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A Strangeness Adventure: Kaonic Atom Measurements with SIDDHARTA-2 at the DAΦNE Collider

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In particle physics, understanding the low-energy strong interaction remains a significant challenge, demanding new experimental data as input and validation. Among the promising approaches, X-ray spectroscopy of kaonic atoms offers a unique window into the antikaon-nucleon interaction at threshold. The SIDDHARTA experiment's measurement of kaonic hydrogen has enhanced our understanding of the antikaon-proton interaction, yet a full determination of the isospin-dependent antikaon-nucleon scattering lengths also requires measurement of kaonic deuterium.

The SIDDHARTA-2 collaboration has leveraged the DAΦNE collider's high-quality low-energy kaon beam, innovative experimental techniques, and state-of-the-art radiation detectors to conduct highly precise kaonic atom measurements. For the first time, X-ray transitions of kaonic deuterium to the ground state have been observed (with data analysis ongoing), in addition to measurements of other low-Z kaonic atoms, including kaonic helium and kaonic neon.

This presentation will discuss the scientific motivation, experimental setup, and findings from these kaonic atom measurements, with a focus on preliminary results from kaonic deuterium. This result, central to kaonic atom research, is expected to provide critical insights into low-energy strong interactions involving strangeness and associated symmetries.

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