

FCC ID: VQ5-EBIIF

EMI -- TEST REPORT

Test Report No. : **T32050-00-09HS**

07. December 2007

Date of issue

Type / Model Name : EBI IF200

Product Description : Interface (13.56 MHz, 2.4 GHz)

Applicant : Ebro Electronic GmbH & Co. KG

Address : Peringerstr. 10

DE-85055 Ingolstadt

Manufacturer : Ebro Electronic GmbH & Co. KG

Address : Peringerstr. 10

DE-85055 Ingolstadt

Licence holder : Ebro Electronic GmbH & Co. KG

Address : Peringerstr. 10

DE-85055 Ingolstadt

Test Result according to the
standards listed in clause 1 test
standards:

POSITIVE



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1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15 Subpart C- Intentional Radiators (May 04, 2007)

Part 15, Subpart C, Section 15.209(a) Radiated emissions, general requirements

Part 15, Subpart C, Section 15.207 Conducted limits

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2 SUMMARY

GENERAL REMARKS:

The EuT works at 13.56 MHz and 2.400 GHz – 2.4835 GHz. The transmitter 2.400 GHz – 2.4835 GHz passed the tests according FCC 15.247 by mikes-testingpartners gmbh. For the measurements results please refer to the testreport T32050-00-10HS.

FINAL ASSESSMENT:

The equipment under test **fulfills** the EMI requirements cited in clause 1 test standards.

| | |
|--------------------------------|----------------------------------|
| Date of receipt of test sample | : <u>acc. to storage records</u> |
| Testing commenced on | : <u>24. September 2007</u> |
| Testing concluded on | : <u>5. December 2007</u> |

Checked by:

Tested by:

Klaus Gegenfurtner
Dipl.-Ing.(FH)
Manager: Radio Group

Hermann Smetana
Dipl.-Ing.(FH)
Radio Expert

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3 EQUIPMENT UNDER TEST

3.1 Photo documentation of the EuT

External Views:

Data logging System assemble, top view



Top view, interface unit



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Back view



Front view



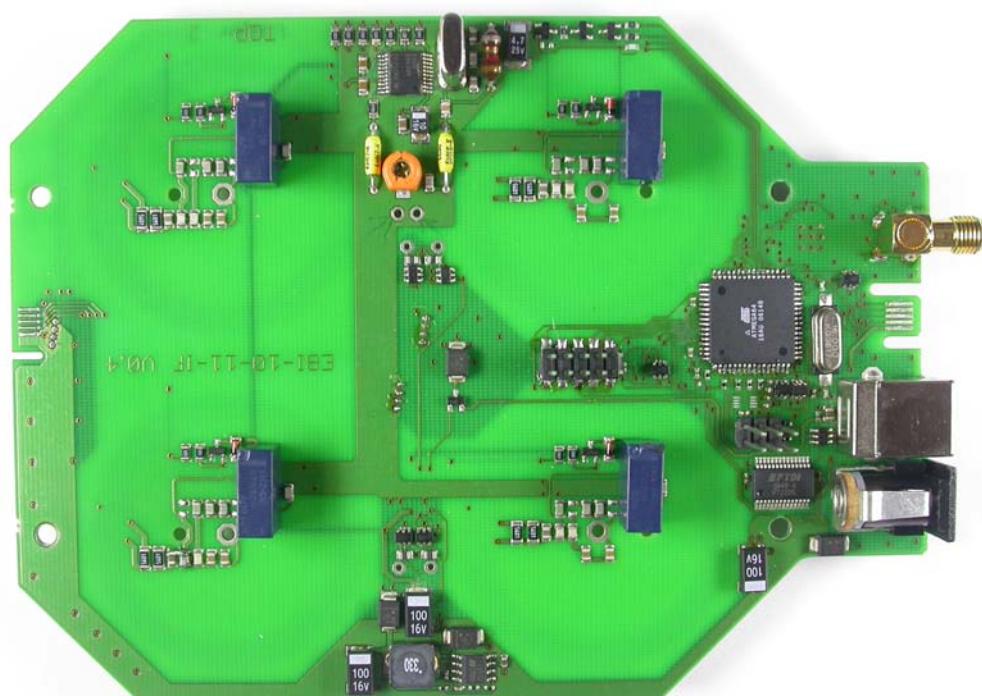
FCC ID: VQ5-EBIIF

Left side view



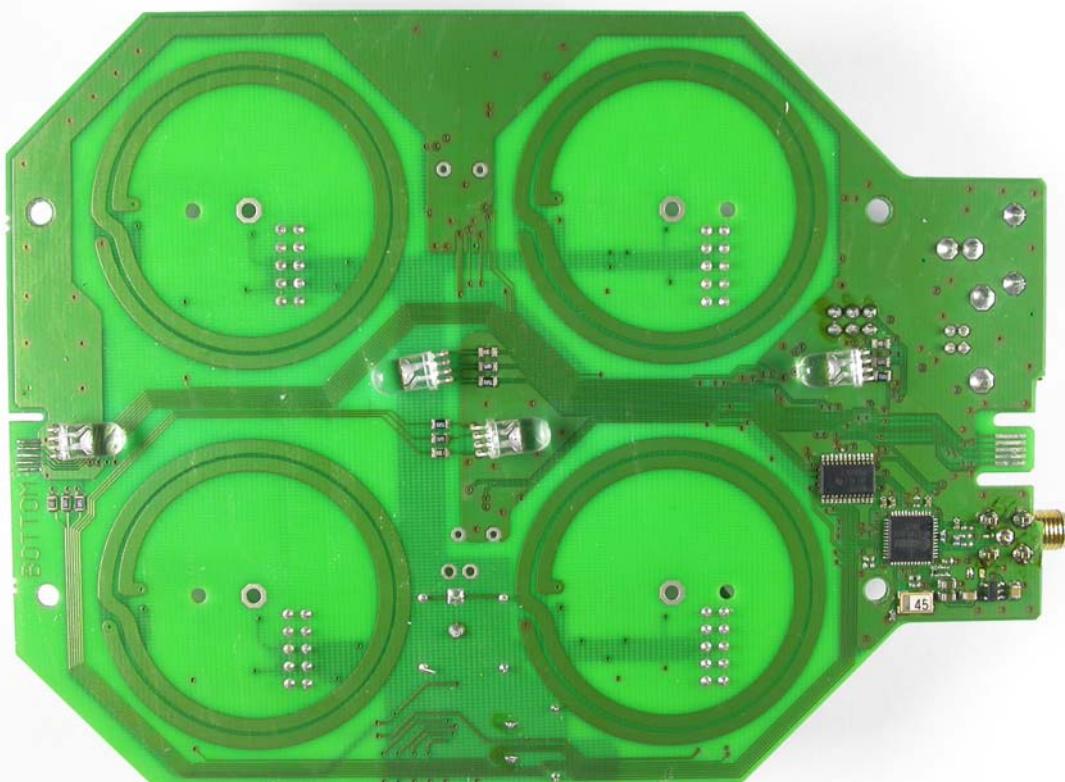
Internal views:

PCB Top view



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PCB Rear view



Optional Antennas:

Antenna, 5 dBi



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Antenna, 2 dBi



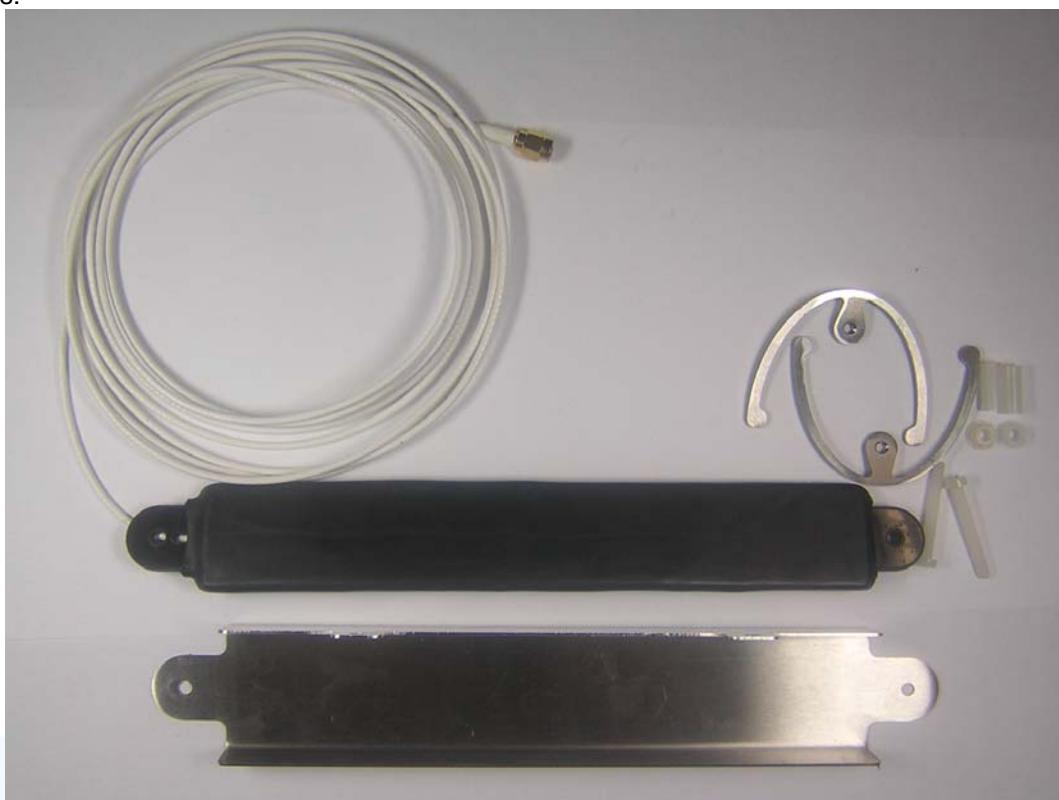
Custom made Antenna, Steri, 5 dBi

External view:

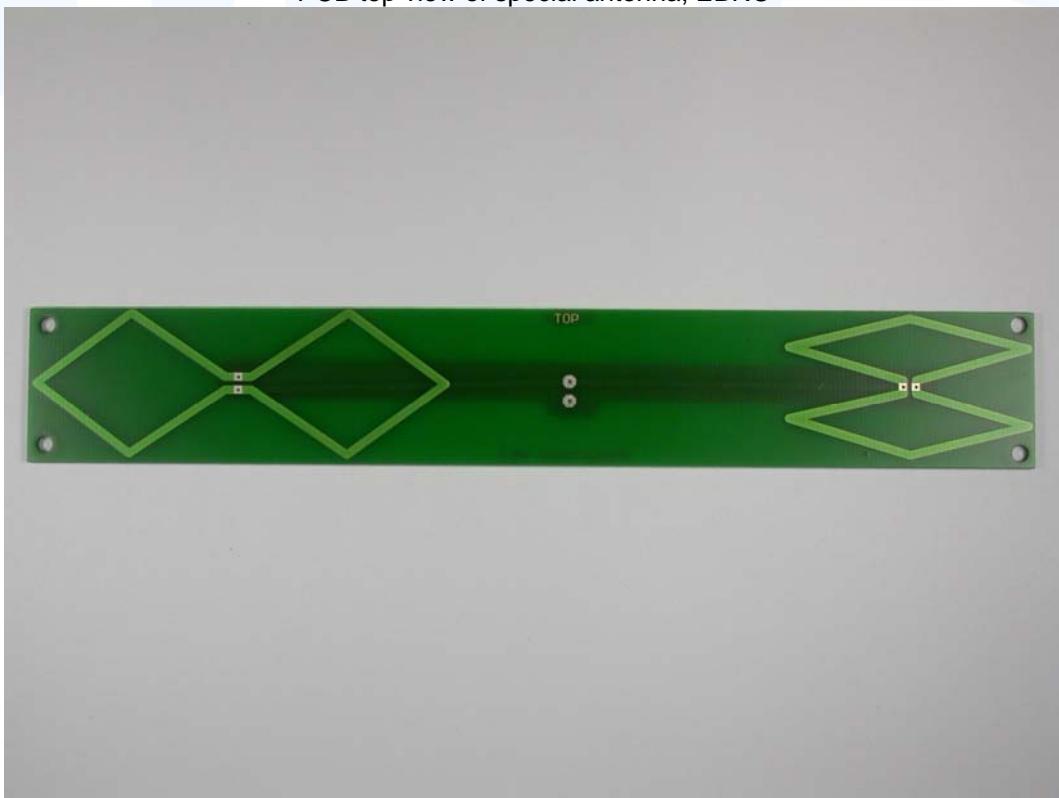


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Internal views:



PCB top view of special antenna, EBRO



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PCB bottom view of special antenna, EBRO



mikes

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4 Power supply system utilised

Power supply voltage : 6 V / DC

4.1 Short description of the Equipment under Test (EuT)

Data logging interface. The system consists of a fixed base station and one up to 4 mobile data logger. The interface identifies a logger in the programming slot via 13.56 MHz RFID-Transceiver. In the mobile data logger has a RFID-Tag only. A 2.4 GHz "ZIGBEE" port (Chipset according IEEE 802.15.4) is used for data exchange, communication and programming the data logger. The power supply as stand alone system is normally via USB, cascaded up to max. 3 systems the 6 V DC power supply have to be used.

Number of tested samples: 1
Serial number: Prototyp

EuT operation mode:

The equipment under test was operated during the measurement under the following conditions:

- TX mode at 13.56 MHz

EuT configuration:

(The CDF filled by the applicant can be viewed at the test laboratory.)

The following peripheral devices and interface cables were connected during the measurements:

| | |
|-------------------------------------|-----------------------------------|
| - <u>USB-Cable (host to client)</u> | Model : <u>As usual in trade</u> |
| - <u>Note book for control</u> | Model : <u>Dell Latitude D600</u> |
| - <u>Power supply, 6 V DC</u> | Model : <u>CP92A0060V2100</u> |
| - _____ | Model : _____ |
| - _____ | Model : _____ |
| - _____ | Model : _____ |

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5 TEST ENVIRONMENT

5.1 Address of the test laboratory

mikes-testingpartners gmbh
Ohmstrasse 2-4
94342 Strasskirchen
Germany

5.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature: 15-35 ° C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

5.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4-2 /11.2003 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

5.4 Measurement Protocol for FCC, VCCI and AUSTEL

5.4.1 GENERAL INFORMATION

5.4.1.1 Test Methodology

Conducted and radiated disturbance testing is performed according to the procedures in International Special Committee on Radio Interference (CISPR) Publication 22, European Standard EN 55022 as shown under section 1 of this report.

In compliance with 47 CFR Part 15 Subpart A Section 15.38 testing for FCC compliance may be done following the ANSI C63.4-2003 procedures and using the CISPR 22 Limits.

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5.4.1.2 Justification

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral using the appropriate impedance characteristic or left unterminated. Where appropriate, cables are manually manipulated with respect to each other thus obtaining maximum disturbances from the unit.

5.4.2 DETAILS OF TEST PROCEDURES

General Standard Information

The test methods used comply with CISPR Publication 22, EN 55022 - "Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement" and with ANSI C63.4-2003 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

5.5 Discovery of worst case measurement conditions

For evaluating the worst case the interface was driven in maximum output power mode and measured in X, Y and Z-Position.

6 TEST CONDITIONS AND RESULTS

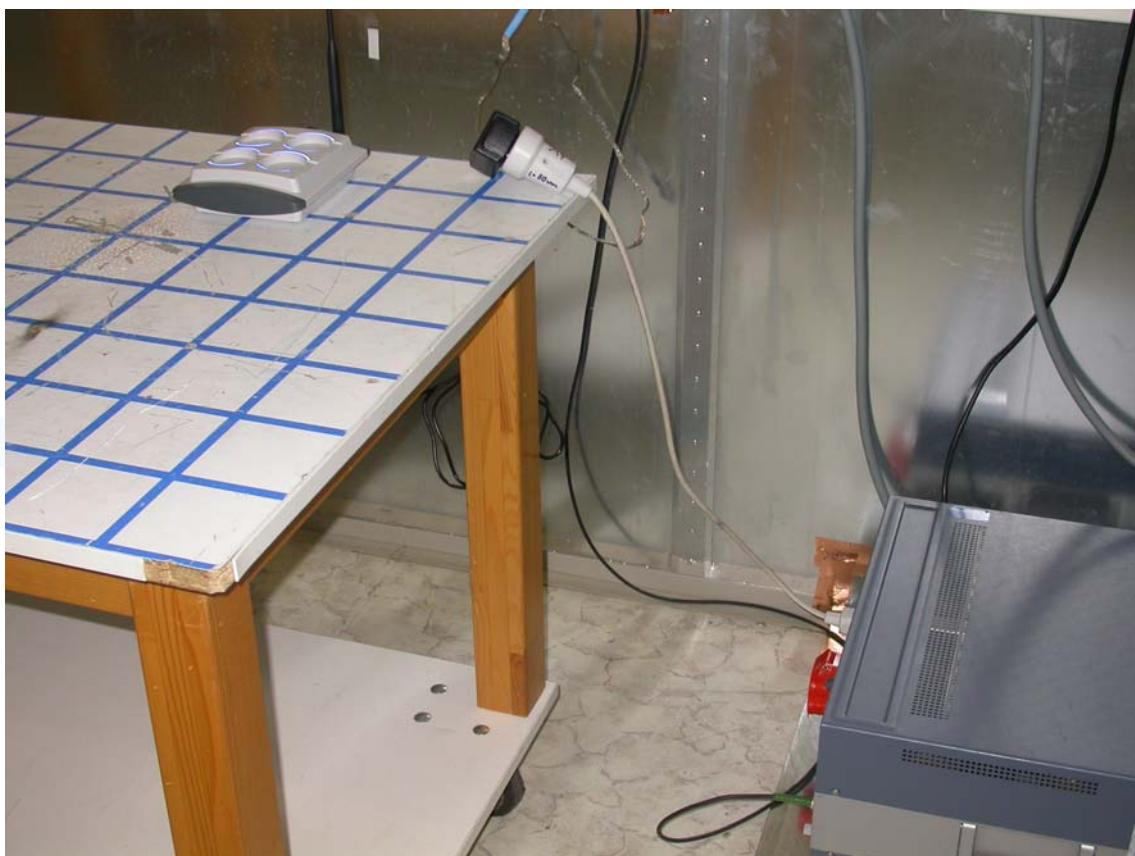
6.1 Conducted emissions

For test instruments and accessories used see section 6 Part A 4.

6.1.1 Description of the test location

Test location: Shielded Room S2

6.1.2 Photo documentation of the test set-up



6.1.3 Description of Measurement

The final level, expressed in dB μ V, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the FCC Limit or to the CISPR limit.

To convert between dB μ V and μ V, the following conversions apply:

$$\begin{aligned} \text{dB}\mu\text{V} &= 20(\log \mu\text{V}) \\ \mu\text{V} &= \text{Inverse log}(\text{dB}\mu\text{V}/20) \end{aligned}$$

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EuT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection and a Line Impedance Stabilization Network (LISN) with 50 Ω /50 μ H (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimeters above the floor and is positioned 40 centimeters from the vertical ground plane (wall) of the screen room. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emissions are remeasured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

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6.1.4 Test result

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin -1.8 dB at 27.12 MHz

The requirements are **FULFILLED**.

Remarks: The measurement was performed with AC (115V, 60 Hz) at the side of the power supply.

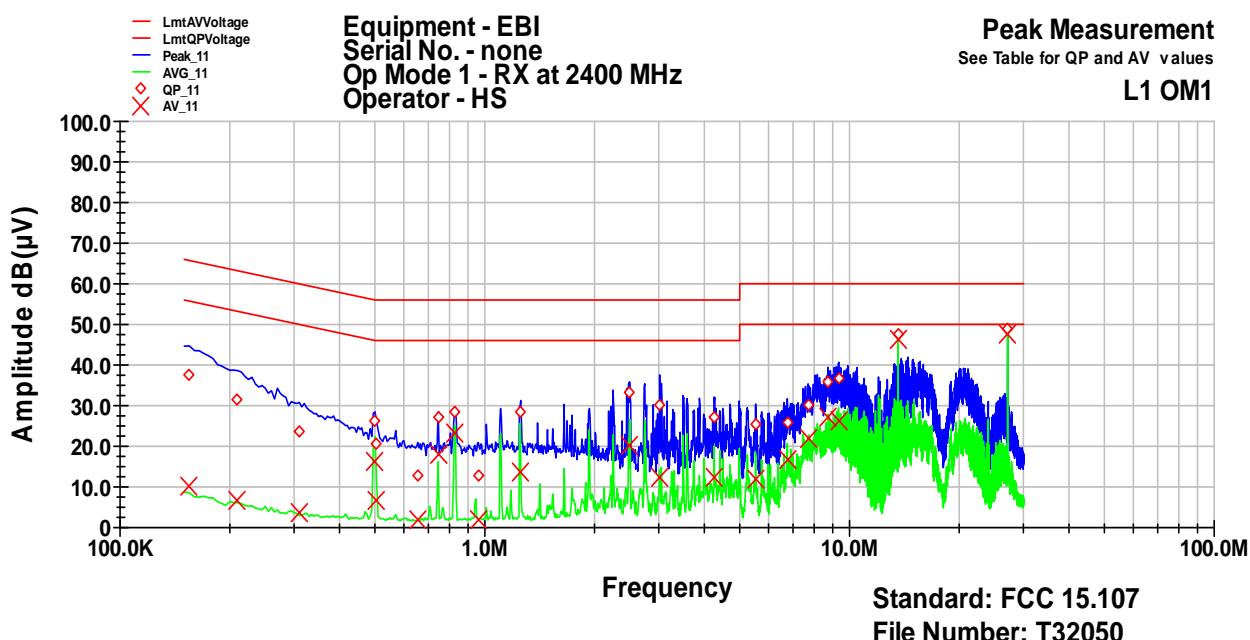
mikes

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6.1.5 Test protocol

Test point: L1
 Operation mode: TX mode at 13.56 MHz
 Remarks: In RX-Mode 2400 MHz is the transmitter 13.56 MHz active.

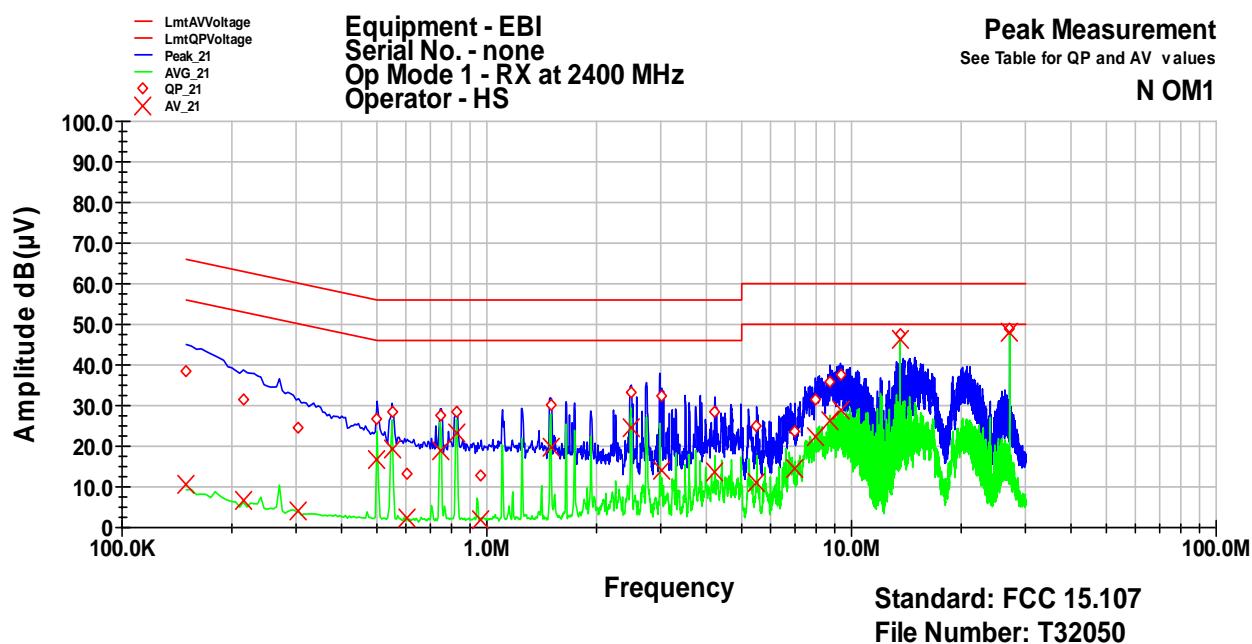
Result: passed



| Frequency | QP Level | QP Margin | QP Limit | AV Level | AV Margin | AV Limit |
|-----------|----------|-----------|----------|----------|-----------|----------|
| MHz | dB(μV) | dB | dB | dB(μV) | dB | dB |
| 0.155 | 37.7 | -28.0 | 65.7 | 10.1 | -45.6 | 55.7 |
| 0.21 | 31.4 | -31.8 | 63.2 | 6.7 | -46.6 | 53.2 |
| 0.31 | 23.6 | -36.3 | 60.0 | 3.6 | -46.4 | 50.0 |
| 0.5 | 26.4 | -29.6 | 56.0 | 16.1 | -29.9 | 46.0 |
| 0.505 | 20.8 | -35.2 | 56.0 | 6.7 | -39.3 | 46.0 |
| 0.655 | 12.7 | -43.3 | 56.0 | 1.9 | -44.1 | 46.0 |
| 0.745 | 27.1 | -28.9 | 56.0 | 18.1 | -27.9 | 46.0 |
| 0.825 | 28.4 | -27.6 | 56.0 | 23.4 | -22.6 | 46.0 |
| 0.96 | 13.0 | -43.0 | 56.0 | 1.9 | -44.1 | 46.0 |
| 1.25 | 28.2 | -27.8 | 56.0 | 13.8 | -32.2 | 46.0 |
| 2.495 | 33.2 | -22.8 | 56.0 | 20.3 | -25.8 | 46.0 |
| 3.015 | 30.0 | -26.0 | 56.0 | 12.3 | -33.7 | 46.0 |
| 4.25 | 27.3 | -28.7 | 56.0 | 12.4 | -33.6 | 46.0 |
| 5.525 | 25.5 | -34.5 | 60.0 | 11.9 | -38.1 | 50.0 |
| 6.75 | 25.7 | -34.3 | 60.0 | 16.9 | -33.2 | 50.0 |
| 7.695 | 30.4 | -29.6 | 60.0 | 22.1 | -27.9 | 50.0 |
| 8.735 | 35.9 | -24.1 | 60.0 | 27.3 | -22.7 | 50.0 |
| 9.345 | 36.8 | -23.3 | 60.0 | 26.5 | -23.5 | 50.0 |
| 13.56 | 47.5 | -12.5 | 60.0 | 46.2 | -3.8 | 50.0 |
| 27.12 | 48.8 | -11.3 | 60.0 | 47.8 | -2.2 | 50.0 |

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Test point: N
 Operation mode: TX mode at 13.56 MHz
 Remarks: In RX-Mode 2400 MHz is the transmitter 13.56 MHz active.



| Frequency MHz | QP Level dB(µV) | QP Margin dB | QP Limit dB | AV Level dB(µV) | AV Margin dB | AV Limit dB |
|------------------|--------------------|-----------------|----------------|--------------------|-----------------|----------------|
| 0.15 | 38.7 | -27.3 | 66.0 | 10.8 | -45.2 | 56.0 |
| 0.215 | 31.3 | -31.7 | 63.0 | 6.6 | -46.4 | 53.0 |
| 0.305 | 24.4 | -35.8 | 60.1 | 3.9 | -46.2 | 50.1 |
| 0.5 | 26.5 | -29.5 | 56.0 | 16.5 | -29.5 | 46.0 |
| 0.55 | 28.6 | -27.4 | 56.0 | 19.3 | -26.7 | 46.0 |
| 0.605 | 13.4 | -42.6 | 56.0 | 2.2 | -43.8 | 46.0 |
| 0.745 | 27.6 | -28.4 | 56.0 | 18.8 | -27.2 | 46.0 |
| 0.825 | 28.5 | -27.5 | 56.0 | 23.4 | -22.6 | 46.0 |
| 0.965 | 12.9 | -43.1 | 56.0 | 1.9 | -44.1 | 46.0 |
| 1.495 | 30.2 | -25.8 | 56.0 | 19.8 | -26.2 | 46.0 |
| 2.48 | 33.3 | -22.8 | 56.0 | 24.5 | -21.5 | 46.0 |
| 3.015 | 32.4 | -23.6 | 56.0 | 14.1 | -31.9 | 46.0 |
| 4.22 | 28.6 | -27.4 | 56.0 | 13.7 | -32.3 | 46.0 |
| 5.49 | 24.9 | -35.1 | 60.0 | 10.9 | -39.1 | 50.0 |
| 6.99 | 23.7 | -36.3 | 60.0 | 14.6 | -35.4 | 50.0 |
| 7.96 | 31.3 | -28.7 | 60.0 | 22.4 | -27.6 | 50.0 |
| 8.735 | 35.7 | -24.3 | 60.0 | 26.4 | -23.6 | 50.0 |
| 9.32 | 37.5 | -22.5 | 60.0 | 29.1 | -20.9 | 50.0 |
| 13.56 | 47.5 | -12.5 | 60.0 | 46.3 | -3.7 | 50.0 |
| 27.12 | 49.1 | -10.9 | 60.0 | 48.2 | -1.8 | 50.0 |

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6.2 Field strength of the fundamental wave

For test instruments and accessories used see section 6 Part **CPR 1**.

6.2.1 Description of the test location

Test location: OATS1

Test distance: 3 metres

6.2.2 Photo documentation of the test set-up



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6.2.3 Description of Measurement

The magnetic field strength from the EuT will be measured on an open area test site in the frequency range of 9 kHz to 30 MHz using a tuned receiver and a shielded loop antenna. The set up of the Equipment under test will be in accordance to ANSI C63.4-2003. The antenna was positioned 3, 10 or 30 meters horizontally from the EuT. Measurements have been made in all three orthogonal axes and the shielded loop antenna was rotated to locate the maximum of the emissions. In the case where larger measuring distances are required the results will extrapolated based on the values measured on the closer distances according to Section 15.31 (f) (2) [2]. The final measurement will be performed with an EMI Receiver set to Quasi Peak detector except for the frequency bands 9 kHz to 90 kHz and 110 to 490 kHz where an average detector will be used according to Section 15.209 (d) [2].

The final level, expressed in dB μ V/m, is arrived at by taking the reading from the EMI receiver (Level dB μ V) and adding the antenna correction factor and cable loss factor (Factor dB) to it. This result then has to be compared with the relevant FCC limit.

The resolution bandwidth during the measurement is as follows:

9 kHz – 150 kHz: ResBW: 200 Hz

150 kHz – 30 MHz: ResBW: 9 kHz

Example:

| Frequency (MHz) | Level (dB μ V) | + | Factor (dB) | = | Level (dB μ V/m) | - | Limit (dB μ V/m) | = | Delta (dB) |
|--------------------|-----------------------|---|----------------|---|-------------------------|---|-------------------------|---|---------------|
| 1.705 | 5 | + | 20 | = | 25 | - | 30 | = | -5 |

6.2.4 Test result

Measured at distance 3m

| Frequency [MHz] | L: PK [dB μ V] | L: AV [dB μ V] | L: QP [dB μ V] | Correct. [dB] | L: PK [dB μ V/m] | L: AV [dB μ V/m] | L: QP [dB μ V/m] | Limit [dB μ V/m] | Delta [dB] |
|--------------------|-----------------------|-----------------------|-----------------------|------------------|-------------------------|-------------------------|-------------------------|-------------------------|---------------|
| 13.56 | 30.9 | 30.2 | 30.0 | 20.0 | 50.9 | 50.2 | 50.0 | 124.0 | -74.0 |

Calculated for distance 30 m

| Frequency [MHz] | L: PK [dB μ V] | L: AV [dB μ V] | L: QP [dB μ V] | Correct. [dB] | L: PK [dB μ V/m] | L: AV [dB μ V/m] | L: QP [dB μ V/m] | Limit [dB μ V/m] | Delta [dB] |
|--------------------|-----------------------|-----------------------|-----------------------|------------------|-------------------------|-------------------------|-------------------------|-------------------------|---------------|
| 13.56 | -10.9 | -10.2 | -10.0 | 20.0 | 10.9 | 10.2 | 10.0 | 84.0 | -74.0 |

Limit according to FCC Part 15 Subpart 15.225(a)

| Frequency (MHz) | Field strength of fundamental wave | | Measurement distance (meters) |
|--------------------|------------------------------------|-----------------|----------------------------------|
| | (μ V/m) | dB (μ V/m) | |
| 13.553-13.567 | 15848 | 84 | 30 |

The requirements are **FULFILLED**.

Remarks:

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6.3 Spurious emissions (Magnetic field) 9 kHz – 30 MHz

For test instruments and accessories used see section 6 Part **SER 1**.

6.3.1 Description of the test location

Test location: OATS1

Test distance: 3 metres

6.3.2 Photo documentation of the test set-up



FCC ID: VQ5-EBIIF

6.3.3 Description of Measurement

The spurious emissions from the EuT will be measured on an open area test site in the frequency range of 9 kHz to 30 MHz using a tuned receiver and a shielded loop antenna. The antenna was positioned 3, 10 or 30 meters horizontally from the EuT. Measurements have been made in all three orthogonal axes and the shielded loop antenna was rotated to locate the maximum of the emissions. In the case where larger measuring distances are required the results will be extrapolated based on the values measured on the closer distances according to Section 15.31 (f) (2) [2]. The final measurement will be performed with an EMI Receiver set to Quasi Peak detector except for the frequency bands 9 kHz to 90 kHz and 110 to 490 kHz where an average detector will be used according to Section 15.209 (d) [2].

The final level, expressed in $\text{dB}\mu\text{V}/\text{m}$, is arrived at by taking the reading from the EMI receiver (Level $\text{dB}\mu\text{V}$) and adding the antenna correction factor and cable loss factor (Factor dB) to it. This result then has to be compared with the relevant FCC limit.

The resolution bandwidth during the measurement is as follows:

9 kHz – 150 kHz: ResBW: 200 Hz

150 kHz – 30 MHz: ResBW: 9 kHz

Example:

| Frequency (MHz) | Level (dB μV) | + | Factor (dB) | = | Level (dB $\mu\text{V}/\text{m}$) | - | Limit (dB $\mu\text{V}/\text{m}$) | = | Delta (dB) |
|--------------------|------------------------------|---|----------------|---|---------------------------------------|---|---------------------------------------|---|---------------|
| 1.705 | 5 | + | 20 | = | 25 | - | 30 | = | -5 |

6.3.4 Test result

Measured at distance 3m

| Frequency [MHz] | L: PK [dB μV] | L: AV [dB μV] | L: QP [dB μV] | Correct. [dB] | L: PK [dB $\mu\text{V}/\text{m}$] | L: AV [dB $\mu\text{V}/\text{m}$] | L: QP [dB $\mu\text{V}/\text{m}$] | Limit [dB $\mu\text{V}/\text{m}$] | Delta [dB] |
|--------------------|------------------------------|------------------------------|------------------------------|------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------|
| 27.12 | 11.5 | 4.1 | 7.4 | 20.0 | 31.5 | 24.1 | 27.4 | 69.5 | -42.1 |

Calculated for distance 30 m

| Frequency [MHz] | L: PK [dB μV] | L: AV [dB μV] | L: QP [dB μV] | Correct. [dB] | L: PK [dB $\mu\text{V}/\text{m}$] | L: AV [dB $\mu\text{V}/\text{m}$] | L: QP [dB $\mu\text{V}/\text{m}$] | Limit [dB $\mu\text{V}/\text{m}$] | Delta [dB] |
|--------------------|------------------------------|------------------------------|------------------------------|------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------|
| 27.12 | -28.5 | -35.9 | -32.6 | 20.0 | -8.5 | -15.9 | -12.6 | 29.5 | -42.1 |

Limit according to FCC Part 15 Subpart 15.209(a)

| Frequency (MHz) | Field strength of spurious emissions | | Measurement distance (meters) |
|--------------------|---|-------------------------------|----------------------------------|
| | ($\mu\text{V}/\text{m}$) | dB ($\mu\text{V}/\text{m}$) | |
| 0.009-0.490 | 2400/F(kHz) | -- | 300 |
| 0.490-1.705 | 24000/F (kHz) | -- | |
| 1.705-30.0 | 30 | 29.5 | |

The requirements are **FULFILLED**.

Remarks:

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6.4 Radiated emissions (electric field) 30 MHz – 1 GHz

For test instruments and accessories used see section 6 Part **SER 2**.

6.4.1 Description of the test location

Test location: OATS1

Test distance: 3 metres

6.4.2 Photo documentation of the test set-up



FCC ID: VQ5-EBIIF

6.4.3 Description of Measurement

Spurious emissions from the EuT are measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection. Table top equipment is placed on a 1.0 X 1.5 meter non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The set up of the Equipment under test will be in accordance to ANSI C63.4-2003. The Interface cables that are closer than 40 centimetres to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna was positioned 3, 10 or 30 meters horizontally from the EuT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters, measurement scans are made with both horizontal and vertical antenna polarization's and the EuT are rotated 360 degrees.

The final level, expressed in dB μ V/m, is arrived by taking the reading from the EMI receiver (Level dB μ V) and adding the correction factors and cable loss factor (Factor dB) to it. This is done automatically in the EMI receiver, where the correction factors are stored. This result then has the FCC or CISPR limit subtracted from it to provide the Delta which gives the tabular data as shown in the data sheets at page.

The resolution bandwidth during the measurement is as follows:

30 MHz – 1000 MHz:

ResBW: 120 kHz

Example:

| | | | | | | | | | |
|--------------------|-----------------------|---|----------------|---|-------------------------|---|-------------------------|---|---------------|
| Frequency (MHz) | Level (dB μ V) | + | Factor (dB) | = | Level (dB μ V/m) | - | Limit (dB μ V/m) | = | Delta (dB) |
| 719 | 75 | + | 32.6 | = | 107.6 | - | 110 | = | -2.4 |

6.4.4 Test result

| Frequency [MHz] | L: QP [dB μ V] | Correct. [dB] | L: QP [dB μ V/m] | Limit [dB μ V/m] | Delta [dB] |
|--------------------|-----------------------|------------------|-------------------------|-------------------------|---------------|
| 40.68 | 23.5 | 15.0 | 38.5 | 40.0 | -1.5 |
| 54.24 | 16.1 | 14.4 | 30.5 | 40.0 | -9.5 |
| 67.80 | 17.7 | 12.6 | 30.3 | 40.0 | -9.7 |
| 81.36 | 28.0 | 10.8 | 38.8 | 40.0 | -1.2 |
| 108.48 | 23.3 | 12.7 | 36.0 | 43.5 | -7.5 |
| 135.60 | 24.2 | 15.1 | 39.3 | 43.5 | -4.2 |

Limit according to FCC Part 15 Subpart 15.209(a)

| Frequency (MHz) | Field strength of spurious emissions | | Measurement distance (meters) |
|--------------------|---|-----------------|----------------------------------|
| | (μ V/m) | dB (μ V/m) | |
| 30-88 | 100 | 40 | 3 |
| 88-216 | 150 | 43.5 | 3 |
| 216-960 | 200 | 46 | 3 |
| Above 960 | 500 | 54 | 3 |

The requirements are **FULFILLED**.

Remarks: Measurement has been performed up to the 10th harmonic of the highest fundamental frequency
designed to be emitted by the intentional radiator.

6.5 Frequency tolerance of the carrier

For test instruments and accessories used see section 6 Part **FE**.

6.5.1 Description of the test location

Test location: AREA4

6.5.2 Photo documentation of the test set-up



6.5.3 Test result

| Test conditions | | Test result | | |
|---|------------------|-----------------|--|--|
| | | Frequency (MHz) | | |
| T_{min} (-20)°C | V_{nom} (6.0)V | 13.561000 | | |
| T (-10)°C | V_{nom} (6.0)V | 13.561003 | | |
| T (0)°C | V_{nom} (6.0)V | 13.561005 | | |
| T (10)°C | V_{nom} (6.0)V | 13.561008 | | |
| T_{nom} (20)°C | V_{min} (5.1)V | 13.561010 | | |
| | V_{nom} (6.0)V | 13.561010 | | |
| | V_{max} (15)V | 13.561000 | | |
| T (30)°C | V_{nom} (6.0)V | 13.561011 | | |
| T (40)°C | V_{nom} (6.0)V | 13.561012 | | |
| T_{max} (50)°C | V_{nom} (6.0)V | 13.561010 | | |
| Maximum tolerance of carrier frequency (kHz) | | -0.00 / +0.012 | | |
| Measurement uncertainty | | ± 10 Hz | | |

Limit according to FCC Part 15 Subpart 15.225 (e): $\pm 0.01\%$ of carrier frequency at 13.561 MHz = ± 1.356 kHz

The requirements are **FULFILLED**.

Remarks:

FCC ID: VQ5-EBIIF

6.6 Emission Bandwidth

For test instruments and accessories used see section 6 Part **MB**.

6.6.1 Description of the test location

Test location: AREA4

6.6.2 Photo documentation of the test set-up



6.6.3 Description of Measurement

The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio of -20 dB. The reference level is the level of the highest amplitude signal observed from the transmitter at either the fundamental frequency or the first-order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical.

The resolution bandwidth of measuring instrument was set to a value as shown in the following table below according to ANSI C63.4-2003.

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

6.6.4 Test result

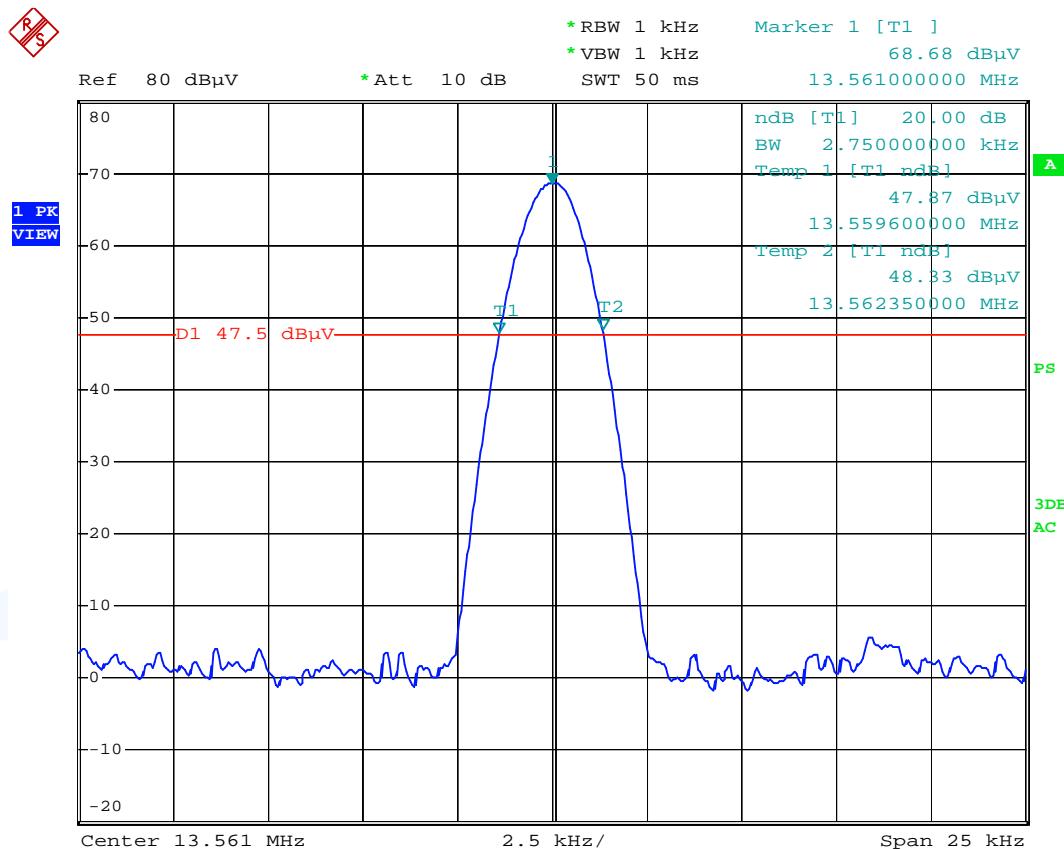
| Channel Frequency [MHz] | 20 dB Bandwidth [kHz] |
|----------------------------|--------------------------|
| 13.56 | 2.75 |

The requirements are **FULFILLED**.

Remarks: For detailed test result please refer to following test protocol.

FCC ID: VQ5-EBIIF

6.6.5 Test protocol



BW1356

Date: 17.OCT.2007 16:09:53

FCC ID: VQ5-EBIIIF

6.7 Transmitter spectrum mask

For test instruments and accessories used see section 6 Part **MB**.

6.7.1 Description of the test location

Test location: AREA4

6.7.2 Test result

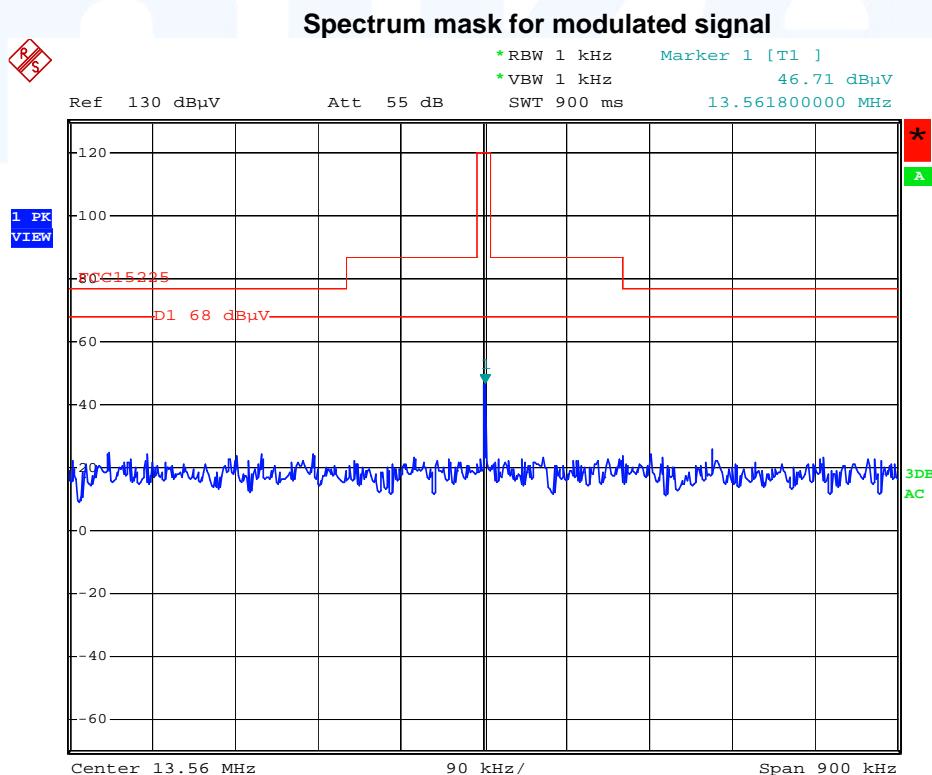
The absolute levels of RF power at any frequency shall not exceed the limits defined in FCC Part §15.225 a-d

The requirements are **FULFILLED**.

Remarks: The carrier of the EuT is 19.5 dB below the spurious emission limit and according FCC 15.209.

A spectrum mask measurement is not applicable.

6.7.3 Test protocol



SPMASK

Date: 29.OCT.2007 10:40:20

FCC ID: VQ5-EBIIF

6.8 Receiver radiated emissions (Magnetic field) 9 kHz – 30 MHz

For test instruments and accessories used see section 6 Part **SER 1**.

6.8.1 Description of the test location

Test location: **NONE**

Remarks: The EuT has no receiver mode

6.9 Receiver radiated emissions (electric field) 30 MHz – 1 GHz

For test instruments and accessories used see section 6 Part **SER 2**.

6.9.1 Description of the test location

Test location: **NONE**

Remarks: The EuT has no receiver mode

FCC ID: VQ5-EBIIF

7 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used, in addition to the test accessories, are calibrated and verified regularly.

The calibration intervals and the calibration history will be given out on request.

| Test ID | Model Type | Kind of Equipment | Manufacturer | Equipment No. |
|---------|---|---|--|--|
| A 4 | ESHS 30 NNLK 8129 ESH 2 - Z 5 N-4000-BNC N-1500-N ESH 3 - Z 2 | EMI Test Receiver LISN LISN RF Cable RF Cable Pulse Limiter | Rohde & Schwarz München Schwarzbeck Mess-Elektron Rohde & Schwarz München mikes-testingpartners gmbh mikes-testingpartners gmbh Rohde & Schwarz München | 02-02/03-05-002 02-02/20-05-001 02-02/20-05-004 02-02/50-05-138 02-02/50-05-140 02-02/50-05-155 |
| CPR 1 | FMZB 1516 ESCI S10162-B/+11N-50-10-5/+1 S10162-B/+11N-50-10-5/+1 NW-2000-NB | Magnetic Field Antenna EMI Test Receiver RF Cable 33m RF Cable 53m RF Cable | Schwarzbeck Mess-Elektron Rohde & Schwarz München Huber + Suhner Huber + Suhner Huber + Suhner | 01-02/24-01-018 02-02/03-05-005 02-02/50-05-031 02-02/50-05-032 02-02/50-05-113 |
| FE | FSP 30 HZ-10 WK-340/40 N-3500-BNC | Spectrum Analyzer Magnetic Field Antenna Climatic Chamber RF Cable | Rohde & Schwarz München Rohde & Schwarz München Weiss Umwelttechnik GmbH mikes-testingpartners gmbh | 02-02/11-05-001 02-02/24-05-012 02-02/45-05-001 02-02/50-05-057 |
| MB | FSP 30 HZ-10 WK-340/40 N-3500-BNC | Spectrum Analyzer Magnetic Field Antenna Climatic Chamber RF Cable | Rohde & Schwarz München Rohde & Schwarz München Weiss Umwelttechnik GmbH mikes-testingpartners gmbh | 02-02/11-05-001 02-02/24-05-012 02-02/45-05-001 02-02/50-05-057 |
| SER 1 | FMZB 1516 ESCI S10162-B/+11N-50-10-5/+1 S10162-B/+11N-50-10-5/+1 NW-2000-NB | Magnetic Field Antenna EMI Test Receiver RF Cable 33m RF Cable 53m RF Cable | Schwarzbeck Mess-Elektron Rohde & Schwarz München Huber + Suhner Huber + Suhner Huber + Suhner | 01-02/24-01-018 02-02/03-05-005 02-02/50-05-031 02-02/50-05-032 02-02/50-05-113 |
| SER 2 | ESVS 30 VULB 9168 S10162-B/+11N-50-10-5/+1 KK-EF393-21N-16 NW-2000-NB | EMI Test Receiver Trilog-Broadband Anten RF Cable 33m RF Cable 20m RF Cable | Rohde & Schwarz München Schwarzbeck Mess-Elektron Huber + Suhner Huber + Suhner Huber + Suhner | 02-02/03-05-006 02-02/24-05-005 02-02/50-05-031 02-02/50-05-033 02-02/50-05-113 |

FCC ID: VQ5-EBIIF
Last Verif.

| Equipment No. | Next Calib. | Last Calib. | Next Verif. | |
|----------------------|--------------------|--------------------|--------------------|------------|
| 02-02/03-05-002 | 04/20/2008 | 04/20/2007 | | |
| 02-02/20-05-001 | 12.08.2007 | 06.08.2007 | | |
| 02-02/20-05-004 | 03.11.2008 | 04.11.2005 | 12.08.2007 | 06.08.2007 |
| 02-02/50-05-138 | | | | |
| 02-02/50-05-140 | | | | |
| 02-02/50-05-155 | 03/25/2008 | 09/25/2007 | | |
| 01-02/24-01-018 | 12.04.2007 | 12.04.2006 | | |
| 02-02/03-05-005 | 06.11.2008 | 06.11.2007 | | |
| 02-02/50-05-031 | | | | |
| 02-02/50-05-032 | | | | |
| 02-02/50-05-113 | | | | |
| 02-02/11-05-001 | 12.06.2007 | 12.06.2006 | | |
| 02-02/24-05-012 | | | | |
| 02-02/45-05-001 | 09.01.2008 | 09.01.2005 | 12.06.2007 | 06.06.2007 |
| 02-02/50-05-057 | | | | |
| 02-02/11-05-001 | 12.06.2007 | 12.06.2006 | | |
| 02-02/24-05-012 | | | | |
| 02-02/45-05-001 | 09.01.2008 | 09.01.2005 | 12.06.2007 | 06.06.2007 |
| 02-02/50-05-057 | | | | |
| 01-02/24-01-018 | 12.04.2007 | 12.04.2006 | | |
| 02-02/03-05-005 | 06.11.2008 | 06.11.2007 | | |
| 02-02/50-05-031 | | | | |
| 02-02/50-05-032 | | | | |
| 02-02/50-05-113 | | | | |
| 02-02/03-05-006 | 07/24/2008 | 07/24/2007 | | |
| 02-02/24-05-005 | 04/15/2008 | 04/15/2005 | 09/21/2008 | 09/21/2007 |
| 02-02/50-05-031 | | | | |
| 02-02/50-05-033 | | | | |
| 02-02/50-05-113 | | | | |