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Re-opening dark matter windows compatible with a diphoton excess

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We investigate a simple setup in which an excess in the di-photon invariant mass distribution around 750 GeV, as seen by the ATLAS and CMS collaborations, is originated through a pair of collimated photon pairs. In this framework a scalar state s decays into two light pseudo-Goldstone bosons a, each of which subsequently decays into a pair of collimated photons which are misidentified as a single photon. In a minimal context of spontaneous symmetry breaking, we show that coupling a complex scalar field $\Phi = (s + ia)/\sqrt{2}$ to a fermionic dark matter candidate χ, also responsible for generating its mass, allows for the correct relic density in a large region of the parameter space, while not being excluded by the direct or indirect detection experiments. Moreover, the correct relic abundance can naturally co-exist with a relatively large width for the resonant field s.

Auteur principal: M. PIERRE, Mathias (LPT Orsay)

Orateur: M. PIERRE, Mathias (LPT Orsay)

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