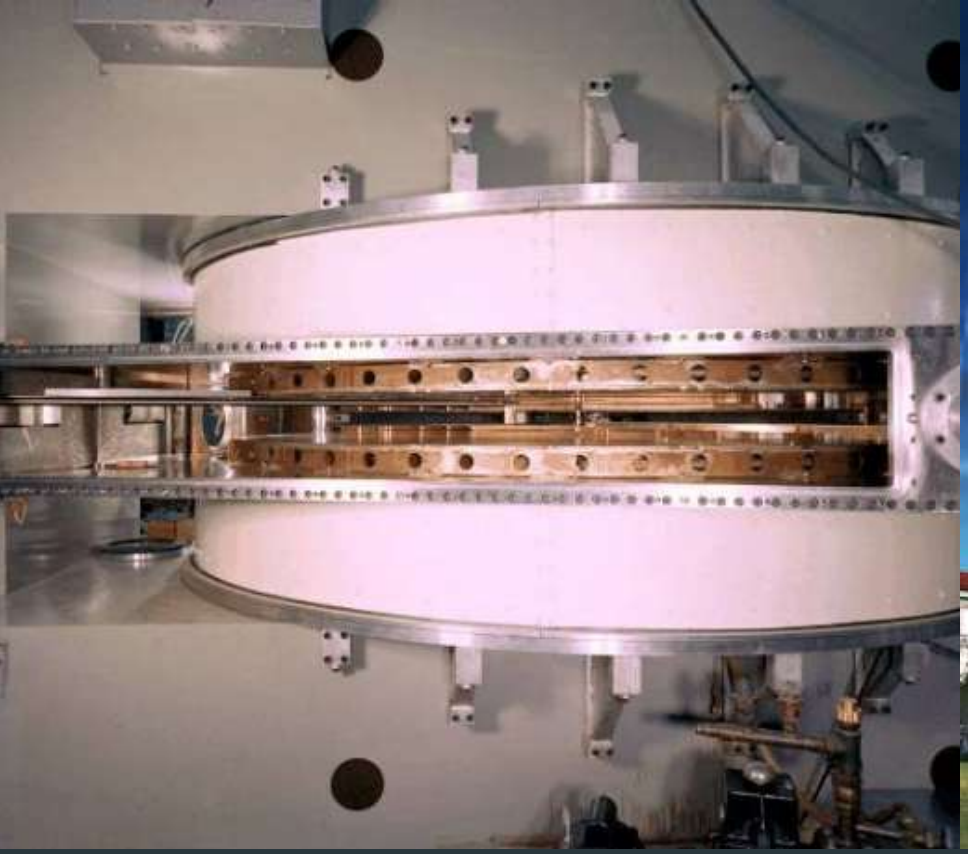

NEUTRON PHYSICS AT BERKELEY: A TALE OF TWO FACILITIES

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University of California, Berkeley

Motivation

PRL 108, 162503 (2012) PHYSICAL REVIEW LETTERS week ending 20 APRIL 2012

Low-Energy Enhancement in the Photon Strength of ^{95}Mo

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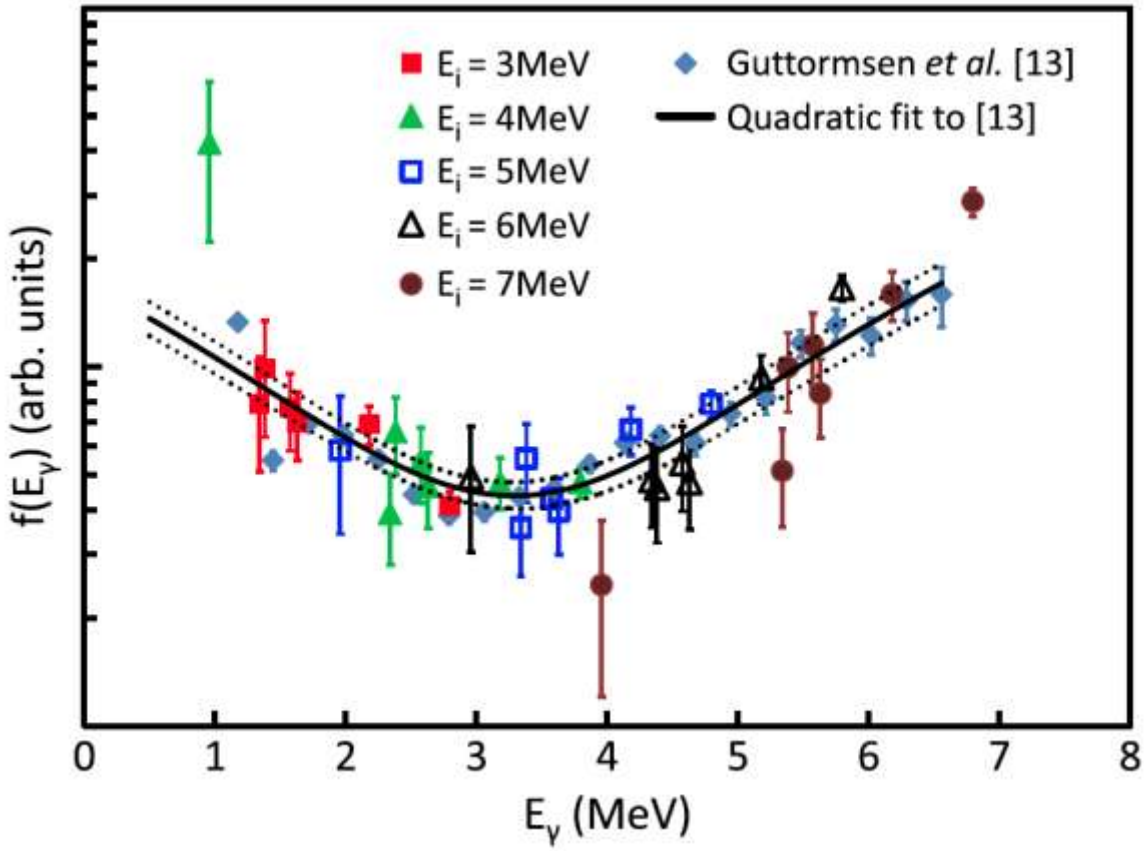
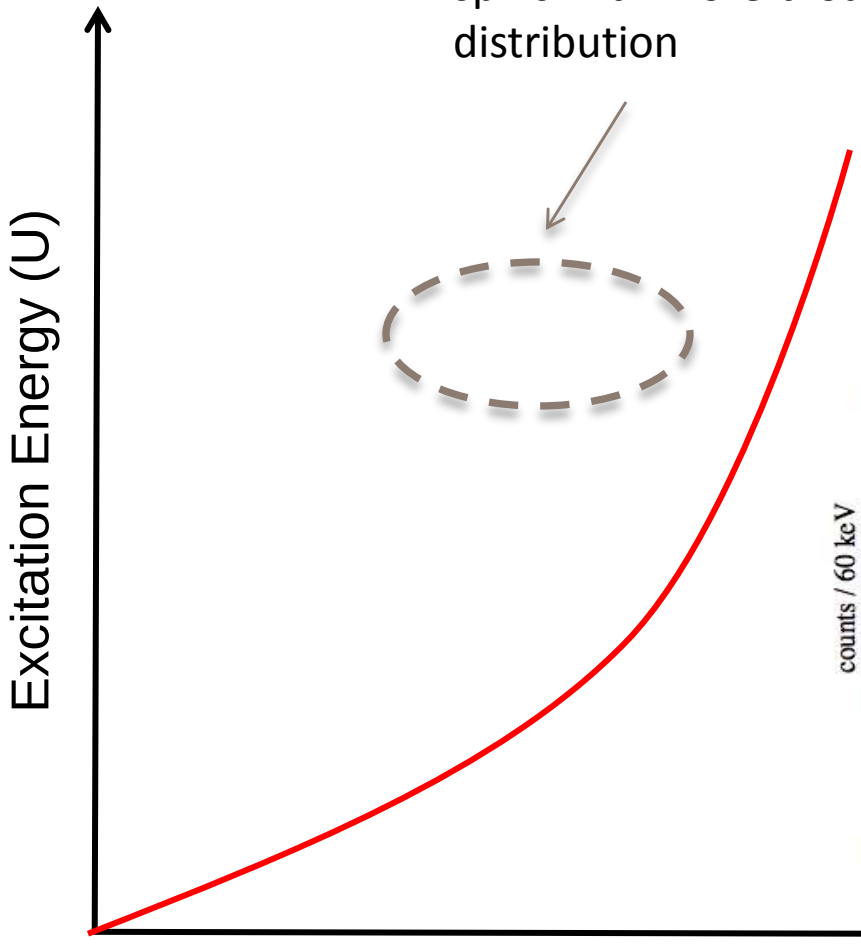
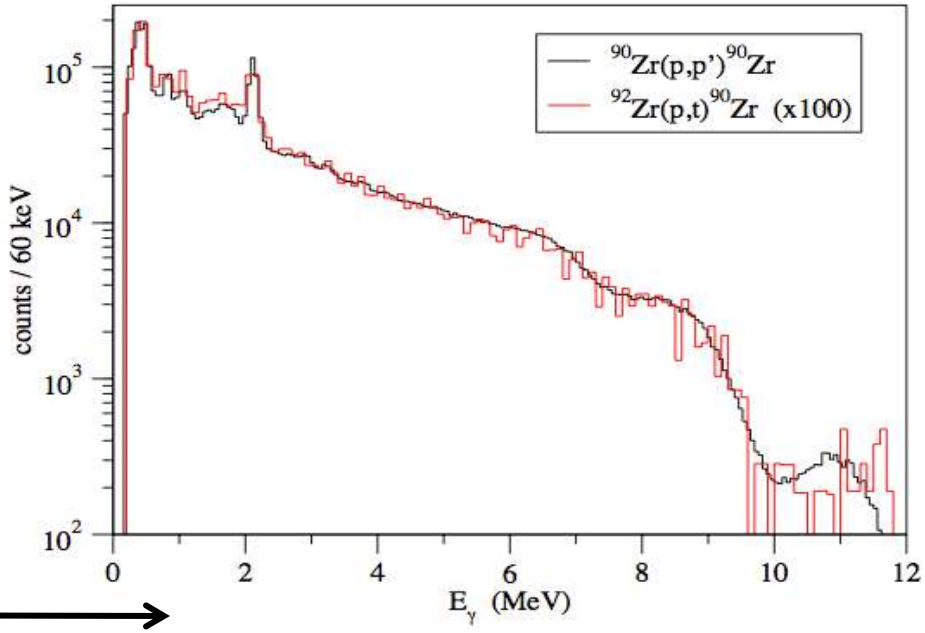
- Shape of the RSF obtained using two-step cascade method consistent with Oslo Method
- Confirmation of low-energy enhancement in ^{95}Mo



Statistical γ-ray Spectral Similarities

Light-ion-induced direct reactions: Higher spins with more broad distribution



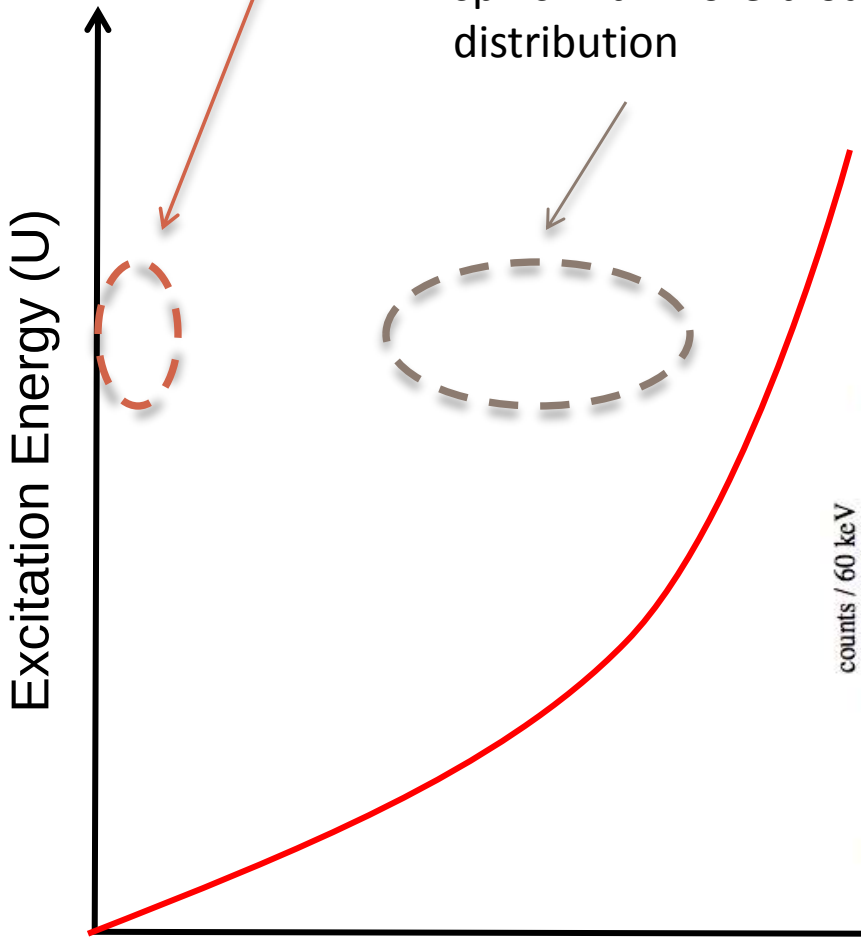


Courtesy of S. Siem

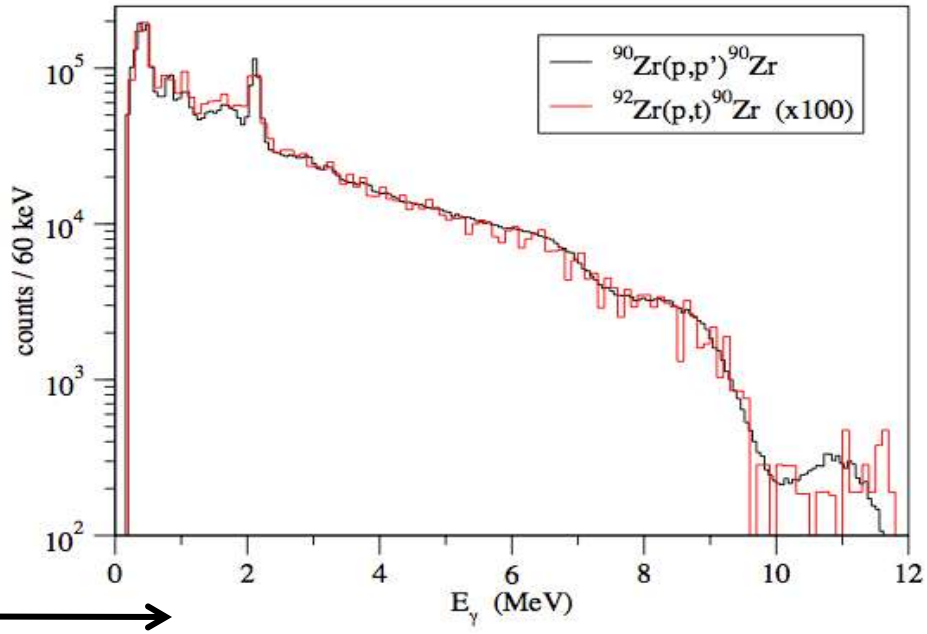
Spectral Similarities and Implications on the Oslo Method

Neutron capture: Mostly s-wave

Light-ion-induced direct reactions: Higher spins with more broad distribution

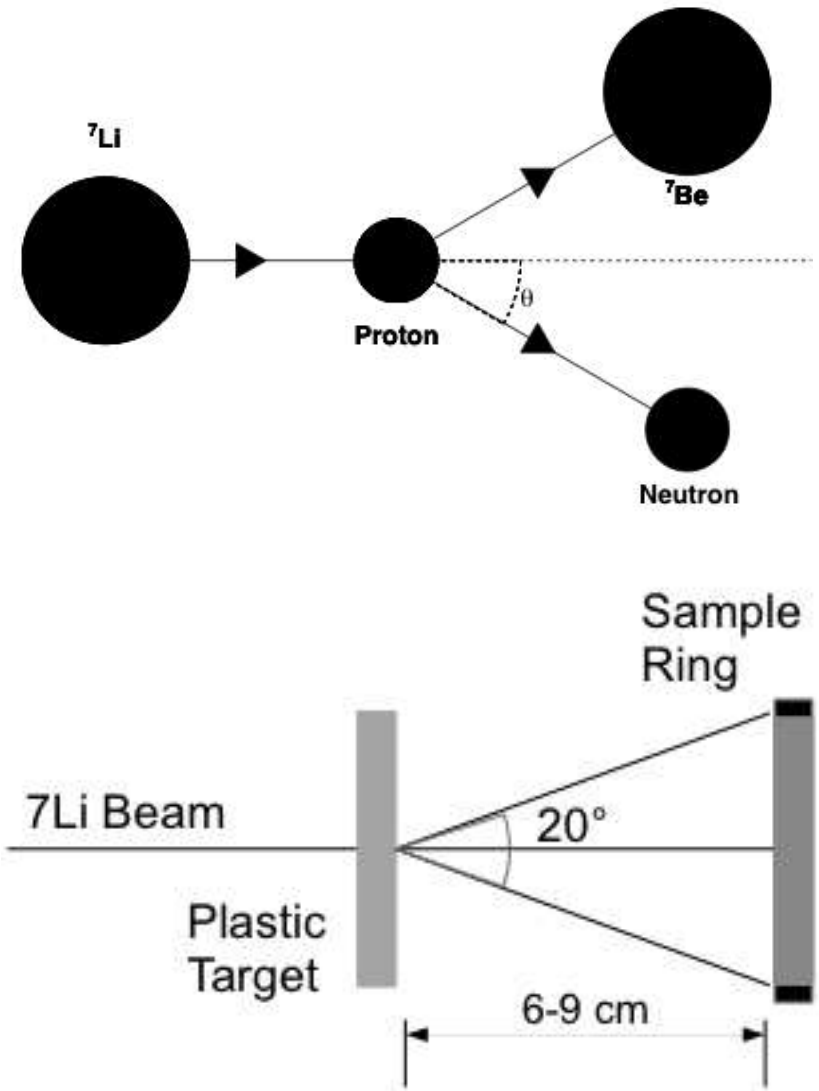


Do we expect to see the same statistical γ-ray spectra for neutron-induced reactions as we do for light-ion-induced reactions?

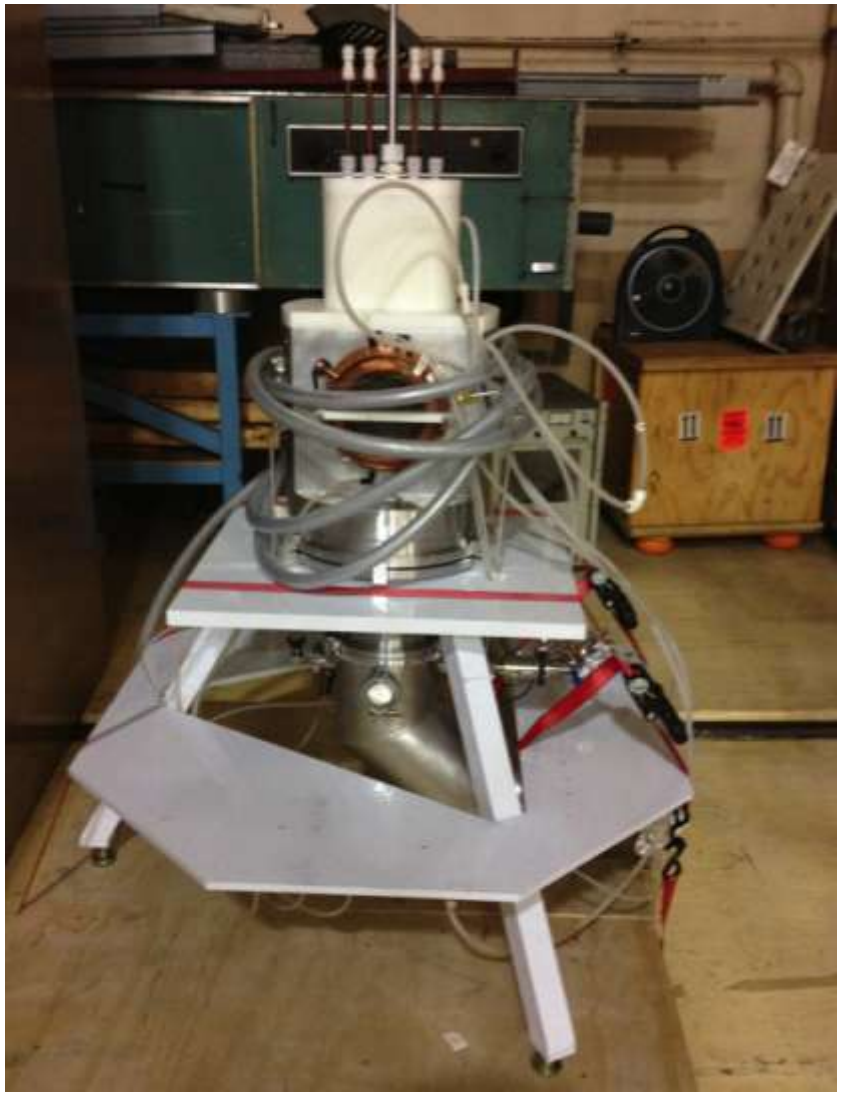


Courtesy of S. Siem

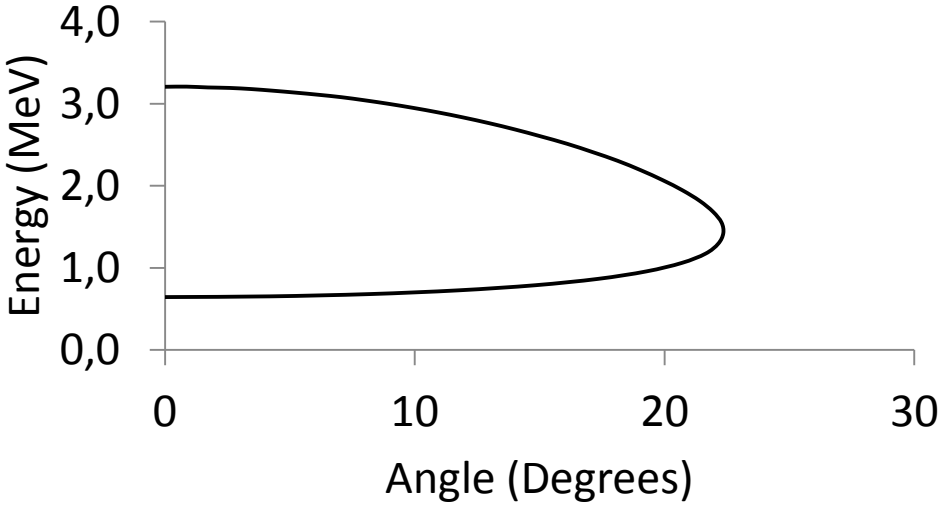
^{7}Li(*p*,*n*) at the 88-Inch Cyclotron



High Flux Neutron Generator



^{7}Li(*p*,*n*) at the 88-Inch Cyclotron at LBNL

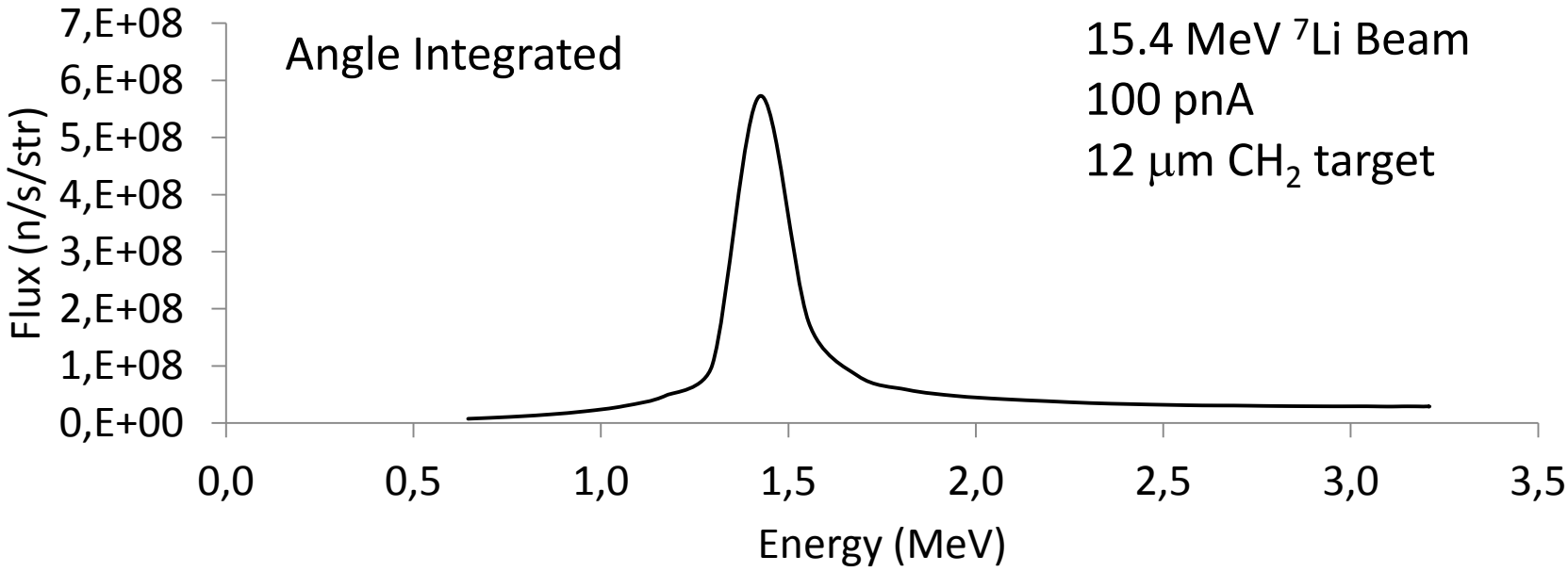


(n,γ) Reaction Rate Estimate

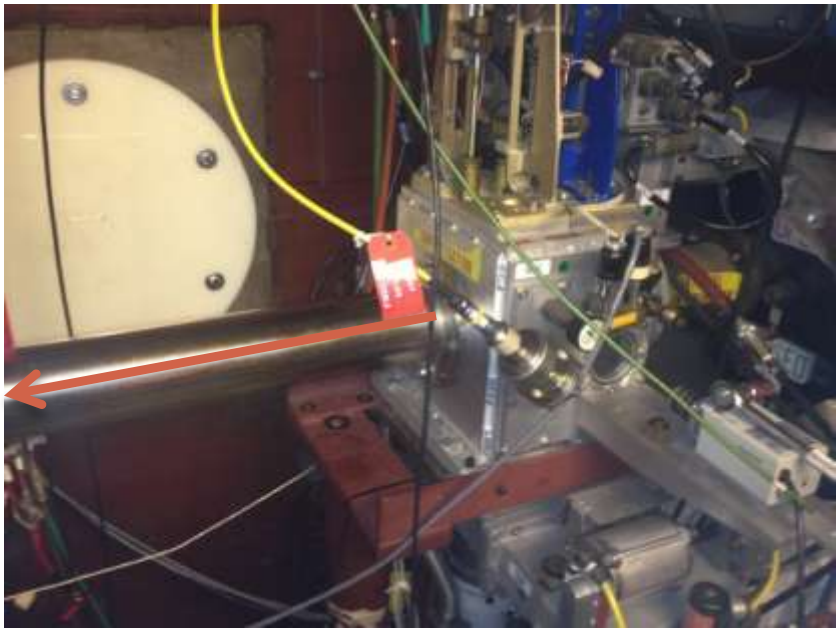
$$R = f s r$$

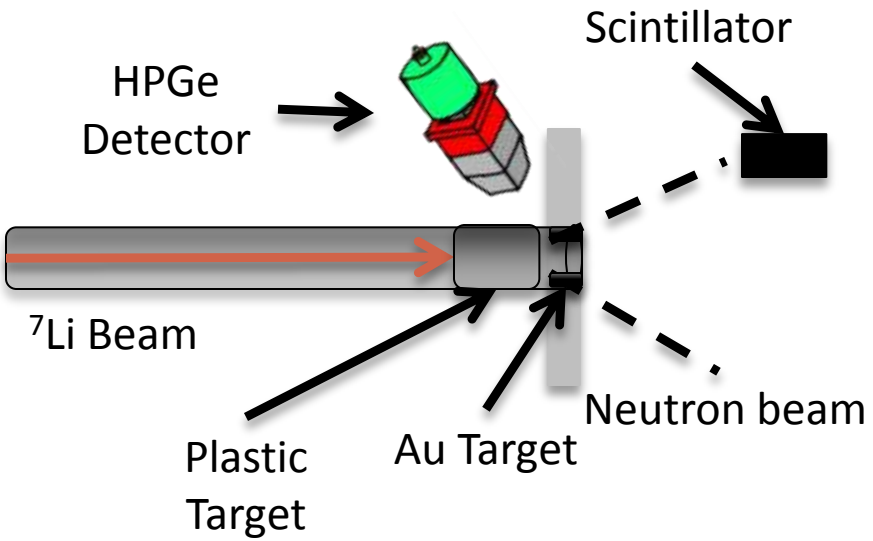
$$= \left(10^{6}\ \frac{n}{s}\right)\left(10^{-26}\ \mathrm{cm}^{2}\right)\left(10^{24}\ \frac{\mathrm{atoms}}{\mathrm{cm}^{2}}\right)$$

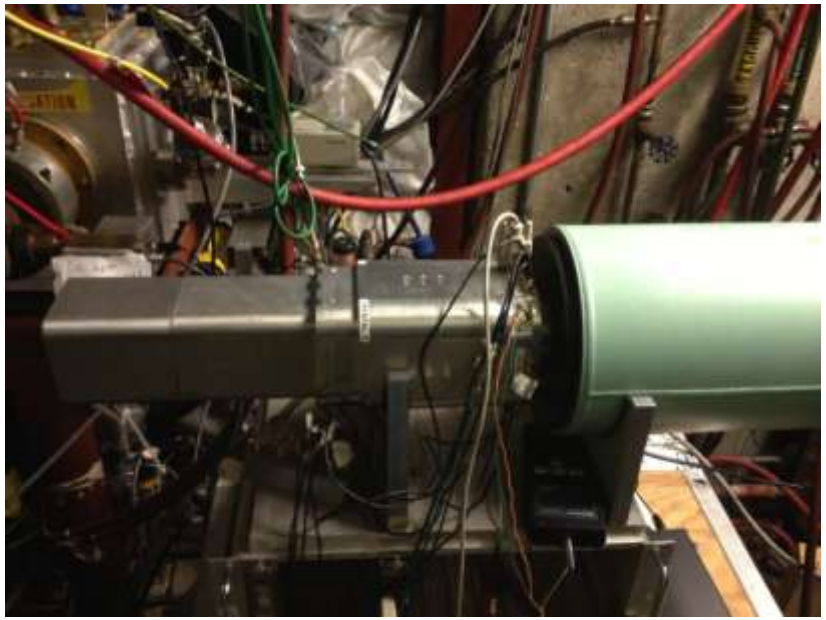
$$= 10^{4}\ \frac{\mathrm{rxns}}{\mathrm{s}}$$



^{7}Li(*p*,*n*) at the 88-Inch Cyclotron at LBNL

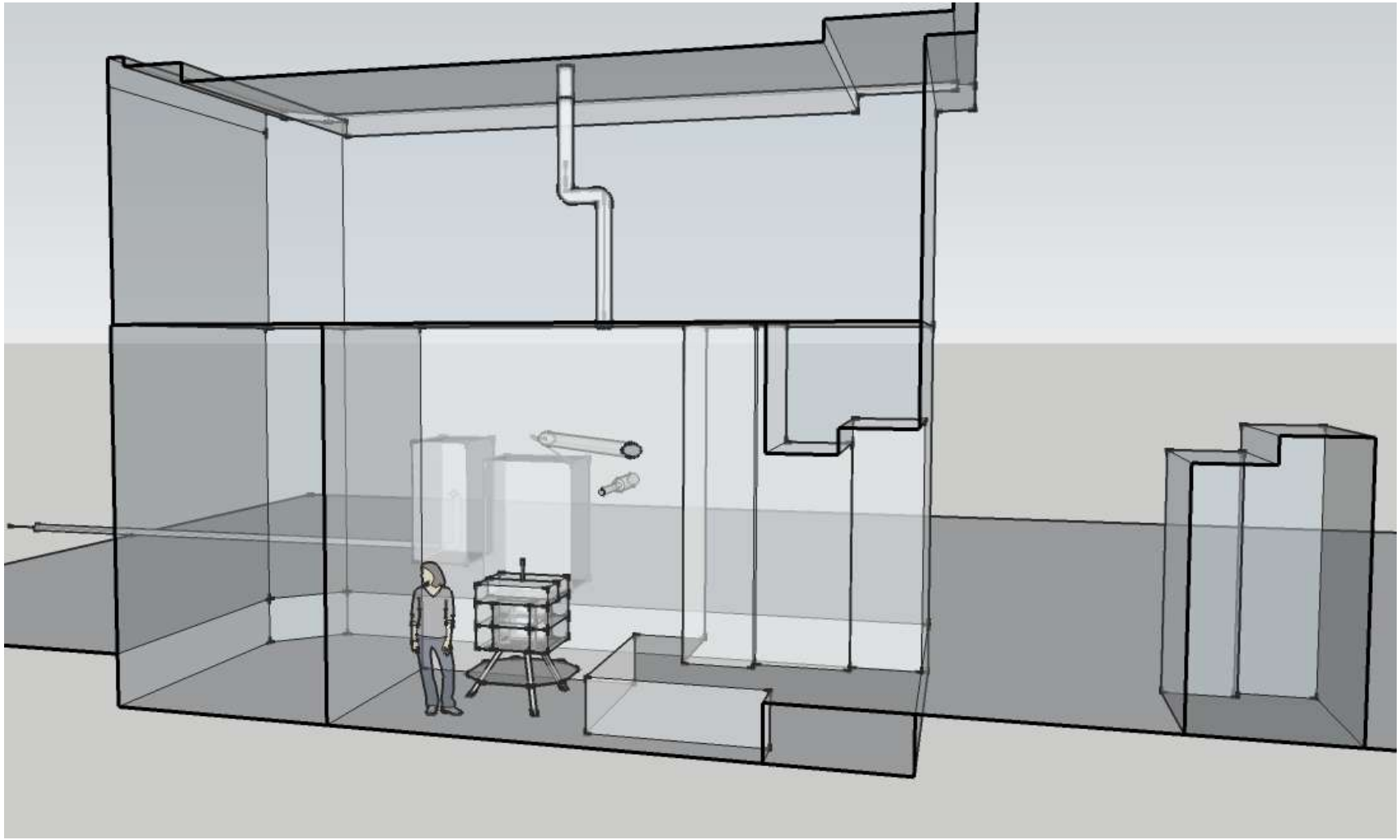




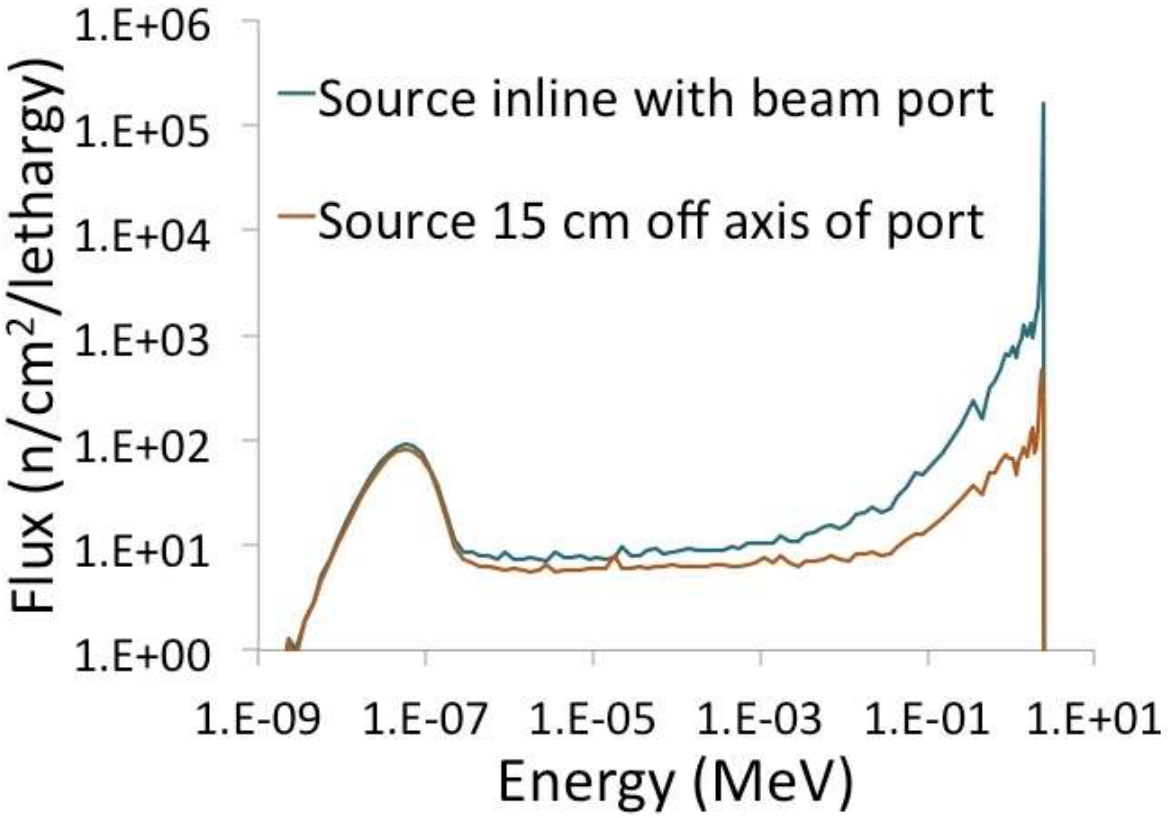


High Flux Neutron Generator at UC Berkeley

$$ {}^{2}_{1}\mathrm{D} + {}^{2}_{1}\mathrm{D} \rightarrow {}^{3}_{2}\mathrm{He} + n\ (2.45\ \mathrm{MeV}) $$



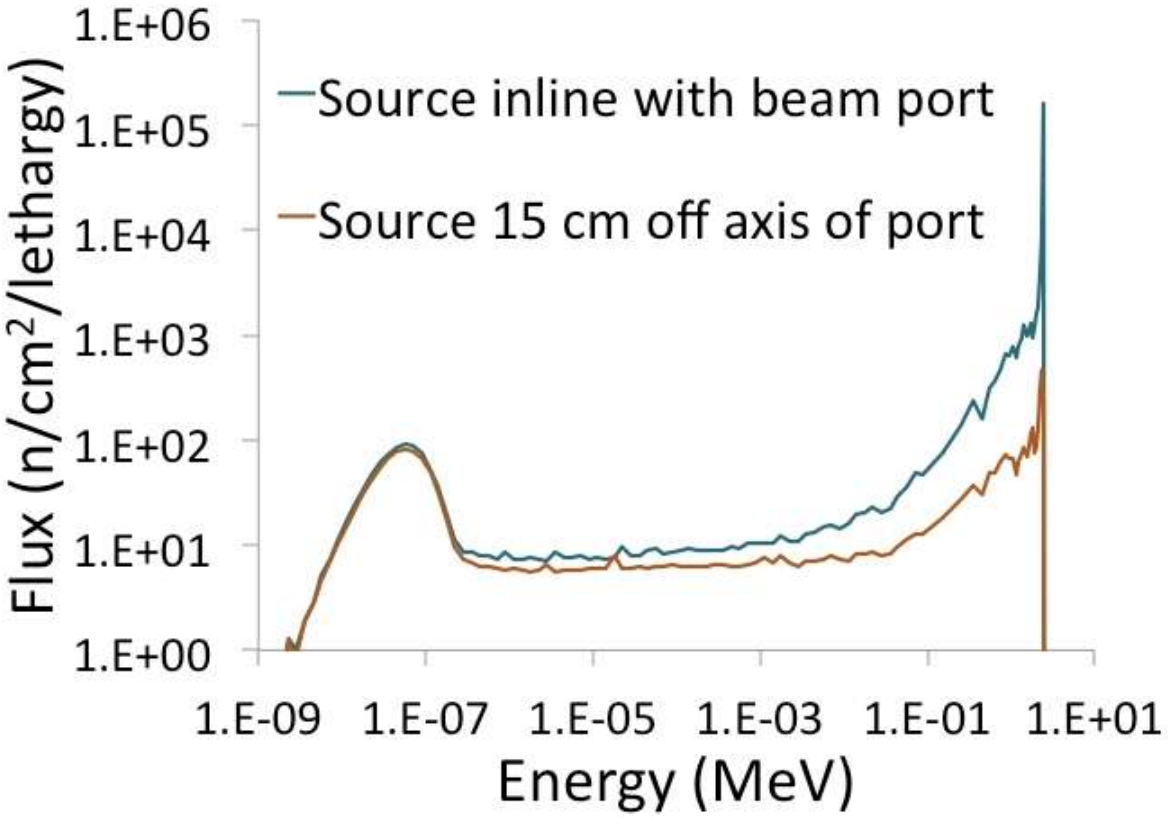
Simulation of the neutron flux as a function of energy at the HFNG



Courtesy of D. Bleuel

Statistical γ-ray spectral similarities for different entrance channels

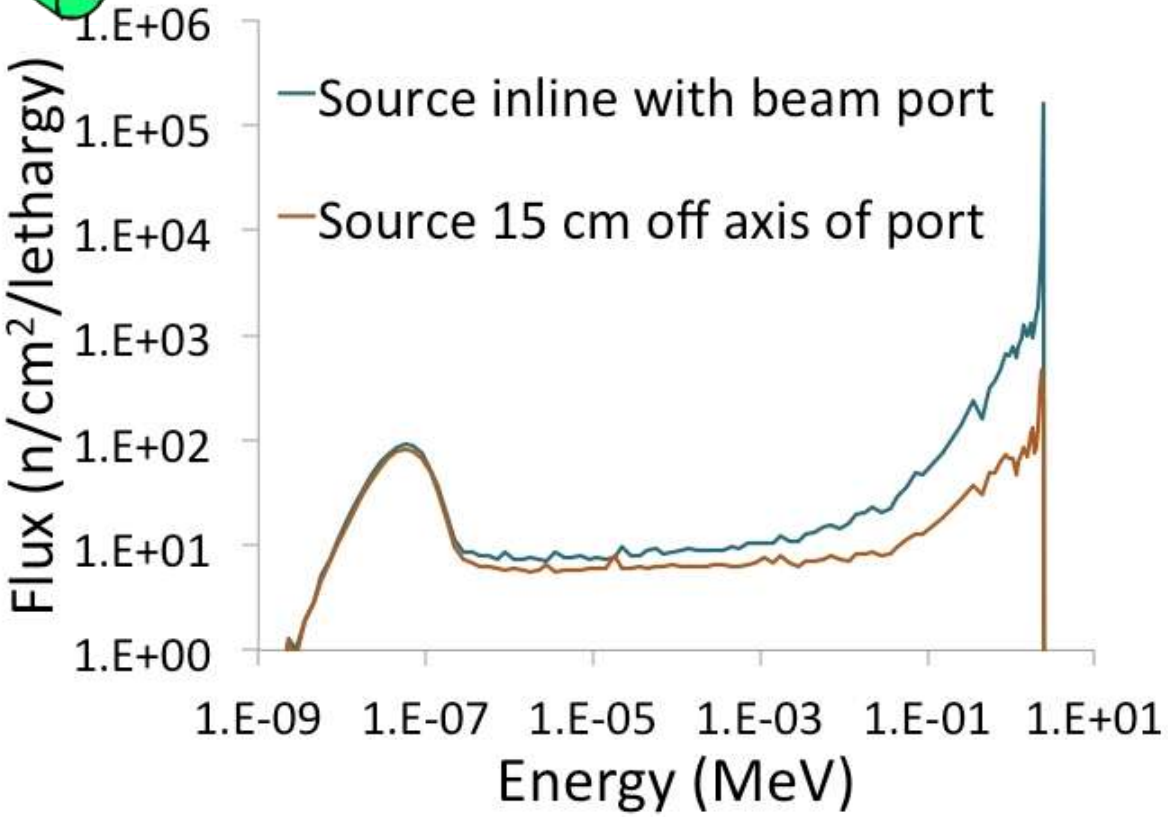
- Spectral similarities of neutron capture γ-rays compared to light-ion-induced reactions



Courtesy of D. Bleuel

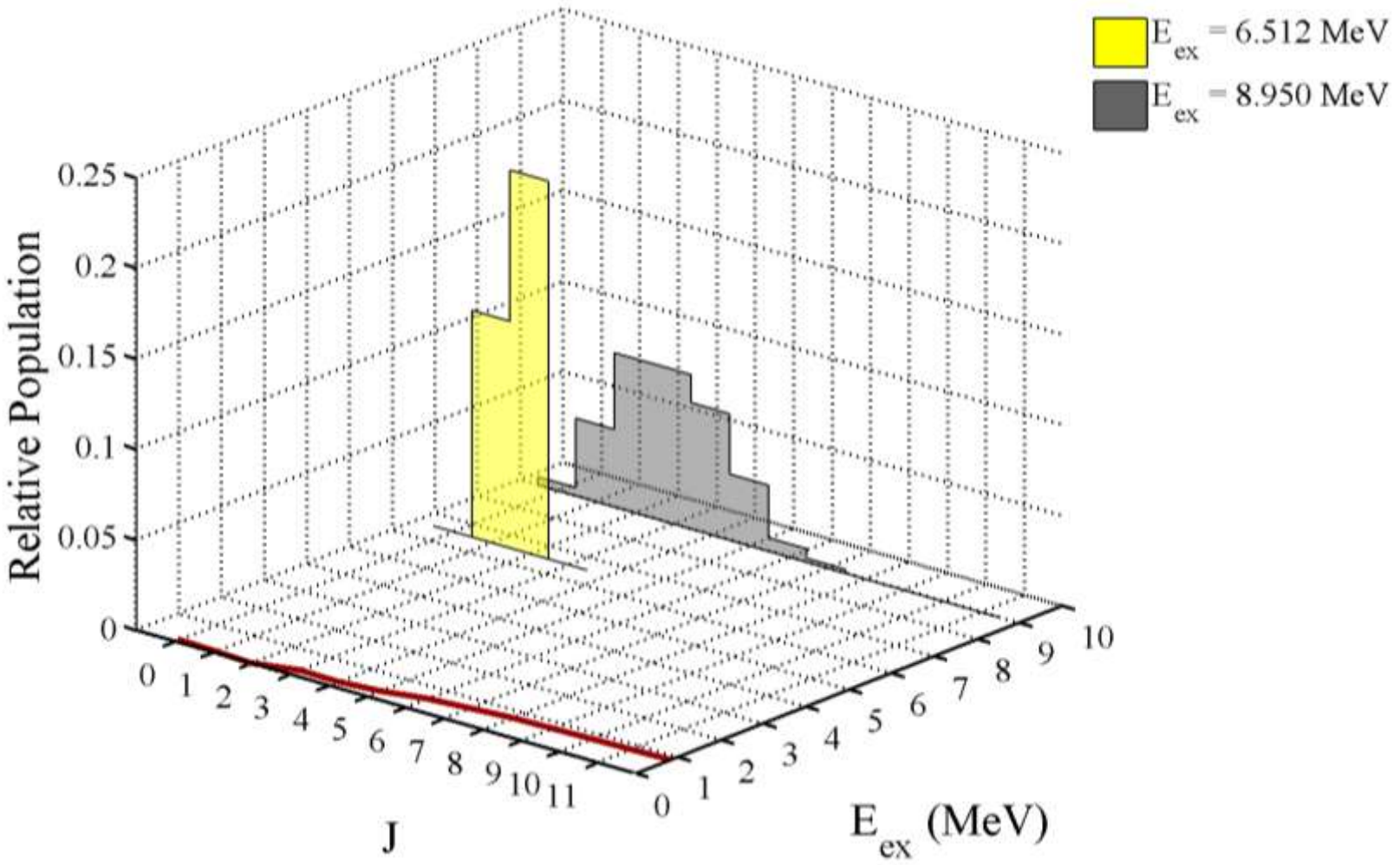
RSF Measurements

- Spectral similarities of neutron capture γ-rays compared to light-ion-induced reactions
- RSF Measurements



Courtesy of D. Bleuel

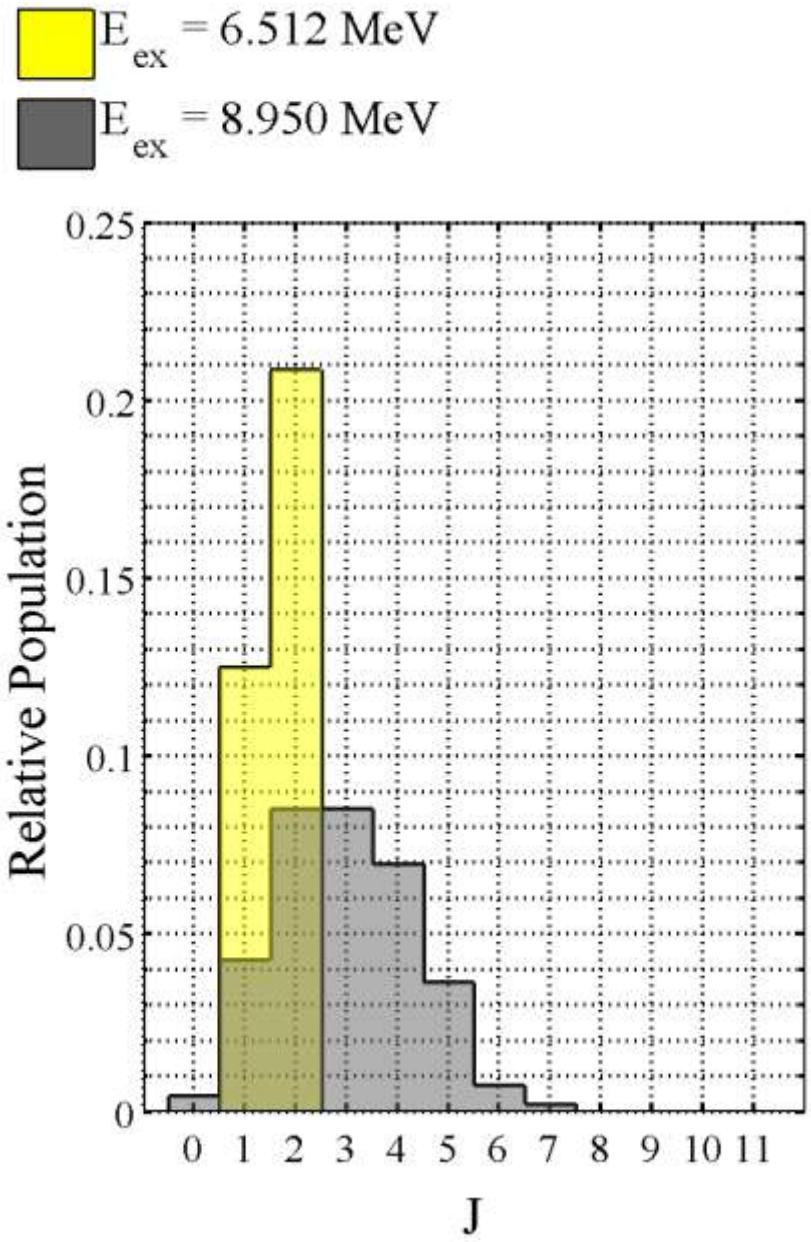
Spin population for different neutron energies

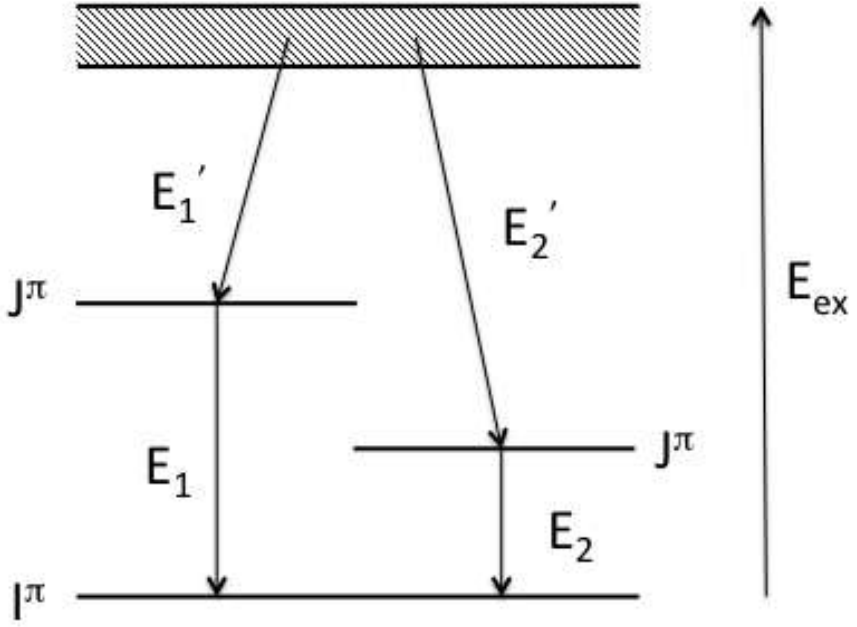


Sampling the different angular momentum population distributions provides a direct test of Brink hypothesis

Thanks to B. Daub

RSF measurements for different spin distributions



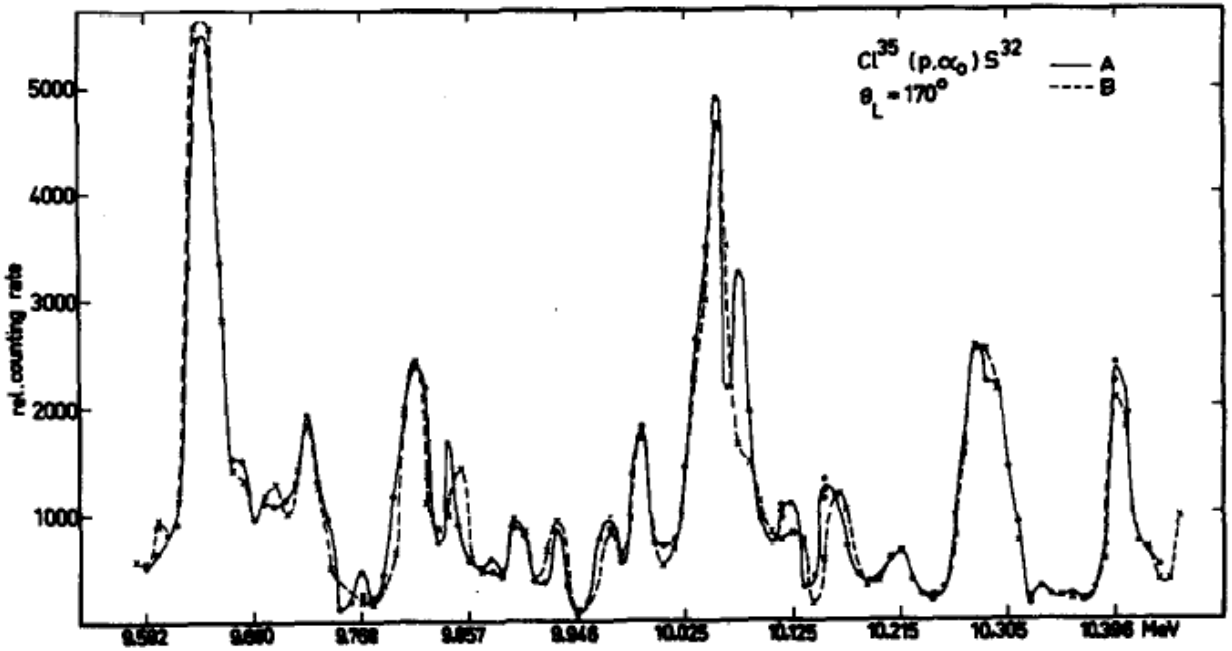


Provides a means for probing the spin dependence of the RSF

Thanks to B. Daub

Discussion Questions

1. What would be the optimal facility for performing such measurements?
2. What additional physics questions could we address using these neutron sources?
3. Is it possible to use these neutron sources to study Ericson fluctuations in some nuclei?



T. Ericson, Phys. Rev. Lett. 5, 430 (1960); Ann. Phys. (N. Y.) 23, 340 (1963). P. Von Brentano, et al., Phys. Lett. 9, 48 (1964).

Collaborators

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BAY AREA NEUTRON GROUP AND ABROAD

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