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On K^- nuclear interaction, K^- nuclear quasibound states and K^- atoms

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The low-energy K^-N interaction is currently described by chiral coupled-channel meson baryon interaction models. Above threshold, all the models agree between each other since their parameters are fitted to available low-energy K^-N observables. However, in the subthreshold region, relevant for K^- bound states, various models have different energy-dependence, which leads to a large variety in predictions [1]. The confrontation of the chiral K^-N potentials with kaonic atom data revealed the necessity to consider the absorption of K^- on two and more nucleons, which is not included in the chiral models. The K^- multinucleon absorption was first described by a phenomenological optical potential [2]. It was shown that only the Prague, Kyoto-Munich and Barcelona models are consistent with experimental data on K^- atoms [3] and from AMADEUS collaboration [5]. A considerable imaginary part coming from the multinucleon absorption ruled out existence of narrow K^--nuclear quasibound states in nuclei with $A > 6$ [4].

The first connection of the K^-NN absorption to chiral models was done by Sekihara et al. [5]. We have developed a microscopic model for the K^-NN absorption in nuclear matter [6]. The absorption was described as a meson-exchange process and the primary K^-N interaction strength was derived from the state-of-the-art chiral models. The medium modifications of the K^-N scattering amplitudes due to the Pauli principle were taken into account. The model was applied in calculations of kaonic atoms for the first time. The description of the data significantly improved when the two nucleon absorption was considered. The branching ratios for various K^- absorption channels in ^{12}C+K^- atom were calculated and compared with old bubble chamber data, as well as with the latest data from the AMADEUS collaboration [7].

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