Simultaneous high $T_i$ and high $T_e$ regime was successfully extended in the LHD due to the establishment of the i-ITB and e-ITB simultaneously by the optimized heating of NBI and ECRH mix.

Although the ion thermal confinement was degraded in the plasma core with increase of $T_e/T_i$ by the “on-axis ECRH” superposition, it was found that the ion thermal confinement was found to be improved at the “edge”.

It was found that the structure of the $n_e$ fluctuation at the “edge” was clearly modified by “on-axis ECRH”.

- **Figure (a)**: Simultaneous high $T_i$ and high $T_e$ regime was successfully extended in the LHD due to the establishment of the i-ITB and e-ITB simultaneously by the optimized heating of NBI and ECRH mix.

- **Figure (b)**: Although the ion thermal confinement was degraded in the plasma core with increase of $T_e/T_i$ by the “on-axis ECRH” superposition, it was found that the ion thermal confinement was found to be improved at the “edge”.

- **Figure (c)**: It was found that the structure of the $n_e$ fluctuation at the “edge” was clearly modified by “on-axis ECRH”.

- **Figure (d)**: Spatiotemporal coherence of $n_e$ fluctuation.