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**Shi Jin\***, University of Wisconsin. *Hamiltonian systems and Liouville equations with discontinuous Hamiltonians: Computational methods for high frequency waves in heterogeneous media.*

We introduce Eulerian methods that are efficient in computing high frequency waves through heterogeneous media. The method is based on the classical Liouville equation in phase space, with discontinuous Hamiltonians (or singular coefficients) due to the barriers or material interfaces. We provide physically relevant interface conditions consistent with the correct transmissions and reflections, and then build the interface conditions into the numerical fluxes. This method allows the resolution of high frequency waves without numerically resolving the small wave lengths, and capture the correct transmissions and reflections at the interface. Moreover, we extend the method to include diffraction, and quantum barriers. Applications to semiclassical limit of linear Schrodinger equation, geometrical optics, elastic waves, and semiconductor device modeling, will be discussed. (Received April 11, 2007)