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U1-16: New Resonators for MRI

✓ An increase in signal to noise ratio of approximately 20%
✓ Target depth of 10 cm at 3 Tesla
✓ Improved parallel imaging performance

Technology

A novel concept to model resonators partially in a plane with maximum sensitivity to the magnetic resonance signal and partially in an orthogonal plane. Thus, properties of individual elements in coil arrays can be modified to optimize physical planar space and increase the sensitivity of the overall array. A particular case of the concept is implemented to decrease H-field destructive interferences in planar concentric in-phase arrays. An increase in signal to noise ratio of approximately 20% was achieved with two resonators placed over approximately the same planar area compared to common approaches at a target depth of 10 cm at 3 Tesla. Improved parallel imaging performance of this configuration is also demonstrated. The concept can be further used to increase coil density.

Background

Signal-to-noise ratio (SNR) is a key factor in magnetic resonance imaging (MRI). SNR can limit the minimum scanning times and applications, the maximum resolution, and could also determine the diagnostic quality of the images. The maximum SNR is limited by the MRI system, the measurement setup and the signal reception elements. For a given setup and system, increasing SNR at a region of interest (ROI) is increasingly challenging as the depth of the ROI increases. The challenge is present even in innovative approaches such as the use of metamaterials, which focus the sensitivity field but obtain maximum SNR gains from objects near the coil i.e. superficial areas of the body. Therefore, the optimization of reception elements for MRI is necessary to maximize SNR especially for deep tissues in the body.

Advantages

- ✓ An increase in signal to noise ratio of approximately 20%
- ✓ Using the anterior-posterior direction to encode the phase
- ✓ Reduce coupling between next-nearest neighbours.
- ✓ Increase coil density
- ✓ Enhance the performance of the array

Developmental Stage

- ✓ proof-of-principle
- ✓ Prototype

Commercial Opportunity

- ✓ New Array Design using Orthogonal RF Resonators

Intellectual Property

Patent filed August **2016** EP 16001 855,2

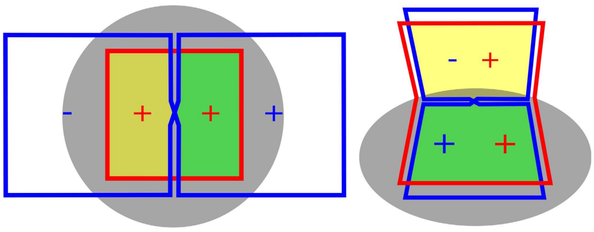

Fig. 1) **Schematic of a traditional planar concentric array in comparison to the new array. The** planar array formed by a single loop (red) and butter y coil (blue) contain an area of destructive interference of H-field (yellow) and the dimensions of the butter y extend far beyond the area of interest (gray) for an optimal performance at the target depth. An array of a partially orthogonal single loop (red) and a partially orthogonal butterfly coil (blue). The orthogonal areas with opposing H-field directions (yellow areas) were used as active shielding in plane orthogonal to the plane with highest sensitivity to a sample (gray). e constructive interference (green areas) can be increased for enhanced **B**1 and more efficient use of planar physical space.

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