Introduction

Chairman's Introduction

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The year 2001 has been another highly productive year at the NSLS, with over 2500 users, including 720 first time users, conducting nearly 1200 experiments in fields ranging from the life, materials, chemical, and environmental sciences to applied science and technology. An impressive array of highlights from this scientific activity is included in this Activity Report. They include the first demonstration of a direct structural probe of the superconducting ground state in the cuprates by utilizing anomalous soft x-ray resonance effects to selectively enhance the scattering from doped holes. Another highly significant result was the determination of the structure of the potassium channel membrane protein. This is especially significant as it provides insight into how the channel functions and how it selects a particular kind of ion. In the nanoscience area, small angle x-ray scattering measurements played an essential role in determining that preferential sequestering of tailored metal nanocrystals into a self-assembled lamellar diblock copolymer can produce high quality metallodielectric photonic bandgap structures, demonstrating the potential of these nanocomposites for photonic crystal engineering. The infrared microscopy program continued to yield noteworthy results, including an important study that characterized the types and abundances of organic materials in contaminated and uncontaminated sediments from the New York/New Jersey Harbor. These results will be useful in devising improved methods for the destruction or removal of these environmental contaminants.

The VUV and X-Ray rings operated with excellent reliability as a result of continued attention to aging critical systems. A redesigned ceramic-metal gap section of the VUV ring was installed to solve a persistent vacuum leak. The process of upgrading the trim magnets and power supplies on the X-Ray ring is underway in order to facilitate orbit corrections and stability around the ring. This was necessitated by the upgrade to 2.8 GeV low emittance operations. Progress continues to be made on implementing the global digital feedback system in the X-Ray ring with efforts focused on extending it to replace the local feedback systems in the insertion device straight sections.

After a busy year of installing and commissioning the NISUS undulator, the DUV-FEL achieved an important milestone this year: the first observation of Self-Amplified Spontaneous Emission (SASE) laser light at the facility. Important results were also achieved on basic beam physics, especially studies of the effects of coherent synchrotron radiation (CSR) on high peak current, high brightness electron beams. These studies attracted worldwide attention, as they are fundamental to many future x-ray sources.

In July of 2001, DOE conducted a major review of the NSLS. They found that the research conducted at the NSLS continues to be world class and the facility continues to be extremely productive. However, they noted difficulties with the PRT system and encouraged the NSLS to become more involved in the management and operation of the beamlines. This has stimulated discussion and has led to a growing consensus that an alternative model, i.e., facility operated General User (GU) beamlines, would better serve the needs and interests of many user groups. In this model, the NSLS would upgrade, maintain, and operate GU beamlines and support the general users. These would include both programmatic efforts, requiring substantial beamtime over an extended period, as well as one-time experiments. The users would focus their efforts and resources on carrying out their science programs. It is essential that we are flexible in order to accommodate different user needs and interests and it is likely that the optimum arrangement will involve a mix of PRT and GU beamlines. There are many issues to be resolved as we consider such a transition and we are actively engaged in discussions with our users as to how best to proceed. In the meantime, to better support our users the NSLS has reexamined its budgetary priorities in order to increase the beamline scientific staff supporting the user program even though this has

been a difficult budget year. The future ability of the NSLS to fully support such GU beamlines would require substantial increases in our operating budget.

The NSLS underwent a major change in organization and management in 2001. This was done in order to improve our strategic planning, insure strong linkage between our goals and accomplishments, and increase the coordination of our activities. It will also facilitate placing increased emphasis on effective use and development of beamline programs. The new top-level organization chart is shown in the accompanying figure.

The NSLS is now organized as four divisions, with each led by an Associate Chairman. Chi-Chang Kao is the new Associate Chair for User Science and oversees the User Science Division, consisting of the Science Program Support, Beamline Support, Controls and Detectors, User Administration, and Information and Outreach Sections. Erik Johnson is the new Associate Chair for Operations and oversees the Operations Division, consisting of the Operations, Electrical Systems, and Mechanical Engineering Sections. Jim Murphy is the new Associate Chair for Accelerators and oversees the Accelerator Division consisting of the Accelerator R&D Section. Bob Casey continues as Associate Chair for ESH and oversees the ESH Division, consisting of the ESH/Q Section. The Accelerator Test Facility is moving from the NSLS to the Physics Department, where it will have increased ties to the Center for Accelerator Physics and the Collider Accelerator Department.

We continued to develop plans in 2001 to upgrade the capabilities of the NSLS. The most significant short-term upgrade would be the development and installation of superconducting in-vacuum undulators in the next few years. These promise to provide higher brightness and full tunability from 2 to 20 keV. Work also proceeded on assessing the feasibility and opportunities associated with a new source at BNL, possibly based on a combination of a new low emittance x-ray storage ring and a superconducting linac operated in energy recovery mode. This effort is intended to identify the optimum approach to a major upgrade that would ensure an exciting long-term future for synchrotron science at BNL.

NSLS Organization Chart