



Contribution ID: 2185 Contribution code: TUPL011

Type: **Poster Presentation**

## Optimization of the THz SASE FEL at PITZ

*Tuesday, 9 May 2023 16:30 (2 hours)*

A THz SASE FEL is currently under operation at the Photo Injector Test facility at DESY in Zeuthen (PITZ) as a prototype THz source for pump-probe experiments at the European XFEL. This prototype should provide tunable (3-5 THz) narrowband THz radiation with THz pulse energies up to several hundred  $\mu\text{J}$  from 17-20 MeV electron beams with a beam charge of several nC and a peak current up to 200 A to demonstrate the THz SASE FEL concept. In experiments it has been learned that strong space charge effects, steering effects from quadrupoles and possibly geometrical and conductive wall wakefields should be carefully treated during the beam transport from the photocathode to the undulator. These effects have been reduced by applying a smooth beam transport and improving the beam trajectory in the booster accelerator and the quadrupole magnets. Furthermore, the beam trajectory and matching into the undulator is critical for the THz output energy. This has been optimized by the Bayesian optimization algorithm. In this paper, experimental findings regarding the optimization of electron beams and THz radiations will be reported.

### Funding Agency

### Footnotes

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Yes

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**Session Classification:** Tuesday Poster Session

**Track Classification:** MC2: Photon Sources and Electron Accelerators: MC2.A06: Free Electron Lasers