Contribution ID: **78**   Type: **1st and 2nd weeks (Hadron structure and interactions)**

Effective range expansion with the left-hand cut

Friday, October 18, 2024 3:30 PM (1 hour)

The validity range of the time-honored effective range expansion can be very limited due to the presence of a left-hand cut close to the two-particle threshold. Such a left-hand cut arises in the two-particle interaction involving a light particle exchange with a mass small or slightly heavier than the mass difference of the two particles, a scenario encountered in a wide range of systems. This can hinder a precise extraction of low-energy scattering observables and resonance poles. To address this issue, we propose a new parameterization for the low-energy scattering amplitude that accounts for the left-hand cut. The parameterization is like a Pad\'e approximation but with nonanalytic terms from the left-hand cut and can be regarded as an extension of the effective range expansion. It is ready to be applied to a broad class of scatterings and, in particular, should be invaluable in understanding various near-threshold hadron resonances. As byproducts, we also show that the parameterization can be used to extract the couplings of the exchanged particle to the scattering particles, and derive expressions for amplitude zeros caused by the interplay between the short- and long-range interactions.

Primary authors: WU, Bing (University of Electronic Science and Technology of China);   GUO, Feng-Kun (Institude of Theoretical Physics, CAS);   DU, Menglin (University of Electronic Science and Technology of China)

Presenter: DU, Menglin (University of Electronic Science and Technology of China)

Session Classification: Seminar (1,2 week)