Contribution ID: **201** Type: **talk**

Saturation of the beam-hosing instability in quasi-linear plasma-wakefield accelerators

Tuesday, 26 September 2017 16:20 (20 minutes)

The beam-hosing instability is of key importance for the design of future plasma-wakefield accelerators. While previous work on this topic focused mainly on the blow-out wakefield regime, here we analyze theoretically the BBU for plasma-accelerators in the quasi-linear wakefield regime. Importantly, we show both analytically and numerically that, in this regime, the instability can saturate after a characteristic acceleration distance, due to head-to-tail variations in focusing forces. Thus the BBU in the quasi-linear regime may not as severe as standard scalings would suggest.

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Session Classification: WG6_Parallel

Track Classification: WG6 - Theory and Simulations