



Contribution ID: 204

Type: Oral Presentation

Anomalies in the production of leptons at the LHC

Thursday, 11 July 2019 12:40 (20 minutes)

Based on a number of features from proton-proton collisions taken during data Run 1 data taking period at the LHC, a boson with a mass around the EW scale was postulated such that a significant fraction of its decays would entail the Standard Model (SM) Higgs boson and an additional scalar, S . One of the phenomenological implications of a simplified model, where S is treated as a SM Higgs boson, is the anomalous production of high transverse momentum leptons. A combined study of Run 1 and Run 2 data are indicative of very significant discrepancies between data and SM Monte Carlos in a variety of final states involving multiple leptons with and without b -quarks. These discrepancies appear in corners of the phase-space where different SM processes dominate, indicating that the potential mismodeling of a particular SM process is unlikely to explain them. Systematic uncertainties from the prediction of SM processes evaluated with currently available tools seem unable to explain away these discrepancies. The internal consistency of these anomalies and their interpretation in the framework of the original hypothesis will be quantified. The potential connection with the muon $g-2$ anomaly is also discussed.

Apply to be considered for a student award (Yes / No)?

No

Level for award (Hons, MSc, PhD, N/A)?

N/A

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Session Classification: Nuclear, Particle and Radiation Physics

Track Classification: Track B - Nuclear, Particle and Radiation Physics