

# TEST RESULT SUMMARY

## FCC PART 15 SUBPART C

### Section 15.209 Radiated Emission Requirements

MANUFACTURER'S NAME	Data Sciences International, Incorporated
NAME OF EQUIPMENT	Mouse Blood Pressure Implant Mouse Biopotential and Temperature Implant Mouse Biopotential Implant Mouse Temperature Implant
MODEL NUMBER	<b>TA11PA-C20</b> <b>TA10ETA-F20</b> <b>TA10EA-F20</b> <b>TA10TA-F20</b>
MANUFACTURER'S ADDRESS	4211 Lexington Avenue North, Suite 2244 St. Paul MN 55126
TEST REPORT NUMBER	NC107204
TEST DATE	31 October 2001

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 Subpart C, Section 15.209.

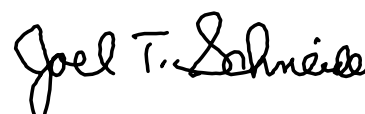
It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics. Any modifications necessary for compliance made during testing on the above mentioned date(s) must be implemented in all production 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 Subpart C, Section 15.209.

Date: 13 November 2001



J. C. Sausen  
Test Engineer



J. T. Schneider  
Chief Engineer

Location: Taylors Falls MN  
USA

Not Transferable

# EMC EMISSION - TEST REPORT

Test Report File No. : **NC107204** Date of issue: 13 November 2001

Model / Serial No. : **TA11PA-C20 / 2014**  
**TA10ETA-F20 / 5143**  
**TA10EA-F20 / 5881**  
**TA10TA-F20 / 6933**

Product Type : **Mouse Blood Pressure Implant**  
**Mouse Biopotential and Temperature Implant**  
**Mouse Biopotential Implant**  
**Mouse Temperature Implant**

Applicant : **Data Sciences International, Incorporated**

Manufacturer : **Data Sciences International, Incorporated**

License holder : **Data Sciences International, Incorporated**

Address : **4211 Lexington Avenue North, Suite 2244**  
**St. Paul MN 55126**

Test Result :  **Positive**     **Negative**

Test Project Number Reference(s) : **NC107204**

Total pages including Appendices : **21**

*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*

## D I R E C T O R Y - E M I S S I O N S

		Page(s)
<b>A) Documentation</b>		
	Test report	<u>1 – 11</u>
	Directory	<u>2</u>
	Test Regulations	<u>3</u>
	Deviation from standard / Summary	<u>9</u>
	Test-setups (Photos)	<u>10 – 11</u>
<b>B) Test data</b>		
	Conducted emissions 10/150 kHz - 30 MHz	<u>5</u>
	Radiated emissions 10 kHz - 30 MHz	<u>6</u>
	Radiated emissions 30 MHz - 1000 MHz	<u>7</u>
<b>C) Appendix A</b>		
	Constructional Data Form	<u>A2 – A8</u>
	Product Information Form(s)	<u>N/A</u>
<b>D) Appendix B</b>		
	Measurement Protocol	<u>B1 – B2</u>

## EMISSIONS TEST REGULATIONS :

The emissions tests were performed according to following regulations:

- |   |   |                                    |
|---|---|------------------------------------|
| <input type="checkbox"/> - EN 50081-1 / 1991                                | <input type="checkbox"/> - Group 1                          | <input type="checkbox"/> - Group 2 |
| <input type="checkbox"/> - EN 55011 / 1991                                  | <input type="checkbox"/> - Class A                          | <input type="checkbox"/> - Class B |
| <input type="checkbox"/> - EN 55013 / 1990                                  | <input type="checkbox"/> - Household appliances and similar |                                    |
| <input type="checkbox"/> - EN 55014 / 1987                                  | <input type="checkbox"/> - Portable tools                   |                                    |
|   | <input type="checkbox"/> - Semiconductor devices            |                                    |
| <input type="checkbox"/> - EN 55014 / A2:1990                               | <input type="checkbox"/> - Household appliances and similar |                                    |
| <input type="checkbox"/> - EN 55014 / 1993                                  | <input type="checkbox"/> - Portable tools                   |                                    |
|   | <input type="checkbox"/> - Semiconductor devices            |                                    |
| <input type="checkbox"/> - EN 55015 / 1987                                  |   |                                    |
| <input type="checkbox"/> - EN 55015 / A1:1990                               |   |                                    |
| <input type="checkbox"/> - EN 55015 / 1993                                  |   |                                    |
| <input type="checkbox"/> - EN 55022 / 1987                                  | <input type="checkbox"/> - Class A                          | <input type="checkbox"/> - Class B |
| <input type="checkbox"/> - EN 55022 / 1994                                  | <input type="checkbox"/> - Class A                          | <input type="checkbox"/> - Class B |
| <input type="checkbox"/> - BS   |   |                                    |
| <input type="checkbox"/> - VCCI   | <input type="checkbox"/> - Class A                          | <input type="checkbox"/> - Class B |
| <input checked="" type="checkbox"/> - FCC Part 15 Subpart C, Section 15.209 |   |                                    |
| <input type="checkbox"/> - FCC Part 15 Subpart B                            | <input type="checkbox"/> - Class A                          | <input type="checkbox"/> - Class B |
| <input type="checkbox"/> - CISPR 11 (1990)                                  | <input type="checkbox"/> - Group 1                          | <input type="checkbox"/> - Group 2 |
|   | <input type="checkbox"/> - Class A                          | <input type="checkbox"/> - Class B |
| <input type="checkbox"/> - CISPR 22 (1993)                                  | <input type="checkbox"/> - Class A                          | <input type="checkbox"/> - Class B |

**Environmental conditions in the lab:**

	<u>Actual</u>
Temperature	: 22 °C
Relative Humidity	: 30 %
Atmospheric pressure	: 98.1 kPa
Power supply system	: 1.5 VDC - Battery

**Sign Explanations:**

- not applicable
- applicable



## CONDUCTED EMISSIONS (15.207)

### Conducted emissions 450 kHz - 30 MHz

The requirements are  - MET  - NOT MET  - N/A  
 Minimum margin of compliance dB at MHz

### The CONDUCTED EMISSIONS (INTERFERENCE VOLTAGE) measurements were performed at the following test location:

- Wild River Lab Large Test Site (Open Area Test Site)

- 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  $\Omega$ /50  $\mu$ H (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)

### Radiated emissions 10 kHz - 30 MHz

The requirements are

■ - MET

□ - NOT MET

Minimum limit margin for fundamental \_\_\_\_\_ 84 dB at \_\_\_\_\_ 455.0 kHz

Minimum limit margin for harmonics/spurious \_\_\_\_\_ >10 dB at \_\_\_\_\_ MHz

No signals could be detected from the eut at a 3 meter antenna distance. Measurements were made at 0.3 and 1 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.

### 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

Test equipment used :

TUV ID	Model Number	Manufacturer	Description	Serial Number	Cal Due
■ - 2517	HFH2-Z2	Polarad	Loop Antenna	879285/036	2-01-02
■ - 2534	ESHS-20	Rhode & Schwarz	EMI Receiver	837055/003	8-22-02

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 or average detection with a receiver.

## RADIATED EMISSIONS DATA

							15.209	
	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dBuV/m	300 meters	300 m spec limit	margin
MHz	0.3 meter	1 meter	3 meters	10 meters	30 meters	dBuV/m	dBuV/m	dB
<b>0.455</b>	<b>53</b>	<b>32.5</b>	<b>12</b>	<b>-8.5</b>	<b>-29</b>	<b>-70</b>	<b>14.4439969</b>	<b>84.444</b>

Average Measurement at 455.0 kHz, no duty cycle correction factor applied.

Tested Models TA11PA-C20, TA10ETA-F20, TA10EA-F20, TA10TA-F20

Worst case data presented above is from the Model TA10EA-F20. Test results listed are with modulation producing highest emission levels.

Levels at 0.3, 1 meter are measured - other levels are extrapolated.

No other significant emissions detected 9 kHz to 30 MHz.

## 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
■ -	2865	11867A	Hewlett-Packard	Limiter	01972	3-21-02
■ -	2690	8566B	Hewlett-Packard	Spectrum Analyzer (Unit F)	2430A00930	11-16-01
■ -	2678	85662A	Hewlett-Packard	Analyzer Display (Unit F)	2403A08134	11-16-01
■ -	2684	85650A	Hewlett-Packard	Quasi-Peak Adapter (Unit F)	2521A01006	11-24-01
■ -	2665	ZHL-1042J	Mini-Circuits	Preamplifier	32296	9-12-02

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 dB $\mu$ V/m, is arrived at by taking the reading from the spectrum analyzer (Level dB $\mu$ V) and adding the antenna correction factor and cable loss factor, and subtracting the preamplifier gain, to it.

Example:

FREQ (MHz)	LEVEL (dB $\mu$ V)	CABLE/ANT/PREAMP (dB) (dB/m) (dB)	FINAL (dB $\mu$ V/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



**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
- \_\_\_\_\_

**Configuration of the device under test:**

- See Constructional Data Form in Appendix B - Page B2
- 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
- \_\_\_\_\_
- \_\_\_\_\_

**DEVIATIONS FROM STANDARD:**

None.

**GENERAL REMARKS:**

The radiated measurements from 10 kHz to 30 MHz are made in quasi-peak detection, except for the levels noted between 110-490 kHz, which are made in average detection.

**SUMMARY:**

The requirements according to the technical regulations are

- met

- **not** met.

The device under test does

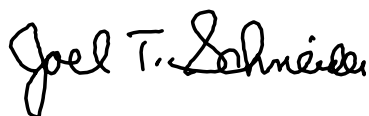
- fulfill the general approval requirements mentioned on page 3.

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

Testing Start Date: 31 October 2001

Testing End Date: 31 October 2001

- TÜV PRODUCT SERVICE INC -



J. T. Schneider  
Chief Engineer



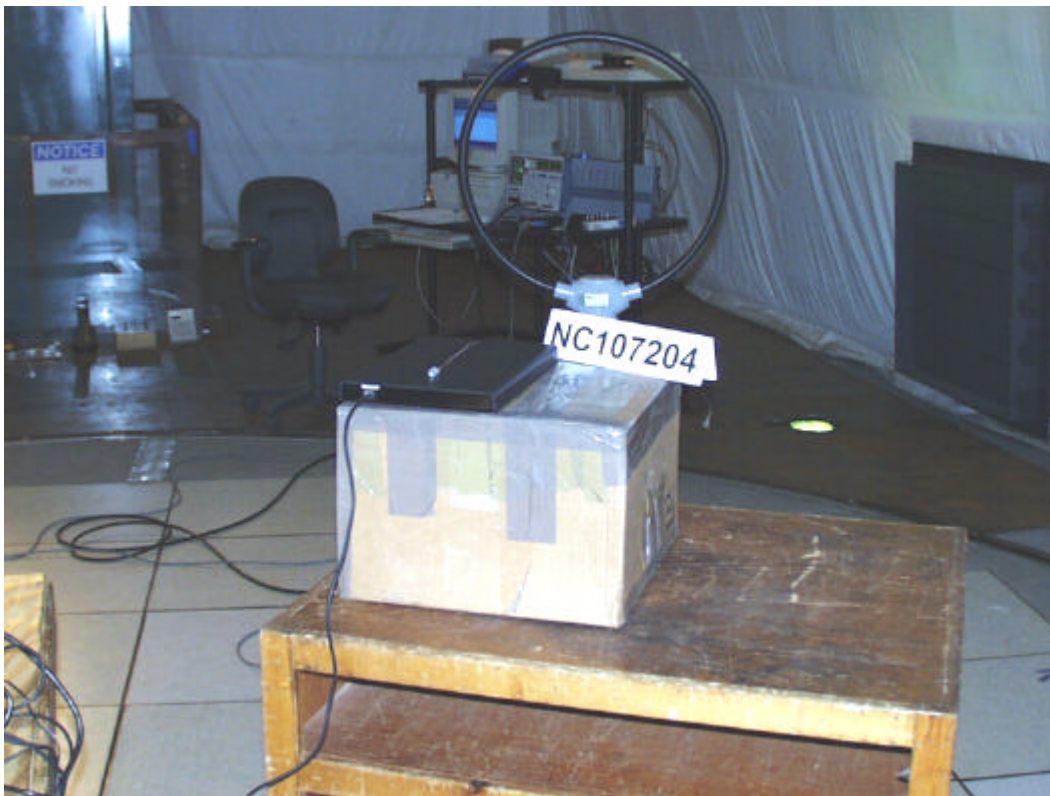
Tested By:  
J. C. Sausen

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

**Not Applicable**



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



## Appendix A

Constructional Data Form



# EMC Test Plan and Constructional Data Form

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) Mouse Blood Pressure Implant  
b) Mouse Biopotential and Temperature Implant  
c) Mouse Biopotential Implant  
d) Mouse Temperature Implant  
 EUT Name a) Mouse Blood Pressure Implant  
b) Mouse Biopotential and Temperature Implant  
c) Mouse Biopotential Implant  
d) Mouse Temperature Implant  
 Model No.: a) TA11PA-C20 Serial No.: a) 2014  
b) TA10ETA-F20 b) 5143  
c) TA10EA-F20 c) 5881  
d) TA10TA-F20 d) 6933  
 Product Options: None  
 Configurations to be tested: Standard

**Test Objective**

- |   |  |
|---|--|
| <input type="checkbox"/> EMC Directive 89/336/EEC (EMC)<br>Std: _____                           | <input checked="" type="checkbox"/> FCC: Class <input checked="" type="checkbox"/> A <input type="checkbox"/> B Part <u>15</u> |
| <input type="checkbox"/> Machinery Directive 89/392/EEC (EMC)<br>Std: _____                     | <input type="checkbox"/> VCCI: Class <input type="checkbox"/> A <input type="checkbox"/> B                                     |
| <input type="checkbox"/> Medical Device Directive 93/42/EEC (EMC)<br>Std: _____                 | <input type="checkbox"/> BSMI: Class <input type="checkbox"/> A <input type="checkbox"/> B                                     |
| <input type="checkbox"/> Vehicle Directive 72/245/EEC (EMC)<br>Std: _____                       | <input type="checkbox"/> Canada: Class <input type="checkbox"/> A <input type="checkbox"/> B                                   |
| <input type="checkbox"/> FDA Reviewers Guidance for Premarket<br>Notification Submissions (EMC) | <input type="checkbox"/> Australia: Class <input type="checkbox"/> A <input type="checkbox"/> B                                |
|   | <input type="checkbox"/> Other: _____  |

## EMC Test Plan and Constructional Data Form

### TÜV Product Service Certification Requested

- Attestation of Conformity (AoC)
  EMC Certification (used with Octagon Mark)
  Certificate of Conformity (CoC)
  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, TÜV 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.

### EUT Specifications and Requirements

Length: 2.5 cm Width: 1.5 cm Height: 1.0 cm Weight: 3.5 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 volt (battery powered) (If battery powered, make sure battery life is sufficient to complete testing.)

# of Phases: \_\_\_\_\_

Current (Amps/phase(max)): < 25uA Current (Amps/phase(nominal)): \_\_\_\_\_

Other \_\_\_\_\_

### Other Special Requirements

N/A

### Typical Installation and/or Operating Environment

(ie. Hospital, Small Business, Industrial/Factory, etc.)  
animal laboratory in industry, hospital, or academia

### EUT Power Cable

- Permanent OR  Removable Length (in meters): \_\_\_\_\_  
 Shielded OR  Unshielded  
 Not Applicable

EMC Test Plan and Constructional Data Form



EUT Interface Ports and Cables												
Interface			Shielding									
Type	Analog	Digital	Qty	Yes	No	Type	Termination	Connector Type	Port Termination	Length (in meters)	Removable	Permanent
<b>EXAMPLE:</b> RS232	<input type="checkbox"/>	<input checked="" type="checkbox"/>	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Foil over braid	Coaxial	Metallized 9-pin D-Sub	Characteristic Impedance	6	<input checked="" type="checkbox"/>	<input type="checkbox"/>
N/A	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>



# 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			

**EMC Test Plan and Constructional Data Form**



<b>Support Equipment</b> -- List and describe all support equipment which is not part of the EUT. (i.e. peripherals, simulators, etc)			
<i>Description</i>	<i>Model #</i>	<i>Serial #</i>	<i>FCC ID #</i>
AM broadcast receiver to verify operation of the implant			

<b>Oscillator Frequencies</b>			
<i>Frequency</i>	<i>Derived Frequency</i>	<i>Component # / Location</i>	<i>Description of Use</i>
0.2 to 1.0 kHz			

<b>Power Supply</b>			
<i>Manufacturer</i>	<i>Model #</i>	<i>Serial #</i>	<i>Type</i>
N/A			<input type="checkbox"/> Switched-mode: (Frequency) _____ <input type="checkbox"/> Linear <input type="checkbox"/> Other: _____
			<input type="checkbox"/> Switched-mode: (Frequency) _____ <input type="checkbox"/> Linear <input type="checkbox"/> Other: _____

<b>Power Line Filters</b>		
<i>Manufacturer</i>	<i>Model #</i>	<i>Location in EUT</i>
N/A		

Form

# EMC Test Plan and Constructional Data Form



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

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

N/A

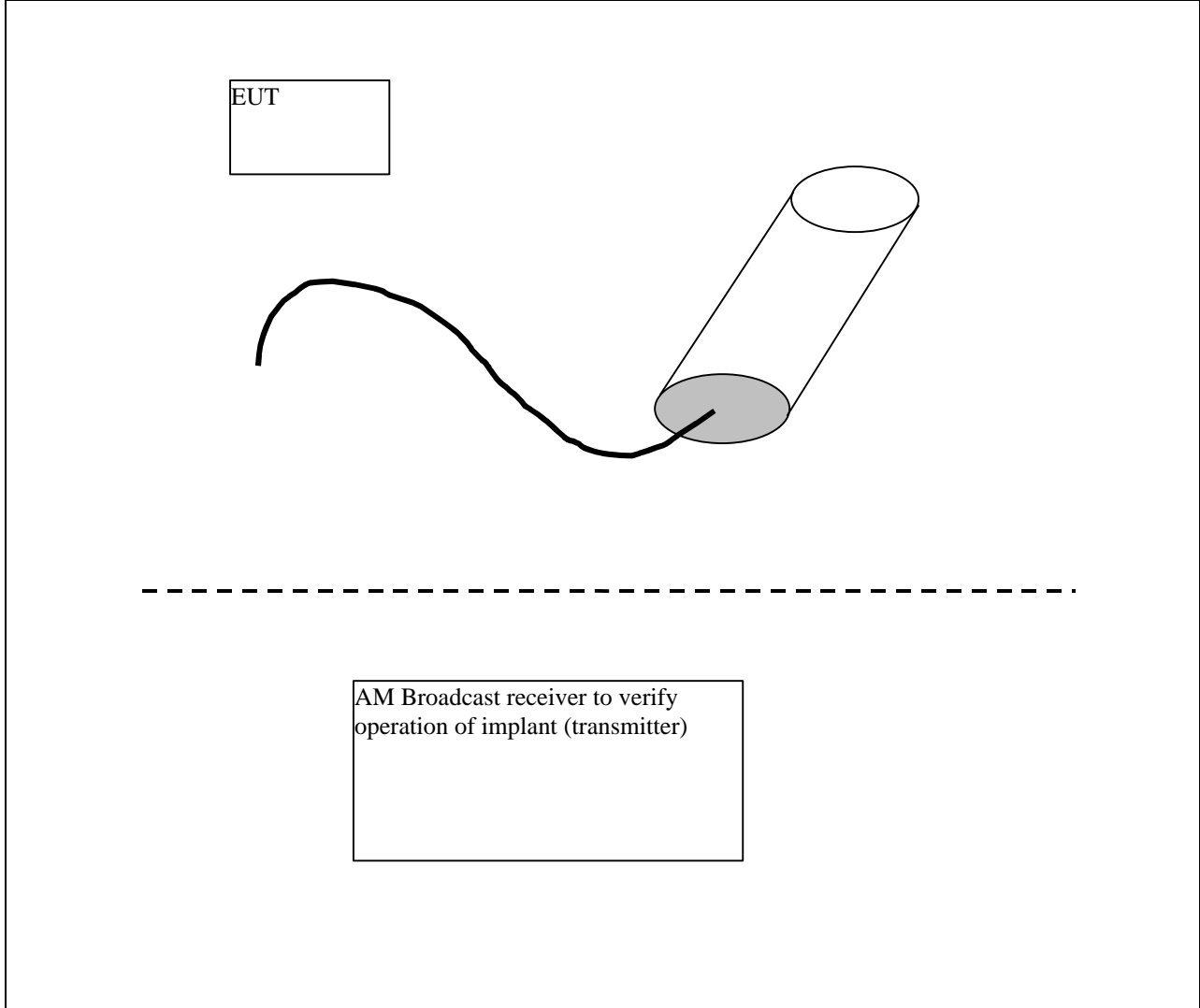
(PLEASE INSERT "ELECTRONIC SIGNATURE" BELOW IF POSSIBLE)

**Authorization Signatures**

Perry Mills	10/26/01
Customer authorization to perform tests according to this test plan.	Date
Perry Mills	10/26/01
Test Plan/CDF Prepared By (please print)	Date
Reviewed by TÜV Product Service Associate	Date

# 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

Perry Mills

10/26/01

Customer authorization to perform tests according to this test plan.

Date

Perry Mills

10/26/01

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  $\pm 4.5$  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  $\text{dB}\mu\text{V}$ , is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the FCC limit.

To convert between  $\text{dB}\mu\text{V}$  and  $\mu\text{V}$ , the following conversions apply:

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

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

### RADIATED EMISSIONS

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

Example:

FREQ (MHz)	LEVEL ( $\text{dB}\mu\text{V}$ )	CABLE/ANT/PREAMP (dB) (dB/m) (dB)	FINAL ( $\text{dB}\mu\text{V}/\text{m}$ )	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

## 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  $\Omega$ /50  $\mu$ 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. 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.