Expanding the Frontiers of Long Wavelength Interband Cascade Lasers using Innovative Quantum Well Active Regions

Yixuan Shen,[1] J. A. Massengale,[1] Rui Q. Yang[1,+], S. D. Hawkins[2], A. J. Muhowski[2]
[1]School of Electrical and Computer Engineering, University of Oklahoma, Norman, OK.
[2]Sandia National Laboratories, PO Box 5800, Albuquerque, NM 87185-1085, USA

Interband cascade lasers (ICLs) [1-2] based on type-II quantum wells (QWs) are an efficient mid-infrared light source for many practical applications due in large part to their low power consumption. High performance operation of ICLs has been demonstrated at room temperature across a wavelength range from 2.7 µm to about 6 µm [2-4]. However, extending the operation of ICLs to longer wavelengths with similar performance as their short wavelength counterparts is challenging due to factors such as the reduced wavefunction overlap in the type-II QW and the increased free-carrier absorption loss. In this work, we report significant progress in long wavelength ICLs from newly designed and grown ICL wafers by employing an innovative QW active region containing strained InAsP layers [5]. These ICLs were able to operate at wavelengths near 14.3 µm as shown in Fig. 1, the longest ever demonstrated for III-V interband lasers, suggesting great potential of ICLs to cover an even wider wavelength range. Devices from another wafer were able to lase at a low threshold current density (*e.g.*, 15 A/cm^2 at 80 K) and at temperatures up to 210 K near 12.3 μm as shown in Fig. 2. Detailed results will be presented at the conference.

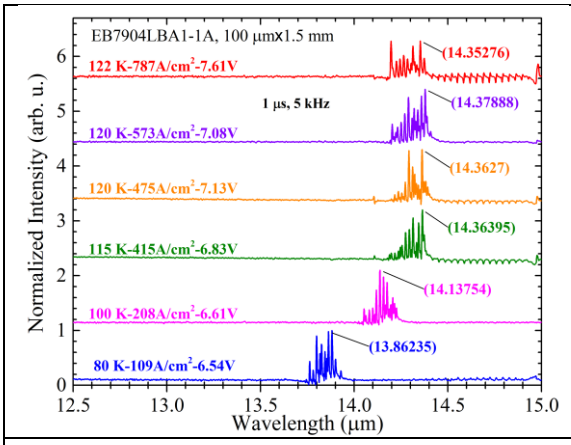

Fig. 1 Pulsed lasing spectra of an ICL from EB7904.

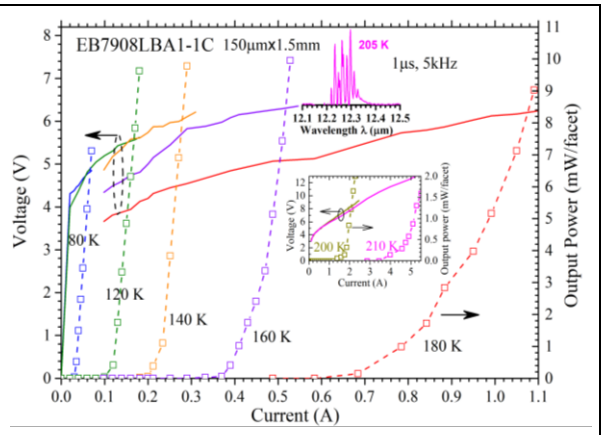

Fig. 2. IVL characteristics and a lasing spectrum.

This work at OU was partially supported by NSF (No. ECCS-1931193), and was performed, in part, at the Center for Integrated Nanotechnologies, an Office of Science User Facility operated for the U.S. Department of Energy (DOE) Office of Science. SNL is managed and operated by NTESS under DOE NNSA contract DE-NA0003525.

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[+] Author for correspondence: Rui.q.Yang@ou.edu