

Straubing, May 17, 2010

TEST - REPORT

No. 50511-061106-2(Edition 3)

for

FMR24X / FMR25X / FMR54X

Tank Level Probing Radar

Applicant: Endress & Hauser GmbH & Co. KG

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

Note:

The test data of this report is related 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.

Table of Contents

1	Description of the Equipment Under Test (EUT)	3
2	Administrative Data	5
3	Identification of the Test Laboratory	6
4	Summary	7
5	Operation Mode and Configuration of EUT	8
6	Measuring Methods	9
6.1	Conducted AC powerline emission	9
6.2	Radiated emission in Fully Anechoic Room	11
6.3	Radiated emission at Open Field Test Site	13
6.4	Desensitization of pulsed Emissions	14
7	Photographs Taken During Testing	15
8	Test Results	19
8.1	Occupied Bandwidth	20
8.2	Designation of Emissions	22
8.3	Duty Cycle Measurement	23
8.4	Restricted bands of operation	25
8.5	Conducted Powerline Emission Measurement 150 kHz to 30 MHz	26
8.6	Radiated Emission Measurement 9 kHz to 30 MHz	28
8.7	Radiated Emission Measurement 30 MHz to 110 GHz	29
9	Referenced Regulations	30
10	Revision History	31
11	Charts taken during testing	32

1 Description of the Equipment Under Test (EUT)

General data of EUT

Type designation ¹ :	FMR24X / FMR25X / FMR54X
Serial number(s):	N/A
Manufacturer:	Endress & Hauser GmbH & Co. KG
Type of equipment:	Tank Level Probing Radar (TLPR)
Version:	As delivered
FCC ID:	
Additional parts/accessories:	

Technical data of EUT

Application frequency range:	24.05 - 27.00 GHz
Frequency range:	24.05 - 27 GHz GHz
Operating frequency:	25.9 GHz (nominal)
Type of modulation:	1G08P0NAN
Pulse train:	558.5 ns
Pulse width:	2.79 ns
Number of RF-channels:	1
Channel spacing:	Not Applicable
Designation of emissions ² :	1G08P0NAN

Type of antenna: See table overleaf

Size/length of antenna:	Type	Gain	Length	Tested	
Plated horn	80 mm / 3"	26 dBi	N/A	Yes	
Horn antenna	100 mm / 4"	26 dBi	282 mm	Yes	
Parabolic antenna	200 mm	34 dBi	N/A	Yes	

Type of power supply:	DC supply				
Specifications for power supply:	nominal voltage:	24 V			
	minimum voltage:	16 V			
	maximum voltage:	36 V			

¹ Type designation of the system if EUT consists of more than one part.

² Also known as "Class of Emission".

Variants and antennas covered by this report

	Model	Description	Main - Electronic	RF-Module	Antennas
1	FMR25X	Solid-Radar	HART, PA FF (in develop.)	<u>RF-Modul E+H with Power-Amplifier</u>	<u>200mm-Parabol</u> 3" - Horn 4" - Horn
2	FMR54X	Tank-Gauging Radar	Own Electronic	<u>Same as in 1, without Power-Amplifier</u>	<u>200mm-Parabol</u> <u>4" - Horn</u>
3	FMR24X FMR240 FMR244 FMR245	Liquid-Radar	Same as in 1	Same as in 1, without Power-Amplifier	1.5" - Horn 2" - Horn 3" - Horn 4" - Horn 1.5" - Horn 3" plated 2" plated Horn <u>3" plated Horn</u> filled

Note: By combining the underlined two RF modules and 3 antennas , all the variants listed above are covered.

2 Administrative Data

Application details	
Applicant (full address):	Endress & Hauser GmbH & Co. KG Hauptstraße 1 D 79689 Maulburg Germany
Contact person:	Mr. Ralf Reimelt
Contract identification:	
Receipt of EUT:	10 May 2007
Date(s) of test:	September 2007
Note(s):	


Report details	
Report number:	50511-061106-2
Issue date:	17 May 2010

3 Identification of the Test Laboratory

Details of the Test Laboratory	
Company name:	Senton GmbH EMI/EMC Test Center
Address:	Aeussere Fruehlingstrasse 45 D-94315 Straubing Germany
Laboratory Accreditation:	DAR-Registration No. DAT-P-171/94-02
FCC Test Site registration number	90926
Industry Canada Test site registration:	IC 3050
Contact person:	Mr. Johann Roidt Phone: (+49) (0)9421 5522-0 Fax: (+49) (0)9421 5522-99

4 Summary

Summary of test results
The tested sample complies with the requirements set forth in the Code of Federal Regulations CFR 47, Part 15, Sections 15.205, 15.207 and 15.209 of the Federal Communication Commission (FCC)

Personnel involved in this report	
Laboratory Manager:	 Mr. Johann Roidt
Responsible for testing:	Mr. Johann Roidt
Responsible for test report:	Mr. Johann Roidt

5 Operation Mode and Configuration of EUT

Operation Mode

Normal operation mode: Measurement with pulsed signal.

Configuration of EUT

FCC test setup.
DC 24 V power supply.
EUT in vertical position.

List of ports and cables

<i>Port</i>	<i>Description</i>	<i>Classification³</i>	<i>Cable type</i>	<i>Cable length</i>
1	DC supply with HART communication	dc power signal/control port	Shielded	> 3 m

List of devices connected to EUT

<i>Item</i>	<i>Description</i>	<i>Type Designation</i>	<i>Serial no. or ID</i>	<i>Manufacturer</i>

List of support devices

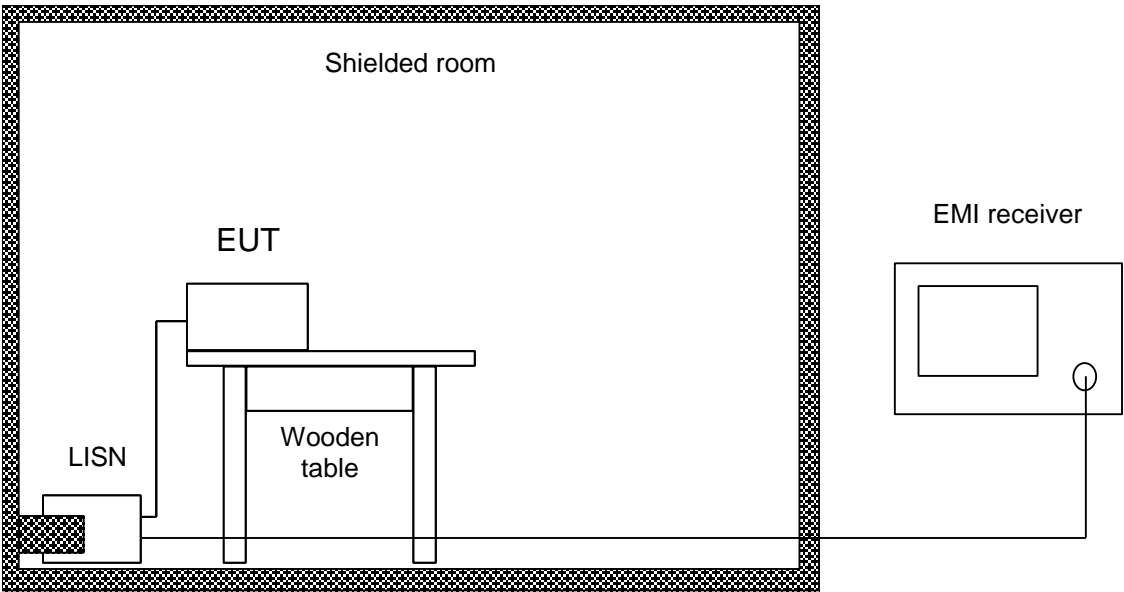
<i>Item</i>	<i>Description</i>	<i>Type Designation</i>	<i>Serial no. or ID</i>	<i>Manufacturer</i>

³ Ports shall be classified as ac power, dc power or signal/control port

6 Measuring Methods

6.1 Conducted AC powerline emission

Measurement Procedure:	
Rules and Specifications:	CFR 47 Part 15, section 15.207 IC RSS-Gen Issue 2, section 7.2.2
Guide:	ANSI C63.4 / CISPR 22
<p>Conducted emission tests in the frequency range 150 kHz to 30 MHz are performed using Line Impedance Stabilization Networks (LISNs). To simplify testing with quasi-peak and average detector the following procedure is used:</p> <p>First the whole spectrum of emission caused by the equipment under test (EUT) is recorded with detector set to peak using CISPR bandwidth of 10 kHz. After that all emission levels having less margin than 10 dB to or exceeding the average (CFR 47 Part 15) or quasi-peak (IC RSS-210) limit are retested with detector set to quasi-peak.</p> <p>If average limit is kept with quasi-peak levels 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 is performed.</p> <p>According to ANSI C63.4, section 13.1.3.1, testing of intentional radiators with detachable antenna shall be performed using a suitable dummy load connected to the antenna output terminals. Otherwise, the tests shall be made with the antenna connected and, if adjustable, fully extended.</p> <p>Testing with dummy load may be necessary to distinguish (unintentional) conducted emissions on the supply lines from (intentional) emissions radiated by the antenna and coupling directly to supply lines and/or LISN. Usage of dummy load has to be stated in the appropriate test record(s) and notes should be added to clarify the test setup.</p>	

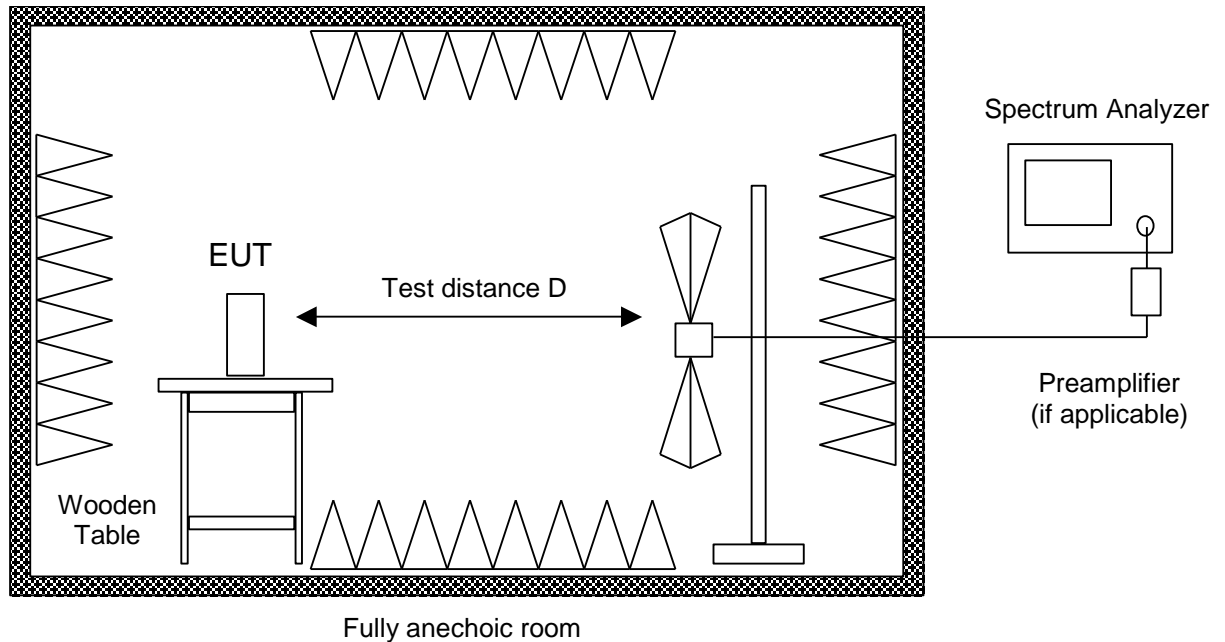


Test instruments used:

Used	Type	Model	Serial No. or ID	Manufacturer
<input checked="" type="checkbox"/>	EMI receiver	ESHS 10	860043/016	Rohde & Schwarz
<input checked="" type="checkbox"/>	LISN	ESH3-Z5	862770/021	Rohde & Schwarz
<input type="checkbox"/>	LISN	ESH3-Z5	830952/025	Rohde & Schwarz
<input type="checkbox"/>	Shielded room	No. 1	1451	Albatross Projects
<input checked="" type="checkbox"/>	Shielded room	No. 4	3FD-100 544	Euroshield

6.2 Radiated emission in Fully Anechoic Room

Measurement Procedure:	
Rules and Specifications:	CFR 47 Part 15, section 15.209 IC RSS-210 Issue 7, section 2.6
Guide:	ANSI C63.4
<p>Radiated emission in fully anechoic room is measured in the frequency range from 30 MHz to the maximum frequency as specified in CFR 47 Part 15 section 15.33.</p> <p>Measurements are made in both the horizontal and vertical planes of polarization in a fully anechoic room using a spectrum analyzer with the detector function set to peak and resolution as well as video bandwidth set to 100 kHz (below 1 GHz) or 1 MHz (above 1 GHz).</p> <p>Testing up to 1 GHz is performed with a linear polarized logarithmic periodic antenna combined with a 4:1 broadband dipole ("Trilog broadband antenna"). For testing above 1 GHz horn antennas are used.</p> <p>All tests below 18 GHz are performed at a test distance D of 3 meters. For higher frequencies the test distance is reduced (e.g. to 1 meter) due to the sensitivity of the measuring instrument(s) and the test results are calculated according to CFR 47 Part 15 section 15.31(f)(1) using an extrapolation factor of 20 dB/decade. If required, preamplifiers are used for the whole frequency range. Special care is taken to avoid overload, using appropriate attenuators and filters, if necessary.</p> <p>If the radiated emission limits are expressed in terms of the average value of the emission there also is a peak limit corresponding to 20 dB above the maximum permitted average limit. Additionally, if pulsed operation is employed, the average field strength is determined by averaging over one complete pulse train, including blanking intervals, as specified in CFR 47 Part 15 section 15.35(c). If the pulse train exceeds 0.1 second that 0.1 second interval during which the value of the emission is at its maximum is selected for calculation. The pulse train correction is added to the peak value of the emission to get the average value.</p> <p>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.</p> <p>During testing the EUT is rotated all around to find the maximum levels of emissions. Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.</p> <p>For final testing below 1 GHz an open field test-site is used and the plots recorded in the fully anechoic room are indicated as prescans.</p>	

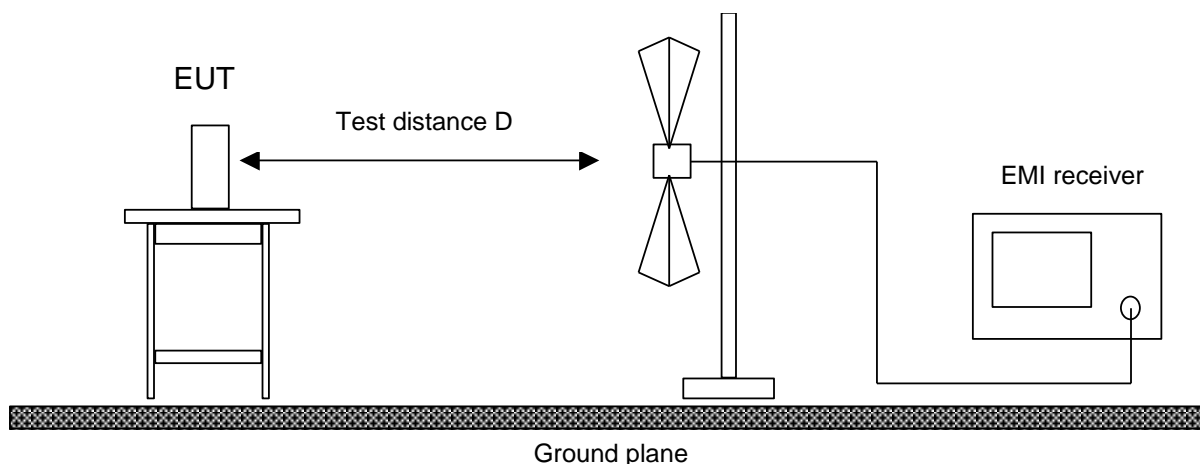


Test instruments used:

Used	Type	Model	Serial No. or ID	Manufacturer
<input checked="" type="checkbox"/>	Spectrum Analyzer	FSP 30	100063	Rohde & Schwarz
<input type="checkbox"/>	EMI test receiver	ESMI	839379/013 839587/006	Rohde & Schwarz
<input checked="" type="checkbox"/>	Preamplifier	CPA9231A	3393	Schaffner
<input checked="" type="checkbox"/>	Preamplifier 1-8 GHz	AFS3-00100800-32-LN	847743	Miteq
<input type="checkbox"/>	Preamplifier 0.5-8 GHz	AMF-4D-005080-25-13P	860149	Miteq
<input checked="" type="checkbox"/>	Preamplifier 8-18 GHz	ACO/180-3530	32641	CTT
<input checked="" type="checkbox"/>	External Mixer	WM782A	845881/005	Tektronix
<input checked="" type="checkbox"/>	Harmonic Mixer	FS-Z30	843389/007	Rohde & Schwarz
	Accessories			
<input checked="" type="checkbox"/>	Trilog broadband antenna	VULB 9163	9163-188	Schwarzbeck
<input checked="" type="checkbox"/>	Horn antenna	3115	9508-4553	EMCO
<input type="checkbox"/>	Horn antenna	3160-03	9112-1003	EMCO
<input type="checkbox"/>	Horn antenna	3160-04	9112-1001	EMCO
<input checked="" type="checkbox"/>	Horn antenna	3160-05	9112-1001	EMCO
<input checked="" type="checkbox"/>	Horn antenna	3160-06	9112-1001	EMCO
<input checked="" type="checkbox"/>	Horn antenna	3160-07	9112-1008	EMCO
<input checked="" type="checkbox"/>	Horn antenna	3160-08	9112-1002	EMCO
<input checked="" type="checkbox"/>	Horn antenna	3160-09	9403-1025	EMCO
<input checked="" type="checkbox"/>	Horn antenna	3160-10	399185	EMCO
<input checked="" type="checkbox"/>	Fully anechoic room	No. 2	1452	Albatross Projects

6.3 Radiated emission at Open Field Test Site

Measurement Procedure:	
Rules and Specifications:	CFR 47 Part 15, section 15.209 IC RSS-210 Issue 7, section 2.6
Guide:	ANSI C63.4
<p>Radiated emission at open field test site is measured in the frequency range 30 MHz to 1 GHz using a biconical antenna up to 300 MHz and a logarithmic periodic antenna above. The measurement bandwidth of the test receiver is set to 120 kHz with quasi-peak detector selected.</p> <p>If the radiated emission limits are expressed in terms of the average value of the emission there also is a peak limit corresponding to 20 dB above the maximum permitted average limit. Additionally, if pulsed operation is employed, the average field strength is determined by averaging over one complete pulse train, including blanking intervals, as specified in CFR 47 Part 15 section 15.35(c). If the pulse train exceeds 0.1 second that 0.1 second interval during which the value of the emission is at its maximum is selected for calculation. The pulse train correction is added to the peak value of the emission to get the average value.</p> <p>Hand-held or body-worn devices are tested in the position producing the highest emission relative to the limit as verified by prescans in the fully anechoic room. EUT is rotated all around and receiving antenna is raised and lowered within 1 meter to 4 meters to find the maximum levels of emission. Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.</p> <p>For measuring emissions of intentional radiators and receivers a test distance D of 3 meters is selected. Testing of unintentional radiators is performed at a distance of 10 meters. If limits specified for 3 meters shall be used for measurements performed at 10 meters distance the limits are calculated according to CFR 47 Part 15 section 15.31(d) and (f)(1) using an inverse linear-distance extrapolation factor of 20 dB/decade.</p>	



Test instruments used:

Used	Type	Model	Serial No. or ID	Manufacturer
<input checked="" type="checkbox"/>	EMI receiver	ESVP	881414/009	Rohde & Schwarz
<input checked="" type="checkbox"/>	Biconical antenna	EG 1 HK 116	842204/001	Rohde & Schwarz
<input checked="" type="checkbox"/>	Log. per. antenna	EG 1 HL 223	841516/023	Rohde & Schwarz
<input checked="" type="checkbox"/>	Open field test site	EG 1	1450	Senton

6.4 Desensitization of pulsed Emissions

Since the EUT transmits pulsed energy, the desensitization factor α has been calculated and included in the calculation for the final peak value.

In the HP Application Note 150-2 the analyzer settings to measure a line spectrum are defined as follows:

- a) Bandwidth $B < 0.3 \times \text{PRF}$
- b) Scan time $T_s > F_s / B^2$

With the pulse repetition frequency (PRF) of the EUT of 3.6 MHz and the selected measuring bandwidth of $B = 1$ MHz the requirement a) was observed.

The scan width of $F_s = 3$ GHz and Bandwidth of $B = 1$ MHz leads to following values:

$$F_s/B^2 = 3 \text{ GHz} / (1 \text{ GHz})^2 = 3 \times 10^{-9} \text{ s}$$

The selected scan time of $T_s = 20$ ms meets requirement b). Hence, a line spectrum was measured, which could be seen, when the Pseudo-Noise-mode of the EUT was switched off (no influence on the measured amplitudes) and the frequency scale of the analyser zoomed.

The desensitization factor α_l was calculated according to HP Application note 150-2:

$$\alpha_l = 20 \log (\tau_{\text{eff}} / T) = - 46 \text{ dB}$$

The calculation based on the pulse width $\tau_{\text{eff}} = 2.79$ ns and the pulse period $T = 558.5$ ns, which have been supplied by the applicant.

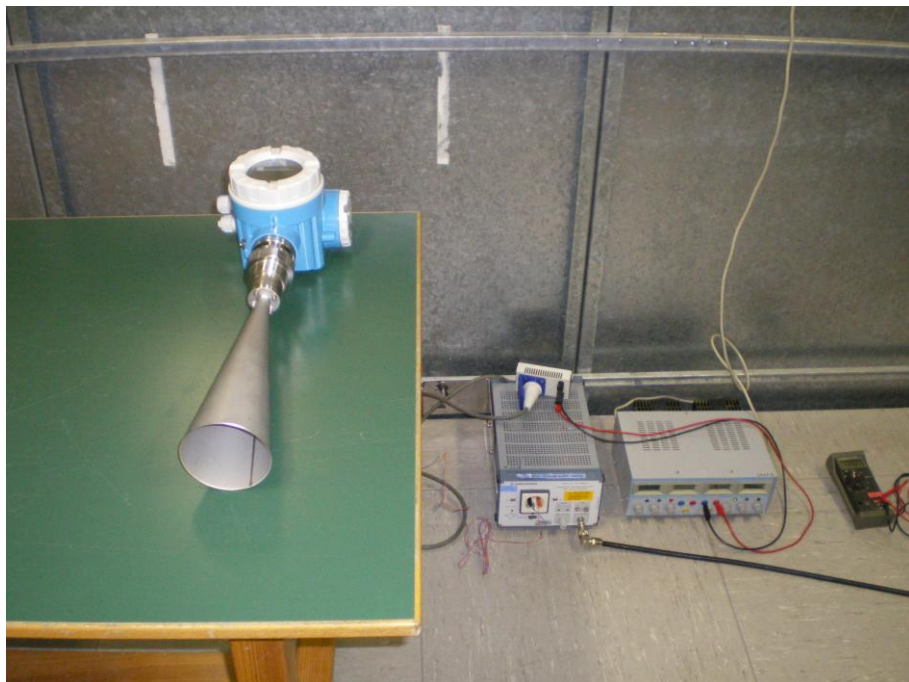
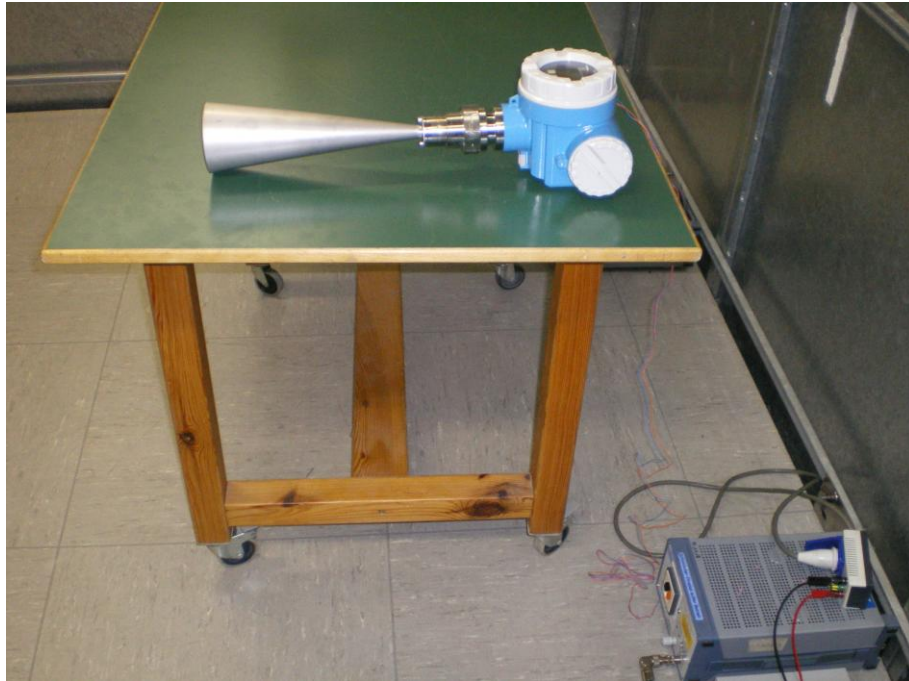
To avoid overloading the spectrum analyzer the internal preselector has been activated during final testing. A linearity check by adding a 3 dB attenuator to the input was used to ensure integrity of the test data.

Sample Calculation of Field Strength values for pulsed systems:

- 1) Measure Peak value with analyzer RBW set to 1 MHz, VBW set to 1 MHz, T_s set to 20 ms
- 2) Calculate Field Strength by adding antenna correction factor
- 3) Calculate True Peak Field Strength by adding Desensitization Factor
- 4) Calculate Average value by subtracting Duty Cycle Correction Factor from True Peak Field Strength Value

7 Photographs Taken During Testing

**Test setup for conducted DC powerline emission measurement
- continued -**



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



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



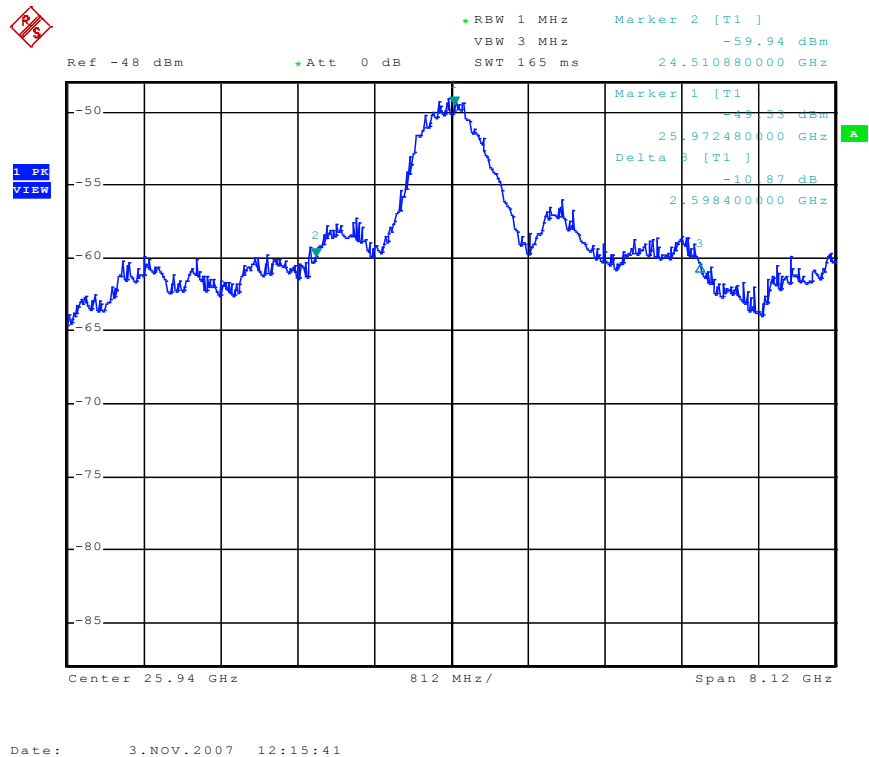
8 Test Results

FCC CFR 47 Parts 2 and 15			
Section(s)	Test	Page	Result
2.1046(a)	Conducted output power	---	Not applicable
2.202(a)	Occupied bandwidth	20	Recorded
2.201, 2.202	Class of emission	22	Calculated
15.35(c)	Pulse train measurement for pulsed operation	23	Recorded
15.205(a)	Restricted bands of operation	25	Test passed
15.207	Conducted AC powerline emission 150 kHz to 30 MHz	26	Test passed
15.205(b) 15.209	Radiated emission 9 kHz to 30 MHz	28	Test passed
15.205(b) 15.209	Radiated emission 30 MHz to 110 GHz	29	Test passed

8.1 Occupied Bandwidth

Rules and specifications:	CFR 47 Part 2, section 2.202(a) ANSI C63.4, annex H.6	
Guide:	ANSI C63.4	
Description:	<p>The occupied bandwidth according to CFR 47 Part 2, section 2.202(a), is measured as the 99% emission bandwidth, i.e. below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5% of the total mean power radiated by a given emission.</p> <p>The occupied bandwidth according to ANSI C63.4, annex H.6; is measured as the frequency range defined by the points that are 26 dB down relative to the maximum level of the modulated carrier.</p> <p>The resolution bandwidth of the spectrum analyzer shall be set to a value greater than 5.0% of the allowed bandwidth. If no bandwidth specifications are given, the following guidelines are used:</p>	
	Fundamental frequency	Minimum resolution bandwidth
	9 kHz to 30 MHz	1 kHz
	30 MHz to 1000 MHz	10 kHz
	1000 MHz to 40 GHz	100 kHz
	The video bandwidth shall be at least three times greater than the resolution bandwidth.	
Comment:	Test performed up to 26.5 GHz only	
Date of test:	September 2007	
Test site:	Fully anechoic room, cabin no. 2	

Occupied Bandwidth (-26 dB):



Occupied Bandwidth (-26 dB): > 4.8 GHz

8.2 Designation of Emissions

Rules and specifications:	CFR 47 Part 2, sections 2.201 and 2.202 IC RSS-Gen Issue 2, sections 3.2(h) and 8
Guide:	ANSI C63.4 / TRC-43

Type of modulation:	Unmodulated Pulse Emission
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B_n = Necessary Bandwidth K = Overall numerical factor t = Pulse duration in seconds at half-amplitude	$B_n = 2 K / t$ $K = 1.5$ $t = 2.79\text{ns}$
Calculation:	$B_n = 2 \cdot 1.5 / 2.79\text{ns} = 1.075 \text{ GHz}$

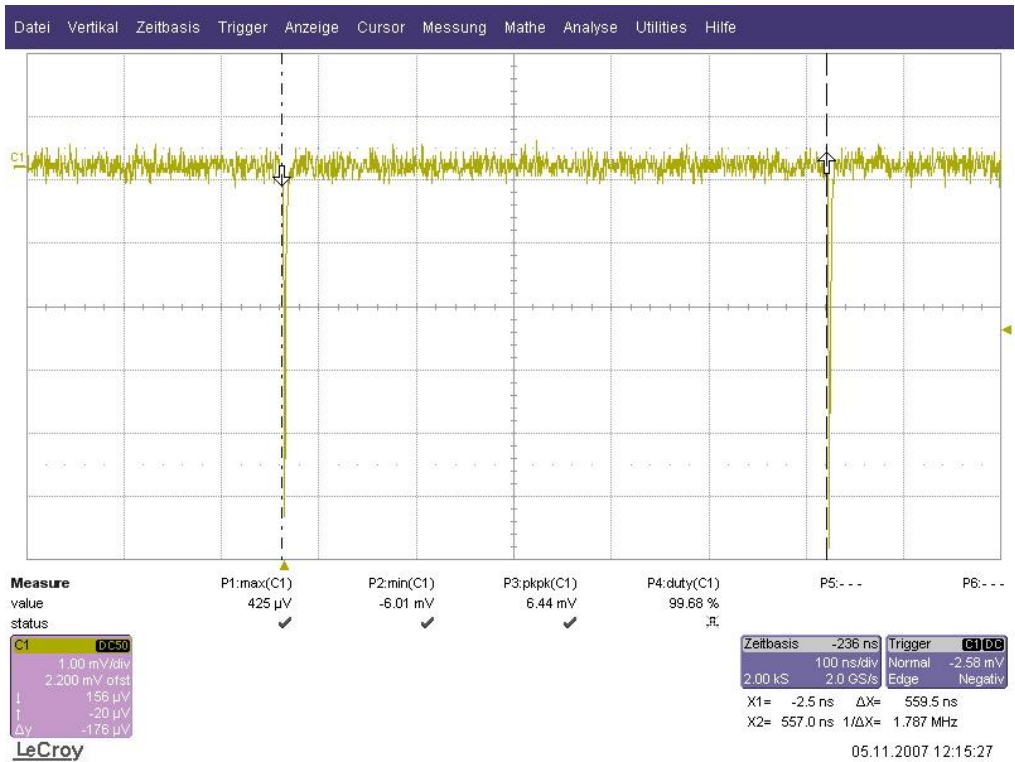
Designation of Emissions:	1G08P0NAN
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8.3 Duty Cycle Measurement

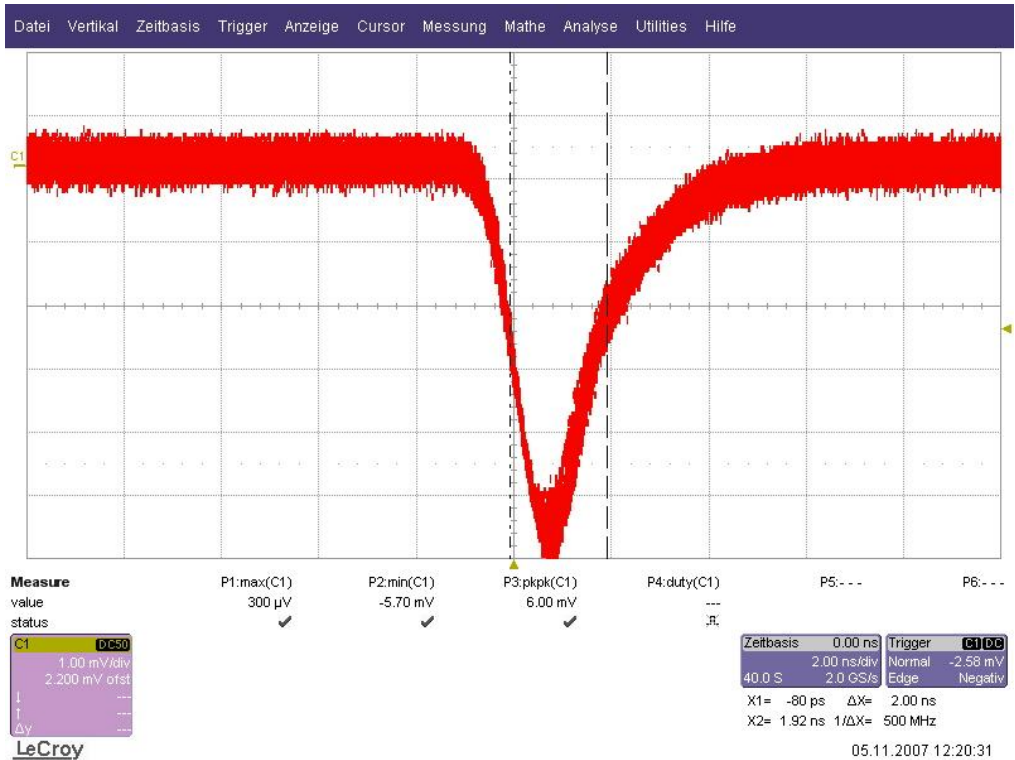
Rules and specifications:	CFR 47 Part 15, section 15.35(c) IC RSS-Gen Issue 2, section 4.5
Guide:	ANSI C63.4

Comment:	Measurement with negative diode detector.
Date of test:	05 November 2007
Test site:	Fully anechoic room, cabin no. 2

Total Pulse Train:



Single pulse:



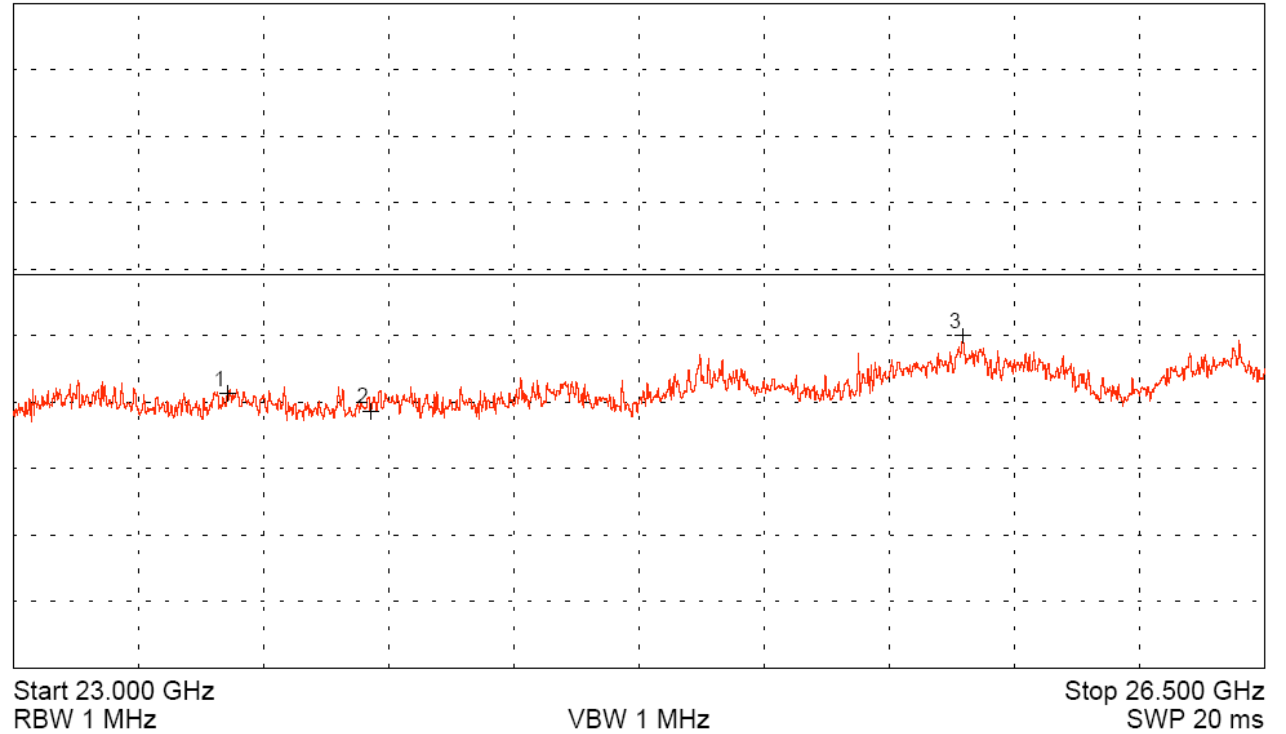
Calculation of Duty cycle correction:

TX-On-Time (worst case):	T_{on}	=	2.79 ns
Pulse Train Time:	T_{pt}	=	558.5 ns
Period Time:	T_{period}	=	558.5 ns
Pulse Train Correction:	C_{pt}	=	$20 \cdot \text{Log}(T_{on} / T_{period}) \text{ dB}$
		=	-46.0 dB

8.4 Restricted bands of operation

Rules and specifications:	CFR 47 Part 15, section 15.205(a) IC RSS-210 Issue 7, section 2.2(a)
Guide:	ANSI C63.4
Limit:	Only spurious emissions are permitted in any of the frequency bands listed in CFR 47 Part 15, section 15.205(a) or IC RSS-210 Issue 7, section 2.2(a).

Comment:	DUT in vertical position
Date of test:	
Test site:	Fully anechoic room, cabin no. 2
Test distance:	3 meters



Test Result:	Test passed
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8.5 Conducted Powerline Emission Measurement 150 kHz to 30 MHz

Rules and specifications:	CFR 47 Part 15, section 15.207 IC RSS-Gen Issue 2, section 7.2.2		
Guide:	ANSI C63.4 / CISPR 22		
Limit:	Frequency of Emission (MHz)	Conducted Limit (dBµV)	
		Quasi-peak	Average
	0.15 - 0.5	66 to 56	56 to 46
	0.5 - 5	56	46
	5 - 30	60	50

Comment:	EUT has no AC mains supply. Test performed on DC supply instead.
Date of test:	2007
Test site:	Shielded room, cabin no. 4

Test Result:	Test passed
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Tested on:	DC supply: PLUS
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Frequency (MHz)	Detector	Reading Value (dBµV)	Correction Factor (dB)	Final Value (dBµV)	CFR 47 Part 15 Limit (dBµV)	Margin (dB)	RSS-210 Limit (dBµV)	Margin (dB)
0.150 - 30	Quasi-Peak	0.0	0.0	***				

*** No measurements above noise level detected.

Tested on:	DC supply: MINUS
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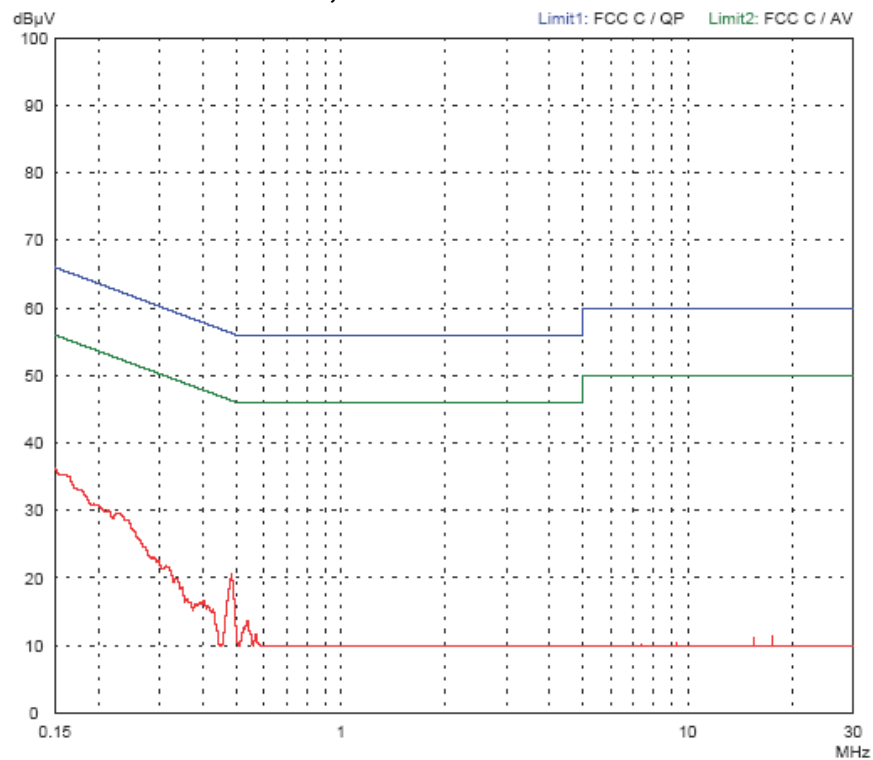
Frequency (MHz)	Detector	Reading Value (dBµV)	Correction Factor (dB)	Final Value (dBµV)	CFR 47 Part 15 Limit (dBµV)	Margin (dB)	RSS-210 Limit (dBµV)	Margin (dB)
0.150 - 30	Quasi-Peak	0.0	0.0	***				

*** No measurements above noise level detected.

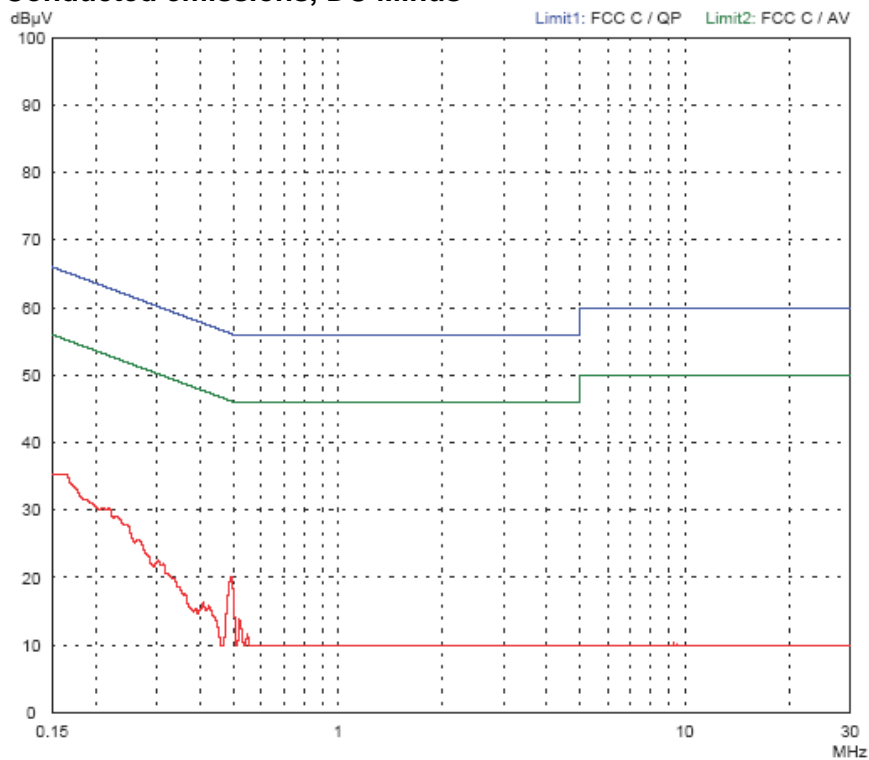
Sample calculation of final values:

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

Conducted emiswsions, DC Plus



Conducted emissions, DC Minus



8.6 Radiated Emission Measurement 9 kHz to 30 MHz

Rules and specifications:	CFR 47 Part 15, sections 15.205 and 15.209 IC RSS-210 Issue 7, sections 2.2 and 2.6			
Guide:	ANSI C63.4			
Limit:	Frequency of Emission (MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Measurement Distance d (meters)
	0.009 - 0.490	2400/F(kHz)	67.6 - 20 · log(F(kHz))	300
	0.490 - 1.705	24000/F(kHz)	87.6 - 20 · log(F(kHz))	30
	1.705 - 30.000	30	29.5	30
Additionally, the level of any unwanted emissions shall not exceed the level of the fundamental emission.				

Test Result:	Test passed
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8.7 Radiated Emission Measurement 30 MHz to 110 GHz

Rules and specifications:	CFR 47 Part 15, section 15.209 IC RSS-210 Issue 7, section 2.6		
Guide:	ANSI C63.4		
Limit:	Frequency of Emission (MHz)	Field Strength (µV/m)	Field Strength (dBµV/m)
	30 - 88	100	40.0
	88 - 216	150	43.5
	216 - 960	200	46.0
	Above 960	500	54.0

Comment:	Tested at 0.5 m distance, reading recalculated for 3 m test distance, includes pulse desensitization factor.		
Date of test:	September 2007		
Test site:	Frequencies ≤ 1 GHz: Open field test site Frequencies > 1 GHz: Fully anechoic room, cabin no. 2		
Test distance:	3 meters		

Test Result:	Test passed
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Frequency (MHz)	Polarization	Detector	Reading (dBµV)	Correction (dB/m)	Pulse Train Corr. (dB)	Final Value (dBµV(m)	Limit (dBµV/m)	Margin (dB)
25972,000	horizontal	Peak	6,0	43,0	0,0	49,0	54,0	5,0

9 Referenced Regulations

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

<input checked="" type="checkbox"/>	CFR 47 Part 2	Code of Federal Regulations Part 2 (Frequency allocation and radio treaty matters; General rules and regulations) of the Federal Communication Commission (FCC)	October 1, 2008
<input checked="" type="checkbox"/>	CFR 47 Part 15	Code of Federal Regulations Part 15 (Radio Frequency Devices) of the Federal Communication Commission (FCC)	October 1, 2008
<input checked="" type="checkbox"/>	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 on January 30, 2004)
<input checked="" type="checkbox"/>	RSS-Gen	Radio Standards Specification RSS-Gen Issue 2 containing General Requirements and Information for the Certification of Radiocommunication Equipmment, published by Industry Canada	June 2007
<input checked="" type="checkbox"/>	RSS-210	Radio Standards Specification RSS-210 Issue 7 for Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, published by Industry Canada	June 2007
<input type="checkbox"/>	RSS-310	Radio Standards Specification RSS-310 Issue 2 for Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category II Equipment, published by Industry Canada	June 2007
<input checked="" type="checkbox"/>	RSS-102	Radio Standards Specification RSS-102 Issue 4: Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands), published by Industry Canada	March 2010
<input type="checkbox"/>	ICES-003	Interference-Causing Equipment Standard ICES-003 Issue 4 for Digital Apparatus, published by Industry Canada	February 7, 2004
<input checked="" type="checkbox"/>	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
<input type="checkbox"/>	CAN/CSA-CEI/IEC CISPR 22	Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment	2002
<input checked="" type="checkbox"/>	TRC-43	Notes Regarding Designation of Emission (Including Necessary Bandwidth and Classification), Class of Station and Nature of Service, published by Industry Canada	October 9, 1982

10 Revision History

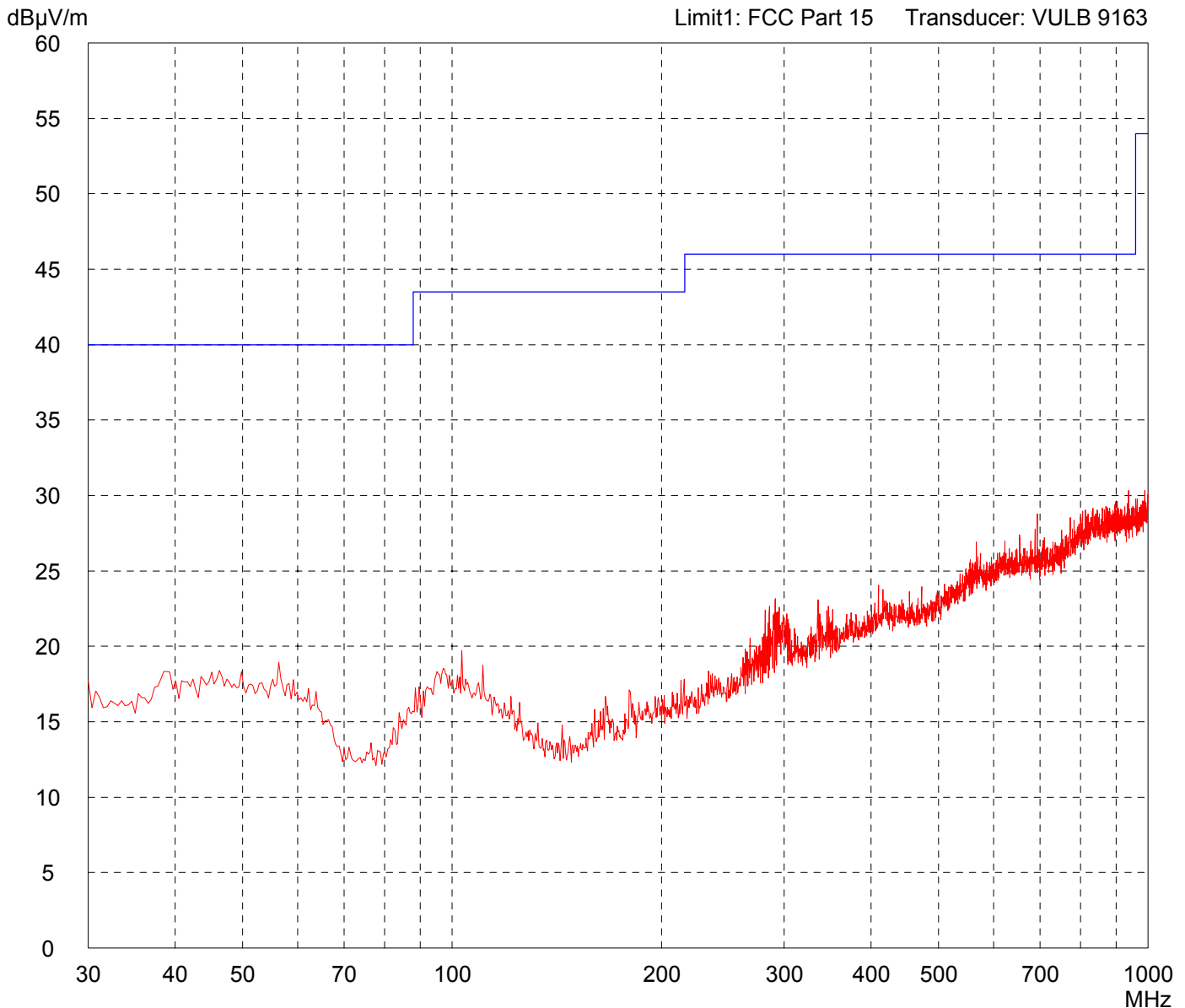
Edition	Date	Issued by	Note
01	10.12.2007	J. Roidt	First edition
02	09.12.2008	C. Jäger (jr)	Edition 2 required for FCC-/IC certification Test report updated: FCC regulations Radiated emission test 9 kHz - 30 MHz
03	17.05.2010	C. Jäger (jr)	Edition 3 required for FCC-/IC certification Test report updated: FCC regulations

11 Charts taken during testing

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

Model: FMR54X with 200 mm Parabol	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

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

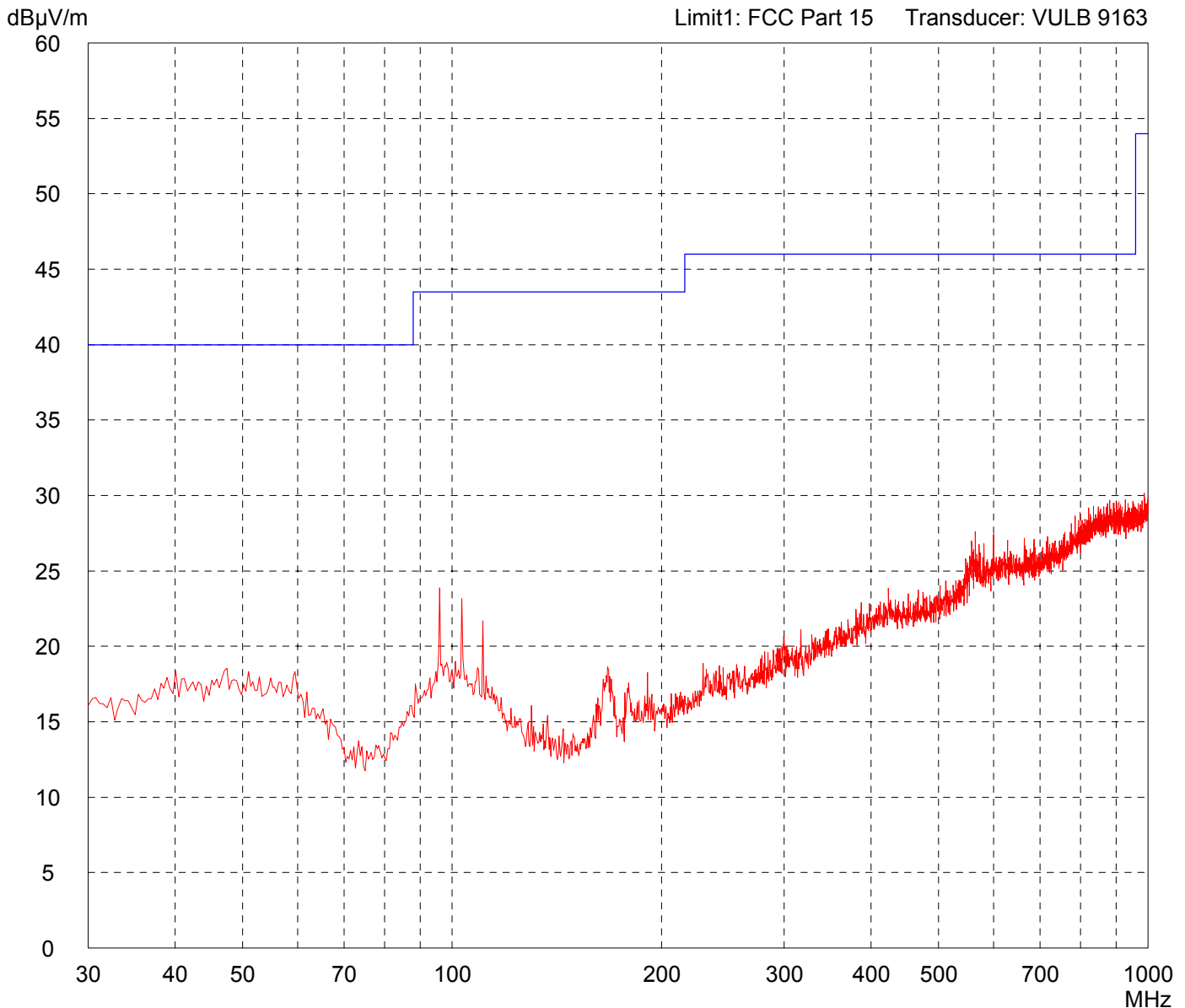


Result: Prescan	Project file: 50511-61106-1
	Page of Pages

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

Model: FMR54X with 200 mm Parabol	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

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

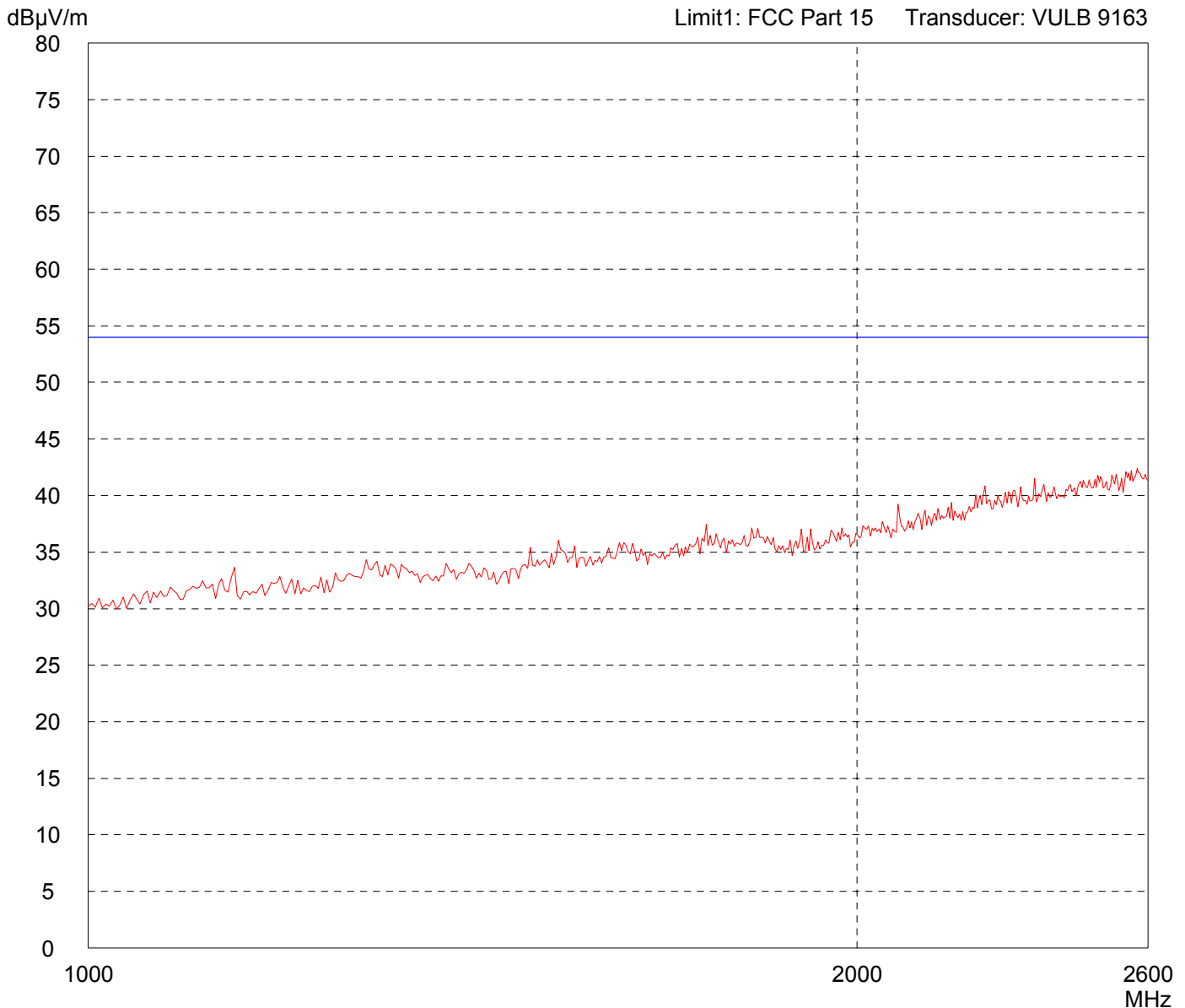


Result: Prescan	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 1 GHz - 2.6 GHz acc. to FCC Part 15 (Fully Anechoic Chamber)

Model: FMR54X with 200 mm Parabol	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

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

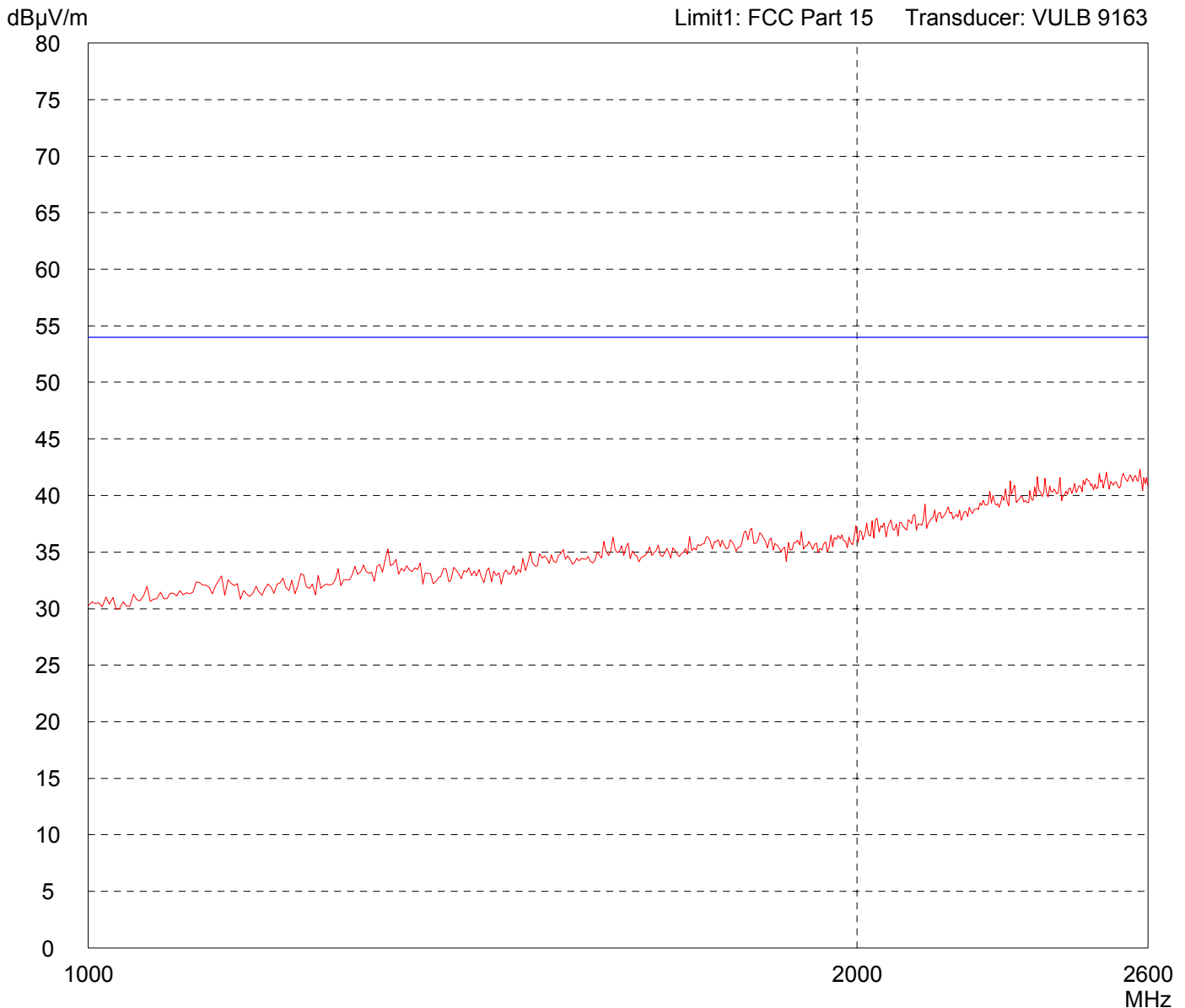


Result: Prescan	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 1 GHz - 2.6 GHz acc. to FCC Part 15 (Fully Anechoic Chamber)

Model: FMR54X with 200 mm Parabol	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: <div style="display: flex; justify-content: space-between;"> 10 dB Margin 50 Subranges </div>
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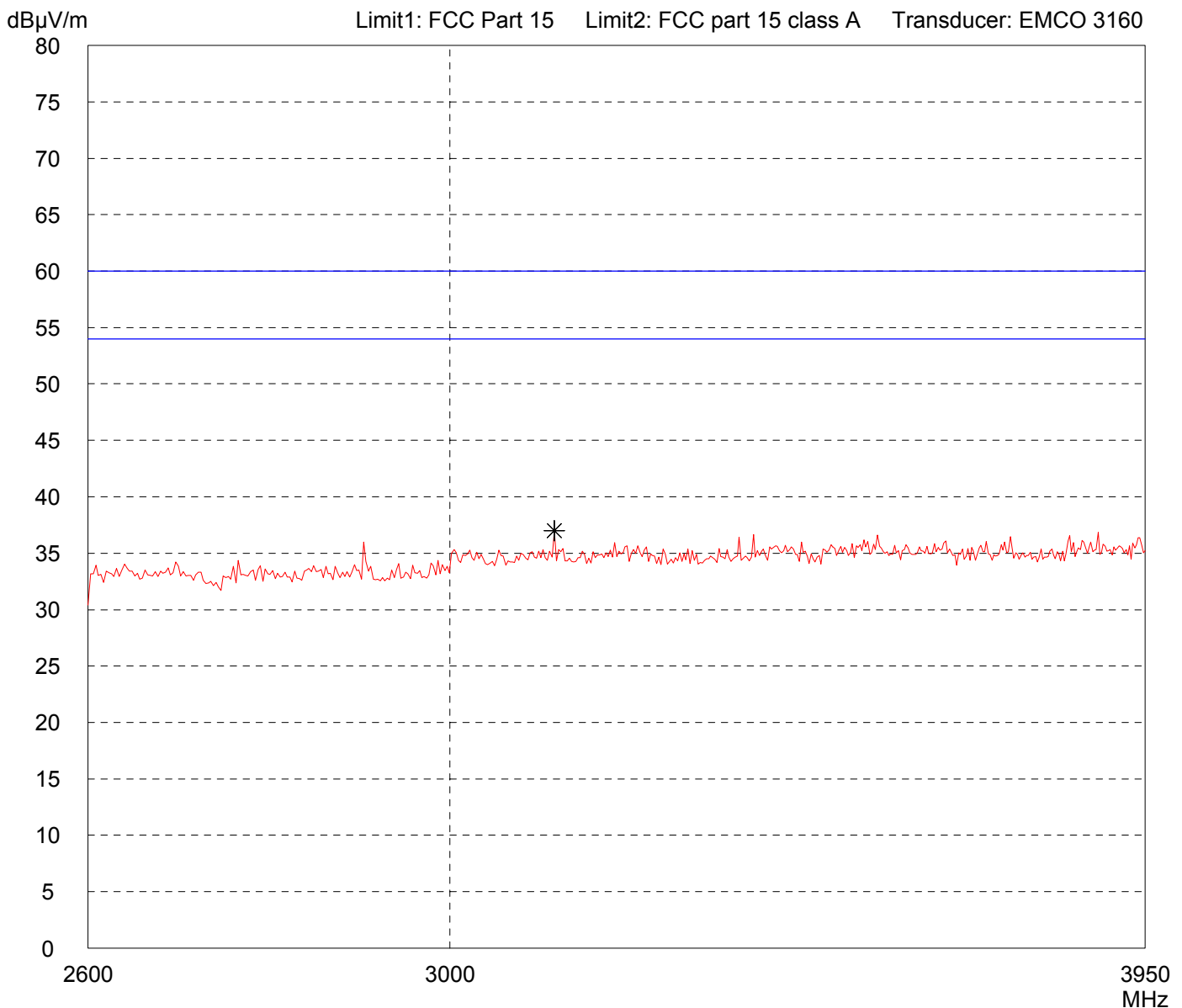


Result: Prescan	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 2.6 GHz - 3.95 GHz acc. to FCC Part 15 (EMCO 3160)

Model: FMR54X with 200 mm Parabol	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 meters Horizontal Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
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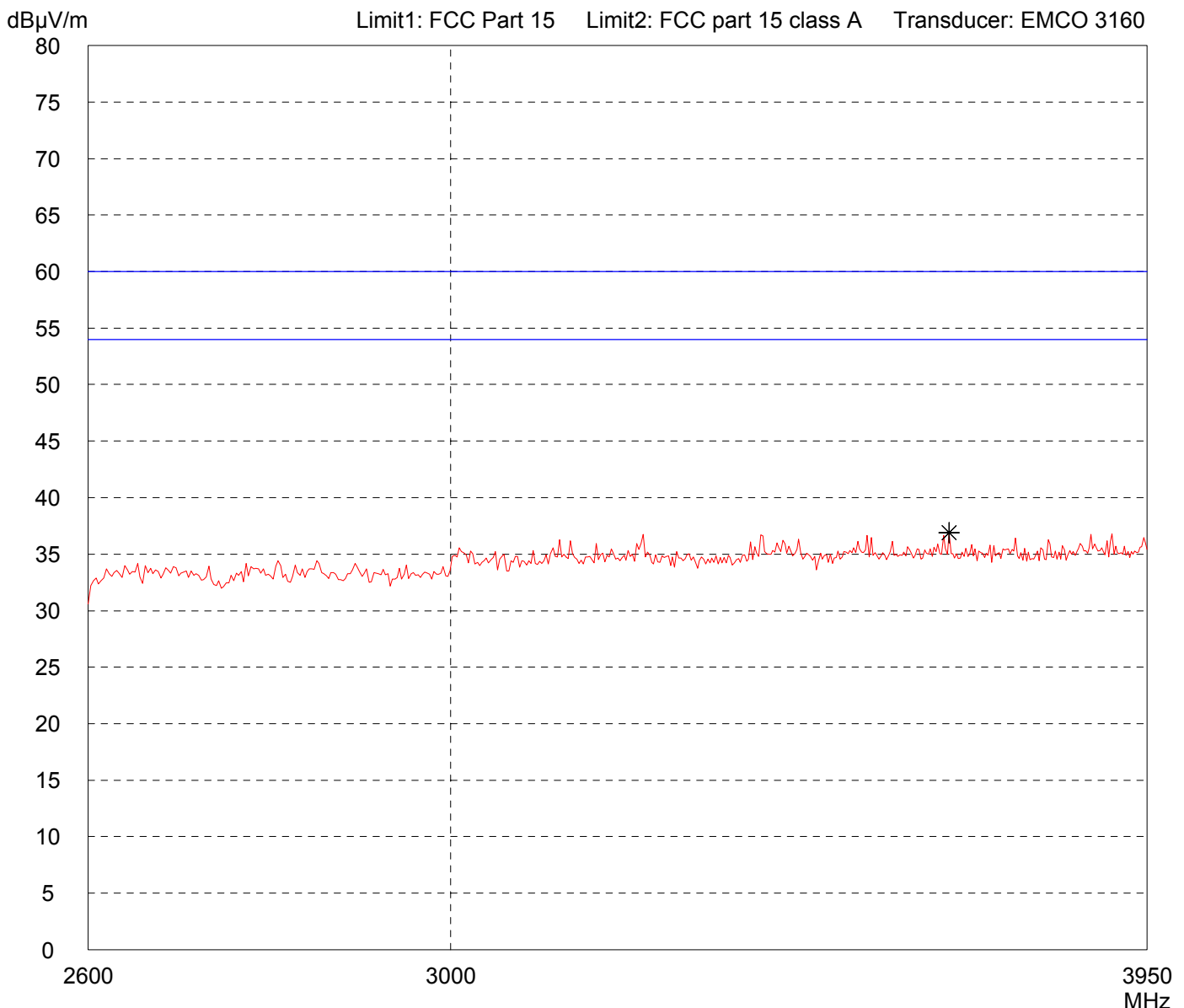


Result: Prescan	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 2.6 GHz - 3.95 GHz acc. to FCC Part 15 (EMCO 3160)

Model: FMR54X with 200 mm Parabol	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 meters Vertical Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
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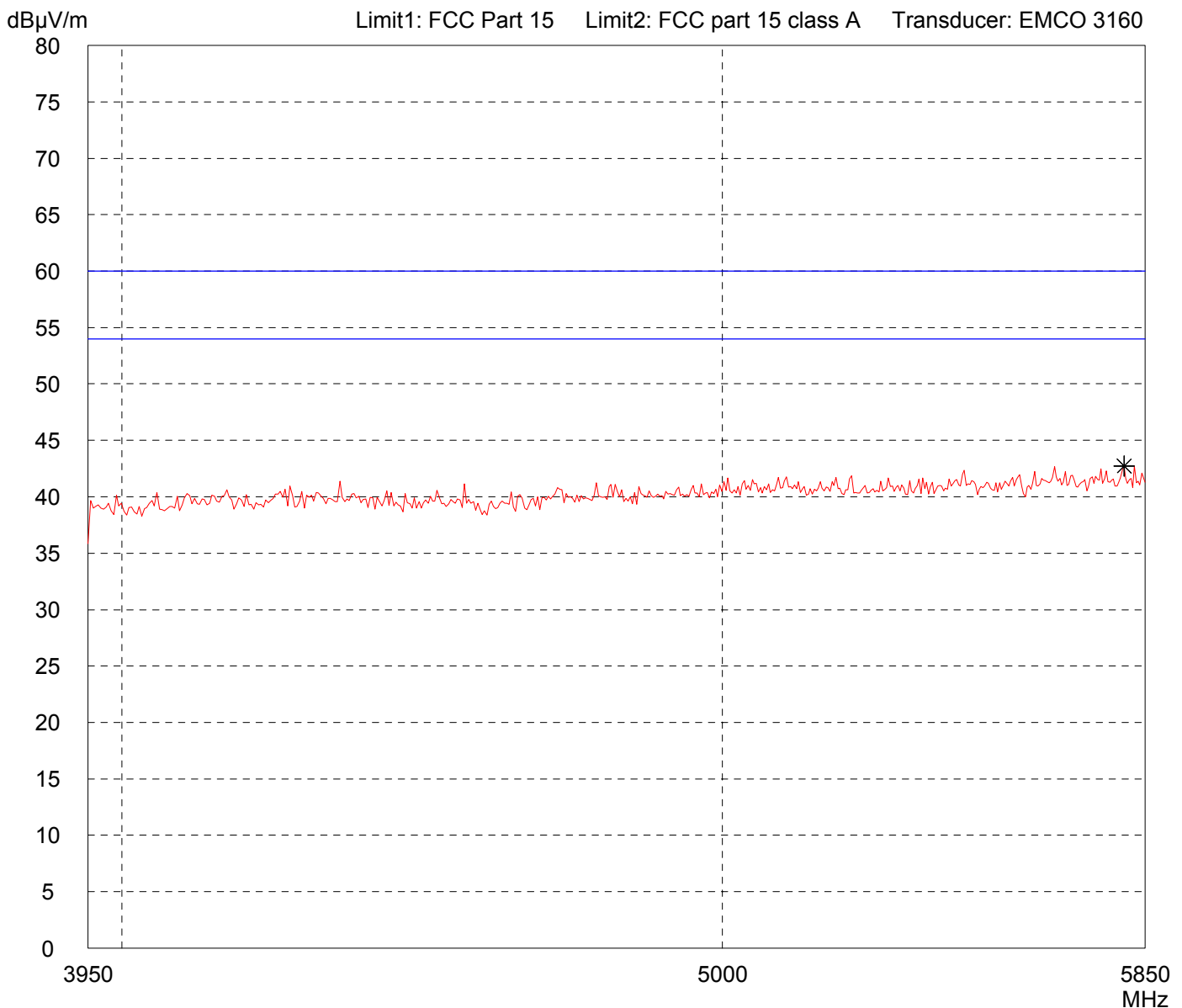


Result: Prescan	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 3.95 GHz - 5.85 GHz acc. to FCC Part 15 (EMCO 3160)

Model: FMR54X with 200 mm Parabol	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
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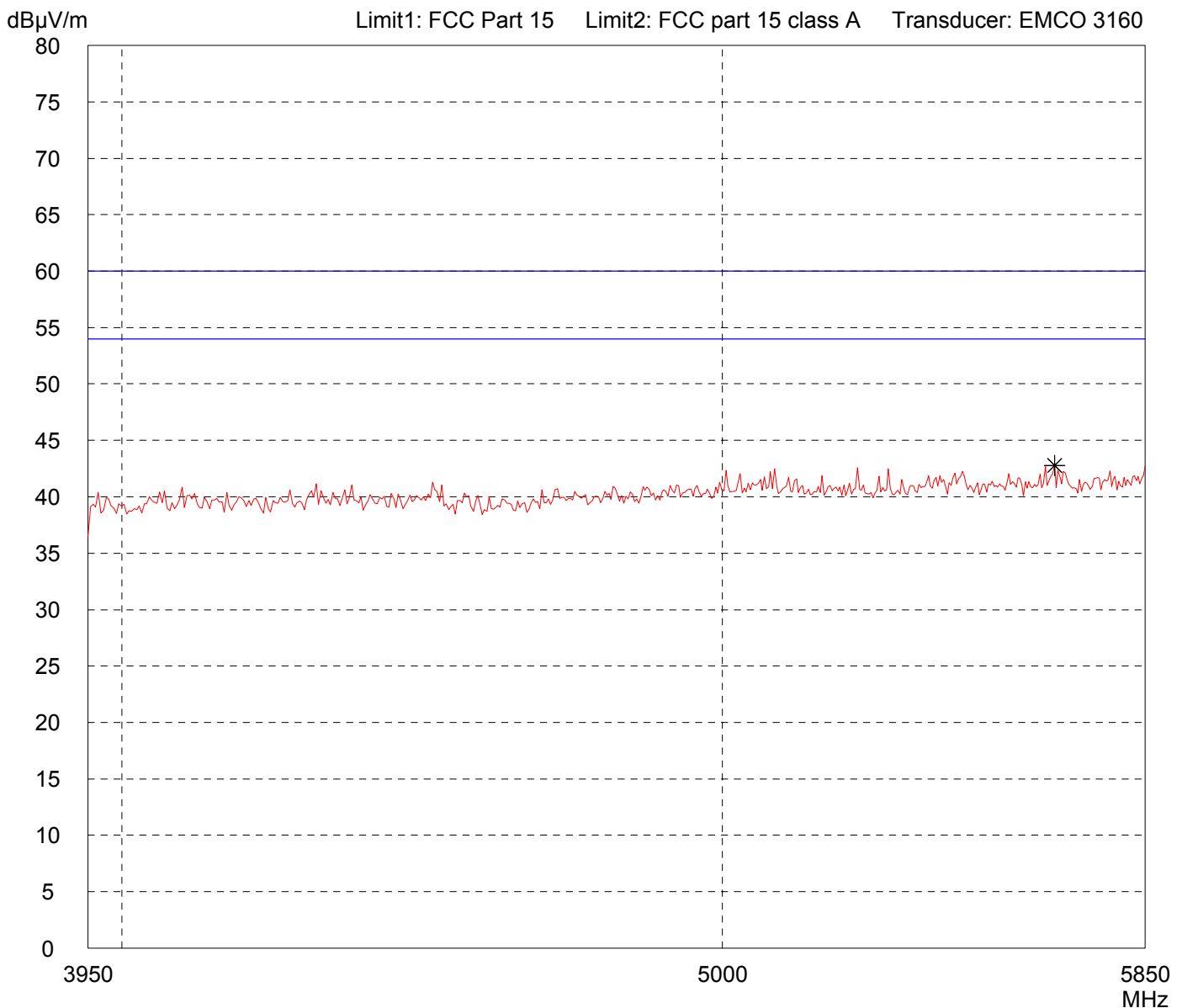


Result: Prescan	Project file: 50511-61106-1
Page of Pages	

Radiated Emission Test 3.95 GHz - 5.85 GHz acc. to FCC Part 15 (EMCO 3160)

Model: FMR54X with 200 mm Parabol	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
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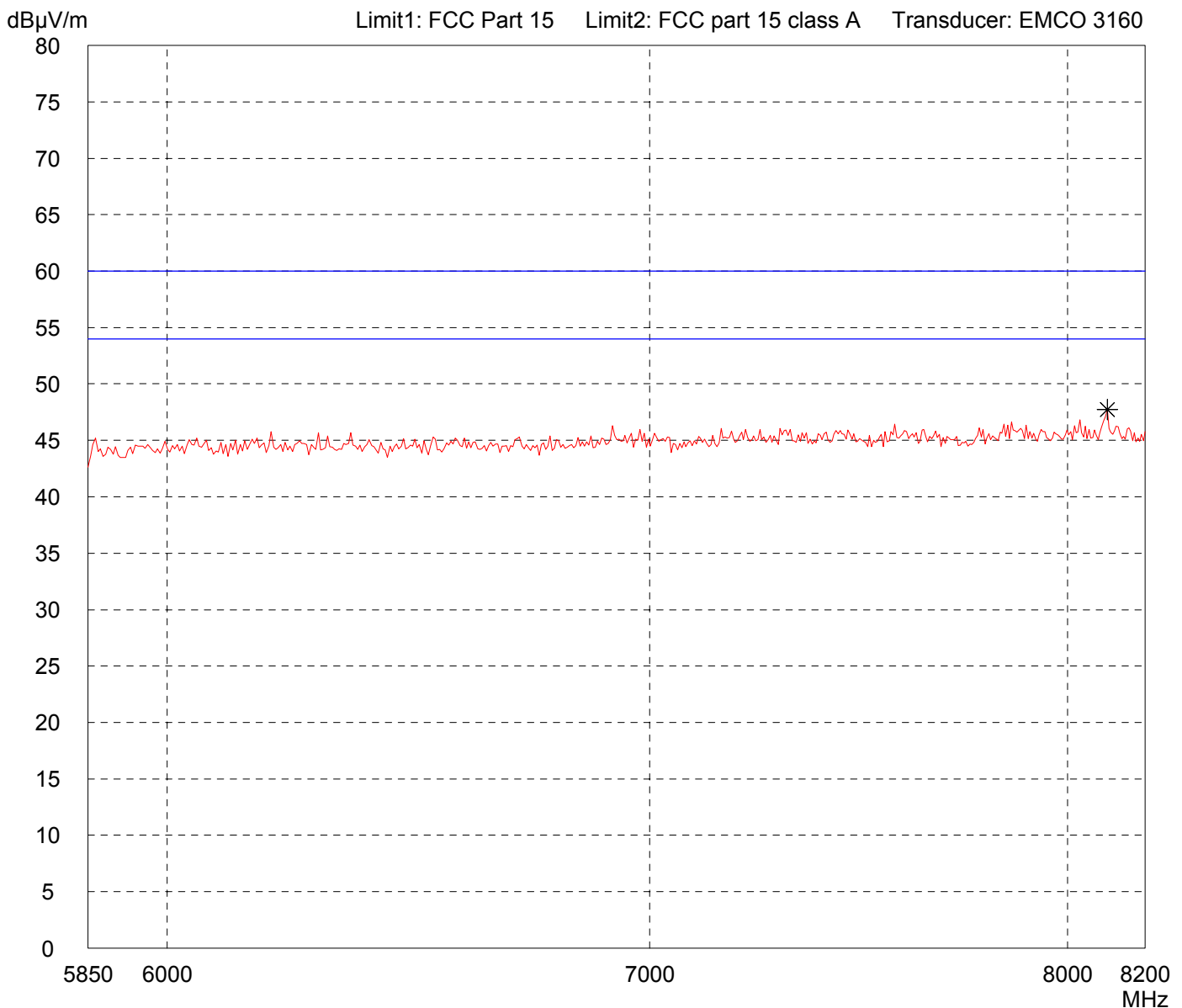


Result: Prescan	Project file: 50511-61106-1
Page of Pages	

Radiated Emission Test 5.85 GHz - 8.2 GHz acc. to FCC Part 15 (EMCO 3160)

Model: FMR54X with 200 mm Parabol	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
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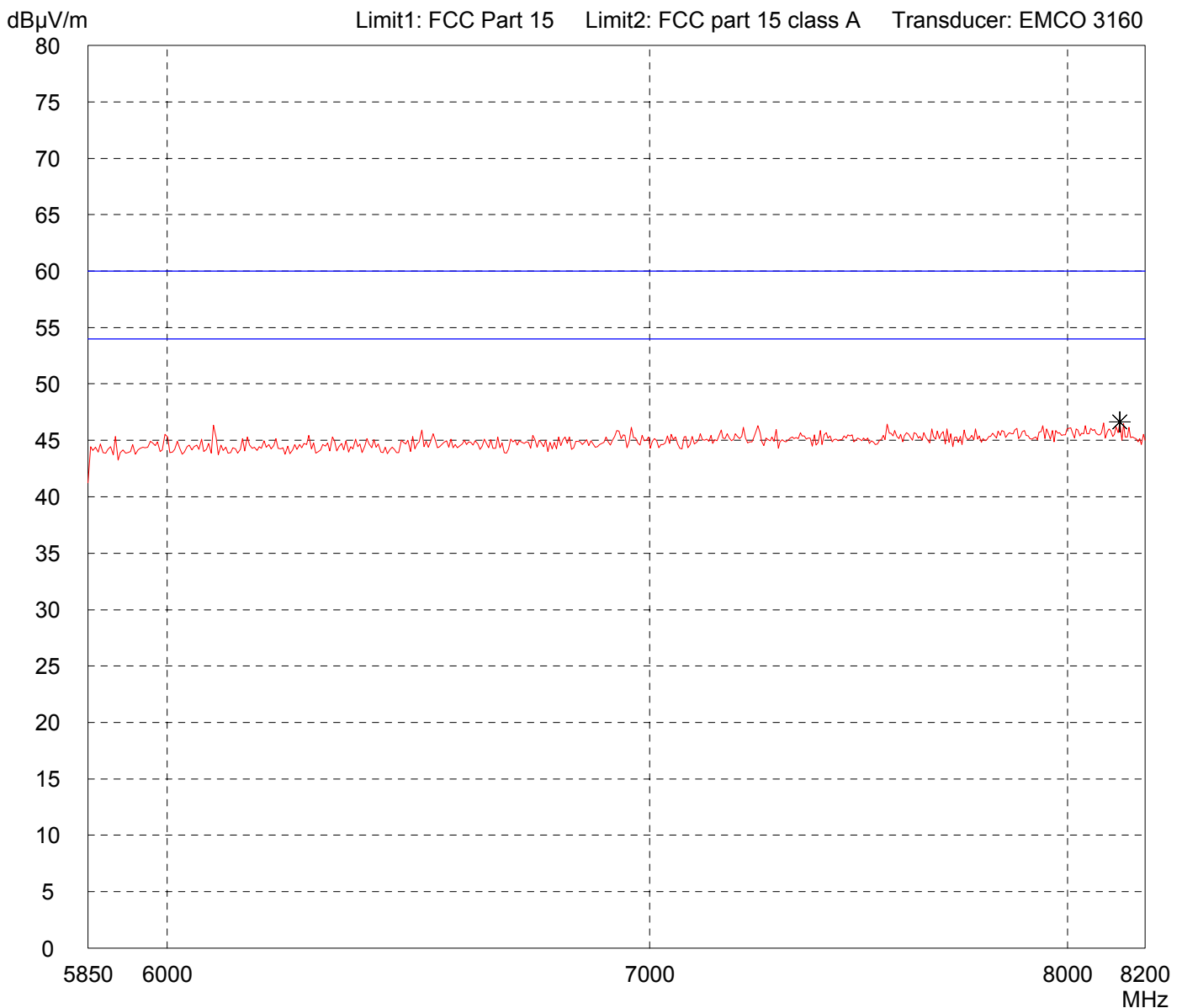


Result: Prescan	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 5.85 GHz - 8.2 GHz acc. to FCC Part 15 (EMCO 3160)

Model: FMR54X with 200 mm Parabol	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
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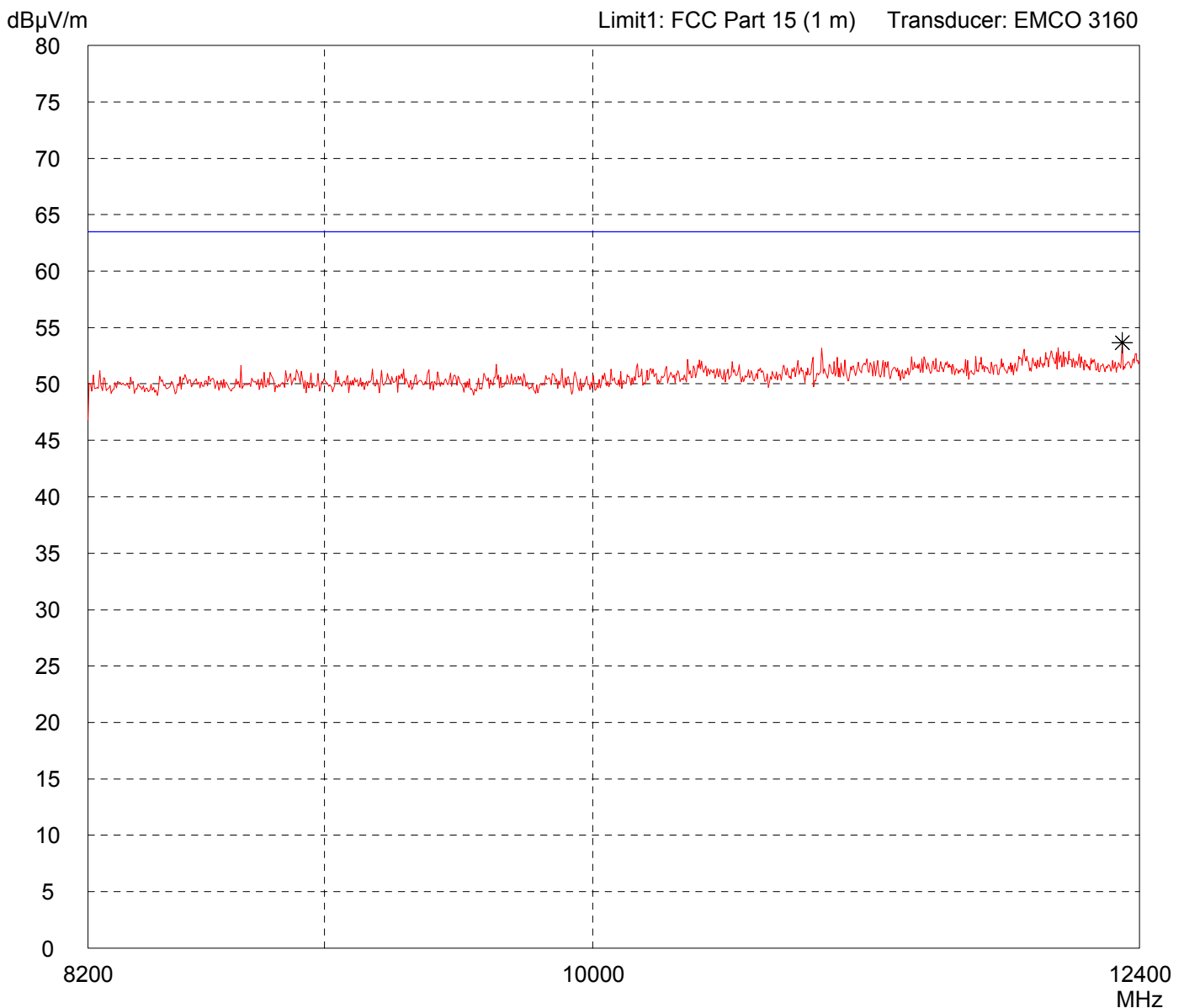


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	Page of Pages

Radiated Emission Test 8.2 GHz - 12.4 GHz acc. to FCC Part 15 (EMCO 3160)

Model: FMR54X with 200 mm Parabol	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 1 meter Horizontal Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

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

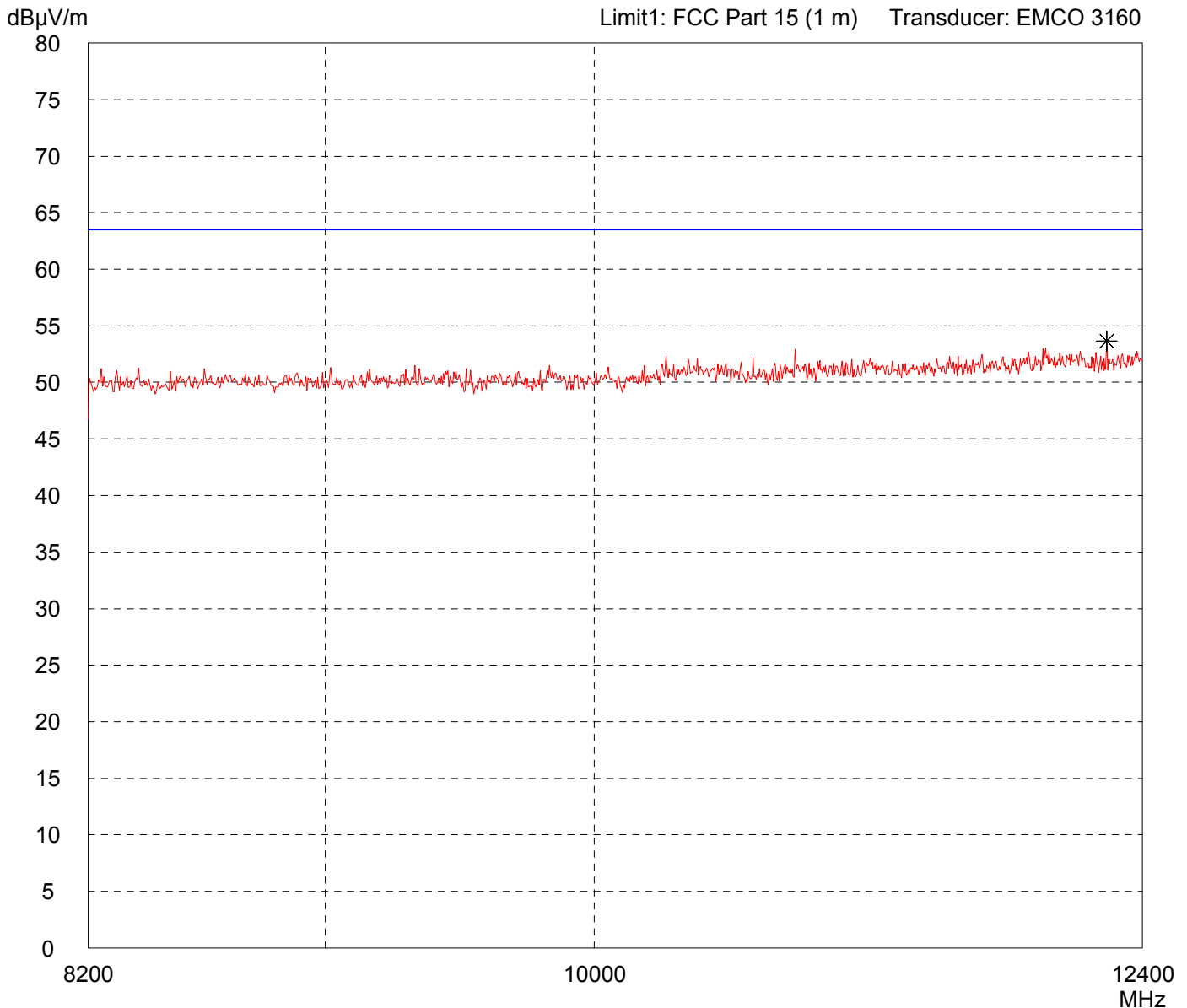


Result: Prescan	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 8.2 GHz - 12.4 GHz acc. to FCC Part 15 (EMCO 3160)

Model: FMR54X with 200 mm Parabol	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 1 meter Vertical Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: <div style="display: flex; justify-content: space-between;"> 10 dB Margin 50 Subranges </div>
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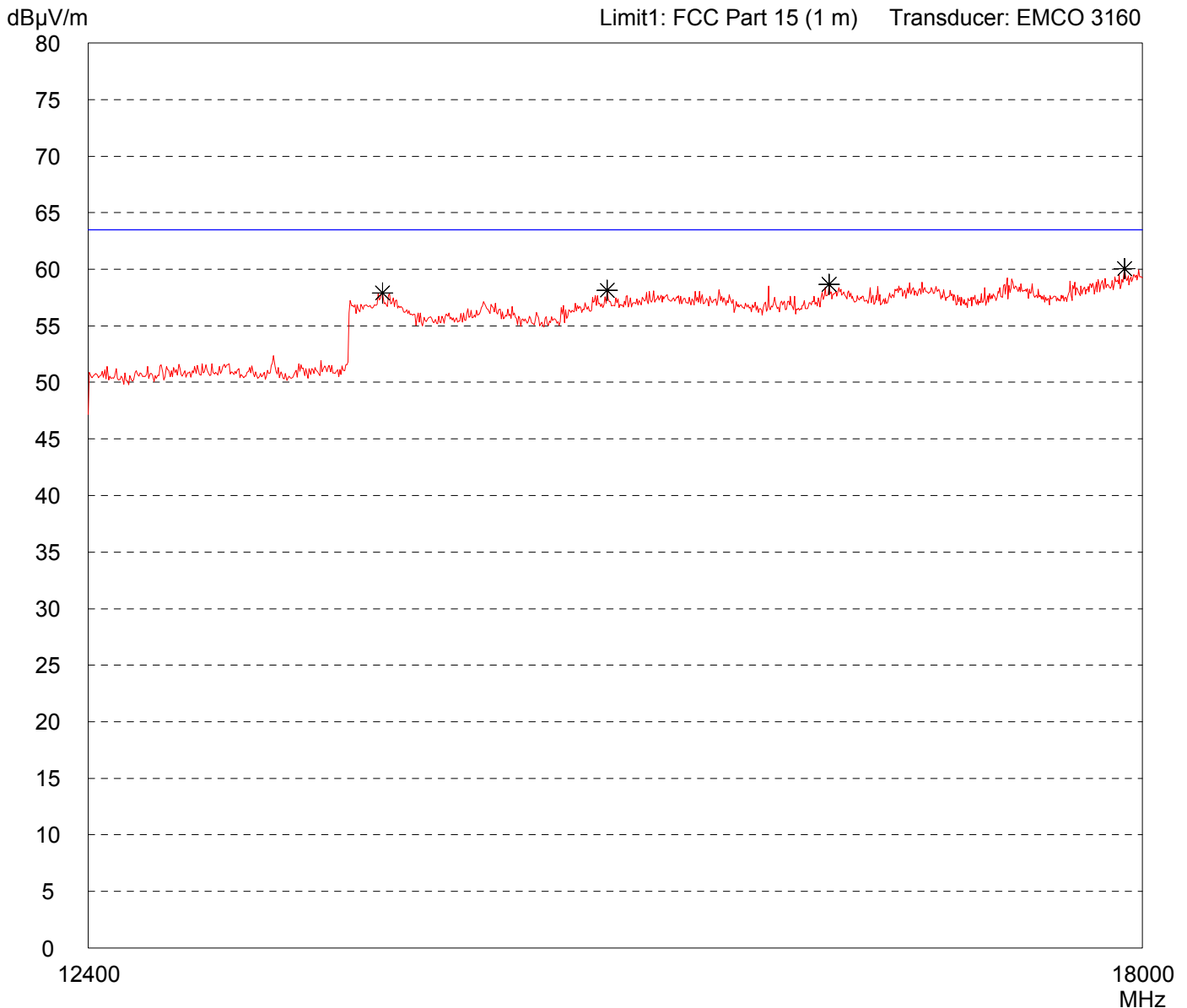


Result: Prescan	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 12.4 GHz - 18 GHz acc. to FCC Part 15 (EMCO 3160)

Model: FMR54X with 200 mm Parabol	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 1 meter Horizontal Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
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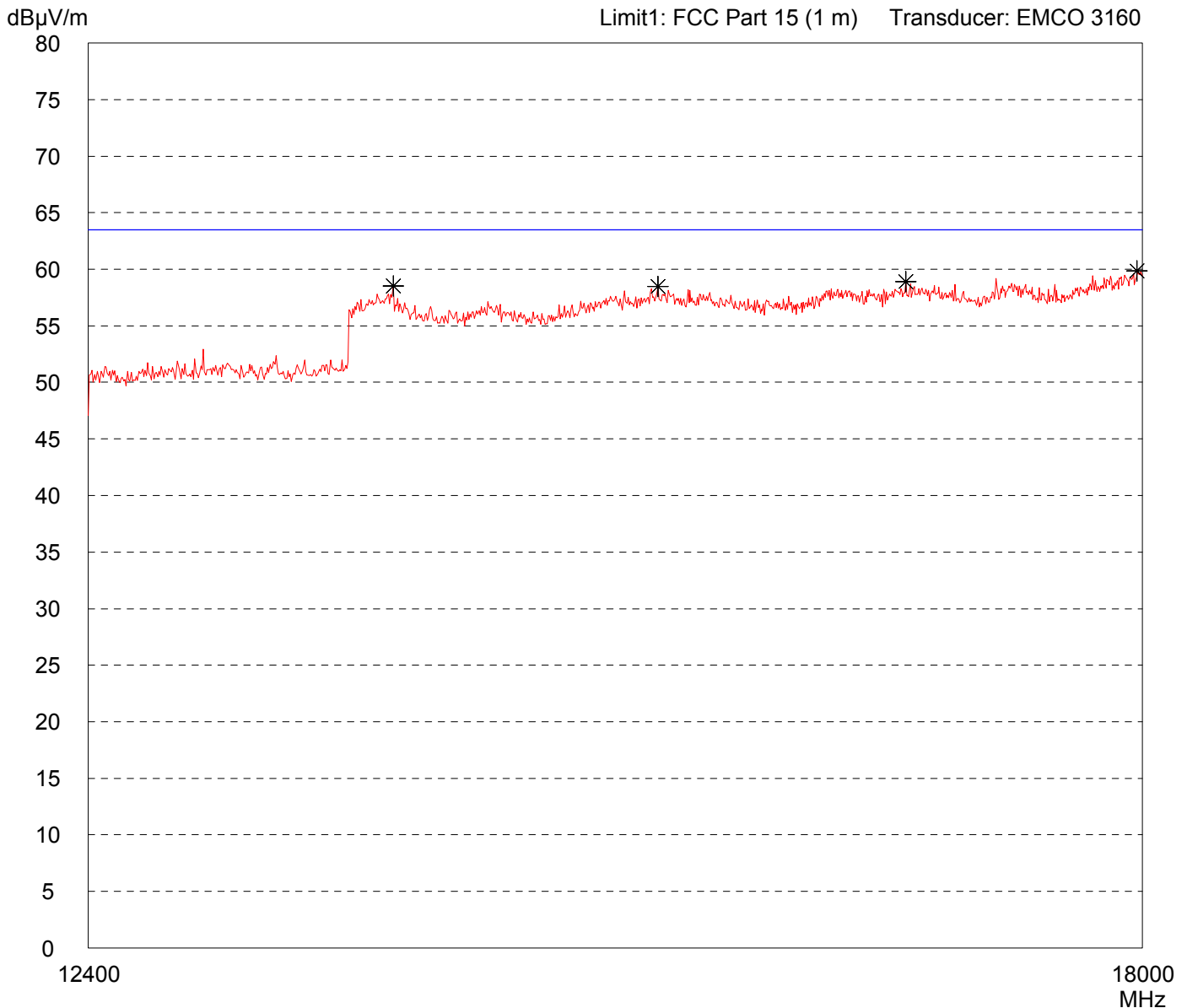


Result: Prescan (VBR = 100 kHz)	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 12.4 GHz - 18 GHz acc. to FCC Part 15 (EMCO 3160)

Model: FMR54X with 200 mm Parabol	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 1 meter Vertical Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
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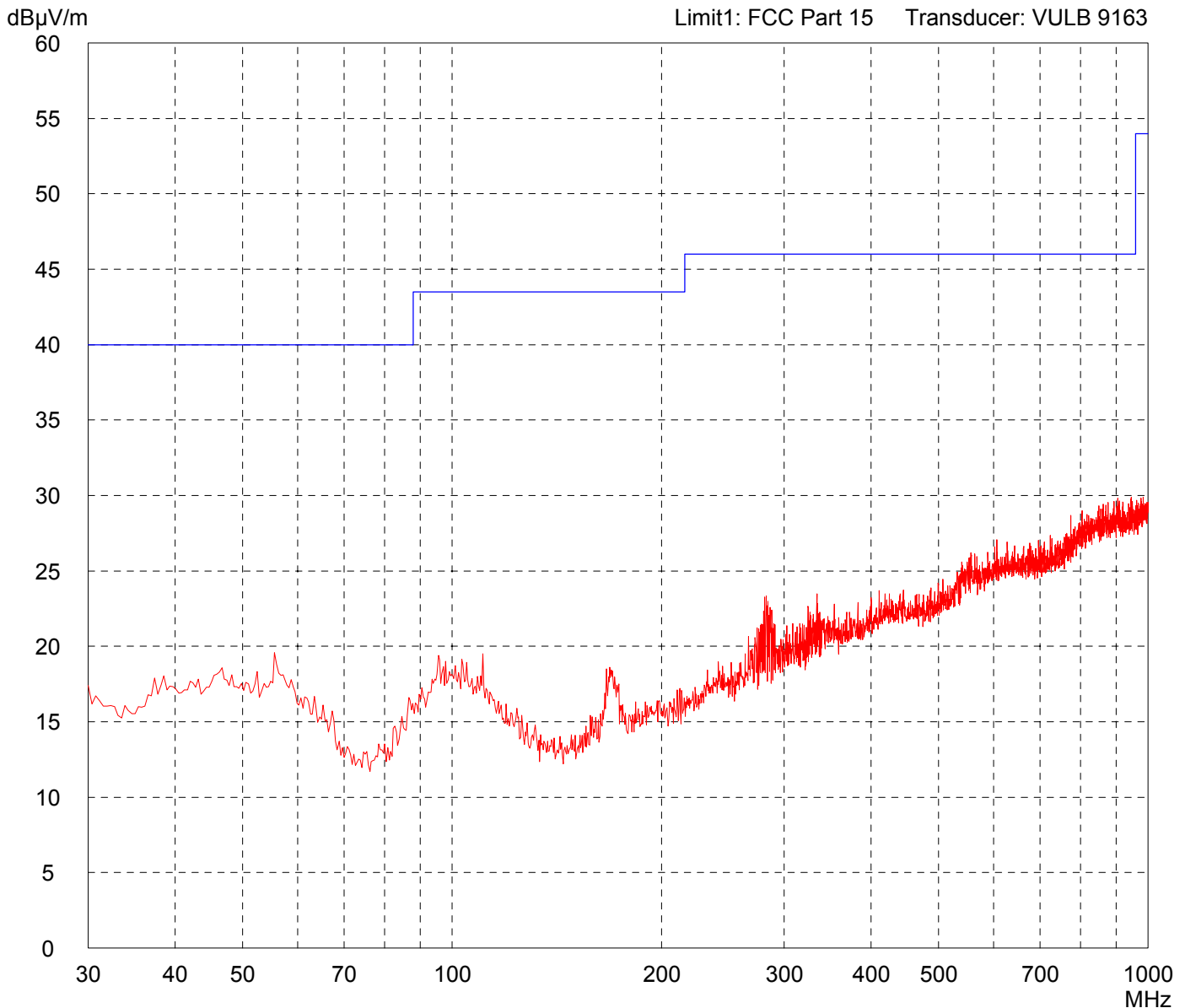


Result: Prescan (VBR = 100 kHz)	Project file: 50511-61106-1
	Page of Pages

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

Model: FMR54X with 4" Horn	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: <div style="display: flex; justify-content: space-between;"> 10 dB Margin 50 Subranges </div>
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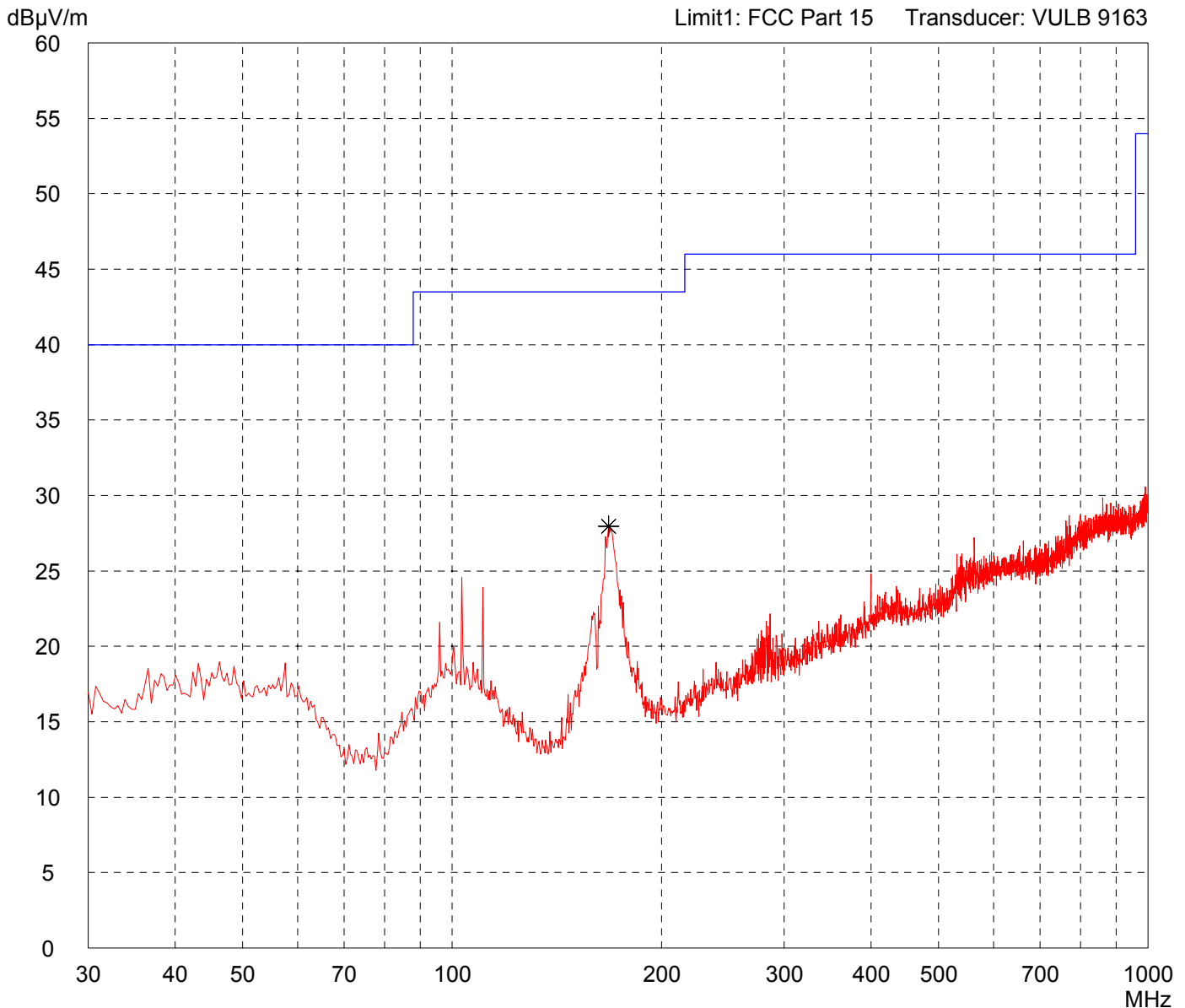


Result: Prescan	Project file: 50511-61106-1
	Page of Pages

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

Model: FMR54X with 4" Horn	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
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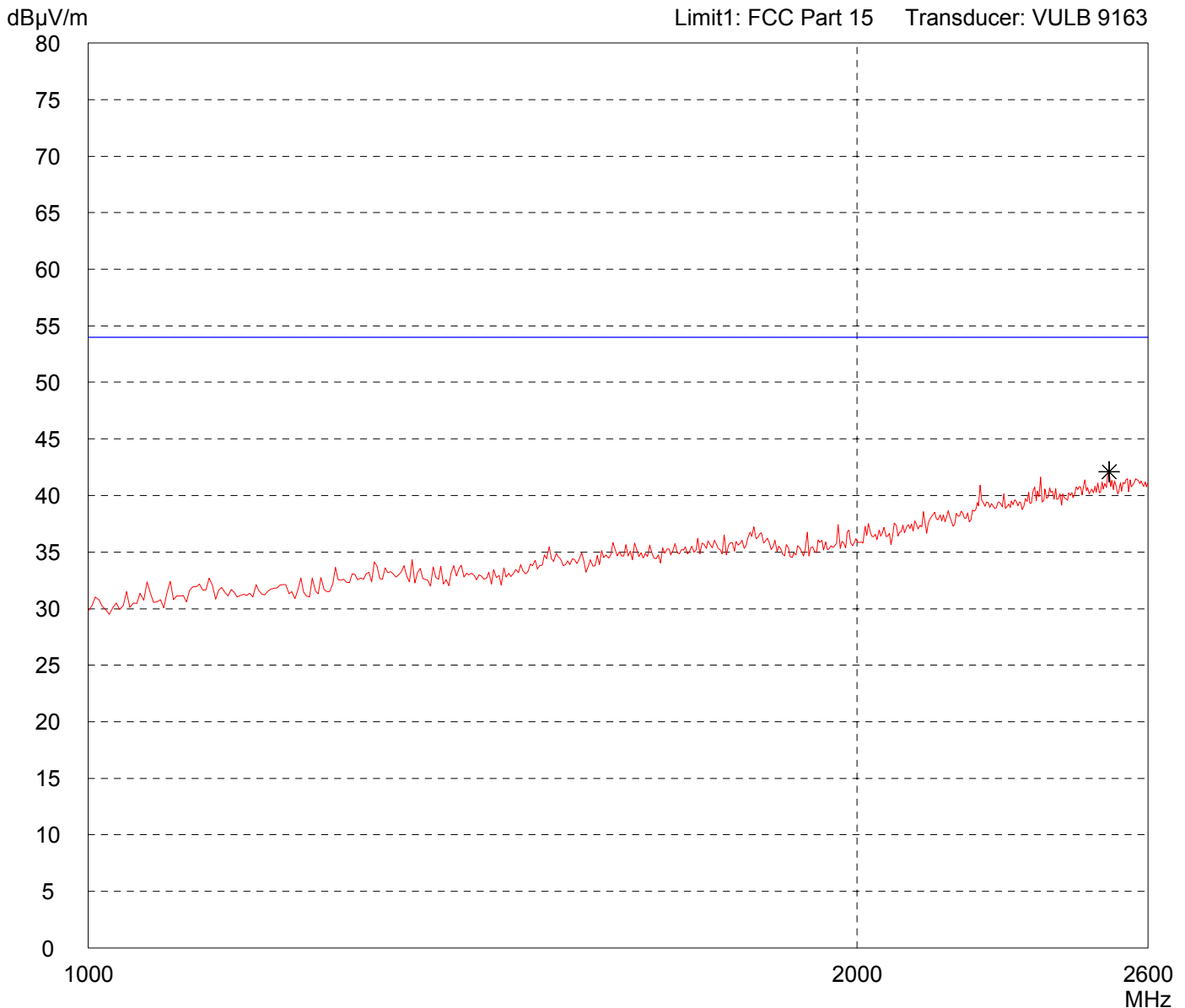


Result: Prescan	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 1 GHz - 2.6 GHz acc. to FCC Part 15 (Fully Anechoic Chamber)

Model: FMR54X with 4" Horn	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
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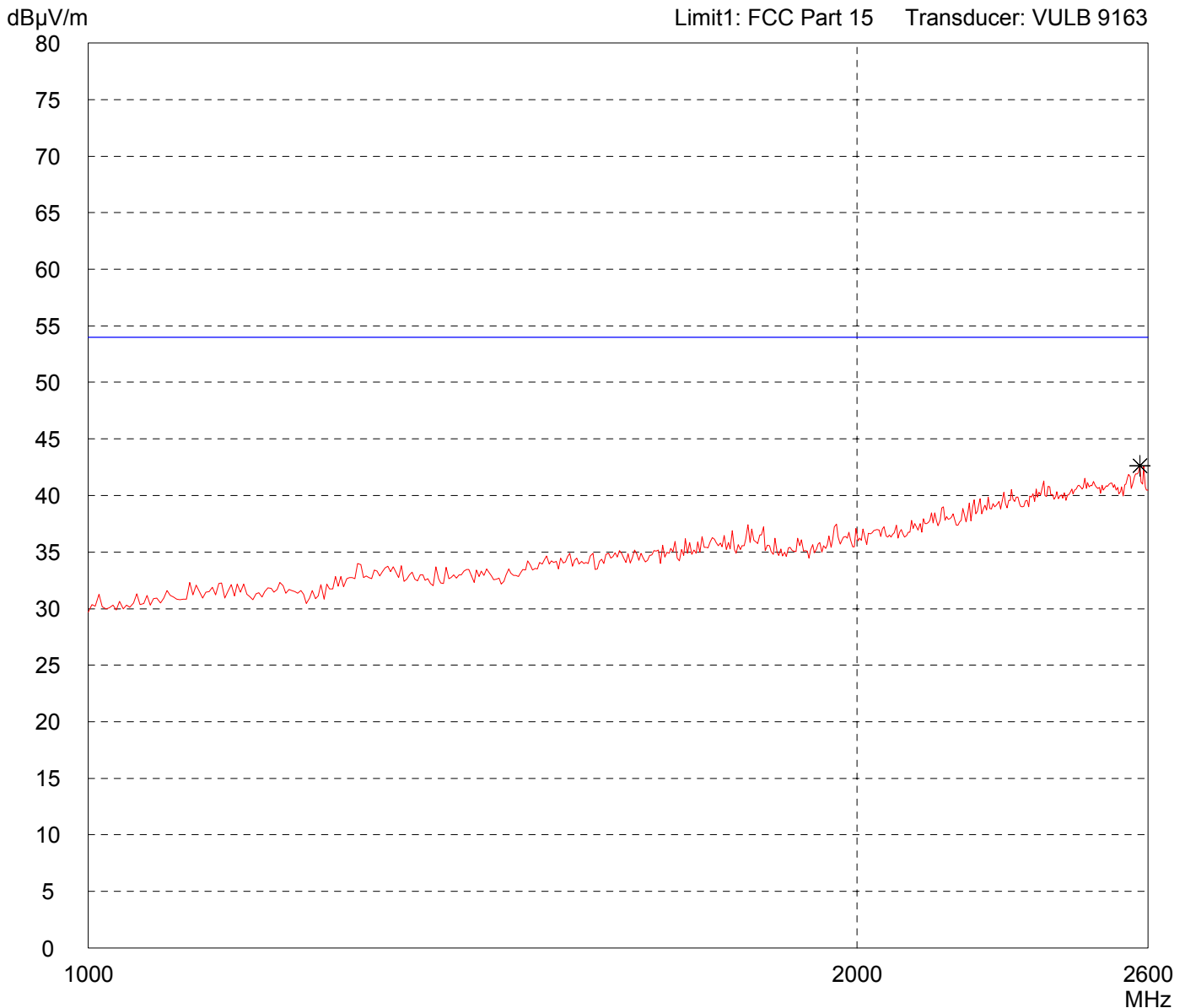


Result: Prescan	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 1 GHz - 2.6 GHz acc. to FCC Part 15 (Fully Anechoic Chamber)

Model: FMR54X with 4" Horn	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

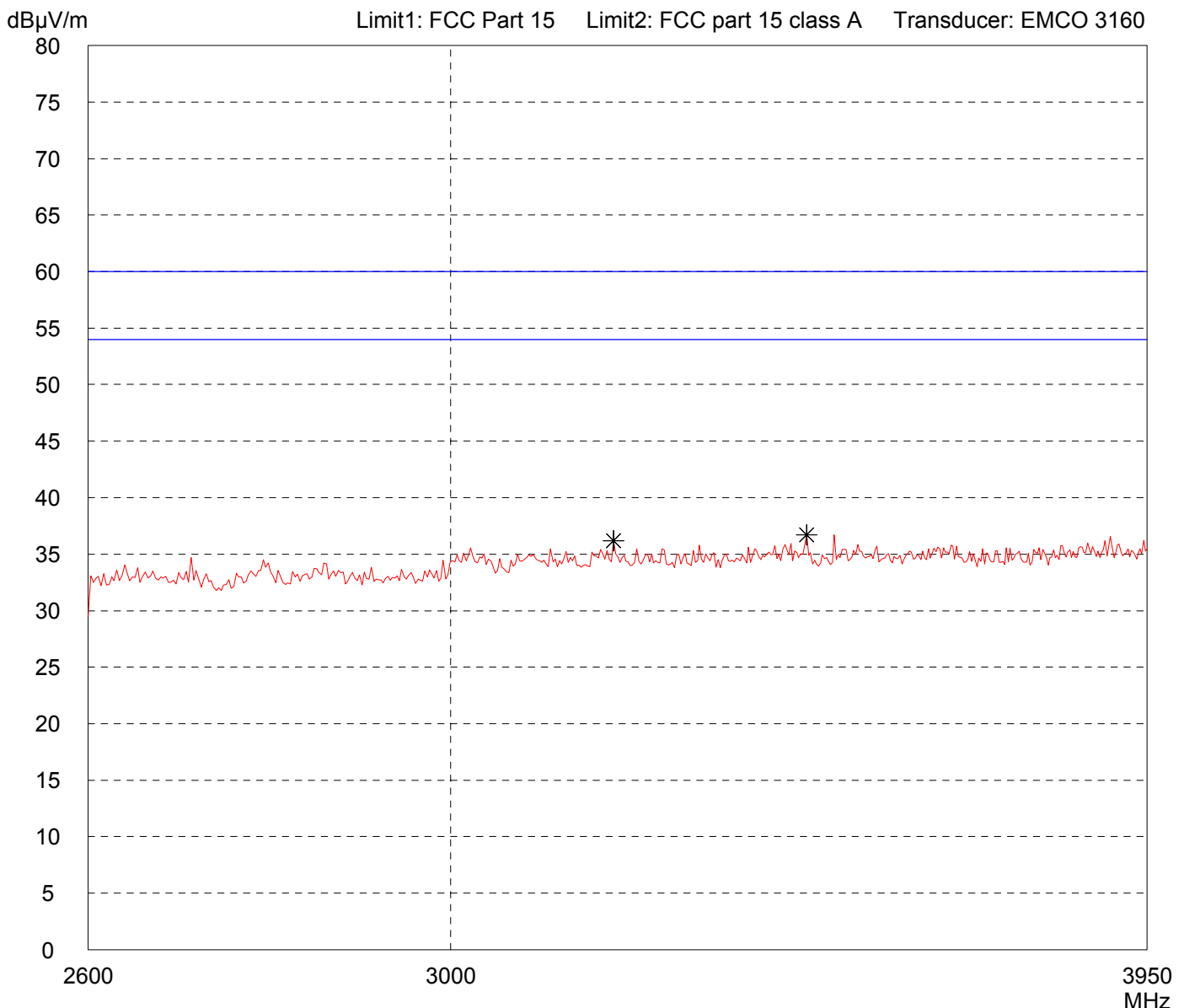
Detector: Peak	List of values: Selected by hand
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Result: Prescan	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 2.6 GHz - 3.95 GHz acc. to FCC Part 15 (EMCO 3160)

Model: FMR54X with 4" Horn		Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD		
Applicant: Endres & Hauser GmbH & Co. KG		
Test site: Fully anechoic room, cabin no. 2		
Tested on: Test distance 3 meters Horizontal Polarization		
Date of test: 06/12/2007	Operator: M. Steindl	
Test performed: automatically	File name: default.emi	
Detector: Peak		List of values: Selected by hand

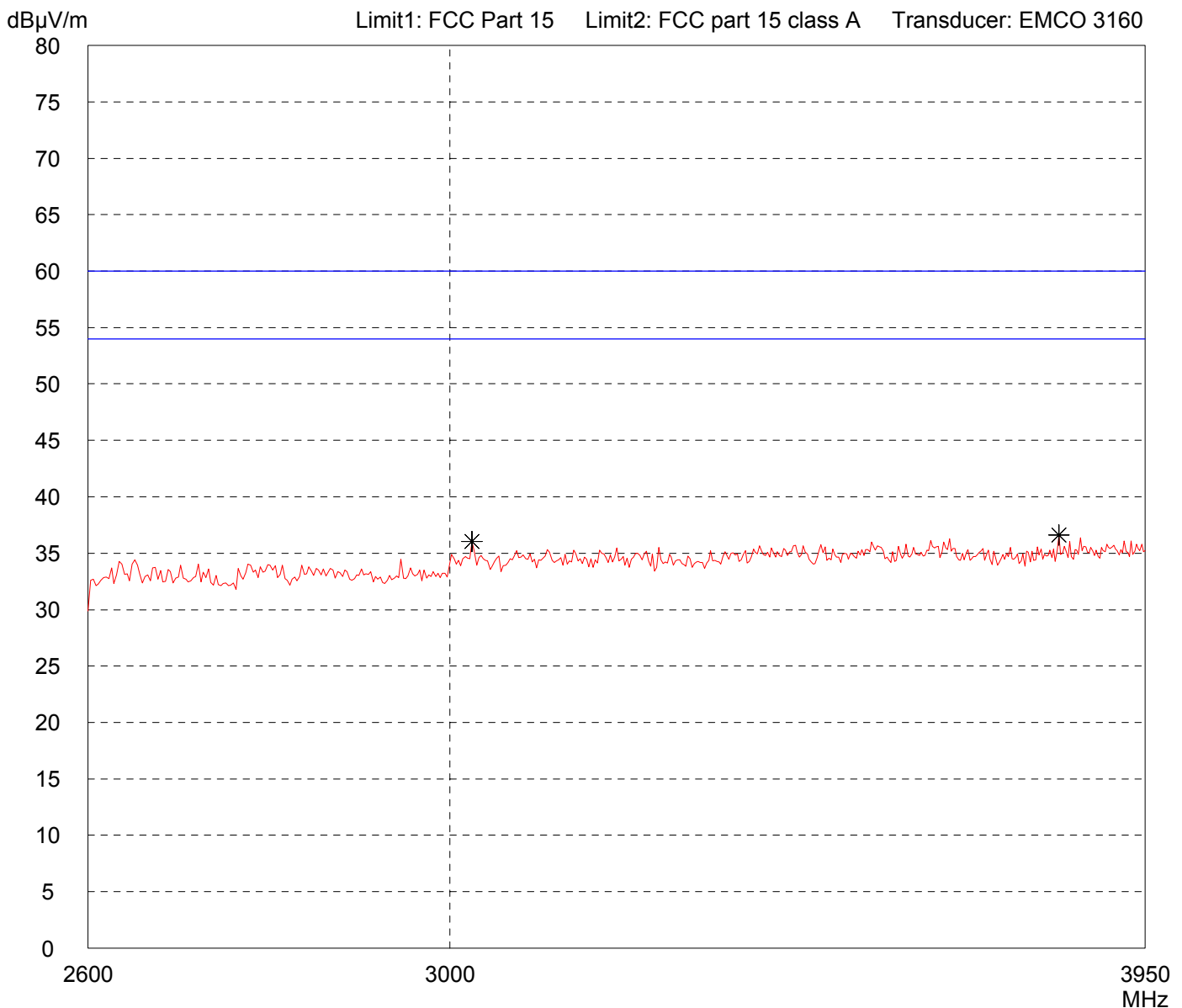


Result: Prescan	Project file: 50511-61106-1
Page of Pages	

Radiated Emission Test 2.6 GHz - 3.95 GHz acc. to FCC Part 15 (EMCO 3160)

Model: FMR54X with 4" Horn	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 meters Vertical Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
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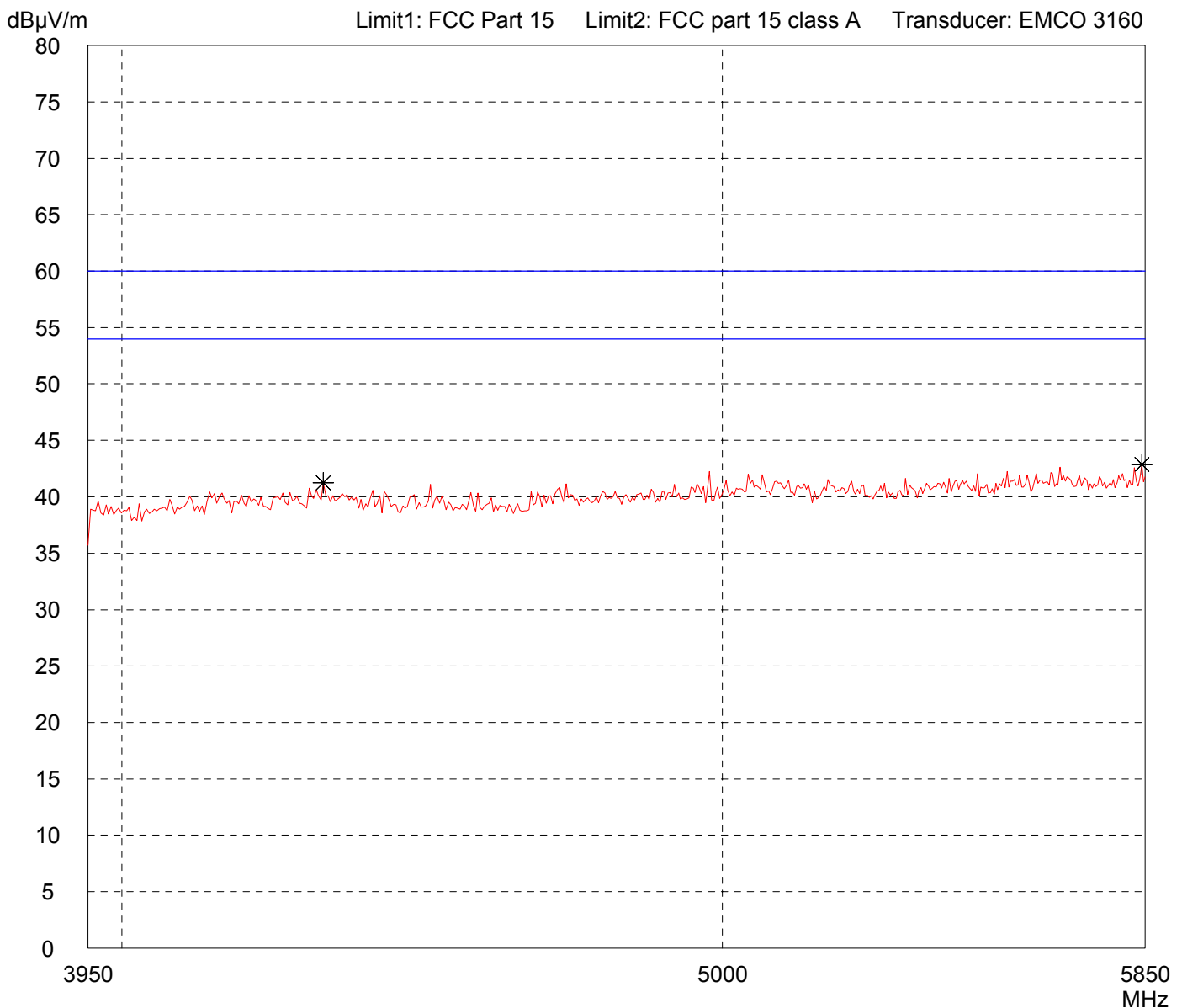


Result: Prescan	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 3.95 GHz - 5.85 GHz acc. to FCC Part 15 (EMCO 3160)

Model: FMR54X with 4" Horn	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
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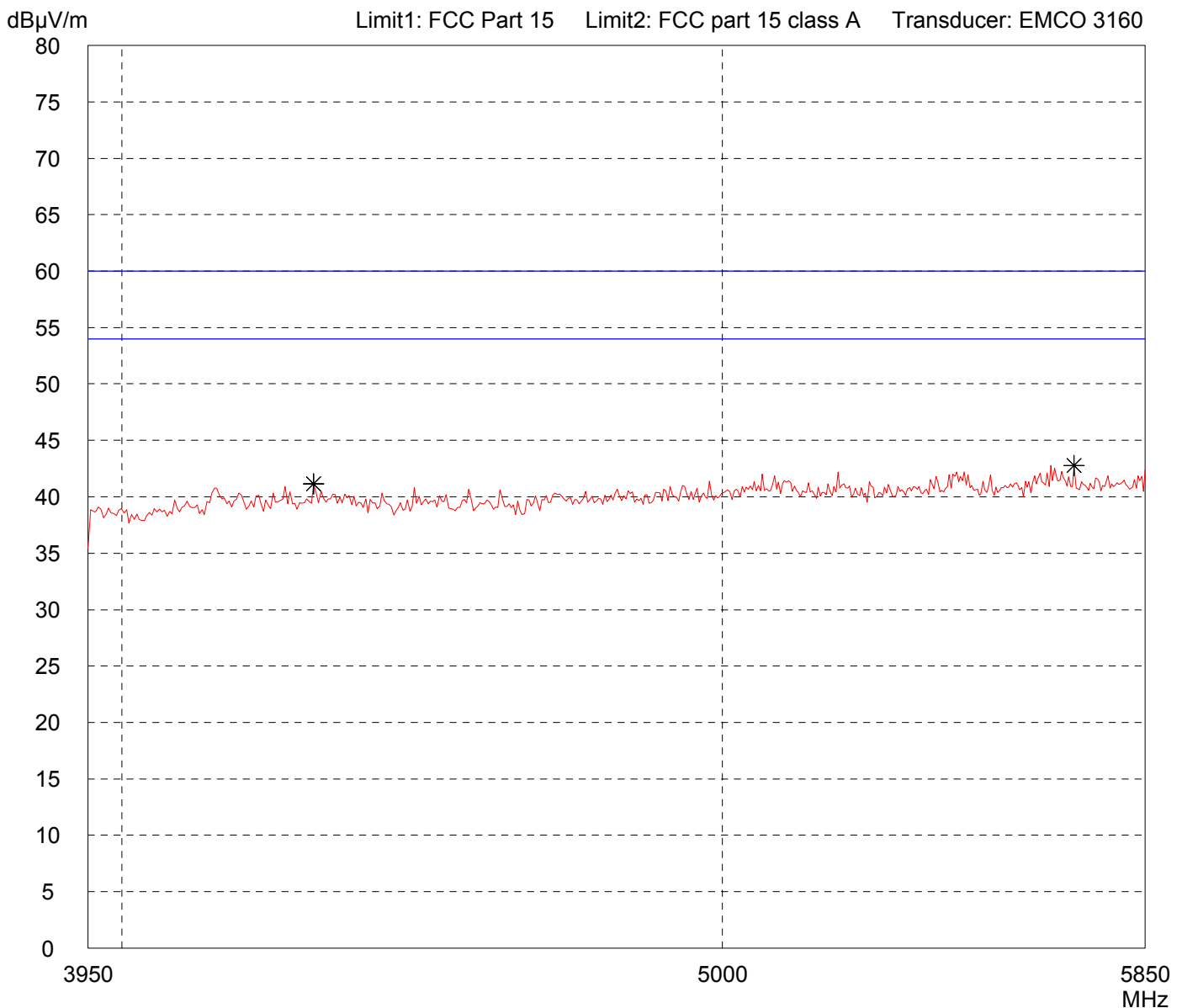


Result: Prescan	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 3.95 GHz - 5.85 GHz acc. to FCC Part 15 (EMCO 3160)

Model: FMR54X with 4" Horn	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
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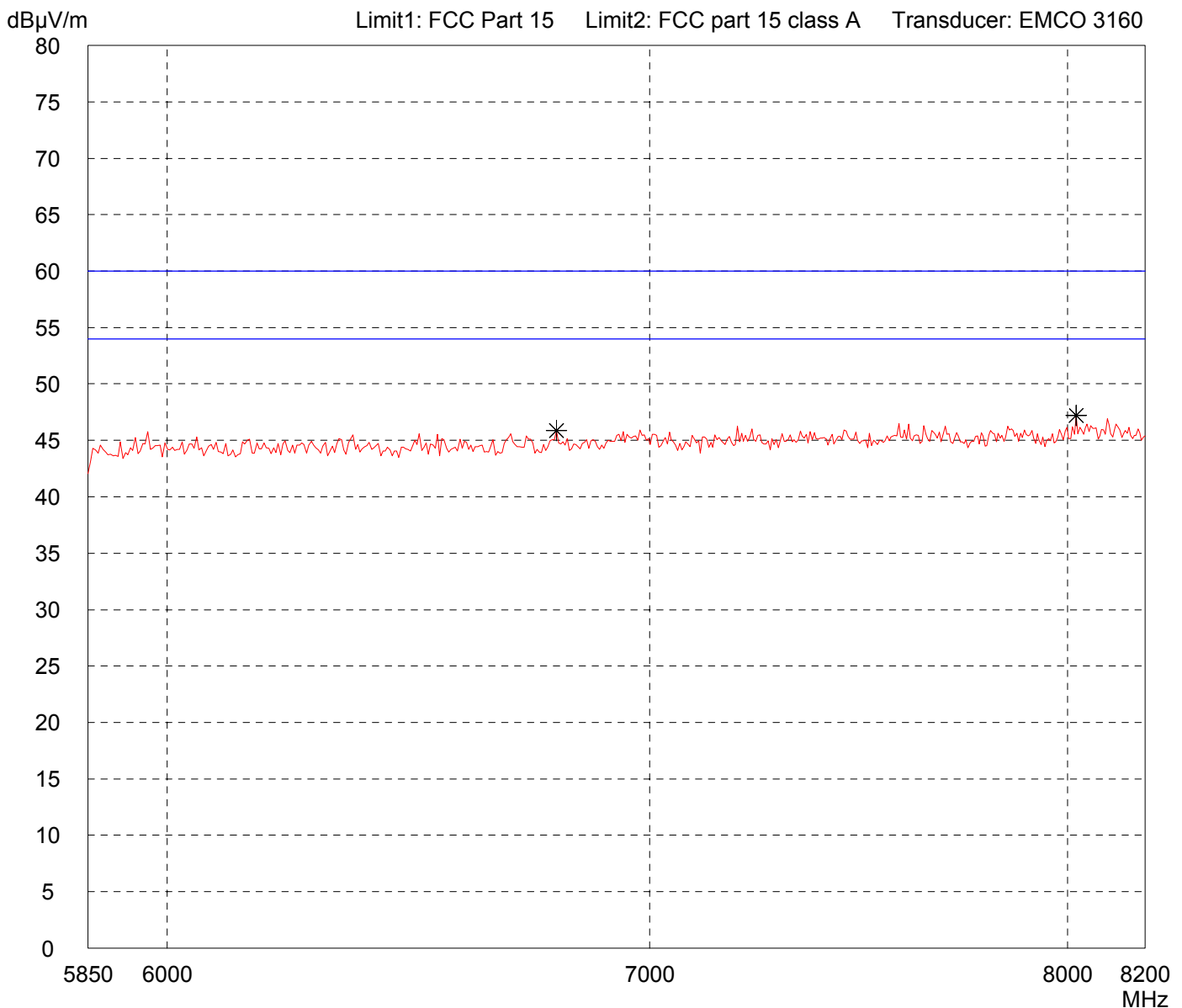


Result: Prescan	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 5.85 GHz - 8.2 GHz acc. to FCC Part 15 (EMCO 3160)

Model: FMR54X with 4" Horn	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
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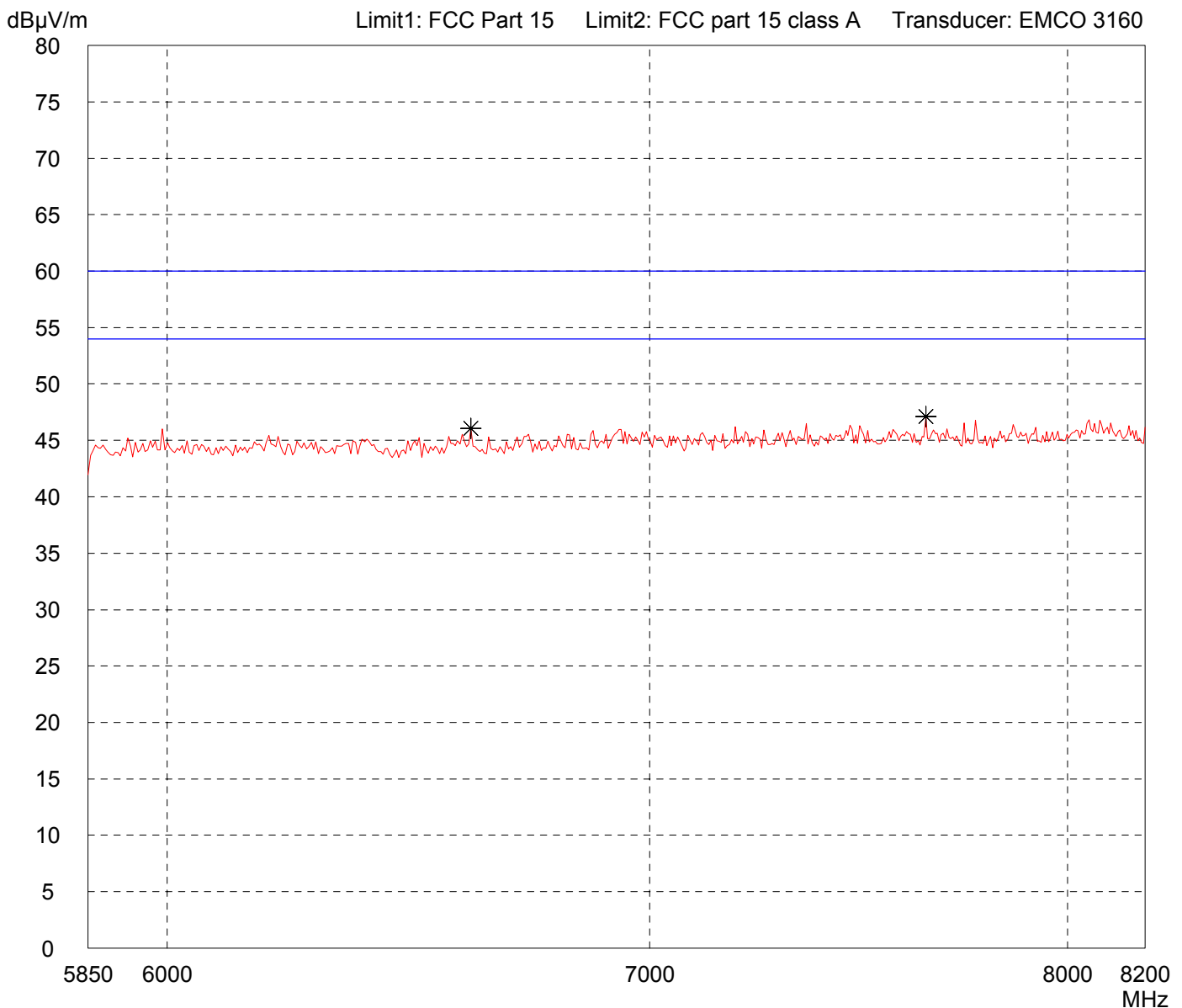


Result: Prescan	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 5.85 GHz - 8.2 GHz acc. to FCC Part 15 (EMCO 3160)

Model: FMR54X with 4" Horn	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
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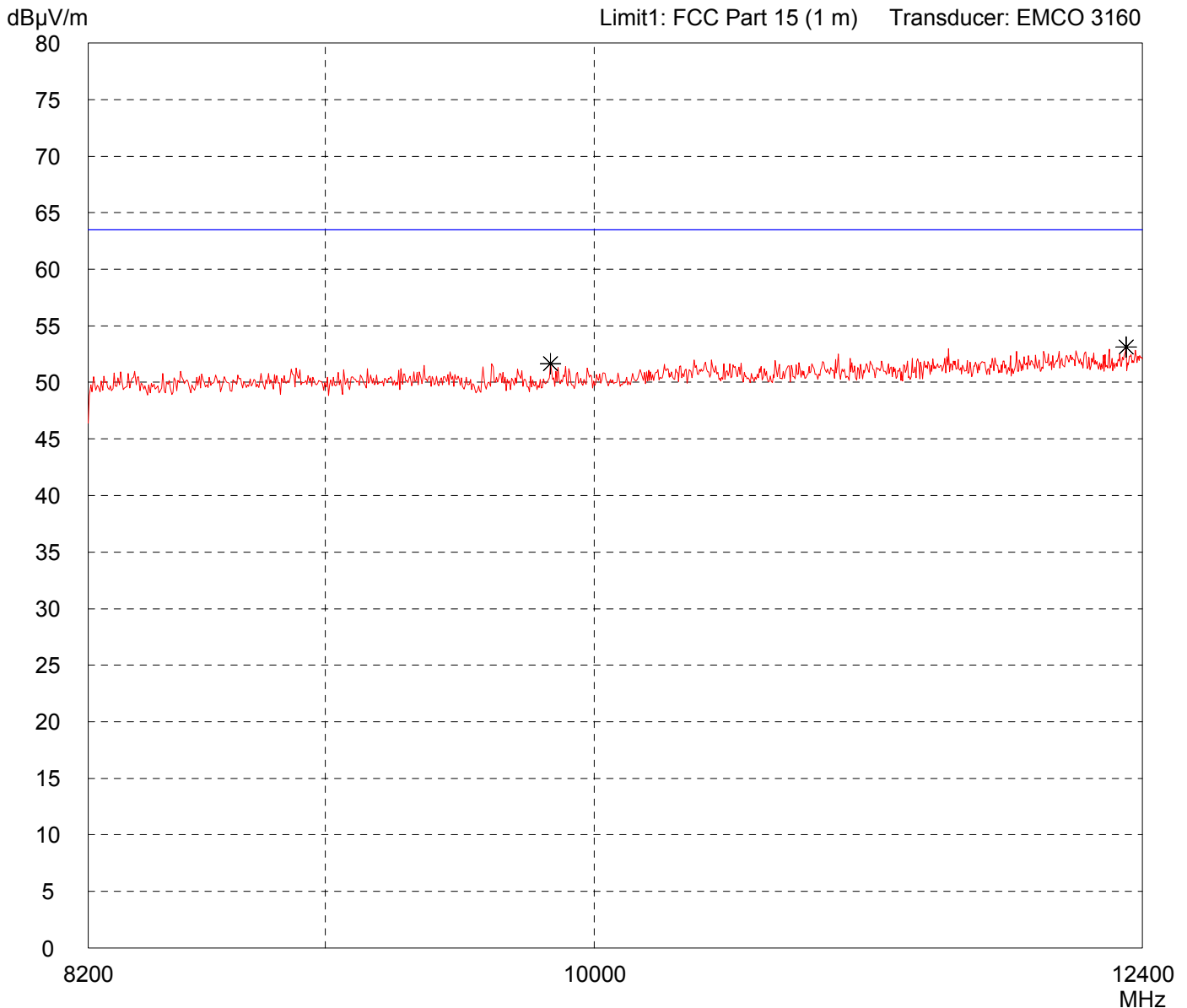


Result: Prescan	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 8.2 GHz - 12.4 GHz acc. to FCC Part 15 (EMCO 3160)

Model: FMR54X with 4" Horn	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 1 meter Horizontal Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
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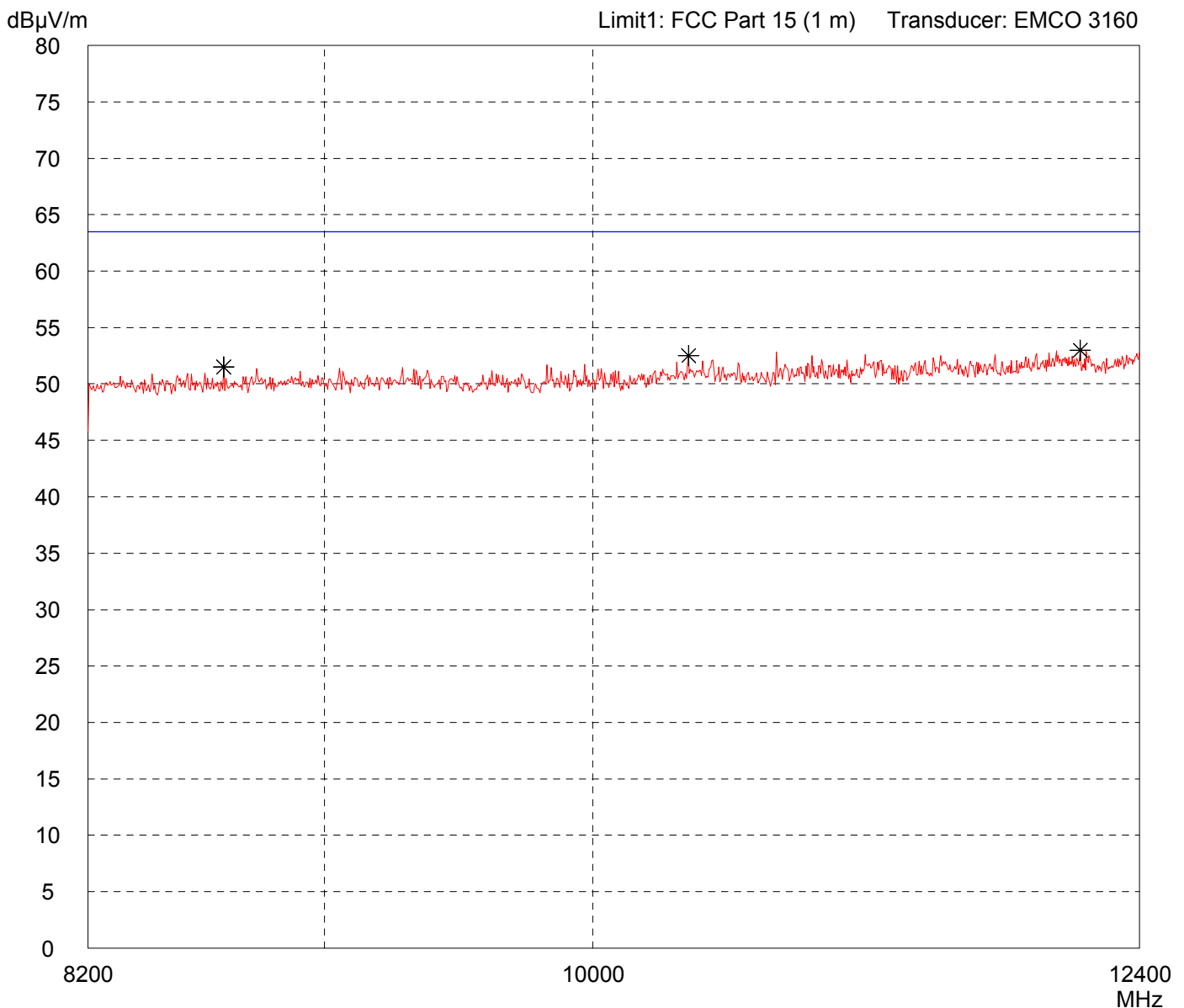


Result: Prescan	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 8.2 GHz - 12.4 GHz acc. to FCC Part 15 (EMCO 3160)

Model: FMR54X with 4" Horn	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 1 meter Vertical Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
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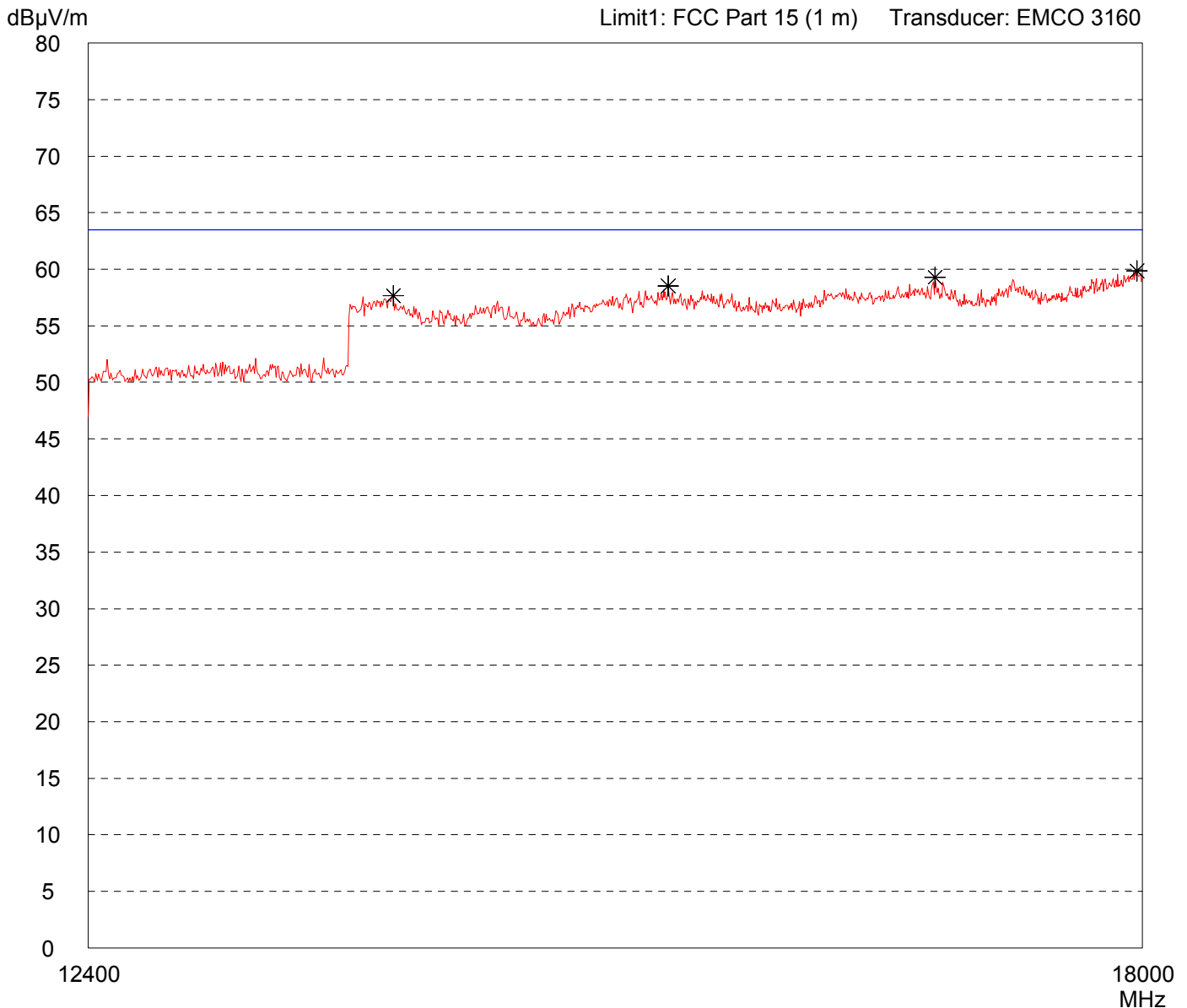


Result: Prescan	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 12.4 GHz - 18 GHz acc. to FCC Part 15 (EMCO 3160)

Model: FMR54X with 4" Horn	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 1 meter Horizontal Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
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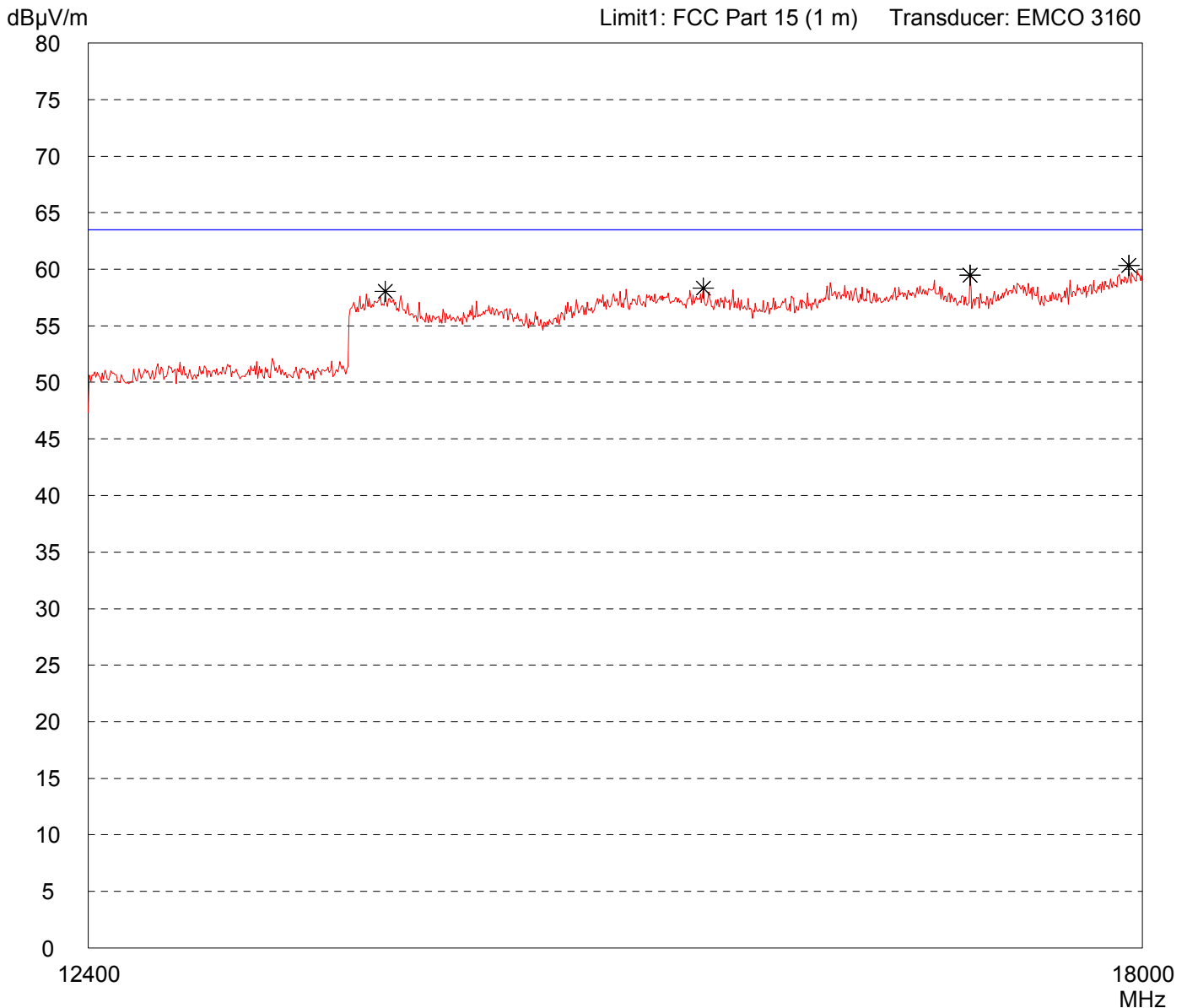


Result: Prescan (VBR = 100 kHz)	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 12.4 GHz - 18 GHz acc. to FCC Part 15 (EMCO 3160)

Model: FMR54X with 4" Horn	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 1 meter Vertical Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
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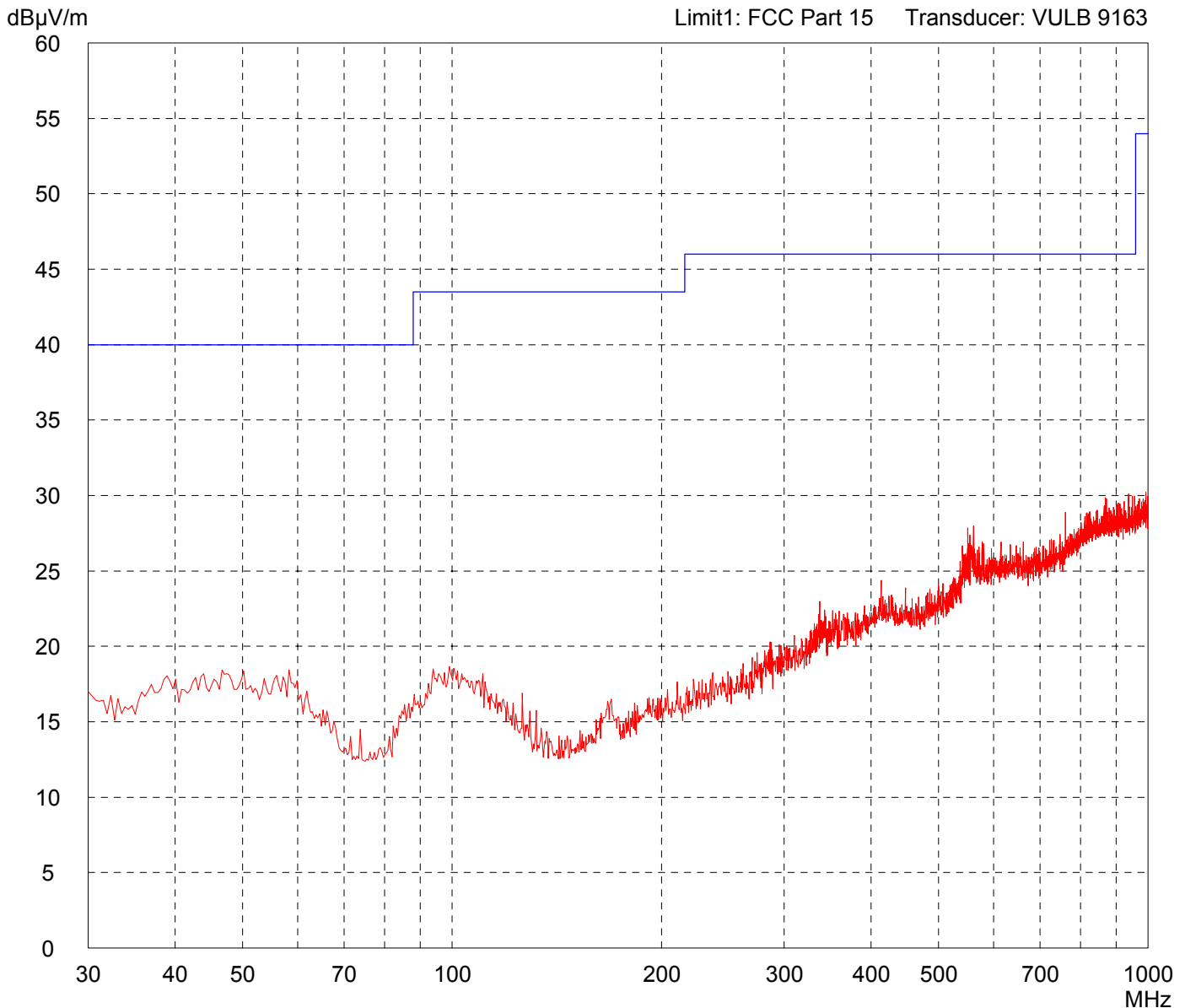


Result: Prescan (VBR = 100 kHz)	Project file: 50511-61106-1
	Page of Pages

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

Model: FMR54X with 3" plated Horn	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: <div style="display: flex; justify-content: space-between;"> 10 dB Margin 50 Subranges </div>
--------------------------	--

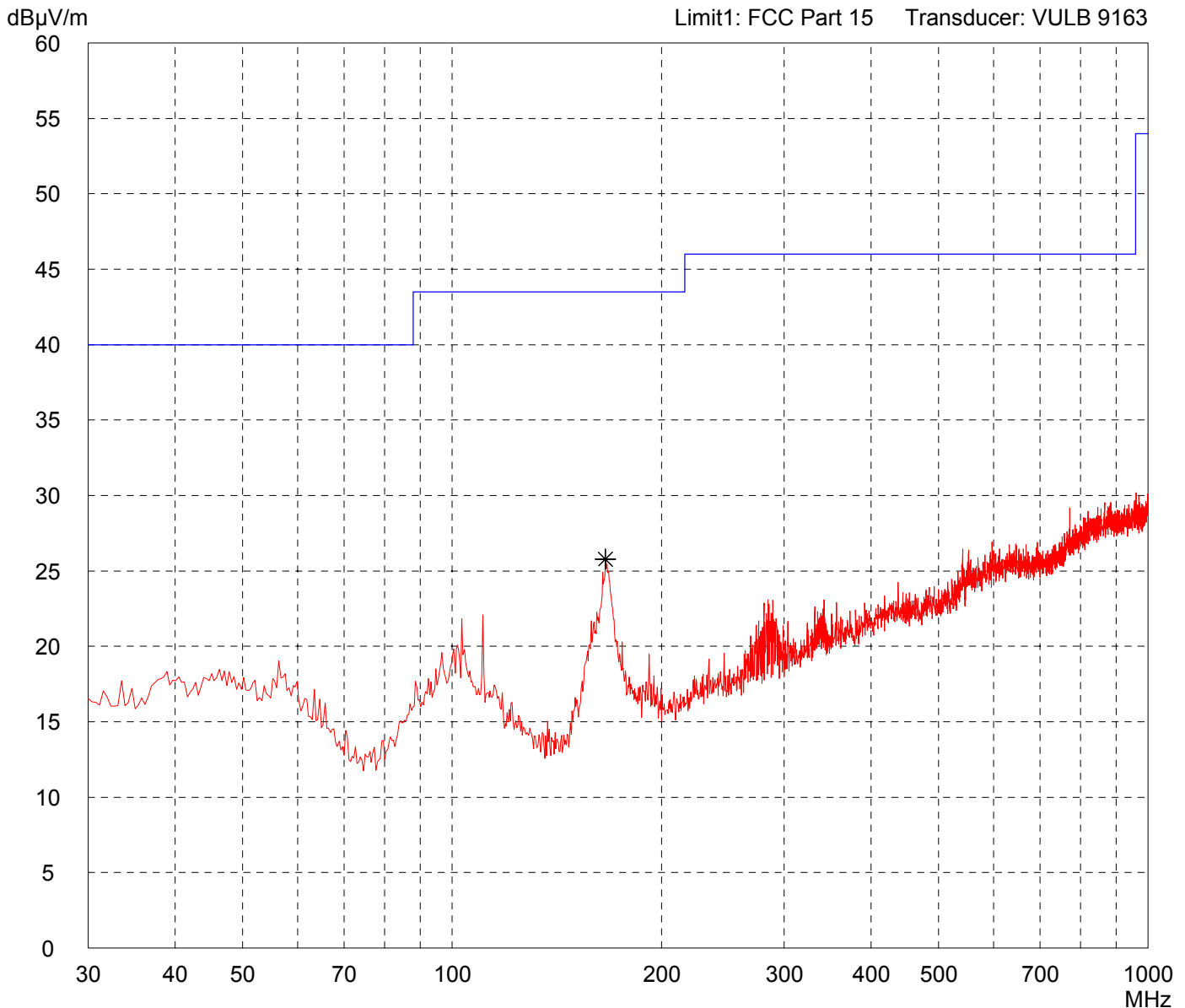


Result: Prescan	Project file: 50511-61106-1
	Page of Pages

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

Model: FMR54X with 3" plated Horn	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
--------------------------	--

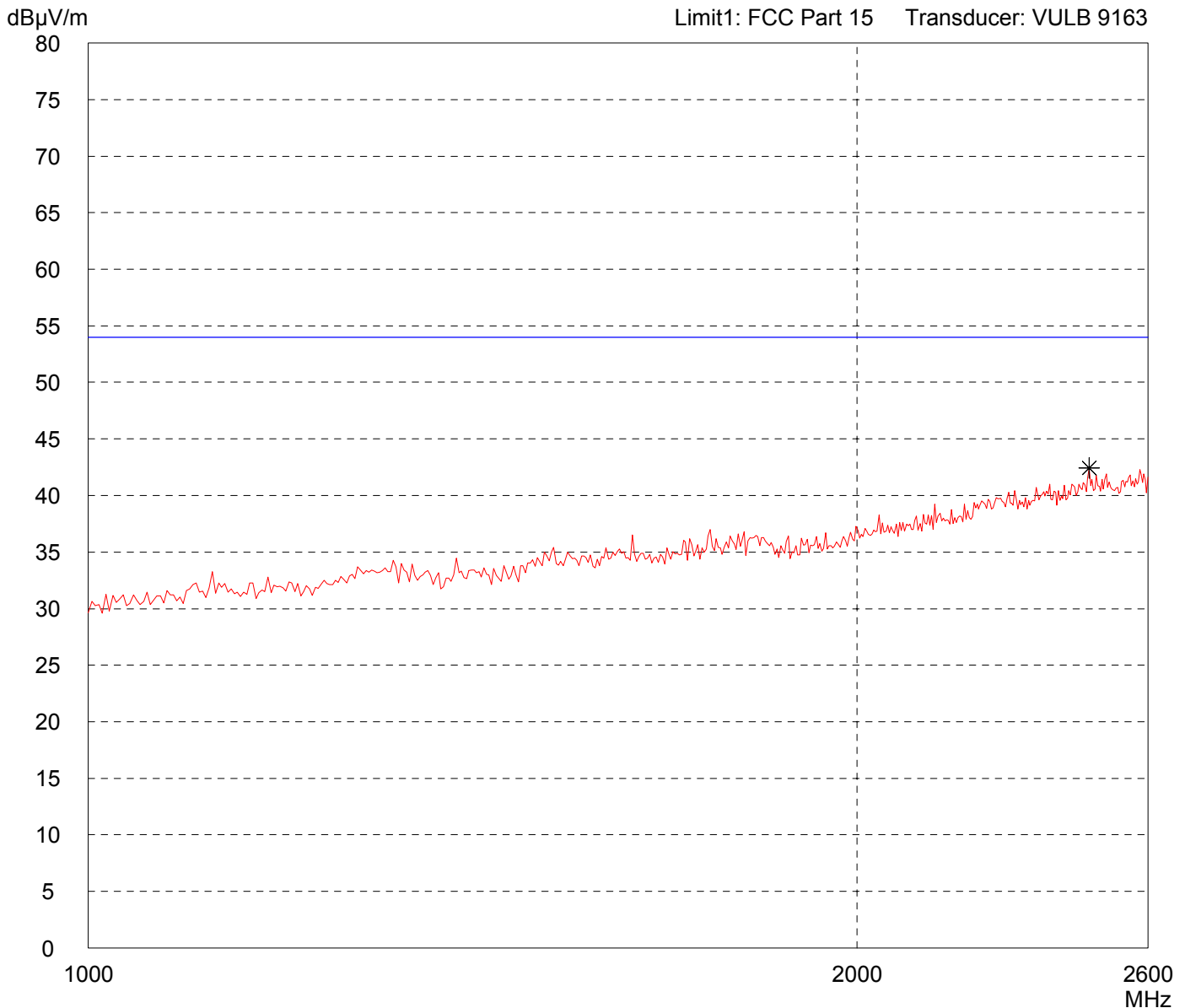


Result: Prescan	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 1 GHz - 2.6 GHz acc. to FCC Part 15 (Fully Anechoic Chamber)

Model: FMR54X with 3" plated Horn	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
--------------------------	--

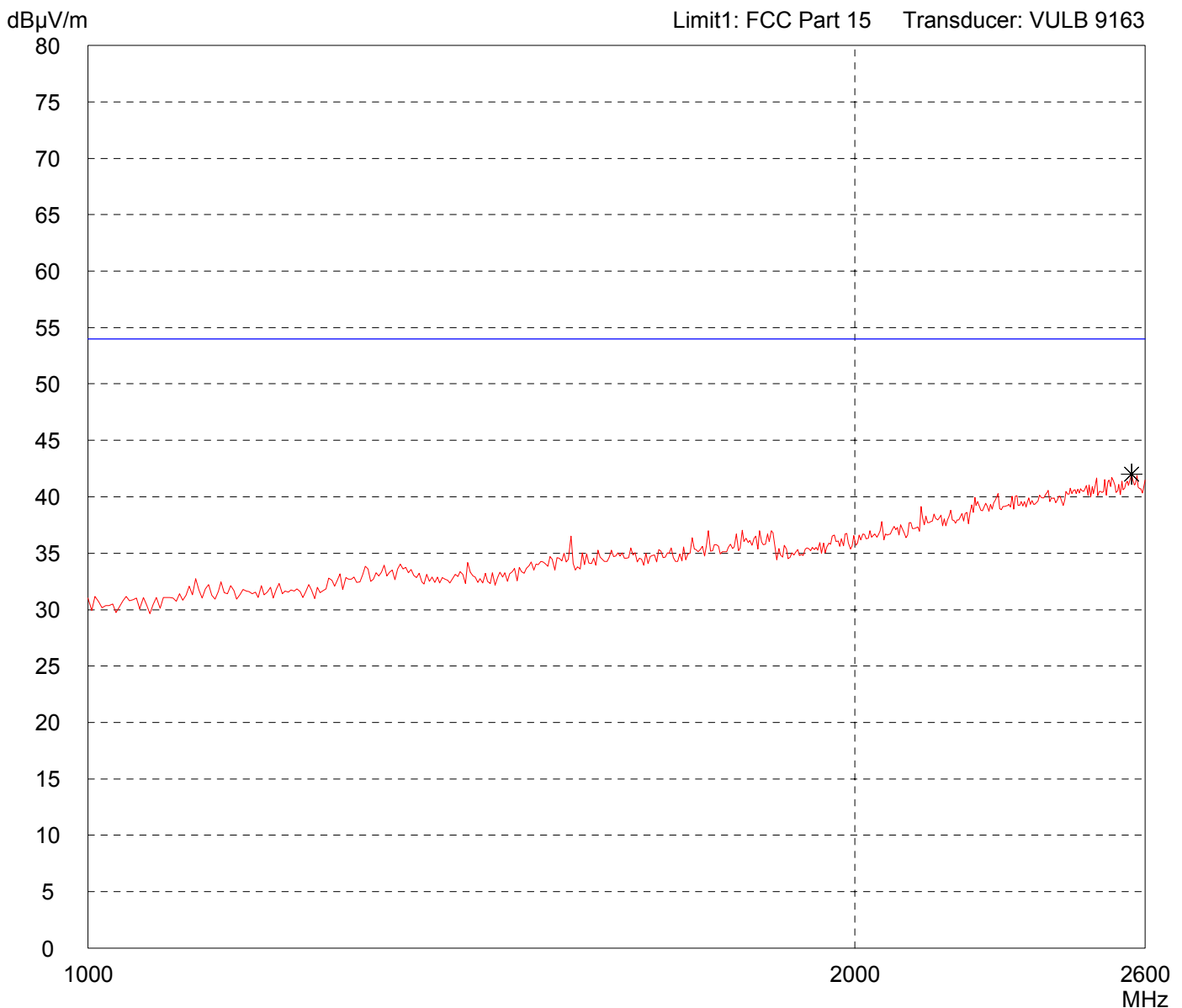


Result: Prescan	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 1 GHz - 2.6 GHz acc. to FCC Part 15 (Fully Anechoic Chamber)

Model: FMR54X with 3" plated Horn	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
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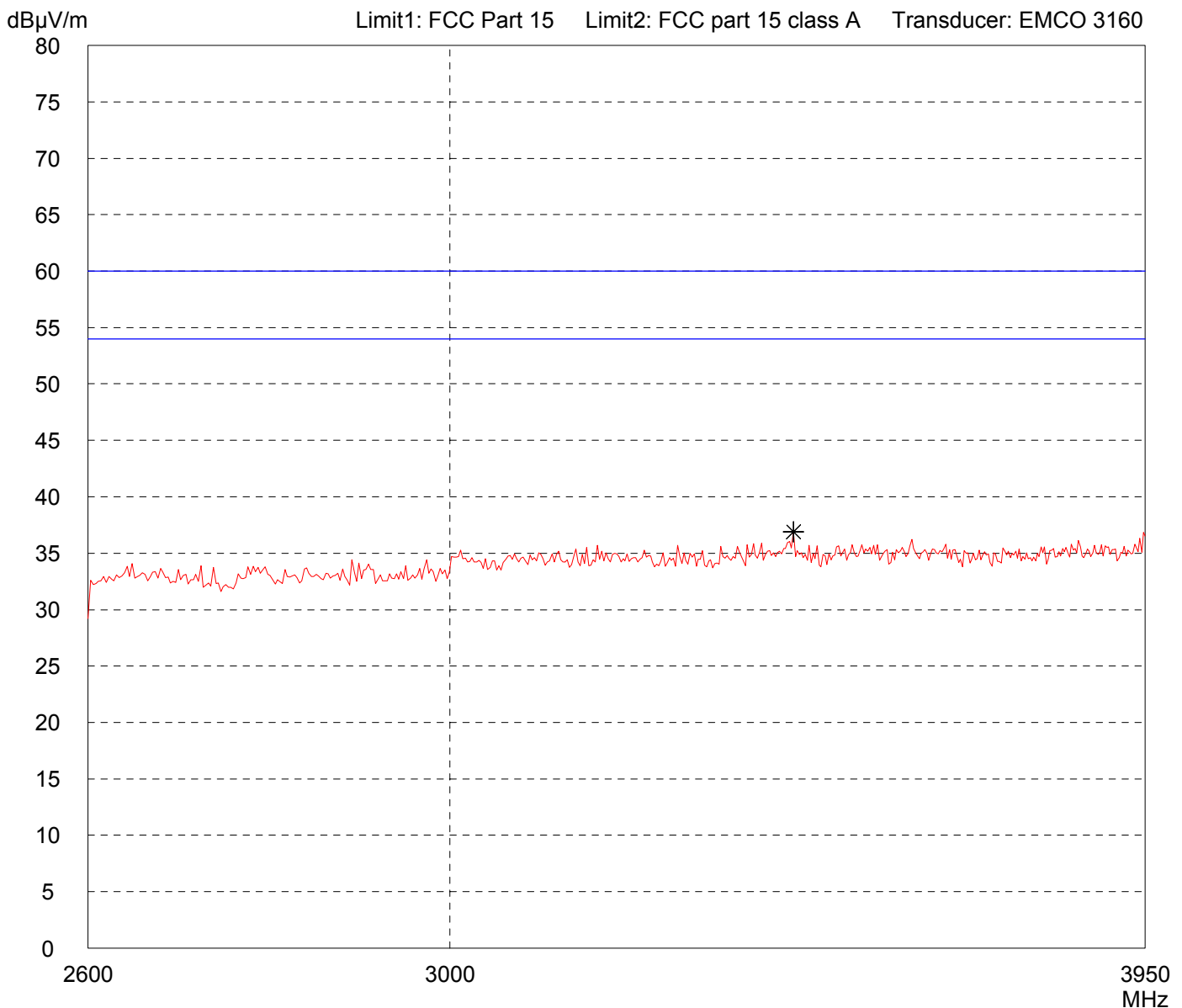


Result: Prescan	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 2.6 GHz - 3.95 GHz acc. to FCC Part 15 (EMCO 3160)

Model: FMR54X with 3" plated Horn	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 meters Horizontal Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
--------------------------	--

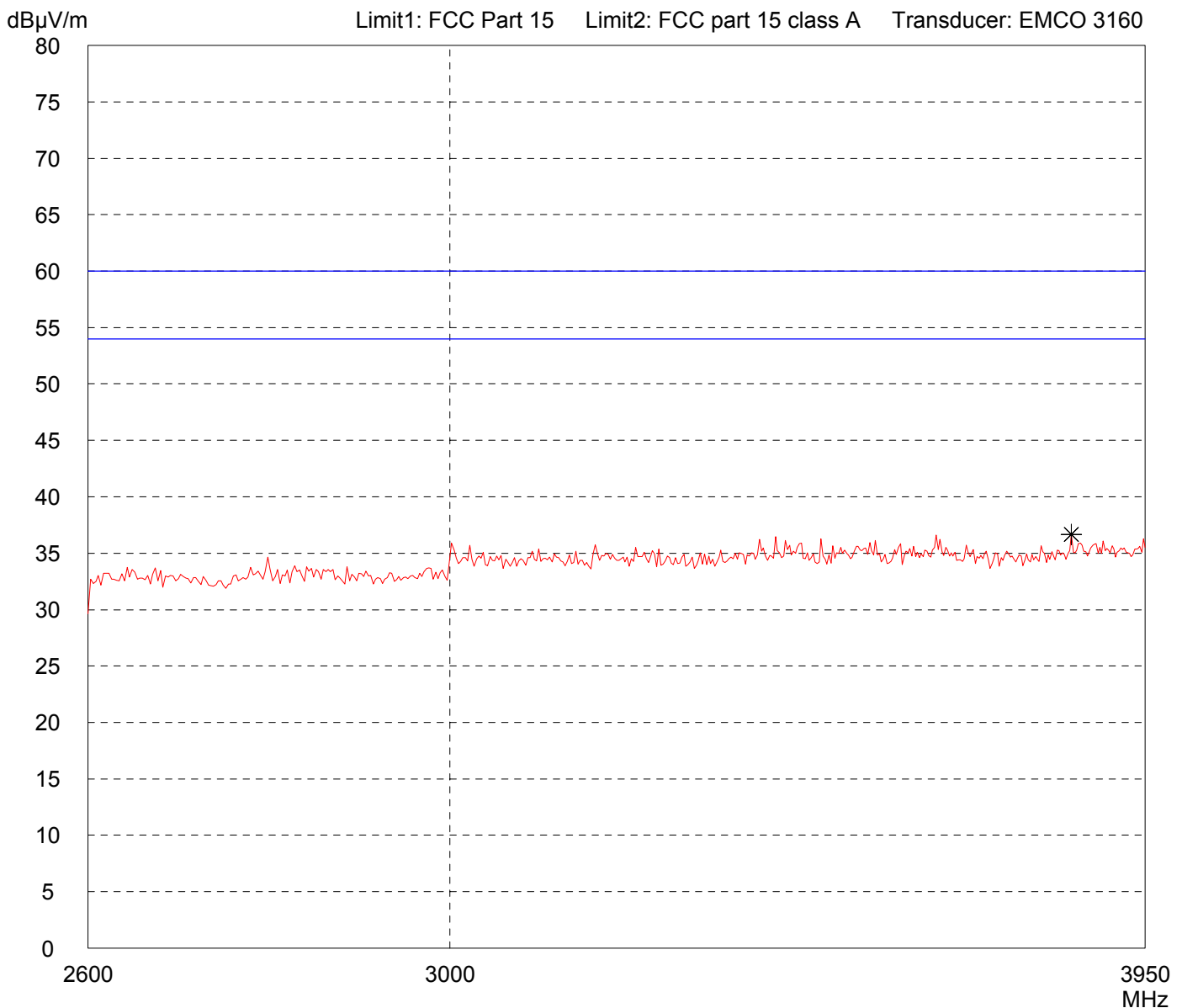


Result: Prescan	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 2.6 GHz - 3.95 GHz acc. to FCC Part 15 (EMCO 3160)

Model: FMR54X with 3" plated Horn	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 meters Vertical Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
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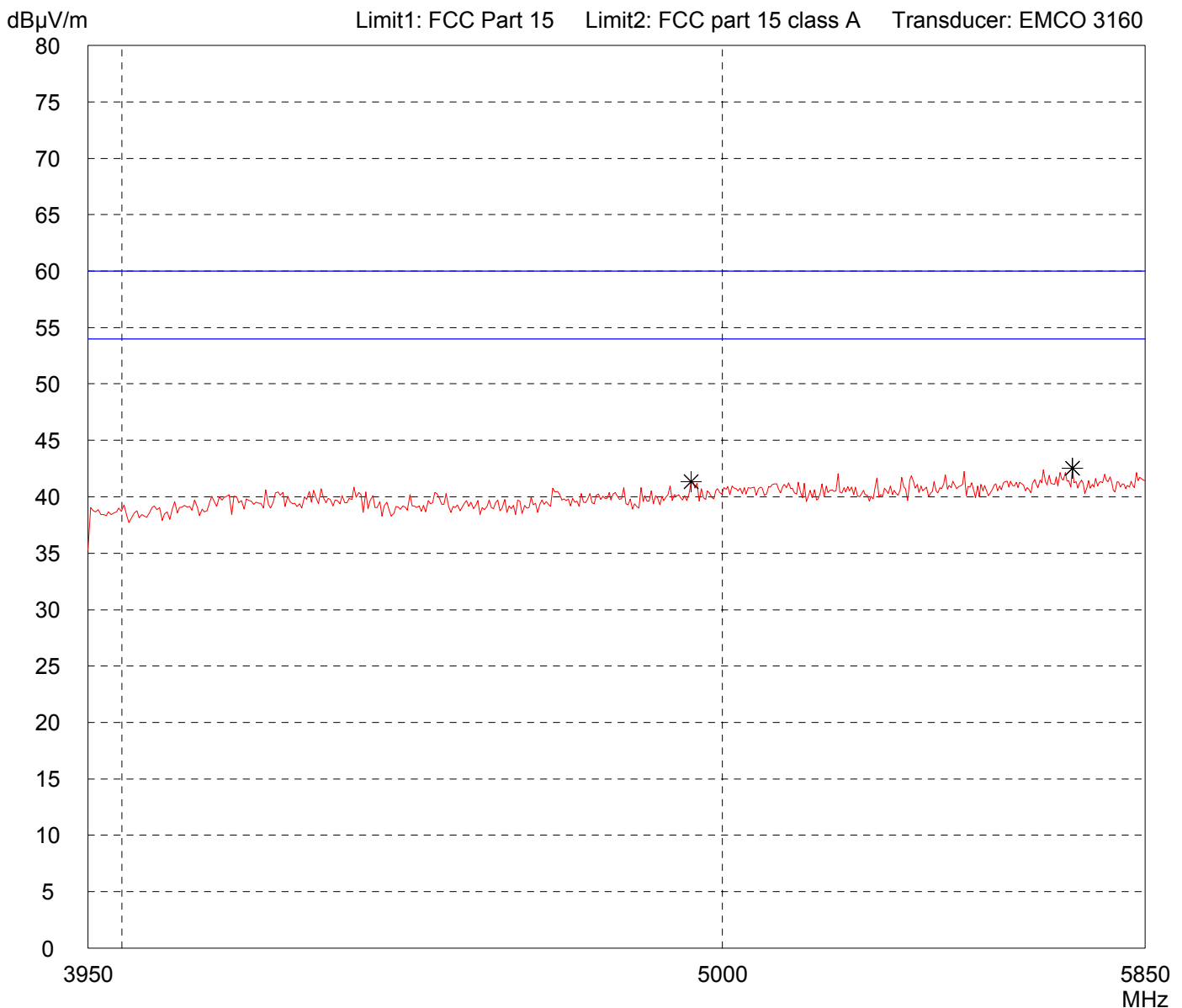


Result: Prescan	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 3.95 GHz - 5.85 GHz acc. to FCC Part 15 (EMCO 3160)

Model: FMR54X with 3" plated Horn	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
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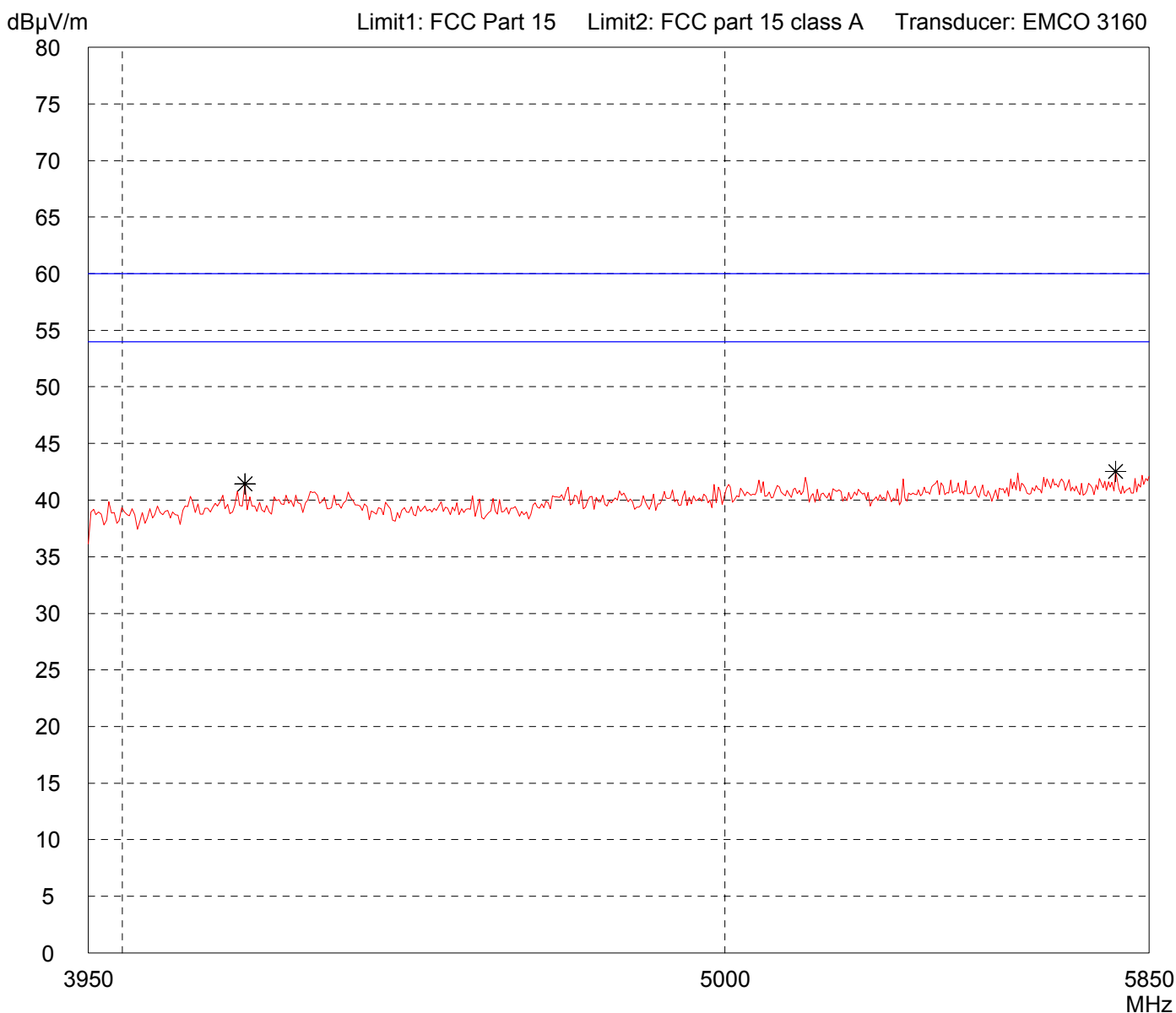


Result: Prescan	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 3.95 GHz - 5.85 GHz acc. to FCC Part 15 (EMCO 3160)

Model: FMR54X with 3" plated Horn	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
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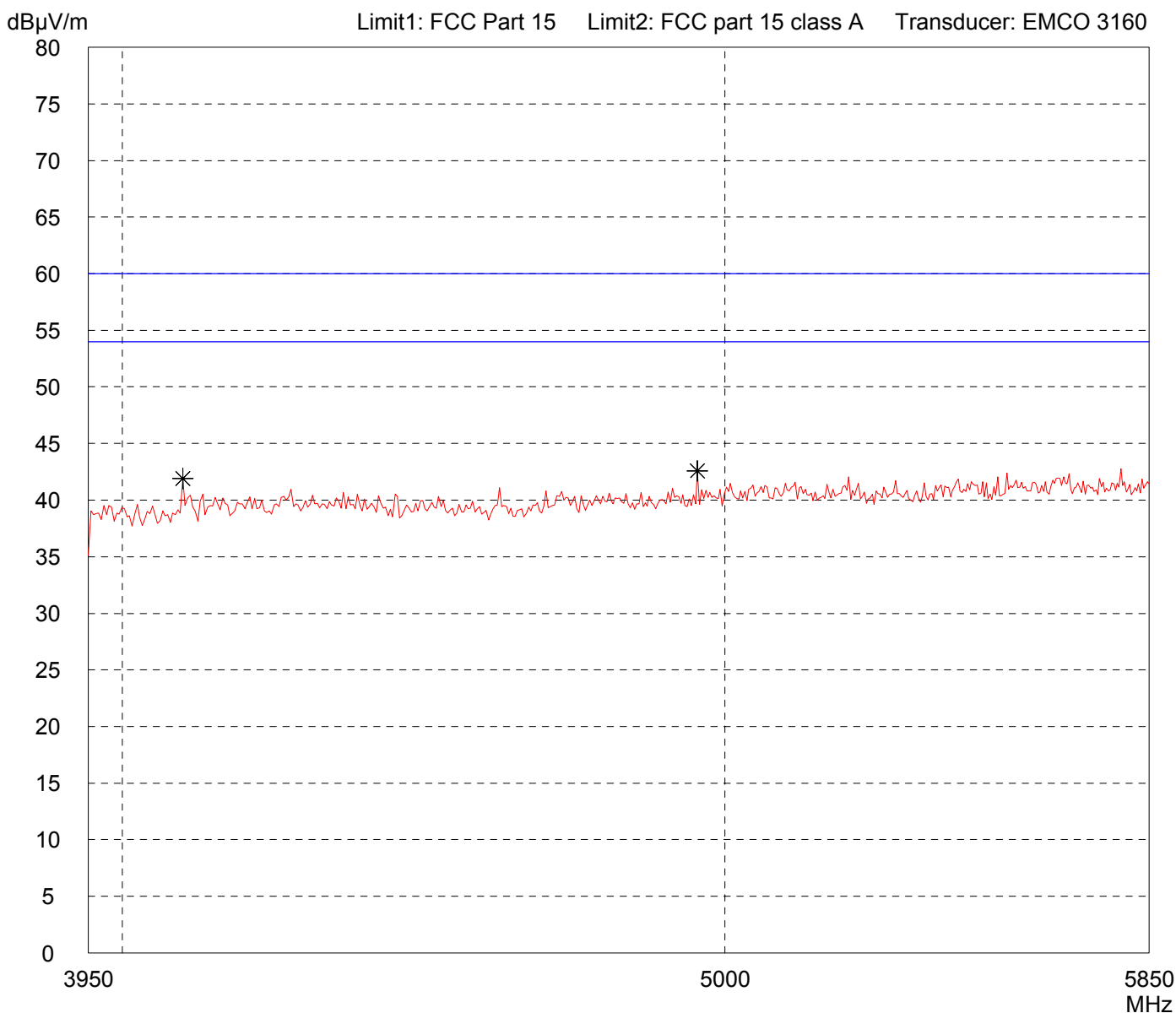


Result: Prescan	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 3.95 GHz - 5.85 GHz acc. to FCC Part 15 (EMCO 3160)

Model: FMR54X with 3" plated Horn	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
--------------------------	--

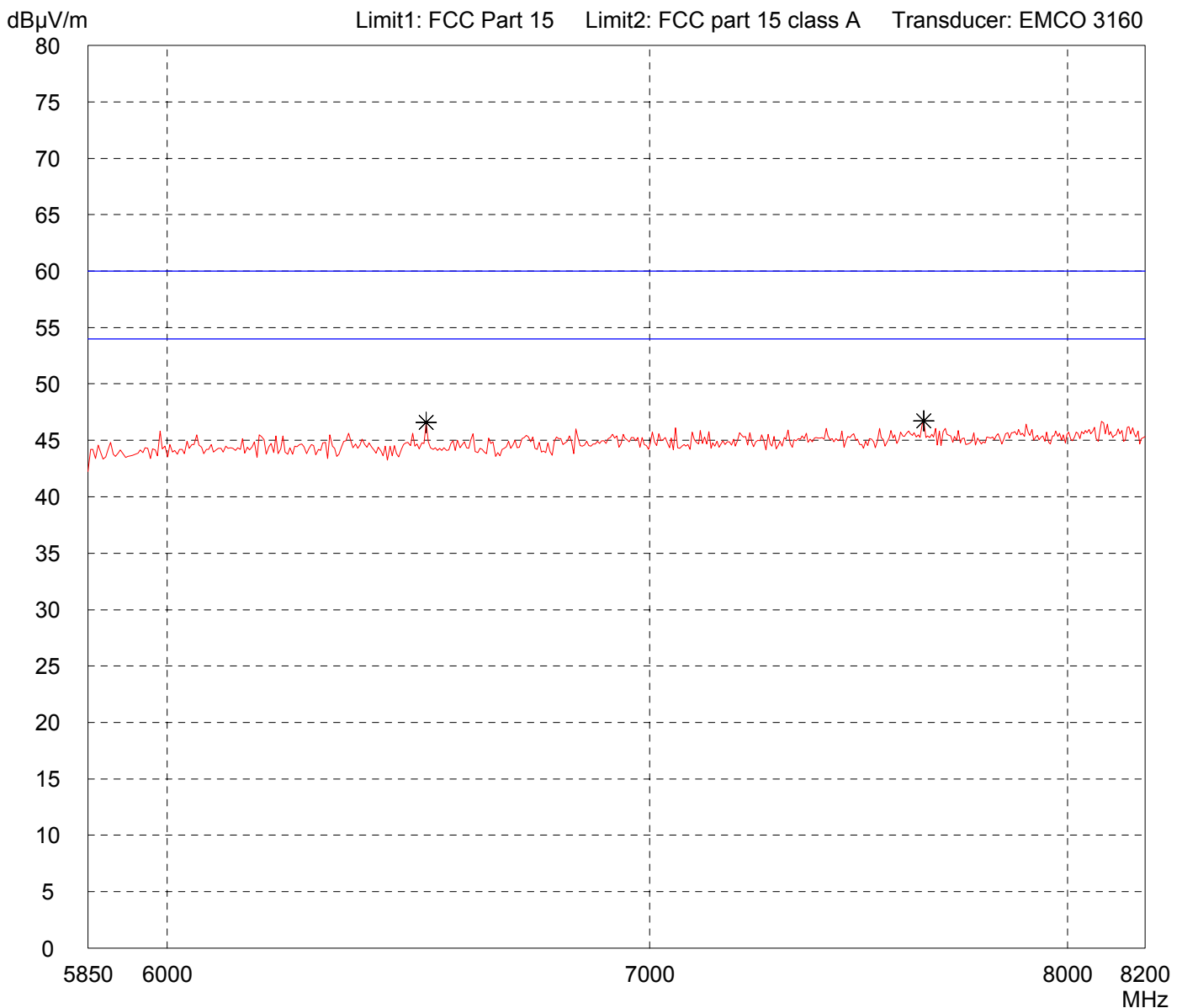


Result: Prescan	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 5.85 GHz - 8.2 GHz acc. to FCC Part 15 (EMCO 3160)

Model: FMR54X with 3" plated Horn	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
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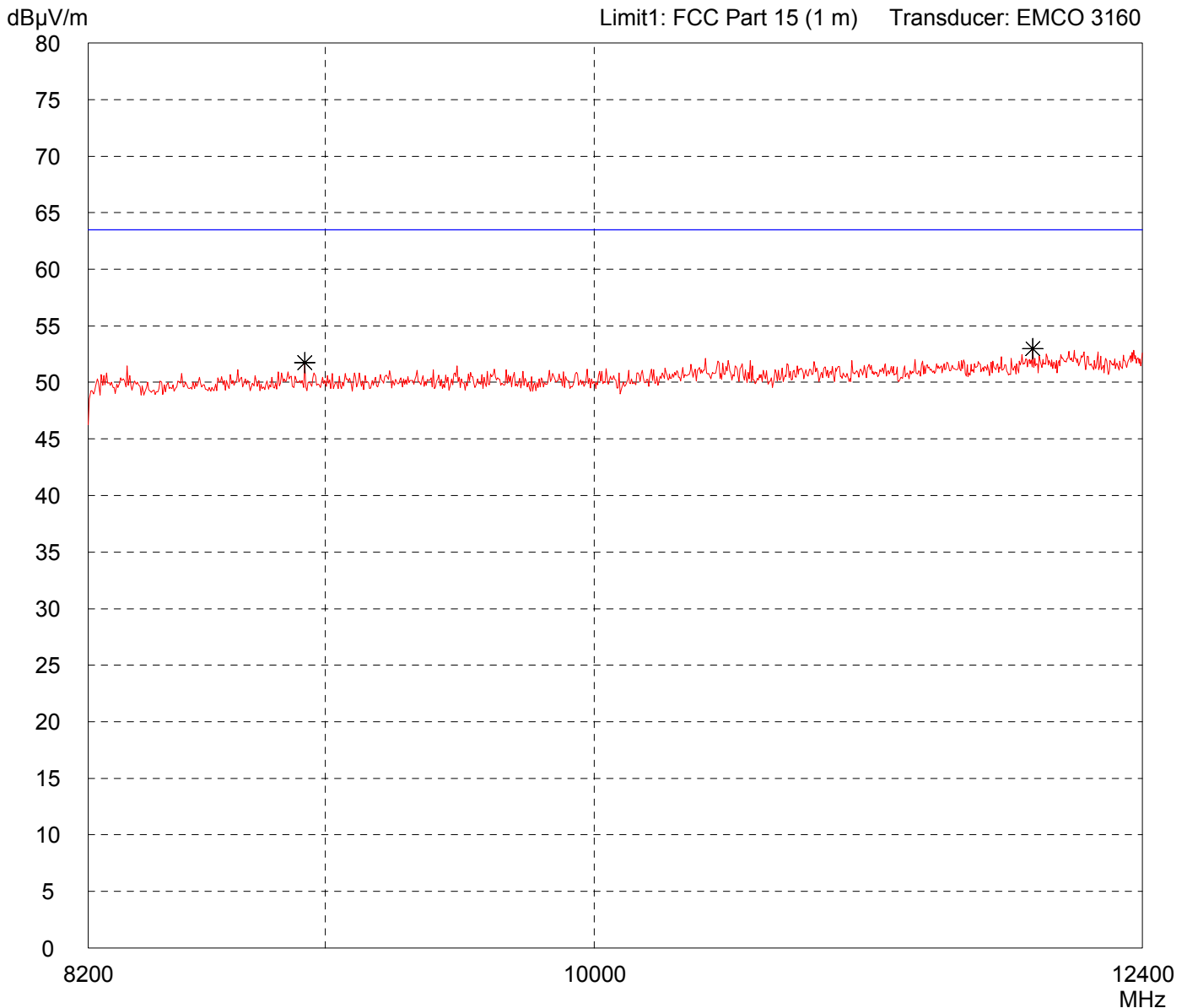


Result: Prescan	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 8.2 GHz - 12.4 GHz acc. to FCC Part 15 (EMCO 3160)

Model: FMR54X with 3" plated Horn	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 1 meter Horizontal Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
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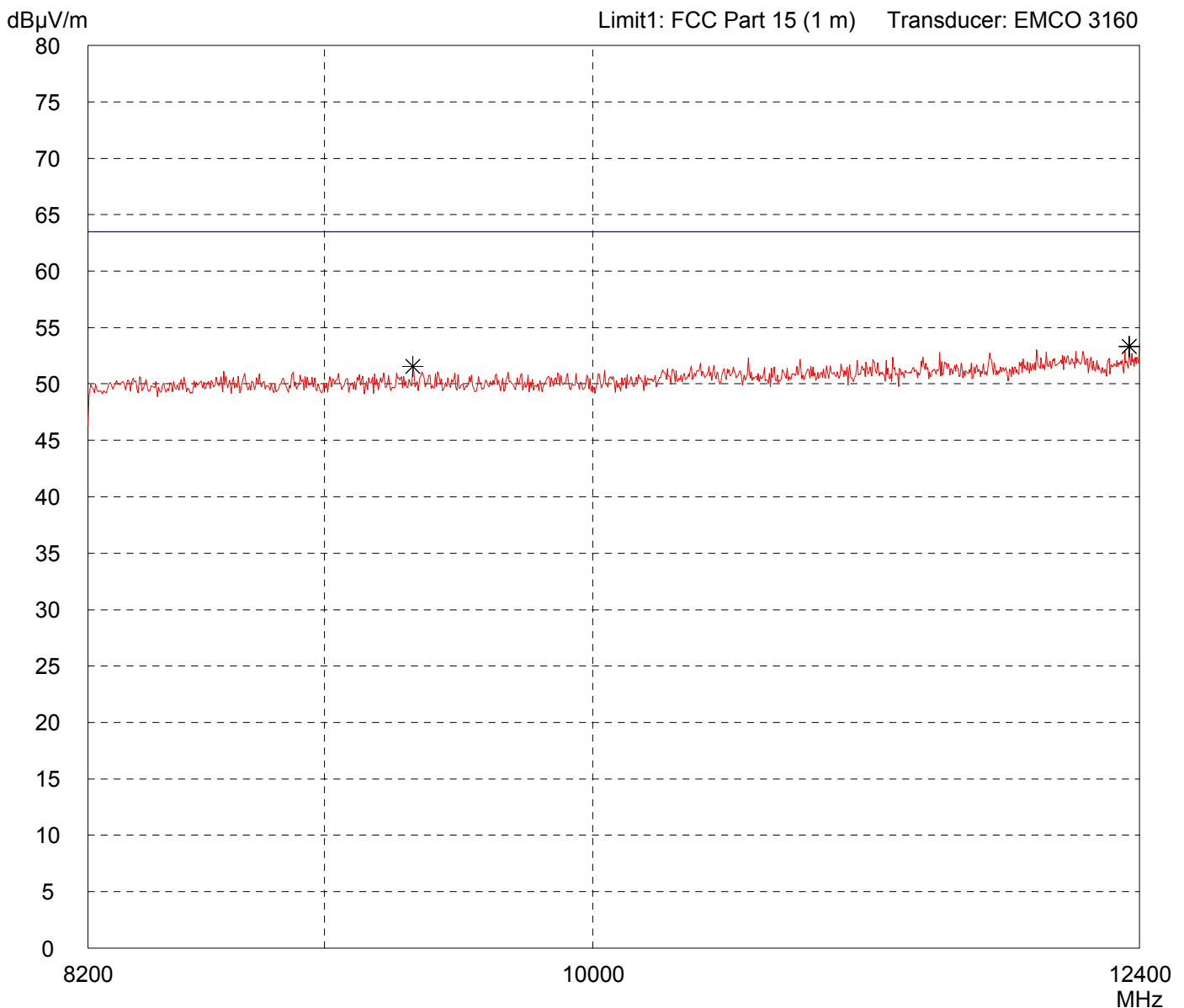


Result: Prescan	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 8.2 GHz - 12.4 GHz acc. to FCC Part 15 (EMCO 3160)

Model: FMR54X with 3" plated Horn	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 1 meter Vertical Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
--------------------------	--

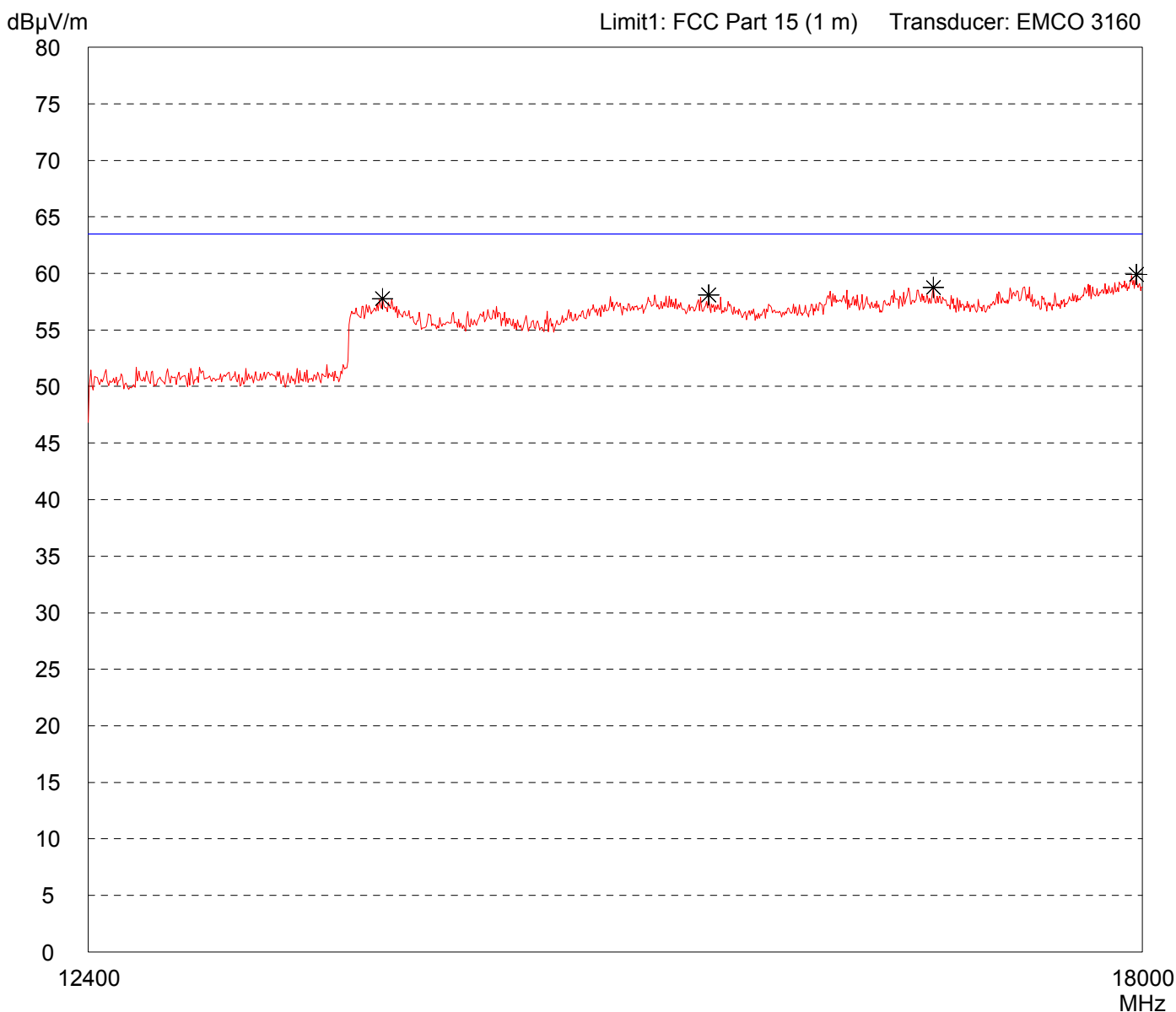


Result: Prescan	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 12.4 GHz - 18 GHz acc. to FCC Part 15 (EMCO 3160)

Model: FMR54X with 3" plated Horn	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 1 meter Horizontal Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
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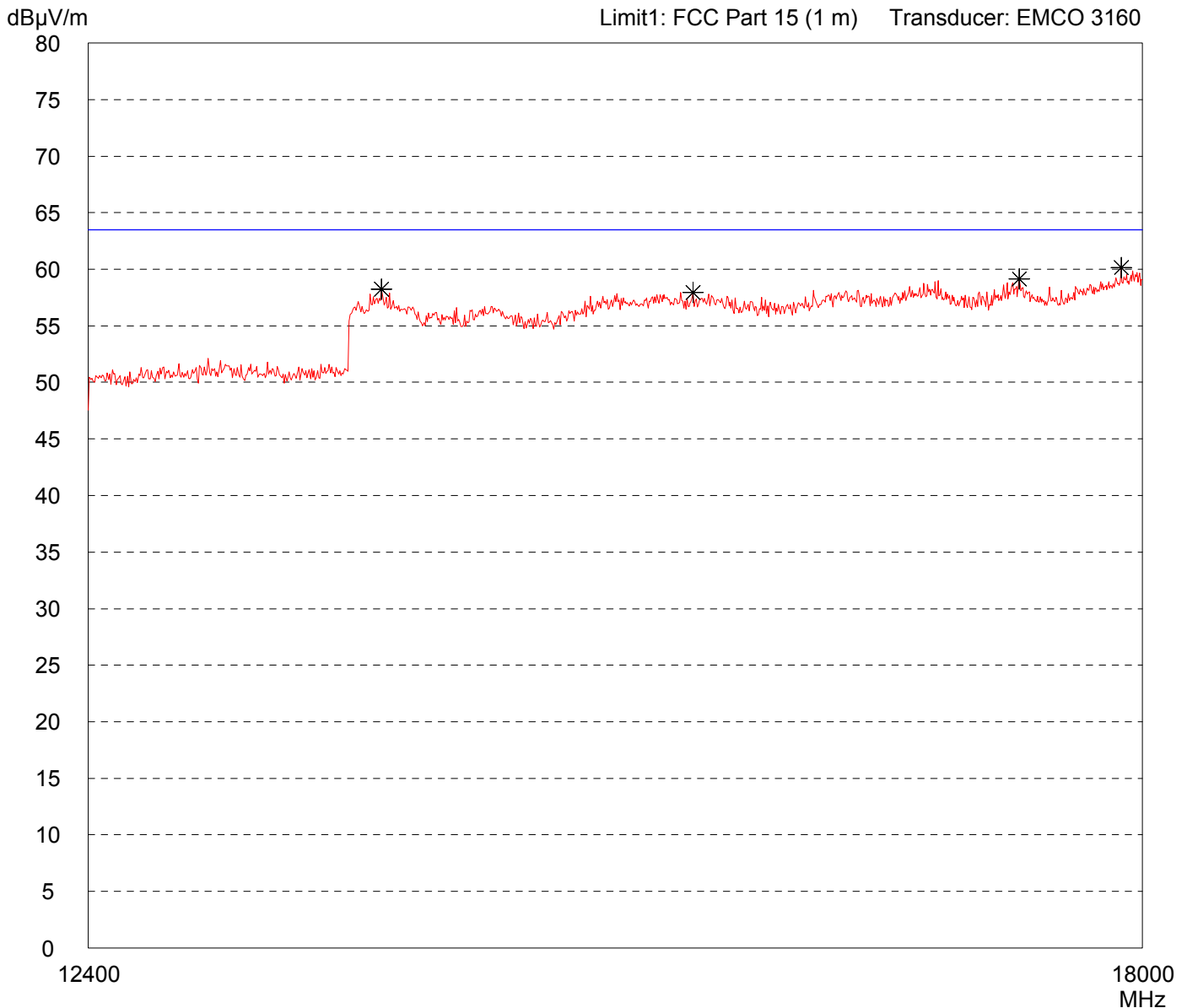


Result: Prescan (VBW = 100 kHz)	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 12.4 GHz - 18 GHz acc. to FCC Part 15 (EMCO 3160)

Model: FMR54X with 3" plated Horn	Comment: - DC 24 V with 330 Ohms resistor - EUT in vertical position - Transmitting continuously
Serial no.: 940001010AD	
Applicant: Endres & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 1 meter Vertical Polarization	
Date of test: 06/12/2007	Operator: M. Steindl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
--------------------------	--

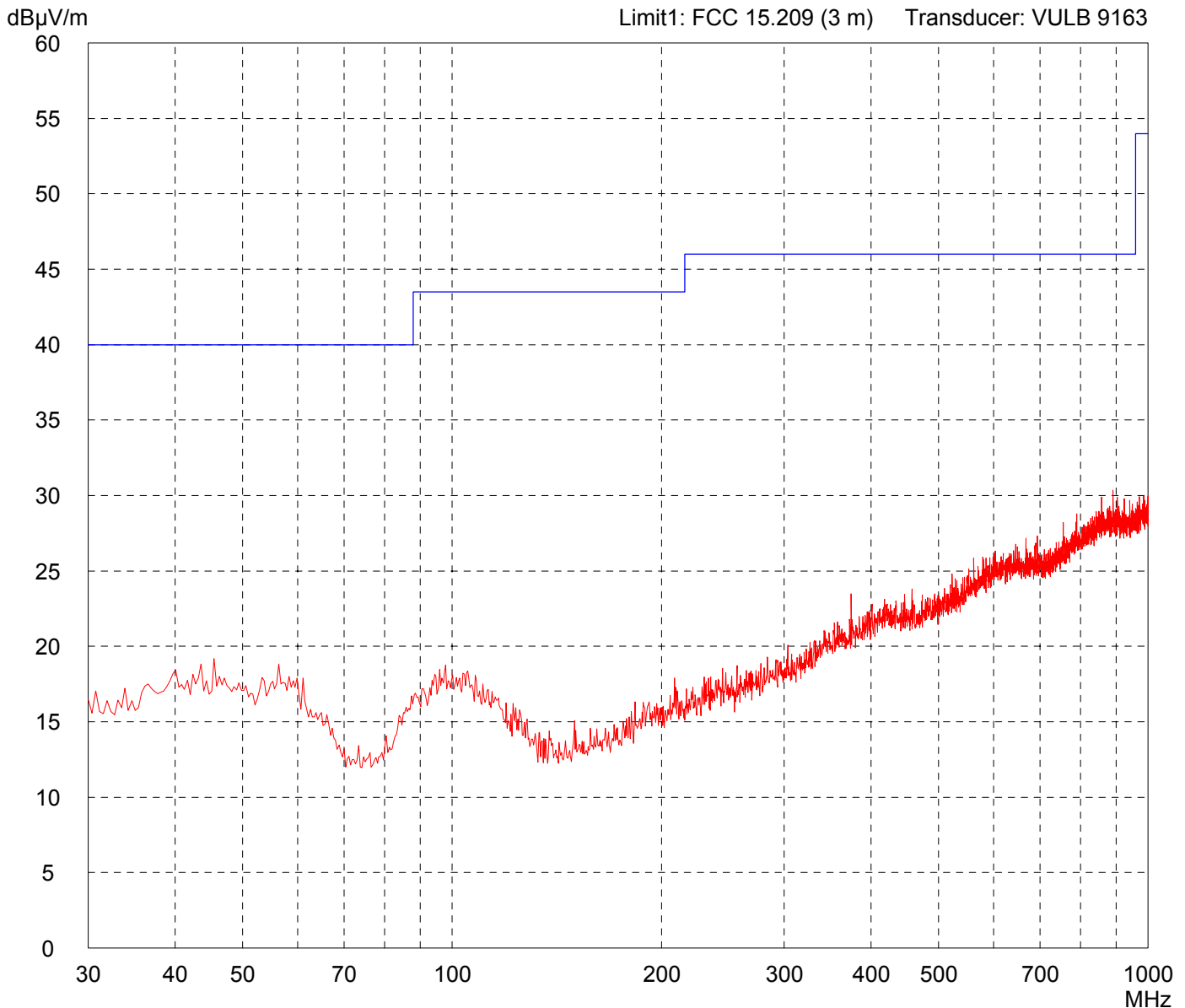


Result: Prescan (VBW = 100 kHz)	Project file: 50511-61106-1
	Page of Pages

Radiated Emission Test 30 MHz - 1 GHz acc. to FCC Part 15 Subpart C (FAR)

Model: FMR 24x	Comment: - TX mode - EUT DC powered : 24 V - Head unit : FMR24 - Antenna :4" Horn - RF module :
Serial no.: ---	
Applicant: Endress & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 11/13/2007	Operator: T. Eberl
Test performed: automatically	File name: default.emi

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

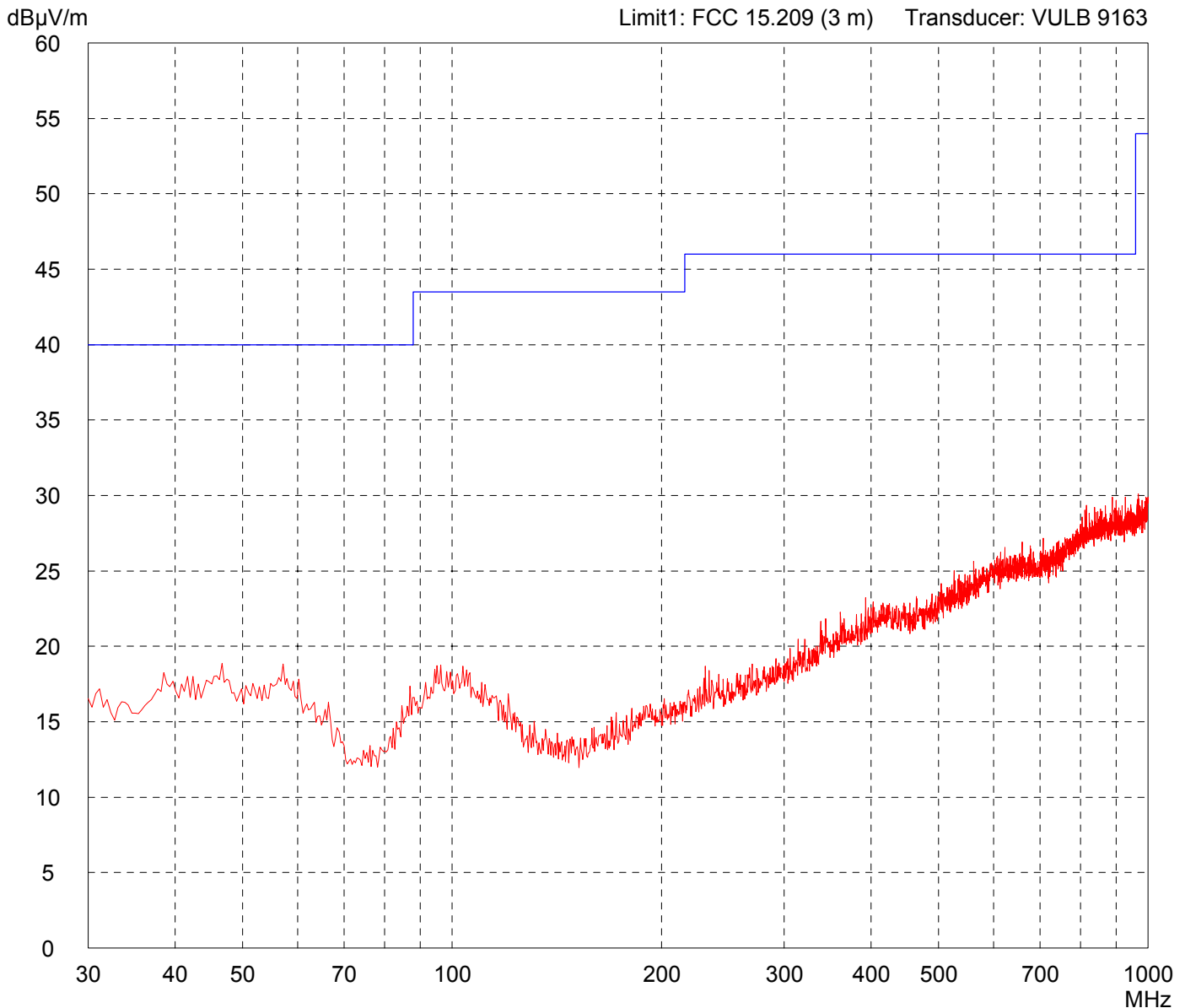


Result: Prescan	Project file: 50511-61106-2
	Page of Pages

Radiated Emission Test 30 MHz - 1 GHz acc. to FCC Part 15 Subpart C (FAR)

Model: FMR 24x	Comment: - TX mode - EUT DC powered : 24 V - Head unit : FMR24 - Antenna :4" Horn - RF module :
Serial no.: ---	
Applicant: Endress & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 11/13/2007	Operator: T. Eberl
Test performed: automatically	File name: default.emi

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

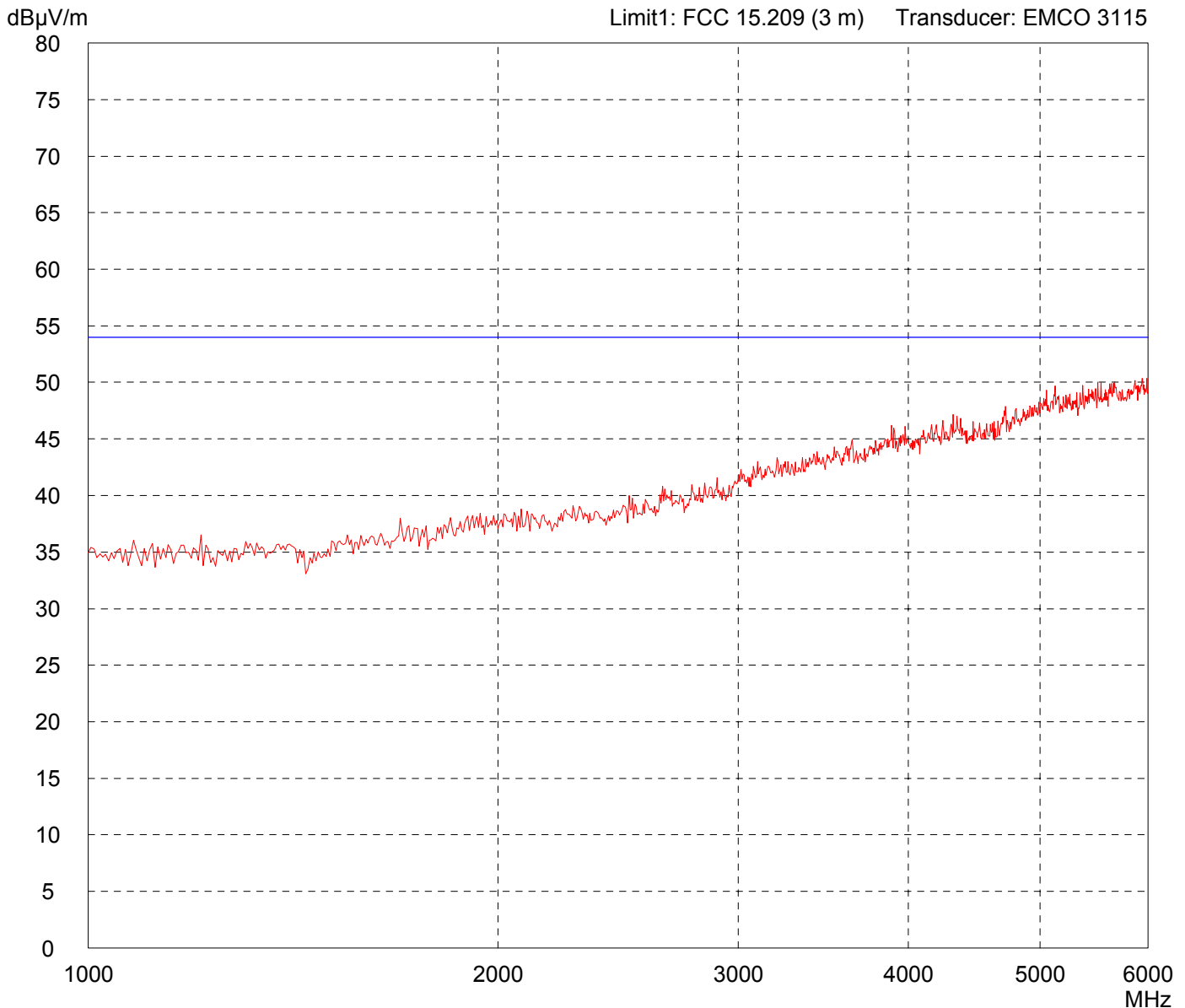


Result: Prescan	Project file: 50511-61106-2
	Page of Pages

Radiated Emission Test 1 GHz - 6 GHz acc. to FCC Part 15 Subpart C (FAR)

Model: FMR 24x	Comment: - TX mode - EUT DC powered : 24 V - Head unit : FMR24 - Antenna :4" Horn - RF module :
Serial no.: ---	
Applicant: Endress & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 11/13/2007	Operator: T. Eberl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
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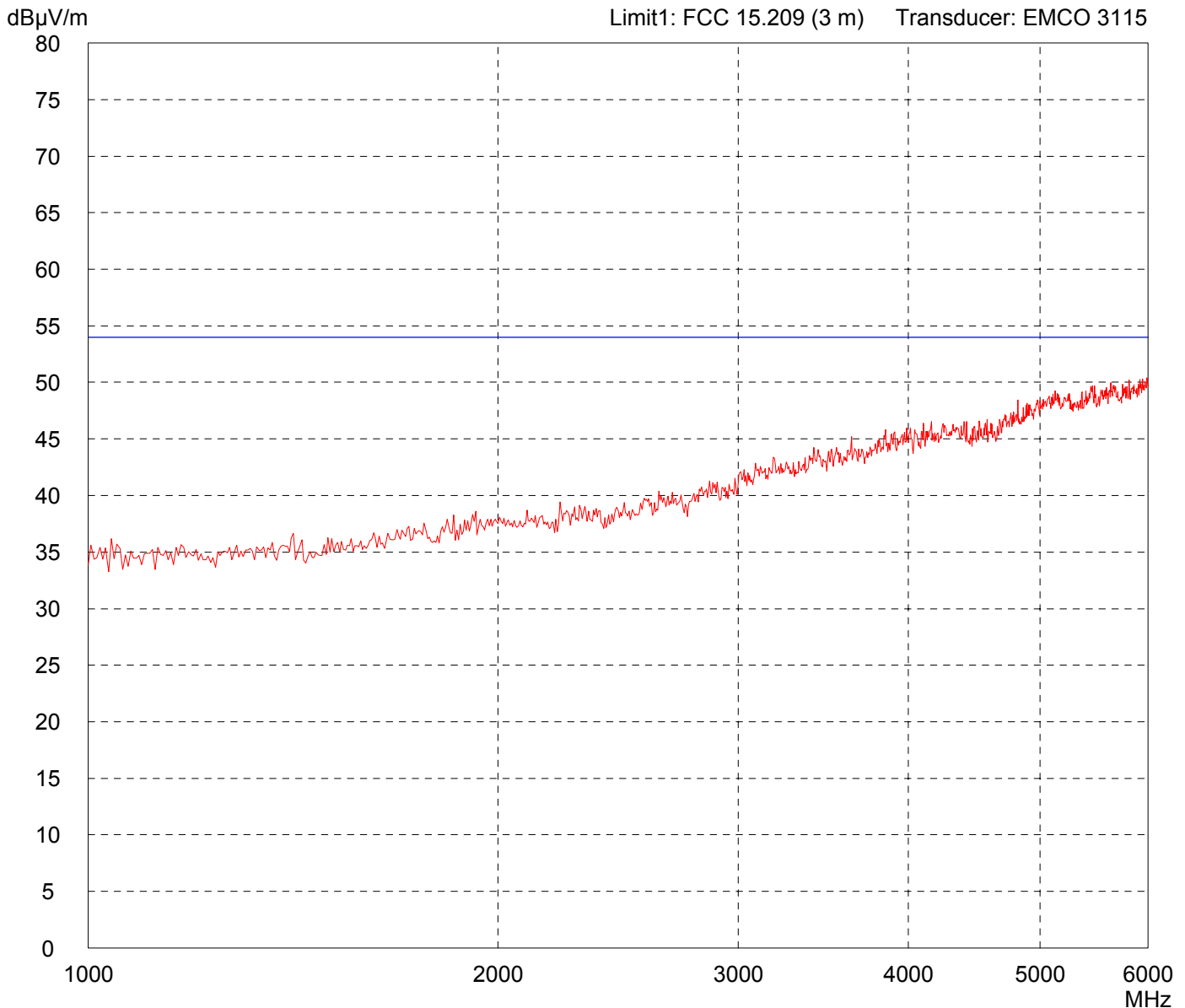


Result: Limit kept	Project file: 50511-61106-2
	Page of Pages

Radiated Emission Test 1 GHz - 6 GHz acc. to FCC Part 15 Subpart C (FAR)

Model: FMR 24x	Comment: - TX mode - EUT DC powered : 24 V - Head unit : FMR24 - Antenna :4" Horn - RF module :
Serial no.: ---	
Applicant: Endress & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 11/13/2007	Operator: T. Eberl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: Selected by hand
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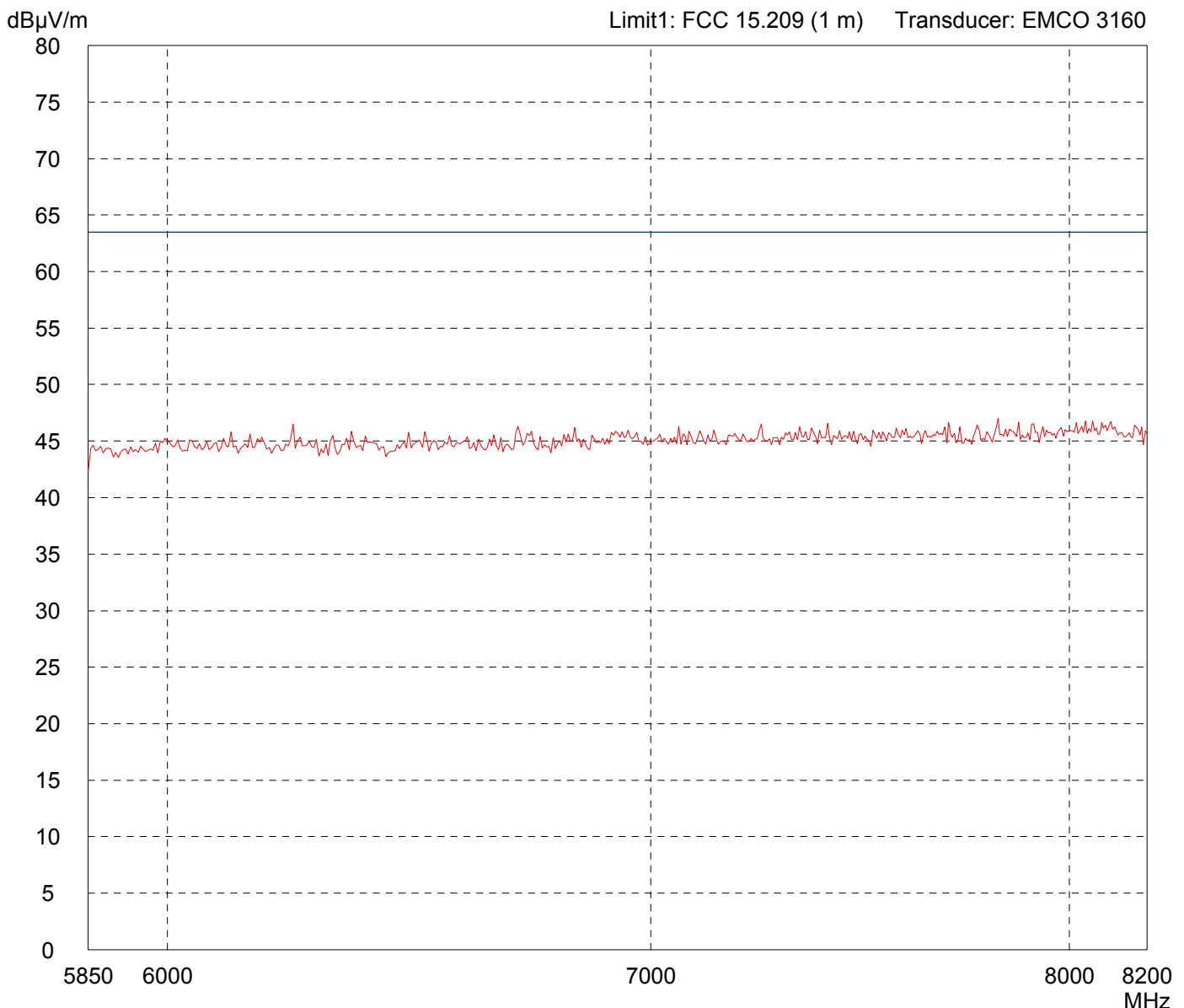


Result: Limit kept	Project file: 50511-61106-2
	Page of Pages

Radiated Emission Test 5.85 GHz - 8.2 GHz acc. to FCC Part 15 Subpart C (FAR)

Model: FMR 24x	Comment: - TX mode - EUT DC powered : 24 V - Head unit : FMR24 - Antenna :4" Horn - RF module :
Serial no.: ---	
Applicant: Endress & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 1 meter Horizontal Polarization	
Date of test: 11/13/2007	Operator: T. Eberl
Test performed: automatically	File name: default.emi

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

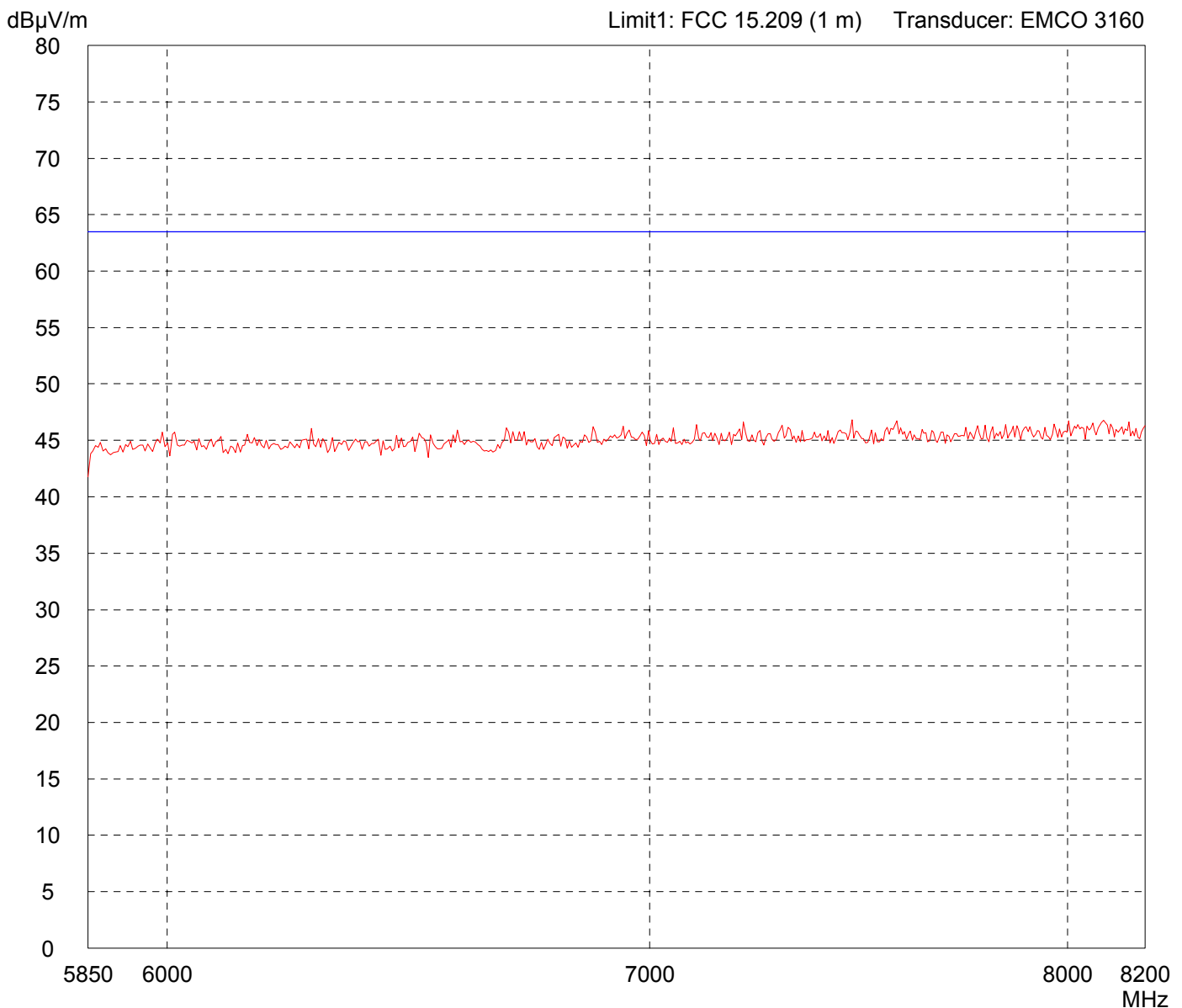


Result: Limit kept	Project file: 50511-61106-2
	Page of Pages

Radiated Emission Test 5.85 GHz - 8.2 GHz acc. to FCC Part 15 Subpart C (FAR)

Model: FMR 24x	Comment: - TX mode - EUT DC powered : 24 V - Head unit : FMR24 - Antenna :4" Horn - RF module :
Serial no.: ---	
Applicant: Endress & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 1 meter Vertical Polarization	
Date of test: 11/13/2007	Operator: T. Eberl
Test performed: automatically	File name: default.emi

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

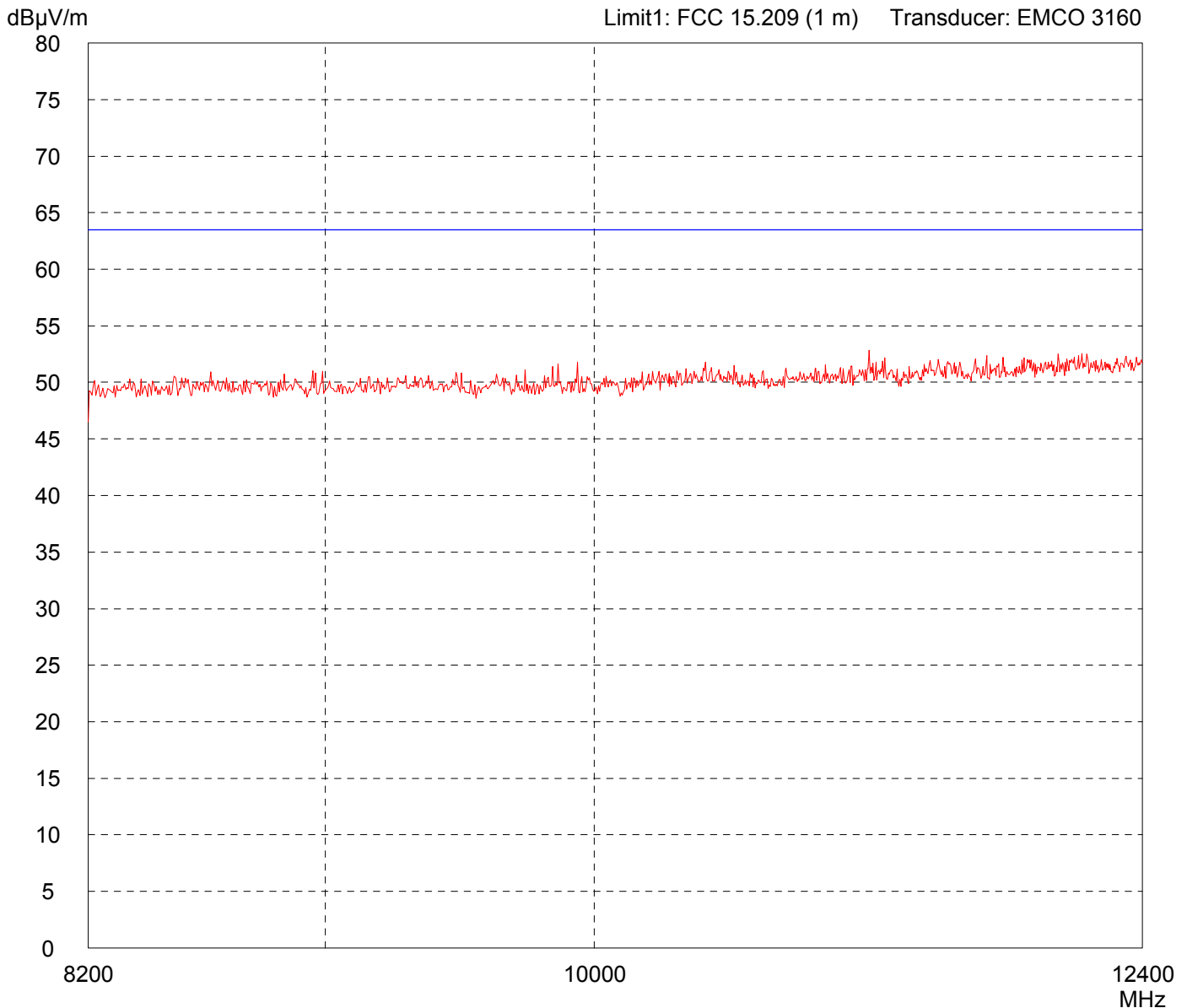


Result: Limit kept	Project file: 50511-61106-2
	Page of Pages

Radiated Emission Test 8.2 GHz - 12.4 GHz acc. to FCC Part 15 Subpart C (FAR)

Model: FMR 24x	Comment: - TX mode - EUT DC powered : 24 V - Head unit : FMR24 - Antenna :4" Horn - RF module :
Serial no.: ---	
Applicant: Endress & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 1 meter Horizontal Polarization	
Date of test: 11/13/2007	Operator: T. Eberl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: <div style="display: flex; justify-content: space-between;"> 10 dB Margin 50 Subranges </div>
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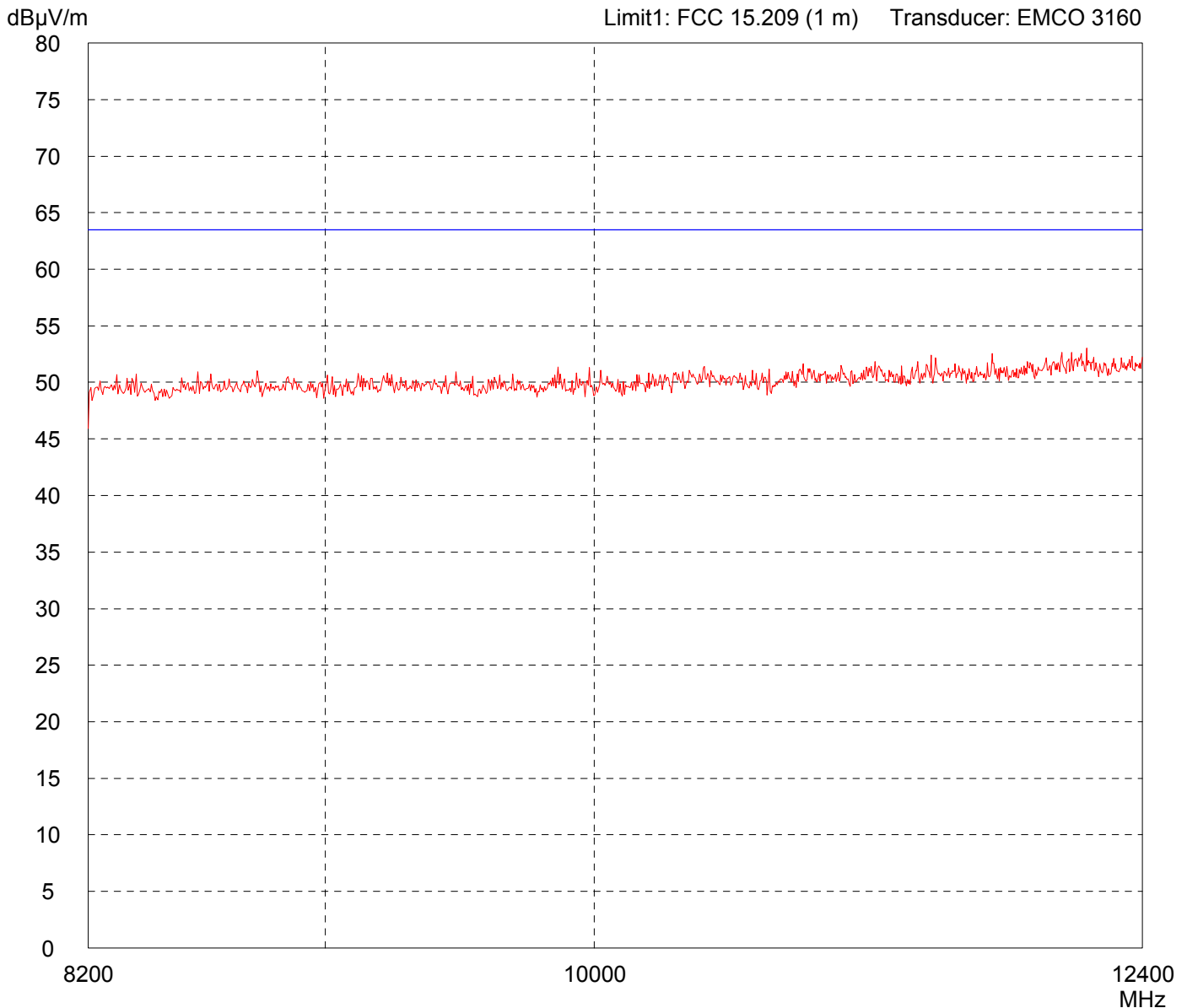


Result: Limit kept	Project file: 50511-61106-2
	Page of Pages

Radiated Emission Test 8.2 GHz - 12.4 GHz acc. to FCC Part 15 Subpart C (FAR)

Model: FMR 24x	Comment: - TX mode - EUT DC powered : 24 V - Head unit : FMR24 - Antenna :4" Horn - RF module :
Serial no.: ---	
Applicant: Endress & Hauser GmbH & Co. KG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 1 meter Vertical Polarization	
Date of test: 11/13/2007	Operator: T. Eberl
Test performed: automatically	File name: default.emi

Detector: Peak	List of values: <div style="display: flex; justify-content: space-between;"> 10 dB Margin 50 Subranges </div>
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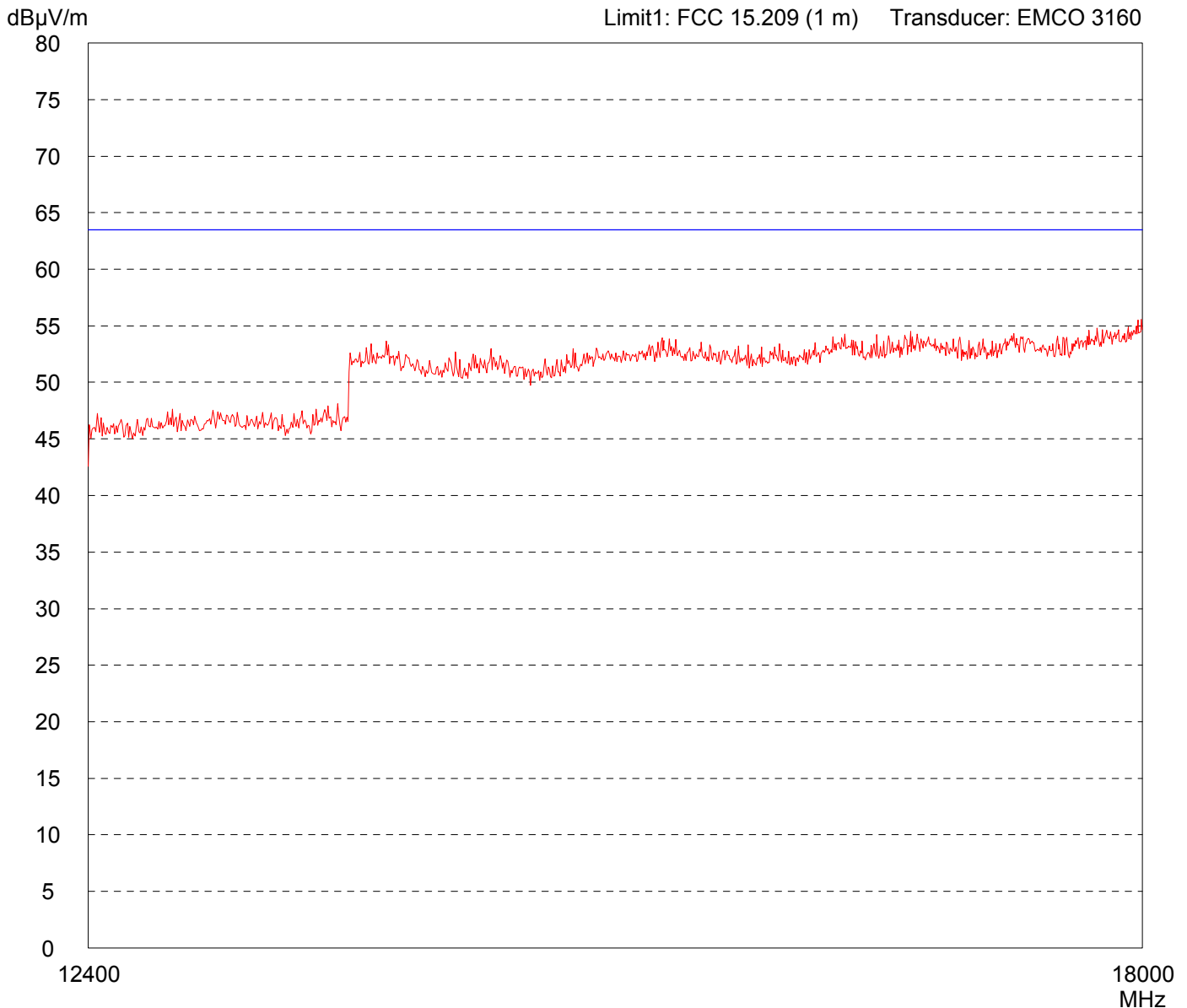


Result: Limit kept	Project file: 50511-61106-2
	Page of Pages

Radiated Emission Test 12.4 GHz - 18 GHz acc. to FCC Part 15 Subpart C (FAR)

Model: FMR 24x		Comment: - TX mode - EUT DC powered : 24 V - Head unit : FMR24 - Antenna :4" Horn - RF module :
Serial no.: ---		
Applicant: Endress & Hauser GmbH & Co. KG		
Test site: Fully anechoic room, cabin no. 2		
Tested on: Test distance 1 meter Horizontal Polarization		
Date of test: 11/13/2007	Operator: T. Eberl	
Test performed: automatically	File name: default.emi	

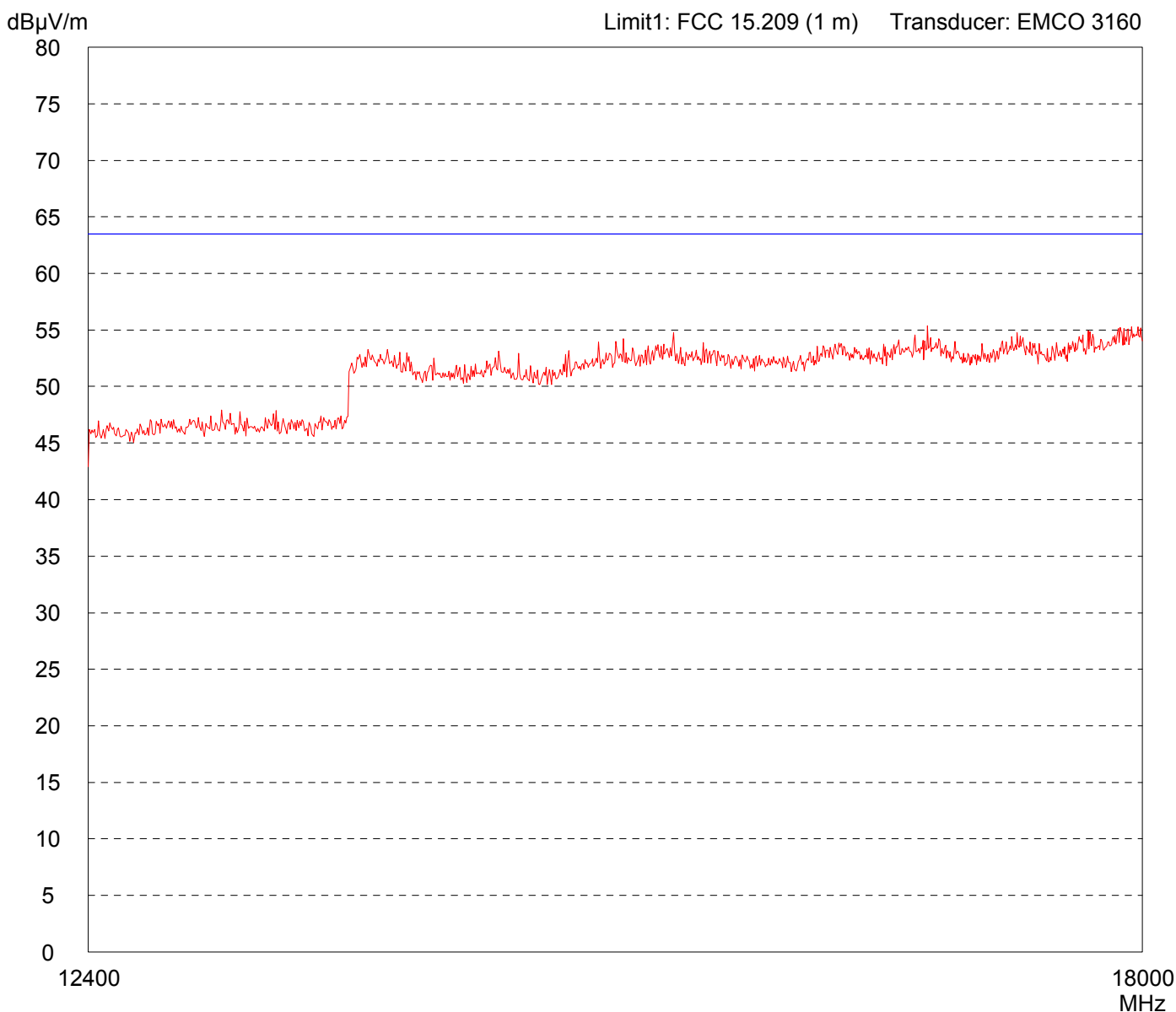
Detector: Peak	List of values: Selected by hand
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Result: Limit kept	Project file: 50511-61106-2
Page of Pages	

Radiated Emission Test 12.4 GHz - 18 GHz acc. to FCC Part 15 Subpart C (FAR)

Model: FMR 24x		Comment: - TX mode - EUT DC powered : 24 V - Head unit : FMR24 - Antenna :4" Horn - RF module :
Serial no.: ---		
Applicant: Endress & Hauser GmbH & Co. KG		
Test site: Fully anechoic room, cabin no. 2		
Tested on: Test distance 1 meter Vertical Polarization		
Date of test: 11/13/2007	Operator: T. Eberl	
Test performed: automatically	File name: default.emi	
Detector: Peak		List of values: Selected by hand



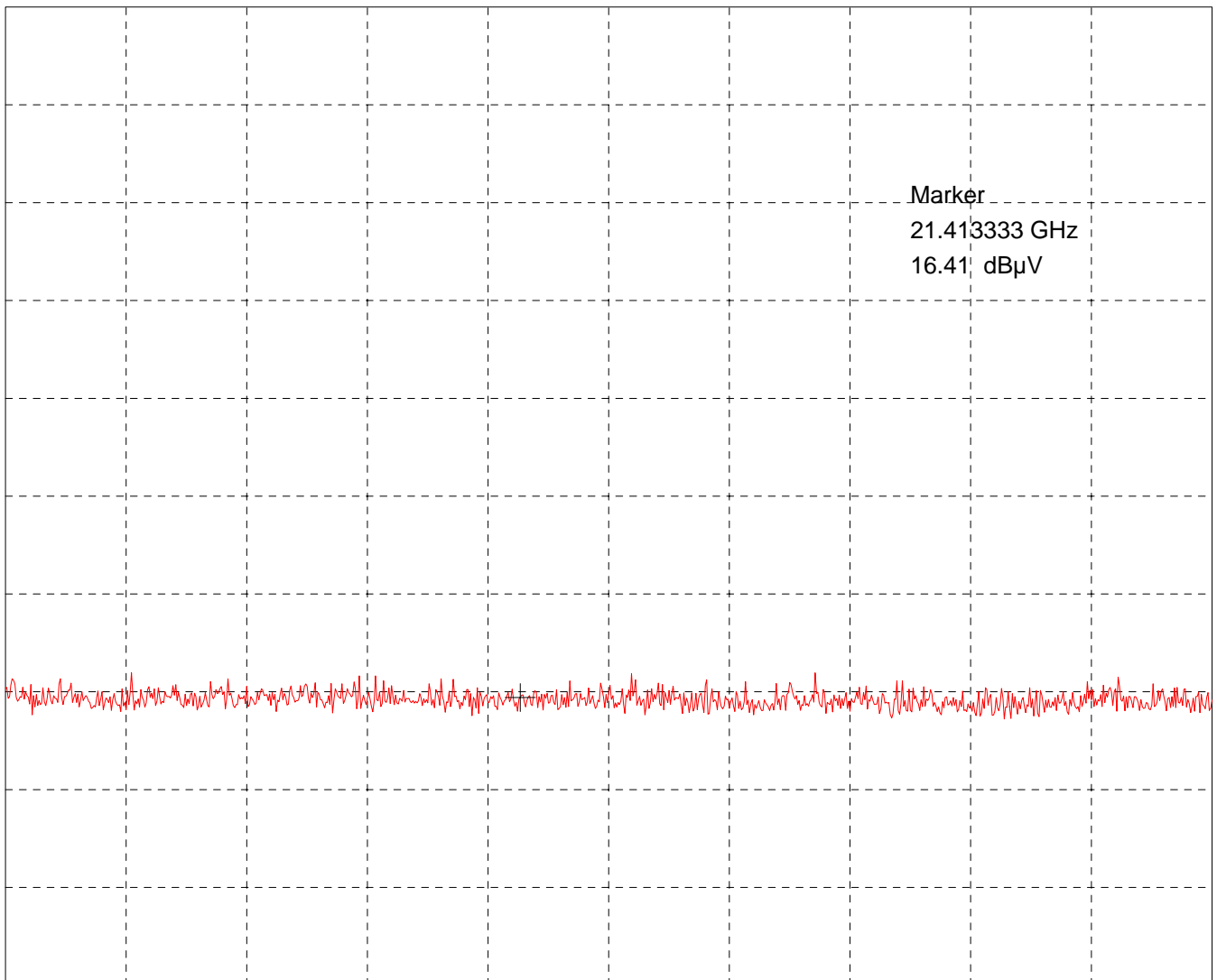
Result: Limit kept	Project file: 50511-61106-2
	Page of Pages

Radiated Emission Test 18 GHz - 26 GHz acc. to FCC Part 15 Subpart C

Model: FMR 24X	Mode:
Serial No.: ---	- TX mode
Applicant: Endress & Hauser GmbH & Co. KG	- EUT DC powered: 24 V
	- Head unit : FMR24
	- Antenna: 4" Horn
	- RF module:
	- Antenna pol. : horizontal
	- Test distance: 0.5 m

Ref.Level 87 dB μ V
10 dB/Div.

ATT 0 dB



Start 18.000 GHz
RBW 100 kHz

VBW 100 kHz

Stop 26.000 GHz
SWP 2.40 s

Tested by: Thomas Eberl	Project-No.: 50511-06110-2
Date: 11/13/2007	Page of pages

Radiated Emission Test 18 GHz - 26 GHz acc. to FCC Part 15 Subpart C

Model:
FMR 24X

Serial No.:

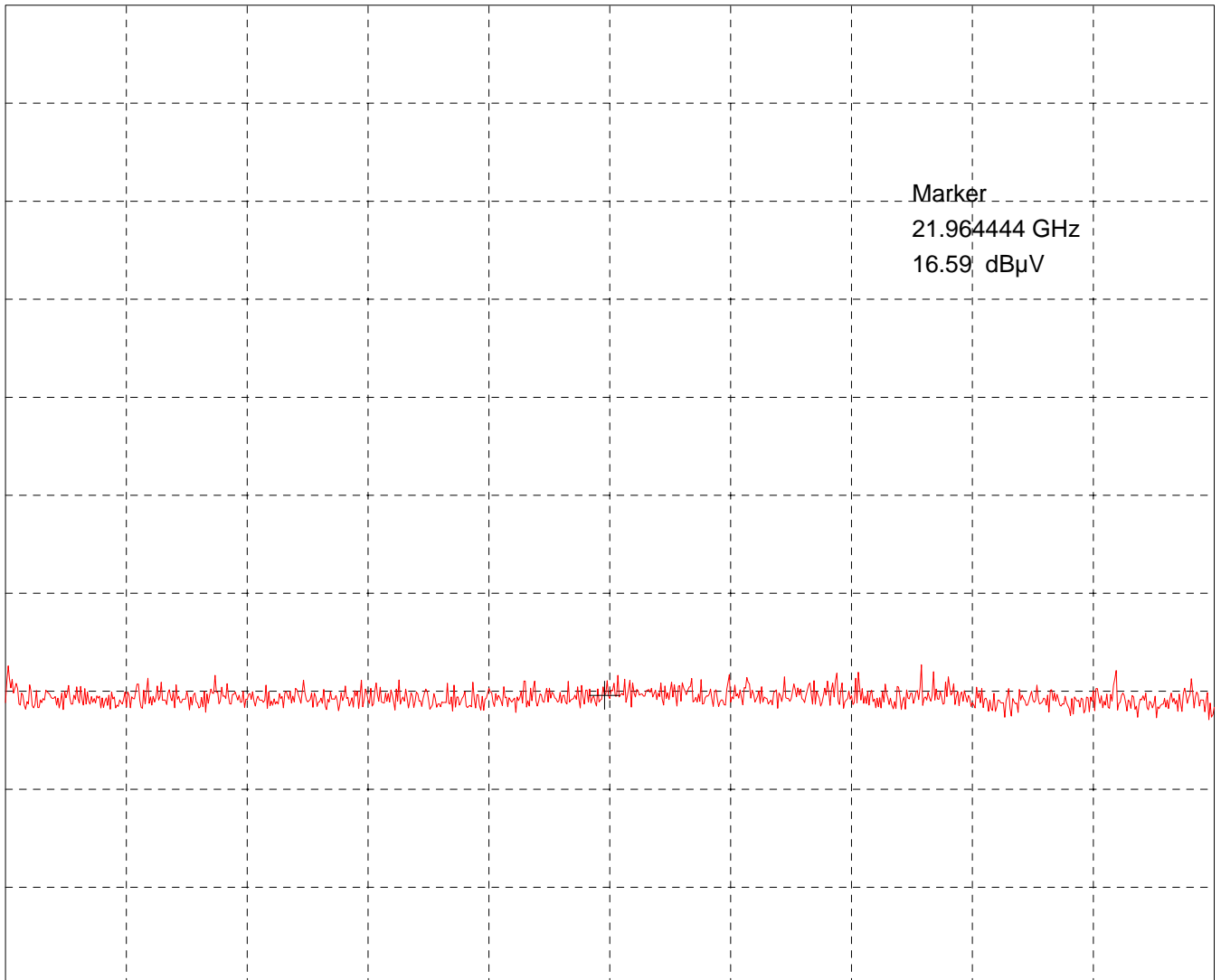
Applicant:
Endress & Hauser GmbH & Co. KG

Mode:

- TX mode
- EUT DC powered: 24 V
- Head unit : FMR24
- Antenna: 4" Horn
- RF module:
- Antenna pol. : vertical
- Test distance: 0.5 m

Ref.Level 87 dB μ V
10 dB/Div.

ATT 0 dB



Start 18.000 GHz
RBW 100 kHz

VBW 100 kHz

Stop 26.000 GHz
SWP 2.40 s

Tested by:
Thomas Eberl

Date:
11/13/2007

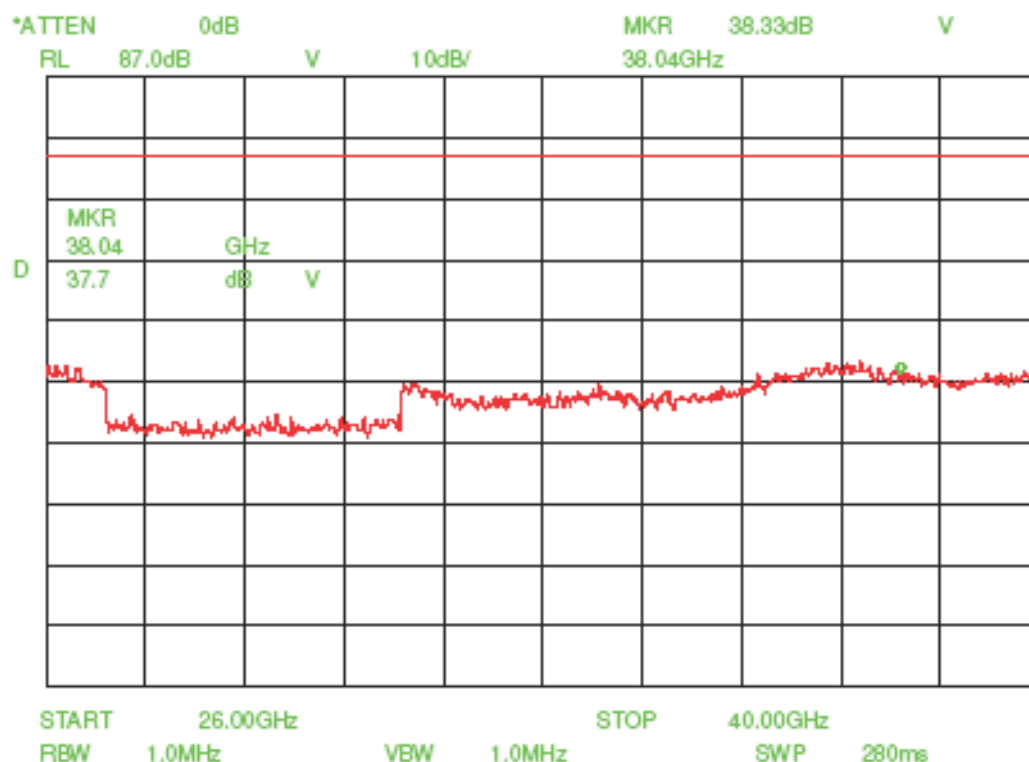
Project-No.:
50511-06110-2

Page of pages

3 Plots, graphs and data sheets: Measurement result

FRM54X Radar with Parabolic antenna 200 mm

Plot no.: 1



Calculation: Field strength = analyzer reading + cable loss - amplifier gain + antenna factor

$$e \text{ [dB}(\mu\text{V/m)}] = u \text{ [dB}(\mu\text{V)}] + a \text{ [dB]} - g \text{ [dB]} + k \text{ [dB(1/m)]}$$

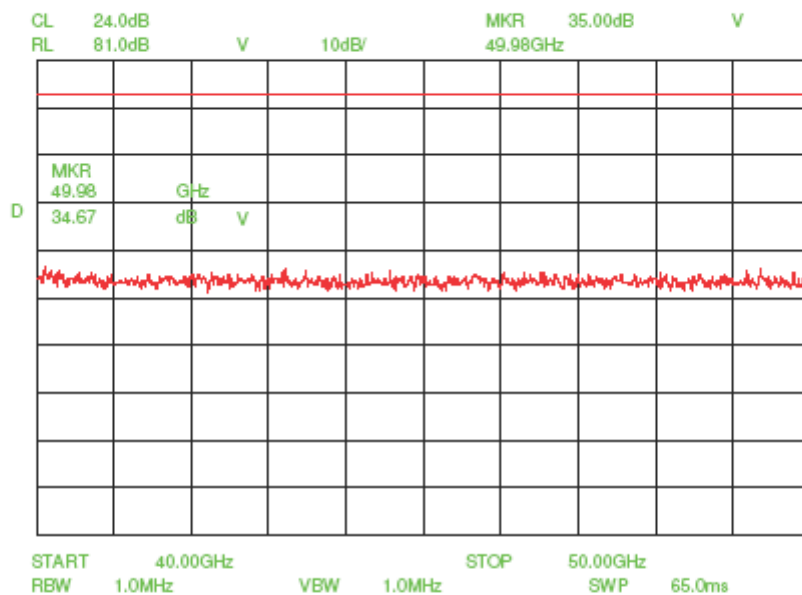
 see page 7 - 8

The offset (cable loss - amplifier gain + antenna factor) is calculated in the analyzer reading.

Limit: see page 10

FRM54X Radar with Parabolic antenna 200 mm

Plot no.: 2



Calculation: Field strength = analyzer reading + cable loss - amplifier gain + antenna factor

$$e \text{ [dB(}\mu\text{V/m)]} = u \text{ [dB(}\mu\text{V)]} + a \text{ [dB]} - g \text{ [dB]} + k \text{ [dB(1/m)]}$$

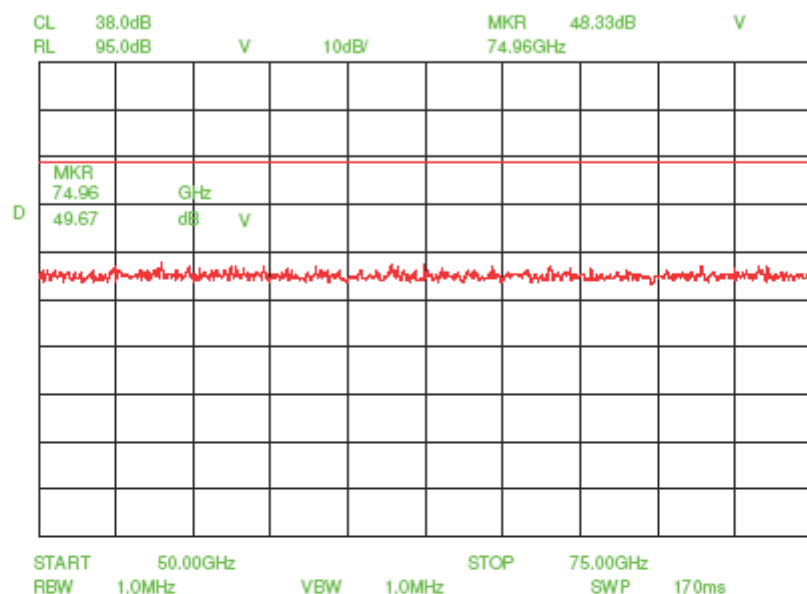
 see page 7 - 8

The offset (cable loss - amplifier gain + antenna factor) is calculated in the analyzer reading.

Limit: see page 10

FRM54X Radar with Parabolic antenna 200 mm

Plot no.: 3



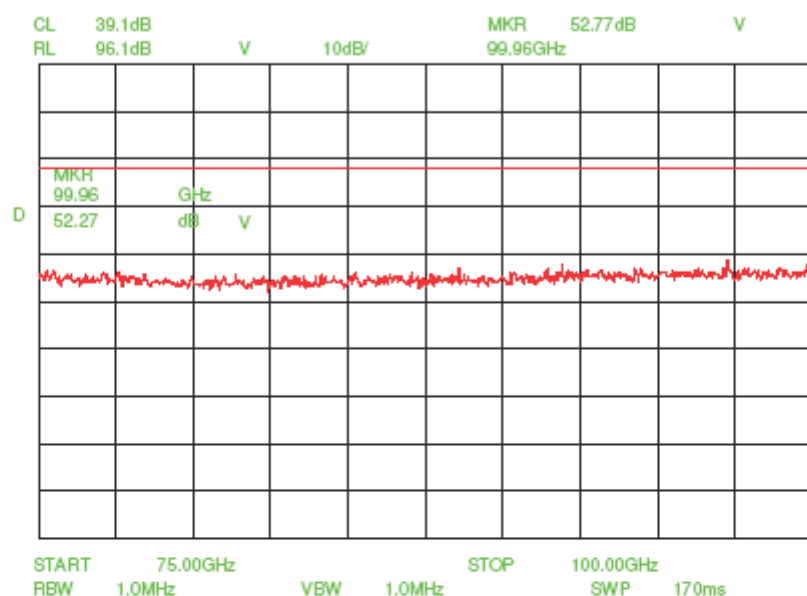
Calculation: Field strength = analyzer reading + cable loss - amplifier gain + antenna factor
 $e \text{ [dB}(\mu\text{V/m)}] = u \text{ [dB}(\mu\text{V)}] + a \text{ [dB]} - g \text{ [dB]} + k \text{ [dB(1/m)]}$
 see page 7 - 8

The offset (cable loss - amplifier gain + antenna factor) is calculated in the analyzer reading.

Limit: see page 10

FRM54X Radar with Parabolic antenna 200 mm

Plot no.: 4



Calculation: Field strength = analyzer reading + cable loss - amplifier gain + antenna factor

$$e \text{ [dB}(\mu\text{V/m)}] = u \text{ [dB}(\mu\text{V)}] + a \text{ [dB]} - g \text{ [dB]} + k \text{ [dB(1/m)]}$$

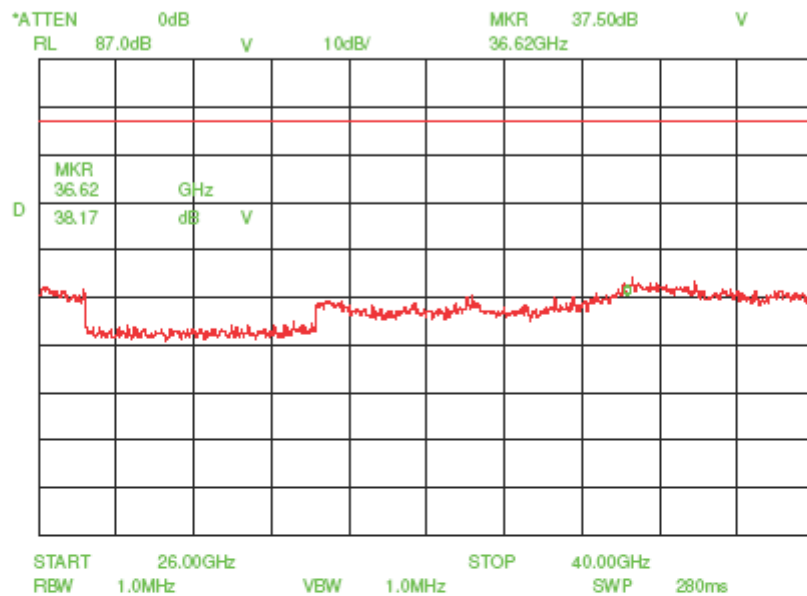
 see page 7 - 8

The offset (cable loss - amplifier gain + antenna factor) is calculated in the analyzer reading.

Limit: see page 10

FRM54X Radar with Horn antenna 4"

Plot no.: 5



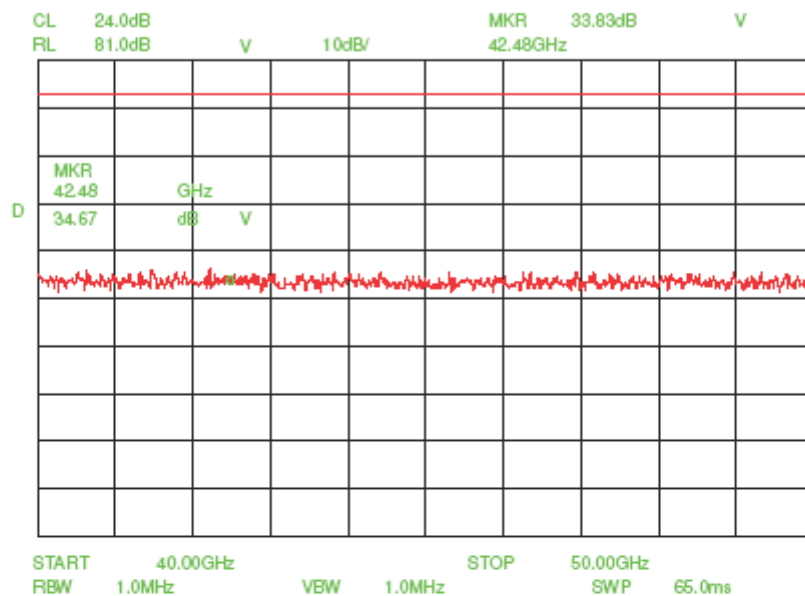
Calculation: Field strength = analyzer reading + cable loss - amplifier gain + antenna factor
 $e \text{ [dB}(\mu\text{V/m)}] = u \text{ [dB}(\mu\text{V)}] + a \text{ [dB]} - g \text{ [dB]} + k \text{ [dB(1/m)]}$
 see page 7 - 8

The offset (cable loss - amplifier gain + antenna factor) is calculated in the analyzer reading.

Limit: see page 11

FRM54X Radar with Horn antenna 4"

Plot no.: 6



Calculation: Field strength = analyzer reading + cable loss - amplifier gain + antenna factor

$$e \text{ [dB}(\mu\text{V/m)}] = u \text{ [dB}(\mu\text{V)}] + a \text{ [dB]} - g \text{ [dB]} + k \text{ [dB(1/m)]}$$

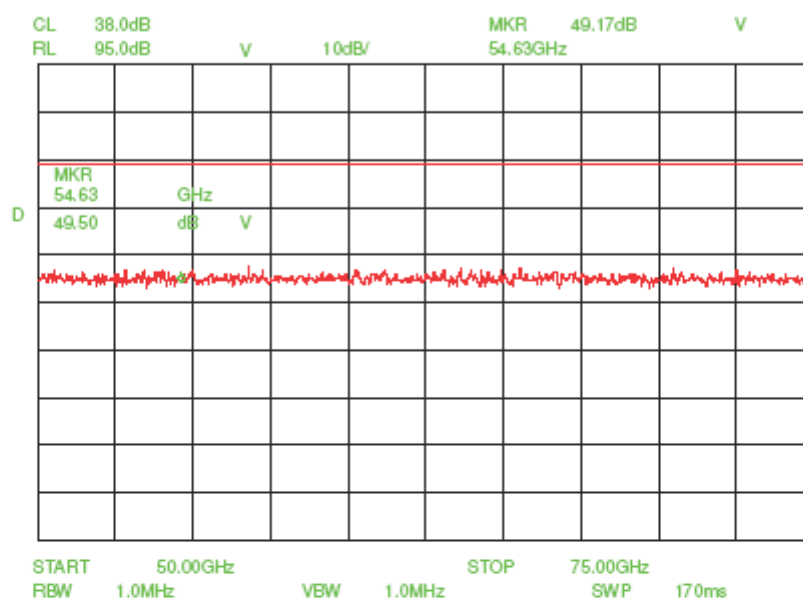
 see page 7 - 8

The offset (cable loss - amplifier gain + antenna factor) is calculated in the analyzer reading.

Limit: see page 11

FRM54X Radar with Horn antenna 4"

Plot no.: 7



Calculation: Field strength = analyzer reading + cable loss - amplifier gain + antenna factor

$$e [\text{dB}(\mu\text{V/m})] = u [\text{dB}(\mu\text{V})] + a [\text{dB}] - g [\text{dB}] + k [\text{dB}(1/\text{m})]$$

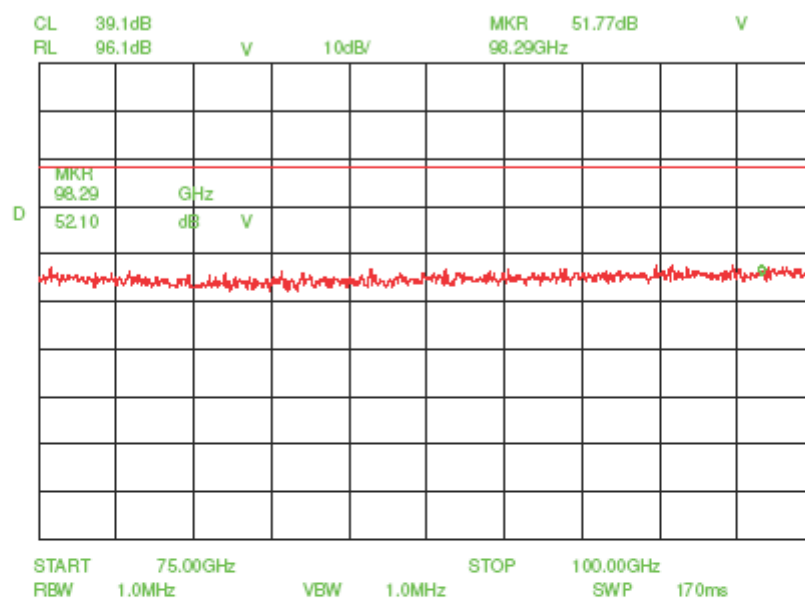
 see page 7 - 8

The offset (cable loss - amplifier gain + antenna factor) is calculated in the analyzer reading.

Limit: see page 11

FRM54X Radar with Horn antenna 4"

Plot no.: 8



Calculation: Field strength = analyzer reading + cable loss - amplifier gain + antenna factor

$$e \text{ [dB}(\mu\text{V/m)}] = u \text{ [dB}(\mu\text{V)}] + a \text{ [dB]} - g \text{ [dB]} + k \text{ [dB(1/m)]}$$

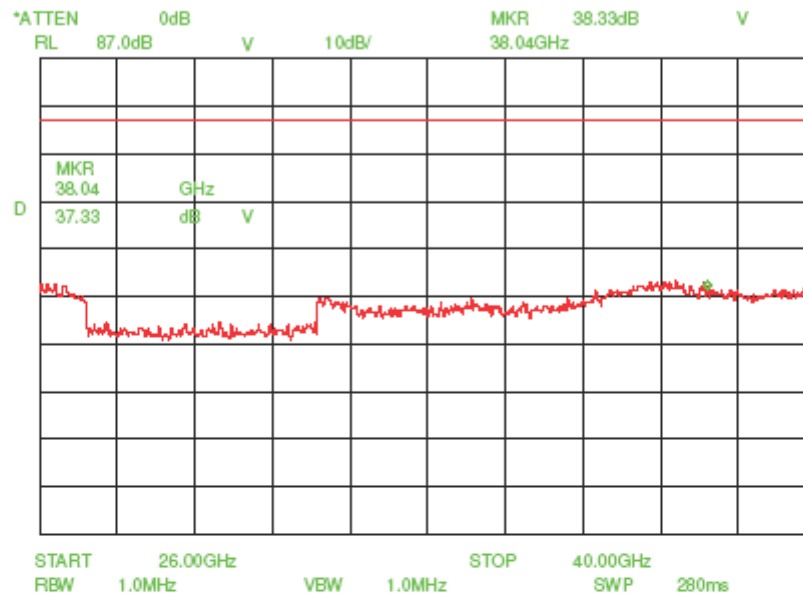
 see page 7 - 8

The offset (cable loss - amplifier gain + antenna factor) is calculated in the analyzer reading.

Limit: see page 11

FRM54X Radar with Plated antenna 2"

Plot no.: 9



Calculation: Field strength = analyzer reading + cable loss - amplifier gain + antenna factor

$$e \text{ [dB}(\mu\text{V/m)}] = u \text{ [dB}(\mu\text{V)}] + a \text{ [dB]} - g \text{ [dB]} + k \text{ [dB(1/m)]}$$

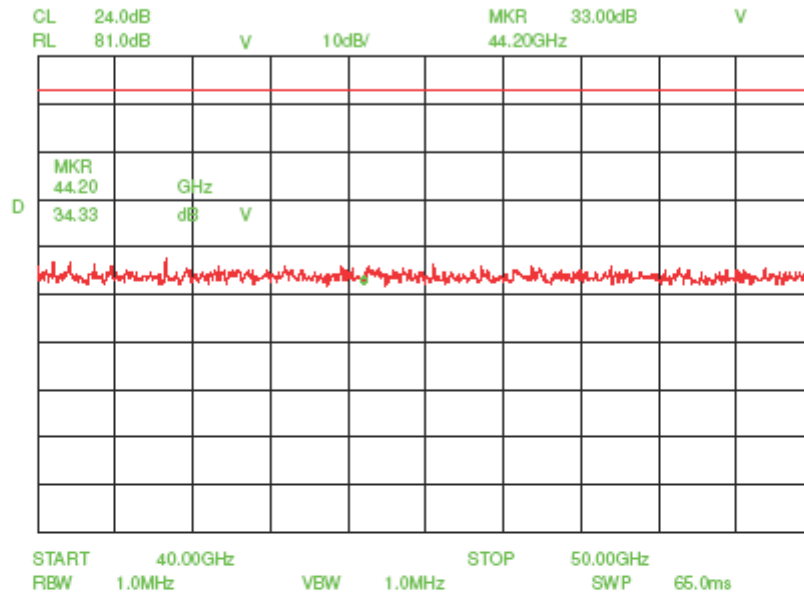
 see page 7 - 8

The offset (cable loss - amplifier gain + antenna factor) is calculated in the analyzer reading.

Limit: see page 12

FRM54X Radar with Plated antenna 2"

Plot no.: 10



Calculation: Field strength = analyzer reading + cable loss - amplifier gain + antenna factor

$$e \text{ [dB}(\mu\text{V/m)}] = u \text{ [dB}(\mu\text{V)}] + a \text{ [dB]} - g \text{ [dB]} + k \text{ [dB(1/m)]}$$

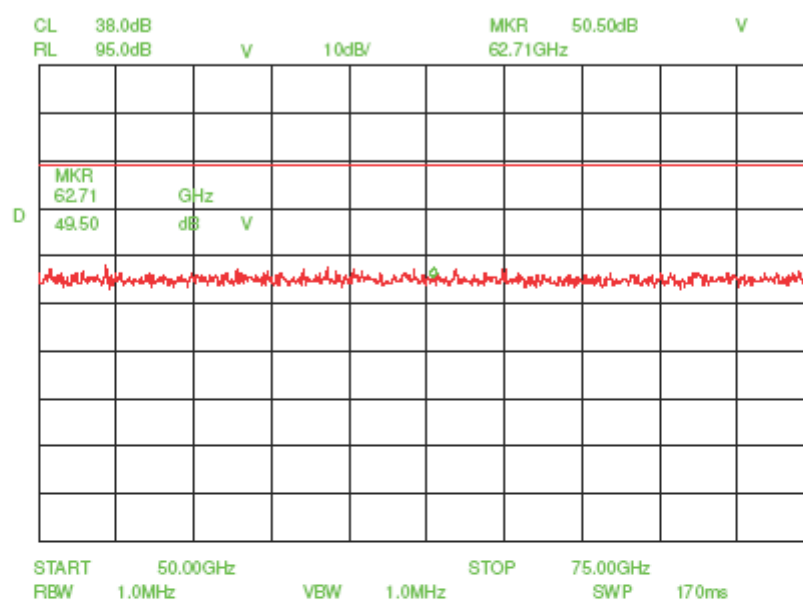
 see page 7 - 8

The offset (cable loss - amplifier gain + antenna factor) is calculated in the analyzer reading.

Limit: see page 12

FRM54X Radar with Plated antenna 2"

Plot no.: 11



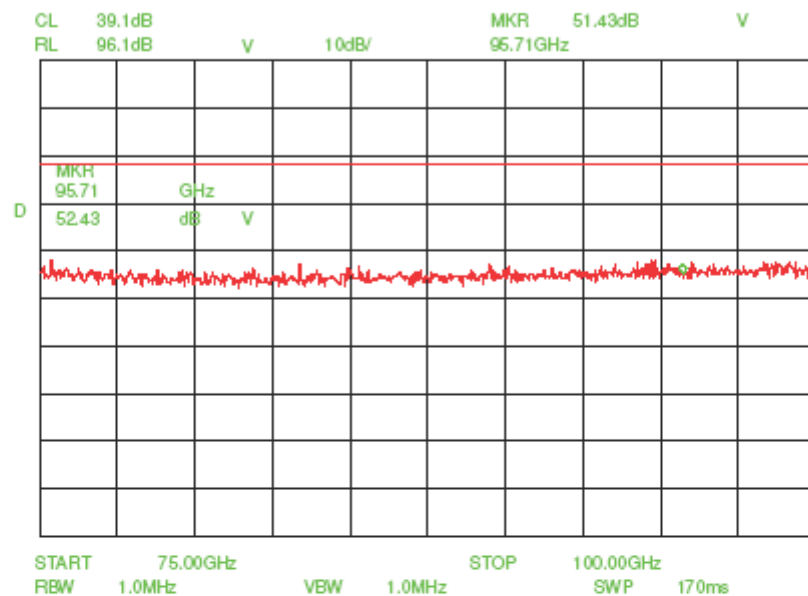
Calculation: Field strength = analyzer reading + cable loss - amplifier gain + antenna factor
 $e \text{ [dB}(\mu\text{V/m)}] = u \text{ [dB}(\mu\text{V)}] + a \text{ [dB]} - g \text{ [dB]} + k \text{ [dB(1/m)]}$
 see page 7 - 8

The offset (cable loss - amplifier gain + antenna factor) is calculated in the analyzer reading.

Limit: see page 12

FRM54X Radar with Plated antenna 2"

Plot no.: 12



Calculation: Field strength = analyzer reading + cable loss - amplifier gain + antenna factor

$$e [\text{dB}(\mu\text{V/m})] = u [\text{dB}(\mu\text{V})] + a [\text{dB}] - g [\text{dB}] + k [\text{dB}(1/\text{m})]$$

 see page 7 - 8

The offset (cable loss - amplifier gain + antenna factor) is calculated in the analyzer reading.

Limit: see page 12