HRIBF ACCELERATOR OPERATION SUMMARY

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During the early part of this reporting period, the required facility documentation and reviews were completed. The Accelerator Safety Envelope and Safety Assessment documents, which were completed in August 1996, were accepted by DOE on October 31, 1996. The Accelerator Readiness Review for Routine Operation was completed on December 3, 1996, and the HRIBF was approved for routine operation on December 10, 1996. The facility training programs were also extensively revised and expanded to meet current regulatory requirements.

During fiscal years 1997 and 1998, the tandem accelerator was operated for over 7,700 hours for development of experimental apparatus, low-intensity on-line studies of targets and ion sources for producing radioactive-ion beams, PAC-approved experiments in nuclear structure studies, and acceleration of radioactive-ion beams. During this same period, the ORIC was operated for approximately 1200 hours for development and production of RIBs and for accelerator development. Operation of the accelerators continues to be on a 24 hour per day, 5 days per week schedule except when radioactive beam is being accelerated. In those cases, the operating schedule has been modified to permit 10 days of continuous operation across a two-week period.

The operation of a radioactive-ion beam facility has provided the accelerator operations staff a number of new challenges such as learning to tune very low intensity beams. Reliability of the ORIC has been a major concern due to the age of many of the associated power supplies and significant progress has been made in making both the ORIC and the tandem accelerator more reliable. Upgrades of the control system and replacement of equipment for which parts were no longer available have also improved serviceability. Additional improvements are planned.

Over the past two years, the research staff has made extensive use of stable-ion beams from the tandem accelerator for the development of experimental apparatus such as the focal plane detectors for the RMS, DRS, and Enge spectrograph. Additional beam time was also provided to develop beam diagnostic devices for monitoring low intensity beams. Stable-ion beams from the tandem accelerator were also provided for 20 PAC-approved experiments. These measurements are considered to be essential to ensure that the experimental apparatus is functioning correctly prior to attempting to perform experiments with radioactive-ion beams. Beam transport studies have also been carried out using stable-ion beams from the RIB injector. These measurements show that the transmission through the tandem accelerator is essentially the same as that obtained for beams provided by the stable-ion injector.

Frequent use has been made of low intensity proton and deuteron beams from the tandem accelerator for on-line tests of potential RIB target/ion source assemblies at the UNISOR facility. Intensities of proton and deuteron beams provided by the tandem are administratively limited to I(max.)=50–E(MeV) pnA to prevent excessive activation of tandem accelerator components. Proton beams having energies up to 40 MeV have

been provided by the tandem to study the use of molten germanium targets, coupled to an EBP positive-ion source, for producing beams of radioactive arsenic and gallium isotopes. Deuteron beams in the range of 30-40 MeV have been used to study metal-oxide targets as potential candidates for making ^{17}F beams using the $^{16}O(d,n)$ reaction. Following low-intensity tests at UNISOR, promising target/ion source systems are then installed on the radioactive-ion beam injector for additional testing using high intensity proton or deuteron beams from the ORIC.