TANDEM ACCELERATOR IMPROVEMENT PROJECT

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The HRIBF tandem electrostatic accelerator, in operation since 1982, is taking on a new role as a national user facility for the study of nuclear structure and astrophysics using low-intensity radioactive-ion beams. Efficient accelerator operation with low-intensity beams places new demands on accelerator components related to stability and tuning. High accelerator availability for the experimental program requires renovation of aging subsystems and operation at maximum terminal potential for the nuclear structure experimental program requires additional SF_6 insulating gas and renovation of the SF_6 gas-handling system to prevent possible SF_6 losses. A proposal has been developed, and funding is expected, to renovate and improve tandem accelerator systems. The improvement project is likely to be carried out over a period of four years.

Stability of tandem accelerator terminal potential, while already quite good, will be improved by upgrading the terminal potential stabilizer electronics and developing an active low-intensity slit system. These measures are needed because radioactive-ion beams have significantly lower intensity than stable-ion beams normally accelerated by the tandem accelerator, intensities at which the existing slit regulation system will not function. In a multi-pronged approach, a more sensitive slit regulation system will be developed and regulation stability in modes other than slit-mode will be improved. In addition, ion transport stability will be improved by replacing existing ion-optic component power supplies with units having better stability.

Improvements will be made to aid tuning of radioactive-ion beams. Tuning of low-intensity beams is accomplished efficiently by first setting up a normal-intensity stable-ion beam with a mass near the radioactive-ion mass of interest, scaling ion-optic elements appropriately and optimizing the tune using special low-intensity diagnostics. To aid in scaling magnetic-optic devices, magnetic-field monitors will be installed in those magnetic-beam-line components which are currently without field monitors. To aid final ion beam transport optimization, low-intensity diagnostic devices will be installed at strategic locations along beam lines to experimental equipment.

The tandem accelerator uses sulfur hexafluoride (SF_6) insulating gas to allow operation at voltages up to 25 MV. Transfer of more than 200,000 pounds of gas between the accelerator and storage is performed using the gas-handling system. Deterioration of several of the gas-handling system components, plus normal losses during tank openings, has resulted in the loss of SF_6 gas to the extent that operation at the maximum design voltage would not be possible with the existing inventory. The proposed project would restore the insulating gas inventory to the point that the tandem accelerator could again be operated at 25 MV, and possibly higher terminal potentials, and would replace or overhaul several leaking SF_6 handling system components to minimize future losses. In addition, the oxygen-deficiency monitoring system, necessary because of the large SF_6 inventory, will be upgraded to ensure continued personnel safety.