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Exploration of Traveling Waves in High Field Magnetic Resonance Imaging ZACHARY HERNANDEZ, SPS — MRI has been a remarkable means of medical imaging for the last three decades without exposure to ionizing radiation. The increase in MRI signal with the increase of magnetic field strength is the main motive in a move towards imaging at higher field strengths. However, the advent of higher field strength MRI has come with the challenge of maintaining homogeneous excitation fields (B1). One promising solution to this has been to transmit radio-frequency (RF) signals using a patch antenna instead of the usual RF coil. This technique exploits the theory of waveguides and traveling waves typically used in high frequency applications. In this particular study we have investigated this unique application by measuring B1 maps, geometric distortions, and signal-to-noise ratios (SNRs) in order to better quantify its potential in MRI. Using phantoms to match the similar physical features of the human head/torso region, we ran comparative scans using the traveling wave setup versus the conventional head volume coil setup on a Philips 7 Tesla MRI scanner. The goal of this experiment was to systematically measure B1 maps for flip angle efficiency and multi-planar rendering images for geometric distortion. Although the application of traveling wave in MRI does suffer from low excitation (small flip angles), there seems to be little to no correlation between traveling wave phase variability and frequency/phase encoding. Therefore, further experiments, if carried out, may enhance image quality such as RF shielding, the use of local receive coils, and/or the addition of a second patch antenna.

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