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IAEA CIELO Evaluations for ^{235,238}U

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Basis

- Advanced nuclear model calculations with the Empire code
- Standards_2016 (preliminary)
- Recent experimental data:
  - ^{235}U capture by Jandel
  - ^{238}U/^{235}U and ^{238}U/^{197}Au capture ratios by Wallner
- Criticality benchmarks from ICSBEP

Procedures

- Standards_2016 caused severe perturbation to criticality prediction, in spite of relatively small changes, compared to “beta-2”
- Re-tuning of Empire calculations
- Improvements in cross sections were sought, making use of:
  - DICE sensitivity profiles
  - Experimental data

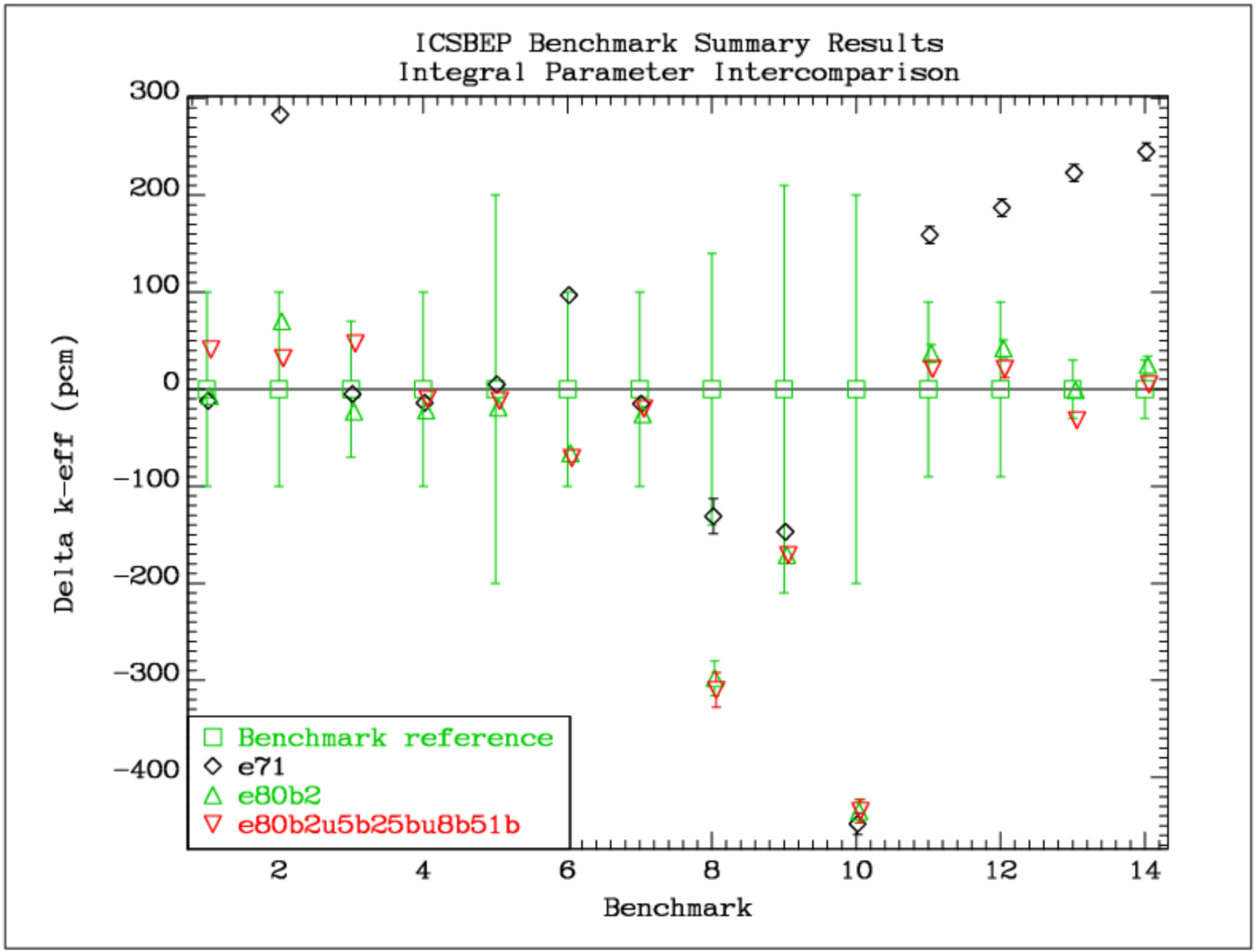
  while respecting the Standards_2016, to improve performance in integral benchmarks

Example:

- Wallner capture measurements at around 25 keV
  - U8/U5 = 0.60 +/- 0.03 (~5%)
  - U8/Au = 0.63 +/-
  - x.s. from Standards_2016 for U8/Au in Excellent agreement with Wallner
  - U8/U5 ratio from Jandel data low by ~6%
- Lowering U5 capture → large impact on criticality
- Solution:
  - Adopt IRMM data directly for U8 capture (+2% max.), raising Wallner measured U8/Au ratio by 0.7%, decreasing U8/U5 ratio to ~5%

Final tuning

- Nu-bar of ^{235}U decreased by 0.1% in the range 0.5-2.0 MeV w.r.t. ENDF/B-VII.1
- Nu-bar of ^{238}U increased, peaking to 1.5% at 2 Mev


ICSBEP Benchmark Summary Results
Integral Parameter Intercomparison
Delta k-eff (pcm)
300
200
100
0
−100
−200
−300
−400
2
4
6
8
10
12
14
Benchmark
Benchmark reference
e71
e80b2
e80b2u5b25bu8b51b

List of “main” benchmarks

1	HEU-MET-FAST-001	hmf001	Godiva
2	HEU-MET-FAST-028	hmf028	Flattop-25
3	IEU-MET-FAST-007	imf007d	Big_Ten(detailed)
4	PU-MET-FAST-001	pmf001	Jezebel
5	PU-MET-FAST-002	pmf002	Jezebel-240
6	PU-MET-FAST-006	pmf006	Flattop-Pu
7	U233-MET-FAST-001	umf001	Jezebel-U233
8	U233-MET-FAST-006	umf006	Flattop-23
9	PU-MET-FAST-022	pmf022	Bare(98
10	PU-MET-FAST-029	pmf029	Bare(88
11	IEU-MET-FAST-001	imf001-001	Jemima-1
12	IEU-MET-FAST-001	imf001-002	Jemima-2
13	IEU-MET-FAST-001	imf001-003	Jemima-3
14	IEU-MET-FAST-001	imf001-004	Jemima-4