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Radio Frequency Coil Design for Flow Measurements

Abstract

OVERVIEW: The fairly recent development of Single Echo Acquisition magnetic resonance imaging (SEA MRI), a new imaging technique permitting all data to be acquired in a single echo and thus eliminating phase encoding, has greatly increased the rate at which images can be taken. This dramatic decrease in imaging times opens up many possibilities in the application of MRI, one of which is in the study of flowing fluids and tissue cells under stress conditions. This is of interest to various groups, including the biology community. In light of the task of using MRI to study fluidics, more suitable designs are desired for radio frequency coils, which apply RF pulses to sample and late detect signals emitted back by the sample. The ultimate goal is to find a design that is open for easy placement of flow phantoms but at the same time produces a strong uniform magnetic field with minimal coupling.

STUDENT PROJECT: In this study, a working version resulting from modification of an already existing parallel plate RF has been constructed. It was found that opening up the top plate of the transmission line resulted in some loss in image details but provided the desired accessibility. As the next logical step, a modular coil design is being contemplated. It would consist of a top plate being joined to bottom plate at four corners through connectors. Furthermore, there will not just be one top plate but rather a set, ranging from a solid plate to just two narrow long strips. Which one will be used will depend on the desirability of openness versus image quality, evaluated as individual situations arise.