

## Compact Semiconductor-Based Laser Sources with Narrow Linewidth and High Output Power



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## COMPACT SEMICONDUCTOR-BASED LASER SOURCES WITH NARROW LINEWIDTH AND HIGH OUTPUT POWER

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Cuvillier Verlag Nov 2012, 2012. Taschenbuch. Condition: Neu. Neuware - This work presents a fully semiconductor-based laser source that meets the requirements of coherent optical communication links in space and further allows to benefit from the numerous advantages of semiconductor lasers. A hybrid master oscillator power amplifier (MOPA) concept enables narrow-linewidth high-power operation. The experimental part of this thesis describes how the linewidth of the laser sources is characterized with a beat note measurement technique. A novel heterodyne linewidth measurement setup with a weak frequency lock of the two lasers features a virtually unlimited resolution. The analysis of the beat note signal is carried out by evaluating radio frequency beat note spectra as well as frequency noise spectra. Further, the characteristics of DFB and DBR lasers optimized for narrow linewidth operation are compared in terms of spectral stability, linewidth, and performance in a master oscillator power amplifier system. DBR lasers with an overall length of 4mm and a front facet reflectivity of 30% feature an intrinsic linewidth of 2 kHz at 180mW and a FWHM linewidth as small as 180 kHz up to an output power of 180mW. An intrinsic linewidth of 2 kHz is, to our knowledge, the smallest linewidth that has been reported in the literature so far. The concept of a hybrid integrated MOPA has been developed and the assembly procedure and the characteristics of the micro-integrated MOPA system are presented. The MOPA is realized on a footprint of 10 x 5mm<sup>2</sup>. The MOPA system features an output power of more than 1W, a FWHM linewidth of 100 kHz and an intrinsic linewidth of 3.6 kHz. To our knowledge, this is the first micro-integrated MOPA concept that simultaneously features narrow linewidth and addresses the requirements of spaceborne laser sources like mechanical stability, compactness, and efficiency. 130 pp....

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