Abstract Submitted
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Hiro currents, current spikes and forces in tokamak disruptions[1]
LEONID E. ZAKHAROV, Princeton University, PPPL — The talk gives resolution of the oldest (known since 1963) puzzle in tokamak physics, related to such bright phenomena as the positive current spike (negative voltage spike) in tokamak disruptions. It is shown that the electric contact between plasma and the wall plays crucial role in tokamak disruptions. When the safety factor q at the plasma boundary crosses the resonant value and a kink mode is excited, two effects follows. One is the generation of the surface, called "Hiro", current at the plasma boundary, unrelated to the resonant character of q-value. Another is the excitation of the stabilizing eddy currents in the wall, negligible when q is resonant. The kink mode starts its development as a fast, invisible magnetically ideal mode with no wall effect present. As soon as plasma touches the wall, the surface Hiro currents from the plasma will be driven through the wall. This stops fast instability and convertw it into a slower resistive mode. The Hiro currents are always opposite to the plasma current. This is consistent with toroidal asymmetry in the plasma current measurements on JET due to m/n=1/1 kink mode. The same Hiro currents, generated by $m > 1$ modes are responsible for positive plasma current spikes (and negative voltage spikes) in conventional disruptions.

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