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**QED-PIC simulations of electromagnetic cascades at the surface of pulsar's polar cap.** THOMAS GRISMAYER, MARIJA VRANIC, GoLP/IPFN, Instituto Superior Tecnico, Universidade de Lisboa, RICARDO FONSECA, DCTI/ISCTE - Instituto Universitario de Lisboa, LUIS SILVA, GoLP/IPFN, Instituto Superior Tecnico, Universidade de Lisboa — The recent implementation of the QED module in the OSIRIS 3.0 framework has enabled to simulate various scenarios where pair production or gamma-rays emission can be produced with ultra-intense lasers and/or relativistic particles beams [1,2]. In this study we leverage on these numerical tools to study extreme astrophysical scenarios where self-consistent produced electron-positron pair plasmas are of relevance such as in pulsar magnetospheres. The dynamics of pulsar's polar cap cascade, based on the Ruderman-Sutherland model, has been investigated for the first time numerically in one dimension by Timokhin [3]. Including quantum synchrotron radiation additionally to curvature photon radiation for the possible processes responsible for photon emission, we present the results of one and two dimensional QED-PIC simulations of the development of electromagnetic cascades at the surface of the polar cap and the subsequent plasma discharges that are accompanied by strong electrostatic waves. [1] M. Vranic et al., NJP, in press (2016) [2] T. Grismayer et al., Physics of Plasmas 23, 056706 (2016) [3] A. N. Timokhin, Mon. Not. R. Astron. Soc. 408, 20922114 (2010)

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