MULTIMODAL FLUORESCENCE & NONLINEAR IMAGING OF FEMTOSECOND LASER INDUCED STRUCTURING WITH STRUCTURED LIGHT

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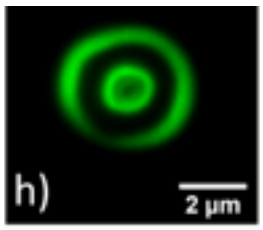
1. INTRODUCTION

Three-dimension femtosecond (fs) laser processing of inorganic materials has a huge potential for innovative developments and industrial manufacturing, thanks to its highly transferable and scalable behavior in terms of repeatability, stability and high precision. Many promising demonstrations of fully integrated optical devices have already been reported of 3D high-density perennial optical data storage, lab-on-chip micro-fluidics, or quantum information based on multiplexed coupled waveguide networks. Since most of these achievements have been obtained by irradiating standard optical materials with standard Gaussian beams, there is still room for new breakthroughs : (i) new abilities and optical properties will rise from the development of new tailored materials [1], and (ii) new patterns, topologies and multi-scale architectures will be reached by considering structured light bearing orbital momentum and optical phase/polarization singularities [2].

2. MULTI-MODAL IMAGING OF VORTEX-INDUCED STRUCTURES



Fs laser structuring of our non-conventional silver-containing glasses allows for the 3D production of intense fluorescent and nonlinear optical structures [3] with original patterns while considering complexe light (see Figure, [2]). Multimodal imaging shows sub-diffraction inner dimensions and provides a comprehensive description of the laser induced processes. These results, also giving access to plasmonic effective dielectric/metal media [4] and being transferable to fibers [5], pave the way to super-resolution laser structuring in inorganic photosensitive glasses, so as to compete nanoscale manufacturing technologies.

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