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Modelling Dielectric Structures with Bends using the Beam Propagation Method

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The Beam Propagation Method is a well established method that has been in use for analysing waveguides. One of its weaknesses is the problem of reflection from the boundaries that cause radiation modes to couple back to dielectric waveguides. To tackle this two methods have been proposed, namely the transparent boundary condition method[1] and the boundaryless BPM method[2]. The former estimates the wave vector near the boundary and designs the boundary condition to absorb those waves. The boundaryless method maps the finite simulation region into an infinite domain to theoretically eliminate all reflections. Unfortunately reflections occur anyway due to the rapidly varying spacing between grid points[3],[4]. These problems and ways to tackle them are discussed in this talk.

References:

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2. F. Ladouceur, "Boundaryless beam propagation," Optics Letters, vol. 21, no.1, January 1996.
3. M. Sicairos and J.C. Vega, Boundaryless finite-difference method for three-dimensional beam propagation," J. Opt. Soc. Am. A, vol. 23, no. 4, April 2006.
4. Swagato Mukherjee and H. Ramachandran, "Eikonal Analysis of the Boundaryless Beam Propagation Method," J. Lightwave Tech., vol. 33, no. 20, October 15, 2015.