Abstract

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Design of compact, high-speed and low-loss silicon-on-silica electro-optic modulators

Throughout a careful step-by-step study, two simple designs of electro-optic modulators are proposed. The study shows the effect of dimensions and doping concentration on the performance parameters such as the modulation bandwidth, the size, the ion loss and the extinction ratio. One design shows a modulation bandwidth of $54.5\text{GHz}$ with a relatively short phase shifter length of $2.5\text{mm}$, a low optical ion loss of $1.1\text{dB}$ and a very high extinction ratio of $30\text{dB}$. The other one shows a bandwidth of $12.8\text{GHz}$, a phase shifter length of $9\text{mm}$, an optical ion loss of $3.3\text{dB}$ and an extinction ratio of $3\text{dB}$. It is shown that these two designs can fit to the requirements of the 5G telecommunications networks at different points which require different speeds of operation. The designs feature the complementary-metal-oxide-semiconductor technology advantages of ease and low-cost of fabrication.