Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Measurement of Localized Nonlinear Microwave Response of Superconductors SHENG-CHIANG LEE, DRAGOS MIRCEA, MATHEW SULLIVAN, GREGORY RUCHTI, STEVEN ANLAGE, Center for Superconductivity Research, Physics Department, University of Maryland, BENJAMIN PALMER, Laboratory for Physical Sciences, College Park, Maryland, B. MAIOROV, E. OSQUIGUIL, Centro Atómico Bariloche and Instituto Balseiro, Comisión Nacional de Energía Atómica, 8400 S. C. de Bariloche, Río Negro, Argentina, CENTER FOR SUPERCONDUCTIVITY RESEARCH TEAM, LABORATORY FOR PHYSICAL SCIENCES TEAM, CENTRO ATÓMICO BARILOCHE AND INSTITUTO BALSEIRO TEAM — We measure the local harmonic generation from superconducting thin films at microwave frequencies to investigate the intrinsic nonlinear Meissner effect near T_c in zero magnetic field. Both second and third harmonic generation are measured to identify time-reversal symmetry breaking (TRSB) and time-reversal symmetric (TRS) nonlinearities. The microscope can measure the local nonlinear response of a bicrystal grain boundary [Sheng-Chiang Lee and Steven M. Anlage, Physica C 408-410, 324 (2004); cond-mat/0408170]. We also performed a systematic doping-dependent study of the nonlinear response and find that the TRS characteristic nonlinearity current density scale follows the doping dependence of the de-pairing critical current density [cond-mat/0405595]. We extract a spontaneous TRSB characteristic current density scale that onsets at T_c, grows with decreasing temperature, and systematically decreases in magnitude (at fixed T/T_c) with under-doping. The origin of this current scale could be Josephson circulating currents or the spontaneous magnetization associated with a TRSB order parameter.

Dragos Mircea
Center for Superconductivity Research, Physics Department

Date submitted: 07 Dec 2004 Electronic form version 1.4