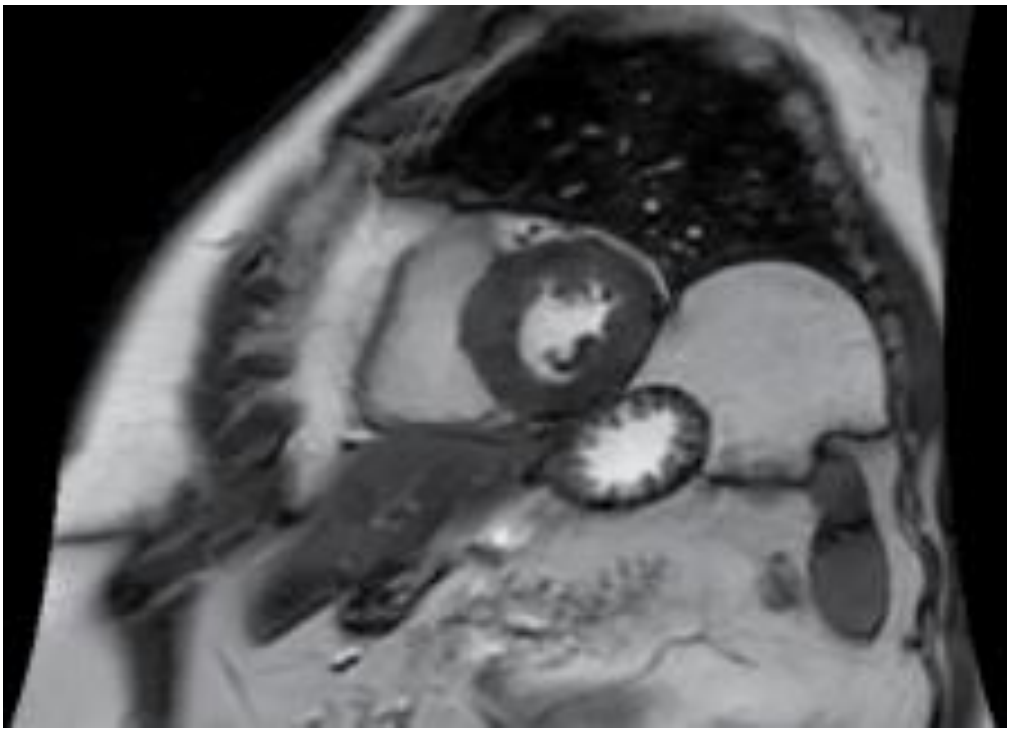


3T MR Research Program

Center for MR Research

University of Illinois at Chicago

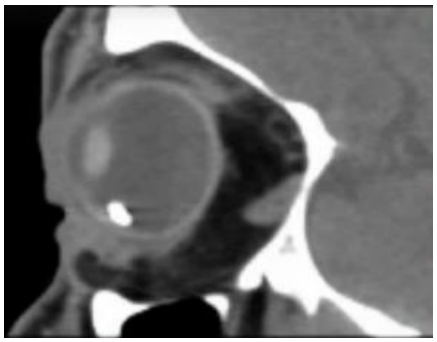
TECH 2000 3T MRI RESEARCH FACILITY

SUMMER 2017 ISSUE

3T MRI Safety Reminder

By Mike Flannery

The 3T MR Research Program would like to send a safety reminder regarding metal in the eyes. If your subject has a past history of having metal in the eyes or any injury to the eyes from metal, an x-ray or CT of the orbits will need to be completed to screen for the presence of metal.
The 3T MR Research Program requires this be done prior to allowing the subject to be scanned. If you find this is the case with one of your recruited subjects please feel free to contact us at (312) 413-1309 to assist in making arrangements.



CT of the orbits showing an intraocular metallic foreign body.

Technology Advances

The design of MRI coils has always played a vital role in providing the highest quality images with sufficient anatomical coverage. GE Healthcare has developed a new coil design that incorporates flexible conductive loops known as the AIR Technology Suite. The AIR coils were developed to address several clinical needs:

- Clinical coverage with high SNR
- Optimized geometries for maximum (use of) parallel imaging
- Adaptive design that fits 99.9% of patients
- Ultra-lightweight

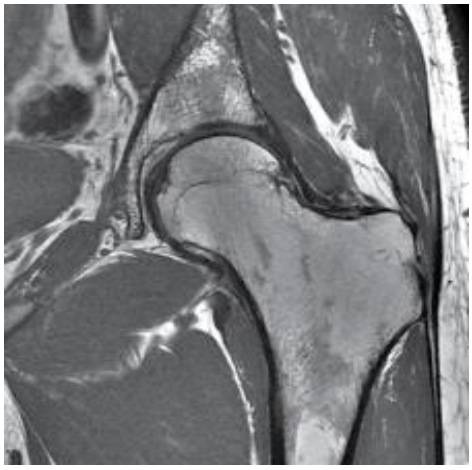
The newly developed multiple resonator conductor arrangement, named the INCA conductor, eliminates lumped components and circuit boards as well as the copper etched and printed wiring boards found in conventional coil designs. The AIR coils also incorporates proprietary E-Mode electronics that reduce component volume by more than 60%, reduce coupling flex conductor geometries by 30%, and deliver 95% more transparency for MR attenuation correction. This technology is also designed to reduce current noise, boost linearity, and improve tolerance to varying coil loading conditions.

The AIR Technology coil uses special conductor material designed for ultra-flexibility, while maintaining its electromechanical properties.

Additional advantages of this design is that it offers total freedom in coil positioning, patient comfort, and the lighter design may be beneficial in neonatal MR imaging. AIR coils also eliminate copper/electronic waste and operate with approximately 50% less power when compared to conventional coil designs.

The new suite of AIR coils will include a 48 channel Head Coil designed to accommodate 99.9% of the patient population and plans to introduce a 30 channel anterior array that provides 65cm of coverage and a 60 channel posterior array providing over 110cm of anatomical coverage. Future coils with AIR Technology may include wearable,

stretchable coils, modular coils, lower cost disposable paper coils, and coils that can be used in radiation oncology and/or surgery settings and applications.



Coronal T1 image of the hip using AIR Technology
Image courtesy of GE Healthcare

Research spotlight

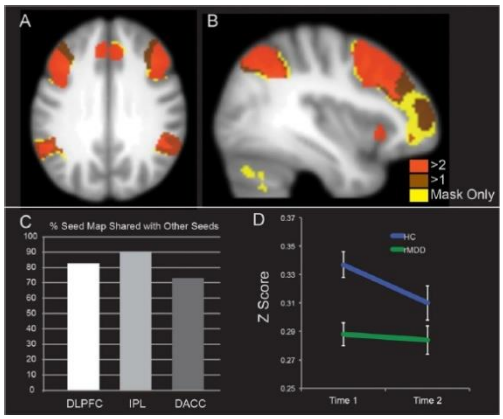
Scott Langenecker, PhD

Dr. Scott Langenecker is the Director of Cognitive Neuroscience at UIC and Associate Professor with tenure in psychology and psychiatry. He completed his undergraduate work at the University of Wisconsin at Madison. Dr. Langenecker completed his graduate work at Marquette University with a dissertation on life span studies of inhibitory control, with focus on healthy aging and functional MRI, winning an APA dissertation award. He completed his internship at the Albert Einstein North Shore-Long Island Jewish Medical Center in New York. Dr. Langenecker's fellowship was at the University of Michigan Medical Center in Clinical Neuropsychology, which he completed in 2003, and he was a faculty member at the University of Michigan until July, 2012.

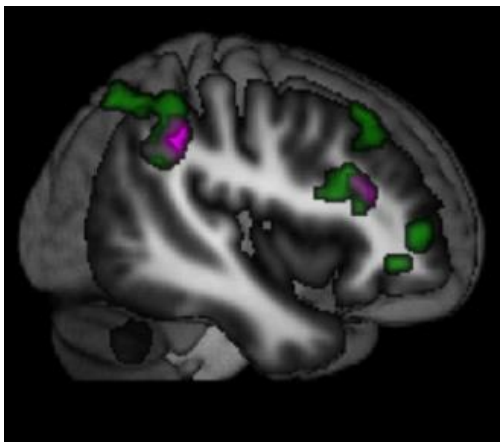
The 3T MR Research Program would like to thank Dr. Langenecker and his research team for submitting the following abstract.

Attenuated Intrinsic Connectivity Within Cognitive Control Network Among Individuals With Remitted Depression: Temporal Stability and Association With Negative Cognitive Styles

Abstract: Many individuals with major depressive disorder (MDD) experience cognitive dysfunction including impaired cognitive control and negative cognitive styles. Functional connectivity magnetic resonance imaging studies of individuals with current MDD have documented altered resting-state connectivity within the default-mode network and across networks. However, no studies to date have evaluated the extent to which impaired connectivity within the cognitive control network (CCN) may be present in remitted MDD (rMDD), nor have studies examined the temporal stability of such attenuation over time. This represents a major gap in understanding stable, trait-like depression risk phenotypes. In this study, resting-state functional connectivity data were collected from 52 unmedicated young adults with rMDD and 47 demographically matched healthy controls, using three bilateral seeds in the CCN (dorsolateral prefrontal cortex, inferior parietal lobule, and dorsal anterior cingulate cortex). Mean connectivity within the entire CCN was attenuated among individuals with rMDD, was stable and reliable over time, and was most pronounced with the right dorsolateral prefrontal cortex and right inferior parietal lobule, results that were corroborated by supplemental independent component analysis. Attenuated connectivity in rMDD appeared to be specific to the CCN as opposed to representing attenuated within-network coherence in other networks (e.g., default-mode, salience). In addition, attenuated connectivity within the CCN mediated relationships between rMDD status and cognitive risk factors for depression, including ruminative brooding, pessimistic attributional style, and negative automatic thoughts. Given that these cognitive markers are known predictors of relapse, these results suggest that attenuated connectivity within the CCN could represent a biomarker for trait phenotypes of depressionrisk. Hum Brain Mapp 38:2939-2954, 2017. © 2017 Wiley Periodicals, Inc.



Connectivity with the three bilateral CCN seeds: (A) sagittal view; (B) axial view; (C) overlap of voxels with significant connectivity of a given bilateral seed with other bilateral seeds, from only one (yellow) to all three (orange); (D) mean *Z*-corrected connectivity across the entire CCN at each time point (error bars represent standard errors from the mean).



Regions of interest with significantly lower connectivity in rMDD relative to HC from all three bilateral seeds within the network mask ($P<0.005$, $k>55$) at Time 1 (green) and Time 2 (purple; right hemisphere sagittal view).