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Mass measurements of neutron-rich nuclides at the N=126 shell with the FRS Ion Catcher

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Direct evidence of the r-process has recently been observed in neutron star mergers, but the debate on the Nucleosynthesis environment is still far from over. Due to the scarcity of experimental information, modern r-process network calculations rely on theoretical models that give divergent predictions as one moves away from the valley of stability. Nuclear masses help to determine the r-process path and shed light on the Nucleosynthesis environment. Thus, high-precision mass measurements are performed to provide key input parameters to r-process calculations.

At GSI Darmstadt, experiments with exotic nuclides are performed, enabling the study of nuclei far from stability. These nuclei are produced at relativistic energies by projectile fragmentation or fission, separated in the fragment separator FRS and sent to the FRS Ion catcher (FRS-IC) for mass measurements utilizing its multiple-reflection time-of-flight mass spectrometer (MR-TOF-MS). An experiment was performed at the FRS-IC within FAIR Phase-0 close to the N=126 line, which is significant for nuclear structure and astrophysics studies and can help us better understand the r-process. Preliminary results from this experiment will be presented, including the first mass measurements of ^{204}Au and ^{205}Au , where significant deviations from AME20 extrapolations indicate a change in the nuclear structure.

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