Diagnostic Applications of Neutral Transport

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Objectives

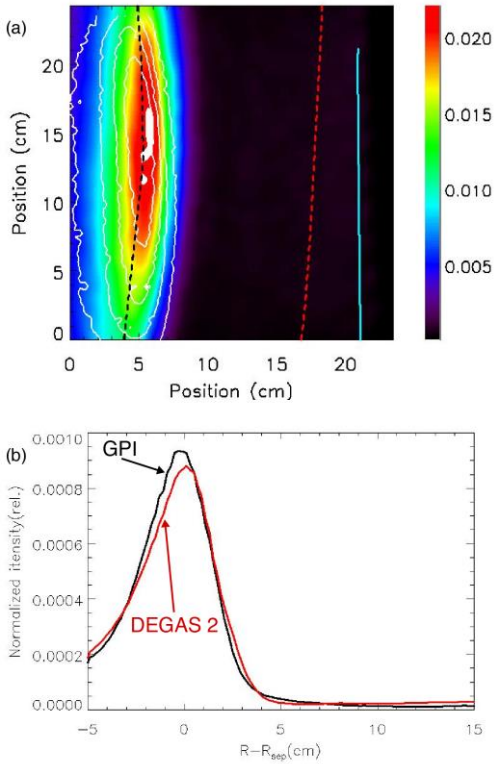
- Quantitative analysis of Gas Puff Imaging experiments,
- Accurate determination of tokamak midplane neutral density profiles.

Accomplishments

A decade of DEGAS 2 simulations of Gas Puff Imaging experiments has provided:

- Efficient and nearly automated techniques for setting up & executing simulations,
- Validation of DEGAS 2's molecular deuterium penetration model.

Led to a new DEGAS 2 based forward analysis technique for inferring atom densities over a wider spatial range than direct inversion; also yields molecular density.

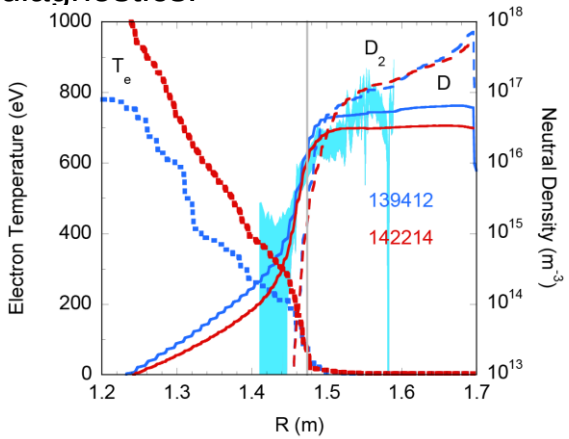


(a) Simulated (color contours) & observed GPI camera images. (b) Radial profiles from vertical summation provide one measure of agreement.

Impact

Application to several 2010 NSTX discharges yielded ranges:

- D_2: 2 → 8x10^{17} m^{-3}
- D: 1 → 7x10^{16} m^{-3}
- Can be used to quantify charge exchange loss of beam ions & resultant wall sputtering,
- & to assist in interpretation of other diagnostics.



Midplane atomic & molecular density profiles for two NSTX discharges.

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