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A model independent probe for elusive dark sectors at future experiments

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The existence of a SM-neutral and light dark sector coupled to the visible sector via irrelevant portal interactions was considered in 2012.08537. Such scenarios tend to be common in dark matter models arising as various extensions of the Standard Model.
The authors of 2012.08537 use the conformal behaviour of this dark sector at energies $\Lambda_{IR} << E << \Lambda_{UV}$ to study their phenomenology in a model independent way, where Λ_{UV} is the scale at which the heavy mediator exchange generates the portal operators and Λ_{IR} is the infrared scale.
Our work extends the work of 2012.08537 as we derive bounds from various classes of future facilities aimed at detecting long lived particles (transverse detectors like MATHUSLA, CODEX-b etc. as well as fixed target experiments like SHiP etc.) to complement the bounds obtained in 2012.08537 by showing an improved reach on small Λ_{IR}.
We hope this study would encourage that future experimental analyses be performed for generic dark sectors without a focus on a particular benchmark model.

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