

Straubing, 21 January 2005

TEST-REPORT

No. 50602-40462-3

for

ID ISC.MR200

Inductive Reader

Applicant: FEIG ELECTRONIC GmbH

Purpose of testing: To show compliance with

FCC Code of Federal Regulations, CFR 47, Part 15, Subpart C, Section 15.225

Note:

The test data of this report relate only to the individual item which has been tested. This report shall not be reproduced except in full extent without the written approval of the testing laboratory.

FCC-ID: FCC ID



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1. Administrative Data

Test item (EUT)			
Type designation	ID ISC.MR200		
Serial number(s):	0001		
Type of equipment:	Inductive Reader		
Parts/accessories:	Antenna ID ISC.ANT300/300 Antenna ID ISC.ANT800/600 RF Power Splitter ID ISC.ANT.PS (to be used with ID ISC.ANT800/600)		
FCC-ID:	PJMMR200		
Technical data			
Frequency range	13.553 – 13.567 MHz		
Operational frequencies	13.560 MHz		
Type of modulation	NON		
Pulse frequency	N/A		
Pulse width	N/A		
Antenna			
Power supply	DC 24 V		
Applicant: (full address)	FEIG ELECTRONIC GmbH Lange Strasse 4 D-35781 Weilburg-Waldhausen		
Contract identification:			
Contact person:	Carsten Fiedler		
Manufacturer:	Applicant		
Application details			
Receipt of EUT:	30 June 2004		
Date of test:	January 2005		
Note:			



2. Identification of Test Laboratory

DETAILS OF THE TEST LABORATORY				
COMPANY NAME:	Senton GmbH EMI/EMC Test Center			
ADDRESS:	Aeussere Fruehlingsstrasse 45 D-94315 Straubing Germany			
LABORATORY ACCREDITATION:	DAR-Registration No. DAT-P-171/94-02			
FCC TEST SITE LISTING	90926			
INDUSTRY CANADA TEST SITE REGISTRATION	IC 3050			
NAME FOR CONTACT PURPOSES:	Mr. Johann Roidt			
TELEPHONE: (+49) (0)9421 5522-0	FAX: (+49) (0)9421 5522-99			

PERSONNEL INVOLVED IN THIS TEST REPORT				
LABORATORY MANAGER:	Mr. Johann Roidt			
RESPONSIBLE FOR TESTING: RESPONSIBLE FOR TEST REPORT:	Mr. Johann Roidt Mr. Johann Roidt			



3. Summary of test results

The tested sample complies with the requirements set forth in the

Code of Federal Regulations 47, Part 15, Subpart C, Section 15.225

of the Federal Communication Commission (FCC) and the

Radio Standards Specification RSS-210 Issue 5, Section 6.2.2(e) for Low Power Licence-Exempt Radiocommunication Devices

of Industry Canada (IC).



4. Operation Mode of EUT

Scan Mode



5. Configuration

Configuration of the EUT

- Reader ID ISC.MR200
- Antenna ID ISC.ANT300/300
- Antenna ID ISC.ANT800/600
- RF Power Splitter ID ISC.ANT.PS

Cables connected to the EUT

All ports of the EUT were loaded with approbiate shielded cables

Peripheral devices connected to the EUT

None



6. Measuring Methods



6.1. Conducted powerline emissions

Rules and Specifications:	Section 15.207
Guide:	ANSI C63.4

Measurement Procedure:

In general conducted emission tests in the frequency range 0.15 - 30 MHz are required to be performed with quasi-peak and average detector. To simplify testing the following procedure is used:

First the whole spectrum of emission caused by equipment under test (EUT) is recorded with detector set to peak. After that all emission levels having less margin than 20 dB to or exceeding the appropriate limit (in general average limit is 10 dB lower than quasi-peak limit) are retested with detector set to quasi-peak. If average limit is kept 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 has to be recorded.



Test instruments used:

Used	Туре	Model	Serial Number	Manufacturer
\boxtimes	EMI receiver	ESHS 10	860043/016	Rohde & Schwarz
\boxtimes	LISN	ESH3-Z5	862770/021	Rohde & Schwarz
	LISN	ESH-3-Z5	830952/025	Rohde & Schwarz
	Shielded room	No. 1	1451	Albatross
\boxtimes	Shielded room	No. 4	3FD-100 544	Euroshield



6.2. Radiated Emission Measurement 9 kHz – 30 MHz

Rules and Specifications:	Sections 15.209, 15.225(a)(b)(c)(d)
Guide:	ANSI C63.4

Measurement Procedure:

Radiated emissions in the frequency range 9 kHz - 30 MHz are measured initially at a distance of 3 meters in a fully anechoic room with the detector of the spectrum analyzer or EMI Receiver set to peak. 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.

Final measurement is then performed at 30 meters distance 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 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 15.31 (d) apply.

According to section 15.209 (d) final measurement is performed with the detector set to quasi-peak except for the frequency bands 9 – 90 kHz and 110 – 490 kHz where average detector is employed.



Test instruments used:

Used	Туре	Model	Serial Number	Manufacturer
\boxtimes	Test receiver	ESHS 10	860043/016	Rohde & Schwarz
\boxtimes	Loop antenna	HFH2-Z2	882964/1	Rohde & Schwarz
\bowtie	Fully anechoic room	No. 2	1452	Albatross Projects
\boxtimes	Open field test site	EG 1	1450	Senton



6.3. Radiated Emission Measurement in Fully Anechoic Room

Rules and Specifications:	Section 15.209
Guide:	ANSI C63.4

Measurement Procedure:

Radiated emissions are measured over the frequency range from 30 MHz to 1 GHz or the 10th harmonic of the maximum frequency of the EUT, whichever is higher.

Measurements are made in both the horizontal and vertical planes of polarization in a fully anechoic room using a spectrum analyzer with detector function set to peak and resolution bandwidth set to 100 kHz up to 1 GHz and to 1 MHz above. 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 produces the highest emission relative to the limit and therefore shall be used for final testing. For final testing an open-area test-site is used. During the tests the EUT is rotated all around to find the maximum levels of emissions. The cables and equipment are placed and moved within the range of position likely to find their maximum emissions.



Fully anechoic room

Test instruments used:

Used	Туре	Model	Serial Number	Manufacturer
\boxtimes	Spectrum Analyzer	FSP 30	100063	Rohde & Schwarz
\boxtimes	Preamplifier	CPA9231A	3393	Schaffner
\boxtimes	Trilog antenna (Chamber 2)	VULB 9163	9163-188	Schwarzbeck
	Horn antenna	3115	9508-4553	EMCO
	Horn antenna set	3160-03/-09	9112-1003	EMCO
	Preamplifier 1-8 GHz	AFS3-00100800- 32-LN	847743	Miteq
	Preamplifier 8-18 GHz	ACO/180-3530	32641	СТТ
\boxtimes	Fully anechoic room	No. 2	1452	Albatross Projects

FCC-ID: FCC ID

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6.4. Radiated Emission Measurement at Open Field Test Site

Rules and Specifications:	Section 15.209
Guide:	ANSI C63.4

Measurement Procedure:

Radiated emissions at open field test site are measured in the frequency range 30 MHz to 1 GHz. with detector of the test receiver set to guasi-peak.

Pretests in a fully anechoic room are performed to find the critical emission levels. With hand-held or body-worn devices prescans are recorded with EUT rotated through three orthogonal axes to determine which attitude and configuration produces the highest emission relative to the limit. The worst case setup is used for final testing.

During test EUT is rotated all around and receiving antenna is raised and lowered to find the maximum levels of emission. The cables and equipment are placed and moved within the range of position likely to find their maximum emissions.



Test instruments used:

Used	Туре	Model	Serial Number	Manufacturer
\boxtimes	EMI receiver	ESVP	881414/009	Rohde & Schwarz
\boxtimes	Biconical antenna EG 1	HK 116	842204/001	Rohde & Schwarz
\bowtie	Log. per. antenna EG 1	HL 223	841516/023	Rohde & Schwarz
\boxtimes	Open Field Test Site	No. 1	N/A	Senton



6.5. Frequency tolerance of the carrier signal

Rules and Specifications:	Section 15.225(e)
Guide:	ANSI C63.4

Measurement Procedure:

The frequency tolerance of the carrier signal is measured over a temperature variation of -20 degrees to +50 degrees 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 degrees C. For battery operated equipment, the test is performed using a new battery.



Temperature test chamber

Test	instruments	used:
1030	monumento	uscu.

Used	Туре	Model	Serial Number	Manufacturer
\boxtimes	Temperature test chamber	HT4010	07065550	Heraeus
\boxtimes	EMI test receiver	ESMI 839379/013 839587/006		Rohde & Schwarz
	EMI test receiver	ESPI7	836914/0002	Rohde & Schwarz
	DC-block	7006	A2798	Weinschel
	Attenuator	4776-10	9412	Narda
\boxtimes	Test probe	TP01	001	Senton
\boxtimes	DC power supply	NGSM 32/10	203	Rohde & Schwarz
	Isolating transformer	RT 5A	10387	Grundig
	Isolating transformer	RT 5A	10416	Grundig



7. Photographs of Test Setups



Test Setup for Radiated Emissions 9 kHz - 30 MHz





Test Setup for Radiated Emissions 30 – 1000 MHz (prescan)



Test Setup for Radiated Emissions 30 - 1000 MHz (prescan) - continued -





Test Setup for Radiated Emissions 30 – 1000 MHz (final scan)





Test Setup for Radiated Emissions 30 - 1000 MHz (final scan) - continued -





Test Setup for conducted Emissions 0.15-30 MHz







8. List of Measurements

8.1. List of Measurements According To FCC Part 15 Subpart C

FCC Part 15 Su	ubpart C		
Section(s):	Test	Page(s)	Result
15.207	Conducted emission test 150 kHz - 30 MHz	23	Passed
15.225 (a)(d) 15.209	Field Strength of Emission 9 kHz - 30 MHz	24	Passed
15.225 (d) 15.209	Field Strength of Emission 30 MHz – 1 GHz	25	Passed
15.225 (a)(b)(c)(d)	Spectrum Mask	27	Passed
15.225 (e)	Frequency tolerance of carrier signal	29	Passed



9. Test Results



Rules and Specifications:	Section 15.207				
Guide:	ANSI C63.4				
Limit:	Frequency of Emission (MHz) Conducted Limit (dBuV)				
		Quasi-peak	Average		
	0.15-0.5 0.5 – 5 5 - 30	66 to 56 56 60	56 to 46 46 50		
Test Site:	Shielded room				
Tested on:	DC supply lines of EUT				
Test Conditions:	RF Output terminated with 50 Ohms load				

Conducted Powerline Emission 150kHz – 30 MHz

Frequency [MHz]	Detector	Receiver Reading [dBµV]	Correction Factor [dB]	Final Value [dBµV]	Limit [dBµV]	Margin [dB]
0,605	QP	35,2	0	35,2	56	-20,8
13,56	QP	42,8	0	42,8	60	-17,2

*** = No emissions above noise floor detected

Sample calculation of Final values:

Final Value ($dB\mu V$) = Receiver Reading ($dB\mu V$) + Correction Factor (dB)

Result:

Test passed



Rules and Specifications:	Section 15.209	Section 15.209				
Guide:	ANSI C63.4	ANSI C63.4				
Limit:	Frequency of Emission (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)			
	0.009.0.490 0.490-1.705 1.705 – 30	2400/F(kHz) 24000/F(kHz) 30	300 30 30			
Test Site:	Open field test site					
Distance:	3 and 10 m					
Test Conditions:	Antenna ID ISC.ANT300/300, Scan Mode, TX Power 1.7 W					

Fieldstrength of Emission 9 kHz - 30 MHz

Frequency	Detector	Receiver Re	æding [dBµV]	Correction	Extrapolation	Fieldst	rength [d	BµV/m]	Limit	Margin
[MHz]		3m	10m	[dB]	Factor [dB]	3m	10m	30m	[dBµV/m]	[dB]
13,56	QP	81,3	69,3	20,0	22,9	101,3	89,3	78,4	84,0	-5,6
27,12	QP	35,0	20,0	20,0	28,7	55,0	40,0	26,3	29,5	-3,2

*** = All emissions showed more than 20 dB margin to the limit

Sample calculation of field strength values:

Field Strength $(dB\mu V/m)$ = Receiver Reading $(dB\mu V)$ + Correction Factor (dB/m)

Result:	Test passed



Rules and Specifications:	15.109, 125.209 Radiated Emission Limits					
Guide:	ANSI C63.4	ANSI C63.4				
Limit:	Frequency of Emission (MHz) Field Strength (microvolts/meter)					
	30 - 88 88 - 216 216 - 960 Above 960	100 150 200 500				
Test Site:	Open Area Test Site (< 1 GHz), Fully anechoic chamber (> 1 GHz)					
Distance:	3 Meters					
Test Conditions:	Antenna ID ISC.ANT300/300, Scan Mode, TX Power 1.7 W					

Fieldstrength of Emission 30 MHz - 1 GHz

Frequency	Detector	Antenna	Receiver	Correction	Fieldstrengt	Limit	Margin [dB]
[MHz]		Polarisation	Reading	Factor [dB]	h [dBµV/m]	[dBµV/m]	
			[dBµV]				
54,20	QP	Vertical	14,60	10,00	24,60	40,00	15,40
162,70	QP	Vertical	22,30	14,00	36,30	43,50	7,20
393,20	QP	Vertical	15,00	18,30	33,30	46,00	12,70
583,00	QP	Vertical	15,90	22,00	37,90	46,00	8,10
745,00	QP	Vertical	16,10	24,90	41,00	46,00	5,00
772,90	QP	Vertical	14,70	24,90	39,60	46,00	6,40
922,00	QP	Vertical	14,90	26,80	41,70	46,00	4,30

*** = All emissions showed more than 20 dB margin to the limit

Sample calculation of field strength values:

Field Strength $(dB\mu V/m)$ = Receiver Reading $(dB\mu V)$ + Correction Factor (dB/m)

Result:	Test passed



Rules and Specifications:	15.109, 125.209 Radiated Emission Limits			
Guide:	ANSI C63.4			
Limit:	Frequency of Emission (MHz)	Field Strength (microvolts/meter)		
	30 - 88 100 88 - 216 150 216 - 960 200 Above 960 500			
Test Site:	Open Area Test Site (< 1 GHz), Fully anechoic chamber (> 1 GHz)			
Distance:	3 Meters			
Test Conditions:	Antenna ID ISC.ANT800/600, RF Power Splitter ID ISC.ANT.PS, Scan Mode, TX Power 1.7 W			

Fieldstrength of Emission 30 MHz - 1 GHz

Frequency	Detector	Antenna	Receiver	Correction	Fieldstrengt	Limit	Margin [dB]
[MHz]		Polarisation	Reading	Factor [dB]	h [dBµV/m]	[dBµV/m]	
			[dBµV]				
311,80	QP	Horizontal	23,00	16,10	39,10	46,00	6,90
339,20	QP	Horizontal	20,20	17,00	37,20	46,00	8,80
433,90	QP	Horizontal	20,90	19,30	40,20	46,00	5,80
569,50	QP	Horizontal	18,90	21,80	40,70	46,00	5,30
596,50	QP	Horizontal	14,10	22,20	36,30	46,00	9,70
894,90	QP	Horizontal	11,30	26,80	38,10	46,00	7,90

*** = All emissions showed more than 20 dB margin to the limit

Sample calculation of field strength values:

Field Strength ($dB\mu V/m$) = Receiver Reading ($dB\mu V$) + Correction Factor (dB/m)

Result:	Test passed



Spectrum Mask

Rules and Specifications:	15.225 (a)(b)(c)(d)		
Test conditions:	TX power 1.7 W, Antenna ID ISC.ANT300/300		



Result:

Test passed



Spectrum Mask





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Measurement of Frequency Stability vs Temperature

Rules and Specifications:	15.225 (e)
Limits and Requirements:	The frequency tolerance of the carrier signal shall be maintained within \pm 0.01% (\pm 100 ppm) of the operating frequency
Nominal Frequency of EUT:	13,560 MHz
Test Conditions:	TX power 1.7 W

Temperature Variation Table

Temperature [°C]	Frequency (+20°C) [MHz]	Frequency (Temperature) [MHz]	Tolerance [ppm]	Limit [ppm]
-20	13,560210	13,560260	4	100
-10	13,560210	13,560270	4	100
±0	13,560210	13,560380	13	100
+10	13,560210	13,560290	6	100
+20	13,560210	13,560210	0	100
+30	13,560210	13,560110	-7	100
+40	13,560210	13,560110	-7	100
+50	13,560210	13,560070	-10	100

Result:

Test passed



Measurement of Frequency Stability vs Supply Voltage

Rules and Specifications:	15.225 (e)
Limits and Requirements:	The frequency tolerance of the carrier signal shall be maintained within \pm 0.01% (\pm 100 ppm) of the operating frequency
Nominal Frequency of EUT:	13,560 MHZ
Test Conditions:	TX power 1.7 W

Voltage Variation Table

Supply Voltage (V)	Nominal Frequency (MHz)	Frequency Measured (MHz)	Tolerance (ppm)	Limit (ppm)
20,4	13,560000	13,5602	15	100
24,0	13,560000	13,5602	15	100
27,6	13,560000	13,5602	15	100

Result:	Test passed



10. Referenced Regulations

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

FCC Part 2	Code of Federal Regulations Part 2 Frequency allocation and radio treaty	October 01, 2001
FCC Part 15 Subpart A	Code of Regulations Part 15 (Radio Frequency Devices), Subpart A (General) of the Federal Communication Commission (FCC)	July 12, 2004
FCC Part 15 Subpart B	Code of Regulations Part 15 (Radio Frequency Devices), Subpart B (Unintentional Radiators) of the Federal Communication Commission (FCC)	July 12, 2004
FCC Part 15 Subpart C	Code of Regulations Part 15 (Radio Frequency Devices), Subpart C (Intentional Radiators) of the Federal Communication Commission (FCC)	July 12, 2004
FCC Part 74 Subpart H	Code of Regulations Part 15 (Radio Frequency Devices), Subpart H (Low Power Auxiliary Stations) of the Federal Communication Commission (FCC)	July 12, 2004
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 January 30, 2004)
RSS-210 Issue 5	Radio Standards Specification RSS-210 Issue 5 for Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands) of Industry Canada	November 2001
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



11. Additional Information supplementary to the Test Report

There is no additional information supplementary to the test report.

Conducted Emis according to FC	sion Te C Part	est_150 kH 15 Subpart	z - 30 MHz B Class B	
Model: ID ISC.MR200		Mode: TX Power 1.7	W	
Serial no.: 0001		Scan Mode RF Output tern	ninated	
Applicant: FEIG Electronic GmbH				
Test site: Shielded room, cabin no. 1				
Tested on: Linecord DC Supply Minus				
Date of test:Operator:01/26/2005J. Roidt				
Test performed: File name: automatically				
Detector: Peak / Final Results: QP		Final results: 20 dB Margin	25 S	ubranges
dΒμV 100	·	L	imit1: FCC B / QP	Limit2: FCC B / AV
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Result: Pass		Project file: 50602-40652-3	3 P	age of Pages

Conducted Emiss according to FCC	ion T Part	est 150 kHz 15 Subpart E	- 30 MHz 3 Class B	
Model: ID ISC.MR200		Mode: TX Power 1.7 W		
Serial no.: 0001		Scan Mode RF Output termir	nated	
Applicant: FEIG Electronic GmbH				
Test site: Shielded room, cabin no. 1				
Tested on: Linecord DC Supply Plus				
Date of test:Operator:01/26/2005J. Roidt				
Test performed: File name: automatically				
Detector: Peak / Final Results: QP		Final results: 20 dB Margin	25 Su	ubranges
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