**HP-FEM AND HP-DGFEM FOR THE HELMHOLTZ EQUATION**

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We consider the question of discretizing the Helmholtz equation at large (real) wavenumber. For high order, piecewise polynomial discretizations we present a convergence theory that is explicit in the discretization parameters (mesh size \(h\) and approximation order \(p\)) and the wavenumber \(k\). In particular, we show for a class of Helmholtz problems quasi-optimality of the Galerkin discretization in the \(H^1\)-norm, if \(kh/p\) is sufficiently small and, at the same time, \(p\) is at least \(O(\log k)\). For a high order discontinuous Galerkin method (DGFEM), we show a similar result under the conditions that \(kh/\sqrt{p}\) is sufficiently small and \(p = O(\log k)\). While this condition holds for rather general meshes, we show that the condition that \(kh/\sqrt{p}\) be small can be relaxed to the condition that \(kh/p\) be sufficiently small if the DG-discretization is based on regular meshes.

**REFERENCES**


