

数学与系统科学研究院

## 计算数学所学术报告

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报告题目:

Nonconforming methods for Maxwell source problems and eigenproblems

邀请人: 陈志明研究员

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报告地点: 科技综合楼三层 311

计算数学所报告厅

Abstract:

Partially motivated by the observation that the curl-curl operator behaves differently when it is applied

to the divergence-free field and the gradient field in the Hodge decomposition of a function, we introduce the reduced time-harmonic Maxwell (RTHM) equations whose solution is the divergence-free component of the solution to the time-harmonic Maxwell equations. Three schemes are formulated for numerically solving the RTHM system. Two of them use the classical nonconforming finite element approximations, and the other is based on the interior penalty type discontinuous Galerkin methods. To weakly impose the divergence-free condition satisfied by the solutions, the schemes work either 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 established which are confirmed by the numerical experiments. The similar numerical schemes and the error estimate results are extended for solving the reduced curl-curl problems. The operators in these schemes naturally define three Maxwell eigensolvers which are free of spurious eigenmodes and are free of penalty parameters. The analysis for these solvers 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.**

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