

On the Effects of Interference in BSM Production and Detection of Two Tau leptons at the LHC

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The study of third-generation fermion channels at the LHC has gained increasing importance, particularly in light of potential excesses observed in the data. This work is a phenomenological study aimed at establishing and distinguishing the effects of different types of BSM particles that can produce an possible excesses in channels with two taus in the final state. These include resonant production, where neutral bosons such as the Z boson, heavy scalars, or pseudoscalars decay into two taus via an s-channel, and non-resonant production, such as the exchange of a scalar or vector leptoquark in a t-channel.

The distinction between these production channels is achieved by analyzing tau polarization and calculating the interference effects among these channels using the MadGraph, Pythia, and Delphes frameworks. This analysis helps identify the best kinematic observables and assess their impact on the statistical significance of the observation.

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