



Microwave and Terahertz Lab (M&THz Lab)

Room 109/109A, Rankine Building

CODE OF PRACTICE

The adoption and practice of good safety procedures is of paramount importance for both the health and safety of fellow workers, and for the integrity of the fabric of the M&THz Laboratory.

1. Lab Safety Management Responsibilities

- 1) **Everyone** has a role in protecting the health and safety of both other lab users and themselves, and thus should be familiar with the **School's Safety Manual**.
- 2) **Academic Supervisors** take full responsibility for the health and safety of their own group's research activities, and consequently must ensure their staff and students are familiar with both the content of this **Code of Practice** and the **School's Safety Manual** and apply its requirements.
- 3) No research activities shall be carried out in the M&THz Lab, Room 109/109A Rankine Building, without the prior permission of the **Lab Responsible Person**. The role of the Lab Responsible Person for the M&THz Lab is specified in **Appendix A**, in accordance with the **School's Safety Manual**.
- 4) No work shall be carried out until a **Risk Assessment** has been conducted by the research staff/students, **approved by their Supervisor** and the **Director of Safety**, and acknowledged by the **Lab Responsible Person**.
- 5) An **electronic copy** of the approved Risk Assessment shall be sent to the Lab Responsible Person to be kept as record (note that this can be done using the online risk assessment system). A hard copy of the approved risk assessment shall be displayed next to the relevant research rig and equipment for inspection. The procedures of the preparation of Risk Assessment are summarised in **Appendix B**.
- 6) **All lab users** should make themselves aware of the **general safety procedures** highlighted in the School's Safety Manual and of the location of safety equipment in the lab.

These are:

In case of emergency, dial telephone number: **4444 (internal), 0141 330 4444 (external)**

Emergency exits are located in the lab or via the main building

The **fire extinguisher** is located in the main corridor level 1

First Aid kits are in the Janitors box on Level 4

- 7) Work outside normal office hours (including weekend working) requires the permission of your supervisor. This can be given by an e-mail trail for audit purposes in the event of an accident and can be for multiple or extended periods of time. If permitted, the out-of-hours working book located in the foyer of the Rankine building must be signed and the time recorded on arrival and the time of departure. Potentially dangerous

operations **must never** be undertaken out-with normal hours **unless a second responsible person is present**. (Please read the safety regulations in the School's Safety Manual for more details.)

2. Practice of General Activities

- 1) A specific guidance for working in this lab is described in **Appendix C**
- 2) The experimental area must be **kept tidy and clean**. This is **NOT** the responsibility of the cleaners. Good housekeeping must be maintained by the lab users and be monitored by the responsible person of each area (see Appendix D).
- 3) **Food and drink are not permitted in the lab.**
- 4) The **walkways** and **marked out** sections of the floor leading to the fire exit must remain clear. Under no circumstances should lab equipment be stored in the route from your place of work to the fire exit route. If things are possibly impeding your exit then you should either move them, contact the person who placed them there, or inform both the Lab Responsible person and the lab technician.
- 5) Access to switch boxes and valves must remain clear and must not be blocked by equipment.
- 6) Dedicated storage cupboards and areas must be used.
- 7) **Laboratory doors should remain shut** at all times to ensure security and fire safety. This includes the rolling door at the end of the lab.
- 8) Equipment must be placed in appropriate locations to safe-guard its integrity, minimise potential damage and to allow other researchers access to it.
- 9) Once experimental work has been completed and the experimental setup is no longer required, the **experimental area must be cleared** in preparation for other experiments and researchers.
- 10) If it is necessary to remove equipment from the lab, permission must be given by the Lab Responsible person. If necessary, seek assistance with moving heavy items.
- 11) If equipment breaks down or is not working, report the fault to the lab technician and the responsible person (see Appendix C) immediately.
- 12) A fault with the fabric of the room, such as a lighting failure, should be reported through the Maintenance Request portal found on the Estates and Commercial Services webpage, <http://www.gla.ac.uk/services/estates/>.

3. Covid-19 measures

- 1) Guidance from the HSE, UK Government and Scottish Government to manage the risk related to Covid-19 pandemic must be applied to the M&THz Lab. These include physical distancing, frequent hand washing and hygiene measures, cough etiquettes and face covering in enclosed public space. Considerations for codes of practice and risk assessment for the James Watt School of Engineering can be found here (<https://www.gla.ac.uk/schools/engineering/informationforstaff/safety/>)
- 2) Physical distancing within the M&THz Lab means a maximum capacity of **2** persons working in the upper area i.e. WA1 and WA2 in 109A and **1** person in the lower area i.e. either WA3 or WA4 in 109 (Appendix D).



- 3) Demand to use the lab will be managed by the Lab Guardian in collaboration with the Safety Coordinator. Collaboration will be required between lab users, supervisors, PIs and the lab guardian to establish a rota where necessary. Impact on the overall capacity of the Rankine building will be reviewed by the Technical Services Manager.
- 4) Measurement booking must be made through the on-line booking form see **Appendix C** for details. For Cascade autoprobe, Lakeshore probe station and the 750 GHz-1.1 THz VNA, only one of the them can be booked for any time slot.
- 5) Once finishing your timeslot, user must indicate you have left the room on the online booking system immediately after leaving the lab.
- 6) The next user must check if the previous user has finished his/her booking on the online booking system. Allow a minimum of 10 minutes for the previous user to leave the building before entering the lab.
- 7) Lab users must wash their hands regularly and wipe workstation surfaces, materials, and equipment at the start of their work and before leaving.
- 8) Emergency support (First Aiders and Fire Area Officer) might ne constrained due to Covid-19 restriction on building capacity. Task risk assessments need to be reviewed to include the above measures and to review with personnel through the risk assessment, which work can be safely undertaken with reduced access to emergency support. A Covid-19 risk assessment template can be found here (https://www.gla.ac.uk/media/Media_723618_smxx.docx).

4. Practice of Hazardous Activities

- 1) **Electrical connections** between different devices or equipment should be safe. If in doubt, speak with the lab technician Tom O'Hara.
- 2) To minimise **trip hazards**, extension cables should be plugged into the closest socket and avoid crossing pathways. If crossing a pathway is totally unavoidable then, only as a temporary measure, the cable must be secured to the floor and covered with a suitable (commercially supplied) floor cable cover, cable protector, floor cable tidy to prevent tripping hazards. However, leads crossing pathways at the top or bottom of stairways is not allowed, even as a temporary measure – they should be routed at least 2 m (i.e. two paces) away from these areas.
 - i. Once equipment is not in use, it must be turned off and any extension cables used should be tidied to a suitable location.
 - ii. Leads and plugs should **ONLY** be used on the allocated item of equipment and should **NOT** be switched between equipment
 - iii. All equipment plugged into university outlets must be PAT tested (contact the electrical workshop for testing).
- 3) To minimise the risk of **falling objects**, no equipment or lab materials should be kept on top of cupboards and file cabinets, particularly those next to the edge of the upper floor.
- 4) Fire hazards:
 - i. All **flammable materials** (gases, liquid and solids) should be stored and handled in accordance to the School's Safety Manual and relevant SEPS guidelines.

- ii. All equipment or experimental rigs using flammable materials should be certified and have adequate measures for preventing fire hazards.
 - iii. All users of flammable gases should be trained.
- 5) Explosion hazards when using compressed gases:
- i. All gas cylinders should be secured to prevent falling.
 - ii. All pressure vessels should be certified by a professional manufacturer.
 - iii. All pressure vessels should have measures to preventing over-charging, such as relief valves.
 - iv. You should seek support from technicians when moving gas cylinders.
 - v. All users of compressed gases should be trained.
- 6) **Only F-gas** qualified individuals can charge or discharge the system when using Freon refrigerants.
- 7) Ear protection and laser safety spectacles should be used when appropriate.
- 8) If you are unsure how to correctly use an item of equipment, seek assistance from an appropriate responsible person(s) (see Appendix C).

Appendix A duties of the Lab Responsible of M&THz Lab (Rankine 109/109A)

According to the School's Safety Manual, the **Lab Responsible is responsible for implementing safety policies in M&THz Lab on a day-day basis.**

1. Considering the particularity of M&THz Lab, the specific duties of its Lab Responsible is listed as below:
 - 1) to maintain the Code of Practice (CoP);
 - 2) to ensure the lab users keep their area in tidy and clean condition;
 - 3) to ensure each activity (experimental rig/equipment) has a Risk Assessment before work commences;
 - 4) to coordinate actions according to the School's Director of Safety's report / instructions following inspections;
2. The appointment of the Lab Responsible
 - 1) The Head of ENE Research Division, Director of the ESDC, in consultation with the academics of the lab, appoints the Lab Responsible of M&THz Lab.
 - 2) The Lab Responsible of M&THz Lab reports to the Director of the ESDC.

Appendix B: Procedures of the preparation of the Risk Assessment

1. PDRAs and PG/UG students are responsible for formulating Risk Assessments on a day-day basis. For potentially hazardous activities, in addition to assessing the risks, the risk assessment form should include a standard operating procedure/method statement (and/or instrument manual) as an appended document.
2. Whilst the preference is for the persons undertaking the practical work to make their own risk assessments, it is permissible to use the on-line multi-user risk assessment forms for activities that will be undertaken by groups of people. However, in this case, each person involved in the practical work must sign the multi-user form online and a strict regime of user training should be in place that encompasses both the risks associated with the work as well as the practicalities of undertaking it.
3. Academic supervisors should assist the PDRAs and PG/UG students in preparing the risk assessment (this would typically be the case for less experienced PDRAs and PG/UG students). They should **ensure** foreseeable risks have been identified and adequate mitigation measures have been provided to reduce them as far as possible.
4. The academic supervisors should then approve the risk assessment form online (or ask for further information to be added); the Lab Responsible should also acknowledge (on-line) that the risk assessment has been completed, to indicate that as far as they can see, this activity does not conflict (in safety terms) with other activities in the lab. The Lab Responsible can also ask for further clarifications/additions concerning the procedures involved to be made, if necessary.
5. After the risk assessment has been approved/acknowledged by the supervisor and Lab Responsible/Lab Guardian, the School's Director of Safety approves, seeks further clarifications, or (exceptionally) rejects the risk assessment if there are clearly hazards that cannot be sufficiently mitigated.
6. An e-copy of the **approved** Risk Assessment should be sent to the Lab Responsible by the PDRA or PG/UG student that originated the assessment (n.b. pdf's of the online form can be made by using the Print to PDF option available in most browsers)
7. A hard copy of the approved Risk Assessment and standard operating procedure should be kept or displayed next to the relevant experimental rig or equipment.
8. The Lab Responsible approves the start of activity after receiving the **approved** Risk Assessment.
9. If there is any substantial change to the people or research activity as stated in the Risk Assessment, it **MUST** be revised accordingly, and pass procedures 1-7 as above.



Appendix C: Microwave & Terahertz Laboratory Guidance Notes

Anyone wishing to work in R109/A must follow the steps below.

1. New users must complete the Microwave & Terahertz Laboratory Registration Form. This can be obtained by emailing Tom at - Thomas.OHara@glasgow.ac.uk
2. Tom will organise training, this preferably be should done with people in your research group.
3. Training will be assessed by Tom or person in other group.
4. Tom will then create a user account for person so they can book user time and operate automatic probe station.
5. Users must book the equipment and associated accessories on the booking webpage; for the autoprobe maximum 2 hours per slot in the morning and 4 hours per slot in the afternoon.
6. Check the status of all equipment before making any measurements and restore the default setups after your measurements.
7. Any moving of equipment to other labs or change of default settings should be authorised by Chong & Tom and this should be recorded in log book associated with equipment, it also should be recorded in Loan's book located at telephone R109A.
8. Any problems & faults to equipment should be reported to Tom - Thomas.OHara@glasgow.ac.uk [Tel:6676](tel:6676) R510.
9. No eating or hot drinks in the lab
10. Sharing the door entry password with others is not permitted
11. Users must obey the fire regulations for the Rankine Building.
12. In the case of an emergency user should call ext 4444 in first instance then call will be directed to appropriate service.

Contacts.

Manager: Dr Chong Li - Chong.Li@glasgow.ac.uk Tel:4626

Support: Tom O'Hara - Thomas.OHara@glasgow.ac.uk Tel:6676

Appendix D: Designated Working Areas

Lab layout is shown below. In R109A, there are two manual probe stations for the 140 GHz-220 GHz VNA and the 220 GHz-325 GHz VNA on the left, a Cascade semi-automated probe station equipped with a Keysight B1500 semiconductor device analyser and 10 MHz-110 GHz VNA in the centre and a workbench with a Lakeshore probe station and a 750 GHz-1.1 THz VNA on the right. Two people can work in R109A simultaneously in the areas i.e. WA1 and WA2 as shown below. In R109, there are an anechoic chamber and its associated control units on the right and a workbench on the left. Only one person can work in this room at either WA3 or WA4.

