

Straubing, September 24, 1999

TEST - REPORT

No. 50217-90595-3

for

FZV Transmitter

Remote control transmitter

Applicant: Bayerische Motorenwerke AG

Purpose of testing: To show compliance with

FCC Code of Federal Regulations,
Part 15 Subpart C, Section §15.231

Industry Canada Radio Standards
Specification RSS-210 Issue 2,
Section 6.1 (Category I Equipment)

Note:

The test data of this report relate only to the individual item which has been tested.
This report shall not be reproduced except in full extent without the written approval
of the testing laboratory.

Table of Contents

1.	Administrative Data	3
2.	Identification of Test Laboratory	4
3.	Summary of Test Results	5
4.	Operation Mode of EUT	6
5.	Configuration of EUT and Peripheral Devices.....	7
6.	Measuring Methods	8
6.1.	Bandwidth of Emission(FCC §15.231.c / RSS-210 Section 6.1.1.c)	8
6.2.	Radiated Emission 30 MHz - 1 GHz (FCC §15.205.a,b, §15.209, §15.231.b / RSS-210 Sections 6.1.1.b, 6.3).....	9
6.3.	Radiated Emission 1 GHz - 10 GHz (FCC §15.205.a,b, §15.209, §15.231.b / RSS-210 Sections 6.1.1.b, 6.3).....	11
7.	Equipment List.....	13
8.	Photographs Taken During Testing.....	15
9.	List of Measurements	21
9.1.	List of Measurements According To FCC Part 15 Subpart C	22
9.2.	List of Measurements According To Industry Canada RSS-210.....	23
10.	Referenced Regulations	24
11.	Test Results.....	25

1. Administrative Data

Equipment Under Test (EUT): FZV Transmitter
Serial number(s): Prototype 1
Type of equipment: Remote control transmitter
Parts/accessories: --
FCC-ID: LX8FZVS

Applicant:
(full address) Bayerische Motorenwerke AG
Petuelring 130
80788 München
Germany

Contract identification: ---

Contact person: Mr. Hochleitner

Manufacturer: Bayerische Motorenwerke AG

Receipt of EUT: September 10, 1999

Date of test: September 23, 1999

Note: --

Responsible for testing: Rupert Kohlhäufel

Responsible for test report: Rupert Kohlhäufel

2. Identification of Test Laboratory

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

FCC file number:	31040/SIT 1300F2
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Industry Canada file number:	IC 3050
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3. Summary of Test Results

The tested sample complies with the requirements set forth in the

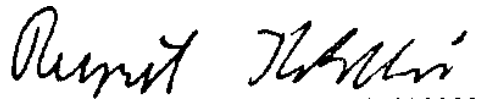
Code of Regulations Part 15 Subpart C, Section §15.231 (intentional radiators) of the Federal Communication Commission (FCC)

and the

Radio Standards Specification RSS-210 Issue 2, Section 6.1 for Low Power Licence-Exempt Radiocommunication Devices of Industry Canada.



Johann Roidt
Technical Manager



Rupert Kohlhäufel
Test Engineer

4. Operation Mode of EUT

EUT is transmitting continuously with modulation, supplied by battery (3 V DC)

5. Configuration of EUT and Peripheral Devices

EUT is configured as stand-alone device

Configuration of cables of EUT

Not applicable

Configuration of peripheral devices connected to EUT

Not applicable

6. Measuring Methods

6.1. Bandwidth of Emission(FCC §15.231.c / RSS-210 Section 6.1.1.c)

The Bandwidth of Emission is measured with a spectrum analyzer connected to measuring antenna (radiated measurement) or test fixture while EUT is operating in transmit mode with modulation at the appropriate center frequency. To increase received signal level distance to EUT is reduced (appropriate level offset is included).

The spectrum analyzer was set to:

RBW = 10 kHz, VBW = 10 kHz, span = 1 MHz, sweep = 40 ms

See figure 1 for the measurement setup.

Test equipment used (see equipment list for details):
02, 55, 67

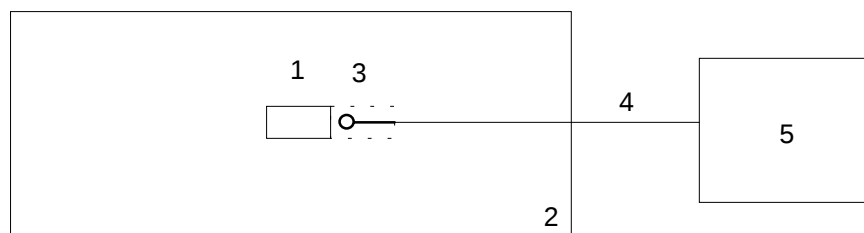


Figure 1: Measurement setup for bandwidth of emission test

1 Transmitter (EUT)
2 Wooden table

3 Test fixture
4 Test cable
5 Spectrum analyzer

6.2. Radiated Emission 30 MHz - 1 GHz (FCC §15.205.a,b, §15.209, §15.231.b / RSS-210 Sections 6.1.1.b, 6.3)

Radiated emissions are measured over the frequency range from 30 MHz to 1 GHz. The bandwidth of the EMI-receiver is set to 120 kHz and the detector-function is set to CISPR quasi-peak.

The test setup is made in accordance with ANSI C63.4-1992.

Measurements are made in both the horizontal and vertical planes of polarization. Preliminary scans are taken in a semi-anechoic room using a spectrum analyzer with the detector function 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.

All tests are performed at a test-distance of 3 meters.

For final testing an open-area test-site is used. During the tests the EUT is rotated all around and the receiving-antenna is raised and lowered from 1 meter to 4 meters to find the maximum levels of emissions. The cables and equipment is placed and moved within the range of position likely to find their maximum emissions.

See figure 2 for the measurement setup.

Test equipment used (see equipment list for details):

01, 02, 05, 12, 38, 39, 40, 41, 58, 61, 64, 66

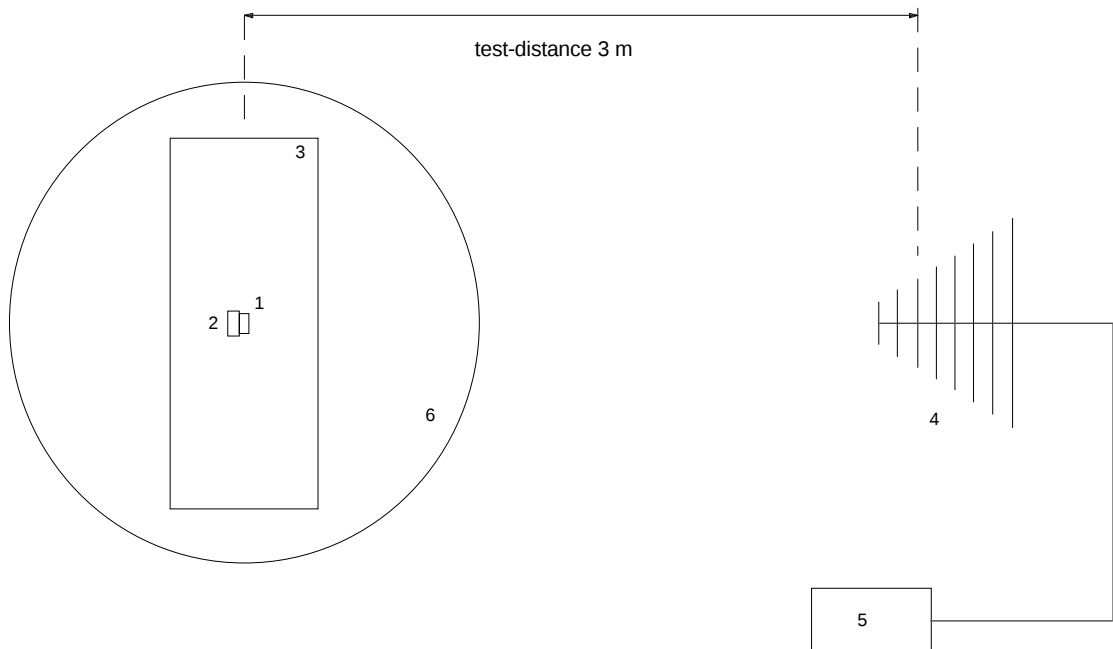


Figure 2: Measurement setup for radiated emission test below 1 GHz

- | | |
|---|------------------------------|
| 1 Transmitter (EUT) | 4 Measurement antenna |
| 2 Wooden pedestal (if necessary) | 5 Test receiver |
| 3 Wooden table | 6 Turn table |

6.3. Radiated Emission 1 GHz - 10 GHz (FCC §15.205.a,b, §15.209, §15.231.b / RSS-210 Sections 6.1.1.b, 6.3)

Radiated emissions are measured in the frequency range 1 GHz to 10 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 semi-anechoic chamber with a test-distance of 3 meters.

If possible preamplifiers are used for the whole frequency range. Special care is taken to avoid overload in transmit mode (using appropriate attenuators if necessary).

See figure 3 for the measurement setup.

Test equipment used (see equipment list for details):

02, 13, 14, 16, ,42, 44, 45, 57, 64

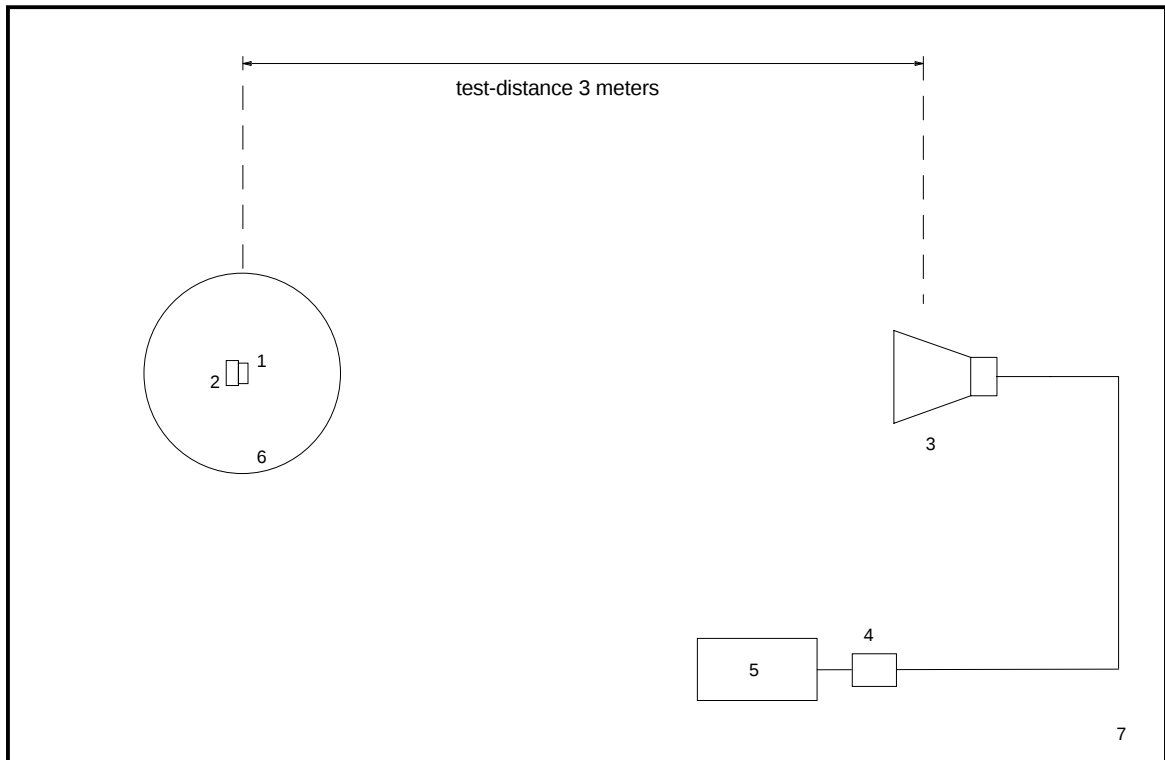


Figure 3: Measurement setup for radiated emission test above 1 GHz

- | | |
|---|---------------------------------------|
| 1 Transmitter (EUT) | 3 Measurement antenna |
| 2 Wooden pedestal (if necessary) | 4 Preamplifier (if applicable) |
| | 5 Spectrum analyzer |
| | 6 Turn table |
| | 7 Semi anechoic room |

7. Equipment List

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

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

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

8. Photographs Taken During Testing

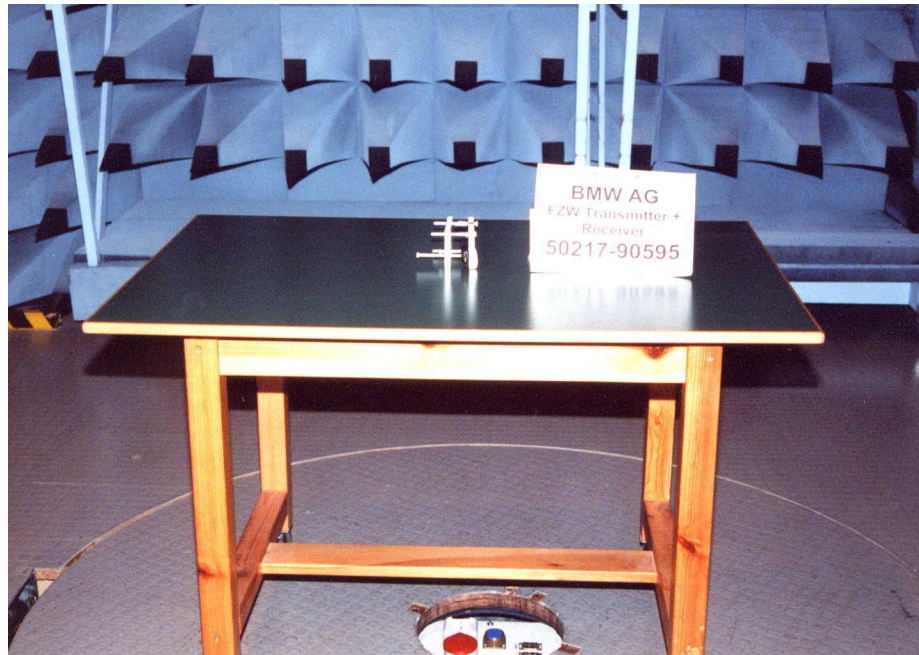
Photos No. 8.1 - 8.2

Test setup for radiated emission pre-test 30 MHz - 1 GHz (semi anechoic room)



Photos No. 8.3

**Test setup for radiated emission pre-test 30 MHz - 1 GHz
(semi anechoic room – continued)**



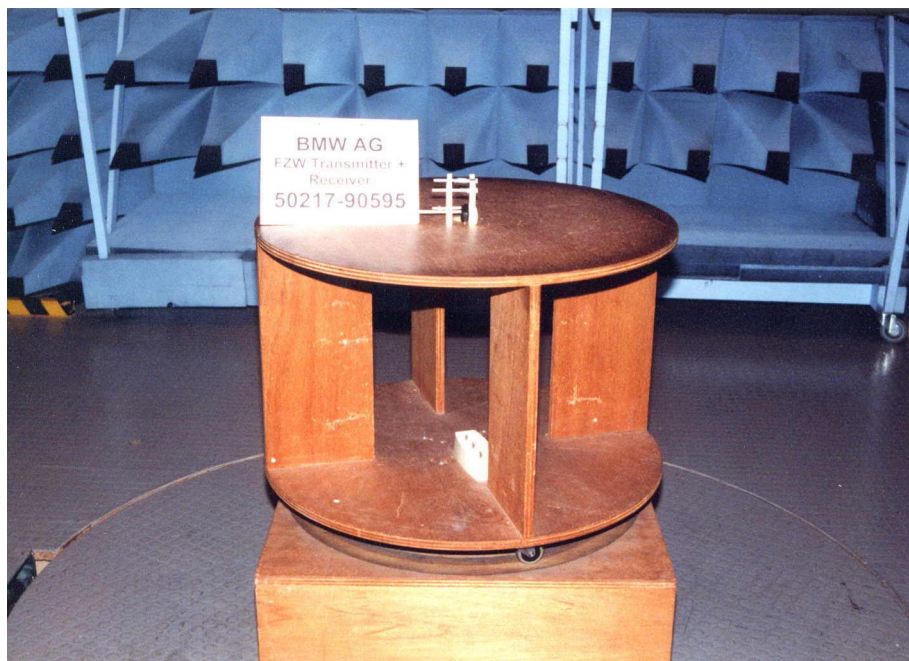
Photos No. 8.4

**Test setup for radiated emission final test 30 MHz - 1 GHz
(open area test site)**



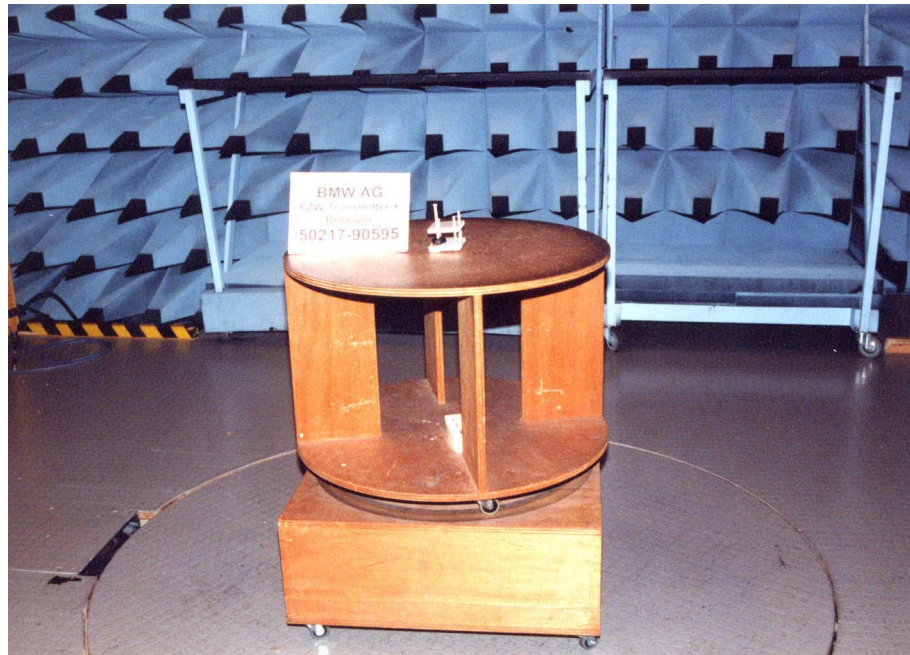
Photos No. 8.5 - 8.6

Test setup for radiated emission test above 1 GHz



Photos No. 8.7

**Test setup for radiated emission test above 1 GHz
(continued)**



9. List of Measurements

9.1. List of Measurements According To FCC Part 15 Subpart C

FCC Part 15 Subpart C			
Section(s):	Test	Page(s)	Result
§15.231.c	Bandwidth of emission	27	Passed
§15.207	Conducted emission test 450 kHz – 30 MHz	--	Not Applicable (battery supply)
§15.231.b §15.209 §15.205.a,b	Radiated emission test 9 kHz - 30 MHz	---	Not Applicable (acc. to §15.33)
§15.231.b §15.209 §15.205.a,b	Radiated emission test 30 MHz - 1 GHz	28 – 45	Passed
§15.231.b §15.209 §15.205.a,b	Radiated emission test 1 GHz – 3.15 GHz	46 – 54	Passed

9.2. List of Measurements According To Industry Canada RSS-210

Industry Canada RSS-210 Issue 2			
Section(s):	Test	Page(s)	Result
6.1.1.c	Bandwidth	27	Passed
6.6	Conducted emission test 450 kHz – 30 MHz	---	Not Applicable (battery supply)
6.1.1.b 6.3	Radiated emission test 9 kHz - 30 MHz	---	Not Applicable (acc. to 6.3.e)
6.1.1.b 6.3	Radiated emission test 30 MHz - 1 GHz	28 – 45	Passed
6.1.1.b 6.3	Radiated emission test 1 GHz – 3.15 GHz	46 – 54	Passed

10. Referenced Regulations

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

☒	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
☒	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 Radiocommunication Devices of Industry Canada	February 24, 1996

11. Test Results

Test results

Bandwidth of emission according to FCC Part 15 Subpart C

Model:
FZV Transmitter

Serial No.:
Prototype 1

Applicant:
BMW AG

Mode:
- transmitting continuously (315.0 MHz)

- with battery supply

Maximum bandwidth:

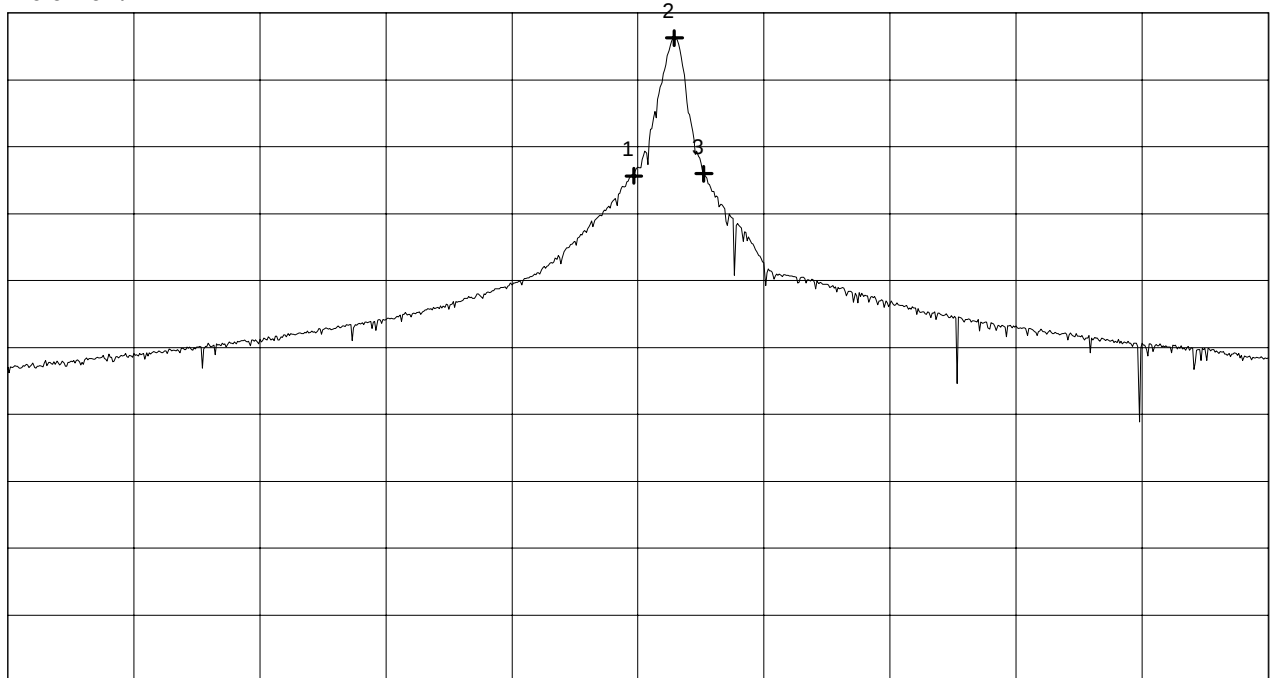
0.25% of center frequency = 787.5 kHz

Measured bandwidth: 55.6 kHz

Ref.Level 70 dB μ V/m
10 dB dB/Div.

ATT 10 dB

Ref. Offset -14 dB



Start 314.500 MHz
RBW 10 kHz

VBW 10 kHz

Stop 315.500 MHz
SWP 40 ms

**** Multi Marker ****

Nr.1	314.996667 MHz	45.63 dB μ V/m
Nr.2	315.028889 MHz	66.27 dB μ V/m
Nr.3	315.052222 MHz	45.96 dB μ V/m
Nr.4		
Nr.5		
Nr.6		
Nr.7		
Nr.8		

Tested by:
Rupert Kohlhäufel

Date:
09/23/1999

Project-No.:
50217-90595-3

Page 27 of 57 Pages

Radiated Emission 30 MHz - 1 GHz (Final Test)
according to FCC Part 15 Subpart C, §15.231.b

Model: FZV transmitter
 Type: Remote control transmitter
 Serial No.: Prototype 1
 Applicant: BMW AG
 Test-site: Open area test-site I
 Test distance: 3 meters
 Date of test: 09/23/1999
 Operator: R. Kohlhäufel
 Mode:
 - transmitting continuously
 - with battery supply 3 V DC

EUT in horizontal position with rear on table

Detector: Peak

Polarization: horizontal

Frequency [MHz]	Receiver reading [dBμV]	Correction factor [dB]	Fieldstrength Peak [dBμV/m]	Limit Peak [dBμV/m]	Duty cycle correction [dB]	Fieldstrength Average [dBμV/m]	Limit Average [dBμV/m]	Limit exceeded
315.00	48.6	17.4	66.0	95.6	18.2	47.8	75.6	
630.00	17.9	25.8	43.7	75.6	18.2	25.5	55.6	
945.00	19.6	31.2	50.8	75.6	18.2	32.6	55.6	

Result: The limits are kept.

Radiated Emission 30 MHz - 1 GHz (Final Test)
according to FCC Part 15 Subpart C, §15.231.b

Model: FZV transmitter
 Type: Remote control transmitter
 Serial No.: Prototype 1
 Applicant: BMW AG
 Test-site: Open area test-site I
 Test distance: 3 meters
 Date of test: 09/23/1999
 Operator: R. Kohlhäufel
 Mode:
 - transmitting continuously
 - with battery supply 3 V DC

EUT in horizontal position with rear on table

Detector: Peak

Polarization: vertical

Frequency [MHz]	Receiver reading [dBμV]	Correction factor [dB]	Fieldstrength Peak [dBμV/m]	Limit Peak [dBμV/m]	Duty cycle correction [dB]	Fieldstrength Average [dBμV/m]	Limit Average [dBμV/m]	Limit exceeded
315.00	34.9	17.4	52.3	95.6	18.2	34.1	75.6	
630.00	4.5	25.8	30.3	75.6	18.2	12.1	55.6	
945.00	7.2	31.2	38.4	75.6	18.2	20.2	55.6	

Result: The limits are kept.

Radiated Emission Test 30 MHz - 1 GHz according to FCC Part 15 Subpart C

Model:
FZV transmitter

Serial no.:
Prototype 1

Applicant:
BMW AG

Test site:
Open area test-site I

Tested on:
Test distance 3 meters
Horizontal Polarization

Date of test:
09/23/1999

Operator:
R. Kohlhäufl

Test performed:
by hand

File name:

Mode:

- transmitting continuously (315 MHz)

- with battery supply

-EUT in horizontal position with rear on table

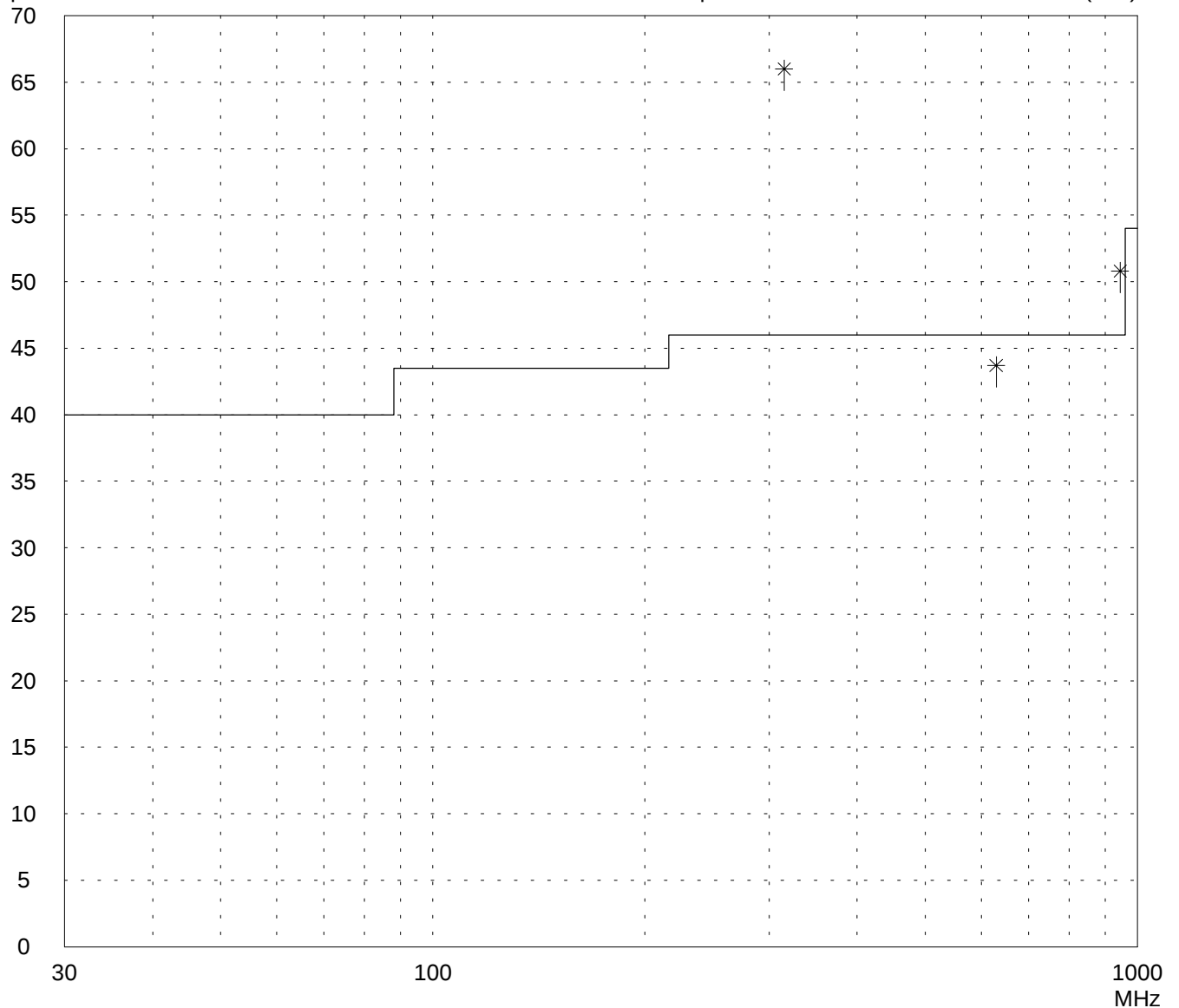
Detector:
Quasi-Peak

List of values:

Selected by hand

dB μ V/m

Limit1: FCC Subpart C Transducer: HK116 / HL223 (3 m)



Result:
Limit kept

Project file:
50217-90595-3

Page 30 of 57 Pages

Radiated Emission Test 30 MHz - 1 GHz according to FCC Part 15 Subpart C

Model: FZV transmitter	Mode: - transmitting continuously (315 MHz) - with battery supply - EUT in horizontal position with rear on table
Serial no.: Prototype 1	
Applicant: BMW AG	
Test site: Open area test-site I	
Tested on: Test distance 3 meters Horizontal Polarization	
Date of test: 09/23/1999	
Test performed: by hand	File name:

Detector: Quasi-Peak	List of values: Selected by hand
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[illegible]

Result: Limit kept	Project file: 50217-90595-3	Page 31 of 57 Pages
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Radiated Emission Test 30 MHz - 1 GHz according to FCC Part 15 Subpart C

Model:
FZV transmitter

Serial no.:
Prototype 1

Applicant:
BMW AG

Test site:
Open area test-site I

Tested on:
Test distance 3 meters
Vertical Polarization

Date of test:
09/23/1999

Operator:
R. Kohlhäufl

Test performed:
by hand

File name:

Mode:

- transmitting continuously (315 MHz)

- with battery supply

-EUT in horizontal position with rear on table

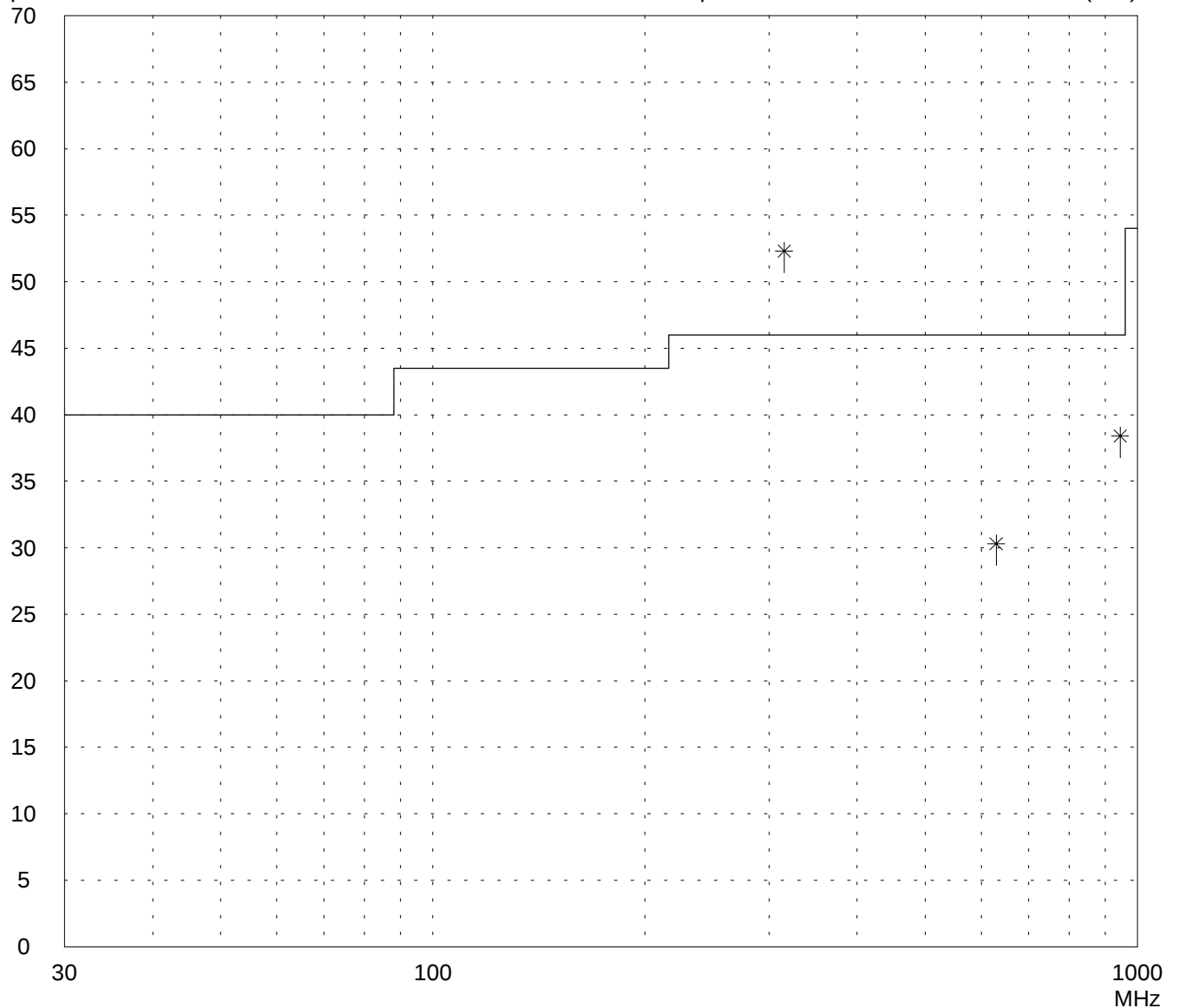
Detector:
Quasi-Peak

List of values:

Selected by hand

dB μ V/m

Limit1: FCC Subpart C Transducer: HK116 / HL223 (3 m)



Result:
Limit kept

Project file:
50217-90595-3

Page 32 of 57 Pages

Radiated Emission Test 30 MHz - 1 GHz according to FCC Part 15 Subpart C

Model: FZV transmitter	Mode: - transmitting continuously (315 MHz) - with battery supply - EUT in horizontal position with rear on table
Serial no.: Prototype 1	
Applicant: BMW AG	
Test site: Open area test-site I	
Tested on: Test distance 3 meters Vertical Polarization	
Date of test: 09/23/1999 Operator: R. Kohlhäufel	
Test performed: by hand File name:	

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

<i>Frequency MHz</i>	<i>Reading dBμV</i>	<i>Correction factor dB</i>	<i>Value dBμV/m</i>	<i>Limit dBμV/m</i>	<i>Limit exceeded</i>
315.0	34.9	17.4	52.3	46.0	*
630.0	4.5	25.8	30.3	46.0	
945.0	7.2	31.2	38.4	46.0	

Result: Limit kept	Project file: 50217-90595-3	Page 33 of 57 Pages
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Radiated emission 30 MHz - 1 GHz acc. to FCC Part 15 Subpart C

Model:
FZV transmitter

Serial No.:
Prototype 1

Applicant:
BMW AG

Mode:
- transmitting continuously (315 MHz)

- with battery supply

- EUT in horizontal position with rear on table

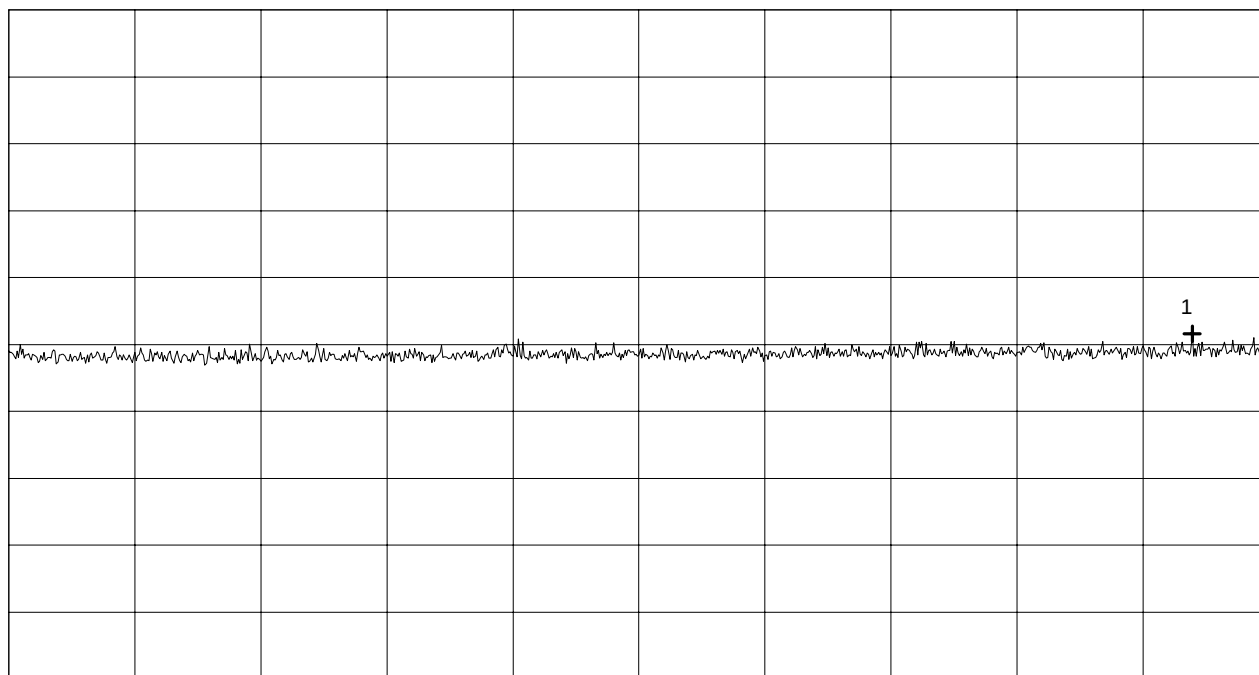
- test distance: 3 meters

- Antenna polarization: horizontal

PRESAN WITHOUT ANY CORRECTIONS !

Ref.Level 60 dB μ V
10 dB dB/Div.

ATT 0 dB



Start 30.000 MHz
RBW 100 kHz

VBW 100 kHz

Stop 300.000 MHz
SWP 100 ms

**** Multi Marker ****

Nr.1	283.500000 MHz	11.58 dB μ V
Nr.2		
Nr.3		
Nr.4		
Nr.5		
Nr.6		
Nr.7		
Nr.8		

Tested by:
Rupert Kohlhäufel

Date:
09/23/1999

Project-No.:
50217-90595-3

Page 34 of 57 Pages

Radiated emission 30 MHz - 1 GHz acc. to FCC Part 15 Subpart C

Model:
FZV transmitter

Serial No.:
Prototype 1

Applicant:
BMW AG

Mode:
- transmitting continuously (315 MHz)

- with battery supply

- EUT in horizontal position with rear on table

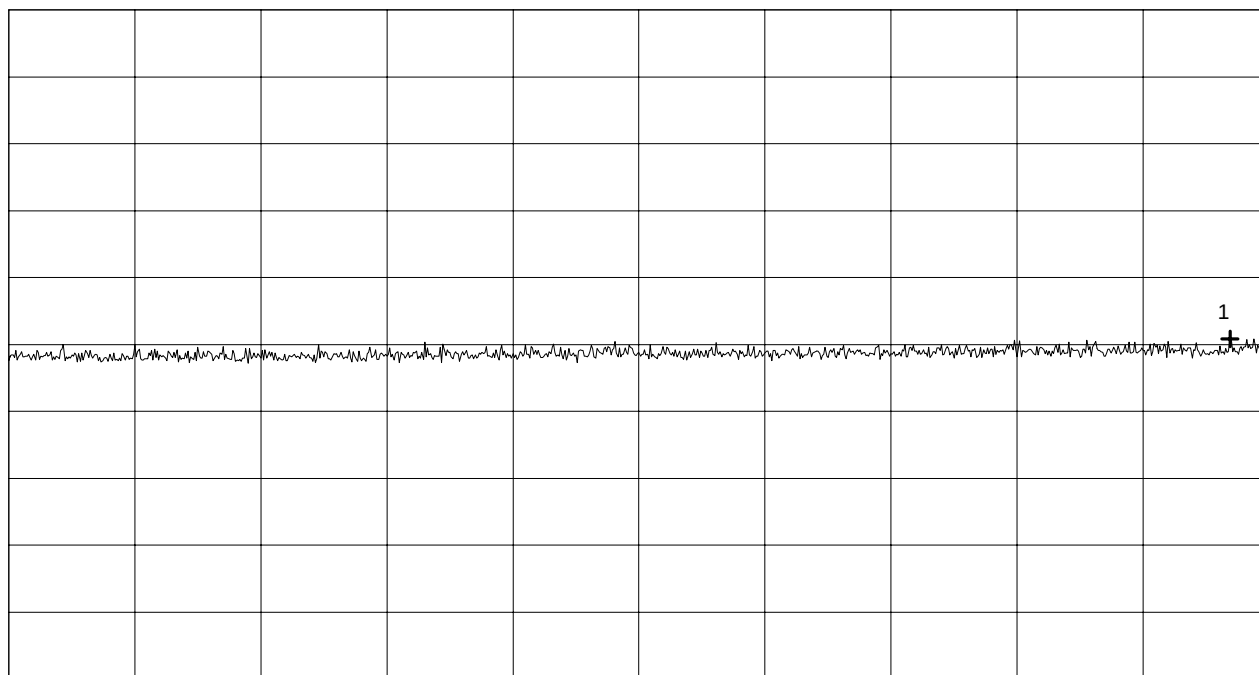
- test distance: 3 meters

- Antenna polarization: vertical

PRESAN WITHOUT ANY CORRECTIONS !

Ref.Level 60 dB μ V
10 dB dB/Div.

ATT 0 dB



Start 30.000 MHz
RBW 100 kHz

VBW 100 kHz

Stop 300.000 MHz
SWP 100 ms

**** Multi Marker ****

Nr.1	291.600000 MHz	10.82 dB μ V
Nr.2		
Nr.3		
Nr.4		
Nr.5		
Nr.6		
Nr.7		
Nr.8		

Tested by:
Rupert Kohlhäufel

Date:
09/23/1999

Project-No.:
50217-90595-3

Page 35 of 57 Pages

Radiated emission 30 MHz - 1 GHz acc. to FCC Part 15 Subpart C

Model:
FZV transmitter

Serial No.:
Prototype 1

Applicant:
BMW AG

Mode:
- transmitting continuously (315 MHz)

- with battery supply

- EUT in horizontal position with rear on table

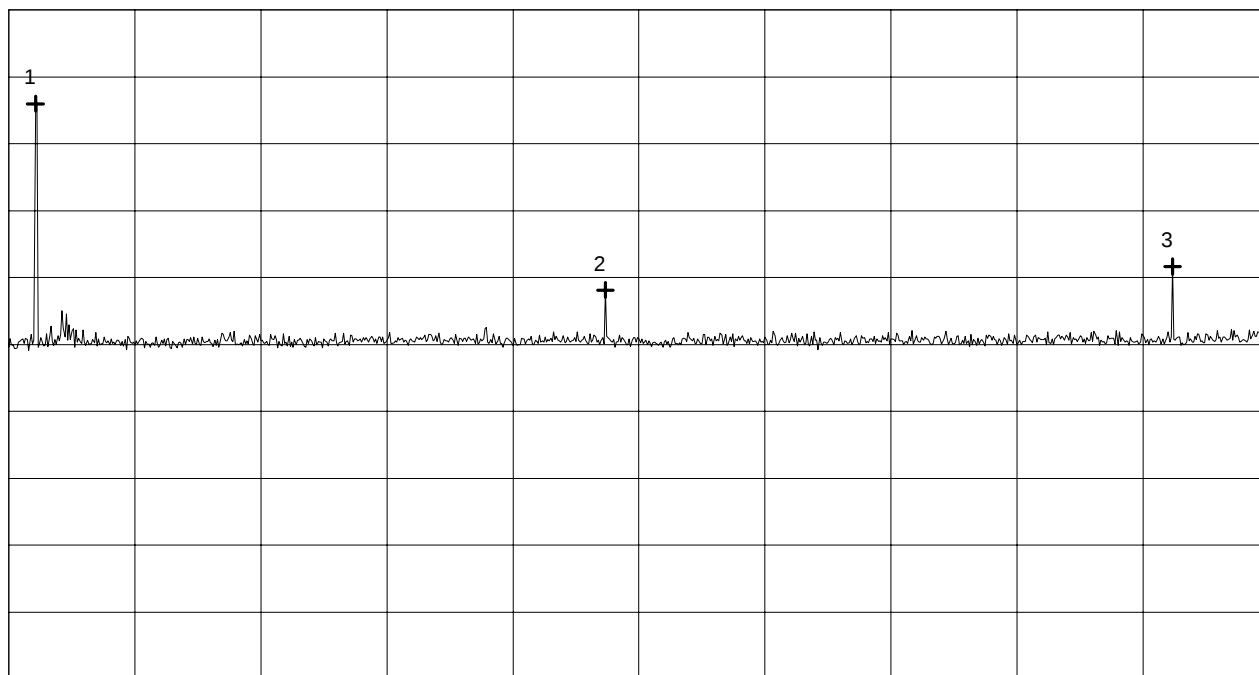
- test distance: 3 meters

- Antenna polarization: horizontal

PRESAN WITHOUT ANY CORRECTIONS !

Ref.Level 60 dB μ V
10 dB dB/Div.

ATT 0 dB



Start 300.000 MHz
RBW 100 kHz

VBW 100 kHz

Stop 1.000 GHz
SWP 220 ms

**** Multi Marker ****

Nr.1	314.777778 MHz	45.99 dB μ V
Nr.2	631.333333 MHz	18.13 dB μ V
Nr.3	946.333333 MHz	21.64 dB μ V
Nr.4		
Nr.5		
Nr.6		
Nr.7		
Nr.8		

Tested by:
Rupert Kohlhäufel

Date:
09/23/1999

Project-No.:
50217-90595-3

Page 36 of 57 Pages

Radiated emission 30 MHz - 1 GHz acc. to FCC Part 15 Subpart C

Model:
FZV transmitter

Serial No.:
Prototype 1

Applicant:
BMW AG

Mode:
- transmitting continuously (315 MHz)

- with battery supply

- EUT in horizontal position with rear on table

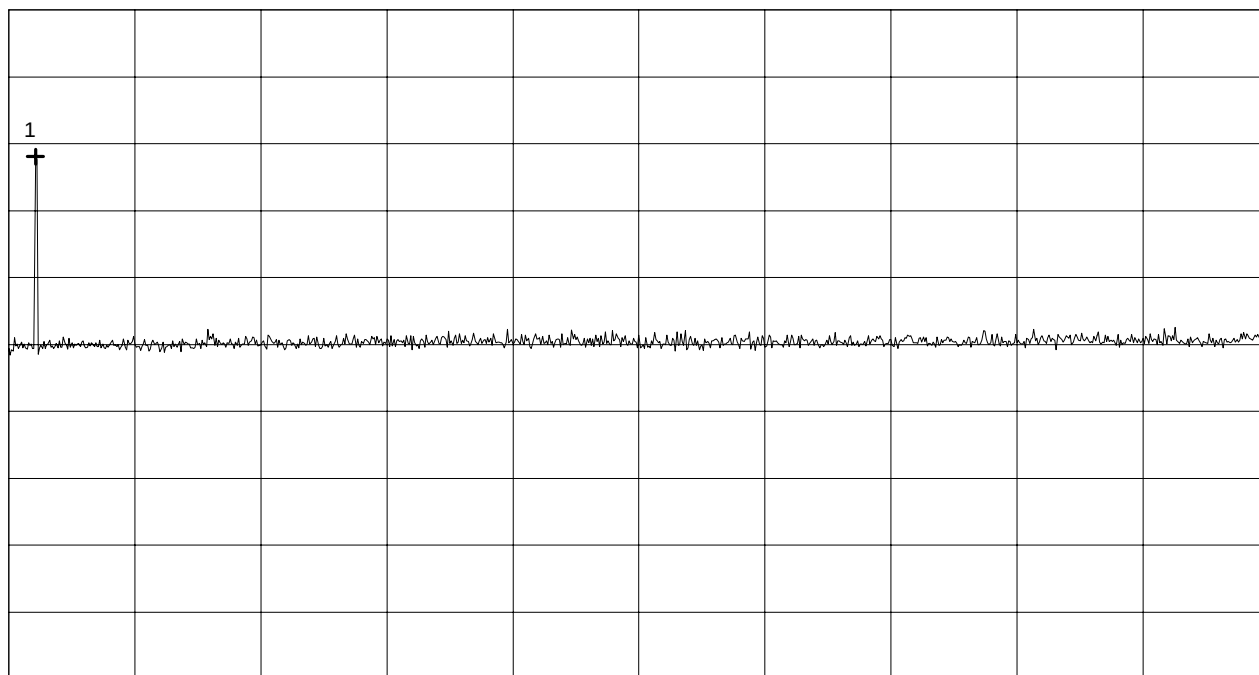
- test distance: 3 meters

- Antenna polarization: vertical

PRESAN WITHOUT ANY CORRECTIONS !

Ref.Level 60 dB μ V
10 dB dB/Div.

ATT 0 dB



Start 300.000 MHz
RBW 100 kHz

VBW 100 kHz

Stop 1.000 GHz
SWP 220 ms

**** Multi Marker ****

Nr.1	314.77778 MHz	38.09 dB μ V
Nr.2		
Nr.3		
Nr.4		
Nr.5		
Nr.6		
Nr.7		
Nr.8		

Tested by:
Rupert Kohlhäufel

Date:
09/23/1999

Project-No.:
50217-90595-3

Page 37 of 57 Pages

Radiated emission 30 MHz - 1 GHz acc. to FCC Part 15 Subpart C

Model:
FZV transmitter

Serial No.:
Prototype 1

Applicant:
BMW AG

Mode:
- transmitting continuously (315 MHz)

- with battery supply

- EUT in horizontal position with right hand side on table

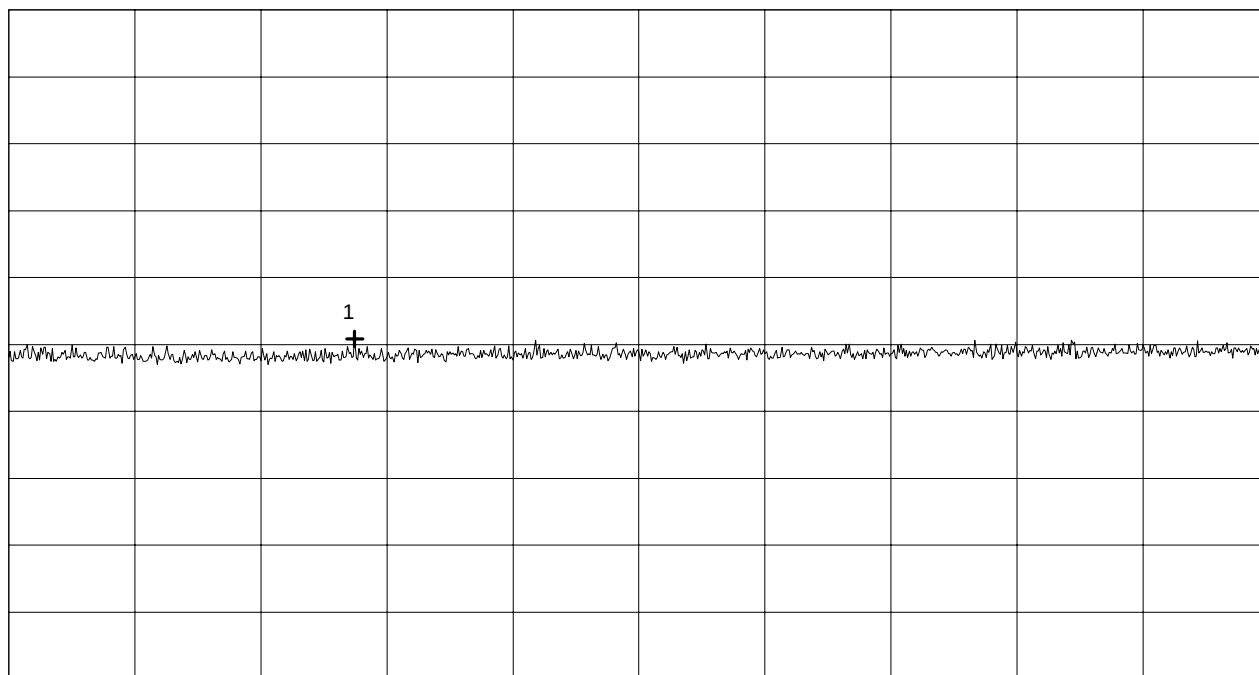
- test distance: 3 meters

- Antenna polarization: horizontal

PRESAN WITHOUT ANY CORRECTIONS !

Ref.Level 60 dB μ V
10 dB dB/Div.

ATT 0 dB



Start 30.000 MHz
RBW 100 kHz

VBW 100 kHz

Stop 300.000 MHz
SWP 100 ms

**** Multi Marker ****

Nr.1	104.100000 MHz	10.84 dB μ V
Nr.2		
Nr.3		
Nr.4		
Nr.5		
Nr.6		
Nr.7		
Nr.8		

Tested by:
Rupert Kohlhäufel

Date:
09/23/1999

Project-No.:
50217-90595-3

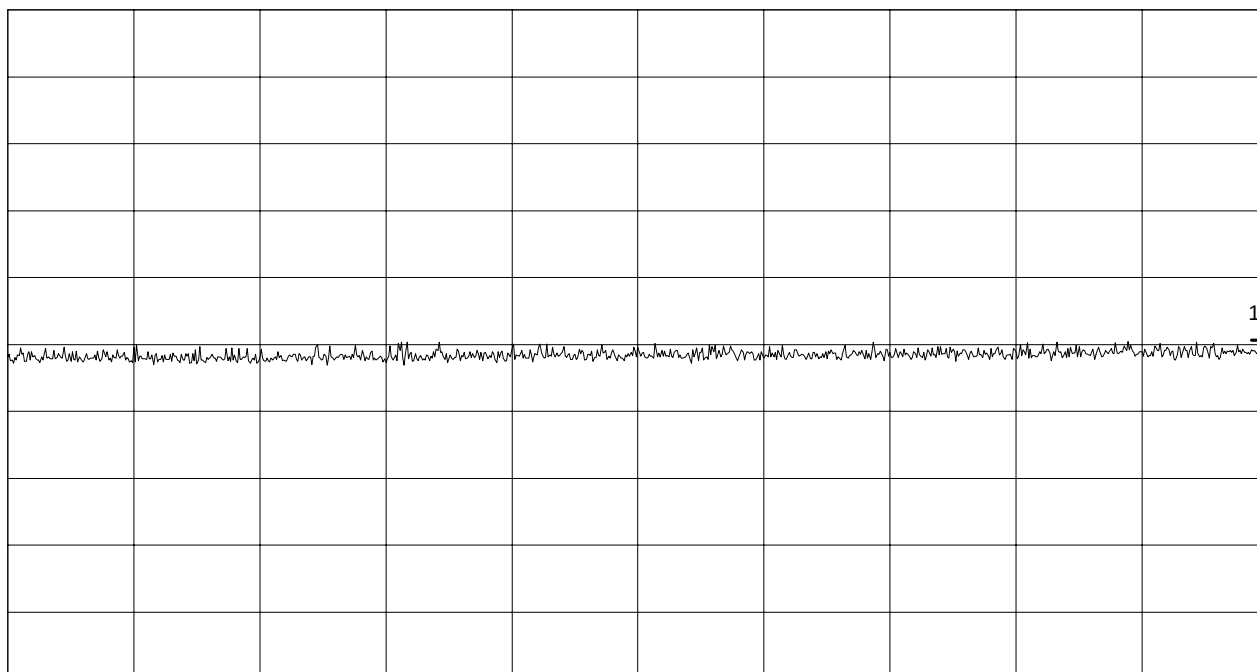
Page 38 of 57 Pages

Radiated emission 30 MHz - 1 GHz acc. to FCC Part 15 Subpart C

Model: FZV transmitter	Mode: - transmitting continuously (315 MHz) - with battery supply
Serial No.: Prototype 1	- EUT in horizontal position with right hand side on table
Applicant: BMW AG	- test distance: 3 meters
	- Antenna polarization: vertical
	PRESAN WITHOUT ANY CORRECTIONS !

Ref.Level 60 dB μ V
10 dB dB/Div.

ATT 0 dB



Start 30.000 MHz
RBW 100 kHz

VBW 100 kHz

Stop 300.000 MHz
SWP 100 ms

**** Multi Marker ****		

Nr.1	298.200000 MHz	10.64 dB μ V
Nr.2		
Nr.3		
Nr.4		
Nr.5		
Nr.6		
Nr.7		
Nr.8		

Tested by: Rupert Kohlhäufel	Project-No.: 50217-90595-3
Date: 09/23/1999	Page 39 of 57 Pages

Radiated emission 30 MHz - 1 GHz acc. to FCC Part 15 Subpart C

Model:
FZV transmitter

Serial No.:
Prototype 1

Applicant:
BMW AG

Mode:
- transmitting continuously (315 MHz)

- with battery supply

- EUT in horizontal position with right hand side on table

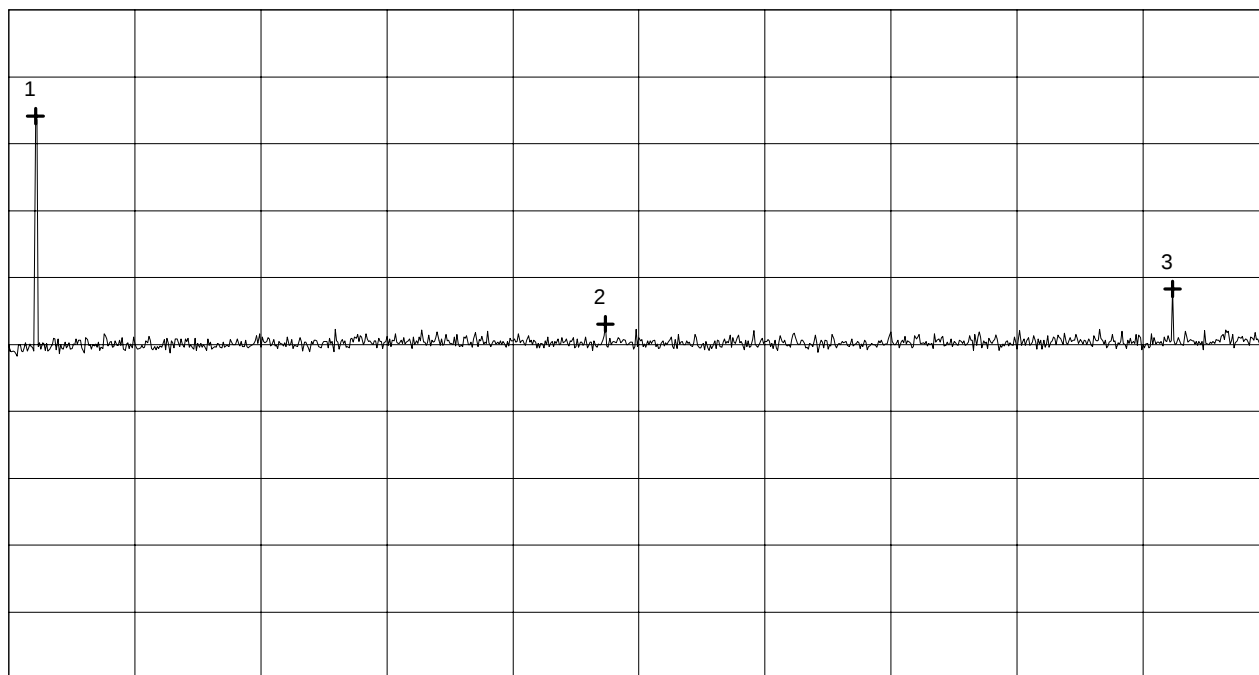
- test distance: 3 meters

- Antenna polarization: horizontal

PRESAN WITHOUT ANY CORRECTIONS !

Ref.Level 60 dB μ V
10 dB dB/Div.

ATT 0 dB



Start 300.000 MHz
RBW 100 kHz

VBW 100 kHz

Stop 1.000 GHz
SWP 220 ms

**** Multi Marker ****

Nr.1	314.777778 MHz	44.13 dB μ V
Nr.2	631.333333 MHz	13.08 dB μ V
Nr.3	946.333333 MHz	18.28 dB μ V
Nr.4		
Nr.5		
Nr.6		
Nr.7		
Nr.8		

Tested by:
Rupert Kohlhäufel

Date:
09/23/1999

Project-No.:
50217-90595-3

Page 40 of 57 Pages

Radiated emission 30 MHz - 1 GHz acc. to FCC Part 15 Subpart C

Model:
FZV transmitter

Serial No.:
Prototype 1

Applicant:
BMW AG

Mode:
- transmitting continuously (315 MHz)

- with battery supply

- EUT in horizontal position with right hand side on table

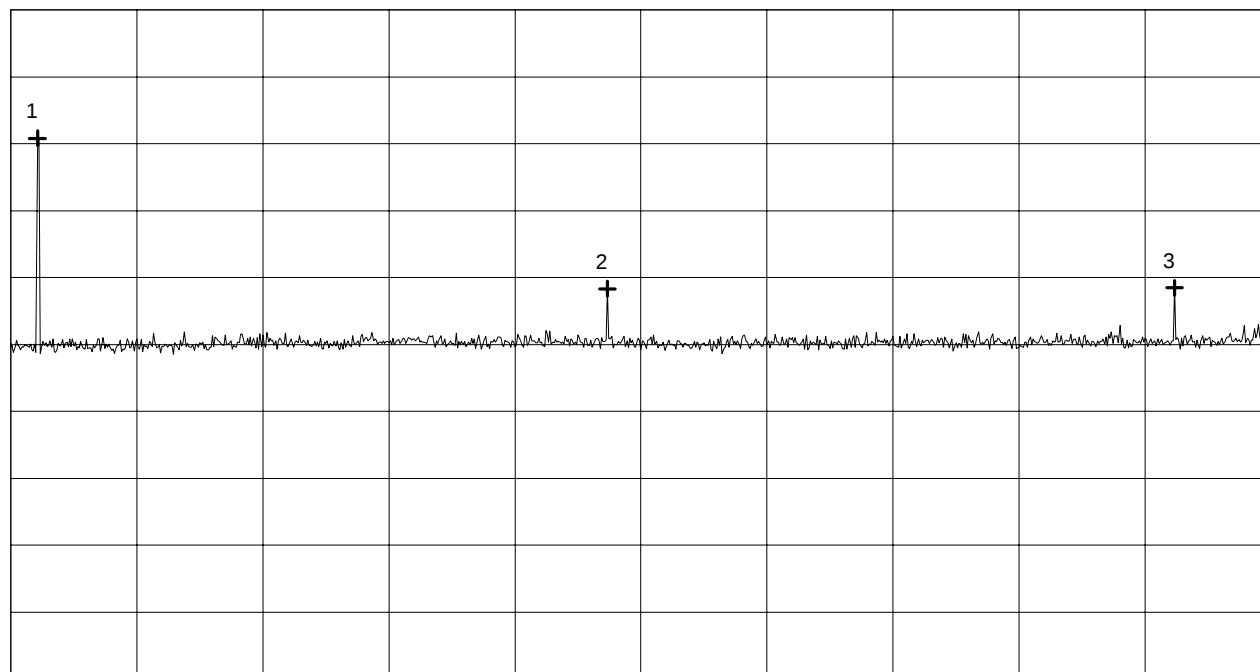
- test distance: 3 meters

- Antenna polarization: vertical

PRESAN WITHOUT ANY CORRECTIONS !

Ref.Level 60 dB μ V
10 dB dB/Div.

ATT 0 dB



Start 300.000 MHz
RBW 100 kHz

VBW 100 kHz

Stop 1.000 GHz
SWP 220 ms

**** Multi Marker ****

Nr.1	314.777778 MHz	40.81 dB μ V
Nr.2	631.333333 MHz	18.33 dB μ V
Nr.3	946.333333 MHz	18.46 dB μ V
Nr.4		
Nr.5		
Nr.6		
Nr.7		
Nr.8		

Tested by:
Rupert Kohlhäufel

Date:
09/23/1999

Project-No.:
50217-90595-3

Page 41 of 57 Pages

Radiated emission 30 MHz - 1 GHz acc. to FCC Part 15 Subpart C

Model:
FZV transmitter

Serial No.:
Prototype 1

Applicant:
BMW AG

Mode:
- transmitting continuously (315 MHz)

- with battery supply

- EUT in vertical position with antenna to the top

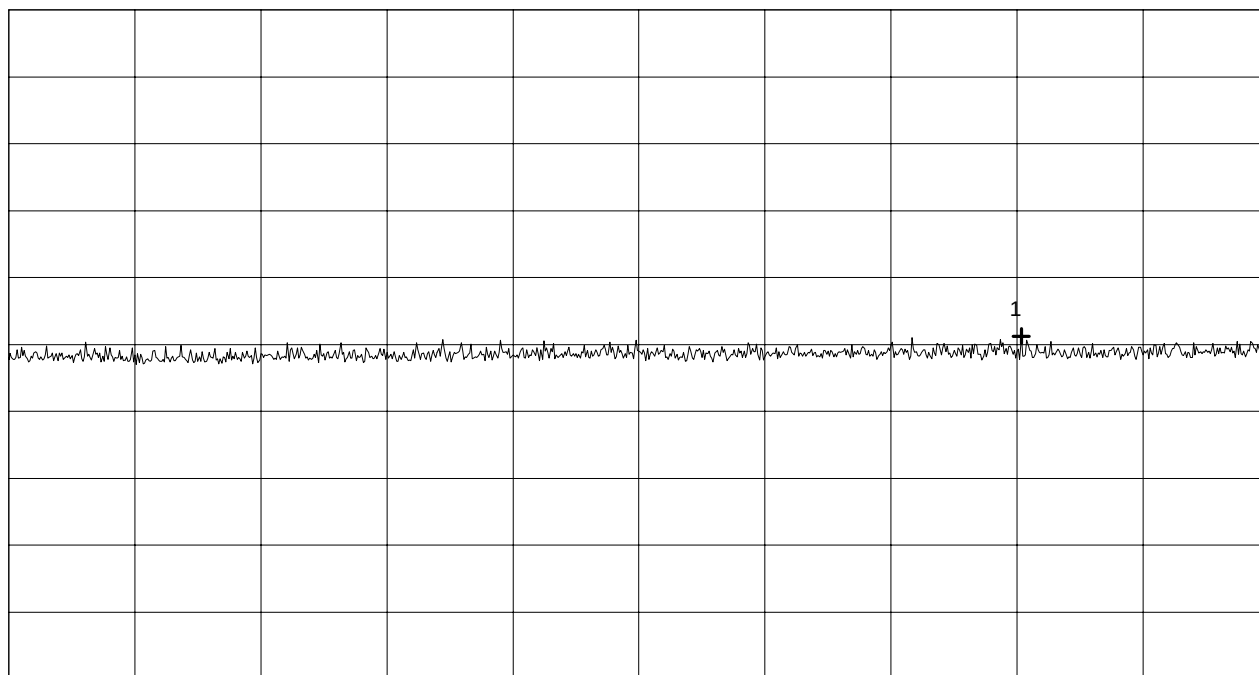
- test distance: 3 meters

- Antenna polarization: horizontal

PRESAN WITHOUT ANY CORRECTIONS !

Ref.Level 60 dB μ V
10 dB dB/Div.

ATT 0 dB



Start 30.000 MHz
RBW 100 kHz

VBW 100 kHz

Stop 300.000 MHz
SWP 100 ms

**** Multi Marker ****

Nr.1	246.900000 MHz	11.25 dB μ V
Nr.2		
Nr.3		
Nr.4		
Nr.5		
Nr.6		
Nr.7		
Nr.8		

Tested by:
Rupert Kohlhäufel

Date:
09/23/1999

Project-No.:
50217-90595-3

Page 42 of 57 Pages

Radiated emission 30 MHz - 1 GHz acc. to FCC Part 15 Subpart C

Model:
FZV transmitter

Serial No.:
Prototype 1

Applicant:
BMW AG

Mode:
- transmitting continuously (315 MHz)

- with battery supply

- EUT in vertical position with antenna to the top

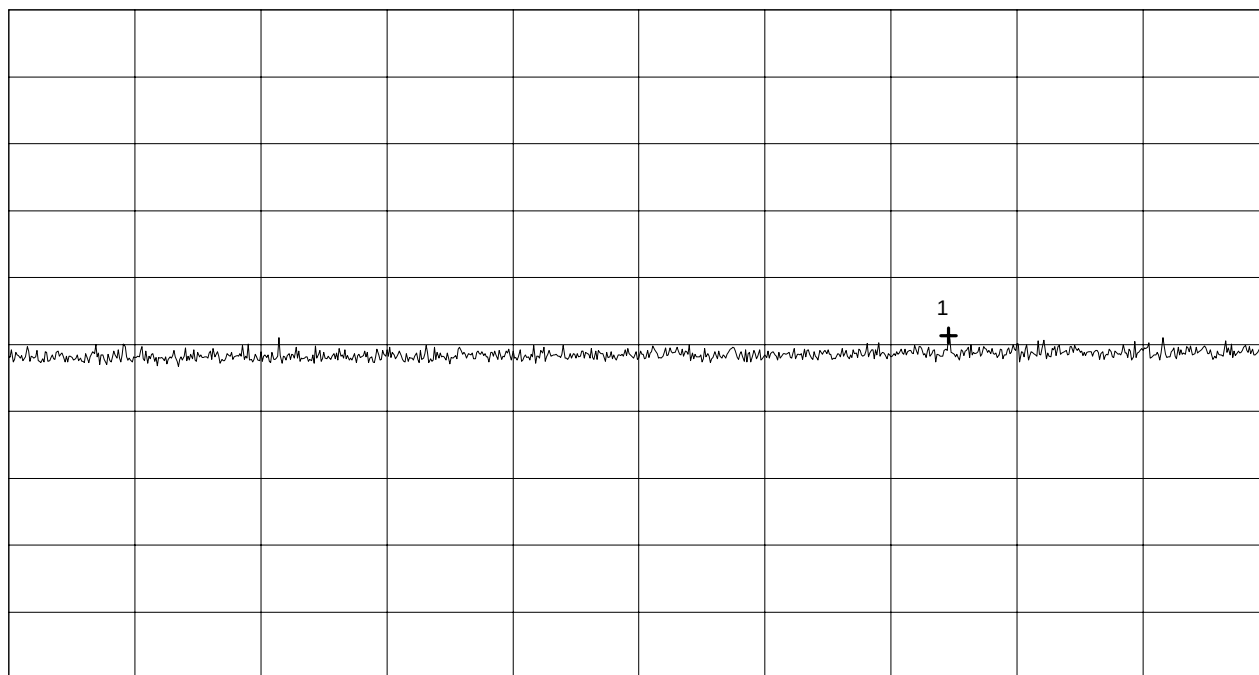
- test distance: 3 meters

- Antenna polarization: vertical

PRESAN WITHOUT ANY CORRECTIONS !

Ref.Level 60 dB μ V
10 dB dB/Div.

ATT 0 dB



Start 30.000 MHz
RBW 100 kHz

VBW 100 kHz

Stop 300.000 MHz
SWP 100 ms

**** Multi Marker ****

Nr.1	231.300000 MHz	11.35 dB μ V
Nr.2		
Nr.3		
Nr.4		
Nr.5		
Nr.6		
Nr.7		
Nr.8		

Tested by:
Rupert Kohlhäufel

Date:
09/23/1999

Project-No.:
50217-90595-3

Page 43 of 57 Pages

Radiated emission 30 MHz - 1 GHz acc. to FCC Part 15 Subpart C

Model:
FZV transmitter

Serial No.:
Prototype 1

Applicant:
BMW AG

Mode:
- transmitting continuously (315 MHz)

- with battery supply

- EUT in vertical position with antenna to the top

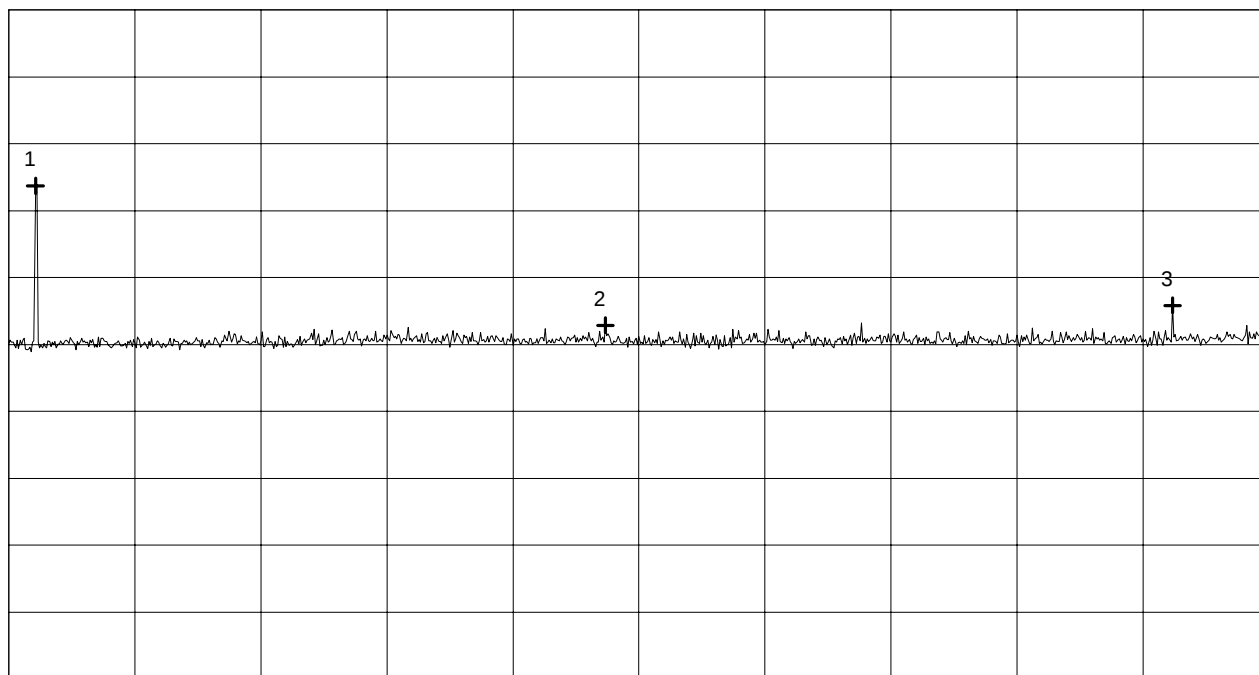
- test distance: 3 meters

- Antenna polarization: horizontal

PRESAN WITHOUT ANY CORRECTIONS !

Ref.Level 60 dB μ V
10 dB dB/Div.

ATT 0 dB



Start 300.000 MHz
RBW 100 kHz

VBW 100 kHz

Stop 1.000 GHz
SWP 220 ms

**** Multi Marker ****

Nr.1	314.777778 MHz	33.70 dB μ V
Nr.2	631.333333 MHz	12.87 dB μ V
Nr.3	946.333333 MHz	15.82 dB μ V
Nr.4		
Nr.5		
Nr.6		
Nr.7		
Nr.8		

Tested by:
Rupert Kohlhäufel

Date:
09/23/1999

Project-No.:
50217-90595-3

Page 44 of 57 Pages

Radiated emission 30 MHz - 1 GHz acc. to FCC Part 15 Subpart C

Model:
FZV transmitter

Serial No.:
Prototype 1

Applicant:
BMW AG

Mode:
- transmitting continuously (315 MHz)

- with battery supply

- EUT in vertical position with antenna to the top

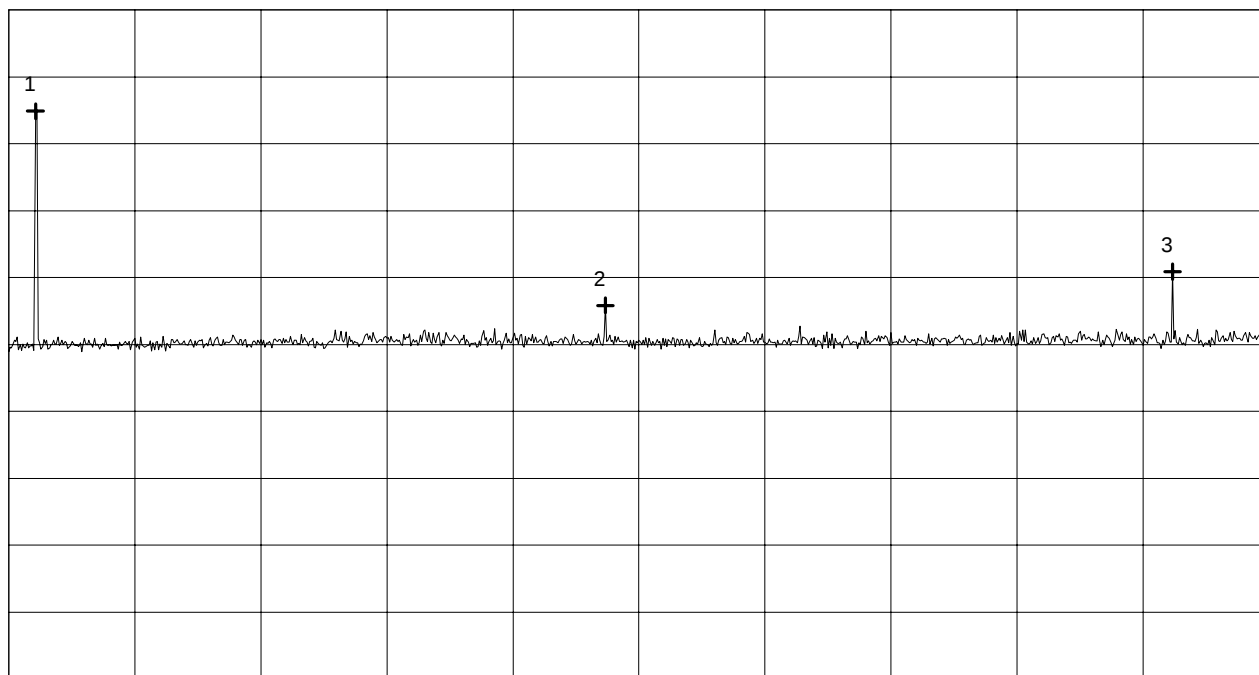
- test distance: 3 meters

- Antenna polarization: vertical

PRESAN WITHOUT ANY CORRECTIONS !

Ref.Level 60 dB μ V
10 dB dB/Div.

ATT 0 dB



Start 300.000 MHz
RBW 100 kHz

VBW 100 kHz

Stop 1.000 GHz
SWP 220 ms

**** Multi Marker ****

Nr.1	314.777778 MHz	44.87 dB μ V
Nr.2	631.333333 MHz	15.82 dB μ V
Nr.3	946.333333 MHz	20.87 dB μ V
Nr.4		
Nr.5		
Nr.6		
Nr.7		
Nr.8		

Tested by:
Rupert Kohlhäufel

Date:
09/23/1999

Project-No.:
50217-90595-3

Page 45 of 57 Pages

Radiated Emission 1 GHz - 3.15 GHz
according to FCC Part 15 Subpart C, §15.231.b

Model: FZV transmitter
Type: Remote control transmitter
Serial No.: Prototype 1
Applicant: BMW AG
Test-site: Semi anechoic room
Test distance: 3 meters
Date of test: 09/23/1999
Operator: R. Kohlhäufel
Mode:
- transmitting continuously
- with battery supply 3 V DC
- EUT in horizontal position with rear on table

Detector: Peak

Frequency [GHz]	Polarization	Analyzer- reading [dBμV]	Antenna- correction [dB]	Cable- correction [dB]	Fieldstrength Peak [dBμV/m]	Limit Peak [dBμV/m]	Duty cycle correction [dB]	Fieldstrength Average [dBμV/m]	Limit Average [dBμV/m]	Limit exceeded
1.2600	horizontal	23.8	26.4	0.5	50.6	75.6	18.2	32.4	55.6	
1.5750	horizontal	29.2	27.1	0.5	56.9	74.0	18.2	38.7	54.0	
1.8900	horizontal	18.5	28.6	0.6	47.6	75.6	18.2	29.4	55.6	
2.2050	horizontal	30.8	20.6	0.6	52.0	74.0	18.2	33.8	54.0	
2.5200	vertical	29.6	20.7	0.6	50.9	75.6	18.2	32.7	55.6	
2.8350	vertical	26.4	23.7	0.7	50.7	74.0	18.2	32.5	54.0	
3.1500	vertical	33.4	23.7	0.7	57.8	75.6	18.2	39.6	55.6	

Note: Frequency error of markers is depending on span of analyzer. Therefore exact frequency values are calculated as harmonics of fundamental frequency.

Result: The limits are kept.

Radiated Emission 1 GHz - 3.15 GHz
according to FCC Part 15 Subpart C, §15.231.b

Model: FZV transmitter
Type: Remote control transmitter
Serial No.: Prototype 1
Applicant: BMW AG
Test-site: Semi anechoic room
Test distance: 3 meters
Date of test: 09/23/1999
Operator: R. Kohlhäufel
Mode:
- transmitting continuously
- with battery supply 3 V DC
- EUT in horizontal position with right hand side on table

Detector: Peak

Frequency [GHz]	Polarization	Analyzer- reading [dBμV]	Antenna- correction [dB]	Cable- correction [dB]	Fieldstrength Peak [dBμV/m]	Limit Peak [dBμV/m]	Duty cycle correction [dB]	Fieldstrength Average [dBμV/m]	Limit Average [dBμV/m]	Limit exceeded
1.2600	vertical	25.0	26.4	0.5	51.9	75.6	18.2	33.7	55.6	
1.5750	horizontal	25.6	27.1	0.5	53.3	74.0	18.2	35.1	54.0	
1.8900	vertical	20.6	28.6	0.6	49.8	75.6	18.2	31.6	55.6	
2.2050	horizontal	31.9	20.6	0.6	53.1	74.0	18.2	34.9	54.0	
2.5200	horizontal	29.8	20.7	0.6	51.1	75.6	18.2	32.9	55.6	
2.8350	horizontal	25.8	23.7	0.7	50.2	74.0	18.2	32.0	54.0	
3.1500	vertical	34.8	23.7	0.7	59.2	75.6	18.2	41.0	55.6	

Note: Frequency error of markers is depending on span of analyzer. Therefore exact frequency values are calculated as harmonics of fundamental frequency.

Result: The limits are kept.

Radiated Emission 1 GHz - 3.15 GHz
according to FCC Part 15 Subpart C, §15.231.b

Model: FZV transmitter
Type: Remote control transmitter
Serial No.: Prototype 1
Applicant: BMW AG
Test-site: Semi anechoic room
Test distance: 3 meters
Date of test: 09/23/1999
Operator: R. Kohlhäufel
Mode:
- transmitting continuously
- with battery supply 3 V DC
- EUT in vertical position with antenna to the top

Detector: Peak

Frequency [GHz]	Polarization	Analyzer- reading [dBμV]	Antenna- correction [dB]	Cable- correction [dB]	Fieldstrength Peak [dBμV/m]	Limit Peak [dBμV/m]	Duty cycle correction [dB]	Fieldstrength Average [dBμV/m]	Limit Average [dBμV/m]	Limit exceeded
1.2600	vertical	24.1	26.4	0.5	50.9	75.6	18.2	32.7	55.6	
1.5750	vertical	24.6	27.1	0.5	52.2	74.0	18.2	34.0	54.0	
1.8900	vertical	21.3	28.6	0.6	50.5	75.6	18.2	32.3	55.6	
2.2050	vertical	30.6	20.6	0.6	51.8	74.0	18.2	33.6	54.0	
2.5200	vertical	30.0	20.7	0.6	51.3	75.6	18.2	33.1	55.6	
2.8350	vertical	25.5	23.7	0.7	49.9	74.0	18.2	31.7	54.0	
3.1500	vertical	33.5	23.7	0.7	57.9	75.6	18.2	39.7	55.6	

Note: Frequency error of markers is depending on span of analyzer. Therefore exact frequency values are calculated as harmonics of fundamental frequency.

Result: The limits are kept.

Radiated emission test 1GHz - 4GHz acc. to FCC Part 15 Subpart C

Model:
FZV Transmitter

Serial No.:
Prototype 1

Applicant:
BMW AG

Mode:
- transmitting continuously (315 MHz)
- with battery supply

- EUT in horizontal position with rear on table

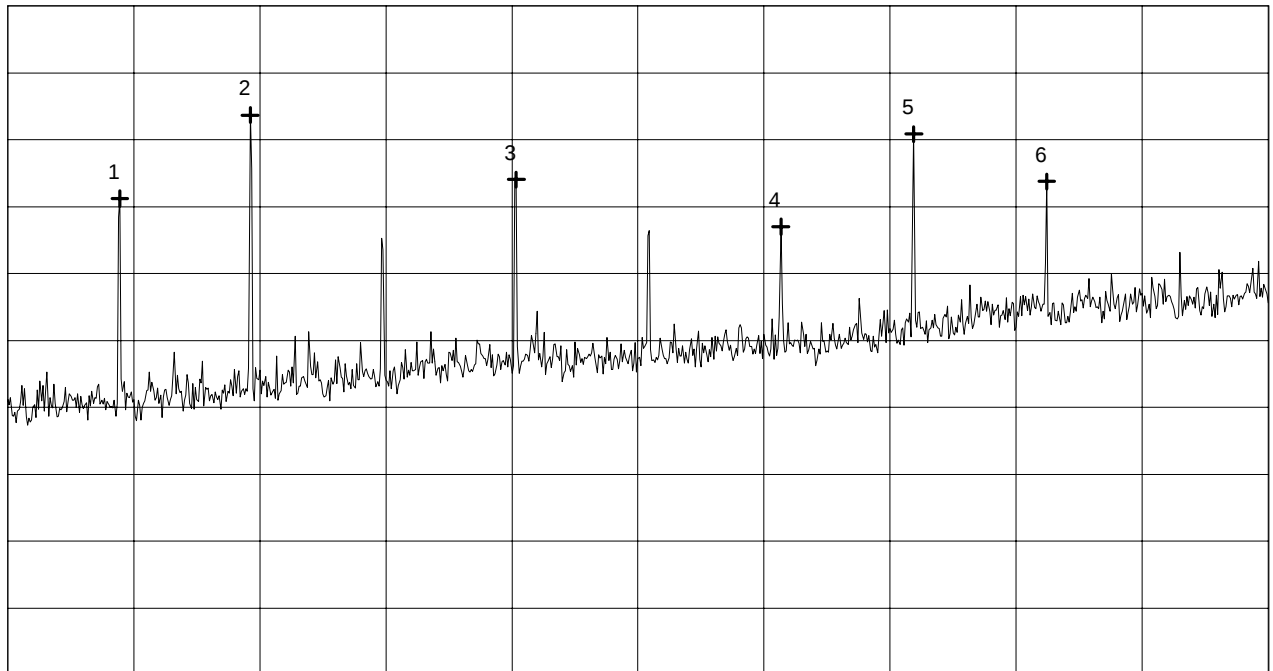
- Test distance: 3 meters

Antenna polarization: horizontal

Ref.Level 65 dB μ V/m
5 dB dB/Div.

ATT 0 dB

Ref. Offset -30.5 dB



Start 1.000 GHz
RBW 1 MHz

VBW 1 MHz

Stop 4.000 GHz
SWP 20 ms

**** Multi Marker ****

Nr.1	1.266667 GHz	50.61 dB μ V/m
Nr.2	1.576667 GHz	56.85 dB μ V/m
Nr.3	2.210000 GHz	52.03 dB μ V/m
Nr.4	2.840000 GHz	48.50 dB μ V/m
Nr.5	3.156667 GHz	55.43 dB μ V/m
Nr.6	3.473333 GHz	51.88 dB μ V/m
Nr.7		
Nr.8		

Tested by:
Rupert Kohlhäufel

Date:
09/23/1999

Project-No.:
50217-90595-3

Page 49 of 57 Pages

Radiated emission test 1GHz - 4GHz acc. to FCC Part 15 Subpart C

Model:
FZV Transmitter

Serial No.:
Prototype 1

Applicant:
BMW AG

Mode:
- transmitting continuously (315 MHz)
- with battery supply

- EUT in horizontal position with rear on table

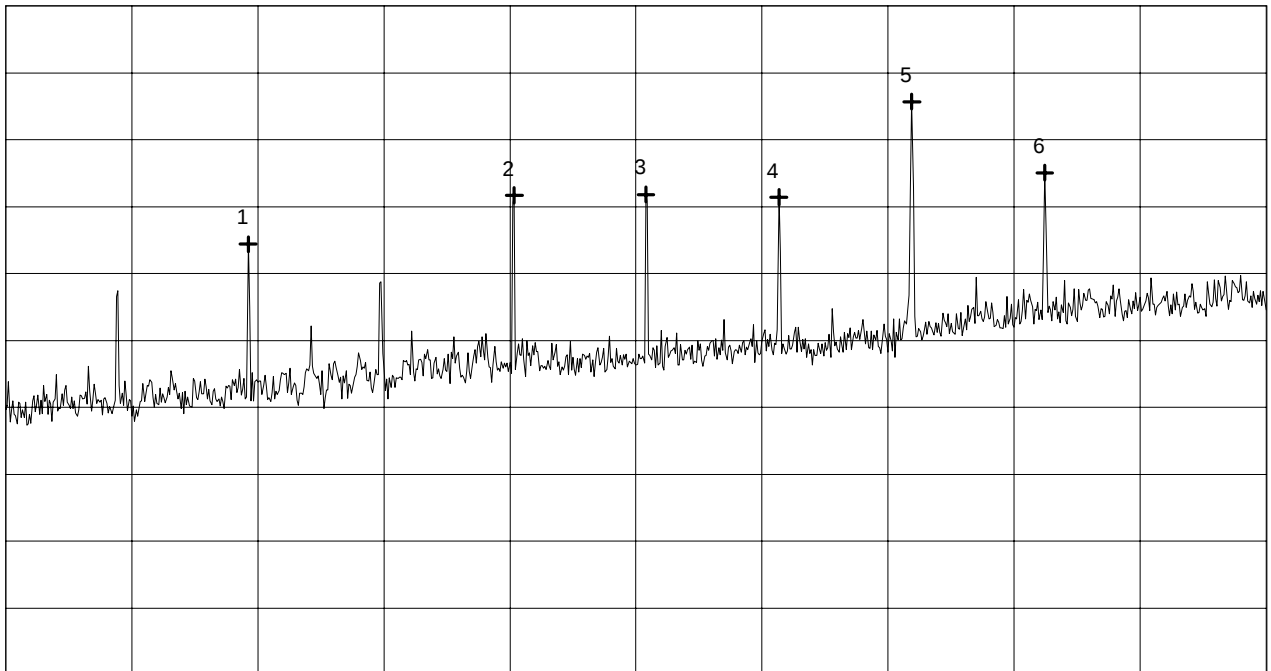
- Test distance: 3 meters

Antenna polarization: vertical

Ref.Level 65 dB μ V/m
5 dB dB/Div.

ATT 0 dB

Ref. Offset -30.5 dB



Start 1.000 GHz
RBW 1 MHz

VBW 1 MHz

Stop 4.000 GHz
SWP 20 ms

**** Multi Marker ****

Nr.1	1.576667 GHz	47.20 dB μ V/m
Nr.2	2.210000 GHz	50.84 dB μ V/m
Nr.3	2.523333 GHz	50.91 dB μ V/m
Nr.4	2.840000 GHz	50.71 dB μ V/m
Nr.5	3.156667 GHz	57.84 dB μ V/m
Nr.6	3.473333 GHz	52.54 dB μ V/m
Nr.7		
Nr.8		

Tested by:
Rupert Kohlhäufel

Date:
09/23/1999

Project-No.:
50217-90595-3

Page 50 of 57 Pages

Radiated emission test 1GHz - 4GHz acc. to FCC Part 15 Subpart C

Model:
FZV Transmitter

Serial No.:
Prototype 1

Applicant:
BMW AG

Mode:
- transmitting continuously (315 MHz)
- with battery supply

- EUT in horizontal position with right hand side on table

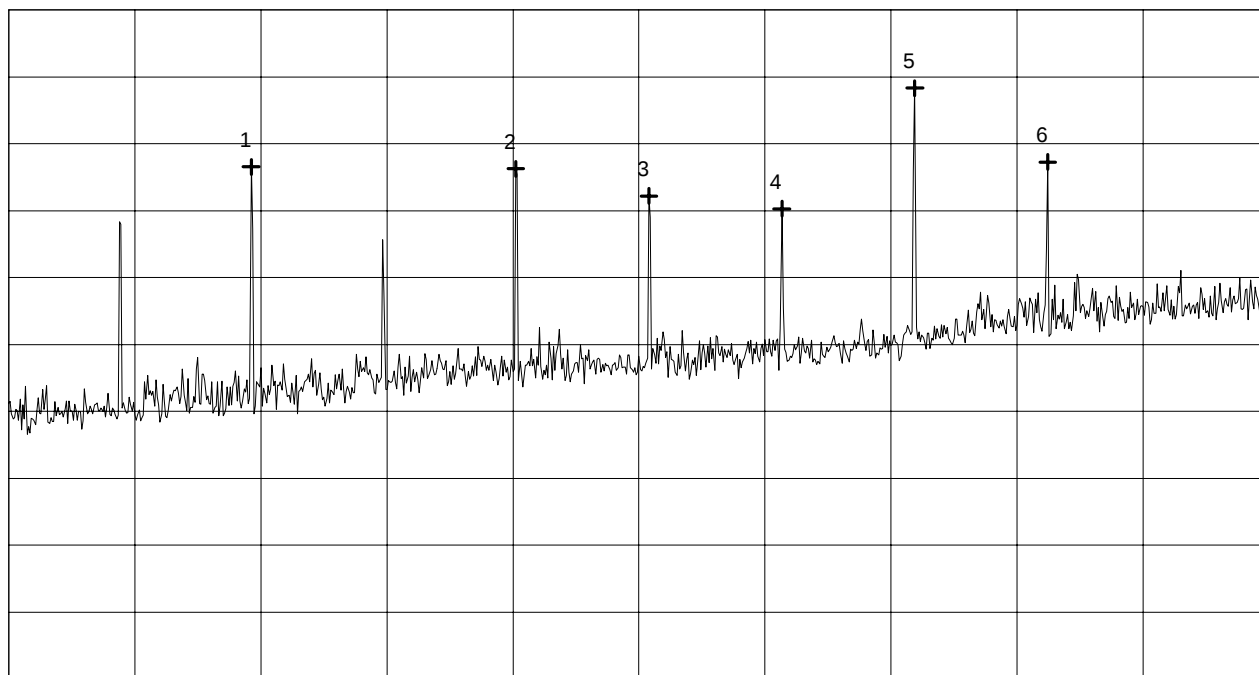
- Test distance: 3 meters

Antenna polarization: horizontal

Ref.Level 65 dB μ V/m
5 dB dB/Div.

ATT 0 dB

Ref. Offset -30.5 dB



Start 1.000 GHz
RBW 1 MHz

VBW 1 MHz

Stop 4.000 GHz
SWP 20 ms

**** Multi Marker ****

Nr.	Frequency (GHz)	Amplitude (dB μ V/m)
Nr.1	1.576667	53.27
Nr.2	2.206667	53.12
Nr.3	2.523333	51.11
Nr.4	2.840000	50.15
Nr.5	3.156667	59.16
Nr.6	3.473333	53.63
Nr.7		
Nr.8		

Tested by:
Rupert Kohlhäufel

Date:
09/23/1999

Project-No.:
50217-90595-3

Page 51 of 57 Pages

Radiated emission test 1GHz - 4GHz acc. to FCC Part 15 Subpart C

Model:
FZV Transmitter

Serial No.:
Prototype 1

Applicant:
BMW AG

Mode:
- transmitting continuously (315 MHz)
- with battery supply

- EUT in horizontal position with right hand side on table

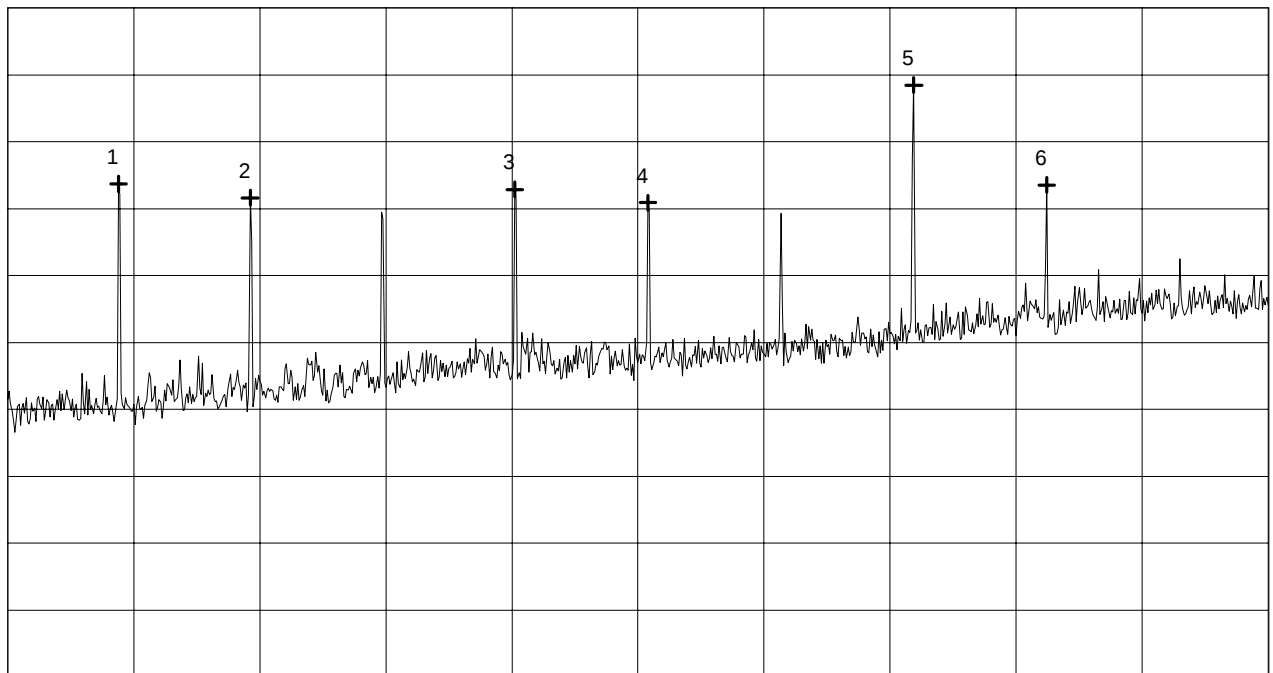
- Test distance: 3 meters

Antenna polarization: vertical

Ref.Level 65 dB μ V/m
5 dB dB/Div.

ATT 0 dB

Ref. Offset -30.5 dB



Start 1.000 GHz
RBW 1 MHz

VBW 1 MHz

Stop 4.000 GHz
SWP 20 ms

**** Multi Marker ****

Nr.	Frequency (GHz)	Amplitude (dB μ V/m)
Nr.1	1.263333	51.85
Nr.2	1.576667	50.81
Nr.3	2.206667	51.44
Nr.4	2.523333	50.45
Nr.5	3.156667	59.24
Nr.6	3.473333	51.77
Nr.7		
Nr.8		

Tested by:
Rupert Kohlhäufel

Date:
09/23/1999

Project-No.:
50217-90595-3

Page 52 of 57 Pages

Radiated emission test 1GHz - 4GHz acc. to FCC Part 15 Subpart C

Model:
FZV Transmitter

Serial No.:
Prototype 1

Applicant:
BMW AG

Mode:
- transmitting continuously (315 MHz)
- with battery supply

- EUT in vertical position with antenna to the top

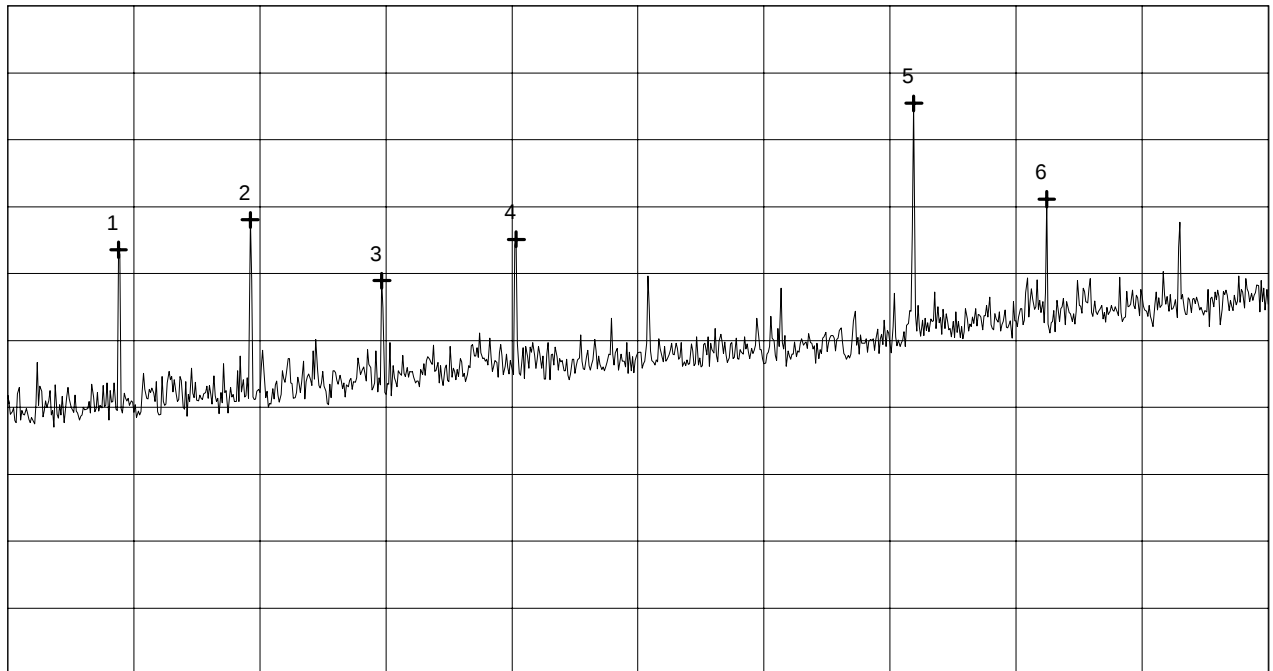
- Test distance: 3 meters

Antenna polarization: horizontal

Ref.Level 65 dB μ V/m
5 dB dB/Div.

ATT 0 dB

Ref. Offset -30.5 dB



Start 1.000 GHz
RBW 1 MHz

VBW 1 MHz

Stop 4.000 GHz
SWP 20 ms

**** Multi Marker ****

Nr.1	1.263333 GHz	46.77 dB μ V/m
Nr.2	1.576667 GHz	49.01 dB μ V/m
Nr.3	1.890000 GHz	44.46 dB μ V/m
Nr.4	2.210000 GHz	47.56 dB μ V/m
Nr.5	3.156667 GHz	57.72 dB μ V/m
Nr.6	3.473333 GHz	50.56 dB μ V/m
Nr.7		
Nr.8		

Tested by:
Rupert Kohlhäufel

Date:
09/23/1999

Project-No.:
50217-90595-3

Page 53 of 57 Pages

Radiated emission test 1GHz - 4GHz acc. to FCC Part 15 Subpart C

Model:
FZV Transmitter

Serial No.:
Prototype 1

Applicant:
BMW AG

Mode:
- transmitting continuously (315 MHz)
- with battery supply

- EUT in vertical position with antenna to the top

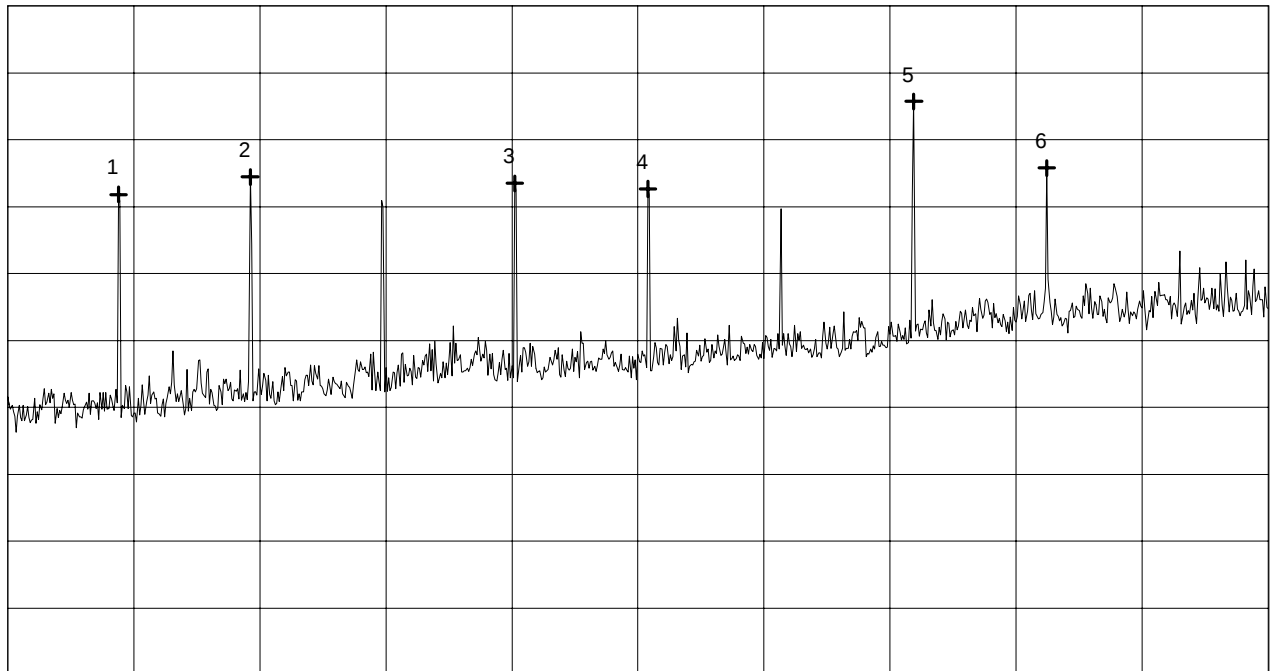
- Test distance: 3 meters

Antenna polarization: vertical

Ref.Level 65 dB μ V/m
5 dB dB/Div.

ATT 0 dB

Ref. Offset -30.5 dB



Start 1.000 GHz
RBW 1 MHz

VBW 1 MHz

Stop 4.000 GHz
SWP 20 ms

**** Multi Marker ****

Nr.1	1.263333 GHz	50.91 dB μ V/m
Nr.2	1.576667 GHz	52.23 dB μ V/m
Nr.3	2.206667 GHz	51.75 dB μ V/m
Nr.4	2.523333 GHz	51.32 dB μ V/m
Nr.5	3.156667 GHz	57.87 dB μ V/m
Nr.6	3.473333 GHz	52.89 dB μ V/m
Nr.7		
Nr.8		

Tested by:
Rupert Kohlhäufel

Date:
09/23/1999

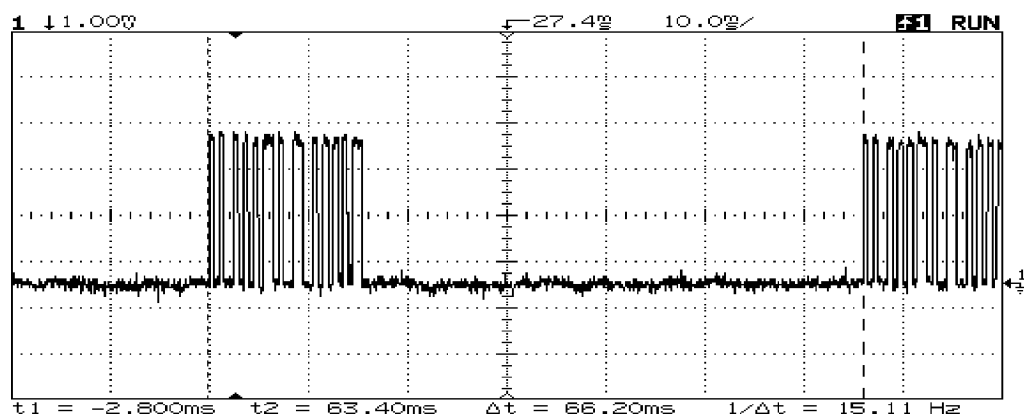
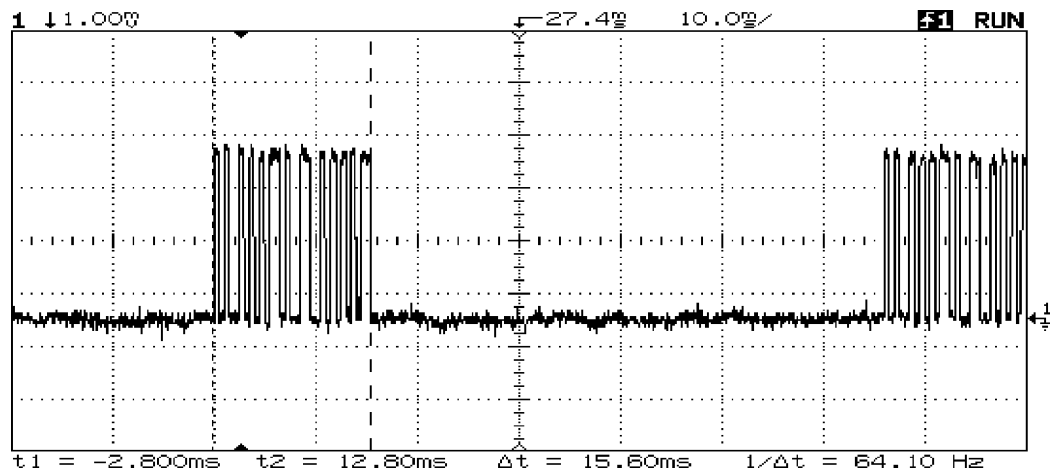
Project-No.:
50217-90595-3

Page 54 of 57 Pages

Duty Cycle Test
according to FCC Part 15 Subpart C, §15.231 / ANSI C63.4-1992 (14.10)

Model: FZV transmitter
Type: Remote control transmitter
Serial No.: Prototype 1
Applicant: BMW AG
Test-site: Shielded room

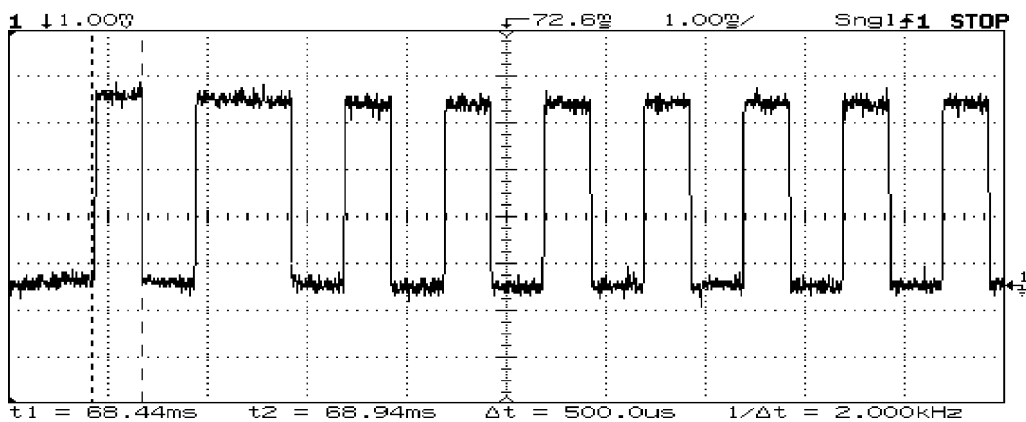
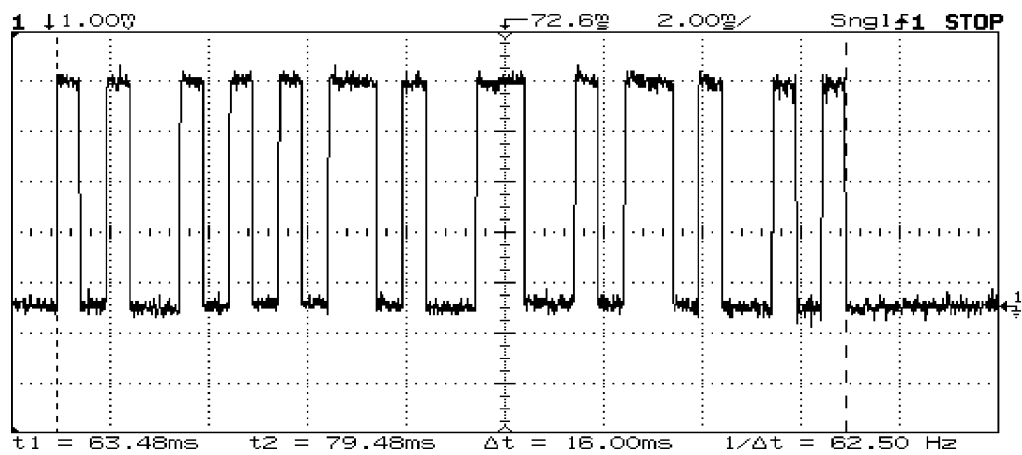
Date of test: 09/23/1999
Operator: R. Kohlhäufel
Mode: - transmitting continuously
- with battery supply 3 V DC



Duty Cycle Test (continued)
according to FCC Part 15 Subpart C, §15.231 / ANSI C63.4-1992 (I4.10)

Model: FZV transmitter
Type: Remote control transmitter
Serial No.: Prototype 1
Applicant: BMW AG
Test-site: Shielded room

Date of test: 09/23/1999
Operator: R. Kohlhäufel
Mode: - transmitting continuously
- with battery supply 3 V DC



Duty Cycle Test (continued)
according to FCC Part 15 Subpart C, §15.231 / ANSI C63.4-1992 (I4.10)

Model: FZV transmitter
 Type: Remote control transmitter
 Serial No.: Prototype 1
 Applicant: BMW AG
 Test-site: Shielded room

Date of test: 09/23/1999
 Operator: R. Kohlhäufel
 Mode: - transmitting continuously
 - with battery supply 3 V DC

(standard mode)

	Number of pulses	T [ms]	Duty Cycle	Duty Cycle Correction [dB]
Pulse Train		66.000	0.091	-20.8
Transmitter ON (long time)	8	0.500		
Transmitter ON (short time)	8	0.250		

(worst case mode)

	Number of pulses	T [ms]	Duty Cycle	Duty Cycle Correction [dB]
Pulse Train		65.000	0.123	-18.2
Transmitter ON (long time)	16	0.500		
Transmitter ON (short time)	0	0.250		