Date: Jan. 25, 2022
Time: 13:32 – 16:55
Shot#: 177129 – 177193 (65 shots)
Prior wall conditioning: H₂
Divertor pump: ON
Gas puff: H₂, N₂, Ar, Ne
Pellet: TESPEL(SiB₆, AlN, CaAl₂O₄, V, Mn, Ni, Fe, Cu)

NBI#(1, 2, 3, 4, 5)=gas(H, H, H, H, H)=P(3.7, 4.5, 4.2, 4.2, 4.2)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 = 2.3 x 10¹²

Topics
1. Light impurity transport studies in D/H plasmas at LHD using VUV spectroscopy (T. Fornal, N. Tamura)
2. Impurity transport study in LHD D/H plasmas using VUV spectroscopy in experiment with TESPEL injection (M. Kubkowska, N. Tamura)
Light impurity transport studies in H plasmas at LHD using VUV/VIS spec. (T. Fornal, N. Tamura et al.)

Magnetic configuration: \((R_{ax}, \text{Polarity}, B_t, \gamma, B_q) = (3.60 \text{ m}, \text{CW}, 2.75 \text{ T}, 1.2538, 100.0\%)\)

Shots: #177129 - #177163 (#177161 - #177163: NBI calib.)

Goal of this experiment:
- To investigate the behavior of light impurities (B, C, N, O) in the hydrogen plasma of LHD and its comparison to the deuterium case, and its comparisons with the results in W7-X

Results:
- TESPELs \((\text{SiB}_6, \text{AlN}, \text{CaAl}_2\text{O}_4)\) \((t = 3.73 \text{ s})\) and \(\text{N}_2\) gas puff \((t = 4.7\text{ s} - 4.8\text{ s})\) are injected into the EC-heated H LHD plasmas with a various density from \(1\text{E}19 \text{ m}^{-3}\) to \(4\text{E}19 \text{ m}^{-3}\)
- N VII intensity (one of target lines with “CO-monitor” to be installed at W7-X) in the high-\(n_e\) case is lower than that in the low-\(n_e\) case  
  - same as in D LHD plasma case  
  - It might be due to “Impurity screening”
- Difference between H and D plasmas will be investigated
Study of impurity transport in ECH LHD plasmas with TESPEL injection (M. Kubkowska, N. Tamura et al.)

Magnetic configuration: \((R_{ax}, \text{Polarity}, B_t, \gamma, B_q) = (3.60 \, \text{m}, \text{CW}, 2.75 \, \text{T}, 1.2538, 100.0\%)\)

Shots: #177164 - #177193

Goal of this experiment

- To obtain the data by using TESPELs containing quadruple tracers \((V/Mn/Ni + \text{Fe or Cu})\) for comparisons with the future results in W7-X

Results

- \((V/Mn/Ni + \text{Fe or Cu})\)-TESPELs are successfully injected into the ECR-heated LHD H plasmas with \(n_e\) up to \(4 \times 10^{19} \, \text{m}^{-3}\)
  - Same heating power as in the D plasma exp. on Nov. 16 has been achieved

V/Mn/Ni + Fe

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<td>3 x 154 GHz (2.35 MW)</td>
<td>✓</td>
<td>✓</td>
<td>Not conducted</td>
<td>✓</td>
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<tr>
<td>2 x 154 GHz (1.52 MW)</td>
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<td>Not conducted</td>
<td>Collapsed by TESPEL</td>
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V/Mn/Ni + Cu

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</tbody>
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- Emission lines from V, Mn, Ni + Fe or Cu have been clearly observed
  - To be identified & to be analyzed later