oxide confinement apertures and intermixed apertures show a reduction in threshold current when compared to VCSELs with oxide confinement alone, indicating carrier confinement by QWI.

Red VECSEL Array

L.G. Morton, J.E. Hastie, S. Calvez, and M. Dawson
Institute of Photonics, University of Strathclyde, Glasgow, UK

The first visible microchip VECSEL, consisting of an AlGaInP gain structure and 250um-thick, single crystal diamond cavity has been demonstrated. With 1% output coupling, a maximum output power of 330mW was achieved at 675nm in a circularly symmetric beam, M2<2. Both fixed array (3x1 and 2x2) and programmable array formats have been demonstrated by manipulation of the pump beam with diffractive optic elements and a spatial light modulator respectively.

Broad-Area Vertical-Cavity Surface-Emitting Lasers: non-modal emission characteristics and reduction of spatial coherence

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Dept. of Applied Physics and Photonics (TONA), Vrije Universiteit Brussel, Belgium

For a small enough aperture, a vertical-cavity surface-emitting laser (VCSEL) cavity will only support the fundamental gaussian transverse mode. If the aperture diameter exceeds a few micrometers, however, it typically becomes multimode with a complex transverse mode structure. We show that when a broad-area VCSEL is driven by a strong current pulse, such a modal description breaks down. Indeed our experimental results show for the first time that instead a VCSEL can behave as a quasi-homogeneous Schell model source. We observe gaussian far-field emission of broad-area vertical-cavity surface-emitting microlasers under pulsed driving conditions. We show that this is due to a reduction of the spatial coherence.

13:00 – 14:00 Lunch

14:00 – 15.30 Session III – chairman: : Johann–Peter Reithmaier

DFB, DBR and Tunable Lasers

Uncooled tunable DBR-SOA laser for WDM access applications

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We propose an uncooled carrier-injection based tunable laser (DBR-SOA) with fixed emission wavelength, for future WDM access networks. Temperature is measured on chip, and thermal wavelength drift is automatically compensated via a feedback loop by current injection wavelength tuning. The main difficulty is to automatically compensate for thermal drift, while remaining on the right ITU wavelength. DBR-SOA is optimised in order to provide largely spaced Fabry-Perot modes, leading to a great tolerance on control currents, and suppress mode hops risk.

State-of-the-art performance of widely tunable twin-guide laser diodes

R. Todt[1], Th. Jacke[1], R. Meyer[1], J. Adler[2], R. Laroy[3], G. Morthier[3], and M.-C. Amann[1]
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[3] Department of Information Technology, Ghent University, Gent, Belgium

The sampled grating tunable twin-guide (SG-TTG) laser diode is a DFB-like tunable laser that employs Vernier-effect tuning to achieve wide wavelength tuning. In contrast to most other monolithic widely tunable lasers (which are usually DBR-type lasers), a phase tuning section is not needed and, hence, the SG-TTG laser requires at least one tuning current less than comparable devices.
Design aspects and tuning characteristics of the SG-TTG laser will be discussed. The devices provide full wavelength coverage over a 40nm-broad tuning range that is centered at 1.54μm. The tuning range consists of several up to 8.2nm large regions where mode-hop-free tuning is possible. Over the whole tuning range, the side-mode suppression ratio and the output power remains above 35dB and 10mW, respectively.

Modal inertia in DBR lasers, simulation and test

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[1]University of Technology Eindhoven, Eindhoven, The Netherlands
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The chief feature of DBR devices is the mechanism that provides continuous tunability over 10 nm per device so that only four are needed cover the entire C-band set of 160 ITU channels. This mechanism is of medium complexity but entirely reliable so long as the chips are properly screened at fabrication stage before packaging into transmitter modules. This process rules out lasers with the potential to mode-hop with ageing so the LUT will be valid for a lifetime. Our simulation is based on the physical principal of optical-spectrum *modal inertia* (to coin a phrase) and the resulting hysteresis that is the chief tuning feature of these lasers. This paper will describe the optoelectronic processes that underpin modal inertia in DBR lasers and go on to describe the validation of simulated transmitter behaviour.

Generation of 40 GHz short pulses with high extinction ratio using a multi-section self-pulsating DBR laser

J. Renaudier, J-G. Provost, F. Poingt, F. Pommereau, L. Legouezigou, F. Lelarge, F. Martin, O. Legouezigou, P. Gallion, and G-H. Duan
Alcatel-Thales III-V Lab, and ENST, Marcoussis, France

We report the generation of short pulses at a repetition frequency of 40 GHz in a self-pulsating multi-section distributed Bragg reflector laser. Measurements using a frequency resolved optical gating method have shown a full width at half maximum of 3 picoseconds and a very high extinction ratio, greater than 30 dB. Moreover, nearly 1 GHz continuous tunability of the self-pulsation frequency has been achieved.

Intrinsic Modulation Bandwidths of Widely Tunable SG-TTG Lasers

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High-speed widely tunable lasers are the answer to an increasing demand for more bandwidth and functionality in WDM networks. The new widely tunable twin-guide (TTG) laser is a quarter-wave-shifted DFB laser that is tunable over a wide tuning range of more than 40nm while maintaining a high side mode suppression.
During this talk the dynamic properties of the SG-TTG laser will be discussed. The RIN characteristics of different lasers were investigated at different ITU frequencies confirming that a maximum intrinsic modulation bandwidth of around 20GHz is reachable over a tuning range of 35nm. This is significantly better than what has been reported so far for other widely tunable lasers.

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