Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Study of local isotropy in a turbulent pipe flow using longitudinal and transverse structure functions KHADIJA HMOUDOU, XIAOHUA WU, Royal Military College of Canada — The scaling exponents of the longitudinal $\langle \Delta u_z^n \rangle$ and the two transverse structure functions, $\langle \Delta u_r^n \rangle$ and $\langle \Delta u_\theta^n \rangle$ with $n \leq 7$ are studied in a fully developed incompressible turbulent pipe flow at $Re_D = 24580$ and 50000 using direct numerical simulation flow fields. The scaling exponents for $\langle \Delta u_r^n \rangle$ and for $\langle \Delta u_\theta^n \rangle$ increase with the turbulent Reynolds number R_λ. However, the scaling exponents for $\langle \Delta u_z^n \rangle$ remain nearly unchanged. The Kolmogorov universal constants in both of the dissipative range and inertial range for the longitudinal structure functions show a smaller increase with R_λ than those for the transverse structure functions. The present results are compared with previous experimental and DNS data for channel and duct flows (Antonia *et al.* (1997). Phys. Fluids, 9 (11), 3465)

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Date submitted: 05 Aug 2009 Electronic form version 1.4