(TG2) Turbulence Topical Group Report

Nov. 17, 2021 (T. Kobayashi)

Date: Nov. 16, 2021
Time: 9:30 – 14:20, 18:05 – 18:45
Shot#: 172623 – 172699, 172773 – 17778 (83 shots)

Prior wall conditioning: D2
Divertor pump: On except for 2-I
Gas puff: D_2, Ar
Pellet: None

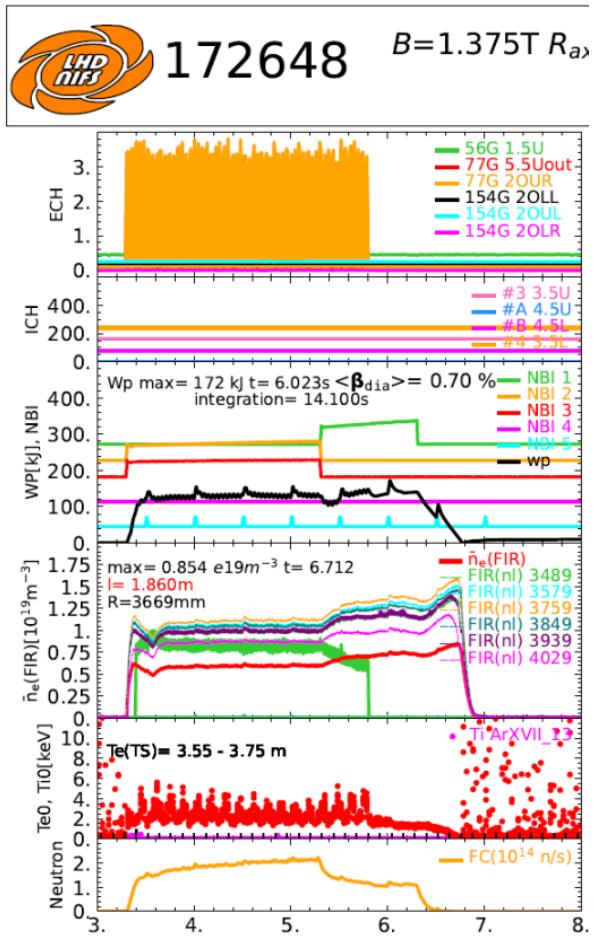
NBI#(1, 2, 3, 4, 5)=gas(D, D, D, D, D)=P(2.2, 2.3, 2.2, 3.8, 4.9)MW

ECH(77GHz)=ant(5.5-Uout (or 1.5U), 2-OUR)=P(703, 792)kW
ECH(154GHz)=ant(2-OLL, 2-OUL , 2-OLR)=P(723, 799, 825)kW
ECH(56GHz)=ant(1.5U)=P(-)kW
ICH(3.5U, 3.5L, 4.5U, 4.5L)=P(-, -, -, -)MW
Neutron yield integrated over the experiment = 1.0×10^{17} (TG2 and TG3 total)

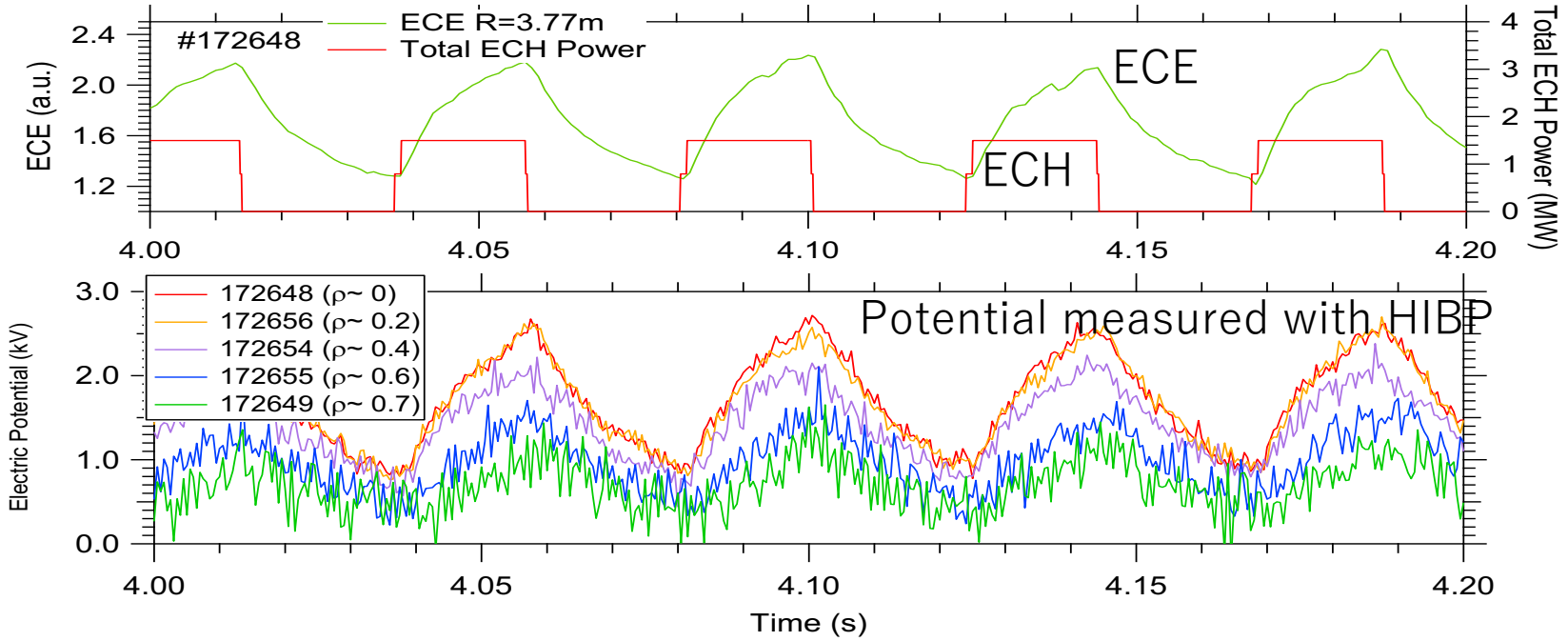
Topics
1. Core and edge turbulence in modulated ECH (M. Nishiura) / Potential and density fluctuation measurement in e-ITB to study isotope effect (A. Shimizu)
2. Direct measurement of ion heat flux using radial CXS view (T. Kobayashi)

Core and edge turbulence in modulated ECH (M. Nishiura)
Potential and density fluctuation measurement in e-ITB to study isotope effect (A. Shimizu)
Collaborator: T. Ido (Kyushu Univ.)

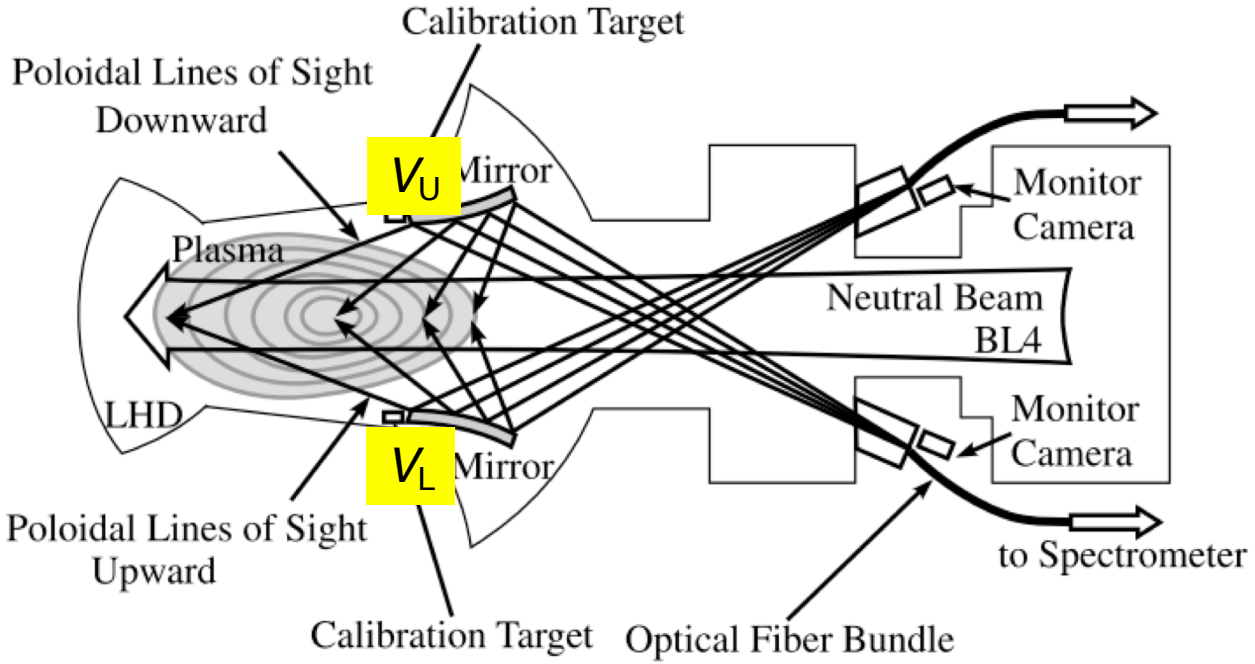
Shot#172648
Bt = 1.375 T Rax = 3.6 m
γ = 1.254 Bq = 100



- We measured the temporal change of plasma potential by modulating an ECH to study the role of the electric field in electron ITB formation in deuterium plasmas.
- Measured position of HIBP is changed from ρ = 0.0 to 0.7 shot to shot. Potential change was synchronized with ECH modulation. Temporal change of the potential was similar to that of ECE signal.
- Density dependence of the potential amplitude was also obtained.
- These data will be compared with data from hydrogen plasmas, and isotope effect will be investigated.

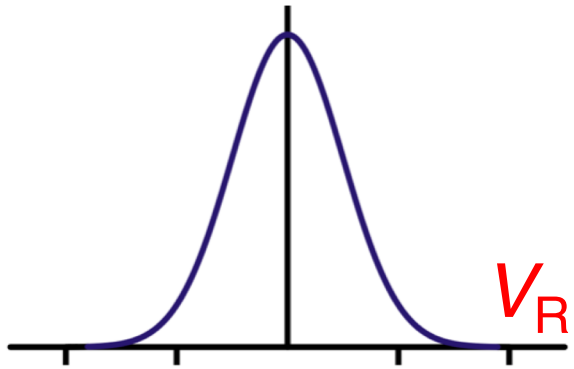


Direct measurement of ion heat flux using radial CXS view



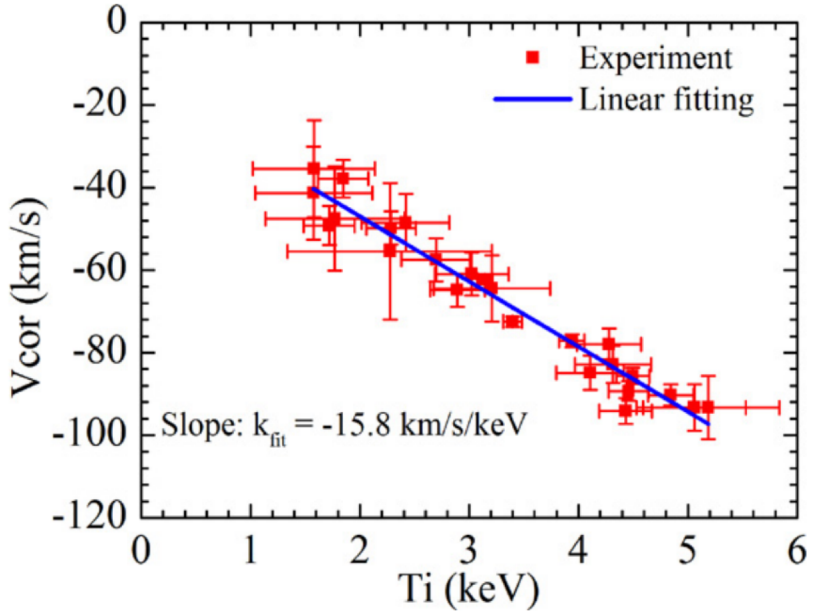
M. Yoshinuma+, Fusion Sci. Tech., 58, 375 (2010)

$$V_P = V_U - V_L$$
$$V_R = V_U + V_L$$



Motivation

- Using the radial-poloidal lines of sight, radial velocity distribution function will be obtained.
- By taking the third order moment, the heat flux is directly evaluated, which is subject to be compared to the power balance/dynamic heat flux.
- Apparent velocity appears due to the atomic process, which is proportional to the ion temperature.
- Modulating heat flux without changing local ion temperature is desirable.



J. Chen+, Phys. Lett. A, **383**, 1293 (2019)

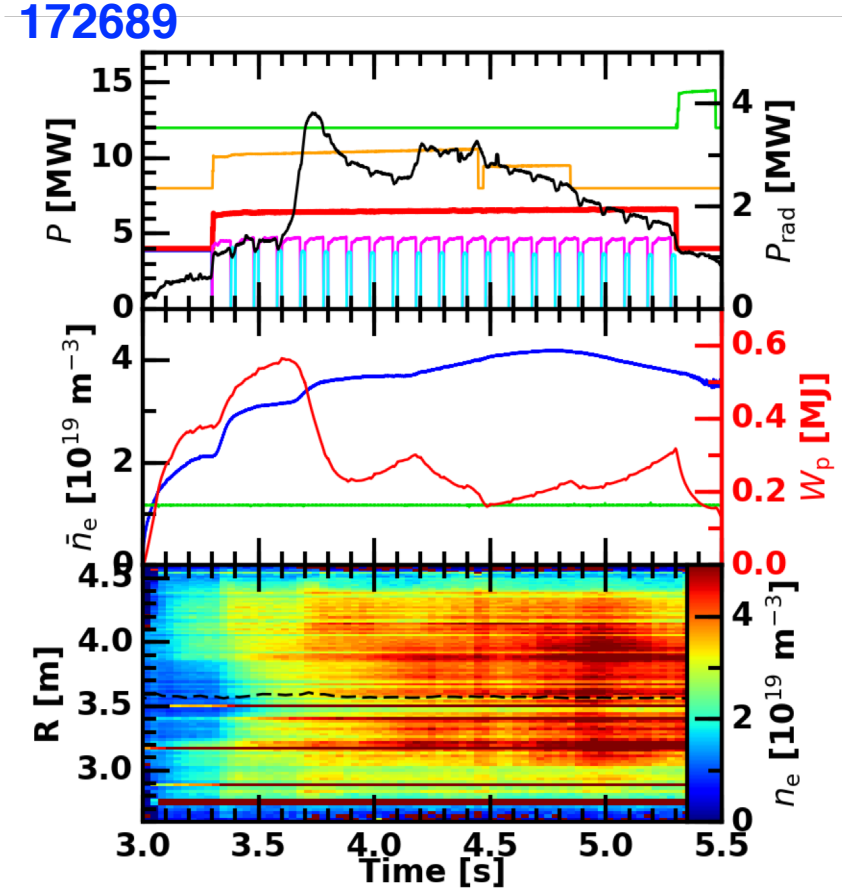
Direct measurement of ion heat flux using radial CXS view

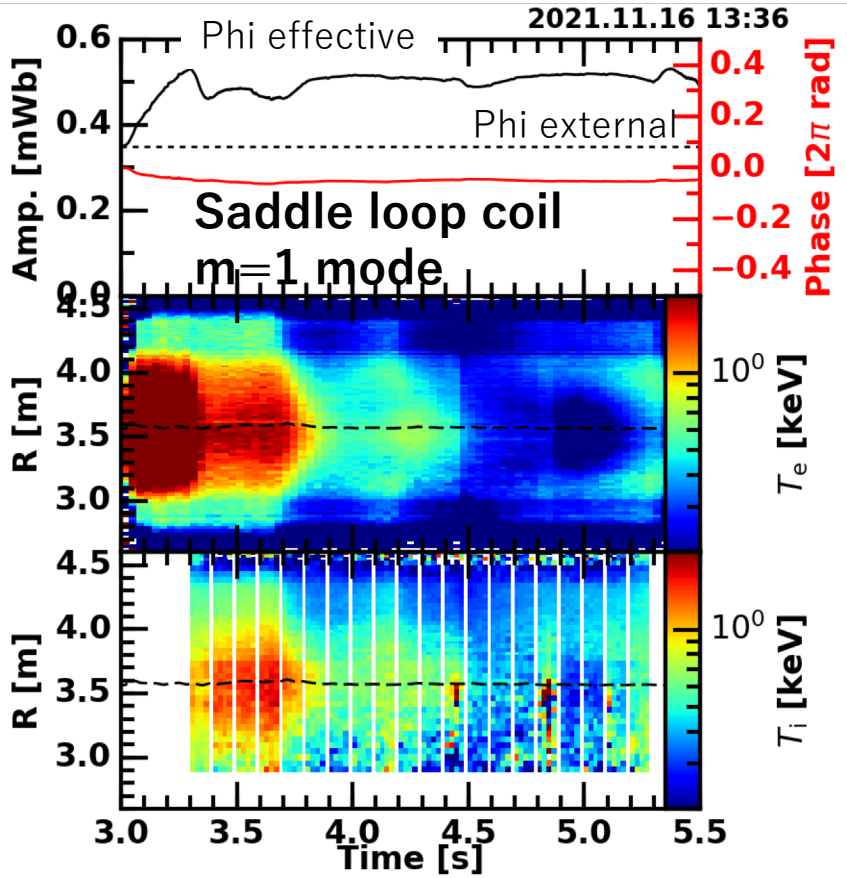
Shot #: 172686-172699

Experimental conditions:

(R_{ax}, Polarity, B_t, γ, B_q) = (3.55 m, CW, -2.79 T, 1.2538, 100 %)

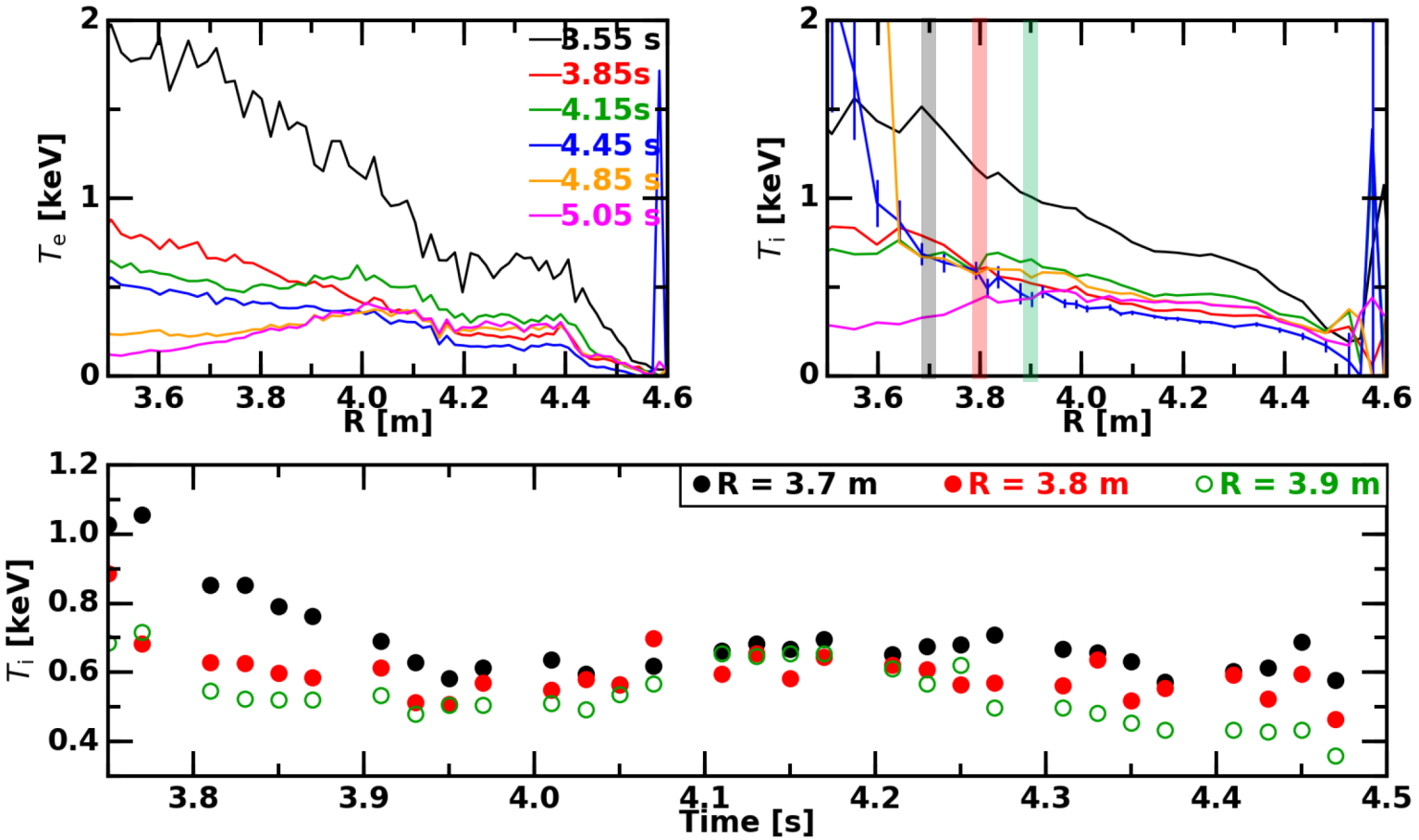
172689





- RMP field was applied to modulate the temperature profile.
- Magnetic island expansion was observed: temperature profile flattening was observed in T_e and T_i at the edge iota/2pi=1 rational surface.

Direct measurement of ion heat flux using radial CXS view



- Not only the edge temperature flattening, but also a core temperature profile collapse was observed.
- At R=3.8m, the ion temperature remains while the gradient changes: A pivoting.
- Distribution function analysis will be performed.