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Constraining sterile neutrinos with lyman alpha forest

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We reconsider the problem of determining the warmness of dark matter from the growth of large scale structures. In particular, we have re-analyzed the previous work of Viel et al 2013, based on high resolution Lyman-alpha forest spectra. In fact, the flux power spectrum exhibits a cut-off below ~ 1.5 Mpc/h, this may be explained by the temperature of the intergalactic medium (IGM) or be due to the free-streaming of dark matter particles. We show that if the IGM temperature at high redshifts was low enough (rising at later times) then the data indeed prefer warm dark matter. Assuming this broader range of thermal histories, we find that mWDM >= 2.1 keV for thermal relic at 95% CL (mNRP >= 12 keV for non-resonantly produced sterile neutrino). We discuss an independent method that would allow to exclude the influence of WDM on observable small-scale structures, or would lead to the discovery of WDM. We also determine values of lepton asymmetry making resonantly produced 7 keV sterile neutrinos consistent with the data.

Author: Dr GARZILLI, Antonella (Leiden University)

Co-authors: RUCHAYSKIY, Oleg (Ecole Polytechnique Federale de Lausanne (CH)); BOIARSKYI, Oleksii (Leiden University (NL))

Presenter: Dr GARZILLI, Antonella (Leiden University)

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