STATUS OF ACCELERATOR ALIGNMENT AT MSU-NSCL/FRIB

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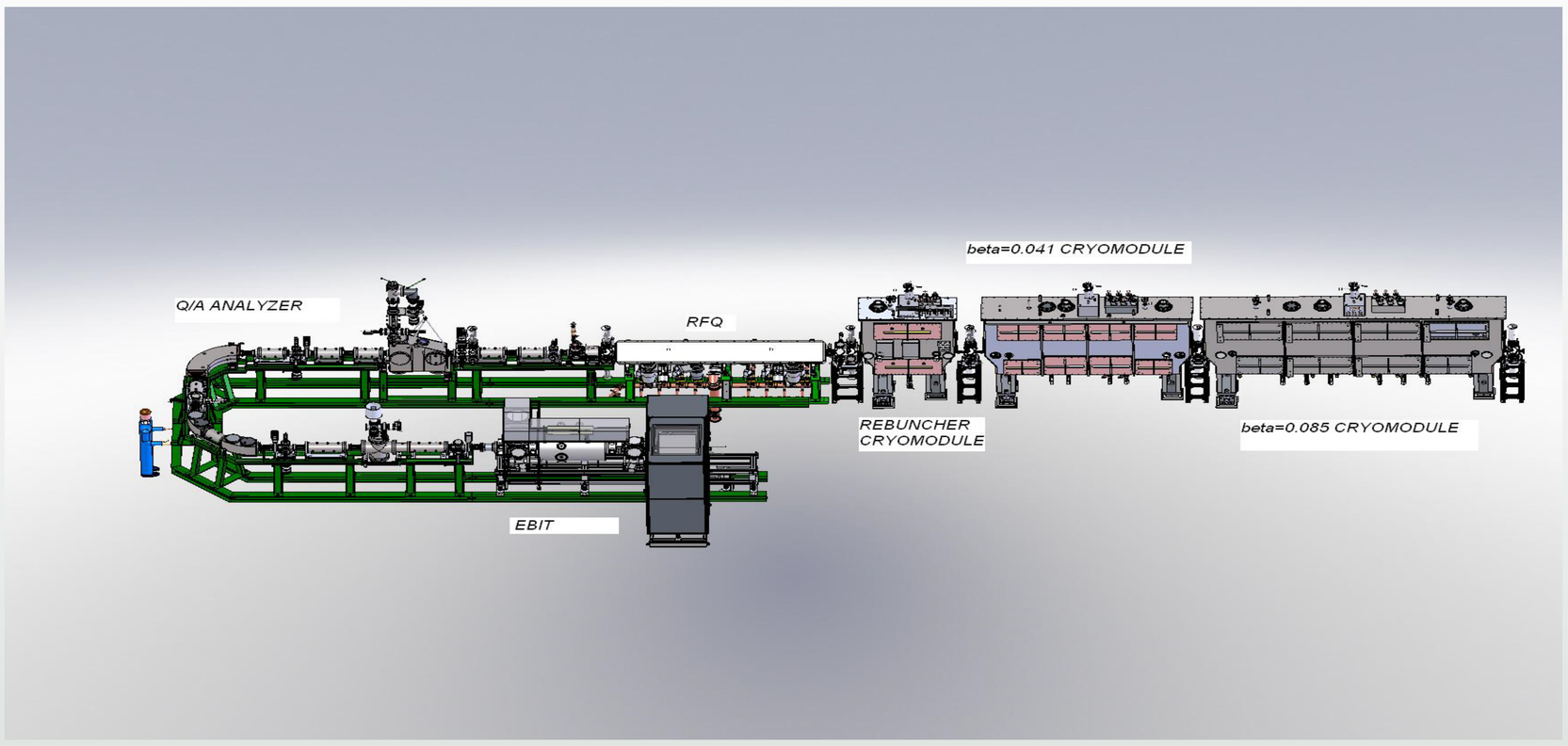
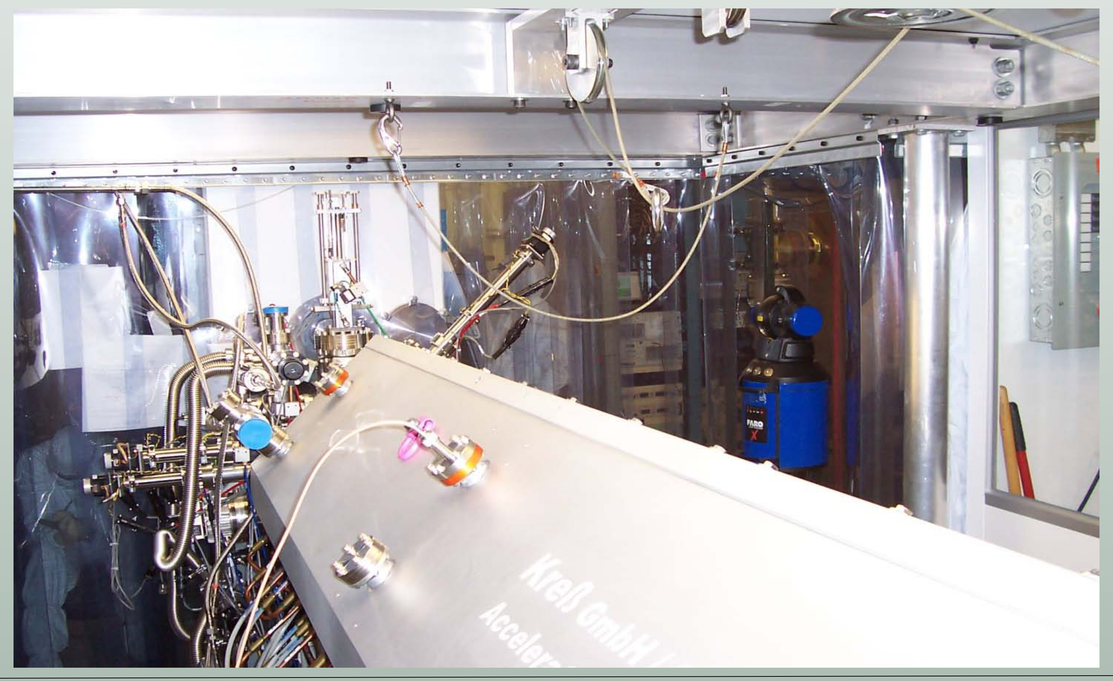
Abstract: Michigan State University is presently installing a Reaccelerator Project at the National Superconducting Cyclotron Laboratory (NSCL) and planning the Facility for Rare Isotope Beams (FRIB). The status of alignment activities for the two projects will be shown.

The Reaccelerator Project:

Rare Isotope beams produced by projectile fragmentation of stable beams from the coupled cyclotrons are stopped in a linear gas cell and then transported to the facility shown. The Electron Beam Ion Trap (EBIT) raises the average charge state and sends the beam through the analyzer to be accelerated by a Radio Frequency Quadrupole (RFQ). Further acceleration to 3 MeV per nucleon for uranium and 6 MeV per nucleon for lighter elements is provided by three superconducting RF linac cryomodules.

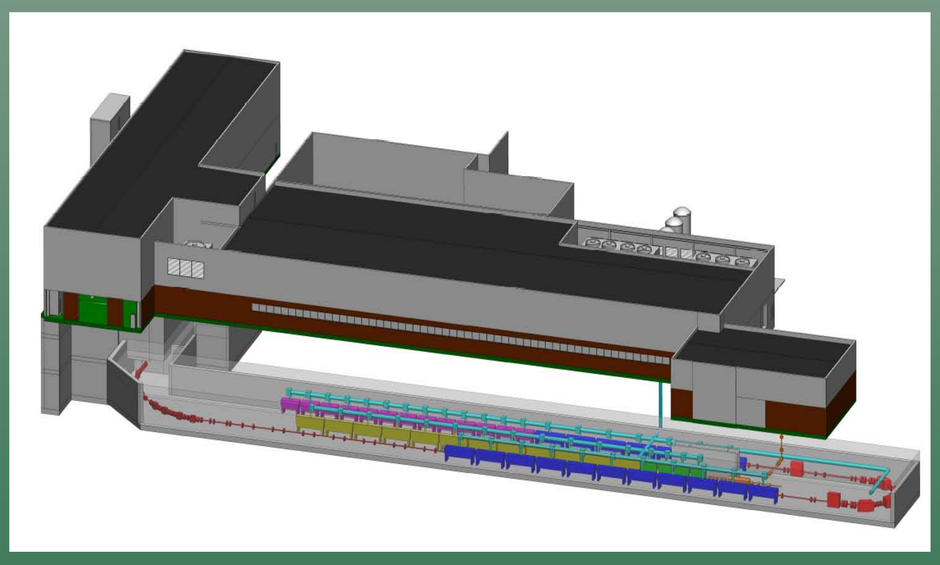


This figure shows the laser tracker placed to align a diagnostic chamber located between the RFQ and the first cryomodule. Once the chamber vacuum system is tested and the diagnostic drives are installed, the tracker calibrates a CMM arm. The arm locates the slits, faraday cups, timing wire detectors, multichannel plate viewers, and scattered particle detectors deep inside the chamber. Because of the risk of contamination of the SRF cavities inside the cryomodules, the beamlines near the linac are enclosed in class 1000 cleanrooms.

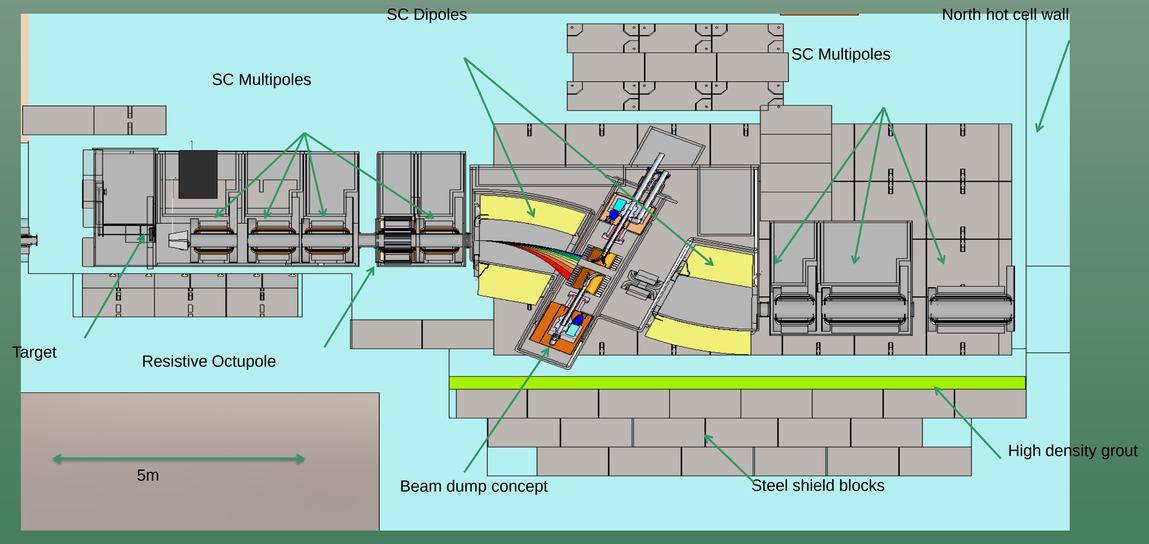


FRIB:

The FRIB Project consists of a pair of ECR ion sources feeding an RFQ and superconducting linear accelerator. The beam energy can reach at least 200 MeV per nucleon for all elements with a beam power of 400 kilowatts continuous. The primary stable beam is focused onto a production target to produce secondary radioactive beams. The secondary beams are chosen from other fragments and the primary beam in a fragment separator and transported to the experimental vaults of the present NSCL laboratory. The project recently passed Critical Decision-1 and is moving from the conceptual design stage to a preliminary design in preparation for CD-2. The figure on the left shows the surface buildings to be located on the existing eleven acre site of the present laboratory.



Conceptual layout of the superconducting linear accelerator. The tunnel is 12 meters below grade and sends the primary beam into the tall target building on the left.



The target, beamdump, and pre-separator section of the project. The 4,000 tons of steel shielding is supported by pillars to bedrock. The high radiation in this area after operations begin will provide interesting challenges for monitoring the alignment and possible installation of replacement hardware.

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