UNDERSTANDING OPERATING PRINCIPLES OF FLEXIBLE RECEIVE-ONLY COIL ARRAYS FROM COAXIAL CABLE FOR 3T MAGNETIC RESONANCE IMAGING

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Project Description

The project focuses on enhancing Magnetic Resonance Imaging (MRI) by investigating whether flexible receive coils, particularly high impedance coaxial coils, can match or exceed the performance of conventional copper coils. Traditional rigid coils often fail to conform to the diverse contours of the human body, compromising image quality. Flexible coils, however, are designed to better fit specific body areas, potentially improving the signal-to-noise ratio (SNR) and facilitating high-resolution imaging. This study aims to evaluate the proposed flexible coil designs based on articles to determine if they can provide equivalent or superior imaging performance compared to conventional copper coils.

Methodology

There are different examples of circuit designs for flexible coils. We specifically examine this circuitry based on findings from related articles. The innovative design incorporates active detuning circuits within each receive coil element. These circuits utilize PIN diodes placed between the coaxial conductors to obstruct current during Radio Frequency (RF) transmissions. During signal reception, the diodes’ stray capacitance merges into the tuning network, accompanied by RF chokes connecting both ends to the power supply. Consequently, a secondary circuit emerges, boasting a resonance frequency of 123.24 MHz. Upon diode activation, this secondary circuit fine-tunes the primary circuit’s frequency, thereby enabling the operation of the smaller loop while disabling the larger one.

Results and Conclusions

The body coil is the primary coil in an MR machine, known for its high image quality. The main idea is to achieve similar image quality with our custom coils.

From the figures, we can see that the image quality of the copper coil is better than that of the coaxial high impedance coils (HICs).

References


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