1077-65-2268 **Juan Galvis*** (jugal@math.tamu.edu), 3404 TAMU, Texas A&M University, College Station,, TX 77843-3404, and **Efendiev**. *Multiscale methods for high-contrast problems using local spectral basis functions.*

We study multiscale finite element methods (MsFEMs) using spectral multiscale basis functions that are designed for high-contrast problems. Multiscale basis functions are constructed using eigenvectors of a carefully selected local spectral problem. This local spectral problem strongly depends on the choice of initial partition of unity functions. The resulting space enriches the initial multiscale space using eigenvectors of local spectral problem. The eigenvectors corresponding to small, asymptotically vanishing as the contrast increases, eigenvalues detect important features of the solutions that are not captured by initial multiscale basis functions. Multiscale basis functions are constructed such that they span these eigenfunctions that correspond to small, asymptotically vanishing, eigenvalues. We present a convergence study that shows that the convergence rate (in energy norm) is proportional to $(H/\Lambda*)^1/2$, where $\Lambda*$ is proportional to the minimum of the eigenvalues that the corresponding eigenvectors are not included in the coarse space. Numerical results are presented. (Received September 22, 2011)