

Similarity study of black aurora to tokamak boundary: electric field and vortex structure

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Three examples of electric field formations in the plasma are analysed based on a new mechanism driven by the ion-neutral collisions. Recently developed Gyro-Center Shift analysis includes perpendicular current which is induced by the momentum exchange between ion and neutral when there is asymmetry over the gyro-motion. The first example is radial electric field formation at the boundary of nuclear fusion devices which is a key player for the high confinement mode operation of future fusion reactors. The second example is reversed rotation of arc discharge cathode spot that has been a mysterious subject for more than hundred years. The third example is electric field formations in earth ionosphere which are important components of equatorial electrojet and black aurora. The black aurora has been a mysterious subject for decades since it has two interesting features which are the strong electric field and breaking into array of circular structure. The process of one method that explains various examples from different plasmas will be presented. The basic ideas of the mechanism for the vortex structure in the black aurora and the ELM formation of tokamak will be discussed.