Abstract Submitted
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Evidence of high-frequency/small-scale turbulence in the Cygnus region and anomalous Faraday rotation[1] MIKHAIL V. MEDVEDEV, University of Kansas — Faraday effect — a common and useful probe of cosmic magnetic fields — is the result of magnetically-induced birefringence in plasmas causing rotation of the polarization plane of a linearly polarized electromagnetic wave. Classically, the rotation angle scales with the wavelength as $\Delta\phi = RM\,\lambda^2$, where RM is the rotation measure. Although a typical RM in the Milky Way is of the order of a few hundred to a few thousand, a famous Cygnus region shows anomalously small, even negative rotation measures. Moreover, Faraday rotation measurements seem to be inconsistent with the standard λ^2-law. We argue that fast micro-turbulence can cause this anomaly. We demonstrate that electromagnetic high-frequency and/or small-scale fluctuations can lead to effective plasma collisionality by scattering electrons over pitch-angle. We show that such quasi-collisionality radically alters Faraday rotation and other radiative transport properties, e.g., absorption, transmission and reflection. Thus, we explain the Cygnus puzzle by anomalous Faraday rotation in a thin "blanket" of highly turbulent plasma at the front of an interstellar bubble/shock.

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