

# **Ionising Radiations Regulations 2017**

## **LOCAL RULES**

**These rules apply to the**

**Use of the Olympus XRF outside University of  
Aberdeen Premises**

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**Note: If you are reading this document after the review date please check with  
your RPS that you have the latest version.**

# ALL USERS MUST READ THIS INFORMATION

## Radiation Safety

The local rules are provided in compliance with the Ionising Radiations Regulations 2017 (IRR17) and **adherence to the rules is a legal requirement**. These rules contain safe working procedures for the use of the Olympus XRF.

The XRF emits ionising radiation, in the form of x-rays, which can be hazardous to health. This radiation emitted from the XRF can be separated into 2 types: primary radiation and secondary radiation.

**Primary radiation** is radiation that is produced by the analyser and emitted through the window aperture. Individuals should **never** place any part of their body in the primary beam when the x-ray tube is on. There should always be a sample in contact with the measurement window when the x-ray tube is on. The sample will absorb most of the primary radiation unless it is smaller than the measurement window or of a low density and/or thickness. **Caution should be taken to ensure that no person is in the path of the primary beam when analysing samples that are small, thin or low density.**

**Secondary radiation** is low-level radiation that comes from the sample being analysed as a result of primary beam radiation scattering in the sample or primary beam radiation inducing fluorescent x-rays in the sample. Under normal use of the analyser, individuals may be exposed to secondary radiation.

### Basics of Radiation Protection

Three factors will help to minimise your radiation exposure:

**Time:** The longer you are exposed to a source of radiation the greater the dose you receive. Dose increases in direct proportion to length of exposure. Therefore, you should only emit x-rays from the analyser for the minimum time needed, and not run the analyser for longer than necessary.

**Distance:** The closer you are to a source of radiation, the greater the dose you will receive. Dose varies with distance according to an inverse-square relationship, therefore if you double the distance between yourself and the source you will quarter the dose you receive. When using the shielded enclosure stand as far back from the enclosure as practicable. Keep your body at arm's length at all times when using the analyser in hand-held mode and ensure that your hands are away from the front of the analyser whilst exposing.

**Shielding:** Shielding can be used to reduce exposure to radiation. This can be in the form of structural shielding, moveable screens and PPE (Personal Protective Equipment). The XRF used in the shielding enclosure will reduce the scatter dose to the operator and nearby persons. The shielded enclosure should be used in all circumstances where it is reasonably practicable. The analyser contains internal shielding around the x-ray tube to protect from any leakage radiation, and ensure that

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radiation is only emitted from the measurement window. If there appears to be any damage to the structural integrity of the analyser or to the shielded enclosure it should be not be used until it has been repaired.

### Female employees

IRR17 places additional restrictions on the dose to the foetus of pregnant employees. Employees should inform their employer in writing as soon as they become aware of their pregnancy. Restrictions on the amount of work carried out with the analyser and additional personal dose monitoring may be carried out during the declared term of pregnancy.

### Radiation Incident

In the event of a radiation incident or suspected incident e.g. an overexposure, system fault etc., you must stop using the analyser and contact the Radiation Protection Supervisor (RPS) who will carry out a full investigation. You must attach a sign saying "Faulty – Do not use" to the analyser and note the details of the fault in the fault log. The analyser must not be put back in use until it has been repaired by an appropriate service company. The name and contact details of the RPS will be listed in the local rules

## 1. Authorised Users

The XRF analyser must only be used by authorised persons. An authorised person is a member of staff or postgraduate student of the University of Aberdeen who has:

- Been given training on use of the XRF analyser, and
- Read the above instruction material entitled "*Radiation Safety*"

Dr Ilse Kamerling will authorise users to operate the XRF once the above has been completed. All training must be recorded. The user must sign these local rules to state that they have read and understood the local rules, including the instruction material entitled "*Radiation Safety*".

## 2. Radiation Protection Supervisor (RPS)

The RPS appointed in accordance with IRR17 is:

Dr Stephen Bowden

Address: Room 136, Meston Building, University of Aberdeen

Telephone: 01224 273467

Any matters relating to radiation safety should, in the first instance, be referred to the RPS.

## 3. Dose Monitoring

Any individual carrying out more than 160 handheld exposures per year will be issued with a collar badge. If issued, the collar badge should be worn when carrying out exposures using the XRF.

- Dose investigation level: 0.3mSv per wear period

## 4. Contingency Plans

In the event of any fault with the equipment or failure of QA checks, the XRF must be removed from use and a sign attached saying "Faulty – Do not use". The details of the fault must be noted on the fault log. The XRF should not be used again until the appropriate service company has rectified the problem. Evidence of the work carried out to resolve the fault must be provided and the advice of the RPA sought on putting the unit back into use. All actions should be recorded on the fault log.

- Exposure not terminating
  - Immediately remove the battery pack. Do not use the XRF again until it has been repaired by the appropriate service company.
- Mechanical or fire damage
  - If mechanical or fire damage to the unit or the shielded enclosure is known or suspected the unit should not be used until it has been

inspected by the appropriate service company and its safe use confirmed.

- Exposure to ionising radiation greater than expected
  - In the event of a known or suspected exposure to ionising radiation that is greater than expected during normal operation of the XRF, the RPS must carry out a full investigation to ascertain whether an overexposure has occurred. If it is confirmed that an overexposure has occurred the RPS will make a detailed record of investigation and inform the RPA for further advice.
- Theft or loss of equipment
  - The RPS should be informed as soon as it is suspected that the unit has been lost or stolen and an immediate search must be started.

## **5. Storage and Transport of the XRF**

When on University of Aberdeen premises and not in use the unit will be stored in locked storage. The key will be kept with Ilse Kamerling.

When off University of Aberdeen premises but not in use the unit should be kept in a secure place. A daily check should be carried out that the unit is in this secure place. This check should be recorded. If the unit is not in place the contingency plan in Section 4 should be enacted.

When the XRF is to be used, the person removing the analyser must sign and date the log book to that effect so that the location of the XRF can be traced at all times. A second entry must be made by the person returning the XRF. Dr Kamerling will only allow authorised users, as defined in Section 1, access to the XRF. The XRF must be carried in its carry case.

When transporting the XRF outside University premises in a vehicle it is extremely important to minimise the risk of theft of the XRF or of the vehicle containing it. The vehicle should never be left unattended or out of sight except for short periods in cases of genuine necessity, in which case the driver must ensure that all doors are locked, windows shut and the XRF is hidden from view.

## **6. Procedure for use of the XRF outside University of Aberdeen premises**

### **6.1 Use in the Shielded Enclosure**

The battery pack should be removed from the unit when it is not in use.

When out of its carry case, the unit must always be carried carefully. If dropped the unit may be damaged.

Do not use the unit if any of the safety features are not working e.g. warning lights. In this instance, inform the RPS and do not use the unit again until a repair has been carried out. The fault procedure detailed in Section 4 must be followed.

You must ensure that the number of exposures the exposures that you have carried out have been logged on the XRF software on the laptop.

## **6.2 Additional rules for use in hand-held mode**

In hand-held mode, the area in the path of the primary beam until it is attenuated by shielding or distance and a radius of 2m in all directions from the XRF will be designated as controlled area. The operator must ensure that the area is kept clear and must keep the controlled area under constant visual supervision.

The operator must give an audible warning to others before exposing.

If any unauthorised persons enter the controlled area, the operator should stop the measurement immediately, either by removing their finger from the trigger or removing the battery pack.

**Under no circumstances should be XRF pointed towards the floor whilst at a desk. In this instance, the primary beam will be directed at your legs.**

The probe must never be pointed or held up against any person. Keep your fingers or any part of your body well away from the front of the unit whilst it is being used.

Samples must **never** be held in the hand whilst being irradiated.

You must complete the log after each use to record the number of exposures that you have carried out, and their approximate length.

**No individual should carry out more than 160 3 minute exposures (or equivalent) in hand-held mode per year without prior discussion with the RPA.**

## **7. Loan of the XRF to a third party**

If a third party requests use of the XRF they must confirm, in writing, to the RPS that they have registered their use with the Health and Safety Executive (HSE) and are in compliance with IRR17.







