

UNIVERSITY OF NOTRE DAME
DEPARTMENT OF PHYSICS

NUCLEAR SEMINAR

Monday, January 25

Direct Measurements of the $^{23}\text{Na}(p,\gamma)^{24}\text{Mg}$ Cross Section Underground at LUNA

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Asymptotic Giant Branch (AGB) stars play a fundamental role in the determination of the observed abundances of light mass elements. One limiting factor for the uncertainty of AGB model predictions is the poor knowledge of the cross sections of the relevant proton capture reactions, in particular for the yield of light elements.

The reaction $^{23}\text{Na}(p,\gamma)^{24}\text{Mg}$ links the NeNa and the MgAl cycles of stellar burning. The reaction rate in AGB star scenarios is influenced significantly by the resonance of this reaction at 138 keV (assuming the most recent upper limit or value for the resonance strength from a possible observation of this resonance), the non-resonant cross section and the tails of resonances at higher energies. To constrain the reaction rate, cross section measurements over a larger energy window are required, leading to a global analysis of all available data.

Current measurements at LUNA, the Laboratory Underground for Nuclear Astrophysics, aim at a direct observation of the 138 keV resonance with a segmented bismuth germanium oxide detector, as well as the measurement of the non-resonant cross section and additional information with a High-Purity Germanium detector for low proton energies up to 400 keV.

High energy measurements up to above 1 MeV are planned at NSL to complement this data; first data taking will start soon. The current status of the experimental efforts will be presented, covering the setup and the preliminary results of measurements at LUNA as well as planned measurements at NSL.

4 pm – 5 pm

**Nuclear Science
Laboratory**

**124 Nieuwland
Science Hall**

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All interested
persons are
cordially invited
to attend

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Refreshments will be
served prior to the
seminar in room 124