Contribution ID : **48** Type : **oral contribution**

Mass measurements of N = 50 isotones and its implications in the nuclear structure around 100Sn

Thursday, 30 May 2024 17:50 (20)

Mass spectrometry is invaluable for probing the essential characteristics of nuclei, particularly their binding energy. The FRS Ion Catcher at GSI employs a Multiple-Reflection Time-of-Flight Mass Spectrometer (MR-TOF-MS) to achieve precise, fast, and sensitive mass measurements, crucial for studying exotic nuclei far from stability. Previous investigations, have scrutinized properties of nuclei surrounding the heaviest N=Z double-magic nucleus, ^{100}Sn [Horn], revealing discrepancies in properties like Q_{ec} and production cross-sections [Hinke, Lubos].
The stability of nuclei along the N=Z line persists up to ^{40}Ca (N=Z=20), beyond which, instability prevails. This increasing divergence from stability poses challenges for both production and measurement techniques in reaching the heaviest N=Z nuclei. In a recent study it was possible to determine the mass value of ^{100}In, based on this and trends in the shifted two-neutron separation energy, the older Q_{ec} value for ^{100}Sn is favoured [Moug]. In the study that will be presented, mass measurements of isotones along the N=50 line ($44 \leq Z \leq 48$) approaching ^{100}Sn were conducted, yielding measurements for 14 ground and two isomeric states [Moll].
The excitation energy of the long-lived isomer in ^{94}Rh was determined for the first time and together with shell model calculations allowed a spin-parity assignment of the observed states.
First direct mass measurement of ^{98}Cd provided a much more accurate and trustful Q_{ec} value than previous mass measurement methods. Systematic investigations of the shifted two-neutron shell-gap, utilizing the newly acquired masses were performed, confirming the results of the previous study, favouring specific Q_{ec} values [Hinke]. Moreover, the Q_{ec} value obtained for ^{98}Cd was also employed to analyze the Gamow-Teller (GT) strength trend along the N=50 isotones, which also has been compared to new state-of-the art calculations utilizing a large-scale shell model (LSSM). This results strongly support the newer Q_{ec} values measured for ^{100}Sn [Lubos].

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Session Classification : Session 14