Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

**Phase transition to sustained turbulence in pipe flow** MUKUND VASUDEVAN, MARCO VASSALLO, BJORN HOF, Max Planck Institute for Dynamics and Self-Organization — Turbulence in pipe flow can first arise at Reynolds numbers somewhat below 2000. Here turbulent structures ("puffs") are localized and have a finite lifetime. Turbulence can also proliferate through puff splitting and it has recently been proposed that turbulence overall becomes sustained when this spreading process outweighs the decay of individual structures. In the present study we measure the decay rate of turbulent puffs in two different set ups: In the first the pressure difference across the experiment is held fixed. In the second the flow is driven a piston system that enforces a constant flow rate. Measurements in both set ups are in excellent qualitative agreement and confirm that individual turbulent puffs are intrinsically transient and decay following a memoryless process. Exploiting the memoryless nature a pipe with quasi periodic boundary conditions is constructed allowing indefinitely long observation times of puff sequences. This method for the first time allows to directly measure the asymptotic evolution of the turbulent flow and to determine the equilibrium turbulent fraction close to the critical point.

Bjorn Hof
Max Planck Institute for Dynamics and Self-Organization

Date submitted: 10 Aug 2012 Electronic form version 1.4