OAK RIDGE 25URC TANDEM ACCELERATOR*
2001 SNEAP LAB REPORT

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RADIOACTIVE ION BEAMS:

Radioactive ion beam production and development at the Holifield Radioactive Ion Beam Facility (HRIBF) will be detailed in a talk at this conference. A highlight during this period, however, has been providing A~130 neutron-rich RIBs at energies up to ~4 MeV/nucleon. At the present time, the HRIBF is the only facility in the world capable of providing such beams.

ACCELERATOR OPERATION:

During FY 2001, the 25URC provided a total of 3412 hours of beam, including 1044 hours of radioactive ion beams. Two new beams, ^{136}Ba and ^{130}Te, were provided from the stable injector while several new neutron-rich beams were provided by the RIB injector. Operation for the experimental program was at terminal potentials from 1.77 to 23.98 MV. After conditioning for routine operation at 24.5 MV, it was found that two of the units on the high-energy side are causing voltage ticking and the ticks remain, at less frequency, down to 20.5 MV. The problem with these units has not been ascertained and they will be examined very closely in our next major tank opening. Four tank openings were required during the year, two scheduled for general maintenance and two unscheduled. One of the openings was to reestablish communications with a major dead section and the second was because of the failure of the Georator at a major dead section. The bearings on this Georator failed and it became so hot that the windings shorted; therefore, it had to be returned to the factory for repair.

ORNL Seed Money was received during this year to investigate the feasibility of using the 25URC Tandem Accelerator for Accelerator Mass Spectrometry (AMS). Proof-of-principle tests have started and our results indicate it is possible to use the HRIBF as a prototyping facility to aid in the development of new AMS methods. The focus is on areas where the high-voltage capability of the HRIBF tandem, plus the specialized instrumentation we have (or will develop), can play a unique role in AMS. There are a number of similarities between AMS and RIBs and it is expected that AMS developments will bring very important benefits to the HRIBF nuclear physics research program. There are a number of isotopes of interest for AMS where the high energies achieved could represent a very important advantage for their detection. For example, the beam energies are sufficiently high to strip all electrons from a good portion of the ions up to about mass 50. The isobar of interest, which has the highest charge state, can be selected by beam analyzers. AMS experiments were performed at HRIBF to detect ^{36}Cl for the first time in a seawater sample. Samples from the Scotia Shelf in Nova Scotia, Canada, from the Barents Sea, and from a depth of 4km in the Atlantic Ocean were tested. Also, groundwater samples from the Great Artesian Basin (the largest freshwater aquifer in Australia) were taken from a well known as "Oodnadatta" and a sample from a drilling core from the "Salina Formation" in southwestern Ontario, Canada. These samples contain some of the lowest levels of ^{36}Cl on earth approaching ppq (parts-per-quadrillion). Initial results proved that the HRIBF tandem is potentially the most powerful in the world for the measurement of ^{36}Cl.

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The recirculating stripper turbo pump, which had been modified to have an o-ring joint on the roughing port rather than an epoxied fitting, was installed and is now in routine operation. At first, the pump was thought to still have a leak at the roughing port, but it was found that helium was diffusing through the o-ring. This was actually a fortunate happenstance, since it was found that a viton o-ring had been used which would also have allowed SF_6 to diffuse through. A Buna-N o-ring was installed and the pump has remained leak free through more than six months of accelerator operation. Testing of the recirculating stripper shows that the sublimator pumps will still have to be used to have effective gas stripping. We are presently looking into reconfiguring the stripper tank to reduce gas flow out of the tank.

We had planned to purchase SF_6 this year and a surprisingly good price for SF_6 ($5/lb) caused us to purchase more than 38,000 pounds. This amount should be the last we have to buy for a long time since that will allow a tank pressure of approximately 88 psig. There has also been a concerted effort to reduce SF_6 leaks, starting last year with the replacement of the vaporizer. The top flange of the accelerator had been known to leak for a long time, but this year a blowing leak was discovered. Estimates for removing the flange and replacing the gasket were more than $20k and down time was three weeks or greater. During this time, no other maintenance could be done since the work platforms could not be rigged with the top flange removed. The work was further complicated because the gasket contains asbestos. Fortunately, the mechanical engineer and the technician who worked on the leak were very creative and fixed the leak without removing the top flange. The leak was located precisely while pressure was in the tank and the leak was fixed with “golf club” epoxy when the tank was at atmosphere. Several smaller leaks still remain on the flange and plans are to try this same technique with them.

New Alpha Omega oxygen monitors have been installed in place of the Beckman monitors. The new fixed monitors are much more reliable and require very little maintenance. The portable monitors that we purchased at the same time, however, are not suitable. When they are taken to an area where the temperature is different, they act like thermometers rather than oxygen monitors. Alpha Omega suggests that we keep them in the same place, thus negating the fact that they are supposed to be portable. Negotiations continue to rectify this problem.

FUTURE PLANS:

Several upgrades are in the planning stage. Voltage capability upgrades are being studied, as is the terminal stripper upgrade to provide gas stripping without the use of the sublimator pumps. The gas handling system will finally be brought into the modern world with new controls, which will use EPICS for some controls and all monitoring. Conversion of the controls for several beam lines to EPICS was done this year and conversion of the cyclotron and the RIB injector is continuing.