MAX PLANCK INSTITUTE
OF MICROSTRUCTURE PHYSICS

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TRANSIENT NANOSCALE THERMAL IMAGING AND HEAT TRANSPORT

ABSTRACT

Heating is a major bottleneck limiting the performance of electronic and optoelectronic integrated circuits. We describe full-field thermoreflectance thermal imaging to characterize localized heating with sub micron spatial, 800ps time and 10mK temperature resolutions. Results are presented for active devices such as GaN high electron mobility transistors, 3D heterogeneously integrated devices, photonics integrated circuits, memristors and heat assisted magnetic recording heads. Applying this technique to nanoscale heat sources, we show breakdown of Fourier diffusion equation Experimental evidence for fractal Levy phonon random walk and hydrodynamic heat transport in semiconductors at room temperature will be presented. We will also describe methods based on image deblurring to obtain far field temperature resolution down to 100nm range as well as quantum illumination to increase the temperature resolution below shot noise.

SEPTEMBER 18, 2023,

2:00 PM

LECTURE HALL