Abstracts

Iterative Solution of the Eigenvalue Problem for a Dielectric Waveguide

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We present a numerical approach to the simulation of dielectric waveguides that is free of spurious modes and is based on the solution of an eigenvalue problem for the two transverse components of the magnetic field. We introduce a new discretization which has several computational advantages. In particular, by careful design of the discretization procedure we obtain systems of equations for the two components which are equivalent in the sense that a rotation over 90° corresponds to a suitable permutation of indices. The eigenvalue problem is solved iteratively by using an adapted version of the Chebyshev-Arnoldi algorithm. This approach takes full advantage of the sparsity of the matrix and circumvents the large memory requirements and the large computational complexity associated with dense methods. This allows us to employ meshes that are sufficiently fine to resolve higher modes without large discretization errors.

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