**Introduction**

The important goal of the LHD project is to demonstrate the scientific feasibility of helical-system reactor. The presentation showed the recent LHD operation oriented the goal:

1. **Performance integration/optimization of high temperature plasmas**
   - Successful extension of simultaneous high $T_i$ and high $T_e$.
   - Electron ITB with low divertor heat load.
   - Steady sustainment of electron ITB plasmas and the better thermal confinement in D.

2. **Thermal confinement of plasmas both with high $T_i$ and high $T_e$**
   - Suppression of EIC using ECRH.
   - Higher $T_i$ maintained with increased $T_e$.
   - Ion thermal confinement is sensitive to $T_e/T_i$.

**Summary**

- The important goal of the LHD project is to demonstrate the scientific feasibility of helical-system reactor.
- The presentation showed the recent LHD operation oriented the goal:
  1. **Performance integration/optimization of high temperature plasmas**
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**Performance integration of high temperature plasmas**

**(1) The performance integration and the optimization of high temperature plasmas**

- High $T_i$ and high $T_e$ e-ITB with detachment, SSO of e-ITB.
- Thermal confinement of plasmas, of which $T_i$ and $T_e$ are simultaneously high.

**(2) Thermal confinement of plasmas both with high $T_i$ and high $T_e$**

- Suppression of EIC using ECRH.
- Higher $T_e$ maintained with increased $T_i$.
- Ion thermal confinement is sensitive to $T_e/T_i$.

**Electron ITB with divertive deuterator**

- High $T_i$ maintained with increased $T_e$.
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**Thermal confinement of plasmas, of which $T_i$ and $T_e$ are simultaneously high**

- MHD event Limiting $T_i$ increase
  - $T_i$ degradation by $T_e$ increase
    - Higher $T_i$ was successfully achieved
      - The increase range of $EIC$ suppressed with reduction trapped line $T_e$, $\delta T_e$,
      - Higher $T_i$ with higher $T_e$.
      - Lower EIC power ($\leq 100$ kW),
      - $T_i$ increased with $P_{ECRH}$.
      - Ion thermal confinement is sensitive to $T_e/T_i$.

**Summary**

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**Performance Integration of High Temperature Plasmas in the LHD deuterium operation**

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