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Experimental Slice Emittance Reduction at PITZ Using Laser Pulse Shaping

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At the Photo Injector Test facility at DESY in Zeuthen (PITZ) photo electron guns for the use at the X-ray free-electron laser (FEL) facilities FLASH and European XFEL are conditioned. An electron beam with high current and low transverse emittance is required for high performance in an X-ray FEL.
As the lasing process occurs on the part of the electron bunch with the highest charge density the emittance of this part is of interest. A scheme to measure the slice emittance which uses a transversely deflecting structure and a single-slit scan has been developed at PITZ. This allows the beam characterisation at low beam energies and high charge densities.
The contribution shows that using laser pulses with temporal flattop shape (and temporal Gaussian shape) or temporal and transverse flattop shape lead to a reduced center slice emittance compared to an electron beam emitted using a laser pulse with temporal Gaussian and transverse flattop shape.

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