EMISSIONS TEST REPORT

Report Number: 3161566BOX-003c

Project Number: 3161566

Testing performed on the

Carelink Monitor

Model: 2490C-LCM

To

CFR47 "Telecommunications" FCC Part 95 Subpart I
IC RSS-243 Issue 2 November 2005
IC RSS-Gen Issue 2 June 2007

For

Medtronic

Test Performed by:	Test Authorized by:
Intertek – ETL SEMKO	Medtronic
70 Codman Hill Road	8200 Coral Sea Street NE
Boxborough, MA 01719	MVC 55
	Mounds View, MN 55112

Prepared by: _____ Date: 02/12/2009
Nicholas Abbondante

Reviewed by: _____ Date: 02/13/09
Jeff Goulet

1.0 Job Description

1.1 Client Information

This EUT has been tested at the request of:

Company:	Medtronic 8200 Coral Sea Street NE MVC 55 Mounds View, MN 55112
Contact:	Andrew Palecek
Telephone:	(763) 526-1686
Fax:	(763) 526-5854
Email:	N/A

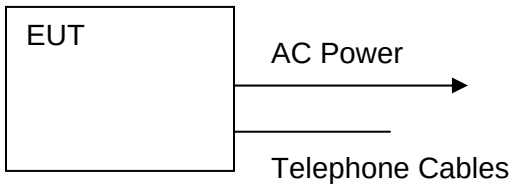
1.2 Equipment Under Test

Equipment Type:	Carelink Monitor
Model Number(s):	2490C-LCM
Serial number(s):	IJX000075A, IJX000052A, IJX000037A, IJX000048A
Manufacturer:	Plexus Services Corp.
EUT receive date:	06/09/2008
EUT received condition:	Prototypes in Good Condition
Test start date:	07/01/2008
Test end date:	08/21/2008
	Serial Number(s): IJX000048A
EUT receive date:	09/02/08
EUT received condition:	Prototype in good condition
Test start date:	09/02/08
Test end date:	09/05/08

1.3 Test Plan Reference: Tested according to the standards listed, ANSI C63.4:2003, and RSS-Gen Issue 2 June 2007.

1.4 Test Configuration

1.4.1 Block Diagram



1.4.2. Cables:

Cable	Shielding	Connector	Length (m)	Qty.
AC Power	None	Metal/360 Jack	1.9	1
Telephone Cables	None	Plastic RJ-11	2.0	2

1.4.3. Support Equipment:

Name: GlobTek AC/DC Power Supply
Model No.: GS-1569
Serial No.: N/L

Name: Virtuoso DR Medical Implant
Model No.: D154AWG
Serial No.: PUL422966H

1.5 Mode(s) of Operation:

The EUT was activated from 120V/60Hz AC power and was transmitting a modulated carrier during testing, except during frequency error testing where a CW signal was transmitted. Channel 4 (403.35 MHz) was utilized for testing unless otherwise indicated.

2.0 Test Summary

TEST STANDARD	RESULTS	
CFR47 Telecommunications 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) and receiver spurious emissions 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
AC Line-Conducted Emissions RSS-Gen Section 7.2.2	The AC line-conducted emissions must not exceed the RSS-Gen Section 7.2.2 Table 2 limits.	Pass

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

Date	Project No.	Project Handler	Page(s)	Item	Description of Change
10/06/08	3161566	Kouma Sinn	10, 19-20, 29-30	Emissions Data	Modified 3161566BOX-003 report by removing redundant data on page 10 and page 19-20, 29-30
02/12/09	3151566	Nicholas Abbondante	All, 1, 4, 15-16, 19-20, 48, 50-51	FCC Part 15 Data, Preamp cal date typo	Modified 3161566BOX-003b to remove references to FCC Part 15 Subpart B and to correct a typo, updated report number

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): 1 & 2 & Littleton

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

Test: Effective Radiated Power

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:	Ambient (°C):	21	Humidity (%):	65	Pressure (hPa):	1007
Pretest Verification Performed	Yes		Equipment under Test:		2490C-LCM	
Test Engineer(s):	Kouma Sinn		EUT Serial Number:		IJX000048A	

Test Equipment Used:

TEST EQUIPMENT LIST					
Item	**Equipment Type**	**Make**	**Model No.**	**Serial No.**	**Next Cal. Due**
1	ANTENNA	EMCO	3142	9711-1224	12/05/2008
2	3 Meter In floor cable for site 1	ITS	RG214B/U	S1 3M FLR	09/08/2009
3	9kHz to 3GHz EMI Test Receiver	Rohde & Schwartz	ESCI 1166.5950K03	100067	01/25/2009
4	Digital 4 Line Barometer	Mannix	0ABA116	BAR1	06/01/2009

Software Utilized:

Name	Manufacturer	Version
EXCEL 2000	Microsoft Corporation	9.0.6926 SP-3
EMI BOXBOROUGH	Intertek	3/07/07 Revision

Test Details:

Radiated Emissions

Company: Medtronic
Model #: 2490C-LCM
Serial #: IJX000048A
Engineers: Kouma Sinn
Project #: 3161566
Standard: FCC Part 95 Subpart I/IC RSS-243
Receiver: R&S ESCI (ROS002)
PreAmp: PRE9 03-27-09.txt
PreAmp Used? (Y or N): N

Location: 1
Date(s): 09/04/08
Limit Distance (m): 3
Test Distance (m): 3
Voltage/Frequency: 120V/60Hz

Antenna & Cables: N
Antenna: LOG3 V3m 12-05-08.txt
Cable(s): S1 3m Floor 9-7-08.txt
Barometer: BAR1
Temp/Humidity/Pressure: 21C 65% 1007mbar
Frequency Range: Fundamental Frequencies

Bands: N, LF, HF, SHF
LOG3 H3m 12-05-08.txt
NONE.

Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
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	Harmonic?
8: Transmit mode, Left Antenna, Unmodulated														
Maxh PK	V	402.174	57.3	12.3	2.6	0.0	0.0	72.2	85.2	-13.0	300k/1M	RB	RB	
Maxh PK	V	403.366	56.0	12.3	2.6	0.0	0.0	70.9	85.2	-14.3	300k/1M	RB	RB	
Maxh PK	V	404.850	56.0	12.3	2.7	0.0	0.0	70.9	85.2	-14.3	300k/1M	RB	RB	
Maxh PK	H	402.174	56.7	12.1	2.6	0.0	0.0	71.5	85.2	-13.7	300k/1M	RB	RB	
Maxh PK	H	403.366	55.2	12.1	2.6	0.0	0.0	70.0	85.2	-15.2	300k/1M	RB	RB	
Maxh PK	H	404.850	54.6	12.2	2.7	0.0	0.0	69.4	85.2	-15.8	300k/1M	RB	RB	
9: Transmit mode, Right Antenna, Unmodulated														
Maxh PK	V	402.174	58.0	12.3	2.6	0.0	0.0	72.9	85.2	-12.3	300k/1M	RB	RB	
Maxh PK	V	403.366	56.1	12.3	2.6	0.0	0.0	71.0	85.2	-14.2	300k/1M	RB	RB	
Maxh PK	V	404.866	55.7	12.3	2.7	0.0	0.0	70.6	85.2	-14.6	300k/1M	RB	RB	
Maxh PK	H	402.174	57.4	12.1	2.6	0.0	0.0	72.2	85.2	-13.0	300k/1M	RB	RB	
Maxh PK	H	403.366	55.7	12.1	2.6	0.0	0.0	70.4	85.2	-14.8	300k/1M	RB	RB	
Maxh PK	H	404.866	54.5	12.2	2.7	0.0	0.0	69.3	85.2	-15.9	300k/1M	RB	RB	
8: Transmit mode, Left Antenna, Modulated														
Maxh PK	V	402.174	58.2	12.3	2.6	0.0	0.0	73.1	85.2	-12.1	300k/1M	RB	RB	
Maxh PK	V	403.334	56.8	12.3	2.6	0.0	0.0	71.7	85.2	-13.5	300k/1M	RB	RB	
Maxh PK	V	404.850	56.1	12.3	2.7	0.0	0.0	71.0	85.2	-14.2	300k/1M	RB	RB	
Maxh PK	H	402.174	57.3	12.1	2.6	0.0	0.0	72.0	85.2	-13.2	300k/1M	RB	RB	
Maxh PK	H	403.334	55.8	12.1	2.6	0.0	0.0	70.6	85.2	-14.6	300k/1M	RB	RB	
Maxh PK	H	404.850	54.5	12.2	2.7	0.0	0.0	69.3	85.2	-15.9	300k/1M	RB	RB	
9: Transmit mode, Right Antenna, Modulated														
Maxh PK	V	402.174	58.4	12.3	2.6	0.0	0.0	73.3	85.2	-11.9	300k/1M	RB	RB	
Maxh PK	V	403.366	56.8	12.3	2.6	0.0	0.0	71.7	85.2	-13.5	300k/1M	RB	RB	
Maxh PK	V	404.866	56.0	12.3	2.7	0.0	0.0	70.9	85.2	-14.3	300k/1M	RB	RB	
Maxh PK	H	402.174	57.1	12.1	2.6	0.0	0.0	71.8	85.2	-13.4	300k/1M	RB	RB	
Maxh PK	H	403.366	55.2	12.1	2.6	0.0	0.0	70.0	85.2	-15.2	300k/1M	RB	RB	
Maxh PK	H	404.866	54.4	12.2	2.7	0.0	0.0	69.2	85.2	-16.0	300k/1M	RB	RB	

Test Results: Pass

Test Standard: FCC Part 95 Subpart I, IC RSS-243

Test: Emission Bandwidth

Performance Criterion: The maximum bandwidth is 300 kHz.

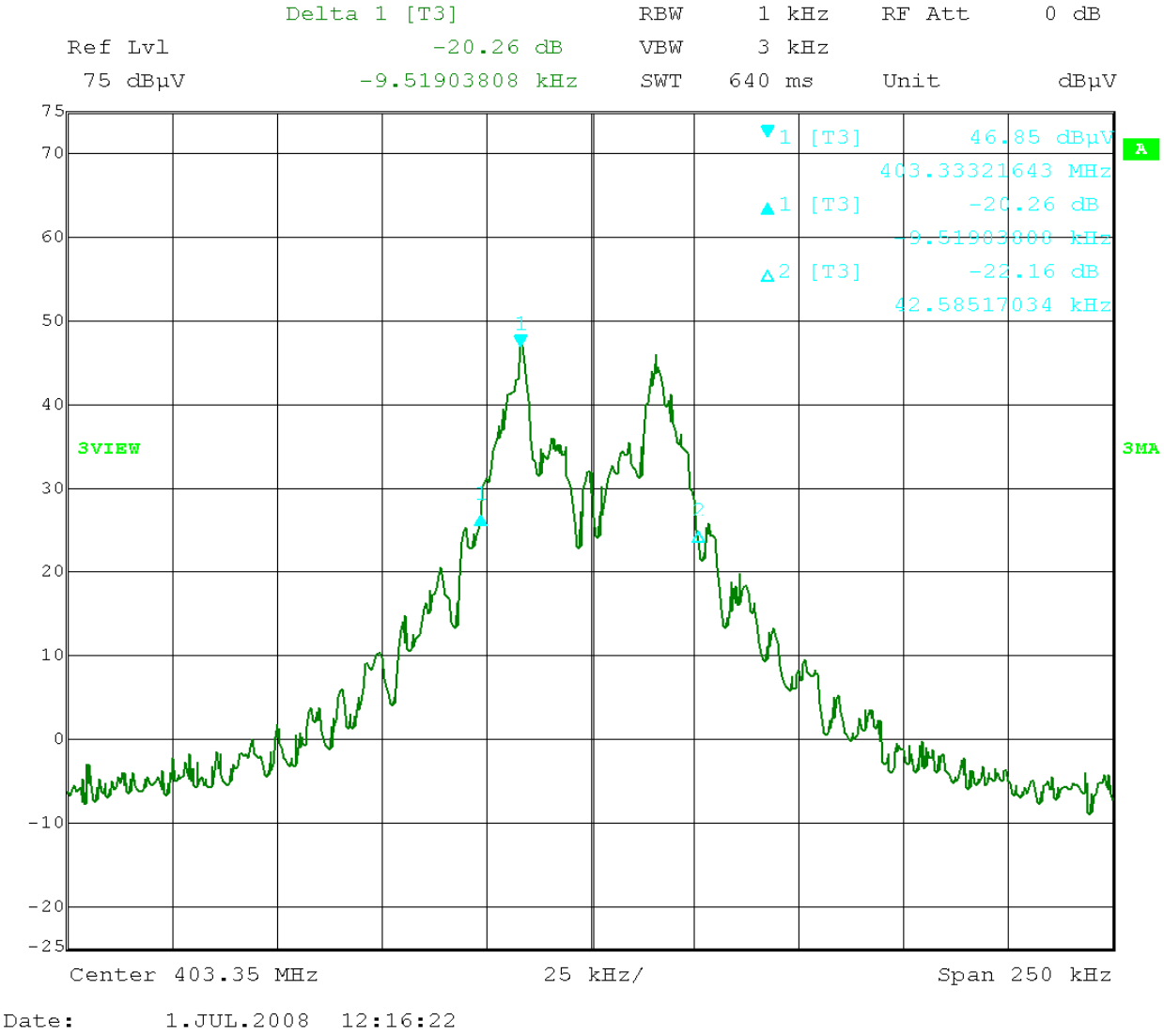
Test Environment:

Environmental Conditions During Testing:		Ambient (°C):	N/A	Humidity (%):	N/A	Pressure (hPa):	N/A
Pretest Verification Performed		Yes		Equipment under Test:		2490C-LCM	
Test Engineer(s):	Nicholas Abbondante			EUT Serial Number:		IJX000052A	

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	11/26/2008
2	ANTENNA	EMCO	3142	9711-1223	02/22/2009
3	3 Meter In floor cable for site 2	ITS	RG214B/U	S2 3M FLR	09/17/2008

Test Details:



Channel 4 20 dB Bandwidth, 52.1 kHz

Test Results: Pass

Test Standard: FCC Part 95 Subpart I, IC RSS-243, IC RSS-Gen

Test: Radiated Spurious Emissions, Band edge Compliance

Performance Criterion: Spurious emissions more than 250 kHz removed from the MICS band (402-405 MHz) and receiver spurious emissions 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 (07/01/2008):

Environmental Conditions During Testing:	Ambient (°C):	See Tables	Humidity (%):	See Tables	Pressure (hPa):	See Tables
Pretest Verification Performed	Yes		Equipment under Test:		2490C-LCM	
Test Engineer(s):	Nicholas Abbondante		EUT Serial Number:		IJX000052A	

Test Environment (09/02/2008, 09/04/2008):

Environmental Conditions During Testing:	Ambient (°C):	See Data Tables	Humidity (%):	See Data Tables	Pressure (hPa):	See Data Tables
Pretest Verification Performed	Yes		Equipment under Test:		2490C-LCM	
Test Engineer(s):	Kouma Sinn		EUT Serial Number:		IJX000048A	

Test Equipment Used (07/01/2008):

TEST EQUIPMENT LIST					
Item	**Equipment Type**	**Make**	**Model No.**	**Serial No.**	**Next Cal. Due**
1	9kHz to 3GHz EMI Test Receiver	Rohde & Schwartz	ESCI 1166.5950K03	100067	01/25/2009
2	ANTENNA	EMCO	3142	9711-1223	02/22/2009
3	3 Meter In floor cable for site 2	ITS	RG214B/U	S2 3M FLR	09/17/2008
4	4 Line Digital Barometer *	Mannix	0ABA116	SAF291	01/30/2009

Test Equipment Used (09/02/2008, 09/04/2008):

TEST EQUIPMENT LIST					
Item	**Equipment Type**	**Make**	**Model No.**	**Serial No.**	**Next Cal. Due**
1	ANTENNA	EMCO	3142	9711-1224	12/05/2008
2	3 Meter In floor cable for site 1	ITS	RG214B/U	S1 3M FLR	09/08/2009
3	Digital 4 Line Barometer	Mannix	0ABA116	BAR1	06/01/2009
4	9kHz to 3GHz EMI Test Receiver	Rohde & Schwartz	ESCI 1166.5950K03	100067	01/25/2009
5	HORN ANTENNA	EMCO	3115	9610-4980	03/03/2009
6	40GHz Cable	Megaphase	TM40-K1K1-197	7030801 001	06/05/2009
7	40 GHz Cable	Megaphase	TM40-K1K1-197	7030801 002	06/05/2009
8	100MHz-40GHz Preamp	MITEQ	NSP4000-NFG	1260417	03/27/2009
9	1GHz High Pass Filter	Reactel, Inc	7HS-1G/10G-S11	06-1	09/18/2008

Software Utilized:

Name	Manufacturer	Version
EXCEL 2000	Microsoft Corporation	9.0.6926 SP-3
EMI BOXBOROUGH	Intertek	3/07/07 Revision

Test Results:

Tx Radiated Emissions

Company: Medtronic
Model #: 2490C-LCM
Serial #: IJX000048A
Engineers: Kouma Sinn
Project #: 3161566
Standard: FCC Part 95 Subpart I/IC RSS-243
Receiver: R&S ESCI (ROS002)
PreAmp: PRE9 03-27-09.txt
PreAmp Used? (Y or N): N

Location: 1
Date(s): 09/04/08
Limit Distance (m): 3
Test Distance (m): 3
Voltage/Frequency: 120V/60Hz

Antenna & Cables: N
Antenna: LOG3 V3m 12-05-08.txt
Cable(s): S1 3m Floor 9-7-08.txt
Barometer: BAR1
Temp/Humidity/Pressure: 21C 65% 1007mbar

Bands: N, LF, HF, SHF
LOG3 H3m 12-05-08.txt
NONE.
Frequency Range: 30-1000MHz

Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
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	Harmonic?
8: Transmit mode, Left Antenna, Unmodulated - Mid and high channel harmonics below 1000MHz														
QP	V	806.732	2.6	18.2	3.9	0.0	0.0	24.8	46.0	-21.2	120/300 kHz			
QP	V	809.724	2.4	18.3	3.9	0.0	0.0	24.6	46.0	-21.4	120/300 kHz			
8: Transmit mode, Left Antenna, Unmodulated - Channel 1 30-1000MHz														
QP	H	224.980	8.2	7.0	2.3	0.0	0.0	17.5	46.0	-28.5	120/300 kHz			
QP	H	270.336	11.3	8.5	2.6	0.0	0.0	22.4	46.0	-23.6	120/300 kHz	RB	RB	
QP	H	300.000	5.4	9.7	2.0	0.0	0.0	17.1	46.0	-28.9	120/300 kHz			
QP	H	320.000	5.8	10.0	2.1	0.0	0.0	17.9	46.0	-28.1	120/300 kHz			
QP	H	375.000	9.8	11.4	2.5	0.0	0.0	23.7	46.0	-22.3	120/300 kHz			
QP	H	804.326	-0.2	17.4	3.9	0.0	0.0	21.1	46.0	-24.9	120/300 kHz			
QP	H	825.700	11.8	17.7	4.0	0.0	0.0	33.5	46.0	-12.5	120/300 kHz			
QP	H	899.964	1.7	18.9	4.5	0.0	0.0	25.1	46.0	-20.9	120/300 kHz			

Tx Radiated Emissions

Company: Medtronic
Model #: 2490C-LCM
Serial #: IJX000048A
Engineers: Kouma Sinn
Project #: 3161566
Standard: FCC Part 95 Subpart I/IC RSS-243
Receiver: R&S ESCI (ROS002)
PreAmp: PRE9 03-27-09.txt

Antenna & Cables: LF Bands: N, LF, HF, SHF
Antenna: HORN3 V3m 3-03-09.txt HORN3 H3m 3-03-09.txt
Cable(s): MEG001 06-05-09.txt MEG002 06-05-09.txt
Location: 1 Barometer: BAR1 REA003
Date(s): 09/02/08
Temp/Humidity/Pressure: 17C 47% 1008mbar
Limit Distance (m): 3
Test Distance (m): 3
PreAmp Used? (Y or N): Y Voltage/Frequency: 120V/60Hz Frequency Range: 1-4.5GHz

Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
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	Harmonic?
Tx Frequency = CH1 402.15MHz (Left Antenna)														
PK	V	1206.450	36.8	24.7	4.0	29.1	0.0	36.4	74.0	-37.6	1/3MHz	RB	RB	
AVG	V	1206.450	31.2	24.7	4.0	29.1	0.0	30.7	54.0	-23.3	1/3MHz	RB	RB	
PK	V	1608.600	37.5	26.0	4.7	29.1	0.0	39.1	74.0	-34.9	1/3MHz	RB	RB	
AVG	V	1608.600	31.9	26.0	4.7	29.1	0.0	33.5	54.0	-20.5	1/3MHz	RB	RB	
PK	V	1651.400	48.6	26.2	4.7	29.1	0.0	50.4	74.0	-23.6	1/3MHz			
AVG	V	1651.400	47.3	26.2	4.7	29.1	0.0	49.1	54.0	-4.9	1/3MHz			
PK	V	2010.750	37.0	27.6	5.3	29.2	0.0	40.7	74.0	-33.3	1/3MHz			
AVG	V	2010.750	31.3	27.6	5.3	29.2	0.0	35.1	54.0	-18.9	1/3MHz			
PK	V	2412.900	33.0	28.4	5.9	29.2	0.0	38.1	74.0	-35.9	1/3MHz			NF
AVG	V	2412.900	24.5	28.4	5.9	29.2	0.0	29.6	54.0	-24.4	1/3MHz			NF
PK	V	2815.050	35.5	29.5	6.4	29.2	0.0	42.2	74.0	-31.8	1/3MHz	RB	RB	MWNF
AVG	V	2815.050	28.6	29.5	6.4	29.2	0.0	35.3	54.0	-18.7	1/3MHz	RB	RB	MWNF
PK	V	2889.936	38.7	29.7	6.5	29.2	0.0	45.7	74.0	-28.3	1/3MHz	RB	RB	
AVG	V	2889.936	34.9	29.7	6.5	29.2	0.0	41.9	54.0	-12.1	1/3MHz	RB	RB	
PK	V	3217.200	33.2	30.5	6.9	29.2	0.0	41.4	74.0	-32.6	1/3MHz			NF
AVG	V	3217.200	25.8	30.5	6.9	29.2	0.0	34.0	54.0	-20.0	1/3MHz			NF
PK	V	3619.350	33.8	31.5	7.4	29.2	0.0	43.5	74.0	-30.5	1/3MHz	RB	RB	NF
AVG	V	3619.350	24.7	31.5	7.4	29.2	0.0	34.4	54.0	-19.6	1/3MHz	RB	RB	NF
PK	V	4021.500	33.8	32.5	7.9	29.3	0.0	44.9	74.0	-29.1	1/3MHz	RB	RB	NF
AVG	V	4021.500	25.0	32.5	7.9	29.3	0.0	36.1	54.0	-17.9	1/3MHz	RB	RB	NF
Tx Frequency = CH5 403.350MHz (Left Antenna)														
PK	V	1210.060	36.7	24.7	4.0	29.1	0.0	36.3	74.0	-37.7	1/3MHz	RB	RB	
AVG	V	1210.060	30.7	24.7	4.0	29.1	0.0	30.3	54.0	-23.7	1/3MHz	RB	RB	
PK	V	1613.400	36.5	26.1	4.7	29.1	0.0	38.1	74.0	-35.9	1/3MHz	RB	RB	
AVG	V	1613.400	30.1	26.1	4.7	29.1	0.0	31.7	54.0	-22.3	1/3MHz	RB	RB	
PK	V	1651.400	48.1	26.2	4.7	29.1	0.0	49.9	74.0	-24.1	1/3MHz			
AVG	V	1651.400	46.7	26.2	4.7	29.1	0.0	48.5	54.0	-5.5	1/3MHz			
PK	V	2016.750	36.7	27.6	5.3	29.2	0.0	40.5	74.0	-33.5	1/3MHz			
AVG	V	2016.750	31.3	27.6	5.3	29.2	0.0	35.1	54.0	-18.9	1/3MHz			
PK	V	2420.100	33.4	28.4	5.9	29.2	0.0	38.6	74.0	-35.4	1/3MHz			NF
AVG	V	2420.100	25.6	28.4	5.9	29.2	0.0	30.8	54.0	-23.2	1/3MHz			NF
PK	V	2823.450	36.0	29.5	6.4	29.2	0.0	42.7	74.0	-31.3	1/3MHz	RB	RB	MWNF
AVG	V	2823.450	28.9	29.5	6.4	29.2	0.0	35.6	54.0	-18.4	1/3MHz	RB	RB	MWNF
PK	V	2889.936	38.7	29.7	6.5	29.2	0.0	45.7	74.0	-28.3	1/3MHz	RB	RB	
AVG	V	2889.936	34.9	29.7	6.5	29.2	0.0	41.9	54.0	-12.1	1/3MHz	RB	RB	
PK	V	3226.800	34.1	30.5	6.9	29.2	0.0	42.4	74.0	-31.6	1/3MHz			NF
AVG	V	3226.800	25.2	30.5	6.9	29.2	0.0	33.5	54.0	-20.5	1/3MHz			NF
PK	V	3630.150	32.7	31.5	7.4	29.2	0.0	42.4	74.0	-31.6	1/3MHz	RB	RB	NF
AVG	V	3630.150	24.5	31.5	7.4	29.2	0.0	34.2	54.0	-19.8	1/3MHz	RB	RB	NF
PK	V	4033.500	33.7	32.5	7.9	29.3	0.0	44.8	74.0	-29.2	1/3MHz	RB	RB	NF
AVG	V	4033.500	25.1	32.5	7.9	29.3	0.0	36.2	54.0	-17.8	1/3MHz	RB	RB	NF
Tx Frequency = CH10 404.850MHz (Left Antenna)														
PK	V	1214.550	36.5	24.7	4.0	29.1	0.0	36.1	74.0	-37.9	1/3MHz	RB	RB	
AVG	V	1214.550	30.3	24.7	4.0	29.1	0.0	29.9	54.0	-24.1	1/3MHz	RB	RB	
PK	V	1619.400	35.2	26.1	4.7	29.1	0.0	36.8	74.0	-37.2	1/3MHz	RB	RB	
AVG	V	1619.400	28.0	26.1	4.7	29.1	0.0	29.6	54.0	-24.4	1/3MHz	RB	RB	
PK	V	1651.400	46.4	26.2	4.7	29.1	0.0	48.2	74.0	-25.8	1/3MHz			
AVG	V	1651.400	44.7	26.2	4.7	29.1	0.0	46.5	54.0	-7.5	1/3MHz			
PK	V	2024.150	37.2	27.6	5.3	29.2	0.0	41.0	74.0	-33.0	1/3MHz			
AVG	V	2024.150	31.0	27.6	5.3	29.2	0.0	34.8	54.0	-19.2	1/3MHz			
PK	V	2429.100	34.4	28.5	5.9	29.2	0.0	39.6	74.0	-34.4	1/3MHz			
AVG	V	2429.100	25.0	28.5	5.9	29.2	0.0	30.2	54.0	-23.8	1/3MHz			
PK	V	2833.950	34.6	29.5	6.4	29.2	0.0	41.3	74.0	-32.7	1/3MHz	RB	RB	MWNF
AVG	V	2833.950	27.0	29.5	6.4	29.2	0.0	33.8	54.0	-20.2	1/3MHz	RB	RB	MWNF
PK	V	2889.936	37.7	29.7	6.5	29.2	0.0	44.7	74.0	-29.3	1/3MHz	RB	RB	NF
AVG	V	2889.936	32.7	29.7	6.5	29.2	0.0	39.7	54.0	-14.3	1/3MHz	RB	RB	NF
PK	V	3238.800	31.8	30.6	7.0	29.2	0.0	40.2	74.0	-33.8	1/3MHz			NF
AVG	V	3238.800	24.3	30.6	7.0	29.2	0.0	32.6	54.0	-21.4	1/3MHz			NF
PK	V	3643.650	33.4	31.6	7.4	29.2	0.0	43.2	74.0	-30.8	1/3MHz	RB	RB	NF
AVG	V	3643.650	25.6	31.6	7.4	29.2	0.0	35.4	54.0	-18.6	1/3MHz	RB	RB	NF
PK	V	4048.500	32.2	32.5	7.9	29.3	0.0	43.4	74.0	-30.6	1/3MHz	RB	RB	NF
AVG	V	4048.500	25.2	32.5	7.9	29.3	0.0	36.4	54.0	-17.6	1/3MHz	RB	RB	NF

Rx Radiated Emissions

Company: Medtronic
Model #: 2490C-LCM
Serial #: IJX000048A
Engineers: Kouma Sinn
Project #: 3161566
Standard: IC RSS-243
Receiver: R&S ESCI (ROS002)
PreAmp: PRE9 03-27-09.txt
PreAmp Used? (Y or N): N
Location: 1
Date(s): 09/05/08
Limit Distance (m): 3
Test Distance (m): 3
Voltage/Frequency: 120V/60Hz
Antenna & Cables: N
Bands: N, LF, HF, SHF
Antenna: LOG3 V3m 12-05-08.txt LOG3 H3m 12-05-08.txt
Cable(s): S1 3m Floor 9-7-08.txt NONE.
Barometer: BAR1
Temp/Humidity/Pressure: 21C 56% 1012mbar
Frequency Range: 30-1000MHz

Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
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
N: Receive mode, Left Antenna, Unmodulated													
QP	H	225.000	7.8	7.0	2.3	0.0	0.0	17.1	46.0	-28.9	120/300 kHz		
QP	H	245.760	4.6	7.9	2.9	0.0	0.0	15.4	46.0	-30.6	120/300 kHz	RB	RB
QP	H	270.336	9.2	8.5	2.6	0.0	0.0	20.3	46.0	-25.7	120/300 kHz	RB	RB
QP	H	294.908	5.4	9.0	2.1	0.0	0.0	16.5	46.0	-29.5	120/300 kHz		
QP	H	300.000	6.7	9.7	2.0	0.0	0.0	18.4	46.0	-27.6	120/300 kHz		
QP	H	319.500	4.7	9.9	2.1	0.0	0.0	16.8	46.0	-29.2	120/300 kHz		
QP	H	375.000	8.3	11.4	2.5	0.0	0.0	22.2	46.0	-23.8	120/300 kHz		
QP	H	825.700	11.9	17.7	4.0	0.0	0.0	33.6	46.0	-12.4	120/300 kHz		
QP	H	899.964	2.2	18.9	4.5	0.0	0.0	25.6	46.0	-20.4	120/300 kHz		

Rx Radiated Emissions

Company: Medtronic
Model #: 2490C-LCM
Serial #: IJX000048A
Engineers: Kouma Sinn
Project #: 3161566
Standard: IC RSS-243
Receiver: R&S ESCI (ROS001)
PreAmp: PRE9 03-27-09.txt
PreAmp Used? (Y or N): Y

Location: 1
Date(s): 09/03/08

Limit Distance (m): 3
Test Distance (m): 3
Voltage/Frequency: 120V/60Hz

Antenna & Cables: LF — Bands: N, LF, HF, SHF
Antenna: HORN3 V3m 3-03-09.txt — HORN3 H3m 3-03-09.txt
Cable(s): MEG001 06-05-09.txt — MEG002 06-05-09.txt
Barometer: BAR1 — REA003
Temp/Humidity/Pressure: 18C — 61% — 1008mbar
Frequency Range: 1-4.5GHz

Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
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	Harmonic?
No setting changes. Tested as received. Receiver Mode 1-4.5GHz														
PK	V	1651.404	47.5	26.2	4.7	29.1	0.0	49.3	74.0	-24.7	1/3MHz			
AVG	V	1651.404	47.3	26.2	4.7	29.1	0.0	49.1	54.0	-4.9	1/3MHz			
PK	V	2889.936	39.8	29.7	6.5	29.2	0.0	46.8	74.0	-27.2	1/3MHz	RB	RB	
AVG	V	2889.936	33.9	29.7	6.5	29.2	0.0	40.9	54.0	-13.1	1/3MHz	RB	RB	

Band Edge Compliance Radiated Emissions

Company: Medtronic
Model #: 2490C-LCM
Serial #: IJX000052A
Engineers: Nicholas Abbondante
Project #: 3155100
Standard: FCC Part 95 Subpart I/IC RSS-243
Receiver: R&S ESCI (ROS002)
PreAmp: PRE9 03-27-09.txt

Antenna & Cables: N
Antenna: LOG2 2-22-09 V3m.txt
Cable(s): S2 3M FLR 9-17-08.txt
Barometer: SAF291

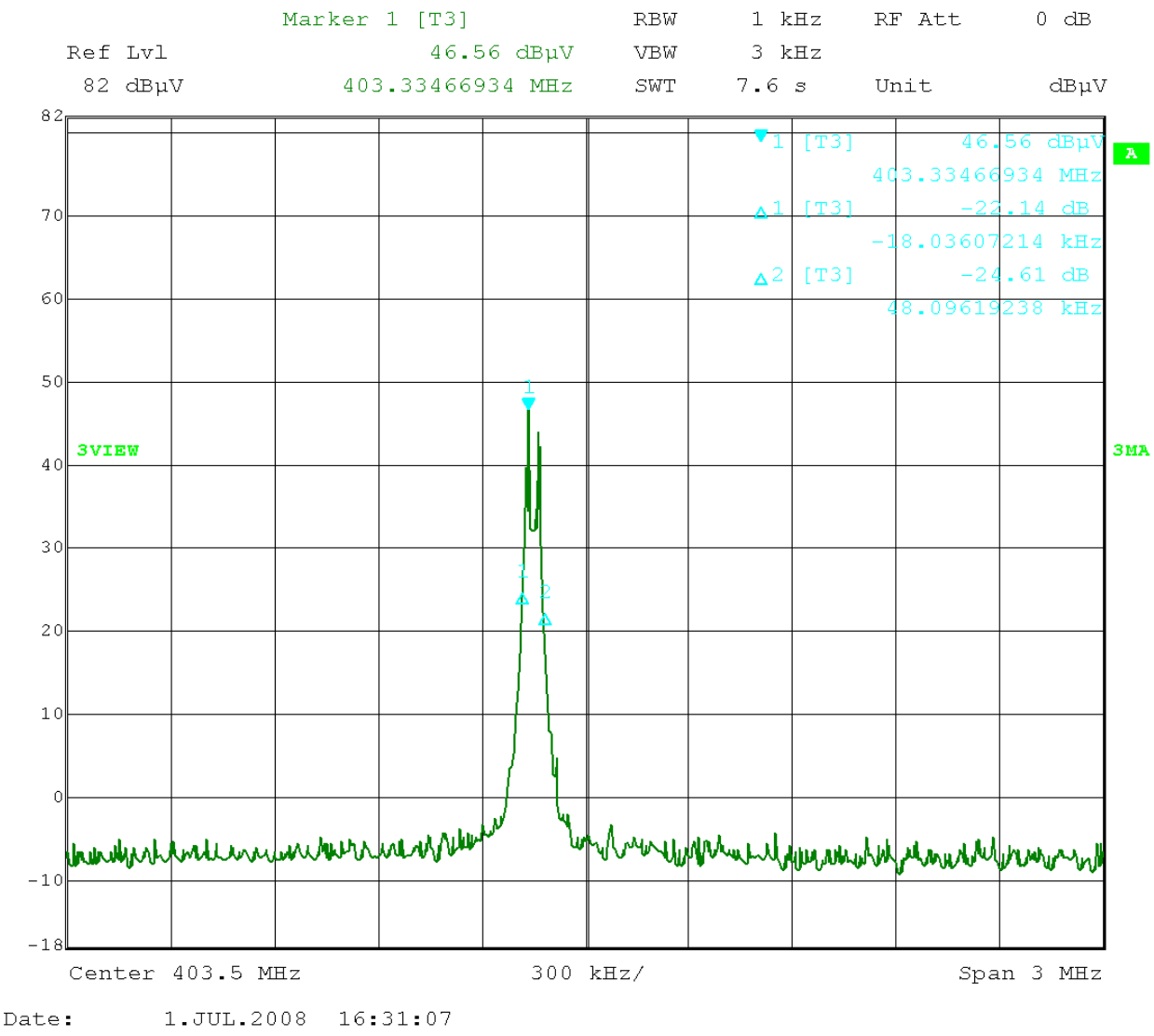
Location: Site 2
Date(s): 07/01/08
Limit Distance (m): 3
Test Distance (m): 3
Temp/Humidity/Pressure: 22c 56% 1002mB

Bands: N, LF, HF, SHF
LOG2 2-22-09 H3m.txt
NONE.

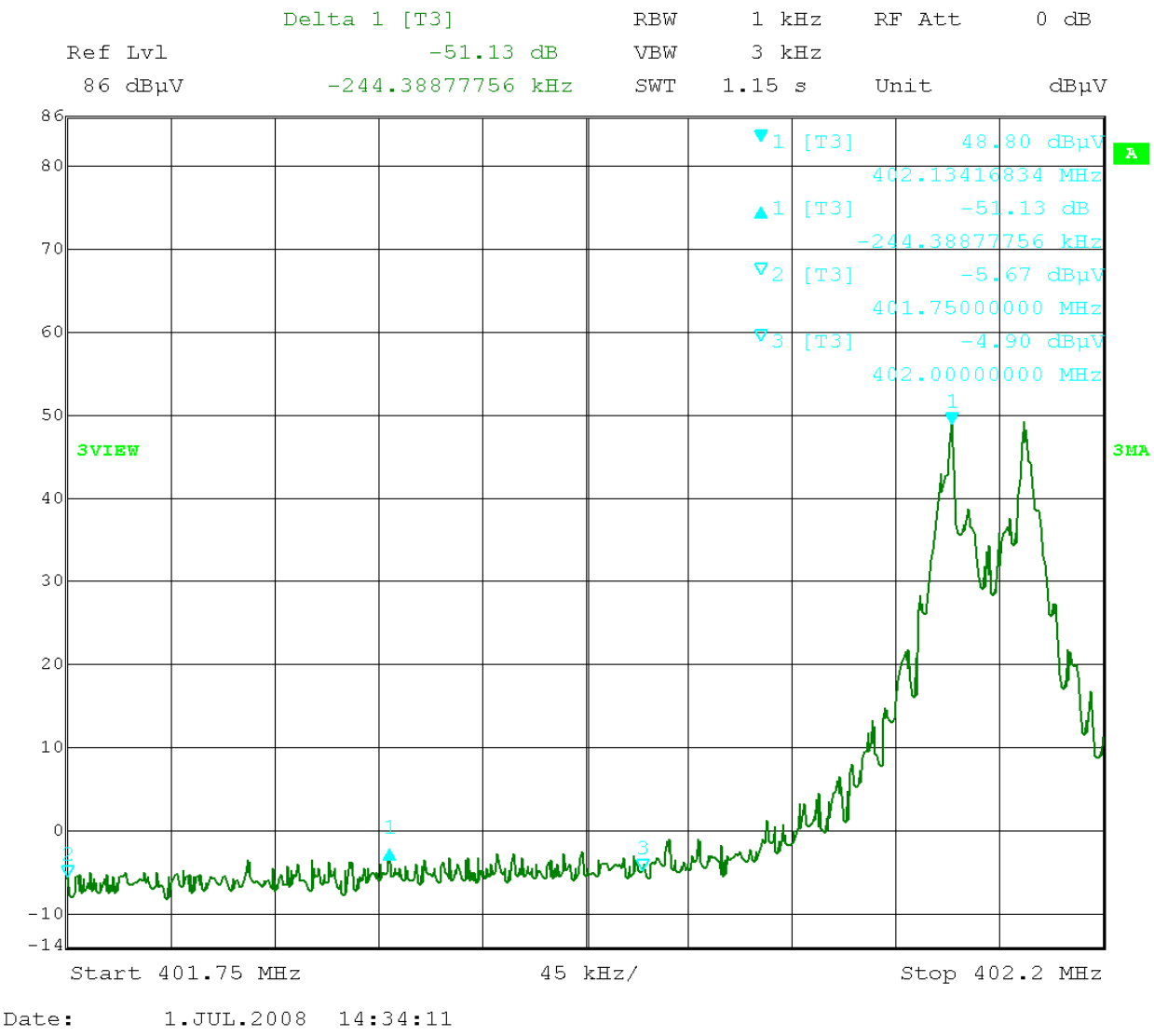
PreAmp Used? (Y or N): N
Voltage/Frequency: 120V/60Hz
Frequency Range: Frequencies Shown

Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

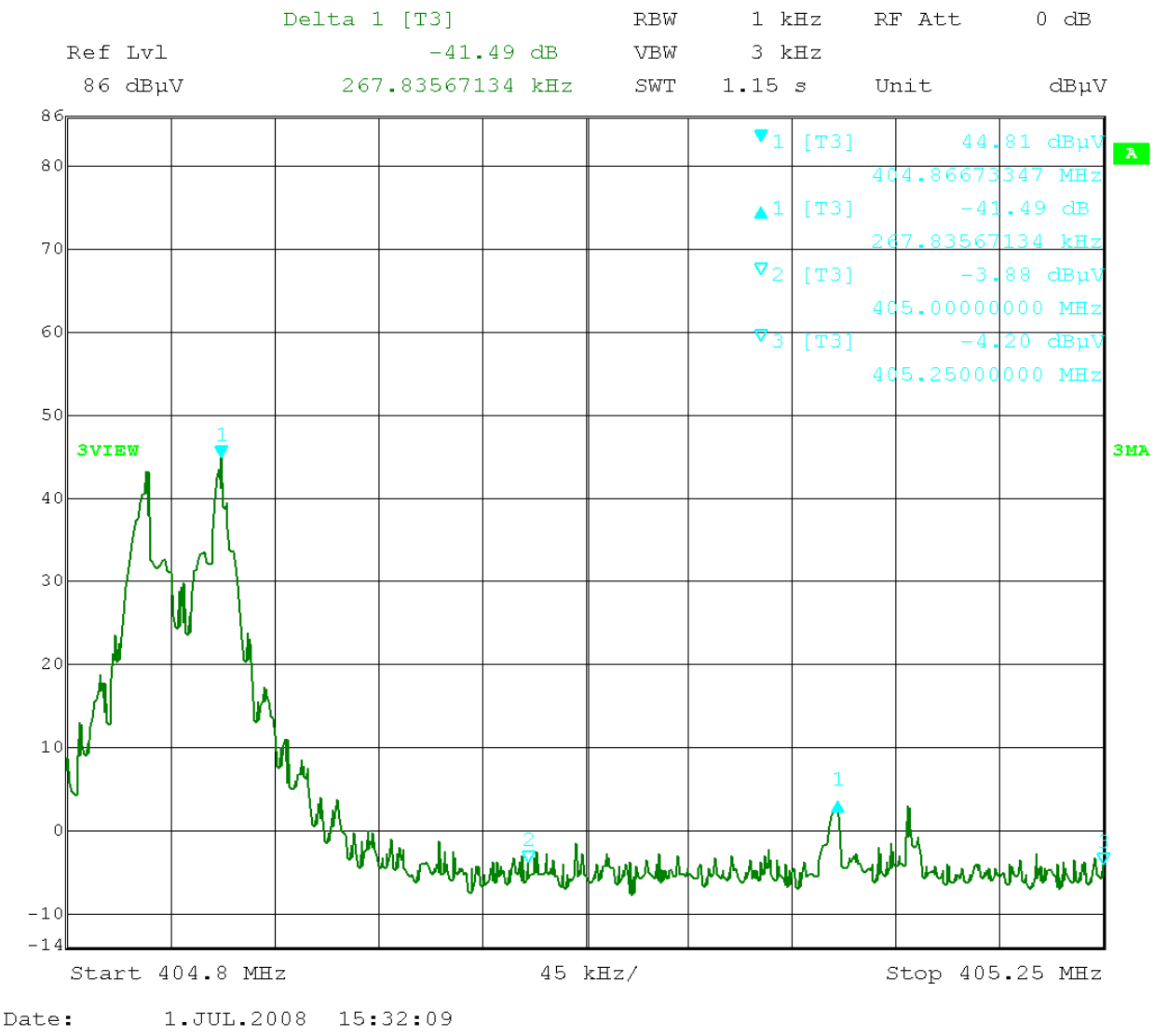
Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC
Note: Right Antenna, Modulated, Band Edge Compliance													
QP	H	401.750	16.2	18.4	2.6	0.0	0.0	37.2	46.0	-8.8	120/300 kHz	RB	RB
QP	H	405.250	16.8	18.1	2.6	0.0	0.0	37.5	46.0	-8.5	120/300 kHz	RB	RB
Note: Left Antenna, Modulated, Band Edge Compliance													
QP	H	401.750	16.2	18.4	2.6	0.0	0.0	37.2	46.0	-8.8	120/300 kHz	RB	RB
QP	H	405.250	16.7	18.1	2.6	0.0	0.0	37.4	46.0	-8.6	120/300 kHz	RB	RB



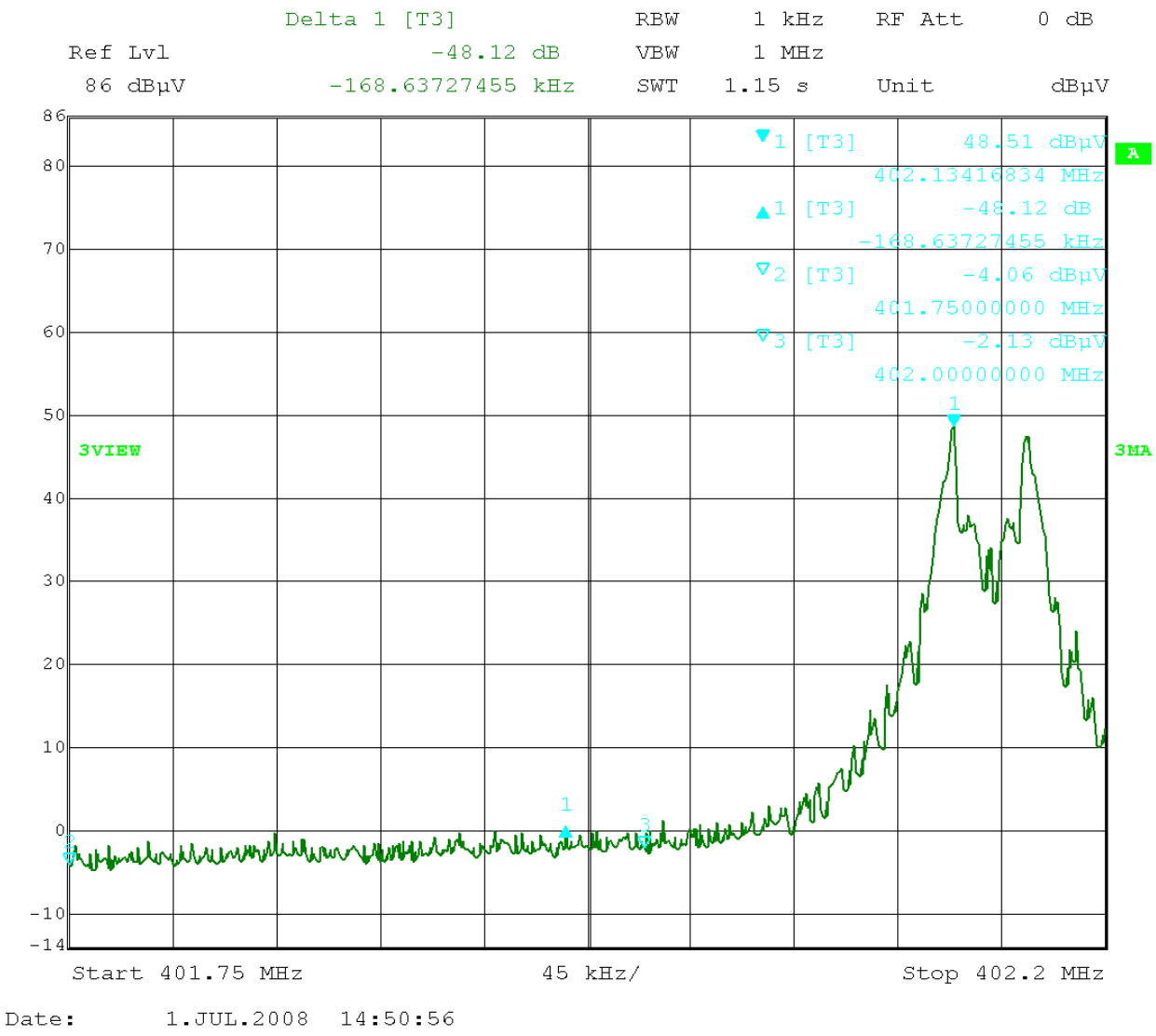
Emissions outside 150 kHz offset from the intended frequency



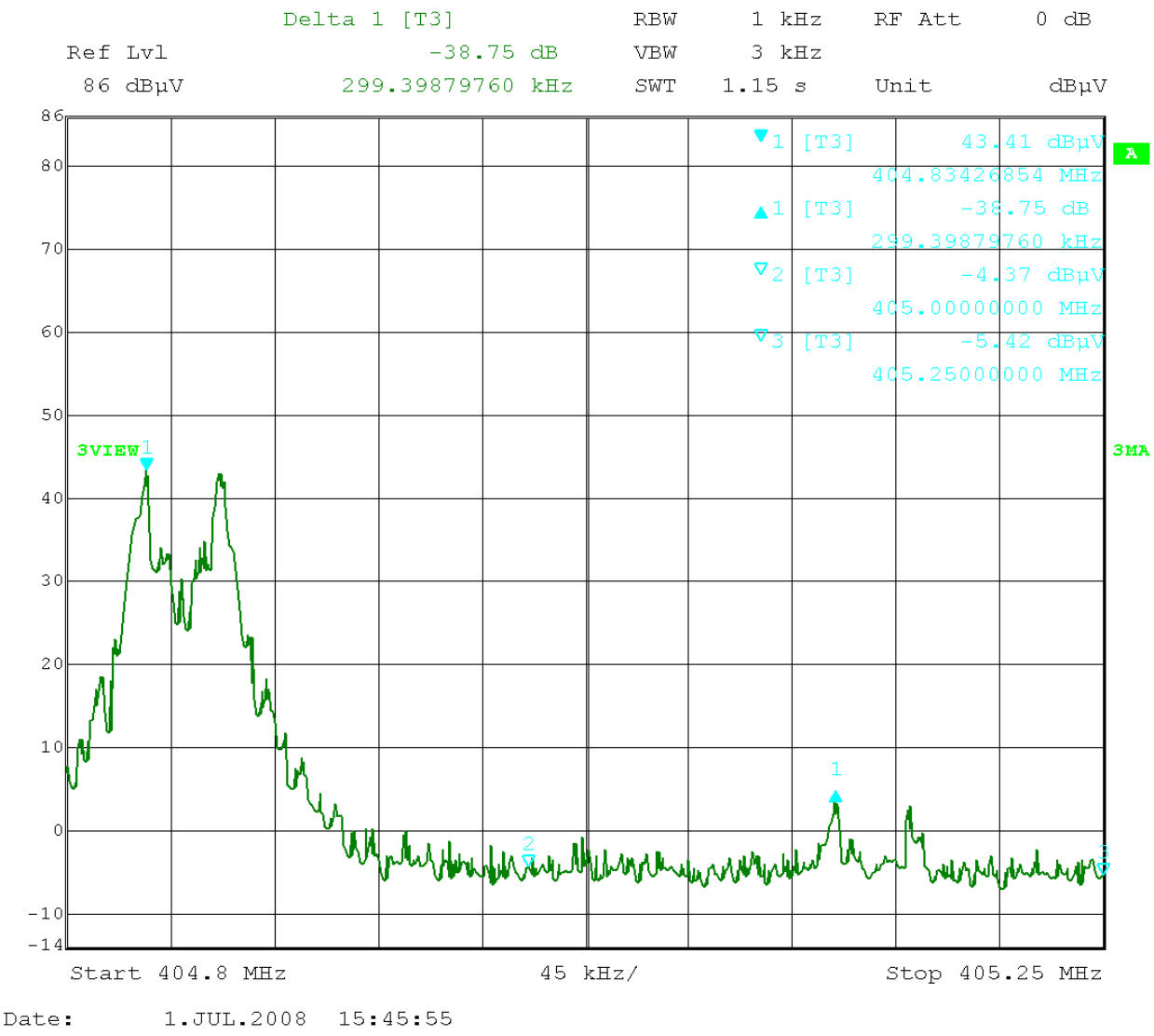
Lower 250 kHz Band Edge, Left Antenna



Upper 250 kHz Band Edge, Left Antenna



Lower 250 kHz Band Edge, Right Antenna



Upper 250 kHz Band Edge, Right Antenna

Test Results: Pass

Test Standard: FCC Part 95 Subpart I, IC RSS-243

Test: Frequency Error

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

Test Environment:

Environmental Conditions During Testing:	Ambient (°C):	N/A	Humidity (%):	N/A	Pressure (hPa):	N/A
Pretest Verification Performed	Yes		Equipment under Test:		2490C-LCM	
Test Engineer(s):	Nicholas Abbondante		EUT Serial Number:		IJX000037A	

Test Equipment Used:

TEST EQUIPMENT LIST					
Item	**Equipment Type**	**Make**	**Model No.**	**Serial No.**	**Next Cal. Due**
1	Temp/Humidity Chamber	Envirotronics	SH27C	08015563S11 263	03/18/2009
2	Spectrum Analyzer	Hewlett Packard	8593A	3009A00659	05/08/2009
3	BROADBAND ANTENNA	Compliance Design	B200	1850	09/13/2008
4	DMM	Fluke	85III	73760202	12/19/2008
5	AC Power Source (+-0.7%)	Elgar	3001	2220 Lot 313	Verified

Software Utilized:

Name	Manufacturer	Version
EXCEL 2000	Microsoft Corporation	9.0.6926 SP-3
EMI BOXBOROUGH	Intertek	3/07/07 Revision

Test Details:

Frequency Stability

Company: Medtronic
Model #: 2490C-LCM
Serial #: IJX000037A
Engineer(s): Nicholas Abbondante
Project #: 3155100
Standard: FCC Part 95 Subpart I, IC RSS-243
Limit: 100 PPM

Date(s): 07/28/08
Location: Littleton

Test Equipment Used:
147237 145038 HP3 ANT2B
148012

Nominal f: 404.55 MHz

Voltage: 230 VAC

%	Voltage Volts	Frequency MHz	Deviation kHz	Limit kHz
-15%	102	404.566300	0	40.46
+0%	120	404.566300	0	40.46
+15%	138	404.566500	0.2	40.46

Temp Celsius	Frequency MHz	Deviation kHz	Limit kHz
-20	404.566300	-0.5	40.46
-10	404.567000	0.2	40.46
0	404.567000	0.2	40.46
10	404.566500	-0.3	40.46
20	404.566800	0	40.46
30	404.566500	-0.3	40.46
40	404.566500	-0.3	40.46
50	404.566300	-0.5	40.46

Test Results: Pass

Test Standard: FCC Part 95 Subpart I, IC RSS-243

Test: MICS Operation

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:

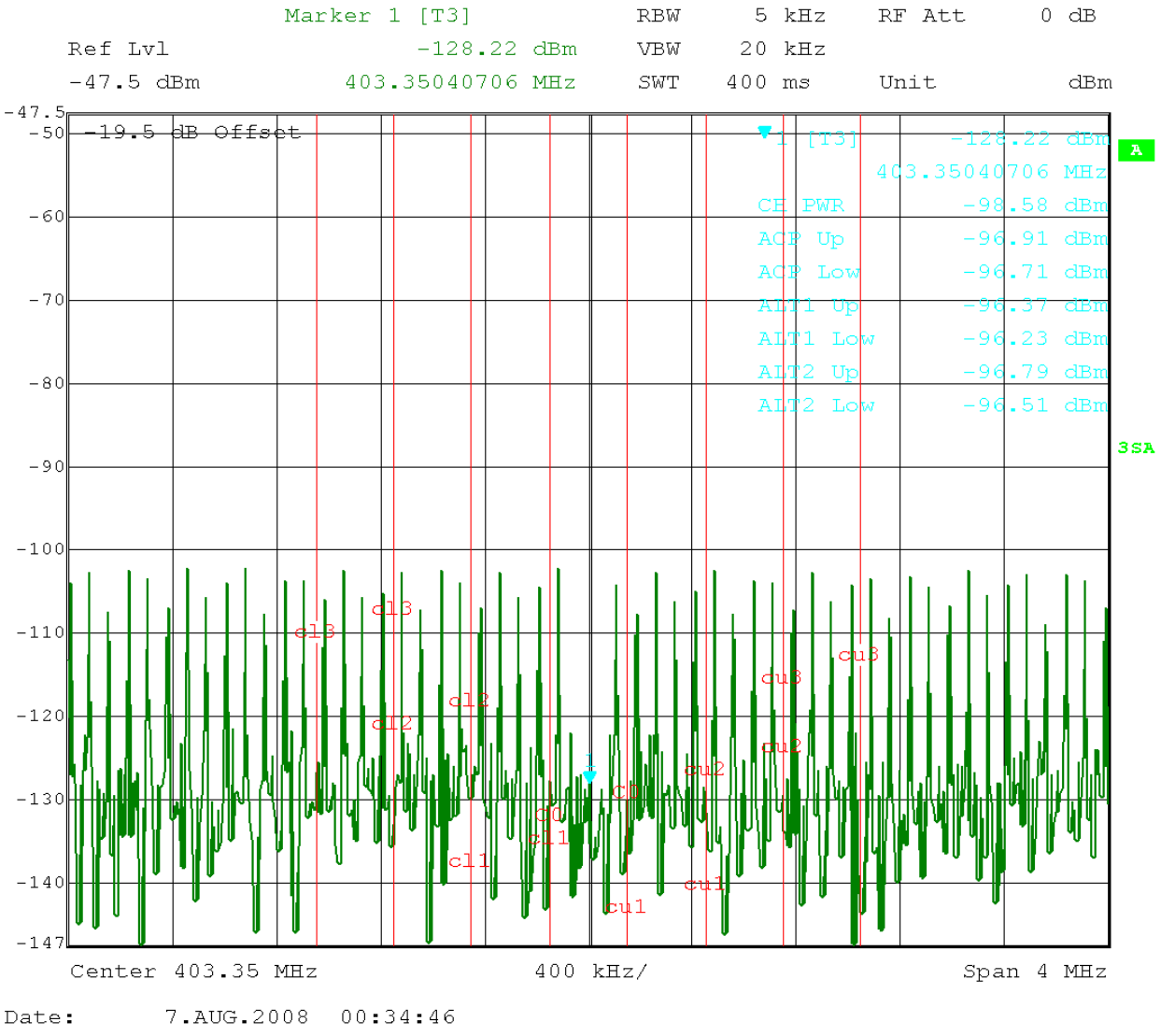
Environmental Conditions During Testing:	Ambient (°C):	N/A	Humidity (%):	N/A	Pressure (hPa):	N/A
Pretest Verification Performed	Yes		Equipment under Test:		2490C-LCM	
Test Engineer(s):	Nicholas Abbondante		EUT Serial Number:		IJX000075A, PUL422966H (implant)	

Test Equipment Used:

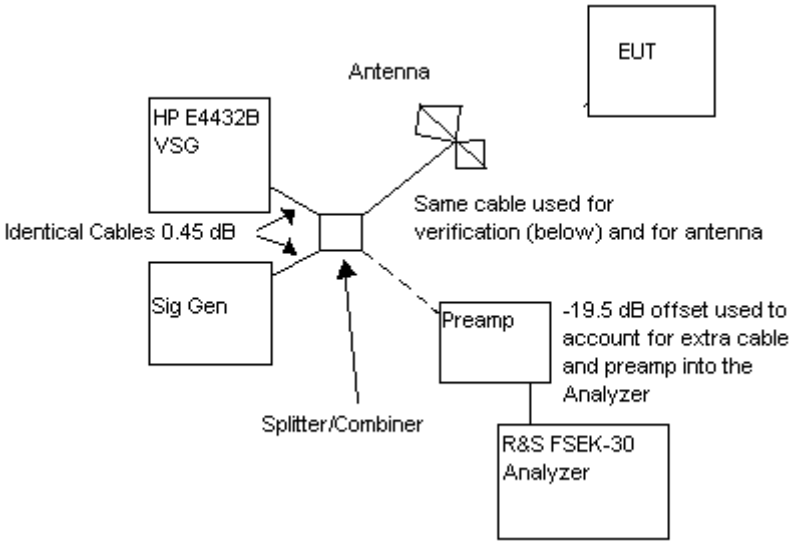
TEST EQUIPMENT LIST					
Item	**Equipment Type**	**Make**	**Model No.**	**Serial No.**	**Next Cal. Due**
1	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwarz	FSEK-30	100225	11/26/2008
2	Vector Signal Generator	Agilent	E-4432B ESG-D	US37231035	02/11/2009
3	Generator, Signal	Hewlett Packard	8648C	3426A01040	09/05/2008
4	PREAMPLFIER 1- 40 GHz	MITEQ	NSP4000-NF	507145	11/09/2008
5	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 197	CBL028	12/06/2008
6	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 80	CBL029	12/06/2008
7	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 80	CBL030	12/06/2008
8	Splitter/Combiner	Mini Circuits	ZFRSC-2050	None	Verified
9	Synthesized Sweep Generator	Hewlett Packard	83620A	3213A01244	02/06/2009
10	BROADBAND ANTENNA	Compliance Design	B200	1850	09/13/2008
11	BROADBAND ANTENNA	Compliance Design	B300	00674	09/13/2008
12	Generator, Signal	Hewlett Packard	8648B	3537A01040	06/30/2009
13	Attenuator	Weinschel Corp	47-10-34	BD8309	Verified
14	10W, 30dB Attenuator	Weinschel Corp	47-30-34	BD43291	Verified
15	Attenuator, 30dB	Weinschel Corp	47-30-34	BD4327	Verified

Test Details:

For these tests, a blocking band was created using the vector signal generator and a transmit antenna. 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 was 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


EUT
Antenna
HP E4432B
VSG
Same cable used for
verification (below) and for antenna
Identical Cables 0.45 dB
Sig Gen
Preamp
-19.5 dB offset used to
account for extra cable
and preamp into the
Analyzer
Splitter/Combiner
R&S FSEK-30
Analyzer

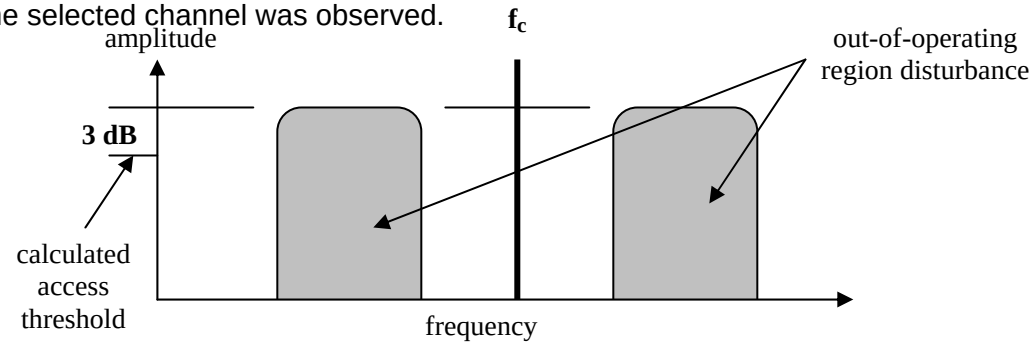
System Threshold Power Levels

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 = 52100 Hz G = 3.0 dBi

10 $\log_{10}$ 52100 (Hz) – 150 (dBm/Hz) + 3(dBi) = 47.17 – 150 + 3.0 = -99.8 dBm

The blocking band was set to ~-101.8 dBm per channel, with a notch left open at channel 4 (403.35) MHz. It was verified that the EUT only transmitted in the notch. A tone was introduced at the center of the notch at -109.8 dBm, and was stepped up to the calculated threshold level, -99.8 dBm. At each step, a MICS communications session was initiated and the selected channel was observed.

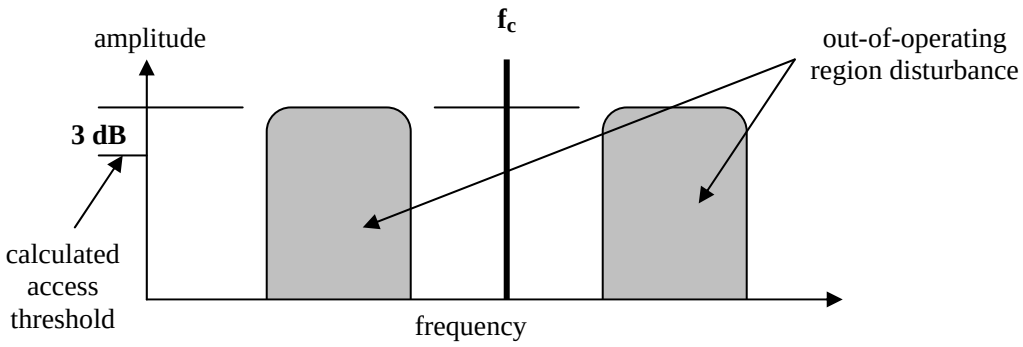


-109.8 dBm Tx on channel
-108.8 dBm Tx off channel

Threshold power = -108.8 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.

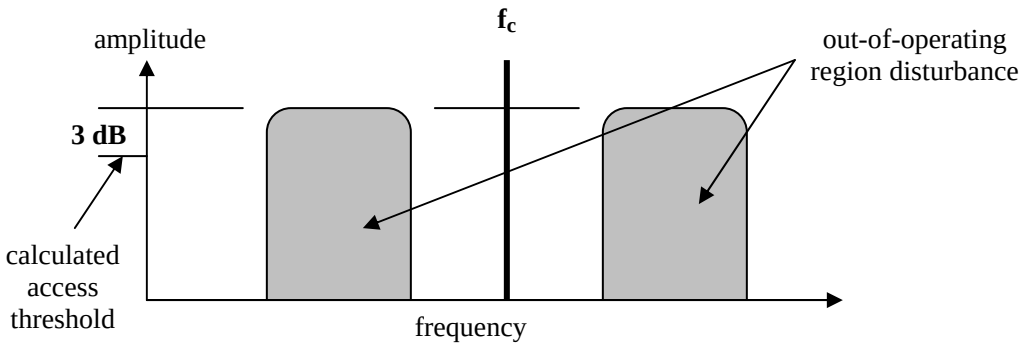
The blocking band was set to ~-101.8 dBm per channel, with a notch left open at channel 4 (403.35) MHz. A tone was introduced at the frequencies corresponding to the 20 dB down points of the fundamental emission, and was increased until the EUT no longer transmitted on channel 4. At each step, a MICS 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.



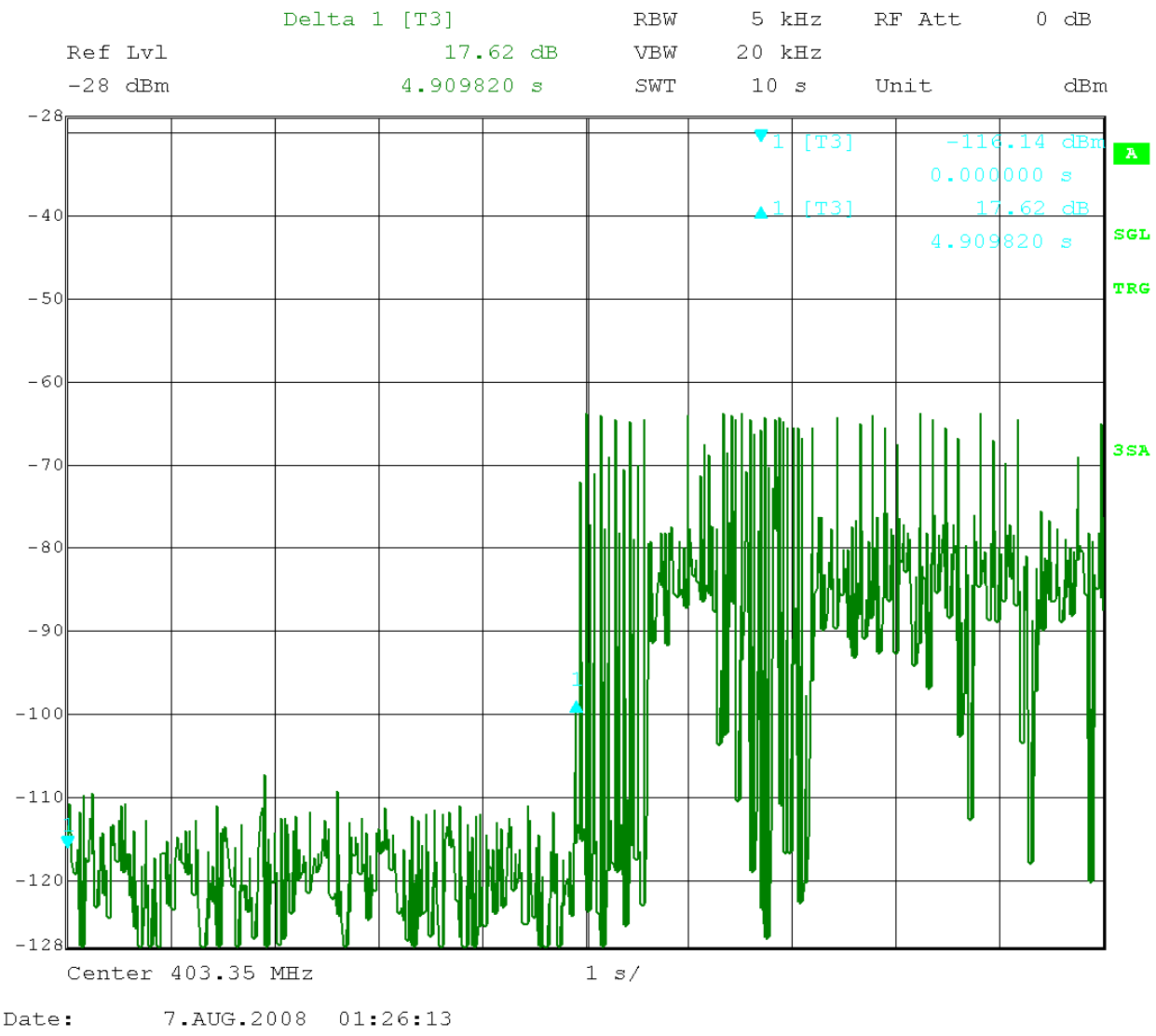
-109.8 dBm Tx off channel
-108.8 dBm Tx on channel
P_a = -109.8 dBm
F_{low} = 403.324 MHz
F_{low} -109.8 dBm Tx on channel
F_{low} -108.8 dBm Tx off channel
P_b = -108.8 dBm
F_{high} = 403.376 MHz
F_{high} -109.8 dBm Tx on channel
F_{high} -108.8 dBm Tx on channel
F_{high} -107.8 dBm Tx off channel
P_c = -107.8 dBm
$D_1 = P_a – P_b$ = 1 dB
$D_2 = P_a - P_c$ = 2 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.

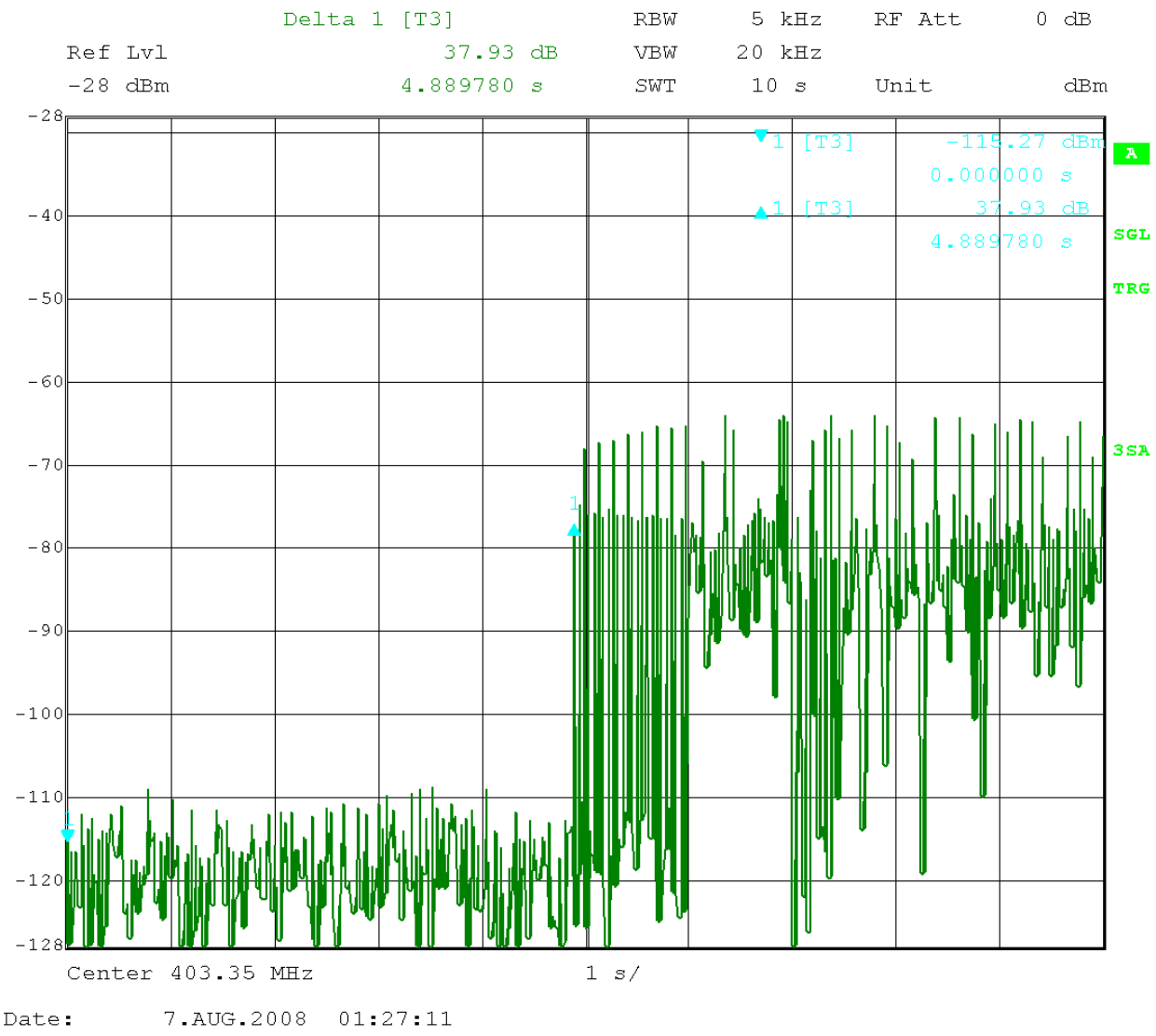
The blocking band was set to ~-101.8 dBm per channel, with a notch left open at channel 4 (403.35) MHz. A tone was introduced at the center of the notch at -98.8 dBm. The tone was removed and a MICS communications session was initiated. The time elapsed between removal of the CW tone and the start of the MICS session was recorded. The highest value was 4.97 seconds.



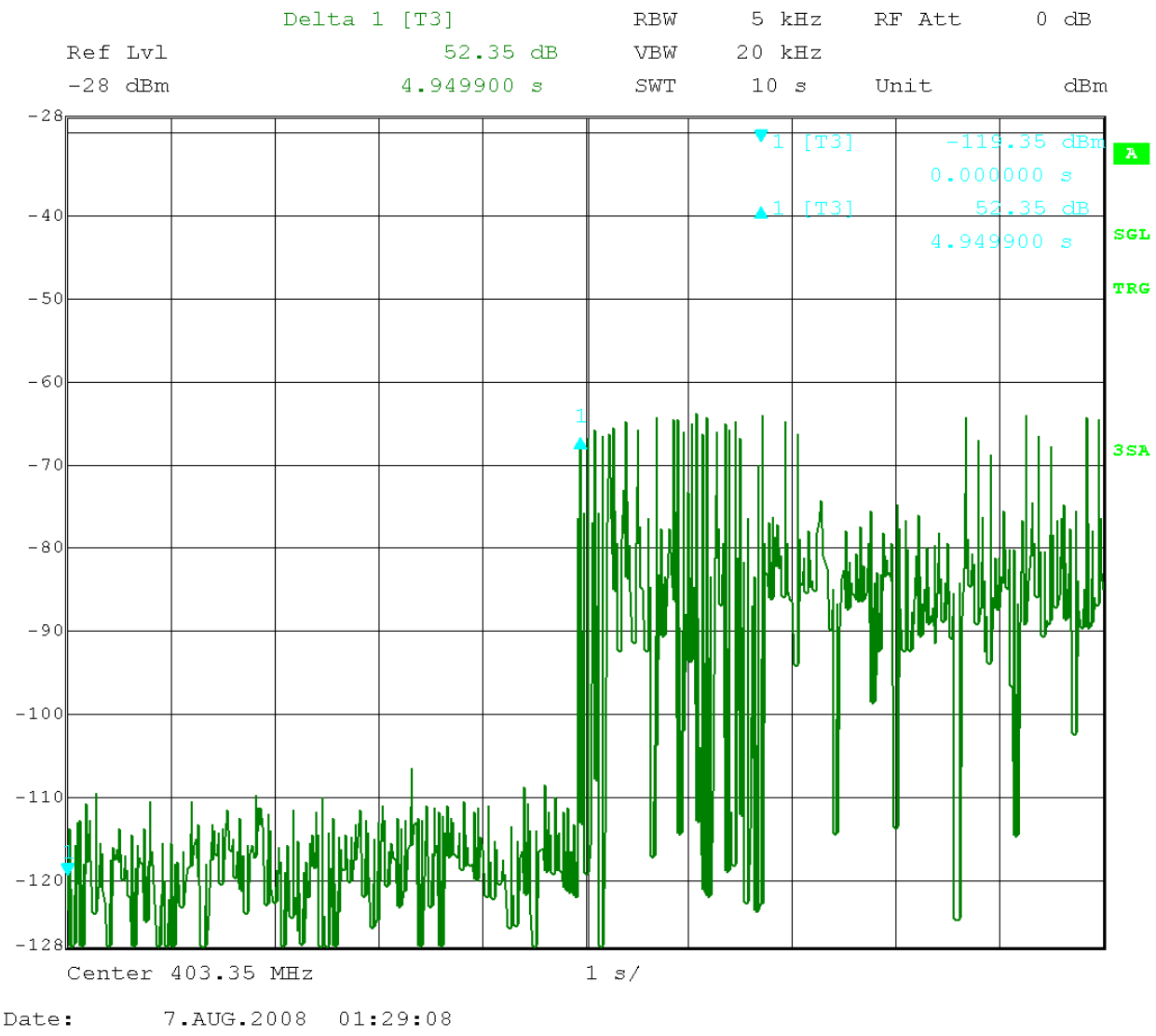
4.91s – Scan cycle time 1
4.89s – Scan cycle time 2
4.95s – Scan cycle time 3
4.95s – Scan cycle time 4
4.97s – Scan cycle time 5



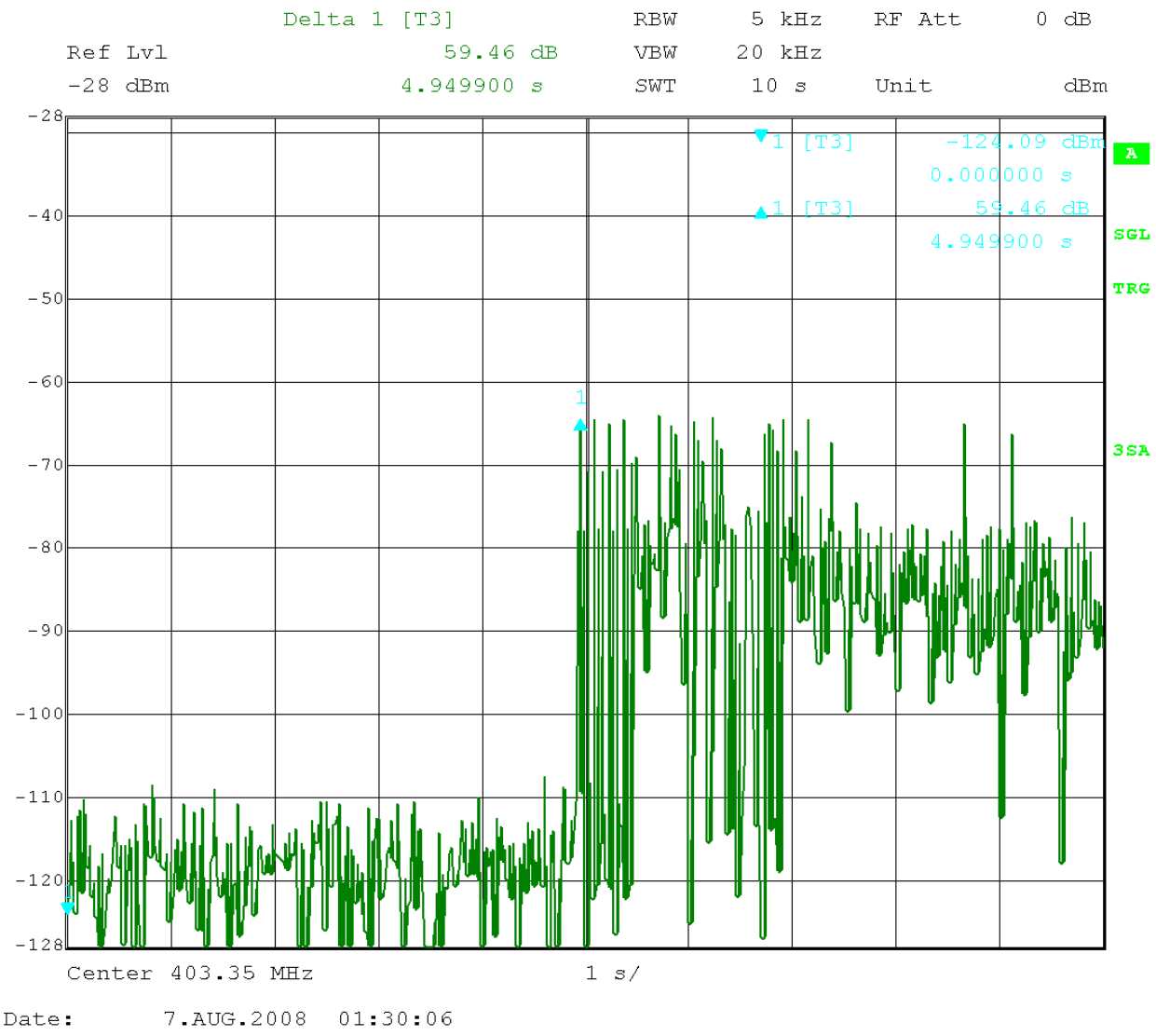
Scan Cycle Time 1 (4.91 s)



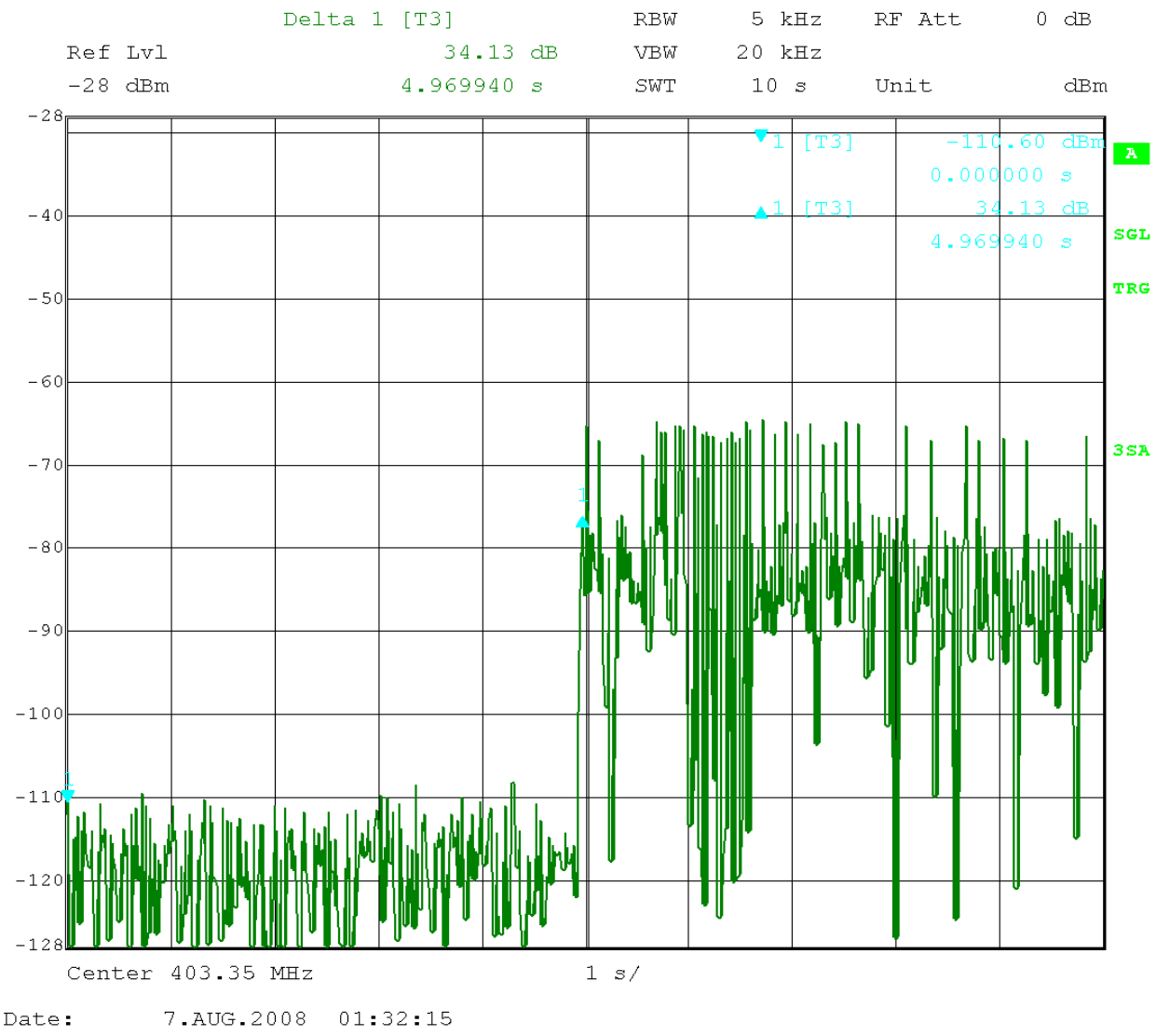
Scan Cycle Time 2 (4.89 s)



Scan Cycle Time 3 (4.95 s)



Scan Cycle Time 4 (4.95 s)



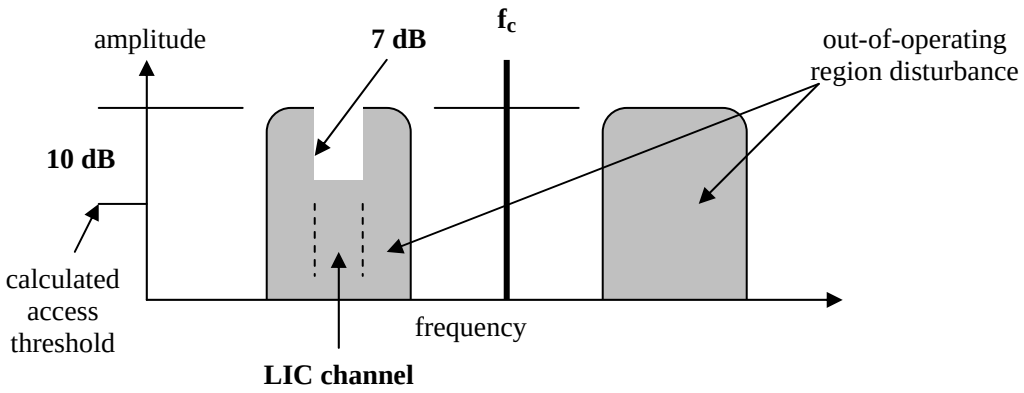
Scan Cycle Time 5 (4.97 s)

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 ~-101.8 dBm per channel, with a notch left open at channel 4 (403.35) MHz. A tone was introduced at the center of the notch at -98.8 dBm. A MICS communication session was initiated and it was verified that the EUT did not select channel 4 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 4 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 ~-94.8 dBm per channel, with a notch left open at channel 4 (403.35) MHz. A second notch was created at channel 7 (404.25 MHz) by lowering the blocking tones at channel 7 by 7 dB. A tone was introduced at the center of the channel 4 notch at -107.8 dBm. A MICS communication session was then initiated and it was verified that the EUT transmitted only on channel 4 through several attempts. The CW tone at channel 4 was then increased to -98.8 dBm, and it was verified that the EUT transmitted only on channel 7 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 lose connection during the session. The time from when the implant ceased transmission until the programmer/controller ceased communication was 3.4 seconds. Communication resumed on channel 4 when the implant was allowed to continue communication.

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

Test Results: Pass

Test Standard: IC RSS-Gen

Test: AC Line-Conducted Emissions

Performance Criterion: The AC line-conducted emissions must not exceed the RSS-Gen Section 7.2.2 Table 2 limits.

Test Environment (07/29/2008):

Environmental Conditions During Testing:		Ambient (°C):	19	Humidity (%):	56	Pressure (hPa):	1004
Pretest Verification Performed		Yes		Equipment under Test:		2490C-LCM	
Test Engineer(s):	Michael Houston			EUT Serial Number:		IJX000052A	

Test Environment (09/05/2008):

Environmental Conditions During Testing:		Ambient (°C):	20	Humidity (%):	56	Pressure (hPa):	1011
Pretest Verification Performed		Yes		Equipment under Test:		2490C-LCM	
Test Engineer(s):	Kouma Sinn			EUT Serial Number:		IJX000048A	
Engineer's Initials:	KPS	Date Test Performed:	09/05/2008	Reviewer's Initials:		Date Reviewed:	

Test Equipment Used (07/29/2008):

TEST EQUIPMENT LIST					
Item	**Equipment Type**	**Make**	**Model No.**	**Serial No.**	**Next Cal. Due**
1	Spectrum Analyzer	Agilent	E7405A	US40240205	08/09/2008
2	30 ft 50 ohm coax, BNC - BNC	ITT Pomona	RG 58 C/U	CBLBNC7	11/06/2008
3	LISN, 50uH, .01 - 50MHz, 24A	Solar Electronics	9252-50-R-24-BNC	941713	08/30/2008
4	Attenuator, 20dB	Mini Circuits	20dB, 50 ohm	DS20	12/28/2008
5	Digital 4 Line Barometer	Mannix	0ABA116	BAR1	06/01/2009

Test Equipment Used (09/05/2008):

TEST EQUIPMENT LIST					
Item	**Equipment Type**	**Make**	**Model No.**	**Serial No.**	**Next Cal. Due**
1	9kHz to 3GHz EMI Test Receiver	Rohde & Schwartz	ESCI 1166.5950K03	100067	01/25/2009
2	Cable BNC/BNC, 30'	ITS	BNC-30	CBLBNC3	03/05/2009
3	LISN, 50uH, .01 - 50MHz, 24A	Solar Electronics	9252-50-R-24-BNC	941714	10/11/2008
4	Attenuator, 20dB	Mini Circuits	20dB, 50 ohm	DS29	03/05/2009
5	Digital 4 Line Barometer	Mannix	0ABA116	BAR1	06/01/2009

Software Utilized:

Name	Manufacturer	Version
EXCEL 2000	Microsoft Corporation	9.0.6926 SP-3
EMI BOXBOROUGH	Intertek	3/07/07 Revision

Test Results:

Serial # IJX000052A Conducted Emissions

Company: Medtronic
Model #: 2490C-LCM (400 MHz)
Serial #: IJX000052A
Engineer(s): Michael Houston
Project #: 3155100
Standard: IC RSS-Gen 7.2.2
Barometer: BAR1

Location: EMI 1
Date: 07/29/08
Temp/Humidity/Pressure: 19 C 56% 1004 mb
Voltage/Frequency: 120V 60Hz

Receiver: Agilent E7405A (AGL001)
Cable: CBLBNC7 11-06-08.txt
LISN 1: LISN11 [1] 8-30-08.lsn
LISN 2: NONE.
LISN 3: NONE.
LISN 4: LISN11 [2] 8-30-08.lsn
Attenuator: DS20 12-28-08.txt
Frequency Range: 0.15 - 30 MHz

Net is the sum of worst-case lisn, cable, & attenuator losses, and initial reading, factors are not shown
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor; Bandwidth denoted as RBW/VBW

Detector Type	Frequency MHz	Reading Line 1 dB(uV)	Reading Line 2 dB(uV)	Reading Line 3 dB(uV)	Reading Line 4 dB(uV)	Net dB(uV)	QP Limit dB(uV)	Margin dB	Bandwidth
QP	0.150	10.7			5.6	30.7	66.0	-35.3	9/30 kHz
QP	0.273	9.2			4.3	29.4	61.0	-31.7	9/30 kHz
QP	0.650	9.9			2.9	30.1	56.0	-25.9	9/30 kHz
QP	1.550	9.0			4.9	29.3	56.0	-26.7	9/30 kHz
QP	5.270	4.8			0.6	25.4	60.0	-34.6	9/30 kHz

Detector Type	Frequency MHz	Reading Line 1 dB(uV)	Reading Line 2 dB(uV)	Reading Line 3 dB(uV)	Reading Line 4 dB(uV)	Net dB(uV)	Average Limit dB(uV)	Margin dB	Bandwidth
AVG	0.150	0.8			-0.3	20.9	56.0	-35.1	9/30 kHz
AVG	0.273	-0.7			-1.7	19.5	51.0	-31.6	9/30 kHz
AVG	0.650	-2.1			-3.0	18.1	46.0	-27.9	9/30 kHz
AVG	1.550	-2.2			-3.0	18.1	46.0	-27.9	9/30 kHz
AVG	5.270	-4.7			-5.3	15.9	50.0	-34.1	9/30 kHz

Serial # IJX000048A Conducted Emissions

Company: Medtronic
Model #: 2490C-LCM
Serial #: IJX000048A
Engineer(s): Kouma Sinn
Project #: 3161566
Standard: IC RSS-Gen
Barometer: BAR1
Temp/Humidity/Pressure: 20C 56% 1011mbar
Voltage/Frequency: 120V/60Hz
Location: 1
Date: 09/05/08
Receiver: R&S ESCI (ROS002)
Cable: CBLBNC3 03-05-09.txt
LISN 1: LISN12 [1] 10-11-08.txt
LISN 2: LISN12 [2] 10-11-08.txt
LISN 3: NONE.
LISN 4: NONE.
Attenuator: DS29 03-05-09.txt
Frequency Range: 150kHz-30MHz

Net is the sum of worst-case lisn, cable, & attenuator losses, and initial reading, factors are not shown
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor; Bandwidth denoted as RBW/VBW

Detector Type	Frequency MHz	Reading Line 1 dB(uV)	Reading Line 2 dB(uV)	Reading Line 3 dB(uV)	Reading Line 4 dB(uV)	Net dB(uV)	QP Limit dB(uV)	Margin dB	Bandwidth
QP	0.206	21.2	21.4	--	--	42.1	63.4	-21.3	9/30 kHz
QP	0.310	9.8	11.7	--	--	32.3	60.0	-27.6	9/30 kHz
QP	0.410	3.9	9.1	--	--	29.7	57.6	-27.9	9/30 kHz
QP	0.716	7.8	12.5	--	--	33.0	56.0	-23.0	9/30 kHz
QP	1.318	6.0	6.2	--	--	26.9	56.0	-29.1	9/30 kHz
QP	1.785	2.1	4.5	--	--	25.2	56.0	-30.8	9/30 kHz
QP	2.300	9.2	9.7	--	--	30.4	56.0	-25.6	9/30 kHz
QP	4.795	3.0	6.5	--	--	27.2	56.0	-28.8	9/30 kHz
QP	15.700	1.8	2.7	--	--	23.8	60.0	-36.2	9/30 kHz
QP	21.200	-0.1	1.0	--	--	22.3	60.0	-37.7	9/30 kHz

Detector Type	Frequency MHz	Reading Line 1 dB(uV)	Reading Line 2 dB(uV)	Reading Line 3 dB(uV)	Reading Line 4 dB(uV)	Net dB(uV)	Average Limit dB(uV)	Margin dB	Bandwidth
AVG	0.206	12.0	10.0	--	--	32.7	53.4	-20.7	9/30 kHz
AVG	0.310	-0.5	2.0	--	--	22.6	50.0	-27.3	9/30 kHz
AVG	0.410	-4.2	0.4	--	--	21.0	47.6	-26.6	9/30 kHz
AVG	0.716	-6.5	-1.3	--	--	19.2	46.0	-26.8	9/30 kHz
AVG	1.318	-11.2	-9.8	--	--	10.9	46.0	-35.1	9/30 kHz
AVG	1.785	-13.7	-12.2	--	--	8.5	46.0	-37.5	9/30 kHz
AVG	2.300	-7.7	-5.1	--	--	15.6	46.0	-30.4	9/30 kHz
AVG	4.795	-12.3	-9.2	--	--	11.5	46.0	-34.5	9/30 kHz
AVG	15.700	-11.5	-8.2	--	--	12.9	50.0	-37.1	9/30 kHz
AVG	21.200	-12.0	-12.0	--	--	9.4	50.0	-40.6	9/30 kHz