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Accuracy and Sensitivity of Hugoniot Measurements at Ultrahigh Pressures W.J. NELLIS, Harvard University, Cambridge MA 02138 — Achieving ultrahigh shock pressures is straight forward. However, Hugoniot measurements at ultrahigh pressures have neither the accuracy nor the sensitivity to provide useful information about physical phenomena. Be, Al, Cu, Fe, and Mo, for example, have calculated maximum compressions on the Hugoniot of 4.6 to 5.7 fold of initial crystal density at shock pressures of 20 to 100 TPa (100 TPa=1000 Mbar) (1). However, Hugoniot experiments are performed in shock velocity-mass velocity, $u_s(u_p)$, space. At 5 fold compression, the uncertainty in compression is 4-fold that in measured u_s. Above a shock pressure of ∼TPa, shock and mass velocities are related by u_s=Su_p. For compressions in the range 4.6 to5.7, S is in the range 1.21<S<1.28. For an ideal gas, limiting shock compression is 4.0 and S=1.33. At ultrahigh shock pressures Hugoniot data have maximum uncertainty and minimum sensitivity to material. To observe such small differences in slope S of $u_s(u_p)$ requires extremely high accuracy in shock velocity measurements, accuracies which do not now exist. (1) B. F. Rozsnyai et al, *Phys. Lett. A* **291** 226 (2001).

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