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SASE Optimization Approaches at FLASH

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The free-electron laser FLASH at DESY can produce SASE-FEL pulses in the extreme ultraviolet to the soft X-ray regime. A superconducting linear accelerator drives two undulator lines (FLASH1 and FLASH2). The FLASH1 undulator beam line contains six fixed gap undulator which implies that the SASE wavelength can only be changed via the electron beam energy, while FLASH2 contains twelve variable gap undulators. Preparing different charges and compression schemes to the two parts of the bunch trains for the two undulator beamlines allows to adjust the phase space in wide range and meeting the various requirements of photon pulse trains properties. In order to improve the SASE performance reference files for standard energies and standard charges are regularly prepared. In the FLASH2 undulator beamline beam-based alignment and phase shifter scans have been applied to improve SASE operations and FEL beam quality. Improving set-up and tuning procedures allow to decrease setup times and optimize performance and stability. Procedures and optimization of FEL parameters towards a reliable SASE-FEL operation as well as the achieved results are discussed.

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