(TG1) Multi-ion group report

Date: Feb. 15, 2022
Time: 13:46-15:43
Shot#: 178970-179009 (40 shots)

Feb. 16, 2022 (G. Motojima)

Prior wall conditioning: No

Divertor pump: YES
Gas puff: H_2, Ar
H pellet: YES

NBI#(1, 2, 3, 4, 5) = gas(H, H, H, H, H) = P(4.4, 2.0, 4.0, 3.9, -) MW

ECH(77 GHz) = ant(5.5-Uout, 2-OUR) = P(703, 792) kW
ECH(154 GHz) = ant(2-OLL, 2-OUL , 2-OLR) = P(979, 930, 986) kW
ECH(56 GHz) = ant(1.5U) = P(-) kW
ICH(3.5U, 3.5L, 4.5U, 4.5L) = P(-) MW
Neutron yield integrated over the experiment = 1.8×10^{11} (TG1)

Topics

1. Isotope effect in high-density ECH plasma after hydrogen pellet injection (T. Tsujimura)

Isotope effects in high-n_e ECH plasma after hydrogen isotope ice pellet injections

T. Tsujimura

Experimental conditions:

(R_{ax}, B_t, γ, B_q) = (3.60 m, CCW 2.85 T, 1.2538, 100.0%)

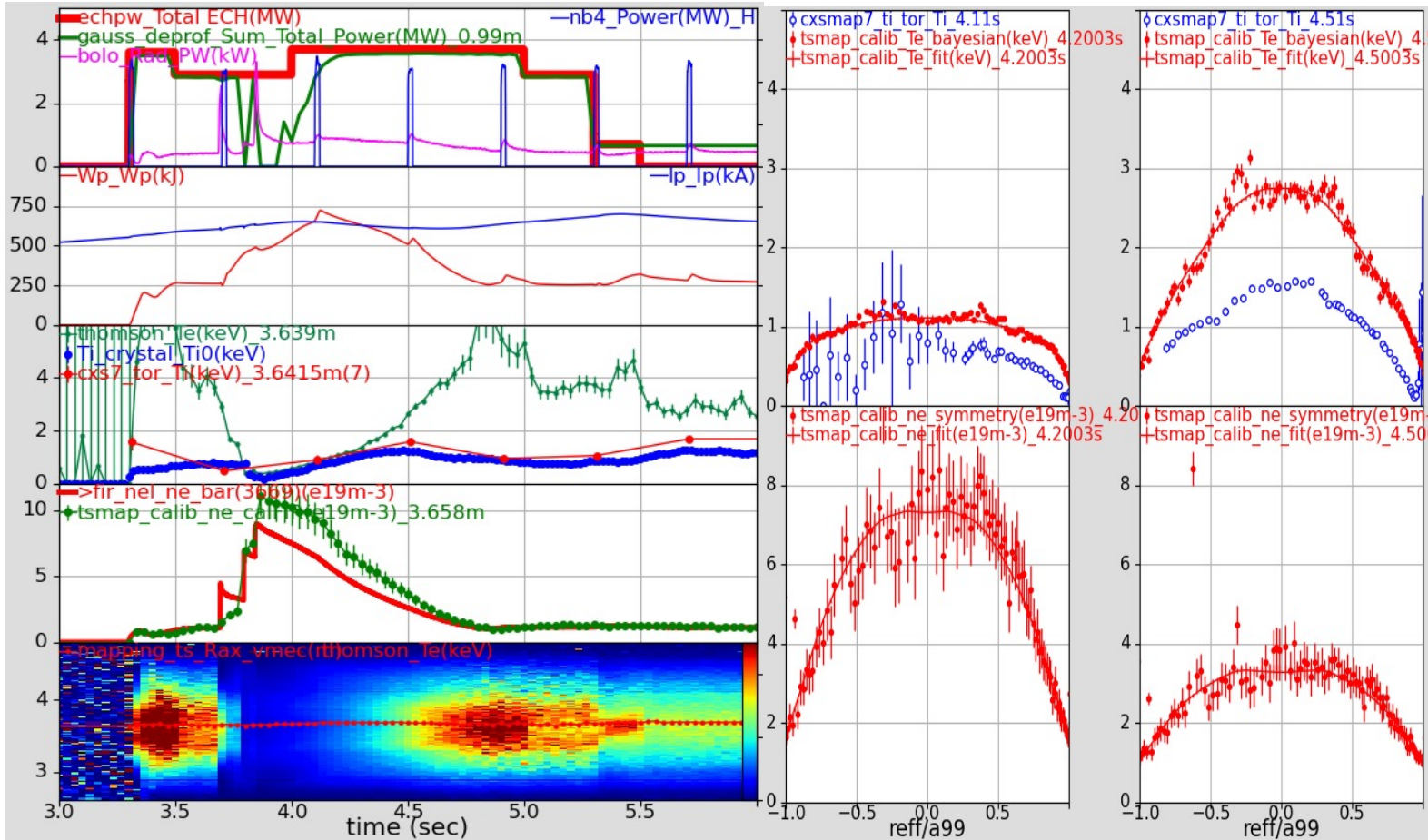
Motivation:

- In this campaign, the third 154-GHz gyrotron is functional in full power.
- In contrast to 21st campaign, experimental data in wide ranges of ECH power and n_e were accumulated to discuss isotope effects in high-n_e ECH plasma.
- D phase on Jan. 12

Results:

- Typical discharge is shown in the figure at the right (#178995).
- High-n_e ECH plasma was sustained after injection of three H pellets together with H gas puff.
- H rich condition was obtained: D/(D+H) ~ 0.1 in comparison to ~0.8 on Jan. 12
- Max. $n_{e0} \sim 10\text{x}10^{19}$ m^{-3}, $T_{e0} \sim T_{i0} \sim 1$ keV
- Thermal relaxation from electrons to ions increased T_{i0} up to ~1.5 keV at $T_{e0} \sim 2.5$ keV, $n_{e0} \sim 3\text{x}10^{19}$ m^{-3}.
- peaked n_e, T_e, and T_i

#178995



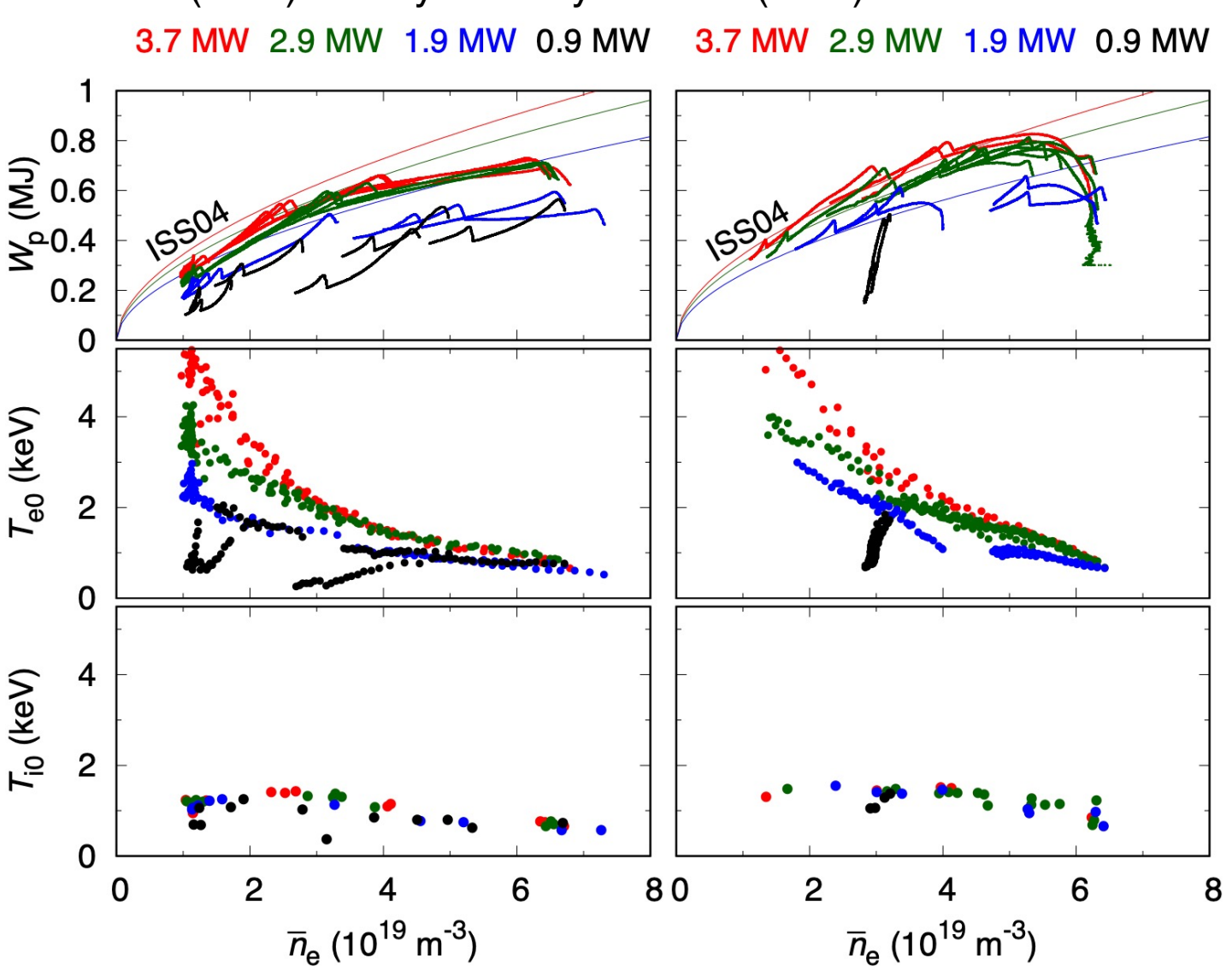
Isotope effects in high-n_e ECH plasma after hydrogen isotope ice pellet injections

T. Tsujimura

Results (cont.):

- Injection power P_{ECH} was scanned from 0.9 MW to 3.7 MW with one 77 GHz perpendicular injection and three 154 GHz oblique injection.
- $n_{e,bar}$ was scanned from 1x to 7x10^{19} m^{-3} by changing the number of pellets: 1-3.
- W_p was beneath ISS04 in H plasma, but almost along ISS04 in D plasma.
- T_{e0} was similar or relatively smaller in H plasma than D plasma
- T_{i0} was almost 1-1.5 keV in the scanned n_e range as T_{e0} decreased.

- n_e fluctuations were measured with PCI and DBS to discuss ion scale turbulence.
- Power balance analysis will be performed in comparison with neoclassical and turbulent transport.
- Comparison with W7-X pellet discharges is desirable.



$$P_{ei} \propto \frac{Z_i^2 n_e^2}{m_i T_e^{3/2}} (T_e - T_i)$$