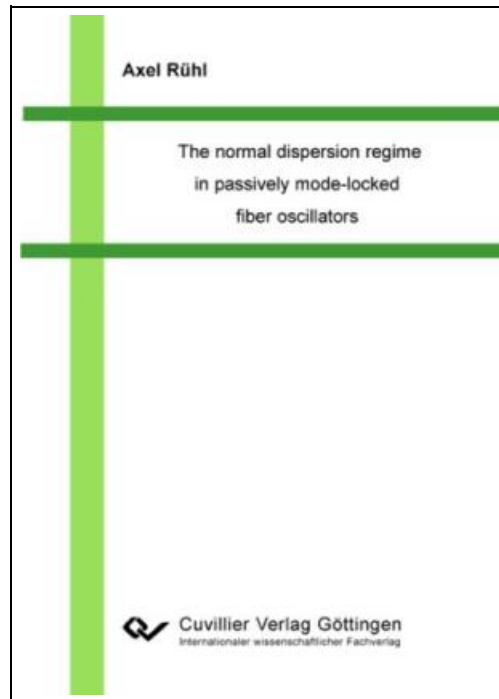


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THE NORMAL DISPERSION REGIME IN PASSIVELY MODE-LOCKED FIBER OSCILLATORS

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Cuvillier Verlag Dez 2008, 2008. Taschenbuch. Condition: Neu. Neuware - The subject of this thesis is the development and study of passively mode-locked fiber oscillators operating in the normal dispersion regime. Inspired by the concept of similariton amplifiers, pulse evolution towards a similariton opened new perspectives for fiber oscillators. In contrast to solitary laser oscillators, pulse shaping towards similaritons offers the possibility of significant energy scaling because of strongly chirped intracavity dynamics while the pulses can be efficiently compressed outside the cavity. These properties make fiber oscillators in the normal dispersion regime versatile femtosecond light sources whose performance can be tailored for various applications. Ytterbium- and erbium-doped fiber oscillators mode-locked by nonlinear polarization evolution were set up and utilized for the study of this pulse regime. The oscillators exhibit promising performances and the pulse energy could be significantly scaled compared to previous concepts. Supported by numerical simulations, various aspects of the intracavity pulse formation and its targeted influence were investigated. Based on the analysis of the intracavity pulse dynamics, the role of dissipative effects in the formation of a stable steady-state was pointed out and its influence on the frequency as well as on the temporal domain was investigated. Filtering in the frequency domain cannot only be provided by spectral filters and a limited gain bandwidth, but also by intrapulse Raman-scattering. By using additional mode-locking mechanisms constituting nonlinear temporal filters, the output characteristic could be significantly tuned and the increased self-starting capability gives access to various cavity designs. The impact of dispersion also allows the adaption and optimization of laser parameters. Changes of the output characteristic for varying group-delay dispersion were addressed and its limits were discussed. Furthermore, the self acting nonlinear compensation of third-order dispersion was experimentally demonstrated for the first time and verified by numerical simulations. Beside experimental...

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