

Radio test report 99830130 - rev. 1.0

based on:

- FCC Part 15 Subpart C, section 15.247 (10-1-05 Edition)
- RSS-210, Issue 6 (Sept. 2005 edition)
- FCC Part 15 Subpart B, section 15.109 (10-1-05 Edition)
- RSS-Gen, Issue 6 (Sept. 2005 edition)

Wireless Audio Module
Panasonic
SH-FX65T-1

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This report comprises of four modules. The total number of pages is: 30

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 : Panasonic AVC Networks Singapore Pte Ltd
Address : 202 Bedok South Avenue 1
Zipcode : 469332
City/town : Singapore
Country : Singapore
Date of order : 30 November 2006

2 Product

A sample of the following product was submitted for testing:

Product description	: Wireless Audio Module
Manufacturer	: Panasonic AVC Networks Singapore Pte Ltd
Trade mark	: Panasonic
Type designation	: SH-FX65T-1
FCC ID	: ACJT07003
IC ID	: 216A-T07003
Hardware version	: --
Serial number	: A000336
Software release	: --

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 are received on:

- 28 November 2006

Tests are carried out from:

- 28 November 2006 to 29 November 2006

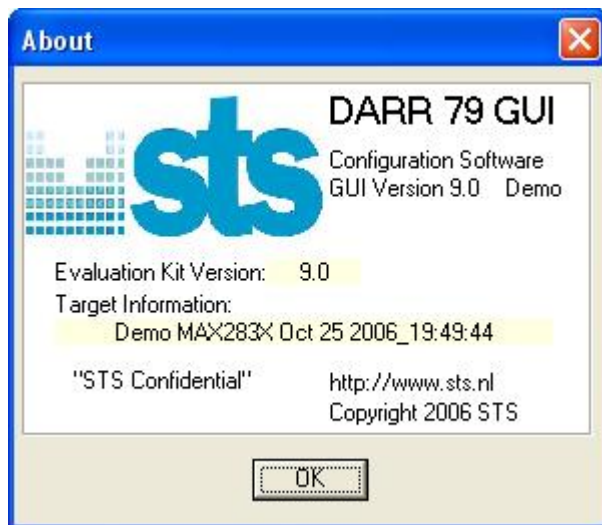
4 Product documentation

For production of this report no product documentation has been used.

5 Observations and comments

The product supplied for testing is a 2.4 GHz digital wireless audio transceiver. The PCB is equipped with two integral PCB antennas. The product is tested in transmitting and receiving mode. For all tests the default RF power setting has been used.

This was enabled by the test tool named DARR 79 GUI Configuration Software (GUI Version 9.0 Demo)



For measurements on the receiving mode of the module the following register of the MAX2831 radio chip was changed: Register 13, the VCO bias bits D12:10 = 000 instead of 011

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.

6 Modifications to the sample

No modifications have been 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 has been tested according to the following specification(s):

FCC Part 15 Subpart C, section 15.247 (10-1-05 Edition)

RSS-210, Issue 6 (Sept. 2005 edition)

FCC Part 15 Subpart B, section 15.109 (10-1-05 Edition)

RSS-Gen, 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 : ing. K.A. Roes

function : Test Engineer

signature :

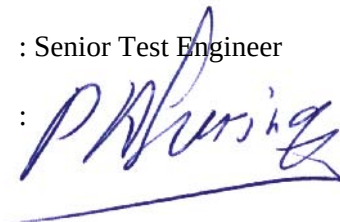


Review of test report by:

name : ing. P.A. Suringa

function : Senior Test Engineer

signature :



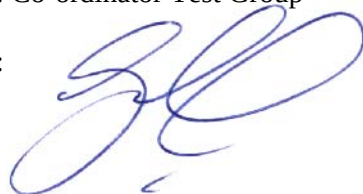
The above conclusions have been verified by the following signatory:

Date : 15 January 2007

name : J.P. van de Poll

function : Co-ordinator Test Group

signature :



Test results module

1.1 Equipment information

Operating frequency range	2412 – 2464 MHz
Occupied bandwidth (measured)	8.6 MHz
ITU emission class	8M6G1D
FCC ID	ACJT07003

1.2 Tested channels

Channel 1	Channel 2	Channel 3
2412 MHz	2438 MHz	2464 MHz

1.3 Summary of test data

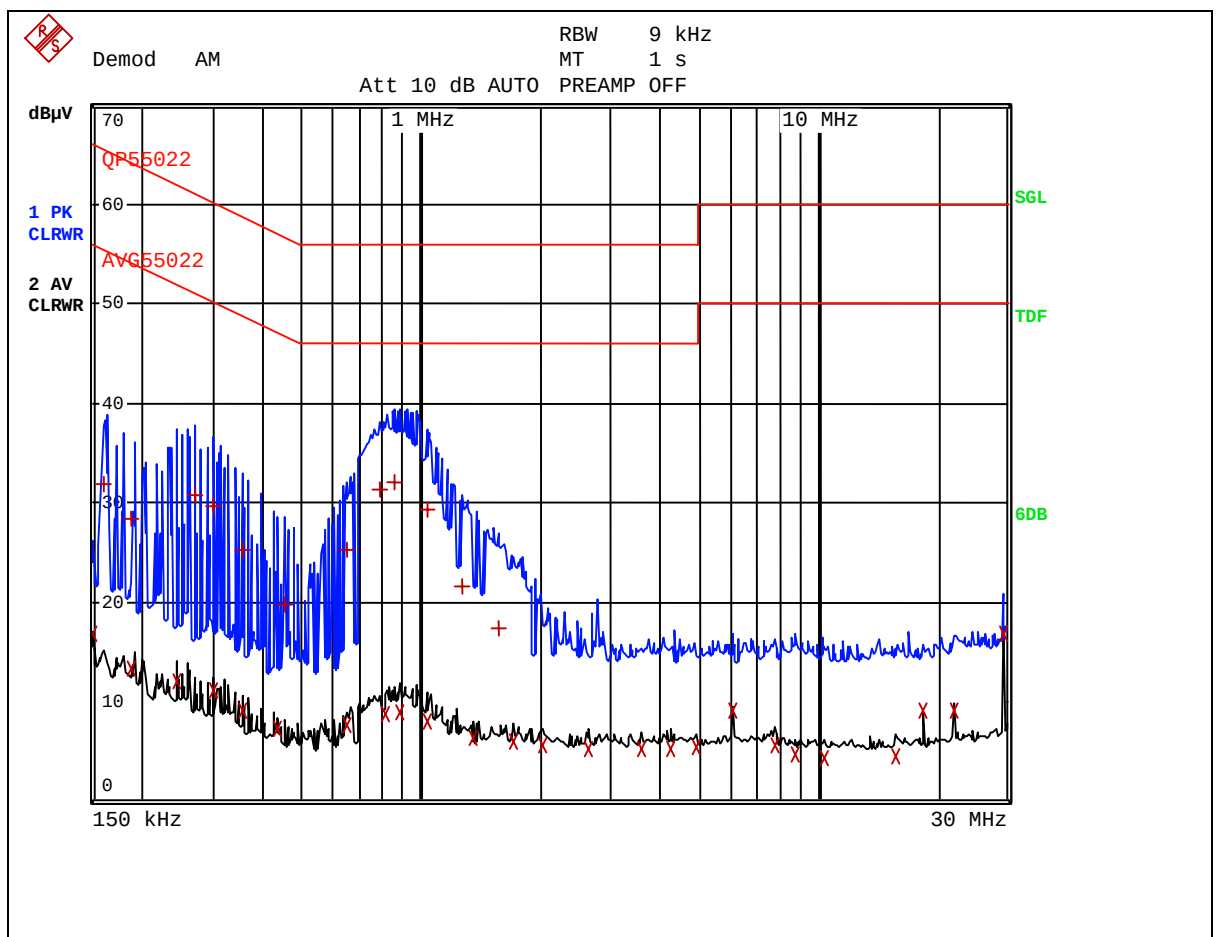
NAME OF TEST	PARA. NO.	Limit	MEAS.	RESULT
Power line conducted emissions	15.207(a)	56 dB μ V	< 56 dB μ V	Complies
Minimum 6 dB bandwidth	15.247(a)(2)	500 kHz	8.6 MHz	Complies
Maximum Peak Power Output	15.247(b)(3)	36 dBm E.I.R.P.	13.9 dBm E.I.R.P.	Complies
Peak Power Spectral Density	15.247(e)	8 dBm/3 kHz	-2.5 dBm/3 kHz	Complies
Spurious Emissions (Radiated)	15.247(d)	> 20 dB below fundamental	$\geq$ 20 dB	Complies
Restricted band edge emission levels (radiated)	15.205(a)	54 dB μ V/m(av) 74 dB μ V/m(pk)	22.4 dB μ V/m 60.9 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 dB μ V/m 71.2 dB μ V/m	Complies
Radiated emissions unintentional radiators	15.109(a)	54 dB μ V/m(av)	53.1 dB μ V/m	Complies

2 Emission tests

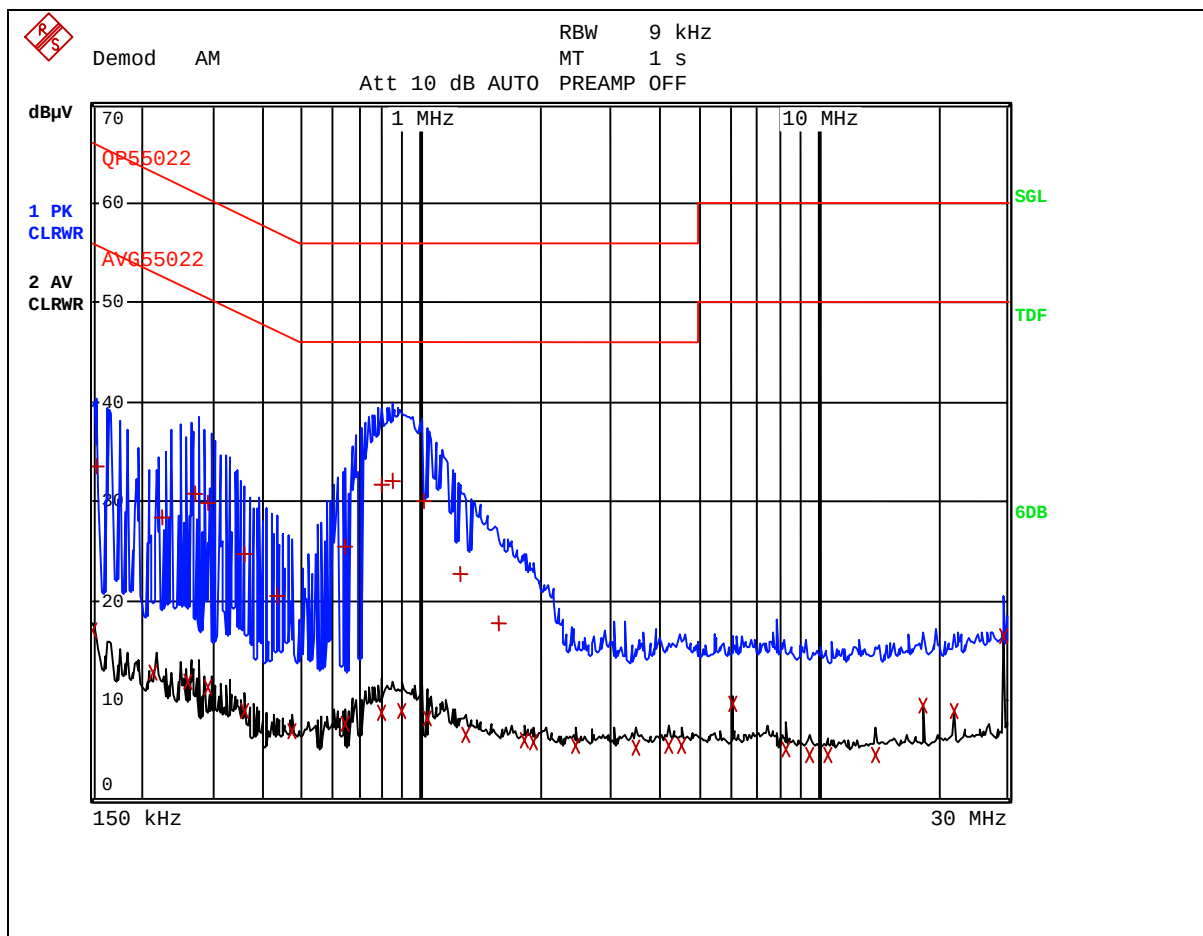
2.1 Power line conducted emissions

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 : 48 %
 EUT condition : Transmitting

Mains port – line



Mains port – Neutral



Measurement uncertainty: +3.70/-3.70 dB

3 Emission tests

3.1 Minimum 6 dB bandwidth

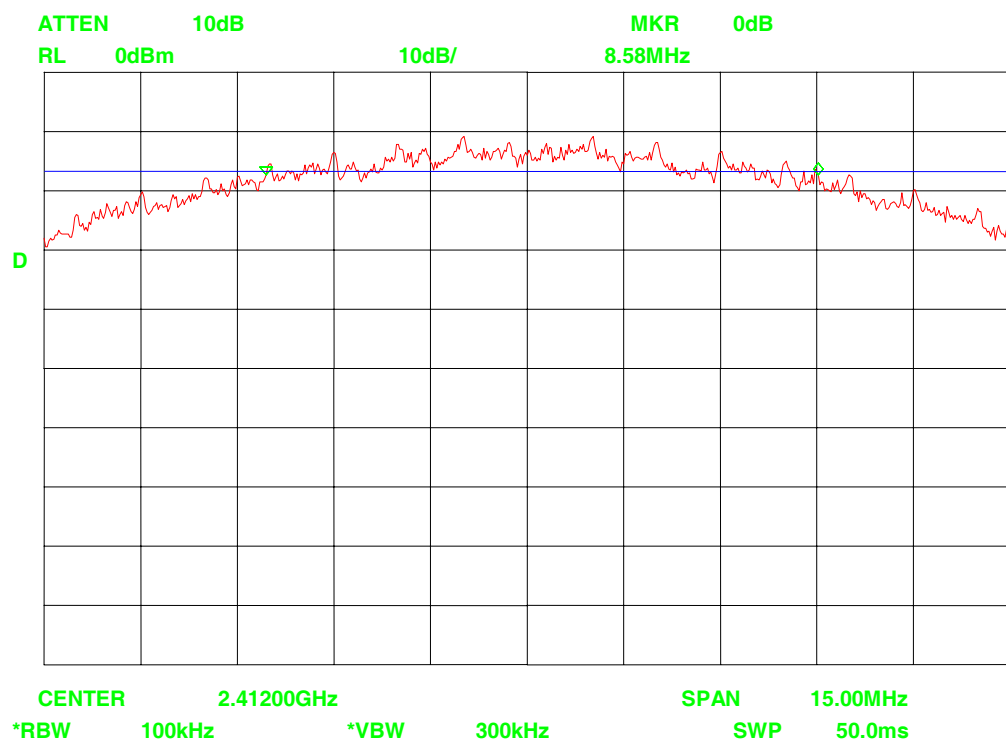
Compliance standard : FCC part 15, subpart C, section 15.247 (a)(2)
Method of test : KDB Publication No. 558074

Ambient temperature : 24 °C
Relative humidity : 48 %

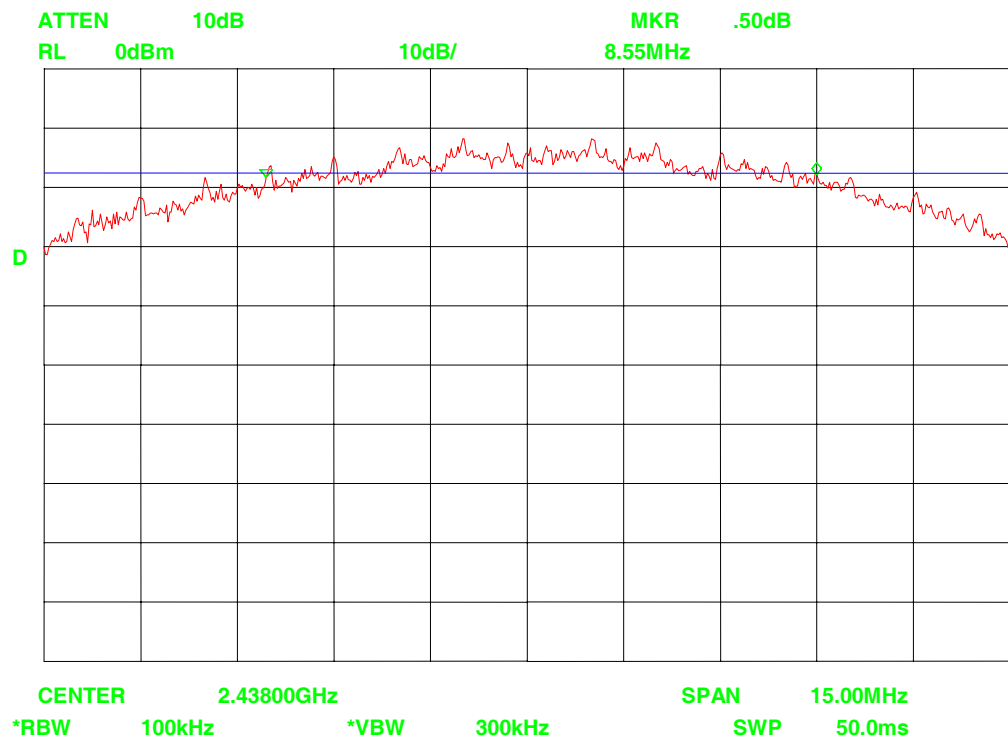
Test results :

Channel 1	Channel 2	Channel 3
8.6 MHz	8.6 MHz	8.1 MHz

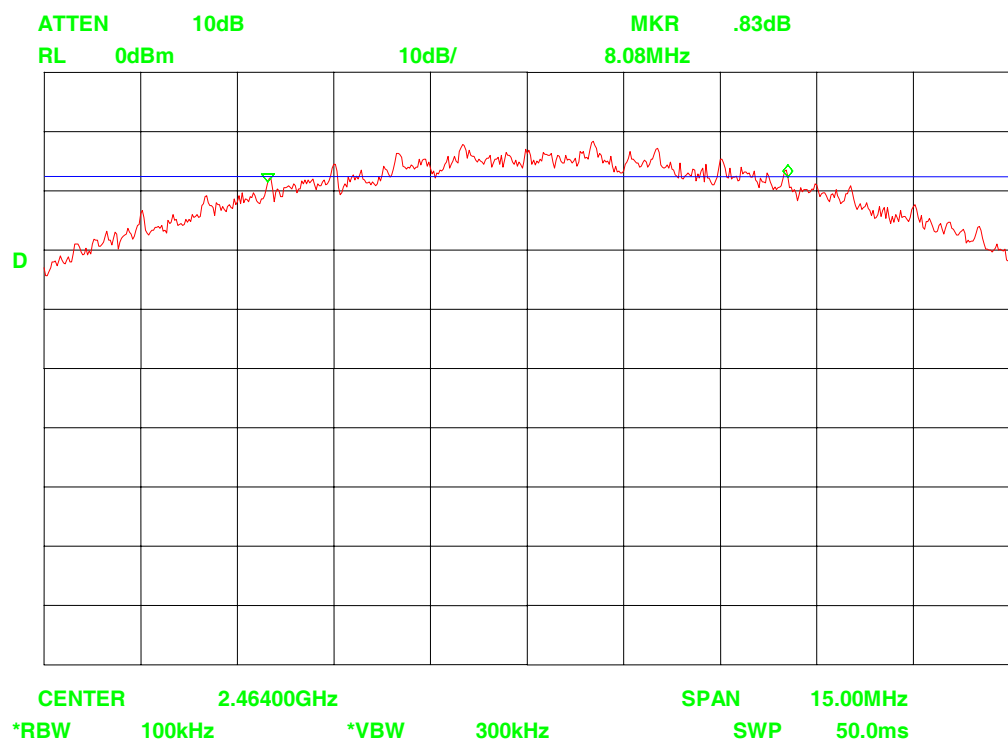
Channel 1 plot



Channel 2 plot



Channel 3 plot



Measurement uncertainty: + 23/- 23 kHz

3.2 Occupied bandwidth

Compliance standard : RSS-Gen, Issue 6 (Sept. 2005 edition) section 4.4.1
Method of test : RSS-Gen, Issue 6 (Sept. 2005 edition) section 4.4.1

Ambient temperature : 24 °C
Relative humidity : 48 %

Test results :

Channel 1	Channel 2	Channel 3
14.7 MHz	14.7 MHz	14.7 MHz

Measurement uncertainty: + 23/- 23 kHz

3.3 Peak power output

Compliance standard : FCC part 15, subpart C, section 15.247 (b)(3)
Method of test : KDB Publication No. 558074 (alternative procedures)

Ambient temperature : 24 °C
Relative humidity : 48 %

Test results :

Channel 1	Channel 2	Channel 3
12.5 dBm e.i.r.p.	13.9 dBm e.i.r.p.	12.5 dBm e.i.r.p.

Measurement uncertainty: + 1.6/ -1.9 dB

3.4 Peak power spectral density

Compliance standard : FCC part 15, subpart C, section 15.247 (e)
Method of test : FCC KDB Publication No. 558074 (alternative procedures)

Ambient temperature : 24 °C
Relative humidity : 48 %

Test results :

Channel 1	Channel 2	Channel 3
-2.5 dBm/3 kHz	-3.7 dBm/3 kHz	-2.8 dBm/3 kHz

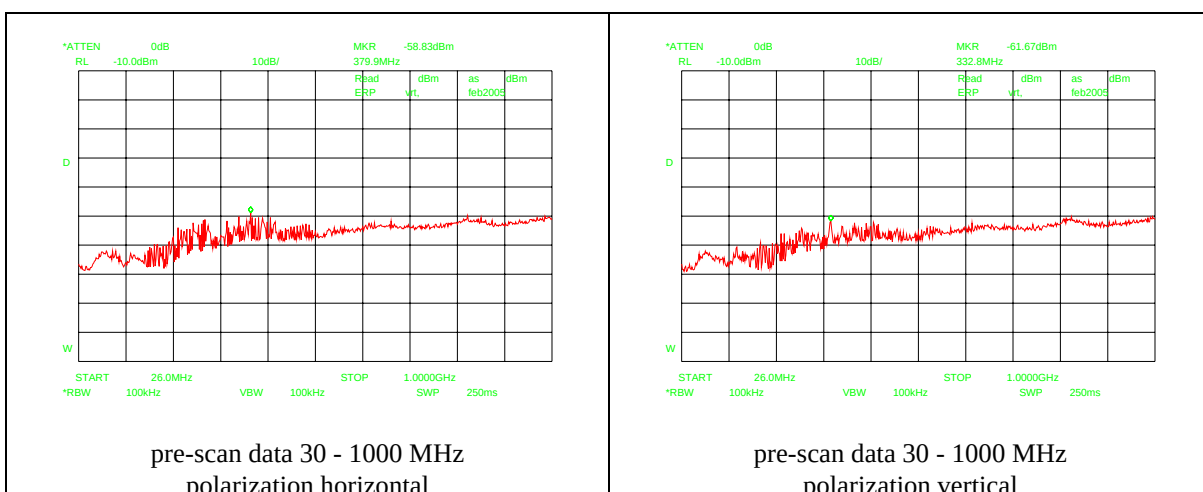
Measurement uncertainty: + 3.7/ -4.5 dB

3.5 Field strength of unwanted emissions 30 - 1000 MHz (exploratory)

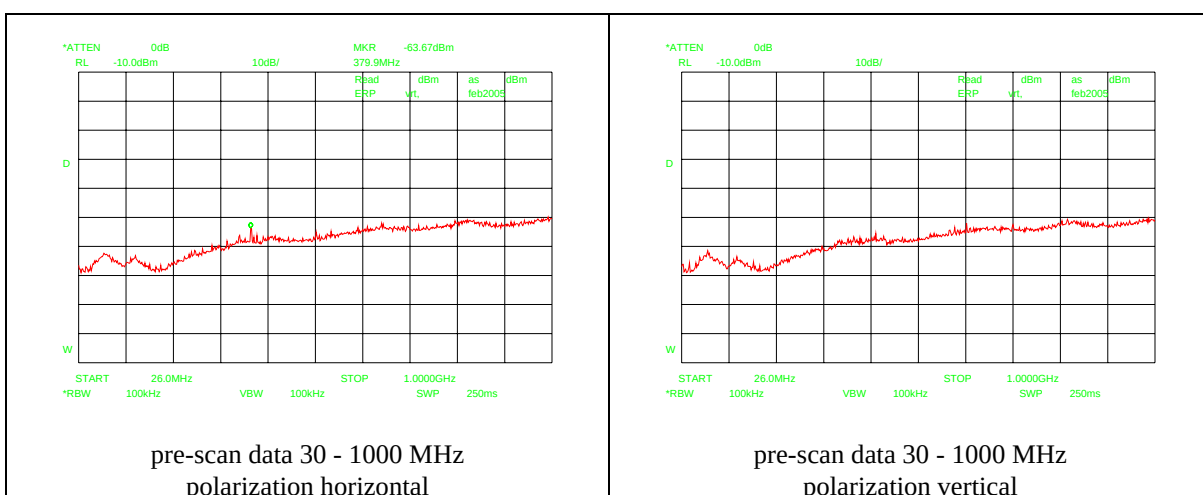
Compliance standard : FCC part 15, subpart C, section 15.209(a)
Method of test : ANSI C63.4-2003, sections 5.4, 8.2.3, 8.2.4 & 8.3.1.2;
FCC part 15, subpart A, section 15.31(m), 15.33, 15.35.

Ambient temperature : 24 °C
Relative humidity : 48 %
EUT condition : Transmitting
Test results :

Transmitting mode:



Receiving mode:



Prior to the tests on the OATS (Open Area Test Site) radiated emission measurements at 3 m distance in a Fully Anechoic Chamber (FAC) have been carried out to determine on which frequencies radiation can be expected

As the pre-compliance test results did not reveal any emissions less than 20 dB below the limit, compliance tests on an OATS were considered unnecessary.

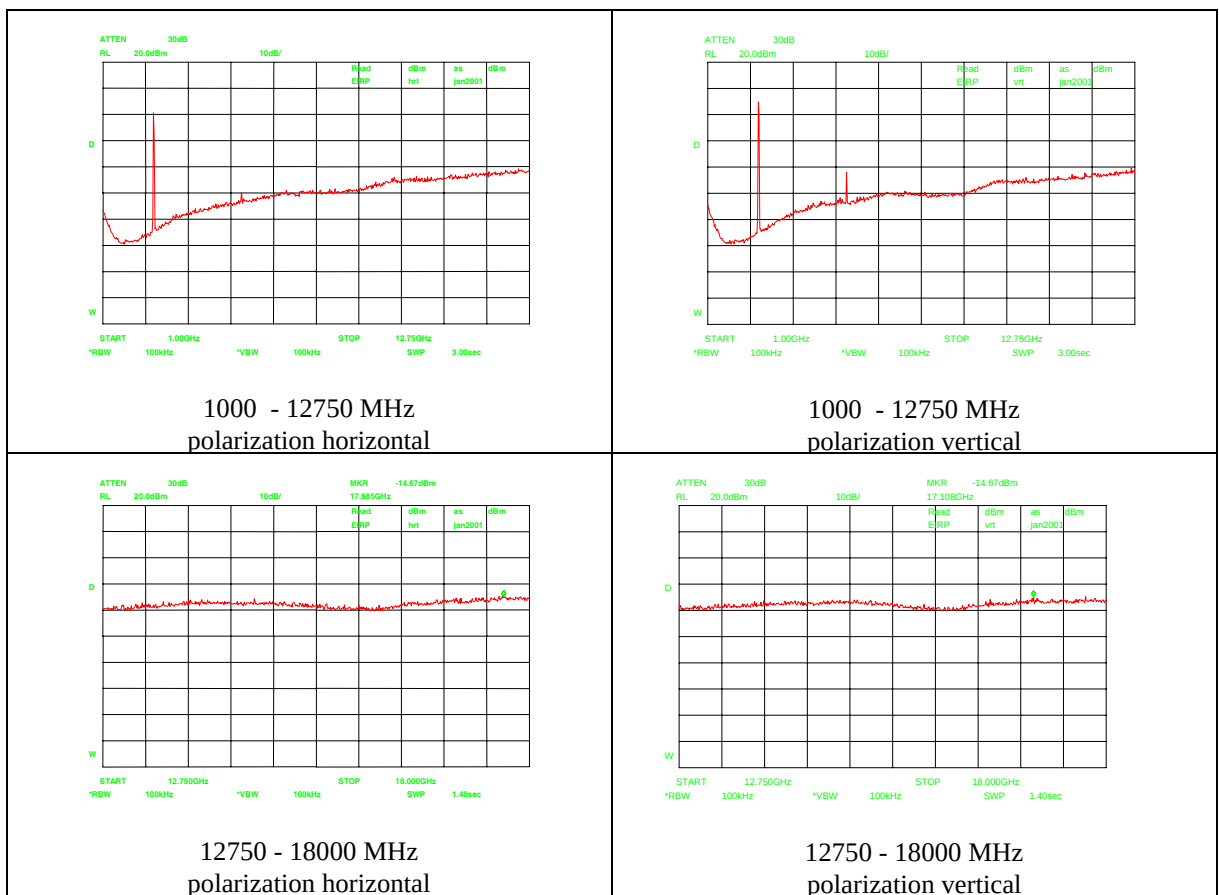
Measurement uncertainty: N/A

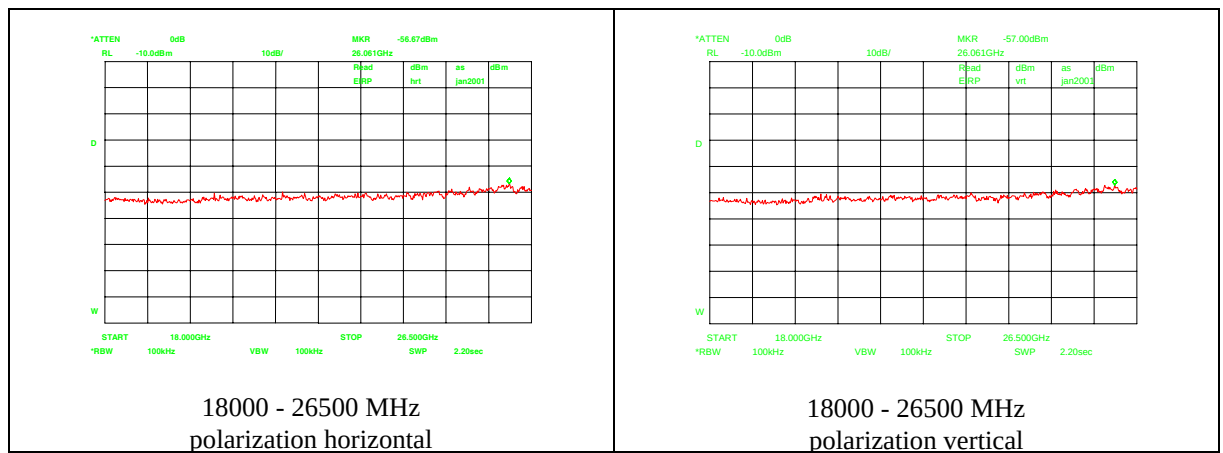
3.6 Field strength of unwanted emissions > 1000 MHz

Compliance standard : FCC part 15, subpart C, section 15.247(d)
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.
Ambient temperature : 24 °C
Relative humidity : 48 %

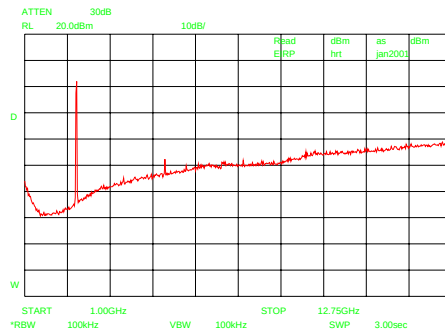
Test results :

CH 1 TX:

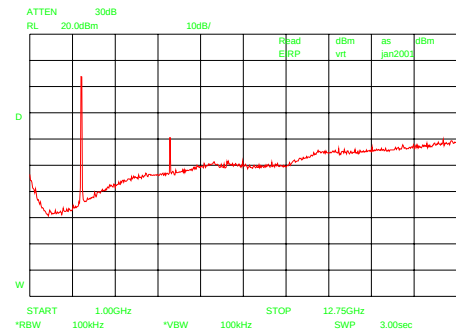




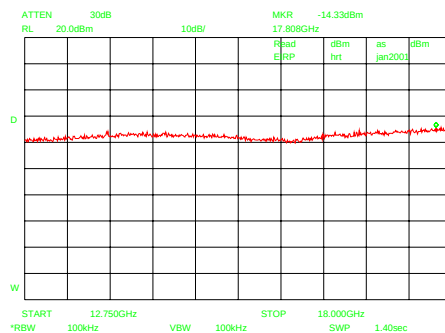
CH 2 TX:



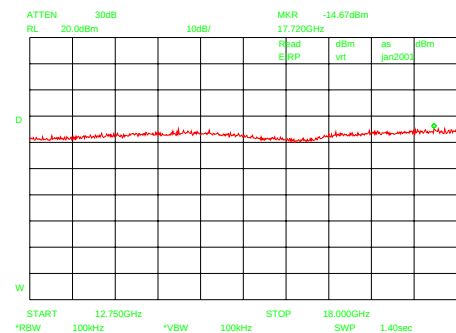
1000 - 12750 MHz
polarization horizontal



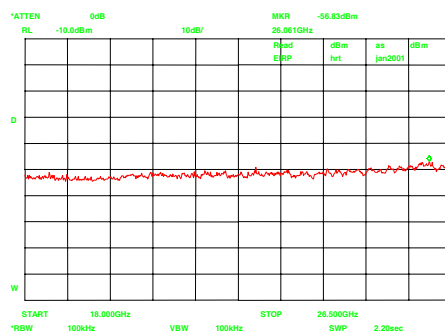
1000 - 12750 MHz
polarization vertical



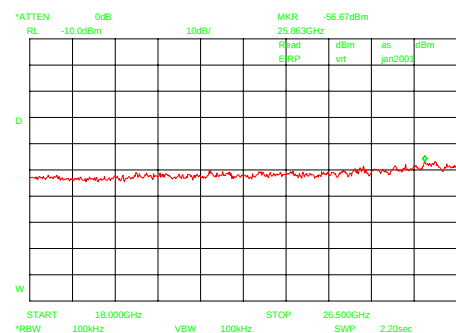
12750 - 18000 MHz
polarization horizontal



12750 - 18000 MHz
polarization vertical

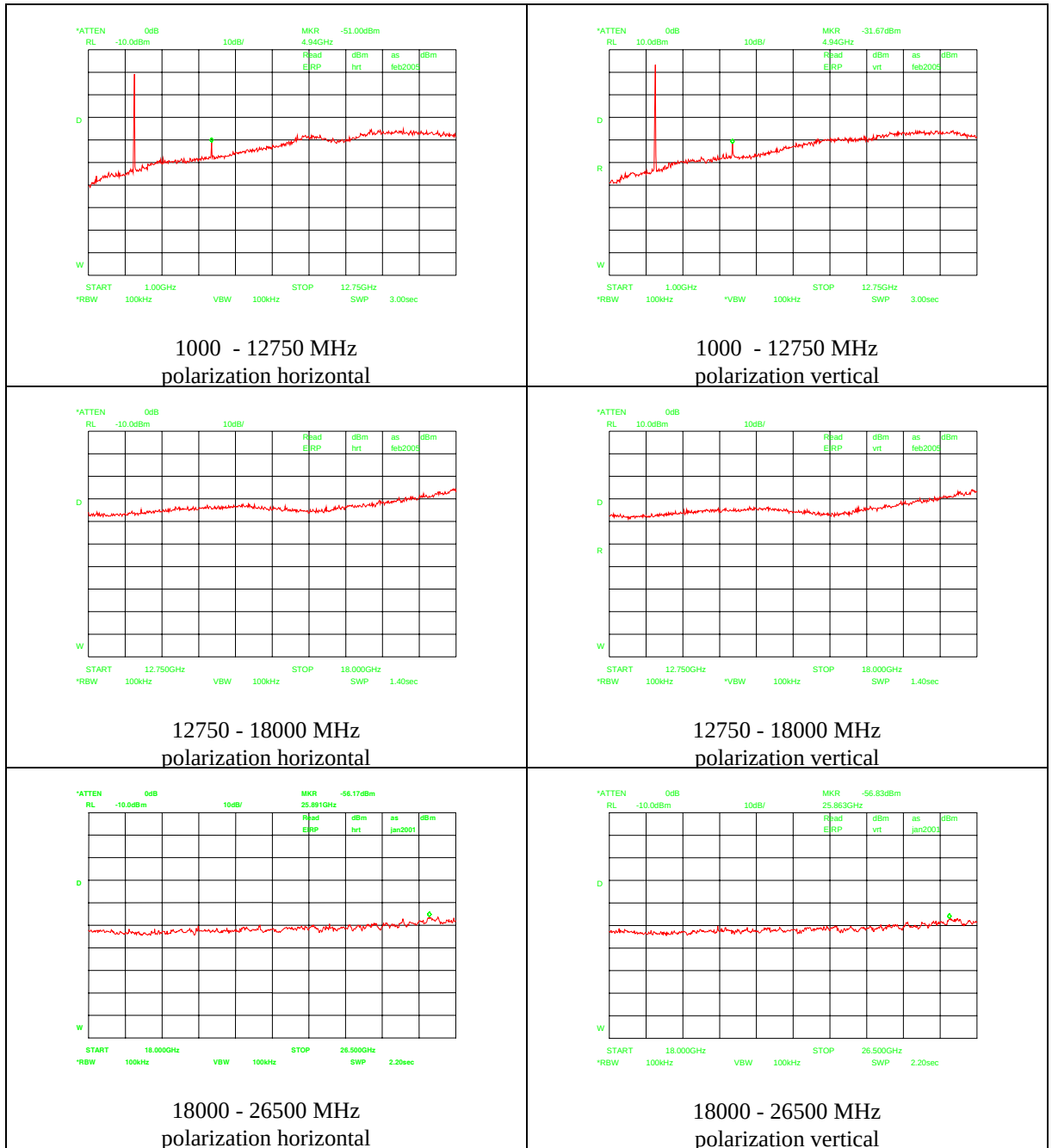


18000 - 26500 MHz
polarization horizontal



18000 - 26500 MHz
polarization vertical

CH 3 TX:



To convert from dBm to dB μ V/m : reading in dBm + 95.2

Measurement uncertainty: +4.5 dB / -6.0 dB

3.7 Field strength of unwanted emissions in restricted band 4.5 – 5.15 GHz

Compliance standard : FCC part 15, subpart C, section 15.205(a)
Method of test : FCC Public Notice DA 00-705

Ambient temperature : 24 °C
Relative humidity : 48 %

ANT A:

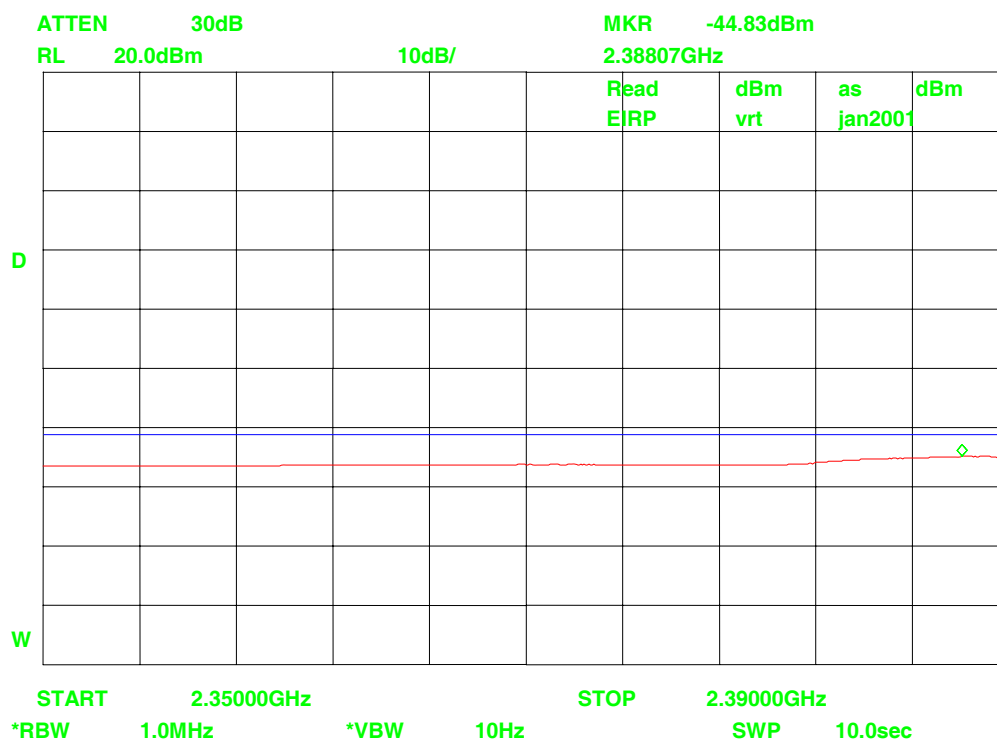
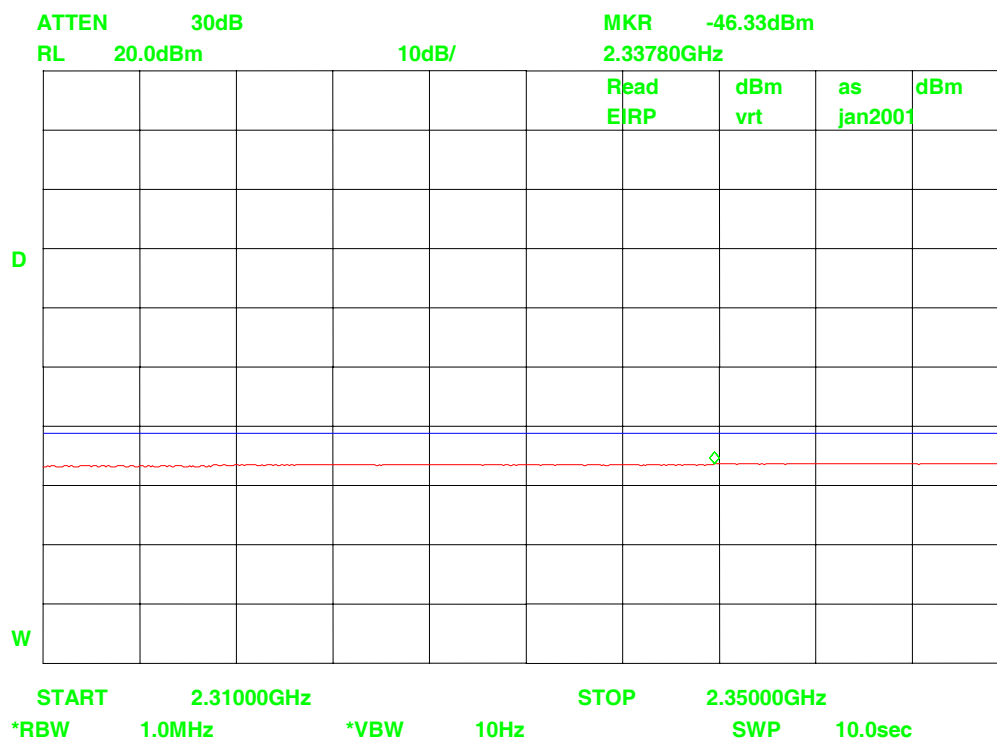
	Peak value (dB μ V/m)	Average value (dB μ V/m)
CH 1, 2 nd harm.	-24.0 + 95.2 = 71.2	-47.3 + 95.2 = 47.9
CH 2, 2 nd harm	-33.2 + 95.2 = 62.0	-48.3 + 95.2 = 46.9
CH 3, 2 nd harm.	-29.8 + 95.2 = 65.4	-47.2 + 95.2 = 48.0

ANT B:

	Peak value (dB μ V/m)	Average value (dB μ V/m)
CH 1, 2 nd harm.	-27.7 + 95.2 = 67.5	-47.5 + 95.2 = 47.7
CH 2, 2 nd harm	-34.3 + 95.2 = 60.9	-50.0 + 95.2 = 45.2
CH 3, 2 nd harm.	-31.0 + 95.2 = 64.2	-48.0 + 95.2 = 47.2

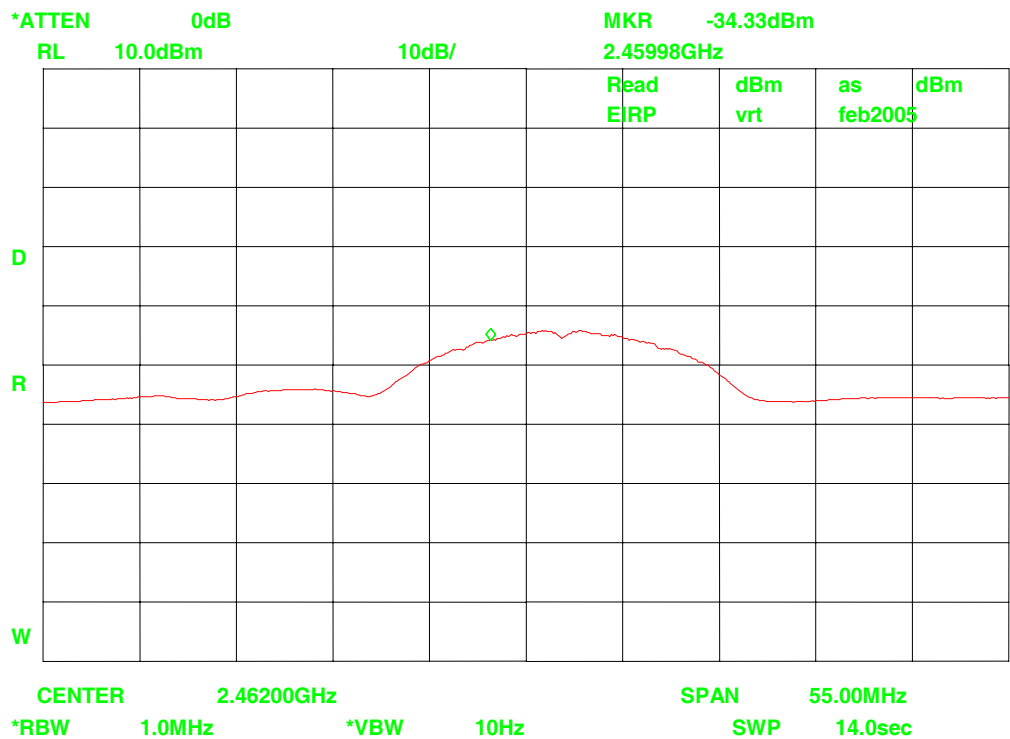
Measurement uncertainty: +4.5 dB / -6.0 dB

Average detector measurement

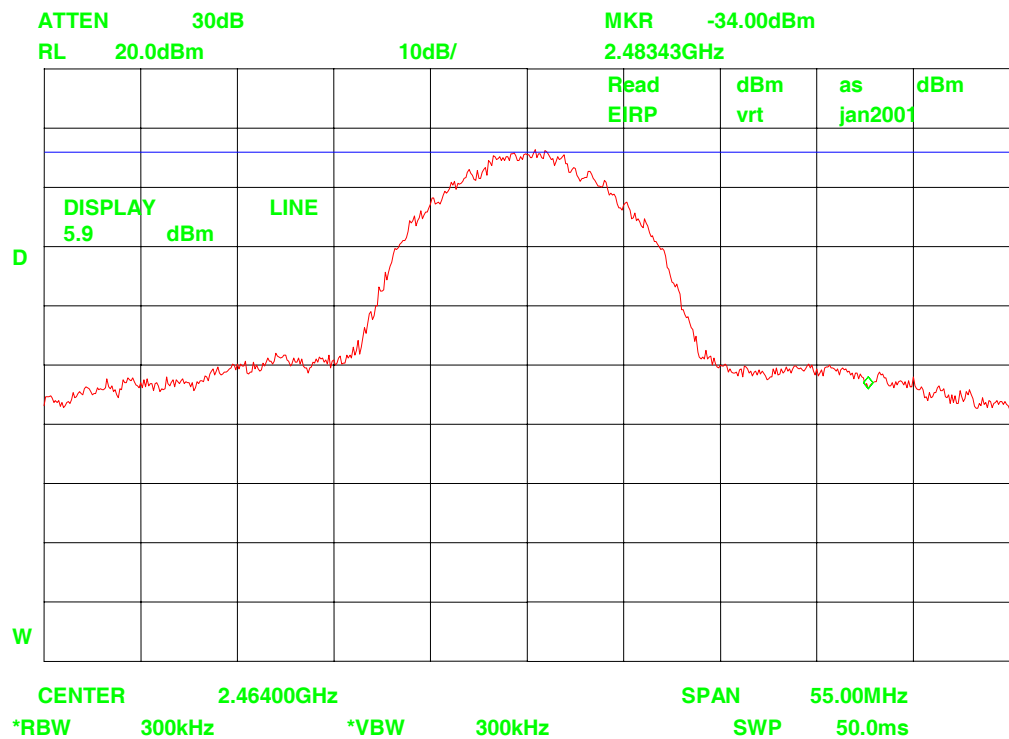


Measurement uncertainty: +4.5 dB / -6.0 dB

Average detector measurement



Delta marker measurement



band edge emission level (peak): $4.17 + 95.2 - 38.5 = 60.9 \text{ dB}\mu\text{V/m}$
band edge emission level (average): $-34.33 + 95.2 - 38.5 = 22.4 \text{ dB}\mu\text{V/m}$

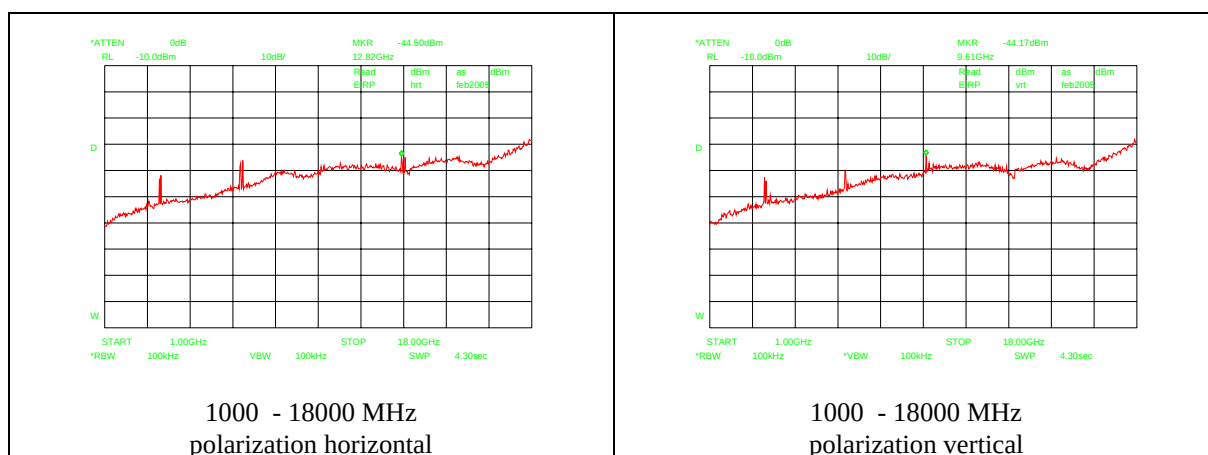
Measurement uncertainty: +4.5 dB / -6.0 dB

3.10 Radiated emissions unintentional radiators > 1000 MHz (Receiver)

Compliance standard : FCC part 15, subpart B, section 15.109(a)
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.
Ambient temperature : 24 °C
Relative humidity : 48 %

Test results :

CH 1/2/3 RX:



Spurious Emission Levels			
Frequency (GHz)	Pol	RBW(kHz)	Level (dBμV/m) (Pk)
3.2	H	100 kHz	43.5
12.8	H	100 kHz	51.7
3.2	H	100 kHz	43
13	H	100 kHz	52.5
5.3	H	100 kHz	43.3
13	H	100 kHz	53.1
Measurement uncertainty		f < 1 GHz: +2.6/-3.3 dB; f > 1 GHz: +4.5/-6.1 dB	
Note: RBW (kHz): refers to the bandwidth of the measuring receiver or spectrum analyzer			

Measurement uncertainty: +4.5 dB / -6.0 dB

Used test equipment module

Description	Telef. ID	Manufacturer	Model	Used at par.
Receiver	--	Rohde & Schwarz	ESU	2.1
Spectrum Analyzer	TE 00481	Hewlett Packard	HP8563E	3.1, 3.2, 3.4, 3.6, 3.7, 3.8, 3.9, 3.10
Power meter	TE 00489	Hewlett Packard	437B	3.3
Power sensor	TE 00355	Hewlett Packard	8481A	3.3
RF Pre-amplifier up to 1000 MHz	TE 00098	Rohde & Schwarz	ESV-Z3	3.5
RF Pre-amplifier 1 - 26.5 GHz	TE 00093	Hewlett Packard	HP8449B	3.2, 3.4, 3.6, 3.7, 3.8, 3.9, 3.10
RF Pre-amplifier 2 – 18 GHz	TE 00124	Hewlett Packard	HP8349A	3.2, 3.4, 3.6, 3.7, 3.8, 3.9, 3.10
Biconilog antenna	TE 00700	Emco	3143	3.5
Horn Antenna 1 – 18 GHz	TE 00532	Emco	3115	3.1, 3.2, 3.3, 3.4, 3.6, 3.7, 3.8, 3.9, 3.10
Horn Antenna 18 – 40 GHz	TE 00533	Emco	3116	3.6,
Band reject filter	TE 00932	K&L	5N45-2441/T83-0/0	3.7
Anechoic Chamber	TE 01064	Euroshield	RFD-F-100	3.1, 3.2, 3.3, 3.4, 3.6, 3.8, 3.9, 3.10
Antenna tower	--	HD	AS 620p	3.1, 3.2, 3.3, 3.4, 3.6, 3.8, 3.9, 3.10
Turntable	--	HD	DS 412	3.1, 3.2, 3.3, 3.4, 3.6, 3.8, 3.9, 3.10
Turntable controller	--	HD	HD 050	3.1, 3.2, 3.3, 3.4, 3.6, 3.8, 3.9, 3.10

Cross reference table

Transmitter	
IC RSS-210 Issue 6, Annex 8	FCC 47 CFR Ch. 1 part 15, subpart C (10-1-05 Edition)
A8.2 (1)	§ 15.247 (a) (2)
A8.4 (4)	§ 15.247 (b) (3)
A8.2 (2)	§ 15.247 (e)
A8.5	§ 15.247 (d)
IC RSS-Gen	FCC 47 CFR Ch. 1 part 15, subpart C (10-1-05 Edition)
7.2.2	§ 15.207 (a)
Receiver	
IC RSS-Gen	FCC 47 CFR Ch. 1 part 15, subpart B (10-1-05 Edition)
6	§ 15.109(a)

Revision history

REVISION	DATE	REMARKS
1.0	15 January 2007	- Added IC ID.