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Title:	Investigation of fission yields in a time-dependent superfluid local density approximation
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Investigation of fission yields in a time-dependent superfluid local density approximation

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Highlight from first microscopic calculation of ^{240}Pu fission:

- ***Fully unrestricted 3D calculation with full nuclear energy density functional***
- ***Long evolution times from outer fission saddle to full scission***
- ***TKE predicted within 3% of expected values***
- ***Light fission fragment heavily deformed, heavy fission fragment spherical (as expected)***
- ***Demonstrated the essential role played by pairing correlations in nuclear shape evolution***

IC's Moonlight was used for small-scale testing

Bulgac et. al, Physical Review Letters 116, 122504 (2016)

Time-Dependent Density Functional Theory with Nuclear Energy Density Functional a la Skyrme

↓

Construct constrained initial state near the outer fission barrier

↓

Evolve in time beyond the scission point

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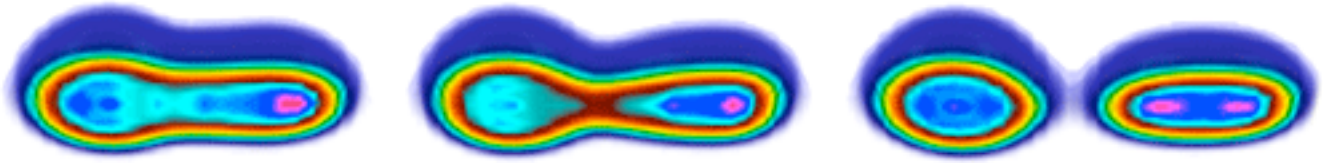
Full characterization of fission fragment properties as a function of initial excitation energy of the fissioning nucleus (neutron incident energy):

- Average mass, charge, excitation energy, and angular momentum
- TKE of fission fragments

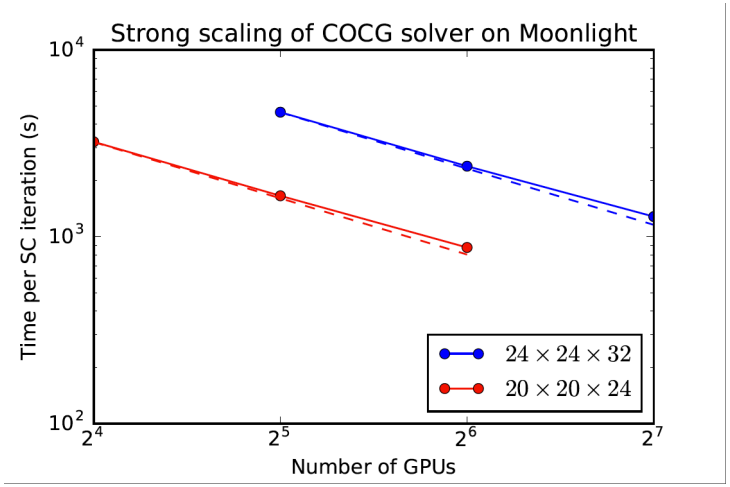


http://physics.aps.org/synopsis-for/10.1103/PhysRevLett.116.122504

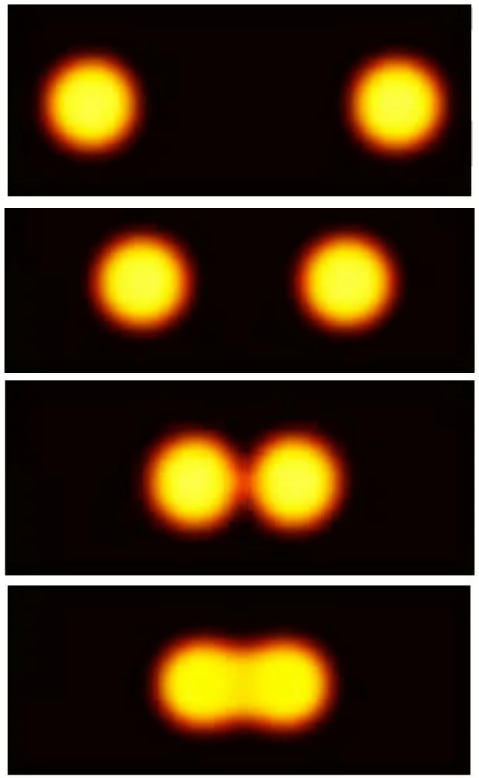
Development of new capabilities

Shifted Conjugate-Orthogonal Conjugate-Gradient (COCG) method for superfluid many-fermion systems:

- Calculating local densities without obtaining the quasiparticle-wfs from a given HFB Hamiltonian.
- Highly effective implementation on GPU
- Flexibility of using spatial symmetry of lattices.
- Will allow for an efficient preparation of initial states for fission and fusion/collision calculations



Shi Jin et al, arXiv:1608:03711 (2016), submitted to Phys. Rev. C



Work in progress

Two ^{120}Sn nuclei colliding

Microscopic simulations that include all relevant degrees of freedom