mikes PRODUCT SERVICE

EMC EMISSION -- TEST REPORT

Test report file no. : **T14885-1-03KG** Date of issue : May 20, 1998

Model / Type No. : Step5

Kind of product : Immobilizer

Applicant : Siemens Automotive Corporation

Manufacturer : Siemens Sistemas Automotrices S.A. de C.V.

Licence holder : Siemens Automotive Corporation

Address : 2400 Executive Hills Drive

Auburn Hills, MI 48326-2980, USA

Test result accrdg. to the regulation(s) at page 3 : ● **Positive** O **Negative**

Mikes Product Service is a subcontractor to TÜV Product Service, GmbH according to the principles outlined in ISO/IEC Guide 25 and EN 45001.

Mikes Product Service reports apply only to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. Mikes Product Service shall have no liability for any deductions, inferences or generalizations drawn by the client or others from Mikes Product Service issued reports.

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Mikes Product Service and its professional staff hold government and professional organization certifications are members of DAR, DaTech, KBA, FCC, VCCI, MoC, AUSTEL.

This testreport with appendix consists of 48 pages.
The testresult only responds to the tested sample. It is not allowed to copy this report even partly without the allowance of the test laboratory.

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DIRECTORY - EMISSIONS

MIKES PRODUCT SERVICE GmbH Ohmstrasse 2-4 94342 Strasskirchen Tel:+9424-9407-0 Fax:+9424-9407-60 Rev.No. 7.1

TESTREGULATIONS

The tests were performed according to following regulations :

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

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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 A	o - class B

● - FCC Part 15 Subpart C Section 15.209

o - CISPR

ENVIRONMENTAL CONDITIONS

Temperature:	20 ° C
Humidity	58 %
Atmospheric pressure	1010 mbar

POWER SUPPLY SYSTEM UTILIZED

Power supply system : 12 V DC (car battery)

SHORT DESCRIPTION OF THE EQUIPMENT UNDER TEST (EUT)

The system is a vehicle immobilization system. The electronic devices in the System are the Immobilizer Step5 and a Cryptographic Transponder. The Immobilizer Step5 is located near the vehicle`s ignition lock.

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.

TESTCONDITIONS

The **measurement of the conducted emissions (interference voltage)** were performed in a shielded room.

● - 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

Test equipment used :

Model Number	Manufacturer	Description	Serial Number	Cal Date

All used test-instruments as well as the Test-accessories are calibrated regularly.

The **measurement of the radiated emissions (magnetic field)** in the frequency range from 9 kHz to 30 MHz were performed

o - Test not applicable

o - in a shielded room
● - at a non - reflecting open-site
and
● - in a testdistance of 3 meters.
● - in a testdistance of 10 meters.
o - in a testdistance of 30 meters.

Test equipment used :

Model Number	Manufacturer	Description	Serial Number	Cal Date
ESHS 30	Rohde & Schwarz	Test Receiver	828.765/003	17.3.1999
FMZB 1516	Rohde & Schwarz	Magnetic field antenna	335.4711.52	17.11.1998

The measurement of the radiated emissions (electric field) in the frequency range of 30 MHz-1000 MHz were performed in horizontal and vertical antenna polarization at a non-reflecting open-site and a test distance of:

o - Test not applicable

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

Test equipment used :

Model Number	Manufacturer	Description	Serial Number	Cal Date
ESVP	Rohde & Schwarz	Test Receiver	880.726/005	5.12.1998
BBA 9106	Schwarzbeck	Antenna	no Number	6.08.1998
UHALP 9107	Schwarzbeck	Antenna	no Number	7.12.1998

All used test-instruments as well as the Test-accessories are calibrated regularly.

The measurement of the interference power were performed in a shielded room by using the absorbing clamp on the mains and interface cables in the frequency range 30 MHz - 300 MHz.

● - Test not applicable

Testlocation :
o - Anechoic chamber
o - Full compact chamber

Test equipment used :

Model Number	Manufacturer	Description	Serial Number	Cal Date

All used test-instruments as well as the Test-accessories are calibrated regularly.

The measurement of the equivalent radiated emissions in the frequency range 1 GHz - 18 GHz were performed in horizontal and vertical antenna polarization at a non-reflecting test-site and a test distance of:

● - Test not applicable

Testlocation :

o - Open-site 1
o - Open-site 2
o - Anechoic chamber
o - Full compact chamber

o - 1 meters
o - 3 meters
o - 10 meters

Test equipment used :

Model Number	Manufacturer	Description	Serial Number	Cal Date

All used test-instruments as well as the Test-accessories are calibrated regularly.

EQUIPMENT UNDER TEST

Operation - mode of the EUT.:

The equipment under test was operated during the measurement under following conditions:

● - Standby

o - Testprogram (H - Pattern)

o - Testprogram (color bar)

o - Testprogram (customer specific)

● - Permanent Transmit (Reading a Transponder)

o - _____

Configuration of the equipment under test:

Following peripherial devices and interface cables were connected during the measurement:

● - Test box	Type : Customer specific
● - DC Power Supply	Type : EA 3016
o - _____	Type : _____
o - _____	Type : _____
o - _____	Type : _____

● - unshielded power cable

o - unshielded cables

o - shielded cables for connection to the notebook

● - customer specific cables

o - _____

o - _____

TESTRESULT

Conducted emissions 10/150 kHz - 30 MHz

● - Test not applicable

The requirements are	O - MET		O - NOT MET	
Min. limit margin	_____	dB	at _____	MHz
Max. limit exceeding	_____	dB	at _____	MHz

Remarks: EUT is connected to the DC power supply in car. There are no requirements for conducted emissions on DC input port for car use.

Radiated emissions (magnetic field) 10 kHz - 30 MHz

o - Test not applicable

The requirements are	● - MET		O - NOT MET	
Min. limit margin	>10	dB	at 0.1346	MHz
Max. limit exceeding	_____	dB	at _____	MHz

Remarks: The limits are met. This was a peak measurement. The reading in average was 5 dB less.

Radiated emissions (electric field) 30 MHz - 1000 MHz

o - Test not applicable

The requirements are	● - MET		O - NOT MET	
Min. limit margin	8	dB	at 48	MHz
Max. limit exceeding	_____	dB	at _____	MHz

Remarks: The limits are met.

TESTRESULT

Interference power at the mains and interface cables 30 MHz - 300 MHz

● - Test not applicable

The requirements are O - MET O - NOT MET

Min. limit margin _____ dB at _____ MHz

Max. limit exceeding _____ dB at _____ MHz

Remarks: _____

Equivalent radiated emissions 1 GHz - 18 GHz

● - Test not applicable

The requirements are O - MET O - NOT MET

Min. limit margin _____ dB at _____ GHz

Max. limit exceeding _____ dB at _____ GHz

Remarks: Because of the used frequencies there are no requirements for radiated emissions.

SUMMARY

GENERAL REMARKS:

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.

Testing Start Date : April 28, 1998

Testing End Date : April 30, 1998

- MIKES PRODUCT SERVICE GmbH -

Günter Mikes
Dipl.-Ing.(FH)

Test-engineer

Klaus Gegenfurtner
Dipl.-Ing. (FH)

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Appendix A

Test Data Sheets

and

Test Setup Drawing(s)

FCC ID: M3NSTEP5

TEST SETUP FOR EMISSIONS TESTING

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Open Test Site 1

Notes:

1. Items shown in dotted lines are located on the floor below the test area. It is about 15 meters vertically from the ground floor to the test area.

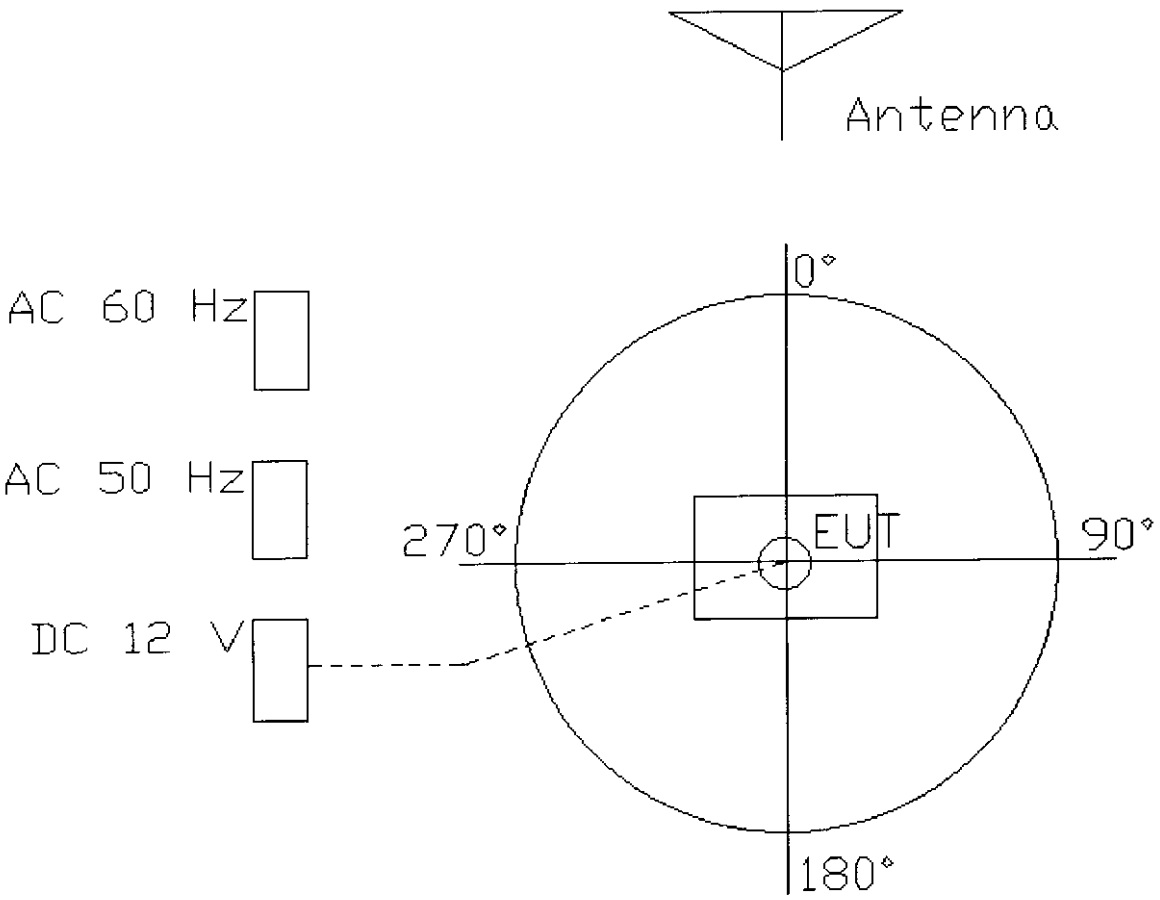
2. 50 Hz and 60 Hz are power panels for alternating current. There is also a power panel for direct current.

3. The antenna may be positioned horizontally 3, 10 or 30 meters from the center of the turntable.

4. The circle is a 5 meter diameter turntable.

5. A ground plane is in the plane of this sheet.

6. The test sample is shown in the azimuthal position representing zero degrees.



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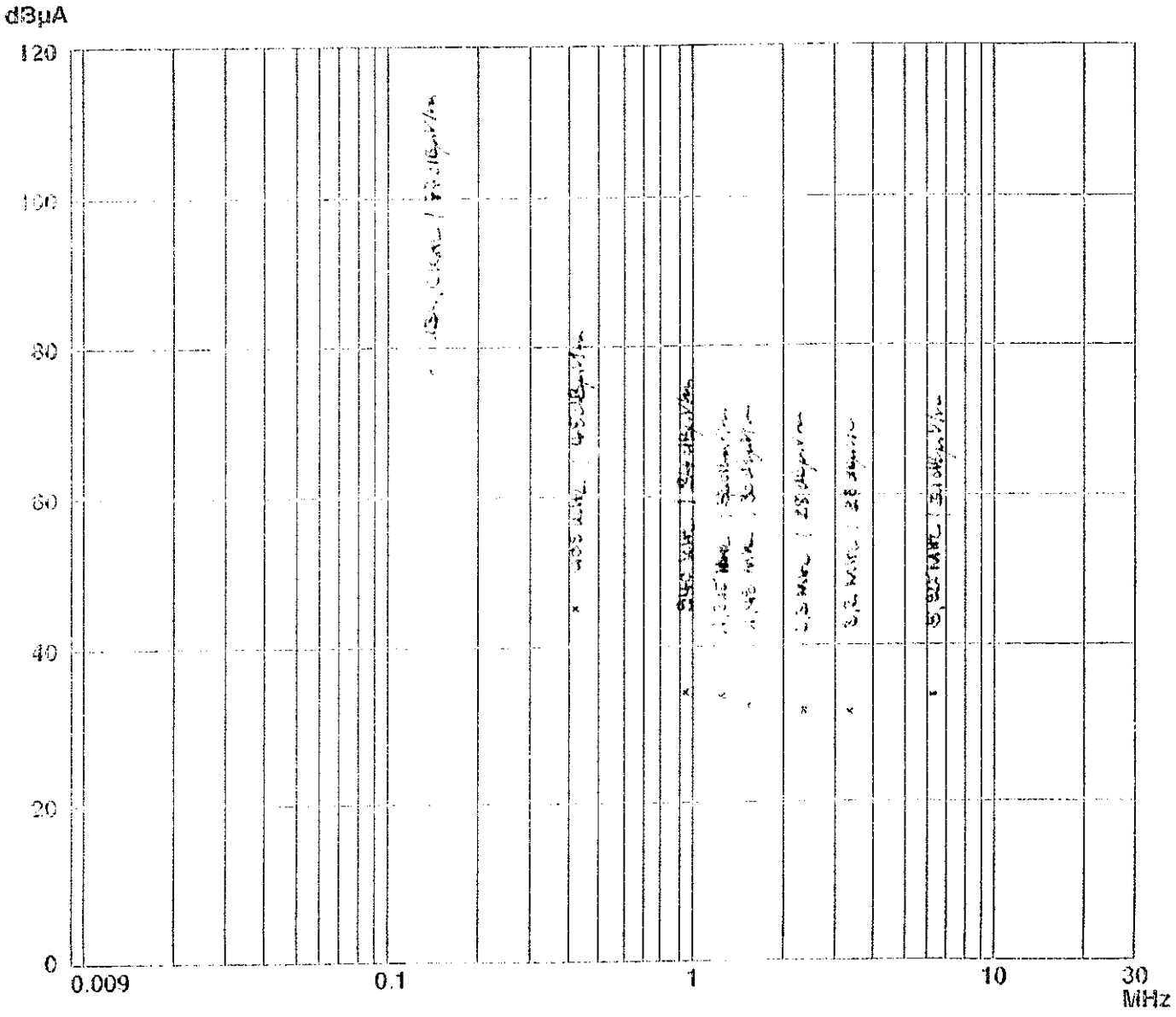
RADIATION-TEST 9 kHz – 30 MHz
Magnetic Field

Type/Model : [illegible]
Ser. No. : [illegible]
Client : Siemens Matsushita
Test mode : [illegible]
Test point : [illegible]
Test spec. : [illegible]

Detection Mode: ● P ○ QP ○ AV

Test result: ● ok ○ n. ok

Remarks: Fundamental and spurious emissions
3m test distance



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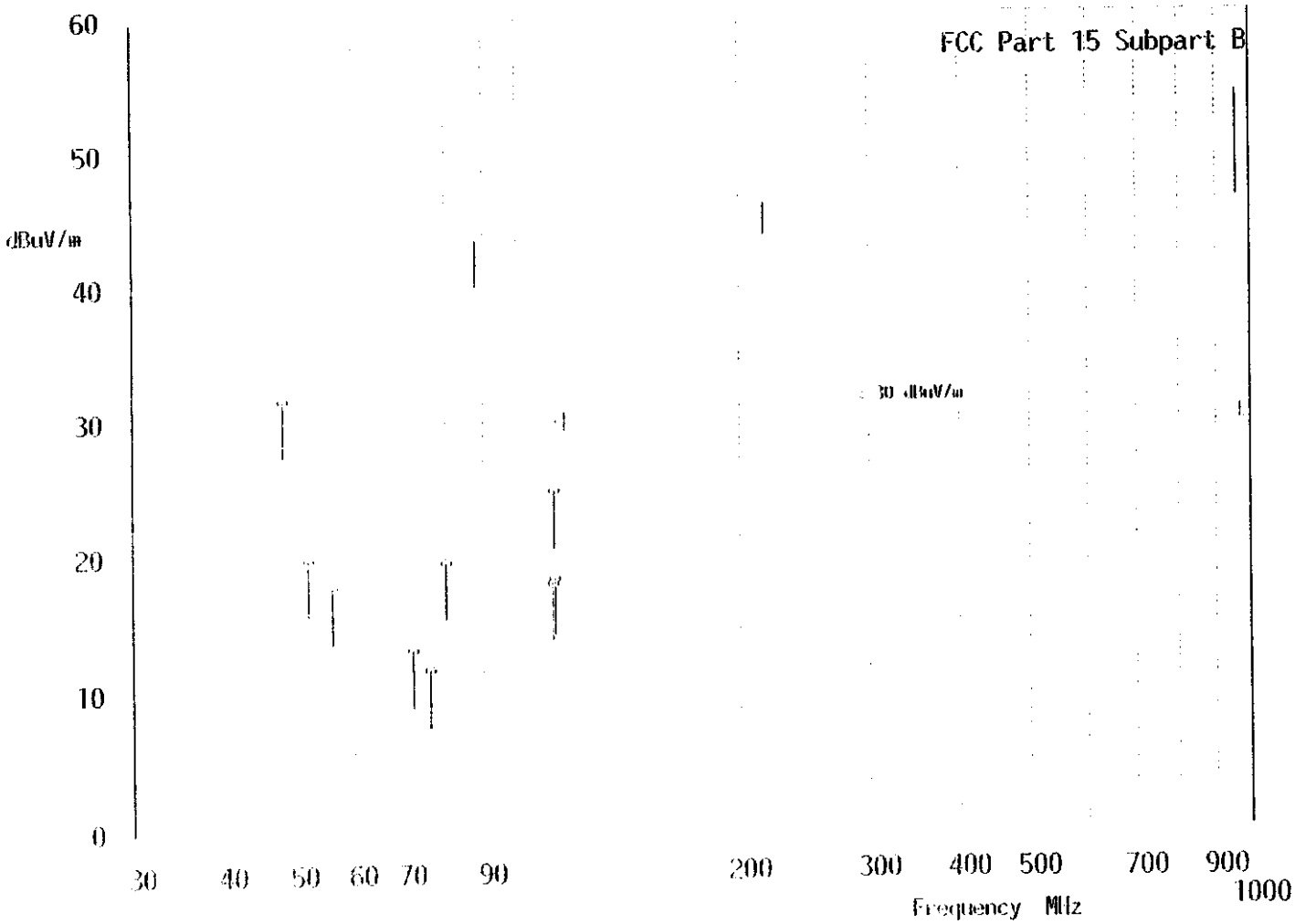
Radiation-Test

accdg.FCC Part 15

Typ:	Step5
Manufacturer:	Siemens Sistemas
Client:	Siemens Automotive
Regulation:	FCC Part 15 Subpart B
Order No.:	114385-1-03 KG
Operation Mode:	Permanent transmit
Remarks:	the limits are kept

Testdistance:	3m
Testreceiver:	Rohde & Schwarz ESVP
Antenna:	Schwarzbeck BBA & UHALP
Testengineer:	Klaus Gegenfurtner
Date:	12-05-1998



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Radiation-Test

accdg.FCC Part 15

Typ: Step5
Manufacturer: Siemens Sistemas
Client: Siemens Automotive
Regulation: FCC Part 15 Subpart B
Order No.: 114885-1-03 KG
eration Mode: Permanent transmit
Remarks: The limits are kept

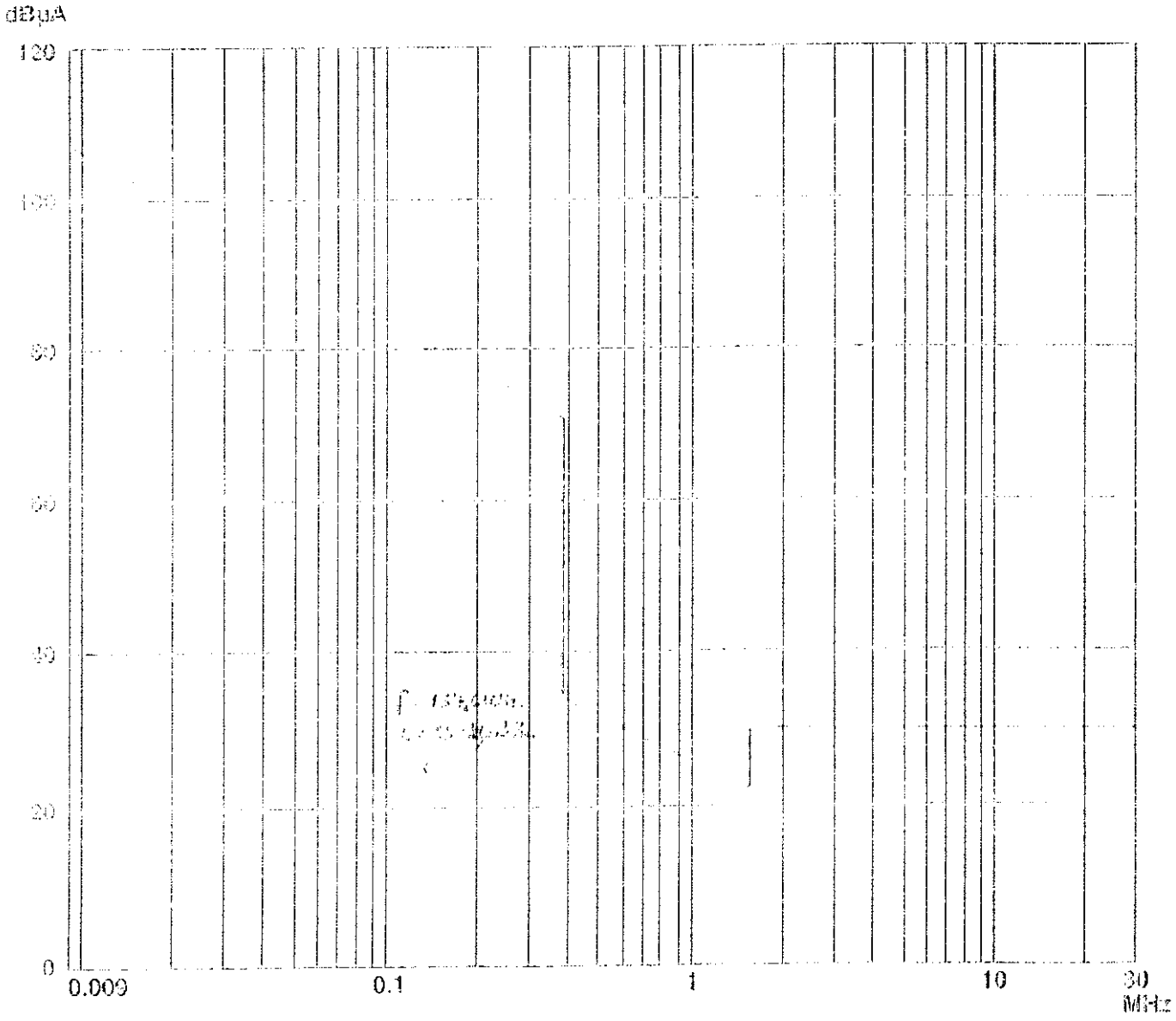
Testdistance: 3m
Testreceiver: Rohde & Schwarz ESVP
Antenna: Schwarzbeck BBA & UHALP
Testengineer: Klaus Gegenfurtner
Date: 12-05-1998

Result	Frequency [MHz]	Reading [dBuV/m]	Korr [dB]	Final [dBuV/m]	Limit [dBuV/m]	DLimit [dB]	Polarisation	Noise
	48.06	16.40	15.35	31.75	40.00	8.25	Vertikal	Diskret
	52.06	5.50	14.39	19.89	40.00	20.11	Vertikal	Diskret
	56.07	4.50	13.38	17.88	40.00	22.12	Vertikal	Diskret
	72.10	2.60	10.61	13.21	40.00	26.79	Vertikal	Diskret
	76.10	1.00	10.81	11.81	40.00	28.19	Vertikal	Diskret
	80.10	8.60	11.02	19.62	40.00	20.38	Vertikal	Diskret
	111.37	1.30	16.78	18.08	43.50	25.42	Vertikal	Diskret
	112.14	8.10	16.82	24.92	43.50	18.58	Vertikal	Diskret
	112.42	1.60	16.86	18.46	43.50	25.04	Vertikal	Diskret

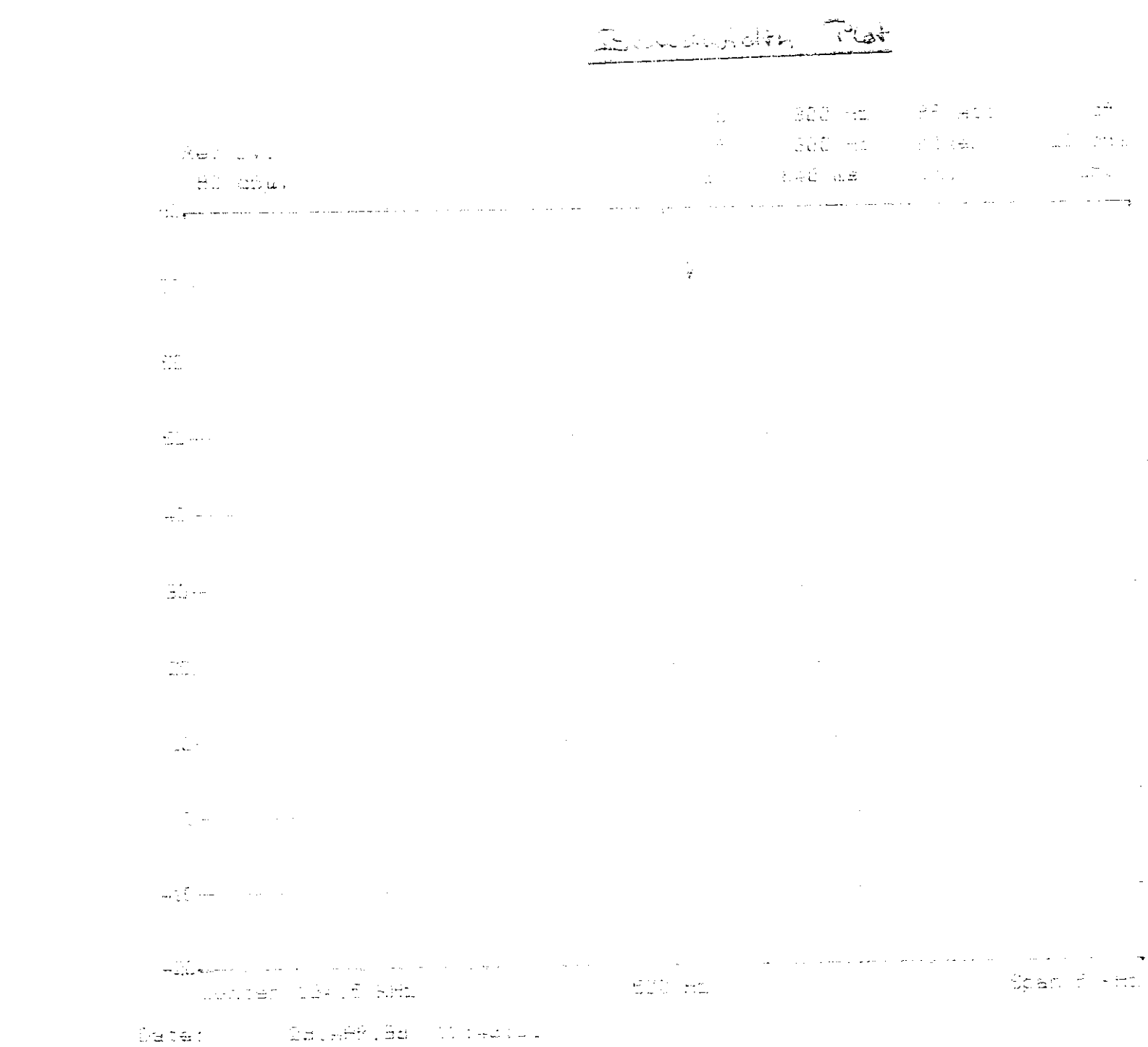
RADIATION-TEST 9 kHz – 30 MHz
Magnetic Field

Type/Model : [illegible] Detection Mode: ● P ○ QP ○ AV
Ser. No : [illegible]
Client : [illegible]
Test mode : [illegible]
Test point : [illegible]
Test spec. : [illegible] Test result: ● ok ○ n. ok

Remarks: [illegible] 3 m horizontal ; 30 m test distance
[illegible] extrapolation factor for limit curve 58 dB/decade

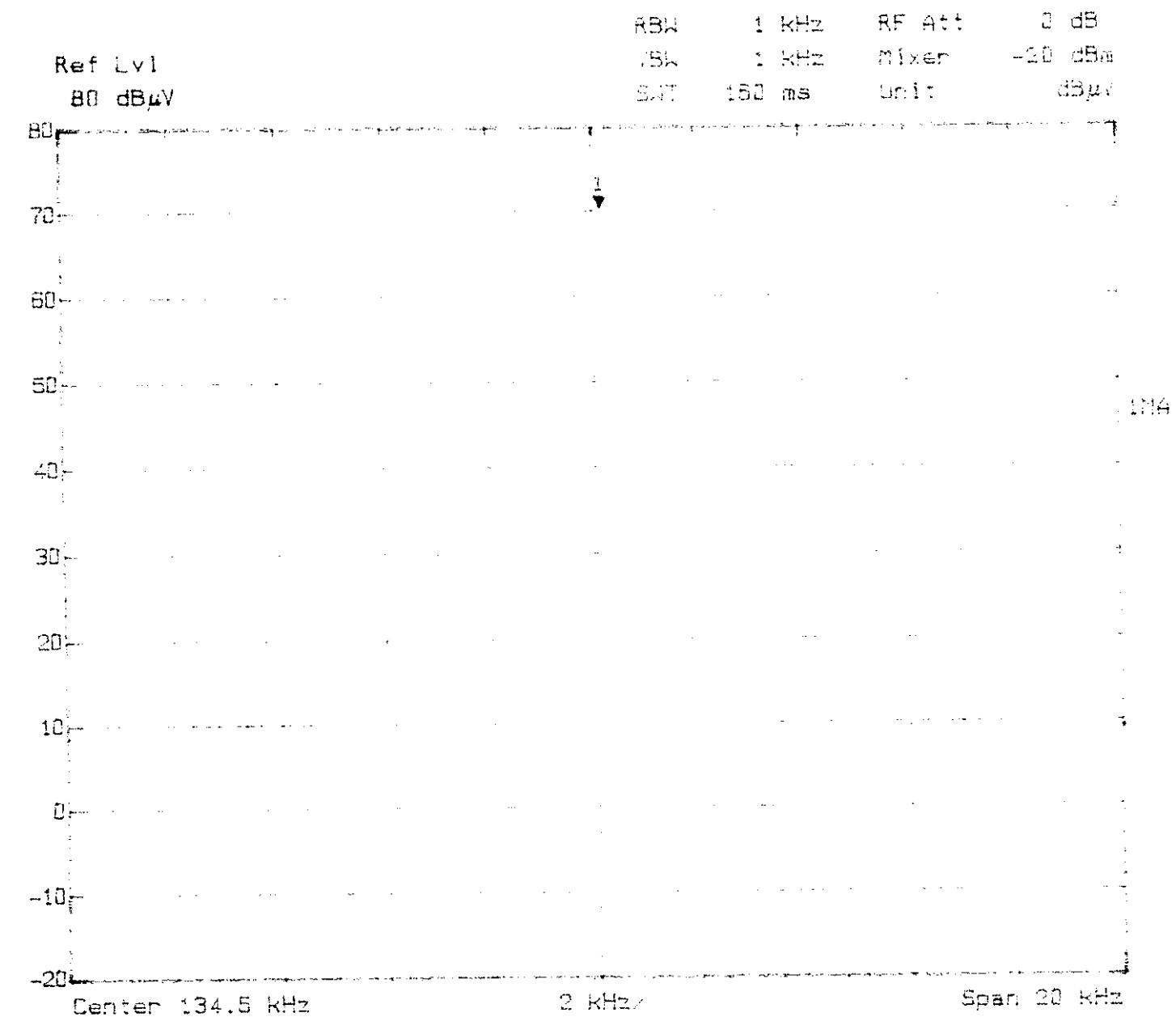


	name	date	page of pages



FCC ID: M3NSTEP5

Bandwidth Plot



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FCC ID: M3NST-EP3

EQUIPMENT

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Simulation Plot

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CONSTRUCTIONAL DATAFORM FOR TESTING OF RADIO EQUIPMENT

Licence holder: Siemens Automotive Corporation

Address: 2400 Executive Hills, Auburn Hills, MI 48326-2980, USA

Manufacturer: Siemens Sistemas Automotrices S.A. de C.V.

Address: Camino a la Tijera #3, Km 3.5 Carretera Guadalajara-Morelia, C.P. 45640 Mpio. Tlajomulco de Zuniga Jalisco, Mexico

Type: Immobilizer 134.4 kHz

Model: Step5

Serial-No.: _____ Protection class: _____

Application for getting

● national approval in the following countries: Europe (west), USA, Canada

○ EC-type examination

Additional informations to the above named model:

Antenna:

transmitter: Type: Loop

Length/size: 120 turns, 32.6 mm diameter

receiver: Type:

Length/size:

Power supply of the transmitter:

Type: Automotive Battery nominal voltage: 12 V

_____ lowest voltage: 9 V

_____ highest voltage: 16 V

Power supply of the receiver:

Type: _____ nominal voltage: _____ V

Ancillary equipment:

Description: _____ Type: _____ Serial-no.: _____

Description: _____ Type: _____ Serial-no.: _____

Description: _____ Type: _____ Serial-no.: _____

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

● Category I: General (-20°C to +55°C) ○ Category II: Portable (-10°C to +55°C)

○ Category III: Equipment for normal indoor use (0°C to +35°C)

Connectable cables:

Name of the cable	Digital	Length/m	shielded
Wire harness	● yes ● no	0.3	○ yes ● no
	○ yes ○ no		○ yes ○ no
	○ yes ○ no		○ yes ○ no

○ If applicable, if necessary complete overleaf

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Type designation:
Step5

Name and type designation of individual units comprising the radio equipment:
Immobilizer 5WK4 8644
5WK4 8643 (reduced Variant)
5WK4 8645 (reduced Variant)

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 equipm.	☐
☐ Satellite earth station	☐ CB radiotelephone equipment	☐ Antenna	☐
☐ Data transmission equipment	☐ Movement detector	☐ Aeronautical equipment	☐

Technical characteristics:

	Transmitter-receiver	Transmitter	Receiver
Frequency range	134.4 kHz		
Maximum no. of channels	1		
Channel spacing			
Class of emission (type of modulation)	NON		
Maximum RF output power			
Maximum effective radiated power (ERP)	50 dBuV/m at 10 m		
Output power variable			
Channel switching frequency range			
Method of frequency generation	☐ Synthesizer	☐ Crystal	■ Other Ceramic resonator
Frequency generation TX	clock		
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	☐ BNC ☐ M ■ None	☐ TNC ☐ UHF ☐	☐ N ☐ Adapter ☐

Type approval specifications:
BAPT 222 ZV 122
ETS 300 330

o If applicable, if necessary complete overleaf

FCC ID: M3NS7EP5

Applicant: Siemens Model-name: Step5

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Declarations:

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

Regensburg place of issue

21. APR. 1998 date

SIEMENS Aktiengesellschaft
Bereich Automobiltechnik
Postfach 10 09 55
93009 Regensburg

Seal and signature of applicant

o If applicable, if necessary complete overleaf

FCC ID: M3NSTEP5

Appendix C

MEASUREMENT PROTOCOL FOR FCC, VCCI AND AUSTEL

GENERAL INFORMATION

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 CISPR 22 Limits.

Measurement Error

The test system for conducted emissions is defined as the LISN, tuned receive and coaxial cable. The test system for radiated 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 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.

CONDUCTED EMISSIONS

The final level, expressed in dBµV, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the CISPR limit, which is equivalent to the Australian AS 3548 limit.

To convert between dBµV and µV, the following conversions apply:

dBµV = 20(log µV)

µV = Inverse log(dBµV/20)

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RADIATED EMISSIONS

The final level, expressed in dBµV/m, is arrived at by taking the reading from the EMI receiver (Level dBµV) and adding the antenna correction factor and cable loss factor (Factor dB) to it. This is done automatically in the EMI receiver, where the correction factor are stored. This result then has the FCC limit subtracted from it to provide the Delta which gives the tabular data as shown in the data sheets in Appendix B. The amplifier gain is automatically accounted for by using an analyzer offset.

Example:

Frequency (MHz)	Level (dBµV)	+	Factor (dB)	=	Final (dBµV/m)	Limit - FCC B (dBµV/m)	-	Final (dBµV/m)	=	Delta FCC B (dB)
37.19	10.2	+	12.0	=	22.2	39.5	-	22.2	=	17.3

DETAILS OF TEST PROCEDURES

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."

Conducted Emissions

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 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.

FCC ID: M3NSTEP5

Radiated Emissions

Intentional radiated 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 360 degrees to locate the maximum of the emissions.

Unintentional radiated emissions from the EUT are measured in the frequency range of 30 to 1000 MHz 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 average detection. 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.