Performance Metrics

Using Laser Operator and Laser Approval Surveys

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DOE LSO Workshop
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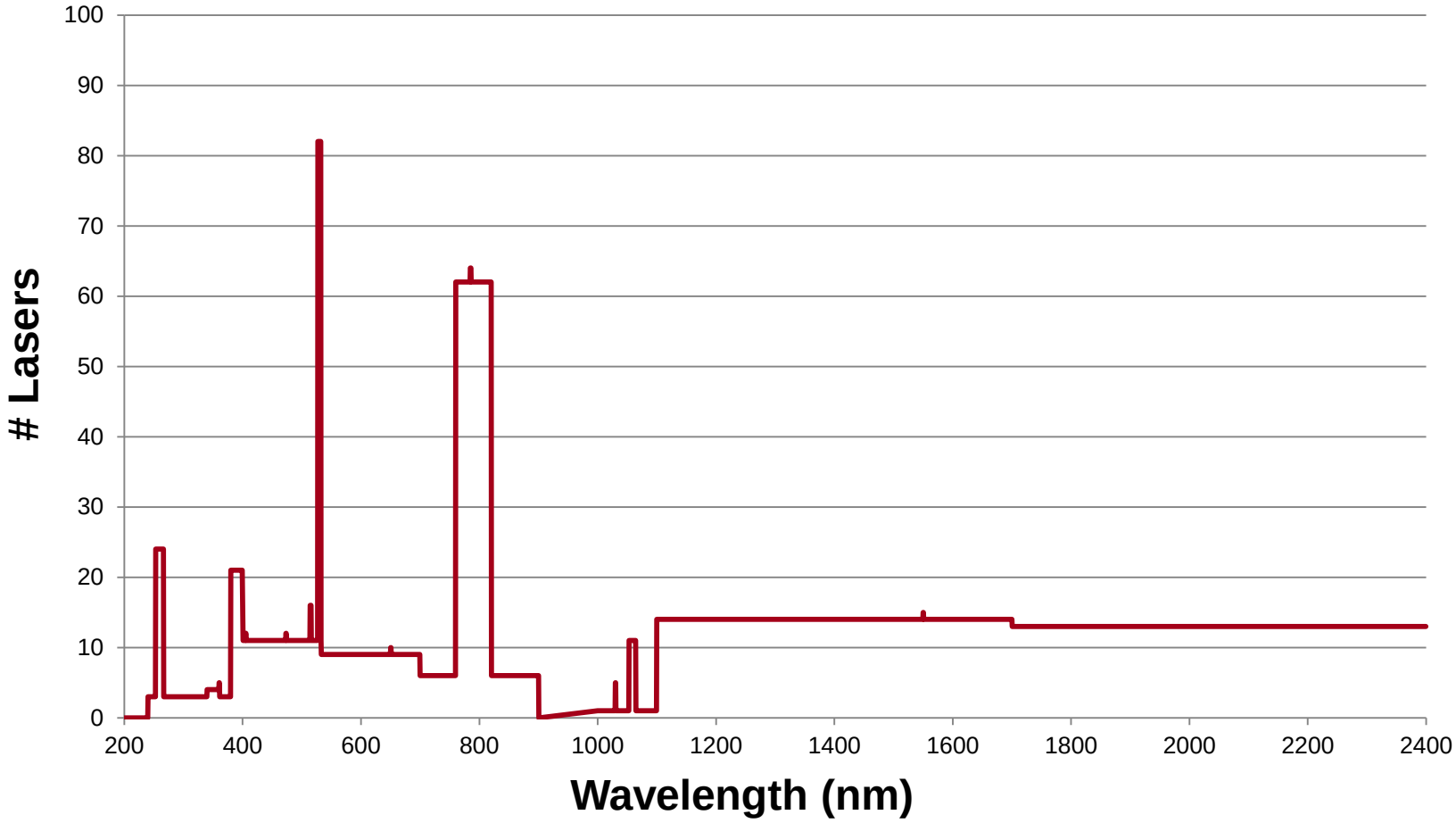
U.S. DEPARTMENT OF ENERGY
Office of Science

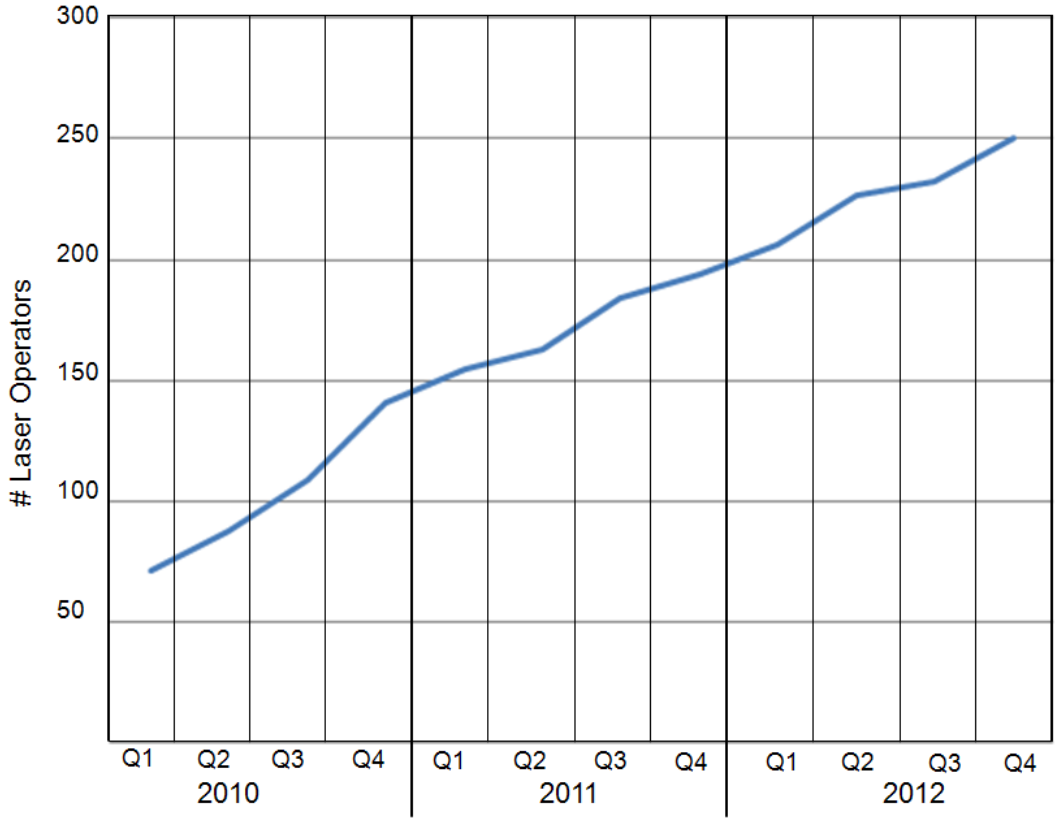
SLAC NATIONAL ACCELERATOR LABORATORY

SLAC's Laser Operations



25 laser facilities, 250 laser operators, 140 source lasers

SLAC's Laser Operations



Rapid growth in last 3 years!

(new programs in ultrafast science, in association with the LCLS x-ray laser facility)

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Laser Survey Questionnaires

SLAC

Annual Laser Operator Survey

- Quality and effectiveness of training, supervision, safety oversight and assistance, and of control measures
- Observations of safe practices and compliance with safety requirements
- Estimates of rates for near misses and injuries
- Estimates of probability to report near misses, injuries and other lessons learned items
- Survey takes ~15-20 minutes and is anonymous
- 79 responses for survey in summer 2012

Laser Operations Approval Survey

Done when approval is given for one of annual operation approval, new or revised laser safety procedure document, or a laser service subcontractor visit.

- Quality and timeliness of the approval process
- Review comments and action items are appropriate?
- Survey takes ~5 minutes and is not anonymous
- 42 surveys completed since May 2012

Laser Survey Questionnaires

Survey Goals

- Assess risk for a laser injury incident +
  identify ways to mitigate the risk
- Assess effectiveness and quality of laser operation reviews/approvals
- Identify areas of risk or concern
- Guide corrective actions and improvement opportunities
- Provide performance metrics that can be tracked for trending

Survey results are made available to SLAC's laser personnel and to the lab's safety management.

Laser Survey Questionnaires

SLAC 2012 Laser Operator Survey Results

- 79 responses received

LSO Workshop Participant Survey Results

- 40 response results reported on in this talk
- Participants were asked
  i. How they think laser operators would respond at their facility
  ii. Their opinion for response for laser lab operations they are familiar with

Will present a sample of the responses received. Will communicate full results from LSO Workshop Participant Survey next week. Results can be filtered, ex. by job function or by affiliation.

SLAC Survey Results + Comparison with LSO Workshop Survey Results

Rank in order from most effective (1) to least effective (5) these safety factors that are used to reduce the risk of a laser eye injury

	1 undefined Most Effective	2	3	4	5 undefined Least Effective
ESH/LSO oversight and assistance for laser safety	4.62% 3	9.23% 6	26.15% 17	30.77% 20	29.23% 19
Supervision of laser facility by SLSO	15.63% 10	37.50% 24	20.31% 13	17.19% 11	9.38% 6
Line management resources and assistance for laser safety (either budget or personnel)	3.17% 2	19.05% 12	22.22% 14	25.40% 16	30.16% 19
Available laser safety equipment or laser facility configuration	74.24% 49	10.61% 7	12.12% 8	1.52% 1	1.52% 1
Laser safety review and approval process	1.56% 1	25% 16	20.31% 13	25% 16	28.13% 18

SLAC Operator Results

SLAC Survey Results + Comparison with LSO Workshop Survey Results

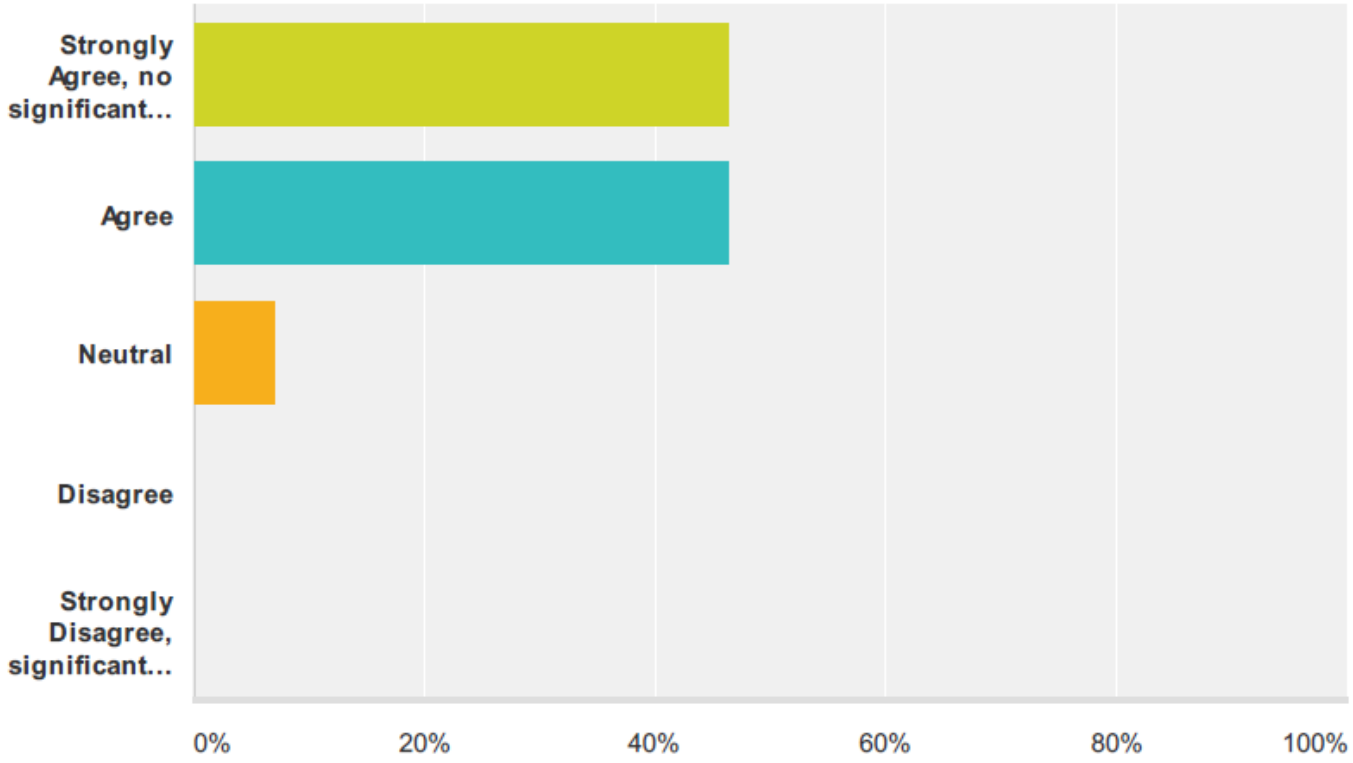
Rank in order from most effective (1) to least effective (5) these safety factors that are used to reduce the risk of a laser eye injury

	1 undefined Most Effective	2	3	4	5 undefined Least Effective
LSO oversight and assistance for laser safety	16.13% 5	9.68% 3	45.16% 14	16.13% 5	12.90% 4
Supervision of laser lab by its laser safety supervisor	24.14% 7	17.24% 5	13.79% 4	31.03% 9	13.79% 4
Line management resources and assistance for laser safety (either budget or personnel)	0% 0	17.24% 5	20.69% 6	20.69% 6	41.38% 12
Available laser safety equipment or laser facility configuration	55.17% 16	34.48% 10	0% 0	6.90% 2	3.45% 1
Laser safety review and approval process	7.14% 2	25% 7	21.43% 6	21.43% 6	25% 7

Workshop: All Participant Results – Expected Operator Response

SLAC Survey Results + Comparison with LSO Workshop Survey Results

Available equipment and laser facility configuration: Within the laser facilities in which you work, these are good and are effective; no significant improvements are needed to reduce risk of a laser injury incident.



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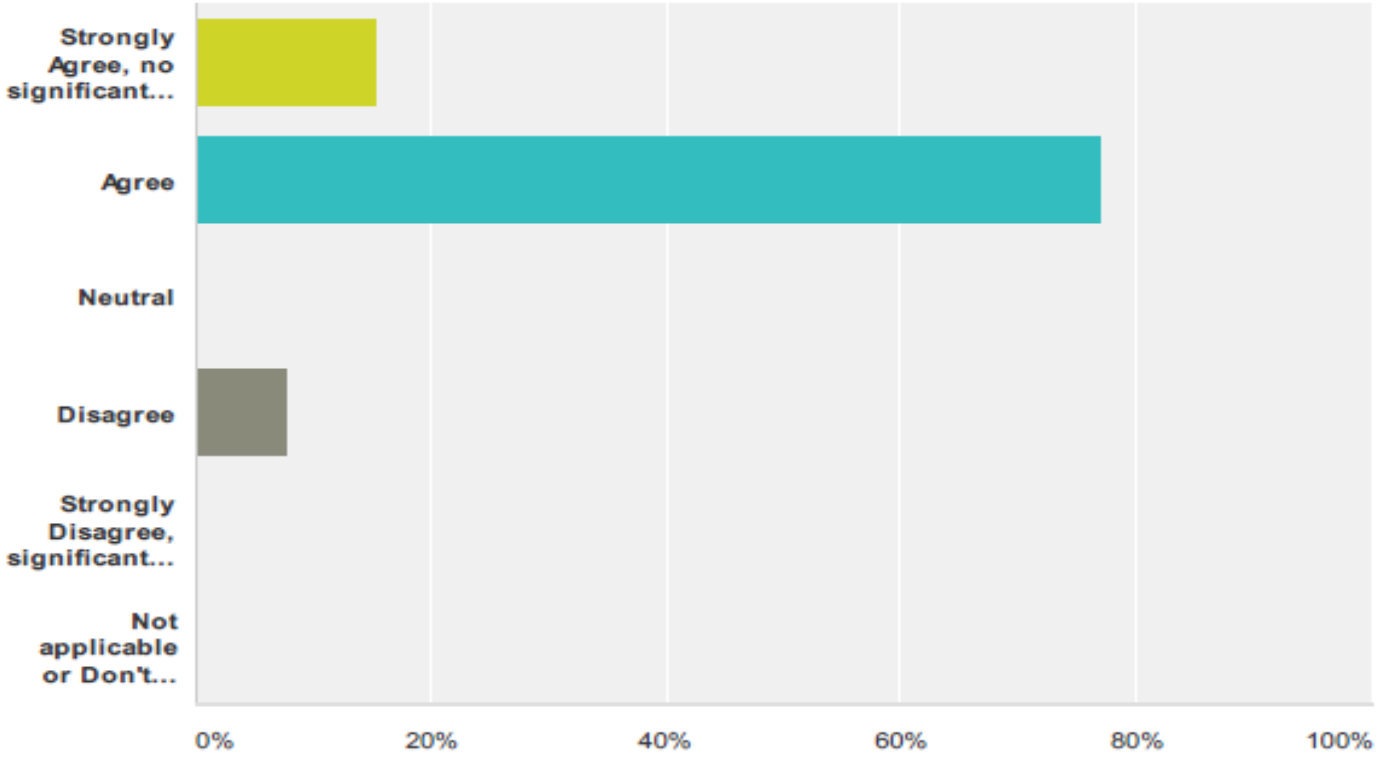

Workshop: University Results – Expected Operator Response

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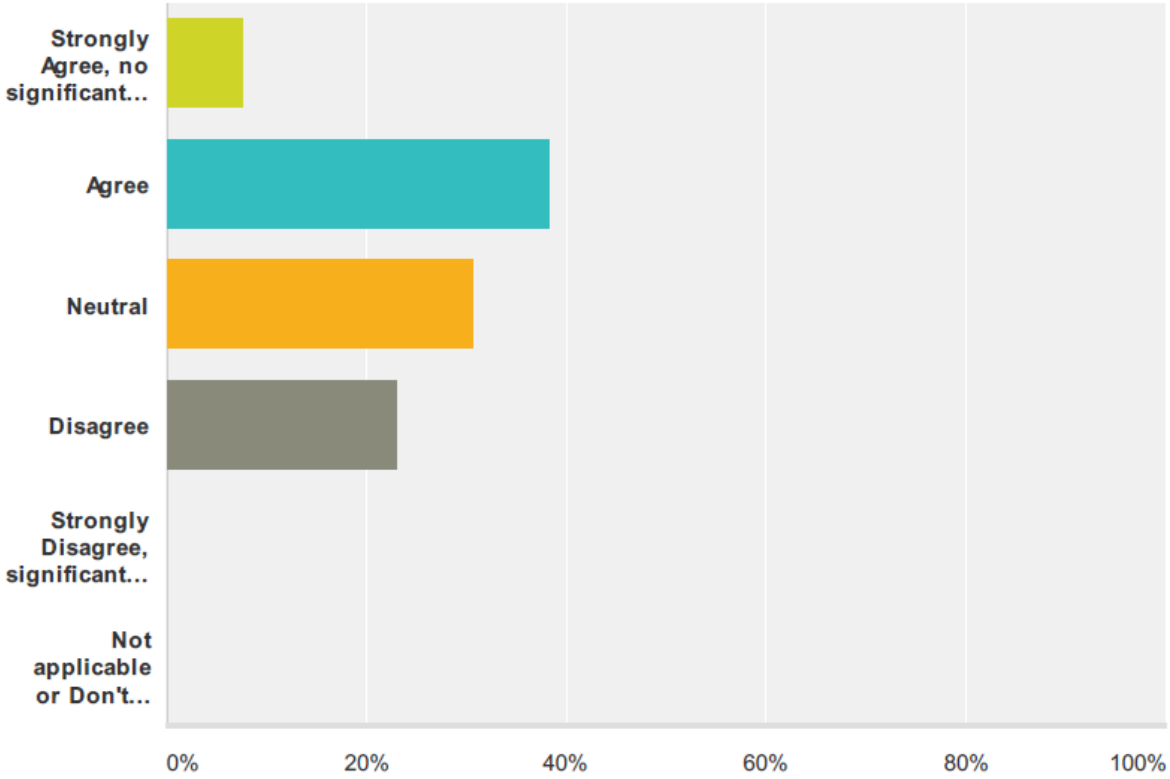
SLAC Survey Results + Comparison with LSO Workshop Survey Results

Available equipment and laser facility configuration: Within the laser facilities with which you are familiar, these are good and are effective; no Significant improvements are needed to reduce risk of a laser injury incident.



Workshop: University Results – Participant Response

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SLAC Survey Results + Comparison with LSO Workshop Survey Results

Rank in order from most effective (1) to least effective (5) these safety factors that are used to reduce the risk of a laser eye injury.

	1 undefined Most Effective	2	3	4	5 undefined Least Effective
Engineering controls	43.08% 28	24.62% 16	21.54% 14	6.15% 4	4.62% 3
Administrative procedures	4.62% 3	9.23% 6	29.23% 19	21.54% 14	35.38% 23
Laser eyewear	33.33% 22	42.42% 28	12.12% 8	7.58% 5	4.55% 3
ESH-provided training (ESH131 or ESH253)	3.08% 2	7.69% 5	13.85% 9	32.31% 21	43.08% 28
Site-specific and supervisor-provided training (SOP, OJT, posted procedures, ESH 253PRA)	16.92% 11	16.92% 11	24.62% 16	30.77% 20	10.77% 7

SLAC Operator Results

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SLAC Survey Results + Comparison with LSO Workshop Survey Results

Rank in order from most effective (1) to least effective (5) these safety factors that are used to reduce the risk of a laser eye injury.

	1 undefined Most Effective	2	3	4	5 undefined Least Effective
Engineering controls	70.97% 22	22.58% 7	0% 0	3.23% 1	3.23% 1
Administrative procedures	3.33% 1	20% 6	23.33% 7	20% 6	33.33% 10
Laser eyewear	3.23% 1	45.16% 14	32.26% 10	6.45% 2	12.90% 4
Training provided by your company or institution	6.25% 2	0% 0	18.75% 6	37.50% 12	37.50% 12
Site-specific and supervisor-provided training	19.35% 6	16.13% 5	22.58% 7	32.26% 10	9.68% 3

Workshop: All Participant Results – Expected Operator Response

SLAC Survey Results + Comparison with LSO Workshop Survey Results

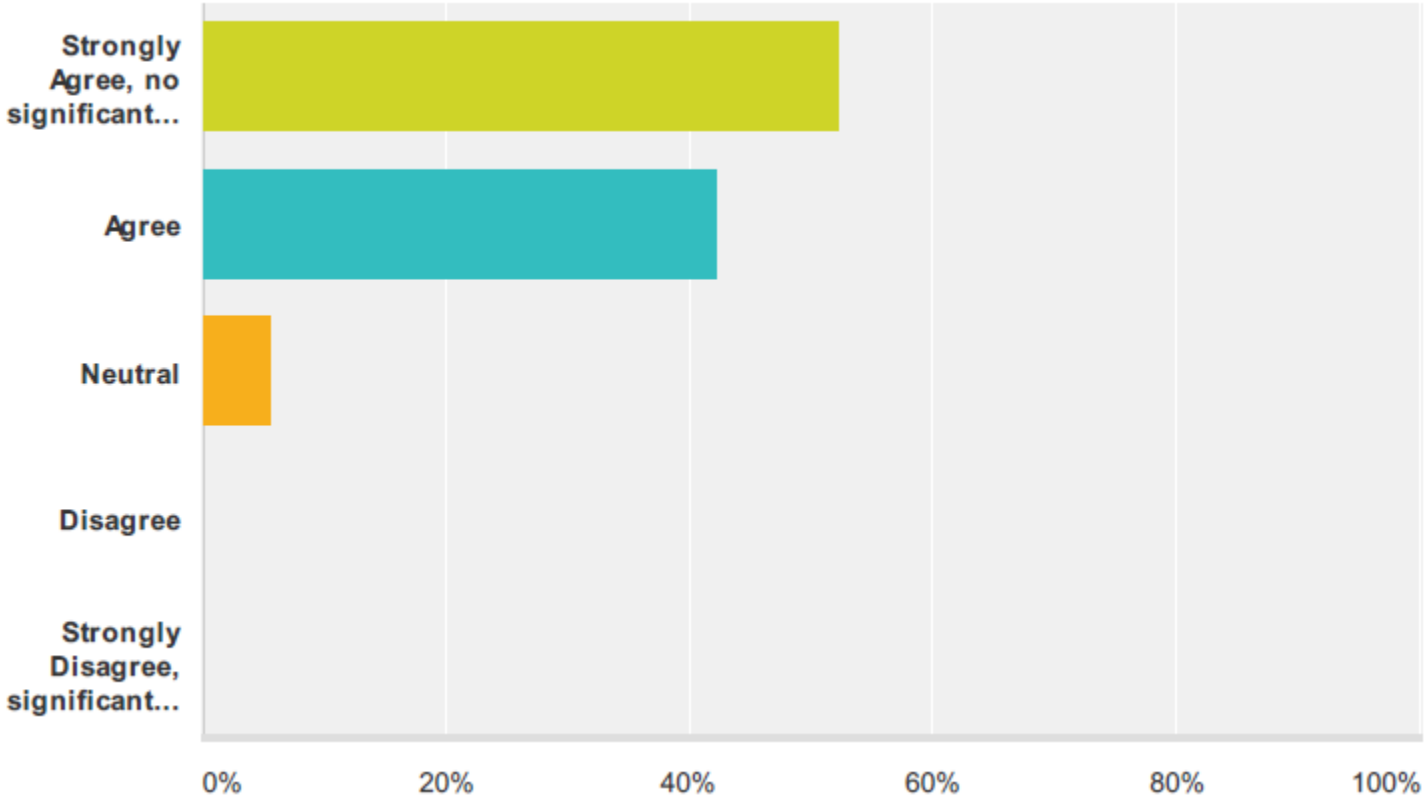
Rank in order from most effective (1) to least effective (5) these safety factors that are used to reduce the risk of a laser eye injury.

	1 undefined Most Effective	2	3	4	5 undefined Least Effective
Engineering controls	83.87% 26	9.68% 3	3.23% 1	0% 0	3.23% 1
Administrative procedures	0% 0	33.33% 10	26.67% 8	16.67% 5	23.33% 7
Laser eyewear	3.23% 1	22.58% 7	35.48% 11	22.58% 7	16.13% 5
Training provided by your company or institution	3.23% 1	3.23% 1	16.13% 5	35.48% 11	41.94% 13
Site-specific and supervisor-provided training	12.90% 4	32.26% 10	16.13% 5	25.81% 8	12.90% 4

Workshop: All Participant Results – Participant Response

SLAC Survey Results + Comparison with LSO Workshop Survey Results

Practicing safe laser procedures: within the laser facilities in which you work, laser operators work safely, adhering to safe practices



SLAC Operator Results

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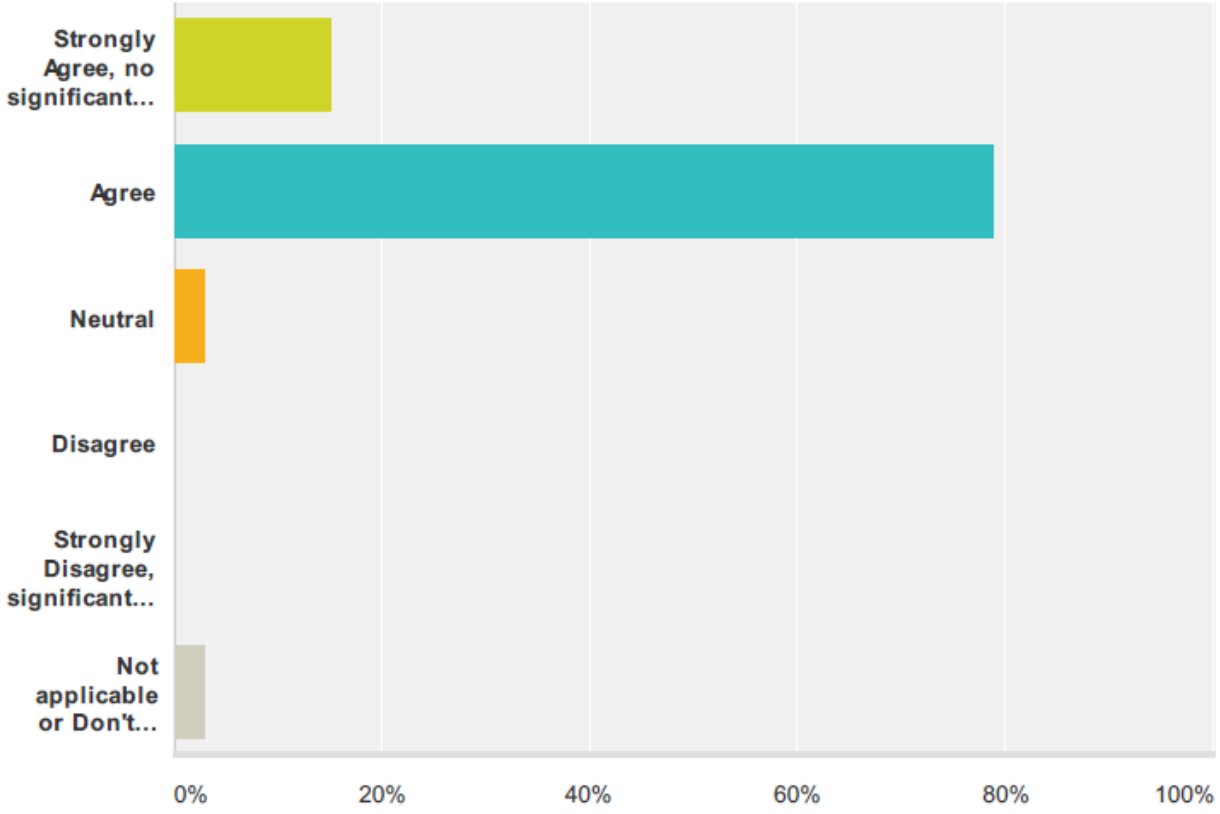

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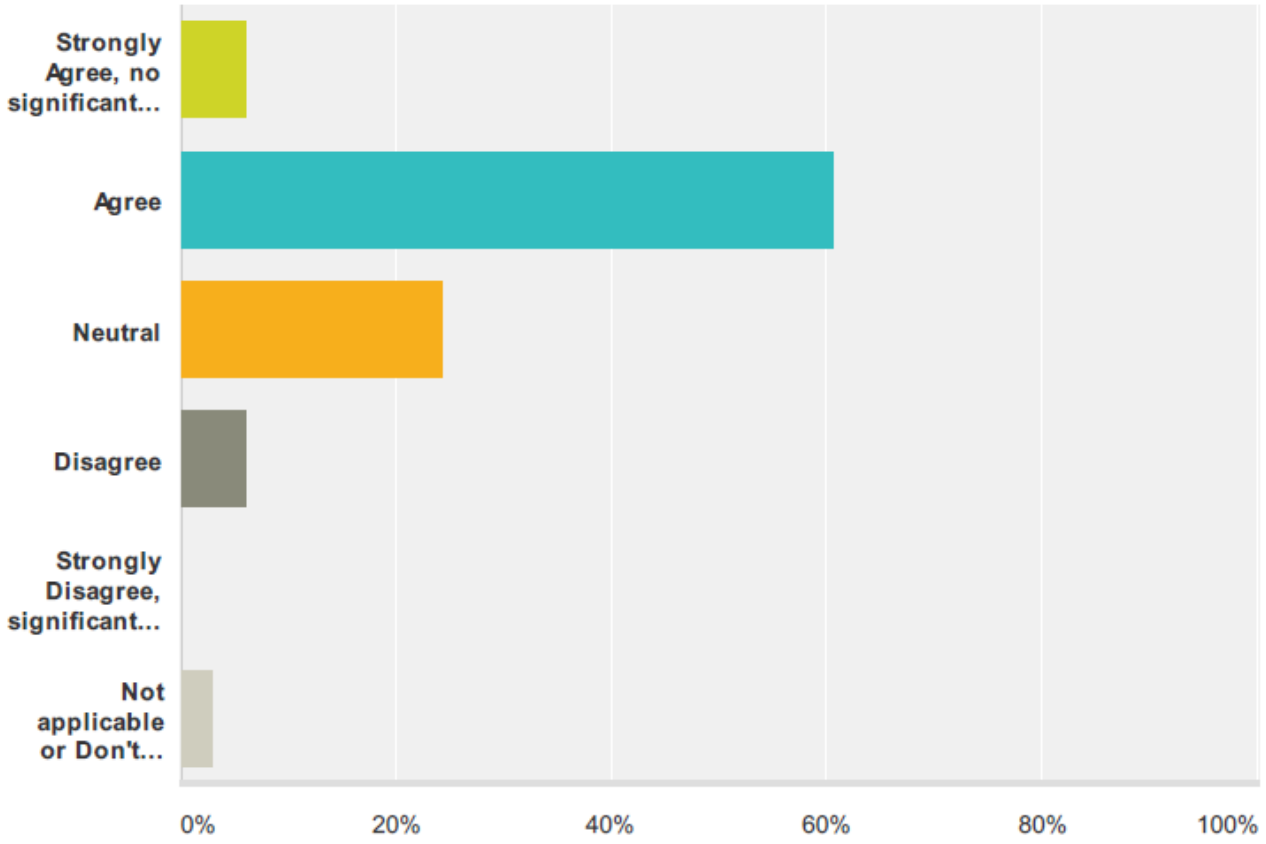

Workshop: All Participant Results – Participant Response

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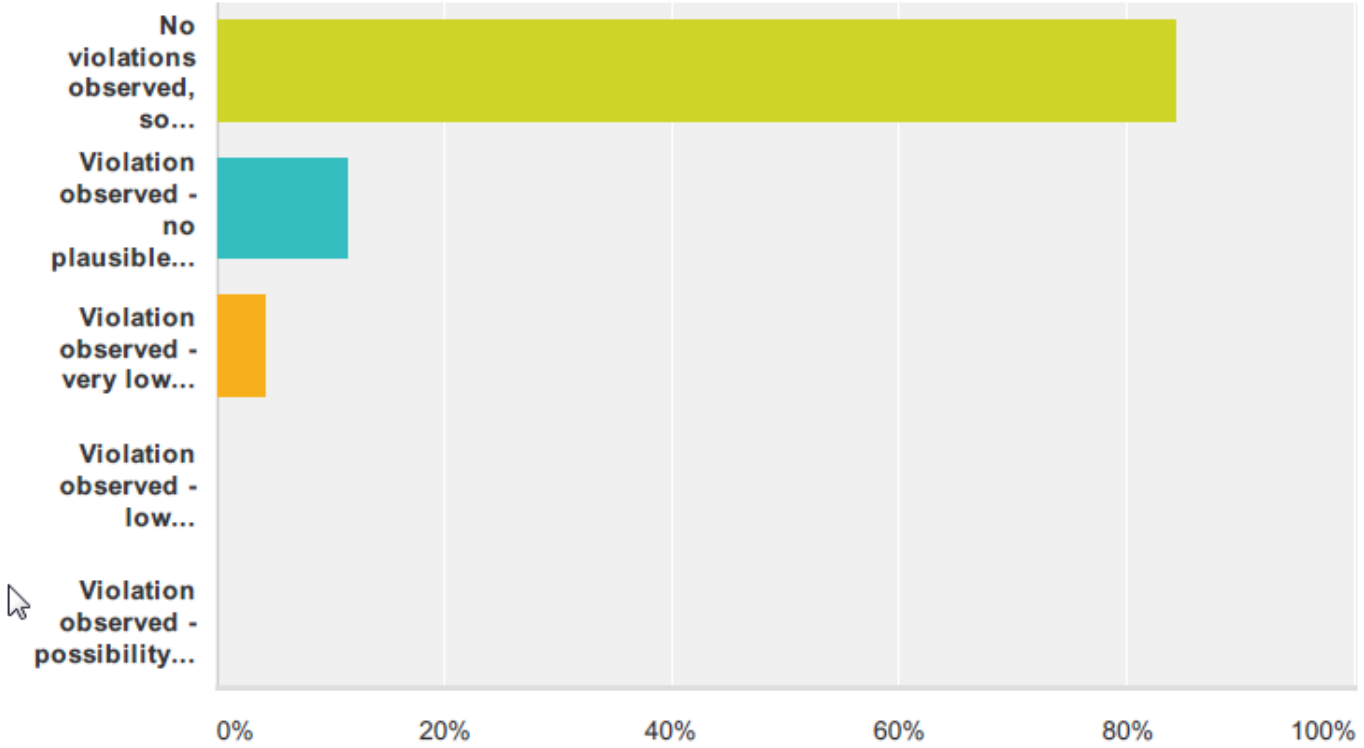
SLAC Survey Results + Comparison with LSO Workshop Survey Results

Laser Eyewear Practices: If a laser eyewear requirement has been observed to be violated, whether intentional or by mistake, estimate potential for a hazardous exposure of the most severe violation observed



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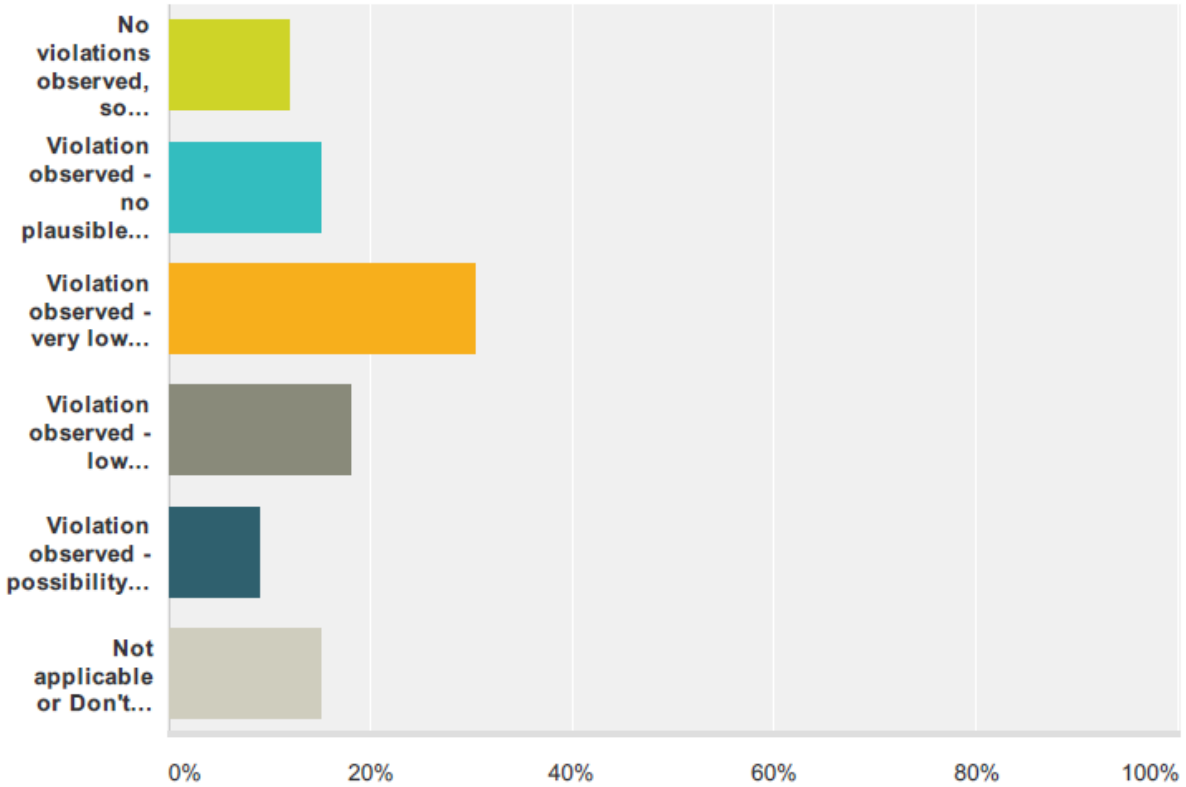

Workshop: All Participant Results – Expected Operator Response

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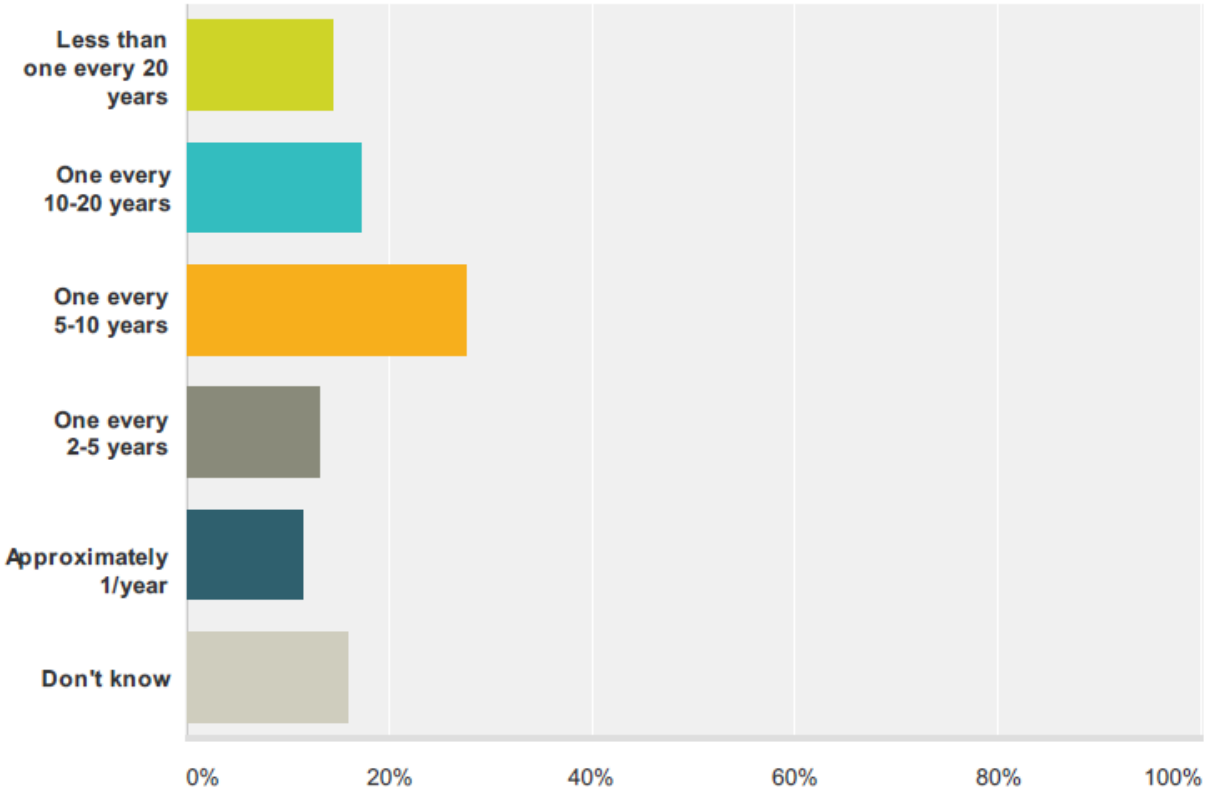
SLAC Survey Results + Comparison with LSO Workshop Survey Results

For every 100 laser operators at SLAC – what is your best estimate for how often a single eye injury may occur from a laser accident to any of these laser operators?



SLAC Operator Results

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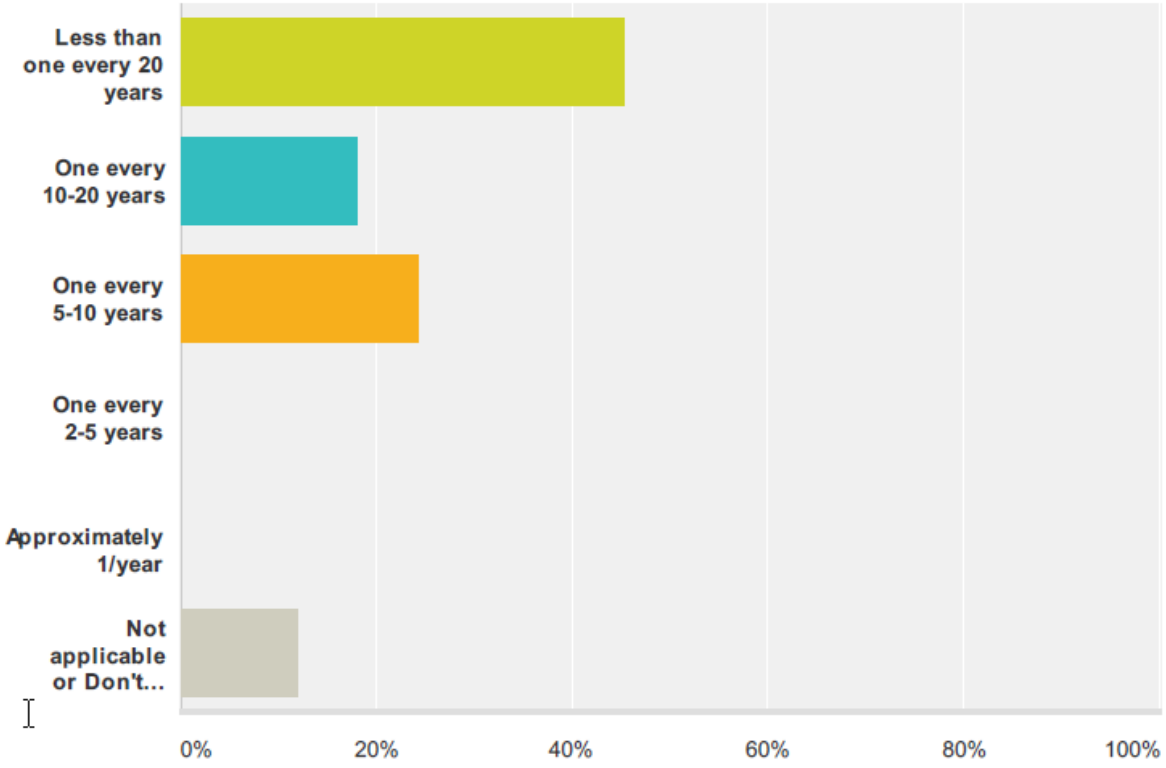
SLAC Survey Results + Comparison with LSO Workshop Survey Results

For every 100 laser operators at your facility – what is your best estimate for how often a single eye injury may occur from a laser accident to any of these laser operators?



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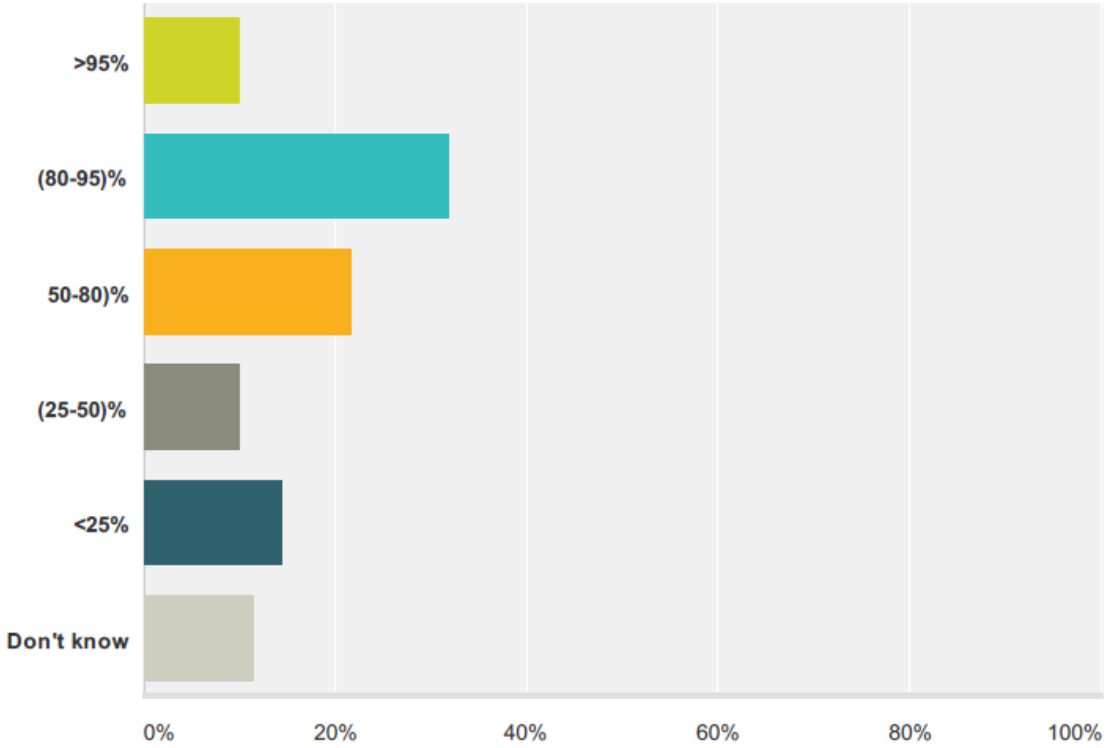
SLAC Survey Results + Comparison with LSO Workshop Survey Results

A Near Miss occurs when safety is compromised such that only one or no barriers are in place to prevent a laser eye injury. What is your best estimate of the probability that a Near Miss laser incident would be reported if it occurred?



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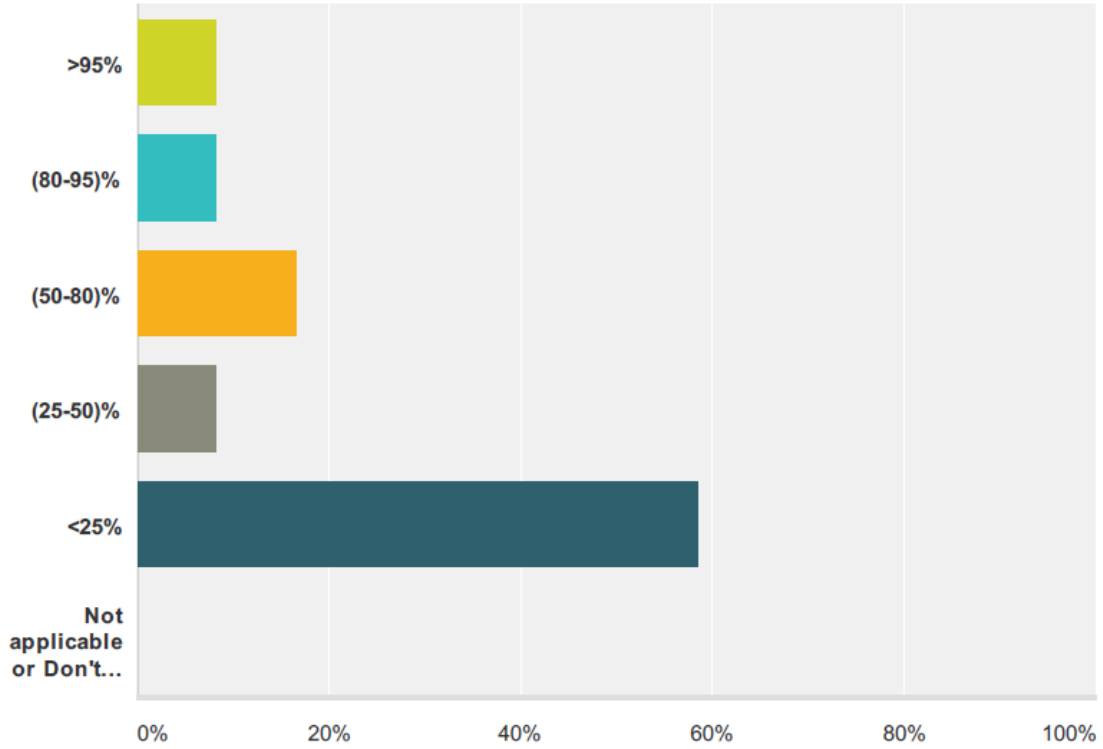

Workshop: All Participant Results – Expected Operator Response

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Summary

Good performance metrics are needed to assess the laser safety program and the safety of laser operations.

SLAC uses 2 surveys for input to its laser safety performance metrics. Results are communicated to laser personnel and lab safety management.

Survey results are used to:

- identify ways to improve SLAC's laser safety program
- help laser personnel (particularly laser supervisors) identify ways to improve safe laser operations.
- provide important information on the scope of laser operations and the associated risk, and on trends for the scope and risk.