(SG1) Multi-phase and Atomic/Molecular physics group report

Apr. 4, 2024 (M. Shoji)

Date: Apr. 3, 2024
Time: 14:35 – 16:45
Shot No.: 188832 – 188874 (43 shots)
Prior wall conditioning: None
Divertor pump: Off
Gas puff: H_2, Ar
Pellet: TESPEL

NBI#(1, 2, 3, 4, 5) = gas(H, H, H, H, H)=P(4.8, 2.4, 1.9, 3.8, 5.5) MW
ECH(77GHz) = ant(1.5-Uo, 5.5-U, 2-OUR)=P(-, 0.71, 0.38) MW
ECH(154GHz) = ant(2-OLL, 2-OUL, 2-OLR)=P(0.71, 0.81, 0.98) MW
ICH(3.5U, 3.5L, 4.5U, 4.5L) = P(-, -, -, -) MW

Topics

1. Impurity confinement and transport dependence on electron temperature gradient (D. Medina Roque, N. Tamura, I. García Cortés, K.J. McCarthy et al.)

Impurity confinement and transport dependence on electron temperature gradient
(D. Medina Roque, N. Tamura, I. García Cortés, K.J. McCarthy et al.)

Magnetic configuration: (R_{ax}, Polarity, B_t, γ, B_q) = (3.60 m, CW, 2.750 T, 1.2538, 100.0%)
Shots: #188832 - #188874

Goal of this experiment

- To characterize the turbulent impurity transport in LHD from the viewpoint of Z-dependence
- Obtain data for comparisons with future results in TJ-II and W7-X

Background & Motivation

- In a high-performance W7-X plasma, which has been achieved by successive hydrogen pellet injections, turbulent transport was much reduced
- It is important to characterize the impurity transport, especially from the viewpoint of its Z-dependence, when the turbulence contribution is changed

Approach & Methodlogy

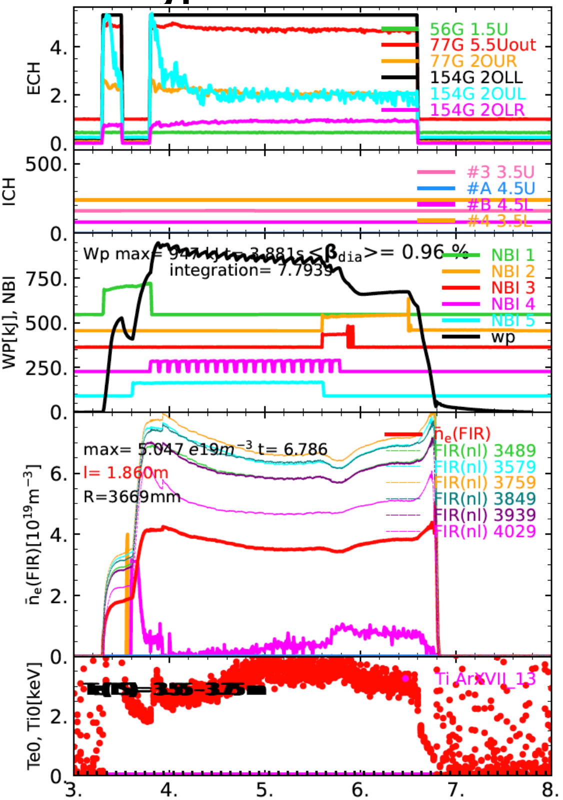
- Estimate an impurity decay time from the line intensity evolution for injected elements (**Ti, Cu, and Mo**) for turbulence-controlled plasmas using EUV/VUV spectrometers
- To change the turbulent contribution on impurity transport, the Te gradient is changed with the change in the total ECRH absorption profile
- In the previous campaign, the ne profile was flattened → we tried to get data in the peaked ne profile

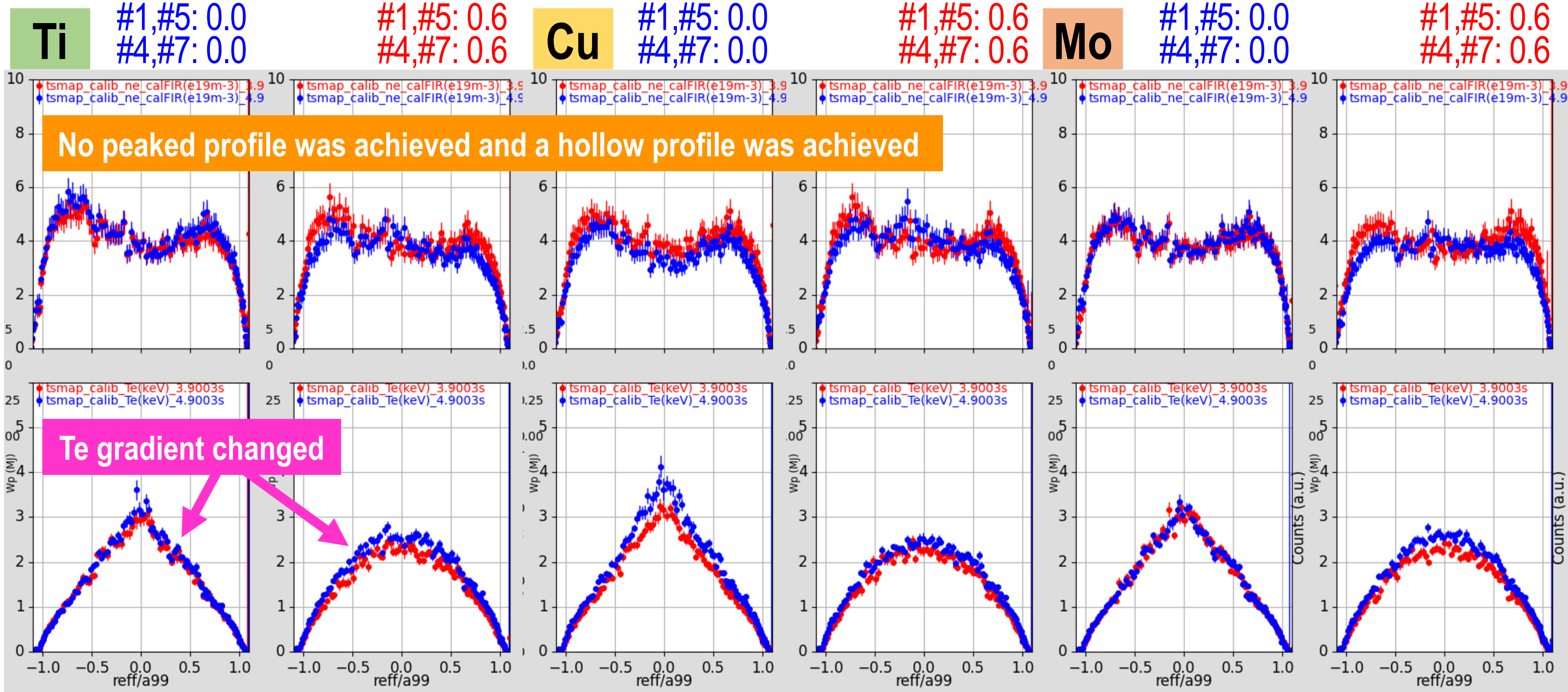
Impurity confinement and transport dependence on electron temperature gradient (D. Medina Roque, N. Tamura, I. García Cortés, K.J. McCarthy et al.)

Results

- **2 ECRH heating patterns are applied in the plasma with ne_bar = 4E19 m^{-3}**
  A) #1, #4, #5, #7: r/a ~ 0.6, **B)** #1, #4, #5, #7: r/a ~ 0.0
- In contrast to the previous campaign, we have observed **NO** impurity accumulation, even with almost the same n_{e0} & T_{e0}
- **A major different point** in this campaign is **a baseline heating with perpendicular NBI**, not with tangential NBI
- The impurity accumulation is strongly related to the Er profile, which will be analyzed later (CXS with NBI#4 was worked)

Typ. waveforms





Red: @~3.9s, just before TESPEL injection@3.925s, Blue: @~4.9s