Nonlinear microresonators: towards integrated ultrafast optical clocks

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In the next generation time-domain multiplexed optical networks, a potential solution for the stringent demand of pulsed laser with repetition rates in the hundreds of GHz and beyond is represented by passive mode locked lasers, which is free of the bandwidth bottleneck imposed by the electronics. Among the many different methods to produce such ultrafast sources, some relies on the reduced round-trip time in the very short semiconductor amplifying cavities at the expense of the laser lines quality [1,2,3]. Other recently investigated alternative approaches rely on external amplifying elements or pump lasers, like in the laser-pumped coherent optical parametric oscillator in silicon platforms [4,5] or our recent demonstration of a fully mode-locked ps and sub-ps source based on an integrated nonlinear resonator closed in an amplifying external loop [6,7]. These solutions are based on the development in the CMOS competible fabrication of nonlinear micro resonators with Q factors exceeding 1 million or at very high-order having free-spectral-range above 100GHz. An overview of the field with our investigations on the topic will be presented in details.

References

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