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Extraction of statistical properties in 181Ta to investigate nucleo-synthesis of 180Ta

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Abstract content
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Most stable and extremely low abundance proton-rich nuclei with A>110 are thought to be produced by the photodisintegration of s- and r- process produced nuclei. However, this p-process is insufficient to explain the observed low abundance (0.012%) of the180Ta isotope. Hence combinations of several processes are considered to reproduce 180Ta in the cosmos, provoking debates and making it a unique case study. Significant errors in the predicted reaction rates in some of the p-nuclei can arise due to large uncertainties in nuclear properties such as the nuclear level densities (NLD) and gamma-ray strength functions (γSF) [1]. An experiment was performed in October 2014 to extract the γSF and NLD below the neutron threshold in 180,181,182Ta which provide important input parameters for nuclear reaction models. In the present case study, these parameters were measured using the 181Ta(3He, 3Heγ)181Ta inelastic scattering reaction with 34MeV beam energy at the Oslo Cyclotron Laboratory. Using the SiRi array at backward angles (64 silicon particle telescopes) and the CACTUS array (26 NaI(Tl) detectors), the NLD and γSF were simultaneously extracted from particle-γ coincidence matrices through iterative procedures using the Oslo method [2]. These results will be used to determine the corresponding neutron capture cross sections which in turn will be utilized in astrophysical network calculations to investigate the galactic production mechanism of 180Ta. I will present preliminary results of this investigation of statistical properties for 181Ta.

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