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Experimental Study on LHCD Efficiency in HT-7 Tokamak

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Lower Hybrid Current Drive (LHCD) experiments on HT-7 Tokamak have been carried out by scanning the following two parameters: central line averaged electron density $(0.5\sim 2.0)\times 10^{19}\text{ cm}^{-3}$ and toroidal magnetic field ($B_t=1.62\sim 2.0\text{ T}$). The dependence of current drive efficiency on these parameters has been studied and the experimental curves of current drive efficiency as a function of n_e and B_t have been obtained. From these experimental curves, it can be seen that lower hybrid current drive efficiency increases with the increase of toroidal magnetic field but, there exists an optimized density regime where highest current drive efficiency can be obtained. The experimental results are analyzed and interpreted through theoretical current drive efficiency. The results are also consistent with numerical simulation by using a ray-tracing code, where A is the parameter related to plasma energy and N_{\parallel} is the parallel refractive index. The results show that current drive efficiency is mainly affected by wave accessibility condition and impurity radiation. As a matter of fact, the experiments on HT-7 shows that the competition of these two factors determines current drive efficiency.