

ES&H DIVISION
RADIATION CONTROL DEPARTMENT

radiological safety analysis document

Hall D Spring 2024 Test Run

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February 2024

RCD-RSAD-02.15.2024-HD

Priority review level	1
Document classification	4
Next review due	n/a

Submit for approval	☐	☒
	yes	no

Thomas
Jefferson
National
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Facility



Hall D Spring 2024 Test Run

RCD-RSAD-02.15.2024-HD

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This Radiological Safety Analysis Document (RSAD) identifies the general conditions and controls with regard to production, movement, or import of radioactive materials.

1 DESCRIPTION

To evaluate beam operations in Hall D after the long SAD, a test run will be conducted this spring from March 11th to 14th. The electron current in the Hall D tagger will be up to 200 nA on an aluminum radiator of 3.4E-4X₀. Hall D will have a nominal photon beam collimator of 5 mm. Additionally, the Pair Spectrometer magnet will be ON, the Hall D solenoid magnet OFF, and the Cryo target will be empty & in a WARM state.

2 SUMMARY and CONCLUSIONS

This test run is not expected to produce significant levels of radiation at the site boundary that will exceed the integrated maximum boundary dose limit of 10 mrem. However, it will be continuously monitored by the Radiation Control Department (RCD or RadCon) to ensure that the site boundary goal is not exceeded. Activation of target cells, collimators, and beam line hardware must also be considered. As specified in Sections 4 and 7, the manipulation and/or handling of target cells and beam line hardware (potentially radioactive material), the transfer of radioactive material, or modifications to the beam line after the target assembly, must be reviewed and approved by the RCD.

Adherence to this RSAD is vital.

3 CALCULATIONS of RADIATION DEPOSITED in the EXPERIMENTAL HALL and at the BOUNDARY

The radiation budget is the amount of radiation that is expected at the site boundary as a result of a given set of experiments. This budget may be specified in terms of mrem at the site boundary or as a percentage of the Jefferson Lab design goal (10 mrem per year) for dose to the public. The design goal is 10% of the DOE annual dose limit to the public and cannot be exceeded without prior written consent from the RCD Manager (RCM) and the TJNAF Director.

Dedicated calculations for the dose rate at the site boundary for this test was not carried out; however, expected conditions were compared against previous experiments. The expectation of the small contribution of Hall D to the boundary dose accumulation will be verified during the run using the active monitors at the site boundary. If it appears that the radiation budget will be exceeded, the RCD will require a meeting with the experimenters and Head of the Physics Division to determine if the run conditions are accurate, and to assess what actions may reduce the dose rates at the site boundary. If the dose approaches or exceeds 10 mrem during any calendar year, the run program will stop until a resolution can be reached.

4 RADIATION HAZARDS

The following controls shall be used to prevent the unnecessary exposure of personnel and to comply with federal, state, and local regulations, as well as with TJNAFs and the experimenter's home institution policies.

4.1 Beam in the Hall

When the Hall status is Beam Permit, there are potentially lethal conditions present. As such, prior to going to Beam Permit, several actions will occur. Announcements will be made over the intercom system notifying personnel of a change in status from Restricted Access (free access to the Hall is allowed with appropriate dosimetry and training) to Sweep Mode. *All* magnetic locks on the exit doors will be activated. Persons trained to sweep the area will enter by Controlled Access (keyed access) and search in all areas of the Hall to check for personnel.

After the sweep, another announcement will be made indicating a change to Power Permit, followed by Beam Permit. The Run-Safe boxes will indicate OPERATIONAL and UNSAFE.

IF YOU ARE IN THE HALL AT ANY TIME THAT THE RUN-SAFE BOXES INDICATE **UNSAFE**,
IMMEDIATELY PRESS THE **PUSH TO SAFE** BUTTON ON THE BOX.

Controlled area radiation monitors (CARMs) are located in strategic areas around the Hall and the Counting House to ensure that unsafe conditions do not occur in occupiable areas. The Radiation Control Department will monitor the CARMs and prepare surveys, as necessary, to assess the impact of the experiment on radiation levels around the Hall.

4.2 Activation of Target and Beamline Components

All radioactive materials brought to Jefferson Lab shall be identified and reported to the RCD. These materials include, but are not limited to, radioactive check sources (of any activity, exempt or non-exempt); previously used targets or radioactive beam line components; or, previously used shielding or collimators. RadCon inventories and tracks *all* radioactive materials onsite.

RadCon staff will coordinate all movement of used targets, collimators, and shields; and, will further assess the radiation exposure conditions and implement controls, as necessary, based on radiological hazards.

There shall be no local movement of activated target configurations without direct supervision by the Radiation Control Department.

No work is to be performed on beam line components which could result in dispersal of radioactive material (e.g., drilling, cutting, welding). Such activities *must* be conducted only with specific permission and control by the Radiation Control Department.

5 INCREMENTAL SHIELDING or OTHER RADIATION-REDUCTION MEASURES

none

6 OPERATIONS PROCEDURES

- All experimenters must comply with experiment-specific administrative controls. These controls begin with the measures outlined in the experiment's Conduct of Operations document. This further includes, but not limited to, radiological work permits (RWPs), temporary operational safety procedures (TOSPs) and operational safety procedures (OSPs), or any verbal instructions from the Radiation Control Department. The General Access RWP governing access to the experimental halls and the accelerator enclosure must be read and signed (signifying understanding of its contents). All participants involved in the experiment must abide by the contents of the GARWP. This RWP can be read and electronically signed online via this website: <https://www.jlab.org/esh/radcon/operations/RWPs>
- Any individual with a need to handle radioactive material shall first successfully complete Radiation Worker Level 1 (RW-1) training.
- There shall be adequate communication between the experimenter(s) and the Accelerator Crew Chief and/or Program Deputy to ensure that all power restrictions on the radiator and the target are well known. Exceeding these power restrictions may lead to excessive and unnecessary contamination, activation, and personnel exposure.
- The radiator assembly and the downstream beam line components may not be altered outside the scope of this RSAD without formal RCD review. Alteration of these components may increase radiation production in the Hall and subsequently increase dose at the site boundary.

- Radiological work permits are the standard work authorization documents used to control radiological work. RadCon will require RWPs based on established trigger levels.
- Standard RSAD controls apply; the RCD shall be contacted for any of the following activities.
 - entry to radiation areas or high radiation areas
 - movement of shielding or collimators
 - breaching the target chamber physical envelope
 - any work on beamline components downstream of, or in proximity to, the target
 - maintenance of known or potentially contaminated systems
 - any destructive modifications to activated components (drilling, cutting, welding, etc.)

All posted guidance and instructions for contamination controls, shielding configuration, and access to radiological areas must be adhered to!

Note: Work planning for all radiological work shall be coordinated through the Hall Work Coordinator using the ATLis work planning tool.

7 DECOMMISSIONING and DECONTAMINATION of RADIOACTIVE COMPONENTS

Experimenters shall retain all targets and experimental equipment brought to Jefferson Lab for temporary use during the experiment.

After sufficient decay of the radioactive target configurations, they shall be returned to the experimenter's home institution for final disposition.

All transportation shall be conducted in accordance with United States Department of Transportation Regulations (Title 49, Code of Federal Regulations). In the event that the experimenter's home institution cannot accept the radioactive material due to licensing requirements, the experimenter shall arrange for appropriate transfer of funds for disposal of the material.

TJNAF cannot indefinitely store radioactive targets and experimental equipment.

8 RADIATION DAMAGE to HALL D ELECTRONICS

It is expected that contribution of this test run to radiation damage to Hall-D electronics will be negligible.

The Radiation Control Department may be reached at any time through the Accelerator Crew Chief (757-269-7045) or directly by calling the RadCon cell phone (757-876-1743). On weekends, swing, and owl shifts, requests for RadCon support should be made through the Crew Chief, ensuring prompt response with no duplication of effort.