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**Instabilities of Relativistic Electron Beams in Plasmas: Spatial Growth and Absolute Instability** R.W. SHORT, J. MYATT, Laboratory for Laser Energetics, U. of Rochester — Proposals for the fast-ignition approach to laser fusion usually depend on the propagation of relativistic electron beams through a plasma from densities near critical where the beam is created by a short-pulse laser, to the compressed core density where the beam deposits its energy. Such beams can be disrupted by the growth of small-scale instabilities such as filamentation and the two-stream instability. Previous treatments of these instabilities have developed dispersion relations assuming real perturbation wave vectors and calculated temporal growth rates.[1] Here the dispersion relation is generalized to complex wave vectors, allowing calculations of spatial growth and absolute instability, as well as mixed filamentation/two-stream instabilities, which grow at an angle to the electron beam. Examples of spatial growth rates, absolute instability thresholds, and transitions from pure to mixed-form instability are shown for some situations relevant to fast ignition. This work should be useful in benchmarking and optimizing codes such as *LSP*, as well as aiding conceptual understanding of the basic physics and behavior of these instabilities. This work was supported by the U.S. Department of Energy Office of Inertial Confinement Fusion under Cooperative Agreement No. DE-FC52-92SF19460.

[1]L. Gremillet, G. Bonnaud, and F. Amiranoff, Phys. Plasmas **9**, 941 (2002).

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