

Abstract Submitted
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Analytical theory for the interaction of a planar shock wave with isotropic turbulence¹ JUAN GUSTAVO WOUCHUK, CESAR HUETE RUIZ DE LIRA, ETSII - UCLM, Campus s/n Ciudad Real, Spain, ALEXANDER VELIKOVICH, Plasma Physics Division, NRL, USA — An analytical model is presented to describe the interaction of a planar incident shock wave with a 3D field of vorticity perturbations, a problem of fundamental importance which attracts the attention of the scientific community for more than fifty years [1]. Assuming isotropy of the perturbations in the fluid ahead of the shock front, the mode averaging can be performed analytically. Fully closed analytical expressions for the turbulent kinetic energy amplification factor and the intensity of sound emitted by the shock wave derived for the whole range of shock intensities and gas gammas are presented for the first time. Excellent agreement with existing simulations and experiments [1] is demonstrated. [1] M. J. Lighthill, Proc. Roy. Soc. London A 198, 554 (1949); H. S. Ribner, AIAA J. 25, 436 (1987), J. Fluid Mech. 35, 289 (1969); S. Lee et al. J. Fluid Mech. 340, 225 (1997); G. Dimonte and R. Tipton, Phys. Fluids 18, 85101 (2006).

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