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# Thermal, Mechanical and Fluid Flow Aspects of the High Power Beam Dump for FRIB

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The Facility for Rare Isotope Beams (FRIB) under construction at Michigan State University is based on a 400 kW heavy ion accelerator and uses in-flight production and separation to generate rare isotope beams. The first section of the fragment separator houses the rare isotope production target and a primary beam dump to absorb unreacted primary beams. The experimental program will use ion beams from 16O to 238U with as much as 300 kW in remaining beam power needing to be absorbed by the dump. A rotating water-cooled thin-shell metal drum was chosen as the basic concept for the beam dump.
Extensive thermal, mechanical and fluid flow analyses were performed to evaluate the effects of high power density in the beam dump shell and water. Results of the simulations of the beam dump with different design options will be discussed. A design modification to the initial flow pattern resulted in a substantial increase in the wall heat transfer coefficient, for example. Detailed evaluation of different materials for the shell were done. Many properties must be optimized simultaneously: low beam power deposition in the shell, mechanical strength, fatigue strength, and radiation resistance. A titanium alloy, Ti-6Al-4V, is presently considered to be the best choice, and is the subject of specific tests, such as heavy irradiation studies.
In this talk we will present simulation results for different design options, the current status of material studies, and the results from a beam dump full-scale mock-up mechanical test.

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