Model of the rigid pair penetrations

P.M. Krassovitskiy and F.M. Pen'kov*

Institute of Nuclear Physics, Almaty, Kazakhstan

*fmp56@mail.ru

The resonant character of the transmission probability for a bound pair of one-dimensional particles incident on a potential barrier was first pointed out by Saito and Kayanuma [1] as far back as 1994**.** Later direct numerical solutions of the two-dimensional scattering problem allowed this effect to be confirmed for the penetration of a pair of particles bound by the oscillatory interaction through potential barriers of the Gaussian and Coulomb type [2, 3]. It was also shown that resonances occurred due to the metastable states of the pair and the barrier and the number of transmission resonances is determined by the degree of excitation of the pair. To date, the effect of resonant tunneling of a bound pair has not only been confirmed for interactions of various types and for particles greater dimension but also extended to objects of more than two particles [4].

Here probabilities of resonant tunneling through a potential barrier are compared for a rigid pair of particles and an excited pair. It is shown that the resonance spectrum is mainly governed by the transmission resonance spectrum of the rigid pair. Analytical expressions for the probability for the tunneling of the rigid pair through a barrier allow resonance-spectrum-averaged observables to be estimated.

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1. N. Saito and Y. Kayanuma, J. Phys.: Condens. Matter. **6** (1994) 3759.
2. F. M. Pen'kov, Phys. Rev. A **62** (2000) 044701.
3. F. M. Pen'kov, Zh. Eksp. Teor. Fiz. **118** (2000) 806 [JETP **91** (2000) 698].
4. A. Gusev et al., Yad. Fiz. **77** (2014) 414 [Phys. At. Nucl. **77** (2014) 389