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## Numerical investigation of the lepton self-modulation plasma wakefield acceleration for the E-209 experiment at SLAC-FACET

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Plasma-based wakefield accelerators are promising configurations for future generation linear colliders. The E-209 experiment [1], currently running at SLAC-FACET was proposed to investigate key-physics of the self-modulated [2] plasma wakefield accelerator using uncompressed lepton bunches. Recent E-209 results show evidence of the self-modulation instability using several diagnostics including: coherent transition radiation (CTR), optical transition radiation and particles energy spectrum measurements. Here we present numerical simulations, performed with the fully-relativistic PIC code OSIRIS [3], using parameters that closely follow the experimental bunch and plasma ones. Numerical results indicate that the self-modulation can be detected by CTR diagnostics. In addition, simulations show the presence of a defocused electron/positron bunch halo as seen with the OTR diagnostics. Simulations suggest that the use of bunches with shorter rise times could enhance experimental self-modulation measurements [4].

[1] J.Vieira, et al., Phys .Plasmas 19, 063105 (2012)

[2] N.Kumar, et al., Phys.Rev.Lett.104, 255003 (2010)

[3] R. A. Fonseca, et al., Lect. Notes Comput. Sci. 2331, 342 (2002)

[4] J. Vieira, et al., Plasma Phys. Control Fusion 56, 084014 (2014)

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