

## Winter College on Optics 2016- ICTP- Trieste

### **Title: Photonics and optics applications: from Time and Frequency metrology to Biomedical Engineer**

**Authors's names:** Marcello Magri Amara<sup>1,2</sup>, Ícaro Teixeira Lima<sup>1</sup>, Daniel Varela<sup>3</sup>, Guilherme Garcia<sup>1</sup>, Luiz Vicente Gomes Tarelho<sup>1</sup>, Denise Maria Zezell<sup>2</sup>

#### **Authors's affiliations:**

1 Division of Metrology for Information and Communication Technology (Dmtic) – INMETRO – Duque de Caxias, RJ

2 Center for Lasers and Applications, IPEN-CNEN/SP, São Paulo, Brazil

3 Escola de Engenharia de São Carlos, Universidade de São Paulo, São Carlos, Brazil

**Abstract:** Optical and photonic techniques have been applied on a broad range of problems from different fields of science. It has an important role on the solution of not only several physical problems but also of biological ones, too. Nowadays, laser technology is broadly applied from daily dentistry clinical procedures to industrial cutting machines. Moreover, spectroscopy is also applied from analysis of biological tissue to interrogation of atomic cesium (Cs) at time and frequency metrology. Additionally, interferometric techniques have been applied for vibration measurement, optical fiber fail detection and retinal diagnostics; particularly OCT (Optical Coherence Tomography) is one of these techniques.

In this work, we briefly present our development at INMETRO (Brazilian National Metrology Institute) in the Primary Time and Frequency Laboratory, showing the importance of optics and photonics on daily work, specially the role of laser frequency stabilization and atomic spectroscopy on Brazilian Thermal Cs Beam Primary Frequency Standard (primary atomic clock).

Furthermore, we show our work in biomedical applications at IPEN (Nuclear and Energetic National Institute) in the Biophotonics Laboratory of the Center for Lasers and Applications, presenting the interferometry technique (OCT) for odontology and dermatology applications.

Even though, they seem to be subjects very different and apart they are under the same knowledge area. Summarizing, the study of optics and photonics techniques has allowed to apply this knowledge to apparently different subjects achieving relevant results for Brazilian Metrology and the Biomedical Engineering field.