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Atomic vapor spectroscopy in integrated photonic structures TILMAN PFAU, ROBERT LW, RALF RITTER, HARALD KBLER, University of Stuttgart, IQST, NICO GRUHLER, Karlsruhe Institute of Technology, WOLFRAM PERNICE, University of Mnster — We investigate an integrated optical chip immersed in atomic vapor providing several waveguide geometries for spectroscopy applications. This includes integrated ring resonators, Mach Zehnder interferometers, slot waveguides and counterpropagating coupling schemes. The narrow-band transmission through a silicon nitride waveguide and interferometer is altered when the guided light is coupled to a vapor of rubidium atoms via the evanescent tail of the waveguide mode. We use grating couplers to couple between the waveguide mode and the radiating wave, which allow for addressing arbitrary coupling positions on the chip surface. The evanescent atom-light interaction can be numerically simulated and shows excellent agreement with our experimental data. This work demonstrates a next step towards miniaturization and integration of alkali atom spectroscopy and provides a platform for further fundamental studies of strong atom light coupling. Cooperativities on the order of 1 are within reach.

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