Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Conditional statistics near strong thin shear layers in DNS of isotropic turbulence at high Reynolds number TAKASHI ISHIHARA, Nagoya University, JULIAN C.R. HUNT, University College London, YUKIO KANEDA, Nagoya University — Data analysis of high resolution direct numerical simulations (DNS) of isotropic turbulence with the Taylor scale Reynolds number up to 1131 shows that there are thin shear layers consisting of a cluster of strong vortex tubes. The widths of the layers are approximately 5λ, where λ is the Taylor micro length scale. According to the analysis of one of the layers, coarse grained vorticity in the layer aligns roughly in one direction, large velocity jump of order of magnitude as large as almost the root-mean-square of the fluctuating velocity occurs across the layer, and energy dissipation averaged over the layer is larger than ten times the average over the whole flow. The mean and the standard deviation of the energy transfer $T(k,x)$ from scales larger than $1/k$ to scales smaller than $1/k$, at position x in the layer are larger than those outside the layer, but the probability distribution function of T in the layer under an appropriate normalization is similar to that outside the layer. The fact that the correlation of velocity fluctuation falls sharply at one of the boundary of the layer suggests that the boundary acts as a barrier of turbulent fluctuations. The space fillingness of such shear layers will be also discussed in the talk.

Takashi Ishihara
Nagoya University

Date submitted: 06 Aug 2010 Electronic form version 1.4