



Contribution ID: 46

Type: **Poster presentation**

Electromagnetic response of nuclei using Gogny energy density functionals

Electromagnetic response of nuclei plays an important probe in the understanding of nuclear structure. This quantity is also very crucial in the context of nucleosynthesis such as in r-process calculations. R-process studies require calculations of many nuclei and typically the response is extracted by using linear response approaches such as quasiparticle random phase approximation (QRPA). But the standard QRPA approach is computationally expensive. An alternative way of solving QRPA equations at a cheaper computational cost called Finite amplitude method (FAM) was introduced and thus making its applications more advantageous for heavy nuclei. In this work, we are developing a FAM computer code using the finite range Gogny energy density functionals and axial symmetry preserving Hartree-Fock-Bogoliubov framework [1]. Various test calculations of the new code and the comparison of electromagnetic response results with standard QRPA calculations are currently being performed and the comparison with available experimental data will also be performed. Once the FAM Gogny code is well tested, it will be used to perform large scale electromagnetic response calculations throughout nuclear chart as required in r-process calculations [2]. We also plan to extend the approach of FAM in the context of fission for evaluating collective inertias [3]. This work is supported by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) Project-ID 499256822 GRK 2891 'Nuclear Photonics'.

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Session Classification: Poster Session