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Tuning the strain-induced resonance shift in silicon racetrack resonators by their orientation

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Abstract: In this work, we analyze the role of strain on a set of silicon racetrack resonators presenting different orientations with respect to the applied strain. The strain induces a variation of the resonance wavelength, caused by the photoelastic variation of the material refractive index as well as by the mechanical deformation of the device. In particular, the mechanical deformation alters both the resonator perimeter and the waveguide cross-section. Finite element simulations taking into account all these effects are presented, providing good agreement with experimental results. By studying the role of the resonator orientation we identify interesting features, such as the tuning of the resonance shift from negative to positive values and the possibility of realizing strain insensitive devices.

OCIS codes: (130.0130) Integrated optics; (130.3060) Infrared; (130.3120) Integrated optics devices; (130.6010) Sensors; (130.6622) Subsystem integration and techniques; (250.5300) Photonic integrated circuits.

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