Effect of applied toroidal electric field on the growth/decay of plateau-phase runaway electron currents in DIII-D

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Abstract

Large relativistic runaway electron currents (0.1-0.5 MA) persisting for ~100 ms are created in the DIII-D tokamak during rapid discharge shut down caused by argon pellet injection. Slow upward and downward ramps in runaway currents were found in response to externally applied loop voltages. Comparison between the observed current growth/decay rate and the rate expected from the knock-on avalanche mechanism suggests that classical collisional dissipation of runaways alone cannot account for the measured growth/damping rates. It appears that a fairly constant anomalous dissipation rate of order 10 s^{-1} exists, possibly stemming from radial transport or direct orbit losses to the vessel walls, although the possibility of an apparent loss due to current profile shrinking cannot be ruled out at present.

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