Canadian Association of Physicists
Association canadienne des physiciens et physiciennes

Contribution ID: **4205** Type: **Poster Competition (Graduate Student) / Compétition affiches (Étudiant(e) 2e ou 3e cycle)**

(G*) (POS-25)The importance of instrument effects on light polarization when imaging retinal biomarkers of brain diseases

Tuesday 28 May 2024 18:13 (2 minutes)

Introduction
Understanding how the polarization states of light are affected by the optical components in a confocal scanning light ophthalmoscope (CSLO) is essential for the development of a novel retinal polarimetry imaging instrument, to be used in in vivo retinal imaging for the detection of protein biomarkers of brain diseases. We measured, modeled, and investigated compensation of the changes in light polarization upon interaction with mirrors, lenses and beam splitters in the instrument.
Methods
The influence of different beam splitters (BS) on different states of polarized light (including linear, circular, and elliptical) was measured experimentally, using a standard Stokes polarimeter. The polarization states were measured without and with the components in the light path (λ=633nm). Interactions with polarized light were calculated from measurements. Additional effects of other previously used CSLO components, as a function of angle of view, were modeled using polarization ray tracing in CODE V, an optical design software package.
Results
The non polarizing BS, mirrors and lenses have a significant ($p_{adj}<0.05$) but relatively small effects on polarized light states. The dichroic BS (which separates different wavelengths) had a much larger effect, systematically reversing the handedness of light ($p_{adj}<0.05$). We discuss how the larger effects can be compensated and polarization states optimized when using polarized light to create visible retinal biomarkers of brain diseases.
Conclusions
To make retinal biomarkers of interest more visible, the large effects of dichroic beam splitters on the polarization states of light need to be compensated during measurements [1]. Other optical components have smaller effects which can be accounted for following the measurements.
References
[1] Bélanger, E., Turcotte, R., Daradich, A., Sadetsky, G., Gravel, P., Bachand, K., De Koninck, Y., & Côté, D. C. (2015). Maintaining polarization in polarimetric multiphoton microscopy. Journal of Biophotonics, 8(11-12), 884–888. https://doi.org/10.1002/jbio.201400116

Keyword-1

Retinal imaging

Keyword-2

Neurodegenerative diseases

Keyword-3

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Session Classification: DPMB Poster Session & Student Poster Competition (28) | Session d'affiches DPMB et concours d'affiches étudiantes (28)

Track Classification: Technical Sessions / Sessions techniques: Physics in Medicine and Biology / Physique en médecine et en biologie (DPMB-DPMB)