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Solution of Bethe–Salpeter equation in Minkowski space with Nakanishi integral representation

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We propose a method to solve for the structure of relativistic 2-body bound states from Bethe–Salpeter equations (BSEs) in Minkowski space. Particularly after introducing both the Källén–Lehmann spectral representation of dressed propagators and the Nakanishi integral representation of the Bethe–Salpeter amplitudes, the BSE for scalar bound states of scalar constituents is converted into integral equations of corresponding spectral functions. Analytical kernel functions for integrations in such equations are deduced. Numerical solutions of the BSE in Minkowski space in terms of the Nakanishi spectral functions are subsequently obtained in the massive variant of the Wick–Cutkosky model. We validate our results with those applying numerical kernels for the BSE in Minkowski space.

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