



Contribution ID: 15

Type: Talk

Isomer studies for r-process nucleosynthesis

Monday, 2 May 2022 18:15 (15 minutes)

To understand the exact path of the r-process and its link to the observed abundance pattern requires experimental discoveries combined with extensive network simulations. Structure and decay properties of thousands of neutron-rich nuclei are key determinants of the nuclear flow throughout the entire r-process. To date, multiple extensive sensitivity studies of nuclear masses, half-lives, beta-decay branching ratios, neutron captures, and neutron emission probabilities, and more recently nuclear isomers [1-4], have been performed. This recent theoretical work highlights the importance of precise information on nuclear masses and careful treatment of isomeric states in network calculations. We have performed measurements to study the energy difference between the ground state and isomeric states of some potential important to astrophysics isomers for nuclei $A \sim 120$ -140 with the Canadian Penning Trap (CPT) using the Phase-Imaging Ion-Cyclotron-Resonance (PI-ICR) technique [5] at Argonne National Laboratory's Californium Rare Isotope Breeder Upgrade (CARIBU) facility. Results will be presented for $^{128,132}\text{Sb}$, ^{131}Sn , $^{119,122}\text{Ag}$ and ^{154}Pm .

- [1] Fujimoto S. and M. Hashimoto (2020), "The impact of isomers on a kilonova associated with neutron star mergers." *MNRAS* (493), L103-L107
- [2] Misch, G. W., T. M. Sprouse and M. R. Mumpower (2021), "Astomers in the radioactive decay of r -process nuclei." *Astrop. Journ. Lett.* (913), L2
- [3] Misch, G. W., S. K. Ghorui, P. Banerjee, Y. Sun and M. R. Mumpower (2021), "Astomers: Nuclear isomers in astrophysics" *Astrophys. J. Suppl. Ser.* (252), 2
- [4] Misch G. W., T. M. Sprouse, M. R. Mumpower, A. Couture, C. L. Fryer, B. S. Meyer, Y. Sun (2021), "Sensitivity of neutron-rich nuclear isomer behavior to uncertainties in direct transitions" *arXiv:2103.09392*
- [5] Eliseev, S., K. Blaum, M. Block, C. Droese, M. Goncharov, E. Minaya Ramirez, D. A. Nesterenko, Yu. N. Novikov, and L. Schweikhard (2013), "Phase-Imaging Ion-Cyclotron-Resonance measurements of short-lived nuclides." *Phys. Rev. Lett.* (110), 082501

Primary author: KOLOS, Karolina (Lawrence Livermore National Laboratory)

Co-authors: HOFF, Daniel (LLNL); MISCH, G. Wendell (LANL); SAVARD, Guy (ANL); MUMPOWER, Matthew (LANL); SCIELZO, Nicholas (LLNL); ORFORD, Rodney (LBNL); RAY, Dwaipayan (University of Manitoba); SHARMA, Kumar (University of Manitoba); CLARK, Jason (ANL); VALVERDE, Adrian (ANL); LEE, Biying (University of Notre Dame); BRODEUR, Maxime (University of Notre Dame); VARRIANO, Louis (University of Chicago); MORGAN, Graeme (Louisiana State University); KONDEV, Filip (ANL); CALLAHAN, Nathan (ANL); BURDETTE, Daniel (ANL)

Presenter: HOFF, Daniel (LLNL)

Session Classification: Evening Online Session