Contribution ID: **1423** Contribution code: **TUPS038** Type: **Poster Presentation**

Low energy beam transport line design for the Sarajevo ion accelerator

Tuesday 3 June 2025 16:00 (2 hours)

The University of Sarajevo Physics Department, in collaboration with CERN's Accelerator Beam Physics group, proposes a compact linear accelerator design for applied physics research spanning from beam dynamics studies to material surface analysis. The Sarajevo Ion Accelerator (SARAI) consists of an electron cyclotron resonance (ECR) ion source, a low energy beam transport line (LEBT) and a radiofrequency quadrupole (RFQ). The ECR ion source can produce an array of ions (H, He, C, Ar, Xe, Au, Pb) extracted with 30 kV voltage. This study presents an iterative parameter optimization method that suggests two LEBT optics: one for beam diagnostics and another for beam matching to the RFQ acceptance. Furthermore, two RFQ designs at 750 MHz frequency are explored: one accelerating He or fully stripped C ions to 2.5 MeV/u, and the other to 0.5 MeV/u. A novel RFQ technology allows a significant reduction in footprint, thus making all beamlines shorter than 5 m. This paper discusses plans for the source commissioning with and without the devised LEBT designs, the experimental characterization of the 2.5 MeV/u RFQ with the ECR source, and potential research applications.

Footnotes

Paper preparation format

LaTeX

Region represented

Europe

Funding Agency

This work was supported by The Three Physicists Foundation.

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Session Classification: Tuesday Poster Session

Track Classification: MC4: Hadron Accelerators: MC4.A08 Linear Accelerators