

Abstract Submitted  
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**Studies of hosing of a witness beam in plasma based acceleration<sup>1</sup>**

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— A major challenge for the next generation of plasma wakefield acceleration is the preservation of emittance of the witness beam. The hosing instability is one source of emittance of the witness beam that occurs when the witness beam has a transverse offset. A general theory has been developed to describe hosing in the blow-out regime and has shown smaller growth than standard theories. However, these theories have not been rigorously tested with witness beams in the relativistic, non-adiabatic regime of interest to plasma wakefield acceleration. A modified theory using an expansion in azimuthal modes is discussed. This theory alongside 3D QuickPIC simulations are used to study perturbations to the wake structure from point charges with transverse displacements as well as witness beams optimized for beam loading.

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