

# Nanometer & Femtosecond Research

## Electromagnetic Phenomena on Nanometer Scales

On a spatial scale, nanoimprint lithography is a promising non-photolithographic method for patterning devices requiring dimensions from the micrometer range to the sub 10 nanometer range. The technique is amenable to developing structures consisting of a broad class of materials including thermoplastics, ultra-violet curable polymers, functional/biopolymers, and metals. A technology with such a broad structural resolution range could spawn devices applicable across the electromagnetic spectrum from RF/THz to optical frequencies.

## Electromagnetic Phenomena on Femtosecond Scales

Mode-locked laser technology yields tabletop research with ultrashort duration pulses in the sub 100 femtosecond range. The interaction of optical beams with optoelectronic and nonlinear devices to perform operations such as generation, detection, and transmission is a technology area with an ever-expanding nature. For example, through the utilization of electro-optic semiconductors and mode-locked laser technology, coupled RF electro-thermal effects may be studied experimentally with a single sensor. Application areas include the study of heat dissipation in high-power quasi-optical amplifiers and RF-induced heating in RF microelectromechanical systems (RF MEMS). Furthermore, ultrashort-duration optical pulses coupled into a photoconductive switch yield a gateway to the terahertz portion of the electromagnetic spectrum.

