

Straubing, 30 August 2004

TEST - REPORT

No. 51514-40562

for

CardMan 5121

RFID Reader 13.56 MHz

Applicant: Omnikey AG

Test Specification: FCC Code of Federal Regulations,
CFR 47, Part 15,
Sections 15.205, 15.207, 15.209, and
15.225

Industry Canada Radio Standards
Specification RSS-210 Issue 5,
Section 6.2.2(e)
(Category I Equipment)

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.

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1. Administrative Data

Test item (EUT)	
Type designation	Card Man
Serial number(s):	001
Type of equipment:	RFID Reader 13.56 MHz
Parts/accessories:	---
FCC-ID:	---
Technical data	
Frequency range	13.553 - 13.567 MHz
Operational frequencies	13.56 MHz
Type of modulation	10K0A1D
Pulse frequency	N/A
Pulse width	N/A
Antenna	Integrated
Power supply	USB interface
Applicant: (full address)	Omnikey AG Zeulenrodaer Str. 17 D-99091 Erfurt
Contract identification:	Order no. 02082004/02
Contact person:	Mr. Abu Ismail
Manufacturer:	Omnikey AG
Application details	
Receipt of EUT:	09 August 2004
Date of test:	August 2004
Note:	---
Responsible for testing:	Thomas Eberl
Responsible for test report:	Thomas Eberl

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. TTI-P-G 062/94-01
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

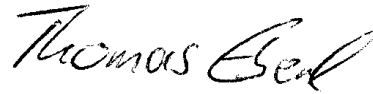
PERSONNEL INVOLVED IN THIS TEST REPORT

LABORATORY MANAGER:



Mr. Johann Roidt

RESPONSIBLE FOR TESTING:



Mr. Thomas Eberl

RESPONSIBLE FOR TEST REPORT:

Mr. Thomas Eberl

SUMMARY OF TEST RESULTS

The tested sample complies with the requirements set forth in the

**Code of Regulations CFR 47, Part 15,
Sections 15.205, 15.207, 15.209, and 15.225 and**

**Industry Canada Radio Standards Specification RSS-210 Issue 5, Section 6.2.2(e)
(Category I Equipment)**

3. Operation Mode of EUT

Continuously reading appropriate TAG

4. Configuration

Configuration of the EUT
Not applicable

Cables connected to the EUT
USB IF cable

Peripheral devices connected to the EUT
Laptop PC Dell AC/DC Adapter Printer HP 2225C AC Adapter Hayes

5. Measuring Methods

5.1. Conducted Emission 0.15 MHz - 30 MHz (§15.207 / IC RSS-210 sec. 6.6, 7.4)

Conducted emissions were measured in the frequency range 0.15 MHz to 30 MHz with bandwidth of the EMI-Receiver set to 10 kHz and according to the following procedure:

First the whole spectrum of emission caused by equipment under test (EUT) was recorded with detector set to peak. After that all peak levels having less margin than 10 dB to the appropriate lower average limit were re-tested 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.

Measurements were performed on phase(s) and neutral lines of the power-cords of the tested system. At the final test the cables and equipment were placed and moved within the range of positions likely to find their maximum emissions.

The test setup was made in accordance with ANSI C63.4-1992.

.The bandwidth of the EMI-Receiver was set to 9 kHz with detector-function set to CISPR quasi-peak and, if necessary, additionally to average.

See figure 1 for the measurement setup.

Test equipment used (see equipment list for details):
005, 015, 104, 125, 127

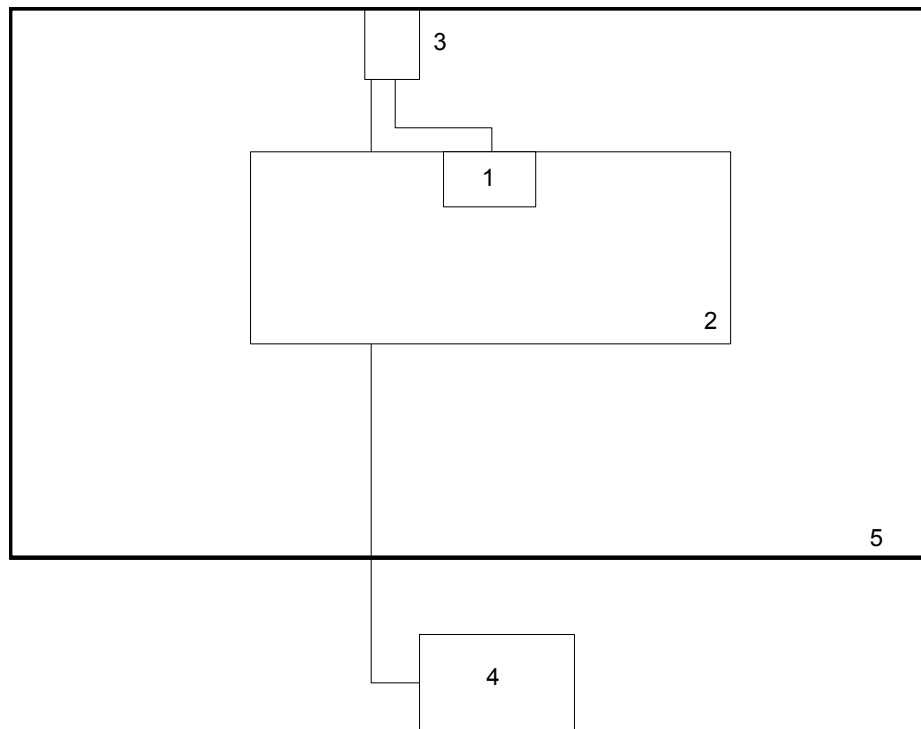


Figure 1: Example for measurement setup for conducted emission test

- 1 Transmitter (EUT)
- 2 Wooden table

- 3 LISN for EUT
- 4 Test receiver
- 5 Shielded room

5.2. Field strength of in-band emissions (§15.225 (a) / IC RSS-210 Section 6.2.2(e)) and unwanted emissions ≤ 30 MHz (§15.225 (b) / IC RSS-210 Section 6.2.2(e))

Radiated emissions in the frequency range 9 kHz – 30 MHz will be measured initially at a distance of 3 meters. A prescan at 3 meter distance will be performed in a shielded room with the detector of the spectrum analyzer or EMI Receiver set to peak. Final measurement is then performed at 30 meter distance. In case the regulation requires testing at other distances, the result will be extrapolated. The extrapolation factor will be determined by making a second measurement at 10 meter distance. 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.

See figure 2 for the measurement setup.

Test equipment used (see equipment list for details):
001, 004, 103, 104, 140, 172

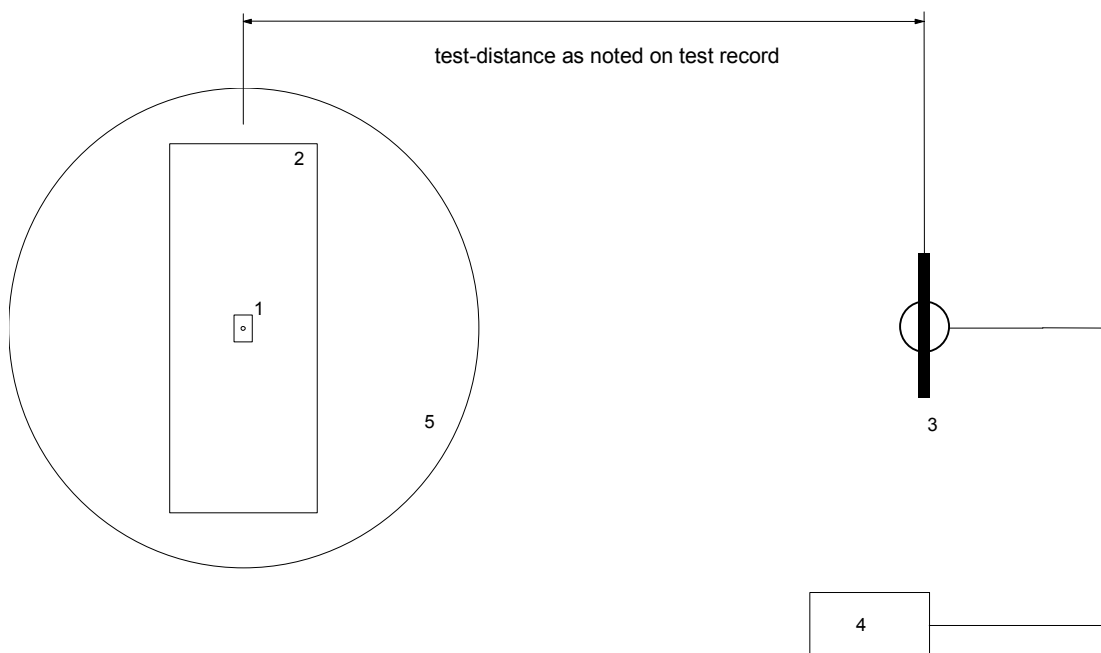


Figure 2: Example for measurement setup for radiated emission test below 30 MHz

- | | |
|---------------------|-----------------------|
| 1 Transmitter (EUT) | 3 Measurement antenna |
| 2 Wooden table | 4 Test receiver |
| | 5 Turn table |

5.3. Frequency tolerance (§15.225 (c) / IC RSS-210 Section 6.2.2(e))

5.3.1. Frequency stability vs. temperature

The frequency stability vs. temperature was measured with a spectrum analyzer connected to the output of the transmitter power amplifier (conducted measurement) via dummy load while EUT was operating in transmit mode using the assigned frequency.

The trace mode of the spectrum analyzer was set to write with frequency count mode activated:
RBW = 100 Hz, VBW = 100 Hz, span = 20 kHz, sweep = 1.5 s (auto mode)

See figure 3 for the measurement setup.

Test equipment used (see equipment list for details):
007, 017, 025, 101, 121, 166

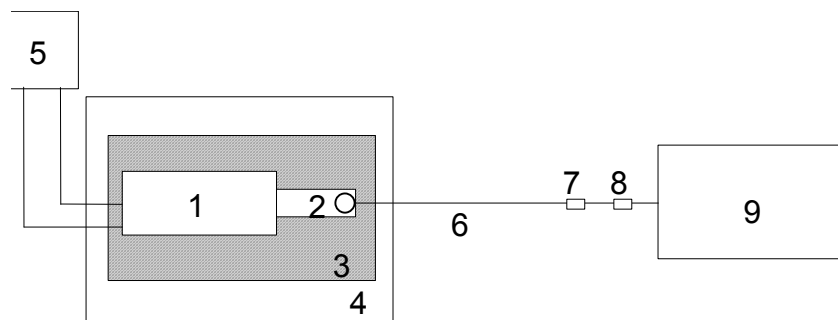


Figure 3: Example for measurement setup for testing within temperature test chamber

- | | |
|----------------------------|------------------------------|
| 1 Transmitter (EUT) | 6 Test cable |
| 2 Test fixture | 7 DC-block (if applicable) |
| 3 Wooden support | 8 Attenuator (if applicable) |
| 4 Temperature test chamber | 9 Spectrum analyzer |
| 5 DC power supply | |

5.3.2. Frequency stability vs. supply voltage

The frequency stability vs. supply voltage was measured with a spectrum analyzer connected to the output of the transmitter power amplifier (conducted measurement) via dummy load while EUT was operating in transmit mode using the assigned frequency.

The trace mode of the spectrum analyzer was set to write with frequency count mode activated:
RBW = 100 Hz, VBW = 100 Hz, span = 20 kHz, sweep = 1.5 s (auto mode)

See figure 3 for the measurement setup.

Test equipment used (see equipment list for details):
007, 017, 025, 101, 121, 166

5.4. Unwanted Emission 30 MHz - 1 GHz (§15.225 (b) / IC RSS-210 Section 6.2.2(e))

Radiated emissions were measured over the frequency range from 30 MHz to 1 GHz. For final testing the detector-function of the spectrum analyzer was set to quasi peak

Measurements were made in both the horizontal and vertical planes of polarization.

Preliminary scans were taken in a semi or fully anechoic room using a spectrum analyzer with the detector function set to peak and resolution bandwidth set to 100 kHz. All tests were 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 was used. During the tests the EUT was rotated all around and the receiving-antenna was raised and lowered from 1 meter to 4 meters 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.

See figure 4 for the measurement setup.

Test equipment used (see equipment list for details):

001, 003, 004, 012, 014, 015, 018, 102, 106, 113, 141, 142, 143, 144, 171, 172

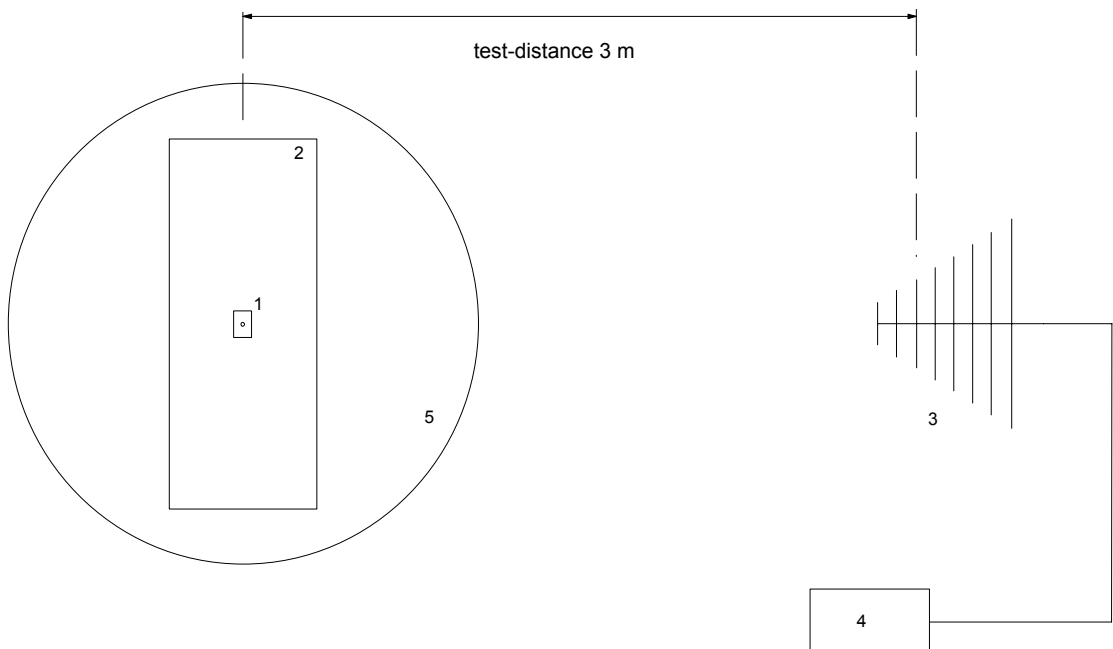


Figure 4: Example for measurement setup for radiated emission test

- 1 Transmitter (EUT)
- 2 Wooden table

- 3 Measurement antenna
- 4 Test receiver
- 5 Turn table

6. Photographs Taken During Testing

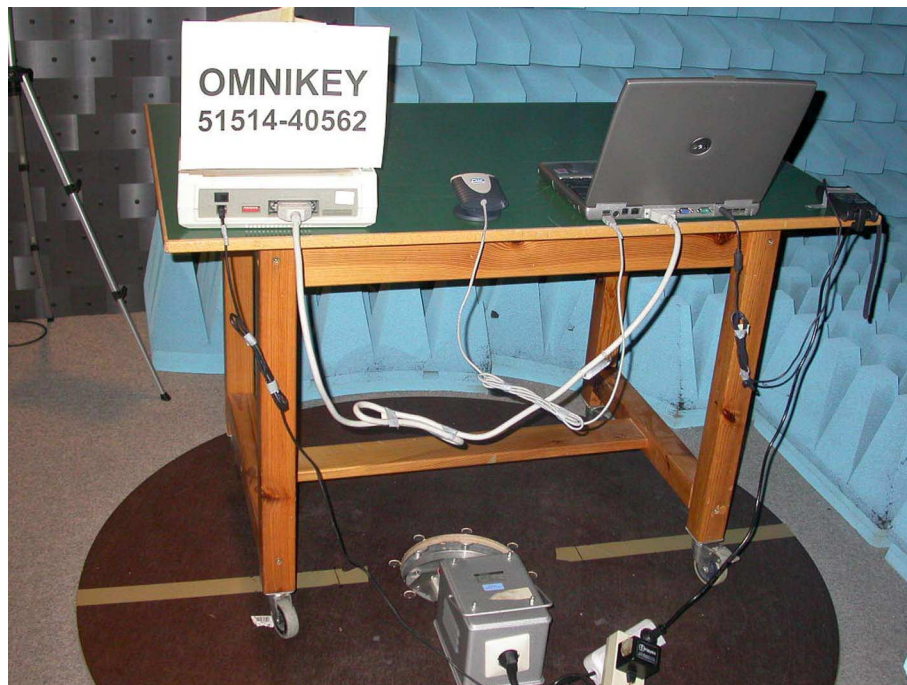
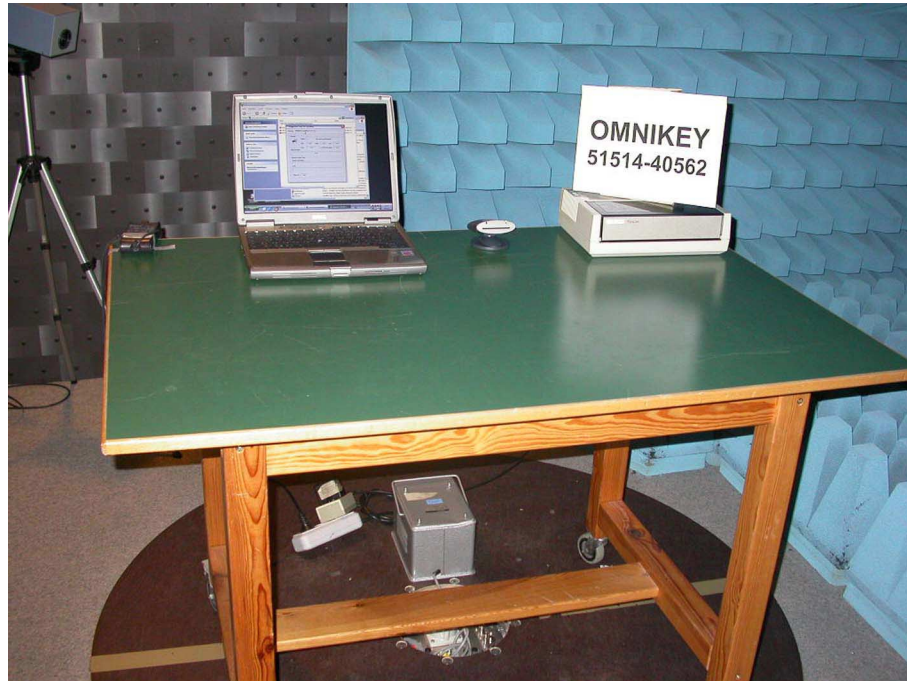
Test setup for conducted power line emission measurement



Test setup for conducted power line emission measurement



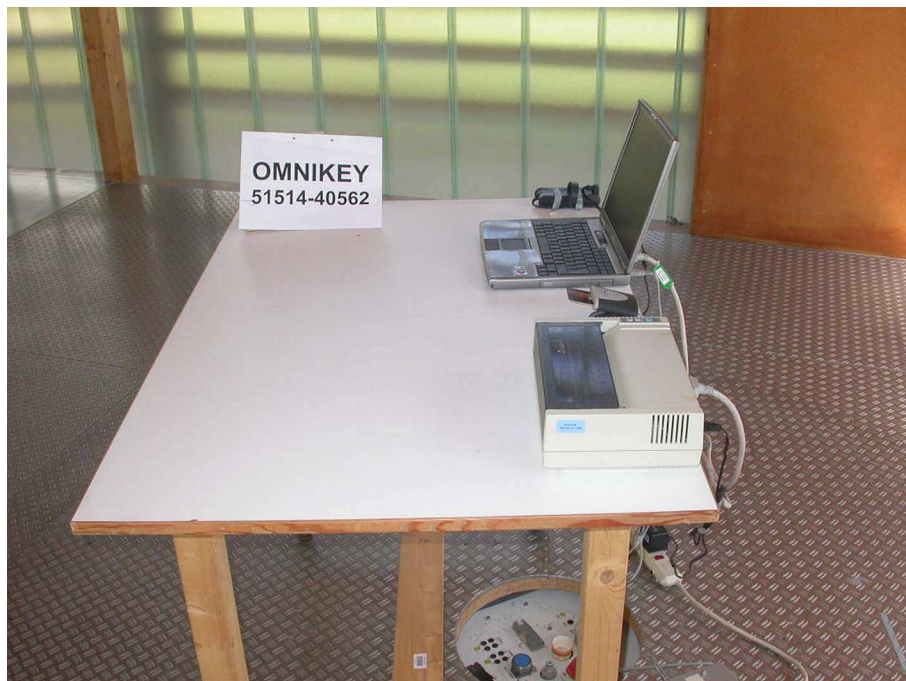
**Test setup for radiated emission measurement
(fully anechoic room)**



**Test setup for radiated emission measurement
(open area test site)**



**Test setup for radiated emission measurement
(open area test site)**



7. Equipment List

To simplify the identification on each page of the test report, each item of test equipment and ancillaries such as cables is identified (numbered) by the test laboratory (version 03/03/2004), below.

General Test Equipment and Ancillaries

No.	Instrument/Ancillary	Type	Serial Number	Manufacturer
001	Open area test site	EG 1		Senton
002	Shielded room	No. 1	1451	Albatross
003	Fully anechoic room	No. 2	1452	Albatross
004	Semi-anechoic room	No. 3	1453	Siemens
005	Shielded room	No. 4	3FD 100 544	Euroshield
006	Shielded room	No. 5	5468	Ray Proof Division
007	Temperature test chamber	HT4010	07065550	Heraeus
008	Cable	RG214	1309	Senton
009	Cable	200CM_001	1357	Rosenberger
010	Cable	150CM_001	1479	Rosenberger
011	Cable	150CM_002	1480	Rosenberger
012	Cable set EG1	RG214	1189 - 1191	Senton
013	Cable set cabin no. 1	RG214		Senton
014	Cable set cabin no. 2	UTIFLEX		Rosenberger
015	Cable set cabin no. 3	RG214		Senton
016	Cable set cabin no. 4	RG214		Senton
017	DC power supply	NGSM 32/10	203	Rohde & Schwarz
018	DC power supply	NGB	2455	Rohde & Schwarz
019	DC power supply	NGA	386	Rohde & Schwarz
020	Isolating transformer	RT 5A	10387	Grundig
021	Isolating transformer	RT 5A	10416	Grundig
022	Digital multimeter	199	463386	Keithley
023	Multimeter	HP E2373A	2927J03345	Hewlett Packard
024	DC-block 0.01 - 18 GHz		8037	Inmet
025	DC-block	7006	A2798	Weinschel
026	Digital multimeter	UDS 5	838760/001	Rohde & Schwarz

Test Equipment and Ancillaries used for Emission Tests

No.	Instrument/Ancillary	Type	Serial Number	Manufacturer
101	EMI test receiver	ESMI	839379/013 839587/006	Rohde & Schwarz
102	Spectrum analyzer	FSP30	100036	Rohde & Schwarz
103	Test receiver	ESH 3	880112/032	Rohde & Schwarz
104	Test receiver	ESHS 10	860043/016	Rohde & Schwarz
105	Test receiver	ESV	881414/009	Rohde & Schwarz
106	Test receiver	ESVP	881120/024	Rohde & Schwarz
107	Audio analyzer	UPA	862954	Rohde & Schwarz
108	Radio communication service monitor	CMS 54	838384/030	Rohde & Schwarz
109	Power meter	NRVS	836856/015	Rohde & Schwarz
110	Power sensor	NRV-Z52	837901/030	Rohde & Schwarz
111	Power sensor	NRV-Z4	863828/015	Rohde & Schwarz
112	Preamplifier	ESV-Z3	860907/004	Rohde & Schwarz
113	Preamplifier	CPA9231A	3393	Schaffner
114	Preamplifier	AFS3-00100800-32-LN	847743	Miteq
115	Preamplifier	ACO/180-3530	32641	CTT
116	Signal generator	SMY 01	830694/001	Rohde & Schwarz
117	Signal generator	HP 8673 D	2930A00966	Hewlett Packard
118	Waveform generator	HP 33120 A	US34005375	Hewlett Packard
119	UHF attenuator set	DPU	300771/075	Rohde & Schwarz
120	UHF attenuator set	DPU	300788/006	Rohde & Schwarz
121	Attenuator	4776-10	9412	Narda
122	Attenuator	4776-20	9503	Narda
123	Pulse limiter	ESH 3-Z2	1144	Rohde & Schwarz
124	Pulse limiter	11947 A	3107A00566	Hewlett Packard
125	V-network	ESH 3-Z5	862770/018	Rohde & Schwarz
127	V-network	ESH 3-Z5	830952/025	Rohde & Schwarz
128	V-network	ESH 3-Z6	830722/010	Rohde & Schwarz
129	V-network	NSLK 8127	8127152	Schwarzbeck
130	Artificial mains network	ESH 2-Z5	842966/004	Rohde & Schwarz
131	T-network	ESH 3-Z4	890602/011	Rohde & Schwarz
132	T-network	ESH 3-Z4	890602/012	Rohde & Schwarz
133	Diode detector negative	8473D	01492	Hewlett Packard
134	High impedance probe	TK 9416	01	Schwarzbeck
135	High impedance probe	TK 9416	02	Schwarzbeck

Test Equipment and Ancillaries used for Emission Tests (continued)

No.	Instrument/Ancillary	Type	Serial Number	Manufacturer
136	Current probe	ESH 2-Z1	863366/18	Rohde & Schwarz
137	Current probe	ESV-Z1	862553/3	Rohde & Schwarz
138	Absorbing clamp	MDS 21	80911	Lüthi
139	Absorbing clamp	MDS 21	79690	Lüthi
140	Loop antenna	HFH2-Z2	882964/1	Rohde & Schwarz
141	Trilog broadband antenna	VULB 9163	9163-188	Schwarzbeck
142	Biconical antenna	HK 116	842204/001	Rohde & Schwarz
143	Log. periodic antenna	3147	9112-1054	EMCO
144	Log. periodic antenna	HL 223	841516/023	Rohde & Schwarz
145	Horn antenna	3115	9508-4553	Emco
146	Horn antenna	3160-03	9112-1003	Emco
147	Horn antenna	3160-04	9112-1001	Emco
148	Horn antenna	3160-05	9112-1001	Emco
149	Horn antenna	3160-06	9112-1001	Emco
150	Horn antenna	3160-07	9112-1008	Emco
151	Horn antenna	3160-08	9112-1002	Emco
152	Horn antenna	3160-09	9403-1025	Emco
153	Stub tuner	904N	04	Narda
154	Mains analyzer	DPA 503	496 - 02	EM Test
155	Controller	HIS 500	X71010	EM Test
156	AC Amplifier	ACS 500	HK51736	EM Test
157	Mains impedance	AIF 500	X71062	EM Test
158	T-Section	BN 42441/50	300808/2	Rohde & Schwarz
159	T-Section	BN 42441/50	300772/29	Rohde & Schwarz
160	Coaxial Switch	HR 07-720	30185	WISI
161	Coaxial resistor	8135	15972	Bird
162	Dummy microphone circuit	DMC-ED-23-B	---	Senton
163	Sampling unit	SU-ED-23-B	---	Senton
164	Detector unit	DU-ED-23-B	---	Senton
165	Oscilloscope	54602B	US35060304	Hewlett Packard
166	Test probe	TP01	001	Senton
167	Serial interface converter	SIC-V24-TTL	001	Senton
168	Dual Directional Coupler	HP 778D	0826A01562	Hewlett Packard
169	White Noise Generator	NG01	001	Senton
170	Audio Filter Circuit	AFC01	001	Senton
171	Preamplifier	R14601		Advantest
172	Spectrum analyzer	R 3271	05050023	Advantest
173	Biconical antenna	HK 116	836239/02	Rohde & Schwarz
174	Log. periodic antenna	HL 223	834408/12	Rohde & Schwarz
175	4-wire ISN	ENY 41	836077/003	Rohde & Schwarz
176	Current probe	HZ-10	827129/013	Rohde & Schwarz
177	Current probe	EZ-17	830633/010	Rohde & Schwarz
178	Peak power sensor	NRV-Z31	8579604.03	Rohde & Schwarz

Test Equipment and Ancillaries used for Immunity Tests

No.	Type	Model	Serial Number	Manufacturer
201	ESD simulator	NSG 435	000290	Schaffner
202	EFT generator	NSG 1025	3020	Schaffner
203	Ultra compact simulator	UCS	1195-30	EM Test
204	Coupling clamp	CDN 8014	131	Schaffner
205	Coupling clamp	SL 400-071D	007	Schaffner
206	Coupling filter	FP 16	080554-14-84	Haefely
207	Oscilloscope	2225	203550	Tektronix
208	Signal generator	SMT 03	838129/029 837533/032	Rohde & Schwarz
209	Power amplifier	25S1G4	23171	Amplifier Research
210	Power amplifier	200 W 1000	12904	Amplifier Research
211	Power meter	NRVS	838624/016	Rohde & Schwarz
212	E-field generator	3107 B	2302	Emco
213	Hybrid log. periodic antenna	HLP-2603	120500	EMC Automation
214	Log. periodic antenna	AT 1080	12834	Amplifier Research
215	Isotropic field probe	FP 2000	12847	Amplifier Research
216	Isotropic field monitor	FM 2004	12632	Amplifier Research
217	Ultra compact simulator	UCS	1195-30	EM Test
218	Surge generator	NSG 2050	200104-005AR	Schaffner
219	Coupling network	CDN 131	34320	Schaffner
220	Coupling network	CDN 115	132	Schaffner
221	Dropping resistor	INA 110-40	121	Schaffner
222	Oscilloscope	HM 408	9005 F 3144	Hameg
223	Signal generator	SMX	883184/018	Rohde & Schwarz
224	Power amplifier	411 LA	299	ENI
225	Power amplifier	HVV 250	836956/004	Rohde & Schwarz
226	Power meter	NRV	863825/018	Rohde & Schwarz
227	Coupling network	FCC - 801- M3-25	117	FCC
228	Coupling network	FCC - 801- M4-25	17	FCC
229	Coupling network	FCC - 801- M5-25	16	FCC
230	Coupling network	FCC - 801- AF4	47	FCC
231	Coupling network	FCC - 801- AF4	48	FCC
232	Coupling network	FCC - 801-T4	68	FCC
233	Coupling network	FCC - 801- C1	64	FCC
234	Coupling network	CDN 801-M3	--	Senton
235	Coupling network	CDN 801-S37	--	Senton
236	Current clamp	FCC-120-9B	15	FCC
237	EM injection clamp	EM 101	35354	Lüthi

Test Equipment and Ancillaries used for Immunity Tests (continued)

No.	Type	Model	Serial Number	Manufacturer
238	Ultra compact simulator	UCS 500	1195-30	EM Test
239	Transformer	EAC/MT27016/ATE /PCG1	96.24.934	ET System Electronic
240	Oscilloscope	54602B	US35060304	Hewlett Packard
241	Coupling network	CNI 503	0796-04	EM Test
242	Test pulse generator	NSG 5003	199811-089AR	Schaffner
243	Test pulse generator	NSG 5001	199849-751AR	Schaffner
244	Test pulse generator	NSG 5005	199840-093AR	Schaffner
245	Coupling clamp	CDN 500	293	Schaffner
246	Signal generator	SML 03	101495	Rohde & Schwarz
247	Power amplifier	150L	8835	Amplifier Research
248	Power amplifier	10W1000	5239	Amplifier Research
249	Power meter	NRVS	100808	Rohde & Schwarz
250	Trilog Broadband Antenna	VULB 9163	9163-188	Schwarzbeck
251	Electromagnetic Radiation Meter	EMR-200	AT-0023	Narda
252	Electric Field Probe	Type 8.3	AU-0008	Narda

8. 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 Allocations And Radio Treaty Matters, General Rules And Regulations) of the Federal Communication Commission (FCC)	October 1, 1999
☐	CFR 47 Part 15 Subpart A	Code of Federal Regulations Part 15 (Radio Frequency Devices), Subpart A (General) of the Federal Communication Commission (FCC)	August 20, 2002
☐	CFR 47 Part 15 Subpart B	Code of Federal Regulations Part 15 (Radio Frequency Devices), Subpart B (Unintentional Radiators) of the Federal Communication Commission (FCC)	August 20, 2002
☒	CFR 47 Part 15 Subpart C	Code of Federal Regulations Part 15 (Radio Frequency Devices), Subpart C (Intentional Radiators) of the Federal Communication Commission (FCC)	August 20, 2002
☐	CFR 47 Part 95 Subpart C/E	Code of Federal Regulations Part 95 (Personal Radio Services), Subpart C/E (Radio Control(R/C) Radio Service) of the Federal Communication Commission (FCC)	October 1, 1998
☒	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 - 40 GHz	October, 1992
☒	RSS-210	Radio Standards Specification RSS-210 Issue 5 for Low Power Licence-Exempt Radiocommunication Devices of Industry Canada	November 2001
☐	TIA/EIA-603	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards	February 1993
☐	TIA/EIA-603-1	Addendum to TIA/EIA-603	March 4, 1998

9. List of Measurements

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

FCC Part 15 Subpart C			
Section(s):	Test	Page(s)	Result
§15.207	Conducted emission test 150 kHz - 30 MHz		Passed
§15.225 (a)(b) §15.209 §15.205.a,b	Field Strength of Emissions 9 kHz - 30 MHz		Passed
§15.225 (b) §15.209	Field Strength of Emissions 30 MHz – 1 GHz		Passed
§15.225 (c)	Frequency tolerance of carrier signal		Passed

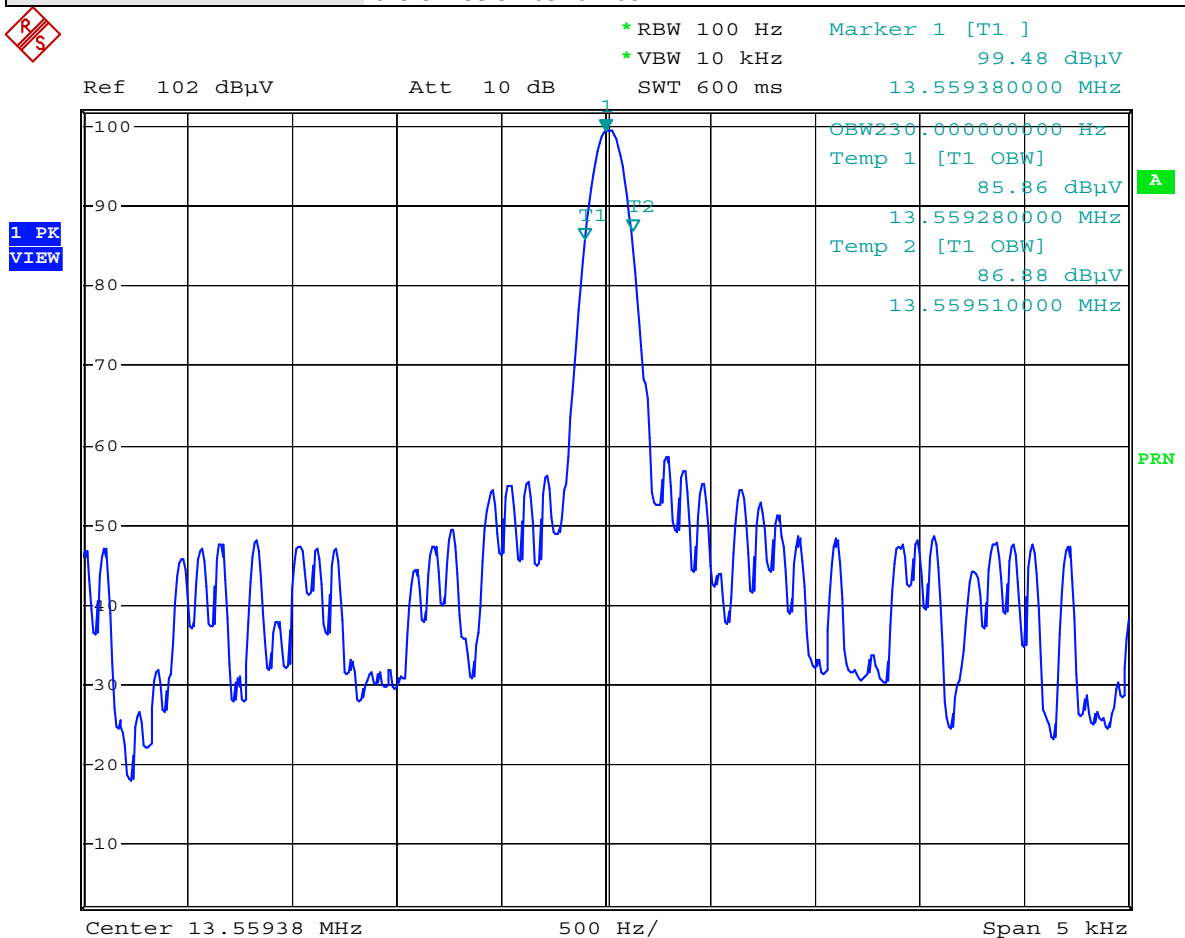
9.2. List of Measurements According To Industry Canada RSS-210

Industry Canada RSS-210 Issue 5			
Section(s):	Test	Page(s)	Result
5.9.1	Occupied Bandwidth		
6.6	Transmitter AC Wireline Conducted Emissions 450 kHz - 30 MHz		Passed
6.2.2 (e)	Field Strength of Emissions 9 kHz - 30 MHz		Passed
6.2.2 (e)	Field Strength of Emissions 30 MHz – 1 GHz		Passed
6.2.2 (e)	Frequency stability of carrier signal		Passed

10. Test Results

Bandwidth of Emission

Rules and Specifications:	IC RSS 210 Issue 5, section 5.9.1: November 2001
Guide:	ANSI C63.4
Limit:	Where indicated, the 6 dB (or 20 dB) bandwidth is measured at the points when the spectral density of the signal is 6 dB (or 20 dB) down from the inband spectral density of the modulated signal, with the transmitter modulated by a representative signal. Spectral density (power per unit bandwidth) is to be measured with a meter of 300 Hz resolution bandwidth or alternatively equal to approximately 1.0% of the emission bandwidth.



Comment A: OMNIKEY40562
Date: 1.SEP.2004 09:09:56

Test Results:	Pass	Bandwidth of Emission = 230 Hz
---------------	------	-----------------------------------

Conducted Powerline Emission Measurement

Rules and Specifications:	15.207		
Guide:	CISPR 22		
Limit (Class B)	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:	Radio Lab.
Tested on:	Linecord PC supply L1
Date of Test:	09 August 2004

Frequency (MHz)	Detector	Analyzer Reading (dBμV)	Correction Factor (dB)	Final Value (dBμV)	Limit (dBμV)	Margin (dB)
0.210	QP	46.0		46.0	63.2	17.2
0.515	QP	35.2		35.2	56.0	20.8
0.620	QP	36.7		36.7	56.0	19.3

*** = No emissions above noise floor detected

Sample calculation of Final values:

$$\text{Final Value (dB}\mu\text{V)} = \text{Analyzer Reading (dB}\mu\text{V)} + \text{Correction Factor (dB)}$$

Test Results:	Pass
----------------------	------

Conducted Powerline Emission Measurement

Rules and Specifications:	15.207		
Guide:	CISPR 22		
Limit (Class B)	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:	Radio Lab.
Tested on:	Linecord PC supply N
Date of Test:	09 August 2004

Frequency (MHz)	Detector	Analyzer Reading (dBuV)	Correction Factor (dB)	Final Value (dBuV)	Limit (dBuV)	Margin (dB)
0.205	QP	48.3		48.3	63.4	15.1
0.310	QP	40.6		40.6	60.0	19.4
0.415	QP	40.5		40.5	57.5	17.0
0.515	QP	40.6		40.6	56.0	15.4
0.635	QP	36.1		36.1	56.0	19.9
0.725	QP	41.2		41.2	56.0	14.8
0.930	QP	38.8		38.8	56.0	17.2
1.240	QP	38.7		38.7	56.0	17.3
1.345	QP	39.2		39.2	56.0	16.8
1.855	QP	37.3		37.3	56.0	18.7
2.065	QP	40.0		40.0	56.0	16.0
4.130	QP	36.2		36.2	56.0	19.8
4.750	QP	37.1		37.1	56.0	18.9

*** = No emissions above noise floor detected

Sample calculation of Final values:

$$\text{Final Value (dBuV)} = \text{Analyzer Reading (dBuV)} + \text{Correction Factor (dB)}$$

Test Results:	Pass
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Spurious Radiation Measurement 9 kHz – 30 MHz

Rules and Specifications:	15.225 (a) (b), 15.209, 15.205.a.b		
Guide:	ANSI C63.4		
Limit (Class B):	Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:		
	Frequency of Emission (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
	0.009-0.490	2400/F(kHz)	300
	0.490-1.705	24000/F(kHz)	30
	1.705 – 30	30	30

Tested Frequency:	13.560 MHz
Test Site:	Open Area Test Site
Distance:	10 Metere

Frequency (MHz)	Detector	Antenna Polarization	Analyzer Reading (dBμV)	Correction Factor (dB/m)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
13.560	AV	Ver	20.1	20	40.1	104.00	63.9

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

Sample calculation of erp values:

$$\text{Field Strength (dB}\mu\text{V/m)} = \text{Analyzer Reading (dB}\mu\text{V)} + \text{Correction Factor (dB/m)}$$

Measurement at 30 m not possible ! (values below noise level of appropriate test receiver)
Limit calculated to 10 m (transmission factor 40 dB/ decade)

Test Results:	Pass
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Spurious Radiation Measurement

Rules and Specifications:	15.225 (b), 15.209	
Guide:	ANSI C63.4	
Limit:	Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:	
	Frequency of Emission (MHz)	Field Strength (microvolts/meter)
	30 - 88	100
	88 - 216	150
	216 - 960	200
	Above 960	500

Tested Frequency:	13.560 MHz
Test Site:	Open Area Test Site (< 1 GHz), Fully anechoic chamber (> 1 GHz)
Distance:	3 Meter

Frequency (MHz)	Detector	Antenna Polarization	Analyzer Reading (dBμV)	Correction Factor (dB/m)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
40.660	QP	Vertical	18.7	11.8	30.5	40.0	9.5
54.200	QP	Vertical	23.5	10.3	33.8	40.0	6.2
67.790	QP	Horizontal	15.5	9.7	25.2	40.0	14.8
122.000	QP	Vertical	16.5	12.5	29.0	43.5	14.5
189.800	QP	Vertical	18.5	16.0	34.5	43.5	9.0
284.700	QP	Vertical	12.5	20.7	33.2	46.0	12.8
325.400	QP	Vertical	14.5	16.2	30.7	46.0	15.3
338.900	QP	Vertical	20.5	16.7	37.2	46.0	8.8
447.453	QP	Horizontal	19.6	19.8	39.4	46.0	6.6
460.000	QP	Horizontal	20.8	20.1	40.9	46.0	5.1
461.000	QP	Vertical	18.2	20.1	38.3	46.0	7.7
474.500	QP	Vertical	21.5	20.3	41.8	46.0	4.2
488.133	QP	Horizontal	19.3	20.5	39.8	46.0	6.2
501.690	QP	Horizontal	12.3	20.7	33.0	46.0	13.0
515.200	QP	Vertical	11.4	21.0	32.4	46.0	13.6

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

Sample calculation of erp values:

Field Strength (dBμV/m) = Analyzer Reading (dBμV) + Correction Factor (dB/m)

Test Results:	Pass
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FCC-ID:

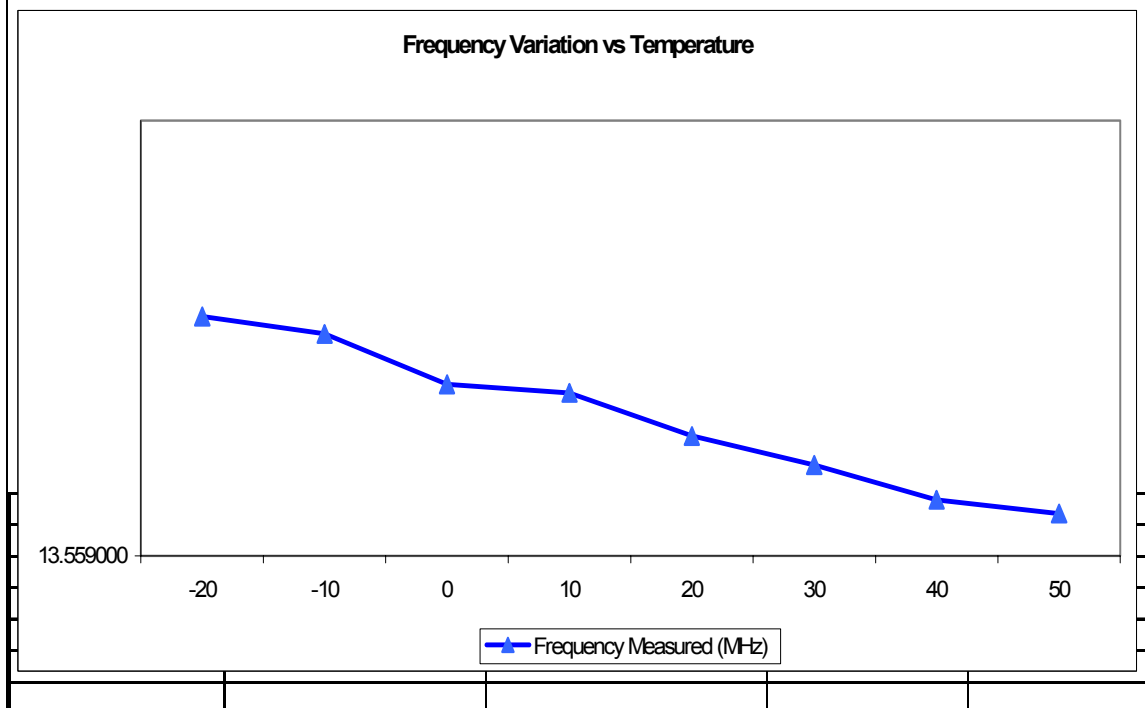
Test Report No. 51514-40562

Measurement of Frequency Stability vs Temperature

Rules and Specifications:	15.225 (c)
Limits and Requirements:	The frequency tolerance of the transmitter shall be 0.01 %
Nominal Frequency of EUT:	13.56 MHz

Temperature Variation Table

Temperature (°C)	Nominal Frequency (MHz)	Frequency Measured (MHz)	Frequency Tolerance (ppm)	Limit (ppm)
-20	13.559248	13.559495	18.22	100
-10	13.559248	13.559459	15.56	100
0	13.559248	13.559355	7.89	100
10	13.559248	13.559337	6.56	100
20	13.559248	13.559248	0.00	100
30	13.559248	13.559188	-4.43	100
40	13.559248	13.559116	-9.74	100
50	13.559248	13.559088	-11.80	100



Test Results:	Pass
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Measurement of Frequency Stability vs Supply Voltage

Rules and Specifications:	15.225 (c)
Limits and Requirements:	The frequency tolerance of the transmitter shall be 0.01 %
Nominal Frequency of EUT:	13.56 MHz
Battery end-point:	No battery supply

Voltage Variation Table

Supply Voltage (V)	Nominal Frequency (MHz)	Frequency Measured (MHz)	Frequency Tolerance (ppm)	Limit (ppm)
4.25	13.559248	13.559243	-0.37	100
5	13.559248	13.559248	0.00	100
5.75	13.559248	13.559247	-0.07	100

Test Results:	Pass	
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Charts taken during testing

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

Model:
CardMan 5121

Serial no.:

Applicant:
OMNIKEY AG

Test site:
Shielded room, cabin no. 2

Tested on:
**Linecord PC supply
Phase L1**

Date of test: 08/09/2004 Operator: M. Steindl

Test performed: automatically File name:

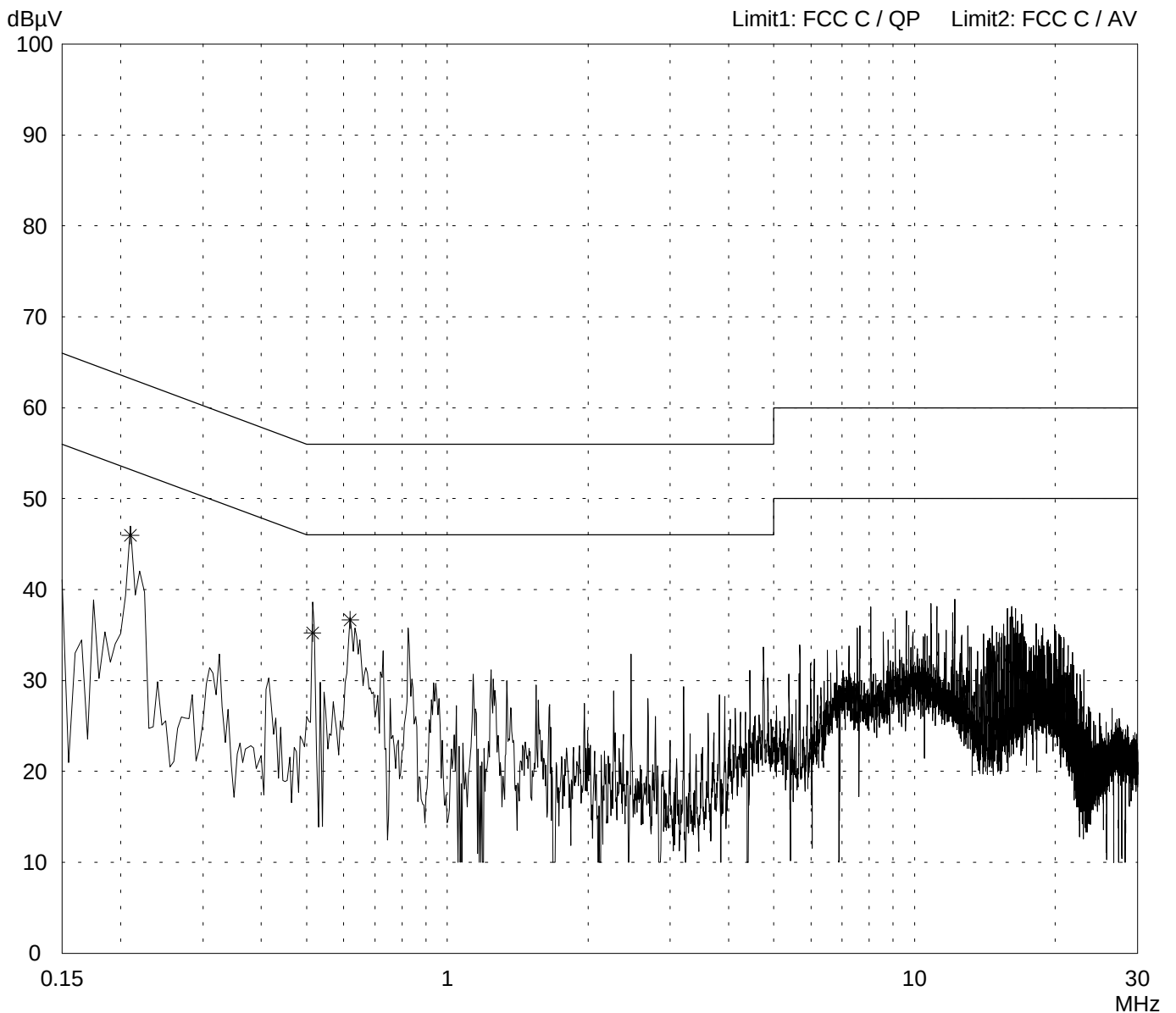
Mode:
- FCC test setup (DELL-laptop)

- internal antenna-connection terminated with 300 Ohms

- EUT working

Detector:
Peak / Final Results: QP

Final results:
20 dB Margin 25 Subranges



Result:
Limit kept

Project file:
51514-40562

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

Model:
CardMan 5121

Serial no.:

Applicant:
OMNIKEY AG

Test site:
Shielded room, cabin no. 2

Tested on:
**Linecord PC supply
Phase N**

Date of test: 08/09/2004 Operator: M. Steindl

Test performed: automatically File name:

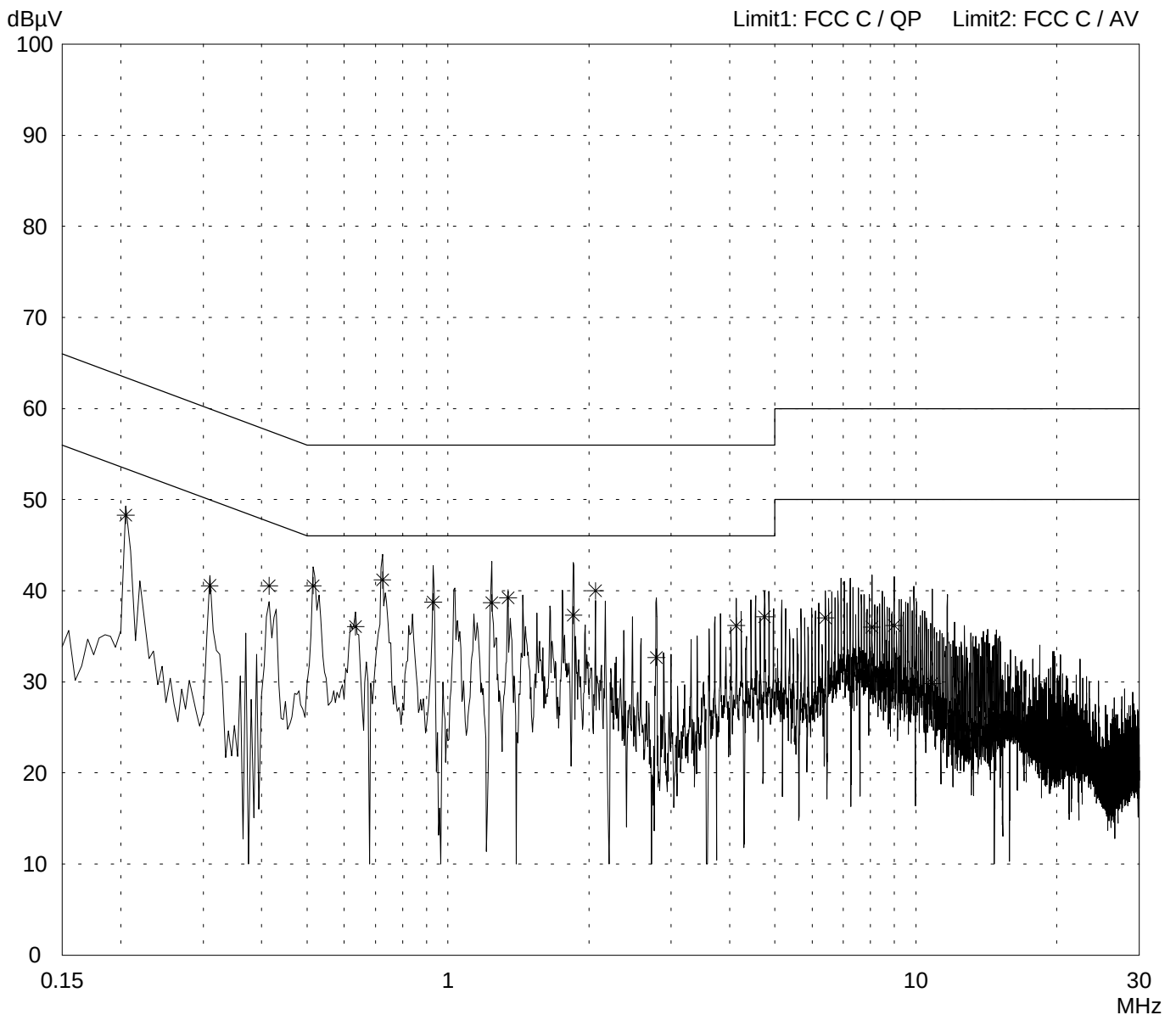
Mode:
- FCC test setup (DELL-laptop)

- internal antenna-connection terminated with 300 Ohms

- EUT working

Detector:
Peak / Final Results: QP

Final results:
20 dB Margin 25 Subranges



Result:
Limit kept

Project file:
51514-40562

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Radiated Emission Test 9 kHz - 30 MHz according to FCC Part 15 Subpart C

Model:
CardMan 5121

Serial no.:

Applicant:
OMNIKEY AG

Test site:
Shielded room, cabin no. 2

Tested on:
Test distance 3 metres

Date of test: **08/10/2004** Operator: **M. Steindl**

Test performed: **automatically** File name:

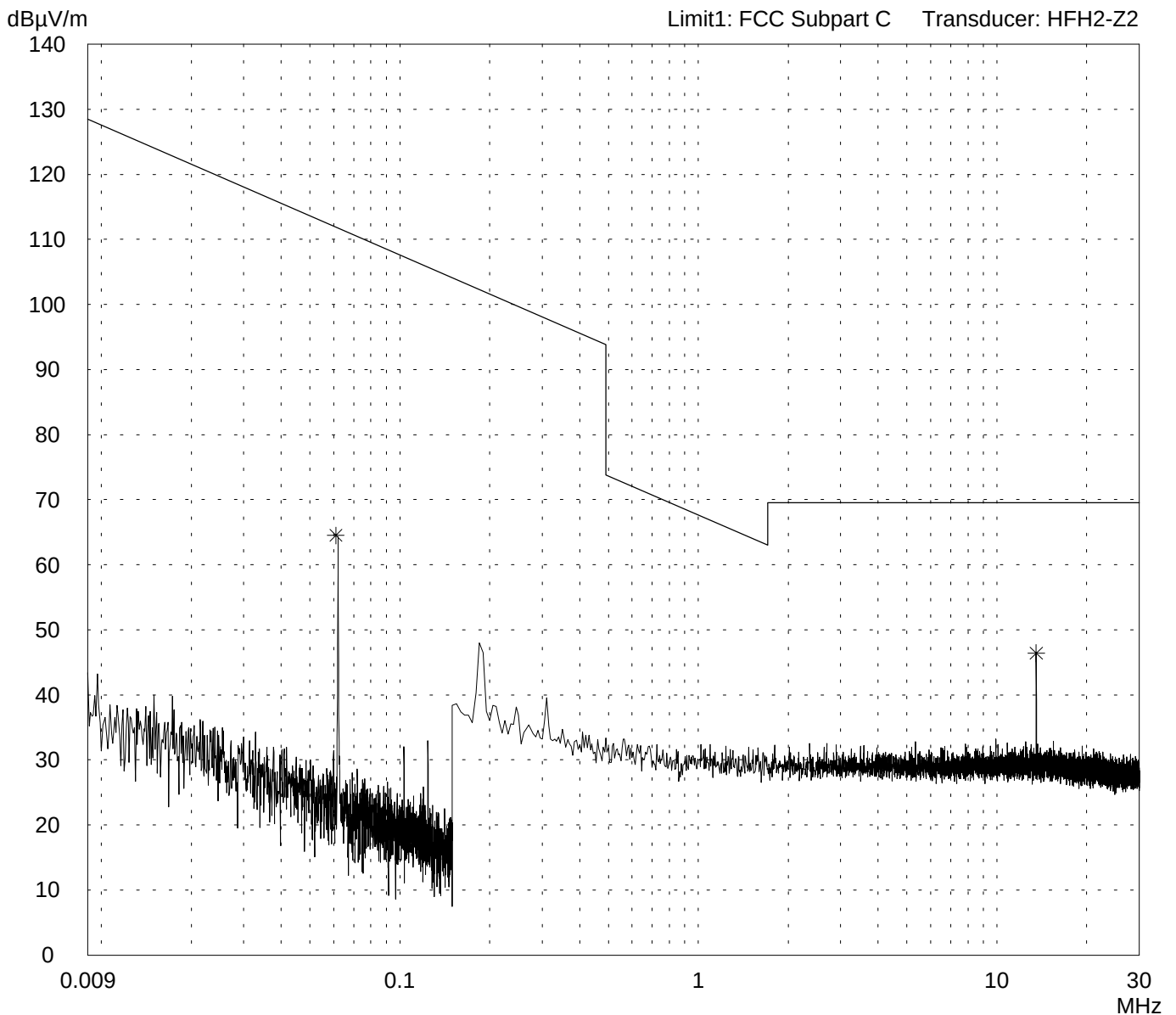
Mode:
- FCC test setup (DELL-laptop)

- transponder card: mifare DESFire

- EUT reading transponder

Detector:
Peak / Final Results: QP

Final results:
Selected by hand



Result:
Prescan

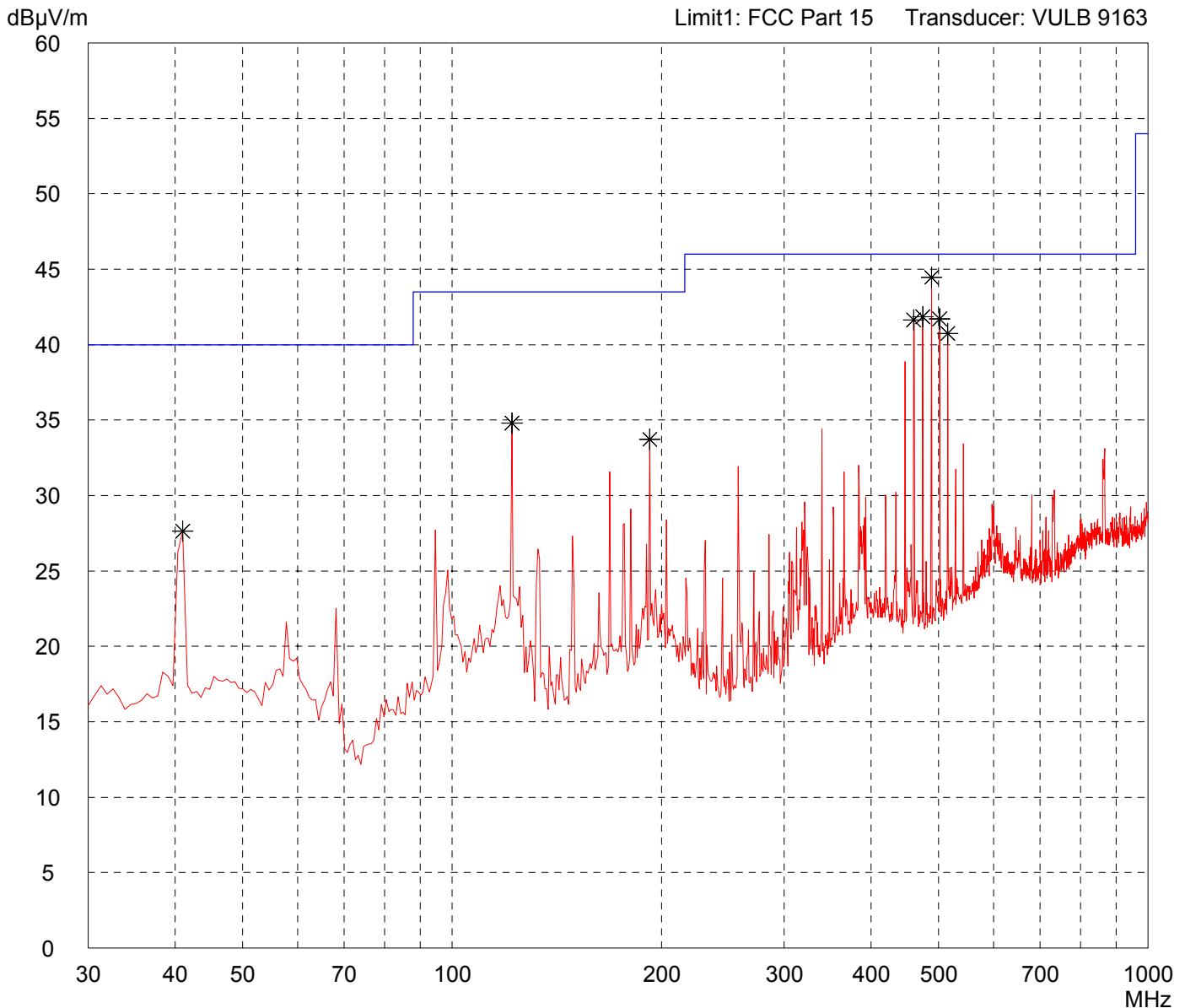
Project file:
51514-40562

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Radiated Emission Test 30 MHz - 1 GHz acc. to FCC Part 15 (Fully Anechoic Chamber)

Model: CardMan 5121	Comment: - FCC test setup (DELL-laptop) - transponder card: mifare DESFire - EUT reading transponder
Serial no.: ---	
Applicant: OMNIKEY AG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 08/04/2004	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
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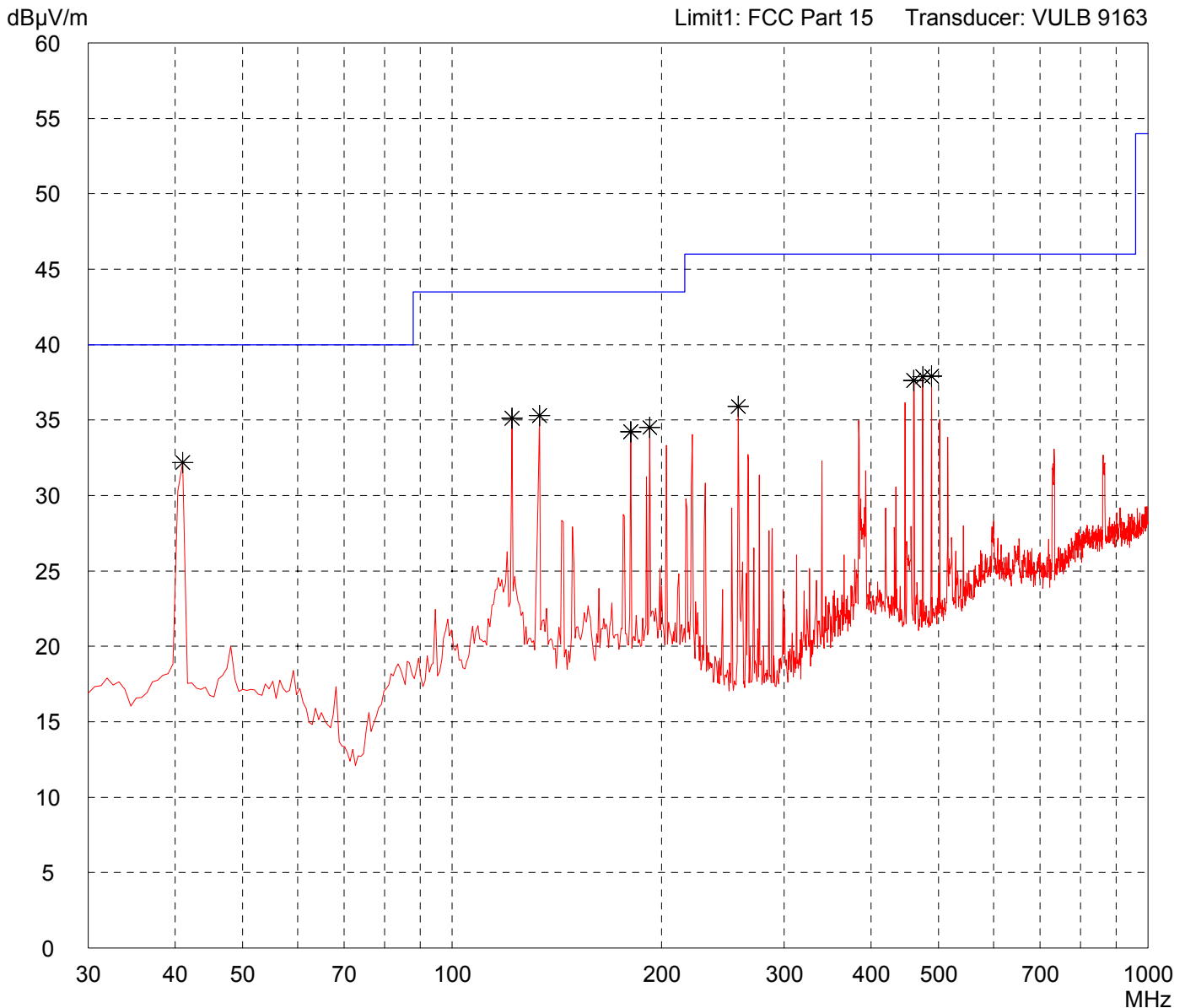


Result: Prescan	Project file: 51514-40562
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Radiated Emission Test 30 MHz - 1 GHz acc. to FCC Part 15 (Fully Anechoic Chamber)

Model: CardMan 5121	Comment: - FCC test setup (DELL-laptop) - transponder card: mifare DESFire - EUT reading transponder
Serial no.: ---	
Applicant: OMNIKEY AG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 08/04/2004	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
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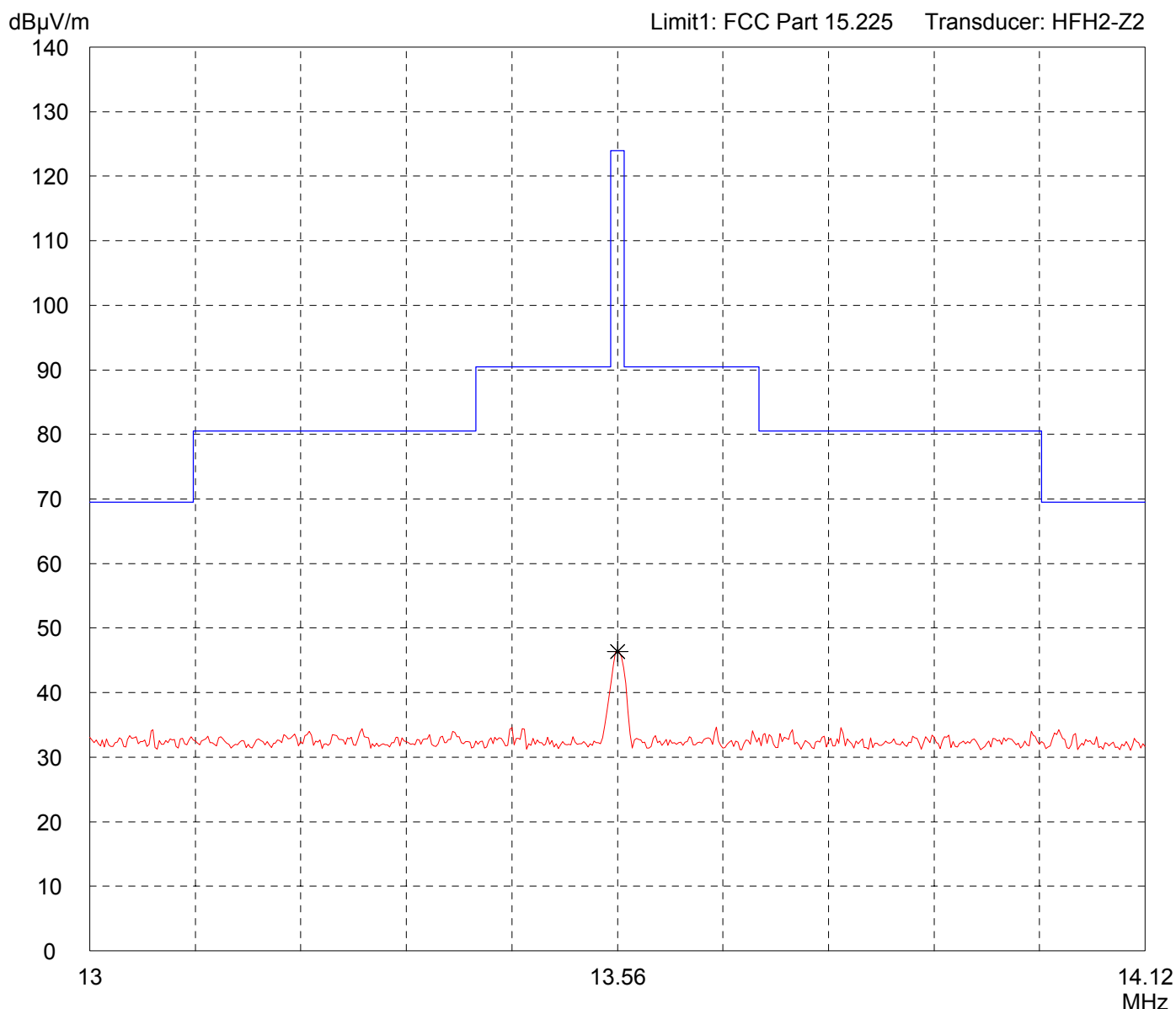


Result: Prescan	Project file: 51514-40562
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Radiated Emission Test 13 MHz - 14.12 MHz acc. to FCC Part 15.225 (Fully Anechoic Chamber)

Model: CardMan 5121	Comment: - FCC test setup (DELL-laptop) - transponder card: MIFARE - EUT reading transponder
Serial no.: ---	
Applicant: OMNIKEY AG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres	
Date of test: 08/26/2004	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: 51514-50562
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