AUBURN UNIVERSITY X-RAY SAFETY STANDARD OPERATING PROCEDURES

Date Completed: _____

X-Ray Permit Holder: _____ AU User ID: _____ Department: _____

X-Ray Supervisor: _____ AU User ID: _____ Department: _____

List x-ray users (AU ID / Department) below. For example: Kevin Ives (pki0002/Risk Management & Safety)

This Standard Operating Procedure (SOP) summarizes regulatory and Auburn University policy requirements to possess and operate analytical x-ray equipment. The analytical x-ray equipments discussed in this SOP include:

- X-ray diffractometers (XRD)
- X-ray fluorescent devices (XRF)
- Hand-held x-ray fluorescent devices
- Educational analytical x-ray equipments

Educational analytical x-ray equipment is a subset of "analytical x-ray equipment" that consists of low current XRF or XRD units used for educational purposes only.

X- RAY SPECIFICATIONS

Type: (diffraction/etc): _____

Manufacturer: _____

Manufacturer Information: _____

Manufacturer Date: _____

Status (Active or Inactive): _____

Location/Room Number: _____

AU Property # (if available): _____

Model: _____

Serial #: _____

Maximum Power: _____

SURVEY METER SPECIFICATIONS (IF AVAILABLE)

Manufacturer: _____

Model: _____

Serial #: _____

Calibration Date: _____

DOSIMETRY

☐ I understand that x-ray users shall wear the whole-body dosimetry or finger rings if assigned by the Radiation Safety Office.

☐ I understand that I must not remove badges from the lab or leave badges in a high exposure area.

GENERAL SAFETY REQUIREMENTS

Exposure Risk

Do not expose any part of the body to the primary radiation beam. The greatest potential for acute exposure occurs during the manipulation of the sample to be irradiated. Exposure rates of up to 10,000 R/sec can occur at the housing ports of certain x-ray units. Signs of exposure include erythema (reddening) of the skin in less than 0.3 seconds. Serious and permanent injury may occur if exposure lasts more than 0.1 seconds. In case of any suspected exposures to x-ray, immediately report to x-ray supervisor and Radiation Safety Officer at 334-703-0164 and go to the nearest hospital emergency room as soon as possible.

State Regulation

All analytical x-ray equipment must be registered with the Alabama Department of Public Health, Office of Radiological Safety within 30 days of receipt, change in location or disposal. Auburn University Radiation Safety Office maintains this registration. The PI must promptly notify the Radiation Safety Office of any such changes. Receipt of new equipment will require a commissioning inspection by the Radiation Safety Office.

ACCESS CONTROLS

Check what applies to your x-ray unit to describe access controls, including use of interlocks.
It is the responsibility of the user to maintain and enforce access control.

☐ **Access to x-ray lab via card/key entry system.**

☐ **Interlocks are depressed by x-ray housing.**
(Removing screws will defeat interlocks. Do not override interlocks)

☐ **Interlocks may be defeated for alignment purposes ONLY with RSO approval.**

WARNING SIGNS & LIGHTS

Check all that apply to your x-ray unit:

☐ **"CAUTION: X-RAY RADIATION. AUTHORIZED PERSONNEL ONLY"**
These signs are posted above the x-ray unit and on doors leading to any restricted area.

☐ **"CAUTION X-RAYS—THIS EQUIPMENT PRODUCES X-RAYS WHEN ENERGIZED"**
This signage is posted near any switch that energizes the x-ray tube.

☐ **"CAUTION: HIGH INTENSITY X-RAY BEAM"**
This signage is affixed to the x-ray source housing.

☐ **WARNING LIGHTS**
Each x-ray unit has a fail-safe warning light to indicate when the x-ray tube is energized.

Additional Signage (if needed):

- Caution Radioactive Materials (Must Be Printed on Yellow Paper)
- No Food or Drink
- Notice to Employees (ADPH Form X)
- Notice – Authorized Personnel Only
- Creating a Door Sign in BioRAFT
- Auburn University Emergency Contacts

TRAINING REQUIREMENTS:

Authorized x-ray users must complete the following training. Please check if completed.

☐ **X-Ray Safety Training in BioRAFT required by the Radiation Safety Office.**

☐ **Hands-on equipment specific training provided by PI or x-ray supervisor.**

This training must emphasize lab-specific protocols and safety, the security of radioactive materials, and lab-specific emergency procedures and documented by completing the Certificate of Training for each x-ray user.

☐ **X-Ray Safety Training in BioRAFT must be retaken as a refresher every other year.**

☐ **Additional vendor-provided equipment training required by the RSO**

X-ray users are responsible for reviewing and complying with all applicable rules, regulations and University procedures as explained in the Auburn University Radiation Safety Manual.

ALIGNMENT PROCEDURES:

X-ray beam alignment is only done by authorized, licensed, and certified personnel.

All x-ray users need to keep in mind that the majority of x-ray accidents occur while aligning the x-ray beam. All possible steps must be taken to prevent any such accidents. Alignment procedures are performed in accordance with the specific manufacturer's instructions.

- Notify supervisor prior to commencing with alignment procedures.
- Notify lab personnel of initiation of alignment procedure.
- Ensure that there are no unauthorized occupants in the area.
- Complete "Standard Operating Procedures."
- Operator must not leave the area until the x-ray housing is replaced and the interlocks are operational.

ACTIONS

Prior to operating the x-ray unit, verify that the following actions have been implemented.
Notify PI prior to operating the x-ray equipment if there are any "NO" responses.
If Not Applicable (N/A) then leave blank.

	YES	NO
Safety devices (interlocks, beam cut-offs, etc) are operating properly.	☐	☐
X-Ray On/Off Lights are functioning.	☐	☐
Unused ports on radiation source are closed.	☐	☐
Lab is secure.	☐	☐
All signs and labels are in place.	☐	☐
If required, survey meter is available.	☐	☐
Survey meter is calibrated.	☐	☐
Current written SOP are available.	☐	☐
Written Use Log is available.	☐	☐
Written Use Log is being used.	☐	☐
All necessary interlocks are operating properly.	☐	☐

PHOTOGRAPH OF X-RAY UNIT (CAN ATTACH AS SEPARATE IMAGE)

STANDARD X-RAY OPERATING PROCEDURES

Prior to operation of the x-ray system, each of the following standard operating steps shall be implemented. Post “Standard X-Ray Operating Procedures” in close proximity to the x-ray unit.

The following list of standard operating procedures shall be maintained in clear view of the operator.

Detail your instrument-specific sequences below:

POWER ON SEQUENCE

Record the DATE and START time on the x-ray use log.

POWER OFF SEQUENCE (NON-EMERGENCY)

POWER OFF SEQUENCE (EMERGENCY)

Describe how would you stop your x-ray unit in case of an emergency. Please provide details below:

BEAM CONFIGURATION

YES	NO	**Please Select YES or NO for the following statements. If Not Applicable (N/A) then leave blank.**
☐	☐	This device has a configuration such that any portion of a person's body can enter the primary x-ray path.
☐	☐	This device has a functioning safety device that will shut off the beam upon entry to the path.
☐	☐	This device does not have a functioning safety device similar to the one listed above. However, an exemption has been issued by the ADPH.
☐	☐	This device has a readily discernable indication of the x-ray "ON" or "OFF"
☐	☐	This device has ON/OFF indicator located near each port on the radiation source housing.
☐	☐	This device has a shutter "Open/Closed" status indicator located near each port on the radiation source housing.
☐	☐	This beam is an open beam device installed after February 1995 and each port has a shutter that CANNOT be opened unless a collimator or coupling has been connected to the port.

NON-BEAM HAZARDS (IF ANY)

List and describe and non-beam hazards and how they have been addressed (electrical, trip & fall, etc.)

Hazard _____

Response Action

_____

Hazard _____

Response Action

_____

Hazard _____

Response Action

_____

Hazard _____

Response Action

_____

HAZARDOUS MATERIAL HANDLING

List hazardous materials involved, such as chemical or biological.
Including the quantity, handling and labeling requirements.

Hazardous Material: _____

Quantity: _____

Handling and Labeling Requirements: _____

Hazardous Material: _____

Quantity: _____

Handling and Labeling Requirements: _____

Hazardous Material: _____

Quantity: _____

Handling and Labeling Requirements: _____

HAZARDOUS WASTE

Identify hazardous waste generated by the x-ray use (if any) and its disposal.

Waste Identification: _____

Disposal Requirements:

_____

Waste Identification: _____

Disposal Requirements:

_____

Waste Identification: _____

Disposal Requirements:

_____

EMERGENCY PROCEDURES

Authorized x-ray users will be familiar with the building's emergency evacuation plan, location of emergency equipment, and emergency procedures for fires or other emergencies. Note locations of main electrical shut off switches to the x-ray unit.

Power off x-ray via:

- ☐ On/Off switch on x-ray control panel
- ☐ Emergency power off (EPO) button on wall. Reference specific EPO that shuts down this equipment. Follow specific instructions for each piece of equipment.
- ☐ Circuit breaker box
- ☐ Follow AU Safety/Emergency Instructions if there is a need to contact Police, Fire or Ambulance Emergency Response personnel.

MAINTENANCE

Only AU authorized, licensed, and certified outside service personnel will maintain the equipment. A current copy of Auburn University registration information for all outside contractors must be on file at RMS prior to any service. All relief devices, safety interlocks, alarms and other hazard prevention devices will be maintained, calibrated, and tested for functionality on a regular basis in accordance with standard industrial practices and recommendations of the manufacturers.

Service Agreement with: _____

Date of last maintenance inspection: _____