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Detailed simulation study of wakefield induced beam dynamics in the dielectric dechirper at CLARA

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Minimising the energy spread within the electron bunch is essential for optimal performance of free electron lasers. Wakefields from corrugated and dielectric structures have been demonstrated to be effective in bunch dechirping. However, the repercussions in beam quality are not yet well understood. Here, a dielectric wakefield structure, manufactured to be included at the CLARA facility, has been studied with simulations. It consists of two planar and orthogonally oriented dielectric waveguides with an adjustable dielectric gap. This structure allows the longitudinal wakefield to compensate the energy spread whilst controlling the undesirable effect of the transverse wakefields on the beam quality. Simulations have been performed at different bunch lengths, bunch energy spreads and dielectric gaps to allow a better understanding of longitudinal and transverse wakefields beam effects within the dechirper.

Footnotes

- Gong, YW. et al (2021). Beam performance of the SHINE dechirper. doi:10.1007/s41365-021-00860-8
- ** Antipov, S. et al (2014). Experimental demonstration of energy-chirp compensation by a tunable dielectric-based structure. doi:10.1103/PhysRevLett.112.114801
- *** Pacey, T. H. et al (2018). Simulation studies for dielectric wakefield programme at CLARA facility. doi:10.1016/j.nima.2017.12.038.

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