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October 5, 2009

# Prüfbericht / *Test Report* Nr. / *No.* 19201-00624-4 (Edition 2)

| | |
|---|---|
| Applicant: | Siemens AG, Fürth |
| Type of equipment: | Inductive TAG Reader |
| Type designation: | RF340R |
| Order No.: | --- |
| Test standards: | FCC Code of Federal Regulations,<br>CFR 47, Part 15,<br>Sections 15.205, 15.207, 15.215 and 15.225<br><br>Industry Canada Radio Standards Specifications<br>RSS-Gen Issue 2, Section 7.2.2 and<br>RSS-210 Issue 7, Sections 2.2, 2.6, A2.6 (Category I Equipment) |

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# 1 Description of the Equipment Under Test (EUT)

| General data of EUT | |
|---|---|
| Type designation[1]: | RF340R |
| Parts[2]: | |
| Serial number(s): | #1 |
| Manufacturer: | Siemens AG, Fürth |
| Type of equipment: | Inductive TAG Reader |
| Version: | |
| FCC ID: | |
| Additional parts/accessories: | |

| Technical data of EUT | | |
|---|---|---|
| Application frequency range: | 13.553 MHz - 13.567 MHz | |
| Frequency range: | | |
| Operating frequency: | 13.560 MHz | |
| Type of modulation: | Amplitude modulation | |
| Pulse train: | --- | |
| Pulse width: | --- | |
| Number of RF-channels: | 1 | |
| Channel spacing: | --- | |
| Designation of emissions[3]: | 2k8A1D | |
| Type of antenna: | Inductive loop | |
| Size/length of antenna: | 0.0025 $m^2$ | |
| Connection of antenna: | ☐ detachable | ☒ not detachable |
| Type of power supply: | DC supply | |
| Specifications for power supply: | nominal voltage:<br>minimum voltage:<br>maximum voltage: | 24.0 V<br>21.6 V<br>26.4 V |

[1] Type designation of the system if EUT consists of more than one part.
[2] Type designations of the parts of the system, if applicable.
[3] Also known as "Class of Emission".

## 2 Administrative Data

| **Application details** | |
|---|---|
| Applicant (full address): | Siemens AG, Fürth<br>Siemensstraße 2<br>D-90766 Fürth |
| Contact person: | Mr. Clemens Bopp |
| Order number: | --- |
| Receipt of EUT: | August 06, 2009 |
| Date(s) of test: | August - September 2009 |
| Note(s): | |

| **Report details** | |
|---|---|
| Report number: | 19201-00624-4 |
| Edition: | 2 |
| Issue date: | November 10, 2009 |

# 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 |
| FCC test site registration number | 90926 |
| Industry Canada test site registration: | 3050A-1 |
| Contact person: | Mr. Johann Roidt<br><br>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<br>**Code of Federal Regulations CFR 47, Part 15, Sections 15.205, 15.207, 15.215 and 15.225**<br>of the Federal Communication Commission (FCC) and the<br>**Radio Standards Specifications**<br>**RSS-Gen Issue 2, Section 7.2.2 and**<br>**RSS-210 Issue 7, Sections 2.2, 2.6, A2.6 (Category I Equipment)**<br>of Industry Canada (IC). |

| **Personnel involved in this report** | |
|---|---|
| Laboratory Manager: |  <br>Mr. Johann Roidt |
| Responsible for testing: |  <br>Mr. Thomas Eberl |
| Responsible for test report: | Mr. Thomas Eberl |

# 5 Operation Mode and Configuration of EUT

| **Operation Mode(s)** |
|---|
| Transmit mode |

| **Configuration(s) of EUT** |
|---|
| EUT was connected to appropriate support devices.<br>The support devices where placed outside of the test environment, because this devices are intended for industrial use and achieve FCC class A limits only. |

**List of ports and cables**

| *Port* | *Description* | *Classification*[4] | *Cable type* | *Cable length* |
|---|---|---|---|---|
| 1 | Interface cable | dc power, signal/control port | Shielded | 3m |

**List of devices connected to EUT**

| *Item* | *Description* | *Type Designation* | *Serial no. or ID* | *Manufacturer* |
|---|---|---|---|---|
| 1 | No devices within the test environment connected | --- | --- | --- |

**List of support devices**

| *Item* | *Description* | *Type Designation* | *Serial no. or ID* | *Manufacturer* |
|---|---|---|---|---|
| 1 | TAG | RF 360T | --- | Siemens |
| 2 | TAG | ISO | --- | Siemens |
| 3 | Power Supply | PS307 | --- | Siemens |
| 4 | CPU | CPU313C-2DP | --- | Siemens |
| 5 | IO | DI16/DO16 xDC24V | --- | Siemens |
| 6 | IO | SM374 IN/OUT 16 | --- | Siemens |
| 7 | Controller | SIMATIC ET 200M | --- | Siemens |
| 8 | IO | MOBY ASM 452 | --- | Siemens |

[4] Ports shall be classified as ac power, dc power or signal/control port

# 6 Measurement Procedures

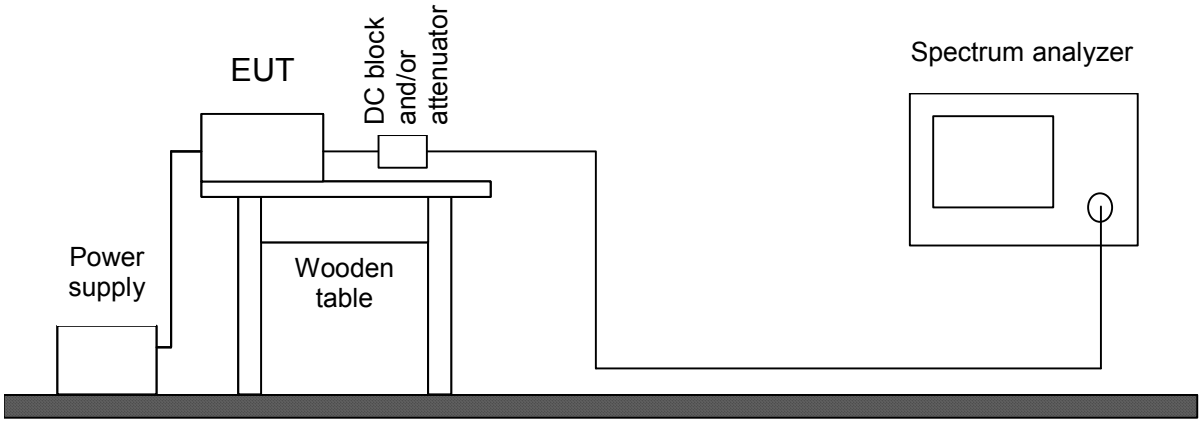
## 6.1 Bandwidth Measurements

| **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: | ☐ Conducted: See below<br>☒ Radiated: Radiated Emission Measurement 9 kHz to 30 MHz (6.3) |

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.

If radiated measurements are performed the same test setups and instruments are used as with radiated emission measurements for the appropriate frequency range.

The analyzer settings are specified by the test description of the appropriate test record(s).



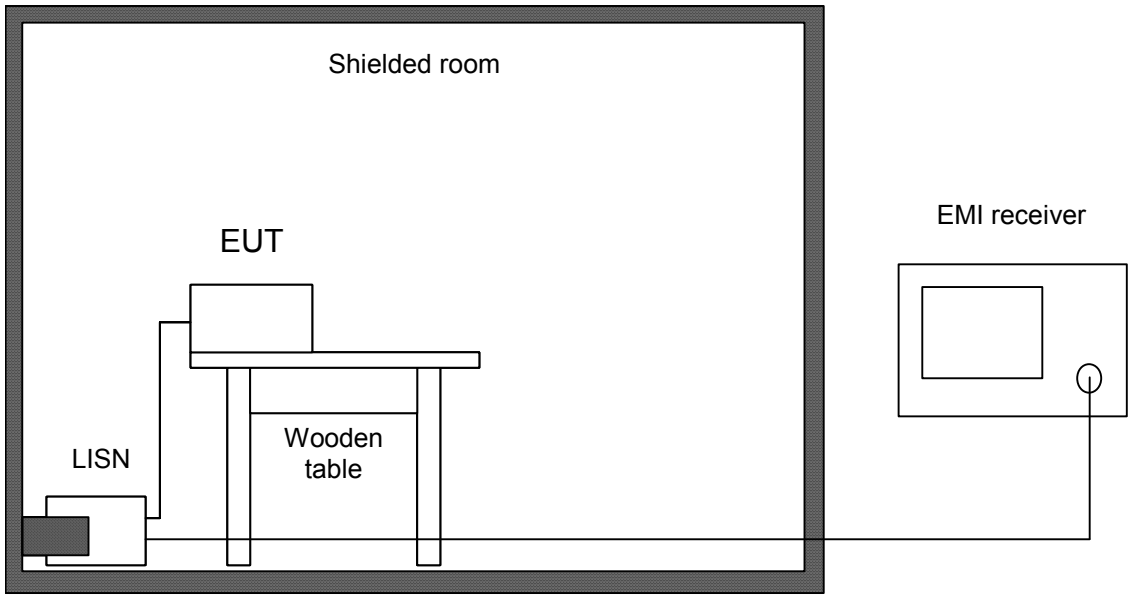
## 6.2 Conducted AC Powerline Emission

| **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 |

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:

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.
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.

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.
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.



Test instruments used:

| Used | Type | Model | Serial No. or ID | Manufacturer |
|---|---|---|---|---|
| ☒ | EMI receiver | ESHS 10 | 860043/016 | Rohde & Schwarz |
| ☒ | LISN | ESH3-Z5 | 862770/021 | Rohde & Schwarz |
| ☐ | LISN | ESH3-Z5 | 830952/025 | Rohde & Schwarz |
| ☐ | Artificial mains network | ESH 2-Z5 | 842966/004 | Rohde & Schwarz |
| ☐ | Shielded room | No. 1 | 1451 | Albatross Projects |
| ☒ | Shielded room | No. 4 | 3FD-100 544 | Euroshield |

## 6.3 Radiated Emission Measurement 9 kHz to 30 MHz

| **Measurement Procedure:** | |
|---|---|
| Rules and specifications: | CFR 47 Part 15, sections 15.205, 15.215(b) and 15.225(a)-(d)<br>IC RSS-210 Issue 7, sections 2.2, 2.6 and A2.6 |
| Guide: | ANSI C63.4 |

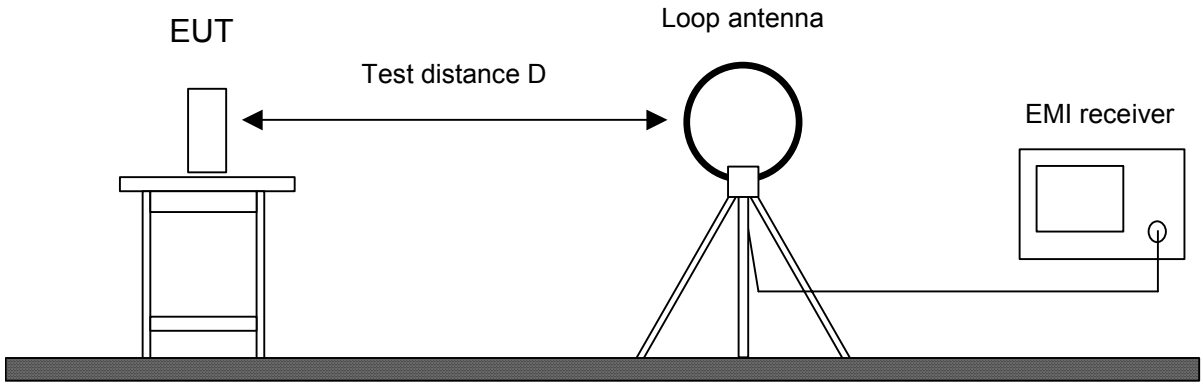
Radiated emission in the frequency range 9 kHz to 30 MHz is measured using an active loop antenna. First the whole spectrum of emission caused by the equipment is recorded at a distance of 3 meters in a fully or semi anechoic room with the detector of the spectrum analyzer or EMI receiver set to peak.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

| Used | Type | Model | Serial No. or ID | Manufacturer |
|---|---|---|---|---|
| ☒ | Spectrum Analyzer | FSP 30 | 100063 | Rohde & Schwarz |
| ☐ | EMI test receiver | ESMI | 839379/013<br>839587/006 | Rohde & Schwarz |
| ☒ | Test receiver | ESHS 10 | 860043/016 | Rohde & Schwarz |
| ☒ | Preamplifier | CPA9231A | 3393 | Schaffner |
| ☒ | Loop antenna | HFH2-Z2 | 882964/1 | Rohde & Schwarz |
| ☒ | Fully anechoic room | No. 2 | 1452 | Albatross Projects |
| ☐ | Semi-anechoic room | No. 3 | 1453 | Siemens |
| ☒ | Open field test site | EG 1 | 1450 | Senton |

## 6.4 Radiated Emission in Fully or Semi Anechoic Room

| **Measurement Procedure:** | |
|---|---|
| Rules and specifications: | CFR 47 Part 15, sections 15.205(b) and 15.225(d)<br>IC RSS-210 Issue 7, sections 2.2(b)(c), 2.6 and A2.6 |
| Guide: | ANSI C63.4 |

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.

Measurements are made in both the horizontal and vertical planes of polarization in a fully anechoic room 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).

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.

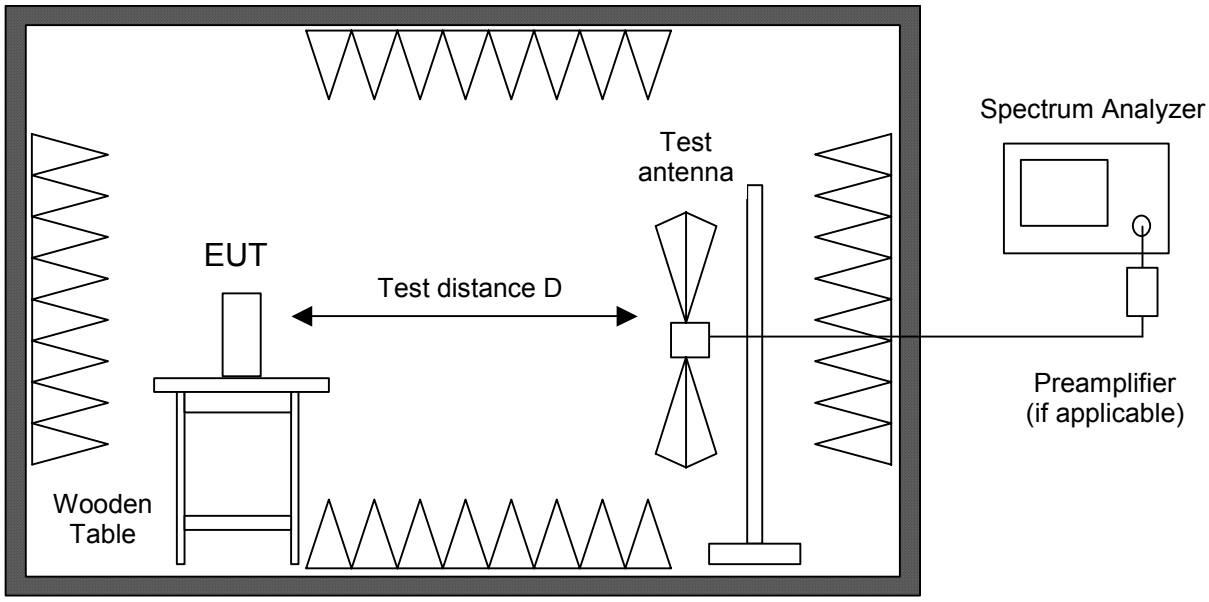
All tests below 8.2 GHz are performed at a test distance D of 3 meters. For higher frequencies the test distance may be reduced (e.g. to 1 meter) due to the sensitivity of the measuring instrument(s) and the test results are calculated according to CFR 47 Part 15 section 15.31(f)(1) using an extrapolation 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.

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.

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.

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.

For final testing below 1 GHz an open field test-site is used and the plots recorded in the fully or semi anechoic room are indicated as prescans.




Fully or semi anechoic room

Test instruments used:

| Used | Type | Model | Serial No. or ID | Manufacturer |
|---|---|---|---|---|
| ☒ | Spectrum Analyzer | FSP 30 | 100063 | Rohde & Schwarz |
| ☐ | EMI test receiver | ESPI7 | 101018 | Rohde & Schwarz |
| ☐ | EMI test receiver | ESMI | 839379/013<br>839587/006 | Rohde & Schwarz |
| ☒ | Preamplifier | CPA9231A | 3393 | Schaffner |
| ☐ | Preamplifier | R14601 | | Advantest |
| ☐ | Preamplifier 1-8 GHz | AFS3-00100800-32-LN | 847743 | Miteq |
| ☐ | Preamplifier 0.5-8 GHz | AMF-4D-005080-25-13P | 860149 | Miteq |
| ☐ | Preamplifier 8-18 GHz | ACO/180-3530 | 32641 | CTT |
| ☐ | External Mixer | WM782A | 845881/005 | Tektronix |
| ☐ | Harmonic Mixer | FS-Z30 | 843389/007 | Rohde & Schwarz |
| | Accessories | | | |
| ☒ | Trilog broadband antenna | VULB 9163 | 9163-188 | Schwarzbeck |
| ☐ | Horn antenna | 3115 | 9508-4553 | EMCO |
| ☐ | Horn antenna | 3160-03 | 9112-1003 | EMCO |
| ☐ | Horn antenna | 3160-04 | 9112-1001 | EMCO |
| ☐ | Horn antenna | 3160-05 | 9112-1001 | EMCO |
| ☐ | Horn antenna | 3160-06 | 9112-1001 | EMCO |
| ☐ | Horn antenna | 3160-07 | 9112-1008 | EMCO |
| ☐ | Horn antenna | 3160-08 | 9112-1002 | EMCO |
| ☐ | Horn antenna | 3160-09 | 9403-1025 | EMCO |
| ☐ | Horn antenna | 3160-10 | 399185 | EMCO |
| ☒ | Fully anechoic room | No. 2 | 1452 | Albatross Projects |
| ☐ | Semi-anechoic room | No. 3 | 1453 | Siemens |

## 6.5 Radiated Emission at Open Field Test Site

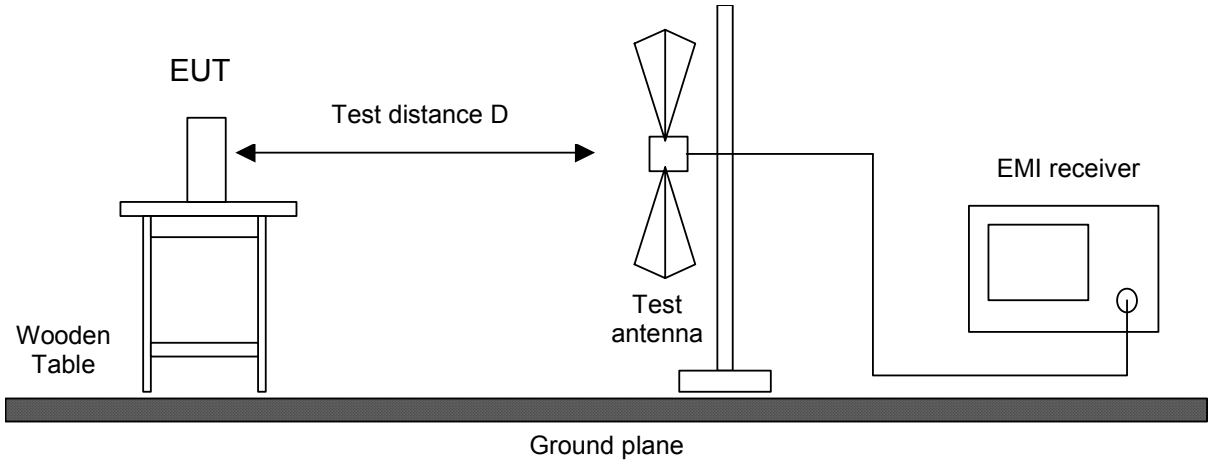
| **Measurement Procedure:** | |
|---|---|
| Rules and specifications: | CFR 47 Part 15, sections 15.205(b) and 15.225(d)<br>IC RSS-210 Issue 7, sections 2.2(b)(c), 2.6 and A2.6 |
| Guide: | ANSI C63.4 |

Radiated emission at open field test site is measured in the frequency range 30 MHz to 1 GHz using a biconical antenna up to 300 MHz and a logarithmic periodic antenna above. The measurement bandwidth of the test receiver is set to 120 kHz with quasi-peak detector selected.

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.

Hand-held or body-worn devices are tested in the position producing the highest emission relative to the limit as verified by prescans in the fully anechoic room. EUT is rotated all around and receiving antenna is raised and lowered within 1 meter to 4 meters to find the maximum levels of emission. Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.

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.



Test instruments used:

| Used | Type | | Model | Serial No. or ID | Manufacturer |
|---|---|---|---|---|---|
| ☒ | EMI receiver | EG 1 | ESVP | 881120/024 | Rohde & Schwarz |
| ☐ | EMI receiver | | ESVP | 891846/003 | Rohde & Schwarz |
| ☒ | Biconical antenna | EG 1 | HK 116 | 842204/001 | Rohde & Schwarz |
| ☒ | Log. per. antenna | EG 1 | HL 223 | 841516/023 | Rohde & Schwarz |
| ☒ | Open field test site | | EG 1 | 1450 | Senton |

## 6.6 Carrier Frequency Stability

| **Measurement Procedure:** | |
|---|---|
| Rules and specifications: | CFR 47 Part 15, section 15.225(e)<br>IC RSS-Gen Issue 2, section 4.7 and IC RSS-210 Issue 7, section A2.6 |
| Guide: | ANSI C63.4 |

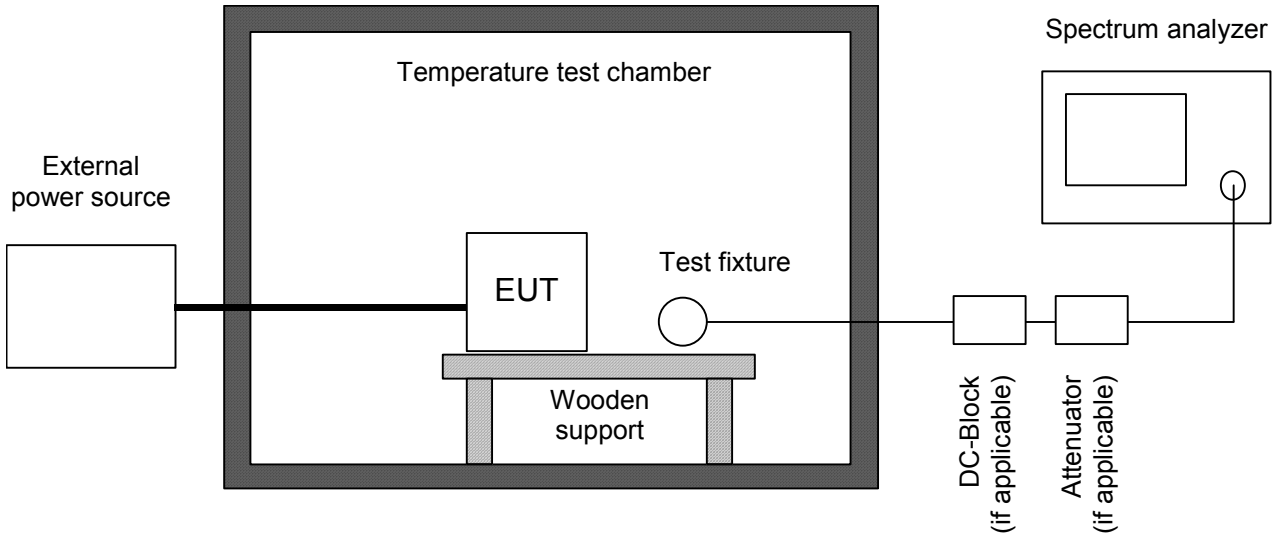
The frequency tolerance of the carrier signal is measured over a temperature variation of -20 °C to +50 °C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 °C.

If the EUT provides an antenna connector the spectrum analyzer is connected to this port. 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). In cases where the EUT does not provide an antenna connector a test fixture is used.

For battery operated equipment, the test is performed using a new battery. Alternatively, an external supply voltage can be used and is at least set to:

- the maximum battery voltage as delivered by a new battery or 115% of the battery nominal voltage
- the battery nominal voltage
- 85% of the battery nominal voltage
- the battery operating end point voltage which shall be specified by the equipment manufacturer

The EUT is operating providing an unmodulated carrier. The peak detector of the spectrum analyzer is selected and resolution as well as video bandwidth are set to values appropriate to the shape of the spectrum of the EUT. The frequency counter mode of the spectrum analyzer is used to maximize the accuracy of the measured frequency tolerance.
If an unmodulated carrier is not available a significant and stable point on the spectrum is selected and the span is reduced to a value that delivers an accuracy which shall be better than 1% of the maximum frequency tolerance allowed for the carrier signal. This method may be performed as long as the margin to the frequency tolerance allowed is larger than the uncertainty of the measured frequency tolerance.



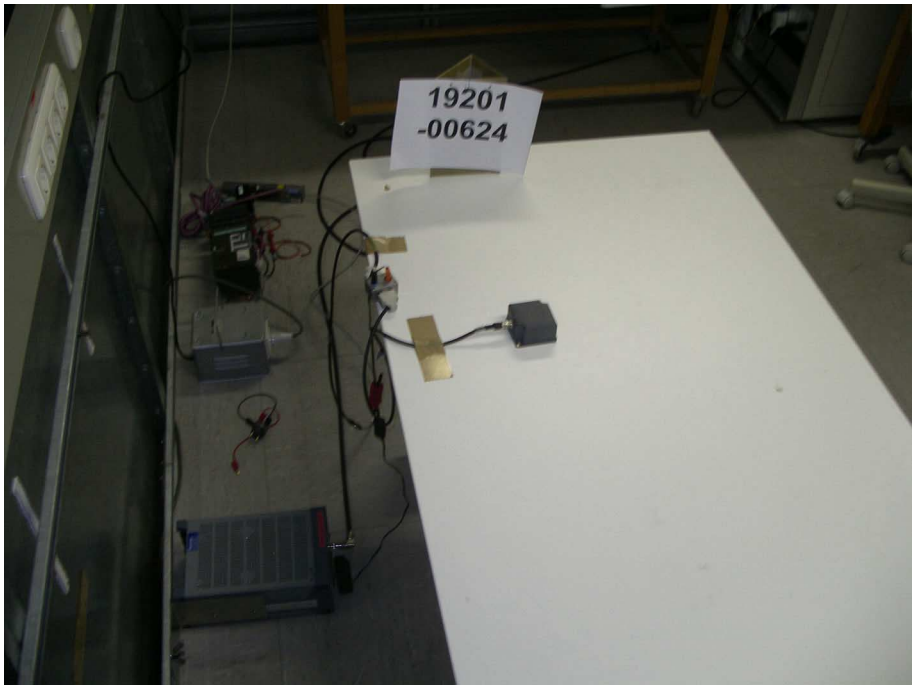
Test instruments used:

| Used | Type | Model | Serial No. or ID | Manufacturer |
|---|---|---|---|---|
| ☐ | Spectrum Analyzer | FSP 30 | 100063 | Rohde & Schwarz |
| ☒ | EMI test receiver | ESPI7 | 836914/0002 | Rohde & Schwarz |
| ☐ | EMI test receiver | ESMI | 839379/013<br>839587/006 | Rohde & Schwarz |
| ☐ | DC-block | 7006 | A2798 | Weinschel |
| ☐ | Attenuator | 4776-10 | 9412 | Narda |
| ☐ | Attenuator | 4776-20 | 9503 | Narda |
| ☒ | Test probe | TP01 | 001 | Senton |
| ☐ | Multimeter | 21 III | 76530546 | Fluke |
| ☐ | Multimeter | 21 III | 76381229 | Fluke |
| ☐ | Multimeter | Fluke 77 III | 92370108 | Fluke |
| ☐ | Multimeter | Fluke 77 IV | 93090238 | Fluke |
| ☐ | Multimeter | Fluke 177 | 96720024 | Fluke |
| ☐ | Multimeter | Fluke 177 | 96720025 | Fluke |
| ☒ | DC power supply | NGSM 32/10 | 203 | Rohde & Schwarz |
| ☐ | Isolating transformer | RT 5A | 10387 | Grundig |
| ☐ | Isolating transformer | RT 5A | 10416 | Grundig |
| ☒ | Temperature test chamber | HT4010 | 07065550 | Heraeus |

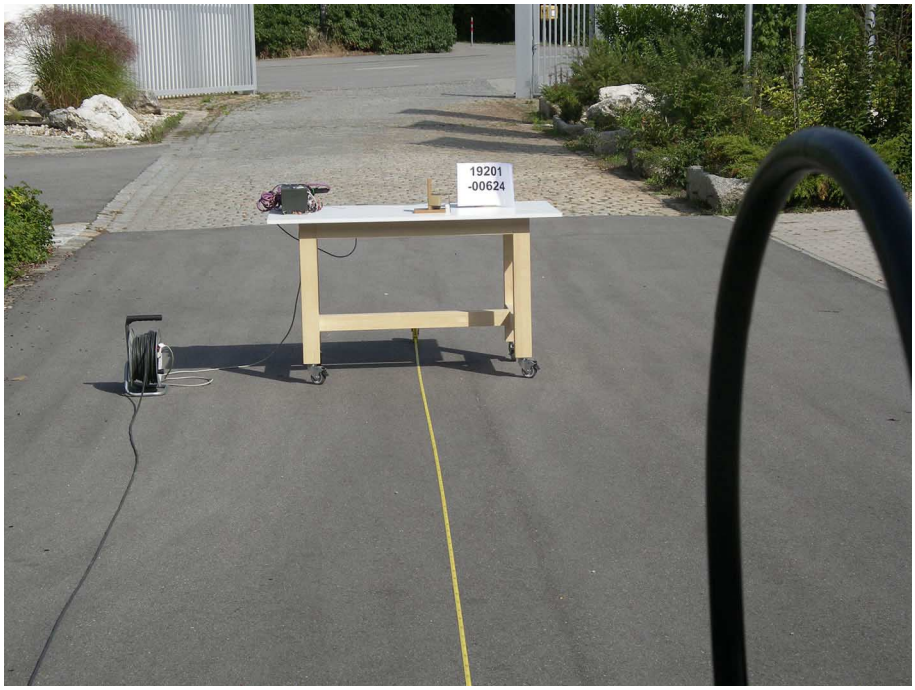
# 7 Photographs Taken During Testing

## Test setup for conducted AC powerline emission measurement

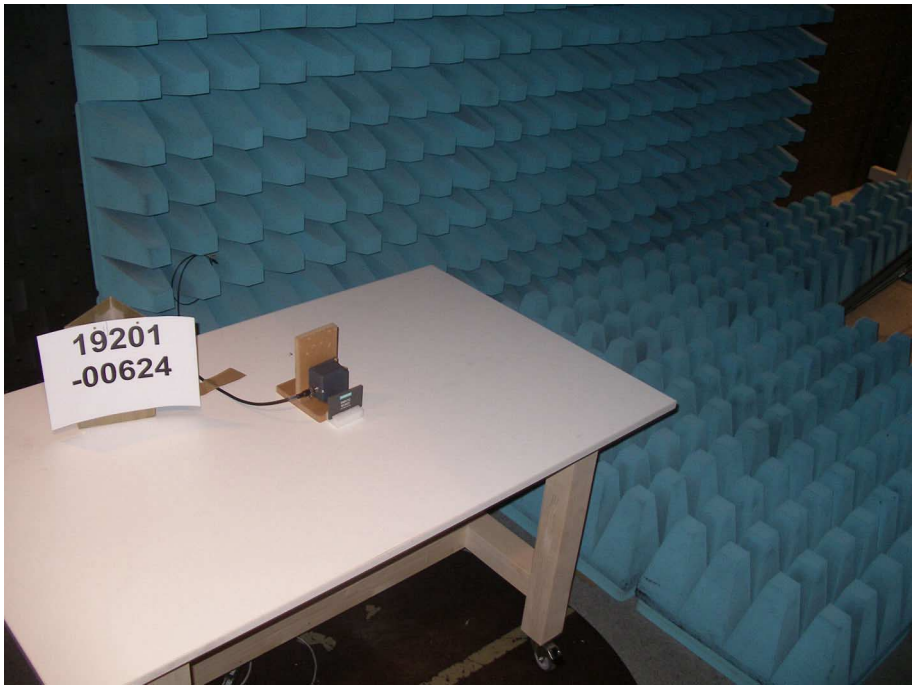

## Test setup for conducted AC powerline emission measurement - continued -



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

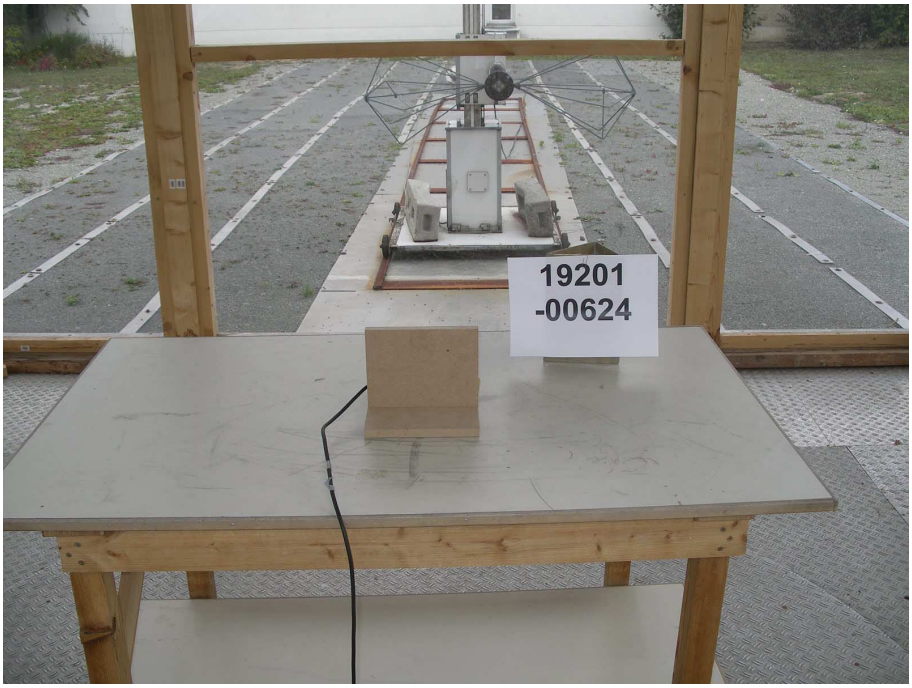


## Test setup for radiated emission measurement (fully anechoic room)




## Test setup for radiated emission measurement (open field test site)


## Test setup for radiated emission measurement (open field test site) - continued -




## Test setup for carrier frequency stability measurement

# 8 Test Results

| FCC CFR 47 Parts 2 and 15 | | | |
|---|---|---|---|
| *Section(s)* | *Test* | *Page* | *Result* |
| 2.1046(a) | Conducted output power | --- | Not applicable |
| 2.202(a) | Occupied bandwidth | 29 | Recorded |
| 15.215(c) | Bandwidth of the emission | 37 | Test passed |
| 2.201, 2.202 | Class of emission | 40 | Calculated |
| 15.35(c) | Pulse train measurement for pulsed operation | --- | Not applicable |
| 15.205(a)<br>15.205(d)(7) | Restricted bands of operation | ---[5] | Test passed |
| 15.207 | Conducted AC powerline emission<br>150 kHz to 30 MHz | 41 | Test passed |
| 15.225(a)-(d) | Spectrum Mask | 42 | Test passed |
| 15.205(b)<br>15.215(b)<br>15.225(a)(d) | Radiated emission<br>9 kHz to 30 MHz | 44 | Test passed |
| 15.205(b)<br>15.225(d) | Radiated emission<br>30 MHz to 1 GHz | 46 | Test passed |
| 15.225(e) | Carrier frequency stability | 48 | Test passed |

[5] See "Spectrum Mask" for the 13.36 to 13.41 MHz band. For all other restricted bands see "Radiated Emission".

| **IC RSS-Gen Issue 2** | | | |
|---|---|---|---|
| *Section(s)* | *Test* | *Page* | *Result* |
| 4.8 | Transmitter output power (conducted) | --- | Not applicable |
| 4.6.1 | Occupied Bandwidth | 29 | Recorded |
| 3.2(h), 8 | Designation of emissions | 40 | Calculated |
| 4.5 | Pulsed operation | --- | Not applicable |
| 7.2.2 | Transmitter AC power lines conducted emissions 150 kHz to 30 MHz | 41 | Test passed |
| 5.5 | Exposure of Humans to RF Fields | 53 | Exempted from SAR and RF evaluation |

| **IC RSS-210 Issue 7** | | | |
|---|---|---|---|
| *Section(s)* | *Test* | *Page* | *Result* |
| 2.2(a) | Restricted bands and unwanted emission frequencies | ---[6] | Test passed |
| A2.6 | Spectrum Mask | 42 | Test passed |
| 2.2(b)(c), 2.6 A2.6 | Unwanted emissions 9 kHz to 30 MHz | 44 | Test passed |
| 2.2(b)(c), 2.6 A2.6 | Unwanted emissions 30 MHz to 1 GHz | 46 | Test passed |
| A2.6 | Carrier frequency stability | 48 | Test passed |

[6] See "Spectrum Mask" and "Unwanted emissions".

## 8.1 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.<br>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.<br>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: |

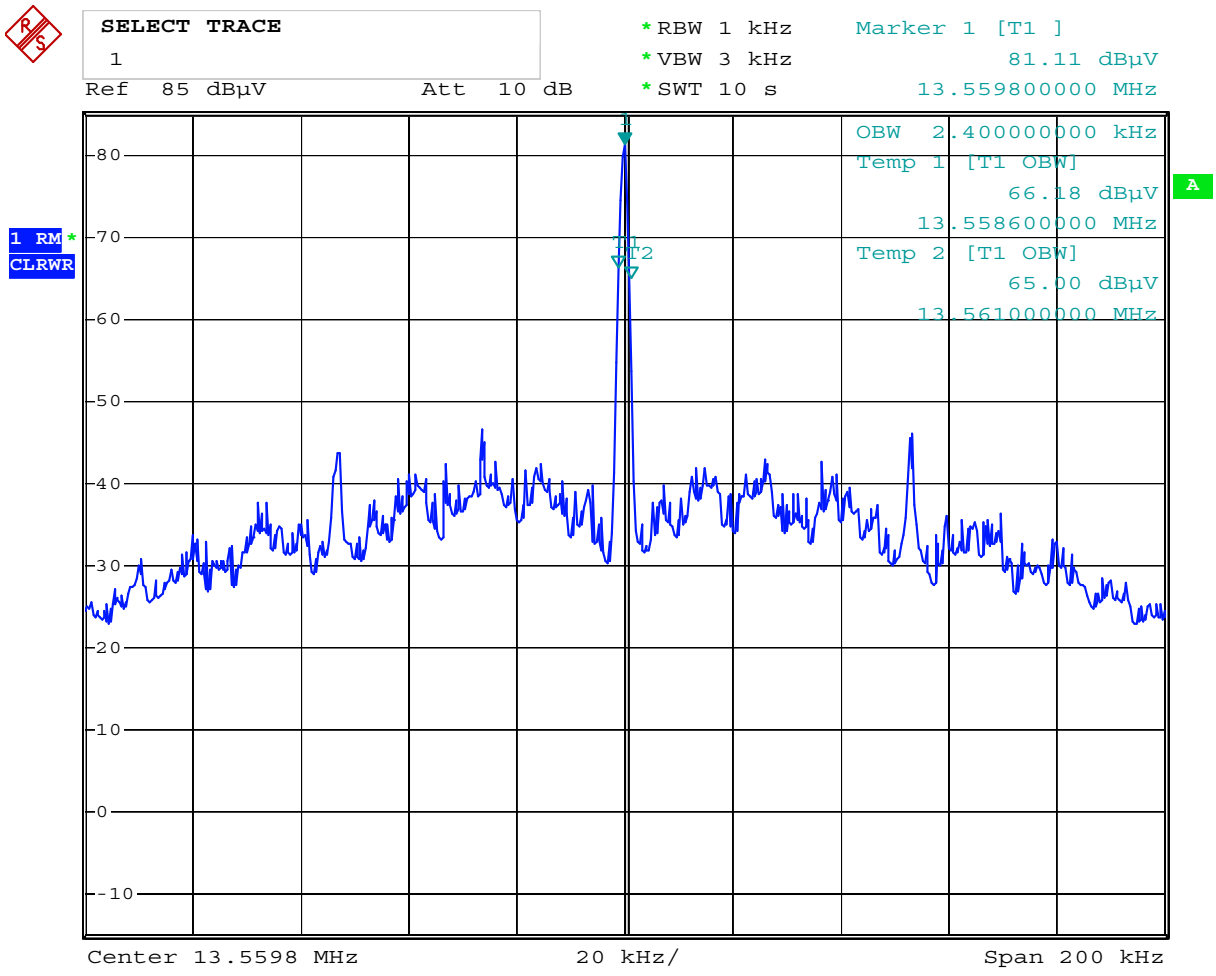
| Fundamental frequency | Minimum resolution bandwidth |
|---|---|
| 9 kHz to 30 MHz | 1 kHz |
| 30 MHz to 1000 MHz | 10 kHz |
| 1000 MHz to 40 GHz | 100 kHz |

The video bandwidth shall be at least three times greater than the resolution bandwidth.

| | |
|---|---|
| Measurement procedure: | Bandwidth Measurements (6.1) |

| | |
|---|---|
| Comment: | ISO and RF300 protocol |
| Date of test: | August 10, 2009 |
| Test site: | Fully anechoic room, cabin no. 2 |

## Occupied Bandwidth (99 %): ISO



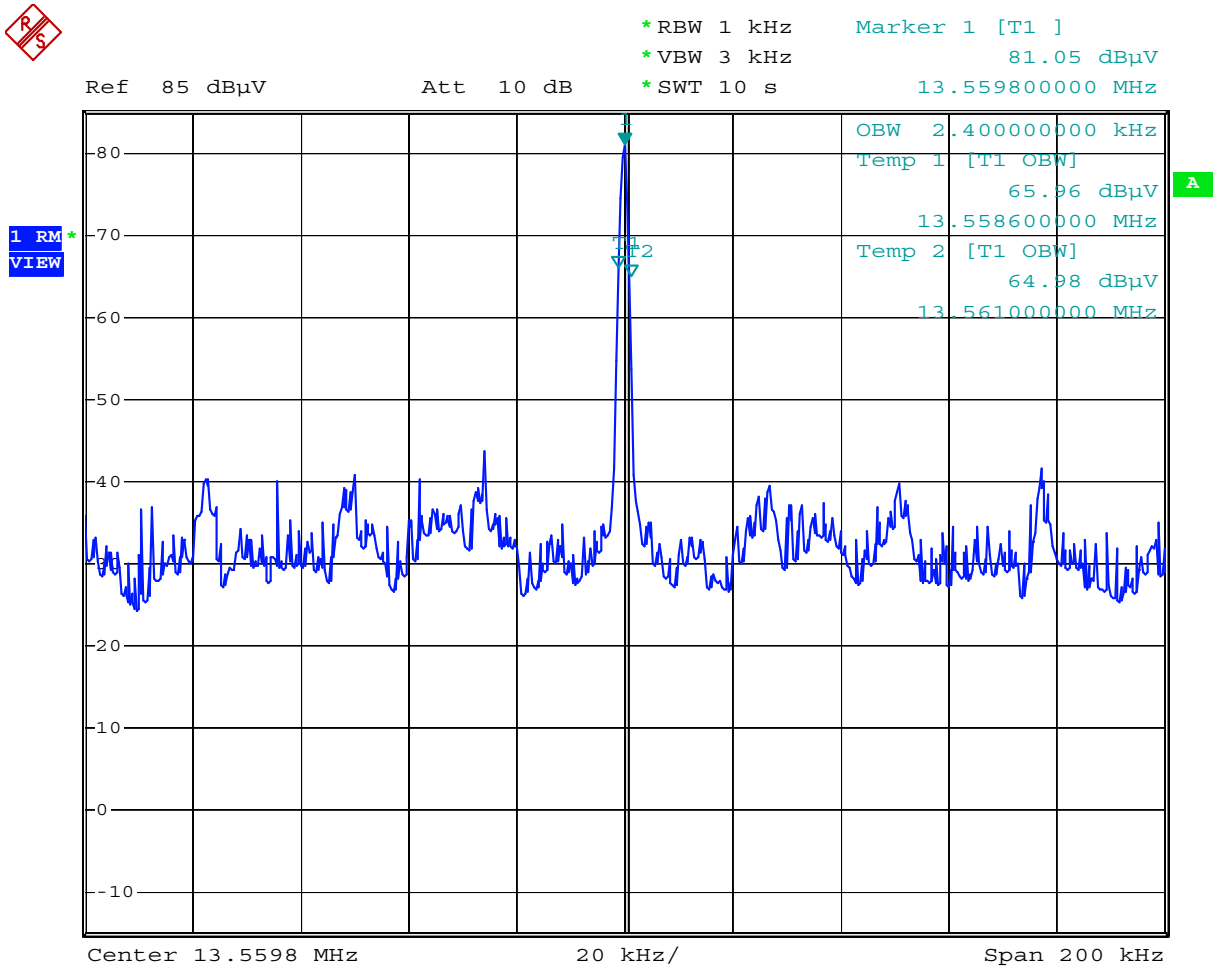

| | |
|---|---|
| Occupied Bandwidth (99 %): | **2.4 kHz** |

TÜV SÜD SENTON GmbH
Äußere Frühlingstraße 45
94315 Straubing
Germany

Phone: +49 9421 5522-0
Fax: +49 9421 5522-99
Web: www.tuev-sued.com/senton



## Occupied Bandwidth (99 %): RF300



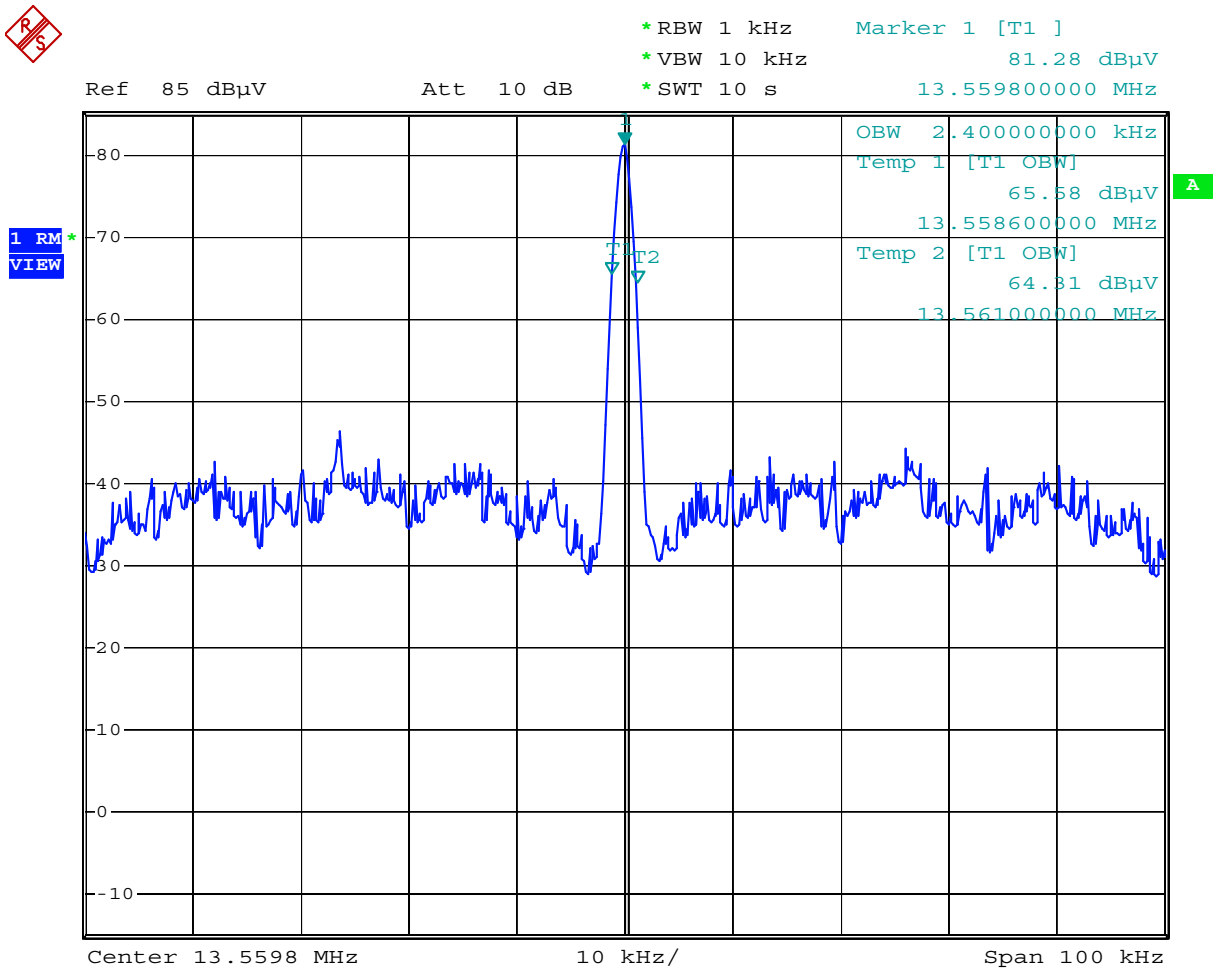

| | |
|---|---|
| Occupied Bandwidth (99 %): | **2.4 kHz** |

## 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: | If not specified in the applicable RSS the occupied bandwidth is measuredas the 99% emission bandwidth.<br>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.<br>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. |
| Measurement procedure: | Bandwidth Measurements (6.1) |

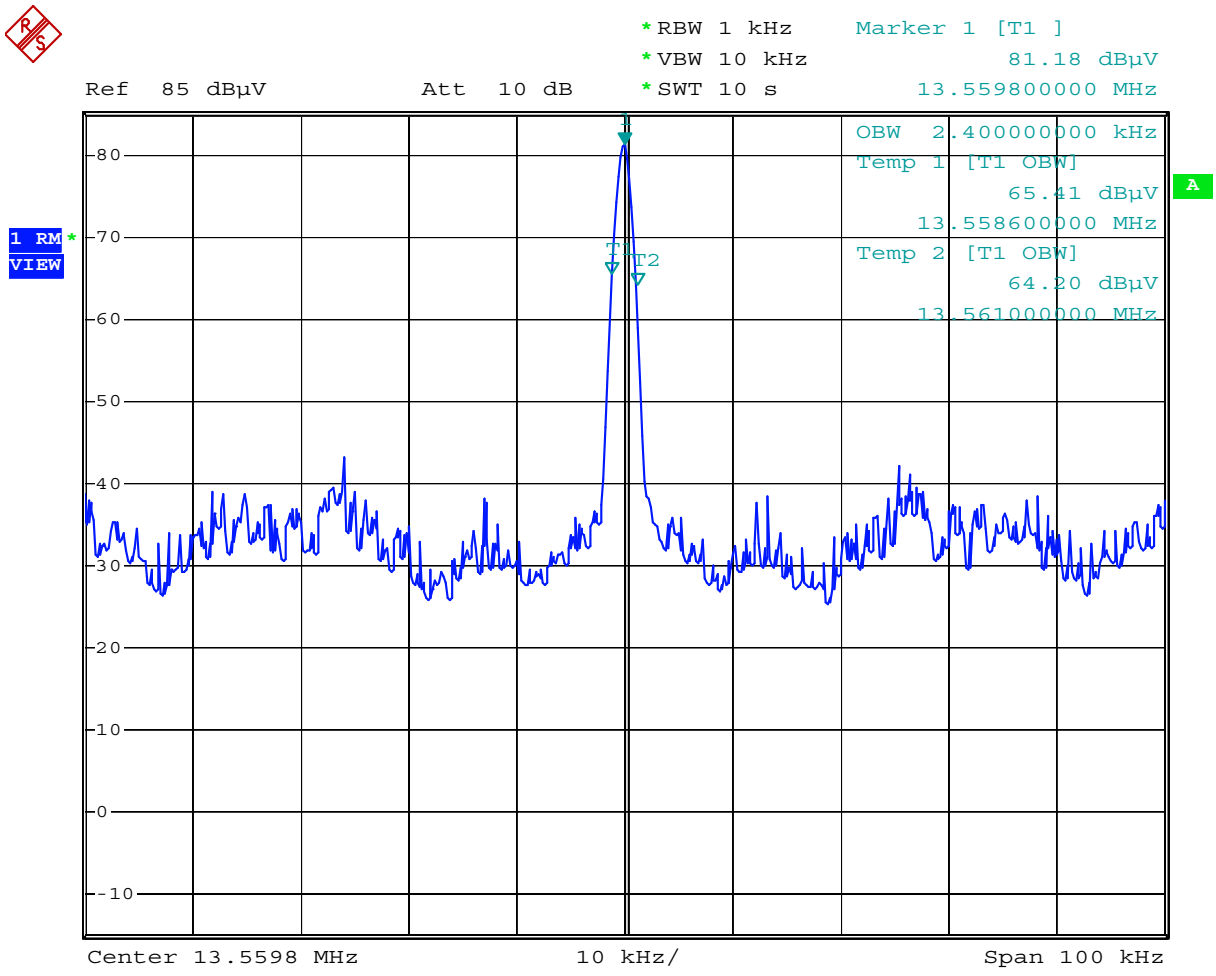
| | |
|---|---|
| Comment: | ISO and RF300 protocol |
| Date of test: | August 10, 2009 |
| Test site: | Fully anechoic room, cabin no. 2 |

## Occupied Bandwidth (99 %): ISO




| | |
|---|---|
| Occupied Bandwidth (99 %): | **2.4kHz** |

## Occupied Bandwidth (99 %): RF300



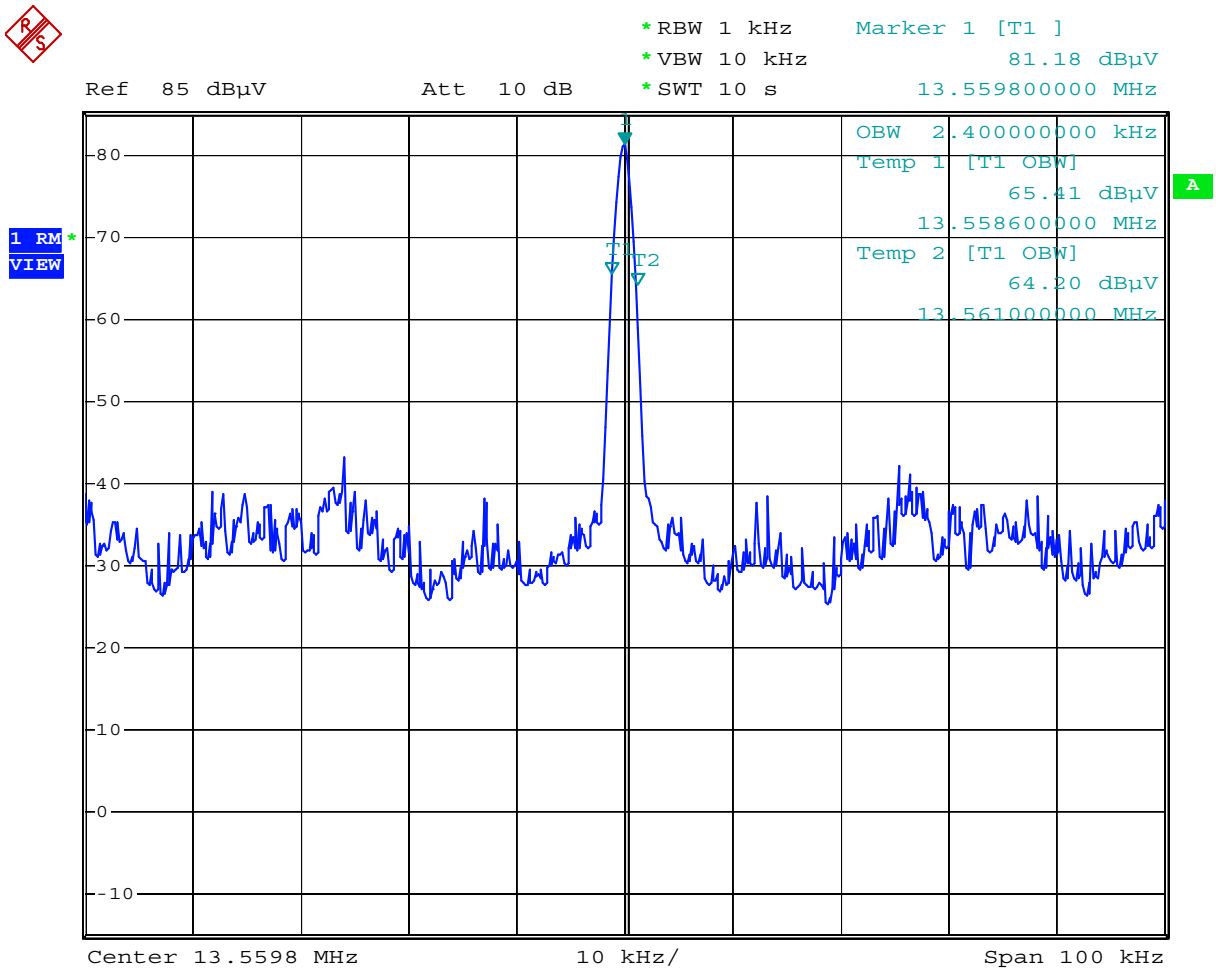

| | |
|---|---|
| Occupied Bandwidth (99 %): | **2.4 kHz** |

## 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: | If not specified in the applicable RSS the occupied bandwidth is measuredas the 99% emission bandwidth.<br>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.<br>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. |
| Measurement procedure: | Bandwidth Measurements (6.1) |

| | |
|---|---|
| Comment: | RF300 protocol |
| Date of test: | August 10, 2009 |
| Test site: | Fully anechoic room, cabin no. 2 |

## Occupied Bandwidth (99 %): RF 300




Date: 10.AUG.2009 15:27:05

| | |
|---|---|
| Occupied Bandwidth (99 %): | **2.4 kHz** |

## 8.2 Bandwidth of the Emission

| | |
|---|---|
| Rules and specifications: | CFR 47 Part 15, section 15.215(c) |
| Guide: | ANSI C63.4 |
| Description: | 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.<br>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.<br>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: |

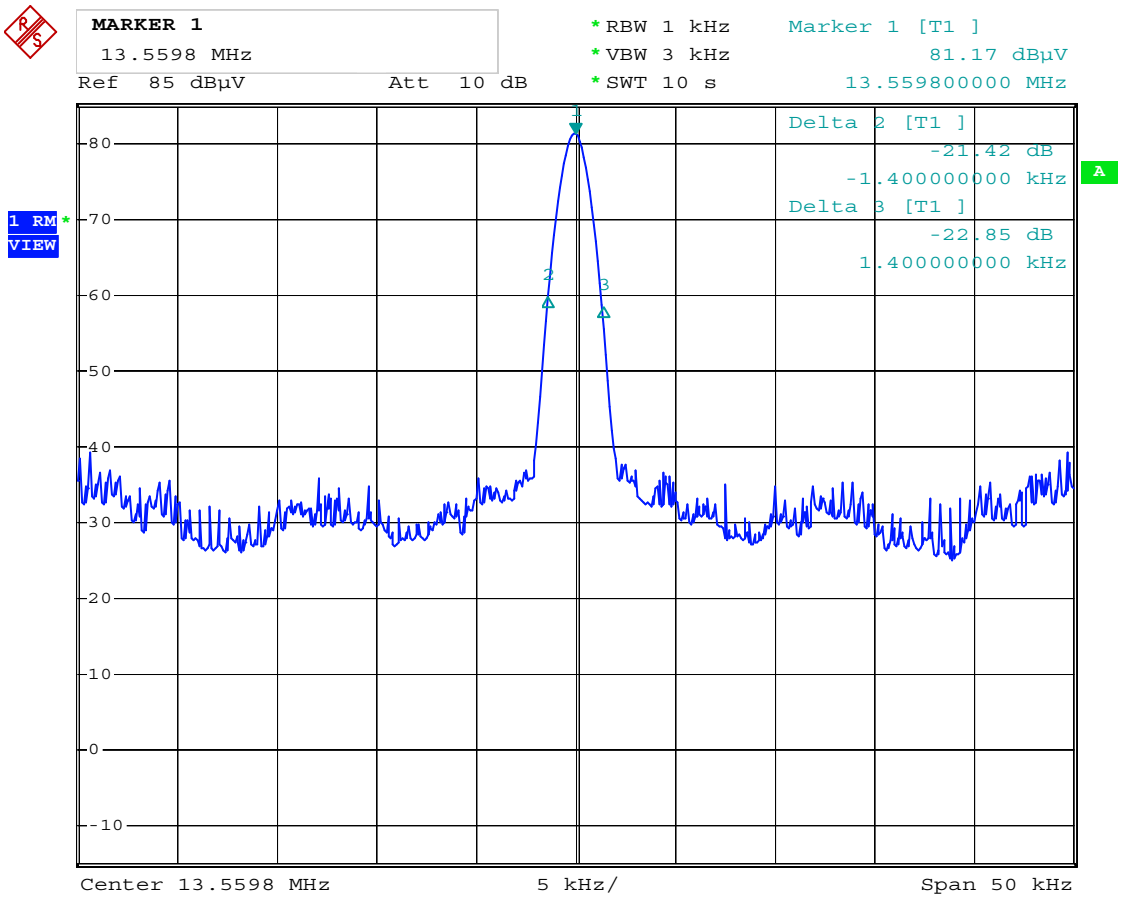
| Fundamental frequency | Minimum resolution bandwidth |
|---|---|
| 9 kHz to 30 MHz | 1 kHz |
| 30 MHz to 1000 MHz | 10 kHz |
| 1000 MHz to 40 GHz | 100 kHz |

The video bandwidth shall be at least three times greater than the resolution bandwidth.

| | |
|---|---|
| Measurement procedure: | Bandwidth Measurements (6.1) |

| | |
|---|---|
| Comment: | ISO and RF300 protocol |
| Date of test: | August 10, 2009 |
| Test site: | Fully anechoic room, cabin no. 2 |

## Bandwidth of the emission: ISO



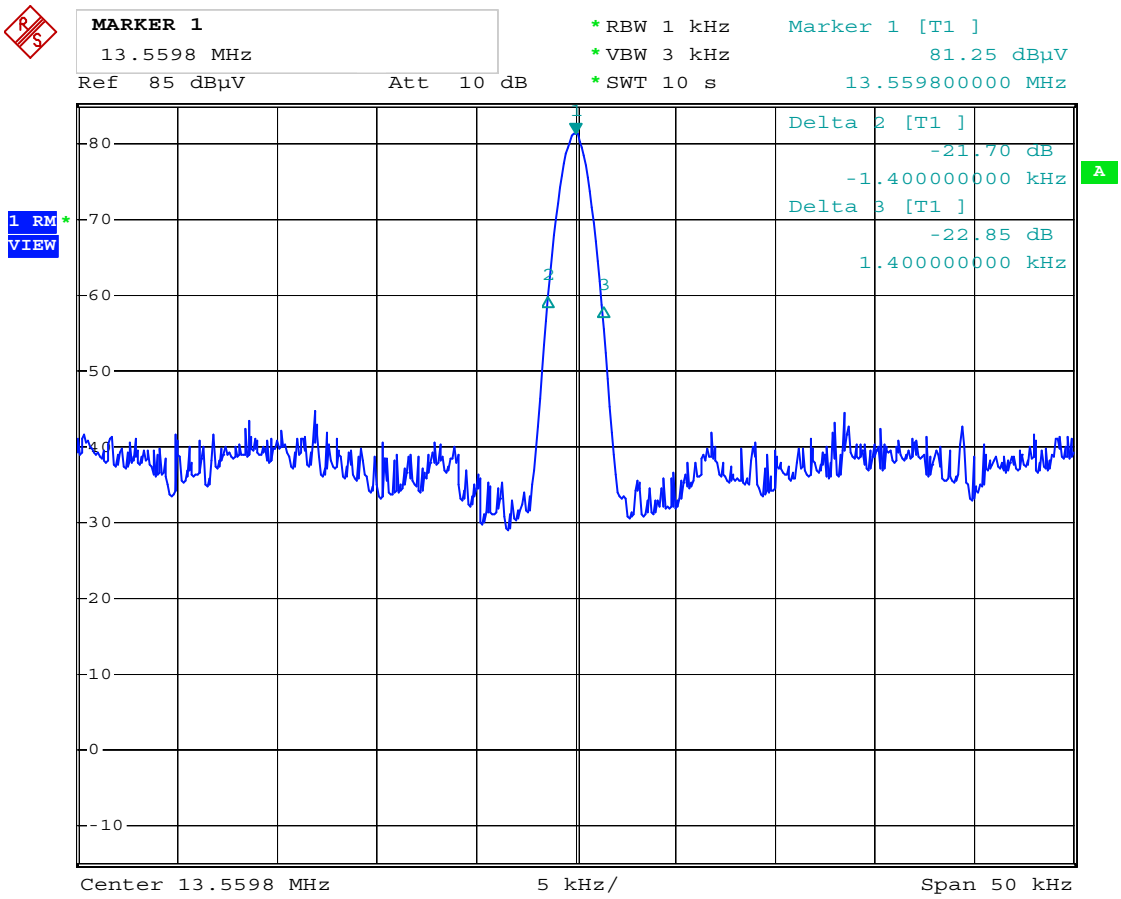

Date: 10.AUG.2009 15:29:14

| | | |
|---|---|---|
| Permitted frequency band: | **13.553 MHz - 13.567 MHz** | |
| 20 dB bandwidth: | **2.8 kHz** | |
| Carrier frequency stability:<br>Maximum frequency tolerances: | ☒ **specified**<br>**+0.057 kHz**<br>**- .0.219 kHz** | ☐ **not specified** |
| Bandwidth of the emission: | **3.076 kHz** | **within permitted frequency band[7]:**<br>☒ **yes** ☐ **no** |

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

[7] 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.

## Bandwidth of the emission: RF300




Date: 10.AUG.2009 15:31:21

| | | |
|---|---|---|
| Permitted frequency band: | **13.553 MHz - 13.567 MHz** | |
| 20 dB bandwidth: | **2.8. kHz** | |
| Carrier frequency stability:<br>Maximum frequency tolerances: | ☒ **specified**<br>**+0.06 kHz**<br>**- 0.219 kHz** | ☐ **not specified** |
| Bandwidth of the emission: | **3.079 kHz** | **within permitted frequency band[8]:**<br>☐ **yes** ☐ **no** |

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

[8] 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.

## 8.3 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: | Amplitude Modulation |

| | |
|---|---|
| $B_n$ = Necessary Bandwidth | $B_n$ = 2BK |
| B = Modulation rate | B = 1.4 kHz |
| K = Overall numerical factor | K = 1 |
| Calculation: | $B_n = 2 \cdot (1.4\ kHz) \cdot 1 = 2.8\ kHz$ |

| | |
|---|---|
| Designation of Emissions: | **2k8A1D** |

## 8.4 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 (MHz) | Conducted Limit (dBµV) | |
| | | Quasi-peak | Average |
| | 0.15 - 0.5<br>0.5 - 5<br>5 - 30 | 66 to 56<br>56<br>60 | 56 to 46<br>46<br>50 |
| Measurement procedure: | Conducted AC Powerline Emission (6.2) | | |

| | |
|---|---|
| Comment: | |
| Date of test: | August 12, 2009 |
| Test site: | Shielded room, cabin no. 1 |

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

| | |
|---|---|
| Tested on: | Linecord power supply : L1 |

| Frequency (MHz) | Detector | Reading Value (dBµV) | Correction Factor (dB) | Final Value (dBµV) | Limit (dBµV) | Margin (dB) |
|---|---|---|---|---|---|---|
| 0.175 | Quasi-Peak | 51.2 | 0.0 | 51.2 | 64.7 | **13.5** |
| 0.215 | Quasi-Peak | 45.8 | 0.0 | 45.8 | 63.0 | 17.2 |

| | |
|---|---|
| Tested on: | Linecord power supply: N |

| Frequency (MHz) | Detector | Reading Value (dBµV) | Correction Factor (dB) | Final Value (dBµV) | Limit (dBµV) | Margin (dB) |
|---|---|---|---|---|---|---|
| 0.170 | Quasi-Peak | 45.4 | 0.0 | 45.4 | 65.0 | **19.6** |

**Sample calculation of final values:**

Final Value (dBµV) = Reading Value (dBµV) + Correction Factor (dB)

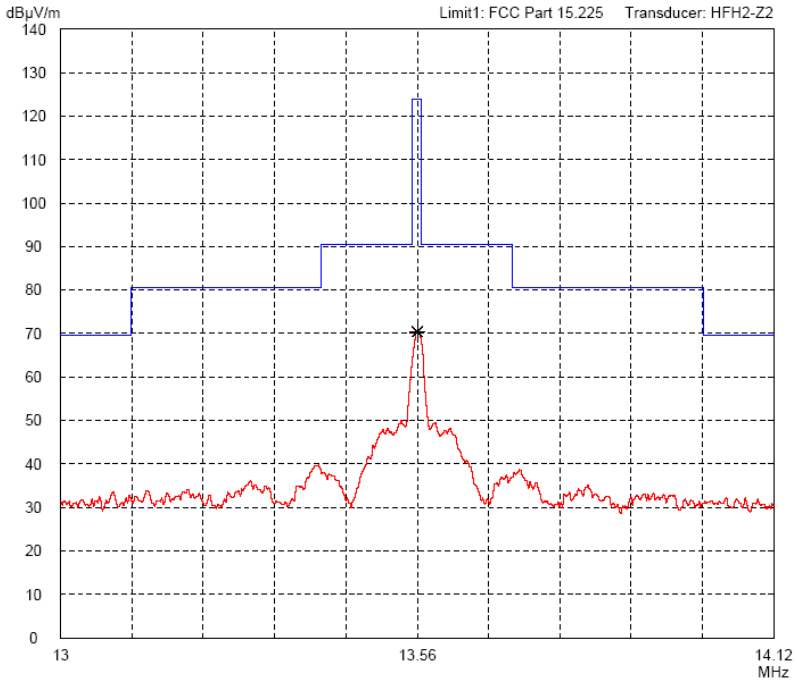
## 8.5 Spectrum Mask

| | | | | |
|---|---|---|---|---|
| Rules and specifications: | CFR 47 Part 15, section 15.225(a)-(d)<br>IC RSS-210 Issue 7, section A2.6 | | | |
| Guide: | ANSI C63.4 | | | |
| Description: | Compliance with the spectrum mask is tested using a spectrum analyzer with resolution bandwidth set to a 1 kHz for the band 13.553 to 13.567 MHz and to 10 kHz outside this band. The video bandwidth shall be at least three times greater than the resolution bandwidth. | | | |
| Limit: | Frequency of Emission (MHz) | Field Strength (µV/m) | Field Strength (dBµV/m) | Measurement Distance d (meters) |
| | 1.705 - 13.110 | 30 | 29.5 | 30 |
| | 13.110 - 13.410 | 106 | 40.5 | 30 |
| | 13.410 - 13.553 | 334 | 50.5 | 30 |
| | 13.553 - 13.567 | 15848 | 84.0 | 30 |
| | 13.567 - 13.710 | 334 | 50.5 | 30 |
| | 13.710 - 14.010 | 106 | 40.5 | 30 |
| | 14.010 - 30.000 | 30 | 29.5 | 30 |
| Measurement procedure: | Radiated Emission Measurement 9 kHz to 30 MHz (6.3) | | | |

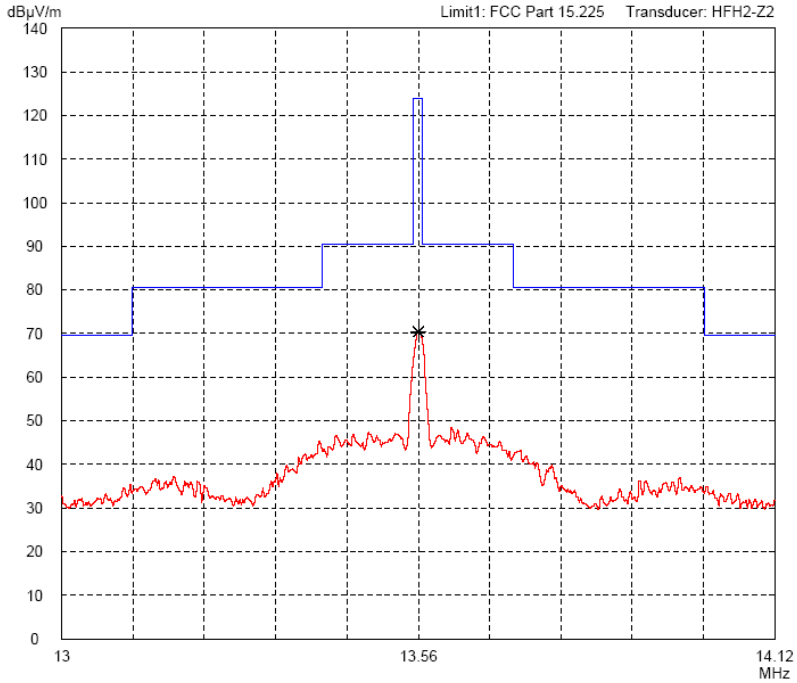
| | |
|---|---|
| Comment: | ISO and RF300 Mode |
| Date of test: | August 12, 2009 |
| Test site: | Fully anechoic room, cabin no. 2 |
| Test distance: | 3 meters |
| Extrapolation Factor: | -40dB/decade |

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

## ISO Mode




## RF300 Mode



## 8.6 Radiated Emission Measurement 9 kHz to 30 MHz

| | | | | |
|---|---|---|---|---|
| Rules and specifications: | CFR 47 Part 15, sections 15.205 and 15.225(a)-(d)<br>IC RSS-210 Issue 7, sections 2.2(b)(c), 2.6 and A2.6 | | | |
| Guide: | ANSI C63.4 | | | |
| Limit: | Frequency of Emission (MHz) | Field Strength (µV/m) | Field Strength (dBµV/m) | Measurement Distance d (meters) |
| | 0.009 - 0.490 | 2400/F(kHz) | 67.6 - 20 · log(F(kHz)) | 300 |
| | 0.490 - 1.705 | 24000/F(kHz) | 87.6 - 20 · log(F(kHz)) | 30 |
| | 1.705 - 13.110 | 30 | 29.5 | 30 |
| | 13.110 - 13.410 | 106 | 40.5 | 30 |
| | 13.410 - 13.553 | 334 | 50.5 | 30 |
| | 13.553 - 13.567 | 15848 | 84.0 | 30 |
| | 13.567 - 13.710 | 334 | 50.5 | 30 |
| | 13.710 - 14.010 | 106 | 40.5 | 30 |
| | 14.010 - 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 (6.3) | | | |

| | |
|---|---|
| Comment: | ISO and RF300 Mode |
| Date of test: | August 12, 2009 |
| Test site: | Open field test site |

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

### ISO Mode

Extrapolation factor: -40 dB/decade

| Frequency (MHz) | Detector | Distance d1 (m) | Distance d (m) | Reading Value (dBµV) | Correction Factor (dB/m) | Extrapolation Factor (dB) | Pulse Train Correction (dB) | Final Value (dBµV/m) | Limit (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| 13.56000 | Quasi-Peak | 10 | 30 | 38.3 | 20.0 | -19.1 | | 39.2 | 84.0 | **44.8** |

### RF300 Mode

Extrapolation factor: -40 dB/decade

| Frequency (MHz) | Detector | Distance d1 (m) | Distance d (m) | Reading Value (dBµV) | Correction Factor (dB/m) | Extrapolation Factor (dB) | Pulse Train Correction (dB) | Final Value (dBµV/m) | Limit (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| 13.56000 | Quasi-Peak | 10 | 30 | 37.7 | 20.0 | -19.1 | | 38.6 | 84.0 | **45.4** |

### Sample calculation of final values:

Extrapolation Factor (dB) = (Log(d) - Log($d_1$)) · Extrapolation Factor (dB/decade)

Final Value (dBµV/m) = Reading Value $d_1$ (dBµV) + Correction Factor (dB/m) + Extrapolation Factor (dB) + Pulse Train Correction (dB)

Note: Extrapolation factor (dB) and final value (dBµV/m) are relating to distance d.

## 8.7 Radiated Emission Measurement 30 MHz to 1 GHz

| | | | |
|---|---|---|---|
| Rules and specifications: | CFR 47 Part 15, sections 15.205(b) and 15.225(d)<br>IC RSS-210 Issue 7, sections 2.2(b)(c), 2.6 and A2.6 | | |
| Guide: | ANSI C63.4 | | |
| Limit: | Frequency of Emission (MHz) | Field Strength (µV/m) | Field Strength (dBµV/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 (6.4)<br>Radiated Emission at Open Field Test Site (6.5) | | |

| | |
|---|---|
| Comment: | ISO and RF300 Mode |
| Date of test: | August 13, 2009 |
| Test site: | Frequencies ≤ 1 GHz: Open field test site<br>Frequencies > 1 GHz: Fully anechoic room, cabin no. 2 |
| Test distance: | 3 meters |

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

ISO Mode

| Frequency (MHz) | Antenna Polarization | Detector | Receiver Reading (dBµV) | Correction Factor (dB/m) | Pulse Train Correction (dB) | Final Value (dBµV/m) | Limit (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| 40.680 | vertical | Quasi-Peak | 7.5 | 11.7 | | 19.2 | 40.0 | 20.8 |
| 54.240 | vertical | Quasi-Peak | 14.5 | 10.0 | | 24.5 | 40.0 | 15.5 |
| 67.800 | vertical | Quasi-Peak | 14.5 | 9.6 | | 24.1 | 40.0 | 15.9 |
| 81.360 | vertical | Quasi-Peak | 15.8 | 9.7 | | 25.5 | 40.0 | 14.5 |
| 176.280 | horizontal | Quasi-Peak | 1.3 | 15.0 | | 16.3 | 43.5 | 27.2 |
| 542.400 | vertical | Quasi-Peak | 7.1 | 21.6 | | 28.7 | 46.0 | 17.3 |
| 555.960 | vertical | Quasi-Peak | 2.7 | 21.8 | | 24.5 | 46.0 | 21.5 |
| 583.080 | vertical | Quasi-Peak | 8.2 | 22.4 | | 30.6 | 46.0 | 15.4 |
| 596.640 | vertical | Quasi-Peak | 18.5 | 22.7 | | 41.2 | 46.0 | **4.8** |
| 623.760 | vertical | Quasi-Peak | 12.3 | 23.6 | | 35.9 | 46.0 | 10.1 |

RF300 Mode

| Frequency (MHz) | Antenna Polarization | Detector | Receiver Reading (dBµV) | Correction Factor (dB/m) | Pulse Train Correction (dB) | Final Value (dBµV/m) | Limit (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| 40.680 | vertical | Quasi-Peak | 9.5 | 11.7 | | 21.2 | 40.0 | 18.8 |
| 54.240 | vertical | Quasi-Peak | 17.7 | 10.0 | | 27.7 | 40.0 | 12.3 |
| 67.800 | vertical | Quasi-Peak | 14.4 | 9.6 | | 24.0 | 40.0 | 16.0 |
| 81.360 | vertical | Quasi-Peak | 14.2 | 9.7 | | 23.9 | 40.0 | 16.1 |
| 108.480 | vertical | Quasi-Peak | 4.0 | 11.5 | | 15.5 | 43.5 | 28.0 |
| 122.040 | horizontal | Quasi-Peak | 3.5 | 12.5 | | 16.0 | 43.5 | 27.5 |
| 542.400 | vertical | Quasi-Peak | 5.4 | 21.6 | | 27.0 | 46.0 | 19.0 |
| 555.960 | vertical | Quasi-Peak | 6.7 | 21.8 | | 28.5 | 46.0 | 17.5 |
| 583.080 | vertical | Quasi-Peak | 14.0 | 22.4 | | 36.4 | 46.0 | 9.6 |
| 596.640 | vertical | Quasi-Peak | 14.4 | 22.7 | | 37.1 | 46.0 | **8.9** |
| 610.200 | vertical | Quasi-Peak | 13.5 | 23.1 | | 36.6 | 46.0 | 9.4 |
| 623.760 | vertical | Quasi-Peak | 11.2 | 23.6 | | 34.8 | 46.0 | 11.2 |
| 637.320 | vertical | Quasi-Peak | 3.3 | 23.7 | | 27.0 | 46.0 | 19.0 |
| 664.400 | vertical | Quasi-Peak | 1.5 | 24.3 | | 25.8 | 46.0 | 20.2 |

**Sample calculation of final values:**

Final Value (dBµV/m) = Reading Value (dBµV) + Correction Factor (dB/m) + Pulse Train Correction (dB)

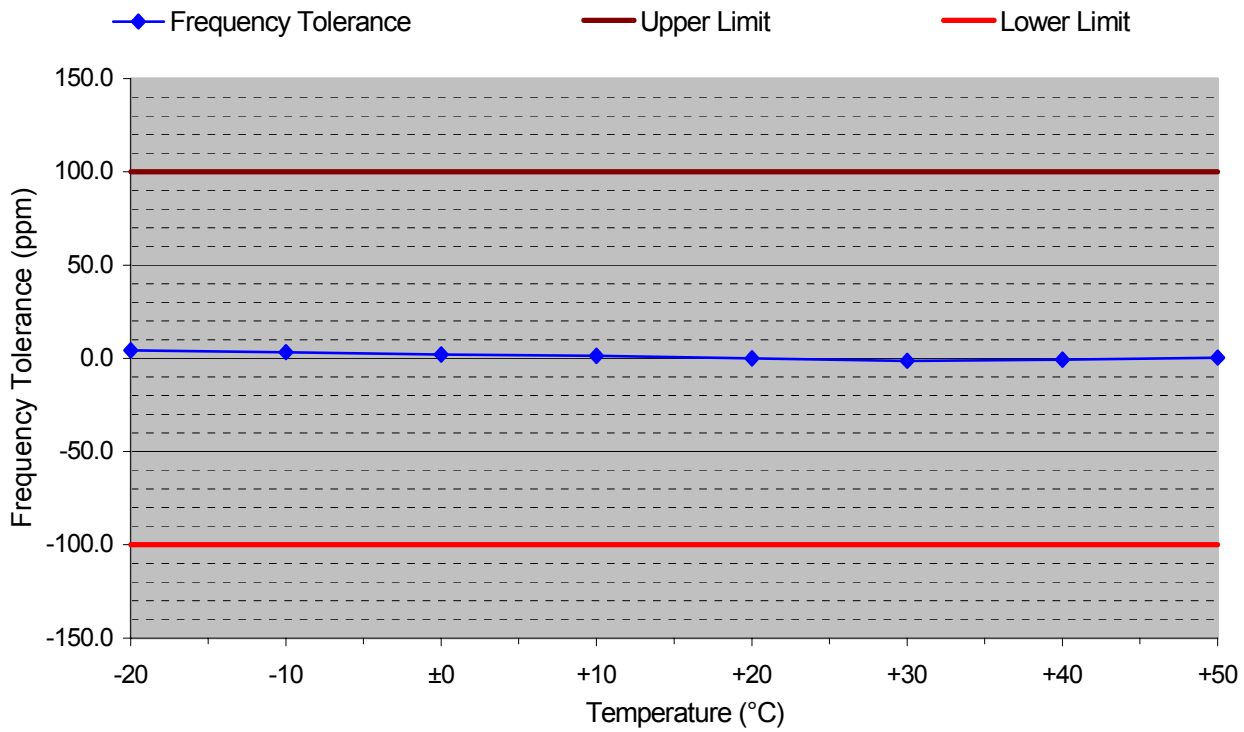
## 8.8 Carrier Frequency Stability

| | |
|---|---|
| Rules and specifications: | CFR 47 Part 15, section 15.225(e)<br>IC RSS-Gen Issue 2, section 4.7 and IC RSS-210 Issue 7, section A2.6 |
| Guide: | ANSI C63.4 |
| Limit: | The frequency tolerance of the carrier signal shall be maintained within ±0.01 % (±100 ppm) of the carrier frequency under nominal conditions. |
| Temperature range:<br>Voltage range: | -20°C to +50°C (at normal supply voltage)<br>85% to 115% of the rated supply voltage (at a temperature of +20°C) |
| Measurement procedure: | Carrier Frequency Stability (6.6) |

| | |
|---|---|
| Comment: | |
| Date of test: | August 12, 2009 |

## 8.8.1 Carrier Frequency Stability vs. Temperature

ISO Mode

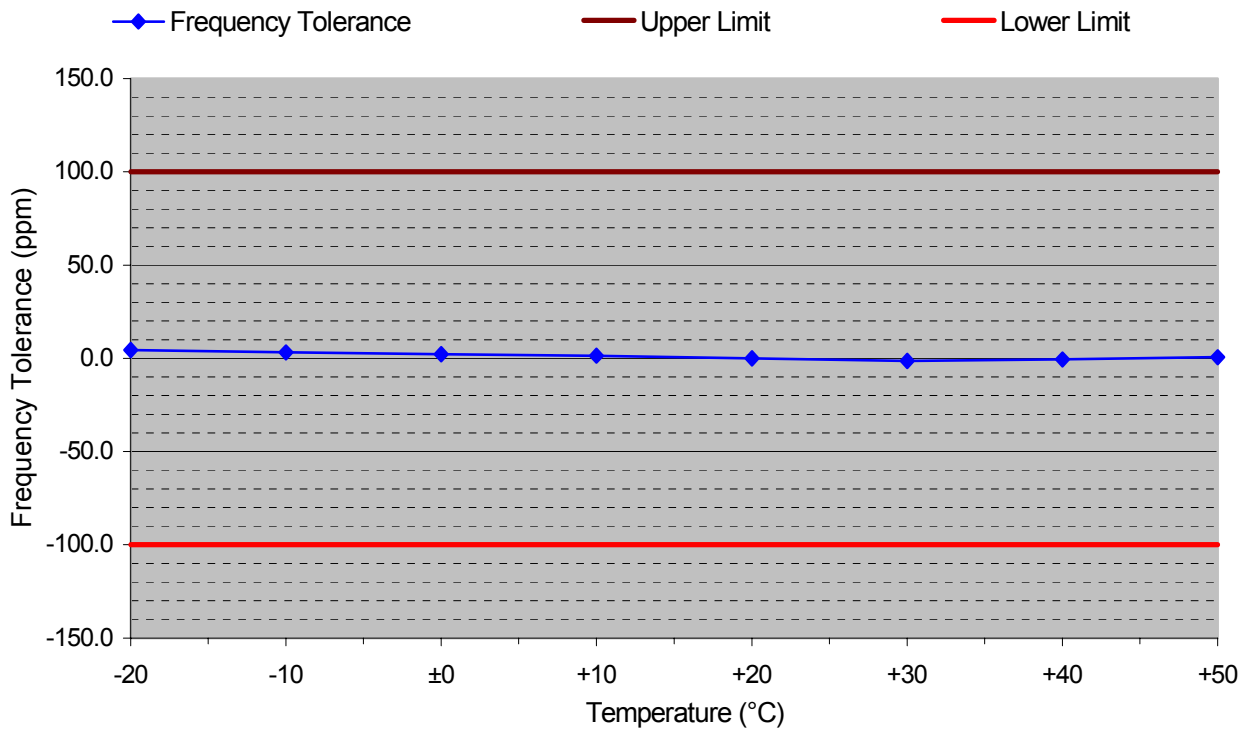



Supply voltage: 24 V Nominal frequency: 13.559782 MHz

| Temperature (°C) | Frequency (MHz) | Frequency Tolerance (Hz) | Frequency Tolerance (ppm) | Upper Limit (ppm) | Lower Limit (ppm) | Margin (ppm) |
|---|---|---|---|---|---|---|
| -20 | 13.559839 | 57 | 4.2 | +100.0 | -100.0 | **95.8** |
| -10 | 13.559826 | 44 | 3.3 | +100.0 | -100.0 | 96.7 |
| ±0 | 13.559810 | 28 | 2.1 | +100.0 | -100.0 | 97.9 |
| +10 | 13.559799 | 18 | 1.3 | +100.0 | -100.0 | 98.7 |
| +20 | 13.559782 | 0 | 0.0 | +100.0 | -100.0 | 100.0 |
| +30 | 13.559764 | -18 | -1.3 | +100.0 | -100.0 | 98.7 |
| +40 | 13.559771 | -10 | -0.8 | +100.0 | -100.0 | 99.2 |
| +50 | 13.559786 | 4 | 0.3 | +100.0 | -100.0 | 99.7 |

## 8.8.2 Carrier Frequency Stability vs. Temperature

RF300 Mode



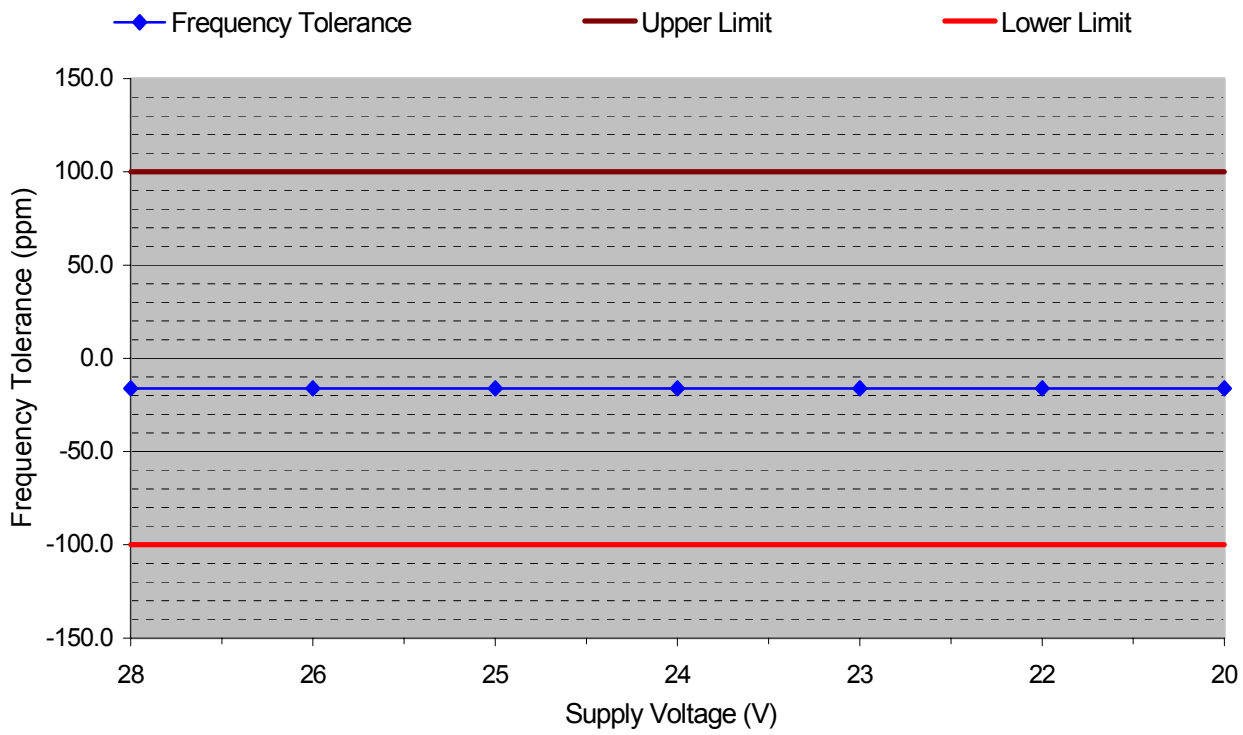

Supply voltage: 24 V Nominal frequency: 13.559781 MHz

| Temperature (°C) | Frequency (MHz) | Frequency Tolerance (Hz) | Frequency Tolerance (ppm) | Upper Limit (ppm) | Lower Limit (ppm) | Margin (ppm) |
|---|---|---|---|---|---|---|
| -20 | 13.559841 | 60 | 4.4 | +100.0 | -100.0 | **95.6** |
| -10 | 13.559825 | 44 | 3.2 | +100.0 | -100.0 | 96.8 |
| ±0 | 13.559811 | 30 | 2.2 | +100.0 | -100.0 | 97.8 |
| +10 | 13.559800 | 19 | 1.4 | +100.0 | -100.0 | 98.6 |
| +20 | 13.559781 | 0 | 0.0 | +100.0 | -100.0 | 100.0 |
| +30 | 13.559762 | -19 | -1.4 | +100.0 | -100.0 | 98.6 |
| +40 | 13.559773 | -8 | -0.6 | +100.0 | -100.0 | 99.4 |
| +50 | 13.559790 | 9 | 0.6 | +100.0 | -100.0 | 99.4 |

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

### 8.8.3 Carrier Frequency Stability vs. Supply Voltage

ISO Mode

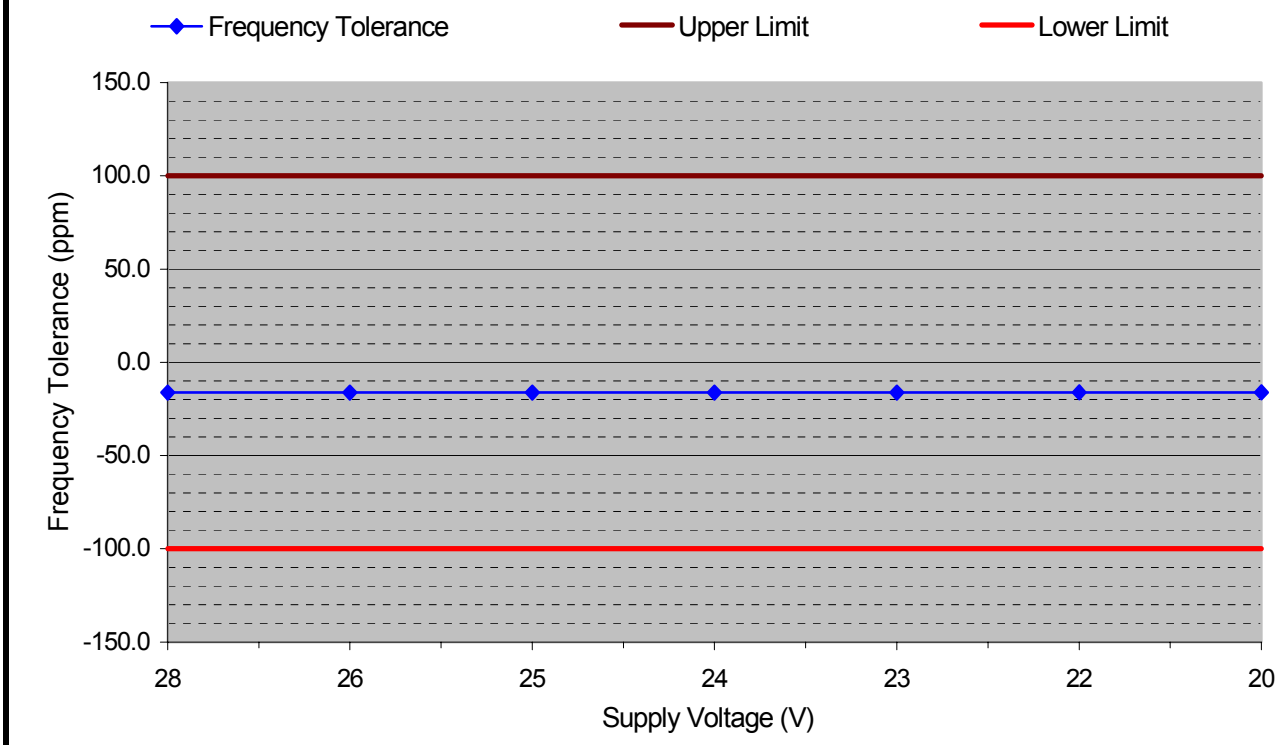



Temperature: +20 °C
Nominal frequency: 13.560000 MHz
Battery End Point: Not applicable

| Supply Voltage (V) | Frequency (MHz) | Frequency Tolerance (Hz) | Frequency Tolerance (ppm) | Upper Limit (ppm) | Lower Limit (ppm) | Margin (ppm) |
|---|---|---|---|---|---|---|
| 28 | 13.559781 | -219 | -16.1 | +100.0 | -100.0 | **83.9** |
| 26 | 13.559781 | -219 | -16.1 | +100.0 | -100.0 | 83.9 |
| 25 | 13.559782 | -218 | -16.1 | +100.0 | -100.0 | 83.9 |
| 24 | 13.559782 | -218 | -16.1 | +100.0 | -100.0 | 83.9 |
| 23 | 13.559782 | -218 | -16.1 | +100.0 | -100.0 | 83.9 |
| 22 | 13.559782 | -218 | -16.1 | +100.0 | -100.0 | 83.9 |
| 20 | 13.559781 | -219 | -16.1 | +100.0 | -100.0 | 83.9 |

## 8.8.4 Carrier Frequency Stability vs. Supply Voltage

RF300 Mode




Temperature: +20 °C
Nominal frequency: 13.560000 MHz
Battery End Point: Not applicable

| Supply Voltage (V) | Frequency (MHz) | Frequency Tolerance (Hz) | Frequency Tolerance (ppm) | Upper Limit (ppm) | Lower Limit (ppm) | Margin (ppm) |
|---|---|---|---|---|---|---|
| 28 | 13.559781 | -219 | -16.2 | +100.0 | -100.0 | 83.8 |
| 26 | 13.559781 | -219 | -16.2 | +100.0 | -100.0 | **83.8** |
| 25 | 13.559781 | -219 | -16.2 | +100.0 | -100.0 | 83.8 |
| 24 | 13.559781 | -219 | -16.2 | +100.0 | -100.0 | 83.8 |
| 23 | 13.559781 | -219 | -16.2 | +100.0 | -100.0 | 83.8 |
| 22 | 13.559781 | -219 | -16.1 | +100.0 | -100.0 | 83.9 |
| 20 | 13.559781 | -219 | -16.1 | +100.0 | -100.0 | 83.9 |

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

## 8.9 Exposure of Humans to RF Fields

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

| Exposure of Humans to RF Fields | Applicable | Declared by applicant | Measured | Exemption |
|---|---|---|---|---|
| The antenna is | | | | |
| ☐ detachable | | | | |
| The conducted output power (CP in watts) is measured at the antenna connector:<br>$CP$ = ..... **W** | | | ☐ | |
| The effective isotropic radiated power (EIRP in watts) is calculated using | | | | |
| ☐ the numerical antenna gain: $G$ = ..... | | ☐ | | |
| $EIRP = G \cdot CP \Rightarrow EIRP$ = ..... **W** | | | | |
| ☐ the field strength[9] in V/m: $FS$ = ..... **V/m** | | | ☐ | |
| $EIRP = \frac{(FS \cdot D)^2}{30} \Rightarrow EIRP$ = ..... **W** | | | | |
| with: | | | | |
| Distance between the antennas in m: $D$ = ..... **m** | | | ☐ | |
| ☒ not detachable | | | | |
| A field strength measurement is used to determine the effective isotropic radiated power (EIRP in watts) given by[9]:<br>$EIRP = \frac{(FS \cdot D)^2}{30} \Rightarrow EIRP$ = **2.13$^{-6}$W** | | | | |
| with: | | | | |
| Field strength in V/m: $FS$ =**0.0008 V/m** | | | ☒ | |
| Distance between the two antennas in m: $D$ =**10 m** | | | ☒ | |
| Selection of output power | | | | |
| The output power TP is the higher of the conducted or effective isotropic radiated power (e.i.r.p.):<br>$TP$ = **2.13$^{-6}$W** | | | | |

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

| Exposure of Humans to RF Fields (continued) | Applicable | Declared by applicant | Measured | Exemption |
|---|---|---|---|---|
| Separation distance between the user and the transmitting device is | | | | |
| ☐ less than or equal to 20 cm ☒ greater than 20 cm | | ☒ | | |
| Transmitting device is | | | | |
| ☐ in the vicinity of the human head ☐ body-worn | | ☒ | | |
| SAR evaluation | | | | |
| SAR evaluation is required if the separation distance between the user and the device is less than or equal to 20 cm. | | | | |
| ☐ The device operates from 3 kHz up to 1 GHz inclusively and its source-based time-averaged output power is less than, or equal to 200 mW for General Public Use and 1000 mW for Controlled Use. | | | | ☐ |
| ☐ The device operates above 1 GHz up to 2.2 GHz inclusively and its source-based time-averaged output power is less than, or equal to 100 mW for General Public Use and 500 mW for Controlled Use. | | | | ☐ |
| ☐ The device operates above 2.2 GHz up to 3 GHz inclusively and its source-based time-averaged output power is less than, or equal to 20 mW for General Public Use and 100 mW for Controlled Use. | | | | ☐ |
| ☐ The device operates above 3 GHz up to 6 GHz inclusively and its source-based time-averaged output power) is less than, or equal to 10 mW for General Public Use and 50 mW for Controlled Use. | | | | ☐ |
| ☐ SAR evaluation is documented in test report no. ..... | | | | |
| RF exposure evaluation | | | | |
| RF exposure evaluation is required if the separation distance between the user and the device is greater than 20 cm. | | | | |
| ☒ The device operates below 1.5 GHz and its e.i.r.p. is equal to or less than 2.5 W. | | | | ☒ |
| ☐ The device operates at or above 1.5 GHz and the e.i.r.p. of the device is equal to or less than 5 W. | | | | ☐ |
| ☐ RF exposure evaluation is documented in test report no. ..... | | | | |

## 9 Referenced Regulations

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

| | | | |
|---|---|---|---|
| ☒ | 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 |
| ☒ | CFR 47 Part 15 | Code of Federal Regulations Part 15 (Radio Frequency Devices) of the Federal Communication Commission (FCC) | October 1, 2008 |
| ☒ | ANSI C63.4 | American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz | December 11, 2003 (published on January 30, 2004) |
| ☒ | RSS-Gen | Radio Standards Specification RSS-Gen Issue 2 containing General Requirements and Information for the Certification of Radiocommunication Equimpment, published by Industry Canada | June 2007 |
| ☒ | 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 |
| ☐ | 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 |
| ☒ | RSS-102 | Radio Standards Specification RSS-102 Issue 3: Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) , published by Industry Canada | June 2009 |
| ☐ | ICES-003 | Interference-Causing Equipment Standard ICES-003 Issue 4 for Digital Apparatus, published by Industry Canada | February 7, 2004 |
| ☒ | 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 |
| ☐ | CAN/CSA-CEI/IEC CISPR 22 | Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment | 2002 |

| | | | |
|---|---|---|---|
| ☒ | 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 |

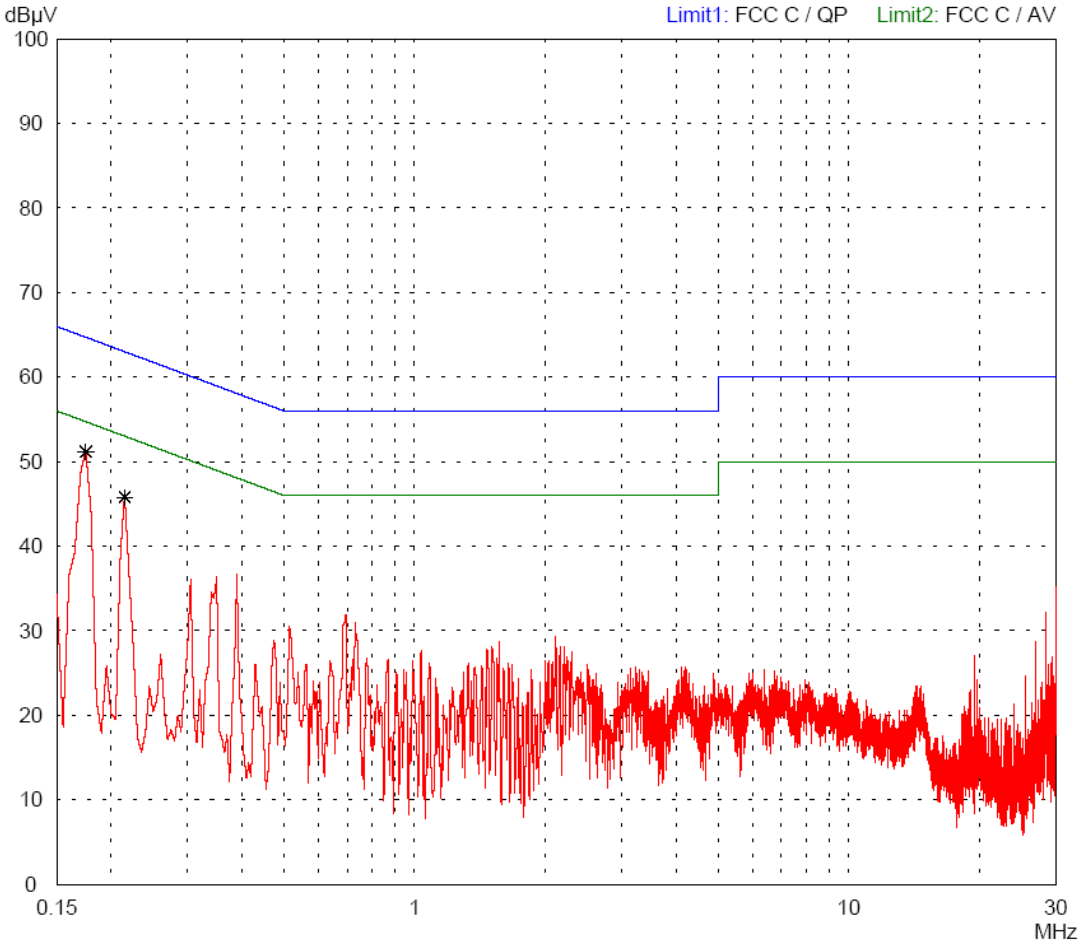
# 10 Revision History

| Revision History | | | |
|---|---|---|---|
| *Edition* | *Date* | *Issued by* | *Modifications* |
| 1 | 05.10.09 | Thomas Eberl (cj) | First Edition |
| 2 | 10.11.09 | Christa Jäger | Edition 2<br>Revision required for FCC-/IC-Certification<br>Update of referenced regulations |

# 11 Charts taken during testing

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

| | |
|---|---|
| Model: RF340R | Mode: |
| Serial no.: #1 | - EUT powered from AC/DC power supply |
| Applicant: Siemens AG, Fürth | - AC supply voltage 120 V |
| Test site: Shielded room, cabin no. 4 | - EUT supply voltage 24 V |
| Tested on: Linecord Phase L1 | - ISO mode |
| Date of test: 08/12/2009 Operator: T. Eberl | - antenna port with 50R load |
| Test performed: automatically File name: | |
| Detector: Peak / Final Results: QP | Final results: 20 dB Margin 25 Subranges |




| | |
|---|---|
| Result: Limit kept | Project file: 19201-00624 Page of Pages |

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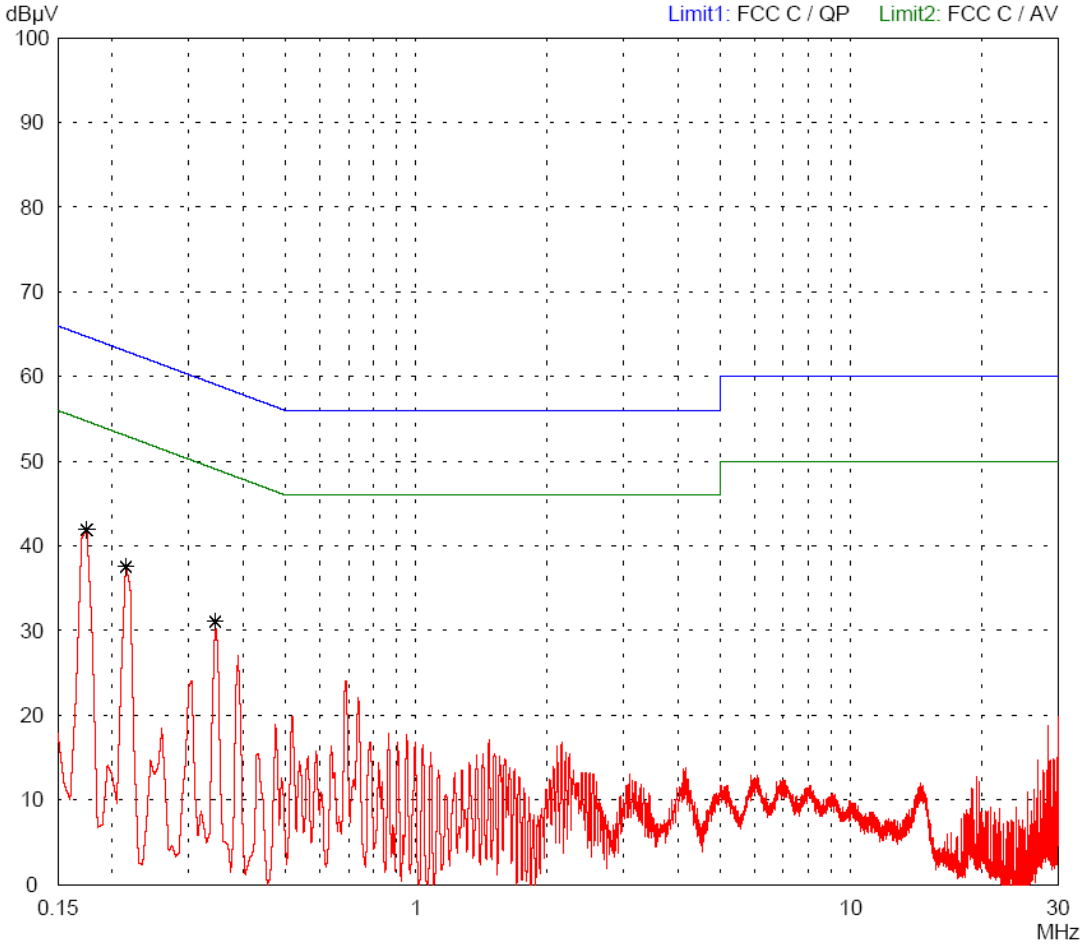
Web: www.tuev-sued.com/senton

SENTON

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

| | |
|---|---|
| Model: RF340R | Mode: |
| Serial no.: #1 | - EUT powered from AC/DC power supply |
| Applicant: Siemens AG, Fürth | - AC supply voltage 120 V |
| Test site: Shielded room, cabin no. 4 | - EUT supply voltage 24 V |
| Tested on: Linecord Phase L1 | - ISO mode |
| Date of test: 08/12/2009 Operator: T. Eberl | - antenna port with 50R load |
| Test performed: automatically File name: | |

| | |
|---|---|
| Detector: Average / Final Results: AV | Final results: 20 dB Margin 25 Subranges |

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| Result: Limit kept | Project file: 19201-00624 Page of Pages |

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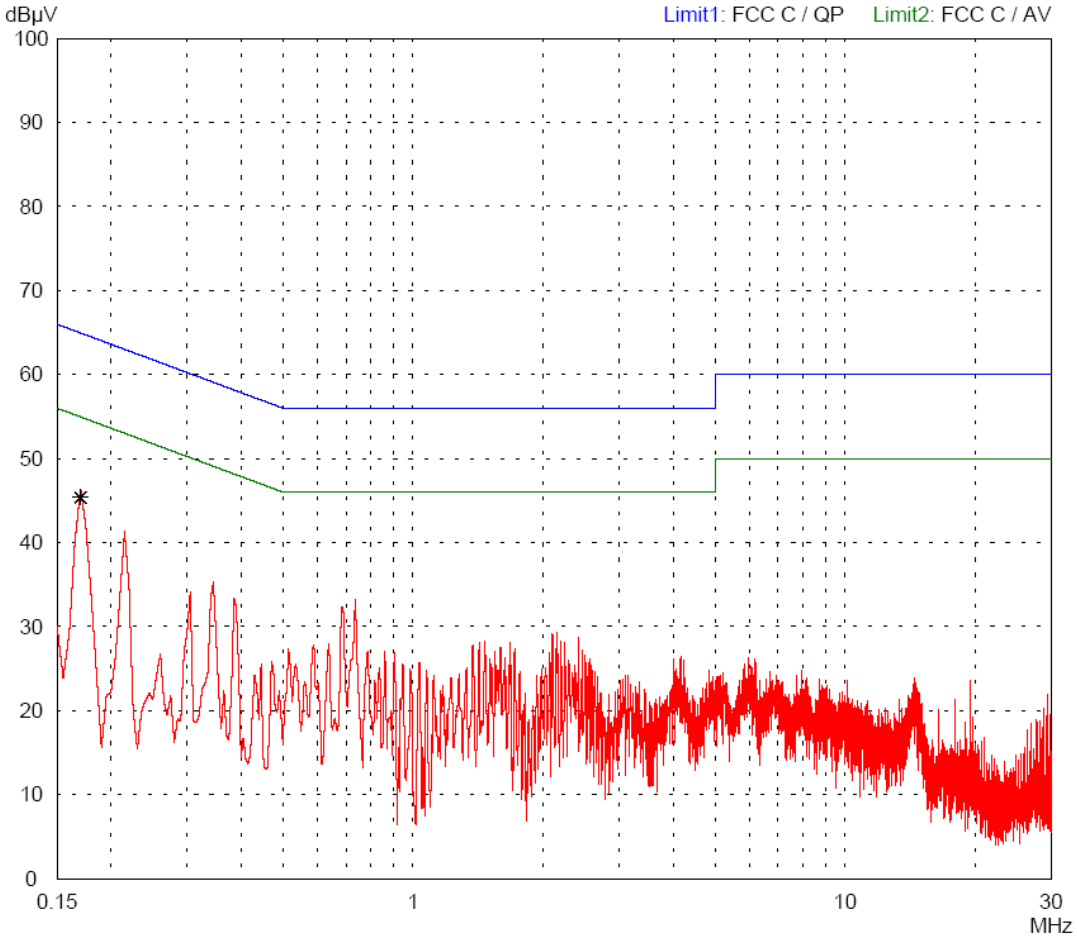
## Conducted Emission Test 150 kHz - 30 MHz
## according to FCC Part 15 Subpart C

| | |
|---|---|
| Model: RF340R | Mode: |
| Serial no.: #1 | - EUT powered from AC/DC power supply |
| Applicant: Siemens AG, Fürth | - AC supply voltage 120 V |
| Test site: Shielded room, cabin no. 4 | - EUT supply voltage 24 V |
| Tested on: Linecord Phase N | - ISO mode |
| Date of test: 08/12/2009 Operator: T. Eberl | - antenna port with 50R load |
| Test performed: automatically File name: | |
| Detector: Peak / Final Results: QP | Final results: 20 dB Margin 25 Subranges |

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| Result: Limit kept | Project file: 19201-00624 Page of Pages |

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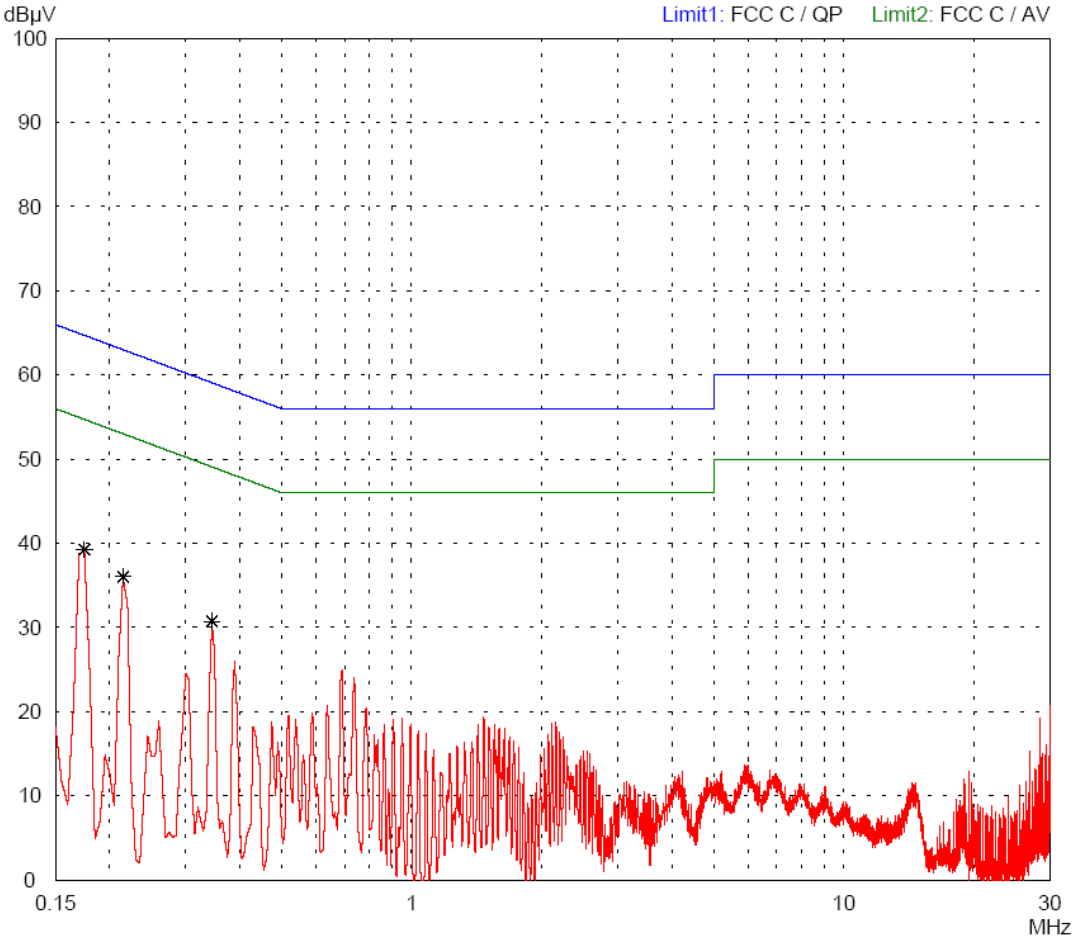
## Conducted Emission Test 150 kHz - 30 MHz
## according to FCC Part 15 Subpart C

| | |
|---|---|
| Model: RF340R | Mode: |
| Serial no.: #1 | - EUT powered from AC/DC power supply |
| Applicant: Siemens AG, Fürth | - AC supply voltage 120 V |
| Test site: Shielded room, cabin no. 4 | - EUT supply voltage 24 V |
| Tested on: Linecord Phase N | - ISO mode |
| Date of test: 08/12/2009 Operator: T. Eberl | - antenna port with 50R load |
| Test performed: automatically File name: | |
| Detector: Average / Final Results: AV | Final results: 20 dB Margin 25 Subranges |

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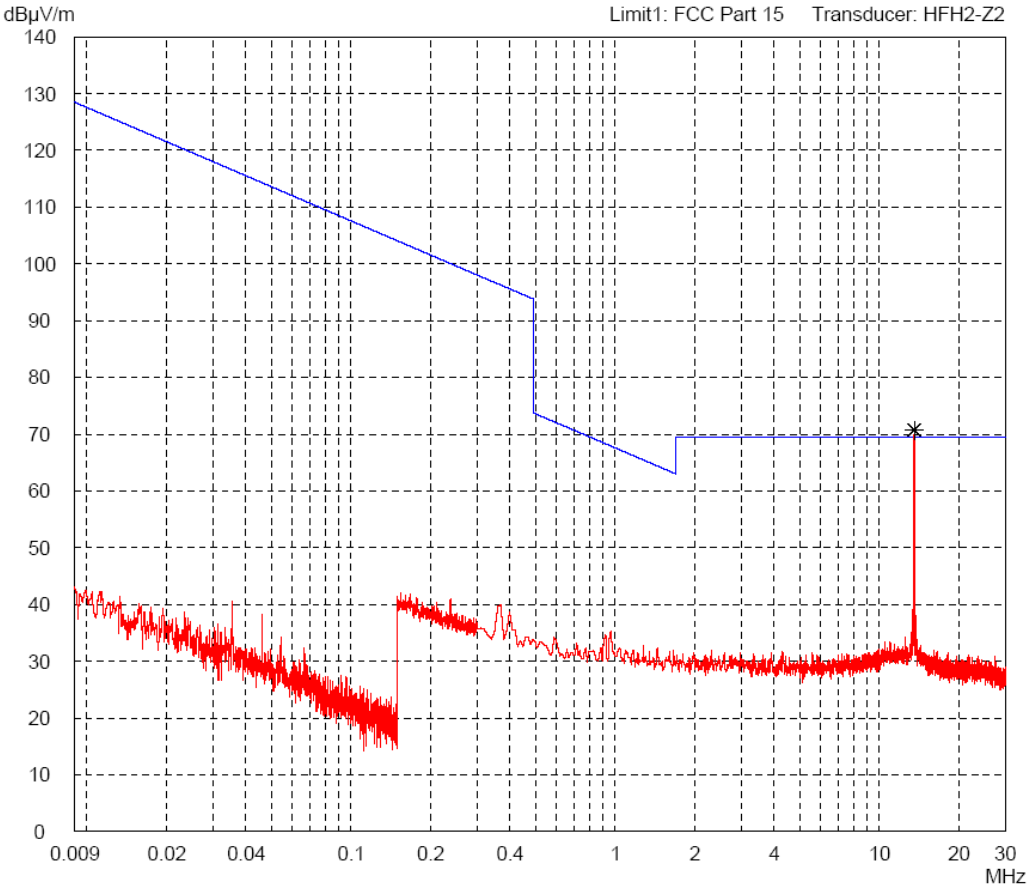
| Result: Limit kept | Project file: 19201-00624 Page of Pages |

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

| | |
|---|---|
| Model: RF340R | Comment: - EUT powered via MOBY ASM 452 external<br>- ISO mode<br>- with TAG |
| Serial no.: #1 | |
| Applicant: Siemens AG, Fürth | |
| Test site: Fully anechoic room, cabin no. 2 | |
| Tested on: Test distance 3 metres<br>Vertical Polarization | |
| Date of test: 08/10/2009 / Operator: T. Eberl | |
| Test performed: by hand / File name: default.emi | |

| | |
|---|---|
| Detector: Peak | List of values: 10 dB Margin 50 Subranges |




| | |
|---|---|
| Result: Prescan | Project file: 19201-00624 Page of Pages |

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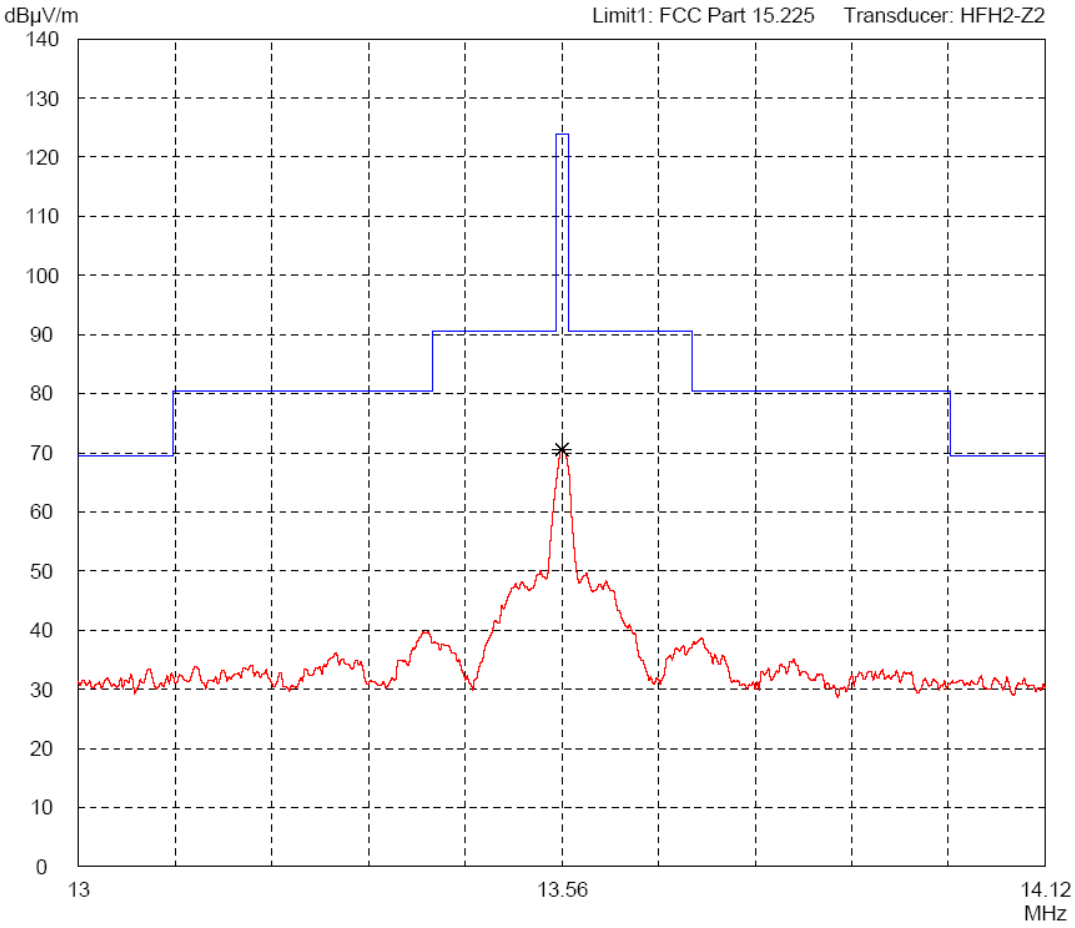
## Radiated Emission Test 13 MHz - 14.12 MHz
## acc. to FCC Part 15.225 (Fully Anechoic Chamber)

| | |
|---|---|
| Model: RF340R | Comment: - EUT powered via MOBY ASM 452 external<br>- ISO mode<br>- with TAG |
| Serial no.: #1 | |
| Applicant: Siemens AG, Fürth | |
| Test site: Fully anechoic room, cabin no. 2 | |
| Tested on: Test distance 3 metres<br>Vertical Polarization | |
| Date of test: 08/10/2009 / Operator: T. Eberl | |
| Test performed: by hand / File name: default.emi | |
| Detector: Peak | List of values: Selected by hand |




| | |
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| Result: Limit kept | Project file: 19201-00624 Page of Pages |

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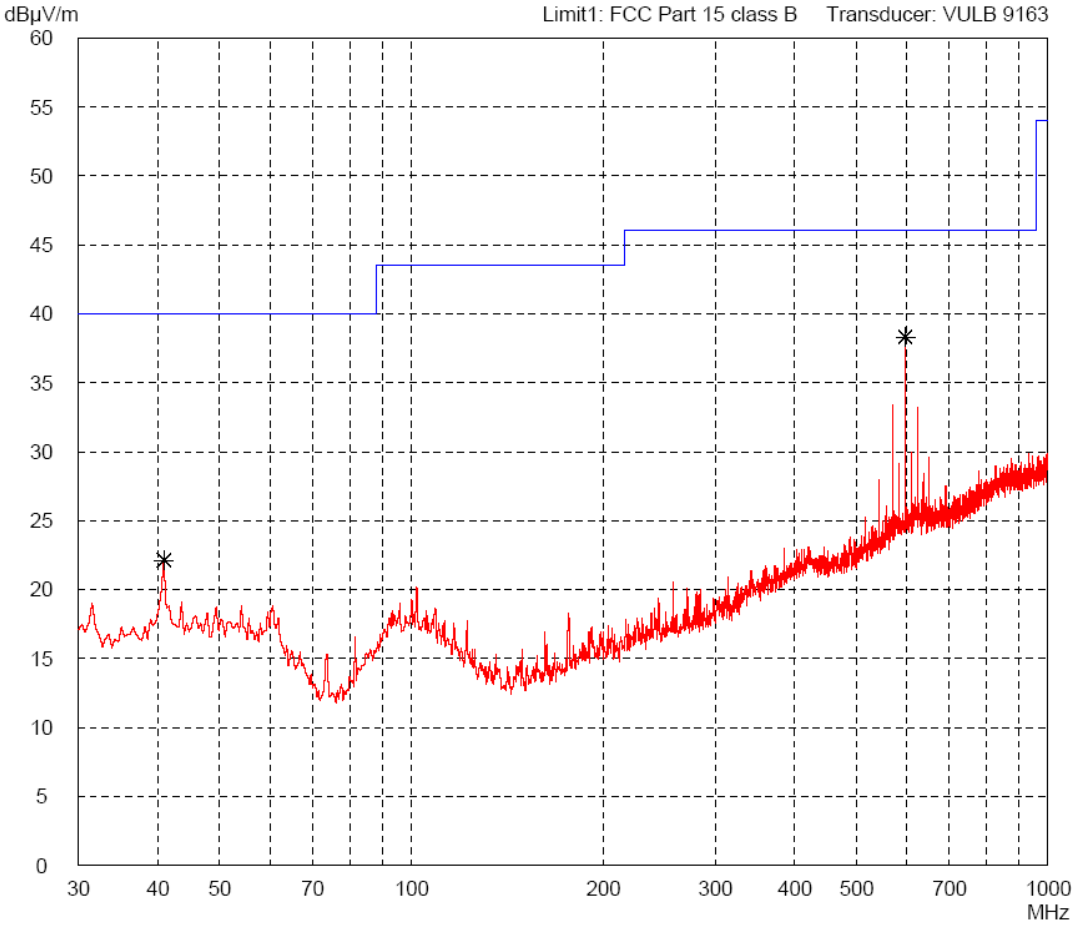
## Radiated Emission Test 30 MHz - 1 GHz
## acc. to FCC Part 15.225 (Fully Anechoic Chamber)

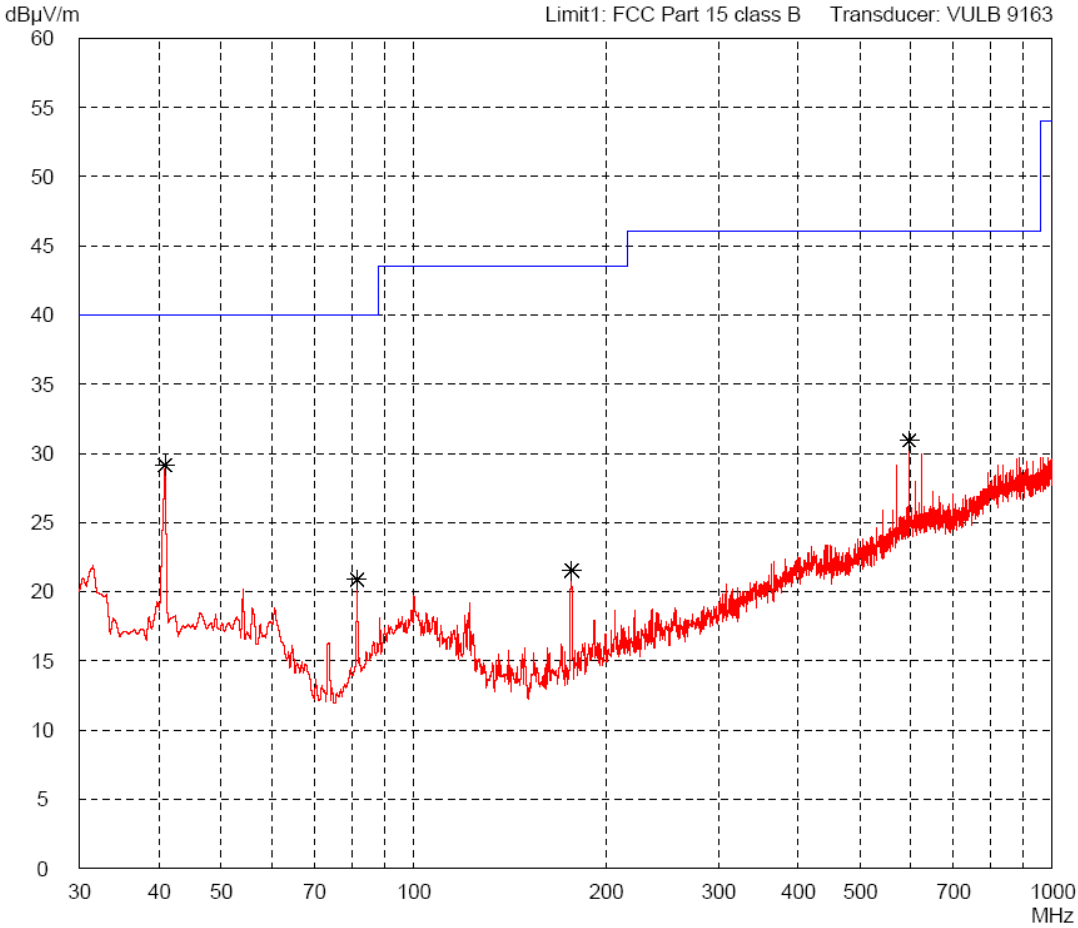
| | |
|---|---|
| Model: RF340R | Comment: - EUT powered via MOBY ASM 456 external<br>- ISO mode<br>- with TAG |
| Serial no.: #1 | |
| Applicant: Siemens AG, Fürth | |
| Test site: Fully anechoic room, cabin no. 2 | |
| Tested on: Test distance 3 meters<br>Horizontal Polarization | |
| Date of test: 08/06/2009 — Operator: T. Eberl | |
| Test performed: automatically — File name: default.emi | |
| Detector: Peak | List of values: Selected by hand |




| | |
|---|---|
| Result: Prescan | Project file: 19201-00624 Page of Pages |

## Radiated Emission Test 30 MHz - 1 GHz
## acc. to FCC Part 15.225 (Fully Anechoic Chamber)

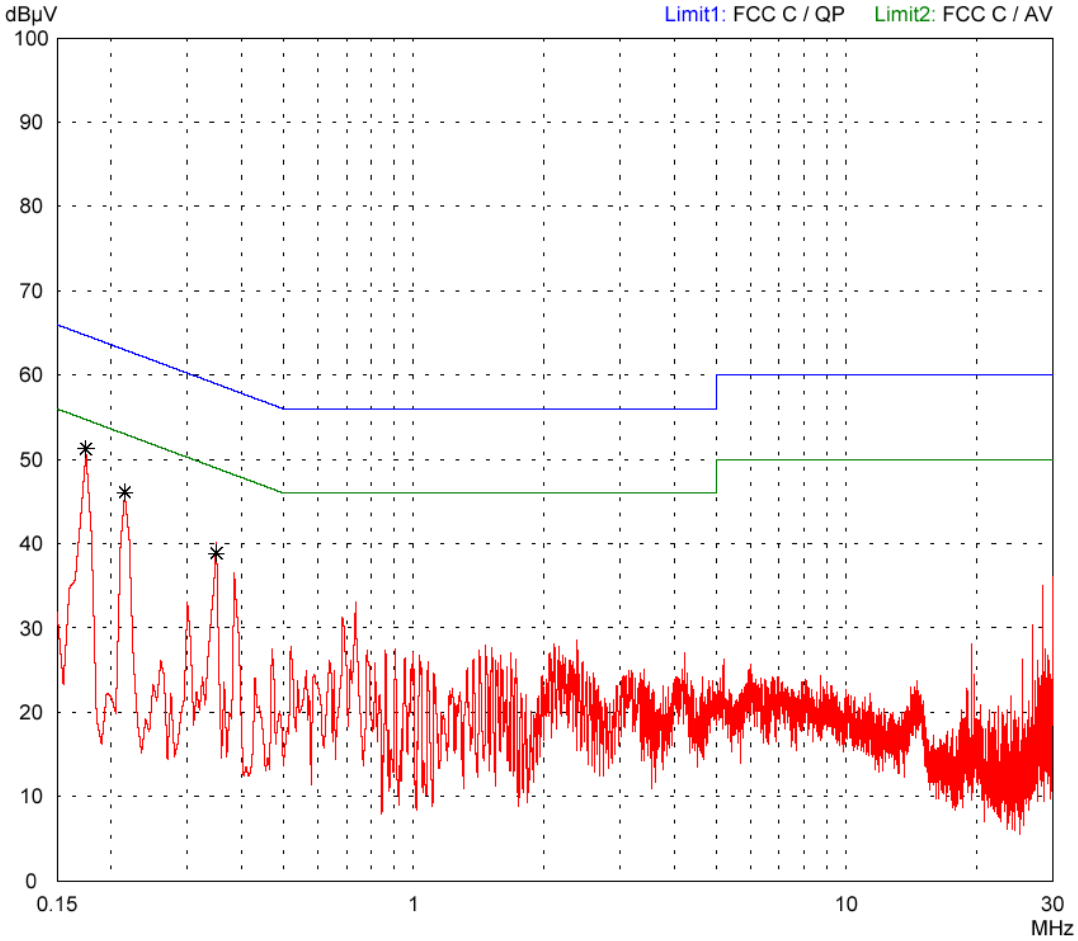
| | |
|---|---|
| Model: RF340R | Comment: - EUT powered via MOBY ASM 456 external<br>- ISO mode<br>- with TAG |
| Serial no.: #1 | |
| Applicant: Siemens AG, Fürth | |
| Test site: Fully anechoic room, cabin no. 2 | |
| Tested on: Test distance 3 meters<br>Vertical Polarization | |
| Date of test: 08/06/2009 / Operator: T. Eberl | |
| Test performed: automatically / File name: default.emi | |
| Detector: Peak | List of values: Selected by hand |




| | |
|---|---|
| Result: Prescan | Project file: 19201-00624 Page of Pages |

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

| | |
|---|---|
| Model: RF340R | Mode: |
| Serial no.: #1 | - EUT powered from AC/DC power supply |
| Applicant: Siemens AG, Fürth | - AC supply voltage 120 V |
| Test site: Shielded room, cabin no. 4 | - EUT supply voltage 24 V |
| Tested on: Linecord Phase L1 | - RF300 mode |
| Date of test: 08/12/2009 Operator: T. Eberl | - antenna port with 50R load |
| Test performed: automatically File name: | |
| Detector: Peak / Final Results: QP | Final results: 20 dB Margin 25 Subranges |

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| Result: Limit kept | Project file: 19201-00624 Page of Pages |

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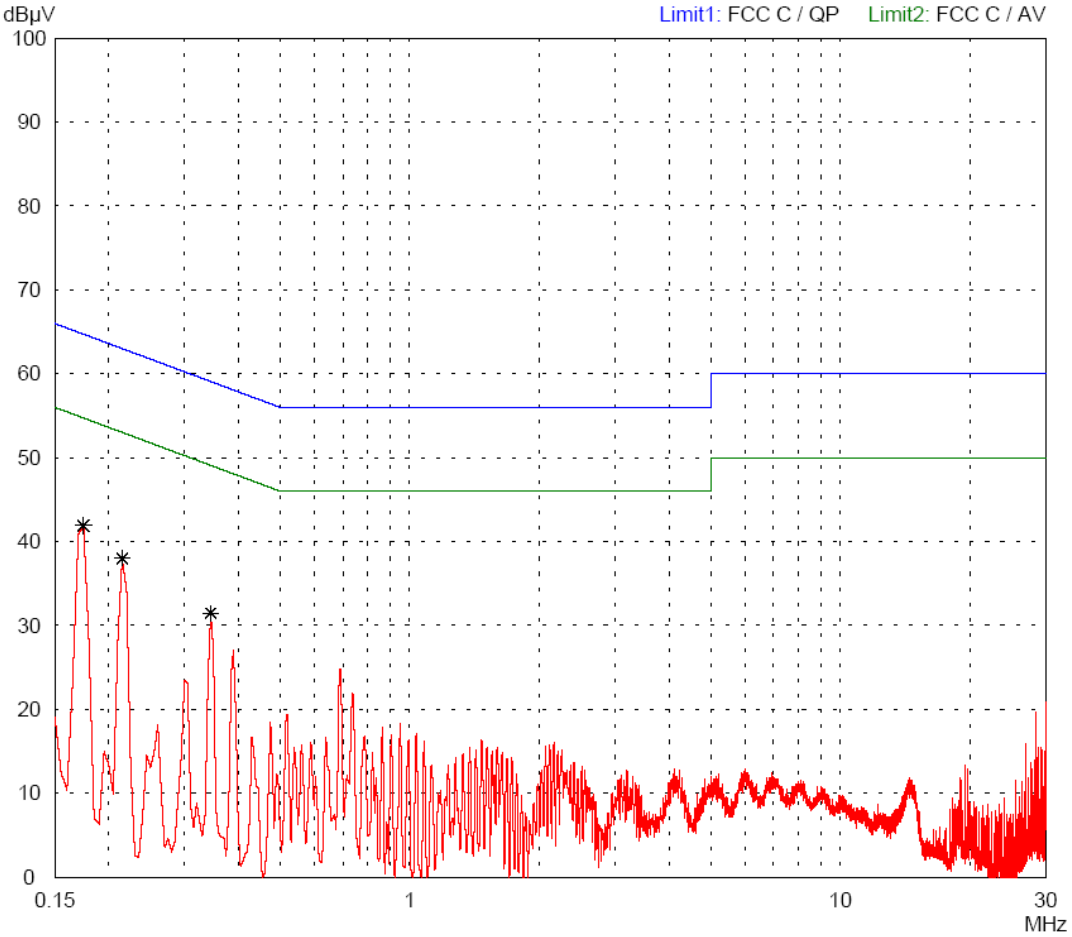
## Conducted Emission Test 150 kHz - 30 MHz
## according to FCC Part 15 Subpart C

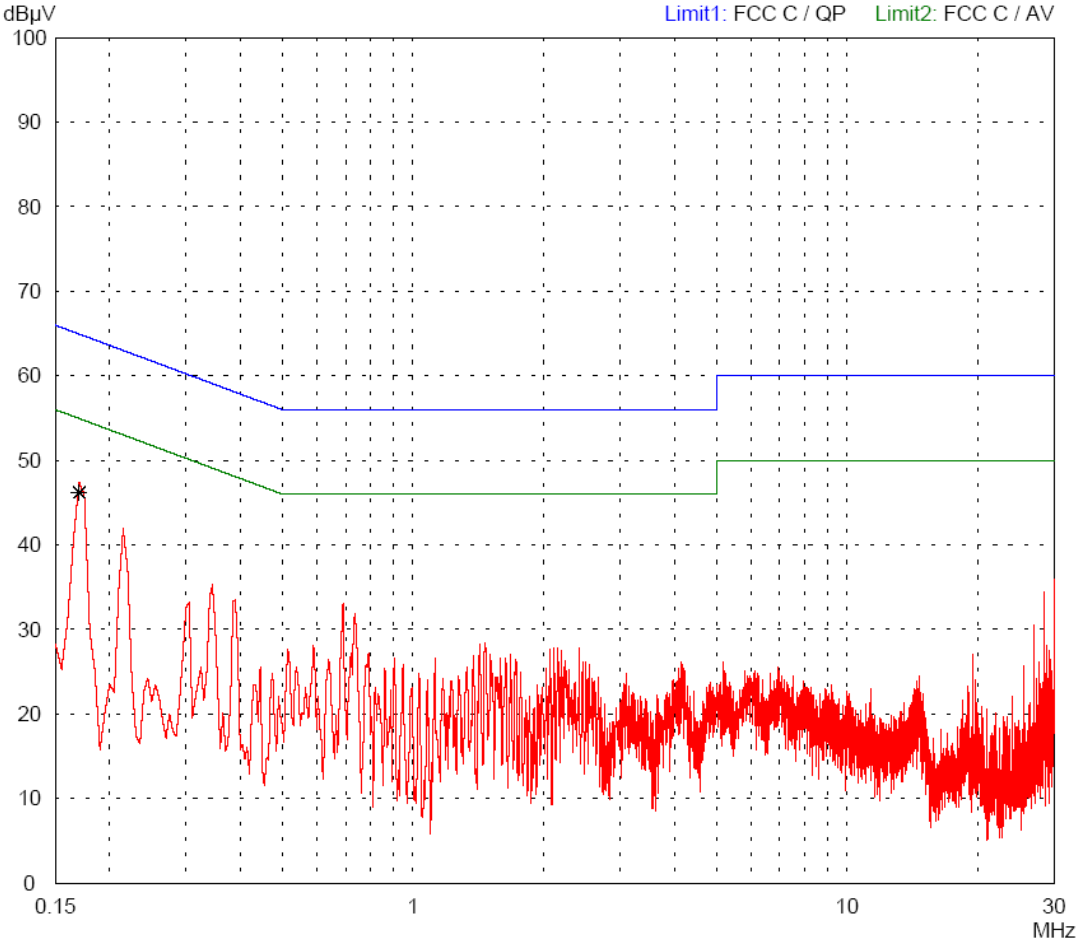
| | |
|---|---|
| Model: RF340R | Mode: |
| Serial no.: #1 | - EUT powered from AC/DC power supply |
| Applicant: Siemens AG, Fürth | - AC supply voltage 120 V |
| Test site: Shielded room, cabin no. 4 | - EUT supply voltage 24 V |
| Tested on: Linecord Phase L1 | - RF300 mode |
| Date of test: 08/12/2009 Operator: T. Eberl | - antenna port with 50R load |
| Test performed: automatically File name: | |
| Detector: Average / Final Results: AV | Final results: 20 dB Margin 25 Subranges |




| | |
|---|---|
| Result: Limit kept | Project file: 19201-00624 Page of Pages |

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

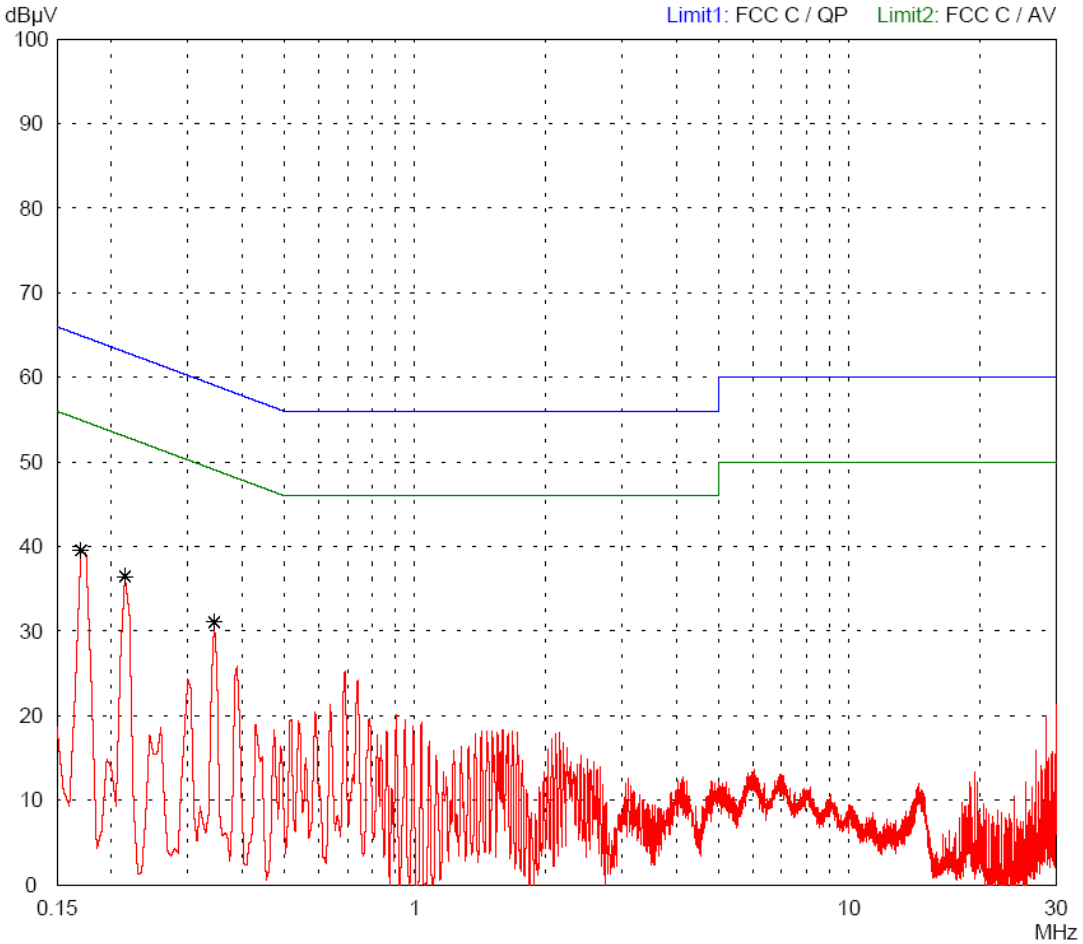
| | |
|---|---|
| Model: RF340R | Mode: |
| Serial no.: #1 | - EUT powered from AC/DC power supply |
| Applicant: Siemens AG, Fürth | - AC supply voltage 120 V |
| Test site: Shielded room, cabin no. 4 | - EUT supply voltage 24 V |
| Tested on: Linecord Phase N | - RF300 mode |
| Date of test: 08/12/2009 Operator: T. Eberl | - antenna port with 50R load |
| Test performed: automatically File name: | |
| Detector: Peak / Final Results: QP | Final results: 20 dB Margin 25 Subranges |




| | |
|---|---|
| Result: Limit kept | Project file: 19201-00624 Page of Pages |

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

| | |
|---|---|
| Model: RF340R | Mode: |
| Serial no.: #1 | - EUT powered from AC/DC power supply |
| Applicant: Siemens AG, Fürth | - AC supply voltage 120 V |
| Test site: Shielded room, cabin no. 4 | - EUT supply voltage 24 V |
| Tested on: Linecord Phase N | - RF300 mode |
| Date of test: 08/12/2009 Operator: T. Eberl | - antenna port with 50R load |
| Test performed: automatically File name: | |
| Detector: Average / Final Results: AV | Final results: 20 dB Margin 25 Subranges |




| | |
|---|---|
| Result: Limit kept | Project file: 19201-00624 Page of Pages |

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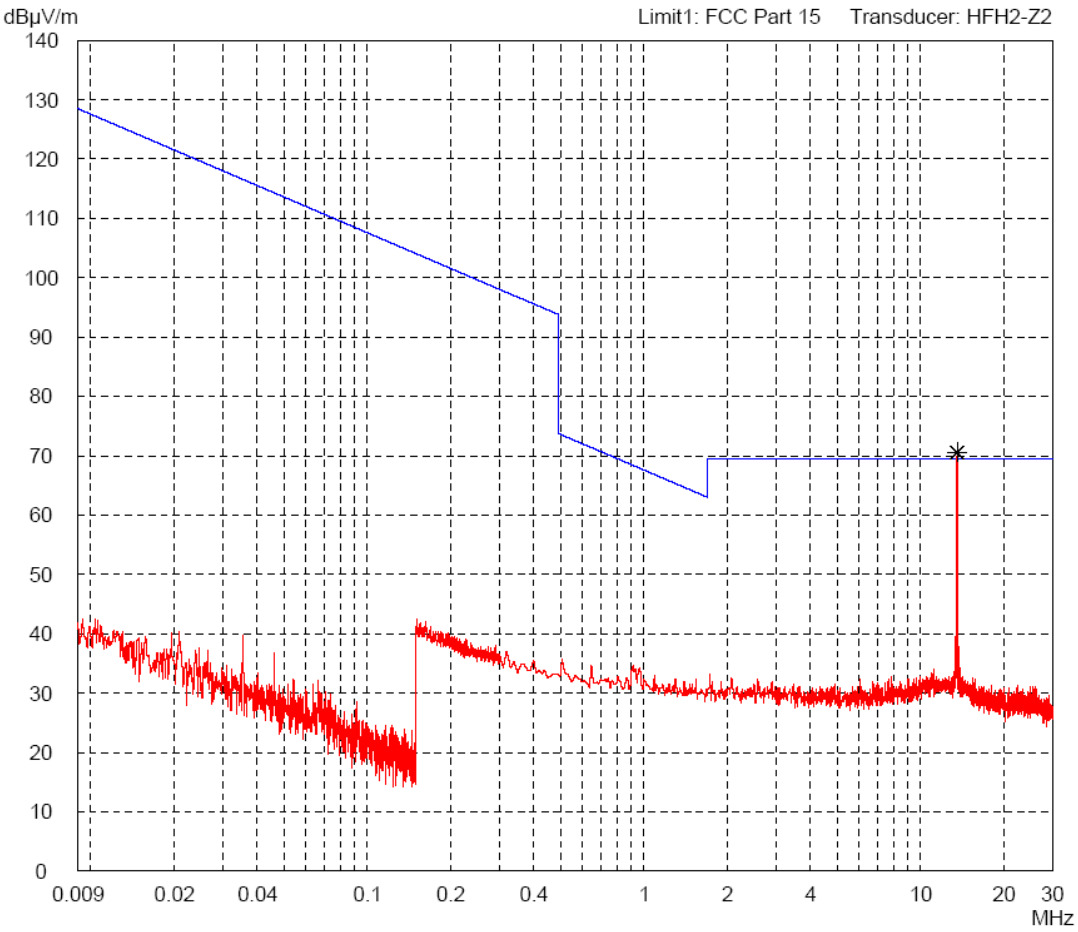
SENTON

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

| | |
|---|---|
| Model: RF340R | Comment: - EUT powered via MOBY ASM 452 external<br>- RF300 mode<br>- with TAG |
| Serial no.: #1 | |
| Applicant: Siemens AG, Fürth | |
| Test site: Fully anechoic room, cabin no. 2 | |
| Tested on: Test distance 3 metres<br>Vertical Polarization | |
| Date of test: 08/10/2009 — Operator: T. Eberl | |
| Test performed: by hand — File name: default.emi | |

| | |
|---|---|
| Detector: Peak | List of values: 10 dB Margin 50 Subranges |

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|---|---|
| Result: Prescan | Project file: 19201-00624 Page of Pages |

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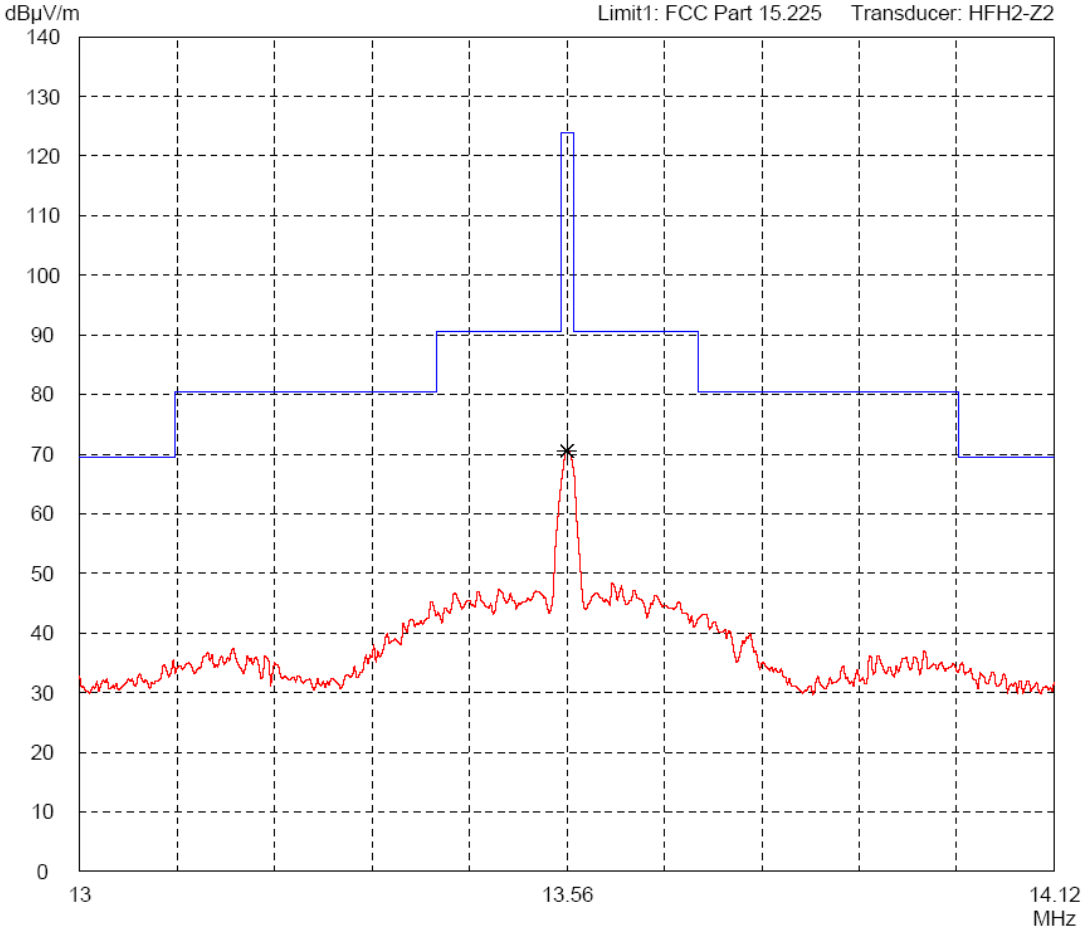
SENTON

## Radiated Emission Test 13 MHz - 14.12 MHz
## acc. to FCC Part 15.225 (Fully Anechoic Chamber)

| | |
|---|---|
| Model: RF340R | Comment: - EUT powered via MOBY ASM 452 external<br>- RF300 mode<br>- with TAG |
| Serial no.: #1 | |
| Applicant: Siemens AG, Fürth | |
| Test site: Fully anechoic room, cabin no. 2 | |
| Tested on: Test distance 3 metres<br>Vertical Polarization | |
| Date of test: 08/10/2009 — Operator: T. Eberl | |
| Test performed: by hand — File name: default.emi | |
| Detector: Peak | List of values: Selected by hand |

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| Result: Limit kept | Project file: 19201-00624 Page of Pages |

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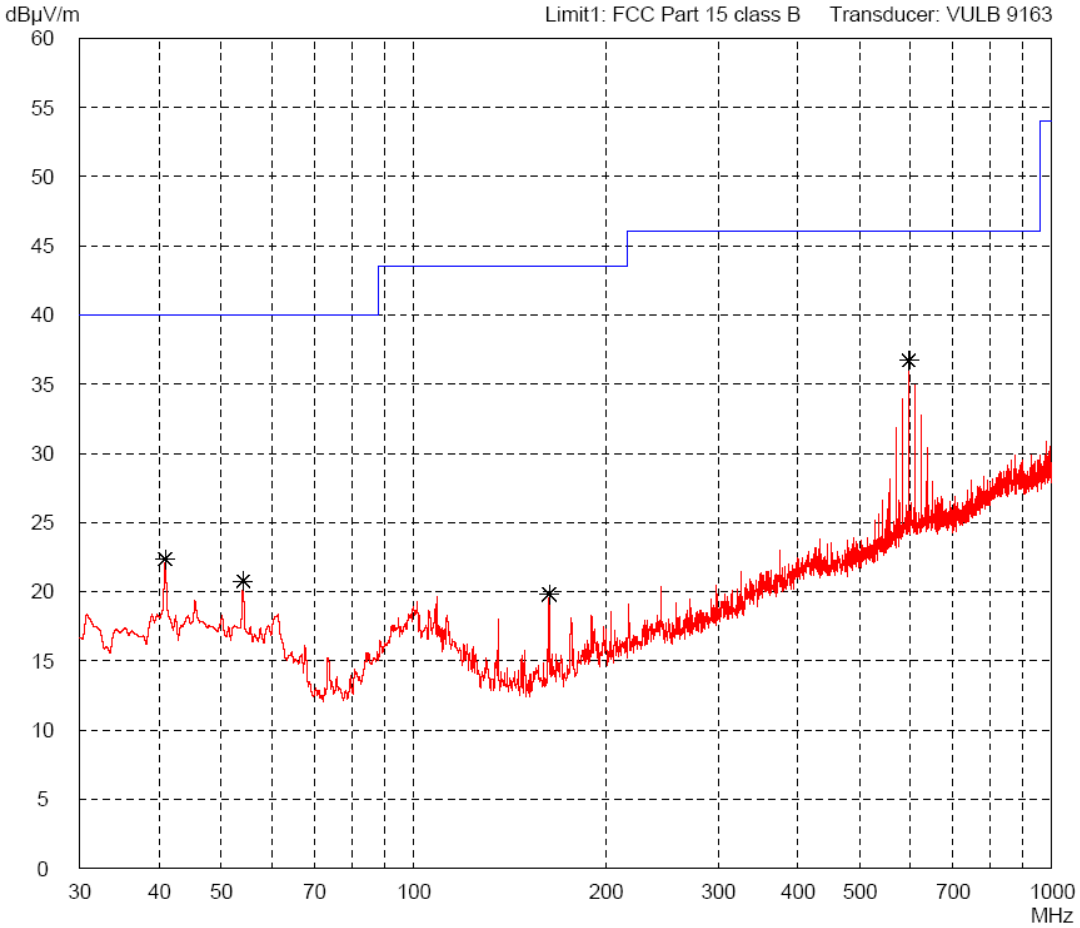
## Radiated Emission Test 30 MHz - 1 GHz
## acc. to FCC Part 15.225 (Fully Anechoic Chamber)

| | |
|---|---|
| Model: RF340R | Comment: - EUT powered via MOBY ASM 456 external<br>- RF 300 mode<br>- with TAG |
| Serial no.: #1 | |
| Applicant: Siemens AG, Fürth | |
| Test site: Fully anechoic room, cabin no. 2 | |
| Tested on: Test distance 3 meters<br>Horizontal Polarization | |
| Date of test: 08/06/2009 — Operator: T. Eberl | |
| Test performed: automatically — File name: default.emi | |
| Detector: Peak | List of values: Selected by hand |

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| Result: Prescan | Project file: 19201-00624 Page of Pages |

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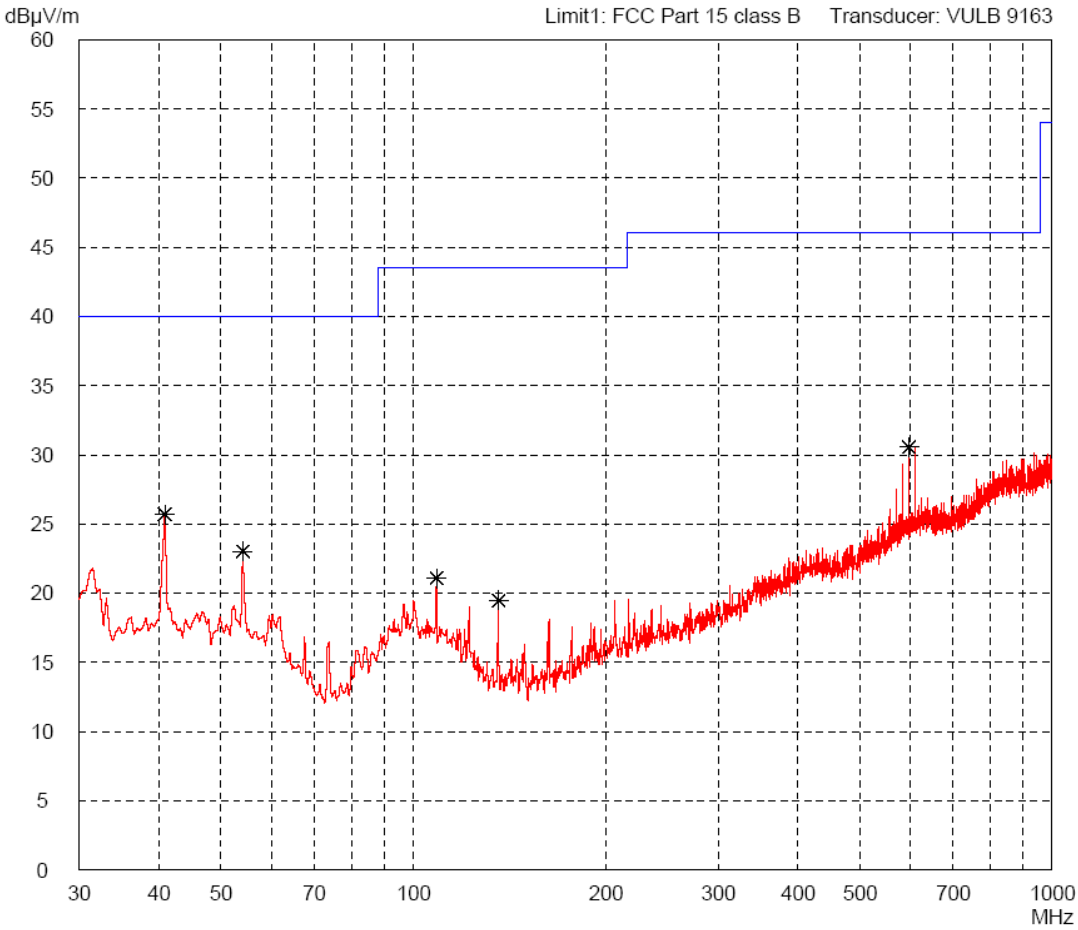
## Radiated Emission Test 30 MHz - 1 GHz
## acc. to FCC Part 15.225 (Fully Anechoic Chamber)

| | |
|---|---|
| Model: RF340R | Comment: - EUT powered via MOBY ASM 456 external<br>- RF 300 mode<br>- with TAG |
| Serial no.: #1 | |
| Applicant: Siemens AG, Fürth | |
| Test site: Fully anechoic room, cabin no. 2 | |
| Tested on: Test distance 3 meters<br>Vertical Polarization | |
| Date of test: 08/06/2009 — Operator: T. Eberl | |
| Test performed: automatically — File name: default.emi | |
| Detector: Peak | List of values: Selected by hand |

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|---|---|
| Result: Prescan | Project file: 19201-00624 Page of Pages |