

EMISSION -- TESTREPORT

Testreport file no. : T19905-1-00 KJ Date : December 13, 2000 of issue

Model / Type No. : 5WK4 5022

Type : RF Transmitter

Applicant : SIEMENS Automotive AG

Manufacturer : SIEMENS Automotive AG

Licence holder : SIEMENS Automotive AG

Address : Wernerwerkstrasse 2

D-93049 Regensburg

Test result accrdg.
to the regulation(s)
at page 3

POSITIVE

This testreport with appendix consists of 27 pages. The testresult only responds to the tested sample. It is not allowed to copy this report even partly without the allowance of the testlaboratory.

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TESTREGULATIONS

The tests were performed according to following regulations :

o - Part 15 Subpart C (15.209)
■ - Part 15 Subpart C (15.231)

o - EN 50081-1 / 2.1991 o - EN 50081-2 / 7.1993 ______ o - EN 55011 / 3.1991 o - Group 1 o - Group 2 o - class A o - class B o - EN 55014 / 4.1993 o - Household appliances and similar o - tools o - Semiconductor devices o - EN 55014 / A2:1990 o - EN 55104 / 5.1995 Category: o - EN 55015 / A1:1990 o - EN 55015 / 12.1993 o - EN 55022 / 5.1995 o - class A o - class B o - prEN 55103-1/ 3.1995 o - prEN 50121-3-2 / 3.1995 o - EN 60601-1-2 / 4.1994 o - VCCI o - class 1 o - class 2

ADDRESS OF THE TEST LABORATORY

-	-	MIKES BABT PRODUCT SERVICE GMbH	
		Ohmstrasse 2-4	
		D - 94342 Strasskirchen	
0	_		

C	_	

ENVIRONMENTAL CONDITIONS

Temperature: 15-35 ° C

Humidity 45-60 %

Atmospheric pressure 860-1060 mbar

POWER SUPPLY SYSTEM UTILIZED

Power supply system : Battery Unom = 3 V DC

STATEMENT OF MEASUREMENT UNCERTAINTY

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities that can account for a nominal measurement error of ±4dB. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

SHORT DESCRIPTION OF THE EQUIPMENT UNDER TEST (EUT)

The 315 MHz RF remote control system consists of a RF transmitter and a RF receiver mounted within the control unit. The RF transmitter is mechanically integrated in the head of the key. This transmitter is used to transmit an information for locking or unlocking the vehicle by an unidirectional RF transmission line for normal remote operation by pressing a button.

Number of received/tested samples: 2 / 2

Serial Number: Prototype

DEFINITIONS FOR SYMBOLS USED IN THIS TEST REPORT

- - Black box indicates that the listed condition, standard or equipment is applicable for this Report.
- o Blank box indicates that the listed condition, standard or equipment was not applicable for this Report.

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MEASUREMENT PROTOCOL FOR FCC, VCCI AND AUSTEL

Test Methodology

Conducted and radiated emission testing is performed according to the procedures in International Special Committee on Radio Interference (CISPR) Publication 22 (1993), European Standard EN 55022 and Australian Standard AS 3548 (which are based on CISPR 22).

The Japanese standard, "Voluntary Control Council for Interference (VCCI) by Data Processing Equipment and Electronic Office Machines, Technical Requirements" is technically equivalent to CISPR 22 (1993). For official compliance, a conformance report must be sent to and accepted by the VCCI.

In compliance with FCC Docket 92-152, "Harmonization of Rules for Digital Devices Incorporate International Standards", testing for FCC compliance may be done following the ANSI C63.4-1992 procedures and using the FCC limits or the CISPR 22 Limits.

Measurement Error

The test system for conducted emissions is defined as the LISN, tuned receiver and coaxial cable. The test system for spurious emissions is defined as the antenna, the pre-amplifier, the tuned receiver and the coaxial cable. These test systems have an expected error of ±3 dB. The equipment comprising the test systems are calibrated on an annual basis.

<u>Justification</u>

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral into it's characteristic impedance or left unterminated. When appropriate, the cables are manually manipulated with respect to each other to obtain maximum emissions from the unit.

General Standard Information

The test methods used comply with CISPR Publication 22 (1993), EN 55022 (1987) and AS 3548 (1992) - "Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment" and with ANSI C63.4-1992 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

For detailed description of each measurement please refer to section testresults.

DISCOVERY OF WORST CASE MEASUREMENT CONDITION:

The RF transmitter 5WK4 5022 is designed for the operation on the fixed transmitter frequency range of approx. $315~\text{MHz} \pm 75~\text{kHz}$. To find out the worst case conditions for the complete measurement the following tests have been performed:

- Measurement of the radiated fieldstrength of the operating frequency measured in permanent operation mode in the specified channel. This measurement have been performed in order to find out the maximum transmitted fieldstrength of the RF transmitter.
- Measurement of the radiated spurious emissions measured in permanent operation mode in the specified channel. This measurement have been performed in order to find out the maximum spurious emissions of the RF transmitter.

Based on this testresults, the measurements have been performed completely on the specified channel. This testresults are documented in the following sections of the testreport.

TESTRESULT

CONDUCTED EMISSIONS - 10/150 kHz - 30 MHz

■ - Test not applicable

Testlocation:

- o Shielded room no. 1
- o Shielded room no. 2
- o Shielded room no. 3
- o Shielded room no. 4
- o Shielded room no. 5
- o Shielded room no. 6
- o Shielded room no. 7
- o Anechoic chamber
- o Full compact chamber

For TEST EQUIPMENT USED please refer to ATTACHMENT B:

or TEST EQUIPMENT USED please refer to ATTACHMENT B:

<u>Description</u> of <u>Measurement</u>

The final level, expressed in $dB\mu V$, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the FCC Limit or to the CISPR limit, which is equivalent to the Australian AS 3548 limit.

To convert between dB μ V and μ V, the following conversions apply:

 $dB\mu V = 20(\log \mu V)$ $\mu V = Inverse \log(dB\mu V/20)$

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasipeak detection, and a Line Impedance Stabilization Network (LISN), with 50Ω /50 μH (CISPR 16) characteristics. Table top equipment is placed on a nonconducting table 80 centimeters above the floor and is positioned 40 centimeters from the vertical ground plane (wall) of the screen room. If the minimum passing margin appears to be less than 20 dB with a peak mode measurement, the emissions are remeasured using a tuned receiver with quasipeak and average detection and recorded on the data sheets.

Testresult

The requir	ements are	O - MET		0	- NOI	MET
Min. limit	margin		dВ	at		_MHz
Max. limit	exceeding		dВ	at		_MHz
Remarks:	NOT APPLICABLE					
_						

SPURIOUS EMISSION

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Spurious emissions from the EUT are measured in the frequency range of 9 kHz to 30 MHz using a tuned receiver and a shielded loop antenna. The antenna was positioned 3, 10 or 30 meters horizontally from the EUT. Measurements have been made in all three orthogonal axes and the shielded loop antenna was rotated to locate the maximum of the emissions.

Spurious emissions from the EUT are measured in the frequency range of 30 MHz to 10 times the highest used frequency using a tuned receiver and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasipeak detection and measurements above 1000 MHz are made with a 1 MHz/6 dB bandwidth and peak detection, remeasurement of results which may be critical will be repeated in average mode. Table top equipment is placed on a 1.0 X 1.5 meter non-conducting table 80 centimeters above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Interface cables that are closer than 40 centimeters to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimeters from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna was positioned 3, 10 or 30 meters horizontally from the EUT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters, measurement scans are made with both horizontal and vertical antenna polarizations and the EUT are rotated 360 degrees.

SPURIOUS EMISSION (MAGNETIC FIELD) 9 kHz - 30 MHz

■ - Test not applicable

o - in a shielded room

o - at a non - reflecting open-site and

o - in a testdistance of 3 meters.

o - in a testdistance of 30 meters.

For TEST EQUIPMENT USED please refer to ATTACHMENT B:

Description of Measurement

The final level, expressed in $dB\mu V/m$, is arrived at by taking the reading from the EMI receiver (Level $dB\mu V$) and adding the antenna correction factor and cable loss factor (Factor dB) to it. This result then has to be compared with the relevant FCC limit.

The resolution bandwidth during the measurement is as follows:

9 kHz - 150 kHz: ResBW: 200 Hz 150 kHz - 30 MHz: ResBW: 10 kHz

Example:

Frequency Level + Factor = Level Limit = Delta (MHz) (dB μ V) (dB) (dB μ V/m) (dB μ V/m) (dB) 1.705 5 + 20 = 25 30 = 5

Testresult in detail:

Frequency [MHz]	L: PK [dBµV]	L: AV [dBµV]	L: QP [dBµV]	Correct. [dB]	L: AV [dBµV/m]	L: QP [dBµV/m]	Limit [dBµV/m]

The requir	rements are	O - MET	0	-	NOT	MET
Min. limit	margin	dB				MH
Max. limit	exceeding	dB				MH
Remarks:	NOT APPLICABLE					

SPURIOUS EMISSIONS (electric field) 30 MHz - 1000 MHz

\circ - Test not applicable

- - Open-site 1
- o Open-site 2
- - 3 meters
- o 10 meters
- o 30 meters

For TEST EQUIPMENT USED please refer to ATTACHMENT B: SER2

Description of Measurement

The final level, expressed in $dB\mu V/m$, is arrived by taking the reading from the EMI receiver (Level $dB\mu V$) and adding the correction factors and cable loss factor (Factor dB) to it. This is done automatically in the EMI receiver, where the correction factors are stored. This result then has the FCC or CISPR limit subtracted from it to provide the Delta which gives the tabular data as shown in the data sheets at page 24 - 25. The CISPR 22 limit is equivalent to the Australian AS 3548 limit.

Example:

Frequency	Level	+	Factor	=	Level	Limit	=	Delta
(MHz)	(dBµV)		(dB)		$(dB\mu V/m)$	(dBµV/m)		(dB)
719	75	+	32.6	=	107.6	110	=	-2.4

Frequency	L: PK	L: AV	L: QP	Correct.	L: PK	L: AV	L: QP	Limit
[MHz]	[dBµV]	[dBµV]	[dBµV]	[dB]	$[dB\mu V/m]$	$[dB\mu V/m]$	[dBµV/m]	$[dB\mu V/m]$
630.04	9.8	9.3	9.1	27.6	37.4	36.9	36.7	55.6
945.06	-0.1	-4.8	-0.2	35.2	35.1	30.4	35.0	55.6

<u>Testresult</u>

The requir	ements are	■ - MET	O - NOT MET
Min. limit	margin	>5 dB	30-1000 MHz
Max. limit	exceeding	dB	MH2
Remarks: _	The limits are kept.		
-			

SPURIOUS EMISSION 1 GHz - 18 GHz

■ - Test not applicable

Testlocation:

- o Open-site 1
- o Open-site 2
- - Anechoic chamber
- o Full compact chamber
- o 1 meters
- - 3 meters
- o 10 meters

For TEST EQUIPMENT USED please refer to ATTACHMENT B: SER3

<u>Description of Measurement</u>

The final level, expressed in $dB\mu V/m$, is arrived by taking the reading from the Spectrumanalyzer in $dB\mu V$ and adding the correction factors of the test setup incl. cables.

Example of the correction value at 1.8 GHz

Level	Correction	correction	Correction	corrected
reading at	EMCO 3115	Amplifier	factor	level
1.8 GHz		AWT 4534 + cable	(summarized)	
56 dBµV	+27.3 dB	-41.2 dB	-15.8 dB	42.1 dBμV/m

Testresult in detail:

Frequency [MHz]	L: PK [dBuV]	L: AV [dBuV]	L: QP	Correct.	L: PK [dBuV/m]	L: AV	L: QP [dBuV/m]	Limit
			[dBµV]	[dB]		[dBµV/m]	[GPHA/III]	[dBµV/m]
1260	57.1	46.4	-	-15.5	41.6	30.9	-	55.6
1575	63.9	43.2	-	-14.9	49.0	28.3	-	54.0
1890	63.5	59.2	-	-12.8	50.7	46.4	-	55.6
2205	64.7	56.8	-	-11.3	53.4	45.5	-	54.0
2520	61.5	57.2	-	-10.6	50.9	46.6	-	55.6
3150	56.6	39.6	-	-9.3	47.3	30.3	-	55.6

<u>Testresult</u>

The requi	rements are	■ - MET	O - NOT MET
Min. limit	margin	_>5 dB	<u>1-3.15</u> GHz
Max. limit	exceeding	dB	GHz
Remarks:	The limits are met.		
	The measurement was performed	up to the 10 th	harmonic

FIELD STRENGTH OF THE FUNDAMENTAL WAVE

o - Test not applicable

- - Open-site 1
- o Open-site 2
- - 3 meters
- o 10 meters
- o 30 meters

For TEST EQUIPMENT USED please refer to ATTACHMENT B: CPR2

Description of Measurement

The final level, expressed in $dB\mu V/m$, is arrived by taking the reading from the EMI receiver (Level $dB\mu V$) and adding the correction factors and cable loss factor (Factor dB) to it. This is done automatically in the EMI receiver, where the correction factors are stored. This result then has the FCC or CISPR limit subtracted from it to provide the Delta which gives the tabular data as shown in the data sheets at page 24 - 25. The CISPR 22 limit is equivalent to the Australian AS 3548 limit.

Example:

Frequency	Level	+	Factor	=	Level	-	Limit	=	Delta
(MHz)	$(dB\mu V)$		(dB)		$(dB\mu V/m)$		(dBµV/m)		(dB)
315	45	+	22.5	=	67.5	-	74.3	=	-6.8

Testresult in detail:

Frequency	L: PK	L: AV	L: QP	Correct.	L: PK	L: AV	L: QP	Limit
[MHz]	[dBµV]	[dBµV]	[dBµV]	[dB]	$[dB\mu V/m]$	$[dB\mu V/m]$	[dBµV/m]	$[dB\mu V/m]$
315.021	50.0	49.5	48.4	20.5	70.5	70.0	68.9	75.6

Testresult

The requirements are	■ - MET	O - NOT MET
Min. limit margin	>5 dB	315.021 MHz
Max. limit exceeding	dB	MHz
Remarks: The limits are kept.		

CONDUCTED POWER OF THE FUNDAMENTAL WAVE MEASURED

ON THE ANTENNA TERMINALS

- Test not applicable

Testlocation:

- o Shielded room no. 1
- o Shielded room no. 2
- o Shielded room no. 3
- o Shielded room no. 4
- o Shielded room no. 5
- o Shielded room no. 6
- o Shielded room no. 7
- o Anechoic chamber
- o Full compact chamber
- o Climatic test chamber VLK

For TEST EQUIPMENT USED please refer to ATTACHMENT B:

Description of Measurement

The conducted power of the fundamental wave measured on the antenna terminals in a climatic test chamber. The antenna jack was connected to the input of a communication test receiver. The internal batteries have been removed also and a variable DC power supply was used instead. The measurements have been made with the EUT unmodulated. During the test the supply voltage and the temperature were varied and applied simultaneously. The lower supply voltage was given by the manufacturer. In case the equipment was switching off before, the switch off voltage was used instead.

Testresult

The requirements are O - MET O - NOT MET

_	y range of ipment							
Tempera-	DC supply	Power/dBm						
ture/°C	voltage/V							
-30								
-20								
-10								
0								
+10								
+20								
+30								
+40								
+50								

Remarks: NOT APPLICABLE

EQUIPMENT UNDER TEST

Operation - mode of the EUT.:

o - customer specific cables

o - Standby

The	equipment	under	test	was	operated	during	the	measurement	under	following
cond	ditions:									

0	-	- Testprogram (H - Pattern)							
0	-	- Testprogram (color bar)							
0	-	- Testprogram (customer specific)							
	_	- Transmit in the frequency range	of 315 MHz ± 75 kHz.						
0	_								
0									
Fc	Configuration of the equipment under test: Following periphery devices and interface cables were connected during the measurement:								
0			Type :						
0		-	Type :						
0			Type :						
0			Type :						
0			Type :						
0	_		Type :						
0	-	- unshielded power cable							
0	-	- unshielded cables							
0	_	- shielded cables	MPS.No.:						

SUMMARY

GENERAL REMARKS:

The product 5WK4 5022 has been tested on the following frequency: TX-Mode: frequency 315 MHz

FINAL JUDGEMENT:

The requirements according to the technical regulations and tested operation modes are

- met.

o - **not** met.

The equipment under test

- - Fulfills the general approval requirements cited on page 3.
- o Does not fulfill the general approval requirements cited on page 3.

Date of receipt of test sample : <u>accdg</u>. to storage record

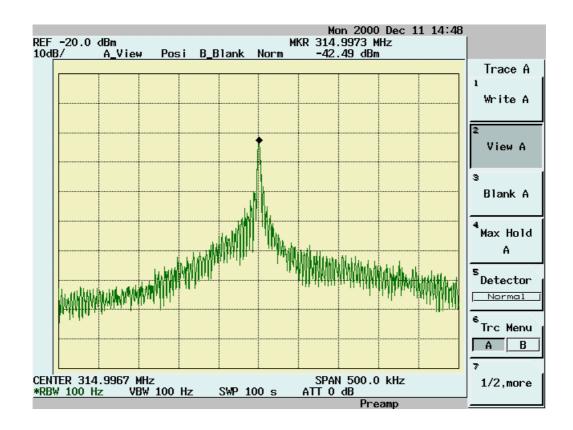
Testing Start Date : December 4, 2000

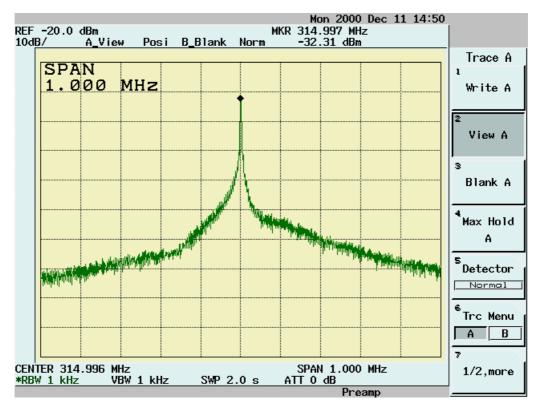
Testing End Date December 11, 2000

- MIKES BABT PRODUCT SERVICE GmbH -

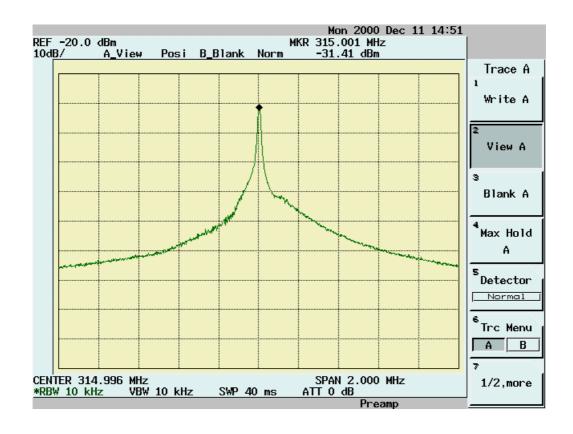
Test-engineer

Dipl.-Inq.(FH)





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Attachment: B

FCC ID KR55 WK45022

List of Test Equipment

All test instruments used, in addition to the test accessories, are calibrated and verified regularly.

Test Report No:

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Beginning of Testing:

04-Dezember-2000

Test ID	Model Type	Kind of Equipment	Manufacturer	Equipment No.
CPR2	HCC	Controller AntMast	Rohde & Schwarz	04-07/59-97-001
	RG 214 U	Antenna cable 2 m	Huber+Suhner	04-07/60-89-463
	HF 7/8 inch	Antenna cable 13 m	Huber+Suhner	04-07/60-99-001
	HF 7/8 inch	Antenna cable 20 m	Huber+Suhner	04-07/60-99-002
	HF 7/8 inch	Antenna cable 40 m	Huber+Suhner	04-07/60-99-003
	KR - 200	Coax Antenna Switch	Rosenberger HF-Technik	04-07/60-99-004
	VULB - 9165	Super-Broadband-Anten	Schwarzbeck G.	04-07/62-00-001
	ESVP	Test Receiver	Rohde & Schwarz	04-07/63-89-008
	ESVP-EZM	Spectrum Monitor	Rohde & Schwarz	04-07/74-86-016
	Antennenmast	Antenna mast	Rohde & Schwarz	04-07/92-97-001
MB	433 MHz-Antenna	Rod Antenna	MIKES PRODUCT SERVICE	04-07/62-97-002
	R 3162	Spectrum Analyzer	Advantest	04-07/74-00-001
SER2	НСС	Controller AntMast	Rohde & Schwarz	04-07/59-97-001
	RG 214 U	Antenna cable 2 m	Huber+Suhner	04-07/60-89-463
	HF 7/8 inch	Antenna cable 13 m	Huber+Suhner	04-07/60-99-001
	HF 7/8 inch	Antenna cable 20 m	Huber+Suhner	04-07/60-99-002
	HF 7/8 inch	Antenna cable 40 m	Huber+Suhner	04-07/60-99-003
	KR - 200	Coax Antenna Switch	Rosenberger HF-Technik	04-07/60-99-004
	VULB - 9165	Super-Broadband-Anten	Schwarzbeck G.	04-07/62-00-001
	ESVP	Test Receiver	Rohde & Schwarz	04-07/63-89-008
	ESVP-EZM	Spectrum Monitor	Rohde & Schwarz	04-07/74-86-016
	Antennenmast	Antenna mast	Rohde & Schwarz	04-07/92-97-001
SER3	Sucoflex 104, SMA	RF-cable 2 m	Huber+Suhner	04-07/60-97-485
	Sucoflex 104, N	RF-cable 3 m	Huber+Suhner	04-07/60-97-492
	Model 3115	Hornantenna	EMCO Elektronik GmbH	04-07/62-96-458
	AWT-4534	Microwave-Amplifier	TransTech Hochfrequenztechn	04-07/66-90-217
	R 3162	Spectrum Analyzer	Advantest	04-07/74-00-001

CONSTRUCTIONAL DATAFORM FOR TESTING OF RADIO EQUIPMENT

Licence holder:	Siemens Automotive Ag				
Address:	Wernerwerkstrasse 2, D-93049 Regensburg, Germany				
Manufacturer:	Siemens Automotive AG				
Address:	Wernerwerkstrasse 2, D-93049 Regensburg, Germany				
Type:	RF Transmitter				
Model:	5WK4 5022				
Serial-No.:	Protection class:				

Additional informations to the above named model:

Antenna:			
transmitter:	Type: integral		
	Length/size: 5 cm		
receiver:	Type:		
	Length/size:		
Power supply of the transmitter:			
Туре:	battery	nominal voltage:	3 V
		_ lowest voltage:	2,4 V
		highest voltage:	3,2 V
Power supply of the receiver:			
Type:		nominal voltage:	V

Ancillary equipment:

Description:	Туре:	Serial-no.:
Description:	Type:	Serial-no.:
Description:	Type:	Serial-no.:

Extreme temperature range in which the approval test should be performed:

☐ Category III: Equipment for normal indoor use (0°C to +55°C)

Connectable cables:

Name of the cable	Digital	Length/m	shielded
	O yes O no		O yes O no
	O yes O no		O yes O no
	O yes O no		O yes O no
	O yes O no		O yes O no
	O yes O no		O yes O no

O If applicable, if necessary complete overleaf

Page D1

Model-name: 5WK4 5022

FCC ID RR55 WK 45022

Type designation: 5WK4 5022								
Name and type designation Not applicable	Name and type designation of individual units comprising the radio equipment: Not applicable							
			•					
Type of equipment:								
☐ Radiotelephone equipment	⊠Remote-control equipment	☐ Radiomaritime equipment	□ LPD					
☐ One-way radiotelephone equipment	☐ Inductive loop system	☐ Inland waterways equipment	□ RLAN					
☐ Personal paging system	☐ Radio-relay system	☐ Radionavigation equipment						
☐ Satellite earth station	☐ CB radiotelephone equipment	☐ Antenna						
☐ Data transmission equipment	☐ Movement detector	☐ Aeronautical equipment	, 					
Technical characteristics:								
	Transmitter-receiver	Transmitter	Receiver					
Frequency range		315 MHz ± 75 kHz						
Maximum no. of channels		1						
Channel spacing		1						
Class of emission		K1D						
(type of modulation)								
Maximum RF output power		0 dBm						
Maximum effective		< 1 mW						
radiated power (ERP) Output power variable								
Channel switching		not applicable						
frequency range		not applicable	·					
Method of frequency generation	☐ Synthesizer	☑ Crystal	☐ Other					
Frequency generation TX								
Frequency generation RX								
IF	1st IF	2nd IF	3rd IF					
Integral selective calling								
Audio-frequency interface level at external data socket			· · · · · · · · · · · · · · · · · · ·					
Modes of operation	☐ Duplex mode	☐ Semi-duplex mode	Simplex mode					
Power source	☐ Mains	☐ Vehicle-regulated	☑ Integral					
Antenna socket	T DNC							
Antenna socket	☐ BNC ☐ M	☐ TNC ☐ UHF	□ N					
	⊠ None		☐ Adapter ☐					
Test specifications:								

FCOID X 355 W K 45022_

Declarations:

■ We declare that the above information are correct and the named model was supplied with the maximum configuration to the accredited test laboratory.

place of issue		Saal and signature of applicant
Regensburg,	19.12.2000 ,date	- Will H
		Postfach 10:09 55 930/9 7/2/ppsburg
		SIEMENS Aktiengesphania Bereich / utomobilitachnik