

## RESEARCH PLANS FOR 2005

# HEATING AND CURRENT DRIVE BY ELECTRON BERNSTEIN WAVES

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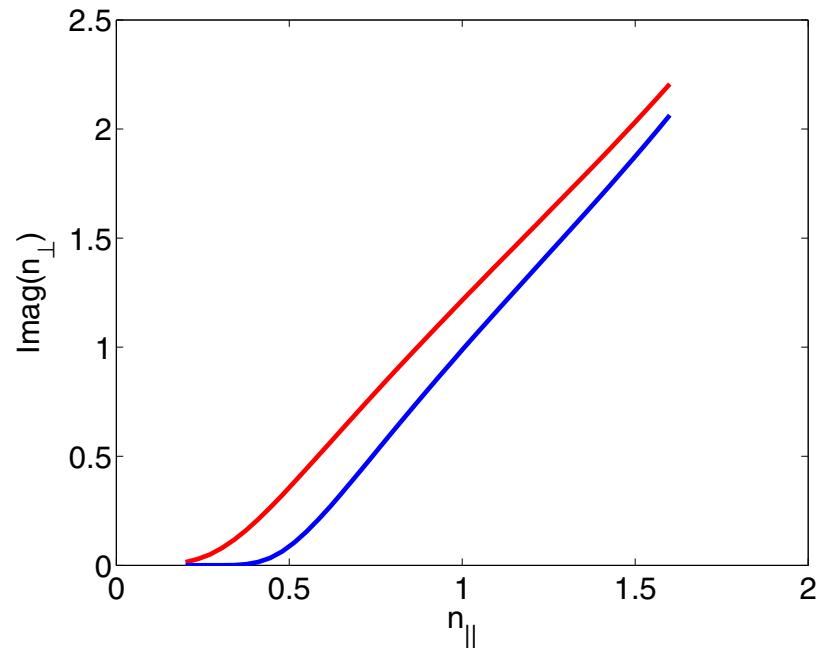
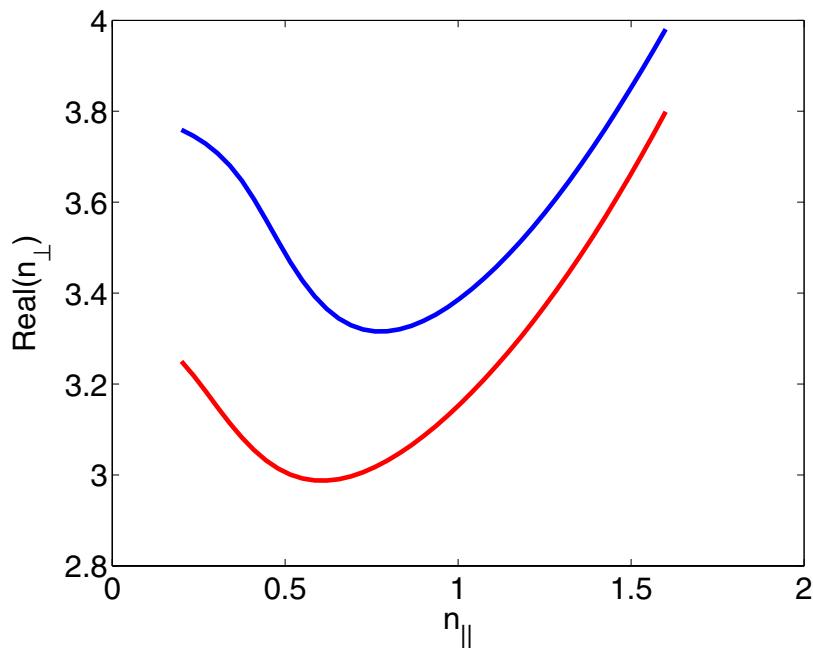
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Supported by DoE Contracts  
DE-FG02-99ER-54521,  
DE-FG02-91ER-54109.

NSTX Results Forum  
Princeton Plasma Physics Laboratory  
Thursday, September 23, 2004

## RECENT DEVELOPMENTS

- A code R2D2 has been developed for studying wave propagation and evaluating the quasilinear diffusion coefficient using a fully relativistic dielectric tensor.

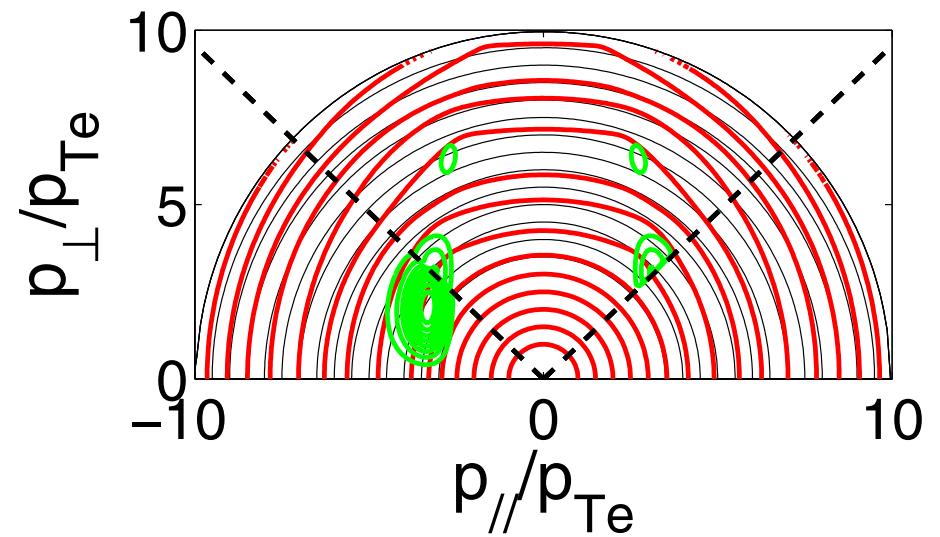
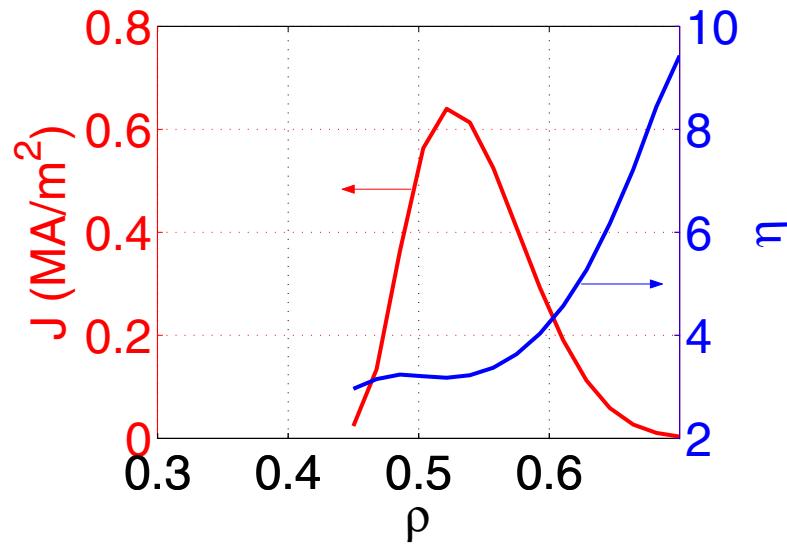


$$(\omega_p/\omega_c)^2 = 36, \quad \omega/\omega_c = 1.8, \quad T_e = 3 \text{ keV}$$

## RECENT DEVELOPMENTS

- A drift kinetic Fokker-Planck code DKE (developed by J. Decker and Y. Peysson) with quasilinear wave diffusion has been implemented for studying current drive by electron Bernstein waves.
- At present DKE is used to solve  $\{C(f)\} + \{Q(f)\} = 0$  for the electron distribution function
  - $C(f)$  is the bounce-averaged collision operator,
  - $Q(f)$  is the bounce averaged quasilinear RF diffusion operator.
- There are two viable schemes for current drive by electron Bernstein waves:
  - OHKAWA: for efficient current drive off-axis;
  - FISCH-BOOZER: for efficient current drive in the plasma core.

# OHKAWA CURRENT DRIVE



$$f = 11.8 \text{ GHz}, n_{\parallel} = 1.5$$

$$J_{peak} \approx 0.64 \text{ MA m}^{-2}, P_{peak} \approx 1.4 \text{ MW m}^{-3}, \eta'_{peak} \approx 0.47 \text{ A.m/W}$$

$$\eta = \frac{J/en_e v_{te}}{P/\nu_e n_e m_e v_{te}^2} \approx 3.2$$

## PLANS FOR 2005

- In collaboration with J. Decker, incorporate the fully relativistic quasilinear diffusion coefficient from R2D2 into DKE
  - study conditions for optimizing EBW driven current in various parts of the plasma;
  - turn on the *drift kinetic* part of DKE.
- Develop a fully relativistic EBW ray tracing package
  - collaborate with Dr. Harvey to implement R2D2 into GENRAY.
- In collaboration with Drs. Taylor and Efthimion try to model and understand EBW emission experiments on NSTX
  - useful in understanding coupling of EBW power.