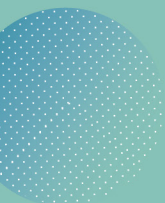




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Poles in πN scattering from forward dispersion relations and revised total cross-section data

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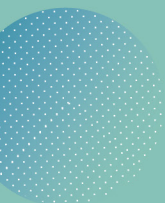
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Abstract

We present a model-independent calculation of πN forward dispersion relations and their analytic continuation to the complex plane, using a revised set of $\pi^{\text{pm}} p$ total cross-section data up to 3 GeV, and Regge asymptotics above. Up to that energy, we find four stable poles for each isospin combination. The lightest pole in the $I=3/2$ channel corresponds to the $\Delta(1232)$ resonance, while the lightest in the $I=1/2$ channel corresponds to the Roper resonance, even though the latter is imperceptible in the data. We extract their pole parameters and the parameter difference between the Δ^{0} and Δ^{++} , without relying on a partial-wave analysis. The remaining poles cannot be identified with a single resonance each. They are not artifacts but the combined effect of multiple resonances unresolved by total cross-section data alone. Finally, we write sum rules relating the residues of these constituent resonances to the residues of the poles extracted from the dispersive representation.

