Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Properties of ultrathin $Bi_2Sr_2CaCu_2O_{8+x}$ films grown by pulsed laser deposition MICHAEL HINTON, JIE YONG, STANLEY STEERS, ADAM AHMED, JOHN DRASKOVIC, TOM LEMBERGER, Ohio State University — Thermal and quantum fluctuations in superconductors are expected to grow as film thickness decreases. Such behavior has been observed in $YBa_2Cu_3O_{7-\delta}$ (YBCO) films as thickness is reduced to two unit cells. In particular, a Kosterlitz-Thouless like drop in superfluid density appears and shows that 2D fluctuations are correlated through the YBCO film thickness. Since $Bi_2Sr_2CaCu_2O_{8+x}$ (Bi-2212) plays such a prominent role in important ARPES and Scanning Probe measurements of the superconducting gap, it is important to see how this compound behaves in reduced dimensions. To that end, we are working to grow films of Bi-2212 as thin as possible, by pulsed laser deposition in on-axis and off-axis geometries. One goal is to look for the KT transition in the superfluid density, to see whether 2D fluctuations are correlated layer-to-layer even in this highly anisotropic compound, and complement the cuprate picture dominated by the wealth of YBCO data. This requires films to be quite homogeneous. To effectively improve homogeneity, we focus the ac magnetic field of our two-coil measurement system by masking the film of interest with a thick superconducting film with a hole etched through it. Thus, the film area probed is greatly reduced and transition widths are narrowed.

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Date submitted: 22 Nov 2011 Electronic form version 1.4