

Texas Southern University
MATHEMATICS DEPARTMENT COLLOQUIUM



**ON AN EFFICIENT PARALLEL FINITE ELEMENT SOLVER FOR THE VELOCITY-
CURRENT MAGNETOHYDRODYNAMICS EQUATIONS**

Keith Brauss

Department of Mathematics, Lamar University
kbrauss@lamar.edu

Thursday, November 12, 2015
3:00 pm – 4:00 pm
Room 151 at Science Building

Abstract

A parallel finite element method is implemented for the velocity-current magnetohydrodynamics equations proposed by A.J. Meir and Paul G. Schmidt from Southern Methodist University and Auburn University. Applications for magnetohydrodynamics equations range from plasma physics to liquid metal casting. The implementation utilizes open source, academic and government funded supercomputing software. The nonlinear integro-differential equations are linearized using a convergent Picard iteration, while the resulting system of linear equations is solved iteratively with the Krylov subspace solver GMRES. A preconditioner is formulated and constructed to obtain GMRES convergence. The implementation is tested on three different problems.