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Closed Shell Charge Breeding of Radioactive Fission Products with an Electron Beam Ion Source

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The closed shell breeding technique has been used to significantly improve the charge breeding efficiency of the Argonne National Laboratory electron beam ion source. The source serves as a charge breeder for the Californium Rare Isotope Breeder Upgrade (nuCARIBU), accepting radioactive beams of 1+ or 2+ ions and raising their charge state for efficient post-acceleration in the ATLAS linac. The 100 ms breeding window and flexible drift tube voltage scheme affords the appropriate time and electron beam energy required to achieve a closed shell configuration for many of the mid-mass species typical of nuCARIBU. Initial tests with stable cesium reached an absolute charge breeding efficiency of 72% for Cs27+ and a total efficiency of 93%. The nuCARIBU system is undergoing commissioning, and results with radioactive species will be presented.

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