Observations of geodesic acoustic modes and low-frequency zonal flow in the edge of HL-2A and HT-7 tokamaks

T. Lan, C. X. Yu, H. L. Zhao, D. F. Kong, A. D. Liu, L. W. Yan[a], W. Y. Hong[a], K. J. Zhao[a], J. Q. Dong[a]J. Qian[a], J. Cheng[a], D. L. Yu[a], Q. W. Yang[a], X. R. Duan[a], B. N. Wan[b], X. Gao[b], J. G. Li[b]

CAS Key Laboratory of Basic Plasma Physics, and Department of Modern Physics, University of Science and Technology of China,Hefei, Anhui 230026, China
[a]*Southwestern Institute of Physics, P.O. Box 432, Chengdu, Sichuan 610041, China*
[b]*Institute of Plasma Physics, Chinese Academy of Sciences, Hefei 230031, China*

bluetao@mail.ustc.edu.cn

Zonal Flows, including Low-Frequency Zonal Flow (LFZF) and geodesic acoustic mode (GAM), had both been characterized in the HL-2A tokamak and the HT-7 tokamak. The three-dimensional mode characteristics of GAM and LFZF had been systematically studied in the edge of HL-2A tokamak recently [1, 2]. The envelopes of the radial electric field and density fluctuations are observed to be modulated by the GAM [3]. By comparing the experimental result with that of the envelop analysis using model signals, the mechanism of the envelop modulation had been identified. The results strongly suggested that the envelop modulation of the radial electric field fluctuations was dominantly caused by the direct regulation of the GAM during the GAM generation in the energy-conserving trial interaction, and the envelop modulation of the density fluctuations was induced by the GAM shearing effect, which transfers the fluctuation energy from low to high frequencies. The radial spectral features of GAM fluctuations were measured using two radial rake probe arrays separated toroidally. The radial wavenumber of GAM had been observed to decrease with increasing radial position. The group velocity of GAM had also been observed to spread outward with a tuning position from which the GAM propagated inward.

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