Chirped Pulse Amplification at 1750 nm Based on Thulium-Doped Core and Terbium-Doped Cladding Fluoride Fibers

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In this work, we demonstrate the generation of watt-class femtosecond pulses in the 1750 nm band utilizing a specialized fiber laser architecture based on a thulium-doped core and terbium-doped cladding fluoride (Tm:Tb:ZBLAN) medium. The initial soliton seed is derived from a femtosecond erbium-doped oscillator driving stimulated Raman scattering within a silica fiber. To facilitate energy scaling, these seed pulses are temporally broadened using a chirped fiber Bragg grating (CFBG) prior to entering a multi-stage Tm:Tb:ZBLAN amplifier cascade. High quality temporal compression of the amplified output down to 222 fs is achieved by leveraging the precise dispersion tuning afforded by the CFBG. Operating at a 4 MHz repetition rate, the system successfully delivers peak single-pulse energies up to 250 nJ alongside an average output power of approximately 1 W. These robust performance characteristics make this laser source an optimal driver for advanced multiphoton microscopy applications.