Polarization imaging of Ar XIV and Hα emission lines for diagnosing anisotropic electron velocity distributions

T. Shikama, H. Inagaki
(Kyoto Univ.) and M. Goto

Experimental conditions:
(R_{ax}, Polarity, B_t, γ, B_q) = (3.6 m, CCW, 2.75 T, 1.2538, 100.0%)
#197224 – #197240

Motivation and method:

- To investigate anisotropy of electron velocity distribution in core plasma.
- Polarization modulation imaging and spectroscopy of Ar XIV M1 emission line

Results:

- High-speed camera did not operate probably due to the magnetic field.
  → We'll further reinforce the shield.
- Instead, we performed spectroscopic measurements to investigate n_e dependence.
  → While Ar II E1 emission line intensities increased with n_e, Ar XIV M1 emission line intensity remained unchanged.

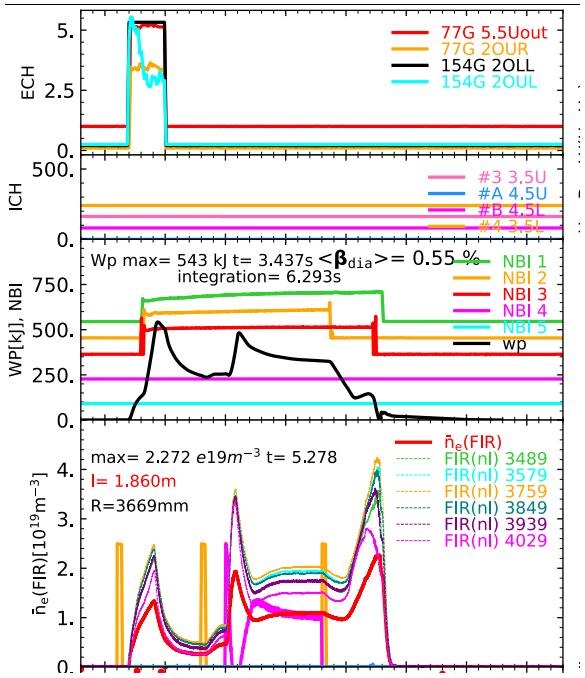


Fig.1 #197240

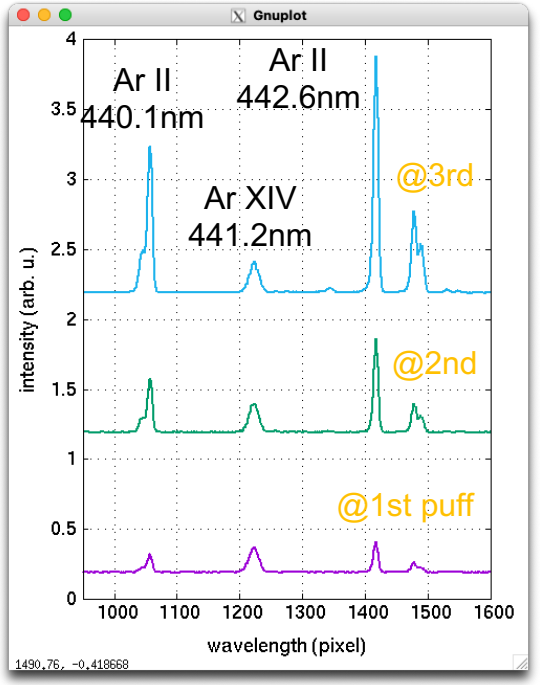


Fig.2 Spectra at Ar puff pulses

- This may be attributed to differences in the population mechanisms of the upper state. The relatively strong Ar XIV M1 emission line observed under low-n_e conditions is advantageous for polarization spectroscopy.

Prediction and control of radiative collapse using a decision tree model.

Y. Suzuki, M. Shoji, N. Kenmochi, M. Yokoyama

Experimental conditions:

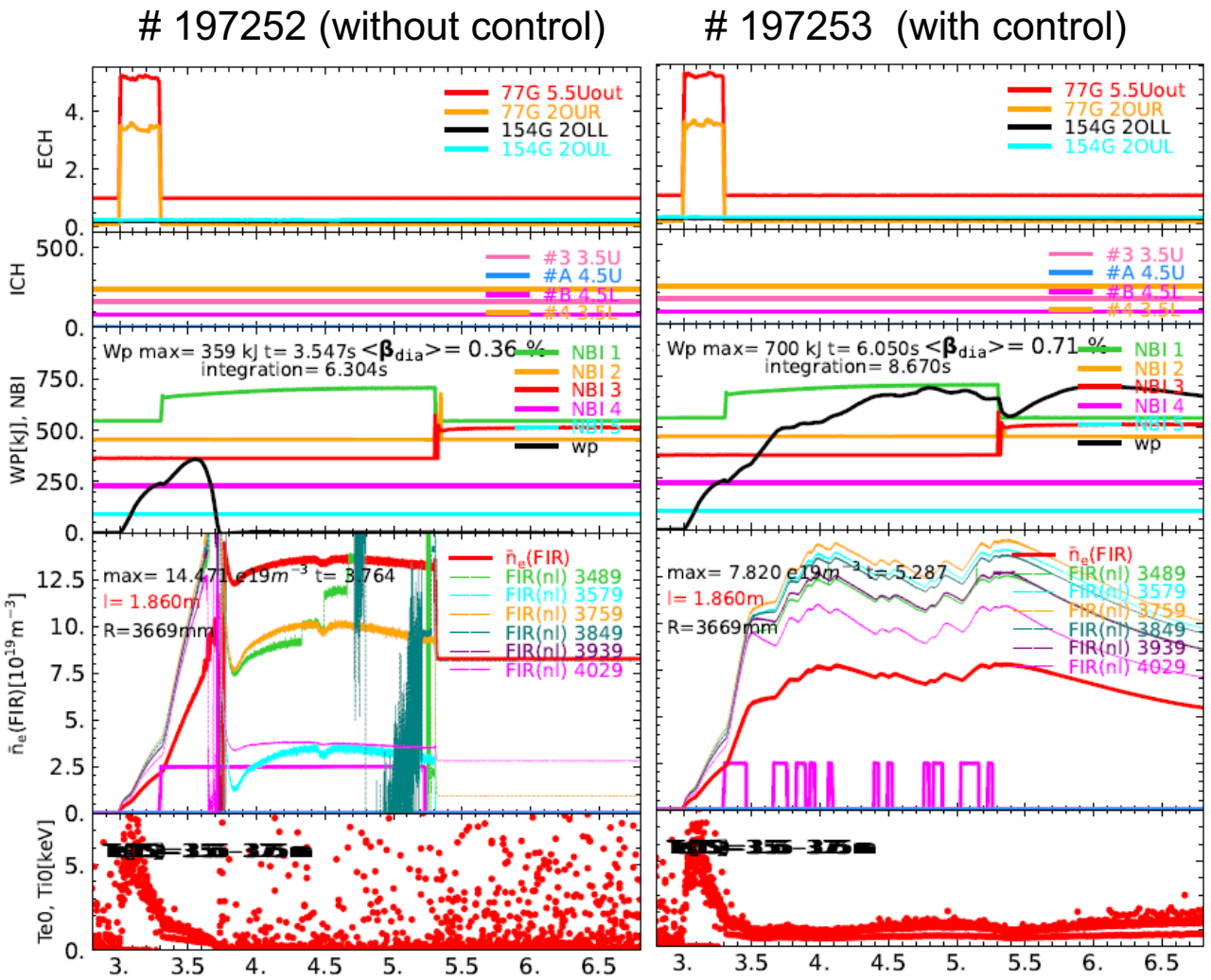
(R_{ax}, Polarity, B_t, γ, B_q) = (3.6 m, CCW, 2.75 T, 1.2538, 100.0%)
#197241 - #197254

Motivation and method:

- This experiment demonstrates the effectiveness of a data-driven approach and camera images for plasma control.
- Control gas puffing and additional ECH based on the output from the Image recognition model.
- This model was trained to classify of discharge state of the plasma (stable state or collapsed state) using camera images from #153,367 to 187,364 shots

Results:

- Under conditions expected to cause radiative collapse, the control system successfully maintained stable plasma in multiple shots.
- Around 3.5 ~ 4.2 seconds, electron density increases while avoiding control.
- The radiative collapse is predicted to occur around 3.6 s.
- The gas puff appears to have been turned off around 3.5 s before collapse.



Real time suppression of turbulence for sustaining high-performance plasmas and investigation of collapse mechanisms

Shot No: #197255,197259-197265 (8shots) ,**Gas-puff:** H
Experimental conditions: (3.6 m, CCW, 2.75 T, 1.2538, 100 %)
Shot No: #197266-197274 (9shots) ,**Gas-puff:** H
Experimental conditions: (3.55 m, CCW, 2.7887 T, 1.2538, 100 %)

T. Kinoshita(Kyushu Univ.), Y. Morishita(Kyoto Univ.), N. Kenmochi, H. Funaba, K. Tanaka

Motivation

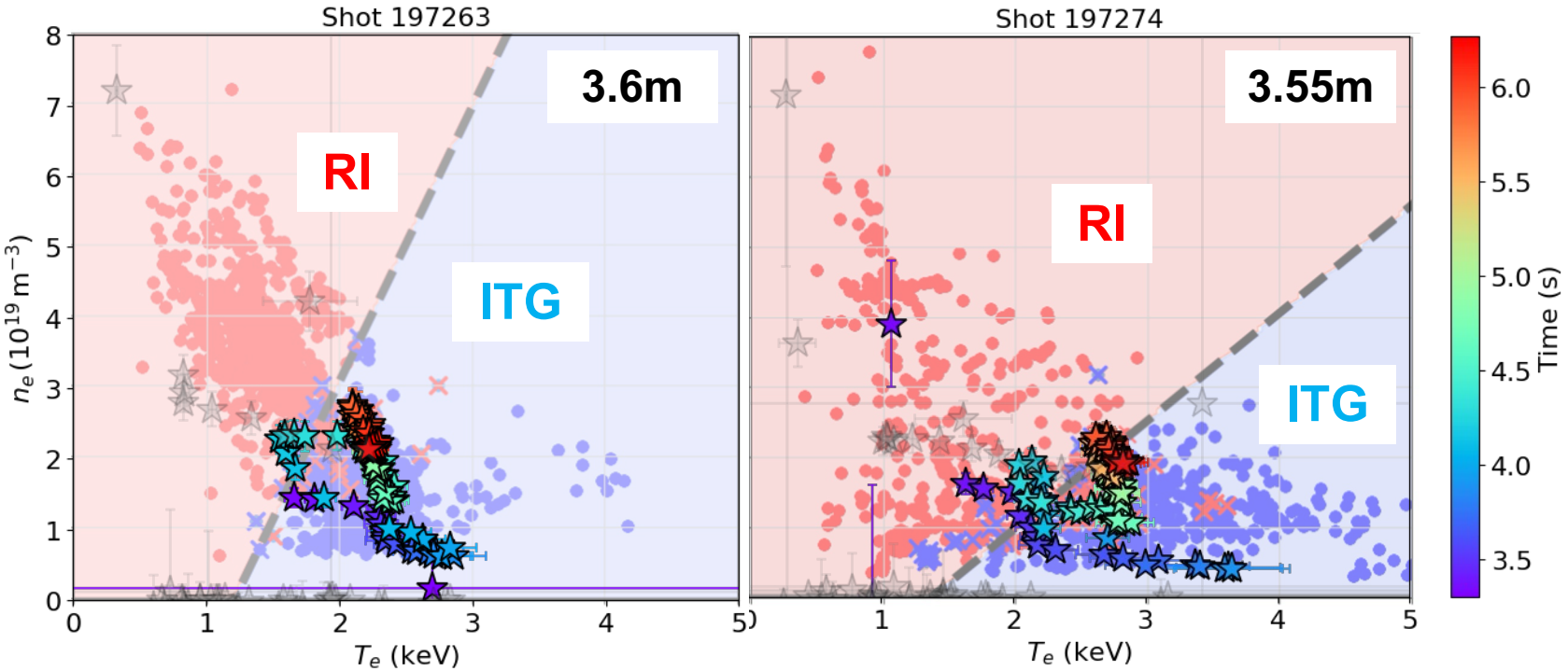
In LHD, anomalous transport is reduced and higher ion temperatures are achieved when the ITG–RI turbulence transition (TT) occurs. This experiment focuses on the operational limits of plasma meeting TT conditions and investigates its characteristics.

Results

- Compared to last year's experiment, the plasma accessed higher ne and Te regions.
- For Rax=3.6m, the plasma moved along the operational limit boundary and approached the TT line.
- For Rax=3.55m, the plasma followed the TT line and approached the operational limit boundary.

Future Work

- I will investigate the plasma characteristics near the LHD operational limits under conditions of turbulence suppression.



Effect of the orbit of high energy ions on the frequencies of coherent ion cyclotron and lower hybrid harmonic emissions

H. Igami, et al

Experimental conditions:

(R_{ax}, Polarity, B_t, γ, B_q) = (3.55 m, CCW, 2.85 T, 1.2538, 100.0%) #197276 - #197295

(R_{ax}, Polarity, B_t, γ, B_q) = (3.55 m, CCW, 2.89 T, 1.2538, 100.0%) #197296 - #197306

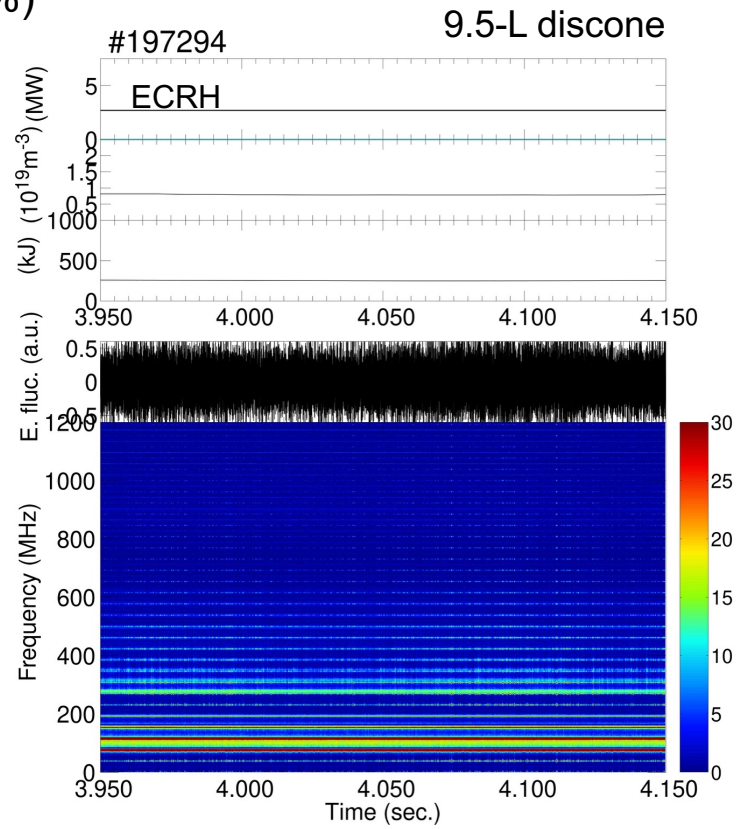
(R_{ax}, Polarity, B_t, γ, B_q) = (3.75 m, CCW, 2.64 T, 1.2538, 100.0%) #197307 - #19716

Motivation and method:

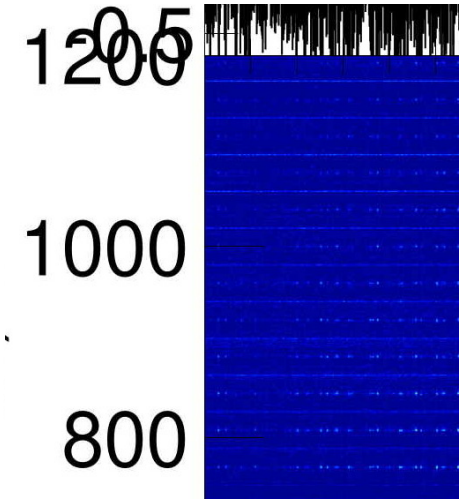
- Energetic ions originated from ICRF minority heating may have varieties of the pitch angle and birth location with changing the locations of
  - Two-ion hybrid resonance
  - ICR corresponding to 38.47 MHz
- With changing the magnetic configuration and NBI applications, emissions up to 1 GHz range were observed by RF probes

Results:

- Intense peaks with gaps less than the ICRF frequency (38.47MHz) in the range of f > 800 MHz were observed during ICRF wave launching by FAIT antenna



(Rax, Bt)=
(3.55 m, 2.789 T)



Effect of the orbit of high energy ions on the frequencies of coherent ion cyclotron and lower hybrid harmonic emissions

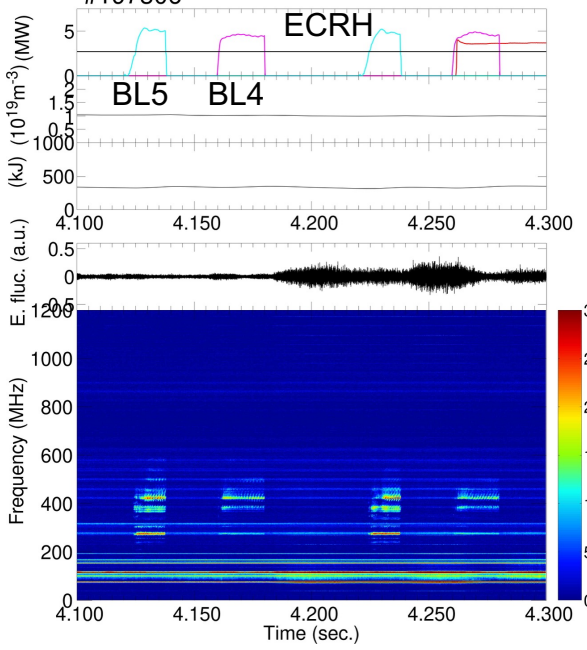
H. Igami, et al

Results:

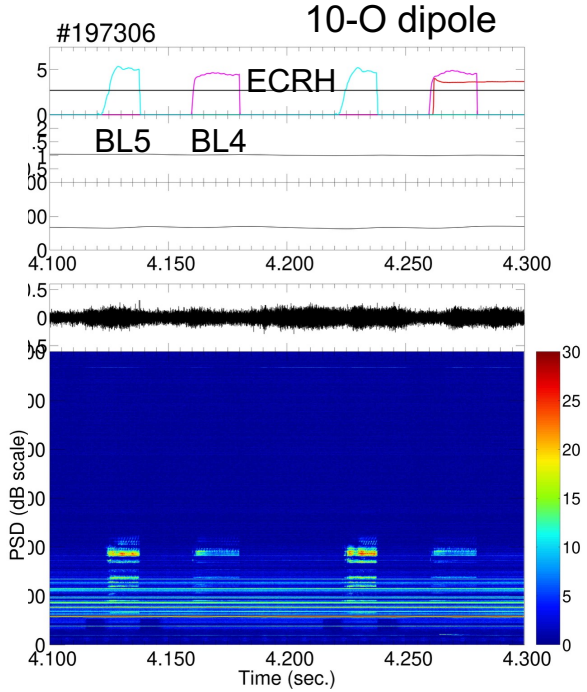
- Frequency Chirpings during blip NB4 and NB5 were observed with ECRH + ICRF wave launching by FAIT antenna
- Abrupt intensity burst during NB5 blips were observed with ECRH + ICRF wave launching by FAIT antenna

(Rax, Bt)=(3.55 m, 2.89 T)

9.5-L discone

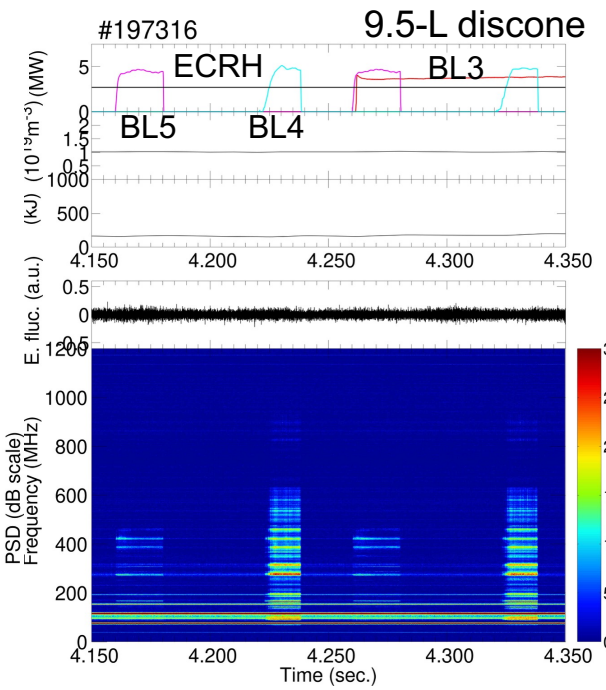


10-O dipole

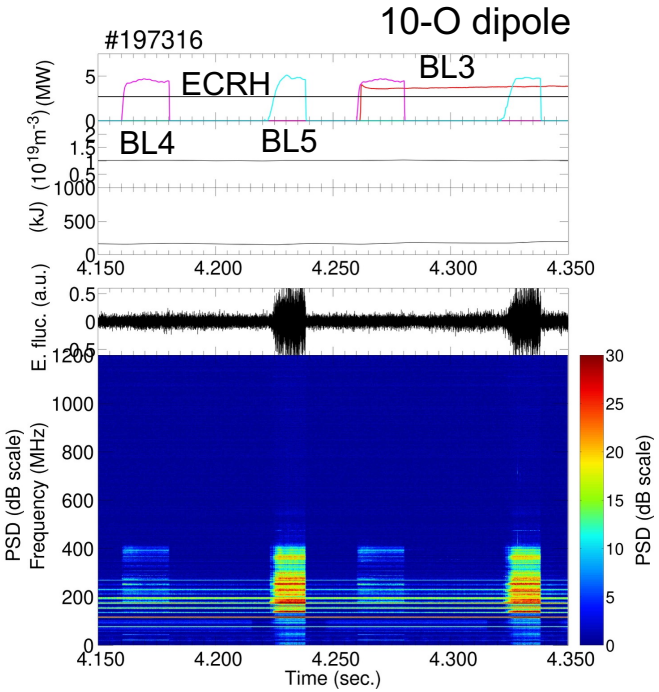


(Rax, Bt)=(3.75 m, 2.64 T)

9.5-L discone



10-O dipole



Neutral particle compression/pumping and detachment on high beta plasmas

G. Motojima, S. Masuzaki

Experimental conditions:

(R_{ax}, Polarity, B_t, γ, B_q) = (3.55 m, CCW, 1.50 T, 1.2538, 100.0%)
#197321 - #197336
(R_{ax}, Polarity, B_t, γ, B_q) = (3.55 m, CCW, 1.375T, 1.2538, 100.0%)
#197337 - #197354
(R_{ax}, Polarity, B_t, γ, B_q) = (3.55 m, CCW, 1.0T, 1.2538, 100.0%)
#197355 - #197372

Motivation and method:

- To investigate whether ultra-high neutral pressure can be achieved in high-β plasmas, and whether such pressure can also be obtained in impurity-seeded plasmas,
- A plasma with an electron density of 0.6-1.0e20 m^{-3} was obtained by gas puffing.

Results:

- At a magnetic field strength of 1.0–1.5 T, a relatively higher ion current was obtained by the neutral pressure gauge.
- Although the sensitivity function has not yet been taken into account, a calibration was performed before the plasma experimental campaign, and the absolute pressure will be quantified.
- Neon was puffed into high-density plasmas, and in some shots, moderate detachment appears to have been observed.