EMISSIONS TEST REPORT
RF EXPOSURE TECHNICAL BRIEF

Report Number: 3114493BOX-001b
Project Number: 3114493

Testing performed on the

Merlin Antenna

Model: 3638

To

FCC Part 95 Subpart I
IC RSS-243 Issue 2 November 2005
IC RSS-102 Issue 2 November 2005

For

St. Jude Medical AB

Test Performed by:	Test Authorized by:
Intertek – ETL SEMKO	St. Jude Medical AB
70 Codman Hill Road	175 84 Järfälla
Boxborough, MA 01719	Stockholm, Sweden

Prepared by: _____ Date: 4/11/2007
Nicholas Abbondante

Reviewed by: _____ Date: 4-11-2007
Roland W. Gubisch

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to copy or distribute this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program. This report must not be used to claim product endorsement by A2LA, NIST nor any other agency of the U.S. Government.

1.0 Job Description

1.1 Client Information

This EUT has been tested at the request of:

Company:	St. Jude Medical AB SE-175 84 Järfälla, Sweden
Contact:	Hans Andersen
Telephone:	+46 8 474 4567
Fax:	+46 8 761 2905
Email:	handersen@sjm.com

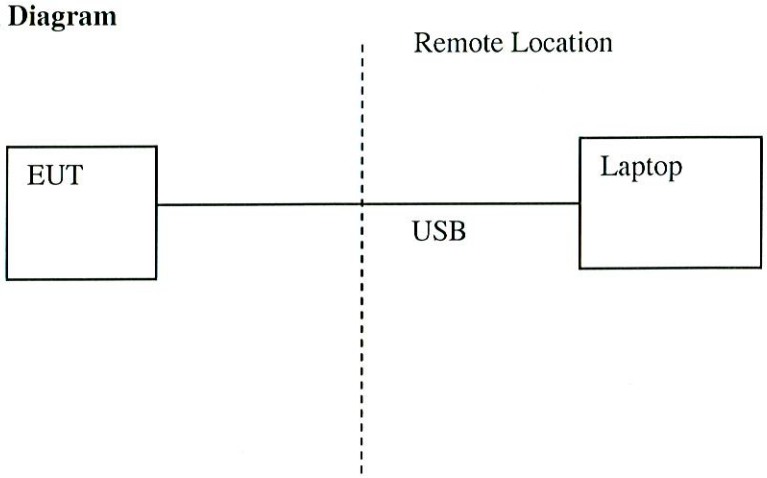
1.2 Equipment Under Test

Equipment Type:	Merlin Antenna
Intended FCC ID:	RIASJMRFANT
Model Number(s):	3638
Serial number(s):	85200001, 85200093
Manufacturer:	St. Jude Medical
EUT receive date:	01/15/2007
EUT received condition:	Prototype in Good Condition
Test start date:	01/18/2007
Test end date:	01/25/2007

1.3 Test Plan Reference: Tested according to the standards listed.

1.4 Test Configuration

1.4.1 Block Diagram



1.4.2. Cables:

Cable	Shielding	Connector	Length (m)	Qty.
USB	Braid	Metal/USB	2	1

1.4.3. Support Equipment:

Name: Laptop Computer
Model No.: Dell Latitude
Serial No.: WS2330

1.5 Mode(s) of Operation:

The EUT was activated from a fresh battery and was transmitting a modulated carrier during testing, except during frequency error testing where a CW signal was transmitted. Channel 5 (403.65 MHz) was utilized for testing unless otherwise indicated.

2.0 Test Summary

TEST STANDARD	RESULTS	
FCC Part 95 Subpart I **IC RSS-243 Issue 2 September 2005** **IC RSS-102 Issue 2 November 2005**		
SUB-TEST	**TEST PARAMETER**	**COMMENT**
Effective Radiated Power FCC §95.639(f), RSS-243 Section 5.4	The maximum effective radiated power is 25μW or 18.2 mV/meter at 3m test distance (85.2 dBμV/m at 3m).	Pass

REVISION SUMMARY – The following changes have been made to this Report:

Date	Project No.	Project Handler	Page(s)	Item	Description of Change

3.0 Sample Calculations

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG
Where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dBμV
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
FS = 32 dBμV/m

Level in μV/m = [10(32 dBμV/m)/20] = 39.8 μV/m

The following is how net line-conducted readings were determined:

NF = RF + LF + CF + AF
Where NF = Net Reading in dBμV
RF = Reading from receiver in dBμV
LF = LISN Correction Factor in dB
CF = Cable Correction Factor in dB
AF = Attenuator Loss Factor in dB

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV

Example:

NF = RF + LF + CF + AF = 28.5 + 0.2 + 0.4 + 20.0 = 49.1 dBμV
$UF = 10^{(48.1\ dB\mu V / 20)}$ = 254 μV/m

3.1 Measurement Uncertainty

Compliance of the product is based on the measured value. However, the measurement uncertainty is included for informational purposes.
The expanded uncertainty (k = 2) for radiated emissions from 30 to 1000 MHz has been determined to be:

±3.5 dB at 10m, ±3.8 dB at 3m

The expanded uncertainty (k = 2) for mains conducted emissions from 150 kHz to 30 MHz has been determined to be:

±2.6 dB

The expanded uncertainty (k = 2) for telecom port conducted emissions from 150 kHz to 30 MHz has been determined to be:

±3.2 for ISN and voltage probe measurements
±3.1 for current probe measurements

3.2 Site Description

Test Site(s): 2

Our OATS are 3m and 10m sheltered emissions measurement ranges located in a light commercial environment in Boxborough, Massachusetts. They meet the technical requirements of ANSI C63.4-2003 and CISPR 22:1993/EN 55022:1994 for radiated and conducted emission measurements. The shelter structure is entirely fiberglass and plastic, with outside dimensions of 33 ft x 57 ft. The structure resembles a quonset hut with a center ceiling height of 16.5 ft.

The testing floor is covered by a galvanized sheet metal groundplane that is earth-grounded via copper rods around the perimeter of the site. The joints between individual metal sheets are bridged with a 2 inch wide metal strips to provide low RF impedance contact throughout. The sheets are screwed in place with stainless steel, round-head screws every three inches. Site illumination and HVAC are provided from beneath the ground reference plane through flush entry ports, the port covers are electrically bonded to the ground plane.

A flush metal turntable with 12 ft. diameter and 5000 lb. load capacity (12,000 lb. in Site 3) is provided for floor-standing equipment. A wooden table 80 cm high is used for table-top equipment. The turntable is electrically connected to the ground plane with three copper straps. The straps are connected to the turntable at the center of it with ground braid. The copper strap is directly connected to the groundplane at the edges of the turntable. The turntable is located on the south end of the structure and the antennas are mounted 3 and 10 meters away to the north. The antenna mast is a non-conductive with remote control of antenna height and polarization. The antenna height is adjustable from 1 to 4 meters.

All final radiated emission measurements are performed with the testing personnel and measurement equipment located below the ground reference plane. The site has a full basement underneath the turntable where support equipment may be remotely located. Operation of the antenna, turntable and equipment under test is controlled by remote controls that manipulate the antenna height and polarization and with a turntable control. Test personnel are located below the ellipse when measurements are performed, however the site maintains the ability of having personnel manipulate cables while monitoring test equipment. Ambient radiated emissions are 6 dB or more below the relevant FCC emission limits.

AC mains power is brought to the equipment under test through a power line filter, to remove ambient conducted noise. 50 Hz (240 VAC single phase), 60 Hz power (120 VAC single phase, 208 VAC three phase), and 60 Hz (480 VAC three phase) are available. Conducted emission measurements are performed with a Line Impedance Stabilization Network (LISN) or Artificial Mains Network (AMN) bonded to the ground reference plane. A removable vertical groundplane (2 meter X 2 meter area) is used for line-conducted measurements for table top equipment. The vertical groundplane is electrically connected to the reference groundplane.

The EMC Lab has two Semi-anechoic Chambers and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 400, and 480 3-Phase. Large reference groundplanes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

Test Results: Pass

Test Standard: FCC Part 95 Subpart I, IC RSS-243 Issue 2 September 2005, IC RSS-102 Issue 2 November 2005

Test: Effective Radiated Power, FCC §95.639(f), RSS-243 Section 5.4

Performance Criterion: The maximum effective radiated power is 25µW or 18.2 mV/meter at 3m test distance (85.2 dBµV/m at 3m).

Test Environment:

Environmental Conditions During Testing:		Humidity (%):	See Table	Pressure (hPa):	See Table	Ambient (°C):	See Table
Pretest Verification Performed		Yes		Equipment under Test:		3638	
Engineer's Initials:	NNA	Date Test Performed:	01/19/2007	Reviewers' Initials:	RWB.	Date Reviewed:	4-11-07

Test Equipment Used:

TEST EQUIPMENT LIST					
Item	**Equipment Type**	**Make**	**Model No.**	**Serial No.**	**Next Cal. Due**
1	Digital 4 Line Barometer	Mannix	0ABA116	BAR2	08/02/2007
2	ANTENNA	EMCO	3142	9711-1223	02/06/2008
3	Spectrum Analyzer	Agilent	E7405A	US40240205	08/16/2007
4	3 Meter In floor cable for site 2	ITS	RG214B/U	S2 3M FLR	09/26/2007

Software Utilized:

Name	Manufacturer	Version
EXCEL 2000	Microsoft Corporation	9.0.6926 SP-3
EMI BOXBOROUGH	Intertek	9/20/06 Revision

Test Details:

Special Radiated Emissions

Company: St. Jude Medical
Model #: 3638
Serial #: 85200001
Engineers: Nicholas Abbondante Location: Site 2
Project #: 3114493 Date(s): 01/19/07
Standard: FCC Part 95/IC RSS-243
Receiver: Agilent E7405A (AGL001) Limit Distance (m): 3
PreAmp: PRE8 11-14-07.txt Test Distance (m): 3
Barometer: BAR2 Temp/Humidity/Pressure: 20c 31% 994mB
PreAmp Used? (Y or N): N Voltage/Frequency: 120V/60Hz Frequency Range: 30-1000 MHz

Antenna & Cables: N Bands: N, LF, HF, SHF
LF Antenna: HORN3 V3m 6-12-07.txt HORN3 H3m 6-12-07.txt
N Antenna: LOG2 2-06-08 V3.txt LOG2 2-06-08 H3.txt
HF Antenna: HORN3 V3m 6-12-07.txt HORN3 H3m 6-12-07.txt
SHF Antenna: EMC04 V 1m 12-13-2007.txt EMC04 H 1m 12-13-2007.txt
LF Cable(s): CBL029 12-04-2007.txt CBL030 12-04-2007.txt
N Cable(s): S2 3M FLR 9-26-07.txt NONE.
HF Cable(s): CBL030 12-04-2007.txt NONE.
SHF Cable(s): CBL029 12-04-2007.txt CBL030 12-04-2007.txt

Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC
Note: Modulated Carrier													
PK	V	403.500	66.6	15.8	2.6	0.0	0.0	85.0	85.2	-0.2	300 kHz/1 MHz	RB	RB

Notes: The EUT was measured in a radiated fashion. The data obtained was adjusted for equipment losses and converted from a field strength reading to a power reading using the provisions of FCC Public Notice DA-00-705A1 and RSS-Gen 4.6. The conversion formula is:

$$EIRP = ((E*d)^2)/30$$

Where EIRP is in Watts, E is in V/m, and d is distance in meters. Given 85.0 dBuV/m for E and 3 meters for d, EIRP is therefore 94.9 uW (0.95 mW). Note that this is higher than the defined limit, as the standards state that in an Open Air Test Site over a ground plane, 18.2 mW/m (85.2 dBuV/m) is equivalent to 25 uW.

The human RF exposure limit is 1 mW/cm^2. The power density S generated by some value of EIRP at a given distance d is related by the equation:

$$S=EIRP / (4\pi d^2)$$

The distance, given a maximum EIRP of either 0.025 mW (25 uW) or 0.95 mW, at which the radiated power density of the EUT is equal to the human RF exposure limit is 0.27 cm from the antenna at 0.95 mW or 0.04 cm at the antenna at 0.025 mW. This is well within 20 cm.

The EUT is exempt from RF evaluation as referenced in RSS-102 because the operating frequency is below 1.5 GHz and the EIRP does not exceed 2.5 watts. The EUT is also exempt from SAR evaluation as the operating frequency is below 1.5 GHz and the EIRP does not exceed 200 mW.