OAK RIDGE 25URC TANDEM ACCELERATOR
2006 SNEAP LAB REPORT

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RADIOACTIVE ION BEAMS:

The Holifield Radioactive Ion Beam Facility's new High Power Target Laboratory (HPTL) was utilized for radioactive ion beam (RIB) development for the first time in FY 2006. This test was for the production of ^{25}Al and ^{26}Al beams from reactions on silicon using a SiC target. The HPTL will be very useful because the targets, ion sources, and production techniques can be tested with driver beams from the Oak Ridge Isochronous Cyclotron (ORIC) which are the same power (or greater) as those used in production on the original RIB platform. Target testing at the On-Line Test Facility, using low-power tandem accelerator beam, has included measuring the yields of fission fragments from three different UC targets and two ThO_2 targets that varied in density and porosity. The two off-line ion source test facilities have also been busy with continued work using lasers to purify RIB beams by selectively neutralizing contaminants in the negative-ion beam and by selectively ionizing atoms of interest in the RIB production ion source.

ACCELERATOR OPERATION:

During FY 2006, the 25URC operated over 4000 hours for research. Of the twenty-three stable beams provided this year, none were new. Only three radioactive species were provided accounting for about 800 research hours. A combination of problems caused the low number of RIB hours, some having to do with ORIC and others with the RIB source. We also are consistently putting a proton beam with higher intensity on the uranium carbide target and have determined that some parts of the source may not be adequately cooled. This higher intensity beam may also be causing some other problems due to radiation damage.

Operation for the experimental program was at terminal potentials from 1.25 to 24.56 MV. Approximately 260 hours of conditioning were necessary, to recover from having the terminal up to atmosphere and to try to push up the voltage. In February, a new SF_6 transfer procedure was put into place to use a compressor to extract more gas from the storage tanks. This allowed about 4.5 psi more gas (thus a total pressure of 81 psig in the accelerator vessel) and allowed operation for many weeks at 24.56 MV without excessive sparking. Three tank openings were required during the year, one scheduled for general maintenance and two unscheduled. One of the unscheduled openings was to remove an obstruction that was left covering a light link during the scheduled tank opening. The other opening was to allow National Geographic to do some filming inside the tank for an episode of "National Geographic Naked Science".

The accelerator has actually run for over nine months with no maintenance, which may be a record and is even more astounding since there were quite a few sparks at 24.56 MV!

In February, nanotube carbon foils were tested in the tandem terminal. This is the first time that nanotube foils have ever been used for stripping beam in an accelerator. These first tests showed that the nanotube foils have a shorter lifetime and lower transmission than the laser-ablated carbon foils, but they are very easy to work with. Very thin foils, 2-3 $\mu g/cm^2$, can be handled like 50 $\mu g/cm^2$ conventional foils. If the homogeneity of the nanotube foils can be improved, they may begin to approach the lifetime and transmission of laser-ablated foils. Karl Von Reden of Woods Hole Institute supplied the foils and participated in the tests. He reported on the findings at CAARI 2006.

FUTURE PLANS:

The HPTL project has been completed and the facility is now being used for high-current target tests. A second upgrade project, the Injector for Radioactive Ion Species 2 (IRIS2), began in FY 2006. This project co-locates a second RIB production system with the HPTL. Two new high-voltage platforms, one for the injector beam line and one for instrumentation, are currently on order from NEC and will be delivered in May and August of 2007, respectively. This new capability will allow more RIB beam hours and will lessen the down time when a new source is needed for a different beam. The completion of the IRIS2 project is scheduled for March 1, 2009.

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