Contribution ID: **54** Type: **Poster**

Radiative capture reaction studies at iThemba LABS

The low-energy nuclear astrophysics beamline at the iThemba LABS 3-MV Tandetron facility enables the study of radiative capture reactions using proton and alpha beams. The setup can presently be instrumented with either up to twelve 3″×3″ $LaBr_3$:Ce detectors or six HPGe detectors (with associated BGO Compton-suppression shields), or with a combination of both detector types. To date, proton beams have primarily been employed for studies of the photon strength function (PSF), which is important not only for calculating nucleosynthesis reaction rates but also for probing the underlying nuclear structure. Experiments using alpha beams have focused on reactions relevant to helium burning in stars.

As is typical for measurements at such low energies, the sensitivity of the experiment is strongly affected by background produced when Rutherford-scattered beam particles interact with nuclei in surrounding hardware rather than in the intended target.

Preliminary results from selected experiments will be presented, together with a discussion of background-mitigation strategies and investigations into the origin of the observed background due to the 19F(p,alpha)16O reaction.

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Track Classification: Nuclear Experimental Techniques and Data Analysis