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Juli 15, 2010

## Prüfbericht / Test Report

Nr. / No. 20029-01719-1 (Edition 2)

Applicant: VEGA Grieshaber KG  
Type of equipment: Microwave Sensor  
Type designation: VEGAMIP 60 MP60T.-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 MP60T.-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 DN80, antenna gain: 22 dBi   |
| 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<br>minimum voltage: 20 V<br>maximum voltage: 253 V                           |
| Specifications for DC power supply:     | nominal frequency: 60 Hz<br>nominal voltage: 24 V<br>minimum voltage: 20 V<br>maximum voltage: 72 V |

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

## 2 Administrative Data

### Application details

|                           |   |
|---------------------------|---|
| Applicant (full address): | VEGA Grieshaber KG<br>Füllstand- und Druckmeßtechnik<br><br>Am Hohenstein 113<br>77761 Schiltach<br>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: | 20029-01719-1 |
| Edition:       | 2             |
| Issue date:    | July 15, 2010 |



### 3 Identification of the Test Laboratory

#### Details of the Test Laboratory

|                           |  |
|---------------------------|--|
| Company name:             | TÜV SÜD SENTON GmbH  |
| Address:                  | Aeussere Fruehlingstrasse 45<br>D-94315 Straubing<br>Germany |
| Laboratory accreditation: | DAR-Registration No. DAT-PL-171/94-03                        |
| Contact person:           | Mr. Johann Roidt   |
|                           | Phone: +49 9421 5522-0<br>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> |
|-------------|--------------------|-------------------------|-------------------------|---------------------|
| 1           | Horn antenna       | DN80                    |                         | Vega                |

### 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

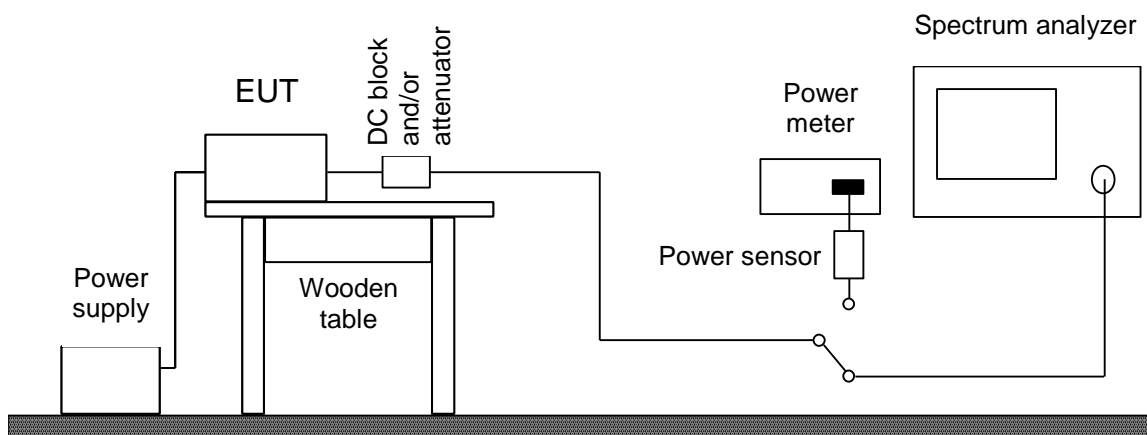
#### Measurement Procedure:

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).



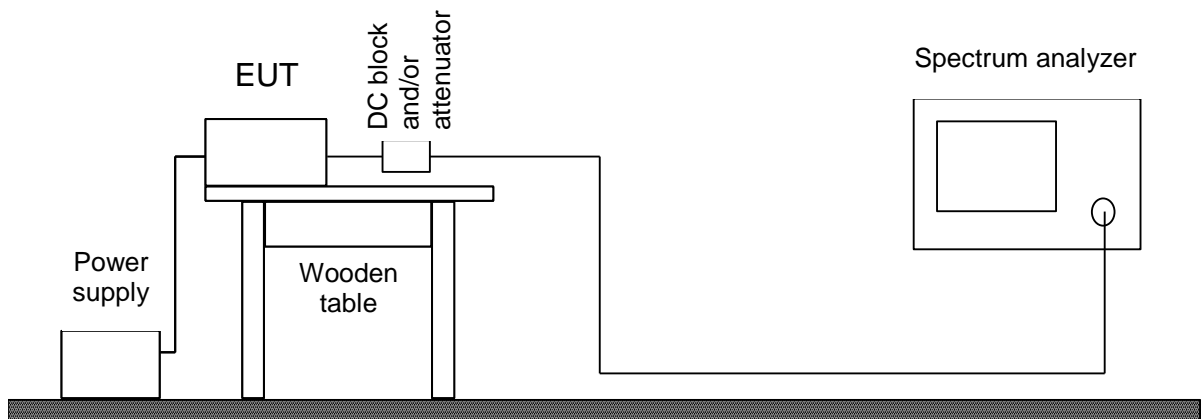


Test instruments used:

| 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<br>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)<br>CFR 47 Part 15, section 15.215(c)<br>IC RSS-Gen Issue 2, sections 4.6.1 and 4.6.2<br>IC RSS-210 Issue 7, section A1.1.3<br>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<br><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> |   |



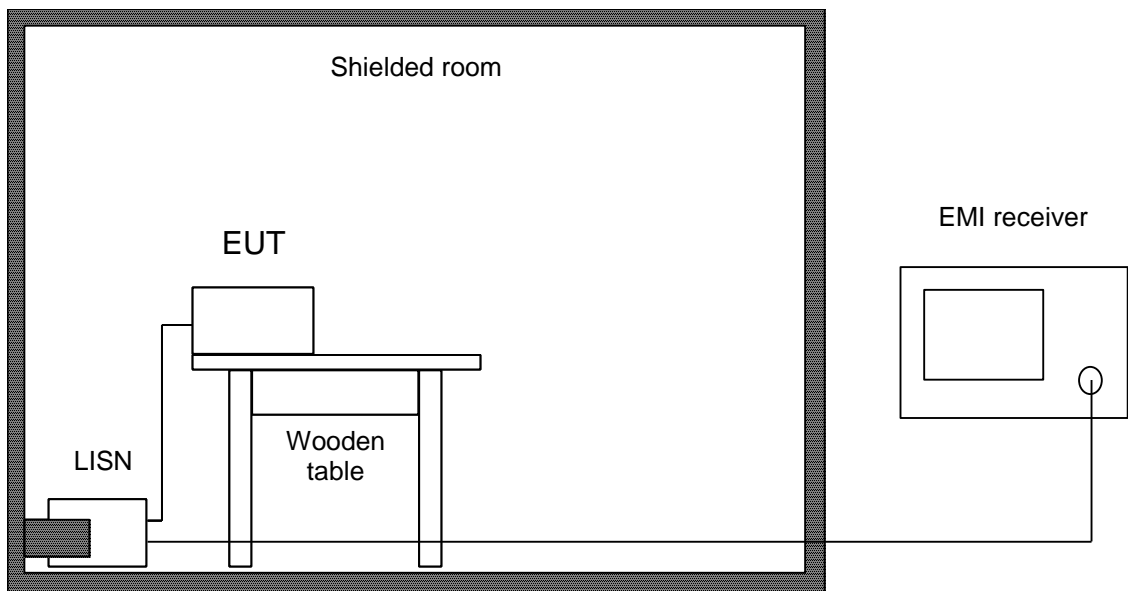


Test instruments used for conducted measurements:

| 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<br>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<br>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)<br>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.

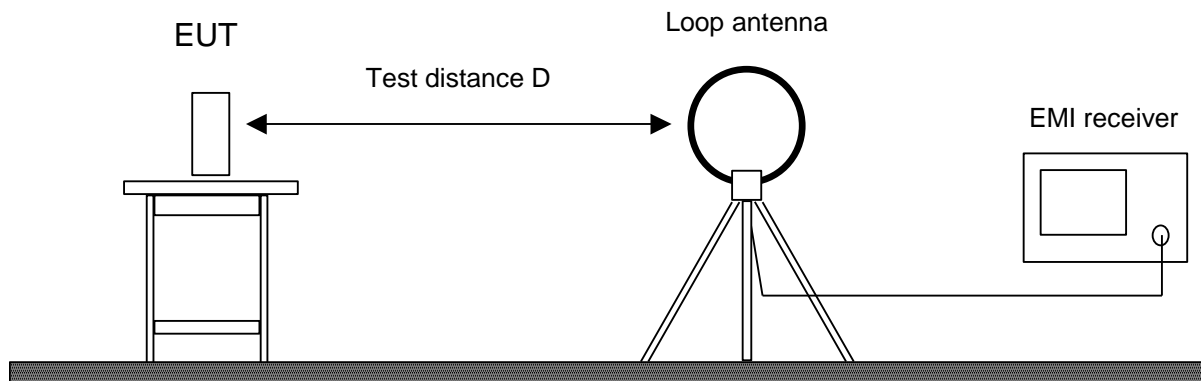
Hand-held or body-worn devices are rotated through three orthogonal axes to determine which attitude and configuration produces the highest emission relative to the limit and therefore shall be used for final testing.

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.





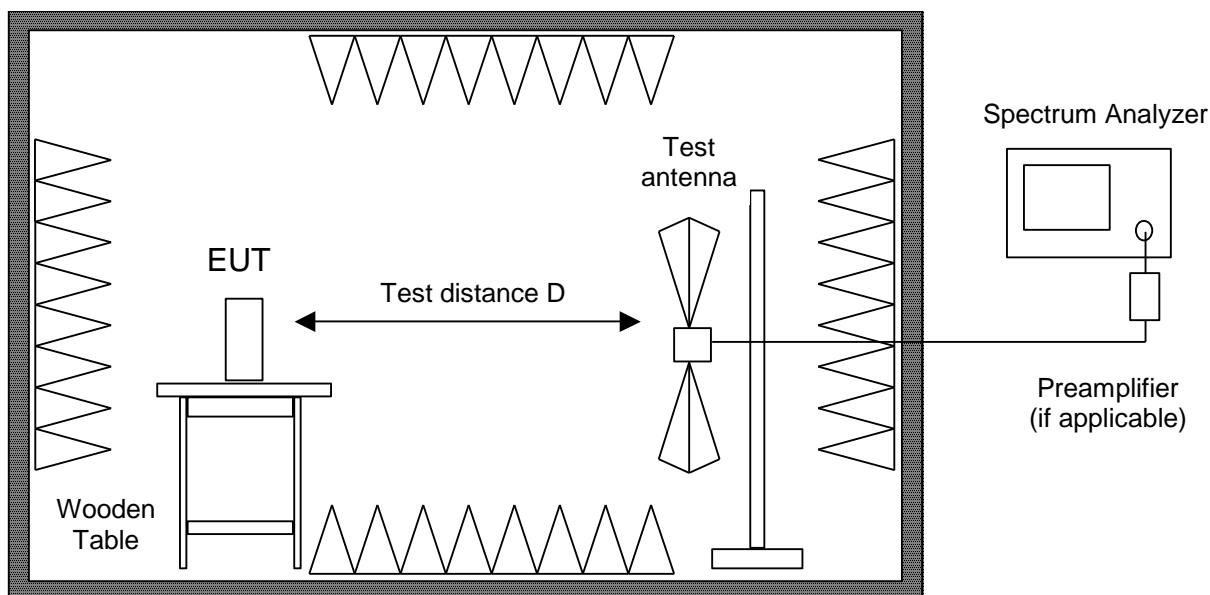
Test instruments used:

| 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<br>839587/006 | Rohde & Schwarz |
| <input type="checkbox"/> Test receiver                  | ESHS 10                 | 1028     | 860043/016               | Rohde & Schwarz |
| <input type="checkbox"/> Preamplifier                   | Cabin no. 2<br>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<br>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> |   |



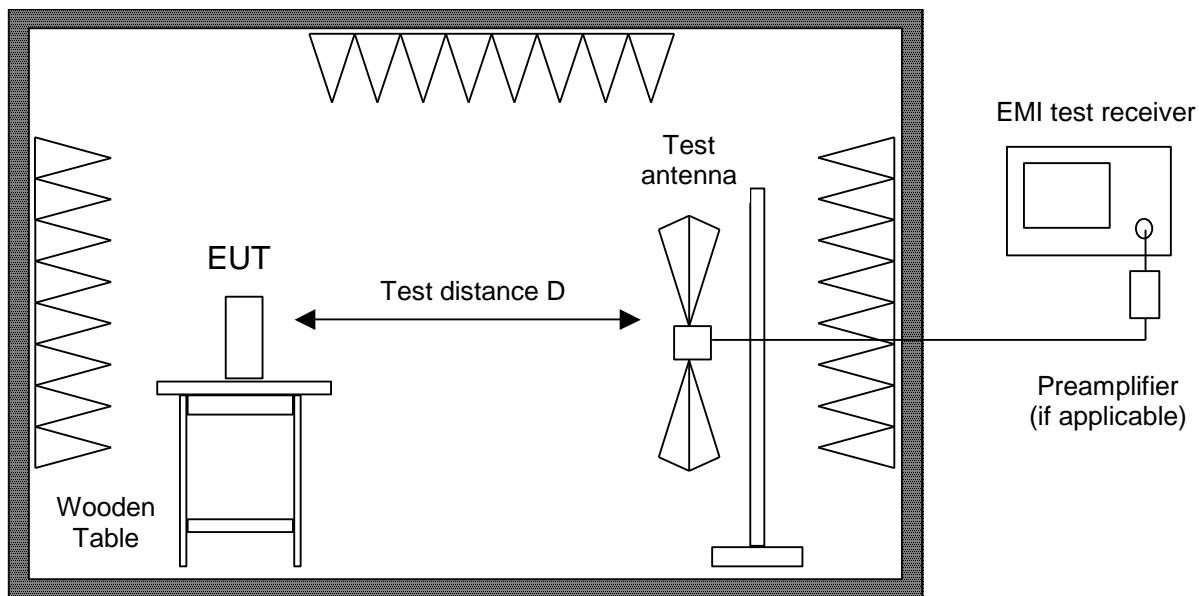
Fully or semi anechoic room

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<br>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<br>839587/006 | Rohde & Schwarz |
| <input checked="" type="checkbox"/> | Preamplifier               | Cabin no. 2<br>CPA9231A  | 1651     | 3393                     | Schaffner       |
| <input type="checkbox"/>            | Preamplifier               | R14601                   | 1142     | 13120026                 | Advantest       |
| <input type="checkbox"/>            | Preamplifier (1 - 8 GHz)   | AFS3-00100800-32-LN      | 1684     | 847743                   | Miteq           |
| <input checked="" type="checkbox"/> | Preamplifier (0.5 - 8 GHz) | AMF-4D-005080-25-13P     | 1685     | 860149                   | Miteq           |
| <input checked="" type="checkbox"/> | Preamplifier (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<br>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 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       |

## 6.6 Radiated Emission at Alternative Test Site

| Measurement Procedure:   |   |
|--|---|
| Rules and specifications:  | CFR 47 Part 15, sections 15.215(b) and 15.245<br>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<br>VULB 9163 | 1802     | 9163-214         | Schwarzbeck     |
| <input checked="" type="checkbox"/> Semi anechoic room | No. 8                    | 2057     | ---              | Albatross       |



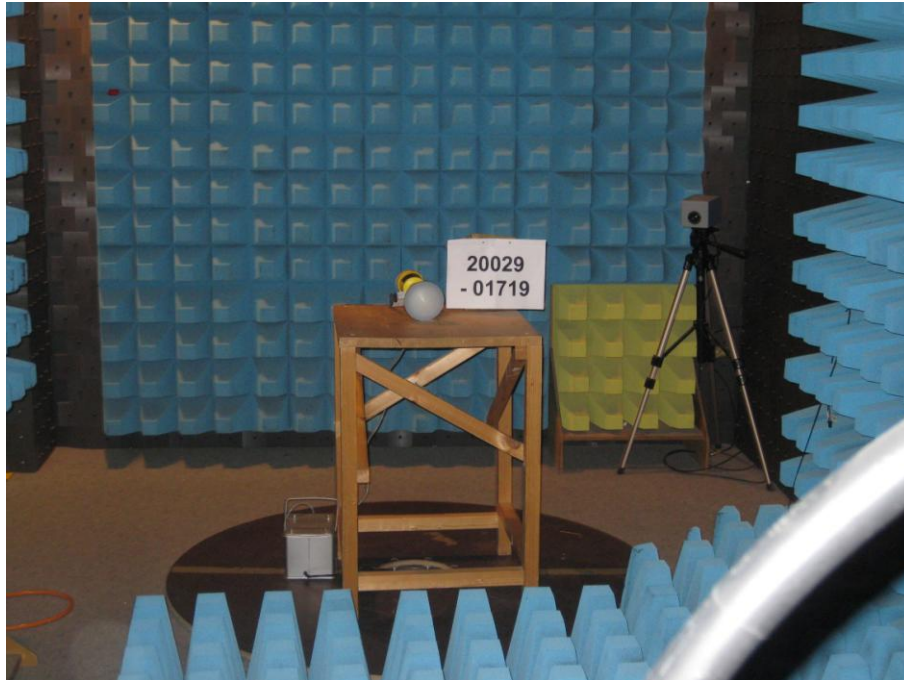
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## 7 Photographs Taken During Testing

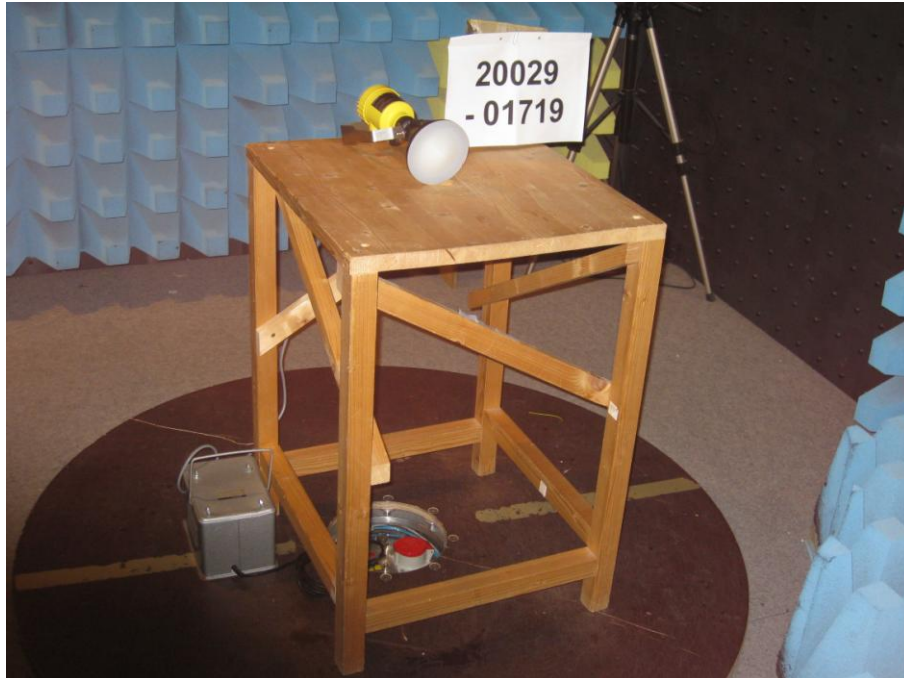
## Test setup for conducted AC powerline emission measurement



## 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<br>150 kHz to 30 MHz | 37               | Test passed    |
| 15.205(b)<br>15.245              | Radiated emission<br>9 kHz to 30 MHz                 | 40               | Test passed    |
| 15.205(b)<br>15.215(b)<br>15.245 | Radiated emission<br>30 MHz to 100 GHz               | 41               | 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<br>150 kHz to 30 MHz | 37          | Test passed                                 |
| 5.5                       | Exposure of Humans to RF Fields                                     | 43          | Exempted from<br>SAR and RF eval-<br>uation |

| <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<br>A7.3    | Unwanted emissions<br>9 kHz to 30 MHz              | 40               | Test passed   |
| 2.2(b)(c), 2.6<br>A7      | Unwanted emissions<br>30 MHz to 100 GHz            | 41               | 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)<br>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       | -5,9          | 0,0             | -5,9               |             |             |

- 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.

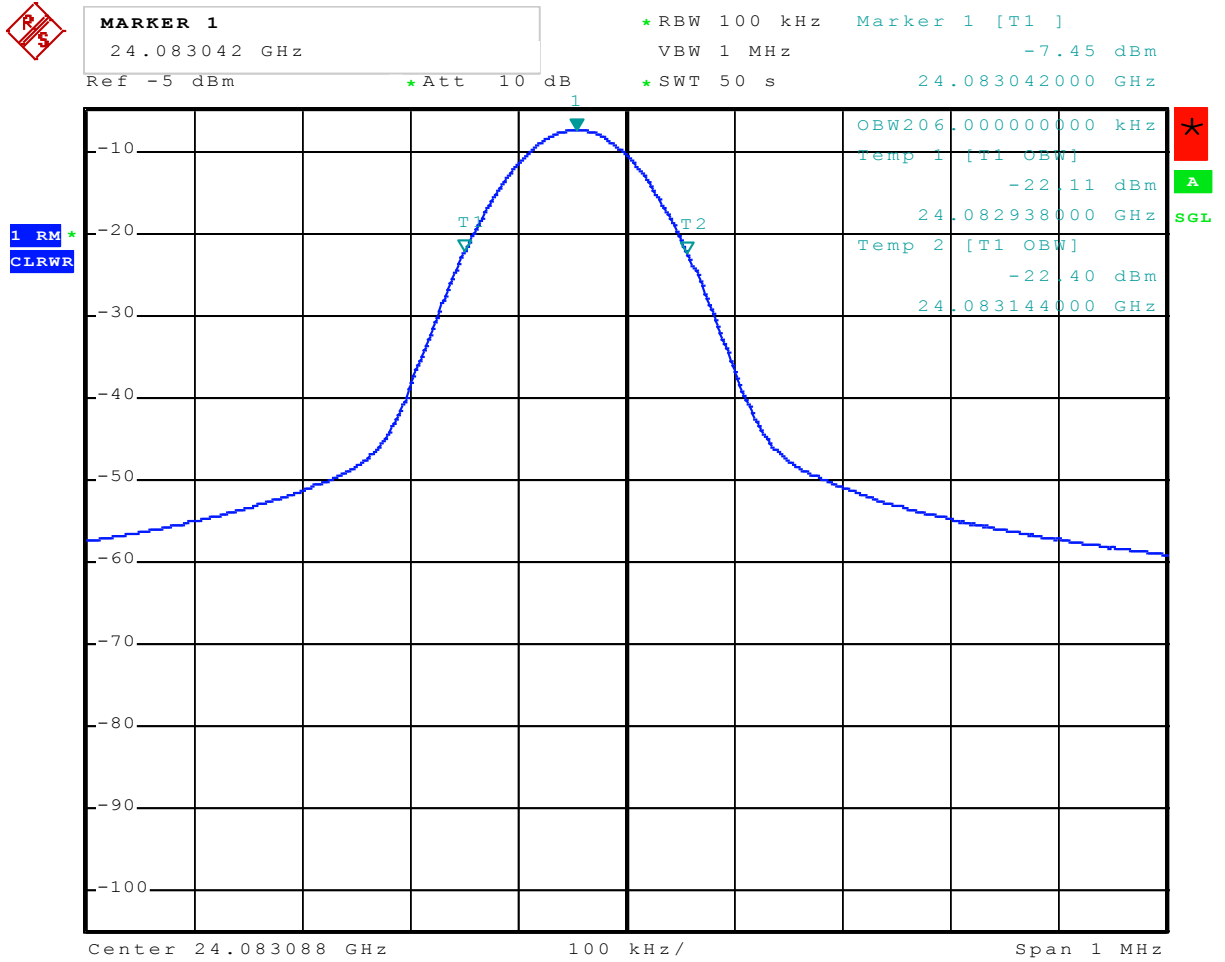


## 8.2 Occupied Bandwidth

|                           |  |                              |
|---------------------------|--|------------------------------|
| Rules and specifications: | CFR 47 Part 2, section 2.202(a)<br>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 16:54:22

Occupied Bandwidth (99 %): **206 kHz**



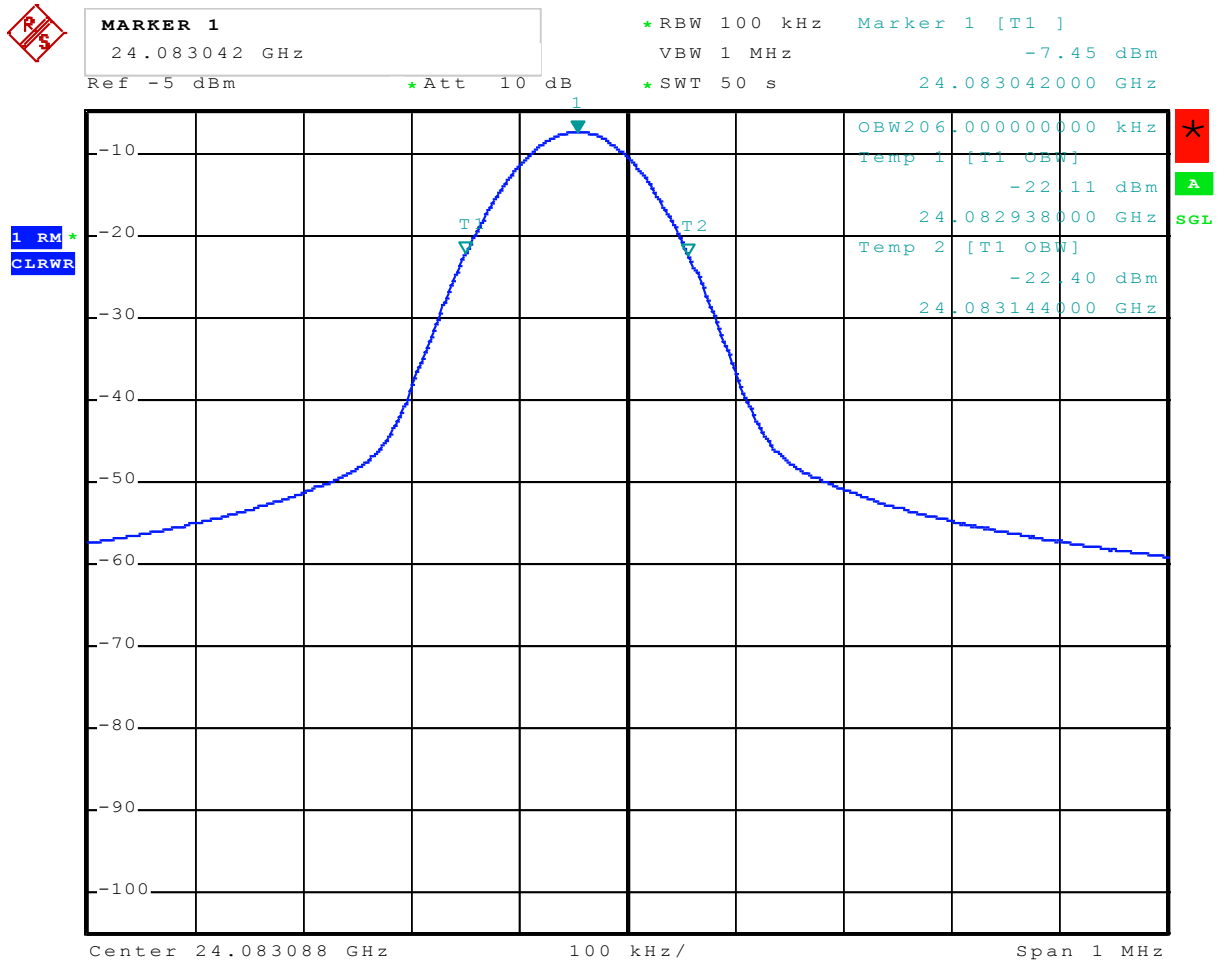
## Occupied Bandwidth (continued)

|                           |   |
|---------------------------|---|
| 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 %):**



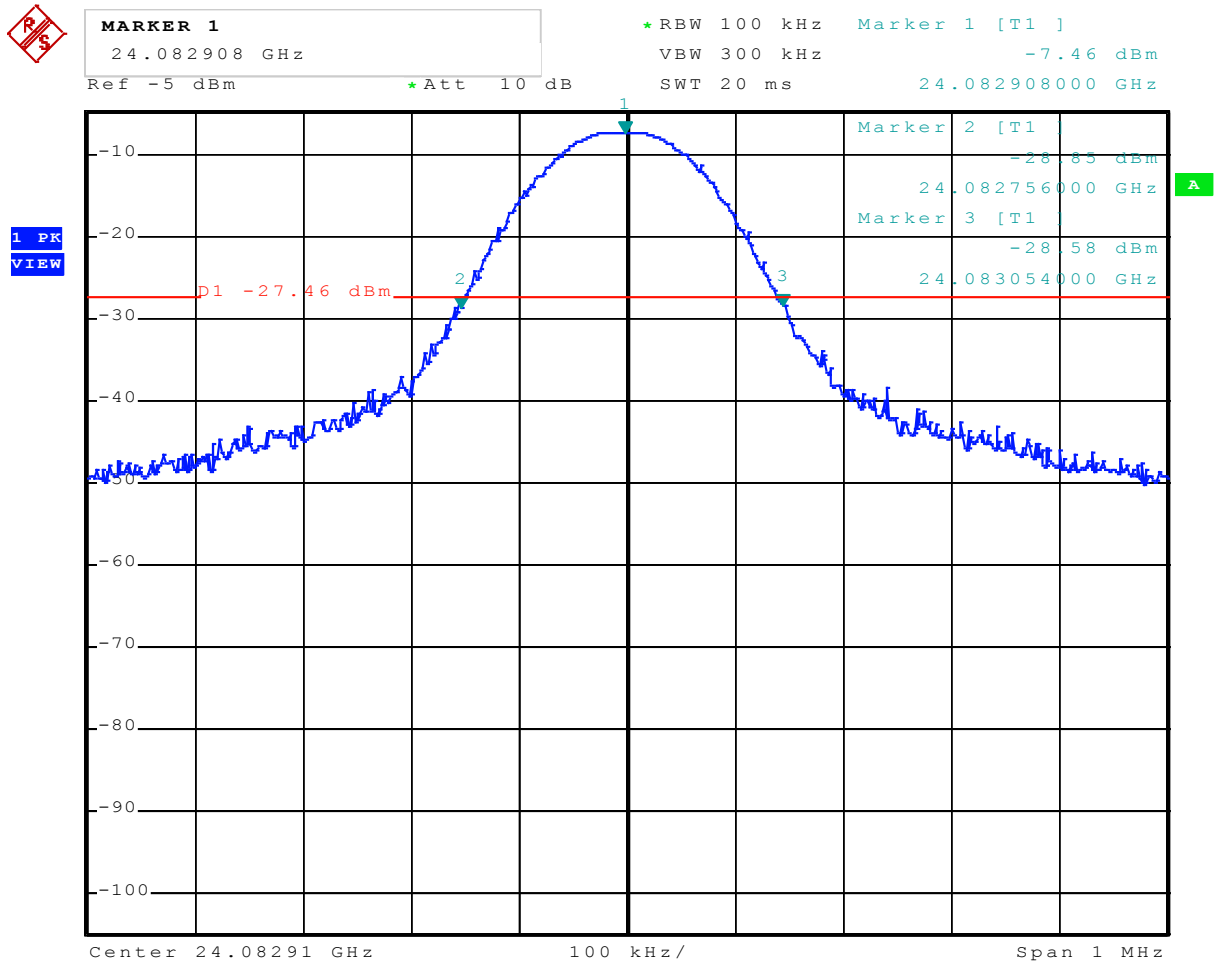
Date: 22.MAR.2010 16:54:22

Occupied Bandwidth (99 %): **206 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 16:56:49

|                               |                                    |  |
|-------------------------------|------------------------------------|--|
| 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><br><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<br>IC RSS-Gen Issue 2, sections 3.2(h) and 8 |
| Guide:                    | ANSI C63.4 / TRC-43  |

|                     |                          |
|---------------------|--------------------------|
| Type of modulation: | Continuous Wave Emission |
|---------------------|--------------------------|

|                           |            |
|---------------------------|------------|
| Designation of Emissions: | <b>NON</b> |
|---------------------------|------------|



## 8.5 Conducted Powerline Emission Measurement 150 kHz to 30 MHz

|                           |   |                                 |          |
|---------------------------|---|---------------------------------|----------|
| Rules and specifications: | CFR 47 Part 15, section 15.207<br>IC RSS-Gen Issue 2, section 7.2.2 |                                 |          |
| Guide:                    | ANSI C63.4 / CISPR 22   |                                 |          |
| Limit:                    | Frequency of Emission<br>(MHz)                                      | Conducted Limit<br>(dB $\mu$ V) |          |
|                           |   | 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<br>(MHz) | Detector   | Reading<br>Value<br>(dBµV) | Correction<br>Factor<br>(dB) | Final<br>Value<br>(dBµV) | Limit<br>(dBµV) | Margin<br>(dB) |
|--------------------|------------|----------------------------|------------------------------|--------------------------|-----------------|----------------|
| 0.175              | Quasi-Peak | 48.3                       | 0.0                          | 48.3                     | 64.7            | 16.4           |
| 0.215              | Quasi-Peak | 46.4                       | 0.0                          | 46.4                     | 63.0            | 16.6           |
| 0.240              | Quasi-Peak | 45.2                       | 0.0                          | 45.2                     | 62.1            | 16.9           |
| 0.325              | Quasi-Peak | 43.3                       | 0.0                          | 43.3                     | 59.6            | <b>16.3</b>    |
| 0.390              | Quasi-Peak | 38.4                       | 0.0                          | 38.4                     | 58.1            | 19.7           |
| 0.510              | Quasi-Peak | 36.7                       | 0.0                          | 36.7                     | 56.0            | 19.3           |
| 0.550              | Quasi-Peak | 34.4                       | 0.0                          | 34.4                     | 56.0            | 21.6           |
| 0.685              | Quasi-Peak | 32.7                       | 0.0                          | 32.7                     | 56.0            | 23.3           |
| 0.830              | Quasi-Peak | 31.8                       | 0.0                          | 31.8                     | 56.0            | 24.2           |
| 1.095              | Quasi-Peak | 29.8                       | 0.0                          | 29.8                     | 56.0            | 26.2           |
| 1.505              | Quasi-Peak | 32.4                       | 0.0                          | 32.4                     | 56.0            | 23.6           |
| 1.830              | Quasi-Peak | 31.2                       | 0.0                          | 31.2                     | 56.0            | 24.8           |
| 2.025              | Quasi-Peak | 32.1                       | 0.0                          | 32.1                     | 56.0            | 23.9           |
| 2.375              | Quasi-Peak | 31.8                       | 0.0                          | 31.8                     | 56.0            | 24.2           |
| 3.435              | Quasi-Peak | 31.1                       | 0.0                          | 31.1                     | 56.0            | 24.9           |
| 3.605              | Quasi-Peak | 30.7                       | 0.0                          | 30.7                     | 56.0            | 25.3           |
| 4.795              | Quasi-Peak | 27.2                       | 0.0                          | 27.2                     | 56.0            | 28.8           |
| 6.550              | Quasi-Peak | 38.8                       | 0.0                          | 38.8                     | 60.0            | 21.2           |
| 6.885              | Quasi-Peak | 33.7                       | 0.0                          | 33.7                     | 60.0            | 26.3           |
| 8.635              | Quasi-Peak | 29.2                       | 0.0                          | 29.2                     | 60.0            | 30.8           |



Tested on: N

| Frequency<br>(MHz) | Detector   | Reading<br>Value<br>(dBµV) | Correction<br>Factor<br>(dB) | Final<br>Value<br>(dBµV) | Limit<br>(dBµV) | Margin<br>(dB) |
|--------------------|------------|----------------------------|------------------------------|--------------------------|-----------------|----------------|
| 0.150              | Quasi-Peak | 49.2                       | 0.0                          | 49.2                     | 66.0            | <b>16.8</b>    |
| 0.190              | Quasi-Peak | 46.8                       | 0.0                          | 46.8                     | 64.0            | 17.2           |
| 0.240              | Quasi-Peak | 44.9                       | 0.0                          | 44.9                     | 62.1            | 17.2           |
| 0.320              | Quasi-Peak | 42.1                       | 0.0                          | 42.1                     | 59.7            | 17.6           |
| 0.360              | Quasi-Peak | 40.7                       | 0.0                          | 40.7                     | 58.7            | 18.0           |
| 0.445              | Quasi-Peak | 37.9                       | 0.0                          | 37.9                     | 57.0            | 19.1           |
| 0.610              | Quasi-Peak | 35.8                       | 0.0                          | 35.8                     | 56.0            | 20.2           |
| 0.675              | Quasi-Peak | 33.5                       | 0.0                          | 33.5                     | 56.0            | 22.5           |
| 0.955              | Quasi-Peak | 31.7                       | 0.0                          | 31.7                     | 56.0            | 24.3           |
| 1.135              | Quasi-Peak | 32.6                       | 0.0                          | 32.6                     | 56.0            | 23.4           |
| 1.305              | Quasi-Peak | 31.1                       | 0.0                          | 31.1                     | 56.0            | 24.9           |
| 1.840              | Quasi-Peak | 30.3                       | 0.0                          | 30.3                     | 56.0            | 25.7           |
| 2.040              | Quasi-Peak | 31.1                       | 0.0                          | 31.1                     | 56.0            | 24.9           |
| 2.700              | Quasi-Peak | 28.8                       | 0.0                          | 28.8                     | 56.0            | 27.2           |
| 3.105              | Quasi-Peak | 30.8                       | 0.0                          | 30.8                     | 56.0            | 25.2           |
| 4.270              | Quasi-Peak | 25.7                       | 0.0                          | 25.7                     | 56.0            | 30.3           |
| 4.695              | Quasi-Peak | 30.7                       | 0.0                          | 30.7                     | 56.0            | 25.3           |
| 6.460              | Quasi-Peak | 42.6                       | 0.0                          | 42.6                     | 60.0            | 17.4           |
| 6.885              | Quasi-Peak | 35.9                       | 0.0                          | 35.9                     | 60.0            | 24.1           |

**Sample calculation of final values:**

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

## 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)<br>IC RSS-210 Issue 7, section A7.3                   |  |   |                                    |
| Guide:                    | ANSI C63.4  |  |   |                                    |
| Limit:                    | Frequency of Emission<br>(MHz)  | Field Strength<br>( $\mu\text{V}/\text{m}$ ) | Field Strength<br>( $\text{dB}\mu\text{V}/\text{m}$ ) | Measurement Distance d<br>(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<br>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> <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.</p> <p>The emission limits shown above are based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emission apply.</p> |   |       |   |      |



|                            |  |                     |                              |
|----------------------------|--|---------------------|------------------------------|
| 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)<br>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<br>Frequencies $>$ 1 GHz: Fully anechoic room, cabin no. 2<br>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 |
|--------------|-------------|

| 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        |
| 24082.220       | vertical             | Average    | 74.6  | 43.0                                |                             | 117.6                                    | 137.5                              | 20.0        |
| 24091.667       | vertical             | Peak       | 75.4  | 43.0                                |                             | 118.4                                    | 137.5                              | 19.2        |

**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> $CP = 257 \mu W$ <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> $EIRP = G \cdot CP \Rightarrow EIRP = 40.74 mW$ <p><input checked="" type="checkbox"/> the field strength<sup>8</sup> in V/m: <math>FS = 831.76 mV/m</math></p> $EIRP = \frac{(FS \cdot D)^2}{30} \Rightarrow EIRP = 23.06 mW$ <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> $TP = 40.74 mW$  |            |                                     |                                     |                                     |

<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.



## 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<br>(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       | First Edition  |
| 2                | 15.07.2010  | C. Jäger         | Edition 2<br>Modification required for FCC-IC-Certification<br>Antenna gain informationen included |



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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 MP60T.-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

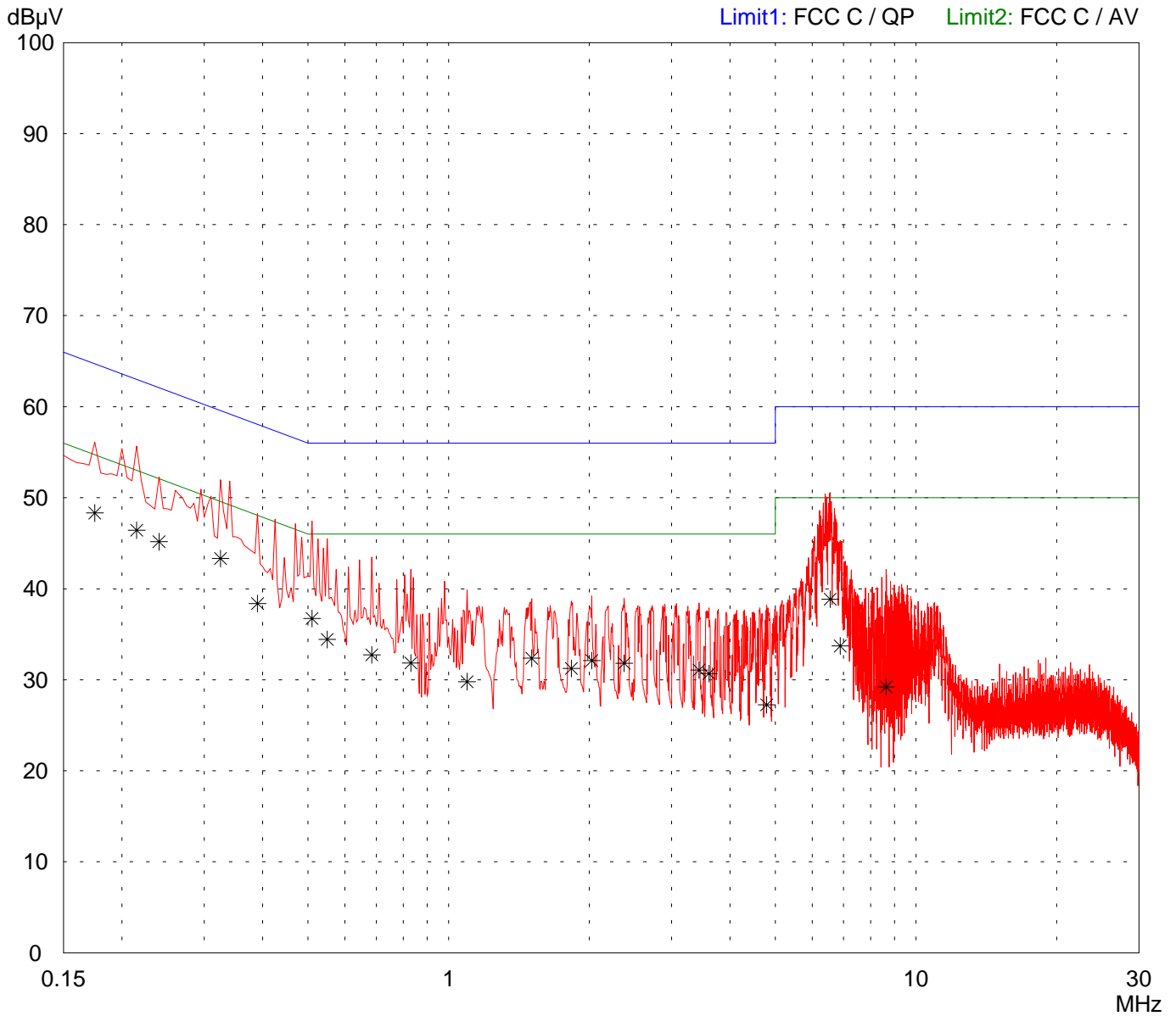
Date of test: 03/10/2010      Operator: M. Steindl

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



Result:  
Limit kept

Project file:  
20029-01719-1      Page      of      Pages



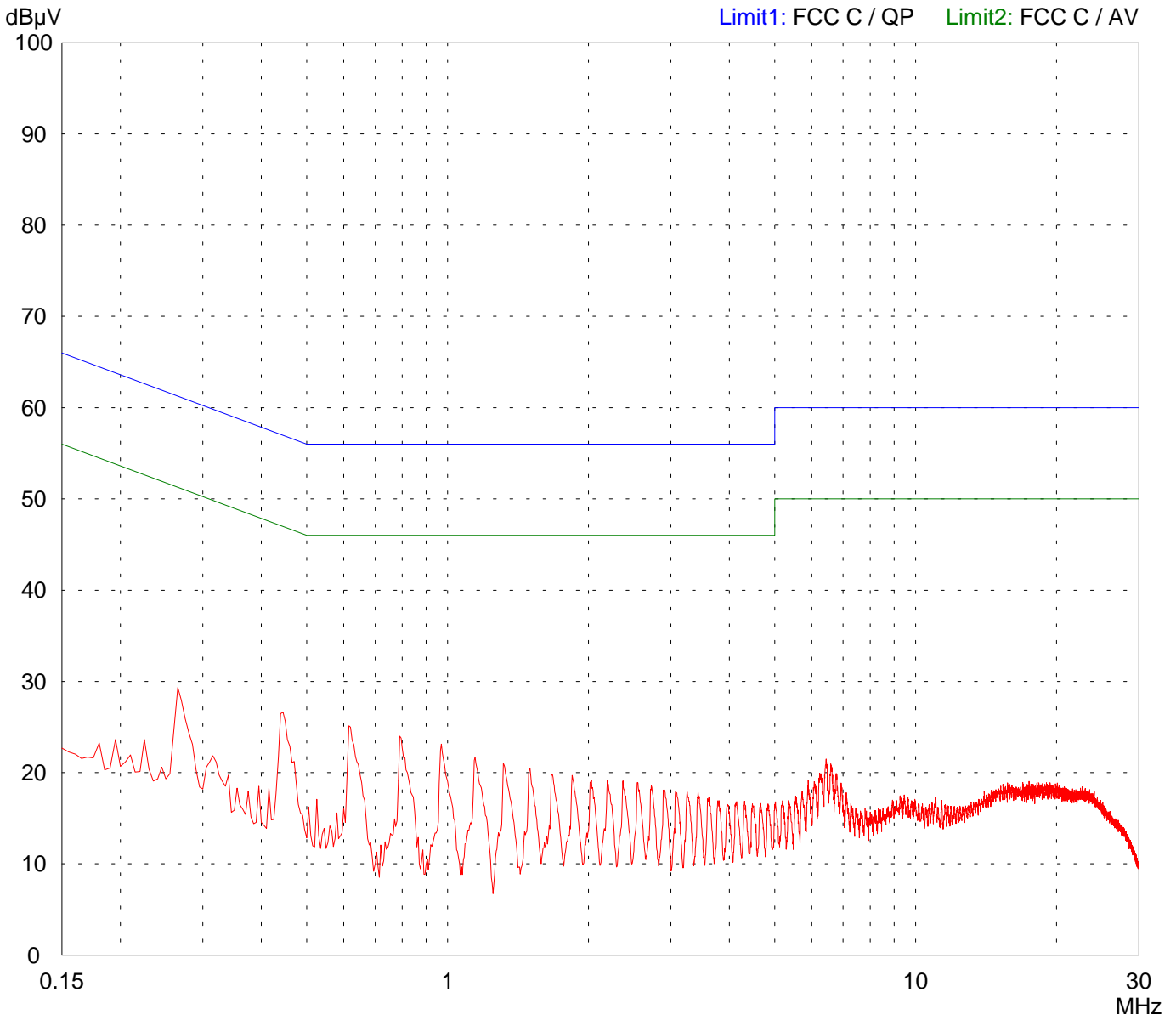
# Conducted Emission Test 150 kHz - 30 MHz according to FCC Part 15 Subpart C

|   |                         |
|---|-------------------------|
| Model:<br>VEGAMIP MP60T.-02                 |                         |
| Serial no.:<br>HW Ver. 1.0.1                |                         |
| Applicant:<br>VEGA Grieshaber KG            |                         |
| Test site:<br>Shielded room, cabin no. 4    |                         |
| Tested on:<br>Linecord AC 115 V<br>Phase L1 |                         |
| Date of test:<br>03/10/2010                 | Operator:<br>M. Steindl |
| Test performed:<br>automatically            | File name:              |

|   |
|---|
| Mode:<br><br>- AC 115 V power supply<br>- Transmitting continuously |
|---|

|  |
|--|
| Detector:<br>Average / Final Results: AV |
|--|

|                                |              |
|--------------------------------|--------------|
| Final results:<br>20 dB Margin | 25 Subranges |
|--------------------------------|--------------|



|                       |
|-----------------------|
| Result:<br>Limit kept |
|-----------------------|

|                                |               |
|--------------------------------|---------------|
| Project file:<br>20029-01719-1 | Page of Pages |
|--------------------------------|---------------|

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

Model:  
VEGAMIP MP60T.-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

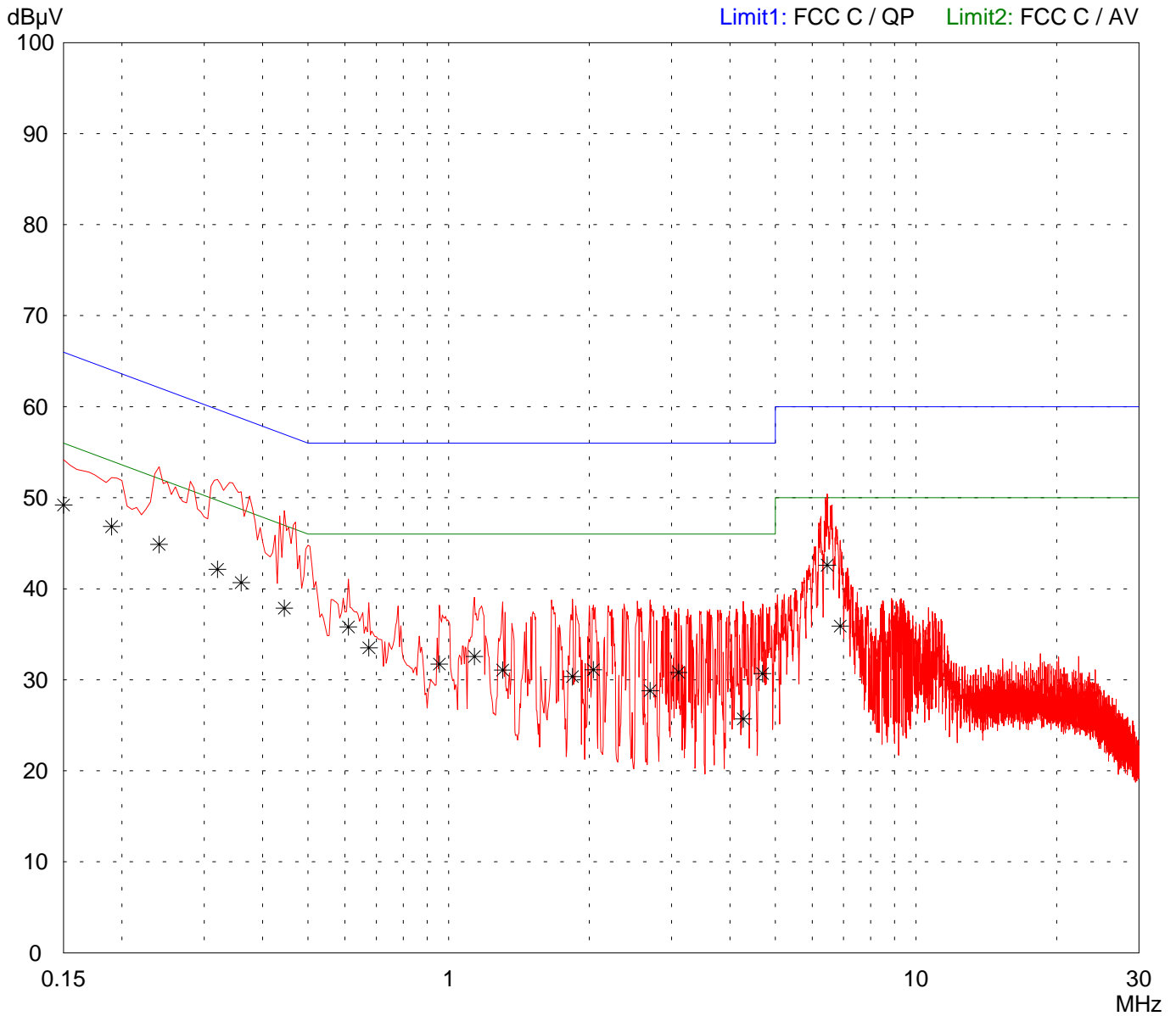
Date of test: 03/10/2010      Operator: M. Steindl

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:  
20029-01719-1                      Page      of      Pages

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

Model:  
VEGAMIP MP60T.-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

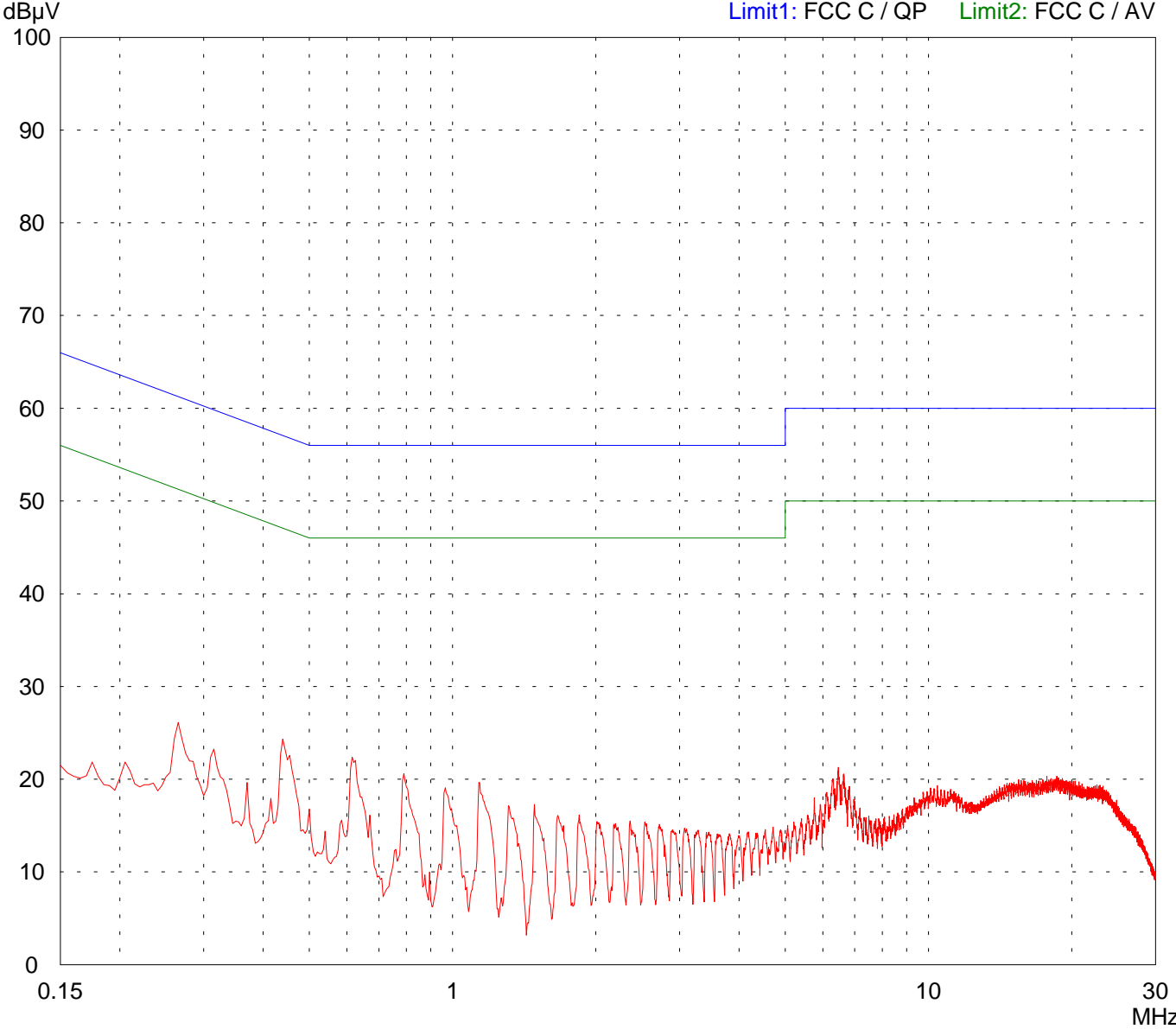
Date of test: 03/10/2010      Operator: M. Steindl

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:  
20029-01719-1      Page      of      Pages

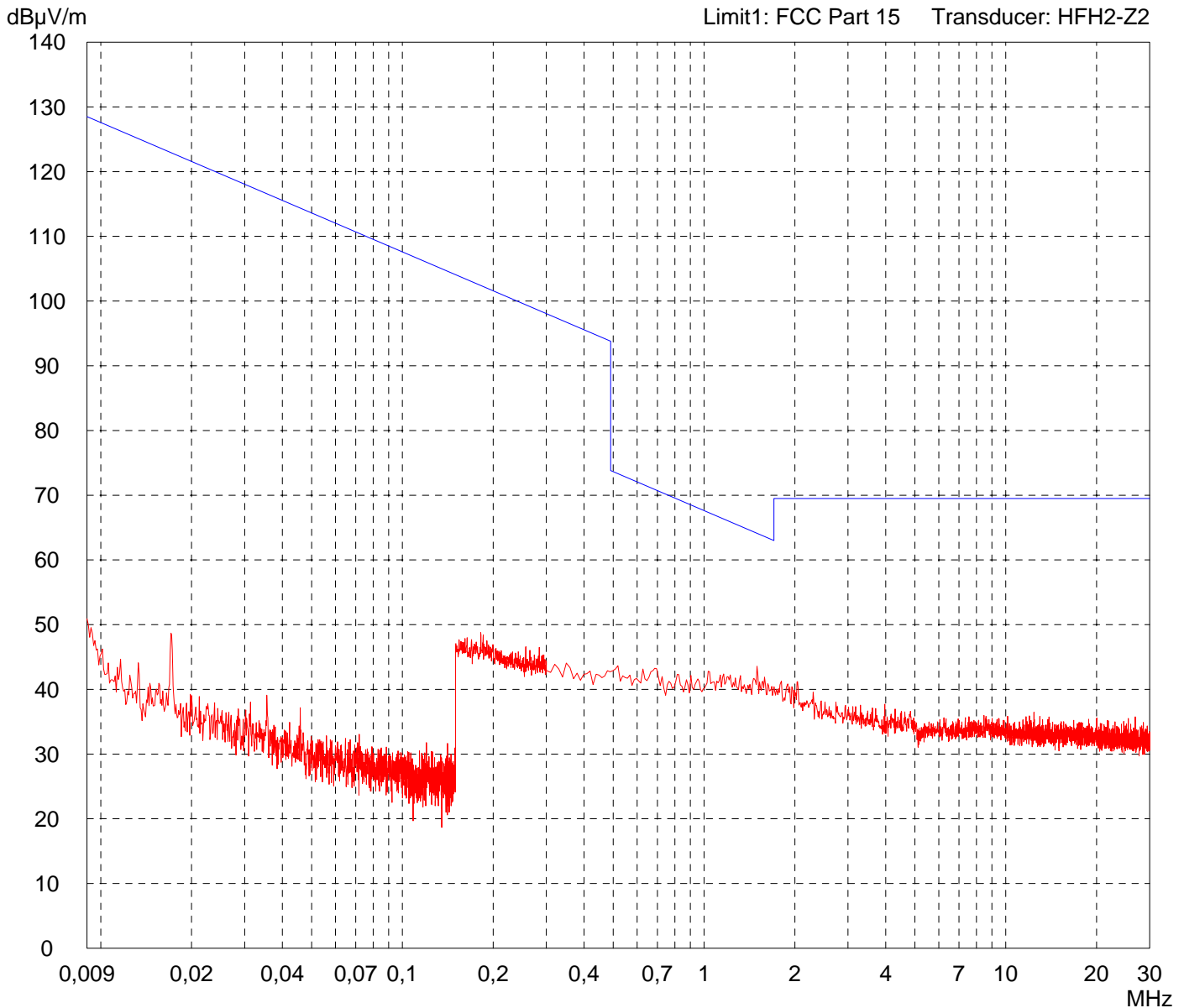
# Radiated Emission Test 9 kHz - 30 MHz acc. to FCC Part 15 Subpart C (FAR)

|  |                           |
|--|---------------------------|
| Model:<br>VEGAMIP MP60T.-02                    |                           |
| Serial no.:<br>HW Ver. 1.0.1                   |                           |
| Applicant:<br>VEGA Grieshaber KG               |                           |
| Test site:<br>Fully anechoic room, cabin no. 2 |                           |
| Tested on:<br>Test distance 3 metres           |                           |
| Date of test:<br>03/04/2010                    | Operator:<br>M. Steindl   |
| Test performed:<br>by hand                     | File name:<br>default.emi |

|  |  |
|--|--|
| Comment:<br><br>- 115 V AC supply<br>- Transmitting continuously |  |
|--|--|

|                   |
|-------------------|
| Detector:<br>Peak |
|-------------------|

|                                 |              |
|---------------------------------|--------------|
| List of values:<br>10 dB Margin | 50 Subranges |
|---------------------------------|--------------|



|                    |
|--------------------|
| Result:<br>Prescan |
|--------------------|

|                                |                     |
|--------------------------------|---------------------|
| Project file:<br>20029-01719-1 | Page    of    Pages |
|--------------------------------|---------------------|

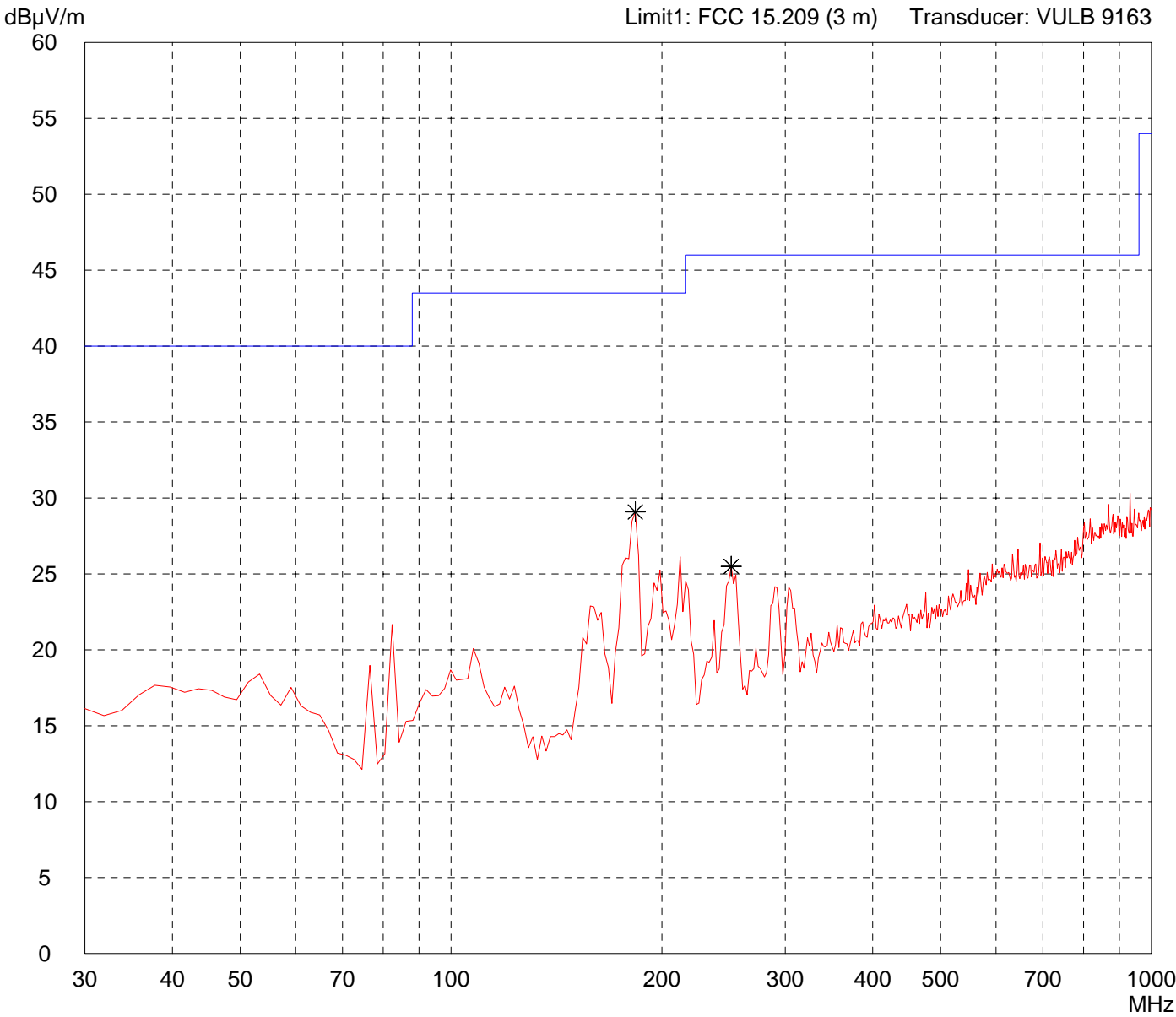
# Radiated Emission Test 30 MHz - 1 GHz acc. to FCC Part 15 Subpart C (FAR)

|   |                           |
|---|---------------------------|
| Model:<br>VEGAMIP MP60T.-02                                     |                           |
| Serial no.:<br>HW Ver. 1.0.1                                    |                           |
| Applicant:<br>VEGA Grieshaber KG                                |                           |
| Test site:<br>Fully anechoic room, cabin no. 2                  |                           |
| Tested on:<br>Test distance 3 metres<br>Horizontal Polarization |                           |
| Date of test:<br>03/04/2010                                     | Operator:<br>M. Steindl   |
| Test performed:<br>automatically                                | File name:<br>default.emi |

|  |
|--|
| Comment:<br><br>- 115 V AC supply<br>- Transmitting continuously |
|--|

|                   |
|-------------------|
| Detector:<br>Peak |
|-------------------|

|                                     |
|-------------------------------------|
| List of values:<br>Selected by hand |
|-------------------------------------|



|                    |
|--------------------|
| Result:<br>Prescan |
|--------------------|

|                                |                     |
|--------------------------------|---------------------|
| Project file:<br>20029-01719-1 | Page    of    Pages |
|--------------------------------|---------------------|

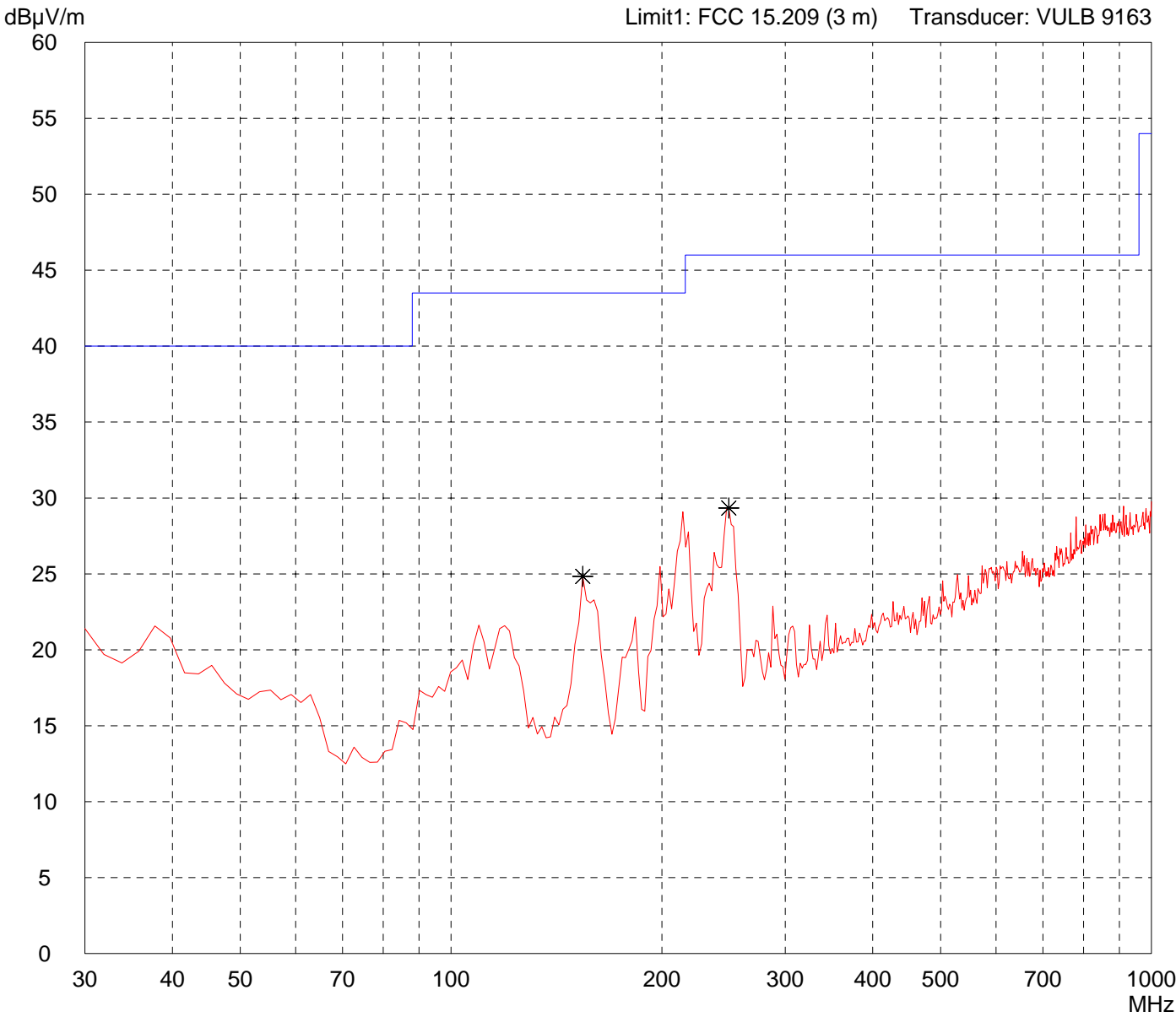
# Radiated Emission Test 30 MHz - 1 GHz acc. to FCC Part 15 Subpart C (FAR)

|   |                           |
|---|---------------------------|
| Model:<br>VEGAMIP MP60T.-02                                   |                           |
| Serial no.:<br>HW Ver. 1.0.1                                  |                           |
| Applicant:<br>VEGA Grieshaber KG                              |                           |
| Test site:<br>Fully anechoic room, cabin no. 2                |                           |
| Tested on:<br>Test distance 3 metres<br>Vertical Polarization |                           |
| Date of test:<br>03/04/2010                                   | Operator:<br>M. Steindl   |
| Test performed:<br>automatically                              | File name:<br>default.emi |

|  |
|--|
| Comment:<br><br>- 115 V AC supply<br>- Transmitting continuously |
|--|

|                   |
|-------------------|
| Detector:<br>Peak |
|-------------------|

|                                     |
|-------------------------------------|
| List of values:<br>Selected by hand |
|-------------------------------------|



|                    |
|--------------------|
| Result:<br>Prescan |
|--------------------|

|                                |                     |
|--------------------------------|---------------------|
| Project file:<br>20029-01719-1 | Page    of    Pages |
|--------------------------------|---------------------|

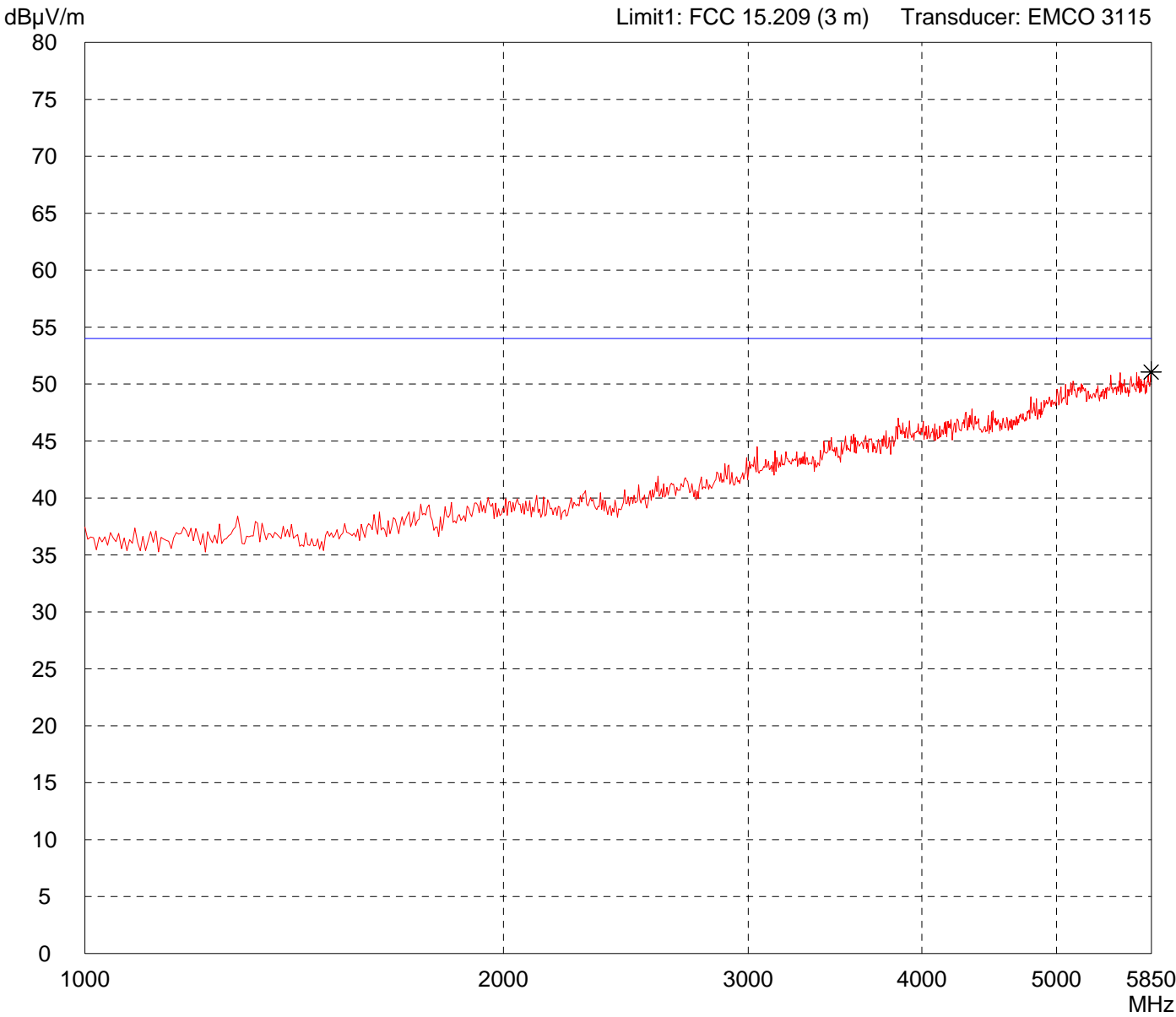
# Radiated Emission Test 1 GHz - 5,85 GHz acc. to FCC Part 15 Subpart C (FAR)

|   |                           |
|---|---------------------------|
| Model:<br>VEGAMIP MP60T.-02                                     |                           |
| Serial no.:<br>HW Ver. 1.0.1                                    |                           |
| Applicant:<br>VEGA Grieshaber KG                                |                           |
| Test site:<br>Fully anechoic room, cabin no. 2                  |                           |
| Tested on:<br>Test distance 3 metres<br>Horizontal Polarization |                           |
| Date of test:<br>03/02/2010                                     | Operator:<br>M. Steindl   |
| Test performed:<br>automatically                                | File name:<br>default.emi |

|  |
|--|
| Comment:<br><br>- 115 V AC supply<br><br>- Transmitting continuously |
|--|

|                   |
|-------------------|
| Detector:<br>Peak |
|-------------------|

|                                     |
|-------------------------------------|
| List of values:<br>Selected by hand |
|-------------------------------------|



|                    |
|--------------------|
| Result:<br>Prescan |
|--------------------|

|                                |                     |
|--------------------------------|---------------------|
| Project file:<br>20029-01719-1 | Page    of    Pages |
|--------------------------------|---------------------|

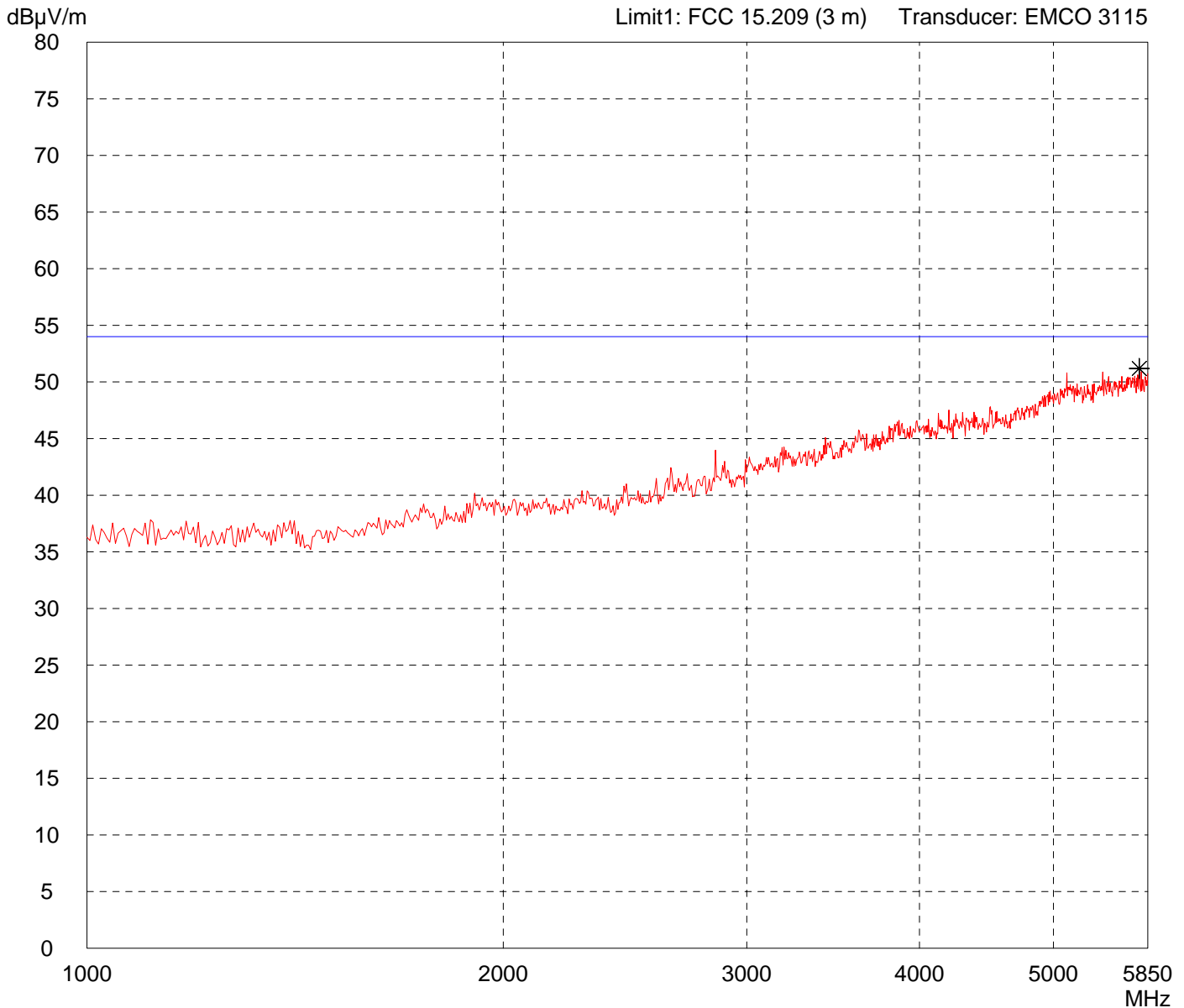
# Radiated Emission Test 1 GHz - 5,85 GHz acc. to FCC Part 15 Subpart C (FAR)

|   |                           |
|---|---------------------------|
| Model:<br>VEGAMIP MP60T.-02                                   |                           |
| Serial no.:<br>HW Ver. 1.0.1                                  |                           |
| Applicant:<br>VEGA Grieshaber KG                              |                           |
| Test site:<br>Fully anechoic room, cabin no. 2                |                           |
| Tested on:<br>Test distance 3 metres<br>Vertical Polarization |                           |
| Date of test:<br>03/02/2010                                   | Operator:<br>M. Steindl   |
| Test performed:<br>automatically                              | File name:<br>default.emi |

|  |
|--|
| Comment:<br><br>- 115 V AC supply<br><br>- Transmitting continuously |
|--|

|                   |
|-------------------|
| Detector:<br>Peak |
|-------------------|

|                                     |
|-------------------------------------|
| List of values:<br>Selected by hand |
|-------------------------------------|



|                    |
|--------------------|
| Result:<br>Prescan |
|--------------------|

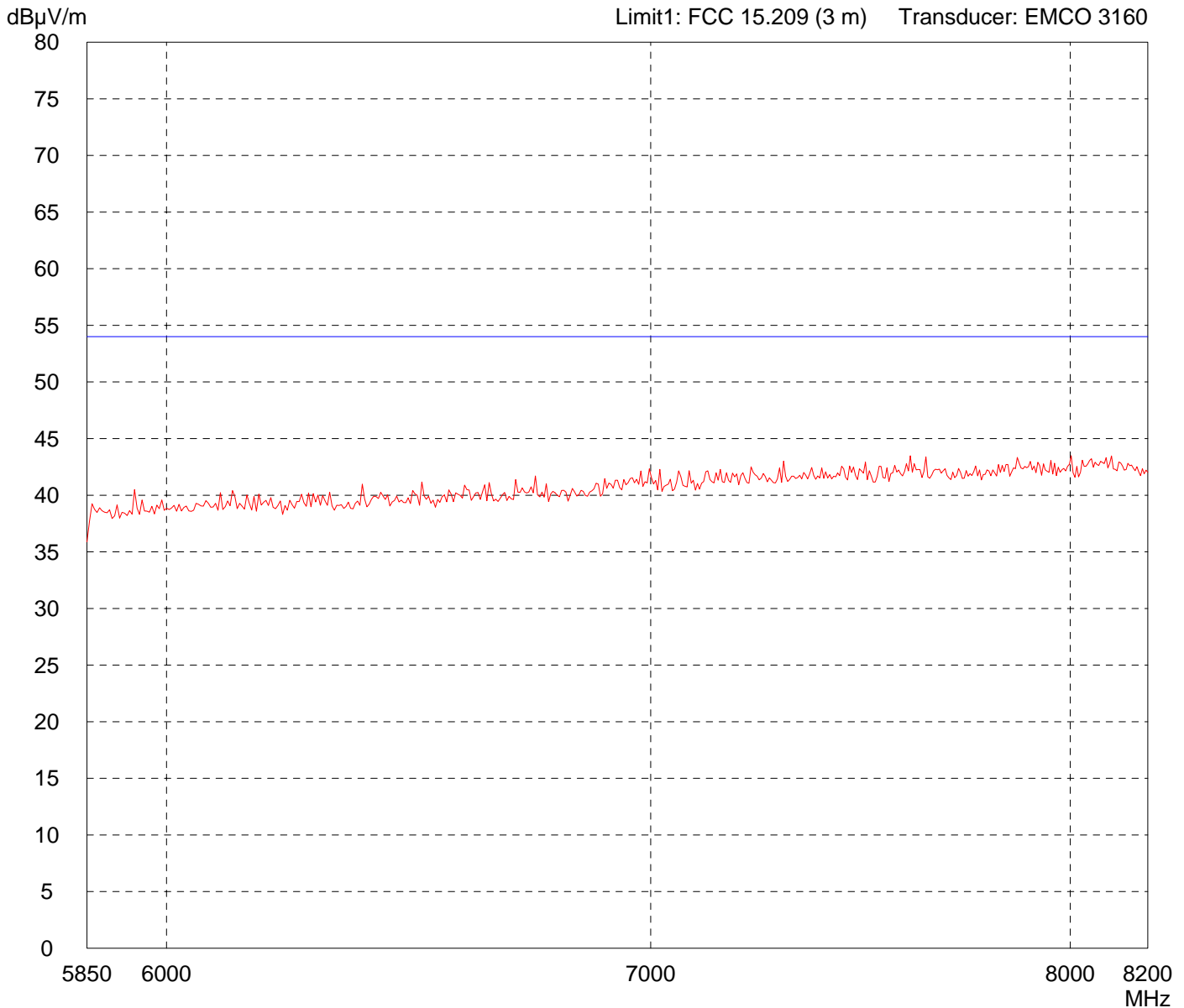
|                                |                     |
|--------------------------------|---------------------|
| Project file:<br>20029-01719-1 | Page    of    Pages |
|--------------------------------|---------------------|



# Radiated Emission Test 5,85 GHz - 8,2 GHz acc. to FCC Part 15 Subpart C (FAR)

|  |  |
|--|--|
| <p>Model:<br/>VEGAMIP MP60T.-02</p> <p>Serial no.:<br/>HW Ver. 1.0.1</p> <p>Applicant:<br/>VEGA Grieshaber KG</p> <p>Test site:<br/>Fully anechoic room, cabin no. 2</p> <p>Tested on:<br/>Test distance 3 metres<br/>Horizontal Polarization</p> <p>Date of test: 03/02/2010      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:<br/>Peak</p> | <p>List of values:<br/>10 dB Margin                      50 Subranges</p> |
|---------------------------|---|

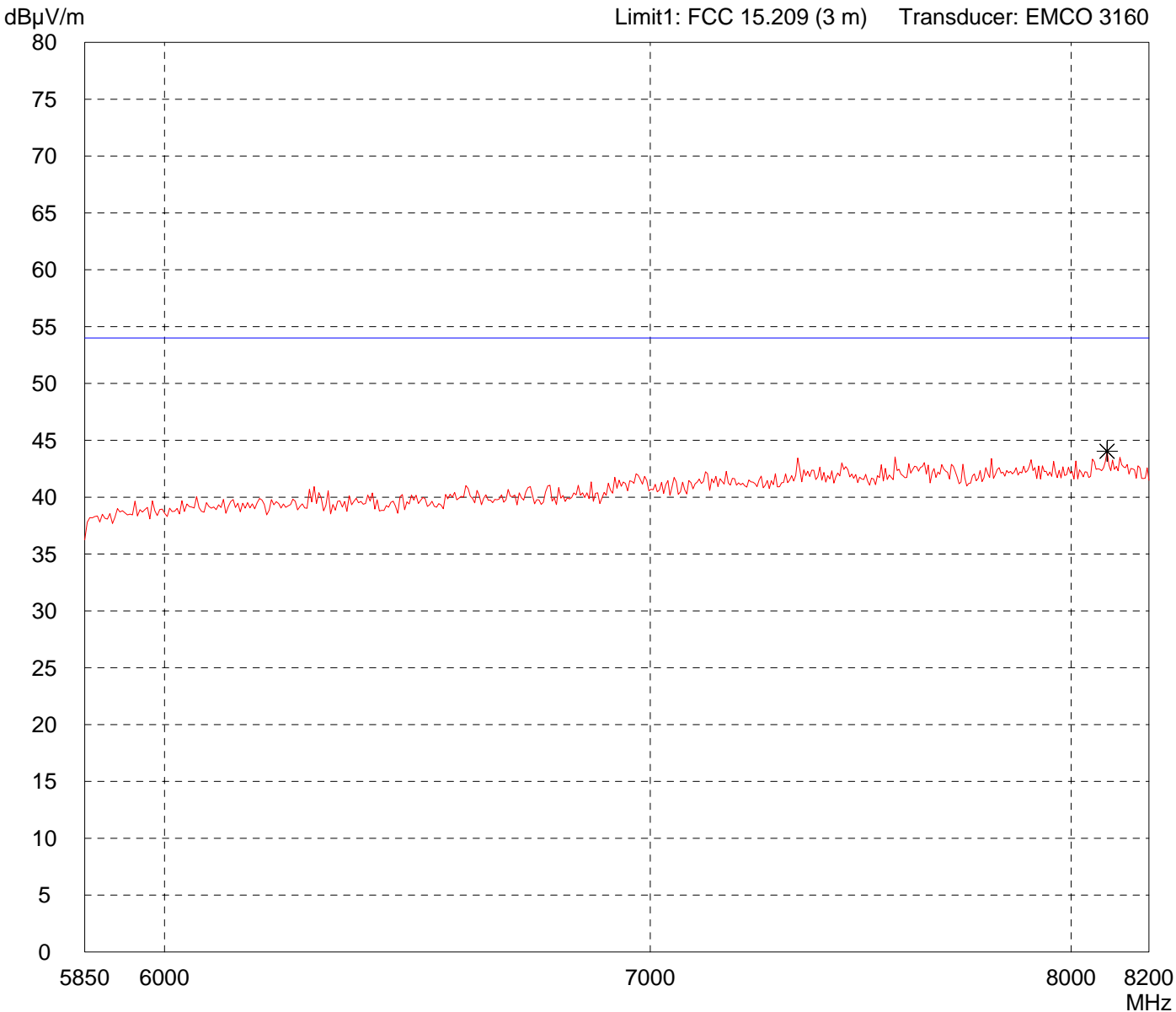


|                            |  |
|----------------------------|--|
| <p>Result:<br/>Prescan</p> | <p>Project file:<br/>20029-01719-1</p> <p style="text-align: right;">Page      of      Pages</p> |
|----------------------------|--|

# Radiated Emission Test 5,85 GHz - 8,2 GHz acc. to FCC Part 15 Subpart C (FAR)

|   |  |
|---|--|
| Model:<br><b>VEGAMIP MP60T.-02</b>                                    | Comment:<br><br>- 115 V AC supply<br><br>- Transmitting continuously |
| Serial no.:<br><b>HW Ver. 1.0.1</b>                                   |  |
| Applicant:<br><b>VEGA Grieshaber KG</b>                               |  |
| Test site:<br><b>Fully anechoic room, cabin no. 2</b>                 |  |
| Tested on:<br><b>Test distance 3 metres<br/>Vertical Polarization</b> |  |
| Date of test: <b>03/02/2010</b> Operator: <b>M. Steindl</b>           |  |
| Test performed: <b>automatically</b> File name: <b>default.emi</b>    |  |

|                          |  |
|--------------------------|--|
| Detector:<br><b>Peak</b> | List of values:<br><b>10 dB Margin</b> <b>50 Subranges</b> |
|--------------------------|--|

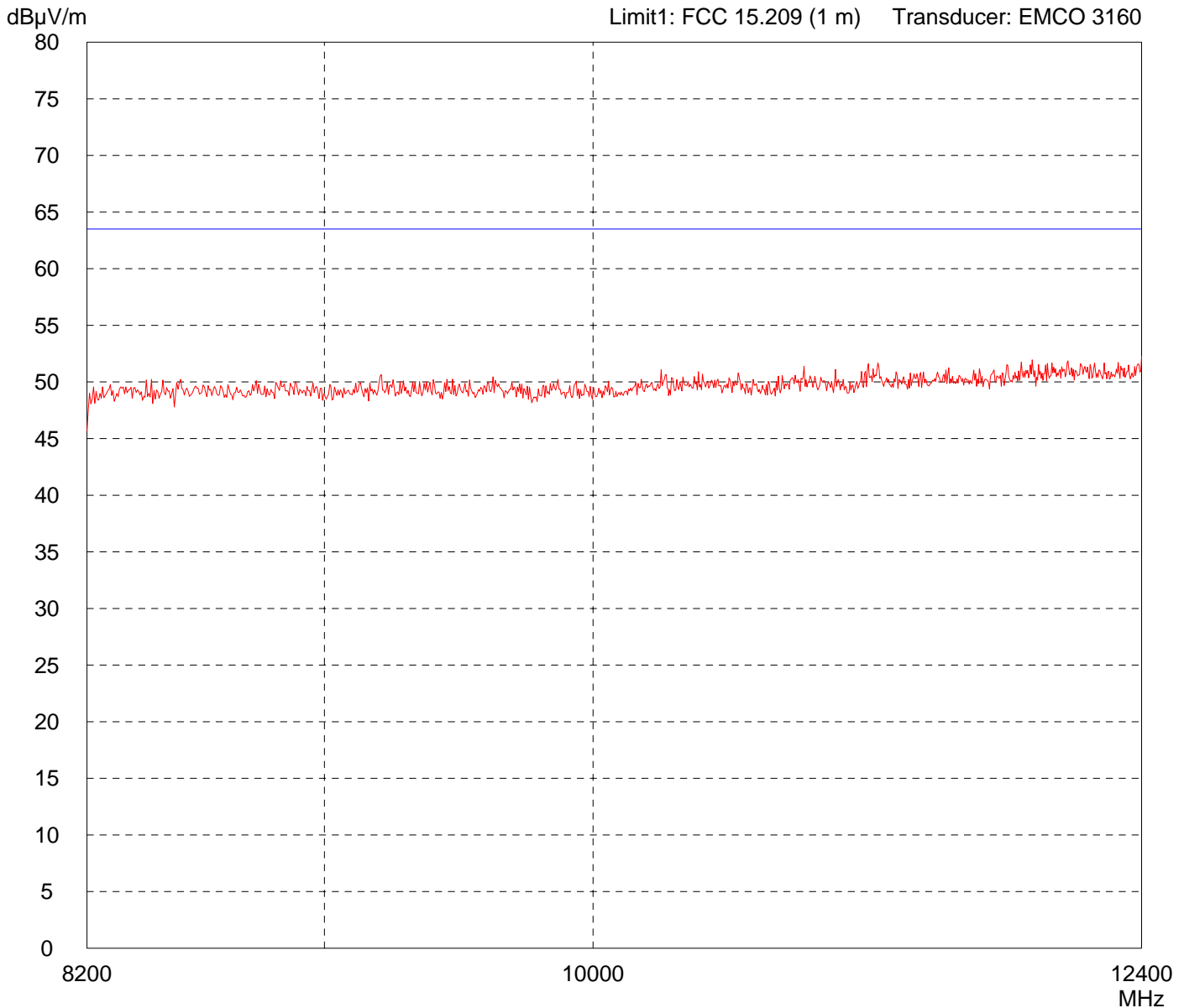


|                           |                                       |
|---------------------------|---------------------------------------|
| Result:<br><b>Prescan</b> | Project file:<br><b>20029-01719-1</b> |
| Page      of      Pages   |                                       |

# Radiated Emission Test 8,2 GHz - 12,4 GHz acc. to FCC Part 15 Subpart C (FAR)

|   |  |
|---|--|
| <p>Model:<br/>VEGAMIP MP60T.-02</p> <p>Serial no.:<br/>HW Ver. 1.0.1</p> <p>Applicant:<br/>VEGA Grieshaber KG</p> <p>Test site:<br/>Fully anechoic room, cabin no. 2</p> <p>Tested on:<br/>Test distance 1 meter<br/>Horizontal Polarization</p> <p>Date of test: 03/02/2010      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:<br/>Peak</p> | <p>List of values:<br/>10 dB Margin                      50 Subranges</p> |
|---------------------------|---|

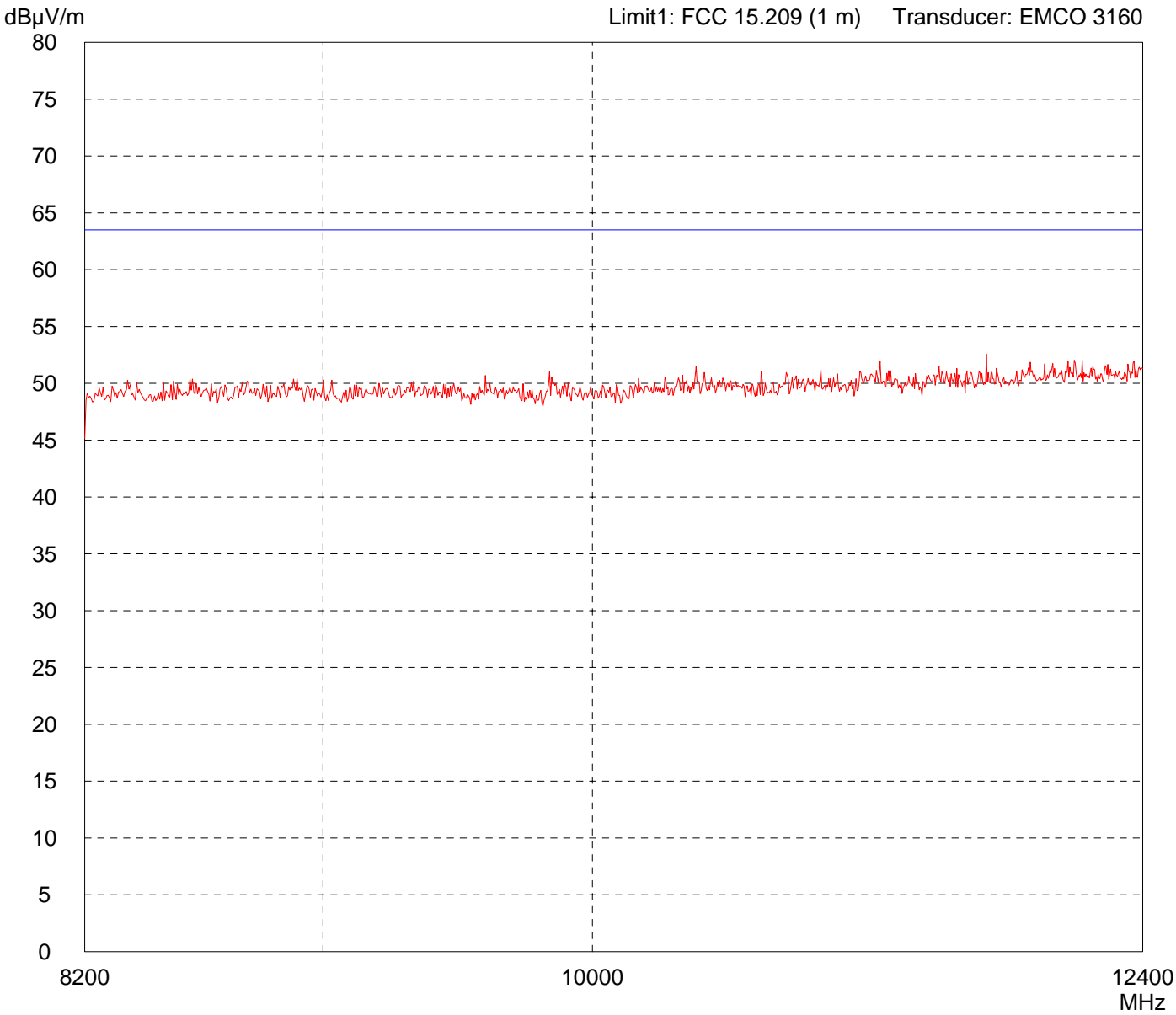


|                            |  |
|----------------------------|--|
| <p>Result:<br/>Prescan</p> | <p>Project file:<br/>20029-01719-1</p> <p style="text-align: right;">Page      of      Pages</p> |
|----------------------------|--|

# Radiated Emission Test 8,2 GHz - 12,4 GHz acc. to FCC Part 15 Subpart C (FAR)

|   |  |
|---|--|
| <p>Model:<br/>VEGAMIP MP60T.-02</p> <p>Serial no.:<br/>HW Ver. 1.0.1</p> <p>Applicant:<br/>VEGA Grieshaber KG</p> <p>Test site:<br/>Fully anechoic room, cabin no. 2</p> <p>Tested on:<br/>Test distance 1 meter<br/>Vertical Polarization</p> <p>Date of test: 03/02/2010      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:<br/>Peak</p> | <p>List of values:<br/>10 dB Margin                      50 Subranges</p> |
|---------------------------|---|

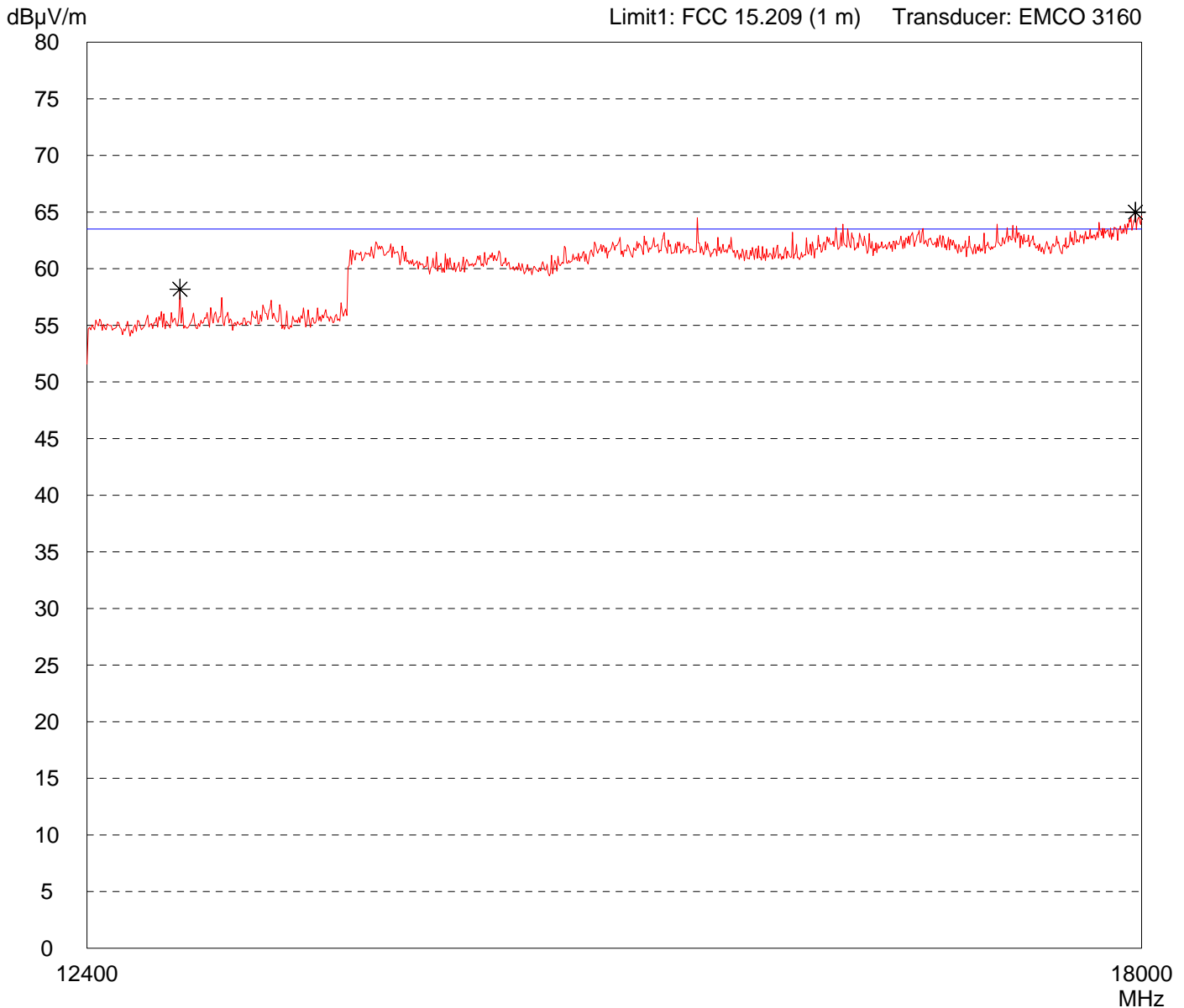


|                            |  |
|----------------------------|--|
| <p>Result:<br/>Prescan</p> | <p>Project file:<br/>20029-01719-1</p> <p style="text-align: right;">Page      of      Pages</p> |
|----------------------------|--|

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

|   |  |
|---|--|
| <p>Model:<br/>VEGAMIP MP60T.-02</p> <p>Serial no.:<br/>HW Ver. 1.0.1</p> <p>Applicant:<br/>VEGA Grieshaber KG</p> <p>Test site:<br/>Fully anechoic room, cabin no. 2</p> <p>Tested on:<br/>Test distance 1 meter<br/>Horizontal Polarization</p> <p>Date of test: 03/02/2010      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:<br/>Peak</p> | <p>List of values:<br/>Selected by hand</p> |
|---------------------------|---|

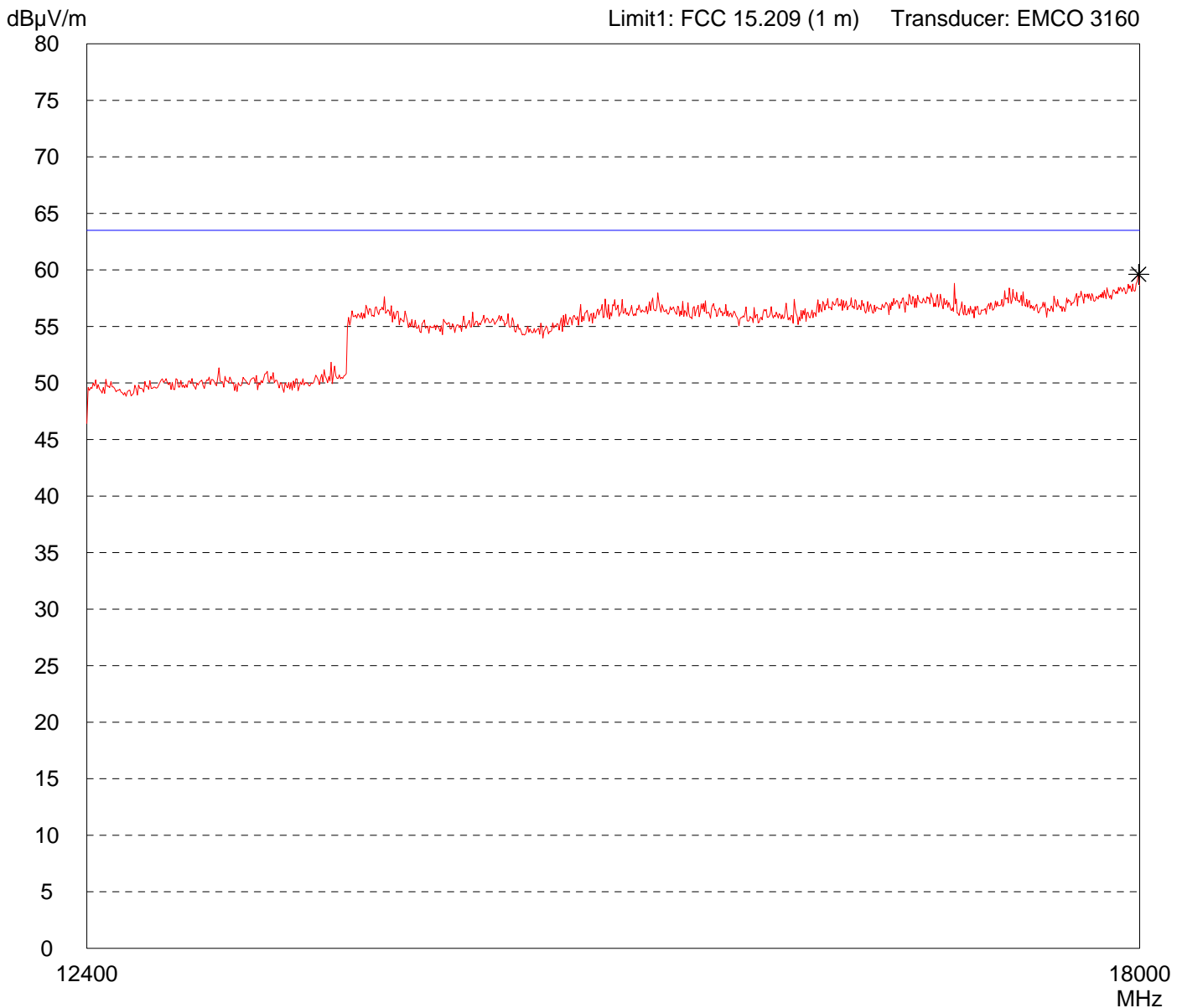


|                            |  |
|----------------------------|--|
| <p>Result:<br/>Prescan</p> | <p>Project file:<br/>20029-01719-1</p> <p style="text-align: right;">Page    of    Pages</p> |
|----------------------------|--|

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

|   |  |
|---|--|
| <p>Model:<br/>VEGAMIP MP60T.-02</p> <p>Serial no.:<br/>HW Ver. 1.0.1</p> <p>Applicant:<br/>VEGA Grieshaber KG</p> <p>Test site:<br/>Fully anechoic room, cabin no. 2</p> <p>Tested on:<br/>Test distance 1 meter<br/>Horizontal Polarization</p> <p>Date of test: 03/02/2010      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:<br/>Peak</p> | <p>List of values:<br/>Selected by hand</p> |
|---------------------------|---|

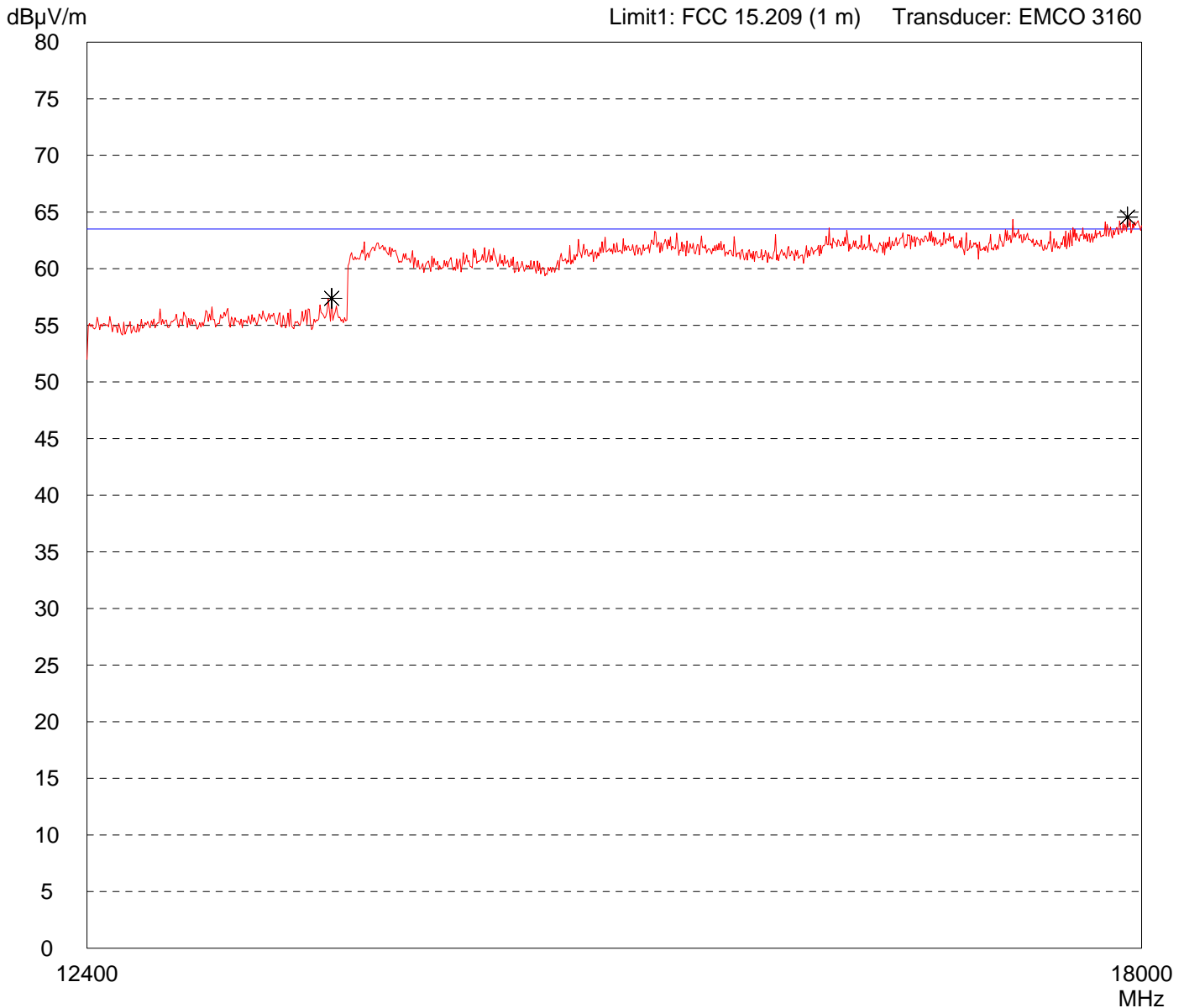


|                            |  |
|----------------------------|--|
| <p>Result:<br/>Prescan</p> | <p>Project file:<br/>20029-01719-1</p> |
| <p>Page    of    Pages</p> |  |

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

|  |  |
|--|--|
| Model:<br><b>VEGAMIP MP60T.-02</b>                                   | Comment:<br>- 115 V AC supply<br>- Transmitting continuously |
| Serial no.:<br><b>HW Ver. 1.0.1</b>                                  |  |
| Applicant:<br><b>VEGA Grieshaber KG</b>                              |  |
| Test site:<br><b>Fully anechoic room, cabin no. 2</b>                |  |
| Tested on:<br><b>Test distance 1 meter<br/>Vertical Polarization</b> |  |
| Date of test:<br><b>03/02/2010</b>                                   | Operator:<br><b>M. Steindl</b>                               |
| Test performed:<br><b>automatically</b>                              | File name:<br><b>default.emi</b>                             |

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

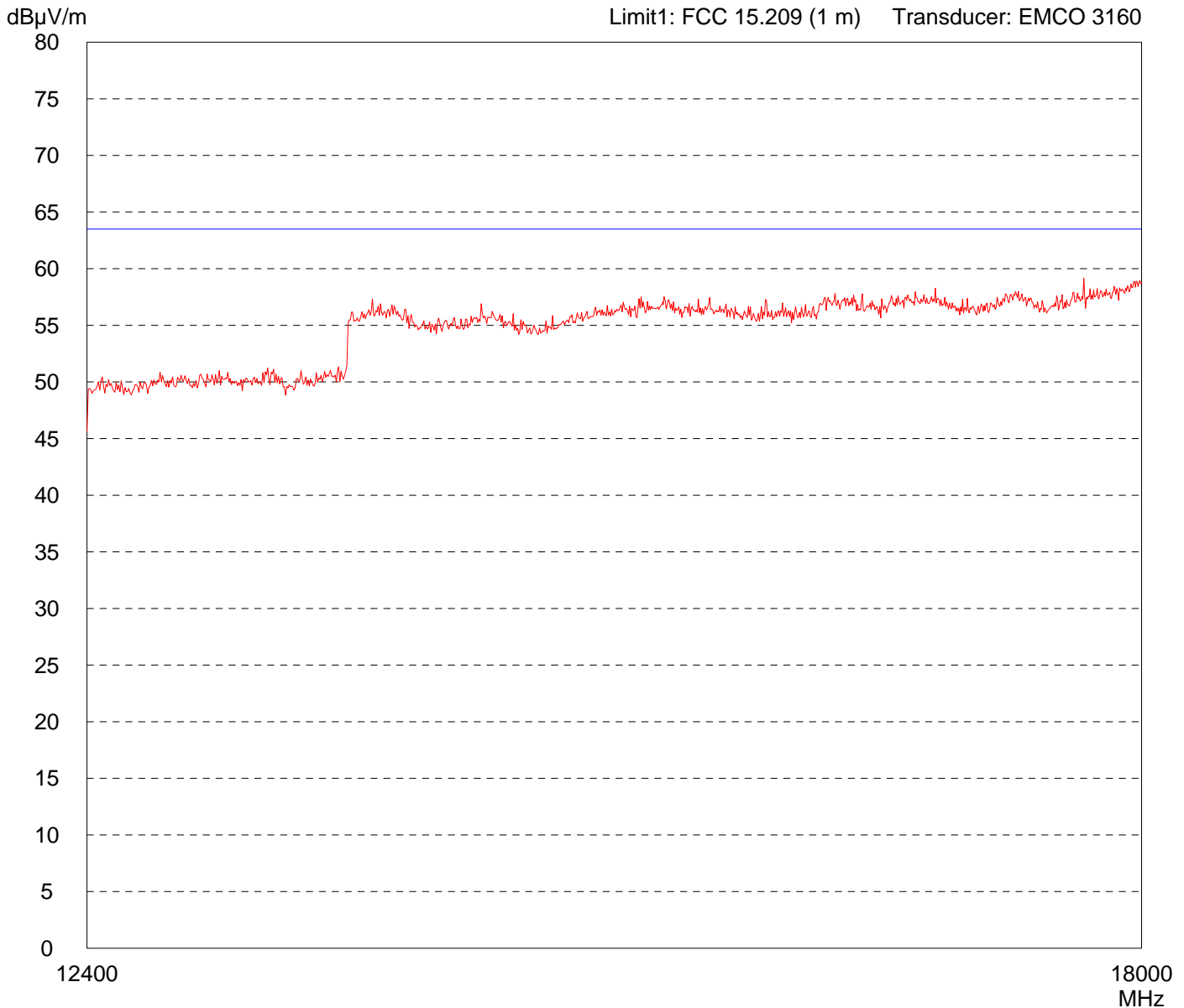


|                           |                                       |
|---------------------------|---------------------------------------|
| Result:<br><b>Prescan</b> | Project file:<br><b>20029-01719-1</b> |
|                           | Page    of    Pages<br>of             |

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

|   |  |
|---|--|
| <p>Model:<br/>VEGAMIP MP60T.-02</p> <p>Serial no.:<br/>HW Ver. 1.0.1</p> <p>Applicant:<br/>VEGA Grieshaber KG</p> <p>Test site:<br/>Fully anechoic room, cabin no. 2</p> <p>Tested on:<br/>Test distance 1 meter<br/>Vertical Polarization</p> <p>Date of test: 03/02/2010      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:<br/>Peak</p> | <p>List of values:<br/>Selected by hand</p> |
|---------------------------|---|



|                                |  |
|--------------------------------|--|
| <p>Result:<br/>Prescan</p>     | <p>Project file:<br/>20029-01719-1</p> |
| <p>Page      of      Pages</p> |  |



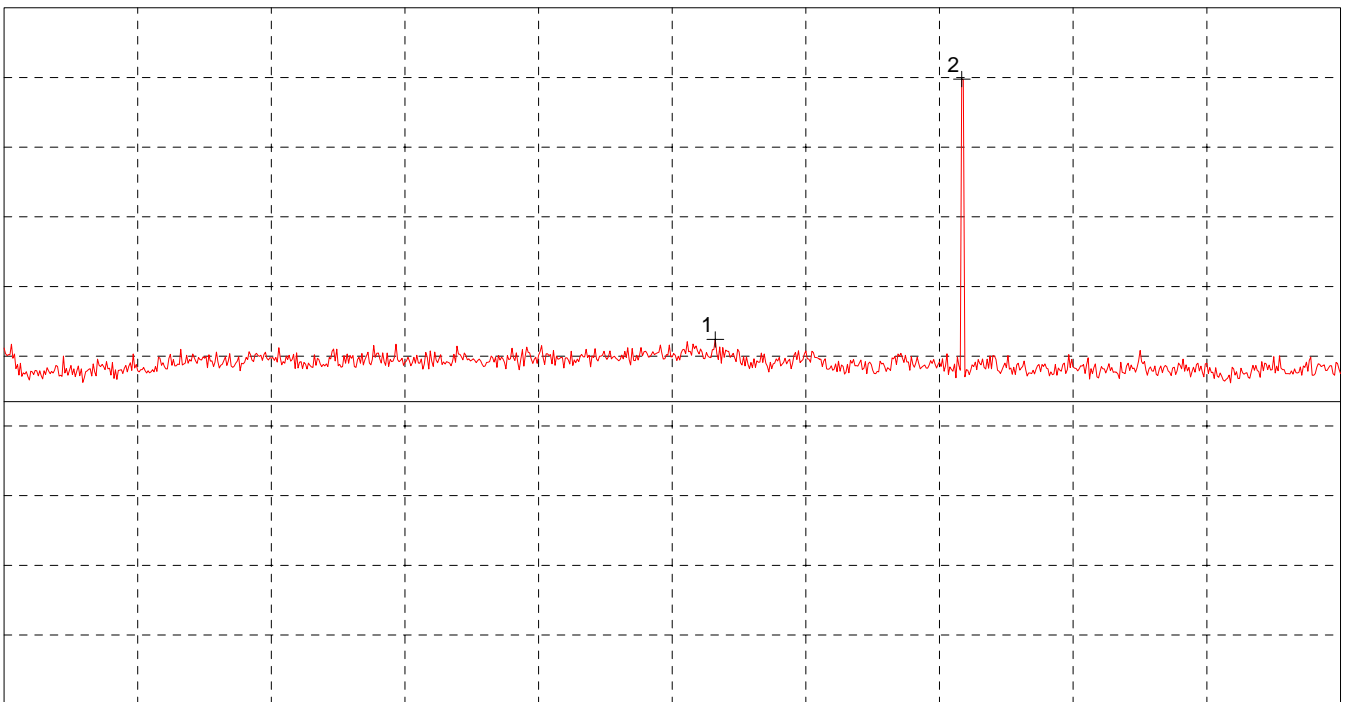
# Radiated Emission Test acc. to FCC Part 15 Subpart C

|                                  |   |
|----------------------------------|---|
| Model:<br>VEGAMIP MP60T.-02      | Mode:<br>- AC 115 V power supply<br>- Transmitting continuously |
| Serial No.:<br>HW Ver. 1.0.1     | Polarisation: horizontal<br>Distance: 1 m                       |
| Applicant:<br>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             | 22.523889 GHz | 72.42 dB $\mu$ V  |  |
| No. 2             | 24.091667 GHz | 109.97 dB $\mu$ V |  |

|                          |
|--------------------------|
| Tested by:<br>M. Steindl |
| Date:<br>2010-03-11      |

|                               |
|-------------------------------|
| Project-No.:<br>20029-01719-1 |
| Page      of      pages       |

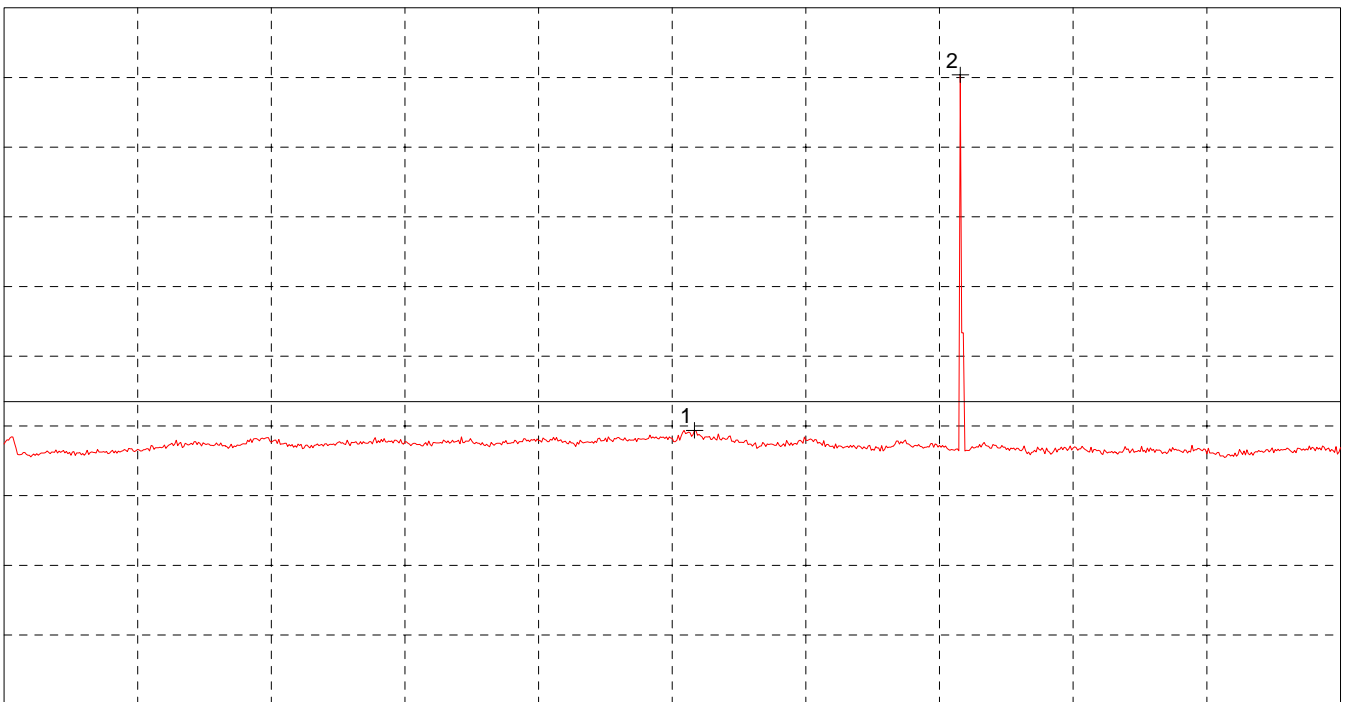
# Radiated Emission Test acc. to FCC Part 15 Subpart C

|                                  |   |
|----------------------------------|---|
| Model:<br>VEGAMIP MP60T.-02      | Mode:<br>- AC 115 V power supply<br>- Transmitting continuously |
| Serial No.:<br>HW Ver. 1.0.1     | Polarisation: horizontal<br>Distance: 1 m                       |
| Applicant:<br>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 | 22.391667 GHz | 59.37 dB $\mu$ V  |
| No. 2 | 24.082222 GHz | 110.38 dB $\mu$ V |

|                          |                               |
|--------------------------|-------------------------------|
| Tested by:<br>M. Steindl | Project-No.:<br>20029-01719-1 |
| Date:<br>2010-03-11      | Page      of      pages       |

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

|                                  |   |
|----------------------------------|---|
| Model:<br>VEGAMIP MP60T.-02      | Mode:<br>- AC 115 V power supply<br>- Transmitting continuously |
| Serial No.:<br>HW Ver. 1.0.1     | Polarisation: vertical<br>Distance: 1 m                         |
| Applicant:<br>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             | 22.410556 GHz | 72.37 dB $\mu$ V  |  |
| No. 2             | 24.091667 GHz | 118.38 dB $\mu$ V |  |

|                          |
|--------------------------|
| Tested by:<br>M. Steindl |
| Date:<br>2010-03-11      |

|                               |
|-------------------------------|
| Project-No.:<br>20029-01719-1 |
| Page      of      pages       |

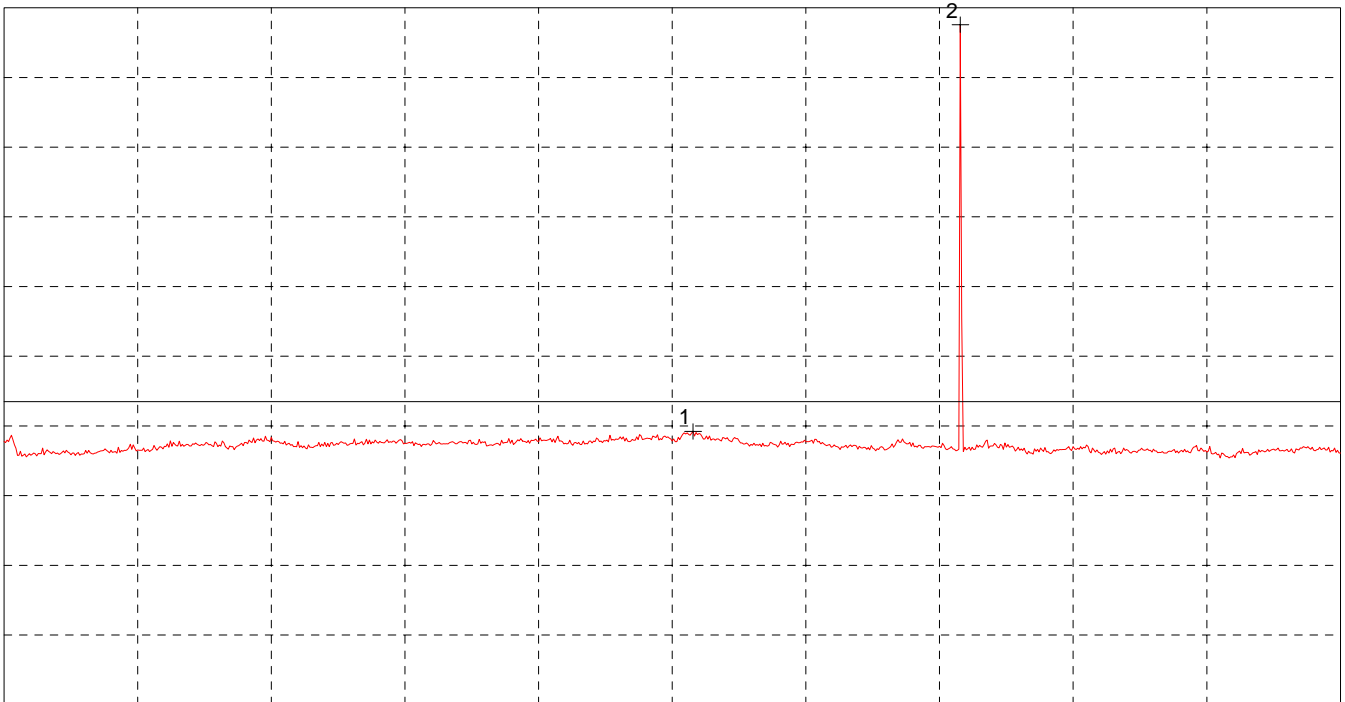
# Radiated Emission Test acc. to FCC Part 15 Subpart C

|                                  |   |
|----------------------------------|---|
| Model:<br>VEGAMIP MP60T.-02      | Mode:<br>- AC 115 V power supply<br>- Transmitting continuously |
| Serial No.:<br>HW Ver. 1.0.1     | Polarisation: vertical<br>Distance: 1 m                         |
| Applicant:<br>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 | 22.382222 GHz | 59.21 dB $\mu$ V  |
| No. 2 | 24.082222 GHz | 117.57 dB $\mu$ V |

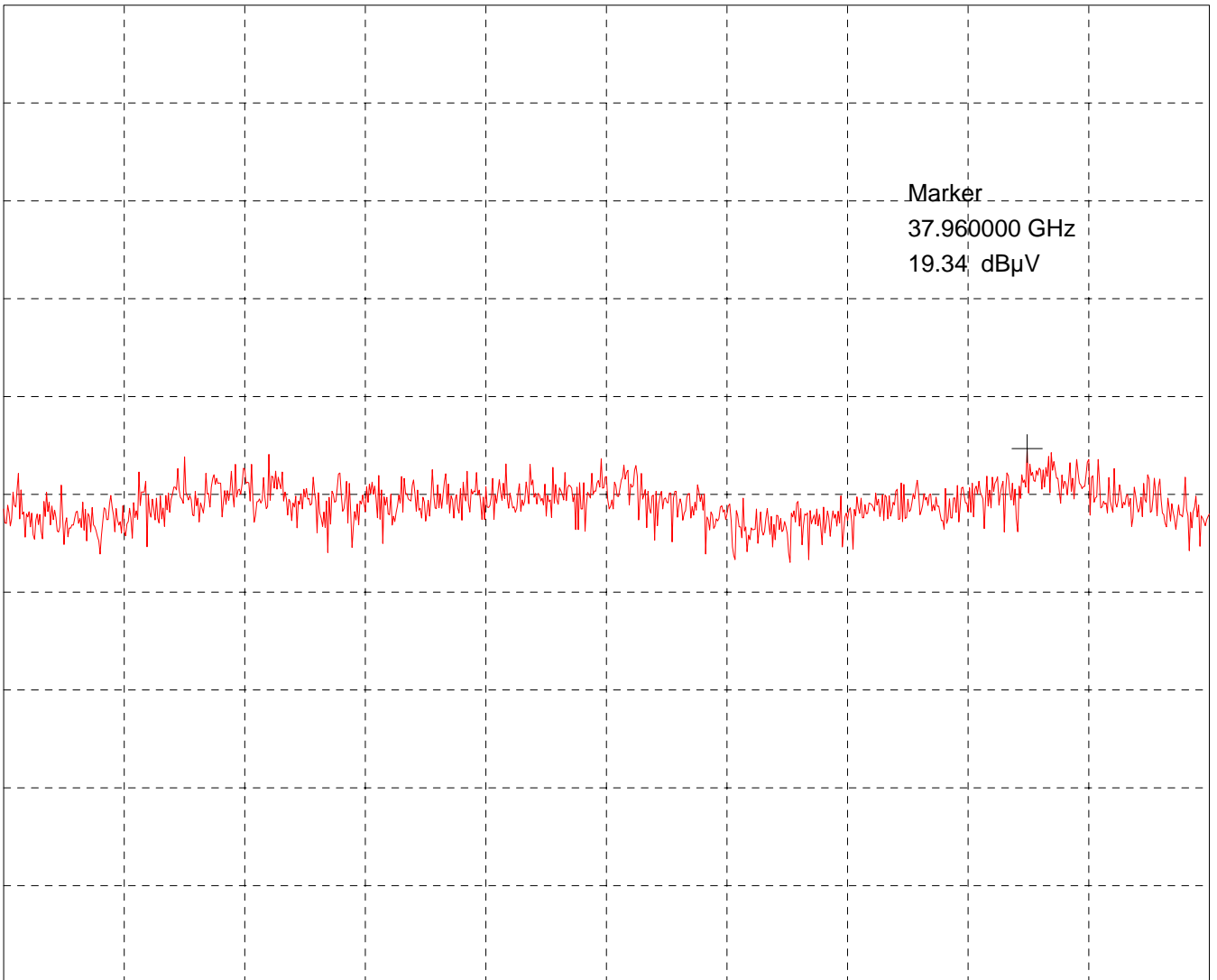
|                          |                               |
|--------------------------|-------------------------------|
| Tested by:<br>M. Steindl | Project-No.:<br>20029-01719-1 |
| Date:<br>2010-03-11      | Page      of      pages       |

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

|                                  |  |
|----------------------------------|--|
| Model:<br>VEGAMIP MP60T.-02      | Mode:<br>- AC 115 V power supply<br><br>- Transmitting continuously<br><br>Polarisation: horizontal<br>Distance: 0.5 m<br>Noise-measurement without correction factors |
| Serial No.:<br>HW Ver. 1.0.1     |  |
| Applicant:<br>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:<br>M. Steindl | Project-No.:<br>20029-01719-1 |
| Date:<br>2010-03-11      | Page of pages                 |

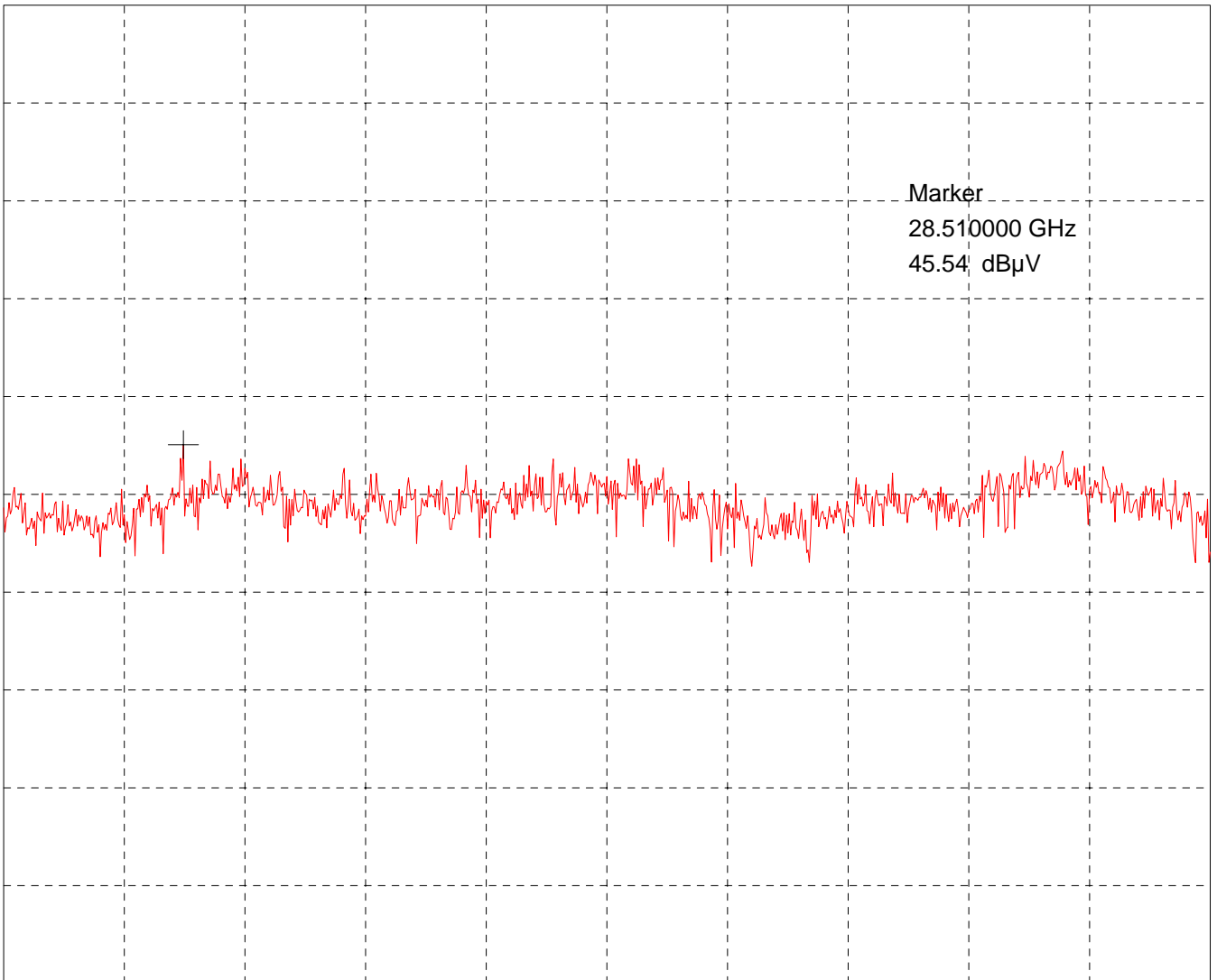
# Radiated Emission Test acc. to FCC Part 15 Subpart C

|                                  |  |
|----------------------------------|--|
| Model:<br>VEGAMIP MP60T.-02      | Mode:<br>- AC 115 V power supply             |
| Serial No.:<br>HW Ver. 1.0.1     | - Transmitting continuously                  |
| Applicant:<br>VEGA Grieshaber KG | Polarisation: vertical                       |
|                                  | Distance: 0.5 m                              |
|                                  | Noise-measurement without correction factors |
|                                  |  |
|                                  |  |
|                                  |  |

Ref.Level 68 dB $\mu$ V  
5 dB/Div.

ATT 0 dB

Ref. Offset 26 dB



Start 26.500 GHz  
RBW 1 MHz

VBW 1 MHz

Stop 40.000 GHz  
SWP 60 ms

|                          |                               |
|--------------------------|-------------------------------|
| Tested by:<br>M. Steindl | Project-No.:<br>20029-01719-1 |
| Date:<br>2010-03-11      | Page of pages                 |

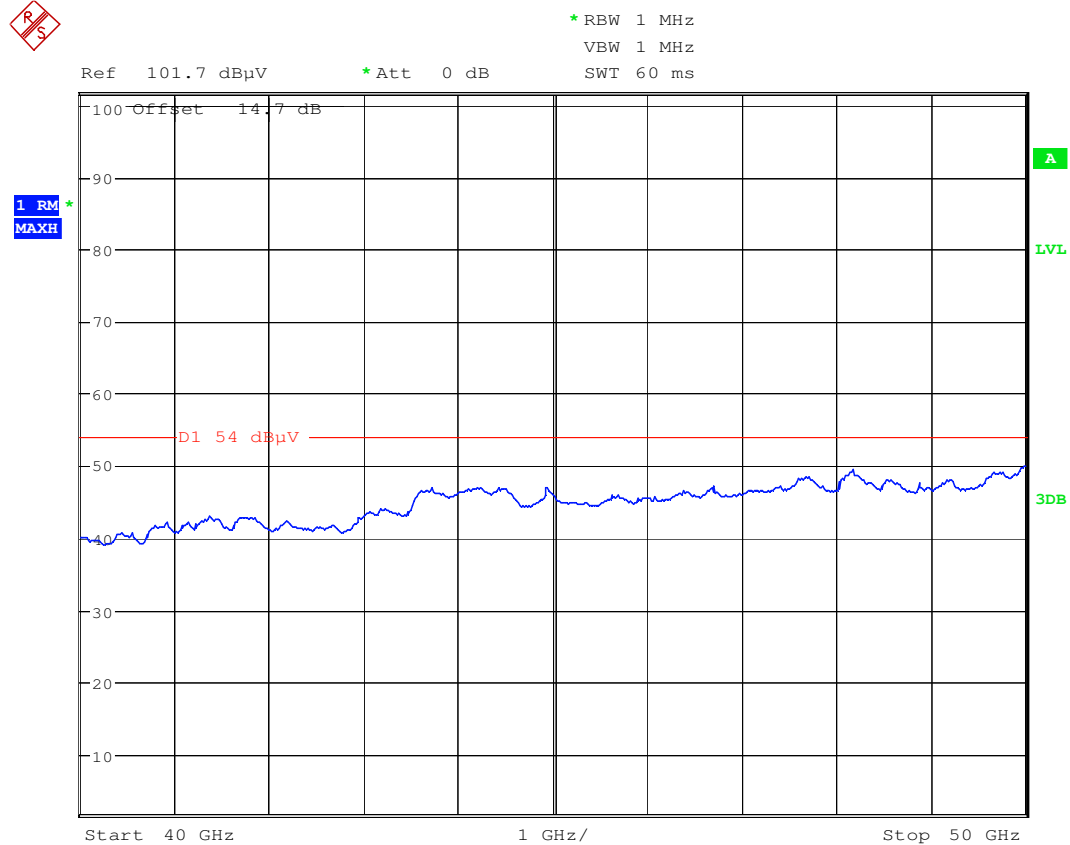
## Prüfmuster: MP60T.-02

### 14. 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 13:54:05

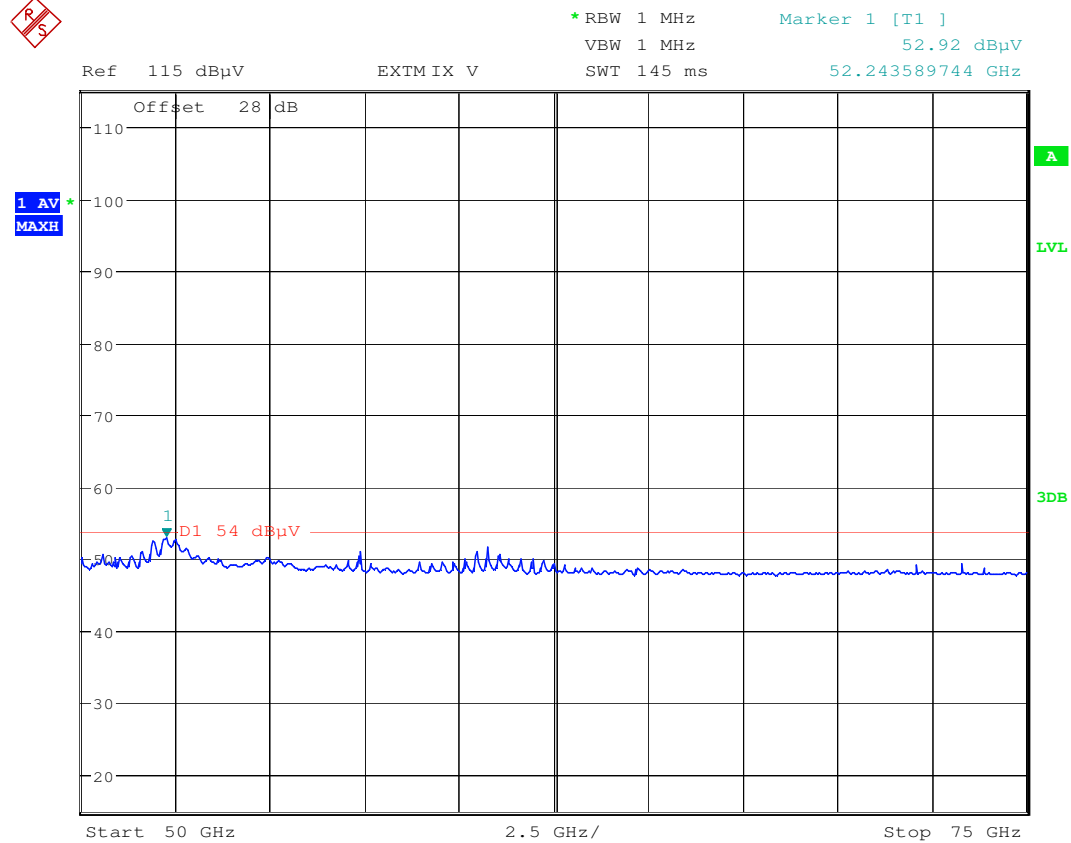
Es wurde keine Oberwelle bei 48 GHz gefunden, daher keine Detailmessung

### 15. 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 10:50:41

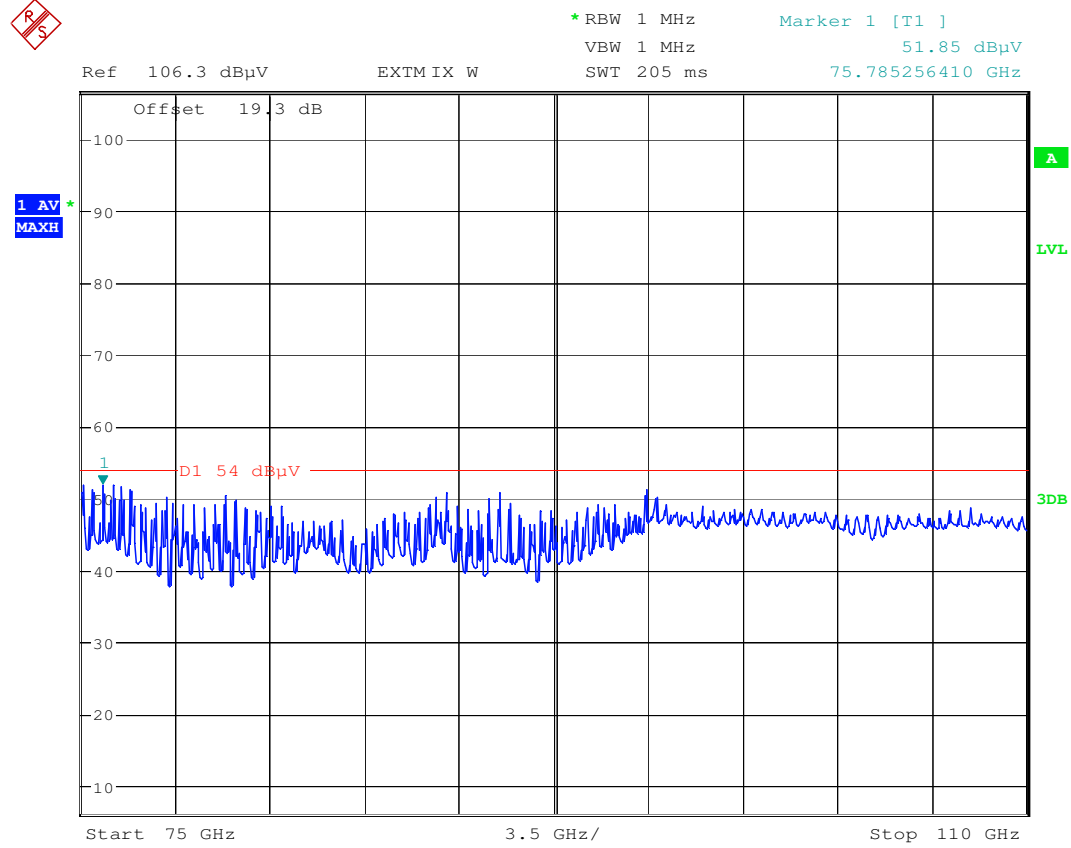


### 16. Plot: Übersicht 75-110 GHz

Messung mit Korrekturfaktor für 92.5 GHz (Messabstand 10 cm)

Messwerte umgerechnet auf Messung in 3m Entfernung

Detector: Average



Date: 8.APR.2010 11:16:10