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Universität Zürich, Irchel Campus

Réunion annuelle commune à Zürich
26 - 30 août 2019

Programmübersicht
Aperçu du programme

in Zusammenarbeit mit - en collaboration avec

MaNEP SWITZERLAND

QSIT Quantum Science and Technology
National Centre of Competence in Research

SSSN SGN

Universität Zürich UZH

12:30	136	**Thermoelectrically cooled THz quantum cascade laser operating up to 210 K** *Lorenzo Bosco, Martin Franckié, Giacomo Scalari, Mattias Beck, Jérôme Faist* *ETH Zürich, Institute for Quantum Electronics* THz radiation is subject to a wide range of research and technological efforts, but it is limited by a lack of compact and powerful THz sources. A promising candidate is the quantum cascade laser (QCL), although it currently requires cryogenics since they only operate below 200 K. We present the first THz QCL operating on a thermoelectric cooler, up to a record-high temperature of 210 K. The design achieves high-temperature operation thanks to a systematic optimization by means of a nonequilibrium Green's function model, which also reliably reproduces the experimental results. Thanks to the relatively high peak power measured at 206 K (>1 mW), the laser spectra were acquired with a commercial room-temperature detector, making the whole setup cryogenic free.
12:45	137	**Ring Interband Cascade Lasers Running in Continuous Mode Operation** *Hedwig Knötig [1], Borislav Hinkov [1], Robert Weih [2], Sven Höfling [2,3], Werner Schrenk [4], Johannes Koeth [2], Johannes P. Waclawek [5], Bernhard Lendl [5], Gottfried Strasser [1,4]* *[1] Institute of Solid State Electronics, TU Wien, [2] nanoplus Nanosystems and Technologies GmbH* *[3] Physikalisches Institut and Wilhelm Conrad Röntgen-Research Center for Complex Material Systems, University Würzburg* *[4] Center for Micro- and Nanostructures, TU Wien* *[5] Institute of Chemical Technologies and Analytics, TU Wien* We present the first interband cascade lasers fabricated into ring-shaped cavities emitting in continuous wave operation. A second order distributed feedback grating is used for single mode emission and light outcoupling in vertical direction through the GaSb substrate. In addition, the implementation of an epitaxial-side down mounting scheme facilitates improved heat transport from the active region. The devices with a waveguide width of ~5 μm and an outer diameter of 800 μm show light emission at a wavelength of ~4.38 μm. These newly developed devices are employed in a project for trace gas analysis via the principle of photothermal interferometry.
13:00	138	**Optoelectronic devices based on non-polar ZnO/ZnMgO quantum wells** *Borislav Hinkov [1], Arnaud Jollivet [2], Hanh T. Hoang [1], Stefano Pirotta [2], Maria Tchernycheva [2], Raffaele Colombelli [2], Maxime Hugues [3], Nolwenn Le Biavan [3], Miguel Montesbajo [4], Adrian Hierro [4], Jean-Michel Chauveau [3], Gottfried Strasser [1,5], Francois H. Julien [2]* *[1] Institute of Solid State Electronics, TU Wien, [2] C2N University Paris-Sud, [3] CNRS-CRHEA,* *[4] ISOM Universidad Politecnica de Madrid, [5] Center for Micro- and Nanostructures, TU Wien* The performance of state-of-the-art GaAs-based THz-QCLs is limited by parasitic LO phonon transitions, preventing above-200 K operation. This can be overcome by using material systems with higher LO-phonon energies like ZnO, for which above-room-temperature operation in THz-QCLs is predicted. Using novel optoelectronic materials like wurzite Zn(Mg)O with no internal fields in the m-plane [10-10] orientation, simplifies the design of any QC structure. After the recent demonstration of intersubband absorption in such m-plane ZnMgO structures, we present the first mid-IR Zn(Mg)O-based QCD with peak responsivity of 0.15 mA/W (77 K) at 3 μm wavelength. The responsivity persists up to 300 K. In addition, we show first photoluminescence measurements from m-plane Zn(Mg)O THz-QCL structures, emitting at ~4.8 THz at liquid-nitrogen temperatures.
13:15	139	**n-type Ge/SiGe Quantum Cascade Devices for THz Electroluminescence** *David Stark [1], Luca Persichetti [2], Michele Montanari [2], Chiara Ciano [2], Luciana di Gaspare [2], Monica de Seta [2], Marvin Zöllner [3], Oliver Skibitzki [3], Michele Ortolani [4], Leonetta Baldassarre [4], Michele Virgilio [5], Thomas Grange [6], Stefan Birner [6], Kirsty Rew [7], Douglas Paul [7], Jerome Faist [1], Giacomo Scalari [1]* *[1] ETH Zürich, [2] Università di Roma Tre, [3] IHP-Leibniz-Institut für innovative Mikroelektronik,* *[4] Università di Roma "La Sapienza", [5] Università di Pisa,* *[6] nextnano GmbH, [7] University of Glasgow* Exploiting intersubband transitions in Ge/SiGe quantum cascade devices provides a way to integrate terahertz light emitters into silicon-based technology. To date all electroluminescence demonstrations of Si-based heterostructures have been p-type using hole-hole transitions. In the