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2D Slice Selective Head Sized TRASE MRI by Coil Rotation

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In this work we present the first low-field TRASE technique capable of encoding 2D axial slices without switching gradients of the main magnetic field (B0). TRASE is an MR imaging technique that utilizes phase gradients within the radiofrequency (RF) fields to achieve k-space encoding. In doing so, TRASE does not require as many technologies of the main magnetic field, significantly reducing the cost and size of the overall system. The TRASE encoding principle ideally requires two and four different RF phase gradient fields for 1D encoding and 2D imaging respectively. Preventing interactions between these RF transmit coils has been the primary challenge, especially for 2D imaging. To address this problem, we constructed a head sized TRASE coil pair capable of 1D encoding any transverse axis. By method of rotation, the encoding axis can be changed, allowing a full 2D k-space acquisition in a radial spoke fashion. This radial TRASE technique requires half the RF transmit coils and accompanying RF electronics than typical cartesian TRASE imaging. As a first demonstration of this technique, a head sized coil pair was constructed and experimentally verified on a uniform 8.65 MHz bi-planar permanent magnet with a constant B0 gradient used for slice-selection. Decoupling of the two transmit coils is performed geometrically and a parallel-transmit system (PTx) is presented as a method to reduce any residual coupling. This work demonstrates that 2D slice-selective imaging is feasible without the use of any B0 switched gradients.

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Keyword-2

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Keyword-3

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