

TEST RESULT SUMMARY

FCC Part 15 Subpart C Section 15.209

IC RSS-210 Issue 6

IC RSS-Gen Issue 1

MANUFACTURER'S NAME	Data Sciences International
NAME OF EQUIPMENT	Quad ET Small Animal 8 MHz transmitter Quad ET Large Animal 8 MHz transmitter
MODEL NUMBER(S) TESTED	TM-S1 TM-L1
MANUFACTURER'S ADDRESS	4358 West Round Lake Rd. Arden Hills, MN 55112
TEST REPORT NUMBER	WC605350.1
TEST DATE(S)	19 September 2006

According to testing performed at TÜV America Inc, the above mentioned unit is in compliance with the applicable electromagnetic compatibility (EMC) portions of the requirements defined in FCC Part 15 Subpart C Section 15.209 and Industry Canada RSS-210 Issue 6 and RSS-Gen Issue 1.

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.

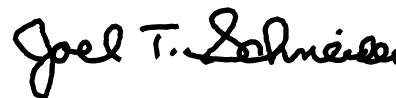
TÜV America Inc, as an independent testing laboratory, declares that the equipment tested as specified above conforms to the applicable EMC requirements of FCC Part 15 Subpart C Section 15.209 "*Radiated emission limits; general requirements*" and IC RSS-210 Issue 6 "*Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment*" and IC RSS-Gen "*General Requirements and Information for the Certification of Radiocommunication Equipment*".

Date: 25 October 2006

Location: Taylors Falls MN
USA



Michael Schultz
EMC Technician



Joel Schneider
Sr. EMC Engineer

Not Transferable

EMC TEST REPORT

Test Report File No. : **WC605350.1** Date of issue: 25 October 2006

Model / Serial No(s) Tested : TM-S1 / 5
TM-L1 / 124

Product Type : Quad ET Small Animal 8 MHz transmitter
Quad ET Large Animal 8 MHz transmitter

Applicant : Data Sciences International

Manufacturer : Data Sciences International

License holder : Data Sciences International

Address : 4358 West Round Lake Rd.
Arden Hills, MN 55112

Test Result : ☒ Positive ☐ Negative

Test Project Number
References : **WC605350.1**

Total pages including
Appendices : **26**

TÜV America 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 America Inc shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV America 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, NIST, or any agency of the US government.

TÜV America Inc and its professional staff hold government and professional organization certifications and are members of AAMI, ACIL, AEA, ANSI, IEEE, NARTE, and VCCI.

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Sign Explanations:

- ☐ - not applicable
- ☒ - applicable

EMC TEST REGULATIONS:

The tests were performed according to the following regulations :

- ☐ - EN 50081-1 / 1991
- ☐ - EN 55014-2: 1997 + Amendment A1: 2001 - Category ____
- ☐ - EN 55024: 1998 + Amendments A1: 2001 + A2: 2003
- ☐ - EN 60601-1-2: 2001
- ☐ - EN 61000-6-1: 2001
- ☐ - EN 61000-6-2: 2001
- ☐ - EN 61326: 1997 + Amendments A1: 1998 + A2: 2001 + A3: 2003
- ☐ - EN 61800-3: 1996 + Amendment A11: 2000
- ☐ - ETS 300 683: 1997
- ☐ - ETS 300 683: 1997
- ☐ - ETSI EN 301 489-3 V1.4.1: 2002
- ☐ - EN 300 220-3 V1.1.1
- ☐ - EN 300 330-2 V1.1.1
- ☐ - FCC Part 15 Subpart C Section 15.249
- ☒ - FCC Part 15 Subpart C Section 15.209
- ☒ - IC RSS-210 Issue 6
- ☒ - IC RSS-Gen Issue 1
- ☐ - IC RSS-Gen Issue 1

ENVIRONMENTAL CONDITIONS IN THE LAB

Temperature:	<u>Actual</u> : 19 °C
Atmospheric pressure	: 98 kPa
Relative Humidity	: 40 %

POWER SUPPLY UTILIZED

Power supply system : 3.6 VDC Battery

General field strength limits 0.009 – 30 MHz

FCC 15.209(a), FCC 15.209(c), IC RSS-210 2.6

Test summary

The requirements are: ☒ - MET ☐ - NOT MET

Minimum margin of compliance of the fundamental is 47.4 dB at 8 MHz

Minimum margin of compliance for spurious / harmonics is 72.1 dB at 16 MHz

No unwanted emissions exceed the level of the fundamental

Test location

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

☒ - Wild River Lab Small Test Site (Open Area Test Site)

Test distance

☒ - 0.3 meters

☒ - 1.0 meters

☒ - 3 meters

☐ - 10 meters

Test equipment

TUV ID	Model Number	Manufacturer	Description	Serial Number	Cal Due
3800	ESCS 30	Rohde & Schwarz	EMI Receiver	100312	07-Jul 07
2517	HFH2-Z2	Polorad	Loop Antenna	879285/036	30-May-07

Test limit

Frequency (MHz)	Field strength $\mu\text{V/m}$	Measurement distance (m)
0.009-0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30	30	30

At the 8 MHz fundamental & 16 MHz 2nd harmonic, the limit is 29.5 dB $\mu\text{V/m}$ at 30 meters

Test data

Quasi peak (dB $\mu\text{V/m}$)

Quad ET Small Animal 8 MHz transmitter

(MHz)	0.3 m	1.0 m	3.0 m	10.0m	30 m*
8	57	34	nf	-	-23*
16	30	nf	-	-	-50*

Quad ET Large Animal 8 MHz transmitter

(MHz)	0.3 m	1.0 m	3.0 m	10.0m	30 m*
8	62.1	39	nf	-	-17.9*
16	37.4	nf	-	-	-42.6*

* Extrapolated values using 40 dB per decade roll off

nf Noise floor

Radiated Emissions 30 - 1000 MHz

FCC 15.209(c), FCC 15.209(f), IC RSS-210 2.6

Test summary

The requirements are: ☒ - MET ☐ - NOT MET
 Minimum margin of compliance is >10dB below the limit from 30 – 1000 MHz
 No emissions were detected from 30 – 1000 MHz
 No unwanted emissions exceed the level of the fundamental

Test location

☐ - Wild River Lab Large Test Site (Open Area Test Site)
☒ - Wild River Lab Small Test Site (Open Area Test Site)

Test distance

☒ - 3 meters
☐ - 10 meters

Test Equipment

TUV ID	Model Number	Manufacturer	Description	Serial Number	Cal Due
3995	EM-6917B	Electro-Metrics	Biconicalog Periodic	151	31-Mar-07
2679	85650A	Hewlett-Packard	Quasi-Peak Adapter	2430A00550	23-Nov-06
8052	8566B	Hewlett-Packard	Spectrum Analyzer	2115A00853	28-Mar-07
8051	85662A	Hewlett-Packard	Analyzer Display	2112A02220	28-Mar-07
2665	ZHL-1042J	Mini-Circuits	Preamplifier 30 - 5000 MHz	32296	Code B

Cal Code B = Calibration verification performed internally.

Test limits

Frequency (MHz)	Field strength (μV/m)	Field strength (dBμV/m)	Measurement distance (m)
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

Test data

Pages 6 - 8

RADIATED EMISSIONS



Test Report #: WC605350 Run 1 Test Area: STS
EUT Model #: QUAD ET 8 MHz Tx Date: 9/19/2006
EUT Serial #: 5 (small animal), 124 (large) EUT Power: 3.6 V battery Temperature: 19.0 °C
Test Method: FCC B Air Pressure: 98.0 kPa
Customer: Transoma Medical Rel. Humidity: 40.0 %

EUT Description: (124 - Large Animal) (5 - Small Animal)

Notes: Testing both large & small animal versions

Data File Name: 5350.dat

Page: 1 of 3

List of measurements for run #: 1

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC-B <1GHz 3m	DELTA2
Checking S/N 00124 Large Animal (8 MHz)						
Noise floor						
40.0 MHz	30.65 Qp	1.02 / 16.13 / 28.37 / 0.0	19.43	V / 1.00 / 0	-20.57	n/a
No emissions detected 30 - 1000 MHz, 1- 4 meters V/H, 360 degrees						
Checking S/N 5 Small Animal (8 MHz)						
Noise floor						
40.0 MHz	30.8 Qp	1.02 / 16.13 / 28.37 / 0.0	19.58	V / 1.00 / 0	-20.42	n/a
No emissions detected 30-1000 MHz 1-4 meters V/H, 360 degrees						

Tested by: Michael Schultz

Printed

Signature

Reviewed by: Greg Jakubowski

Printed

Signature

RADIATED EMISSIONS



Test Report #: WC605350 Run 1 Test Area: STS

EUT Model #: QUAD ET 8 MHz Tx Date: 9/19/2006

EUT Serial #: 5 (small animal), 124 (large) EUT Power: 3.6 V battery Temperature: 19.0 °C

Test Method: FCC B Air Pressure: 98.0 kPa

Customer: Transoma Medical Rel. Humidity: 40.0 %

EUT Description: (124 - Large Animal) (5 - Small Animal)

Notes: Testing both large & small animal versions

Data File Name: 5350.dat Page: 2 of 3

Measurement summary for limit1: FCC-B <1GHz 3m (Qp)

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC-B <1GHz 3m
40.0 MHz	30.8 Qp	1.02 / 16.13 / 28.37 / 0.0	19.58	V / 1.00 / 0	-20.42

Tested by: Michael Schultz

Printed

Signature

Reviewed by: Greg Jakubowski

Printed

Signature

RADIATED EMISSIONS



Test Report #: WC605350 Run 1 Test Area: STS

EUT Model #: QUAD ET 8 MHz Tx Date: 9/19/2006

EUT Serial #: 5 (small animal), 124 (large) EUT Power: 3.6 V battery Temperature: 19.0 °C

Test Method: FCC B Air Pressure: 98.0 kPa

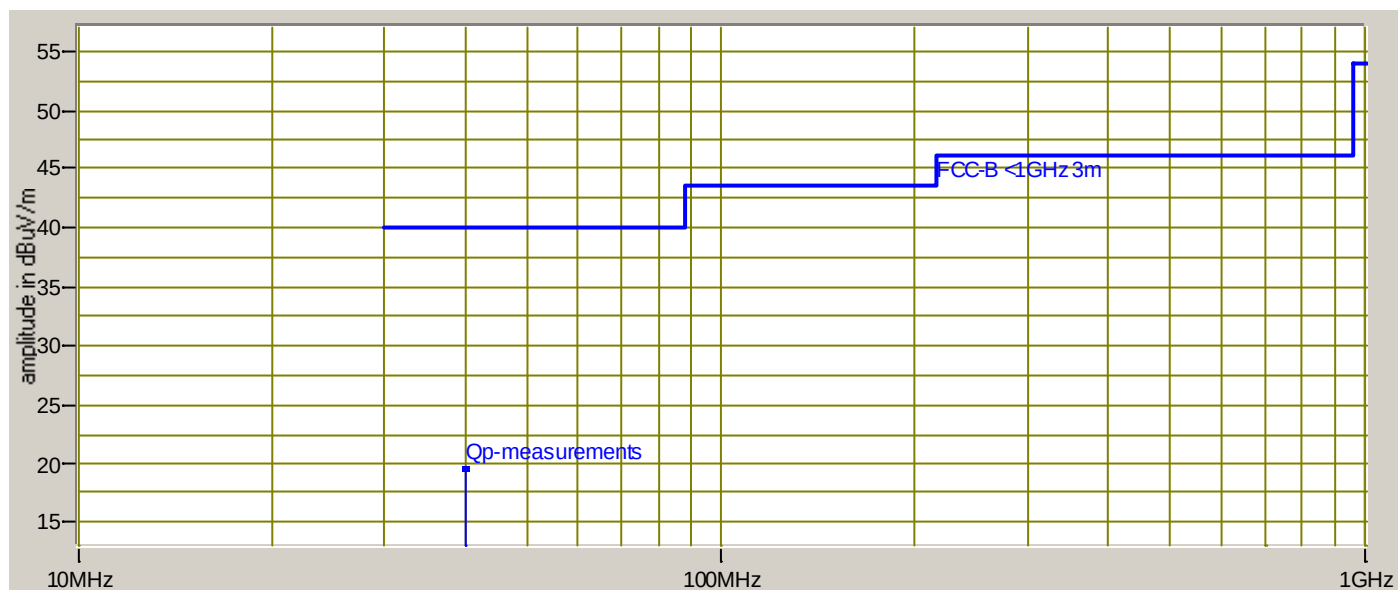
Customer: Transoma Medical Rel. Humidity: 40.0 %

EUT Description: (124 - Large Animal) (5 - Small Animal)

Notes: Testing both large & small animal versions

Data File Name: 5350.dat Page: 3 of 3

Graph:



Tested by: Michael Schultz

Printed

Michael Schultz

Signature

Reviewed by: Greg Jakubowski

by:

Printed

Greg Jakubowski

Signature

Occupied bandwidth

RSS-Gen 4.4.1

Test summary

The requirements are: ■ - MET □ - NOT MET

Maximum occupied bandwidth = 587 kHz

Test location

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

■ - Wild River Lab Small Test Site (Open Area Test Site)

Test equipment

TUV ID	Model Number	Manufacturer	Description	Serial Number	Cal Due
3367	E4440A	Agilent	Spectrum Analyzer	MY42510439	14 Sep 07
	7405-901	EMCO	Near field probe	na	Code Y

Cal Code B = Calibration verification performed internally. Cal Code Y = Calibration not required when used with other calibrated equipment.

Test limit

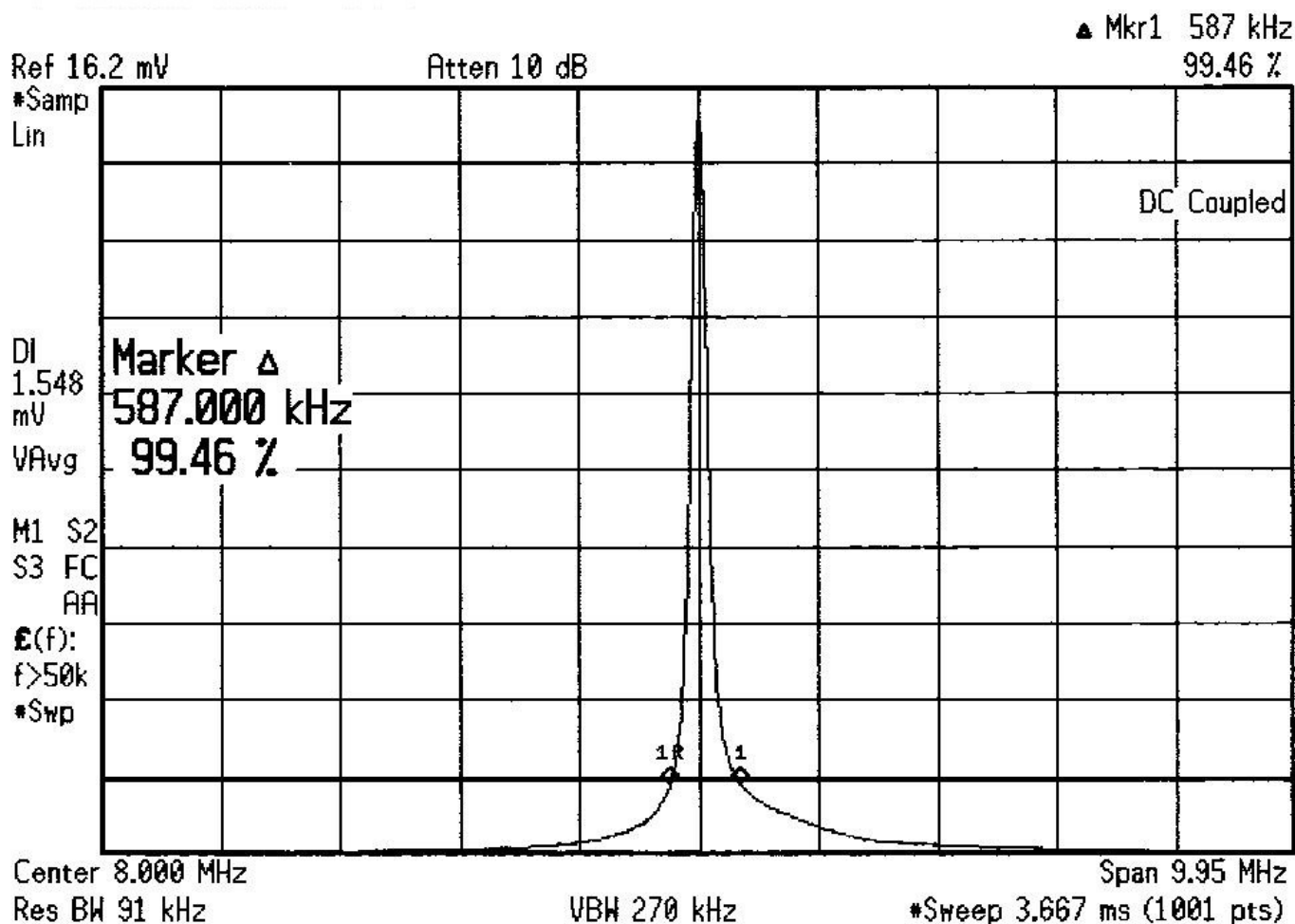
No limit specified

Test data

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Occupied Bandwidth

Quad ET Small Animal 8 MHz transmitter



Occupied Bandwidth Quad ET Large Animal 8 MHz transmitter

▲ Mkr1 547 kHz
98.49 %

Ref 16.2 mV

Atten 10 dB

#Samp
Lin

DI
1.463
mV
VAvg

Marker Δ
547.000 kHz
98.49 %

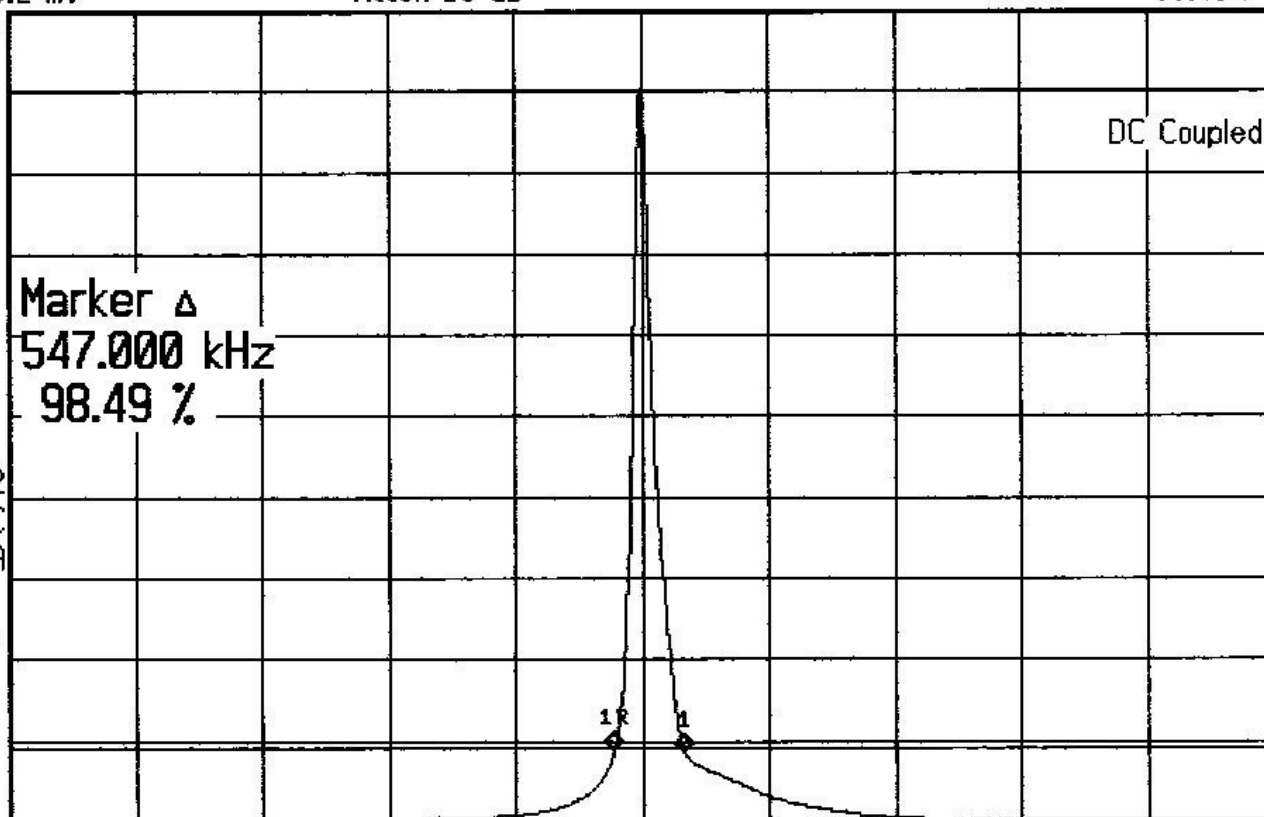
V1 S2
S3 FC
AA

E(f):
f>50k
*Swp

Center 8.000 MHz
Res BW 91 kHz

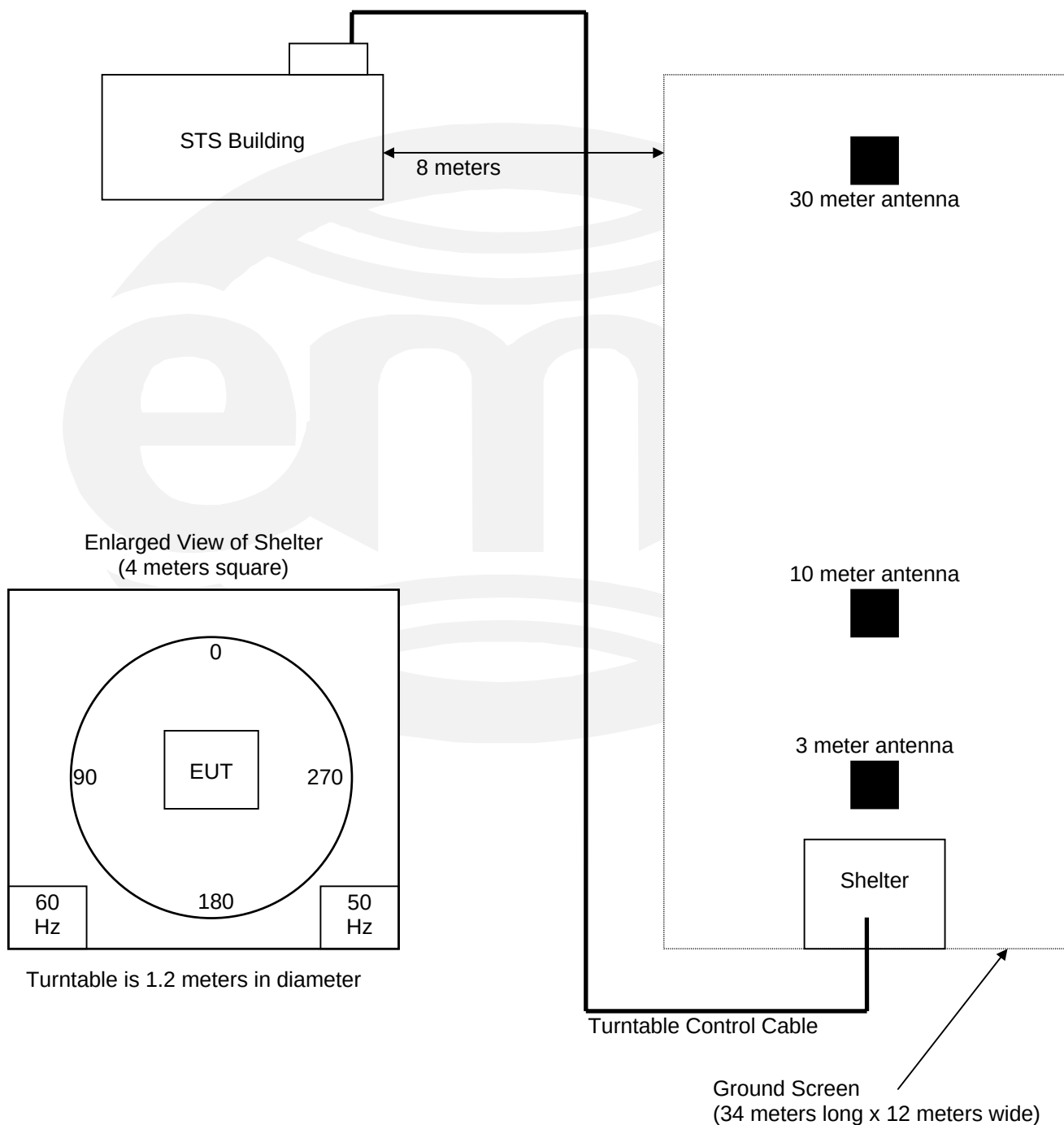
VBW 270 kHz

Span 9.95 MHz
*Sweep 3.667 ms (1001 pts)



TEST SETUP FOR EMISSIONS TESTING

WILD RIVER LAB
Small Test Site (STS)



Test-setup photo(s):
General Field Strength Limits 0.009 – 30 MHz



Test-setup photo(s):
Radiated Emissions 30 - 1000 MHz



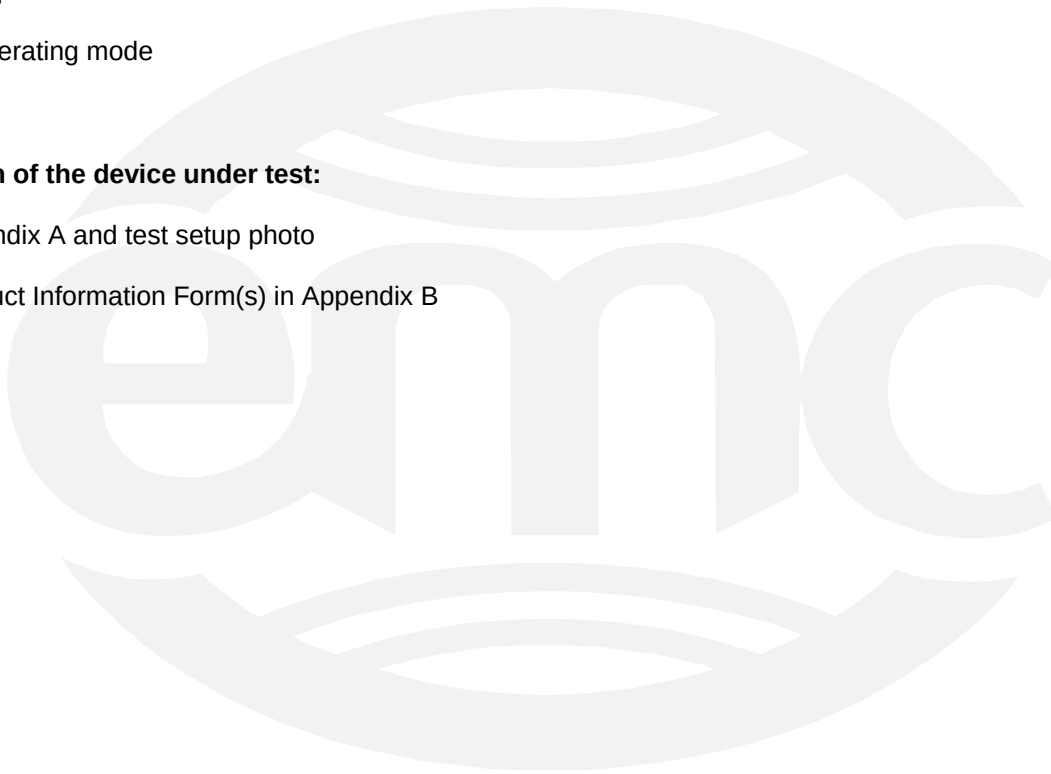
Equipment Under Test (EUT) Test Operation Mode:

The device under test was operated under the following conditions during immunity 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 Appendix A and test setup photo
- ☐ - See Product Information Form(s) in Appendix B



DEVIATIONS FROM STANDARD:

None.

GENERAL REMARKS:

Modifications required to pass:

- ☒ None
- ☐ As indicated on the data sheet(s)

Test Specification Deviations: Additions to or Exclusions from:

- ☒ None
- ☐ As indicated in the Test Plan

SUMMARY:

The requirements according to the technical regulations are

- ☒ - met and the device under test does fulfill the general approval requirements.
- ☐ - **not** met and the device under test does **not** fulfill the general approval requirements..

EUT Received Date: 19 September 2006

Condition of EUT: Normal

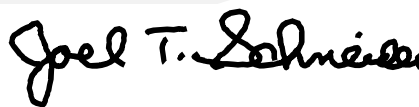
Testing Start Date: 19 September 2006

Testing End Date: 19 September 2006

TÜV AMERICA INC



Michael Schultz
EMC Technician



Joel Schneider
Sr. EMC Engineer

Appendix A

Constructional Data Form

and

Block Diagram





EMC Test Plan and Constructional Data Form

PLEASE COMPLETE THIS DOCUMENT IN FULL, ENTERING N/A IF THE FIELD IS NOT APPLICABLE. IF TESTING RESULTS IN MODIFICATIONS TO THE EQUIPMENT, PLEASE SUBMIT A REVISED TP/CDF INDICATING THOSE MODIFICATIONS.
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 Internstionsl
 Address: 4358 West Round Lake Rd.
Arden Hills, MN 55112
 Contact: Tom Bredemus Position: Senior Designer
 Phone: 651-481-7410 x2335 Fax: 651-481-7416
 E-mail Address: tbredemus@transomamedical.com

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

EUT Description Transmitter
The battery powered transmitter when enabled transmits telemetry data at 8 MHz

EUT Name Quad ET Small Animal 8 MHz transmitter; Quad ET Large Animal 8 MHz transmitter

Model No.: TM-S1 Serial No.: 5
TM-L1 124

Product Options:

Configurations to be tested: Small animal and large animal 8 MHz transmitters. A 4NET sensor module will be attached to the Telemetry Module providing for highest data rate conditions.

Equipment Modification (If applicable, indicate modifications since EUT was last tested. If modifications are made during this testing, submit revised TP/CDF after testing is complete.)

Modifications since last test: _____
 Modifications made during test: _____

Test Objective(s): Please indicate the tests to be performed, entering the applicable standard(s) where noted.

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



EMC Test Plan and Constructional Data Form

America

Third Party Certification, if applicable (*Signature on Page 6 Required)

- | | |
|--|---|
| ☐ 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 |
| <small>(Press F1 when field is selected to show additional information on Protection Class.)</small> | |
| ☐ FCC / TCB Certification | ☐ Industry Canada / FCB Certification |
| ☐ E-Mark Certification | ☐ Taiwan Certification |

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 America 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: _____ Width: _____ Height: _____ Weight: _____

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

of Phases: _____

Current (Amps/phase(max)): _____ Current (Amps/phase(nominal)): _____

Other _____

Other Special Requirements

Typical Installation and/or Operating Environment

(ie. Hospital, Small Business, Industrial/Factory, etc.)
Research lab, university labs

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														
Type	Analog	Digital	During Test		Qty	Shielding		Termination	Connector Type	Port Termination	Length tested (in meters)	Removable	Permanent	
			Active	Passive		Yes	No							Type
EXAMPLE: RS232	☐	☒	☒	☐	2	☒	☐	Foil over braid	Coaxial	Metallized 9-pin D-Sub	Characteristic Impedance	6	☒	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
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	☐	☐	☐	☐		☐	☐						☐	☐

**EMC Test Plan and Constructional Data Form****EUT Software.**

Revision Level:

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.

2.

3.

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

Description	Model #	Serial #	FCC ID #
Quad ET Small Animal 8 MHz TX	TM-S1	5	
Quad ET Large Animal 8 MHz TX	TM-L1	124	



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)
This information is required for FCC & Taiwan testing.

<i>Description</i>	<i>Model #</i>	<i>Serial #</i>	<i>FCC ID #</i>
DSI Quad ET Sensor Module	4NET	008	

Oscillator Frequencies

<i>Frequency</i>	<i>Derived Frequency</i>	<i>Component # / Location</i>	<i>Description of Use</i>

Power Supply

<i>Manufacturer</i>	<i>Model #</i>	<i>Serial #</i>	<i>Type</i>
			☐ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____
			☐ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____

Power Line Filters

<i>Manufacturer</i>	<i>Model #</i>	<i>Location in EUT</i>



EMC Test Plan and Constructional Data Form

Critical EMI Components (Capacitors, ferrites, etc.)

<i>Description</i>	<i>Manufacturer</i>	<i>Part # or Value</i>	<i>Qty</i>	<i>Component # / Location</i>

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

(PLEASE INSERT "ELECTRONIC SIGNATURE" BELOW IF POSSIBLE)

Authorization Signatures (Signature Required for Certifications checked on pg 1)

Customer authorization to perform tests
according to this test plan.

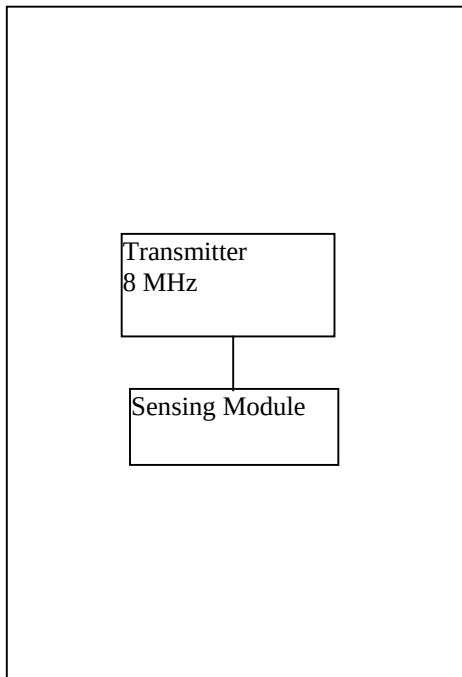
Date

Test Plan/CDF Prepared By (please print)

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

Customer authorization to perform tests
according to this test plan.

Date

Test Plan/CDF Prepared By (please print)

Date

Appendix B

Measurement Protocol



MEASUREMENT PROTOCOL

GENERAL INFORMATION

Test Methodology

Emissions testing is performed according to the procedures in ANSI C63.4-2003.

Measurement Uncertainty

The test system for conducted emissions is defined as the LISN, tuned receiver or spectrum analyzer, and coaxial cable. The test system has a measurement uncertainty of ± 1.8 dB. The test system for radiated emissions is defined as the antenna, the pre-amplifier, the spectrum analyzer and the coaxial cable. The test system has a measurement uncertainty of ± 4.8 dB. The equipment comprising the test systems is 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.

Conducted Emissions

The final level, in dB μ V, equals the EMI receiver level plus the cable loss and LISN factor.

Radiated Emissions

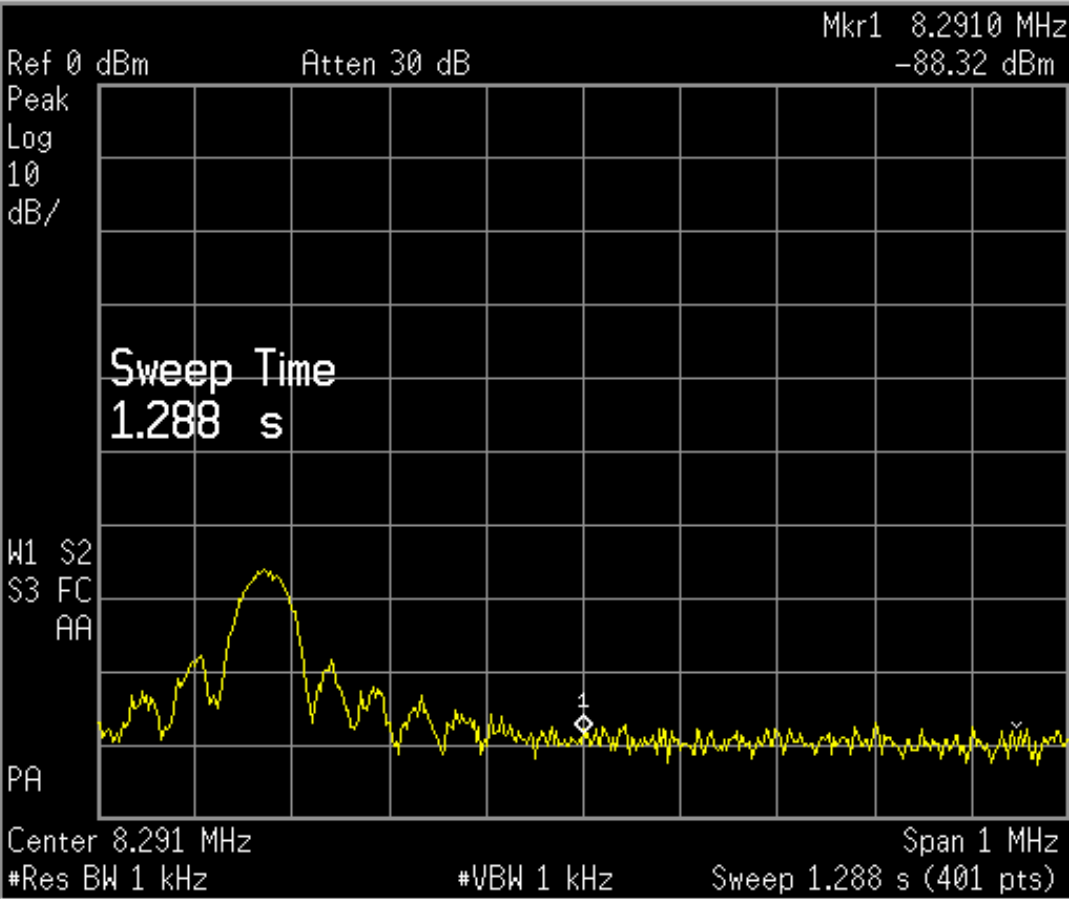
The final level, in dB μ V/m, equals the reading from the spectrum analyzer (Level dB μ V), adding the antenna correction factor and cable loss factor (Factor dB) to it, and subtracting the preamp gain (and duty cycle correction factor, if applicable). This result then has the limit subtracted from it to provide the Delta, which gives the tabular data as shown in the data sheets in Attachment A.

Example:

FREQ (MHz)	LEVEL (dB μ V)	CABLE/ANT/PREAMP			FINAL (dB μ V/m)	POL/HGT/AZ			DELTA1
		(dB)	(dB/m)	(dB)		(m)	(deg)		
60.80	42.5Qp +	1.2	+ 10.9	- 25.5 =	29.1	V	1.0	0.0	-10.9

Test Equipment

All measurement instrumentation is traceable to the National Institute of Standards and Technology and is calibrated according to internal procedure.



Sweep

Sweep Time

1.288 s

Auto

Man

Sweep

Single

Cont

**Auto Sweep
Coupling**

SR

SA

Points

401

Segmented