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Light WIMPs And Equivalent Neutrinos

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The presence of light WIMPs modifies the early Universe energy and entropy densities, changing the early evolution of the Universe as probed, for example, by the cosmic microwave background radiation (CMB) and big bang nucleosynthesis (BBN). For observables related to BBN and the CMB, there are degeneracies among the WIMP mass (m_χ), the number of equivalent neutrinos (ΔN_ν), the effective number of neutrinos (N_{eff}), and the baryon-to-photon ratio (η_B). For example, light WIMPs that couple electromagnetically can lead to $N_{eff} < 3$ even if $\Delta N_\nu > 0$, while those that couple only to neutrinos can lead to $N_{eff} > 3$ even if $\Delta N_\nu < 0$. Since BBN and the CMB provide independent, complementary probes, they may used to constrain these parameters. In this talk I will compare the parameter constraints from BBN with those from the CMB and use this comparison to set a lower bound to the WIMP mass.

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