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Transverse Stability in an Alternating Gradient Planar Dielectric Wakefield Structure

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Dielectric Wakefield Acceleration (DWA) as a practical means of realizing next-generation accelerators is predicated on the ability to sustain the beam-structure interaction over experimentally meaningful length scales. This goal is complicated by the fact that the beams in question inherently couple to transverse modes in addition to the desired longitudinal modes which, if left unaccounted for, lead to a beam breakup instability. We attempt to, in part, address this issue by tackling the quadrupole mode excited in a planar-symmetry dielectric structure. We do so by periodically alternating the orientation of said structure in order to alternate the orientation of the excited quadrupole wake causing the tail of the beam to experience sequential focusing and defocusing fields, stabilizing the interaction. We examine this technique computationally and lay out a planned experiment at the Argonne Wakefield Accelerator to verify it experimentally.

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