Senton GmbH
Aeussere Fruehlingstrasse 45
D-94315 Straubing

Straubing, November 7, 2007

T E S T - R E P O R T

No. 50531-070577-2 (Edition 2)

for

PD Remote Control (Porsche Design)

Remote Control Transmitter

Applicant:	NAVIGON AG
Test Specifications:	FCC Code of Federal Regulations, CFR 47, Part 15, Sections 15.205, 15.207, 15.215 and 15.231 Industry Canada Radio Standards Specifications RSS-Gen Issue 2, Section 7.2.2 and RSS-210 Issue 7, Sections 2.2, A1.1 (Category I Equipment)

Table of Contents

1 Description of the Equipment Under Test (EUT)

General data of EUT	
Type designation[1]:	PD Remote Control (Porsche Design)
Parts[2]:	
Serial number(s):	0001
Manufacturer:	Rapid-e-Engineering
Type of equipment:	Remote Control Transmitter
Version:	As delivered
FCC ID:	
Additional parts/accessories:	

Technical data of EUT		
Application frequency range:	433.92 MHz	
Frequency range:	433.92 MHz	
Operating frequency:	433.92 MHz	
Type of modulation:	FSK	
Pulse train:	Not Applicable	
Pulse width:	Not Applicable	
Number of RF-channels:	1	
Channel spacing:	Not Applicable	
Designation of emissions[3]:	88k2F1D	
Type of antenna:	Integrated on printed board	
Size/length of antenna:	50 mm	
Connection of antenna:	☐ detachable	☒ not detachable
Type of power supply:	Battery supply	
Specifications for power supply:	nominal voltage: minimum voltage: maximum voltage:	3.00 V 2.55 V 3.00 V

[1] Type designation of the system if EUT consists of more than one part.
[2] Type designations of the parts of the system, if applicable.
[3] Also known as "Class of Emission".

2 Administrative Data

Application details	
Applicant (full address):	NAVIGON AG Berlinerplatz 11 97080 Würzburg Germany
Contact person:	Mr. Thomas Engelhardt
Contract identification:	
Receipt of EUT:	6 July 2007
Date(s) of test:	July 2007
Note(s):	

Report details	
Report number:	50531-070577-2
Edition:	2
Issue date:	November 7, 2007

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, 15.215 and 15.231(a)-(d)** of the Federal Communication Commission (FCC) and the **Radio Standards Specifications** **RSS-210 Issue 7, Sections 2.2, A1.1.1 to A1.1.4 (Category I Equipment)** of Industry Canada (IC).

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

5 Operation Mode and Configuration of EUT

Operation Mode
The EUT was set to continuous transmit mode.

Configuration of EUT
The EUT was configured as stand alone device. Full tests were performed for three positions.

List of ports and cables				
Port	*Description*	*Classification*[4]	*Cable type*	*Cable length*
	Not Applicable			

List of devices connected to EUT				
Item	*Description*	*Type Designation*	*Serial no. or ID*	*Manufacturer*
	Not Applicable			

List of support devices				
Item	*Description*	*Type Designation*	*Serial no. or ID*	*Manufacturer*
	Not Applicable			

[4] Ports shall be classified as ac power, dc power or signal/control port

6 Measurement Procedures

6.1 Bandwidth Measurements

Measurement Procedure:	
Rules and specifications:	CFR 47 Part 2, section 2.202(a) CFR 47 Part 15, section 15.215(c) IC RSS-Gen Issue 2, sections 4.6.1 and 4.6.2 IC RSS-210 Issue 7, section A1.1.3 ANSI C63.4, annex H.6
Guide:	ANSI C63.4 / IC RSS-Gen Issue 2, sections 4.6.1 and 4.6.2
Measurement setup:	☐ Conducted: See below ☒ Radiated: Radiated Emission in Fully or Semi Anechoic Room (6.3)
If antenna is detachable bandwidth measurements shall be performed at the antenna connector (conducted measurement) when the transmitter is adjusted in accordance with the tune-up procedure, if applicable. The RF output terminals are connected to a spectrum analyzer. If required, a resistive matching network equal to the impedance specified or employed for the antenna is used as well as dc block and appropriate attenuators (50 Ohms). The electrical characteristics of the radio frequency load attached to the output terminals shall be stated, if applicable. If radiated measurements are performed the same test setups and instruments are used as with radiated emission measurements for the appropriate frequency range. The analyzer settings are specified by the test description of the appropriate test record(s).	

6.2 Radiated Emission Measurement 9 kHz to 30 MHz

Measurement Procedure:	
Rules and specifications:	CFR 47 Part 15, sections 15.205 and 15.231 IC RSS-210 Issue 7, sections A1.1.2, 2.2(b)(c), 2.6
Guide:	ANSI C63.4

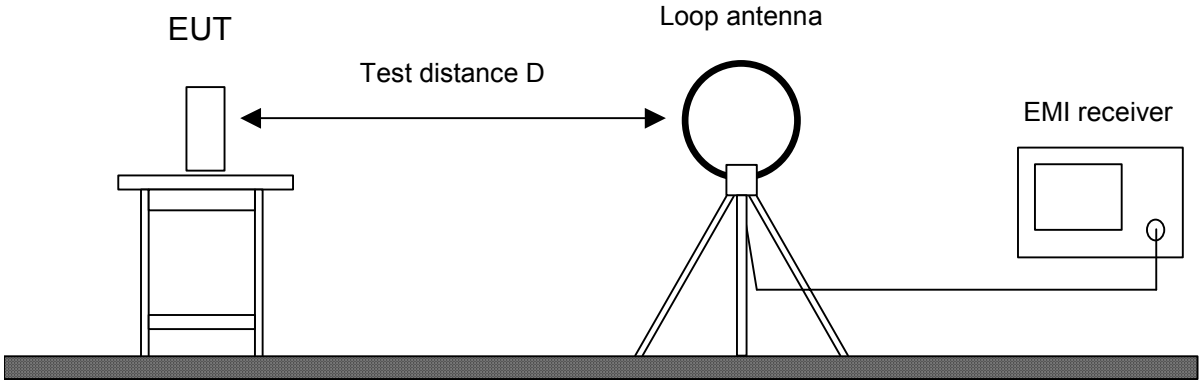
Radiated emission in the frequency range 9 kHz to 30 MHz is measured using an active loop antenna. First the whole spectrum of emission caused by the equipment is recorded at a distance of 3 meters in a fully or semi anechoic room with the detector of the spectrum analyzer or EMI receiver set to peak. This configuration is also used for recording the spectrum of intentional radiators.

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.

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.
If worst case emission of the EUT cannot be recorded with EUT in standard position and loop antenna in vertical polarization the EUT (or the radiating part of the EUT) is rotated by 90 degrees instead of changing the loop antenna to horizontal polarization. This procedure is selected to minimize the influence of the environment (e.g. effects caused by the floor especially with longer distances).

Final measurement is performed at a test distance D of 30 meters using an open field test site. In case the regulation requires testing at other distances, the result is extrapolated by either making measurements at an additional distance D of 10 meters to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). In cases of very low emissions measurements are performed at shorter distances and results are extrapolated to the required distance. The provisions of CFR 47 Part 15 sections 15.31(d) and (f)(2) apply. According to CFR 47 Part 15 section 15.209(d) final measurement is performed with detector function set to quasi-peak except for the frequency bands 9 to 90 kHz and 110 to 490 kHz where, for non-pulsed operation, average detector is employed.

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.



Test instruments used:

Used	Type	Model	Serial No. or ID	Manufacturer
☐	Spectrum Analyzer	FSP 30	100063	Rohde & Schwarz
☐	EMI test receiver	ESMI	839379/013 839587/006	Rohde & Schwarz
☒	Test receiver	ESHS 10	860043/016	Rohde & Schwarz
☐	Preamplifier	CPA9231A	3393	Schaffner
☒	Loop antenna	HFH2-Z2	882964/1	Rohde & Schwarz
☐	Fully anechoic room	No. 2	1452	Albatross Projects
☐	Semi-anechoic room	No. 3	1453	Siemens
☒	Open field test site	EG 1	1450	Senton

6.3 Radiated Emission in Fully or Semi Anechoic Room

Measurement Procedure:	
Rules and specifications:	CFR 47 Part 15, sections 15.215(b) and 15.231 IC RSS-210 Issue 7, section A1.1.2
Guide:	ANSI C63.4

Radiated emission in fully or semi 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.

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).

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.

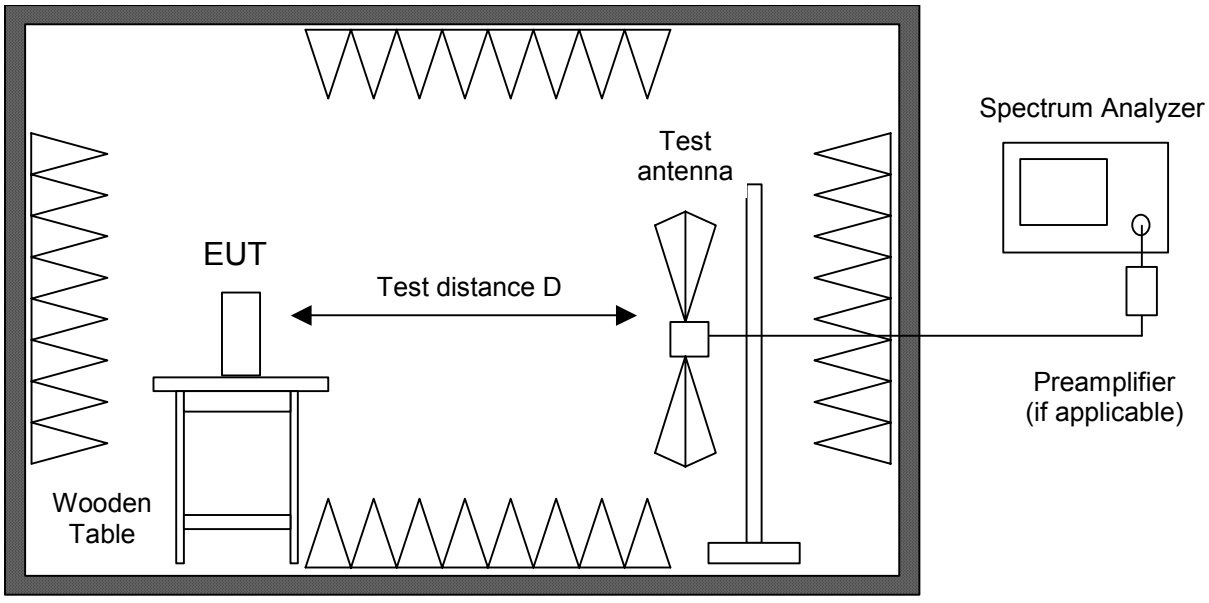
All tests below 18 GHz are performed at a test distance D of 3 meters. For higher frequencies the test distance is reduced (e.g. to 1 meter) due to the sensitivity of the measuring instrument(s) and the test results are calculated according to CFR 47 Part 15 section 15.31(f)(1) using an extrapolation 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.

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.

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.

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.

For final testing below 1 GHz an open field test-site is used and the plots recorded in the fully or semi anechoic room are indicated as prescans.



Fully or semi anechoic room

Test instruments used:

Used	Type	Model	Serial No. or ID	Manufacturer
☒	Spectrum Analyzer	FSP 30	100063	Rohde & Schwarz
☐	Spectrum analyzer	R 3271	05050023	Advantest
☐	EMI test receiver	ESMI	839379/013 839587/006	Rohde & Schwarz
☒	Preamplifier	CPA9231A	3393	Schaffner
☐	Preamplifier	R14601		Advantest
☐	Preamplifier 1-8 GHz	AFS3-00100800-32-LN	847743	Miteq
☐	Preamplifier 0.5-8 GHz	AMF-4D-005080-25-13P	860149	Miteq
☐	Preamplifier 8-18 GHz	ACO/180-3530	32641	CTT
☐	External Mixer	WM782A	845881/005	Tektronix
☐	Harmonic Mixer Accessories	FS-Z30	843389/007	Rohde & Schwarz
☐	Trilog broadband antenna	VULB 9163	9163-188	Schwarzbeck
☒	Horn antenna	3115	9508-4553	EMCO
☐	Horn antenna	3160-03	9112-1003	EMCO
☐	Horn antenna	3160-04	9112-1001	EMCO
☒	Horn antenna	3160-05	9112-1001	EMCO
☐	Horn antenna	3160-06	9112-1001	EMCO
☐	Horn antenna	3160-07	9112-1008	EMCO
☐	Horn antenna	3160-08	9112-1002	EMCO
☐	Horn antenna	3160-09	9403-1025	EMCO
☐	Horn antenna	3160-10	399185	EMCO
☐	Fully anechoic room	No. 2	1452	Albatross Projects
☐	Semi-anechoic room	No. 3	1453	Siemens

6.4 Radiated Emission at Open Field Test Site

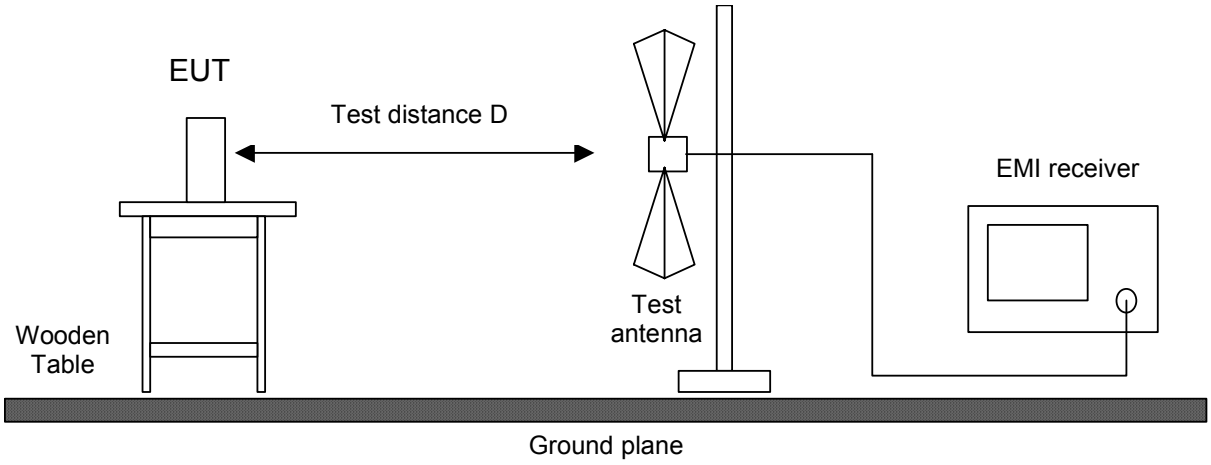
Measurement Procedure:	
Rules and specifications:	CFR 47 Part 15, sections 15.215(b) and 15.231 IC RSS-210 Issue 7, section A1.1.2
Guide:	ANSI C63.4

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.

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.

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.

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.



Test instruments used:

Used	Type		Model	Serial No. or ID	Manufacturer
☒	EMI receiver		ESVP	881120/024	Rohde & Schwarz
☒	Biconical antenna	EG 1	HK 116	842204/001	Rohde & Schwarz
☒	Log. per. antenna	EG 1	HL 223	841516/023	Rohde & Schwarz
☒	Open field test site		EG 1	1450	Senton

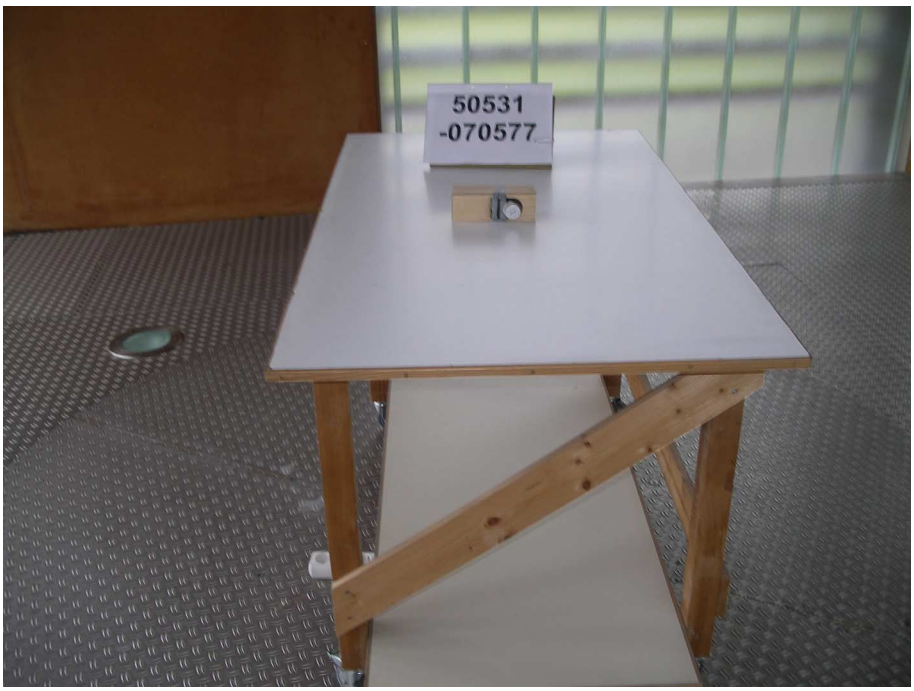
7 Photographs Taken During Testing

Test setup for radiated emission measurement (fully anechoic room)

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

Test setup for radiated emission measurement (open field test site)

Test setup for radiated emission measurement (open field test site) - 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	21	Recorded
15.215(c) 15.231(c)	Bandwidth of the emission	25	Test passed
2.201, 2.202	Class of emission	28	Calculated
15.35(c)	Pulse train measurement for pulsed operation	---	Not applicable
15.205(a)	Restricted bands of operation	29	Test passed
15.207	Conducted AC powerline emission 150 kHz to 30 MHz	---	Not applicable
15.231(a)	Periodic operation requirements	30	Test passed
15.205(b) 15.231(b)	Radiated emission 9 kHz to 30 MHz	31	Test passed
15.205(b) 15.215(b) 15.231(b)	Radiated emission 30 MHz to 5 GHz	32	Test passed
15.231(d)	Carrier frequency stability	---	Not applicable

IC RSS-Gen Issue 2			
Section(s)	*Test*	*Page*	*Result*
4.8	Transmitter output power (conducted)	---	Not applicable
4.6.1	Occupied Bandwidth	21	Recorded
3.2(h), 8	Designation of emissions	28	Calculated
4.5	Pulsed operation	---	Not applicable
7.2.2	Transmitter AC power lines conducted emissions 150 kHz to 30 MHz	---	Not applicable
5.5	Exposure of Humans to RF Fields	34	Exempted from SAR and RF evaluation

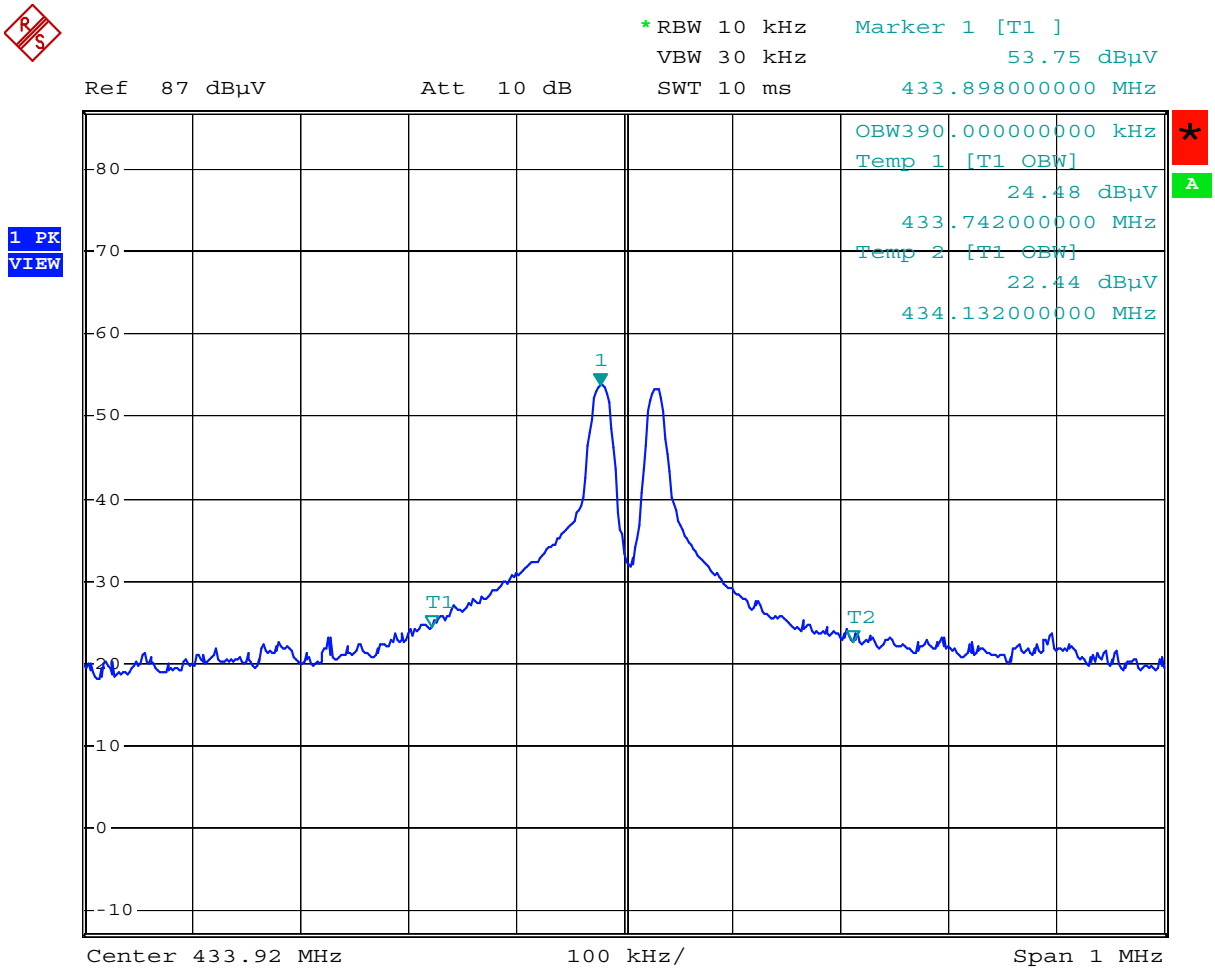
IC RSS-210 Issue 7			
Section(s)	*Test*	*Page*	*Result*
2.2(a)	Restricted bands and unwanted emission frequencies	29	Test passed
A1.1.1	Requirements for momentarily operated devices	30	Test passed
A1.1.2 2.2(b)(c), 2.6	Unwanted emissions 9 kHz to 30 MHz	31	Test passed
A1.1.2 2.2(b)(c), 2.6	Unwanted emissions 30 MHz to 5 GHz	32	Test passed
A1.1.3	Bandwidth of momentary signals	27	Test passed
A1.1.4	Carrier frequency stability	---	Not applicable

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:	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. 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. 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:	
	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.	
Measurement procedure:	Bandwidth Measurements (6.1)	

Comment:	
Date of test:	10 July 2007
Test site:	Fully anechoic room, cabin no. 2

Occupied Bandwidth (99 %):



Date: 10.JUL.2007 09:28:16

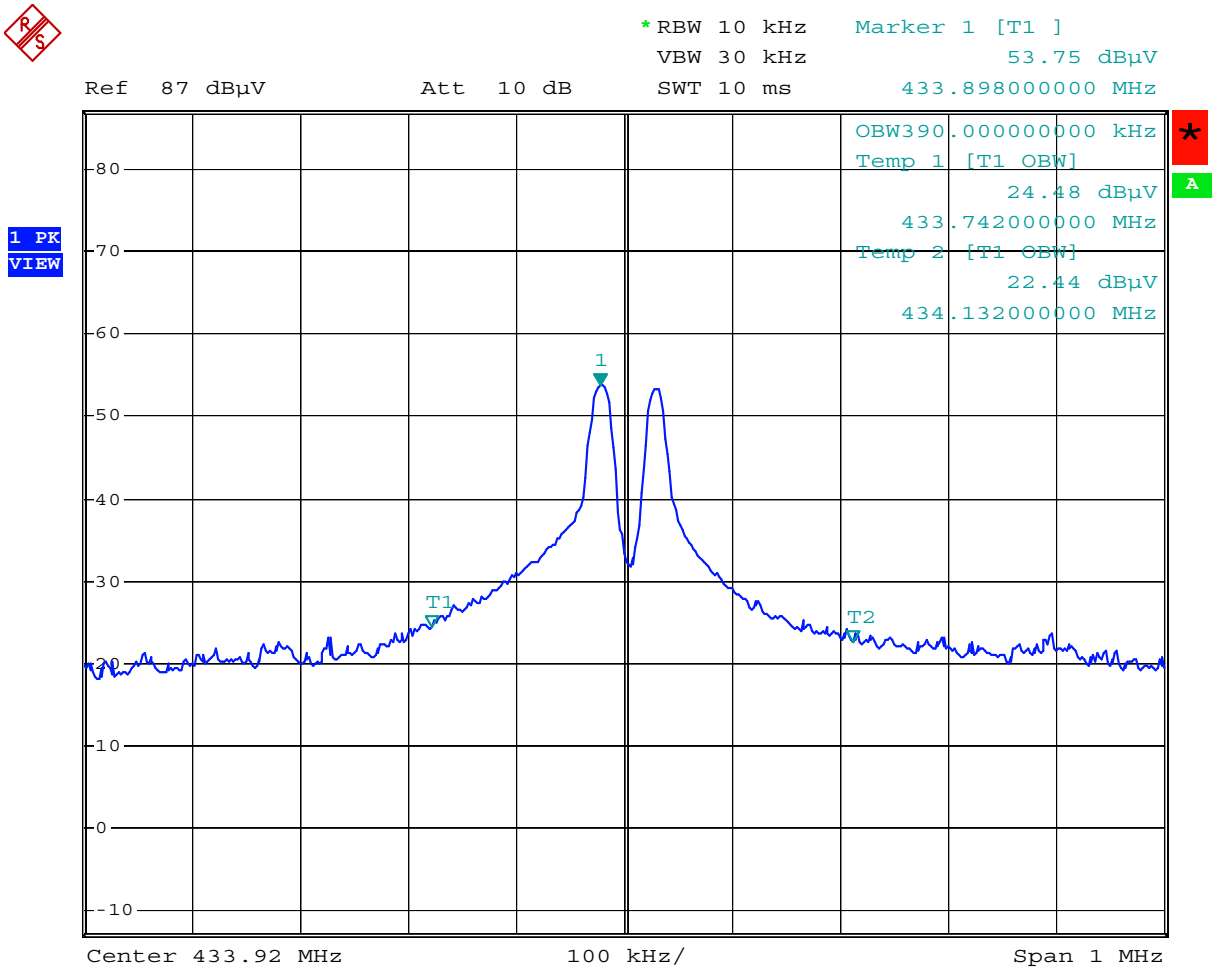
Occupied Bandwidth (99 %):	**390 kHz**

Occupied Bandwidth (continued)

Rules and specifications:	IC RSS-Gen Issue 2, section 4.6.1
Guide:	IC RSS-Gen Issue 2, section 4.6.1
Description:	If not specified in the applicable RSS the occupied bandwidth is measuredas the 99% emission bandwidth. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is also recorded. The span between the two recorded frequencies is the occupied bandwidth.
Measurement procedure:	Bandwidth Measurements (6.1)

Comment:	
Date of test:	10 July 2007
Test site:	Fully anechoic room, cabin no. 2

Occupied Bandwidth (99 %):

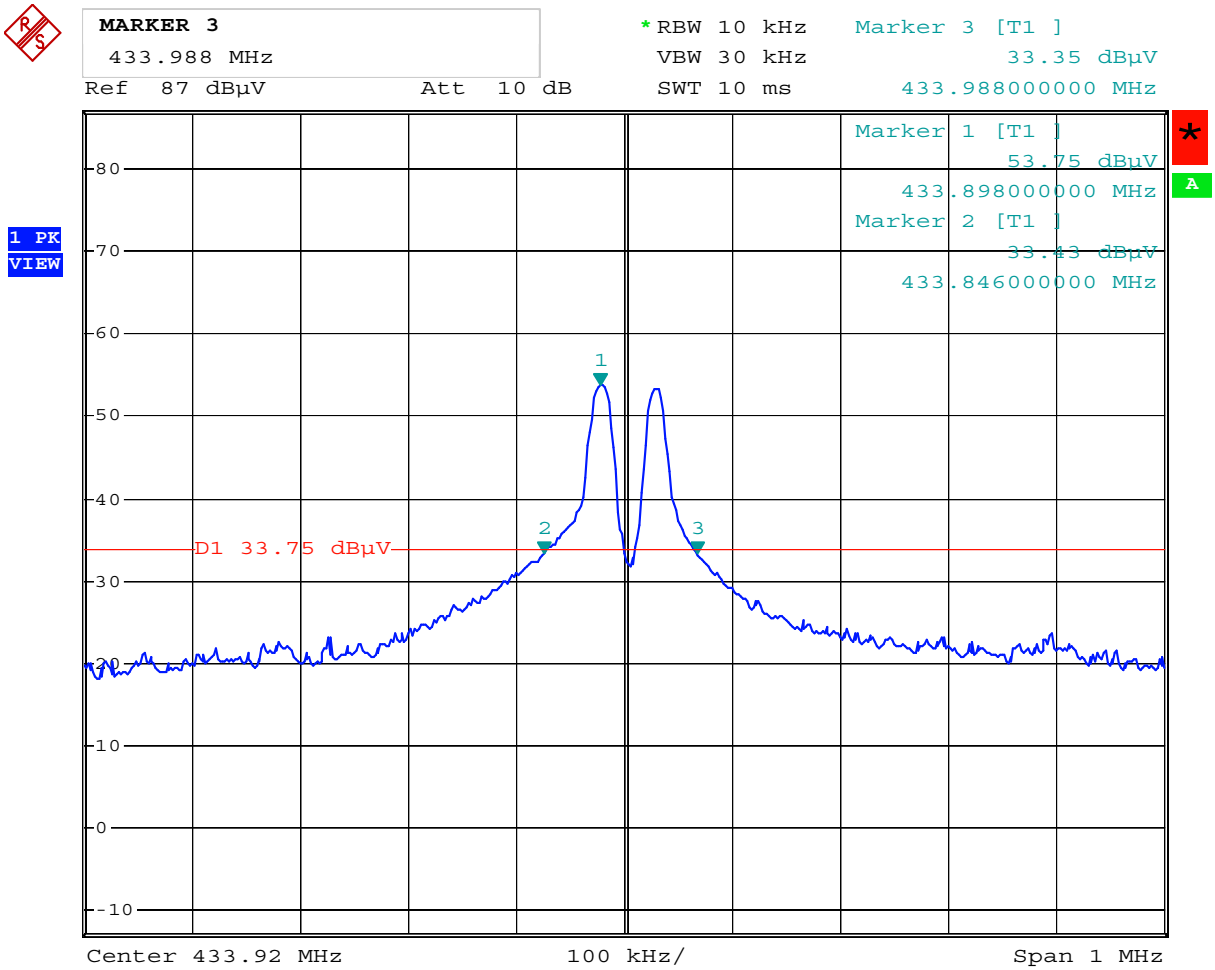


Occupied Bandwidth (99 %):	**390 kHz**

8.2 Bandwidth of the Emission

Rules and specifications:	CFR 47 Part 15, section 15.215(c)
Guide:	ANSI C63.4
Description:	The 20 dB bandwidth of the emission is measured as the frequency range defined by the points that are 20 dB down relative to the maximum level of the modulated carrier. For intentional radiators operating under the alternative provisions to the general emission limits the requirement to contain the 20 dB bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation. 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:
	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.
Measurement procedure:	Bandwidth Measurements (6.1)

Comment:	
Date of test:	10 July 2007
Test site:	Fully anechoic room, cabin no. 2



Permitted frequency band:	**433.92 MHz**	
20 dB bandwidth:	**142 kHz**	
Carrier frequency stability: Maximum frequency tolerances:	☐ **specified**	☒ **not specified**
Bandwidth of the emission:		**within permitted frequency band[5]:** ☒ **yes** ☐ **no**

Test Result:	Test passed

[5] If a frequency stability is not specified, it is recommended that the fundamental emission is kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

8.3 Bandwidth of Momentary Signals

Rules and specifications:	IC RSS-210 Issue 7, section A1.1.3
Guide:	IC RSS-Gen Issue 2, section 4.6.1
Limit:	For the purpose of Section A1.1, the 99% bandwidth shall be no wider than 0.25% of the centre frequency for devices operating between 70 and 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the centre frequency.

Operating frequency: Bandwidth limit:	**433.92 MHz** **1084.8 kHz**
Occupied bandwidth:	**390 kHz**
Emission bandwidth within bandwidth limit:	☒ **yes** ☐ **no**

Test Result:	Test passed

8.4 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:	Frequency Modulation

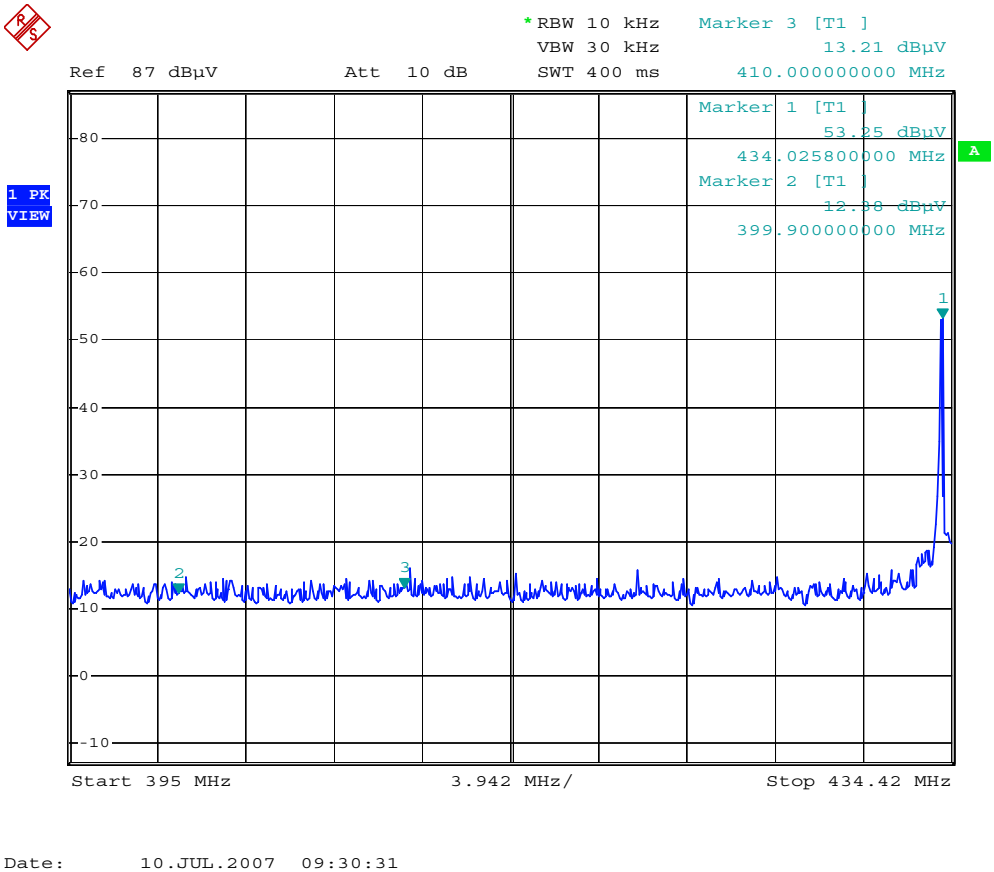
B_n = Necessary Bandwidth	B_n = 2M + 2DK
M = Modulation frequency	M = 0.1 kHz
D = Peak deviation	D = 44 kHz
K = Overall numerical factor	K = 1
Calculation:	$B_n = 2 \cdot (0.1\ kHz) + 2 \cdot (44\ kHz) \cdot 1 = 88.2\ kHz$

Designation of Emissions:	**88k2F1D**

8.5 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).
Measurement procedure:	Radiated Emission in Fully or Semi Anechoic Room (6.3)

Comment:	
Date of test:	10 July 2007
Test site:	Fully anechoic room, cabin no. 2
Test distance:	3 meters



Test Result:	Test passed

8.6 Periodic Operation Requirements

Rules and specifications:	CFR 47 Part 15, section 15.231(a) IC RSS-210 Issue 7, section A1.1.1
Guide:	---

Periodic operation requirements	Applicable	Declared by applicant	Test performed	Passed
The transmitter is used for				
☐ security or safety applications ☒ other applications		☒		
The transmitter is operated				
☒ manually ☐ automatically		☒		
Periodic operation according to				
☒ CFR 47 Part 15, section 15.231(a) / IC RSS-210 Issue 7, section A1.1.1				
Only control signals are sent and there is no continuous transmission	☒	☒	☐	☐
A manually operated transmitter employs a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released	☒	☒	☒	☒
A transmitter activated automatically ceases transmission within 5 seconds after activation	☐	☐	☐	☐
Periodic transmissions at regular predetermined intervals are ☒ not performed ☐ performed with total transmission time of two seconds per hour or less (for polling or supervision transmissions to determine system integrity of transmitters used in security or safety applications)	☐	☒	☐	☐
☐ CFR 47 Part 15, section 15.231(e) / IC RSS-210 Issue 7, section A1.1.5				
The device is provided with a means for automatically limiting operation so that the duration of each transmission is not greater than one second and the silent period between transmissions is at least 30 times the duration of the transmission but in no case less than 10 seconds.	☐	☐	☐	☐

Note: Result may be based on the appropriate declaration of the applicant (i.e. no test is performed). However, in this case there is no verification by the test laboratory.

8.7 Radiated Emission Measurement 9 kHz to 30 MHz

Rules and specifications:	CFR 47 Part 15, sections 15.205 and 15.231 IC RSS-210 Issue 7, sections A1.1.2, 2.2(b)(c), 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.			
Measurement procedure:	Radiated Emission Measurement 9 kHz to 30 MHz (6.2)			
Test site:	Open field test site			

Test Result:	Test passed (No values below 30 MHz)

8.8 Radiated Emission Measurement 30 MHz to 5 GHz

Rules and specifications:	CFR 47 Part 15, sections 15.205, 15.215(b) and 15.231(b) IC RSS-210 Issue 7, section A1.1.2
Guide:	ANSI C63.4
Limit:	In addition to the provisions of section 15.205, the field strength shall not exceed the levels as listed in the table below or the general limits shown in section 15.209, whichever limit permits a higher field strength. In no case shall the level of the unwanted emissions exceed the field strength of the fundamental emission.

Frequency of Emission (MHz)	Field Strength of Fundamental (µV/m)	Field Strength of Fundamental (dBµV/m)	Field Strength of Spurious Emissions (µV/m)	Field Strength of Spurious Emissions (dBµV/m)
40.66 - 40.70	2,250	67.0	225 **	47.0
70 - 130	1,250	61.9	125	41.9
130 - 174	1,250 to 3,750 *	61.9 to 71.5	125 to 375 *	41.9 to 51.5
174 - 260	3,750	71.5	375	51.5
260 - 470	3,750 to 12,500 *	71.5 to 81.9	375 to 1,250 *	51.5 to 61.9
Above 470	12,500	81.9	1,250	61.9

* linear interpolations ** for harmonics only

Measurement procedures:	Radiated Emission in Fully or Semi Anechoic Room (6.3) Radiated Emission at Open Field Test Site (6.4)

Comment:	
Date of test:	6 July 2007, 9 July 2007, 10 July 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

Frequency (MHz)	Antenna Polarization	Detector	Receiver Reading (dBµV)	Correction Factor (dB/m)	Pulse Train Correction (dB)	Final Value (dBµV/m)	Limit (dBµV/m)	Margin (dB)
433.920	vertical	Quasi-Peak	49.5	18.9		68.4	80.8	12.4
867.900	horizontal	Quasi-Peak	24.7	26.4		51.1	60.8	9.7
1300.900	vertical	Average	24.9	28.9		53.9	54.0	**0.1**
1731.600	horizontal	Peak	18.0	30.9		48.9	60.8	11.9
1736.000	horizontal	Peak	17.8	30.9		48.7	60.8	12.1
2168.200	vertical	Peak	12.5	32.7		45.2	60.8	15.6

Sample calculation of final values:

Final Value (dBµV/m) = Reading Value (dBµV) + Correction Factor (dB/m) + Pulse Train Correction (dB)

8.9 Exposure of Humans to RF Fields

Rules and specifications:	IC RSS-Gen Issue 2, section 5.5
Guide:	IC RSS-102 Issue 2, section 2.5

Exposure of Humans to RF Fields	Applicable	Declared by applicant	Measured	Exemption
The antenna is				
☐ detachable				
The conducted output power (CP in watts) is measured at the antenna connector: CP = **..... W**			☐	
The effective isotropic radiated power (EIRP in watts) is calculated using				
☐ the numerical antenna gain: G = **.....** $EIRP = G \cdot CP \Rightarrow EIRP$ = **..... W**		☐		
☐ the field strength[6] in V/m: FS = **..... V/m** $EIRP = \frac{(FS \cdot D)^2}{30} \Rightarrow EIRP$ = **..... W**			☐	
with: Distance between the antennas in m: D = **..... m**			☐	
☒ not detachable				
A field strength measurement is used to determine the effective isotropic radiated power (EIRP in watts) given by[6]: $EIRP = \frac{(FS \cdot D)^2}{30} \Rightarrow EIRP$ = **2.08 µW**				
with: Field strength in V/m: FS = **2.64 mV/m** Distance between the two antennas in m: D = **3 m**			☐ ☐	
Selection of output power				
The output power TP is the higher of the conducted or effective isotropic radiated power (e.i.r.p.): TP = **2.08 µW**				

[6] The conversion formula is valid only for properly matched antennas. In other cases the transmitter output power may have to be measured by a terminated measurement when applying the exemption clauses.
If an open area test site is used for field strength measurement, the effect due to the metal ground reflecting plane should be subtracted from the maximum field strength value in order to reference it to free space, before calculating TP.

Exposure of Humans to RF Fields (continued)	Applicable	Declared by applicant	Measured	Exemption
Separation distance between the user and the transmitting device is				
☐ less than or equal to 20 cm ☒ greater than 20 cm		☒		
Transmitting device is				
☐ in the vicinity of the human head ☐ body-worn		☒		
SAR evaluation				
SAR evaluation is required if the separation distance between the user and the device is less than or equal to 20 cm.				
☐ The device operates from 3 kHz up to 1 GHz inclusively and its source-based time-averaged output power is less than, or equal to 200 mW for General Public Use and 1000 mW for Controlled Use.				☐
☐ The device operates above 1 GHz up to 2.2 GHz inclusively and its source-based time-averaged output power is less than, or equal to 100 mW for General Public Use and 500 mW for Controlled Use.				☐
☐ The device operates above 2.2 GHz up to 3 GHz inclusively and its source-based time-averaged output power is less than, or equal to 20 mW for General Public Use and 100 mW for Controlled Use.				☐
☐ The device operates above 3 GHz up to 6 GHz inclusively and its source-based time-averaged output power) is less than, or equal to 10 mW for General Public Use and 50 mW for Controlled Use.				☐
☐ SAR evaluation is documented in test report no.				
RF exposure evaluation				
RF exposure evaluation is required if the separation distance between the user and the device is greater than 20 cm.				
☒ The device operates below 1.5 GHz and its e.i.r.p. is equal to or less than 2.5 W.				☒
☐ The device operates at or above 1.5 GHz and the e.i.r.p. of the device is equal to or less than 5 W.				☐
☐ RF exposure evaluation is documented in test report no.				

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 allocation and radio treaty matters; General rules and regulations) of the Federal Communication Commission (FCC)	October 1, 2006
☒	CFR 47 Part 15	Code of Federal Regulations Part 15 (Radio Frequency Devices) of the Federal Communication Commission (FCC)	May 4, 2007
☒	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)
☒	RSS-Gen	Radio Standards Specification RSS-Gen Issue 2 containing General Requirements and Information for the Certification of Radiocommunication Equimpment, published by Industry Canada	June 2007
☒	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
☐	RSS-310	Radio Standards Specification RSS-310 Issue 1 for Low Power Licence-Ecempt Radiocommunicaton Devices (All Frequency Bands): Category II Equipment, published by Industry Canada	September 2005
☒	RSS-102	Radio Standards Specification RSS-102 Issue 2: Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)	November 2005
☐	ICES-003	Interference-Causing Equipment Standard ICES-003 Issue 4 for Digital Apparatus, published by Industry Canada	February 7, 2004
☒	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
☐	CAN/CSA-CEI/IEC CISPR 22	Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment	2002
☒	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

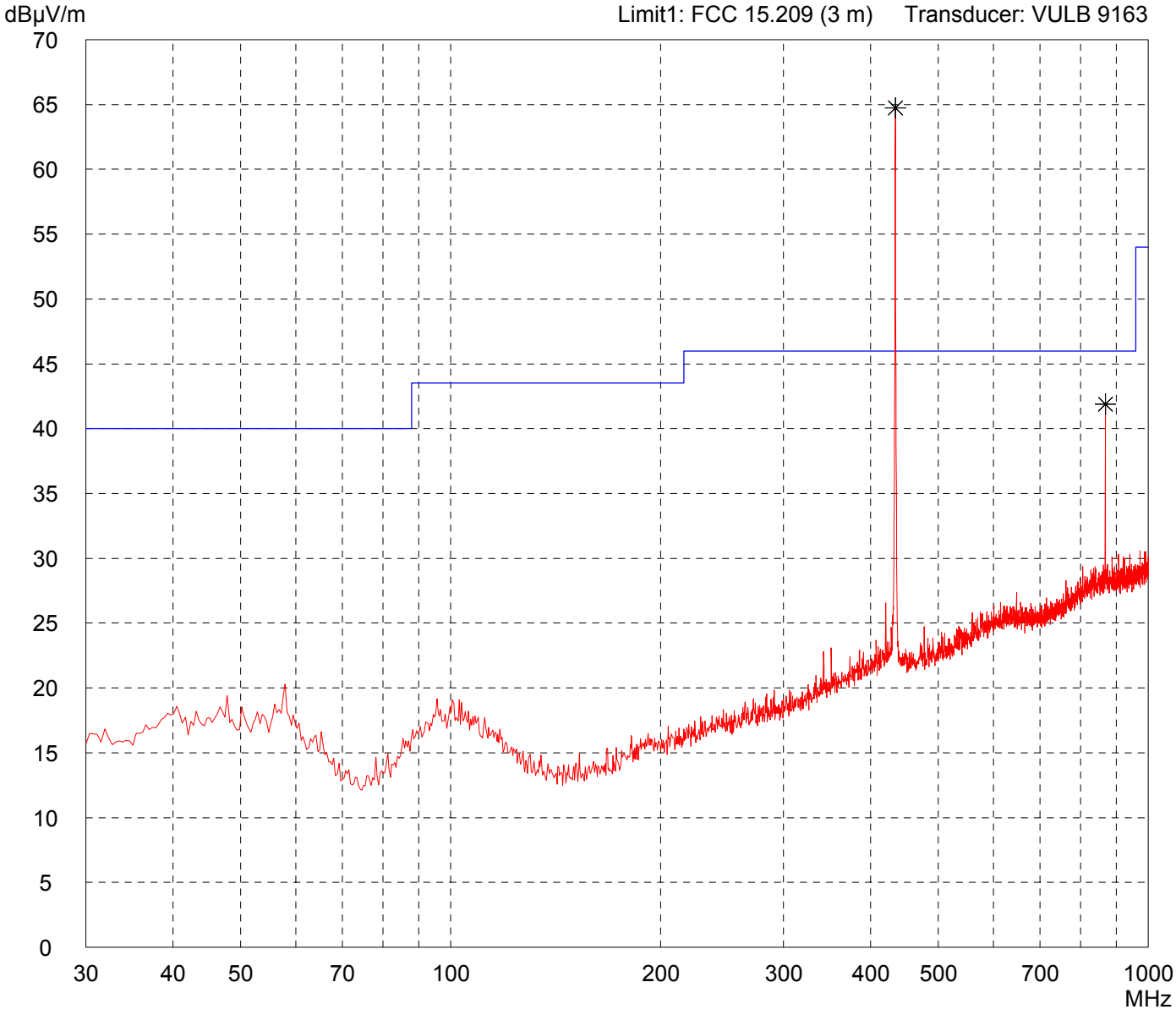
Revision History			
Edition	*Date*	*Issued by*	*Modifications*
1	13 July 2007	M. Steindl	First Edition
2	07 November 2007	C. Jäger	Edition 2 Spurious Radiated Test < 30 MHz added

11 Charts taken during testing

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

Model: PD remote control (Porsche Design)	Comment: - 3 V power supply - EUT in upright position (P1) - transmitting continuously with modulation
Serial no.: ---	
Applicant: EMV-Testhaus GmbH	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 07/06/2007 / Operator: M. Steindl	
Test performed: automatically / File name: default.emi	

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

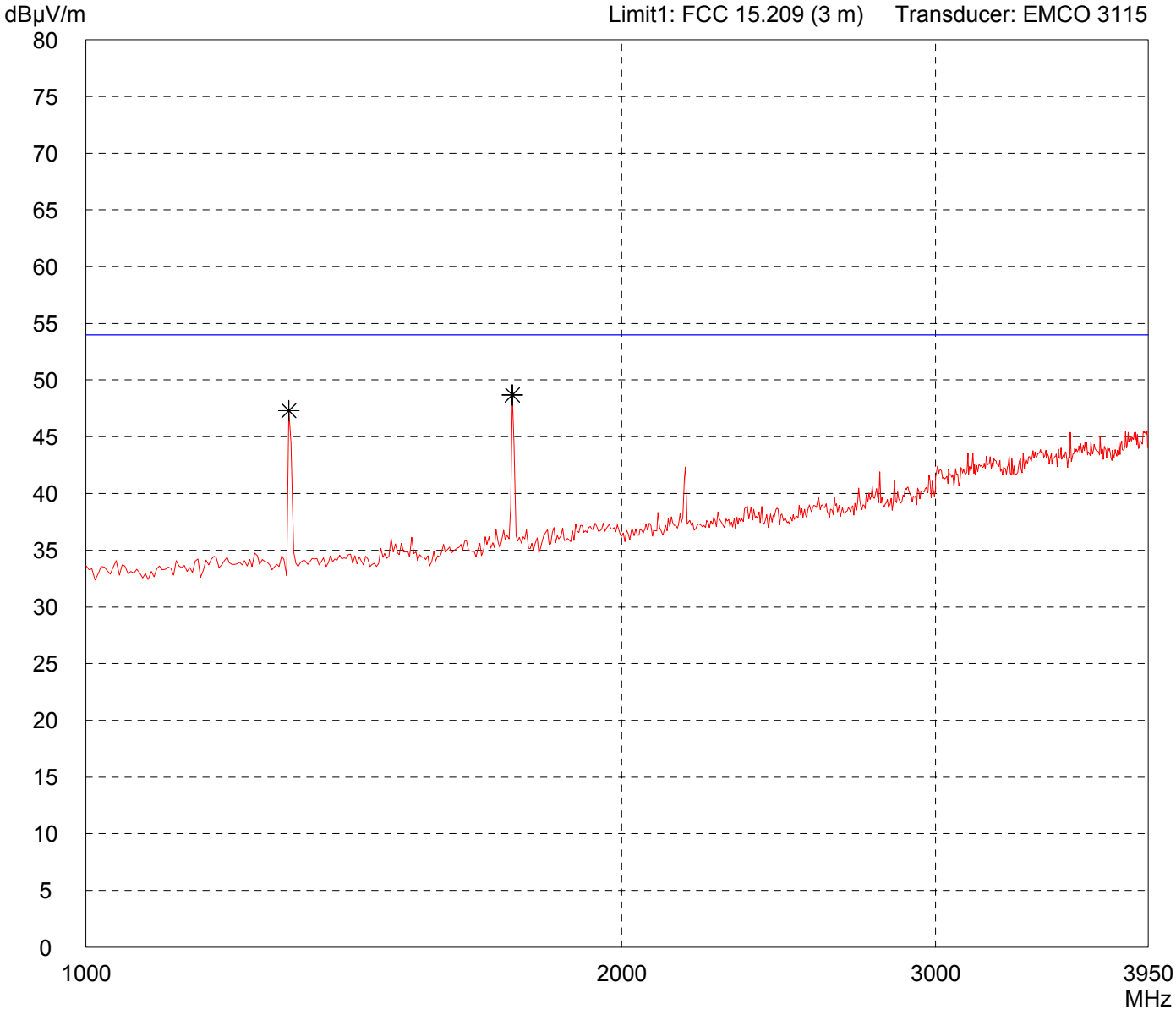


Result: Prescan	Project file: 50531-70577

Senton GmbH / Aeussere Fruehlingstrasse 45 / D-94315 Straubing / Germany / Tel. +49 (0)9421 5522-0 / Fax +49 (0)9421 5522-99

Radiated Emission Test 1 GHz - 3.95 GHz
acc. to FCC Part 15 Subpart C (FAR)

Model: PD remote control (Porsche Design)	Comment: - 3 V power supply - EUT in upright position (P1) - transmitting continuously with modulation
Serial no.: ---	
Applicant: EMV-Testhaus GmbH	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 07/06/2007 / Operator: M. Steindl	
Test performed: automatically / File name: default.emi	
Detector: Peak	List of values: Selected by hand

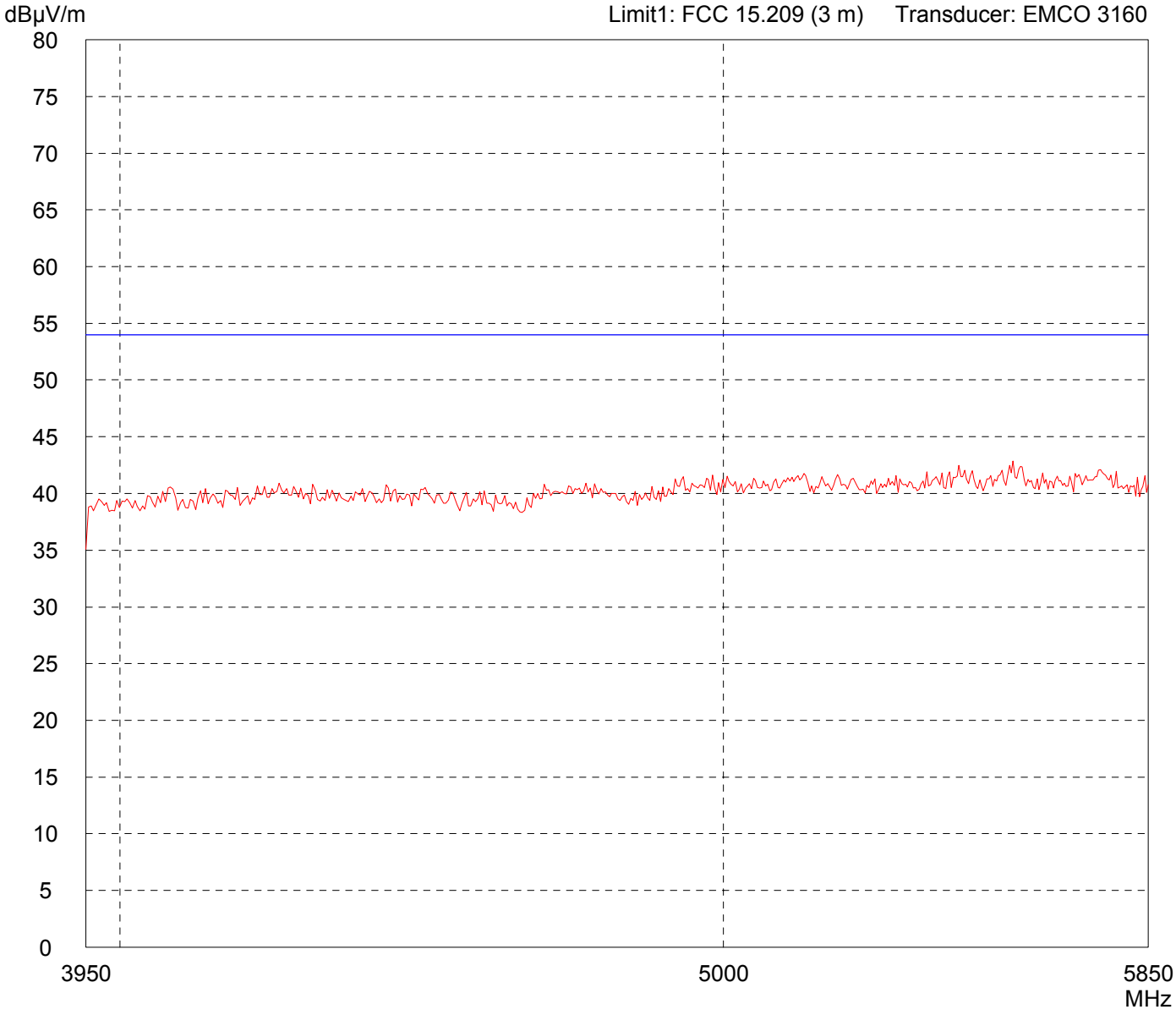


Result: Prescan	Project file: 50531-70577

Radiated Emission Test 3.95 GHz - 5.85 GHz
acc. to FCC Part 15 Subpart C (FAR)

Model: PD remote control (Porsche Design)	Comment: - 3 V power supply - EUT in upright position (P1) - transmitting continuously with modulation
Serial no.: ---	
Applicant: EMV-Testhaus GmbH	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 07/06/2007 / Operator: M. Steindl	
Test performed: automatically / File name: default.emi	

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

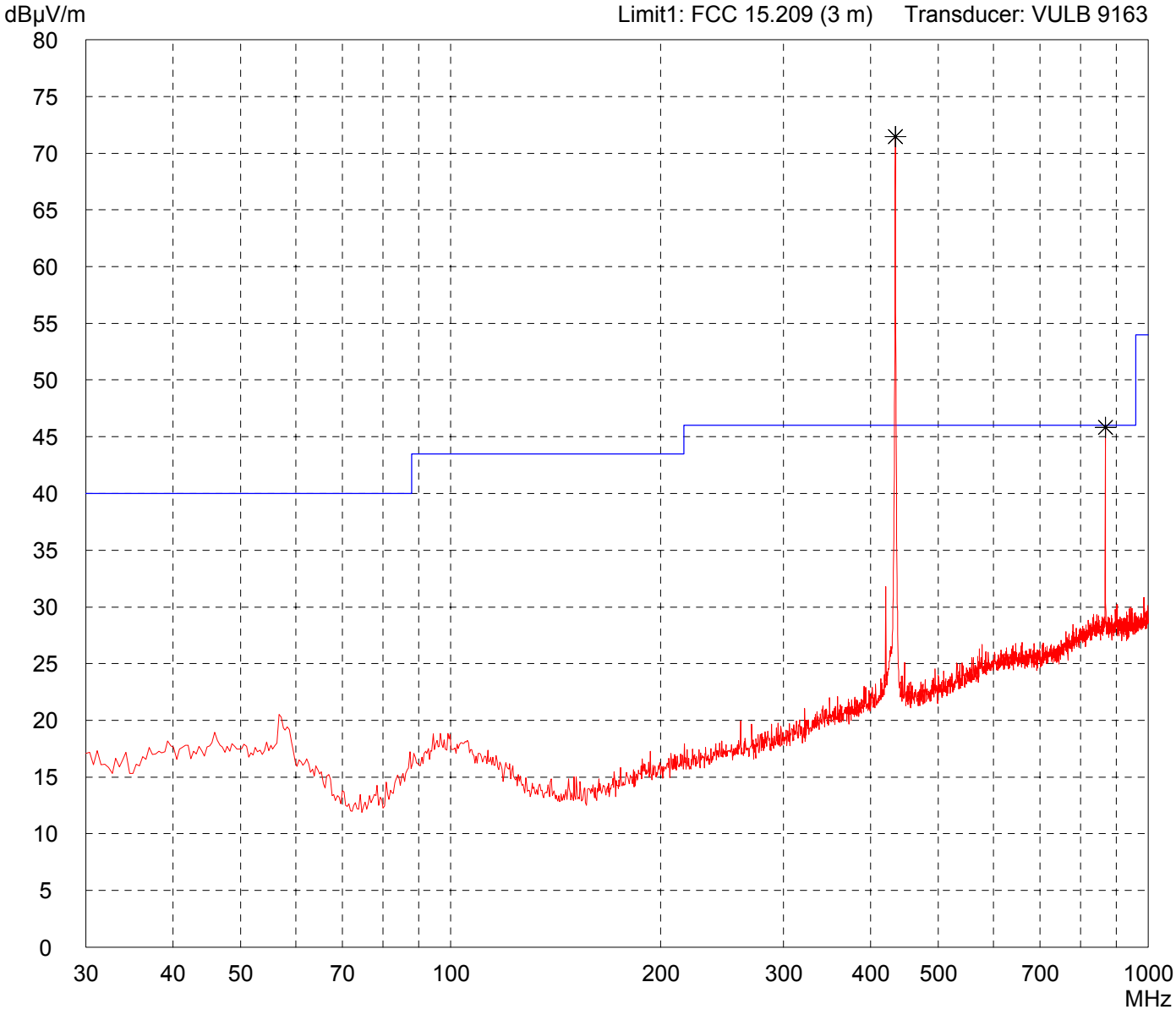


Result: Prescan	Project file: 50531-70577

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

Model: PD remote control (Porsche Design)	Comment: - 3 V power supply - EUT in upright position (P1) - transmitting continuously with modulation
Serial no.: ---	
Applicant: EMV-Testhaus GmbH	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 07/06/2007 / Operator: M. Steindl	
Test performed: automatically / File name: default.emi	

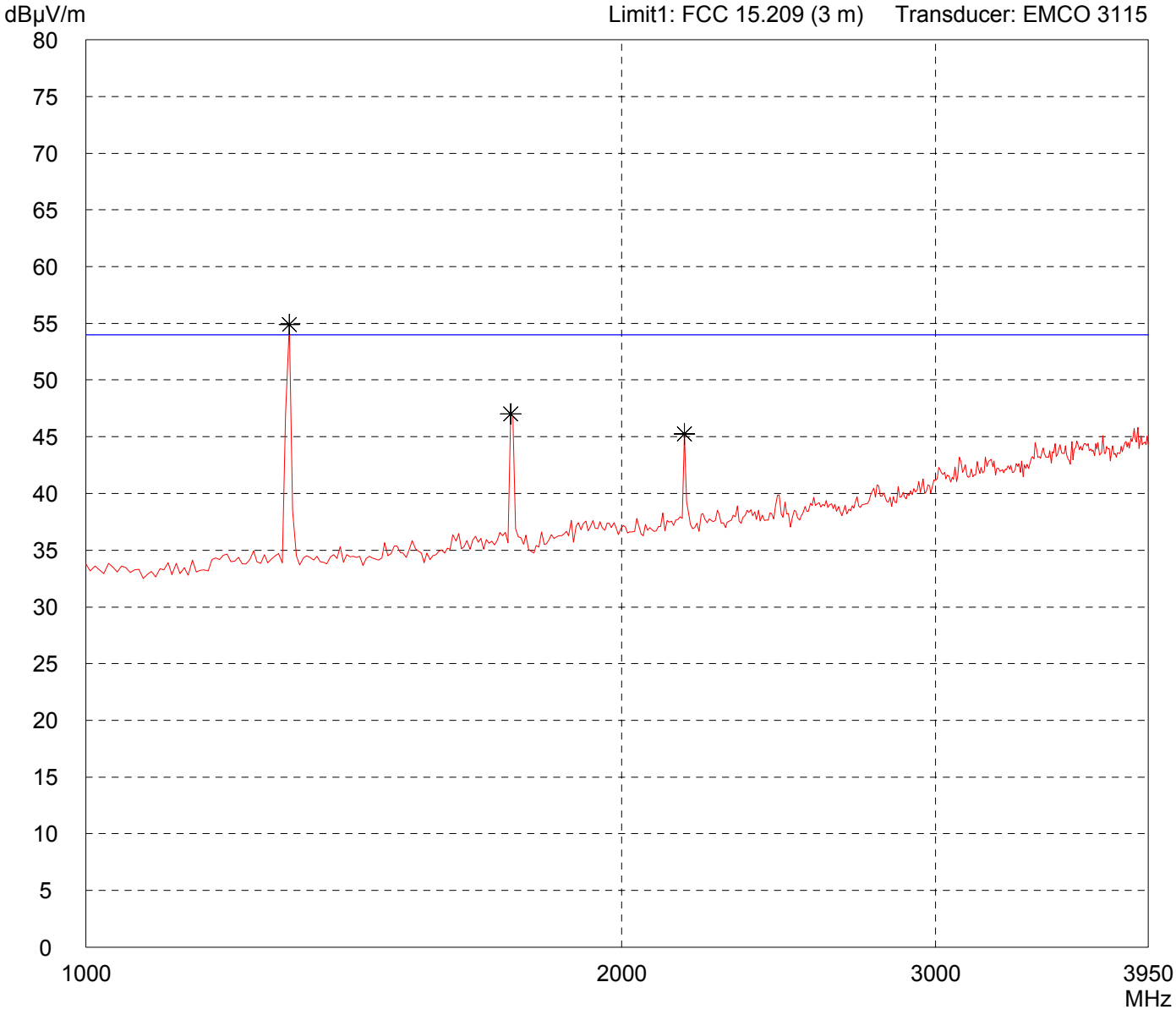
Detector: Peak	List of values: 10 dB Margin / 50 Subranges



Result: Prescan	Project file: 50531-70577

Radiated Emission Test 1 GHz - 3.95 GHz
acc. to FCC Part 15 Subpart C (FAR)

Model: PD remote control (Porsche Design)	Comment: - 3 V power supply - EUT in upright position (P1) - transmitting continuously with modulation
Serial no.: ---	
Applicant: EMV-Testhaus GmbH	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 07/06/2007 / Operator: M. Steindl	
Test performed: automatically / File name: default.emi	
Detector: Peak	List of values: Selected by hand

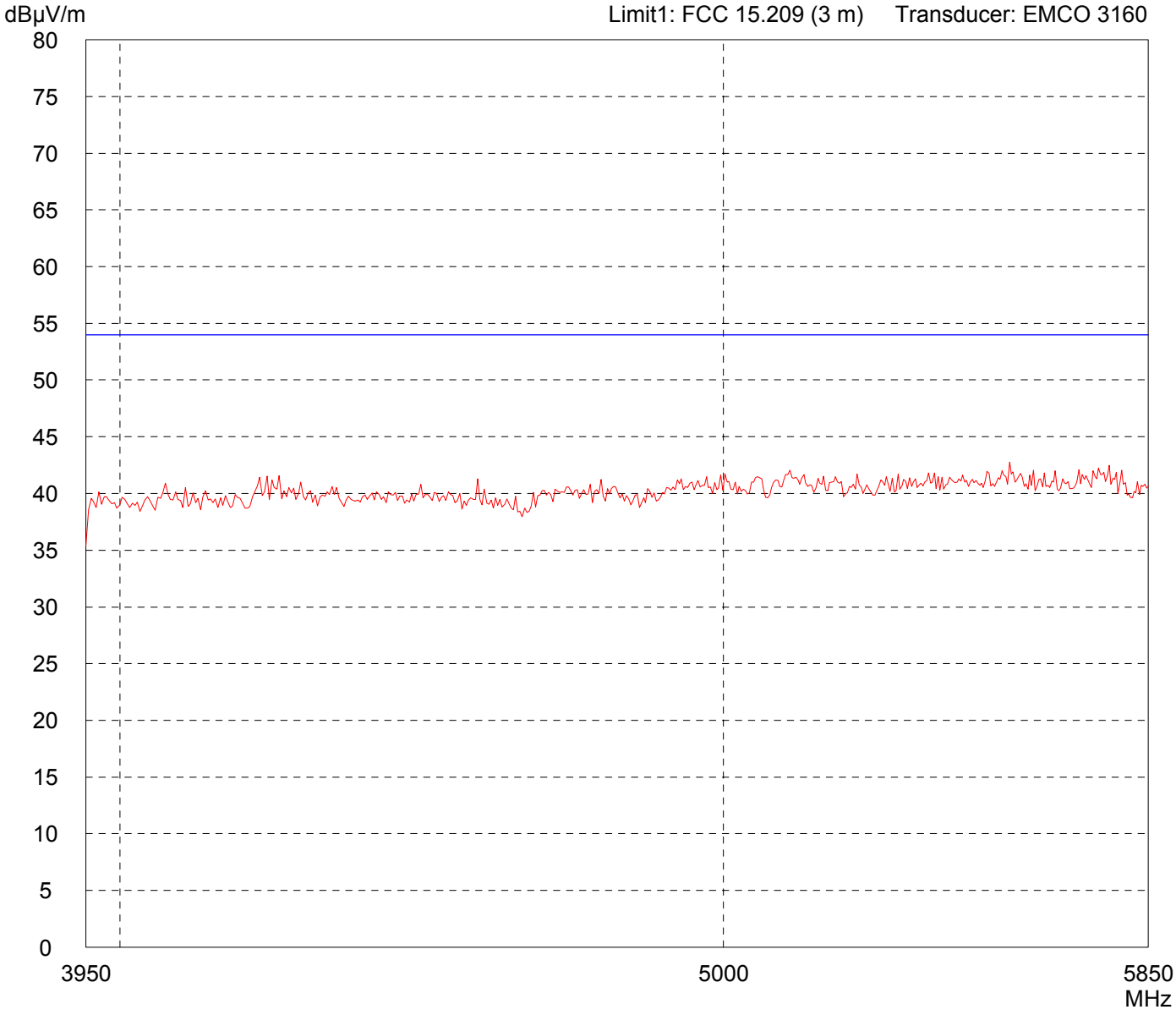


Result: Prescan	Project file: 50531-70577

Radiated Emission Test 3.95 GHz - 5.85 GHz
acc. to FCC Part 15 Subpart C (FAR)

Model: PD remote control (Porsche Design)	Comment:
Serial no.: ---	- 3 V power supply
Applicant: EMV-Testhaus GmbH	- EUT in upright position (P1)
Test site: Fully anechoic room, cabin no. 2	- transmitting continuously with modulation
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 07/06/2007 / Operator: M. Steindl	
Test performed: automatically / File name: default.emi	

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



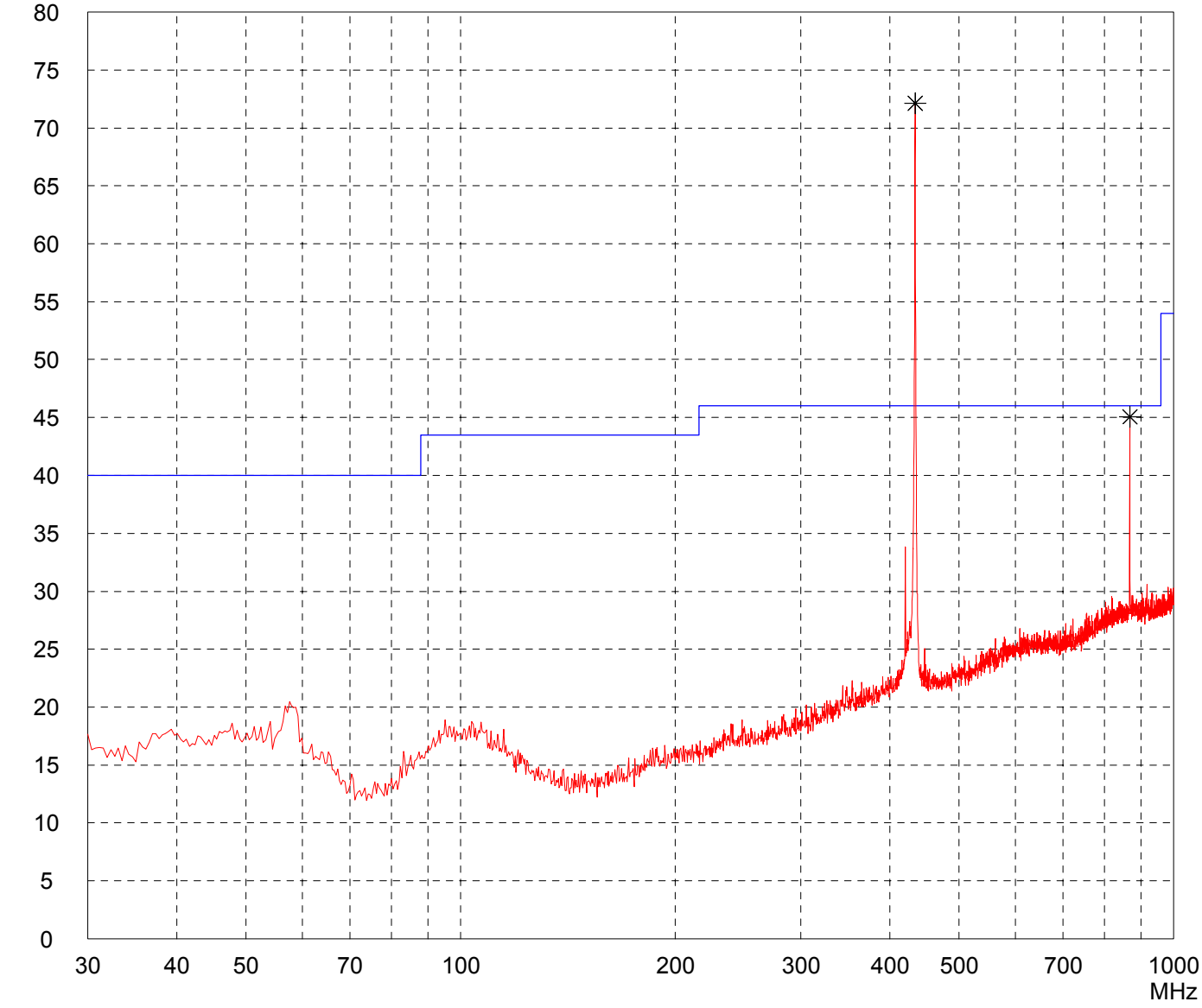
Result: Prescan	Project file: 50531-70577

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

Model: PD remote control (Porsche Design)	Comment: - 3 V power supply - EUT flat on table (P2) - transmitting continuously with modulation
Serial no.: ---	
Applicant: EMV-Testhaus GmbH	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 07/06/2007 / Operator: M. Steindl	
Test performed: automatically / File name: default.emi	

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

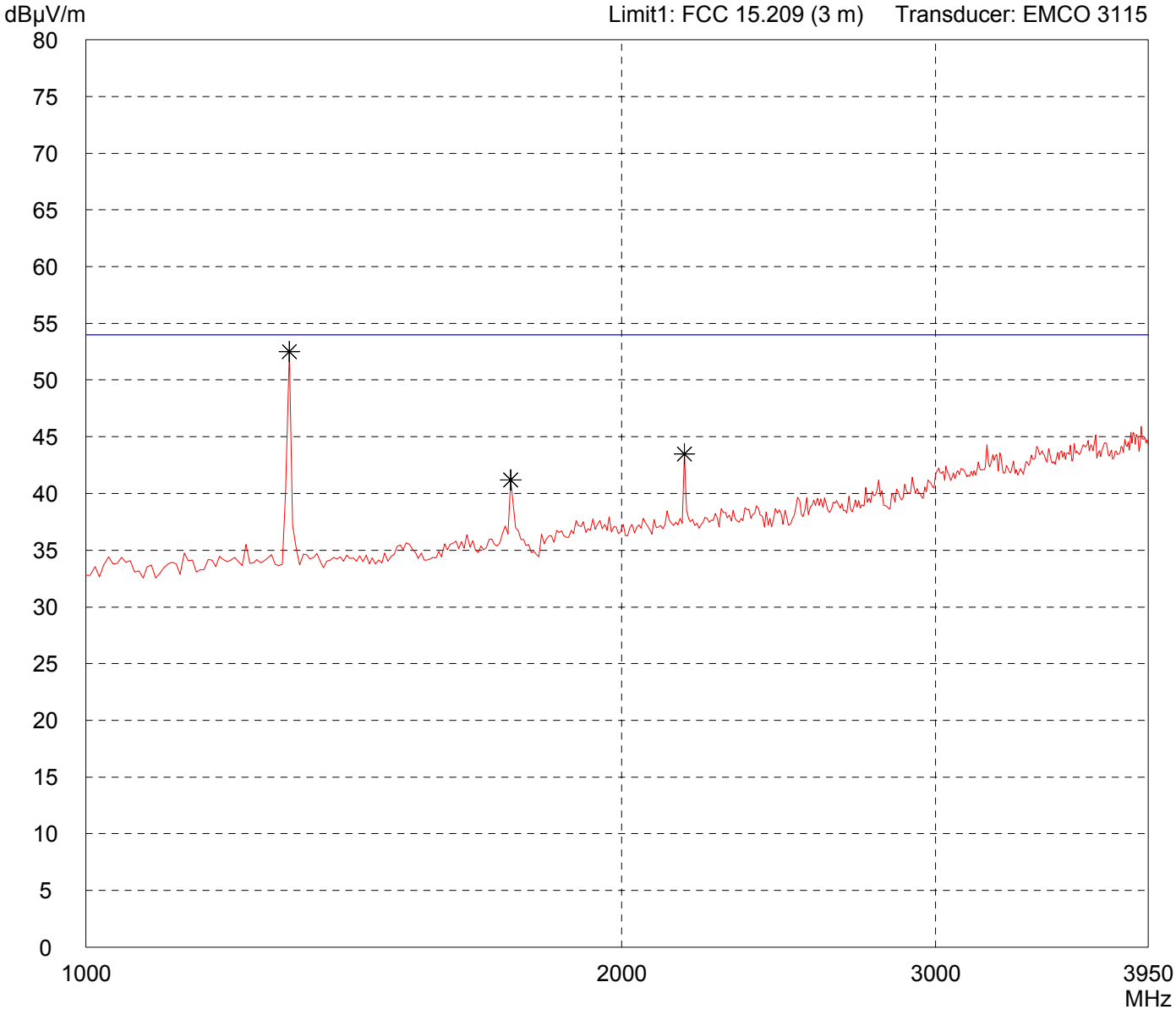
dBµV/m — Limit1: FCC 15.209 (3 m) — Transducer: VULB 9163



Result: Prescan	Project file: 50531-70577

Radiated Emission Test 1 GHz - 3.95 GHz
acc. to FCC Part 15 Subpart C (FAR)

Model: PD remote control (Porsche Design)	Comment: - 3 V power supply - EUT flat on table (P2) - transmitting continuously with modulation
Serial no.: ---	
Applicant: EMV-Testhaus GmbH	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 07/06/2007 / Operator: M. Steindl	
Test performed: automatically / File name: default.emi	
Detector: Peak	List of values: Selected by hand



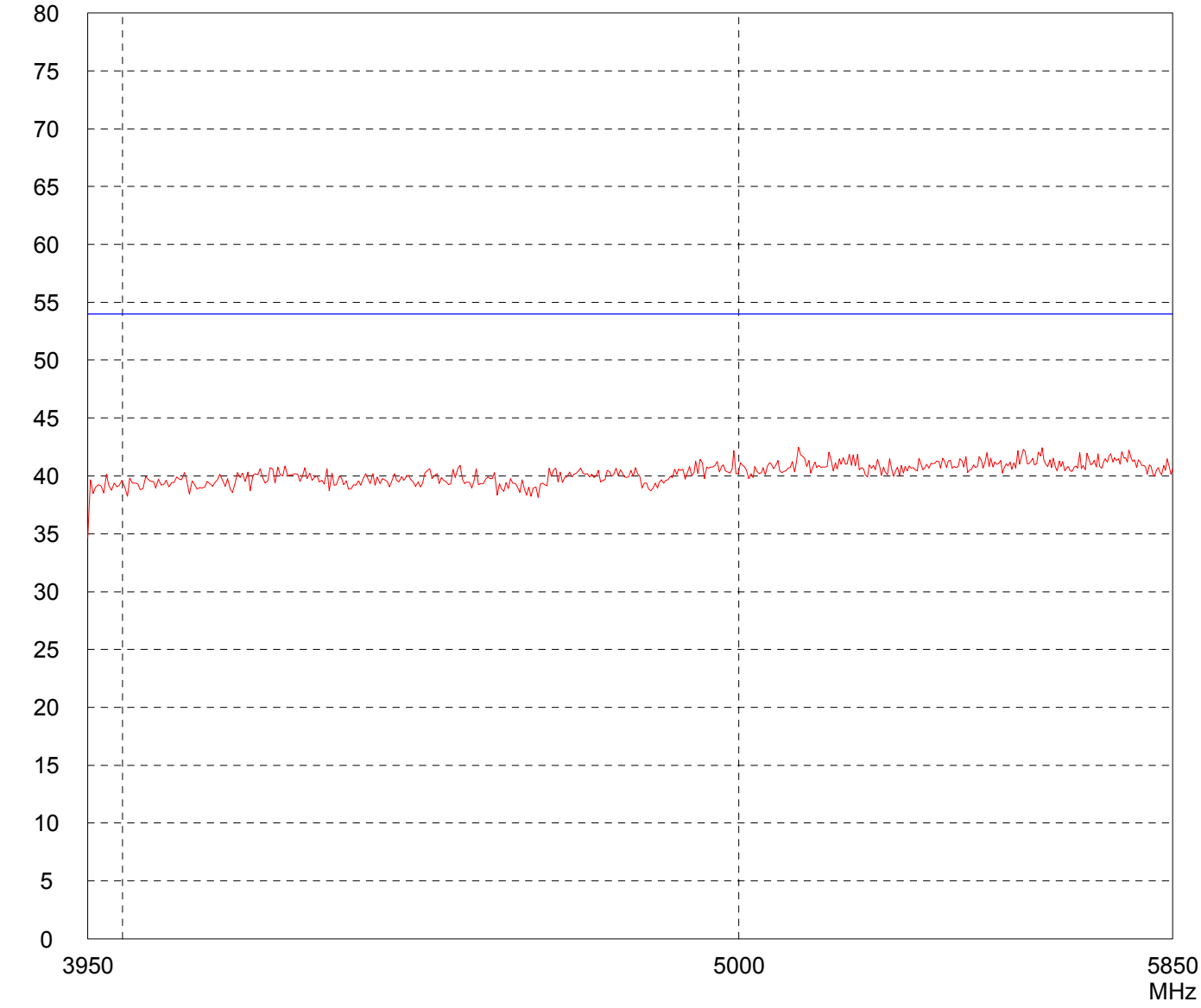
Result: Prescan	Project file: 50531-70577

Radiated Emission Test 3.95 GHz - 5.85 GHz
acc. to FCC Part 15 Subpart C (FAR)

Model: PD remote control (Porsche Design)	Comment: - 3 V power supply - EUT flat on table (P2) - transmitting continuously with modulation
Serial no.: ---	
Applicant: EMV-Testhaus GmbH	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 07/06/2007 / Operator: M. Steindl	
Test performed: automatically / File name: default.emi	

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

dBµV/m — Limit1: FCC 15.209 (3 m) — Transducer: EMCO 3160



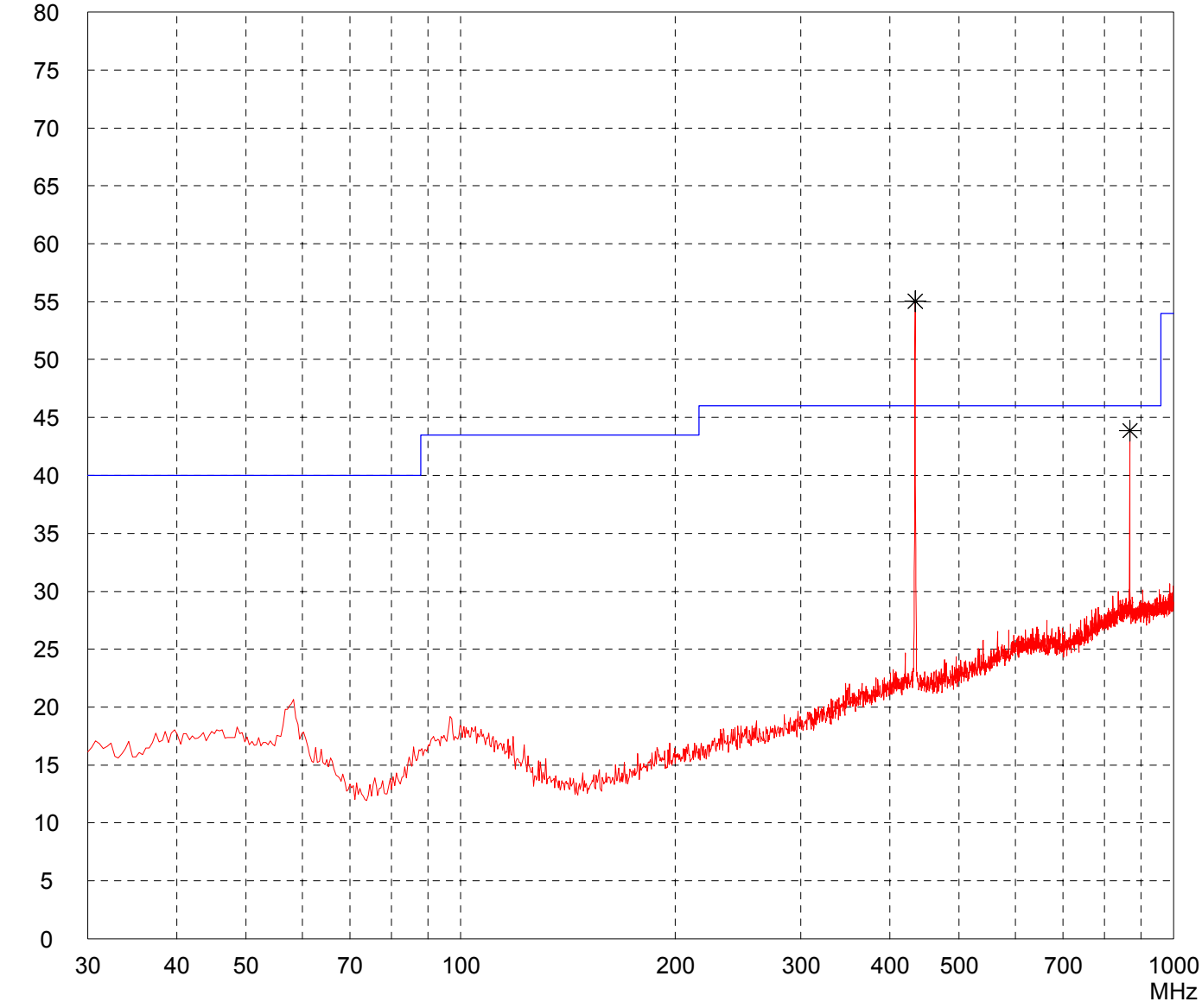
Result: Prescan	Project file: 50531-70577

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

Model: PD remote control (Porsche Design)	Comment: - 3 V power supply - EUT flat on table (P2) - transmitting continuously with modulation
Serial no.: ---	
Applicant: EMV-Testhaus GmbH	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 07/06/2007 / Operator: M. Steindl	
Test performed: automatically / File name: default.emi	

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

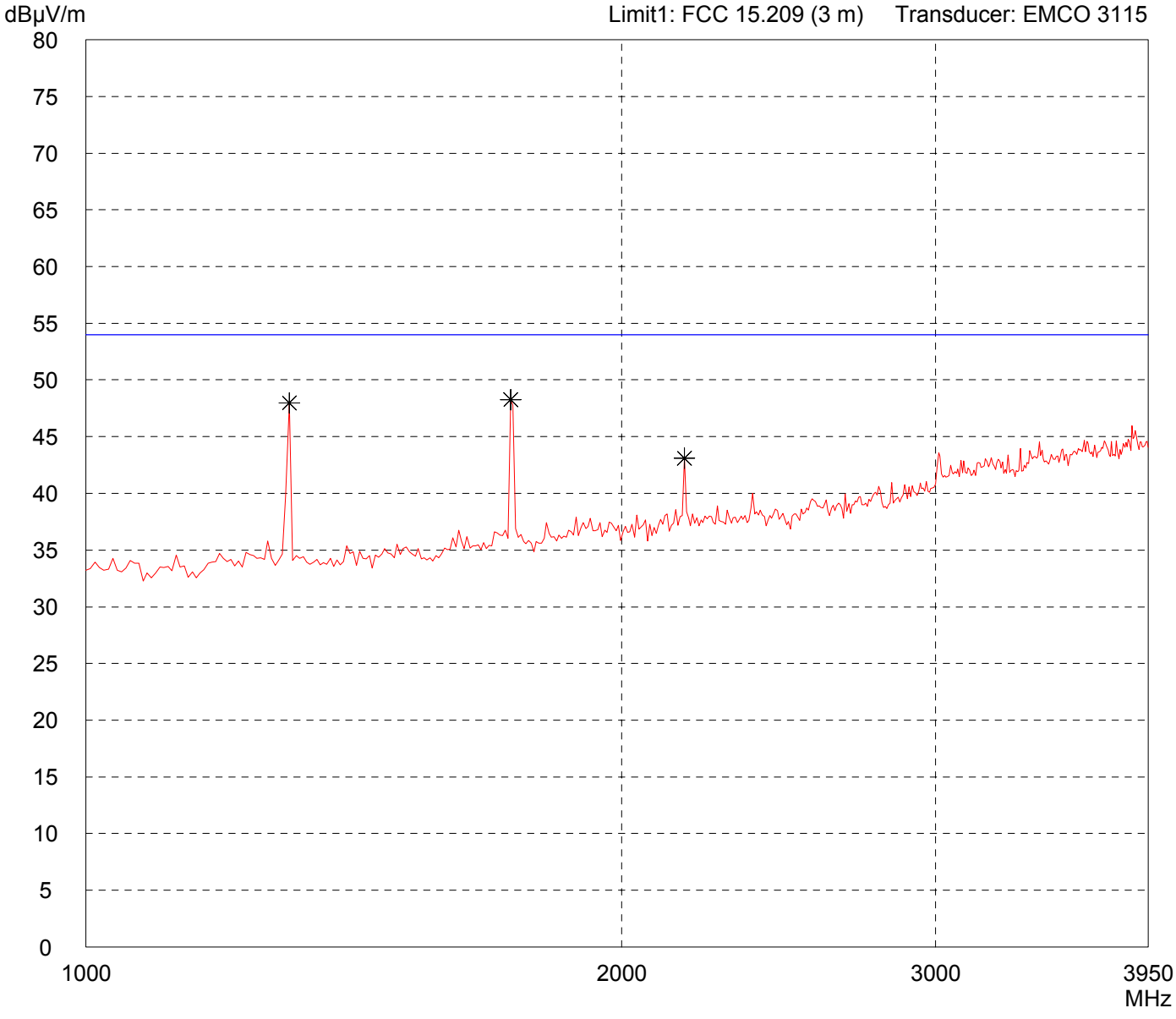
dBµV/m — Limit1: FCC 15.209 (3 m) — Transducer: VULB 9163



Result: Prescan	Project file: 50531-70577

Radiated Emission Test 1 GHz - 3.95 GHz
acc. to FCC Part 15 Subpart C (FAR)

Model: PD remote control (Porsche Design)	Comment: - 3 V power supply - EUT flat on table (P2) - transmitting continuously with modulation
Serial no.: ---	
Applicant: EMV-Testhaus GmbH	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 07/06/2007 / Operator: M. Steindl	
Test performed: automatically / File name: default.emi	
Detector: Peak	List of values: Selected by hand

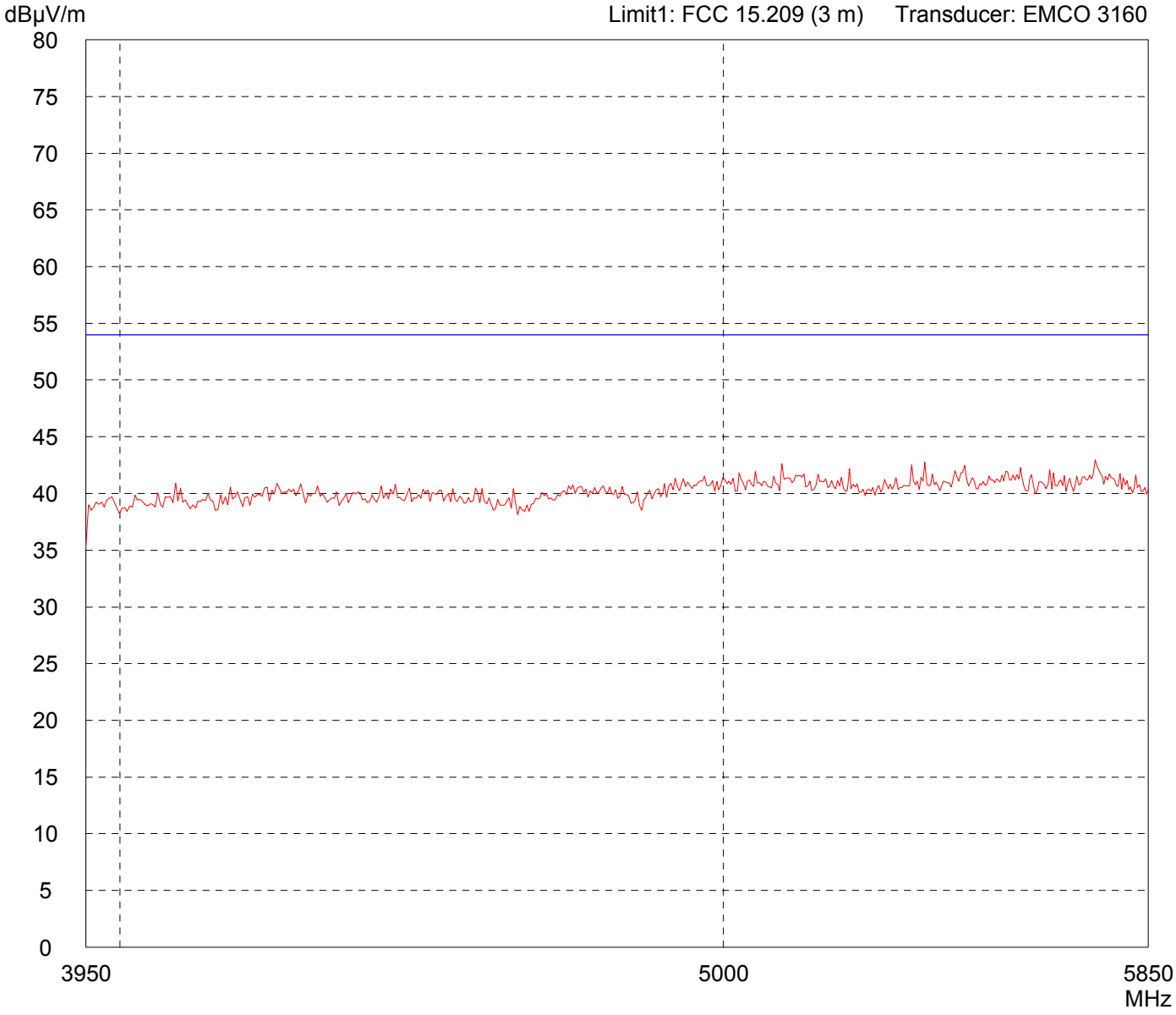


Result: Prescan	Project file: 50531-70577

Radiated Emission Test 3.95 GHz - 5.85 GHz
acc. to FCC Part 15 Subpart C (FAR)

Model: PD remote control (Porsche Design)	Comment:
Serial no.: ---	- 3 V power supply
Applicant: EMV-Testhaus GmbH	- EUT flat on table (P2)
Test site: Fully anechoic room, cabin no. 2	- transmitting continuously with modulation
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 07/06/2007 / Operator: M. Steindl	
Test performed: automatically / File name: default.emi	

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

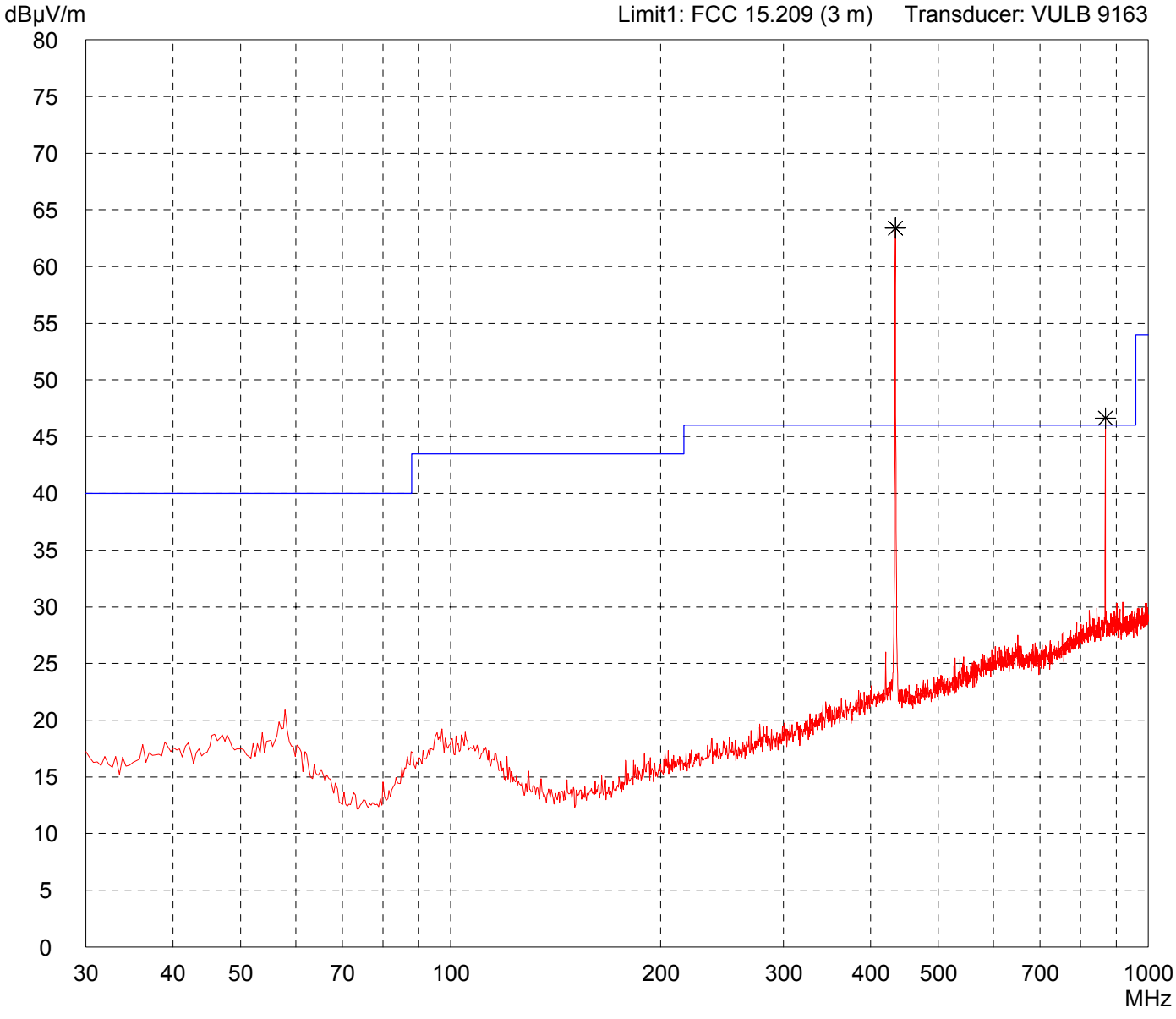


Result: Prescan	Project file: 50531-70577

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

Model: PD remote control (Porsche Design)	Comment: - 3 V power supply - EUT on long side (P3) - transmitting continuously with modulation
Serial no.: ---	
Applicant: EMV-Testhaus GmbH	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 07/06/2007 / Operator: M. Steindl	
Test performed: automatically / File name: default.emi	

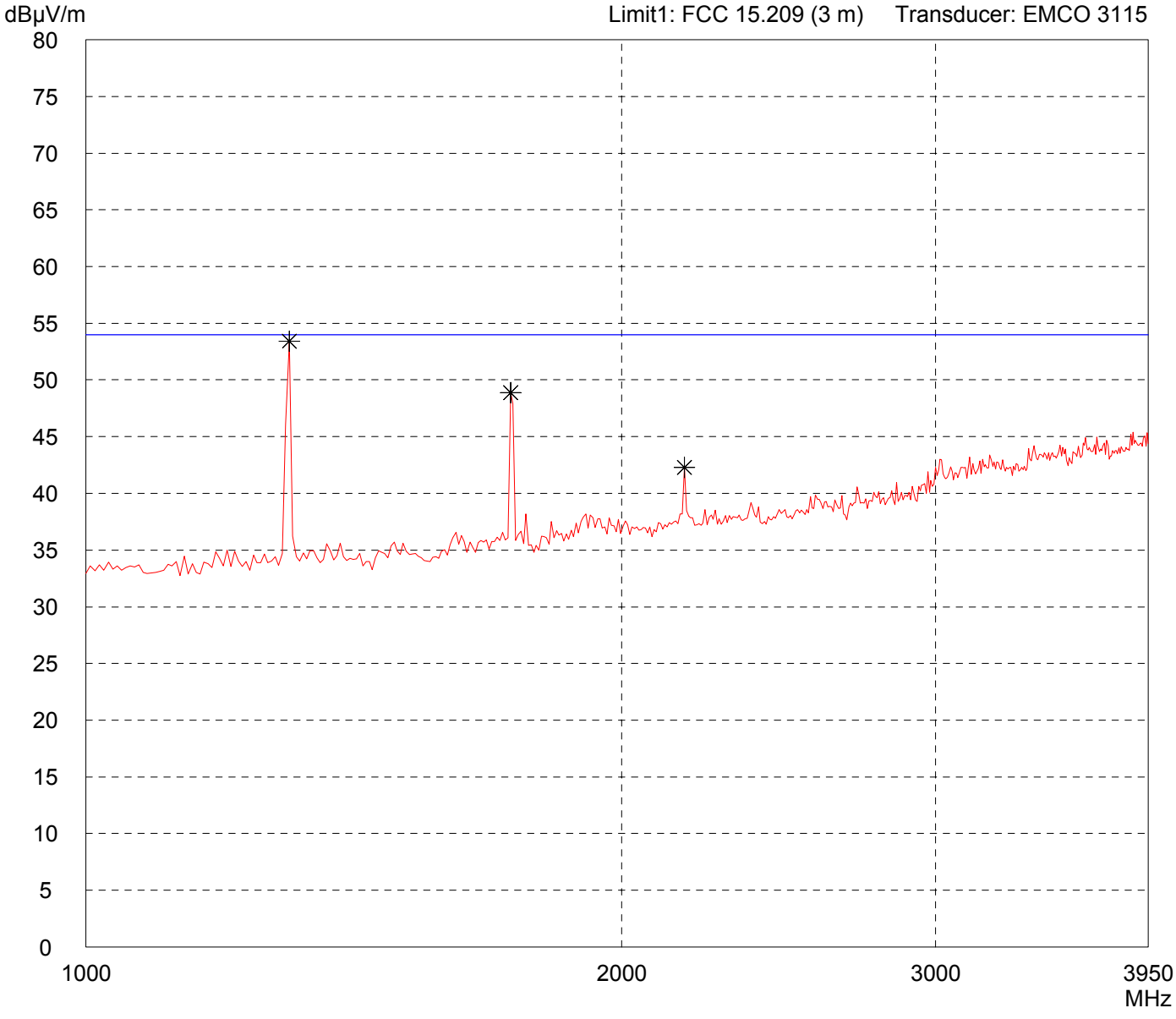
Detector: Peak	List of values: 10 dB Margin / 50 Subranges



Result: Prescan	Project file: 50531-70577

Radiated Emission Test 1 GHz - 3.95 GHz
acc. to FCC Part 15 Subpart C (FAR)

Model: PD remote control (Porsche Design)	Comment: - 3 V power supply - EUT on long side (P3) - transmitting continuously with modulation
Serial no.: ---	
Applicant: EMV-Testhaus GmbH	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 07/06/2007 / Operator: M. Steindl	
Test performed: automatically / File name: default.emi	
Detector: Peak	List of values: Selected by hand

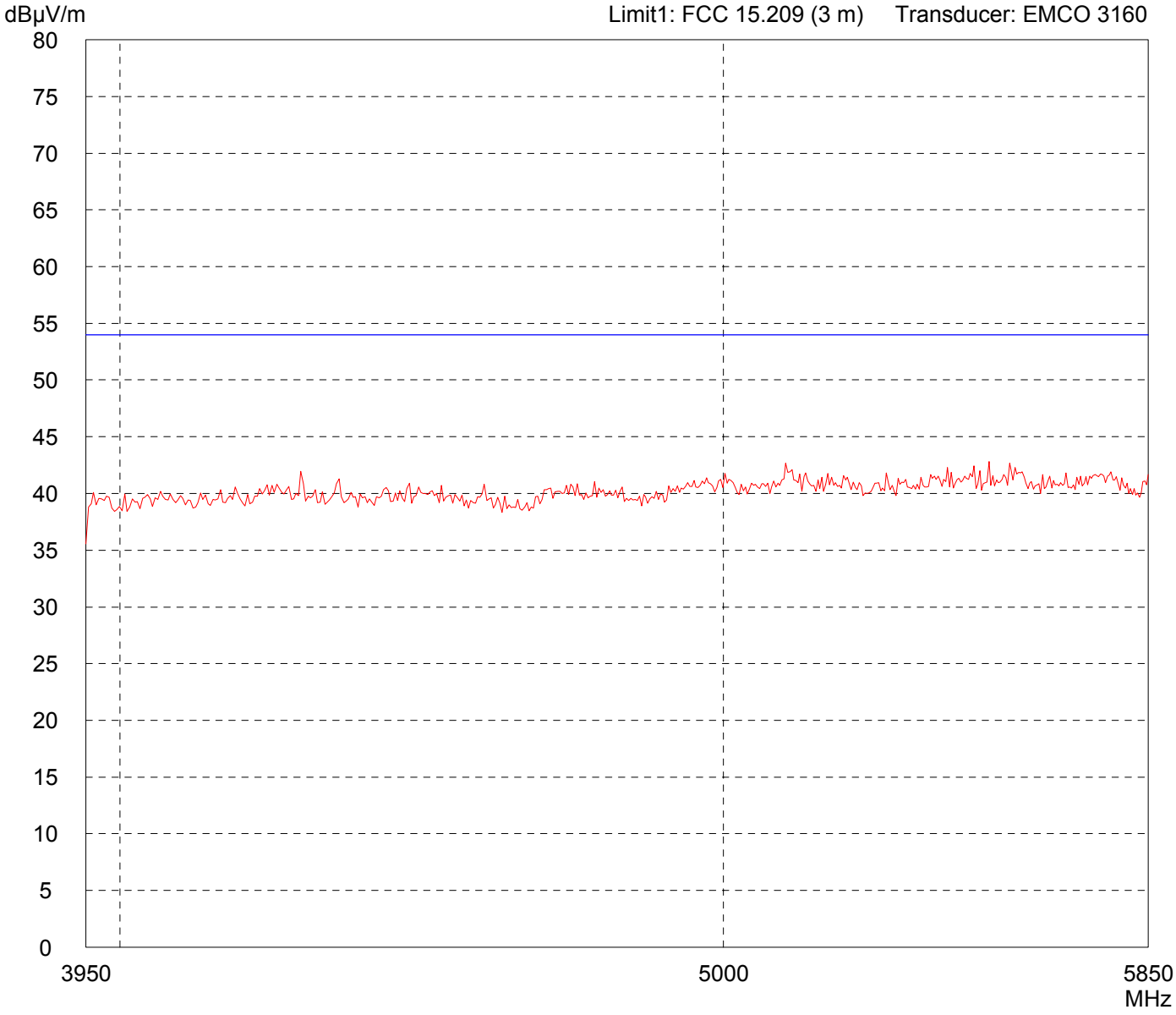


Result: Prescan	Project file: 50531-70577

Radiated Emission Test 3.95 GHz - 5.85 GHz
acc. to FCC Part 15 Subpart C (FAR)

Model: PD remote control (Porsche Design)	Comment: - 3 V power supply - EUT on long side (P3) - transmitting continuously with modulation
Serial no.: ---	
Applicant: EMV-Testhaus GmbH	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 07/06/2007 / Operator: M. Steindl	
Test performed: automatically / File name: default.emi	

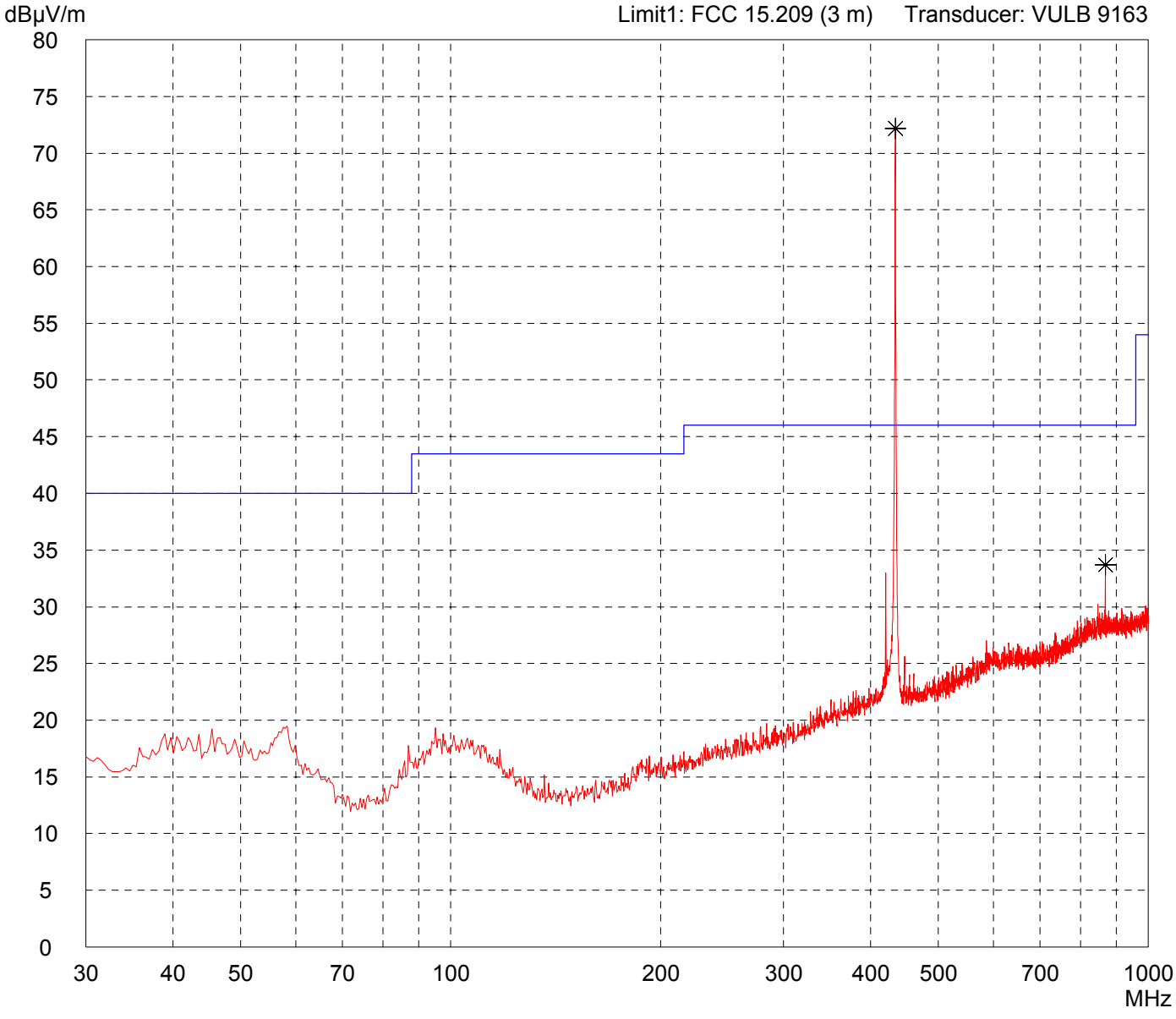
Detector: Peak	List of values: 10 dB Margin / 50 Subranges



Result: Prescan	Project file: 50531-70577

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

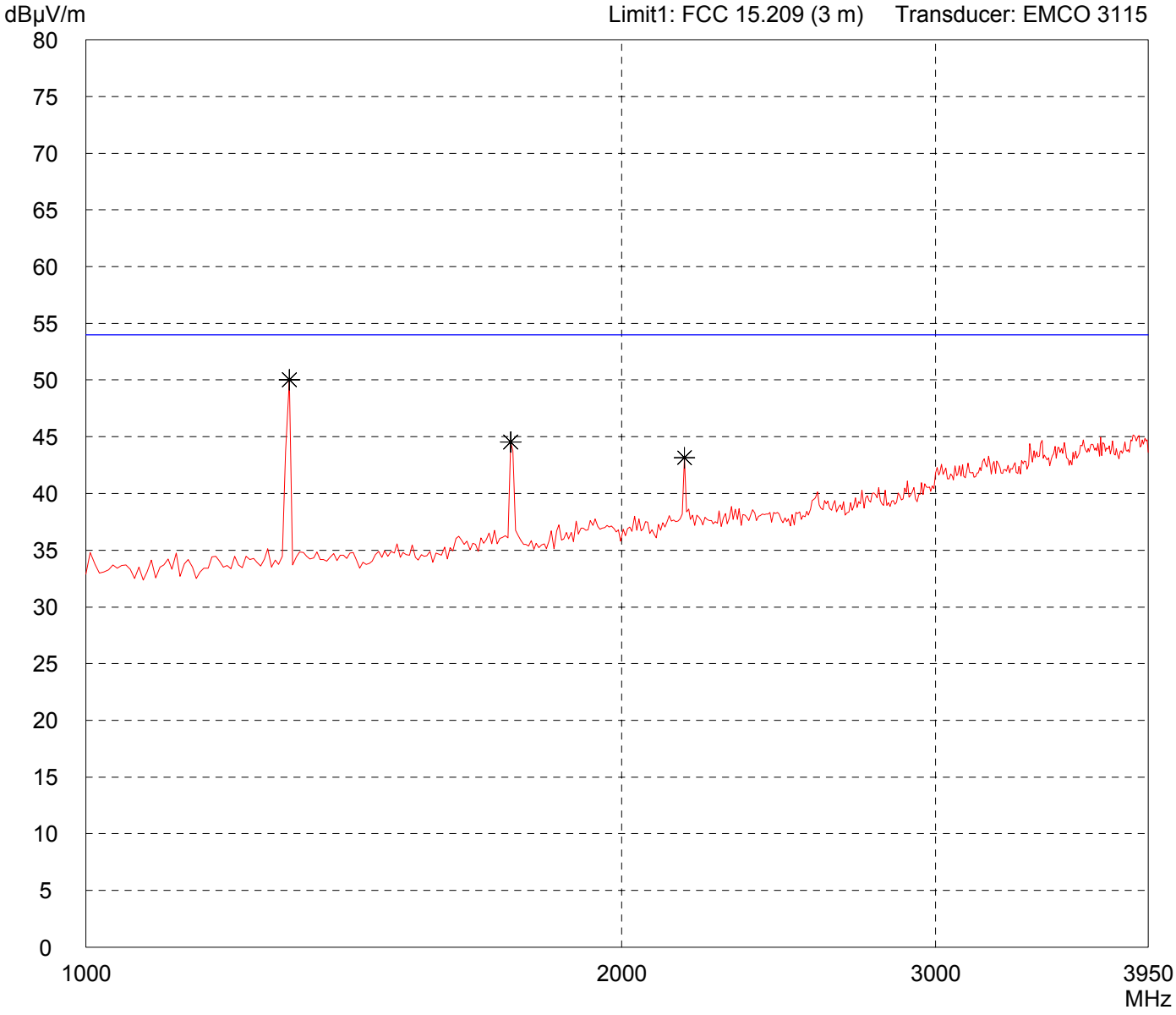
Model: PD remote control (Porsche Design)	Comment: - 3 V power supply - EUT on long side (P3) - transmitting continuously with modulation
Serial no.: ---	
Applicant: EMV-Testhaus GmbH	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 07/06/2007 / Operator: M. Steindl	
Test performed: automatically / File name: default.emi	
Detector: Peak	List of values: Selected by hand



Result: Prescan	Project file: 50531-70577

Radiated Emission Test 1 GHz - 3.95 GHz
acc. to FCC Part 15 Subpart C (FAR)

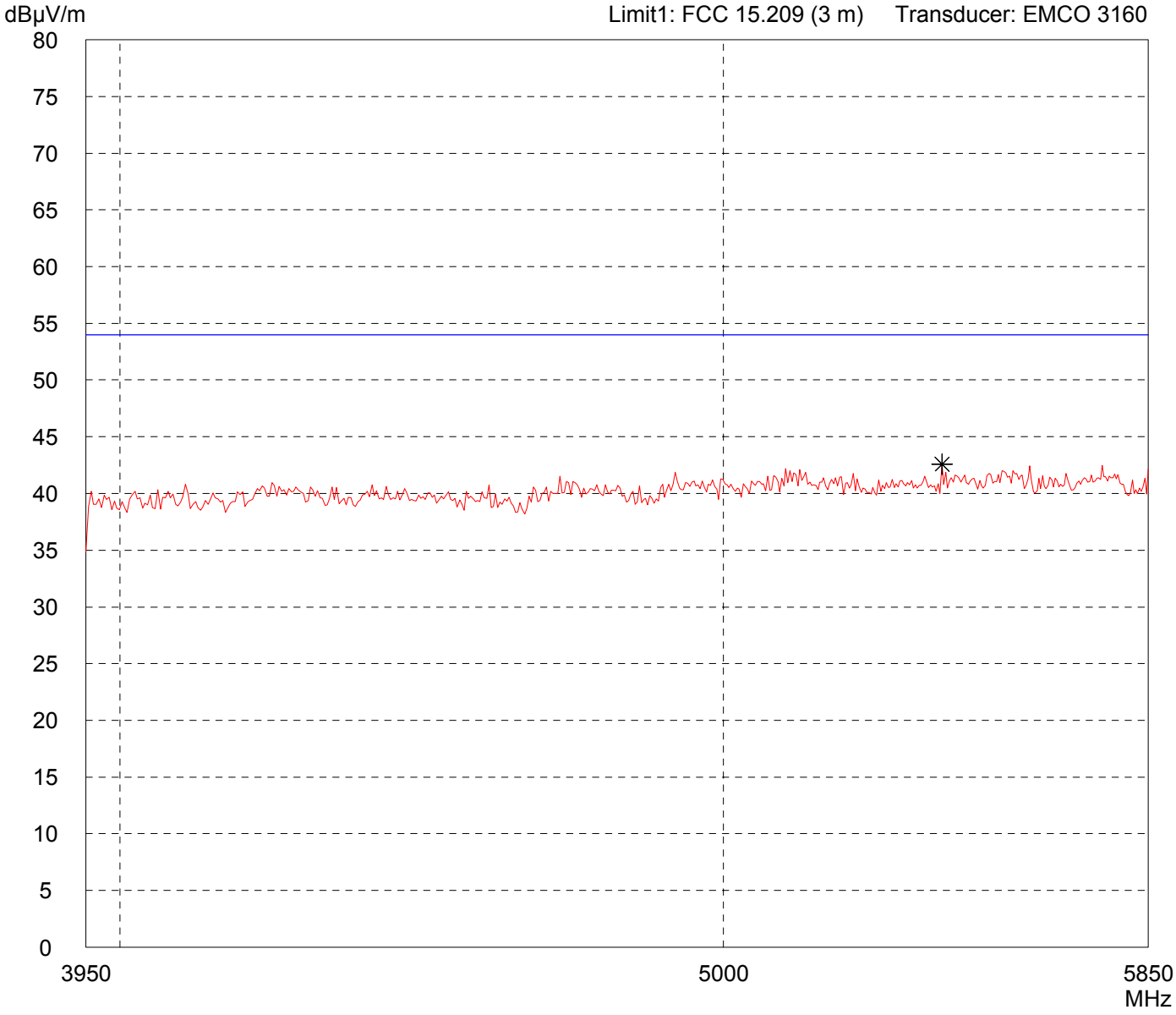
Model: PD remote control (Porsche Design)	Comment: - 3 V power supply - EUT on long side (P3) - transmitting continuously with modulation
Serial no.: ---	
Applicant: EMV-Testhaus GmbH	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 07/06/2007 / Operator: M. Steindl	
Test performed: automatically / File name: default.emi	
Detector: Peak	List of values: Selected by hand



Result: Prescan	Project file: 50531-70577

Radiated Emission Test 3.95 GHz - 5.85 GHz
acc. to FCC Part 15 Subpart C (FAR)

Model: PD remote control (Porsche Design)	Comment: - 3 V power supply - EUT on long side (P3) - transmitting continuously with modulation
Serial no.: ---	
Applicant: EMV-Testhaus GmbH	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 07/06/2007 / Operator: M. Steindl	
Test performed: automatically / File name: default.emi	
Detector: Peak	List of values: Selected by hand



Result: Prescan	Project file: 50531-70577