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Full Wave Simulations of ICRF Mode Conversion and Lower Hybrid Propagation in Toroidal Geometry.*

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ABSTRACT

The increased availability of massively parallel processing (MPP) systems has lead to the improved accessibility of some Full Wave (FW) phenomena and some new regimes as well. FW studies of mode conversion (MC) processes in toroidal plasmas have required prohibitive amount of computer resources in the past. The TORIC code solves the linear fourth order reduced wave equation for the ion cyclotron range of frequencies (ICRF) - in toroidal geometry using a Fourier representation for the poloidal dimension and finite elements in the flux dimension. It has been parallelized to access the increased available computer processing and memory of MPP computers. Mode conversion scenarios may now be done routinely in a few hours of elapsed time with only 32 processors – even large problems can be done with more processors. We present examples of fully converged studies of MC on Asdex-Upgrade and Alcator C-Mod. The new capabilities of the code extend beyond what is required for ICRF MC and permit studies of the very small wavelengths of lower hybrid (LH) waves. We will show preliminary results of FWLH calculations in C-Mod geometry. Some discussion of LH physics issues from a FW perspective, such as focusing, diffraction, and spectral broadening will also be given.

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