

# POLARIZED PHOTON PAIR CONFOCAL MICROSCOPE FOR A SCATTERING MEDIUM

Hsiu-Fong Chang<sup>1,2</sup>, Chien Chou<sup>1,2</sup>, Hon-Fai Yau<sup>1</sup>

<sup>1</sup>Institute of Radiological Sciences, National Yang Ming University,  
Peitou, Taipei, Taiwan 112

<sup>2</sup>Institute of Optical Sciences, National Central University,  
Jhongli, Taoyuan, Taiwan 320

E-mail: [cchou@ym.edu.tw](mailto:cchou@ym.edu.tw), [hfchang@ios.ncu.edu.tw](mailto:hfchang@ios.ncu.edu.tw)

**KEY WORDS:** Scattering media, polarization, optical heterodyne, imaging, photon pair, confocal microscopy

A novel confocal microscope designed to see things in a turbid medium is proposed. We use a Zeeman laser as the source. Due to the two frequencies feature of the Zeeman laser and the common path feature of these two components, the microscope thus incorporates three gatings (spatial gating, polarization gating and spatial coherence gating) in it. As a result, the proposed microscope looks deeper into a turbid medium or works with a denser medium, and the depth resolution is better.

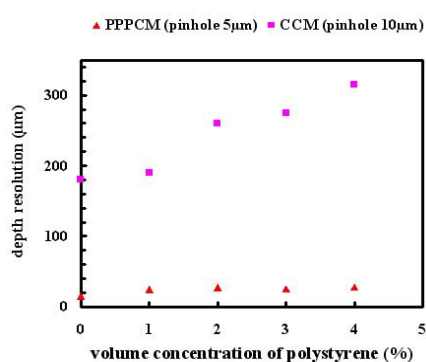


Fig.1 The depth resolution of polarized photon pair confocal microscope(PPPCM) and CCM.

The performance on depth resolution of polarized photon pair confocal microscope compared to convention confocal microscope (CCM) is shown in Fig.1. We think that this superior behavior of polarized photon pair confocal microscope is due to the successful suppression of diffused photons, and the successful mechanism of the cancellation of the aberration.

## REFERENCES

- [1] L. C. Peng, C. Chou, C. W. Lyu, and J. C. Hsieh, "Zeeman laser-scanning confocal microscopy in turbid media," *Opt. Lett.*, **26**, 349-352 (2001).
- [2] M. Kempe, A. Z. Genack, W. Rudolph and P. Dorn, "Ballistic and diffuse light detection in confocal and heterodyne imaging systems," *J. Opt. Soc. Am. A*, **14**, 216-223 (1997).
- [3] T. Wilson and A. R. Carlini, "Size of the detector in confocal imaging systems," *Opt. Lett.*, **26**, 227-229 (1987).