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EX/P7-14: The Observation of Dual-peak Geodesic Acoustic Modes in the Edge Plasma on Tokamaks

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In low density (HL-2A) and lithium wall condition (HT-7) two coherent modes are discovered of the GAM frequency range only on potential signals, i.e. at 11kHz and 18kHz, which are symmetric for their poloidal and toroidal mode number $n=m=0$. So we can conclude that both two coherent modes are GAMs, named LFGAM and HFGAM respectively.

The results show that the amplitudes of LFGAM and HFGAM decrease in outward direction. For LFGAM, the amplitude reach maximum value at $r-a = -1\text{cm}$ and then decrease with radial outward. In the mean time, the peak frequencies for dual GAMs remain the same of the range $\rho > 0.93$, while the theoretical predict frequencies calculated from the local plasma temperatures increase with radial inward. The radial wave number for HFGAM increases in radial outward direction and keep positive, where the positive sign means outward. These characteristics of GAM are consistent with the kinetic GAM theory after considering the finite Larmor radius effect. For LFGAM, experiment results indicate that the phase velocity of LFGAM propagates outward in the range of $r-a > -0.8\text{cm}$ and inward in the rest range.

To study the nonlinear coupling among LFGAM, HFGAM and ambient turbulence, the envelope analysis are used. There are strong nonlinear coupling between the dual GAMs and AT. Moreover, the cross phase at LFGAM and HFGAM frequencies are near π and $\pi/2$, respectively. It reveals that the LFGAM modulates AT with amplitude modulation, which means LFGAM is generated locally. For HFGAM, the AT is modulated with phase modulation, which means HFGAM is generated in deeper radial position and modulates local AT.

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