University of Kentucky Accelerator Laboratory: Capabilities and Equipment Upgrades

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UKAL 7 MV Model CN VDG (External View) – Located on U. of KY's main campus

DOE Collaboration:

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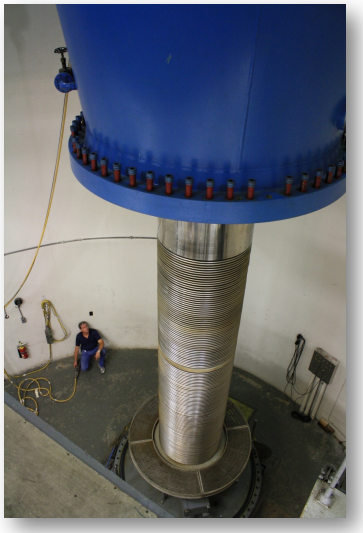
United States Naval Academy – J. R. Vanhoy and A. Perkoff
University of Dallas – S. F. Hicks, S. Evans, and E. Chouinard

U. Kentucky Accelator Laboratory

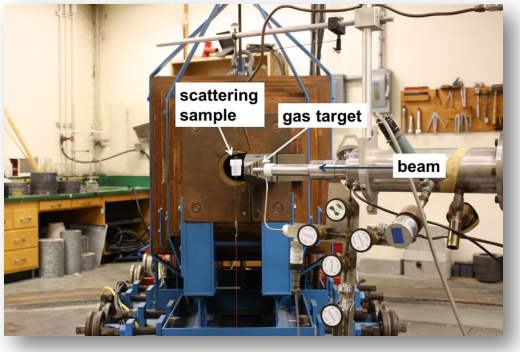
- 7 MV Model CN VDG
- p, d, ^{3}He, and α beams
- D.C. (~50 μA)
- Pulsed beams (~5 μA)
- f = 1.875 MHz
- Δt ~1 ns



Neutron production facility:

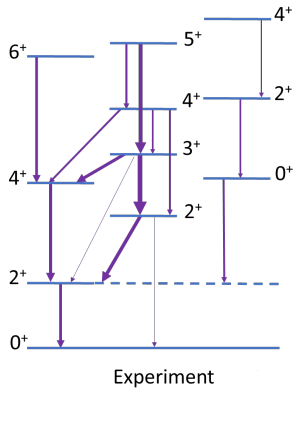
- ^{3}H(p,n)^{3}He, E_n < 5.5 MeV
- ^{2}H(d,n)^{3}He, E_n = 4 – 9 MeV
- ^{3}H(d,n)^{3}He, E_n = 18 – 23 MeV
- Nearly monoenergetic:

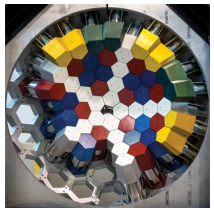
  ΔE < 100 keV

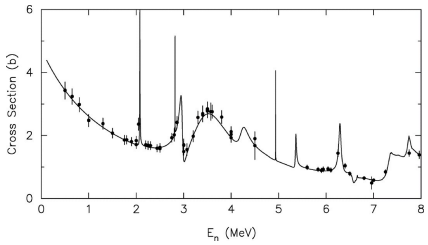


Primary facility uses (pure and applied science): Nuclear structure (nonyrast states, lifetimes), Neutron cross sections, Detector development

- TOF techniques: up to 4 m flight path
- C_6H_6 & C_6D_6 neutron detectors
- Compton-suppressed HPGe's
- Flux monitors: long counter, NE213



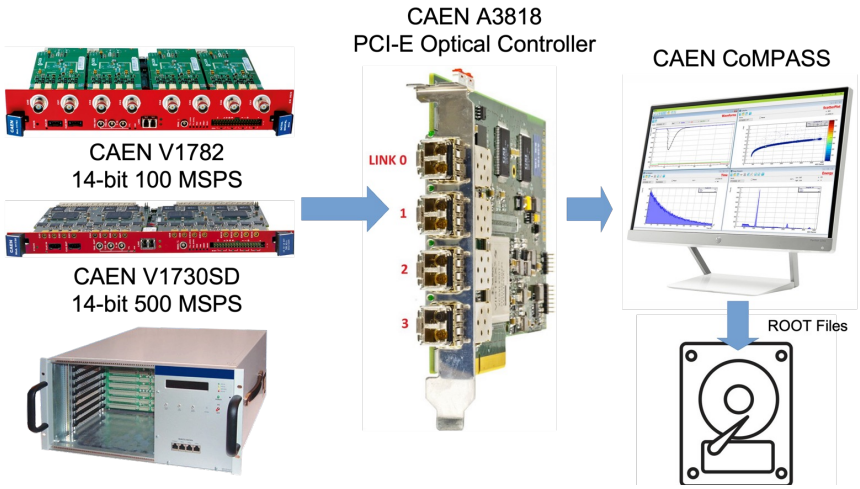


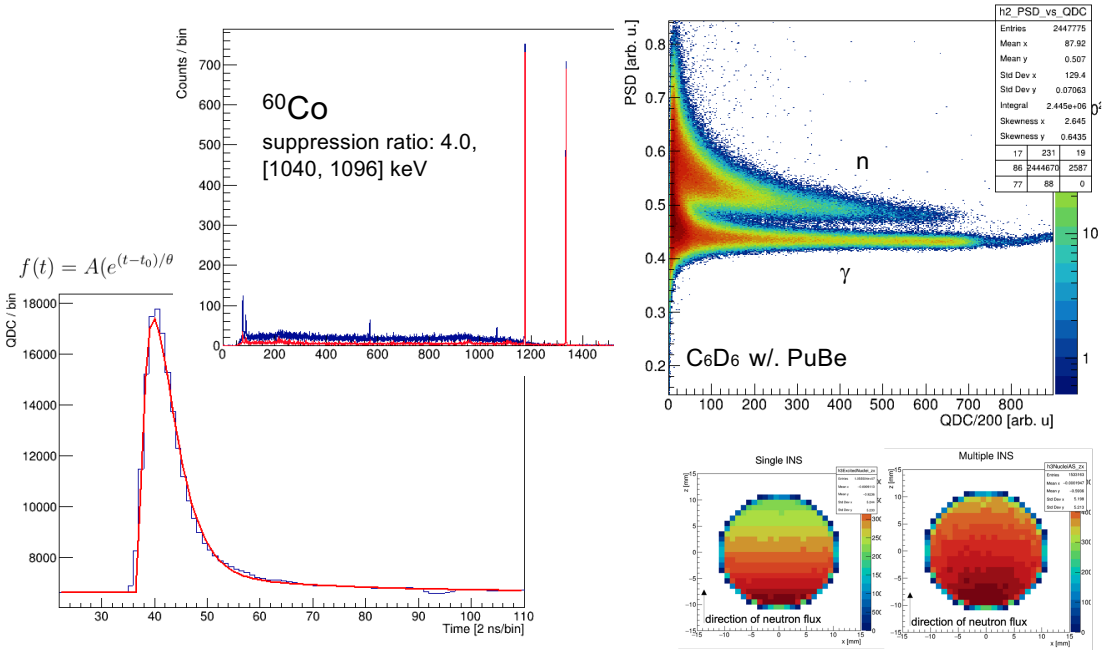


New Digital DAQ

Advantages:

- **Simplified front-end electronics**
- **Larger range for lifetime measurements (up to 500 ns)**
- **Online adjustment of parameters for timing and evaluation of energy**
- **Flexibility for offline analysis by enabling event-by-event recording**
- **Variable ToF gate**
- **Pulse shape analysis**
- **Spatial/temporal correlations among detectors**
- **Time-dependent gain drift correction**
- **Enhancement of analysis pipeline**
- **Geant4 simulations in place of numerical calculations/approximations**
- **Integrated offline analysis workflow**





Educating the Next Generation

https://www.pa.uky.edu/accelerator

Education:

- More than 40 undergraduate theses and projects (30 from Sally Hicks alone)
- More than 60 UK Ph.D. dissertations
- Hands-on experience at every step

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