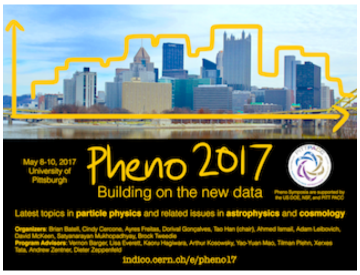

Contribution ID: **253** Type: **parallel talk**

Revisiting Supernova 1987A Constraints on Dark Photons

Monday 8 May 2017 17:00 (15 minutes)

We revisit constraints on dark photons with masses below ~ 100 MeV from the observations of Supernova 1987A. If dark photons are produced in sufficient quantity, they reduce the amount of energy emitted in the form of neutrinos, in conflict with observations. For the first time, we include the effects of finite temperature and density on the kinetic-mixing parameter, ε, in this environment. This causes the constraints on ε to weaken with the dark- photon mass below ~ 15 MeV. For large-enough values of ε, it is well known that dark photons can be reabsorbed within the supernova. Since the rates of reabsorption processes decrease as the dark-photon energy increases, we point out that dark photons with energies above the Wien peak can escape without scattering, contributing more to energy loss than is possible assuming a blackbody spectrum. Furthermore, we estimate the systematic uncertainties on the cooling bounds by deriving constraints assuming one analytic and four different simulated temperature and density profiles of the proto-neutron star. Finally, we estimate also the systematic uncertainty on the bound by varying the distance across which dark photons must propagate from their point of production to be able to affect the star. This work clarifies the bounds from SN1987A on the dark-photon parameter space.

Summary

Updated constraints on dark photons from SN1987A with thermal effects.

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