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Looking for Beyond Standard Model short-lived particles with secondary production

Many New Physics scenarios contain new long-lived particles, leading to interesting experimental signatures such as, e.g., highly displaced decay signatures. Examples of such models are so-called portals which include coupling of BSM particle to ordinary matter through a renormalizable interaction. Going beyond such simple realisations of BSM physics, one can introduce non-minimal particle content where lighter particle can upscatter into heavier one in front of the detector, leading to interplay between short and long-lived regimes. We illustrate the prospects of such searches in representative LHC-based experiments FASER, SHiP and MATHUSLA for illustrative models with inelastic dark matter, neutrino dipole portal and dark neutrino portal, among others.

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