Standard Operating Procedures – Rankine 205a&b

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Emergency Contacts

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Lasers

A number of laser devices up to Class IV are in use at any time in the lab. There are listed as follows and laser systems are indicated in the lab layout, attached. All lab users must be aware of the following laser and their positions in the lab and be adequately trained for safe working with high power laser systems. Protective equipment suitable for the lasers in use must be worn at all times. A contact name is provided for each system for training and safe operation purposes.

- (A) Light Conversion Carbide
  - 290fs – 10ps tunable pulse duration
  - 1030nm centre wavelength
  - 400µJ maximum pulse energy
  - 40W max average power
  - 60khz – 2MHz tunable rep. rate
  - Contact: Ashley Lyons, Matteo Clerici, Daniele Faccio
- (B) Light Conversion Orpheus OPA
  - Pumped by Carbide laser above
  - 650nm – 2500nm tunable centre wavelength
  - Contact: Ashley Lyons, Daniele Faccio
- (C) Coherent Chameleon Ultra
  - 650nm – 1100nm tunable centre wavelength
  - 80MHz rep. rate
  - 4W max average power
  - 100fs pulse duration
  - Contact: Ashley Lyons, Daniele Faccio
- (D) Chromacity Spark 1040 (x 2)
  - 100fs pulse duration
  - 2W average power
  - 100MHz/80MHz rep. rate (model dependent)
  - 1030nm centre pulse duration
  - Both systems equipped with third harmonic module emitting at 515nm and 347nm
  - Contact: Bienvenu Ndagano, Daniele Faccio
- (E) NKT Photonics SuperK EXTREME (x 2)
  - 400nm-2400nm supercontinuum
  - Tunable rep rate – max 80MHz
  - 7W total average power across entire spectrum (2W visible, 5W NIR)
  - Minimum pulse duration 6ps
  - Contact: Ashley Lyons, Daniele Faccio
- (F) Coherent Chameleon Discovery

        - 140fs pulse duration
        - 2 Outputs: 1 fixed at 1040nm and 1 tunable 650-1300nm
        - 3.5W (4W) max output power for fixed (tuable) outputs
        - 80MHz rep. rate (with optional pulse picker)
        - Contact: Ashley Lyons, Daniele Faccio
- (G) Coherent Levante OPO
        - Pumped by Chameleon Discovery (fixed output)
        - 150fs pulse duration
        - 80MHz rep. rate
        - Signal output: 0.9W max, tunable 1320 – 2000nm
        - Idler output: 550mW max, tunable 2170 – 5000nm
        - Contact: Ashley Lyons, Daniele Faccio

Laser Safety Equipment

Laser safety glasses for suitable for each of the systems listed above must be work at all times when the lasers are in use. Goggles are to be left in the lab ante-room (205a); if goggles are not available entry to the lab (205b) is not permitted. Before using any of the laser systems each user must be trained in its operation to ensure safe handling of laser radiation.

Gases

Potential risks of having gases in the Lab are mechanical and asphyxiation. These can be due to errors in handling or failure of cylinders. The gases used in the Lab are Nitrogen, Dry Air, Argon, and Krypton. The compressed gas volume should be such that a complete discharge of the cylinders will not result in a reduction of the oxygen level below 19%. All the gases used in the Lab are not flammable and non-toxic. The cylinders are securely mounted to the wall with adequate racks. The Lab has 24/7 air conditioning. The main cylinder valve should be closed when not in use. All users will undergo safety training. Correct tools will be used for mounting or moving the gas cylinder

Entrances & Exits

All doors are to be kept shut at all times. The side door to the lab (indicated at “Fire exit” on the map below) must never be used except for emergencies. All doorways are to be kept clear including the fire exit.

Food & Drink

Food and drink are not to be taken into the lab or ante-room under any circumstances. Sealed water bottle may be left in the ante-room but must not be taken into the lab.

Lab Consumables

Any lab consumables (cleaning solvents, tissues, gloves, general purpose cleaning products, handwash) are welcomed to be used by anyone. It is the responsibility of all users to ensure these remain topped up and must be ordered when supplies are low. Communication through the group Slack channel can help prevent multiple orders however multiple orders are favoured over running out of stock (orders will get used eventually).

Faulty Equipment

Any equipment that is found to be faulty and/or dangerous must be reported to the main user immediately. For general equipment or general issues with the lab (e.g. electricity, air con, lights) this must be reported to Ashley Lyons.

Interlock System

For health and safety reasons, all lasers must be connected to the main lab entrance interlock system. This is to ensure no harm comes in inexperienced lab users and, in an emergency situation, it is safe to enter the lab. The system operates such that when the door is opened without entering the 4 digit code, all lasers are shut down or safely blocked with a shutter. When the code is entered correctly the lasers remain active providing the door is closed within 30s, failing this the lasers will shut down/close shutter. When the interlock system has been tripped i.e. the door has been opened without the code, the system must be reset from the panel on the left hand wall upon entering the lab. The secondary door on the far side upon entering is to be used as an emergency exit only, under no circumstances should lab users enter via this door.

Air Conditioning

The lab air conditioning system has been provided for optimum operation and maintenance of the laser systems and not for personal comfort. If the air-con system fails the lab temperature will quickly rise due to the heat output from the large number of laser systems and electronics. This will cause potentially irreparable damage to equipment, many hours of lab downtime, and tens-hundreds of thousands of pounds is equipment costs. If any change is noticed in the operation of the lab air-con system please inform one of the emergency contacts immediately.

Lights

Due to the nature of the research performed in the lab the main room lights are kept off the majority of the time. This is to avoid damage to sensitive detectors and disruption to experiments. Before turning on the lights please ensure with all other lab users that it is OK to do so. In an emergency situation, such as accident or injury, this can be ignored and the lights may be turned on as necessary. Torches and small lights are provided such that lab users can safely operate under these conditions.

Equipment loans

Loans of any equipment either into or out of the lab are to be documented in the loan book (orange notebook) located in the ante-room (205a).

Dirt

To alleviate the level of dust and dirt in the lab users must step on the provided sticky mats on entering both the ante-room and lab (205a & b respectively). The mats must be changed whenever an appreciable level of dirt has been accumulated (approx. every 2 days). Further to this either plastic overshoes or the footwear provided must be work on entering the lab. Footwear provided should not be removed from the lab and ante-room under any circumstances. The level of cleanliness is to be maintained in the lab to increase the lifetime of expensive laser systems and other optical equipment.

Cleaning

Full cleaning of the lab including mopping of the floors is to be completed on a weekly basis and is currently scheduled for 4pm on a Friday. Only the cleanroom vacuum cleaner is to be used in the lab (205b) to avoid the spreading of dirt and dust. Any vacuum cleaner is suitable for the ante-room (205a).

Rules for Working under Social Distancing

See the Covid-19 Draft Code of Practice & Risk Assessment on the School Safety pages: https://www.gla.ac.uk/schools/engineering/informationforstaff/safety/ for general details of working practices and risks that must be observed during the Covid-19 pandemic.

The outlined set of rules below *must* be adhered to following the return to lab work after the Covid-19 pandemic. These rules will remain active until further notice and are subject to change in accordance with changes in government & university guidelines. Where there is any conflict with other rules (e.g. interlock), the social distancing rules take priority.

- Where possible, all work must be completed remotely. Changes to experimental setups to enable this are to be prioritised.

- During Tier 4 protocols, all experimental projects will be placed on hold for the duration unless they:
  - Are related to human health research/funded by covid related sources
  - Are critical to PhD students/funded projects ending within the next year
  - Jeopardise contractual obligations with external partners.

  Please see attached spreadsheet to see which projects are affected by this and discuss with Daniele if changes should be made. Lab usage will be re-assessed on a weekly basis.

- During Tier 4 protocols, some experiments will run remotely but still require occasional access to the lab. It is expected that this will be kept to a maximum of 3 hrs per week.

- During Tier 4 access to the office space is prohibited with the except for usage of the printer. If the printer needs to run for more than a couple of minutes you must wait in the lab.

- No more than 8 people are allowed in the lab at any one time, with a recommended occupancy of 6, equally divided in each lab section. These sections are the left- and right-hand areas separated by the safety curtain (indicated by the dashed line in the map below – classical/quantum sections).

- Access to the anteroom is *strictly* limited to 1 at a time. If the anteroom is occupied, you must wait until it is vacated before entering. Even if only passing through.

- Facemasks are to be worn when social distancing is not possible, e.g. when mentoring another researcher in the use of a specific piece of equipment that requires the co-presence of both researchers due to e.g. laser safety issues and/or safe operation of the equipment.

- Social distancing rules as indicated by the government apply

- Hands are to be washed regularly. This must be done whenever entering and leaving the lab as a minimum.

- Lab availability will be timetabled. This will be open for booking and accessible to view via the group google calendar. Only authorised users will be allowed entry. 2 slots of 4 hours each, (am and pm) will be available per day

- After each booked session, door handles, interlock controls, and communal surfaces (optics cleaning station) are to be disinfected upon leaving the lab.

- The small glass meeting room in the office (205d) can be used for experiments where an optical table is not required and eye-safe conditions are met. Recommended occupancy is 1 person and limited at 2 people where deemed necessary (e.g. student supervision). Experiments in this space must first be cleared with Daniele and/or Ash and the same rules apply as the standard lab space (Bookkit, social distancing etc.)

Lab Map