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High precision kaonic atoms X-ray spectroscopy with the SIDDHARTA-2 experiment at the DAFNE collider

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Kaonic atoms represent a unique laboratory for the study of the antikaon-nucleus interaction at threshold and investigate the low-energy quantum chromodynamics (QCD) in the strangeness sector. State-of-the-art X-ray detectors and modern experimental techniques allow to perform high-precision X-ray kaonic atoms spectroscopy, leading to fundamental input for nuclear, particle, and astrophysics research.
The SIDDHARTA-2 experiment at the INFN-LNF DAΦNE collider is currently performing a data taking campaign to carry out high-precision X-ray spectroscopy of various kaonic atoms, with a particular focus on the first measurement ever of the kaonic deuterium X-ray transitions to the fundamental level. This measurement aims to allow to determine the isospin-dependent antikaon-nucleon scattering length and contribute to our understanding of the strong interaction in the strangeness sector.
In this talk, I will present the SIDDHARTA-2 experiment, the recent results obtained during the first phase of the experiment, in particular the most precise measurement of kaonic helium X-ray Lα transition in gas and the first measurement ever of the M-type transition, as well as the first measurement of several high-n transitions in other kaonic atoms.
Finally, I will outline the prospects for the ongoing kaonic deuterium measurement and our future plans.

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