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Experimental study of turbulence in a counter-rotating swirling flow ROBERT MORRIS, TIMOTHY NICKELS, University of Cambridge, UK — Numerous experimental studies of turbulence have been carried out in a variant of the Von Kármán swirling flow: flow between two counter-rotating discs or impellers in a closed vessel. Turbulence of very high Reynolds number can be achieved, with a flow in the central region that has zero mean velocity in time. However, there is limited coverage in the literature of isotropy, interaction between modes of flow, and low-frequency fluctuations in this flow. This work presents the results of an experimental study of such a flow, using bladed impellers and several configurations, with an R_λ of approximately 500. High-speed Particle Imaging Velocimetry was used to measure the velocity of microspheres mixed in the flow. The bulk motion of the flow was studied, revealing pumping and bulk rotation in the fluid, and the velocity correlation function of the velocity fluctuations was calculated, showing anisotropic turbulence with an integral length scale significantly smaller than the vessel radius, and largely independent of Reynolds number. The frequency content of velocity fluctuations was studied.

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