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Comment on "Measurement and correction of transverse chromatic offsets for multi-wavelength retinal microscopy in the living eye"

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Abstract: An interesting method to measure and correct chromatic magnification offsets in a multi-wavelength retinal imaging microscope was recently reported [Harmening et al., Biomed. Opt. Express **3**, 2066 (2012)]. These values were in part related to the ocular transverse chromatic aberration (TCA). This method could be potentially used in the future to overcome the fundamental limitation to estimate the eye's TCA with ophthalmoscopic (double-pass) configurations.

OCIS codes: (170.4460) Ophthalmic optics and devices; (330.5370) Physiological optics.

References

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1. Introduction

Harmening et al. [1] recently presented a study where the effect of chromatic magnifications offsets in a scanning laser ophthalmoscope (SLO) using different wavelengths was evaluated. This is a relevant work with practical applications to obtain better retinal images with the instrument. In addition, the study may also have some more fundamental implications for physiological optics, since these chromatic offsets can be related in part with the ocular transverse chromatic aberration (TCA). Measuring the TCA in the human eye has attracted a lot of interest during decades because the impact in vision and the potential large values in some subjects. However, all the available data in the literature were obtained by using subjective methods, where the retina acted as detector after single pass of the light through the eye. Perhaps one of the main reasons for the lack of objective information on the ocular TCA has been due to its elusive behavior in standard double-pass ophthalmic configurations. It was shown experimentally that TCA, and also monochromatic asymmetric aberrations, were cancelled after double pass through the eye and reflection in the retina [2]. This means that by recording double-pass retinal images of point sources of different wavelengths could not be assessed TCA. A modification of the double-pass technique was developed to overcome the limitation for monochromatic aberrations, essentially by disrupting the two passes by using unequal aperture sizes in the first and second passes [3]. The work of Harmening et al. [1] presented a clever way to also overcome in part the limitation for the TCA, in this case by using a large structured object, instead of a point-like stimulus. However, the authors did not

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fully explain this issue within the context of the cancellation problem in the double-pass. Although it was clearly stated that they were not actually measuring the ocular TCA, but the chromatic magnification for their specific SLO configuration it could be perhaps possible some future ways to actually measure TCA objectively with the reported approach. This could surely serve to better understand the fascinating features of the eye's transverse chromatic aberration.

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