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**Unreacted Equations of State of Shocked Single Crystal PETN and Beta-HMX**[1] JOSEPH ZAUG, MICHAEL ARMSTRONG, JONATHAN CROWHURST, LOUIS FERRANTI, SORIN BASTEA, LAWRENCE FRIED, LLNL — We report results from ultrafast shockwave experiments conducted on single crystal high explosives. Ultrafast shock studies can enable high throughput characterizations of unreacted equations of state to higher pressures than previously reported and also quantify the magnitude of anisotropic mechanical response to shock waves. Our ultrafast results yield –as of this writing- [110] PETN data up to a pressure of 26 GPa, which is 1.6x higher than published mid-scale gun results. Published HMX shock data are strikingly sparse; seven points up to approximately 10 GPa are reported from shocked solvent-pressed beta-HMX and Robert Craig reported three single crystal points (undisclosed crystal orientation) between 34 and 42 GPa. Two nonhydrostatic cold-compression diamond-anvil cell studies, u-Raman + u-XRD, and u-Raman + deflagration rates, report a transition in HMX, possibly shear induced, beginning at 26-27 GPa. A previously posed question is whether Craig's data are affected by this transition.\pard An analysis of our results for [010] beta-HMX indicate it is less compressible than portrayed by the commonly accepted Hugoniot, which is based on a parameterized third-order Birch-Murnaghan model EoS using the ten before mentioned shock wave measurements and the more recent cold-compression u-XRD study by Yoo et al.

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Joseph Zaug
LLNL

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