Title : Solutions of the Bethe-Salpeter equation for fermion boson system

Speaker : Colasante D., Phys. Dept. Rome Univ. "Tor Vergata"

Coauthor : Pace E., Salmè G., Frederico T., Viviani M.

Abstract : After more than half century, in the last few years, to solve the Bethe-Salpeter equations (BSEs), both homogeneous (bound states) and inhomogeneous (scattering states), directly in Minkowski space is becoming feasible (see, e.g. [1-4]). The ladder BSE has been investigated both for a two-scalar interacting system and a two-fermion one, with massive exchanged bosons. The technique, based on an initial Ansatz for the actual solution has been greatly improved by the so-called Light-front projection, i.e. the integration on the $k^- = k^0 + k^3$ component of the interacting-pair relative momentum, The Ansatz is constructed by using the Nakanishi integral representation of the BS amplitude, and this makes possible and extremely effective the second ingredient, since one can analytically treat the singularities present in the BSE, crucial for the fermionic systems. In this contribution, for the first time the extension to an interacting fermion-scalar system, with different masses, will be presented as well as some preliminary numerical results. In perspective, since both the interaction kernel can be improved and self-energies can be included, our investigation is the needed initial step for elaborating new relativistic phenomenological models of composite systems, in hadron physics or other fields.

References :

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