Four-Body Bound States: A $t-$Matrix-Free Approach to Yakubovsky Equations

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The Yakubovsky equations have been a tool for studying four-body (4B) bound states, with their solutions requiring input fully-off-shell two-body (2B) $t-$matrices. This necessitates solving the Lippmann-Schwinger integral equation for the 2B subsystem energies controlled by the second and third Jacobi momenta. In this presentation, we introduce a novel form of the Yakubovsky equations that directly interfaces with 2B interactions, thereby eliminating the need for 2B $t-$matrices. This approach significantly simplifies coding requirements and reduces computational runtime. Numerical evaluations using our new method reveal that it reproduces the same 4B binding energies as the traditional Yakubovsky equation when used with separable Yamaguchi and Gaussian interactions.

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