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Possible $K\bar{K}^*$ and $D\bar{D}^*$ resonances by solving Schrodinger equation

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The Schrodinger equation with a Yukawa type of potential is solved analytically. When different boundary conditions are taken into account, a series of solutions are indicated as Bessel function, the first kind of Hankel function and the second kind of Hankel function, respectively. Subsequently, the scattering processes of $K\bar{K}^*$ and $D\bar{D}^*$ are investigated. In the $K\bar{K}^*$ sector, the $f_1(1285)$ particle is treated as a $K\bar{K}^*$ bound state, therefore, the coupling constant in the $K\bar{K}^*$ Yukawa potential can be fixed according to the binding energy of the $f_1(1285)$ particle. Consequently, a $K\bar{K}^*$ resonance state is generated by solving the Schrodinger equation with the outgoing wave condition, which lie at $1417 - i18$MeV on the complex energy plane. It is reasonable to assume that the $K\bar{K}^*$ resonance state at $1417 - i18$MeV might correspond to the $f_1(1420)$ particle in the review of Particle Data Group(PDG). In the $D\bar{D}^*$ sector, since the $X(3872)$ particle is almost located at the $D\bar{D}^*$ threshold, the binding energy of it equals to zero approximately. Therefore, the coupling constant in the $D\bar{D}^*$ Yukawa potential is determined, which is related to the first zero point of the zero order Bessel function. Similarly to the $K\bar{K}^*$ case, four resonance states are produced as solutions of the Schrodinger equation with the outgoing wave condition. It is assumed that the resonance states at $3885 - i1$MeV, $4328 - i191$MeV and $4772 - i267$MeV might be associated with the $Zc(3900)$, the $\chi_{c1}(4274)$ and $\chi_{c1}(4685)$ particles, respectively. As to the resonance state at $4029 - i108$ MeV, no counterpart has been found in the PDG data. It is noted that all solutions are independent on the isospin.

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