Geophysical Research Abstracts
Vol. 14, EGU2012-8711, 2012
EGU General Assembly 2012

Effects of "shot" noise on excitation of the small-scale electromagnetic fluctuations in the inner heliosphere: hybrid modeling

A.S. Lipatov (1), E.C. Sittler Jr. (2), R.E. Hartle (2), and J.F. Copper (2)
(1) GPHI UMBC/NASA GSFC, Code 673, Greenbelt, MD 20771, USA, (2) NASA GSFC, Greenbelt, MD 20771, USA

The hybrid kinetic model of the interaction of the solar wind (SW) with the Solar Probe Plus spacecraft (SPPSC) shows the excitation of the short-wave electromagnetic perturbations in the inner heliosphere [1]. The modeling also demonstrates the excitation of strong electromagnetic perturbations ($\delta E \approx U \times B/c$) on the spatial scale of about 1 m in the SW due to the “shot" noise even in the absence of the SPPSC [1]. The “shot" noise effect is well known in the plasma numerical modeling [2], and it may be important for wave-particle interactions e.g. it may cause an algebraic grow in the tearing instability [3]. We shall discuss the effects of “shot" noise at different distances from the Sun and their consequences on the solar wind dynamics. We shall compare the results of modeling with theoretical investigation of the small-scale electromagnetic fluctuations [4,5]. These effects must be taken into account in the course of electromagnetic measurements planned for the future Solar Probe Plus and Solar Orbiter missions.

References

[1] Lipatov, A.S., Sittler Jr., E.C., Hartle, R.E., Cooper, J.F., Short wave-length electromagnetic perturbations excited near the Solar Probe Plus spacecraft in the inner heliosphere: 2.5D hybrid modeling, Planet. Space Sci., 2011, doi:10.1016/j.pss.2011.12.008.

[2] Birdsall, C.K., Langdon, A.B., Okuda, H., Finite-Size Particle Physics Applied to Plasma Simulation. In: Methods in Computational Physics. Plasma Physics. Vol. 9, ed. by B. Alder, S. Fernbach, M. Rotenberg (Academic Press, New York and London) p. 241, 1970.

[3] Lipatov, A.S., Zelenyi, L.M., The study of magnetic islands dynamics, Plasma Physics, 24(9), 1065, 1982.

[4] Gary, P.S., Smith C.W., Short-wavelength turbulence in the solar wind: Linear theory of whistler and kinetic Alfvén fluctuations, J. Geophys. Res., 114, A12105, doi:10.1029/2009JA014525, 2009.

[5] Ruiz, M.E., Dasso, S., Matthaeus, W.H., Marsch, E., Weygand, J.M., Aging of anisotropy of solar wind magnetic fluctuations in the inner heliosphere, J. Geophys. Res., 116, A10102, doi:10.1029/2011JA016697, 2011.