

P25 Hazard Control Plan

Construction of the PHENIX Multiplicity Vertex Detector in TA3, SM218

ID: MVD_HCP_021

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Originated: July 17, 1996 (by Jehanne Simon-Gillo)

Latest Revision: August 30, 2002

Highest Initial Risk: Medium

Residual Risk Level: Minimal

Consultation is required (initial risk estimate is medium):

Jim Amann, P25 Safety Officer

Date

Concurrence not required (Initial risk estimate is not high).

Work Authorization (initial risk estimate is medium):

Andrea Palounek, P25 Group leader

Date

Next Review Date: August 28, 2002

Revised:

Jul 15, 1997 Updated to reflect ongoing activities

Aug 02, 1999 Convert to a Hazard Control Plan

Sep 20, 1999 Minor Revisions

Aug 29, 2002 Revise to reflect current activities

Work Description

This project involves the construction and assembly of a silicon multiplicity and vertex detector (MVD) and similar detector testing related to the Compton imaging project. Upon completion, the MVD detector will be shipped to Brookhaven National Laboratory for installation into the PHENIX experiment. The detector is composed of several elements which must be assembled and tested. The various components undergo quality control tests, individually and as assemblies. Some of the quality control tests require powered instrumentation, radiological sources, VME and CAMAC crates are used in the electronics test systems. Chemicals are used to clean and assemble components. Some soldering is done in the assembly and testing steps. Machine shop tools and hand-tools are often required for construction of jigs and other assembly materials. A small oven is sometimes used for thermal tests of components.

Work Locations:

All work described in this document will be performed in TA3, SM218.

Identified Hazards, Controls and Risks

Hazards, controls and risks were identified through discussions and walkthroughs with MVD team members, the P25 Safety Officer (Jim Amann), ES&H personnel and the Building Facility Manager.

- Laser station
- Chemical hazards
- Hazardous Waste
- Solder operations
- Operation of Machine shop tools
- Use of Hand tools
- 110V AND 208V equipment and circuits
- CAMAC crates
- Radiological sources
- Oven operation
- Glue dispensation gun
- Compressed gas cylinders
- P21 Magnet
- Roll-Up Door
- General Housekeeping
- Theft

General Hazard Mitigation:

All MVD personnel must follow the "two-person rule" when working in the laboratory on weekends or after normal working hours. No food or drink is allowed in the laboratory area except in the student offices and in the designated food area by the sink to the left of the bathroom.

Hazard: Laser Station

A 1064nm Class 1 Laser Diode with optical fiber was once used to test detector and electronics assemblies. Although it is no longer used, it remains in the lab. There are no special procedures which must be followed or training which must be taken in order to operate a Class 1 laser. The bias supply for the laser operates at 28V (60V max) and 0.5A and is covered with a guard, which

should not be removed. The RF enclosure which is lowered over the laser station is heavy and could hurt someone if it were to lower unexpectedly onto a body part. Initial risk to personnel is MINIMAL. Initial risk to property is MINIMAL.

Hazard mitigation: An RF enclosure is also lowered over the laser and guard when laser is in operation. This enclosure is also kept closed when the laser is not in use. A set of wooden braces prevent the enclosure from falling on someone while it is open.

Residual risk: MINIMAL

Hazard: Chemical Hazards

Several chemicals are occasionally used to clean the silicon detectors and associated cables. These are: ethanol and on rare occasions, acetone. These solvents are flammable. In small quantities, these solvents are mild irritants of the skin and respiratory passages. Contact of concentrated solutions with the eyes can cause corneal damage. There are also adhesives that are used in the assembly of the detector. These are: Densil dry adhesive (benign) with primer (flammable), Araldyte, 5-minute epoxies, Radioshack Future glue, thermal and conductive epoxies. Contact with these adhesives or their fumes could cause skin irritations or allergies. Initial risk to personnel is MEDIUM. Initial risk to property is MINIMAL.

Hazard Mitigation: All of these chemicals are in well-labeled containers. The chemicals are used in only well-ventilated areas. Latex gloves and safety goggles or glasses should be used when working with the chemicals. When not in use, they are housed in one of two flammable chemical cabinets in the laboratory. These chemical cabinets are kept locked. If you need access to the chemical cabinet, please contact John Sullivan for access to a key. The inventories of the chemical cabinets are kept up-to-date. MSDS sheets exist for all of the chemicals used in the laboratory, are in well-marked areas, and identified to all MVD personnel. MSDS instructions are followed when working with the chemicals. No chemicals are allowed in designated food and drinking areas.

Residual risk: MINIMAL

Hazard: Hazardous Waste

The MVD construction project generates very little waste. Epoxy is discarded when fully mixed and cured. The solvents are usually used in small quantities and are evaporated during use. In the extremely rare event that excess solvent exists, then it is disposed of appropriately. Initial risk to personnel is MINIMAL. Initial risk to property is MINIMAL.

Hazard Mitigation: If there is any waste, we will contact a properly trained waste generator, who has had the required training and will insure that all chemical wastes are properly disposed.

Residual risk: MINIMAL

Hazard: Soldering Operations

Electronics components are soldered to cables and various printed-circuit boards. An individual could suffer minor burns if the soldering iron were not handled properly. A soldering iron could cause a fire if mishandled. Eye damage could occur if solder were to sputter significantly during operation. Personnel could obtain lead poisoning if they were to ingest lead solder. Initial risk to personnel is LOW. Initial risk to property is MINIMAL.

Hazard Mitigation: Experienced personnel first train individuals performing the soldering. Soldering operations are performed in a well-ventilated area. No food or drink are allowed in the soldering area. Well-labeled recycling containers are located at each soldering station. Scraps of solder are placed in the solder recycling containers. Safety glasses are worn during soldering operations to safeguard against splattering. Personnel are instructed to wash their hands after soldering operations.

Residual risk: MINIMAL

Hazard: Operation of Machine Shop Tools

Simple machining tasks are often required in MVD activities. An individual could cause major injury to their fingers, hands, face or eyes if the tools were not handled properly. Initial risk to personnel is MEDIUM. Initial risk to property is LOW.

Hazard Mitigation: No personnel operate machine shop tools unless they have been properly trained according Mark Peters (P-21), who manages the shop in SM-218. A list of properly trained persons is available in the P-21 group office. Currently, Hubert van Hecke and Toshi Shiina are on this list. Safety glasses are worn during the machining. The machines are locked-out when not in use; the keys are given to properly trained persons by P-21.

Residual risk: MINIMAL

Hazard: Use of Hand Tools

Simple tasks requiring the use of hand tools, such as a hand drill or saw, are occasionally required. An individual could cause minor injury to their body, face or eyes if the tools were not handled properly. Initial risk to personnel is LOW. Initial risk to property is LOW

Hazard Mitigation: MVD personnel follow OSHA and Laboratory policy during operation of hand tools. A knowledgeable staff member trains the individual prior to the operation of the hand tool. Safety glasses are worn during the use of the hand tool.

Residual risk: MINIMAL

Hazard: 110V and 208V equipment and circuits

Most laboratory instrumentation and equipment uses standard 110V line power. Unauthorized and nonstandard operation of equipment, or defective 110V equipment could cause shock to an individual. The MVD environmental chambers are commercial units which employ 208V 1-phase power. Unauthorized and nonstandard operation of or defective 208V equipment could cause shock to an individual. Initial risk to personnel is MEDIUM. Initial risk to equipment is LOW.

Hazard mitigation: All MVD instrumentation and equipment are standard units that incorporate all of the industry standard safety features. Equipment should be operated according to manufacturer Instructions. Equipment should not be opened for inspection or repair. After discussions with the P25 Safety Officer, Jim Amann, it was determined that all equipment in the MVD laboratory is such that personnel are not exposed to hazardous voltage, stored energies or currents and no special training is required to work with the equipment.

Residual risk: MINIMAL

Hazard: 120V AC CAMAC crates

Partially populated 120V AC CAMAC crates in the MVD laboratory are occasionally used. These sometimes contain modules with exposed circuit boards. If an individual were to insert a body part into the crate and come in contact with the exposed circuit board, shock could occur. Initial risk to personnel is LOW. Initial risk to equipment is LOW.

Hazard Mitigation: Unused slots in the crates are covered such that it is not possible to insert a body part into the crate. The crates are without a covering over the open part of the crate and are labeled explaining that the covering must be in place prior to operation of crate. In addition, only voltages below 24 V are expected on the parts of the crate which are open.

Residual risk: MINIMAL

Hazard: Radiological sources

We use a 1 micro-Curie Ruthenium-106 source in the testing of silicon detectors and electronics. Improper handling of the source could result in radiation exposure. Initial risk to personnel is LOW. Initial risk to equipment is MINIMAL.

Hazard Mitigation: MVD personnel involved in these tests have successfully passed Radiological Worker 1 Training. Signs are posted indicating when a radiological source is in use. No source requires special work permits or radiological work permits. Radiological sources are housed in the source cabinet, which is kept locked with a combination lock. The key to the combination lock is written inside of the flammable cabinet, which is also kept locked. Contact John Sullivan if you need access to the chemical or source cabinet.

Residual risk: MINIMAL

Hazard: Oven operation

A small oven in SM218 is on occasion used to heat samples of foam, cables and electronic components for thermal tests. Improper usage of the oven or handling of the hot components could result in minor burns. Initial risk to personnel is MINIMAL. Initial risk to equipment is MINIMAL.

Hazard Mitigation: MSDS sheets are always consulted prior to the heating of any component. Safe procedure is followed and fireproof gloves are always worn when operating the oven or hot components.

Residual risk: MINIMAL

Hazard: Glue dispensing gun

A commercial hand-held glue-dispensing gun is used in the construction process of adhering detector assemblies to their support structure. The gun is operated at approximately 40psi. If the gun were operated in a non-standard way, one could create a sticky projectile and cause harm to an individual. Initial risk to personnel is MINIMAL. Initial risk to equipment is MINIMAL.

Hazard mitigation: Common sense and caution should be exercised when utilizing the glue-dispensing gun. The operator should verify that the gun is approximately under the correct amount of pressure before use. An experienced MVD person should train all users. Manufacturer operating instructions should be followed.

Residual risk: MINIMAL

Hazard: Compressed gas cylinders

There is one nitrogen gas cylinders in SM218. It should only be used for one of two purposes: cleaning particles off of electronics and supplying pressure to a glue-dispensing gun. Nitrogen is non-toxic and non-flammable. The main hazards are rapid depressurization and oxygen deprivation. Initial risk to personnel is MEDIUM. Initial risk to equipment is LOW.

Hazard Mitigation: Only personnel trained in Gas Cylinder Safety are allowed to handle or exchange the gas cylinders. The bottles are secured to a bottle holder and screwed to the MVD cleanroom. The pressure is limited to 30 psi with a relief valve.

Residual risk: MINIMAL

Hazard: P21 Magnet

The space in SM218 is shared between two groups, P25 and P21. Half of the building is designated for work on the MVD while the other half is designated for work on a superconducting solenoid magnet used for magnetic resonance imaging. The magnet boasts a low external magnetic field and most openings are closed off with screens. If one had the inclination, a person could climb inside of the magnet. If the magnet suffered a violent quench and the vent stacks simultaneously blew up or cracked, oxygen displacement could occur. Initial risk to personnel is MEDIUM. Initial risk to equipment is LOW

Hazard Mitigation: MVD personnel have undergone walkthroughs with P21 personnel to understand the hazards associated with the P21 project. All MVD personnel have a copy of the P21 magnet Hazard Control plan and have read the plan. A well-displayed light flashes when the P21 magnet is in operation. An audible alarm sounds if low oxygen levels are detected. Personnel should evacuate the building if the low oxygen level is sounded.

Residual risk: MINIMAL

Hazard: Roll-Up Door

The MVD laboratory in SM218 has one roll-up door. This door was manufactured and installed according to standard commercial practices, including limit switches. This door still presents a potential hazard from either uncontrolled closure or from interference of objects in its path. There have been incidents at LANL where these roll-up doors have become detached and fallen. Initial risk to personnel is LOW. Initial risk to equipment is LOW

Hazard Mitigation: Use of the roll-up door is subject to the following guidelines: user must be present for the entire time during opening and closing, user must assure no people or equipment are in path of the door during opening and closing, and user must assure no people or equipment are leaning against the door or chain. Individuals should not stand under open doors. Roll-up doors should not be used for common entrance or exit to SM218.

Residual risk: MINIMAL

Hazard: A Lack of General Housekeeping

With the number of personnel in the MVD team and the wide variety of tasks occurring in parallel during the construction and assembly of the detector, it is important to maintain a high level of general housekeeping. Otherwise, minor injury is conceivable. Initial risk to personnel is LOW. Initial risk to equipment is LOW.

Hazard Mitigation: MVD personnel must make an effort to keep their workplace in order. Blades from sharp objects (razor blades, Exacto knives etc) should be disposed of in designated receptacles located throughout the MVD lab. Walkthroughs are periodically conducted P25 Safety Officer (Jim Amann) and Group Management to verify that the general housekeeping is adequate.

Residual risk: MINIMAL

Hazard: Theft

Over the years, several incidents of theft and wrongdoing have been reported in SM215, the most recent occurring in 1999. Initial risk to personnel is MINIMAL. Initial risk to equipment is LOW

Hazard Mitigation: The doors to SM218 must be kept locked at all times. Only individuals authorized by P25, P21 or the Building and Facility Manager have keys to the building. MVD personnel witnessing suspicious individuals in the laboratory space or missing equipment should notify the project leader.

Residual risk: MINIMAL