

# **Trends, challenges and applications of high-average power ultrafast lasers**

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The first part of the lecture will focus on providing basic tools for understanding ultrashort pulse generation and amplification with specific emphasis on how to generate such pulses at high average power. We will briefly review the three main technologies that have resulted in major advances in the generation of high average power ultrafast lasers, namely slabs, fibers and thin-disk lasers.

Following this, we will review in detail ultrafast thin-disk laser technology as an example of a technology that has progressed particularly fast in the last decade. We will present an in-depth discussion about the geometry, the specific technological aspects of generating ultrashort pulses in this geometry and discuss the latest state-of-the-art and potential future developments.

Last but not least, we will focus our attention on some of the main areas that drive the development of these high-average power ultrafast lasers: their potential as drivers for secondary sources from the THz to the XUV and other direct scientific and industrial applications.