(TG4) Plasma instability group report

Feb. 9, 2022 (N. Kenmochi)

Date: Feb. 8, 2022
Time: 11:15 - 14:10
Shot#: 178420 – 178475 (56 shots)

Prior wall conditioning: No
Divertor pump: On except for 2-I
Gas puff: H2, Ne, Ar, Pellet: No
NBI#(1, 2, 3, 4, 5)=gas(H, H, H, H, H)=P(2.1, 1.1, 0.9, 0, 0)MW
ECH(77GHz)=ant(5.5-Uout (or 1.5U), 2-OUR)=P(0.45, 0.56)MW
ECH(154GHz)=ant(2-OLL, 2-OUL, 2-OLR)=P(0, 0, 0)MW
ECH(56GHz)=ant(1.5U)=P(0)MW
ICH(3.5U, 3.5L, 4.5U, 4.5L)=P(0, 0, 0, 0)MW
Neutron yield integrated over experiment = 2.9×10^{10}

Topics

1. Demonstration of enhanced energy channeling from energetic ions to bulk ions via energetic-ion-driven geodesic acoustic modes in reversed magnetic shear plasmas of LHD(K. Toi)

Demonstration of enhanced energy channeling from energetic ions to bulk ions via energetic-ion-driven geodesic acoustic modes in reversed magnetic shear plasmas of LHD   K. Toi

Background and objective

-In the past shots with high plasma current (~100-110kA), the central ion temperature T_{io}-increase triggered without suppression of microturbulence was observed, accompanying intense energetic ion driven geodesic acoustic mode (EGAM) activities. This phenomenon is interpreted to be energy channeling from energetic ions to bulk ones via EGAM. The T_{io}-increase was suddenly terminated by a large EGAM burst. Main objective is to control the sudden termination by using co-NBCD and co/ctr-ECCD.

Experimental condition

- #178420 ~ #178475 (56 shots)
- (R_{ax}, B_t, γ, B_q) = (3.75 m, 1.375 T, 1.254, 100%), (3.75 m, 1.3 T, 1.254, 100%)

Results

-Reversed shear plasmas having reversed Alfven eigenmodes (RSAEs) and EGAM are reproduced in appreciably high plasma current I_p~125 kA shots. Right figure shows time evolutions of T_{io} , T_{eo}, I_p, <n_e> and toroidal mode number n determined by magnetic probes. Time evolution of T_{io} is not smooth, while it behaves smoothly in about 50% higher <n_e> shots. Correlation study between T_{io} evolution and activities of EGAM and RSAEs is needed.

- Control of ι(ρ)-profile established by counter NBCD has been attempted by using co-NBI(i.e., #1) and on-axis ECCD. However, it is not easy, because co-NBCD and on-axis ECCD link with neon transport as well as appreciably large difference in these current drive efficiencies.

-The time response of neon puff is not good, which may be small conductance to the vacuum vessel. The n_e-rise by neon is too slow, so that plasma current driven by #1 & #3 NBIs also rises slowly. This leads to slow saturation of I_p.