NLD issues for the new CRP

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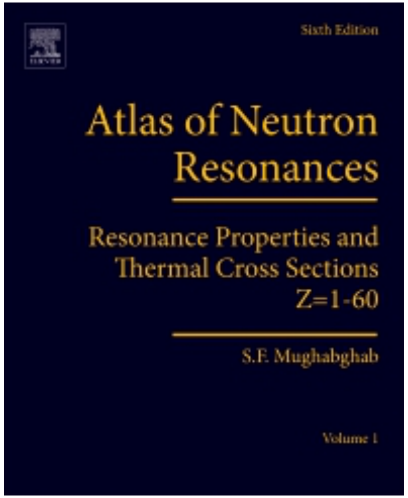
Obvious tasks

- Update D_{obs} (new Mughabghab Atlas, …).
- Refit current systematics.
  - Correct RIPL-3 GC and GSM systematics that used vibrational enhancement of the same order as rotational.
  - Consider Menghoni systematics for GC
- Estimate reliable uncertainties on parameters



Key challenges: 1. dumping of collective enhancements

- We really do not know how they go away
  - EGSM assumes(!) that vibrational enhancements fall to 1/2 at $T_{1/2}$ = 1 MeV
  - Some experimental data suggest that they do NOT disappear
  - There are some theoretical indications (e.g., Joram Alashid) that should be considered

$$K_{vib} = exp\left\{1.7\left(\frac{3m_0A}{4\pi h^2 S_{drop}}\right)^{2/3} T^{4/3}\right\}$$

$$Q_{vib} = 1.0/\{exp[(T\text{-}T_{1/2})/DT)]+1.0\}$$

$$T_{1/2} = 1 \text{ MeV and } DT = 0.1 \text{ MeV}$$

Nucl. Phys. A629 (1998) 635

$$1 - Q_{rot}\left(1 - \frac{1}{\hbar^2/\Im_\perp t}\right)$$

$$Q_{rot} = \frac{1}{1 + exp\left(-\frac{E_{cr}}{d_{cr}}\right)} - \frac{1}{1 + exp\left(-\frac{E-E_{cr}}{d_{cr}}\right)}$$

$$E_{cr} = 40 \text{ MeV and } d_{cr} = 10 \text{ MeV}$$

Key challenges: 2. parity distributions

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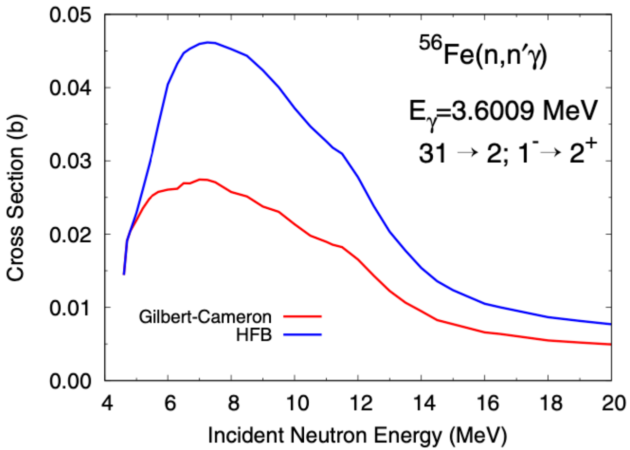


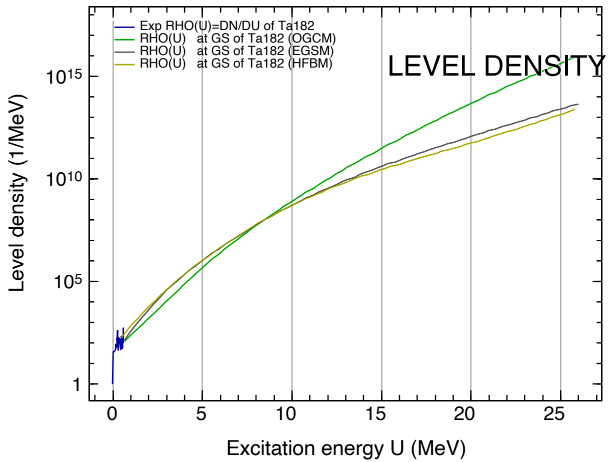
- Cross sections are generally not sensitive to parity distributions, however …
  - discrete gamma transitions, especially for decay of un-natural parity states (inelastic experiments), are.
  - isomeric cross sections are.
  - D_{obs} are for a single (ground state) parity; we assume equal parity distribution and multiply LD by 2; in reality it could be anything between 1 and 3,4,…
- We could make use of microscopic calculations to derive (Z,N,β,E) systematics (AI?)

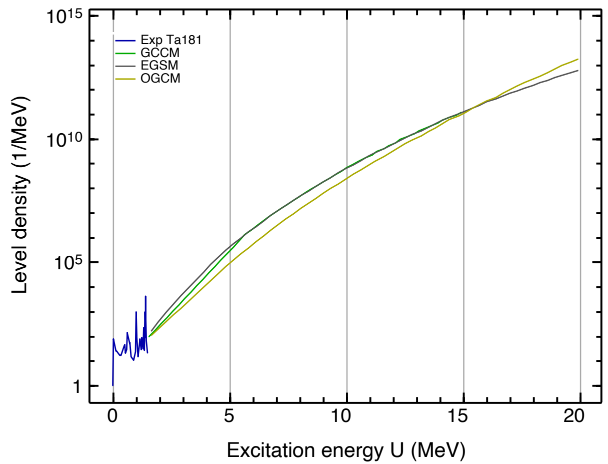
Key challenges: 3. microscopic approaches

- Even if not always competitive to phenomenological approaches they remain an ultimate goal!
- Microscopic approaches give us
  - better understanding
  - extrapolation capability to nuclei off the stability line
  - insight into spin and parity distributions and potentially into dumping of collective effects

Key challenges: 4. new phenomenological approaches

- For example, EMPIRE includes new LD combining
  - constant temperature (GC) with
  - Fermi gas with dumped collective enhancements (EGSM)
  - matching at BCS critical energy (phase transition so no need to ensure smoothness of the second derivative)
- Below critical energy LD are usually between GC and EGSM
- Limited testing performed in reaction calculations with varying results (GC and EGSM are usually closest to each other)





Key challenges: 5. experimental opportunities: D_{obs}, Oslo method, reaction x-sec., …

- Oslo method (I think amply discussed during this meeting)
- D_{obs} (as already mentioned)
- Gamma spectra (discrete gamma-lines), e.g. from inelastic scattering, (n,2n), (n,p)… reactions => spin and parity distributions
- Reaction cross sections used to adjust LD in the evaluations
- Neutron spectra (well known to be sensitive but, I think, generally ignored in determining LD)

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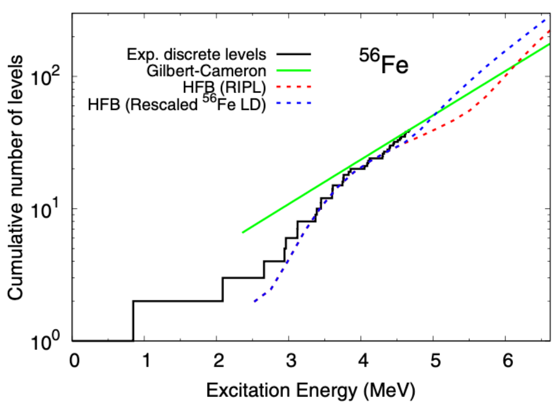

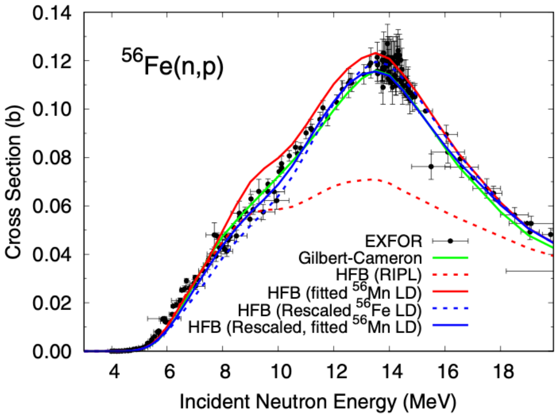

Key challenges: 5. experimental opportunities: neutron spectra