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Emittance of the accelerated electron bunch in two-stage AWAKE scenario

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AWAKE is a proton-driven plasma wakefield experiment at CERN. Its future goal is to demonstrate a good quality of the accelerated electron beam. One of possible options under consideration for this experiment is a two-stage scenario, in which the electron beam is injected between two plasma cells. In the first plasma cell, the proton beam self-modulates, and the second cell is dedicated for acceleration. Possible energies and emittances of test electron microbunches in this scenario are numerically studied. Effect of strong emittance blow-up is demonstrated and described. The dependence of this effect on the length of the vacuum gap is also studied with simulations.

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