

Abstract Submitted
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Remote Sensing of Electrical Currents in Astrophysical Plasmas¹

STEVEN SPANGLER, University of Iowa — Galvanometry is usually considered a local lab measurement carried out with electrical circuits. Electrical currents must flow in astrophysical plasmas like the solar corona, the interstellar medium, and the plasma “atmospheres” of clusters of galaxies (intracluster media), but it would seem to be nearly impossible to measure them. Remote measurements of electrical currents in astrophysical plasmas are possible, using observations of Faraday rotation with a radio telescope such as the Very Large Array. Faraday rotation is a rotation in the plane of polarization of a linearly polarized electromagnetic wave due to propagation through a ionized gas with a magnetic field. Differential Faraday rotation, or the difference in the Faraday rotation between two adjacent lines of sight, gives a quantity which is very close to the integral in Ampere’s Law (Spangler, *Astrophysical Journal* 670, 841, 2007). Application of this technique to observations through the solar corona yields currents as high as 2.5 Giga-Amperes flowing in an Amperian Loop with sides separated by 33,000 km. I will discuss the extension of this technique to other astrophysical plasmas that can be probed by the Very Large Array.

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