



Contribution ID: 69

Type: talk

Modeling and simulation of transverse wakefields in PWFA

Tuesday, September 17, 2019 6:20 PM (20 minutes)

A simplified model describing the PWFA transverse instability in the form of a wake function parameterized only with an effective cavity aperture radius a is benchmarked against QuickPIC simulations. This wake function implies a $1/a^4$ scaling of the transverse wakefields, which indicates transverse intra-beam wakefields typically several orders of magnitude higher than in conventional acceleration structures. The constraint on main beam charge and efficiency imposed by such transverse wakefields is addressed using a simplified theoretical model and numerical simulations, and a mitigation method inspired by BNS damping is also assessed.

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Session Classification: WG6

Track Classification: WG6 - Theory and simulations