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EW Portal to the Hidden Valley

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We discuss dark shower signals at the LHC from a dark QCD sector, containing GeV-scale dark pions. The portal with the Standard Model is given by the mixing of the Z boson with a dark Z' coupled to the dark quarks. Both mass and kinetic mixings are included, but the mass mixing is the essential ingredient, as it is the only one mediating visible decays of the long-lived dark pions on collider scales. We focus especially on the possibility that the dark Z' is lighter than the Z . Indirect constraints are dominated by electroweak precision tests, which we thoroughly discuss, showing that both Z -pole and low-energy observables are important. We then recast CMS and LHCb searches for displaced dimuon resonances to dark shower signals initiated by the production of on-shell Z or Z' , where the visible signature is left by a dark pion decaying to $\mu^+\mu^-$. We demonstrate how dark shower topologies have already tested new parameter space in Run 2, reaching better sensitivity on a light dark Z' compared to the flavor-changing decays of B mesons, which can produce a single dark pion at a time, and the electroweak precision tests.

Mini Symposia (Invited Talks Only)

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