Wideband photonic crystal bends with high transmission and linear dispersion for photonic integrated applications

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Bends are an integral part of an integrated optics platform. Most of the research in designing photonic crystal bends has concentrated on achieving high transmission without much attention given to their dispersive behavior that affects the practical operational bandwidth. As a result, most of proposed structures for photonic crystal bends with high transmission over a large bandwidth demonstrate non-linear dispersion. In this paper we present a systematic method for designing photonic crystal bends, which offer both high transmission and linear dispersion over a large bandwidth. While most of the proposed techniques for designing bends are based on treating the bend region as a cavity and optimizing its properties to improve transmission, our proposed technique is based on designing the bend region as a buffer stage for mode matching (field profile, dispersion, and group velocity) between the input and output waveguides. We show that the resulting bend combines the linear dispersion with high transmission over a large bandwidth. We will compare the performance of the proposed bends with all exiting ones and will show that the operation bandwidth of these bends is higher than all proposed bends to date. Experimental properties of these bends along with the challenges in their implementation will also be addressed.