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Generation of compressible turbulence using lasers as sources of intense energy[1] AGUSTIN MAQUI, DIEGO DONZIS, Texas A&M University — Intense energy from lasers can be used to photo-dissociate molecules, ejecting fragments with extremely high energy. This energy can be in the form of translation (kinetic energy) as well as rotation and vibration for more complex molecular systems. When lasers are used in a flow, "lines" of concentrated kinetic and internal energy are generated. It is of fundamental as well as practical interest to know whether this source of energy is sufficient to generate turbulence downstream of a supersonic flow. Direct numerical simulations (DNS) are used to study how the flow evolves past the photo-excitation of molecules. Convergence studies are carried out to understand the numerical challenges associated with the strong gradients imposed by the intense energy fluctuations. A comprehensive analysis of single, as well as two point statistics is performed to understand the development towards realistic turbulence. The perturbations introduced are fully characterized to analyze how they determine the flow evolution and if the conditions can be replicated within a wind tunnel. Further results and consequences for particular cases realizable in laboratories will be discussed.

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