

## **Decoupling of a diamagnetic plasma blob from background magnetic field and plasma**

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Laboratory and numerical experiments with plasmoids impulsively injected in transverse distributions of magnetic field show “anomalous plasma transport”. The plasma blob is skidding in the direction perpendicular to the magnetic field over distances larger than the average ion Larmor radius and is not “glued” to magnetic field lines. Similar behavior is observed in space plasma during active experiments or by in-situ measurements in magnetospheric regions where the “frozen-in” condition is violated. This type of transport cannot be described in the framework of the ideal MHD approximation, where the condition  $\mathbf{E} \cdot \mathbf{B} = 0$  must be satisfied everywhere and the “frozen-in” magnetic field lines are everywhere bent and compressed by the plasma flow. Starting from a 2D stationary kinetic model, I show that the boundaries of a diamagnetic plasma blob impulsively injected across magnetic field lines are the sites of a parallel electric field that disconnects the plasma from the background magnetic field. The strong shear of bulk velocity,  $\nabla_{\parallel} V_{\text{perp}}$ , driven in the direction parallel to the magnetic field by the excess momentum of the plasma blob, acts like a generator of parallel electric field inside the blob's boundary layers. The model is derived from first principles of classical physics and does not rely on anomalous processes postulated in fluid models. I discuss also the effectiveness of decoupling as a function of the blob's excess velocity, density, temperature and plasma beta.