

# Characterization of HHFW Driven H-Mode Plasmas

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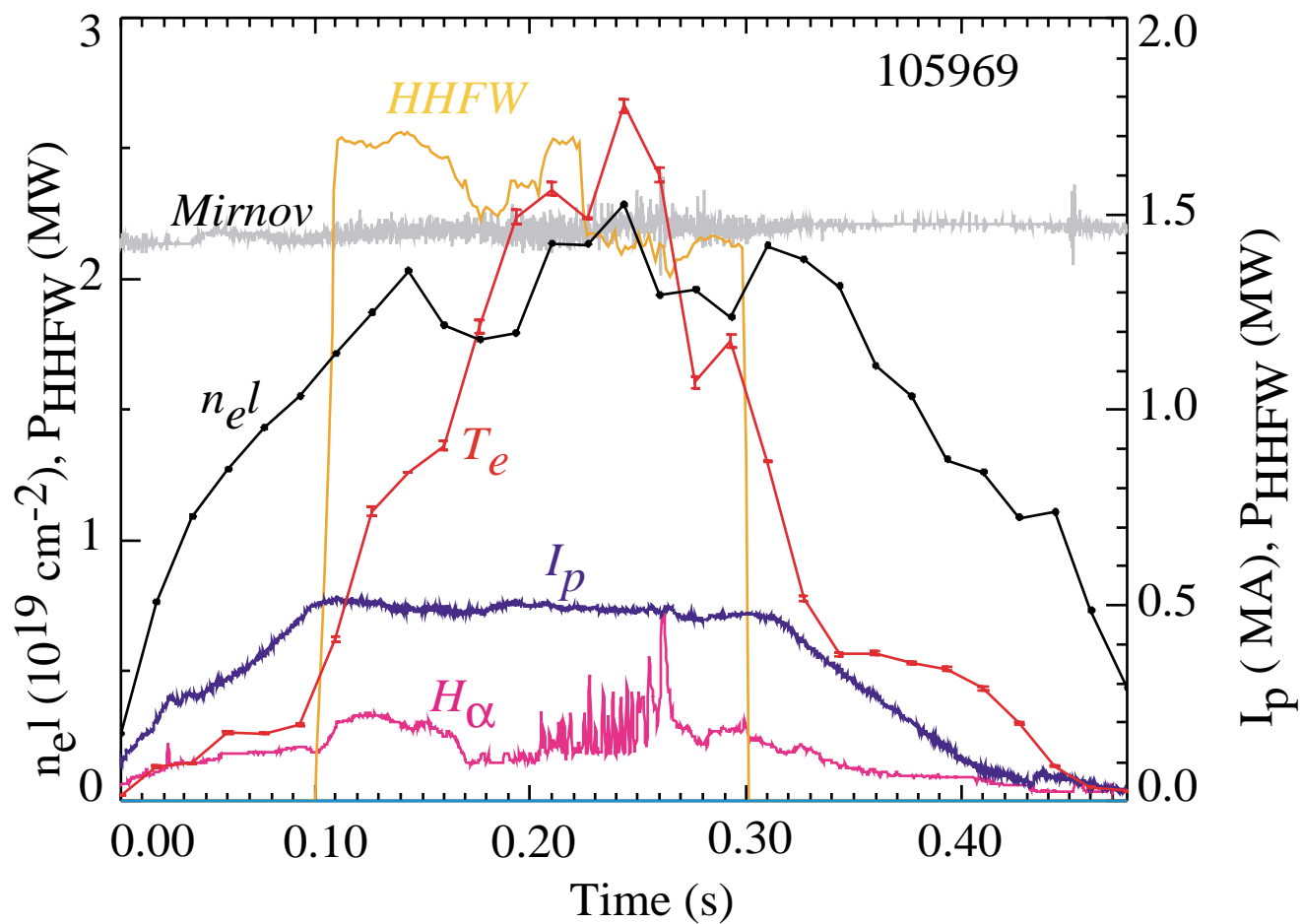
# HHFW Driven H-mode Plasmas in NSTX

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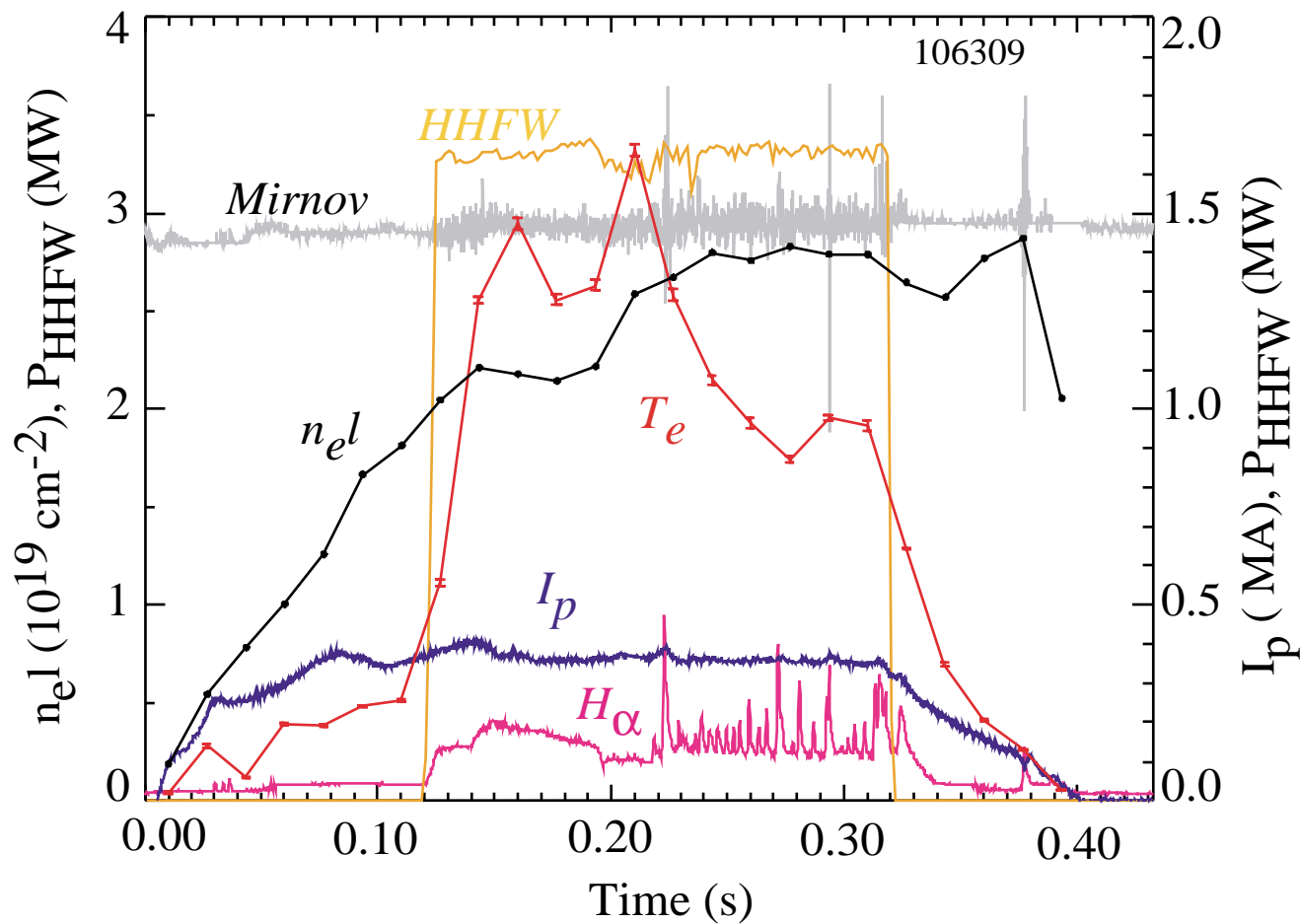
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- Observed in He and D plasmas.
- Standard H-mode signatures observed.
  - High edge  $n_e$ ,  $T_e$  pedestal,  $H_\alpha$  drop, increased  $E_{store}$ .
- So far, observed at 400, 500 kA.
  - Looked very close to H-mode at 700 kA.
- So far , have tried only 4.5 kG + 3.75 kG.

# A Medium-duration HFW H-mode Discharge 500 kA, Deuterium



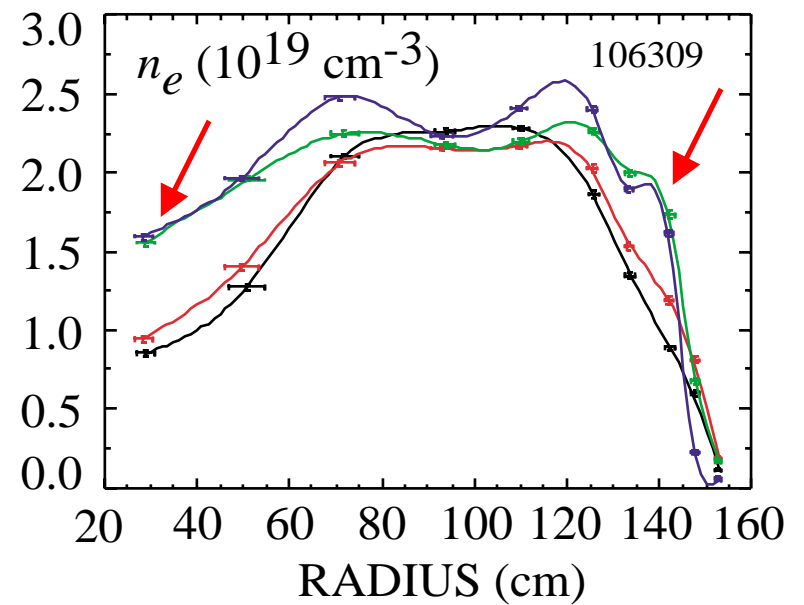
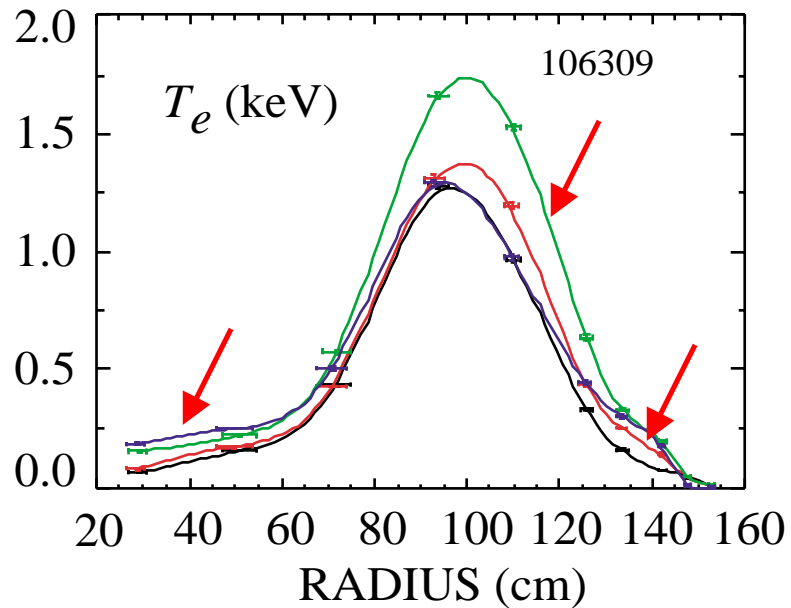
# A Long-duration HHFW H-mode Discharge 370 kA, Deuterium



# $n_e(R)$ and $T_e(R)$ with H-mode Shape

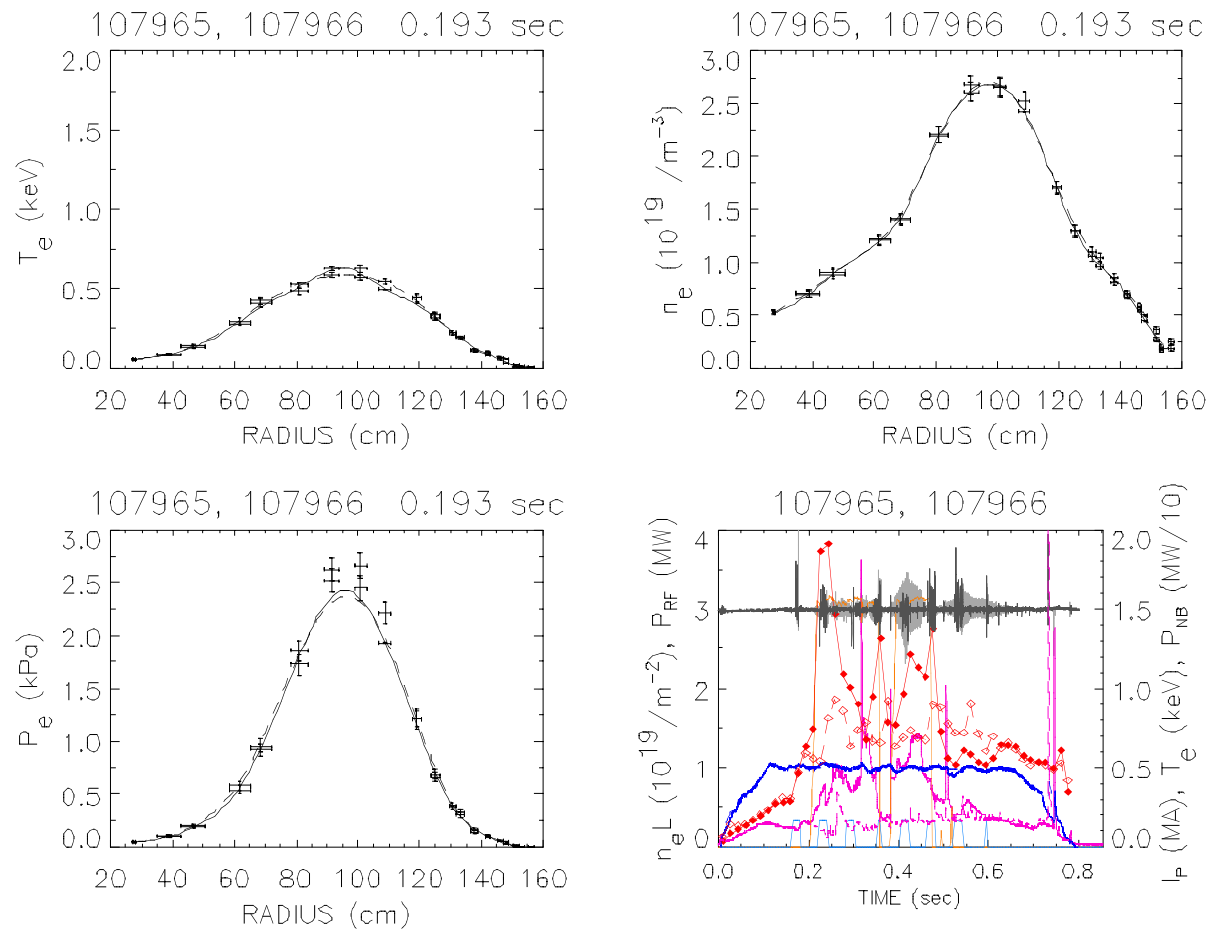
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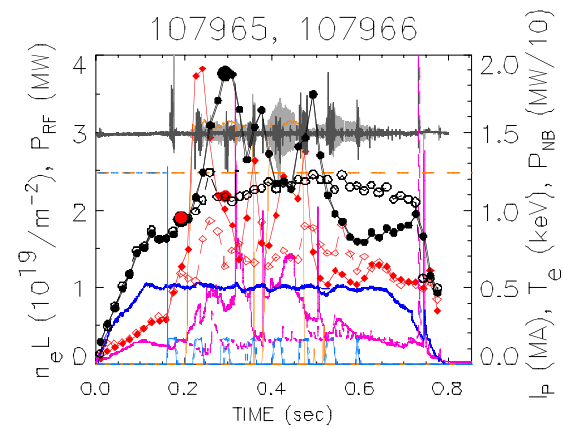
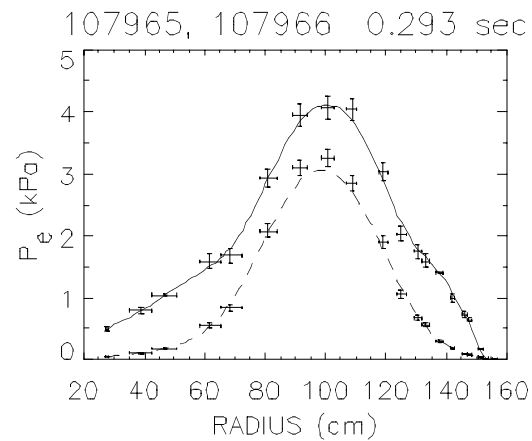
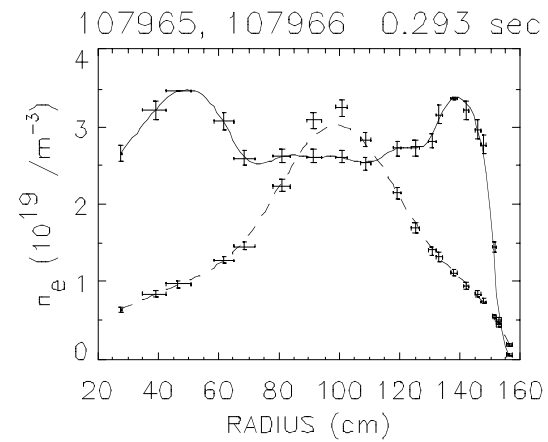
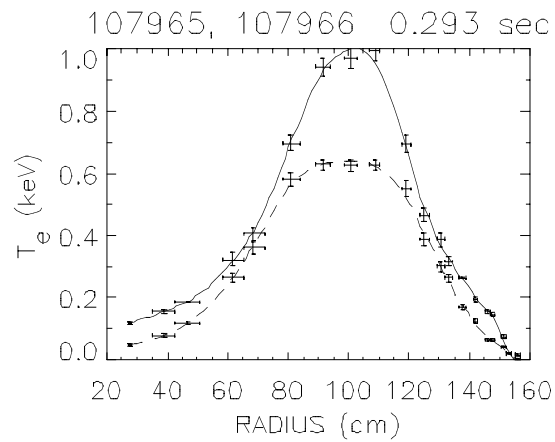
# HHFW Target Plasma and Placebo

## *Just before HHFW Turn-on*



# HHFW Target Plasma and Placebo

## *During HHFW H mode*



## Experimental Plan/Goal

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- Can we find H mode at higher  $I_p$  (800 kA)?
- Try lower field, 3.5kG and 4 kG.
- Can we find a power threshold?
- CHERS via NBI multi blips for  $T_i(R)$ .
- Central  $T_i$  from x-ray crystal spectrometer or NPA.



# Already Have a Shot List

- Re-establish HHFW H mode.
- Ip scan: 0.35, 0.5 0.75 MA.
- TF scan: 3.0, 3.75, 4.5 kG.
- Threshold at some condition(s).
- CHERS via NBI multi blips for  $T_i(R)$ .
- Central  $T_i$  from x-ray crystal spectrometer or NPA.

SHOT	Ip (MA)	TF (kG)	CHERS Beam blips	XCS Ar puff	k// (m-1)	Goal and/or comments
XP-33 22-Apr-02						
Target nel = 2.e15 cm-2						
In gap (cm) Out gap(cm)						
107918 inner=5 - 7 small 1-2						
107921						
107922						
1	0.5	4.5	no	no		14 Reproduce H-mode plasma - 107918, 921, 922 Optimize gas puff, delay/eliminate MHD around 0.4 s. Do HFS fueling scan: 750, 500, 250, 0 .. T.I
2	0.5	4.5	no	yes		14 Verify that H-mode condition persists with A puff.
3	0.5	4.5	yes	no		14 Beam blips 0.16-18, 0.22-0.24, 0.28-30 , 0.34-0.36, 0.40-0.42, 0.46-0.48. 0.52-0.54. 0.58-0.6 s NB line B or C
4	0.5	4.5	yes	no		X No-Rf, beam blips on.
5	0.5	4.5	no	no		X No-Rf
6	0.35	4.5	no	no		14 Recover H-mode plasma
7	0.35	4.5	no	yes		14 HHFW + XCS
8	0.35	4.5	yes	no		14 HHFW + Beam blips
9	0.35	4.5	yes	no		X No-Rf, beam blips on.
10	0.75	4.5	no	no		Recover H-mode plasma
11	0.75	4.5	no	yes		14 HHFW + XCS
12	0.75	4.5	yes	no		14 HHFW + Beam blips
13	0.75	4.5	yes	no		X No-Rf, beam blips on.
14	0.5	3.75	no	no		DO TF SCAN Recover H-mode plasma
15	0.5	3.75	no	yes		14 HHFW + XCS
16	0.5	3.75	yes	no		14 HHFW + Beam blips
17	0.5	3.75	yes	no		14 No-Rf, beam blips on.
18	0.5	3.00	no	no		Recover H-mode plasma
19	0.5	3.00	no	yes		14 HHFW + XCS
20	0.5	3.00	yes	no		14 HHFW + Beam blips
21	0.5	3.00	yes	no		14 No-Rf, beam blips on.
22	best	best	no	yes		Find power threshold at best condition
23	best	best	no	yes		14 1.25, 1.5, 1.75, 2.0 WW X No-Rf shot
24	best	best	no	yes		7 Recover H mode and document.