Contribution ID: **360** Type: **Oral Presentation**

Study of the low-lying states in ²⁶ Mg nuclei.

Wednesday, 5 July 2017 11:50 (20 minutes)

The study of ²⁶ Mg level structure is of particular importance in nuclear structure physics because of its impact in the slow neutron capture process (s-process) for the nucleosynthesis of heavy elements up to lead. In fact, the ²⁶ Mg is the compound nucleus for the s-process neutron source ²²Ne (α, n)²⁵ Mg that is one of the dominant reaction in the s-process. Since it is an endothermic reaction it competes directly with the ²² Ne (α,γ) ²⁶ Mg radiative capture. Understanding the rate of both of these reactions is crucial for linking the observational evidence of s-process abundance with the internal structure of the stars. The uncertainties in the energy of the ²⁶ Mg states and the inconclusive spin- parity assessments still lead in large error bars in these reaction rates.

In this work, the low-energy states in ²⁶ Mg were populated using the inelastic scattering of alpha particles with beam energy of 120 MeV. The ²⁶ Mg (α,α'γ)²⁶ Mg measurements can be useful to improve the uncertainties in these rates by studying and extracting the characteristics of the excited states of ²⁶ Mg. The experiment was performed at iThemba LABS research facility using a new designed experimental set-up: the K600 magnetic spectrometer coupled to the BaGeL array (Ball of Germanium and LaBr detectors). This combination was used to perform the coincidence measurements between charged particles and gamma rays. The excitation and the subsequent gamma decay of the ²⁶ Mg states of interest will be investigated. Preliminary results on the analysis will be presented.

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Session Classification: Nuclear, Particle and Radiation Physics 1

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