

Radio test report

20124484300rev1.0

based on:

- FCC part 15; subpart C; section 15.209 & 15.249 (10-1-11 edition)
- FCC part 15, subpart B, section 15.109 (10-1-11 edition)

Text on Top transmitter
Text on Top
TOT-1

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This report comprises of three modules. The total number of pages is: 35

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).

Telefication is designated by the FCC as an Accredited Test Firm for compliance testing of equipment subject to Certification under Parts 15 & 18. The Registration Number is: 282250.

The Industry Canada number for the Open Area Test Site of Telefication is: 4173A-1.

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	:	Velotype V.O.F.
Address	:	Vlokhovenseweg 1
Zipcode	:	5625 WT
City/town	:	Eindhoven
Country	:	The Netherlands
Date of order	:	20 November 2012

2 Product

A sample of the following product was submitted for testing:

Product description	:	Text on Top transmitter
Manufacturer	:	Velotype V.O.F.
Trade mark	:	Text on Top
Type designation	:	TOT-1
FCC ID	:	R8JTOT-1
Hardware version	:	--
Serial number	:	--
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 were received on:

- 12 November 2012

Tests are carried out between:

- 12 November and 13 December 2012

4 Product documentation

For production of this report no product documentation was used.

5 Observations and comments

All measurements are performed with the antenna vertical and perpendicular to the printed circuit board (normal usage position).

The power setting was set to 5, which means -7.5 dBm output powers.

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):

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 15.209 & 15.249 (10-1-11 edition)

FCC part 15, subpart B, section 15.109 (10-1-11 edition)

8 Conclusions

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

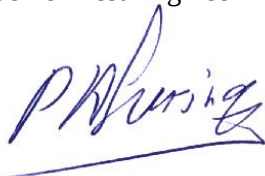
The results of the tests as stated in this report are exclusively applicable to the product item as identified in this report. Telefication accepts no responsibility for any stated properties of product items in this test report, which are not supported by the tests as specified in chapter 7 “Summary”

All tests are performed by:

name : ing. P.A. Suringa

function : Senior Test Engineer

signature :

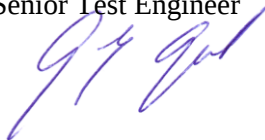


Review of test methods and report by:

name : G.J. Gort

function : Senior Test Engineer

signature :



The above conclusions have been verified by the following signatory:

Date : 22 January 2013

name : ing. A. van der Valk

function : Manager Laboratory

signature :



Test results module

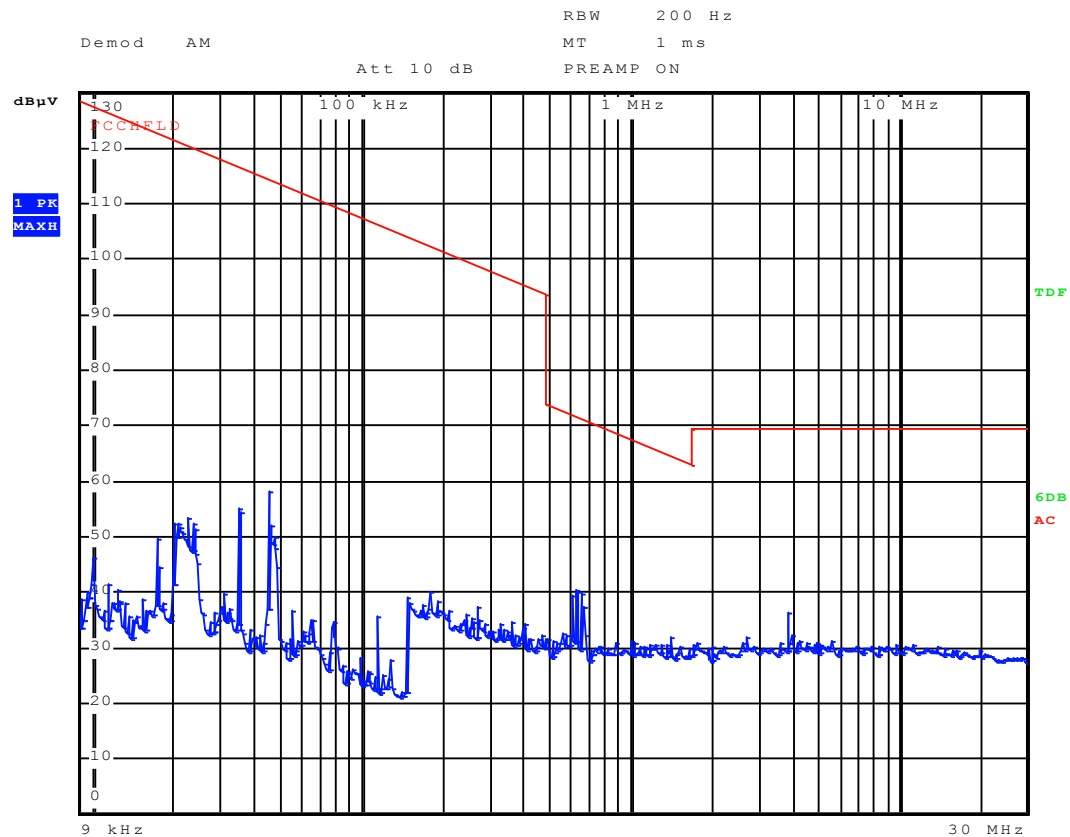
1 General information

Rated RF output power	-7.5 dBm
Rated radiated RF power	Not provided
Operating frequency range	902.130 – 922.829 MHz
Modulation	GFSK
Modulation bit rate	19200 bits/sec
ITU emission class	--
Duty cycle (during testing)	100 %
FCC ID	R8JTOT-1
Antenna type	$\frac{1}{4} \lambda$ whip

2 Emission tests

2.1 Field strength of unwanted emissions < 30 MHz (Tx mode)

Compliance standard : FCC part 15, subpart C, section 15.209 (a) & 15.249 (d)
 Method of test : ANSI C63.4-2009, sections 5.3, 8.2.1, 8.2.2
 FCC part 15, subpart A, section 15.31(f) (2), 15.33, 15.35.
 Measuring distance : 3 m



Note: due to the measurement at a closer distance than specified, an inverse linear distance extrapolation factor of 40 dB per decade is used (ref. FCC part 15A, section 15.31 (f) (2))

Measurement uncertainty	+1.5 / -1.6 dB.
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Limit	0.009 – 0.49 MHz: 2400/F(kHz) μ V/m (300 m distance)
	0.49 – 1.705 MHz: 24000/F(kHz) μ V/m (30 m distance)
	1.705 – 30 MHz: 30 μ V/m (30 m distance)

Measurement equipment used (item numbers refer to section “used test equipment”)	4, 5, 8
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2.2 Field strength of intentional signal

Compliance standard : FCC part 15, subpart C, section 15.249 (a)
Method of test : ANSI C63.4-2009, sections 5.4 & 8.2.3

Test results :

(only the highest of the two polarizations are stated)

Peak field strength:

Channel	Frequency (MHz)	Test result @ 3 m distance (dB μ V/m) (PK)	Polarisation	Limit (dB μ V/m)
Low	902.130	91.3	V	114
Middle	913.7	93.3	V	114
High	922.829	93	V	114

Quasi peak field strength:

Channel	Frequency (MHz)	Test result @ 3 m distance (dB μ V/m) (QP)	Polarisation	Limit (dB μ V/m)
Low	902.130	91.7	V	94
Middle	913.7	93.3	V	94
High	922.829	93.8	V	94

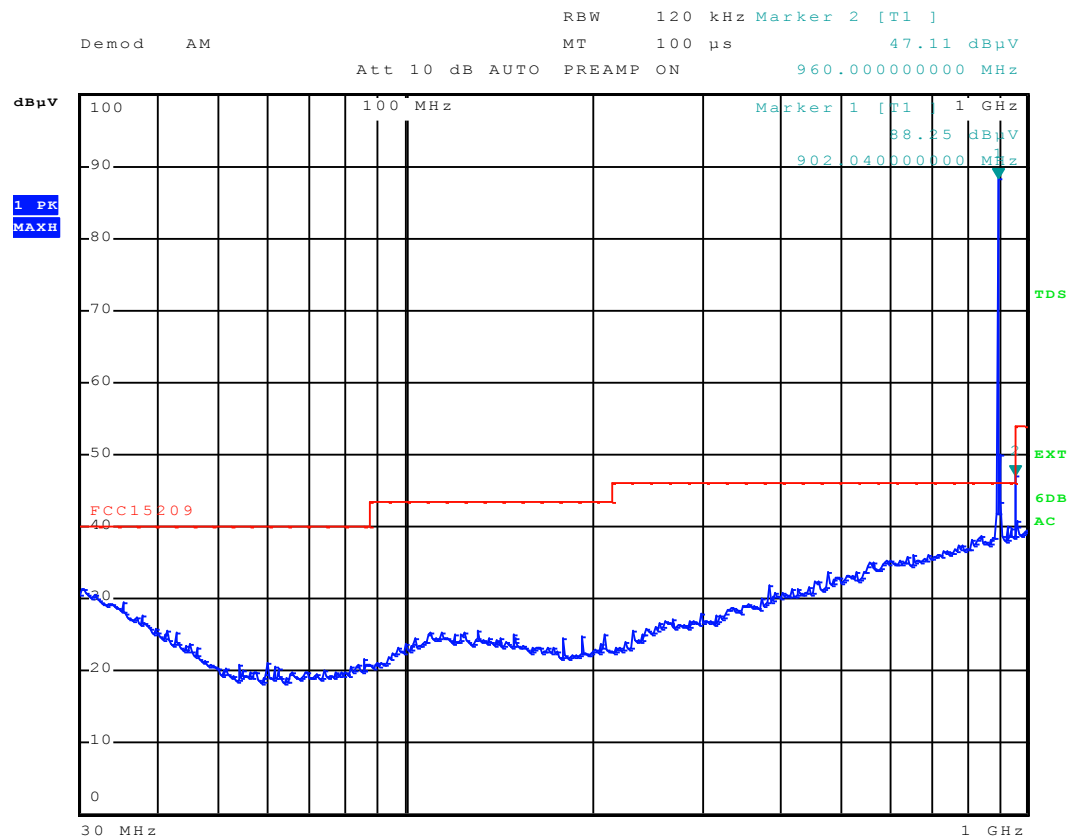
Measurement uncertainty	+4.6 / -4.6 dB.
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Measurement equipment used (item numbers refer to section “used test equipment”)	5, 6, 8
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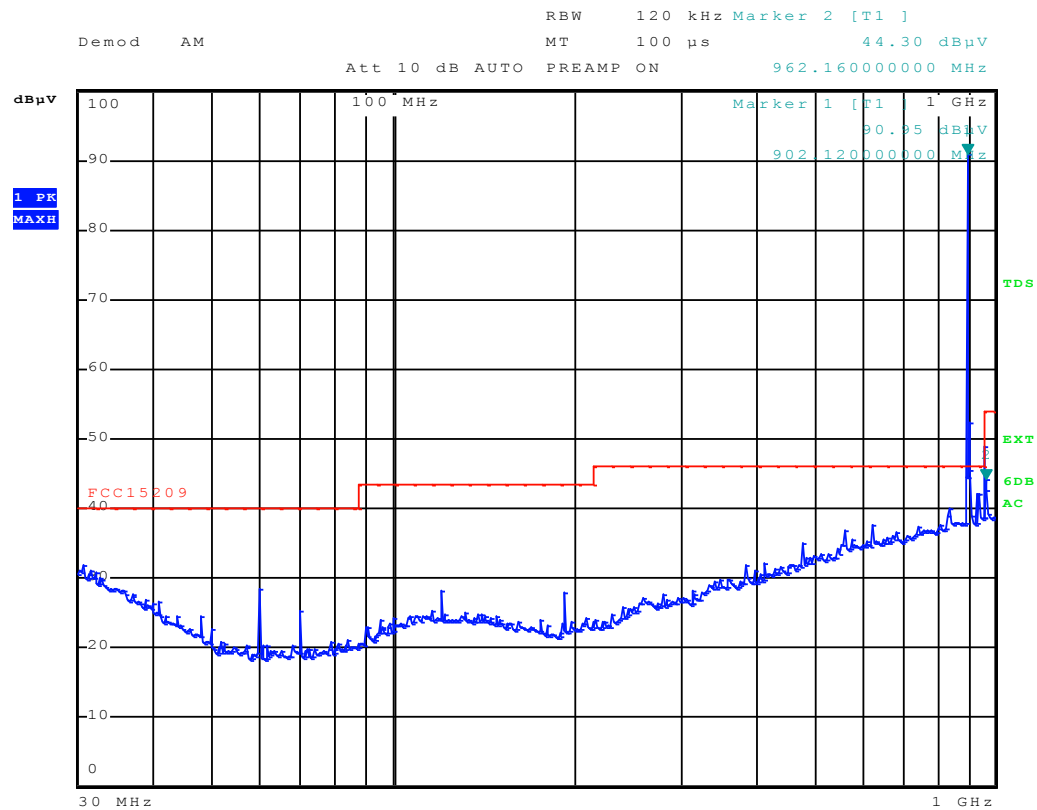
2.3 Field strength of unwanted emissions 30 - 1000 MHz (Tx mode)

Compliance standard : FCC part 15, subpart C, section 15.209 (a) & 15.249 (d)
 Method of test : ANSI C63.4-2009, sections 5.4, 8.2.3, 8.3.1, 8.3.2
 FCC part 15, subpart A, section 15.31(m), 15.33, 15.35.
 Test results :

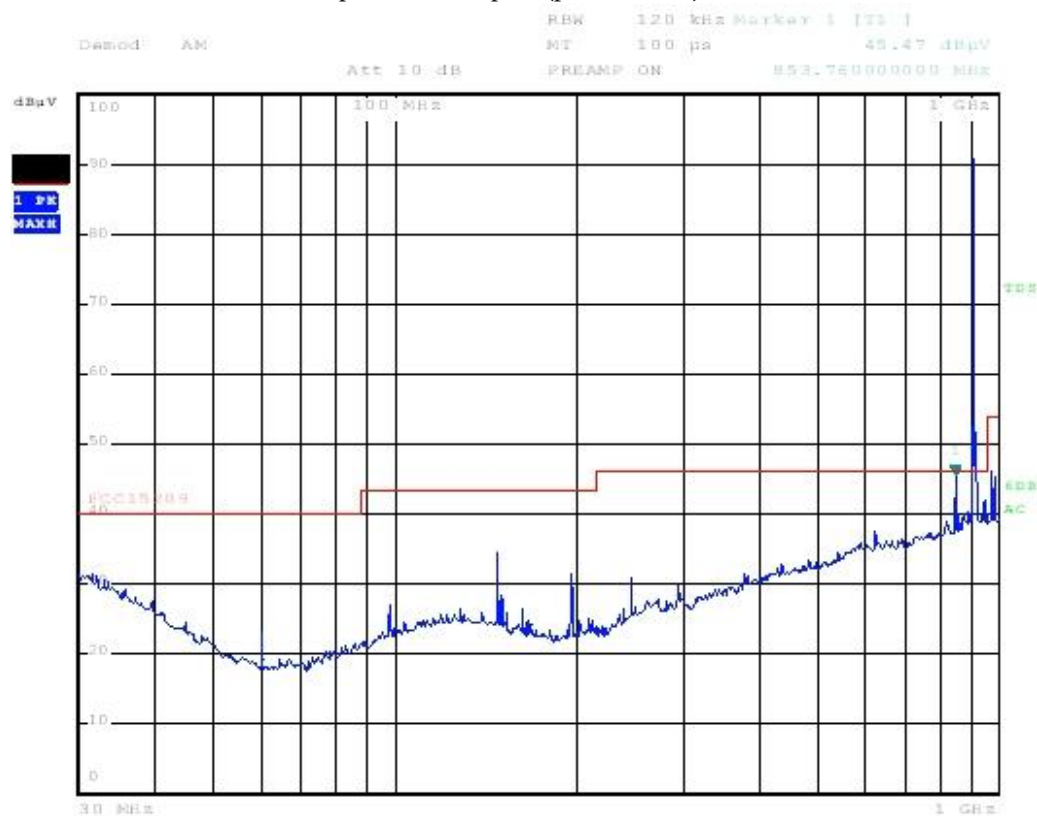
Low channel: horizontal polarization plot (peak values)



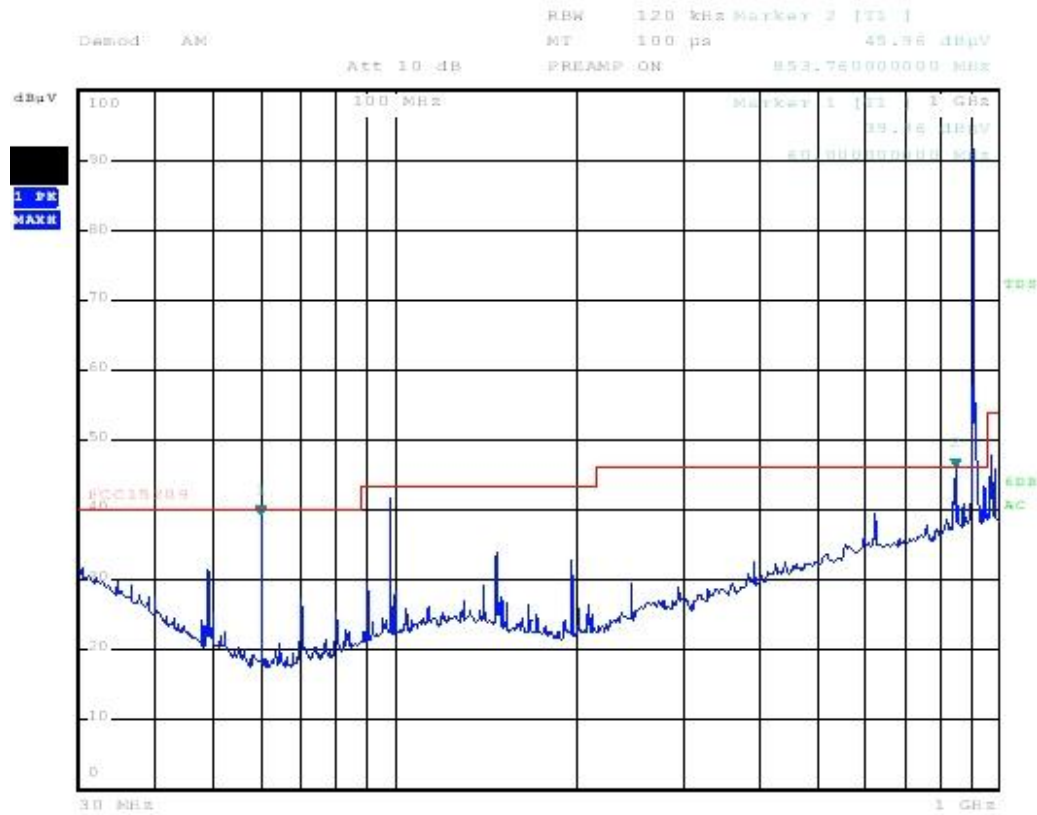
Low channel: vertical polarization plot (peak values)



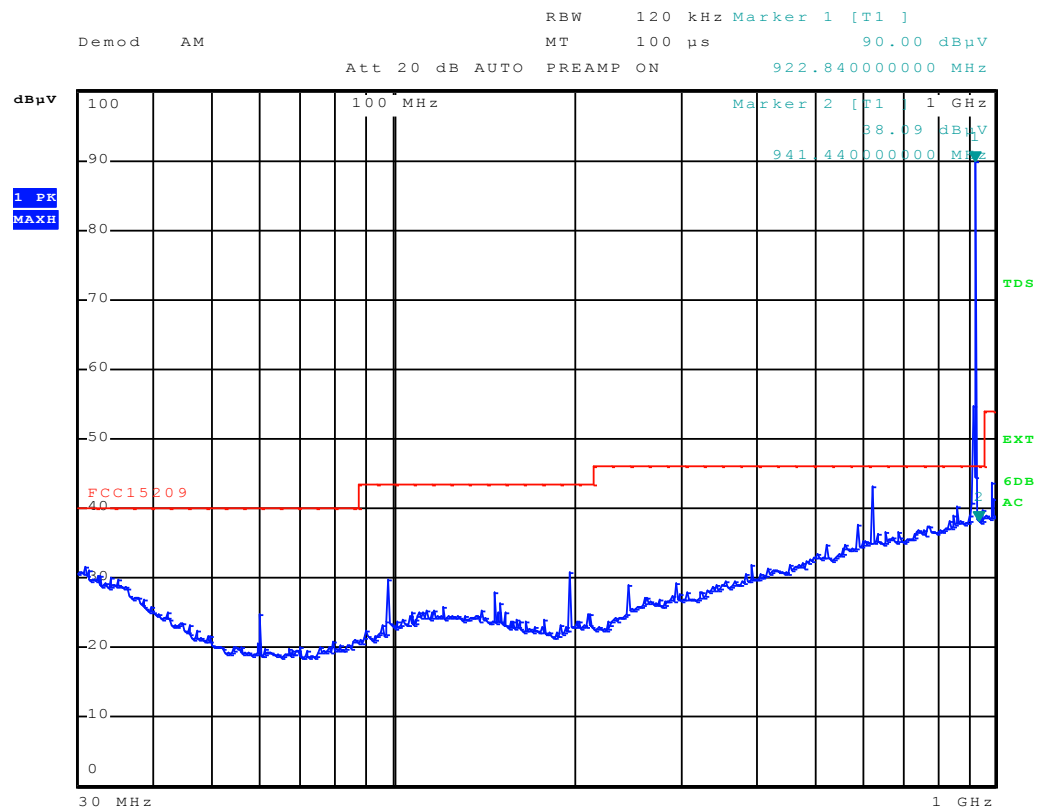
Middle channel: horizontal polarization plot (peak values)



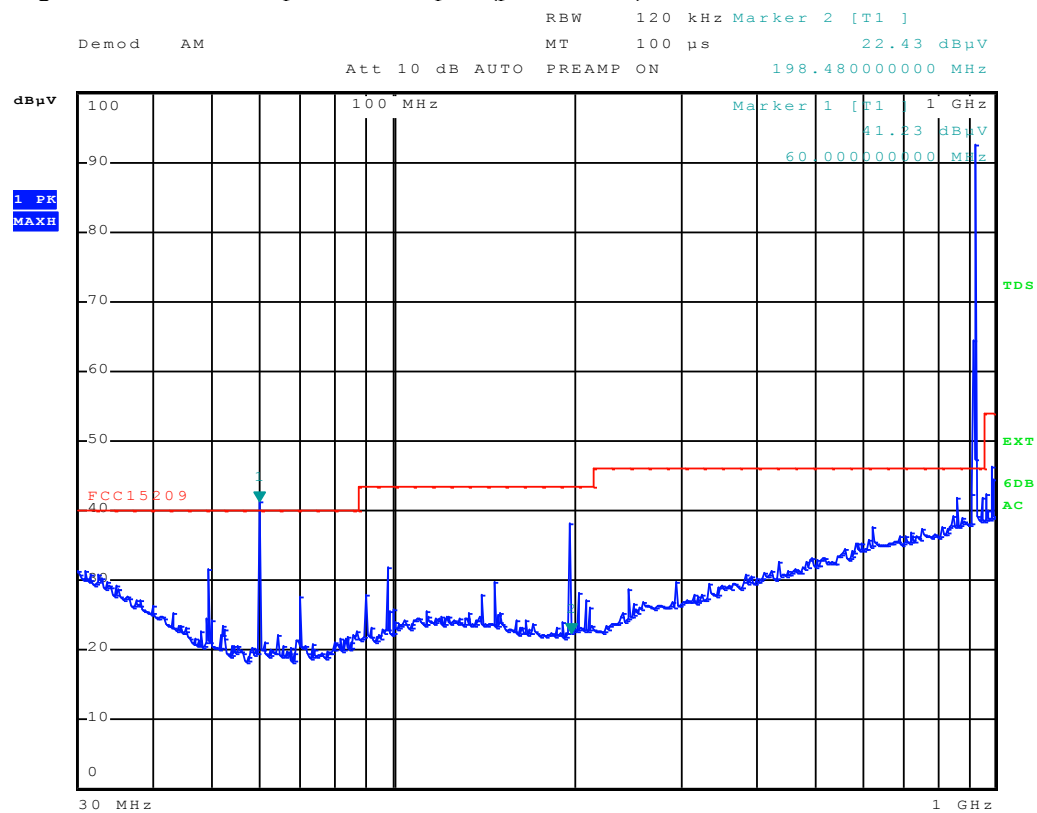
Middle channel: vertical polarization plot (peak values)



High channel: horizontal polarization plot (peak values)



High channel: vertical polarization plot (peak values)



High channel: vertical polarization plot (detail) (peak values)

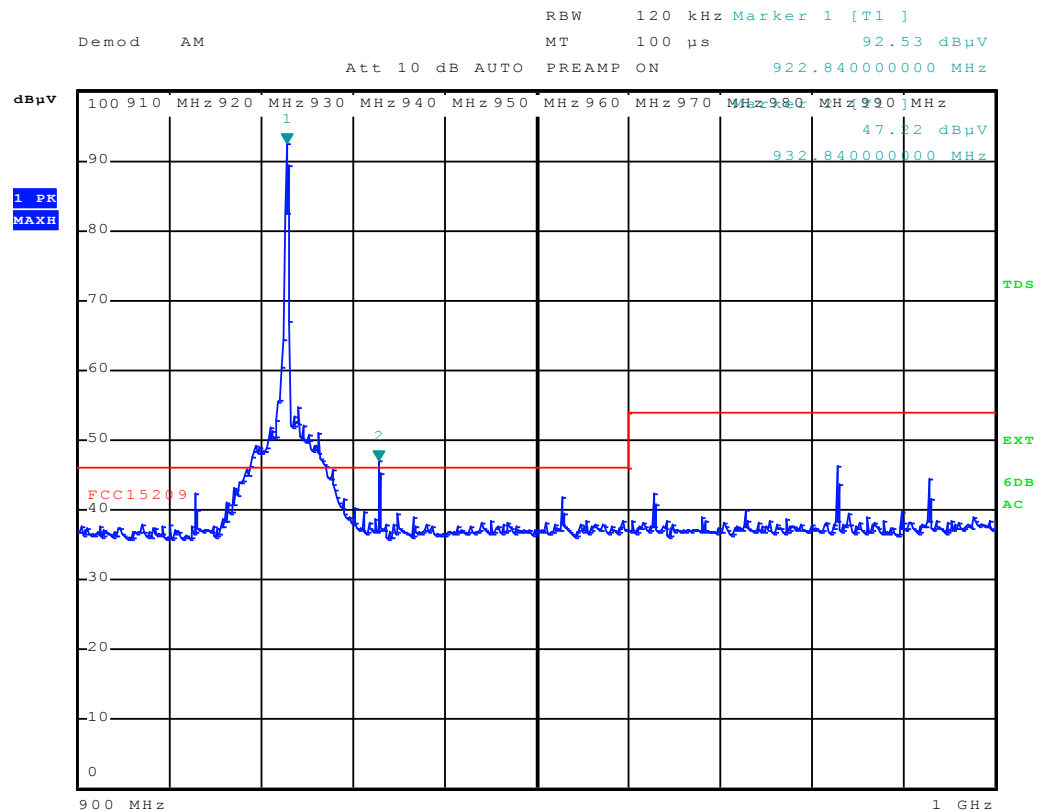


Table with quasi peak values

Frequency (MHz)	Polarization	Field strength (QP) (dB μ V/m)	Limit (dB μ V/m)
60	V	equal or below measurement system noise floor ^{*)}	40
98.28	V	equal or below measurement system noise floor ^{*)}	43.5
853.76	V	45.4	46
932.84	V	43 ^{*)}	46
960	V	45.1	46

^{*)} measured with EUT inserted in laptop computer

Measurement uncertainty:

Vertical polarisation:	
30 – 200 MHz	5.4 dB
200 -1000 MHz	4.6 dB
Horizontal polarisation:	
30 – 200 MHz	4.5 dB
200 -1000 MHz	3.6 dB

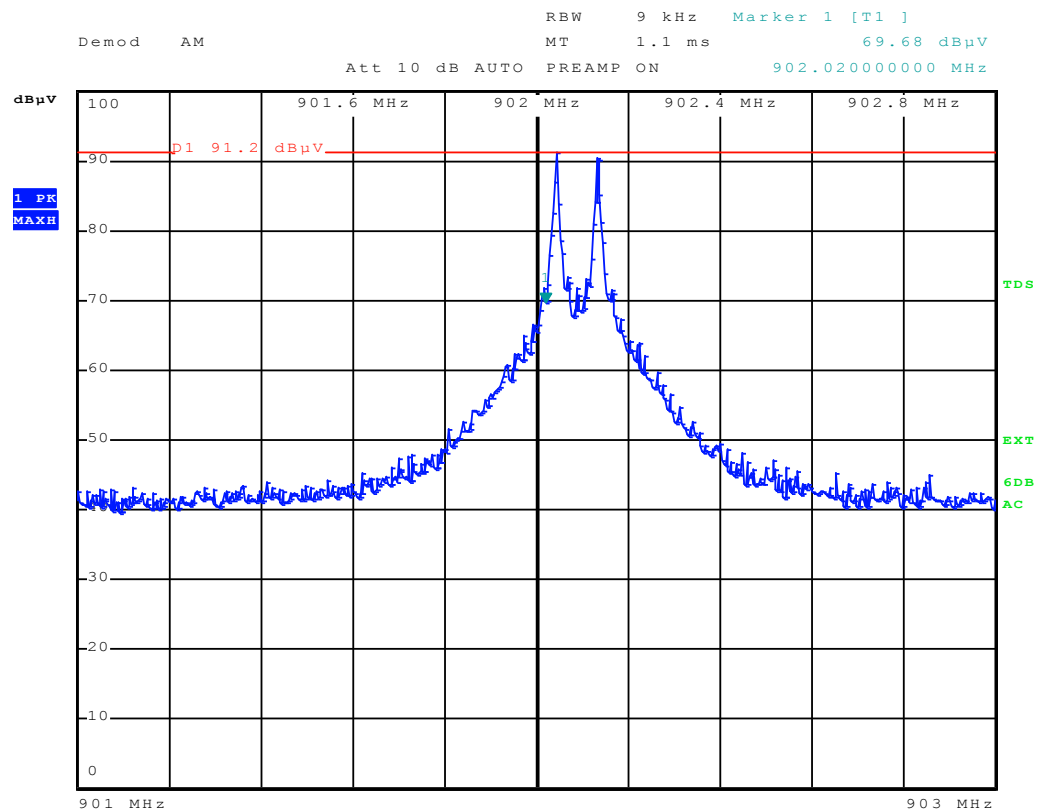
Limit (@ 3m distance)	30 – 88 MHz: 100 μ V/m (40 dB μ V/m)
	88-216 MHz: 150 μ V/m (43.5 dB μ V/m)
	216 – 960 MHz: 200 μ V/m (46 dB μ V/m)
	> 960 MHz: 500 μ V/m (54 dB μ V /m)

Measurement equipment used (item numbers refer to section “used test equipment”)	5, 6, 8
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2.4 20 dB bandwidth

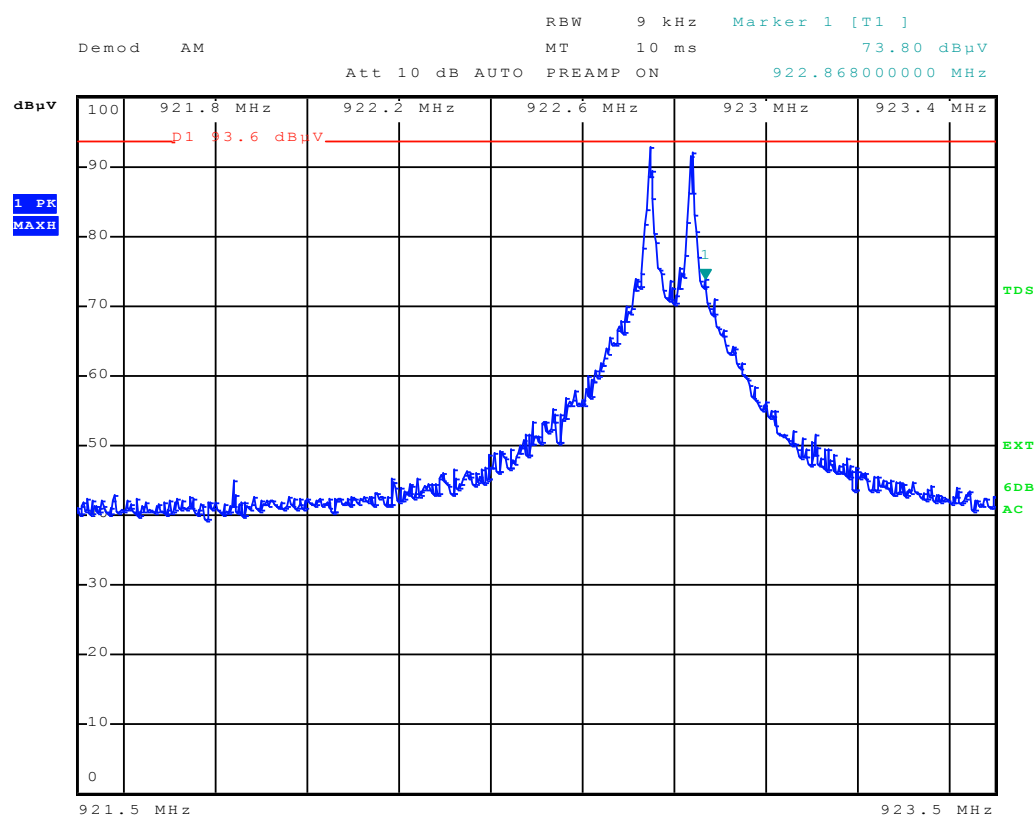
Compliance standard : FCC part 15, subpart C, section 15.215
Method of test : ANSI C63.4-2009, section
Test results :

Lower band edge of 20 dB bandwidth



From plot above the marker read out is: 902.020 MHz

Upper band edge of 20 dB bandwidth



From plot above the marker read out is: 922.868 MHz

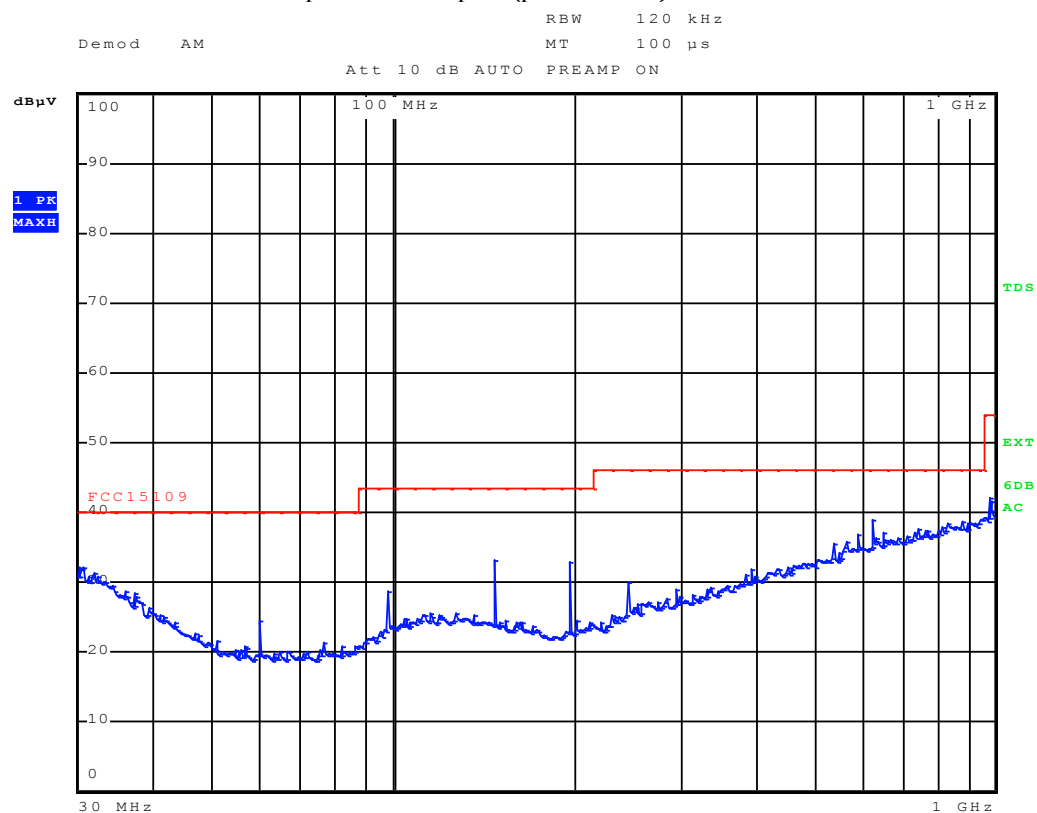
Limit	Lower band edge: ≥ 902 MHz; Upper band edge: ≤ 928 MHz
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Measurement equipment used (item numbers refer to section “used test equipment”)	5, 6, 8
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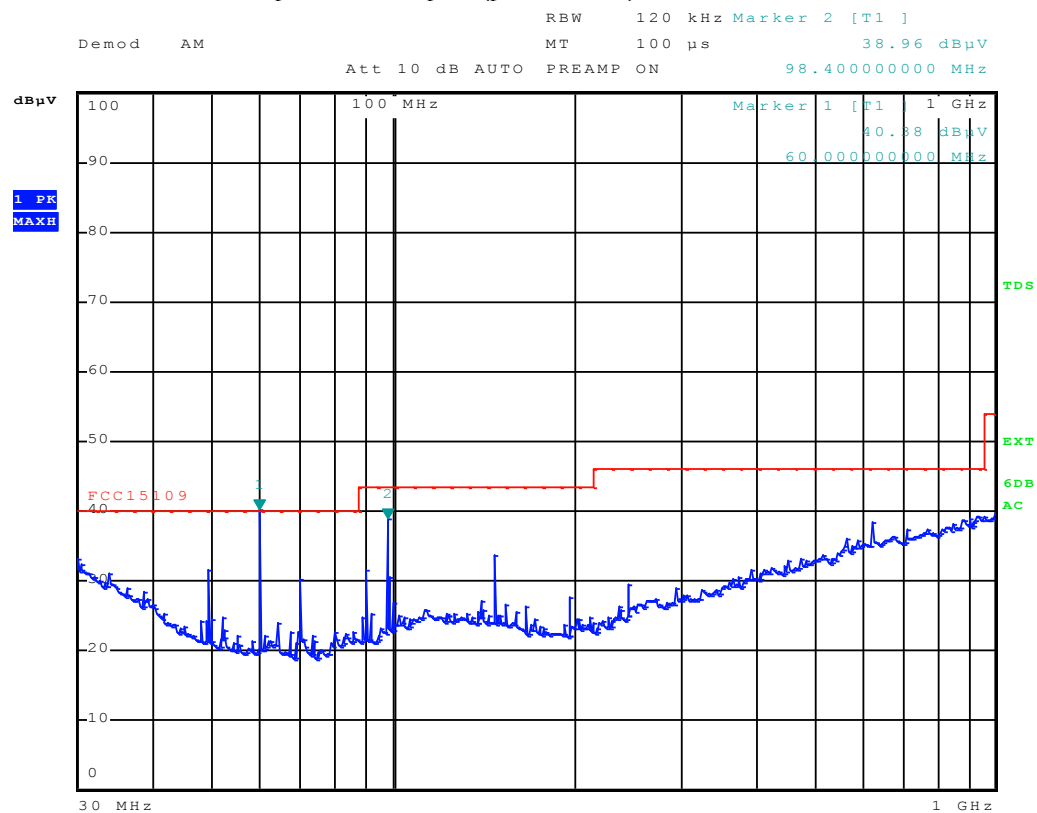
2.5 Field strength of unwanted emissions 30 - 1000 MHz (Rx mode)

Compliance standard : FCC part 15, subpart B, section 15.109
Method of test : ANSI C63.4-2009, sections 5.4, 8.2.3, 8.3.1, 8.3.2
FCC part 15, subpart A, section 15.31(m), 15.33, 15.35.
Test results :

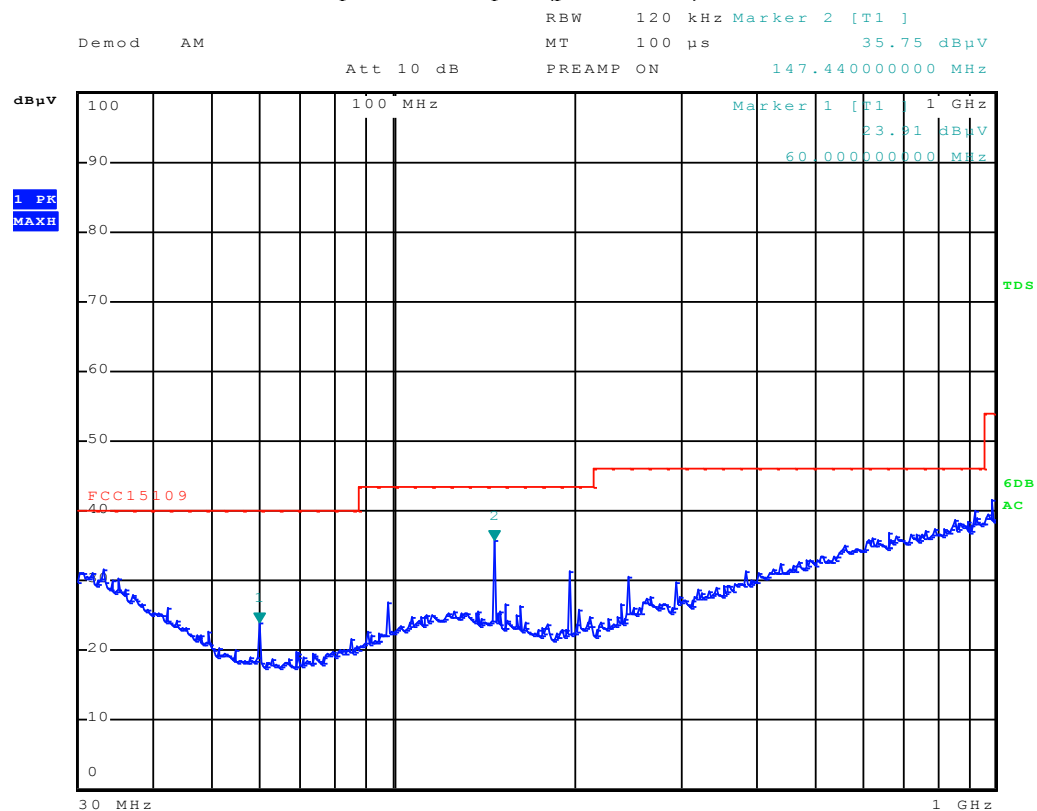
Low channel: horizontal polarization plot (peak values)



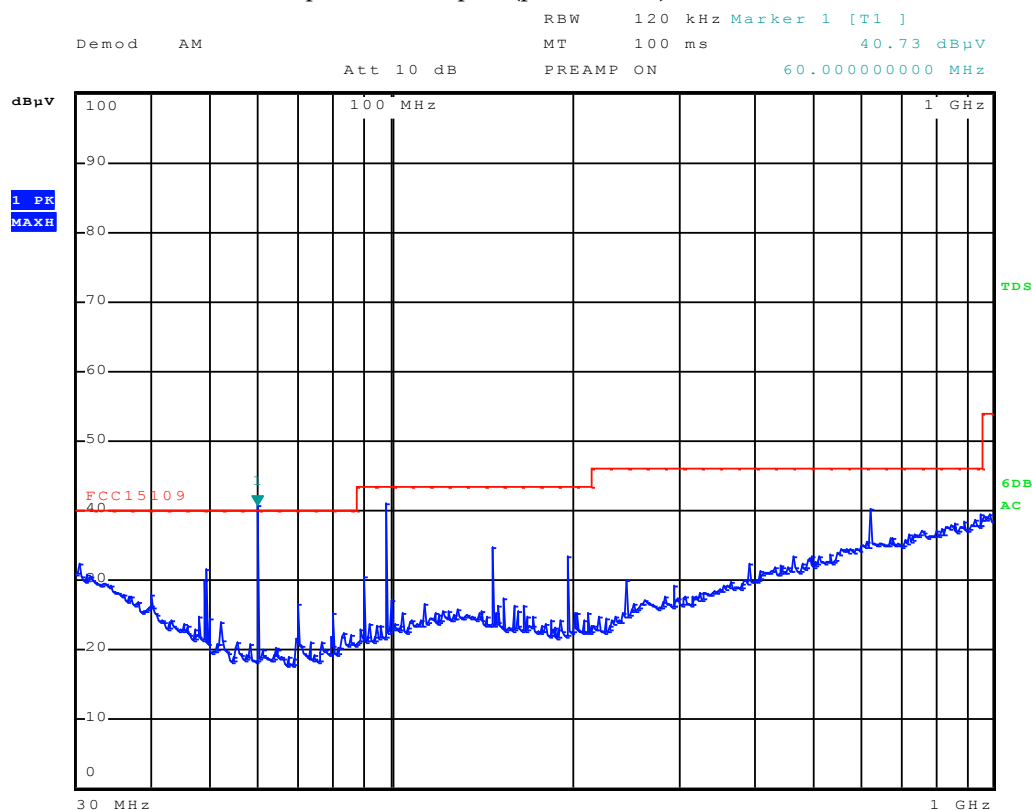
Low channel: vertical polarization plot (peak values)



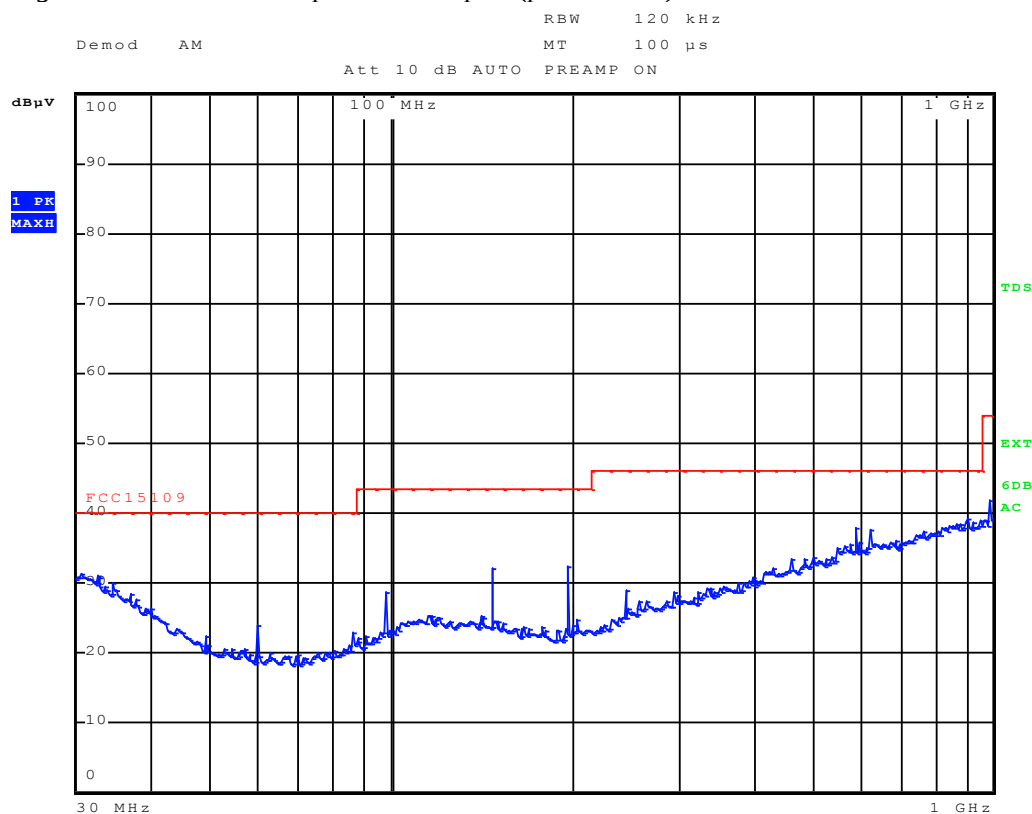
Middle channel: horizontal polarization plot (peak values)



Middle channel: vertical polarization plot (peak values)



High channel: horizontal polarization plot (peak values)



High channel: vertical polarization plot (peak values)

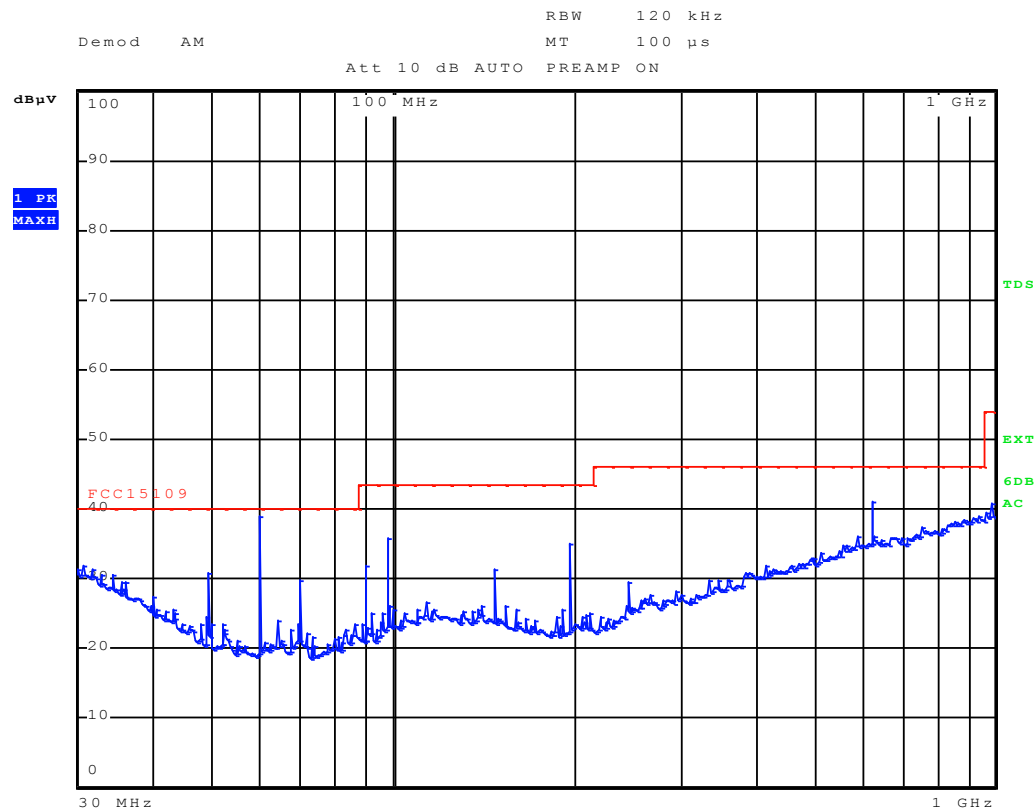


Table with quasi peak values

Frequency (MHz)	Field strength (QP) (dB μ V/m)	Limit (dB μ V/m)
60	equal or below measurement system noise floor ^{*)}	40
98.28	equal or below measurement system noise floor ^{*)}	43.5

^{*)} measured with EUT inserted in laptop computer

Measurement uncertainty:

Vertical polarisation:	
30 – 200 MHz	5.4 dB
200 -1000 MHz	4.6 dB
Horizontal polarisation:	
30 – 200 MHz	4.5 dB
200 -1000 MHz	3.6 dB

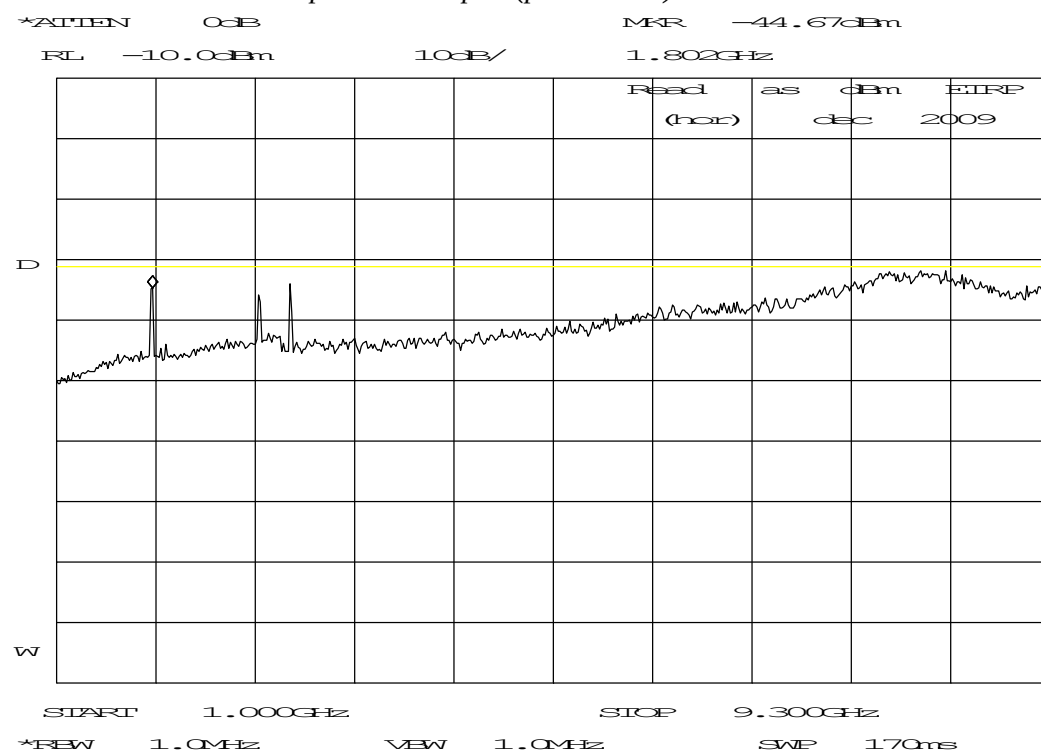
Limit (@ 3m distance)	30 – 88 MHz: 100 μ V/m (40 dB μ V/m)
	88-216 MHz: 150 μ V/m (43.5 dB μ V/m)
	216 – 960 MHz: 200 μ V/m (46 dB μ V/m)
	> 960 MHz: 500 μ V/m (54 dB μ V /m)

Measurement equipment used (item numbers refer to section “used test equipment”	5, 6, 8
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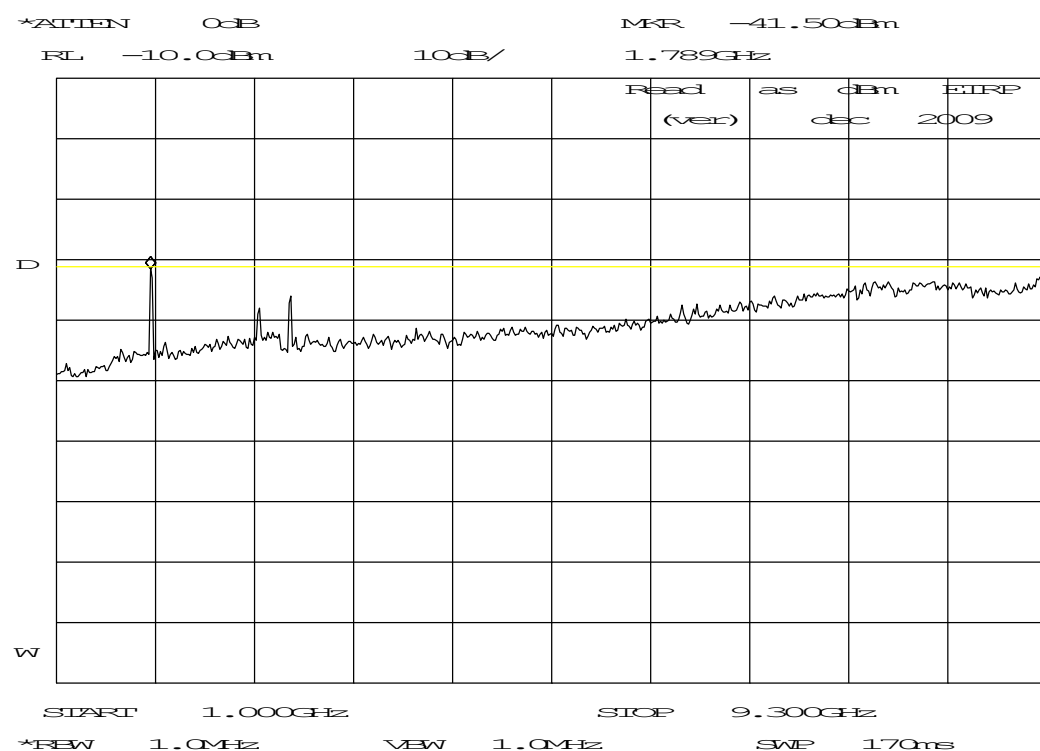
2.6 Field strength of unwanted emissions > 1000 MHz (Tx mode)

Compliance standard : FCC part 15, subpart C, section 15.209 (a); 15.249 (a) & (e)
Method of test : ANSI C63.4-2009, sections 4.2.2 e), 5.5, 8.2.4, 8.3.1.2;
FCC part 15, subpart A, section 15.31(m), 15.33, 15.35
Measuring distance : 3 m

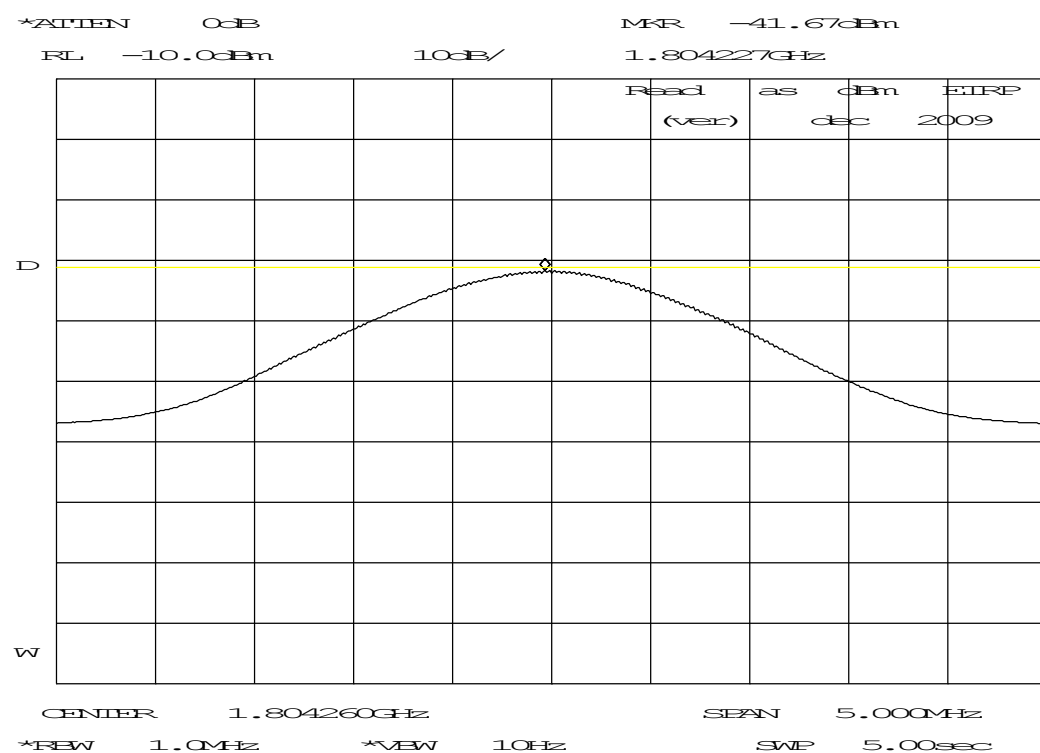
Low channel: horizontal polarization plot (peak values)



Low channel: vertical polarization plot (peak values)

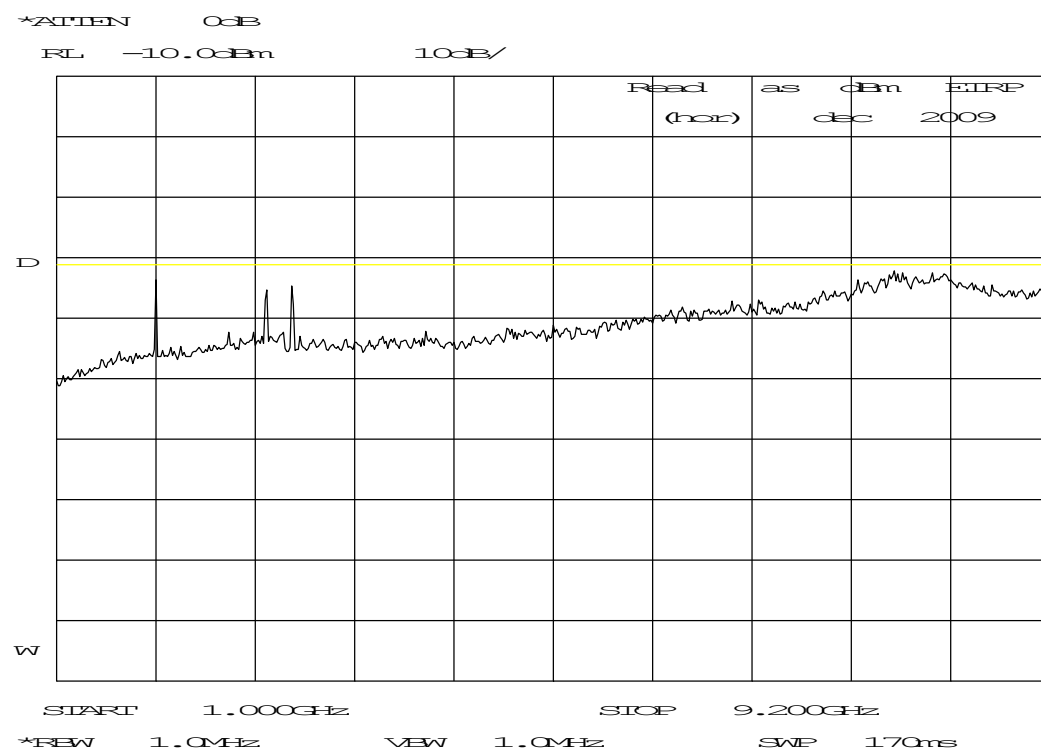


Low channel: vertical polarization plot (average value of first harmonic)

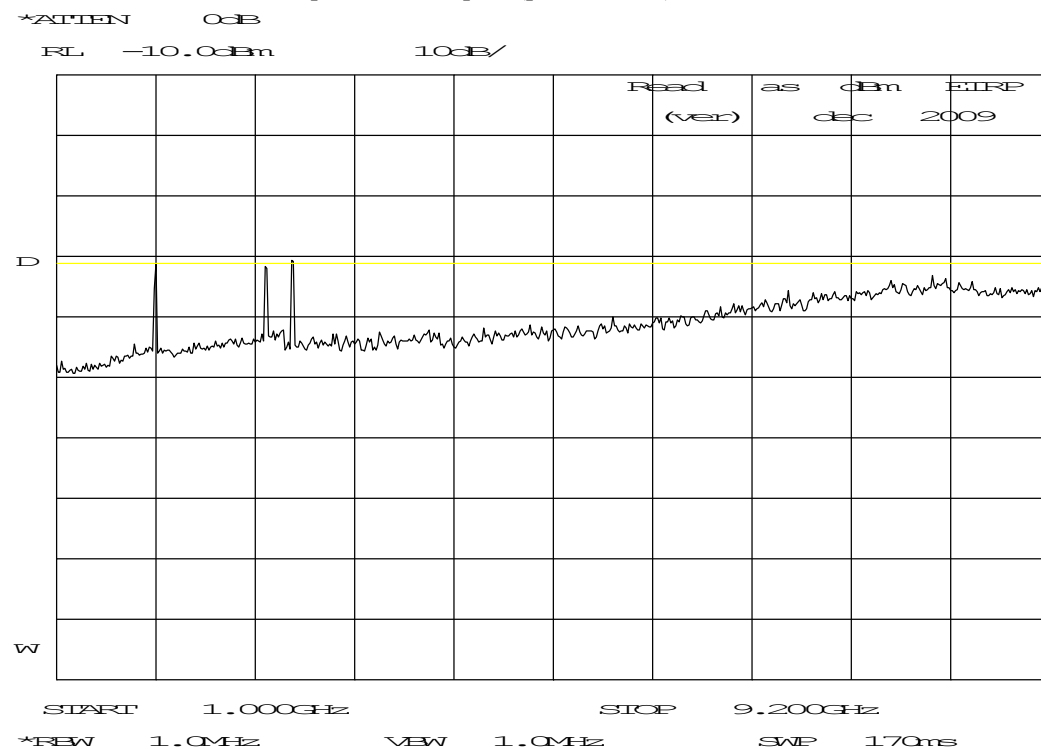


Note: use has been made of a full anechoic room calibrated for EIRP measurements;
for this purpose the conversion applies: $\text{EIRP}_{\text{dBm}} = \text{E}_{\text{dB}\mu\text{V/m}} - 95.3 \text{ dB}$

Middle channel: horizontal polarization plot (peak values)

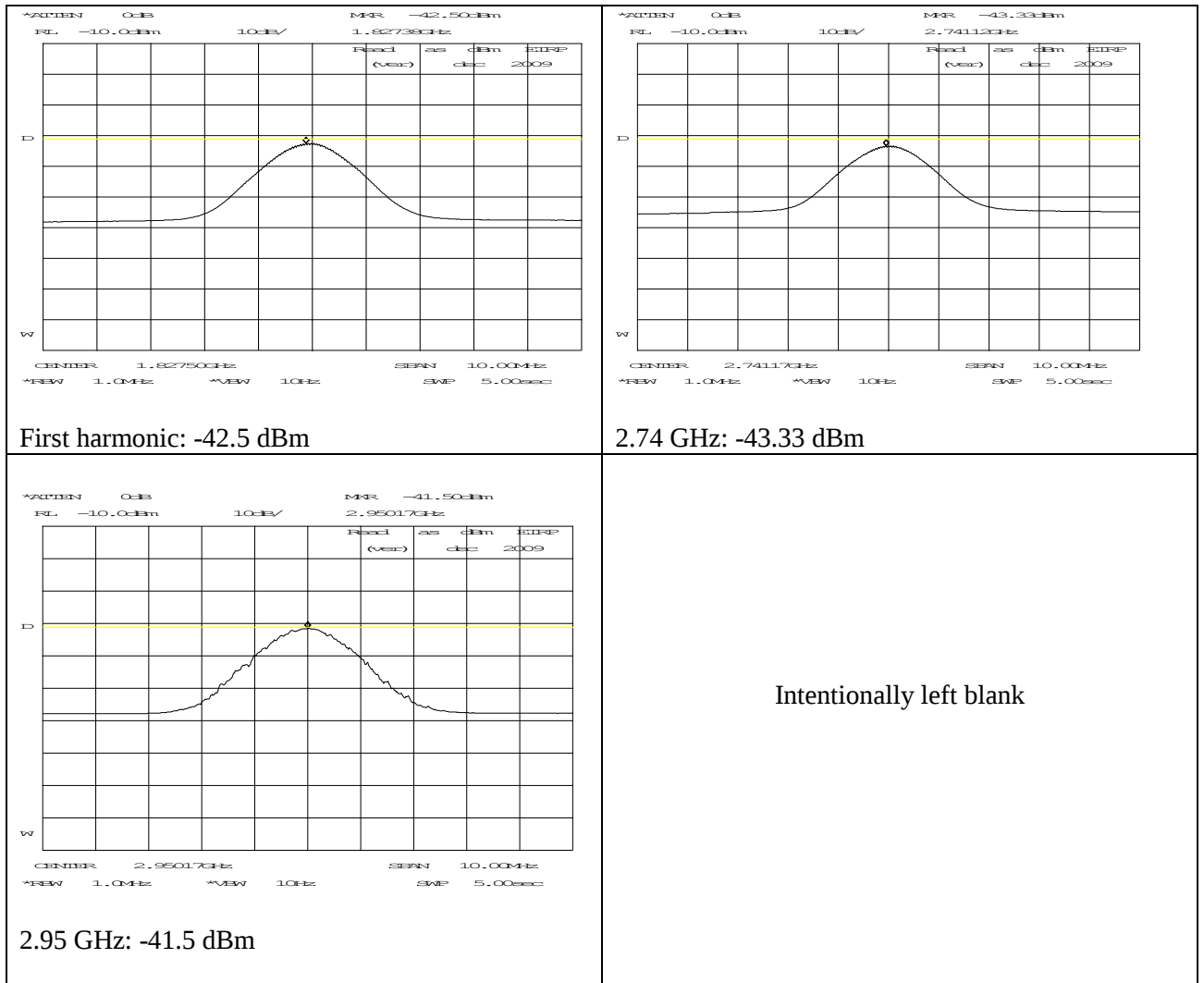


Middle channel: vertical polarization plot (peak values)



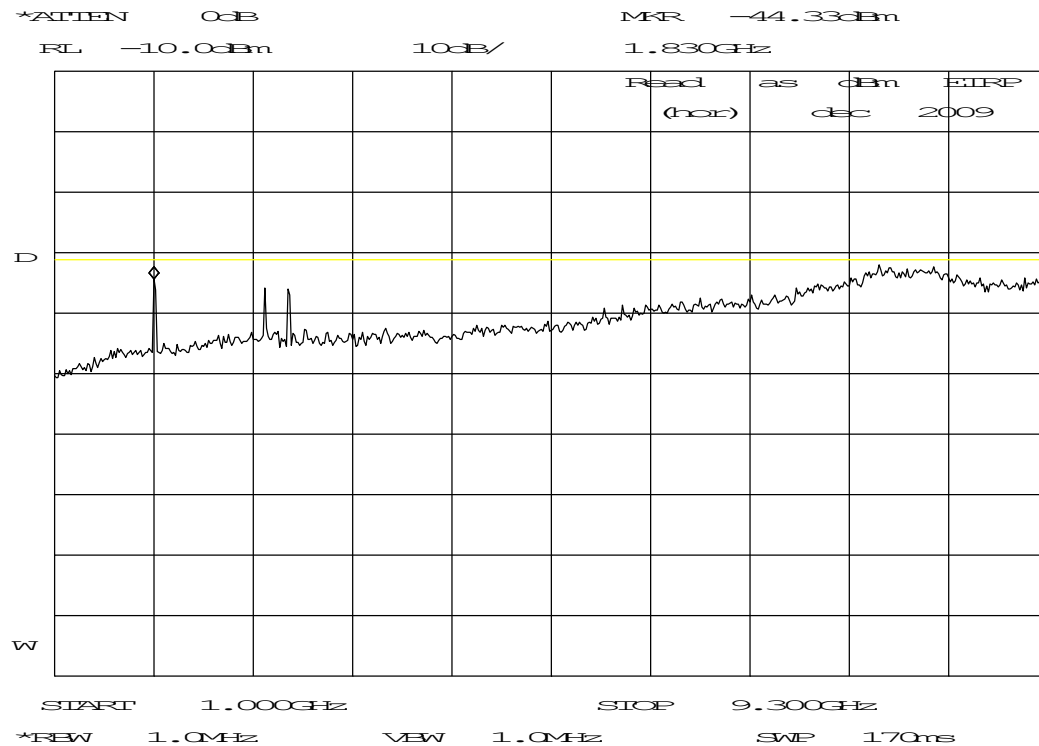
**Note: use has been made of a full anechoic room calibrated for EIRP measurements;
for this purpose the conversion applies: $EIRP_{dBm} = E_{dB\mu V/m} - 95.3 \text{ dB}$**

Middle channel: vertical polarization plots (average values)

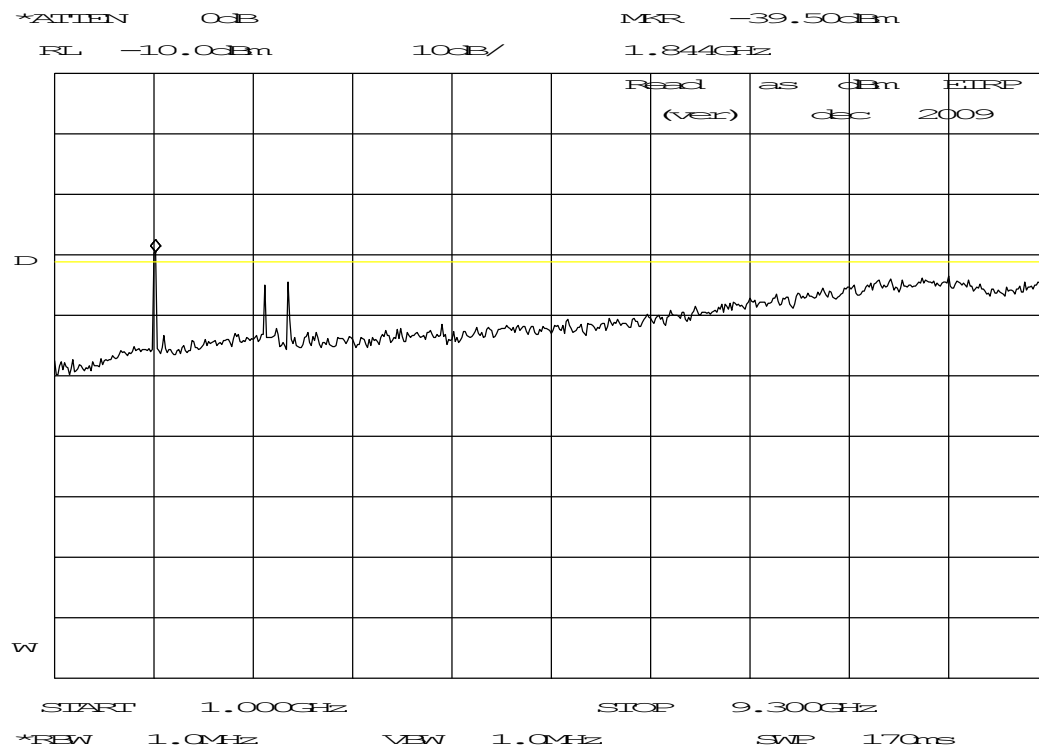


Note: use has been made of a full anechoic room calibrated for EIRP measurements;
for this purpose the conversion applies: $EIRP_{dBm} = E_{dB\mu V/m} - 95.3 \text{ dB}$

High channel: horizontal polarization plots (peak values)

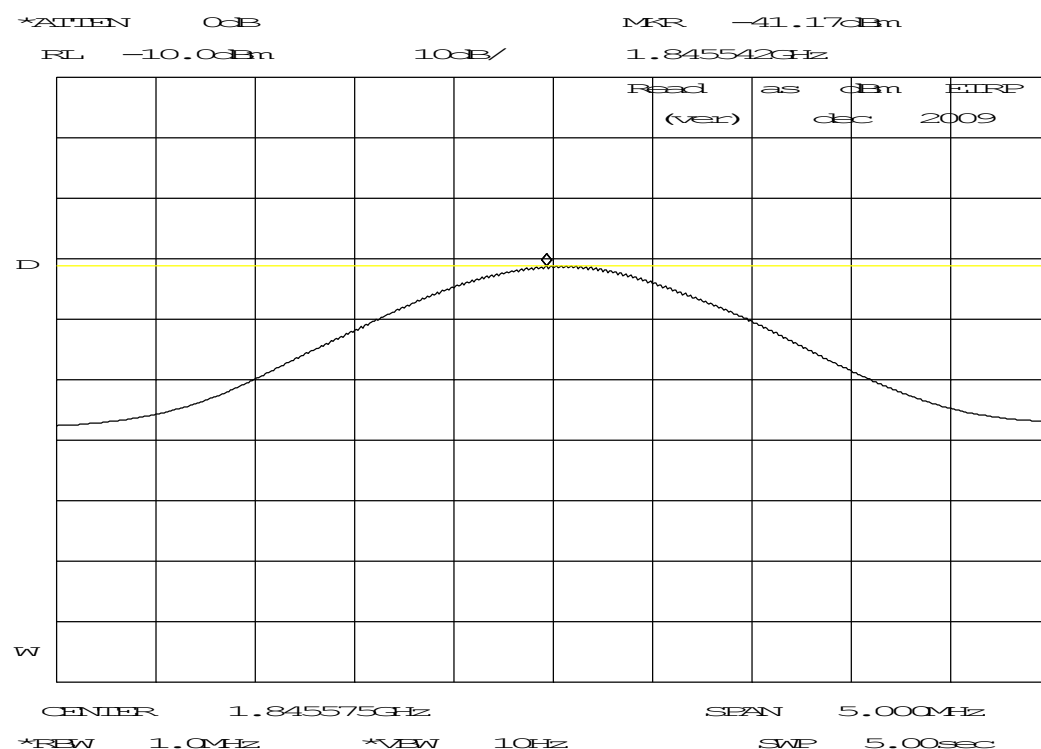


High channel: vertical polarization plots (peak values)



Note: use has been made of a full anechoic room calibrated for EIRP measurements;
for this purpose the conversion applies: $\text{EIRP}_{\text{dBm}} = \text{E}_{\text{dBuV/m}} - 95.3 \text{ dB}$

High channel: vertical polarization plot (average value of first harmonic)



Note: use has been made of a full anechoic room calibrated for EIRP measurements;
 for this purpose the conversion applies: $EIRP_{dBm} = E_{dB\mu V/m} - 95.3 \text{ dB}$

Measurement uncertainty	+4.5/ -6.1 dB.
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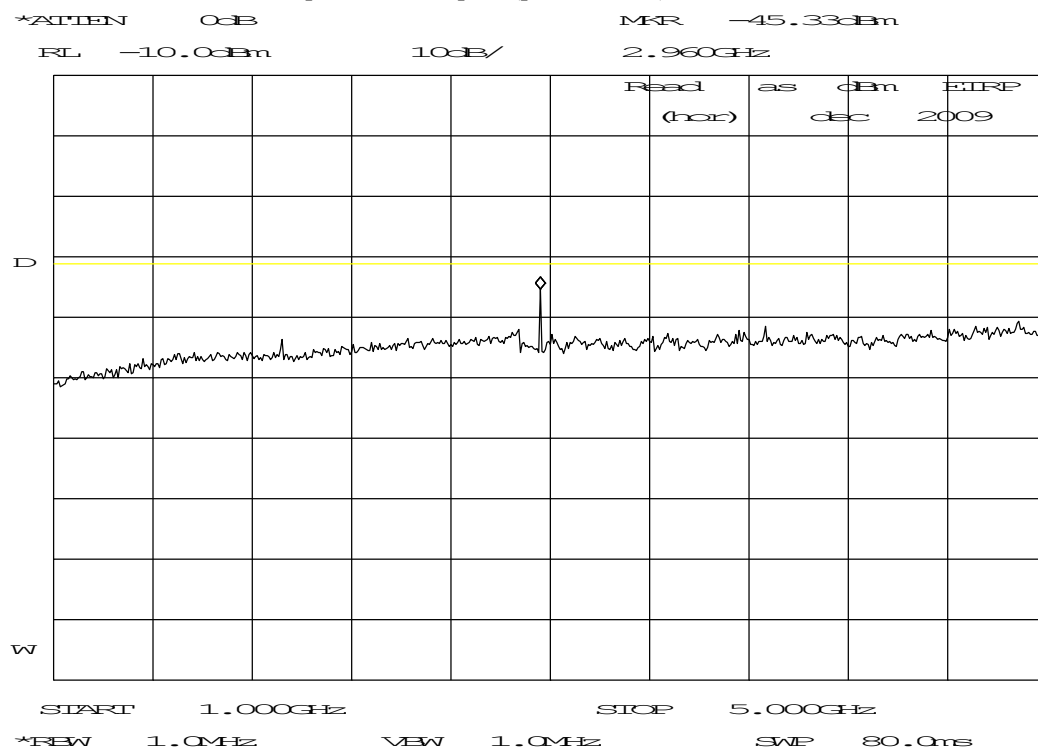
Limit (@ 3 m distance)	Average: 500 $\mu V/m$ (54 dB $\mu V/m$)
	Peak: 5 mV/m (74 dB $\mu V/m$)

Measurement equipment used (item numbers refer to section “used test equipment”)	1, 2, 3, 7
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2.7 Field strength of unwanted emissions > 1000 MHz (Rx mode)

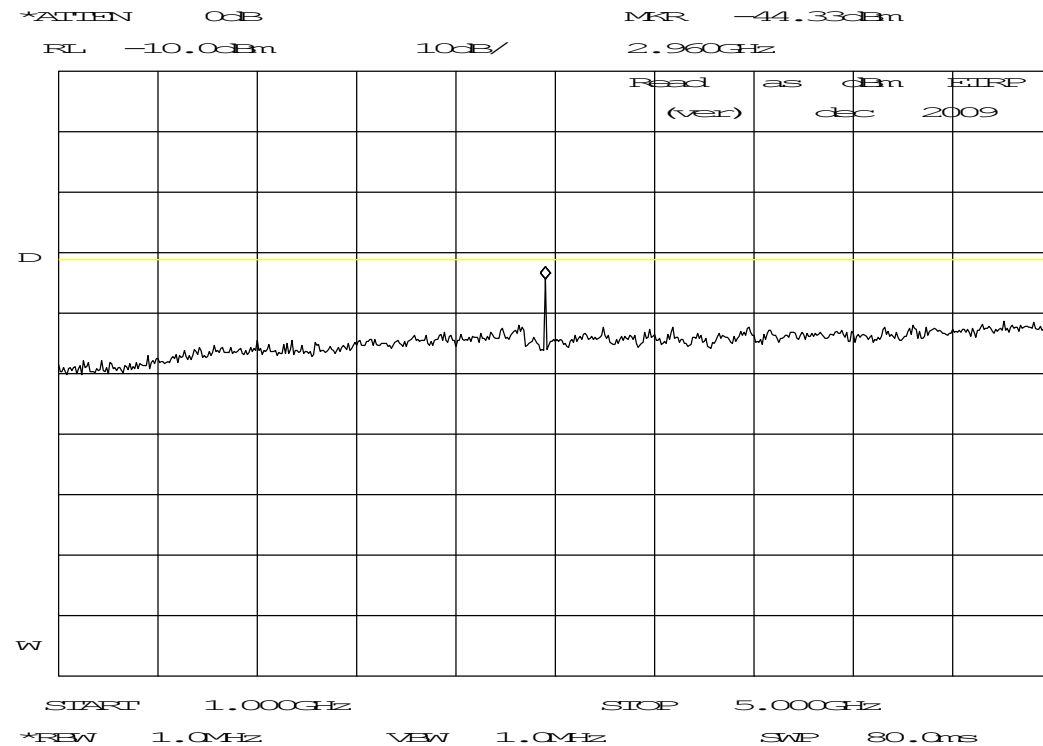
Compliance standard	:	FCC part 15, subpart B, section 15.109 (a)
Method of test	:	ANSI C63.4-2009, sections 4.2.2 e), 5.5, 8.2.4, 8.3.1.2; FCC part 15, subpart A, section 15.31(m), 15.33, 15.35
Measuring distance	:	3 m
Test results	:	

Low channel: horizontal polarization plot (peak values)

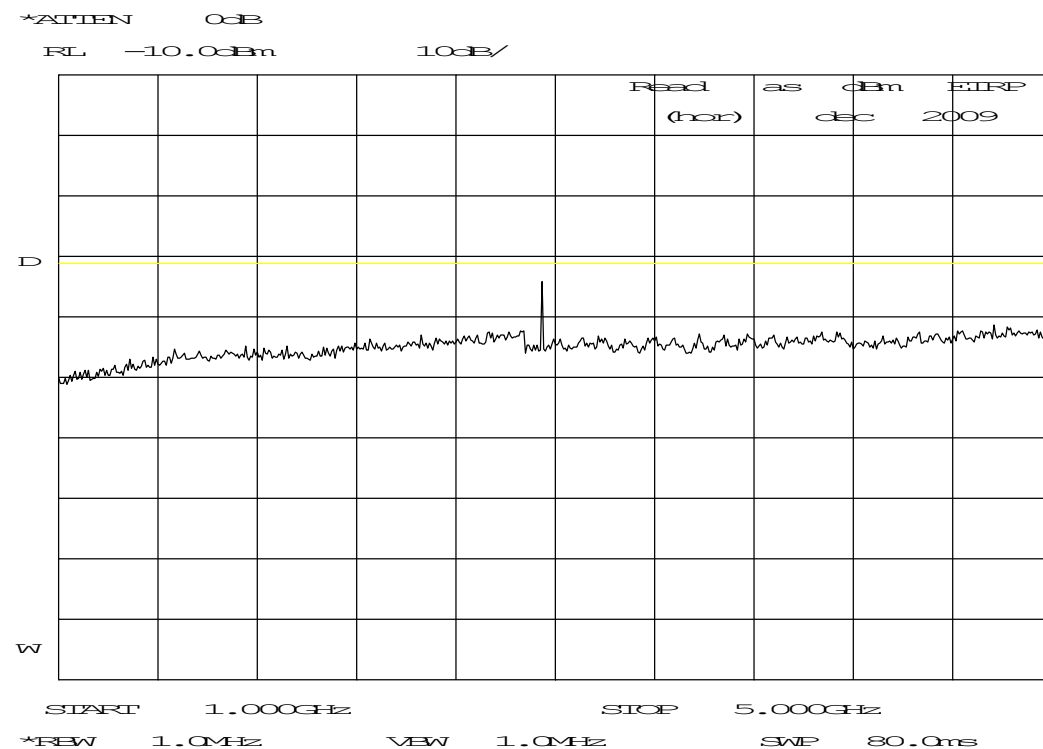


Note: use has been made of a full anechoic room calibrated for EIRP measurements;
for this purpose the conversion applies: $\text{EIRP}_{\text{dBm}} = \text{E}_{\text{dBuV/m}} - 95.3 \text{ dB}$

Low channel: vertical polarization plot (peak values)

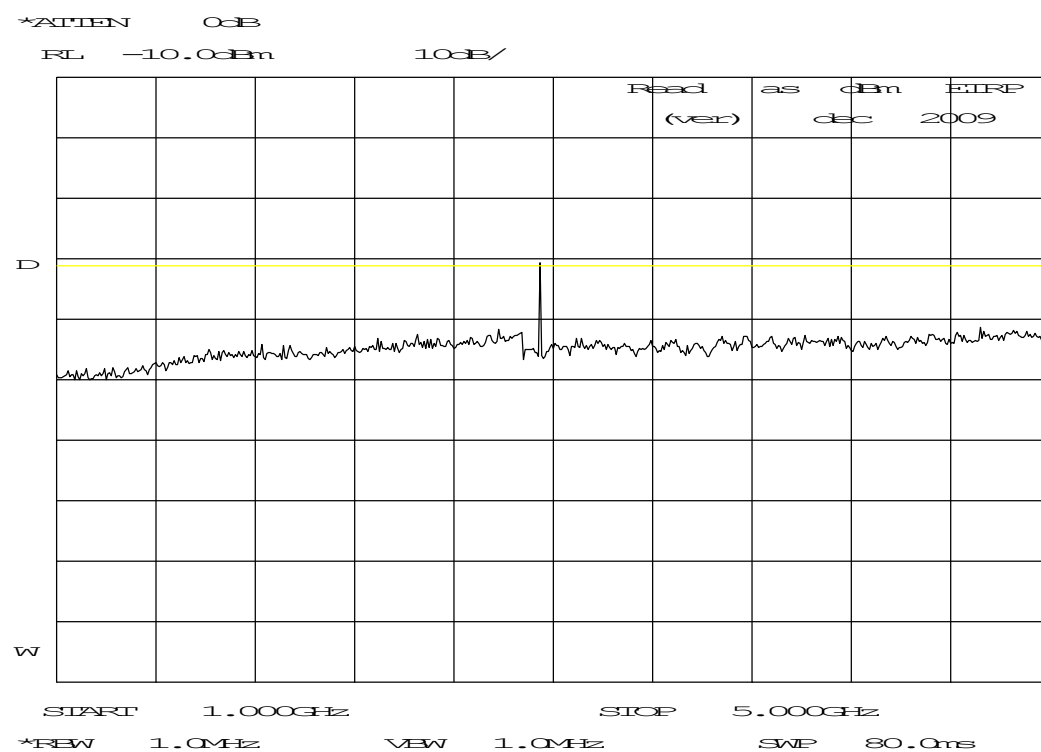


Middle channel: horizontal polarization plot (peak values)

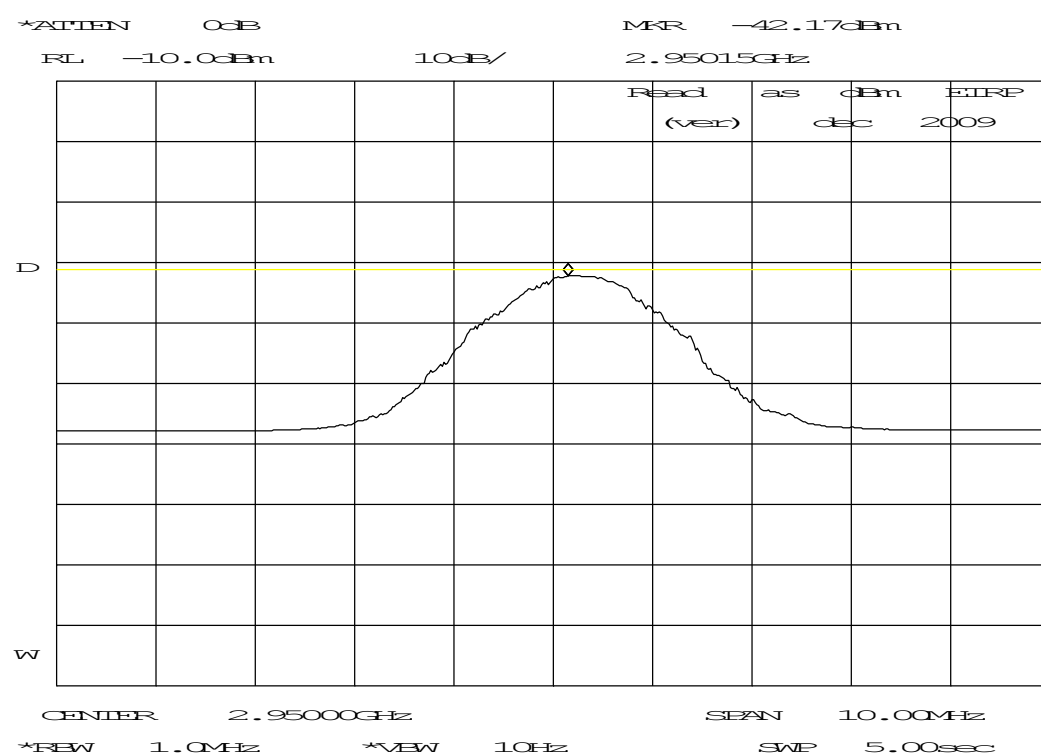


Note: use has been made of a full anechoic room calibrated for EIRP measurements;
for this purpose the conversion applies: $\text{EIRP}_{\text{dBm}} = \text{E}_{\text{dB}\mu\text{V/m}} - 95.3 \text{ dB}$

Middle channel: vertical polarization plot (peak values)

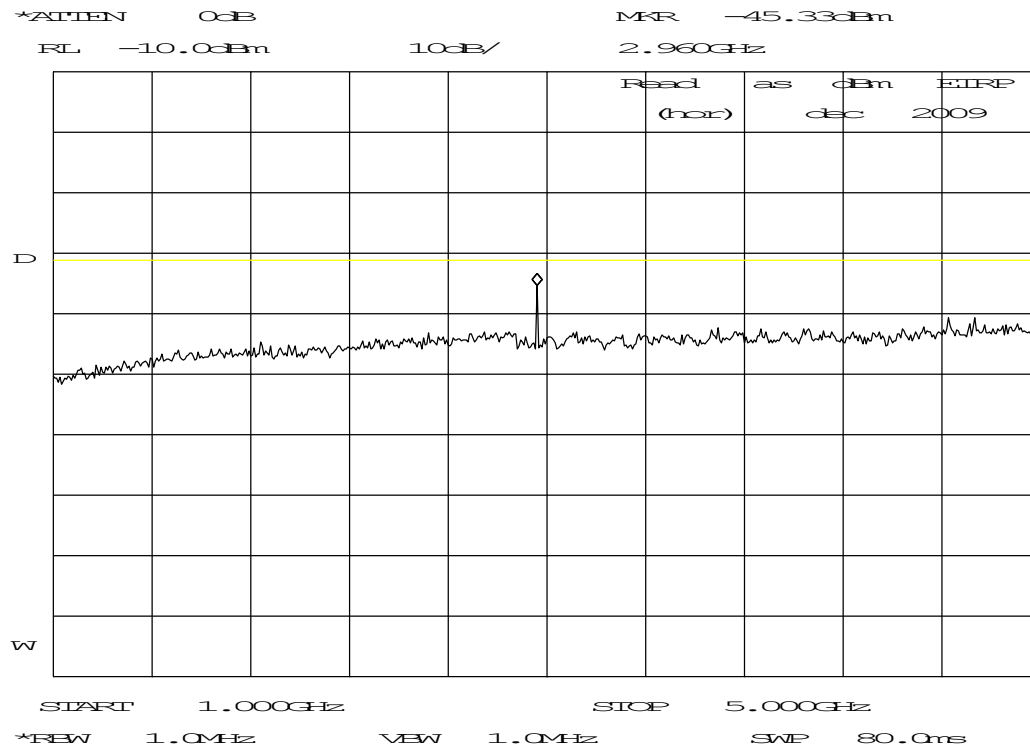


Middle channel: vertical polarization plot (average measurement)

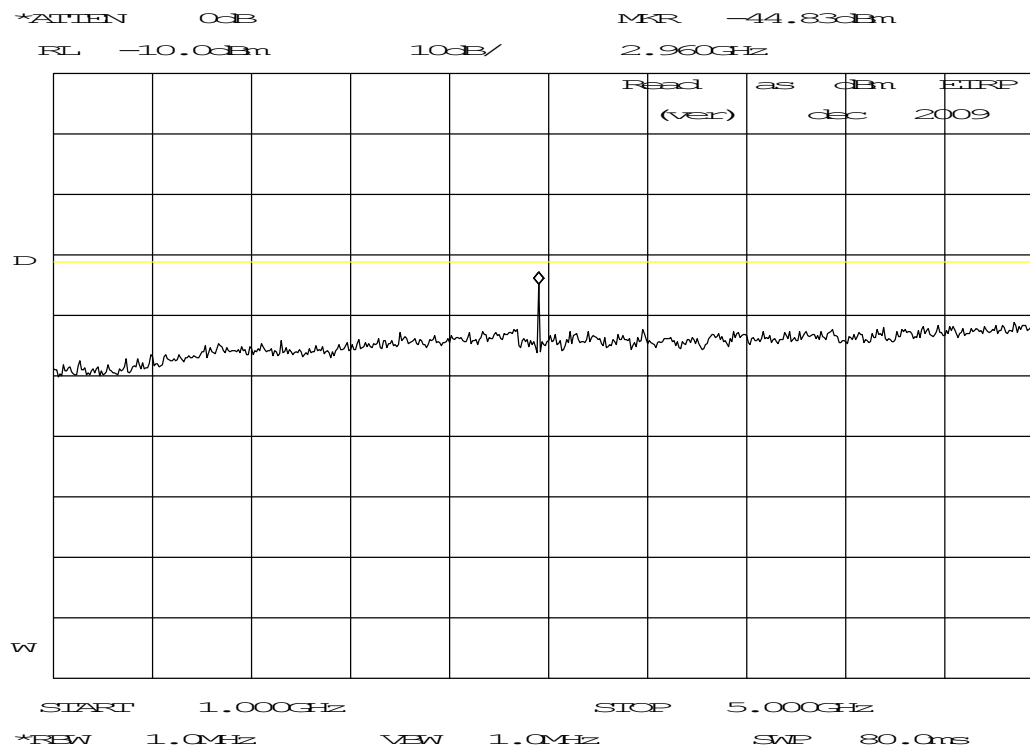


Note: use has been made of a full anechoic room calibrated for EIRP measurements;
 for this purpose the conversion applies: $EIRP_{dBm} = E_{dB\mu V/m} - 95.3 \text{ dB}$

High channel: horizontal polarization plot (peak values)



High channel: vertical polarization plot (peak values)



Note: use has been made of a full anechoic room calibrated for EIRP measurements;
 for this purpose the conversion applies: $EIRP_{dBm} = E_{dB\mu V/m} - 95.3 \text{ dB}$

Measurement uncertainty	+4.5 / -6.1 dB.
-------------------------	-----------------

Limit (@ 3 m distance)	Average: 500 $\mu\text{V/m}$ (54 dB $\mu\text{V/m}$)
	Peak: 5 mV/m (74 dB $\mu\text{V/m}$)

Measurement equipment used (item numbers refer to section “used test equipment”)	1, 2, 3, 7
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Used test equipment module

Item	Description	Manufacturer	Type	ID
1	Preamplifier 1 – 26.5 GHz	HP	8449B	TE 00092
2	Spectrum analyser	HP	8562E	TE 00099
3	Horn antenna	EMCO	3115	TE 00531
4	Active loop antenna	R & S	HFH2-Z2	TE 00746
5	Semi Anechoic Room	Comtest	--	TE 00861
6	Biconilog antenna	Chase	CBL6112A	TE 00967
7	Anechoic chamber	Euroshield	RFB-F-100	TE 01064
8	EMI test receiver	R & S	ESCI	TE 11128

Revision history

REVISION	DATE	REMARKS	REVISED BY
1.0	January 22 2013	Added two sentences to the main module, Introduction : • Telefication is designated by the FCC as an Accredited Test Firm for compliance testing of equipment subject to Certification under Parts 15 & 18. The Registration Number is: 282250. • The Industry Canada number for the Open Area Test Site of Telefication is: 4173A-1.	A. van der Valk