

Radio test report

20071410301 - rev 3.0

based on:

- FCC Part 15 Subpart E, section 15.407 (10-1-06 Edition)
- IC RSS-210, Issue 7 (June 2007 edition)
- IC RSS-Gen, Issue 2 (June 2007 edition)

Wireless Mesh Node
Xnet Viper
Xnet Viper-IV

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This report comprises of five modules. The total number of pages is: 33

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 : Hopling Technologies B.V.
Address : Camerastraat 10
Zipcode : 1322 BC
City/town : Almere
Country : The Netherlands
Date of order : 23 April 2007

2 Product

A sample of the following product was submitted for testing:

Product description	: Wireless Mesh Node
Manufacturer	: Hopling Technologies B.V.
Trade mark	: Xnet Viper
Type designation	: Xnet Viper-IV
FCC ID	: VEE-H5486868
IC ID	: 6614A-H5486868
Hardware version	: --
Serial number	: HV.11.2222.01262
Software release	: 3.1.4 HT1 (1012)

Variant models	: Xnet Viper-I Xnet Viper-II Xnet Viper-III
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Variant series	: Xnet Raptor
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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:

- 18 June 2007

Tests are carried out from:

- 18 June 2007 to 14 August 2007

4 Product documentation

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

Description	Date	Identification
Xnet Viper series reference guide	18-04-2007	Ref. Guide version HD.02.104.00001
Similarity declaration for Xnet Raptor series	August 28, 2007	Letter of similarity

The above mentioned documentation will be filed at Telefication for a period of 10 years.

5 Observations and comments

Test software:

A connection with the EUT is established using a LAN. The EUT is provided with a web-interface by which the test mode can be initialized. The actual programming of the test mode is done using a PuTTY – client.

Settings:

All tests are performed on Radio 0.

During all tests the beacon was disabled.

The data-rate of 802.11a was set at 54 Mb/s.

The powersetting of 802.11a from 5150 MHz to 5250 MHz was set at: 5.

A verification test has been performed in order to determine output power dependency on the bit rate. No significant differences were observed.

Except for field strength measurements all measurements are performed conducted.

All conducted measurements are carried out with a 10 dB external attenuator to the spectrum analyser.

The printed text on the radio module displays: NMP-8602 PLUS(FCC)

The label on the radio module displays: NMP-8601 PLUS(FCC)

The 802.11b/g test results are laid down in Telefication test report 20071410300.

Radiated emission tests below 1 GHz are performed at an open area test site.

TNO Electronic Products & Services (EPS) B.V.

Smidshornerweg 18

9822 TL Niekerk

The Netherlands

FCC listed : 90828

Industry Canada : IC3501A-1

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 5150 – 5250 MHz
INTENTIONAL RADIATOR OPERATING IN THE FREQUENCY BAND 2400 – 2483.5 MHz^{*)}

^{*)} The 2.4 GHz band test results are laid down in Telefication test report 20071410300.

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

FCC Part 15 Subpart E, section 15.407 (10-01-06 Edition);
RSS-210, Issue 7 (June 2007 edition);
RSS-Gen, Issue 7 (June 2007 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 : M. Kronenburg

function : Test Engineer

signature :

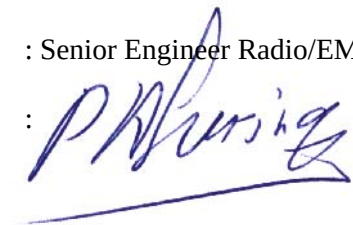


Review of test report by:

name : P.A. Suringa

function : Senior Engineer Radio/EMC

signature :



The above conclusions have been verified by the following signatory:

Date : 5 September 2007

name : J.P. van de Poll

function : Co-ordinator Test Group

signature :



Test results module

1.1 Equipment information

Operating frequency range	2412 – 2462 MHz; 5150 – 5250 MHz
Occupied bandwidth (calculated) (RSS-Gen; 4.6.1)	11 MHz (IEEE 802.11b); 16.6 MHz (IEEE 802.11g); 16.6 MHz (IEEE 802.11a)
Rated RF power output	22.7 dBm (IEEE 802.11a); 25.26 dBm (IEEE 802.11b); 26.26 dBm (IEEE 802.11g)
ITU emission class	11M0G1D (IEEE 802.11b);16M6W1D (IEEE 802.11g); 16M6W1D (IEEE 802.11a)
Antenna type (5 GHz band)	Omni-directional, type MA-W055-10 9 (gain 9.21 dBi)
Antenna type (2.4 GHz band)	Omni-directional, type MA-W025-9 (gain 10.31 dBi)

1.2 Tested channels

Mode	Channel 36	Channel 40	Channel 44	Channel 48
IEEE 802.11a	5180 MHz	5200 MHz	5220 MHz	5240 MHz

1.3 Summary of test data (IEEE 802.11a, 5150 – 5250 MHz band)

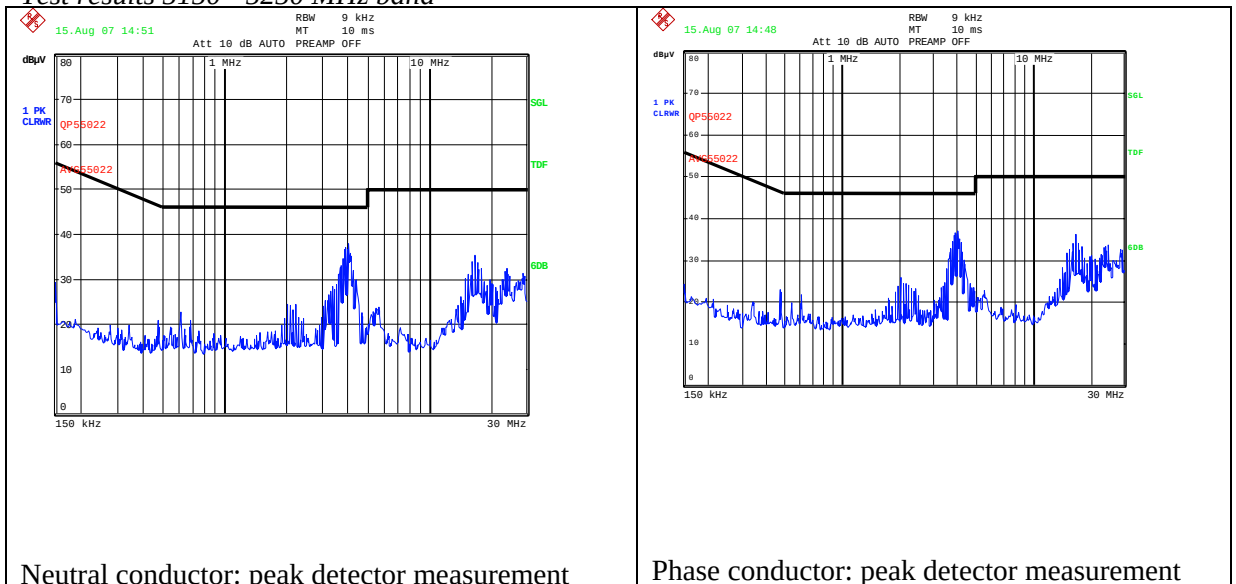
NAME OF TEST	PARA. NO.	Limit	MEAS.	RESULT
Power line conducted emissions	15.207(a)	66 dB μ V	38 dB μ V	Complies
Maximum Peak Power Output	15.407(a)(1)	23 dBm E.I.R.P.	19.41 dBm E.I.R.P.	Complies
		17 dBm conducted	10.20 dBm conducted	
Peak Power Spectral Density	15.407(a)(1)	10 dBm/MHz E.I.R.P.	9.21 dBm/MHz E.I.R.P.	Complies
		4 dBm/MHz conducted	0.00 dBm/MHz conducted	
Ratio of peak excursion	15.407 (a)(6)	13 dB	12.70 dB	Complies
Spurious Emissions 30-1000 MHz	15.407(b)(6)	see § 15.209	41.7 dB μ V/m @ 151 MHz	Complies
Spurious Emissions >1000 MHz	15.407(b)(1)	-27 dBm/MHz E.I.R.P.	$\leq$ -37 dBm/MHz E.I.R.P.	Complies
Restricted band edge emission levels	15.205(a)	54 dB μ V/m(av) 74 dB μ V/m(pk)	dB μ V/m 50.32 dB μ V/m	Complies
4.5 –5.15 GHz restricted band emission	15.205(a)	54 dB μ V/m(av) 74 dB μ V/m(pk)	48.2 dB μ V/m dB μ V/m	Complies

2 Emission tests 802.11a: 5150 – 5250 MHz band

2.1 Power line conducted emissions

Compliance standard : FCC part 15, subpart C, section 15.207 (a)
Method of test : ANSI C63.4-2003, sections 7 & 11.5
Ambient temperature : 24 °C
Relative humidity : 50 %
EUT condition : continuously transmitting on channel 40/157

Test results 5150 - 5250 MHz band



Measurement uncertainty: +3.7/-3.7 dB

3 Emission tests 802.11a: 5150 – 5250 MHz band

3.1 Peak power output

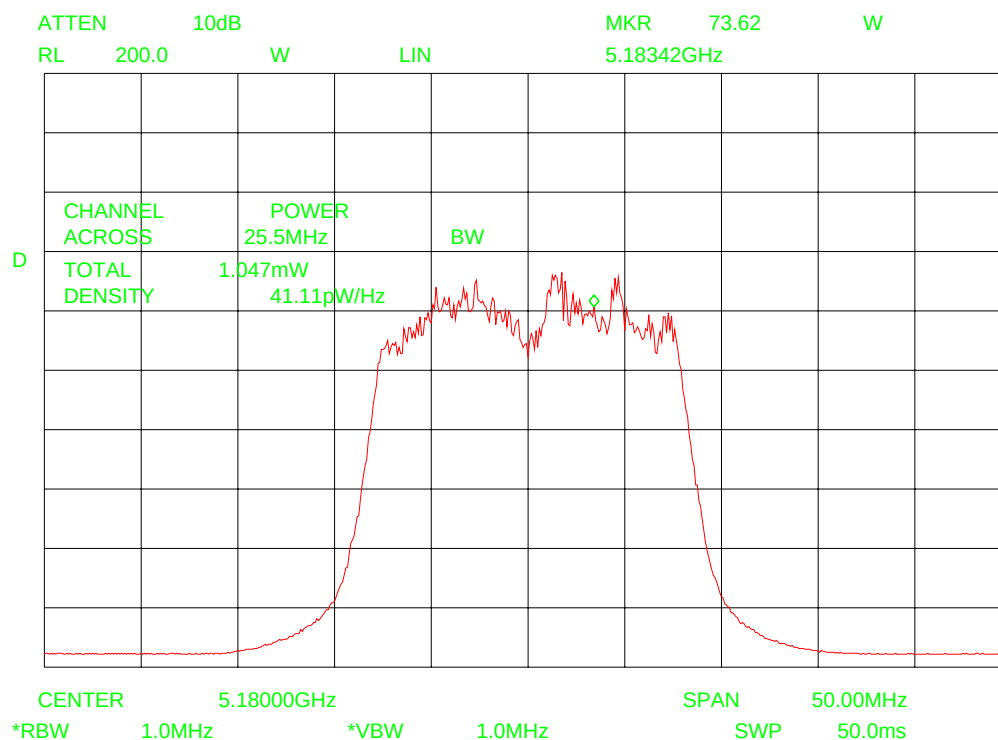
Compliance standard : FCC part 15, subpart E, section 15.407 (a)(1)
Method of test : FCC Public Notice DA 02-2138 method 3

Ambient temperature : 24 °C
Relative humidity : 50 %

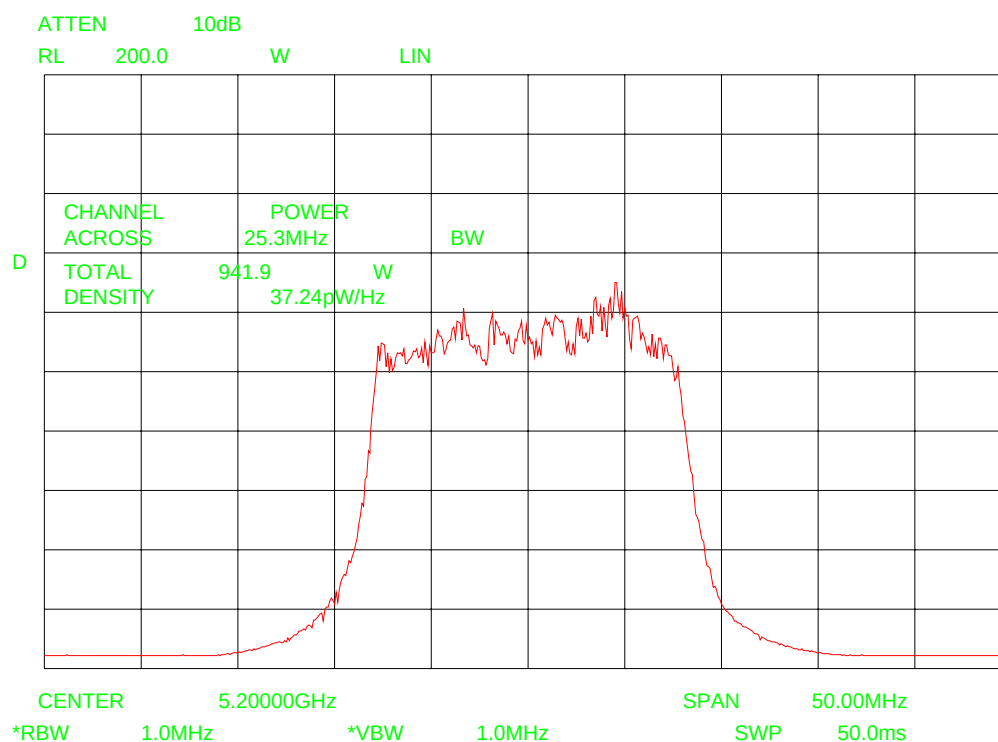
Test results :

Channel 36	Channel 40	Channel 44	Channel 48
10.20 dBm	9.74 dBm	8.05 dBm	7.56 dBm
19.41 dBm E.I.R.P.	18.95 dBm E.I.R.P.	17.26 dBm E.I.R.P.	16.77 dBm E.I.R.P.

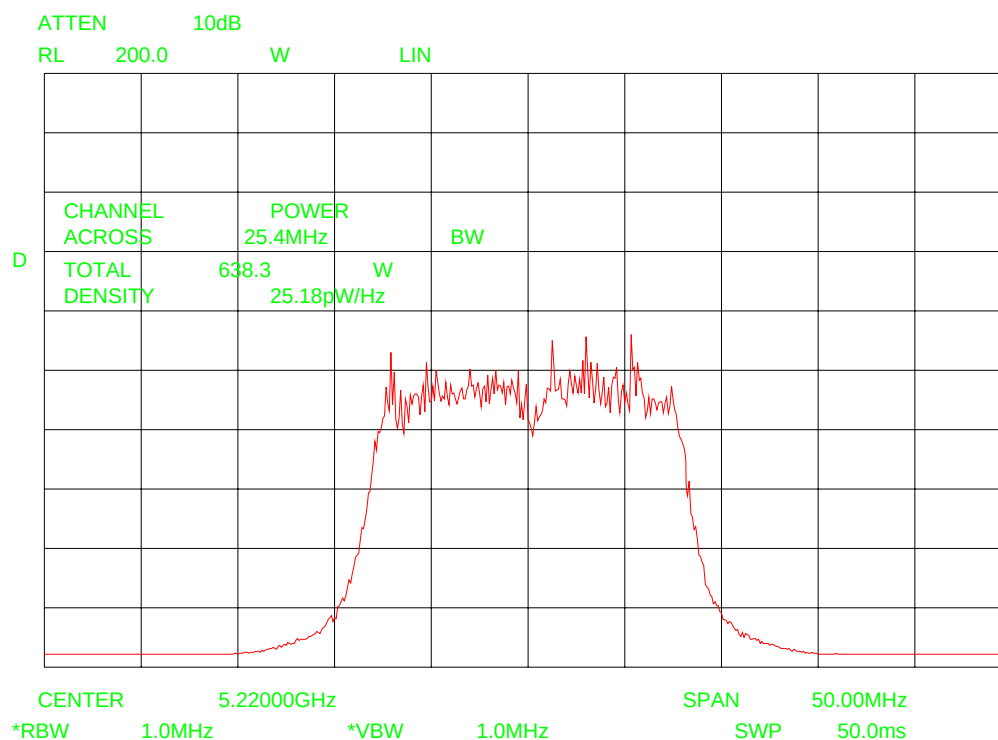
Channel 36 plot



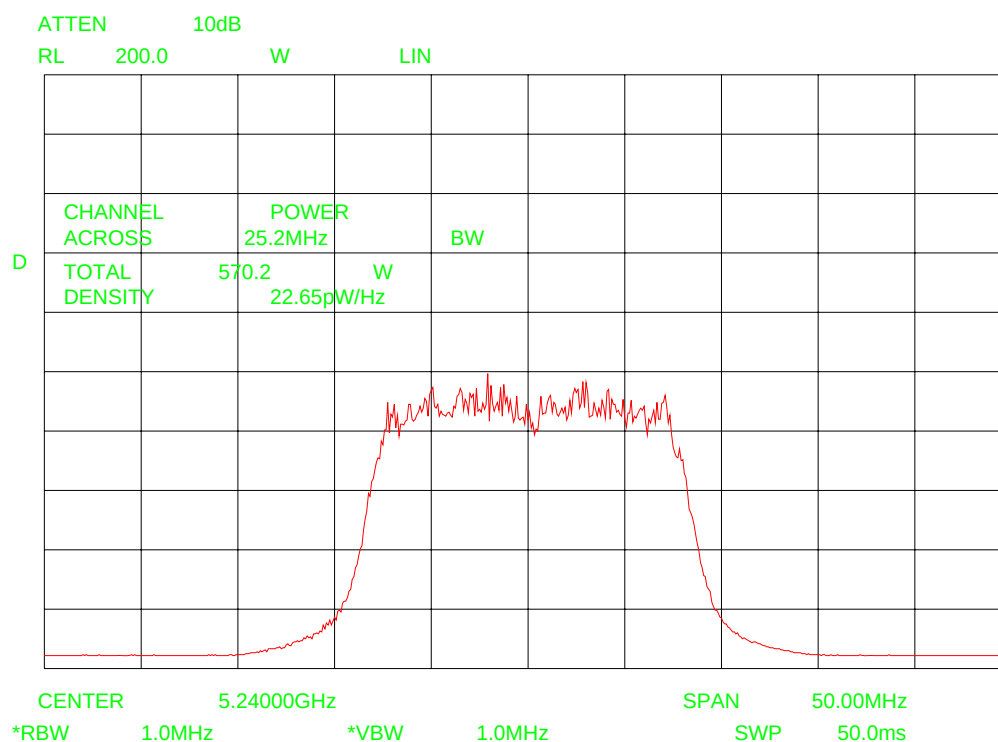
Channel 40 plot



Channel 44 plot



Channel 48 plot



Measurement uncertainty: + 2.4/ -2.7 dB

3.2 Peak power spectral density

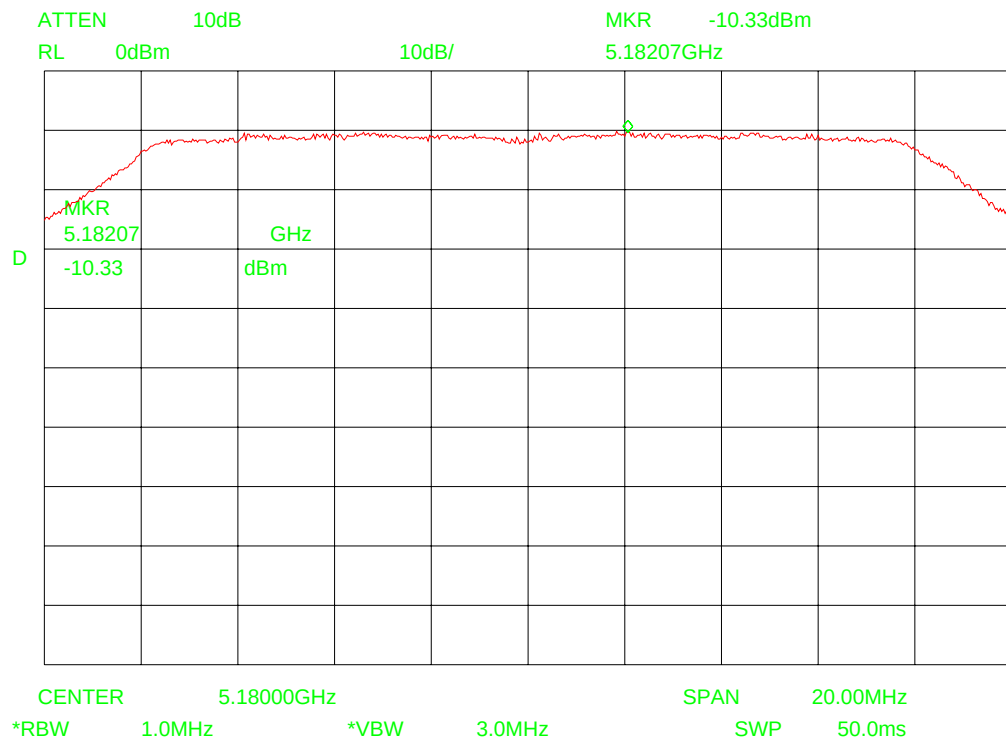
Compliance standard : FCC part 15, subpart E, section 15.407 (a) (3)
Method of test : FCC Public Notice DA 02-2138

Ambient temperature : 24 °C
Relative humidity : 50 %

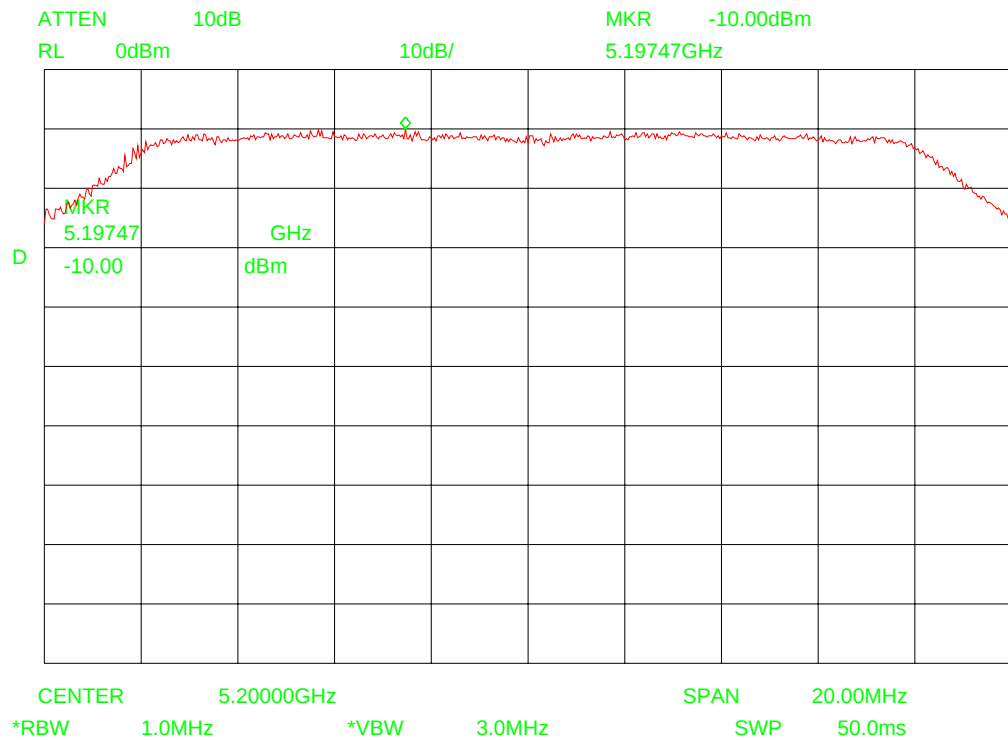
Test results :

Channel 36	Channel 40	Channel 44	Channel 48
-0.33 dBm/MHz	0 dBm/MHz	-0.83 dBm/MHz	-1.67 dBm/MHz
8.88 dBm/MHz E.I.R.P.	9.21 dBm/MHz E.I.R.P.	8.38 dBm/MHz E.I.R.P.	7.54 dBm/MHz E.I.R.P.

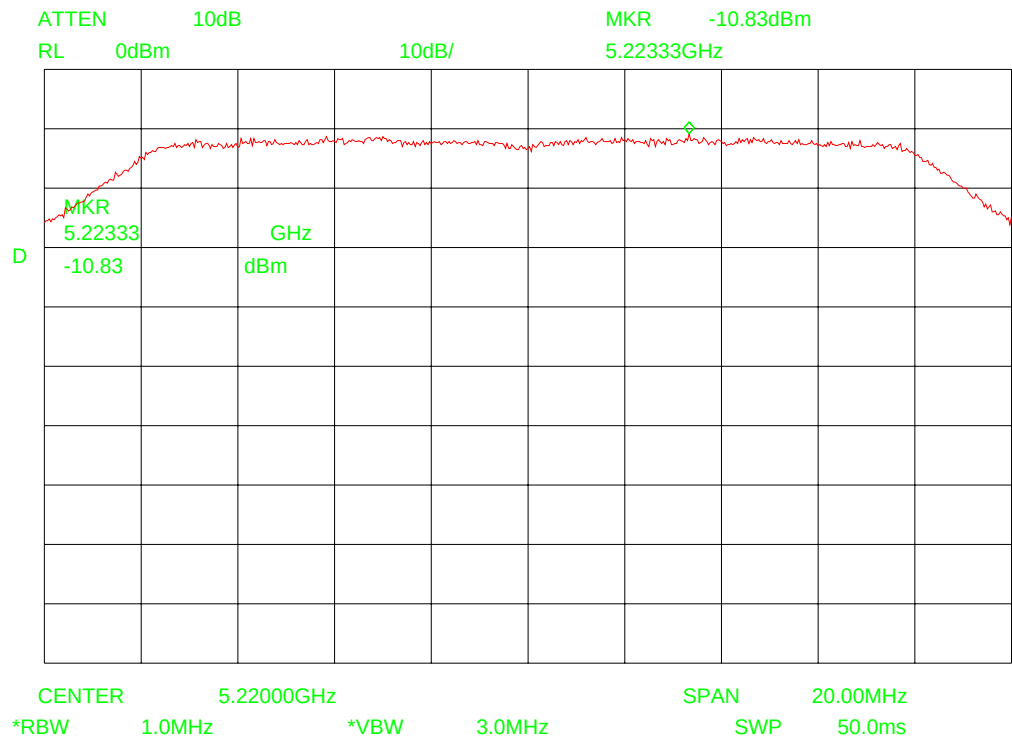
Channel 36 plot



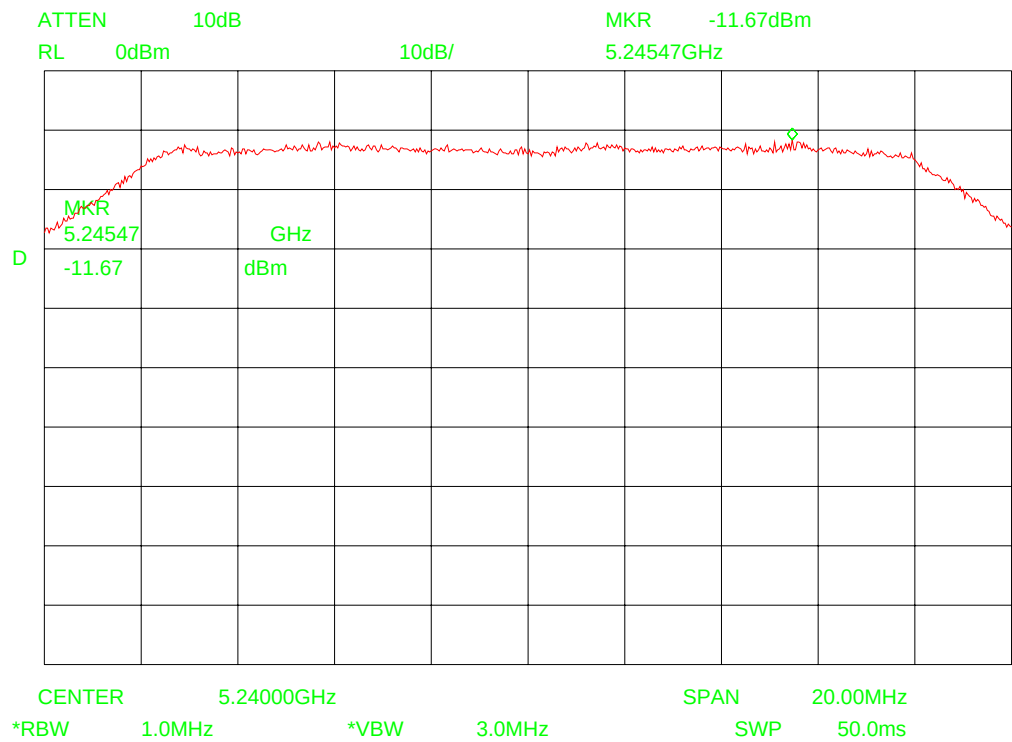
Channel 40 plot



Channel 44 plot



Channel 48 plot

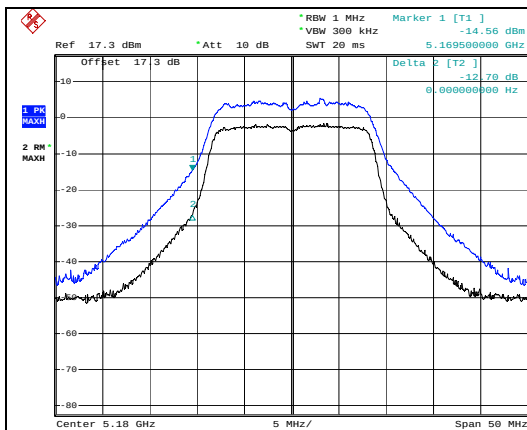


Measurement uncertainty: + 2.4/ -2.7 dB

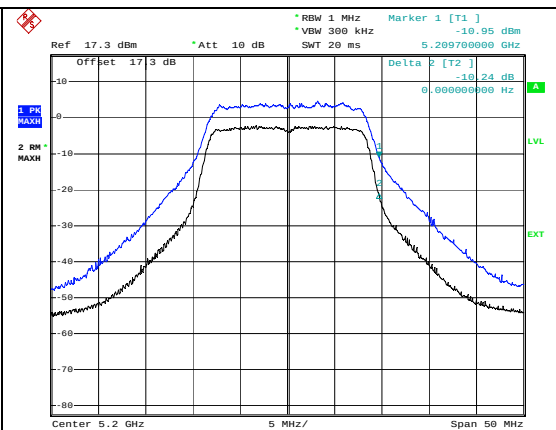
3.3 Peak excursion

Compliance standard : FCC part 15, subpart E, section 15.407 (a) (6)
Method of test : FCC Public Notice DA 02-2138

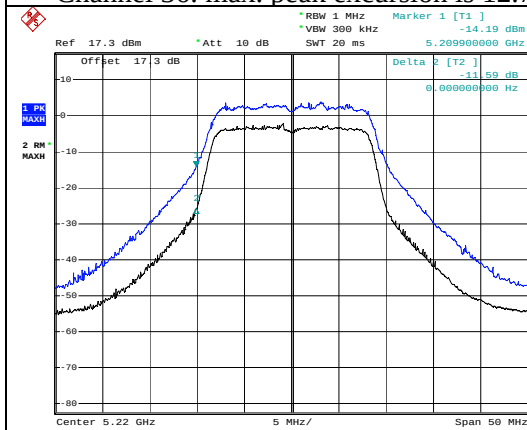
Ambient temperature : 24 °C
Relative humidity : 50 %



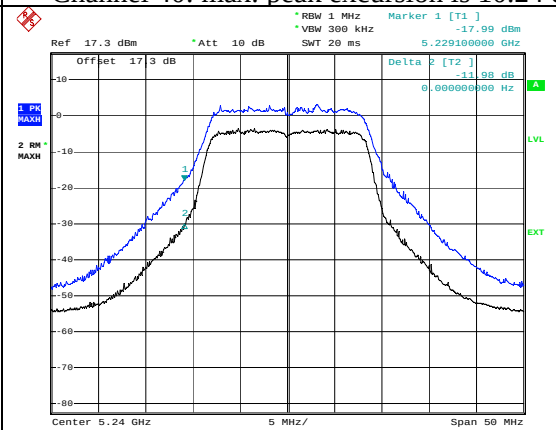
Channel 36: max. peak excursion is 12.70 dB



Channel 40: max. peak excursion is 10.24 dB



Channel 44: max. peak excursion is 11.59 dB



Channel 48: max. peak excursion is 11.38 dB

Measurement uncertainty: + 5.1/ -5.1 dB

3.4 Field strength of unwanted emissions 30 – 1000 MHz

Compliance standard : FCC part 15, subpart E, section 15.407(b)(6)
Method of test : ANSI C63.4-2003, sections 5.4, 8.2.3, 8.2.4 & 8.3.1.2;
FCC part 15, subpart A, section 15.31(m), 15.33, 15.35.
EUT config : 4 radio modules were installed, of which one was transmitting
Ambient temperature : 24 °C
Relative humidity : 50 %

Test results :

Frequency (MHz)	Value (dB μ V/m) QP	Polarization	Limit (dB μ V/m)
151.0	41.7	Horizontal	43.5
175.0	41.3	Horizontal	43.5
352.0	38.1	Vertical	46

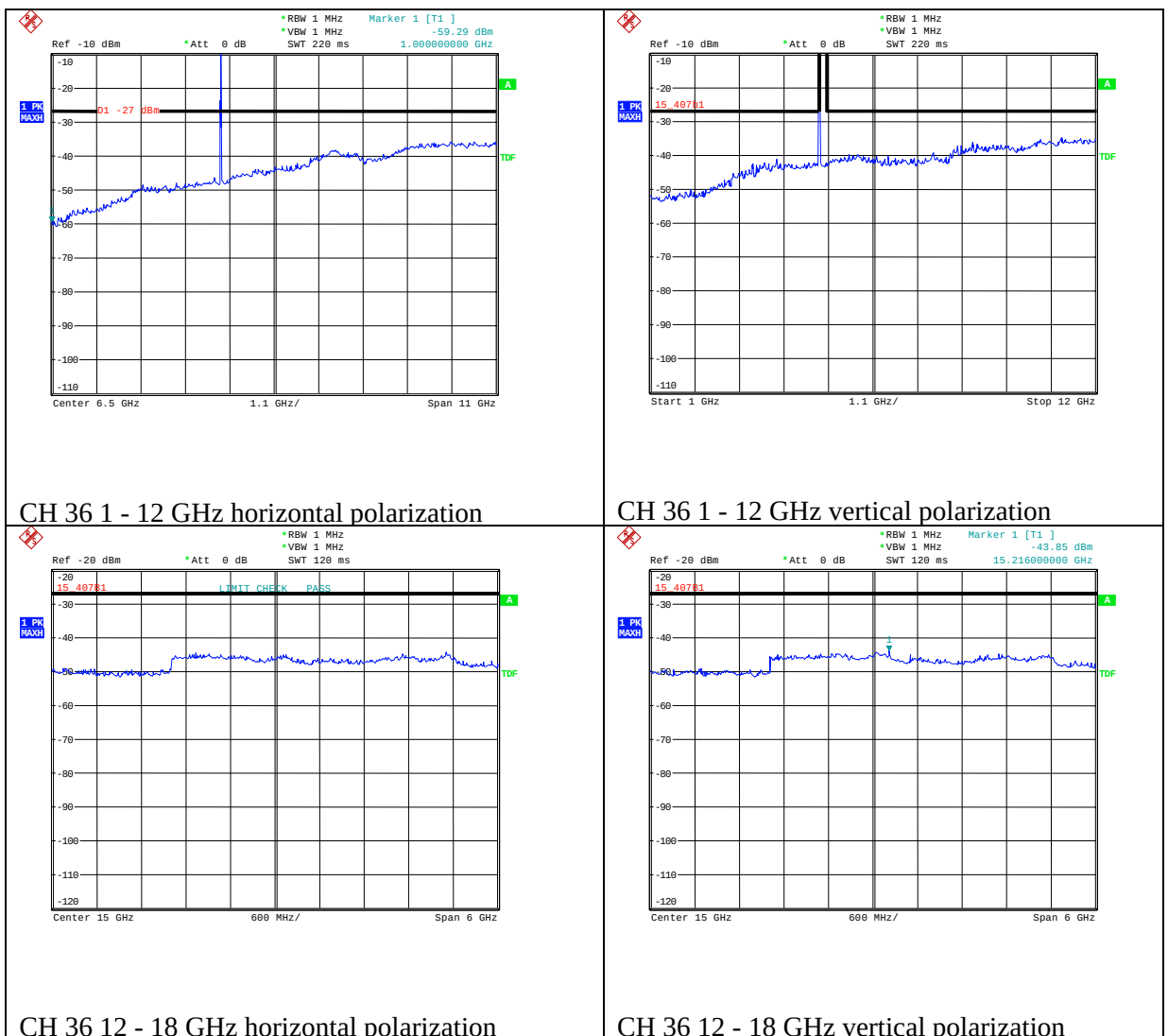
Note: it was observed that the emissions below 1 GHz are independent from the radio transmitting mode.

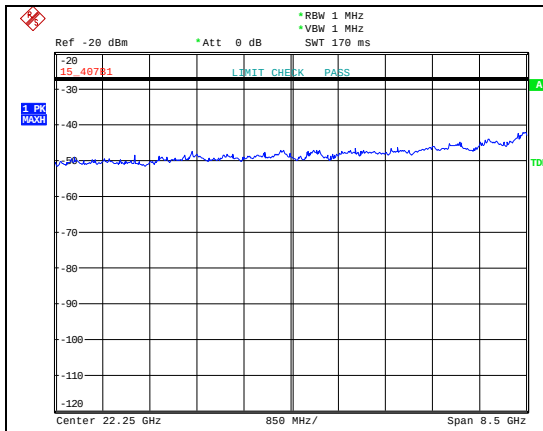
Measurement uncertainty: + 4.4/ - 4.4 dB

3.5 Field strength of unwanted emissions > 1000 MHz

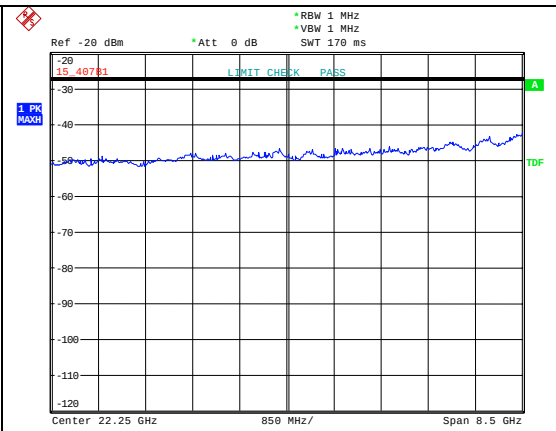
Compliance standard : FCC part 15, subpart E, section 15.407 (b) (1)
Method of test : ANSI C63.4-2003, sections 5.5, 8.2.3, 8.2.4 & 8.3.1.2;
FCC part 15, subpart A, section 15.31(m), 15.33, 15.35.
EUT config : 4 radio modules were installed, of which one was transmitting
Ambient temperature : 24 °C
Relative humidity : 50 %

Test results :

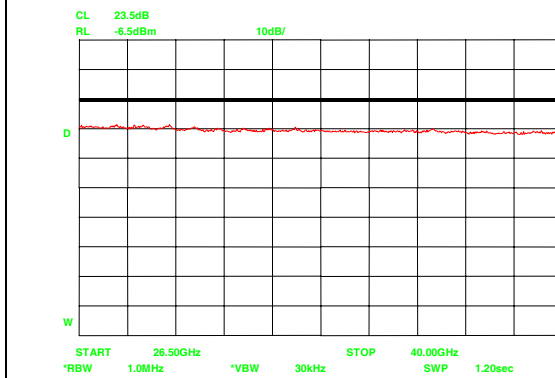




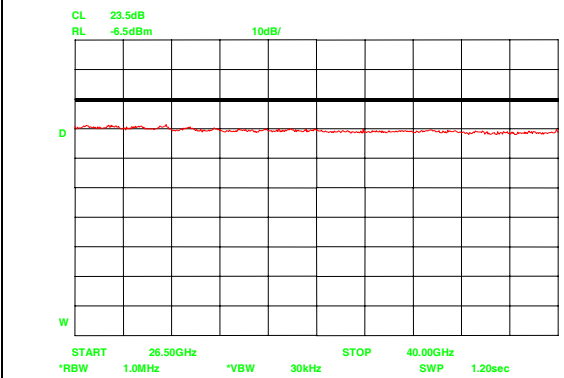
CH 36 18 - 26 GHz horizontal polarization



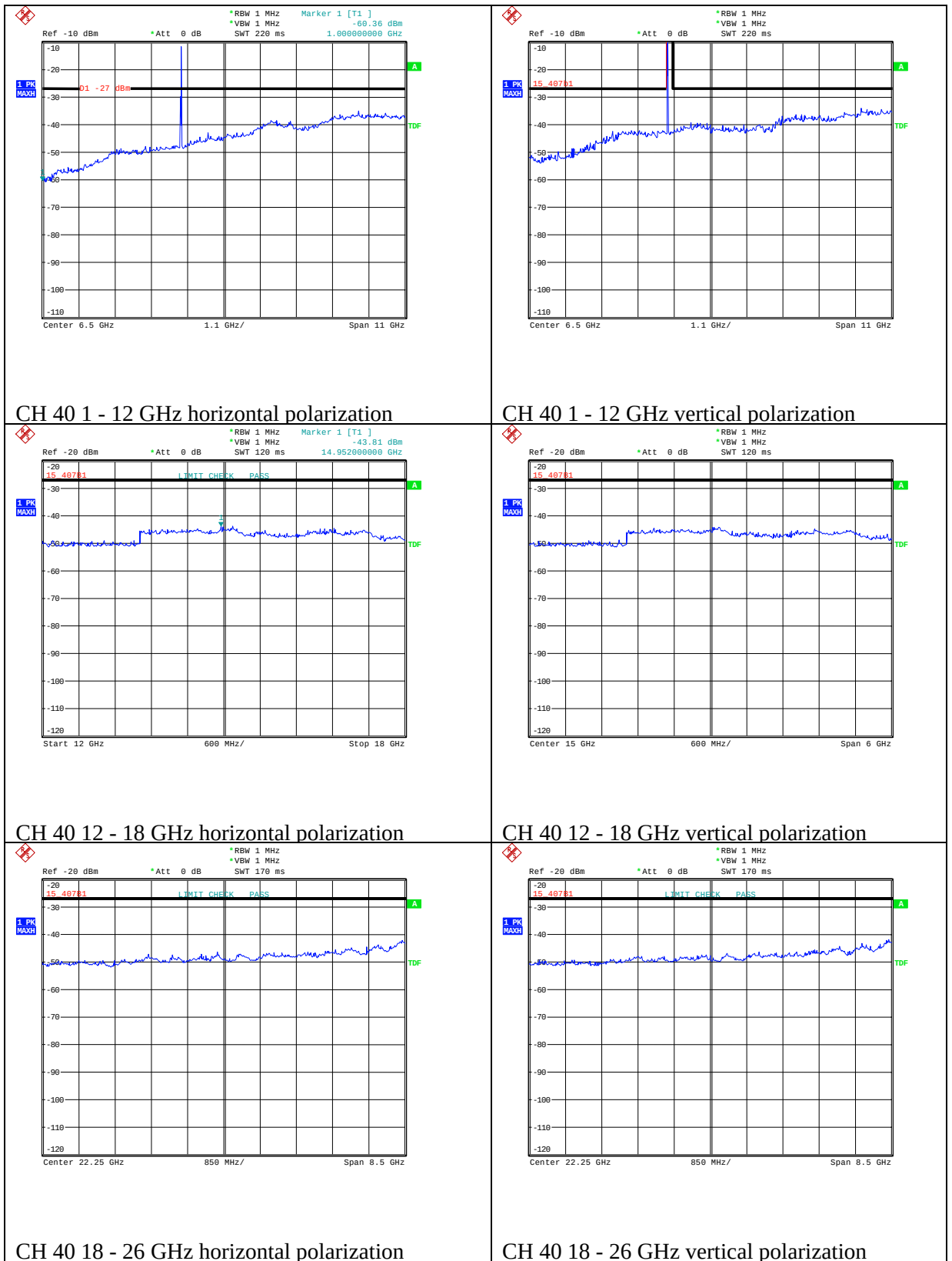
CH 36 18 - 26 GHz vertical polarization

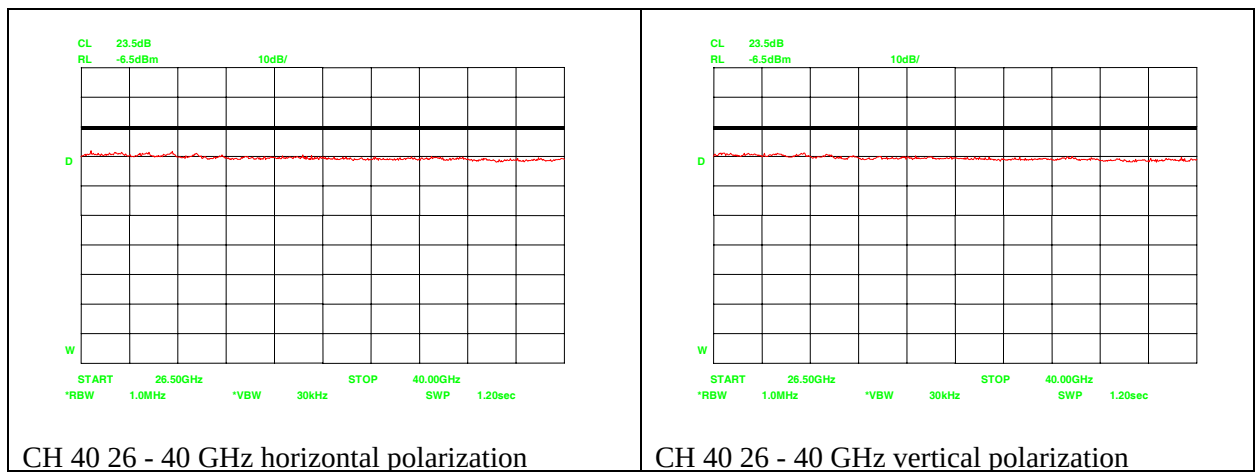


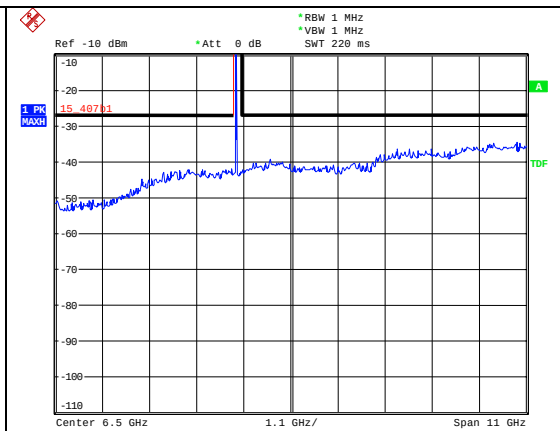
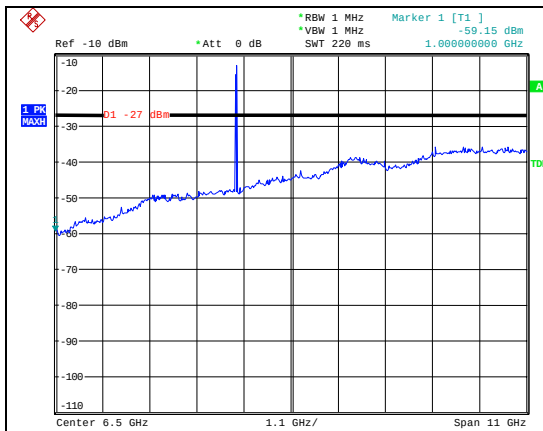
CH 36 26 - 40 GHz horizontal polarization



CH 36 26 - 40 GHz vertical polarization

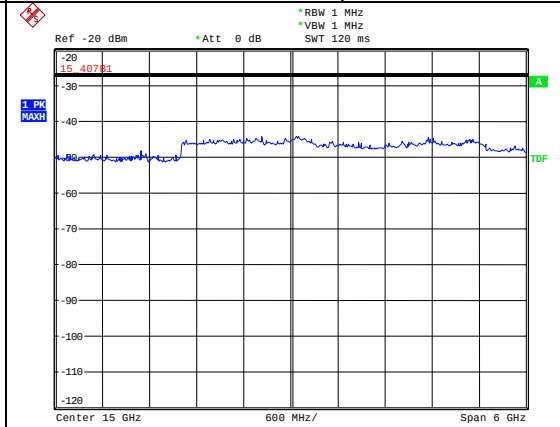
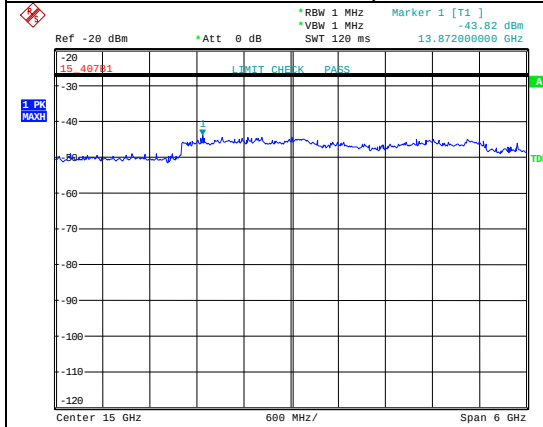






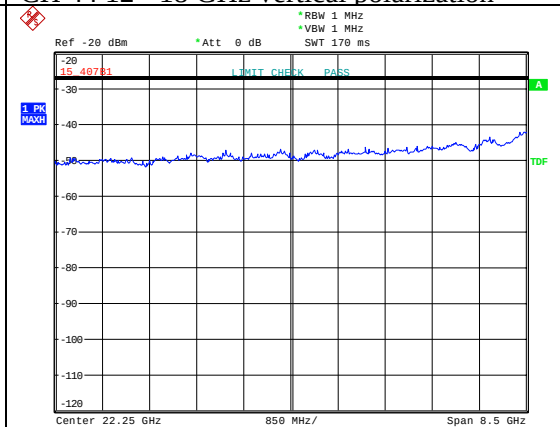
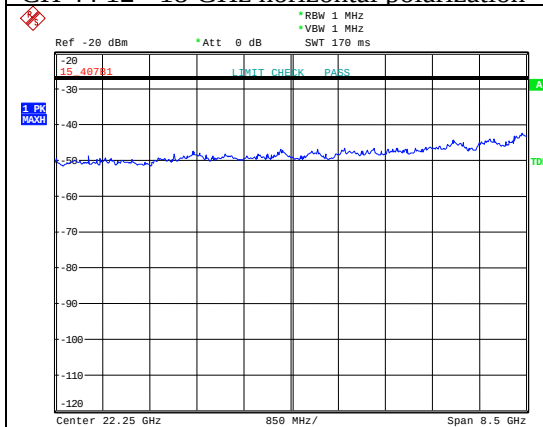
CH 44 1 - 12 GHz horizontal polarization

CH 44 1 - 12 GHz vertical polarization



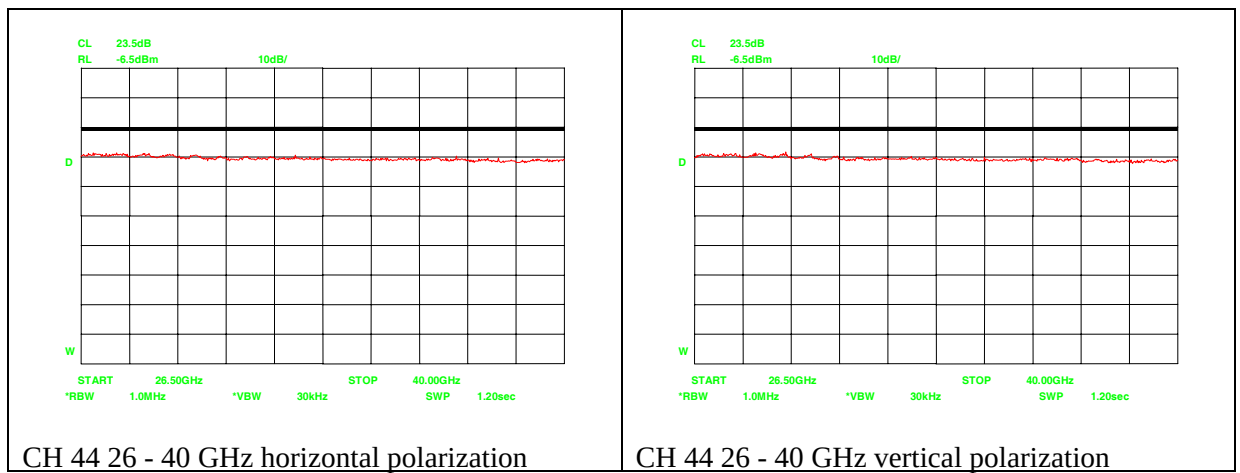
CH 44 12 - 18 GHz horizontal polarization

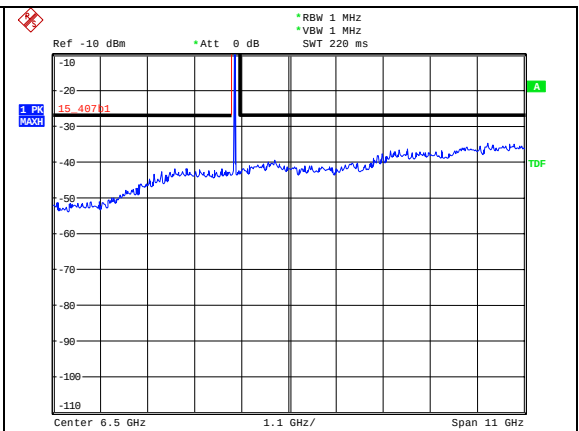
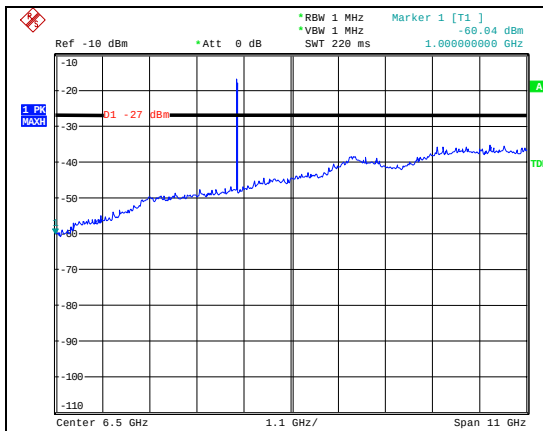
CH 44 12 - 18 GHz vertical polarization



CH 44 18 - 26 GHz horizontal polarization

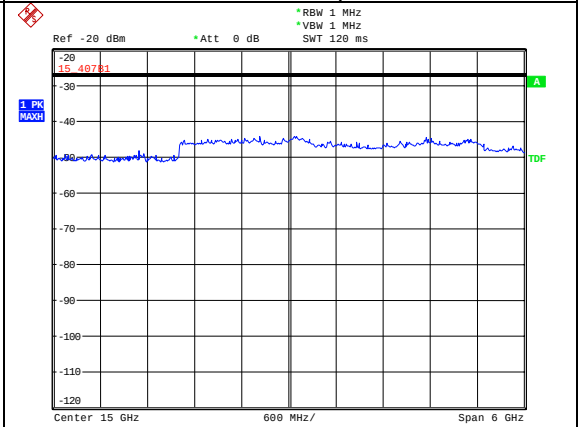
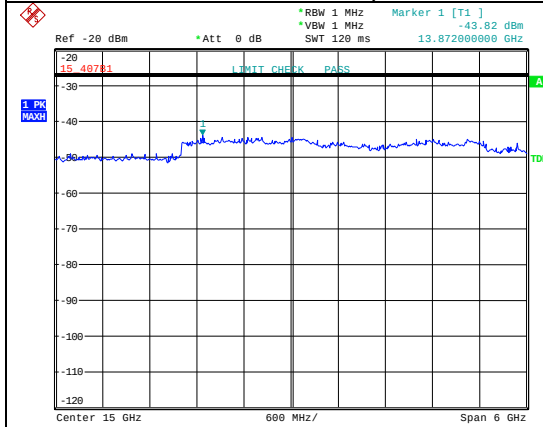
CH 44 18 - 26 GHz vertical polarization





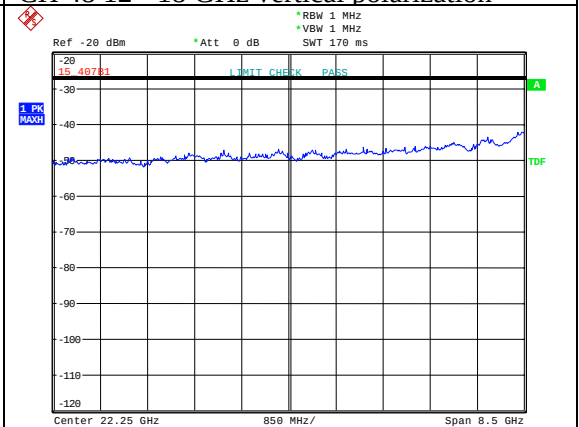
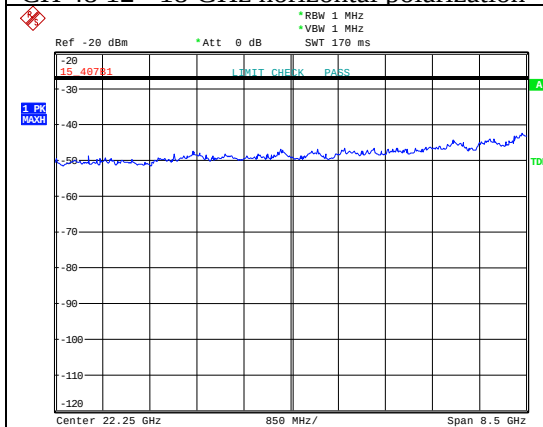
CH 48 1 - 12 GHz horizontal polarization

CH 48 1 - 12 GHz vertical polarization



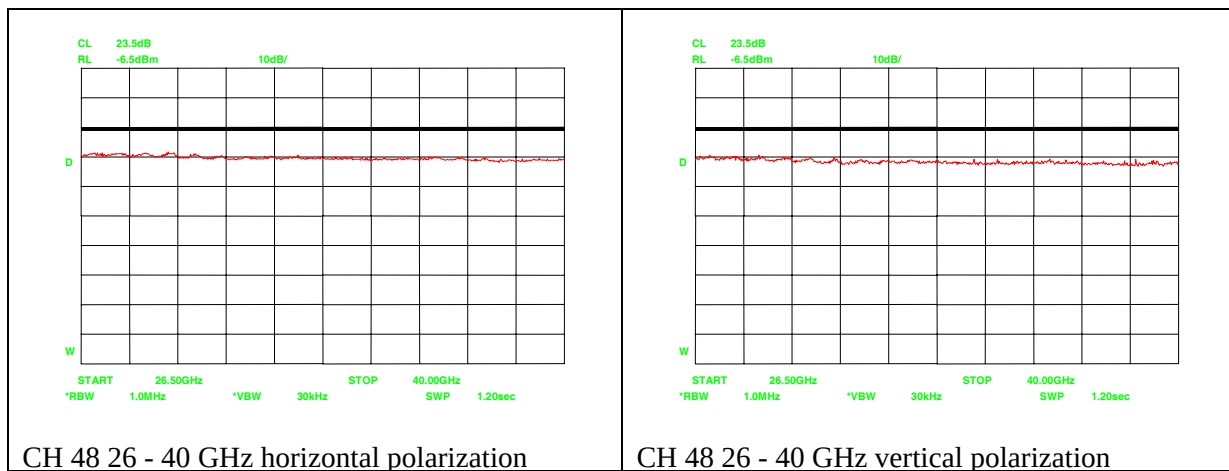
CH 48 12 - 18 GHz horizontal polarization

CH 48 12 - 18 GHz vertical polarization



CH 48 18 - 26 GHz horizontal polarization

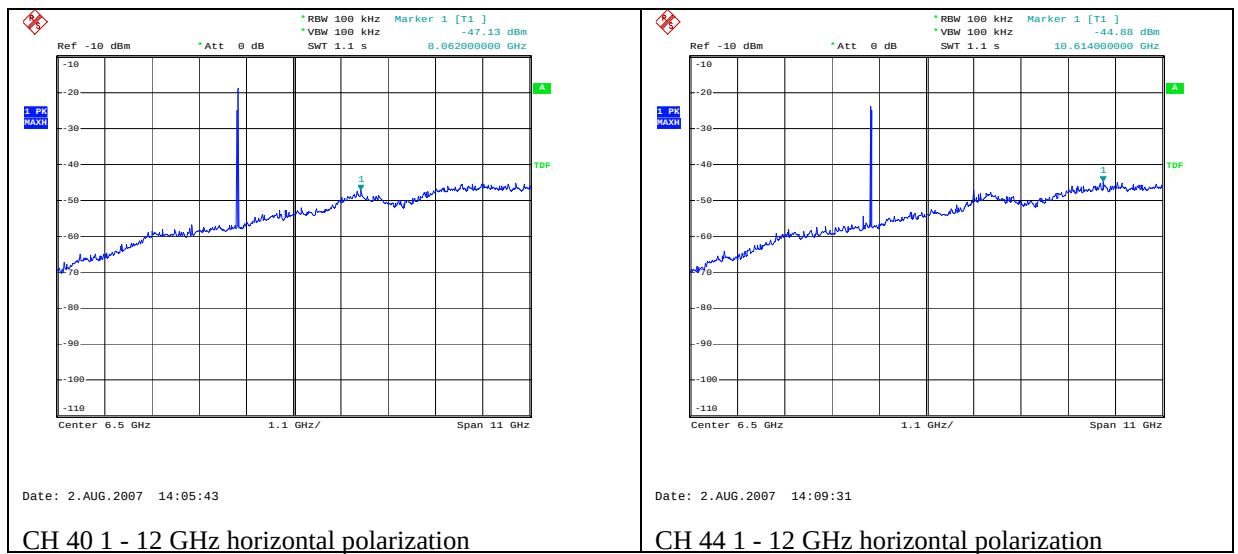
CH 48 18 - 26 GHz vertical polarization



Measurement uncertainty: +4.5 dB / -6.0 dB($f < 18$ GHz)
+3.3 dB/-3.3 dB($18 \text{ GHz} \leq f < 26 \text{ GHz}$)
+5.5 dB/ -8.1 dB($26 \text{ GHz} \leq f < 40 \text{ GHz}$)

3.6 Field strength of unwanted emissions in restricted bands

Compliance standard : FCC part 15, subpart E, section 15.407 (b) (7)
 Method of test : FCC Public Notice DA 00-705
 EUT config : 4 radio modules were installed, of which one was transmitting
 Ambient temperature : 24 °C
 Relative humidity : 50 %

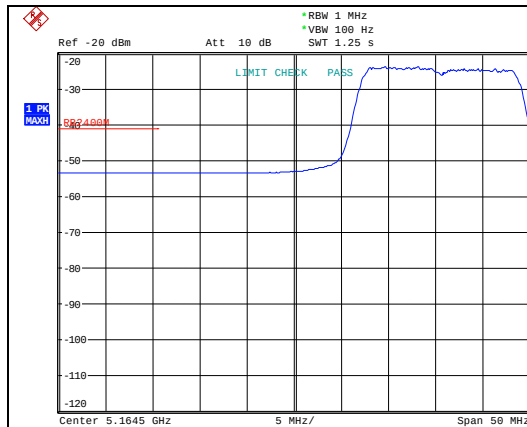


Frequency (MHz)	Peak value (dBμV/m)	Average value (dBμV/m)
8062	48.07	--
10614	50.32	--

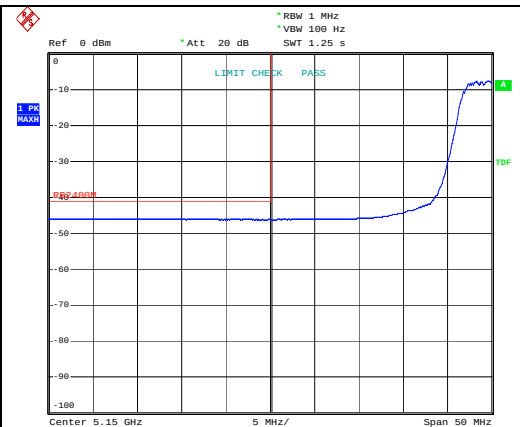
Measurement uncertainty: +4.5 dB / -6.1 dB

3.7 Field strength of unwanted emissions in adjacent restricted bands

Compliance standard : FCC part 15, subpart E, section 15.407 (b) (7)
 Method of test : FCC Public Notice DA 00-705
 EUT config : 4 radio modules were installed, of which one was transmitting
 Ambient temperature : 24 °C
 Relative humidity : 50 %



Lower band
 Channel 36
 Polarization horizontal



Date: 9.AUG.2007 16:59:25

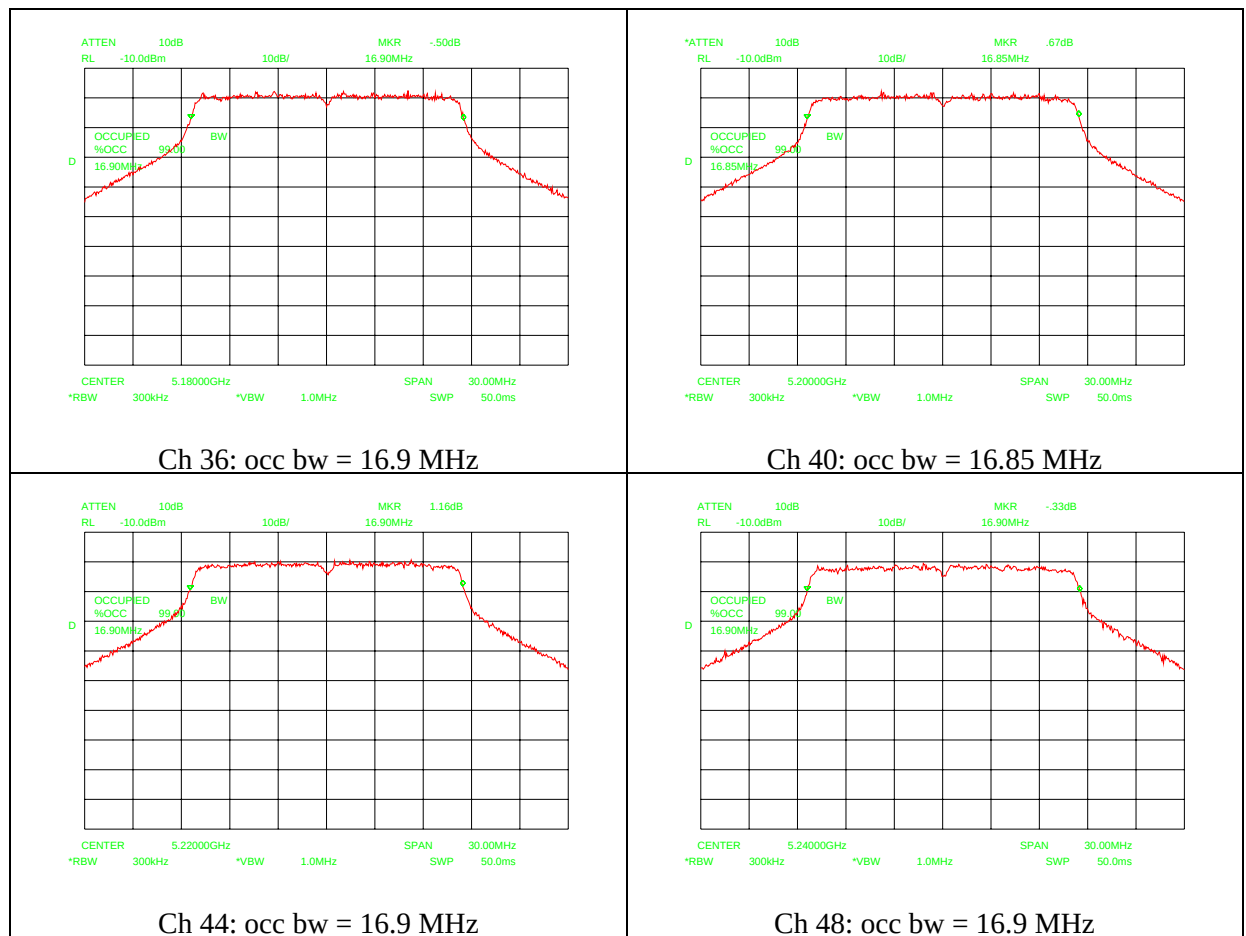
Lower band
 Channel 36
 Polarization vertical

Measurement uncertainty: +4.5 dB / -6.1 dB

3.8 99 % emission bandwidth

Compliance standard : IC RSS-Gen, section 4.6.1
Method of test : IC RSS-Gen, section 4.6.1

Ambient temperature : 24 °C
Relative humidity : 50 %

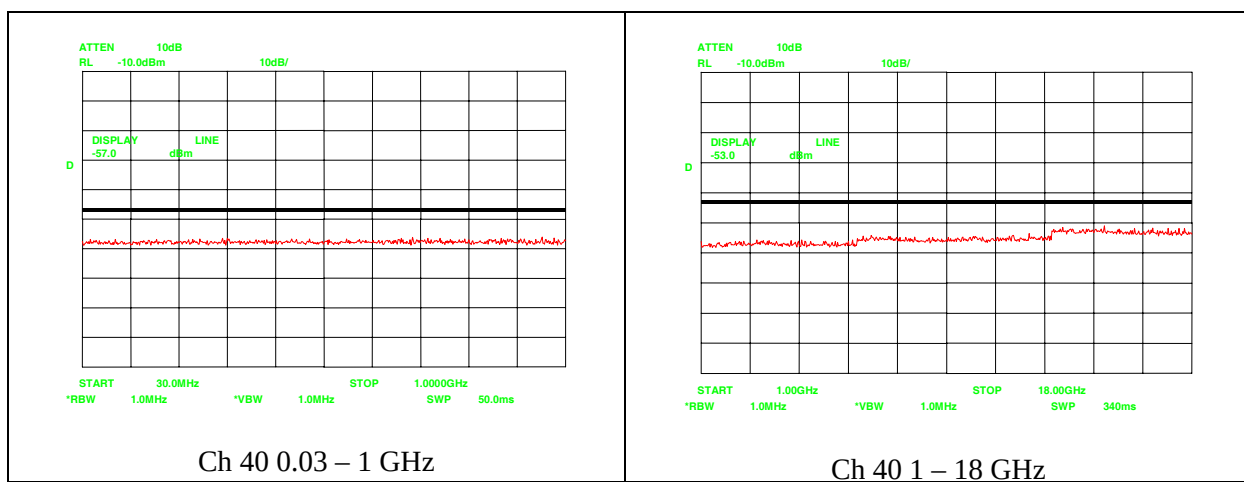


Measurement uncertainty: +23 / -23 kHz

3.9 Rx spurious emissions

Compliance standard : IC RSS-Gen, section 2.3
Method of test : IC RSS-Gen, section 4.10 & 7.2.3.1

Ambient temperature : 24 °C
Relative humidity : 50 %



Measurement uncertainty: +4.5 dB / -6.1 dB

Used test equipment module

Description	Telef. ID	Manufacturer	Model	Used at par.
Spectrum Analyzer	TE 00359	Hewlett Packard	HP 8563E	3.1; 3.2; 3.3; 3.4; 3.5; 3.8; 3.9; 4.1; 4.2; 4.3; 4.4; 4.5; 4.7; 4.8;
Spectrum Analyzer	TE 11125	Rohde & Schwarz	FSP 40	3.5; 3.6; 3.7; 4.5; 4.6;
RF Pre-amplifier up to 1000 MHz	TE 00098	Rohde & Schwarz	ESV-Z3	3.4; 4.4;
RF Pre-amplifier 1 – 20.0 GHz	TE 00092	Hewlett Packard	HP 8349A	3.5; 3.6; 3.7; 4.5; 4.6;
RF Pre-amplifier 1 - 26.5 GHz	TE 00093	Hewlett Packard	HP 8449B	3.5; 3.6; 3.7; 4.5; 4.6;
Anechoic chamber	TE 01064	Euroshield	RFD-F-100	3.3; 3.4; 3.5; 3.6; 3.7; 4.4; 4.5; 4.6;
Biconilog antenna	TE 00700	Emco	3143	3.4; 4.4;
DRG Antenna 1 - 18 GHz	TE 00532	Emco	3115	3.5; 3.6; 3.7;
Horn Antenna 1 - 12 GHz	TE 00602	Scientific Atlanta	12-1.7	3.5; 3.6; 3.7;
Horn Antenna 12 - 18 GHz	TE 00607	Scientific Atlanta	12-12	3.5; 3.6; 3.7;
Horn Antenna 18 – 26.5 GHz	TE 00608	Scientific Atlanta	12A-16	3.5; 3.6; 3.7;
Horn Antenna 26.5 - 40 GHz	TE 00609	Scientific Atlanta	12A-26	3.5; 3.6; 3.7;
Horn Antenna 8.2 - 12 GHz	TE 00604	Scientific Atlanta	12-8.2	3.5; 3.6; 3.7;
Antenna tower	--	HD	AS 620p	3.3; 3.4; 3.5; 3.6; 3.7; 4.4; 4.5; 4.6;
Turntable	--	HD	DS 412	3.3; 3.4; 3.5; 3.6; 3.7; 4.4; 4.5; 4.6;
Turntable controller	--	HD	HD 050	3.3; 3.4; 3.5; 3.6; 3.7; 4.4; 4.5; 4.6;
Attenuator	TE 00500	Hewlett Packard	HP 8459D	3.4; 3.5; 3.6; 3.7; 3.8; 3.9; 4.4; 4.5; 4.6; 4.7; 4.8;
Coaxial attenuator	TE 00784	Hewlett Packard	HP 8491A	3.1; 3.2; 3.3; 4.1; 4.2; 4.3;
Test receiver	TE 11128	Rohde & Schwarz	ESCI	2.1
Variac	5260 T1		B870900/02	2.1
Two-line V network	TE 00208	Rohde & Schwarz	ESH 3-Z5	2.1
Mixer	TE 00419	Agilent	11970A	3.5; 4.5
Laptop		Toshiba		All

The following measurement equipment was used at TNO EPS facilities, Nieuwerkerk, The Netherlands.

Description	TNO ID	Manufacturer	Model	Used at par.
Plastic measurement room	12636	Polyforce	--	3.4; 4.4;
Open Area Test Site	13886	Comtest	--	3.4; 4.4;
Antenna mast 1- 4 m	--	EMCS Japan	--	3.4; 4.4;
Controller antenna mast	--	EMCS Japan	--	3.4; 4.4;
Biconilog antenna 30 – 1000 MHz	15633	Chase	CBL6111B	3.4; 4.4;
EMI test receiver	15667	Rohde & Schwarz	ESCS 30	3.4; 4.4;
Turntable OATS	14278	Heinrich Diesel	HD100	3.4; 4.4;
Controller Turntable	14278	Heinrich Diesel	HD100	3.4; 4.4;

Cross reference table

Transmitter	
IC RSS-210 Issue 7, Annex 9	FCC 47 CFR Ch. 1 part 15, subpart E (10-1-06 Edition)
A9.2 (1)	§ 15.407 (a) (1)
A9.2 (3)	§ 15.407 (a) (3)
--	§ 15.407 (a) (6)
A9.3 (1)	§ 15.407 (b) (1)
A9.3 (4)	§ 15.407 (b) (3)
A9.3 (4)	§ 15.407 (b) (4)
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§ 4.6.1	--
Receiver	
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§ 7.2.3	--
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§ 7.2.2	§ 15.207 (a)

Revision history

REVISION	DATE	REMARKS
1.0	24 August 2007	- Corrected results table for field strength of unwanted emissions 30 – 1000 MHz (page 17) to reflect the actual requirement, as set out in FCC part 15.407 (b)(6).
2.0	28 August 2007	- Addition of Xnet Raptor series variant; - Added some clarifications to test results and EUT-setup.
3.0	5 September 2007	- Reference to subpart C changed into subpart E