Recent mass measurements of neutron-rich rare-earth nuclides with the JYFLTRAP double Penning Trap at IGISOL for the astrophysical r-process.

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High precision mass spectrometry of neutron-rich rare-earth nuclides near A=160 was performed recently with the JYFLTRAP double Penning trap [1] using the phase-imaging ion cyclotron resonance technique [2] at the IGISOL facility in the JYFL Accelerator Laboratory. The mass measurements continued the previous successful measurement campaigns at JYFLTRAP in this region [3,4] and now reached the region around the neutron midshell at N=104, important for studying how the nuclear structure evolves further from stability. The properties of these nuclides also impact the models describing the formation of the rare-earth abundance peak around A=160 in the astrophysical rapid neutron capture (r) process [5]. Masses are critical inputs for modelling stellar nucleosynthesis, which is relevant for understanding origins of different chemical elements found on Earth and their abundances in the Solar System. As variations in nuclear masses affect all the relevant nuclear properties of neighboring nuclei that depend on the mass, reducing their related uncertainties give better constraints on the calculated astrophysical reaction rates.

[1] T. Eronen et al., The European Physical Journal A 48 (2012) 46
[2] D. A. Nesterenko et al., The European Physical Journal A 54 (2018) 154
[3] M. Vilen et al., Physical review letters 120, 262701 (2018)
[4] M. Vilen et al., Physical review C 101, 034312 (2020)
[5] M. Mumpower et al. Physical review C 85, 045801 (2012)