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Shock-resolving direct numerical simulations of strong turbulence interacting with a normal shock wave[1] CHANG-HSIN CHEN, DIEGO DONZIS, Texas A&M University — In many natural and engineering systems, turbulence is found to interact with shock waves. Thus, canonical interactions between isotropic turbulence and a normal shock have been studied extensively, theoretically and numerically, though theories assume the shock to be a discontinuity and most simulations have used shock-capturing schemes which may miss details of the structure of the shock, especially for weak shocks in relatively strong turbulence. We present results on this regime from shock-resolving direct numerical simulations at a range of Reynolds and Mach numbers. Our focus is on the shock structure and the effect on turbulence downstream of the shock. We study the distribution of velocity gradients, in particular dilatation across the shock and compare with theory available. We characterize turbulent shock jumps which are found to depart from the laminar theory as they depend not only on the mean Mach number but also on the Reynolds and turbulent Mach number. Changes experienced by thermodynamic variables across the shock will also be discussed.

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