EMISSIONS TEST REPORT

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

Testing performed on the

Merlin Antenna

Model: 3638

To

FCC Part 95 Subpart I
IC RSS-243 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: 2/16/07
Nicholas Abbondante

Reviewed by: _____ Date: 2-16-07
Roland W. Gubisch

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

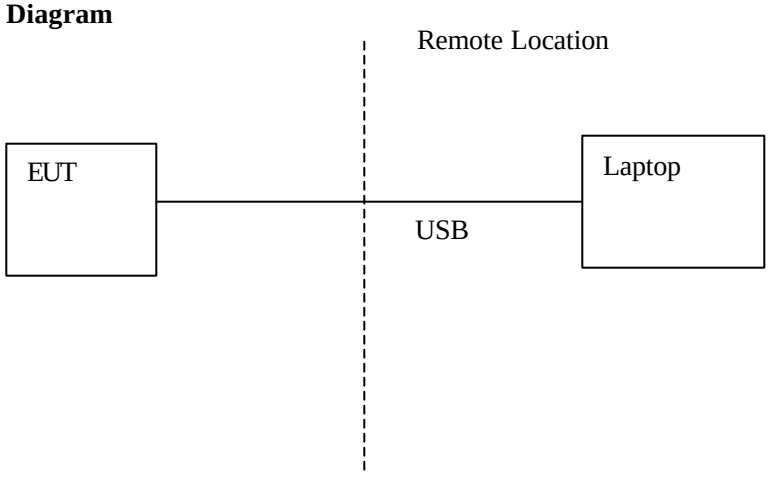
1.2 Equipment Under Test

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**		
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
Emission Bandwidth FCC §95.633(e), RSS-243 Section 5.1	The maximum bandwidth is 300 kHz.	Pass
Radiated Spurious Emissions FCC §95.635, RSS-243 Sections 5.5, 5.6	Spurious emissions more than 250 kHz removed from the MICS band (402-405 MHz) at 3 meters test distance must not exceed 40.0 dBµV/m in the range from 30-88 MHz, 43.5 dBµV/m from 88-216 MHz, 46.0 dBµV/m from 216-960 MHz, and 54.0 dBµV/m above 960 MHz. Emissions within 250 kHz of the MICS band must be attenuated by at least 20 dB below the maximum permitted output power, using an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth. Emissions within the MICS band more than 150 kHz away from the center frequency of the spectrum the transmission is intended to occupy, will be attenuated below the transmitter output power by at least 20 dB, using an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth.	Pass
Frequency Error FCC §95.628(e), RSS-243 Section 5.3	The carrier frequency must not deviate from the reference frequency by more than ±100 PPM.	Pass
MICS Operation FCC §95.628(a)(1-4), RSS-243 Section 5.7	The MICS communication sessions must meet operating requirements for System Threshold Power Levels, Monitoring System Bandwidth, Scan Cycle Time, Minimum Channel Monitoring Period, Channel Access, Discontinuation of a MICS Session, and Use of a Pre-Scanned Alternate Channel.	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

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	

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						Antenna & Cables:	N	Bands: N, LF, HF, SHF				
Model #:	3638						LF Antenna:	HORN3 V3m 6-12-07.txt	HORN3 H3m 6-12-07.txt				
Serial #:	85200001						N Antenna:	LOG2 2-06-08 V3.txt	LOG2 2-06-08 H3.txt				
Engineers:	Nicholas Abbondante			Location:	Site 2		HF Antenna:	HORN3 V3m 6-12-07.txt	HORN3 H3m 6-12-07.txt				
Project #:	3114493	Date(s):	01/19/07				SHF Antenna:	EMC04 V 1m 12-13-2007.txt	EMC04 H 1m 12-13-2007.txt				
Standard:	FCC Part 95/IC RSS-243						LF Cable(s):	CBL029 12-04-2007.txt	CBL030 12-04-2007.txt				
Receiver:	Agilent E7405A (AGL001)		Limit Distance (m):	3			N Cable(s):	S2 3M FLR 9-26-07.txt	NONE.				
PreAmp:	PRE8 11-14-07.txt		Test Distance (m):	3			HF Cable(s):	CBL030 12-04-2007.txt	NONE.				
Barometer:	BAR2	Temp/Humidity/Pressure:	20c	31%	994mB		SHF Cable(s)	CBL029 12-04-2007.txt	CBL030 12-04-2007.txt				
PreAmp Used? (Y or N):		N	Voltage/Frequency:		120V/60Hz		Frequency Range:		30-1000 MHz				
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW													
	Ant.			Antenna	Cable	Pre-amp	Distance						
Detector	Pol.	Frequency	Reading	Factor	Loss	Factor	Factor	Net	Limit	Margin	Bandwidth		
Type	(V/H)	MHz	dB(uV)	dB(1/m)	dB	dB	dB	dB(uV/m)	dB(uV/m)	dB		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

Test Results: Pass

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

Test: Emission Bandwidth, FCC §95.633(e), RSS-243 Section 5.1

Performance Criterion: The maximum bandwidth is 300 kHz.

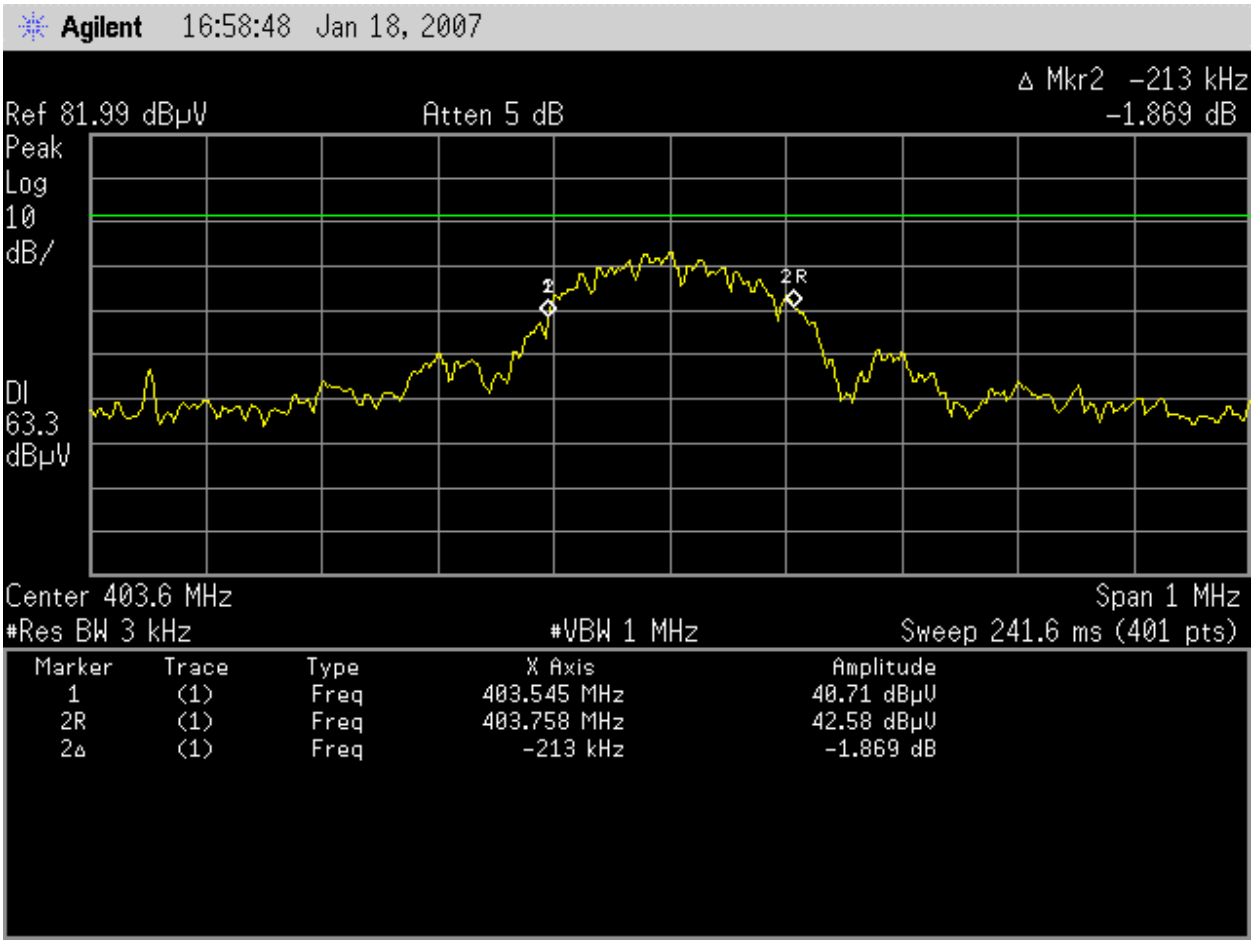
Test Environment:

Environmental Conditions During Testing:	Humidity (%):	N/A	Pressure (hPa):	N/A	Ambient (°C):	N/A
Pretest Verification Performed	Yes		Equipment under Test:		3638	

Test Equipment Used:

TEST EQUIPMENT LIST					
Item	**Equipment Type**	**Make**	**Model No.**	**Serial No.**	**Next Cal. Due**
1	Spectrum Analyzer	Agilent	E7405A	US40240205	08/16/2007

Test Details:



Notes: The 20 dB bandwidth is 213 kHz.

Test Results: Pass

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

Test: Radiated Spurious Emissions, FCC §95.635, RSS-243 Sections 5.5, 5.6

Performance Criterion: Spurious emissions more than 250 kHz removed from the MICS band (402-405 MHz) at 3 meters test distance must not exceed 40.0 dBµV/m in the range from 30-88 MHz, 43.5 dBµV/m from 88-216 MHz, 46.0 dBµV/m from 216-960 MHz, and 54.0 dBµV/m above 960 MHz.

Emissions within 250 kHz of the MICS band must be attenuated by at least 20 dB below the maximum permitted output power, using an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth.

Emissions within the MICS band more than 150 kHz away from the center frequency of the spectrum the transmission is intended to occupy, will be attenuated below the transmitter output power by at least 20 dB, using an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth.

Test Environment:

Environmental Conditions During Testing:	Humidity (%):	See Tables	Pressure (hPa):	See Tables	Ambient (°C):	See Tables
Pretest Verification Performed	Yes		Equipment under Test:		3638	

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	EMI Receiver Set W/RF Filter	Hewlett Packard	8542E	3520A00125	02/28/2007
3	RF FILTER	Hewlett Packard	85420E	3427A00126	02/28/2007
4	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	10/23/2007
5	1GHz High Pass Filter	Reactel, Inc	7HS-1G/10G-S11	06-1	09/06/2007
6	ANTENNA	EMCO	3142	9711-1223	02/06/2008
7	3 Meter In floor cable for site 2	ITS	RG214B/U	S2 3M FLR	09/26/2007
8	HORN ANTENNA	EMCO	3115	9610-4980	06/12/2007
9	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 80	CBL029	12/04/2007
10	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 80	CBL030	12/04/2007
11	Spectrum Analyzer	Agilent	E7405A	US40240205	08/16/2007
12	PREAMPLFIER 1-40 GHz	MITEQ	NSP4000-NF	507145	11/14/2007

Software Utilized:

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

Test Details:

Radiated Emissions													
Company:	St. Jude Medical						Antenna & Cables:	N	Bands: N, LF, HF, SHF				
Model #:	3638						LF Antenna:	HORN3 V3m 6-12-07.txt	HORN3 H3m 6-12-07.txt				
Serial #:	85200001						N Antenna:	LOG2 2-06-08 V3.txt	LOG2 2-06-08 H3.txt				
Engineers:	Nicholas Abbondante			Location:	Site 2		HF Antenna:	HORN3 V3m 6-12-07.txt	HORN3 H3m 6-12-07.txt				
Project #:	3114493	Date(s):	01/18/07	01/19/07	01/22/07		SHF Antenna:	EMC04 V 1m 12-13-2007.txt	EMC04 H 1m 12-13-2007.txt				
Standard:	FCC Part 95/IC RSS-243						LF Cable(s):	CBL029 12-04-2007.txt	CBL030 12-04-2007.txt				
Receiver:	HP 8542E (REC2/RECFL2)		Limit Distance (m):	3			N Cable(s):	S2 3M FLR 9-26-07.txt	NONE.				
PreAmp:	PRE8 11-14-07.txt		Test Distance (m):	3			HF Cable(s):	CBL030 12-04-2007.txt	NONE.				
Barometer:	BAR2	Temp/Humidity/Pressure:	19c	24%	1026mB		SHF Cable(s):	CBL029 12-04-2007.txt	CBL030 12-04-2007.txt				
	PreAmp Used? (Y or N):	N	Voltage/Frequency:	120V/60Hz				Frequency Range:	30-1000 MHz				
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW													

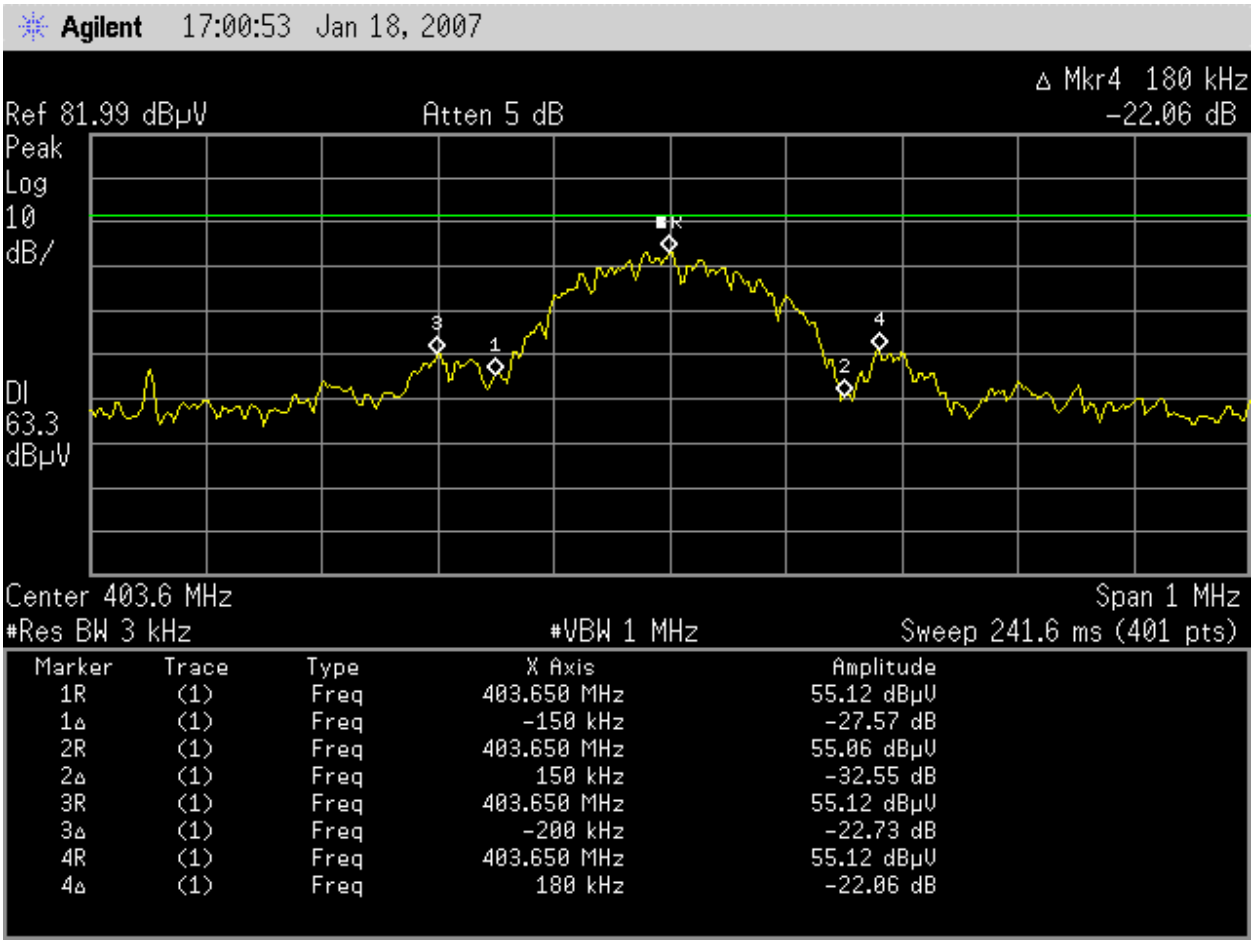
Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC
QP	V	36.000	16.7	13.5	1.0	0.0	0.0	31.1	40.0	-8.9	120/300 kHz		
QP	V	45.120	14.8	9.8	1.0	0.0	0.0	25.5	40.0	-14.5	120/300 kHz		
QP	V	48.000	22.9	8.9	0.9	0.0	0.0	32.8	40.0	-7.2	120/300 kHz		
QP	V	53.240	21.5	8.5	1.0	0.0	0.0	31.0	40.0	-9.0	120/300 kHz		
QP	V	63.300	21.5	8.3	1.1	0.0	0.0	31.0	40.0	-9.0	120/300 kHz		
QP	V	74.600	25.1	7.5	1.2	0.0	0.0	33.8	40.0	-6.2	120/300 kHz	RB	RB
QP	V	75.390	26.3	7.5	1.2	0.0	0.0	35.0	40.0	-5.0	120/300 kHz		
QP	V	84.000	26.6	7.7	1.2	0.0	0.0	35.5	40.0	-4.5	120/300 kHz		
QP	V	108.800	13.0	7.9	1.4	0.0	0.0	22.3	43.5	-21.2	120/300 kHz	RB	RB
QP	V	114.500	16.8	7.5	1.5	0.0	0.0	25.7	43.5	-17.8	120/300 kHz	RB	RB
QP	V	120.000	26.2	7.0	1.4	0.0	0.0	34.6	43.5	-8.9	120/300 kHz	RB	RB
QP	V	122.800	10.3	6.9	1.5	0.0	0.0	18.7	43.5	-24.8	120/300 kHz		RB
QP	V	126.800	17.8	6.7	1.5	0.0	0.0	25.9	43.5	-17.6	120/300 kHz	RB	RB
QP	V	132.100	25.9	6.7	1.6	0.0	0.0	34.1	43.5	-9.4	120/300 kHz	RB	RB
QP	V	138.800	17.5	7.1	1.5	0.0	0.0	26.1	43.5	-17.4	120/300 kHz		
QP	V	144.000	24.0	7.6	1.5	0.0	0.0	33.1	43.5	-10.4	120/300 kHz		
QP	V	156.000	14.0	8.4	1.7	0.0	0.0	24.2	43.5	-19.3	120/300 kHz		
QP	V	168.000	15.5	8.7	1.8	0.0	0.0	26.0	43.5	-17.5	120/300 kHz	RB	
QP	V	172.800	9.7	8.8	1.8	0.0	0.0	20.2	43.5	-23.3	120/300 kHz	RB	
QP	V	180.000	13.9	9.0	1.8	0.0	0.0	24.6	43.5	-18.9	120/300 kHz		
QP	V	185.100	7.9	9.5	2.0	0.0	0.0	19.4	43.5	-24.1	120/300 kHz		
QP	V	204.000	12.9	10.7	2.0	0.0	0.0	25.7	43.5	-17.8	120/300 kHz		
QP	V	216.000	12.1	11.5	2.0	0.0	0.0	25.6	43.5	-17.9	120/300 kHz		
QP	V	228.000	9.9	12.1	2.2	0.0	0.0	24.2	46.0	-21.8	120/300 kHz		
QP	V	240.000	7.8	12.4	2.2	0.0	0.0	22.4	46.0	-23.6	120/300 kHz	RB	RB
QP	V	252.000	3.3	12.7	2.4	0.0	0.0	18.3	46.0	-27.7	120/300 kHz	RB	RB
QP	H	264.000	5.0	12.7	2.4	0.0	0.0	20.0	46.0	-26.0	120/300 kHz	RB	RB
QP	V	276.000	-3.2	13.4	2.3	0.0	0.0	12.5	46.0	-33.5	120/300 kHz	RB	RB
QP	V	288.000	4.8	13.9	2.4	0.0	0.0	21.1	46.0	-24.9	120/300 kHz		
QP	V	300.000	1.0	14.4	2.4	0.0	0.0	17.8	46.0	-28.2	120/300 kHz		
QP	V	312.000	5.7	14.4	2.4	0.0	0.0	22.4	46.0	-23.6	120/300 kHz		
QP	V	314.000	7.1	14.4	2.6	0.0	0.0	24.1	46.0	-21.9	120/300 kHz		
QP	V	324.000	1.2	14.4	2.5	0.0	0.0	18.1	46.0	-27.9	120/300 kHz	RB	RB
QP	V	326.500	7.6	14.5	2.4	0.0	0.0	24.5	46.0	-21.5	120/300 kHz	RB	RB
QP	V	336.000	6.6	14.7	2.6	0.0	0.0	24.0	46.0	-22.0	120/300 kHz		
QP	V	348.000	5.1	15.1	2.5	0.0	0.0	22.8	46.0	-23.2	120/300 kHz		
QP	V	360.000	2.8	15.2	2.7	0.0	0.0	20.7	46.0	-25.3	120/300 kHz		
QP	V	372.000	3.7	15.2	3.1	0.0	0.0	22.0	46.0	-24.0	120/300 kHz		
QP	V	384.000	8.3	15.4	2.8	0.0	0.0	26.5	46.0	-19.5	120/300 kHz		
QP	V	418.000	0.4	16.2	3.0	0.0	0.0	19.5	46.0	-26.5	120/300 kHz		
QP	V	420.000	1.2	16.2	2.9	0.0	0.0	20.3	46.0	-25.7	120/300 kHz		
QP	V	432.000	2.7	16.5	3.0	0.0	0.0	22.1	46.0	-23.9	120/300 kHz		
QP	V	444.000	-5.9	16.7	2.9	0.0	0.0	13.7	46.0	-32.3	120/300 kHz		
QP	V	456.000	1.6	17.2	3.2	0.0	0.0	22.0	46.0	-24.0	120/300 kHz		
QP	V	807.000	3.4	21.4	4.2	0.0	0.0	29.0	46.0	-17.0	120/300 kHz		
QP	V	401.750	27.4	15.8	2.7	0.0	0.0	45.9	46.0	-0.1	120/300 kHz	RB	RB
QP	V	405.250	27.0	15.8	2.7	0.0	0.0	45.5	46.0	-0.5	120/300 kHz	RB	RB
Note: Firmware updated to remove pedestal of emission, power lowered 4.6 dB, channel of operation at Channel 0 (402.15 MHz)													
QP	V	401.750	27.0	15.8	2.7	0.0	0.0	45.5	46.0	-0.5	120/300 kHz	RB	RB
Note: Firmware updated to remove pedestal of emission, power lowered 4.6 dB, channel of operation at Channel 9 (404.85 MHz)													
QP	V	405.250	27.0	15.8	2.7	0.0	0.0	45.5	46.0	-0.5	120/300 kHz	RB	RB

Special Radiated Emissions

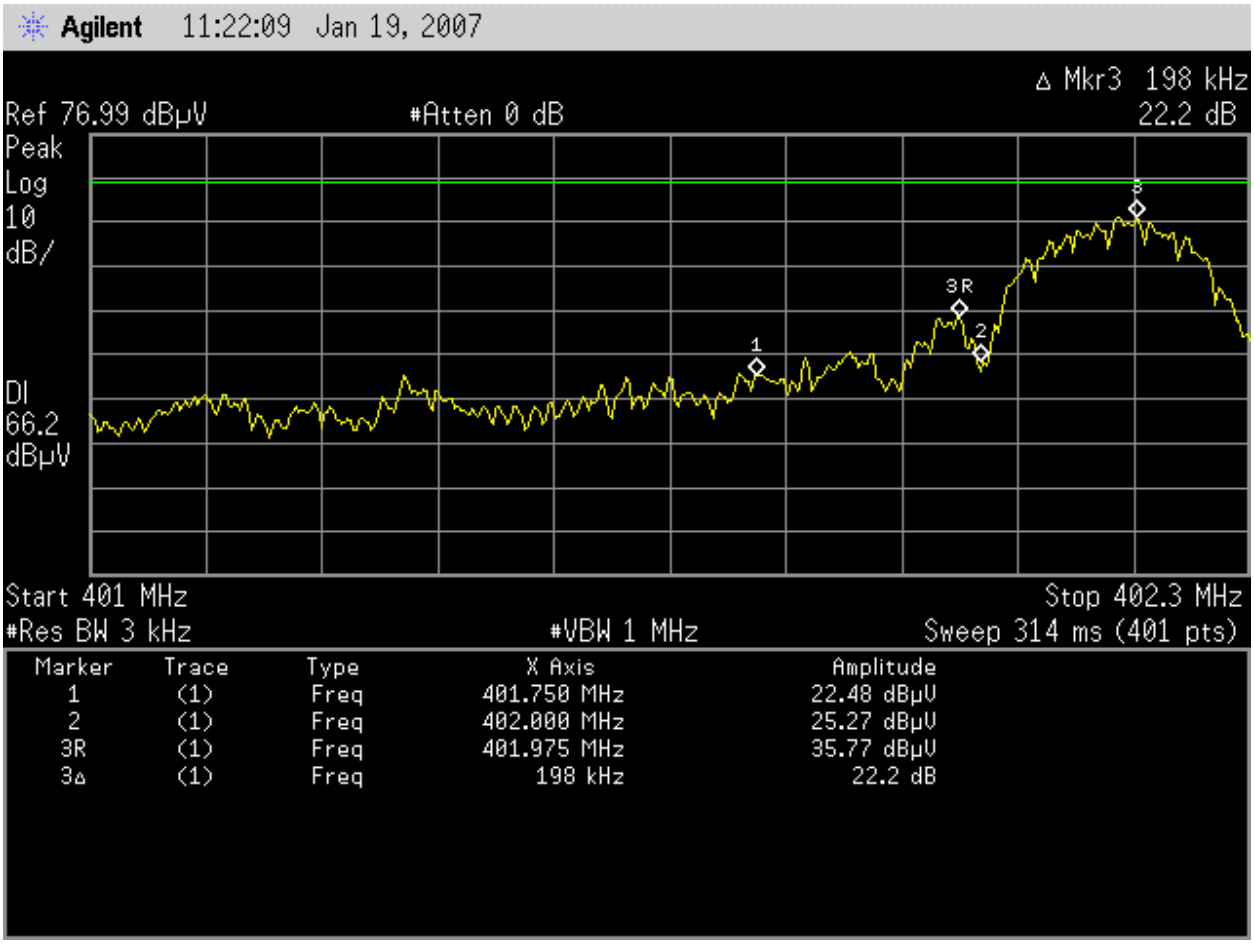
Company:	St. Jude Medical						Antenna & Cables:	LF	Bands: N, LF, HF, SHF				
Model #:	3638						LF Antenna:	HORN3 V3m 6-12-07.txt	HORN3 H3m 6-12-07.txt				
Serial #:	85200001						N Antenna:	LOG2 2-06-08 V3.txt	LOG2 2-06-08 H3.txt				
Engineers:	Nicholas Abbondante			Location:	Site 2		HF Antenna:	HORN3 V3m 6-12-07.txt	HORN3 H3m 6-12-07.txt				
Project #:	3114493	Date(s):	01/22/07				SHF Antenna:	EMC04 V 1m 12-13-2007.txt	EMC04 H 1m 12-13-2007.txt				
Standard:	FCC Part 95/IC RSS-243						LF Cable(s):	CBL029 12-04-2007.txt	CBL030 12-04-2007.txt				
Receiver:	R&S FSEK-30 (ROS001)		Limit Distance (m):		3		N Cable(s):	S2 3M FLR 9-26-07.txt	NONE.				
PreAmp:	PRE8 11-14-07.txt		Test Distance (m):		3		HF Cable(s):	CBL030 12-04-2007.txt	NONE.				
Barometer:	BAR2	Temp/Humidity/Pressure:	20c	24%	1005mB		SHF Cable(s):	CBL029 12-04-2007.txt	CBL030 12-04-2007.txt				
	PreAmp Used? (Y or N):	Y	Voltage/Frequency:		120V/60Hz			Frequency Range:	1-4.1 GHz				

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

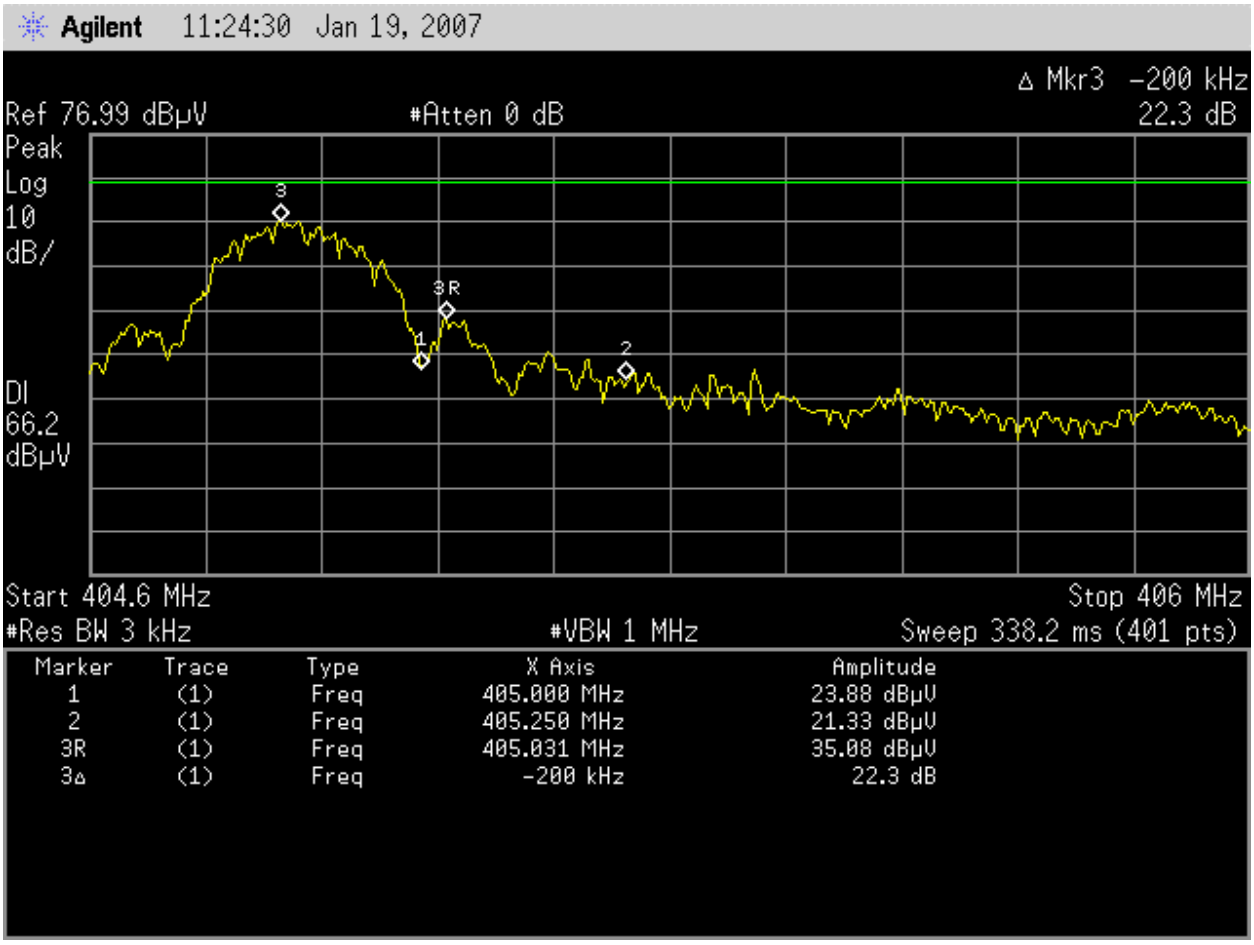
Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC
Note: External MICS operating on Channel 5 (403.65 MHz) with high-pass filter REA003 passband 1-10 GHz													
PK	V	1210.950	30.2	25.1	1.7	19.9	0.0	37.2	74.0	-36.8	1/10 MHz	RB	RB
AVG	V	1210.950	21.5	25.1	1.7	19.9	0.0	28.5	54.0	-25.5	1/10 MHz	RB	RB
PK	V	1614.600	30.9	26.7	2.0	20.0	0.0	39.7	74.0	-34.3	1/10 MHz	RB	RB
AVG	V	1614.600	22.0	26.7	2.0	20.0	0.0	30.7	54.0	-23.3	1/10 MHz	RB	RB
PK	V	2018.250	31.1	28.7	2.3	20.1	0.0	42.0	74.0	-32.0	1/10 MHz		
AVG	V	2018.250	21.5	28.7	2.3	20.1	0.0	32.5	54.0	-21.5	1/10 MHz		
PK	V	2421.900	30.9	29.9	2.8	20.2	0.0	43.3	74.0	-30.7	1/10 MHz		
AVG	V	2421.900	21.5	29.9	2.8	20.2	0.0	33.9	54.0	-20.1	1/10 MHz		
PK	V	2825.550	30.8	31.0	2.9	20.4	0.0	44.2	74.0	-29.8	1/10 MHz	RB	RB
AVG	V	2825.550	21.5	31.0	2.9	20.4	0.0	35.0	54.0	-19.0	1/10 MHz	RB	RB
PK	V	3229.200	32.3	31.9	3.0	20.5	0.0	46.7	74.0	-27.3	1/10 MHz		
AVG	V	3229.200	21.5	31.9	3.0	20.5	0.0	36.0	54.0	-18.0	1/10 MHz		
PK	V	3632.850	32.1	32.6	3.2	20.7	0.0	47.3	74.0	-26.7	1/10 MHz	RB	RB
AVG	V	3632.850	22.9	32.6	3.2	20.7	0.0	38.1	54.0	-15.9	1/10 MHz	RB	RB
PK	V	4036.500	31.4	33.2	3.4	21.1	0.0	47.0	74.0	-27.0	1/10 MHz	RB	RB
AVG	V	4036.500	22.9	33.2	3.4	21.1	0.0	38.5	54.0	-15.5	1/10 MHz	RB	RB



Emissions outside 150 kHz offset from the intended frequency

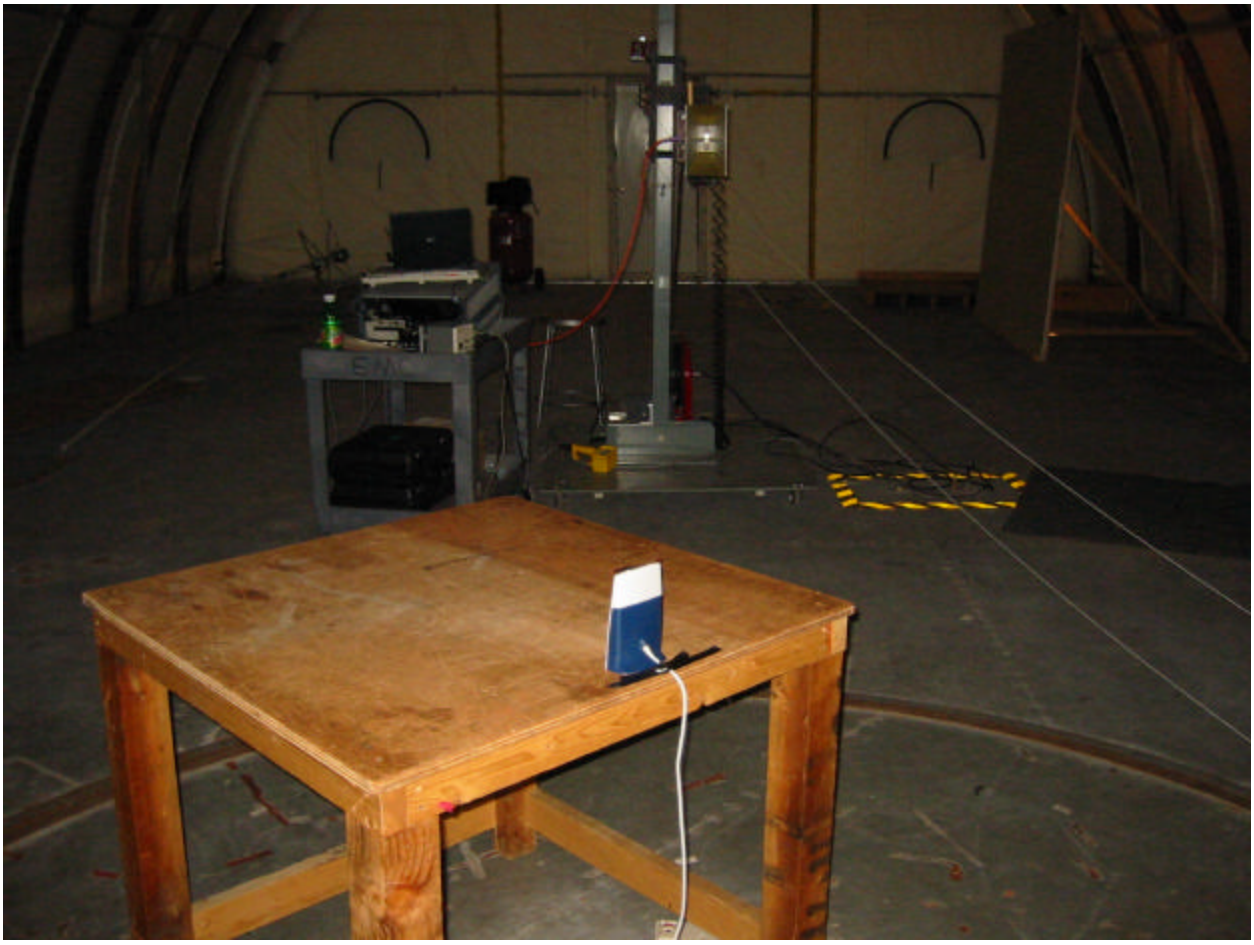


Lower 250 kHz band edge



Upper 250 kHz band edge

Setup Photos



Test Results: Pass

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

Test: Frequency Error, FCC §95.628(e), RSS-243 Section 5.3

Performance Criterion: The carrier frequency must not deviate from the reference frequency by more than ±100 PPM.

Test Environment:

Environmental Conditions During Testing:	Humidity (%):	N/A	Pressure (hPa):	N/A	Ambient (°C):	See Table
Pretest Verification Performed	Yes		Equipment under Test:		3638	

Test Equipment Used:

TEST EQUIPMENT LIST					
Item	**Equipment Type**	**Make**	**Model No.**	**Serial No.**	**Next Cal. Due**
1	Small Temperature/Humidity Chamber	Bryant Manufacturing	TH-5S	1207	04/06/2007
2	Spectrum Analyzer	Agilent	E7405A	US40240205	08/16/2007
3	Digital Multimeter	Meterman	15XP	050407779	08/03/2007
4	DC Power Supply	Lambda	LQD-423	N/L	Verified

Software Utilized:

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

Test Details:

Frequency Stability

Company:	St. Jude Medical						Test Equipment Used:			SAF187
Model #:	3638							AGL001	CBL027	MET2
Serial #:	85200093									
Engineer(s):	Nicholas Abbondante				Location:	Safety				
Project #:	3114493		Date(s):	01/24-25/2007						
Standard:	FCC Part 95/IC RSS-243									
		Limit:	100	PPM						
		Nominal f:	403.65	MHz			Voltage:	5	VDC	

%	Voltage Volts	Frequency MHz	Deviation kHz	Limit kHz
-15%	4.25	403.652783	0.04	40.37
+0%	5	403.652743	0	40.37
+15%	5.75	403.652843	0.1	40.37

Temp Celsius	Frequency MHz	Deviation kHz	Limit kHz
0	403.652445	-0.298	40.37
10	403.649702	-3.041	40.37
20	403.652743	0	40.37
30	403.649102	-3.641	40.37
40	403.652403	-0.34	40.37
50	403.652333	-0.41	40.37
55	403.650717	-2.026	40.37

Test Results: Pass

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

Test: MICS Operation, FCC §95.628(a)(1-4), RSS-243 Section 5.7

Performance Criterion: The MICS communication sessions must meet operating requirements for System Threshold Power Levels, Monitoring System Bandwidth, Scan Cycle Time, Minimum Channel Monitoring Period, Channel Access, Discontinuation of a MICS Session, and Use of a Pre-Scanned Alternate Channel.

Test Environment:

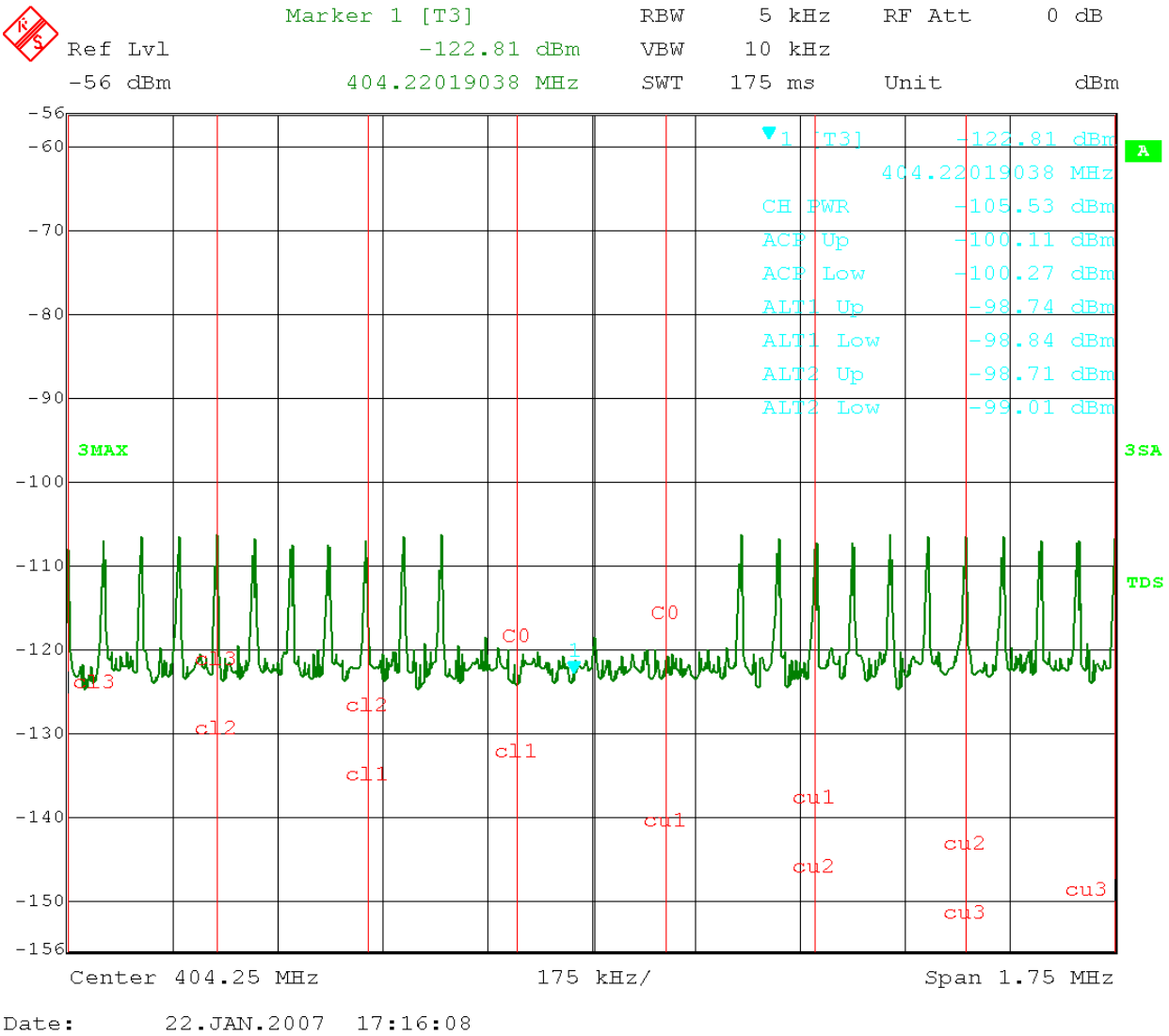
Environmental Conditions During Testing:	Humidity (%):	N/A	Pressure (hPa):	N/A	Ambient (°C):	N/A
Pretest Verification Performed	Yes		Equipment under Test:		3638	

Test Equipment Used:

TEST EQUIPMENT LIST					
Item	**Equipment Type**	**Make**	**Model No.**	**Serial No.**	**Next Cal. Due**
1	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	10/23/2007
2	Vector Signal Generator	Agilent	E-4432B	US40053417	03/01/07
3	PREAMPLFIER 1-40 GHz	MITEQ	NSP4000-NF	507145	11/14/2007
4	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 80	CBL030	12/04/2007
5	Oscilloscope, Digital Storage	Tektronix	TDS3052	B014809	03/03/2007
6	Pulse Generator	Philips	PM 5786B	SM 1342	Verified
7	BROADBAND ANTENNA	Compliance Design	B300	3352	10/11/2007
8	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 80	CBL029	12/04/2007
9	Generator, Signal	Hewlett Packard	8648C	3847A05291	02/15/2008

Test Details:

For these tests, a blocking band was created using the vector signal generator. A notch was created in the blocking band by removing some of the tones, or by lowering the output power of some of the tones in relation to the other. A second signal generator was used to generate a tone on specific channels. For some tests, more than one notch at different levels were created. Below is an example plot of the blocking band at the EUT, including a single notch in the center. For some tests, the center notch was narrowed further so that the EUT only transmitted in the notch.



Blocking Band Example

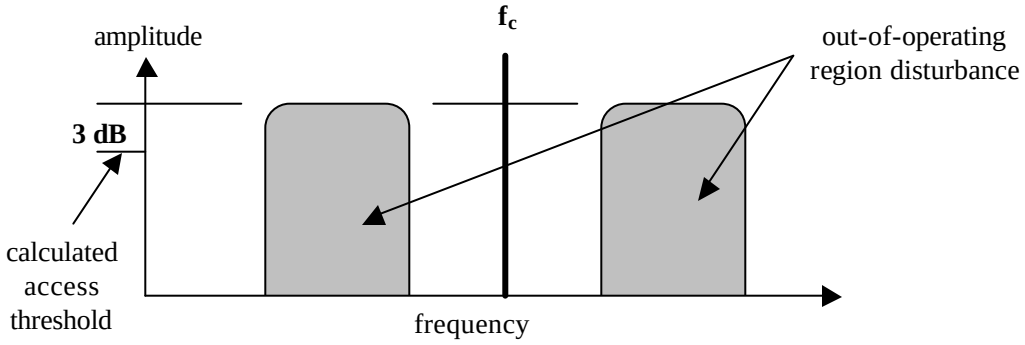
System Threshold Power Levels

The monitoring threshold power level shall not be greater than the calculated level given by the equation, $10 \log_{10} B$ (Hz) – 150 (dBm/Hz) + G(dBi), where B is the emission bandwidth of the MICS communication session transmitter having the widest emission bandwidth and G is the antenna gain of the medical implant programmer/control transmitter monitoring system, relative to an isotropic antenna.

B = 213000 Hz G = -6 dBi

$10 \log_{10} 213000$ (Hz) – 150 (dBm/Hz) + 6(dBi) = 53.28 – 150 – 6 = -102.72 dBm

The blocking band was set to ~-99.7 dBm per channel (3 dB above the calculated threshold level), with a notch left open at channel 5 (403.65) MHz. A tone was introduced at the center of the notch at -108.7 dBm, and was stepped up to the threshold level, -102.72 dBm. At each step, a MICS communications session was initiated and the selected channel was observed.

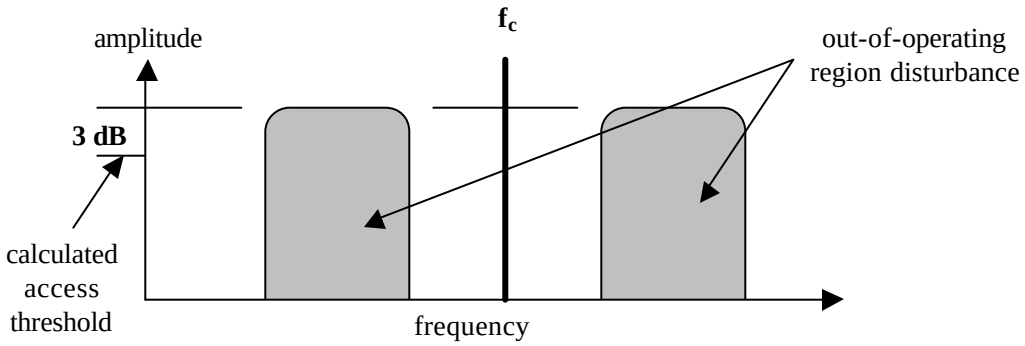


-108.7 dBm Tx on channel
-107.7 dBm Tx on channel
-106.7 dBm Tx on channel
-105.7 dBm Tx on channel
-104.7 dBm Tx on channel
-103.7 dBm Tx on channel
-103.2 dBm Tx on channel
-102.8 dBm Tx off channel

Threshold power = -102.8 dBm

Monitoring System Bandwidth
The monitoring system bandwidth measured at its 20 dB down points shall be equal to, or greater than the emission bandwidth of the intended transmission.

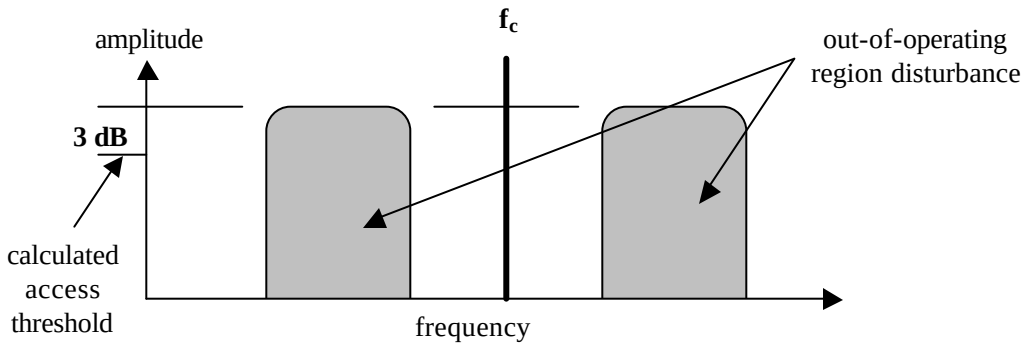
The blocking band was set to ~-99.7 dBm per channel (3 dB above the calculated threshold level), with a notch left open at channel 5 (403.65) MHz. A tone was introduced at the frequencies corresponding to the 20 dB down points of the fundamental emission, and was increased until the EUT no longer transmit on channel 5. At each step, a MICS communications session was initiated and the selected channel was observed. The difference between the values at which the EUT detects the center-channel emission and the channel edge emissions should be less than 20 dB in order for the monitoring system bandwidth to be wider than the emission bandwidth.



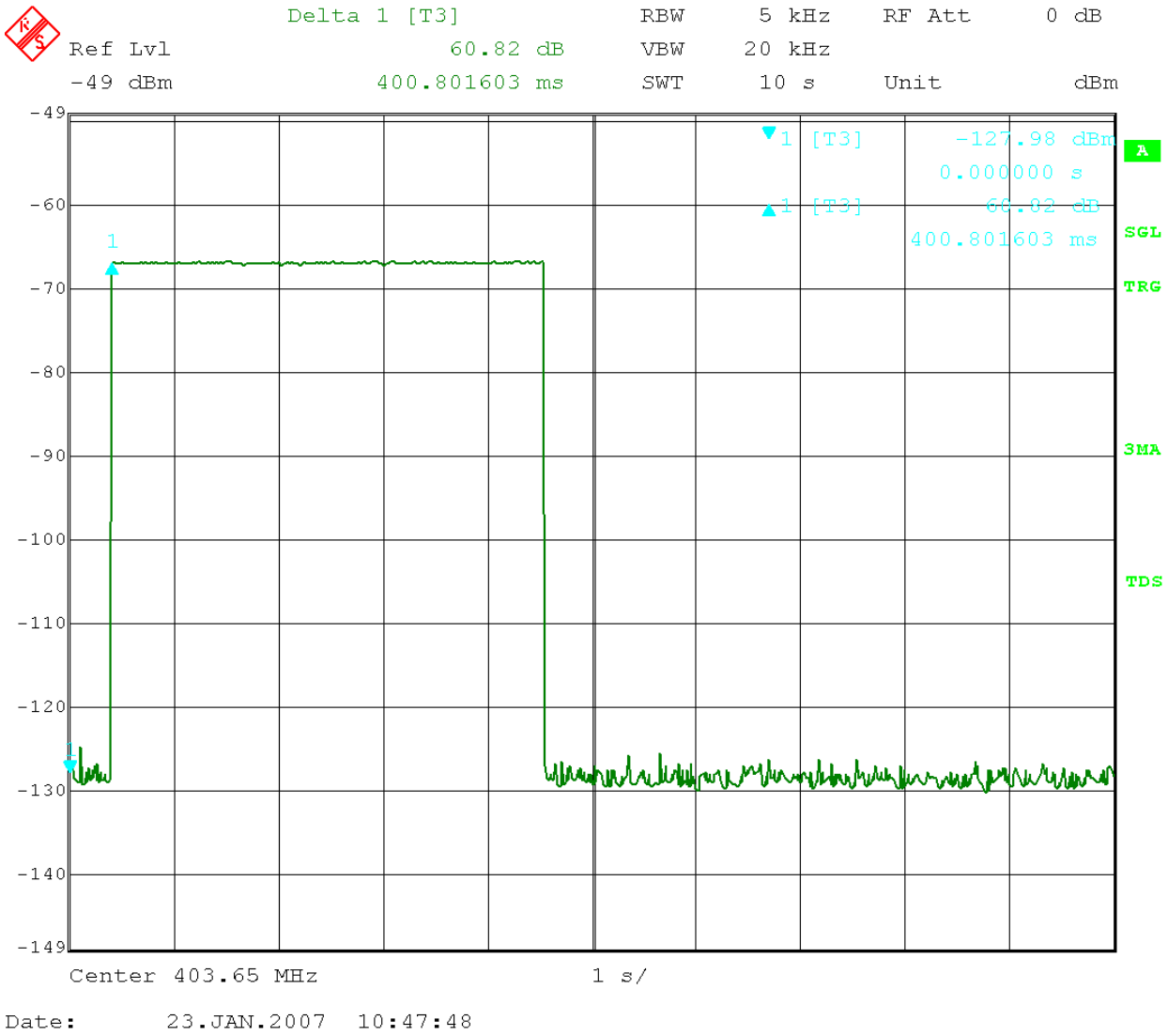
-101.7 dBm Tx off channel
-102.8 dBm Tx on channel
P_a = -102.8 dBm
F_{low} = 403.545 MHz
F_{low} -102.7 dBm Tx on channel
F_{low} -101.7 dBm Tx on channel
F_{low} -100.7 dBm Tx on channel
F_{low} -99.7 dBm Tx off channel
P_b = -99.7 dBm
F_{high} = 403.758 MHz
F_{high} -102.7 dBm Tx on channel
F_{high} -101.7 dBm Tx on channel
F_{high} -100.7 dBm Tx on channel
F_{high} -99.7 dBm Tx off channel
P_c = -99.7 dBm
$D_1 = P_a - P_b$ = -3.1 dB
$D_2 = P_a - P_c$ = -3.1 dB
D_1 and D_2 are both less than 20 dB

Scan Cycle Time
Within 5 seconds prior to initiating a communications session, circuitry associated with a medical implant programmer/control transmitter shall monitor all the channels in the 402-405 MHz frequency band.

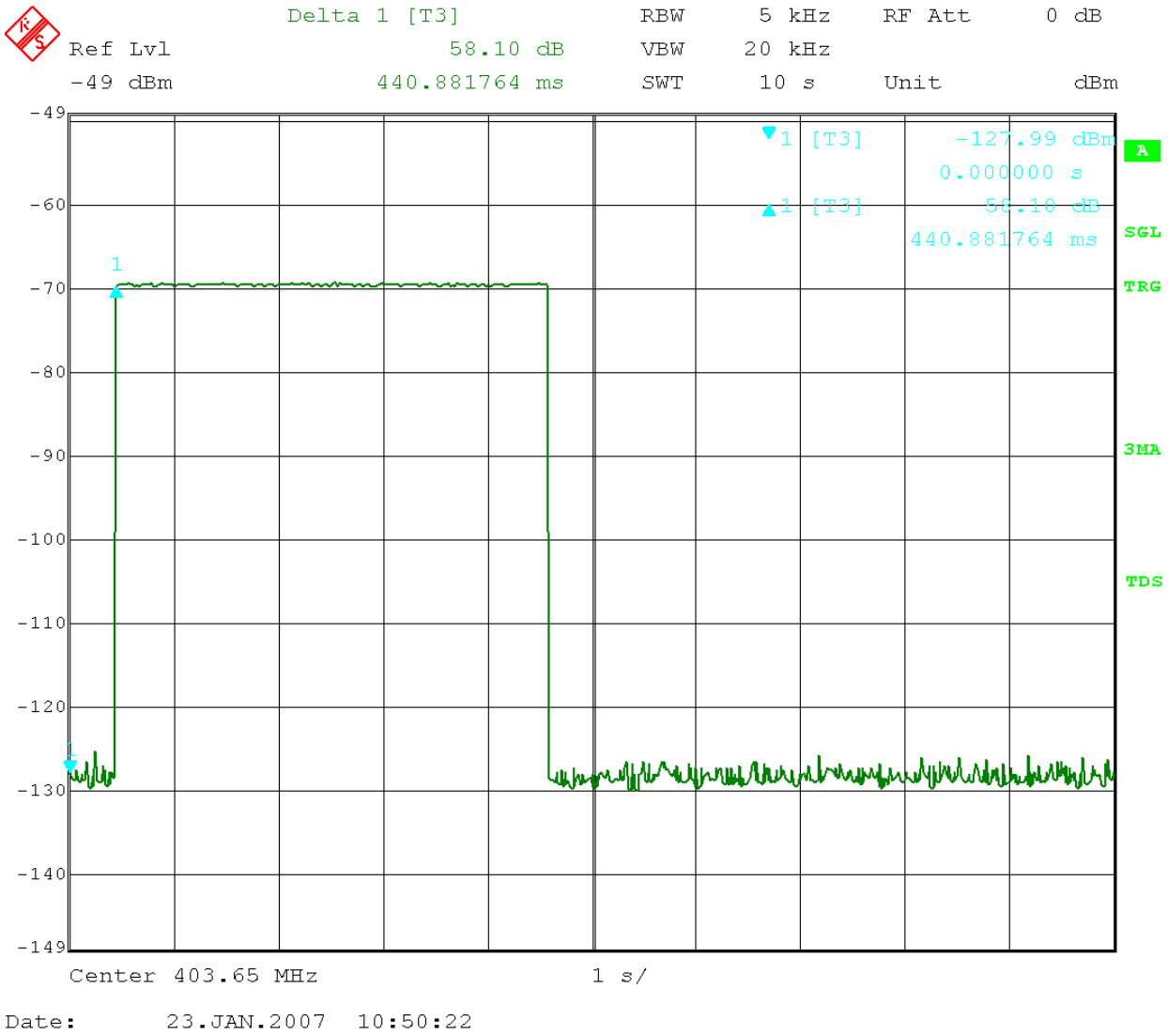
The blocking band was set to ~-99.7 dBm per channel (3 dB above the calculated threshold level), with a notch left open at channel 5 (403.65) MHz. A tone was introduced at the center of the notch at -96.7 dBm. The tone was removed and a MICS communications session was initiated. The time elapsed between removal of the CW tone and the start of the MICS session was recorded. The highest value was 521.0 ms.



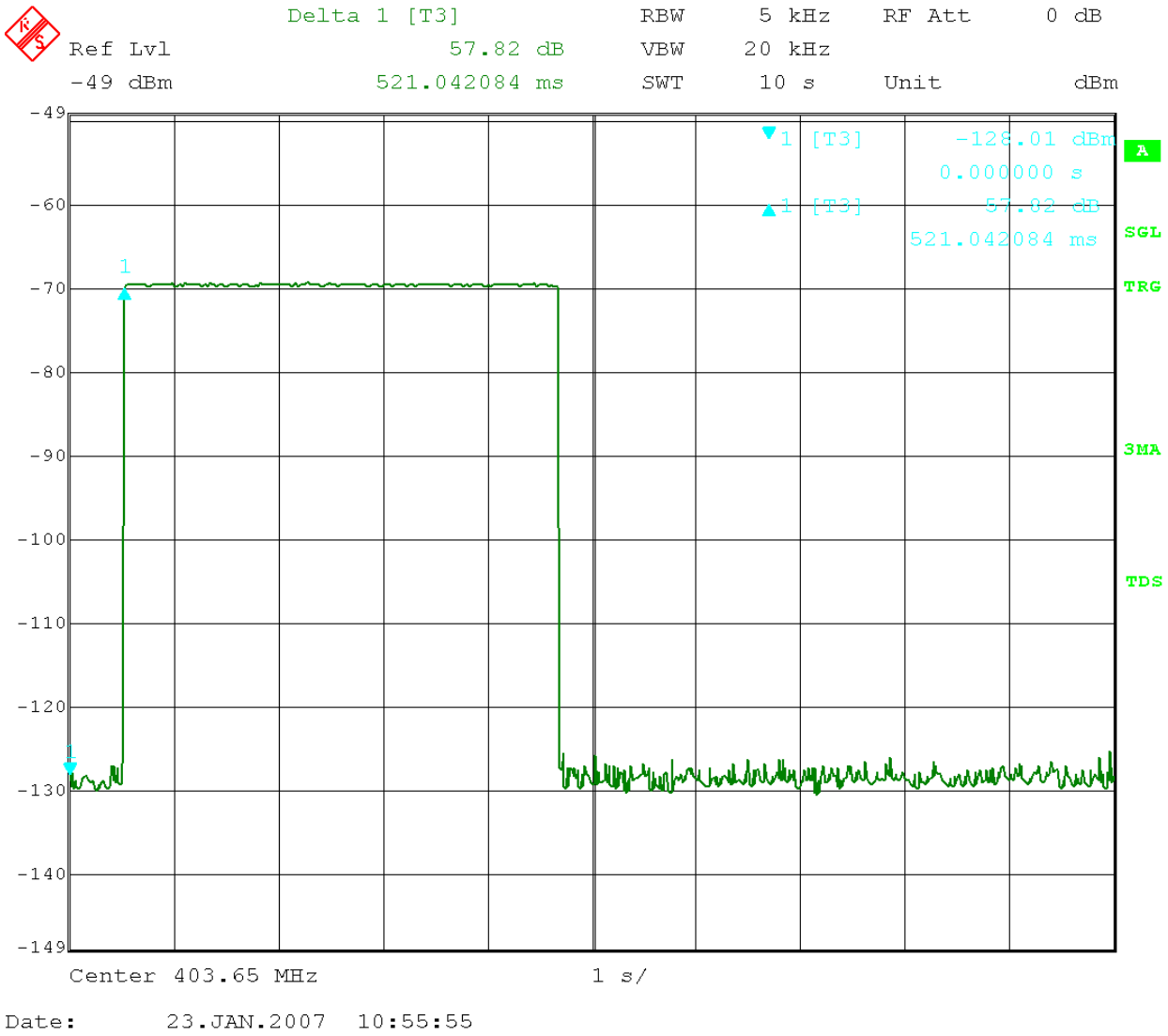
400.8ms – Scan cycle time 1
440.9ms – Scan cycle time 2
521.0ms – Scan cycle time 3
320.6ms – Scan cycle time 4
340.7ms – Scan cycle time 5



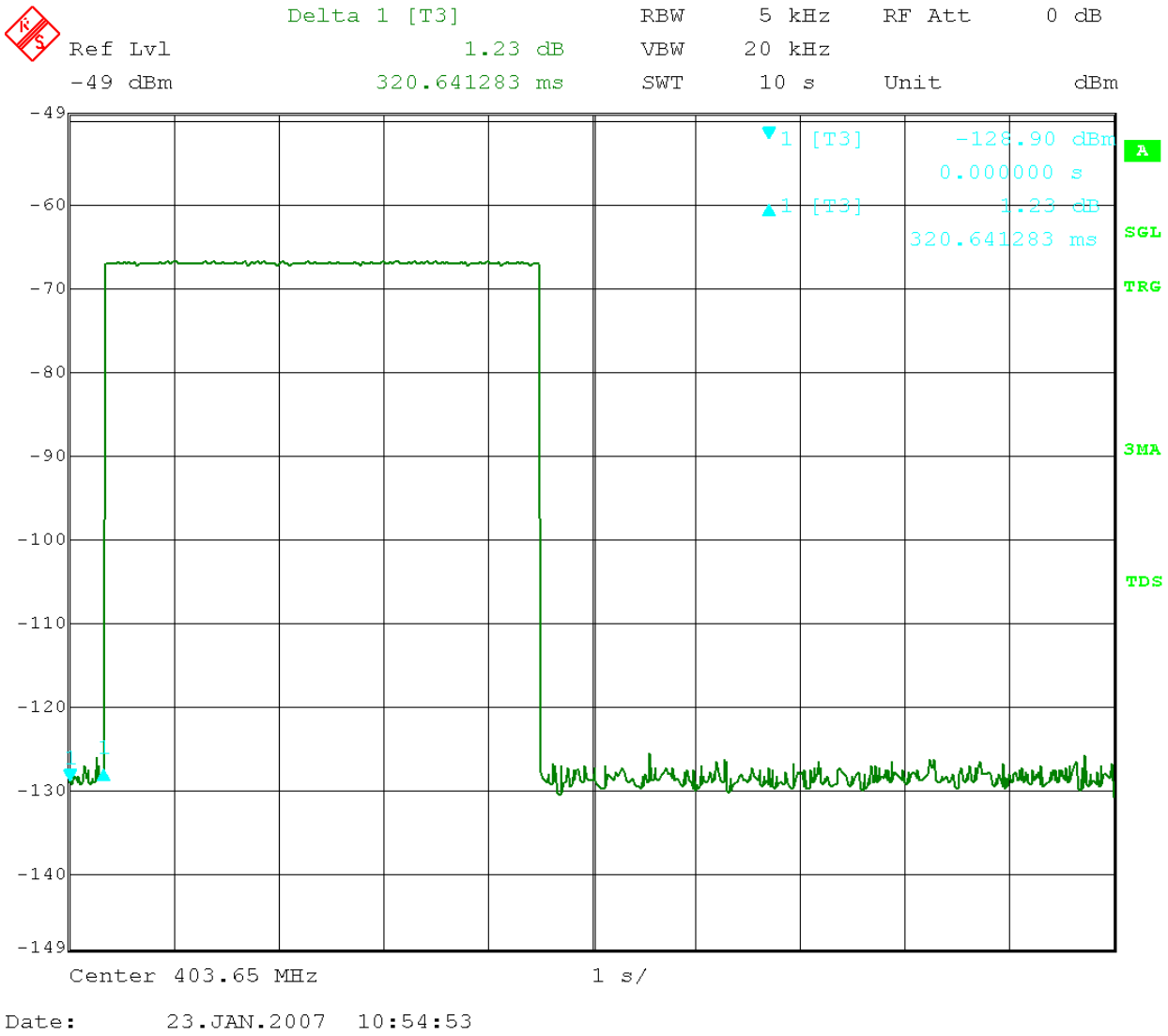
Scan Cycle Time 1 (400.8 ms)



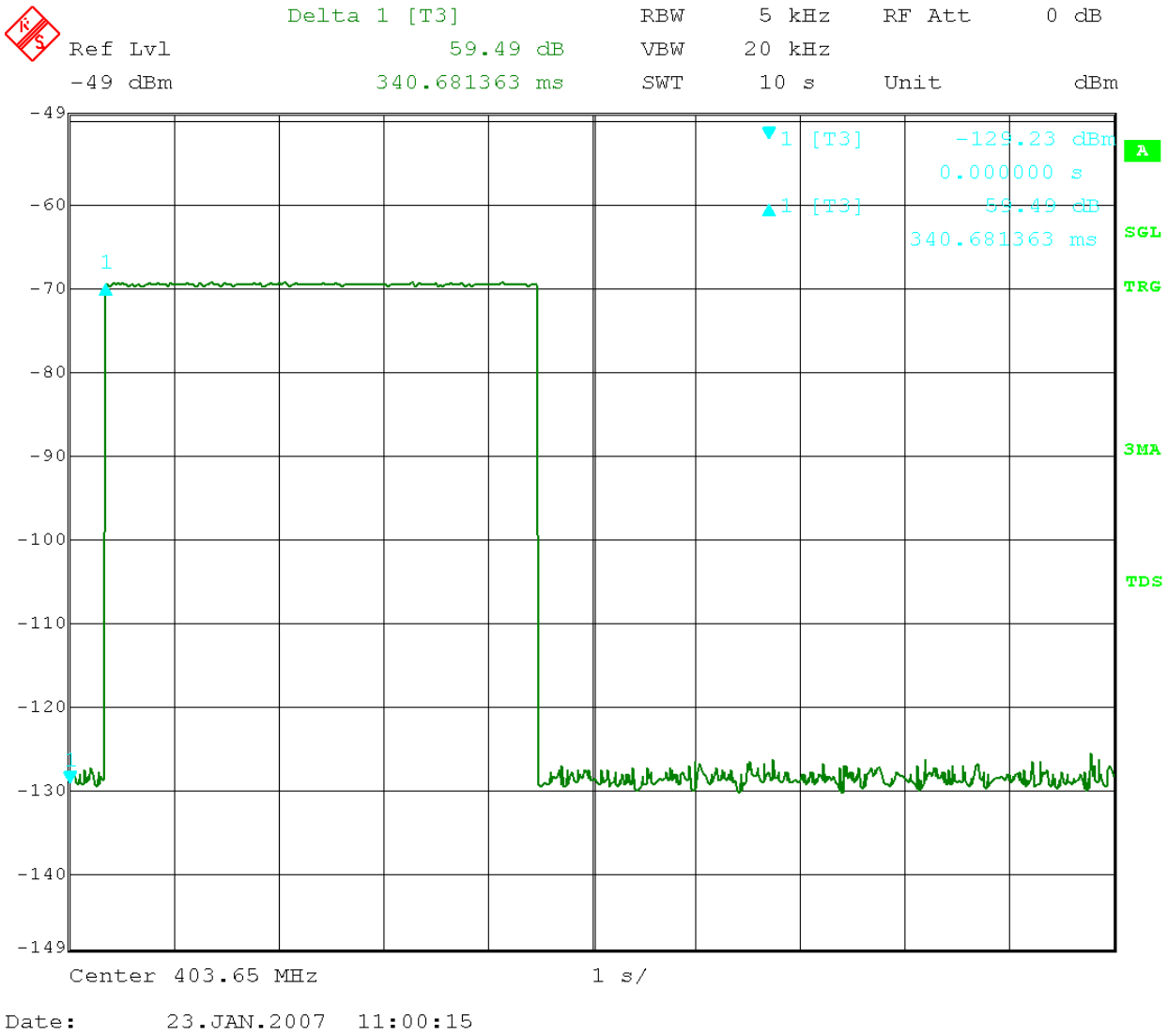
Scan Cycle Time 2 (440.9 ms)



Scan Cycle Time 3 (521 ms)



Scan Cycle Time 4 (320.6 ms)



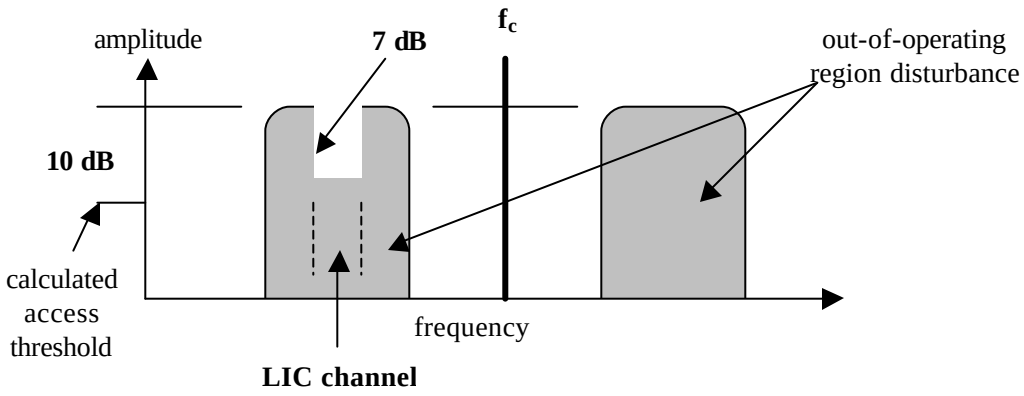
Scan Cycle Time 5 (340.7 ms)

Minimum Channel Monitoring Period
Each MICS channel shall be monitored for a minimum of 10 milliseconds during each scan cycle of 5 seconds or less.

The blocking band was set to ~-93.7 dBm per channel (9 dB above the calculated threshold level), with a notch left open at channel 5 (403.65) MHz. A tone was introduced at the center of the notch at -89.7 dBm. A MICS communication session was initiated and it was verified that the EUT did not select channel 5 over several attempts. The CW tone was then pulsed with a 100µs pulse length and a 10 ms pulse interval (100 Hz PRF). It was then verified that the EUT continued not to select channel 5 over 10+ attempts.

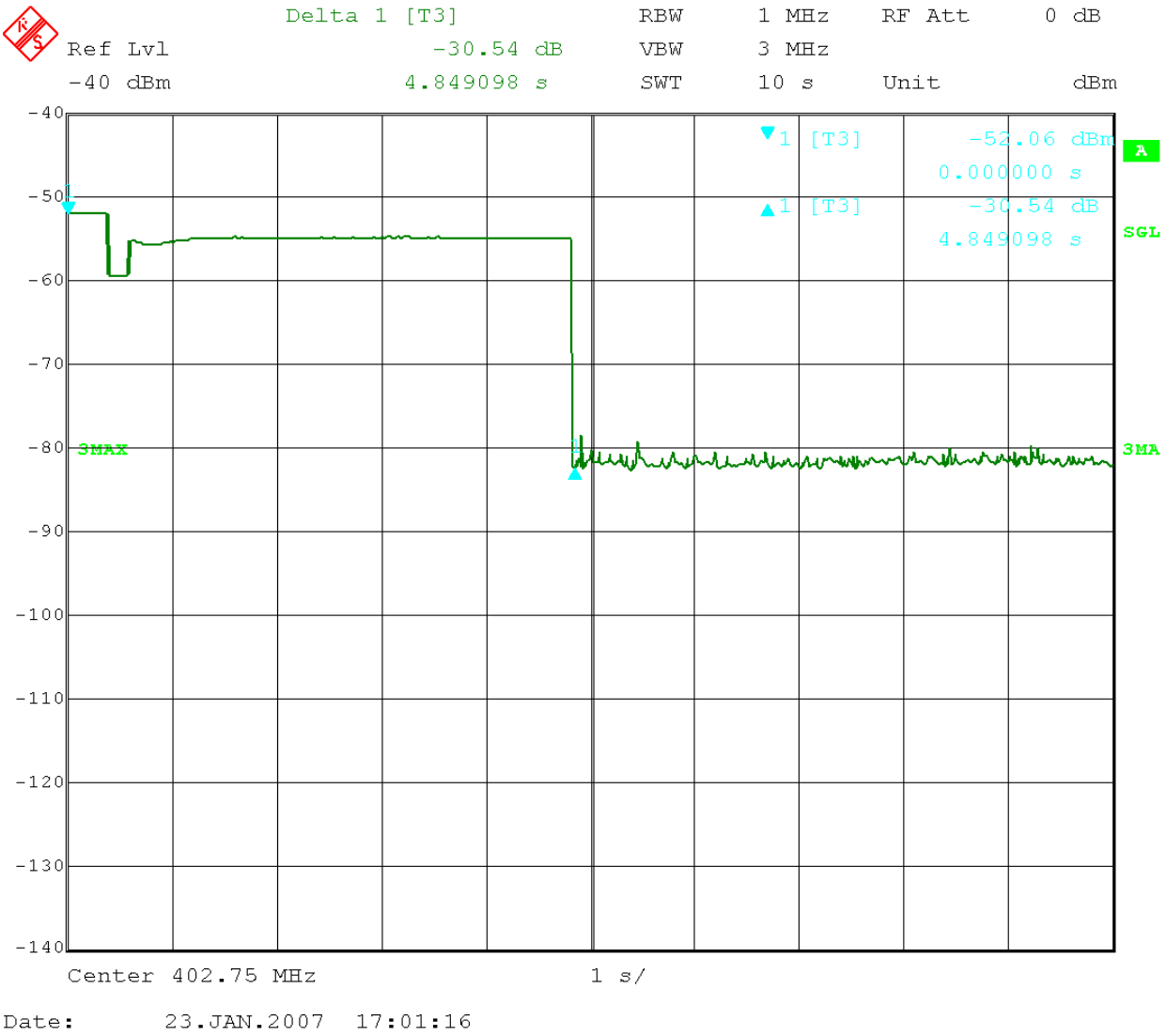
Channel Access
Immediate access is permitted on any channel having an ambient power level that is below the maximum threshold. If no channel having an ambient power level below the maximum threshold is available, the equipment under test shall access and transmit on the least interfered channel (LIC).

The blocking band was set to ~-92.7 dBm per channel (10 dB above the calculated threshold level), with a notch left open at channel 5 (403.65) MHz. A second notch was created at channel 2 (402.75 MHz) by lowering the blocking tones at channel 2 by 7 dB. A tone was introduced at the center of the channel 5 notch at -105.7 dBm. A MICS communication session was then initiated and it was verified that the EUT transmitted only on channel 5 through several attempts. The CW tone at channel 5 was then increased to -96.7 dBm, and it was verified that the EUT transmitted only on channel 2 over 10+ attempts.



Discontinuation of a MICS Session
MICS shall cease transmission in the event the communications session is interrupted for a period of 5 seconds or more.

A MICS communication session was initiated, and the MICS implant was caused to cease transmission during the session. The time from when the implant ceased transmission until the programmer/controller ceased communication was 4.85 seconds, as shown in the plot below. Communication did not resume.



Discontinuation of a MICS session

Use of the Pre-scanned Alternate Channel
Pre-scanned alternate channel operation is not implemented.