3D Full Wave Simulation of Reflectometry in Toroidal Plasma

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Objectives

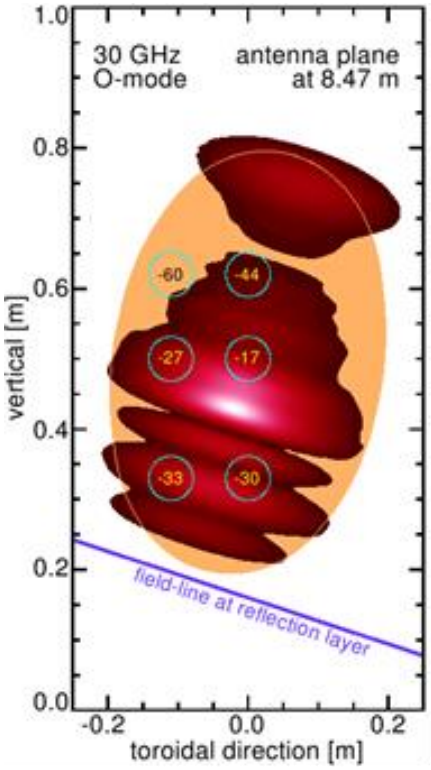
- Develop 2 and 3 dimensional efficient full wave solvers.
- Use for quantitative assessment of multi-dimensional geometric effects: curvature of reflecting surface, refraction, diffraction, variable magnetic field orientation, antenna gain and orientation.

Accomplishments

- By using multiple spatial domains and solving the demanding full wave equations only in a narrow layer surrounding the reflection surface, computational demands are greatly reduced, making simulations in realistic geometry feasible.

Impact

- 2D code (FWR2D) has been used to:
  - Interpret NSTX, CMOD data
  - Help optimize D3D imaging reflectometry configuration
  - Investigate effects of shift of reflection layer in ITER due to relativistic electron mass increase at high electron temperature.
- 3D code (FWR3D) is being used to help optimize low field side reflectometry configuration on ITER.



3D O-mode reflectometry simulation for ITER H-mode profiles. Amplitude of reflected field at antenna plane is shown, without (orange) and with (red) one realization of 5% amplitude field aligned density fluctuations of characteristic wavevector 1/cm. Launch is from the center-right antenna. The signal strength (dB) transmitted to each receiver is indicated.

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