Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

Drift turbulence driven shear flow study in a laboratory plasma MIN XU, GEORGE TYNAN, PATRICK DIAMOND, STEFAN MULLER, CHRISTOPHER HOLLAND, JONATHAN YU, University of California, San Diego, ZHENG YAN, University of Wisconsin-Madison — The nonlinear spectral energy transfer rates between large-scale shear flows and drift wave turbulence were directly measured in a linear plasma device CSDX (Controlled Shear Decorrelation Experiment) using a recently developed technique [1]. The results clearly show a net kinetic energy transfer from turbulence with intermediate frequencies ($\sim$10kHz) to shear flows with low frequencies ($<$1kHz), thus directly confirm the turbulence-driven mechanism of shear flows. In addition, a combined study using Langmiur probe arrays and fast visible light imaging strongly supports a vortex driven physics picture for the observed nonlinear energy transfer. And it shows that the sheared zonal flow is sustained by the emission of drift vortices in the central plasma which then propagate in a spiral trajectory, approach the shear layer, and then merge into the sheared flow, thereby transferring their momentum and kinetic energy to it. Similar mechanisms likely operate at the boundary of tokamak plasmas and should contribute to shear flow amplification and intrinsic rotation in these devices.

[1] M. Xu et al, Phys. Plasmas **16** 042312 (2009).

Min Xu
Center for Momentum Transport and
Flow Organization (CMTFO), UC San Diego

Date submitted: 26 Jul 2010 Electronic form version 1.4