NIST Nuclear Data Measurements

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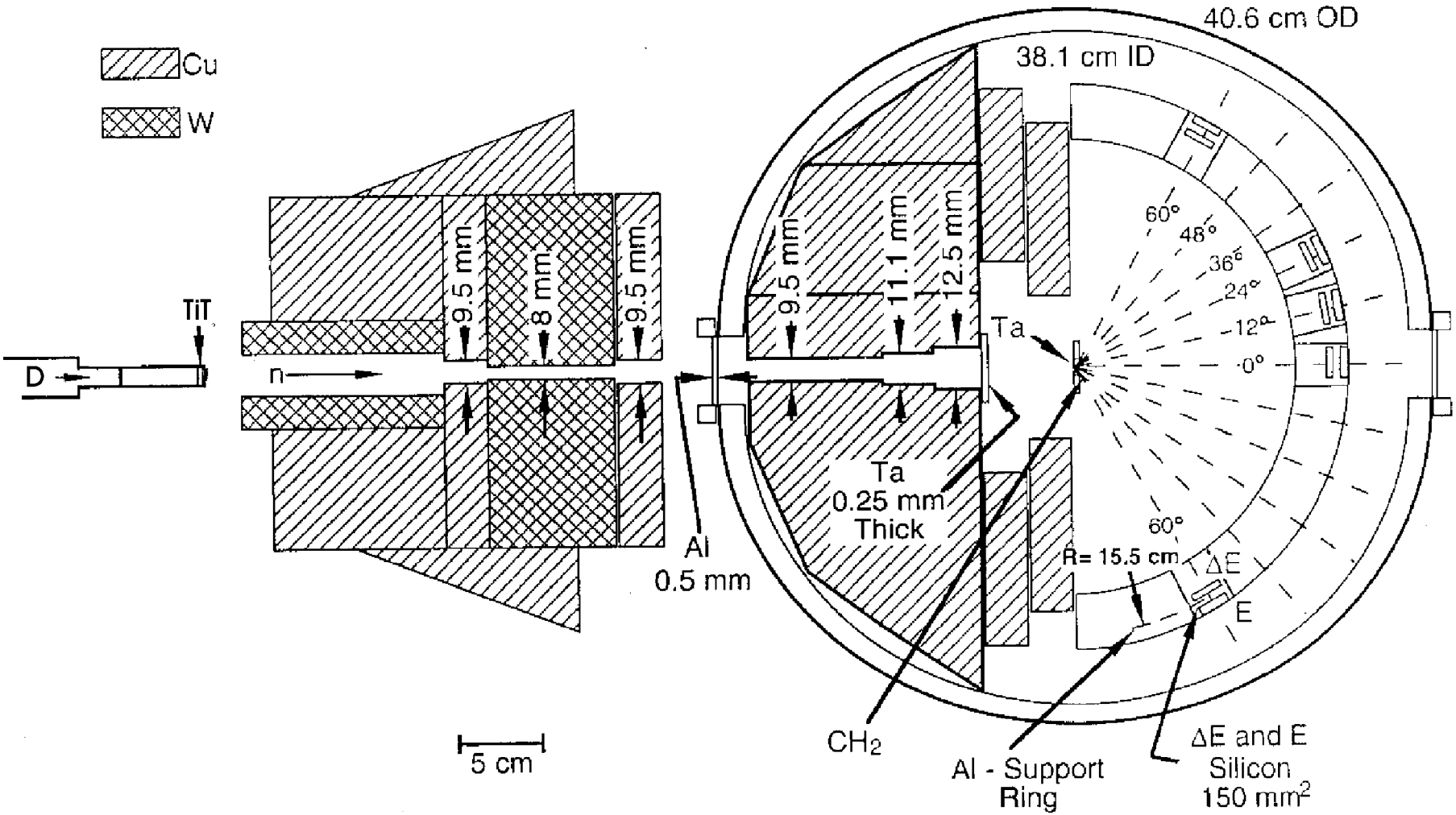
H(n,n)H Recent Work

- Data continues to be accumulated at the Ohio University accelerator facility for the Hydrogen scattering angular distribution experiment. The measurements are being made at 15 MeV neutron energy. Data are being obtained with two different hydrogenous sample thicknesses. Measurements are being made at angles of 0 degrees, ± 12 degrees (one on each side of the beam direction), ± 24 degrees, ± 36 degrees, ± 48 and ± 60 degrees. A paper on this work will be given at the ND2007 conference. (collaboration with Ohio University and LANL)



Experimental setup for the Ohio U.-NIST-LANL measurement of the n-p scattering angular distribution at 15 MeV.

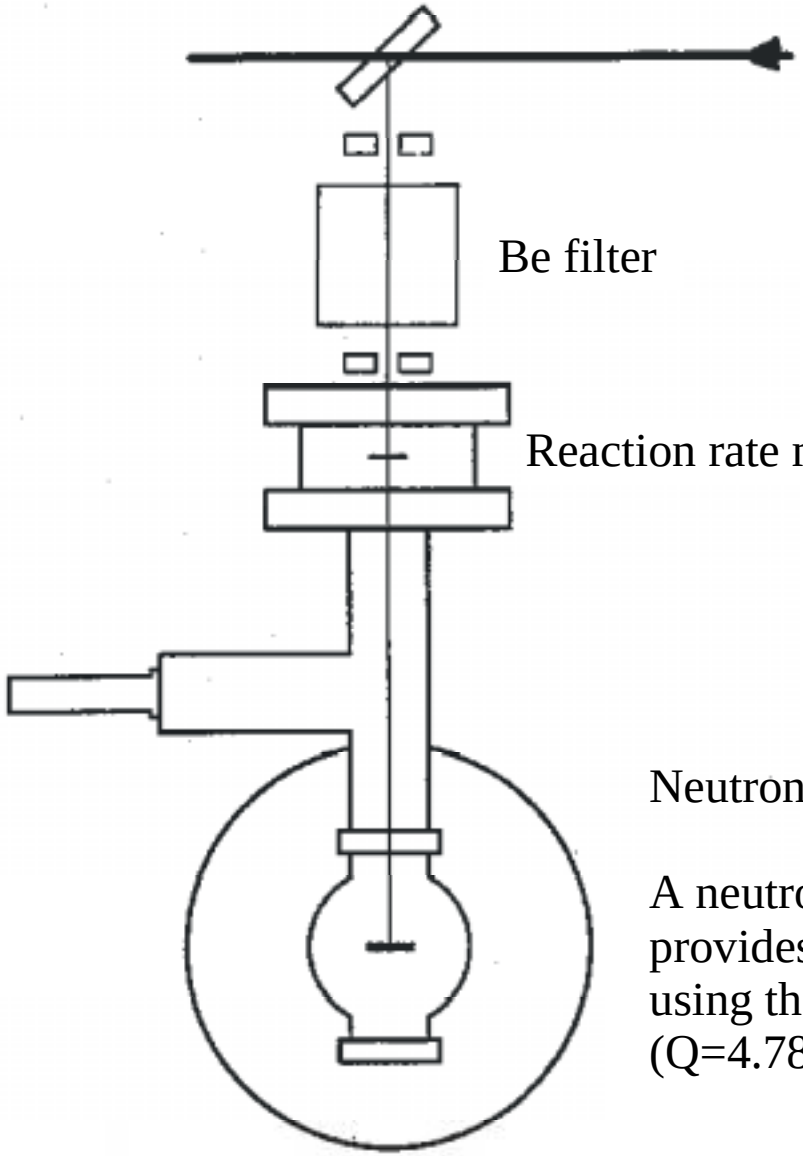
^{3}He(n,p) Recent Work

- NIST measurements of the ^{3}He total cross section and coherent scattering length have been published in the Physical Review.
- An experiment employing polarized neutrons and a polarized ^{3}He beam is being designed. This measurement will allow separation of the real part of the two spin channels of this interaction.
- All of the above types of data can be used in R-matrix evaluations to improve the ^{3}He(n,p) standard cross section.

^{6}Li(n,t) Recent Work

- New measurements have been made of the ^{6}Li(n,t) cross section standard at ~ 4 meV neutron energy. Three different means of determining the neutron fluence are used for this measurement:
  - One method employs the accurately known nu-bar of ^{252}Cf (uncertainty of 0.12%). By using precise solid angle counting of fission fragments, the amount of ^{252}Cf in a thin deposit can be accurately determined. Using nu-bar, the neutron emission rate (fluence) can then be calculated.
  - The second method, which is absolute, is based on α-γ coincidences using the ^{10}B(n,$\alpha_1\gamma$) reaction. It is anticipated that this method can achieve an accuracy of 0.1% for neutron fluence.
  - The third method employs a cryogenic radiometer to measure the heat produced by neutrons being absorbed by the ^{6}Li(n,t) reaction in a thick lithium target.

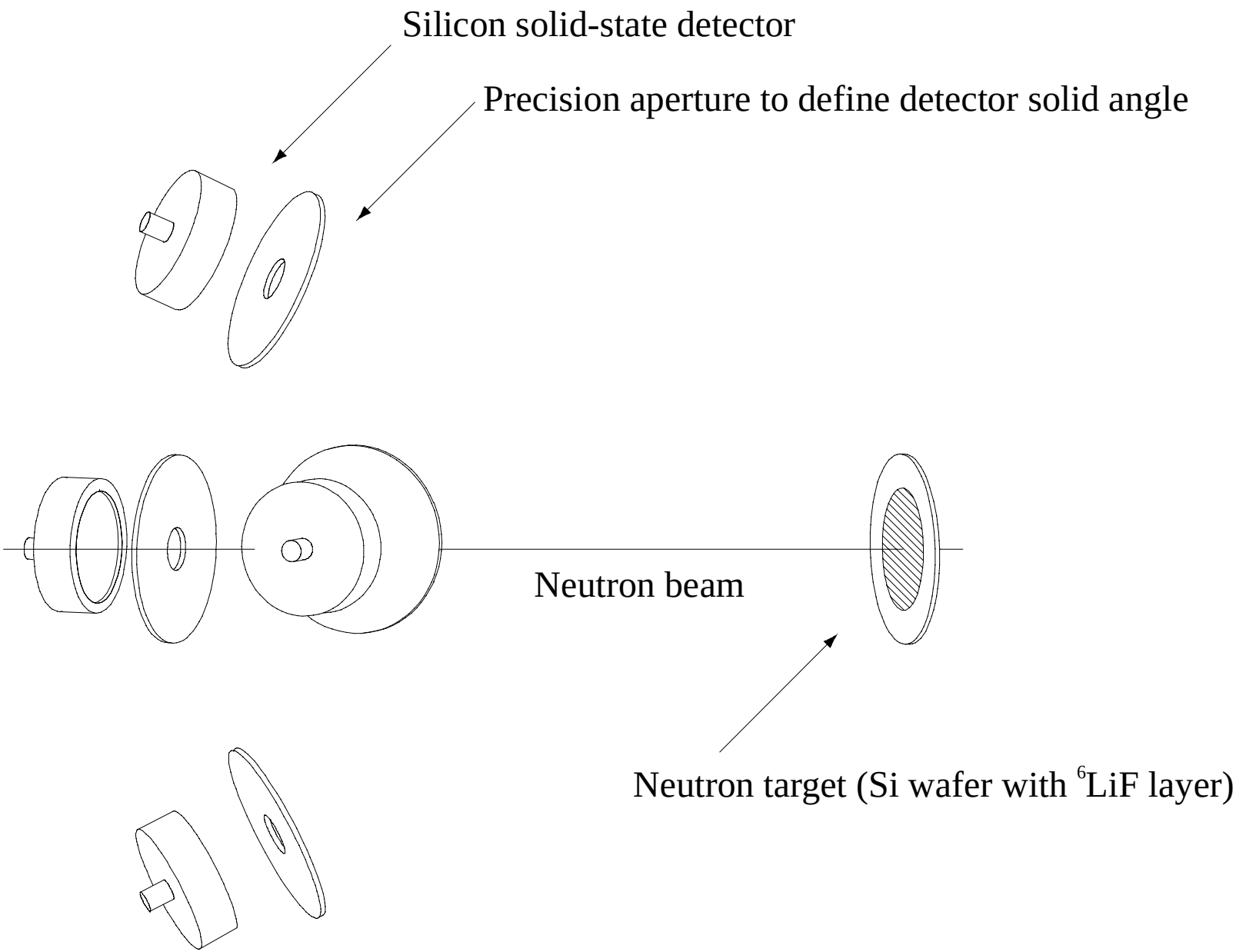
Pyrolytic graphite monochromator



Neutron Cryogenic Radiometer

A neutron rate of 300,000 n/s provides 230 nW of power using the Li-6(n,t) reaction (Q=4.78 MeV)

NIST monoenergetic beam line facility and radiometer



Experimental setup for the ^{6}Li(n,t) reaction rate measurement
to obtain the 6Li(n,t) cross section

^{6}Li(n,t) Recent Work (cont.)

- A paper on the ^{6}Li(n,t) cross section work will be given at the ND2007 conference.
- In addition to the ^{6}Li(n,t) cross section determination, this effort will be used to provide an improved determination of the standard neutron source, NBS-I.
- It may be possible to improve the accuracy of the determination of nu-bar for ^{252}Cf based on the results of this work.