

## Technical Guidance for Beam Alignments on Crystallography X-Ray Sets

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## 1. Introduction

Users conducting beam alignments on either 'closed' or 'open' beam crystallography sets must be aware of potential exposure hazards to their upper limbs, fingers, and hands. This document outlines the steps to follow and is provided in support of the X-Ray Generators Code of Practice.

## 2. Technical statement

A typical diffraction X-ray set operates at 50 kV and 40 mA, generating 'soft' X-rays at very high dose rates measured in mGy per minute. It may utilise a copper or molybdenum anode, producing  $\text{K}\alpha$  X-rays with effective energies of either 8 keV or 17.4 keV from a very narrow X-ray beam, which can be as small as  $200\text{ }\mu\text{m} \times 200\text{ }\mu\text{m}$ . This presents a real hazard, as high doses from direct exposure or leakage of these  $\text{K}\alpha$  X-rays can affect the skin of exposed hands and fingers.

Since leakage from crystallography X-ray equipment is primarily dominated by  $\text{K}\alpha$  X-rays from the target and is less influenced by tube potential compared to other X-ray techniques, it is crucial to use an appropriate radiation monitor that responds well to these  $\text{K}\alpha$  X-ray energies.

If users need to perform beam alignments, the following steps must be followed:

1. Users must indicate that beam alignments will be performed when initially registering their work with the University Radiation Protection Adviser (RPA) or Radiation Protection Officer (RPO).
2. A written process (Standard Operating Procedure or SOP) for conducting beam alignments needs to be developed. This SOP and associated risk assessment must be reviewed by the University RPA/RPO before any alignments can occur.
3. Only individuals named in the risk assessment are permitted to conduct beam alignments.
4. Whenever possible, beam alignments should be performed by the manufacturer during the annual servicing of the equipment.
5. The Head of Department (HoD) and the department should consider investing in automated equipment to conduct beam alignments, thereby minimising the risk of exposure for personnel.
6. The named individual on the risk assessment will be identified as the qualified person to perform the beam alignment. This individual **must** use a suitable radiation monitor and wear finger dosimetry when carrying out beam alignment tasks.

**Beam alignments cannot be conducted by users unless the above steps have been adhered to.**

## 3. Document History

This document will be reviewed at least annually.

Details of previous reviews are as follows:

Review Date	Reviewer	Summary of Review
Apr-2025	Isabelle Sangregorio, University Biological	First revision (V.25.1)

	& Scientific Safety Advisor, Radiation Protection Officer	
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