Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Experimental and computational investigation of percolation in complex polymer nanocomposites DERRICK STEVENS, LORI DOWNEN, NCSU Dept. of Physics, RUSSELL GORGA, NCSU Dept. of Textile Engineering, LAURA CLARKE, NCSU Dept. of Physics — The continuing development of polymer nanocomposites has led to increasingly complex morphology, such as the mats of composite nanofibers formed from electrospinning. The formation of particle networks within the composite volume that leads to enhanced properties, such as electrical conductivity, may be influenced by this complex sample geometry. In this work, experimental and computational efforts are utilized to understand and predict the percolation threshold (critical volume fraction) for two cases: single ultra-high aspect ratio fibers (where fiber diameter can be similar to the particle dimensions) and these same fibers arranged in a random mat with up to 80% porosity. 2D and 3D Monte Carlo simulations, modeled on the actual parameters of our experimental system [1], are utilized and the results are compared with our experimental findings. In particular, confinement to fibers increases the percolation threshold; however the multi-fiber pathways available in mats partially reduce this constraint [2]. [1] S.S. Ojha, D.R. Stevens, K. Stano, T. Hoffman, L.I. Clarke, R.E. Gorga, *Macromolecules* **41**, 2509 (2008). [2] D.R. Stevens, L.N. Downen, L.I. Clarke, *Phys. Rev. B* **in press** (2008).

Derrick Stevens
NCSU Dept. of Physics

Date submitted: 21 Nov 2008 Electronic form version 1.4