COSMOLOGICAL CONSEQUENCES OF AN UNSTABLE HEAVY NEUTRINO

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In a recent paper Simpson has reported evidence for a heavy neutrino of about 17.1 kev mass. Cosmological bounds on stable neutrino species imply that this neutrino [ν_H] must be unstable. The most likely decay mode $\nu_H \rightarrow \nu_L + f$ where ν_L is a light neutrino and f is a scalar boson leads to a cosmological scenario which is quite different from the conventional picture. In this scenario universe becomes matter dominated at a redshift of $z \sim 10^7$ and becomes radiation dominated [by the decay product ν_L of ν_H] at $z \sim 310$. The kinematic constraints on the lifetime of ν_H do not lead to any contradictions. On the other hand, growth of baryonic perturbations is severely limited in this model due to two reasons: (i) virtually no growth can take place in the radiation dominated region $z \leq 310$. (ii) Decay of ν_H is likely to disrupt and smoothen out past growth by a large factor. It is doubtful whether a simple way out of this difficulty exists.

Reference.

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