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Simulation of Strong Shock and Turbulence Interactions using High-Order Shock-Fitting Algorithms[1] PRADEEP RAWAT, XIAOLIN ZHONG, University of California Los Angeles — We present results for Direct Numerical Simulations (DNS) of interactions of shock waves with realistic isotropic turbulence using shock-fitting schemes that are highly accurate and stable even for very strong shocks. We consider interaction of normal shocks of mean Mach numbers $M_1 = 2 - 20$ with incoming isotropic turbulence of turbulent Mach number, $M_t = 0.12 - 0.38$, and Reynolds number based on Taylor microscale, $Re_\lambda = 7 - 40$. New trends are observed in turbulent statistics for the shocks stronger than those considered in previous studies. Amplifications in streamwise Reynolds stress values downstream of the shock are found to be initially decreasing as Mach number is increased but for stronger than Mach 8 shocks this trend reverses. We also observe that vorticity fluctuations return to isotropy behind the shock, but increasing Mach number of incoming flow delays this return to isotropy. Taylor microscales decrease as flow passes through a shock wave and amplification factors agree well with the linear theory results. Overall, the results generally confirm the findings by earlier studies but show new trends for stronger shocks than those considered by studies in the past.

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