Laboratório de Instrumentação e Física Experimental de Partículas

Seminário LIP

Quinta Feira, 29 de Novembro 2018
11:30

Modern Meson Spectroscopy: The Importance of Unitarity for Experiment, Lattice & Models

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The most fundamental cornerstone of the PDG tables is the uniqueness of S-matrix pole positions of unstable particles, as a consequence of quantum-field-theory principles. Therefore, the unitarity property of the S-matrix should ideally be respected in whatever description of hadronic resonances in experiment, on the lattice, and in quark models. Unfortunately, simple Breit-Wigner (BW) parametrisations continue to be widely used in data analyses of hadronic processes, while lattice and model calculations are often still done by ignoring strong decay and its dynamical effects. All such approaches manifestly violate unitarity.

In the present talk I shall show how a BW description of a resonance produces a wrong pole position, even in the elastic case, while for inelastic decays the error can become huge, in excess of 100 MeV. Its consequences for meson spectroscopy and possible remedies will be discussed. As for the lattice, some recent calculations of meson resonances will be presented that do satisfy unitarity, by using Luescher's method to compute scattering phase shifts in a Euclidean framework. These calculations lend strong support to earlier model descriptions of enigmatic resonances like the light scalar mesons, as well as the puzzling states Ds0(2317), Ds0(2460), and X(3872). Finally, a case is made for considering non-resonant, threshold-related enhancements, which are a consequence of extended unitarity in production processes. Typical examples of such enhancements will be discussed, as e.g. X(4260), X(4660), and Upsilon(10580).

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Café e bolinhos 30 min antes