Description for deuteron by covariant Bethe-Salpeter equation.

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In order to investigate electromagnetic properties of light nuclei, especially in from intermediate energy region to high energy region, it is necessary to take relativistic effects into account. Usually relativistic properties have been treated as corrections to non-relativistic caluculations.

The Bethe-Salpeter equation(BSE) is one of the methods which enable us to treat composite systems of nucleons in relativistic way. But it is very difficlut to solve the BSE with keeping relativistic covariance.Therefore to solve the BSE, we introduce the Separable *ansatz*,where we assume that we can express the Bethe-Salpeter amplitude as a product of function of initial state momentum and that of final state momentum.The BSE is then written as [1,2]

$$T_{\alpha\beta}(p',p) = V_{\alpha\beta}(p',p) + \frac{i}{2\pi^2}\int dq_0 q^2 d|q| \sum V_{\lambda\gamma}(p',q)S_{\gamma\delta}(q)T_{\delta\beta}(q,p)$$

$$V_{\alpha\beta}(p',p) = \sum \lambda_{ij} g_i^{(\alpha)}(p') g_j^{(\beta)}(p)$$

$$T_{\alpha\beta}(p',p) = \sum \tau_{ij} g_i^{(\alpha)}(p') g_j^{(\beta)}(p)$$

where $T_{\alpha\beta}$ is the BS amplitude,$V_{\alpha\beta}$ the interaction kernel and $S_{\gamma\delta}$ the two nucleon propagator. $P'$and P are the initial and final momenta. In the separable *ansatz* V and T are written interms of the g-functions.

We have applied this method to the caluculation of deuteron properties. We have employed a simple Gaussian form for the BS amplitude and calculated the electron-deuteron elastic scattering in relativisitic impulse approximation(RIA). We extracted form factor and compared it with experimental data[3] up to the momentum transfer few Gev.

References

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