SENTON
EMV-Prüfzentrum EMI/EMC-Testcenter

Straubing, December 20, 2000

T E S T - R E P O R T

No. 50430-00640

for

PRM 5M

Inductive Tag System

Applicant:	deister electronic GmbH
Purpose of testing:	To show compliance with FCC Code of Federal Regulations, Part 15 Subpart C, Sections 15.205, 15.209 and 15.225

Table of Contents

1. Administrative Data

Equipment Under Test (EUT):	PRM 5 M
Serial number:	0001069
Type of equipment:	RF-identification system
Parts/accessories:	
FCC-ID:	IXLPRM5M

Applicant: (full address)	deister electronic GmbH Herrmann-Bahlsen-Strasse 11-13 D-30890 Barsinghausen Germany
Contract identification:	
Contact person:	Mr. Stefan Eichler
Manufacturer:	Applicant

Receipt of EUT:	November 15, 2000
Date of test:	December 6, 2000
Note:	

Responsible for testing:	J. Roidt
Responsible for test report:	J. Roidt

2. Summary of Test Results

The tested sample complies with the requirements set forth in the Code of Regulations Part 15 Subpart C, Sections §15.205, §15.207, §15.209 and §15.225 (intentional radiators) of the Federal Communication Commission (FCC).

Johann Roidt
Technical Manager

3. Operation Mode of EUT

Continuously reading a transponder

4. Configuration of EUT and Peripheral Devices

Configuration of cables of EUT and peripheral devices

- Unshielded wires

Configuration of peripheral devices connected to EUT

Not applicable

5. Measuring Methods

5.1. Radiated Emission 9 kHz - 30 MHz (§15.209, §15.205 a,b)

Radiated emissions were measured over the frequency range from 9 kHz to 30 MHz. The bandwidth of the EMI-receiver was set to 200 Hz below 150 kHz and to 10 kHz above 150 kHz. According to section §15.209 (d) final measurements were performed with the detector set to CISPR quasi-peak except for the frequency bands 9 - 90 kHz and 110 - 490 kHz where average detector is employed.
The test setup was made in accordance with ANSI C63.4-1992.
Preliminary scans were taken in a shielded room with a test-distance of 3 meters and detector-function of EMI-receiver set to peak to determine the radiated EMI-profile of the EUT. EUT was rotated all around and cables and equipment were placed and moved within the range of positions likely to find their maximum emissions. Final test was performed using an open-area test-site with a test-distance of 30 meters. In cases the regulation requires testing at 300 meters distance the results will be extrapolated by using either an inverse linear distance extrapolation factor of 40 dB/decade or the extrapolation factor will be determined by making a second measurement at 10 meters distance. The provisions of §15.31 (d) and §15.31 (f) apply.
See figure 1 for the measurement setup.

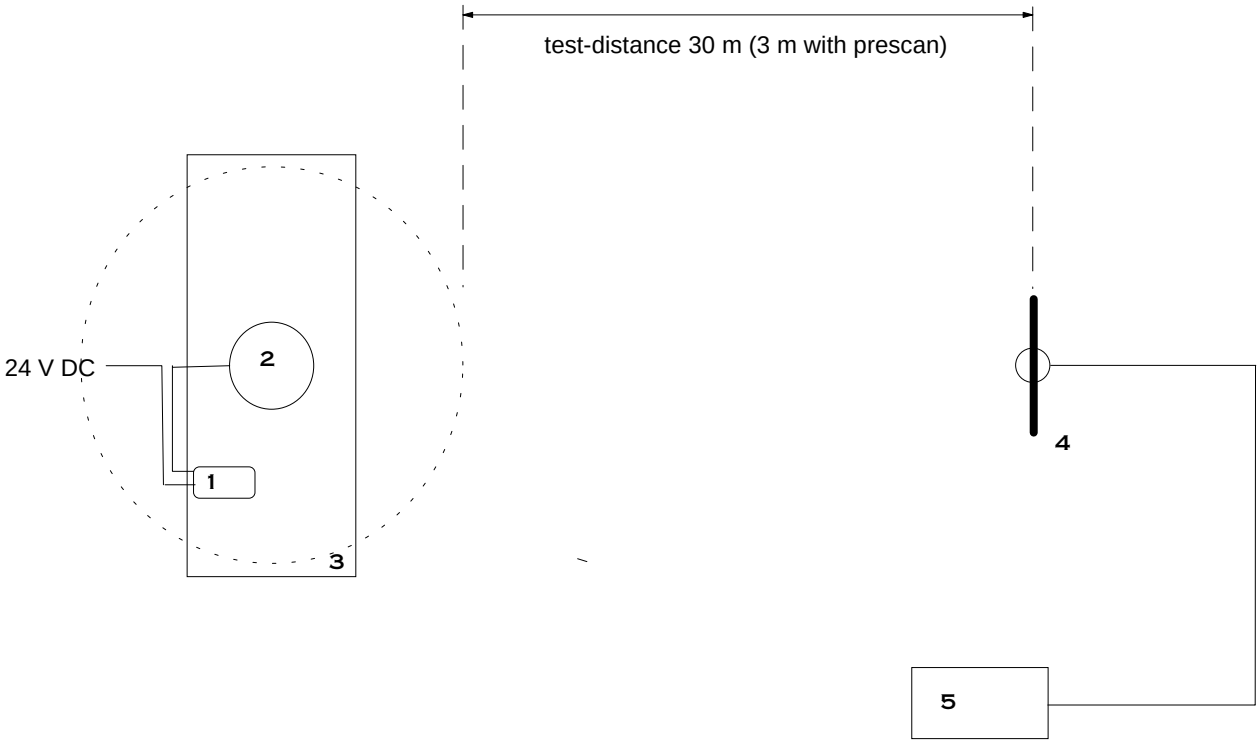


Figure 1: Measurement setup for radiated emission test below 30 MHz

1 Power supply
2 EUT
3 Wooden table
4 Measurement antenna
5 Test receiver

5.2. Radiated Emission 30 MHz - 1 GHz (§15.209)

Radiated emissions were measured over the frequency range from 30 MHz to 1 GHz. The bandwidth of the EMI-receiver was set to 120 kHz and the detector-function was set to CISPR quasi-peak.
The test setup was made in accordance with ANSI C63.4-1992. Measurements were made in both the horizontal and vertical planes of polarization. Preliminary scans were taken in a semi-anechoic room using a spectrum analyzer with the detector function set to peak. All tests were performed at a test-distance of 3 meters. 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 2 for the measurement setup.

Test equipment used (see equipment list for details):
01, 06, 12, 38, 39, 40, 41, 58, 61, 64, 66

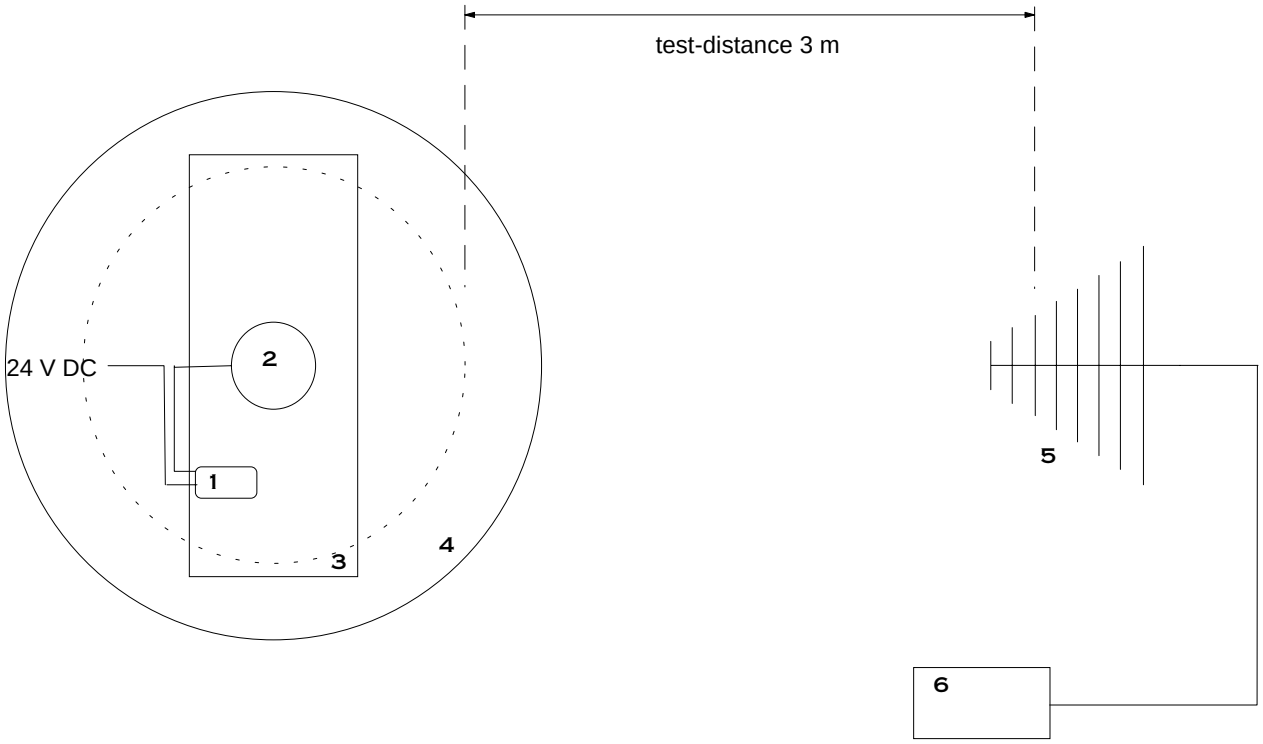


Figure 2: Measurement setup for radiated emission test above 30 MHz

1 Power supply
2 EUT
3 Wooden table
4 Turn table
5 Measurement antenna
6 Test receiver

5.3. Frequency tolerance for operation within the band 13.553 - 13.567 MHz (§15.225)

The measurements were performed using a peak-detector with resolution and video bandwidth of the spectrum analyzer set to 30 Hz and center frequency adjusted to operating frequency of the EUT.
According to section §15.225 (c) the measured carrier signal shall be maintained within +/-0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal 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 equipment tests are performed using a new battery.
See figure 3 for the measurement setup.

Test equipment used (see equipment list for details):
02, 54, 55

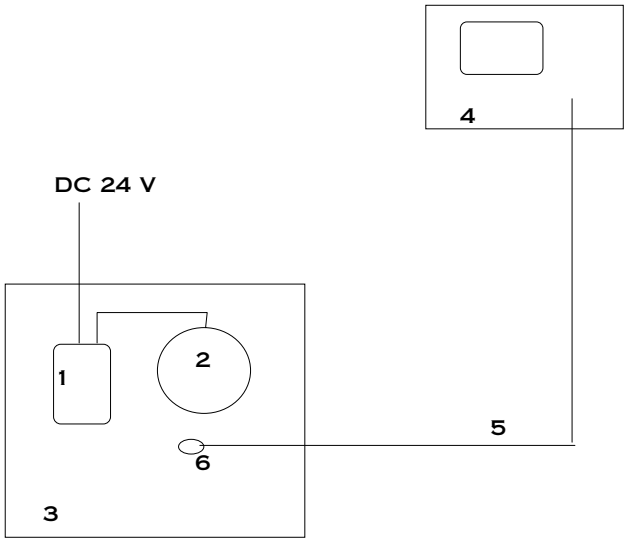


Figure 3: Measurement setup for frequency tolerance of the carrier signal

1 Power supply
2 EUT
3 Temperature test chamber
4 Spectrum analyzer
5 RF cable
6 Test probe

6. Equipment List

To facilitate reference to test equipment used for related tests, each item of test equipment and ancillaries such as cables are identified (numbered) by the Test Laboratory.

No.	Type	Model	Serial Number	Manufacturer
01	Spectrum Analyzer	R 3271	05050023	Advantest
02	EMI Test Receiver	ESMI	839379/013 839587/006	Rohde & Schwarz
03	Test Receiver	ESH 3	880112/032	Rohde & Schwarz
04	Test Receiver	ESHS 10	860043/016	Rohde & Schwarz
05	Test Receiver	ESV	881414/009	Rohde & Schwarz
06	Test Receiver	ESVP	881120/024	Rohde & Schwarz
07	Audio Analyzer	UPA	862954	Rohde & Schwarz
08	Power Meter	NRVS	836856/015	Rohde & Schwarz
09	Power Sensor	NRV-Z52	837901/030	Rohde & Schwarz
10	Power Sensor	NRV-Z4	863828/015	Rohde & Schwarz
11	Preamplifier	ESV-Z3	860907/004	Rohde & Schwarz
12	Preamplifier	R14601		Advantest
13	Preamplifier	ACX/080-3030	32640	CTT
14	Preamplifier	ACO/180-3530	32641	CTT
15	Signal Generator	SMS	872166/039	Rohde & Schwarz
16	Signal Generator	HP 8673 D	2930A00966	Hewlett Packard
17	Waveform Generator	HP 33120 A	US34005375	Hewlett Packard
18	Attenuator 20 dB	4776-20	9503	Narda
19	Attenuator 10 dB	4776-10	9412	Narda
20	Pulse Limiter	ESH 3-Z2	1144	Rohde & Schwarz
21	Pulse Limiter	11947 A	3107A00566	Hewlett Packard
22	V-Network	ESH 3-Z5	862770/018	Rohde & Schwarz
23	V-Network	ESH 3-Z5	894785/005	Rohde & Schwarz
24	V-Network	ESH 3-Z5	830952/025	Rohde & Schwarz
25	V-Network	ESH 3-Z6	830722/010	Rohde & Schwarz
26	V-Network	NSLK 8127	8127152	Schwarzbeck
27	V-Network	NNLA 8119	8119148	Schwarzbeck
28	V-Network	SE 01	01	Senton
29	T-Network	ESH 3-Z4	890602/011	Rohde & Schwarz
30	T-Network	ESH 3-Z4	890602/012	Rohde & Schwarz
31	High Impedance Probe	TK 9416	01	Schwarzbeck
32	High Impedance Probe	TK 9416	02	Schwarzbeck
33	Current Probe	ESH 2-Z1	863366/18	Rohde & Schwarz
34	Current Probe	ESV-Z1	862553/3	Rohde & Schwarz

No.	Type	Model	Serial Number	Manufacturer
35	Absorbing Clamp	MDS 21	80911	Lüthi
36	Absorbing Clamp	MDS 21	79690	Lüthi
37	Loop Antenna	HFH2-Z2	882964/1	Rohde & Schwarz
38	Biconical Antenna	HK 116	842204/001	Rohde & Schwarz
39	Biconical Antenna	HK 116	836239/02	Rohde & Schwarz
40	Log. Periodic Antenna	HL 223	841516/023	Rohde & Schwarz
41	Log. Periodic Antenna	HL 223	834408/12	Rohde & Schwarz
42	Horn Antenna	3115	9508-4553	Emco
43	Horn Antenna	3160-03	9112-1003	Emco
44	Horn Antenna	3160-04	9112-1001	Emco
45	Horn Antenna	3160-05	9112-1001	Emco
46	Horn Antenna	3160-06	9112-1001	Emco
47	Horn Antenna	3160-07	9112-1008	Emco
48	Horn Antenna	3160-08	9112-1002	Emco
49	Horn Antenna	3160-09	9403-1025	Emco
50	Digital multimeter	199	463386	Keithley
51	DC Power Supply	NGSM 32/10	203	Rohde & Schwarz
52	DC Power Supply	NGB	2455	Rohde & Schwarz
53	DC Power Supply	NGA	386	Rohde & Schwarz
54	Temperature Test Chamber	HT4010	07065550	Heraeus
55	Cable	RG214	1309	Senton
56	Cable	200CM_001	1357	Rosenberger
57	Cable	150CM_001	1479	Rosenberger
58	Cable Set EG1	RG214	1189 - 1191	Senton
59	Cable Set Cabine 1	RG214		Senton
60	Cable Set Cabine 2	RG214		Senton
61	Cable Set Cabine 3	RG214		Senton
62	Shielded Room	No. 1	1451	Senton
63	Shielded Room	No. 2	1452	Senton
64	Semi-anechoic Chamber	No. 3	1453	Siemens
65	Shielded Room	No. 4	1454	Euroshield
66	Open Area Test Site	EG 1		Senton
67	Cable for Antenna Connector			Lucent Technologies
68	DC Block 0.01-18GHz		8037	Inmet Corp.
69	High pass filter			Lucent Technologies

7. List of Measurements

FCC Part 15 Subpart C			
Section(s):	**Test**	**Page**	**Result**
§15.207	Conducted emission test 450 kHz - 30 MHz		Not applicable
§15.31 d,f **§15.209** **§15.205.a,b**	Radiated emission test 9 kHz - 30 MHz		Test passed
§15.209	Radiated emission test 30 MHz - 1 GHz		Test passed
§15.225 (c)	Frequency tolerance		Test passed

8. Test Results

Field Strength of Emissions according to FCC Rules, Part 15, Subpart C, Section 15.209 and 15.225 Frequency Band < 30 MHz

Model:	PRM 5M
Type:	Inductive Reader
Serial No.	001069
Applicant:	deister electronic GmbH
Test Site:	Open Field Test Site (without Ground Plane)
Distance:	3 Meter
Date of Test:	December 6, 2000

Frequency (MHz)	Detector	Antenna Polarization	Analyzer Reading (dBµV)	Correction Factor (dB)	Field Strength (dBµV/m)	Limit dBµV/m	Margin dB
13.553	Q.P.	---	0.80	20.0	20.8	29.5	**8.7**
13.560	Q.P.	---	32.1	20.0	52.1	80.0	**27.9**
13.567	Q.P.	---	5.57	20	25.57	29.5	**3.9**

***** = No emissions above noise floor detected**

Sample calculation of field strength values:

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

Test equipment used (see equipment list for details):
02, 13, 14, 16, 38, 40 ,42, 57, 64, 67

SENTON
EMV-Prüfzentrum EMI/EMC-Testcenter

Field Strength of Emissions according to FCC Rules, Part 15, Subpart C, Section 15.209 Frequency Band 30 - 1000MHz

Model:	PRM 5M
Type:	Inductive Reader
Serial No.	001069
Applicant:	deister electronic GmbH
Test Site:	Open Field Test Site (without Ground Plane)
Distance:	3 Meter
Date of Test:	December 6, 2000

Frequency (MHz)	Detector	Antenna Polarization	Analyzer Reading (dBµV)	Correction Factor (dB)	Field Strength (dBµV/m)	Limit dBµV/m	Margin dB
30.0	Q.P.	Hor.	14.0	19.8	33.8	40.0	**6.2**
40.68	Q.P.	Hor.	16.0	17.4	33.4	40.0	**6.6**
54.24	Q.P.	Hor.	17.3	15.5	32.8	40.0	**7.2**
271.84	Q:P.	Ver.	14.9	25.2	40.1	46.0	**5.9**
285.34	Q:P.	Ver.	14.8	26.5	41.3	46.0	**4.7**
299.23	Q:P.	Ver.	12.8	27.7	40.5	46.0	**5.5**

***** = No emissions above noise floor detected**

Sample calculation of field strength values:

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

Test equipment used (see equipment list for details):
02, 13, 14, 16, 38, 40 ,42, 57, 64, 67

Frequency Tolerance according to FCC Rules, Part 15, Subpart C, Section 15.225 (c)

Model:	PRM 5M
Type:	Inductive Reader
Serial No.	001069
Applicant:	deister electronic GmbH
Test Site:	N/A
Distance:	---
Date of Test:	December 6, 2000

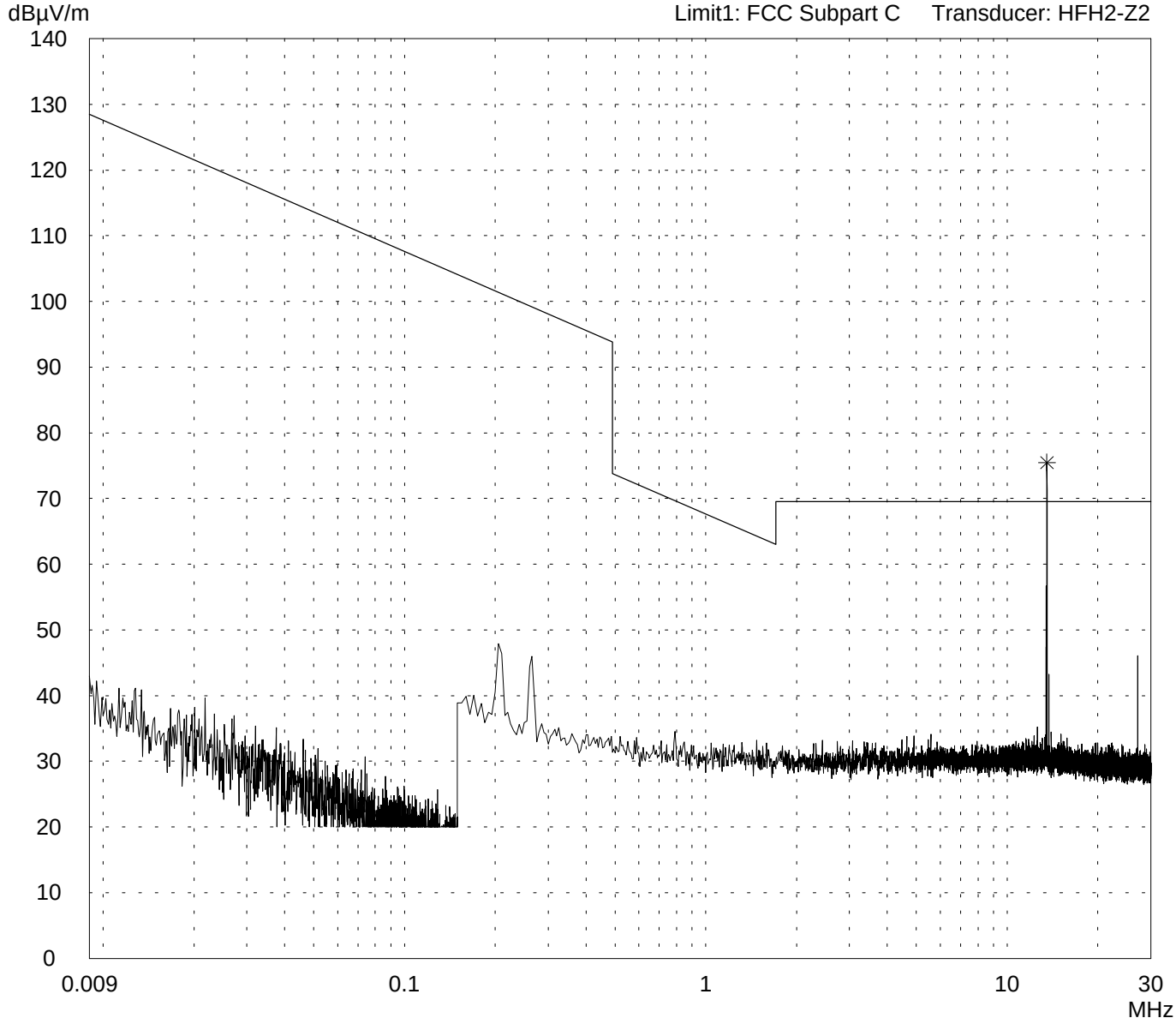
Condition:	Frequency measured (MHz)	Frequency Tolerance (%)	Result
T = +20°C U = Nominal	13.560676	---	**Pass**
T = -20°C U = Nominal	13.560820	<0.001	**Pass**
T = +50°C U = Nominal	13.560559	<0.001	**Pass**
T = +20°C U = 0.85 U_N	13.560682	<0.001	**Pass**
T = +20°C U = 1.15 U_N	13.560683	<0.001	**Pass**

Test equipment used (see equipment list for details):
02, 13, 14, 16, 38, 40 ,42, 57, 64, 67

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

Model: PRM 5 M	Mode: with TAG
Serial no.: --	
Applicant: deister electronic GmbH	
Test site: Shielded room, cabin no. 2	
Tested on: Test distance 3 metres	
Date of test: 11/27/2000 / Operator: K. Roidt	
Test performed: automatically / File name:	

Detector: Peak / Final Results: QP	Final results: 20 dB Margin 25 Subranges

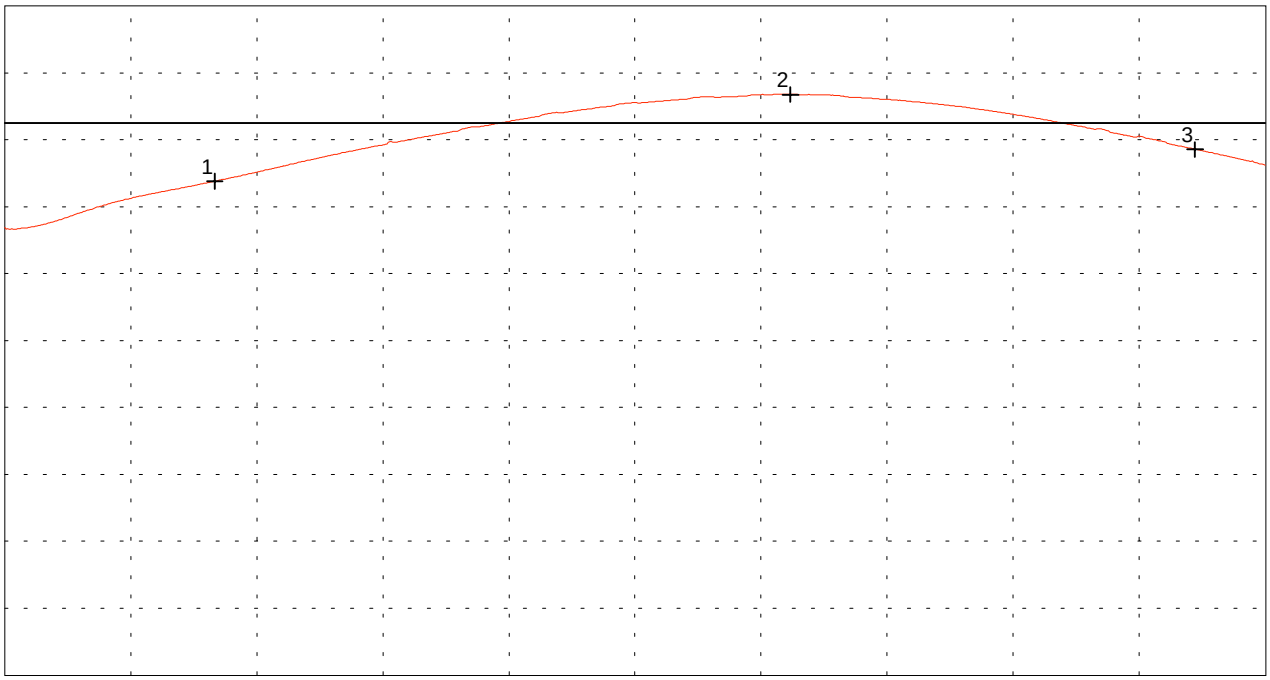


Result:	Project file: 50430-00639 Page of Pages

Field strength of emission according to FCC Rules 15.225 (c)

Model: PRM 5 M	Mode: Condition: Reading tag U= 12 V DC T= 21.0°C Detector: QuasiPeak Limit at 13.553 and 13.567 MHz: 29.5 dBµV/m
Serial No.: ---	
Applicant: Deister electronic GmbH	

Ref.Level 47 dBµV/m ATT 10 dB Ref. Offset -33 dB
10 dB/Div.



Start 13.550 MHz Stop 13.568 MHz
RBW 10 kHz VBW 10 kHz SWP 20 ms

Multi Marker List

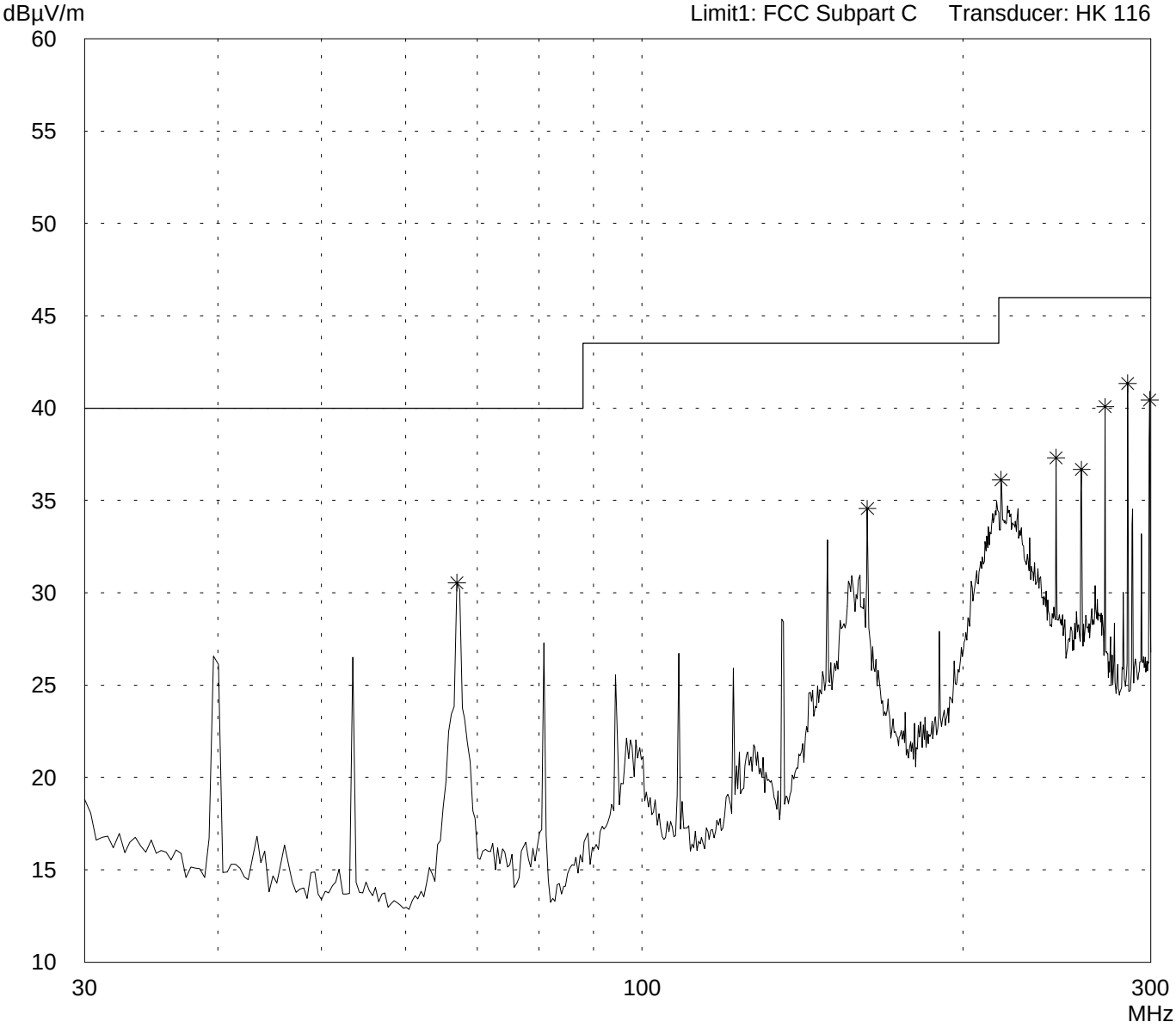
No. 1	13.553000 MHz	20.80 dBµV/m
No. 2	13.561220 MHz	33.75 dBµV/m
No. 3	13.567000 MHz	25.57 dBµV/m

Tested by: Johann Roidt	Project-No.: 50430-00640
Date: November 29, 2000	Page of pages

Radiated Emission Test 30 MHz - 300 MHz
according to FCC Part 15 Subpart C

Model: PRM 5M	Mode:
Serial no.: 001069	
Applicant: deister electronic GmbH	
Test site: Semi anechoic room, cabin no. 3	
Tested on: Test distance 3 meters Horizontal Polarization	
Date of test: November 25, 2000 / Operator: J. Roidt	
Test performed: automatically / File name:	

Detector: Peak	List of values: 10 dB Margin 50 Subranges

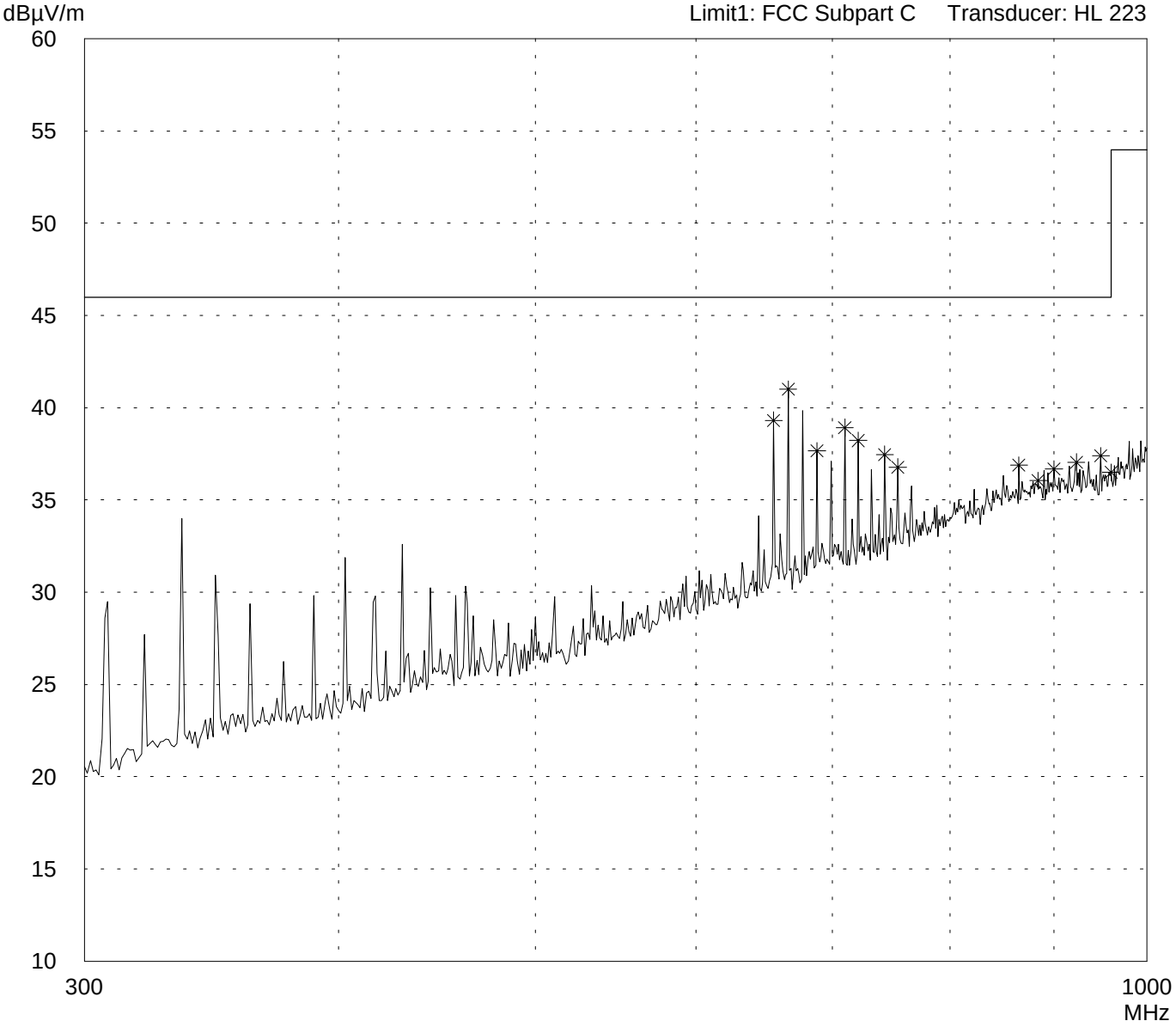


Result: Prescan	Project file: 50430-00640 Page of Pages

Radiated Emission Test 300 MHz - 1 GHz
according to FCC Part 15 Subpart C

Model: PRM 5M	Mode:
Serial no.: 001069	
Applicant: deister electronic GmbH	
Test site: Semi anechoic room, cabin no. 3	
Tested on: Test distance 3 meters Horizontal Polarization	
Date of test: November 25, 2000 / Operator: J. Roidt	
Test performed: automatically / File name:	

Detector: Peak	List of values: 10 dB Margin 50 Subranges

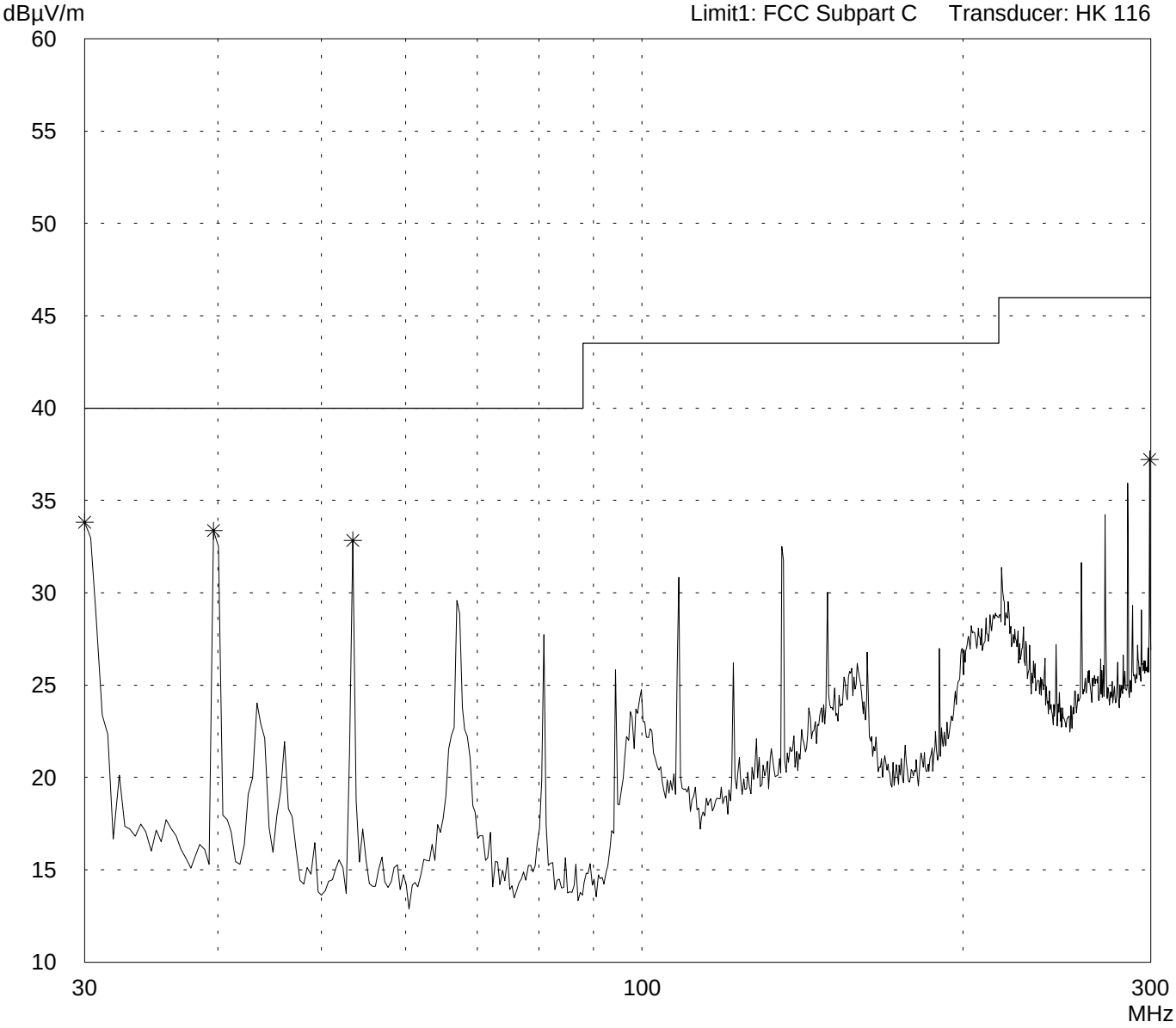


Result: Prescan	Project file: 50430-00640 Page of Pages

Radiated Emission Test 30 MHz - 300 MHz
according to FCC Part 15 Subpart C

Model: PRM 5M	Mode:
Serial no.: 001069	
Applicant: deister electronic GmbH	
Test site: Semi anechoic room, cabin no. 3	
Tested on: Test distance 3 meters Vertical Polarization	
Date of test: November 25, 2000 / Operator: J. Roidt	
Test performed: automatically / File name:	

Detector: Peak	List of values: 10 dB Margin 50 Subranges

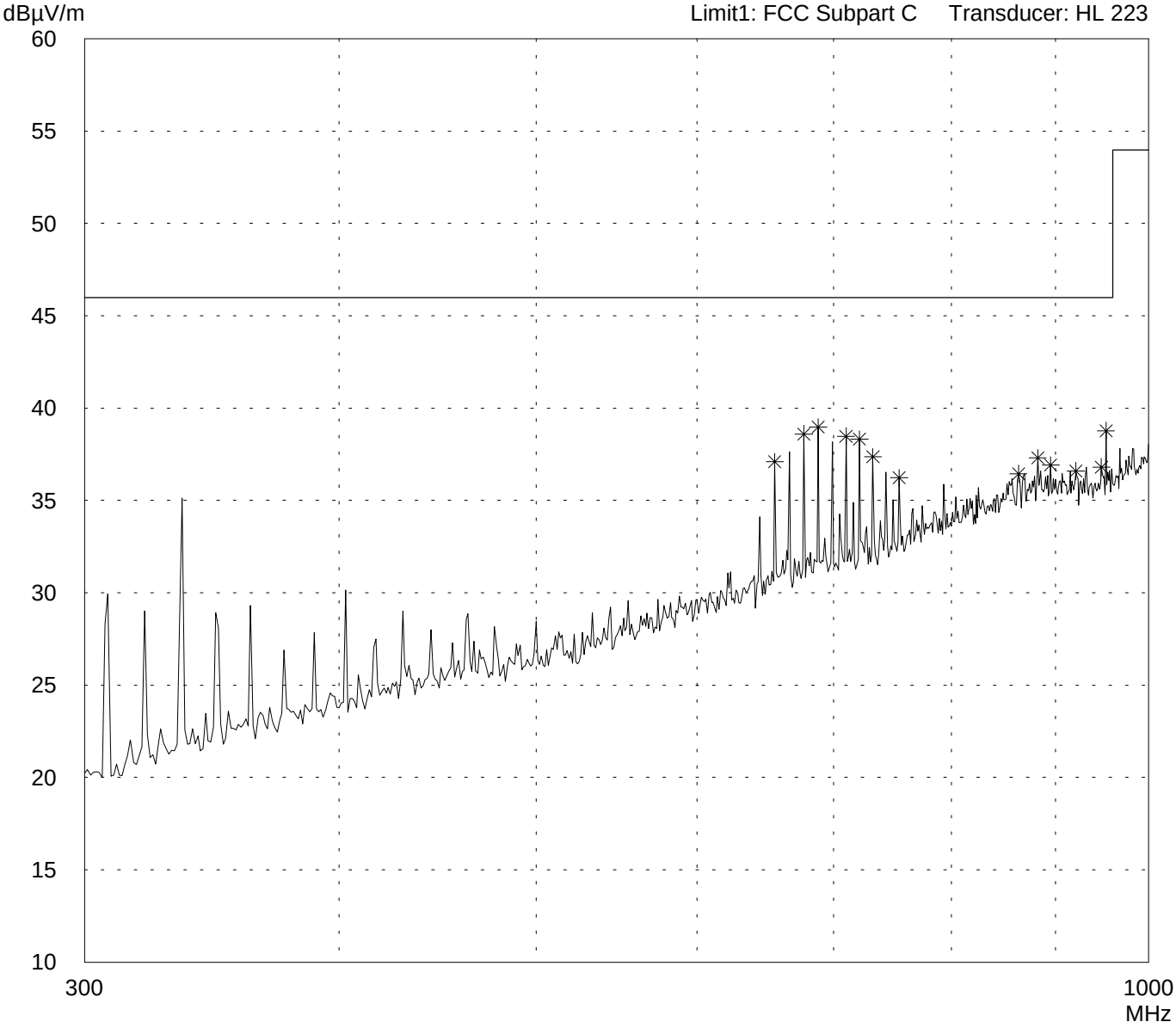


Result: Prescan	Project file: 50430-00640 Page of Pages

Radiated Emission Test 300 MHz - 1 GHz
according to FCC Part 15 Subpart C

Model: PRM 5M	Mode:
Serial no.: 001069	
Applicant: deister electronic GmbH	
Test site: Semi anechoic room, cabin no. 3	
Tested on: Test distance 3 meters Vertical Polarization	
Date of test: November 25, 2000 / Operator: J. Roidt	
Test performed: automatically / File name:	

Detector: Peak	List of values: 10 dB Margin 50 Subranges



Result: Prescan	Project file: 50430-00640 Page of Pages

Blank Page