Overview of Physics Results from HL-2A

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Abstract. Important advances have been made on HL-2A, aided by substantial developments to plasma control, diagnostics and heating systems. The first high coupling efficiency of low-hybrid current drive (LHCD) with the Passive-Active Multi-junction (PAM) antenna was successfully demonstrated in H-mode plasma on the HL-2A tokamak, such low-hybrid wave has also been found to be advantageous in ELM mitigation. In addition, various ELM mitigation techniques have been investigated, including supersonic molecular beam injection (SMBI), impurity seeding, resonant magnetic perturbation (RMP). For the first time, the synchronization of geodesic acoustic mode (GAM) and magnetic fluctuations was observed in edge plasmas, revealing the frequency entrainment and phase lock. For the internal transport barrier observed in the neutral beam injection (NBI) heated plasmas，both magnetic shear and EPM modes such as fishbone activities or long-live modes have been identified as playing a determining role in the initial onset of ITB and its subsequent development. In the MHD research, neoclassical tearing modes (NTMs) driven by the transient perturbation of local electron temperature during the non-local thermal transport events have been observed. Feedback control/suppression of MHD tearing modes with EC heating has been demonstrated. Long-lasting runaway electron plateau was achieved after argon injection and the runaway current beam was successfully suppressed by SMBI. In the area of energetic particle research, it was found that low-n Alfvenic ion temperature gradient (AITG) modes could be destabilized in even with weak magnetic shear and low pressure gradients. Moreover, EPMs were completely stabilized with very localized deposition of ECRH in the dedicated experiments.