

Radio test report **20114276301 rev 2.0**

based on:

- FCC Part 15 Subpart C, sections 15.209 and 15.247 (10-1-11 Edition)
- RSS-210, Issue 8 (December 2010 edition)

Avalanche Beacon
Mammut
Element Barryvox A10012-10000

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This report comprises of three modules. The total number of pages is: 22

Main module

1 Introduction

This report contains the result of tests performed by:

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

Tel

efication 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 : Adaxys Solutions AG
Address : Eichtalstrasse 55
Zipcode : CH-8634
City/town : Hombrechtikon
Country : Switzerland
Date of order : 8 November 2011

2 Product

A sample of the following product was submitted for testing:

Product description	:	Avalanche Beacon
Manufacturer	:	Mammut Sports Group AG
Trade mark	:	Mammut
Type designation	:	Element Barryvox A10012-10000
FCC ID	:	ARN-ELEMENT-B-211
Hardware version	:	HW1
Serial number	:	1127807097
Software release	:	1.0

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 December 2011

Tests were carried out between:

- 30 January and 10 February 2012

4 Product documentation

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

Identification	Date
ELEMENT_Barryvox_WLINK_certification_short_instructions_nov_2011.pdf	2011-12-05
ELEMENT Barryvox Users Manual.pdf	2012-01-20
ELEMENT Barryvox Operational Description.pdf	2012-01-20

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 Element Barryvox A10012-10000 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).

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 8 (December, 2010 edition).

8 Conclusions

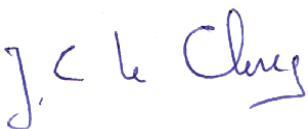
The samples of the product showed **NO NON-COMPLIANCES** to the specification stated in chapter 7 of this report.

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 : ing. J.C. le Clercq

function : Test Engineer

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 : 6 September 2012

name : ing. A. van der Valk

function : Manager Laboratory

Signature : i.a. ing. H. Rutjes

Function : Director Laboratory



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	915.965 – 925.826 MHz (50 hop frequencies)
Modulation	GFSK
Modulation bit rate	50 kbits/s
ITU emission class	217KF7D
Duty Cycle	0.26 %.)
FCC ID	ARN-ELEMENT-B-211

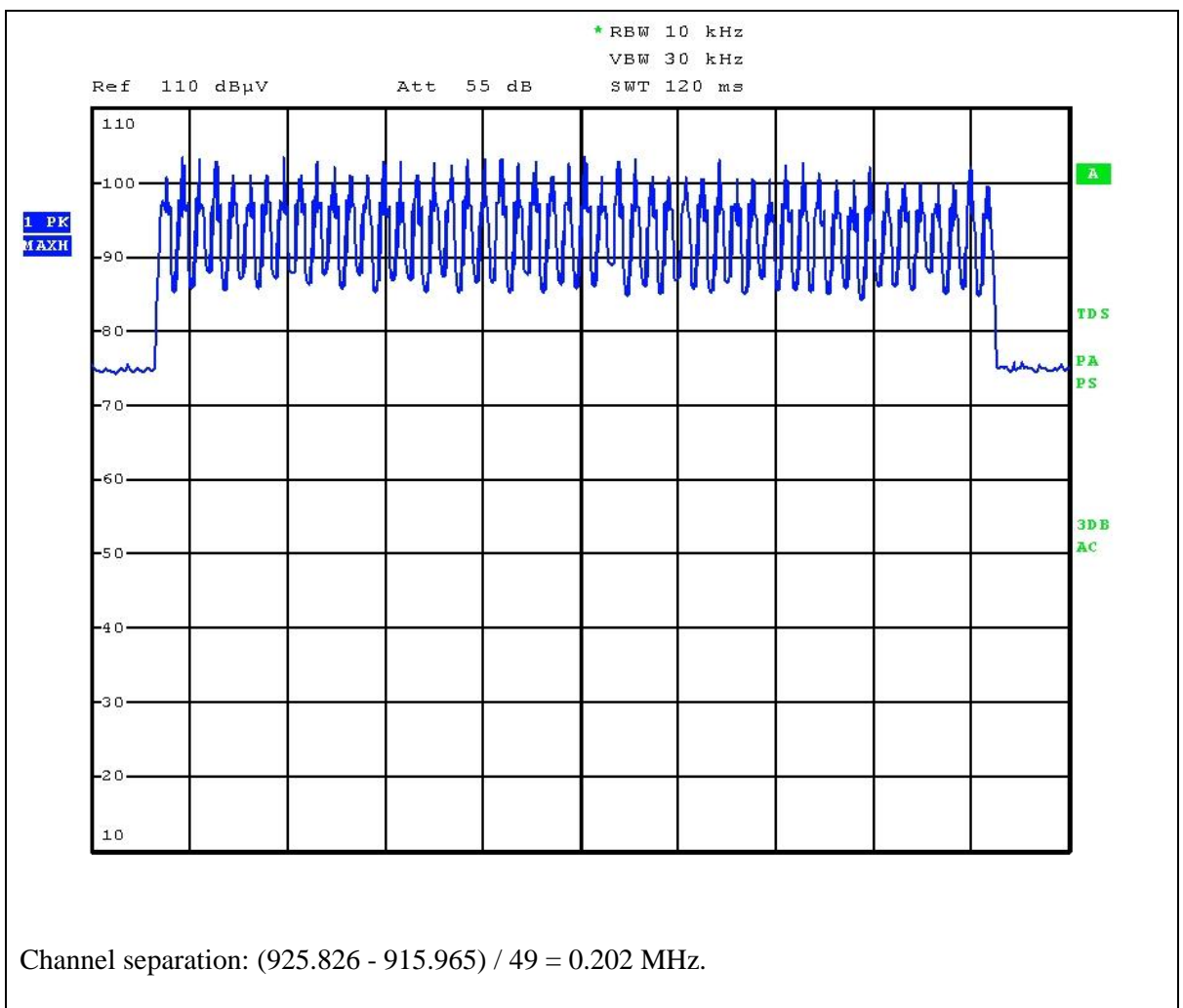
1.2 Frequency test channels

Channel	TX
1	915.9650 MHz
27	921.1974 MHz
50	925.8280 MHz

2 Test results

2.1 Channel separation

Compliance standard : FCC part 15, subpart C, section 15.247 (a)(1)
 RSS-210 (Issue 8, December 2010) section A8.1(2)
 Method of test : ANSI C63.10-2009, section 6.5
 RSS-GEN (Issue 3, Dec 2010) section 4.6
 Test results :



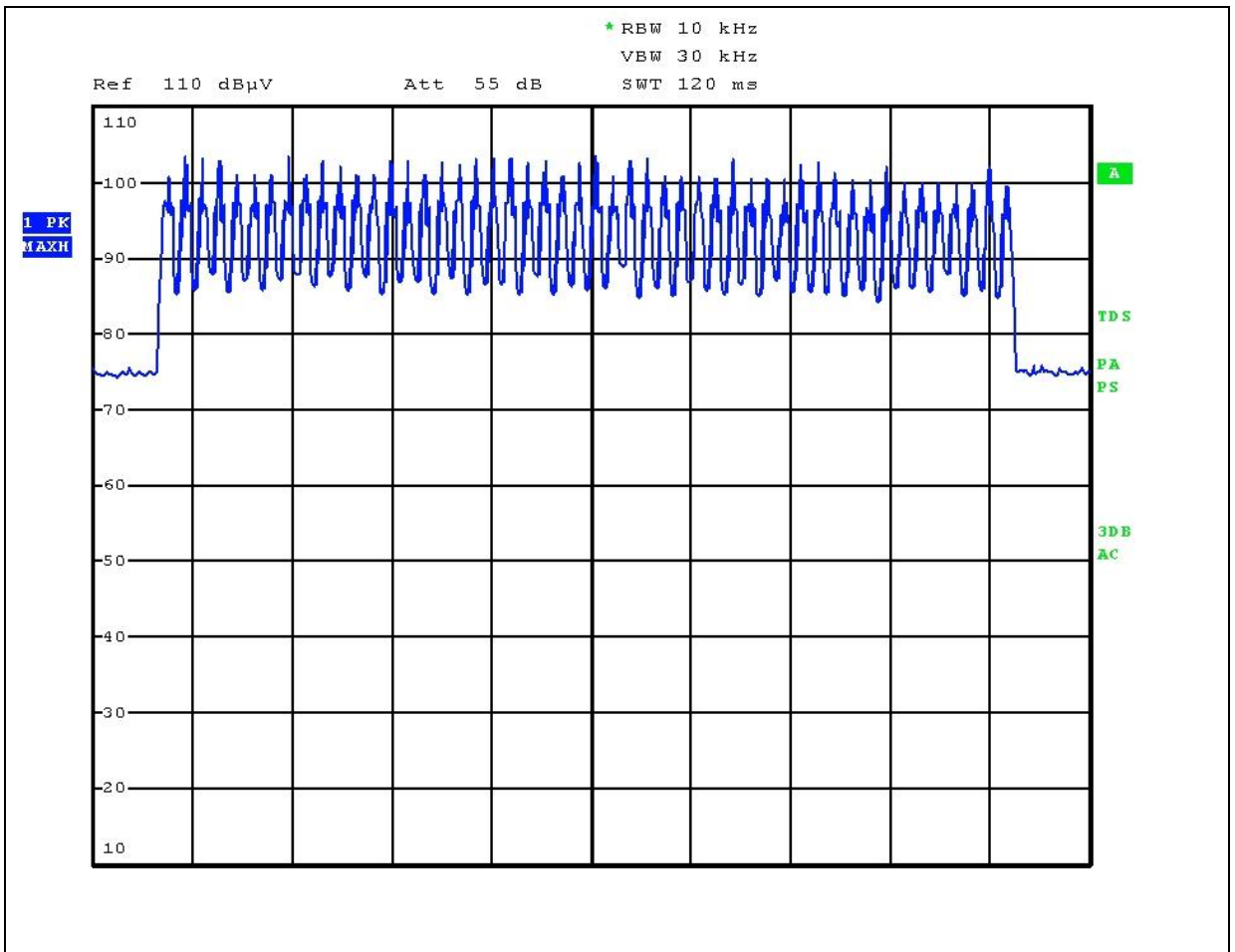
Measurement uncertainty	± 1.3 kHz
Limit	Channel BW < 250 kHz)

Note: The picture shows that 50 discrete hop frequencies are used. The lowest hop frequency is 915.965 MHz and the highest hop frequency is 925.826 MHz.

Test equipment used	9, 10, 14, 15, 16, 17.
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2.2 Number of hop frequencies

Compliance standard : FCC part 15, subpart C, section 15.247 (a)(1)
 RSS-210 (Issue 8, Dec 2010) section A8.1(3)
 Method of test : ANSI C63.10-2009, section 6.5
 RSS-GEN (Issue 3, Dec 2010) section 4.6
 Test results :



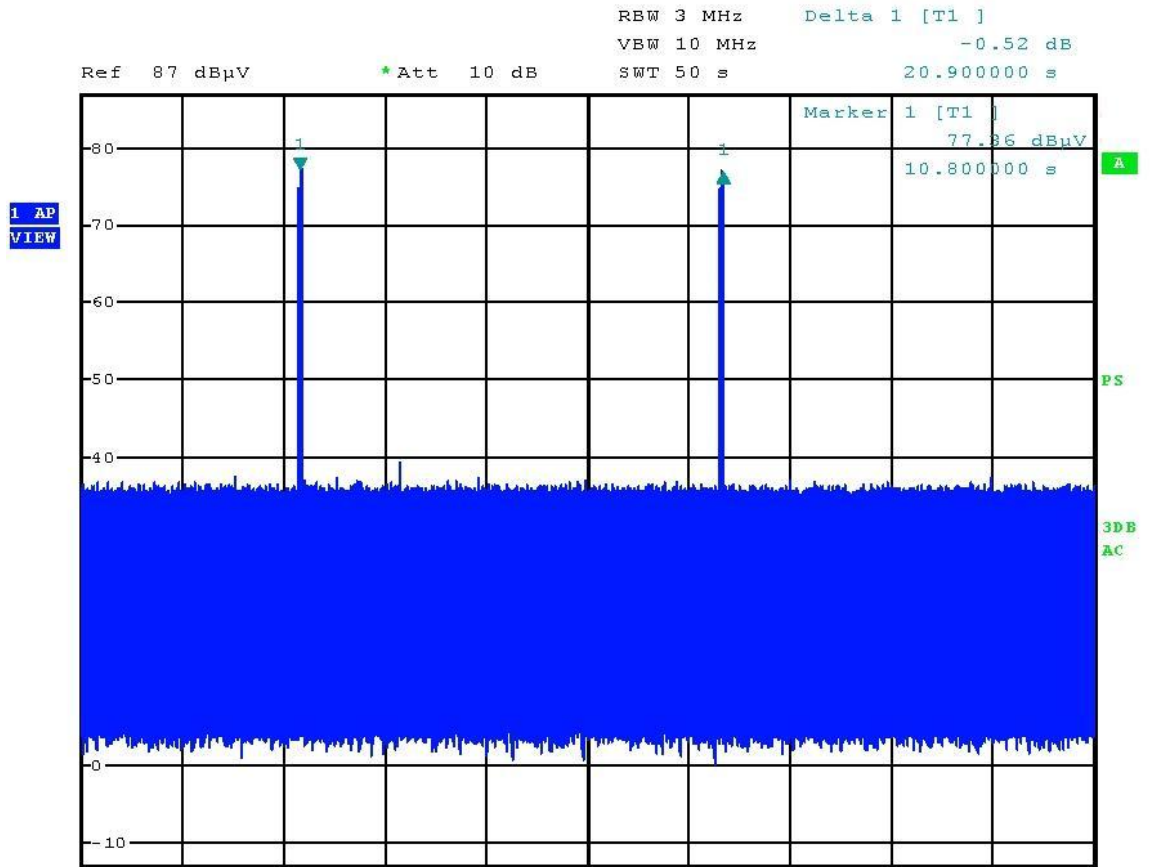
In total 50 discrete hop frequencies are used.

Measurement uncertainty	± 1.3 kHz
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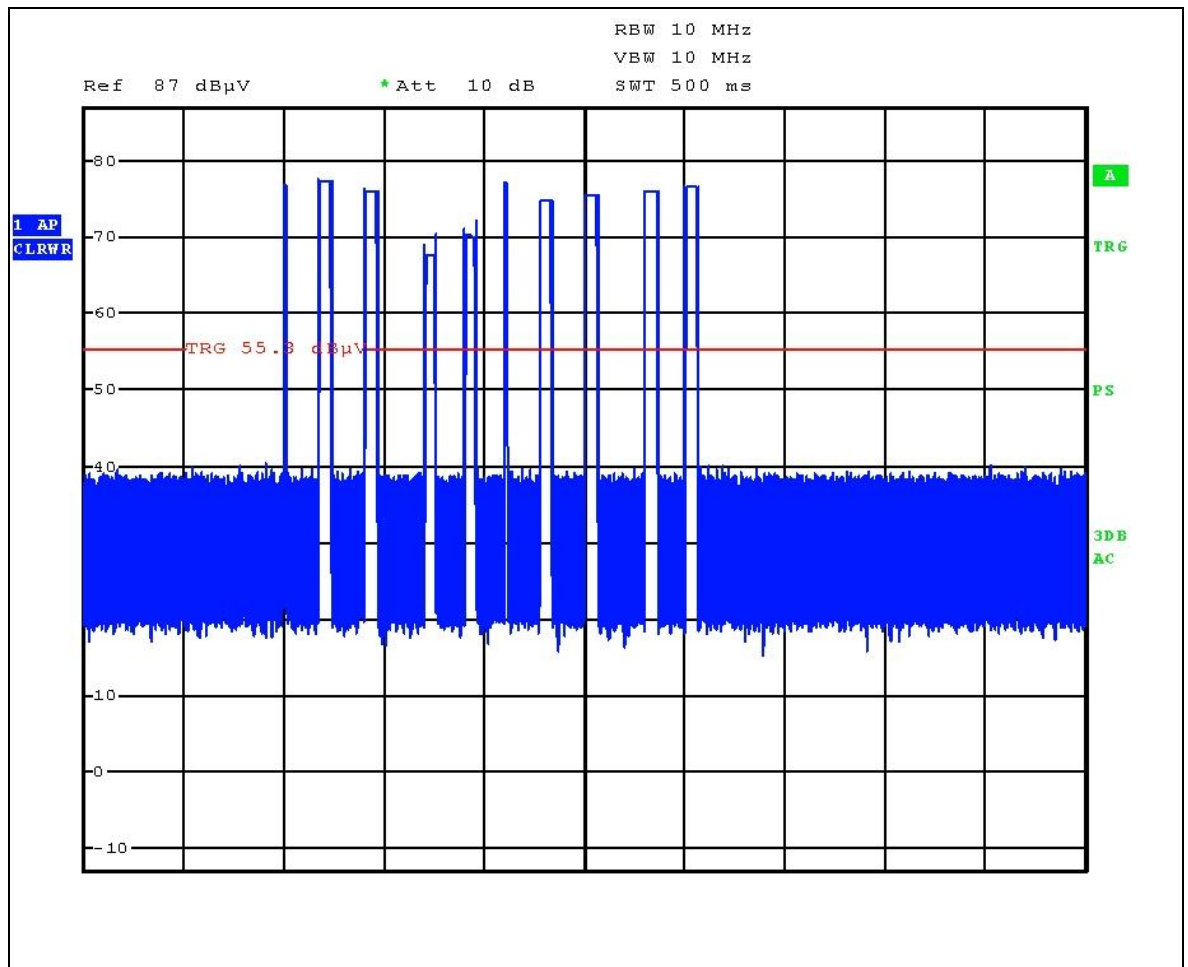
Limit	≥50 hopping frequencies (for channel BW < 250 kHz) ≥25 hopping frequencies (for channel BW ≥ 250 kHz)
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Note: The picture shows that 50 discrete hop frequencies are used. The lowest hop frequency is 915.965 MHz and the highest hop frequency is 925.826 MHz.

Test equipment used	9, 10, 14, 15, 16, 17.
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Period = 20.9 seconds



Occupancy during one period of 20 seconds:

Impulse 2 to 5 and impulse 7 to 10: 6.4 ms duration
 Impulse 1 and 6: 1.6 ms duration

Total occupancy during one period of 20 seconds:

$$8 \times 6.4 + 2 \times 1.6 + 54.4 \text{ ms}$$

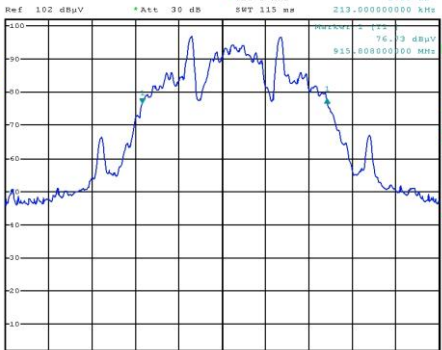
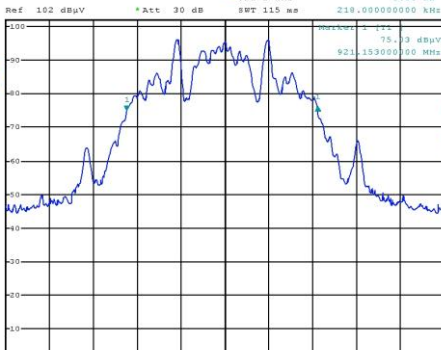
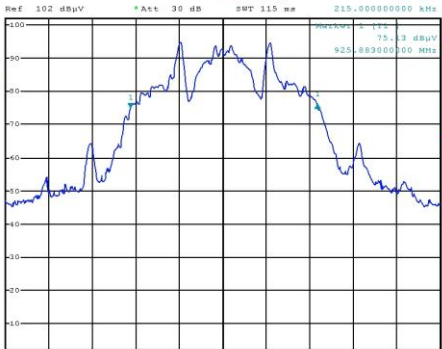
Limit	Maximum occupancy per channel: 0.4 sec per 20 seconds.
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Measurement uncertainty	0.25 %
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Test equipment used	9, 10, 14, 15, 16, 17.
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2.3 Bandwidth and Power spectral density

Compliance standard : FCC part 15, subpart C, section 15.247 (a)(1)(i) and (e)
 RSS-210 (Issue 8, Dec 2010) section A8.1(1)
 Method of test : ANSI C63.10-2009, section 6.5
 RSS-GEN (Issue 3, Dec 2010) section 4.4.1
 Test results :

	
<p>Channel 1 20 dB Bandwidth = 213.0 kHz Maximum PSD = 5.2 dBm / 3 kHz</p>	<p>Channel 27 20 dB Bandwidth = 218.0 kHz Maximum PSD = 6.8 dBm / 3 kHz</p>
	
<p>Channel 50 20 dB Bandwidth = 215.0 kHz Maximum PSD = 6.5 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>

<p>Test equipment used</p>	<p>9, 10, 14, 15, 16, 17.</p>
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3 Emission tests

3.1 Peak power of intentional signal

Compliance standard : FCC part 15, subpart C, section 15.247 (b)
 RSS-210 (Issue 8, Dec 2010) section A8.4(1)
 Method of test : ANSI C63.10-2009, section 6.5
 RSS-GEN (Issue 3 Dec 2010) section 4.6
 RSS-210 (Issue 8, Dec 2010) section A8.4(1)
 Test results :

peak power:

Frequency (MHz)	Test result dBm ERP	Polarisation	Conducted power (calculated)	Limit (dBm)
915.965	1.17	V	11.17	30
921.197	2.83	V	12.83	30
925.826	2.50	V	12.50	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
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Limit	< 1 Watt
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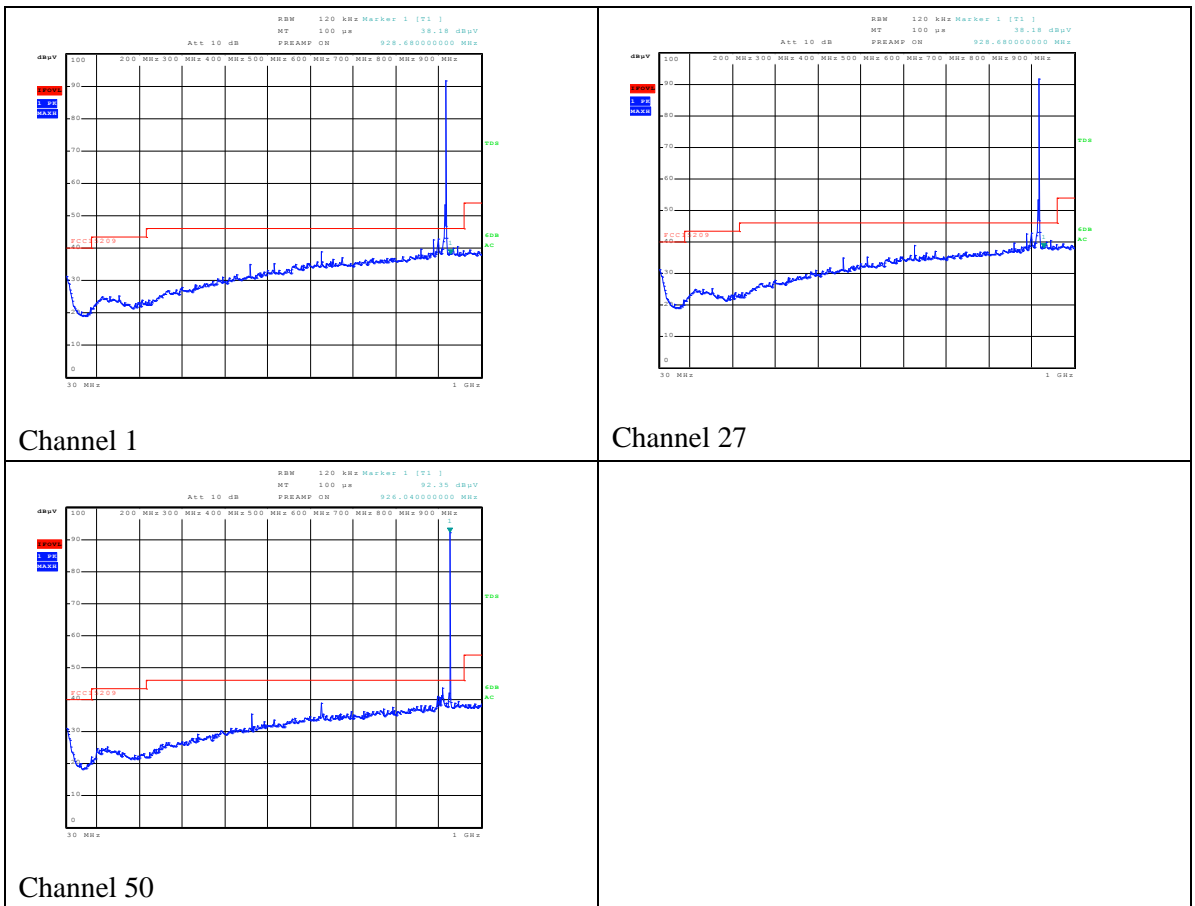
Test equipment used	9, 10, 14, 15, 16, 17.
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3.2 Field strength of unwanted emissions 30 - 1000 MHz

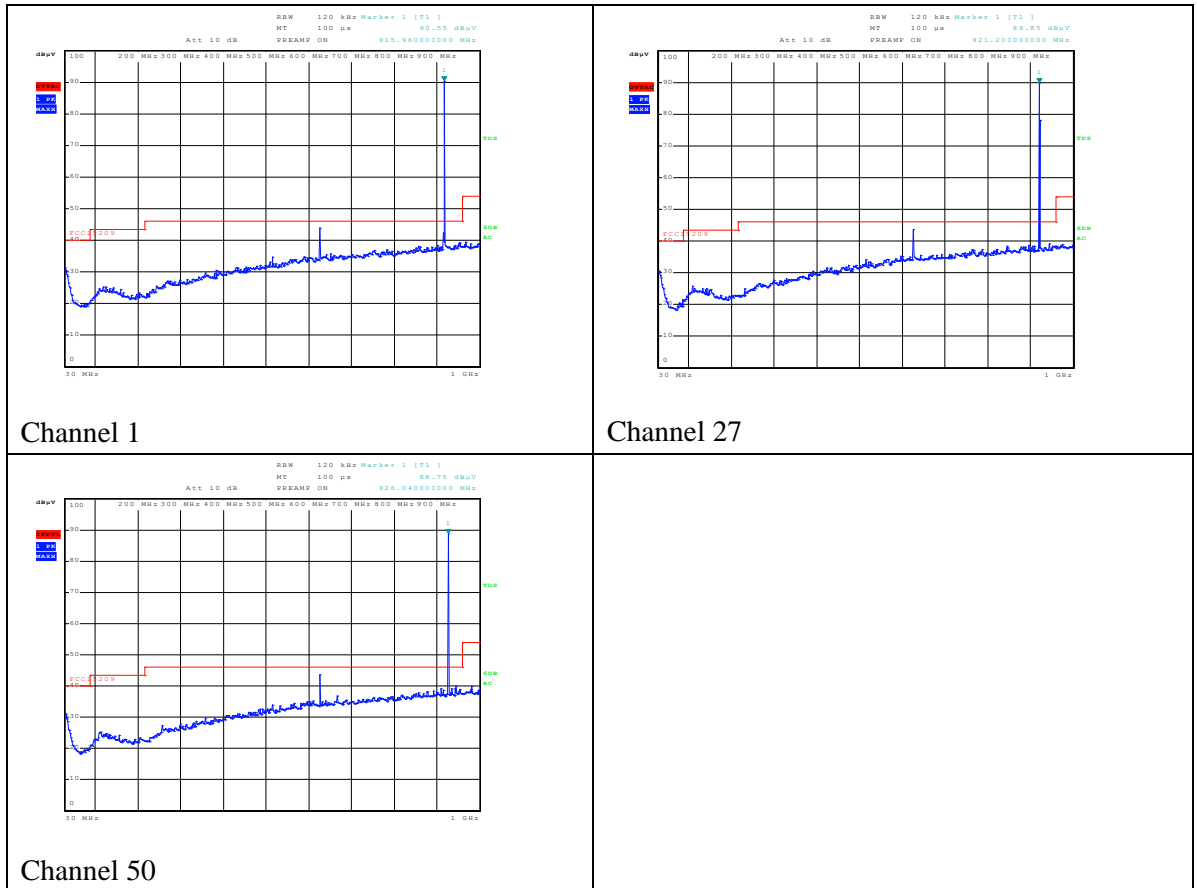
Compliance standard : FCC part 15, subpart C, section 15.209 (a)
 RSS-GEN (Issue 3, Dec 2010) section 4.7 & 4.8
 RSS-210 (Issue 8, Dec 2010) sections A8.4(1) & A8.5
 Method of test : ANSI C63.10-2009, section 6.5,
 FCC part 15, subpart A, section 15.31(m), 15.33, 15.35.
 EUT condition : center channel
 Test results :

Measurements of unwanted emissions in transmit mode 30 - 1000 MHz

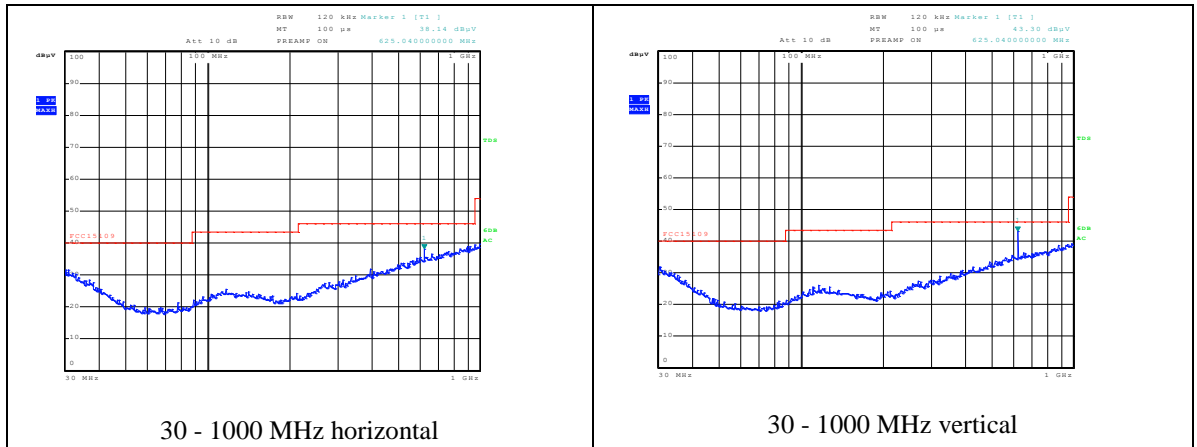
30 - 1000 MHz horizontal



30 - 1000 MHz vertical



Measurements of unwanted emissions in receiver mode 30 - 1000 MHz



Measurement uncertainty	+2.6/-3.3 dB
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Test equipment used	9, 10, 14, 15, 16, 17.
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3.3 Field strength of unwanted emissions > 1000 MHz

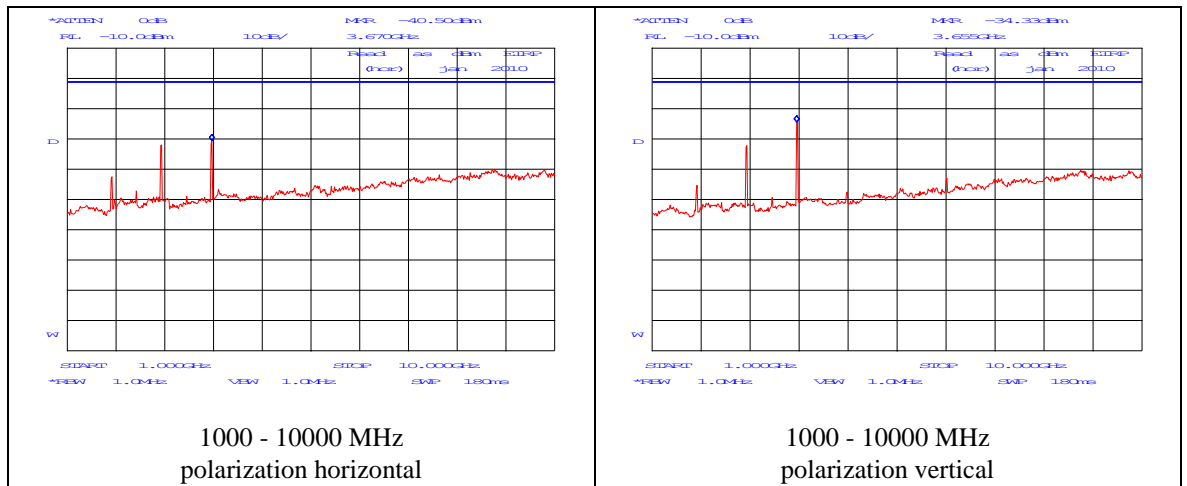
Compliance standard : FCC part 15, subpart C, 15.209 (a) & 15.247 (d)
 RSS-GEN (Issue 3, Dec 2010) section 4.7
 RSS-210 (Issue 8, Dec 2010) section A8.5

Method of test : ANSI C63.10-2009, section 6.6;
 FCC part 15, subpart A, section 15.31(m), 15.33, 15.35.
 RSS-GEN (Issue 3, Dec 2010) section 4.7
 RSS-GEN (Issue 3, Dec 2010) section A8.5

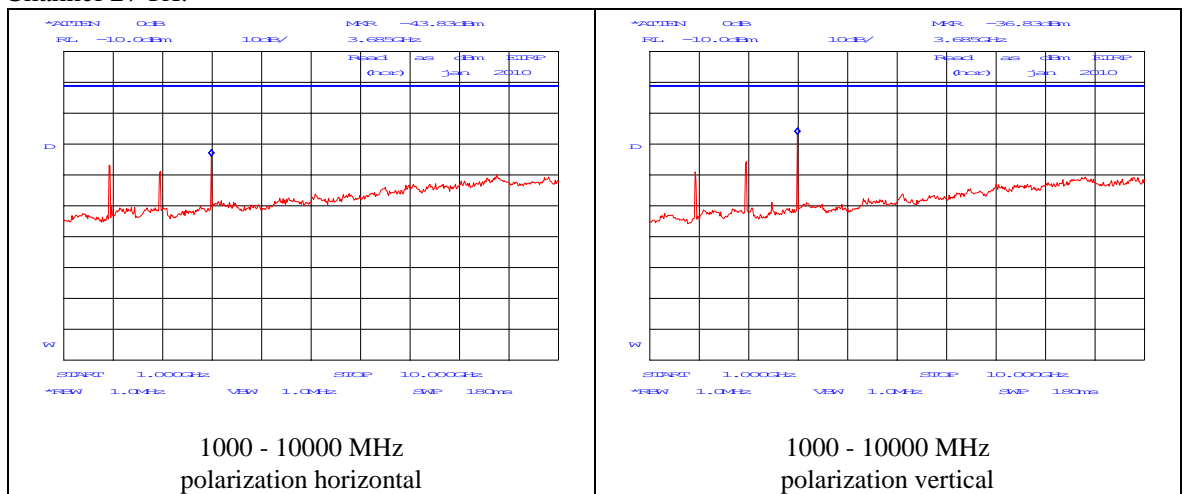
Test results :

Transmitter tests:

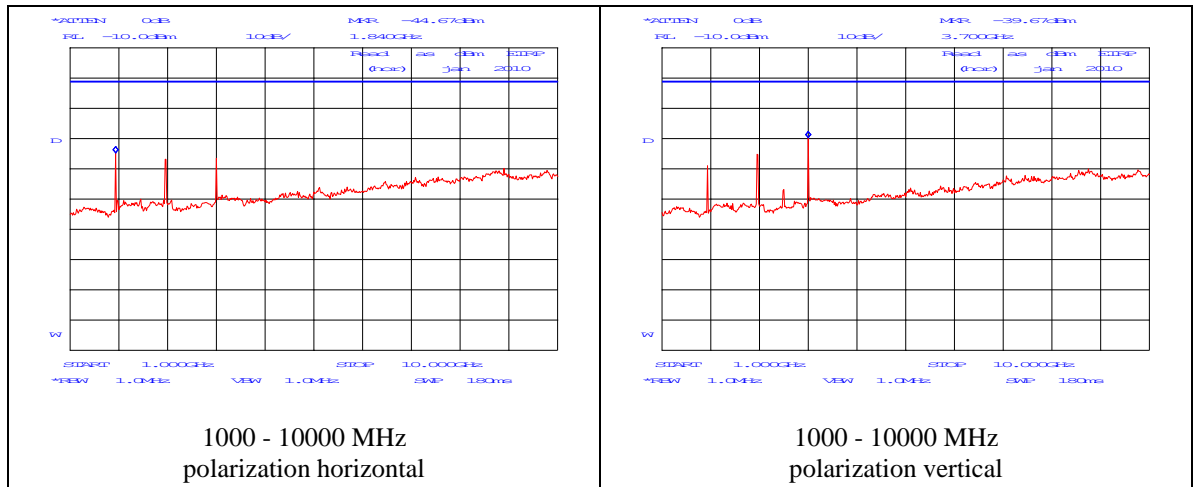
Channel 1 TX:



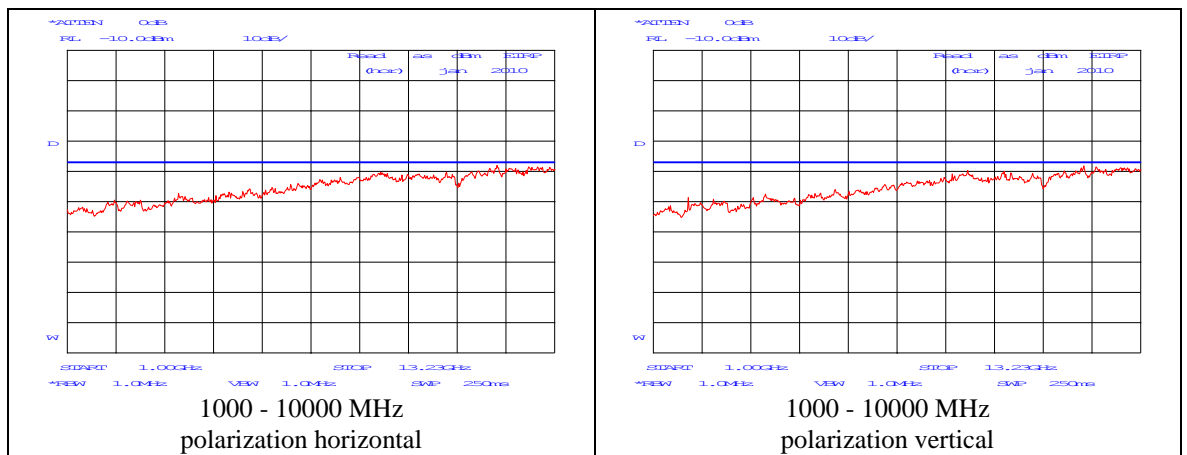
Channel 27 TX:



Channel 50 TX:



Receiver tests:



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

Measurement uncertainty	+4.5/-6.1 dB
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Test equipment used	1, 3, 5, 7, 11, 12, 13.
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Comment:

The equipment under test complies with par. 15.247(d) because all radiated spurious signals are below the general limits specified in par. 15.209.

Radiated emissions in the restricted bands also comply with par. 15.209.

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 3, Dec 2010) section 4.7
 RSS-210 (Issue 8, Dec 2010) section A8.5

Method of test : ANSI C63.10-2009, section 6.6;
 FCC part 15, subpart A, section 15.31(m), 15.33, 15.35.
 RSS-GEN (Issue 3, Dec 2010) section 4.7
 RSS-GEN (Issue 3, Dec 2010) section A8.5

Test results :

Spurious measurement of 3rd harmonic in restricted band. 2690 – 2900 MHz

Channel	Frequency MHz	Pol	Level PK dBm	Limit PK dBm	Level AV dBm	Limit AV dBm
1	2740	H	-42.00	-21.2	-67.87	-41.2
1	2740	V	-42.17	-21.2	-68.04	-41.2
27	2755	H	-49.83	-21.2	-75.70	-41.2
27	2755	V	-45.67	-21.2	-71.54	-41.2
50	2755	H	-46.00	-21.2	-71.87	-41.2
50	2755	V	-45.17	-21.2	-71.04	-41.2

Spurious measurement of 4th harmonic in restricted band. 3600 – 4400 MHz

Channel	Frequency MHz	Pol	Level PK dBm	Limit PK dBm	Level AV dBm	Limit AV dBm
1	3670	H	-40.50	-21.2	-66.37	-41.2
1	3670	V	-34.33	-21.2	-60.20	-41.2
27	3685	H	-43.83	-21.2	-69.70	-41.2
27	3685	V	-36.83	-21.2	-62.70	-41.2
50	3700	H	-46.33	-21.2	-72.20	-41.2
50	3700	V	-39.67	-21.2	-65.54	-41.2

Note: Average values are compensated for the transmit duty cycle using the $10 \log(1/x)$ formula.

Duty cycle: $10 \log (54/20900) = -25.87 \text{ dB}$

Note: Values in tables are converted from $\text{dB}\mu\text{V}/\text{m}$ to dBm (e.i.r.p) using the following formula:

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

Measurement uncertainty	+4.5/-6.1 dB
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Test equipment used	1, 3, 5, 7, 11, 12, 13.
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Comment:

The equipment under test complies with par. 15.247(d) because all radiated spurious signals are below the general limits specified in par. 15.209.

Radiated emissions in the restricted bands also comply with par. 15.209.

Used test equipment module

The following measurement equipment was used:

Ref	Description	Manufacturer	Model	ID
1	Spectrum analyzer	HP	HP8563E	TE 00481
2	RF pre-amplifier up to 1000 MHz	Rohde & Schwarz	ESV-Z3	TE 00098
3	RF pre-amplifier 1 - 26.5 GHz	HP	HP8449B	TE 00093
4	Biconilog antenna	EMCO	3143	TE 00700
5	Horn antenna	EMCO	3115	TE 00532
6	Horn antenna	EMCO	3116	TE 00533
7	Anechoic chamber	Euroshield	RFD-F-100	TE 01064
8	Digital thermometer	Fluke	Fluke 51	TE 00388
9	EMI test receiver	Rohde & Schwarz	ESCI	TE 11128
10	Biconilog antenna	Chase	CBL6113A	TE 00967
11	Antenna tower	HD	AS 620p	ANEC
12	Turntable	HD	DS 412	ANEC
13	Turntable controller	HD	HD 050	ANEC
14	Antenna tower	inn-Co	MA-4000	SAR
15	Antenna mast	inn-Co	1070	SAR
16	Turn table	inn-Co	1060-2M	SAR
17	Semi Anechoic Room	Comtest		SAR

Revision History

REVISION	DATE	REMARKS	REVISED BY
1.0	29 June 2012	A note concerning the hop frequencies was added on page 8.	ing. J.C. le Clercq
1.0	29 June 2012	A note concerning the hop frequencies was added on page 9.	ing. J.C. le Clercq
1.0	29 June 2012	A note concerning the spurious emissions was added on page 18	ing. J.C. le Clercq
1.0	29 June 2012	A note concerning the spurious emissions was added on page 20	ing. J.C. le Clercq
2.0	6 September 2012	Plot replaced on page 10	A. Ibrahim