NSTX-U CS diagnostic scoping (Langmuir Probes)

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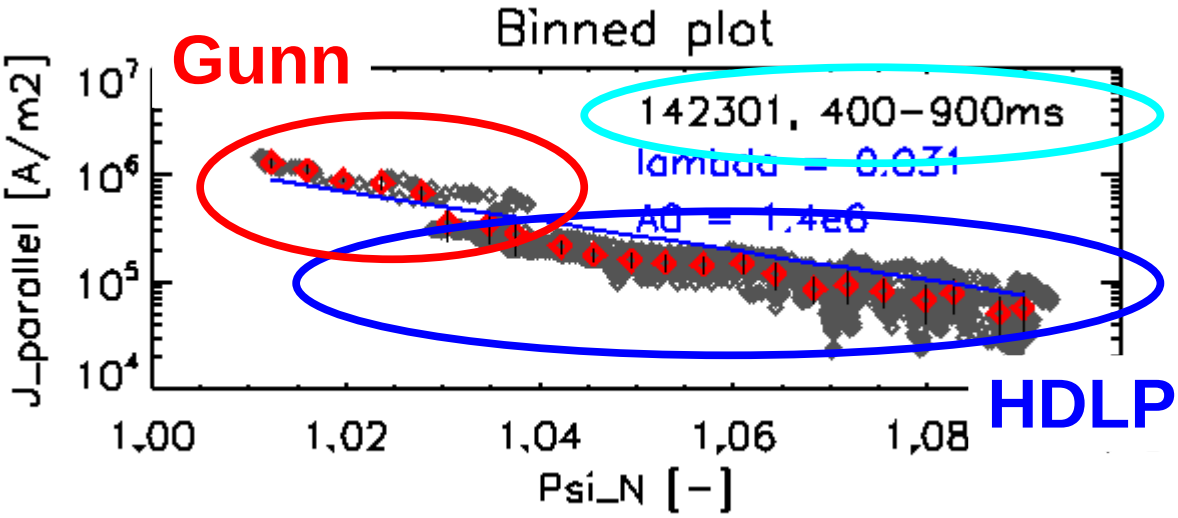
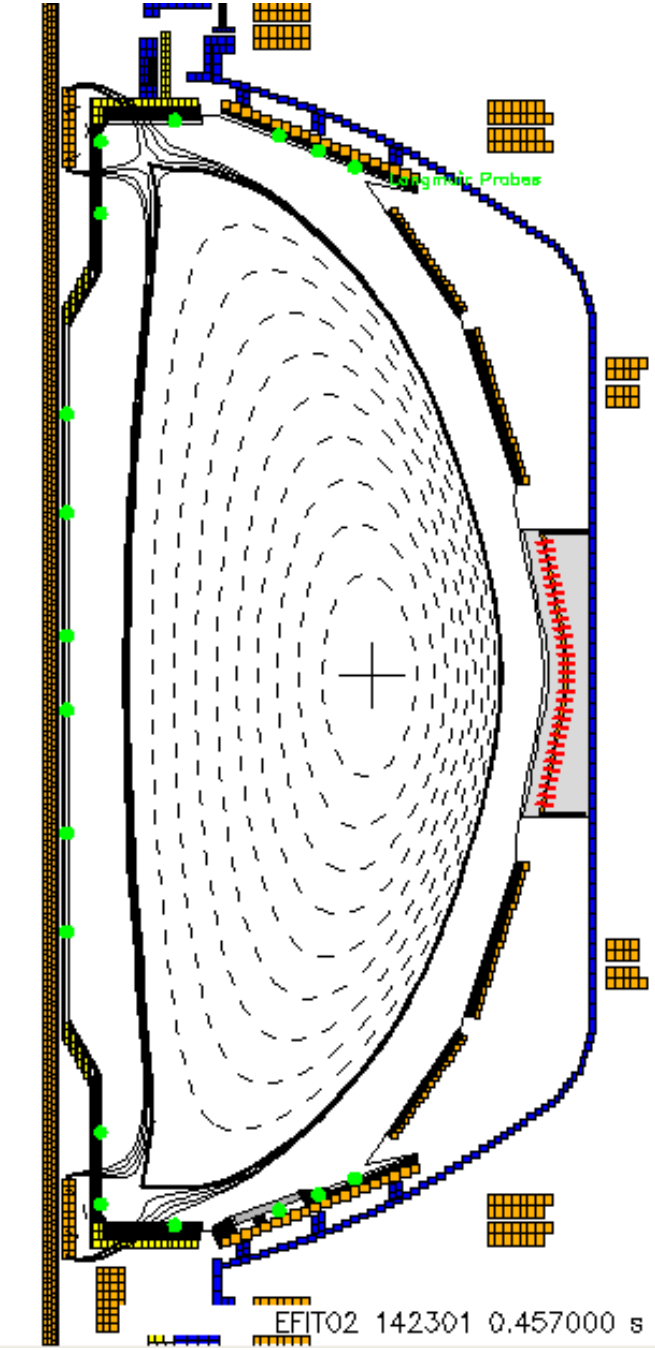
Overview of existing system

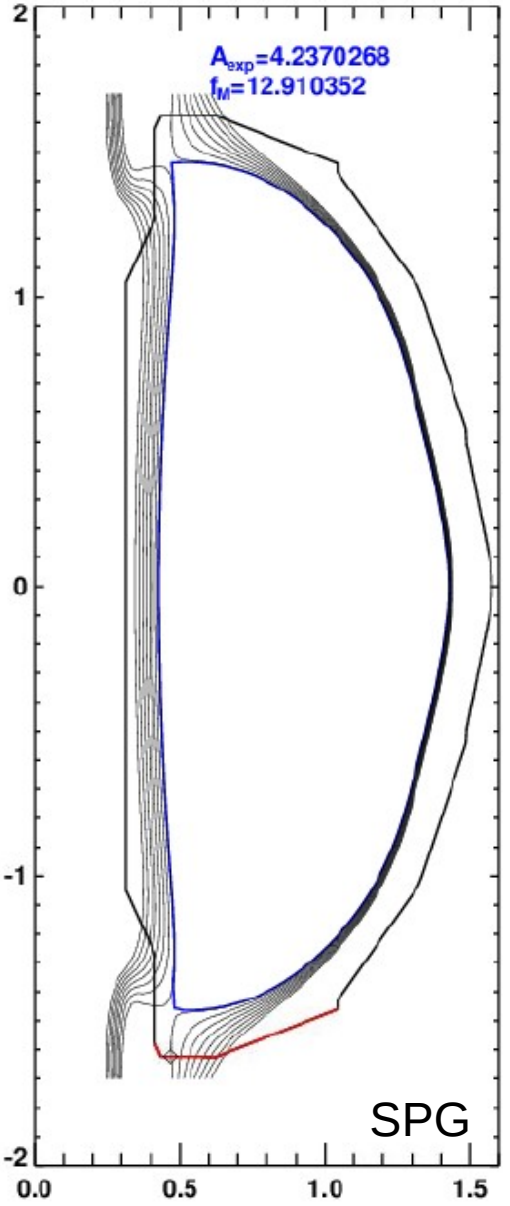
- 14 CS “Gunn” probes
  - 12 unique R-Z coordinates
  - Redundant wiring utilized, 2 wires run for each probe – 28 wires
- Single probe can be used to obtain profiles given strike-point sweep
  - Requires long collection period
  - Unless controlled, sweep range can change shot-to-shot





Upgrade prospects

- Example equilibrium shown at right
- Upgrade CS PFC outline obtained from “NSTX_CS_Upgrade_110317.xls” file for available lengths
  - IBDH = 15.6cm, IBDV = 35.3cm,
  - IBDC = 24.4cm, CS_lower = 1.05m
- Note: many upgrade shapes indicate significant quantities of flux on the “crown” portion of the divertor
- Improved coverage of divertor desirable so that:
  - Time dependent evolution will be resolvable without 500ms strike-point sweep
  - Improved plasma shaping flexibility while still getting probe data near strike-point
  - Some options on next slide...



Two strawman thoughts for now

- Consider (nearly) even distribution of probes along IBDV, IBDH, IBDC
  - Either 3 or 5cm spacing
- 20cm spacing along CS+1 at midplane
- Do not use redundant wiring (HDLP success)
- RFAs powerful T_i and E_{impact} diagnostic, need minimum 3 wires ea.
- Only consider internal wiring – external to vessel additional ground leads and shielding required

Option	Probes	Wires
Existing	14	28
A – 3cm spacing in divertor	57	57
B – 5cm spacing in divertor	37	37
Per RFA, minimum	1	3
B+ 5cm spacing + 4 RFAs	37LP + 4RFA	49