



**3T/7T MRI FACILITY**

<b>SOP Number:</b>	<b>200.03</b>
<b>Title</b>	<b>General Experimental</b>

<b>Revision Chronology</b>		
<b>Version Number</b>	<b>Date</b>	<b>Changes</b>
<b>200.01</b>	<b>15 August 2008</b>	<b>New</b>
<b>200.02</b>	<b>31 January 2013</b>	<b>Updates throughout, IV regulations added</b>
<b>200.03</b>	<b>27 October 2015</b>	<b>Review/update</b>

**Associate Director Signature:** \_\_\_\_\_  
**Date:** \_\_\_\_\_

**ROBARTS RESEARCH INSTITUTE**  
**CENTRE FOR FUNCTIONAL AND METABOLIC MAPPING:**  
**3T/7T MRI FACILITY**

**Standard Operating Procedure #200.03**

**General Experimental**

**1. Introduction**

- 1.1 Research involving Magnetic Resonance Imaging (MRI) at high magnetic field strengths presents unique hazards to both research subjects and individuals working within and around the MRI system. Consequently, the potential for serious personal injury is present due to the sheer magnitude and strength of the static magnetic field along with the immense flexibility of the research system and associated peripheral hardware.
- 1.2 The static magnetic field in the 3T/7T MRI Facility is always present. It is essential that everyone entering the facility is aware of the presence of the magnetic field, since we cannot otherwise detect it (i.e. magnetic fields cannot be seen or felt).
- 1.3 Dangerous and potentially lethal levels of electricity are used by both the 3T and 7T MRI systems. Therefore it is important that all individuals working around the MRI systems be aware of the dangers and understand the safety issues concerning electricity. Current-carrying cables, connections, and junction points in the vicinity of the main magnetic field are particularly susceptible to damage due to the extreme Lorentz forces created through the normal operation of the system. Periodically, the effects of prolonged mechanical fatigue may result in breakage, thereby causing electrical arcing, sparking, and high heat levels before the system can shut down. In these instances there is a high potential for personal injury as well as the possibility of a fire being ignited.
- 1.4 During certain types of MRI data collection, high and potentially dangerous acoustic sound pressure levels (SPL) are generated. Everyone entering the facility must be made aware of this risk and be instructed as to the precautionary measures that must be taken. Any patients, volunteers, or other personnel present in the magnet room during an MRI scan must wear appropriate hearing protection as outlined in SOP#120: "General Safety".
- 1.5 Due to the inherent hazards associated with the static magnetic field, access to the 3T/7T MRI Facility is restricted to ensure the safety of all patients, subjects, visitors, and staff. The 3T/7T MRI Facility is conceptually divided into four Zones of increasing level of potential risk and access restriction. See SOP#100a: "MRI Facility Safety Zones", SOP#100b: "MRI Facility Access Approval Policy", and SOP#110: "MRI Facility Visitor Approval Policy".
- 1.6 Personnel working within the 3T/7T MRI Facility require extensive training, see SOP#130 "MRI Personnel Training".

**2. General Set-Up Procedure**

- 2.1 All studies must have appropriate Review Ethics Board (REB) protocols in place before commencing, see SOP#210: "New Protocols and Ethics".
- 2.2 All volunteers, patients, and Research Personnel entering Zone III or IV of the 3T/7T MRI Facility must be screened using the facility's "Magnetic Resonance Environment Screening Questionnaire" (see Appendix 1) and have it reviewed, signed, and approved by authorized Level 2 MRI Personnel.
- 2.3 The volunteer/patient, Research Personnel, MRI Technologist/Operator, and anyone else entering Zone IV (magnet room), must remove all metallic objects from their person, see SOP#120: "General Safety".
  - 2.3.1 The MRI Technologist/Operator is responsible to screen all objects entering Zone IV for ferrous components.
  - 2.3.2 All objects, not already in Zone IV, should not be brought into the magnet room, unless they are necessary for the successful execution of the experiment, and have been tested and permitted for entry by Level 2 MRI Personnel.
- 2.4 It is mandatory for the volunteer/patient, and all others who will be present in the magnet room during scan acquisition to wear hearing protection either in the form of earplugs or headphones provided by the 3T/7T MRI Facility.
- 2.5 The MRI Technologist/Operator will advance the volunteer/patient into the magnet at his/her own discretion. If the operator at any time feels that the volunteer/patient is not safe to enter the scanner, is unwilling to enter the scanner (e.g. due to claustrophobia), or for any other reason, s/he may refuse to advance them into the magnet and may cancel the scan session at the research group's expense.

### 3. **Responsibilities of the MRI Technologist/Operator**

- 3.1 The MRI Technologist/Operator is responsible to ensure the physical and emotional safety of all volunteers, patients, and Research Personnel within Zone IV (magnet room). This responsibility includes screening all individuals and objects for safety, explaining the MRI procedure, providing and enforcing the use of hearing protection, and informing Research Personnel of the critical operating areas.
- 3.2 The MRI Technologist/Operator is responsible to ensure that all necessary patient safety devices are operational and utilized for a scan session. It is at the discretion of the operator to cancel the scan session at any time if any or all of the safety devices are not operational. Patient safety devices are listed below; not all safety devices are necessary for all experiments.
  - 3.2.1 Emergency squeeze ball
  - 3.2.2 Audio system
  - 3.2.3 In-bore camera
  - 3.2.4 Infrared camera
  - 3.2.5 Physiological monitoring devices
    - 3.2.5.1 ECG
    - 3.2.5.2 Pulse oximeter
    - 3.2.5.3 Respiratory belt
  - 3.2.6 Crash cart / AED
  - 3.2.7 Fire extinguisher
  - 3.2.8 Smoke detector

- 3.3 The MRI Technologist/Operator is responsible to notify the Associate Director or the Senior MRI Research Technologist of any patient safety device that is not operational or report a malfunction/error state to Siemens Service.
- 3.4 The MRI Technologist/Operator is responsible to notify the Associate Director and/or Siemens Service if any peripheral device is not operational. Peripheral devices include but are not limited to:
  - 3.4.1 Stimulus Projection Systems
  - 3.4.2 Control or Stimulus Presentation Computers
  - 3.4.3 Projection Screens
  - 3.4.4 RF Coils
- 3.5 It is the responsibility of the MRI Technologist/Operator to screen all items entering Zone IV (magnet room) for ferrous components. A strong hand held magnet is available in the control room for such testing.
- 3.6 The MRI Technologist/Operator is responsible to place any soiled linen in the laundry bag.
- 3.7 The MRI Technologist/Operator is responsible for returning all peripheral devices and any other item used during the scan session to their proper storage location upon completion of the scan session.

#### 4. **Responsibilities of the Facility**

- 4.1 The facility is responsible to check all primary devices daily to ensure their functionality. Primary devices include:
  - 4.1.1 The magnet system.
  - 4.1.2 All patient safety devices.
- 4.2 The facility will inform MRI Technologists/Operators and investigators of any malfunctions of Primary devices if their scan session will be affected.
- 4.3 Secondary devices will not be checked daily. Secondary devices are all peripheral devices as listed in Section 3.4 above. If the facility is aware of failure of a specific secondary device that will affect upcoming scan time, the facility will notify the appropriate MRI Technologists/Operators and investigators.

#### 5. **Intravenous Access, Injections, and Contrast-Enhanced Studies**

- 5.1 Studies involving the injection of gadolinium-based contrast media or other intravenous (IV) agents may be conducted in the 3T/7T MRI Facility as long as the appropriate Review Ethics Board (REB) protocols and approvals are in place, see SOP#210: "New Protocols and Ethics".
- 5.2 Due to the potential for adverse reactions, a licensed physician must assume responsibility and be "on-site" during the injection of any gadolinium-based contrast media. It is the responsibility of the study's Primary Investigator (PI) to ensure a collaborating physician is involved, as one will not be provided by the 3T/7T MRI Facility.
  - 5.2.1 Should a severe adverse reaction occur, the 3T/7T MRI Facility has LHSC Code

Blue coverage, see SOP#140: "Emergency Code Blue".

- 5.3 Peripheral IV lines may be started in the 3T/7T Facility by Level 2 MRI Personnel, Level 1 MRI Personnel, Research Personnel, or other associated study staff who:
  - 5.3.1 Hold Intravenous Certification, either by the successful completion of an academic course or have completed appropriate training as determined by the study's supervising physician.
  - 5.3.2 Insert IV lines only under the direction and supervision of the study's physician.
- 5.4 Intravenous injections of gadolinium-based contrast media or other agents may only be performed by those holding Intravenous Certification, and who are acting under the direction and supervision of a physician.