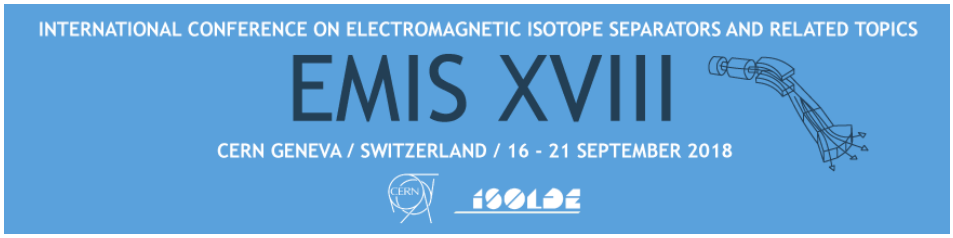

Contribution ID: **152** Type: **Submitted Oral**

Ba-ion extraction from high pressure Xe gas for double-beta decay studies with EXO

Thursday 20 September 2018 11:50 (20 minutes)

An RF-only ion funnel has been developed to efficiently extract single Ba ions from a high-pressure (10 bar) xenon gas into vacuum. Gas is injected into the funnel where ions are radially confined by an RF field while the neutral gas escapes. Residual gas flow alone (without any DC drag potential) transports the ions longitudinally through the funnel. In the downstream chamber the ions are captured by ion guides and delivered to an ion identification device. The xenon gas is captured by a cryopump and then recovered back into storage cylinders for future use.

With the current setup ions were extracted from xenon gas of up to 10 bar. This was one of the highest gas pressures ions have been extracted from so far. The ions were produced by a 252Cf-ion source placed in the high-pressure gas. The ion transmission has been studied in detail for various operating parameters and initial ion-identification has been achieved with a commercial mass spectrometer. An improved mass-to-charge identification via a multi-reflection time-of-flight mass spectrometer is currently being developed to further investigate the properties of the funnel and to measure the Ba-ion extraction efficiency of this setup.

This approach of ion extraction is intended for application in a future large-scale ¹³⁶Xe neutrinoless double-beta decay (0nbb) experiment. The technique aims to extract the bb-decay product, ¹³⁶Ba, from the xenon volume of a gaseous time-projection chamber and detect it unambiguously and efficiently. This individual identification of the decay product allows for an ideally background-free measurement of 0nbb by vetoing natural occurring backgrounds. This identification enables a higher level of sensitivity to the 0nbb decay half-life and thus is a more sensitive probe of the nature of the neutrino.

Primary authors: Dr BRUNNER, Thomas (McGill and TRIUMF); FOR THE NEXO COLLABORATION

Presenter: Dr BRUNNER, Thomas (McGill and TRIUMF)

Session Classification: Session 12 - Ion guide, gas catcher, and beam manipulation techniques

Track Classification: Ion guide, gas catcher, and beam manipulation techniques