

# ABSTRACT

Master Thesis Subject:

Development of web-based Ultra Fast LASER Simulation Software for Organic Photovoltaic electrode patterning *-LMM-*

The Ultra-fast lasers (UFLs), being a chemical-free, non-contact, automation and micro-machining adaptable technology, can be considered a cost-effective and reliable tool for material ablation and patterning. Because of the UFL “athermal” process, they can produce high-quality and controllable micro-machining.

Thin film layers of organic and inorganic materials constitute the future building blocks of organic electronic devices. One of the most active and promising branches of organic electronics today, is the Organic Photovoltaics (OPVs), which are a low-cost source of renewable energy. A factor of utmost importance that affects the OPV modules’ throughput is the formation of electrodes such as ITO and ITO/ZnO. To ensure electrical isolation, the laser parameters have to be appropriately determined in order to selectively subtract small ITO or ITO/ZnO parts from PET flexible substrate.

The laser processing parameters and the manipulation of patterns for electrode formation, can be effectively controlled by the LMM simulation software. LMM is a web-based simulation software for S2S application. It is easy-to-use, self-explanatory with short-time responses, and with no specific user orientation (no necessity of any experience). It is ASP.NET (C#) web-site, and integrates JavaScript for the graphical visualization, HTML&CSS for design and structure of the web page. LMM simulates the patterning process by showing/displaying in animation the laser’s galvo-scanner movements. User can observe and change the way that patterning will be performed. In addition, LMM gives a reliable (being within a small margin of error) profile simulation of ITO and ITO/ZnO scribes, by calculating the parameters that user gives.

In general, LMM is a time and cost-effective solution for scribing simulation. A further optimization in software, in conjunction with an integration of mark recognition set-up, would be an optimal solution for future R2R applications.