



EMISSION -- TESTREPORT

Testreport file no. : **T13826-1-16KG** Date : Nov.10, 1999
of issue

Model : 5WK4 8028

Type : VENUS chip card 315 MHz

Applicant : Siemens AG

Manufacturer : Siemens AG

Licence holder : Siemens AG

Address : Wernerwerkstraße 2
D-93049 Regensburg

Test result accrdg.
to the regulation(s) : ☒ Positive ☐ Negative
at page 3

This testreport with appendix consists of 36 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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FCC ID: KR55WK48028

TEST REGULATIONS

The tests were performed according to following regulations :

- o - EN 50081-1 / 2.1991
- o - EN 50081-2 / 7.1993

-
- o - EN 55011 / 3.1991

- o - Group 1
- o - class A

- o - Group 2
- 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

- - Part 15 Subpart C (15.231)

ADDRESS OF THE TEST LABORATORY

- - MIKES PRODUCT SERVICE GmbH
Ohmstrasse 2-4
D - 94342 Strasskirchen

○ - _____

ENVIRONMENTAL CONDITIONS

Temperature: 15-35 ° C
Humidity 45-60 %
Atmospheric pressure 860-1060 mbar

POWER SUPPLY SYSTEM UTILIZED

Power supply system : Battery Unom = 6 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 $\pm 4\text{dB}$. 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 chip card 5WK4 8028 is part of an Automobile Radio frequency and Immobilizer system. The chip card is for opening and closing the vehicle by remote control and to start the engine.

Number of received/tested samples: 7/2

DEFINITIONS FOR SYMBOLS USED IN THIS TEST REPORT

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

M E A S U R E M E N T P R O T O C O L F O R F C C , V C C I
A N D A U S T E L

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.

Justification

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 its 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 chip card 5WK4 8028 is designed for the operation on the fixed transmitter frequency of approx. 315 MHz. The chip card emits a FSK signal (Frequency Shift Keying) up to three times for 20 ms to 60 ms.

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 chip card.
- 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 chip card.

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.

TEST RESULT**CONDUCTED EMISSIONS - 10/150 kHz - 30 MHz**

■ - Test not applicable

Testlocation :

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

For TEST EQUIPMENT USED please refer to ATTACHMENT B: _____

Description of Measurement

The final level, expressed in dB μ 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:

$$\text{dB}\mu\text{V} = 20(\log \mu\text{V})$$

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

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 50 Ω /50 μ H (CISPR 16) characteristics. Table top equipment is placed on a non-conducting 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 requirements are	O - MET		O - NOT MET
Min. limit margin	_____	dB	at _____ MHz
Max. limit exceeding	_____	dB	at _____ MHz

Remarks: NOT APPLICABLE

SPURIOUS EMISSION

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) 10 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 μ V/m, is arrived at by taking the reading from the EMI receiver (Level dB μ 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.

Example:

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

Testresult in detail:

Frequency MHz	L: QP dB μ V	L: AV dB μ V	Correct.	L: QP dB μ V/m	L: AV dB μ V/m	Limit dB μ V/m

The requirements are

O - MET

O - NOT MET

Min. limit margin

dB

MHz

Max. limit exceeding

dB

at

MHz

Remarks: NOT APLLICABLE

SPURIOUS EMISSIONS (electric field) 30 MHz - 1000 MHz

☐ - Test not applicable

- ☒ - Open-site 1
- ☐ - Open-site 2
- ☒ - 3 meters
- ☐ - 10 meters
- ☐ - 30 meters

For TEST EQUIPMENT USED please refer to ATTACHMENT B: SER2

Description of Measurement

The final level, expressed in dB μ V/m, is arrived by taking the reading from the EMI receiver (Level dB μ 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 μ V)		(dB)		(dB μ V/m)	(dB μ V/m)		(dB)
719	75	+	32.6	=	107.6	110	=	-2.4

Testresult in detail:

Frequency MHz	L: QP dB μ V	L: AV dB μ V	Correct.	L: QP dB μ V/m	L: AV dB μ V/m	Limit dB μ V/m
630.06	28.5	24.8	27.8	56.3	52.6	55.6
945.09	5.2	3.6	36.8	42.0	40.4	62

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Testresult

The requirements are

■ - MET

○ - NOT MET

Min. limit margin

5.7

dB

at 630.06 MHz

Max. limit exceeding

dB

at MHzRemarks: The limits are met.

SPURIOUS EMISSION 1 GHz - 18 GHz

☐ - Test not applicable

Testlocation :

- ☐ - Open-site 1
- ☐ - Open-site 2
- ☒ - Anechoic chamber
- ☐ - Full compact chamber

- ☐ - 1 meters
- ☒ - 3 meters
- ☐ - 10 meters

For TEST EQUIPMENT USED please refer to ATTACHMENT B: SER3

Description of Measurement

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

Example of the correction value at 1.8 GHz

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

Testresult in detail:

Frequency GHz	L: QP dB μ V	L: AV dB μ V	Correct.	L: QP dB μ V/m	L: AV dB μ V/m	Limit dB μ V/m
1.258		50.5	-15.5		35.0	55.6
1.577		47.2	-15.0		32.2	54.0
1.890		40.7	-12.8		27.9	55.6
2.208		40.0	-11.2		28.8	54.0
2.840		39.4	-10.2		29.2	54.0

The measurement was performed up to the 10th harmonic (3.15 GHz).

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Unknown switch argument.

Testresult

The requirements are

■ - MET

O - NOT MET

Min. limit margin

20.6 dB

at 1.258 GHz

Max. limit exceeding

dB

at _____ GHz

Remarks: The limits are met.

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FIELD STRENGTH OF THE FUNDAMENTAL WAVE

☐ - Test not applicable

- ☒ - Open-site 1
- ☐ - Open-site 2
- ☒ - 3 meters
- ☐ - 10 meters
- ☐ - 30 meters

For TEST EQUIPMENT USED please refer to ATTACHMENT B: CPR2

Description of Measurement

The final level, expressed in dB μ V/m, is arrived by taking the reading from the EMI receiver (Level dB μ 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 (MHz)	Level (dB μ V)	+	Factor (dB)	=	Level (dB μ V/m)	-	Limit (dB μ V/m)	=	Delta (dB)
315	45	+	22.5	=	67.5	-	74.3	=	-6.8

Testresult in detail:

Frequency MHz	L: QP dB μ V	L: AV dB μ V	Correct.	L: QP dB μ V/m	L: AV dB μ V/m	Limit dB μ V/m
315.03	50.3		20.7	71.0		75.6

Testresult

The requirements are

☒ - MET

☐ - NOT MET

Min. limit margin 4.6 dB at 315.03 MHz

Max. limit exceeding _____ dB at _____ MHz

Remarks: The limits are met.