TEST Engineering Laboratory, In
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CERTIFICATE OF COMPLIANCE
FCC Part 95 Certification

Medtronic, Inc.
7000 Central Ave.
Minneapolis, MN 55432-3576
U.S.A.
Attention: Mr. Len Twetan,
Senior Product Development Manager

Dates of Tests: August 29, 2003
TestReportS/N: 95.230829413.LF5
Test Site: PCTEST Lab, MD

FCC ID	LF5MICSIMPLANT
APPLICANT	Medtronic, Inc.

Classification:	Licensed Non-Broadcast Transmitter Placed in the Body
FCC Rule Part(s):	§§§ 95
EUT Type:	Medical Implant Device
Trade Name(s):	*Medtronic*
Tx/Rx Frequency Range:	402.15 – 404.85 MHz
Max. RF Output Power:	5.8 e-8 watts
Frequency Tolerance:	100 ppm
Emission Designator:	240K0F1D
Channel Capacity:	10

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

PCTEST certifies that no party to this application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 862.

Randy Ortanez
President

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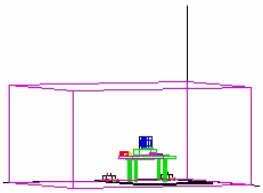
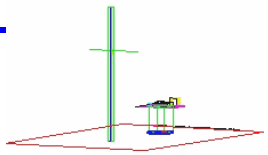
TABLE OF CONTENTS



MEASUREMENT REPORT



1.1 Scope

Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission.

General Information

Applicant Name:	**Medtronic, Inc.**
Address:	**7000 Central Ave.**
	Minneapolis, MN 55432-3576
Attention:	**Mr. Len Twetan,**
	Sr. Product Development Manager

- **FCC ID:** **LF5MICSIMPLANT**
- Quantity: Quantity production is planned
- Tx/Rx Freq. Range: 402.15 – 404.85 MHz
- Equipment Class: Licensed Non-Broadcast Transmitter Place in the Body
- Equipment Type: Medical Implant Device
- Emission Designator: 240K0F1D
- Modulation: FSK
- Frequency Tolerance: 100 ppm
- Max. Power: 5.8 x e-8
- FCC Rule Part(s): §§§§ 95
- Dates of Tests: August 29, 2003
- Place of Tests: PCTEST Lab, Columbia, MD U.S.A.
- Test Report S/N: 95.230829413.LF5

2.1 INTRODUCTION

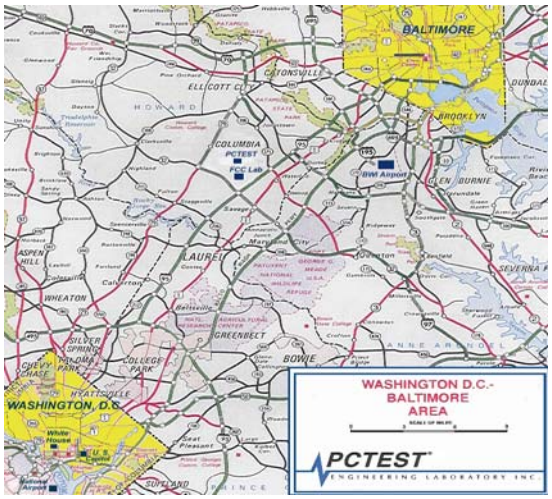


Figure 1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area.

These measurement tests were conducted at ***PCTEST Engineering Laboratory, Inc.*** facility in New Concept Business Park, Guilford Industrial Park, Columbia, Maryland. The site address is 6660-B Dobbin Road, Columbia, MD 21045. The test site is one of the highest points in the Columbia area with an elevation of 390 feet above mean sea level. The site coordinates are 39° 11'15" N latitude and 76° 49'38" W longitude. The facility is 1.5 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. There are no FM or TV transmitters within 15 miles of the site. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4 on October 19, 1992.

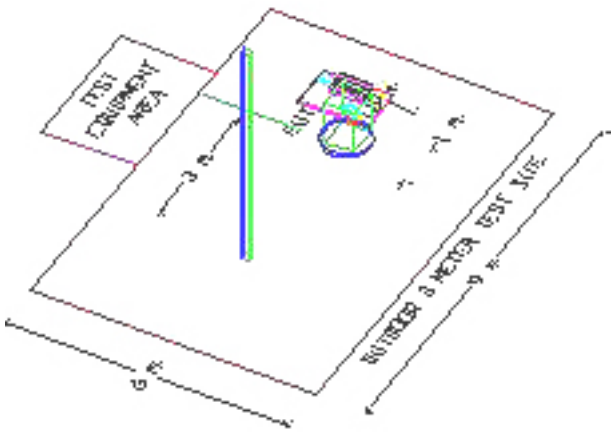


Figure 2. 3-meter outdoor test site

Measurement Procedure

The radiated and spurious measurements were made outdoors at a 3-meter test range (see Figure2). The equipment under testing was placed on a wooden turntable, 3-meters from the receive antenna. The receive antenna height and turntable rotations was adjusted for the highest reading on the receive spectrum analyzer. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This level was recorded.

For readings above 1 GHZ, the above procedure would be repeated using horn antennas and the difference between the gain of the horn and an isotropic antenna are taken into consideration.

3.1 INSERTS

Block Diagram(s) & Circuit Diagram(s)

The block diagram is submitted as attachment “Block Diagram”.

Operating Instructions

The instruction manual is submitted as “User Manual”.

4.1 DESCRIPTION OF TESTS

4.2 Transmitter Audio Frequency Response

N/A

4.3 Modulation Limiting

N/A

4.1 DESCRIPTION OF TESTS (CONTINUED)

4.4 20dB Bandwidth

The unit was internally modulated and the Spectrum Analyzer was set with a Resolution Bandwidth of 3 kHz and a Video Bandwidth of 30Hz to simulate an average responding meter.

See the attached plot.

4.5 Spurious and Harmonic Emissions at Antenna Terminal

N/A

4.6 Radiated Fundamental, Spurious and Harmonic Emissions

Radiation and harmonic emissions are measured at out 3-meter outdoor site. The implant was placed on the turntable in the specified torso simulator with the correct tissue substitute material in a vertical plane and operated at the frequency selected by the programmer/controller. With the prevailing ambient at the PCTest, the frequency of operation selected by the programmer was 402.15MHz. Care was taken to identify the respective emissions from the implant and the programmer/controller. A receiving antenna located 3 meters from the turntable receives any signal radiated from the transmitter and its operating accessories. The antenna was varied from 1 to 4 meters and the polarization is varied (horizontal and vertical) to determine the worst-case emission level. This process was repeated with the implant in a horizontal position in the torso simulator. To obtain actual radiated power, a signal generator is adjusted in output until a reading identical to that obtained with the actual transmitter is obtained at the receiver. Signal strength is read directly from the generator and recorded in the attached table.

The table contains worst case emissions for the various orientations and antenna polarizations. Vertical orientation of the implant and measuring antenna produced worst case emissions.

4.1 DESCRIPTION OF TESTS (CONTINUED)

4.7 Frequency Stability/Temperature Variation

The frequency stability of the transmitter is measured by:

a.)**Temperature:** The temperature is varied from +25°C to +45°C using an environmental chamber.

b.)**Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied.Does not apply.

Specification – The minimum frequency stability shall be 100 ppm at any time during normal operation.

Time Period and Procedure:

1. The carrier frequency of the transmitter and the individual oscillators is measured at room temperature (25°C to 27°C to provide a reference).
2. The equipment is subjected to an overnight “soak” at -30°C without any power applied.Does not apply
3. After the overnight “soak” at -30°C (usually 14-16 hours), the equipment is turned on in a “standby” condition for one minute before applying power to the transmitter. Measurement of the carrier frequency of the transmitter and the individual oscillators is made within a three minute interval after applying power to the transmitter. Does not apply to this device
4. Frequency measurements are made at 10°C from 25 to 45 degree C. At least a period of one and one half-hour is provided to allow stabilization of the equipment at each temperature level.
5. Again the transmitter carrier frequency and the individual oscillators is measured at room temperature to begin measurement of the upper temperature levels.
6. Frequency were made at 3 intervals starting at 25°C up to +45°C allowing at least two hours at each temperature for stabilization. In all measurements the frequency is measured within three minutes after applying power to the transmitter.
7. The artificial load is mounted external to the temperature chamber. Does not apply

5.1 TEST DATA

5.2 Radiated Measurements

Field Strength of SPURIOUS Radiation –Low

Frequency (MHz)	Level (dBm)	AFCL (dB)	POL (H/V)	F/S (dBμV/m)	F/S (μV/m)	Power (W)	Margin (dB)
402.15	- 71.8	23.72	V	58.92	883.08000	6E-08	chan 01
804.30	- 107.2	31.45	V	31.25	36.51740	1E-10	27.67
1206.45	- 118.4	32.10	V	20.70	10.83930	9E-12	38.22
1608.60	-131.4	34.50	V	10.10	3.19890	8E-13	48.82
2010.75	-135.0	36.00	V	8.00	2.51189	5E-13	50.92

6.1 Test Data

6.2 FREQUENCY STABILITY

OPERATING 402,150,0 Hz

CHANNEL 01

REFERENCE 3.2 Volts (nominal)

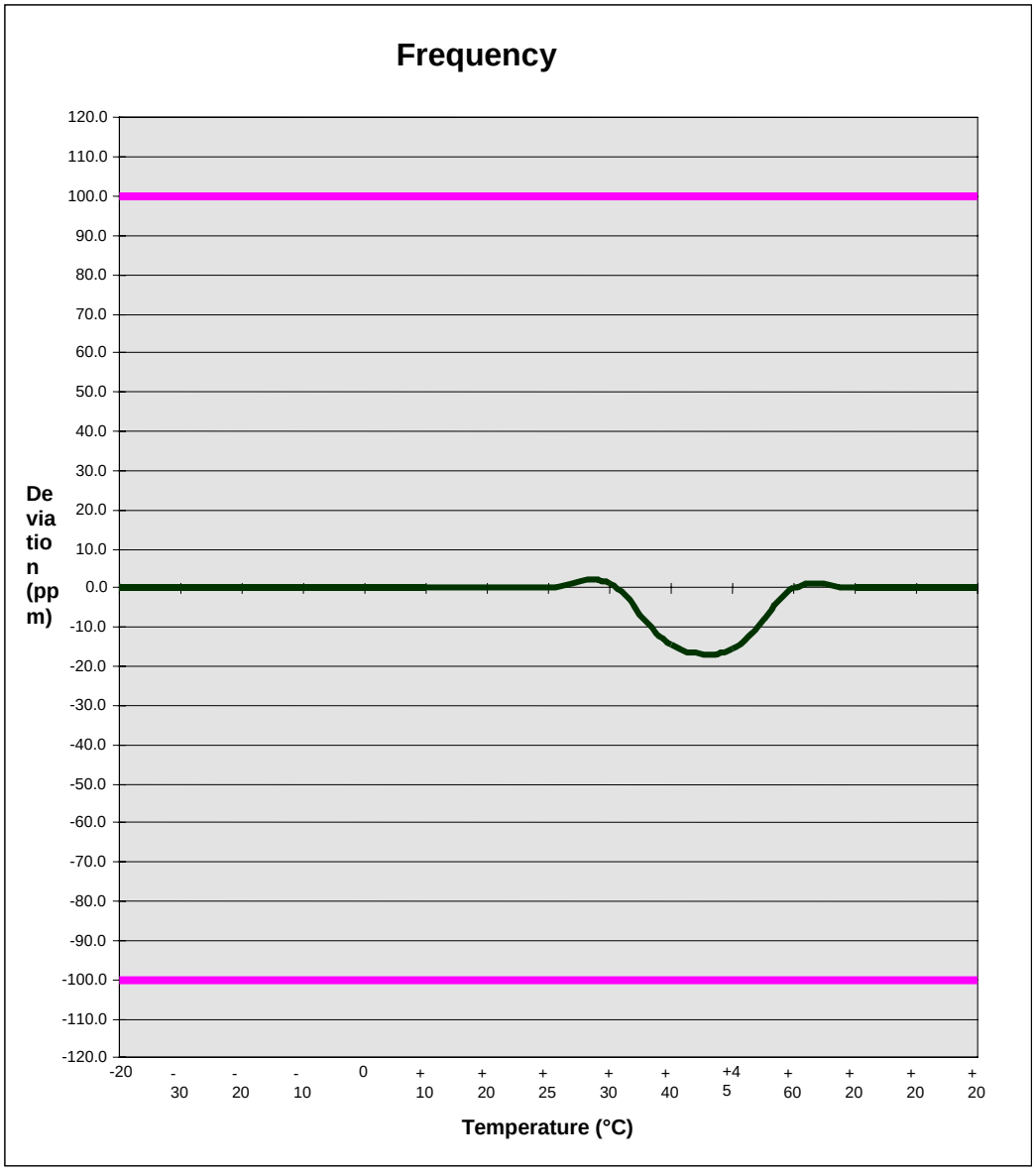
DEVIATION ± % or 2.5

Medtronic implant 08/29/20

VOLTAGE (%)	POWER (VDC	TEMP (ºC)	FREQ. (Hz)	Deviation (%)
100	3.2	+ 20	402,150,0	N/A
100		- 30	N/A	N/A
100		- 20	N/A	N/A
100		- 10	N/A	N/A
100		0	N/A	N/A
100		+	A	A
100		+	402,150,0	0.00000
100		+	402,149,9	0.00002
100		+	402,149,5	0.00010
100		+	402,155,8	-
100		+45	402,156,2	-
100		+	N/A	N/A
85	2.7	+	N/A	N/A
115	3.6	+	N/A	N/A
BATT.	N/A	+	N/A	N/A

6.1 Test Data (Continued)

6.3 FREQUENCY STABILITY



7.1 PLOT(S) OF EMISSIONS

SEE ATTACHMENT D

8.1 TEST EQUIPMENT

8.2 Type	Model	Cal. Due Date	S/N
Microwave Spectrum Analyzer	HP 8566B (100Hz-22GHz)	08/15/04	3638A08713
Microwave Spectrum Analyzer	HP 8566B (100Hz-22GHz)	04/17/04	2542A11898
Spectrum Analyzer/Tracking Gen.	HP 8591A (100Hz-1.8GHz)	08/10/04	3144A02458
Signal Generator*	HP 8640B (500Hz-1GHz)	06/03/04	2232A19558
Signal Generator*	HP 8640B (500Hz-1GHz)	06/03/04	1851A09816
Signal Generator*	Rohde & Schwarz (0.1-1000MHz)	09/11/02	894215/012
Ailtech/Eaton Receiver	NM 37/57A-SL (30-1000MHz)	04/12/04	0792-03271
Ailtech/Eaton Receiver	NM 37/57A (30-1000MHz)	03/11/04	0805-03334
Ailtech/Eaton Receiver	NM 17/27A (0.1-32MHz)	09/17/02	0608-03241
Quasi-Peak Adapter	HP 85650A	08/15/04	2043A00301
Ailtech/Eaton Adapter	CCA-7 CISPR/ANSI QP Adapter	03/11/04	0194-04082
RG58 Coax Test Cable	No. 167		n/a
Harmonic/Flicker Test System	HP 6841A (IEC 555-2/3)		3531A00115
Broadband Amplifier (2)	HP 8447D		1145A00470, 1937A03348
Broadband Amplifier	HP 8447F		2443A03784
Transient Limiter	HP 11947A (9kHz-200MHz)	2820A00300	
Horn Antenna	EMCO Model 3115 (1-18GHz)		9704-5182
Horn Antenna	EMCO Model 3115 (1-18GHz)		9205-3874
Horn Antenna	EMCO Model 3116 (18-40GHz)		9203-2178
Biconical Antenna (4)	Eaton 94455/Eaton 94455-1/Singer 94455-1/Compliance		Design 1295, 1332, 0355
Log-Spiral Antenna (3)	Ailtech/Eaton 93490-1		0608, 1103, 1104
Roberts Dipoles	Compliance Design (1 set)		
Ailtech Dipoles	DM-105A (1 set)		33448-111
EMCO LISN	3816/2	1079	
EMCO LISN	3816/2	1077	
EMCO LISN	3725/2	2009	
Microwave Preamplifier 40dB Gain	HP 83017A (0.5-26.5GHz)		3123A00181
Microwave Cables	MicroCoax (1.0-26.5GHz)		
Ailtech/Eaton Receiver	NM37/57A-SL		0792-03271
Spectrum Analyzer	HP 8594A	3051A00187	
Spectrum Analyzer (2)	HP 8591A	3034A01395, 3108A02053	
Modulation Analyzer	HP 8901A	2432A03467	
NTSC Pattern Generator	Leader 408		0377433
Noise Figure Meter	HP 8970B	3106A02189	
Noise Figure Meter	Ailtech 7510		TE31700
Noise Generator	Ailtech 7010		1473
Microwave Survey Meter	Holaday Model 1501 (2.450GHz)		80931

Digital Thermometer	Extech Instruments 421305	426966
Attenuator	HP 8495A (0-70dB) DC-4GHz	
Bi-Directional Coax Coupler	Narda 3020A (50-1000MHz)	
Shielded Screen Room (PCT270)	RF Lindgren Model 26-2/2-0	6710
Shielded Semi-Anechoic Chamber (PCT278)	Ray Proof Model S81	R2437
Enviromental Chamber PCT285	Associated Systems Model 1025 (Temperature/Humidity)	

* Calibration traceable to the National Institute of Standards and Technology (NIST).

9.1 SAMPLE CALCULATIONS

SAMPLE ONLY To Show Technique

The EIRP for channel 01 (402.15 MHz) was measured at a 3 meter distance on our OATS. The turn table and antenna mast were adjusted to obtain the highest reading on a receiver spectrum analyzer with RBW and VBW set at 3MHz each. A dipole antenna driven by a signal generator was substituted in place of the EUT and adjusted to match the –50.1 dBm receiver spectrum analyzer reading. (The dipole antenna used during the substitution has a gain of 2.14 dBi at 403.35 MHz.) The power at the antenna terminals of the substituted dipole was –18.87 dBm. This value was corrected by adding the 2.14 dBi gain of the substituted dipole to yield – 16.73 dBm for EIRP.

10.1 CONCLUSION

The data collected shows that the Medtronic Medical Implant Device **FCC ID: LF5MICSIMPLANT** complies with all the requirements of Parts 2 and 95 of the FCC rules.