Session: OS-O-MON-02

Optics and Instrumentation 1

14:00–15:30 / Room 2

OS-O-MON-02-01

(Invited Paper) Compact Laser Accelerators Towards Medical Applications – perspectives for a Brazilian Program

Nilson Vieira, Ricardo E. Samad, and Edison P Maldonado

14:00–14:30 / Room 2

Laser particle acceleration is now in a new trend due to an enormous worldwide effort to increase the peak power of femtosecond lasers, as well as increasing their average power in order to make them useful for applications. The leading example is the Extreme Light Infrastructure in Europe, which has led to the establishment of three large research facilities in the Czech Republic, Romania and Hungary that host some of the most powerful lasers world-wide (above PW peak power). This action is now being followed by the USA LaserNetUS initiative, that comprises all the big laser facilities in US, and similar efforts also happen in Asia. We are starting a program to establish a laser accelerator facility in Brazil, aiming to produce radiation (electrons, protons and X rays) to be used in medical applications, like X ray and electron therapy, nuclear reactions and, eventually, protontherapy.

OS-O-MON-02-02

Assessment of burn wounds status using mid-infrared spectroscopy

Pedro Castro, Cassio Lima, Telma Zorn, and Denise M. Zezell

14:30–14:50 / Room 2

Burns are one of the major causes of morbidity and the most costly traumatic injuries worldwide. Better understanding of the molecular mechanisms associated with wound healing might provide improved clinical strategies to speed up the tissue repair process and reduce the global impact of burns on public health services. The traditional techniques used to assess the biochemical events related to wound repair are laborious, time-consuming and require multiple staining. Thus, the present study aims to evaluate the feasibility of Fourier transform infrared (FTIR) spectroscopy in order to monitor the progress and healing status of burn wounds. Third-degree burn injuries were induced on Wistar rats by water vapor exposure. Afterwards, biopsies specimen was extracted for further histopathological examination and spectroscopic evaluation at 4 time-points (3, 7, 14 and 21 days). Raw spectral data were offset-corrected and normalized by amide I band area. The second derivatives were compared by the Principal Component Analysis

(PCA). On days 3 and 7, when compared to healthy group, biomolecules bands were most prominent. However, on days 14 and 21, these molecular bands decreased. Therefore, our pairwise comparison revealed that metabolic activity induced by thermal injury decreases as the healing process progresses. Our findings show that FTIR spectroscopy can monitor the biochemical development induced by burn injury and detect the status of wound repair. This study was supported by CEPID/FAPESP 05/51689-2, CAPES/PROCAD 88881.068505/2014-01, CNPq (INCT-465763/2014/6, Phd-grant-141946/2018-0 and 141629/2015-0, PQ-309902/2017-7).

OS-O-MON-02-03

Performance Evaluation of the ADI-FDTD Method on the Simulation of Optical Devices

Licinius Alcantara, and Carlos Alberto De Francisco

14:50–15:10 / Room 2

This work checks the accuracy of the ADI-FDTD method for simulations of guided optical propagation regarding two optical devices: a directional coupler and a distributed Bragg reflector in a planar waveguide. The results show that despite the ADI-FDTD method is unconditionally stable as the numerical time step increases, which reduces the total time steps and the runtime compared with the conventional explicit FDTD method, its precision otherwise may decline at a level that may prevent an accurate assessment of the optical devices operational characteristics.

OS-O-MON-02-04

Sub-20 fs UV spectroscopy to track primary photoinduced processes in Thiobases

Danielle Cristina Teles Ferreira, Rocio Borrego-Varillas, Lucia Ganzer, Cristian Manzoni, Giulio Cerullo, Irene Conti, Artur Nenov, Marco Garavelli, and Ana Maria de Paula

15:10–15:30 / Room 2

Thiobases are DNA or RNA nucleobases where an exocyclic carbonyl oxygen is replaced by a sulfur atom [1]. Thiation induces a red-shift in the absorption spectrum and causes also a dramatic change in the photophysics with respect to the canonical nucleobases: while in DNA/RNA monomers internal conversion S1→S0 mediated by a conical intersection (CI) is the main deactivation channel, the major relaxation pathway in thiobases is via the population of triplet states via an ultrafast intersystem crossing (ISC). Thiobases have attracted much interest in the last few years due to their photo-therapeutic applications [1]. In spite of that, their ultrafast deactivation mechanisms are not yet