

Mid-infrared lasers: Challenges imposed by the population dynamics of the gain system

Markus Pollnau

*Integrated optical MicroSystems Group, MESA+ Institute for Nanotechnology,
University of Twente, The Netherlands*

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This paper discusses the influence of the population dynamics on mid-infrared lasers. Specifically, the typically longer lifetime of the lower compared to the upper laser level has to be addressed in order to achieve highly efficient laser operation in this wavelength range. Examples of different operational regimes of the erbium-doped ZBLAN 3- μ m laser are presented [1-4].

- [1] M. Pollnau, Ch. Ghisler, G. Bunea, M. Bunea, W. Lüthy, and H.P. Weber, "*150 mW unsaturated output power at 3 μ m from a single-mode-fiber erbium cascade laser*", *Applied Physics Letters* **66** (26), 3564-3566 (1995).
- [2] S.D. Jackson, T.A. King, and M. Pollnau, "*Diode-pumped 1.7-W erbium 3- μ m fiber laser*", *Optics Letters* **24** (16), 1133-1135 (1999).
- [3] M. Pollnau and S.D. Jackson, "*Energy recycling versus lifetime quenching in erbium-doped 3- μ m fiber lasers*", *IEEE Journal of Quantum Electronics* **38** (2), 162-169 (2002).
- [4] S.D. Jackson, M. Pollnau, and J. Li, "*Diode pumped erbium cascade fiber lasers*", submitted (2010).