Daily Report for 2025-11-11

K. Ogawa

Date: November 11, 2025
Time: 10:00 – 11:33 and 15:04-17:15 (Experiment was terminated due to the HC power supply interlock)
Shot: 196477 – 196578 (102 shots)
Prior wall conditioning: No
Divertor pump: Yes (until 11:33)
Gas puff: Yes
Pellet: TESPEL, Impurity pellet

NBI: #1 (until 11:33), #2, #3, #4, #5
ECH: 2-OUR (77GHz), 5.5-UO (77GHz), 2-OUL (154GHz), 2-OLL (154GHz)

Topics

1. Optimized Configurations with Enhanced Confinement in LHD (Caoxiang Zhu)
2. Investigation of tungsten impurity confinement time in presence of additional ECH heating with spatially resolved EUV spectroscopy (Ivan Traparić)
3. Mitigation of tungsten induced plasma termination and identification of transient transport mechanisms (Hjördis Bouvain)
4. Tungsten spectroscopy to support atomic physics at fusion reactor relevant temperatures (Novimir Pablant)

Optimized Configurations with Enhanced Confinement in LHD

Caoxiang Zhu[1*], Hengqian Liu[1], Jialei wang[2], Junhao Liu[1], Guodong Yu[1], Zhenyu Zhou[3], Yao Zhou[3] Ryohsuke Seki[1], Kenichi Nagaoka[1], Hiroyuki Yamaguchi[2] and Yuya Lin[1]
[1] University of Science and Technology of China
[2] National Institute for Fusion Science
[3] Shanghai Jiao Tong University

Experimental conditions:

(R_{ax}, Polarity, B_t, γ, B_q) = (3.55 m, CW, 1.375 T, 1.254, 100.0%)
(R_{ax}, Polarity, B_t, γ, B_q) = (3.75 m, CW, 1.375 T, 1.254, 100.0%)
(R_{ax}, Polarity, B_t, γ, B_q) = (3.85 m, CW, 1.375 T, 1.200, 100.0%)

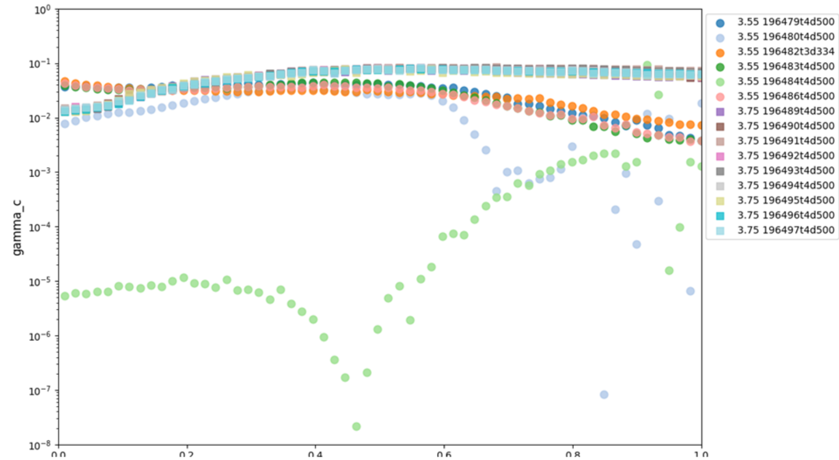
#196479 - #196503 (#196503 failed)

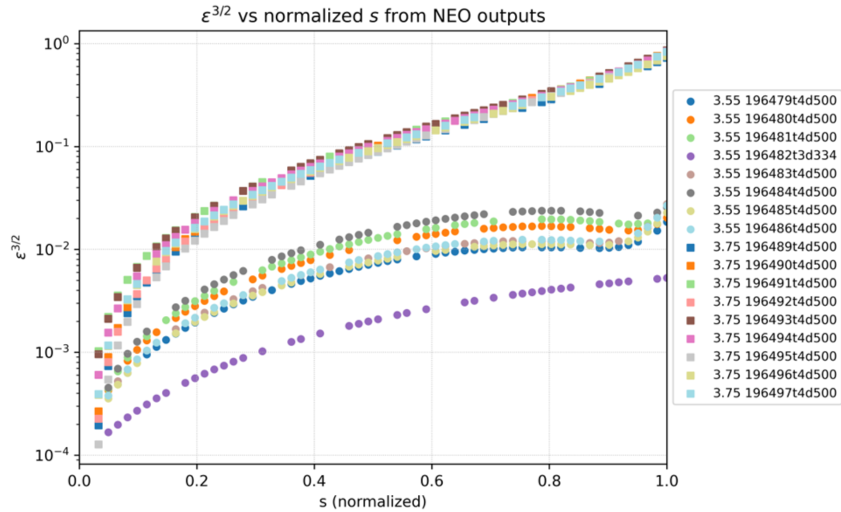
Motivation and method:

- Optimize the LHD magnetic-field configuration using stellarator-optimization tools while strictly adhering to the device's existing operational constraints.
- Require that solutions produced by general-purpose stellarator optimization frameworks/metric be consistent with experimental observations.

Results:

- Unfortunately, owing to a system malfunction and limited available data, the third configuration could not be incorporated into the comparative assessment.
- However, the results for the available configurations demonstrate agreement between the fast-ion confinement proxy and the neoclassical-transport proxy.





Investigation of tungsten impurity confinement time in presence of additional ECH heating with spatially resolved EUV spectroscopy

I. Traparić (Inst. Phys. Belgrade) and C. Suzuki

Experimental conditions:

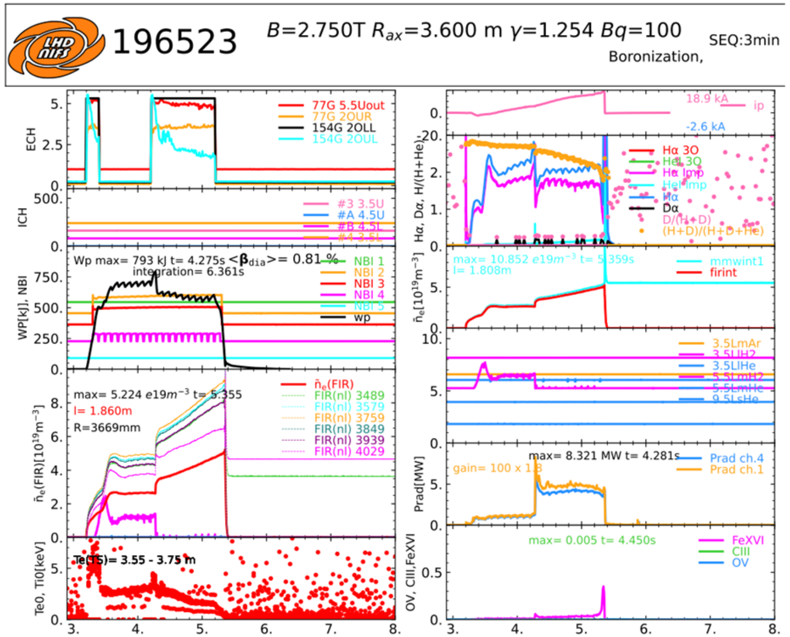
(R_{ax}, Polarity, B_t, γ, B_q) = (3.6 m, CW, 2.75 T, 1.2538, 100.0%)
#196505 - #196529

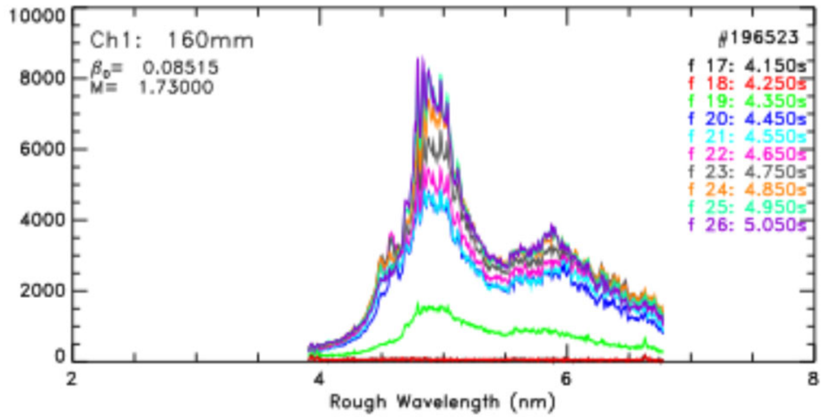
Motivation and method:

- Tungsten impurity confinement time is expected to drop significantly in the presence of additional ECH heating.
- In the discharges with tungsten pellet injection, time evolution of tungsten UTA structure is recorded with EUV_Short2 and SOXMOS spectrometers with/without additional ECH.
- Also we tried to scan the electron density and tungsten pellet injection timing.

Results:

- We could record tungsten UTA spectra to be analyzed in the future, for different pellet injection timings for some condition with additional ECH.





Mitigation of tungsten induced plasma termination and identification of transient transport mechanisms (N. Tamura, H. Bouvain, A. Dinklage et al.)

Experimental conditions

(R_{ax}, Polarity, B_t, γ, B_q) = (3.60 m, CW, 2.750 T, 1.2538, 100.0%)
#196538 - #196558

Motivation and method

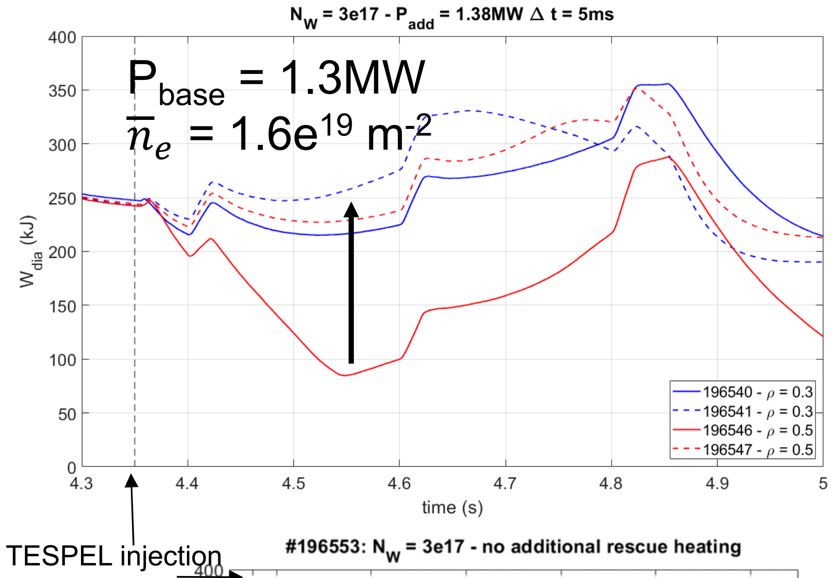
- On-axis ECRH in H-plasma mitigates plasma termination induced by tungsten TESPEL
- Investigation of dependency of termination mitigation on ECRH deposition position in H-plasma

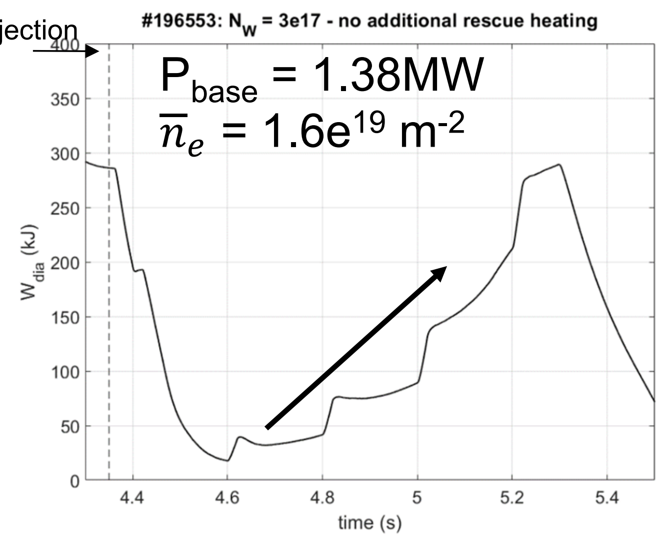
- 21 3e17 W TESPEL injected (81% successful delivery)
  - ✓ Delay time scan with $\rho = 0.3$ with $\Delta t = [5,10,20]$ ms and P_{add} = [0.64,1.38] MW
  - ✓ Delay time scan with $\rho = 0.5$ with $\Delta t = [5,10,20]$ ms and P_{add} = 1.38 MW

Results

- Off-axis application of additional ECRH prevents plasma termination if $P_{add} > P_{base}$
- Additional ECRH closer to on-axis deposition shows stronger mitigation effect

- Observation of plasma recovery without additional rescue measures not previously observed in LHD but in W7-X, likely due to low density





Tungsten spectroscopy to support atomic physics at fusion reactor relevant temperatures

N. Pablant(PPPL), C. Perks (MIT), N. Tamura(IPP), T. Oishi(Tohoku), J.E. Rice(MIT), D. Moseev(IPP),

Experimental conditions:

(R_{ax}, Polarity, B_t, γ, B_q) = (3.6 m, CCW, 2.75 T, 1.2538, 100.0%)
#196560 - #196578

Motivation and method:

- Demonstrate of ICRH pumpout of high-Z impurities, in particular Fe, Mo as a reactor relevant demonstration applicable to W
- Inject Fe/Mo pellets/TESPEL into helium plasmas with tuned He/H fraction to achieve matching ICRH resonance to Fe24+ and Mo40+
- Extension of experiments on 2025-11-05

Results:

- Technically a very successful experiment!
- He/H scan performed with Fe TESPEL and Fe impurity pellet.
    - Each condition probed with and without ICRH
- Correct plasma parameters achieved for possible pumpout; detailed analysis is needed to see if pumpout was achieved