Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

The Structure of Large- and Very Large-Scale Motions in Turbulent Pipe Flow[1] ALEXANDER SMITS, SEAN BAILEY, Princeton University — Multi-point velocity measurements in turbulent pipe flow have been performed at $Re_D = 1.5 \times 10^5$. Using cross-spectral and Proper Orthogonal Decomposition analysis, information is elucidated on the structure of the large- and very-large scale motions in the outer layer of wall-bounded flows. The results indicate that the large-scale motions are composed of attached eddies in the logarithmic layer but are mostly composed of detached eddies in the outer layer with a wide range of azimuthal scales. The very-large-scale motions have large radial and azimuthal scales, are concentrated around a single azimuthal mode, and make a smaller angle with the wall compared to the large-scale motions. The results support a hypothesis that only the detached large-scale motions in the outer layer align to form the very-large-scale motions.

[1]Supported by ONR through Grants No. N00014-07-1-0111 and N00014-09-1-0263 (program Manager Ron Joslin).

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Date submitted: 05 Aug 2009 Electronic form version 1.4