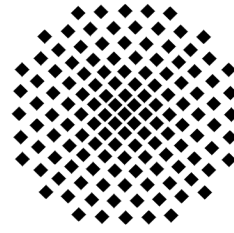


Stuttgarter Physikalisches Kolloquium

Fachbereich Physik, Universität Stuttgart
Max-Planck-Institut für Festkörperforschung
Max-Planck-Institut für Intelligente Systeme*

Ansprechpartner: Prof. Harald Giessen
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Achtung geänderte Uhrzeit!

Dienstag, 31. Januar 2012

15:30 Uhr

Hörsaal V 57.01

Universität Stuttgart, Pfaffenwaldring 57, 70569 Stuttgart-Vaihingen

Gastgeber: Prof. Harald Gießen, Universität Stuttgart, Telefon: 0711 - 685-65110

Optics with electrons

Albert Polman

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Abstract

We introduce Angle-Resolved Cathodoluminescence Imaging Spectroscopy (ARCIS), that enables, for the first time, measurements of both the local optical density of states (LDOS) and the angular radiation profile of nanophotonic structures at deep subwavelength resolution. ARCIS employs a 30 keV electron beam in an SEM to excite plasmonic resonant modes with 10-nm spatial resolution. The radiation from these modes is collected in the SEM and analyzed using both a spectrometer and a position-sensitive CCD detector.

We use this new technique to demonstrate the first plasmonic metastructure with a refractive index $n=0$, tunable over the entire visible to near-infrared spectral range. In this new material, light exhibits vanishing phase advance and a strongly enhanced LDOS over a large volume. Next, we resolve the radiation mechanism of elementary plasmonic nanowire antennas using ARCIS, directly probing the spatially resolved antenna radiation profile. Finally, using the angular detection capabilities of ARCIS, we carry out deep-subwavelength momentum spectroscopy, enabling reconstruction of the full band diagram and LDOS of two-dimensional plasmonic and photonic crystals over the entire visible to near-infrared spectral range.