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Energy dependence of K^- -"pp" effective potential derived from coupled-channel Green's function

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A new experimental search for K^-pp via the ^{3}He(in-flight K^-, n) reaction is planned (J-PARC E15 experiment). We have theoretically discussed the expected inclusive and semi-exclusive spectra for the J-PARC E15 experiment within the framework of the K^-pp single-channel distorted-wave impulse approximation (DWIA) using Green's function method by employing the phenomenological K^--"pp" (complex) effective potential[1,2,3].

In the single-channel DWIA framework, the spectrum shape can be understood by the "moving pole" picture[3]; the pole position of the K^-pp bound state in the complex energy plane changes with the energy along the real axis, and its trajectory determines the spectrum shape. Therefore, the bound-state peak generally deviates from the standard Breit–Wigner type. Moreover, a cusp-like peak may appear at the $[K^-pp] \to \pi\Sigma N$ decay threshold energy in some cases, depending on the K^-pp binding energy.

In this talk, we would like to focus on the the energy dependence of the imaginary part of the K^--pp" effective potential which governs the trajectory of moving pole. In the phenomenological potential used so far, its imaginary part strength is assumed to be proportional to the phase space suppression factor for decay channels[3]. Here, the single channel K^--pp" effective potential is derived from the model using coupled-channel (K^-p)p-($\pi \Sigma)N Green's function, and the validity of the phenomenological one is discussed.

References:
1. T. Koike and T. Harada, Phys. Lett. B652, 262 (2007).
2. T. Koike and T. Harada, Nucl. Phys. A804 (2008) 231.
3. T. Koike and T. Harada, Phys. Rev. C80(2009) 055208.

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