



Contribution ID: 27 Contribution code: PSA-37

Type: Poster

Technical design of a new facility: positive ion source mass spectrometry

Monday, 21 October 2024 16:55 (20 minutes)

The positive ion source mass spectrometry is currently undergoing extensive research and development, being regarded as a more compact and cost-effective alternative to conventional tandem accelerator mass spectrometers. However, its elimination of the accelerator design presents challenges in overcoming the instability of low-energy carbon ion beams extracted by the Electron Cyclotron Resonance (ECR) ion source of gaseous samples, as well as the beam losses post-passing through the charge exchange cell. Particularly sensitive to changes in gas density within the charge exchange cell as the beam energy decreases. In this paper, the comprehensive design of low energy carbon ion beam is investigated deeply. In the optimization process, TraceWin, TOSCA and LISE++ are used to complete the task. LISE++ software, in particular, facilitates simulation calculations of complex interactions between ion beams and medium. Additionally, comprehensive testing of the device's bending magnet components has been conducted, with final results demonstrating strong concordance between magnetic field measurements and the physical design model. Presently, all components of the device have been fabricated, and equipment installation is forthcoming. Subsequent analysis of beam measurements will be carried out and compared with calculated models. The objective of this comparative analysis is to ascertain the final designing scheme, with a paramount focus on achieving efficiency and reliability in the entire system.

Keywords PIMS · Beam dynamics · LISE++ · TOSCA

Student Submission

Yes

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Session Classification: Poster Session A

Track Classification: New and Advanced AMS Techniques