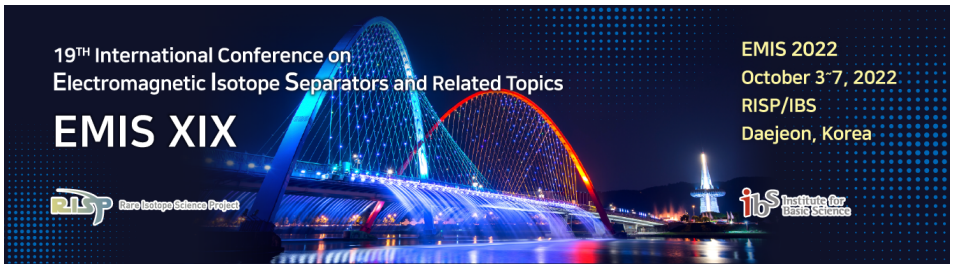

Contribution ID: **21** Type: **Poster Session**

Radioactive ion source experimental study for ISOL@MYRRHA

Monday, October 3, 2022 5:34 PM (8 minutes)

MYRRHA [1,2] (Multi-purpose hYbrid Research Reactor for High-tech Applications) will be the world's first large-scale Accelerator Driven System project at power levels scalable to industrial systems. In parallel to the reactor, ISOL@MYRRHA [3] will produce Radioactive Ion Beams (RIBs) using the Isotope Separation On-Line (ISOL) technique. The isotope production will be increased by using a high intensity primary beam over a long period while maintaining high-quality RIBs. Higher atom flux produced prevalently affects the ISOL system, one part in particular is the ion source. An ion source adapted to these new conditions has to be developed before the start of the new accelerator for ISOL@MYRRHA at SCK CEN.

A surface ion source is chosen as a first source to test because of its reliability and simple design. This source was already studied theoretically and experimentally by Kirchner [4] and has shown that one of this source key element is the temperature, which is why those sources are also called hot cavity. To understand the hot cavity's behaviour, finite element thermal-electric simulations were performed with ANSYS [5,6]. To start, a heating system study with experimental results from the SPES project [7] was reproduced. Then, this concept was modified by: electrically insulating the source from its support, adding a feedthrough and transforming a passive thermal screen into an active part. With this heating system upgrade, the ion source temperature profile can be improved, especially at its exit where high temperature is expected to play a crucial role in ion production and extraction. This heating system upgrade was assessed through thermal-electric simulation [6] and now needs to be validated experimentally. A prototype of this novel hot cavity configuration will be tested at a heating test stand at SCK CEN: first through thermal-electric test to assess the hot cavity's temperature behaviour, but also test the prototype reliability, then the ion source properties will be tested with offline ion extraction tests.

References :

1 Aït Abderrahim, Hamid ; Michiels, Sidney. "MYRRHA - An Innovative and unique research facility". 10th International Topical Meeting on Nuclear Applications of Accelerators. United States, 2011.

2 Popescu, Lucia 2014 EPJ Web of Conferences 66 10011

3 Ashford M, Popescu L, Houngbo D, Dierckx M and Aït Abderrahim H 2020 Nucl. Instrum. Methods Phys. Res. B 463 244-247

4 R. Kirchner. "On the thermoionization in hot cavities". In: Nuclear Instruments and Methods in Physics Research Section A 292 (July 1990), pp. 203–208.

5 ANSYS. *www.ansys.com.*

6 Sophie Hurier et al "Design and thermal simulations towards a high intensity radioactive ion source for ISOL@MYRRHA" 2022 J. Phys.: Conf. Ser. 2244 012065

7 M. Manzolaro et al. "The SPES surface ionization source". In: Review of Scientific Instruments 88, 093302 (Sept. 2017).

Primary authors: HURIER, Sophie (SCK CEN & KULeuven); RIJPSTRA, Kim (SCK CEN); COCOLIOS, Thomas Elias (KULeuven); RAMOS, João Pedro (SCK CEN); POPESCU, Lucia (SCK CEN); CREEMERS, Philip (SCK CEN)

Presenter: HURIER, Sophie (SCK CEN & KULeuven)

Session Classification: Poster Session