2次元PICシミュレーションによる衝撃波面構造の解析

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Properties of collisionless shock front : 2D PIC simulations

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There have been reported many processes and structures on the shock surface, those are, shock reformation, rippling and so on. Now it is well known that the backstreaming ions are responsible for the shock reformation with small modifications by electrons and waves. On the other hand, the formation of the rippling and other small scale structures are still under consideration because of the mutual coupling of the electron and ion dynamics. Here we have performed two-dimensional PIC simulations to investigate the structure on the shock surface in a super-critical Mach number shock regime. We have observed clear density fluctuations on the shock surface. In the high beta case (ion beta ˜1), the high dense front is perpendicular to the upstream magnetic field. On the other hand, in the low beta case (ion beta ˜0.1), the high dense region extends along the ambient magnetic field. In both cases, the high dense front is convected with the upstream bulk flow. Resultantly the shock surface is not uniformed but wavy (rippled) along the shock tangential direction. We will discuss the excitation mechanism of these high dense regions with relation to the particle dynamics.