

Ion traps for the study of stellar nucleosynthesis

There is an astute idea of the different processes that assemble heavy elements ($Z > 26$) in our universe, but the production sites of some of them remain unclear. The processes that generate the most exotic nuclei such as r-process, for rapid neutron capture, and rp-process, for rapid proton capture are difficult to thoroughly describe because of the lack of experimental nuclear properties of those regions. Indeed, said properties are key inputs to calculate nucleosynthesis processes. Regarding nuclear masses, we have on one hand sensitivity studies using theoretical input that show higher effects on the r-process around $N = 82$ region of the nuclear chart [1]. On another hand, we know that the region around 100Sn is a key area for the rp-process, as it is called the “end point” of the rapid proton capture process [2]. During this talk, I will be presenting the part of my Phd work that revolves around the development of a new data acquisition system for the ISOLTRAP mass spectrometer at ISOLDE, CERN. Which will improve measurements of difficult cases with very low yields. Additionally, I aim to study the effect of new measured masses on the nucleosynthesis processes that are planned this year with the ISOLTAP experiment along with previously measured masses in these regions. Such nuclei are $96\text{-}98\text{Cd}$ [3] for rp-process, and $126\text{-}129\text{Ag}$ [4] for r-process.

[1] M. R. Mumpower et al., 10.1103/PhysRevC.92.035807 (2015)

[2] H. Schatz et al., 10.1103/PhysRevLett.86.3471(2001)

[3] M. Mougeot et al. INTC-P-682 (2023)

[4] P. F. Giesel, M. Benhatchi et al., INTC-P-742 (2025)

Autor: BENHATCHI, Maroua (IJCLab/in2p3/CNRS)

Vortragende(r): BENHATCHI, Maroua (IJCLab/in2p3/CNRS)