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Spurious-Free Maxwell Eigensolvers.

Three Maxwell eigensolvers are discussed in this presentation, two of them are using classical nonconforming finite element approximations, and the other is based on the interior penalty type discontinuous Galerkin methods. The main feature is that these solvers are free of spurious eigenmodes and are free of penalty parameters. To weakly impose the divergence-free condition satisfied by the eigenfunctions, the solvers either work with the locally divergence-free trial spaces, or contain a weighted divergence term in the formula. With the properly chosen graded meshes, the optimal error estimates are obtained which are confirmed by the numerical experiments. The analysis is closely related to the reduced curl-curl problems and their numerical approximations. Not like many other Maxwell eigensolvers based on the full curl-curl problems, the compactness of the involved operator and the uniform error estimates for the source problems greatly simplify the analysis of our proposed eigensolvers. (Received February 10, 2008)