**Technical Report on DOE project: "X-ray Physics of Materials"
(proposal #Z817).**

DOE awarded \$1.3M for the "X-Ray Physics of Materials" proposal from the X-Ray Physics group for the three year period ending August 15, 1999. As a result of this award, the SRI-CAT was able to order the construction of the First Optics Enclosure, the second enclosure housing the monochromator and the first user station, and various motors, controllers, and electronics for the control of the hard x-ray beamline components. Funds have also been applied to the purchase of a primary high-heat-load monochromator, and to an array of detectors, with their associated electronics and computers, to cover a variety of user needs.

This award included about \$922K for beamline-related permanent equipment. These funds have been allocated in the following way:

Optical table, beamline motors and electronics	\$150 K
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Contract for construction of the First Optics Enclosure (FOE)	\$159 K
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Construction of the Second Optical Enclosure, i.e. the hard x-ray station for use by the X-Ray Physics Group	\$445 K
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Contribution to the cost of the primary monochromator	\$ 71 K
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CCD x-ray detector, standard station detectors, all associated detector electronics, rotary tables and slides, motors, and computers	\$ 97 K
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TOTAL	\$922 K
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DOE Patent Clearance Granted

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Office of Intellectual Property Law
DOE Chicago Operations Office

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Date

The DOE award included a \$100 K subcontract to NIST, by which Dr. Terrence Jach was supported in the development of Kirkpatrick-Baez x-ray multilayer mirrors and in preliminary support of the new NIST high-energy-resolution calorimetric x-ray detector, among other activities in support of this beamline. Remaining DOE funds went to salary support for the principal investigators (Colella and Durbin) and a Purdue graduate student (Bakulin), supplies, overhead, and travel for group meetings of the X-Ray Physics group.

The SRI-CAT has provided all of the front end components for this sector, including the insertion devices. It has also managed the procurement of all of the major expenditures, such as enclosures and the monochromator. An eight-circle Huber diffractometer has been acquired by the SRI-CAT for eventual use in Sector 4, among other standard systems needed for an APS hard x-ray station. The value of the physical components as well as the manpower

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for design and management of this project significantly exceeds the \$1.3 M supplied so far to the X-Ray Physics Group by DOE. However, DOE funding has played a critical role in getting Sector 4 built. These DOE funds have been highly leveraged, because of the substantial expertise and resources which the SRI-CAT has been able to apply to this Sector, once these DOE funds were in hand to initiate this project.

One student was supported by this grant for work at the SRI-CAT of APS: Alex Bakulin. He graduated in May 1999. His Ph.D. thesis was: "Imaging of Hard X-rays with a Multilayer Kirkpatrick-Baez CCD Microscope in the Laboratory and at the Synchrotron".

His work was performed to a large extent at the SRI-CAT of APS, using facilities purchased with money from this grant.