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Chaotic semiconductor ring lasers subject to optical feedback: Applications to chaos-based communications

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Abstract

Synchronisation of two unidirectionally coupled semiconductor ring lasers working in a chaotic regime (transmitter and receiver) is studied numerically. Two different configurations: open and closed loops, and two different ways of light injection: one- and two-mode injection are investigated. We show that synchronisation is more efficient when the closed loop is used compared to the open loop. When one directional mode is injected, very high coupling between the lasers is required to get the lasers synchronised, while in case of injection of both modes synchronisation with high cross-correlation coefficient is obtained at moderate values of coupling. The ON/OFF phase shift keying method is successfully applied to encrypt a message at a high bitrate.