

(TG4) Plasma instability group report

Date: Nov.3, 2022

Nov. 4, 2022 (R. Seki)

Time: 9:37 -18:45

Shot#: 182357-182509 (152 shots)

Prior wall conditioning: No

Divertor pump: On

Gas puff: D2 Pellet: No

NBI#(1, 2, 3, 4, 5)=gas(D, D, H, D, D)=P(2.0, 2.2, 2.0, 3.4, 3.9)MW

ECH(77GHz)=ant(5.5-Uout (or 1.5U), 2-OUR)=P(0.703, 0.792)MW

ECH(154GHz)=ant(2-OLL, 2-OUL, 2-OLR)=P(0.723, 0.799, 0.825)MW

ECH(56GHz)=ant(1.5U)=P(0)MW

ICH(3.5U, 3.5L, 4.5U, 4.5L)=P(0, 0, 0, 0)MW45

Neutron yield integrated over experiment = 4.6×10^{16}

Topics

1. Beam ion transport due to toroidal Alfvén eigenmode (K. Ogawa)/ Exploration of AE excitation by multiple Energetic Particle (EP) species(M. Osakabe)
2. ECRH/ ECCD effects on energetic particle-driven Alfvén eigenmodes (S. Sharapov)

Beam ion transport due to toroidal Alfvén eigenmode (TAE)/Exploration of AE excitation by multiple Energetic Particle (EP) species (K. Ogawa, M. Osakabe, M. Isobe et al.)

Shot #:182357-182412

Experimental conditions: $(R_{ax}, \text{Polarity}, B_t, \gamma, B_q) = (3.6 \text{ m}, \text{CCW}, 0.6 \text{ T}, 1.2538, 100), (3.9 \text{ m}, \text{CCW}, 1.0 \text{ T}, 1.2538, 100)$

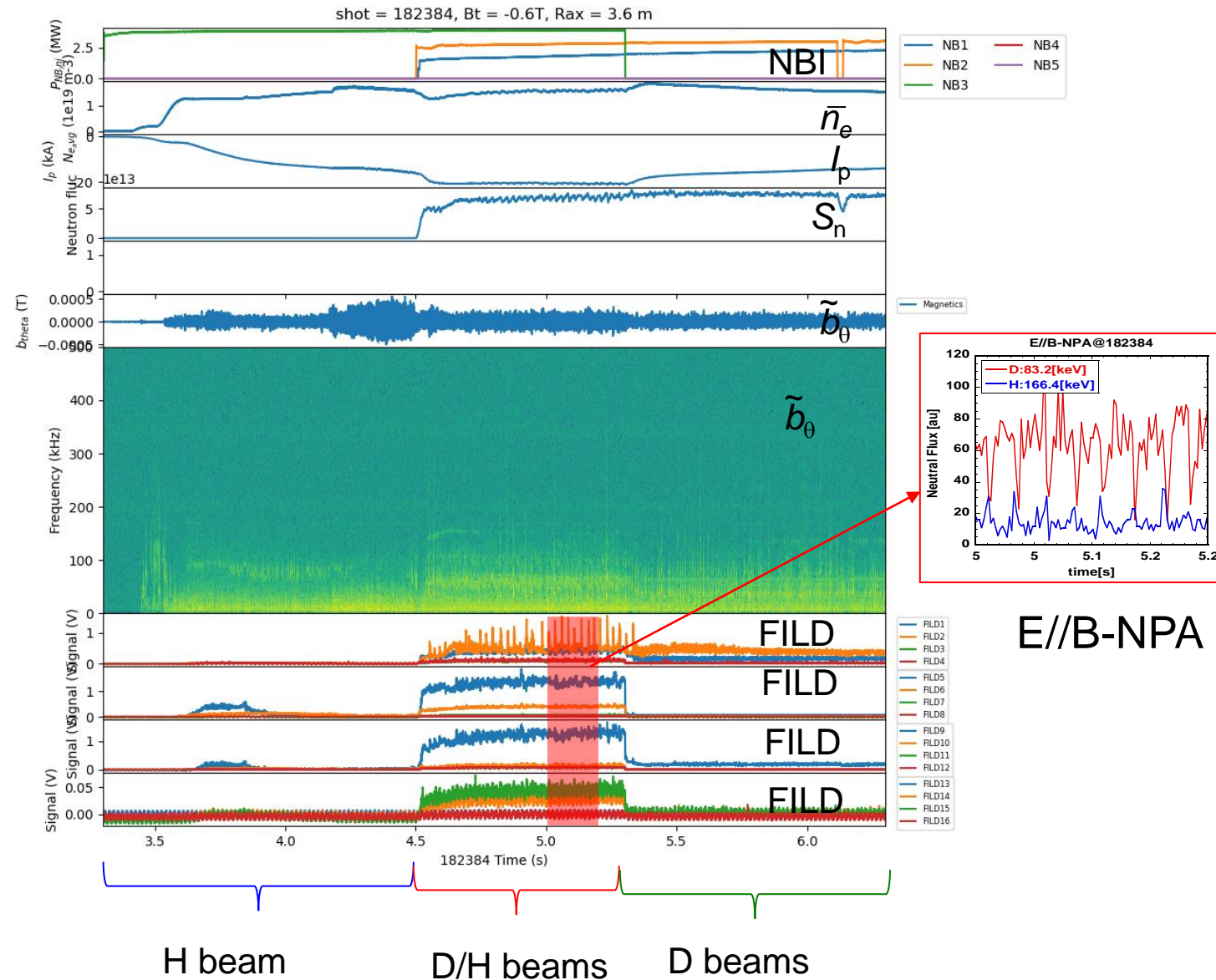
Background and motivation:

- We performed the study of energetic particle transport due to TAE on $R_{ax}=3.60 \text{ m}/B_t=0.6 \text{ T}$ (CCW) in H plasma with H beams (12th campaign), D plasma with D/H beams (21st campaign), and D plasma with D beam conditions (23rd campaign, but E||B-NPA data unavailable).

- To understand energetic ion transport due to TAE in D plasma D/H beam condition, we would like to perform the sequence of experiments in the same day with D plasma condition.

Results:

- We performed D plasma experiments with H-beam, H/D-beams, and D-beams. All required neutron and fast-ion diagnostics were available.
- Clear change in FILD, NFM, and E||B-NPA signals due to TAE were obtained.
- One MCP section which measure the highest energy ranges over 180[keV/amu] had a trouble.



E//B-NPA

ECH/ECCD effects on Alfvén eigenmodes (S.E. Sharapov, M. Osakabe, K. Ogawa, M. Isobe)

Shot #:182413-182509

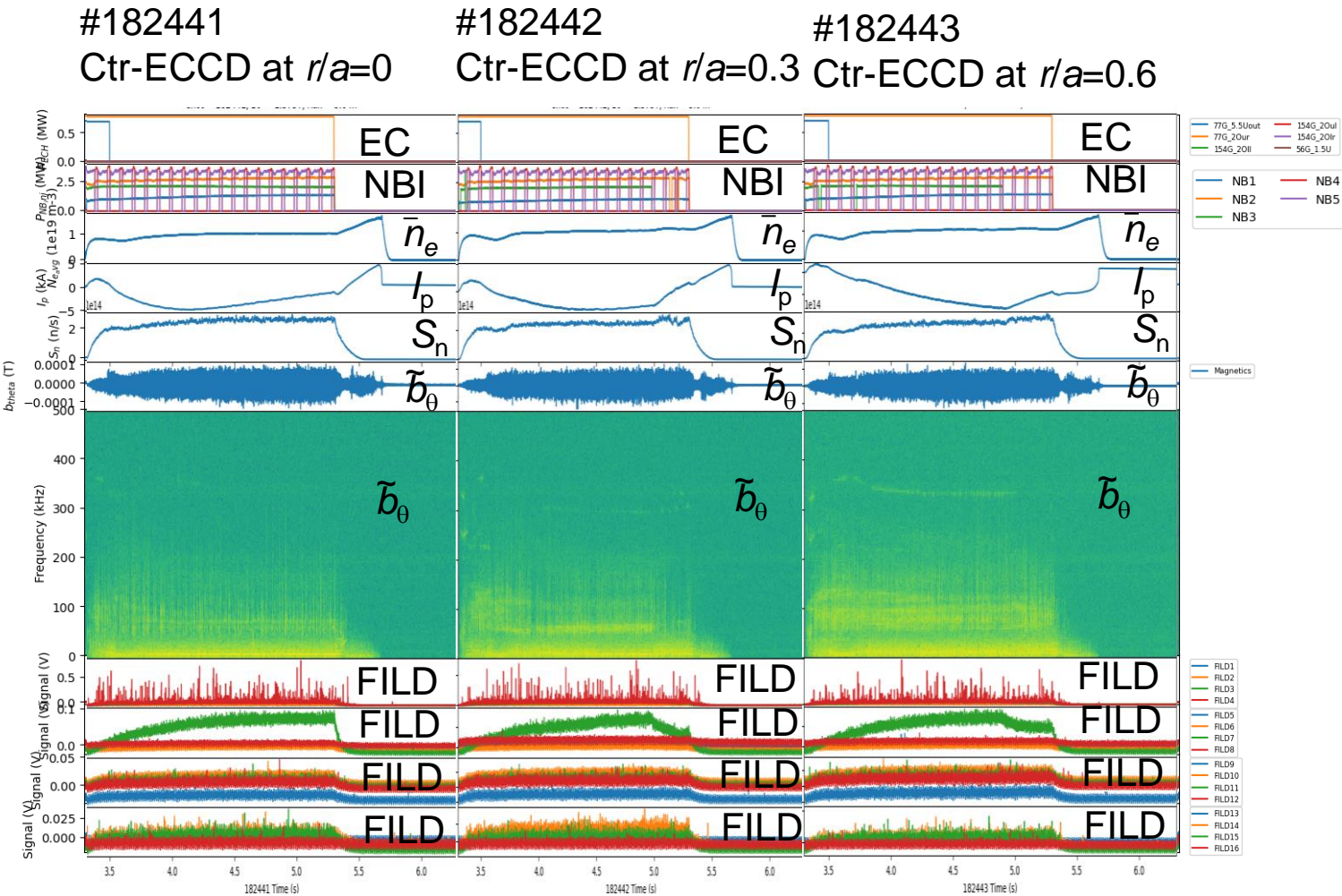
Experimental conditions: (R_{ax} , Polarity, B_t , γ , B_q) = (3.9, CCW, 1.375, 1.254, 100), (3.6, CCW, 1.375, 1.254, 100), (3.9, CCW, 2.538, 1.254, 100), (3.6, CCW, 2.75, 1.254, 100),

Background and motivation:

The possibility of mitigating energetic particle-driven modes with ECH/ ECCD is investigated in line with the on-going feasibility study of suppressing alpha-driven Alfvén eigenmodes (AEs) in ITER with ECCD. The ECRH/ECCD effects on AEs to be investigated at LHD with $B_t \sim 2.75$ T and at $B_t = 1.375$ T.

Results:

- We observed significant difference in ECCD effects on AEs depending on radial position of ECCD and co/ ctr.
- NB3 with H used for MSE, ECCD modulation, FILD, FIDA, neutron diagnostics were all used OK in our pulses.



Comparison of LHD pulses with Ctr-ECCD at $r/a=0$ (#182441), $r/a=0.3$ (#182442) and $r/a=0.6$ (#182443). Mode at 350 kHz appears at off-axis ECCD while lower-frequency modes ($\sim 50-100$ kHz) decrease in amplitude.