

**Theory, developments and applications of optical coherence tomography**

Anderson Zanardi de Freitas, Denise Maria Zezell, Nilson Dias Vieira Jr.  
*Instituto de Pesquisas Energéticas e Nucleares - IPEN/CNEN/SP*

In this work, we review the developments in optical coherence tomography (OCT) for three-dimensional non-invasive imaging. Two different OCT techniques are discussed in some detail including time-domain and polarization sensitive OCT. The current and potential applications of OCT are discussed, with close attention paid to biomedical imaging. Some experiments are discussed in details, with particular attention in biomedical applications with hard tissue. The polarization properties of tissue are discussed by analyzing the Stokes vector and the Mueller matrix that provide a complete characterization of the optical polarization properties of biological tissue. Two-dimensional depth resolved images of both the Stokes vectors of the backscattered light and the full Mueller matrices of biological tissue were measured with this system. These polarization measurements revealed some tissue structures that are not perceptible with standard OCT.