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Kaonic Atom Properties and Cascade Models: Exploring Strong Interactions through First-Principles Calculations

Monday 1 July 2024 16:00 (30 minutes)

Kaonic atom experiments at SIDDHARTA2 provide a unique platform to explore the effects of strong interactions at low momenta. Specifically, during the de-excitation process of the highly excited kaonic atom, known as cascade, the emitted X-rays may be significantly influenced by the strong nuclear interaction between the nucleus and the kaon. Here, I present a detailed description of the method to calculate kaonic atom properties completely from first principles. Using the Multi-Configurational Dirac Fock approach, I will present applications from transition energy calculations with the inclusion of electronic screening effects, up to the setting bounds on the kaon mass value. Furthermore, I will describe how to model the cascade process with the Monte Carlo approach to predict and explain the experimentally observed X-ray transition yields. This work aims to deliver precise theoretical insights that can guide future experimental investigations in the field of strong nuclear interaction.

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