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CMB Tomography: Reconstruction of Adiabatic Primordial Scalar Potential Using Temperature and Polarization Maps. AMIT P. S. YADAV, BENJAMIN D. WANDELT, University of Illinois at Urbana-Champaign — Assuming linearity of the perturbations at the time of decoupling, we reconstruct the primordial scalar potential from the temperature and polarization anisotropies in the cosmic microwave background radiation. In doing so we derive an optimal linear filter which, when operated on the spherical harmonic coefficients of the anisotropy maps, returns an estimate of the primordial scalar potential fluctuations in a spherical slice. The reconstruction is best in a thick shell around the decoupling epoch; the quality of the reconstruction depends on the redshift of the slice within this shell. With high quality maps of the temperature and polarization anisotropies it will be possible to obtain a reconstruction of potential fluctuation on scales between $\ell = 2$ and $\ell \sim 300$ at the redshift of decoupling, with some information about the three-dimensional shapes of the perturbations in a shell of width 250Mpc. The main motivation for reconstructing primordial perturbations is to study the non-Gaussianities in the initial conditions. Reconstruction allows us to be more sensitive to the primordial perturbations, which is important because current detections of non-Gaussianity do not specifically select for the primordial perturbations.

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