1135-39-850 **Tiffany Jones*** (tiffany_jones1@baylor.edu), Department of Mathematics, Baylor University, One Bear Place #97328, Waco, TX 76798-7328, and **Qin Sheng** (qin_sheng@baylor.edu), Department of Mathematics, Baylor University, One Bear Place #97328, Waco, TX 76798-7328.

On Stabilities of a Decomposed Compact Method for Solving Highly Oscillatory Wave Equations.

The study of numerical partial differential equations has been an ever-expanding field of computational mathematics. This growth is inspired by the challenges in the theory and methods, but also the significance of the equations involved. And yet, even with this motivation compelling the advances of recent years, the research of numerical partial differential equations is far from completion.

A key component in aforementioned explorations is the stability analysis. In this talk, we will concentrate on two types of the numerical stability for a decomposed compact method, which is highly effective and efficient for solving highly oscillatory Helmholtz equations. A radially symmetric transverse field and polar coordinates are considered.

To remove the singularity due to coordinate transformations, decomposed transverse domains are incorporated. A compact algorithmic structure is thus introduced to raise the accuracy of the finite difference scheme in the transverse direction.

Though the decomposed compact scheme implemented is shown to shy away from conventional stability in the von Neumann sense, it is unconditionally stable with index one in an asymptotical sense. Computer experiments and beam propagation simulations further verify our conclusions. (Received September 15, 2017)