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Invited Lecture

A STUDY OF SUPERSONIC TURBULENCE IN STAGNATING PLASMAS

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Evolution of the ion kinetic energy in a stagnating z-pinch plasma was determined from Doppler-dominated lineshapes augmented by measurements of plasma properties and assuming first a uniform-plasma model. Notably, the energy was found to be dominantly stored in hydrodynamic flow. The Reynolds and Mach numbers are such that this motion could be supersonically turbulent, implying a non-uniform distribution of the plasma density. The data was re-analyzed under this assumption, resulting in a substantially decreased inferred mean density, while improving agreement of the model with observations. Beyond aiding our understanding of z-pinches, it is hoped that this study has highlighted fertile ground for relation to problems of astrophysical interest, such as the star formation efficiency or molecular cloud dynamics.