WPEC Subgroup 40 (CIELO)
May 2015

O16 Items

C. R. Lubitz

#1 Agree on one or more ***defined collections*** of integral benchmarks

- Agreement between calculated eigenvalues and the integral benchmarks is an objective measure of their ***utility*** (not accuracy).
- That agreement ***and particularly the trends*** with leakage and absorption, depend on what benchmarks we compare to, so we all need to be using the same collections.

#2 Freeze the thermal scattering cross section at ~3.765 barns

- That number is well-defined by low-energy measurements, give or take some unexplained divergence in the coherent scattering results.
- There is nothing to be gained by letting it be altered by high-energy measurements.
- Agree that all future evaluations will lie between 3.76 and 3.77.

#3 Remeasure the 0-1 MeV cross section

- The new RPI data will help define where we end up above 0.5 MeV. Their data diverge from ENDF71 down near 0.5 MeV.
- We need a similar current look at the 0-1 MeV region, to augment the Ohkubo data.
- The latter is widely used but had problems with the aluminum resonances in the Al2O3 sample and it now contains a moisture "correction" with no experimental basis.

#4 Figure out what the total cross section really is between 3.3 and 3.8 MeV

- Plots of measured O16 cross sections fluctuate wildly in this region. Why?
- One possibility is that there are narrow resonances which cannot be seen but contribute to the resolution-limited measured data.
- Some kind of high-resolution technique is needed.
- Other explanations? Fixes?

#5 Require that all changes to existing cross sections, not only O16, be accompanied by a ***trend analysis*** of the ***absorption rates*** and ***leakage***.

- Why? Because It's ***easy*** to fix problems with the overall reactivity, <Keff>. The simplest is to replace a "high-reactivity" isotopic cross section set with a "lower-reactivity" version (or vice versa).
- Unfortunately, it is ***difficult*** to do that without introducing ***trends***.

#6 Recommendation

- It seems reasonable to require that ***every*** isotopic evaluation in CIELO be trend-free before it is considered as a candidate for the "mix and match" effort to keep the benchmark <Keff> C/E equal to 1.0.
- We should not rely on "canceling trends".

#7 Kahler's recent leakage trends

- E71+G6PFNS k = 1.0010 + ***0.0073****ATLF
- Softening the spectrum to which E71 U235 was adjusted ***degrades the adjustment***.
- E71+G6PFNS+Hale O16 k = 1.0004 + ***0.0051****ATLF
- If subtracting these estimates is legitimate it says Hale O16 is k = 0.9994 - ***0.0022****ATLF.
- That looks pretty good. We also need the ***absorption trend*** to help with the (n,α) cross section.
- We need similar data on Leal's new O16 evaluation.

Thank you

We are very far from

THE END

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O16 Items - Rev 2

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Agree on one or more ***defined collections*** of integral benchmarks (same slide as U235)

- Agreement between calculated eigenvalues and integral benchmarks depends on the benchmarks we compare to so we should all use the ***same*** collections.

Freeze the thermal scattering cross section at ~3.765 barns

- That number is well-defined by low-energy measurements, give or take some unexplained divergence in the coherent scattering results.
- There is nothing to be gained by letting it be altered by high-energy measurements.
- Agree that all future evaluations will lie between 3.76 and 3.77.

Remeasure the 0-1 MeV total cross section

- The new RPI data have helped define O16 from 0.5-6 MeV.
- We need a similar look at the 0-1 MeV region, to augment the Ohkubo data. The RPI data diverge from ENDF71 near 0.5 MeV.
- Ohkubo had aluminum resonance problems with the Al2O3 and with a possible moisture contaminant.
- A single measurement covering the entire range would be reassuring.

Figure out what the total cross section really is between 3.3 and 3.8 MeV

- Plots of measured O16 cross sections fluctuate wildly in this region. Why?
- Are there narrow resonances which cannot be seen but contribute to the resolution-limited measured data?
- Some kind of high-resolution technique?.
- Other explanations? Fixes?

Include a ***trend analysis*** of the ***absorption rates*** and ***leakage*** with proposed changes to existing cross sections. (same slide as U235)

- The isotopic absorption rates tell us if the isotope itself is trend-free.
- The leakage trend tells us how well the unknown errors in the data set have fortuitously canceled and is sensitive to the angular distributions.

Kahler's leakage trends

- E71 k = 1.0007(32) – 0.0010(85)*ATLF is good.
- E71+G6PFNS k = 1.0010 + ***0.0073****ATLF
- Soft spectrum degrades the U235 ***adjustment***.
- E71+G6PFNS+Hale O16 k = 1.0004 + ***0.0051****ATLF
- If subtracting these estimates is legitimate it says Hale O16 is k = 0.9994 - ***0.0022****ATLF.
- That looks pretty good. We need the Hale O16 ***absorption trend*** to help with the (n,α) cross section.
- We need the same data for Leal's new O16 evaluation.

Thank you

We are very far from

THE END