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Transverse stability in an alternating gradient planar-symmetric dielectric wakefield structure

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In this work we present the result of a Dielectric Wakefield Acceleration (DWA) design that uses a longitudinally varying alternating gradient configuration of a planar-symmetric DWA structure to exploit the inherent quadrupole-mode transverse wakes to achieve second-order stability. We have designed and fabricated a new apparatus for positioning the DWA components in our setup. This allows us to precisely and independently control the gap in both transverse dimensions and consequently the strength of the respective destabilizing fields. We present the effect of various structure configurations on the transverse beam distribution and compare those results to simulation. Our results show that the use of alternating gradient structures in DWA can significantly improve its performance, offering a promising path forward for high-gradient particle acceleration.

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