Scientists build high power cladding-pumped Raman fiber laser at 1.2 μm waveband

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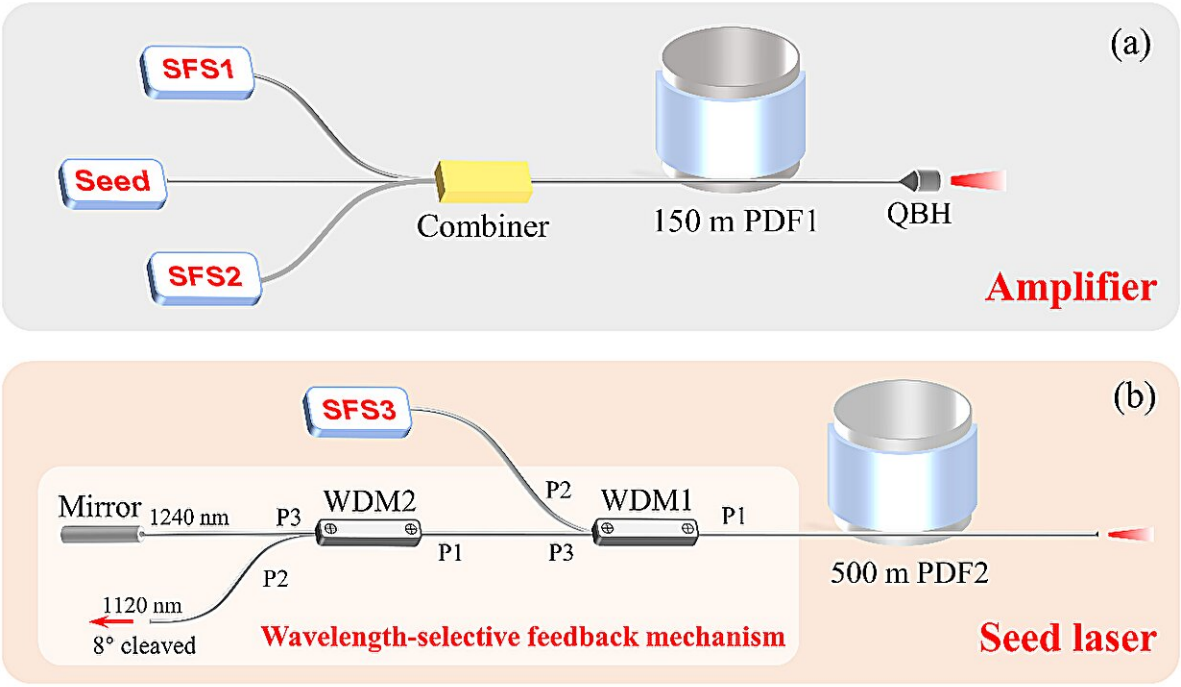

Experimental setup of the (a) high power tunable Raman fiber amplifier and (b) tunable random Raman fiber seed laser at 1.2 μm waveband. PDF, phosphorus-doped fiber; QBH, quartz block head; WDM, wavelength division multiplexer; SFS, superfluorescent fiber source; P1, port 1; P2, port 2; P3, port 3. Credit: Yang Zhang, Jiangming Xu, Junrui Liang, Jun Ye, Sicheng Li, Xiaoya Ma, Zhiyong Pan, Jinyong Leng, Pu Zhou

Laser sources operating at the 1.2 μm wavelength band have some

unique applications in photodynamic therapy, biomedical diagnosis and oxygen sensing. Additionally, they can be adopted as pump sources for mid-infrared optical parametric generation as well as visible light generation by frequency doubling.

Laser generation at 1.2 μm waveband has been achieved with different solid-state lasers including semiconductor lasers, diamond Raman lasers, and fiber lasers. Among these three types, the fiber laser thanks to its simple structure, good beam quality, and operation flexibility, is a great choice for 1.2 μm waveband laser generation.

Researchers led by Prof. Pu Zhou at National University of Defense Technology (NUDT), China, are interested in a high power fiber laser at 1.2 μm waveband. Current high power fiber lasers are mostly ytterbium-doped fiber lasers at 1 μm waveband, and the maximum output at 1.2 μm waveband is limited at 10-watt level.

Their research titled "High power tunable Raman fiber laser at 1.2 μm waveband" is published in *Frontiers of Optoelectronics*.

Their idea is to use stimulated Raman scattering effect in passive fiber to obtain high power laser generation at 1.2 μm waveband. Stimulated Raman scattering effect is a kind of third order nonlinear effect that converts photons into longer wavelengths.

By utilizing stimulated Raman scattering effect in phosphorus-doped fiber, the researchers converted high power ytterbium-doped fiber at 1 μm waveband into 1.2 μm waveband. A Raman signal with power up to 735.8 W at 1,252.7 nm was obtained, which is the highest output power ever reported for fiber lasers at 1.2 μm waveband.

More information: Yang Zhang et al, High power tunable Raman fiber laser at 1.2 μm waveband, *Frontiers of Optoelectronics* (2024). DOI:

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