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**SLAC RADIATION MEMORANDUM**October 17, 2001

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**To:** Keith Jobe**From:** Sayed Rokni *S.H. Pappi***Title:** Modifications in requirements for unattended operations without beam in the NLCTA.

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Thank you for your memo of September 20<sup>th</sup> and your presentation of October 3<sup>rd</sup> to the Radiation Physics Department staff and ADSO detailing your request for modifications in the requirements for unattended operations without beam in the NLCTA.

The Radiation Safety Committee has previously reviewed and authorized unattended operations without beam in the NLCTA to allow processing of r.f. components<sup>1</sup>. You are requesting modifications in two of the conditions set by the Committee. These conditions were:

1-An operator performs the "Inspection Check Sheet" daily and

2-SLAC Security is requested to provide surveillance in the area three times a shift.

Specifically, you are requesting exemption, on weekends and holidays, from the requirement of performing daily inspection checklist, and modification from the requirement of surveillance of the area by the SLAC Security of "three times per shift" to regular surveillance.

The justifications for your requests are:

1-All possible sources of radiation for this mode of operation are well understood, shielded and are on the roof of the NLCTA which is posted as "Radiation Area". The integrated dose from the TLDs placed on contact with the shielding boxes for r.f. couplers and bends on the roof, when extrapolated to one year, is 544 mrem<sup>2</sup>. One foot away this level is expected to drop off by a factor of two. Additionally, a BSOIC, set to trip at 10 mR/hr is located on the roof.

2-The "no-beam" status of the operation is enforced through locking the beam gun. The PPS assures that a casual site visitor cannot enter inside the NLCTA tunnel when r.f. is operating.

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<sup>1</sup> SLAC Memo from G. Nelson, "Radiation Safety Committee Meeting February 7, 2000, Unattended Operations of NLCTA", RSC-00-001, February 15, 2001.

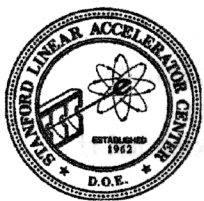
<sup>2</sup> SLAC Memo from W. R. Nelson and K. Jobe, "Dosimetry results for the roof of the NLCTA", October 9, 2001.

Your analysis is thorough and your justifications are well documented and supported by the dosimetry results and radiation surveys. Your request is approved subject to the following conditions:

1. Proper labeling of all the radiation safety items.
2. Providing information on who to contact should the need arises over the weekend and holidays. This information should be readily available to MCC as well as posted on various locations around the NLCTA facility.
3. Inform chair of the Safety Oversight Committee of this change and make sure other safety issues are also addressed.

**CC:**  
**Radiation Safety Committee members**  
**Radiation Physics Department staff**

84 I. Boczek  
66 D. Burke  
55 R. Erickson  
55 P. Miller  
78 K. Moffeit  
55 M. Stanek



To: Ralph Nelson September 20, 2001  
From: Keith Jobe *[Signature]*  
Cc: Sayed Rokni, Mike Saleski, Marc Ross, Dave Burke  
Subject: Request for change in permission to operate NLCTA when an operator is not in attendance

We are requesting a change in the conditions for "Unattended Operations Without Beam" at the NLCTA to allow operation without requiring the daily inspection by an NLCTA operator on the weekend.

### **Justification / Motivation:**

We believe that safe machine operation can be supported without a NLCTA operator visiting the end station on weekends.

Staffing of the test accelerator is very tight, with only six operators available to support unattended operation. Over-weekend machine running presents special operational difficulties, especially when staffing levels are reduced due to travel, illness, or other reasons. (One operator is pregnant, one is frequently traveling out of the country, and four operators live a significant distance from the laboratory.) For this reason, we are motivated to request a change in the required conditions for unattended operation.

### **Historical Background:**

In February of 2000, the Radiation Safety Committee authorized a mode of operation for the test accelerator which allowed structure and rf component processing to continue around the clock without having an operator present in the control room (RSC-00-001). Previously, there was no significant distinction between beam-on and beam-off modes of operation, and a qualified operator was required to be present in or very near the control room at all times.

Unattended Operations Without Beam is currently only allowed when the following operational conditions are met:

1. The high power rf devices (mode converters, bends, etc.) in operation on the roof of the radiation enclosure are shielded with 1/8 inch equivalent of lead,
2. The gun is locked off,
3. An operator performs the "Daily Inspection Check Sheet" daily.

Additionally, there were a number of operational changes to the procedures and the BAS requested to support unattended operations, most notably:

4. The BSOIC on the roof was lowered to 10 mR/hr (from 100 mR/hr),
5. SLAC Security is requested to provide surveillance in the area three times a shift.

## **Operational Experience:**

Unattended Operations Without Beam has been critical to the mission of the test accelerator as it has allowed us to accumulate the required hours of high power accelerator operation to measure various structure damage processes due to extended rf processing.

The lead shielding of the rf devices appears to have successfully controlled the radiation from rf breakdown and other processes. There has not been a single radiation-related trip of the BSOIC on the roof during unattended operation.

## **Changes Requested:**

The following two changes in the approved Unattended Operations Without Beam mode are requested:

1. That the daily checklist be required only on normal non-holiday working days (Monday through Friday), with operation permitted through the weekend on Friday's checklist.
2. That the surveillance requirement be modified from "three times per shift" to "as part of the regular surveillance of the research yard area."

## **Implications:**

To implement this change, the following will documents and procedures need to be modified:

1. The NLCTA BAS page 10 item 4b language "each day" will need to be changed,
2. The NLCTA Daily Inspection Checklist 020311 does not currently indicate that it requires daily signatures, but should be modified to indicate that it is applicable on normal weekdays only,
3. The NLCTA Operations Directives 020201 will need minor changes consistent with the approved change in operations requirements.

## **Comments:**

At the Radiation Safety Committee meeting in February 2000, we were unable to provide any historical perspective regarding unattended operation. We can now, after almost 1½ years of unattended mode operation experience, state that operation is smooth and routine. Laboratory staff are aware of the operations schedule of the machine. Shift schedules are posted with EOIC rotations every week. The operations logs, daily and weekly inspection checklists have not identified any issue that argues against unattended and un-daily checklisted operation through the weekend.

Over the past year, the roving guards have proven to be very good about checking the area, and frequently point out items they consider unusual. Their log, which they sign on every visit, indicates that there are 6-8 visits on a typical day rather than the RSC requested number of 3 visits per shift. I am personally very satisfied with the current level of surveillance and believe that is it adequate.

# SLAC MEMORANDUM

October 9, 2001

To: H. Lynch and S. H. Rokni  
From: W. R. Nelson and K. Jobe WRN  
Subject: Dosimetry results for the roof area of the NLCTA

On February 7, 2000 the Radiation Safety Committee approved the "Unattended Operation of NLCTA" mode (see RSC-00-001), with the condition that a report be made on the *integrated dose during RF processing*. This memo is a follow-up to that request.

## Background information

Aside from the normal beam operation mode, which is not the subject of this memo, the primary radiation sources on the roof of the NLCTA are X-rays coming from the couplers and bends of waveguide structures. A set of experiments (memo by Nelson to Jobe dated January 17, 2000, attached to RSC-00-01) was presented to the committee that showed that the dose rate 1-ft away from these sources could be as high as 10 mrem/h -- i.e., a 2000-h integrated dose of 20 rem. The memo also stated that an transmission factor of 0.03 would be obtained by covering these sources with wooden boxes lined with 1/8-inches of Pb. The projected integrated dose would then be reduced to 600 mrem/y, which is below the 1000 mrem/y shielding design limit. Accordingly, Unattended Operation of the NLCTA was approved provided that Pb-lined boxes were installed.

## OHP Event Monitoring results

On December 19, 2000, TLDs were placed on the outside of the wooden boxes during a 49-day period of RF processing. The TLDs associated with Stations 0 and 2 all read zero and the highest dose measured at Station 1 was 73 mrem. The integrated dose extrapolated to 365 days is 544 mrem and for a working week of 40-h becomes 124 mrem. However, this is the *contact dose* and the dose measured 1-foot away from the shield will drop off by at least a factor of two, resulting in an integrated dose less than 100 mrem per year (i.e., the non-radiation worker limit).

## Additional information

Prior to the installation of the Pb-lined boxes there had been frequent trips of the BSOIC that is purposely located near Station 1 which, in fact, led to the series of X-ray measurements that were reported by Nelson on January 17, 2000. Since the Pb-lined boxes were installed this BSOIC has never tripped once due to radiation.

Also, during the period October 2000 – March 2001 the Area Monitors around the entire NLCTA, including the roof area, never measured a dose exceeding 4 mrem, which is essentially at the level of "background noise".

## Summary

We conclude that the Pb-lined boxes are performing their function as expected and the shield-design criteria ( $D < 1$  rem/y) has been met.