Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

**Holographic measurement of wall stress distribution and 3D flow over a surface textured by microfibers** HUMBERTO BOCANEGRA, SEDER GORUMLU, BURAK AKSAK, LUCIANO CASTILLO, JIAN SHENG, Texas Tech Univ. — Understanding how fluid flow interacts with micro-textured surfaces is crucial for a broad range of key biological processes and engineering applications including particle dispersion, pathogenic infections, and drag manipulation by surface topology. Existing methods, such as $\mu$PIV, suffers from low spatial resolution and fail to track tracer particle motion very close to a rough surface and within roughness elements. In this paper, we present a technique that combines high speed digital holographic microscopy (DHM) with a correlation based de-noising algorithm to overcome the optical interference generated by surface roughness and to capture a large number of 3D particle trajectories. It allows us to obtain a 3D velocity field with an uncertainty of 0.01% and 2D wall shear stress distribution at the resolution of $\sim 65\mu$Pa. Applying the technique to a microfluidics with a surface textured by microfibers, we find that the flow is three-dimensional and complex. While the microfibers affect the velocity flow field locally, their presence is felt globally in terms of wall shear stresses. The study of effect of microfiber patterns and flow characteristics on skin frictions are ongoing and will be reported.

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Date submitted: 31 Jul 2015 Electronic form version 1.4