

A Monopole Intravascular Antenna with Three Parasitic Elements Optimized for Higher Tesla MRI Systems

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Abstract : In this paper, a new design of monopole antenna has been proposed that increases the contrast of intravascular magnetic resonance images through increasing the homogeneity of the intrinsic signal-to-noise ratio (ISNR) distribution around the antenna. The antenna is made of a coaxial cable with three parasitic elements. Lengths and positions of the elements are optimized by the improved genetic algorithm (IGA) for 1.5, 3, 4.7, and 7Tesla MRI systems based on a defined cost function. Simulations were also conducted to verify the performance of the designed antenna. Our simulation results show that each time IGA is executed different values for the parasitic elements are obtained so that the cost functions of those antennas are high. According to the obtained results, IGA can also find the best values for the parasitic elements (regarding cost function) in the next executions. Additionally, two dimensional and one-dimensional maps of ISNR were drawn for the proposed antenna and compared to the previously published monopole antenna with one parasitic element at the frequency of 64MHz inside a saline phantom. Results verified that in spite of ISNR decreasing, there is a considerable improvement in the homogeneity of ISNR distribution of the proposed antenna so that their multiplication increases.

Keywords : intravascular MR antenna, monopole antenna, parasitic elements, signal-to-noise ratio (SNR), genetic algorithm

Conference Title : ICBPE 2016 : International Conference on Biomedical and Pharmaceutical Engineering

Conference Location : San Francisco, United States

Conference Dates : June 09-10, 2016