HEP Laser Lab.
Work category: Non-experimental work

Project No:		**Name:**	Gary Drake
Project title:	HEP Laser Lab	**Location (Building/Room, etc.)**	Bldg 362 E208D
Project start date:	June 30, 2008	**Project end date:**	Long-term
Date of submission:	June 24, 2008	**Submission type: (new, renewal, change)**	New

The Project Manager / Principle Investigator must be familiar with the responsibilities and the requirements of the experiment safety review in the *ESH Manual*, Section 21.2.

Work may not be performed until procedures have been approved, and authorization is granted. This completed form, and all supporting documentation must be submitted to the division ES&H Coordinator. Appropriate personnel for ES&H issues associated with the proposed work will review the information. The Project Manager must resolve outstanding issues before the work begins; no work may begin until Approval and Authorization is granted.

Gary Drake — 7/11/08
Project Manager Approval — **Date**

Review Approval — **Date**

7/11/2008
ES&H Authorization — **Date**

H. Weerts — 7/11/08
Division Authorization — **Date**

I received a copy of

HEP Laser Lab scope of work, hazard analysis and required controls for hazards.

I understand the information provided.

Date	Badge #	Printed Name	Signature
7/11/08	57461	Camden Ertley	Camden Ertley
7/14/08	22476	Robert G. Wagner	Robert G. Wagner

SCOPE OF WORK (ISM STEP 1)

General Description

Provide a general overview description of the experiment (or non-experimental work project). Describe specific equipment relating to tasks within the project, concentrate on operations that focus on the work, and summarize the hazards that you expect to encounter. Attach designs, drawings, or other useful descriptive material.

The Laser Test Stand will be used in the development and characterization of different types of photo-detectors for use in scientific applications and instrumentation. The work involves measuring the response of the device under test from a stimulus created by a laser with a Class 2 rating, operating in the visible light frequency range. The room is not light tight, and the measurements will be performed with the laser head and the devices under test inside light-tight boxes that reside on a 4 foot by 8 foot optical table. Some of the measurements may involve splitting the light using mirrors and other optics, so that the relative response of the device under test with respect to a known standard device can be measured. The period of the work is long-term, and may encompass several photo-detector R&D projects. It is expected that the general nature of the measurement program will remain the same across the different projects, although the nature of the instrumentation and optics may change depending on the application and research goals.

Lab Custodian:	Gary Drake
Current Users:	Karen Byrum
	Camden Ertley
	Bob Wagner

HAZARD ANALYSIS (ISM STEP 2)

Hazard List

Examples include but are not limited to the examples below. You may expand your comments on hazard analysis in the scope of work (ISM STEP 1) section of this document.

Low Risk

☐ Delivery of items such as furniture, office supplies.

☑ Equipment (bench top set up) utilizing hand tools and that does not fall into another hazard classification

☑ Equipment repair, de-energized, utilizing hand tools, and that does not fall into another hazard classification

☐ Equipment calibration, de-energized, utilizing hand tools, and that does not fall into another hazard classification

☑ Computer set-up

☐ Installation of window blinds that requires no power tools or use of a ladder

☐ Performing office-type tasks

☑ Assembly of technical components with use of hand tools and no exposure to additional hazards of a greater risk

Moderate Risk

☐ Installation of furniture utilizing power tools, battery operated tools or hand tools

☐ Installation of office partitions.including repair and modification to existing partitions, shelving involving no hard wiring of electrical connections, plug type only

☐ Installations of carpet with or without utilizing consumer quantity of adhesive product

☑ Low voltage calibration/testing.below 50 volts

☐ Repair and/or window glass replacement, window cleaning below 6 ft.

☐ Repairs that do not require lockout/tagout or use of chemicals that are above a consumer commodity quantity

☐ Kitchen appliance repair with out any additional exposure to a high risk activity

☐ Activity that does not involve working with any type of energy source, working above 6 ft., or entry into a confined space

☐ Painting with latex paint

☐ Site survey work that is not within 6. of a roadway and does not include the use of lasers higher than class 2

☐ Tree and flower planting in pots or planters

☑ Use of class 2 lasers

☑ Assembly of technical components utilizing power tools, battery operated tools, or hand tools

☑ Assembly of purchased component utilizing power tools, battery operated tools, or hand tools

☑ Service of experimental mechanical devices utilizing power tools, battery operated tools, or hand tools

☐ Installation of wire cages utilizing power tools, battery operated tools, or hand tools

High Risk

☐ Electrical or other energy sources requiring lockout/tagout for any installation or modification

☐ Working with or having an exposure to hazardous materials (e.g., toxins, carcinogens, asbestos, lead, beryllium, etc.)

☐ Excavations of any type or depth that requires a Dig Permit

☐ Confined spaces

☐ Noise levels above 85 dB

☐ Ionizing radiation (per entry posting)

☐ Non-ionizing radiation (per entry posting)

☑ Working on energized equipment of greater than 50 volts

☐ Installation of office partitions containing electrical hard wire electrical connections

☐ Activity requiring lockout/tagout of energy source

☐ Work on transformer

☐ Working with the potential for a fall from a height greater than 6 ft

☐ Pole work of any nature

☐ Communication tower work including erecting, painting, or inspection

☐ Elevator repair/maintenance/inspection

☐ Overhead crane inspections or repair

☐ Equipment alignment of energized equipment

☐ Sprinkler repairs or modifications

☐ Utility line work on gas line, electrical, water, steam, air, or communication

☐ Mechanical work that may include welding, cutting, burning, or any open flame work, metal grinding, or saw cutting

☐ Concrete boring/cutting/grinding/jack hammering

☐ Hoisting, rigging, or lifting

☐ Parking lot paving and striping

☐ Tree and stump removal, grass burning, or chemical treatments

☐ Laser repair and installation

☐ Painting with epoxy paint

☐ Chiller or refrigerant repair/recovery or replacement

☐ Chemical use (use of flammable products,asbestos abatement, work on lead painted surfaces)

☐ Potential releases to environmental media (air, land, surface water, and/or groundwater)

☐ Equipment use (cranes, fork lift, scissor lift, boom lift, scaffolds, back hoes, bobcats)

☐ Other high risk situations as determined by line management or the division ES&H coordinator

Yes No

◉ ○ **Is this job performed in a location or environment having a special designation where specific precautions are to be observed?**

Examples (Check those applicable)

☐ Nuclear facility

☐ Nonnuclear radiological facility

☐ Radiological controlled area

☐ Outdoor-NEPA review

☑ Indoor-laboratory, service area, common area

☐ Floor loading limitations

☐ Noise posted area

- ☐ Laser controlled area
- ☐ Biohazard area
- ☐ Magnetic field
- ☐ Ultraviolet (UV)
- ☐ Microware
- ☐ High heat/cryogenics
- ☐ Hazardous/flammable/reactive chemicals
- ☐ Energized systems, electrical, pressure
- ☐ Confined space
- ☐ Elevated 6 feet or more above working level
- ☐ Asbestos, lead, mercury, beryllium in area or could be disturbed
- ☐ Clean room
- ☐ Other specifically defined locations or environments?

Yes No

○ ◉ **Is this job a complex activity?**

Examples (Check those applicable)

- ☐ More than one work group necessary to complete the job.
- ☐ Steps of a task or tasks of a job must be completed in an exact sequence.
- ☐ Shutdowns of various systems and lockout/tagouts of various energy sources must be completed.
- ☐ Life safety features/egress routes altered.
- ☐ Additional specific training/skills/knowledge/fitness required for those performing task.
- ☐ Materials handling issues - heavy, bulky, hazardous materials handled individually, with manually operated equipment with powered equipment such as forklifts, cranes, etc.
- ☐ Other specific complex activities? You may expand your comments in the scope of work (ISM STEP 1) section of this document.

HAZARD CONTROLS (ISM STEP 3)

ENGINEERING CONTROLS

Describe the engineering controls applied to control the hazards. Engineering controls include enclosures and barriers that cannot be removed without the use of tools, interlocks, ventilation, software controls, etc.

Task	Engineering Controls
1. Class 2 Laser The laser used is a Hamamatsu PLP-10 laser, and will be operated in the visible light band. Currently there are 2 heads, one at 408 nm, and one at 635 nm. The power output is 122 mW and 103 mW respectively for the heads. It operates in pulsed mode (not DC), with a maximum pulse width of 100 pSec. It has a maximum repetition rate of 100 MHz, although typically will be operated around 1 KHz due to limitations with the data acquisition system. The laser is listed as a Class 3B laser, but in consultation with an ANL Laser Safety Officer (Bruce Murdoch, LSO), it has been de-rated to Class 2 because of the low output power, and the fact that the laser operates in pulsed mode.	The primary hazard associated with the laser is inadvertent exposure to a human eye. Because of the Class 2 designation, the risk of damage to the human eye is small. Interlocks and safety glasses are not required, although the use of safety glasses is recommended for people working in the room. In general, the laser and photo-detectors under test reside inside of light-tight boxes, and are not operated with the boxes open. While the boxes are not interlocked, this operational policy reduces the potential for accidental exposure to the laser. Operators should be instructed as to how to turn on and off the laser. A part of operational policy should be that the laser power supply is turned off when access occurs to the inside of the boxes.

2. High Voltage The photo-detectors under test will often require the use of high voltage, low current power supplies for biasing. Typical voltage and current levels are 1-2 KV, ~1-10 mA. The primary hazard associated with high voltage is electrical shock should a worker come in contact with exposed conductors while the power supply is energized. Because this is an R&D facility, the nature of the connections to photo-detector devices under test is sometimes not very robust, and exposed conductors may exist. Also, the high-voltage connections to photo-detectors often use large bypass capacitors that act as noise filters. The size of the capacitors is often of order 1 □F, which at 2 kV could store ~2 Joules of energy.	In general, the laser and photo-detectors under test reside inside of light-tight boxes, and are not operated with the boxes open. While the boxes are not interlocked, this operational policy reduces the potential for accidental exposure to energized conductors. Operators should be instructed as to how to turn on and off the high voltage. No special controls are needed unless exposed hazardous electrical conductors are created through the setup of a research activity. Consult with members of the HEP Electronics Support Group for advice and assistance (Gary Drake, HEP Electronics Support, 2-1568, drake@anl.gov).
3. Line Voltage The data acquisition system is powered from 120 V line voltage. The primary hazard associated with line voltage is electrical shock should a worker come in contact with exposed conductors.	Generally, the R&D work in this facility will use commercial equipment installed in relay racks, and will not involve working directly with exposed line voltage. No special controls are needed, unless exposed hazardous electrical conductors are created through the setup of a research activity. Nonetheless, good safety grounding practices are required. The equipment used in the lab should conform to Nationally Recognized Testing Laboratory (NRTL) electrical equipment safety standards.

ADMINISTRATIVE CONTROLS

List all work procedures, permits and checklists necessary to mitigate hazards. The Project Manager must describe where skill of the researcher/craft/work is being relied upon for hazard mitigation and control.

Task	Administrative Controls
1. Class 2 Laser	The use of the laser requires a permit and authorization from an ANL Laser Safety Officer. Because the laser is an integral part of the facility, the facility should be reviewed by an ANL Laser Safety Officer and the HEP Safety Committee. The Argonne LSO will review the laser yearly as part of the yearly permit. Because the laser is rated as Class 2, formal laser safety training is not required for operators and others who may work in the room during operation. For questions or consultation about the use of the laser, the primary support person is the ANL LSO (Bruce Murdoch, 2-4905, btmurdoch@anl.gov).
2. High Voltage	It is expected that the nature of the high voltage connections to different kinds of photo-detectors to be studied in this facility might be different from application to application. The users of the facility are encouraged to consult with members of the HEP Electronics Support Group, for advice and assistance in making connections to the high voltage power supplies (Gary Drake, HEP Electronics Support, 2-1568, drake@anl.gov). The nature of the connections should conform to accepted safety practices, in accordance with laboratory electrical safety policy. Use of the high voltage system requires Basic Electrical Safety Training. No special permits are needed for operation unless exposed hazardous electrical conductors are created through the setup of a research activity. Consult with members of the HEP Electronics Support Group for advice and assistance. This aspect of the operations should be reviewed annually by the HEP safety committee as part of operational readiness. Other operational permits are not required unless conditions are created where workers might become exposed to energized conductors, in which case a Working Hot permit is required.

3. Line Voltage	No special permits are needed unless exposed hazardous electrical conductors are created through the setup of a research activity. Consult with members of the HEP Electronics Support Group for advice and assistance (Gary Drake, HEP Electronics Support, 2-1568, drake@anl.gov).

PERSONAL PROTECTIVE EQUIPMENT

Specify personal protective equipment (PPE) to be worn. For gloves, be specific as to the type appropriate for the task and which steps in the activity the PPE is required.

Task	PPE
1. Class 2 Laser	None required. Laser safety glasses recommended.
2. High Voltage	None required under normal operational conditions. If Working Hot work rules are enacted, PPE will be specified in the permit.
3. Line Voltage	None required under normal operational conditions.

WORKING WITHIN CONTROLS (ISM STEP 4)

All work must be performed within the controls for all the identified hazards.

It is the Project Manager responsibility to verify that this document is kept up to date and determine if changes are significant enough to require a new review/document.

FEEDBACK (ISM STEP 5)

Identify types of records or reporting method that is useful for improvement on the tasks relating to this project. This could include lab notebooks, datasheets, computer data, instrument logs, images, etc.

Task/Situation	Record
1. Class 2 Laser	Problems recorded in logbook.
2. High Voltage	Problems recorded in logbook.
3. Line Voltage	Problems recorded in logbook.
4.	
5.	

Yes No

○ ◉ **Was a graded approach applied to this scope of work? Graded approach for example is to have a knowledgeable colleague that will not supervise nor perform the experiment or non-experimental work, examine the setup then document his or her conclusions in accordance with the ANLHEP_644 form for divisional work approval and authorization.**

If yes, describe the graded approach taken.