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Title: Pockels effect based fully integrated, strained silicon electro-optic modulator
Author: Chmielak, B Waldow, M Matheisen, C Ripperda, C Bolten, J Wahlbrink, T Nagel, M Merget, F Kurz, H
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Abstract: We demonstrate for the first time a fully integrated electro-optic modulator based on locally strained silicon rib-waveguides. By depositing a Si(3)N(4) strain layer directly on top of the silicon waveguide the silicon crystal is asymmetrically distorted. Thus its inversion symmetry is broken and a linear electro-optic effect is induced. Electro-optic characterization yields a record high value chi((2))(yyz) = 122 pm/V for the second-order susceptibility of the strained silicon waveguide and a strict linear dependence between the applied modulation voltage V(mod) and the resulting effective index change Delta n(eff). Spatially resolved micro-Raman and terahertz (THz) difference frequency generation (DFG) experiments provide in-depth insight into the origin of the electro-optic effect by correlating the local strain distribution with the observed second-order optical activity.