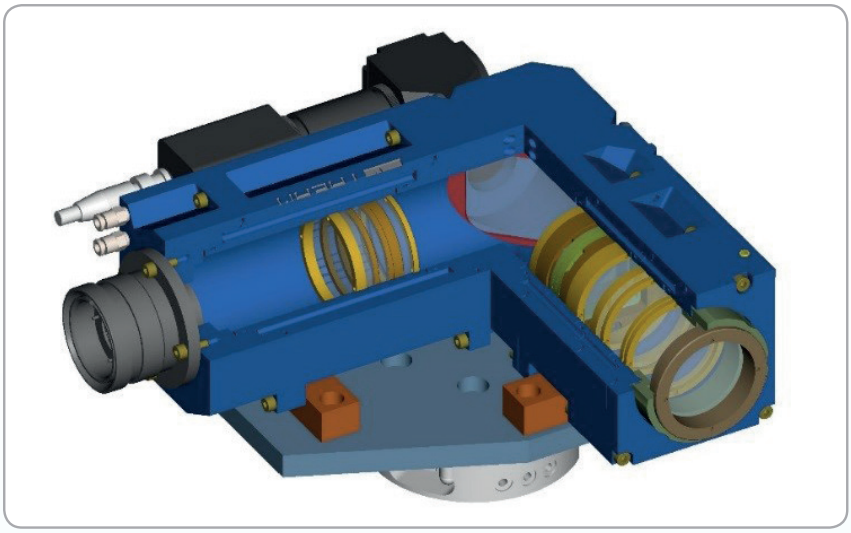
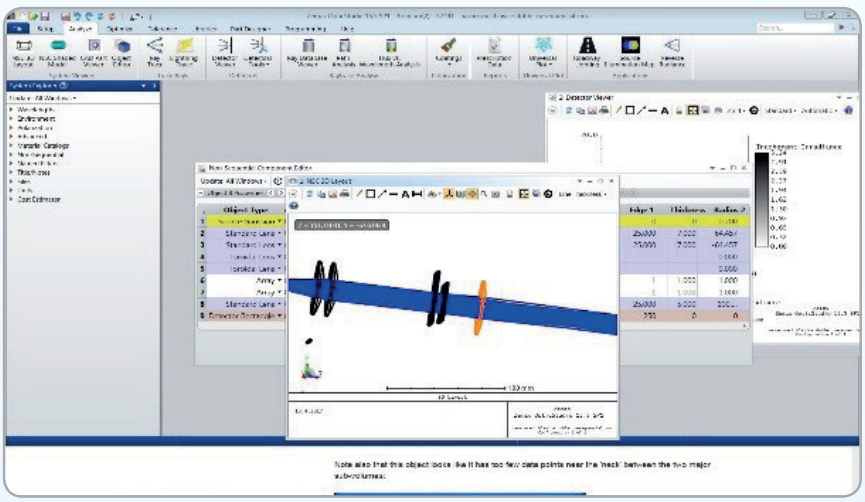
Project no.:	FV10071
Provider:	Ministry of Industry and Trade
Realization period:	1st September 2016 – 31st December 2019

Project Title:

New Generation of Laser Processing Optics



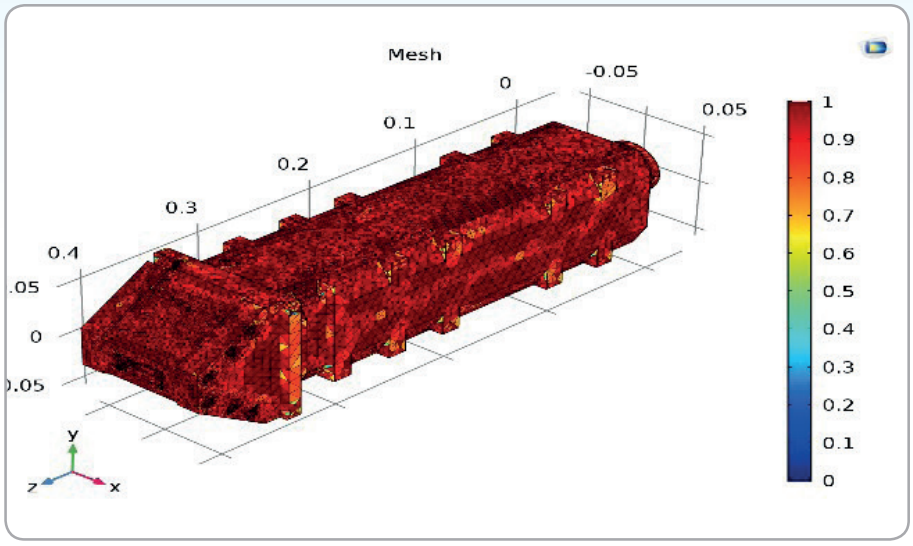
The project is characterized by innovations which lie in the improvement of optical, mechanical, as well as optoelectronic construction of high performance laser processing heads. As far as optics is concerned, the development team is solving not only a highly functional design from the point of view of optimizing beam propagation through the system to achieve the greatest consistency of the system with respect to beam energy, but is also exploring thin films, heat removal from optical components, high beam homogeneity, or possibility of temperature measurement in the machined area by a pyroelectronic sensor field. The main motivation of the project is the development and realization of new laser heads with power of up to 20 kW and the reduction of the number of optical components contained inside the head with the help of free-form elements and aspherical lenses, which will also reduce the weight of the laser head. This involves the development of technological processes in the field of optical design, followed by the development of thin film technologies and subsequent measurements.

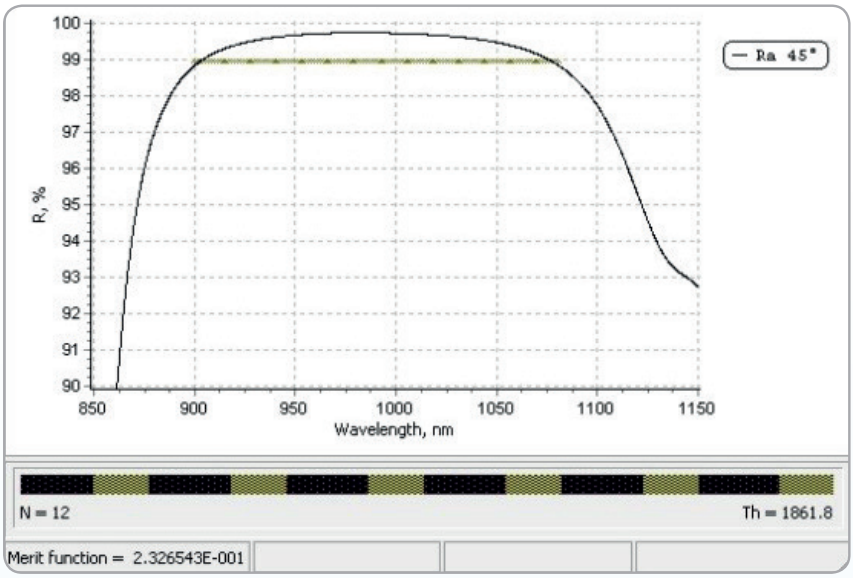


The project is realized in cooperation with LaserTherm s.r.o., a Czech manufacturer of industrial

laser heads. While the TOPTEC Centre is carrying out the optical design, thin film development for high-performance lasers, and thermal analyses, LaserTherm is developing the mechanical design of the laser heads, optical simulations and testing of models and their implementation into production.

Our team performs research and development tasks in the following areas:





- **optical design** – use of Zemax software for optical design and tolerance analysis of advanced optical systems with free-form elements; active optics design for laser applications
- **thermal analysis** – study of thermal energy generated by the passage of a laser beam, determination of temperature on optical elements, change of refractive index due to temperature, beam analysis of heated optical components
- **development of thin layers for laser applications** – development of anti-reflective and super-reflective thin film coatings, field strength and robustness simulation, testing of a new layer deposition process, high performance thin-film coatings.

As part of the project realization, we have developed and subsequently optimized free-form mirror surfaces which we are going to protect by a trademark (patent, utility model). Currently we are preparing two Prototypes of free-form optics and three publications in science magazines.