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## Anomalous Ionization Regime in a Forced Electron Beam Induced Arc Discharge Ion Source for Singly Charged Radioactive Ion Beam Production

At TRIUMF, 1+ Radioactive Ion Beams (RIBs) of noble gases, halogens, and molecules are created using a Forced Electron Beam Induced Arc Discharge (FEBIAD) ion source. Reported ionization efficiencies for FEBIADs at other facilities range from 10% to 25% for 40Ar+, while TRIUMF-FEBIAD ionization efficiency is < 1% with an emittance < 15  $\mu\text{m}$ . As RIB ion sources aim for a high ionization efficiency, an experimental and numerical campaign was conducted to investigate the low efficiencies observed. The experimental results for 40Ar+ indicate that up to a 10% ionization efficiency is possible by operating the source at different parameters. The measurements agree with theoretical estimations; however, certain combination of parameters produce an anomalously high electron current which enhances the ionization efficiency threefold. Present investigations aim to characterize and model the anomalous electron current because, if proven reliable, the argon ionization efficiency could reach 30% with no significant impact on beam emittance.

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