(SG3) Instability & Anisotropy group report

May. 29, 2024 (T. Kawate)

Date: May. 28, 2024
Time: 10:25 – 16:45
Shot#: 192009 – 192122 (114 shots)
Prior wall conditioning: Yes (H_2)
Divertor pump: Yes
Gas puff: H_2, Ar, CH_4

NBI#(1, 2, 3, 4, 5)=gas(H, H, H, H, H)=P(4.4, 3.6, 3.9, 2.9, 4.2)MW
ECH(77GHz)=ant(5.5-U, 2-OUR)=P(0.70, 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. Measurement of fluctuation of electron velocity distribution function from high harmonics electron cyclotron emission (E. Kawamori (National Cheng Kung Univ.), H. Igami)
2. Direct observation of bulk phase space dynamics during the energetic particle driven Geodesic Acoustic Mode (Y. Kawachi (Nagoya Univ.), T. Kobayashi)
3. Manipulation of radial electric field using perpendicular neutral beam injection for improved confinement (Z. Lin (UCI), M. Osakabe)

Measurement of electron entropy (velocity distribution function) from high harmonic ECE

Kawamori E. (National Cheng Kung Univ. Taiwan), Igami H., Tokuzawa T. (NIFS)

Shot #: 192009-192064

Magnetic configuration: (R_{ax}, Polarity, B_t, γ, B_q) = (3.60, CW, 1.0, 1.2538, 100),

Background and motivation:

- Entropy($-\int \tilde{f}_e \ln(\tilde{f}_e) dv$) transport is a key for understanding turbulent heat transport
- Validation of our idea of $\tilde{f}_e(v)$ measurement from harmonics of ECE

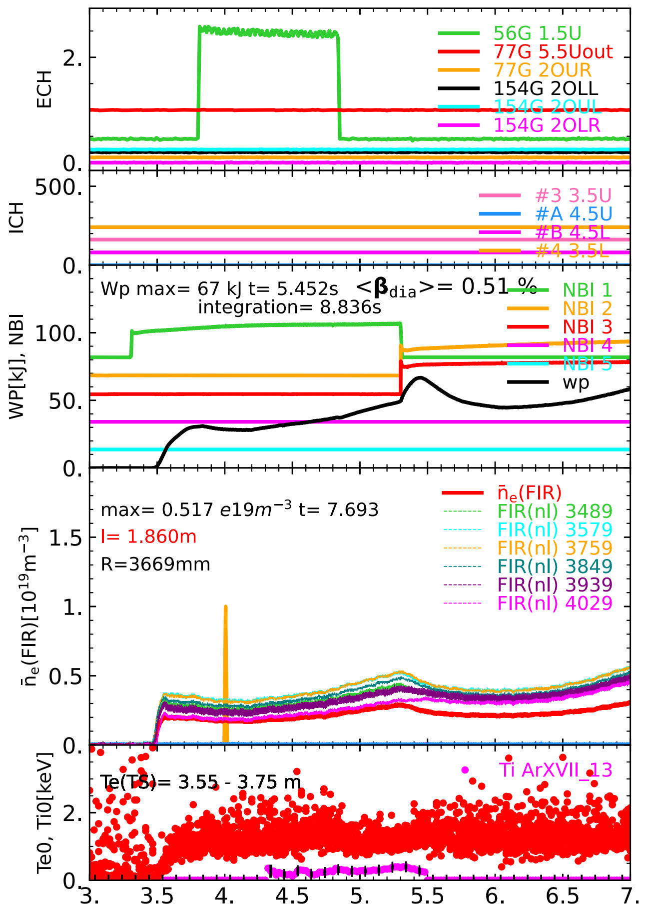
Method:

- Observe ECE from optically thin plasmas, whose $f_e(v)$ is externally perturbed by NB/ECH modulation
- Crosscheck of $\tilde{f}_e(v)$ measurement by ECE with Thomson scattering measurement

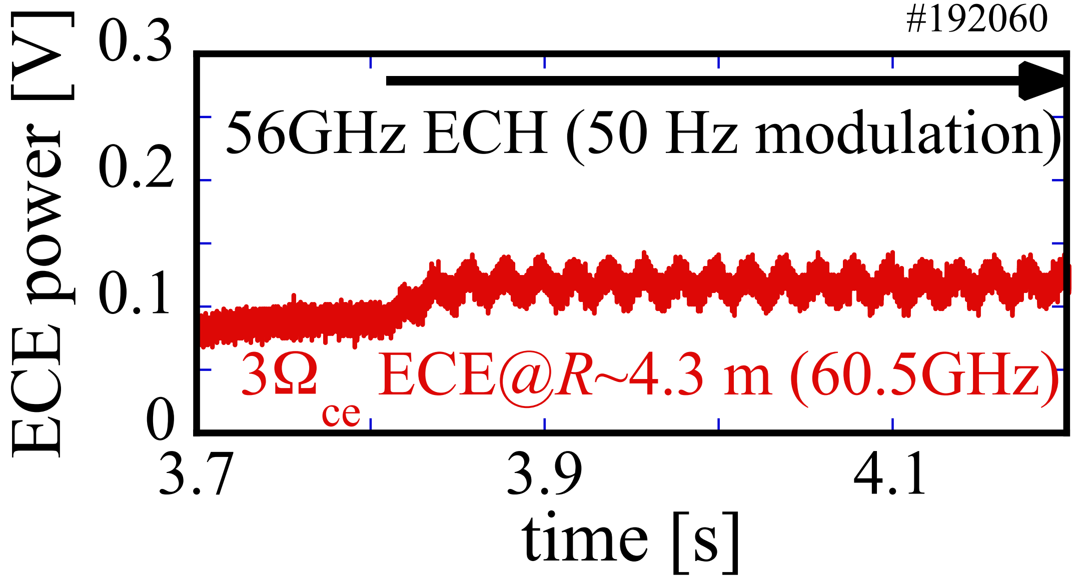
Result:

- Fluctuation of high harmonic ECE induced by ECH modulation was confirmed
- Further investigation including comparison with Thomson scattering measurement will be conducted

Electron heating power was modulated in optically thin plasmas



- Low ne plasmas were produced by NB start-up
- Te (measured by Thomson scatt.) fluctuation by ECH modulation was observed



- Fluctuation of 3rd harmonics ECE driven by ECH modulation was observed
- Comparison b/w ECE & Thomson scattering measurement results is to be conducted

Direct observation of bulk phase space dynamics during the energetic particle driven Geodesic Acoustic Mode

Y. Kawachi et al

Shot #: 192069-192102 (total 36 shots)

Experimental conditions: (R_{ax}, Polarity, B_t , γ, B_q) = (3.75 m, CW, 1.375 T, 1.2538, 100 %)

Objective: Investigation how the EGAM affects the ion temperature by using Fast CXS

What we did:

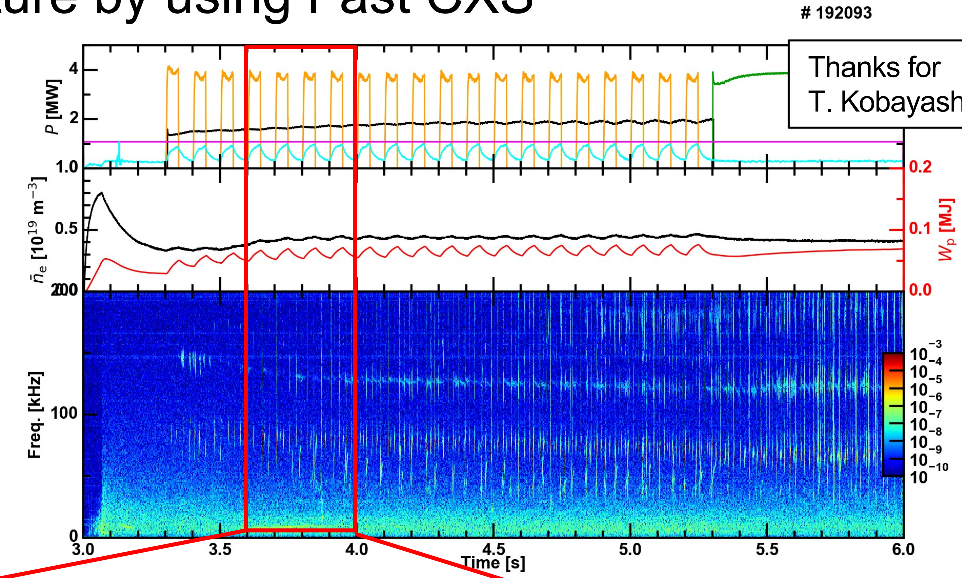
- We investigated low density and the EGAM excitation condition even when the NB#5 was injection
- we measured the velocity distribution dynamics by using 12 channels of Fast CXS with 10kHz sampling

Results:

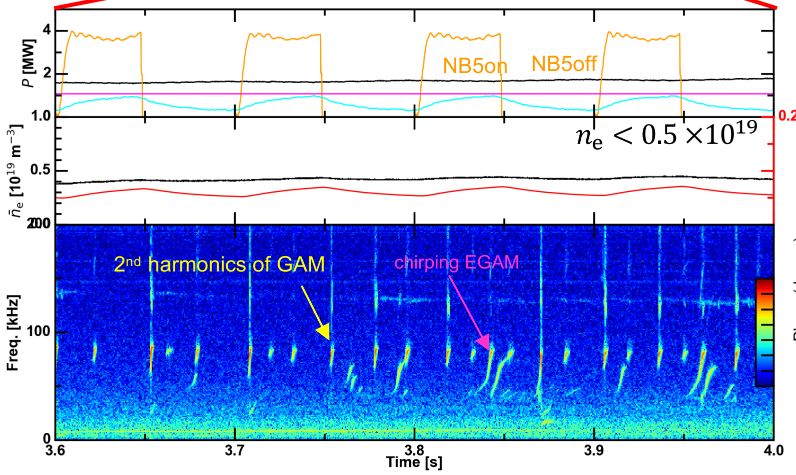
- We successfully found the EGAM excitation condition with NB#5 50ms on/off modulation operation
- EGAM like chirping signal and bursty mode exhibiting second harmonics of GAM frequency with n=0 characteristics

Future work:

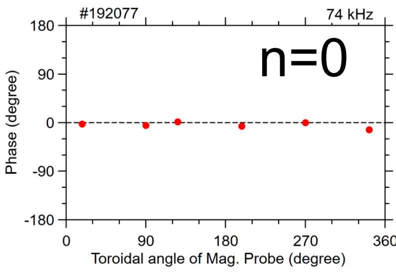
- We will analyze Fast CXS data to investigate velocity distribution dynamics, and HIBP data to examine internal structure of the observed modes



Thanks for
T. Kobayashi



Thanks for
T. Ido

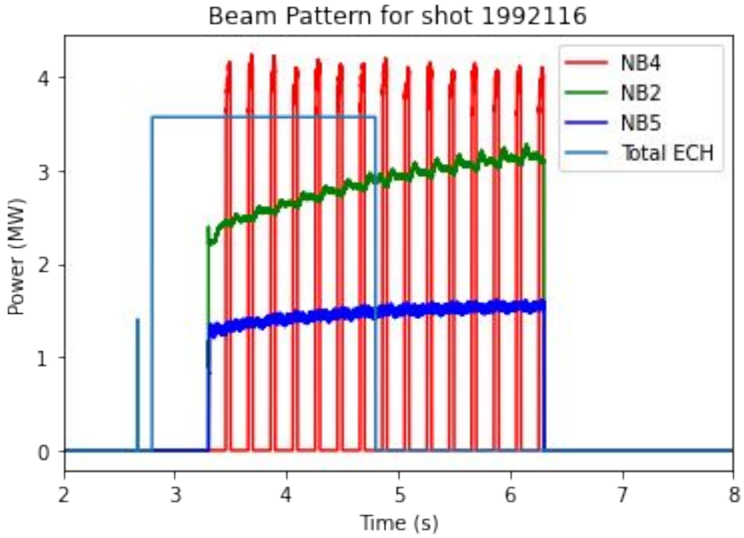


Motivation: Manipulation of radial electric field through neutral beam injection

Two sets of scans

1. Scan 3 injection energies of NB5 by 3 different parallel beam arrangements (copassing, counterpassing, mixed) for a total of 9 shots.
2. Scan the fraction of beam power going from perpendicular to parallel. All shots in this scan will have a total injection power of 6 MW.

All shots will have ECH on for half of the shot to measure the effects in both electron root and ion root



3.6 m, 2.75 T, clockwise magnetic field from above, HIBP potential measurements, ~half of the shots were quiescent

Future work: Perform simulations to compare Er growth with experiment, and compare Er between all shots

Energy Scan

NB5	NB1:H NB3:H	NB1: H NB2: H	NB2:F
4 sources 25 keV			
3 sources 30 keV			
2 sources 40 keV			

Power scan

	6 MW Perp 0 MW Parallel NBI 5: F NBI 4: F	4.5 MW Perp 1.5 MW Parallel NBI 5: F NBI 4: H	3 MW Perp 3 MW Parallel NBI 5: F NBI 4: 0	1.5 MW Perp 4.5 MW Parallel NBI 5: H NBI 4: 0	0 MW Perp 6 MW Parallel NBI 5: 0 NBI 4: 0
Mixed	0 Parallel		NB1: H NB2: H		NB1: F NB2: F
Counter passing		NB1: H NB3: 0	NB1: H NB3: H	NB1: H NB3: F	
Copassing			NB2: F		

Note that NBI 4 is always used for diagnostic purposes