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Semi-visible Jets: Dark Matter Undercover at the LHC

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The dark matter may be a remnant of strong dynamics that is accessible via a weakly coupled portal. If the hidden-sector states are produced at the Large Hadron Collider (LHC), they would undergo a QCD-like shower yielding a spray of stable invisible dark matter along with unstable states that decay back to the Standard Model. Such “semi-visible” jets arise, for example, when their production and decay are driven by a leptophobic Z resonance; the resulting signature is characterized by significant missing energy aligned along the direction of one of the jets. These events are vetoed by the current suite of searches employed by the LHC, resulting in low acceptance. This Letter will demonstrate that the transverse mass—computed using the final-state jets and the missing energy—provides a powerful discriminator between the signal and the QCD background. Assuming that the Z couples to the Standard Model quarks with the same strength as the Z^0 , the proposed search can exclude Z masses below 3.6 TeV with 100 fb^{-1} of 14 TeV data at the LHC.

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