

Ultrafast laser applications development in EU Project TiSaTD: ultrafast high-average Power Ti:Sapphire Thin-Disk Oscillators and Amplifiers

D. KARNAKIS*, N.BELLINI, R.GEREMIA, S.TUOHY

¹*Oxford Lasers Ltd, Unit 8 Moorbrook Park, Didcot, OX11 7HP United Kingdom*

*Corresponding author: Tel: +44 (0)1235 814 433; E-mail:
dimitris.karnakis@oxfordlasers.com

EU project TiSa TD aims to demonstrate industrial high-average power ultrafast Ti:sapphire (Ti:Sa) lasers and their application to high-productivity precision micromachining of mainly transparent materials like glass, sapphire, diamond and ceramics. Thin Ti:Sa disks cooled on both faces using transparent diamond heat spreaders are employed to achieve the targeted high output powers >100W. The Ti:Sa TD consortium comprises laser technology research centres (Universität Stuttgart, CNRS FEMTO-ST), and industrial partners (Oxford Lasers Ltd, M Squared Lasers Ltd, Thales Optronique S.A., Element Six Ltd, Kite Innovation) from Germany, France and the UK. The goal of the project is to achieve an average output power of 200 W at pulse duration of 100 fs and max pulse energy of 20 μ J. A chirped-pulse Ti:Sa thin-disk amplifier with 200 W average output power and 10 mJ pulse energy will also be developed. Oxford Lasers is in charge of laser applications development.

Here we will present recent advances in both the ultrafast laser sources development and mainly laser micromachining of both transparent dielectrics (cutting, milling, drilling, welding) as well as surface processing results at high MHz rate for controlled wetting. Special optical beam delivery schemes are designed to tailor the focused light in volume as needed or for high speed laser scanning. Experimental results will present achieved feature quality, surface roughness, removal rate, practical feasibility. The technology's merits will be discussed in terms of process optimization and consistency for demanding industrial applications.

This research has received funding from the European Union Seventh Framework Programme [ICT-2013.3.2- Photonics] under grant agreement n°619177.

www.tisa-td.eu

