

Structure functions for semileptonic tau decays including heavy new physics.

Content

1. SMEFT lagrangian and chiral perturbation theory with tensor sources.
2. Semileptonic 4-body decays of polarized τ leptons phase space distribution derivation including tensor structures.
3. Some Lorentz and $SO(3)$ relevant structures.
4. Structure functions derivation.
5. Wigner D functions representation.
6. Statistical properties of Wigner D functions.

Summary

Semileptonic decays of polarized τ leptons are investigated, and the most general angular distribution of three meson final states is derived following the so celebrated Kuhn and Mirkes formalism but extending it now to include possible induced heavy new physics effects coming from the inclusion of tensor currents interactions between quarks and leptons that can be found in the most general SMEFT lagrangian. It is shown that the most general distribution can be characterized by the 16 structure functions studied by Kuhn and Mirkes, which are in turn corrected by heavy new physics effects plus 12 additional structure functions coming from the interference between the axial-vector and tensor structures. In addition a new representation in terms of Wigner D functions is derived, and some relevant traits of such a representation are studied by combining the orthogonality of these functions and the statistical method of moments in order to build a new estimator for the angular part of the distribution.

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