Ultrafast fiber laser produces record high power

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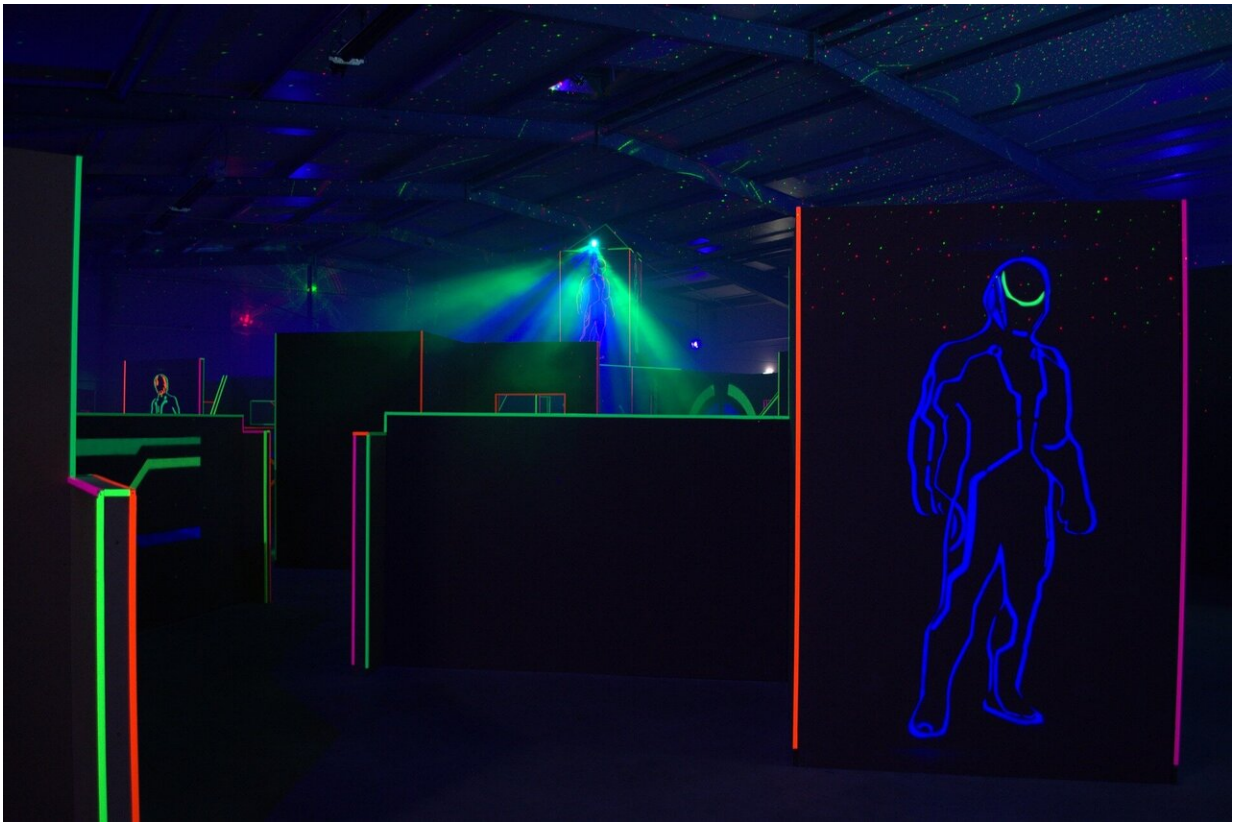

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Researchers have developed an ultrafast fiber laser that delivers an average power more than ten times what is available from today's high-power lasers. The technology is poised to improve industrial-scale

materials processing and paves the way for visionary applications.

Michael Müller, a Ph.D. student of Prof. Jens Limpert from the Friedrich Schiller University's Institute of Applied Physics and the Fraunhofer Institute of Institute for Applied Optics and Precision Engineering in Jena, Germany, will present the new laser at the all-virtual 2020 OSA Laser Congress to be held 12-16 October. The presentation is scheduled for Tuesday, 13 October at 14:30 EDT.

High power without the heat

In lasers, waste heat is generated in the process of light emission. Laser geometries with a large surface-to-volume ratio, such as fibers, can dissipate this heat very well. Thus, an average power of about 1 kilowatt is obtained from today's high-power lasers. Beyond this power, the heat load degrades the beam quality and poses a limit.

To circumvent this limitation, the research team around Müller and Limpert created a new laser that externally combines the output of 12 laser amplifiers. They showed that the laser can produce 10.4 kW average power without degradation of the beam quality. Thermographic imaging of the final beam combiner revealed a marginal heating. Thus, power scaling to the 100-kW level could be accomplished by adding even more amplifier channels.

"In the future, high-power combined lasers not only will accelerate industrial processing, but also enable formerly visionary applications such as laser-driven particle acceleration and space debris removal," said Müller.

The investigation of novel applications at that power level as well as the transfer of the laser technology to commercial systems is ongoing within the frame of the Fraunhofer Cluster of Excellence Advanced Photon

Sources (CAPS), which foremost involves engineering of the laboratory setup into a rugged design. On the research side, the team in Jena now focuses on multicore fibers that offer the potential to deliver even superior performance in simpler and smaller systems.

More information: OSA Laser Congress: www.osa.org/en-us/meetings/osa … ings/laser_congress/

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