

## F. INSTITUTIONAL COMMITMENT

The Massachusetts General Hospital, a founding member of the Mass General Brigham integrated health care system in Boston, is strongly committed to excellence in biomedical research. Supporting and growing the community of researchers who are making clinically relevant developments through the use of cutting-edge imaging tools is an area of particular interest, and the hospital has generously supported the Martinos Center throughout the years.

To increase close scientific collaboration and facilitate scientific research requiring data acquired by multiple imaging modalities, the MGH has focused a large and growing part of its biomedical research community on its research campus in the Charlestown Navy Yard. Today, this location is home to the well-established Martinos Center (including the NIH P41-funded National Center for Biomedical Imaging and Bioengineering, the Center for Mesoscale Mapping), the MGH Cancer Center, the MGH Stroke Center, the NIA-funded Massachusetts Alzheimer's Disease Research Center, the MGH Psychiatric Neuroimaging Program, and the MGH Morphometric Analysis Center. Also located in the Charlestown Navy Yard, in space adjacent to the Martinos Center, is the Biomedical Imaging Core of the NCATS-funded Harvard Catalyst Clinical and Translational Science Center, which facilitates clinical/translational research using the advanced imaging tools of the Martinos Center, and other large research centers, including the MIND (MassGeneral Institute for Neurodegenerative Diseases).

As noted previously, the Martinos Center plays a major role in helping to drive research in several domains on an institutional level, as an MGH Research Core facility, making MR and multimodal imaging technologies available to users from across Mass General Brigham, the Boston area, and the national biomedical research community.

### F.1 Situation and Installation of the Proposed Instrument

After completing a major expansion project in early 2008, the Martinos Center currently occupies ~85,000 square feet of research space. The expansion into Building 75, directly adjacent to the Center's main quarters in Building 149, added roughly 32,000 square feet of new research and office space, nearly doubling the size of the Center.

The proposed instrument will provide a substantial improvement of a critical resource to the broad-based user community of the MGH. Because the siting requirements of the new whole-body 3 Tesla MRI scanner and the current 3 Tesla MRI it replaces are nearly identical, the new system will be placed into the same suite from which the old one is being removed. We are anticipating a short period of downtime between the removal of the old system and the arrival of the new system. Once the new 3 Tesla scanner is fully operational, the Operations Committee will assist investigators and their teams in migrating their studies over to the new scanner and help them plan future studies to take full advantage of the unique capabilities of the new system.

The Martinos Center's imaging facilities, which currently include state-of-the-art MRI systems for human head and whole-body imaging, animal imaging, multinuclear imaging and spectroscopy, in addition to MEG, EEG, optical, and PET imaging, are supported by an established network of ancillary laboratories and resources for biochemistry, biomaterials, molecular biology, cell culture and microscopy, histology, animal surgery, and human behavioral testing and clinical examination; the Center also has dedicated electronics and machine shops and extensive computer facilities—including an NIBIB-supported storage area network (SAN) to support the extensive computational needs of the Center.

The installation of the system will require modifications to an existing scanner bay to accommodate the wiring for the additional hardware. The Executive Committee on Research (ECOR) of MGH has guaranteed \$150,000 in infrastructure funds specifically for this project to support electrical upgrades for the system and to purchase auxiliary equipment for the scanner suite as detailed in the attached letter from the Senior Vice President for Research. In addition to this support, we will also have the opportunity to apply for internal grants through ECOR if the proposal is awarded.

The new MRI system will be delivered by Siemens and installed by the on-site Siemens service engineer, with oversight provided by the on-site Siemens local support and R&D team and Martinos personnel from the RF Laboratory; the installation will be supervised jointly by Dr. Giri of Siemens and Dr. Kirsch of MGH.

### F.2 Support Commitments

*As indicated in the support letters provided by Martinos Center Director and MGH Department of Radiology Vice Chair for Research (Dr. Bruce Rosen), Chief of Enterprise Radiology at MGB and Radiologist in Chief at MGH (Dr. James Brink), and the Massachusetts General Hospital Executive Committee on Research, the institution has committed financial support of up to \$1,200,000 for the purchase of the proposed new 3T system, which, when combined with the \$2.0M supported by this HEI grant, will allow us to complete the purchase from Siemens.*

The institution has committed to provide backup of the financial plan for five years from installation of the instrument and beyond on an as-needed basis, aligning with the expected effective lifetime of the requested instrument, which is projected to be at least 10-15 years.

Beyond our substantial institutional support for the purchase of the new system, the institution has also pledged continued support of this new system into the future to guarantee that the 3 Tesla program at the Martinos Center continues to thrive. Since the installation of the first whole-body Siemens 3T MRI in 2001, the Department of Radiology and the Martinos Center have made significant investments in the instrument, including providing the salaries of support staff, dedicated engineering staff in the early years of the instrument, service contracts for the magnet and MRI console and supplies for the magnet. Furthermore, investments were made in two MRI console upgrades and an additional insert gradient to be used for awake non-human-primate imaging. Over the 23 years of operation, these investments alone exceed \$2 million. Though there are several funded studies on the current system, as shown in the Administration section, at the hourly rate charged, only the operating costs can be covered within a reasonable margin of error.

In addition to the renewed and continued commitment of the space that will be occupied by the new 3T MRI system, the MGH and the Department of Radiology will support the continued operation and technical support of the 3T system for the years to come. Furthermore, the department will continue to support the development of new pulse sequences and protocols as well as RF coil hardware for the system, above and beyond NIH funding, to further improve the system and fully support and enable the development of clinically relevant applications of whole-body 3T MRI.

The MGH has also recently invested more than \$2 million in a new dedicated chilled water system for the 8 MRI systems housed at the Martinos Center, replacing the over-14-year-old local chiller systems. The project, completed in 2018, will ensure the operation of our MRI machines, including the new 3T whole-body MRI scanner, for years to come.

All Siemens manufactured hardware used at the Martinos Center is covered by service agreements with Siemens to ensure their continued proper function throughout their expected lifetime. This service agreement includes preventative maintenance plans and regular replacement of safety-relevant components within the guidelines of the FDA.

### **F.3 Support Infrastructure**

The Martinos Center houses a fully equipped and staffed RF and electronics workshops equipped to design, build, test and maintain RF coils and coil arrays. With respect to this proposal, the RF Coil Laboratory will design, build, and test custom receive coil arrays for users with the new whole-body 3T system.

Support from our MRI physicists, MRI technologists and the Directors associated with the instrument is available to all users, as is the complete IT infrastructure of the Martinos Center, which includes automated archiving and backup of all imaging data from the scanner and free compute resources provided for data analysis.

The Martinos Center also hosts a local Siemens R&D team, consisting of a research collaboration manager, a software developer, a hardware/systems engineer, and an applications specialist. Also, we have a dedicated on-site service engineer and an on-site MRI physicist belonging to the Siemens service organization. A second service engineer, who has been trained on all of the customized investigational MRI devices housed at the Martinos Center, is located in the Boston area, in case the dedicated engineer is not available. The combination of the R&D team and specially trained service engineers assures the maintenance and level of function of the MRI machines to a standard far exceeding that of clinical systems and also enables the integration of new and highly optimized investigational devices for our user community.