New diamond laser 20 times more powerful

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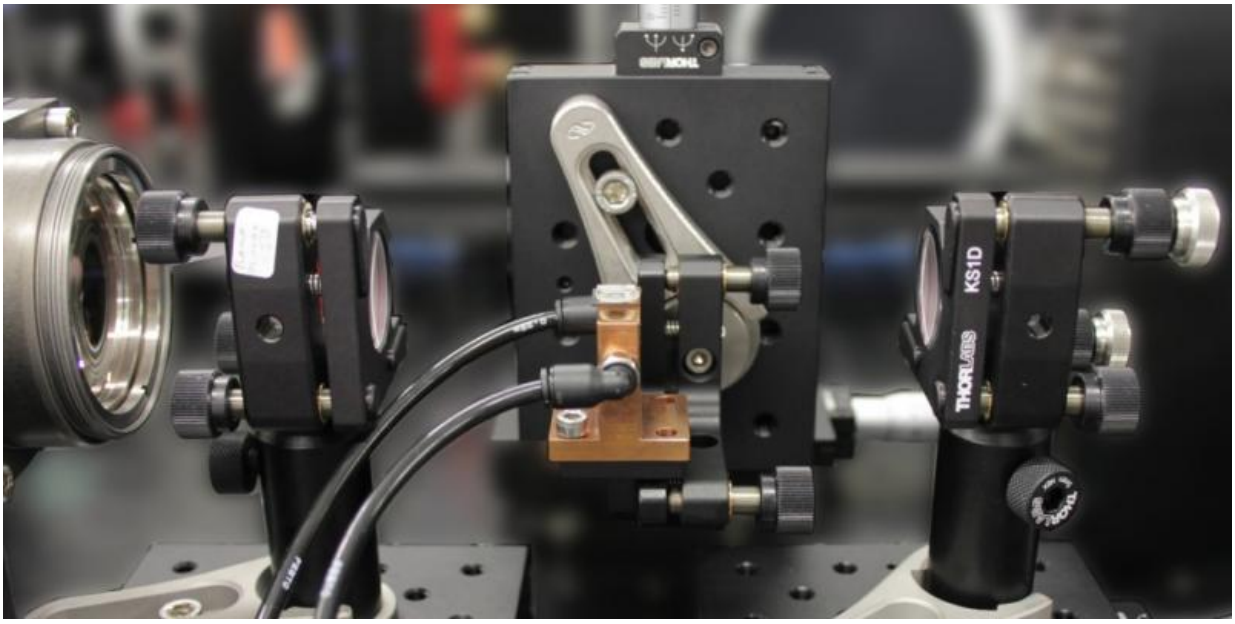

Credit: Dr Robert Williams

Researchers from the MQ Photonics Research Centre joined with fiber laser experts from the Fraunhofer Institute for Applied Optics and Precision Engineering in Jena, Germany to demonstrate a diamond laser 20 times more powerful than previous diamond lasers.

Average power levels were less than 20 Watts, with the new laser now providing up to 380 Watts of output power – the equivalent of approximately 400,000 laser pointers and enough power to easily cut through steel.

High-power diamond lasers are well-suited to applications that require beaming power over long distances, such as optical communications in space, laser ranging, and the tracking and removal of space debris.

Diamond is a relatively new material for creating laser beams, but it is rapidly becoming a technology leader in terms of generating powerful, high-brightness beams at wavelengths, or 'colours', where traditional lasers are not able to shine.

"Just as x-rays pass through flesh to enable us to see bones within a body, different colours of laser radiation can interact or be transmitted by different target materials," said Dr Robert Williams, the lead researcher on the project.

The wavelength of the new diamond laser, at 1240nm, has high transmission through the atmosphere, and is safer to use because of its reduced transmission through the front of the eye and lower risk of damage to the retina.

Diamond lasers have progressed enormously over the last few years due to advances in synthesis of high quality diamond – better than what can be obtained naturally.

"Diamond is an ancient material, yet only now many of its extraordinary properties are becoming evident. High power lasers is one such area that diamond looks like providing a major advantage," said Rich Mildren, Associate Professor in the MQ Photonics Research Centre.

"Diamond crystals seems to naturally fit to high power fiber lasers. It's interesting to see that such a development is now possible and I'm sure much exciting research will follow," said Thomas Schreiber, group leader for the fiber laser research at the Fraunhofer IOF Jena, Germany.

"Around the time of its invention, the laser was famously labelled 'a solution in need of a problem', but now it has penetrated so many aspects of industry, science and our daily lives that the number of applications are countless. A key to unlocking many more applications of lasers will be the development of high-brightness beams at new wavelengths, and diamond is providing just that," said Dr Williams.

More information: "Efficient Raman frequency conversion of high-power fiber lasers in diamond." *Laser & Photon. Rev.*, 9: 405–411. doi: 10.1002/lpor.201500032

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