Date: Feb. 1, 2022
Time: 11:55-14:00, 15:45-18:45
Shot#: 177775 - 177808, 177842 – 177901 (94 shots)

Prior wall conditioning: Hydrogen glow discharge
Divertor pump: ON (w/o 2I)
Gas puff: H, Ne, Ar
Pellet: -

NBI#: (1, 2, 3, 4, 5)=gas(H, H, H, D, D)=P(4.6, 1.8, 3.9, 3.1, 2.8)MW
ECH(77GHz)=ant(5.5-Uout (and 1.5U), 2-OUR)=P(703, 792)kW
ECH(154GHz)=ant(2-OLL, 2-OUL, 2-OLR)=P(979, 930, 986)kW
ECH(56GHz)=ant(1.5U)=P(-)kW
ICH(3.5U, 3.5L, 4.5U, 4.5L)=P(-)MW

Neutron yield integrated over the experiment = 7.75x10^{11}

Topics
1. Effect of the anisotropy of the electron velocity on the excitation of low whistler frequency waves via the nonlinear wave-wave coupling from the lower hybrid wave originated by high energy beam ions (H.Igami)
2. Study of W erosion, transport, deposition and screening in LHD by emission spectroscopy on neutral and low ionising W transitions (S.Brezinsek, M.Goto)
Effect of the anisotropy of the electron velocity on the excitation of low whistler frequency waves via the nonlinear wave-wave coupling from the lower hybrid wave originated by high energy beam ions

Shot #: 177775 - 177808

Experimental conditions:
\((R_{ax}, \text{Polarity, } B_t, \gamma, B_q) = (3.6 \text{ m, } \text{CW, } 2.75 \text{ T, } 1.2538, 100.0\%))\)

Purpose:
- To investigate whether the \(T_e\) anisotropy affects the excitation of the GHz range waves including whistler waves

Experimental result:
- During the plasma production phase by ECH and NBI, frequency peaks were observed up to the GHz range (more than 70 times of central IC frequency)
- The wave emissions are bursty not continuous

H. Igami
Effect of the anisotropy of the electron velocity on the excitation of low whistler frequency waves via the nonlinear wave-wave coupling from the lower hybrid wave originated by high energy beam ions

- Periodic intense frequency peaks are observed with ~180MHz gap
- Periodic staircase spectra are observed at 9.5-L
- Possible propagation modes should be identified with solving the dispersion equation
- Dependence of ECH power, $T_e$ anisotropy, $T_e$ in the emission region on the frequency spectra will be examined
Effect of the anisotropy of the electron velocity on the excitation of low whistler frequency waves via the nonlinear wave-wave coupling from the lower hybrid wave originated by high energy beam ions

- Anisotropic EVDF could induce polarization in the atomic line radiation
- Polarization-resolved measurement is attempted for Hα line with a Glan-Thompson prism
- π and σ components of Zeeman split line profile are clearly separated
- Polarization is detected in the initial phase of discharges and $P > 0$ suggests $T_\perp > T_\parallel$
- Quantitative analysis will be made with a population-alignment collisional-radiative model

$P = \frac{I_\pi - I_\sigma}{I_\pi + I_\sigma}$
Study of W erosion, transport, deposition and screening in LHD by emission spectroscopy on neutral and low ionising W transitions  S. Ertmer, S. Brezinsek (FZJ), M. Goto, M. Kobayashi, T. Oishi et al.

Background & motivation:  
As W is a candidate for divertor armor tile for a future reactor, it is important to understand the sputtering (erosion) of W and subsequent transport in plasmas. The experiment was aimed at obtaining the W emission spectra in various charge states to study the processes of sputtering and transport in LHD plasmas.

Results: $R_{ax}=3.60\text{m}, 2.75\text{T}, \gamma=1.254$, Bq=100%

- The heating scheme (ECH, NBI) and density were scanned to change plasma parameters, and spectroscopy data were obtained. Especially, WI spectra in various wavelength range were systematically acquired by the divertor spectroscopy that views the W divertor tiles.

- Ar and Ne were seeded to enhance W sputtering. It is found that Ar is most effective to enhance WI emission. (Without impurity seeding, almost no WI spectra observed.)

- WI becomes stronger with lower density with same heating power, especially in e-ITB plasmas with dominant ECH, as shown in the figure. The results indicate that acceleration of impurity ions in the sheath potential drop ($\sim 3\times Te$) is important.

- Detailed analysis will be conducted for various W spectra.