

# A Generalized Eigen-oscillation Spectral Element Method(GeSEM) for High Frequency complex Helmholtz equations and Phase Shift Mask Modeling in Nano-lithography

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In this talk, we will present a new parallel Schwarz generalized eigen-oscillation spectral element method (GeSEM) of 2-D complex Helmholtz equations for high frequency wave scattering in dispersive inhomogeneous media. This method is based on the spectral expansion of complex generalized eigen-oscillations for the electromagnetic fields and the Schwarz non-overlapping domain decomposition iteration method. The GeSEM takes advantages of a special real orthogonality property of the complex eigen-oscillations and a new radiation interface condition for the system of equations for the spectral expansion coefficients. As an application of the GeSEM, we conduct rigorous simulation of phase shift mask used in lithography for nano-scale VLSI micro-chip design. The numerical results demonstrate the advantage of GeSEM for its handling non-periodic structures such as the optical image near mask edge and parallel performance which make simulation of large scale mask possible for whole chip mask modeling.

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