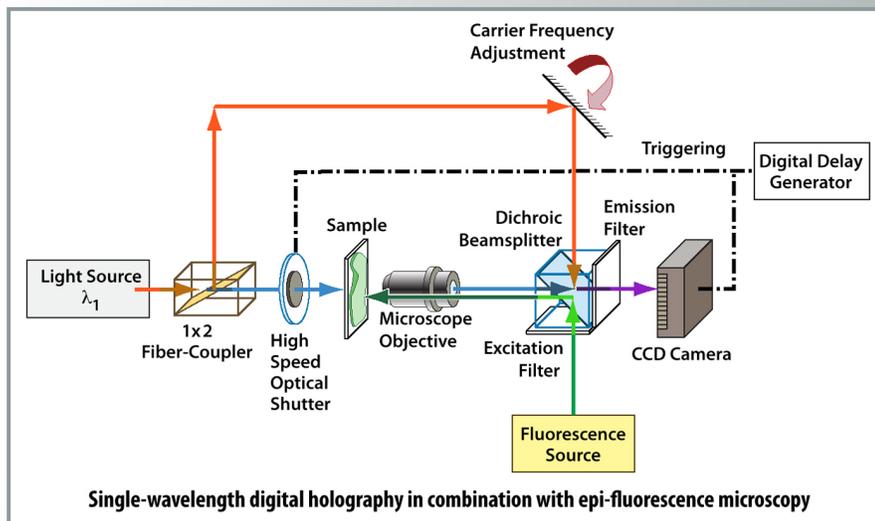


Combined Quantitative Phase-Contrast and Epi-Fluorescence Microscope

UT-B ID 200802153



Technology Summary

ORNL researchers invented a combined quantitative phase and fluorescence microscopic instrument with real-time performance. This optical system provides a means to simultaneously study living samples with two different yet complementary microscopic techniques. Users of this invention will be able to study both structural changes and shape variations in biological processes. Conventional bright-field microscopes do not offer the same capability.

The invention offers a way of analyzing the relationship between cellular morphology and functionality and can be used to monitor dynamic processes such as drug delivery and progression of diseases. The system also has the ability to quantify the optical path length changes. This calculation allows researchers to investigate morphological variations associated with dynamic biological processes, such as drug delivery, disease progression, or general pathology.

To obtain the quantitative phase information, the invention uses a multiple-wavelength digital holographic approach. This method supports a deterministic method of obtaining phase information and eliminates the need for time-consuming algorithms. The objective of this approach is to obtain the quantitative phase information both deterministically and with high speed, and in combination with the fluorescence information.

Advantages

- Noninvasive, real-time study of specimen physical structure/refractive index
- Fast image acquisition
- Reduced errors due to elimination of phase unwrapping algorithms
- Enables identification of individual cell structures
- Enables analysis of relationship between cellular morphology and functionality

Potential Applications

- Quantitative bright field/phase contrast and epi-fluorescence biological microscope
- Imaging of live cells
- Measuring internal structures of a specimen
- Dynamic process monitoring such as drug delivery or disease progression

Patent

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