

Injection tolerances for a quasilinear wakefield accelerator

J. P. Farmer^{1,2}, L. Liang³, R. Ramjiawan², F. M. Velotti², M. Weidl⁴,
E. Gschwendtner², and P. Muggli¹.

¹ *Max Planck Institute for Physics, Munich, Germany*

² *CERN, Geneva, Switzerland*

³ *University of Manchester, Manchester, UK*

⁴ *Max Planck Institute for Plasma Physics, Garching, Germany*

The AWAKE project at CERN harnesses a high-energy proton beam as a driver for wakefield acceleration. Run 2 will allow improved control over the acceleration process by using a separate plasma stage for the self-modulation of the proton driver. The modulated driver will then be injected into a second plasma stage where it is used to accelerate a witness bunch. Although statistical quantities such as emittance and energy spread are useful for describing the witness evolution, the accelerated bunch is ultimately best characterised in terms of its suitability for applications. We here present a figure of merit based on an electron-proton collider, and show how this leads naturally to constraints on both the tunability and stability of the witness bunch parameters at the point where it is injected into the wakefield.