Evaluation of Half-lives of ground states and long-lived isomers in ENSDF

B. Singh

McMaster University

US-NDP, Nov 2-3, 2010

Current sources of half-life information

- ENSDF (most comprehensive source)
- DDEP (for selected ~250 nuclei)

- Nuclear Wallet Cards (ENSDF and other)
- NuDat (mainly ENSDF / Nuclear Wallet Cards)
- NUBASE-2003 (mainly ENSDF, NWC, other)
- Wall Chart of Nuclides-2002 (mainly ENSDF, NWC)
- Table of Isotopes (1996, 1999: mainly ENSDF)

Guidelines for evaluating half-lives in ENSDF ?

Clear guidelines or procedures for ENSDF evaluation of half-lives are not established. Thus there seems no consistent approach to deduce a “recommended” half-life from all the reported measurements.

Methods for averaging

- Un-weighted Average
- Weighted Average
- Limitation of Relative Statistical Weights
- Normalized Residuals (uncertainties often adjusted)
- Rajeval Technique (uncertainties often adjusted quite significantly)

- Bootstrap Median (not yet used in ENSDF)
- Others…

What one finds in ENSDF?

- Average by a certain method, often without giving reduced χ^2 value. All measured values are quite often not quoted. Uncertainty assignments inconsistent.
- Select one (most precise) value. Reason for choice or method quite often not given.
- No clear policy when values are measured by the same group over a number of years.

Some suggestions

- Compile all the measured values: brief method, number of half-lives followed. Source purity, counting statistics.

- Very precisely quoted values need critical assessment (see e.g. Krane's comments last year about claim of very precise data from a certain experimental group)

- If available data are not discrepant, weighted average is probably the simplest approach, but assign uncertainty with care. Reduced χ^2 should be given. If too large, other methods should be tried.
- AVETOOL package has four methods built in. Others can be added to it.