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Mai 18, 2010

## Prüfbericht / Test Report

Nr. / No. 20029-01719-3 (Edition 1)

Applicant: VEGA Grieshaber KG  
Type of equipment: Microwave Sensor  
Type designation: VEGAMIP 60 MP60U.-02  
Order No.: Order of February 5, 2010  
Test standards: FCC Code of Federal Regulations,  
CFR 47, Part 15,  
Sections 15.205, 15.207, 15.215 and 15.245  
  
Industry Canada Radio Standards Specifications  
RSS-Gen Issue 2, Section 7.2.2 and  
RSS-210 Issue 7, Sections 2.2, A7 (Category I Equipment)

**Note:**

The test data of this report is related only to the individual item which has been tested. This report shall not be reproduced except in full extent without the written approval of the testing laboratory.



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## 1 Description of the Equipment Under Test (EUT)

### General data of EUT

Type designation <sup>1</sup> :	VEGAMIP 60 MP60U.-02
Parts <sup>2</sup> :	
Serial number(s):	HW Ver. 1.0.1
Manufacturer:	VEGA Grieshaber KG
Type of equipment:	Microwave Sensor
Version:	As received
FCC ID:	
Additional parts/accessories:	

<sup>1</sup> Type designation of the system if EUT consists of more than one part.

<sup>2</sup> Type designations of the parts of the system, if applicable.



Technical data of EUT	
Application frequency range:	24075 - 24175 MHz
Frequency range:	24.1 GHz
Operating frequency:	24.1 GHz
Type of modulation:	---
Pulse train:	---
Pulse width:	---
Number of RF-channels:	1
Channel spacing:	---
Designation of emissions <sup>3</sup> :	NON
Type of antenna:	Horn antenna
Size/length of antenna:	75 mm
Connection of antenna:	<input checked="" type="checkbox"/> detachable <input type="checkbox"/> not detachable
Type of power supply:	AC supply and DC supply
Specifications for AC power supply:	nominal voltage: 110 V minimum voltage: 20 V maximum voltage: 253 V
Specifications for DC power supply:	nominal frequency: 60 Hz nominal voltage: 24 V minimum voltage: 20 V maximum voltage: 72 V

<sup>3</sup> Also known as "Class of Emission".



## 2 Administrative Data

### Application details

Applicant (full address):	VEGA Grieshaber KG Füllstand- und Druckmeßtechnik  Am Hohenstein 113 77761 Schiltach Deutschland
Contact person:	Mr. Peter Junker
Order number:	Order of February 5, 2010
Receipt of EUT:	February 25, 2010
Date(s) of test:	March – April 2010
Note(s):	

### Report details

Report number:	20029-01719-3
Edition:	1
Issue date:	May 18, 2010



### 3 Identification of the Test Laboratory

#### Details of the Test Laboratory

Company name:	TÜV SÜD SENTON GmbH
Address:	Aeussere Fruehlingstrasse 45 D-94315 Straubing Germany
Laboratory accreditation:	DAR-Registration No. DAT-PL-171/94-03
Contact person:	Mr. Johann Roidt
	Phone: +49 9421 5522-0 Fax: +49 9421 5522-99

## 4 Summary

### Summary of test results

The tested sample complies with the requirements set forth in the

**Code of Federal Regulations CFR 47, Part 15, Sections 15.205, 15.207, 15.215 and 15.245**

of the Federal Communication Commission (FCC) and the

**Radio Standards Specifications  
RSS-Gen Issue 2, Section 7.2.2 and  
RSS-210 Issue 7, Sections 2.2, A7 (Category I Equipment)**

of Industry Canada (IC).

### Personnel involved in this report

Laboratory Manager:



Mr. Johann Roidt

Responsible for testing:



Mr. Martin Steindl

Responsible for test report:

Mr. Martin Steindl



## 5 Operation Mode and Configuration of EUT

### Operation Mode(s)

Transmitting continuously

### Configuration(s) of EUT

The EUT was configured as stand alone device.

### List of ports and cables

<i>Port</i>	<i>Description</i>	<i>Classification<sup>4</sup></i>	<i>Cable type</i>	<i>Cable length</i>
1	AC supply	ac power	Unshielded	1 m

### List of devices connected to EUT

<i>Item</i>	<i>Description</i>	<i>Type Designation</i>	<i>Serial no. or ID</i>	<i>Manufacturer</i>
---				

### List of support devices

<i>Item</i>	<i>Description</i>	<i>Type Designation</i>	<i>Serial no. or ID</i>	<i>Manufacturer</i>
---				

<sup>4</sup> Ports shall be classified as ac power, dc power or signal/control port



## 6 Measurement Procedures

### 6.1 Conducted Output Power

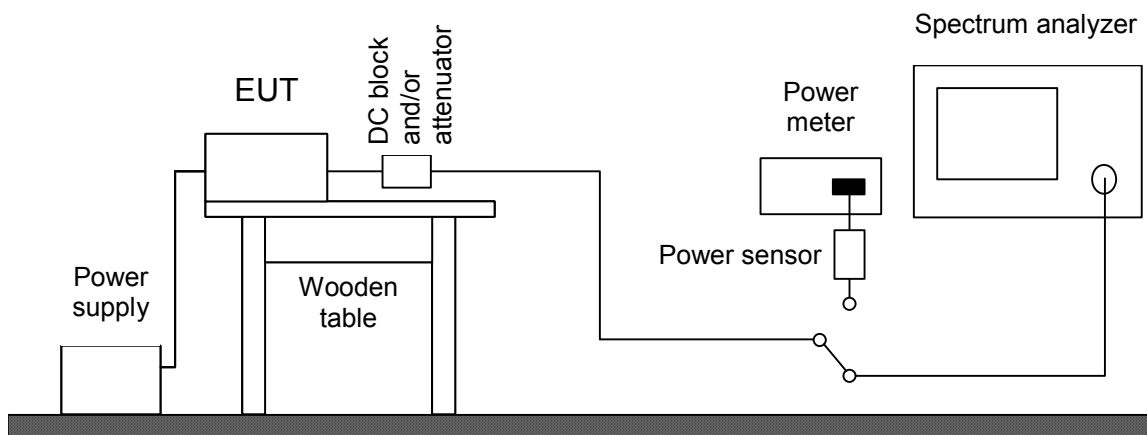
#### Measurement Procedure:

Rules and specifications: CFR 47 Part 2, section 2.1046(a)  
 IC RSS-Gen Issue 2, section 4.8

Guide: CFR 47 Part 2, section 2.1046 / IC RSS-Gen Issue 2

Conducted output power is measured at the RF output terminals (e.g. antenna connector if antenna is detachable) when the transmitter is adjusted in accordance with the tune-up procedure, if applicable. The RF output terminals are connected to a spectrum analyzer and/or a power meter with appropriate sensor. If required, a resistive matching network equal to the impedance specified or employed for the antenna is used as well as dc block and appropriate attenuators (50 Ohms). The electrical characteristics of the radio frequency load attached to the output terminals shall be stated, if applicable.

If a spectrum analyzer is used and no other settings are specified resolution bandwidth shall be selected according to the carrier frequency  $f_c$  and set to 10 kHz ( $150 \text{ kHz} \leq f_c < 30 \text{ MHz}$ ), 100 kHz ( $30 \text{ MHz} \leq f_c < 1 \text{ GHz}$ ) or 1 MHz ( $f_c \geq 1 \text{ GHz}$ ). The video bandwidth shall be at least three times greater than the resolution bandwidth. The settings used have to be indicated within the appropriate test record(s).



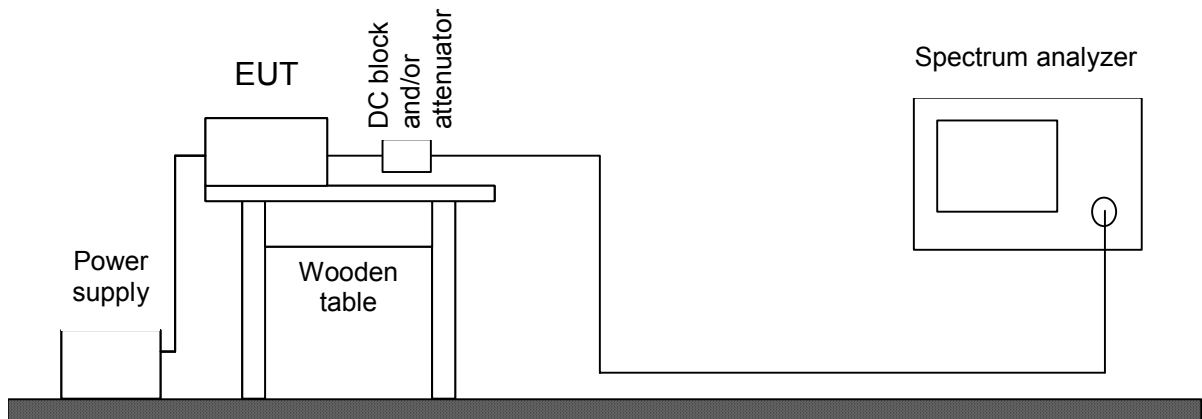


Test instruments used:

Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer
<input checked="" type="checkbox"/> Spectrum analyzer	FSP30	1666	100036	Rohde & Schwarz
<input type="checkbox"/> EMI test receiver	ESPI7	1711	836914/0002	Rohde & Schwarz
<input type="checkbox"/> EMI test receiver	ESMI	1569	839379/013 839587/006	Rohde & Schwarz
<input type="checkbox"/> Power meter	NRVS	1264	836856/015	Rohde & Schwarz
<input type="checkbox"/> Peak power sensor	NRV-Z31	1701	8579604.03	Rohde & Schwarz
<input type="checkbox"/> Power sensor	NRV-Z52	1499	837901/030	Rohde & Schwarz
<input type="checkbox"/> Power sensor	NRV-Z4	1034	863828/015	Rohde & Schwarz
<input checked="" type="checkbox"/> DC-block	7006	1636	A2798	Weinschel
<input type="checkbox"/> Attenuator	4776-10	1638	9412	Narda
<input type="checkbox"/> Attenuator	4776-20	1639	9503	Narda

## 6.2 Bandwidth Measurements

Measurement Procedure:	
Rules and specifications:	CFR 47 Part 2, section 2.202(a) CFR 47 Part 15, section 15.215(c) IC RSS-Gen Issue 2, sections 4.6.1 and 4.6.2 IC RSS-210 Issue 7, section A1.1.3 ANSI C63.4, annex H.6
Guide:	ANSI C63.4 / IC RSS-Gen Issue 2, sections 4.6.1 and 4.6.2
Measurement setup:	<input checked="" type="checkbox"/> Conducted: See below <input type="checkbox"/> Radiated: Radiated Emission in Fully or Semi Anechoic Room (6.5)
<p>If antenna is detachable bandwidth measurements shall be performed at the antenna connector (conducted measurement) when the transmitter is adjusted in accordance with the tune-up procedure, if applicable. The RF output terminals are connected to a spectrum analyzer. If required, a resistive matching network equal to the impedance specified or employed for the antenna is used as well as dc block and appropriate attenuators (50 Ohms). The electrical characteristics of the radio frequency load attached to the output terminals shall be stated, if applicable.</p> <p>If radiated measurements are performed the same test setups and instruments are used as with radiated emission measurements for the appropriate frequency range.</p> <p>The analyzer settings are specified by the test description of the appropriate test record(s).</p>	



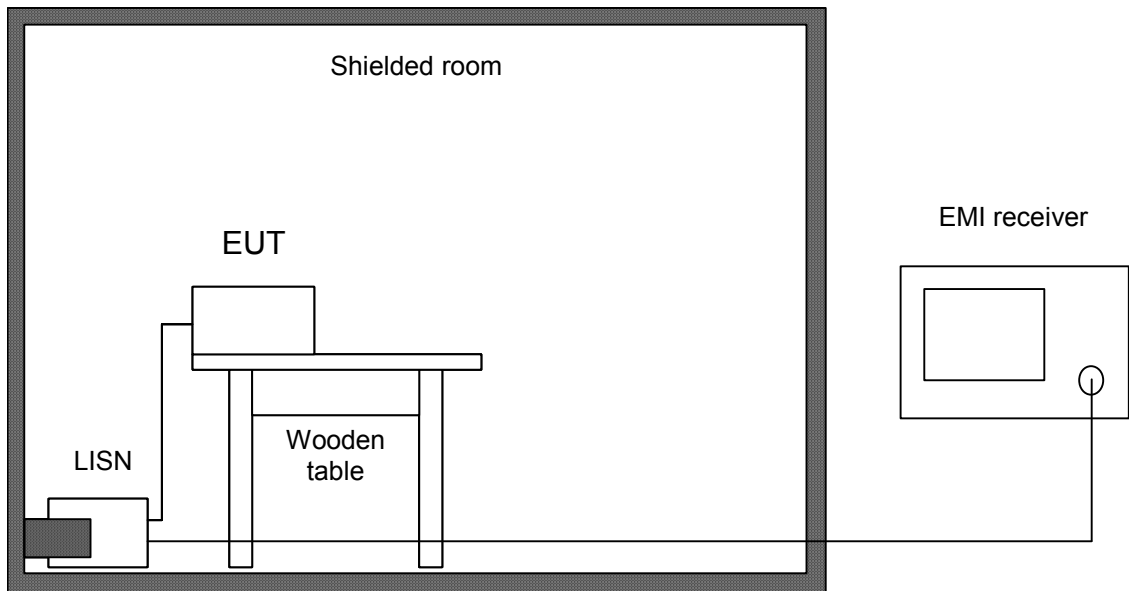


Test instruments used for conducted measurements:

Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer
<input checked="" type="checkbox"/> Spectrum analyzer	FSP30	1666	100036	Rohde & Schwarz
<input type="checkbox"/> EMI test receiver	ESPI7	1711	836914/0002	Rohde & Schwarz
<input type="checkbox"/> EMI test receiver	ESMI	1569	839379/013 839587/006	Rohde & Schwarz
<input type="checkbox"/> Power meter	NRVS	1264	836856/015	Rohde & Schwarz
<input type="checkbox"/> Peak power sensor	NRV-Z31	1701	8579604.03	Rohde & Schwarz
<input type="checkbox"/> Power sensor	NRV-Z52	1499	837901/030	Rohde & Schwarz
<input type="checkbox"/> Power sensor	NRV-Z4	1034	863828/015	Rohde & Schwarz
<input checked="" type="checkbox"/> DC-block	7006	1636	A2798	Weinschel
<input type="checkbox"/> Attenuator	4776-10	1638	9412	Narda
<input type="checkbox"/> Attenuator	4776-20	1639	9503	Narda

### 6.3 Conducted AC Powerline Emission

Measurement Procedure:	
Rules and specifications:	CFR 47 Part 15, section 15.207 IC RSS-Gen Issue 2, section 7.2.2
Guide:	ANSI C63.4 / CISPR 22
<p>Conducted emission tests in the frequency range 150 kHz to 30 MHz are performed using Line Impedance Stabilization Networks (LISNs). To simplify testing with quasi-peak and average detector the following procedure is used:</p> <p>First the whole spectrum of emission caused by the equipment under test (EUT) is recorded with detector set to peak using CISPR bandwidth of 10 kHz. After that all emission levels having less margin than 10 dB to or exceeding the average limit are retested with detector set to quasi-peak.</p> <p>If average limit is kept with quasi-peak levels no additional scan with average detector is necessary. In cases of emission levels between quasi-peak and average limit an additional scan with detector set to average is performed.</p> <p>According to ANSI C63.4, section 13.1.3.1, testing of intentional radiators with detachable antenna shall be performed using a suitable dummy load connected to the antenna output terminals. Otherwise, the tests shall be made with the antenna connected and, if adjustable, fully extended.</p> <p>Testing with dummy load may be necessary to distinguish (unintentional) conducted emissions on the supply lines from (intentional) emissions radiated by the antenna and coupling directly to supply lines and/or LISN. Usage of dummy load has to be stated in the appropriate test record(s) and notes should be added to clarify the test setup.</p>	





Test instruments used:

Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer
<input checked="" type="checkbox"/> Test receiver	ESHS 10	1028	860043/016	Rohde & Schwarz
<input checked="" type="checkbox"/> V-network	ESH 3-Z5	1059	894785/005	Rohde & Schwarz
<input type="checkbox"/> V-network	ESH 3-Z5	1218	830952/025	Rohde & Schwarz
<input type="checkbox"/> Artificial mains network	ESH 2-Z5	1536	842966/004	Rohde & Schwarz
<input type="checkbox"/> Shielded room	No. 1	1451	---	Albatross
<input checked="" type="checkbox"/> Shielded room	No. 4	1454	3FD 100 544	Euroshield

## 6.4 Radiated Emission Measurement 9 kHz to 30 MHz

### Measurement Procedure:

Rules and specifications: CFR 47 Part 15, sections 15.215(b) and 15.245(b)(3)  
 IC RSS-210 Issue 7, section A7.3

Guide: ANSI C63.4

Radiated emission in the frequency range 9 kHz to 30 MHz is measured using an active loop antenna. First the whole spectrum of emission caused by the equipment is recorded at a distance of 3 meters in a fully or semi anechoic room with the detector of the spectrum analyzer or EMI receiver set to peak. This configuration is also used for recording the spectrum of intentional radiators.

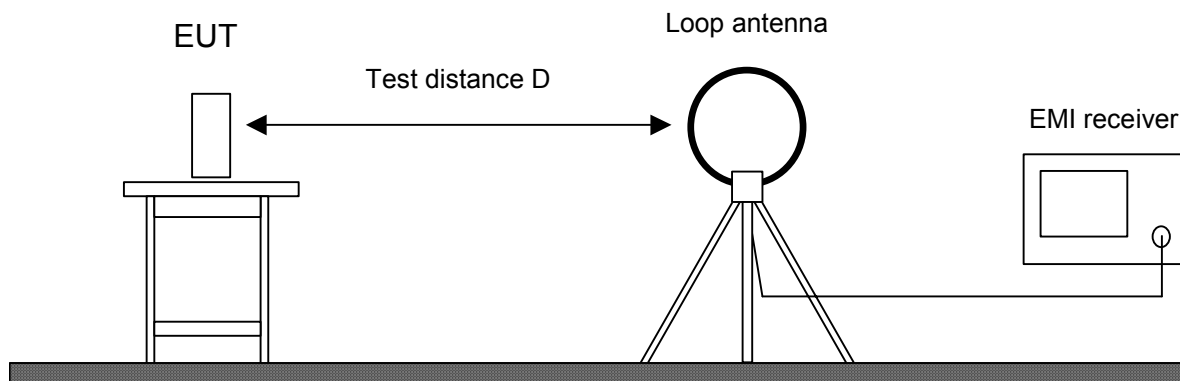
Hand-held or body-worn devices are rotated through three orthogonal axes to determine which attitude and configuration produces the highest emission relative to the limit and therefore shall be used for final testing.

EUT is rotated all around to find the maximum levels of emissions. Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.

If worst case emission of the EUT cannot be recorded with EUT in standard position and loop antenna in vertical polarization the EUT (or the radiating part of the EUT) is rotated by 90 degrees instead of changing the loop antenna to horizontal polarization. This procedure is selected to minimize the influence of the environment (e.g. effects caused by the floor especially with longer distances).

Final measurement is performed at a test distance D of 30 meters using an open field test site. In case the regulation requires testing at other distances, the result is extrapolated by either making measurements at an additional distance D of 10 meters to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). In cases of very low emissions measurements are performed at shorter distances and results are extrapolated to the required distance. The provisions of CFR 47 Part 15 sections 15.31(d) and (f)(2) apply. According to CFR 47 Part 15 section 15.209(d) final measurement is performed with detector function set to quasi-peak except for the frequency bands 9 to 90 kHz and 110 to 490 kHz where, for non-pulsed operation, average detector is employed.

If the radiated emission limits are expressed in terms of the average value of the emission there also is a peak limit corresponding to 20 dB above the maximum permitted average limit. Additionally, if pulsed operation is employed, the average field strength is determined by averaging over one complete pulse train, including blanking intervals, as specified in CFR 47 Part 15 section 15.35(c). If the pulse train exceeds 0.1 second that 0.1 second interval during which the value of the emission is at its maximum is selected for calculation. The pulse train correction is added to the peak value of the emission to get the average value.





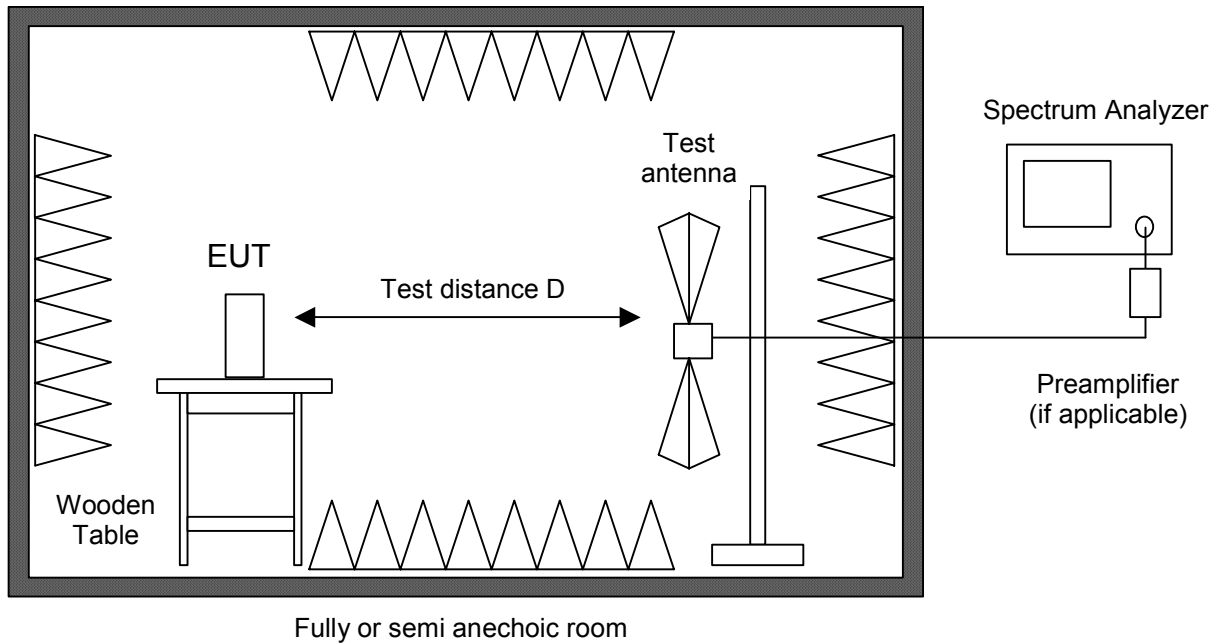
Test instruments used:

Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer
<input checked="" type="checkbox"/> Spectrum analyzer	FSP30	1666	100036	Rohde & Schwarz
<input type="checkbox"/> EMI test receiver	ESMI	1569	839379/013 839587/006	Rohde & Schwarz
<input type="checkbox"/> Test receiver	ESHS 10	1028	860043/016	Rohde & Schwarz
<input type="checkbox"/> Preamplifier	Cabin no. 2 CPA9231A	1651	3393	Schaffner
<input checked="" type="checkbox"/> Loop antenna	HFH2-Z2	1016	882964/1	Rohde & Schwarz
<input checked="" type="checkbox"/> Fully anechoic room	No. 2	1452	---	Albatross
<input type="checkbox"/> Semi anechoic room	No. 3	1453	---	Siemens
<input type="checkbox"/> Semi anechoic room	No. 8	2057	---	Albatross



## 6.5 Radiated Emission in Fully or Semi Anechoic Room

Measurement Procedure:	
Rules and specifications:	CFR 47 Part 15, sections 15.215(b) and 15.245 IC RSS-210 Issue 7, section A7
Guide:	ANSI C63.4
<p>Radiated emission in fully or semi anechoic room is measured in the frequency range from 30 MHz to the maximum frequency as specified in CFR 47 Part 15 section 15.33.</p> <p>Measurements are made in both the horizontal and vertical planes of polarization using a spectrum analyzer with the detector function set to peak and resolution as well as video bandwidth set to 100 kHz (below 1 GHz) or 1 MHz (above 1 GHz).</p> <p>Testing up to 1 GHz is performed with a linear polarized logarithmic periodic antenna combined with a 4:1 broadband dipole ("Trilog broadband antenna"). For testing above 1 GHz horn antennas are used.</p> <p>All tests below 8.2 GHz are performed at a test distance D of 3 meters. For higher frequencies the test distance may be reduced (e.g. to 1 meter) due to the sensitivity of the measuring instrument(s) and the test results are calculated according to CFR 47 Part 15 section 15.31(f)(1) using an extrapolation factor of 20 dB/decade. If required, preamplifiers are used for the whole frequency range. Special care is taken to avoid overload, using appropriate attenuators and filters, if necessary.</p> <p>If the radiated emission limits are expressed in terms of the average value of the emission there also is a peak limit corresponding to 20 dB above the maximum permitted average limit. Additionally, if pulsed operation is employed, the average field strength is determined by averaging over one complete pulse train, including blanking intervals, as specified in CFR 47 Part 15 section 15.35(c). If the pulse train exceeds 0.1 second that 0.1 second interval during which the value of the emission is at its maximum is selected for calculation. The pulse train correction is added to the peak value of the emission to get the average value.</p> <p>Hand-held or body-worn devices are rotated through three orthogonal axes to determine which attitude and configuration produces the highest emission relative to the limit and therefore shall be used for final testing.</p> <p>During testing the EUT is rotated all around to find the maximum levels of emissions. Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.</p> <p>For final testing below 1 GHz a semi anechoic room complying with the NSA requirements of ANSI C63.4 for alternative test sites is used (see 6.6). If prescans are recorded in fully anechoic room they are indicated appropriately.</p>	

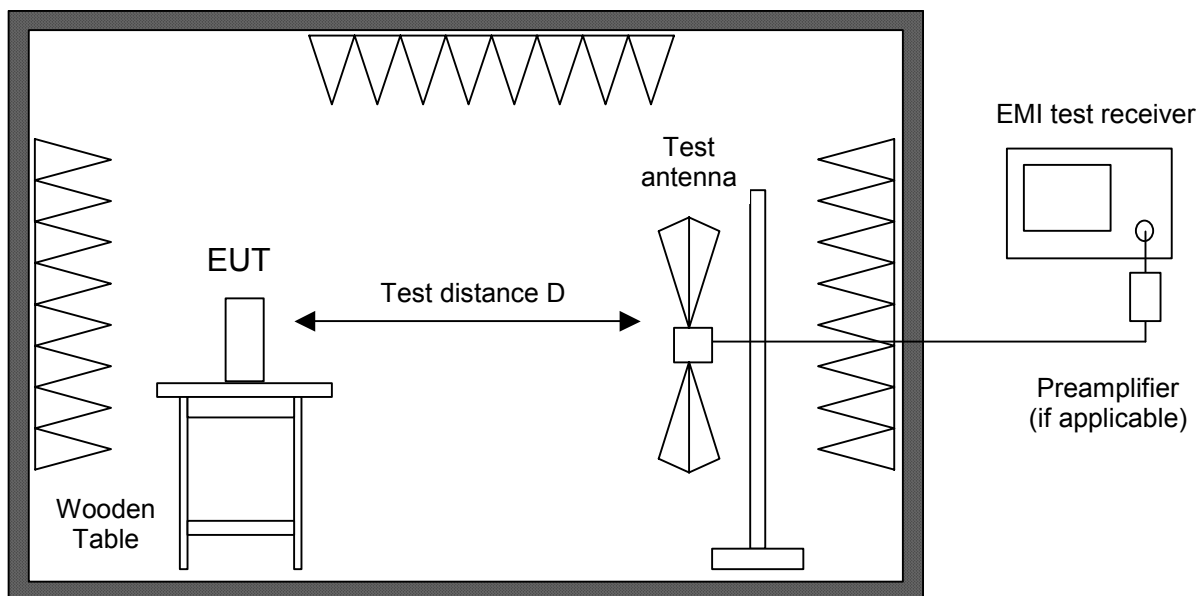


Test instruments used:

Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer
<input checked="" type="checkbox"/> Spectrum analyzer	FSP30	1666	100036	Rohde & Schwarz
<input type="checkbox"/> EMI test receiver	Cabin no. 3 ESPI7	2010	101018	Rohde & Schwarz
<input type="checkbox"/> EMI test receiver	ESU8	2044	100232	Rohde & Schwarz
<input checked="" type="checkbox"/> EMI test receiver	ESMI	1569	839379/013 839587/006	Rohde & Schwarz
<input checked="" type="checkbox"/> Pre-amplifier	Cabin no. 2 CPA9231A	1651	3393	Schaffner
<input type="checkbox"/> Pre-amplifier	R14601	1142	13120026	Advantest
<input type="checkbox"/> Pre-amplifier (1 - 8 GHz)	AFS3-00100800-32-LN	1684	847743	Miteq
<input checked="" type="checkbox"/> Pre-amplifier (0.5 - 8 GHz)	AMF-4D-005080-25-13P	1685	860149	Miteq
<input checked="" type="checkbox"/> Pre-amplifier (8 - 18 GHz)	ACO/180-3530	1484	32641	CTT
<input checked="" type="checkbox"/> External Mixer	WM782A	1576	845881/005	Tektronix
<input checked="" type="checkbox"/> Harmonic Mixer Accessories	FS-Z30	1577	624413/003	Rohde & Schwarz
<input checked="" type="checkbox"/> Trilog antenna	Cabin no. 2 VULB 9163	2058	9163-408	Schwarzbeck
<input checked="" type="checkbox"/> Horn antenna	3115	1516	9508-4553	EMCO
<input type="checkbox"/> Horn antenna	3160-03	1010	9112-1003	EMCO
<input type="checkbox"/> Horn antenna	3160-04	1011	9112-1001	EMCO
<input type="checkbox"/> Horn antenna	3160-05	1012	9112-1001	EMCO
<input checked="" type="checkbox"/> Horn antenna	3160-06	1013	9112-1001	EMCO
<input checked="" type="checkbox"/> Horn antenna	3160-07	1014	9112-1008	EMCO
<input checked="" type="checkbox"/> Horn antenna	3160-08	1015	9112-1002	EMCO
<input checked="" type="checkbox"/> Horn antenna	3160-09	1265	9403-1025	EMCO
<input checked="" type="checkbox"/> Horn antenna	3160-10	1575	399185	EMCO
<input type="checkbox"/> Fully anechoic room	No. 2	1452	---	Albatross
<input type="checkbox"/> Semi anechoic room	No. 3	1453	---	Siemens
<input type="checkbox"/> Semi anechoic room	No. 8	2057	---	Albatross

## 6.6 Radiated Emission at Alternative Test Site

Measurement Procedure:	
Rules and specifications:	CFR 47 Part 15, sections 15.215(b) and 15.245 IC RSS-210 Issue 7, section A7
Guide:	ANSI C63.4
<p>Radiated emission in the frequency range 30 MHz to 1 GHz is measured within a semi-anechoic room with groundplane complying with the NSA requirements of ANSI C63.4 for alternative test sites. A linear polarized logarithmic periodic antenna combined with a 4:1 broadband dipole ("Trilog broadband antenna") is used. The measurement bandwidth of the test receiver is set to 120 kHz with quasi-peak detector selected.</p> <p>If the radiated emission limits are expressed in terms of the average value of the emission there also is a peak limit corresponding to 20 dB above the maximum permitted average limit. Additionally, if pulsed operation is employed, the average field strength is determined by averaging over one complete pulse train, including blanking intervals, as specified in CFR 47 Part 15 section 15.35(c). If the pulse train exceeds 0.1 second that 0.1 second interval during which the value of the emission is at its maximum is selected for calculation. The pulse train correction is added to the peak value of the emission to get the average value.</p> <p>Hand-held or body-worn devices are tested in the position producing the highest emission relative to the limit as verified by prescans in fully anechoic room.</p> <p>If no prescan in a fully anechoic room is used first a peak scan is performed in four positions to get the whole spectrum of emission caused by EUT with the measuring antenna raised and lowered from 1 to 4 m to find table position, antenna height and antenna polarization for the maximum emission levels.</p> <p>Data reduction is applied to these results to select those levels having less margin than 10 dB to or exceeding the limit using subranges and limited number of maximums. Further maximization is following.</p> <p>With detector of the test receiver set to quasi-peak final measurements are performed immediately after frequency zoom (for drifting disturbances) and maximum adjustment.</p> <p>Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.</p> <p>In cases where prescans in a fully anechoic room are taken (e. g. if EUT is operating for a short time only or battery is discharged quickly) final measurements with quasi-peak detector are performed manually at frequencies indicated by prescan with EUT rotating all around and receiving antenna raising and lowering within 1 meter to 4 meters to find the maximum levels of emission.</p> <p>Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.</p> <p>For measuring emissions of intentional radiators and receivers a test distance D of 3 meters is selected. Testing of unintentional radiators is performed at a distance of 10 meters. If limits specified for 3 meters shall be used for measurements performed at 10 meters distance the limits are calculated according to CFR 47 Part 15 section 15.31(d) and (f)(1) using an inverse linear-distance extrapolation factor of 20 dB/decade.</p>	



Alternate test site (semi anechoic room)

Test instruments used:

Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer
<input checked="" type="checkbox"/> EMI test receiver	ESU8	2044	100232	Rohde & Schwarz
<input checked="" type="checkbox"/> Trilog antenna	Cabin no. 8 VULB 9163	1802	9163-214	Schwarzbeck
<input checked="" type="checkbox"/> Semi anechoic room	No. 8	2057	---	Albatross



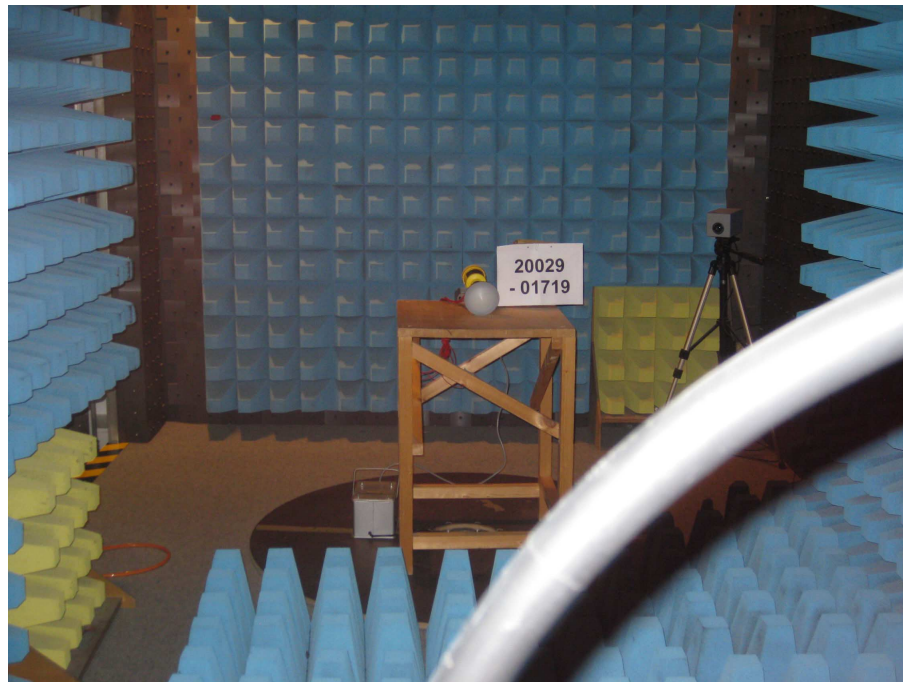
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## 7 Photographs Taken During Testing

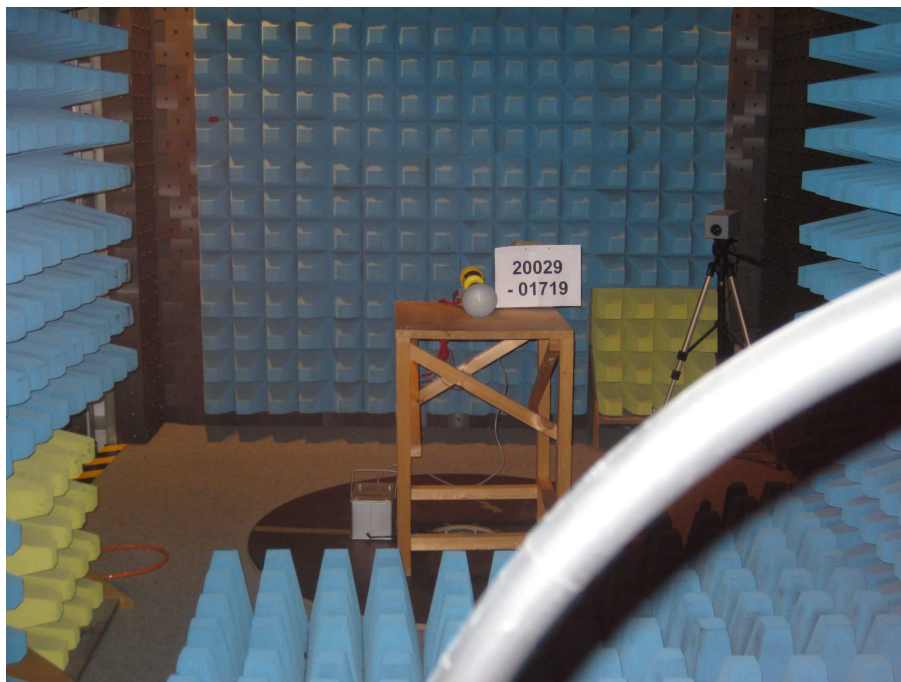
## Test setup for conducted AC powerline emission measurement



## Test setup for radiated emission measurement 9 kHz – 30 MHz



### Test setup for radiated emission measurement (fully anechoic room)





### Test setup for radiated emission measurement (alternate test site)



**Test setup for radiated emission measurement  
(alternate test site) - continued -**





## 8 Test Results

FCC CFR 47 Parts 2 and 15			
Section(s)	Test	Page	Result
2.1046(a)	Conducted output power	29	Recorded
2.202(a)	Occupied bandwidth	30	Recorded
15.215(c)	Bandwidth of the emission	34	Test passed
2.201, 2.202	Class of emission	36	Calculated
15.35(c)	Pulse train measurement for pulsed operation	---	Not applicable
15.205(a)	Restricted bands of operation	--- <sup>5</sup>	Test passed
15.207	Conducted AC powerline emission 150 kHz to 30 MHz	37	Test passed
15.205(b) 15.245	Radiated emission 9 kHz to 30 MHz	39	Test passed
15.205(b) 15.215(b) 15.245	Radiated emission 30 MHz to 100 GHz	40	Test passed

<sup>5</sup> See "Radiated emissions" for details



<b>IC RSS-Gen Issue 2</b>			
<i>Section(s)</i>	<i>Test</i>	<i>Page</i>	<i>Result</i>
4.8	Transmitter output power (conducted)	29	Recorded
4.6.1	Occupied Bandwidth	30	Recorded
3.2(h), 8	Designation of emissions	36	Calculated
4.5	Pulsed operation	---	Not applicable
7.2.2	Transmitter AC power lines conducted emissions 150 kHz to 30 MHz	37	Test passed
5.5	Exposure of Humans to RF Fields	42	Exempted from SAR and RF evaluation

<b>IC RSS-210 Issue 7</b>			
<i>Section(s)</i>	<i>Test</i>	<i>Page</i>	<i>Result</i>
2.2(a)	Restricted bands and unwanted emission frequencies	--- <sup>6</sup>	Test passed
2.2(b)(c), 2.6 A7.3	Unwanted emissions 9 kHz to 30 MHz	39	Test passed
2.2(b)(c), 2.6 A7	Unwanted emissions 30 MHz to 100 GHz	40	Test passed

<sup>6</sup> See "Unwanted emissions" for details

## 8.1 Conducted Output Power

Rules and specifications:	CFR 47 Part 2, section 2.1046(a) IC RSS-Gen Issue 2, section 4.8
Guide:	CFR 47 Part 2, section 2.1046 / IC RSS-Gen Issue 2
Description:	Conducted output power shall be measured at the RF output terminals (e.g. antenna connector if antenna is detachable) when the transmitter is adjusted in accordance with the tune-up procedure, if applicable. The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.
Measurement procedure:	Conducted Output Power (6.1)

Comment:	
Date of test:	April 29, 2010
Test site:	Unshielded room

Antenna gain: 22 dBi							
Mode	Frequency (GHz)	Power Type	Reading (dBm)	Correction (dB)	Output Power (dBm)	Limit (dBm)	Margin (dB)
CW	24.1	Peak	-10.4	0.0	-10.4		

- Note 1:* If applicable, PEP (peak envelope power) and RMS values are measured using a power meter with appropriate sensor.
- Note 2:* If applicable, peak or average values are measured using a spectrum analyzer with resolution and video bandwidth set to: RBW = 10 MHz VBW = 10 MHz
- Note 3:* If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power limit is reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

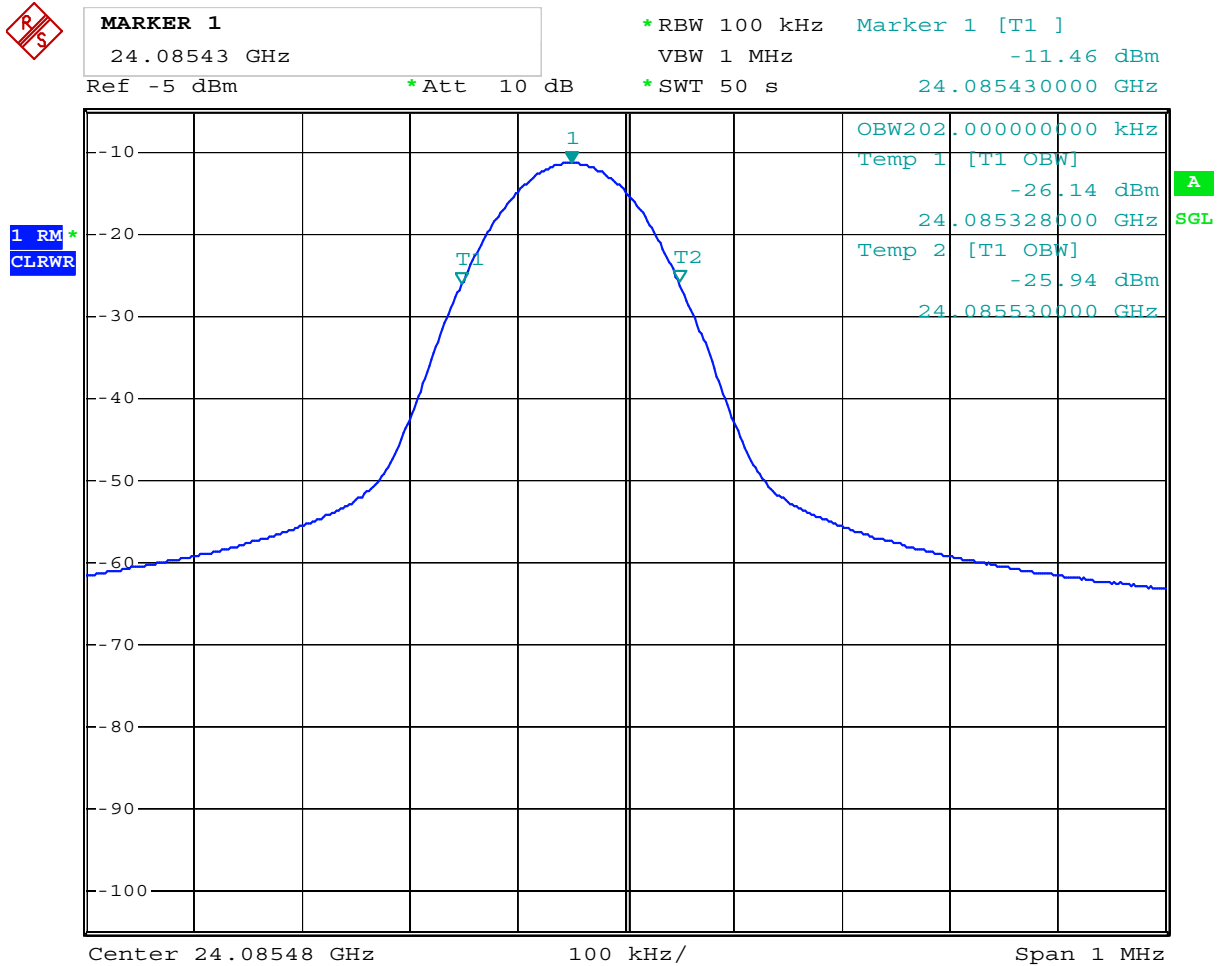


## 8.2 Occupied Bandwidth

Rules and specifications:	CFR 47 Part 2, section 2.202(a) ANSI C63.4, annex H.6	
Guide:	ANSI C63.4	
Description:	The occupied bandwidth according to CFR 47 Part 2, section 2.202(a), is measured as the 99% emission bandwidth, i.e. below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5% of the total mean power radiated by a given emission.	
	The occupied bandwidth according to ANSI C63.4, annex H.6; is measured as the frequency range defined by the points that are 26 dB down relative to the maximum level of the modulated carrier.	
	The resolution bandwidth of the spectrum analyzer shall be set to a value greater than 5.0% of the allowed bandwidth. If no bandwidth specifications are given, the following guidelines are used:	
	Fundamental frequency	Minimum resolution bandwidth
	9 kHz to 30 MHz	1 kHz
	30 MHz to 1000 MHz	10 kHz
	1000 MHz to 40 GHz	100 kHz
	The video bandwidth shall be at least three times greater than the resolution bandwidth.	
Measurement procedure:	Bandwidth Measurements (6.2)	

Comment:	
Date of test:	March 22, 2010
Test site:	Fully anechoic room, cabin no. 2

**Occupied Bandwidth (99 %):**



Date: 22.MAR.2010 16:45:05

Occupied Bandwidth (99 %): **202 kHz**



## Occupied Bandwidth (continued)

Rules and specifications:	IC RSS-Gen Issue 2, section 4.6.1
Guide:	IC RSS-Gen Issue 2, section 4.6.1
Description:	<p>If not specified in the applicable RSS the occupied bandwidth is measured as the 99% emission bandwidth.</p> <p>The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth.</p> <p>The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is also recorded. The span between the two recorded frequencies is the occupied bandwidth.</p>
Measurement procedure:	Bandwidth Measurements (6.2)

Comment:	
Date of test:	March 22, 2010
Test site:	Fully anechoic room, cabin no. 2



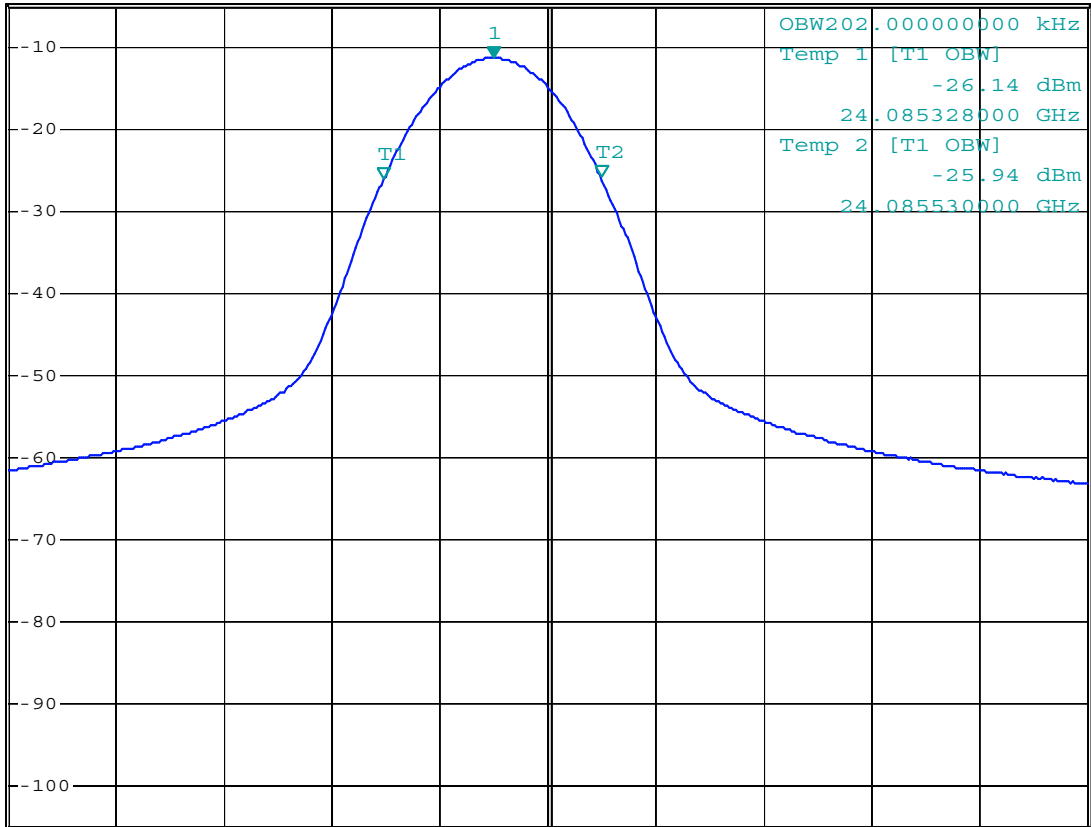
**Occupied Bandwidth (99 %):**



**MARKER 1**  
 24.08543 GHz  
 Ref -5 dBm \*Att 10 dB

\*RBW 100 kHz Marker 1 [T1 ]  
 VBW 1 MHz -11.46 dBm  
 \*SWT 50 s 24.085430000 GHz

1 RM\*  
 CLRWR



Center 24.08548 GHz 100 kHz/ Span 1 MHz

Date: 22.MAR.2010 16:45:05

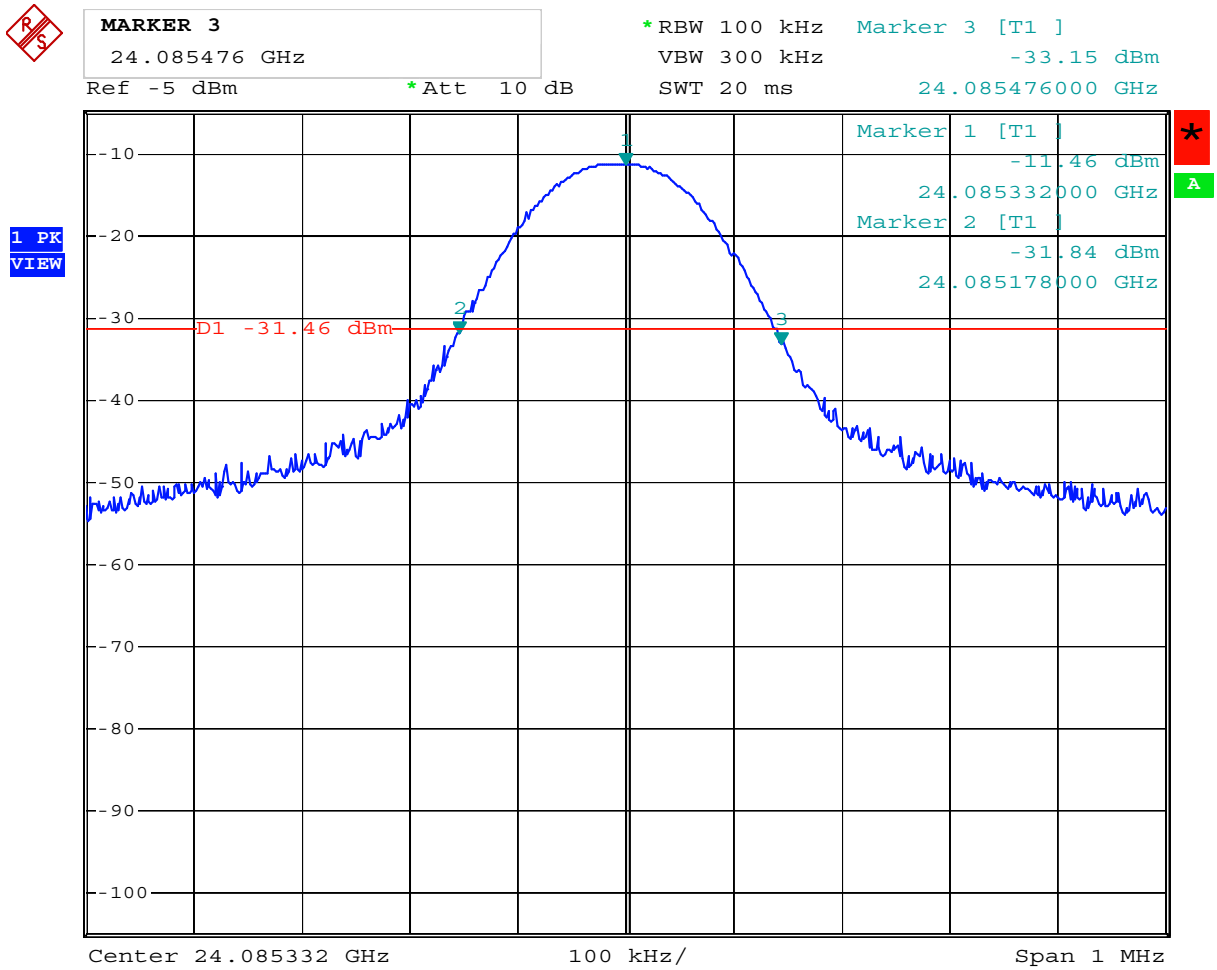
Occupied Bandwidth (99 %): **202 kHz**



### 8.3 Bandwidth of the Emission

Rules and specifications:	CFR 47 Part 15, section 15.215(c)	
Guide:	ANSI C63.4	
Description:	<p>The 20 dB bandwidth of the emission is measured as the frequency range defined by the points that are 20 dB down relative to the maximum level of the modulated carrier.</p> <p>For intentional radiators operating under the alternative provisions to the general emission limits the requirement to contain the 20 dB bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.</p> <p>The resolution bandwidth of the spectrum analyzer shall be set to a value greater than 5.0% of the allowed bandwidth. If no bandwidth specifications are given, the following guidelines are used:</p>	
	Fundamental frequency	Minimum resolution bandwidth
	9 kHz to 30 MHz	1 kHz
	30 MHz to 1000 MHz	10 kHz
	1000 MHz to 40 GHz	100 kHz
	The video bandwidth shall be at least three times greater than the resolution bandwidth.	
Measurement procedure:	Bandwidth Measurements (6.2)	

Comment:	
Date of test:	March 22, 2010
Test site:	Fully anechoic room, cabin no. 2



Date: 22.MAR.2010 16:46:24

Permitted frequency band:	<b>24075 - 24175 MHz</b>	
20 dB bandwidth:	<b>298 kHz</b>	
Carrier frequency stability:	<input type="checkbox"/> specified	<input checked="" type="checkbox"/> not specified
Maximum frequency tolerances:		
Bandwidth of the emission:	<b>298 kHz</b>	<b>within permitted frequency band<sup>7</sup>:</b> <input checked="" type="checkbox"/> yes <input type="checkbox"/> no

Test Result:	Test passed
--------------	-------------

<sup>7</sup> If a frequency stability is not specified, it is recommended that the fundamental emission is kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.



## 8.4 Designation of Emissions

Rules and specifications:	CFR 47 Part 2, sections 2.201 and 2.202 IC RSS-Gen Issue 2, sections 3.2(h) and 8
Guide:	ANSI C63.4 / TRC-43

Type of modulation:	Continuous Wave Emission
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Designation of Emissions:	<b>NON</b>
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## 8.5 Conducted Powerline Emission Measurement 150 kHz to 30 MHz

Rules and specifications:	CFR 47 Part 15, section 15.207 IC RSS-Gen Issue 2, section 7.2.2		
Guide:	ANSI C63.4 / CISPR 22		
Limit:	Frequency of Emission (MHz)	Conducted Limit (dBµV)	
		Quasi-peak	Average
	0.15 - 0.5	66 to 56	56 to 46
	0.5 - 5	56	46
	5 - 30	60	50
Measurement procedure:	Conducted AC Powerline Emission (6.3)		

Comment:	
Date of test:	March 10, 2010
Test site:	Shielded room, cabin no. 4

Test Result:	Test passed
--------------	-------------

Tested on:	L1
------------	----

Frequency (MHz)	Detector	Reading Value (dBµV)	Correction Factor (dB)	Final Value (dBµV)	Limit (dBµV)	Margin (dB)
0.155	Quasi-Peak	48.4	0.0	48.4	65.7	17.3
0.200	Quasi-Peak	42.6	0.0	42.6	63.6	21.0
0.265	Quasi-Peak	40.9	0.0	40.9	61.3	20.4
0.310	Quasi-Peak	45.6	0.0	45.6	60.0	<b>14.4</b>
0.360	Quasi-Peak	39.8	0.0	39.8	58.7	18.9
0.505	Quasi-Peak	35.8	0.0	35.8	56.0	20.2
0.605	Average	26.0	0.0	26.0	46.0	20.0
0.650	Quasi-Peak	34.6	0.0	34.6	56.0	21.4
0.755	Quasi-Peak	33.2	0.0	33.2	56.0	22.8
0.820	Quasi-Peak	32.6	0.0	32.6	56.0	23.4
1.020	Quasi-Peak	30.5	0.0	30.5	56.0	25.5



Tested on: N

Frequency (MHz)	Detector	Reading Value (dBµV)	Correction Factor (dB)	Final Value (dBµV)	Limit (dBµV)	Margin (dB)
0.150	Quasi-Peak	49.4	0.0	49.4	66.0	16.6
0.205	Quasi-Peak	43.0	0.0	43.0	63.4	20.4
0.250	Quasi-Peak	42.6	0.0	42.6	61.8	19.2
0.330	Quasi-Peak	46.5	0.0	46.5	59.5	13.0
0.355	Quasi-Peak	40.6	0.0	40.6	58.8	18.2
0.485	Quasi-Peak	39.6	0.0	39.6	56.3	16.7
0.605	Quasi-Peak	39.4	0.0	39.4	56.0	16.6
0.795	Quasi-Peak	36.7	0.0	36.7	56.0	19.3
0.975	Quasi-Peak	34.6	0.0	34.6	56.0	21.4
1.130	Quasi-Peak	33.3	0.0	33.3	56.0	22.7
1.305	Quasi-Peak	31.4	0.0	31.4	56.0	24.6

**Sample calculation of final values:**

$$\text{Final Value (dBµV)} = \text{Reading Value (dBµV)} + \text{Correction Factor (dB)}$$

## 8.6 Radiated Emission Measurement 9 kHz to 30 MHz

Rules and specifications:	CFR 47 Part 15, sections 15.215(b) and 15.245(b)(3) IC RSS-210 Issue 7, section A7.3			
Guide:	ANSI C63.4			
Limit:	Frequency of Emission (MHz)	Field Strength ( $\mu\text{V}/\text{m}$ )	Field Strength ( $\text{dB}\mu\text{V}/\text{m}$ )	Measurement Distance d (meters)
	0.009 - 0.490	2400/F(kHz)	67.6 - 20 · log(F(kHz))	300
	0.490 - 1.705	24000/F(kHz)	87.6 - 20 · log(F(kHz))	30
	1.705 - 30.000	30	29.5	30
	Additionally, the level of any unwanted emissions shall not exceed the level of the fundamental emission.			
Measurement procedure:	Radiated Emission Measurement 9 kHz to 30 MHz (6.4)			

Comment:	
Date of test:	March 4, 2010
Test site:	Open field test site

Test Result:	Test passed
--------------	-------------

No emissions above noise level detected.

### Sample calculation of final values:

$$\text{Extrapolation Factor (dB)} = (\text{Log}(d) - \text{Log}(d_1)) \cdot \text{Extrapolation Factor (dB/decade)}$$

$$\text{Final Value (dB}\mu\text{V}/\text{m)} = \text{Reading Value } d_1 \text{ (dB}\mu\text{V)} + \text{Correction Factor (dB/m)} \\ + \text{Extrapolation Factor (dB)} + \text{Pulse Train Correction (dB)}$$

Note: Extrapolation factor (dB) and final value (dB $\mu\text{V}/\text{m}$ ) are relating to distance d.

## 8.7 Radiated Emission Measurement 30 MHz to 100 GHz

Rules and specifications:	CFR 47 Part 15, sections 15.215(b) and 15.245 IC RSS-210 Issue 7, section A7				
Guide:	ANSI C63.4				
Limit according to 15.245:	Fundamental Frequency (MHz)	Field Strength of Fundamental (mV/m) (dBµV/m)		Field Strength of Harmonics (mV/m) (dBµV/m)	
	902 – 928	500	114.0	1.6	64.1
	2435 – 2465	500	114.0	1.6	64.1
	5785 – 5815	500	114.0	1.6	64.1
	10500 – 10550	2500	128.0	25	88.0
	24075 – 24175	2500	128.0	25	88.0
<p>Regardless of the limits shown in the above table, harmonic emission in the restricted bands below 17.7 GHz, as specified in §15.205, shall not exceed the field strength limits shown in §15.209. Harmonic emission in the restricted bands at and above 17.7 GHz shall not exceed the following field strength limits:</p> <p>(i) For the second and third harmonics of field disturbance sensors operating in the 24075 – 24175 MHz band and for other field disturbance sensors designed for use only within a building or to open building doors, 25.0 mV/m.</p> <p>(ii) For all other field disturbance sensors, 7.5 mV/m.</p> <p>(iii) Field disturbance sensors designed to be used in motor vehicles or aircraft must include features to prevent continuous operation unless their emissions in the restricted bands, other than the second and third harmonics from devices operating in the 24075 – 24175 MHz band, fully comply with the limits given in §15.209. Continuous operation of field disturbance sensors designed to be used in farm equipment, vehicles such as fork lifts that are intended primarily for use indoors or for very specialized operations, or railroad locomotives, railroad cars and other equipment which travels on fixed tracks is permitted. A field disturbance sensor will be considered not to be operating in a continuous mode if its operation is limited to specific activities of limited duration (e.g. putting a vehicle into reverse gear, activating a turn signal etc.)</p>					
Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general limits in §15.209, whichever is the lesser attenuation.					
The emission limits shown above are based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emission apply.					





Limit according to 15.209:	Frequency of Emission	Field Strength	
	(MHz)	( $\mu\text{V/m}$ )	( $\text{dB}\mu\text{V/m}$ )
	30 – 88	100	40.0
	88 – 216	150	43.5
	216 – 960	200	46.0
	above 960	500	54.0
	Additionally, the level of any unwanted emissions shall not exceed the level of the fundamental emission.		
Measurement procedures:	Radiated Emission in Fully or Semi Anechoic Room (6.5) Radiated Emission at Alternative Test Site (6.6)		

Comment:	Final measurements in the frequency range from 30 MHz to 1 GHz were taken with type R of the EUT which has the same RF part and showed maximum emissions at prescans.		
Date of test:	March 2, 2010; March 4, 2010; March 11, 2010; April 8, 2010		
Test site:	Frequencies $\leq$ 1 GHz: Open field test site Frequencies $>$ 1 GHz: Fully anechoic room, cabin no. 2 Frequencies $>$ 40 GHz: External test side		
Test distance:	Frequencies $\leq$ 8.2 GHz:	3 meters	
	Frequencies $>$ 8.2 GHz to $\leq$ 26.5 GHz:	1 meters	
	Frequencies $>$ 26.5 GHz to $\leq$ 40 GHz:	0.5 meters	
	Frequencies $>$ 40 GHz to $\leq$ 75 GHz:	0.375 meters	
	Frequencies $>$ 75 GHz:	0.1 meters	

Test Result:	Test passed
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Frequency (MHz)	Antenna Polarization	Detector	Receiver Reading ( $\text{dB}\mu\text{V}$ )	Correction Factor ( $\text{dB/m}$ )	Pulse Train Correction (dB)	Final Value ( $\text{dB}\mu\text{V/m}$ )	Limit ( $\text{dB}\mu\text{V/m}$ )	Margin (dB)
36.300	vertical	Quasi-Peak	24.8	14.4		39.2	40.0	<b>0.8</b>
40.350	vertical	Quasi-Peak	15.9	14.4		30.3	40.0	9.7
182.340	horizontal	Quasi-Peak	18.3	11.3		29.6	43.5	13.9
24082.222	vertical	Average	70.9	43.0		113.9	137.5	23.6
24091.667	vertical	Peak	72.9	43.0		115.9	137.5	21.6
48166.683	horizontal	Average	51.8	28.3		80.1	88.0	7.9

**Sample calculation of final values:**

$$\text{Final Value (dB}\mu\text{V/m)} = \text{Reading Value (dB}\mu\text{V)} + \text{Correction Factor (dB/m)} + \text{Pulse Train Correction (dB)}$$

## 8.8 Exposure of Humans to RF Fields

Rules and specifications:	IC RSS-Gen Issue 2, section 5.5
Guide:	IC RSS-102 Issue 4, section 2.5

Exposure of Humans to RF Fields	Applicable	Declared by applicant	Measured	Exemption
<b>The antenna is</b>				
<input checked="" type="checkbox"/> detachable				
<p>The conducted output power (CP in watts) is measured at the antenna connector:</p> $CP = 91.20 \mu W$ <p>The effective isotropic radiated power (EIRP in watts) is calculated using</p> <p><input checked="" type="checkbox"/> the numerical antenna gain: <math>G = 158.5</math></p> $EIRP = G \cdot CP \Rightarrow EIRP = 14.46 mW$ <p><input checked="" type="checkbox"/> the field strength<sup>8</sup> in V/m: <math>FS = 623.73 mV/m</math></p> $EIRP = \frac{(FS \cdot D)^2}{30} \Rightarrow EIRP = 12.97 mW$ <p>with:</p> <p>Distance between the antennas in m: <math>D = 1 m</math></p>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> not detachable				
<p>A field strength measurement is used to determine the effective isotropic radiated power (EIRP in watts) given by<sup>8</sup>:</p> $EIRP = \frac{(FS \cdot D)^2}{30} \Rightarrow EIRP = \dots\dots\dots W$ <p>with:</p> <p>Field strength in V/m: <math>FS = \dots\dots\dots V/m</math></p> <p>Distance between the two antennas in m: <math>D = \dots\dots\dots m</math></p>			<input type="checkbox"/>	<input type="checkbox"/>
<b>Selection of output power</b>				
<p>The output power TP is the higher of the conducted or effective isotropic radiated power (e.i.r.p.):</p> $TP = 14.46 mW$				

<sup>8</sup> The conversion formula is valid only for properly matched antennas. In other cases the transmitter output power may have to be measured by a terminated measurement when applying the exemption clauses. If an open area test site is used for field strength measurement, the effect due to the metal ground reflecting plane should be subtracted from the maximum field strength value in order to reference it to free space, before calculating TP.



Exposure of Humans to RF Fields (continued)	Applicable	Declared by applicant	Measured	Exemption			
<b>Separation distance between the user and the transmitting device is</b>							
<input type="checkbox"/> less than or equal to 20 cm <input checked="" type="checkbox"/> greater than 20 cm		<input checked="" type="checkbox"/>					
<b>Transmitting device is</b>							
<input type="checkbox"/> in the vicinity of the human head <input type="checkbox"/> body-worn		<input checked="" type="checkbox"/>					
<b>SAR evaluation</b>							
<p>SAR evaluation is required if the separation distance between the user and the device is less than or equal to 20 cm.</p> <p><input type="checkbox"/> The device operates from 3 kHz up to 1 GHz inclusively and with output power (i.e. the higher of the conducted or equivalent isotropically radiated power (e.i.r.p.) source-based, time-averaged output power) that is less than or equal to 200 mW for general public use and 1000 mW for controlled use.</p> <p><input type="checkbox"/>;</p> <p><input type="checkbox"/> The device operates above 1 GHz and up to 2.2 GHz inclusively and with output power (i.e. the higher of the conducted or radiated (e.i.r.p.) source-based, time-averaged output power) that is less than or equal to 100 W for general public use and 500 W for controlled use.</p> <p><input type="checkbox"/> The device operates above 2.2 GHz and up to 3 GHz inclusively and with output power (i.e. the higher of the conducted or radiated (e.i.r.p.) source-based, time-averaged output power) that is less than or equal to 20 mW for general public use and 100 mW for controlled use.</p> <p><input type="checkbox"/> The device operates above 3 GHz and up to 6 GHz inclusively and with output power (i.e. the higher of the conducted or radiated (e.i.r.p.) source-based, time-averaged output power) that is less than or equal to 10 mW for general public use and 50 mW for controlled use.</p> <p><input type="checkbox"/> SAR evaluation is documented in test report no. ....</p>				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>RF exposure evaluation</b>							
<p>RF exposure evaluation is required if the separation distance between the user and the device is greater than 20 cm.</p> <p><input type="checkbox"/> The device operates below 1.5 GHz and the maximum e.i.r.p. of the device is equal to or less than 2.5 W.</p> <p><input checked="" type="checkbox"/> The device operates at or above 1.5 GHz and the maximum e.i.r.p. of the device is equal to or less than 5 W.</p> <p><input type="checkbox"/> RF exposure evaluation is documented in test report no. ....</p>				<input type="checkbox"/>	<input checked="" type="checkbox"/>		

## 9 Referenced Regulations

All tests were performed with reference to the following regulations and standards:

<input checked="" type="checkbox"/>	CFR 47 Part 2	Code of Federal Regulations Part 2 (Frequency allocation and radio treaty matters; General rules and regulations) of the Federal Communication Commission (FCC)	October 1, 2008
<input checked="" type="checkbox"/>	CFR 47 Part 15	Code of Federal Regulations Part 15 (Radio Frequency Devices) of the Federal Communication Commission (FCC)	October 1, 2008
<input checked="" type="checkbox"/>	ANSI C63.4	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz	December 11, 2003 (published on January 30, 2004)
<input checked="" type="checkbox"/>	RSS-Gen	Radio Standards Specification RSS-Gen Issue 2 containing General Requirements and Information for the Certification of Radiocommunication Equipment, published by Industry Canada	June 2007
<input checked="" type="checkbox"/>	RSS-210	Radio Standards Specification RSS-210 Issue 7 for Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, published by Industry Canada	June 2007
<input type="checkbox"/>	RSS-310	Radio Standards Specification RSS-310 Issue 2 for Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category II Equipment, published by Industry Canada	June 2007
<input checked="" type="checkbox"/>	RSS-102	Radio Standards Specification RSS-102 Issue 4: Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands), published by Industry Canada	March 2010
<input type="checkbox"/>	ICES-003	Interference-Causing Equipment Standard ICES-003 Issue 4 for Digital Apparatus, published by Industry Canada	February 7, 2004
<input checked="" type="checkbox"/>	CISPR 22	Third Edition of the International Special Committee on Radio Interference (CISPR), Pub. 22, "Information Technology Equipment – Radio Disturbance Characteristics – Limits and Methods of Measurement"	1997
<input type="checkbox"/>	CAN/CSA-CEI/IEC CISPR 22	Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment	2002
<input checked="" type="checkbox"/>	TRC-43	Notes Regarding Designation of Emission (Including Necessary Bandwidth and Classification), Class of Station and Nature of Service, published by Industry Canada	October 9, 1982



## 10 Revision History

Revision History			
<i>Edition</i>	<i>Date</i>	<i>Issued by</i>	<i>Modifications</i>
1	18.05.2010	M. Steindl (cj)	First Edition

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## 11 Charts taken during testing

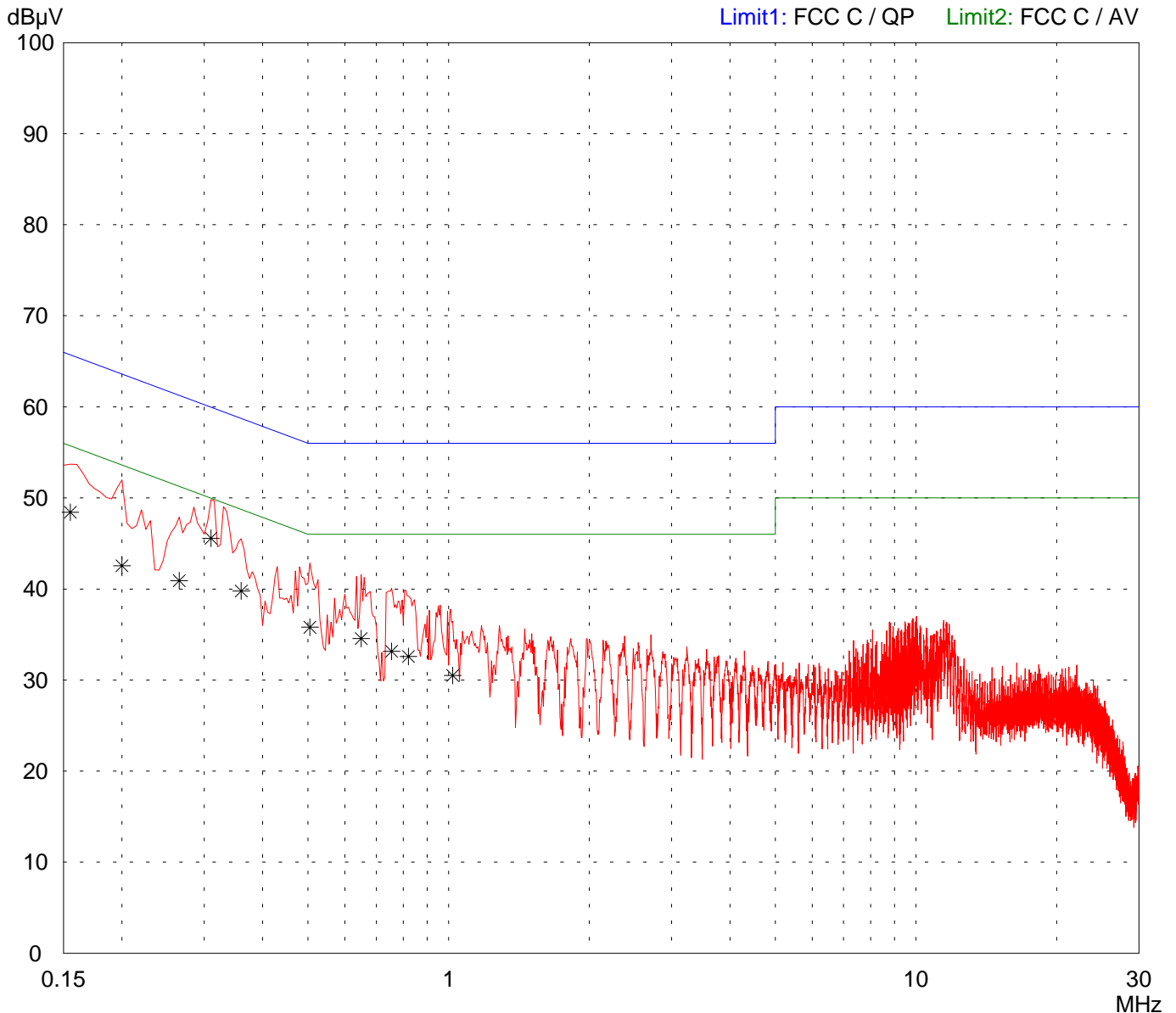
# Conducted Emission Test 150 kHz - 30 MHz according to FCC Part 15 Subpart C

Model: VEGAMIP MP60U.-02	
Serial no.: HW Ver. 1.0.1	
Applicant: VEGA Grieshaber KG	
Test site: Shielded room, cabin no. 4	
Tested on: Linecord AC 115 V Phase L1	
Date of test: 03/10/2010	Operator: M. Steindl
Test performed: semi automatically	File name:

Mode:  - AC 115 V power supply - Transmitting continuously
---

Detector: Peak / Final Results: QP
---------------------------------------

Final results: 20 dB Margin	25 Subranges
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Result: Limit kept
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Project file: 20029-01719-3	Page    of    Pages
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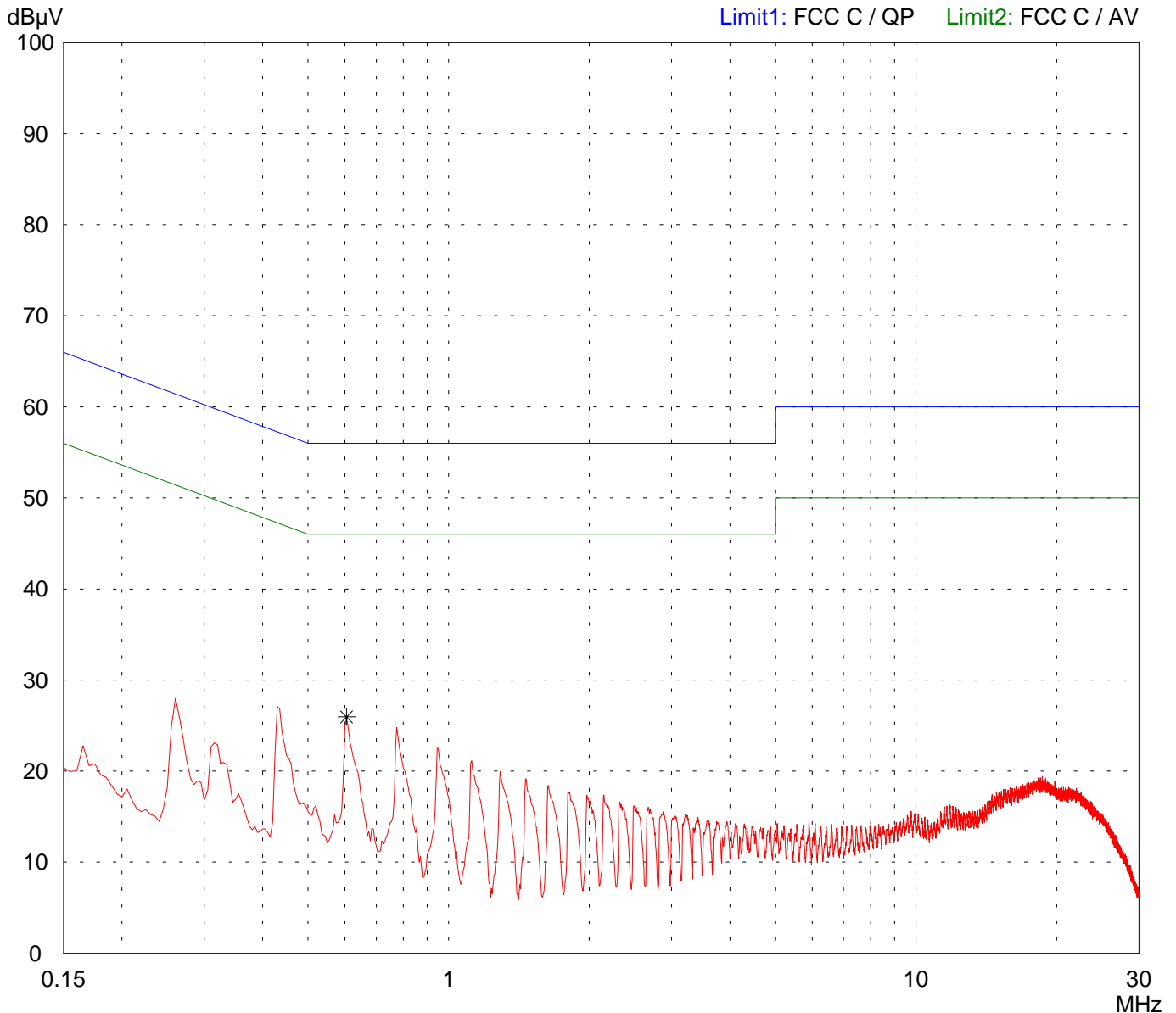
# Conducted Emission Test 150 kHz - 30 MHz according to FCC Part 15 Subpart C

Model: VEGAMIP MP60U.-02	
Serial no.: HW Ver. 1.0.1	
Applicant: VEGA Grieshaber KG	
Test site: Shielded room, cabin no. 4	
Tested on: Linecord AC 115 V Phase L1	
Date of test: 03/10/2010	Operator: M. Steindl
Test performed: automatically	File name:

Mode:  - AC 115 V power supply - Transmitting continuously
---

Detector: Average / Final Results: AV
--

Final results: 20 dB Margin	25 Subranges
--------------------------------	--------------



Result: Limit kept
-----------------------

Project file: 20029-01719-3	Page of Pages
--------------------------------	---------------



## Conducted Emission Test 150 kHz - 30 MHz according to FCC Part 15 Subpart C

Model:  
VEGAMIP MP60U.-02

Serial no.:  
HW Ver. 1.0.1

Applicant:  
VEGA Grieshaber KG

Test site:  
Shielded room, cabin no. 4

Tested on:  
Linecord AC 115 V  
Phase N

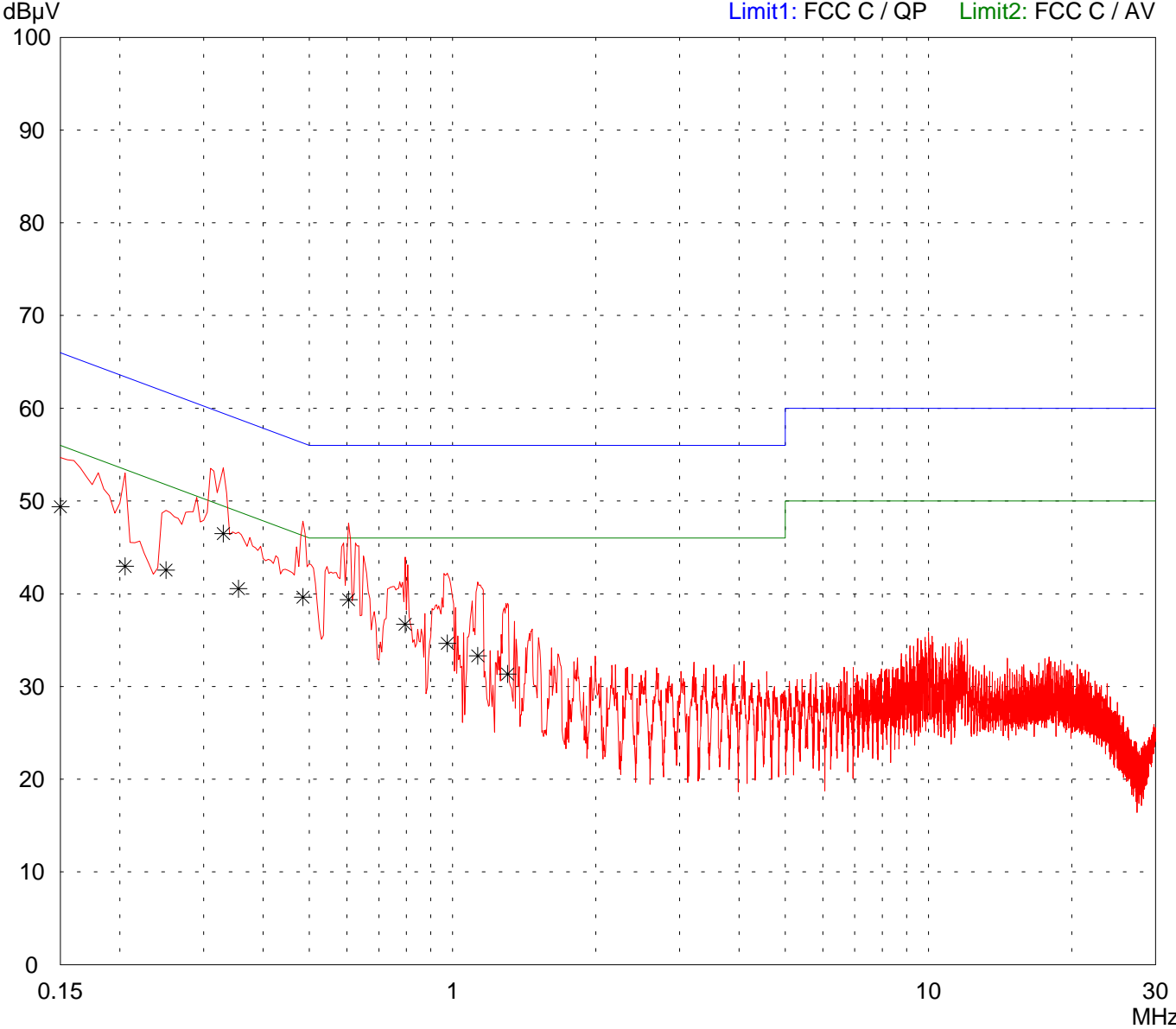
Date of test: 03/10/2010      Operator: M. Steindl

Test performed: semi automatically      File name:

Mode:  
- AC 115 V power supply  
- Transmitting continuously

Detector:  
Peak / Final Results: QP

Final results:  
20 dB Margin                      25 Subranges



Result:  
Limit kept

Project file:  
20029-01719-3                      Page      of      Pages

# Conducted Emission Test 150 kHz - 30 MHz according to FCC Part 15 Subpart C

Model:  
VEGAMIP MP60U.-02

Serial no.:  
HW Ver. 1.0.1

Applicant:  
VEGA Grieshaber KG

Test site:  
Shielded room, cabin no. 4

Tested on:  
Linecord AC 115 V  
Phase N

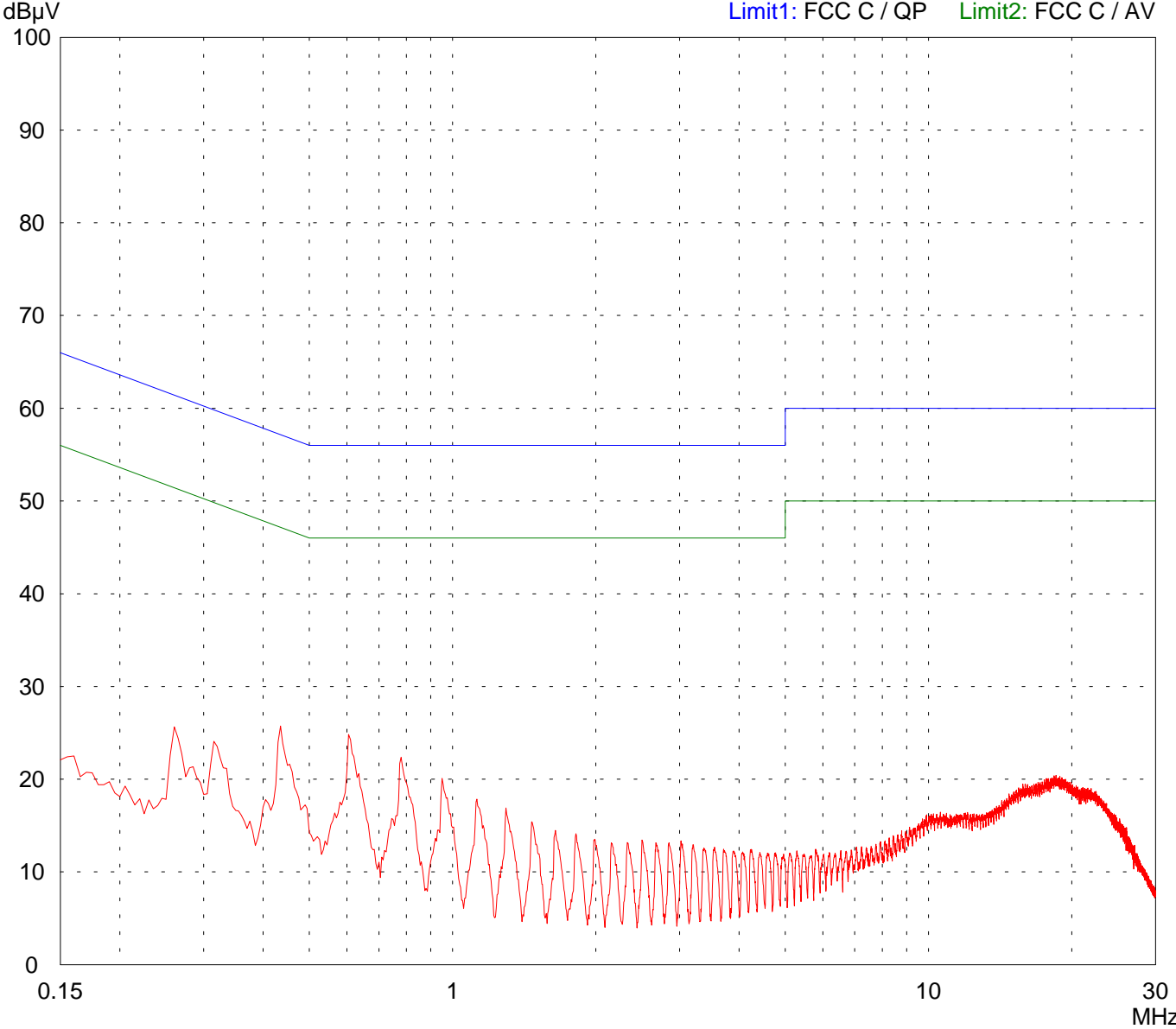
Date of test: 03/10/2010      Operator: M. Steindl

Test performed: automatically      File name:

Mode:  
- AC 115 V power supply  
- Transmitting continuously

Detector:  
Average / Final Results: AV

Final results:  
20 dB Margin                      25 Subranges



Result:  
Limit kept

Project file:  
20029-01719-3                      Page      of      Pages

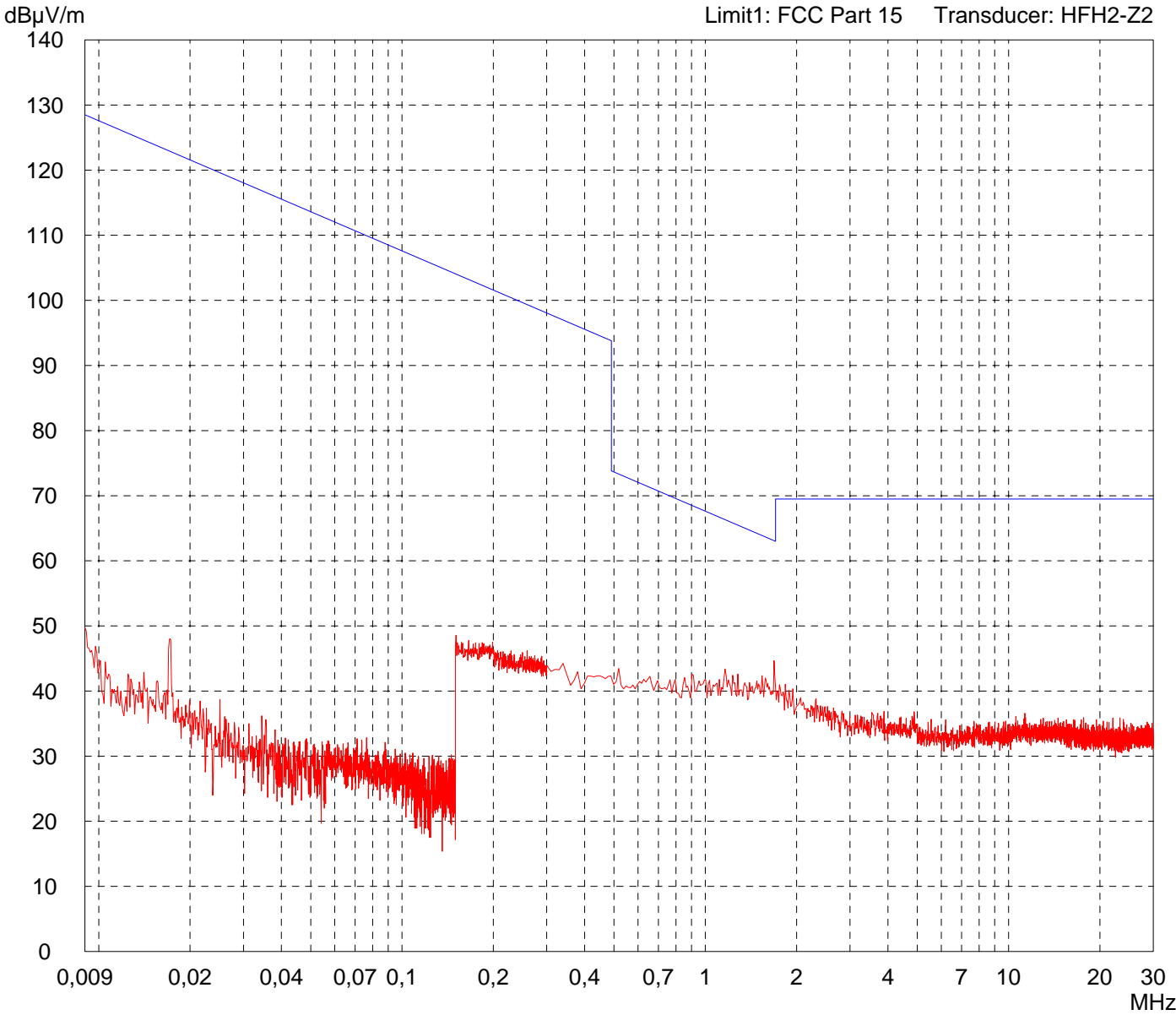
# Radiated Emission Test 9 kHz - 30 MHz acc. to FCC Part 15 Subpart C (FAR)

Model: VEGAMIP MP60U.-02	
Serial no.: HW Ver. 1.0.1	
Applicant: VEGA Grieshaber KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres	
Date of test: 03/04/2010	Operator: M. Steindl
Test performed: by hand	File name: default.emi

Comment:  - 115 V AC supply - Transmitting continuously	
--	--

Detector: Peak
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List of values: 10 dB Margin	50 Subranges
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Result: Prescan
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Project file: 20029-01719-3	Page    of    Pages
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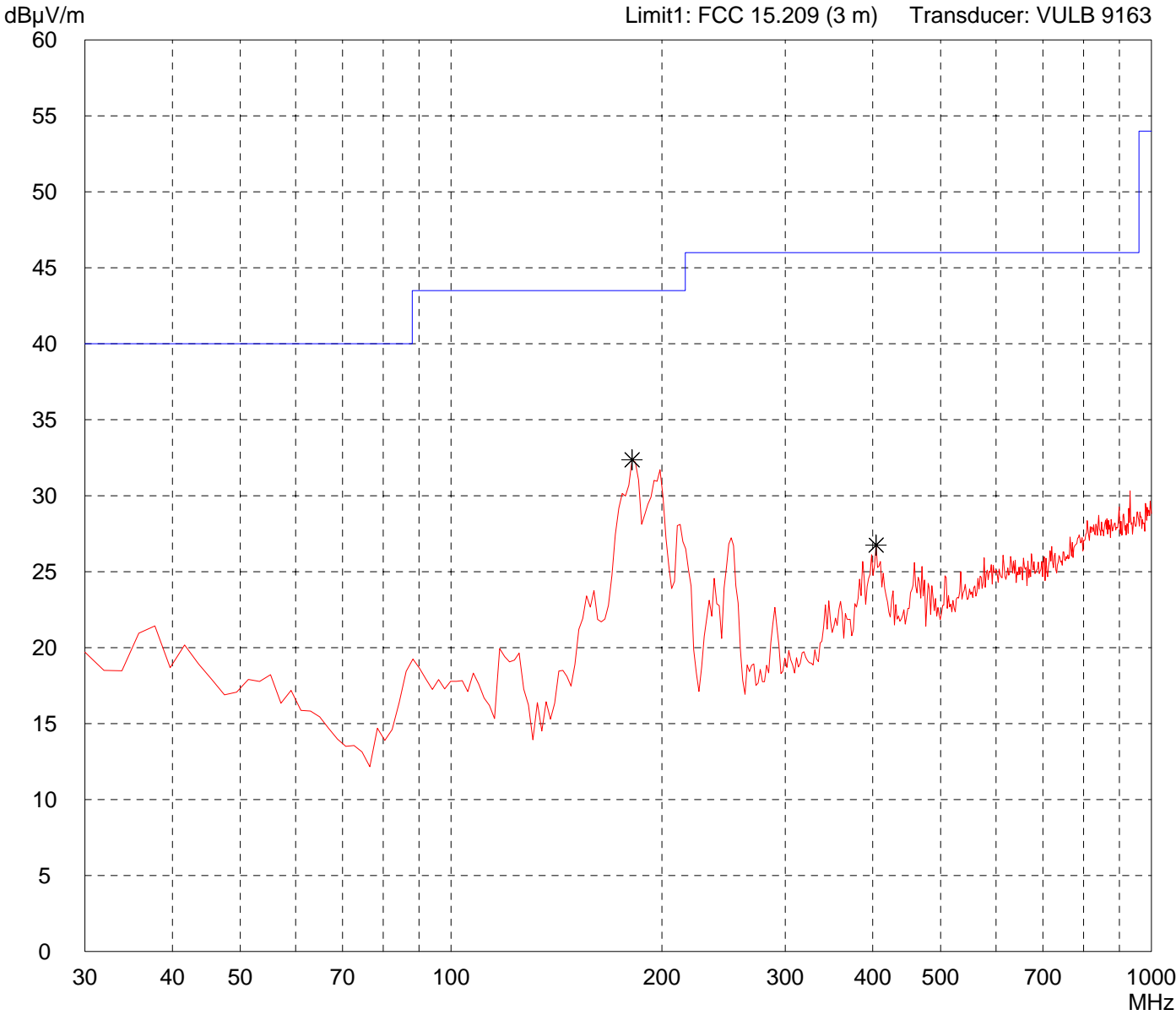
# Radiated Emission Test 30 MHz - 1 GHz acc. to FCC Part 15 Subpart C (FAR)

Model: VEGAMIP MP60U.-02	
Serial no.: HW Ver. 1.0.1	
Applicant: VEGA Grieshaber KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 03/04/2010	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Comment:  - 115 V AC supply - Transmitting continuously
--

Detector: Peak
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List of values: Selected by hand
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Result: Prescan
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Project file: 20029-01719-3	Page    of    Pages
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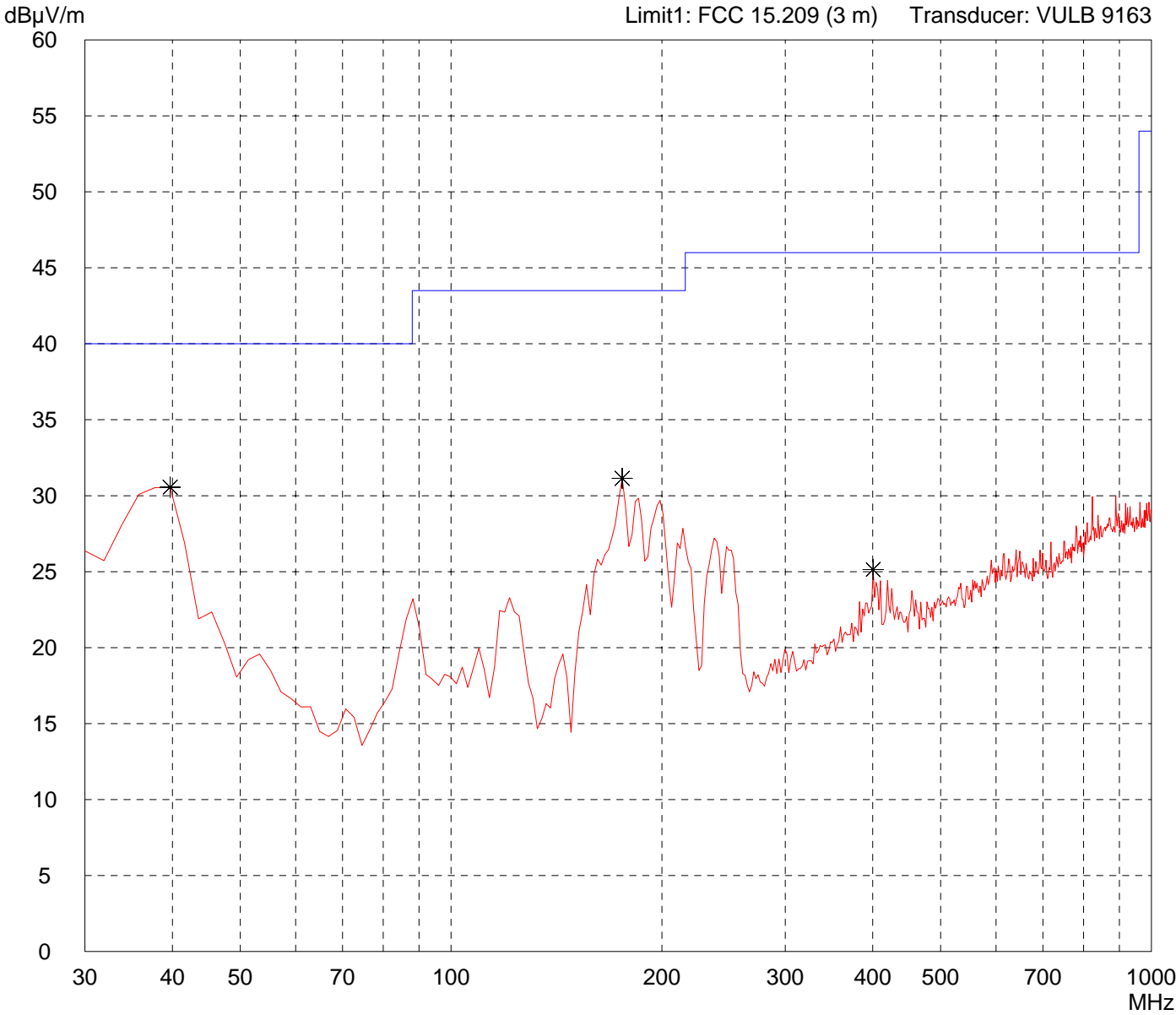
# Radiated Emission Test 30 MHz - 1 GHz acc. to FCC Part 15 Subpart C (FAR)

Model: VEGAMIP MP60U.-02	
Serial no.: HW Ver. 1.0.1	
Applicant: VEGA Grieshaber KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 03/04/2010	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Comment:  - 115 V AC supply - Transmitting continuously
--

Detector: Peak
-------------------

List of values: Selected by hand
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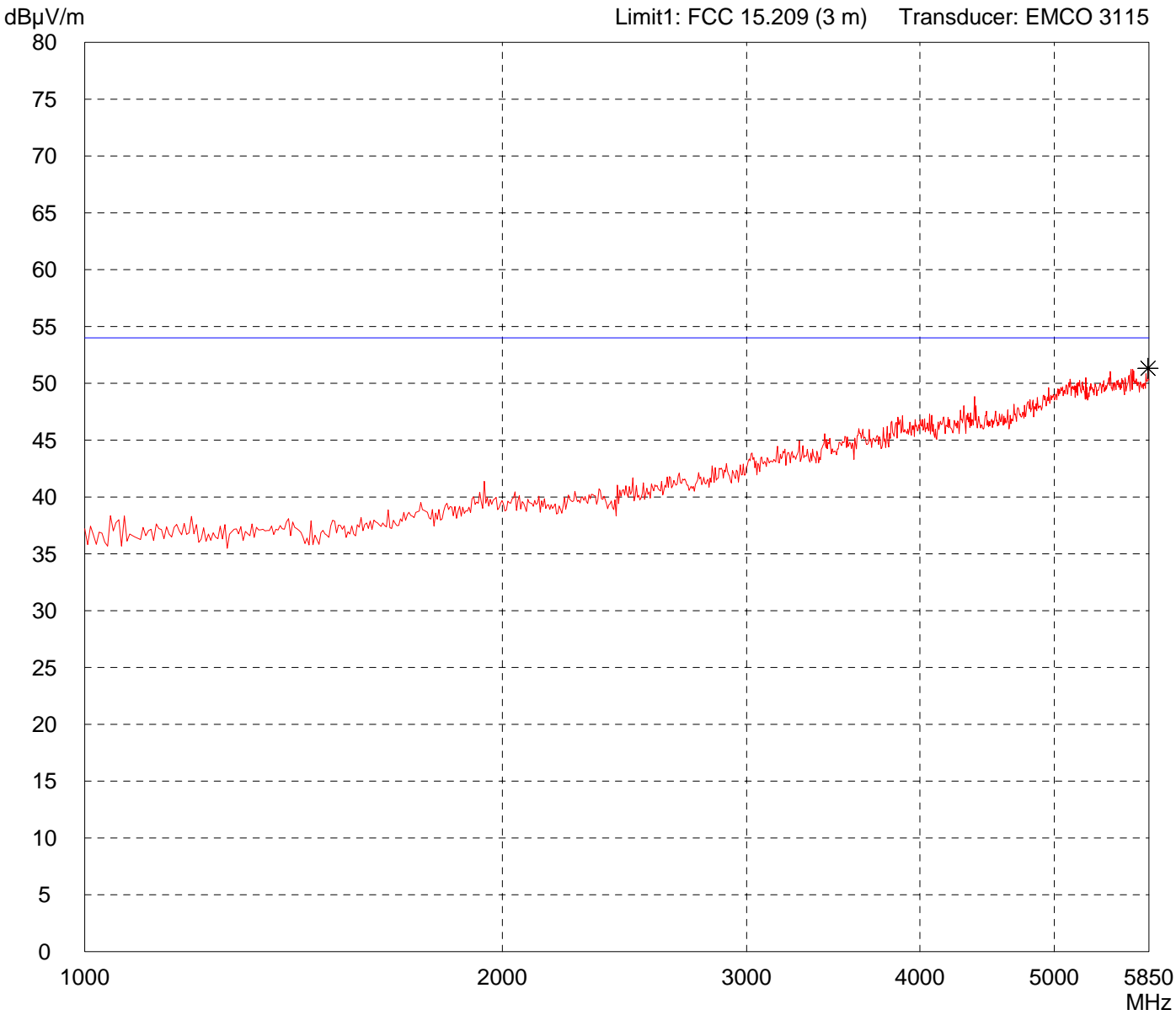
Result: Prescan
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Project file: 20029-01719-3	Page    of    Pages
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# Radiated Emission Test 1 GHz - 5,85 GHz acc. to FCC Part 15 Subpart C (FAR)

<p>Model: VEGAMIP MP60U.-02</p> <p>Serial no.: HW Ver. 1.0.1</p> <p>Applicant: VEGA Grieshaber KG</p> <p>Test site: Fully anechoic room, cabin no. 2</p> <p>Tested on: Test distance 3 metres Horizontal Polarization</p> <p>Date of test: 03/03/2010      Operator: M. Steindl</p> <p>Test performed: automatically      File name: default.emi</p>	<p>Comment:</p> <ul style="list-style-type: none"> <li>- 115 V AC supply</li> <li>- Transmitting continuously</li> </ul>
--	--

<p>Detector: Peak</p>	<p>List of values: Selected by hand</p>
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<p>Result: Prescan</p>	<p>Project file: 20029-01719-3</p> <p style="text-align: right;">Page    of    Pages</p>
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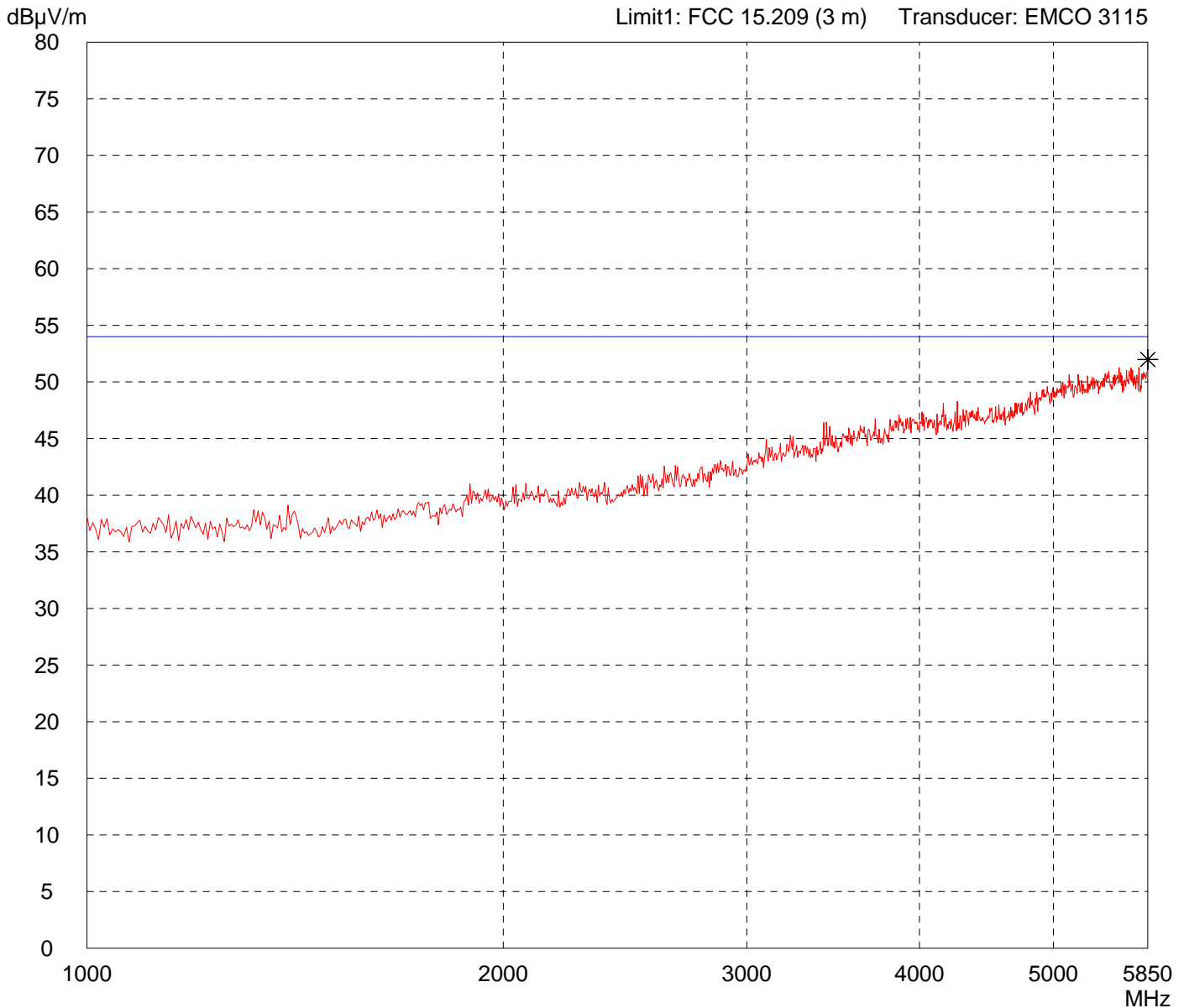
# Radiated Emission Test 1 GHz - 5,85 GHz acc. to FCC Part 15 Subpart C (FAR)

Model: VEGAMIP MP60U.-02	
Serial no.: HW Ver. 1.0.1	
Applicant: VEGA Grieshaber KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 03/03/2010	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Comment:  - 115 V AC supply - Transmitting continuously
--

Detector: Peak
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List of values: Selected by hand
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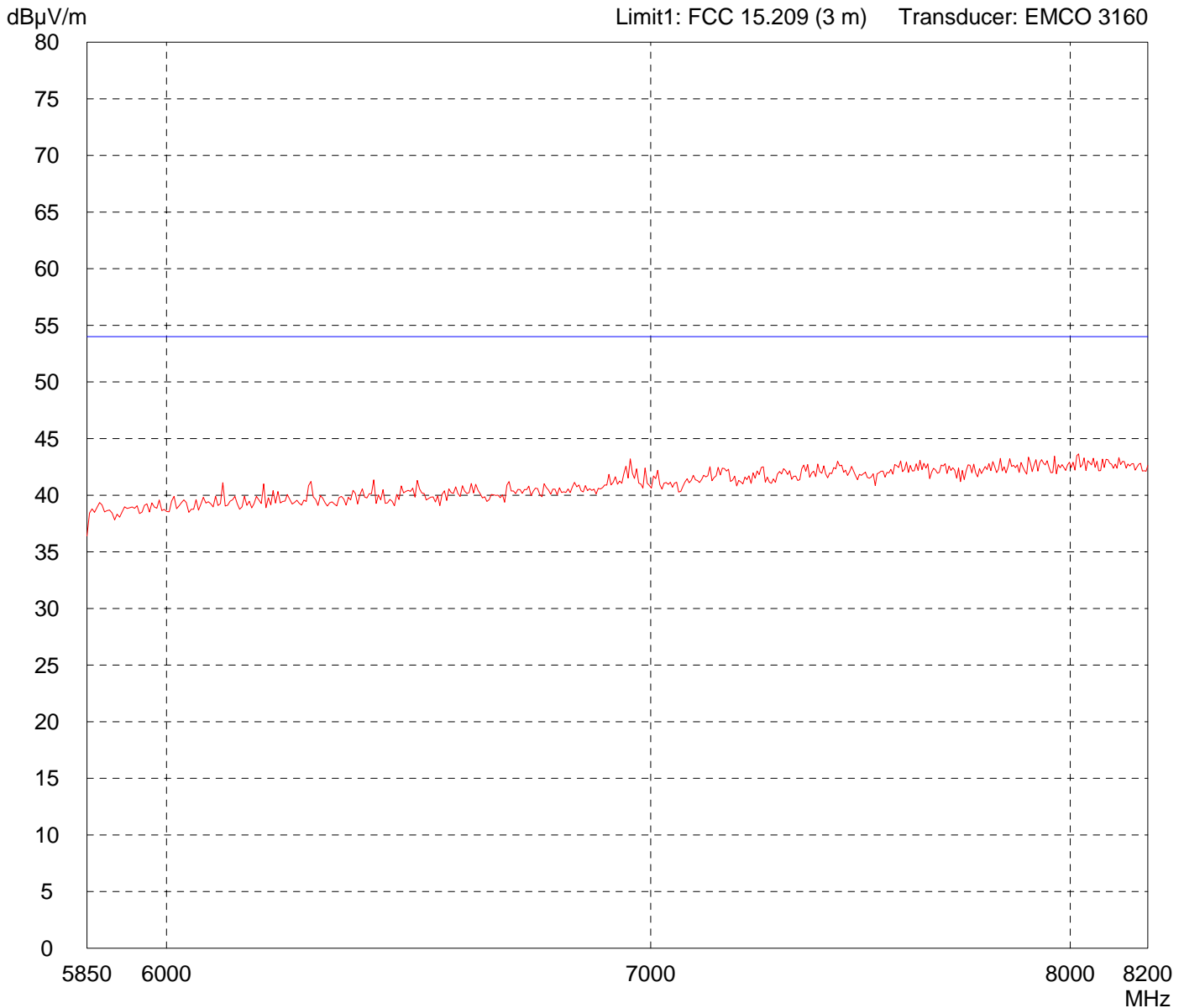
Result: Prescan
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Project file: 20029-01719-3	Page    of    Pages
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# Radiated Emission Test 5,85 GHz - 8,2 GHz acc. to FCC Part 15 Subpart C (FAR)

<p>Model: VEGAMIP MP60U.-02</p> <p>Serial no.: HW Ver. 1.0.1</p> <p>Applicant: VEGA Grieshaber KG</p> <p>Test site: Fully anechoic room, cabin no. 2</p> <p>Tested on: Test distance 3 metres Horizontal Polarization</p> <p>Date of test: 03/03/2010      Operator: M. Steindl</p> <p>Test performed: automatically      File name: default.emi</p>	<p>Comment:</p> <ul style="list-style-type: none"> <li>- 115 V AC supply</li> <li>- Transmitting continuously</li> </ul>
--	--

<p>Detector: Peak</p>	<p>List of values: 10 dB Margin                      50 Subranges</p>
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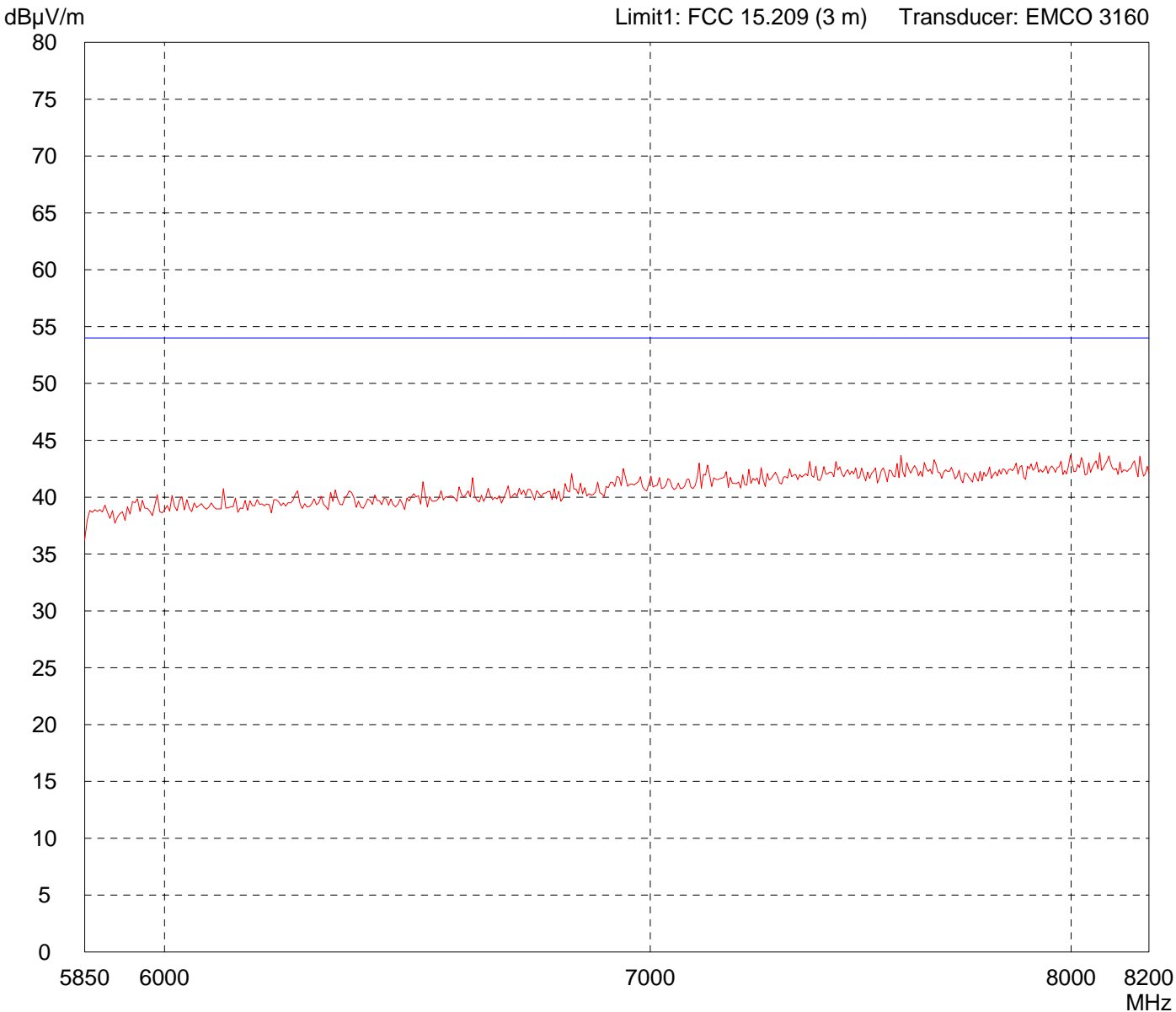
<p>Result: Prescan</p>	<p>Project file: 20029-01719-3</p> <p style="text-align: right;">Page      of      Pages</p>
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# Radiated Emission Test 5,85 GHz - 8,2 GHz acc. to FCC Part 15 Subpart C (FAR)

<p>Model: VEGAMIP MP60U.-02</p> <p>Serial no.: HW Ver. 1.0.1</p> <p>Applicant: VEGA Grieshaber KG</p> <p>Test site: Fully anechoic room, cabin no. 2</p> <p>Tested on: Test distance 3 metres Vertical Polarization</p> <p>Date of test:                      Operator: 03/03/2010                      M. Steindl</p> <p>Test performed:                  File name: automatically                  default.emi</p>	<p>Comment:</p> <ul style="list-style-type: none"> <li>- 115 V AC supply</li> <li>- Transmitting continuously</li> </ul>
--	--

<p>Detector: Peak</p>	<p>List of values: 10 dB Margin                      50 Subranges</p>
---------------------------	---

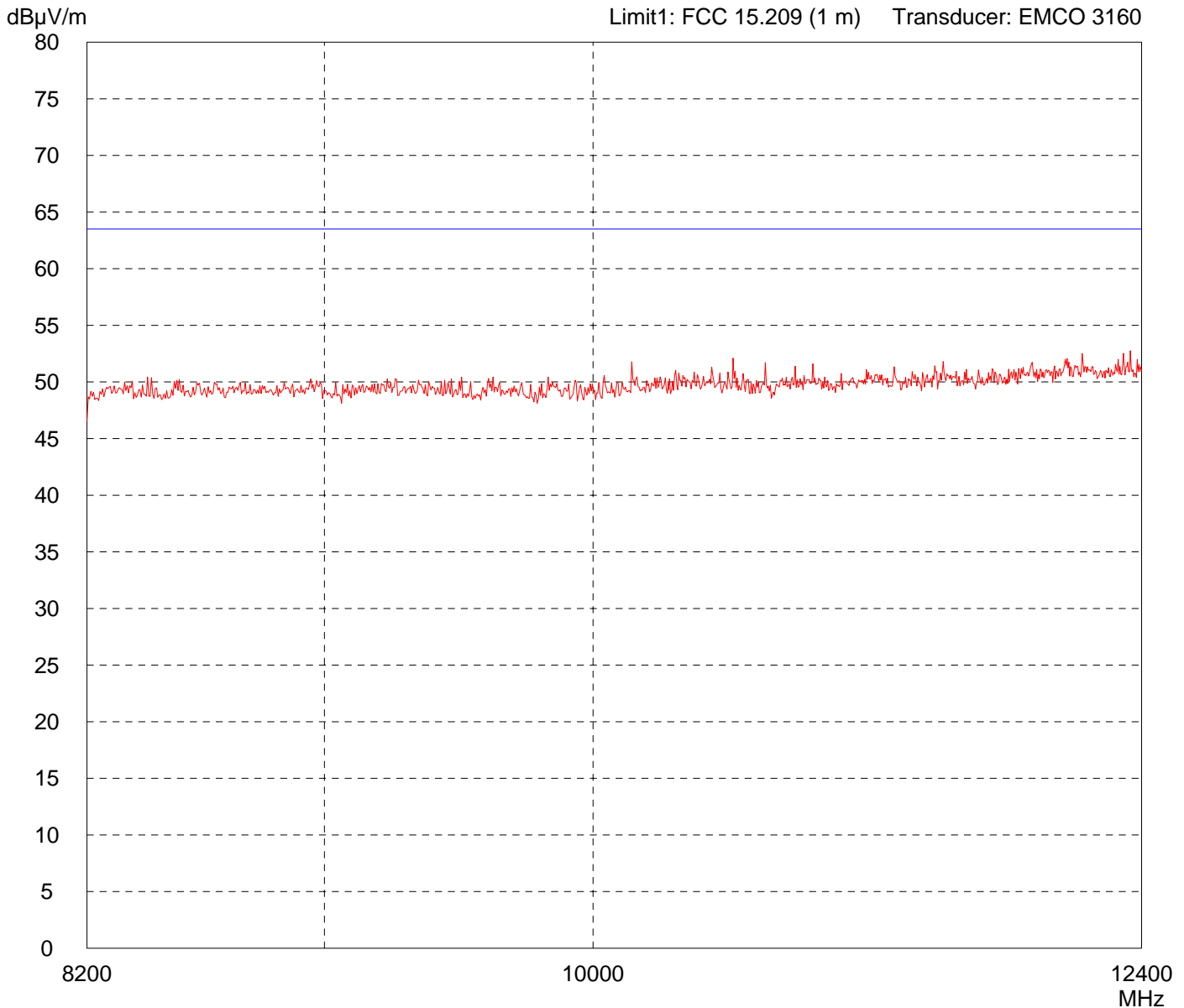


<p>Result: Prescan</p>	<p>Project file: 20029-01719-3</p> <p style="text-align: right;">Page    of    Pages</p>
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# Radiated Emission Test 8,2 GHz - 12,4 GHz acc. to FCC Part 15 Subpart C (FAR)

<p>Model: VEGAMIP MP60U.-02</p> <p>Serial no.: HW Ver. 1.0.1</p> <p>Applicant: VEGA Grieshaber KG</p> <p>Test site: Fully anechoic room, cabin no. 2</p> <p>Tested on: Test distance 1 meter Horizontal Polarization</p> <p>Date of test: 03/03/2010      Operator: M. Steindl</p> <p>Test performed: automatically      File name: default.emi</p>	<p>Comment:</p> <ul style="list-style-type: none"> <li>- 115 V AC supply</li> <li>- Transmitting continuously</li> </ul>
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<p>Detector: Peak</p>	<p>List of values: 10 dB Margin                      50 Subranges</p>
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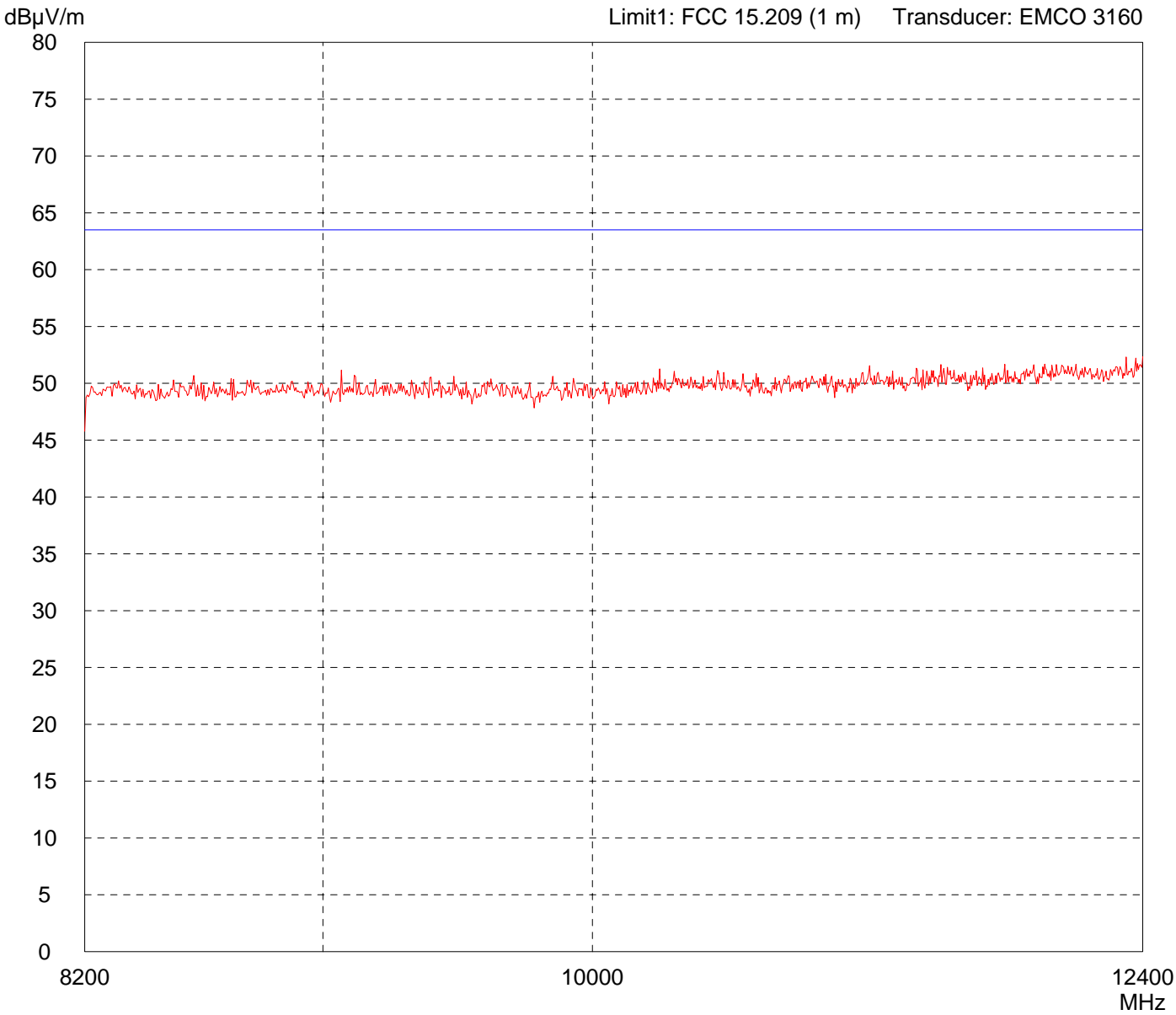


<p>Result: Prescan</p>	<p>Project file: 20029-01719-3</p> <p style="text-align: right;">Page      of      Pages</p>
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# Radiated Emission Test 8,2 GHz - 12,4 GHz acc. to FCC Part 15 Subpart C (FAR)

<p>Model: VEGAMIP MP60U.-02</p> <p>Serial no.: HW Ver. 1.0.1</p> <p>Applicant: VEGA Grieshaber KG</p> <p>Test site: Fully anechoic room, cabin no. 2</p> <p>Tested on: Test distance 1 meter Vertical Polarization</p> <p>Date of test:                      Operator: 03/03/2010                      M. Steindl</p> <p>Test performed:                  File name: automatically                  default.emi</p>	<p>Comment:</p> <ul style="list-style-type: none"> <li>- 115 V AC supply</li> <li>- Transmitting continuously</li> </ul>
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<p>Detector: Peak</p>	<p>List of values: 10 dB Margin                      50 Subranges</p>
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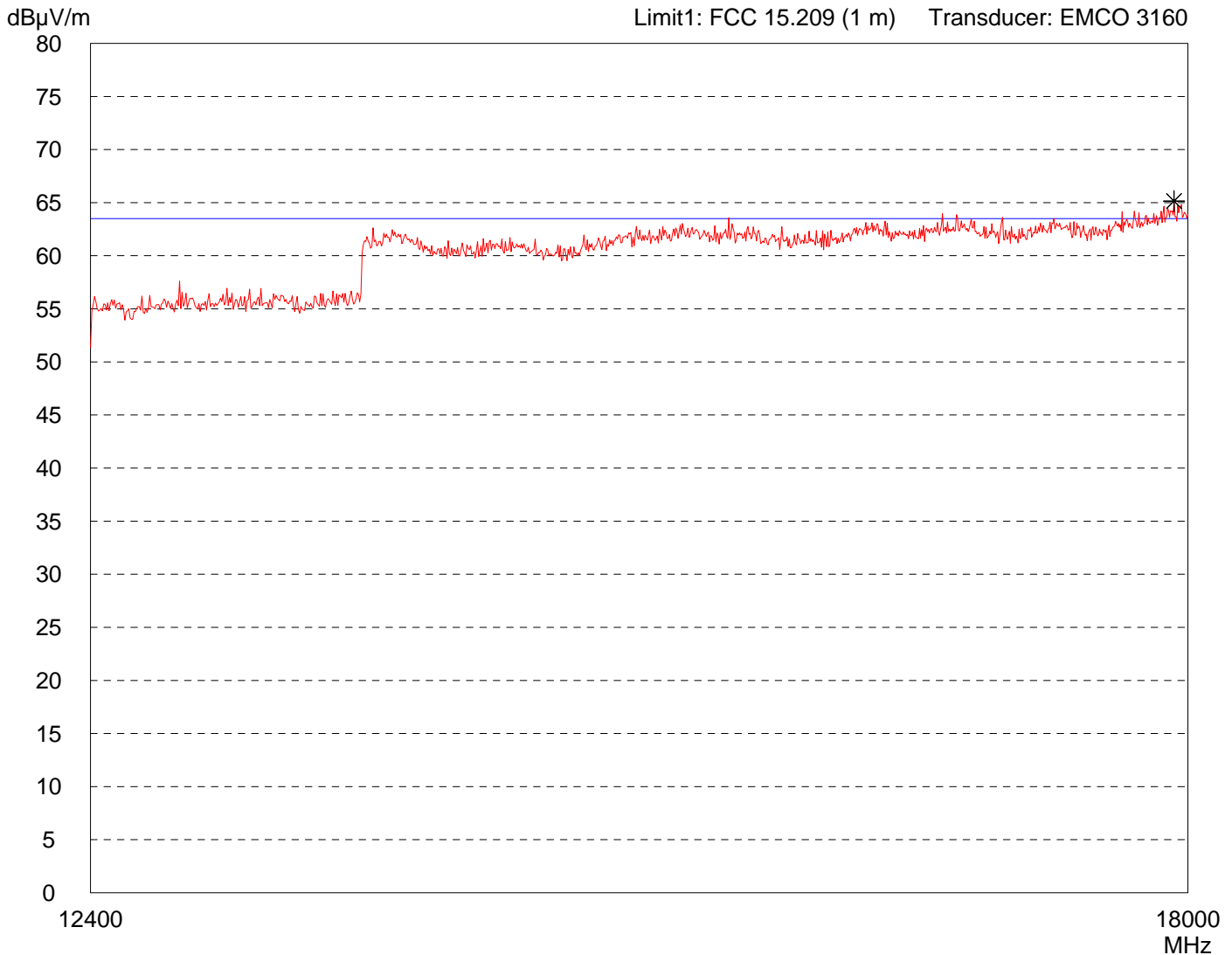


<p>Result: Prescan</p>	<p>Project file: 20029-01719-3</p> <p style="text-align: right;">Page    of    Pages</p>
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# Radiated Emission Test 12,4 GHz - 18 GHz acc. to FCC Part 15 Subpart C (FAR)

<p>Model: VEGAMIP MP60U.-02</p> <p>Serial no.: HW Ver. 1.0.1</p> <p>Applicant: VEGA Grieshaber KG</p> <p>Test site: Fully anechoic room, cabin no. 2</p> <p>Tested on: Test distance 1 meter Horizontal Polarization</p> <p>Date of test:                      Operator: 03/03/2010                      M. Steindl</p> <p>Test performed:                  File name: automatically                  default.emi</p>	<p>Comment:</p> <p>- 115 V AC supply - Transmitting continuously</p>
<p>Detector: Peak</p>	<p>List of values: Selected by hand</p>

Frequency range	Resolution bandwidth	Video bandwidth	Sweep time	Preselection	Preamplification	Correction factor
12,4 GHz - 18 GHz	1000 kHz	1000 kHz	0,02 s	Off	10 dB	EMCO 3160

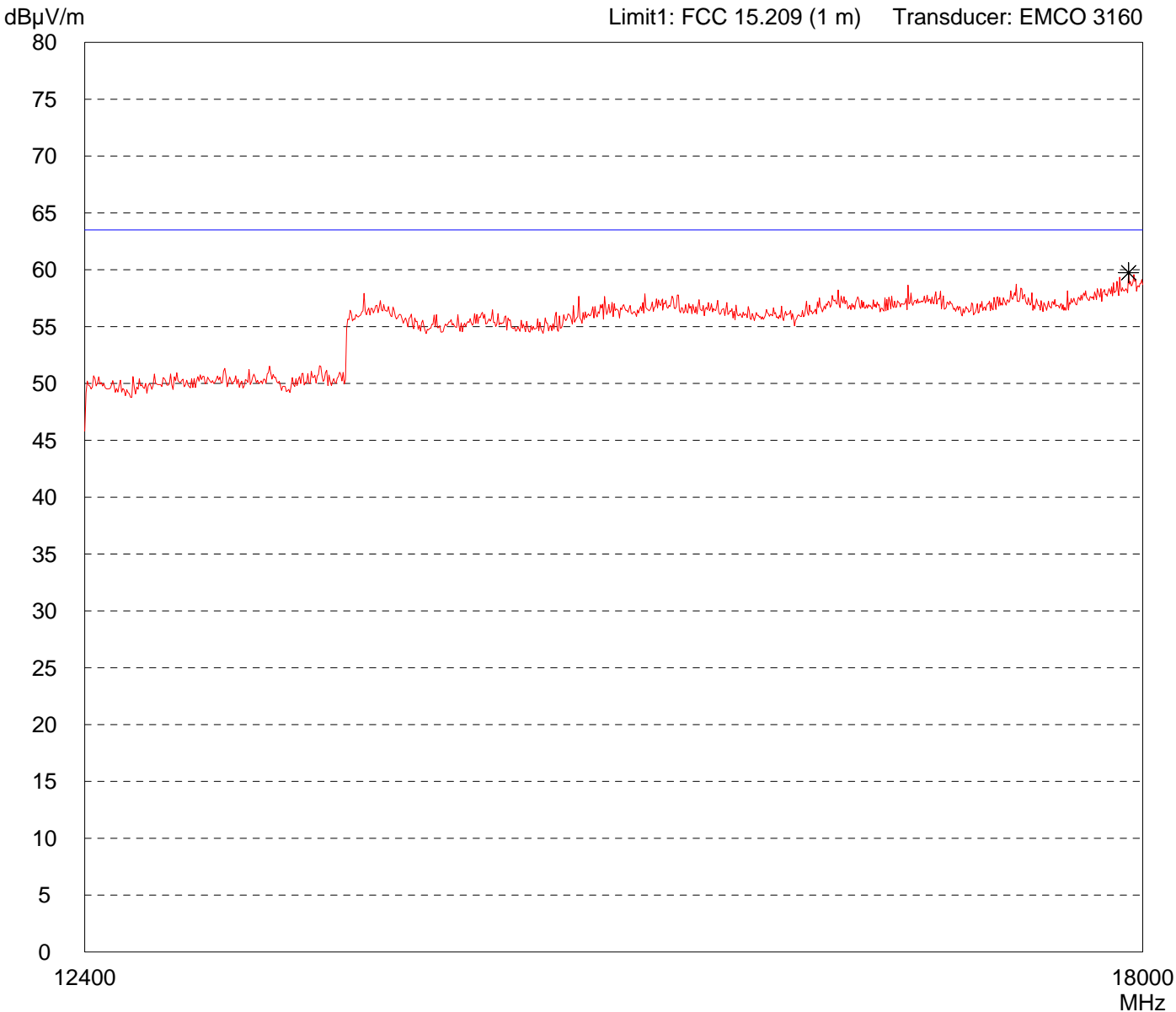


<p>Result: Prescan</p>	<p>Project file: 20029-01719-3</p> <p style="text-align: right;">Page    of    Pages</p>
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# Radiated Emission Test 12,4 GHz - 18 GHz acc. to FCC Part 15 Subpart C (FAR)

Model: <b>VEGAMIP MP60U.-02</b>	Comment:  - 115 V AC supply - Transmitting continuously
Serial no.: HW Ver. 1.0.1	
Applicant: <b>VEGA Grieshaber KG</b>	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 1 meter Horizontal Polarization	
Date of test:                      Operator: 03/03/2010                      M. Steindl	
Test performed:                      File name: automatically                      default.emi	

Detector: <b>Peak</b>	List of values: <b>Selected by hand</b>
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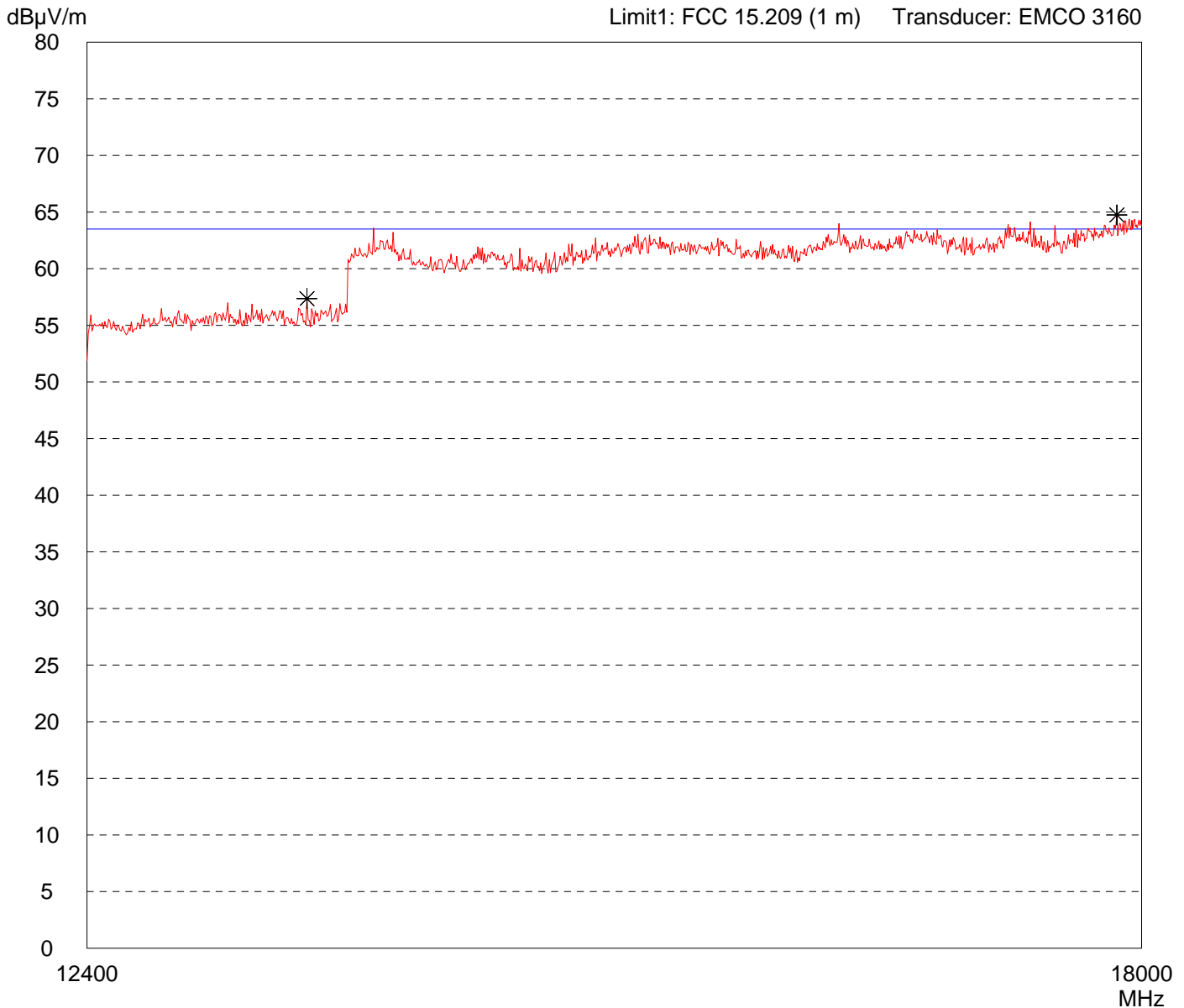


Result: <b>Prescan</b>	Project file: 20029-01719-3
Page    of    Pages	

# Radiated Emission Test 12,4 GHz - 18 GHz acc. to FCC Part 15 Subpart C (FAR)

Model: <b>VEGAMIP MP60U.-02</b>	Comment:  - 115 V AC supply - Transmitting continuously
Serial no.: <b>HW Ver. 1.0.1</b>	
Applicant: <b>VEGA Grieshaber KG</b>	
Test site: <b>Fully anechoic room, cabin no. 2</b>	
Tested on: <b>Test distance 1 meter          Vertical Polarization</b>	
Date of test: <b>03/03/2010</b>	Operator: <b>M. Steindl</b>
Test performed: <b>automatically</b>	File name: <b>default.emi</b>

Detector: <b>Peak</b>	List of values: <b>Selected by hand</b>
--------------------------	--

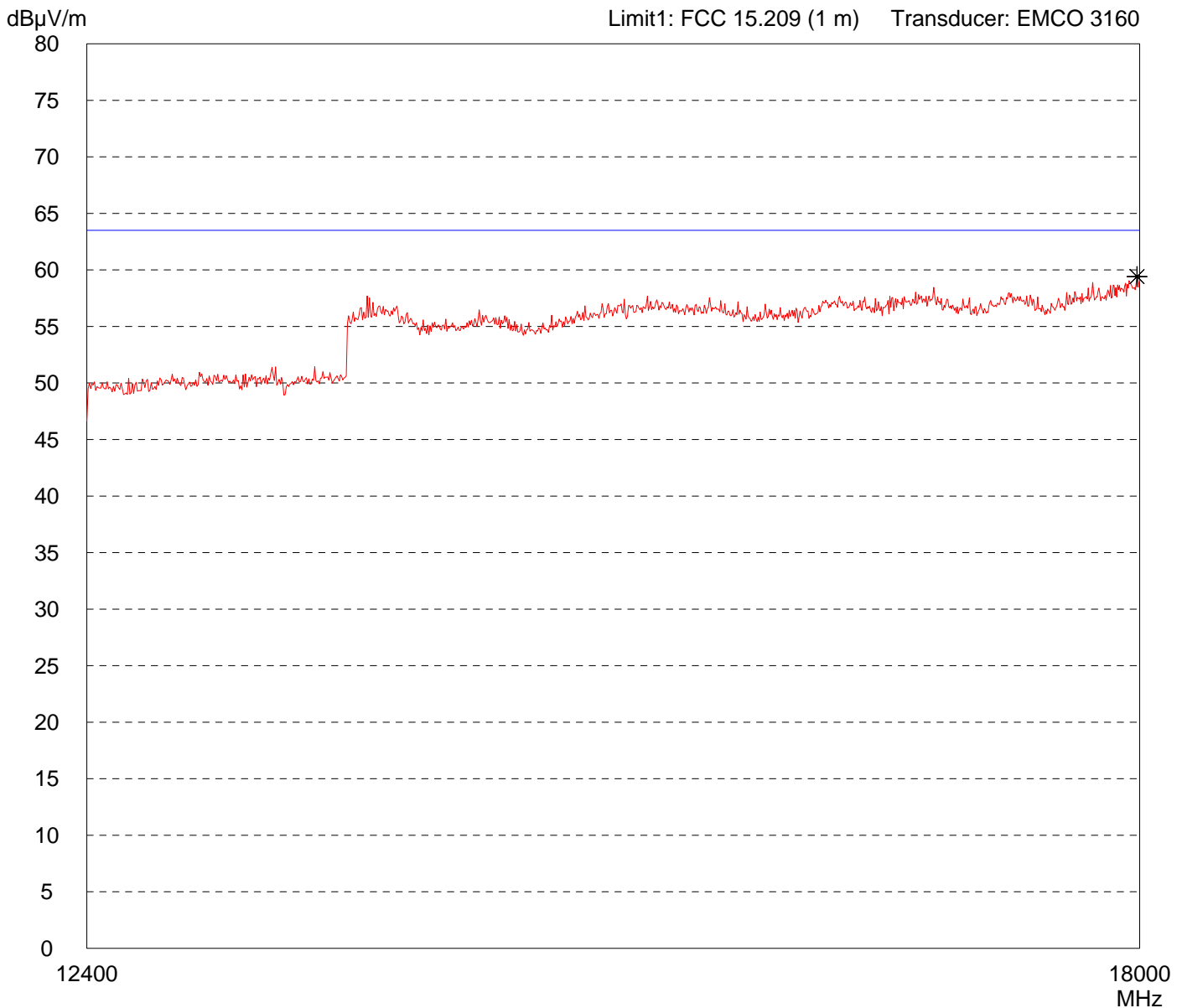


Result: <b>Prescan</b>	Project file: <b>20029-01719-3</b>
	Page    of    Pages

# Radiated Emission Test 12,4 GHz - 18 GHz acc. to FCC Part 15 Subpart C (FAR)

Model: <b>VEGAMIP MP60U.-02</b>	Comment:  - 115 V AC supply - Transmitting continuously
Serial no.: <b>HW Ver. 1.0.1</b>	
Applicant: <b>VEGA Grieshaber KG</b>	
Test site: <b>Fully anechoic room, cabin no. 2</b>	
Tested on: <b>Test distance 1 meter          Vertical Polarization</b>	
Date of test:                      Operator: <b>03/03/2010                      M. Steindl</b>	
Test performed:                  File name: <b>automatically                  default.emi</b>	

Detector: <b>Peak</b>	List of values: <b>Selected by hand</b>
--------------------------	--



Result: <b>Prescan</b>	Project file: <b>20029-01719-3</b>
Page    of    Pages	

# Radiated Emission Test acc. to FCC Part 15 Subpart C

Model: VEGAMIP MP60U.-02	Mode: - AC 115 V power supply - Transmitting continuously
Serial No.: HW Ver. 1.0.1	Polarisation: horizontal Distance: 1 m
Applicant: VEGA Grieshaber KG	

Ref.Level 120 dB $\mu$ V  
10 dB/Div.

ATT 0 dB

Ref. Offset 43 dB



Start 18.000 GHz  
RBW 1 MHz

VBW 1 MHz

Stop 26.500 GHz  
SWP 40 ms

Multi Marker List			
No. 1	23.071667 GHz	71.86 dB $\mu$ V	
No. 2	24.091667 GHz	105.05 dB $\mu$ V	

Tested by: M. Steindl
Date: 2010-03-11

Project-No.: 20029-01719-3
Page      of      pages



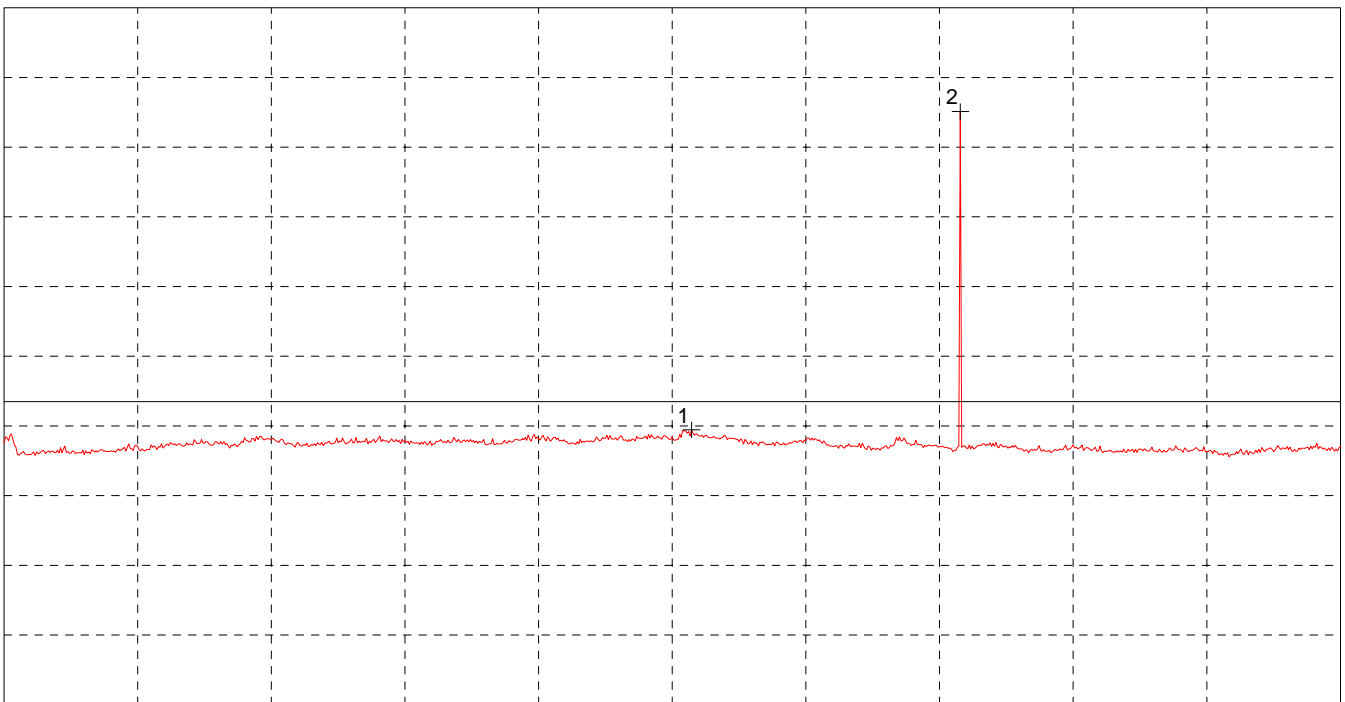
# Radiated Emission Test acc. to FCC Part 15 Subpart C

Model: VEGAMIP MP60U.-02	Mode: - AC 115 V power supply - Transmitting continuously
Serial No.: HW Ver. 1.0.1	Polarisation: horizontal Distance: 1 m
Applicant: VEGA Grieshaber KG	

Ref.Level 120 dB $\mu$ V  
10 dB/Div.

ATT 0 dB

Ref. Offset 43 dB



Start 18.000 GHz  
RBW 1 MHz

VBW 10 kHz

Stop 26.500 GHz  
SWP 2.60 s

### Multi Marker List

No. 1	22.372778 GHz	59.44 dB $\mu$ V
No. 2	24.082222 GHz	105.02 dB $\mu$ V

Tested by: M. Steindl	Project-No.: 20029-01719-3
Date: 2010-03-11	Page      of      pages

# Radiated Emission Test acc. to FCC Part 15 Subpart C

Model: VEGAMIP MP60U.-02	Mode: - AC 115 V power supply - Transmitting continuously
Serial No.: HW Ver. 1.0.1	Polarisation: vertical Distance: 1 m
Applicant: VEGA Grieshaber KG	

Ref.Level 120 dB $\mu$ V  
10 dB/Div.

ATT 0 dB

Ref. Offset 43 dB



Start 18.000 GHz  
RBW 1 MHz

VBW 1 MHz

Stop 26.500 GHz  
SWP 40 ms

### Multi Marker List

No. 1	20.568889 GHz	72.11 dB $\mu$ V
No. 2	24.091667 GHz	115.94 dB $\mu$ V

Tested by: M. Steindl	Project-No.: 20029-01719-3
Date: 2010-03-11	Page      of      pages

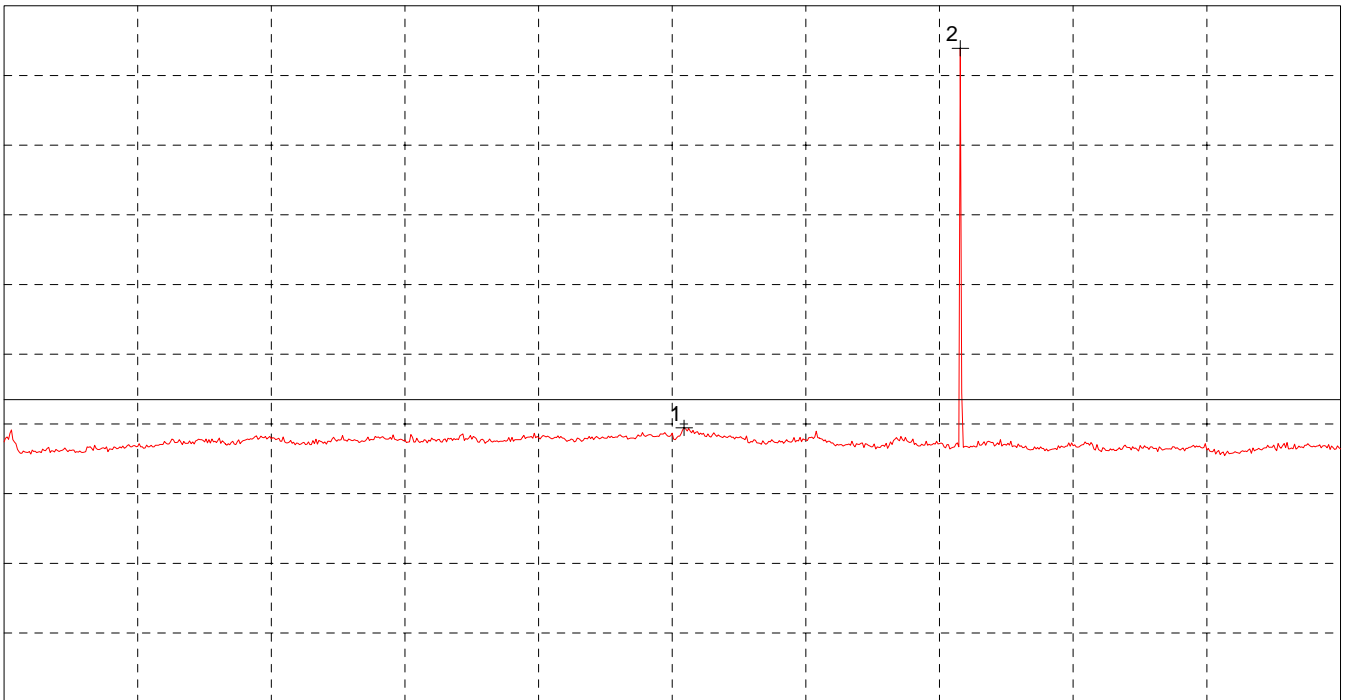
# Radiated Emission Test acc. to FCC Part 15 Subpart C

Model: VEGAMIP MP60U.-02	Mode: - AC 115 V power supply - Transmitting continuously
Serial No.: HW Ver. 1.0.1	Polarisation: vertical Distance: 1 m
Applicant: VEGA Grieshaber KG	

Ref.Level 120 dB $\mu$ V  
10 dB/Div.

ATT 0 dB

Ref. Offset 43 dB



Start 18.000 GHz  
RBW 1 MHz

VBW 10 kHz

Stop 26.500 GHz  
SWP 2.60 s

### Multi Marker List

No. 1	22.325556 GHz	59.44 dB $\mu$ V
No. 2	24.082222 GHz	113.91 dB $\mu$ V

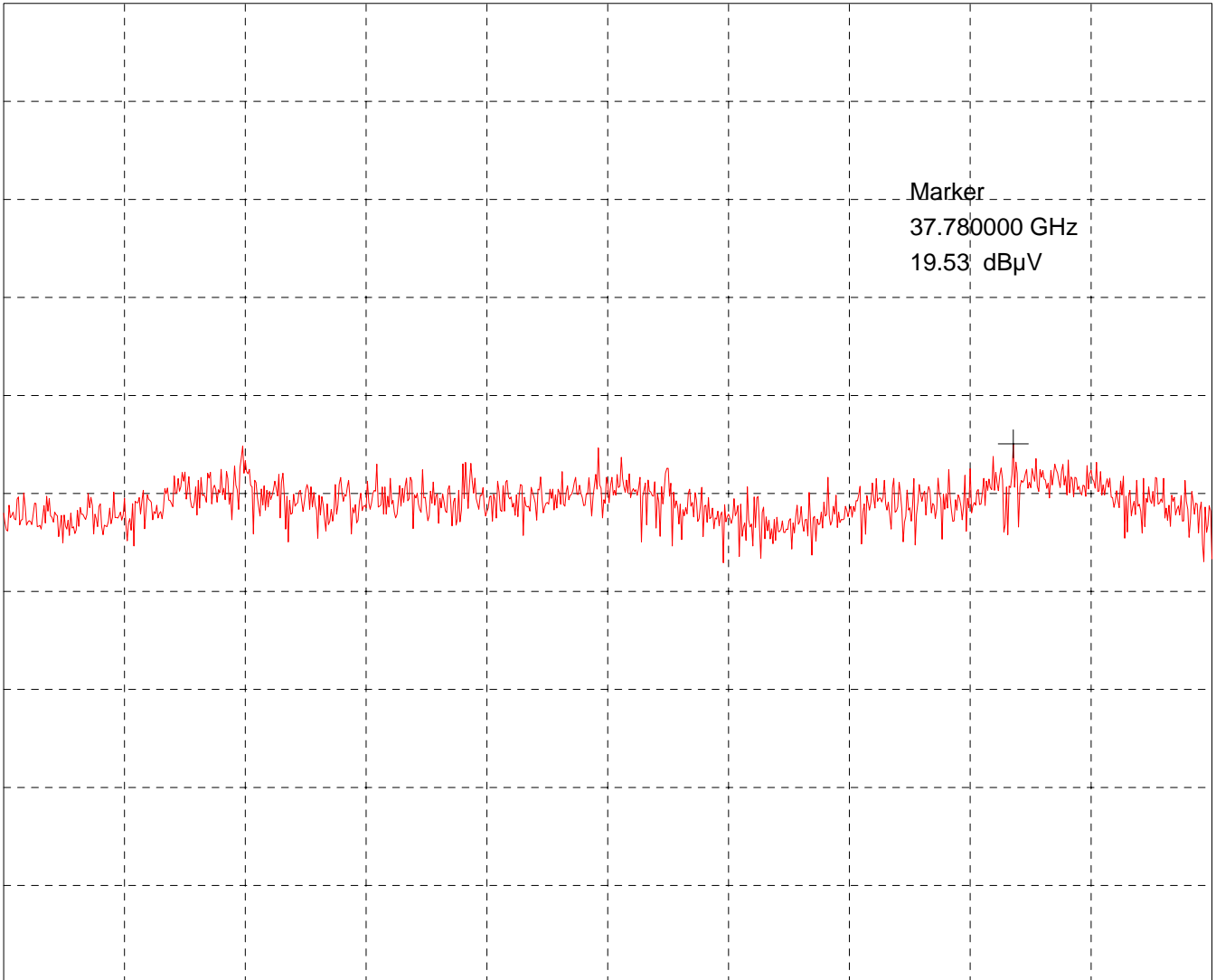
Tested by: M. Steindl	Project-No.: 20029-01719-3
Date: 2010-03-11	Page      of      pages

# Radiated Emission Test acc. to FCC Part 15 Subpart C

Model: VEGAMIP MP60U.-02	Mode: - AC 115 V power supply  - Transmitting continuously  Polarisation: horizontal Distance: 0.5 m Noise-measurement without correction factors
Serial No.: HW Ver. 1.0.1	
Applicant: VEGA Grieshaber KG	

Ref.Level 42 dB $\mu$ V  
5 dB/Div.

ATT 0 dB



Start 26.500 GHz  
RBW 1 MHz

VBW 1 MHz

Stop 40.000 GHz  
SWP 60 ms

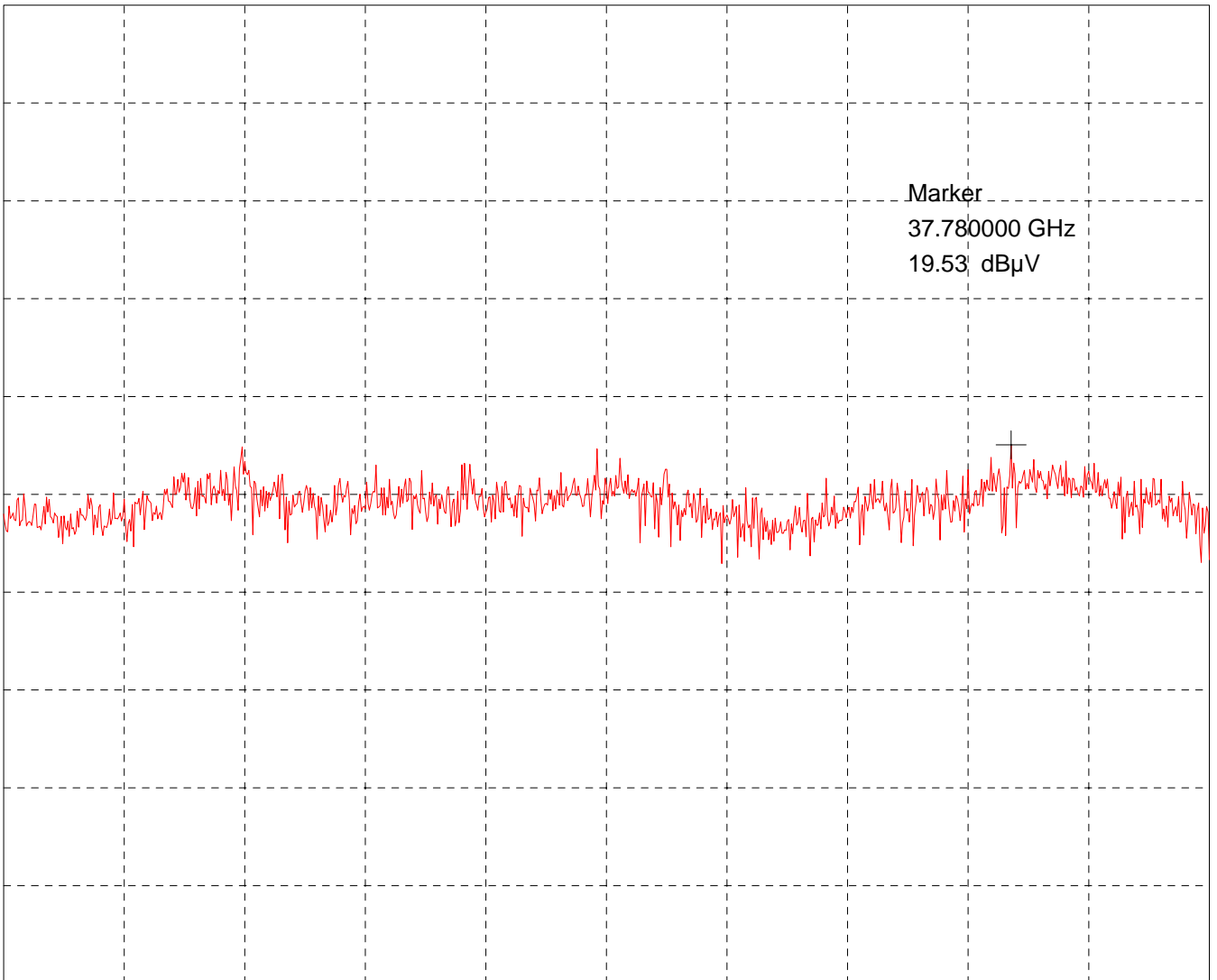
Tested by: M. Steindl	Project-No.: 20029-01719-3
Date: 2010-03-11	Page of pages

# Radiated Emission Test acc. to FCC Part 15 Subpart C

Model: VEGAMIP MP60U.-02	Mode: - AC 115 V power supply
Serial No.: HW Ver. 1.0.1	- Transmitting continuously
Applicant: VEGA Grieshaber KG	Polarisation: vertical
	Distance: 0.5 m
	Noise-measurement without correction factors

Ref.Level 42 dB $\mu$ V  
5 dB/Div.

ATT 0 dB



Start 26.500 GHz  
RBW 1 MHz

VBW 1 MHz

Stop 40.000 GHz  
SWP 60 ms

Tested by: M. Steindl	Project-No.: 20029-01719-3
Date: 2010-03-11	Page of pages

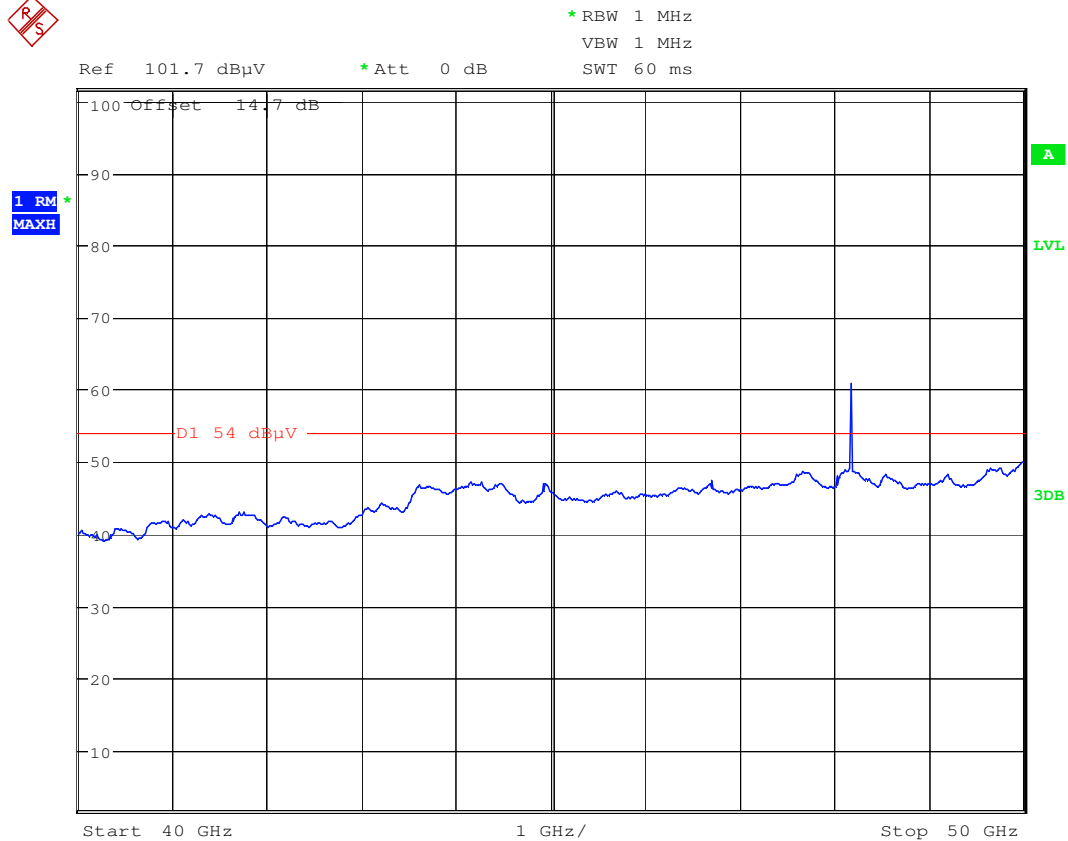
## Prüfmuster: MP60U.-02

### 10. Plot: Übersicht 40-50 GHz

Messung mit Korrekturfaktor für 45 GHz (Messabstand 37.5 cm)

Messwerte umgerechnet auf Messung in 3m Entfernung

Detector: Average



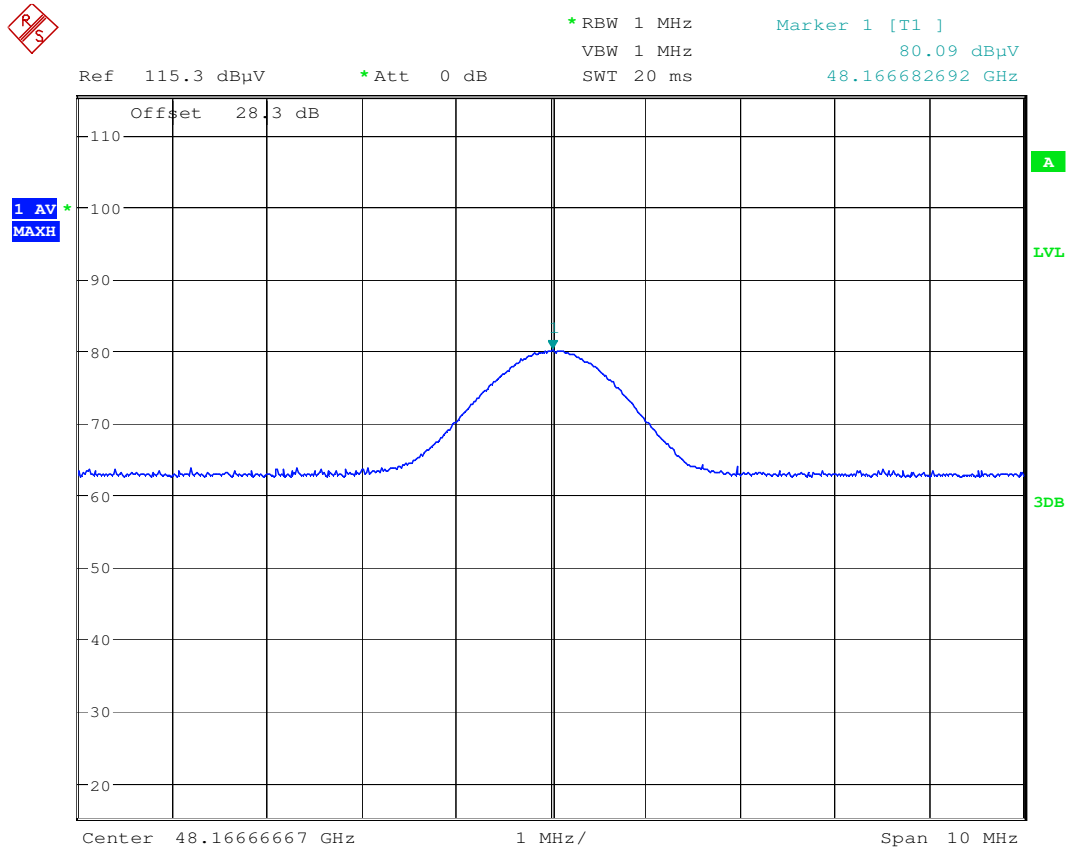
Date: 8.APR.2010 13:38:38

### 11. Plot: Oberwelle bei 48 GHz

Detailmessung mit Korrekturfaktor für 48 GHz (Messabstand 75 cm)

Messwerte umgerechnet auf Messung in 3m Entfernung

Detector: Average



Date: 8.APR.2010 13:32:48

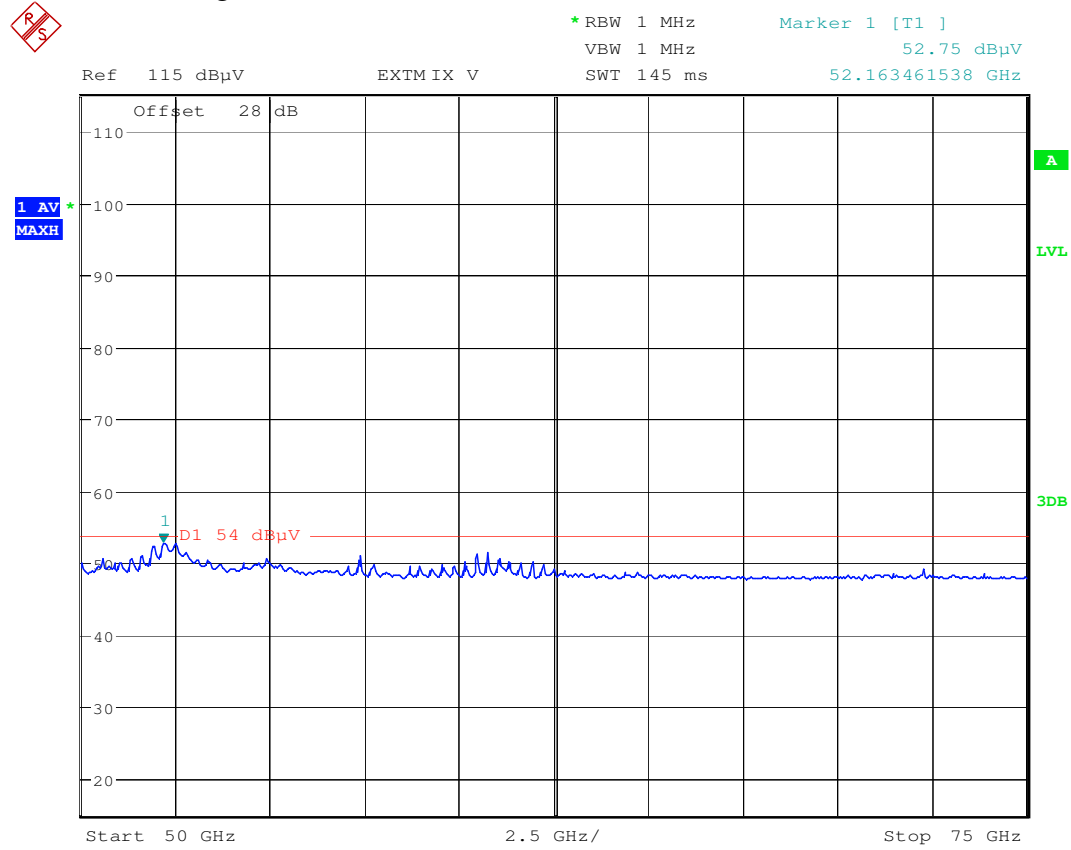
Feldstärke der Oberwelle bei 48.167 GHz: 80.09 dBμV/m in 3m Entfernung

## 12. Plot: Übersicht 50-75 GHz

Messung mit Korrekturfaktor für 62.5 GHz (Messabstand 37.5 cm)

Messwerte umgerechnet auf Messung in 3m Entfernung

Detector: Average



Date: 8.APR.2010 10:45:53

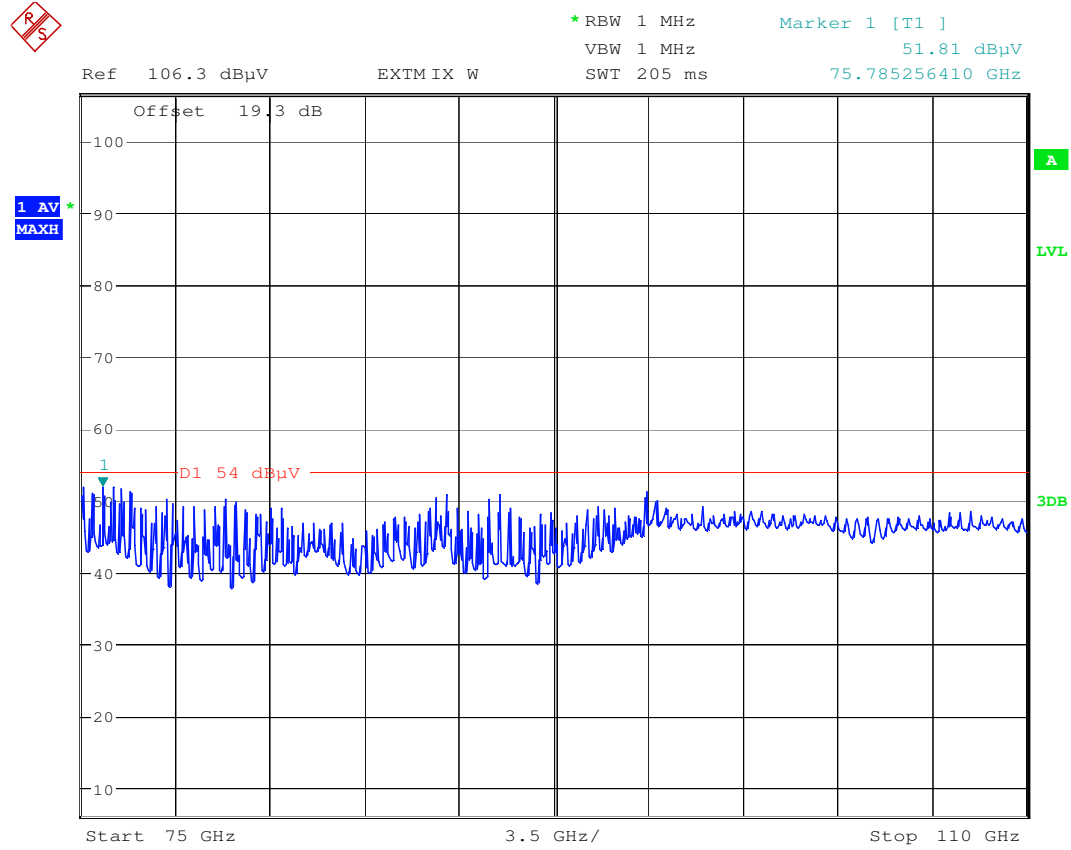


### 13. Plot: Übersicht 75-110 GHz

Messung mit Korrekturfaktor für 92.5 GHz (Messabstand 10 cm)

Messwerte umgerechnet auf Messung in 3m Entfernung

Detector: Average



Date: 8.APR.2010 11:33:47