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

- 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 $^{19}F(p,\alpha\text{-}\gamma)^{16}O$ reaction.

♦ At these γ-ray energies, neutrons are generated by (γ,f) and (γ,n) reactions in actinides, ^{6}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}Be,γ)^{8}B, H(^{17}F,γ)^{18}Ne, and H(^{18}F,γ)^{19}Ne to be carried out with ORNL at Holifield RIB facility (HRIBF). Preparations for experiment are in progress.

♦ Measurements on ^{36}Ar(p,t) are being planned for the ORNL HRIBF.

♦ Proposal prepared for ^{17}F(^{14}N,^{13}C)^{18}Ne measurements to study the direct capture component of ^{17}F(p,γ)^{18}Ne for astrophysics.

♦ Measurements of direct capture reactions performed with RIB at TRIUMF. Proposal prepared for ^{20}Na(p,γ)^{21}Mg measurements.

♦ Series of (d,n) measurements on light nuclei ^{2}H, ^{6}Li, ^{7}Li, ^{9}Be, ^{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 ^{8}B were performed at GSI (Germany) to obtain the $^{7}Be(p,\gamma)^{8}B$ 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.
- ^{3}He 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}Li(n,t)^{4}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 $^{19}F(p,\alpha\text{-}\gamma)^{16}O$ 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 $^{9}Be(p,n)$ 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 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 ^{6}Li 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* A438, 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.