Mauterndorf 2020

21st International Winterschool

New Developments in Solid State Physics

Abstract Book

23-28 February 2020

JOHANNES KEPLER UNIVERSITY LINZ

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FRIDAY, 28 FEBRUARY 2020

FrMo: Qbits	Chairs: R. Friedemann / A. Wixforth
09:00 – 10:10	**Thomas Ihn**, ETH Zürich *Quantum engineering of quantum dot qubits*
10:10 – 10:40	Coffee Break
10:40 – 11:20	**Yiwen Chu**, ETH Zürich *Creating quantum states of acoustic waves*
11:20 – 12:00	**Arne Laucht**, University New South Wales, Sydney *Silicon MOS quantum dots for spin-based quantum computation*

Lunch and afternoon break

13:00 - 16:00 **SKI RACE** (Grosseck middle station)

FrA: Photonic Devices	Chair: G. Strasser
17:15 – 17:55	**Max Andrews**, Technical University of Vienna *Growth of Intersubband Devices*
17:55 – 18:35	**Christian Schimpf**, University of Linz *Quantum cryptography with entangled photons from semiconductor quantum dots*
18:35 – 18:45	**Closing**

19:15 – 22:00 **Farewell Party at Hotel Post**

Growth of Intersubband Devices

A. M. Andrews[1,3]*, M. Beiser[1,3], M. Giparakis[1,3], H. Detz[3], M.A. Kainz[2,3], S. Schönhuber[2,3], M. Limbacher[2,3], B. Schwarz[1,3], J. Hillbrand[1,3], W. Schrenk[3], K. Unterrainer[2,3], G. Strasser[1,3]

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Intersubband (ISB) devices are unipolar semiconductor superlattice heterostructures where the optical transitions and energy levels are created through bandstructure design and not inherently linked to the bandgap of the quantum well material. Development of ISB optoelectronic devices has greatly paralleled the progress made in III-V semiconductor epitaxy. Quantum cascade lasers (QCL) and quantum cascade detectors (QCD) are their own class of solid-state devices that span the mid-infrared (3-30 μm) and the THz region (60-300 μm). Together they cover the molecular fingerprint region where optical spectroscopy can measure and detect chemicals in solid, vapor, or liquid form. ISB devices allow great freedom in the choice of active region designs and materials selection. The growth and processing of a QCL or QCD requires new epitaxy techniques and the active region designs and the material systems employed are of continuing research. This makes ISB devices excellent tools for characterizing the growth, doping, interfaces, and the semiconductor alloys used in their fabrication.

In this presentation, the new knowledge gained in epitaxy will be applied to improving the maximum operating temperature of THz QCLs [1,2].

References:

[1] M. A. Kainz, S. Schönhuber, A. M. Andrews, H. Detz, B. Limbacher, G. Strasser, and K. Unterrainer, ACS Photonics **5**(11), 4687 (2018).
[2] M. A. Kainz, S. Schönhuber, B. Limbacher, A. M. Andrews, H. Detz, G. Strasser, G. Bastard, and K. Unterrainer, APL **114**, 191104 (2019).

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