High power Tm:silica fiber lasers: current status, prospects and challenges

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Reported near-diffraction-limited, cw power levels from Tm-doped silica fiber lasers in the 2000-nm wavelength region have now passed the 1 kW level, due to advances in fiber technology, pump lasers and associated pump-coupling fiber optics. Compared to the more common high-power Yb-doped fibers, Tm:silica fibers have several advantages, particularly with respect to limits set by fiber nonlinear effects such as stimulated Brillouin scattering. These have been exploited to allow generation of 600 W of single-frequency, narrow-linewidth power, the most, to our knowledge, of any fiber-based laser. In addition, there have been significant advances in generation of high-peak-power pulses from Tm:fiber-based sources.

In this talk we will review the fundamental properties of Tm:silica and our understanding of the fundamental operational limits of the material compared to other fiber lasers. We also review the current status of the technology and describe efforts to further increase the power levels in a variety of operational modes. Finally, we will show some applications of Tm:silica laser systems.