

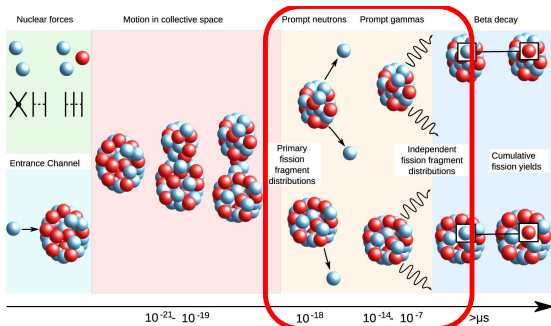
Uncertainty Quantification in Fission Fragment De-Excitation

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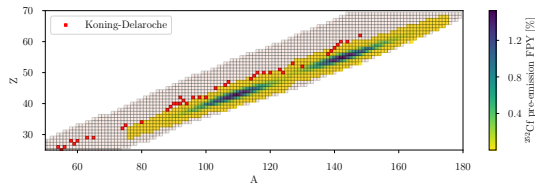
WANDA 2026



Modeling prompt neutron emission from fission fragments involves extrapolating the optical potential



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fission fragments²

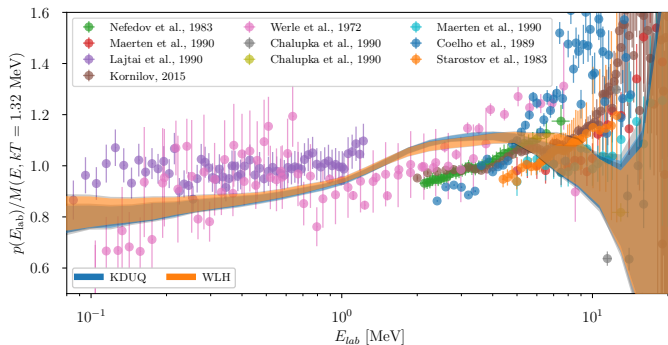
- optical potential for core-neutron interaction extrapolated in $(N - Z)/A$ away from stability
- along with NLDs, γ SF, optical potentials are necessary for modeling fission fragment de-excitation
- prompt n modeled in full competition with prompt γ in Monte Carlo Hauser-Feshbach in CGMF³

¹Bender et al. 2020, *Journal of Physics G: Nuclear and Particle Physics* 47(11), p. 113002

²Beyer et al. 2025, *Phys. Rev. C* 112, p. 024604

³Talou et al. 2021, *Computer Physics Communications* 269, p. 108087

Optical model uncertainty in CGMF fission observables: important for PFNS



^{252}Cf PFNS

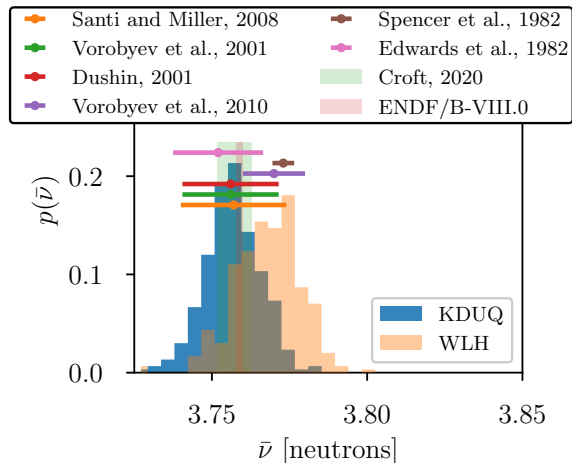
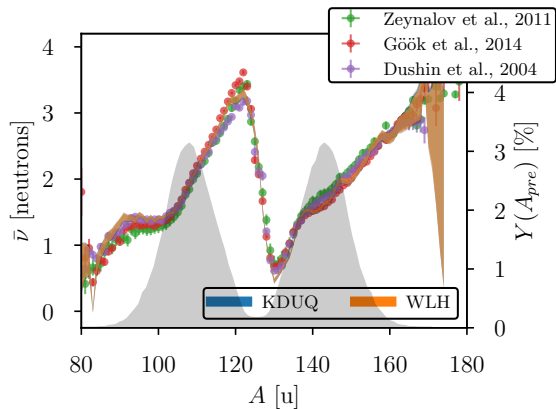
2- σ uncertainty bands from propagation of KDUQ⁴ and WLH⁵ into fission observables using CGMF⁶

⁴Pruitt et al. 2023, *Physical Review C* 107(1), p. 014602

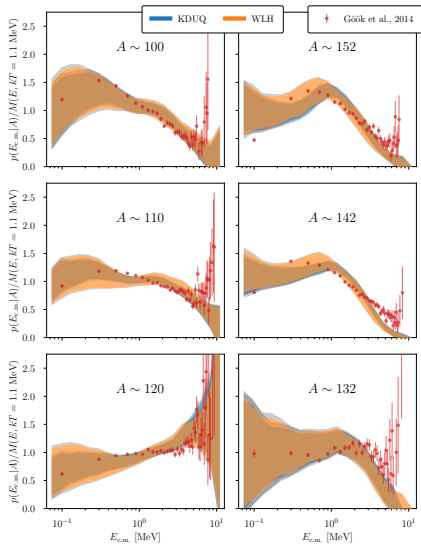
⁵Whitehead et al. 2021, *Physical Review Letters* 127(18), p. 182502

⁶Beyer et al. 2025, *Phys. Rev. C* 112, p. 024604

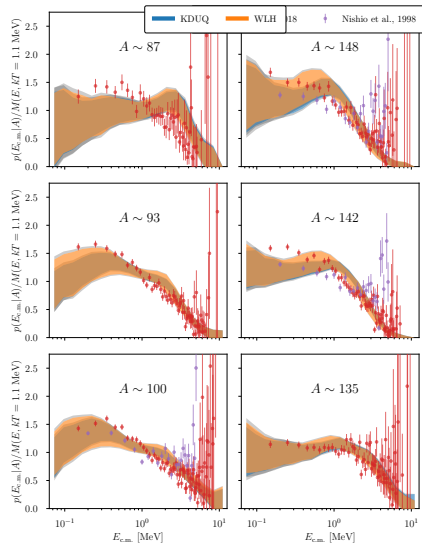
Optical model uncertainty in CGMF fission observables: and multiplicity



What is going on at high energies in fragment-neutron correlated PFNS measurements?



$^{252}\text{Cf}(\text{sf})$



$^{235}\text{U}(n_{\text{thermal}}, \text{f})$

Conclusions

- Full UQ of model inputs for MCHF fission calculations (OMP, NLD, γ sf, pre-emission A, Z, J, π, E_x yields) nearly within reach
- rich backlog of fragment-neutron correlated experimental measurements
- fork of CGMF with python bindings that takes OMP parameters as input: <https://github.com/beykyle/cgmf>
- what is going on with fragment-neutron correlated energy spectra? Could it be scission neutrons? Suggested in microscopic calculations ⁷

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⁷Abdurrahman et al. 2024, *Physical review letters* 132(24), p. 242501