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Investigation of Interactions of Filaments using Simulations based on 2D fluid equations

This work investigates the interactions between two filaments in fusion plasma. Plasma filament is used to investigate dynamics of plasma and energy transport at scrape-off layer (SOL). They play an important role in plasma particles transport at far from SOL. Their mechanism was discovered during both low confinement mode and inter-ELM phase of high confinement mode by using infrared measurements. The mechanism driving of plasma filaments is the formation of an electric field and diamagnetic current field. The keys of movement of filaments come from dipolar electrostatic potential field in perpendicular direction to the magnetic field. Ion and electron are separated by diamagnetic drift, causing magnetic fields to be nonconstant. Electric field is generated by diamagnetic drift. Through $\vec{E} \times \vec{B}$ motion, the filament is driven in outwards direction. This work investigates dynamics of interaction by using fluid equations called STROM2D. The model is implemented in BOUT++ code and run in two-dimension. Initial condition of the two filaments is setup by angle between center of mass and size of the two filaments. Interaction of the two filaments is shown by velocity of the center of mass. Relations of interactions of two filaments were compared with noninteraction case at center of mass. It was found that interactions of the two filaments depend on initial angle, as shown by value of velocity in outwards direction. Initial angle at 0.0- and 180.0-degree yield maximum of outwards velocity at same-sized of filaments. On the other hand, different-sized of filaments have only maximum of outwards velocity at initial angle is 0.0. Two-size of filaments at horizon angle shows that small size in front of center of mass has outwards velocity more than opposite direction.

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