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Chapman-Ferraro-like magnetopause in the laboratory

R. PRESURA, V.V. IVANOV, A. ESAULOV, Y. SENTOKU, V.I. SOTNIKOV, J. FUCHS¹, N. LE GALLOUDEC, P.J. LACA, A.L. ASTANOVITSKIY, B. LE GALLOUDEC, C. PLECHATY, B. GOETTLER, R.J. HALL, A. CLINTON, T. COWAN, University of Nevada, Reno, W. HORTON, C. CHIU, T. DITMIRE, University of Texas, Austin — A laboratory simulation of the interaction of the solar wind with the earth's magnetosphere is presented. The plasma wind was created ablating a solid CH₂ target with up to 0.1PW/cm² pulses of the “Tomcat” Nd:glass laser. Azimuthal magnetic fields with strength up to 20 T were generated by high current discharges of the “Zebra” pulsed-power generator. A dynamic boundary layer with steep density gradient forms at the plasma-field interface. It acts as a piston and has the potential of launching collisionless shocks into the continuing plasma flow from the laser focus region. Features of the plasma expansion in the external magnetic field are well reproduced by 3D-ideal-MHD modeling. A fully particle approach is needed to understand the plasma dynamics, particularly the plasma expansion beyond the stopping point predicted by ideal MHD. Work supported by DOE/NNSA under UNR grant DE-FC52-01NV14050.

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