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Demonstration of transverse stability in an alternating symmetry planar dielectric structure

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Dielectric wakefield acceleration (DWA) is a promising approach to particle acceleration, offering high gradients and compact sizes. However, beam instabilities can limit its effectiveness. In this work, we present the result of a DWA design that uses alternating gradients to counteract quadrupole-mode induced instabilities in the drive beam. Through simulation and experimental results, we show that this approach is effective at suppressing beam breakup, allowing for longer accelerating structures.

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 destabilizing fields.

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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Footnotes

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Yes

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