

Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Method for determining k-vector of a wave by a single spacecraft¹

PAUL BELLAN, Caltech — A practical method² is described for determining the 3D wave-vector of quasi-neutral plasma waves using magnetic field and electric current density measurements made by a single spacecraft. This wave-vector knowledge can then be used to remove the space-time ambiguity produced by frequency Doppler shift associated with spacecraft motion so the actual plasma-frame wave dispersion relation is determined with no theoretical assumptions. The method involves applying the Wiener-Khinchin theorem to cross-correlations of the current and magnetic field oscillations and to auto-correlations of the magnetic field oscillations; the wave-vector is proportional to the ratio of the Fourier transforms of these cross- and auto-correlations. The method requires that each wave frequency component map to a unique wave-vector, a situation presumed true in many spacecraft measurement situations. Synthetic data examples that validate the method are presented. The method has recently been used successfully on data from the MMS spacecraft³.

¹Supported by DOE, NSF, and AFOSR

²P. M. Bellan, JGR-Space Phys. 121, 8589 (2016).

³D. Gershman et al., Nature Comm. 8, 14719 (2017).

Paul Bellan
Caltech

Date submitted: 06 Jun 2017

Electronic form version 1.4