$B(E2; 0^+_1 \rightarrow 2^+_1)$ Evaluation for Z=2-22

B. Pritychenko[a], M. Birch[b], J. Choquette[b], M. Horoi[c], B. Singh[b]

a National Nuclear Data Center, Brookhaven National Laboratory, Upton, NY 11973-5000, USA

b Department of Physics & Astronomy, McMaster University, Hamilton, Ontario, L8S 4M1, Canada

c Department of Physics, Central Michigan University, Mount Pleasant, MI 48859, USA

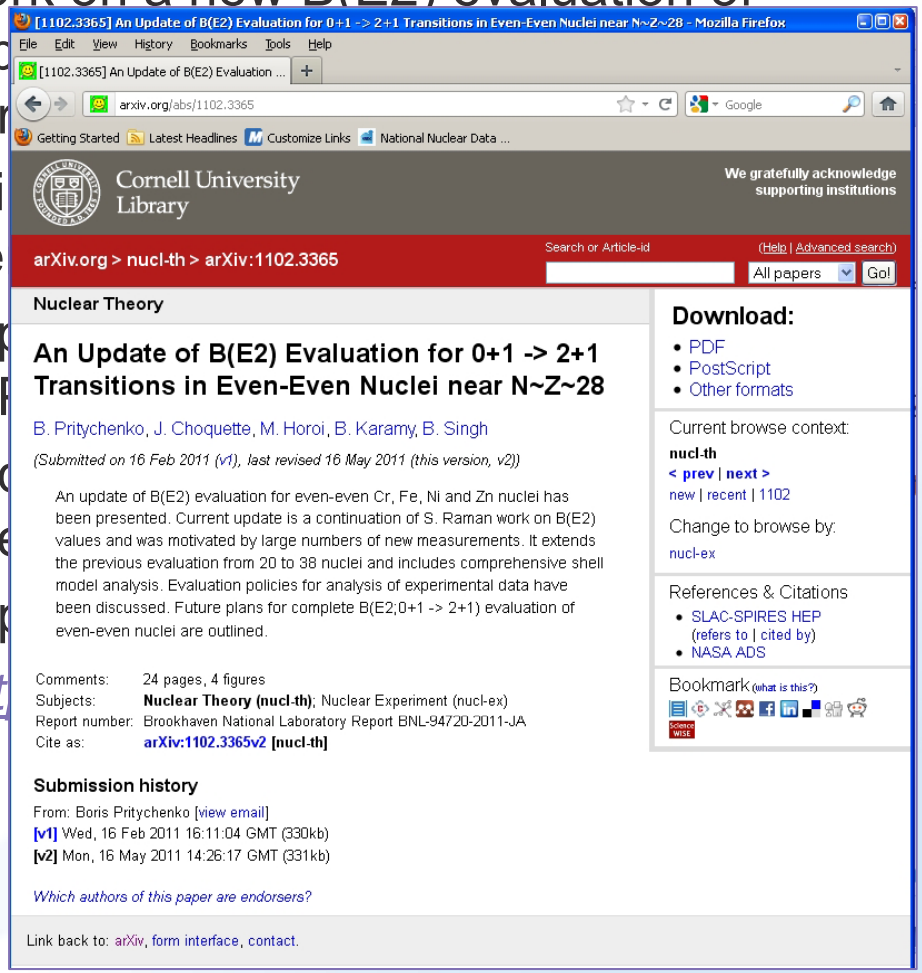
BROOKHAVEN NATIONAL LABORATORY

a passion for discovery

U.S. DEPARTMENT OF ENERGY | Office of Science

Introduction

- In 2010, we started to work on a new B(E2) evaluation of B(E2; $0^+_1 \rightarrow 2^+_1$) that was p
  Oak Ridge National Labor
- Since then, we finished pi
  isotopes (active experime
- It includes extensive comp
  evaluated values and GX
- This pilot evaluation was
  policies and collect user fe
- This evaluation was accep
- Publicly available from *htt*



Experimental Values

- Next stage was Z=2-22 region
- We went back and reanalyzed all publications on the subject
- We have added many new measurements
- We provided exact measured quantity: B(E2), τ or β_2
- We fixed many typos in Raman & USNDP databases
- We extended the experimental data sets by adding target, beam and beam energy information to provide complete information on particular measurement
- We actively used NSR & XUNDL databases in this work
- ENSDF database was not used here because its evaluations are twice older than previous evaluation of Raman
- We kept NSR keynumbers for experimental references

Evaluation Policies

There are several classes of B(E2)↑ measurements:

- Model-independent measurements: lifetime(τ), Coulomb Excitation (including intermediate-energy) and (γ,γ')
- Somewhat model-dependent measurements: (e,e′), muonic x-rays, Mössbauer
- Model-dependent measurements: inelastic scattering of light and heavy ions

Evaluation priorities:

- Deduce model-independent B(E2) ↑ values
- Deduce combined B(E2) ↑ values : model-independent + Somewhat model-dependent
- Compile model-dependent values from inelastic scattering data

Adopted (Recommended) Values

Adopted values for Z=2-22 nuclei have been produced:

- Model-independent and combined B(E2) ↑ values
- Assigned 5% minimum uncertainty to the experiments
- AveTools software package (consultations with T. Kibedi) + M. Birch code
- Uncertainties treatment (more by M. Birch, Thursday morning)

Shell-model Calculations

- $E(2^+)$ and $B(E2; 0^+_1 \rightarrow 2^+_1)$ values will be calculated for Z=2-22 using shell model with GXPF1A effective interaction or Ab-initio by M. Horoi (Cental Michigan University)
- M. Horoi is NuShellX code developer, UNEDF project
- We actively collaborate with nuclear theory on this project

Conclusion & Outlook

- B(E2) evaluation & compilation will be finalized in December 2011
- Shell model calculations will be performed in December 2011-February 2012
- Evaluation of Z=2-22 will be submitted to ADNDT in March 2012
- Z=32-56 is next, May 2012???
- Updated compilation for Z=2-100 was finished in summer of 2011 by McMaster University students, we in good shape