Contribution ID: **67** Type: **not specified**

# Towards ending the partial-sky E-B ambiguity in CMB observations

*Thursday, 3 December 2020 11:35 (25 minutes)*

A crucial problem for part-sky analysis of CMB polarization is the E-B leakage problem. Such leakage arises from the presence of ambiguous' modes that satisfy properties of both E and B modes. Solving this problem is critical for primordial polarization B mode detection in part-sky CMB polarization experiments. In this work we introduce a new method for reducing the leakage. We demonstrate that if we complement the E-mode information outside the observation patch with ancillary data from full-sky CMB observations, we can reduce and even effectively remove the E-to-B leakage. For this objective, we produce E-mode Stokes QU maps from Wiener filtered full-sky intensity and polarization CMB observations. We use these maps to fill the sky region that is not observed by the ground-based experiment of interest, and thus complement the part-sky Stokes QU maps. Since the E-mode information is now available on the full sky we see a significant reduction in the E-to-B leakage. We evaluate on simulated data sets the performance of our method for ashallow' fsky=8%, and a 'deep' fsky=2% northern hemisphere sky patch, with AliCPT-like properties, by combining those observations with Planck-like full sky polarization maps. We find that our method outperforms the standard and the pure-B method pseudo-C_\ell estimators for all of our simulations. Our new method gives unbiased estimates of the B-mode power spectrum with near-optimal errors. We also study the application of our method to the CMB-S4 experiment combined with LiteBIRD-like full sky data, and show that using signal-dominated full sky E-mode data we can eliminate the E-to-B leakage problem.

**Presenter:** Dr GHOSH, Shamik (University of Science and Technology of China)

**Session Classification:** 12. method: analysis 4