Report on the JIFT Workshop of 1/25 to 1/27, 2005 in Kyoto

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Talks of:

1. Y. Nakamura, Bumpy Field Effect on Bootstrap Current
2. Y. Todo, Simulation of Alfvén Eigenmodes and Energetic Particles in LHD
3. S. Yamamoto, Config. Dependence of Energetic Ion Driven Instabilities in LHD
4. S. Murakami, Global Simulation Studies of Energetic Ions in LHD
5. A. Boozer, EQUILIBRIUM INFORMATION FROM δW STABILITY CODES

Bumpy Field Effect on Bootstrap Current

Y. Nakamura
Kyoto University

Based on: SHAING KC, CARRERAS BA, DOMINGUEZ N, et al., *BOOTSTRAP CURRENT CONTROL IN STELLARATORS*, Phys Fluids B 1, 1663 (1989).

Experiments on Heliotron J show the sign of the bootstrap current depends on the magnitude of the vertical field.

Did calculations of bootstrap current in $\nu \to 0$ limit to understand results and obtained qualitative agreement.

Confirmed that toroidal ripple ε_r reduces bootstrap current in a tokamak. For ε_r to increase bootstrap current need $\varepsilon_r < \varepsilon_t < \varepsilon_h$.

Simulation of Alfvén Eigenmodes and Energetic Particles in LHD

Y. Todo
NIFS

Wants to extend the MEGA code, which is now axisymmetric to LHD. MEGA is δf for particles plus nonlinear MHD.

Neglects $\vec{B} \times \vec{\nabla} B$ drift but keeps $\vec{E} \times \vec{B}$ and $A_{\parallel}$ motions in the evolution of δf weights but all three in location of particles.

$$p_{\perp}(\vec{x}) = B \sum \mu_i w_i S(\vec{x} - \vec{x}_i)$$

Using NEC SX-7 computer nonlinear runs take about 1 week, so he is using linear runs to test code.

Configuration Dependence of Energetic Ion Driven Instabilities in LHD

S. Yamamoto
Kyoto University

Using Carolin Nührenberg's CAS3D code found agreement between *N=1* and *N=2* gaps and observed frequencies of modes driven by neutral beams in LHD.

Sees both T(toroidal)AE (*N=1 to 5*) and H(helical)AE (*N=1 to 3*).

Global Simulation Studies of Energetic Ions in LHD

S. Murakami
Kyoto University

Used δf Monte Carlo code to study the ICRH heating in LHD by finding the Green's function for a delta function source. This was convoluted with the spatial dependence of the ICRH wave.

Has not yet chosen ICRH spatial dependence so the power out of the wave is consistent with the power into the particles, but obtains extremely close agreement with empirical total absorbed power.

Primary particle/wave interaction is in trapped particles near their turning points. Spreads particles using $J_0(k_\perp \rho)$ with wave phase chosen using a random number at each interaction.

EQUILIBRIUM INFORMATION FROM δW STABILITY CODES

Allen Boozer
Columbia University

1. Find improved equilibria and equilibria with complicated forces

2. Find and eliminate islands through jumps in $\left[\xi^{\psi}\right]$

3. Design and interpret magnetic diagnostics

4. Find improved equilibria and find minimal number constraints on coils.

In collaboration with Carolin Nührenberg, MPI Greifswald, Germany.
C. Nührenberg and A. H. Boozer, Physics of Plasmas 10, 2840 (2003).