

Standard Model-Like Higgs Decay into Displaced Heavy Neutrino Pairs in U(1)' Models

Authors : E. Accomando, L. Delle Rose, S. Moretti, E. Olaiya, C. Shepherd-Themistocleous

Abstract : Heavy sterile neutrinos are almost ubiquitous in the class of Beyond Standard Model scenarios aimed at addressing the puzzle that emerged from the discovery of neutrino flavour oscillations, hence the need to explain their masses. In particular, they are necessary in a U(1)' enlarged Standard Model (SM). We show that these heavy neutrinos can be rather long-lived producing distinctive displaced vertices and tracks. Indeed, depending on the actual decay length, they can decay inside a Large Hadron Collider (LHC) detector far from the main interaction point and can be identified in the inner tracking system or the muon chambers, emulated here through the Compact Muon Solenoid (CMS) detector parameters. Among the possible production modes of such heavy neutrino, we focus on their pair production mechanism in the SM Higgs decay, eventually yielding displaced lepton signatures following the heavy neutrino decays into weak gauge bosons. By employing well-established triggers available for the CMS detector and using the data collected by the end of the LHC Run 2, these signatures would prove to be accessible with negligibly small background. Finally, we highlight the importance that the exploitation of new triggers, specifically, displaced tri-lepton ones, could have for this displaced vertex search.

Keywords : beyond the standard model, displaced vertex, Higgs physics, neutrino physics

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