Benchmark predictive capability of advanced quasi-linear RF simulation codes.

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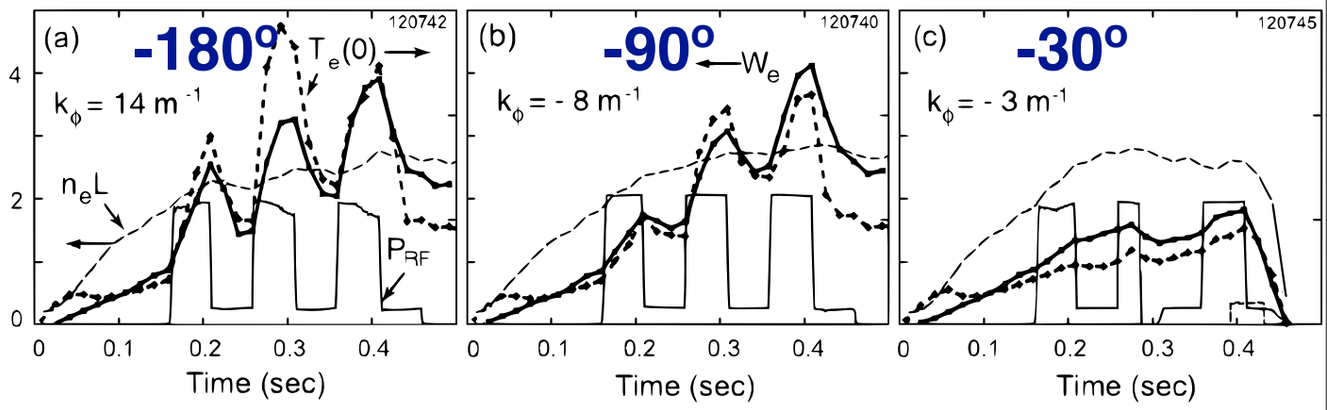
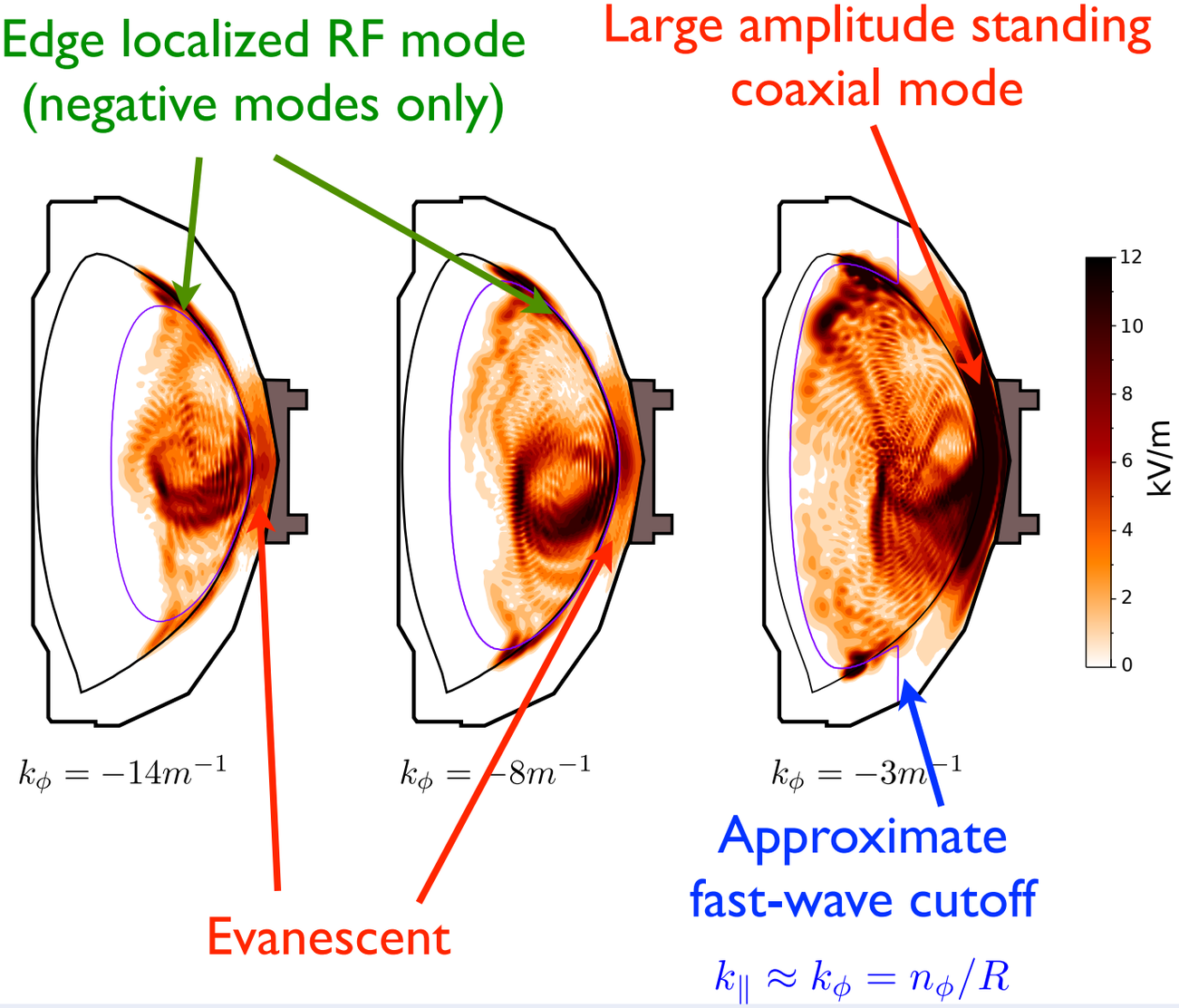
- The RF-SciDAC collaboration have added several new features to the suite of predictive RF tools. These features require validation with experiment.
- NSTX provides a suitable testbed for validating the following ITER relevant physics ...
  - RF power coupling efficiency.
  - Impact of fast alphas and finite ion orbit effects.

RF Edge Modes and Heating Efficiency

- AORSA improvements that include a SOL need to be validated.
- Recent simulations predict **coaxial standing modes in the SOL** and **edge localized RF modes for co-CD only**.
- New (100 MHz) magnetic loop probes should see edge standing modes.
- ERD should show enhancement of perp ion temperature near LCFS for co-CD only.

Shot #120742, 120740 & 120745 from Hosea et al., [PoP 15, 056104 (2008)]





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Finite Ion Orbit Effects and Fast Alphas

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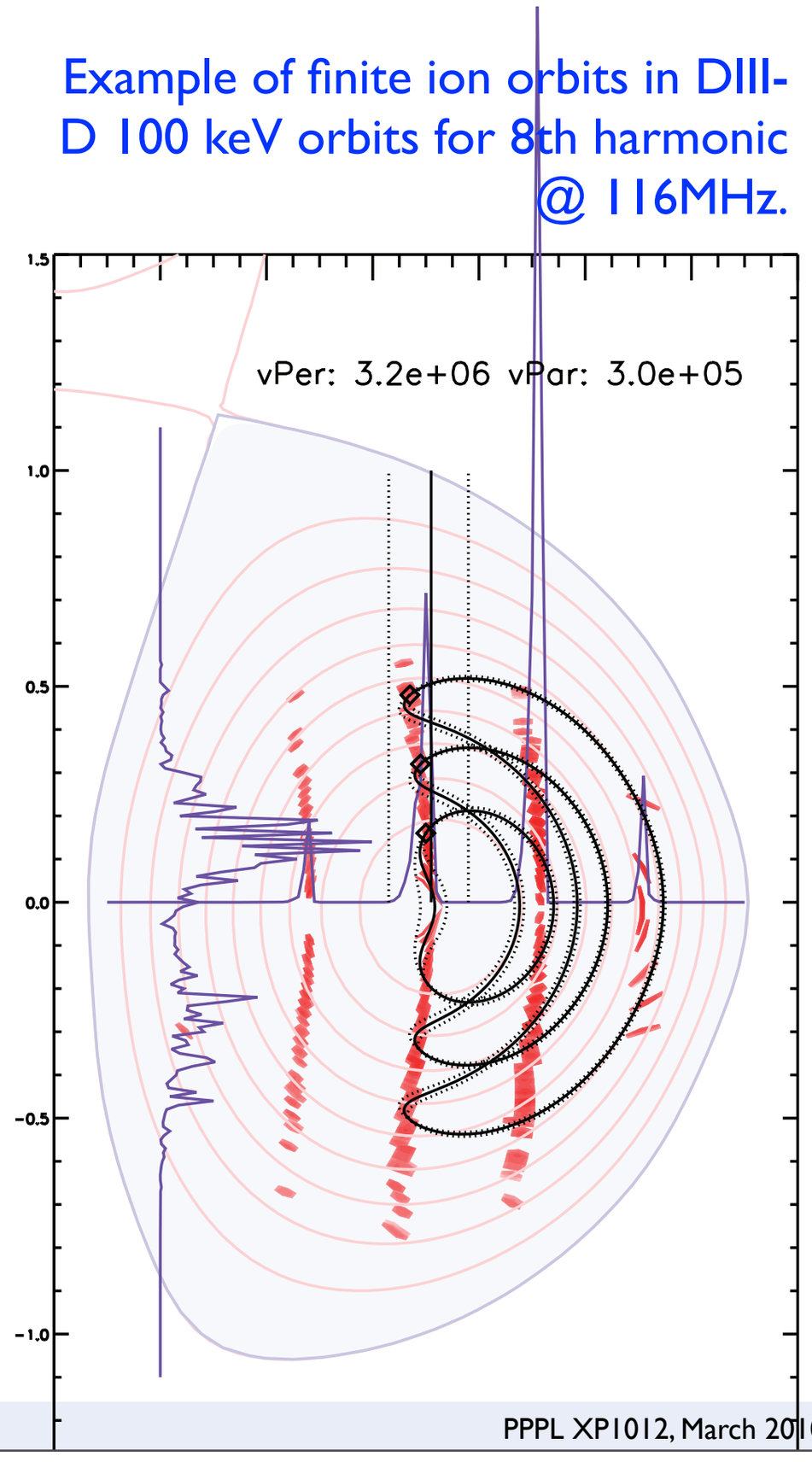
- The sMC (simple Monte-Carlo) code was created specifically to include finite ion orbit effects in quasi-linear self-consistent calculations in the $k_\perp \rho \sim 1$, HHFW, large-upshift regime, i.e., NSTX.
- sMC + AORSA gives the RF modified ion distribution function under collisions with a background thermal population.
- sMC is a toy to be replaced by NuBeam.
- **The RF modified beam distribution function (sMC or NuBeam) will be used in a synthetic diagnostic to compare with FIDA results.**

Example of finite ion orbits in DIII-D 100 keV orbits for 8th harmonic @ 116MHz.



PPPL XP1012, March 2010

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