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Title:Free-carrier electrorefraction and electroabsorption modulation predictions for silicon over the 1-14-um infrared wavelength range

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Abstract:We present relationships for the free-carrier-induced electrorefraction and electroabsorption in crystalline silicon over the 1-14-um wavelength range. Electroabsorption modulation is calculated from impurity-doping spectra taken from the literature, and a Kramers-Kronig analysis of these spectra is used to predict electrorefraction modulation. More recent experimental results for terahertz absorption of silicon are also used to improve the commonly used 1.3- and 1.55- um equations. We examine the wavelength dependence of electrorefraction and electroabsorption, finding that the predictions suggest longer wave modulator designs will, in many cases, be different from those used in the telecom range.

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