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Numerical Study of Self-Modulation with Plasma Density Gradients PABLO ISRAEL MORALES GUZMAN, FABIAN BATSCH, Max Planck Inst for Phys, TATIANA NECHAEVA, Belorusian State University, PATRIC MUGGLI, Max Planck Inst for Phys — We study through numerical simulations the effect of a linear plasma density gradient on the self-modulation of a long proton bunch in plasma. Numerical simulations give access to the details of the self-modulation process and wakefields along the bunch and along the plasma. We obtain characteristics such as the bunch modulation frequency and wakefields frequency and phase evolution, as well as the charge of the modulated bunch. These could then be compared to experimental results that can only be acquired at the end of the 10 m plasma[1]. In addition, they show the effect of the density gradient on the wakefields amplitude, a quantity so far not measured in experiments. We use parameters that are similar to those of the AWAKE experiment[2]. Detailed results will be presented.

[1]F. Braunmueller and T. Nechaeva et al. (AWAKE Collaboration), to be submitted
[2]P. Muggli et al. (AWAKE Collaboration), Plasma Physics and Controlled Fusion, 60(1) 014046 (2017)

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