

Analysis of intrinsic rotation change induced by neutrals on KSTAR

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More than 400 Shots of KSTAR ohmic discharge were analyzed for the study of intrinsic rotation change [1]. The toroidal rotation of KSTAR ohmic discharge begins with acceleration in counter-current direction at the early current ramp-up stage and later on at certain level of electron density, the rotation starts to accelerate in co-current direction. When the peak counter-current rotation is higher than 40 km/sec, co-current acceleration couldn't make rotation reverse. The origin of early counter-current rotation is the unbalanced momentum transfer to prefilled neutrals from electrons and main ions, which is induced by the impurity ions. This unbalanced momentum transfer generates neutral movement in counter-current direction and the neutrals return this momentum back to ions by charge exchange reactions. The co-current or counter-current momentum transfer to neutrals is not only a function of temperature and density but also a function of the electron density ratio to the main ion. The detail parameters calculated by the analysis are well agreed with the experimental measurement on KSTAR.

[1] S. G. Lee, and J. W. Yoo, "Experimental evidence of intrinsic ohmic rotation in KSTAR" *Phys. Plasmas*. 25, 044502 (2018).