

## Abstract

According to the standard cosmology, near the last scattering surface at a temperature of the order of 0.3 eV, the scattered photons via Compton scattering are just linearly polarized and then the primordial circular polarization of the CMB photons is zero. In this work we show that CMB polarization obtain a small circular polarization component if one extend the standard model by considering nonzero backgrounds coming from noncommutativity or Lorentz violation corrections. The Compton scattering of a electron with the CMB photons calculated in these backgrounds gives new corrections where can produce nonzero sources for the transport equation of the Stokes parameter  $V$  which shows a non-vanishing circular polarization. It is also shown that the Compton scattering calculated in a small magnetic field background can also generates such a circular polarization. Such a small magnetic field is already assumed to be present prior to the recombination era. The existence of circular polarization for the CMB radiation may be verified during future observation programs which is a new channel in order to detect new physics in the sky.