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Constraining the antikaon-nucleon interaction from the 1S level shift of kaonic deuterium

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Motivated by the precise measurement of the 1S level shift of kaonic hydrogen, we perform accurate three-body calculations for the spectrum of kaonic deuterium using a realistic antikaon-nucleon (KbarN) interaction. In order to describe both short- and long-range behavior of the kaonic atomic states, we solve the three-body Schroedinger equation with a superposition of a large number of correlated Gaussian basis functions covering distances up to several hundreds of fm. Transition energies between 1S, 2P and 2S states are determined with high precision. The complex energy shift of the 1S level of kaonic deuterium is found to be 670–i508 eV. The sensitivity of this level shift with respect to the isospin I=1 component of the KN interaction is examined. It is pointed out that an experimental determination of the kaonic deuterium level shift within an uncertainty of 25% will provide a constraint for the I=1 component of the KN interaction significantly stronger than that from kaonic hydrogen.

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