SAR REDUCTION TECHNIQUES FOR IMPLANTED PLANAR INVERTED F ANTENNAS

Jaehoon Kim, Yahya Rahmat-Samii
University of California - Los Angeles

For telemedicine applications, active medical devices require a reliable communication link between internal and external devices for exchange of useful information through a human body. To build a reliable link, compact antennas should be designed and evaluated in terms of the radiation performances of the antennas inside a human body. Furthermore, it is needed to study if the active medical devices on which the designed antennas are mounted observe the important electrical regulations such as effective radiation power and specific absorption rate (SAR), etc.

For this study, the basic spiral planar inverted F antenna (PIFA) with superstrate dielectric layers is designed to operate at the medical implant communications service (MICS) frequency band (402 - 405 MHz) for ultra low power active medical implants. The numerical computational procedures (Annex E of Std. C95.3-2002) recommended by IEEE are applied to calculate spatial-average SAR for the implanted antennas located under the skin tissue whose thickness is less than 1 cm. Based on this study, this paper mainly deals with how to reduce SAR value for the spiral PIFA using finite difference time domain simulations.

To improve the SAR characteristic of the antenna, the spiral PIFA is redesigned in two ways: by modifying the radiators shape and by changing the dielectric layers thickness. The antenna uses the uniform width (2.5 mm) planar patches for the radiator and the thickness of the dielectric layers (substrate and superstrate) is 2.5 mm. Using the relationship between the radiation principle and SAR characteristics of PIFAs, the radiator is modified to have non-uniform width patches. Additionally, the dielectric layers play an important role in determining the antennas radiation characteristics because the antennas directly contact biological tissues which are normally high dielectric and lossy materials.

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1. (a)
Jaehoon Kim
University of California - Los A
64-118 Engineering IV
405 Hilgard Avenue
Los Angeles, CA
90095 USA
kjhoon@ee.ucla.edu
(b) 310-206-4801
(c) 310-206-8495

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