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Full-scale EM-PIC modeling: new developments in the OSIRIS framework RICARDO FONSECA[1], PAULO ABREU, FREDERICO FIÚZA, JOANA MARTINS, JORGE VIEIRA, LUIS SILVA, GoLP / IPFN-LA, FRANK TSUNG, VIKTOR DECYK, WARREN MORI, UCLA — The complexity of the phenomena involved in several relevant plasma physics scenarios, where highly non-linear and kinetic processes dominate, makes purely theoretical descriptions impossible. Further understanding of these scenarios requires detailed numerical modeling, but fully relativistic particle-in-cell codes such as OSIRIS [1] are computationally intensive. We report on the new developments in the OSIRIS framework focusing on performance optimization, new physics models and deployment on new hardware paradigms. We will discuss our implementation of shared memory parallelism, and improvements to the dynamic load balance algorithm for improved scalability of strongly unbalanced physical problem in systems of ~ 0.25 M cores. We will also present our new energy conserving EM-PIC implementation. Finally, we will present our work on deploying the EM-PIC algorithm on state of the art, large scale parallel GPGPU architectures [2].

[1] R. A. Fonseca et al., LNCS 2331, 342, (2002)
[2] V. K. Decyk, T. V. Singh; Comput. Phys. Commun. 182, 641-648 (2011)

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