

ES&H and Accelerator Readiness

Theodore Lavine

NLCTA Safety Officer & Operations Manager

- ES&H Milestones
- SLAC's ES&H Framework
- Safety Reviews
- Assuring the Accelerator Safety Envelope (ASE)
- Accelerator Readiness Review (ARR)
- Operations Organization
- Operator Training



Reference Documents

- Conceptual Design Report
- Hazard Classification
- Fire Hazard Analysis
- SAD Approval Draft
- Transactions of Safety Committees
- "Proposed PPS Access Control System for the NLCTA,"
(*NLCTA Note 45*)
- "Radiation Protection in the NLCTA," (*NLCTA-Note 46, Rev. 1*)
- "Average Current Limit for the NLCTA Thermionic Gun,"
(*NLCTA-Note 48*)
- "Analysis of Failure Modes of the Average Current Limit for
the NLCTA Thermionic Gun," (*NLCTA-Note 51*)
- ARR Report
- NLCTA Operations Directives (Draft)
- NLCTA Operations Personnel Plan (Draft)
- NLCTA Safety Procedures
- SLAC Guidelines for Operations
- SLAC ES&H Manual

ES&H Milestones

NEPA: Categorical Exclusion granted by DOE, 12/29/92.

Conceptual Design Report, SLAC-411, 8/93.

Hazard Classification

Low-Hazard Radiological Facility: Other than routinely accepted hazards, the impact of potential hazards to people or the environment is minor on site, and negligible off site.

Haz. Class. proposal submitted to DOE, 5/31/95.

Accepted by the Director, Office of ER, 6/16/95.

Fire Hazard Analysis

A comprehensive assessment of risks from fire, in relation to existing or proposed fire protection, so as to ascertain whether the objectives of the DOE Fire Protection Order (5480.7A) have been met.

FHA submitted to DOE Field Office, 5/4/95.

Approved, 6/1/95.

Safety Analysis Document

Draft to Directorate, DOE, and ARR Team, 5/31/95.

Accelerator Readiness Review

Conducted by SLAC, 6/95.

Table 1.1: Hazard Identification and Risk Determination Summary

Note: The hazards reviewed and listed here are only those which arise as a consequence of the operation of the facility concerned. Hazards which arise in the course of production of parts of the facility, or involving on-site transportation of materials or personnel, are not considered here. Normal and customary hazards typical of light industrial operations are not considered.

Item	Hazard	Causes	Prevention/Mitigation Means	Potential Impact	Consequence	Probability
7.3.1	Ionizing radiation exposure, outside housing	Personnel error, interlock failure	Safety procedures, design, maintenance, and inspection of radiation safety systems; training	Personnel injury	3—Low	A—Extremely Low
7.3.2	Ionizing radiation exposure, inside housing	Personnel error, interlock failure	Safety procedures, design, maintenance, and inspection of radiation safety systems; training	Personnel injury	2—Medium	A—Extremely Low
7.3.3	Exposure to residual activity inside housing	Procedural error, personnel error	Guidelines for Operations, training, Radiation Work Permits	Personnel injury	1—Extremely Low	A—Extremely Low
8.1	Fire; accelerator housing, equipment and control areas	Equipment failure	Sprinklers, fire alarms, exit routes, training, on-site fire department	Personnel injury, property loss	3—Low	B—Low
8.3	Electric Shock	Personnel error, interlock failure	NEC compliance, interlocks, training, lock and tag	Personnel injury, fatality	2—Medium	B—Low
8.4	Non-ionizing radiation exposure	Personnel error, interlock failure	Safety procedures, design of interlock systems, training	Personnel injury	3—Low	B—Low
8.7	Seismic Hazards	Earthquake	Building and structural codes and standards, field inspection	Personnel injury, property loss	3—Low	B—Low

E S & H Framework at SLAC

- ES&H Coordinating Council
- Operating Safety Committee
- Local, Departmental Safety Committees
- Citizen Safety Committees
 - ALARA
 - Earthquake Safety
 - Electrical Safety
 - Fire Protection
 - Hazardous Experimental Equipment
 - Hoisting & Rigging
 - Radiation Safety
 - Non-ionizing Radiation Safety
 - Safety Overview Committee
- ES&H Division
 - ES&H Manual
 - Electrical Safety (*Ishwar Garg*)
 - Fire Protection (*Jim Scott, Fire Prot. Engr.*)
 - Radiation Physics (*Vashek Vylet*)
 - Operational Health Physics
 - Occupational Safety
 - Industrial Hygiene (*John Shepardson, Ih Lin*)
 - Medical Department
 - PAFD Fire Station on site
 - Environmental Protection & Waste Management
 - Quality Assurance (Compliance Auditing)
- Each Accelerator (SLAC, PEP, SPEAR, NLCTA, . . .)
 - Safety Office(r)
 - Operations group

Citizen Safety Committees

Safety Overview Committee (D. Fryberger, Chair)

Presentation by Lavine 10/7/93;

Approval Memo from Fryberger to Lavine 10/18/93.

Electrical Safety Committee (I. Garg, Chair)

Presentations by Lavine, Fuller, and Corvin, 3/9/94;

Presentations by Kendall and Fuller, 6/8/94;

Memo from Lavine to Garg resolving issues 7/8/94;

Memo from Garg to Lavine accepting resolutions 7/12/94;

Minutes granting approval 6/20/94;

Tour of completed electrical systems, 6/7/95.

Fire Safety Committee (C. W. Allen, Chair)

Presentation to Committee by Lavine 9/7/94;

Request for info. from Allen to Lavine, 11/30/94;

Memo resolving questions from Lavine to Allen, 5/1/95;

Approval Memo from Allen to Lavine 5/15/95.

Earthquake Safety Committee (B. Youngman, Chair)

Presentation of shielding design, 8/27/92;

Presentation of ESB wall reinf. design, 5/27/93;

Presentation of Substation Bldg (No. 501), 8/11/93;

Presentation of overhead cable tray system, 9/13/93;

Presentation of Control Room Bldg (No. 128), 5/11/94;

Memo of approval from Youngman to Lavine 7/13/94.

(Citizen Safety Committees, Cont'd.)

Radiation Safety Committee (H. Lynch, Chair)

Presentation by Lavine and P. Bong, 5/7/95.

Second meeting, 6/6/95, to review:

- (a) Average Current Limiting Circuit,
- (b) Beam Dump power-handling capability,
- (c) PPS interface details.

Third meeting, 6/7/95, to review ASE, 6/7/95.

Future mtg. to review failure-modes of av. current limiter.

Non-Ionizing Radiation Safety Committee (G. Caryotakis, Chair)

Future meeting to review potential hazards due to:

- (a) Ceramic gap of X-band klystron isolated collector,
- (b) Non-interlocked air-filled waveguide carrying 0.5-W average power from the TWT driver.

Table 9.1: Means of Assurance of Accelerator Safety Envelope; Ionizing Radiation

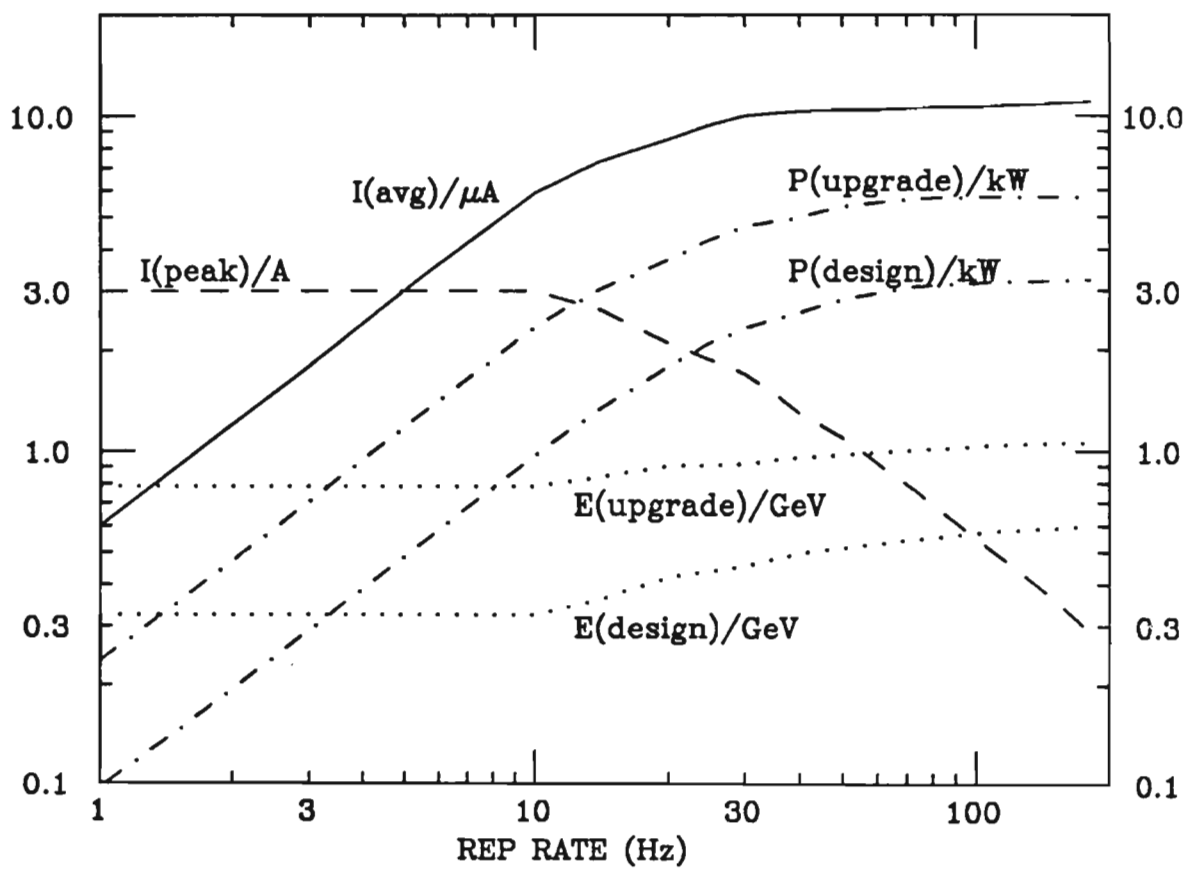
Restraint	Means of Assurance
Beam Power	Intrinsic capability of linear accelerator. Average current limiting circuit required to be periodically checked by BAS.
Radiation Shielding Design	<ol style="list-style-type: none"> 1. Beam line design and shielding arrangement by Radiation Physicist, in accordance with Radiological Protection Guidelines. 2. Review by Radiation Safety Committee. 3. Field Inspection(s) by Radiation Physicist and operations staff. 4. Radiation measurements during commissioning to validate design.
Configuration Control	<ol style="list-style-type: none"> 1. Beam Authorization Sheet (BAS) requires inspection of moveable shielding, and other safety-related items on start up. 2. Configuration control via Guideline 14.
Radiation Safety Systems	<ol style="list-style-type: none"> 1. Personnel Protection System (PPS), Beam Containment System (BCS) and Beam Shut Off Ion Chamber (BSOIC) system design, maintenance and periodic inspection controlled by formal procedures. 2. Design changes reviewed by Radiation Safety Committee and/or Radiation Safety Officer. 3. Operation of PPS and BCS and BSOIC system controlled by formal procedures. 4. Configuration control via Guideline 14.
Significant Modification	<ol style="list-style-type: none"> 1. Modifications which may impact Safety Envelope require review by Safety Overview Committee.*
Operations	<ol style="list-style-type: none"> 1. Control room is required to be staffed by specified complement of qualified operators.† 2. Operators are required to be qualified in accordance with training plan.‡

* See SLAC Guidelines for Operations, Guideline 24, "Safety Review of Major Modifications."

† See NLCTA Operations Directives, (in preparation).

‡ See Section 5.2 above.

Beam Power Limits



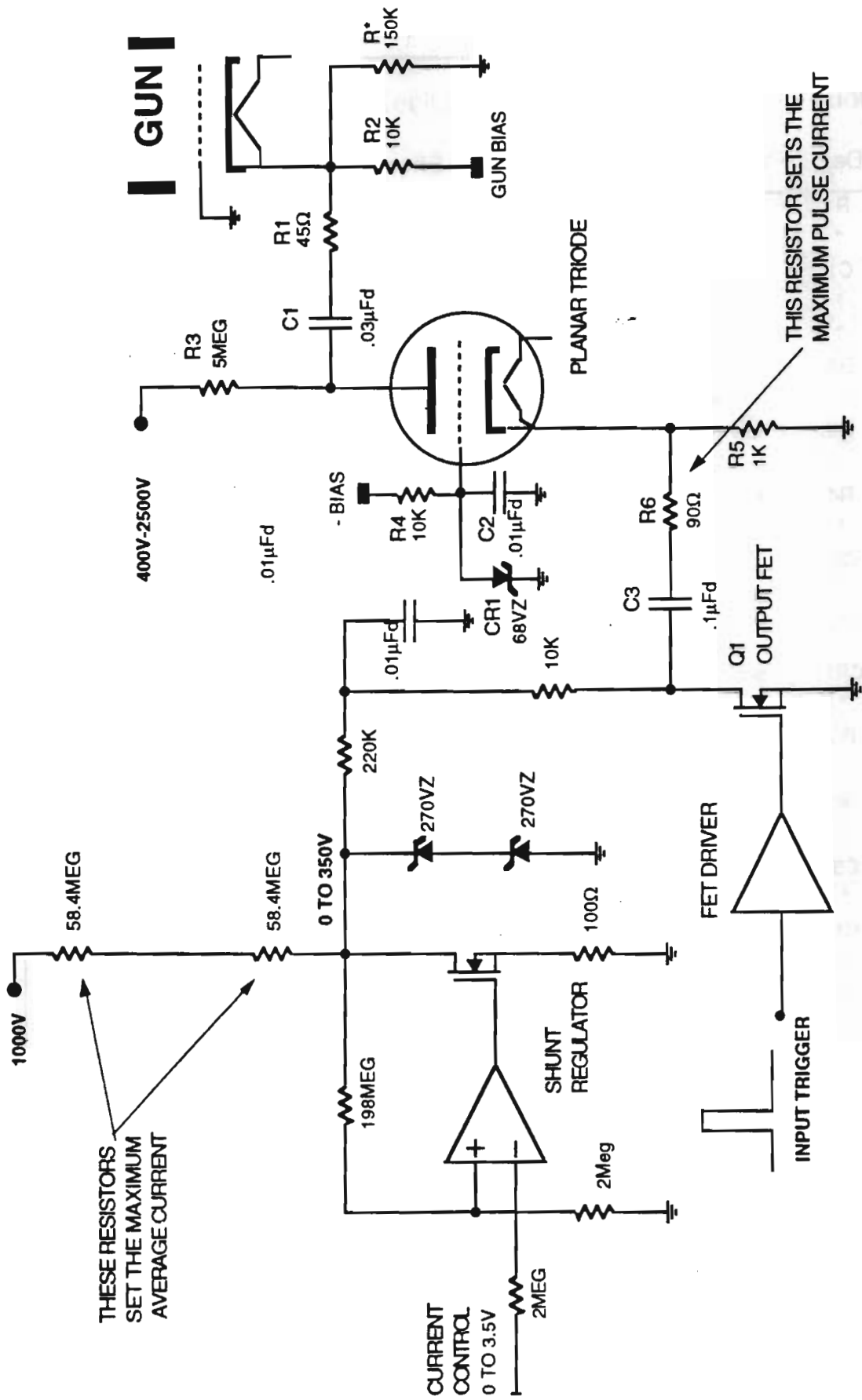


Fig. 2 PROPOSED NLCTA GUN PULSER CIRCUIT

Table 1

Effects of Various Component Failures, Gun Pulser Circuit (Fig. 2)

Component	Des.	Failure Mode	Effect
45Ω Resistor	R1	increase	Reduced output current, slower output rise time
"	"	open	No output current
.03μF Cap	C1	decrease	Pulse distortion (droop)
"	"	leaky	Reduced output current, lower Planar Triode anode voltage
"	"	shorted	Reduced or zero output current
10KΩ Resistor	R2	increase	Reduced output current
"	"	open	No output, potential damage to gun*
5MΩ Resistor	R3	increase	Reduced output current
"	"	open	No output current
10KΩ Resistor	R4	increase	Little or no change in output
"	"	open	Little or no change in output
.01μF Cap	C2	decrease	Pulse distortion (droop)
"	"	leaky	Reduced output current, lower Planar Triode anode voltage
"	"	shorted	Zero output current, lower Planar Triode anode voltage to about 100 V
68V Zener	CR1	decrease	Reduced output current, lower Planar Triode anode voltage
"	"	shorted	Zero output current, load down Planar Triode anode supply
1KΩ Resistor	R5	increase	Little or no change in output
"	"	open	No output, C3 would charge up
90Ω Resistor	R6	increase	Reduced output current
"	"	open	No output current
.1μF Cap	C3	decrease	Pulse distortion (droop)
"	"	short	No output current
FET Switch	Q1	open	No output current
"	"	leaky	Reduced output current
"	"	short	No output current
Gun Bias Supply	-	increase	Reduced output current
"	-	decrease	Increased DC output current, may cause 200KV supply to trip off
Triode Bias Supply	-	increase	Reduced output current
"	-	decrease	Reduced output current, lower Planar Triode anode voltage

* The 150-kΩ resistor (R*) between the gun cathode and ground is present to prevent excessive voltage from developing between the cathode and grid.

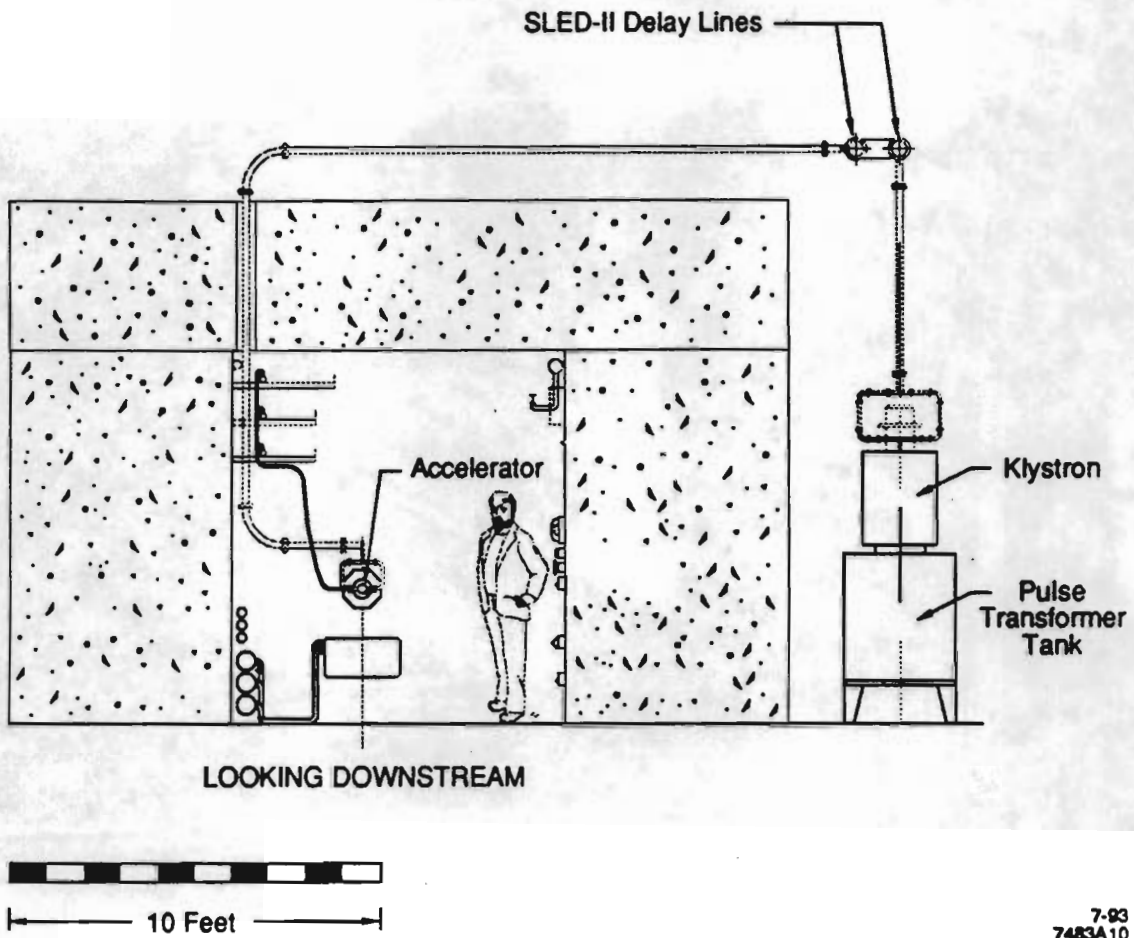
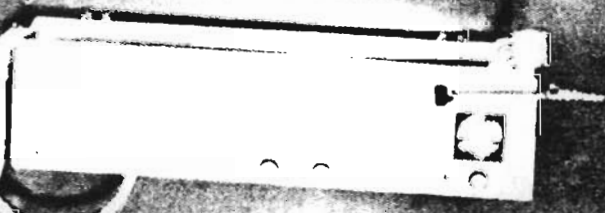


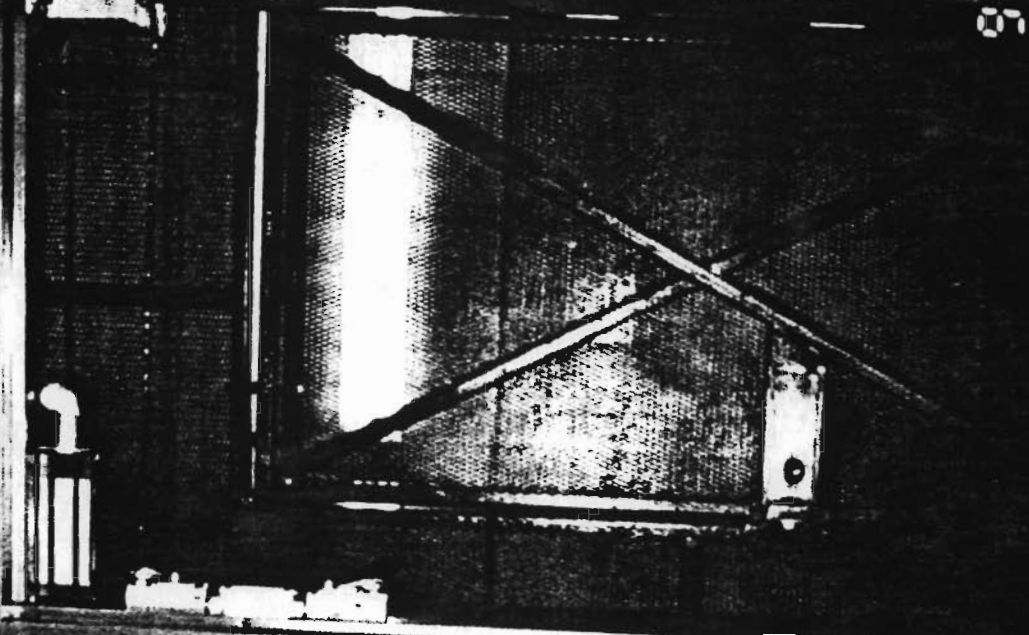
Figure 3.2: Cross-sectional View of the NLCTA Linac

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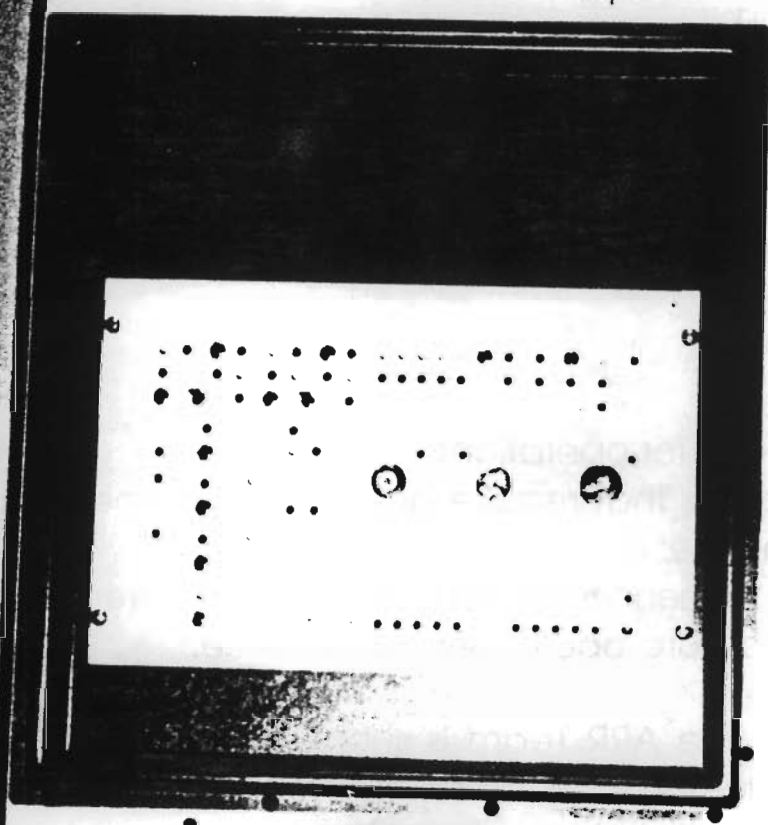


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The Accelerator Readiness Review

- Assesses readiness of hardware, people, and procedures for safe operation.
- Audits the Safety Analysis Document.
- Must occur prior to commissioning or operation of an accelerator facility. (Is conducted by the contractor for a low-hazard facility.)
- Possible outcomes:
 - (a) Facility is ready for operations;
 - (b) A list of findings that require action before operations may commence;
 - (c) A list of recommendations which are not required to be addressed before operations commence.
- Written report of the ARR Team is submitted to the senior management official responsible for the facility.
- The senior management official requires that the project management respond appropriately to the findings of the ARR report, and may call upon review-team members to evaluate the responses of the project staff to their findings.
- When the senior management official is satisfied that the project has responded to the ARR report, he may request the DOE local office to authorize the appropriate stage of operations.
- *Validation of the ARR:* The DOE local office is required to confirm the adequacy of the ARR, and of the project's response to the Findings, prior to authorizing operation.

ARR Process

4/95	Review Team Appointed (from SLAC, SSRL, LBL)
6/8-6/22/95	ARR & Field Investigation
6/26/95	Findings reviewed with project staff
7/5/95	ARR Report
Soon	DOE Validation Review Report

ARR TEAM

John Harris *SLAC, Technical Division (ARR Team Leader)*

Bob Hettell *SLAC, SSRL Division*

Alan Jackson *LBL, Advanced Light Source*

Lew Keller *Independent Consultant*

Sandy Pierson *SLAC, PEP II Division*

Sayed Rokni *SLAC, ES&H Division*

Tom Taylor *SLAC, PEP II Division*

THE ARR TEAM

John Harris has been involved in the management of operations at high energy physics facilities since 1959 when he joined the staff of the Cosmotron at Brookhaven National Laboratory, later becoming Operations Manager of that facility. In 1965 he moved to SLAC, and was charged with the construction and operations management of the experimental areas. He later became involved in the construction, commissioning and operations of the SPEAR storage ring facility. In 1976 he was charged with managing the routine operations of SPEAR and in coordinating the experimental schedule for both high energy physics and synchrotron radiation programs. He was the liaison between SLAC and SSRL in the early years of the latter facility. He was appointed to manage the operation of the SLAC Linear Collider in 1984, remaining in that position until he retired from full time assignments at SLAC in 1988. He has remained as a part-time consultant, concentrating on drafting policies and procedures to bring the laboratory into compliance with the new wave of DOE orders. He was a Technical consultant on the DOE panel that developed the Accelerator Safety Order (DOE 5480.25), and has served on a number of DOE panels regarding accelerator safety. He is attached to the office of the Associate Director, Technical Division.

Robert Hettel is EE Group Leader for the SSRL Accelerator Systems Department and a member of the accelerator physics group. He has been a member of the SSRL staff since 1980 and has extensive experience in instrumentation and control systems, personnel protection and beam containment interlock design, feedback systems, and accelerator component and system design in general. He was electrical systems manager for the SPEAR 3 GeV Injector construction project (1987-91), responsible for instrumentation, control, power supply, magnet pulser, and rf system implementation, and was heavily involved with the DOE ARR conducted for that facility. He has been a review committee member and consultant for several beam monitoring and control systems at other synchrotron radiation labs around the world. Before SSRL, he was a SLAC employee off and on since his student days in the late 1960s, working primarily on high energy beam detector data acquisition systems. He has a BS in Physics from Harvey Mudd College (1971).

(Continued on next page)

ARR TEAM (Cont'd.)

Alan Jackson is a Staff Scientist at the Lawrence Berkeley Laboratory, and serves as Advanced Light Source Accelerator Group Leader with responsibility for determining and maintaining accelerator parameters for different user configurations, and for accelerator development. From 1987-1993, he was Deputy Director of the ALS (construction) Project. Responsible for accelerator design, specifying engineering tolerances, accelerator commissioning, developing accelerator safety documentation. He was the ALS coordinator of the ALS accelerator readiness review. He was a Technical consultant on the DOE panel that developed the Accelerator Safety Order (DOE 5480.25), and served as a technical consultant to DOE on the ARR's of the SPEAR injector and of CEBAF.

Low Keller has worked in high energy physics experimentation and beam design since 1968, first at Argonne National Laboratory and then at SLAC. He managed the Experimental Facilities Department at SLAC from 1973 to 1992. He was chairman of two Independent Accelerator Readiness Review Committees convened by the Department of Energy at CEBAF. He is presently consulting for the PEP-II Machine Detector Interface Group and the BaBar Detector Collaboration at PEP-II.

Everett (Sandy) Pierson is currently the ES&H officer for the PEP-II division, responsible for all aspects of environment safety and health at PEP-II. Before being assigned to PEP-II he worked as a Quality Engineer for the Quality Assurance Dept. of the ES&H division. Some of his duties with QA included Contract Oversight of construction, OSH oversight, transportation inspections of radioactive materials and hazardous waste shipments, Health Physics and ORPS. He has been at SLAC for eleven years.

Sayed Rokni received a Ph.D. in Nuclear Physics from Utah State University in 1987. He was a postdoctoral fellow at the University of Massachusetts, Amherst, from 1987 to 1989 studying electron-nucleon, electron-nucleus scattering at SLAC and Bates/MIT laboratories. He joined SLAC as an Engineering Physicist in the Experimental Facilities Department in 1989, serving as Safety officer for the Final Focus Test Beam (FFTB) Project. In 1991 he became a Health Physicist in the Radiation Physics Department, with responsibility for the radiation safety of the FFTB and the BSY. He is a member of the E142 and E154 collaborations.

Tom Taylor joined SLAC in 1965. He has worked in many areas of accelerator operations from standing shifts to the development and management of operating organizations that included SPEAR and PEP. He is presently the installation manager for the PEP-II/B-factory storage rings.

ARR TEAM ASSIGNMENTS

Item	Assigned
1.0 Accelerator Safety Envelope	
1.1 Accelerator Safety Envelope (ASE) has been developed which correctly describes the maximum credible accident scenarios and adequately provides for risk limitation.	Jackson, Rokni
1.2 The ASE has been reviewed by the internal safety review system and comments from that review process have been addressed.	Rokni
1.3 The shielding has been installed in accordance with the shielding design document (NLCTA #46.1, May 30 1995), and constitutes an adequate access control barrier.	Rokni, Taylor
1.4 The radiation safety systems that are identified in the ASE are complete, and have been functionally tested. A system is in place to assure the continued testing and inspection of ASE items.	Hettel
1.5 The administrative systems identified in the ASE are in place and necessary personnel have been trained in their use.	Taylor
1.6 Training has been provided for personnel involved in operations, maintenance and emergency response. Qualifications for operations staff have been specified and adequate numbers of operators have been qualified. Operator training workbooks and qualification records are available.	Taylor
1.7 A draft Beam Authorization Sheet has been prepared which correctly identifies the testing and verification required to assure that operations will not exceed the accelerator safety envelope.	Rokni
2.0 Fire Safety	
2.1 Fire Alarm and Suppression equipment as identified in the Fire Safety Analysis is in place, has been functionally checked. A system is in place to assure the continued testing and inspection of fire safety items.	Pierson
3.0 Electrical Safety	
3.1 Electrical safety interlocks within the shielding enclosure are installed and have been functionally tested. A system is in place to assure the continued testing and inspection of this system.	Taylor, Pierson
3.2 Electrical installations comply with the National Electrical Code, SLAC ES&H Manual, Section 8, and other relevant documents.	Pierson
3.3 Facility complies with SLAC Lock and Tag Program for the Control of Hazardous Energy, and necessary training has been implemented	Pierson

4.0 Non-Ionizing Radiation Exposure

4.1 Appropriate interlocks are in place to protect personnel from exposure to hazardous non-ionizing radiation. Interlocks have been tested. Hettel

5.0 Seismic Hazards

5.1 The seismic design of the facility has been reviewed by the internal safety review system, and comments arising from that review have been addressed. A facility emergency plan has been written, and key personnel trained. Pierson

9.0 Other items

9.1 The facility is fully in conformance with SLAC Guidelines for Operations, and operations personnel are familiar with the contents of that document. Taylor, Pierson

9.2 The facility is fully in conformance with SLAC ES&H Manual and operations staff are familiar with that document. Pierson

9.3 There are no unreviewed safety issues. Jackson

ARR Agenda

Thursday 6/8/95: Plenary Session with Project Mgmt and Staff

- 0830-0900 **Executive Session**
ARR Team
- 0900-0930 **NLCTA Project Purposes and Technical Introduction**
Ruth
- 0930-1000 **Operations Organization and Program Management**
Ruth
Lavine
- 1000-1100 **Operator Training**
Baumgartner
- 1100-1200 **Field Trip**
Ruth, Rifkin, Fuller, Lavine, Adolphsen
- 1200-1230 **Lunch**
- 1230-1400 **Radiation Safety and Accelerator Safety Envelope**
Lavine (Shielding, Beam Containment)
Vylet (Beam Authorization Sheet)
Smith (PPS/Radiation)
Constant (BCS)
- 1400-1430 **Other Hazards**
Fuller (PPS/Electrical, Lock & Tag)
Lavine (Fire, Earthquake)
- 1430-1500 **Reserved for ARR Team questions**
All presenters
- 1500-1600 **Executive Session**
ARR Team

ARR Meeting Summary

The ARR consisted of a 16 separate meetings lasting a total of 23 hours. Excluding the Review Team, the ARR presentations, preparation, and interviews involved 22 project-related personnel for 200 man-hours. A brief summary of the meetings follows.*

Plenary Session (ARR Team and DOE)

Thursday 6/8/95, 9:00–4:00, Bldg 685 (PCR)/Conference Room

R. Ruth, T. Lavine, W. Baumgartner, R. Fuller, H. Smith, T. Constant, P. Bong, V. Vylet, G. Nelson, J. Rifkin, C. Adolphsen (77 h)

Interview: Shielding Verification (S. Rokni/ARR, H. Lee/DOE)

Tues, 6/13/95, 2:00–3:30, Bldg 128 (NLCTA Control)

R. Atkinson, J. Rifkin, V. Vylet, B. Youngman, T. Lavine (7.5 h)

Interview: Fire Safety (S. Pierson/ARR, D. Chang/DOE)

Wed, 6/14/95, 9:00–10:30, Bldg 685 (PCR)/Pierson's Office

J. Scott (1.5 h)

Interview: Electrical Safety (S. Pierson/ARR, R. Haddock/DOE)

Wed, 6/14/95, 3:00–4:00, Bldg 685 (PCR)/Pierson's Office

R. Fuller, I. Garg, T. Lavine (3 h)

Interview: ES&H Compliance (S. Pierson/ARR, R. Haddock/DOE)

Wed, 6/14, 4:00–5:00, Bldg 685 (PCR)/Pierson's Office

R. Atkinson, W. Baumgartner, R. Fuller, S. Gold, K. Kendall, R. Koontz, T. Lavine, M. Regan, J. Rifkin (9 h)

Interview: Operator Training (T. Taylor/ARR, H. Lee/DOE)

Thurs, 6/15/95, 9:00–10:30, Bldg 685 (PCR)/Taylor's Office

W. Baumgartner, T. Lavine (3 h)

Interview: Guidelines for Operations (T. Taylor, S. Pierson/ARR, H. Lee/DOE)

Fri, 6/16/95, 9:00–10:30, Bldg 685 (PCR)/Taylor's Office

W. Baumgartner, T. Lavine (3 h)

Interview: Non-Ionizing Radiation (R. Hettel/ARR, H. Grasso/DOE)

Thurs, 6/16/95, 10:00–10:30, Bldg 685 (PCR)/Taylor's Office

R. Koontz, G. Caryotakis (1 h)

* The project-related personnel involved were C. Adolphsen, R. Atkinson, W. Baumgartner, P. Bong, G. Caryotakis, T. Constant, R. Fuller, I. Garg, S. Gold, K. Kendall, R. Koontz, T. Lavine, J. Liu, G. Nelson, J. Paterson, M. Regan, J. Rifkin, R. Ruth, J. Scott, H. Smith, V. Vylet, and B. Youngman.

Interview: ASE Administration (T. Taylor/ARR, R. Teets/DOE)
Fri, 6/16/95, 10:30–10:45, Bldg 685 (PCR) Conference Room
V. Vylet, J. Liu, G. Nelson, W. Baumgartner, T. Lavine (1.25 h)

Interview: Beam Authorization (S. Rokni, T. Taylor/ARR, R. Teets/DOE)
Fri, 6/16/95, 10:45–11:45, Bldg 685 (PCR) Conference Room
V. Vylet, J. Liu, G. Nelson, W. Baumgartner, T. Lavine (5 h)

Interview: Electrical Interlocks in the Enclosure (T. Taylor, S. Pierson/ARR, R. Teets/DOE)
Mon, 6/19/95, 9:00–10:00, Bldg 685 (PCR)/Taylor's Office
R. Fuller (2 h)

Interview: BCS Circuitry and Certification (R. Hettel/ARR, R. Teets/DOE)
Mon, 6/19/95, 1:15–2:00, CD (Constant's office)
T. Constant, R. Fuller
(1.5 h)

Interview: PPS Circuitry and Certification (R. Hettel/ARR, R. Teets/DOE)
Mon, 6/19/95, 2:00–3:30,
H. Smith, P. Bong, R. Fuller
(4.5 h)

Interview: Calculation of the ASE (S. Rokni/ARR)
Wed, 6/21/95, 1:00–2:30, A&E 106 Conf. Rm.
T. Lavine, V. Vylet, C. Adolphsen (4.5 h)

Interview: Guidelines for Operations - Cont'd. (T. Taylor, S. Pierson/ARR)
Wed, 6/21/95, 3:30–5:00, Bldg 685 (PCR)/Conference Rm.
T. Lavine (1.5 h)

Interview: Discussion of Findings (J. Harris/ARR)
Mon 6/26/95, 10:00–10:40, Paterson's Office
R. Ruth, T. Lavine, J. Rifkin, R. Fuller, J. Paterson (3.3 hr)

Excerpts from the ARR Report's Executive Summary:

“The review resulted in about forty concerns or findings. Most of these were resulting from the fact that the activities concerned were incomplete but it could be reasonably expected that they would be satisfactorily resolved before operations were attempted. One set of findings resulted from the fact that the hazard from non-ionizing radiation emanating from the klystrons had not been adequately reviewed by the project nor by the internal safety organization.”

“The (ARR) team members were uniformly impressed by the efforts made to make the facility ready for operations, and by the high professional standards of the project staff. No disagreements occurred as to the rationale or necessity for any finding.”

“When the project responds to the findings listed the project will be ready to carry on operations within the specified safety envelope.”

ARR Findings Response Action Plan

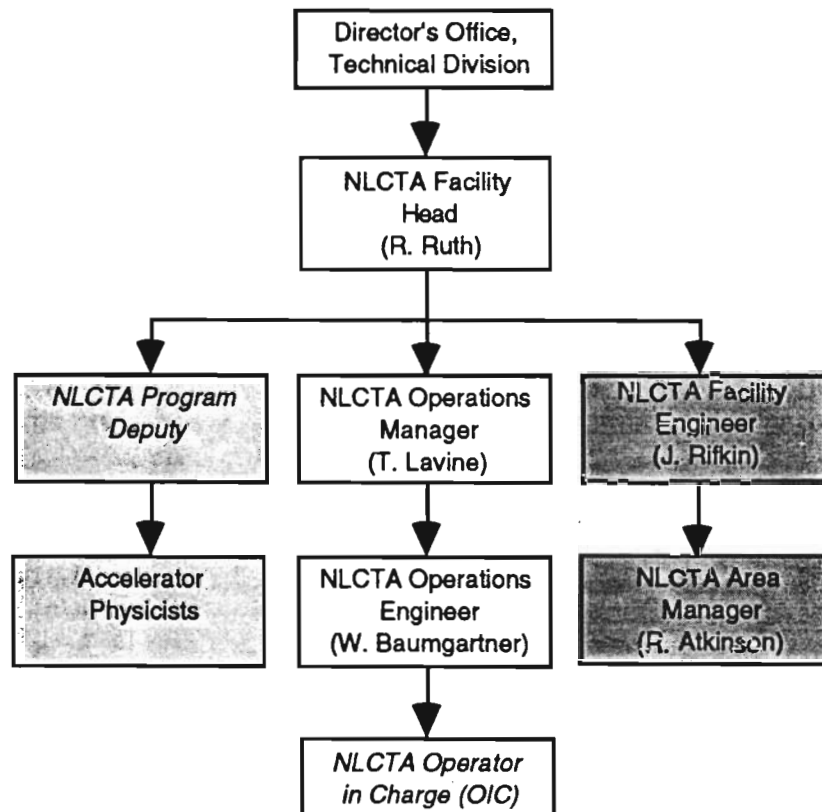
Item	Action to be Taken	How/Who?	When?
Comment [1.2]	SAD (including ASE) to be approved by SLAC and DOE.	Revise SAD.	10/95
Concern 1.2.A	Independent review of av. cur. lim., and sign-off by Radiation Safety Committee.	Fuller, Browne, Lavine, Rad. Safety Com.	9/95
Comment [1.3]	Roof of shielding should not be used for storage since it is a potential radiation area.	Atkinson	2/96
Finding 1.3.1	Install radiation signs in utility tunnel under chicane.	Atkinson, Vylet	11/95
Finding 1.3.2	Install radiation signs and barriers in utility tunnel under spectrometer.	Atkinson, Vylet	11/95
Finding 1.3.3	Secure the utility penetration through shielding in east maze.	Atkinson	7/95 (Done)
Finding 1.3.4	Put system in place to impede unscheduled removal of roof blocks.	Atkinson, Vylet	1/96
Finding 1.3.5	Secure cable tray penetration near outer PPS door of west maze.	Atkinson	7/95 (Done)
Finding 1.3.6	Prohibit access to enclosed space above beam dump.	Atkinson	7/95 (Done)
Concern 1.4.A	As-built, signed-off drawings for BCS.	Fuller	11/95
Concern 1.4.B	As-built signed-off drawings for PPS.	Fuller	11/95
Finding 1.4.1	Validate BCS and PIC test procedures.	Fuller, Baumgartner	1/96
Finding 1.4.2	Rad. Safety Com. review of BCS Level-1 logic for a disconnected PIC.	Fuller, RSC	10/95
Finding 1.4.3	BCS to be completed and tested.	Fuller, Vylet	1/96
Finding 1.4.4	Make policy for storage and issuance of keys for BCS components and racks.	Lavine (Directives)	9/95
Finding 1.4.5	Make policy for storage and issuance of keys for PPS components and racks.	Lavine (Directives)	9/95
Finding 1.4.6	Review and sign-off PPS test procedures.	Fuller	10/95
Finding 1.4.7	PPS to be completed and tested.	Fuller	11/95
Finding 1.4.8	Complete and test systems that limit the gun rep rate and average current.	Fuller, Baumgartner	11/95
Finding 1.4.9	Complete and validate procedures for testing systems that limit the gun rep rate and average current.	Fuller, Baumgartner	11/95

Finding 1.5.1	Train the operating organization in the use of the BAS.	Baumgartner	10/95
Finding 1.6.1	Finish and approve the "Operations Personnel Plan" (02-02-02).	Lavine	9/95
Finding 1.6.2	Finish and approve the "Operator Safety Training Reference Manual" (02-03-04).	Lavine, Baumgartner	9/95
Finding 1.6.3	Institute a system to ensure timely updating of operations safety training requirements.	Lavine (Directives)	9/95
Finding 1.6.4	Institute a system to ensure that only qualified personnel assume responsibilities of OIC.	Lavine (Directives)	9/95
Finding 1.6.5	Operator training workbooks and qualification records to be made available (as operators are trained).	Baumgartner	10/95
Finding 1.7.1	Write, review, and approve the "Safety Procedures" (02-03-03) that are referred to in the BAS.	Lavine, Baumgartner	10/95
Finding 1.7.2	Develop procedures for initial beam-on checkout of the BCS PICs (as required by the BAS).	Fuller, Baumgartner, Vylet	10/95
Finding 1.7.3	Prepare procedure for initial beam-on checkout of rep-rate limiting components and current-limiting (peak and average) components.	Fuller, Baumgartner	10/95
Finding 1.7.4	Incorporate, into the BAS prerunning conditions, verification of the integrity of the shielding walls and roof.	Vylet, Atkinson, Lavine	10/95
Finding 2.1.1	Install the fire alarm system for the modulators.	Grippe	7/95 (Done)
Finding 2.1.2	Perform fire alarm acceptance test.	J. Scott	9/95
Finding 2.1.3	Include NLCTA in procedures for periodic and routine testing of fire safety equipment.	J. Scott	9/95
Finding 3.1.1	Test the electrical safety interlocks in the PPS enclosure.	Fuller	7/95 (Done)
Comment [3.2]	No action required.	—	
Finding 3.3.1	Complete all relevant lock-and-tag training (as required by SLAC Program) after installation is complete.	Baumgartner	1/96
Finding 4.1.1	Non-ionizing radiation hazards to be reviewed by the internal safety committee.	Koontz	10/95

Finding 4.1.2	Specify and document routine testing of klystron interlocks protecting against the hazards of non-ionizing radiation.	Koontz	10/95
Finding 4.1.3	Write a procedure for surveying non-ionizing radiation fields at each newly installed klystron at the time of startup of the klystron.	Koontz	10/95
Finding 5.1.1	Write the Facility Emergency Plan.	Atkinson, Baumgartner	9/95
Finding 5.1.2	Train personnel in the Facility Emergency Plan.	Baumgartner, Atkinson	9/95
Comment [9.1]	Review and revise Incident and Alarm Response Procedures for conformance with Guidelines for Operations. Incorporate the Notification Report Log for occurrence reporting, as required by GfO 7.7. Approve the documents created to satisfy the Guidelines for Operations.	Lavine (<i>Plan for Occurrence Reporting</i>)	10/95
Finding 9.1.1	Make a Work Control Form for work on accelerator electrical systems, as required by GfO 18.	Baumgartner, Lavine	7/95 (Done)
Finding 9.1.2	All major components (such as LCW piping) to be clearly marked as required by GfO 21.	Atkinson	7/95
Finding 9.1.3	Make appropriate forms for operations with deficient safety systems, and for approval to continue operations, as specified in GfO 23.	Lavine, Baumgartner	10/95
Finding 9.1.4	Appropriately mark all components of the BCS (such as PICs) as required by GfO 14.2.3.	Fuller, Atkinson	9/95
Comment [9.2]	No action required.	—	
Comment [9.3]	Ozone measurements to be made during commissioning.	Lavine	5/96

NLCTA Operations Organization

The organizational structure of the NLCTA management and staff for accelerator operations is shown below. Italicized titles are non-permanent, rotating positions. The Program Deputy title is passed weekly between accelerator physicists. The Operator in Charge title is passed several times per day between qualified operators.



OPERATIONS DIRECTIVES

1. Program Control

- Personnel and Responsibilities
- Scheduling

2. Accelerator Operations

- Personnel and Responsibilities
- Shift Protocol
- Formal Transfer of Authority
- Operating Procedures
- Record Keeping

3. Safety

- Personnel and Responsibilities
- Safety Rules and Procedures
- Key Control
- Safety Communications
- Safety Record Keeping

4. Maintenance

- Personnel and Responsibilities
- Maintenance Categories
 - (Benign, Immediate, Scheduled)
- Trouble Reports
- Storage and Use of Liquid Nitrogen

OPERATOR-IN-CHARGE TRAINING

General SLAC Training (by ES&H Division)

- Radiation Safety
- Lock & Tag Program for the Control of Hazardous Energy
- Electrical Safety
- CPR/First Aid
- Emergency Management Program
- Hazard Communication

Specific NLCTA Training (by Operations Engineer)

- NLCTA Safety Orientation
- Responsibilities of the Operator in Charge
- Operations Safety Procedures

Final Approval

- Operations Engineer
- Operations Manager



Next Linear Collider Test Accelerator

ACCELERATOR READINESS REVIEW REPORT

JULY 5 1995