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Search for displaced lepton jets with the ATLAS experiment

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Several possible extensions of the Standard Model predict the existence of a dark sector that is weakly coupled to the visible one: i.e. the two sectors couple via the vector portal, where a dark photon with mass in the MeV to GeV range mixes kinetically with the SM photon. If the dark photon is the lightest state in the dark sector, it will decay to SM particles, mainly to leptons and possibly light mesons. Due to its weak interactions with the SM, it can have a non-negligible lifetime. At the LHC, these dark photons would typically be produced with large boost resulting in collimated jet-like structures containing pairs of leptons and/or light hadrons, the so-called lepton-jets (LJs).

This work is focused on the search for â€œdisplaced LJsâ€⊠, which are produced away from the interaction point and their constituents are limited to electrons, muons, and pions. The requested topology includes one or two LJs + leptons/jets/MET. The most recent ATLAS results based on samples collected at a center of mass energy of 13 TeV will be presented.

Results are interpreted in terms of the Falkowsky-Ruderman-Volansky-Zupan models where dark photons are generated through the decay of a Higgs boson to intermediate hidden fermions. The Higgs boson is supposed to be produced via gluon-fusion and for the first time, results are also presented in terms of the associated production of a Higgs boson with a W/Z and in the context of inelastic thermal relic dark matter.

Topic:

Topic: High Energy Particle Physics

Summary

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