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Semi-microscopic approach to nucleon-nucleus inelastic scattering for spherical nuclei

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Proton-nucleus inelastic scattering is an experimental probe for excitation spectrum of the target nucleus. On the other hand, the experimental data for neutron-nucleus inelastic scattering is scarce and thus one needs a robust theoretical framework to study it. Our work uses microscopic nuclear structure calculations for spherical nuclei to obtain nucleon-nucleus scattering potentials to calculate cross sections for these processes. \\

We implement Jeukenne, Lejeune, Mahaux (JLM) semimicroscopic folding approach [1,2,3] where the medium effects on nuclear interaction are parameterized in nuclear matter to obtain a local energy-dependent nucleon-nucleon interaction in a medium at positive energies. We solve the nuclear ground state using Hartree-Fock-Bogoliubov many-body method, and by approximating interaction between nucleons within a nucleus as Gogny D1M potential [4]. The vibrational excited states of the target nucleus are calculated using quasi-particle random phase approximation method. We calculate the nucleon-nucleus optical and transition potentials by folding in microscopic ground state and transition densities with the JLM potential. \\

We will present the results for elastic and inelastic scattering cross sections for Zr90, Zr94 and Zr96 using our scattering potentials for proton and neutron incident energies from 10-30 MeV. We will also discuss the application of this approach to computing (n, γ) cross sections using surrogate method. \\

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