Wenting Chen from Fudan University poster at **SPIE Photonics West**

Title:

Investigation of temperature influence on output properties of high-power cladding-pumped Er,Yb co-doped fiber laser

250-word text Abstract:

Effect of the fiber's temperature on lasing performance was investigated in high-power, cladding-pumped Er, Yb co-doped fiber laser system. A three-layer symmetric cylindrical model was applied to describe the temperature distribution of the fiber under natural air convection. Radial temperature distribution of the fiber was calculated with consideration of the quantum defect heat, the heat from the absorption of spontaneous emission, and the convection and radiation at the heat transfer boundaries. The steady-state theoretical model based on rate equations took into account of the energy transfers between Er^{3+}-ions and Yb^{3+}-ions and a fraction of nonparticipatory Yb^{3+}-ions. Shooting method and Newton iteration method were used to solve the boundary-value problems under different environment temperatures, pump powers and reflectivities at the fiber ends. Numerical simulations was consistent with experimental results and showed that increasing the fiber's temperature was an effective strategy to suppress the 1 µm parasitic lasing and improve the lasing performance at 1.5 µm, a similar phenomenon was found with enhancing doping concentrations of the two ions and decreasing the reflectivities at the fiber ends. Our numerical results presented a theoretical guideline for further improving the laser performance in terms of output power of ~1.5 µm in high-power Er,Yb-doped fiber laser systems.

100-word text Summary:

Effect of the fiber temperature on lasing performance was investigated in high-power, cladding-pumped, double-clad Er, Yb co-doped fiber laser system. The temperature profile in the fiber was sketched with the consideration of quantum defect heat, heat from the absorption of spontaneous emission, and the convection and radiation at the heat transfer boundaries. It was showed that increasing the fiber's temperature was an effective strategy to suppress 1 µm parasitic lasing and improve the lasing performance at 1.5 µm, a similar phenomenon was found with enhancing doping concentrations of the two ions and decreasing the reflectivities at the fiber ends.