



SPEAKER: Pietro Faccioli (LIP and IST, Lisbon)

TITLE: **Angular momentum and decay distributions in high energy physics: an introduction and use cases**

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ABSTRACT

Measurements of the angular distributions of particle decays give unique insights into the underlying fundamental interactions and play a central role in the determination of coupling properties, in the verification of production models and even in the discovery and identification of new particles. However, some of the most basic properties of the decay distributions are ignored in the vast majority of the experimental analyses. For example, decades of theoretical and experimental studies used the dilepton decay distributions as crucial instruments (Drell-Yan and quarkonium production, Standard-Model couplings of vector bosons), but only recently some general characteristics of the angular distribution have been systematically addressed, highlighting the importance of the choice of polarization axis, revealing the existence of frame-independent relations and precisely defining the shape of the physically-allowed parameter domain.

This seminar illustrates the basic notions of quantum mechanics that determine the shape of the decay angular distributions studied in high-energy particle physics. Some use-cases are taken as examples: the measurements of quarkonium and Standard-Model vector-boson polarizations, the characterization of the recently discovered Higgs-like resonance. Emphasis is placed on how more general and rigorous results can sometimes be obtained by "going back to basics".