

Fast solvers for frequency domain wave propagation

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Direct numerical approximation of high frequency wave propagation typically requires a very large number of unknowns and is computationally very costly. We will discuss two aspects of this type of problem formulated in frequency domain. One is the development and analysis of fast numerical algorithms of optimal computational complexity for boundary integral formulations and for variable coefficient differential equations. In the variable coefficient case the challenge is preconditioning. The algorithms are based on separable approximation lemmas. The other aspect is analysis revealing when algorithms of this type of operator compression are possible and when they are not. We will comment on analysis based on stationary phase and lower bounds for low rank approximations.