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Demonstration of high-charge bunch shaping for wakefield acceleration with high gradient and high transformer ratio

Longitudinal bunch shaping is one of the important challenges for collinear wakefield acceleration due to its impact on acceleration efficiency. While shaping both drive and main beams is important, shaping drive beam is particularly challenging due to the stringent requirement for high charge to achieve a high gradient. The challenge is usually originated from the Coherent Synchrotron Radiation (CSR), which is unavoidable in beamlines using dipole magnets. Several years ago, a method using transverse deflecting cavities (TDC) was introduced to fully avoid the CSR effect on the shaping process. Our collaboration plans to demonstrate the concept in the near future. Once the demonstration is completed, we plan to experimentally investigate the relationship between the transformer ratio and the gradient. Furthermore, we aim to demonstrate high-gradient (~100 MV/m) and high transformer ratio (~90% of ideal) simultaneously. We present the status and preliminary simulation results.

Working group

WG4 : Novel structure acceleration

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