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Searches for New Physics that couple with third generation fermions

Wednesday 6 December 2023 13:30 (20 minutes)

The tau lepton is the only one kinematically allowed to decay into hadrons and a tau neutrino. Semi-leptonic tau decays (indicated as hadronic decays) occur about the 65% of times in a combination of charged and neutral hadrons, and a tau neutrino. The remaining times, tau leptons decay into a lighter charged lepton which can be identified and reconstructed by detectors, and two neutrinos, which escape undetected. The Tau leptons play a key role for many analyses involving Standard Model (SM) phenomena, like the leptonic Higgs decays, or searches for New Physics that couple with third generation fermions. Therefore a correct identification of taus, especially hadronic ones, is crucial at the CMS experiment. The major challenge is to discriminate hadronically decaying taus against the backgrounds originated from quark or gluon jets, which are copiously produced in QCD multijet processes; moreover, also electrons or muons that can be produced by Drell-Yan, leptonic W decays and other SM processes. The tau reconstruction at CMS starts at L1-Trigger, the hardware based trigger, where the seeds for the HLT objects reconstruction are defined, then it is reconstructed at the High Level Trigger (offline) through different steps, depending on the tau decay channel.
The talk will cover the techniques adopted at the CMS experiment to identify tau leptons, with a specific focus on hadronic decays, at the High Level Trigger during the current ongoing data taking (Run 3), which started in 2022.

Name of collaboration or list of co-authors

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