

We present the new PIC/hydrodynamic hybrid code H-VLPL which combines a fully kinetic treatment of the proton beam with a highly accurate, efficient fluid modeling of the plasma. The grid convention and numerical schemes have been optimized for low noise, exact charge conservation and high performance. We use this code for investigations of the self-modulated proton driver plasma wake field accelerator (SM-PDPWA) regime[1], presenting results on the self-modulation instability, the wake field phase velocity and electron injection mechanisms.

References

- [1] A. Caldwell, K. Lotov, A. Pukhov, and F. Simon, Proton-driven plasma-wakefield acceleration, *Nature Physics* **5**(5), 363–367 (Apr. 2009).