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Turbulent energy flux generated by shock/homogeneous-
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lege Park — High-speed turbulent flows with shock waves are characterized by high
localized surface heat transfer rates. Computational predictions are often inaccurate
due to the limitations in modeling of the unclosed turbulent energy flux in the highly
non-equilibrium regions of shock interaction. In this paper, we investigate the turbu-
lent energy flux generated when homogeneous isotropic turbulence passes through a
nominally normal shock wave. We use linear interaction analysis where the incoming
turbulence is idealized as being composed of a collection of two-dimensional planar
vorticity waves, and the shock wave is taken to be a discontinuity. The nature of
the post-shock turbulent energy flux is predicted to be strongly dependent on the
incidence angle of the incoming waves. The energy flux correlation is also decom-
posed into its vortical, entropy and acoustic contributions to understand its rapid
non-monotonic variation behind the shock. Three-dimensional statistics, calculated
by integrating two-dimensional results over a prescribed upstream energy spectrum,
are compared with available direct numerical simulation data. A detailed budget of
the governing equation is also considered in order to gain insight into the underlying
physics.

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