DEGAS 2 Simulations of NSTX Gas Puff Imaging Experiments

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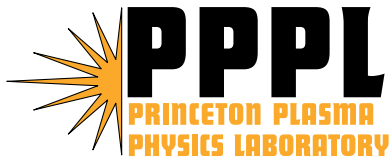
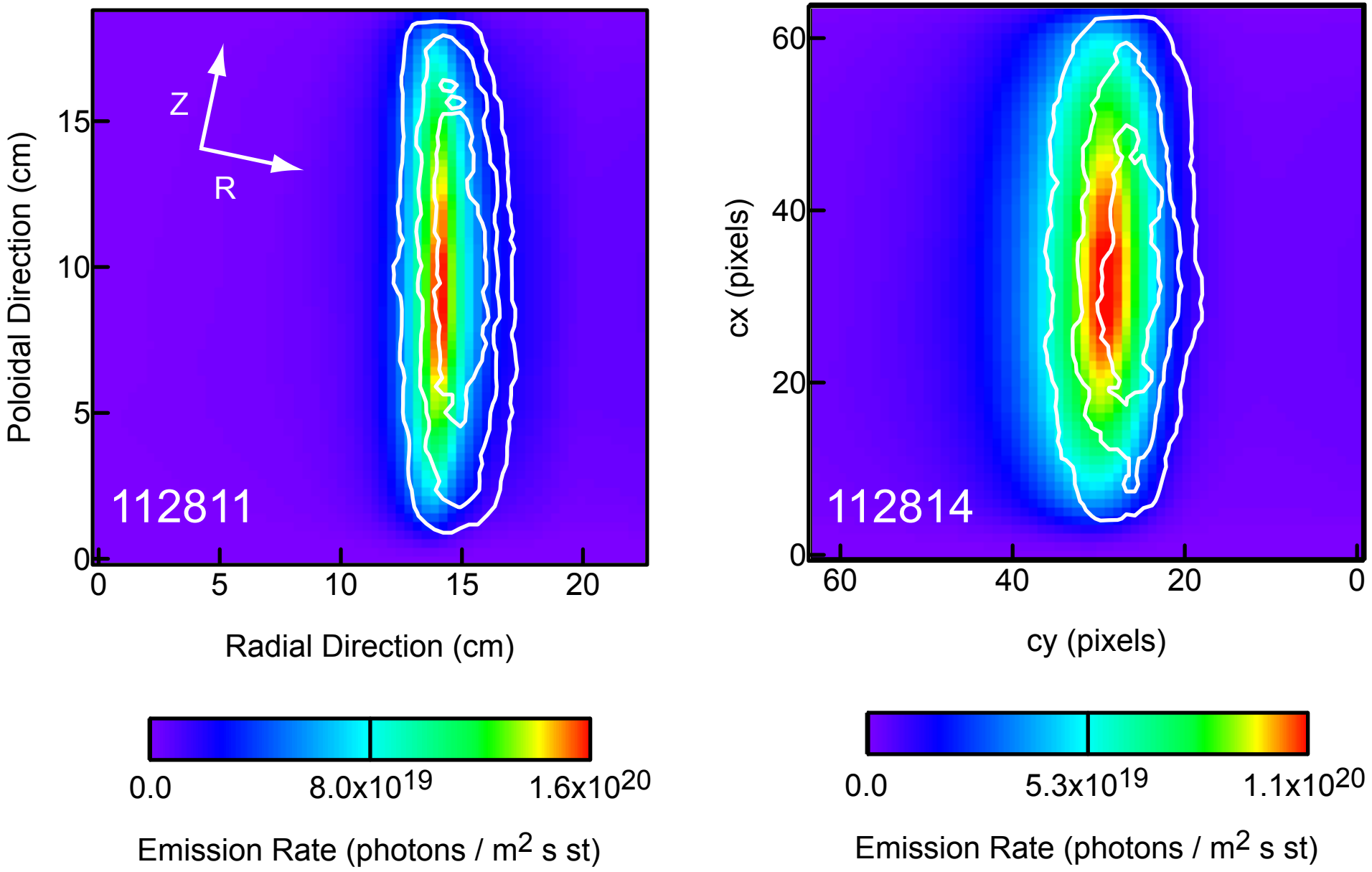


Radial Width & Location of Simulated Emission Clouds Match Experiment to Within Estimated Error



- For details, see: J. Nucl. Mater. **363–365**, 686 (2007).

- Conclude:
  - Analysis of time-dependence $\Rightarrow$ conventional, single-state atomic physics model for He valid.
  - DEGAS 2 can compute n_0 accurately
    $\Rightarrow$ use in unfolding 2-D vs. time n_e, T_e from GPI.

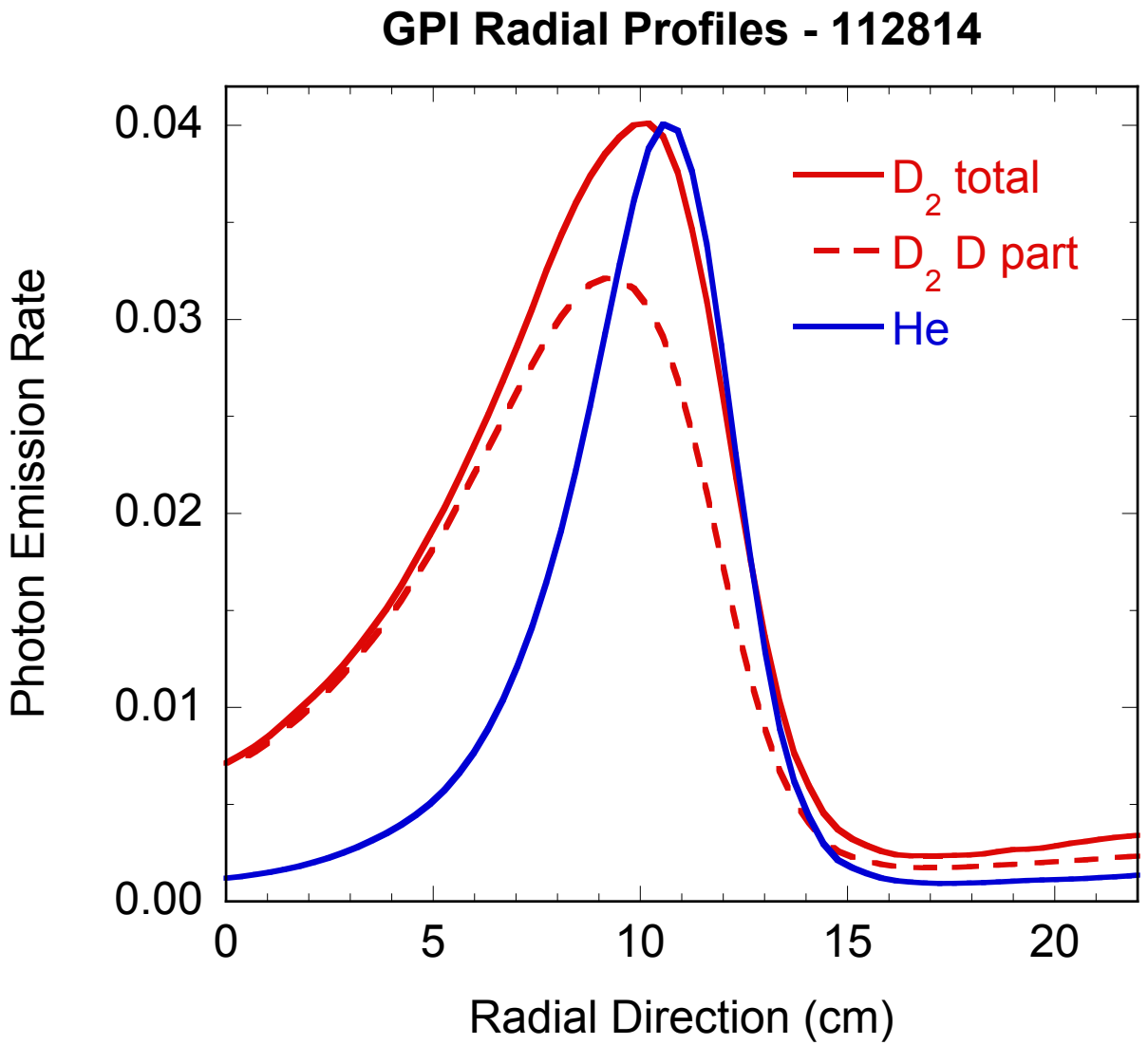
- Or use in synthetic diagnostic: Lodestar SOLT code,
  - Simulated 2-D turbulent, n_e, T_e + DEGAS 2 atomic physics tables
    $\Rightarrow$ emission rate per atom,
  - Radially varying neutral density profile: combine experimental median camera image / emission rate & DEGAS 2 n_0.

- All this with He puff, but most GPI data are for D_2.
  - More complex because get D_α photons from excited dissociation products.
  - And dissociation determines initial atom energy distribution.

Repeat DEGAS 2 Simulations with D_2 Puff

NSTX

- Molecular contribution is 20 - 30%,
- Shape not very different from that due to atoms only,
- Cloud is wider than with He,
  - Atoms from dissociation penetrate further.



Construct Fits to Simulated D Density

NSTX

- Simulated 7 n_e, T_e profiles with DEGAS 2,
  - Some ad hoc to enlarge parameter space.

- Fit radial profile of D density,
  - Function of local n_e, T_e
  - $\Rightarrow$ can apply to arbitary GPI data,
  - Or use in SOLT synthetic GPI diagnostic.