Summary Slide of P6-49 ThW presentation:

NBI and HHFW Fast Ion Temporal Dynamics Modeling with CQL3D-Hybrid-FOW in NSTX Discharges

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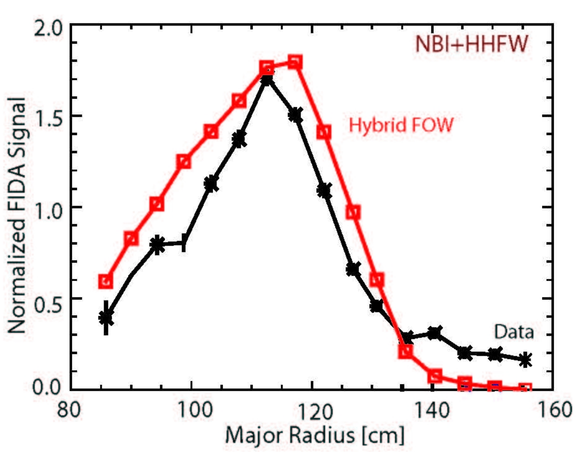
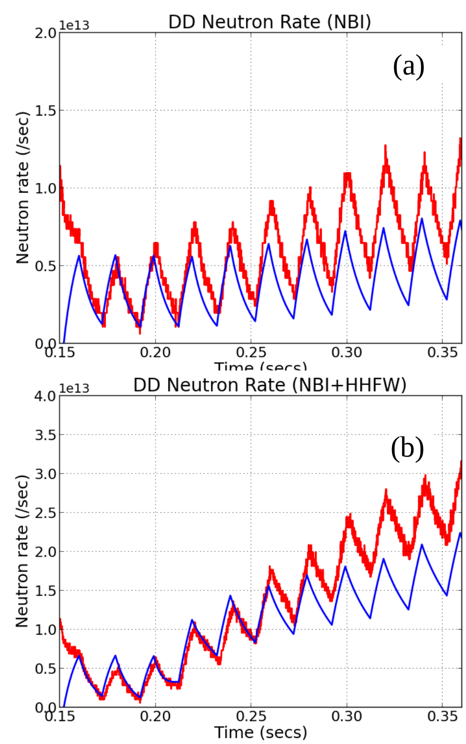
Accurate and computationally tractable simulations of plasmas are key elements in our fusion energy program, demonstrating predictive and scoping studies capabilities. Our contribution supports these important objectives.

The key elements of the authors' presentation are:

1. Inclusion of full, guiding-center finite-orbit-width (FOW) effects in a single-processor-level calculation of time-dependent evolution of the radial profile of time-dependent fast ion distributions.
2. A reduced CQL3D-Hybrid-FOW simulation provides synthetic diagnostic signals for time-dependent simulations of heating by neutral beam (NB) and high harmonic fast wave (HHFW) in NSTX discharges.
3. The diagnostic signals are for fast ion D-alpha (FIDA), neutral particle analyzer (NPA), and neutron rates (dN/dt).
4. The simulated signals are in reasonable agreement with the experiment, as indicated in Figs. 1 and 2, below.
5. These signals substantially validate CQL3D-Hybrid-FOW simulation of the fast ion distribution, neutral beam and high harmonic heating rates, and classical Coulomb collision slowing down rates.



Comparison of simulated (red) and measured (black) data from a Fast Ion D-alpha (FIDA) detector for NSTX HHFW heating in the presence of NBI injection. The fast ion distribution used for the diagnostic calculation is from a combined GENRAY ray tracing and finite ion-orbit width ("Hybrid-FOW") CQL3D Fokker Planck model.



Time-dependent neutron simulation(blue) and experiment(red[redacted] of (a) a modulated beam NBI only NSTX discharge; and (b) modulated NBI with steady HHFW turned on at 0.2 secs.