

Abstract Submitted
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Evidence for a Primordial Magnetic Field from the CMB Polarization and Power Spectra¹ GRANT MATHEWS, University of Notre Dame, DAI YAMAZAKI, TOSHITAKA KAJINO, NAOJ, KIYOTOMO ICHIKI, Nagoya University — Magnetic fields play an important role in many astronomical phenomena on various cosmological scales. In particular, a primordial magnetic field (PMF) could manifest itself in the cosmic microwave background (CMB) temperature and polarization anisotropies, and also in the formation of large-scale structure. We have developed a new high-precision theoretical framework in which to calculate the CMB temperature and polarization anisotropies, along with the matter power spectrum generated when a power-law PMF is present at the epoch of photon last-scattering. We discuss preliminary evidence that the existing accumulated data on both the matter and CMB power spectra on small angular scales fixes both the upper and lower limits to the magnetic field strength and power spectral index. We find parameter values for the amplitude of the PMF of $2.248 \text{ nG} < B < 3.055 \text{ nG}$ and a spectral index in the range $-2.387 < n < -1.367$ at the present scale of 1 Mpc. This may be the first direct evidence that a primordial magnetic field was indeed present during the big bang.

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