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## Ion Source Research and Development on Behalf of the TRIUMF ARIEL Development Team

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TRIUMF's flagship is the Advanced Rare IsotopE Laboratory (ARIEL), which will operate the existing ISOL facility, ISAC, to increase the number of shifts available to experimental users by a factor of three. In order to not only deliver more experimental hours but also better beams, a dedicated research and development program is required. There is scope for significant improvements to the performance of the target ion source systems currently used. The ion sources used at TRIUMF such as surface ion sources, and especially the FEBIAD (Forced Electron Beam Induced Arc Discharge) ion source will benefit for the dedicated research and development. ISAC will serve as a starting point to validate simulations and experimental methodology that will be applied to the ARIEL design.

Experimental characterization and calibration of the ion source parameters has been performed to gain more understanding of the ion source performance. Additionally, the simulations are capable of coupling different physics aspects of the source. This information allows a visualization of ionization maps that serve for a more realistic ion generation. Finally, the software tracks the ion extraction and exports data from which observables, such as the emittance are obtained. Preliminary simulation results show a similar behavior to the experimental ion current as a function of the varying magnetic field. Through the multiphysics approach of the simulations, and the experimental validation, it is hoped a better understanding will lead to possibilities for the optimization of the current ion sources used at TRIUMF.

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