Abstract

A non-covariant but approximately relativistic two-body wave equation (Breit equation); describing the quantum mechanics of quark-antiquark systems interacting with one another through a potential containing scalar linear confinement, vector Coulomb-like and Breit potential parts; is presented. After expressing the sixteen component two-body wave function in terms of a radial and angular functions by means of the multipole expansion, the initial Breit equation can be reduced into a set of sixteen radial equations which, in turn, can be classified in accordance to the parity and the spin of states involved. The final equations are solved numerically. A comparison between our results and the corresponding experimental data shows that, the used potential can describe the interaction in quark-antiquark systems.

In chapter I a brief history about the discovery of elementary particles, its general properties and a general introduction about the forces in nature. The concept by which we chose the interacting potential in Breit equation and some selected previous works are given.

In chapter II a discussion about Breit potential and its constituent terms in the non-relativistic limit, and the used mathematical treatment to reduce Breit equation into its radial form are performed.

In chapter III a discussion about the new locations of singularity which appears in the final radial equations due to the reduction procedure is given. A comparison between our results and the available experimental data is also performed