Weill Cornell Medicine

Flexible and Stretchable Radiofrequency Coils for Improved Magnetic Resonance Imaging

Lead Inventors:

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Background & Unmet Need

- MRI uses radiofrequency (RF) coils to obtain images of internal anatomy
- Current MRI techniques use rigid RF coil arrays to accommodate a wide range of patient anatomies
- Arrays that better conform to the anatomy of interest yield better signal-to-noise ratio (SNR)
- While newer, flexible RF designs improve this volume issue, full SNR optimization requires that RF coils be stretchable
- Current efforts for stretchable RF coils suffer from detuning during stretching or require outside circuitry to retune coils
- **Unmet Need:** RF coils which are both stretchable and flexible to conform to patient anatomy and are automatically tunable

Technology Overview

- **The Technology:** The inventors have developed a stretchable and autotuning RF coil array for MRI
- In this RF coil, liquid metal is embedded in a soft polymer, which allows it to conform to a variety of patient shapes
- The design of the proposed coil includes a stretchable interdigital capacitor, which reduces resonance frequency shift with stretching
- **PoC Data:** In bench measurements, the proposed coil had a frequency shift of only 0.4% at 27% stretch, compared to the control coil at 4%
- In vivo, the proposed coil showed a 60% SNR increase compared to a dedicated knee coil array

Inventors:
Eliza Motovilova
Simone A. Winkler

Patents:
PCT Application Filed

Publications:
Motovilova et al. *Sci Rep*. 2021.

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Technology Applications

- General MR imaging with increased resolution
- More effective MRI for challenging anatomies
- Wearable MRI technology

Technology Advantages

- Design provides higher SNR for better imaging
- Flexible and stretchable design can be worn by patient and conform to a variety of anatomies
- Coils are autotuning, so there is no need for external tuning circuits or equipment

Supporting Data / Figures

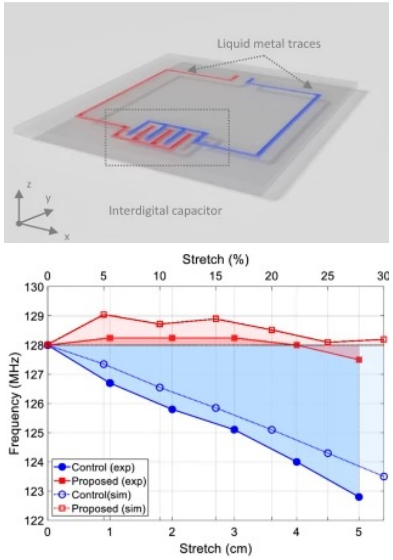

Figure 1: Top: Schematic of RF coil in stretchable polymer **Bottom:** Experimental and simulated change in resonance frequency with stretching is reduced in proposed design.

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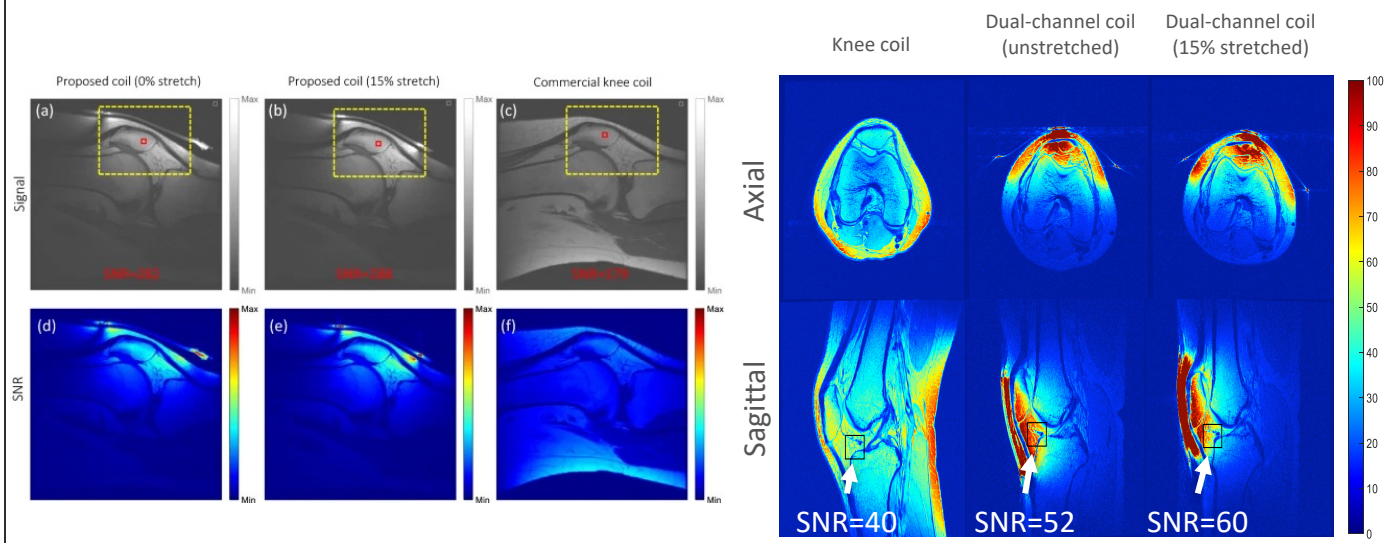

Figure 2: Prototype of proposed RF coil shows higher SNR compared to a commercial knee coil array.

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