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Two natural scenarios for dark matter particles coexisting with supersymmetry

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We describe two natural scenarios in which both dark matter weakly interacting massive particles (WIMPs) and a variety of supersymmetric partners should be discovered in the foreseeable future. In the first scenario, the WIMPs are neutralinos, but they are only one component of the dark matter, which is dominantly composed of other relic particles such as axions. (This is the multicomponent model of Baer, Barger, Sengupta and Tata.) In the second scenario, the WIMPs result from an extended Higgs sector and may be the only dark matter component. In either scenario, both the dark matter WIMP and a plethora of other neutral and charged particles await discovery at many experimental facilities. The new particles in the second scenario have far weaker cross-sections for direct and indirect detection via their gauge interactions, which are either momentum-dependent or second-order. However, as we point out here, they should have much stronger interactions via the Higgs. We estimate that their interactions with fermions will then be comparable to (although not equal to) those of neutralinos with a corresponding Higgs interaction. It follows that these newly proposed dark matter particles should be within the reach of emerging and proposed facilities for direct, indirect, and collider-based detection.

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