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A Minimal Model For Two-Component FIMP Dark Matter: A Basic Search

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In the multi-component configurations of dark matter phenomenology, we propose a minimal two-component one which is an extension
of the Standard Model with only three new fields; one scalar and one
fermion interact with the thermal soup through Higgs portal mediated
by the other scalar in such a way that the stabilities of dark matter candidates are made simultaneously by an explicit Z2 symmetry. Against
the most common freeze-out framework, we look for dark matter particle signatures in the freeze-in scenario by evaluating the relic density
and detection signals. A simple distinguishing feature of the model
is the lack of dark matter conversion, so the dark matter components
act individually and the model can be adapted entirely to both singlet
scalar and singlet fermionic models, separately. We find dark matter
self-interaction as the most promising approach to probe such feeble
models. Although, the scalar component adopts this constraint, the
fermionic one refuses it even in the resonant region.

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