

# Light Dark Matter Showering under Broken $U(1)$ – Revisited

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The scenario of light dark matter fermion under a massive  $U(1)$  group has attracted some attention lately. It was proposed recently that different chiralities of the DM can lead to different showering patterns, resulting in distinguishable signatures in LHC. This can be helpful in understanding the origin of the dark photon mass and the DM mass. Here we study this subject further by examining the dark shower of two simplified models – named Chiral Model and Vector Model. We derive a more complete set of collinear splitting functions by specifying the helicities of the fermion, incorporating all degrees of freedom and splittings arising from symmetry breaking. We implement dark shower with those splitting functions in the two models and analyze the jet profiles after the dark photons decay back the SM particles. The effects of different aspects of splitting functions are demonstrated and discussed.

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