Direct numerical simulation for incompressible channel flow at \(Re = 5200\)\(^{1}\) MYOUNGKYU LEE, NICHOLAS MALAYA, ROBERT D. MOSER, The University of Texas at Austin — High-resolution direct numerical simulation (DNS) of wall-bounded canonical channel flow at \(Re = 5200\) is performed. The computational domain is \(8\pi\delta \times 2\delta \times 3\pi\delta\) with \(10240 \times 1536 \times 7680\) grid points in streamwise\((x)\), wall-normal direction\((y)\), and spanwise\((z)\) directions, respectively. Fourier spectral method\((x, \text{ and } z)\) and B-splines\((y)\) are used for the computation of derivatives. In this presentation we demonstrate that the simulation exhibits several features of high Reynolds number wall-bounded turbulence. The value of von Kármán constant appears to be \(\kappa = 0.384\) in the region of \(y^+ =300 \sim y=0.2\delta\) where the mean velocity profile shows logarithmic variation. Also, distinct inner\((\lambda_x^+ = 800, \lambda_z^+ = 120)\) and outer\((\lambda_x = 8\delta, \lambda_z = \delta)\) peaks in one-dimensional premultiplied spectra of the velocity variance are observed. Finally, the \(k_x^{-1}\) region is observed in the range of \(y^+ = 120 \sim 150\) and \(k_x = 6 \sim 10\).

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Myoungkyu Lee
The University of Texas at Austin

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