

Brookhaven's high-field magnetic resonance imaging facility is a state-of-the-art diagnostic tool and an integral component of the Laboratory's Center for Imaging and Neurosciences.

Magnetic Resonance Imaging at Brookhaven

Each year, scientists at Brookhaven National Laboratory gain national recognition for their groundbreaking work in the field of medical imaging.

The Brookhaven Center for Imaging and Neurosciences is well-equipped for imaging research. It boasts two Positron Emission Tomography (PET) scanners, a Single Photon Emission Computed Tomography (SPECT) scanner, and a high-field Magnetic Resonance Imaging (MRI) facility. This integration of PET, SPECT, and MRI imaging within a single center provides the tools necessary for researchers to conduct a broad spectrum of basic research.

Potent Attraction

Brookhaven's high-field MRI is on the cutting edge of imaging technology. While most clinical MRIs operate at about 1.5 Tesla (a Tesla is a measurement of magnetic field strength), the Brookhaven MRI operates at 4 Tesla, which is 40,000 times stronger than the Earth's magnetic field.

That power allows Brookhaven scientists to make fine-detailed pictures of the human brain. Using the Brookhaven MRI, researchers can see structures within the brain as small as half a millimeter across — half the thickness of a penny. After completion of an upgrade, now under way, it will be able to take hundreds of scans a minute, making "movies" of brain function.

Another advantage of the high-field MRI is that it provides much greater sensitivity for detecting contrast agents in the brain. Some contrast agents are used to label certain brain chemicals, making them visible on MRI scans, and this allows



Brookhaven's Magnetic Resonance Imaging facility.

researchers to detect much lower concentrations of the chemicals of interest and get a more complete picture of brain function.

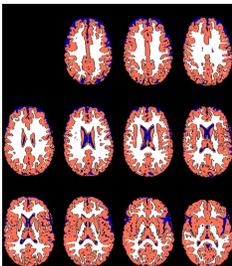
Brookhaven's MRI began operation in 1997. The current upgrade to the

machine's gradient system will allow researchers to collect each image in one second, as opposed to the 30 seconds required in the previous configuration. This upgrade will significantly increase image resolution and may decrease the amount of time patients spend within the MRI.

Working Together

The Center for Imaging and Neurosciences affords Brookhaven and visiting researchers a unique opportunity — the ability to combine PET and MRI imaging methods in order to study multiple aspects of brain function. This combination may provide insights into the mechanisms of normal brain activity and a variety of disease states, including those associated with addiction and aging. The two methods can also be combined to yield maps of the concentrations and/or reactions of metabolites and neuroreceptors with very high resolution.

A major research effort about to begin will search for clues about multiple sclerosis, a chronic, often disabling disease of the brain and spinal cord. Researchers will use Brookhaven's MRI to look for early signs of the disease, which could lead to more effective diagnosis and treatment.



Human brain images taken with the Lab's MRI scanner.