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| **Assessment ID:** RA\_SEE\_7 |  | **Laser Safety Officer:** Dr G Keevil |
| **Assessor:** Dr A Connelly | **Group:** SEE | **Location:** 10.134 |
| **Application description:** Use of Raman Spectrometer |
| Schematic and other associated files: |  |   |
| Lasers**Lasers used for this application** |
| Laser type | Serial | Class | Wavelength | Power  |  |
| Argon Laser | ML0421REN311ACR | 3B | 514nm | 50 mW |  |
| Diode laser | 76K326 | 3B | 785nm | 300 mW |  |
| Activities / processes associated with this system |
| Activity / process | Hazard | Potential risk | Risk control/Work protocol | L2/L3 | How risk will be controlled for this application  |
| Class 3B laser | Main laser beam.Specular reflections. | Reflections from uncoated (shiny) metallic surfaces or jewellery (during alignment): leading to reflections entering eye causing retinal damage.Beams directed off the optical bench: leading to intrabeam viewing and significant loss of vision.Unsecured optics, flexible optical 'bench', movement of optical bench (and optics) with respect to laser(s): leading to intrabeam viesing or reflections entering eye causing significant retinal damage.Inadvertent exposure of hands to optical beams: leading to tissue damage. | Jewellery (including loose neck chains) must not be worn.Laser and optics must be secured such that there is no movement of each to the other. Optics etc must be secured to the bench. Lasers must be secured in place. Where beams are taken off benches they must be contained within flight tubes and optics that must be secured / immovable.Where possible optic holders etc should have non-reflective surfaces.Optical benches should be uncluttered, and care should be taken not to leave tools in likely beam paths.Where possible enclose beam pathways using flight tubes or fully enclosing optical arrays. Use blackened aluminium ~200 mm side walls around part or all of optical bench. | 2 | The system is interlocked so for general users the system operates as a class 1 system. Access to the alignment mirrors is controlled by a key which is locked in a key cabinet with controlled access.For the reasons stated above users of this instrument do not require laser safety training. Only those who wish to align the laser require this training (see Alignment risk assessment) |
| Beam delivery: Simple alignment | Potentially high energy laser beams and reflections.Invisible laser beams (UV and IR). | Improperly aligned or unsecured optics causing laser beams to leave the optical bench: leading to intrabeam viewing and significant retinal damage or spectal reflections from uncoated optic stands and retinal damage.Improperly aligned optics or careless beam training during alignment: leading to unpredicted beams striking hands causing skin burns.Hand exposure to invisible beams during alignment: leading to tissue damage. | Follow the laser alignment flowchart (http://www.leeds.ac.uk/rps/lasers/guidance.html).Ensure all optics are firmly secured (bolted) to the optical bench.Use beam stops when training leaser beams. | 2 | The system is interlocked so for general users the system operates as a class 1 system. Access to the alignment mirrors is controlled by a key which is locked in a key cabinet with controlled access.For the reasons stated above users of this instrument do not require laser safety training. Only those who wish to align the laser require this training (see Alignment risk assessment) |
| Infrared lasers | Infra red beams invisible, potentially high energy.Very high peak powers from pulsed lasers. | Partial focussing of high energy near infra-red (780 nm - 1400 nm) on the retina: leading to rapid heating of tissue and potential thermo-acoustic damage (rupture).Blink reflex not triggered by infra-red radiation: leading to prolonged exposure of retina to specular or diffuse radiation and potential tissue damage. | Read alignment protocol.Align laser beams on lowest feasible power settings. Learn how to steer invisible beams. Where possible / practicable use infra-red viewers during alignment and also to detect stray beams. | 3 | The system is interlocked so for general users the system operates as a class 1 system. Access to the alignment mirrors is controlled by a key which is locked in a key cabinet with controlled access.For the reasons stated above users of this instrument do not require laser safety training. Only those who wish to align the laser require this training (see Alignment risk assessment) |
| Slips & trips | Cables on floor.Loose electrical cables, gas lines, water pipes.Liquids.Clutter. | Tripping over cables on floor or trailing services cables, and clutter or slipping on spilt liquids: leading to trips, falls and muscoskeletal injury. | Do not run cables across the floor.Use cable gantries to mount services and deliver vertically downwards to work area.Clean up spillages and ensure floors are dry.Walkways should be free of obstructions and clutter and be at least 800 mm wide. | 2 | All cabling is arranged such that there is no trips hazards are present. The presence of a chiller unit gives potential for slip hazard. However, users are trained that any liquid spill will be cleaned up straight away. The chiller unit is not used all of the time - normally it is disconnected. As such, the connections on the chiller unit are checked when it is connected to the microscope.  |
| Security & access | Multiple lasing hazards. | Unauthorised access by unaccompanied persons allowing persons to inadvertently or deliberately interfere with equipment: leading to damage, harm or serious injury. | Where possible laser facilities must be secured with transponder based (e.g. Simons-Voss) security systems for which only laser users are given access rights. Lesser protection systems include keypad based locks or guaranteed unique key locks.Except in genuine emergencies, the only persons permitted to enter laser labs are registered laser users. Other persons may be permitted access if supervised and access is agreed by a laser lab manager or Laser Safety Officer. | 3 | The laboratory is only accessible via a transponder based (e.g. Simons-Voss) security systems. All users will be made aware of the presence of the laser within the laboratory. However, as the system is interlocked it is classed as a Class 1 system and so danger to general lab users is limited.  |
| Coolant system | Water (mains or secondary systems), chemical coolant (recycling systems). | Leakage of coolant arising from loose clips or worn pipework: leading to slips and trips, or electrocution if liquids fall on unguarded electrical components / sockets.Skin irritation from leaking coolant chemicals. | Ideally recycling coolant systems should be used as these tend to be more efficient, compact and the likelyhood of leakage is lower.Check joints, clips and pipework for wear and tear, and also secure joints when establishing an experiment. | 2 | The presence of a chiller unit gives potential for slip hazard. However, users are trained that any liquid spill will be cleaned up straight away. The chiller unit is not used all of the time - normally it is disconnected. As such, the connections on the chiller unit are checked when it is connected to the microscope.  |
| Microscopy | Potentially high energy laser beams and reflections.Dazzle (microscopy) | Improperly aligned or unsecured optics causing laser beams to leave the optical bench: leading to intrabeam viewing and significant retinal damage or spectal reflections from uncoated optic stands and retinal damage.Improperly aligned optics or careless beam training during alignment: leading to unpredicted beams striking hands causing skin burns.Malfunctioning microscopy equipment: leading to intrabeam viewing and significant retinal damage.Dazzle from (visible) microscope stages: leading to temporary diminished vision, or discomfort. | For open beam spectrometry if enclosure is problematic treat as for beam alignment.Ensure all optics are firmly secured (bolted) to the optical bench.Ensure microscopes are serviced by reputable engineers.Use coloured plastic screen around microscope stage to reduce dazzle. | 2 | The microscope on the Raman is interlocked so there is no possibility of users being exposed to laser light while using the microscope.  |
| Persons who will use this laser system |  |  |   |
| Dr A Connelly |  |  |  |
| Persons who will build or modify this laser system (including maintenance operations)(Also any user named above can undertake L3 activities under the supervision of a competent person for that activity named below) |
| Name | Level 3 Activity / Process competence |
|  | Authorised for: | Not authorised for:  |
| Approval  | Review date  |  |