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Development of an Electro-Optic Sampling Beam-Position Monitor at FACET-II

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We report on the ongoing commissioning of a prototype Electro-Optic Sampling Beam Position Monitor (EOS-BPM) at the FACET-II Facility at SLAC National Accelerator Laboratory. In EOS-BPM, a birefringence is induced in two electro-optic crystals on either side of the electron beam's trajectory as it passes by. Laser pulses traveling through each crystal pick up a spacially encoded polarization which is detected. The signal from each crystal provides a single-shot, non-destructive diagnostic of the relative time of arrival of the beam and, in two bunch operation, the longitudinal separation between the drive and witness bunches. By comparing the relative strengths and locations of the signals on each crystal, the instrument can in principle measure the transverse x position and angle of both bunches. We discuss how the installed prototype is currently being employed at FACET-II for plasma acceleration experiments and two bunch commissioning. We present the results of preliminary attempt to commission the beam position and angle monitoring functionality of the prototype. Finally, we discuss engineering improvements to the currently installed instrument as well as work designing and building an improved prototype capable of measuring beam position and angle in both transverse directions.

Working group

WG5 : Beam sources, monitoring and control

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