New EDOF IOL set

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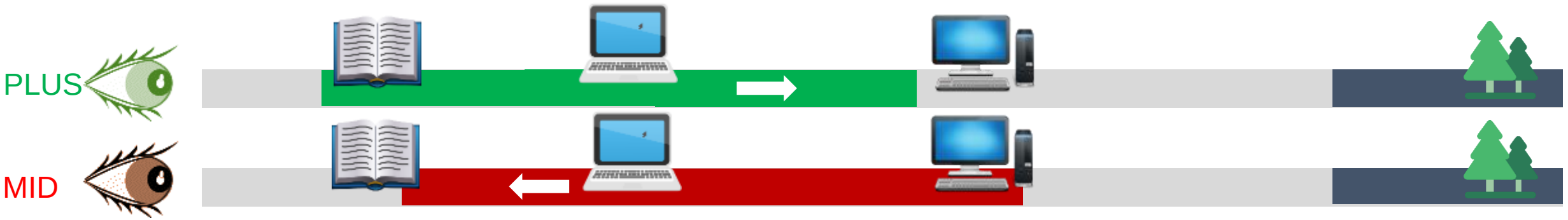
F. Castignoles is employed by a for-profit company with an interest in the subject of the presentation,
F. Le Guyader's travel has been funded, fully or partially, by a company producing, developing or supplying the product or procedure presented

Introduction

- The principle of this new EDOF IOL set is to capitalize on binocularity.

The idea was then:

- For one eye, to extend the depth of field towards 90 cm.
- For the fellow eye, to extend the depth of field towards 40 cm.



Distance of vision	35cm		40 cm		45 cm		55 cm		70 cm		90 cm	2 m	Infinity
Add of the IOL	+4D	+3.75D	+3.5D	+3.25D	+3D	+2.75D	+2.5D	+2.25D	+2D	+1.75D	+1.5D	+0.75D	+0D

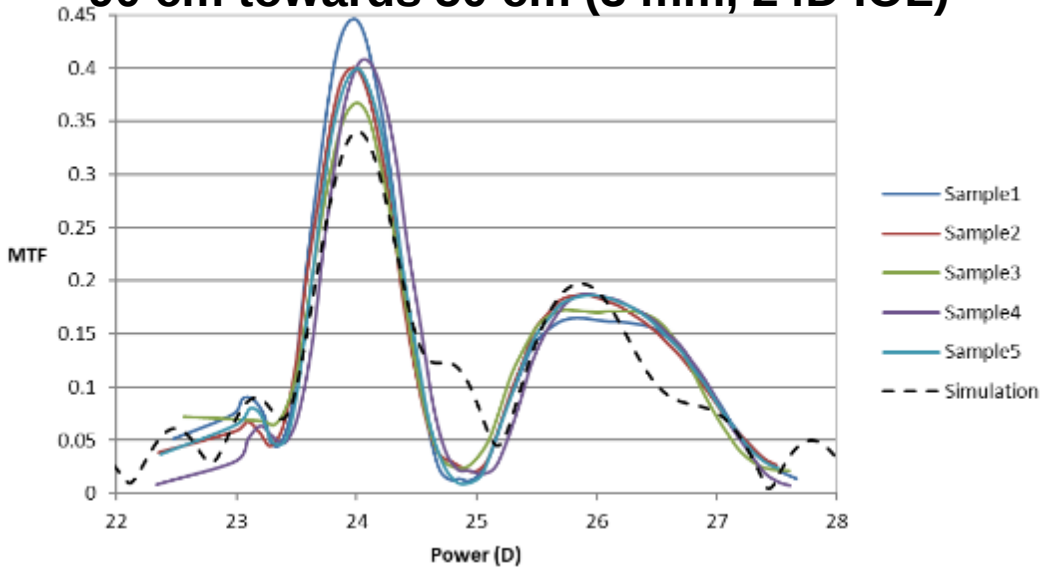
Material and methods:

- Simulations done using Matlab (MathWorks) for the diffractive profile design.
- Simulations using Zemax (Zemax) for the simulated profile validation.
- Validation: measurements of manufactured diffractive EDOF IOLs using Trioptics Optispheric IOL PRO II optical bench (TRIOPTICS).

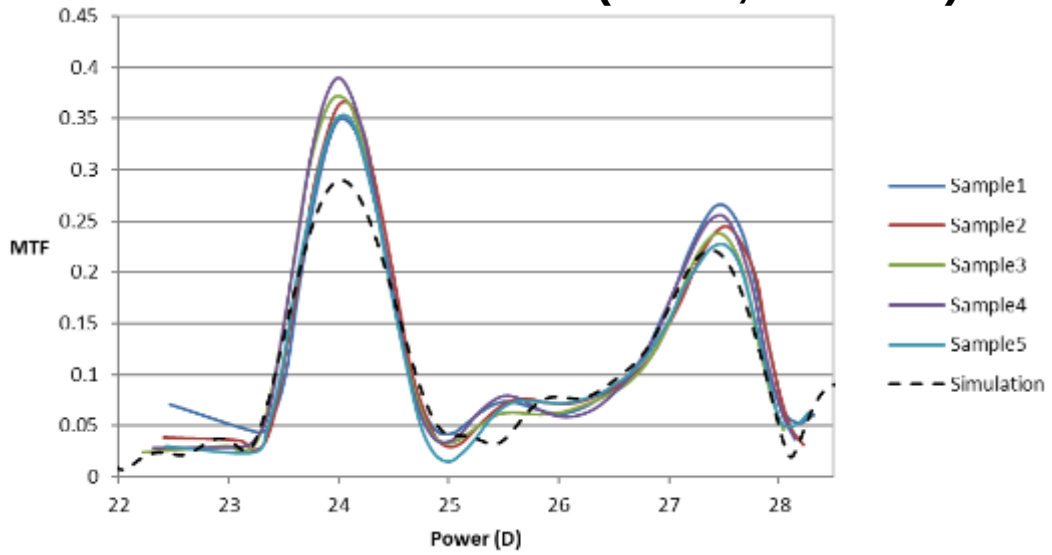
Example of optical ray propagation with a diffractive profile (Matlab)

Results: Comparison of simulated and measured through-focus MTF in an optical bench with eye model 1 (ISO 11979-2 : 2014) for 5 manufactured IOL samples.

MID diffractive profile: for vision from 90 cm towards 50 cm (3 mm, 24D IOL)



PLUS diffractive profile: for vision from 70 cm towards 40 cm (3 mm, 24D IOL)

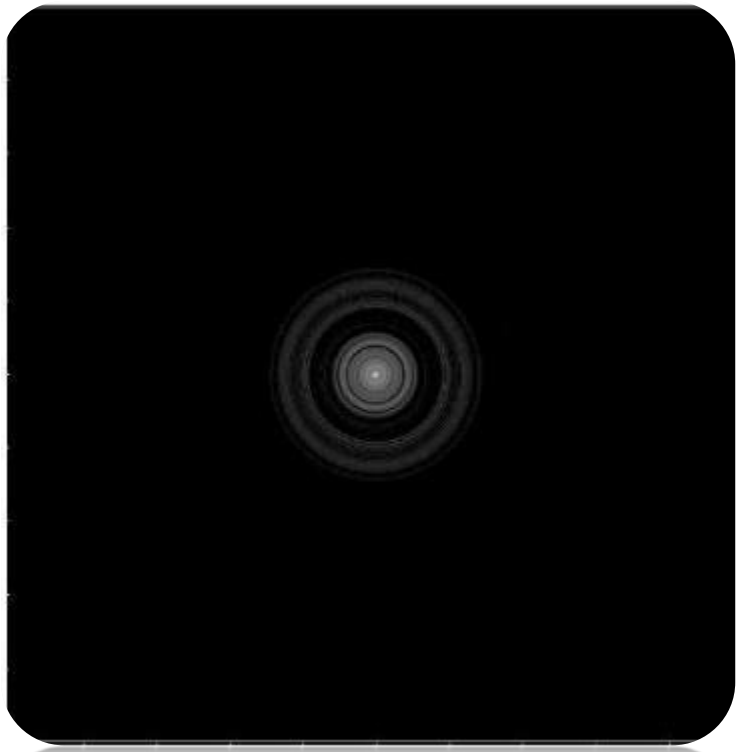


Simulated sharpest through-focus images from the two diffractive profiles

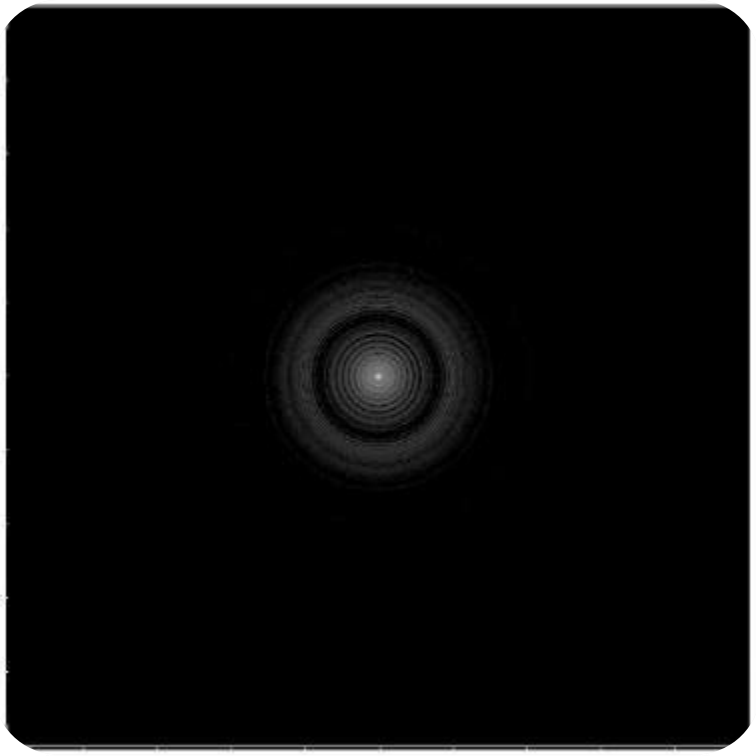
Distance of vision	infinity		2m		1m		66 cm			50 cm		40 cm		33 cm
Addition (IOL plane)	0D	+0.34D	+0.7D	+1D	+1.4D	+1.7D	+2D	+2.4D	+2.7D	+3D	+3.4D	+3.7D	+4D	

Results: Halos simulation (4.5 mm for dim conditions simulations)

MID

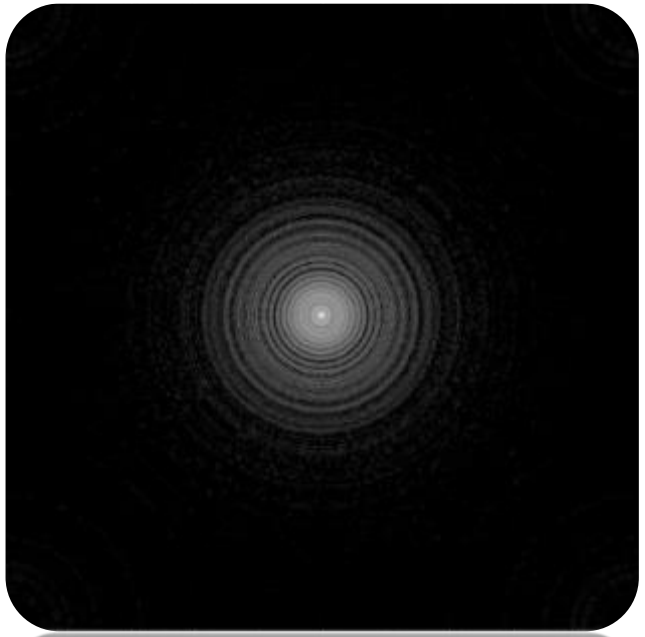


PLUS



FOR SAKE OF COMPARISON

HALO WITH BIFOCAL



Conclusion

- Good agreement between simulated and achieved outcomes with the 2 diffractive profiles.
- Achieved extension of the depth of focus and confirmation of the IOL profile complementarity (patent pending).
- Control of the extension of halos.
- This set of IOLs was conceived to achieve a true EDOF range of vision. Combining the two complementary profiles should enable a sharp vision range from 90 cm up until 40 cm.
- CE mark (brand name: ARTIS ACTIVE).
- Postmarket follow-up pending.

Simulated through-focus MTF curves in Zemax eye model (red and green) and expected TF-MTF from binocularity (purple)