

Abstract Submitted  
for the DPP15 Meeting of  
The American Physical Society

**Foreshock magnetic structure ahead of a laser-driven shock wave**

ROBERT CROWSTON, University of York, H. DOYLE, G. GREGORI, J. MEINECKE, A.R. BELL, University of Oxford, Y. KURAMITSU, National Central University, Taiwan, H. TAKABE, T. MORITA, T. SANO, T. MORITAKA, Y. YAMURA, T. ISHIKAWA, Osaka University, H. YONEDA, University of Electromicronics, Chofu, A. PELKA, École Polytechnique, NIGEL WOOLSEY, University of York — The Earth's bow shock contains many wave species that propagate upstream from the shock, against the incoming flow. The mechanism by which these waves are produced remains an open problem. Here, we present an experiment for studying one proposed excitation mechanism. A shock is launched by laser irradiation of a carbon pin immersed in a nitrogen gas. A shock forms, propagates parallel to an externally imposed magnetic field and is diagnosed using interferometry, streaked optical emission imaging and a three axis induction coil. Imaging aids establishing the shock conditions and the induction coil data is used to infer the time evolution of magnetic fields. Analysis extracts the frequency, amplitude and polarisation of magnetic waves arriving ahead of the shock. The results are consistent with instabilities and magnetic waves driven by warm electrons generated at the shock mixing with cold electrons. These waves propagate along magnetic field lines, transport energy and matter ahead of the shock ultimately resulting in an extended foreshock consisting of shock-reflected ions and electrons.

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Date submitted: 24 Jul 2015

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