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Modeling of thermal effects in dielectric wakefield accelerators

PETER STOLTZ, Tech-X Corp., PHILIPPE PIOT, DANIEL MIHALCEA, FRANCOIS LEMERY, Northern Illinois University — An electron bunch passing through a dielectric-lined waveguide generates Čerenkov radiation that can result in a high-peak axial electric field suitable for acceleration of a subsequent bunch. Axial fields beyond gigavolt-per-meter are attainable in structures with sub-mm sizes depending on the achievement of suitable electron bunch parameters. A promising configuration consists of using a planar dielectric structure driven by flat electron bunches. However, a main concern is the thermal loading in the dielectric that will result from a high repetition rate. We present numerical modeling of the temperature rise due to single and multiple bunch passings and also the thermal conduction and cooling requirements.

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