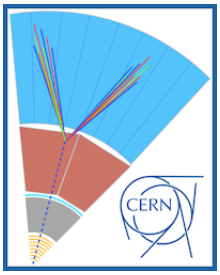

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Long-lived Light Mediators in a Higgs Portal Model at the FCC-ee and FCC-hh

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In the search for beyond the Standard Model (SM) physics, long-lived particles (LLPs) have emerged as potential candidates and are being explored in various ongoing experiments. Future lepton colliders, such as the FCC-ee, shall provide an excellent opportunity to probe LLPs, owing to their clean environment and improved particle identification. This study investigates the potential of the proposed Innovative Detector for an Electron-Positron Accelerator (IDEA) detector at FCC-ee in the detection of LLPs produced from B-meson and Higgs boson decays. We explore benchmark scenarios for different final states resulting from LLP decays, including a detailed analysis of the SM long-lived hadronic background. Additionally, we propose dedicated LLP detectors with different configurations, dimensions, and locations with respect to the IDEA detector. DELIGHT B, originally proposed as a dedicated LLP detector for the FCC-hh, stands out as the detector with the maximum efficiency for detecting LLPs produced at FCC-ee. We find that cylindrical detector configurations, if feasible to construct around the IDEA detector, would also enhance sensitivity for LLPs mostly decaying outside it. We also discuss briefly the potential of FCC-hh.

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