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Multi-Charged Phosphorus and Cesium Beams at the OLIS Facility at TRIUMF

We describe the development of novel $^{31}P^{+n}$ and $^{133}Cs^{+n}$ beams for fundamental nuclear astrophysics research at TRIUMF's ISAC (Isotope Separator and ACcelerator) complex. Both beams were individually created for different experiments, and for the first time at TRIUMF's Off-Line Ion Sources (OLIS) facility by dual-frequency electron cyclotron resonance (ECR) using a Supernanogan ion source. Vapour pressures produced from pure samples of both elements were created and directed into the ECR plasma without support gas following heating of either (a) red phosphorus in an oven facing the plasma, or (b) cesium metal in a custom boiler/heater and transfer-line assembly. Charge-state spectra of $^{31}P^{+n}$ and $^{133}Cs^{+n}$ obtained before and after the ISAC linear accelerator confirmed the isotopic identity and purity of each beam. P and Cs expands the portfolio of available stable beams at ISAC to quantify the reaction rates of explosive nucleosynthetic processes, i.e. ^{133}Cs to constrain neutron capture rates of r-process nucleosynthesis, while ^{31}P to constrain thermonuclear reaction rates in the convective-reactive regions of AGB stars, novae, and phosphorus-rich stars with unexpected overabundances of elements.

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I have read the Code of Conduct to attend ICIS2023.

Yes

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