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Demonstration of a reliable high gain free electron laser driven by a laser plasma accelerator

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Compact free electron laser (FEL) technology enabled by plasma-based accelerators is a rapidly maturing technology with several milestone demonstrations in the last several years. Still, critical work is needed to bridge the gap from proof of concept experiments to reliable operation of laser plasma accelerator (LPA) driven FELs. At the BELLA Center, we have a dedicated facility equipped with a 100 TW laser coupled to an electron beam transport section that culminates in a 4m long, strong focusing undulator. Recent efforts have enabled the production of reliable high quality e-beams which has in turn enabled exponential SASE gain of order 10^3 at 400 nm with gain lengths <20 cm.

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