

Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Fully-resolved turbulence measurements in high Reynolds number pipe flow using a nano-scale probe¹ MARGIT VALLIKIVI, MARCUS HULTMARK, ALEXANDER SMITS, Princeton University — Statistics of the streamwise velocity component were measured at Reynolds numbers from 45×10^3 to 800×10^3 in the Princeton/ONR Superpipe. A nano-scale thermal anemometry probe (NSTAP) with sensing volume $60 \times 2 \times 0.1 \mu\text{m}$ was used to obtain data that were free from the effects of spatial filtering. The results agree well with data from conventional measurement techniques for the lower Reynolds numbers but the NSTAP allows the study of fully resolved turbulence at Reynolds numbers almost one order of magnitude larger than conventional techniques. The data gives new insight on pipe flow turbulence, as well as providing a quantitative estimate of the effects of spatial filtering, allowing for re-evaluation of previous datasets obtained with limited spatial resolution.

¹Supported under NSF Grant CTS-0421147 and ONR Grant N00014-09-1-0263.

Margit Vallikivi
Princeton University

Date submitted: 27 Jul 2010

Electronic form version 1.4