Daily Report for 2025-11-06

Y. Takemura

Date: November 6, 2025
Time: 10:00 – 17:15
Shot: 196201 – 196338 (138 shots)
Prior wall conditioning: He
Divertor pump: Used
Gas puff: H2, Ar
Pellet: H2 pellet, TESPEL

NBI: #1, #2, #3, #4, #5
ECH: 2-OUR (77GHz), 5.5-UO (77GHz), 2-OUL (154GHz), 2-OLL (154GHz)

Topics

1. Diagnosis of electron entropy distribution in phase space of electron scale turbulence via electron cyclotron emission spectra II, Turbulence experiment (Eiichirou Kawamori)
2. Pellet injection into plasmas with stepped up heating power (Kenneth Hammond)
3. Siliconization via powder injection (Federico Nespoli)
4. Model predictive density profile control with pellet fueling (Christopher Anthony Orrico)
5. Z Dependence of Temporal Evolution of Emission Spectra in Impurity Pellet Injection (Tomoko Kawate)

Measurement of electron velocity distribution function (entropy) from harmonic ECE spectrum (2025 Nov. 6)

Kawamori E. (National Cheng Kung Univ. Taiwan), Igami H., Tokuzawa T. (NIFS)

Shot #: 196204-196247

Magnetic configuration: (R_{ax}, Polarity, B_t, γ, B_q) = (3.60, CW, 1.375, 1.2538, 100),

Background and motivation:

- Validation of $\tilde{f}_e(v)$ measurement from harmonic spectrum of ECE: Verification exp
- Entropy($-\int \tilde{f}_e \ln(\tilde{f}_e) dv$) measurement in turbulence: Turbulence experiment

Method:

Verification exp

- Observe ECE from optically thin plasmas, whose $f_e(v)$ is externally perturbed by ECH modulation
- Crosscheck of $\tilde{f}_e(v)$ measurement by ECE with Thomson scattering measurement

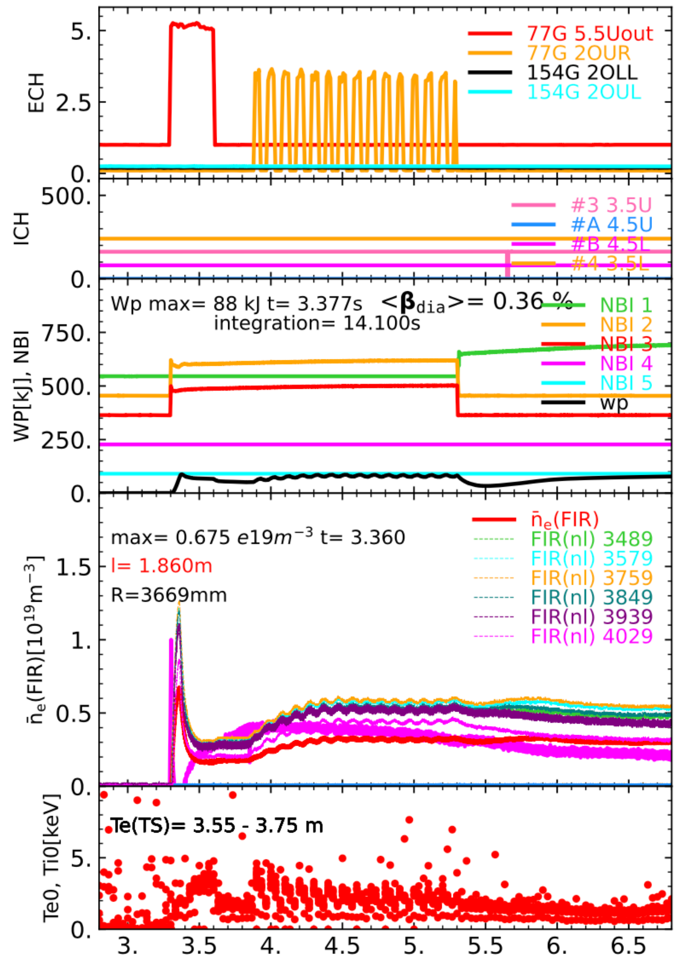
Turbulence experiment

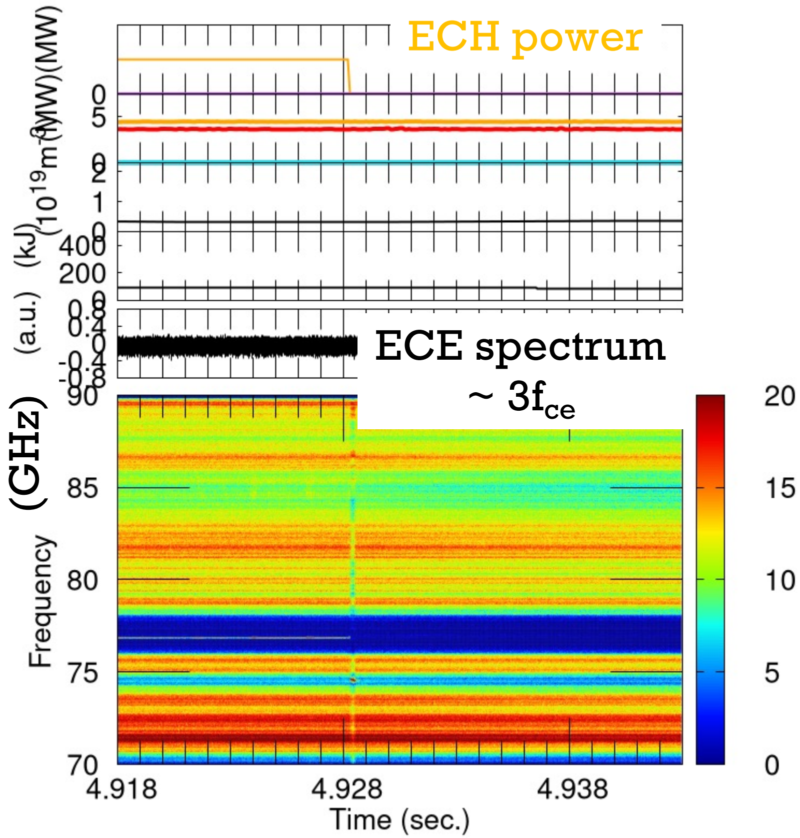
- Observe ECE spectrum in ETG turbulence (on-/off- axis ECH to control ∇T_e)

Result:

- harmonic spectra of ECE were successfully measured
- Further investigation including comparison with Thomson scattering measurement will be conducted

Transient evolution of ECE spectrum was successfully obtained





- Transient evolution of the ECE spectrum during ECH modulation was successfully measured.
- The ECE and Thomson scattering measurement results are to be compared

Pellet injection into plasmas with stepped up heating power

K. C. Hammond et al.

Experimental conditions:

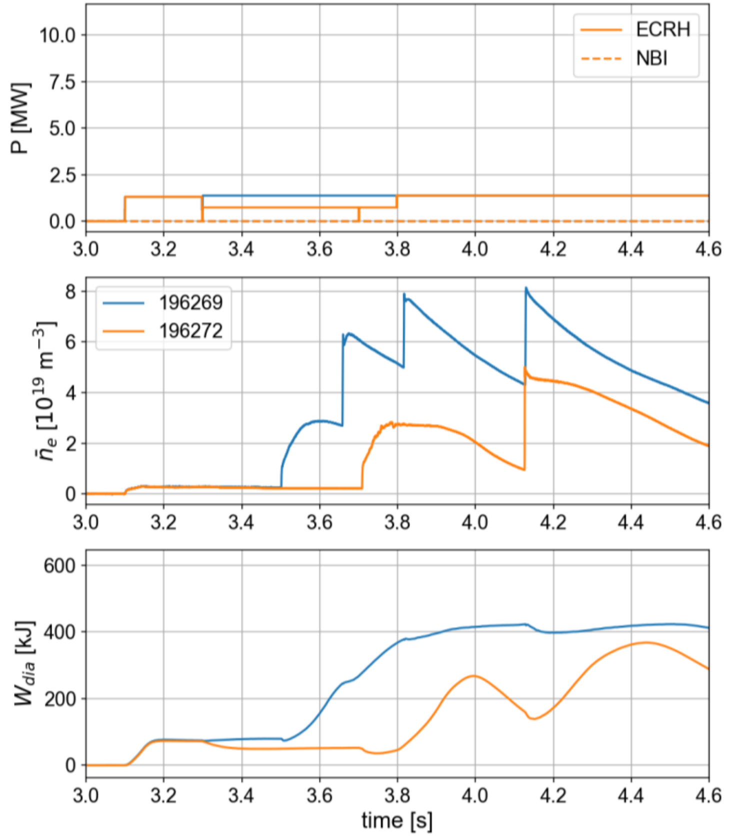
(R_{ax}, Polarity, B_t, γ, B_q) = (3.55. m, CW, 2.79 T, 1.2538, 100.0%)
#196249 – #196275

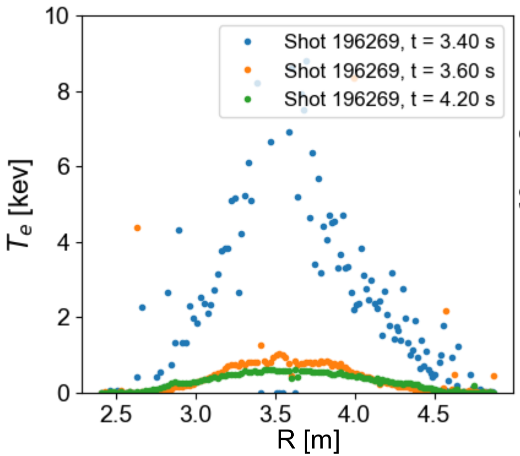
Motivation and method:

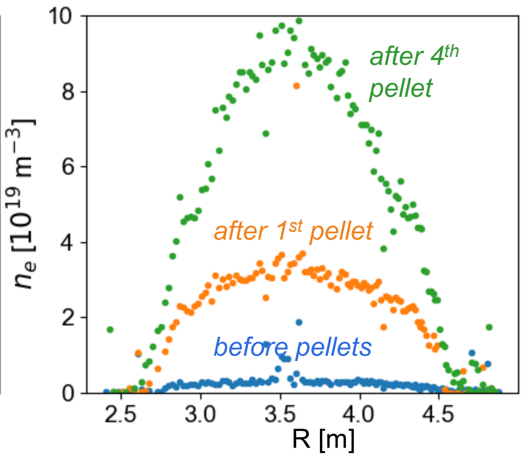
- ➢ Inject pellets into plasmas with constant and stepped-up ECH heating power to boost confinement
- ➢ Compare plasma response to observations from W7-X

Results:

- ➢ Pellets injected successfully into ECH discharges
- ➢ Differences between discharges with and without a power step are difficult to assess
- ➢ Injection at a sufficiently high rate led to energy accumulation and sustained high confinement
  - Up to 4x increase in $\boldsymbol{\tau}_E$ (larger than increases observed to date on W7-X)
- ➢ Similar relationship seen in NBI reference shots







Siliconization via powder injection

F. Nespoli
S. Masuzaki
M. Shoji

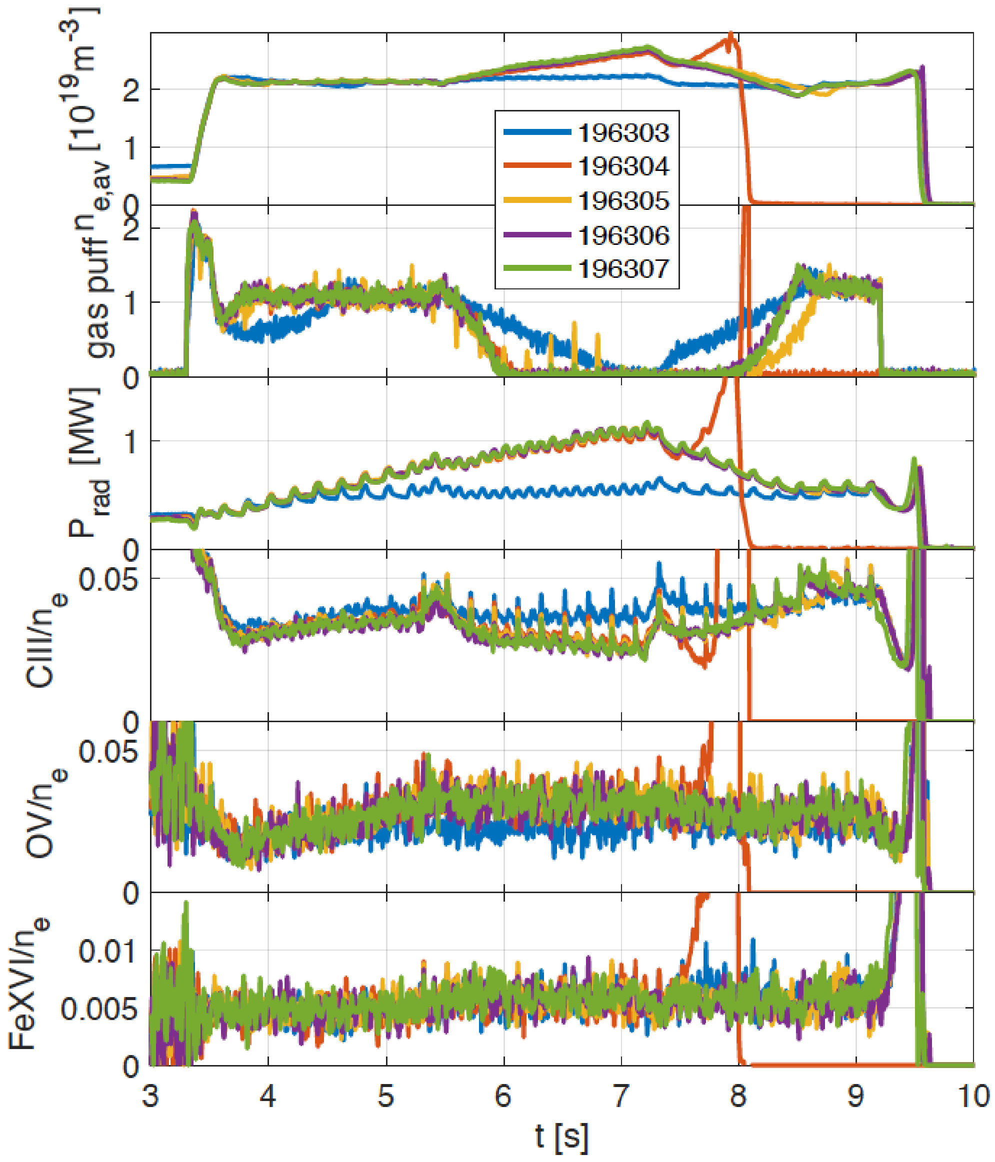
Experimental conditions:
(R_{ax}, Polarity, B_t, γ, B_q) = (3.6. m, CW, 2.75 T, 1.2538, 100.0%)
#196280 – #196309

Motivation and method:

- Explore Si powder injection as a possible technique for real time wall conditioning
- Follow up from experiment in last year campaign with long, low power plasmas

Results:

- Si powder injected in NBI train P ~ 3.5 MW
- Different plasma densities investigated n_e~1, 2, 4 $10^{19}m^{-3}$
- Material probe manipulator exposed samples to the plasma in series of 5 repeated Si injection at n_e~ 2 $10^{19}m^{-3}$ to measure Si deposition
- No striking wall conditioning effect other than reduction in CIII radiation, more analysis needed



Development of model predictive density profile control with pellets and gas

C. Orrico

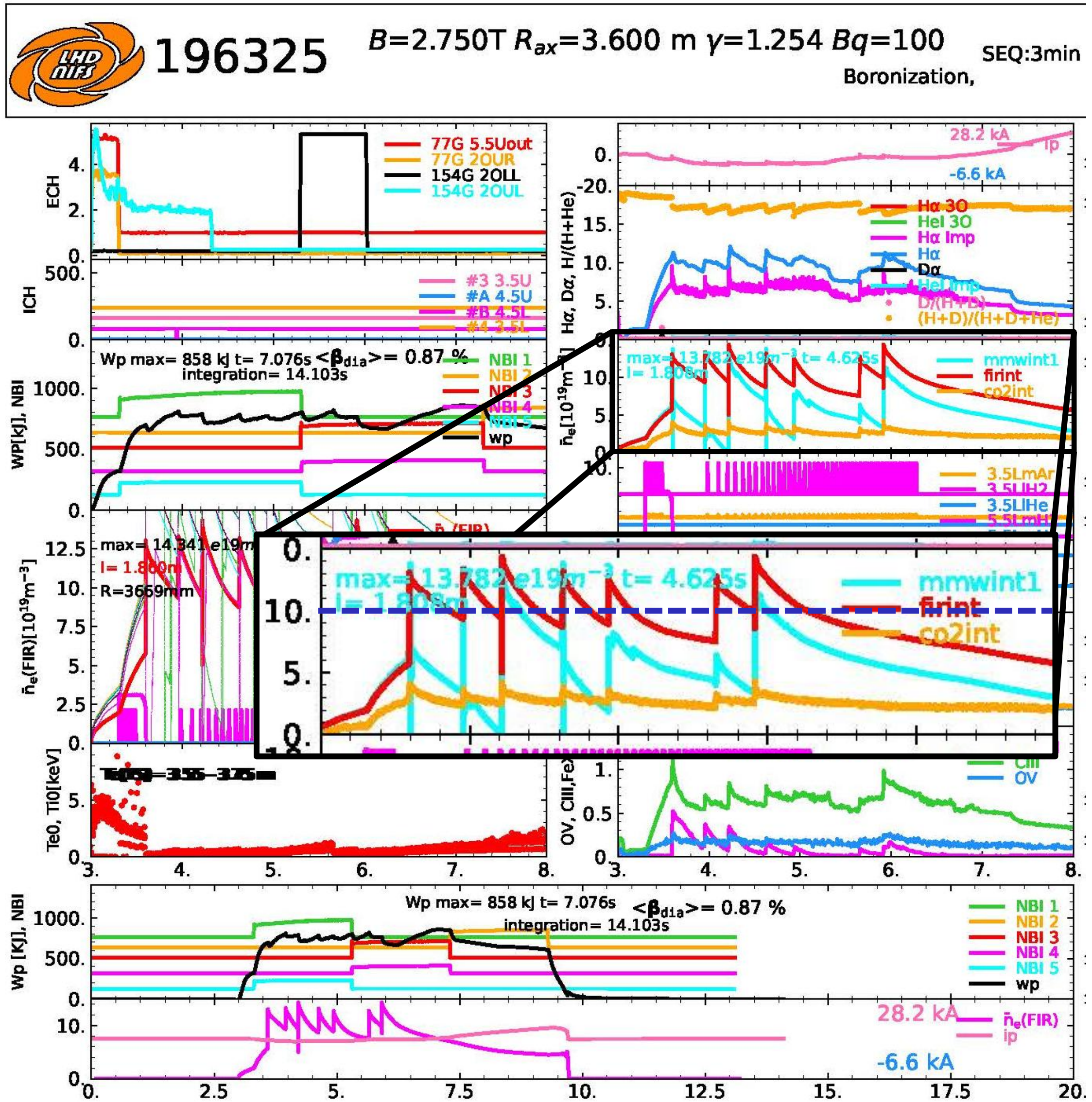
Experimental conditions:
(R_{ax}, Polarity, B_t, γ, B_q) = (3.6. m, CW, 2.75 T, 1.2538, 100.0%)
#196310-196327

Motivation and method:

- Pellet and gas perturbation discharges to create a dataset for prediction model regression/validation
- Test preliminary prediction model with feedforward optimization of pellet timings and gas signals

Results:

- 18/18 discharges have useful FIR and TS data on n_e dynamics. Possibly also T_e, n_i, and T_i data.
- Will use TS and FIR data to improve prediction model for MPC control of density Nov 13th
- Feedforward discharges use optimization of pellet timing based on *preliminary* prediction model. Already accurately tracked target density! (right)

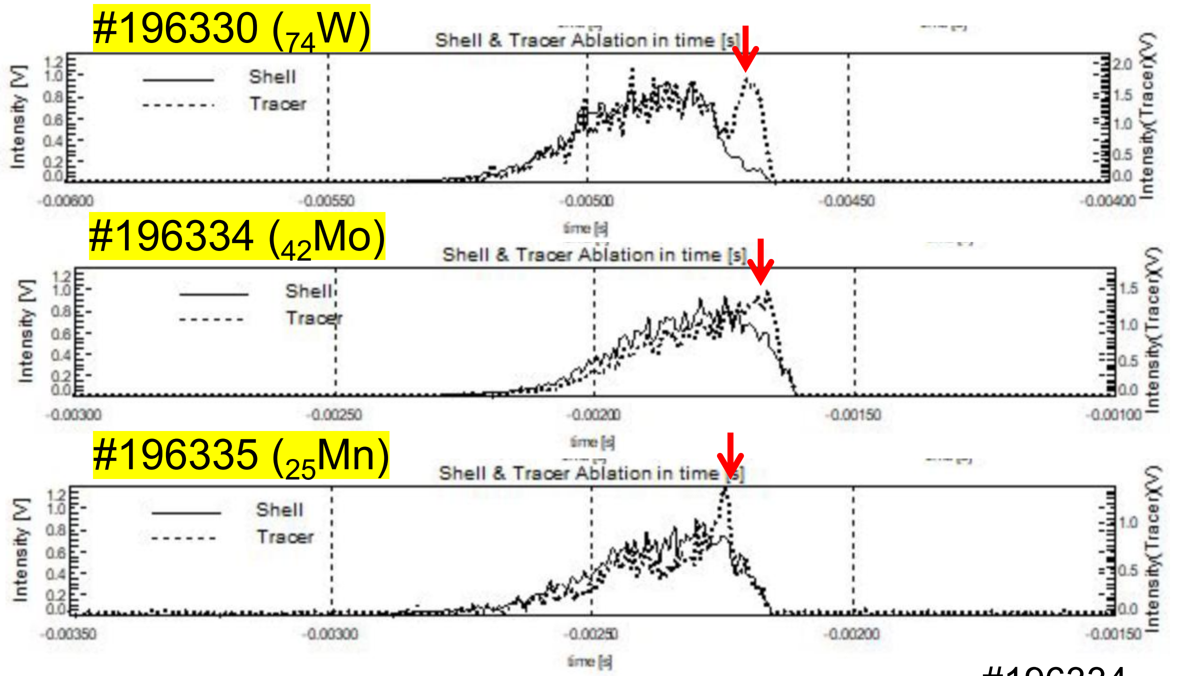


Dependence of Temporal Evolution of Emission Spectra in Impurity Pellet Injection

T. Kawate, M. Akimitsu (QST), N. Tamura (IPP) et al.

Experimental conditions:

(R_{ax}, Polarity, B_t, γ, B_q) = (3.6. m, CW, 2.75 T, 1.2538, 100.0%)
#196329 – #196338



Motivation and method:

- Examining the Z dependence of the time evolution of ablation and impurity transport via line emissions over wide wavelength ranges from EUV to visible light.
- Obtaining datasets during and after TESPEL injection to support the development of a diagnostics system for TESPEL in JT-60SA.

Results:

- Under the same heating and density conditions, W, Mo, Mn as well as empty (reference) TESPELs were successfully injected at t = 4.356s.
- The time evolution of ablation of TESPEL was observed for each shot, and it shows different behaviors among the different elements.
- N_e profile changed before and after the TESPEL injection. The detailed impurity behavior will be examined using spectroscopic data in the visible and EUV wavelength ranges.