Contribution ID: **88** Type: **Oral Presentation**

An alternative explanation of the multi-lepton anomalies at the LHC

Wednesday, 5 July 2023 15:40 (20 minutes)

In recent years, multi-lepton anomalies have been accumulated by analyzing Large Hadron Collider (LHC) data, pointing towards the existence of beyond the Standard Model (SM) bosons. The data is consistent with a scalar particle S within a mass range between 130 GeV and 160 GeV. A simplified model, the Two-Higgs Doublet plus an additional Scalar (2HDM+S) is used to predict the decay of a singlet scalar $S \to \gamma\gamma$, $Z\gamma$, ZZ and WW and in a recent paper (arxiv:2109.02650), a singlet scalar at 150 GeV was identified, which indicates a scalar resonance S which decays into photons, and, to a lesser extent to $Z\gamma$, in association with missing energy, jets, or lepton. However, we do not see the $S \to ZZ$ signal. Therefore, to allow the scalar to decay into the channel WW and not the ZZ, we look at the Higgs Triplet model where a neutral scalar H^0 can only decay into WW. This study investigates these multi-lepton anomalies by considering the Higgs Triplet Model with a hyper-charge of zero (HTM0). It consists of a neutral scalar H^0 that stems from the CP-even component of the Higgs triplet and the two charged scalars $h^{\pm}$ which stem from the charged component of the Higgs triplet. These components come from the mixing between the nonphysical fields of the Higgs doublet and the Higgs triplet.

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Yes

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

MSc

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Session Classification: Nuclear, Particle and Radiation Physics

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