TEST RESULT SUMMARY

FCC PART 15 SUBPART C
Section 15.209

MANUFACTURER'S NAME	Data Sciences Intl. Inc.
NAME OF EQUIPMENT	a) Small Animal Temperature Implant b) Small Animal Pressure Implant c) Small Animal Biopotential Implant d) Small Animal Biopotential and Temperature Implant e) Small Animal Pressure, Biopotential, and Temperature Implant f) Small Animal 3-channel Biopotential Implant g) Small Animal 4-channel Biopotential Implant h) Large Animal Temperature Implant i) Large Animal Pressure Implant j) Large Animal Biopotential and Temperature Implant k) Large Animal Biopotential and 2-channel Pressure Implant l) Large Animal Pressure, Biopotential, and Temperature Implant m) Large Animal 3-channel Biopotential Implant
MODEL NUMBER	a) TA10TA-F40 b) TA11PA-C40 c) TA11CA-F40 d) TA11CTA-F40 e) TL11M2-C50-PXT f) TL10M3-F50-EEE g) TL10M4-F50-EEEE h) TA10TA-D70 i) TA11PA-D70 j) TA10CTA-D70 k) TL11M2-D70-PCT l) TL11M3-D70-PCP m) TL10M3-D70-EEE
MANUFACTURER'S ADDRESS	4211 Lexington Ave. N. Suite 2244 St. Paul, Minnesota 55126-6164
TEST REPORT NUMBER	NC203681
TEST DATE	10 July 2002

According to testing performed at TÜV Product Service Inc, the above-mentioned unit is in compliance with the electromagnetic compatibility requirements defined in FCC Part 15.

It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics. Any modifications necessary for compliance made during testing on the above mentioned date(s) must be implemented in all production units for compliance to be maintained.

TÜV Product Service Inc, as an independent testing laboratory, declares that the equipment tested as specified above conforms to the requirements of FCC Part 15.

Date: 17 July 2002

Location: Taylors Falls MN USA

G. S. Jakubowski
Test Engineer

T. K. Swanson
EMC Technical Writer

Not Transferable

EMC EMISSION - T E S T R E P O R T

Test Report File No.	:	**NC203681**	Date of issue: 17 July 2002

Model No. :

a) TA10TA-F40
b) TA11PA-C40
c) TA11CA-F40
d) TA11CTA-F40
e) TL11M2-C50-PXT
f) TL10M3-F50-EEE
g) TL10M4-F50-EEEE
h) TA10TA-D70
i) TA11PA-D70
j) TA10CTA-D70
k) TL11M2-D70-PCT
l) TL11M3-D70-PCP
m) TL10M3-D70-EEE

Product Type :

a) Small Animal Temperature Implant
b) Small Animal Pressure Implant
c) Small Animal Biopotential Implant
d) Small Animal Biopotential and Temperature Implant
e) Small Animal Pressure, Biopotential, and Temperature Implant
f) Small Animal 3-channel Biopotential Implant
g) Small Animal 4-channel Biopotential Implant
h) Large Animal Temperature Implant
i) Large Animal Pressure Implant
j) Large Animal Biopotential and Temperature Implant
k) Large Animal Biopotential and 2-channel Pressure Implant
l) Large Animal Pressure, Biopotential, and Temperature Implant
m) Large Animal 3-channel Biopotential Implant

Applicant, Manufacturer, License holder	:	Data Sciences Intl. Inc.
Address	:	4211 Lexington Ave. N. Suite 2244
	:	St. Paul, Minnesota 55126-6164
Test Result	:	■ **Positive** ☐ **Negative**
Test Project Number		**NC203681**
Total pages including Appendices		22

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

TÜV Product Service Inc 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. TÜV Product Service Inc shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV Product Service Inc issued reports.

This report is the confidential property of the client. As a mutual protection to our clients, the public and ourselves, extracts from the test report shall not be reproduced except in full without our written approval. This report shall not be used by the client to claim product endorsement by NVLAP or any agency of the US government.

TÜV Product Service Inc and its professional staff hold government and professional organization certifications and are members of AAMI, ACIL, AEA, ANSI, IEEE, NVLAP, and VCCI

TÜV PRODUCT SERVICE INC 19333 Wild Mountain Road Taylors Falls MN 55084-1758 Tel: 651 638 0297 Fax: 651 638 0298 Rev.No 1.0

D I R E C T O R Y - EMISSIONS

TÜV PRODUCT SERVICE INC 19333 Wild Mountain Road Taylors Falls MN 55084-1758 Tel: 651 638 0297 Fax: 651 638 0298 Rev.No 1.0

EMISSIONS TEST REGULATIONS :

The emissions tests were performed according to following regulations:

☐ - EN 50081-1 / 1991

☐ - EN 55011 / 1991 ☐ - Group 1 ☐ - Group 2
☐ - Class A ☐ - Class B

☐ - EN 55013 / 1990

☐ - EN 55014 / 1987 ☐ - Household appliances and similar
☐ - Portable tools
☐ - Semiconductor devices

☐ - EN 55014 / A2:1990

☐ - EN 55014 / 1993 ☐ - Household appliances and similar
☐ - Portable tools
☐ - Semiconductor devices

☐ - EN 55015 / 1987

☐ - EN 55015 / A1:1990

☐ - EN 55015 / 1993

☐ - EN 55022 / 1987 ☐ - Class A ☐ - Class B

☐ - EN 55022 / 1994 ☐ - Class A ☐ - Class B

☐ - BS

☐ - VCCI ☐ - Class A ☐ - Class B

■ - FCC Part 15 Subpart C Section 15.209

☐ - FCC Part 15 Subpart B ☐ - Class A ☐ - Class B

☐ - CISPR 11 (1990) ☐ - Group 1 ☐ - Group 2
☐ - Class A ☐ - Class B

☐ - CISPR 22 (1993) ☐ - Class A ☐ - Class B

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Environmental conditions in the lab:

	Actual
Temperature	: 24 °C
Relative Humidity	: 68 %
Atmospheric pressure	: 99.6 kPa
Power supply system	: 1.5 to 3.6 volt (battery powered)

Sign Explanations:

☐ - not applicable
■ - applicable

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CONDUCTED EMISSIONS (15.207)

■ **- Test not applicable**

Conducted emissions on the 60 Hz power interface of the EUT are measured in the frequency range of 450 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection, and a Line Impedance Stabilization Network (LISN), with 50 Ω/50 μH (CISPR 16) characteristics. In some cases, a pre-scan using a spectrum analyzer is initially performed on the units comprising the system under test to locate the highest emissions. If the minimum passing margin appears to be less than 20 dB with a peak mode measurement, the emissions are re-measured using a tuned receiver or spectrum analyzer with quasi-peak and average detection and recorded on the data sheets. The final measurement is taken off of the receiver, which has the LISN insertion loss, cable loss, and 10 dB attenuator factors stored in memory.

RADIATED EMISSIONS (15.209 - 10 kHz to 30 MHz)

The *RADIATED EMISSIONS (10 KHZ TO 30 MHZ*) measurements were performed at the following test location:

■ - Wild River Lab Large Test Site (Open Area Test Site)
at a test distance of :
■ - .3 meters
■ - 1 meters
■ - 3 meters
■ - 10 meters

Radiated emissions 10 kHz - 30 MHz

The requirements are	■ - MET		☐ - NOT MET	
Minimum limit margin for fundamental	45 dB	at	455.0	kHz
Minimum limit margin for harmonics/spurious	47 dB	at	1.36	MHz

Measurements were made at 0.3, 1, 3, and 10 meters in order to establish the falloff rate of the measured signals, and this rate was used to extrapolate the measured values out to 30 or 300 meters, as appropriate. Most measurements were in the noise floor at 3 meters and all but the fundamental was in the noise floor at 10 meters.

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Radiated emissions data 10 kHz - 30 MHz

						30 m		300 m	
						spec limit		spec limit	
	.3 meters	1 meter	3 meters	10 meters	30 meters	15.209	300 meters	15.209	margin
MHz	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB
0.009								48.51937	48.51937
0.02	66		21		-24		-69	41.58362	110.5836
0.025	67		22		-23		-68	39.64542	107.6454
0.03	68		23		-22		-67	38.0618	105.0618
0.05	67		22		-23		-68	33.62482	101.6248
0.09	67	44	21		-25		-71	28.51937	99.51937
0.1	66		21		-24		-69	27.60422	96.60422
0.455	104	82	59	34	14		-31	14.444	45.444
0.49						33.8003			
1.36	49	31	13		-23	24.93345			47.93345
1.705						29.54243			
30						29.54243			29.54243
Measurements on Data Sciences CTA-D70 - 10 July 2002 - G. S. Jakubowski - NC203681									
All measurements are quasi-peak - levels beyond 10 meters are extrapolated values for fundamental									
levels beyond 1 meter are extrapolated for spurious									

Test equipment used :

	TUV ID	Model Number	Manufacturer	Description	Serial Number	Cal Due
■ -	2534	ESHS-20	Rhode & Schwarz	EMI Receiver	837055/003	8-22-02
■ -	2517	HFH2-Z2	Polorad	Loop Antenna	879285/036	2-11-03

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST) and is calibrated annually.

In the frequency range of 10 kHz to 30 MHz, a shielded loop antenna is positioned with its plane vertical at 0.3 and 1 meters from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. The loop antenna is also positioned horizontally. The center of the loop antenna is 1 meter above the ground plane. Since the measurements were well within the requirements, the unit was not remeasured off of the ground plane. Measurements between 9 kHz and 30 MHz are made with 9 kHz/6 dB bandwidth and quasi-peak detection with a receiver.

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Emissions Test Conditions: RADIATED EMISSIONS (30-1000 MHz)

The *RADIATED EMISSIONS (ELECTRIC FIELD)* measurements, in the frequency range of 30 MHz-1000 MHz, were tested in a horizontal and vertical polarization at the following test location:

■ - Wild River Lab Large Test Site (Open Area Test Site) – NSA measurements made 7-01, due 7-02.

at a test distance of :

■ - 3 meters – no signals detected from the transmitter within 10 dB of the limit.

Test equipment used :

	TUV ID	Model Number	Manufacturer	Description	Serial Number	Cal Due
■ -	3202	EM-6917B	Electro-Metrics	Biconicalog Periodic	102	9-24-02
■ -	3926	11867A	Hewlett-Packard	Limiter	02442	3-18-03
■-	2665	ZHL-1042J	Mini-Circuits	Preamplifier	32296	9-12-02
■-	2690	8566B	Hewlett-Packard	Spectrum Analyzer (Unit F)	2430A00930	11-19-02
■ -	2678	85662A	Hewlett-Packard	Analyzer Display (Unit F)	2403A08134	11-19-02
■ -	2684	85650A	Hewlett-Packard	Quasi-Peak Adapter (Unit F)	2521A01006	11-19-02

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST) and is calibrated annually.

Radiated emissions from the EUT are measured in the frequency range of 30 to 1000 MHz using a spectrum analyzer and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection and measurements above 1000 MHz are made with a 1 MHz/6 dB bandwidth and peak 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 is positioned 3 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. The final level, expressed in dBµV/m, is arrived at by taking the reading from the spectrum analyzer (Level dBµV), adding the antenna correction factor and cable loss factor, and then subtracting the preamplifier gain.

Example:

FREQ (MHz)	LEVEL (dBuV)	CABLE/ANT/PREAMP (dB) (dB/m) (dB)	FINAL (dBuV/m)	POL/HGT/AZ (m) (deg)	DELTA1
79.06	40.7Qp +	1.9 + 6.6 - 28.3 =	20.9	V 1.0 0.0	-9.1

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Equipment Under Test (EUT) Test Operation Mode - Emission tests :

The device under test was operated under the following conditions during emissions testing:

☐ - Standby

☐ - Test program (H - Pattern)

☐ - Test program (color bar)

☐ - Test program (customer specific)

☐ - Practice operation

☐ - Normal Operating Mode

■ - Normal (on)

Configuration of the device under test:

■ - See Constructional Data Form in Appendix A - Page A2

☐ - See Product Information Form in Appendix B - beginning on Page B3

The following peripheral devices and interface cables were connected during the measurement:

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - unshielded power cable

☐ - unshielded cables

☐ - shielded cables MPS.No.: _____

☐ - customer specific cables

☐ - _____

☐ - _____

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DEVIATIONS FROM STANDARD:

None.

GENERAL REMARKS:

A prescan was performed at 1 meter on all models. The prescans showed the Model CTA-D70 to be the worst case. Final testing was perfomed on this model only.

SUMMARY:

The requirements according to the technical regulations are

■ - met

☐ - **not** met.

The device under test does

■ - fulfill the general approval requirements mentioned on page 3.

☐ - **not** fulfill the general approval requirements mentioned on page 3.

Testing Start Date: 10 July 2002

Testing End Date: 10 July 2002

- TÜV PRODUCT SERVICE INC -

T. K. Swanson
EMC Technical Writer

Tested By:
G. S. Jakubowski

TÜV PRODUCT SERVICE INC 19333 Wild Mountain Road Taylors Falls MN 55084-1758 Tel: 651 638 0297 Fax: 651 638 0298 Rev.No 1.0

Test-setup photo(s):
Conducted emission 10/150 kHz - 30 MHz

Not Applicable

TÜV PRODUCT SERVICE INC 19333 Wild Mountain Road Taylors Falls MN 55084-1758 Tel: 651 638 0297 Fax: 651 638 0298 Rev.No 1.0

Test-setup photo(s):
Radiated emission 10 kHz - 1000 MHz

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Appendix A

Constructional Data Form

TÜV PRODUCT SERVICE INC 19333 Wild Mountain Road Taylors Falls MN 55084-1758 Tel: 651 638 0297 Fax: 651 638 0298 Rev.No 1.0

Form

EMC Test Plan and Constructional Data Form

PRODUCT SERVICE

PLEASE COMPLETE THIS DOCUMENT IN FULL, ENTERING N/A IF THE FIELD IS NOT APPLICABLE.

Applicant -- ***NOTE: This information will be input into your test report as shown below.***
Press the F1 key at any time to get HELP for the current field selected.

Company:	Data Sciences Intl. Inc.		
Address:	4211 Lexington Ave. N. Suite 2244		
	St. Paul, Minnesota 55126-6164		
Contact:	Perry Mills	Position:	CTO
Phone:	651-481-7421	Fax:	651-481-7416
E-mail Address:	pmills@datasci.com		

General Equipment Description -- ***NOTE: This information will be input into your test report as shown below.***

EUT Description

a) Small Animal Temperature Implant
b) Small Animal Pressure Implant
c) Small Animal Biopotential Implant
d) Small Animal Biopotential and Temperature Implant
e) Small Animal Pressure, Biopotential, and Temperature Implant
f) Small Animal 3-channel Biopotential Implant
g) Small Animal 4-channel Biopotential Implant
h) Large Animal Temperature Implant
i) Large Animal Pressure Implant
j) Large Animal Biopotential and Temperature Implant
k) Large Animal Biopotential and 2-channel Pressure Implant
l) Large Animal Pressure, Biopotential, and Temperature Implant
m) Large Animal 3-channel Biopotential Implant

EUT Name

a) Small Animal Temperature Implant
b) Small Animal Pressure Implant
c) Small Animal Biopotential Implant
d) Small Animal Biopotential and Temperature Implant
e) Small Animal Pressure, Biopotential, and Temperature Implant
f) Small Animal 3-channel Biopotential Implant
g) Small Animal 4-channel Biopotential Implant
h) Large Animal Temperature Implant
i) Large Animal Pressure Implant
j) Large Animal Biopotential and Temperature Implant
k) Large Animal Pressure, Biopotential, and Temperature Implant
l) Large Animal Biopotential and 2-channel Pressure Implant
m) Large Animal 3-channel Biopotential Implant

Form

EMC Test Plan and Constructional Data Form

TÜV PRODUCT SERVICE

Model No.:	a) TA-F40	Serial No.:	a) 4900
	b) PA-C40		b) 5877
	c) CA-F40		c) 7478
	d) CTA-F40		d) 2576
	e) C50-PXT		e) 10837
	f) F50-EEE		f) 20007
	g) F50EEEE		g) 20275
	h) TA-D70		h) 2361
	i) PA-D70		i) 8657
	j) CTA-D70		j) 7764
	k) D70-PCT		k) 6727
	l) D70-PCP		l) 13330
	m) D70-EEE		m) 9432

Product Options: None

Configurations to be tested: Standard

Test Objective

- ☒ EMC Directive 89/336/EEC (EMC)
  Std: RTTE Directive
- ☐ Machinery Directive 89/392/EEC (EMC
  Std:
- ☐ Medical Device Directive 93/42/EEC (EMC)
  Std:
- ☐ Vehicle Directive 72/245/EEC (EMC)
  Std:
- ☐ FDA Reviewers Guidance for Premarket Notification Submissions (EMC)

- ☒ FCC: Class ☐ A ☐ B Part 15
- ☐ VCCI: Class ☐ A ☐ B
- ☐ BSMI: Class ☐ A ☐ B
- ☐ Canada: Class ☐ A ☐ B
- ☐ Australia: Class ☐ A ☐ B
- ☐ Other:

TÜV Product Service Certification Requested

- ☐ Attestation of Conformity (AoC)
- ☐ Certificate of Conformity (CoC)
- ☐ EMC Certification (used with Octagon Mark)
- ☐ Compliance Document

Protection Class (N/A for vehicles) ☐ Class I ☐ Class II ☐ Class III

(Press **F1** when field is selected to show additional information on Protection Class.)

Attendance

Test will be: ☒ Attended by the customer ☐ Unattended by the customer

Failure - *Complete this section if testing will not be attended by the customer.*

If a failure occurs, TUV Product Service should:

- ☐ Call contact listed above, if not available then stop testing. (After hrs phone):
- ☐ Continue testing to complete test series.
- ☐ Continue testing to define corrective action.
- ☐ Stop testing.

Form

EMC Test Plan and Constructional Data Form

TÜV PRODUCT SERVICE

EUT Specifications and Requirements

Length: 5 cm Width: 5 cm Height: 1.5 cm Weight: 50 grams

Power Requirements

Regulations require testing to be performed at typical power ratings in the countries of intended use. (i.e., European power is typically 230 VAC 50 Hz or 400 VAC 50 Hz, single and three phase, respectively)

Voltage: 1.5 to 3.6 volt (battery powered) (If battery powered, make sure battery life is sufficient to complete testing.)

# of Phases: _____

Current (Amps/phase(max)): < 200uA Current (Amps/phase(nominal)): _____

Other _____

Other Special Requirements

N/A

Typical Installation and/or Operating Environment

(ie. Hospital, Small Business, Industrial/Factory, etc.)

This product will typically be used in an animal laboratory in industry, in a hospital, or at an academic institution.

EUT Power Cable

☐ Permanent OR ☐ Removable Length (in meters): _____

☐ Shielded OR ☐ Unshielded

☒ Not Applicable

Form

EMC Test Plan and Constructional Data Form

TÜV PRODUCT SERVICE

EUT Interface Ports and Cables

Interface				Shielding								
Type	Analog	Digital	Qty	Yes	No	Type	Termination	Connector Type	Port Termination	Length (in meters)	Removable	Permanent
EXAMPLE: *RS232*	☐	☒	*2*	☒	☐	*Foil over braid*	*Coaxial*	*Metallized 9-pin D-Sub*	*Characteristic Impedance*	*6*	☒	☐
N/A	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐

Form

EMC Test Plan and Constructional Data Form

EUT Software.

Revision Level: N/A

Description:

Equipment Under Test (EUT) Operating Modes to be Tested -- list the operating modes to be used during test. It is recommended the equipment be tested while operating in a typical operation mode. FCC testing of personal computers and/or peripherals requires that a simple program generate a complete line of upper case H's. Provide a general description of all software, firmware, and PLD algorithms used in the equipment. List all code modules as described above, with the revision level used during testing. Consult with your TÜV Product Service Representative if additional assistance is required.

1. Normal (on)

2.

3.

Equipment Under Test (EUT) System Components -- List and describe all components which are part of the EUT. For FCC testing a minimum configuration is required. (ie. Mouse, Printer, Monitor, External Disk Drive, Motherboard, etc.)

Description	Model #	Serial #	FCC ID #
implant only			

Form

EMC Test Plan and Constructional Data Form

Support Equipment -- List and describe all support equipment which is not part of the EUT. (i.e. peripherals, simulators, etc)

Description	*Model #*	*Serial #*	*FCC ID #*
AM broadcast receiver to verifiy operation of the implant			

Oscillator Frequencies

Frequency	*Derived Frequency*	*Component # / Location*	*Description of Use*
0.2 to 2.0 kHz			

Power Supply

Manufacturer	*Model #*	*Serial #*	*Type*
N/A			☐ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____
			☐ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____

Power Line Filters

Manufacturer	*Model #*	*Location in EUT*
N/A		

Form

EMC Test Plan and Constructional Data Form

Critical EMI Components (Capacitors, ferrites, etc.)				
Description	***Manufacturer***	***Part # or Value***	***Qty***	***Component # / Location***
None				

EMC Critical Detail -- Describe other EMC Design details used to reduce high frequency noise.

N/A

(PLEASE INSERT "**ELECTRONIC SIGNATURE**" BELOW IF POSSIBLE)

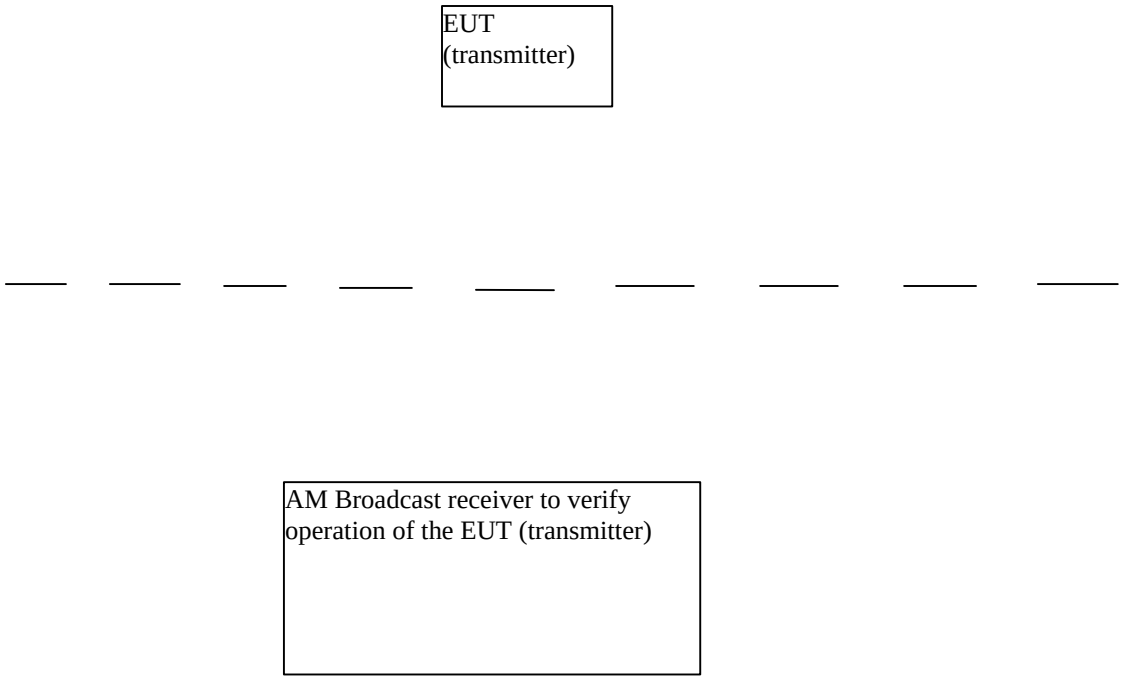
Authorization Signatures

Customer authorization to perform tests according to this test plan.	Date
Test Plan/CDF Prepared By (please print)	Date
Reviewed by TÜV Product Service Associate	Date

Form

EMC Block Diagram Form

System Configuration Block Diagram -- Provide a line drawing identifying the EUT, simulators, support equipment, I/O cables, power cables, and any other pertinent components to be used during testing. Use a dashed line to separate the equipment in the testing field versus equipment outside testing field.



Authorization Signatures

Customer authorization to perform tests according to this test plan.	Date
Test Plan/CDF Prepared By (please print)	Date
Reviewed by TÜV Product Service Associate	Date

Appendix B

MEASUREMENT PROTOCOL FOR FCC

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 Uncertainty

The test system for conducted emissions is defined as the LISN, tuned receiver or spectrum analyzer, and coaxial cable. The test system for radiated emissions is defined as the antenna, the pre-amplifier, the spectrum analyzer and the coaxial cable. These test systems have a measurement uncertainty of ±4.5 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 FCC limit.

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

dBµV = 20(log µV)

µV = Inverse log(dBµV/20)

RADIATED EMISSIONS

The final level, expressed in dBµV/m, is arrived at by taking the reading from the spectrum analyzer (Level dBµV), adding the antenna correction factor and cable loss factor, and then subtracting the preamplifier gain. This result then has the duty cycle correction factor subtracted from it to provide the final average reading.

Example:

FREQ (MHz)	LEVEL (dBuV)	CABLE/ANT/PREAMP (dB) (dB/m) (dB)	FINAL (dBuV/m)	POL/HGT/AZ (m) (deg)	DELTA1
79.06	40.7Qp +	1.9 + 6.6 - 28.3 =	20.9	V 1.0 0.0	-9.1

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DETAILS OF TEST PROCEDURES

General Standard Information

The test methods used comply 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 60 Hz power interface of the EUT are measured in the frequency range of 450 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection, and a Line Impedance Stabilization Network (LISN), with 50 Ω/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. In some cases, a pre-scan using a spectrum analyzer is initially performed on the units comprising the system under test to locate the highest emissions. If the minimum passing margin appears to be less than 20 dB with a peak mode measurement, the emissions are re-measured using a tuned receiver or spectrum analyzer with quasi-peak and average detection and recorded on the data sheets.

Radiated Emissions

Radiated emissions from the EUT are measured in the frequency range of 30 to 1000 MHz using a spectrum analyzer and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection and measurements above 1000 MHz are made with a 1 MHz/6 dB bandwidth and peak 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 is positioned 3 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. Intentional radiators are rotated through three orthogonal axes to determine the attitude that maximizes the emissions.

In the frequency range of 10 kHz to 30 MHz, a shielded loop antenna is positioned with its plane vertical at 0.3 and 1 meters from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. The loop antenna is also positioned horizontally. The center of the loop antenna is 1 meter above the ground plane. Since the measurements were well within the requirements, the unit was not remeasured off of the ground plane. Measurements between 9 kHz and 30 MHz are made with 9 kHz/6 dB bandwidth and quasi-peak detection with a receiver.

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