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Effects of the transverse plasma gradient in the plasma wakefield accelerator

Tuesday 3 June 2025 16:00 (2 hours)

We present basic analytical studies on the effects of the local transverse plasma density fluctuations. We show that in two acceleration schemes (blow-out regime and hollow plasma channel) transverse plasma density gradient results in a transverse wakefield. This, in turn, may lead to significant limitations in the machine's performance. We consider the classical round driver in the transverse coordinates and show, that in the blow-out regime transverse plasma inhomogeneity results in the dipole wake that may deflect the driver and result in housing instability. We show that in the case of a hollow plasma channel, transverse plasma gradient shifts the electromagnetic center of the plasma channel. As a remedy, we propose to consider flat driver injection and show, that a flat driver in the blow-out regime can be robust to the perturbation in transverse plasma density.

Footnotes

Paper preparation format

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Region represented

Europe

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