Title: Proton Radiography of Shape Charge Jets Penetrating Teflon and Explosive

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Proton Radiography of Shape Charge Jets Penetrating Teflon and Explosive

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We have used the proton radiography capability at the Los Alamos Neutron Science Center to observe viper shaped charge jets penetrating inert and explosive materials. A viper jet was observed penetrating Teflon in one case and PBX 9501 in the second case. Radiographs captured the penetration events at several times and are analyzed to determine the density of the materials imaged at each time. The interfaces and shock waves in the flow are clearly evident in the images and the multiple time images allow the determination of the velocities of the interfaces and shock waves. Comparisons are made in the Teflon case with estimates of penetration rates and densities using quasi-steady approximation analysis used in many terminal ballistics models. The PBX 9501 case clearly detonated from the impact of the shape charge jet tip traveling at 9.1 mm/µs. The detonation wave is examined to see what support it obtains from the pursing jet and the jet is examined to find the influence of the explosive products on penetration velocity. This experiment gives us experimental results of in-situ penetration process and results that can be used to verify common modeling techniques and fluid mechanic calculations of the penetration process.