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Characteristics of Zonal Flows in the HL-2A and HT-7 tokamaks[1]

T. LAN, A.D. LIU, C.X. YU, USTC, China, L.W. YAN, W.Y. HONG, K.J. ZHAO, J.Q. DONG, J. QIAN, J. CHENG, D.L. YU, Q.W. YANG, SWIP, China — Zonal Flows, including low frequency Zonal Flow (LFZF) and geodesic acoustic mode (GAM), have been characterized in the HL-2A and HT-7 tokamaks. The three-dimension wavenumber and frequency spectrum for the GAM has been measured in the HL-2A tokamak for the first time. The poloidal and toroidal wave number spectra are peaked sharply at$k_\theta = k_\phi \simeq 0$, while the radial spectrum shows a strong peak at $k_r\rho_i \approx 0.04 - 0.09$ with a width$\Delta(k_r\rho_i) \approx 0.03 - 0.07$. The whole spectral characters of LFZF in both tokamaks are firstly presented here. Bispectral analysis, nonlinear energy transfer and experimental studies on the GAM interaction with turbulence reveal that the parametric instability is a mechanism contributing to the generating of the GAM. Wavenumber mismatch estimation, denoting the coupling of nonlinear three-wave interactions, shows that the resonance conditions are satisfied exactly at the region with highest auto-bicoherency. The turbulent transport related to GAM has been studied in HL-2A tokamak and the results are reported.

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