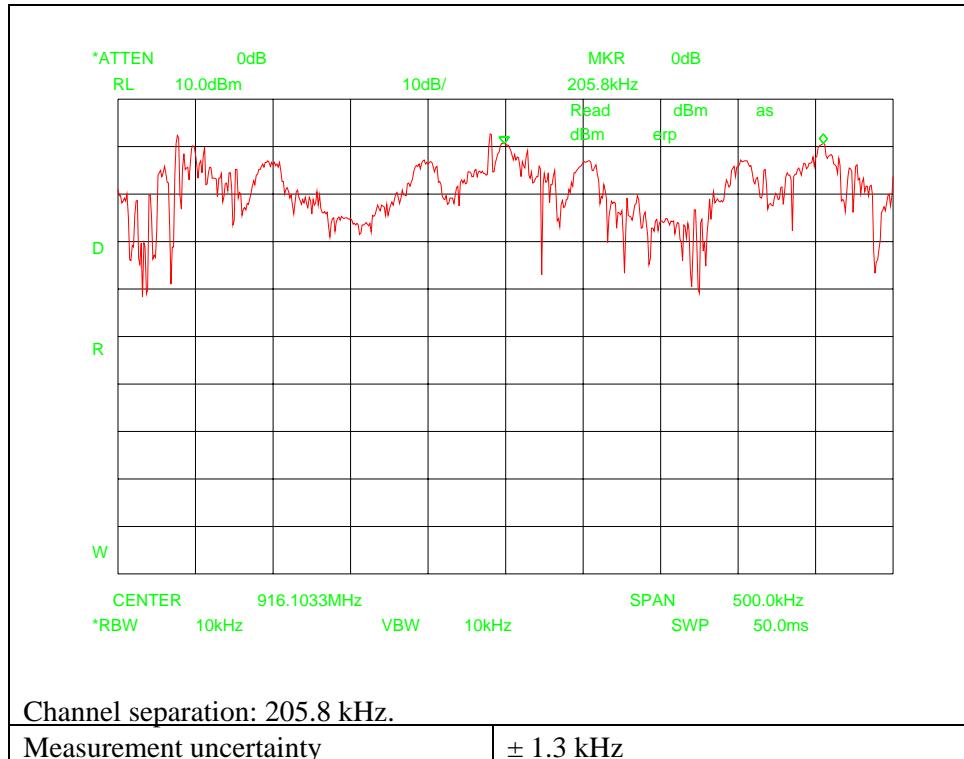
2 Test results

2.1 Channel Separation

Compliance standard : FCC part 15, subpart C, section 15.247 (a)(1)
RSS-210 (Issue 6, Sept 2005) section A8.1(2)

Method of test : ANSI C63.4-2003, sections 5.5 & 8.2.4
RSS-GEN (Issue 1, Sept 2005) section 4.6

Test results :



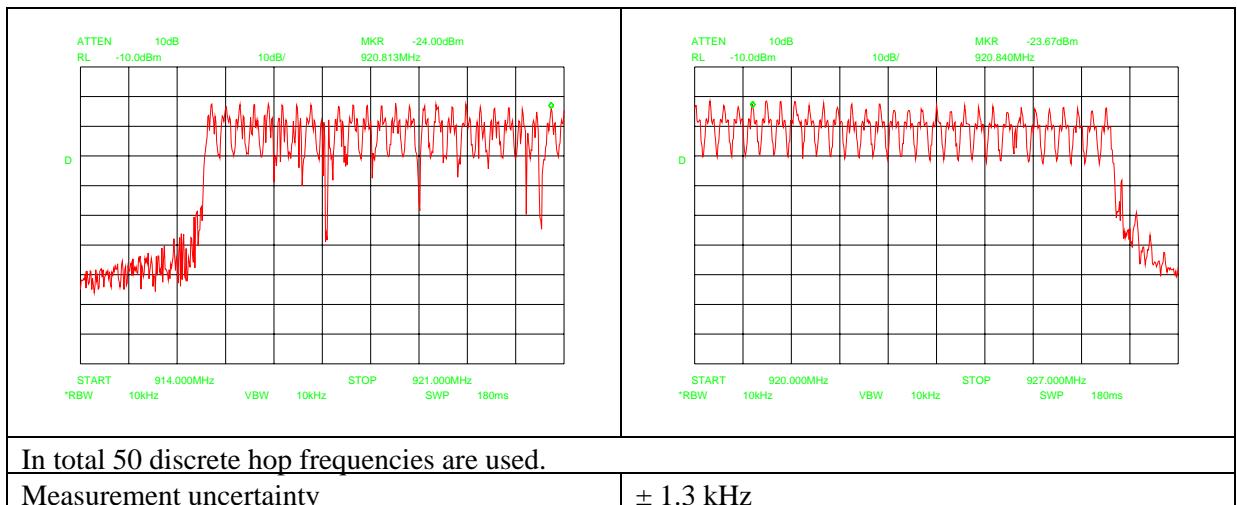
Note: The plot above shows 3 adjacent channels.

2.2 Number of hop frequencies

Compliance standard : FCC part 15, subpart C, section 15.247 (a)(1)
 RSS-210 (Issue 6, Sept 2005) section A8.1(3)

Method of test : ANSI C63.4-2003, sections 5.5 & 8.2.4
 RSS-GEN (Issue 1, Sept 2005) section 4.6

Test results :



The maximum occupancy of one of the hopping frequencies is calculated from the duty cycle and the maximum number of channels: in a period of 20 seconds the device sends 162 ms. This total transmission time is valid when the EUT is in test mode. When the EUT is in normal mode, the duty cycle will be even lower. the 162 ms will also be spread over 50 separate frequencies. The average time of occupancy will be 3.24 ms.

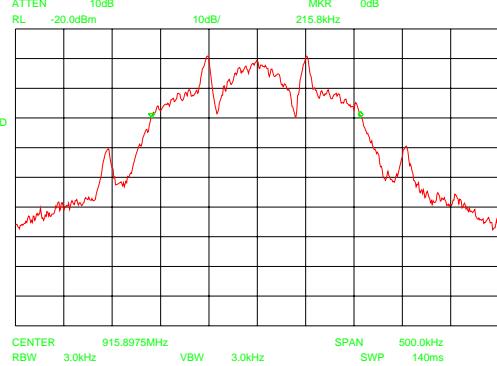
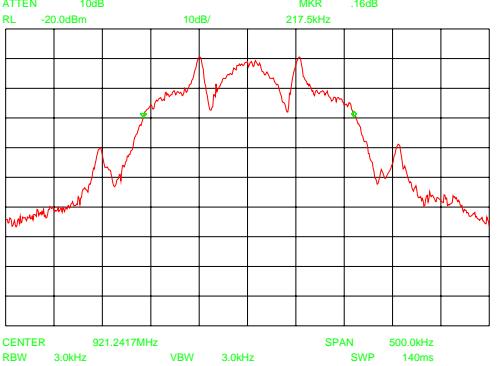
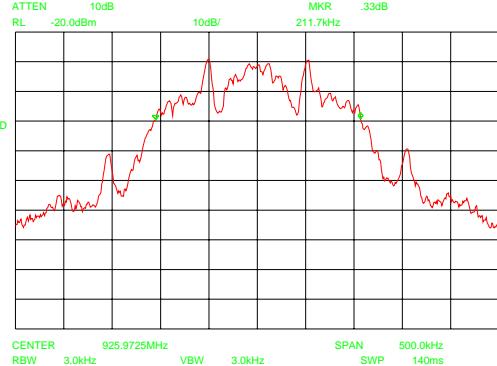
Limit	≥ 50 hopping frequencies (for Channel BW < 250 kHz) ≥ 25 hopping frequencies (for Channel BW ≥ 250 kHz) maximum occupancy per channel: 0.4 sec per 20 seconds.
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2.3 Bandwidth and Power Spectral Density

Compliance standard : FCC part 15, subpart C, section 15.247 (a)(1)(i) and (e)
 RSS-210 (Issue 6, Sept 2005) section A8.1(1)

Method of test : ANSI C63.4-2003, sections 5.5 & 8.2.4
 RSS-GEN (Issue 1, Sept 2005) section 4.4.1

Test results :

 <p>ATTEN 10dB RL -20.0dBm MKR 215.8kHz 0dB</p> <p>CENTER RBW 3.0kHz 915.8975MHz VBW 3.0kHz SPAN SWP 500.0kHz 140ms</p>	 <p>ATTEN 10dB RL -20.0dBm MKR 217.5kHz .16dB</p> <p>CENTER RBW 3.0kHz 921.2417MHz VBW 3.0kHz SPAN SWP 500.0kHz 140ms</p>
<p>Channel 1 20 dB Bandwidth = 215.8 kHz Maximum PSD = -28.7 dBm / 3 kHz</p>  <p>ATTEN 10dB RL -20.0dBm MKR 211.7kHz .33dB</p> <p>CENTER RBW 3.0kHz 925.9725MHz VBW 3.0kHz SPAN SWP 500.0kHz 140ms</p>	<p>Channel 27 20 dB Bandwidth = 217.5 kHz Maximum PSD = -29.0 dBm / 3 kHz</p>
<p>Measurement uncertainty</p>	<p>± 1.3 kHz $+4.5/-6.1$ dB</p>
<p>Bandwidth Limit</p>	<p>20 dB BW < 500 kHz</p>
<p>Power spectral density</p>	<p>8 dBm in any 3 kHz band</p>

3 Emission tests

3.1 Peak power of intentional signal

Compliance standard : FCC part 15, subpart C, section 15.247 (b)
RSS-210 (Issue 6, Sept 2005) section A8.4(1)

Method of test : ANSI C63.4-2003, sections 5.5 & 8.2.4
RSS-GEN (Issue 6 Sept 2005) section 4.6
RSS-210 (Issue 6, Sept 2005) section A8.4(1)

Test results :

peak power:

Frequency (MHz)	Test result dBm ERP	Polarisation	conducted power (calculated)	Limit (dBm)
915.840	1.00	V	11.0	30
921.300	1.33	V	11.3	30
925.917	1.33	V	11.3	30

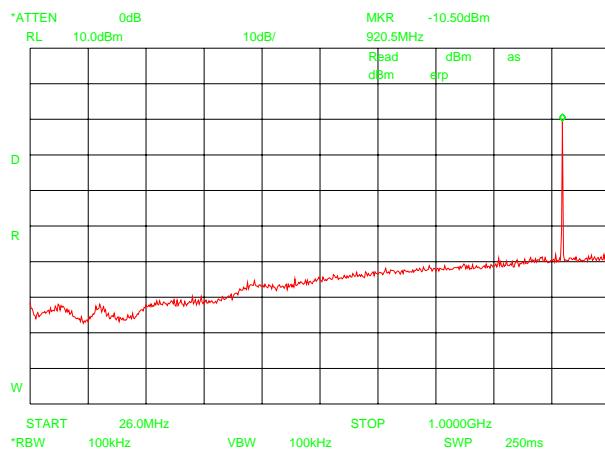
Note: The conducted power was calculated using the ERP values and an antenna gain of -10 dBd.

Measurement uncertainty	+4.5/-6.1 dB
Limit	< 1 Watt

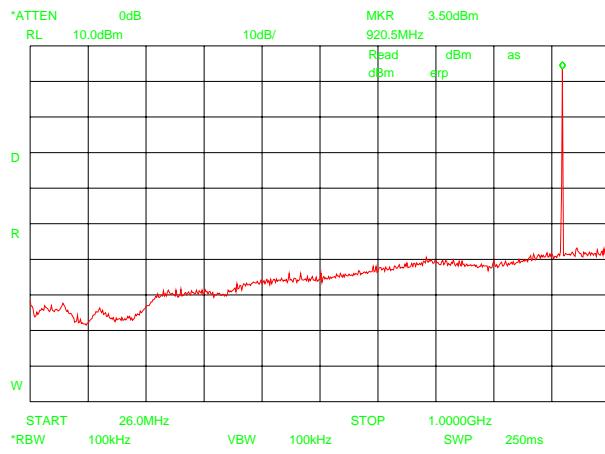
3.2 Field strength of unwanted emissions 30 - 1000 MHz

Compliance standard : FCC part 15, subpart C, section 15.209 (a)
 RSS-GEN (Issue 1, Sept 2005) section 4.7 & 4.8
 RSS-210 (Issue 6, Sept 2005) sections A8.4(1) & A8.5
 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 : center channel
 Test results :

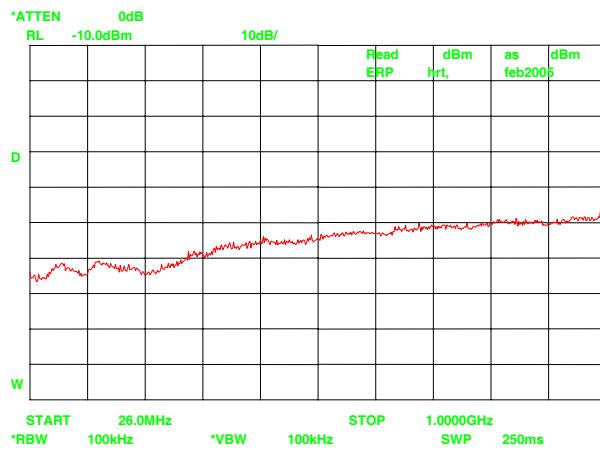
Exploratory measurements of unwanted emissions in transmit mode 30 - 1000 MHz



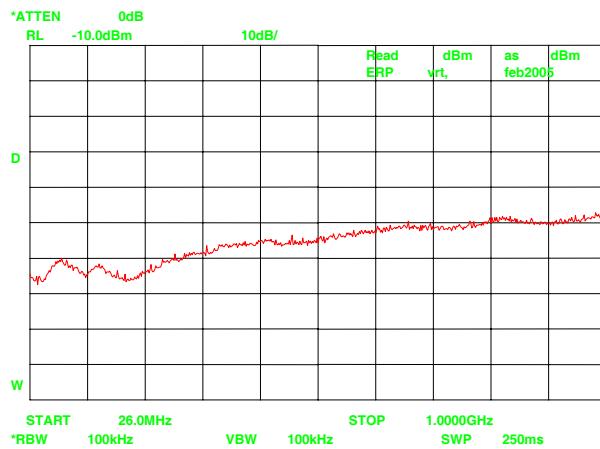
pre-scan data 30 - 1000 MHz Horizontal



pre-scan data 30 - 1000 MHz Vertical

Exploratory measurements of unwanted emissions in receive mode 30 - 1000 MHz


pre-scan data 30 - 1000 MHz Horizontal



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

Measurement uncertainty: N/A

3.3 Field strength of unwanted emissions > 1000 MHz

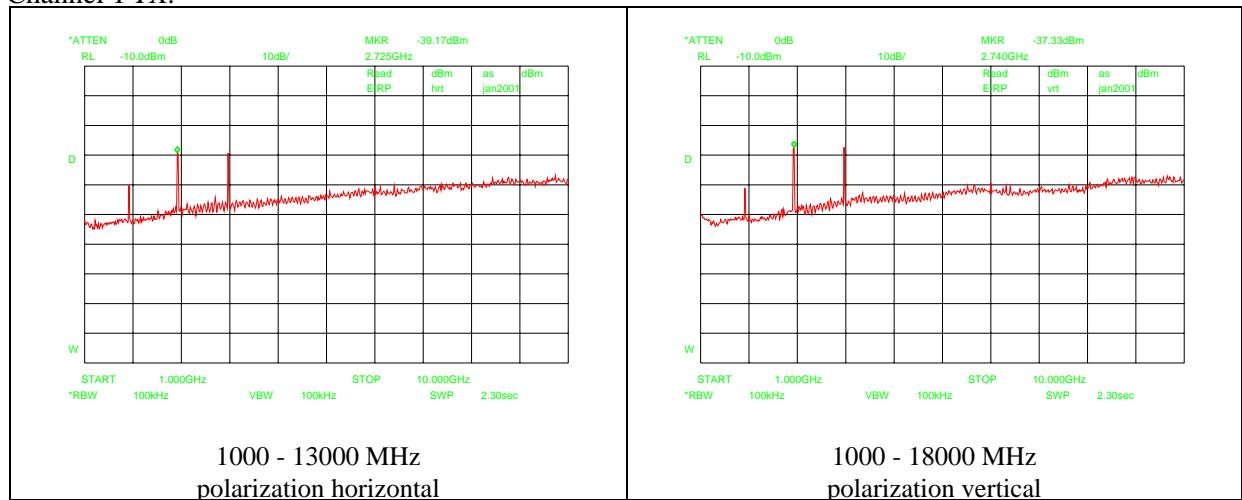
Compliance standard : FCC part 15, subpart C, 15.209 (a) & 15.247 (d)
 RSS-GEN (Issue 1, Sept 2005) section 4.7
 RSS-210 (Issue 6, Sept 2005) section A8.5

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
 RSS-GEN (Issue 6, Sept 2005) section A8.5

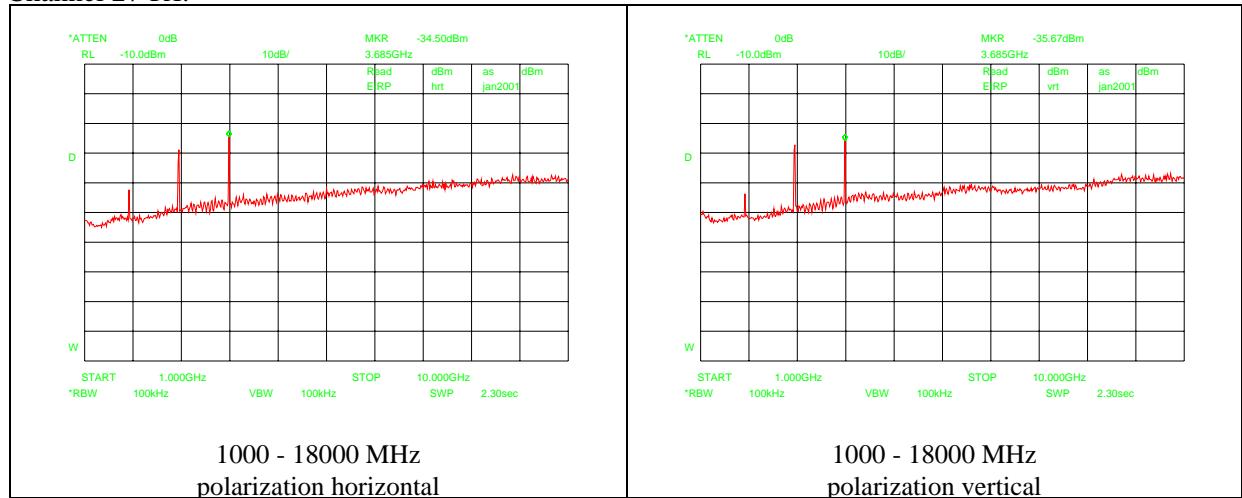
Test results :

Transmitter tests:

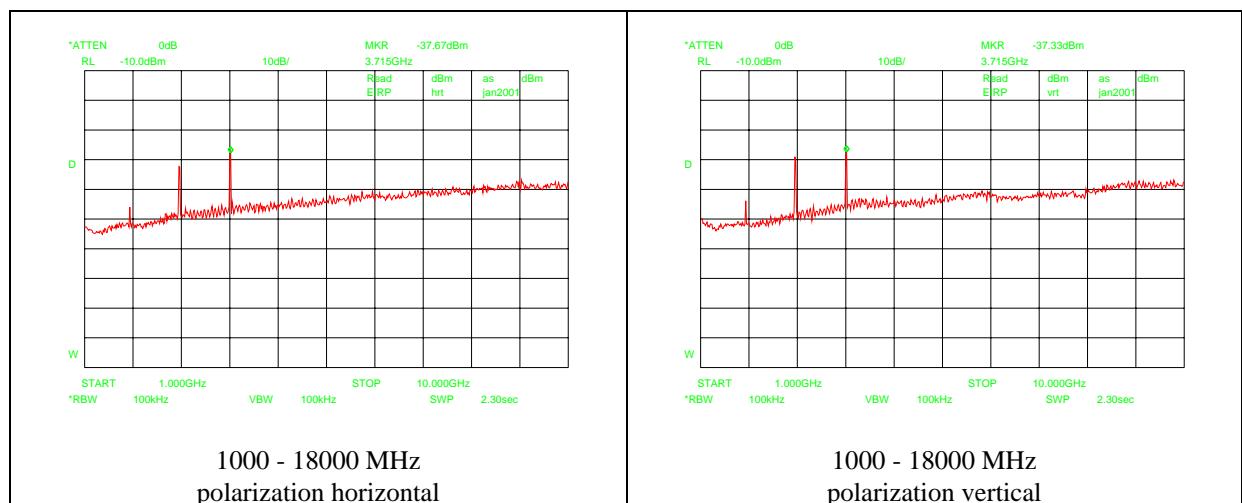
Channel 1 TX:



Channel 27 TX:

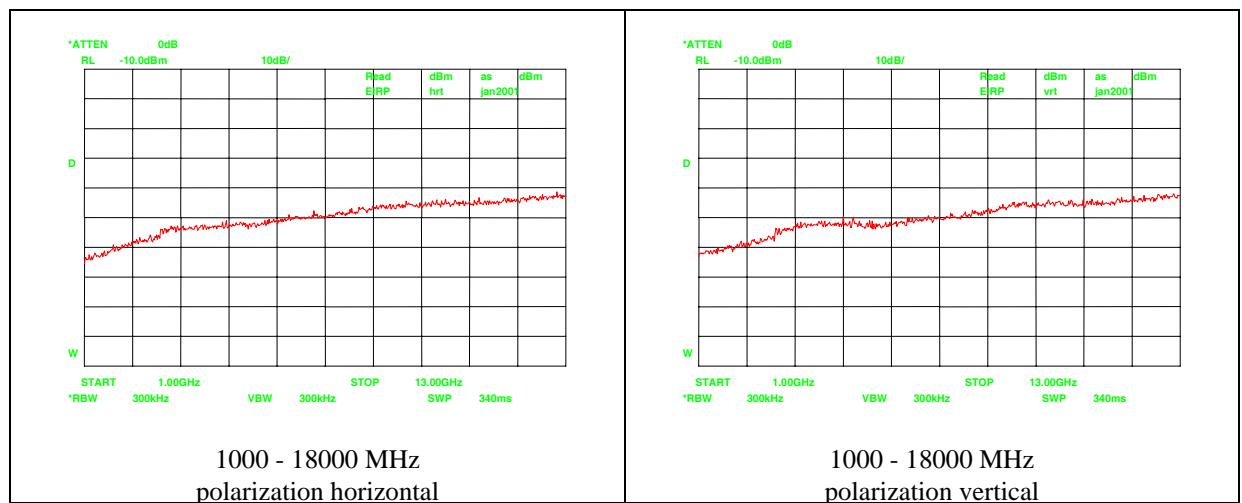


Channel 50 TX:



Receiver tests:

Channel 27 RX



Note: No unwanted emissions with frequencies higher than 1 GHz were found when in receive mode.

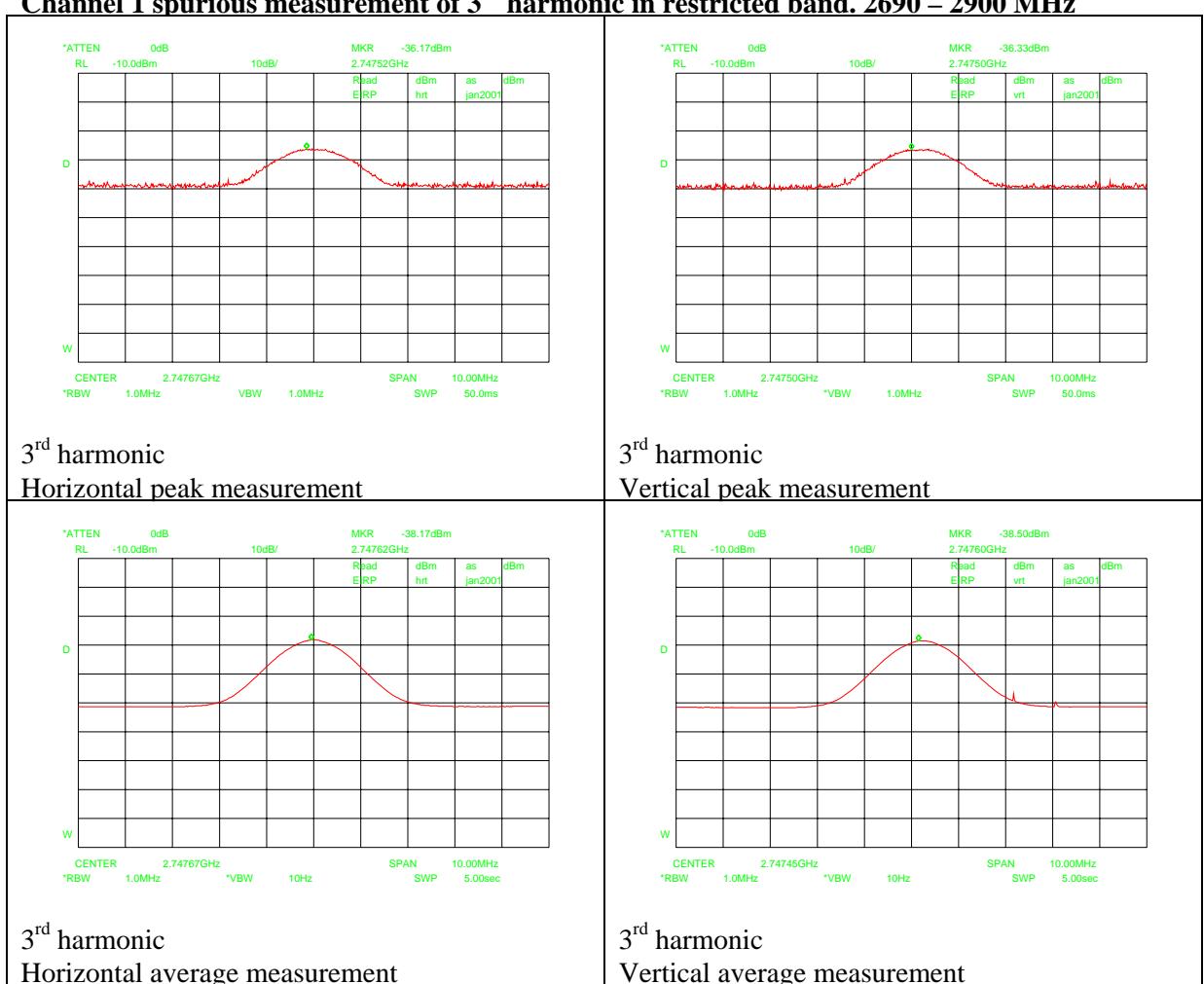
3.4 Emissions in the restricted bands

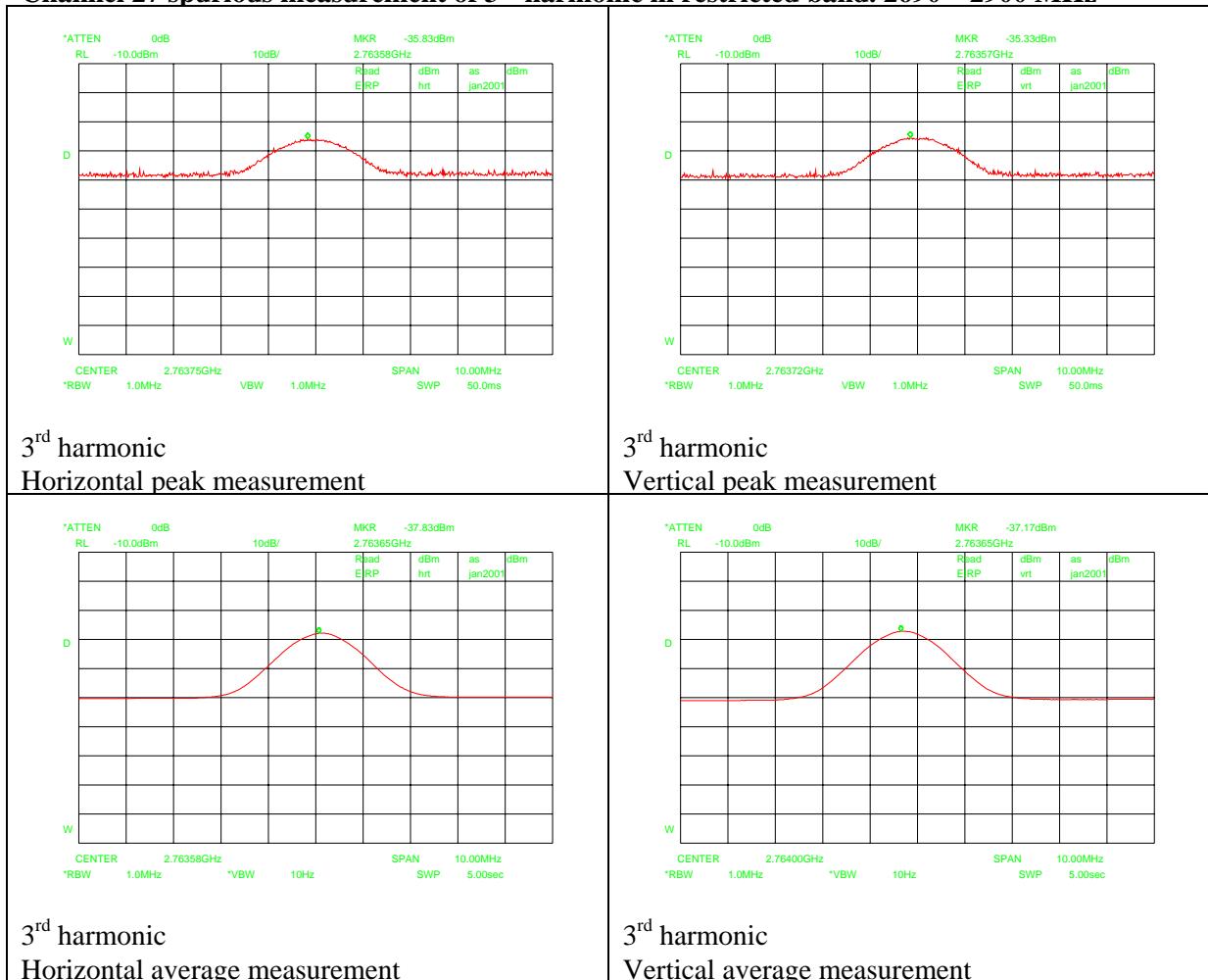
Compliance standard : FCC part 15, subpart C, 15.205, 15.209 (a) & 15.247 (d)
 RSS-GEN (Issue 1, Sept 2005) section 4.7
 RSS-210 (Issue 6, Sept 2005) section A8.5

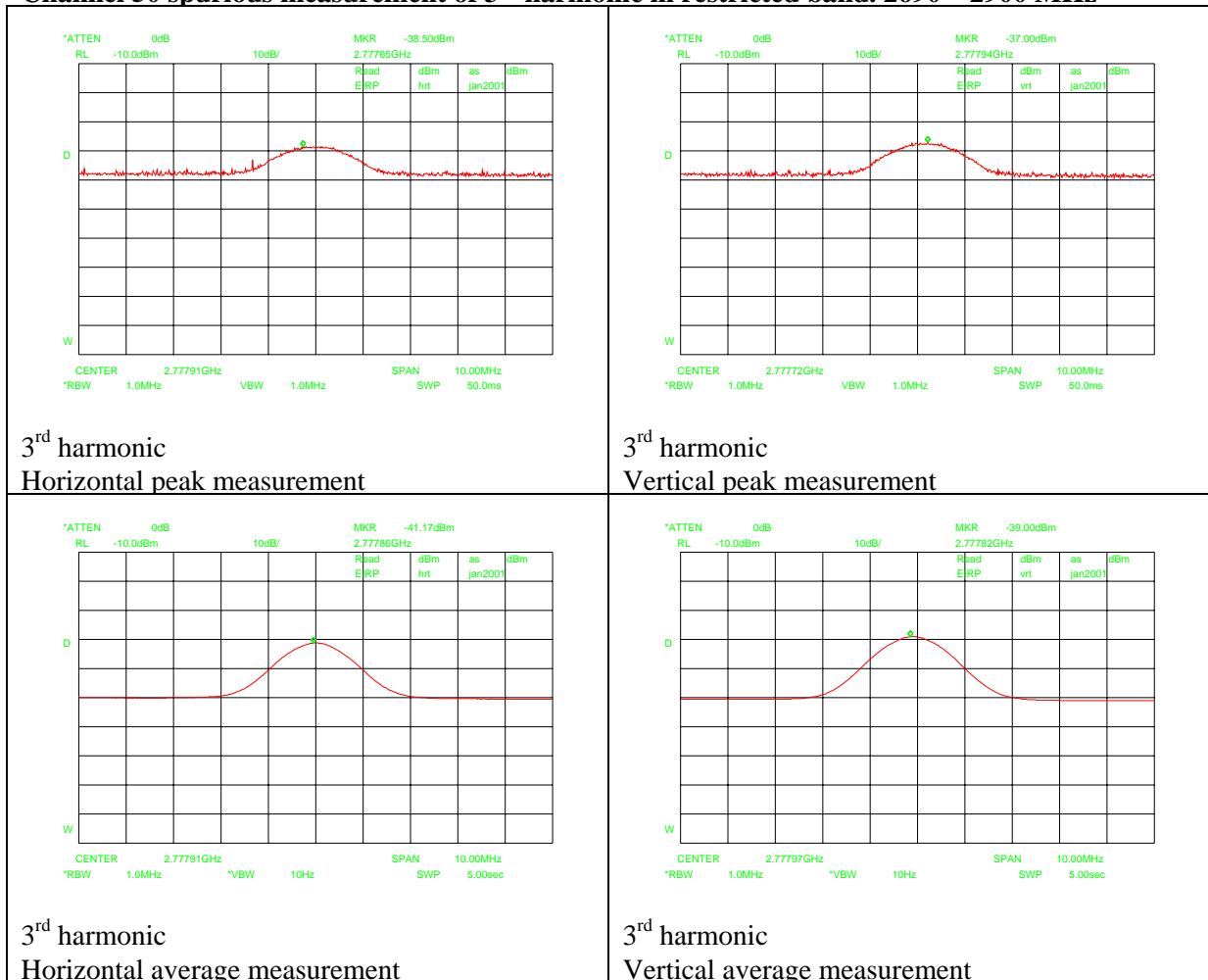
Method of test : ANSI C63.4-2003, sections 5.5, 8.2.3, 8.2.4 & 8.3.1.2;
 FCC part 15, subpart A, section 15.31(m), 15.33, 15.35.
 RSS-GEN (Issue 1, Sept 2005) section 4.7
 RSS-GEN (Issue 6, Sept 2005) section A8.5

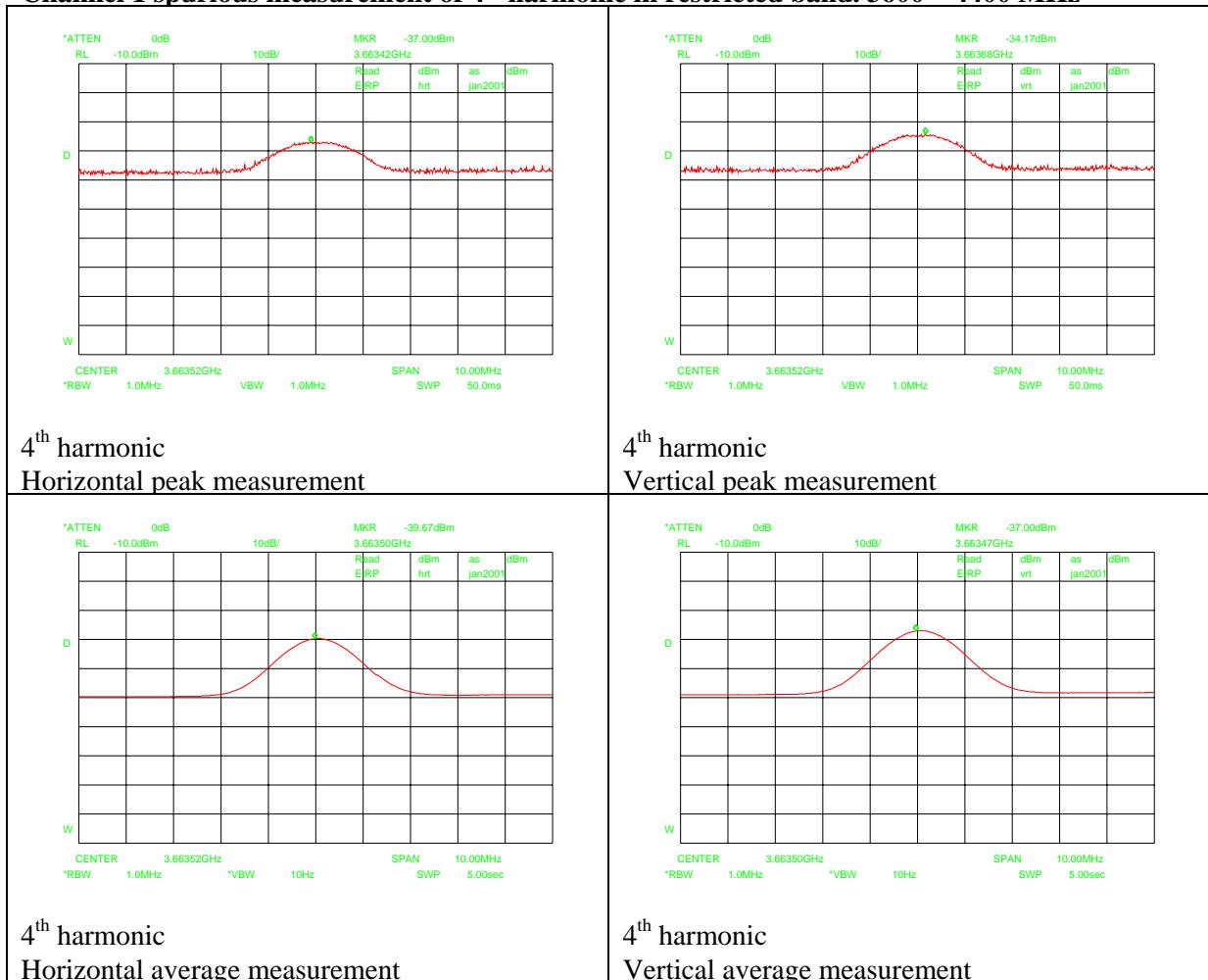
Test results :

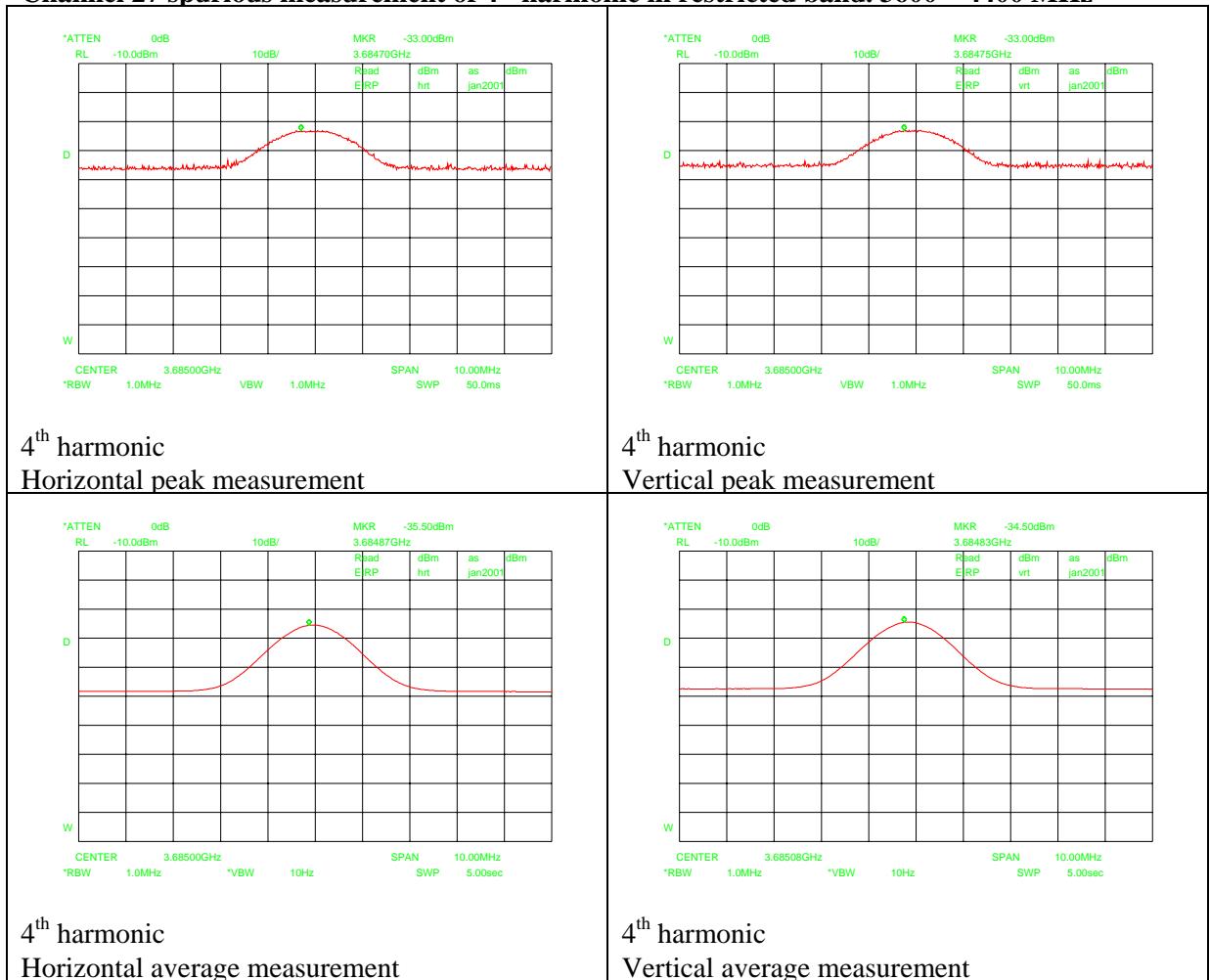
Channel 1 spurious measurement of 3rd harmonic in restricted band. 2690 – 2900 MHz

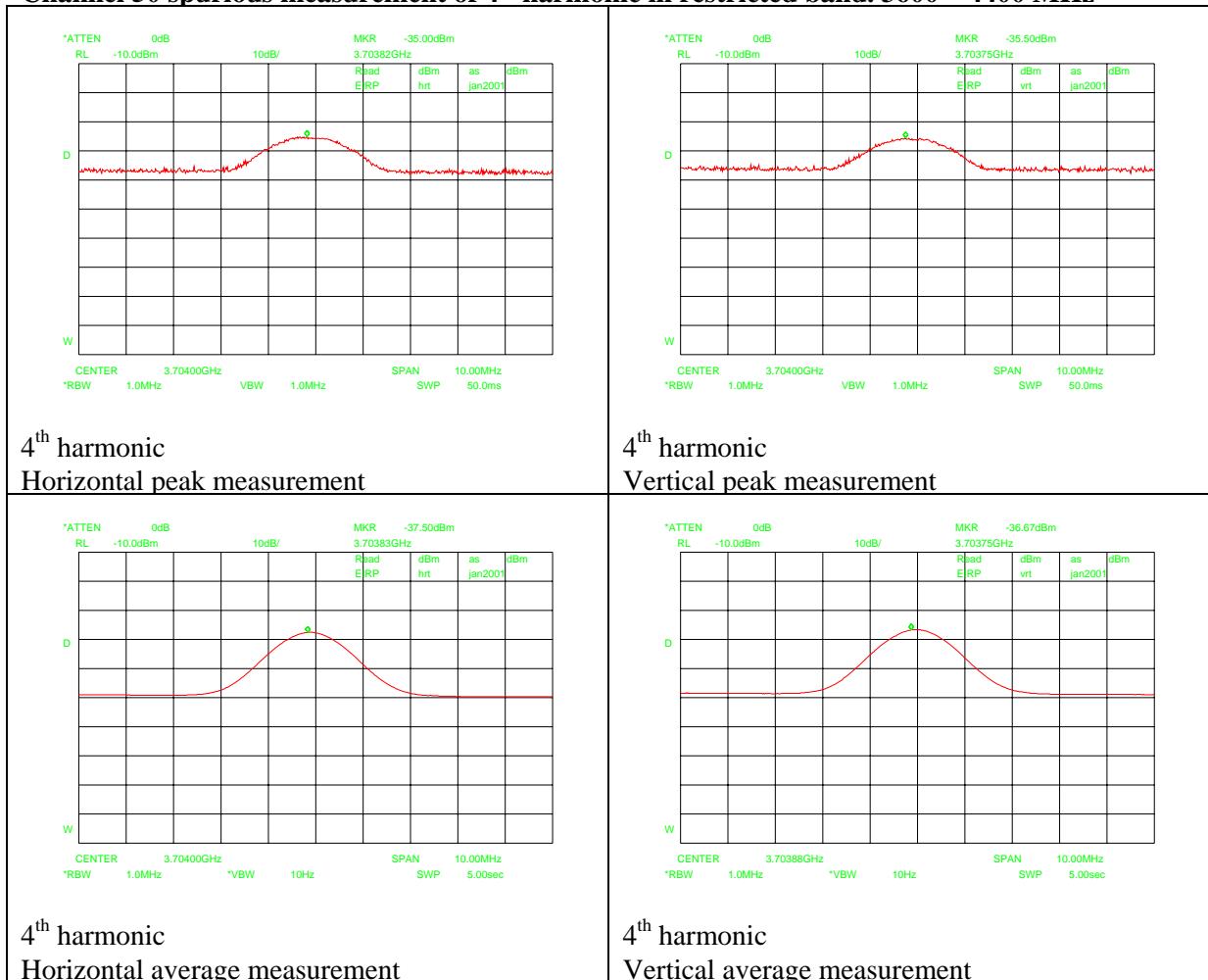


Channel 27 spurious measurement of 3rd harmonic in restricted band. 2690 – 2900 MHz


Channel 50 spurious measurement of 3rd harmonic in restricted band. 2690 – 2900 MHz


Channel 1 spurious measurement of 4th harmonic in restricted band. 3600 – 4400 MHz


Channel 27 spurious measurement of 4th harmonic in restricted band. 3600 – 4400 MHz


Channel 50 spurious measurement of 4th harmonic in restricted band. 3600 – 4400 MHz


Average measurements on harmonics

Frequency (GHz)	Test result @ 3 m distance (dB μ V/m) (AV)	Polarisation	Limit (dB μ V/m)
2.747	36.1	H	54
2.747	35.8	V	54
2.763	36.5	H	54
2.763	37.1	V	54
2.776	33.1	H	54
2.776	35.3	V	54
3.663	34.6	H	54
3.663	37.3	V	54
3.685	38.8	H	54
3.685	39.8	V	54
3.704	36.8	H	54
3.704	37.6	V	54

Note: Average values are compensated for the transmit duty cycle using the $10\log(1/x)$ formula.
 The duty cycle was measured to be 0.81%.

Peak measurements on harmonics

Frequency (GHz)	Test result @ 3 m distance (dB μ V/m) (PK)	Polarisation	Limit (dB μ V/m)
2.747	58.0	H	74
2.747	58.9	V	74
2.763	59.4	H	74
2.763	59.9	V	74
2.776	56.7	H	74
2.776	58.2	V	74
3.663	58.2	H	74
3.663	61.0	V	74
3.685	62.2	H	74
3.685	62.2	V	74
3.704	60.2	H	74
3.704	59.7	V	74

Note: Values in tables are converted from dBm (e.i.r.p) to dB μ V/m using the following formula:

$$\text{dB}\mu\text{V/m} = \text{dBm (e.i.r.p.)} + 95.2$$

Measurement uncertainty	+4.5/-6.1 dB
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Used test equipment module

The following measurement equipment was used:

Description	ID	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

Revision History

REVISION	DATE	REMARKS
1.0	13 September 2006	In chapter 1.1, the ITU designator was changed from 250K7D to 217KF7D In chapter 3.2 “Field strength of unwanted emissions 30 - 1000 MHz” and 3.3 “Field strength of unwanted emissions > 1000 MHz “did not include the receiver spurious emissions results as required by the RSS-GEN paragraph 4.8.
2.0	28 September 2006	In chapter 2.3 the power spectral density was added as a test result as required by the FCC subpart C 15.247 (e).