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Minkowski space approch to the relativistic bound state spectrum

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The Nakanishi integral representation of the
Bethe-Salpeter amplitude is used in order to derive a workable framework for bound states,
solutions of the homogeneous Bethe-Salpeter Equation, in Minkowski space.
The projection onto the null-plane of the homogeneous Bethe-Salpeter Equation is used to
derive an equation for the Nakanishi weight function for bound states. We study the bound
state of two spinless bosons with the interaction given by the exchange of scalar bosons
in the ladder plus cross-ladder approximation, which is used to obtain the spectrum
and the three-dimensional structure of the bound states.
The unique feature of the method is to access the
valence light-front wave function, which are explored in detail
for the ground and excited states. The valence momentum
distribution amplitude and the impact parameter space representation of the valence
state are calculated.
Resorting to the analytic structure of the Nakanishi integral representation for
the valence wave function, we analysed the equality between the
transverse momentum amplitudes computed within Minkowski and Euclidean frameworks.
The leading exponential fall-off of the valence wave function in the impact
parameter space wave function is derived, which could be of particular interest
for studies to hadron structure investigations.

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