Simulation of penetration supersonic beam in fusion plasma using neutral/HESEL model

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Supersonic molecular beam injection (SMBI) is one of the fueling methods on tokamaks and demonstrated deeper penetration of neutrals and higher fueling efficiency in comparison to traditional gas puffing (GP) [1]. We simulated the interactions between supersonic beam and plasma using the neutral/HESEL model [2] which describe neutrals based on a multi temperature fluid approach. The HESEL model [3] is capable of describing interchange-driven low frequency turbulence in the SOL region and in combination with the neutral model used for investigation of neutral penetration in different fuelling scenarios. Statistical analysis shows deeper penetration of supersonic beam compared to GP. This can be explained by the high direct velocity of particles in the beam and domination of convection transport. The analysis performed by scanning parameters of the supersonic beam. Numerically finds a parametric dependence of penetration depth and fueling efficiency as a function of beam velocity and density. The results are contrasted with available experimental data.

References

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