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BBN constraints on massive 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 and hadro-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 and hadronic particles will induce electromagnetic and hadronic cascades that affect the abundances of the already formed light elements. In this work, we present new constraints on these dark sector particles. We find improved bounds on the particle's lifetime, abundance, and mass.

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