

Overview of recent progress in ECH experiments on LHD

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The most prominent result of ECH activity on LHD in F. Y. 2004 was an achievement of 65 minute discharge by CW ECH system. The very stable discharge closed without any trouble proved the advantage of helical systems for CW plasma sustainment.

In F. Y. 2005, one of 6-ID88.9mm waveguide transmission lines, which have been used in the atmospheric pressure, was modified to be evacuated to reduce the arcing inside the waveguide at high power transmission. A high power 800kW/3s 84GHz gyrotron was connected to this evacuated line. As a result, injection power of up to 500kW from one gyrotron became possible.

Using antenna systems which have wide range of beam direction controllability, X-B heating and ECCD experiments were performed. Though the ECH beam is injected from LFS, by selecting proper injection path, HFS injection can be realized in the LHD magnetic field structure with present antenna system. According to the changes of beam direction and polarization, clear variations were observed in response of electron temperature such as modulation amplitude and spatial phase delay measured with ECE to power-modulated ECH. It is now under investigation whether the results are explained by X-B heating. Also by oblique power injection aiming at magnetic axis, total plasma current was changed and the direction of driven current agrees with the prediction by linear ECCD theory in the case of LFS injection.