



Contribution ID: 14

Type: **not specified**

Nonlinear optics with ultrashort mid-infrared laser pulses

Thursday, 28 January 2021 10:20 (10 minutes)

In the past two decades, there has been a growing interest and investment in the study of ultrafast optics in the mid-infrared (MIR 2-12 μm) region. Mainly because most gaseous and biomolecules have their fundamental vibrational absorptions within this range, leaving distinctive spectral fingerprints of key importance for industrial, medical, and scientific applications.

The first generation of high-energy and high-efficiency laser sources in the MIR region has only a few years of existence and Instituto Superior Técnico (IST) has recently installed one of these new state-of-the-art laser sources. This thesis aims to explore this new laser system, particularly its characterization and the development of the first series of experiments. These will consist of SuperContinuum Generation (SCG) and High-Harmonic Generation (HHG) and will be performed at the Laboratory for Intense Lasers (L2I) in IST. A numerical simulation will then support the experimental results.

By the end of the thesis, it is expected to present this work at an international conference and co-author a paper in an international scientific journal.

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