

Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Revealing Some Roots to Our Uncertainty Regarding Values of Von Kármán Constants HASSAN NAGIB, IIT, Chicago,USA, LUCIA MAS-COTELLI, GABRIELE BELLANI, ALESSANDRO TALAMELLI, Università di Bologna, Forlì, Italy — Three different fits of logarithmic dependence of center-line velocity, U_{CL}^+ , in pipe flow at CICLoPE, with nearly equal representation of experimental data over range $8,000 < Re_\tau < 40,000$ have been used to generate synthetic data that are densely spaced with Reynolds number. A higher order term proportional to inverse of Re_τ was incorporated into one. Two approaches to uncertainty analysis of three sets of synthetic data were used to study dependence of uncertainty of extracted values of κ_{CL} : Random Sampling of Full Range of Uncertainty and All Possible Permutations of Extreme Uncertainties. Role of low Reynolds number data and accuracy of pressure transducer used to measure pressure gradient along pipe were examined. Results reveal following mean values and uncertainties from measurements by the multiple-transducer pressure scanner that was used: $\kappa_{CL} = 0.44 \pm 0.062$ for all Reynolds numbers, and $\kappa_{CL} = 0.45 \pm 0.038$ for data with $Re_\tau > 12,000$. More significantly, we conclude that CICLoPE requires a more accurate pressure scanning method for determining dp/dx ; e.g., using a Scanivalve connected to a single more accurate pressure transducer. Such an approach has potential of reducing uncertainty by an order of magnitude.

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Date submitted: 31 Jul 2019

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