

FCC ID: VNQ-0200201

EMI -- TEST REPORT

Test Report No. :	T31962-00-02HS	12. October 2007 Date of issue
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Type / Model Name : jxp-HPS**Product Description** : RFID reading and writing device**Applicant** : INRO Elektrotechnik GmbHAddress : Leiderer Str. 12D-63811 Stockstadt**Manufacturer** : INRO Elektrotechnik GmbHAddress : Leiderer Str. 12D-63811 Stockstadt**Licence holder** : INRO Elektrotechnik GmbHAddress : Leiderer Str. 12D-63811 Stockstadt

Test Result according to the standards listed in clause 1 test standards:	POSITIVE
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The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

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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 (October 01, 2006)

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

2 SUMMARY

GENERAL REMARKS:

FINAL ASSESSMENT:

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

Date of receipt of test sample : 03 September 2007

Testing commenced on : 03 September 2007

Testing concluded on : 13 September 2007

Checked by:

Tested by:

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

Hermann Smetana
Dipl.-Ing.(FH)

3 EQUIPMENT UNDER TEST

3.1 Photo documentation of the EuT

External Views



Top



Front

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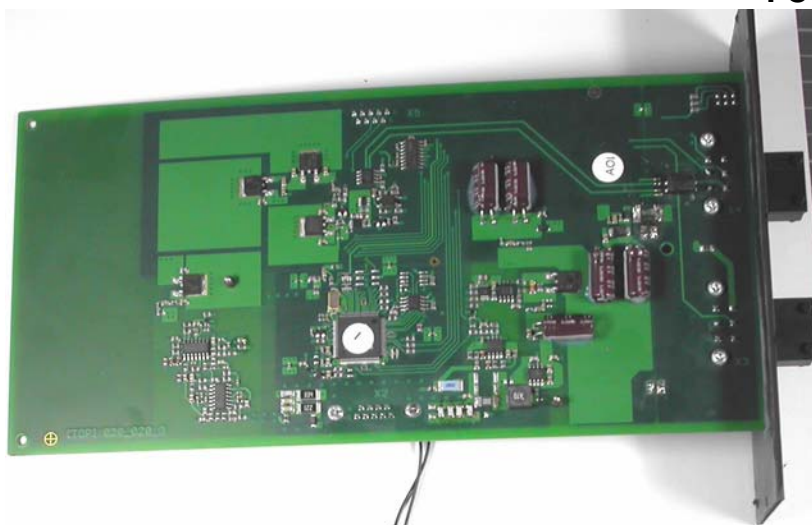
Back



Internal Views

Top View PCB

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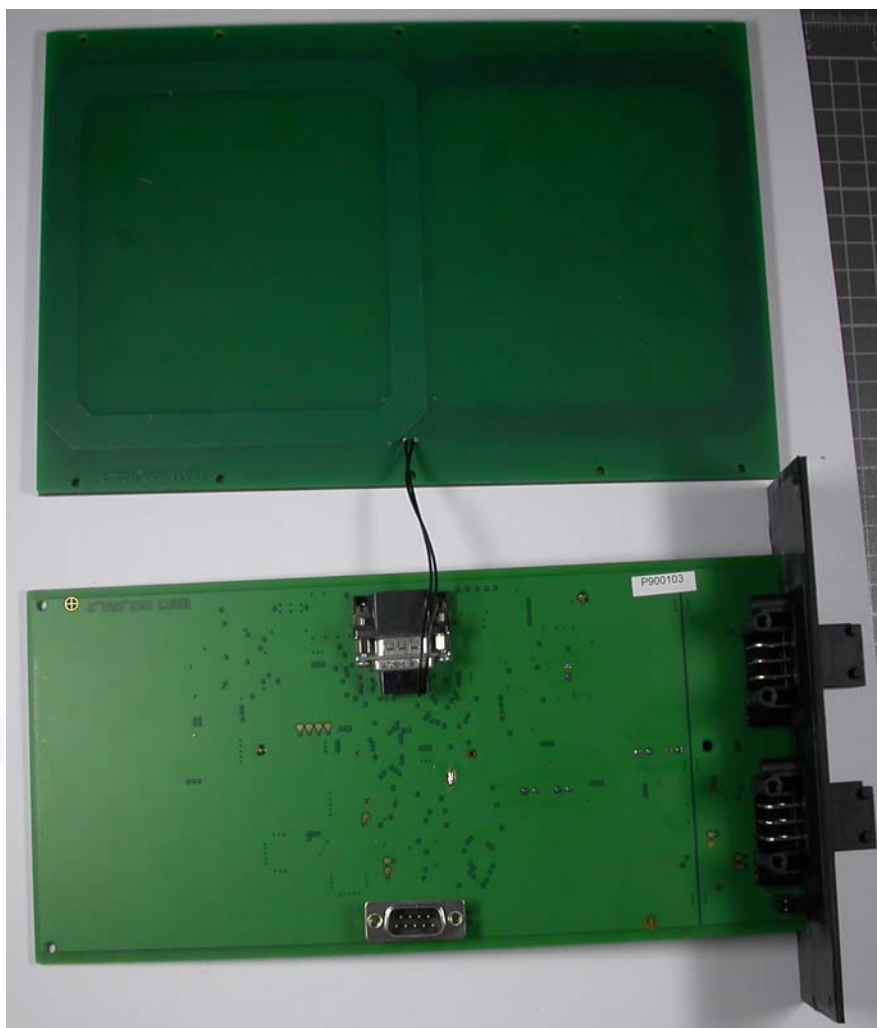


Antenna

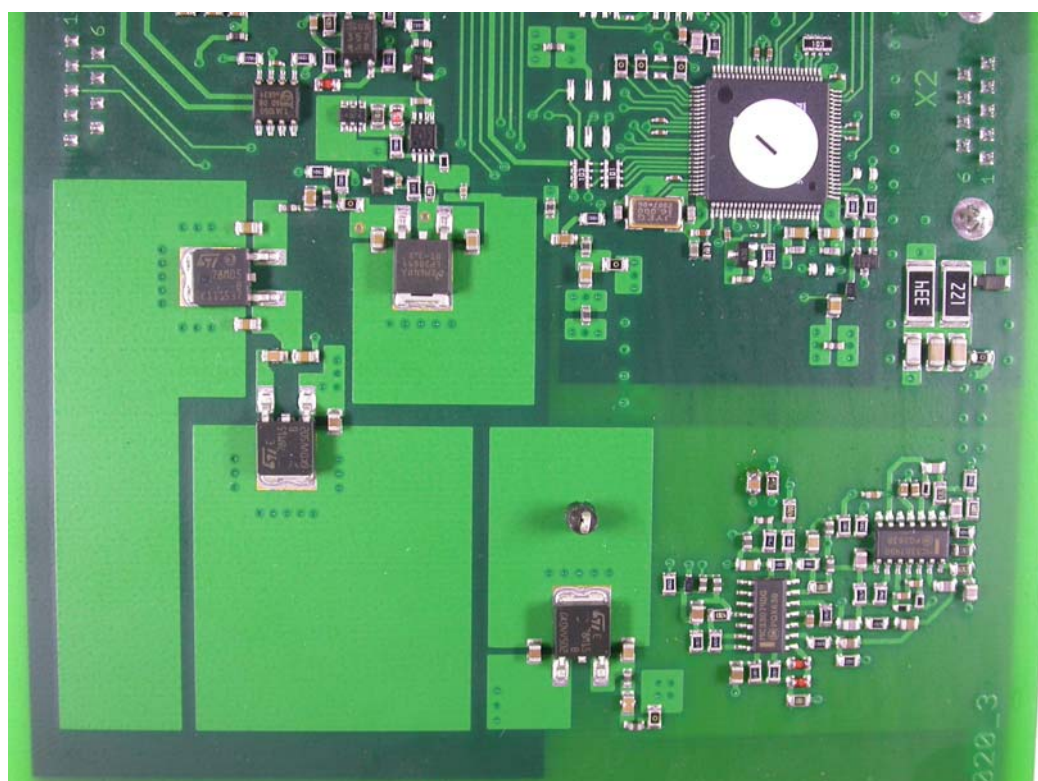


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Back View PCB + Antenna



Top View PCB



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DC Power Line and CAN Communication Interface



3.2 Power supply system utilised

Power supply voltage : 24 V / DC

3.3 Short description of the Equipment under Test (EuT)

RFID reading and writing device for vehicular use especially for fork-lift trucks.

Number of tested samples: 1
Serial number: Prototype

EuT operation mode:

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

- Continuous mode at 125 kHz

-

-

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:

DC-Power Line	Supplied by the Customer
- DC-Power Supply	Model : Agilent E3641A
-	Model :
-	Model :
-	Model :
-	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 – 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.

4.4 Measurement Protocol for FCC, VCCI and AUSTEL

4.4.1 GENERAL INFORMATION

4.4.1.1 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.

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

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."

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5 TEST CONDITIONS AND RESULTS

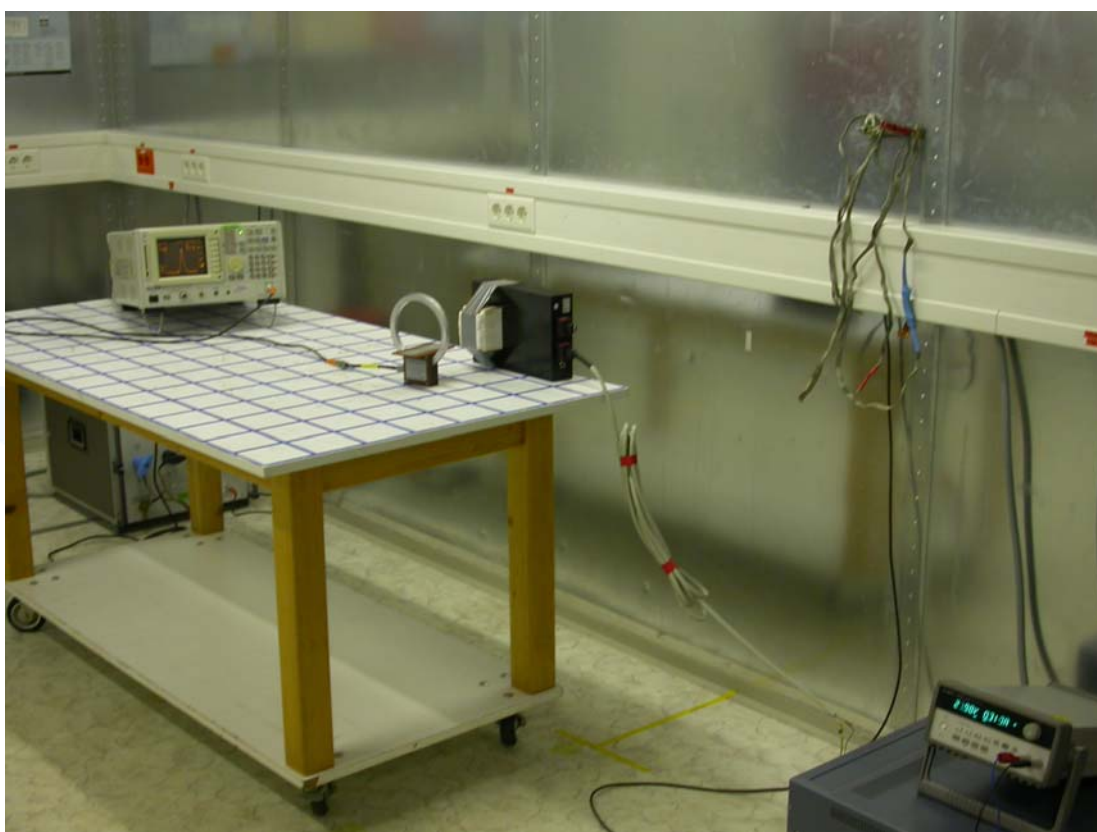
5.1 Conducted emissions

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

5.1.1 Description of the test location

Test location: Shielded Room S2

5.1.2 Photo documentation of the test set-up



5.1.3 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:

$$\text{dB}\mu\text{V} = 20(\log \mu\text{V})$$

$$\mu\text{V} = \text{Inverse log}(\text{dB}\mu\text{V}/20)$$

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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5.1.4 Test result

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin -3.9 dB at 0.375 MHz

The requirements are **FULFILLED**.

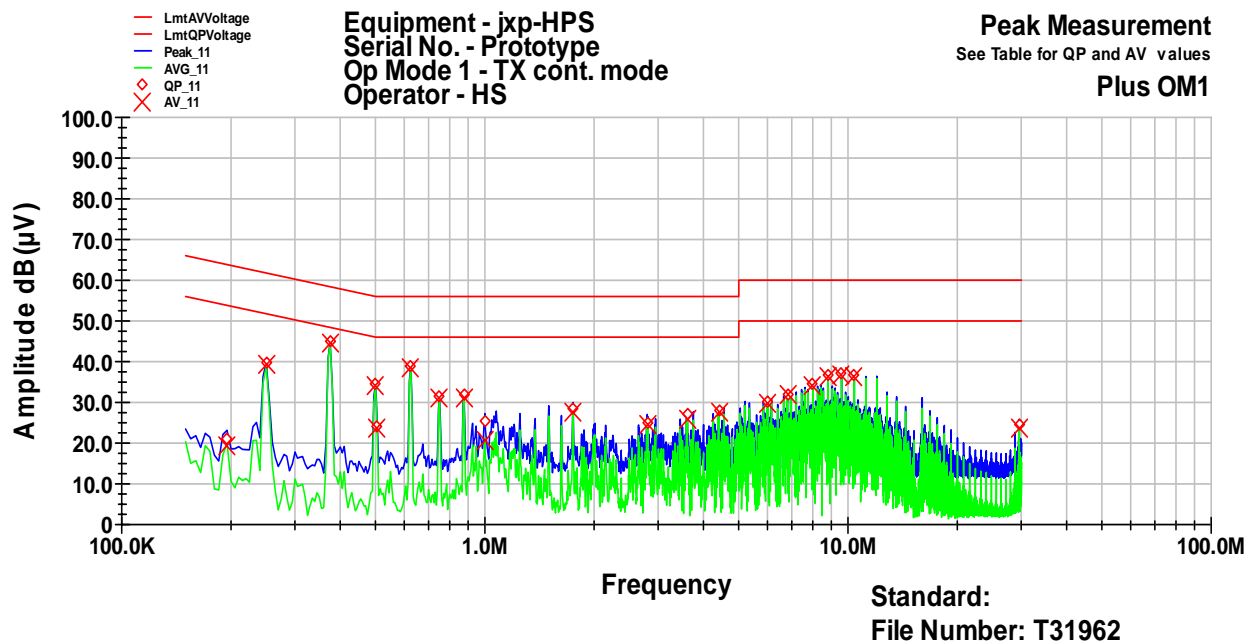
Remarks:

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5.1.5 Test protocol

Test point Positive Line
Operation mode: Continuous mode at 125 kHz
Remarks:
Date: 11.9.2007
Operator: HS

Result: passed

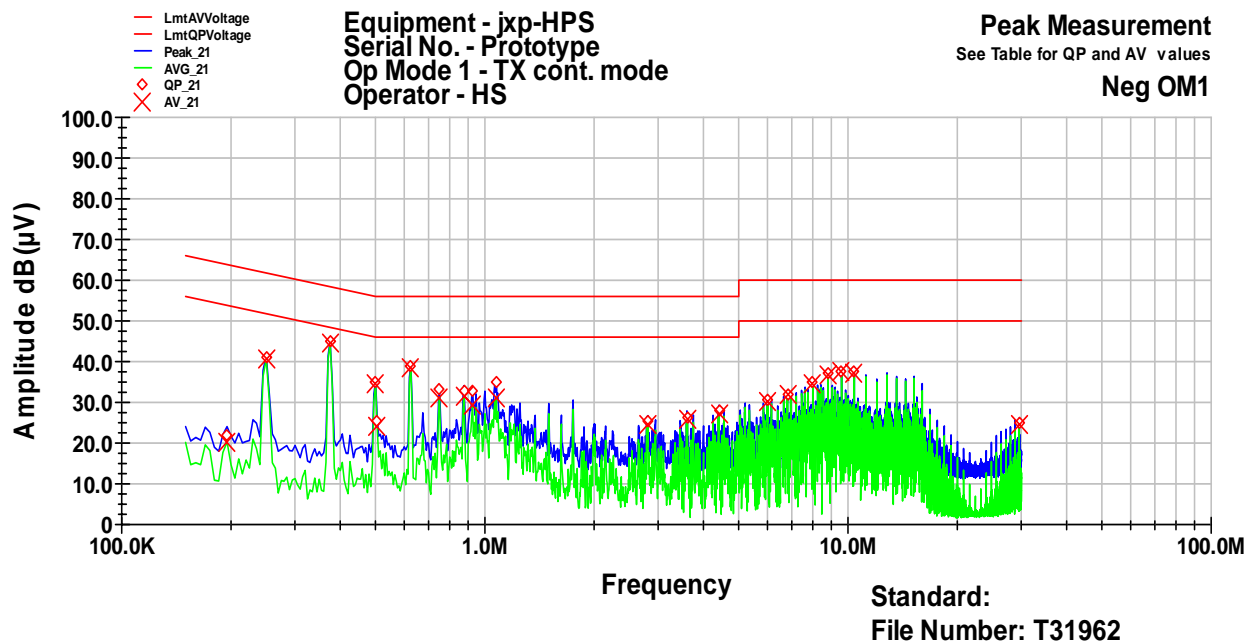


Frequency MHz	QP Level dB(μV)	QP Margin dB	QP Limit dB	AV Level dB(μV)	AV Margin dB	AV Limit dB
0.195	20.9	-42.9	63.8	19.4	-34.5	53.8
0.25	39.9	-21.9	61.8	39.1	-12.6	51.8
0.375	44.8	-13.6	58.4	44.5	-3.9	48.4
0.5	34.4	-21.6	56.0	34.0	-12.0	46.0
0.505	24.3	-31.8	56.0	23.6	-22.4	46.0
0.625	38.8	-17.2	56.0	38.4	-7.6	46.0
0.75	31.7	-24.3	56.0	30.9	-15.1	46.0
0.875	31.8	-24.2	56.0	31.2	-14.8	46.0
1	25.4	-30.6	56.0	20.8	-25.2	46.0
1.75	28.5	-27.5	56.0	27.5	-18.5	46.0
2.81	25.1	-30.9	56.0	24.4	-21.6	46.0
3.61	27.3	-28.7	56.0	26.0	-20.0	46.0
4.41	28.0	-28.0	56.0	27.5	-18.5	46.0
6	30.0	-30.0	60.0	29.6	-20.4	50.0
6.81	32.1	-27.9	60.0	31.7	-18.3	50.0
8	34.8	-25.3	60.0	34.3	-15.8	50.0
8.8	36.5	-23.5	60.0	36.2	-13.8	50.0
9.6	37.2	-22.8	60.0	36.8	-13.2	50.0
10.4	36.7	-23.3	60.0	36.3	-13.7	50.0
29.595	24.7	-35.3	60.0	23.8	-26.2	50.0

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Test point: L2
Operation mode: Continuous mode at 125 kHz
Remarks:
Date: 11.9.2007
Operator: HS

Result: passed



Frequency MHz	QP Level dB(μV)	QP Margin dB	QP Limit dB	AV Level dB(μV)	AV Margin dB	AV Limit dB
0.195	21.9	-41.9	63.8	20.1	-33.7	53.8
0.25	41.3	-20.5	61.8	40.6	-11.2	51.8
0.375	45.0	-13.3	58.4	44.5	-3.9	48.4
0.5	34.8	-21.2	56.0	34.4	-11.6	46.0
0.505	25.2	-30.8	56.0	24.0	-22.0	46.0
0.625	39.0	-17.0	56.0	38.6	-7.4	46.0
0.75	33.2	-22.8	56.0	31.1	-14.9	46.0
0.875	32.8	-23.2	56.0	31.6	-14.4	46.0
0.925	32.8	-23.2	56.0	29.5	-16.5	46.0
1.075	35.0	-21.0	56.0	31.3	-14.7	46.0
2.8	25.3	-30.7	56.0	24.4	-21.6	46.0
3.61	26.5	-29.5	56.0	25.8	-20.2	46.0
4.41	28.1	-27.9	56.0	27.2	-18.8	46.0
6	30.5	-29.5	60.0	30.1	-19.9	50.0
6.81	32.1	-27.9	60.0	31.8	-18.2	50.0
8	35.0	-25.0	60.0	34.5	-15.5	50.0
8.8	37.0	-23.0	60.0	36.6	-13.4	50.0
9.6	37.8	-22.3	60.0	37.4	-12.6	50.0
10.4	37.4	-22.6	60.0	37.1	-12.9	50.0
29.595	25.2	-34.8	60.0	24.4	-25.6	50.0

5.2 Field strength of the fundamental wave

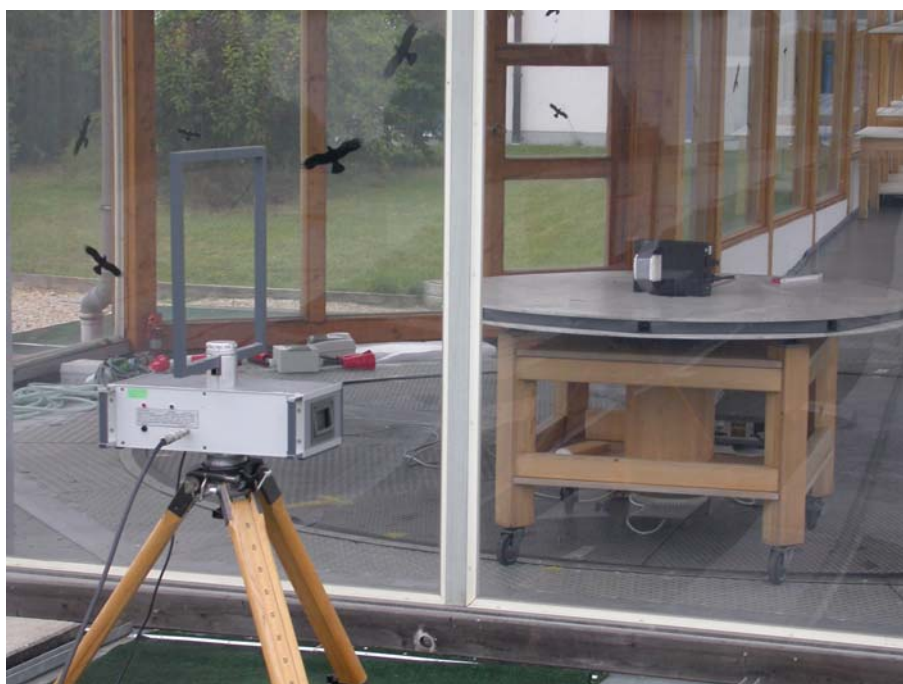
For test instruments and accessories used see section 6 Part CPR 1.

5.2.1 Description of the test location

Test location: OATS1

Test distance: 3 metres

5.2.2 Photo documentation of the test set-up



5.2.3 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

5.2.4 Test result

Measurement Distance: 3 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]
0.125			78.8	20			98.8	105.0	6.2

Caculated value at 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]
0.125			38.8	20			58.8	65.0	6.2

Caculated value at distance: 300 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]
0.125			-1.2	20			18.8	25.0	6.2

Limit according to FCC Part 15 Subpart 15.209(a)

Frequency (MHz)	Field strength of fundamental wave		Measurement distance (meters)
	(μ V/m)	dB (μ V/m)	
0.009-0.490	2400/F(kHz)	--	300
0.490-1.705	24000/F (kHz)	--	30
1.705-30.0	30	29.5	30

The requirements are **FULFILLED**.

Remarks:

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

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

5.3.1 Description of the test location

Test location: OATS1
Test distance: 3 metres

5.3.2 Photo documentation of the test set-up



5.3.3 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 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

5.3.4 Test result

Measurement Distance: 3 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]
0.250		33.5		20		53.5		99.6	46.1
0.375		31.0		20		51.0		96.0	45.0
0.500			21.2	20			41.2	73	31.8
0.625			16.8	20			36.8	71	34.3
0.750			18.1	20			38.1	70	31.9
0.875			9.0	20			29.0	68	39.0

Caculated value at distance: 300 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]
0.250		-46.5		20		-26.5		19.6	46.1
0.375		-49.0		20		-29.0		16	45.0

Caculated value at 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]
0.500			-18.8	20			1.2	33	31.8
0.625			-23.2	20			-3.2	31	34.3
0.750			-21.9	20			-1.9	30	31.9
0.875			-31.0	20			-11.0	28	39.0

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Limit according to FCC Part 15 Subpart 15.209(a)

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

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.

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

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

5.4.1 Description of the test location

Test location: NONE

Remarks: The measurement is not applicable.

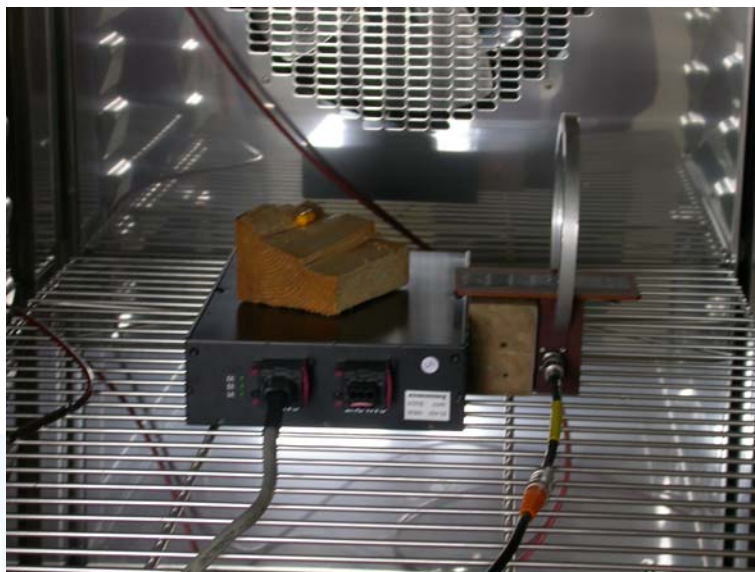
5.5 Emission Bandwidth

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

5.5.1 Description of the test location

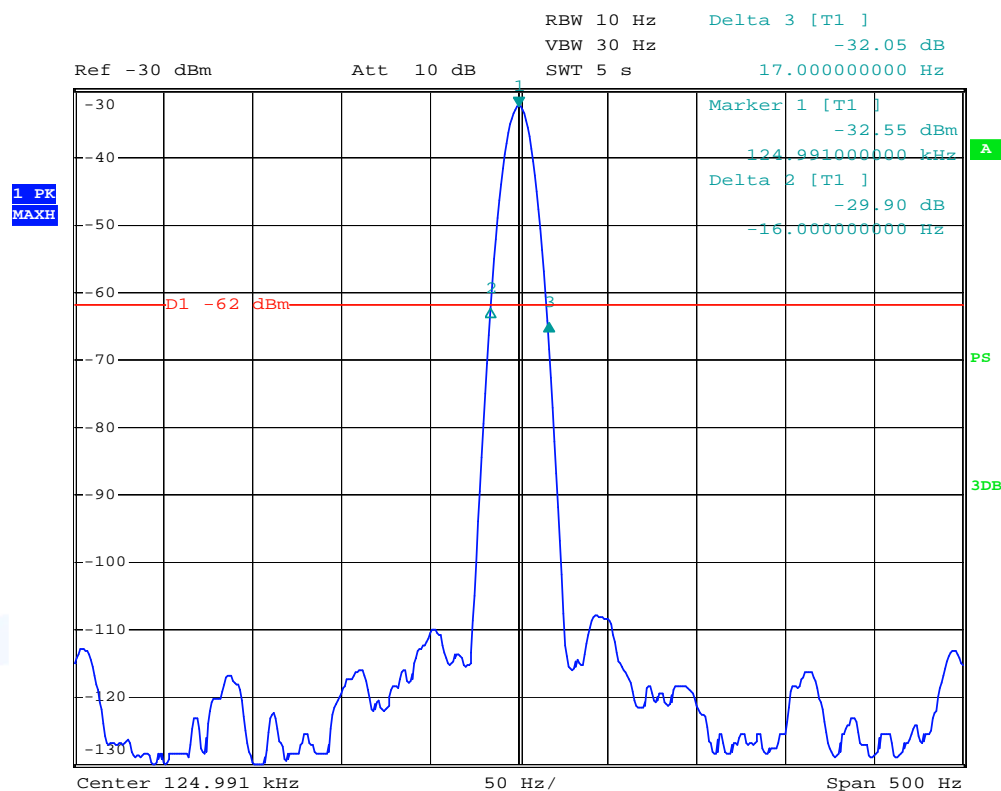
Test location: AREA4

5.5.2 Photo documentation of the test set-up



5.5.3 Test protocol

Emission Bandwidth plots



Date: 12.SEP.2007 10:22:18

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.

Test ID	Model / Type	Kind of Equipment	Manufacturer	Equipment No.
CPR 1	FMZB 1516	Magnetic Field Antenna	Schwarzbeck Mess-Elektronik	01-02/24-01-018
	ESHS 30	EMI Test Receiver	Rohde & Schwarz München	02-02/03-05-002
	S10162-B/+11N-50-10-5	RF Cable 33m	Huber + Suhner	02-02/50-05-031
	KK-EF393-21N-16	RF Cable 20m	Huber + Suhner	02-02/50-05-033
	NW-2000-NB	RF Cable	Huber + Suhner	02-02/50-05-113
MB	ESCI	EMI Test Receiver	Rohde & Schwarz München	02-02/03-05-004
	THS730A	Handheld Scope	Tektronix GmbH	02-02/13-05-001
	HZ-10	Magnetic Field Antenna	Rohde & Schwarz München	02-02/24-05-012
	WK-340/40	Climatic Chamber	Weiss Umwelttechnik GmbH	02-02/45-05-001
	6543A	Power Supply	HP Hewlett-Packard	02-02/50-05-157
SER 1	FMZB 1516	Magnetic Field Antenna	Schwarzbeck Mess-Elektronik	01-02/24-01-018
	ESHS 30	EMI Test Receiver	Rohde & Schwarz München	02-02/03-05-002
	S10162-B/+11N-50-10-5	RF Cable 33m	Huber + Suhner	02-02/50-05-031
	KK-EF393-21N-16	RF Cable 20m	Huber + Suhner	02-02/50-05-033
	NW-2000-NB	RF Cable	Huber + Suhner	02-02/50-05-113
Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
01-02/24-01-018	12/04/2007	12/04/2006		
02-02/03-05-002	04/20/2008	04/20/2007		
02-02/50-05-031				
02-02/50-05-033				
02-02/50-05-113				
02-02/03-05-004	11/30/2007	11/30/2006		
02-02/13-05-001	09/03/2008	09/03/2007		
02-02/24-05-012				
02-02/45-05-001	09/01/2008	09/01/2005	12/06/2007	06/06/2007
02-02/50-05-157				
01-02/24-01-018	12/04/2007	12/04/2006		
02-02/03-05-002	04/20/2008	04/20/2007		
02-02/50-05-031				
02-02/50-05-033				
02-02/50-05-113				