High-power Terahertz sources based on modelocked thin-disk oscillators

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The performance of ultrafast laser systems has seen tremendous progress in the last decades, continuously giving momentum to many fields of science and technology. In particular, the average power of ultrafast sources has seen extremely fast progress. Nowadays, ultrafast laser systems delivering hundreds of watts to kilowatts of average power with pulse energies ranging from hundreds of microjoules to hundreds of millijoules start to be even commercially available, based on optimal geometries such as fiber, slabs and disks. In particular, disk lasers have consistently been at the forefront of latest progress. Their geometry is particularly well-suited for power and energy scaling of ultrashort pulses: the thin, disk-shaped gain medium combined with large mode areas, results both in nearly unrestricted power scalability, and low accumulated nonlinearities. Among these laser systems based on the disk technology, one particular technology has attracted attention as a potential path to achieve the desired level from a simple, one-box, multi-MHz repetition rate oscillator: modelocked thin-disk oscillators can reach hundreds of watts of average power with femtosecond pulses at multi-MHz repetition rate. In this talk, we will discuss ultrafast disk technology, current challenges and research directions, and present one application area which is the generation high average power THz radiation.