Lesson Learned Briefing

No.: LL18-0014

Title: Laser Beam Skin Exposure

Event: LBNL Event

Event Date: 05/22/2018

Category: ESH-Laser - All Laser Users

Lesson Learned Statement:
-- Each person must verify for themselves that the state is safe (using approved IR cards, foam, cameras or other approved method) before taking action, regardless of communication.
-- Everyone must at all times be aware of safe and unsafe areas and the configuration of beam blocks and shutters. Everyone must pay full attention to the task on hand.
-- When inserting, removing, changing optical elements, or intercepting the beam, laser beams must be blocked. Consider installing cameras or other means to confirm beam absence.
-- Do not reach into laser beam path without being 100% sure that it is safe; neither with your hand or other body parts, nor with parts of equipment.
-- Before enabling the interlock or starting up a laser, or sending any laser beam into any area, one must ensure that all personnel in the area are aware, have appropriate PPE, and that the beam is safely controlled.
-- Communicate your intentions and confirm that it is safe to proceed. Update the existing procedures to include clear language. Communication is a part of the administrative controls and should be evaluated during the hazard assessment.
-- Consider installing automated/motorized beam blocks, filter holders, and physical indicators of beam block status when the operations require routine, repetitive inserting/removing of beam blocks or intercepting the beam for diagnostics, and fully enclosing the beam path.
-- The project lead and activity lead should revisit the work practices if or when students and/or visitors are allowed to work on new or high power systems.

Discussion:
On Tuesday, May 22, 2018, a laser skin exposure occurred. The exposure was to one shot of a 532nm beam of approximate

parameters: 5-6J in energy, 1-inch diameter, and 35ns pulse duration. It occurred on the back of the hand of a laser user. This caused a first-degree burn.

The exposure occurred during a routine laser operation in which a laser beam block needs to be removed or put into the beam. The approved process for doing this is that the laser shutter is closed, then the beam block is actuated, then the laser shutter is opened. The work lead was not present in the lab at the time of the exposure but had supervised similar operations with these workers previously, including on that day. During the event, one person was operating the laser shutter and another person the beam block. The person operating the beam block asked the shutter operator to see if the shutter was closed and received a response that he interpreted to mean it was closed, when it was in fact not closed. He reached in to put the block down and was exposed.

Work was immediately paused, and the worker and work lead exited the lab and called the BELLA Center Operations Coordinator. A picture of the exposed area was shared and discussed via text message. Whether the exposure required immediate medical attention, immediate further notification, or cessation of work was discussed. It was decided that work could continue after review of the incident and with ongoing monitoring of the exposure to be sure that the exposed person was not in pain or discomfort and that signs of blistering did not develop. A follow up image was shared and assessed two and a half hours after the event. Monitoring was conducted until approximately nine hours after the event. The event was reported at the start of the following business day and the exposed person was evaluated by medical as soon as he arrived at work. Laser work was stopped during the investigation.

The investigation determined:
-- Both workers were authorized to perform this work and had completed associated on-the-job training.
-- Procedures to operate the laser were established and included as part of on-the-job training. On-the-Job training included procedures for communication and verification of beam status. The specific operation procedures however did not address communication terminology to be used during this task step.
-- Both workers were wearing appropriate eye-protection.
-- Both workers had performed this operation successfully before, including on the date of exposure.

A re-start plan was developed and completed, including:
-- Evaluating the extent of condition. Similar laser activities in nearby laboratories were inspected.
-- Updating written procedures for starting the laser system were updated with steps which address explicit communication, including

specific terms to be used, to announce that the beam is off, and separate verification that the beam is not present by the user (e.g., using an approved card or foam block) before any item is inserted or removed from the laser beam.
-- Updating the On-the-Job Training to include the procedure changes and training all applicable laser users on the new procedures.
-- Re-training all the active laser users in the Program on basic laser safety.

A plan is being developed to implement engineering/automated controls for monitoring beam status and/or inserting and removing objects to reduce the risk of human error.

Lessons Learned are part of the ISM Core Function 5, Feedback and Improvement. Applicable Lessons Learned are to be considered during working planning activities and incorporated in work processes, prior to performing work.

Please contact the following subject matter experts if you have any questions regarding this briefing.

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