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Long-Lived Radioactive Beam Upgrade at TRIUMF-ISAC

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TRIUMF's Isotope Separator and Accelerator (ISAC) complex produces rare radioactive ion beams for experiments by bombarding targets with a primary H^+ driver beam from the 500 MeV cyclotron. A dedicated electron cyclotron resonance (ECR) ion source at ISAC –the so-called "charge-state booster"(CSB), is used to charge-breed those radioactive ions for post-accelerated experiments. Here we consider a future upgrade to the existing CSB facility where a second small ion source positioned upstream would deliver low charge-state ion beams from solid or gaseous samples into the injection-side of the CSB for charge-state boosting. Adding a second ion source, perhaps a small permanent magnet ECR, would significantly improve beam delivery capabilities and availability at TRIUMF-ISAC for heavy long-lived radioactive elements from prepared materials. Here we study various ion / ECR source designs, characteristics, and optics from different manufacturers together with all required matching and transport optics, to determine the best possible integration of a new ion source to the existing ISAC-CSB system.

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