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The effect of toroidal magnetic field strength on the energy of runaway electrons in Damavand tokamak

In addition to the ohmic heating of the plasma, toroidal electric field in tokamaks which crosses a critical limit, leads to the acceleration of plasma electrons to relativistic energies. Due to the inability of the tokamak magnetic fields to confine them, these energetic electrons escape from the plasma column and collide with the vacuum chamber wall and the plasma facing components. As a result of the collision of these electrons with the target, hard X-rays are produced due to the bremsstrahlung process, and these radiations, in addition to causing serious damage to the wall materials, can carry information about their generating electrons.
In this research, the spectrum of hard X-rays emitted from Damavand tokamak at different times of discharge has been studied. Also, the effect of toroidal magnetic field intensity on the energy spectrum of runaway electrons and their confinement quality in Damavand tokamak was investigated. The results showed that the presence of stronger toroidal magnetic fields causes more confinement of the runaway electrons in the discharge column and thus increases their average energy. According to these results, it can be expected that tokamaks with stronger toroidal magnetic fields are subject to more damage by runaway electrons.

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