Abstract Submitted
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Hardware acceleration of PIC codes: tapping into the power of state of the art processing units R.A. FONSECA, DCTI, Instituto Superior de Ciências do Trabalho e da Empresa, Lisboa, Portugal, P. ABREU, S.F. MARTINS, L.O. SILVA, GoLP/Instituto de Plasmas e Fusão Nuclear, Instituto Superior Técnico, Lisboa, Portugal — There are many astrophysical and laboratory scenarios where kinetic effects play an important role. Further understanding of these scenarios requires detailed numerical modeling using fully relativistic three-dimensional kinetic code such as OSIRIS [1]. However, these codes are computationally heavy. Explicitly using available hardware resources such as SIMD units (Altivec/SSE3) [2], cell processors or graphics processing units (GPUs) may allow us to significantly boost performance of these codes. For the most cases, the processing units are limited to single precision arithmetic, and require specific C/C++ code to be used. We present a comparison between double precision and single precision results, focusing both on performance and on the effects on the simulation in terms of algorithm properties. Details on a framework allowing the integration of hardware optimized routines with existing high performance codes in languages other than C is given. Finally, initial results of high performance modules of the PIC algorithm using SIMD units and GPU's will also be presented. [1] R. A. Fonseca et al., LNCS 2331, 342, (2002) [2] K. J. Bowers et al., Phys Plasmas vol. 15 (5) pp. 055703 (2008)

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