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Pionic Hydrogen

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K X-rays from pionic hydrogen and deuterium as well as muonic hydrogen have been measured using a high-resolution crystal spectrometer at the E5 beam line of PSI. From the ground-state level shifts and broadenings of the hydrogen isotopes, caused by the strong interaction, low-energy parameters of QCD become accessible as are the pion-nucleon scattering lengths and the threshold production strength of pions in nucleon-nucleon collisions. Muonic hydrogen allows important insights in the deexcitation cascade of such exotic atoms, the understanding of which is essential for a precision determination of the above-mentioned quantities. First experimental results are discussed in the context of recent results from theoretical efforts within the approach of Chiral Perturbation Theory and atomic cascade calculations.

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