(TG4) Plasma instability group report

Jan. 13, 2023 (N. Kenmochi)

Date: Dec.27, 2022
Time: 11:55 -14:45
Shot#: 187282- 187295 (14 shots)

Prior wall conditioning: No

Divertor pump: On
Gas puff: H2, Ar Pellet: No
NBI#(1, 2, 3, 4, 5)=gas(H, H, H, H, H)=P(0, 0, 0, 0.3, 0)MW
ECH(77GHz)=ant(5.5-Uout (or 1.5U), 2-OUR)=P(0.2, 0)MW
ECH(154GHz)=ant(2-OLL, 2-OUL, 2-OLR)=P(0.2, 0.2, 0.2)MW
ECH(56GHz)=ant(1.5U)=P(0.0)MW
ICH(3.5U, 3.5L, 4.5U, 4.5L)=P(0, 0, 0, 0)MW
Neutron yield integrated over experiment = 1.7×10^{13}

Topic

1. Precise investigation on termination phase of plasmas with Serpens-mode-like event (Y. Yoshimura)

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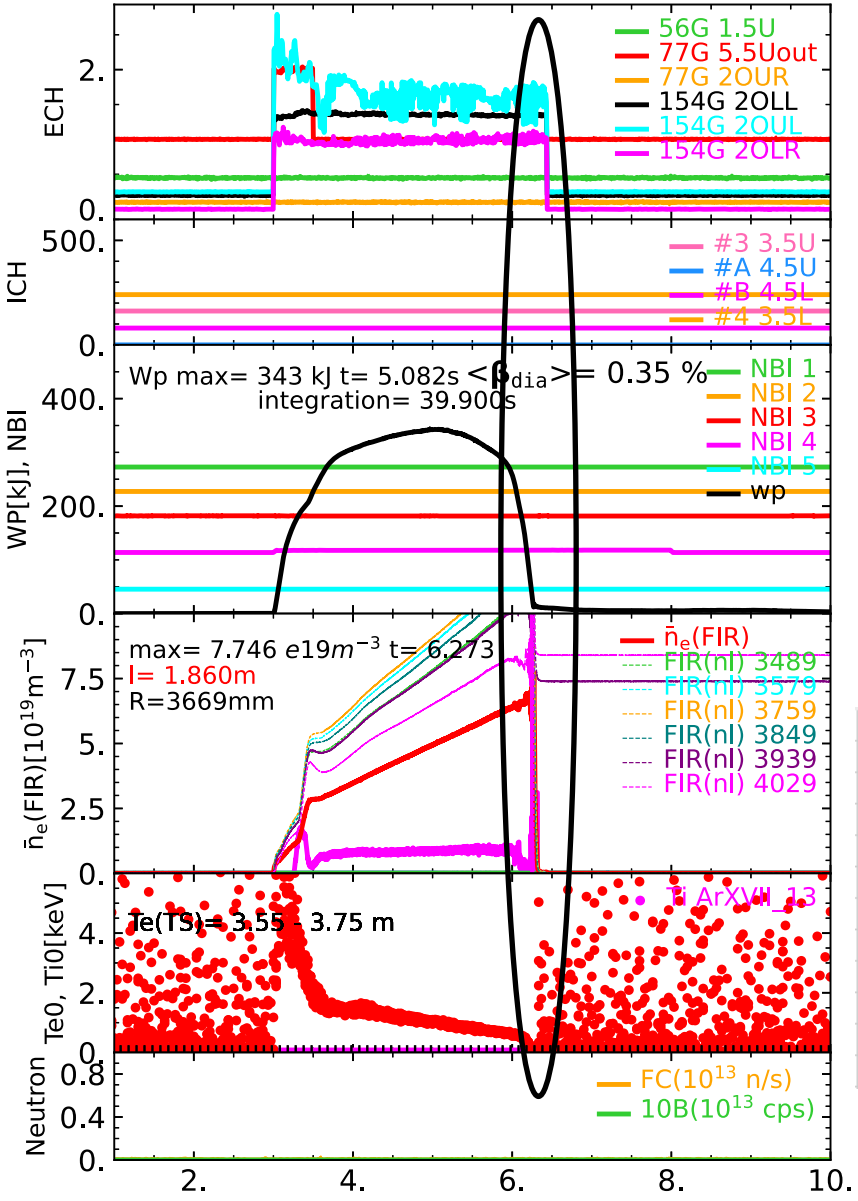
Experimental conditions: #187282 - #187295
(Polarity, R_{ax}, B_t, γ, B_q) = (CW, 3.6 m, 2.75 T, 1.2538, 100%)
ECH Power:
77GHz#1 (5.5-Uo) = 0.209MW (start-up only)
154GHz#4 (2-OLL) = 0.205MW
154GHz#5 (2-OUL) = 0.203MW
154GHz#7 (2-OLR) = 0.237MW
NBI power: NBI#4 = 0.42MW

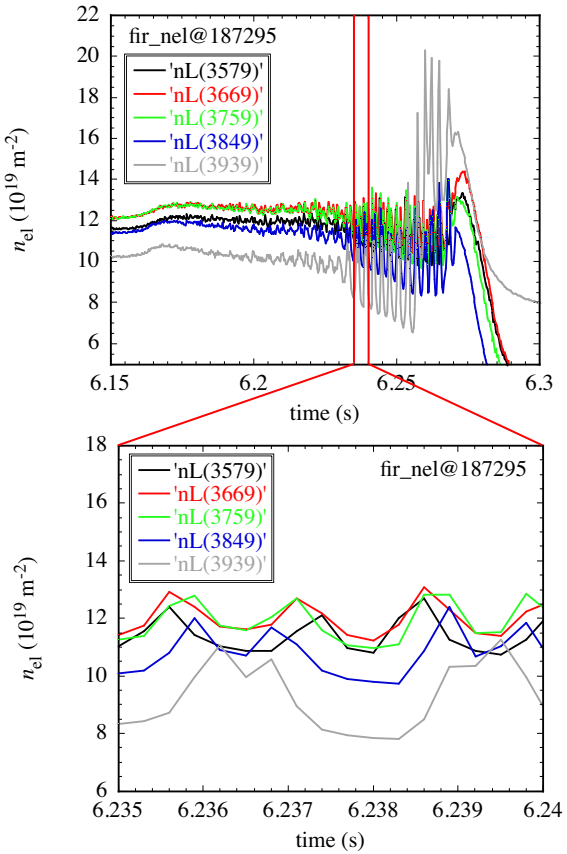
Background and motivation:
In long pulse discharge #179225 in 23rd exp. campaign, in the termination phase at ~ 25s, specific poloidal rotation of density-fluctuating region was observed.
By reproducing the discharge with short pulse length, physical process and cause of the event and termination are investigated with higher time resolution data set.

Results:
The termination phase of the reference long pulse discharge with the poloidal rotation of density-fluctuating region was successfully reproduced by 5s discharges with heating powers from three 154GHz ECHs and NBI#4.
FIR interferometer data set shows the rotating nature of temporally peaked high density region.
Unfortunately, fast Thomson scattering and CO2 laser interferometer were not available due to hardware troubles.

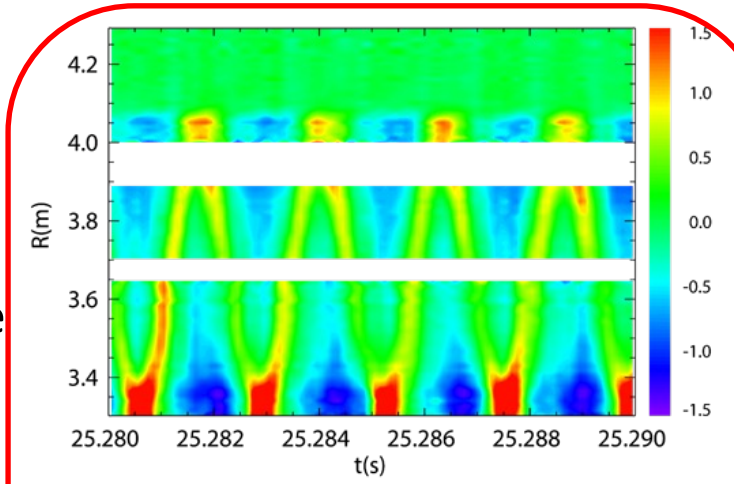
187295

B=2.750T R_{ax}:





Fluctuations in nel_FIR data at the termination timing in the discharge #187295 and its expansion



Contour plot of nel_CO2 fluctuation amplitude in the ref. discharge #179225
T. Kinoshita *et. al*, PFR **17** 1402107 (2022), Fig. 18 (c)

'nL(3309)'	2.7764	2.6737	2.2806	2.0528	2.0126	1.9813	1.8785	1.7669	1.7758	2.3654	0.93156	0.50720	1.2040	1.0075	0.86455	0.82882	0.83329
'nL(3399)'	8.5079	8.7915	7.6388	6.9252	6.7240	6.4038	6.2940	6.4495	7.0716	9.0476	16.156	15.415	13.979	13.064	12.862	12.689	12.606
'nL(3489)'	10.044	10.870	10.580	9.8446	9.5905	9.3908	9.2456	9.6631	10.770	10.108	9.8265	10.870	10.680	9.6631	9.2910	9.1276	9.3092
'nL(3579)'	11.037	11.543	12.402	11.435	11.037	10.865	10.865	11.552	12.103	10.955	10.802	12.022	12.691	11.254	10.856	10.729	11.245
'nL(3669)'	11.422	11.740	12.920	12.393	11.731	11.604	11.767	12.702	12.166	11.413	11.232	11.794	13.101	12.302	11.504	11.395	12.239
'nL(3759)'	11.252	11.389	12.419	12.792	11.753	11.589	12.045	12.692	11.599	11.079	10.970	11.088	12.820	12.838	11.480	11.526	12.847
'nL(3849)'	10.091	10.181	10.814	12.025	10.904	10.706	11.673	11.112	10.172	9.8830	9.7835	9.7293	10.859	12.396	10.688	11.022	11.854
'nL(3939)'	8.3174	8.4350	8.7152	9.9717	11.066	9.9717	10.586	8.9593	8.1366	7.9287	7.8293	7.8022	8.5073	10.324	10.351	11.255	9.9536
'nL(4029)'	8.6938	10.254	9.9882	-1.4654	1.1556	9.7184	7.0425	5.5468	5.0802	4.9293	4.7371	4.7097	4.8332	6.4890	10.533	10.839	8.1037
'nL(4119)'	9.8780	9.9277	9.9368	9.9277	9.9955	10.213	10.194	10.054	9.9639	9.9323	9.9097	9.9051	10.009	10.027	10.122	10.235	10.258
time (s)	6.2350	6.2353	6.2356	6.2359	6.2362	6.2365	6.2368	6.2371	6.2374	6.2377	6.2380	6.2383	6.2386	6.2389	6.2392	6.2395	6.2398

Rotating nature of temporally peaked high density region in #187295