ID de Contribution: **132** Type: **Non spécifié**

Different avenues for improving current Energy Density Functionals: The inverse Kohn-Sham problem

jeudi 2 février 2023 11:00 (20 minutes)

Despite the steady and remarkable progress in *abinitio* approaches to nuclear structure, Density Functional Theory remains a tool of broader applicability. It makes sense to derive an Energy Density Functional (EDF) from an underlying ab initio method: this is the topic addressed by a few contributions to the conference. At the same time, it is worth attempting other routes for improving current EDFs. We have started to make the first steps in the so- called inverse Kohn-Sham problem, that is, in grasping information on the effective nuclear potential and the associated energy functional by starting from the knowledge of the nuclear densities. In particular, we have recently proposed a complete solution to the inverse Kohn-Sham (KS) problem. Our method consists of two steps. First, the effective KS potential is determined from the ground-state density of a given system. Then, the knowledge of the potentials along a path in the space of densities is exploited in a line integration formula to determine the KS energy of that system numerically. A possible choice for the density path is proposed. A benchmark in the case of a simplified yet realistic nuclear system is shown to be successful, so the method seems promising for future applications.

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Classification de Session: Session 14: Nuclear structure with density functional and shell-model approaches