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High performance, low dissipation QCL across the Mid-IR range

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The mid-infrared (IR) spectral region is of crucial importance in the spectroscopy, due to the very prominent absorption lines of substances in this region. The intensity of these lines enables the development of very compact sensing systems with high sensitivity. Twenty years after their invention, quantum cascade lasers can now be considered as the most mature source in the Mid-IR region. Nevertheless, in order to enable the development of mass products based on these lasers, both low electrical dissipation and spectral control are crucial. For this work, different spectral regions across the mid-IR range have been chosen due to their commercial interest and distributed feedback quantum cascade lasers have been fabricated. We will show single-mode QCLs working in continuous-wave operation with electrical dissipations smaller than 0.5 W and threshold currents smaller than 50 mA. The impact of the different factors that contributed to this dissipation level, i.e., active region design, waveguide design and thermal management, will be analyzed through various theoretical models. Another key parameter for the development of QCL-based products is the fabrication yield of the sources. Based on a large number of lasers measured across the spectral range, an analysis of the laser performance and single mode yield will be presented.

Biography

Alfredo Bismuto has obtained his MS in Physics with honors in July 2006 from University of Naples "Federico II", Italy. He worked on all-optical gas sensing with nanostructures. From 2007 to 2011, he carried out a thesis on high performance QCLs in the Mid-IR in the group of Prof. Jerome Faist at the ETH of Zurich. After the thesis, he worked in the same group as a Post-doc focusing on short-wavelength QCLs. In October 2012, he joined Alpes Lasers SA where he is responsible of the wafer production process. He has published more than 30 papers in reputed journals.

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