

UNIVERSITY OF NOTRE DAME  
DEPARTMENT OF PHYSICS

# SPECIAL NUCLEAR SEMINAR

Thursday, July 21

## *A direct study of $^{20}\text{Ne}(\alpha,p)^{23}\text{Na}$ with the HELICAL Orbit Spectrometer (HELIOS)*

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Type Ia Supernovae are thermonuclear explosions that occur in binary system with at least one CO white dwarf, completely disrupting the system. While the exact progenitor of these events is unclear, there have been several studies exploring the nucleosynthesis that drives these stellar explosions. The  $^{20}\text{Ne}(\alpha,p)^{23}\text{Na}$  reaction has been shown to be one of the five most influential reactions, and it has not been directly measured at astrophysically relevant energies. We performed direct measurements of this reaction with multiple  $^{20}\text{Ne}$  beam energies (100 MeV, 80 MeV and 31 MeV) in inverse kinematics, at Argonne National Laboratory using the HELIOS (HELICAL Orbit Spectrometer) beam line. This measurement is also a proof-of-principle test for direct  $(\alpha,p)$  reaction studies with radioactive ion beams, using a cryogenic gas target and a fast position sensitive ionization chamber (IC), and details of the commissioning runs for these devices will be discussed.

The newly measured  $^{20}\text{Ne}(\alpha,p)^{23}\text{Na}$  cross sections are compared to those previously used for nuclear reaction sensitivity studies and the likely effects on Type Ia Supernova nucleosynthesis will be discussed. Candidate reactions for future studies will also be proposed.

**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