SENTON

■ EMV-Prüfzentrum ■ EMI/EMC-Testcenter ■

Straubing, 20 April 2004

T E S T - R E P O R T

No. 50217-40229-1

for

PGS2

Transceiver for Car-Immobilizer

Applicant:	Bayerische Motoren Werke AG
Test Specification:	FCC Code of Federal Regulations, CFR 47, Part 15, Section 15.209

Table of Contents

1. Administrative Data

Test item (EUT)	
Type designation	PGS2
Serial number(s):	5WK4 9135, 5WK4 9133
Type of equipment:	Transceiver for Car-Immobilizer
Parts/accessories:	Control unit, Antenna
FCC-ID:	
Technical data	
Frequency range	123.75 – 126.25 kHz
Operational frequencies	125 kHz
Type of modulation	10K0A1D
Pulse frequency	N/A
Pulse width	N/A
Antenna	Bumper antenna
Power supply	12 V regulated lead acid battery
Applicant: (full address)	Bayerische Motoren Werke AG BMW Haus Pertuelring 130 D 80788 München Germany
Contract identification:	---
Contact person:	Mr. Richard Hochleitner
Manufacturer:	Siemens VDO AG
Application details	
Receipt of EUT:	2 April 2004
Date of test:	April 2004
Note:	
Responsible for testing:	Martin Steindl
Responsible for test report:	Martin Steindl

2. Identification of Test Laboratory

DETAILS OF THE TEST LABORATORY	
COMPANY NAME:	Senton GmbH EMI/EMC Test Center
ADDRESS:	Aeussere Fruehlingsstrasse 45 D-94315 Straubing Germany
LABORATORY ACCREDITATION:	DAR-Registration No. TTI-P-G 062/94-01
FCC TEST SITE LISTING	90926
INDUSTRY CANADA TEST SITE REGISTRATION	IC 3050
NAME FOR CONTACT PURPOSES:	Mr. Johann Roidt
TELEPHONE: (+49) (0)9421 5522-0	FAX: (+49) (0)9421 5522-99

PERSONNEL INVOLVED IN THIS TEST REPORT	
LABORATORY MANAGER:	 Mr. Johann Roidt
RESPONSIBLE FOR TESTING:	Mr. Martin Steindl
RESPONSIBLE FOR TEST REPORT:	Mr. Martin Steindl

SUMMARY OF TEST RESULTS
The tested sample complies with the requirements set forth in the **Code of Regulations CFR 47, Part 15, Section 15.209**

3. Operation Mode of EUT

Transmitting continiously

4. Configuration

Configuration of the EUT
Not applicable

Cables connected to the EUT			
Description	**Classification**	**Cable type**	**Maximum cable length**
DC-supply	DC power	Unshielded	> 3m
Antenna-supply	signal/control port	Unshielded	1.9 m

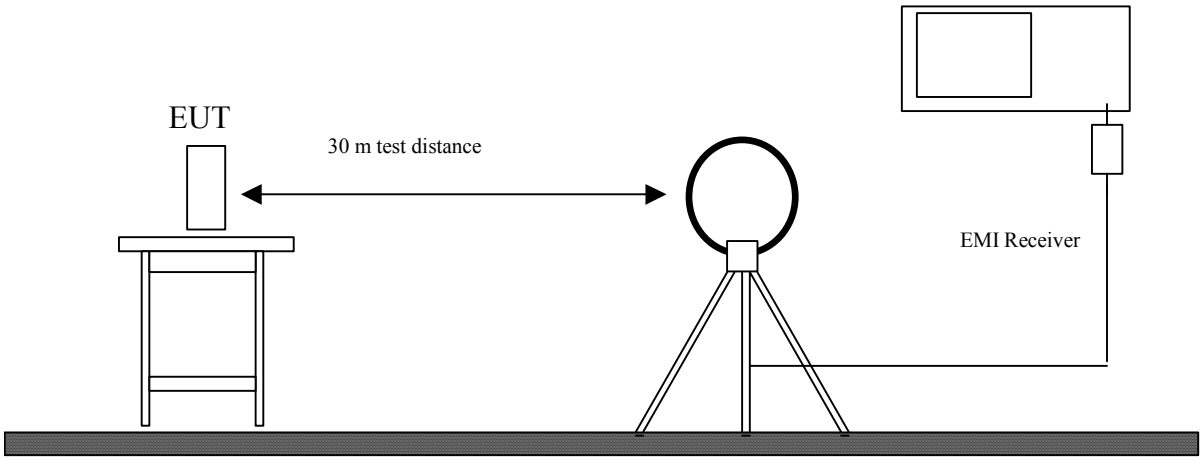
Peripheral devices connected to the EUT
Not applicable

5. Measuring Methods

5.1. Radiated Emission Measurement 9 kHz – 30 MHz

Rules and Specifications:	Sections 15.109 & 15.209
Guide:	ANSI C63.4 1997

Measurement Procedure:
Radiated emissions in the frequency range 9 kHz – 30 MHz were measured initially at a distance of 3 meters. A prescan at 3 meter distance were performed in a shielded room with the detector of the spectrum analyzer or EMI Receiver set to peak. 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. Final measurement is then performed at 30 meter distance. In case the regulation requires testing at other distances, the result will be extrapolated. The extrapolation factor is determined by making a second measurement at 10 meter distance. In cases of very low emissions measurements are performed at shorter distances and results are extrapolated to the required distance. The provisions of 15.31 (d) apply. According to section 15.209 (d) final measurementis performed with the detector set to Quasi Peak except for the frequency bands 9 – 90 kHz and 110 – 490 kHz where average detector is employed.



Test instruments used:

No.	Type	Model	Serial Number	Manufacturer
01	Test receiver	ESH 3	880112/032	Rohde & Schwarz
02	Loop antenna	HFH2-Z2	882964/1	Rohde & Schwarz
03	Open Field Test Site	No. 1	N/A	Senton

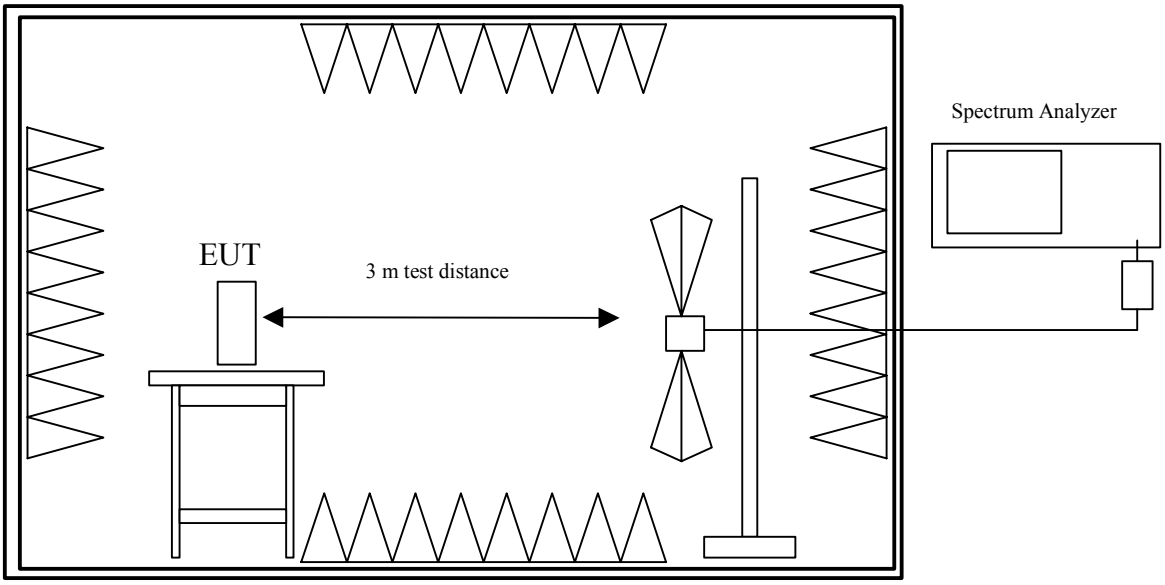
5.2. Field Strength of Emissions, Prescans in a fully-anechoic Room

Rules and Specifications:	Sections 15.109 & 15.209
Guide:	ANSI C63.4 1997

Measurement Procedure:

Radiated emissions are measured over the frequency range from 30 MHz to the 5th harmonic of the maximum frequency of the EUT.

Measurements were 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 bandwidth set to 100 kHz. All tests were performed at a test-distance of 3 meters. Hand-held or body-worn devices are rotated through three orthogonal axes to determine which attitude and configuration produces the highest emission relative to the limit and therefore shall be used for final testing. For final testing an open-area test-site was used. During the tests the EUT is rotated all around to find the maximum levels of emissions. The cables and equipment were placed and moved within the range of position likely to find their maximum emissions.



Fully anechoic chamber

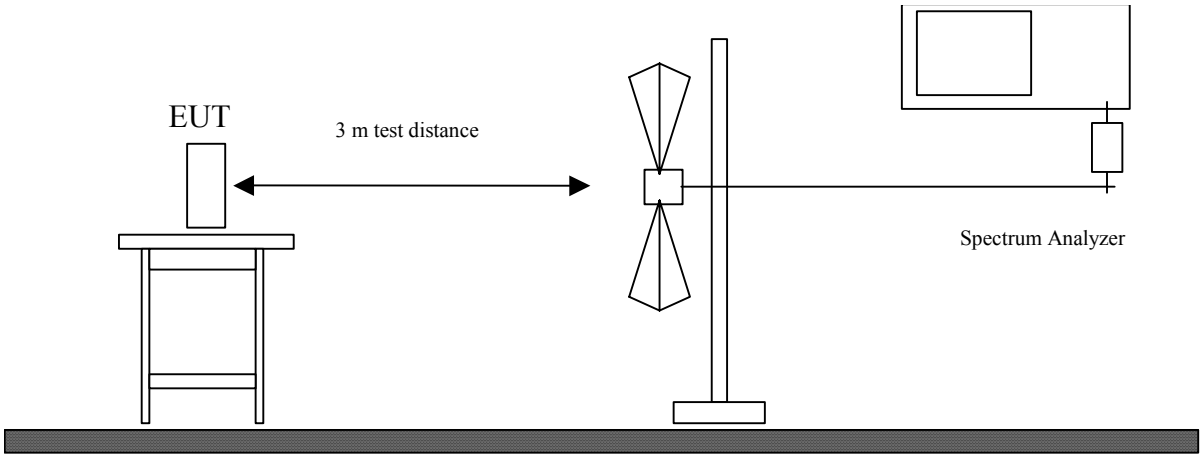
Test instruments used:

No.	Type	Model	Serial Number	Manufacturer
01	Spectrum Analyzer	FSP 30	100063	Rohde & Schwarz
113	Preamplifier	CPA9231A	3393	Schaffner
141	Biconical antenna	HK 116	829708/006	Rohde & Schwarz
143	Log. periodic antenna	3147	9112-1054	EMCO
145	Horn antenna	3115	9508-4553	EMCO
146	Horn antenna set	3160-03/-09	9112-1003	EMCO
114	Preamplifier 1-8 GHz	AFS3-00100800-32-LN	847743	Miteq
115	Preamplifier 8-18 GHz	ACO/180-3530	32641	CTT
003	Fully anechoic room	No. 2	1452	Albatross Projects

5.3. Radiated Emission Measurement at Open Area Test Site

Rules and Specifications:	Sections 15.109 & 15.209
Guide:	ANSI C63.4 1997

Measurement Procedure:
Radiated emissions are measured in the frequency range 1 GHz to 8 GHz. Resolution and video bandwidth of the spectrum analyzer are set to 1 MHz. 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. Additional measurements are performed at critical frequencies with reduced span. EUT is rotated all around and receiving antenna is raised and lowered to find the maximum levels of emission. The cables and equipment are placed and moved within the range of position likely to find their maximum emissions. All tests are performed in a fully-anechoic chamber with a test-distance of 3 meters. If required preamplifiers are used for the whole frequency range. Special care is taken to avoid overload in transmit mode (using appropriate attenuators and filters if necessary).

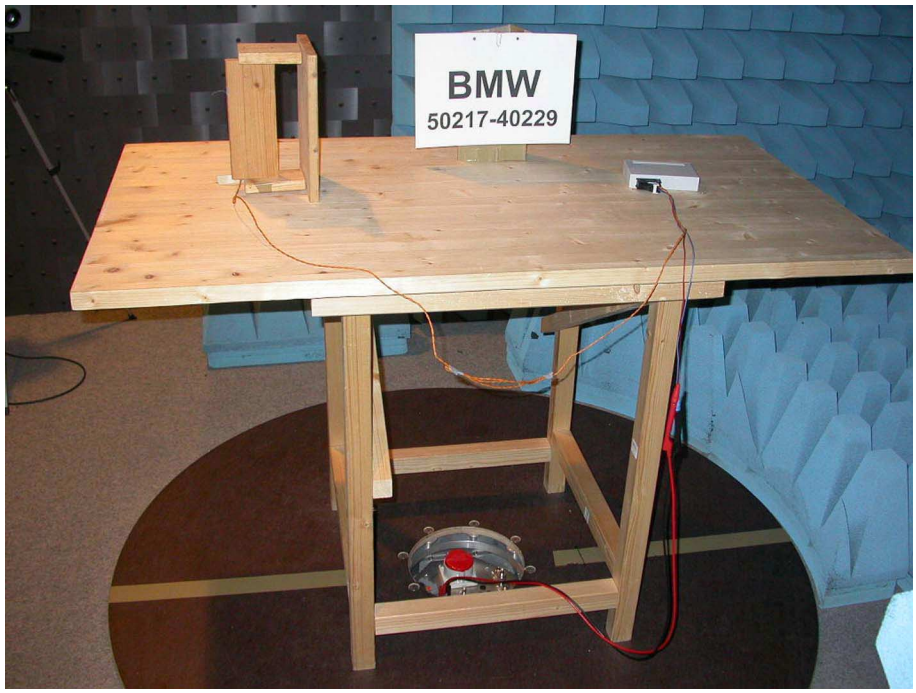


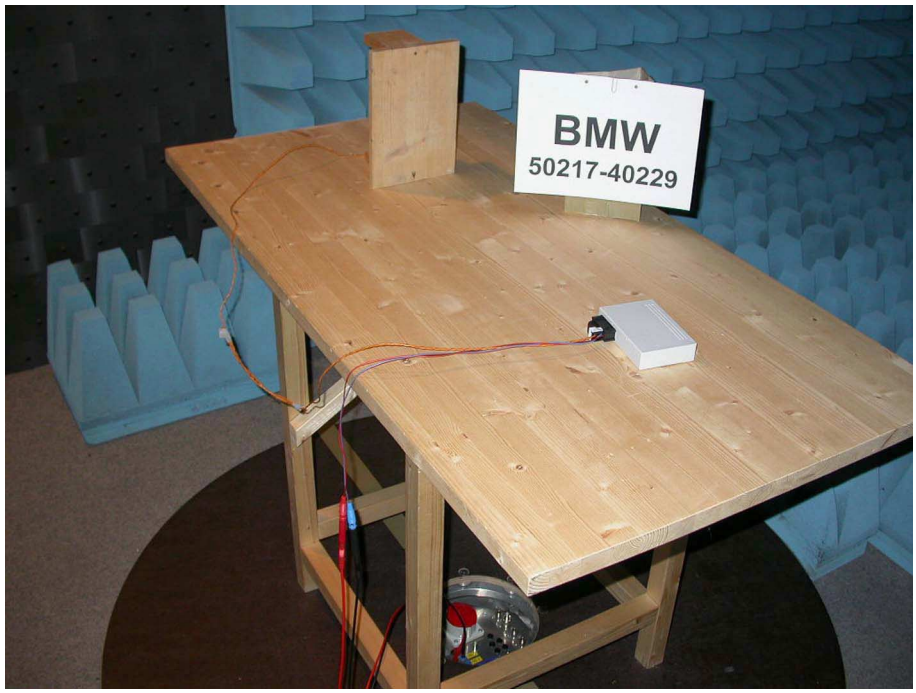
Test instruments used:

No.	Type	Model	Serial Number	Manufacturer
01	EMI Receiver	ESVP	881414/009	Rohde & Schwarz
141	Biconical antenna	HK 116	829708/006	Rohde & Schwarz
143	Log. periodic antenna	3147	9112-1054	EMCO
145	Horn antenna	3115	9508-4553	EMCO
146	Horn antenna set	3160-03/-09	9112-1003	EMCO
114	Preamplifier 1-8 GHz	AFS3-00100800-32-LN	847743	Miteq
115	Preamplifier 8-18 GHz	ACO/180-3530	32641	CTT
003	Open Field Test Site	No. 1	N/A	Senton

6. Photographs Taken During Testing

Test setup for radiated emission measurement (fully anechoic room)





Test setup for radiated emission measurement (open area test-side

7. List of Measurements

FCC Part 15			
Section(s):	**Test**	**Page(s)**	**Result**
15.205	Restricted Bands		Pass
15.207	AC Powerline Emissions	---	Not Applicable
15.109	Radiated Spurious emissions		Pass

Fieldstrength of Emission 9 kHz – 30 MHz

Rules and Specifications:	15.109, 125.209 Radiated Emission Limits		
Guide:	ANSI C63.4		
Limit:	Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:		
	Frequency of Emission (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
	0.009 - 0.490 0.490 - 1.705 1.705 – 30	2400/F(kHz) 24000/F(kHz) 30	300 30 30

Tested Frequency:	125 kHz
Test Site:	Open Area Test Site
Distance:	30 Meter

Frequency (MHz)	Detector	Antenna Polarization	Analyzer Reading (dBµV)	Correction Factor (dB/m)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
0.125	AV	Hor/Ver	4.8	20	24.8	65.67	**40.9**

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

Sample calculation of erp values:

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

Test Results:	Pass	

Fieldstrength of Emission

Rules and Specifications:	15.109, 125.209 Radiated Emission Limits	
Guide:	ANSI C63.4	
Limit:	Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:	
	Frequency of Emission (MHz)	Field Strength (microvolts/meter)
	30 - 88	100
	88 - 216	150
	216 - 960	200
	Above 960	500

Tested Frequency:	125 kHz
Test Site:	Open Area Test Site (< 1 GHz), Fully anechoic chamber (> 1 GHz)
Distance:	3 Meter

Frequency (MHz)	Detector	Antenna Polarization	Analyzer Reading (dBµV)	Correction Factor (dB/m)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
30 - 1000					***		

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

Sample calculation of erp values:

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

Test Results:	Pass	

8. Referenced Regulations

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

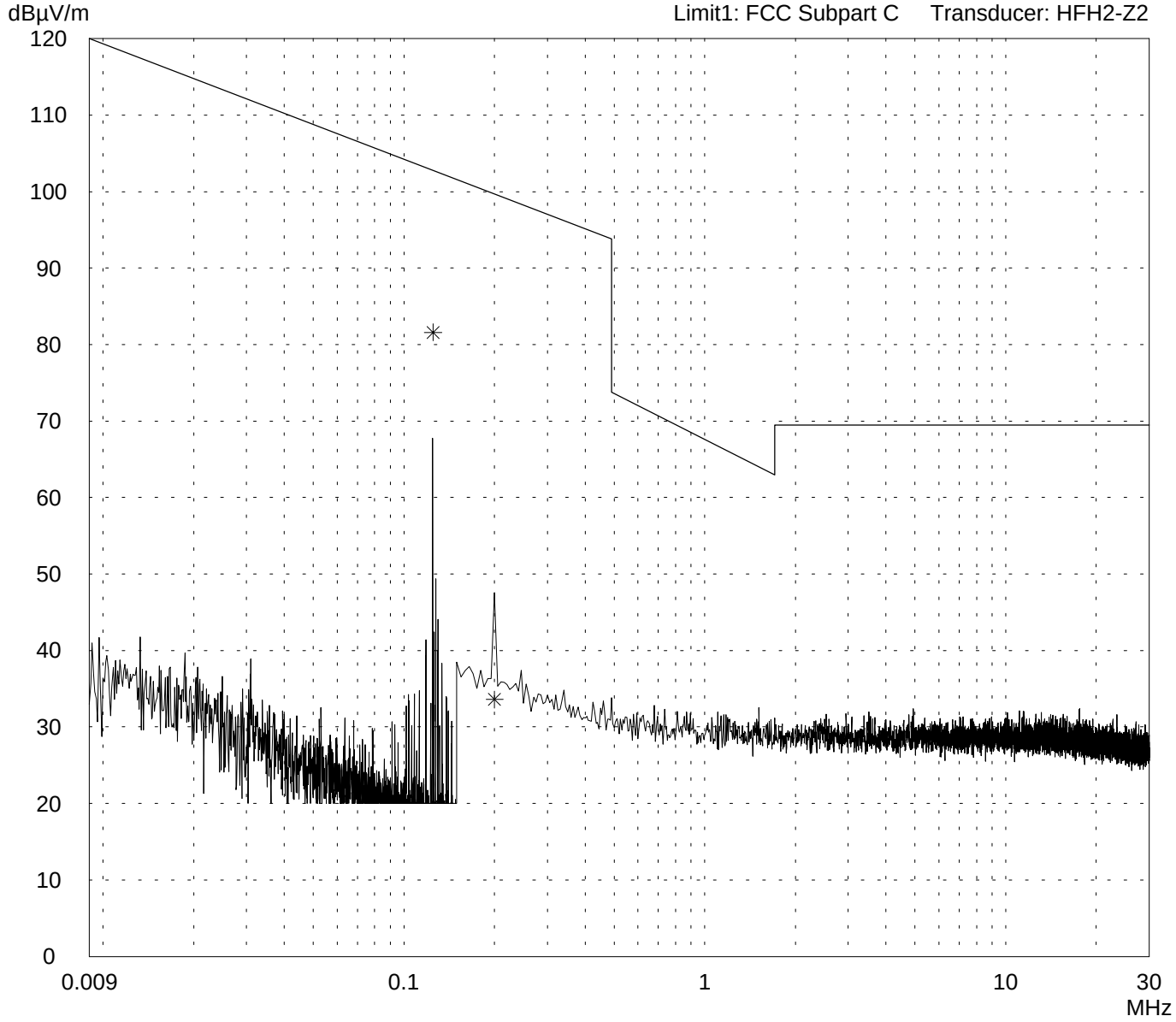
☒	FCC Part 2	Code of Federal Regulations Part 2 Frequency allocationand radio treaty matters; General rules and regulations	October 01, 1999
☐	FCC Part 15 Subpart A	Code of Regulations Part 15 (Radio Frequency Devices), Subpart A (General) of the Federal Communication Commission (FCC)	October 20, 1997
☐	FCC Part 15 Subpart B	Code of Regulations Part 15 (Radio Frequency Devices), Subpart B (Unintentional Radiators) of the Federal Communication Commission (FCC)	October 20, 1997
☒	FCC Part 15 Subpart C	Code of Regulations Part 15 (Radio Frequency Devices), Subpart C (Intentional Radiators) of the Federal Communication Commission (FCC)	October 20, 1997
☐	FCC Part 74 Subpart H	Code of Regulations Part 15 (Radio Frequency Devices), Subpart H (Low Power Auxiliary Stations) of the Federal Communication Commission (FCC)	October 20, 1997
☒	ANSI C63.4	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz - 40 GHz	October, 1992
☐	RSS-210	Radio Standards Specification RSS-210 Issue 2 for Low Power Licence-Exempt Radiocommuniction Devices of Industry Canada	February 24, 1996

Charts taken during testing

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

Model: PGS2	Mode:
Serial no.: 61.35 - 6944812.9	- DC 12 V power supply
Applicant: BMW AG	- antenna in vertical position
Test site: Shielded room, cabin no. 2	- transmitting continiously
Tested on: Test distance 3 metres	
Date of test: 04/15/2004 / Operator: M. Steindl	
Test performed: automatically / File name:	

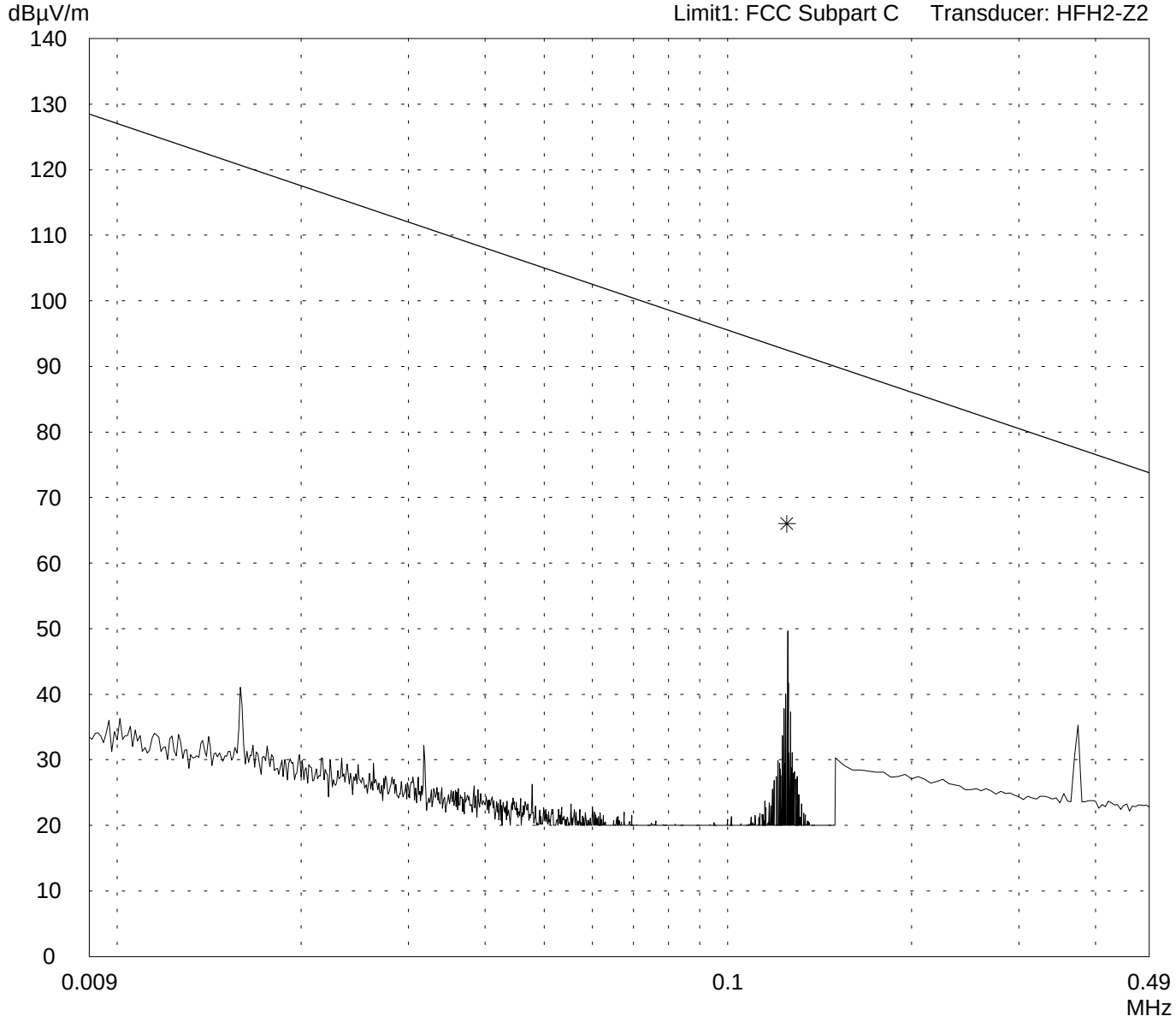
Detector: Peak / Final Results: QP	Final results: Selected by hand



Result: Prescan	Project file: 50217-40229-1 Page of Pages

Radiated Emission Test 9 kHz - 490 kHz
according to FCC Part 15 Subpart C

Model: PGS2	Mode: - DC 12 V power supply
Serial no.: 61.35 - 6944812.9	- antenna in vertical position
Applicant: BMW AG	- transmitting continiously
Test site: Shielded room, cabin no. 2	
Tested on: Test distance 3 metres	
Date of test: 04/15/2004 / Operator: M. Steindl	
Test performed: automatically / File name:	
Detector: Average / Final Results: AV	Final results: Selected by hand

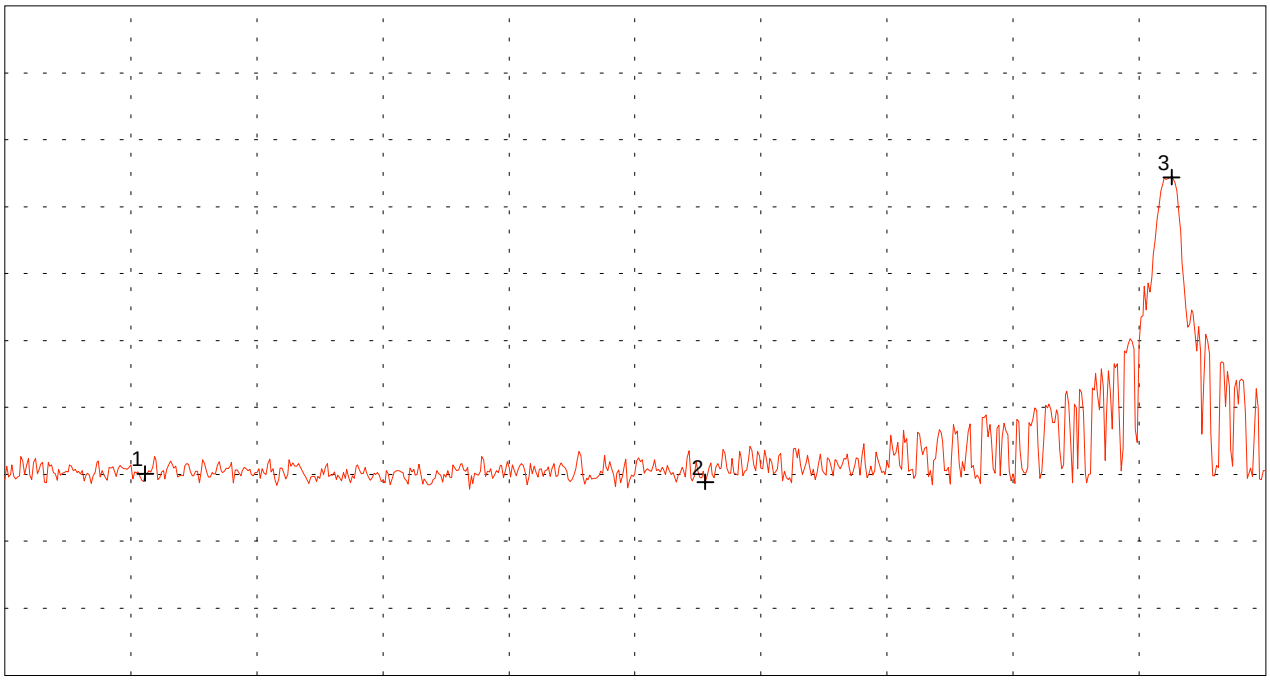


Result: Prescan	Project file: 50217-40229-1 Page of Pages

Restricted Bands Requirement according FCC Part 15.205

Model: PGS2	Mode: - DC 12 V power supply - antenna in vertical position - transmitting continiously
Serial No.: 61.35 - 6944812.9	
Applicant: BMW AG	

Ref.Level 117 dBuV ATT 10 dB Ref. Offset 30 dB
10 dB/Div.



Start 85.000 kHz Stop 130.000 kHz
RBW 300 Hz VBW 1 kHz SWP 1 s

Multi Marker List

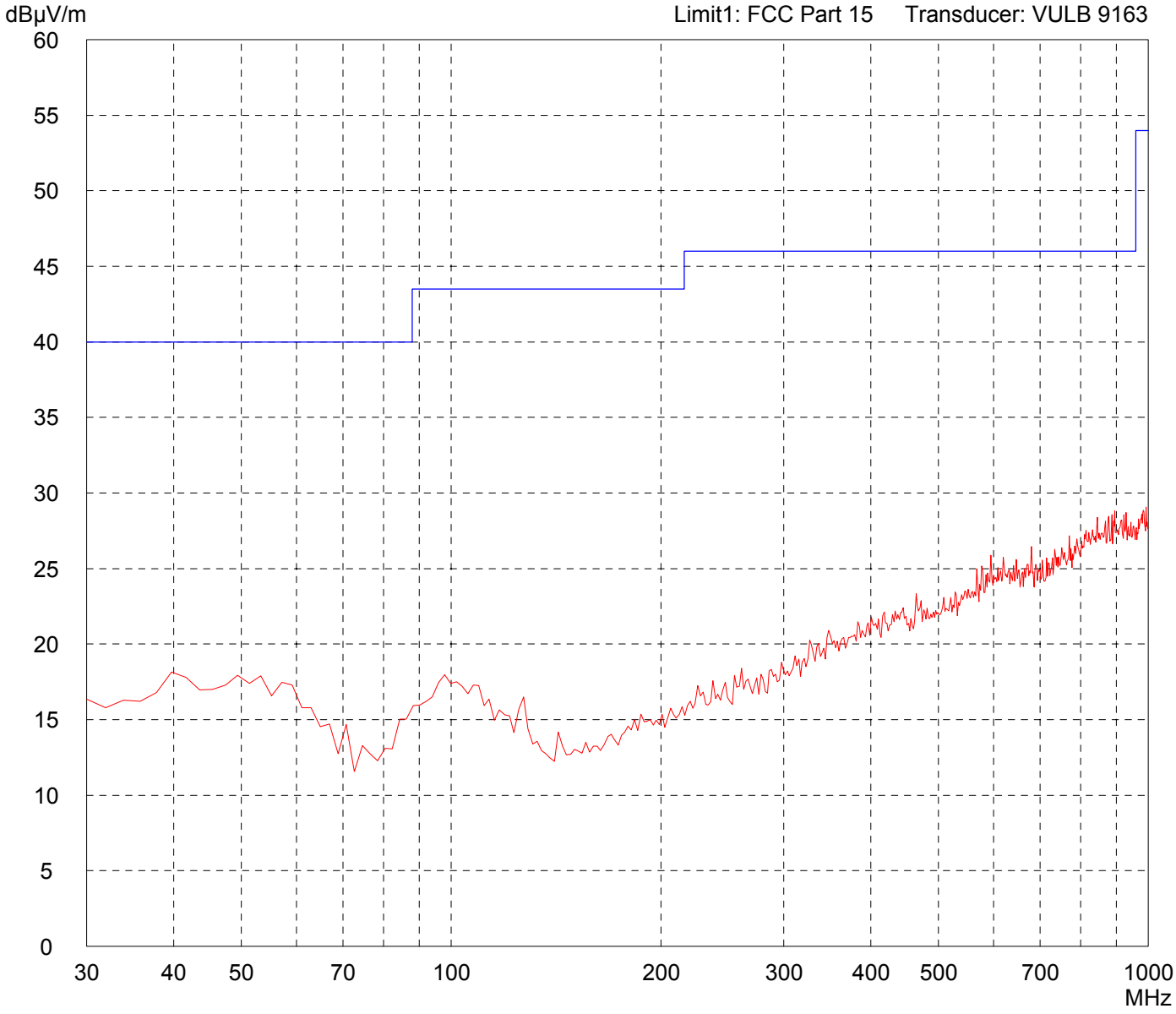
No. 1	90.000 kHz	47.09 dBuV
No. 2	110.000 kHz	45.84 dBuV
No. 3	126.660 kHz	91.38 dBuV

Tested by: M. Steindl	Project-No.: 50217-40229-1
Date: 04/15/2005	Page of pages

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

Model: PGS2	Comment: - DC 12 V power supply - antenna in vertical position - transmitting continiously
Serial no.: 61.35 - 6944812.9	
Applicant: BMW AG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Horizontal Polarization	
Date of test: 04/15/2004 / Operator: M. Steindl	
Test performed: automatically / File name: default.emi	

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

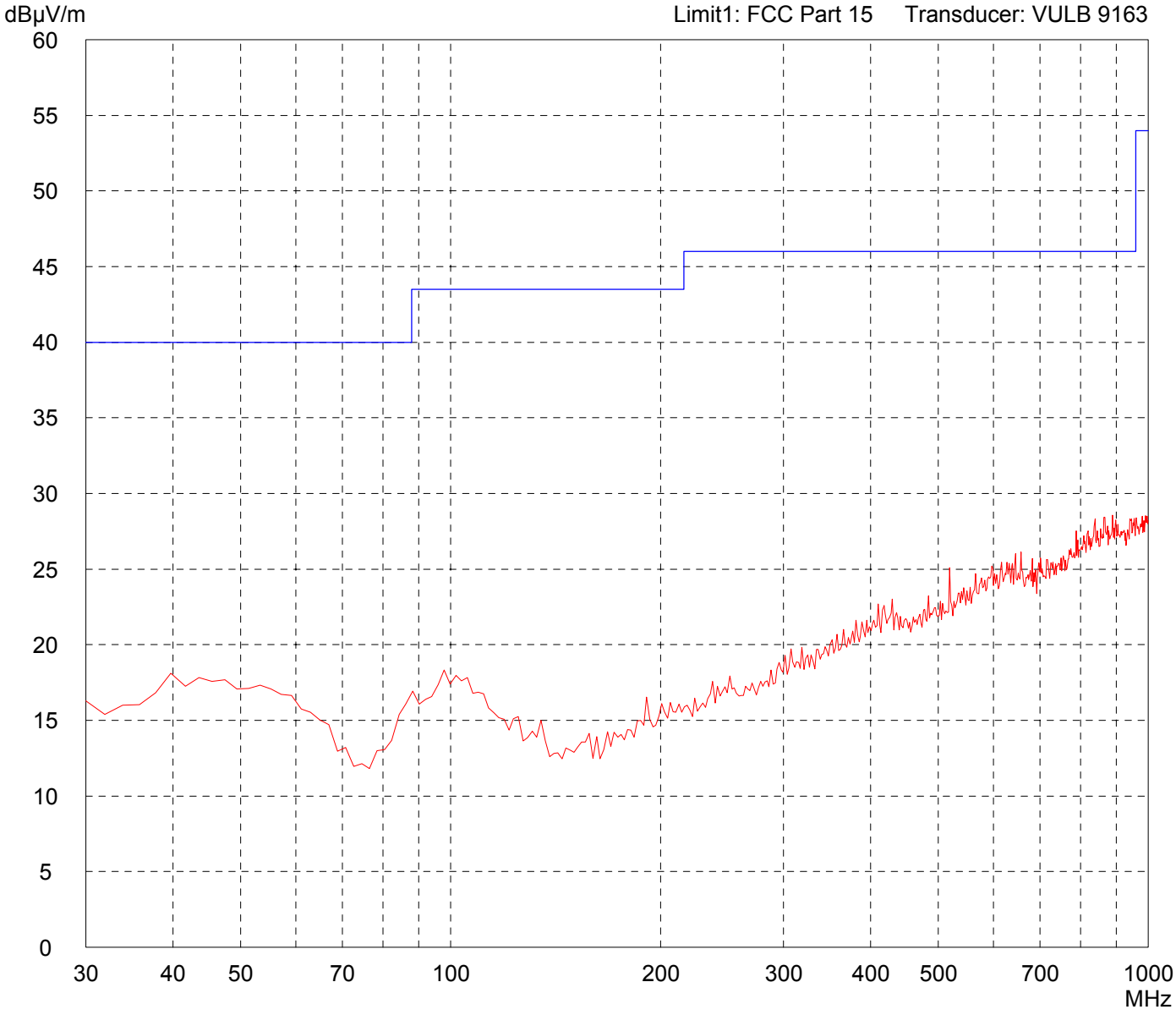


Result: Prescan	Project file: 50217-40229-1 / Page of Pages

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

Model: PGS2	Comment: - DC 12 V power supply - antenna in vertical position - transmitting continiously
Serial no.: 61.35 - 6944812.9	
Applicant: BMW AG	
Test site: Fully anechoic room, cabin no. 2	
Tested on: Test distance 3 metres Vertical Polarization	
Date of test: 04/15/2004 / Operator: M. Steindl	
Test performed: automatically / File name: default.emi	

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



Result: Prescan	Project file: 50217-40229-1 / Page of Pages