

The 135 GeV Fermi Line and MiDM/RayDM at the LHC

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Abstract: Magnetic and Rayleigh dark matter (MiDM/RayDM) are models describing weak interactions of dark matter with photons through non-renormalizable operators. Such operators motivate the existence of heavier states that couple to dark matter and are also charged under the electroweak interactions. The recent hints of a gamma ray line in the Fermi data suggest that these states may be light enough to be produced at the LHC. We categorize such states according to their charges and decay modes, and examine the corresponding LHC phenomenology, emphasizing unconstrained models that can be discovered in targeted searches at the upgraded LHC run, while also enumerating models excluded by current data. We propose searches to constrain models allowed by current LHC bounds, including models with multiple tau lepton and gauge boson final states, and in particular find superior performance for our methods over existing proposals for multi-tau analyses.

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Session Classification: Indirect searches for dark matter