SLAC MEMORANDUM **July 5 1995**

To: J M Paterson, Associate Director, Technical Division

From: J L Harris

Subject: NLCTA Accelerator Readiness Review

The report of the Accelerator Readiness Review for the NLCTA, commissioned by you in April of this year, is attached.

cc. Ron Ruth, Head, Accelerator Theory and Special Projects Department
SLAC Directorate
Burt Richter, Director
Sidney Drell, Deputy Director
Matt Allen, Associate Director
Arthur Bienenstock, Associate Director
Jonathan Dorfan, Associate Director
Jerry Jobe, Associate Director
Ken Kase, Associate Director
David Leith, Associate Director
Hanley Lee, DOE Site Office
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Alan Jackson
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Sandy Pierson
Sayed Rokni
Tom Taylor

The NLCTA Accelerator Readiness Review

July 3 1995

John. L. Harris, ARR Team Leader

for Bob Hettel Bob Hettel

for A. Jackson Alan Jackson

Lew Keller

Everett P. Pierson jr. Sandy (Everett) Pierson

S. H. Rokni Sayed Rokni

Thomas Taylor Tom Taylor

List of Contents

Executive Summary

The Associate Director, Technical Division appointed an Accelerator Readiness Review team in April 1995 to review the readiness for operations of the Next Linear Collider Test Accelerator.

The team began its work on June 8 1995 and completed the field investigation two weeks later on June 22. To facilitate the DOE validation of the ARR, team members advised the DOE Site Office of scheduled interviews twenty four hours in advance and a DOE representative was present at most interviews. The list of findings was reviewed for factual accuracy with the project staff on June 26. No disagreements were identified.

At the time of the appointment of the ARR team it was expected that the project might be ready for operations in July 1995. Other laboratory priorities caused a slippage in the NLCTA schedule, however, and at the completion of the review the scheduled date for operations remained several months off.

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 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.

Introduction

An Accelerator Readiness Review is required to be performed prior to the commencement of Commissioning and prior to the commencement of Routine Operations of an accelerator facility. An accelerator facility is defined as a system which includes a device capable of accelerating particle beams, and thereby creating a radiation area[1].

Commissioning is the process of determining that the system elements perform in a manner which allows the system as a whole to carry out its intended purpose with reasonable efficiency[2]. Commissioning is considered to begin at the point when a radiation area can be produced, which is when charged particles can be produced by the facility. Routine Operations are considered to begin when the initial operations of the system have shown that it is capable of performing its mission, and that the staff are trained adequately.

An Accelerator Readiness Review is a contractor conducted activity, and the review report is addressed to the senior management official having responsibility for the facility being reviewed. The report may conclude that the facility is ready for the appropriate stage of operations, or it may present a list of findings which require action to be taken prior to operation being permitted. It may also submit a list of recommendations which are not required to be addressed before the commencement of operations. The senior management official shall require that the project management respond in an appropriate manner to the findings of the report, and may call upon ARR 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[3] to authorize the appropriate stage of operations.

The DOE local office is required to confirm the adequacy of the Accelerator Readiness Review, and of the project response to the findings of the review, prior to authorizing operation.

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[1] An accelerator facility which is constructed within an existing accelerator facility in such a way that its hazards are fully contained within the existing facility's Accelerator Safety Envelope may not need an independent Safety Assessment Document, nor an Accelerator Readiness Review.

[2] These and the following definitions are based on *DOE 5480.25 Safety of Accelerator Facilities*, on the *Guidance* to that order, and on the draft *Accelerator Readiness Review Guidance* dated February 27 1995.

[3] For Low Hazard facilities.

The NLCTA ARR

The Next Linear Collider Test Accelerator (NLCTA) is a 600 Mev x-band linear accelerator currently completing the first stage of construction at SLAC. It was classified as a Low Hazard Radiological Facility by the Director, Office of Energy Research, Department of Energy on June 16 1995.

The NLCTA is clearly a facility requiring an independent SAD and an Accelerator Readiness Review, since, although it is in part physically contained within a (inactive) part of the Linear Accelerator Facility shielding barrier, it creates a separate and distinct set of hazards, and its operations are managed by a separate organization.

The nature of its intended use creates some problems of interpretation of the difference between *commissioning* and *routine operations*. Indeed, since the purpose of the facility is to evaluate various innovative solutions to the problems of the design of accelerators, it will be permanently in a state of commissioning. The review team has been asked to approve operations in general rather than commissioning as a separate activity. We may assume that the engineered safety systems, procedures and staffing and training plans which are in place prior to initial operations are not likely to need be much changed as operations continue in the future. *Commissioning* and *Routine Operations* in this facility are the same thing. Furthermore, it is apparent from a study of DOE 5480.25 *Safety of Accelerator Facilities* that commissioning operations are assumed to take place in an environment where the training of operators is less complete than would be required for routine operations. In this case, the project is prepared to commit to having an adequate staff of fully trained operators from the beginning.

Another difference between the environment for this particular ARR and the context of the *ARR Guidance* arises from the fact that the NLCTA is being constructed in a mature laboratory which has in place a management system and an internal review system which performs many of the tasks which would be expected to be handled by the ARR in a new laboratory. Thus the radiation safety design of the NLCTA is the subject of several stages of internal review, the NLCTA is required to be operated with a formality specified by *SLAC Guidelines for Operations* , the staff are required to be trained in accordance with existing ES&H training policies, and so forth.

We have considered that it is not sufficient that the ARR should assume that these pre-existing laboratory procedures are fully adequate to mitigate the hazards of the NLCTA but at the same time, we consider that to conduct an extensive review of the SLAC internal safety review system is clearly beyond the scope and capability of the ARR. Indeed, the ARR Guidance specifically states that an *ARR is not intended as an evaluation of the overall ES&H program at a* (site). Consequently the ARR team did not attempt to duplicate the review functions carried out by the laboratory internal safety review systems, but at the same time does not take it for granted that those systems have in all cases carried out their intended function.

The Review Process

The review team consisted of the following members[4]:

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

No team member has been associated with the NLCTA project, but John Harris has been involved in the editing and formatting of the Safety Assessment Document.

Lew Keller had not been named to the initial team, but was added to carry out a role in providing a critique of the process of the review. He had been involved in a similar way with the CEBAF ARR. His remarks are attached as Appendix B of this report.

To organize the work, the Team Leader prepared a list of assignments which, taken together, were intended to cover the full scope of the questions that needed to be addressed, and assigned one or more team members to each of the questions. The work assignments for the team members were as follows:

Item	Assigned
1.0 Accelerator Safety Envelope	

[4] See Appendix A for brief note of background of each team member.

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

The Formal Review Session

The ARR team met in plenary session on Thursday June 8 1995 from 0830 to 1600. The project management presented material in accordance with the following agenda:

0830-0900 ARR Team Executive Session

0900-0930 NLCTA Project - purposes and technical introduction - Ron Ruth

0930-1000 Operations organization and Program management - Ron Ruth and Ted Lavine

1000-1100 Operator training - Bill Baumgartner

1100-1200 Field trip

1200-1230 Lunch

1230- 1400 Radiation safety and Accelerator Safety Envelope
- Ted Lavine (Shielding, Beam Containment)
- Vaclav Vylet (Beam Authorization Sheet)
- Hal Smith (PPS)
- Ted Constant (Beam Containment System)

1400-1430 Other hazards
- Bob Fuller (Electrical, Lock and Tag)
- Ted Lavine (Fire, Earthquake)

1430-1500 Reserved for ARR team questions

1500-1600 ARR Team Executive Session

The presentations were supported by the following documentation which was made available to the team:

Conceptual Design Report for NLCTA (SLAC - 411)

Safety Assessment Document (review draft dated 31 May 1995)

Accelerator Safety Envelope (included as Section 9 of the Safety Assessment Document)

SLAC Guidelines for Operations

Safety Review Documentation
- Hazard Classification Proposal
- Fire Hazard Analysis
- Transactions of SLAC Internal Safety Review
  - Safety Overview Committee
  - Fire Protection Committee
  - Earthquake Safety Committee

Electrical Safety Committee
Radiation Safety Committee

NLCTA Operations Documents
- Operations Directives (drafts)
- Operations Personnel Plan (draft)
- Operator Safety Training Reference Manual (draft)
- Incident and Alarm Response Procedures (draft)
- Safety Procedures (draft)
- Beam Authorization Sheet (draft)

Various drawings

NLCTA 46.1 Radiation Protection in the NLCTA

Executive Session Thursday June 8 1500-1600

The following issues were discussed:

Stages of Operation. The project has presented a schedule which calls for commencement of operations to be staged as follows:

Stage	Date	Event
One	August 1995	Commission injector with electrons transported to dump at 74 MeV (P=97W)
Two	July 1996	Accelerate beam to dump at 630 MeV (P=3233W)
Three	Future	Upgrade to 75 MW klystrons to give beam energy of 1096 MeV and power of 5745W

The Accelerator Safety Envelope (beam power, shielding thickness, dump design) has been described in terms of this last condition. The project would like to receive approval to operate in all stages that are within this envelope[5]. The presentation by the NLCTA project staff indicates that they expect to have all necessary operator training and procedures in place before commencing Stage One operations, and that the Accelerator Safety Envelope presented will not be exceeded in any stage; One through Three. There will be some necessary inspections and check-offs required in the progression from Stage One to Stage Three, but these are of the sort that would be accomplished by the laboratory internal review system, and will

[5] The project appears to have assumed earlier that it would not require an ARR for commissioning the injector (see NLCTA Project Milestones, Ron Ruth presentation.)

be reviewed by the Accelerator Department Safety Office(ADSO) which has oversight responsibility for this facility.

After some discussion the ARR team agreed that it would probably be able to consider the request to approve all operations within the stated Accelerator Safety Envelope, and could rely on the internal safety review system to conduct any inspections and reviews which might be required as the project moved from one stage to the next. It noted that there was no internal review system regarding the formality of operations and the ARR would, therefore, require that the operator training and documentation status would need to be sufficiently mature as to constitute an adequate environment for Routine Operations.

Review of design of Personnel Protection System. One team member inquired whether there was a policy which required independent review of the circuit logic and execution of the Personnel Protection System(PPS) or other radiation safety systems. The team leader responded that there was no such laboratory policy, and that the system under consideration was a simple extension of the system used in the Linear Accelerator Facility. The SLAC radiation protection system had received external review at some times in the past, but the team leader did not have the dates at hand. After discussion the team agreed that, since this was an extension of an existing design, there was no reason to require an independent review of the logic beyond that which could be accomplished by the assigned team member. If any team member reached a conclusion that SLAC should have a policy requiring periodic independent review of radiation safety system design, that matter should be raised outside this review, by memo to the Associate Director, Technical Division.

Assignments. The group discussed the assignments which had been made by the team leader and members agreed that the assignments were well understood. The team leader announced that, in view of the schedule slippage which had taken place since the publication of the ARR plan, the schedule for completion of the individual assignments could be relaxed by a week until June 22.

The meeting adjourned at 1600.

ARR Team members' reports and findings

The ARR team carried out field inspections and interviews with project staff in the period June 9 to June 21. Team members' logs of interviews are available for inspection, as are the forms used by the team members for each comment, concern or finding. The results from the inspections and interviews are presented here below, classified by the work assignment categories. They are presented in one of three categories:

- **Comments**, which do not require further action by the project, often because a process of closure is known to be under way at this time, or
- **Concerns**, which are items which require some action from the project, but the action does not need to be completed before the start of operations, or
- **Findings**, which are errors or omissions which may have a significant impact on operational safety and thus should be cleared before operations commence.

The Concerns and Findings are annotated with the file number of the original report of the team member (e.g. TAY-01). The reports may have been edited in some cases by the Team Leader for brevity and consistency of format, and in some cases for appropriate assignment as either comments, concerns or findings.

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**

Comment: The Accelerator Safety Envelope correctly describes the maximum credible accident scenarios and the measures taken to limit radiation exposure to workers and public. The ASE is a part of the Safety Assessment Document which is under review and has not yet been approved by management or the DOE Local Office. (JLH/Jackson)

1.2 The ASE has been reviewed by the internal safety review system and comments from that review process have been addressed.	**Rokni**

Concern 1.2.A: The ASE has been reviewed by the Radiation Safety Committee at SLAC. The committee has approved the proposed ASE pending independent review of the failure modes of the average current limiting circuit. The results from the review are not available at this time. (ROK-07

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**

Comment: The shielding installation has been carried out completely in accordance with the shielding design document. We note, however, that the roof of the shielding is being used as a storage area for rigging equipment and other materials. This is not recommended since this area will be classified as a Radiation Area when operations are taking place.

Finding 1.3.1: Existing End Station B radiation gates below the Chicane Manhole have not had the "Radiation Area" signs installed. NLCTA-Note #46.1,Sect. 3.6.1 (TAY-01)

Finding 1.3.2: The tunnel below the spectrometer manhole has not been posted with standard Radiation Signs nor have the swinging barriers been installed. It is understood from discussions that the radiation signs are to be mounted on the swinging barriers. NLCTA-Note #46.1,Sect. 3.6.2 (TAY-02)

Finding 1.3.3: The utility penetration through the shielding wall that separates the east maze from the I&C Systems area is not covered in a way that would prevent a person from passing through it. (TAY-03)

Finding 1.3.4: There is no system in place to impede the unscheduled removal of some of the roof shielding blocks. (TAY-04)

Finding 1.3.5: The cable tray penetration portion of the west maze PPS Access Module, Outer door, has not been adequately sealed against personnel entry. (TAY-05)

Finding 1.3.6: There is no procedure in place to allow for routine inspection of the space enclosed by the wall and roof shielding blocks, top of the dump, and the vertical metal panel above the front face of the beam dump. The space is on the order of 500 cu.ft. (TAY-06)

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**

Concern 1.4.A: As built, signed off drawings for the Beam Containment System are not available.(HET-4)

Concern 1.4.B: As built, signed off drawings for the Personnel Protection System are not available.(HET-11)

Finding 1.4.1: Validated BCS and PIC test procedures are not available. (HET-5)

Finding 1.4.2: A disconnected cable to a PIC causes a "level 1" BCS interlock fault which only reduces the gun repetition rate from 10 Hz to 1 Hz. No document exists which asserts that this is a safe failure mode and the issue has not been addressed by the Radiation Safety Committee. (Note: this facility is using the PIC's as direct radiation protection interlocks which has not been done before at SLAC-JLH) (HET-6)

Finding 1.4.3: The Beam Containment System is not complete and has not been functionally tested. (HET-7)

Finding 1.4.4: A clear policy concerning the storage and issuance of keys for BCS components and racks does not exist. (HET-8)

Finding 1.4.5: A clear policy concerning the storage and issuance of keys for PPS components and racks does not exist. (HET-9)

Finding 1.4.6: Reviewed and signed off PPS test procedures are not complete. (HET-10)

Finding 1.4.7: The NLCTA PPS is not complete and has not been functionally tested. (HET-12)

Finding 1.4.8: The 10 Hz rate and gun average current limiting systems are not complete and have not been functionally tested. (HET-13)

Finding 1.4.9: Test procedures for the 10 Hz rate and gun average current limiting systems are not complete and have not been validated. (HET-14)

1.5 The administrative systems identified in the ASE are in place and necessary personnel have been trained in their use.	**Taylor**

Finding 1.5.1: The administrative systems identified in the ASE manifest themselves in the form of the Beam Authorization Sheet (BAS), those persons in control of the BAS, and the Operating Organization that is governed, in part, by the BAS. These systems are in place but the operating organization has not been trained in their use. Particular attention should paid to Beam Authorization Sheet familiarization training.(TAY-07)

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**

Finding 1.6.1: The document *NLCTA Operations Personnel Plan* (02-02-02, May 22, 1995) has not been approved. (TAY-08)

Finding 1.6.2: The document *NLCTA Operator Safety Training Reference Manual* (02-03-04, June 7, 1995) has not been approved. (TAY-09)

Finding 1.6.3: There is no system in place to ensure timely updating of operations safety training requirements.(TAY-10)

Finding 1.6.4: There is no system or procedure in place to ensure that only qualified personnel are allowed to assume shift responsibilities as Operator in Charge. (TAY-12)

Finding 1.6.5: Operator training workbooks and qualification records are not available. (TAY-13)

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**

Finding 1.7.1: The procedures listed in the NLCTA Safety Procedures SLAC 02-03-03, which has been referred to in the BAS, have not been reviewed or approved. (ROK-01)

Finding 1.7.2: Procedures describing initial beam-on checkout of the BCS PICs as required in the BAS have not been developed yet. (ROK-03)

Finding 1.7.3: Procedures describing initial beam-on check out of the following power-limiting devices have not been prepared yet:

a)rep rate limiting components
b)circuit limiting the peak and average current (ROK-04)

Finding 1.7.4: The draft BAS does not identify the verification of the integrity of the lateral/roof shielding in the pre-running conditions. (ROK-05)

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**

Finding 2.1.1: Fire alarm system to the modulators has not been installed. Fire Hazard Analysis section 5. (PIE-01)

Finding 2.1.2: National fire alarm code chapter 7 section 3.1. Fire alarm acceptance test has not been done. The national code requires all areas of new alarm systems be inspected and tested prior to actual operation. At this time the fire alarm system at NLCTA is not complete. (PIE-02)

Finding 2.1.3: NLCTA is not specifically listed in the procedures for periodic and routine testing of fire safety equipment. (PIE-03)

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**

Finding 3.1.1: Electrical safety interlocks within the shielding enclosure have not been functionally tested.(TAY-14)

3.2 Electrical installations comply with the National Electrical Code, SLAC ES&H Manual, Section 8, and other relevant documents.	**Pierson**

Comment: The facility was inspected and found to be in compliance with the NEC and the ES&H Manual, Section 8.

3.3 Facility complies with SLAC Lock and Tag Program for the Control of Hazardous Energy, and necessary training has been implemented	**Pierson**

Finding 3.3.1: All relevant training has not been completed due to the fact that installation is still being conducted. (PIE-04)

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**

Finding 4.1.1: A review of the NLCTA non-ionizing radiation hazards by the SLAC Non-ionizing Radiation Committee has not been conducted. Unreviewed potential hazards include a ceramic gap insulating the x-band klystron collector and the non-interlocked air filled waveguide at the output of the TWT klystron driver. The SAD is in error (Section 8.4). (HET-1)

Finding 4.1.2: Routine testing of the klystron interlocks providing protection against the hazards of non-ionizing radiation as specified in SAD Section 8.4.2.1 are not specified in any document. (HET-2)

Finding 4.1.3: There should be a written procedure which requires survey of non-ionizing radiation fields at each newly installed klystron at the time of start up of the klystron. (HET-3)

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**

Finding 5.1.1: A facility emergency plan has not been written. (PIE-05)

Finding 5.1.2: Personnel have not been trained upon the facility emergency plan, because the plan has not been written. (PIE-06)

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**

Comment 9.1 : *NLCTA Incident and Alarm Response Procedures* (DRAFT), May 1995, need further review as to their conformance with the SLAC Guidelines for Operations. (e.g., A Notification Report Log is called for in the Guidelines for Operations sect. 7.7 yet no such document is listed in the *NLCTA Incident and Alarm*

Response Procedures.) (TAY-15) Not all NLCTA documents created to satisfy the *SLAC Guidelines for Operations* have been approved.(TAY-16)

Finding 9.1.1: Guidelines for Ops Chapter 18; NLCTA does not have a Work Control Form for work on Accelerator Electrical Systems as called out in attachment 1 of Chapter 18. (PIE-07)

Finding 9.1.2: Guidelines for Ops Chapter 21; NLCTA is not in complete compliance with the requirement 1.4 that requires major components to be clearly marked. (e.g. Marking of LCW piping) (PIE-08)

Finding 9.1.3: Guidelines for Operations Chapter 23; NLCTA does not have a Safety System Deficiency and Approval to Continue Operations form. It was noted in the interview with NLCTA management that they do not intend to run with deficient safety systems, if this is to be considered policy it should be so noted in their operations documentation. (PIE-10)

Finding 9.1.4: Not all necessary items are marked to indicate that they are part of the Beam Containment System (BCS) as required in the *Guidelines for Operations* Ch. 14.2.3. (e.g. Discrete Ionization Chambers are part of the BCS per. SAD 7.1.2.2)

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

Comment: The ES&H Manual has been reviewed with the project staff, and they appear to be fully in compliance with it.

9.3 There are no unreviewed safety issues.	**Jackson**

Comment: A question was raised concerning the possible production of ozone in the housing during operations. We understand that this issue will be reviewed again, and measurements made, during commissioning. We note also the apparent failure to properly review the possibility of accidental worker exposure to microwave radiation. (Findings 4.1.1 through 4.1.3). No other unreviewed safety issues have been identified. (Jackson/JLH.)

APPENDIX A ARR Team Members; Biographic Notes

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).

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.

Lew 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, 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.

APPENDIX B; Critique of the Process by Lew Keller

As part of the NLCTA Accelerator Readiness Review, the Team Leader asked me to observe the process and evaluate the adequacy of the ARR. While I was not able to observe the interviews of the NLCTA staff by the ARR Team members, I heard the kickoff presentations and accompanied the tour of the facility. I also reviewed the team assignments and examined each team member's report.

I have the following opinions about the process:

- The lines of inquiry were complete,
- The process contained the appropriate level of rigor,
- It was apparent that the team members took their assignments seriously,
- The review generally followed the Accelerator Readiness Review Guidance and DOE Order 5480.25.

Comments:

1. Since this is an R&D Project, the machine parameters and hardware will be varied as a matter of course. A state of routine operations as it is usually defined will probably never be part of the program. That is, the machine will not be in a production mode for weeks or months at a a time, but rather will itself be tested in different hardware configurations, with changes being made on the time scale of hours and days. The NLCTA will have to be cognizant of new hardware being added and existing hardware being removed or modified.
2. I agree with the ARR team that since the review was conducted on the basis of a safety envelope which encompassed all three anticipated stages of operation, the NLCTA can use the SLAC Internal Safety Review System to monitor further changes in accelerator configuration.
3. The NLCTA now needs to develop a corrective action plan with a procedure for formally closing out Findings and Concerns.

I would like to commend all those involved for conducting a thorough and serious ARR.