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Wavefront sensing : Investigating FEL sources and Optics tuning

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For the past 10 years, wavefront sensing has been a crucial component of Free Electron Laser (FEL) facilities. Not only does it help evaluate the quality of the wavefront delivered on the sample and optimize optical systems, but it also opens the door to the new, intriguing field of source metrology. Because of the complexity of the emission process, important parameters such as the effective source position and dimension may be a-priori not known and depend on the required machine optimization. Therby, the idea of aiming wavefront sensing at source characterization is captivating because of its shot-to-shot operability and accuracy, making it suitable as feedback for machine-tuning operations.In such a scenario, the interplay of both source and optics is determinant for the quality of the delivered spot. Here, we will report on the recent advances in both fields at the FERMI XEUV seeded-FEL facility.
On the optics side, we will discuss the application of Hartmann wavefront sensing for pushing to the limit the capabilities of the KAOS active focusing system when operated far away from its ordinary working range. This is necessary to deliver a near collimated beam, and it is becoming increasingly common with the use of auxiliary diffractive optics used to deliver OAM beams.
On the source metrology side, we will show how distinct machine configurations may affect the emitted wavefront, inspect subtle parameters, such as phase shifter, dispersive section currents and the seed delay.

Journal of Synchrotron Radiation Special Issue: will you submit your contribution?

no

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