Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Time-resolved infrared spectroscopy of superconducting films in a magnetic field[1] H. ZHANG, H. TASHIRO, J.M. GRAYBEAL, D.H. REITZE, C.J. STANTON, D.B. TANNER, Department of Physics, University of Florida, G.L. CARR, Brookhaven National Laboratory — We performed time-resolved, optical pump-probe measurements on thin NbTi and MoGe films in applied magnetic fields up to H_{c2} /3 to study the recombination dynamics of excess quasiparticles. The films were pumped by a picosecond near-infrared Ti:sapphire laser and probed by time-synchronized far-infrared pulses from a synchrotron storage ring at the National Synchrotron Light Source. The photoexcited high energy quasiparticles (on the order of 1 eV) quickly relax to produce excess quasiparticles with energies $\sim \Delta$ (few meV) at the superconducting gap edge. Those excess quasiparticles recombine into Cooper pairs and produce phonons of energy 2Δ. The resulting nonequilibrium phonon distribution slowly decays on a time scale of 1 ns by anharmonic effects or by escaping into the environment. When the shortest possible synchrotron pulses were used, we reached a temporal resolution of 300 ps. Despite the presence of the normal cores from vortices in the films, we find that the relaxation time does not decrease with magnetic field. The transmittance change in the far-infrared region due to the change of the applied magnetic field of the superconductor will also be discussed.

[1]Supported by the DOE through grant DE-FG02-96ER45584 and contract DE-AC02-98CH10886 at BNL.

Haidong Zhang
Department of Physics, University of Florida

Date submitted: 04 Dec 2004 Electronic form version 1.4