(IA) Instability and Anisotropy group report

Mar. 26, 2024 (R. Seki)

Date: Mar. 22, 2024
Time: 14:45 - 16:45
Shot#: 188094 –188133 (40 shots)

Prior wall conditioning: OFF
Divertor pump: off
Gas puff: H_2, Pellet: H
NBI#(1, 2, 3, 4, 5)=gas(H, H, H, H, H)=P(--,--,2.0,3.6, 5.6)MW
ECH(56GHz)=ant(1.5-U)=P(-.-)MW
ECH(77GHz)=ant(5.5-U, 2-OUR)=P(0.698, 0.38)MW
ECH(154GHz)=ant(2-OLL, 2-OUL, 2O-LR)=P(0.389, 0.806, --)MW
ICH(3.5U, 3.5L, 4.5U, 4.5L) = P(0, 0, 0, 0)MW

Topics

1. Investigation of the impact of the fast-ion losses (FI) induced by pellet injection on the density limit in LHD plasmas. (B.L.Miranda, N. Panadero)

Investigation of the impact of the fast-ion (FI) losses induced during pellet injection on the density limit (DL) in LHD plasmas

Belén López-Miranda (CIEMAT),
Naoki Tamura (NIFS), Rayosuke Seky (NIFS), Kieran J. McCarthy (CIEMAT), Nerea Panadero (CIEMAT)

belen.lopez.miranda@ciemat.es

Objectives and expected results

- **Objectives**: *Stellarator plasmas can suffer from confinement degradation and radiative collapse leading to their premature termination. Plasma performance can be aggravated by the premature loss of high-energy ions. Recently, in the TJ-II, it has been observed, using the FILD, that FI losses are significantly reduced by cryogenic PIs in NBI heating plasmas. This may indicate that PI plays an additional role in improving plasma performance, as well as modifying the radial density profile, and might a role in the DL.*
- *This experiment aims to study the impact of FI population and AE induced during the injection of cryogenic pellets on the density limit in the LHD.*

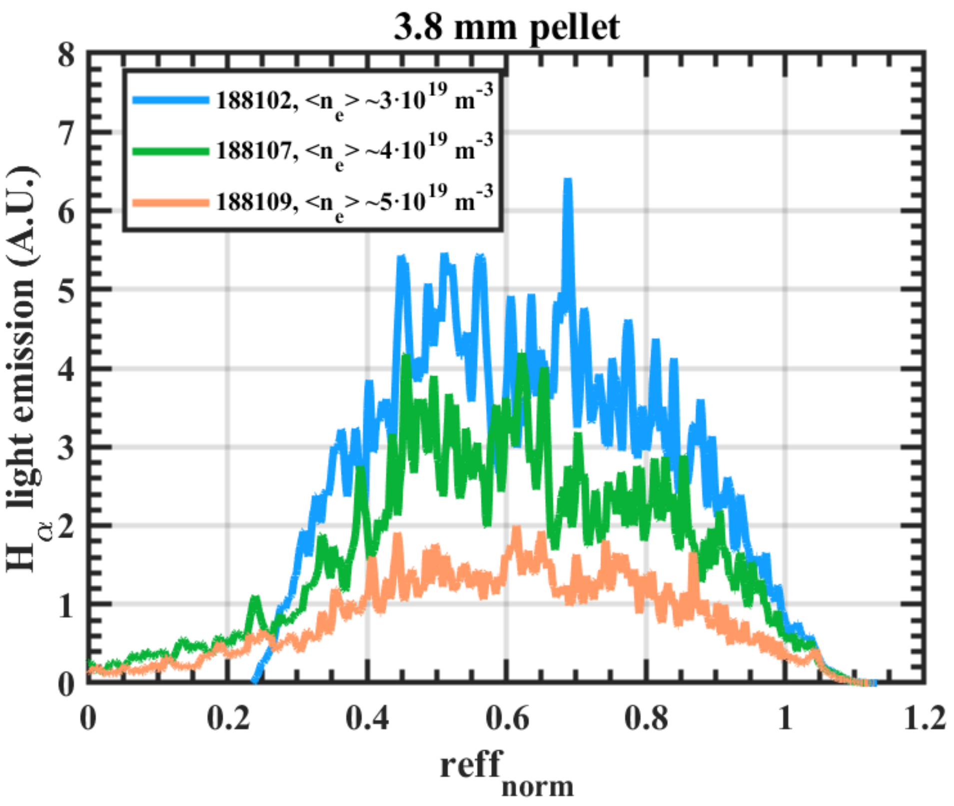
Approach & methodology

- **Session planning/shot sequence:**
  - *40 discharges*
  - *R_{ax} = 3.6 configuration*
  - *Pellet at maximum energy → Characterize the effect on FI*
  - *Shots: 188096 - 188133*

	Heating power I (1nNBI (#3) 2pNBI (#4, #5))			Heating power II (1nNBI (#3) 1pNBI (#4))		
	$3 \cdot 10^{19}$ m^{-3}	$4 \cdot 10^{19}$ m^{-3}	$5 \cdot 10^{19}$ m^{-3}	$3 \cdot 10^{19}$ m^{-3}	$4 \cdot 10^{19}$ m^{-3}	$5 \cdot 10^{19}$ m^{-3}
3.8 mm	✓	✓	✓	✓	✓	✗
3.4 mm	✓	✗	✗	✓	✓	✓
3 mm	✗	✗	✗	✓	✗	✗

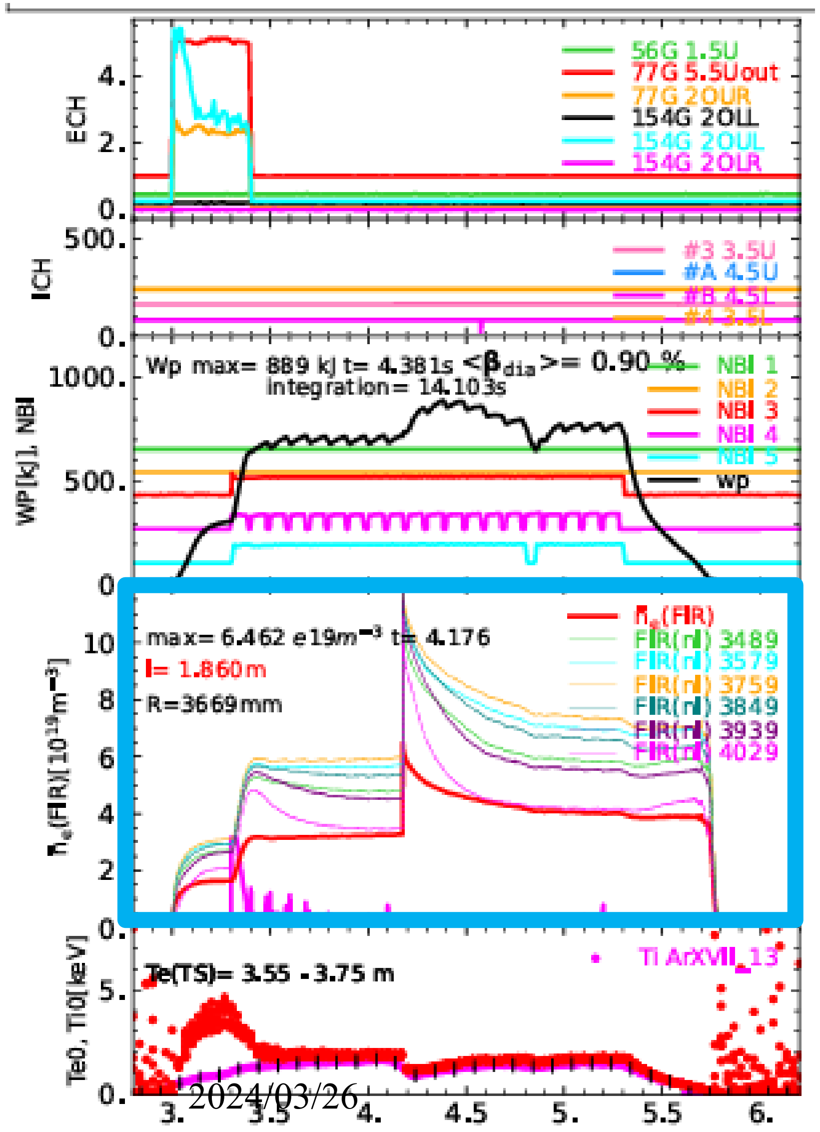
240322_LHDxp_SG3_BLM_Experiment

NBI	Pellet size	Number of discharges
Scenario I: Heating I, 3 x 10^{19}	x	188099-100: References
	3.8 mm	188101-102
	3.4 mm	188103-104
Scenario II: Heating I, 4 x 10^{19}	x	188105-106: References
	3.8 mm	188107-108
Scenario III: Heating I, 5 x 10^{19}	x	188110: Reference
	3.8 mm	188109

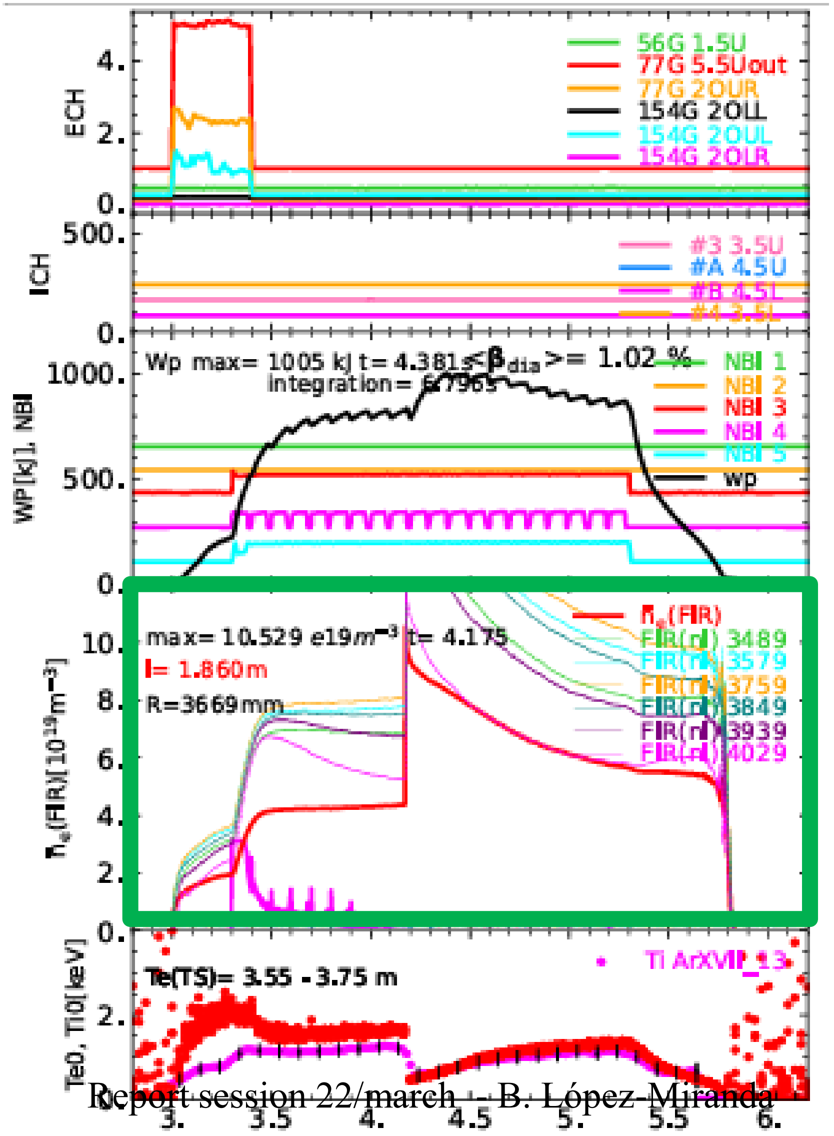


240322_LHDxp_SG3_BLM_Experiment

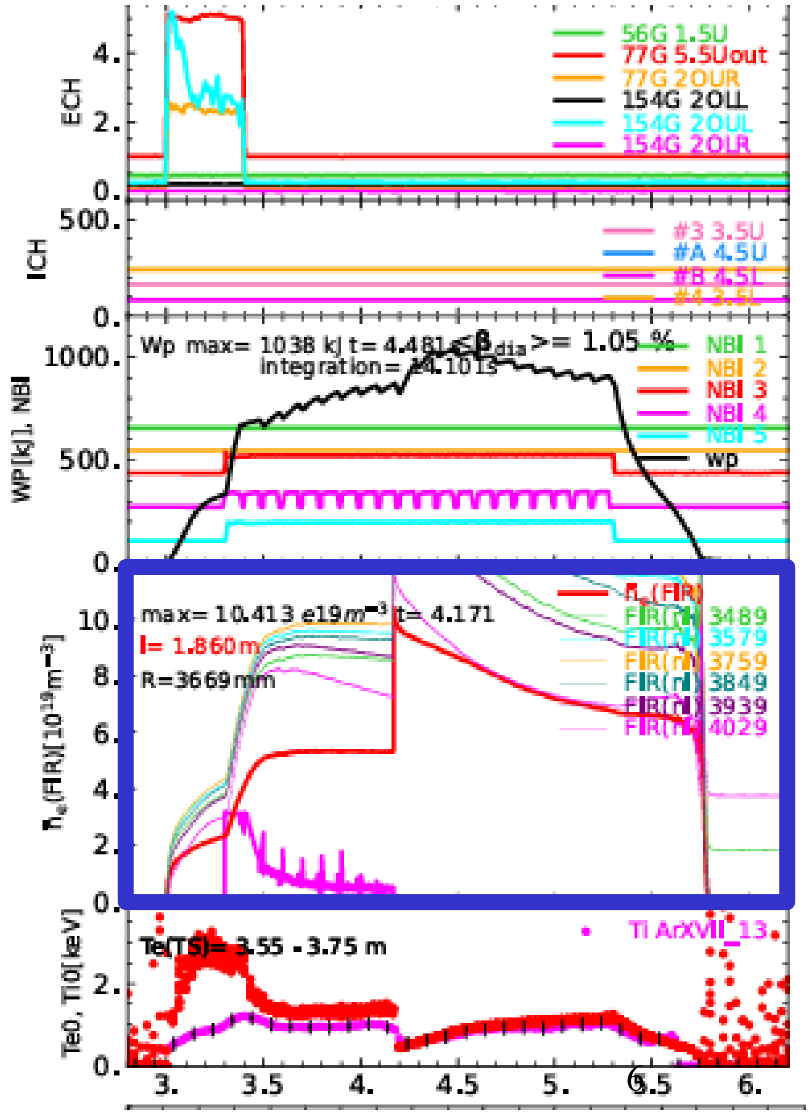
Scenario I: 3.8 mm #188101



Scenario II: 3.8 mm #188107

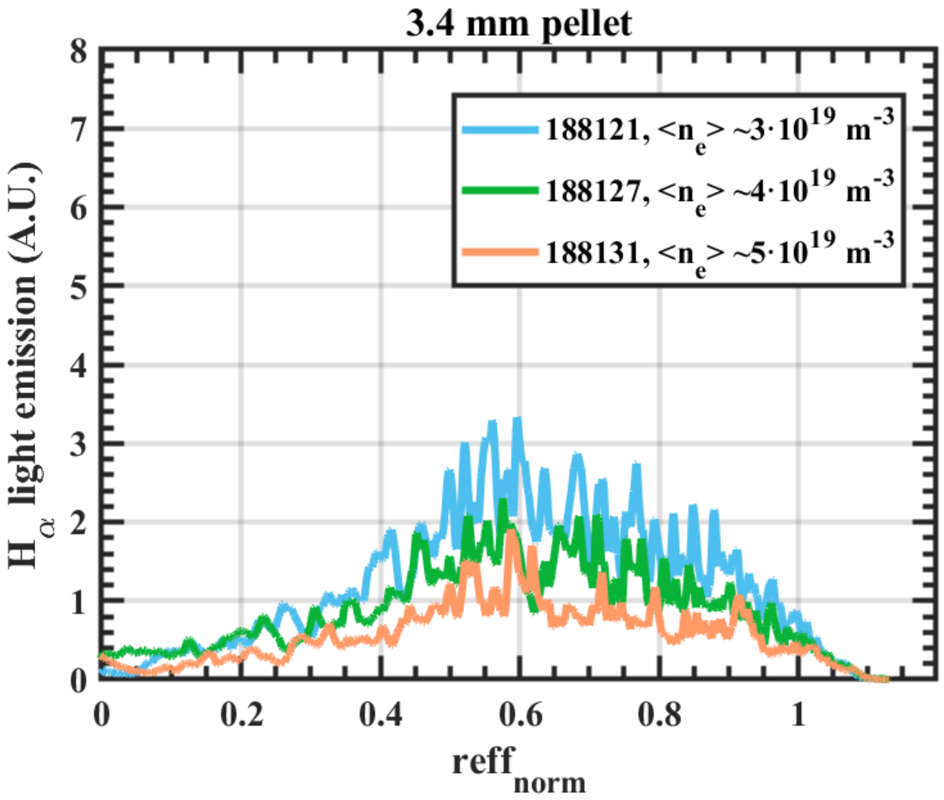


Scenario III: 3.8 mm



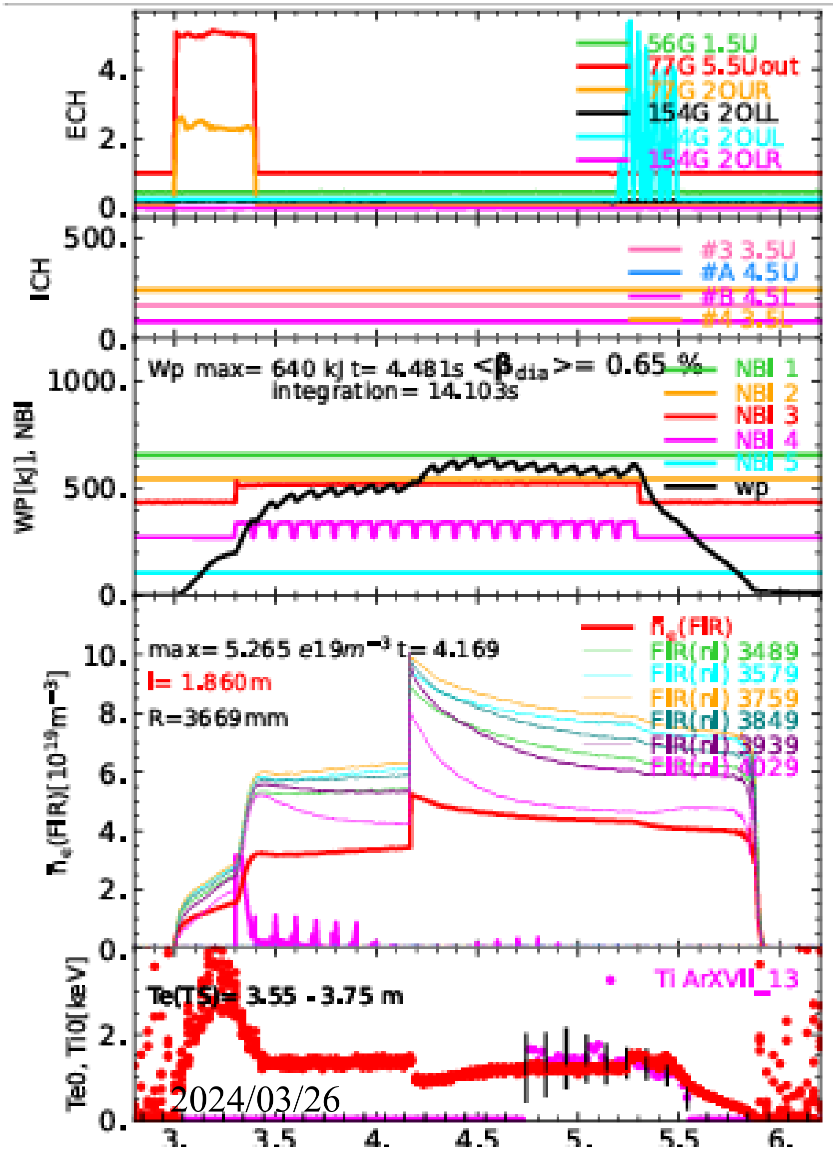
240322_LHDxp_SG3_BLM_Experiment

NBI	Pellet size	Number of discharges
Scenario I.2: Heating II, 3 x 10^{19}	x	188115: References
	3.8 mm	188116-117
	3.4 mm	188119-122
Scenario II.2: Heating II, 4 x 10^{19}	x	188123-124: References
	3.8 mm	188125-126
	3.4 mm	188127-128
Scenario III.2: Heating II, 5 x 10^{19}	x	188129-130: Reference
	3.4 mm	188131

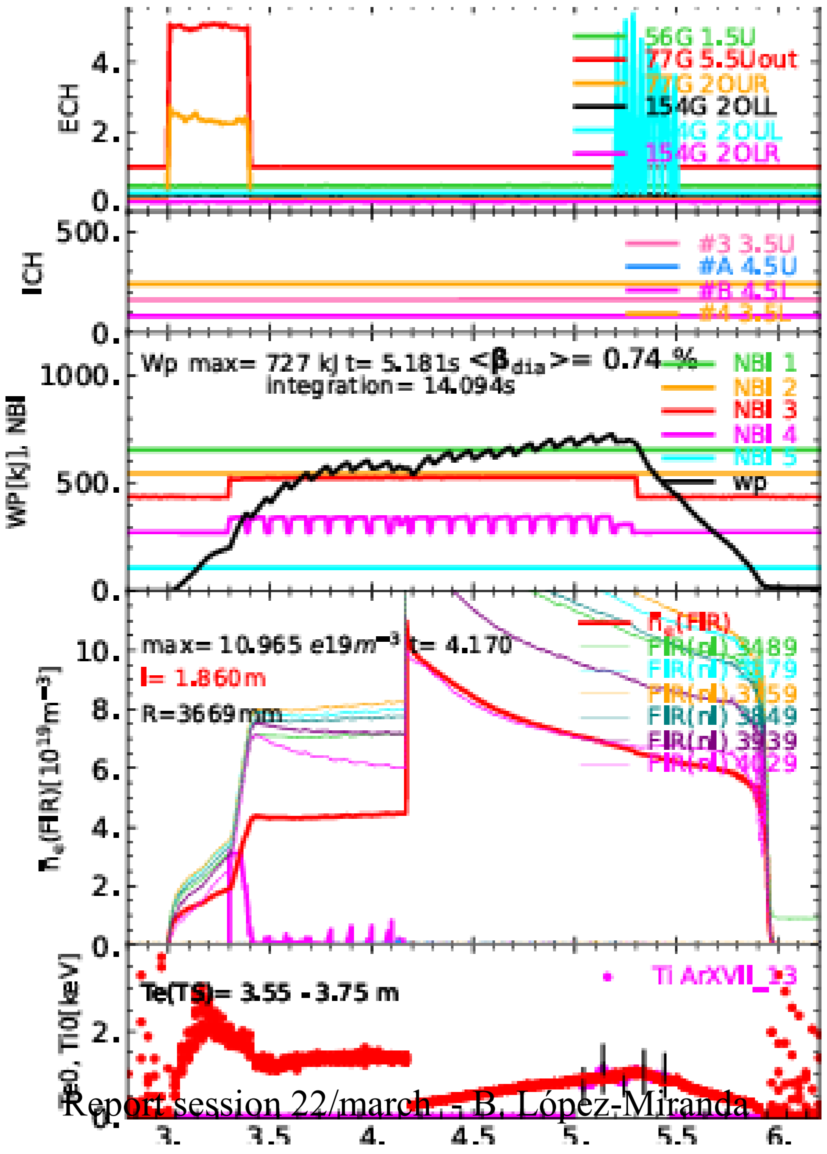


240322_LHDxp_SG3_BLM_Experiment

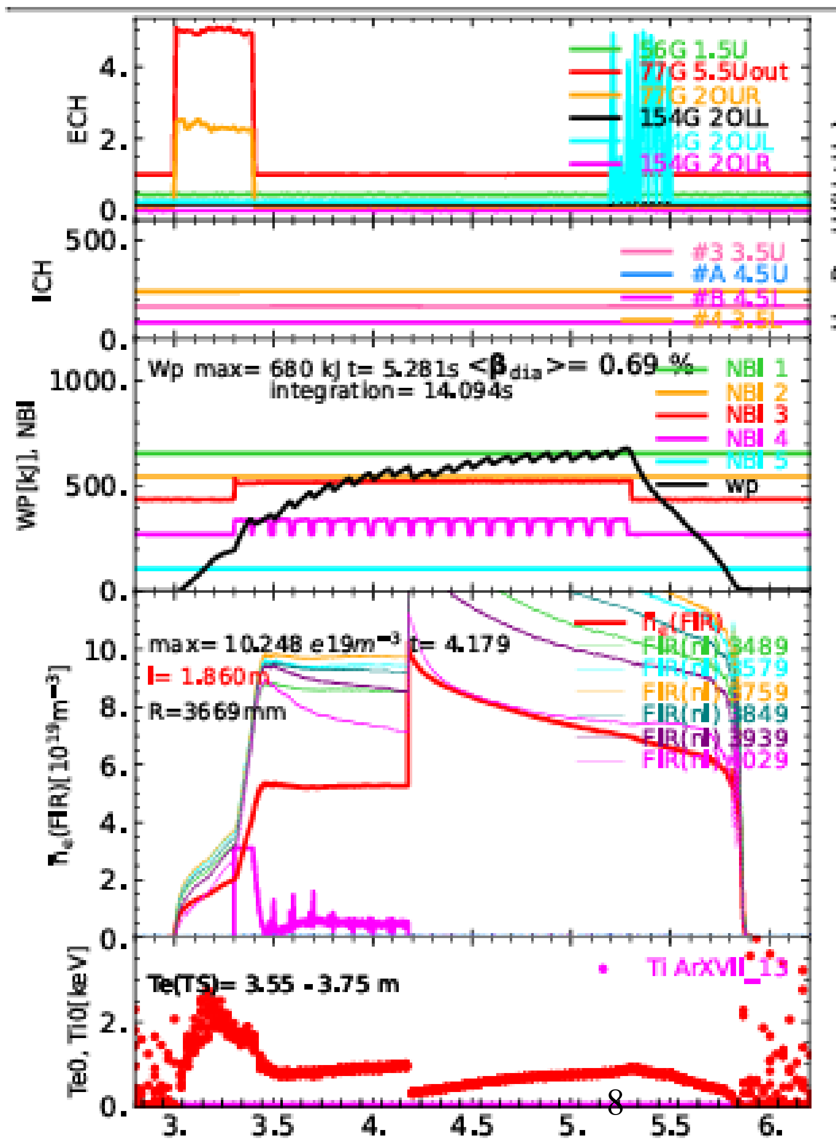
Scenario I.2: 3.4 mm #188119



Scenario II.23.4 mm #188128



Scenario III.2: 3.4 mm #188131



Thank you for your attention