Dairy Report for 2025-11-27

H. Funaba, M.Kobayashi

Date: November 27, 2025
Time: 10:00 – 17:15
Shot#: 197968 – 198107 (140 shots)
Prior wall conditioning: HeGDC
Divertor pump: Off
Gas puff: He

Pellet: Impurity Pellet (B), TESPEL, IPD

NBI : #1, #2, #3, #4, #5
ECH : 2-OUR (77GHz), 5.5UO (77GHz), 2-OLL (154GHz), 2-OUL (154GHz)
ICH : 4.5UL, 3.5U

Topics

1. Validation of p-11B fusion reactivity using MeV ICRF tail ions in LHD (J. Wang)
2. Experimental investigation targeting maximum alpha particle emission rate in p-11B fusion reactions (Y. Fujiwara (TAE), M. Osakabe)
3. Fast-ion phase space engineering by RF waves to actively control bursting SAWs (J. Wang)
4. Effects of boronizatoin on plasma facing surface (S. Masuzaki)

Validation of p-11B fusion reactivity using MeV ICRF tail ions in LHD

J. WANG, S. Kamio(TAE), Y. Fujiwara(TAE), R. Magee(TAE), K. Ogawa, R. Seki, T. Tajima(TAE), M. Osakabe et al.

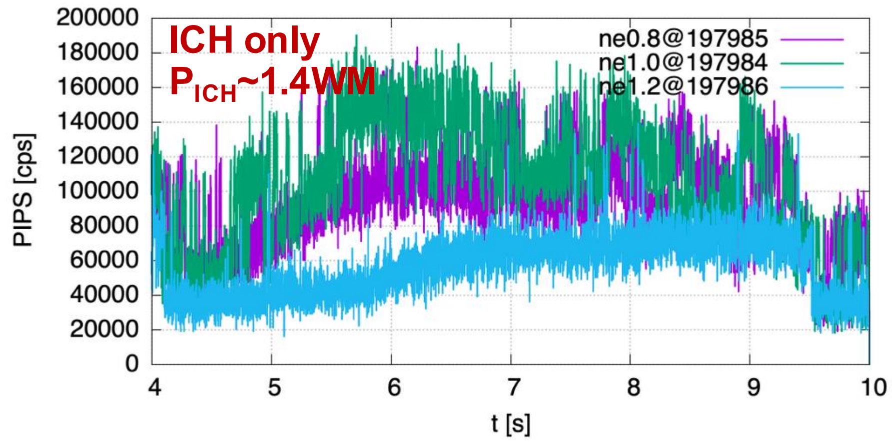
Experimental conditions:
(R_{ax}, Polarity, B_t, γ, B_q) = (3.6 m, CCW, 2.75 T, 1.2538, 100.0%)
#197968 - #198021

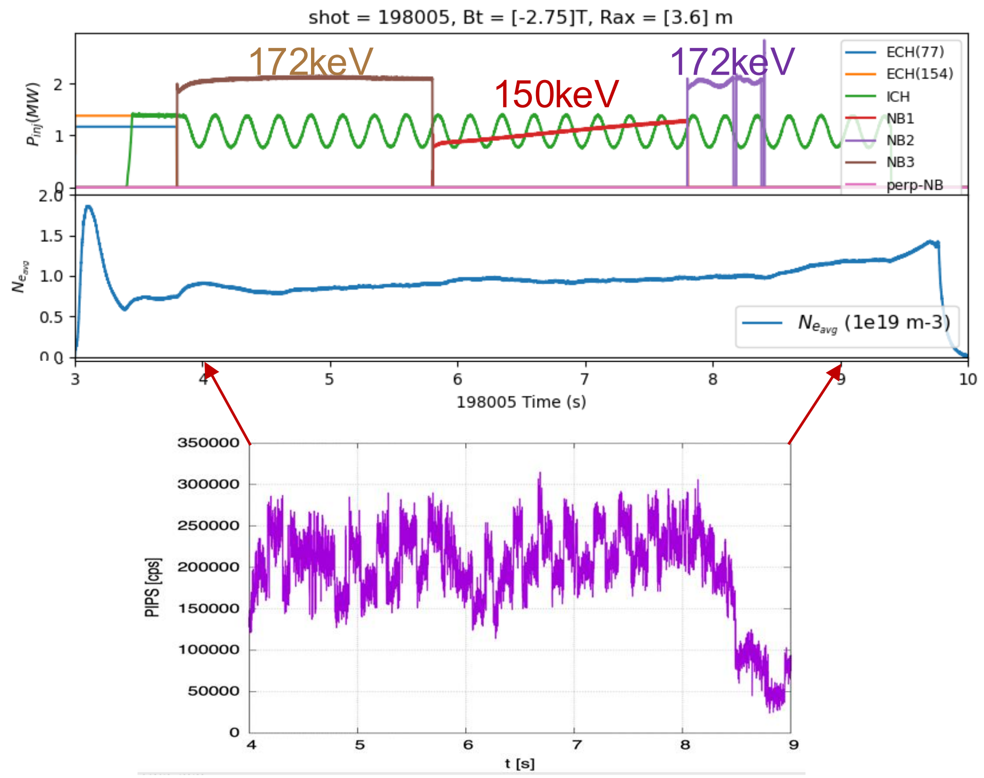
Aim:

- To study the optimum conditions for ICRF-induced p-11B fusion in LHD.

Results:

- ICH-induced p-11B fusion was successfully reproduced, and a larger density region was scanned.
- The majority of shots use IPD as a boron source, and a few boron pellet injection shots are also conducted.
- CXS measurements of the boron profile were carefully conducted in this campaign.
- ICH-assisted t-NBI-driven p-11B fusion was successfully conducted. Strong PIPS counting rate during NB1(150keV) injection suggests the acceleration of beam ions by ICH.





Fast-ion phase space engineering by RF waves to actively control bursting SAWs

J. WANG, R.Seki, S. Kamio(TAE), Y. Fujiwara(TAE), R. Magee(TAE), K. Nagaoka, K. Ogawa, T. Tajima(TAE), M. Osakabe et al.

Experimental conditions:

(R_{ax}, Polarity, B_t, γ, B_q) = (3.6 m, CCW, 1.375 T&1.25T, 1.2538, 100.0%)

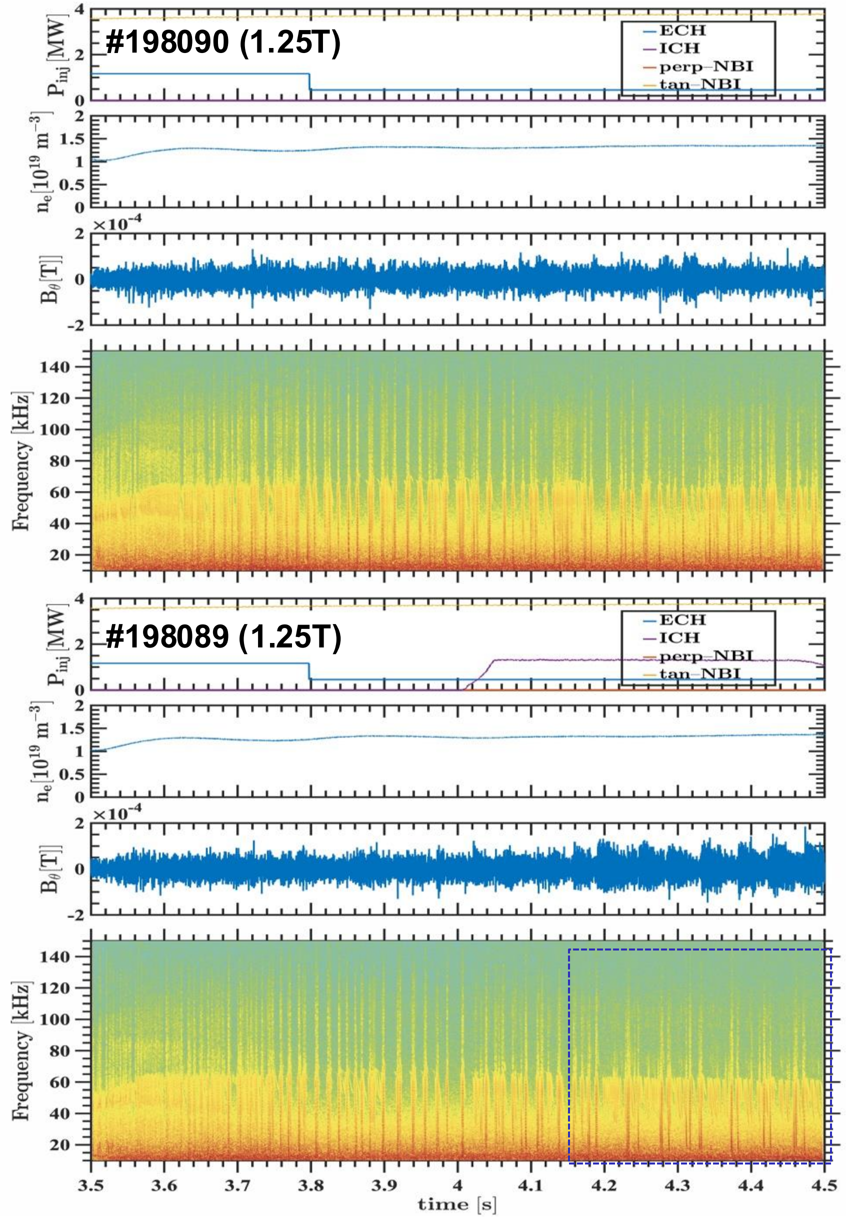
#198067 - #198107

Aim:

- **To modify the beam-driven SAW nonlinear behavior by changing the EP phase space structure using 2nd harmonic ICH.**
- To explore the synergy of NBI and 2nd harmonic ICH p-B fusion.

Results:

- Both off-axis (1.375T) and on-axis (1.25T) are conducted.
- ICH did affect the t-NBI-driven SAW behavior.
- The frequency of the SAW burst can be reduced, and some benign chirping SAWs appear between two giant bursts.
- ICH has little effect on the SAW behavior for a superposition of two/three t-NBI, which will weaken the ICH capability of modifying the EP phase space structure.



Fast-ion phase space engineering by RF waves to actively control bursting SAWs

J. WANG, R.Seki, S. Kamio(TAE), Y. Fujiwara(TAE), R. Magee(TAE), K. Nagaoka, K. Ogawa, T. Tajima(TAE), M. Osakabe et al.

Experimental conditions:

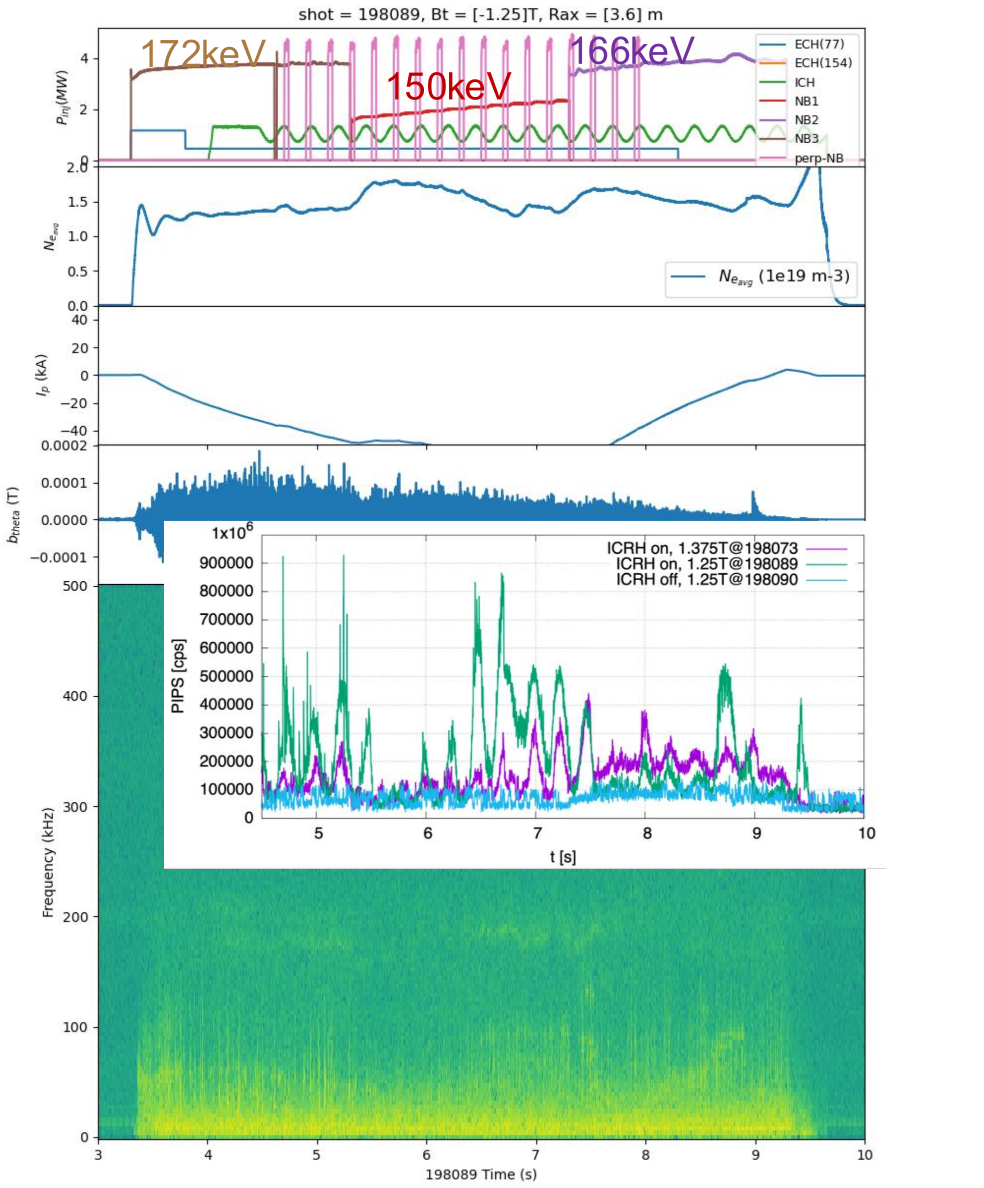
(R_{ax}, Polarity, B_t, γ, B_q) = (3.6 m, CCW, 1.375 T&1.25T, 1.2538, 100.0%)
#198067 - #198107

Aim:

- To modify the beam-driven SAW nonlinear behavior by changing the EP phase space structure using 2nd harmonic ICH.
- **To explore the synergy of NBI and 2nd harmonic ICH p-B fusion.**

Results:

- Both off-axis (1.375T) and on-axis (1.25T) are conducted.
- Synergy of NBI and 2nd harmonic ICH p-B fusion in LHD is confirmed for the first time.
- Preliminary results show that the p-11B fusion reactivity during on-axis heating (1.25T) is better than that of the off-axis heating case (1.375T).
- H gas from the wall recycling may also contribute to this fusion yield.



Experimental investigation targeting maximum alpha particle emission rate in p-11B fusion reactions

Y. Fujiwara, M. Osakabe, S. Kamio, K. Ogawa, H. Noto, N. Tamura, R. Magee

Shot#: 199022 – 198065 (44 shots)
Experimental conditions: (R_{ax}, Polarity, B_t, γ, B_q) = (3.60 m, CCW, 2.75 T, 1.254, 100%)
Impurity injection: IPI, TESPEL, IPD

Experiment purpose

This experiment aims to achieve the world's highest alpha particles emission rate through p–11B fusion reactions, based on the knowledges of last champaign.

Results

- We successfully achieved fusion reaction rates higher than those obtained in all previous experiments at LHD.
- Injection of the pellet and ICRF heating demonstrated the ability to sustain an elevated fusion reaction rate for a longer duration.
- The combined use of the pellet, IPD, and ICRF suggests the potential to maintain even higher fusion reaction rates over extended periods.