FACILITIES & RESOURCES

The University of Michigan Functional MRI Laboratory (fMRI) is an interdepartmental collaborative facility that reports to the University of Michigan Office of Research. It is located in the Bonisteel Interdisciplinary Research Building on the University of Michigan North Campus, has three dedicated parking spots for research subjects, and is connected by high-speed networks to laboratories on the campuses of the University.

The fMRI Laboratory is Co-Directed by Douglas C. Noll, Professor of Biomedical Engineering and John Jonides, Professor of Psychology. Other facility research faculty includes Scott Peltier, Ph.D., Research Scientist and Technical Director, and Luis Hernandez, Ph.D., Research Professor. Staff includes two Research Technologists, IT Specialist, Research Computer Specialist, Neuroimaging Analysis Specialist and an Administrative Specialist. The facility has two scanner rooms and control rooms, as well as office space for faculty, students and post-docs, dedicated subject preparation and training areas, and a workshop for coil and phantom construction.

The Functional MRI Laboratory provides preliminary preprocessing for fMRI data including image reconstruction with correction for susceptibility distortions, slice-timing correction, and movement correction. Two large scale Linux servers with dedicated backup are available for reconstruction, processing and archival storage (Main machine: 24 core/16G RAM/15T storage; secondary machine: 8 core/16G/5T). Multiple Linux workstations are available for use for processing fMRI data for pilot and other small projects. Software packages available for data collection and analysis include EPrime, Presentation, MATLAB, SPM, FSL, AFNI, C++ and a variety of custom packages.

The Laboratory also holds an NIH-funded intensive two-week course in FMRI every summer to facilitate training of new investigators, both locally and internationally.

EQUIPMENT

The Laboratory is equipped with two state-of-the-art 3.0 T GE MRI scanners (MR750, DV26R2 software version). They both have high performance gradient systems (peak 50 mT/m, slew rate 200 T/m/s). This model has a full set of functional imaging capabilities, including single-shot imaging (spiral and EPI), automated shimming, real-time image reconstruction and processing. The MR750 scanners also comes equipped with standard MR spectroscopy (MRS) pulse sequences, as well as sequences to detect GABA. The scanners are equipped with a standard eight-channel coil for parallel imaging, in addition to the standard volumetric quadrature bird-cage head coil and whole body coil. Additionally, the FMRI Lab has two 32-channel receive arrays from Nova Medical for greater image acquisition speed-up factors and improved SNR, and implementation of cutting-edge multi-band acquisitions. The FMRI Lab also has access to pulse sequence source code and GE's pulse sequence compiler, and has built in-house an extensive library of rapid acquisition pulse sequences designed for functional brain imaging including spiral acquisition, arterial spin labeling, SSFP, multi-band imaging, etc.

Several FMRI participant stimulation devices are available to investigators at the FMRI laboratory. These include fiber-optic button response systems from Brain Logics (Pittsburgh, PA); a 32 inch MR compatible, HD resolution LED monitor from Nordic Neurolabs (Bergen, Norway); MR compatible eye-tracking (MagDesign, CA); and MR compatible headphones (Sensimetrics, Malden, MA; MR Confon, Germany).

Electronics Shop
The electronics shop at the Laboratory is equipped with machining tools, soldering stations, oscilloscopes, function generators, two data acquisition boards and two Network Analyzers.

Transcranial Magnetic Stimulation
The Functional MRI Laboratory houses a Magstim Model 220 Biphasic TMS stimulator and a MacIntosh computer equipped with Rogue research's Brainsight positioning system interfaced with a Polaris frameless infrared stereotaxic system dedicated for TMS and MR image coregistration and targeting in real-time. We also have at our disposal a new prototype TMS driver constructed in-house. This prototype is able to generate >1 kA currents in a TMS probe in the 3 -15 kHz frequency range.