

## EMI -- TEST REPORT

**Test Report No. :** **T32050-00-11HS**

11. December 2007

Date of issue

**Type / Model Name** : EBI 10**Product Description** : Data logger (13.56 MHz, 2.4 GHz)**Applicant** : Ebro Electronic GmbH & Co. KG**Address** : Peringerstr. 10DE-85055 Ingolstadt**Manufacturer** : Ebro Electronic GmbH & Co. KG**Address** : Peringerstr. 10DE-85055 Ingolstadt**Licence holder** : Ebro Electronic GmbH & Co. KG**Address** : Peringerstr. 10DE-85055 Ingolstadt**Test Result** according to the standards listed in clause 1 test standards:**POSITIVE**

## Contents

<b>1 TEST STANDARDS</b>	<b>3</b>
<b>2 SUMMARY</b>	<b>4</b>
<b>3 EQUIPMENT UNDER TEST</b>	<b>5</b>
3.1 PHOTO DOCUMENTATION OF THE EUT	5
3.2 POWER SUPPLY SYSTEM UTILISED	14
3.3 SHORT DESCRIPTION OF THE EQUIPMENT UNDER TEST (EUT)	14
<b>4 TEST ENVIRONMENT</b>	<b>15</b>
4.1 ADDRESS OF THE TEST LABORATORY	15
4.2 ENVIRONMENTAL CONDITIONS	15
4.3 STATEMENT OF THE MEASUREMENT UNCERTAINTY	15
4.4 MEASUREMENT PROTOCOL FOR FCC, VCCI AND AUSTEL	15
4.5 DISCOVERY OF WORST CASE MEASUREMENT CONDITIONS	16
<b>5 TEST CONDITIONS AND RESULTS</b>	<b>17</b>
5.1 RADIATED EMISSIONS (ELECTRIC FIELD)	17
<b>6 USED TEST EQUIPMENT AND ACCESSORIES</b>	<b>21</b>

## 1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15 Subpart B - Unintentional Radiators (May 04, 2007)

Part 15, Subpart B, Section 15.109 Radiated emissions, general requirements

Part 15, Subpart B, Section 15.111 Antenna power conduction

## **2 SUMMARY**

### **GENERAL REMARKS:**

The EUT works at 13.56 MHz and 2.400 GHz – 2.4835 GHz. The RFID-Part at 13.56 MHz is for receiving only. Therefore no transmitter measurements are necessary. The transceiver 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 T32050-00-12HS.

### **FINAL ASSESSMENT:**

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

Date of receipt of test sample : acc. to storage records

Testing commenced on : 24. September 2007

Testing concluded on : 6. December 2007

Checked by:

Tested by:

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

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

### **3 EQUIPMENT UNDER TEST**

#### **3.1 Photo documentation of the EUT**

External views of the data logger family EBI10:

Top view, Logger with internal temperature sensor



Top view, Logger with external temperature sensor



FCC ID: VQ5-EBI10

Side view, Logger with external temperature sensor

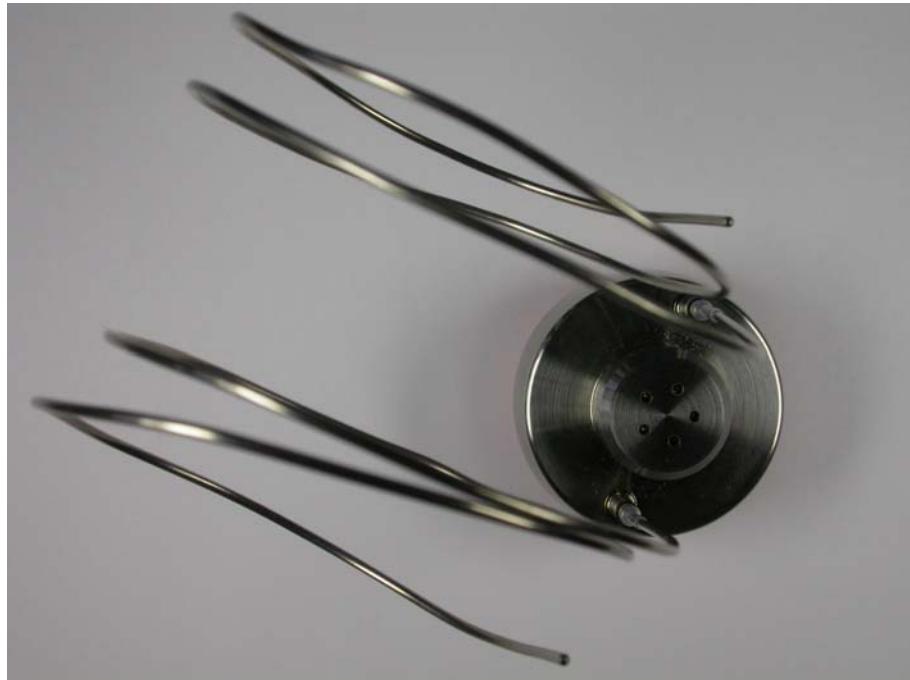


Top view, Logger with pressure sensor

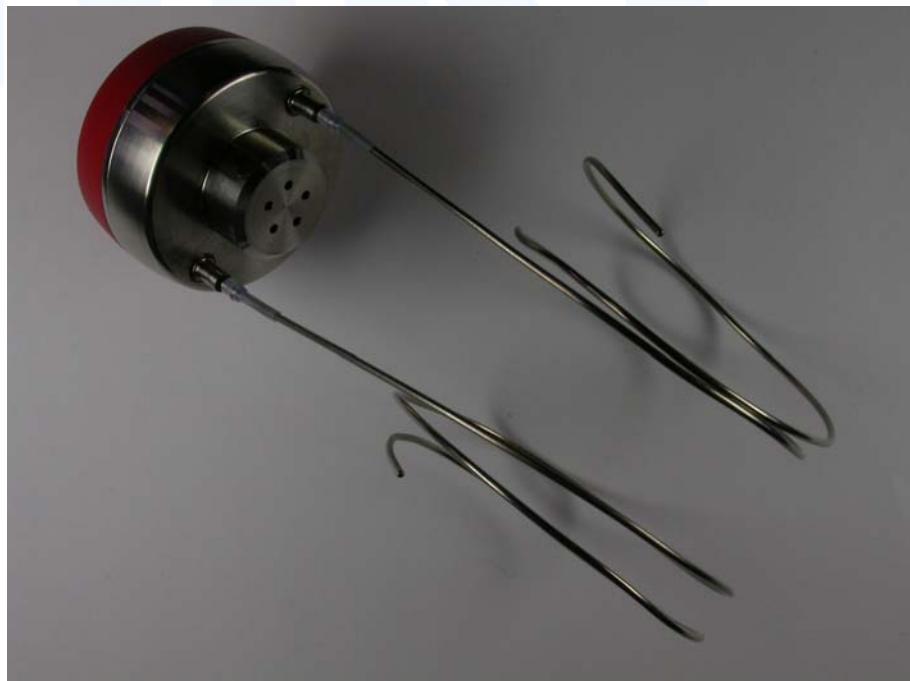


FCC ID: VQ5-EBI10

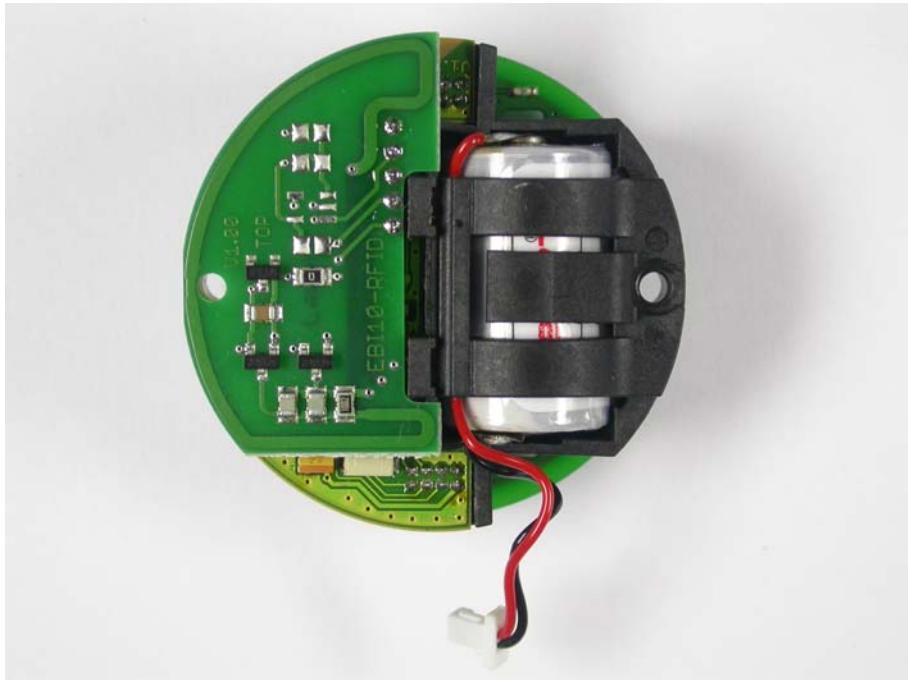
Top view, Logger with pressure sensor and external temperature sensor

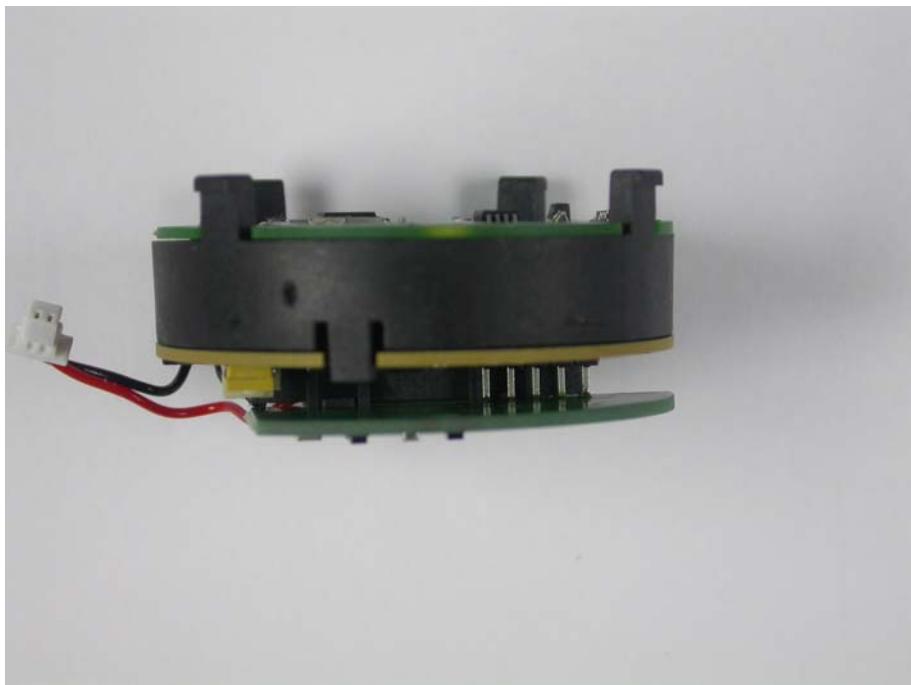


Side view, Logger with pressure sensor and external temperature sensor

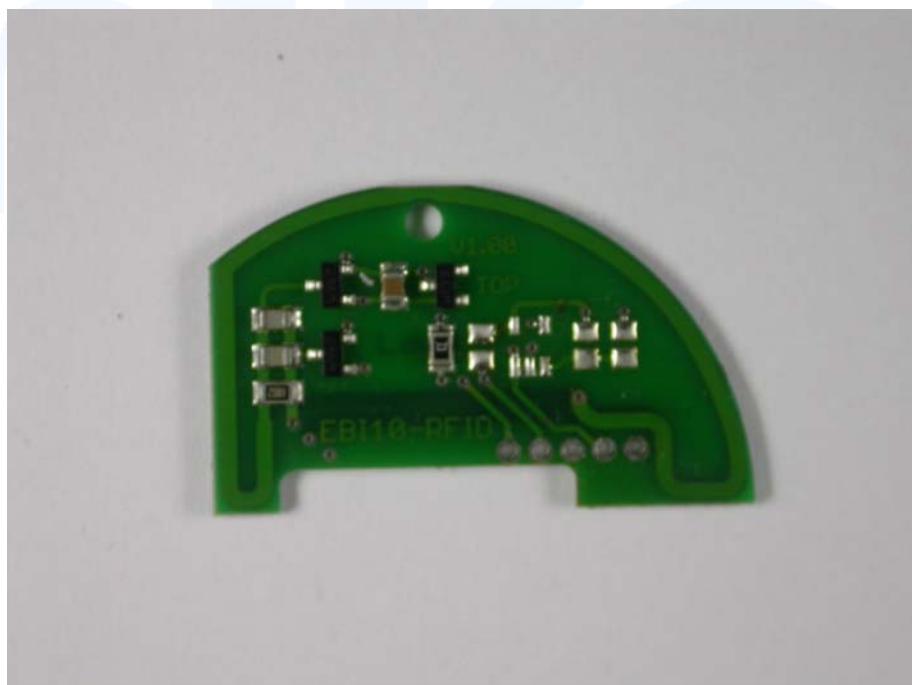
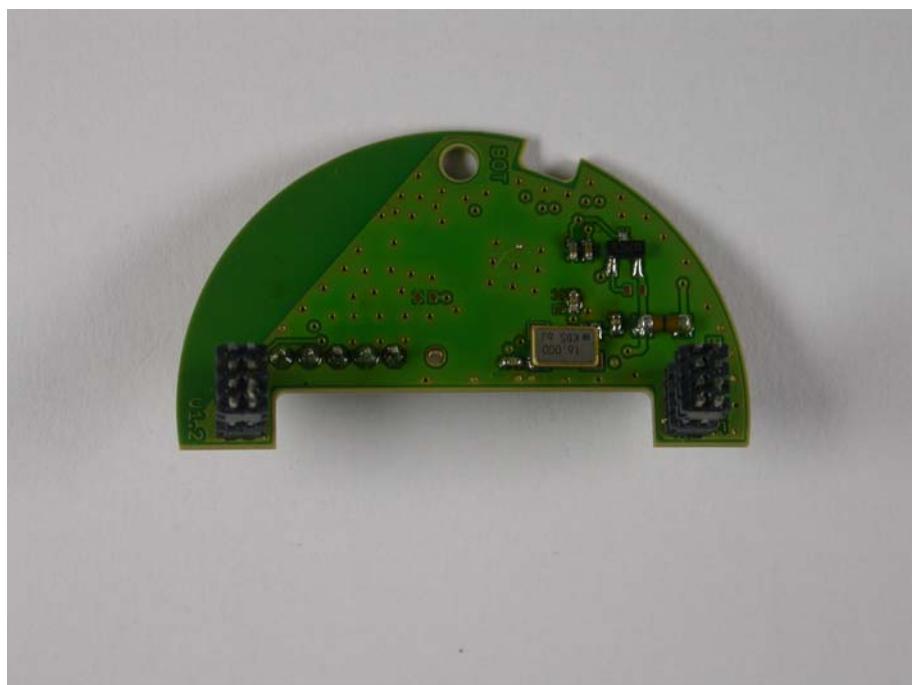


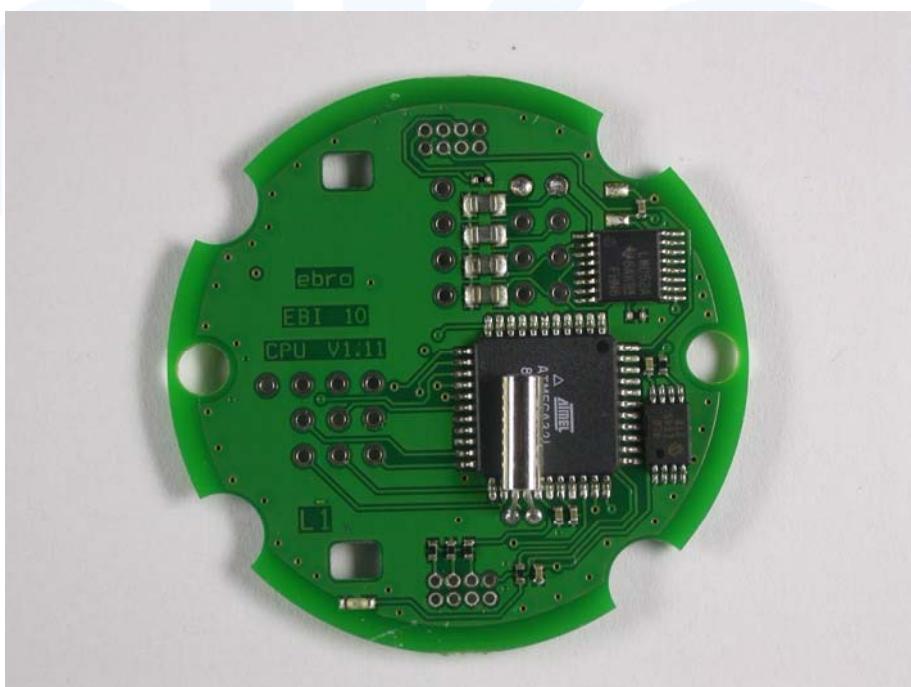
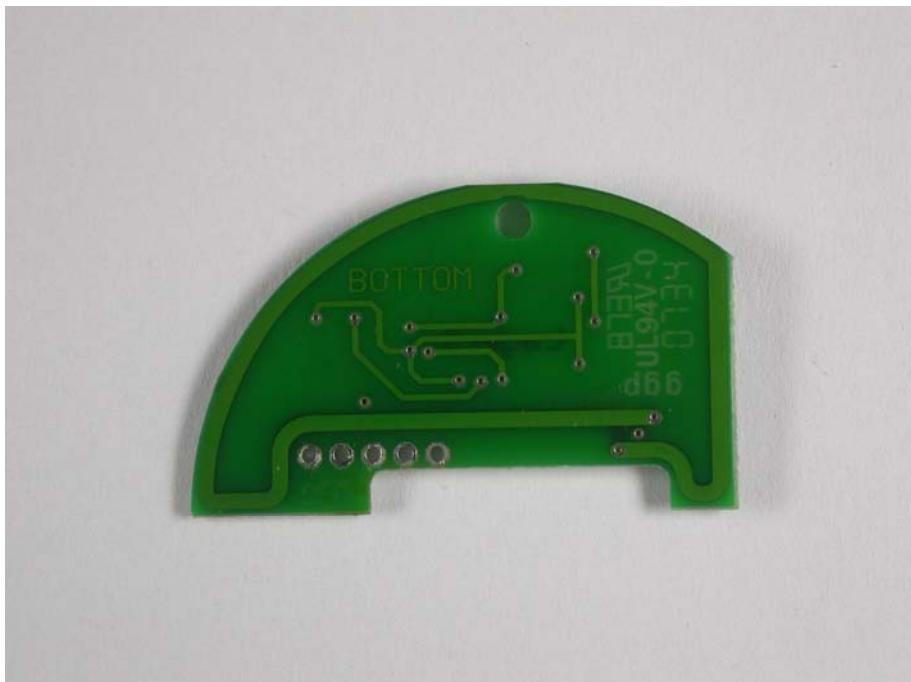
Internal views of the logger:





FCC ID: VQ5-EBI10





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### 3.2 Power supply system utilised

Power supply voltage : 3.6 V, Lithium Battery powered, (Size=1/2AA)

### 3.3 Short description of the Equipment under Test (EUT)

Data logger for temperature and pressure. Up to 4 mobile data logger can be used by one interface. The interface identifies a logger in the programming slot via 13.56 MHz RFID-Transceiver. In the mobile data logger is 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, if the logger is enabled for communication via 13.56 MHz signal. This enable signal is necessary to activate the 2.4 GHz interface, other wise no communication is possible.

Number of tested samples: 1  
Serial number: Prototype

#### EUT operation mode:

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

- RX 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:

- \_\_\_\_\_ Model : \_\_\_\_\_

## 4 TEST ENVIRONMENT

### 4.1 Address of the test laboratory

**mikes-testingpartners gmbh**  
Ohmstrasse 2-4  
94342 Strasskirchen  
Germany

### 4.2 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

### 4.3 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 – Uncertainties 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.

### 4.4 Measurement Protocol for FCC, VCCI and AUSTEL

#### 4.4.1 GENERAL INFORMATION

##### 4.4.1.1 Test Methodology

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.

##### 4.4.1.2 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.

#### 4.4.2 DETAILS OF TEST PROCEDURES

##### 4.4.2.1 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."

#### 4.5 Discovery of worst case measurement conditions

For evaluating the worst case the data logger was driven in maximum output power mode and measured in X, Y and Z-Position. The data logger has no active RFID at 13.56 MHz so the logger was set into network Mode to enable the communication for the 2.4 GHz interface. The maximum output power was found in X-Position. So the measurements were performed in this direction to express the worst case.

## **5 TEST CONDITIONS AND RESULTS**

### **5.1 Radiated emissions (electric field)**

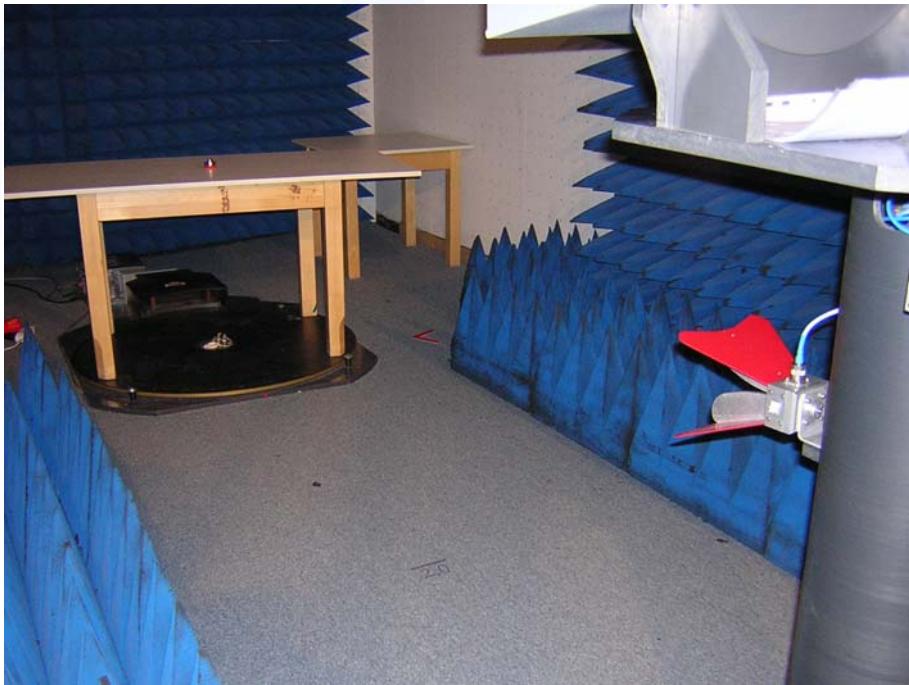
For test instruments and accessories used see section 6 Part **SER1, SER 2, SER 3**.

#### **5.1.1 Description of the test location**

Test location: OATS1  
Test location: Anechoic Chamber A2

#### **5.1.2 Photo documentation of the test set-up**





### 5.1.3 Description of Measurement

Radiated 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 $\mu$ V/m, is arrived by taking the reading from the EMI receiver (Level dB $\mu$ 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 radiated emissions from the EUT are measured in the frequency range of 1 GHz to maximum frequency as specified in section 15.33, using a tuned receiver (Spectrum Analyser) and appropriate linearly polarized antennas. 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 horizontally from the EUT.

Measurement 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 1 MHz. All tests are performed at a test-distance of 3 meters. Hand-held or body-worn devices are rotated through three orthogonal axes to determine which attitude and configuration procedure the highest emission relative the limit and therefore shall be used for final testing. During the tests the EUT is rotated all around to find the maximum levels of emissions. The cables and equipment were placed and moved within the range of position likely to find their maximum emissions. When the EUT is larger than the beamwidth of the measuring antenna, the measurement antenna will be moved over the surfaces for the four sides or the test distance will be reduced to demonstrate that emissions were at maximum at the limit distance.

The resolution bandwidth during the measurement is as follows:

30 MHz – 1000 MHz: ResBW: 120 kHz  
Above 1000 MHz: ResBW: 1 MHz

#### 5.1.4 Test result

##### Testresult in detail:(<1GHz)

Frequency [MHz]	L: QP [dB $\mu$ V]	L: AV [dB $\mu$ V]	Bandwidth [kHz]	Correct. [dB]	L: QP [dB $\mu$ V/m]	L: AV [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Delta [dB]
0.009-0.15			0.2	0.2	< 30			
0.15-30			9.0	9	< 30			
30-1000			120		< 30			

FCC ID: VQ5-EBI10

Testresult in detail:(>1GHz)

Frequency [GHz]	L: PK [dB $\mu$ V]	L: AV [dB $\mu$ V]	Bandwidth [kHz]	Correct. [dB]	L: PK [dB $\mu$ V/m]	L: AV [dB $\mu$ V/m]	Limit AV [dB $\mu$ V/m]	Delta [dB]
1.0 – 4.0			1000			< 30	54	> -24

Limit according to FCC Subpart 15.109(a)

Frequency [MHz]	Limits [ $\mu$ V/m]	Limits [dB $\mu$ V/m]
30-88	100	40
88-216	150	43,5
216-960	200	46
Above 960	500	54

The requirements are **FULFILLED**.

**Remarks:** The measurement was performed up to 4.0 GHz.

## **6 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.

<b>Test ID</b>	<b>Model / Type</b>	<b>Kind of Equipment</b>	<b>Manufacturer</b>	<b>Equipment No.</b>
SER 1	FMZB 1516 ESVS 30 S10162-B/+11N-50-10-5/+1 KK-EF393-21N-16 NW-2000-NB	Magnetic Field Antenna EMI Test Receiver RF Cable 33m RF Cable 20m RF Cable	Schwarzbeck Mess-Elektron Rohde & Schwarz München Huber + Suhner Huber + Suhner Huber + Suhner	01-02/24-01-018 02-02/03-05-003 02-02/50-05-031 02-02/50-05-033 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
SER 3	AFS4-01000400-10-10P-4 AMF-4F-04001200-15-10P AFS5-12001800-18-10P-6 BBHA 9120 E 251 WBH218H N Sucoflex N-2000-SMA Sucoflex N-2000-SMA Sucoflex N-2000-SMA	RF Amplifier 1-4 GHz RF Amplifier 4-12 GHz RF Amplifier 12-18 GHz Broad-Band Horn Anten Horn Antenna 2-18 GHz RF Cable RF Cable RF Cable	PARZICH GMBH PARZICH GMBH PARZICH GMBH Schwarzbeck Mess-Elektron Q-par Angus Ltd novotronik Signalverarbeit novotronik Signalverarbeit novotronik Signalverarbeit	02-02/17-05-003 02-02/17-05-004 02-02/17-06-002 02-02/24-05-006 02-02/24-05-007 02-02/50-05-075 02-02/50-05-083 02-02/50-05-088
<b>Equipment No.</b>	<b>Next Calib.</b>	<b>Last Calib.</b>	<b>Next Verif.</b>	<b>Last Verif.</b>
01-02/24-01-018	12.04.2007	12.04.2006		
02-02/03-05-003	04/26/2008	04/26/2007		
02-02/50-05-031				
02-02/50-05-033				
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	05.09.2007	05.09.2006
02-02/50-05-031				
02-02/50-05-033				
02-02/50-05-113				
02-02/17-05-003				
02-02/17-05-004				
02-02/17-06-002				
02-02/24-05-006	04/15/2008	04/15/2005	10/23/2007	04/23/2007
02-02/24-05-007	10/23/2007	04/23/2007		
02-02/50-05-075				
02-02/50-05-083				
02-02/50-05-088				