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Freeze-in sterile neutrino dark matter in a class of U(1)′ models with inverse seesaw

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We consider a general, anomaly free U(1)′ extension of the Standard Model (SM) where the neutrino mass is generated at tree level from the inverse seesaw mechanism.
After U(1)′ symmetry breaking the mass of a neutral beyond the SM (BSM) gauge boson (Z') is originated which can be produced it at high energy colliders.
The model contains three generations of heavy neutrinos which can interact with Z' and could be produced in pair at colliders.
A trilepton signature is very unique and clean when such pair production occurs at electron positron colliders from a TeV scale Z'.
In this model we assign one pair of the degenerate sterile neutrinos as Dark Matter (DM) candidate whose relic density is generated by freeze-in mechanism. To reproduce the correct relic abundance we consider different mass regimes of the DM candidate and the Z'. The production of DM can occur at different reheating temperatures in various scenarios depending on Z' and DM masses. Additionally, if the DM mass is greater than 1 MeV and Z' is heavier than DM, the DM may decay into positron explaining the galactic 511 keV line in the Milky Way observed by the INTEGRAL satellite.

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