

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

*B. Pritychenko<sup>a</sup>, M. Birch<sup>b</sup>, J. Choquette<sup>b</sup>,  
M. Horoi<sup>c</sup>, B. Singh<sup>b</sup>*

*<sup>a</sup> National Nuclear Data Center, Brookhaven National  
Laboratory, Upton, NY 11973-5000, USA*

*<sup>b</sup> Department of Physics & Astronomy,  
McMaster University, Hamilton,  
Ontario, L8S 4M1, Canada*

*<sup>c</sup> Department of Physics, Central Michigan University,  
Mount Pleasant, MI 48859, USA*

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# Introduction

- In 2010, we started to work on a new  $B(E2)$  evaluation of  $B(E2; 0^+_1 \rightarrow 2^+_1)$  that was published by the Oak Ridge National Laboratory.
- Since then, we finished pilot evaluations for several isotopes (active experiments).
- It includes extensive comparisons with other evaluated values and GXF values.
- This pilot evaluation was used to develop evaluation policies and collect user feedback.
- This evaluation was accepted for publication in the Nuclear Theory section of arXiv.
- Publicly available from <http://arxiv.org/abs/1102.3365>

The screenshot shows a Mozilla Firefox browser window displaying the arXiv abstract page for the paper "An Update of B(E2) Evaluation for 0+1 -> 2+1 Transitions in Even-Even Nuclei near N~Z~28". The page is hosted by Cornell University Library. The abstract title is "An Update of B(E2) Evaluation for 0+1 -> 2+1 Transitions in Even-Even Nuclei near N~Z~28" by B. Pritychenko, J. Choquette, M. Horoi, B. Karamy, B. Singh. The abstract text states: "An update of B(E2) evaluation for even-even Cr, Fe, Ni and Zn nuclei has been presented. Current update is a continuation of S. Raman work on B(E2) values and was motivated by large numbers of new measurements. It extends the previous evaluation from 20 to 38 nuclei and includes comprehensive shell model analysis. Evaluation policies for analysis of experimental data have been discussed. Future plans for complete B(E2;0+1 -> 2+1) evaluation of even-even nuclei are outlined." The page also includes a "Download:" section with links for PDF, PostScript, and Other formats. A "Submission history" section shows two versions: v1 (Wed, 16 Feb 2011 16:11:04 GMT, 330kb) and v2 (Mon, 16 May 2011 14:26:17 GMT, 331kb). The page footer includes a link back to the arXiv form interface and contact information.

# 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:  $B(E2)$ ,  $\tau$  or  $\beta_2$
- 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  $B(E2) \uparrow$  measurements:

- Model-independent measurements: lifetime( $\tau$ ), Coulomb Excitation (including intermediate-energy) and  $(\gamma, \gamma')$
- 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  $B(E2) \uparrow$  values
- Deduce combined  $B(E2) \uparrow$  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  $B(E2) \uparrow$  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 (Central 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