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Amplitude Reproducibility of the Self-Modulation Process of a Proton Bunch in Plasma

Tuesday, 23 July 2024 18:00 (1h 30m)

The Advanced WAKefield Experiment (AWAKE) relies on the self-modulation of a long proton bunch in plasma to resonantly excite wakefields. We use a relativistic ionization front to provide initial transverse wakefields for the self-modulation to grow from. It was shown that when the amplitude of the initial transverse wakefields exceeds a given value, a transition between two regimes, self-modulation instability (SMI) and seeded self-modulation (SSM), occurs. In the case of SSM the timing of the self-modulation along the bunch, and thus of the wakefields, becomes reproducible. We now show experimentally that, when transitioning from SMI to SSM, the self-modulation process also becomes more reproducible in amplitude. Amplitude reproducibility is essential for deterministic injection, and energy gain of a witness bunch.

Working group

WG3 : Beam-driven plasma acceleration

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