

FRIB Radiation Studies: Damage, Component Lifetimes, Hands-on Accessibility

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The Facility for Rare Isotope Beams (FRIB), a project supported by the US DOE Office of Science, is in the final stage of construction at Michigan State University. The project will use projectile fragmentation and induced in-flight fission of heavy ion beams at energies of 200 MeV/u and higher, and at a beam power of up to 400 kW, to produce rare isotope beams for nuclear physics experiments.

This work is focused on the target and beam dump modules located in the FRIB target hall. About 25% of the total beam power is absorbed by the target, creating high radiation environment. Another 75% of the beam is dissipated in the beam dump. We use radiologically bounding beams to estimate target graphite disk and titanium alloy beam dump drum radiation damage, and discuss their lifetimes. We calculate absorbed doses in target module and beam dump module parts and estimate component lifetimes. Radiation-tolerant materials will be used in the locations where high radiation occurs. We analyze hands-on accessibility to the top parts of the modules where utilities will be connected and disconnected. Further scenarios of the target module and beam dump evolution (removal, movement, repair, storage, and disposal) are briefly discussed.

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