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Calculation of neutron resonances parameters of scattering by system of two heavy nuclei

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Neutron scattering processes in two heavy nuclei system belong to the class of quantum-mechanical problems, which are becoming more and more interesting. This interest is connected not only with explanation of nuclear interactions details, but also a manifestation of extraordinary events, the inherent problems of three or more bodies. The examples of this are Thomas [1] and Efimov [2] effects, which describe the "fall of particles to the center" and "increase in the number of bound states" in the three-particle systems. New developments in three-particle systems have been identified, concerning "movement of Efimov levels to threshold or from threshold" when you change interaction forces, while the main ("not Efimov") levels are moving in the opposite direction [3]. This phenomenon has been used in experiments to identify the Efimov levels [4]. These effects are amazing and unusual features of quantum problem of three (and more) interacting bodies, which have been confirmed in a number of unique and subtle experiments [4].

Two-particle processes of neutron scattering on a system of two heavy nuclei were considered in this paper. The resonance amplification mechanism of interaction between the heavy nuclei was investigated. The problem of neutrons scattering at crystal structures, in which nuclei are fixed in the crystal lattice was also considered. The use of crystal lattice allows get nucleus "heavier" as well as in Messbauera effect. Two-body interaction of neutron with nucleus was taken in the Breit-Wigner form, which allows the use of analytical expressions for two-enforcement amplitudes of neutron scattering at the nucleus. Calculations have shown that two-particle amplitudes have a resonant dependence not only on energy but also on the distance between the nuclei lattice.Calculations of three-particle type resonances were conducted for ^{103}Ag, ^{52}Cr, ^{51}V, ^{157}Gd and other nuclei.

References:

[1] Landau L.D., Lifshic E.M. «Kvantovaja mehanika»,