Abstract Submitted
for the SHOCK11 Meeting of
The American Physical Society

Shock Physics Analysis to Support Optical Signature Prediction in Hypervelocity Impacts AARON J. WARD, ROBERT P. NANCE, JOHN R. COGAR, Corvid Technologies, JOSEPH J. MACFARLANE, Prism Computational Sciences, WILLIAM D. REINHART, Sandia National Laboratories, THOMAS F. THORNHILL, Ktech Corporation, JACOB GRUN, Naval Research Laboratory, ROBERT LUNSFORD, Research Support Instruments — In a recent series of light-gas-gun experiments performed at Sandia National Laboratories, aluminum projectiles impacted titanium alloy plates at 6 km/s, with a variety of witness plates downstream. The radiative characteristics of the target debris cloud were measured using a combination of time-resolved visible emission spectroscopy and high-speed wavelength-filtered camera imagery. This paper will describe the analyses performed in support of the test series using the CTH shock-physics package from Sandia, discuss the methodology developed to port CTH results into radiation-physics codes, and provide comparisons between CTH results and experimental observations of debris-cloud shape. The combination of high-fidelity shock-physics analysis and high-fidelity spectral analysis of the shock-physics results represents a first-principles approach toward optical signature prediction in hypervelocity impacts. Details on the radiation analysis techniques and results will be presented in a companion paper.

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Date submitted: 07 Mar 2011 Electronic form version 1.4