

Two component WIMP–FlmP dark matter model with singlet fermion, scalar and pseudo scalar

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We explore a two component dark matter model with a fermion and a scalar. In this scenario the Standard Model (SM) is extended by a fermion, a scalar and an additional pseudo scalar. The fermionic component is assumed to have a global $U(1)_{DM}$ and interacts with the pseudo scalar via Yukawa interaction while a Z_2 symmetry is imposed on the other component –the scalar. These ensure the stability of both dark matter components. Although the Lagrangian of the present model is CP conserving, the CP symmetry breaks spontaneously when the pseudo scalar acquires a vacuum expectation value (VEV). The scalar component of the dark matter in the present model also develops a VEV on spontaneous breaking of the Z_2 symmetry. Thus the various interactions of the dark sector and the SM sector occur through the mixing of the SM like Higgs boson, the pseudo scalar Higgs like boson and the singlet scalar boson. We show that the observed gamma ray excess from the Galactic Centre as well as the 3.55 keV X-ray line from Perseus, Andromeda etc. can be simultaneously explained in the present two component dark matter model and the dark matter self interaction is found to be an order of magnitude smaller than the upper limit estimated from the observational results.

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