(TG3) Spectroscopy group report

Oct. 21, 2022 (T. Kawate)

Date: Oct. 20, 2022
Time: 14:35 – 18:42
Shot#: 181032 – 181110 (79 shots)
Prior wall conditioning: No
Divertor pump: Yes
Gas puff: H_2, Xe, Kr, N_2, Ar
Pellet: impurity pellets (C, Ti, Fe)

NBI#(1, 2, 3, 4, 5)=gas(H, H, H, H, H)=P(1.6, 3.5, 3.4, 5.1, 3.0)MW
ECH(77GHz)=ant(5.5-U, 2-OUR)=P(0.703, 0.792)MW
ECH(154GHz)=ant(2-OLL, 2-OUL, 2-OLR)=P(0.723, 0.799, 0.825)MW
ICH(3.5U, 3.5L, 4.5U, 4.5L)=P(0, 0, 0, 0)MW
Neutron yield integrated over the experiment = 6.9×10^{12}

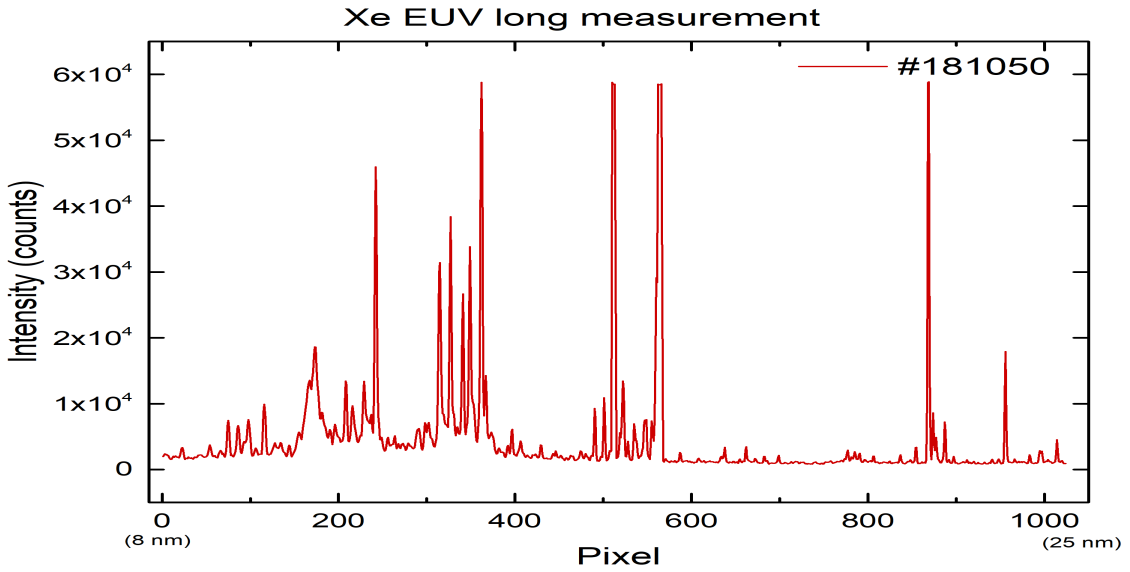
Topics

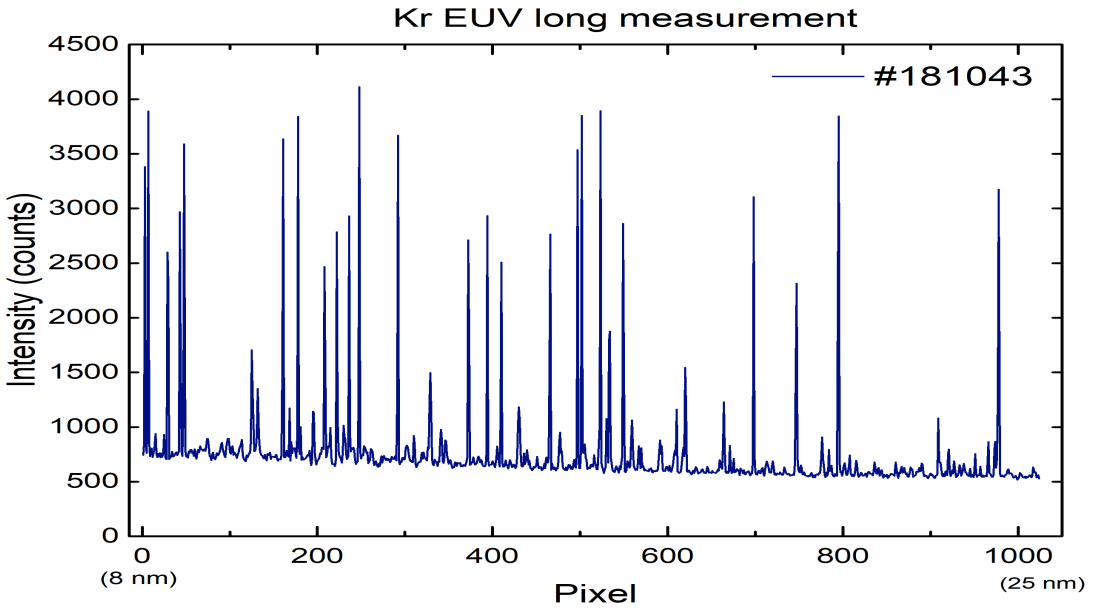
1. Spectroscopic studies of highly charged Kr and Xe ions through impurity seeding experiment in LHD (S. Gupta, I. Murakami, T. Oishi)
2. Recycling of heavy elements on PFC via molecular spectroscopy (T. Kawate)

TG3: "Spectroscopic studies of highly charged Kr and Xe ions through impurity seeding experiment in LHD"

S. Gupta, C. Suzuki, T. Oishi, I. Murakami

- **Conditions:** #181032-#181081. NBI #1-#5. ECH. H_2 gas. (R_{ax}, Polarity, B_t, γ, B_q) = (3.6 m, CW, 2.75 T, 1.2538, 100.0%)
- **Objectives:** Validation of the atomic structure and collisional radiative (CR) plasma model calculations through the LHD spectral measurements to identify the emission lines of highly charged Kr and Xe ions.
- **Experiments**: Kr and Xe impurities were injected at 4.0s. NBI #1-2 and NBI #3 were injected at 3.3-5.3s and at 5.3-7.3s, respectively, to sustain the plasma. NBI#4-5 were injected at 4.0-6.0s for charge exchange recombination spectroscopy to measure the ion temperature. EUV spectra were measured at 2.0-6.0nm and 8.0-25nm.
- **Results:** Kr and Xe emission profiles were measured in EUV short and EUV long regions with EUV spectroscopy and SOXMOS. Intense emission lines of Kr and Xe were found at different shots. Further, these lines will be analyzed and compared with the theoretical CR model calculations.





Recycling of heavy elements on PFC via molecular spectroscopy

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Background: Molecular spectroscopy has a capability of diagnosing desorption processes especially via chemical sputtering at PFC. Simultaneous measurements of highly charged ions and hydride molecules may provide relationship (timing, relative amount) between impurity transports in the core plasma and PFC, respectively.

Experimental conditions:

- (R_{ax}, B_t, γ, B_q) = (3.6 m, 2.75 T, 1.254, 100%), H_2, #181082-181110
- injection of impurity pellets (C, Ti, Fe) and simultaneously measure EUV and visible spectra emitted from (C^{n+}, Ti^{n+}, Fe^{n+}) and (CH, TiH, FeH), respectively, with spatial resolution.

Results:

- CH molecular lines, presumably emitted from near PFC, are confirmed during the shot with C pellet injection.
- CH emission is enhanced ~0.4s after pellet injection especially around the divertor viewing chord.
- Comparison with spatio-temporal evolution of C^{n+} will be made