

# A Method to Obtain Uniform Radio Frequency Fields in the Body for High Field MRI

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## Technology description

### Summary

Researchers at Vanderbilt have created a new approach to produce uniform radio frequency (RF) fields in the body during high field magnetic resonance imaging (MRI). Existing high field MRI machines create non-uniform RF fields that lead to non-uniform sensitivity in the generated images, also referred to as “hot” and “cold” spots. These local variations interfere with the tissue contrast of the images that radiologists depend upon to make accurate diagnoses. By generating uniform RF fields in the body, this technology provides the benefits of high field MRI without the non-uniform RF fields.

### Addressed Need

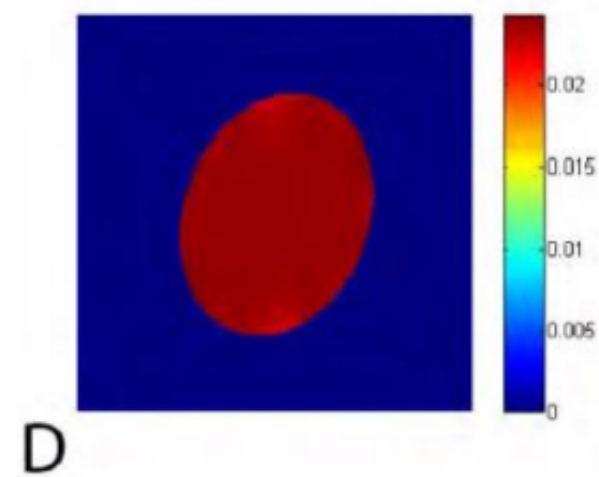
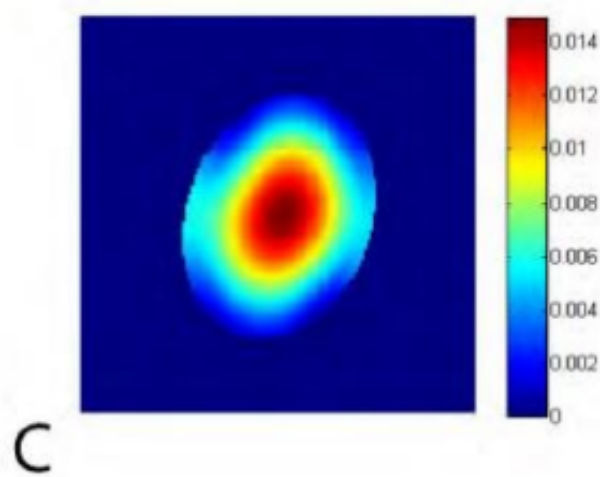
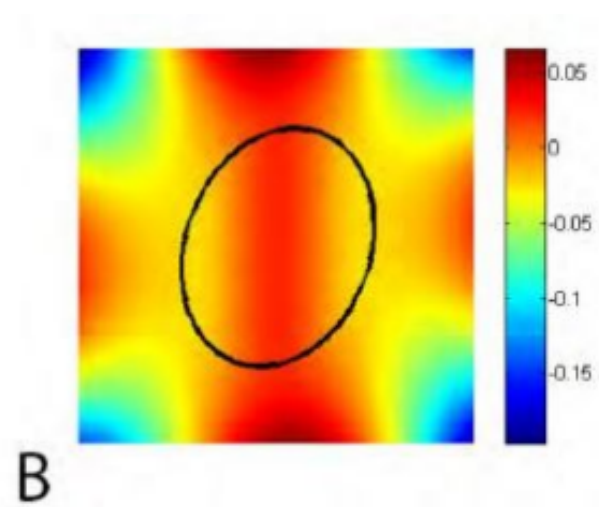
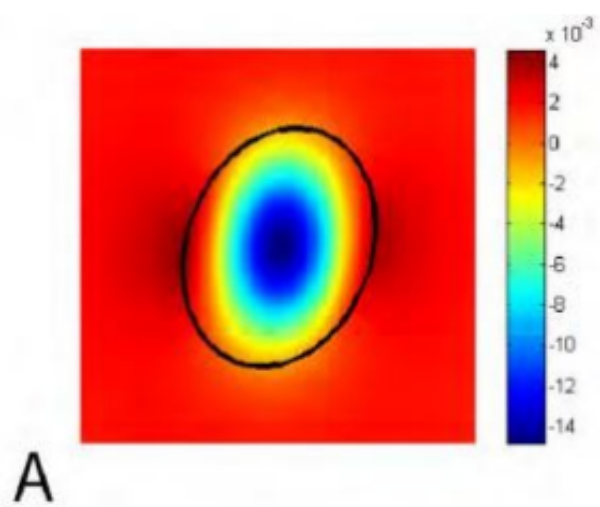
Increasing the static magnetic field strength of MRI machines results in increased sensitivity and higher resolution images. Scans done with high field MRI machines provide unprecedented anatomical detail and clarity. Unfortunately, existing high field MRI machines also have serious limitations that affect the clinical utility of the machines. Although existing high field MRI scanners can operate at up to 7 Tesla, this high strength makes it challenging to create a uniform RF field due to the reduced wavelength generated by the field. This limitation has been addressed by the present invention.

### Unique Features

Produces a uniform RF field at high magnetic field strengths by generating a traveling plane wave within the body

Ability to support multi-slice 2D and multi-slab 3D imaging at arbitrarily high static field strength.

Figure 1: The y-component of the magnetic field,  $H_y$ , for the ellipsoidal dielectric phantom for an incident plane wave (A,C) and the optimized incident plane wave (B,D). Note the nearly uniform internal wavefront in the optimized waves, B and D with no “hot” spots.



Institution

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