Abstract Submitted
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Investigating the Formation and Sub-Structure of Unmagnetized Collisionless Shocks[1] DOUGLASS ENDRIZZI, Univ of Wisconsin, Madison, J. EGEDAL, C. FOREST, S. GREESS, A. MILLET-AYALA, J. OLSON, A. READY, R. WALEFFE, Univ of Wisconsin-Madison, H. GOTA, TriAlphaEnergy — Collisionless shocks, where the shock thickness is much smaller than the collisional mean free path, are ubiquitous astrophysical phenomena. In all shocks, the Rankine-Hugoniot jump conditions are satisfied through entropy generation at the interface; the shock propagation angle with respect to the magnetic field affects the mechanism by which this entropy is generated. Two experiments on the Big Red Ball (BRB) at UW-Madison explored the formation mechanisms of parallel and perpendicular, unmagnetized and magnetized collisionless shocks with large ($1-3\ m$) system sizes. In the first experiment, a $1\ m$ diameter theta-pinch drove a supersonic ($3 < M < 4$) compressive flow perpendicular to the background magnetic field. In the second, a compact toroid ([cite TriAlpha]) was fired supersonically ($4 < M < 5$) parallel to the background magnetic field. Triple, Langmuir, emissive, and magnetic probes were used to measure electron density, temperature, plasma potential, and fluctuations in magnetic fields. Results showing the transition from above to below $M_A = 1$, measurements of electron precursors, exploration of subshock structure, evidence of instabilities in the shock formation process, and future work will be presented.

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