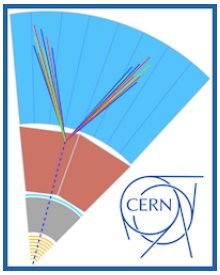

Contribution ID: **58** Type: **not specified**

Searches for displaced Scalar decays to dimuons: LHCb's extended reach in Run 3

Tuesday, 3 June 2025 11:50 (17 minutes)

A detailed study exploiting novel trigger and reconstruction techniques developed to search for Beyond Standard Model (BSM) Long-Lived Particles (LLPs) with very displaced vertices is presented. Building on feasibility studies that have successfully reconstructed Standard Model decays occurring up to 8 m forward of the interaction point in LHCb's magnet region, the search for LLP particles into charged final states exploits LHCb's unique forward geometry and segmented tracking system—comprising the Vertex Locator, Upstream Tracker, and SciFi stations—to extend sensitivity into previously inaccessible regions.
The presentation will cover innovative trigger strategies implemented in LHCb's software trigger for inclusively selecting very displaced dimuon pairs, alongside advanced offline selection methods utilising multivariate analysis methods to robustly suppress background while maintaining high signal efficiency. Preliminary sensitivity estimates for Dark Higgs -> mu mu search indicate that these approaches can achieve competitive performance compared to dedicated LLP experiments. Future prospects will also be discussed. This work aims to provide a comprehensive framework for enhancing LLP discovery potential at LHCb and offers insights that could be beneficial for the broader BSM LLP search community.

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Session Classification: ATLAS, CMS, LHCb results I