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Cosmological constraints on the neutron lifetime

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We show how to derive new constraints on the neutron lifetime based on cosmological observations. Under the assumption of standard Big Bang Nucleosynthesis, the abundance of light elements, in particular Helium, is strongly dependent on the neutron lifetime. From CMB anisotropies it is possible to constrain primordial abundances of light elements, inferring the value of the neutron lifetime. We start considering recent Planck 2015 results of temperature and polarization anisotropies of the CMB. We show how including direct astrophysical measurements of primordial Helium abundance it is possible to obtain stringent constraints on the neutron lifetime. Furthermore, we compute the neutron lifetime theoretical expectation and we compare this value with our results, with the value quoted by the Particle Data Group and with the ones obtained in bottle method" andbeam method" experiments. Finally, we perform forecasts on different future CMB experiments. We highlight the high precision that can be reach from these experiments, such as CMB surveys as COrE+, in combination with a weak lensing survey as EUCLID, that could constrain the neutron lifetime up to a ~ 6 s precision.

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