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## Fractal RF Coils for Use in High Field MRI (>3T) Resulting in High Resolution Images

Tech ID: 24346 / UC Case 2011-640-0

### BRIEF DESCRIPTION

Researchers at the University of California, Irvine have designed a fractal shaped RF coil for magnetic resonance (MR) image acquisition that effectively reduces interference commonly associated with coil loops (such as the birdcage coil) that are in close proximity. Limiting coil interference enables an increase in the flexibility of phased array design and reduces the need for additional system components to cancel out signal noise.

### FULL DESCRIPTION

When identical resonance RF coil loops are placed close to each other, the mutual inductance causes splitting of the resonance frequency, resulting in a loss of sensitivity at the resonance frequency. Moreover, signal and noise are also transferred from one coil to the other via the mutual coupling. The conventional method to reduce the inductive coupling of close coils is to zero their relative positioning, however conventional RF coils have only one optimum overlap location for cancellation of coupling between immediate neighbors. These resonance effects have a negative effect in the area of high field MRI (>3.0T), and these effects yield bright and dark areas across the entire imaging region.

Fractal shaped RF coils, however, have two optimized overlap positions. Limiting coil interference enables an increase in the flexibility of phased array design and reduces the need for additional system components to cancel out mutual coupling.

### SUGGESTED USES

The coil is designed for MR image acquisition. The inventors anticipate that the fractal shaped coil will be effective in high field MRI and aid in the design of phased array coils with parallel imaging capability.

### ADVANTAGES

With a fractal shaped RF coil, neighbor coils can be arranged with minimum overlap or non-overlap without adding components to cancel out mutual coupling. This new design offers flexibility in phased array design by minimizing geometrical limitations that are caused by mutual interference between RF coils.

The fractal coil also produced a more focused magnetic field along a horizontal plane parallel to the plane of the RF coil and higher magnetic field sensitivity in a plane vertical to the iso-center of the RF coil.

### PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,784,806	10/10/2017	2011-640

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### OTHER INFORMATION

#### KEYWORDS

Fractal, RF coil, High field MRI, Resonance, 3T, Imaging, Phased array, Magnetic field, Coupling, Inductance

#### CATEGORIZED AS

- » **Communications**
  - » Other
  - » Wireless
- » **Engineering**
  - » Engineering
  - » Other
- » **Imaging**
  - » Medical
  - » Other
- » **Medical**

## STATE OF DEVELOPMENT

Prototypes have been developed and tested.

- » Devices
- » Diagnostics
- » Disease: Cancer
- » Disease: Cardiovascular and Circulatory System
- » Disease: Central Nervous System
- » Disease: Musculoskeletal Disorders
- » Imaging
- » Research Tools
- » **Sensors & Instrumentation**
  - » Medical
  - » Other
  - » Scientific/Research
- » **Veterinary**
  - » Companion Animal
  - » Diagnostics
  - » Large Animal
  - » Other

## RELATED CASES

2011-640-0

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