

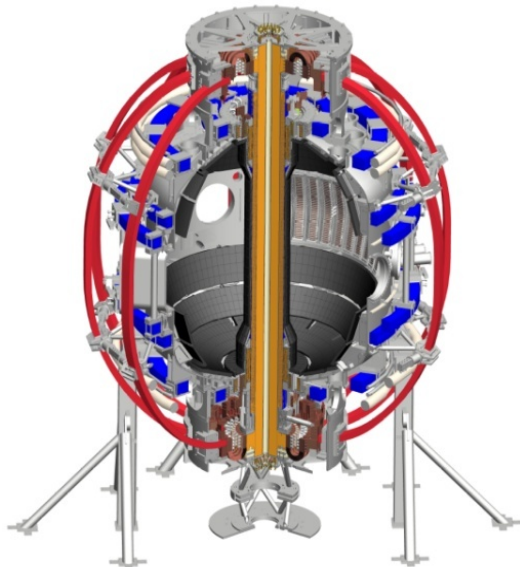
ENDD Midplane Neutral Density Profiles in NSTX-U

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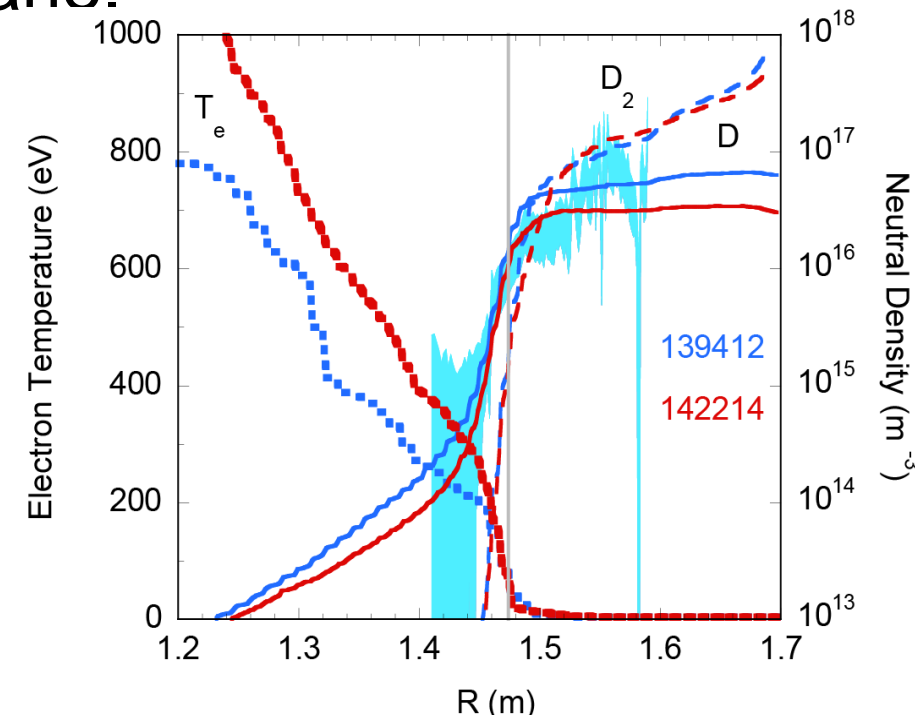
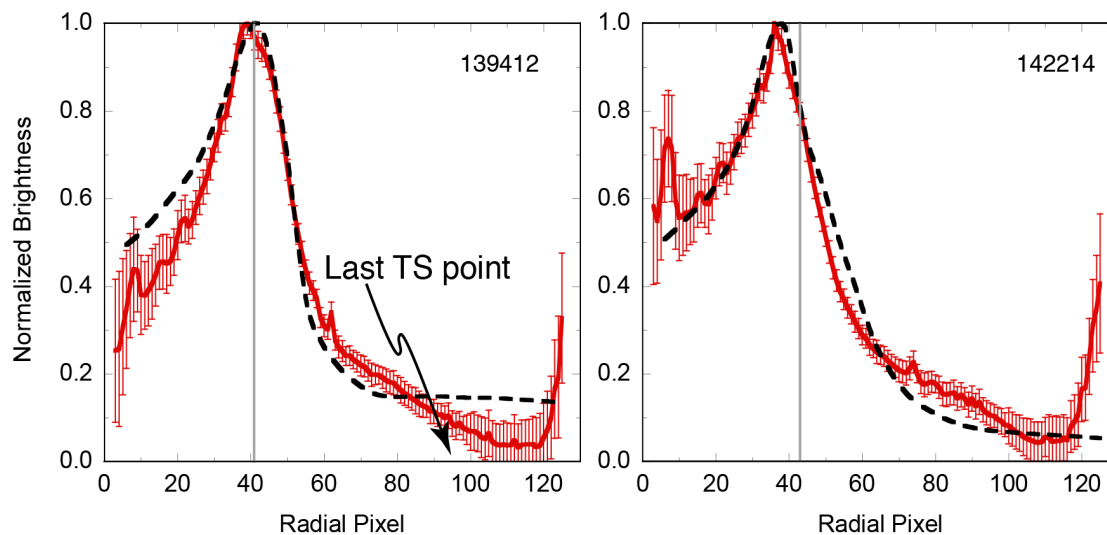
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Determine Prospects for Getting Routine Neutral Density Profiles from NSTX-U ENDD

- Multiple needs for midplane neutral density profiles:
 - CX losses of neutral beam ions,
 - Fluxes of energetic CX atoms to the wall,
 - Diagnostic interpretation, e.g., CHERS.
- Also of interest for pedestal build-up [R(15-1)] & plasma turbulence.
- And other XPs. E.g., from Pedestal:
 - Chang, “Effect of neutral particles...”
 - Churchill, “Effect of poloidal variation of gas fueling...”
 - Diallo, “ELM-induced fueling effects on the pedestal evolution”
- Simulation based technique for inferring D & D₂ profiles from ENDD data developed & applied to 2010 shots [D. P. Stotler et al., J. Nucl. Mater. (2014)].
- Can this be done routinely in NSTX-U? Yes, but...
 - Will it provide useful data in its new location?
 - Application may be at different toroidal location, e.g., NBI port.
- XP attempts to answer two questions:
 1. How do profiles obtained with current view compare with those from 2010?
 2. How much do midplane neutral density profiles vary toroidally?

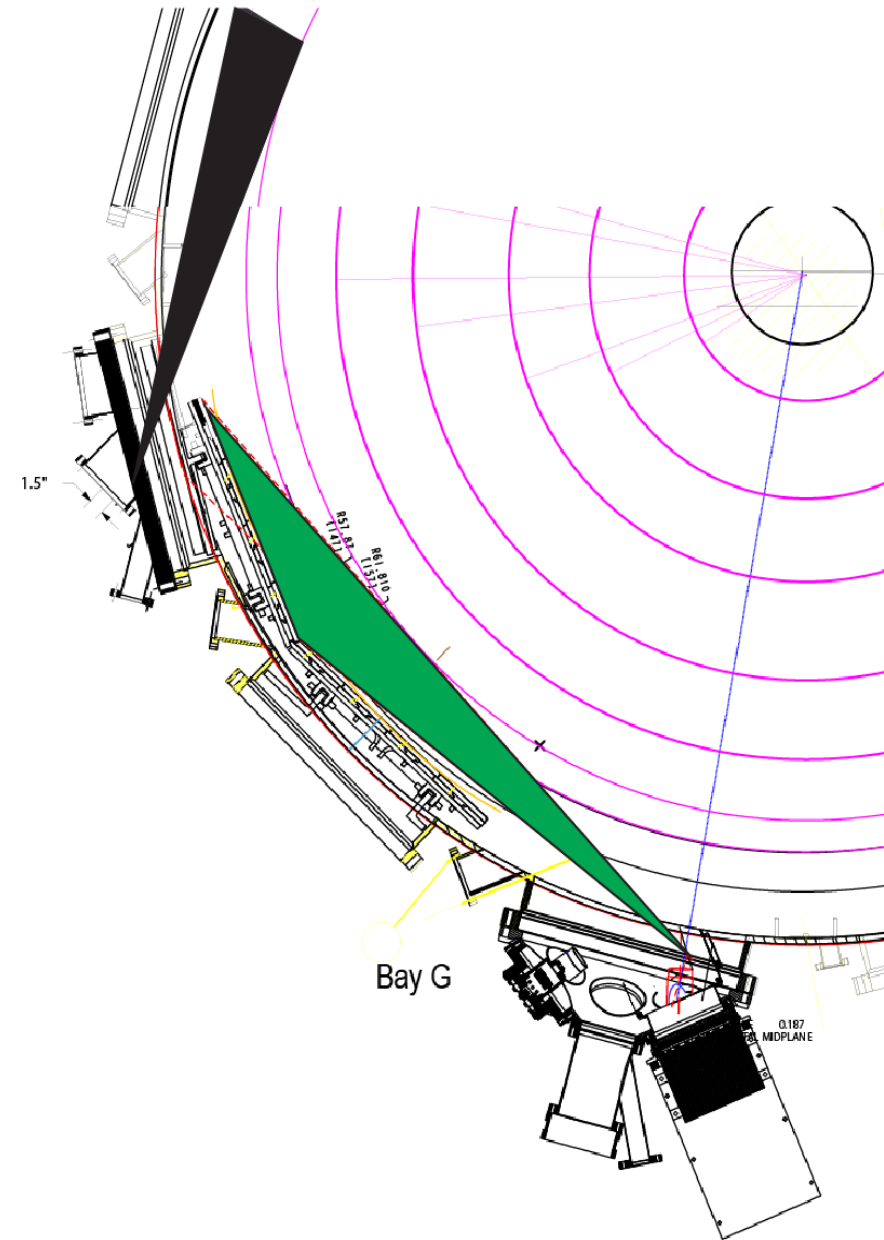
ENDD Data from 2010 Used to Develop & Test Method

- Input to DEGAS 2: EFIT equilibrium, ENDD geometry, Thomson & CHERS profiles.
- Assume vertically uniform D_2 source at vessel wall,
 - Results very insensitive to source spatial distribution.
- Scale simulation to match ENDD D_β brightness \Rightarrow absolute D_2 & D profiles at midplane.



ENDD Moved to Bay G → H: How Does $n_D(R)$ Compare with Bay I → J?

- Attempt to reproduce simulated discharges from 2010 to permit direct comparison,
 - E.g., 142214 from XP1029.
 - Match shape, $\langle n_e \rangle$, W_{tot} , etc.
 - \Rightarrow 0.5 day of operation.
- Assemble broader set of data in piggyback to compare with 2010 database.
- Diagnostics: ENDD, Thomson T_e & n_e , CHERS T_i & n_D , midplane micro-ion gauge pressures.
- Do neutral beams contribute?
 - Test by turning off or notching beams, one source or all.



Results May Provide Insight into Toroidal Variation of $n_D(R)$

- If shots similar to 2010 yield similar $n_D(R)$, would suggest small toroidal variation.
- If not, consider data from toroidally distributed diagnostics,
 - Midplane micro-ion gauges,
 - Other cameras.
 - More comprehensive modeling required to tie them together.
 - Facilitated by plasma background from whole-device plasma reconstructions / models (OEDGE, XGC).