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Theory of turbulence driven intrinsic rotation and current

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We present new results in the theory of turbulence driven intrinsic rotation and current. Both the intrinsic rotation and the intrinsic current driven by micro-turbulence are important for ITER. The former is critical for ITER due to its important role in suppressing MHD instabilities, since neutral beam injection may not provide enough external rotation drive in ITER. The latter is important because the non-inductive current drive is essential for steady state operation of tokamak reactor. This paper presents a novel mechanism for the origin of intrinsic rotation, which is referred as turbulent acceleration [1]. We emphasize that the turbulent acceleration does not contradict momentum conservation law [2]. The possible relevance of the turbulent acceleration to some experimental observations is also discussed [3, 4]. Inspired by the investigation of intrinsic rotation (which is related to ion momentum) driven by turbulence, we also present the intrinsic current (which is related to electron momentum) driven by turbulence [5].
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Primary author: Prof. WANG, Lu (International Joint Research Laboratory of Magnetic Confinement Fusion and Plasma Physics, State Key Laboratory of Advanced Electromagnetic Engineering and Technology, School of Electrical and Electronic Engineering, Huazhong University of Science and Technology)

Co-authors: Prof. DIAMOND, Patrick H. (NFRI, UCSD); Mr PENG, Shuitao (International Joint Research Laboratory of Magnetic Confinement Fusion and Plasma Physics, State Key Laboratory of Advanced Electromagnetic Engineering and Technology, School of Electrical and Electronic Engineering, Huazhong University of Science and Technology); Mr HE, Wen (International Joint Research Laboratory of Magnetic Confinement Fusion and Plasma Physics, State Key Laboratory of Advanced Electromagnetic Engineering and Technology, School of Electrical and Electronic Engineering, Huazhong University of Science and Technology)

Presenter: Prof. WANG, Lu (International Joint Research Laboratory of Magnetic Confinement Fusion and Plasma Physics, State Key Laboratory of Advanced Electromagnetic Engineering and Technology, School of Electrical and Electronic Engineering, Huazhong University of Science and Technology)

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