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Production of quasi-ellipsoidal photo cathode laser pulses for next generation high brightness photo injectors.

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The use of high brightness electron beams in Free Electron Laser (FEL) applications is of increasing importance. One of the most promising methods to generate such beams is the shaping of the photo cathode laser pulses. It was already demonstrated that temporal and transverse flat-top laser pulses can produce very low emittance beams. Theoretical considerations supported by simulations suggest that further improvements can be achieved using quasi-ellipsoidal laser pulses, namely a reduction in transverse projected emittance at 1 nC bunch charge by 30%.

In a collaboration between DESY, the Institute of Applied Physics (IAP) in Nizhny Novgorod and the Joint Institute of Nuclear Research (JINR) in Dubna such a laser system capable of producing trains of micropulses, where each micropulse has a quasi-ellipsoidal pulse shape, has been developed. The prototype of the system was recently installed at the Photo Injector Test facility at DESY in Zeuthen (PITZ) and is now in the commissioning phase.

In this contribution comparison of beam dynamics simulations for different laser beam shapes, the overall setup, as well as first experimental results of the new laser system will be presented.

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