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P2.006 Passive control of runaway electron displacement by magnetic energy transfer in J-TEXT

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During disruptions runaway electrons(REs) often drift from high field side to low field side in J-TEXT. It may damage plasma facing components when REs strike the first wall with high energies. In order to mitigate the damage, a novel approach called magnetic energy transfer(MET) based on the principle of electromagnetic coupling is presented in this paper. A set of extra coils with a high coupling coefficient with plasma is installed on the device, and a toroidal current can be induced in the coils during disruptions which can transfer the plasma poloidal magnetic energy out of vacuum vessel. Flowing in the same direction as the runaway current, the induced current can attract the runaway current to high field side, control the displacement of the RE beams and prolong runaway current plateau. Compared with vertical field control, a significant advantage of MET can be seen that the MET is passive control without power supply, while vertical field control needs a power supply and belong to active control. The J-TEXT experiment results show that the increase rate of RE beams' horizontal displacement can be obviously slowed. The runaway current plateau can be prolonged 4-5 ms and the control effect becomes better as the induced current in the MET coils increases. Thus the MET can control the displacement of RE beams effectively.

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