Improving Image Contrast in MRI 7T for Early Diagnosis and Disease Detection

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Magnetic Resonance Imaging (MRI) has profound advantages in diagnosis and detection in the medical field. MRI is considered non-invasive diagnostic technique and does not use ionized radiation. However, images generated by MRI system may exhibit blurring effect, due to noise interference generated by radio frequency (RF) and internal thermal noise (electronic circuitry). This project aims to improve the image contrast by improving the signal to noise ratio (SNR) to leads indication of the received signal from the spin function of hydrogen protein inside living cells. An equivalent circuit simulating the one normally used in signal receiving was developed including simulation to its antenna coils. Three different types of coils have been considered in this project to represent part of the antenna side of the receiving circuitry. Using the Phantom Calibration for the three coils and the results have shown that the 35mm diameter copper (128 MHZ) coil 3 has provided the best SNR about 20%, better then coil 2 and more the 40% than coil 1. Additionally, the use of new equivalent circuit, coil geometry and cooling cryostat, has shown an improvement of the SNR by 15%. Hence, using coil 3 with cooling ability would improve the SNR to improve image contrast in 7T MRI devices. This will potentially help the world to transferring MR 7T to the early diagnosis of diseases, and development of cells and living tissues.

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