# Validating the LANL versus INDEN $^{239}$Pu file in the fast range

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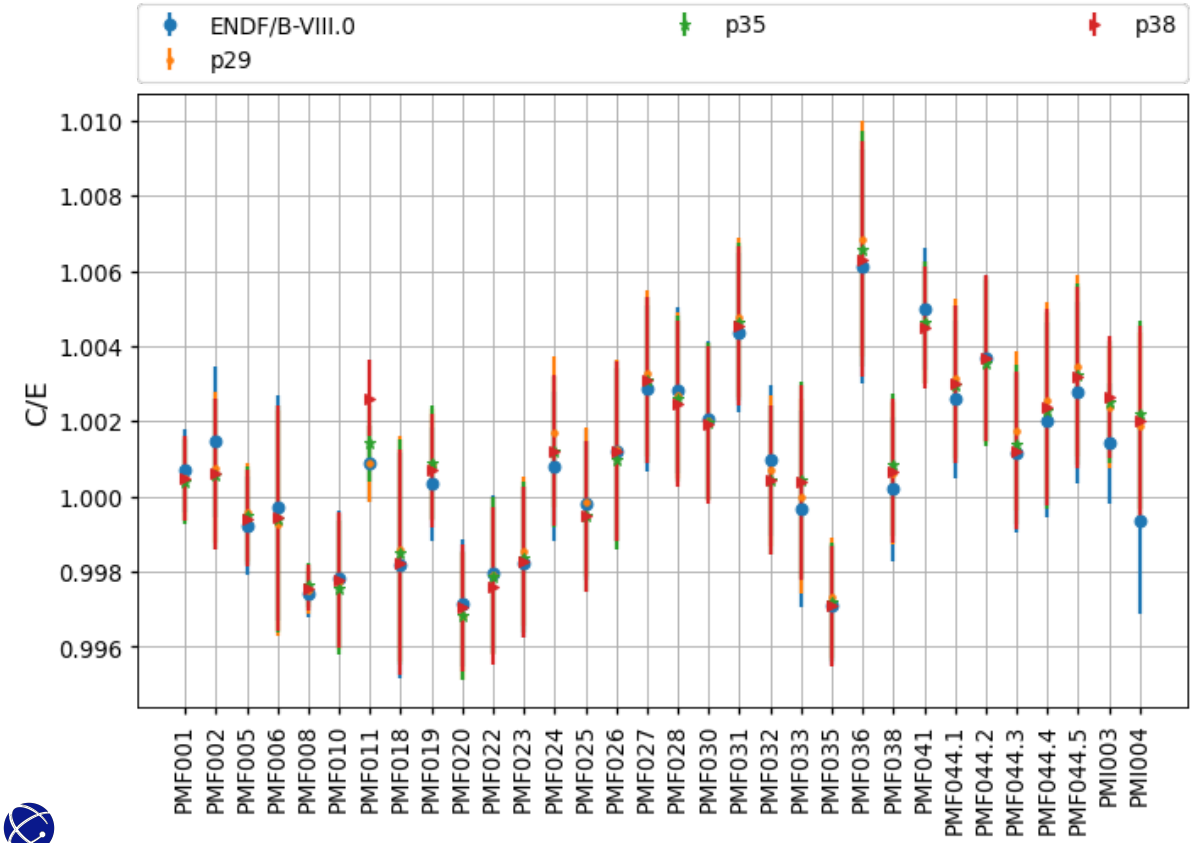
# $^{239}$Pu files validated:

- ENDF/B-VIII.0

- LANL file:
  - New fission source term: PFNS (Chi-Nu+CEA data, INDEN at thermal), nu-bar (Marini data, CGMF modeling), (n,f) cross section (updates according to template, fissionTPC),
  - New (n,g) cross section (closer to Mosby, M1 enhancement),
  - New scattering data (Engelbrecht-Weidenmuller, removal of fictitious levels).

- INDEN files: Empire p27, ORNL/IAEA/JSI RR parameters, VIII.0 (n,g), fission source term from LANL file,
  - p29: + IAEA nubar + Empire (n,2n),
  - p35: + LANL nubar + Empire (n,2n),
  - p38: + LANL nubar + VIII.0 (n,2n).

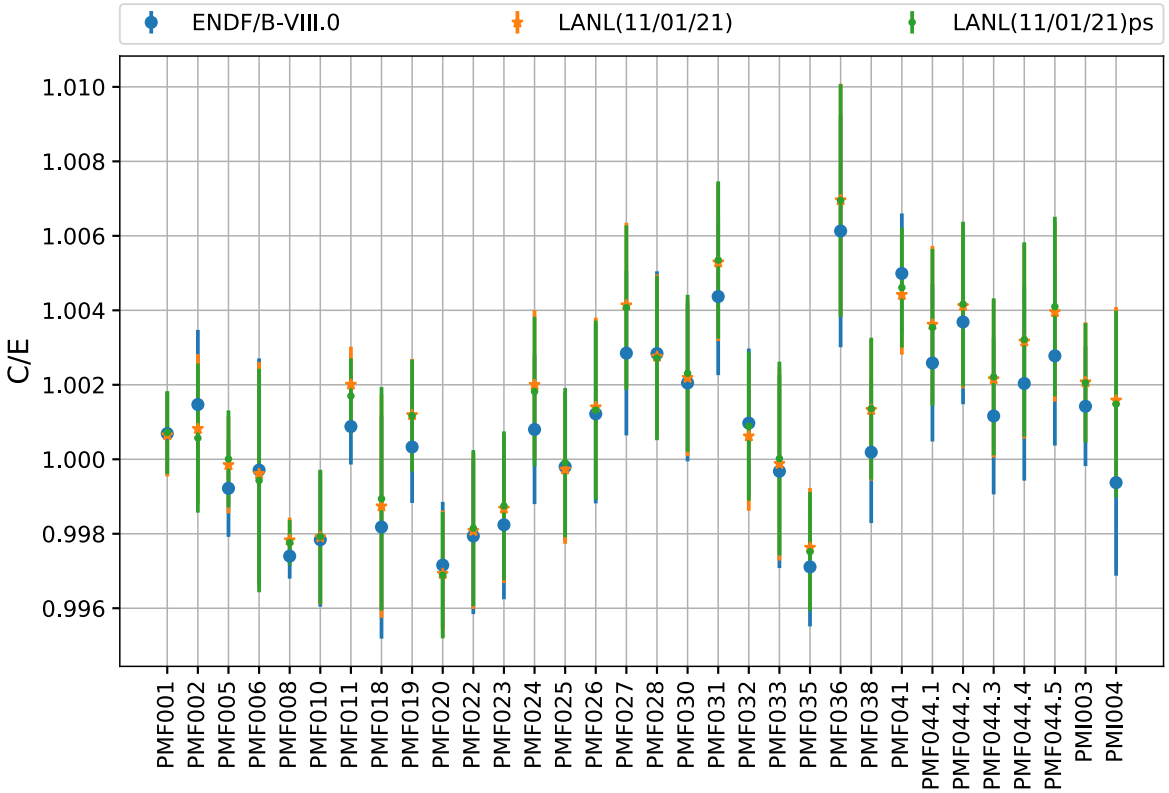
# $k_{eff}$ of PMFs and PMIs with INDEN files: all 3 perform well.




Mean bias:

- p29: 104 pcm
- p35: 98 pcm
- p38: 98 pcm
- VIII.0: 78 pcm

# $k_{eff}$ of PMFs and PMIs with LANL files: small tweak needed.



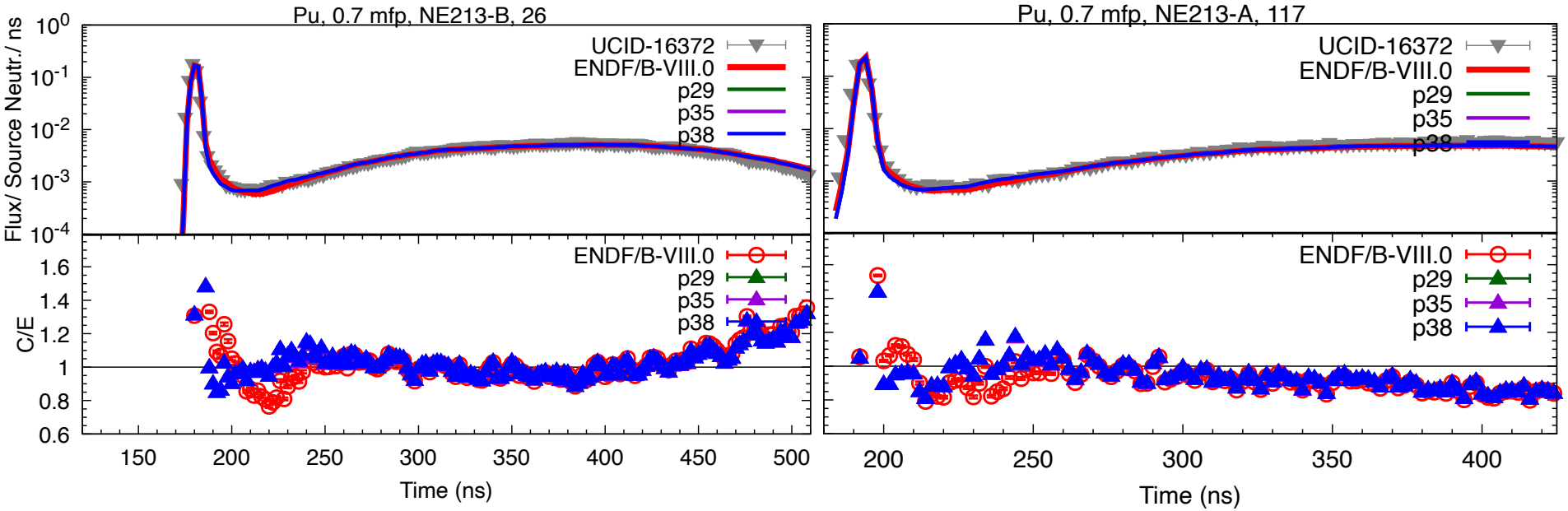

Mean bias:

- 11/1: 130 pcm
- 11/1ps: 129 pcm
- VIII.0: 78 pcm

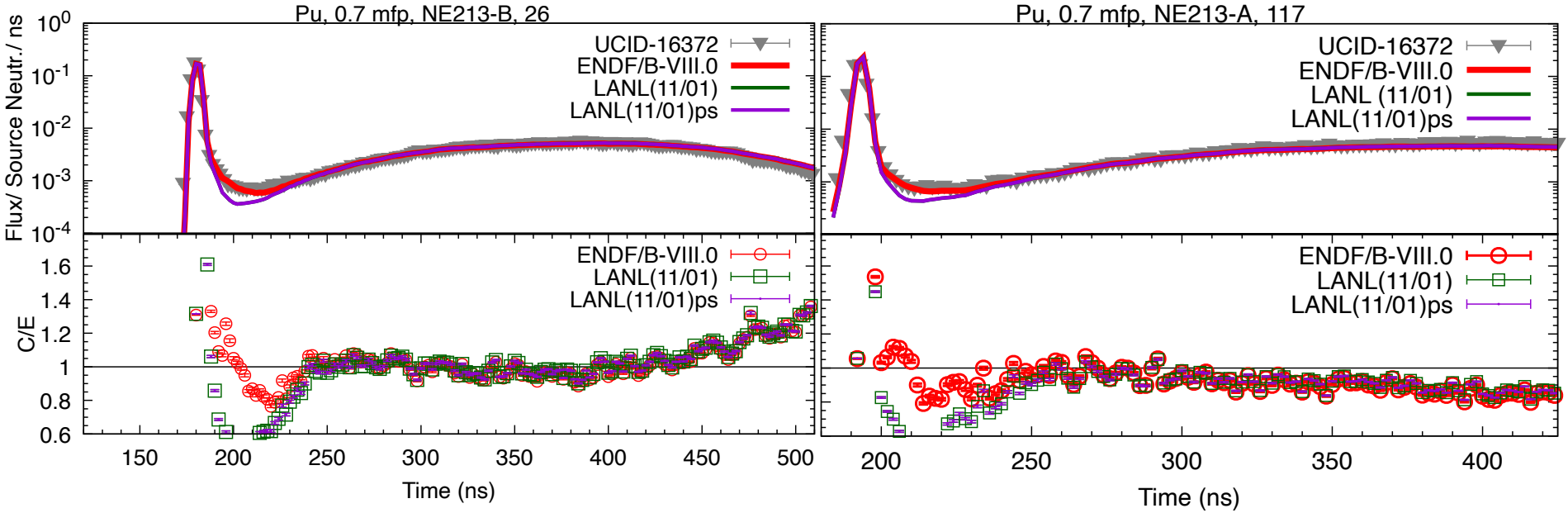
# Benchmarking of reaction rates in Jezebel critical assembly. INDEN and LANL are reasonably close to VIII.0.

| Jezebel | keff | Pu9(n,2n)/(n,f) | Pu9(n,g)/(n,f) | U8/U5(n,f) | Np/U5(n,f) | U3/U5(n,f) | Pu9/U5(n,f) |
|---|---|---|---|---|---|---|---|
| VIII.0 | 1.00069(1) | 0.00230(5) | 0.0345(2) | 0.212(1) | 0.9768(5) | 1.566(7) | 1.427(6) |
| p35 | 1.00031(1) | 0.00235(8) | 0.0355(3) | 0.209(2) | 0.9654(8) | 1.567(11) | 1.423(10) |
| p38 | 1.00029(1) | 0.00222(8) | 0.0354(3) | 0.209(2) | 0.9653(8) | 1.567(11) | 1.423(10) |
| LANL, 11/1 | 1.00065(8) | 0.00229(8) | 0.0342(3) | 0.208(2) | 0.9640(8) | 1.567(11) | 1.422(10) |
| LANL, 11/1ps | 1.00072(1) | 0.00228(8) | 0.0342(3) | 0.208(2) | 0.9644(8) | 1.567(11) | 1.422(10) |

# Pulsed spheres various INDEN files: virtually the same and all good.



# Pulsed spheres VIII.0 vs LANL→ Under active development!




LANL is currently working on tweaking for better prediction of pulsed spheres.

We gratefully acknowledge the support of the Advanced Simulation and Computing (ASC) program at Los Alamos National Laboratory.

Current status:

- INDEN performs well on keff, pulsed spheres and many RR (Pu9(n,g)/(n,f) needs some work),
- LANL performs reasonably well on keff and RR, some work on pulsed spheres needed.