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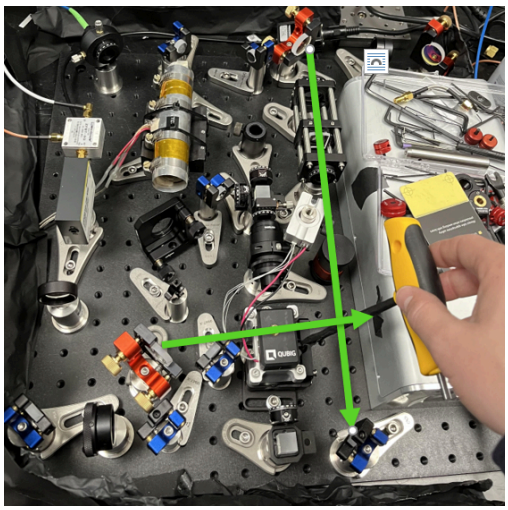
LESSON LEARNED

Berkeley Environment, Health & Safety

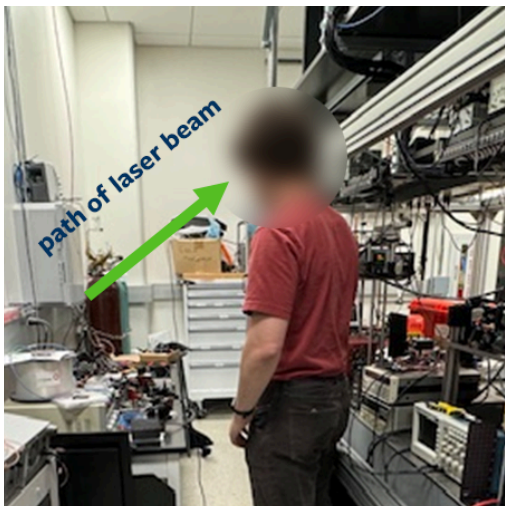
Laser Eye Exposure from a Specular Reflection

What Happened

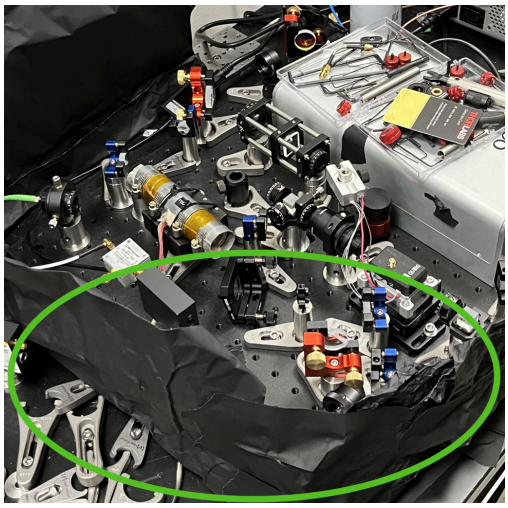
A researcher walking towards an optical table was exposed to a laser beam that reflected off a hex ball driver tool. Another researcher at a nearby bench was installing an optical component on a breadboard when the hex ball driver he was using inadvertently moved into an active beam path. The hex ball tool had a reflective surface.



Tool in beam path



Approx. location of researcher struck by specular reflection



Low beam curb/barrier

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What went right?

- Laser user alerted the Principal Investigator (PI) and group laser safety contact of the incident.
- The PI contacted Environment Health & Safety (EH&S) Laser Safety to inform them that a laser eye exposure incident involving one of their staff occured.
- Research group paused laser operation.
- Research group held a meeting to discuss eye exposure incident and laser safety issues specific to ensure laser researchers have and wear Personal Protective Equipment (PPE) as needed in accordance with the campus laser safety policy and group laboratory safety operating procedure(s) (SOPs).
- Research group created a laser safety corrective action plan.

What should be done differently?

- Laser user should have used tools that do not have a reflective surface or coating.
- Laser user and the other researcher in the same room should have worn appropriate laser protective eyewear as required.
- Laser user should have installed appropriate laser beam curbs or barriers (including those of appropriate height) to contain or block any stray laser reflections.

What was the cause of the eye exposure?

The direct cause of the incident was the insertion of a ball driver tool with a reflective surface into the path of the 0.02 W continuous wave beam (420 nm), which reflected the laser beam into the eye of a nearby researcher.

The laser user was not adequately trained (hands on) and lacked experience with building an optical layout with an active beam present, including appropriate laser safety beam management.

Laser Eye Exposure from a Specular Reflection

What corrective actions will be taken?

- Research group will replace tools that have reflective surfaces/coating with tools that have matte black finish.
- Research group will draft a separate procedure for all “new” optical builds. This procedure will include safety requirements.
- Research group will review and revise all laser SOPs incorporating new procedures for working in the lab. This will include photos of how alignment mode can be turned on for each optical system. Group will submit revised SOPs to the EH&S Laser Safety program for review.
- Research group will have a procedure to ensure that all laser users have met the campus laser safety initial training requirement prior to working on any optical experimental set-up and are provided appropriate “hands-on” training.

Lessons Learned

- Install appropriate beam barrier/curb to contain any specular or diffuse reflections. Ensure that beam barrier/curb height is sufficient to contain any entrant reflections. Beam curb/barrier was too short.
- Laser SOPs shall be reviewed for operational accuracy and include detailed procedures on conditions when laser eye protection is required to be worn.
- Develop a procedure to ensure that all laser users have met the campus laser safety initial training requirement prior to working on any optical experimental set-up and are provided appropriate “hands-on” training.
- Wear appropriate laser protective eyewear whenever working with an open laser beam.