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## Bayesian Optimization for the Control Parameters of the Optical Synchronization System at European XFEL

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Linear particle accelerators require outstanding synchronization of the subsystems to provide high quality results for temporally resolved experiments. Considering the laser-based synchronization system at the European X-Ray Free-Electron Laser, the optimization process involves searching for the global optimum in a high-dimensional parameter space whereby safety constraints are fulfilled. For this purpose, Bayesian optimization is iteratively applied on subspaces of the high-dimensional optimization problem to maintain numerical tractability. Furthermore, modifications to an existing safety mechanism are developed which show significantly improved convergence rates. This opens the applicability to even higher-dimensional problems with high iteration cost.

The developed algorithm was applied on the main branch of the optical synchronization system.

### Summary

**Primary author:** LUEBSEN, Jannis (MSK (Strahlkontrollen))

**Co-authors:** EICHLER, Annika (MSK (Strahlkontrollen)); SCHUETTE, Maximilian (MSK (Strahlkontrollen)); SCHULZ, Sebastian (Deutsches Elektronen-Synchrotron); CALENDRON, Anne-Laure (DESY-CFEL); FELBER, Matthias (MSK (Strahlkontrollen)); KOZAK, Tomasz (DESY - Deutsches Elektronen-Synchrotron); KSCHUEV, Nick (MSK (Strahlkontrollen)); LAMB, Thorsten (DESY); MUELLER, Jost (MSK (Strahlkontrollen)); SCHLARB, Holger (MSK (Strahlkontrollen)); ZUMMACK, Falco (DESY); WERNER, Herbert; ADITYA, Prima

**Presenter:** LUEBSEN, Jannis (MSK (Strahlkontrollen))

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