

# CADERNO DE RESUMOS DA V ESCOLA DE VERÃO DE FÍSICA DE CURITIBA



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## DERIVATIVE OPTICAL IMAGING TECHNIQUE (DOIT)

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This work introduces an innovative laser scanning optical imaging acquisition technique employing a cylindrical lens, single-element detection (photodetector), and a temporal signal derivation for image recovery. The use of a cylindrical lens generates a line that can be focused onto a sample, facilitating rapid two-dimensional image acquisition by requiring only one-axis scanning. To obtain the one-dimensional cross-sections of the sample, we encode the position information using an optical chopper, which gradually obstructs the laser beam line as the chopper's blade rotates. The sample's image information along the line is then extracted through temporal derivation of the signal collected by the photodetector. This enables the transformation of the collected signal into an intensity mapping corresponding to the unique spatial locations of each point along the geometric line of the beam. Consequently, scanning along the axis perpendicular to the laser propagation direction enables the acquisition of a two-dimensional sample image. The Derivative Optical Imaging Technique (DOIT) emerges as a powerful tool due to its relatively simple optical setup, fast image acquisition, compatibility with unusual wavelengths where an array camera is unavailable, potential to work with scattering samples, etc. Furthermore, it is adaptable to linear and nonlinear optical processes for image acquisition and resolution enhancement. Therefore, this work demonstrates this derivative microscope's operational principles, along with presenting the obtained results and comparing them with other existing microscopy techniques.