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Experimental investigation of coherent structures in turbulent pipe flow using a large-scale pipe flow facility DAVID DENNIS, University of Liverpool — In recent years it has been shown by various researchers, using either experimental techniques or direct numerical simulations, that coherent structures (i.e. features of the flow that persist in space and time) such as hairpin vortices, vortex packets, and very large scale motions (or superstructures) play an important role in wall-bounded turbulent flows (boundary layers, pipes and channel flows). A large-scale recirculating pipe flow facility at the University of Liverpool has been developed to enable the investigation of large and very large scale coherent motions in turbulent pipe flow. The facility includes a 100mm-diameter working section, consisting of individual modules of precision-bore borosilicate glass tubes each 1.027m long, totalling 22 metres in length. Experimental measurements using high-speed stereoscopic particle image velocimetry at approximately 210 pipe diameters downstream of the inlet are made possible using a unique mechanical arrangement for performing the calibration. Reynolds numbers of up to $Re_D = 10^5$ can be reached when the working fluid is water.

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