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NATIONAL SYNCHROTRON LIGHT SOURCE FACILITY MANUAL	Number: BNL-49735	Revision: 1
	Effective 12/01/93	
SUBJECT: MAINTENANCE MANAGEMENT PROGRAM	Prepared by: N. Fewell	
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MAINTENANCE MANAGEMENT PROGRAM * **NATIONAL SYNCHROTRON LIGHT SOURCE** **BROOKHAVEN NATIONAL LABORATORY**

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NSLS MAINTENANCE MANAGEMENT PROGRAM

1. INTRODUCTION

The purpose of this program is to meet the policy and objectives for the management and performance of cost-effective maintenance and repair of the National Synchrotron Light Source, as required by the U.S. Department of Energy Order DOE 4330.4A.

It is the DOE's policy that:

- a. The maintenance management program for the NSLS be consistent with this Order and that NSLS property is maintained in a manner which promotes operational safety, worker health, environmental protection and compliance, property preservation, and cost-effectiveness while meeting the NSLS's programmatic mission.
- b. Structures, components and systems (active and passive) that are important to safe operation of the NSLS shall be subject to a maintenance program to ensure that they meet or exceed their design requirements throughout the life of the NSLS.
- c. Periodic examination of structures, systems components and equipment be performed to determine deterioration or technical obsolescence which may threaten performance and/or safety.
- d. Primary responsibility, authority, and accountability for the direction and management of the maintenance program at the NSLS reside with the line management assigned direct programmatic responsibility.
- e. Budgeting and accounting for maintenance programs are consistent with DOE Orders and guidance.

Chapter 1 of DOE 4330.4A describes the key elements of an overall DOE maintenance program for non-nuclear facilities (figure 1). The NSLS Maintenance Management Program is therefore documented so as to address those elements.

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2. MAINTENANCE MANAGEMENT

The DOE maintenance management objectives are to:

- a. Develop a cost-effective and efficient maintenance program for all DOE facilities that is consistent with DOE's research, production, safety, worker health, reliability and environmental quality objectives.
- b. Establish a review and analysis capability for evaluation of maintenance program performance and effectiveness.
- c. Develop a requirements-based maintenance budget that is defensible and provides for a well maintained complex and ensures an information-reporting system that is consistent throughout DOE and facilitates the tracking of maintenance expenditures against specific maintenance activities.
- d. Ensure the reliability, safety and operability of structures, systems and components.
- e. Ensure compliance with current environmental, safety, and health standards.
- f. Ensure that the responsibility, authority, and accountability for maintenance are clearly defined and appropriately assigned within the appropriate Departmental Elements.
- g. Ensure that, where maintenance requirements or accepted maintenance standards cannot be met, such instances are appropriately documented and acknowledged by line management.
- h. Ensure that sufficient resources are designated and budgeted in a timely manner to accomplish the maintenance program objectives.
- i. Ensure that effective programs are in place to evaluate and measure facility condition.
- j. Ensure that a graded approach is taken by the line management in the development and implementation of maintenance programs. By a graded approach, DOE intends that the depth of detail required and the magnitude of resources expended for a particular maintenance management element, be commensurate with the element's importance to safe and reliable operations, environmental compliance, safeguards and security, programmatic mission, facility prescription and/or other facility specific requirements.

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The NSLS Maintenance Management Program endeavors to meet the above objectives, utilizing NSLS technical staff, in conjunction with assistance from the Plant Engineering Division and other BNL support divisions.

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3. MAINTENANCE MANAGEMENT PROGRAM ELEMENTS

3.1 Organization, Administration, and Training

The NSLS management has established a program for the maintenance of the facilities programmatic equipment. This equipment is categorized by function and maintained by technical groups responsible for the performance of that function (e.g.: R.F., Power, Vacuum, Water, etc.) The NSLS does not employ a staff group whose sole responsibility is maintenance.

The Plant Engineering Division, the Staff Services Division, and other support divisions are responsible for maintenance of non-programmatic real property, including the building, utilities, and plant equipment, which shall be maintained in accordance with DOE Order 4330.4A.

3.1.1 Organization/Staffing

The responsibility for maintenance management extends from the Director through the Associate Director to the NSLS Chairman and Section Heads and ultimately to each employee.

The NSLS Chairman, Deputy Chairman, Associate Chairman and Section Heads are directly responsible for implementing the NSLS Maintenance Program. They ensure that the NSLS facilities and activities comply with the DOE maintenance management requirements based on a graded approach. They are responsible for supporting those activities related to maintenance management practices, training, reporting, and other actions designed to enhance the operational safety and reliability of the NSLS operation.

The overall organization of the NSLS (figure 2) is shown in the NSLS "Safety and Environmental Administration Policies and Procedures Manual" (SEAPPM) and the NSLS Facilities Manual. Each person involved in the operation is shown and to whom that person is primarily responsible.

Included on the organizational chart are the Maintenance Coordinators who are responsible to the NSLS chairman for setting up a maintenance program consistent with the intent of DOE Order 4330.4A. Also included are the functional groupings, their supervisors and section heads.

NSLS supervisors are responsible for ensuring that activities under their jurisdiction are conducted in accordance with general conduct of maintenance principles and this document, to ensure safe and reliable operations.

All NSLS employees are responsible for performing their assignments in a manner that is safe

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* Temporary
** Reports to John Axe,
Assoc. Dir. for Basic Energy Sciences

October 1, 1993

Dennis McWhan
Dennis McWhan, Chairman

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to themselves and their co-workers. Employees should also ensure that their actions are responsive to NSLS facility conditions and maintain facility safety and reliability.

NSLS employees are encouraged to make suggestions to improve operational safety and reliability. They should bring their suggestions and report deficiencies to their supervisor. Suggestions may be submitted to the BNL Suggestion System for evaluation, and if adopted may result in a cash award. Exceptional performance by support staff employees may also result in a cash award under the BNL Spotlight program. Details of these programs are given in Appendix A.

Staff support organizations within the laboratory have been assigned, by the Director, various responsibilities to develop standards, provide guidance and training, and to assist in developing and improving maintenance management plans:

Laboratory Operations Support Office (LOSO)

The LOSO is responsible for developing standards, providing guidance and training, and reviewing implementation of maintenance management programs.

Safety & Environmental Protection Division (S&EP)

The S&EP Division, through their Departmental Representatives, act as independent assessment personnel in close contact with NSLS operations. They are responsible for reporting any suspected safety or reliability issues, related to maintenance, to the LOSO for investigation.

BNL Quality Assurance Office (BNL-QA)

BNL-QA is responsible for providing guidance, assistance, and training to the NSLS in developing and implementing the NSLS Quality Assurance Program. The BNL-QA also assesses the effectiveness of the QA Program.

BNL Training Office

The BNL Training Office provides guidance to the NSLS on training policy, standards, and guidelines.

3.1.2 Administration

The organization and administration of the NSLS achieves a high level of safety and performance through the effective implementation and control of operational and maintenance activities. The NSLS management ensures that there is sufficient staff, equipment, funding and time available for the maintenance program.

The NSLS maintenance program is a computer based, Work Request Order (WRO) system, that

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clearly identifies work needs, and provides instructions for performing the work. All NSLS programmatic equipment is entered into its data base. This program is the responsibility of the Maintenance Coordinators, who are also responsible for coordinating the various technical groups' maintenance activities.

The NSLS technical groups are responsible for the performance and maintenance of specific types of equipment. They are therefore fully cognizant of its operation and trained in its maintenance requirements. In addition, the technical staff receives training in various safety areas.

Technical staff members are assigned equipment responsibilities by the Chief Electrical and Mechanical Engineers (see NSLS Electrical Systems Responsibilities SLS-08.2-1-1 and NSLS Mechanical Systems Responsibilities SLS-08.2-3-1 in Appendix B).

NSLS personnel are held accountable for their performance through supervisory counseling, performance appraisals, and when necessary, administrative action.

3.1.3 Policies, Goals and Objectives

The NSLS is one of the world's foremost facilities for scientific research using x-rays, ultraviolet and infrared radiation. In a single year a total of about 2500 researchers from almost 450 institutions perform experiments at the NSLS. Management's goal, therefore, is to ensure that this facility is operating in a safe manner at peak performance and for the longest duration. This is only possible if the equipment is adequately designed, upgraded and maintained. The NSLS management and user community, therefore, set long-range operational schedules that maximize machine availability for research while allowing sufficient time to perform the necessary maintenance.

Operational goals are defined at weekly meetings of the experimental users. Performance standards are set, monitored and recorded at these meetings. Monthly charts of machine performance are kept and published in the National Synchrotron Light Source Annual Report.

A fault reporting system accounts for all machine downtime. These reports are reviewed biweekly by the engineering and technical staff to determine equipment inadequacies or failure trends.

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3.1.4 Training and Qualification

The NSLS Training Policy, Responsibilities and Requirements are documented in the NSLS SEAPPM Chapter 7 and are included in the NSLS Facility Manual. (See Appendix C)

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3.2 Condition of Facilities and Equipment

NSLS facility, equipment and housekeeping deficiencies are identified by periodic walk-throughs and detailed inspections.

3.2.1 Facility Condition Inspections

Environmental Safety and Health Inspections are carried out at the NSLS in accordance with Chapter NS1.2.0 of the NSLS SEAPPM. (See Appendix D)

Periodic walk-throughs are carried out by the NSLS Housekeeping Committee. Housekeeping Deficiency Reports are issued that require corrective actions to be taken and for the return of the Report upon completion.

Detailed equipment inspections are carried out at least once a year as part of the NSLS preventive maintenance program.

3.2.2 Condition Assessment Surveys

NSLS real property and equipment is inspected at predetermined frequencies by BNL Plant Engineering Division.

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3.3 Maintenance Documentation

The NSLS Site Maintenance Plan describes the total integrated maintenance program of the NSLS Department.

3.3.1 Site Maintenance Plan

The responsibility of the overall maintenance of the NSLS facility is shared by the BNL Plant Engineering Division and the NSLS Department.

BNL Plant Engineering Division is responsible for the maintenance of the NSLS building and grounds, its utilities including: water, heating and cooling, electricity and lighting, and fire prevention systems. This maintenance is covered by Plant Engineering Maintenance Program and Budget.

The NSLS programmatic equipment is maintained by the NSLS staff, funding for which is covered by its operational budget.

Due to its diversity and complexity, the NSLS programmatic equipment is maintained by technical groups that are also responsible for its design, construction, and performance. The NSLS does not employ a conventional maintenance staff.

The NSLS group staffing and programmatic equipment responsibilities are defined by the Chief Electrical and Chief Mechanical Engineers.

Programmatic equipment maintenance activities and procedures are the responsibility of the designated engineers and group supervisors.

Programmatic equipment maintenance activities, procedures, and scheduling are entered into a computer based "Work Order and Tracking" program managed by the Maintenance Coordinators.

Scheduling of work to be done during designated maintenance periods is accomplished at pre-maintenance meetings of the NSLS technical staff and representatives of the Plant Engineering Division. Detailed schedules are then prepared by the Maintenance Coordinators.

Maintenance requirements are reviewed at long-range scheduling meetings and the necessary time periods allocated. Preventive maintenance Work Orders are generated and distributed to the technical groups prior to a maintenance period.

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NSLS facility and equipment performance is monitored and reviewed by BNL and NSLS management.

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3.4 Work Control System

The NSLS has established a computer generated work control system by which maintenance activities are planned and scheduled.

3.4.1 Work Request (Order) System

A NSLS computer generated "Work Order and Tracking" system has been established that clearly identifies the work needed and provides instructions to perform the work.

The program's EQUIPMENT Database holds information on all NSLS programmatic equipment. Each piece of equipment is uniquely identified by an alpha-numeric code. Using this code, information about the equipment can be obtained. This information includes: Equipment Make, Model#, Serial#, Date in-service, Location, Technical Staff responsible, Preventive Maintenance Procedure#, QA Level and Service Interval.

The PREVENTIVE MAINTENANCE (P.M.) Database contains two separate databases, an ACTIVE and a HISTORY. The history contains records of all preventive maintenance done on all equipment since the establishment of the program. This history can be viewed or printed.

The active database contains records of equipment that is due for service. When a maintenance period is scheduled the Maintenance Coordinator enters the date and the program searches the Equipment Database for equipment due for service. The active database can then be used to print out work orders for the various technical groups that must perform the preventive maintenance.

At the completion of the maintenance period, completed work orders are entered into the active database, and are posted into the history database. The serviced equipment's "LAST P.M." field is set to the current date and the active database is then cleared.

The PROCEDURE database contains preventive maintenance procedures for all types of equipment in the Equipment database. Each procedure has a PMTYPE field that uniquely identifies it. This field corresponds to the PMTYPE field of particular equipment in the equipment database, and identifies the procedure that must be performed during servicing. This saves time, paper and disc space as many pieces of equipment have the same procedure.

Typical work orders are included in Appendix E.

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3.4.2 Formal Job Planning and Estimating

A system of job planning has been established at the NSLS in order to minimize interruption of the user community's research mission.

Long-range scheduling meetings are held by NSLS engineering and technical staff, together with representatives of Plant Engineering, to coordinate and plan maintenance periods. These plans are then reviewed by the NSLS user community for their comments and revised if necessary. The long-range schedule (which usually covers a period of eight months) is then approved by the NSLS Chairman.

Prior to a scheduled maintenance period, an in-depth planning meeting is held by the engineering and technical staff and a maintenance schedule is then drawn up by the maintenance coordinator.

3.4.3 Work Performance (Time) Standards

Maintenance of the NSLS programmatic equipment is limited to when the electron storage rings are shutdown. Storage ring shutdowns are scheduled to occur for two days in each four week period, plus two long shutdowns in the spring and fall of approximately four weeks duration. In order to maximize the use of our limited personnel, the two day shutdowns for the X-Ray ring and the VUV Ring are staggered by one day. The one common day allows time for maintenance of the Linac, Booster ring, computer, water and electrical systems.

3.4.4 Priority Systems

Maintenance priority is based on safety, environmental and facility concerns.

Failure of personnel protection systems are attended to at the highest priority. Such failures result in the immediate shutdown of the facility's electron storage rings or experimental program. Repair of these systems, therefore, becomes top priority, and may require personnel to be called in. The personnel protection systems are tested and recertified on a six month rotational basis. Due to the large number of systems involved, these recertification procedures require the facility to be shut down for six hours twice a month.

Equipment that is not performing to specification may degrade the stored electron beam quality, or cause it to "dump". Repair of this equipment, therefore, becomes a high priority item which again may require suspension of operations and personnel to be called in. The NSLS preventive maintenance program was established to minimize this type of problem.

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3.4.5 Maintenance Procedures and Other Work-Related Documents

Maintenance procedures have been established by the various NSLS groups for the equipment for which they are responsible. These procedures are included in the computer generated Preventive Maintenance Work Orders.

These procedures are to be performed only by technicians trained and qualified to work on particular equipment and are therefore general in nature. They provide safety instructions and the tasks to be done.

3.4.6 Scheduling System

Scheduling of corrective and preventive maintenance and modifications at the NSLS is performed in such a way that maintenance activities are conducted in a proper sequence, efficiently and within the prescribed time periods. (see 3.3.1)

Maintenance activities are scheduled and coordinated to provide the best manpower utilization and to minimize facility downtime.

Long-range schedules are posted enabling the Ring Managers, NSLS technical staff and Plant Engineering to plan ahead for upcoming maintenance periods and shutdowns.

Detailed maintenance schedules are posted enabling the NSLS technical and operational staff to coordinate their activities and restore the facility to its operational status.

3.4.7 Post-Maintenance Testing

Post-maintenance testing is performed as appropriate after maintenance activities conclude to verify that equipment, systems and components fulfill their design functions when returned to service.

The NSLS Safety Officer conducts Personnel Security Systems and radiation shielding checkouts, prior to facility startup.

The power supply group may perform high-voltage ground fault tests with the rings secured, before turning over the equipment to the operations staff.

The on-duty machine operator sets equipment parameters (via computer "Save and Restore" programs) to a baseline configuration. Other computer programs then check the equipment for errors.

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After extended maintenance shutdowns, machine commissioning periods are scheduled to bring the facility back to peak operational performance.

3.4.8 Backlog Work Control

Corrective maintenance is performed on any programmatic equipment essential to maintaining the facilities performance upon discovery of a malfunction. Non-essential equipment repair is held-over until a scheduled maintenance period.

Preventive maintenance is monitored by the computer "Work Order & Tracking" program. This program tracks work done, and re-issues work orders for unaccomplished tasks. Printouts of preventive maintenance backlogs are available for analysis and priority determination.

3.4.9 Equipment Repair History and Vendor Information

Equipment and system faults that result in machine performance deterioration, (or downtime) are noted in the log by the machine operator and a fault report is sent to the responsible group supervisor or engineer. Monthly and yearly equipment fault charts are generated by the Operators Supervisor.

Biweekly meetings of NSLS engineers and technical supervisors are held to analyze equipment failures and to plan equipment improvement, and reliability.

Preventive maintenance history of all NSLS programmatic equipment is stored in the computer "Work Order and Tracking" program, and is readily available to NSLS staff.

Test equipment is sent to an outside vendor for repair and calibration, details of which are recorded in the control room.

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3.5 Maintenance Facilities, Equipment, and Materials Control System

NSLS facilities, equipment and material control are periodically reviewed by the NSLS Management.

3.5.1 Maintenance Facilities, Equipment, and Tools

NSLS maintenance facilities, including machine shops, storage areas and set-up spaces, are sized and arranged to promote the safe and effective completion of work.

Technician work areas, shops, storage areas, offices, conference areas, toilet facilities, and lunch areas are evaluated for adequacy by NSLS management and the NSLS Space Committee.

NSLS uncluttered work areas and adequate lighting promote safe and effective working conditions. However, the nature of electron storage rings with their radiation shielding, and cramped and delicate equipment demand extreme caution and concentration by maintenance workers.

The necessary ladders, work platforms and special tools and lifting arrangements are provided when required.

Tools and components are kept in the technical groups' work areas to improve efficiency. A departmental stock room is located in the NSLS facility and the BNL stock rooms are nearby.

Communication equipment is provided by the control room.

3.5.2 Requisitioning/Procurement

An effective procurement process exists to ensure that parts, materials and services are available for maintenance activities when scheduled.

Procurement documents provide clear and adequate technical and quality assurance requirements consistent with design specifications. Quality assurance records are controlled and maintained to provide documentation for qualified parts and materials and to ensure traceability.

The NSLS Stockroom Committee periodically reviews material and component activity to determine possible additions to be included in the NSLS Stockroom. The NSLS also has a representative on the BNL Stockroom Committee.

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Material Safety Data Sheets (MSDS) are obtained when hazardous materials and chemicals are procured. A MSDS library is maintained by the S&EP Division and is readily available to NSLS staff and users. Local stations are provided in populated work areas such as labs and technical staff work areas.

3.5.3 Materials Control

The NSLS stockroom is a controlled area with after-hours access via a card reader.

All stockroom material withdrawals are entered manually or via a bar code reader into a computer materials control program. The program records the item, number issued, cost, recipients name, life number and account number. Periodic printouts of materials issued are sent out to the account holder and budget administrator for their review and control.

Items held in the BNL and NSLS stockrooms have not been inspected before being issued. It is the cognizant Engineers responsibility to determine if parts should be inspected, before installation, dependent on the performance requirements and QA category of the system.

Long lead-time items, vital to the continued operation of the facility are held in the NSLS special process spares storage area.

Flammable and hazardous materials are identified, segregated, and properly controlled during receipt inspection, storage and issuance.

3.5.4 Control and Calibration of Measuring and Test Equipment

Each NSLS technical group is responsible for the control and calibration of measuring and test equipment used in the performance of their maintenance activities.

A NSLS test equipment calibration program database is maintained by the Controls & Diagnostics Group. This program includes test equipment calibration history, and prints out when equipment re-calibration is due. The NSLS has a repair and/or calibration contract with an outside vendor that has a calibration program based on standards traceable to national standards.

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3.5.5 Maintenance Tools and Equipment Control

Each NSLS technical group maintains an adequate supply of tools and equipment to support the maintenance program.

Special jigs and lifting fixtures are designed, built and stored by the NSLS Mechanical Group as necessary.

Proper loading, lifting and transporting equipment, together with the necessary personnel, are available for the movement of large equipment, upon request from the Rigging Group of the Plant Engineering Division.

Local area cranes are installed in the VUV Ring and the X-Ray loading area to facilitate maintenance and equipment movement activities. These lifting devices may only be operated by trained personnel possessing a valid crane operators card (also known as a BNL safety awareness certificate "SAC card").

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3.6 Implementation of Maintenance Activities

The NSLS employs a proper balance of corrective and preventive maintenance that provides a high degree of machine performance and reliability. The program identifies equipment degradation, and repairs or replaces equipment dependent on its cost effectiveness or impact on the NSLS scientific mission.

3.6.1 Surveillance and Preventive Maintenance

The NSLS electron storage rings provide radiation to a very large number of experimental beam lines. This radiation is maintained in position to extremely tight tolerances (10 microns). This precision can only be accomplished if every piece of equipment is functioning to specification. Beam position and equipment performance are therefore constantly monitored by the computer and any deviation is recorded.

An effective preventive maintenance program has been established at the NSLS that includes all of the facilities programmatic equipment.

A complete database of all NSLS programmatic equipment is included in the preventive maintenance "Work Order & Tracking Program".

Operational experience, engineering analysis and reliability considerations are used as a basis to establish preventive maintenance tasks and intervals.

Trending data is acquired as part of the fault reporting system for long-term performance evaluations on such things as water hose failures and water flow meter reliability. Items such as these are then repaired or replaced on a lifetime based preventive maintenance schedule.

Preventive maintenance activities are scheduled and performed within periods established at the long-range scheduling meetings.

Procedures are included in the preventive maintenance equipment work orders and cover safety, equipment inspection, adjustment and testing.

3.6.2 Predictive Maintenance

Predictive maintenance is performed at the NSLS only on an "as needed" basis. The trending of equipment failures by the fault reporting system is sufficient to forecast equipment preventive maintenance requirements.

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3.6.3 Corrective (Repair) Maintenance

The NSLS operates on a 24-hour, 7-day/week schedule, and all programmatic equipment must function within specification to achieve the machine performance required by the experimental user community. Therefore, degradation or failure of equipment may necessitate the shutdown of the machine for repair and consequently, the experimental program. Corrective maintenance must be performed in a timely and proficient manner. The NSLS technical groups are therefore highly trained on specific types of equipment and are subject to being called in after normal working hours to conduct the necessary repairs.

The NSLS has no Corrective Maintenance Backlog of its programmatic equipment.

All equipment failures that result in machine downtime are logged and reported in the fault reporting system for failure analysis and reliability monitoring.

3.6.4 Modification Work (Non-Davis-Bacon)

Modifications and upgrades of NSLS programmatic equipment are accomplished under the same administrative controls as those applied to its maintenance program so that there is no increase in risk to the equipment, environment or personnel.

Major modifications or upgrades are subject to an engineering review process and are scheduled for installation at the long-range scheduling meetings.

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3.7 Maintenance Evaluation and Analysis

Overall NSLS operational performance is used as a yard-stick in determining the effectiveness of the NSLS Maintenance Program.

3.7.1 Analysis of Root Causes of Problems

The NSLS fault reporting system provides a history of equipment malfunction or failure and provides a machine problem data base. From this database recurring equipment problems can be identified.

The engineering and technical staff analyze recurring equipment problems to determine the root cause and implement the necessary equipment or maintenance changes required to eliminate the problem.

3.7.2 Periodic Review and Analysis

Monthly statistics of machine performance and equipment malfunction are provided to the Operations Manager by the Operators Supervisor. This information, together with fault report feedback from the technical group supervisors, is reviewed at the biweekly downtime meetings held by the engineering and technical staff. The results of this review are used as the basis for program improvements such as: adjustments, additions or deletion of preventive maintenance activities, equipment design changes and manpower changes or training.

3.7.3 Performance Measurement and Improvement

The performance and reliability of the NSLS experimental program serves as an accurate measurement of the effectiveness of the NSLS maintenance program.

The preventive maintenance "Work Order and Tracking" program monitors the equipment maintenance backlog. This information is then used by the group supervisors to adjust their manpower assignments or schedules needed to eliminate the backlog.

3.7.4 Management Involvement

NSLS Operations and Ring Managers monitor the daily activities of the facility and have the responsibility of maintaining and improving the facility's overall performance. During

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maintenance periods, they monitor maintenance activities by touring the facility and observing people at work. They, together with the group supervisors and safety staff, are sufficiently technically informed and familiar with the facility to ensure that maintenance activities are carried out in a safe and proficient manner.

3.7.5 Work Sampling

Work sampling is not an appropriate measure of performance at the NSLS.

3.7.6 Cost Identification and Control

Cost accumulation and reporting systems are established at the NSLS to maintain and evaluate the facilities activities and performance. Procedures are in place to define costs of manpower, materials and services.

Maintenance is included in the facility operating budget and is subject to review by management to prevent overruns and adverse trends.

3.7.6 Audits and Lessons Learned

External and internal audits are utilized, evaluated and the appropriate changes needed to improve or delete management concepts, procedures or systems are made.

Assigned personnel and procedures are in place to take the necessary corrective actions required to comply with DOE and OSHA requirements and audits.

Experience and "lessons learned" from other DOE and similar sites are applied to NSLS activities as appropriate.

NSLS MAINTENANCE PROGRAM

APPENDIX A

SPOTLIGHT - EXCEPTIONAL PERFORMANCE AWARD

DESCRIPTION AND INSTRUCTIONS

Purpose of Award

The purpose of this \$500 cash award is to reward short term extraordinary effort extended by support staff employees in response to departmental or divisional needs.

Eligibility

Eligible for receiving awards under this program are all employees on the Administrative Monthly schedule, the Technical Monthly schedule, the Clerical Weekly schedule and the Technical Weekly schedule, and Reactor Division employees who are members of OCAW.

Program Cycle

This program is operated on a fiscal year basis. Award allocations are established each fiscal year.

Award Size

The award size is \$500 after mandatory taxes are withheld.

In general, the award is intended to recognize short term performance of a period from several weeks to several months. It should not replace recognition by promotion for permanent significant changes in responsibility or salary increase for sustained performance levels.

Criteria for Selection

Criteria for selection for an award is short term performance of an extraordinary nature. The performance may be related to a particular assignment given by a supervisor or be an accomplishment initiated by the individual. In either case, the activity must have been of significant benefit to the Department, Division or Laboratory. Awards are not intended for service outside of the Laboratory.

It is important that each organization realize that the number of awards is limited and therefore discretion in selection is necessary.

To assist in ensuring consistency throughout the Laboratory in granting awards, a set of three criteria have been defined in choosing the individual accomplishments appropriate for an award. The criteria definitions are presented below:

- (1) *Benefit to the Laboratory* - The Laboratory or some unit of the Laboratory should have benefited in a significant way through either cost savings, efficiency of operations, satisfaction of some work requirement or some similar gain.

- (2) *Exceptional Nature of Effort Required* - It is expected that award recipients will have overcome problems which would be considered the most difficult for their classification or even beyond the expectations for employees in their classification.
- (3) *Length of Time for Accomplishment* - It is expected that any achievement worthy of this award would require at least two weeks of intense effort to complete.

Allocation

A total annual allocation of 5 percent of the eligible population is authorized for each fiscal year. Allocations are issued by the Personnel Division.

The number of awards is based on the October 1 population for each fiscal year. It is not necessary that all allocations be spent as awards in any year.

Awards will be allocated according to the eligible population within each Department or Division with an single net award level of \$500 per individual. This means that with an organization's eligible population of 100, a total of 5 individual awards would be allocated for that year.

Organizations with less than 20 employees in the eligible population will not have sufficient number to meet the 5% guideline and be capable of granting at least one award. In these cases, a centrally administered fund is created through the responsible Associate Director. This places some limitations on departmental/divisional discretion but provides a fair distribution and a greater possibility of award funds being available when needed.

Documentation and Approval

A SPOTLIGHT award form is used to obtain departmental or divisional approvals on individual selection and Personnel approval on availability of award budget for that organization. The form is available through Salary Administration in Personnel.

A description of the extraordinary performance is required on the form to document that the award is consistent with program objectives.

Processing and Presentation of Awards

After each organization completes the form and obtains approval from the organization head, the form should be forwarded to Salary Administration in Personnel. After checking the remaining award allocation for the organization and that the award conforms to award criteria, Personnel will forward a copy of the signed form to Payroll.

Award checks will be issued upon the receipt of an approved Spotlight form at Payroll. The check will be forwarded through the employee's management chain to the supervisor specified on the form for presentation to the employee.

Award Publicity

Managers will have the opportunity to provide Labwide publicity of individual awards through a periodic listing of Spotlight recipients in the Brookhaven Bulletin. The Spotlight approval form requests authorization for this publicity.

Timing of Awards

Awards are intended to be presented at the completion of the extraordinary accomplishment. The immediacy of the award conferral will depend on the timing of each organization's procedure for reviewing nominations.

More than one award per individual per accomplishment is not permitted. Awards may not be granted to an individual more than once during a fiscal year.

The awards may be granted at any time during a fiscal year provided that funds are available. No carry forward or advancing of funds between periods is permitted. The ultimate disposition of budgeted amounts for the awards remaining at fiscal year end is determined by the Budget Office.

Funding

The cost for the awards is drawn from a Personnel Division overhead account.

Tax and Benefit Impact

SPOTLIGHT awards are subject to Federal, State, local and Social Security taxes. In order to result in a net amount of \$500 for the award, the actual before tax award size is \$775.50. A set percentage of 35.525% which equates to \$275.50 will be set aside for taxes on the award amounts regardless of the employees withholding status. This total corresponds to the sum of 20% for federal taxes, 7.875% for state taxes, and 7.65% for Social Security taxes.

This withholding will apply to all employees even though it will affect all employees differently. Any surplus or deficiency in taxes withheld is expected to be minimal and will be the responsibility of the employee to reconcile with the IRS when filing their tax return at year's end. A statement attached to the award check indicates the amount of taxes withheld so that management and award recipients are aware of the tax consequences of the awards.

Regular monthly paychecks of award recipients may reflect a higher tax withholding rate than normal. This occurs because the employee's gross pay for that month is greater and therefore may push the employee into a higher tax bracket temporarily. While the program intends to deliver a check of \$500 to each awardee after taxes are withheld, individual variations in tax withholding effects are the responsibility of the employee.

Award recipients see no impact of the award in their employee benefits. Life insurance levels are not adjusted nor are retirement contributions changed. The amounts are not available for allocation to the Supplementary Retirement Account.

SPOTLIGHT

BNL Support Staff Cash Award for Recognition of Exceptional Performance

Award Nomination and Approval Form

Employee Information

Name _____

Life # _____ Social Security # _____

Classification _____ Grade _____

Department _____

Supervisor's Name _____

Award Information

■ Description of Exceptional Performance

- Dates of start and end of performance _____
- Description of performance _____

- Reason why performance is outstanding _____

■ Award Amount: \$500 (\$775.50 before tax withholding)

- Publicity Authorization _____ Yes _____ No
This individual's name and organization may be included in a list of Spotlight Award Recipients in the Brookhaven Bulletin.

- Payroll, please forward award check privately to: _____
(name of manager or supervisor)

Award Approvals

Department Chairman/Division Manager _____

Personnel _____

Effectiveness of Solution: Your suggestion must include a specific solution which provides substantial assistance in bringing about an improvement.

Relationship of Idea to Suggester's Job Responsibility: The suggestion subject must fall outside normal job scope.

If eligible, you can earn cash awards from \$25 to \$10,000. The size of an award is in proportion to the relative value of the suggestion. Two classes of awards will be used to recognize accomplishments.

Tangible: Awards for suggestions with direct cost savings will be equal to 10% of the first year's estimated net savings to a maximum of \$10,000.

Intangible: Awards for suggestions that cannot be measured in dollars will be determined on the basis of degree of benefit and extent of application.

All awards will be paid after implementation. However, if the estimated cost savings of an implemented suggestion cannot be accurately determined immediately, or if implementation covers a lengthy period, payment will be made in several installments.

Suggestion awards will be treated as wages for tax purposes and will be subject to applicable federal, state and local withholding and payroll taxes.

Termination of employment will not disqualify employees from receiving awards for approved ideas submitted while employed at the Laboratory. If death is the cause of termination, the award will be paid to an employee's estate, less withheld taxes.

PROTECTION PERIOD FOR SUGGESTIONS

Suggestions are protected for a two-year period starting with the date of receipt by the Administrator. If your idea is not adopted at the time of submission, you may resubmit it at the end of the two-year period. In this way, your suggestion is kept active, and you would be eligible for recognition if your idea is implemented during this time.

OWNERSHIP OF SUGGESTION

The Laboratory has absolute and exclusive rights to all suggestions and ideas embodied in them and may make whatever use it wants of the suggestion. You may seek patents on ideas developed within the Suggestion System, in which case the conditions of AUI's Patent Agreement would prevail.

Suggestions are governed by the terms of the System in effect on the date they are received. However, the Laboratory reserves the right to change the Suggestion System at its discretion and without prior notice.

Any decisions of the Suggestion Committee concerning eligibility of suggestions and suggesters, or amount and distribution of awards, are final and binding.

This booklet is intended to supply you with highlights of the BNL Suggestion System. Should you require further information, the Suggestion System Staff (on extension 7631) will be glad to assist you.

The BNL Suggestion System is part of an organization-wide effort to actively involve employees in better utilizing the Laboratory's resources.

The System provides a means for you, as a regular employee, to submit constructive ideas on any aspect of Laboratory operations, to have these ideas evaluated and to receive cash awards for approved suggestions. It offers management a vehicle to encourage employee initiative in increasing productivity.

ADMINISTRATION

Overall responsibility for administration of the system rests with the Suggestion System Administrator in Personnel. This individual functions as the primary contact for suggesters and the coordinator of the review and award process.

All suggestions are evaluated by individuals with expertise in the area involved in the suggestion. The recommendations of evaluators are reviewed by a Suggestion Committee. This Committee, composed of management-level staff with broad knowledge of Laboratory operations, makes final decisions relating to suggestion adoption and award. They are also responsible for developing policy and procedure for the system.

ELIGIBILITY

Any ideas you have on improving a specific operation, process, method or practice at the Laboratory are encouraged. Suggestions may pertain to your own work area or to the work of other employees. Implementation of your idea must result in direct cost savings or other real benefit within the foreseeable future.

Ideas can involve elimination of unnecessary operations or safety hazards, simplification of procedures, material savings, improved storage or material handling, more effective utilization of machines, improvements in method or routine, or anything else which tangibly or intangibly benefits the Laboratory. Suggestions can be an original idea or an adaptation of an idea already in use elsewhere.

Certain subjects, such as benefit plans, salary or wages, routine maintenance/repairs and bargaining matters will not be eligible for consideration.

The scope and responsibility of your job will be primary factors in deciding whether your suggestion qualifies for an award. Awards will only be given for an accepted suggestion whose subject is ruled to be outside the scope of your normal duties, responsibilities and authority. The Suggestion Administrator, Directorate and members of the Suggestion Committee will not be eligible to receive cash awards.

SUBMISSION

All suggestions must be submitted in writing on a signed suggestion form. Official forms are available from your department/division's central

administration office or from the receptionist in Personnel. While joint suggestions are acceptable, no more than two employees may submit a single suggestion.

In writing up your suggestion, you must be sure to:

- State the specific problem or situation the suggestion addresses.
- Propose a specific and reasonable solution or approach.
- Describe the impact/benefit of implementation.

You are asked to give completed forms to your immediate supervisor who, in turn, will forward them to the central Suggestion Office in Personnel. If you wish, your suggestion may remain anonymous from your supervisor. However, it is more desirable that suggestions be channeled through supervision so an initial evaluation can be made as to eligibility and subject matter.

When the suggestion is received in Personnel, it is checked for eligibility and originality. If the suggestion duplicates one already under investigation or under consideration by management, it is ineligible, and you are notified immediately. In addition, if the suggestion is a duplicate of a previously rejected one, the new suggestion will be ineligible for consideration as long as the rejected one is still within the protection period of two years.

EVALUATION

Suggestions are investigated by an individual who is knowledgeable about the subject of your suggestion. Factors such as cost savings, extent of application, creativity and effectiveness of solution are used in determining the feasibility and benefit of implementation. Based on the evaluation and in cooperation with the Suggestion Committee, a recommendation for implementation or non-implementation is made. If implementation is approved, action resulting from your suggestion may be taken exactly as recommended, or it may be modified to maximize benefit to the Laboratory. In the latter case, your suggestion would still be eligible for an award because improvement results as a consequence of the suggestion. When action results from a suggestion bearing the names of two suggesters, the total award is divided equally.

If your suggestion is ruled to be unacceptable, you will receive a written explanation. Should you feel your suggestion was not properly understood or evaluated, you may request a reevaluation. Your request must state on what grounds you are appealing.

Suggestions should be answered within 60 days. In cases where the nature and complexity of your suggestion requires a longer evaluation period, you will be notified.

AWARDS

Adopted suggestions may or may not result in a cash award. Eligibility for awards is based on a number of factors:

Value of Idea: Suggestion must result in a benefit to the Laboratory equal, in dollar value, to \$250.

NSLS MAINTENANCE PROGRAM

APPENDIX B

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NSLS MECHANICAL SYSTEM RESPONSIBILITIES

QA CATEGORY **A-3**

OUTSTANDING ECN'S

ALL			C	CHANGED ASSIGNMENTS				MW	8/16/93	MW	MW
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ASSOCIATED UNIVERSITIES, INC.				APPROVED	JOB NUMBER	DRAWING NUMBER	SIZE	REV			
UPTON, N. Y.											
Form 1803											

1. NSLS Light Source Facility

1.1 System: LINAC

1.1.1 Electron Gun and Front End

1.1.2 Accelerating Cavities

1.1.3 Waveguides

1.1.4 Diagnostics

1.1.5 Process Water/Comp. Air

1.1.5.1 Pumping Station 1

1.1.5.1.1 Heaters

1.1.5.1.2 Flowmeters

1.1.5.1.3 Pressure Gages

1.1.5.1.4 Flowswitches

1.1.5.1.5 Pump/Motor

1.1.6 Vacuum Components

1.1.6.1 Chamber Assy. - Beamline

1.1.6.2 Pumpout Port Assy.

1.1.7 Vacuum System

1.1.7.1 SIP (Sputter Ion Pump)

1.1.7.1.1 8 l/s (3)

1.1.7.1.2 80 l/s (4)

1.1.7.1.3 120 l/s (1)

1.1.7.1.4 220 l/s (6)

1.1.7.2 Gauges

1.1.7.2.1 Cold Cathode (2)

1.1.7.2.2 Convector (1)

1.1.7.3 Valves

1.1.7.3.1 Gate Valve (Viton) (3)

Engineer

Technician

Mortazavi

Neuberg

Mortazavi

Neuberg

Mortazavi

Neuberg

Mortazavi

Neuberg

Beauman

White

Foerster

Gaudet

Foerster

Gaudet

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UPTON, N. Y.											
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1.2 System: Transfer Line-
LINAC to Booster

Engineer

Technician

1.2.1 Magnetic Components

Lynch

Scheuerer

1.2.1.1 Quads

1.2.1.2 Dipoles

1.2.2 Diagnostics

Lynch

Radulescu

1.2.2.1 Flags

1.2.2.2 PUE's

1.2.3 Vacuum Components

Foerster/
Woodle

Gaudet

1.2.3.1 Chamber Assy - Beam Line

1.2.3.2 Support Assy - Beam Line

1.2.3.3 Chamber Assy - Dipole

1.2.3.4 Pumpout Port Assy

1.2.4 Vacuum System

Foerster

Gaudet

1.2.4.1 SIP

1.2.4.1.1 60 l/s (Triode) (4)

1.2.4.2 Gauges

1.2.4.2.1 Cold Cathode (1)

1.2.4.2.2 Convector (1)

1.2.4.3 Valves

1.2.4.3.1 Gate (Viton)

1.2.5 Radiation Shield

Shleifer/
Pjerov

Scheuerer

1.2.6 Water/Air

Beauman

White/
Wozniak

1.2.6.1 Hoses

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		Engineer	Technician	-1	REV				
1.3	System: Booster								
1.3.1	Injection/Extraction								
1.3.1.1	Injection/Extraction Magnet	Lynch/ Woodle	Breck						
1.3.1.2	Injection/Extraction Kickers	Lynch/ Woodle	Breck						
1.3.1.3	Injection/Extraction Str. Sect.	Lynch/ Woodle	Breck						
1.3.2	Ring Magnets	Lynch/ Woodle	Scheuerer						
1.3.2.1	Dipoles								
1.3.2.2	Quads								
1.3.2.3	Sextupoles								
1.3.2.4	Trims								
1.3.3	R/F Cavity	Mortazavi	Neuberg						
1.3.3.1	Vac Pumps								
1.3.3.2	Power Window								
1.3.3.3	Antennas & Loads								
1.3.3.4	Transmission Line								
1.3.3.5	Cooling								
1.3.3.6	Tuner								
1.3.4	Vacuum Components	Foerster/ Woodle	Gaudet						
1.3.4.1	Chamber Assy - Dipole								
1.3.4.2	Support Assy - Dipole Chamber								
1.3.4.3	Pumpout Port Assy								
1.3.5	Vacuum System	Foerster	Gaudet						
1.3.5.1	SIP								
1.3.5.1.1	220 l/s	(7)							
1.3.5.2	Gauges								
1.3.5.2.1	BA Gauges	(1)							
1.3.5.2.2	Cold Cathode	(1)							
1.3.6	Diagnostics	Lynch	Radulescu						
1.3.6.1	Pickup Electrodes (PUE's)								
1.3.6.2	Electrostatic Kicker								
1.3.6.3	Electrostatic Monitor								
1.3.6.4	Flags								
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1.3 System: Booster (continued)

Engineer

Technician

1.3.6.5 Current Transformer

1.3.7 Radiation Shielding

Shleifer/
Pjerov

1.3.7.1 Injection

1.3.7.2 Extraction

1.3.7.3 Straight Section

1.3.8 Water/Air

Beauman

White/
Wozniak

REV

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1.4 System: Transfer Line - Booster to
VUV Ring

Engineer

Technician

1.4.1 Magnetic Components

Lynch/
Woodle

Breck

1.4.1.1 Quads

1.4.1.2 Trims - Horizontal

1.4.1.3 Trims - Vertical

1.4.1.4 Trims - Horiz./Vertical

1.4.1.5 Dipoles

1.4.2 Diagnostics

Lynch

Radulescu

1.4.2.1 Flags

1.4.2.2 PUE's

1.4.3 Safety Shutter

Lynch

Radulescu

1.4.4 Vacuum Components

Foerster/
Woodle

1.4.4.1 Chamber Assy - Beamline

1.4.4.2 Support Assy - Beamline

1.4.4.3 Pumpout Port Assy

1.4.5 Isolation Window

Foerster

Radulescu

1.4.6 Vacuum System

Foerster

Gaudet

1.4.6.1 SIP

1.4.6.1.1 60 l/s (Triode) (4)

1.4.6.2 Gauges

1.4.6.2.1 Cold Cathode (1)

1.4.6.3 Valves

1.4.6.3.1 Gate - Viton (1)

1.4.7 Radiation Shield

Shleifer/
Pjerov

1.4.8 Water/Air

Beauman

White/
Wozniak

1.4.8.1 Hoses

1.4.8.2 Air Operated Solenoids

1.4.8.3 Flowswitches

REV

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Form 1803					APPROVED	JOB NUMBER	DRAWING NUMBER	SIZE	REV		

				Engineer	Technician	REV			
1.5	System: VUV Ring					-1			
1.5.1	Injection System			Lynch/ Woodle		SLS-08.2-3			
1.5.1.1	Lamberson Septum			Lynch					
1.5.1.2	Kickers			Lynch					
1.5.1.3	Ceramic Chambers			Foerster	Scheuerer				
1.5.1.4	Injection Straight Section			Foerster	Scheuerer				
1.5.2	Magnetic Components			Lynch	Breck				
1.5.2.1	Dipoles								
1.5.2.2	Quadrupoles								
1.5.2.3	Sextupoles								
1.5.2.4	Trims								
1.5.2.5	Dipole Buss								
1.5.3	R/F Cavity			Mortazavi	Neuberg				
1.5.3.1	Vacuum Pumps								
1.5.3.2	Power Window								
1.5.3.3	Antennas & Loads								
1.5.3.4	Transmission Line								
1.5.3.5	Cooling								
1.5.3.6	Tuner								
1.5.4	Diagnostics			Foerster	Radulescu				
1.5.4.1	Pickup Electrodes (PUE's)								
1.5.4.2	Electrostatic Kicker								
1.5.4.3	Electrostatic Monitor								
1.5.4.4	Flags								
1.5.4.5	Current Transformer			Lynch/ Mortazavi					
1.5.4.6	Beam Scraper (No Watercooling)								
1.5.5	Vacuum Components			Foerster/ Woodle	Gaudet				
1.5.5.1	Chamber Assy - Dipole								
1.5.5.2	Chamber Assy - Beamline								
1.5.6	Vacuum System			Foerster	Gaudet				
1.5.6.1	SIP								
1.5.6.1.1	30 l/s	(1)							
1.5.6.1.2	120 l/s	(1)							
1.5.6.1.3	220 l/s	(12)							
1.5.6.2	DIP	(8)							
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1.5 System: VUV Ring (continued)

Engineer

Technician

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- 1.5.6.3 TSP (22)
- 1.5.6.4 NEG
- 1.5.6.4.1 Modules (2)
- 1.5.6.4.2 Strips (2)
- 1.5.6.5 Gauge
- 1.5.6.5.1 BA Gauge (12)
- 1.5.6.5.2 Convection (3)
- 1.5.6.6 RGA (4)
- 1.5.6.7 Valves
- 1.5.6.7.1 All Metal Gate (7)

Foerster

Gaudet

1.5.7 Radiation Shielding

Shleifer/
Pjerov

- 1.5.7.1 Inside Ring Shielding
- 1.5.7.2 Outside Ring Shielding

1.5.8 Water/Air

Beauman

White/
Wozniak

- 1.5.8.1 Hoses
- 1.5.8.2 Air Operated Solenoids
- 1.5.8.3 Vacuum Valve Controllers
- 1.5.8.4 Nitrogen Gas Distribution
- 1.5.8.5 Flowswitches

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Form 1803					SLS-08.2-3	-1	C	

				Engineer	Technician	-1	REV
1.6	System: VUV Ring Insertion Devices			Woodle	Radulescu		
1.6.1	FEL Undulator			Woodle	Radulescu		
1.6.1.1	Drives - Mechanical Drive Assy						
1.6.1.2	Magnet Assembly						
1.6.2	FEL Undulator Straight Section			Woodle	Radulescu		
1.6.2.1	Chamber Assy - Undulator FEL						
1.6.3	TOK			Woodle	Radulescu		
1.6.3.1	Mechanical Drive Assy						
1.6.3.2	Magnet Assembly						
1.6.4	TOK Straight Section			Woodle	Radulescu		
1.6.4.1	Chamber Assy - Undulator TOK						

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1.7 System: VUV Ring Front End & Beamline

Engineer

Technician

Shleifer

Radulescu

1.7.1 Front End Components

1.7.1.1 Water Cooled Mask

1.7.1.2 Fast Valve

1.7.1.3 Safety Shutter

1.7.1.4 Gate Valve

1.7.2 Beamline Components

1.7.2.1 U5

1.7.2.1.1 Mirror Box Assembly

1.7.2.2 U7

1.7.2.2.1 Goniometer

1.7.2.3 U9

1.7.2.3.1 Spherical Mirror Manipulator

1.7.2.4 U10

1.7.2.4.1 PSD Experimental Station

1.7.2.5 U13

1.7.2.5.1 Mirror Holder Assembly

1.7.2.6 U14

1.7.2.6.1 Experimental Chamber

1.7.2.6.2 Preparation Chamber

1.7.2.6.3 Sample Transfer Mechanism

1.7.2.7 IR4

1.7.2.7.1 Infrared Mirror Box

1.7.2.7.2 Infrared Actuator

1.7.2.7.3 Manual Mirror Manipulator

1.7.2.7.4 Upper Mirror Box

1.7.2.7.5 Slit Mechanism

1.7.2.8 TOK

1.7.2.8.1 Water Cooled Aperture

1.7.2.8.2 Safety Shutter

1.7.2.8.3 Mirror Box #1

1.7.2.8.4 Mirror Box #2

1.7.2.8.5 Upstream End

1.7.2.9 TOK Branch Line

Foerster

Gaudet

1.7.3 Vacuum System

1.7.3.1 SIP

1.7.3.1.1 220 l/s (17)

1.7.3.1.2 TSP (17)

1.7.3.2 BA Gauges (17)

1.7.3.3 RGA (17)

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1.7 System: VUV Ring Front End &
Beamline (continued)

Engineer

Technician

1.7.3.4 All Metal Valves (19)

1.7.4 VUV Total & Partial Pressure System

Foerster

Gaudet/
deBoer

1.7.4.1 PC/XT Computer (1)

1.7.4.1.1 Computer (1)

1.7.4.1.2 Color Monitor (1)

1.7.4.1.3 Printer (1)

1.7.4.2 VG Mass Spect. Sys. (1)

Foerster

Gaudet/
deBoer

1.7.4.2.1 VG/PC Card (1)

1.7.4.2.2 VG Interface (1)

1.7.4.2.3 SX-200 Controller (2)

1.7.4.2.4 MPX-64 Multiplexer (1)

1.7.4.2.5 MPX-8 Multiplexer (2)

1.7.4.2.6 VG SX200 RF Box (18)

1.7.4.2.7 SX200 Mass Spec (18)

1.7.4.2.8 VG Cables (18)

1.7.4.3 Total Pressure Monitor

1.7.4.3.1 PC Interface (1)

1.7.4.3.2 Camac Crate (1)

1.7.4.3.3 Analog Card (1)

1.7.4.3.4 Control Card (1)

1.7.4.4 Total Pressure System

1.7.4.4.1 Grnvl Phl. Contrler (18)

1.7.4.4.2 Varian (NIG) Gauge (18)

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				REV
1.8	System: Transfer Line - Booster to X-Ray	Engineer	Technician	-1
1.8.1	Magnetic Components	Lynch/ Woodle	Scheuerer	SLS-08.2-3
1.8.1.1	Dipoles			
1.8.1.2	Quadrupoles			
1.8.1.3	Sextupoles			
1.8.1.4	Trims			
1.8.2	Diagnostics	Lynch	Radulescu	
1.8.2.1	Flags			
1.8.2.2	PUE's			
1.8.2.3	Monitors			
1.8.3	Safety Shutter	Lynch	Radulescu	
1.8.4	Vacuum Components	Foerster/ Woodle	Gaudet	
1.8.4.1	Chamber Assy - Beamline			
1.8.4.2	Support Assy - Beamline			
1.8.4.3	Pumpout Port Assy			
1.8.5	Isolation Window	Foerster	Radulescu	
1.8.6	Vacuum System	Foerster	Gaudet	
1.8.6.1	SIP			
1.8.6.1.1	60 l/s	(4)		
1.8.6.2	Gauges			
1.8.6.2.1	Cold Cathode	(1)		
1.8.6.3	Valves			
1.8.6.3.1	Gate Viton	(1)		
1.8.7	Radiation Shield	Lynch/ Pjerov		
1.8.7.1	Lead Shielding Along Injection Line			
1.8.8	Water/Air	Beauman	White/ Wozniak	

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		-1 REV						
1.9	System: X-Ray Ring	Engineer	Technician					
1.9.1	Injection System	Lynch/ Woodle	Scheuerer					
1.9.1.1	Injection Septum	Lynch/ Woodle	Scheuerer					
1.9.1.2	Kickers	Lynch	Scheuerer					
1.9.1.3	Ceramic Chambers	Foerster	Scheuerer					
1.9.1.4	Injection Straight Section	Foerster	Scheuerer					
1.9.2	Magnetic Components	Lynch						
1.9.2.1	Dipoles							
1.9.2.2	Quadrupoles							
1.9.2.3	Sextupoles							
1.9.2.4	Trims							
1.9.2.5	Dipole Magnet Bus							
1.9.3	R/F Cavities	Mortazavi	Neuberg					
1.9.3.1	Vacuum Pumps							
1.9.3.2	Power Window							
1.9.3.3	Antennas & Loads							
1.9.3.4	Transmission Line							
1.9.3.5	Cooling							
1.9.3.6	Tuner							
1.9.4	Vacuum Components	Foerster/ Woodle	Gaudet					
1.9.4.1	Chamber Assy - Dipole							
1.9.4.2	Chamber Assy - Beamline							
1.9.5	Vacuum System	Foerster	Gaudet					
1.9.5.1	SIP							
1.9.5.1.1	8 l/s	(2)						
1.9.5.1.2	45 l/s (Star Cell)	(3)						
1.9.5.1.3	120 l/s	(3)						
1.9.5.1.4	220 l/s	(60)						
1.9.5.1.5	440 l/s	(3)						
1.9.5.2	DIP	(16)						
1.9.5.3	TSP	(95)						
1.9.5.4	NEG							
1.9.5.4.1	Modules	(5)						
1.9.5.4.2	Strips	(6)						
1.9.5.4.3	Cartridge	(1)						
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				Engineer	Technician	REV			
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1.9	System: X-Ray Ring (continued)					SLS-08.2-3			
1.9.5.5	Gauge								
1.9.5.5.1	BA Gauge (27)								
1.9.5.5.2	Convectron (4)								
1.9.5.6	RGA (4)								
1.9.5.7	Valves								
1.9.5.7.1	All Metal Gate (14)								
1.9.6	Diagnostics			Lynch	Radulescu				
1.9.6.1	Pickup Electrodes (PUE's)								
1.9.6.2	Electrostatic Kicker								
1.9.6.3	Electrostatic Monitor								
1.9.6.4	Flags								
1.9.6.5	Current Transformer								
1.9.6.6	Beam Scraper (No Watercooling)								
1.9.6.7	Water Cooled Beam Scraper								
1.9.7	Radiation Shield			Lynch/ Pjerov	Warkentien				
1.9.8	Water/Air			Beauman	White/ Wozniak				
1.9.8.1	Hoses								
1.9.8.2	Air Operated Solenoids								
1.9.8.3	Vacuum Valve Controllers								
1.9.8.4	Nitrogen Gas Distribution								
1.9.8.5	Low Press. Air Distribution								
1.9.8.6	Flowswitches								
1.9.8.7	Pressure Regulators								
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1.10 System: X-Ray Ring Insertion Devices

Engineer

Technician

Woodle

Radulescu

1.10.1 X-1 Undulator

1.10.1.1 Mechanical Drive Assy

1.10.1.2 Correction Coils

1.10.1.3 Magnet Assembly

1.10.2 X-1 Straight Section

Woodle

1.10.2.1 Chamber Assy - Undulator X-1

1.10.2.2 Chamber Assy - X8D2-D4

1.10.3 X-1 Exit Chamber

Lynch/
Foerster

1.10.3.1 Dipole Chamber

1.10.3.2 Copper Crotch

1.10.3.3 NEG and DIP Pumps

1.10.3.4 Exit Chamber Support

1.10.4 X-13 Undulator

Woodle

Radulescu

1.10.4.1 Mechanical Drive Assy

1.10.4.2 Correction Coils

1.10.4.3 Magnet Assembly

1.10.5 X-13 Straight Section

Woodle

1.10.5.1 Chamber Assy - Undulator X-13

1.10.5.2 Chamber Assy - X3D2-D4

1.10.6 X-13 Exit Chamber

Woodle

1.10.7 X-17 Wiggler

Mortazavi/ Warkentien
Beauman

1.10.8 X-17 Cryogenics

Mortazavi/ Warkentein/
Beauman Wozniak

1.10.8.1 Model 1430 Helium Refrigerator

1.10.8.2 Model RS Compressor

1.10.8.3 Hereaus Process Vacuum Pump

1.10.8.4 Hereaus Vac Pump LN₂ dewar

1.10.8.5 Turbo Pump Sta-Magnet Ins. Vac.

1.10.8.6 Helium Gas Storage Tubes

1.10.8.7 O₂ Monitor

1.10.9 X-17 Straight Section

Woodle

1.10.9.1 Chamber Assy - X4D1

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1.10 System: X-Ray Ring Insertion Devices (cont'd)

Engineer

Technician

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1.10.9.2 Chamber Assy - X4D2-D4

1.10.10 X-17 Exit Chamber

Lynch/
Woodle

1.10.10.1 Dipole Chamber

1.10.10.2 Copper Crotch

1.10.10.3 NEG and DIP Pumps

1.10.10.4 Exit Chamber Support

Woodle

Radulescu

1.10.11 X-21 Wiggler

1.10.11.1 Mechanical Drive Assy

1.10.11.2 Correction Coils

1.10.11.3 Magnet Assembly

Woodle

1.10.12 X-21 Straight Section

1.10.12.1 Chamber Assy - Undulator X-21

1.10.12.2 Chamber Assy - X5D2-D4

1.10.13 X-21 Exit Chamber

Lynch/
Woodle

1.10.13.1 Dipole Chamber

1.10.13.2 Copper Crotch

1.10.13.3 NEG and DIP Pumps

1.10.13.4 Exit Chamber Support

Lynch

Radulescu

1.10.14 X-25 Wiggler

1.10.14.1 Mechanical Drive Assy

1.10.14.2 Correction Coils

1.10.14.3 Magnet Assembly

Woodle

1.10.15 X-25 Straight Section

1.10.15.1 Chamber Assy - Undulator X-25

1.10.15.2 Chamber Assy - X6D2-D4

Lynch/
Woodle

Neuberg

1.10.16 X-25 Exit Chamber

1.10.16.1 Dipole Chamber

1.10.16.2 Copper Crotch

1.10.16.3 NEG and DIP Pumps

1.10.16.4 Exit Chamber Support

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1.10 System: X-Ray Ring Insertion Devices

Engineer

Technician

1.10.17 Water/Air

Beauman

White/
Wozniak

1.10.17.1 Hoses

1.10.17.2 Flowswitches

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1.11 System: X-Ray Front Ends & Beamlines

EngineerTechnician

1.11.1 Front End Components

Pjerov/
Foerster

Radulescu

1.11.1.1 ARC Source

Pjerov/
Foerster

Radulescu

1.11.1.1.1

X2 Front End

1.11.1.1.1.1

X2 X-Ray Water Cooled Mask 10°

1.11.1.1.1.2

X2 X-Ray 6" UHV Valve (VAT)

1.11.1.1.1.3

X2 X-Ray Fast Valve "C" Type

1.11.1.1.1.4

X2 X-Ray W.C. Safety Shtr. 18.18mRad

1.11.1.1.1.5

X2 X-Ray Water Cooled Aperture

1.11.1.1.2

X3 Front End

1.11.1.1.2.1

X3 X-Ray Water Cooled Mask 2½°

1.11.1.1.2.2

X3 X-Ray 6" UHV Valve (VAT)

1.11.1.1.2.3

X3 X-Ray Fast Valve "C" Type

1.11.1.1.2.4

X3 X-Ray W.C. Safety Shtr. 18.18mRad

1.11.1.1.2.5

X3 X-Ray Water Cooled Aperture

1.11.1.1.3

X4 Front End

1.11.1.1.3.1

X4 X-Ray Water Cooled Mask 10°

1.11.1.1.3.2

X4 X-Ray 6" UHV Valve (VAT)

1.11.1.1.3.3

X4 X-Ray Fast Valve "C" Type

1.11.1.1.3.4

X4 X-Ray W.C. Safety Shtr. 18.18mRad

1.11.1.1.3.5

X4 X-Ray Water Cooled Aperture

1.11.1.1.4

X5 Front End

1.11.1.1.4.1

X5 X-Ray Water Cooled Mask 10°

1.11.1.1.4.2

X5 X-Ray 6" UHV Valve (VAT)

1.11.1.1.4.3

X5 X-Ray Fast Valve "D" Type

1.11.1.1.4.4

X5 X-Ray W.C. Safety Shtr.

1.11.1.1.4.5

X5 X-Ray Watered Cooled Aperture

1.11.1.1.5

X6 Front End

1.11.1.1.5.1

X6 X-Ray Water Cooled Mask 10°

1.11.1.1.5.2

X6 X-Ray 6" UHV Valve (VAT)

1.11.1.1.5.3

X6 X-Ray Fast Valve "C" Type

1.11.1.1.5.4

X6 X-Ray W.C. Safety Shtr. 18.18mRad

1.11.1.1.5.5

X6 X-Ray Water Cooled Aperture

1.11.1.1.6

X7 Front End

1.11.1.1.6.1

X7 X-Ray Water Cooled Mask 2½°

1.11.1.1.6.2

X7 X-Ray 6" UHV Valve (VAT)

1.11.1.1.6.3

X7 X-Ray Fast Valve "C" Type

1.11.1.1.6.4

X7 X-Ray W.C. Safety Shtr. 18.18mRad

1.11.1.1.6.5

X7 X-Ray Water Cooled Aperture

1.11.1.1.7

X8 Front End

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1.11 System: X-Ray Front Ends & Beamlines (cont'd)

Engineer

Technician

REV

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1.11.1.1.7.1 X8 X-Ray Water Cooled Mask 10°
 1.11.1.1.7.2 X8 X-Ray 6" UHV Valve (VAT)
 1.11.1.1.7.3 X8 X-Ray Fast Valve "C" Type
 1.11.1.1.7.4 X8 X-Ray W.C. Safety Shtr. 10.3.10mRad
 1.11.1.1.7.5 X8 X-Ray Water Cooled Aperture
 1.11.1.1.8 X9 Front End

Pjerov/
Foerster

Radulescu

1.11.1.1.8.1 X9 X-Ray Water Cooled Mask 2½°
 1.11.1.1.8.2 X9 X-Ray 6" UHV Valve (GP)
 1.11.1.1.8.3 X9 X-Ray Fast Valve "C" Type
 1.11.1.1.8.4 X9 X-Ray W.C. Safety Shtr. 18.18mRad
 1.11.1.1.8.5 X9 X-Ray Water Cooled Aperture

X10 Front End

1.11.1.1.9.1 X10 X-Ray Water Cooled Mask 10°
 1.11.1.1.9.2 X10 X-Ray 6" UHV Valve (GP)
 1.11.1.1.9.3 X10 X-Ray Fast Valve "C" Type
 1.11.1.1.9.4 X10 X-Ray W.C. Safety Shtr. 10.3.10mRad
 1.11.1.1.9.5 X10 X-Ray Water Cooled Aperture

X11 Front End

1.11.1.1.10.1 X11 X-Ray Water Cooled Mask 2½°
 1.11.1.1.10.2 X11 X-Ray 6" UHV Valve (GP)
 1.11.1.1.10.3 X11 X-Ray Fast Valve "C" Type
 1.11.1.1.10.4 X11 X-Ray W.C. Safety Shtr. 18.18mRad
 1.11.1.1.10.5 X11 X-Ray Water Cooled Aperture

X12 Front End

1.11.1.1.11.1 X12 X-Ray Water Cooled Mask 10°
 1.11.1.1.11.2 X12 X-Ray 6" UHV Valve (GP)
 1.11.1.1.11.3 X12 X-Ray Fast Valve "C" Type
 1.11.1.1.11.4 X12 X-Ray W.C. Safety Shtr. 10.3.10mRad
 1.11.1.1.11.5 X12 X-Ray 6" UHV Valve (GP)

X13 Front End

1.11.1.1.12.1 X13 X-Ray Water Cooled Mask 0°
 1.11.1.1.12.2 X13 X-Ray 6" UHV Valve (GP)
 1.11.1.1.12.3 X13 X-Ray Water Cooled Aperture
 1.11.1.1.12.4 X13 X-Ray Water Cooled Paddle
 1.11.1.1.12.5 X13 X-Ray Water Cooled Beam Monitor
 1.11.1.1.12.6 X13 X-Ray W.C. Safety Shtr. 6mRad

X14 Front End

1.11.1.1.13.1 X14 X-Ray Water Cooled Mask 10°
 1.11.1.1.13.2 X14 X-Ray 6" UHV Valve (GP)
 1.11.1.1.13.3 X14 X-Ray Fast Valve "C" Type

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1.11 System: X-Ray Front Ends & Beamlines (cont'd)		Engineer	Technician	-1	REV
1.11.1.1.13.4	X14 X-Ray W.C. Safety Shtr. 18.18mRad			SLS-08.2-3	
1.11.1.1.13.5	X14 X-Ray Water Cooled Aperture				
1.11.1.1.14	X15 Front End				
1.11.1.1.14.1	X15 X-Ray Water Cooled Mask 2½°				
1.11.1.1.14.2	X15 X-Ray 6" UHV Valve (GP)				
1.11.1.1.14.3	X15 X-Ray Fast Valve "C" Type				
1.11.1.1.14.4	X15 X-Ray W.C. Safety Shtr. 18.18mRad				
1.11.1.1.14.5	X15 X-Ray Water Cooled Aperture				
1.11.1.1.15	X16 Front End	Pjerov/ Foerster	Radulescu		
1.11.1.1.15.1	X16 X-Ray Water Cooled Mask 10°				
1.11.1.1.15.2	X16 X-Ray 6" UHV Valve (GP)				
1.11.1.1.15.3	X16 X-Ray Fast Valve "C" Type				
1.11.1.1.15.4	X16 X-Ray W.C. Safety Shtr. 10.3.10mRad				
1.11.1.1.15.5	X16 X-Ray Water Cooled Aperture				
1.11.1.1.16	X18 Front End				
1.11.1.1.16.1	X18 X-Ray Water Cooled Mask 10°				
1.11.1.1.16.2	X18 X-Ray 6" UHV Valve (GP)				
1.11.1.1.16.3	X18 X-Ray Fast Valve "C" Type				
1.11.1.1.16.4	X18 X-Ray W.C. Safety Shtr. 18.18mRad				
1.11.1.1.16.5	X18 X-Ray Water Cooled Aperture				
1.11.1.1.17	X19 Front End				
1.11.1.1.17.1	X19 X-Ray Water Cooled Mask 2½°				
1.11.1.1.17.2	X19 X-Ray 6" UHV Valve (GP)				
1.11.1.1.17.3	X19 X-Ray Fast Valve "C" Type				
1.11.1.1.17.4	X19 X-Ray W.C. Safety Shtr. 10.3.10mRad				
1.11.1.1.17.5	X19 X-Ray Water Cooled Aperture				
1.11.1.1.18	X20 Front End				
1.11.1.1.18.1	X20 X-Ray Water Cooled Mask 10°				
1.11.1.1.18.2	X20 X-Ray 6" UHV Valve (GP)				
1.11.1.1.18.3	X20 X-Ray Fast Valve "C" Type				
1.11.1.1.18.4	X20 X-Ray W.C. Safety Shtr. 18.18mRad				
1.11.1.1.18.5	X20 X-Ray Water Cooled Aperture				
1.11.1.1.19	X22 Front End				
1.11.1.1.19.1	X22 X-Ray Water Cooled Mask 10°				
1.11.1.1.19.2	X22 X-Ray 6" UHV Valve (GP)				
1.11.1.1.19.3	X22 X-Ray Fast Valve "C" Type				
1.11.1.1.19.4	X22 X-Ray W.C. Safety Shtr. 10.3.10mRad				
1.11.1.1.19.5	X22 X-Ray Water Cooled Aperture				
1.11.1.1.20	X23 Front End				
1.11.1.1.20.1	X23 X-Ray Water Cooled Mask 2½°				

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PAGE 20 OF 27 <table style="display: inline-table; vertical-align: top; margin-left: 10px;"> <tr> <td style="border: 1px solid black; width: 50px; height: 20px;">DRAWN</td> <td style="border: 1px solid black; width: 50px; height: 20px;">CHECKER</td> <td style="border: 1px solid black; width: 50px; height: 20px;">DATE</td> </tr> </table>				DRAWN	CHECKER	DATE	NSLS MECHANICAL SYSTEM RESPONSIBILITIES				
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1.11 System: X-Ray Front Ends & Beamlines (cont'd)

EngineerTechnician

-1 REV

1.11.1.1.20.2 X23 X-Ray 6" UHV Valve (GP)
 1.11.1.1.20.3 X23 X-Ray Fast Valve "C" Type
 1.11.1.1.20.4 X23 X-Ray W.C. Safety Shtr. 18.18mRad
 1.11.1.1.20.5 X23 X-Ray Water Cooled Aperture
 1.11.1.1.21 X24 Front End
 1.11.1.1.21.1 X24 X-Ray Water Cooled Mask 10°
 1.11.1.1.21.2 X24 X-Ray 6" UHV Valve (GP)

Pjerov/
Foerster

Radulescu

SLS-08.2-3

1.11.1.1.21.3 X24 X-Ray Fast Valve "C" Type
 1.11.1.1.21.4 X24 X-Ray W.C. Safety Shtr. 10.3.10mRad
 1.11.1.1.21.5 X24 X-Ray Water Cooled Aperture
 1.11.1.1.22 X26 Front End
 1.11.1.1.22.1 X26 X-Ray Water Cooled Mask 10°
 1.11.1.1.22.2 X26 X-Ray 6" UHV Valve (VAT)
 1.11.1.1.22.3 X26 X-Ray Fast Valve "C" Type
 1.11.1.1.22.4 X26 X-Ray W.C. Sfty. Shtr. (Beamline "A" 6mRad)
 1.11.1.1.22.5 X26 X-Ray W.C. Sfty. Shtr. (Beamline "B" 6mRad)
 1.11.1.1.22.6 X26 X-Ray W.C. Sfty. Shtr. (Beamline "C" 6mRad)
 1.11.1.1.22.7 X26 X-Ray Water Cooled Aperture
 1.11.1.1.23 X27 Front End
 1.11.1.1.23.1 X27 X-Ray Water Cooled Mask 2½°
 1.11.1.1.23.2 X27 X-Ray 6" UHV Valve (VAT)
 1.11.1.1.23.3 X27 X-Ray Fast Valve "C" Type
 1.11.1.1.23.4 X27 X-Ray W.C. Sfty. Shtr. (Beamline "A" 6mRad)
 1.11.1.1.23.5 X27 X-Ray W.C. Sfty. Shtr. (Beamline "B" 6mRad)
 1.11.1.1.23.6 X27 X-Ray W.C. Sfty. Shtr. (Beamline "C" 6mRad)
 1.11.1.1.23.7 X27 X-Ray Water Cooled Aperture
 1.11.1.1.24 X28 Front End
 1.11.1.1.24.1 X28 X-Ray Water Cooled Mask 10°
 1.11.1.1.24.2 X28 X-Ray 6" UHV Valve (VAT)
 1.11.1.1.24.3 X28 X-Ray Fast Valve "C" Type
 1.11.1.1.24.4 X28 X-Ray W.C. Sfty. Shtr. (Beamline "A" 6mRad)
 1.11.1.1.24.5 X28 X-Ray W.C. Sfty. Shtr. (Beamline "B" 6mRad)
 1.11.1.1.24.6 X28 X-Ray W.C. Sfty. Shtr. (Beamline "C" 6mRad)
 1.11.1.1.24.7 X28 X-Ray Water Cooled Aperture
 1.11.1.1.25 X29 Front End
 1.11.1.1.25.1 X29 X-Ray Water Cooled Mask 2½°
 1.11.1.1.25.2 X29 X-Ray 1½° UHV Valve Port "A"
 1.11.1.1.25.3 X29 X-Ray 1½° UHV Valve Port "B"
 1.11.1.1.26 X30 Front End

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1.11 System: X-Ray Front Ends & Beamlines (cont'd)

Engineer

Technician

-1 REV

- 1.11.1.1.26.1 X30 X-Ray Water Cooled Mask 10°
- 1.11.1.1.26.2 X30 X-Ray 1½" UHV Valve Port "A"
- 1.11.1.1.26.3 X30 X-Ray 1½" UHV Valve Port "B"
- 1.11.1.1.26.4 X30 X-Ray Light Monitor Port "B"
- 1.11.1.1.26.5 X30 X-Ray Mirror Part "B"

1.11.1.2 X1 Insertion Device F/E

Woodle/
Foerster

Radulescu

- 1.11.1.2.1 Water Cooled Mask 0°
- 1.11.1.2.2 UHV Valve (VAT)
- 1.11.1.2.3 Fast Valve (Type "D")
- 1.11.1.2.4 Water Cooled Aperture
- 1.11.1.2.5 Beam Position Monitor
- 1.11.1.2.6 UHV Valve (VAT)
- 1.11.1.2.7 Beam Defining Aperture
- 1.11.1.2.8 Safety Shutter
- 1.11.1.2.9 Graphite Filter
- 1.11.1.2.10 1½" UHV Valve (VAT)

1.11.1.3 X21 Insertion Device F/E

Woodle/
Foerster

Radulescu

- 1.11.1.3.1 Water Cooled Mask 0°
- 1.11.1.3.2 UHV Valve (VAT)
- 1.11.1.3.3 Fast Valve (Type "D")
- 1.11.1.3.4 Beam Position Monitor
- 1.11.1.3.5 Beam Defining Aperture
- 1.11.1.3.6 Safety Shutter
- 1.11.1.3.7 Graphite Filter
- 1.11.1.3.8 UHV Valve (VAT)

1.11.1.4 X25 Insertion Device F/E

Woodle/
Foerster

Radulescu

- 1.11.1.4.1 Water Cooled Mask 0°
- 1.11.1.4.2 UHV Valve (VAT)
- 1.11.1.4.3 Fast Valve (Type "D")
- 1.11.1.4.4 Beam Position Monitor
- 1.11.1.4.5 Beam Defining Aperture
- 1.11.1.4.6 Safety Shutter
- 1.11.1.4.7 Graphite Filter
- 1.11.1.4.8 UHV Valve (VAT)

1.11.1.5 X17 Insertion Device F/E

Shleifer/
Pjerov

Radulescu

- 1.11.1.5.1 X-Ray Water Cooled Mask 0°
- 1.11.1.5.2 X-Ray 6" UHV Valve (VAT)

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1.11 System: X-Ray Front Ends & Beamlines (cont'd)

EngineerTechnician

-1 REV

- 1.11.1.5.3 X-Ray Fast Valve "D" Type
 1.11.1.5.4 X-Ray Beam Position Monitor
 1.11.1.5.5 X-Ray Aperture & Shutter Assy
 1.11.1.5.6 X-Ray Graphite Filter
 1.11.1.5.7 X-Ray Safety Shutter
 1.11.1.5.8 X-Ray Xenon Filter

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1.11.2 Beamline Components

Shleifer

1.11.2.1 X1 Beamline

- 1.11.2.1.1 Bellows Assy
 1.11.2.1.2 Mirror Assy (LBL)
 1.11.2.1.3 1½" UHV Valve
 1.11.2.1.4 Mirror Box (EXXON)
 1.11.2.1.5 1½" UHV Valve
 1.11.2.1.6 Entrance Slit
 1.11.2.1.7 Lead Backstop
 1.11.2.1.8 1½" UHV Valve
 1.11.2.1.9 Grating Mask Assy
 1.11.2.1.10 Monochromator Assy
 1.11.2.1.11 Zero Order Stop
 1.11.2.1.12 1½" UHV Valve
 1.11.2.1.13 Exit Slit (S.W.L.)
 1.11.2.1.14 Refocusing Mirror Assy (S.W.L.)
 1.11.2.1.15 Exit Slit (S.W.L.)
 1.11.2.1.16 1½" UHV Valve
 1.11.2.1.17 Refocusing Mirror Assy (S.W.L.)
 1.11.2.1.18 1½" UHV Valve
 1.11.2.1.19 Differential Pumping Station
 1.11.2.1.20 1½" UHV Valve
 1.11.2.1.21 Scanning Transmission Microscope

1.11.2.2 X17 Beamline

Shleifer/
Pjerov

- 1.11.2.2.1 X17 Beamline 12" Valve (VRC)
 1.11.2.2.2 X17 Beamline Ion Pump 220 ℓ/s
 1.11.2.2.3 X17 Beamline Aperture & Shtr. Assy
 1.11.2.2.4 X17 Beamline Aperture & Shtr. Ion Pump 220 ℓ/s
 1.11.2.2.5 X17 Beamline Aperture & Shtr. Ion Gauge
 1.11.2.2.6 X17 Beamline 12" Valve (VRC)
 1.11.2.2.7 X17 Beamline Safety Shtr. Assy
 1.11.2.2.8 X17 Beamline Safety Shtr. Ion Pump
 1.11.2.2.9 X17 Beamline Big Hutch

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1.11 System: X-Ray Front Ends & Beamlines (cont'd)		Engineer	Technician	REV				
1.11.2.2.10	X17 Beamline Water Cooled Be Window			-1				
1.11.2.2.11	X17 Beamline Beam Stop Assy			SLS-08.2-3				
1.11.2.2.12	X17 Beamline B & C Hutch							
1.11.2.2.13	X17 Beamline Monochromator							
1.11.2.2.14	X17 Beamline Slits							
1.11.2.2.15	X17 Beamline Fast Acting Safety Shtr.							
1.11.2.2.16	X17 Beamline Photon Shutter							
1.11.2.2.17	X17 Beamline Dual Beam Monitor							
1.11.2.2.18	X17 Beamline Chair							
1.11.2.2.19	X17 Beamline Dual Beam Detector							
1.11.2.3	X21 Beamline	Shleifer						
1.11.2.4	X25 Beamline	Woodle						
1.11.3	Vacuum System	Foerster	Gaudet					
1.11.3.1	SIP							
1.11.3.1.1	20 l/s (1)							
1.11.3.1.2	60 l/s (1)							
1.11.3.1.3	220 l/s (33)							
1.11.3.2	TSP (33)							
1.11.3.3	BA Gauges (30)							
1.11.3.4	RGA (30)							
1.11.3.5	All Metal Valves (30)							
1.11.4	X-Ray Total & Partial Pressure System	Foerster	Gaudet/ deBoer					
1.11.4.1	VG Mass Spect. Sys. (1)							
1.11.4.1.1	MPX-8 Multiplex (2)							
1.11.4.1.2	SX-200 Controller (1)							
1.11.4.1.3	Chart Recorder (1)							
1.11.4.1.4	RF Box (32)							
1.11.4.1.5	SX-200 Mass Spec Hd. (32)							
1.11.4.1.6	VG Cables (32)							
1.11.4.2	Total Pressure System							
1.11.4.2.1	Granvle Philips Cntrlr (32)							
1.11.4.2.2	Varian (NIG) Guage (32)							
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1.12 System: Process Water/Pneumatics

Engineer

Technician

1.12.1 Pump Room Equipment

Beauman/

White/
Wozniak

1.12.1.1 High Pressure Copper System

1.12.1.1.1 Heat Exchangers

1.12.1.1.2 Pumps

1.12.1.1.3 Motors

1.12.1.1.4 Deionizers

1.12.1.1.5 Control System

1.12.1.2 Low Pressure

1.12.1.2.1 Heat Exchangers

1.12.1.2.2 Pumps

1.12.1.2.3 Motors

1.12.1.2.4 Deionizers

1.12.1.2.5 Control System

1.12.2 Experimental Water System

Beauman/

White/
Wozniak

1.12.2.1 Heat Exchangers

1.12.2.2 Pumps

1.12.2.3 Motors

1.12.2.4 Deionizers

1.12.2.5 Control System

1.12.3 Pneumatics

Beauman/

White/
Wozniak

1.12.3.1 Low Pressure Air

1.12.3.1.1 Compressors

1.12.3.1.2 Dryers

1.12.3.1.3 Filters

1.12.3.2 High Pressure Nitrogen Gas

1.12.3.2.1 Manifold

1.12.3.2.2 Distribution Lines

1.12.3.2.3 Regulators

REV

-1

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1.13 System: Facility Support

Engineer

Technician

-1 REV

- 1.13.1.13.1 CVC Penter Vac (1)
- 1.13.1.13.2 GP 303 Ion Gauge (2)
- 1.13.1.13.3 GP 271 Ion Gauge (5)
- 1.13.1.14 Sublimation Ti Bal Control (1)
- 1.13.1.15 PE Bosstivac Supply (1)
- 1.13.1.16 VG SX-200 Controller (2)
- 1.13.1.17 VG SX-200 RF Supply (2)
- 1.13.1.18 Hughs DC Spot Welder VTA 50 (1)
- 1.13.1.19 Ultrasonic Cleaner (1)

Foerster

Gaudet

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1.13.2 Machine Shop

Woodle

McKenna

- 1.13.2.1 Machine Tools
- 1.13.2.2 Precision Measuring Tools

1.13.3 Mechanical Tech Shop

Woodle

McKenna

- 1.13.3.1 Machine Tools
- 1.13.3.2 Precision Measuring Tools
- 1.13.3.3 Surface Tables
- 1.13.3.4 Material Handling Equipment
- 1.13.3.5 Laminar Flow Hoods
- 1.13.3.6 Ovens-Drying

1.13.4 Survey

Lynch

Scheuerer

- 1.13.4.1 Survey Equipment
 - 1.13.4.1.1 Theodolites
 - 1.13.4.1.2 Levels
 - 1.13.4.1.3 Inclinator
 - 1.13.4.1.4 Plummets
 - 1.13.4.1.5 Precision Bubbles
 - 1.13.4.1.6 Lenses
 - 1.13.4.1.7 Scales
- 1.13.4.2 Ring Component Survey
 - 1.13.4.2.1 X-Ray Ring Dipole Closure
 - 1.13.4.2.2 VUV Ring Dipole Closure
 - 1.13.4.2.3 X-Ray Ring PUE's Survey
 - 1.13.4.2.4 VUV Ring PUE's Survey
 - 1.13.4.2.5 X-Ray Ring Dipole Closure
 - 1.13.4.2.6 Booster Ring PUE's Survey
- 1.13.4.3 Transfer Line Components Survey
 - 1.13.4.3.1 Booster-to-VUV Transfer Line

Engineer

Technician

1.13 System: Facility Support (continued)

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1.13.4.3.2	Booster-to-X-Ray Transfer Line				
1.13.4.4	Beamline Components Survey				
1.13.5	Magnetic Measurements		Lynch/ Woodle	Scheuerer	
1.13.5.1	SCW				
1.13.5.2	Undulator/Wiggler				
1.13.5.3	Straight Section Multipoles				
1.13.5.4	72° Bender				
1.13.5.5	180° Dipole				
1.13.5.6	Fringe Field 180° Dipole				
1.13.6	Chemical Cleaning		Foerster	Gaudet/ Cernyar	
1.13.6.1	Cleaning Tanks				
1.13.6.1.1	#1 D.I. Water	(1)			
1.13.6.1.2	#2 Alutone	(1)			
1.13.6.1.3	#3 Water Rinse	(1)			
1.13.6.1.4	#4 Oakite #166	(1)			
1.13.6.1.5	#5 HF & Nitric	(1)			
1.13.6.1.6	#6 Water Rinse	(1)			
1.13.6.1.7	#7 Oakite #360-L	(1)			
1.13.6.2	Exhaust Scrubber	(1)			
1.13.6.3	Crane 1500#	(1)			
1.13.6.4	Copper Cleaning Tanks AC-500	(1)			
1.13.6.5	Vythane Degreaser				
1.13.6.5.1	Sonicor U/S	(1)			
1.13.6.5.2	Sonicor Still	(1)			
1.13.6.6	D.I. Water System	(1)			
1.13.6.7	Hot Water Heater	(1)			
1.13.6.8	Hot Pack Drying Oven	(1)			
1.13.7	Welding Shop		Woodle	McKenna/ Sorensen	
1.13.7.1	ACDC TIG Welding Machines				
1.13.7.2	Hand Torch Brazing Equipment				

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NATIONAL SYNCHROTRON LIGHT SOURCE ELECTRICAL SYSTEM RESPONSIBILITIES

QA CATEGORY	A-3 ²⁸ 11/4/93
OUTSTANDING ECN'S	

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I. SYSTEM: COMPUTER CONTROL

	ELECTRICAL		SOFTWARE
	PHY/ENG	TECH	PROGRAMMER
1. VAX	SMITH	FOXWORTH	LANGENBACH
2. PERIPHERALS	SMITH	FOXWORTH	FLANNIGAN
3. COMPUTER ROOM PC'S	FLANNIGAN	FOXWORTH	FLANNIGAN
4. MASTER TIMING SYSTEM	FLANNIGAN	KLEIN/RAMBO	RAMAMOORTHY
5. TV, ERROPRO	SMITH	FOXWORTH	RAMAMOORTHY
6. TV SYSTEM AND DISTRIBUTION	FLANNIGAN	FOXWORTH/FRISBIE	
7. REALTIME ETHERNET	LANGENBACH	FOXWORTH/LINK	
8. USER ETHERNET	LANGENBACH/KLEIN	HUGHES/FOXWORTH	
9. ETHERNET BRIDGES	LANGENBACH	FOXWORTH	
10. PBX SYSTEM	LANGENBACH	FOXWORTH/FRISBIE	LANGENBACH
11. VME MAGNET RAMPING	FLANNIGAN	FRISBIE/McDONALD	SMITH
12. VME COMMUNICATIONS (GPLS)	SMITH/KLEIN	FRISBIE	RAMAMOORTHY
13. COMPUTER ROOM VME	FLANNIGAN	FOXWORTH	COMPUTER GROUP

II. SYSTEM: MICROS

	ELECTRICAL		SOFTWARE
	PHY/ENG	TECH	PROGRAMMER
1. BRAMP	SMITH	FRISBIE	RAMAMOORTHY
2. KICKER (VME)	SMITH	FRISBIE	ROSE
2a. KICKER (MBUS)	SMITH	RAMBO	
3. UV MAIN MAG	SMITH	FRISBIE/McDONALD	FLANNIGAN
4. XRAY MAIN	SMITH	FRISBIE/McDONALD	FLANNIGAN
5. LINAC GUN	SMITH/SHEEHAN	LINK	ROSE
6. UVBL STATUS	SMITH	LINK	ROSE
7. UGFDBK H F	OM SINGH	LINK	DABROWSKI
8. UGFDBK H T	OM SINGH	LINK	DABROWSKI
9. UGFDBK V F	OM SINGH	LINK	DABROWSKI
10. UGFDBK V T	OM SINGH	LINK	DABROWSKI
11. UORBIT	OM SINGH	LINK	ROSE/DABROWSKI
12. X13FDBK	OM SINGH	LINK	FLANNIGAN
13. X17FDBK	OM SINGH	LINK	FLANNIGAN
14. X1FDBK	OM SINGH	LINK	FLANNIGAN
15. X21FDBK	OM SINGH	LINK	FLANNIGAN
16. X25FDBK	OM SINGH	LINK	FLANNIGAN
17. X5FDBK	OM SINGH	LINK	FLANNIGAN
18. XBMLNSTAT	OM SINGH	LINK	DESMOND
19. XGFDBK H F	OM SINGH	LINK	DABROWSKI/ROSE
20. XGFDBK H T	OM SINGH	LINK	DABROWSKI/ROSE
21. XGFDBK V F	OM SINGH	LINK	DABROWSKI/ROSE
22. XGFDBK V T	OM SINGH	LINK	DABROWSKI/ROSE
23. XORBIT	OM SINGH	LINK	ROSE/DABROWSKI
24. U5UNDUL	KLEIN	NIELSON	DABROWSKI
25. UV RF 1&2	SMITH	NIELSON	RAMAMOORTHY
26. UTOK	KLEIN	NIELSON	DABROWSKI
27. X13UNDUL	KLEIN	NIELSON/LINK	DABROWSKI
28. X1UNDUL	KLEIN	NIELSON	DABROWSKI
29. X21UNDUL	KLEIN	NIELSON	DABROWSKI
30. XRAY RF 1 & 2	SMITH	NIELSON	RAMAMOORTHY
31. XRAY RF 3 & 4	SMITH	NIELSON	RAMAMOORTHY
32. X25UNDUL	KLEIN	NIELSON	DABROWSKI
33. BUD/LBD	OM SINGH	RAMBO	ROSE
34. BXD	OM SINGH	RAMBO	ROSE
35. BSTEERM	OM SINGH	RAMBO	RAMAMOORTHY
36. BUTRANM	OM SINGH	RAMBO	RAMAMOORTHY
37. BXTRANM	OM SINGH	RAMBO	RAMAMOORTHY
38. LBTRANM	OM SINGH	RAMBO	RAMAMOORTHY
39. SBUNCHM	OM SINGH	RAMBO	RAMAMOORTHY
40. X17SCWIG	SMITH	RAMBO	FLANNIGAN
41. UV DBASE	SMITH	RAMBO	FLANNIGAN
42. UVTRIM	SINGH	RAMBO	ROSE/FLANNIGAN
43. XRAY DBASE	SMITH	RAMBO	FLANNIGAN
44. XTRIMM	SINGH	RAMBO	ROSE/FLANNIGAN
45. CENTRAL AI	NAWROCKY	TALLENT	DABROWSKI
46. LBTVACM	SMITH	TALLENT	TALLENT
47. UVVACUUM	SMITH	TALLENT	TALLENT
48. X17 AI	NAWROCKY	TALLENT	FLANNIGAN
49. X21 AI	NAWROCKY	TALLENT	FLANNIGAN
50. X25 AI	NAWROCKY	TALLENT	FLANNIGAN
51. XRAY VAC	SMITH	TALLENT	TALLENT
52.			
53. FLAG	SMITH	FRISBIE	ROSE
54. KNOB	SMITH	FRISBIE	FLANNIGAN
55. VIDEO MUX	SMITH	FRISBIE	FLANNIGAN

I. SYSTEM: VUV INSERTION DEVICES TOK, U5

	ELECTRICAL		SOFTWARE
	PHY/ENG	TECH	PROGRAMMER
1. CONTROLS AND INTERLOCKS	KLEIN	NIELSON/CASE	DABROWSKI
2. MAGNETIC AND MECHANICAL SYSTEM	SOLOMON	STENBY	
3. COMPUTER CONTROL	KLEIN/DABROWSKI	NIELSON	
4. MOTOR DRIVE SYSTEM	KLEIN	CASE	
5. U5, TOK POWER SUPPLIES	KLEIN	NIELSON/RAMBO	

II. SYSTEM: XRAY INSERTION DEVICES X1, X13, X17, X21, X25

	ELECTRICAL		SOFTWARE
	PHY/ENG	TECH	PROGRAMMER
1. X1 CONTROLS AND INTERLOCKS	KLEIN	NIELSON/CASE	DABROWSKI
2. MAGNETIC AND MECHANICAL SYSTEM	SOLOMON		
3. COMPUTER CONTROL	KLEIN/DABROWSKI	NIELSON/RAMBO	
4. MOTOR DRIVE SYSTEM	KLEIN	CASE	
5. X13 CONTROLS AND INTERLOCKS	KLEIN	NIELSON/CASE	
6. MAGNETIC AND MECHANICAL SYSTEM	SOLOMON		DABROWSKI
7. COMPUTER CONTROL	KLEIN/DABROWSKI	NIELSON/RAMBO	
8. MOTOR DRIVE SYSTEM	KLEIN	CASE	
9. X17 POWER SUPPLIES	SHEEHAN	MEIER	
10. REFRIGERATION SYSTEM	MEIER	MEIER	
11. MECHANICAL SYSTEMS		WARKENTEN	FLANNIGAN FLANNIGAN DABROWSKI
12. CONTROLS	SHEEHAN/MEIER		
13. RAMPING AND SETPOINT	FLANNIGAN		
14. STATUS MONITOR COMPUTER CONTROL	FLANNIGAN		
15. PHOTON SHIELD COMPUTER CONTROL	KLEIN/DABROWSKI	CASE	
16. VACUUM SYSTEMS		DEBOER	DABROWSKI
17. SECURITY	LARSON	GALLAGHER	
18. X21 CONTROLS AND INTERLOCKS	KLEIN	NIELSON/CASE	
19. MAGNETIC AND MECHANICAL SYSTEM	SOLOMON		
20. COMPUTER CONTROL	KLEIN/DABROWSKI	NIELSON/RAMBO	
21. MOTOR DRIVE SYSTEM	KLEIN	CASE	DABROWSKI
22. X25 CONTROLS AND INTERLOCKS	KLEIN	NIELSON/CASE	
23. MAGNETIC AND MECHANICAL SYSTEMS	SOLOMON		
24. COMPUTER CONTROL	KLEIN/DABROWSKI	NIELSON/RAMBO	
25. MOTOR DRIVE SYSTEM	KLEIN	CASE	
26. ACTIVE INTERLOCK	NAWROCKY	TALLENT	FLANNIGAN
27. X1, X13, X21, X25 END CORRECTERS	KLEIN	NIELSON/RAMBO	

I. SYSTEM: DIAGNOSTICS LINAC-BOOSTER-TRANSPORT LINE

	ELECTRICAL		SOFTWARE
	PHY/ENG	TECH	PROGRAMMER
1. FLAGS	FLANNIGAN/KLEIN	FRISBIE/JAHNES	RAMAMOORTHY
2. SAFETY SHUTTERS	DICKINSON	FRISBIE/JAHNES	RAMAMOORTHY
3. BEAM CURRENT XFMRs	SHEEHAN	MEIER	

II. SYSTEM: DIAGNOSTICS VUV

	ELECTRICAL		SOFTWARE
	PHY/ENG	TECH	PROGRAMMER
1. FRONT END STATUS	FLANNIGAN/KLEIN	LINK	RAMAMOORTHY
2. RADIATION MONITORS (RS232)	DICKINSON	LINK	RAMAMOORTHY
3. BEAM CURRENT DISTRIBUTION	KLEIN	RAMBO/FRISBIE	RAMAMOORTHY
4. TIMING DISTRIBUTION	D'ALSACE/KLEIN	GALLAGHER	DABROWSKI
5. BEAM CURRENT XFMR	NAWROCKY	TALLENT	
6. BEAM PROFILE MONITOR	NAWROCKY	TALLENT	
7. LONGITUDINAL FEEDBACK	NAWROCKY	TALLENT	
8. BPM'S	BORDLEY	BORRELLI	
9. ORBIT MONITOR COMPUTER CONTROL	NAWROCKY/SMITH	LINK	DABROWSKI

III. SYSTEM: DIAGNOSTICS

XRAY

	ELECTRICAL		SOFTWARE
	PHY/ENG	TECH	PROGRAMMER
1. FLAGS	FLANNIGAN/KLEIN	FRISBIE/JAHNES	RAMAMOORTHY
2. BEAM CURRENT XFMR	NAWROCKY	TALLENT	RAMAMOORTHY
3. BEAM CURRENT DISTRIBUTION	KLEIN/FLANNIGAN	RAMBO/FRISBIE	
4. SCRAPERS(ORIGINAL)	KLEIN	NIELSON	DABROWSKI
5. STRIP-LINES	NAWROCKY	TALLENT	
6. LONGITUDNAL FEEDBACK	NAWROCKY	TALLENT	
7. BEAM PROFILE MONITOR	NAWROCKY	TALLENT	
8. LOCAL FEEDBACK	O. SINGH	LINK	FLANNIGAN
9. ACTIVE INTERLOCK'S (CENTRAL)	NAWROCKY/THOMAS	TALLENT/RF GROUP	DABROWSKI/SO
10. BPM'S	BRODOLEY	BORRELLI	DABROWSKI
11. ORBIT MONITOR COMPUTER CONTROL	NAWROCKY/SMITH	LINK	DABROWSKI

I. SYSTEM: MAGNET POWER SUPPLY SYSTEM

LINAC

	ELECTRICAL		SOFTWARE
	PHY/ENG	TECH	PROGRAMMER
1. QUADRUPOLE POWER SUPPLIES	O. SINGH	BORRELLI/GARRISON	
2. CONTROLS	O. SINGH	BORRELLI/GARRISON	
3. COMPUTER CONTROL	O. SINGH	P.S. GROUP/RAMBO	RAMAMOORTHY
4. DIPOLE POWER SUPPLY	R. OLSEN	FULKERSON/McDONALD	
5. CONTROLS	R. OLSEN	FULKERSON/McDONALD	
6. COMPUTER CONTROL	O. SINGH	P.S. GROUP/RAMBO	RAMAMOORTHY
7. TRIM POWER SUPPLY	O. SINGH	BORRELLI	
8. CONTROLS	O. SINGH	BORRELLI/GARRISON	
9. COMPUTER CONTROL	O. SINGH	P.S. GROUP/RAMBO	RAMAMOORTHY
10. WATER SYSTEMS		P. SINGH	

II. SYSTEM: MAGNET POWER SUPPLY SYSTEM

BOOSTER

	ELECTRICAL		SOFTWARE
	PHY/ENG	TECH	PROGRAMMER
1. QUADRUPOLE POWER SUPPLY	O. SINGH	FULKERSON/McDONALD	
2. CONTROLS	O. SINGH	FULKERSON/McDONALD	
3. COMPUTER CONTROLS	O. SINGH	P.S. GROUP/RAMBO	RAMAMOORTHY
4. DIPOLE POWER SUPPLY	R. OLSEN	FULKERSON/McDONALD	
5. CONTROLS	R. OLSEN	FULKERSON/McDONALD	
6. COMPUTER CONTROL	O. SINGH	P.S. GROUP/RAMBO	RAMAMOORTHY
7. SEXUPOLE POWER SUPPLY	O. SINGH	FULKERSON/McDONALD	
8. CONTROLS	O. SINGH	FULKERSON/McDONALD	
9. COMPUTER CONTROL	O. SINGH	P.S. GROUP/RAMBO	RAMAMOORTHY
10. TRIM POWER SUPPLY	O. SINGH	BORRELLI/GARRISON	
11. CONTROLS	O. SINGH	BORRELLI/GARRISON	
12. COMPUTER CONTROL	O. SINGH	P.S. GROUP/RAMBO	RAMAMOORTHY
13. WATER SYSTEMS		P. SINGH	

III. SYSTEM: MAGNET POWER SUPPLY SYSTEM VUV TRANSFER LINE

	ELECTRICAL		SOFTWARE
	PHY/ENG	TECH	PROGRAMMER
1. QUADRUPOLE POWER SUPPLY	O. SINGH	BORRELLI/GARRISON	
2. CONTROLS	O. SINGH	BORRELLI/GARRISON	
3. COMPUTER CONTROL	O. SINGH	P.S. GROUP/RAMBO	RAMAMOORTHY
4. DIPOLE POWER SUPPLY	R. OLSEN	FULKERSON	
5. CONTROLS	R. OLSEN	FULKERSON	
6. COMPUTER CONTROL	O. SINGH	P.S. GROUP/RAMBO	RAMAMOORTHY
7. TRIM POWER SUPPLIES	O. SINGH	BORRELLI/GARRISON	
8. CONTROLS	O. SINGH	BORRELLI/GARRISON	
9. COMPUTER CONTROL	O. SINGH	P.S. GROUP/RAMBO	RAMAMOORTHY
10. WATER SYTEM		P. SINGH	

IV. SYSTEM:

MAGNET POWER SUPPLY SYSTEM XRAY TRANSFER LINE

	ELECTRICAL		SOFTWARE
	PHY/ENG	TECH	PROGRAMMER
1. QUADRUPOLE POWER SUPPLY	O. SINGH	BORRELLI/GARRISON	
2. CONTROLS	O. SINGH	BORRELLI/GARRISON	
3. COMPUTER CONTROL	O. SINGH	P.S. GROUP/RAMBO	RAMAMOORTHY
4. DIPOLE POWER SUPPLY (BXD)	R. OLSEN	FULKERSON	
5. CONTROLS	R. OLSEN	FULKERSON	
6. COMPUTER CONTROL	O. SINGH	P.S. GROUP/RAMBO	RAMAMOORTHY
7. DIPOLE POWER SUPPLY (BXD5T)	O. SINGH	BORRELLI/GARRISON	
8. CONTROLS	O. SINGH	BORRELLI/GARRISON	
9. COMPUTER CONTROL	O. SINGH	P.S. GROUP/RAMBO	RAMAMOORTHY
10. TRIM POWER SUPPLIES	O. SINGH	BORRELLI/GARRISON	
11. CONTROLS	O. SINGH	BORRELLI/GARRISON	
12. COMPUTER CONTROL	O. SINGH	P.S. GROUP/RAMBO	RAMAMOORTHY
13. WATER SYSTEM		P. SINGH	

V.

SYSTEM:

MAGNET POWER SUPPLY SYSTEM

VUV RING

	ELECTRICAL		SOFTWARE
	PHY/ENG	TECH	PROGRAMMER
1. QUADRUPOLE POWER SUPPLIES	O. SINGH	P. SINGH	
2. CONTROLS	O. SINGH	P. SINGH	
3. COMPUTER CONTROL	O. SINGH	P.S. GROUP/RAMBO	FLANNIGAN
4. DIPOLE POWER SUPPLY	R. OLSEN	FULKERSON/McDONALD	
5. CONTROLS	R. OLSEN	FULKERSON/McDONALD	
6. COMPUTER CONTROL	O. SINGH	P.S. GROUP/RAMBO	FLANNIGAN
7. SEXAPOLE POWER SUPPLY	O. SINGH	P. SINGH	
8. CONTROLS	O. SINGH	P. SINGH	
9. COMPUTER CONTROL	O. SINGH	P.S. GROUP/RAMBO	FLANNIGAN
10. TRIM POWER SUPPLIES (KEPCO)	O. SINGH	BORRELLI/GARRISON	
11. CONTROLS	O. SINGH	BORRELLI/GARRISON	
12. COMPUTER CONTROL	O. SINGH	P.S. GROUP/RAMBO	FLANNIGAN
13. GLOBAL FEEDBACK	O. SINGH/YU	FRISBIE/P. SINGH	DABROWSKI
14. WATER SYSTEMS		P. SINGH	

VI.

SYSTEM:

MAGNET POWER SUPPLY SYSTEM

XRAY RING

	ELECTRICAL		SOFTWARE
	PHY/ENG	TECH	PROGRAMMER
1. QUADRUPOLE POWER SUPPLIES	R. OLSEN	FULKERSON/McDONALD	
2. CONTROLS	R. OLSEN	FULKERSON/McDONALD	
3. COMPUTER CONTROL	O. SINGH	P.S. GROUP/RAMBO	FLANNIGAN
4. DIPOLE POWER SUPPLY	R. OLSEN	FULKERSON/McDONALD	
5. CONTROLS	R. OLSEN	FULKERSON/McDONALD	
6. COMPUTER CONTROL	O. SINGH	P.S. GROUP/RAMBO	FLANNIGAN
7. SEXUPOLE POWER SUPPLY	R. OLSEN	FULKERSON/McDONALD	
8. CONTROLS	R. OLSEN	FULKERSON/McDONALD	
9. COMPUTER CONTROL	O. SINGH	P.S. GROUP/RAMBO	FLANNIGAN
10. TRIM POWER SUPPLIES	O. SINGH	BORRELLI/GARRISON	
11. CONTROLS	O. SINGH	BORRELLI/GARRISON	
12. COMPUTER CONTROL	O. SINGH	P.S. GROUP/RAMBO	FLANNIGAN
13. LOCAL FEEDBACK	O. SINGH/NAWROCKY	LINK/P. SINGH	FLANNIGAN

VII.

SYSTEM:

INJECTION AND EXTRACTION SYSTEM

	ELECTRICAL		SOFTWARE
	PHY/ENG	TECH	PROGRAMMER
1. KICKERS AND BUMPS	HEESE	ROMANO/GARRISON	
2. KICKER INTERLOCKS	SHEEHAN	ROMANO	
3. SINGLE BUNCH TIMING SYSTEM	O. SINGH	RAMBO	RAMAMOORTHY
4. COMPUTER CONTROL CHASSIS	O. SINGH	RAMBO	RAMAMOORTHY
5. TIMING DISTRIBUTION	O. SINGH	RAMBO/ROMANO	
6. MECHANICAL		ROMANO/GARRISON	

I. SYSTEM: RADIO FREQUENCY GUN--LINAC

	ELECTRICAL		SOFTWARE
	PHY/ENG	TECH	PROGRAMMER
1. KLYSTON, MODULATOR, LLRF, VAC. & REV. PWR. INT'LK.	BLUM/SHEEHAN	MEIER/RF GROUP	
2. WAVEGUIDE AND LINAC VACUUM			
3. CONTROLS AND DIAGNOSTICS	SHEEHAN	MEIER	
4. COMPUTER CONTROL	SHEEHAN	LINK/RAMBO	SMITH
5. MECHANICAL SYSTEMS			
6. PROCESS WATER			
7. SECURITY INTERLOCK	DICKINSON	GALLAGHER/BEST	

II. SYSTEM: RADIO FREQUENCY BOOSTER

	ELECTRICAL		SOFTWARE
	PHY/ENG	TECH	PROGRAMMER
1. CAVITY	KEANE/THOMAS	D'ALSACE/RF GROUP	
2. CAVITY VACUUM	FOERSTER	DEBOER	
3. RF AMPLIFIERS	KEANE/THOMAS	RF GROUP	
4. CONTROLS	THOMAS	RF GROUP	
5. COMPUTER CONTROL	SMITH	CONTROLS GROUP	RAMAMOORTHY
6. WATER COOLING		WHITE	
7. PROCESS WATER		WHITE	
8. MECHANICAL SYSTEMS		NEWBURGH	

III. SYSTEM: RADIO FREQUENCY VUV

	ELECTRICAL		SOFTWARE
	PHY/ENG	TECH	PROGRAMMER
1. CAVITY	KEANE/THOMAS	RF GROUP	
2. CAVITY VACUUM	FOERSTER	DEBOER	
3. RF AMPLIFIERS	KEANE/THOMAS	RF GROUP	
4. CONTROLS	THOMAS	RAMIREZ/RF GROUP	
5. COMPUTER CONTROL	SMITH	NEILSON/RAMBO	RAMAMOORTHY/TANG
6. WATER COOLING		WHITE	
7. PROCESS WATER		WHITE	
8. MECHANICAL SYSTEMS		NEWBURGH	
9. SECURITY	DICKINSON	BEST	

IIIa. SYSTEM: RADIO FREQUENCY VUV HARMONIC 211MHZ

	ELECTRICAL		SOFTWARE
	PHY/ENG	TECH	PROGRAMMER
1. CAVITY	BISCARDI	RF GROUP	
2. CAVITY VACUUM	FOERSTER	DEBOER	
3. RF AMPLIFIERS	BISCARDI	RF GROUP	
4. CONTROLS	THOMAS	RAMIREZ/RF GROUP	
5. COMPUTER CONTROL	SMITH	NEILSON/RAMBO	RAMAMOORTHY/TANG
6. WATER COOLING		WHITE	
7. PROCESS WATER		WHITE	
8. MECHANICAL SYSTEMS		NEWBURGH	
9. SECURITY	DICKINSON	BEST	

IV. SYSTEM: RADIO FREQUENCY XRAY

	ELECTRICAL		SOFTWARE
	PHY/ENG	TECH	PROGRAMMER
1. CAVITIES 52 MHZ	KEANE/THOMAS	RF GROUP	
2. CAVITIES VACUUM	FOERSTER	DEBOER	
3. RF AMPLIFIERS	KEANE/THOMAS	RF GROUP	
4. RF AMPLIFIERS	THOMAS	RF GROUP	
5. CONTROLS	THOMAS	RAMIREZ/RF GROUP	
6. COMPUTER CONTROLS	SMITH	NEILSON/RAMBO	RAMAMOORTHY/TANG
7. WATER COOLING		WHITE	
8. PROCESS WATER		WHITE	
9. MECHANICAL SYSTEMS		NEWBURGH	
10. SECURITY INTERLOCKS	DICKINSON	GALLAGHER/BEST/HUGHES	
11. ACTIVE INTERLOCKS INTERFACE	THOMAS	RF GROUP	DABROWSKI

**I. SYSTEM: PERSONNEL AND EQUIPMENT SAFETY INTERLOCKS,
BEAM LINE SUPPORT**

VUV

	ELECTRICAL		SOFTWARE
	PHY/ENG	TECH	PROGRAMMER
1. FRONT END AND CHAMBER WATER COOLING INTERLOCKS		CHURCH	
2. RING/FRONT END VACUUM INTERLOCKS		GALLAGHER/BEST	
3. FAST VALVES	LARSON	GALLAGHER/STONER	
4. U4IR MIRROR MOTOR CONTROLS	LARSON	HUGHES/BEST	
5. BEAMLINE PERSONNEL INTERLOCKS	LARSON/DICKINSON	GALLAGHER/BEST/HUGHES	
6. RING SECURITY	DICKINSON	BEST/HUGHES	
7. MASTER ENABLE		GALLAGHER/BEST/HUGHES	
8. U13U PERSONNEL AND EQUIPMENT INTERLOCKS	LARSON	BEST/HUGHES	
9. LINAC/BOOSTER PERSONNAL SAFETY INTERLOCKS	DICKINSON	BEST/HUGHES	

**II. SYSTEM: PERSONNEL AND EQUIPMENT SAFETY INTERLOCKS,
BEAM LINE SUPPORT**

XRAY

	ELECTRICAL		SOFTWARE
	PHY/ENG	TECH	PROGRAMMER
1. TUNNEL SECURITY	DICKINSON	BEST/HUGHES	
2. TAGGING CAVE	LARSON	BEST/HUGHES	
3. FRONT END AND CHAMBER WATER COOLING INTERLOCKS		CHURCH	
4. FRONT END MACHINE INTERLOCKS	LARSON	BEST/HUGHES	
5. BEAM LINE PERSONNEL INTERLOCKS	LARSON/DICKINSON	GALLAGHER/BEST/HUGHES/CASE	
6. SCW MACHINE INTERLOCKS	LARSON	BEST/MEIER	
7. PLUG DOOR INTERLOCKS	LARSON/DICKINSON	BEST	
8. Be WINDOW COOLING INTERLOCK	LARSON	BEST/HUGHES	
9. X17 APERATURE AND BEAM POSITION MONITOR MOTOR INTERLOCKS	CHAPMAN	GALLAGHER/CASE GREENE (MECHANICAL)	

NSLS MAINTENANCE PROGRAM

APPENDIX C

TRAINING POLICY

NATIONAL SYNCHROTRON LIGHT SOURCE

**SAFETY AND ENVIRONMENTAL
ADMINISTRATIVE POLICIES AND PROCEDURES MANUAL**

Approved

Department Chairman

Issued 3/3/93

NATIONAL SYNCHROTRON LIGHT SOURCE

TRAINING POLICY

1. Training Policy

- 1.1 The policy of the NSLS Department is to assure the training of personnel including: employees, contract employees, guests, visitors and all others who perform work at the NSLS. Training shall be provided, to the level appropriate, to ensure the highest level of employee performance, the health and safety of individuals, and to protect the environment.
- 1.2 A Training Plan shall define the training requirements specified in NS7.0.0 as follows:
 - 1.2.1 General Training required for all Department personnel regardless of assignment.
 - 1.2.2 Facility/Location Training (in order of priority) required for assigned personnel and for those requiring access or special instructions in order to perform work in the facility/location. (Example - Radiation Worker)
 - 1.2.3 Job Training (in order of priority) required for each position or functional job assignment. Job Training requirements and critical job skills shall be determined by completing a Job Training Assessment. Critical job skills shall require trainee evaluation to assure that the required level of competence has been attained. (Example - Electrical Safety)

2. Responsibilities

- 2.1 The Department Chairman shall have overall responsibility for implementation of the Training Plan.
- 2.2 The Department Chairman shall appoint a Training Coordinator.
- 2.3 The Training Coordinator shall develop and update the Training Plan in consultation with the Department ES&H Coordinator.

- 2.4 The Training Coordinator shall be responsible for departmental training records, including ES&H training records, which shall be located in the Training Coordinator's Office and in Building 728.
- 2.5 Line Supervisors shall be responsible for the following:
 - 2.5.1 Ensure that personnel under their supervision complete the appropriate training for the type of work performed.
 - 2.5.2 Identify and update Job and Facility/Location training requirements.
 - 2.5.3 Provide and/or oversee and document on-the-job training.
 - 2.5.4 In case of failure to demonstrate competence on critical skills, the Supervisor will provide remedial training until the employee successfully demonstrates the required knowledge or skills.
 - 2.5.5 Collaborate with the Training Coordinator on all of the above.
- 2.6 Employees shall complete required training as directed by their supervisors and maintain an acceptable level of knowledge required for safe and efficient performance of assigned duties. The Employee shall sign the training roster or on the job training (OJT) checklist, indicating that they have acquired the knowledge and skills needed to meet performance expectations.

3. Training Provisions

- 3.1 In some cases the NSLS may provide required training courses to personnel from other Departments/Divisions. As a provider of training the Light Source shall meet these additional requirements: (Example - Experimental Machine Shop practices).
 - 3.1.1 Conduct a pilot evaluation of such training courses to assure quality. The pilot evaluation shall be completed by a committee representative of the population for which the training is intended and may also include subject matter experts, a member of the Management Oversight Committee and a member of the BNL Training Office.
 - 3.1.2 Retain documentation of the content of the training courses provided.

- 3.1.3 Retain original hard copy attendance data (e.g. signed BNL Training Roster).
- 3.1.4 Provide timely notification of courses that are scheduled and attendance data to the appropriate Training Coordinators so that Department/Division training records may be updated.
- 3.1.5 Assure and document the qualifications of instructors of required training courses provided.

4. Training Documentation

- 4.1 Assurance of training will be accomplished in the following ways. The NSLS Personnel and User Data Base will have fields added for training. The training requirements and dates when training was accomplished will be included. Renewal dates will be flagged. The training requirements will be determined through job responsibility assessments and job locations. The assessments will encompass the staff, guests and PRT's (Beamlines) and their guests. Other Departments/Divisions will be informed of the requirements for working at the NSLS. The PRT Designee will be the liaison for the people affiliated with each beamline. The supervisors and PRT Designee will retain signed rosters or on the job training (OJT) checklists documenting the training that was provided by them. Other providers of training will either provide a signed roster or information from their data bases on training status. This will be recorded in the NSLS Data Base and also, in the future, in the Central Training Data Base. The NSLS Data Base will be used by the Training Coordinator to track an individual's current training status. The Training Data Base records will have a tape back up and will be stored in a fire proof file in building 728 along with hard copy records.

5. Training Objectives

- 5.1 Complete Critical Job Skills Training assessments for technician positions by section:
 - 5.1.1 Operations
 - 5.1.2 Electrical Systems
 - 5.1.3 Mechanical Systems
 - 5.1.4 Beam Line Operations and Development
 - 5.1.5 Accelerator Test Facility (ATF)

5.2 Develop NSLS Specific Training as follows to supplement S&EP provided training:

5.2.1 Electrical Safety and Lockout/Tagout.

5.2.2 Laser Safety Orientation.

5.2.3 Overhead Crane and Forklift.

5.3 Develop NSLS User Community Training:

5.3.1 Develop Beamline Operation Training Assessments. (General Safety Requirements)

5.3.2 Develop training based on the results of Assessments.

5.4 Document and upgrade existing NSLS training courses.

6. Facilities

6.1 Building 725B, 725C, 725D, 510E, 728 Office, Work and Shop Areas. (3)

6.2 Building 725A, Operation, Experimental and Support Areas. (3)

6.2.1 Injector, Booster and Storage Rings. (2)

6.2.2 Xray and VUV Beamlines. (90)

6.2.3 Other Areas. (7)

6.2.3.1 Control Room (1)

6.2.3.2 Staging Area (VUV labs. Xray labs and Staging Area) (2)

6.2.3.3 Stock Room (1)

6.2.3.4 Library and Lounges (1)

6.2.3.5 VUV and Xray Equipment Areas (2)

6.2.3.6 X17 Cryogenics Area (1)

6.2.3.7 Support Offices (1)

6.3 Building 726 and 727, Mechanical Work Areas. (2)

6.4 Building 535C, Work Areas. (3)

6.5 Building 820 (ATF), Work and Experimental Areas. (3)

6.6 Building 197, Acid Cleaning Facility. (1)

6.7 Building 729, NSLS Support Facility. (1)

7. General Training Requirements

7.1 All NSLS personnel, regardless of assignment shall complete the following required training:

7.1.1 Employees and Long Term Experimenters (Users)

- 7.1.1.1 NESO (New Employees Safety Orientation)
- 7.1.1.2 RADIATION TRAINING (Facility/Location Specific)
- 7.1.1.3 HAZ COM (OSHA Hazard Communications)

7.1.2 Short Term Experimenters (Users)

- 7.1.2.1 NSLS Safety Video (Experimenters)
- 7.1.2.2 Beamline Specific Training

NSLS MAINTENANCE PROGRAM

APPENDIX D

ENVIRONMENTAL SAFETY AND HEALTH INSPECTIONS

NATIONAL SYNCHROTRON LIGHT SOURCE

SAFETY AND ENVIRONMENTAL
ADMINISTRATIVE POLICIES AND PROCEDURES
MANUAL

Approved
Department Chairman

Rev. 1, 9/19/91

1. Frequency of ES&H Inspections

- 1.1 The NSLS Department shall appoint an inspection team to conduct quarterly ES&H inspections for the Department laboratory and industrial work areas, such as shops, garages, warehouses, and other similar areas.
- 1.2 In offices, libraries, conference rooms and similar non-industrial, non-laboratory areas, the Department shall appoint an Inspection Team to conduct annual ES&H inspections.

2. Tier I ES&H Inspections

- 2.1 The NSLS Department shall schedule ES&H inspections so that all areas are inspected in accordance with the frequencies specified in 1 above and all Departmental written SEAPPMS are properly implemented as specified in 2.5 below. The inspection schedule shall be submitted annually to the Associate Director for Safety.
- 2.2 The NSLS Department Chairman or his designate shall appoint an Inspection Team of 6 members for each inspection. The NSLS safety associate shall send a quarterly schedule to all participating tour members and send a reminder notice during the week prior to the tour. The team shall include a designated reporter who is an NSLS staff member. Other team members are as follows. NSLS Safety Associate, S&EP Division Representative resident at the NSLS, Technical Supervisor for the area undergoing inspection, NSLS Department Quality Assurance Representative, ES&H Representative for the area undergoing inspection.
- 2.3 The Inspection Team shall review records of previous inspections, departmental accident and injury reports, Occurrence Reports, and environmental noncompliance before conducting its inspection.
- 2.4 The Inspection Team shall include a review of ES&H conditions in the Department.
- 2.5 The Inspection Team shall determine whether selected written Departmental SEAPPMS are properly implemented and operations and procedures are conducted in accordance with BNL ES&H Policy.

ATTACHMENT 1

SAFETY INSPECTION REPORT

Inspection Date _____

Inspection Team Members

_____	_____
_____	_____
_____	_____

I. Imminent Danger Items Discovered During the Inspection

Item	Area	Date Corrected
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

II. Non-Imminent Danger Items Discovered During the Inspection

Item	Location/Corrective Action/Person to Correct	Date Corrected
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

III. Current Status of Items Discovered From Previous Inspections

Item	Original Date	Current Status
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

IV. SEAPPM Procedures and Operations Review

SEAPPM Reviewed	Status, Corrective Action, ES&H Coordinator Action
_____	_____
_____	_____
_____	_____
_____	_____

Report Prepared By: _____

Name	Signature	Date
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NSLS MAINTENANCE PROGRAM

APPENDIX E

Service QA Level: A3
PM Procedure # : RF001
Revision Date : 07/14/1992
Service to be done:
PREVENTATIVE MAINTENANCE PROCEDURE FOR 3KW AMPLIFIERS.

note: THE FOLLOWING PROCEDURE MUST BE PERFORMED ONLY BY QUALIFIED RF GROUP PERSONNEL.

- 1- Turn OFF the RF system 3KW amplifier via computer control.
 - 2- Set system 50KW (VUV) or 125KW (X-RAY) amplifier to STANDBY state via computer control.
 - 3- LOCK OUT and RED TAG 3KW and 50KW (VUV) or 125KW (X-RAY) amplifier power supplies and 100W amplifier as per BNL ENVIRONMENT SAFETY AND HEALTH STANDARDS manual section 1.5.1.
 - 4- Inspect grounding stick connections as per BNL ENVIRONMENT SAFETY AND HEALTH STANDARDS manual section 1.5.2.
 - 5- Remove 3KW amplifier top front panel and short high voltage points with grounding stick.
 - 6- Remove lower front panel.
 - 7- Remove upper chimney and lower air tube and clean all screened air flow vents.
 - 8- Inspect electrical and mechanical connec and correct any loose contacts.
 - 9- Reassemble upper chimney and lower air flow tube.
 - 10- Reinstall both front panels.
 - 11- Conditions permitting, remove RED TAGS and LOCK OUT devices as per BNL ENVIRONMENT SAFETY AND HEALTH STANDARDS manual section 1.5.1.
 - 12- Turn ON 100W, 3KW and 50KW (VUV) or 125KW (X-RAY) amplifiers via computer controls.
-

Equipmnt #	Location	Equipment Type	Description	Date	Init.
RF0012	VUV	POWER SUPPLY	VUVRF1 50KW AMP.	_____	_____

Service QA Level: A2
PM Procedure # : RF002
Revision Date : 07/14/1992
Service to be done:
PREVENTATIVE MAINTENANCE PROCEDURE FOR 50KW AND 125KW RCA BRAND RF
AMPLIFIERS.

note: THE FOLLOWING PROCEDURE MUST BE PERFORMED ONLY BY QUALIFIED RF
GROUP PERSONNEL.

- 1- Turn OFF 50KW (VUV) or 125KW (X-RAY) amplifier via computer controls.
 - 2- Set system 3KW amplifier to STANDBY state via computer control.
 - 3- LOCK OUT and RED TAG 3KW and 50KW (VUV) or 125KW (X-RAY) power
supplies and 100W amplifier as per BNL ENVIRONMENT SAFETY AND HEALTH
STANDARDS manual section 1.5.1., retaining KIRK KEYS in your possession.
 - 4- Remove and clean air intake filter from 50KW (VUV) or 125KW (X-RAY)
amplifier blower.
 - 5- Inspect grounding stick connections as per BNL ENVIRONMENT SAFETY AND
HEALTH STANDARDS manual section 1.5.2.
 - 6- Open amplifier rear top panel (VUV) or top panel (X-RAY) and short
high voltage points with grounding stick.
 - 7- Verify activation of high voltage door interlock.
 - 8- Inspect plumbing connections for leaks. Correct as necessary.
 - 9- Inspect electrical connections and correct any loose contacts.
 - 10- Vacuum if necessary.
 - 11- Reinstall top (or rear) panel and air intake filter.
 - 12- Conditions permitting, remove RED TAGS and LOCK OUT devices as per
BNL ENVIRONMENT SAFETY AND HEALTH STANDARDS manual section 1.5.1.
 - 13- Turn ON system 100W, 3KW and 50KW (VUV) or 125KW (X-RAY) amplifiers
via computer controls.
-

Equipmnt #	Location	Equipment Type	Description	Date	Init.
RF0013	VUV	POWER SUPPLY	VUVRF1 50KW PLATE SU	_____	_____

Service QA Level: A3
PM Procedure # : RF006
Revision Date : 07/14/1992
Service to be done:
PREVENTATIVE MAINTENANCE PROCEDURE FOR 50KW (VUV) AND 125KW (X-RAY)
AMPLIFIER PLATE POWER SUPPLIES.

note 1: THE FOLLOWING PROCEDURE MUST BE PERFORMED ONLY BY QUALIFIED RF
GROUP PERSONNEL.

note 2: A SECOND PERSON MUST BE PRESENT AS A SAFETY-WATCH UNTIL ISOLATION
OF UNIT FROM 480 VAC IS VERIFIED (STEP 7).

- 1- Set system 3KW and 50KW (VUV) or 125KW (X-RAY) amplifiers to STANDBY
via computer control.
- 2- RED TAG and LOCK OUT 3KW and 50KW (VUV) or 125KW (X-RAY) amplifier
power supplies and 100W amplifier as per BNL ENVIRONMENT SAFETY AND HEALTH
STANDARDS manual section 1.5.1.
- 3- Inspect grounding stick connections as per BNL ENVIRONMENT SAFETY AND
HEALTH STANDARDS manual section 1.5.2.
- 4- Open front door of unit and short output and any energy storage devices
with grounding stick.
- 5- Verify high voltage door interlock activation.
- 6- Remove front lower panel (AHVT supplies, only).
- 7- Verify that 480 VAC is NOT present.
- 8- Test Line Overcurrent Circuit operation.
- 9- Inspect cooling fan(s) operation and replace as necessary.
- 10- Inspect all electrical connections and repair any loose contacts.
- 11- Remove and clean air intake filters (if any).
- 12- Vacuum unit if necessary.
- 13- Reinstall air intake filters and close door(s) of unit.
- 14- Conditions permitting, remove RED TAGS and LOCK OUT devices as per BNL
ENVIRONMENT SAFETY AND HEALTH STANDARDS manual section 1.5.1.
- 15- Turn ON system 100W, 3KW and 50KW (VUV) or 125KW (X-RAY) amplifiers
via computer control.

Equipmnt #	Location	Equipment Type	Description	Date	Init.
RF0023	X-RAY	AMPLIFIER	XRF1 125KW AMPLIFIER	_____	_____

Service QA Level: A2
PM Procedure # : RF002
Revision Date : 07/14/1992
Service to be done:
PREVENTATIVE MAINTENANCE PROCEDURE FOR 50KW AND 125KW RCA BRAND RF
AMPLIFIERS.

note: THE FOLLOWING PROCEDURE MUST BE PERFORMED ONLY BY QUALIFIED RF
GROUP PERSONNEL.

- 1- Turn OFF 50KW (VUV) or 125KW (X-RAY) amplifier via computer controls.
 - 2- Set system 3KW amplifier to STANDBY state via computer control.
 - 3- LOCK OUT and RED TAG 3KW and 50KW (VUV) or 125KW (X-RAY) power
supplies and 100W amplifier as per BNL ENVIRONMENT SAFETY AND HEALTH
STANDARDS manual section 1.5.1., retaining KIRK KEYS in your possession.
 - 4- Remove and clean air intake filter from 50KW (VUV) or 125KW (X-RAY)
amplifier blower.
 - 5- Inspect grounding stick connections as per BNL ENVIRONMENT SAFETY AND
HEALTH STANDARDS manual section 1.5.2.
 - 6- Open amplifier rear top panel (VUV) or top panel (X-RAY) and short
high voltage points with grounding stick.
 - 7- Verify activation of high voltage door interlock.
 - 8- Inspect plumbing connections for leaks. Correct as necessary.
 - 9- Inspect electrical connections and correct any loose contacts.
 - 10- Vacuum if necessary.
 - 11- Reinstall top (or rear) panel and air intake filter.
 - 12- Conditions permitting, remove RED TAGS and LOCK OUT devices as per
BNL ENVIRONMENT SAFETY AND HEALTH STANDARDS manual section 1.5.1.
 - 13- Turn ON system 100W, 3KW and 50KW (VUV) or 125KW (X-RAY) amplifiers
via computer controls.
-

Equipmnt #	Location	Equipment Type	Description	Date	Init.
RF0024	X-RAY	POWER SUPPLY	XRF1 125KW PLATE SUP	_____	_____

Service QA Level: A3
PM Procedure # : RF006
Revision Date : 07/14/1992
Service to be done:
PREVENTATIVE MAINTENANCE PROCEDURE FOR 50KW (VUV) AND 125KW (X-RAY)
AMPLIFIER PLATE POWER SUPPLIES.

note 1: THE FOLLOWING PROCEDURE MUST BE PERFORMED ONLY BY QUALIFIED RF
GROUP PERSONNEL.

note 2: A SECOND PERSON MUST BE PRESENT AS A SAFETY-WATCH UNTIL ISOLATION
OF UNIT FROM 480 VAC IS VERIFIED (STEP 7).

- 1- Set system 3KW and 50KW (VUV) or 125KW (X-RAY) amplifiers to STANDBY
via computer control.
- 2- RED TAG and LOCK OUT 3KW and 50KW (VUV) or 125KW (X-RAY) amplifier
power supplies and 100W amplifier as per BNL ENVIRONMENT SAFETY AND HEALTH
STANDARDS manual section 1.5.1.
- 3- Inspect grounding stick connections as per BNL ENVIRONMENT SAFETY AND
HEALTH STANDARDS manual section 1.5.2.
- 4- Open front door of unit and short output and any energy storage devices
with grounding stick.
- 5- Verify high voltage door interlock activation.
- 6- Remove front lower panel (AHVT supplies, only).
- 7- Verify that 480 VAC is NOT present.
- 8- Test Line Overcurrent Circuit operation.
- 9- Inspect cooling fan(s) operation and replace as necessary.
- 10- Inspect all electrical connections and repair any loose contacts.
- 11- Remove and clean air intake filters (if any).
- 12- Vacuum unit if necessary.
- 13- Reinstall air intake filters and close door(s) of unit.
- 14- Conditions permitting, remove RED TAGS and LOCK OUT devices as per BNL
ENVIRONMENT SAFETY AND HEALTH STANDARDS manual section 1.5.1.
- 15- Turn ON system 100W, 3KW and 50KW (VUV) or 125KW (X-RAY) amplifiers
via computer control.

Equipmnt #	Location	Equipment Type	Description	Date	Init.
RF0034	X-RAY	AMPLIFIER	XRF2 125KW AMPLIFIER	_____	_____

Service QA Level: A2
PM Procedure # : RF002
Revision Date : 07/14/1992

Service to be done:

PREVENTATIVE MAINTENANCE PROCEDURE FOR 50KW AND 125KW RCA BRAND RF
AMPLIFIERS.

note: THE FOLLOWING PROCEDURE MUST BE PERFORMED ONLY BY QUALIFIED RF
GROUP PERSONNEL.

- 1- Turn OFF 50KW (VUV) or 125KW (X-RAY) amplifier via computer controls.
 - 2- Set system 3KW amplifier to STANDBY state via computer control.
 - 3- LOCK OUT and RED TAG 3KW and 50KW (VUV) or 125KW (X-RAY) power
supplies and 100W amplifier as per BNL ENVIRONMENT SAFETY AND HEALTH
STANDARDS manual section 1.5.1., retaining KIRK KEYS in your possession.
 - 4- Remove and clean air intake filter from 50KW (VUV) or 125KW (X-RAY)
amplifier blower.
 - 5- Inspect grounding stick connections as per BNL ENVIRONMENT SAFETY AND
HEALTH STANDARDS manual section 1.5.2.
 - 6- Open amplifier rear top panel (VUV) or top panel (X-RAY) and short
high voltage points with grounding stick.
 - 7- Verify activation of high voltage door interlock.
 - 8- Inspect plumbing connections for leaks. Correct as necessary.
 - 9- Inspect electrical connections and correct any loose contacts.
 - 10- Vacuum if necessary.
 - 11- Reinstall top (or rear) panel and air intake filter.
 - 12- Conditions permitting, remove RED TAGS and LOCK OUT devices as per
BNL ENVIRONMENT SAFETY AND HEALTH STANDARDS manual section 1.5.1.
 - 13- Turn ON system 100W, 3KW and 50KW (VUV) or 125KW (X-RAY) amplifiers
via computer controls.
-

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----- Equipmnt # -----	----- Location -----	----- Equipment Type -----	----- Description -----	Date	Init.
RF0035	X-RAY	POWER SUPPLY	XRF2 125KW PLATE SPL	_____	_____

Service QA Level: A3
PM Procedure # : RF006
Revision Date : 07/14/1992

Service to be done:

PREVENTATIVE MAINTENANCE PROCEDURE FOR 50KW (VUV) AND 125KW (X-RAY)
AMPLIFIER PLATE POWER SUPPLIES.

note 1: THE FOLLOWING PROCEDURE MUST BE PERFORMED ONLY BY QUALIFIED RF
GROUP PERSONNEL.

note 2: A SECOND PERSON MUST BE PRESENT AS A SAFETY-WATCH UNTIL ISOLATION
OF UNIT FROM 480 VAC IS VERIFIED (STEP 7).

- 1- Set system 3KW and 50KW (VUV) or 125KW (X-RAY) amplifiers to STANDBY
via computer control.
- 2- RED TAG and LOCK OUT 3KW and 50KW (VUV) or 125KW (X-RAY) amplifier
power supplies and 100W amplifier as per BNL ENVIRONMENT SAFETY AND HEALTH
STANDARDS manual section 1.5.1.
- 3- Inspect grounding stick connections as per BNL ENVIRONMENT SAFETY AND
HEALTH STANDARDS manual section 1.5.2.
- 4- Open front door of unit and short output and any energy storage devices
with grounding stick.
- 5- Verify high voltage door interlock activation.
- 6- Remove front lower panel (AHVT supplies, only).
- 7- Verify that 480 VAC is NOT present.
- 8- Test Line Overcurrent Circuit operation.
- 9- Inspect cooling fan(s) operation and replace as necessary.
- 10- Inspect all electrical connections and repair any loose contacts.
- 11- Remove and clean air intake filters (if any).
- 12- Vacuum unit if necessary.
- 13- Reinstall air intake filters and close door(s) of unit.
- 14- Conditions permitting, remove RED TAGS and LOCK OUT devices as per BNL
ENVIRONMENT SAFETY AND HEALTH STANDARDS manual section 1.5.1.
- 15- Turn ON system 100W, 3KW and 50KW (VUV) or 125KW (X-RAY) amplifiers
via computer control.

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Equipmnt #	Location	Equipment Type	Description	Date	Init.
RF0045	PENTHOUSE	AMPLIFIER	XRF3 125KW AMPLIFIER	_____	_____

END DATE
3-11-94