SENTON

■ EMV-Prüfzentrum ■ EMI/EMC-Testcenter ■

Straubing, 13 February 2002

T E S T - R E P O R T

No. 56408-20042

for

99931 TX

ERGO TECH CORDLESS

Applicant:	Fellowes Manufacturing company
Purpose of testing:	To show compliance with FCC Code of Federal Regulations, CFR 47, Part 15, Subpart C, Section 15.227

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

Equipment Under Test (EUT):	99931 TX
Serial number(s):	---
Type of equipment:	ERGO TECH CORDLESS
Type of emission:	10K0F1D
Parts/accessories:	---
FCC-ID:	---

Applicant:	Fellowes Manufacturing company
(full address)	1789 Norwood Avenue Itasca, Illinois 60143-1095 USA
Contract identification:	---
Contact person:	Joan Wu (Universal Technology Co. Ltd.)
Manufacturer:	Fellowes Manufacturing company

Receipt of EUT:	September 19, 2001
Dates of test:	September to November 2001
Note:	---

Responsible for testing:	Thomas Eberl
Responsible for test report:	Thomas Eberl (cj)

2. Identification of Test Laboratory

Test Laboratory: (full address):	Senton GmbH EMI/EMC Test Center Aeussere Fruehlingstrasse 45 D-94315 Straubing Germany	
Contact person:	Mr. Johann Roidt	
Communication:	Telephone Fax eMail:	(+49) 0 94 21 / 55 22-0 (+49) 0 94 21 / 55 22-99 Office@senton.de
FCC registration number:	90926	
Industry Canada file number:	IC 3050	

3. Summary of Test Results

The tested sample complies with the requirements for set forth in the

The Code of Federal Regulations 47, Part 15, Subpart C, Section 15.227

of the Federal Communication Commission (FCC).

Johann Roidt
Technical Manager

Thomas Eberl
Test Engineer

4. Operation Mode of EUT

Continuously TX mode (by moving mouse automaticly)

5. Configuration of EUT and Peripheral Devices

Configuration of cables of EUT

Not applicable

Configuration of peripheral devices connected to EUT

No peripheral devices connected

6. Measuring Methods

6.1. Field strength of in-band emissions (§15.227 (a)) and unwanted emissions < 30 MHz (§15.209 (b))

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. The provisions of 15.31 (d) apply.
According to section 15.209 (d) final measurementis 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.

6.2. Unwanted Emission 30 MHz - 1 GHz (§15.209 (b))

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-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 1 for the measurement setup.

Test equipment used (see equipment list for details):
01, 06, 12, 15, 38, 39, 40, 41, 55, 58, 61, 64, 66

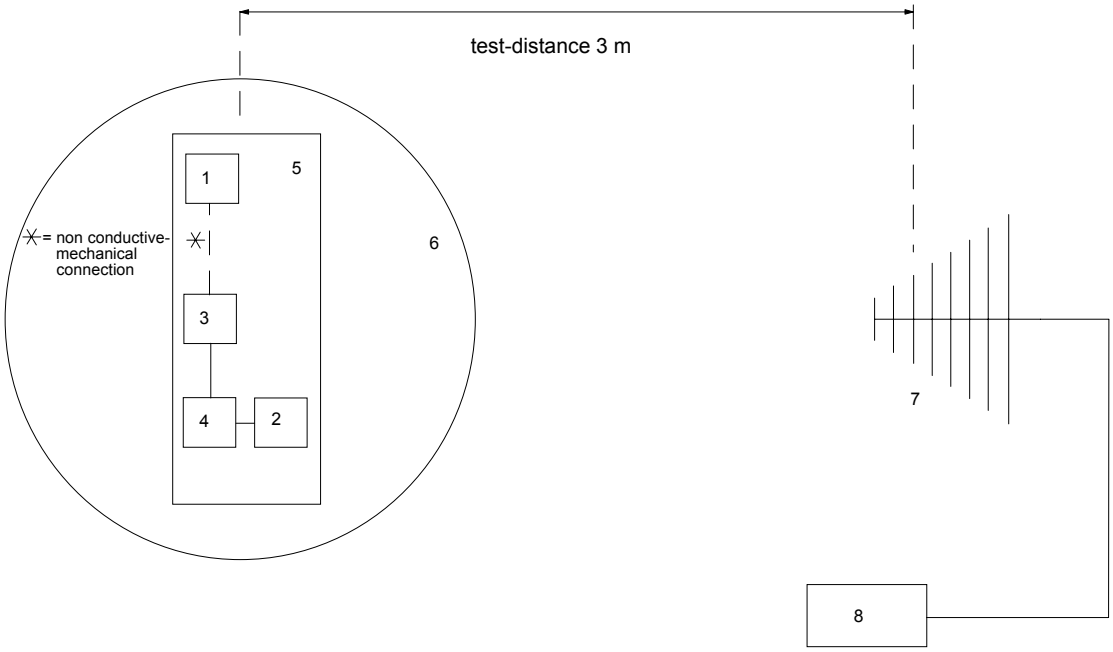


Figure 1: Measurement setup for radiated emission test

1 EUT (Mouse)
2 Servo tester
3 Servo gear
4 Accu Pack
5 Wooden Table
6 Turn table
7 Measurement antenna
8 Test receiver

7. Photographs of Test Setups

7.1. Radiated Emissions 30 – 1000 MHz (Pre-Test in Fully Anechoic Chamber)

7.2. Radiated Emissions 30 – 1000 MHz (Final Test in Open Area Test-Site)

8. 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	SMY 01	830694/001	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
69	DC Block	7006	A2798	Weinschel Corp.
70	Cable for Antenna Connector			Senton
71	Dummy load			Futaba Corporation

9. 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)	October 1, 1999
☐	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)	October 1, 1999
☒	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)	October 1, 1999
☐	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 2 for Low Power Licence-Exempt Radiocommuniction Devices of Industry Canada	February 24, 1996
☐	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

10. List of Measurements

CFR 47 Part 15 Subpart C			
Section(s):	**Test**	**Page**	**Result**
§15.227 (a)	Maximum in-band field strength		Passed
§15.209 (b)	Out-of-band emissions		Passed

11. Test Results

Field Strength of Emissions according to FCC Rules, Part 15, Subpart C, Section 15.227 (b) Frequency Band < 30 MHz

Model:	**99931 TX**
Type:	**ERGO TECH CORDLESS**
Serial No.	**0001**
Applicant:	**Fellowes Manufacturing company**
Test Site:	**Open Field Test Site**
Distance:	**3 Meter**
Date of Test:	**January 24, 2002**

Frequency (MHz)	Detector	Antenna Polarization	Analyzer Reading (dBµV)	Correction Factor (dB)	Field Strength (dBµV/m)	Limit dBµV/m (3m)	Margin dB
27.0	Q.P.	h	32.3	16.1	48.4	80.0	**31.6**

***** = 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

Field Strength of Emissions according to FCC Rules, Part 15, Subpart C, Section 15.209 (b) Frequency Band > 30 MHz

Model:	**99931 TX**
Type:	**ERGO TECH CORDLESS**
Serial No.	**0001**
Applicant:	**Fellowes Manufacturing company**
Test Site:	**Open Field Test Site**
Distance:	**3 Meter**
Date of Test:	**January 24, 2002**

Frequency (MHz)	Detector	Antenna Polarization	Analyzer Reading (dBµV)	Correction Factor (dB)	Field Strength (dBµV/m)	Limit dBµV/m	Margin dB
54.0	Q.P.	h	16.3	11.3	27.6	40.0	**12.4**
108.0	Q.P.	h	16.5	13.2	29.7	43.5	**13.8**
135.0	Q.P.	h	13.1	15.5	28.6	43.5	**14.9**
162.0	Q.P.	h	12.9	16.6	29.5	43.5	**14.0**
270.0	Q.P.	h	6.7	22.5	29.2	46.0	**16.8**
432.0	Q.P.	h	4.9	23.3	28.2	46.0	**17.8**
459.0	Q.P.	h	7.2	23.9	31.1	46.0	**14.9**
486.0	Q.P.	h	5.9	24.6	30.5	46.0	**15.5**

***** = 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

Field Strength of Emissions according to FCC Rules, Part 15, Subpart C, Section 15.209 (b) Frequency Band > 30 MHz

Model:	**99931 TX**
Type:	**ERGO TECH CORDLESS**
Serial No.	**0001**
Applicant:	**Fellowes Manufacturing company**
Test Site:	**Open Field Test Site**
Distance:	**3 Meter**
Date of Test:	**January 24, 2002**

Frequency (MHz)	Detector	Antenna Polarization	Analyzer Reading (dBµV)	Correction Factor (dB)	Field Strength (dBµV/m)	Limit dBµV/m	Margin dB
486.0	Q.P.	v	5.3	24.6	29.9	46.0	**16.1**
513.0	Q.P.	v	1.0	25.3	26.3	46.0	**19.7**
540.0	Q.P.	v	2.0	26.2	28.2	46.0	**17.8**
567.0	Q.P.	v	0.1	27.0	27.0	46.0	**19.0**
	Q.P.						

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

Sample calculation of field strength values:

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

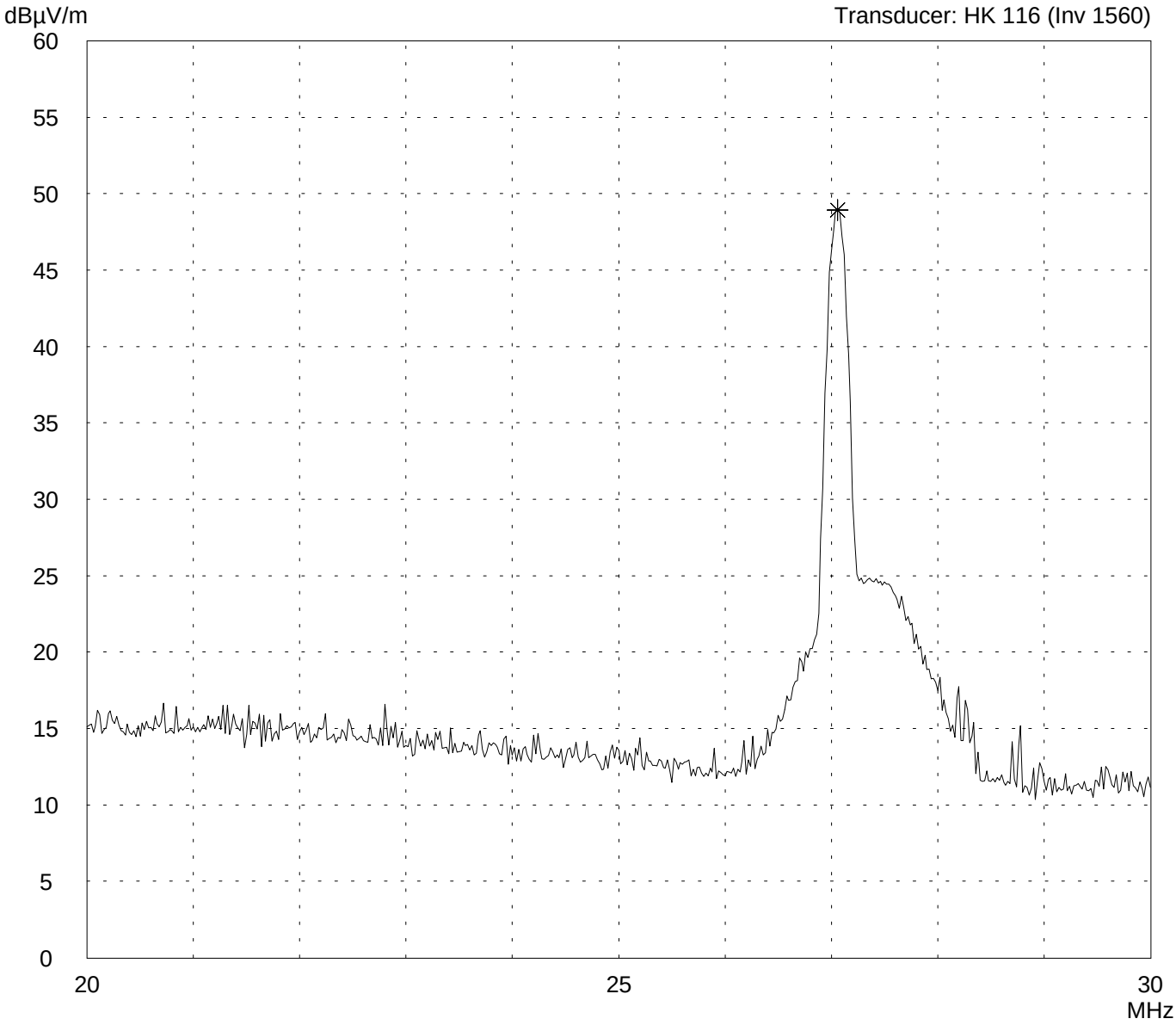
Test equipment used (see equipment list for details):
02, 13, 14, 16, 38, 40 ,42, 57, 64, 67

12. Charts taken during testing

Radiated Emission Test 20 MHz - 30 MHz
acc. to FCC Part 15 (Fully Anechoic Chamber)

Model: 99931 TX ERGO TECH CORDLESS	Comment: - FCC-test-setup - test of transmitter - continous transmission
Serial no.: test-sample	
Applicant: Fellowes Manufacturing company	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 01/21/2002 / Operator: A. Stübinger	
Test performed: automatically / File name: default.emi	

Detector: Peak	List of values: Selected by hand



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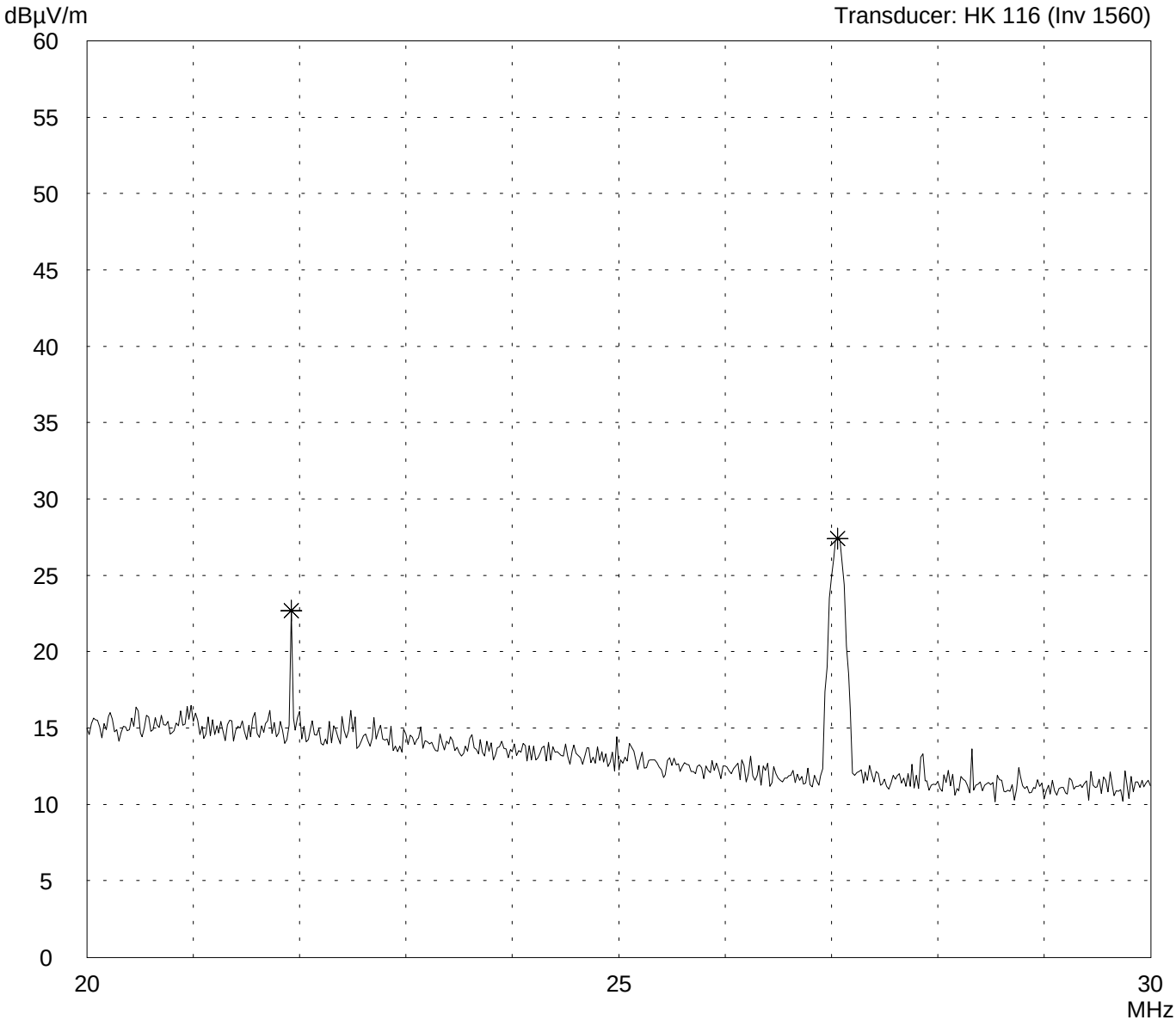
Radiated Emission Test 20 MHz - 30 MHz
acc. to FCC Part 15 (Fully Anechoic Chamber)

Model: 99931 TX ERGO TECH CORDLESS	Comment: - FCC-test-setup - test of transmitter - continous transmission
Serial no.: test-sample	
Applicant: Fellowes Manufacturing company	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 01/21/2002 / Operator: A. Stübinger	
Test performed: automatically / File name: default.emi	
Detector: Peak	List of values: Selected by hand



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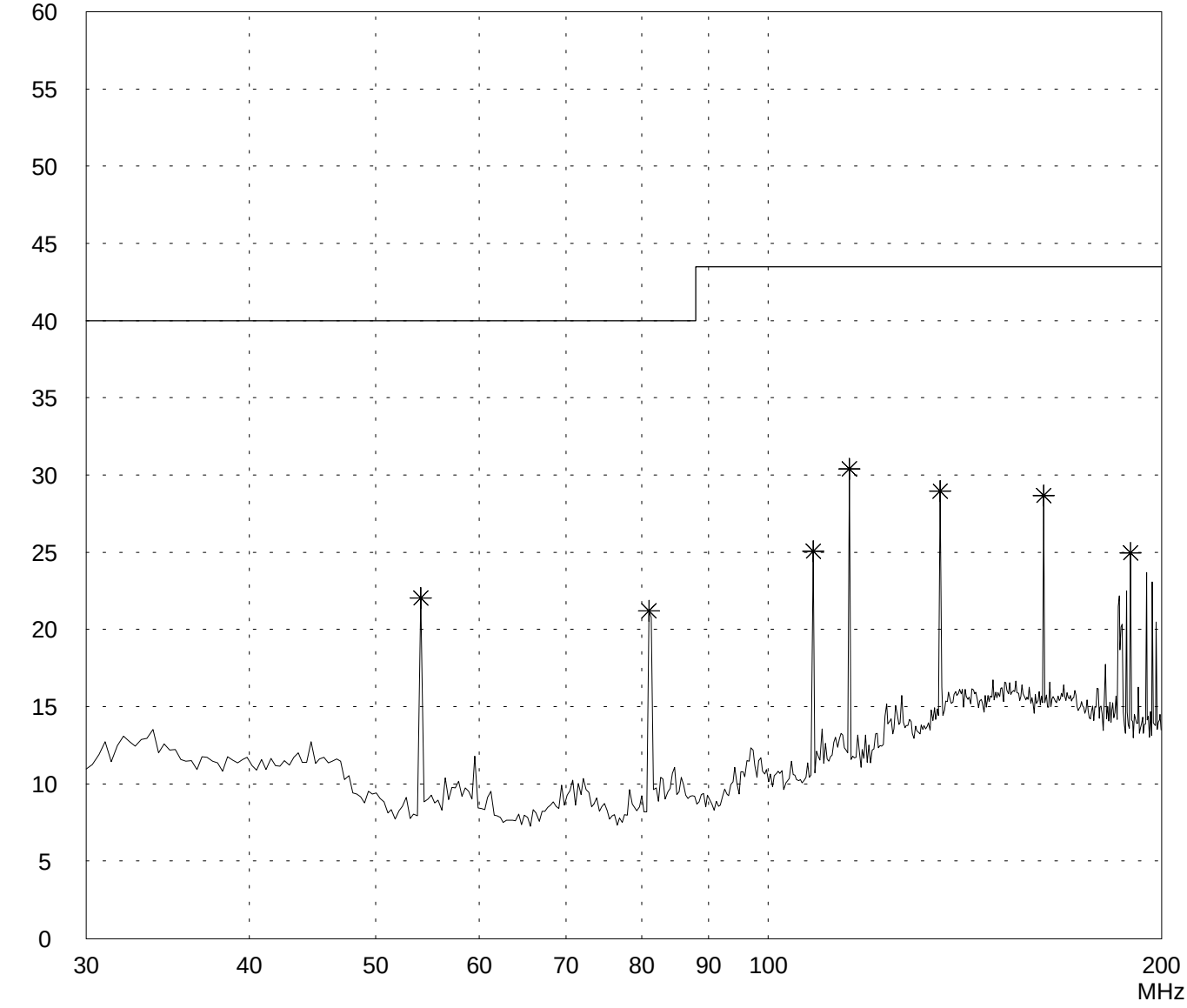
Radiated Emission Test 30 MHz - 200 MHz
acc. to FCC Part 15 (Fully Anechoic Chamber)

Model: 99931 TX ERGO TECH CORDLESS	Comment: - FCC-test-setup - test of transmitter - continous transmission
Serial no.: test-sample	
Applicant: Fellowes Manufacturing company	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 01/21/2002 / Operator: A. Stübinger	
Test performed: automatically / File name: default.emi	
Detector: Peak	List of values: Selected by hand

dBµV/m Limit1: FCC Part 15 Transducer: HK 116 (Inv 1560)



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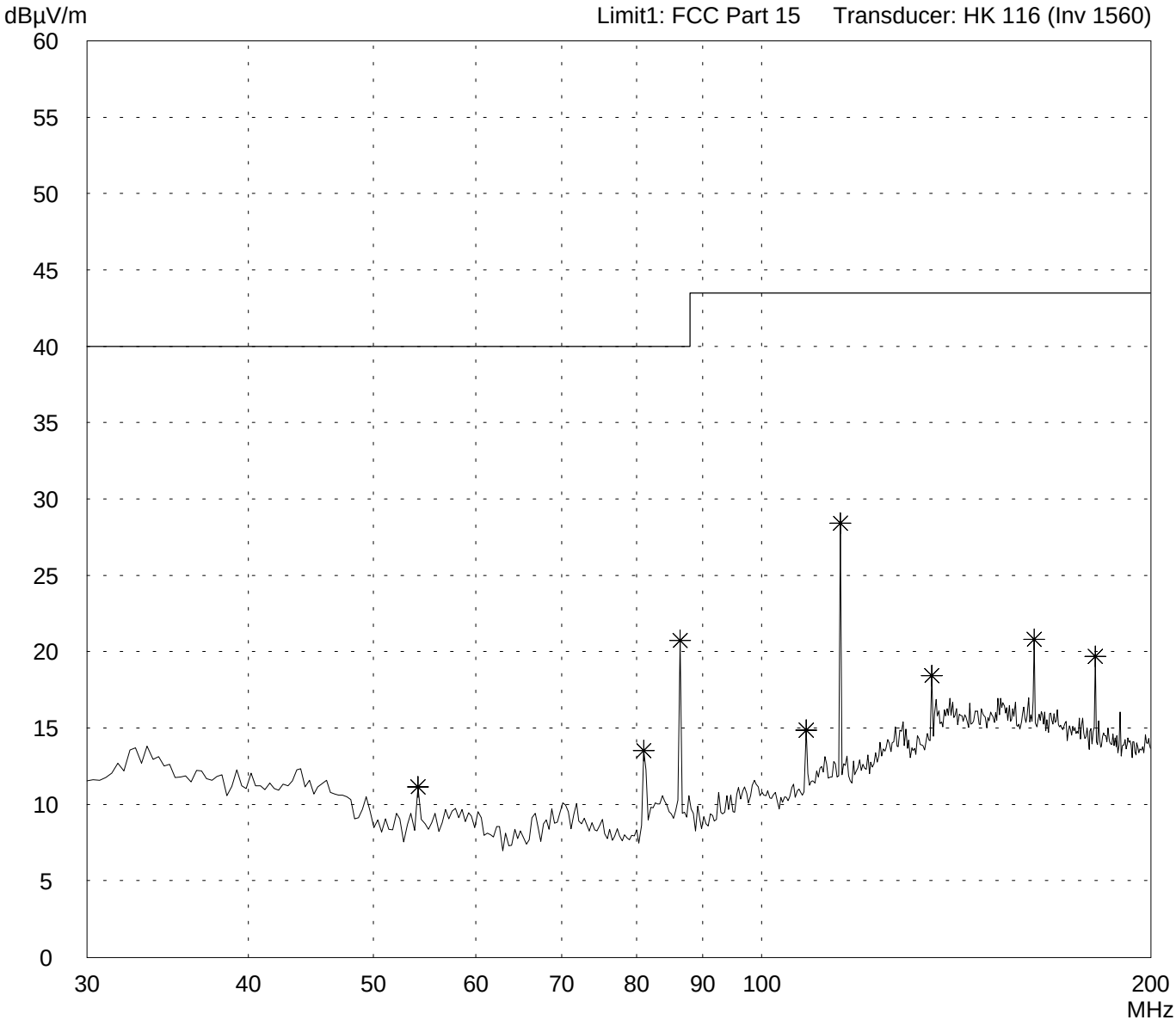
Radiated Emission Test 30 MHz - 200 MHz
acc. to FCC Part 15 (Fully Anechoic Chamber)

Model: 99931 TX ERGO TECH CORDLESS	Comment: - FCC-test-setup - test of transmitter - continous transmission
Serial no.: test-sample	
Applicant: Fellowes Manufacturing company	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 01/21/2002 / Operator: A. Stübinger	
Test performed: automatically / File name: default.emi	
Detector: Peak	List of values: Selected by hand



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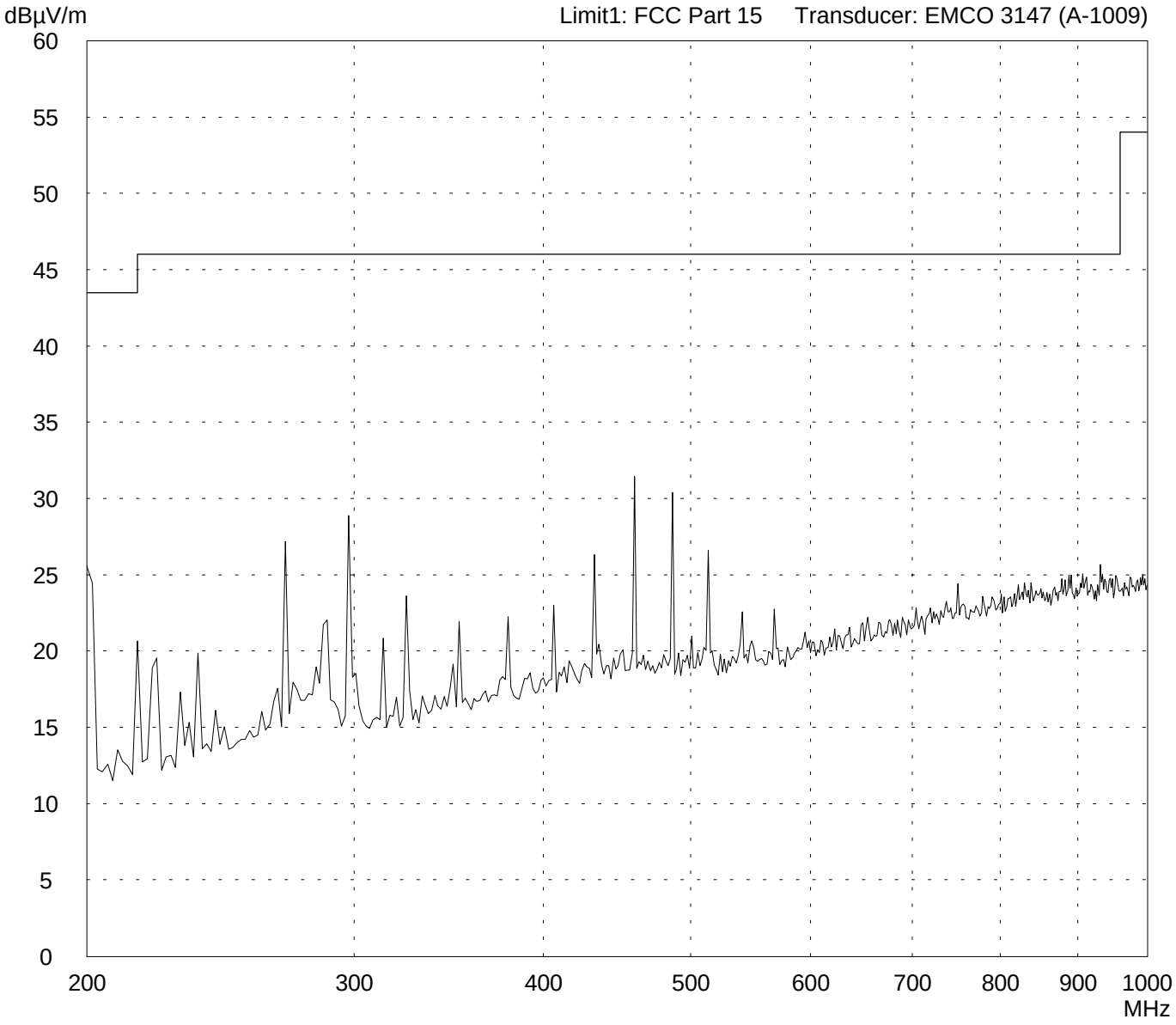
Radiated Emission Test 200 MHz - 1 GHz
acc. to FCC Part 15 (Fully Anechoic Chamber)

Model: 99931 TX ERGO TECH CORDLESS	Comment: - FCC-test-setup - test of transmitter - continous transmission
Serial no.: test-sample	
Applicant: Fellowes Manufacturing company	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 01/21/2002 / Operator: A. Stübinger	
Test performed: automatically / File name: default.emi	

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



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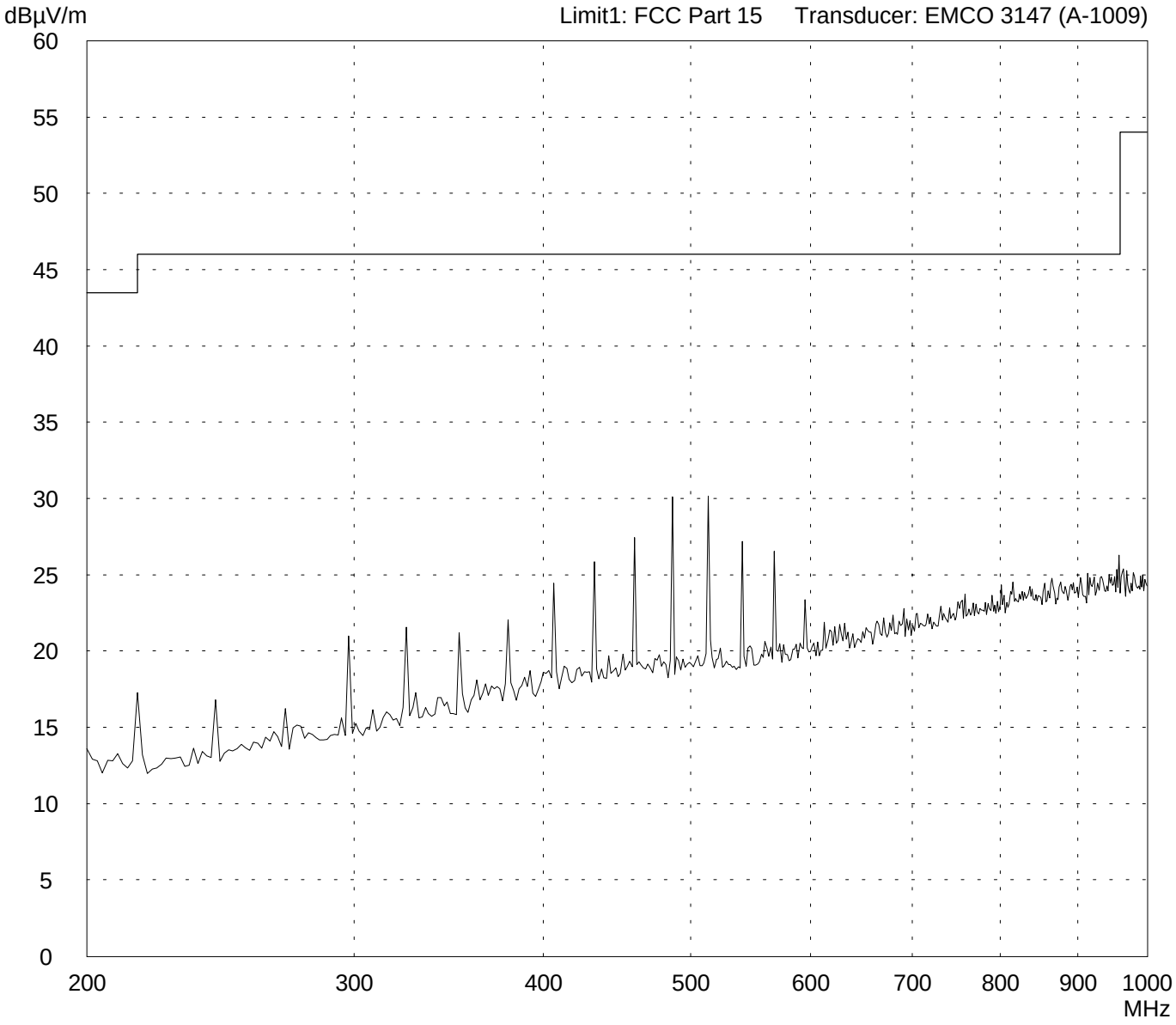
Radiated Emission Test 200 MHz - 1 GHz
acc. to FCC Part 15 (Fully Anechoic Chamber)

Model: 99931 TX ERGO TECH CORDLESS	Comment: - FCC-test-setup - test of transmitter - continous transmission
Serial no.: test-sample	
Applicant: Fellowes Manufacturing company	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 01/21/2002 / Operator: A. Stübinger	
Test performed: automatically / File name: default.emi	

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



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