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Search for New Heavy Neutral Gauge Boson using Vector Boson Fusion Processes at the LHC

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To address the incompleteness of the Standard Model (SM), many models introduce new gauge fields and interactions, which manifest as new particles with TeV scale masses. Thus, it is imperative to understand particles and interactions at the TeV scale. An example of one such particle is the Z' boson, a heavy, neutral spin-1 gauge boson. Numerous ideas exist to probe the TeV scale, motivating a large volume of Z' searches at the LHC. However, those searches have failed to show signs of new physics. Possible explanations point to new physics having different features to what is traditionally assumed in Z' searches, remaining concealed in processes not yet investigated. In particular, existing searches targeting Drell-Yan processes rely on a sizable coupling for the Z' to light quarks (g_ℓ). This talk focuses on a search for Z' produced via vector boson fusion processes (VBF), whose production rate is independent of g_ℓ , and which has non-universal fermion couplings (NUFC). Scenarios with NUFC are motivated by the recent anomalies in the B -physics sector and the muon anomalous magnetic moment.

Primary author: Ms KAUR, Amandeep (Panjab University (IN))

Presenter: Ms KAUR, Amandeep (Panjab University (IN))

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