Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

Speed of Opening a Relativistically Transparent Channel in an Overdense Plasma by a Linearly Polarized Wave MIN SUP HUR, YOUNG-KUK KIM, UNIST, VICTOR KULAGIN, Moscow State University, HYYONG SUK, APRI, GIST — We investigated by theory and simulations how fast a relativistically transparent channel is opened by a linearly polarized relativistic laser pulse in an overdense plasma, which is classically opaque. The relativistic transparency has been well known: the dispersion relations were revealed for various steady states. However, as long as we understand, the answer to the question 'how the relativistic channel is formed dynamically from an opaque plasma' has not been so clear. In this work, we focused on finding analytically the speed of such a channel opening. By employing the 'channel-opening-time' concept, we could derive semi-analytically a simple formula, which showed excellent agreement with the one-dimensional PIC simulations. The theory was successfully applied in predicting the pulse shape after the interaction of an ultraintense linear polarized laser pulse and a thin foil both in one- and two-dimensional systems.

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Date submitted: 20 Jul 2011 Electronic form version 1.4