Momentum-space analysis of suprathermal electrons generation under conditions of gas puffing during runaway tokamak discharges

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The energy of disruption generated runaway electrons can reach as high as tens of mega-electron volt energy and they can cause a serious damage of plasma-facing-component surfaces in large tokamaks like International Thermonuclear Experimental Reactor [1]. At the same time, the quiescent runaway electron generation during the flat-top of DIII-D low density Ohmic discharges allows accurate measurement of all key important parameters to runaway electron excitation [2].

Using a test particle description (like [3]) that includes acceleration in the toroidal electric field and collisions with the plasma particles the generation of suprathermal electrons is analyzed under conditions of gas puffing. In presented modeling, the plasma parameter behavior close to the DIII-D quiescent runaway shot #152895 parameters is used. For this puffed discharge the growth and decay of high-frequency ECE signal was in disagreement with the HXR and synchrotron emission signals. Possibility of formation of the suprathermal electron population with $v_\perp >> v_\parallel$, which is trapped in a uniform magnetic field, is shown ($v_\parallel$ and $v_\perp$ are the velocities parallel and perpendicular to the magnetic field, respectively). The growth and decay of high-frequency ECE signal may be explained by occurrence of this suprathermal population.

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