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## Full-scale modeling of plasma-based accelerators using ponderomotive guiding center solver in OSIRIS

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Full 3D modeling of plasma-based accelerators using particle-in-cell (PIC) simulations is very computationally demanding. The use of a reduced model such as the ponderomotive guiding center algorithm (PGC) [1] allows us to bridge the large-scale disparity between the shortest (laser) wavelengths, which is in  $\mu\text{m}$  range, and the acceleration distance, which can exceed the meter range. Here, we present our implementation of a 3D PGC solver [2] into OSIRIS [3] which includes cylindrical, 3D cartesian coordinates and full ionization support. We discuss the potential of using PGC for parametric studies for down ramp injection and magnetic injection. Furthermore, we present the full 10 m modeling of the AWAKE experiment [4], detailing the laser ionization seeding of the self-modulation of the driving proton beam.

### References:

- [1] D. F. Gordon et al., IEEE Trans. Plasma Scii., 28(4), 1135 (2000)
- [2] A. Helm et al. to be submitted J. Comput. Phys.
- [3] R. A. Fonseca et. al., Lect. Notes Comp. Sci., 2331, 343 (2002)
- [4] E. Adli et. al., Nature 561, 363–367 (2018)

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