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Blow-out and self injection in the laser wake field accelerator JORGE VIEIRA, RICARDO FONSECA, LUIS SILVA, GoLP/CFP, Instituto Superior Tecnico, Portugal, WEI LU, MICHAIL TZOUFRAS, FRANK TSUNG, WARREN MORI, University of California Los Angeles, CA 90095, U.S.A. — Recent experimental results showed that electron acceleration via laser wake field is an effective way to accelerate electrons to the hundred of MeV range in high quality beams. Numerical experiments also show that, with present day laser technology, it is feasible to accelerate electrons to the GeV range, in the same regime (the blow out regime), by making use of a parabolic plasma channel to guide the laser. We develop a theoretical model for wave breaking of relativistic plasma waves in the presence of an intense laser pulse, and self injection in a channel, based on the Dawson model for wave-breaking [1], that allowed us to determine the optimized conditions for blow-out and self injection in this regime. The model is compared with 2D and 3D PIC simulations. Scalings derived from the model allow for the design of accelerating stages of high quality self injected beams with energies to 10 GeV with new future laser technology. [1] J.M. Dawson Phys. Rev. 113, 383 (1959)

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