

Local Rules for the Use of the Skyscan Micro-CT systems (1172 and 1272)

Location: 2_014 (CCMM Labs), Department of Materials Science and Metallurgy

Departmental Radiation Protection Supervisor	Prof. Jason Robinson Jjr33@cam.ac.uk 31051
University Radiation Protection Officer (University)	Ms. Lisabeth Yates ly215@admin.cam.ac.uk 66354
Class A user <ul style="list-style-type: none">• Practical training• Minor maintenance (including alignment and X-ray leakage tests), nothing with source or interfering with interlock system	Mr Wayne Skelton-Hough wrh23@cam.ac.uk Tel. 67030
Class B user <ul style="list-style-type: none">• Use of system according to standard protocols.	Updated list attached
Issued under the authority of	Professor Serena Best / Professor Ruth Cameron
Version number and Date	Version Number 2 Date 31/03/2020

Scope

These local rules cover the use of Cambridge Centre for Medical Materials' (CCMMs) Bruker Skyscan micro-CT desktop systems (1172 and 1272), (radiation generators). They cover the day to day use of these systems, which are fully interlocked and maintained by trained service engineers. The rules are designed to ensure all work complies with the requirements of IRR99 and the associated Approved Code of Practice, enforced by the Health and Safety Executive, as well as to avoid personal injury or damage to the system.

These rules cover only the use of the micro-CT systems and do not consider any risks associated with samples used. These risks should be covered by separate COSHH forms.

Description

The Skyscan Micro-CT scanners allowing non-destructive visualisation of virtual slices through specimens using an X-ray detector. During a scan a micro-focus x-ray source (100kV, 10W maximum power) illuminates the object and a planar x-ray detector collects magnified projection images. Hundreds of angular views are acquired while the object rotates. From these projections a computer synthesizes a stack of virtual cross section slices through the object. In the case of the 1272 an integrated micro-positioning stage allows for optimal sample placement and the 6 position automatic filter changer and a wide range of source energy selection optimises signal to noise ratio. For the 1172 a mechanical testing stage allows for the scanning of samples under mechanical load (rules for this covered elsewhere). Image reconstruction is GPU accelerated.

Authorised Users

- Only persons who are adequately trained and authorised (by Wayne Skelton-Hough) may work with any of the Micro-CT systems.
- Day to day users are trained only to use the micro-CT system according to standard protocols and may undertake no maintenance or otherwise interfere with the system.
- Class A users can carry out minor maintenance activities (for example alignments, leak detection tests) but may not in any way interfere with the interlock system or the X-ray source.
- Factory trained Bruker engineers carry out all tasks that involve interference with interlock system or source and this will never involve the generation of radiation without the full shielding.

In order to become an authorised user (class B)

A series of steps are needed before becoming a Class B user. Once a Class B user, access will be provided to the online booking system for the systems.

1. If from outside CCMM, permission should be sought from either Prof R Cameron or Prof S Best to use the system
2. Appropriate COSHH forms for any materials to be scanned should be completed, signed by the user's supervisor and cleared by Prof Cameron or Prof Best (if non-group member)
3. For those from outside the Materials Science Department, the department's health and safety test must be passed for unsupervised access to the lab.
4. For non-group members Wayne Skelton-Hough must be contacted to arrange a lab induction
5. An X-ray user's registration form must be filled in, signed by the users Supervisor and Prof J. Robinson (Department Radiation Protection Supervisor) and attached to the user's Generic risk assessment training record. This user form requires that the University's health and safety course has been carried out
6. Full training for the appropriate scanner must be provided by W Skelton-Hough and the generic risk assessment read. The appropriate place on the

personal risk assessment should be signed by the user, trainer and either Prof. Ruth Cameron or Prof. Serena Best.

7. These local rules should be read, and the attached sheet signed.

For those not prepared to go through these steps, requests may be made to Wayne Skelton-Hough for a limited number of samples to be run on the applicant's behalf. (this will require completion of COSHH forms for the samples to be run)

Procedures

In order to prevent damage to the machine, injury to users or other lab members and to prolong the life of the X-ray source:

1. Under no circumstances should the interlock system or source be interfered with by any user
2. Unless given permission by class A users, class B users should not undertake alignment or any other maintenance tasks associated with the system.
3. In scan settings options should be selected such that the source is switched off after the scan and the door is not left open.

Specifically for the 1272 system:

4. When inserting a sample great care should be taken to ensure lateral force is not applied to the micro-positioning stage.

Booking rules:

1. Booking slots are divided into:
 - Morning – 9:00 to 13:00
 - Afternoon – 13:00 to 17:00
 - Overnight – 17:00 to 09:00 (only bookable to midnight)
2. Users may book only 6 slots at a time (unless express permission is given) and further slots may not be booked until all 6 slots have been used up.
3. If you find you are unable to use a booked slot, you must email other users on the user email list using met-skyscan-ccmm@lists.cam.ac.uk as soon as possible so that someone else may make use of this slot.

Protection Measures

Access by service engineers is supervised by Wayne Skelton-Hough.

If there are any concerns about the safety of the machine, stop use immediately, switch off power and contact a Class A user.

X-ray leakage tests will be carried out at 6 monthly intervals according to factory standard. Manual lock off will be applied (power switched off and key removed) if any increased levels and authorized Bruker engineer contacted. If any reading greater than $<1 \mu\text{Sv/h}$ at 10cm from the instrument surface are found then RPS and RPA should be additionally contacted. These values at leakage test ensure personal exposure significantly below the formal investigation level of 2 mSv on whole body (effective) dose for x-ray and sealed source applications as set by the University, in accordance with Regulation 8(7) of the Ionising Radiations Regulations 1999.

Summary of Hazards

For full details see risk assessment

The major hazard is possible exposure to X-rays. This is very low risk as a result of the built in interlock system and shielding.

The service engineers test the system for electrical safety as part of the service agreement. Ancillary portable electrical equipment undergoes regular PAT testing as part of the Department of Materials Science and Metallurgy safety policy.

Contingency Plan

In the event of any incident, accident, fault or suspected fault of a radiation generator the electricity supply must be switched off immediately and the RPS informed.

If the matter is an incident which has resulted from failure of safety devices, and/or resulted in exposure of persons to ionising radiation, then the RPA must immediately be informed.

Change log

Change	Date	Updated by	Description
1	15/09/2017	W. Skelton-Hough	Document issued.
2	30/03/2020	W. Skelton-Hough	Reference to Skyscan 1072 removed. Note added to description stating that there is no need to wear safety glasses when using the μ -CT machines in the Microtomography lab.