38. A Microscopic Compound Nucleus in the Time-dependent Mean-field Theory

Paul Stevenson (University of Surrey)

09/07/2024, 17:45

Level Densities and Phot... | Poster | Poster Session

Background: The time-dependent mean-field approach can simulate many dynamic processes in nuclear physics. Its main use has been in reaction studies around the Coulomb barrier, fission, and collective excitation. We summarise some results relevant to compound nuclei and welcome suggestions for collaboration and further areas of application: p.stevenson@surrey.ac.uk

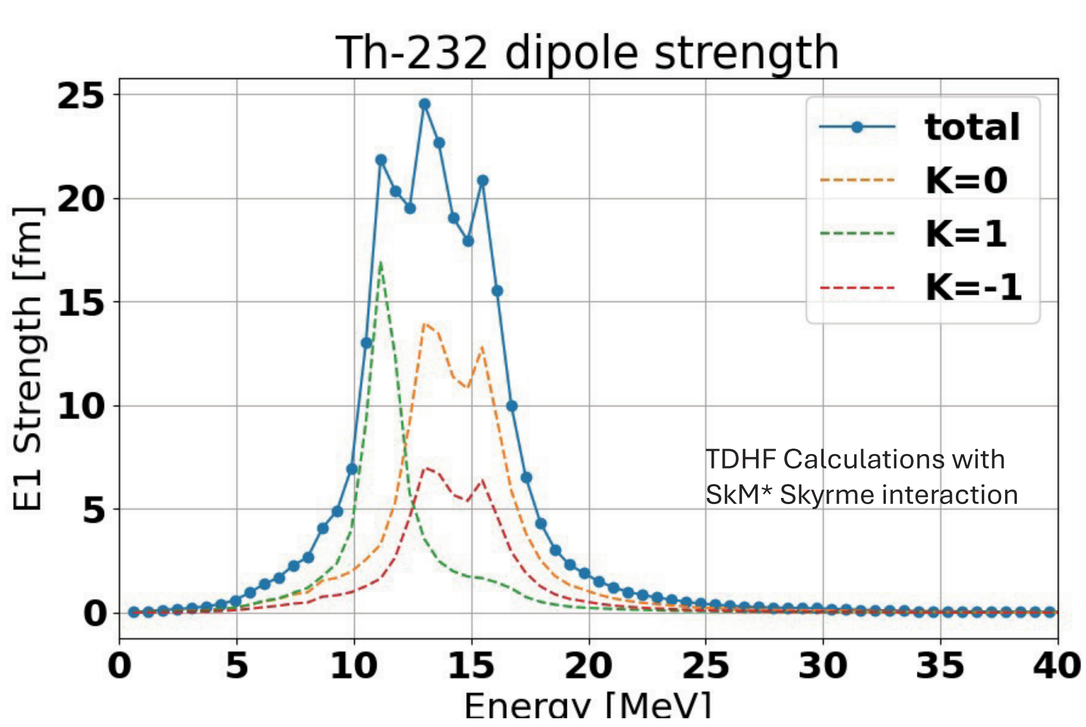
Methods:

• Time-Dependent Density Functional Theory: Input is microscopic effective interaction fitted only to global structure properties mainly of ground states and of nuclear matter.

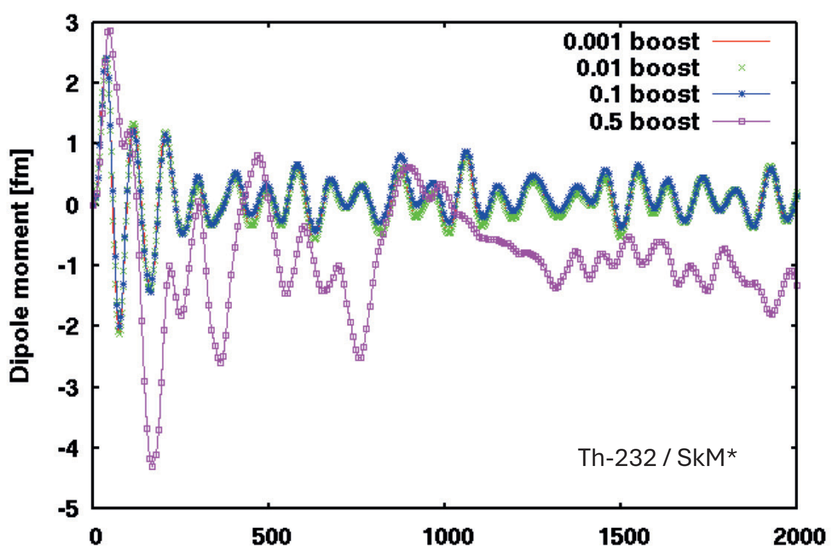
• Initial conditions are the (usually ground) states of nuclei of interest, boosted with desired reaction geometry or collective excitation mode

• For details see Sky3D code papers:
v1.0 Comput. Phys. Commun. 185, 2195 (2014)
v1.1 Comput. Phys. Commun. 229, 211 (2018)
v1.2 Comput. Phys. Commun. 301, 109239 (2024)

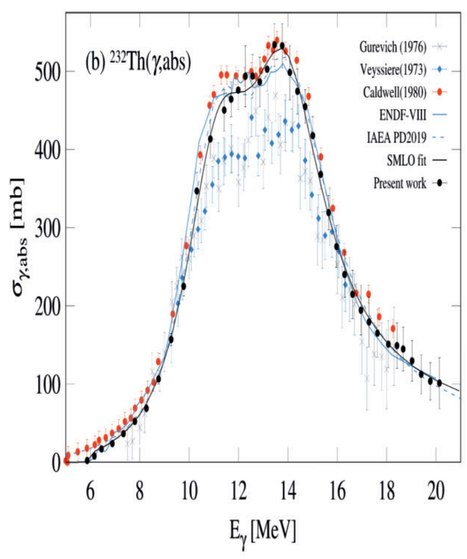
GIANT RESONANCES / GAMMA STRENGTH FUNCTIONS



⇧ Our calculation



← Can explore non-linearities in photon response through large amplitude motion: Potential to explore photofission in cases of interest



← Recent data from Filipescu et al, Phys. Rev. C 109, 044602 (2024)

CN FORMATION IN FUSION REACTION

Example of compound nucleus formation in heavy-ion fusion reaction above the Coulomb barrier: ^{48}Ca on ^{254}Es leading to element 119, "*Mean-field Simulations of Es-254 + Ca-48 Heavy-Ion Reactions*", Paul D Stevenson, Frontiers in Physics 10, 1019285 (2022) (doi: 10.3389/fphy.2022.1019285)