1138-65-298 **Ming-Jun Lai** (mjlai@uga.edu), Prof. Ming-Jun Lai, 540 Boyd Graduate Studies Building, Athens, GA 30602, and **Clayton Mersmann*** (mersmann@uga.edu), Clayton Mersmann, 524A Boyd Graduate Studies Building, Athens, GA 30602. *Spline Solutions to the Helmholtz Equation with High Wave Number.*

We study the mathematics of wave phenomena arising from the Maxwell equations. In the time-harmonic regime, the Maxwell equations reduce to the time-invariant Helmholtz equation. We use bivariate splines of arbitrary degree and smoothness to solve the Helmholtz equation with high wave number, while keeping the size of the underlying triangulation reasonable.

It is known that for linear finite elements, the wave number k and the size h of triangulation satisfies a stubborn relation $k^2h = 1$. For high order finite elements, so-called hp version of internal penalty discontinuous Galerkin (IPDG) methods, the relation is $k^3h^2 = O(p^2)$ for polynomial degree p. For continuous internal penalty finite element method (CIP-FEM), the relation is $O(k^{2p+1}h^{2p}) = O((k^{1+1/(2p)}h)^p$. Bivariate splines enable us to have very accurate solution for $kh \leq p/2$. No pollution phenomenon is observed in our experiments as long as $kh = p/2$. (Received February 12, 2018)