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Proper orthogonal decomposition of a decelerating turbulent boundary layer[1] MURAT TUTKUN, Norwegian Defence Research Establishment (FFI) and Laboratoire de Mecanique de Lille (LML) — Our analysis is based only on streamwise component of velocity fluctuations since the data were simultaneously obtained using a hot-wire rake of 143 single wire probes. The experiment was carried out in the large wind tunnel of Laboratoire de Mécanique de Lille whose test section is 20 m long, 2 m wide and 1 m high. A 2D bump was used to create converging-diverging flow inside the test section. The thickness of the boundary layer was 25 cm at the measurement location and Reynolds number based on momentum thickness, Re_θ, was 17 100 for 10 m s^{-1} external free stream velocity measured before the bump. Eigenvalue distribution over POD modes shows that approximately 90% of turbulence kinetic energy due to streamwise fluctuations within the domain was captured by the first 5 POD modes. The first POD mode carried more than 45% of turbulence kinetic energy. Resulting eigenspectra are studied for different frequencies and spanwise Fourier indices in order to reduce the number of modes used in reconstructed velocity fields.

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