

EXPERIMENTAL ACTIVITIES IN THE UNITED STATES

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- This presentation is based largely on material assembled for the annual meeting of the Cross Section Evaluation Working Group (CSEWG) held at BNL on 8-10 November 2000.
- Seven laboratories are included in this report to be presented as follows:
 - Argonne National Laboratory (DLS)
 - Colorado School of Mines (DLS)
 - National Institute of Standards and Technology – NIST (DLS)
 - Ohio University (DLS)
 - Rensselaer Polytechnic Institute (DLS)

 - Los Alamos National Laboratory – LANSCE (RCH)

Argonne National Laboratory

Collaborators: IRMM (Belgium) and Ohio University.

Gamma Rays from $^{19}\text{F}(p, \alpha-\gamma)^{16}\text{O}$

- ◆ Intense source of nearly mono-energetic photons (6-7 MeV).
- ◆ Thick-target γ -ray yields have been measured from 1.5-4 MeV for solid CaF_2 , MgF_2 , and gaseous SF_6 stopping targets.
- ◆ Angular distributions also measured at selected proton energies.
- ◆ Results published: Fessler et al., *NIM A450*, 353 (2000).

Interrogation for NM with γ -Rays

- ◆ Method uses 6-7 MeV γ -rays from $^{19}\text{F}(p, \alpha-\gamma)^{16}\text{O}$ reaction.

- ◆ At these γ -ray energies, neutrons are generated by (γ, f) and (γ, n) reactions in actinides, ${}^6\text{Li}$, Be, and deuterium, but not from most benign materials. Neutron yields were measured for a variety of materials. Mock luggage setups were “interrogated”.
- ◆ Interrogation technique works! Reported at November 2000 Denton Conference.

Neutron Activation Measurements

- ◆ Measured neutron activation cross sections in the energy range 16-21 MeV. Participated in series of measurements at IRMM during January-February 2001.
- ◆ Objective: Generate database for use in validating parameters of nuclear models. Utilizes a sensitivity analysis method.
- ◆ WPEC Subgroup 19 project (to be discussed by A. Plompen).

Colorado School of Mines

- ◆ Measurements of direct capture in the reactions $H(^7\text{Be},\gamma)^8\text{B}$, $H(^{17}\text{F},\gamma)^{18}\text{Ne}$, and $H(^{18}\text{F},\gamma)^{19}\text{Ne}$ to be carried out with ORNL at Holifield RIB facility (HRIBF). Preparations for experiment are in progress.
- ◆ Measurements on $^{36}\text{Ar}(p,t)$ are being planned for the ORNL HRIBF.
- ◆ Proposal prepared for $^{17}\text{F}(^{14}\text{N},^{13}\text{C})^{18}\text{Ne}$ measurements to study the direct capture component of $^{17}\text{F}(p,\gamma)^{18}\text{Ne}$ for astrophysics.
- ◆ Measurements of direct capture reactions performed with RIB at TRIUMF. Proposal prepared for $^{20}\text{Na}(p,\gamma)^{21}\text{Mg}$ measurements.
- ◆ Series of (d,n) measurements on light nuclei ^2H , ^6Li , ^7Li , ^9Be , ^{10}B , and ^{11}B from 10-180 keV has been completed.
- ◆ A General Ionex 2 MeV He^{++} RBS Analyzer has been installed at CSM 180-kV accelerator. To be used for quantitative target analyses (stoichiometry and stability).

- ◆ A new multi-purpose vacuum chamber was installed at CSM 180-kV accelerator.
- ◆ Test setup was installed for measuring Rutherford backscattering (RBS) at the CSM 180-kV accelerator.
- ◆ Tests performed on preparation of ^{36}Ar targets by ion implantation in aluminum.
- ◆ Tests performed with cooled Si detectors intended for use at the end detector of the DRAGON separator at TRIUMF.
- ◆ Measurements of Coulomb breakup of ^8B were performed at GSI (Germany) to obtain the $^7\text{Be}(p,\gamma)^8\text{B}$ cross sections.

National Institute of Standards and Technology

Collaborators: LANL, Ohio University, CSM, Indiana University, Penn State, U. New Hampshire, JIN-Dubna (Russia).

- ◆ Precision angular distribution measurements for $H(n,n)H$ at 10 MeV were completed and submitted for publication.
- ◆ Plans are being made for accurate $H(n,n)H$ measurements at 15 MeV.
- ◆ Very accurate measurements (0.005%) completed on coherent scattering lengths for Si and ^{208}Pb at NIST reactor facility.
- ◆ ^3He total cross section has been measured from 0.1-500 eV at LANSCE.
- ◆ A new cryogenic calorimeter has been built at NIST to permit more accurate measurements to be made of neutron fluence. Uses heat from $^6\text{Li}(n,t)^4\text{He}$ reaction.

◆ Recent measurements relating to Fe inelastic scattering at the NIST ^{252}Cf facility led to concerns about this cross section. New measurements > 1 MeV by the spherical-shell transmission method are planned at Ohio University to resolve this issue.

Ohio University

Collaborators: ANL, MIT

- ◆ Measured thick-target γ -ray yields and angular distributions for the $^{19}\text{F}(p,\alpha\text{-}\gamma)^{16}\text{O}$ reaction (see ANL presentation.)
- ◆ Measured (γ,f) neutron yields from fissionable materials and (γ,n) yields from a variety of benign materials and NM. (see ANL presentation.)
- ◆ Completed a study of thick-target neutron production from the $^9\text{Be}(p,n)$ reaction at $E_p = 3.0, 3.4, 3.7, 4.0,$ and 5.0 MeV. Used TOF. Neutron energies as low as $E_n = 70$ keV measured using Li-glass scintillators, fission-chambers, and the $\text{Al}(d,n)$ reaction for calibration. Submitted for publication.

Oak Ridge National Laboratory

- ◆ Improvements have been made to the neutron-capture measurement facility at ORELA. Main emphasis of this upgrade was to minimize the amount of perturbing structural materials in the experimental area.
- ◆ Measurements recently completed or planned for the future at the ORELA Linac:
 - ^{233}U neutron fission and transmission.
 - ^{27}Al neutron capture and transmission.
 - Nat-Si capture.
 - Nat-Cl capture.
 - Nat-K and enriched K isotope capture and transmission (planned).

Rensselaer Polytechnic Institute

- ◆ A major project to refurbish the Gaerttner Laboratory Linear Accelerator Facility at RPI is nearly completed. Klystron tubes have been replaced. Arc detectors and a new RF monitoring system have also been installed. A spare klystron focusing magnet has been acquired to minimize downtime.
- ◆ A new transmission detector which has only the ^6Li glass scintillator in the beam has been installed on the 25-m flight path.
- ◆ A new neutron target has been installed. Description has been published: Overberg et al., *NIM A*438, 253 (1999).
- ◆ Neutron transmission and capture measurements made for several materials:
 - Nat-Zr transmission and capture.
 - ^{176}Hf and ^{178}Hf transmission and capture.
 - Nat-Sm transmission and capture.
 - Nat-Gd transmission and capture.
 - ^{236}U transmission.