HL 82: Semiconductor Lasers II

Time: Thursday 14:45–15:30 Location: H13

HL 82.1 Thu 14:45 H13

Coaxial GaAs-AlGaAs core multishell nanowire lasers with epitaxial gain control — •Philipp Zimmermann[1], Thomas Stettner[1], Bernhard Loitsch[1], Markus Döblinger[2], Gerhard Abstreiter[1], Gregor Koblmüller[1], and Jonathan J. Finley[1] — [1]Walter Schottky Institut and Physik Department, Technische Universität München, Garching, Germany — [2]Department of Chemistry, Ludwig-Maximilians-Universität München, Munich, 81377, Germany

Semiconductor nanowires (NW) open up promising routes towards ultra-small, coherent light sources integrated on silicon. NWs act as natural Fabry-Perot cavities and have sufficient modal high reflectivity at the end facets, to facilitate lasing. Lasing has recently been demonstrated from conventional GaAs-AlGaAs core shell NWs up to room-temperature with emission in the near infrared [1]. For improved gain characteristics and lower threshold it is desirable to incorporate low-dimensional systems within the NW geometry. Here, we present single-mode lasing from radial single and multiple GaAs quantum wells (QWs) as active gain media in a GaAs-AlGaAs core-multishell NW. When subject to optical pumping lasing emission with a distinct s-shaped input-output characteristics and emission energies associated with the confined QWs are observed. The low temperature performance shows a reduced threshold power density for 7 coaxial QWs compared to a single QW in a NW with the same diameter, which confirms that gain characteristics can be optimized by epitaxial design [2]. [1] B. Mayer, et al. Nature Comm. 4, 2961 (2013). [2] T. Stettner, P. Zimmermann, et al., in review (2015).

HL 82.2 Thu 15:00 H13

InP-based tunable narrow linewidth laser array for use as local oscillator in coherent communication — •Annette Becker[1], Vitalii Sichkovskyi[1], Marko Bjelica[2], Florian Schnabel[1], Anna Rippien[1], Bernd Witzigmann[2], and Johann Peter Reithmaier[1] — [1]Institut für Nanostrukturtechnologie und Analytik, CINSaT, Universität Kassel, Deutschland — [2]Computational Electronics and Photonics, CINSaT, Universität Kassel, Deutschland

Reference lasers are a key element for high-capacitance coherent optical communication. These lasers need to be narrow linewidth widely tunable DFB lasers.

InP based quantum dot (QD) material developed for 1.55 μm enables tailoring of device properties, like low linewidth enhancement factor (α-factor) favourable for such an application. Theoretical considerations taking into account the quasi zero-dimensional nature of the active zone, clearly predict a strong reduction of the laser linewidth by appropriate tailoring the QD material design.

By adjusting growth parameters and QD layer numbre, the gain function could be tailored to be more symmetric, resulting in considerable reduction of the α-factor. Intrinsic linewidths of less than 200 kHz could be achieved. By arranging the lasers in an array, the tuning range could be extended to meet the demands of coherent communication systems.

HL 82.3 Thu 15:15 H13

Characterization of Multimode Semiconductor Lasers by Intensity and Wavefront Analysis — •Inga-Maria Eichentopf and Martin Reufer — Hochschule Ruhr West, Institut Naturwissenschaften, Mülheim an der Ruhr, Germany

In recent years wavefront measurements using a Shack-Hartmann Sensor became an established way to analyze the beam quality of laser sources. With the detection of the wavefront deformation a change of the modal composition can be recorded instantaneously. While this method is well established for nearly Gaussian laser beams, the wavefront analysis of broadarea semiconductor lasers requires a detailed understanding of the composition of the laser modes. For our investigations we utilize lasers emitting light in the near infrared based on the material system of GaAs. For this type of laser the number and structure of optical modes is affected by thermal as well as electric effects inside the active medium. Spectral information is recorded over the position at the laser facet by means of a spectrometer. Moreover the intensity distribution of the optical near and far field is monitored for a variation of diode currents. To describe the structure of the laser modes the measured intensity distributions are associated with a composition of Hermite Gaussian Modes gained by a simulation software.