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Design of High Power Beam Dump and Collimator

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ABSTRACT

Argonne is funded by the National Nuclear Security Administration's (NNSA) Office of Material Management and Minimization (M³) to assist NorthStar Medical Technologies to develop an electron-accelerator-based system that produces ⁹⁹Mo by a γ, n reaction on a ¹⁰⁰Mo target. This production facility will require a high-energy beam dump system and a collimator to provide safe beam tuning and delivery to the production area. The projected beam parameters are as follows: energy 40-42 MeV, average power 120 kW, repetition rate 800 Hz. The beam collimator is to be installed before the target to protect the target holder and the surrounding area from excessive power deposition from the beam. The beam dump is to be used like a beam stop for tuning the accelerator for nominal power and beam shape before putting it directly on the target. For these purposes we designed a system that combines a water-cooled set of aluminum plates with ribs. To minimize the thermal stress, two separate water loops were used. The beam collimator is composed of a water-cooled aluminum cylinder. It is electrically insulated from the vacuum chamber by ceramic holders.

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