Collisionless plasma instabilities have been proposed as candidates to explain the origin of magnetic fields required by models for non-thermal radiation emission in GRBs. Since these extreme scenarios are usually associated with strain and rapid variability of the ejecta, it is likely that strong velocity shears are present, triggering a variety of collisionless electron-scale instabilities. We investigate the 2D linear stability analysis of a plasma shear, studied in the cold fluid limit and show that electromagnetic perturbations are unstable both in the parallel and in the transverse plane of the flow. During the non linear stage of the instabilities, the parallel modes exhibit features analogues to the one observed in the usual Kelvin Helmholtz instability whereas the transverse modes evolve towards mushroom-like structures similar to the ones in the Rayleigh-Taylor instability. We study the competition of those two unstable branches as the velocity of the flow is varied and show that the longitudinal modes are dominant for non relativistic flows whereas the transverse modes become the preponderant feature of the system when the flow become ultra relativistic. Finally, interplay between these processes presented is discussed with multidimensional PIC simulations.

References