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Growth rate spectrum of the hosing instability in the long-beam overdense regime MARIANA MOREIRA, Instituto Superior Tecnico, CERN, JORGE VIEIRA, Instituto Superior Tecnico, PATRIC MUGGLI, Max Planck Institute for Physics — The hosing instability is still one of the main feasibility risks for plasma wakefield accelerator (PWFA) concepts. Though potential mitigation methods have been discussed extensively in the blow-out regime, less attention has been devoted to hosing in the long-beam, overdense regime[1,2,3], which is relevant for PWFA concepts using a long drive bunch and geared towards high-energy physics applications.

This work presents a fuller picture of the physics of beam hosing in the overdense regime by focusing on the development of the instability when the initial centroid oscillates at a wavelength different than the plasma wavelength λ_p. We use theory and particle-in-cell simulations with OSIRIS to show that the growth rate for beam hosing is a function of the centroid perturbation wavelength with a maximum at λ_p (similarly to laser hosing[4]), and that this property can be exploited to conditionally achieve damping instead of amplification of the centroid oscillation.

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