

Improvement of NBI heating efficiency with Magnetic field well

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Neutral Beam Injection (NBI) is one of main methods for plasma heating and current drive in magnetic fusion devices. Versatile Experiment Spherical Torus (VEST), recently constructed at Seoul National University [1] considers NBI as a main heating tool to access target advanced performance. However, large orbit loss is expected due to small toroidal field and plasma current in VEST. Sufficient beam power is difficult to be used, since high energy beam particles in a small field are suffering from large beam loss. In this study, we suggest adding a magnetic well structure to the low field side of the tokamak as a robust solution to improve such large beam losses. The effect of the well structure on reducing orbit loss is confirmed by a zero dimensional analysis [2, 3] and more detailed NUBEAM [4, 5] calculations. Finally, we adopt this well structure on VEST equilibrium to assess its effect. From NUBEAM simulations, we find that this magnetic field configuration can significantly improve the beam efficiency in VEST. This magnetic well configuration is envisaged to be applicable to other spherical tokamaks with the low magnetic field strength in enhancing the NBI efficiency.

References:

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