(TG2) Turbulence Topical Group Report

Date: Dec. 13, 2022
Time: 12:15 - 15:30
Shot#: 185797 – 185863 (67 shots)

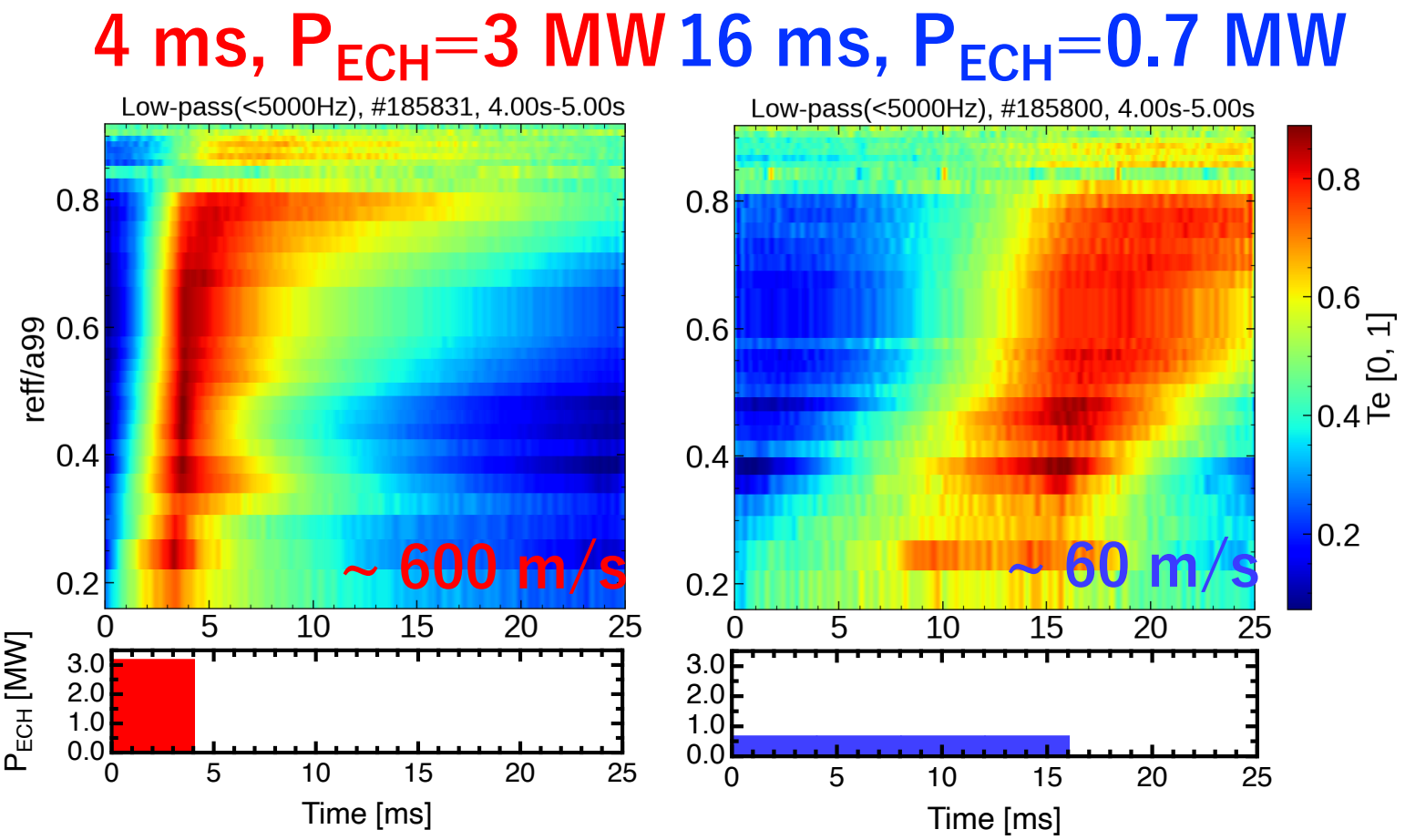
Dec. 14, 2022 (T. Kobayashi)

Prior wall conditioning: NO
Divertor pump: YES
Gas puff: H2 Pellet: NO
NBI#(1, 2, 3, 4, 5)=gas(H, H, H, H, H)=P(1.1, 2.0, 1.9, 3.7, 3.7) MW
ECH(77GHz)=ant(5.5-U, 2-OUR)=P(703, -)kW
ECH(154GHz)=ant(2-OLL, 2-OUL, 2O-LR)=P(723, 799, 986) kW
ECH(116GHz)=ant(2O-LR)=P(-)kW
ECH(56GHz)=ant(1.5-U)=P(-)kW
ICH(3.5U, 3.5L, 4.5U, 4.5L) = P(-, -, -, -) MW
Neutron yield integrated over the experiment = 2.5×10^{13}

Topics

1. Effects of multi-ion and the magnetic field structure on non-local transport (N. Kenmochi)
2. Effect of magnetic islands on the bootstrap current in LHD / Study of the effect of the inversion of the magnetic shear on the e-ITB performance in stellarators with controlling the rotational transform by ECCD and NBCD (H. Igami, A. Dinklage, B. Hjoerdus, M. Markl, Y. Narushima, S. Satake et. al)

Effects of multi-ion and the magnetic field structure on non-local transport (N. Kenmochi)



Shot #: 185797 – 185838 (42 shots)

Experimental conditions:

(R_{ax}, Polarity, B_t, γ, B_q) =
(3.6 m, CW, 2.75 T, 1.2538, 100 %)
D/(H+D)=0.2

Motivation and objective:

- ✓ It is demonstrated that the avalanche events with a short time scale propagated faster than those with a long time scale [Politzer+PoP2002, Kenmochi+Scientific Reports2022].
- ✓ To investigate the effects of the time scale of turbulence and heat pulse on their propagation velocity systematically, the modulated ECH experiments were conducted in which the induced time width of heat pulse was varied with constant injected energy by changing the time width and power of the ECH.

Results:

- ➢ The propagation velocity of the thermal pulses are faster in the case of heating with shorter pulse widths.
- ➢ Since BS and HIBP have also been measured, the effect of the width of the thermal pulse on the propagation velocity of turbulence will be investigated.
- ➢ Isotope effects for the non-local transport will also be investigated comparing with the results of D plasmas.

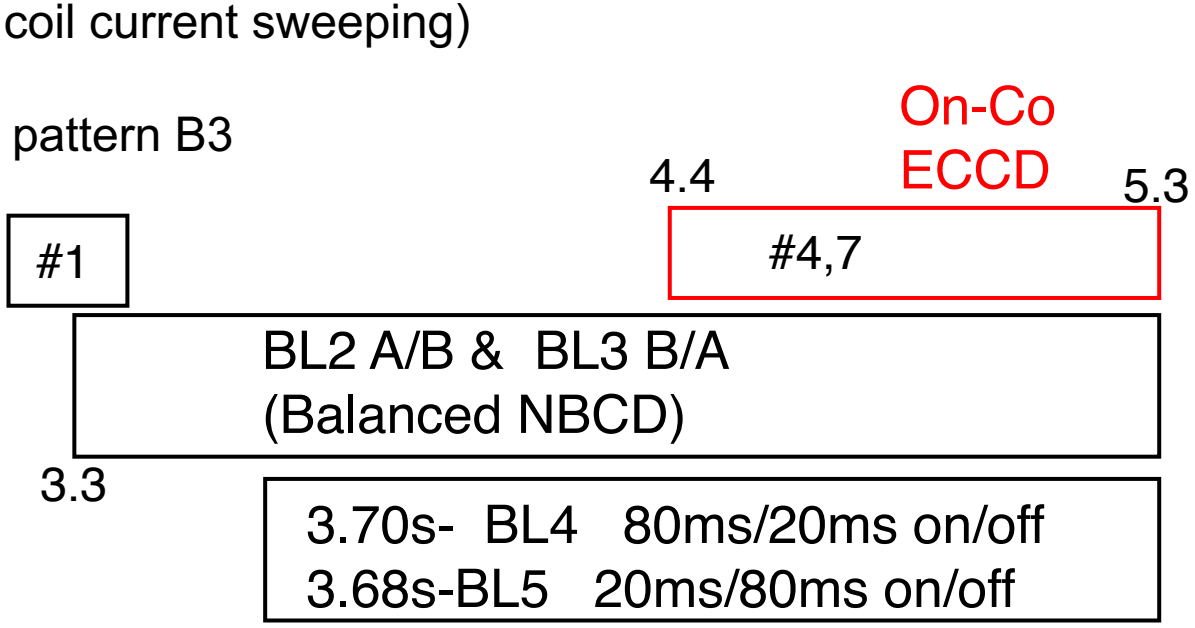
Effect of magnetic islands on the bootstrap current in LHD
Study of the effect of the inversion of the magnetic shear on the e-ITB performance in stellarators with controlling the rotational transform by ECCD and NBCD

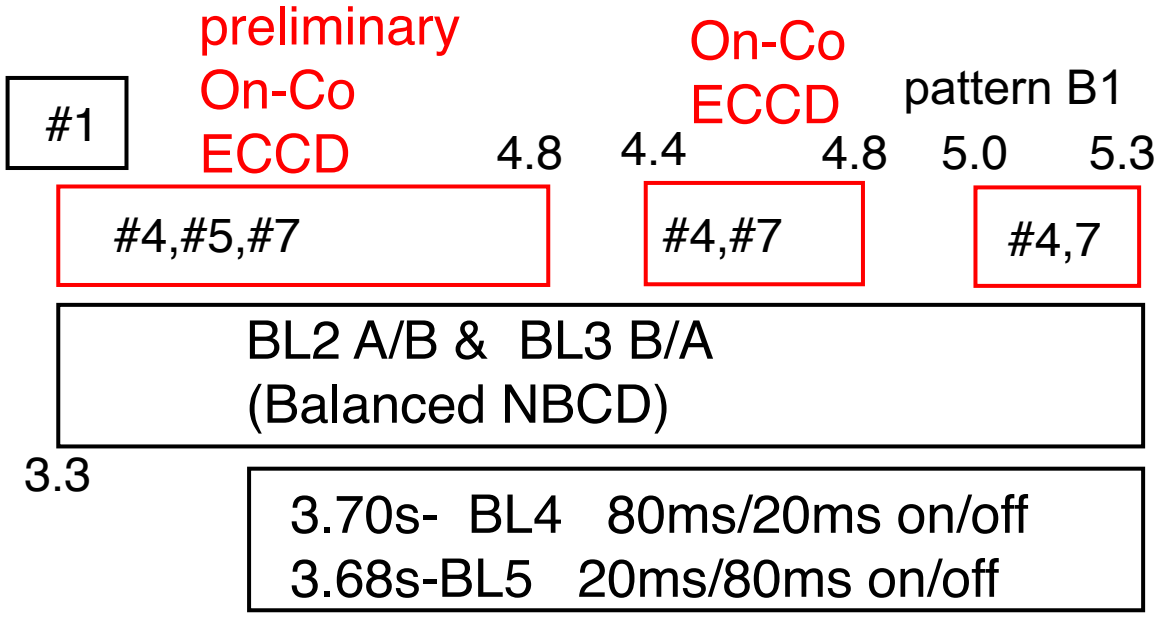
(H. Igami, A. Dinklage, B. Hjoerdus, M. Markl, Y. Narushima, S. Satake et. al)

Shot #: 185839 – 185863
Experimental conditions: (R_{ax}, Polarity, B_t, γ, B_q) = (3.6 m, CW, 2.75 T, 1.2538, 100 %)

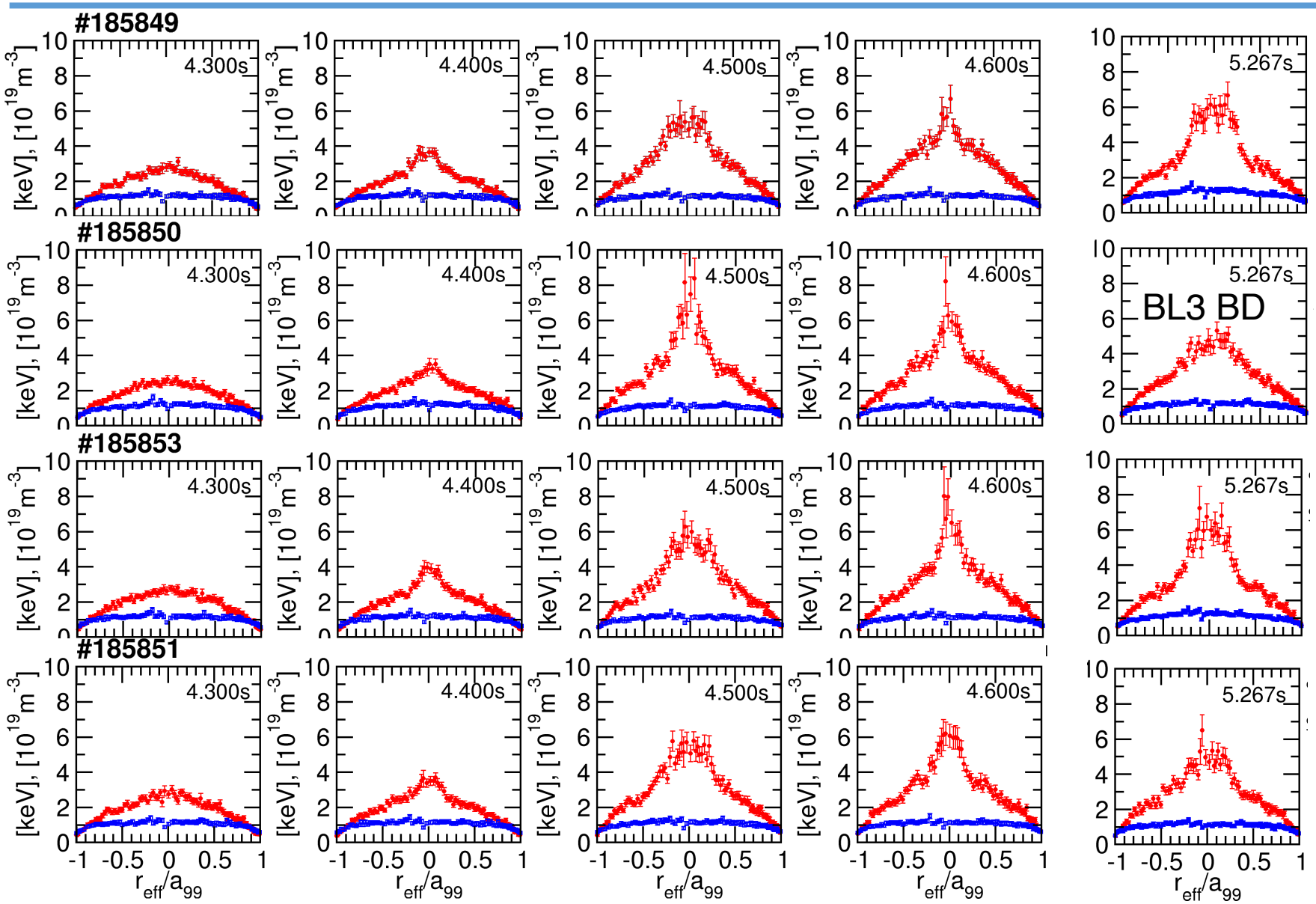
Purpose:
Investigate the effect of magnetic islands on bootstrap current Complementary study with eITB transition program
Investigate the effect of the background $\iota/2\pi$ profile on the "formation mechanism" of the e-ITB

ECCD was superimposed with different profile of the rotational transform controlled by ECCD and NBCD
The width of the m/n=2/1 island was also controlled with RMP coils (cancel, 2/1 expanding, 2/1 expanding with coil current sweeping)





Pattern B3: Different characteristics were observed with e-ITB formation phase for different RMP operations. Evolutions of the Te profile for 0.9s are also different



canceling
(I_A, I_{B1}, I_{B2})=(-300A,0A,-300A)
7-O mode

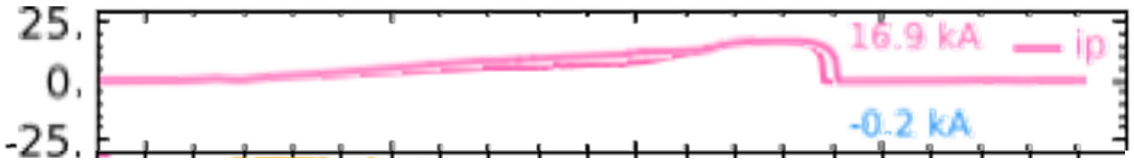
no RMP

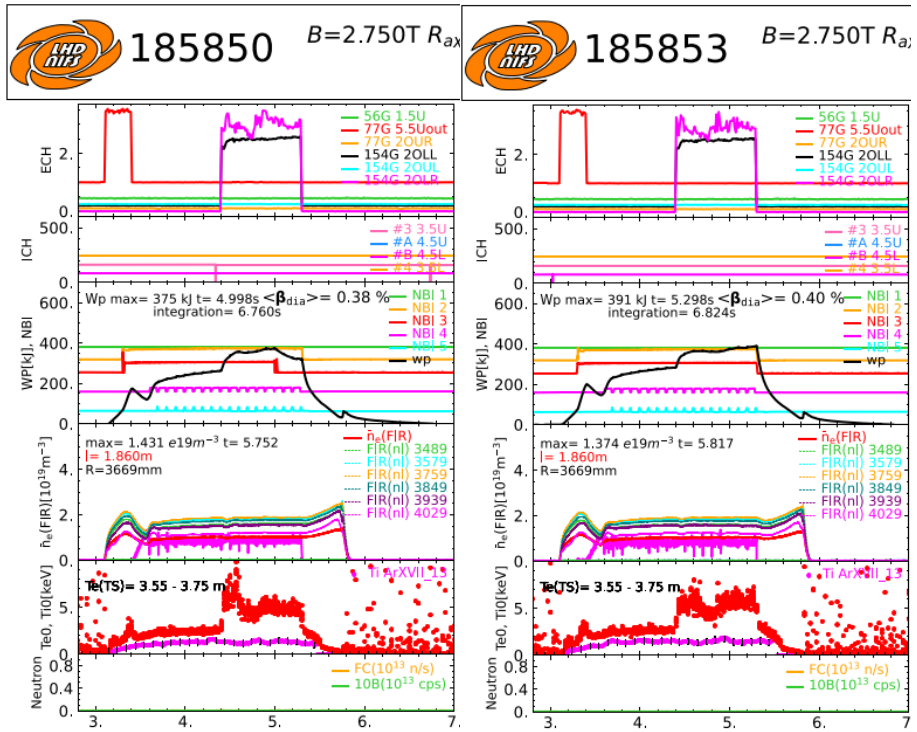
m/n=2/1 expanding with coil current sweeping
(dI_A/dt, dI_{B1}/dt, dI_{B2}/dt)=
(-380A/s,-307A/s,0A/s)
(-931A,-754A,10A)@4.4s
6-O mode

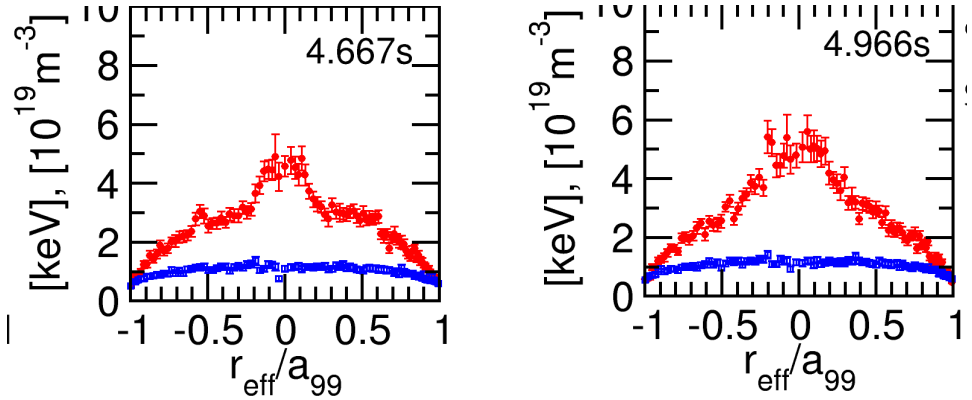
m/n=2/1 expanding
(I_A, I_{B1}, I_{B2})=(-1100A,-890A,10A)
6-O mode

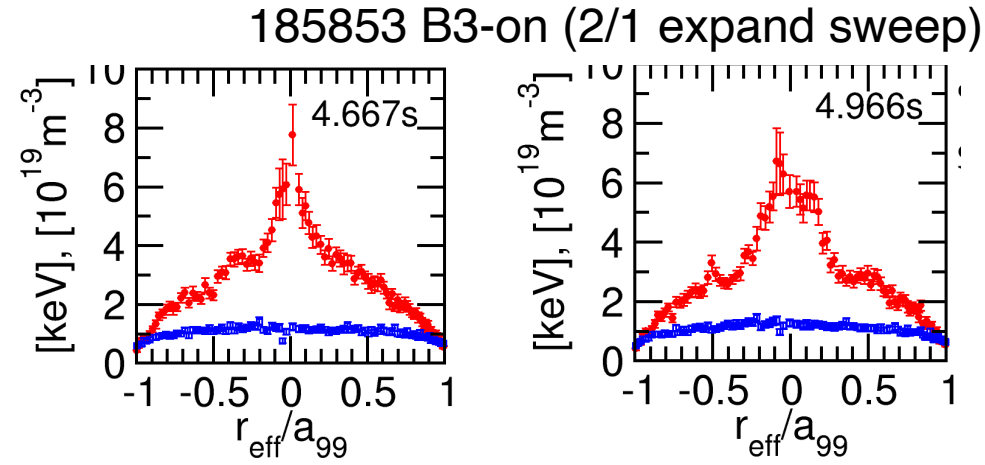
Pattern B3: Small but measurable differences in Ip Differences in the profiles

-> effect of RMP on plasma current documented, detailed analysis required

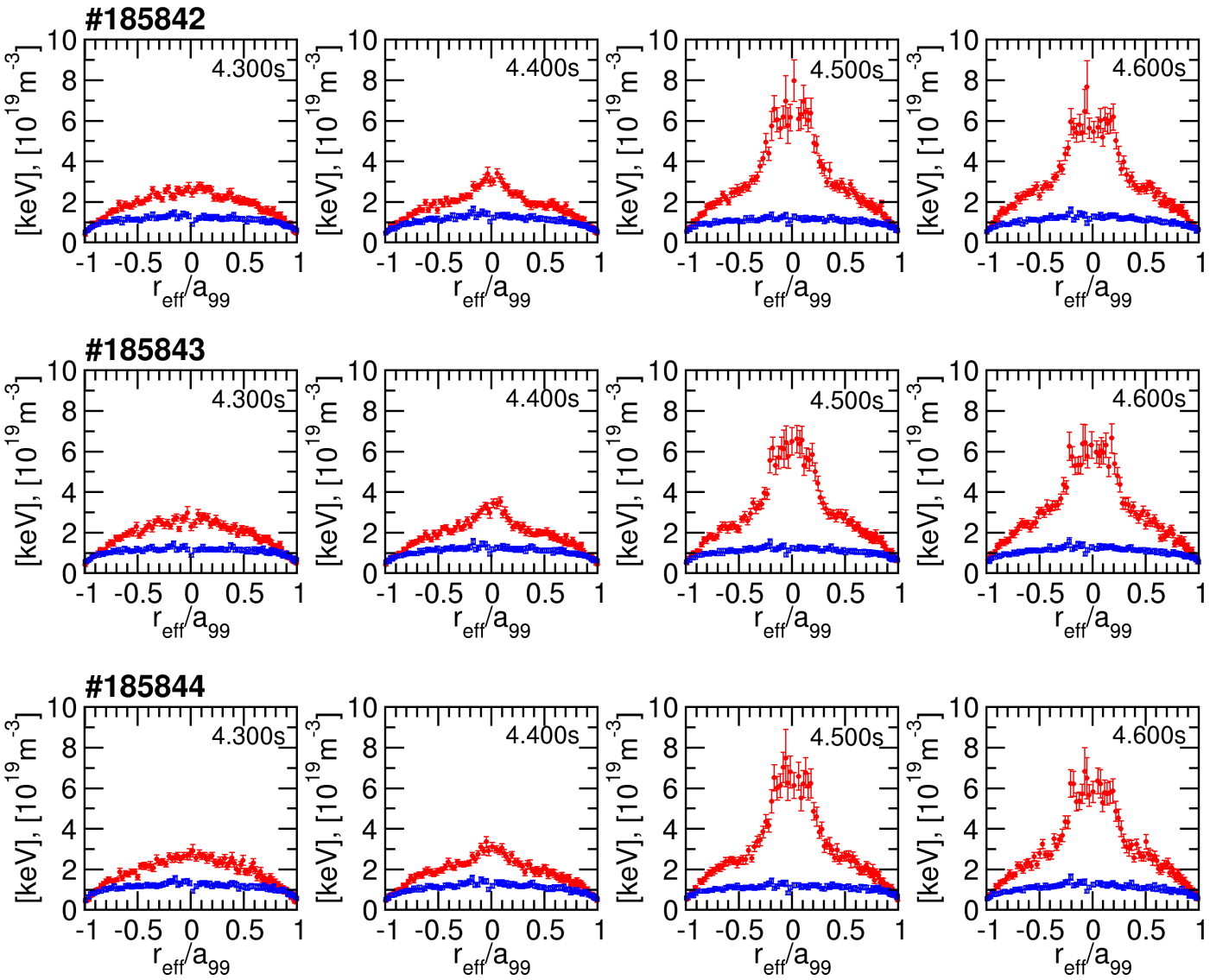








Pattern B1: Higher central Te was obtained with superimposing ECCD after preliminary co ECCD. Evolutions of the Te profile are also different



canceling
(I_A, I_{B1}, I_{B2})=(-300A,0A,-300A)
7-O mode

no RMP

m/n=2/1 expanding
(I_A, I_{B1}, I_{B2})=(-1100A,-890A,10A)
6-O mode