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Investigation of Toroidal Rotation Reversal in KSTAR Ohmic Plasmas

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A reversal of the intrinsic toroidal rotation at the core region has been observed in Ohmic plasmas of various tokamaks as confinement characteristics changes from the low density linear Ohmic confinement (LOC) regime to the saturated Ohmic confinement (SOC) regime. On the other hand, dedicated experiments on KSTAR in search of this phenomenon have not exhibited any toroidal rotation reversal to date, while similar behaviours in the core toroidal rotation dependency on density have been observed across the confinement regime transition from LOC to SOC. We characterise common features of results from KSTAR by recognising that the toroidal rotation at normalised radius around 0.6,so called the anchor point, acts as an effective boundary value affecting the core rotation value. We found that the toroidal rotation at the anchor point plays an important role to the core rotation reversal which exhibits strong correlation with the plasma current. Momentum transport modelling considering diffusion, pinch, and residual stress reveals that the core toroidal rotation reversal, for KSTAR plasma conditions, could occur even without sign-flip of the residual stress appearing during the Ohmic confinement transition.

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