

Abstract Submitted
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Effect of Carrier Doping on Nonlinearity of High Temperature Superconducting Thin Films MICHAEL BISCHAK, JINU THOMAS, STEPHEN REMILLARD, Hope College — The nonlinearity of superconductors is found to depend on the sample's location on the phase diagram, and hence on the carrier doping. The doping level was tuned by annealing $\text{Tl}_2\text{Ba}_2\text{CaCu}_2\text{O}_{8-x}$ thin films in a reducing nitrogen atmosphere at temperatures ranging from 250°C to 400°C. Nonlinear microwave surface impedance of $\text{Tl}_2\text{Ba}_2\text{CaCu}_2\text{O}_{8-x}$ wafers in a 5.6 GHz sapphire dielectric resonator reveal dependence on carrier doping x , with fluxon hysteresis contributing more significantly in under-doped films (x greater than 0.1) at all temperatures and in more optimally doped films at high reduced temperature. With the critical temperature being used as the indicator of carrier density, it was found that under-doped samples have larger fluxon hysteresis losses as indicated by a one-to-one variation of surface reactance with surface resistance. This work was supported by the National Science Foundation under grants 1206149 and 1004811, and by the Research Corporation for Science Advancement.

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