Robust Design of Slow-Light Tapers in Periodic Waveguides

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This paper concerns the design of tapers for coupling power between uniform and slow-light periodic waveguides. New optimization methods are described for designing *robust* tapers, which not only perform well under nominal conditions, but also over a given set of parameter variations. When the set of parameter variations models the inevitable variations typical in the manufacture or operation of the coupler, a robust design is one that will have a high yield, despite these parameter variations.

We introduce the ideas of successive refinement, and robust optimization based on multi-scenario optimization with iterative sampling of uncertain parameters, using a fast method for approximately evaluating the reflection coefficient. Robust design results are compared to a linear taper, and to optimized tapers that do not take parameter variation into account. Finally, robust performance of our designs is verified using an accurate, but much more expensive, method for evaluating the reflection coefficient.

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