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Implementing the relativistic-field-theory finite-volume formalism across all three-pion isospins

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In this talk, we present a numerical exploration of the relativistic field theory (RFT) formalism for three pions with all possible values of non-maximal isospin, $I_{\pi\pi\pi} = 2, 1, \text{ and } 0$. Using the published generic-isospin extension of the RFT formalism and applying our open-source Python library to implement the formalism, we predict an array of three-pion energies for realistic values of the two-to-two scattering amplitudes. Considering all possible finite-volume irreps with three values of total momentum, we demonstrate how complicated spectra emerge, in particular from the mixing of all allowed two-pion isospins in a given sector of definite $I_{\pi\pi\pi}$. The present results restrict attention to the case of a vanishing intrinsic three-body interaction so that the spectra can be understood as a baseline. In future lattice QCD calculations, deviations from these values will translate to evidence of intrinsic three-particle effects.

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