

Numerical simulation of Maxwell equation with projective free Jacobi-Davidson method

**Yin-Liang
Huang**

*Department of
Mathematics,
National Tsing Hua
University,
Hsinchu 300, Tai-
wan*

d897203@oz.nthu.edu.tw

**Tsung-Min
Hwang**

*Department of
Mathematics,
National Taiwan
Normal University,
Taipei 116, Taiwan*

twmin@math.ntnu.edu.tw

Wen-Wei Lin

*Department of
Mathematics,
National Tsing Hua
University,
Hsinchu 300, Tai-
wan*

wlin@am.nthu.edu.tw

**Wei-Cheng
Wang**

*Department of
Mathematics,
National Tsing Hua
University,
Hsinchu 300, Tai-
wan*

wangwc@math.nthu.edu.tw

Abstract — In this talk, we present a numerical method to compute full band gaps of three dimensional photonic crystals. The governing equation for this problem is the time-independent Maxwell equation. Based on Yee's scheme, the discretization of Maxwell equation results in a large generalized eigenvalue problem. The matrix form of such generalized eigenvalue problem can be explicitly represented. Under such matrix form, a basis of the high dimensional null space and a matrix representation of the subspace \mathcal{R} for all nonzero eigenvalues of this problem are shown in this talk. Using this representation, a projective free Jacobi-Davidson (PFJD) algorithm is developed such that the correct vector in the iteration of the PFJD Algorithm is automatically belonged to the subspace \mathcal{R} and then the target value in the algorithm can be easily set to zero. The computational results show that the PFJD Algorithm is very efficient.

Presenter's Name — Tsung-Min Hwang
