Abstract Submitted
for the DPP06 Meeting of
The American Physical Society

The Wavelet Approach to Solving the Mode Conversion Wave Equation[1] S.P. SMITH, C.K. PHILLIPS, E.J. VALEO, PPPL, D.N. SMITHE, Tech-X Corp., RF SCIDAC TEAM — Existing "state of the art" full wave radio frequency (RF) field codes utilize a Fourier expansion for the wave fields on a fixed grid. In plasmas in which both short and long wavelength modes co-exist due to mode conversion, this solution method entails the filling and subsequent inversion of very large matrices, which limits the attainable resolution and requires significant computational time, even on the largest supercomputers. An alternate approach based on wavelet expansions for solving wave equations arising in the context of mode conversion between a fast and slow wave is presented. The merits of using either Gabor or modified Morlet wavelet expansions, as well as the effects of irregularly spacing the wavelets to increase the spatial resolution, are discussed. Initial results indicate that it is possible to reduce the computational load while maintaining numerical accuracy by utilizing the wavelet expansion to avoid computing matrix elements for short wavelength modes in regions where such waves should not exist, based on a dispersion relation analysis.

[1]This work was performed under appointment to the Fusion Energy Sciences Fellowship Program administered by ORISE under a contract between the US DOE and ORAU and was also supported by DOE Contract No. DE-AC02-76CH03073.

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Date submitted: 21 Jul 2006 Electronic form version 1.4