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Effects on the WIMPs capture efficiency in the neutron star temperature surface

Surface temperatures of neutron star have been used as a probe for weakly interacting dark matter (WIMPs) models. While this is masked by a variety of heat sources at young age, in later stages of neutron stars the capture of dark matter by the star, after thermalization, renders a steady state and becames equal to photon emission. In this way, the heat generate by dark matter can rise the internal temperature, which is in turn reflected by the surface temperature . We study the framework of contact operators which are applicable for the DM capture in the limit that the transfer momentum is small compared to any intermediate particles. We also take into account the vector-vector interaction between dark matter and neutrons within a fermionic dark matter model. This kind of operators is spin-independent (and thus have a much better chance of first direct detection discovery), have a cutoff scale lambda and quark Yukawa coupling as required by minimal flavor violation. We find that the surface temperature of neutron star due this mechanism is reduced and constrain the cutoff lambda using the collider condition.

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