

## Magnetic Resonance Research Facility (MRRF) Major Equipment

### MR Research Scanners

#### **3.0T GE Discovery Premier MRI Scanner (100% Research Dedicated)**

Description: This scanner offers a 70cm bore and is equipped with parallel RF Transmit (MultiDrive), Total Digital Imaging (TDI), and AIR Coils for neuro and body imaging. TDI is composed of three advancements in RF technology: 1) Direct Digital Interface (DDI), 2) Digital Surround Technology (DST), and 3) Digital Micro Switching (DMS). The scanner is equipped with gradient coils of strength of 80 mT/m and a maximum slew rate of 200 T/m/s. The scanner also has multi band echo-planar imaging, spectroscopic imaging, and multi-nuclear imaging capabilities. The scanner is located in the Iowa Institute for Biomedical Imaging (IIBI) within the Pappajohn Biomedical Discovery Building (PBDB). The IIBI has 20,081 square feet allocated to human imaging and the scanner is sited in one of the four whole body scanner bays within the facility. A waiting room and three subject preparation rooms are also part of the facility. Additionally, the Department of Radiology has research agreements in place with GE Healthcare to support pulse programming efforts and sharing of state-of-the-art pre-release pulse sequences.

#### **Specialized Sequences:**

- IDEAL (Fat/Water Imaging)
- 3D ASL
- SWAN (QSM)
- Cardiac Expert
- MERGE (Multi-echo GRE)
- T1 $\rho$
- 2D COSY
- Elastography
- Disco
- Propeller
- HARDI DTI
- MAVRIC (Metal Reduction)
- Silent
- LAVA (T1 DCE)
- Single Voxel Spectroscopy
- EPSI
- ZTE
- 4D Flow
- 3D CUBE
- Multi-band (SMS) echo-planar
- Parametric Mapping (T1, T2, T2\*)
- 2D/3D SSFP
- PROMO (Motion Correction)
- Chemical Shift Imaging
- CEST
- LAVA

#### **Coils:**

- 48-Channel Head Coil
- 21-Channel Head/Neck Array
- 30-Channel Anterior Array
- 16-Channel Shoulder Array
- 16-Channel Breast Array
- 60-Channel Posterior Array
- 16-Channel Flex Coils (Md, Lg)
- TR Head Coil
- 16-Channel Pediatric Brain Coil Set (Sm, Md, Lg)
- <sup>129</sup>Xe Lung Coil
- 30-Channel Anterior Array
- 16-Channel Hand/Wrist Array
- 18-Channel Knee Coil
- 16-Channel Upper Airway Coil

#### **fMRI Equipment:**

- Avotec Silent Scan
- Stimulus computer
- OptoActive Active Noise Cancelling Headphones and FOMRI III Dual-channel MRI microphone
- Avotec Silent Vision SV-6060
- Software: E-prime, Presentation, PsychoPy, & Matlab
- Response Pads: Lumina Response Pad, Psychology Software Tools (PST) fiber optic manipulandums
- Avotec Real Eye Tracker
- MediGlasses corrective lenses

#### **Other Equipment:**

- BIOPAC Physiological Monitor: photoplethysmograph (PPG), respiratory, galvanic skin response (GSR), pulse ox, air flow, and expired gas analysis.
- Metrasens FerroGuard metal detector

### **GE SIGNA 7T Whole Body MRI Scanner (100% Research Dedicated)**

Description: This actively shielded scanner was brought on line in March 2015 as an MR950 and was upgraded to the SIGNA 7T in the Fall of 2022. The Signa 7T scanner has ultra-high performance gradients with a maximum amplitude of 100 mT/m and slew rate of 200 T/m/s. The scanner is equipped with 8-channel transmit, 64-channels broadband receive, and third order shims. The scanner is located in the Iowa Institute for Biomedical Imaging (IIBI) within the Pappajohn Biomedical Discovery Building (PBDB). The IIBI has 20,081 sq.ft allocated to human imaging and the scanner is sited in one of the four whole body scanner bays within the facility. A waiting room and three subject preparation rooms are also part of the facility. The Department of Radiology has research agreements in place with GE Healthcare to support pulse programming efforts and sharing of state-of-the-art pre-release pulse sequences.

#### **Specialized Sequences:**

- IDEAL (Fat/Water Imaging)
- 3D ASL
- SWAN (QSM)
- ZTE
- MERGE (Multi-echo GRE)
- T1 $\rho$
- 2D COSY
- Disco
- Propeller
- HARDI DTI
- MAVRIC (Metal Reduction)
- Silent
- LAVA (T1 DCE)
- Single Voxel Spectroscopy
- EPSI
- 4D Flow
- 3D CUBE
- Multi-band (SMS) echo-planar
- Parametric Mapping (T1, T2, T2\*)
- 2D/3D SSFP
- PROMO (Motion Correction)
- Chemical Shift Imaging
- CEST
- LAVA

#### **Coils:**

- 2Tx/32Rx Channel Head Coil
- 8Tx/32Rx Channel Body Coil
- $^1\text{H}/^{23}\text{Na}$  Dual Tune Flex Coil
- 8Tx/32Rx Channel Head Coil
- $^1\text{H}/^{31}\text{P}$  Dual Tune Head Coil
- 2Tx/28Rx Extremity Coil
- $^1\text{H}/^{23}\text{Na}$  Dual Tune Head Coil

#### **fMRI Equipment:**

- Avotec Silent Scan
- Stimulus computer
- Avotec Silent Vision SV-6060
- Software: E-prime, Presentation, PsychoPy, & Matlab
- MediGlasses prescriptive lenses
- Current Designs 5 button response pad

#### **Other Equipment:**

- BIOPAC Physiological Monitor: photoplethysmograph (PPG), respiratory, galvanic skin response (GSR), pulse ox, ECG
- Metrasens FerroGuard metal detector

### **3.0T GE MAGNUS MRI Scanner (100% Research Dedicated)**

Description: We have recently installed a MAGNUS 3T scanner funded by an NIH High End Instrumentation grant (S10OD030220). The MAGNUS scanner is a head only scanner with high performance gradient system ideal for neuroimaging studies. The scanner has a maximum gradient amplitude of 300mT/m per axis with a slew rate of 750T/m/s making it ideal for diffusion weighted imaging, fMRI, and fast spin-echo imaging. This high slew is provided by an asymmetric gradient system with a limited FOV designed for neuroimaging applications. The scanner has 64 receive channels. The scanner also has multi band echo-planar imaging, spectroscopic imaging, and multi-nuclear imaging capabilities. The scanner is located adjacent to our existing 3T Premier scanner in PBDB with all of the same support facilities available.

#### **Specialized Sequences:**

- IDEAL (Fat/Water Imaging)
- 3D ASL
- SWAN (QSM)
- MERGE (Multi-echo GRE)
- T1 $\rho$
- Single Voxel Spectroscopy
- Propeller
- HARDI DTI
- ZTE
- 2D COSY
- PROMO (Motion Correction)
- CEST
- 3D CUBE
- Multi-band (SMS) echo-planar
- Parametric Mapping (T1, T2, T2\*)
- 2D/3D SSFP
- EPSI
- Chemical Shift Imaging

**Coils:**

- 32-Channel Head Coil
- TR Head Coil
- 12-Channel Knee Coil

**fMRI Equipment:**

- Magnacoustics Sound system
- Avotec Silent Vision SV-6060
- Response System: Current Designs 5 Button Pad
- Stimulus computer
- Software: E-prime, Presentation, PsuchoPy, & Matlab
- MediGlasses corrective lenses

**Other Equipment:**

- BIOPAC Physiological Monitor: photoplethysmograph (PPG), respiratory, galvanic skin response (GSR), pulse ox, air flow, and expired gas analysis.
- Metrasens FerroGuard metal detector

**MRI Simulator**

Description: An MRI Simulator is available free of charge for any researcher participating in MR imaging studies. The MRI Simulator was built by Psychology Software Tools (PST) and provides a realistic approximation of an actual MRI scanner to allow acclimatization and fMRI training of participants in an environment less daunting than a real scanner.

**Features:**

- 60 cm bore with tapered entry
- Lights, fan, speakers and subwoofer
- Table and head coil pads
- Psychology Software Tools MoTrak head motion tracking system
- Integrated control panel
- Motorized participant table with remote control and drag sensing safety stop
- Mock head coil
- SimFx (Authentic MRI sounds)

**fMRI Equipment:**

- 15" high-definition LCD monitor
- Stimulus computer with DVD player
- Sennheiser HD 280 professional headphones
- Rear-facing mirror for fMRI studies
- Software: E-prime, Presentation, & Matlab
- Microphone system