(TG3) Spectroscopy group report

Dec. 13, 2022 (T. Kawate)

Date: Dec. 9, 2022
Time: 9:50 – 13:10
Shot#: 185579 – 185646 (68 shots)
Prior wall conditioning: No
Divertor pump: Yes
Gas puff: H_2, He
Pellet: No

NBI#(1, 2, 3, 4, 5)=gas(H, H, H, H, H)=P(3.4, 3.9, 3.2, 5.5, 4.1)MW
ECH(77GHz)=ant(5.5-U, 2-OUR)=P(0.703, -)MW
ECH(154GHz)=ant(2-OLL, 2-OUL, 2-OLR)=P(0.723, 0.799, 0.986)MW
ICH(3.5U, 3.5L, 4.5U, 4.5L)=P(0.52, 0.52, 0.68, 0.69)MW
Neutron yield integrated over the experiment = 2.6×10^{13}

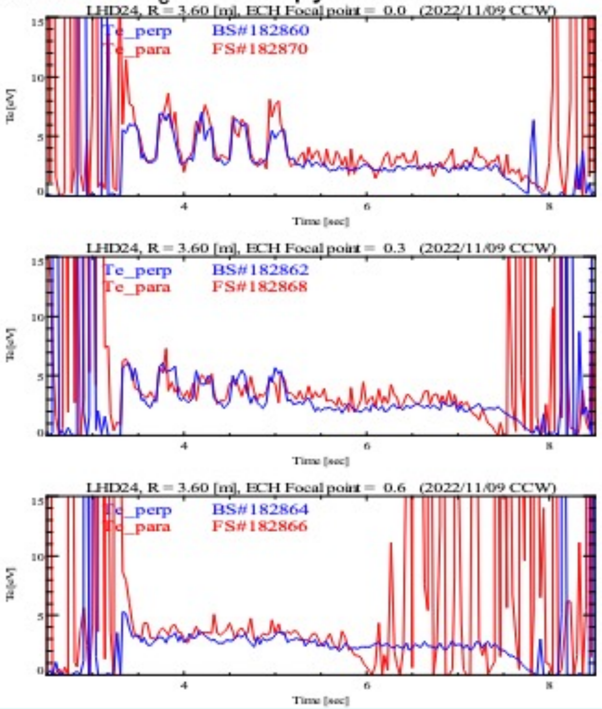
Topics
1. Experimental study of the electron temperature anisotropy by using the LHD Thomson scattering system (I. Yamada)
2. Quasioptical wave absorptions with anisotropic and fully relativistic electron dynamics in high Te and low ne plasma (K. Yanagihara, R. Yanai)

Non-Maxwellian distributions of electrons and Electron temperature anisotropy By Thomson scattering diagnostics

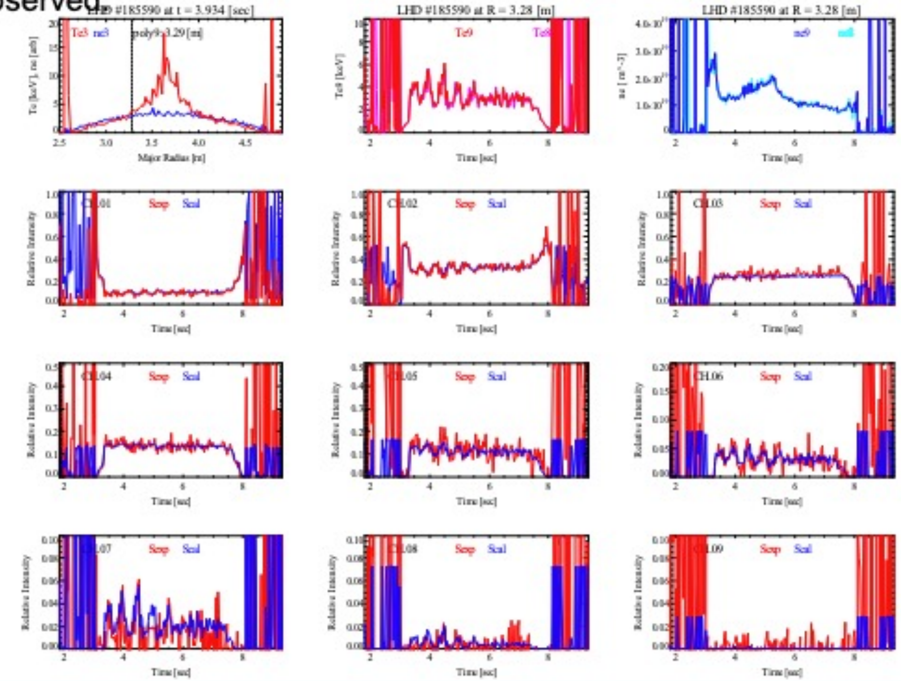
2022/12/13 Ichihiro YAMADA and Hisamichi FUNABA

- Date: December 9, 2022 / Shot number: #185579 - #185603 (25 shots)
- (R_{ax}, Polarity, B_t, γ, B_q) = (3.60 m, CW, 2.75 T, 1.254, 100.0%)
- T_{e0}~10 keV, n_e~1.5 x 10^{19} m^{-3}
- ECH 2.5 Hz modulation / Focal Point = 0.0, 0.1, 0.3, and 0.6
- We tried the forward scattering measurement to obtain T_e^{para} by Thomson scattering diagnostics.

<u>T_e anisotropy</u>:
An example of comparison of T_e^{para} and T_e^{perp} measured on Nov. 9[th] and Dec. 9[th]. No clear evidence of T_e anisotropy was observed.

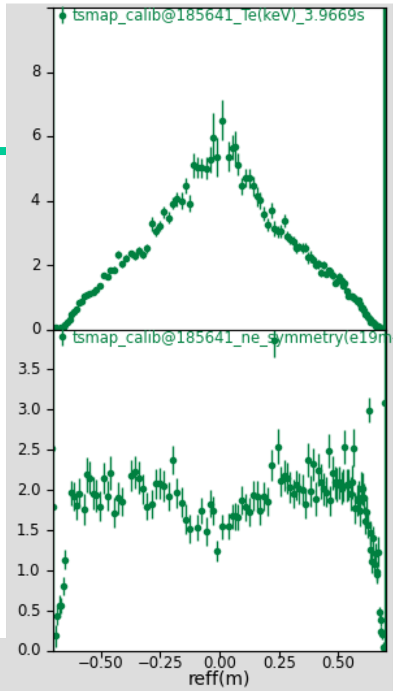


<u>Non-Maxwellian distribution</u>:
Lower 9 figures show comparisons of relative signal intensity ratios by theoretical estimation and experimental result for the wavelength CHs #1 - #9. No clear evidence of non-Maxwellian distribution was observed.



No clear evidence for T_e anisotropy and non-Maxwellian distribution was observed. However, we think good evidence that the calibrations performed in 2018-2020 are highly accurate is obtained in this campaign. We will continue with more detailed analysis.

Quasioptical wave absorptions with anisotropic and fully relativistic electron dynamics in high Te and low ne plasma (K. Yanagihara (QST), R. Yanai, and T. Tsujimura (Chubu Univ.))



Shot #: 185604 – 185643

Experimental conditions: (R_{ax}, Polarity, B_t, γ, B_q) = (3.6 m, CCW, 2.75 T, 1.2538, 100 %)

Motivation and objective:

Fully relativistic absorption model is installed to quasioptical ray tracing code PARADE.
To validate it, EC power deposition position in high T_e plasma is experimentally studied.

Method:

Applying modulation (11 Hz) ECH (MECH),
time variation of T_e profile (=$T_e(\rho,t)$) is measured.
$dT_e(\rho,t)$ profile, modulating with same frequency to MECH,
tells the EC power deposition position.
To get high T_e, n_e is scanned from 2.0×10^{19} to 0.2×10^{19} [m^{-3}]
and input ECH is from 1 to 3 lines.
Experimental positions are compared with PARADE simulations.

Results:

In high n_e (~2×10^{19}) case (#185641),
standard Thomson works well.
Conditional averaging is planed to obtain
$dT_e(\rho,t)$ profile with sufficient accuracy.

In low n_e (~0.2×10^{19}) case (#185633),
standard Thomson has large error-bar.
High-speed Thomson was also used in both on/off timing
of MECH for same condition plasmas, shot by shot.
It will provide sufficiently accurate $T_e(\rho,t=t_T)$ and $dT_e(\rho,t=t_T)$.