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New Limits on Small-Scale Turbulence in the Solar Corona
STEVEN SPANGLER, LAURA SPITLER, University of Iowa — Many observed characteristics of the solar corona are interpreted as heating by ion cyclotron waves. Intense electromagnetic plasma waves, with wavelengths of the order of the ion inertial length or smaller, can be detected via a phenomenon called Faraday screen depolarization (Spangler and Mancuso, ApJ 530,491,2000). The fine scale turbulent magnetic field randomizes the Faraday rotation within the beam of a radio telescope, causing a decrease in the degree of linear polarization. We present new observations specifically intended to measure this effect. Observations were made with the Very Large Array radiotelescope on August 16 and 18, 2003, of the extended radio source 3C228 when it was occulted by the corona. The line of sight to the source passed at a heliocentric distance of $6.2R_\odot$ on August 16, and $4.7R_\odot$ on August 18. No indication is seen of depolarization by the corona. On August 16, the most conservative limit is that the degree of polarization is ≥ 0.75 of its intrinsic value. A more likely limit is that the degree of polarization with the corona interposed is ≥ 0.85 that in the absence of the corona. Even stronger limits are obtained on August 18. We discuss the implications of these measurements for the amplitude and outer scale of Alfvén-Ion Cyclotron turbulence in the corona.

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