

**Part A: Source Hazard Assessment Record**

I. Source Identification			
<b>Department:</b> <b>NSLS</b>	<b>Building:</b> <b>725</b>	<b>Room or Area (location of source):</b> <b>U4B</b>	
<b>Identifier/ Name of Source:</b>  <b>In-beam electromagnets</b>			
<b>Status of Source Usage (check all that apply):</b> <input checked="" type="checkbox"/> In use on frequent basis <input type="checkbox"/> Planned use in the near future <input type="checkbox"/> Possible future use <input type="checkbox"/> No planned use <input type="checkbox"/> Intermittent use <input type="checkbox"/> One-time use <input type="checkbox"/> Other:			
<b>Check or Describe Use or Process:</b> <div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <input type="checkbox"/> Accelerator magnets  <input type="checkbox"/> Beam transport magnet  <input checked="" type="checkbox"/> Detector magnets  <input type="checkbox"/> Super-conducting coils  <input type="checkbox"/> Other (specify):         </div> <div style="width: 30%;"> <input type="checkbox"/> Nuclear Magnetic Resonance  <input type="checkbox"/> Magnetic Resonance Imaging  <input type="checkbox"/> Medical device  <input type="checkbox"/> Electron microscope  <input type="checkbox"/> Magnetometers         </div> <div style="width: 30%;"> <input type="checkbox"/> Ion pumps  <input type="checkbox"/> Permanent magnet  <input type="checkbox"/> Electromagnet lifting device  <input type="checkbox"/> Tool Chuck/clamp         </div> </div>			
II. Exposure Summary [Complete Part B: Field Strength Measurement Record or attach documentation from manufacturer]			
<b>Target Body Area</b>	<b>BNL Exposure Limits**</b>		
	TWA-8		Ceiling
	(mT)	(G)	(mT)      (G)
Cardiac Pacemaker & Ferromagnetic Objects*			0.5      5
Whole Body (Torso or Head)	60	600	2,000 (2 T)      20,000
Extremities (Limbs)	600	6,000	5,000 (5 T)      50,000
*Ferromagnetic Objects (Ceiling), including medical implants and prostheses, may be affected by fields. Additional evaluation is required.			
** TWA-8 = (B <sub>1</sub> t <sub>1</sub> + B <sub>2</sub> t <sub>2</sub> + .... + B <sub>n</sub> t <sub>n</sub> ) / 480 minutes      (See Exhibit BNL Static Magnetic Field Exposure Limits for details.) B = Flux Density [mT] t = time of exposure [minutes]			
<b>Maximum Exposure Potential surveyed applicable to worker exposure (mT): 202 mT extremities during repair or maintenance</b>			
III. Exposure Hazard Evaluation: Indicate worker exposure potential on the OMC Job Assessment Form or OMC Static Magnetic Field Questionnaire form.			
Flux Density			
1a. <input type="checkbox"/> Flux Density ≥ 0.5 mT (5 Gauss). No potential for individuals with medical electronic devices or ferromagnetic implants/prostheses* to be exposed above 0.5 mT (5 Gauss).			
1b. <input checked="" type="checkbox"/> Flux Density ≥ 0.5 mT (5 Gauss). Access to > 5G for individuals with medical electronic devices or ferromagnetic implants/prostheses* is not permitted.			
2a. <input type="checkbox"/> Flux Density ≥ 60 mT (600 Gauss) - Whole Body. No potential to exceed the 8 hours TWA.			
2b. <input type="checkbox"/> Flux Density ≥ 60 mT (600 Gauss) - Whole body. Potential to exceed the 8 hours TWA. Controls must be used.			
3a. <input type="checkbox"/> Flux Density ≥ 600 mT (6000 Gauss) - Limbs. No potential to exceed the 8 hours TWA.			
3b. <input type="checkbox"/> Flux Density ≥ 600 mT (6000 Gauss) - Limbs. Potential to exceed the 8 hours TWA. Controls must be used.			
4a. <input type="checkbox"/> Flux Density ≥ 2T (ceiling) - Whole Body. No potential to exceed the BNL ceiling.			
4b. <input type="checkbox"/> Flux Density ≥ 2T (ceiling) - Whole Body. Potential to exceed the BNL ceiling. Controls must be used.			
5a. <input type="checkbox"/> Flux Density ≥ 5T (ceiling) - Limbs. No potential to exceed the BNL ceiling.			
5b. <input type="checkbox"/> Flux Density ≥ 5T (ceiling) - Limbs. Potential to exceed the BNL ceiling. Controls must be used.			
* Medical electronic devices include cardiac pacemakers, electronic inner ear prostheses, and insulin pumps. Ferromagnetic implants/ prostheses include aneurysm clips, replacement hips.			

**4. Describe job/task and potential for employee exposures** (e.g., type of work performed around source, method of control, time spent in fields [hours/day] and method of determining exposure):

U4B employs a number of these electromagnets. They operate within the vacuum of the beam pipe and are used for magnetic spectroscopies. They may occasionally be tested outside the beam pipe for maintenance and repair purposes.

**5. Frequency of exposure** (e.g., # days per year or month, # tests per year, in continuous use, etc.):

The magnetic field is present only when the magnet is electrically powered. With the electromagnet inside the beam pipe, the field at 5 cm from the beam pipe surface is 34 gauss and drops to 2 gauss at 30 cm. These fields are present while making spectroscopic measurements on samples. During an experiment, it is common for beamline electromagnets to be operating 24 hours/day. A typical experiment will last for several days up to a week, but two weeks in duration is possible. Twelve to sixteen experiments are conducted/year.

Operating outside the beam pipe, the highest field of 2020 gauss is at the gap dropping to 132 gauss at 2.5 cm and 2 gauss at 30 cm. These fields would only be encountered during repairs or maintenance. Maintenance and upgrades to the magnets require several days/year, during which the maximum continuous time a magnet would be powered outside the experimental chamber is one hour.

#### IV. Precautions / Engineering & Administrative Controls

**Precautions During Use** (check all that apply):

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> Signs   | <input type="checkbox"/> Lights                    |
| <input type="checkbox"/> Barriers   | <input type="checkbox"/> Restricted access         |
| <input type="checkbox"/> Rotation of workers  | <input type="checkbox"/> Working when de-energized |
| <input type="checkbox"/> Use of nonferromagnetic tools  |  |
| <input type="checkbox"/> Physical indicator of fringe fields (e.g., use of string with paper clips or equivalent) |  |

Other:

#### Written Documentation:

- Experimental Review ([Work Planning and Control for Experiments and Operations](#) Subject Area)  
 Work Planning and Control ([Work Planning and Control for Experiments and Operations](#) Subject Area)  
 Written SOP (describe):

Other kinds of workers who may require information/written documentation/training to enter this area:

#### Checklist:

- |   |  |  |
|---|--|--|
| Employee training:  | <input type="checkbox"/> Static Magnetic Fields Web Course | <input type="checkbox"/> Dept/Division-Specific Training |
| Supervisors training:   | <input type="checkbox"/> Static Magnetic Fields Web Course | <input type="checkbox"/> Dept/Division-Specific Training |
| Training required to be linked to Job Training Analysis for affected workers: | <input type="checkbox"/> yes                               | <input type="checkbox"/> no                              |
| Worker evaluation required by OMC (all workers exposed to $\geq 5G$ )         | <input checked="" type="checkbox"/> yes                    | <input type="checkbox"/> no                              |
|   | <input type="checkbox"/> yes                               | <input type="checkbox"/> no                              |

#### V. Initial Assessment

**Completed by:** L. Stiegler & D. Arena

**Date:** 10/20/08

**Reviewed by ES&H Coordinator:** L. Stiegler

**Date:** 10/20/08

Forward the original form to the Static Magnetic Fields Subject Matter Expert, copies to your ES&H Coordinator and Safety & Health Representative. Retain a copy in your files. Update and resubmit the assessment when changes occur.