

Simultaneous determination of the cosmic birefringence and miscalibrated polarization angles

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We show that the cosmic birefringence and miscalibrated polarization angles can be determined simultaneously by cosmic microwave background (CMB) experiments using the cross-correlation between E - and B -mode polarization data. This is possible because the polarization angles of the CMB are rotated by both the cosmic birefringence and miscalibration effects, whereas those of the Galactic foreground emission are rotated only by the latter. Our method does not require prior knowledge of the E - and B -mode power spectra of the foreground emission, but uses only the knowledge of the CMB polarization spectra. Specifically, we relate the observed EB correlation to the difference between the observed E - and B -mode spectra in the sky, and use different multipole dependences of the CMB (given by theory) and foreground spectra to derive the likelihood for the miscalibration angle α and the birefringence angle β . We show that a future satellite mission similar to LiteBIRD can determine β with a precision of 6 arcmin.

Presenter: Dr MINAMI, Yuto (KEK)

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