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Fully-resolved DNS of finite-size particles exposed to a turbulent stream[1] LORENZO BOTTO, ANDREA PROSPERETTI[2], Johns Hopkins University — A field of homogeneous isotropic turbulence is convected with a mean velocity past a group of fixed, finite-size particles and the structure and intensity of the resulting downstream turbulence are compared to the particle-free case. The diameter of the particles is larger than the Kolmogorov scale and is of the order of the Taylor micro-scale. The results illustrate the central role played by the particle wakes in destroying the isotropy and homogeneity of the incident turbulence. Furthermore, as a result of wake interactions, the time-dependent hydrodynamic forces on the downstream and upstream spheres are correlated. The numerical simulations are carried out on a uniform grid by employing the "Physalis" method which can be regarded as a combination of an immersed boundary and spectral method. Among other advantages, it does not require interpolation and its spectral convergence permits computations with relatively few grid nodes per particle.

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