Contribution ID: **278** Type: **Oral Presentation**

Indirect experimental technique for constraining the 193,194Ir(n,γ) cross sections

Wednesday 9 July 2025 15:00 (20 minutes)

The formation of elements, particularly those heavier than iron, predominantly occurs through two neutron capture processes: slow neutron capture process and rapid neutron capture process, each contributing approximately 50%. These are known as the s- and r-processes, respectively [1].
The neutron capture reactions 192Ir(n,γ)193Ir and 193Ir(n,γ)194Ir were indirectly studied by analyzing data obtained from the Oslo Cyclotron Laboratory (OCL). These data enabled the study of the 193,194Ir isotopes, originating from the 192Os(α,tγ) and 192Os(α,dγ) reactions, respectively. The 193Ir(n,γ)194Ir cross sections constrained by our measurements provided a comparison to existing (n,γ) measurement data [2]. Additionally, the 192Ir(n,γ)193Ir reaction maps a branching point in the s-process, making it highly significant. However, directly measuring the (n,γ) cross section is challenging due to the instability of 192Ir. Therefore, the OCL data provided valuable information on the 192Ir(n,γ)193Ir cross section by indirectly constraining it using the experimental nuclear level density (NLD) and γ-strength function (γSF).
An array of Sodium Iodine (NaI)Tl detectors, called CACTUS, detected γ-rays, while the silicon particle telescope array, called SiRi, was used to detect charged particles in coincidence. The NLDs and γSFs were extracted below the neutron separation energy, Sn, using the Oslo Method [3]. Furthermore, the NLDs and γSFs were used as inputs in the open-source code TALYS to calculate the neutron cap-
ture cross-sections and Maxwellian averaged neutron capture cross sections (MACS) for 193,194Ir. Final results of this study will be presented in comparison to existing data.

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This work is based on research supported in part by the National Research Foundation of South Africa (Grant Number:PMDS22070734847), SAINTS Prestigious Doctoral Scholarship, U.S. Department of Energy, Office of Science, Office of Nuclear Physics under Contract No. DE-AC02-05CH11231 and the SARChI under grant No REP-SARC180529336567. The experiment was financed through ERC-STG-2014 under Grant Agreement No. 637686

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Session Classification: Nuclear, Particle and Radiation Physics-1

Track Classification: Track B - Nuclear, Particle and Radiation Physics