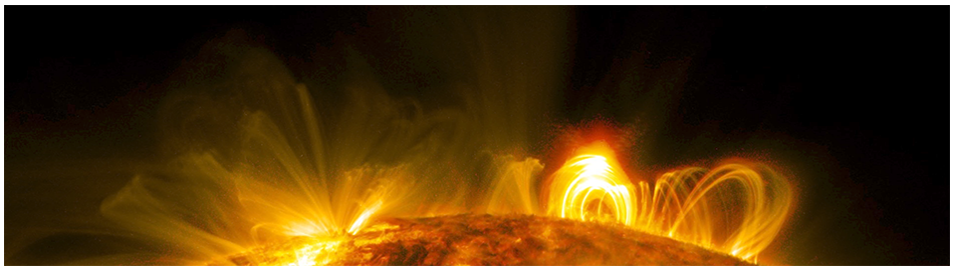

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Effects of magnetic fields on primordial abundance evolution

Wednesday 17 November 2021 09:45 (1 hour)

Various effects of primordial magnetic fields (PMFs) on nuclear abundances are reported. It has been known that a strong PMF enhances the cosmic expansion rate and distribution functions of electrons and positrons in the early universe. Therefore, primordial nuclear abundances are a probe of the PMF during the big bang nucleosynthesis (BBN). A fast expansion due to the magnetic field energy density results in more abundant relic neutrons at the primordial helium synthesis than in standard BBN. This large neutron abundance results in a stronger destruction of 7Be via the 7Be(n,p)7Li(p,alpha) reaction sequence [1]. Although the primordial Li abundance is reduced by the efficient 7Be destruction, the degree of the reduction is limited by significant effects on D and 4He abundances. A recent calculation of BBN under inhomogeneous PMFs shows that the effects on nuclear abundances significantly depend on the spatial distribution of the PMF amplitude [2]. Long after the BBN, the cosmological structure formation progresses. If there is a PMF with a comoving intensity of nano-Gauss over small structure scales, it affects motions of charged particles including Li+ ions [3]. As a result, abundances of chemical species as well as the baryonic density can evolve inhomogeneously under PMFs. This can give a solution to the cosmic Li problem, that is, a discrepancy in Li abundance between observations of metal-poor stars and the standard BBN prediction [3,4].

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