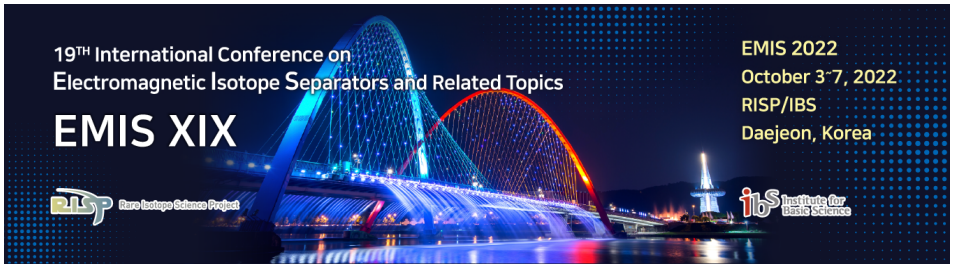

Contribution ID: **67** Type: **Poster Session**

A new laser ionisation scheme resulting in a 10-fold yield increase of Pb isotopes at ISOLDE

Monday, 3 October 2022 19:50 (8 minutes)

The development of new, more efficient laser ionisation schemes at the ISOLDE Resonance Ionisation Laser Ion Source (RILIS) directly impacts the yields of radioactive beams at ISOLDE [1]. Additionally, laser ionisation schemes which only use solid-state Titanium:Sapphire (Ti:Sa) lasers, are easier to maintain over long run durations [2]. An added bonus is reduced set up time, if the scheme ties in well with the laser availabilities. This contribution will present the development of a new laser ionisation scheme for lead (Pb), which has improved efficiency over the previously used scheme, facililitated the laser setup and reduced maintenance requirements.

The previously used Pb ionisation scheme at RILIS was developed using a dye laser system pumped with copper vapour lasers. It includes two resonant excitation steps and a non-resonant transition to the ionisation continuum with a 532nm Nd:YVO laser. The ionisation efficiency of stable Pb isotopes measured with this scheme was about 3%. This work will present a new three-step scheme which has been developed using only Ti:Sa lasers - one frequency quadrupled and two within the fundamental Ti:Sa wavelength range. The UV-step utilised in this scheme has a lower wavelength (217nm) than was previously feasible to generate at RILIS due to challenges with continued stable UV-generation. This UV-instability has been investigated and solved. A comparison between the old and the new scheme for lead revealed a factor 10 improvement of the laser ionisation efficiency. A 10-fold increase of isotopic yield over the ISOLDE database values was determined by applying the new scheme for delivery of $^{187-208}$Pb radioactive ion beams to the COLLAPS experiment.

[1] Valentin Fedosseev et al. “Ion beam production and study of radioactive isotopes with the laser ion source at ISOLDE”. In: Journal of Physics G: Nuclear and Particle Physics 44.8 (July 2017), p. 084006. doi: 10 . 1088 / 1361 - 6471 / aa78e0. url: https : / / doi . org / 10 . 1088 / 1361 - 6471/aa78e0.

[2] S. Rothe et al. “Laser ion beam production at CERN-ISOLDE: New features –More possibilities”. In: Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms 376 (2016). Proceedings of the XVIIth International Conference on Electromagnetic Isotope Separators and Related Topics (EMIS2015), Grand Rapids, MI, U.S.A., 11-15 May 2015, pp. 91–96. issn: 0168-583X. doi: https://doi.org/10.1016/j.nimb.2016.02.024. url: https://www.sciencedirect.com/science/article/pii/S0168583X1600152X.

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