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Dielectric Collimators for Beam Delivery Systems

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The collimation systems of the Compact Linear Collider (CLIC) and International Linear Collider (ILC) need to simultaneously fulfill three different functions. These systems must (1) provide adequate halo collimation to reduce the detector background, (2) ensure collimator survival and machine protection against missteered beams, and (3) not significantly amplify incoming trajectory fluctuations via the collimator wakefields.Recent LHC studies have shown the benefits of replacing metal collimators with dielectrics (graphite). We are investigating the possibility of using collimator designs that incorporate dielectrics as a means to reduce wakefields in linear colliders, permitting higher luminosities to be achieved with smaller collimator apertures. Dielectrics provide the additional parameters of permittivity and bulk conductivity to be used in the optimization process. Based on experience with dielectric wakefield accelerating structures, composite dielectric-metal and dielectric-dielectric composite collimators have also been studied. Candidate dielectric materials include graphite and ceramics. We report on the status of our work including our proposed experiment at the SLAC/FACET facility.

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