Abstract Submitted
for the SHOCK11 Meeting of
The American Physical Society

Deceleration of Projectiles in Sand STEPHAN BLESS, Institute for Advanced Technology, WILLIAM COOPER, Air Force Research Laboratory, ZACH STONE, Institute for Advanced Technology, KEIKO WATANABE, Osaka University, ROBERT PEDEN, Institute for Advanced Technology, AIR FORCE RESEARCH LABRATORY, EGLIN AFB COLLABORATION, INSTITUTE FOR ADVANCED TECHNOLOGY - UT AUSTIN COLLABORATION, DEPARTMENT OF PHYSICS - UT AUSTIN COLLABORATION, OSAKA UNIVERSITY COLLABORATION — Deceleration of projectiles has been measured for hemispherical and conical nose shapes penetrating granular media. Targets were beds of Ottawa sand and Eglin sand. The velocity range extended up to 600 m/s. Projectiles were rigid metals. Deceleration was measured by conventional time-of-arrival screens plus several innovative techniques: embedded EM coils, embedded optical fibers, and a photonic Doppler velocimeter (PDV), which observed the rear surface of the penetrator. Experimental parameters that were varied included velocity (from 300 to 600 m/s), sand density, and scale (from 5 mm to 25 mm). In this paper we will compare these various measurement techniques and we will show how the cavity geometry (cavitation and crushed veins of sand) and retarding stress $(MdV/dt)/A$vary with velocity, scale, and density.

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Date submitted: 18 Feb 2011 Electronic form version 1.4