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BBN photodisintegration limits on relics decaying into neutrinos.

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Constraints on dark sector particles decaying into neutrinos typically focus on their impact on the effective number of relativistic species, N_{eff} , in the early Universe. However, for heavy relics with longer lifetimes, constraints mainly arise from the photo-disintegration of primordial abundances. The high-energy neutrinos injected by the decay can interact with both the thermal neutrinos and other high-energy neutrinos. Among these interactions, annihilations into electromagnetic particles will induce an electromagnetic cascade that affects the abundances of the already formed light elements via photo-disintegration. In this work, we present constraints on these dark sector particles. Specifically, we implement a Monte Carlo code to simulate the electromagnetic cascade, instead of solving the full set of Boltzmann equations. We find improved bounds on the particle's lifetime, abundance, and mass.

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