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Parameter studies on dielectric gratings as electron accelerators

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Dielectric laser driven particle acceleration (DLA) is one of the candidates for novel high-gradient technologies to reduce the footprint of large scale particle acceleration facilities. On the other hand these devices can be used to interact with the particle beams of state-of-the-art photon science machines, especially with FELs, to manipulate the longitudinal phase space in a compact and cost effective way. The near-field surface modes of dielectric gratings can be used to interact with particle beams close to the surface. To achieve transversely homogeneous accelerating fields two gratings are opposed. The laser can be coupled from the side into the structure. In this work we present a study on the influence of the geometry parameters of the grating on the acceleration gradient and its transverse uniformity. Based on this study a design for production was chosen, which will be used for experiments at the ARES linac within the SINBAD facility at DESY. This work was carried out within the ACHIP project funded by the Gordon and Betty Moore Foundation (GBMF 4744).

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