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BPM-based electron beam trajectory optimization at PITZ

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The Photo Injector Test Facility at DESY in Zeuthen (PITZ) has been developing high brightness electron sources for the XUV and soft X-ray free-electron facility (FLASH) and the European X-Ray Free Electron Laser facility (EuXFEL) at Hamburg. Its research fields have expanded into applications in recent years like THz FELs, and radiation biology for cancer treatment. Since the applications require varying beam parameters (bunch charge from <10 pC up to 4 nC, momentum from 6 MeV/c up to 22 MeV/c), a robust and reliable beam trajectory recovery and correction algorithm has been developed, which allows to fast establish and/or recover a quasi-optimal performance for different experiments. One of the key functions is to make certain quadrupoles steering-free, which is critical for THz FELs and radiation experiments. It also provides a detailed beam trajectory overview by fitting the beam positions measured at beam position monitors (BPMs) using the response matrices and with the earth magnetic fields (EMF) considered, providing a deeper understanding of the intermediate beam trajectory and enabling efficient corrections. In this poster, the analytical model, the robustness test and the experimental performance of this tool will be presented.

Footnotes

Funding Agency

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Yes

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