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Decaying turbulence in the presence of a shearless uniform kinetic energy gradient[1] ADRIEN THORMANN, CHARLES MENEVEAU, Johns Hopkins University — The study of decaying isotropic turbulent flow is an important point of reference for turbulence theories and numerical simulations. For the past several decades, most experimental results have focussed on possible power-law decays and found exponents between -1 and -1.4, approximately. Another class of experiments have been shear less mixing layers in which there are two regions with different kinetic energy levels that slowly diffuse into each other downstream. In this study we consider flow without shear-production of turbulence with a cross-stream uniform spatial gradient of kinetic energy k(z) = C z. Such gradient is generated with the use of an active grid and screens mounted upstream of the wind-tunnel's test section iteratively designed to produce a linear gradient of kinetic energy without mean shear. In such a flow, deviations from constant lateral flux of kinetic energy are due only to spatial variations in turbulent diffusivity of k (turbophoresis). Data are acquired using X-wire thermal anemometry at different spanwise and downstream locations. Tests of homogeneity, as well as spectral characteristics of the flow, decay and diffusion rates of the kinetic energy will be presented.

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