

<b>Title of project/experiment/activity</b>			
Horiba LabRam HR800 Raman spectrometer/ Raman and PL spectroscopy/ Use of Raman spectrometer			
<b>Location of activity</b>		<b>Start and end dates</b>	
EEDB Annexe, Ground floor, Raman Spectroscopy Laboratory (Room 82)		23/3/2017 – open-ended	
<b>Brief description (or attach procedure/protocol)</b>			
<p>Raman and PL spectroscopy is used for characterizing optical properties of various materials. In this experiment, various lasers can be used (Ar-Kr laser and He-Ne gas laser). The laser light is guided by mirrors and focused on the sample by an objective. During the measurements the laser power on the sample is kept below a few mW. The scattered light coming from the material is guided to the spectrometer, dispersed by a grating and detected by a charge coupled device (CCD) camera. Raman and PL spectroscopy allows to assess structural and electronic properties of a material. Mainly, carbon based materials and other 2d materials will be investigated, such as amorphous carbon, graphite, graphene, graphene oxide and transition metal dichalcogenides.</p> <p>The LabRam HR800 Raman spectrometer is commercially available and used according to the manufacturers' guidelines.</p>			
<b>Hazard</b>	<b>Effect</b>	<b>Control measures</b>	<b>Residual risk</b>
Pinch point	Skin damage, bruises	Care must be taken when changing gratings and filters when opening the hood of the spectrometer to avoid pinched fingers or hitting the head.	Low risk
Lack of visibility (Dark room)	Bruises	The light might be switched off during measurements. There are small reading lamps on each desk. Prior to switching the lights off, users should make themselves aware of the obstacles on the floor, such as ramps, cable covers to avoid stumbling over them, as well as other obstacles, such as chillers and power supplies. Users must familiarize themselves with the locations of the light switches available.	Low risk
High power lasers, class 3B and 4	Skin damage, burns, eye damage	All beam paths are fully enclosed to prevent the risk of someone being exposed to direct, scattered or reflected laser light. The laser power is reduced significantly and all jewellery has to be removed when alignment work is carried out. Appropriate laser safety goggles must be worn while aligning. Observers (visitors) must wear laser safety goggles at all times while the alignment is done. An interlock system is installed and must be switched on when switching on any laser. The lamp outside the lab indicates if a laser is on or not. A code has to be entered to open the door to override the interlock and open the door, while lasers	Low risk

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		are on.	
Electrical shock	Shock to user	Do not open the laser enclosure when it is switched on (water cooled Ar ion laser and Ar-Kr laser)	Low risk

**Personal Protective Equipment required** [eye/face protection, respiratory protection, gloves, lab coat etc]

While aligning, appropriate laser safety goggles must be worn.

**Emergency Instructions & First Aid**

Fire: In case of fire, the fire alarm should be activated and fire service called. Evacuate the building.

**Any special monitoring required** [e.g. hearing test, vibration monitoring, health surveillance]

N/A

**Further control measures required? If yes, list with actions.**

N/A

**Biological/Laser/Radiation Approval** [requires relevant Specialist Safety Officer signature and date]

Class 3B and 4 lasers are being used.


**Signature of Departmental Laser Officer:**

Date:

**Out of hours/Lone working**

Out of hours working must be authorized according to Engineering Department regulation.

Signature to confirm that this is a suitable and sufficient assessment of risk and that stated control measures are in place. This risk assessment should be reviewed if additional risks not covered in this assessment are identified or if there is any reason to indicate that the control measures are insufficient.

<b>Name of Assessor</b> Duhee Yoon Email: dy254@cam.ac.uk	<b>Signature</b> 	<b>Date</b> 23/03/2017
<b>Name of Supervisor</b> Prof. A.C. Ferrari Email: acf26@cam.ac.uk	<b>Signature</b>	<b>Date</b>

<b>Local Safety Coordinator</b>	<b>Signature</b>	<b>Date</b>
<b>Departmental Safety Office</b>	<b>Signature</b>	<b>Date</b>