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Mitigation of the onset of hosing in the linear regime through plasma frequency detuning

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The hosing instability poses a feasibility risk for plasma-based accelerator 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, linear wakefield regime [1,2], which is relevant for PWFA concepts geared towards high-energy physics applications, such as the AWAKE experiment.

We show that the growth rate for hosing in this regime is a function of the centroid perturbation wavelength. We demonstrate how this property can be used to damp centroid oscillations by detuning the plasma response sufficiently early in the development of the instability. We also develop a new theoretical model for the early evolution of hosing.

[1] C. B. Schroeder *et al.*, Phys. Rev. E **86**, 026402 (2012)

[2] J. Vieira *et al.*, Phys. Rev. Lett. **112**, 205001 (2014)

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