Tunable External Cavity Ring Laser with Wavelength Selective Elements

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The main objective of this study is to develop a near-infrared (NIR) tunable external cavity laser (ECL) that is based on a semiconductor optical amplifier and two different wavelength selective elements. In order to achieve the wavelength selection, several filters have been tested in the ECL setups, including plasmonic filter, acousto-optic tunable filter (AOTF), gradient photonic crystal and Fabry-Perot (FP) cavity filter. The results show that the AOTF and FP filter have been applied successfully in the ECL system as wavelength selective elements to demonstrate a broadband wavelength tuning in the range between 830 nm and 870 nm. The tunable ECL realized with the variation of electrical radio frequency input of AOTF or incident angle of FP cavity filter from 15.5° to 30° in each system. By controlling the wavelength selective elements, continuous tuning of ECL over 30 nm can be achieved and 23 lasing peaks were measured and analyzed in the laser system with FP cavity filter. The characteristics of the AOTF-based and FP-based tunable ECL, including power-current curve, threshold, tuning range and output power, are measured and reported in this thesis.