(IA) Instability and Anisotropy group report

Apr. 17, 2024 (R. Seki)

Date: Apr. 16, 2024
Time: 10:30 - 12:15, 13:30-16:45
Shot#: 189571 –189601, 189622-189668 (78 shots)

Prior wall conditioning: He(Sat. and Sun.)
Divertor pump: off
Gas puff: He, H2, Pellet: no
NBI#(1, 2, 3, 4, 5)=gas(H, H, H, H, H)=P(4.6,3.9,4.3,4.9,5.4)MW
ECH(56GHz)=ant(1.5-U)=P(-.-)MW
ECH(77GHz)=ant(5.5-U, 2-OUR)=P(0.109, 0.112)MW
ECH(154GHz)=ant(2-OLL, 2-OUL, 2O-LR)=P(0.145, 0.143, 0.11)MW
ICH(3.5U, 3.5L, 4.5U, 4.5L) = P(0.65, 0.5, 0.67, 0.58)MW

Topics

1. Investigation of instability driven by ICRF fast ion. (R. Seki and J. Wang)
2. Understanding the dependence of fast ion distribution on various magnetic field configurations using the newly installed Imaging Neutral Particle Analyzer (INPA) (S. Sangaroon, K. Ogawa)

Investigation of instability driven by ICRF fast ion.(R. Seki and J. Wang.)

Shot #:189571 –189601, 189642-189668

Experimental conditions: (R_{ax}, Polarity, B_t, γ, B_q) = (3.6, CW, 2.5, 1.2538, 100), (3.6, CW, 2.75, 1.2538, 100) (3.6, CW, 1.25, 1.2538, 100)

Background and motivation:

- The ICRF fast ion kick model was introduced to the MEGA for analyses of the instability induced due to the ICRF fast ion. In the MEGA simulation, the fast-ion induced instabilities are destabilized in the case of ∼ 2.5 T, where the ICRF resonance layers are set near the magnetic axis.

Results:

- Since it was not possible to start up the plasma only with three ECHs, we observed the fast-ion distribution and magnetic fluctuation in the case of 2.75 T and 1.25 T.
- The instabilities which may be driven by ICRF fast ions could be observed.
- We will validate the MEGA simulation by comparing magnetic fluctuation and fast-ion tail with DNPA.

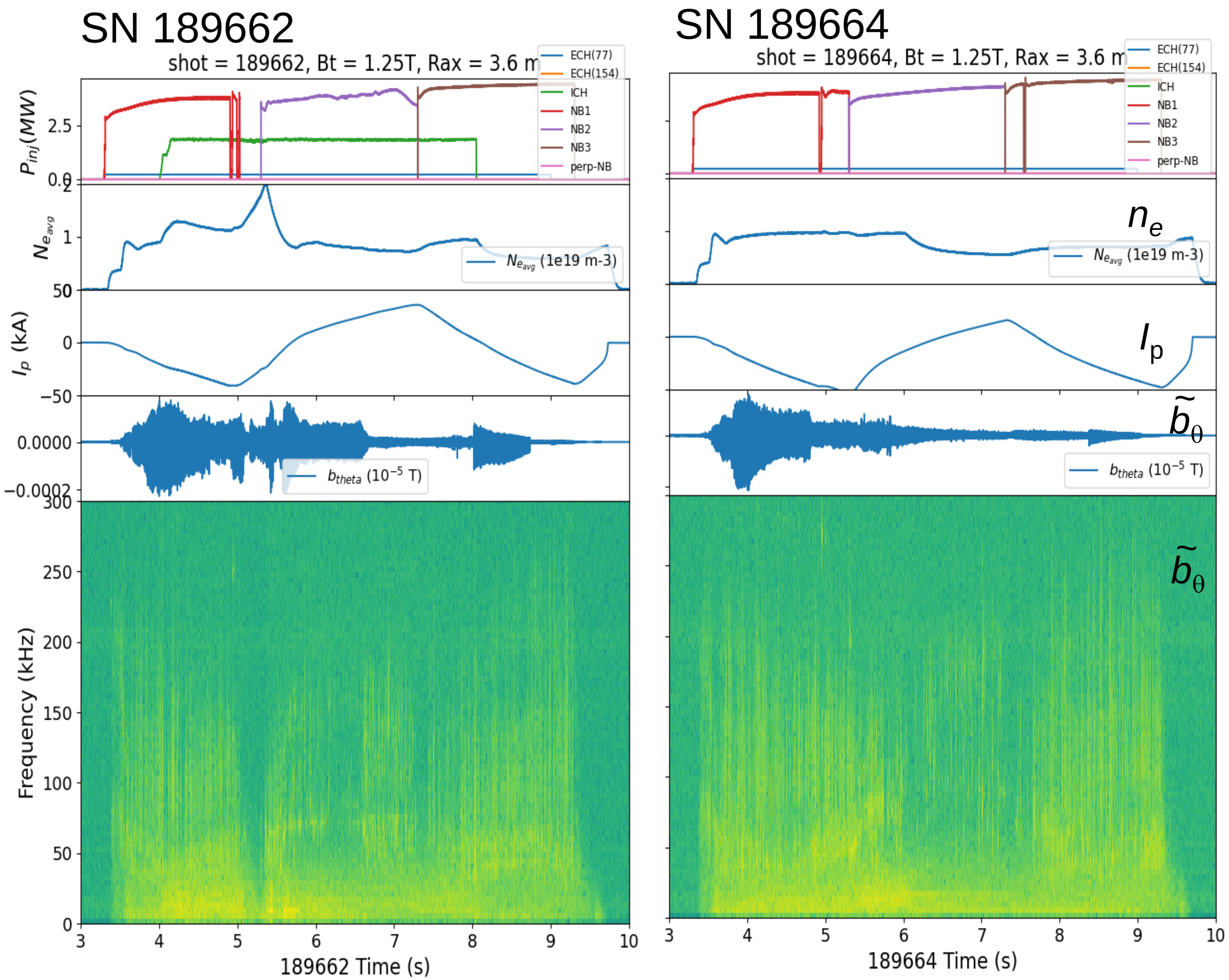


Fig.1 Time evolution of ICRF and ECH power, density, signal of magnetic probe.

Understanding the dependence of fast ion distribution on various magnetic field configurations using the newly installed Imaging Neutral Particle Analyzer (INPA)

S. Sangaroon (MSU), K. Ogawa (NIFS), M. Isobe (NIFS), W. Paenthong (SOKENDAI), X.D. Du (GA),
A. Wisitsorasak (KMUTT), N. Poolyarat (TINT), B. Chatthong (PSU), T. Onjun (TINT)

Experimental conditions: (Rax, Polarity, Bt, γ, Bq) =
(3.9 m, CW, 2.538 T, 1.2538, 100.0%) Shots: #189628 - #189640
*On 29 March 2024, we have: 3.6 m, CW, 2.75 T for density scan.

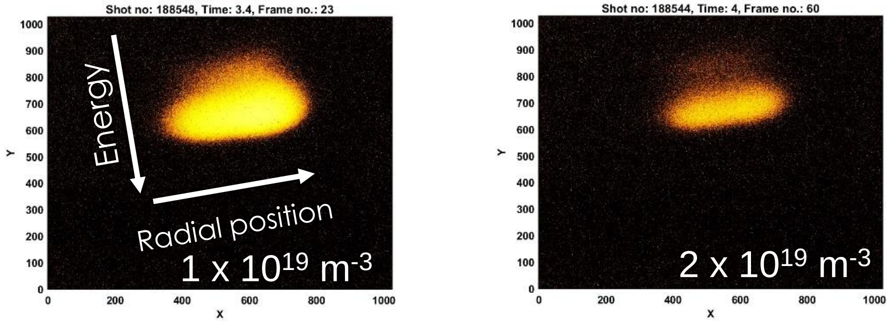
Motivation & Objectives

- We newly installed INPA as part of a collaboration between Japan, Thailand, and the US to gain a deeper understanding of energetic particle behavior in the helical device.
- This proposal aims to analyze the fast ion distribution within LHD plasma encompassing a variety of magnetic field configurations utilizing the INPA, including: variations in magnetic field strengths (B_t), variations in the magnetic axis (R_{ax}), variations in the plasma density (n_e)

Results

- With this configuration, we successfully observed a scintillation spot correlated with perpendicular neutral beam (P-NB) injection with the density scan between 0.5 - 4 x 10^{19} m^{-3}.
- We will investigate the effect with magnetic axis (R_{ax}) of 3.6 m, 3.75 m in CCW.

3.6 m, CW, 2.75 T



3.9 m, CW, 2.538 T