Mode-hop free tuning of a hybrid glass-semiconductor laser

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Combining an InP semiconductor optical amplifier (SOA) with a micro-ring resonator feedback circuit implemented using silicon nitride waveguides has the advantage of obtaining extremely narrow laser linewidths. Such lasers can be tuned over the full gain bandwidth of about 100 nm of the SOA, however, this is typically accompanied with mode hops. The laser we consider here, consists of a InP SOA coupled to a silicon nitride photonic integrated circuit containing a phase section, an outcoupler and a wavelength tunable mirror. The mirror consists of two microring resonators with circumferences of 857 and 885 µm that have a free spectral range of 50 nm combined. The resulting laser resonator has a mode spacing of 5 GHz. By controlling the phase section alone, a mode-hop free tuning over 5 GHz is obtained, while preliminary results show that a simultaneous tuning of the phase section and the mirror avoids mode hopping over an at least 5 times larger range.