Abstract Submitted
for the APR08 Meeting of
The American Physical Society

Effects of a Primordial Magnetic Field on Low and High Multipoles of the CMB GRANT MATHEWS, Univ. Notre Dame, DAI YAMAZAKI, TOSHITAKA KAJINO, NAOJ, KIYOTOMO ICHIKI, RESCEU, Univ. Tokyo —
The existence of a primordial magnetic field (PMF) would affect both the temperature and polarization anisotropies of the cosmic microwave background (CMB). It also provides a plausible explanation for the possible disparity between observations and theoretical fits to the CMB power spectrum. Here we report on numerical calculations of the CMB power spectrum and analyze the correlations between the CMB power spectrum from the PMF and the primary curvature perturbations. We deduce a precise estimate of the PMF effect on all modes of perturbations. We find that the PMF affects not only the CMB TT and TE modes on small angular scales, but also on large angular scales. The introduction of a PMF leads to a better fit to the CMB power spectrum for the higher multipoles, and the fit at lowest multipoles can be used to constrain the correlation of the PMF with density fluctuations for large negative values of the spectral index. Our prediction for the BB mode for a PMF average field strength of $|B_\lambda| = 4.0$ nG is consistent with the upper limit on the BB mode deduced from the latest CMB observations. We find that the BB mode is dominated by the vector mode of the PMF for higher multipoles. We also show that by fitting the complete power spectrum one can break the degeneracy between the PMF amplitude and its power spectral index.

Grant Mathews
Univ. Notre Dame

Date submitted: 11 Jan 2008 Electronic form version 1.4