Class II permissive change: LF5MICSIMPLANT
SAR Analysis

Dr. Piotr Przybyszewski
Chris Fuller
Lawrence Baylis
Medtronic Inc.
Minneapolis, MN 55432

November 9, 2005

The report is a summary of the additional FDTD modeling and simulations results of SAR to support the class II permissive change request. The class II permissive change is for changes to the layout of the RF circuit and a change in the antenna location and design as stated in the application. The resultant changes did not affect the RF power output of the unit as determined from measurement of the radiated field in the torso simulator required by the FCC.

FCC Part 95, section 95.603(g) requires manufacturers of MICS transmitters perform a Finite Difference Time Domain (FDTD) computational modeling report showing compliance with radiofrequency radiation exposure requirements as specified in 1.1307 and 2.1093.

To show compliance with FCC rules with our design changes a new device model was created. This model incorporates mechanical changes as described above.   A smaller mesh size was utilized than in the previous SAR analysis. For this analysis a 1 mm mesh was used. Figure 1 depicts the antenna model. Figure 2 depicts different views of the entire implant model used in the analysis. The information in this report is intended to supplement the original report to show continued compliance of the modified unit with the RF exposure limits in the FCC rules.

LF5MICSIMPLANT model

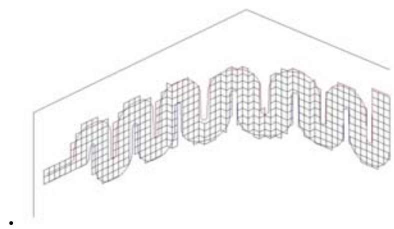

Figure 1: Antenna model

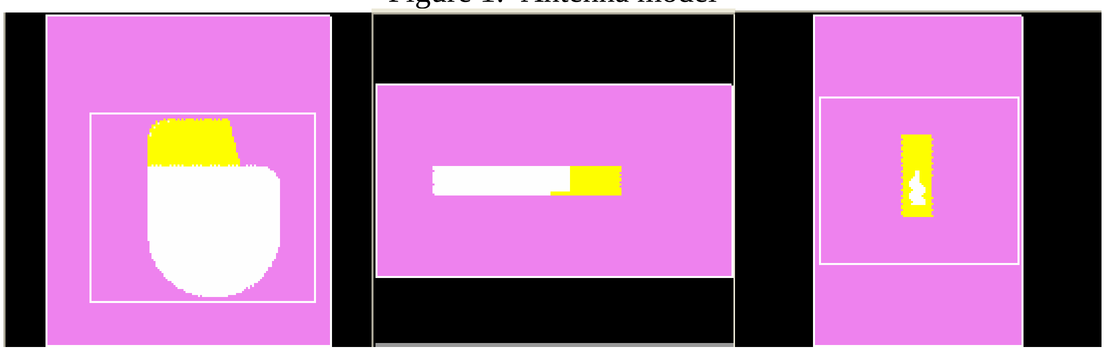

Figure2: Views of Implant model

All simulation data is related to the implant placed in a cube of muscle tissue. The domain is surrounded by electric wall boundary. The antenna surfaces are at 4cm distance from the wall in the transverse plane and 3 cm from the wall in the normal plane. The smallest distance between the can and the wall is 2cm. Figure 3 depicts a 3D view of the FDTD model used for SAR analysis.

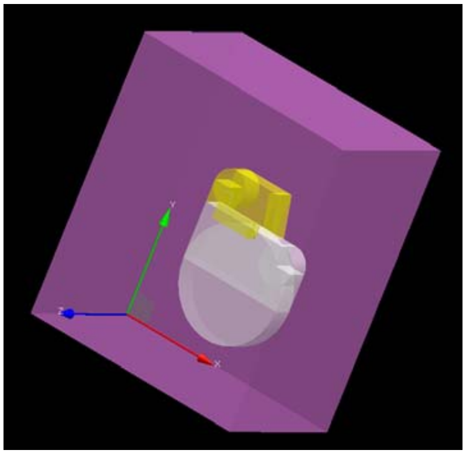

Figure 3: 3D view of SAR model

LF5MICSIMPLANT SAR results

The SAR simulation result plots show the relative SAR level for the model implant in muscle tissue.

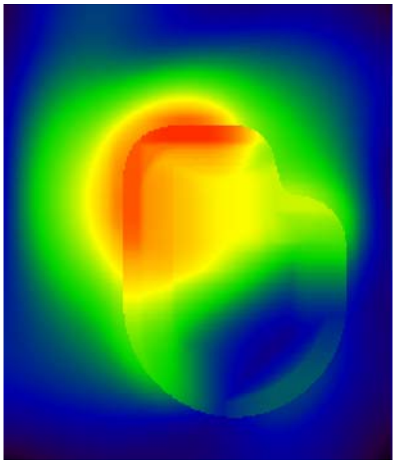

Figure 4: 1g Avg SAR distribution at front surface

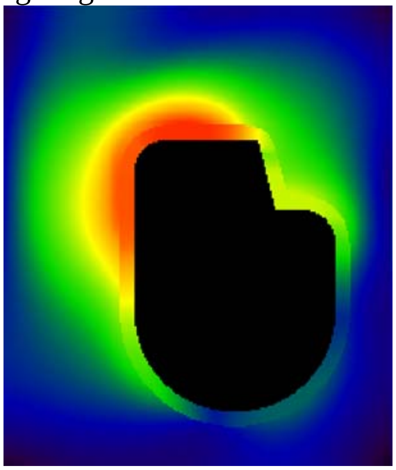

Figure 5: 1 g Avg SAR distribution at max SAR cross section

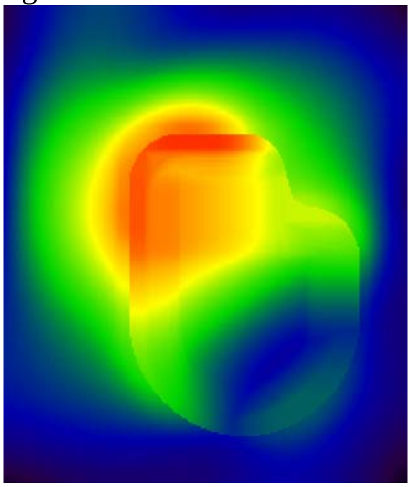

Figure 6: 1 g Avg. SAR distribution at back surface

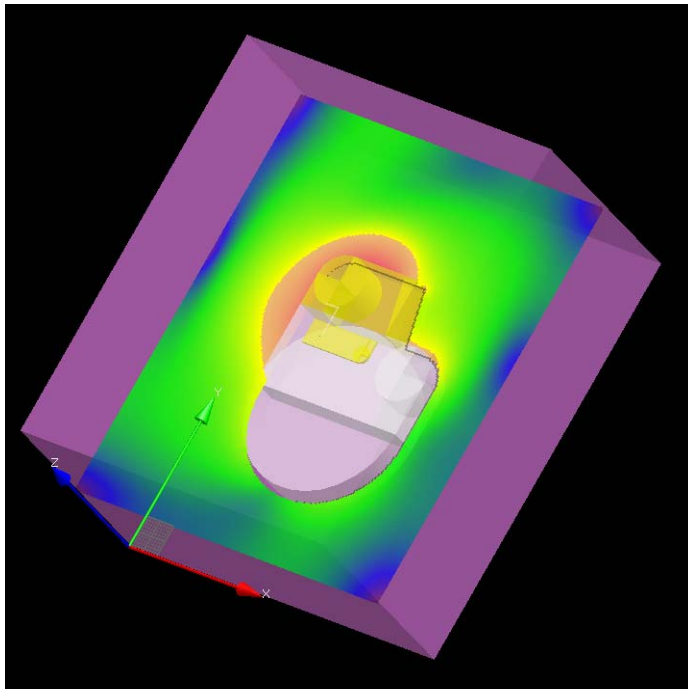

Figure 7: SAR distribution 3D view.

Implant Safety Conclusions

The important SAR conclusions:

- The SAR average in exposed object is 9.02 e-04 W/kg. This is below the ANSI safety standard of 0.08 W/kg.

  Note: This is a worst case result since the exposed object in this analysis was a cube of muscle tissue significantly smaller than the Human Body Model. Therefore if this result was averaged over an entire body the calculated SAR value would be smaller and the relative safety margin would be greater. This is justified by comparison to original SAR analysis using the Human Body Model that was accepted by FCC.

- The maximum 1 g average SAR is 0.078 W/kg. This is below the ANSI safety standard of 1.6 W/kg.

Summary of FDTD Modeling Conclusions

Analysis of SAR shows an absorption rate of power into the body well within the standard guidelines for safety, demonstrating the ability of MICS to operate safely within the human body. The unit complies with the RF exposure guidelines specified in the FCC Rules.