REPPERGER RESEARCH INTERN PROGRAM

RESEARCH PROJECT #: AFRL-RHD-25-01

Development of a Phantom for Diffusion Magnetic Resonance Imaging (MRI) in Radio Frequency Bioeffects

PROJECT DESCRIPTION: The Radio Frequency Bioeffects Branch uses magnetic resonance imaging (MRI) to study the dose-response relationship of biological systems exposed to radio frequency electromagnetic energy in order to improve human health and safety. Physicists use phantoms for MRI system tests, image quality control, and to improve, develop, and test imaging sequences and protocols for the machines. Phantoms are effective, versatile, economical, and can be standardized. For clinical MRI, standardized phantoms are used for such purposes; however, no standardized phantoms currently exist for research MRIs. Phantoms for research MRI's are usually custom-made, specialized, and dependent on the model of interest. We seek an interdisciplinary researcher and engineer to develop a custom-made phantom that is for general use between different radio frequency (RF) coils designated for different models and can be used for evaluating diffusion imaging techniques. Such a phantom would be used for quality control and to aid in the development of new scan parameters and protocols for our studies.

LEARNING OBJECTIVE: Selectee will develop an understanding of radio frequency (RF) and magnetic resonance (MR) properties in materials. Selectee will build skills on the physical development of MRI phantoms that includes 3D computer-aided design, 3D printing, fabrication, MR image acquisition and processing, and MRI physics.

ACADEMIC LEVEL: Undergraduate; Masters; Doctoral

DISCIPLINE NEEDED:

- Bioengineering
- Biomedical Engineering
- Biophysics
- Engineering Physics

RESEARCH LOCATION: JBSA-Fort Sam Houston, San Antonio, Texas

RESEARCH MENTOR: Jennie M. Burns, Ph.D.
Biomedical Engineering, Tulane University, 2012

Dr. Burns is a Research Biomedical Engineer with the Radio Frequency Bioeffects Branch of the 711th Human Performance Wing, Air Force Research Laboratory. Dr. Burns has over 18 years of experimental research experience in a diverse range of scientific disciplines that include experimental high energy particle physics, computational modeling in biophysics and biomechanics, microfabrication, biomedical device development, microscopy, physiology, risk of injury, signal processing, bio-electromagnetics, optical engineering, neuroscience, electrophysiology, and medical imaging. Currently, she serves as the principal investigator on experimental research projects focusing on the use of MRI to study the biological and physiological effects of the absorption of radio frequency electromagnetic energy in complex biological systems. The research helps elucidate the RF dose-response relationship and characterize the health and safety implications RF exposure.

The material was CLEARED on 04 Nov 2024; Case Number: AFRL-2024-6170.