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Class-A Operation of InAs Quantum Dash-based Vertical-External-Cavity Surface-Emitting Laser



S. Pes^{1,*}, K. Audo¹, C. Paranthoën¹, C. Levallois¹, N. Chevalier¹, G. Loas¹, S. Bouhier¹, C. Hamel¹, C. Gomez², J.-C. Harmand², S. Bouchoule², H. Folliot¹ and M. Alouini¹

¹ FOTON, UMR CNRS, INSA Rennes, Université de Rennes 1, 35708 Rennes, FRANCE

² Centre de Nanosciences et de Nanotechnologies, CNRS, Université Paris-Sud, 91360 Marcoussis, FRANCE

* salvatore.pes@insa-rennes.fr



Motivations

Realization of an optical laser source with high spectral purity, low intensity noise and highly tunability for microwave photonics and coherent communication systems

Applications

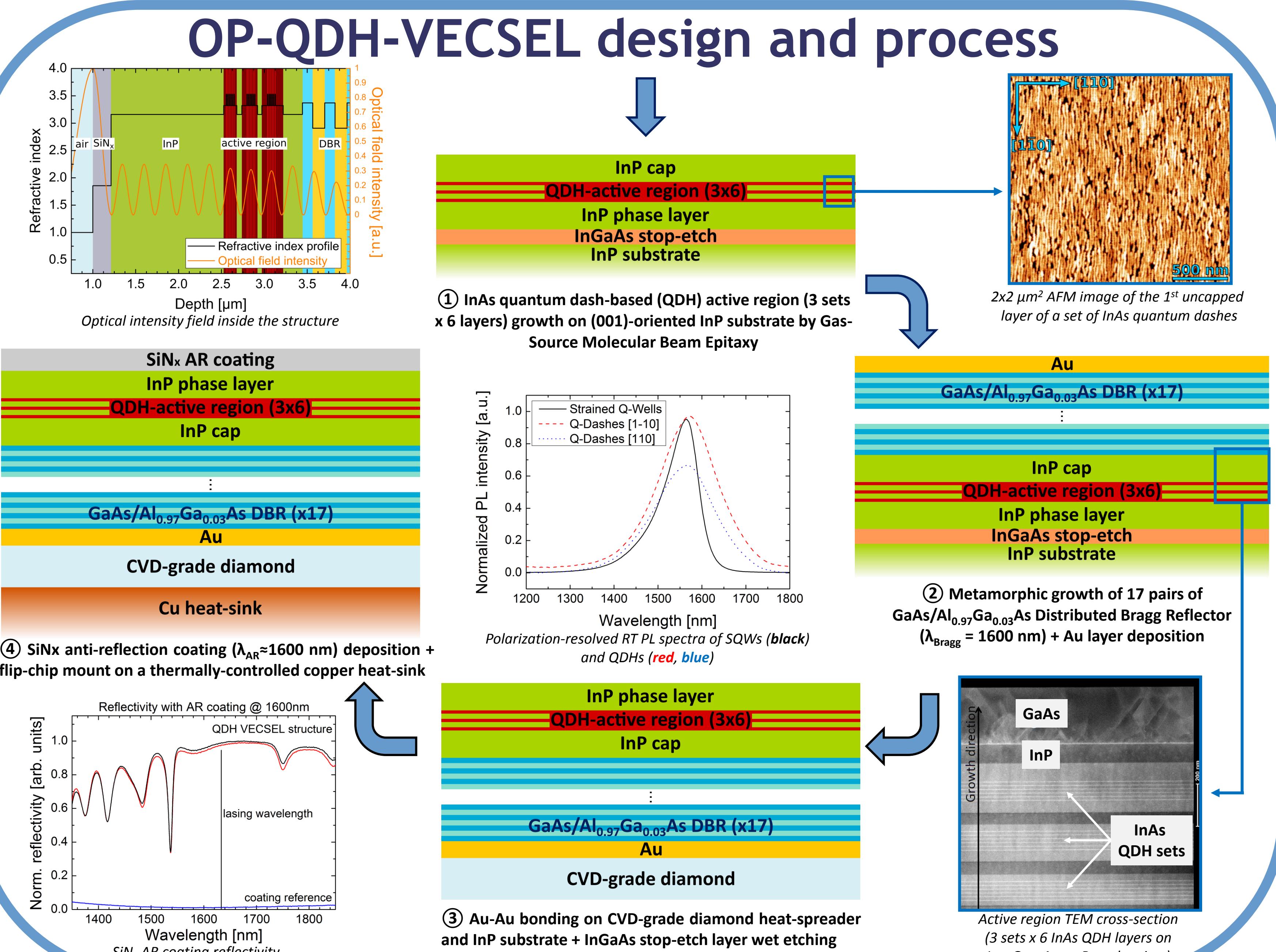
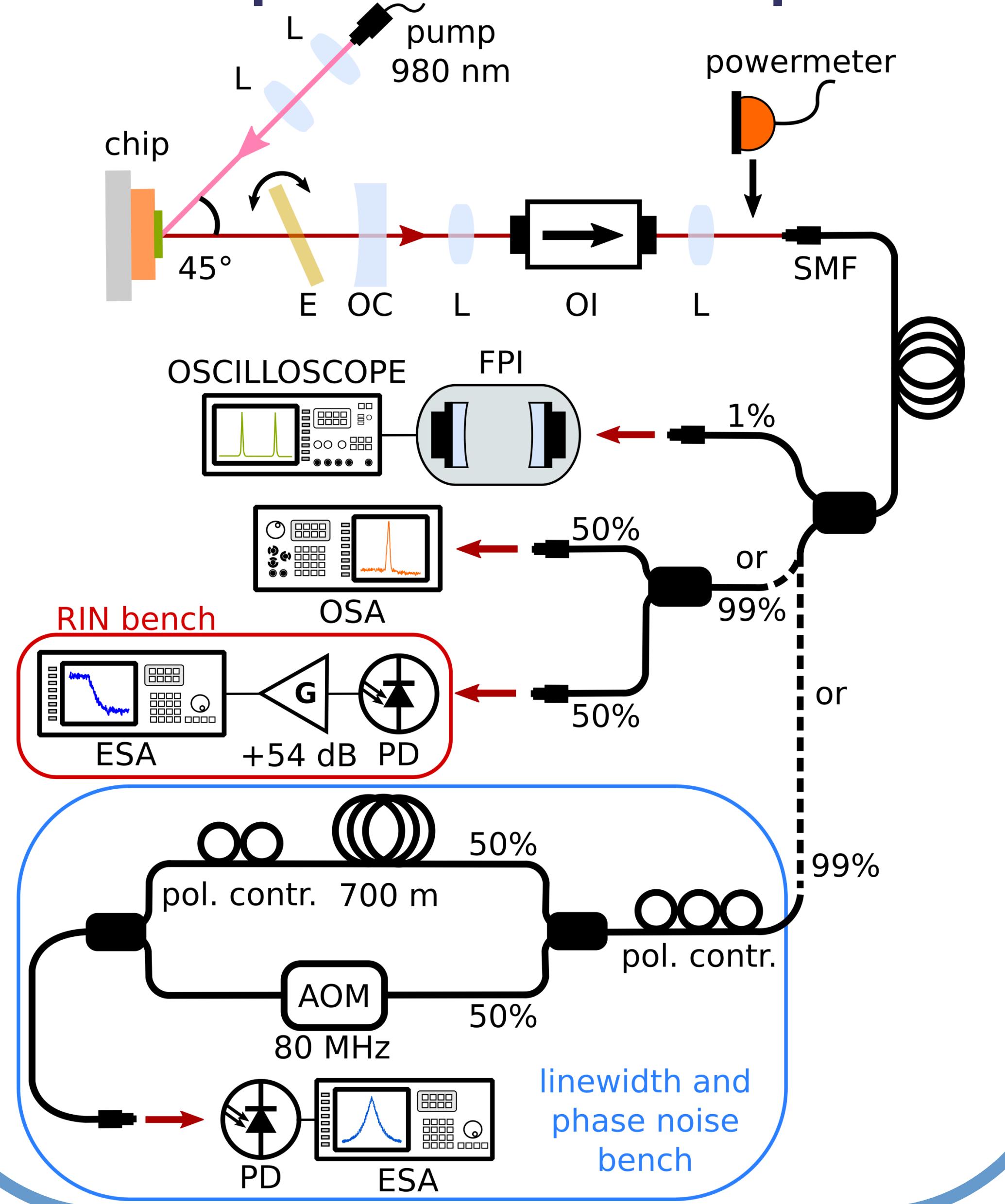
MICROWAVES:

- RADAR/LIDAR systems
- Ultra low-noise sources
- Dual-frequency lasers
- THz generation

METROLOGY:

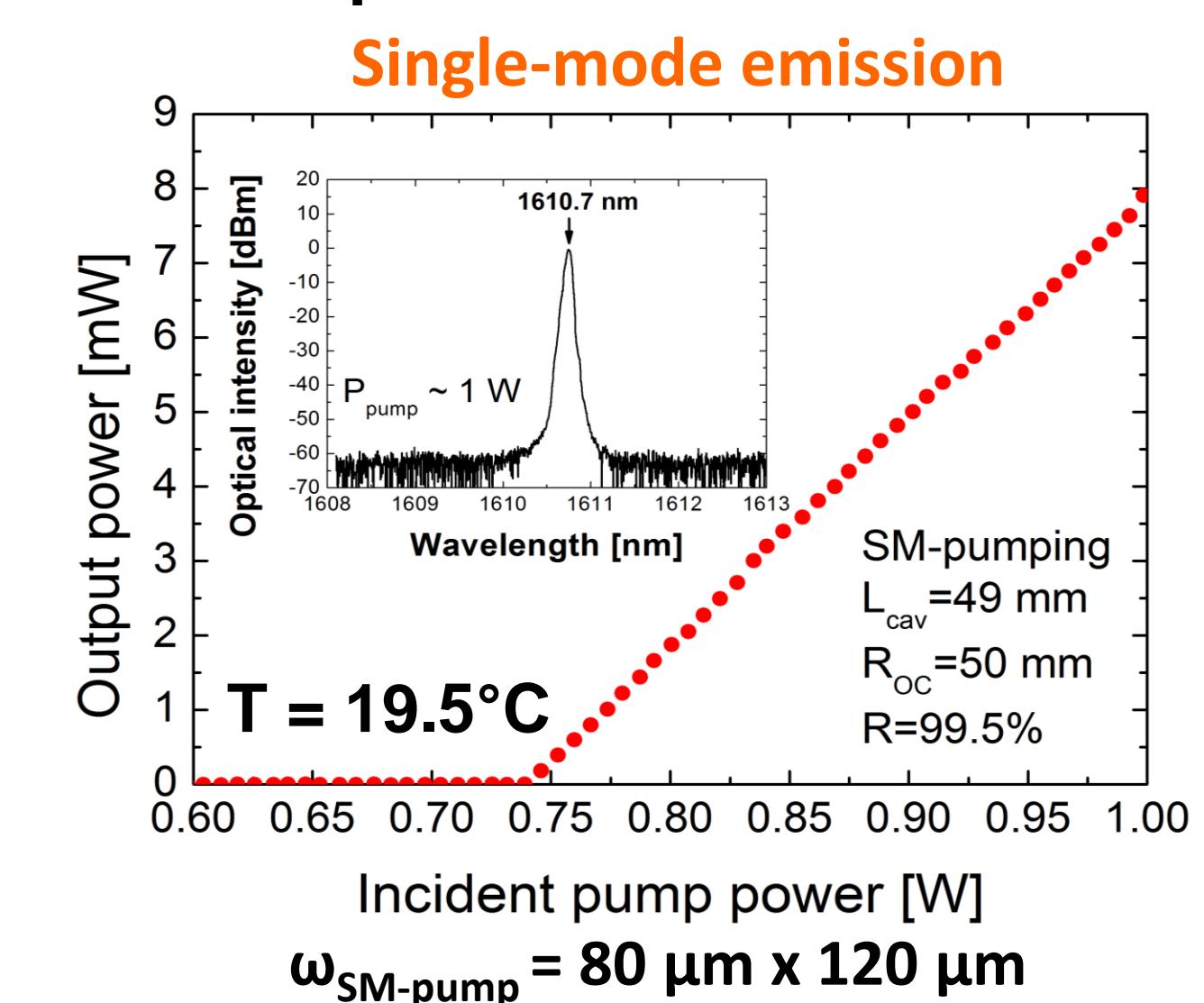
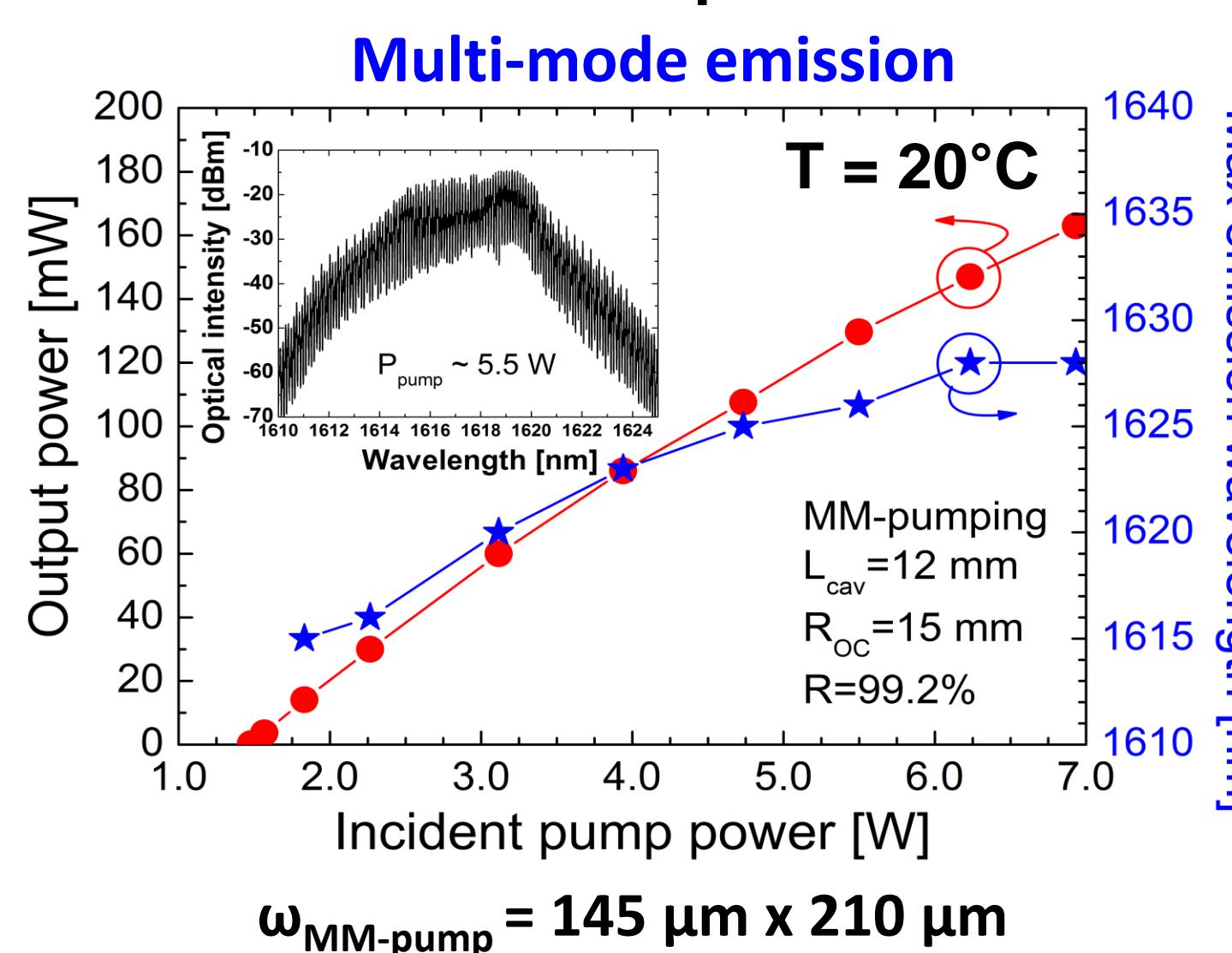
- High resolution spectroscopy
- High pure optical reference signal distribution
- Time/frequency metrology

Experimental setup

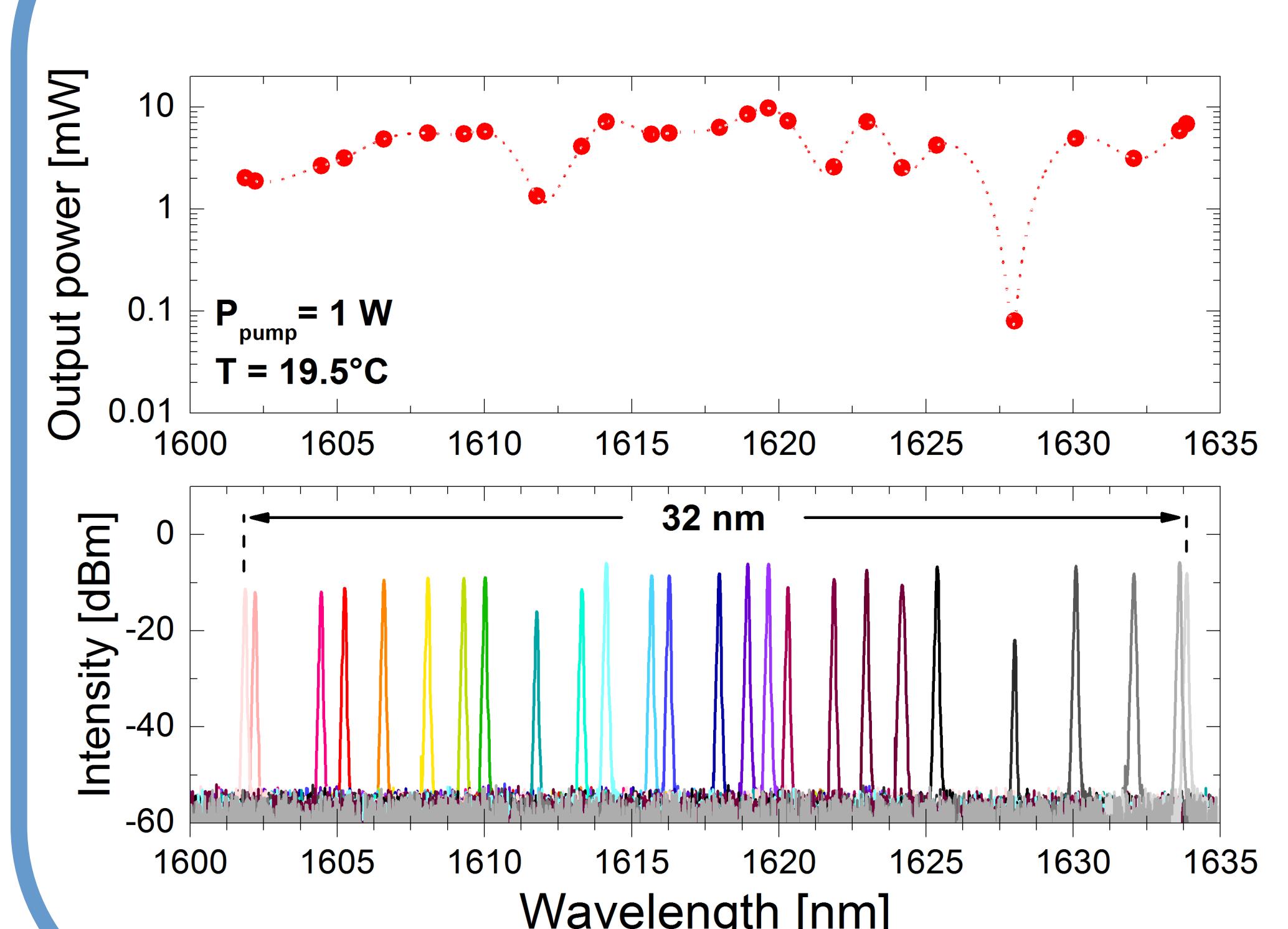


Laser characterization

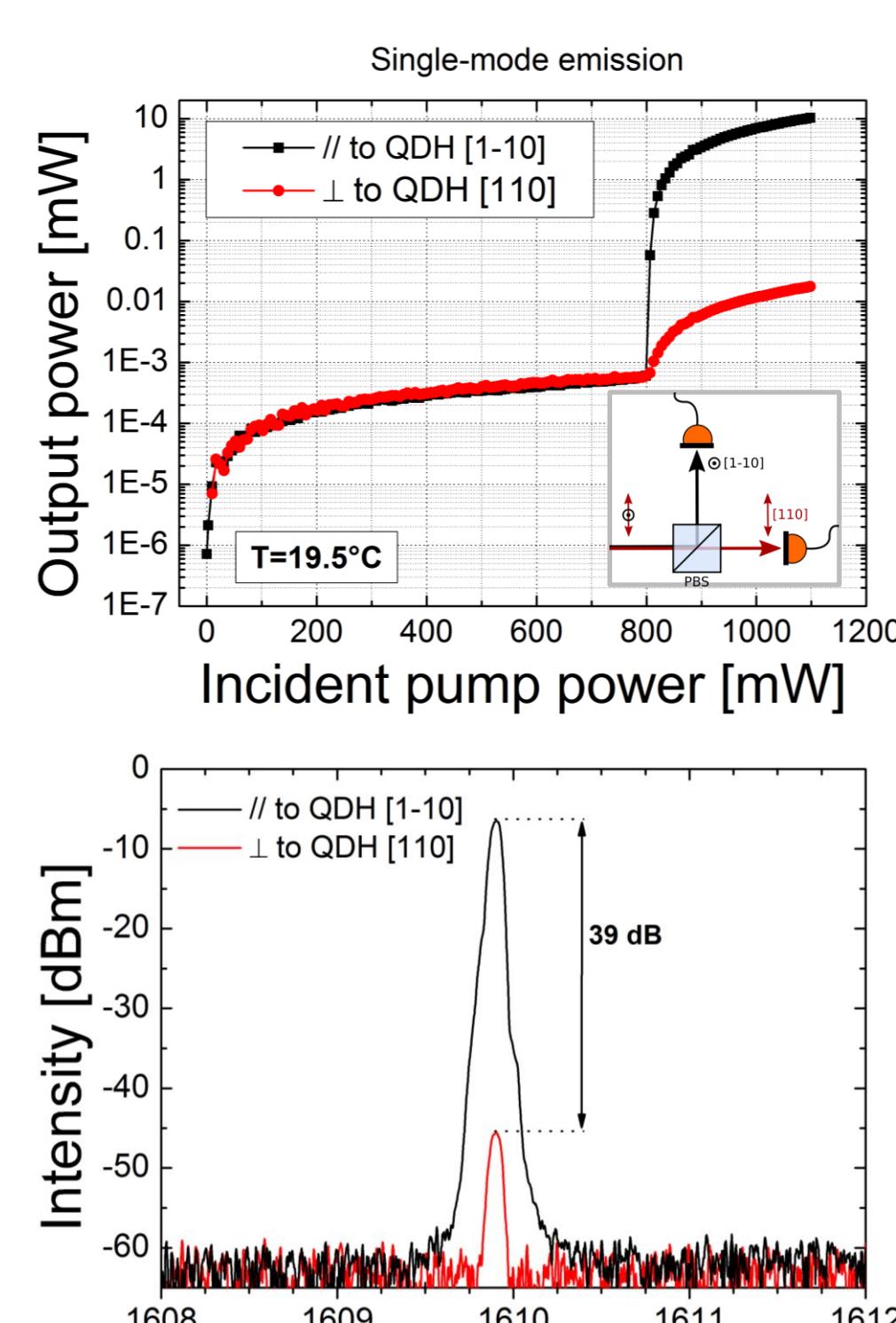
Output characteristics and emission spectra



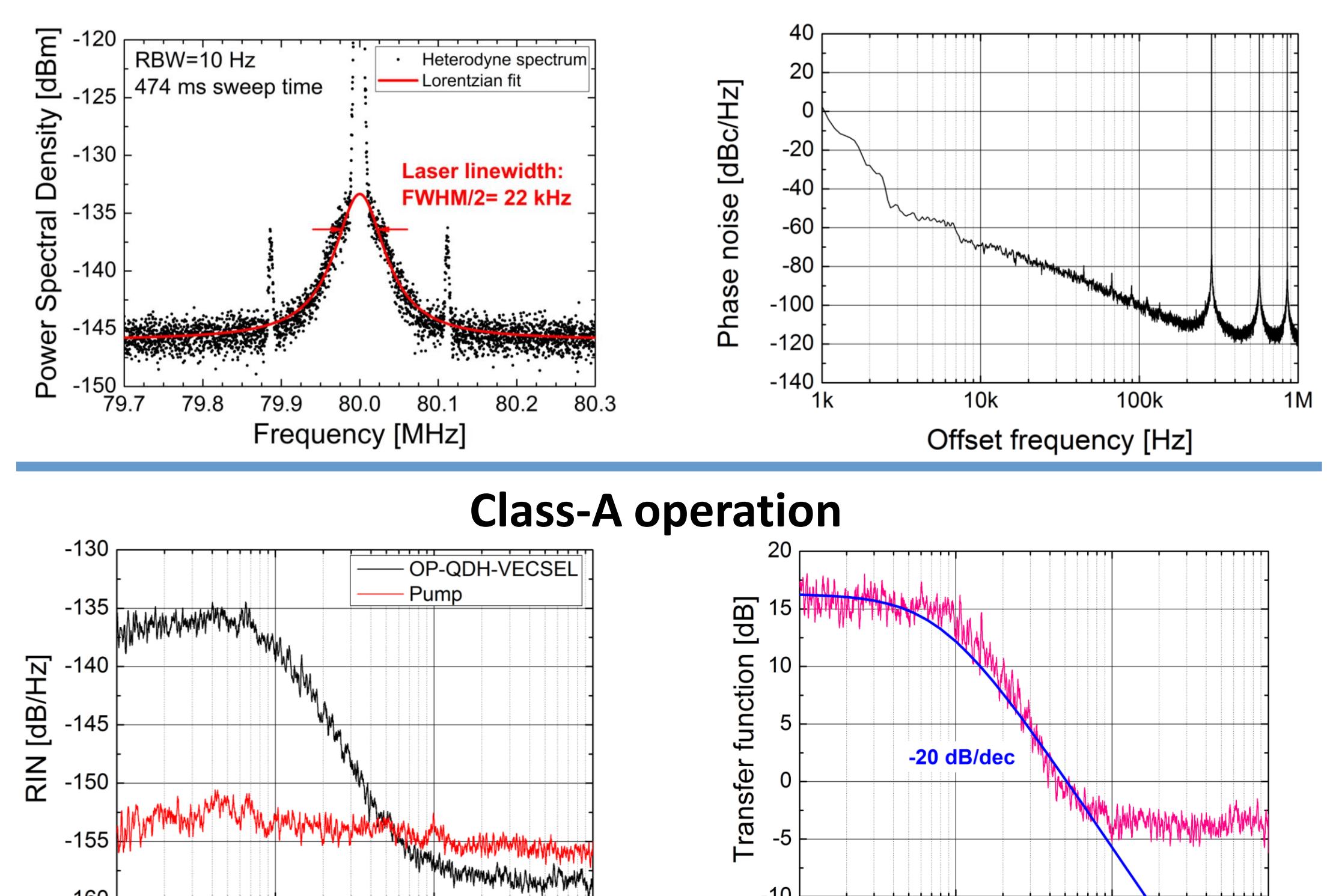
Single-frequency wavelength tuning



Polarization-resolved SM-emission



Laser linewidth and phase noise



Conclusion

Demonstration of a Class-A Optically-Pumped InAs Quantum Dash-based Vertical-External-Cavity Surface-Emitting Laser on InP.

MM-emission: $P_{out} = 163 \text{ mW}$ @ $P_{inc} = 7 \text{ W}$, $T=20^\circ\text{C}$

SM-emission: $P_{out} = 10.4 \text{ mW}$ @ $P_{inc} = 1.1 \text{ W}$, $T=19.5^\circ\text{C}$, 32 nm tuning
Polarization stably aligned along dash [1-10] direction, OPSR = 39 dB

Laser linewidth estimation: 22 kHz (49 mm-long cavity)

Phase noise: -110 dBc/Hz @ $f > 200 \text{ kHz}$ (free-running)

Class-A operation: $f_c = 800 \text{ kHz}$, RIN = -158 dB/Hz ($I_{phd} = 2 \text{ mA}$)

Future perspectives

- Dual-frequency operation
- Laser stabilisation on ULE cavity (metrology)
- Electrical pumping

References

S. Pes et al., "Class-A Operation of an Optically-Pumped 1.6 μm-emitting Quantum Dash-based Vertical-External-Cavity Surface-Emitting Laser on InP", Opt. Express 25(10), 11760-11766 (2017)

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