PREEQUILIBRIUM MODEL & CODE DEVELOPMENT

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NUCLEAR STRUCTURE DATA EVALUATION PROGRAM

John H. Kelley, D. Ron Tilley, and Henry R. Weller

Preequilibrium Models/Code

- Exciton preequilibrium model & code PRECO
  - Nucleon and complex particle channels
  - E_{inc} = 14 to 100 MeV

- Current Work
  - Nucleon transfer reactions
  - Surface localization of first interaction
  - Conditions for isospin conservation

Preequilibrium Models/Code

- Future Work
  - Finish work in progress
  - Write journal articles
  - Add missing state density components
  - New release of PRECO

Nuclear Structure Evaluation

- US Nuclear Data Program members responsible for A=2-20
- Continuation of Fay Ajzenberg-Selove's "Energy Levels of Light Nuclei" Series

Evaluators/Reviewers - J.H. Kelley, D.R. Tilley (Emeritus), H.R. Weller and Jim Purcell (Georgia State-Emeritus)

Evaluation efforts leading to preprints, publications in Nucl. Phys. A, additions to NNDC/ENSDF database and other online content.

Project Coordinator/Assistant-Jennifer Godwin & Grace Sheu

Information dissemination. Prepare preprint/publications in print-ready format. Manage website content. Oversee reference database.

Collaborators - G. Hale, H. Hoffman, J. Millener

Participate in publications with specific expertise.

- Accomplishments:
  - "Energy Levels of Light Nuclei A=5-7" with G. Hale and H.H. Hoffman NPA 708 (2002) 3.
  - Preprint Distributions A=8 (February 2002), A=9 (June 2001), A=10 (August 2003)
  - ENSDF: A=2, 5, 6, 7 (will keep pace with NPA)
- Activities:
  - Finalize A=8-10 (publish in 2004)
  - Evaluate A=11
  - Evaluation effort on A=3 (motivated by FB17)

TUNL Nuclear Data Evaluation

Information on mass chains and nuclides available on this website:

3	4
5	6
7	8
9	10
11	12
13	14
15	16
17	18
19	20

Search:

- TUNL Nuclear Data Group: Who we are and what we do.

Our publications on Energy Levels of Light Nuclei, A = 3 - 20:

- Publications: TUNL evaluations of A = 3 - 10 and A = 16 - 20, and modified versions of Fay Ajzenberg-Selove's publications of A = 3 – 20, are available here in PDF format. Some reprints and preprints may be requested by email.
- HTML for Nuclides: HTML documents are available for individual nuclides found within the TUNL or FAS evaluations.
- Energy Levels of Light Nuclei provided by Elsevier: The "Energy Levels of Light Nuclei" A = 3 - 20 series (FAS) are now provided in PDF format from Elsevier (*Nuclear Physics A*) for the years 1966 - 1998.

Resources relating to our publications:

- General Tables: General Tables in HTML for A = 3 - 10 nuclei.
- Update Lists contain important papers published since the most recent evaluation of each nucleus and are available for A = 3 - 10 nuclei.
- Energy Level Diagrams are available for A = 4 - 20 nuclides.
- Tables of Energy Levels: a brief listing of tables of energy levels from the most recent publication for each nuclide, A = 4 - 20.
- Complete List of Available TUNL Documents: A brief list of the available Nuclear Physics A and preliminary report manuscripts, HTML documents, General Tables, Figures and Update Lists provided in this website.

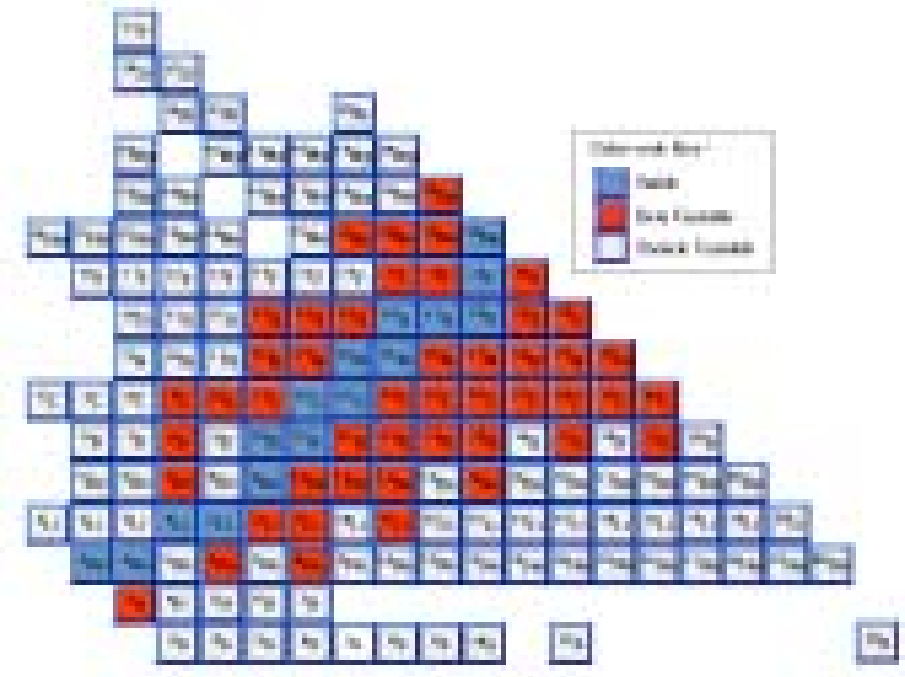
Applications and databases relating to the A = 3 - 20 nuclides:

- ENSDF information for A = 3 - 20 nuclides available through the National Nuclear Data Center (NNDC) site.
- Palm Pilot Physics Page: Links to Palm applications and databases that are of interest to the Nuclear Physics community.
- Table of Isotopes v. 1.0 (1996): This short version contains only information on A = 1 - 20 isotopes.

Energy Levels of Light Nuclei, A = 3 - 20

Nuclear Data Evaluation Project

Enhanced Functionality - Reviews in HTML



Example:

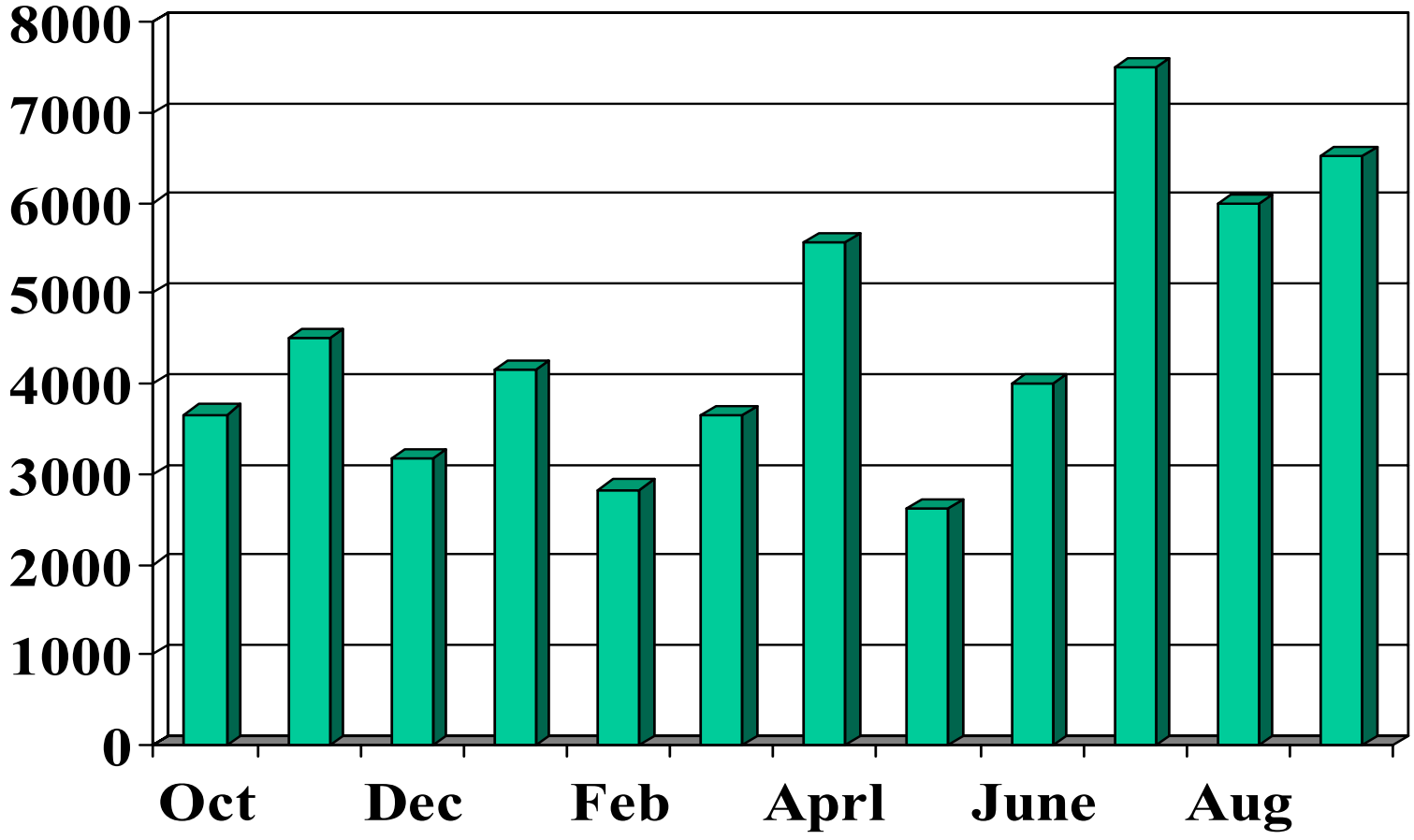
^{7}B (02TI10)

(See the Isobar Diagram for ^{7}B)

The mass excess of ^{7}B adopted by (97AU04) is 27.870 ± 0.070 MeV. It was obtained by averaging the values of 27.94 ± 0.10 MeV from the ^{10}B(^{3}He, ^{6}He)^{7}B reaction (67MC14, 88AJ01) and the value 27.800 ± 0.10 MeV obtained in the ^{7}Li(π^{+}, π^{-})^{7}B reaction (81SE1B). The width of the ground state is Γ = 1.4 ± 0.2 MeV: see (67MC14, 88AJ01). ^{7}B is unbound with respect to ^{6}Be + p, ^{5}Li + 2p and ^{4}He + 3p by 2.21, 1.61 and 3.38 MeV, respectively.

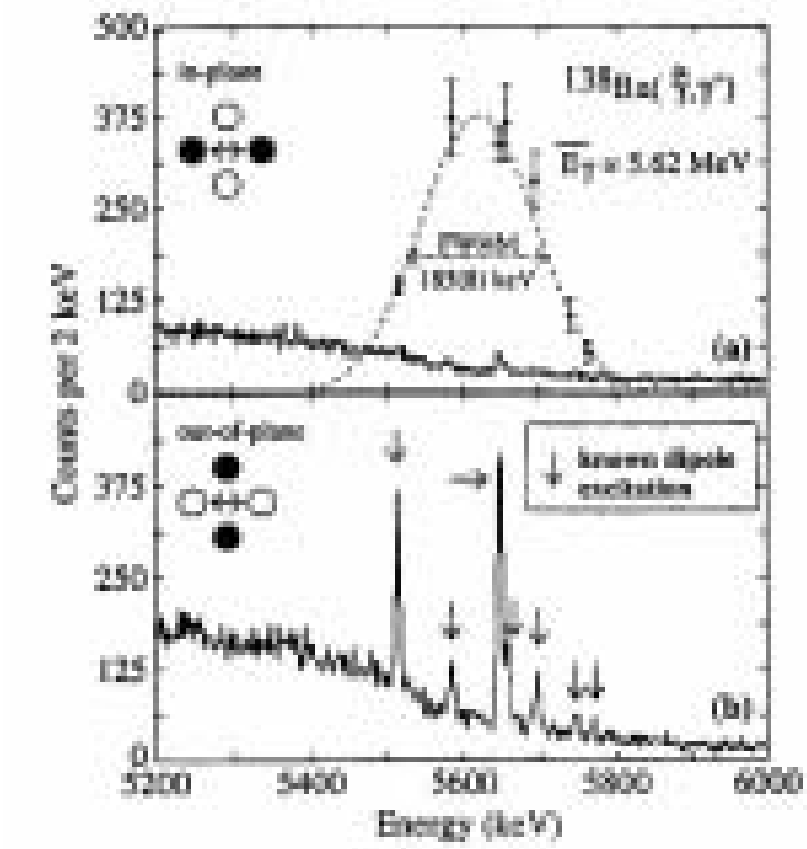
The predicted mass excess for ^{7}B based on the isobaric multiplet mass equation using the T = 3/2 level energies in ^{7}He, ^{7}Li and ^{7}Be is 27.76 ± 0.17 MeV (67MC14). See also the early references cited in (88AJ01, 84AJ01, 79AJ01, 74AJ01). Recent cross section measurements for ^{7}Li(π^{+}, π^{-})^{7}B (98PA40) were used to deduce information on ^{7}B proton halo features. Measurements at E_{π} = 30 - 90 MeV reported by (00DR19) were used to deduce energy-dependent features. Theoretical studies relevant to ^{7}B include work on the spherical properties of nuclei (95JA06, 97AB27); Skyrme Hartree-Fock model calculations (97BA54); Coulomb-energy studies (97PO12); and large-basis shell-model calculations of level energies and other properties (98NA17).

Web Dissemination



Experimental Activities
Nuclear Resonance Fluorescence

- High Intensity Gamma-ray Source
  - 10^6 γ-rays/sec
  - ΔE/E~1%
  - 100% polarized
- N. Pietralla, H.R. Weller (Darmstadt, Yale, TUNL)
- A_y resolves π
- ^{88}Sr, ^{92}Zr, ^{96}Mo, ^{138}Ba, ^{172,174,176}Yb, ^{164}Dy (43 states)



TUNL -High Resolution Lab

- Gary Mitchell *et al*.
- Closing to make way for new Duke Science Building