(MAP) Session Report

May 17, 2024 (K. Mukai)

Date: May 16, 2024
Time: 10:30 – 16:45
Shot#: 191271 – 191399 (129 shots)
Prior wall conditioning: He
Divertor pump: Off
Gas puff: H_2, N_2, Ne, Ar
Pellet: Impurity pellet, TESPEL

NBI#(1, 2, 3, 4, 5) = gas(H, H, H, -, -)=P(4.6, 4.2, 4.2, 4.0, 5.6) MW
ECH(77GHz) = ant(1.5-Uo, 5.5-U, 2-OUR)=P(-, 0.70, 0.38) MW
ECH(154GHz) = ant(2-OLL, 2-OUL, 2-OLR)=P(0.71, 0.89, 0.98) MW
ICH(3.5U, 3.5L, 4.5U, 4.5L) = P(-, -, -, -) MW

Topics

1. Construction of atomic data and plasma modeling toward understanding the origin of heavy elements (D. Kato)
2. Measurement of anisotropy in EVDF with polarization spectroscopy for Argon ion M1 lines (M. Goto)
3. Experimental identification of spectral lines from highly charged heavy ions (C. Suzuki)
4. Study of poloidal and toroidal asymmetries during impurity seeding in LHD (B.J. Peterson)

Construction of atomic data and plasma modeling toward understanding the origin of heavy elements

D. Kato

Experimental conditions:

(R_{ax}, Polarity, B_t, γ, B_q) = (3.6 m, CCW, 2.75 T, 1.2538, 100.0%), #191274 - #191293, ECH (for start 3.2-3.5s), NBI#1-3 (3.5-5.5s), NBI#4-5(5.5-7.5s), H2 gas

Objectives

Measurements of high-resolution visible spectra of ablation cloud of **La and Ce: the first lanthanide elements identified in kilonova (GW170817/AT2017gfo).**

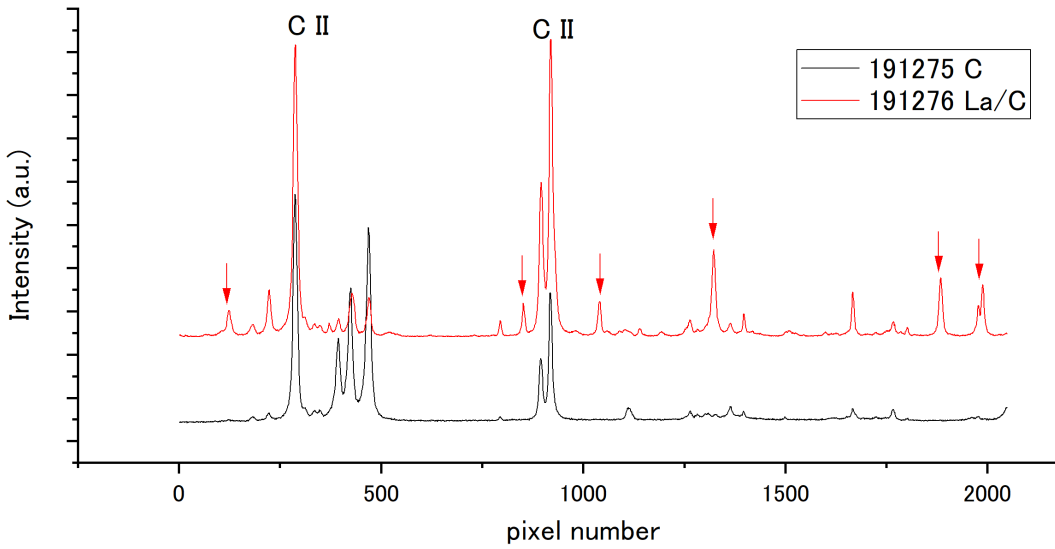
Experiments

- Carbon pellets containing each of La and Ce powders (about 200 μg in average) were injected by impurity pellet at 4.0s.
- Visible spectrometers (50cmVis2 and 1.33m), central wavelength: 394nm, grating: 1800 grooves/mm, slit width: 25um, exposure time: 5 ms.

Preliminary results

The initial ne=1e19 m-3 increased up to 3e19 m-3 by the pellet injection, and it decayed down to 2e19 m-3 in 400 ms.

Figure shows visible spectra of pellet ablation clouds for successive shots. The black spectrum of C pellet and the red spectrum of La/C pellet. The emission lines indicated by the red arrows can be assigned to La emission lines. Line identification is undergoing.



Measurement of anisotropy in EVDF with polarization spectroscopy for Argon ion M1 lines

M. Goto

Experimental conditions:

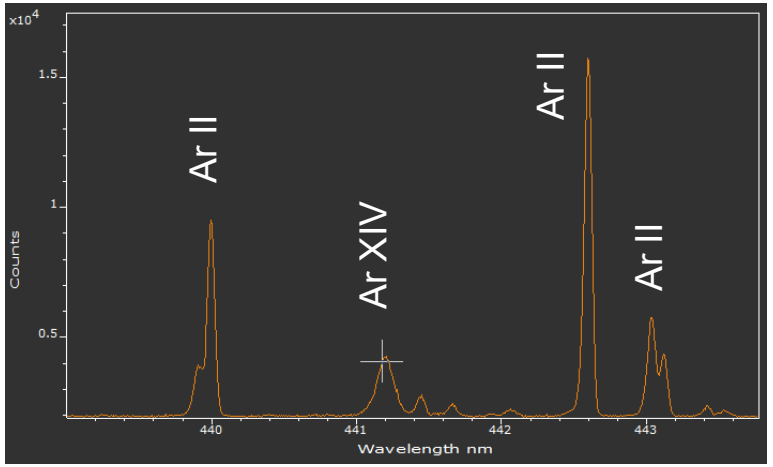
(R_{ax}, Polarity, B_t, γ, B_q) = (3.6 m, CW, 2.75 T, 1.2538, 100%) #191296 – #191330

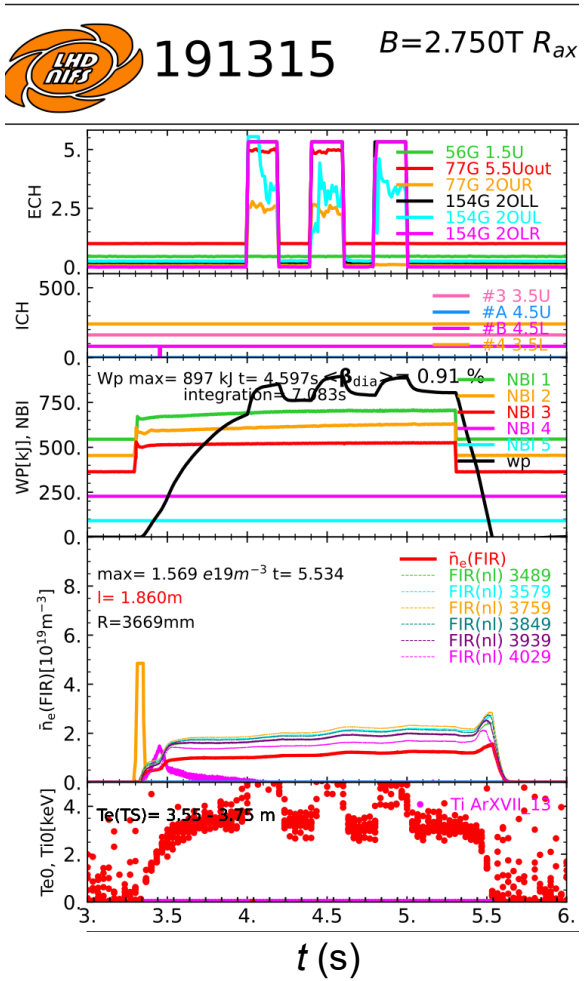
Motivation and method:

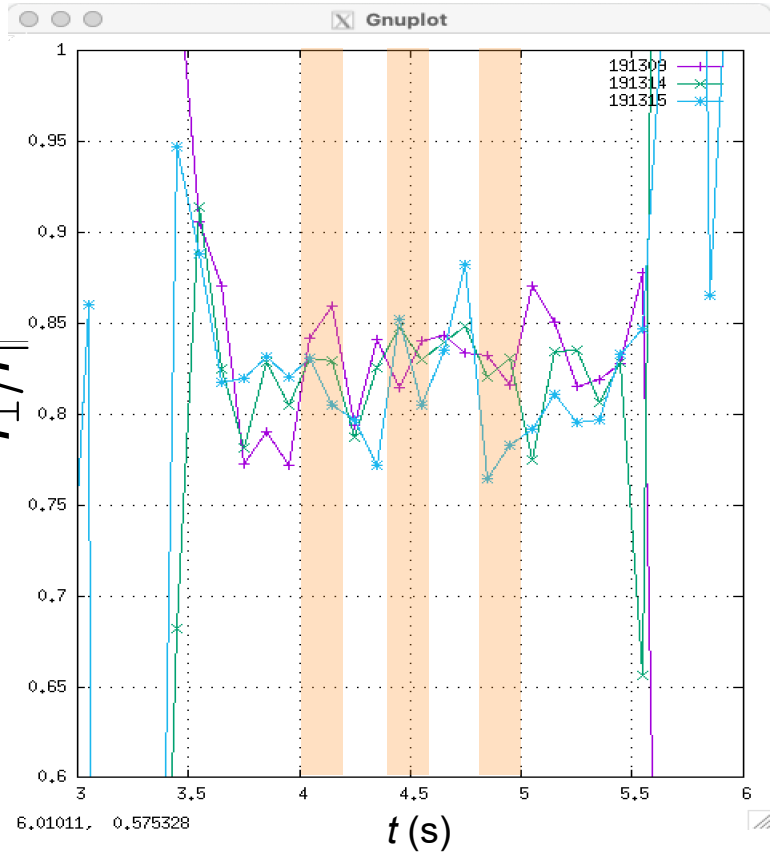
- We have so far succeeded to detect polarization in Lyman-alpha line emission, and anisotropy in EVDF has been analyzed with an atomic model.
- We attempt to measure polarization of Ar M1 lines due to ECH which are emitted in the core plasma.

Results:

- Ar XIV 441.2 nm ($2s^2 2p\ ^2P_{1/2} - ^2P_{3/2}$) was identified.
- Initial analysis shows no clear modulation in $I_\perp/I_\parallel$ synchronized with ECH injection.







Experimental identification of spectral lines from highly charged heavy ions

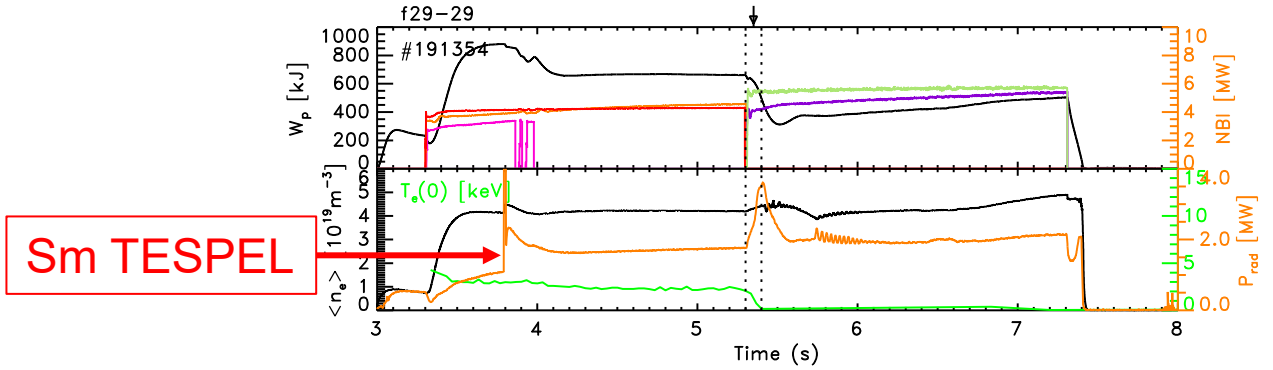
C. Suzuki et al.

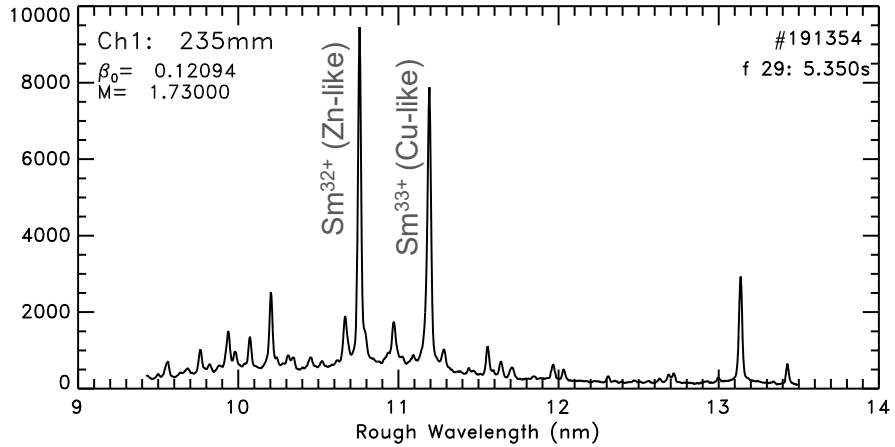
Objective: In order to further extend our database of experimental spectra from highly charged heavy ions, we try to measure soft X-ray/EUV spectra of Pr, Nd and Sm injected by TESPEL.

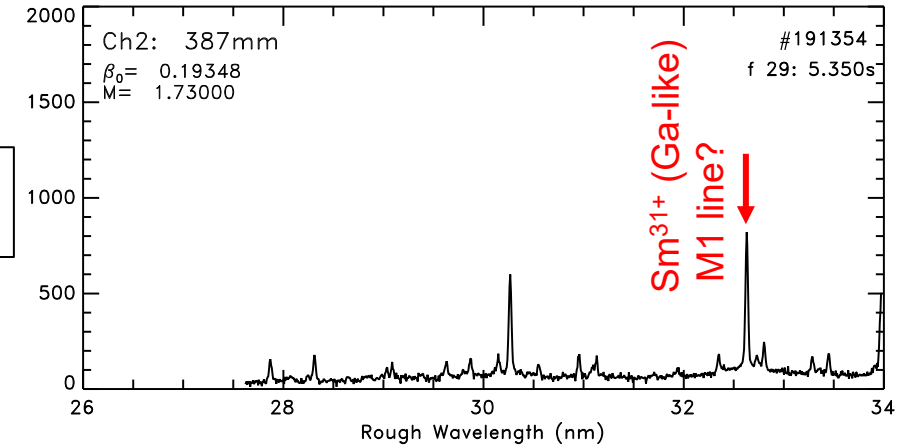
Experimental conditions:
(R_{ax}, Polarity, B_t, γ, B_q) = (3.6 m, CW, 2.75 T, 1.2538, 100.0%) #191334–191360

Experiment:
The heavy elements were injected into NBI plasmas with electron density of (3–8)x10^{19} m^{-3} and electron temperature of about 3 keV. Soft X-ray/EUV spectra in various wavelength ranges were measured by SOXMOS and EUV spectrometers.

Results:
In particular, we focus on the identification of forbidden (M1) lines of Ga-like ions in the longer wavelength region. For example, we observed a candidate for such an M1 line of Sm around 33 nm as shown in the figure.







Toroidal a/symmetry with Ne and N_2 seeding at R_{ax} = 3.6 m, B (CW)

B. Peterson and K. Mukai

Background and objective:

- Bolometers are installed at 3-O, 6.5-L, 8-O and 10-O ports
- Ne and N_2 seeding experiment were performed at R_{ax} = 3.6 m and B to investigate the toroidal asymmetry of radiation.
- in the next campaign we hope to repeat experiments with -B to look at effect of B direction.

Experimental condition:

- NBI #1, 2, 3, $n_{e,\,bar}$=4 x 10^{19}/m^3, N_2 or Ne puffing
- density is held constant during impurity puff by feedback control
- shots # 191361 – 191399 (39 shots)
- with LID cancel
- # 191372 reference shot with no impurity puff

N_2 puffed shots:

- #191366 from 3.5-L
- #191367 from 5.5-L
- #191368 from 9.5-L
- #191369 from 3.5-L and 5.5-L
- #191373 from 9.5-L and 5.5-L
- #191374 from 9.5-L and 3.5-L

Ne puffed shots:

- #191382 from 3.5-L
- #191383 from 5.5-L
- #191381 from 9.5-L
- #191385 from 3.5-L and 5.5-L
- #191386 from 9.5-L and 5.5-L
- #191387 from 9.5-L and 3.5-L
- #191388 from 3.5-L, 5.5-L, 9.5-L

Results:

Localized effects of impurity gas puffing observed especially with N_2.