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P1.1044 Operation in the quiescent regime with a high runaway electron current fraction on the EAST tokamak

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Plasmas with a high runaway electron (RE) current fraction, fRE > 0.5, have been achieved during the flat-top of EAST Ohmic discharges with both a circular limited and an X-point diverted configuration. The RE current fraction and the energy distribution are characterized stably and independent of plasma current and density. Operation in the quiescent regime including accurate measurement of all key parameters related to REs provides a suitable experimental platform for RE excitation and dissipation, which could potentially have beneficial implications to the post-disruption RE regime [1-3]. Extremely low density operation (ne<41018m^-3) free of error field penetration supports the excitation of fruitful quiescent RE populations. By slowly letting the density ramp down during the flattop, REs are firstly confirmed by visible hard X-rays (HXRs) and electron cyclotron emission (ECE) and then the signals of HXRs and ECE grow fast, indicating that amount of REs are generated. At a lower density, a transition from growth of HXRs and ECE to saturation are simultaneously observed. Meanwhile, a large drop of the surface loop voltage (down to <50% of the loop voltage value before this transition) is found, indicating the replacement of the resistive plasma current by that carried by the REs. After the transition, continuing to ramp down the density does not raise the toroidal electric field (Eloop) and the amplitude of HXRs and ECE keeps constant, supporting that the stable characterizations of the RE current fraction and the energy distribution in the regime. Also, the saturated electric field is ~8 times above the theoretical critical electric field for avalanche growth (EC) but lower than the threshold electric field for Dreicer generation (12-20 EC).

References
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