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What UV Evolution Can Tell Us About The Dark Sector

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We analyze the UV breakdown of sub-GeV Dark Matter Models that live in a new, dark U(1) sector. Many of these models include a scalar field, which is either the Dark Matter itself or a dark Higgs field that generates mass terms for the Dark Matter particle via Spontaneous Symmetry Breaking. A quartic self coupling of this scalar field is generically allowed, and we show that its running is largely governed by the strength of the U(1) gauge field. Furthermore, it consistently has a lower Landau pole than the gauge coupling. We consider the implication of this Landau pole from three perspectives: what are the most reasonable low energy parameters, at what energies are novel UV completions needed, and where might one expect to discover Standard Model charged particles associated with the dark sector?

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