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# Multi-Beam Accelerator-Driven Systems: A Safer and Scalable Approach to Nuclear Waste Transmutation

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This study analyzes the differences in the operation and heat distribution of single-beam and multi-beam Accelerator-Driven Systems (ADS) through burn-up simulation calculations. Compared to conventional single-beam configurations, the multi-beam ADS achieves a flat neutron flux and heat distribution, effectively suppressing radial power peaking. The distributed spallation target design in multi-beam ADS enhances minor actinide (MA) incineration efficiency under subcritical conditions while requiring substantially lower proton beam currents to sustain stable operation. These results demonstrate the feasibility of multi-beam architectures as a viable approach to sustainable nuclear waste transmutation, supporting further exploration of next-generation ADS technologies for industrial applications.

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