

Nuclear Science at LANSCE

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on behalf of P-27

The P-27 group in Physics Division at the Los Alamos Neutron Science Center has unique neutron beams and facilities supporting a diverse experimental program for both basic and applied research.



National User Facility

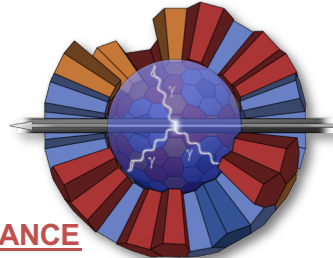
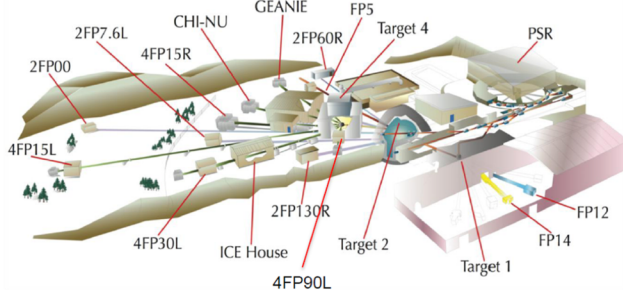
800 MeV linear accelerator: H⁺ beams for isotope production and H⁻ beams to drive two neutron beam facilities

Lujan center (pink): moderated spallation source, three flight paths devoted to nuclear science sub-thermal $E_n \leq 500$ keV

WNR (blue): unmoderated spallation target, generating neutrons with $100 \text{ keV} \leq E_n \leq 600$ MeV

Approximately 200 unique users run experiments annually at the LANSCE Nuclear Physics Facilities

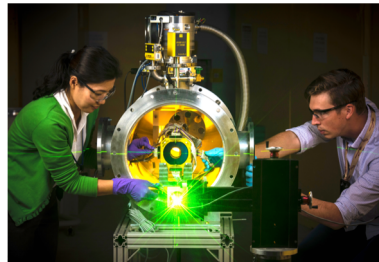
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DANCE

- Studies of neutron capture and gamma decay
- Premier instrument in the world to measure neutron capture on short-lived isotopes relevant to *s*-process nucleosynthesis
- 4π BaF₂ scintillator ball – 160 segments
- High efficiency, segmentation, and neutron flux
- Can be combined with PPAC for capture measurements on fissile isotopes

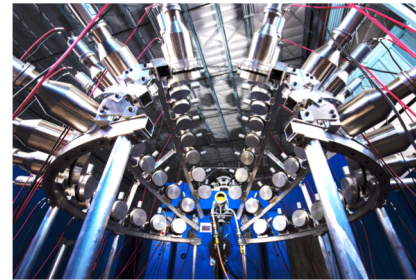
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LENZ

- (n, α) and (n, p) reactions of interest for nuclear astrophysics, nuclear energy, and device performance
- Coupling with Isotope Production Facility allows studies on a wide range of short-lived isotopes (days)
- Tight coupling between experiment and theory (T-2) essential for experimental analysis and interpretation
- Current program at WNR can be extended to lower energies ($E_n < 1$ MeV) with Lujan Target upgrade

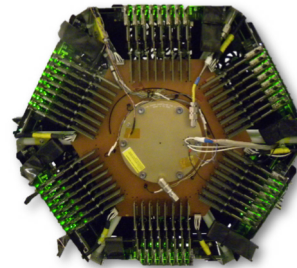
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Chi-Nu

- Completing precision measurements of the prompt fission neutron spectrum on ²³⁹Pu and ²³⁵U
- Future efforts focused on minor actinides and neutron scattering measurements for transport
- 2 arrays for broad energy range (54 liquid scintillators/22 Li-glass scintillators)
- Uses double time-of-flight technique for incident and emitted neutron energies

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TPC

- Designed for precision (n, f) cross-section measurements – can also be applied to fundamental fission research like ternary fission studies, kinetic energy/mass distributions...
- Time Projection Chamber, uses MICROMEGAS amplification and 6000 readout pads for tracking and background suppression

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SPIDER

- High-resolution measurements of fission fragment yields as a function of A, Z, incident E_n, and total kinetic energy
- Uses “2E-2V” method with 8 arm pairs– MCPs for fast timing/velocity component and axial ionization chambers for fission fragment energy

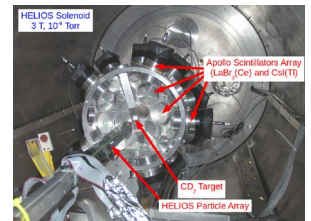
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APOLLO

Building capabilities to use external facilities to complement local expertise and instrumentation

Study of gamma decay following neutron transfer

- Gamma array designed to work inside HELIOS spectrometer at ANL
- Initial focus on constraining neutron capture rates off stability

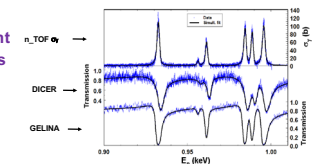


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DICER

- Neutron resonance transmission setup allows reach to high-activity samples
- Allows measurement on ug sized samples with Ci activities
- Allows improved calculation of nuclear reaction rates

Neutron Resonance properties impact reaction rate calculations through level density and partial widths



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