

SCHOOL OF MATH AND SCIENCE STANDARD OPERATING PROCEDURE 5104.4D

From: Dean, School of Mathematics and Science

Subj: OPERATION AND SAFETY PROCEDURES FOR THE RIGAKU XTALAB SYNERGY-I X-RAY DIFFRACTOMETER (SERIAL NUMBER PL24120034)

Ref: (a) Rigaku XtaLAB "Synergy-i User Manual, Release 2024"
(b) NAVMED P-5055 "Radiation Health Protection Manual"
(c) NAVSEA S0420-AA-RAD-010 REVISION 2A (RAD-010) "Radiological Affairs Support Program Manual"
(d) USNAINST 5104.2B Radiological Safety Program

Encl: (1) Facility Description
(2) Facility Radiation Safety Evaluation
(3) General Controls and Practices
(4) General Operating Procedures
(5) Emergency Procedures
(6) Radiation Monitoring
(7) Authorized User Qualification Requirements
(8) Example Records - Sheets and Logs

1. Purpose. This Standard Operating Procedure (SOP) outlines the procedures for safe operation of the Rigaku XtaLAB Synergy-i X-ray diffractometer.

2. Cancellation. MATHSCIDIVSOP 5104.4C.

3. Applicability. This SOP shall be used to govern operation of the X-ray diffractometer located in Michelson 131 (MI-131).

4. Discussion. The Rigaku XtaLAB Synergy-i is a single crystal X-ray diffractometer (XRD). The instrument uses a monochromatic copper X-ray source to determine crystal structures of both small molecules and macromolecules. The purpose of the X-ray laboratory is to support Chemistry laboratory courses as well as midshipman and faculty research. This SOP establishes the responsibilities of individuals involved with the safe operation and maintenance of the X-ray diffractometer.

5. Responsibilities

a. Laboratory Manager. The Laboratory Manager shall:

- (1) Ensure that the Rigaku XtaLAB Synergy-i is operated only in accordance with this SOP.
- (2) Ensure and certify that operators are familiar with this SOP and with references (a) through (d) and are able to operate the X-ray diffractometer safely.
- (3) Conduct periodic surveillance checks of the facility to ensure that hazard areas are posted.
- (4) Complete a quarterly Audit of the facility, records, and postings,
- (5) Complete a quarterly Surveillance of an operator.

(6) Ensure that required Usage Log and Radiation Survey Logs are properly maintained.

(7) Investigate and report alleged or suspected incidents of overexposure to the Radiation Safety Officer and the Radiation Safety Committee.

(8) Keep RSO informed of any issues related to management of the Rigaku XtaLAB Synergy-i XRD laboratory, to include recommending (to the RSO and RSC) the removal of Authorized User qualification as needed.

(9) Endorse qualified users to the RSC to become approved Authorized Users.

(10) Ensure required full power surveys are completed.

b. Authorized Users. Machine sources at USNA are only to be operated by Authorized Users, or by qualified operators under the direct supervision of an Authorized User.

(1) In order to qualify as an Authorized User, the individual must meet the following conditions:

(a) Individual shall be a DoD employee or shall have an official appointment to the USNA faculty/staff.

(b) Individual shall have been designated as an Authorized User by the Radiation Safety Officer.

(c) Individual shall have completed the training program provided by the Radiation Safety Office. The training will be commensurate to the type of risk they are exposed at the workplace.

(d) Individual shall have received on job training from the Laboratory Manager covering the specific procedures and attendant hazards associated with the work to be performed in accordance with this SOP.

(e) Students taking the SC351 course and SC495/SC496 research courses will not be classified as Authorized Users.

(2) Authorized Users are not required to be classified as Radiation Workers due to the low radiological risk associated with the instrument. All personnel shall strive to control their radiation exposure in accordance with the ALARA principle - As Low As Reasonably Achievable.

(3) The Authorized User shall:

(a) Be responsible for all aspects of X-ray diffractometer operation, including the radiation safety of everyone in and around the X-ray diffractometer room.

(b) Ensure that they are a qualified Authorized User, as defined in enclosure (7) of this SOP, before operating the X-ray diffractometer.

(c) Ensure that they are familiar with the contents of this SOP, its enclosures and the relevant parts of the references.

(d) Operate the X-ray diffractometer only in strict accordance with this SOP.

(e) Complete and record all checks required on the Usage Log sheet before starting the X-ray diffractometer.

(f) In the event of an abnormal shutdown or equipment malfunction, stop all operations, make a note on the Usage Log and contact the Lab Manager.

(g) Ensure that the X-ray diffractometer lab facility is securely locked when an Authorized User is not present.

(h) Ensure that the computer workstation screen is password-locked prior to leaving the lab facility.

(i) Ensure that radiation surveys are current prior to commencing routine operations.

c. **Qualified Operator.** A Qualified Operator may operate the instrument in the presence of an Authorized User. A qualified operator shall not independently operate the instrument. Only under the circumstance in which a midshipman requires use of the instrument on a continuous and recurring basis shall he or she be certified as a qualified operator.

A qualified operator shall:

(1) Control their radiation exposure in accordance with the ALARA principle – As Low As Reasonably Achievable.

(2) Follow all directions of the Authorized User.

(3) Follow all provisions of this SOP.

(4) Maintain their listing as a qualified operator in Enclosure (8).

d. **Other Personnel.** Other personnel, midshipmen and guests, are allowed access to the Diffraction Lab Facility accompanied by an Authorized User.

Other personnel entering the X-ray diffractometer laboratory shall:

(1) Control their radiation exposure in accordance with the ALARA principle – As Low As Reasonably Achievable.

(2) Follow all directions of the Authorized User.

(3) Follow all provisions of this SOP.

d. **The Radiation Safety Officer (RSO) shall:**

(1) Have authority to terminate immediately any operation that they find to be unsafe or not in accordance with this or other applicable documents.

(2) Ensure that area monitoring surveys are conducted and recorded every 6 months and prior to commencing routine operations after equipment maintenance or modification.

(3) Conduct initial radiation safety training of operators as required by reference (d), provide appropriate annual refresher training, and certify the satisfactory completion of such training.

(4) Provide support as necessary to ensure compliance with higher authorities.

(5) Provide immediate assistance should any radiological safety incident occur.

e. The RSC shall qualify users submitted by the lab manager as Authorized Users. This may be performed during quarterly meetings or on an ad hoc basis.

6. Review. This SOP will be in effect for the entire time that the Rigaku XtaLAB Synergy-i X-ray diffractometer is installed at the U.S. Naval Academy. The SOP will be reviewed on an annual basis by the Laboratory Manager and the RSO to ensure that the procedures are current and in full compliance with reference (c). Operators must review this SOP on an annual basis. This SOP must undergo complete review every five years by the USNA Radiation Safety Committee.

7. Approvals. This SOP and all references contained therein have been reviewed and approved by the USNA Radiation Safety Committee. Operation or maintenance of the X-ray diffractometer in any manner or in reference to any procedure not described herein must first be approved by the RSC. Approval of such requested operation, procedure, or both will be temporary and will not constitute general approval by the RSC and RSO of the requested operation or procedure.

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Distribution:
MATHSCI
Chemistry Department
Radiation Safety Officer
Radiation Health Officer

FACILITY DESCRIPTION

The Rigaku XtaLAB Synergy-i is a single crystal X-ray diffractometer. The instrument uses a monochromatic copper X-ray source to determine crystal structures of both small molecules and macromolecules. The primary purpose of the X-ray laboratory is to give midshipmen practical experience using diffractometer methods in determining the structures of chemical compounds. The laboratory is also used to support midshipman and faculty research.

The X-ray diffractometer (Serial Number (S/N) PL24120034), its operating controls, experimental areas and data acquisition/analysis computer are located in Michelson 131 (MI-131) (see Figure 1). This room is surrounded by one exterior wall on the north side, a research lab on the east side, and a hallway and lobby area on the other two sides. The lab sits over top of the Instruments Lab on the zeroth deck. The interior walls are made of standard “2x4” gypsum construction.

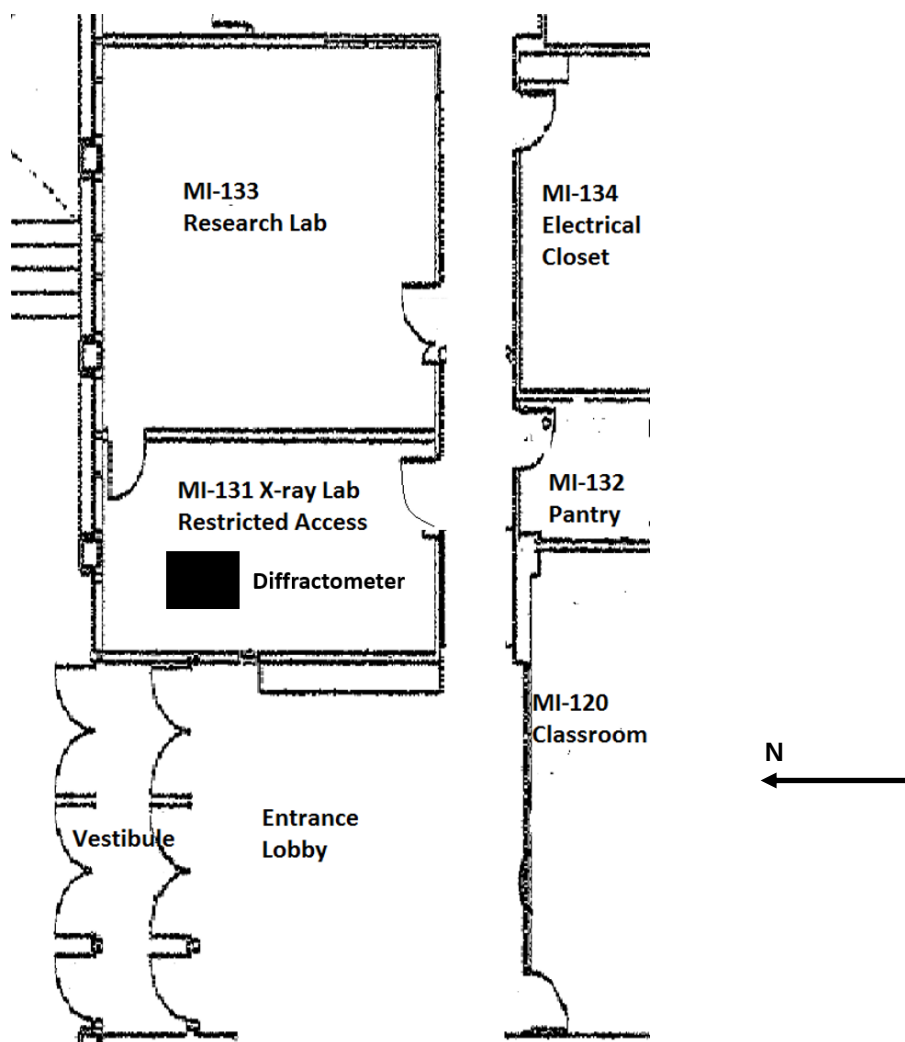


Figure 1. The Rigaku XtaLAB Synergy-i X-ray diffractometer (S/N PL24120034) is located in Michelson 131, a 10 ft x 27 ft room on the northern wall of the Michelson Hall first deck. The relative orientation of the diagram is specified.

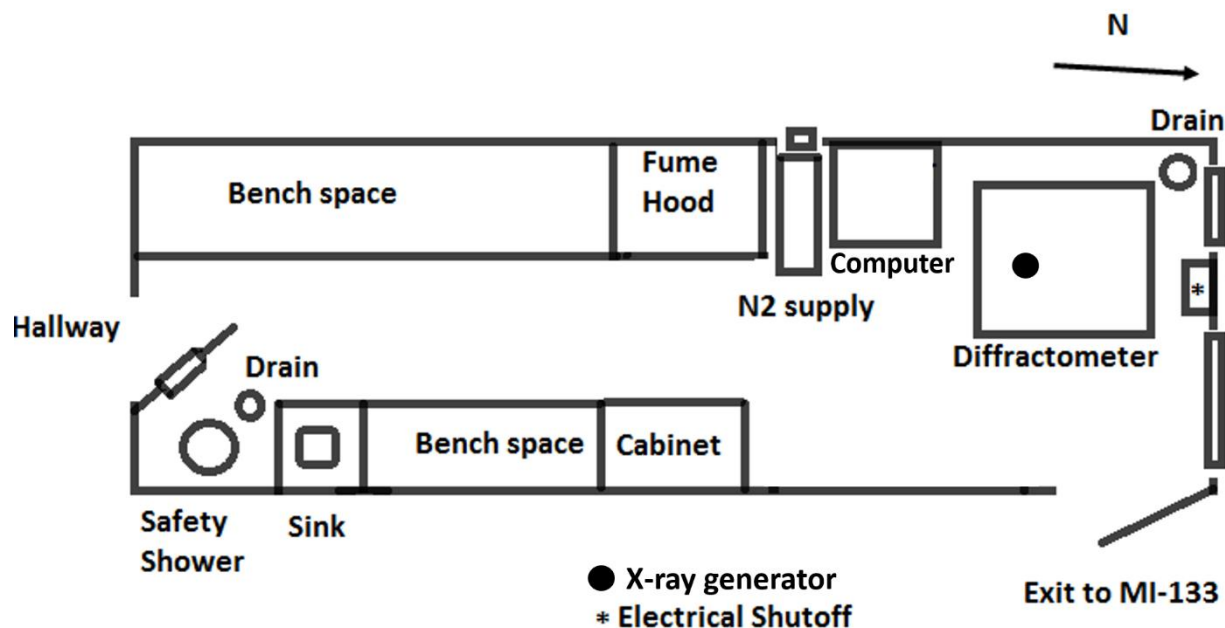


Figure 2. Location of X-ray diffractometer equipment in Michelson 131. The relative orientation of the diagram is specified.

Entrance to the X-ray diffractometer room Michelson 131 is available through the hallway door or the shared door with room Michelson 133 (see Figure 2). Hallway doors for both Michelson 131 and Michelson 133 are kept locked when the room is unattended by an Authorized User. The rear shared door is required for compliance to the USNA Chemical Hygiene Plan as required by OSHA regulations: All Chemistry laboratories shall have two exits to ensure safe exit in the event of an emergency that blocks the primary door. Each laboratory has its own cipher lock code.

The room has two standard floor drains into the sanitary sewer system. The drain closest to the Michelson 131 door is for the laboratory safety shower. Neither drain is required for the X-ray diffractometer.

There are four windows in the room, two along the north wall, one in the west wall and one in the hallway door.

The room has two standard building HVAC vents overhead, rated at 425 cubic feet per minute per vent. Volatile radioactive materials are not used in Michelson 131. The X-ray diffractometer does not generate any radioactive material.

Doors are posted with emergency contact information. There is no radiological hazard when the X-ray diffractometer is off. Status lights on the X-ray diffractometer, showing operational status, can be seen from the window in the hallway door.

Rigaku XtaLAB Synergy-i X-ray Diffractometer (S/N PL24120034)

The Rigaku XtaLAB Synergy-i X-ray diffractometer, serial number PL24120034, is a copper radiation source X-ray diffractometer designed for the collection of single crystal X-ray diffraction data that are used in the determination of inorganic, organic, and biochemical crystal structures.



Figure 3. View of the X-ray diffractometer hutch.

Experimental Area

The X-ray diffractometer is equipped with one high-intensity, low power, air-cooled X-ray source, using copper, Cu, radiation. Operating parameters for the Cu tube is 50 kV, 1.0 mA. The beam is tightly collimated with full width at half maximum (FWHM) in the widest direction of 120 microns for Cu. The beamline is contained within the instrument hutch (see Figures 3 and 4). To prevent exposure of personnel to the particle beam, interlocks prevent the beam from entering the scattering chamber unless the enclosure is secure. The X-ray diffractometer is controlled using the computer (see Figure 5).



Figure 4. Inside the X-ray diffractometer hutch showing the X-ray source on the left, the crystal mounting position in the middle and the detector on the right.



Figure 5. Computer console showing the server computer to the left of the instrument that directly controls the X-ray diffractometer.

FACILITY RADIATION SAFETY EVALUATION

Hazard Discussion

The Rigaku XtaLAB Synergy-i is classified as an enclosed beam X-ray diffractometer. Safety requirements for closed-beam, stationary X-ray equipment are listed in Section 13 of reference (c). Issues concerning radiation safety that pertain to the X-ray diffractometer are:

a. **Radiation levels outside the hutch.** No measurement higher than 0.10 mrem/hr has ever been recorded in Michelson 131 outside the hutch using Navy RADIAC radiation detectors. As a result, the following requirements have been met:

- (1) the dose rate from high voltage rectifiers shall not exceed 2 mrem/hr.
- (2) under normal operation, an operator would not be able to experience a dose of 0.25 mrem/hr.
- (3) the beam stop assembly prevents readings greater than 0.25 mrem/hr outside of the hutch.

b. The X-ray diffractometer complies with all of the requirements of **a closed beam system**.

- (1) The radiation source, sample and detector are enclosed in a chamber (the hutch).
- (2) The hutch is protected by a fail-safe interlock system.
- (3) Operators are prohibited by the fail-safe interlock system from entering the hutch while the system is producing X-rays. The hutch is locked during operation. If the door is opened, the X-rays instantly shut off and the shutter cannot open.

- (4) The beam cannot operate when the hutch is open while the interlock system is in place.
- (5) Operators are considered to be non-radiation workers and are not required to wear dosimetry.

c. The X-ray diffractometer is to be **serviced only by personnel who have been trained by Rigaku**. A Radiation Survey must be performed after any alignment procedure has been performed. No accessory shall be aligned or operated until procedures have been reviewed and a radiation survey conducted by the RSO" (Section 13.2.4.7).

d. The X-ray diffractometer does not activate material and, as a result, does not produce any airborne radioactivity.

GENERAL CONTROLS AND PRACTICES

Physical Controls for Michelson 131

Security.

a. Access to MI-131 is controlled by the Rigaku XRD Laboratory Manager. Access to MI-131 (code to cipher lock) may be granted to approved personnel. All Authorized Users of the Rigaku XRD will have access to MI-131. In order to control the radiological aspects of the XRD, one of three conditions must always exist in MI-131:

- (1) MI-131 is occupied by an Authorized User of the Rigaku XRD;
- (2) The Rigaku XRD software is not running (no user logged in);
- (3) The Rigaku XRD software is running, but the computer screen is locked to prevent any modification to current XRD conditions.

Any one of these conditions meets required radiological safety requirements. In general, the door to MI-131 shall remain shut and locked when the room is not occupied. This will minimize the unnecessary access to the space, but does not guarantee that no unauthorized users will have access to the XRD. Students and visitors may use the XRD or observe XRD operations, but only under the direct supervision of a Authorized User. Students and visitors are provided a general public brief to understand the hazards of entering a radiological space, the general rules of the laboratory (no food or drink), and that their potential exposure will fall below 100 mrem in a given year.

- b. The X-ray diffractometer hutch is powered on by a keyed switch.
- c. The key shall be removed from the switch and secured when the X-ray diffractometer has been powered down. This key shall be housed in a combination Master Lock key box.
- d. The computers that control the X-ray diffractometer are password protected to prevent use by unauthorized users.
- e. The shared door between Michelson 131 and Michelson 133 is required for compliance with the USNA Chemical Hygiene Plan as required by OSHA regulations: All Chemistry laboratories shall have two exits to ensure safe exit in the event of an emergency that blocks the primary door. Each laboratory has its own cipher lock code but the shared door cannot be locked.

Warning Devices.

- a. Lighted warning signs.
 - (1) The X-ray diffractometer hutch is equipped with lighted warning signs that operate automatically when the X-ray diffractometer controls are set to produce radiation.
 - (2) One column of lights is located on the left wall of the hutch. The "Orange" caution lights on the top indicate that one of the X-ray tubes is energized and capable of producing X-rays. The "Red" lights in the middle indicate that the shutter is open and X-rays are being produced (see Figure 6).



Figure 6. Warning lights within the hutch that indicate the status of the X-ray source.

- (3) The warning lights are of a redundant design, with four lamps of each color in each row.
- (4) The warning signs at the top of the hutch shall be part of a warning and interlock system that are required to be operational in order to produce X-rays (see Figure 7).



Figure 7. Warning lights on top of the hutch. Left image: Illuminated “X-rays on” warning light. Right image: Illuminated “Shutter Open” and “X-rays on” warning lights.

b. Other signs and barriers.

(1) A sign is posted on the X-ray diffractometer hutch bearing the conventional yellow and magenta radiation symbol and the words: "**CAUTION: RADIATION. THIS EQUIPMENT PRODUCES RADIATION WHEN ENERGIZED. TO BE OPERATED ONLY BY QUALIFIED PERSONNEL**".

(2) Entrances to Michelson 131 are posted with yellow and magenta signs bearing the words: "**CAUTION: RADIATION. THIS EQUIPMENT PRODUCES RADIATION WHEN ENERGIZED**".

GENERAL OPERATING PROCEDURES

These procedures represent a basic outline for safely operating the X-ray diffractometer. More detailed data collection procedures can be found in reference (a). These procedures are only a guide and are not a substitute for understanding the function and operation of the X-ray diffractometer. Only qualified operators are allowed to operate the X-ray diffractometer. Only qualified Authorized Users are allowed to independently operate the X-ray diffractometer.

1. Record the starting time and date on the sheet in the Usage Log. Enclosure (8) contains a copy of the usage log sheet.
2. Obtain permission to operate the X-ray diffractometer from the X-ray Diffraction Laboratory Facility Manager.
3. If the X-ray diffractometer is not powered up, proceed with step 4. If the X-ray diffractometer is powered up, proceed with step 14.
4. Obtain the key to the X-ray diffractometer from the X-ray Diffraction Laboratory Facility Manager. The key is stored in a locked box.
5. Check that the electricity is turned on at the back of the hutch (see Figure 8).

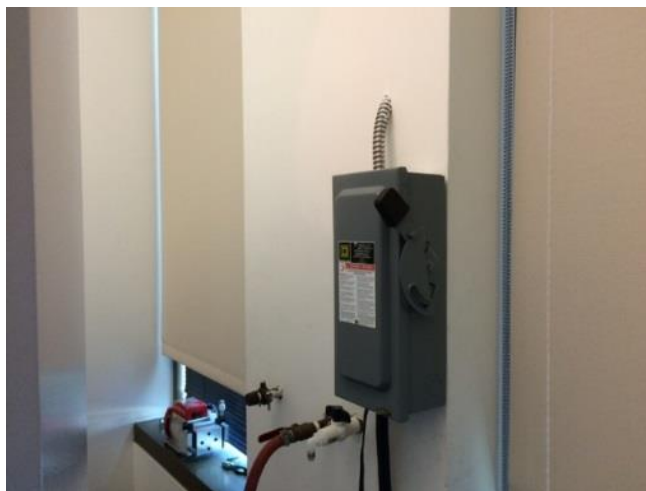


Figure 8. Main electrical supply to the X-ray diffractometer.

6. Turn on the main breaker on the back of the instrument (see Figure 9).
7. Turn the key switch on the back of the instrument to the “On” position (see Figure 9).

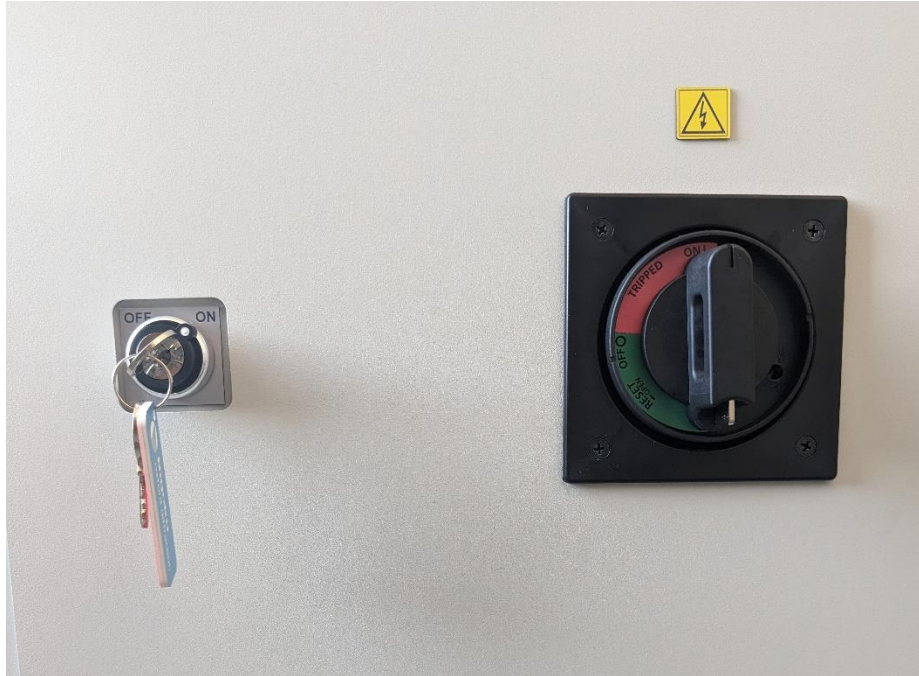


Figure 9. Back panel of the instrument showing main breaker and instrument key in the “On” position.

8. Ensure that the hv key switch at the front right panel is switched to “Enabled”. See Figure 10.
9. Press the “hv on/start” button on the front right panel. The button should illuminate with a green light. See Figure 10.



Figure 10. Front right panel of the instrument, showing hv key switch in the “Enabled” position, “hv on” button illuminated green, and “Doors ok” button illuminated red.

10. Press the “Doors ok” button on the front right panel. The illumination should change from a red ring to no illumination.
11. Turn on the computer, shown in Figure 5, and initiate the system software (refer to Sections 6.4 and 6.5 of reference (a)).
12. Open the doors of the hutch, mount the crystal, and optically center the crystal using the video camera (refer to Chapter 6.4.2 of reference (a)).
13. Close the hutch doors, press the “Doors ok” button to secure the hutch door, and begin recording measurements using the CrysAlis Pro software interface on the client computer.
14. When the experiment is complete, record the ending time and date of the experiment in the Usage Log.

16. Upon leaving the lab, ensure that the lab doors are securely locked. Report the completion of the experiment to the Lab Manager. To avoid equipment, damage due to power supply cycling, the X-ray diffractometer may remain energized provided that unauthorized equipment use is prevented by both (1) password protection on the computer control system and (2) locking the doors to the lab.

17. The instrument should only be shut down by the Lab Manager using the procedures that are found in Section 6.5 of reference (a) and summarized as follows:

a. Ramp the generator down by clicking the “X-ray” button at the top right of the CrysAlis GUI, then selecting “Set kV, mA, X-ray” button in the pop-up window, and selecting the “Off” option. Select “OK” to assign the off mode.

b. Turn off the cryosystem by selecting the cryo window in the GUI, then set the temperature to 300 K. Allow the cryosystem to reach room temperature, then flip the power switch on the back of the cryosystem, underneath the power cord.

c. Turn the key switch in the back of the X-ray instrument to the “off” position (Figure 9) and lock the computer.

Maintenance Procedures

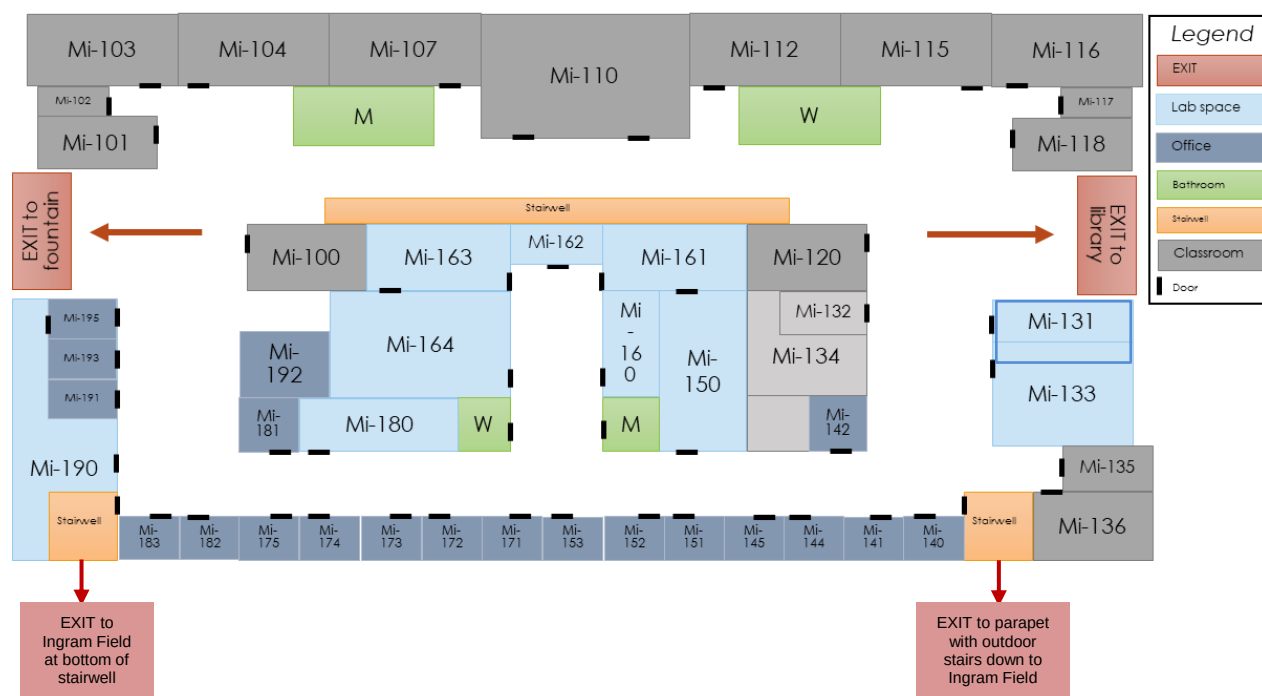
All hardware maintenance and alignment procedures will be performed by authorized Rigaku personnel. Surveys shall be performed after all maintenance.

EMERGENCY PROCEDURES

In the event of an emergency requiring a quick shutdown to minimize risk of human injury, the following procedures shall be followed.

1. Shut down the instrument by turning off the power by pressing the Red OFF button or the Emergency Stop button, as shown in Figure 10. Shut down the main power box shown in Figure 8.
2. Lockdown the facility by closing and locking all means of access. For MI-131, this requires evacuating rooms Mi-131 and Mi-133. Doors lock automatically upon closing.
3. Notify the XRD Laboratory Manager, the Radiation Safety Officer to ensure the space remains secured.
4. Notify other emergency contacts, such as fire, or police departments, if appropriate (ext. 3-3333).

Evacuation Route 1-deck



RADIATION MONITORING

Personnel Radiation Monitoring Equipment.

Operators of the Rigaku XtaLAB Synergy-i are Non-Radiation Workers and do not require personnel dosimetry.

Equipment Radiation Monitoring Equipment.

a. Reference (c) and (d) specifies when a Radiation Survey is required. The local USNA RSO and RSC policy is semi-annually, which is more frequent than required by reference (c). In addition, a survey is required after service, any abnormal condition and whenever an issue with beam alignment is suspected or possible. (Semi-annual means to perform once in the first 6 months of the calendar year and once in the second 6 months of the calendar year.)

b. Surveys will be performed with an Ion Chamber Survey Meter (RADIAC), suitable for X-ray radiation. Because the machine is operated at <40 keV, the sliding window protector must be open on the IM-231D/PD ion chamber. Only RASO approved meters shall be used to measure radiation levels needed to satisfy legal and health related documentation requirements.

c. RADIACs must be in calibration and source-checked prior to use.

d. The survey will be performed and documented by an Authorized User, and reviewed by the RSO or ARSO.

e. Full requirements and the sheet used for surveys is found in Enclosure (8).

Permanent Area Radiation Monitors:

A TLD may be placed close to the radiation hutch to serve as an area monitor. There is no requirement for having area radiation monitors under the NRMP Broad Scope License. Having a thermoluminescent dosimeter placed close to the radiation hutch provides long term documentation useful for evaluating annual exposure rates.

AUTHORIZED USER QUALIFICATION REQUIREMENTS

A qualification program shall include, at a minimum:

- a. Radiation health requirements in accordance with Reference (c).
- b. Radiation safety requirements in accordance with References (a), (b) and (c).
- c. Knowledge of operating procedures in accordance with Reference (a).

d. A full understanding of this SOP, with the SOP reviewed annually and documented on the Machine Log sheet.

A qualified operator shall be recommended as an authorized user by the X-ray diffraction Laboratory Manager and reviewed by the RSO. A qualified operator must be approved by the RSC to become an Authorized User. Only an Authorized User may operate the instrument unattended. A qualified operator may operate the instrument only in the presence of an Authorized User. The list of qualified operators and Authorized Users shall be maintained by the X-ray diffraction Laboratory Manager using the sheet in this SOP. Any qualified operator or Authorized User who does not operate the instrument within the span of one year must be requalified. Midshipmen shall not routinely be qualified as operators. Only under the circumstance in which a midshipman requires use of the instrument on a continuous and recurring basis shall he or she be certified as a qualified operator. Qualification sheets are found in Enclosure (8).

RECORDS – SHEETS and LOGS

Usage Log.

a. Each use of the X-ray diffractometer shall be documented by the Operator in the Usage Log maintained for that purpose at the X-ray diffractometer control console. Data recorded shall include the following items:

- (1) The instrument name and location of the lab.
- (2) Laboratory Manager's name and office phone.
- (3) User name and signature.
- (4) Date/time on and Date/time off.
- (5) Estimate of Exposure time.
- (6) Machine settings (operating parameters: kV and mA).
- (7) Experiment name or sample type under Remarks.
- (8) Verification that the interlock check is current (list, date, and initial).
- (9) Verification that radiation surveys are current (list, date, and initial).

b. Verification of operator annual review of SOP. An example of the Usage Log sheet is shown on page 3 of Enclosure (8).

Radiation Survey Log.

a. A complete radiation survey for each source, with the X-ray diffractometer running under typical conditions, shall be conducted every six months or after maintenance has been performed which might result in an increase in radiation levels. Data recorded shall include the following:

- (1) Date and time of the survey
- (2) Name of the surveyor
- (3) Date of last survey and interlock check
- (4) Verification of the interlock check
- (5) Survey meter used including Model #, Serial #, Calibration and Due date
- (6) System parameters including: Anode, kV and mA
- (7) Diagram showing survey points
- (8) Readings (mr/hr) at the survey points

(9) RSO or ARSO signature

b. This radiation survey satisfies the USNA requirement for semi-annual radiation protection surveys and interlock checks. (Semi-annual means to perform once in the first 6 months of the calendar year and once in the second 6 months of the calendar year.)

c. The sheet for the radiation survey is shown on page 3 of Enclosure (8).

Qualified Operator/Authorized User Authorization Sheet.

An example of this sheet is found on page 4 of Enclosure (8).

Lists of Qualified Operators.

An example of this sheet is found on page 5 of Enclosure (8).

EXAMPLE

MATHSCISOP 5104.4D

22 AUGUST 2024

RIGAKU XTALAB SYNERGY-i X-RAY DIFFRACTOMETER (S/N PL24120034), Michelson 131

Machine Usage Log

Laboratory Manager / Office Phone: _____ Laboratory: ____Michelson-131____

Authorized User Name	Authorized User Signature	Date/Time on	Date/Time off	Estimated Exposure Time	Anode: Cu	Experiment- Target Type	Verified 6-month interlock check within periodicity	Verified 6-month radiation survey within periodicity	Verified Users are current in training and reviewing SOP

*Cu parameters: 50 kV, 1.0 mA

EXAMPLE

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22 AUGUST 2024

RADIATION SURVEY RIGAKU XTALAB SYNERGY-I X-RAY DIFFRACTOMETER (S/N PL24120034, Michelson Hall 131)

Date _____ Time _____ Performed by _____

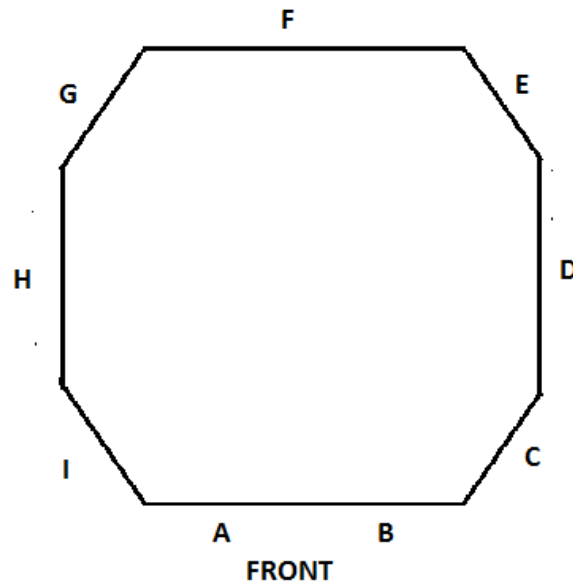
Date of last: Facility Survey & SOP Update (5 yrs) _____
General Radiation Survey (semiannual) _____
Interlock check (semiannual) _____

Interlock verified -- shutters do not open when enclosure doors are open (initials) _____

Survey Meter	System Parameters
Model # _____	Anode _____
Serial # _____	Cu (50 kV, 1.0 mA)
Calibration Date _____	
Due Date _____	

Survey points are 5 cm from the enclosure. Readings (mrem/hr)

A _____ B _____ C _____ D _____ E _____ F _____ G _____ H _____ I _____



Radiation Field at Control Console _____

RSO review: _____

EXAMPLE

MATHSCISOP 5104.4D

22 AUGUST 2024

AUTHORIZED USER QUALIFICATION REQUIREMENTS RIGAKU XTALAB SYNERGY-I (S/N PL24120034, Michelson 131)

Name: _____

#	Description	LM Initial and Date
1	Familiar with radiation health requirements of NAVMED P-5055 and RAD-010 and requirement for annual Non-Radiation Worker training.	
2	Has demonstrated understanding of operating procedures, and fully able to safely operate the Rigaku XtaLAB Synergy-I X-ray Diffractometer as described in the section "General Operating Procedures". This includes demonstrating the ability to:	
	Perform user logbook tasks.	
	Identify major components of the X-ray diffractometer both externally and internally.	
	Safely load and unload samples from the X-ray diffractometer, maintaining cleanliness.	
	Turn the beam on and off and make measurements using software control.	
	Return the X-ray diffractometer to STANDBY condition.	
3	Authorize User has read and understands the XRD SOP (annual requirement). Signed _____	
4	Understands radiation safety hazards, warning systems and safety precautions associated with the instrument.	

Annual SOP Review Date	Authorized User Signature

**AUTHORIZED USER QUALIFICATION REQUIREMENTS
RIGAKU XTALAB SYNERGY-I (S/N PL24120034)**

Name: _____

1. Completed all required training by Laboratory Manager.

Laboratory Manager/Date

2. Department Chair Authorization (Chemistry)

Department Chair/Date

3. School of Math & Science Dean Authorization

Dean Math & Sci/Date

4. RSO Review

RSO/Date

5. Designated Authorized User by RSC Majority Vote

RSC Chair/Date

EXAMPLE

MATHSCISOP 5104.4D
22 AUGUST 2024

OPERATORS QUALIFIED BY LAB MANAGER
RIGAKU XTALAB SYNERGY-I (S/N PL24120034)

Name	Date Qualified & SOP Review	Level Qualified (Authorized User or Qualified Operator)	Laboratory Manager Signature

RSO review: _____