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**AMG methods for indefinite Helmholtz and Maxwell
systems**

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We discuss the use of algebraic multigrid techniques for indefinite Maxwell and Helmholtz systems. In particular, we examine the complex frequency shift method for handling the negative eigenmodes. We describe the dependence of the solver performance on the frequency and the frequency shift in the preconditioner. We pay special attention to photonic crystal systems, in which the physics of an electromagnetic problem significantly reduces the size of the near-null space. We also discuss the effect of the curl operator on solver performance and the interaction of the complex shift with the curl-free modes.