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EX/P4-05: Observation of Current Structures at Type-III ELM Onset on EAST

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In far scrape-off layer (SOL), alternating negative and positive burst structures in ion saturation current were detected at the onset of each type-III edge localized mode (ELM) on EAST. Different from the fast streaming phenomenon reported previously, one subsequent positive burst structure appears every time in the early phase of ELM. It seems like a quick transitional stage between edge localized mode (MHD) phase and transport phase during the ELM. A pronounced sinusoidal pattern has been observed on the radial magnetic induction signal by Langmuir - magnetic probe, corresponding with almost a single peak mode on the poloidal induction signal in this transitional phase. As a local diagnostic, the floating potential arises abruptly in this phase, indicating the emergence or passage of polarized plasma structure. Further more, the ELM crash enter into another phase after this sudden burst structure. To verify the current characteristic of this structure, a mono-polar current filaments model was involved, which can reproduce same pattern commendably. Thus, current transport may dominant in transitional stage and plays an important role in the nonlinear development phase of ELM exhaustive crash. As current structure can only be observed in far SOL region of EAST, it maybe conceivable to consider the current origin from local condition rather than release from inside of the pedestal. Our observation may potentially provide support evidence for the recent theory prediction that the error filed generated by scrape-off layer current can ultimately trigger the ELM through the coupling with MHD modes inside the separatrix.

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