

Occurrence Report

After 2003 Redesign

Lawrence Livermore Nat. Lab. (BOP)

(Name of Facility)

Accelerators

(Facility Function)

Lawrence Livermore National Lab.

Lawrence Livermore National Lab.

(Site)

(Contractor)

Name: Cherry Murray

Title: Principle Associate Director, Science & Technology

Telephone No.: (925) 422-7264

(Facility Manager/Designee)

Name: FREEMAN, JEFFREY W

Title: OCCURRENCE REPORTING

Telephone No.: (925) 424-6787

(Originator/Transmitter)

Name:

Date:

(Authorized Classifier (AC))

1. Occurrence Report Number: NA--LSO-LLNL-LLNL-2008-0015

Building 194 Employee Exposure to Diffuse Laser Light

2. Report Type and Date: FINAL

	Date	Time
Notification:	05/09/2008	16:34 (ETZ)
Initial Update:	06/17/2008	19:28 (ETZ)
Latest Update:	06/20/2008	17:02 (ETZ)
Final:	06/20/2008	17:02 (ETZ)

3. Significance Category: 3

4. Division or Project: S&T

5. Secretarial Office: NA - National Nuclear Security Administration

6. System, Bldg., or Equipment: 194 Accelerator Cave Laser

7. UCNI?: No

8. Plant Area: Site 200

9. Date and Time Discovered: 05/08/2008 12:00 (PTZ)

10. Date and Time Categorized: 05/08/2008 13:14 (PTZ)

11. DOE HQ OC Notification:

Date	Time	Person Notified	Organization
NA	NA	NA	NA

12. Other Notifications:

Date	Time	Person Notified	Organization
05/08/2008	13:52 (PTZ)	David Prokosch	ESH TL
05/08/2008	13:55 (PTZ)	Anita Gursahani	LEDO
05/08/2008	13:58 (PTZ)	John Retelle	NNSA/LSO

13. Subject or Title of Occurrence:

Building 194 Employee Exposure to Diffuse Laser Light

14. Reporting Criteria:

10(2) - An event, condition, or series of events that does not meet any of the other reporting criteria, but is determined by the Facility Manager or line management to be of safety significance or of concern to other facilities or activities in the DOE complex. One of the four significance categories should be assigned to the occurrence, based on an evaluation of the potential risks and the corrective actions taken. (1 of 4 criteria - This is a SC 3 occurrence)

15. Description of Occurrence:

On May 7, 2008 at approximately 10:30 a.m., two employees reported seeing laser light from a Class IV laser operation in the basement of Building 194. The two employees were reviewing the configuration of detectors in an adjacent room (Zero Degree Cave) from where the laser was operating. When they looked into an electron beam transport tube, they described seeing a green flickering light coming from the other room (Accelerator Cave). While a mechanism (i.e., gate valve on the tube) exists which could be employed to block the electron beam transport tube, it is not a required control for laser operations since the focused laser beam is not in the direct line-of-sight of the electron beam transport tube.

The employees were subsequently evaluated by an on-site optometrist and an off-site ophthalmologist who concluded that no injuries were sustained to either employee. Laser power meter readings conducted by both program and ES&H personnel confirmed that the level/intensity of light available to the affected employees was negligible. Upon reporting the incident, normal operations in the two rooms was suspended, although the laser was allowed to continue to operate in order to take the measurements which were found to be indistinguishable to background levels (nothing detected above 1 microWatt).

16. Is Subcontractor Involved? No

17. Operating Conditions of Facility at Time of Occurrence:

Does not apply

18. Activity Category:

03 - Normal Operations (other than Activities specifically listed in this Category)

19. Immediate Actions Taken and Results:

Immediately after the exposure, the operators of the laser system were notified and conducted informal laser power readings at and adjacent to where the employees were exposed. The meter readings, which were barely above background, ambient levels, were confirmed using calibrated meters employed by ES&H professionals. Normal operations were suspended in the two affected rooms until the preliminary evaluation of the incident was complete. Administrative controls will be in effect to prohibit occupancy in the area adjacent to the laser operation while the laser is operating until the two rooms can be totally isolated.

Immediately after the exposure, the operators of the laser system were notified and conducted informal laser power readings at and adjacent to where the employees were exposed. The meter readings, which were barely above background, ambient levels (approximately 1 microWatt), were confirmed using calibrated meters employed by ES&H professionals. Normal operations were suspended in the two affected rooms until the preliminary evaluation of the incident was complete. Administrative controls were put into effect to prohibit occupancy in the area adjacent to the laser operation while the laser is operating until the two rooms could be totally isolated. A new procedure was drafted and will be utilized by both operations (the detector operation in the Zero Degree Cave and the laser operations in the Accelerator Cave) which discusses the interlock of the gate valve. A Management Review identified three main causes and provided recommended corrective actions and will be shared with other LLNL programs.

20. ISM:

- 2) Analyze the Hazards
- 3) Develop and Implement Hazard Controls
- 5) Provide Feedback and Continuous Improvement

21. Cause Code(s):

A3B3C04 - Human Performance Less Than Adequate (LTA); Knowledge Based Error; LTA review based on assumption that process will not change
 -->couplet - A4B5C04 - Management Problem; Change Management LTA; Risks / consequences associated with change not adequately reviewed / assessed
 A4B5C05 - Management Problem; Change Management LTA; System interactions not considered
 A5B4C01 - Communications Less Than Adequate (LTA); Verbal Communications LTA; Communication between work groups LTA
 A4B3C08 - Management Problem; Work Organization & Planning LTA; Job scoping did not identify special circumstances and/or conditions

22. Description of Cause:

A Management Review was initiated as a result of several unique circumstances with this incident, including the

potential severity of the incident, the potential for some hazards not to be fully identified or evaluated, and the involvement of several work "groups." The review team reviewed work control documentation, toured the locations, and interviewed the affected workers. The review team concluded that the root cause of the incident was a failure to fully evaluate all hazards of the operation. The primary hazard in the room, the accelerator, was adequately evaluated, but the hazards with the laser operation, and the potential for the laser light to enter an adjacent room, were not fully addressed.

Corrective Action: Isolate the Two Work Locations - The Physical Sciences Directorate will take steps necessary to ensure that the two rooms are totally isolated which will include sealing gaps in the walls and developing a procedure to ensure that the gate valve that blocks the electron beam transport tube is down whenever work occurs in the Zero Degree Cave.

A3B3C04 LTA review based on assumption that process will not change. Over time, both the nature of the operation and the configuration of the hardware (i.e., electron beam tube, laser beam tube, etc.) in the Accelerator Cave was modified. Each change was considered relatively minor and insignificant by itself, but taken together the changes resulted in different operational conditions. Couplet A4B5C04 Risks/consequences associated with change not adequately reviewed/assessed. The potential for someone to view laser light through the now opened electron beam tube, through the now modified laser beam tube was not adequately reviewed.

A4B5C05 System interaction not considered. The potential of the laser operation to impact operations in adjacent rooms was not fully evaluated. Whereas the laser table was configured in such a way that a direct beam could not be directed down the electron beam tube, the diffuse laser light was able to be viewed through the modified laser beam tube and down the open electron beam tube.

A4B3C08 Job scoping did not identify special circumstances and/or conditions. While the work control documentation adequately covered the impact of the accelerator and the need to prohibit access into adjacent areas, the special circumstances around the use of Class IV laser(s) was only addressed for the potential impact to the Accelerator Cave and not adjacent space.

Corrective Action: Perform an Extent of Condition Review - The Physical Sciences Directorate will examine its operations to identify situations or operations that could pose similar concerns (i.e., hazards to co-located operations not fully evaluated, reconfigured operations not completely analyzed).

A5B4C01 Communication between work groups LTA. The two affected employees were working in the Zero Degree Cave as part of a separate project, but were also included in the laser operation's project planning documentation because of the need to access shared space where diagnostic equipment was located. The affected individuals had some level of knowledge that the two rooms were not truly isolated, but the significance of the gaps between rooms was never addressed or evaluated.

Corrective Action: Brief Physical Sciences Management on the Need for Improved Communication - The need for increased and improved communication between work groups will be conveyed at senior management meetings within the Physical Sciences Directorate along with instructions to pass this information along to lower management levels (i.e., group meetings).

23. Evaluation (by Facility Manager/Designee):

A Management Review was initiated as a result of several unique circumstances with this incident, including the potential severity of the incident, the potential for some hazards not to be fully identified or evaluated, and the involvement of several work "groups." The review team reviewed work control documentation, toured the locations, and interviewed the affected workers. The review team concluded that the root cause of the incident was a failure to fully evaluate all hazards of the operation. The primary hazard in the room, the accelerator, was adequately evaluated, but the hazards with the laser operation, and the potential for the laser light to enter an adjacent room, were not fully addressed.

24. Is Further Evaluation Required?: No**25. Corrective Actions**

(* = Date added/revised since final report was approved.)

- | | | | |
|----|---|--|------------------------------------|
| 1. | Perform causal analysis - Perform apparent cause analysis to identify the most probably cause(s) that explains why the event occurred. This information is contained in the Occurrence Report | Target Completion Date: 06/22/2008 | Completion Date: 06/03/2008 |
| 2. | Prepare Management Review - A Management Review Team was formed to investigate the incident, interview the affected employees and develop recommendations to prevent a recurrence. | Target Completion Date: 06/02/2008 | Completion Date: 06/03/2008 |
| 3. | Issue LLNL-Wide Lessons Learned - The Physical Sciences Directorate will work with the Lessons Learned Coordinator to issue a Lessons Learned highlighting the major issues from this incident. | Target Completion Date: *08/29/2008 | Completion Date: 08/18/2008 |
| 4. | Perform an Extent of Condition Review - The Physical Sciences Directorate will examine its operations to identify situations or operations that could pose similar concerns (i.e., hazards to co-located operations not fully evaluated, reconfigured operations not completely analyzed). | Target Completion Date: *08/29/2008 | Completion Date: 09/19/2008 |
| 5. | Brief Physical Sciences Management on the Need for Improved Communication - The need for increased and improved communication between work groups will be conveyed at senior management meetings within the Physical Sciences Directorate along with instructions to pass this information along to lower management levels (i.e., group meetings). | Target Completion Date: *08/29/2008 | Completion Date: 09/16/2008 |
| 6. | Isolate the Two Work Locations - The Physical Sciences Directorate will take steps necessary to ensure that the two rooms are totally isolated which will include sealing gaps in the walls and developing a procedure to ensure that the gate valve that blocks the electron beam transport tube is down whenever work occurs in the Zero Degree Cave. | Target Completion Date: 09/30/2008 | Completion Date: 06/24/2008 |

26. Lessons Learned:

The Management Review identified several Lessons Learned which can be shared with other organizations. The main point is that all aspects of operations need to be examined for the potential to impact other working groups/locations. This applies to not only the primary hazard with an operation (in this case, the accelerator was the primary hazard), but to secondary hazards. The same level of scrutiny needs to be applied for all hazards. Another Lessons Learned is the need to evaluate all operations whenever there is a change in configuration or operating parameters. A succession of small changes can, over time, lead to significant changes in the operation and possibly introduce new hazards. The third Lesson Learned is the need to maintain frequent and detailed communications with all working groups that are either directly involved with an operation or are working in close proximity. Increased communication between work groups can help identify hazards that are not immediately apparent to one group and is essential to the ISM Function of Feedback and Improvement.

27. Similar Occurrence Report Numbers:

DP-OAK--LLNL-LLNL-1999-0043DP-OAK--LLNL-LLNL-1998-0065SC-OAK--LLNL-LLNL-1998-0007DP-OAK--LLNL-LLNL-1996-0060

28. User-defined Field #1:

No injuries, No property damage

29. User-defined Field #2:

S&T PAT

30. HQ Keyword(s):

01A--Inadequate Conduct of Operations - Inadequate Conduct of Operations (miscellaneous)

01B--Inadequate Conduct of Operations - Loss of Configuration Management/Control

01G--Inadequate Conduct of Operations - Inadequate Procedure

01N--Inadequate Conduct of Operations - Inadequate Job Planning (Other)

01P--Inadequate Conduct of Operations - Inadequate Oral Communication

01R--Inadequate Conduct of Operations - Management issues

08C--OSHA Reportable/Industrial Hygiene - Industrial Hygiene Exposure

11F--Other - Inadequate Design

12J--EH Categories - OS/IH

14D--Quality Assurance - Documents and Records Deficiency

14E--Quality Assurance - Work Process Deficiency

14F--Quality Assurance - Design Deficiency

31. HQ Summary:

Two employees reported seeing laser light from a Class IV laser operation in the basement of Building 194 while they were reviewing the configuration of detectors in an adjacent room from where the laser was operating. When they looked into an electron beam transport tube, they saw a green flickering light coming from the other room. The employees were subsequently evaluated by an on-site optometrist and an off-site ophthalmologist who concluded that no damage occurred to either employee. Administrative controls will be in effect to prohibit occupancy in the adjacent area while the laser is operating until the two rooms can be totally isolated.

32. DOE Facility Representative Input:

33. DOE Program Manager Input:

34. Approvals:

Approved by: Cherry Murray, Facility Manager/Designee

Date: 06/20/2008

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