Study of energetic ion confinement during combined NBI and ICRF heating in LHD

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In the LHD, significant performances of ICRF heating (fundamental, minority heating regime) have been demonstrated and up to 1MeV of energetic tail ions have been observed by fast neutral particle analysis (NPA). These obtained results indicate a good property of energetic ion confinement in helical systems. Recently the perpendicular NBI heating system (P<6MW) has been installed in LHD and a strong coupling between the perpendicularly injected beam ions and the higher harmonics ICRF heating is expected.

In this paper the energetic ion confinement during combined NBI and 2nd harmonics ICRF heating is studied in LHD. We perform the 2^{nd} harmonics ICRF heating experiment in LHD with the perpendicular and tangential injection NBI heating. Energetic ion distributions are measured by several types of NPAs. The differences of the energetic ion distributions are investigated changing the heating conditions.

The energetic ion distribution is also investigated by GNET code[1-3], in which a linearized drift kinetic equation for energetic ions is solved including complicated behaviour of trapped particles in 5-D phase space. The energetic ion distributions are evaluated with NBI and ICRF heating assuming experimentally obtained plasma parameters. As a result, the simulated NPA count number using the GNET results show relatively good agreements with the experimental results.

These results indicate an effective energetic particle generation in the 2nd harmonics ICRF heating in LHD.

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