

Seminar

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ULTRAFAST LASER MICROMACHINING IN DIFFERENT CRYSTALS USING PULSED BESSEL BEAMS

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Sala Wataghin, Physics Department, via Pietro Giuria 1, Torino

Abstract

Lasers are now widely applied in scientific and industrial applications due to a highly directional and localized material modification at precise locations. The use of ultrafast lasers with picosecond and femtosecond pulse durations can overcome the limitations such as cracking effects, heat effects and additional collateral damages in micro and nano fabrication of different materials due to the deposition of energy before the thermal diffusion thus giving an unparalleled control in chiselling the desired structures both internally and on the surface.

The standard technique for micromachining makes use of focused Gaussian beam which is characterised with a short focus. But recently, non-conventional beams such as Bessel beams have become widely used in ultrafast laser micromachining of transparent materials. On contrary to the conventional Gaussian beams, these particular beams are characterised with very long, elongated focal zone due to their non-diffracting nature. This helps in creating very high aspect-ratio microstructures without the need for sample translation.

This talk focuses on ultrafast laser fabrication of crystals, mainly diamond and sapphire, for various applications in photonics, microfluidics and semiconductor industries using Bessel beams. This includes creation of in-bulk conductive electrodes, micro-through holes and their characterisation and further analysis.



Speaker:



Akhil Kuriakose was born in Kerala (India) in 1994. He received his Integrated Master's degree in Photonics in 2019 from Cochin University of Science And Technology. His undergraduate thesis was carried out at International School of Photonics, CUSAT and was focused on synthesis of platinum nanoparticles using laser ablation for photocatalytic applications. His master thesis investigated the rate of nuclear fusion in graphite for Inertial Electrostatic Confinement systems and was conducted at Fusion-Plasma Group, University of Sydney. He also spent significant amount of time as an intern at Indira Gandhi Centre for Atomic Research in India working on Ab-Initio studies on the ground state properties of nuclear materials.

Akhil is currently a doctoral student at the University of Insubria as a part of LaslonDef project and is working at CNR-IFN on femtosecond laser micromachining of diamond using Bessel beams for wave guiding and microfluidic applications under the supervision of Dr. Ottavia Jedrkiewicz.