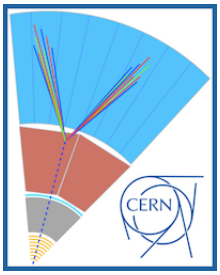

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Results and prospects of an LHCb Run 3 HNL analysis with very displaced vertex reconstruction

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Heavy Neutral Leptons (HNLs) are theoretical long-lived particles introduced to the Standard Model (SM) to explain, among other things, the observed, non-zero SM neutrino mass. In this presentation plans and potential sensitivity of an HNL analysis leveraging the Run 3 (2022-2026) data set of the Large Hadron Collider beauty (LHCb) experiment are discussed. In particular, a novel analysis strategy is presented wherein HNLs are reconstructed inclusively as a very displaced vertex; a vertex displaced between 0.5 and 8.0 meters from the proton-proton interaction point at LHCb. Over contemporary methods, this strategy yields a 40-fold increase in the number of considered HNL events and a 16-fold increase in the HNL lifetime to which we are sensitive. With the results of a sensitivity study, it is shown that these improvements directly translate to an increased reach in the HNL mass-coupling plane, and that with this strategy LHCb has discovery potential and the capacity to set world-best limits in HNL parameter space.

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