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ELM Mitigation by Lower Hybrid Waves in EAST

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ELM mitigation has been observed on the Experimental Advanced Superconducting Tokamak (EAST) when lower hybrid waves (LHWs) are applied to H-mode plasmas sustained mainly with ion cyclotron resonant heating (ICRH). This has been demonstrated to be due to the formation of helical current filaments (HCFs) flowing along field lines in the scrape-off layer induced by LHWs. Because of the geometric effect of the LHW antenna, the perturbation fields induced by the HCFs are dominated by the $n=1$ components, where n is the toroidal mode number. In comparison to previous RMP ELM mitigation experiments, using a set of fixed in-vessel coils, ELM mitigation with LHWs on EAST is achieved with a wider range of q_{95} . This is because the HCFs induced by the LHWs flow along the magnetic field lines in the SOL, thus the helicity of the HCFs always closely fits the pitch of the edge field lines whatever the value of the plasma edge safety factor.

Splitting of the outer divertor strike point during LHWs has been observed similar to previous observations with RMPs. The change in edge magnetic topology has been qualitatively modelled by including the HCFs in a field line tracing code. The results show a strong modification of the plasma edge topology dependent on the edge safety factor as well as the amplitude of currents flowing in these filaments. This can qualitatively explain the experimental observations of SP splitting.

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