

The MARA Low-Energy Branch – towards day 1

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The MARA low-energy branch (MARA-LEB) [1,2] is a novel facility currently under development at the University of Jyväskylä. Its main focus will be the study of ground-state properties of exotic proton-rich nuclei employing in-gas-cell and in-gas-jet resonance ionisation spectroscopy and mass measurements of nuclei close to the $N=Z$ line of particular interest to the astrophysical rp process [3].

MARA-LEB will combine the MARA vacuum-mode mass separator [4] with a gas cell, an ion guide system and a dipole mass separator for stopping, thermalising and transporting reaction products to the experimental stations. The gas cell has been designed and built based on a concept developed at KU Leuven [5].

Following extraction from the cell the ions will be transferred by radiofrequency ion guides and accelerated towards a magnetic dipole for further mass separation before transportation to the experimental setups [6]. Laser ionisation will be possible either in the gas cell or in the gas jet using a dedicated Ti:Sapphire laser system and will provide reliable experimental data on the ground-state properties of exotic isotopes close to the $N=Z$ line.

Mass measurements will be achieved through a dedicated radiofrequency quadrupole cooler and buncher and a multiple-reflection time-of-flight mass spectrometer [7] which will be combined with the facility. These devices will allow for mass measurements of several isotopes with high impact on the rp process and which could be used as test grounds for state-of-the-art nuclear models.

In this presentation we will give an update on the current state of the MARA-LEB facility and discuss the development of individual parts.

[1] P. Papadakis *et al.*, *Hyperfine Interact* **237**:152 (2016).

[2] P. Papadakis *et al.*, *AIP Conf. Proceed.* **2011**, 070013 (2018).

[3] R.K. Wallace and S.E. Woosley, *Astrophys. J. Suppl. Ser.* **45**, 389 (1981).

[4] J. Sarén, PhD thesis, University of Jyväskylä (2011).

[5] Yu. Kudryavtsev *et al.*, *Nucl. Instr. and Meth. B* **376**, 345 (2016).

[6] P. Papadakis *et al.*, *Nucl. Instr. and Meth. B*, *article accepted for publication*.

[7] R.N. Wolf *et al.*, *Nucl. Instr. and Meth. A* **686**, 82 (2012).