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LHDにおける高イオン温度プラズマの統合熱輸送シミュレーション
Integrated Heat Transport Simulation of High-Ion Temperature Plasma in LHD

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Extension of the high-temperature region is one of the important issues in helical systems for better understandings of the physics properties of high temperature plasmas in non-axisymetric devices. In Large Helical Device (LHD), NBI heating system (three tangential and two perpendicular beam lines) has been installed and applied to various plasma experiments such as the high ion temperature (high-$T_{\rm i}$) experiment[1]. In the high-$T_{\rm i}$ experiment, helium gas puffing and carbon pellet injection have been done in order to obtain a high ion temperature plasma. High-$T_{\rm i}$ plasmas have been obtained in the decay phase of the density after rapid increase due to a carbon pellet injection. In order to understand the transport property of these time-evolving plasmas, a time-dependent simulation of power deposition and heat transport is necessary.

In this study we perform an integrated heat transport simulation of the high-$T_{\rm i}$ plasma in LHD using an integrated transport code, TASK3D[2] combining GNET-TD code, a extended version of the GNET[3] to analyze the time evolving plasma. The time evolution of the density and temperature of the background plasma is taken into account in the beam slowing-down calculations by GNET-TD code. We assume a multi ion species (hydrogen, helium, and carbon) plasma in beam ion birth, slowing-down, and heat transport calculation. Some anomalous transport models, such as gyro-Bohm model, are applied for the anomalous heat transport. We will compare the simulation result with the experimental result and discuss the confinement improvement in high-$T_{\rm i}$ plasma in LHD.

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