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Time-resolved Infrared Magnetospectroscopy of GaAs at the NSLS[1] G.L. CARR, NSLS, Brookhaven National Lab, J.J. TU, Physics Department, City College of the City Univ. of NY — We describe a facility for performing photo-induced time-resolved infrared spectroscopy of materials in magnetic fields up to 10T at beamline U4IR of the National Synchrotron Light Source (NSLS). The facility combines an existing time-resolved capability (based on pulsed synchrotron radiation and a synchronized Ti:sapphire laser to achieve ∼100 ps resolution) with a split-coil superconducting solenoid and optical cryostat. We also report a THz study of photocarrier and exciton dynamics in GaAs using this facility. It is found that, for B>0, a portion of the photo-induced carrier absorption appears as an electron cyclotron resonance, while the exciton unbinding absorption splits into spin and orbital transitions (Zeeman effect). At low temperatures, we observe that the relaxation of photocarriers toward the band edge involves the breaking of existing excitons, leading to a combination of absorption and bleaching features that evolve on a ∼1 ns time scale.

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