Abstract Submitted
for the DPP09 Meeting of
The American Physical Society

Shock Wave Structure in a Fully Ionized Plasma THOMAS MASSER, JOHN WOHLBIER, ROBERT LOWRIE, Los Alamos National Laboratory — We study the structure of planar shock waves in a two-temperature model of a fully ionized plasma that includes electron heat conduction and energy exchange between electrons and ions. For steady flow in a reference frame moving with the shock, the model reduces to an autonomous system of ordinary differential equations which can be numerically integrated. A phase space analysis of the ODEs provides additional insight into the structure of the solutions. For example, below a threshold mach number the model produces fully dispersed shocks; while above the threshold, the solutions contain embedded hydrodynamic shocks. We also find that the ion temperature may continue to increase after the shock and reaches a maximum near the isothermal sonic point. We summarize the methodology for solving for two-temperature shocks, and show results for several values of shock strength and material parameters to quantify the shock structure and explore the range of possible solutions. Such solutions may be used to verify hydrodynamic codes that use similar plasma physics models.

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Date submitted: 17 Jul 2009 Electronic form version 1.4