STATE BOARD OF OPTOMETRY
2450 DEL PASO ROAD, SUITE 105, SACRAMENTO, CA 95834
P (916) 575-7170 F (916) 575-7292 www.optometry .ca.gov

Continuing Education Course Approval Checklist

Title: Extended Depth of Focus IOL's vs. Spherical Abberation Optimized Multifocial IOLs

Provider Name: Assil Institute c/o Ms. Jessica Morales

☑Completed Application
Open to all Optometrists? ☑Yes ☐No
Maintain Record Agreement? ☑Yes ☐No

☑Correct Application Fee

☑Detailed Course Summary

☑Detailed Course Outline

☑PowerPoint and/or other Presentation Materials

☐Advertising (optional)

☑CV for EACH Course Instructor

☑License Verification for Each Course Instructor
Disciplinary History? ☐Yes ☑No

CALIFORNIA STATE BOARD OF OPTOMETRY

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CONTINUING EDUCATION COURSE APPROVAL APPLICATION

$50 Mandatory Fee (PAID)

Pursuant to California Code of Regulations (CCR) § 1536, the Board will approve continuing education (CE) courses after receiving the applicable fee, the requested information below and it has been determined that the course meets criteria specified in CCR § 1536(g).

In addition to the information requested below, please attach a copy of the course schedule, a detailed course outline and presentation materials (e.g., PowerPoint presentation). Applications must be submitted 45 days prior to the course presentation date.

Please type or print clearly.

Course Title	**Course Presentation Date**
Extended depth of focus IOL's VS. Spherical Abberation Optimized Multifocal IOLs"	10 AM - 3PM (5hrs) 02/26/2017

Course Provider Contact Information

Provider Name

Jessica (First) Morales (Last) _____ (Middle)

Provider Mailing Address

Street 450 N. Roxbury Dr. 3rd floor **City** Beverly Hills **State** CA **Zip** 90210

Provider Email Address jmorales@assileye.com

Will the proposed course be open to all California licensed optometrists?	☑ YES ☐ NO
Do you agree to maintain and furnish to the Board and/or attending licensee such records of course content and attendance as the Board requires, for a period of at least three years from the date of course presentation?	☑ YES ☐ NO

Course Instructor Information

Please provide the information below and attach the curriculum vitae for each instructor or lecturer involved in the course. If there are more instructors in the course, please provide the requested information on a separate sheet of paper.

Instructor Name

Dr. Kerry (First) Assil (Last) _____ (Middle)

License Number G62647	**License Type** Physician & Surgeon
Phone Number (310) 651-2300	**Email Address** Kerry@assileye.com

I declare under penalty of perjury under the laws of the State of California that all the information submitted on this form and on any accompanying attachments submitted is true and correct.

Kerry Assil — JAN 19 2017

Signature of Course Provider ***Date***

Assil Eye Institute
Submission for Continuing Education Credits

LOCATION:
Assil Eye Institute
450 N. Roxbury Drive
Beverly Hills, CA 90210

DATE/TIME:
February 26, 2017 from 10:00am-3:00pm (5 hours)

SUMMARY of Directly Related Topics:
Assil Eye Institute will review the latest technologies which offer new opportunities for improved quality of life and safety. We will review the pre and post operative management with each treatment. By way of example, the micro-invasive glaucoma procedures and YAG Vitreolysis each significantly reduce the level of morbidity associated with the prior standard surgeries of Trabeculectomy and Vitrectomy. Similarly, both procedures share in common with Extended Depth of Focus IOLs, certain quality of life improvements. We will review these features and also focus upon the role of Co-Management with each of these procedures.

Course Title: **"Newest Advances in Ocular Surgery"**
Subtitle: "Extended depth of focus IOL's vs. Spherical Abberation Optimized Multifocal IOLs"
Speaker: Dr. Kerry Assil
License #G62647 Exp. 4/20/2018
License Type: Physician and Surgeon
Summary: The recent FDA approval of the Tecnis Symfony IOL has enabled a new category Premium IOL to be offered for patients seeking a reduction in spectacle dependency, following cataract surgery. These extended depth of focus lenses offer a lower add power than do the traditional multifocal IOLs. We will assess the contrasting physical and optical qualities of these alternative IOL types and map out a rationale for their selection. We will thus review patient selection, surgical protocol, ancillary testing and post operative care.
Presentation Material: "OD CE Event" Multifocal IOLs
Slides Attached, 89 pages

Course Title: **"Newest Advances in Ocular Surgery"**
Subtitle: "YAG Vitreolysis"
Speaker: Dr. Kerry Assil
License #G62647 Exp. 4/20/2018
License Type: Physician and Surgeon
Summary: Vitreous detachments, accompanied by floaters, have presented a dilemma over the years, as patients are informed they are benign, so long as there is no concomitant retinal tear. Yet, the vitreous condensation (floater) itself can serve as a source of visual handicap.

Vitrectomy used to serve as the most reliable means for removing a floater and the associated surgical risks were typically considered to outweigh the benefits. Recent advances in YAG Laser technology enable ab interno vaporization of the vitreous condensation, with a much great safety profile than with vitrectomy. We will review the procedure including treatment criteria and post operative monitoring.
Presentation Materials: "Laser Vitreolysis"
Slides Attached, 13 pages

Course Title: **"Newest Advances in Ocular Surgery"**
Subtitle: "Micro Invasive Glaucoma Surgery"
Speaker: Dr. Mona Bagga
License #A104390
License Type: Physician and Surgeon
Summary: See Attached 4 pages
Presentation Materials: "Cataract Surgery In Glaucoma Patients"
Slides Attached, 34 pages

Course Title: **"Newest Advances in Ocular Surgery"**
Subtitle: "Understanding Vitreoretinal Interface: Diagnosis and Management and the Relationship to Anterior Segment Procedures."
Speaker: Dr. Svetlana Pilyugina
License #A89078 Exp. 6/30/2018
License Type: Physician and Surgeon
Summary: This lecture will discuss the anatomy of vitreous and vitreoretinal interface and their role in the pathophysiology of various retinal conditions, such as vitreomacular traction, macular hole, epiretinal membrane, diabetic retinopathies, and vascular occlusions. The use of imaging modalities, such as OCT, in the understanding and therapy selection will be reviewed. Impact of vitreomacular interface abnormalities on visual acuity and their role in preoperative evaluation of patients undergoing cataract surgery and refractive procedures will be discussed. Advances in treatment modalities including pharmacologic vitreolysis and developments in microinvasive vitrectomy procedures will be reviewed.
Presentation Materials: "Diseases and Surgery of Retina, Macula & Vitreous"
Slides Attached, 51 pages

LECTURER'S CVs:
See Attached

CONTACT: Jessica Morales
310.409.9333/jmorales@assileye.com

Course Outlines for Newest Advances in Ocular Surgery:

Extended depth of focus IOLs vs Spherical Abberation Optimized Multifocal IOLs

- FDA approval of Tecnis Symfony IOL
- Extended depth of focus lenses
- Physical and optical qualities of alternative IOL types
- Rationale for novel IOL selection
- Latest in surgical protocol and post operative care

YAG Vitreolysis

- The nature of vitreous detachments
- Vitreous condensation and visual handicap
- Removal of vitreous floaters and associated risks
- Advances in YAG laser technology
- Vitreolysis treatment criteria and post operative monitoring

Microinvasive Glaucoma Surgery

- Latest technologies for glaucoma surgery
- Pre operative factors affecting surgical outcomes
- Patient selection for glaucoma surgery
- Intraoperative factors for successful microsurgery
- Post operative care and management

Understanding Vitreoretinal Interface: Diagnosis and Management and
The Relationship to Anterior Segment Procedures

- Anatomy of the vitreoretinal interface
- Pathophysiology of various retinal conditions
- Vitreomacular interface abnormalities
- Imaging modalities of the vitreoretinal interface
- Advances in treatment modalities including pharmacologic and microinvasive surgical therapies

Welcome

AEI's Unique Collaboration Commitment

- OD Liaison
- Closed Optical Shop
- Dropped VSP
- Closed CL Dispensary
- Dedicated Charting
- Complementary CE Events

Optimizing Premium Cataract Surgery Outcomes: Ingredients

Kerry K. Assil, M.D.
Assil Eye Institute
Beverly Hills and Santa Monica, California

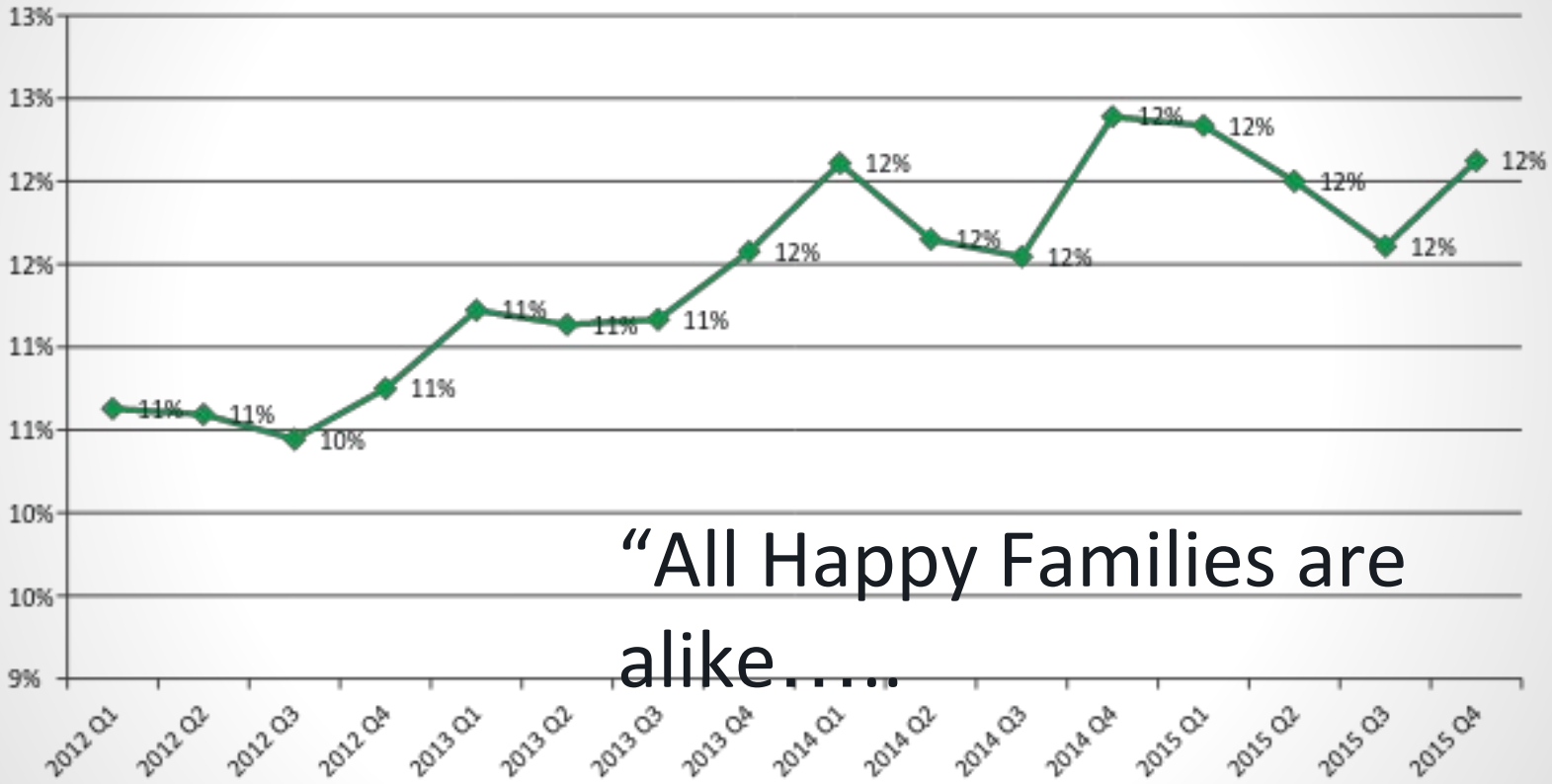
Which of the following patients is least likely to benefit from a multifocal IOL?

A. 85 y.o. female with mild glaucoma, on alphagan, mild NFL loss and 3+ NS
B. 46 y.o. Police officer with MRx of +6 -1.75 x 180 OU and CL intolerance
C. 34 y.o. software programmer, with unilateral post traumatic cataract
D. 64 y.o. Pilot s/p highly successful macular hole repair (post vitrectomy) and 1-2+ NS
E. All of the above

Which of the following are Less appealing characteristics for a Premium IOL?

A. Low Abbe number
B. High Abbe number
C. High index of refraction
D. Cryolathe manufacturing technique
E. Negative Z4,0
F. A and C above
G. C and E above

US Premium IOL Penetration



"All Happy Families are alike…..

Source: Market Scope data

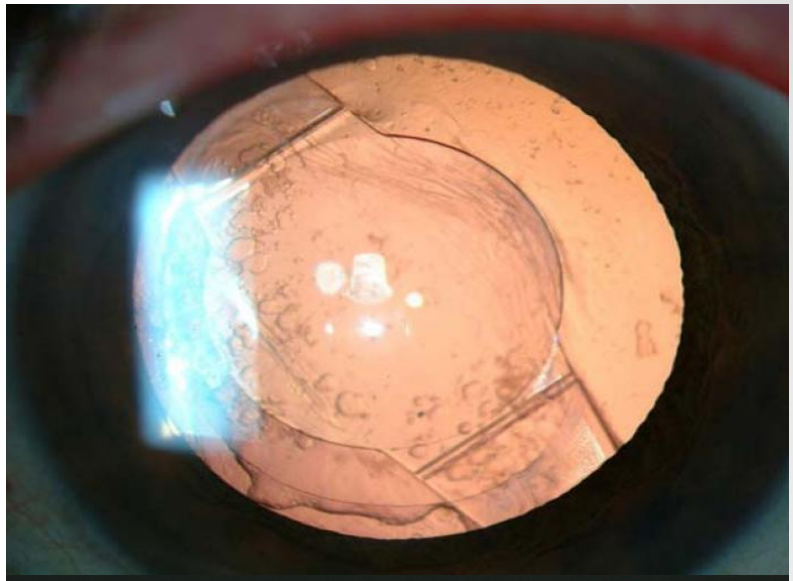
…….each unhappy family is different in their own way.”

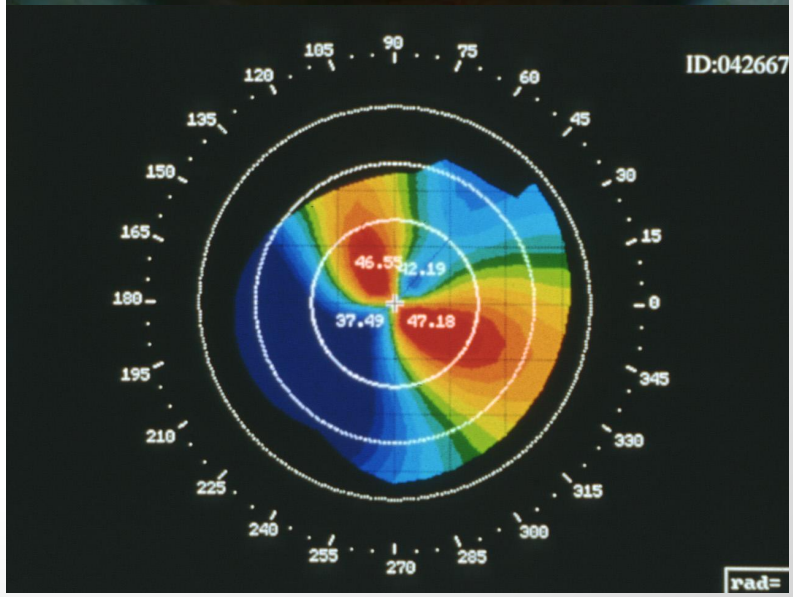
Premium IOLs have Failed to Consistently deliver on the promise of lifestyle liberation

Premium IOL Limitations

- Accommodating IOLs;
  - Limited Range
  - Capsular Bag Dynamics
  - Induced Astigmatism
  - Delayed Issues

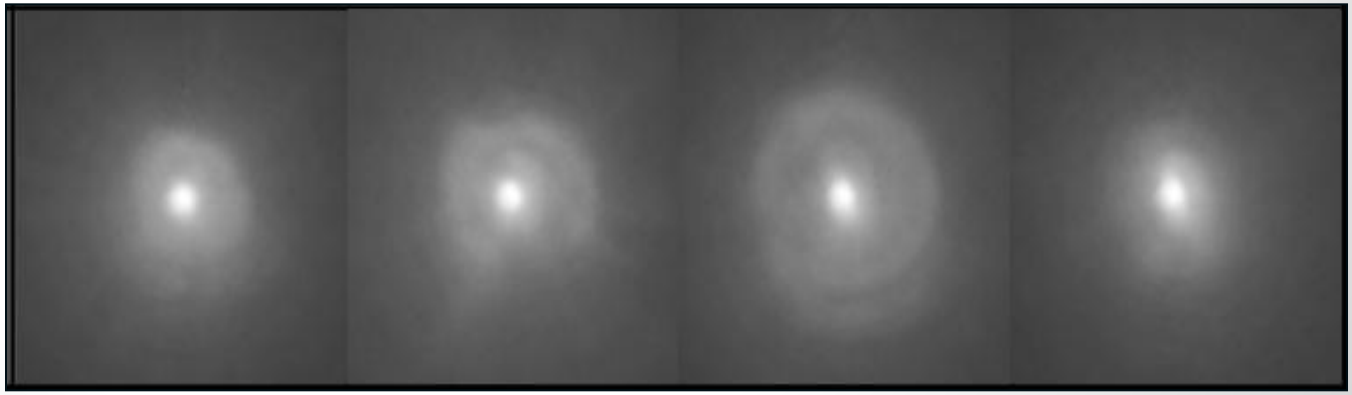
- Toric IOLs
  - Stacking Cylinders
    - Contrast acuity loss
  - Rotation
  - Monofocal





Premium IOL Limitations

- Multifocal IOLs
  - Contrast Acuity Loss
  - Limited Near Depth of Field
  - Astigmatism Not Addressed
  - Glare



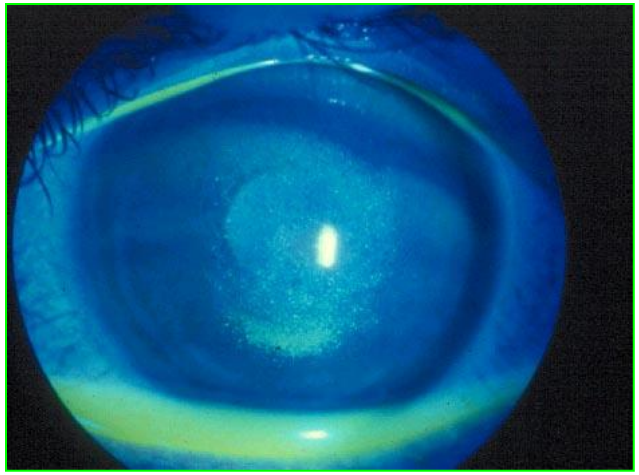
Many other hurdles too…..

Required Journey to Overcome The Hurdles

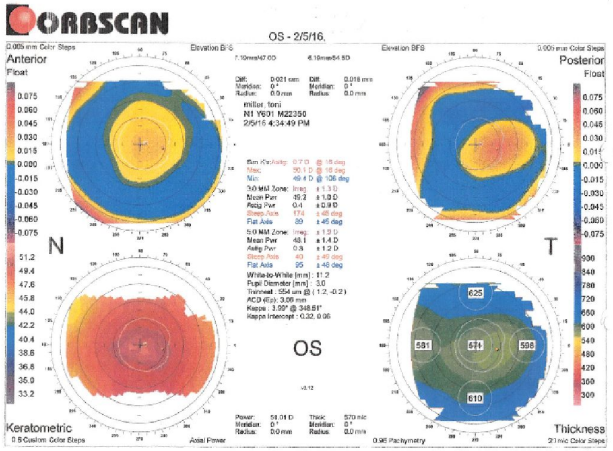
- ✓ Patient History
- ✓ Examination
- ✓ Address Treatable Conditions
- ✓ Ancillary Testing
- ✓ Select IOL
- ✓ Assistive Technology
- ✓ Treat Astigmatism
- ✓ Post Operative Care
- ✓ Refractive Error Enhancement

Identify and Exclude or Treat Co-Morbidities

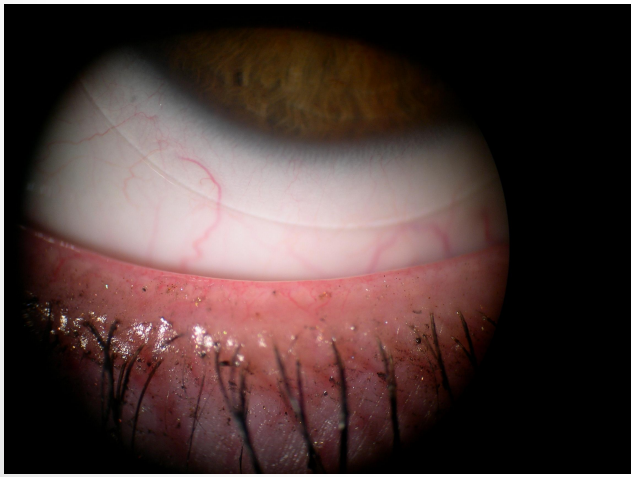
- Cornea
  - Tear Film
    - Aqueous
    - Lipid
  - MDF

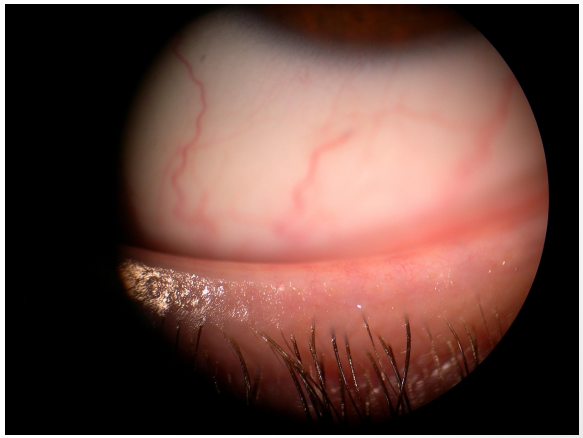


  - Ectasia
  - Post Hyperopic Lasik
  - Endothelium



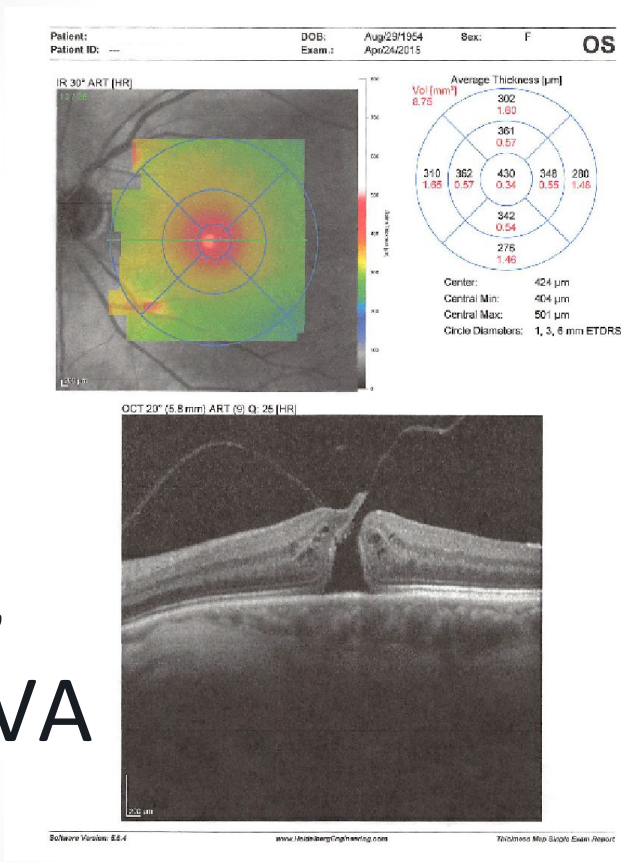
Tear Film Improvement - DELIT



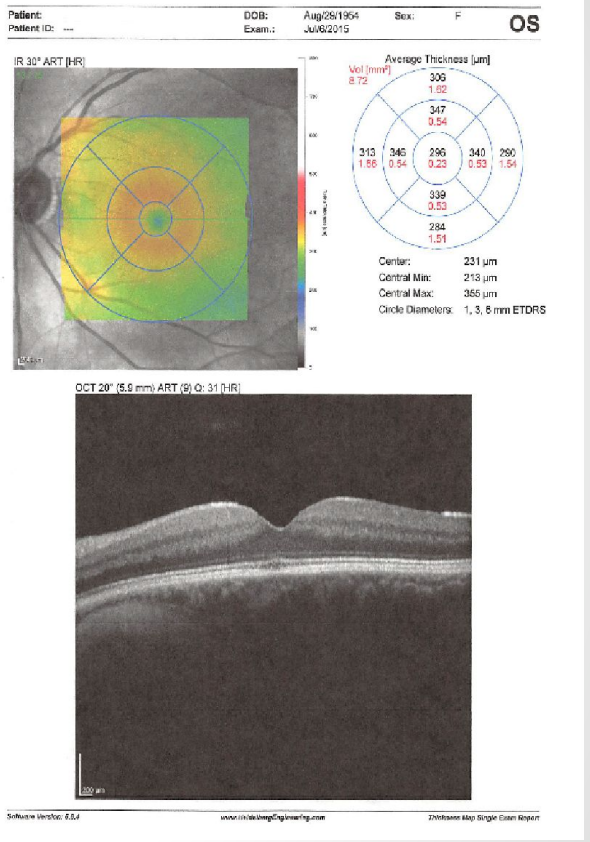


Retinal History

- Macula
  - ERM
  - AMD



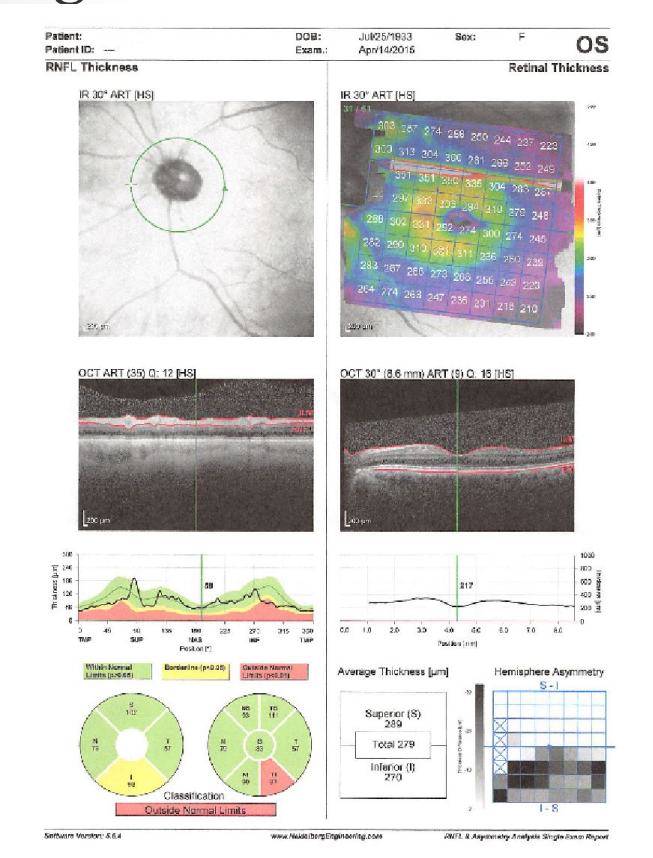
Trace NS,
20/125 BCVA

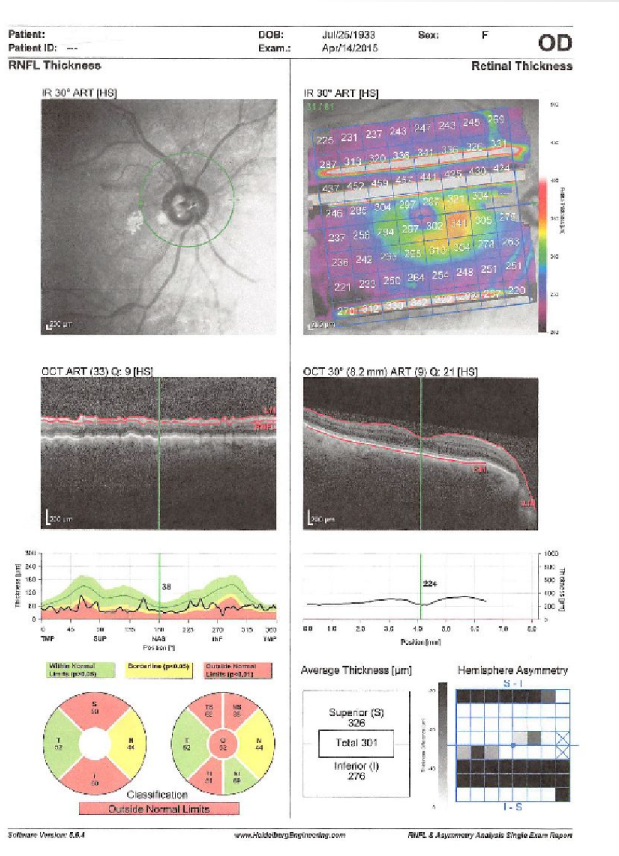


1+ NS
20/40 BCVA

Optic Nerve

- Optic Neuritis
  - MS
- Glaucoma
  - Degree





Ancillary Testing
Lens calculations

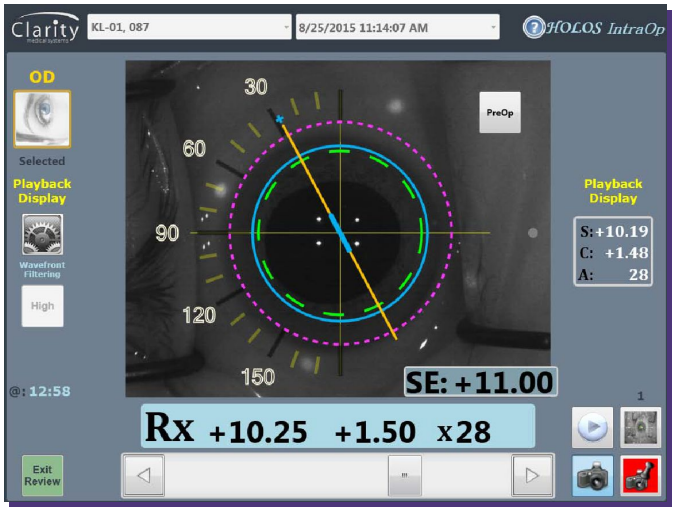
– Acoustic
  - Applanation

  - Immersion

– Optical biometry (Partial coherence interferometry)

Advanced Tools: Technologies Treatments

- Intraoperative aberrometry

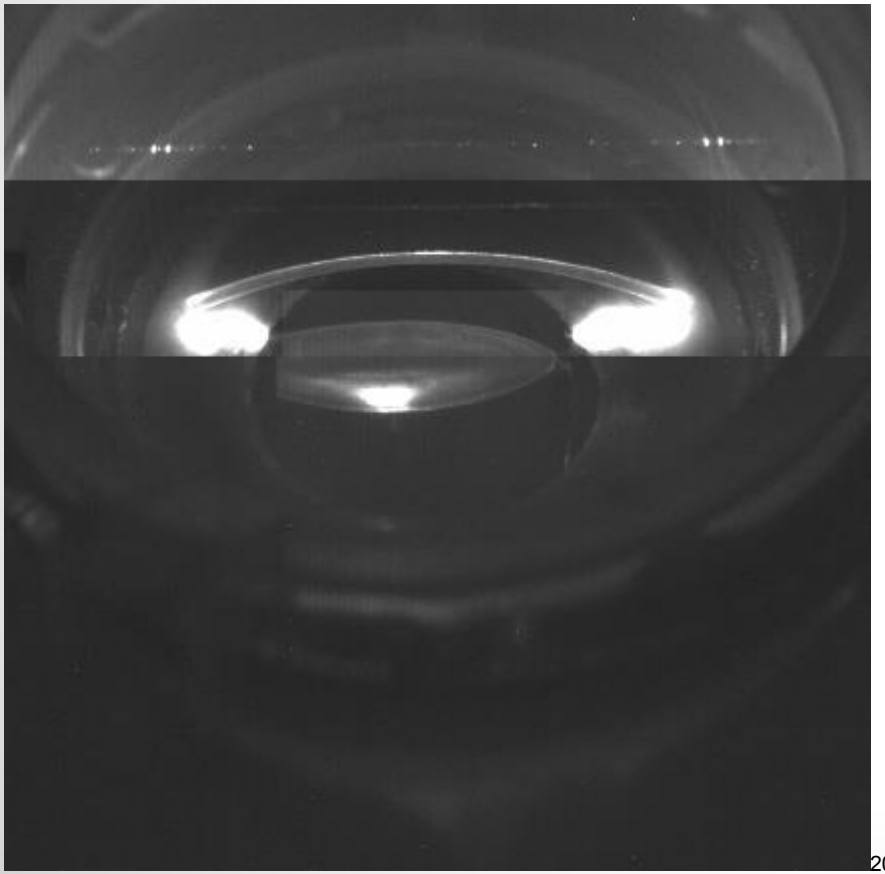


  - Address Astigmatism
  - Select Proper IOL

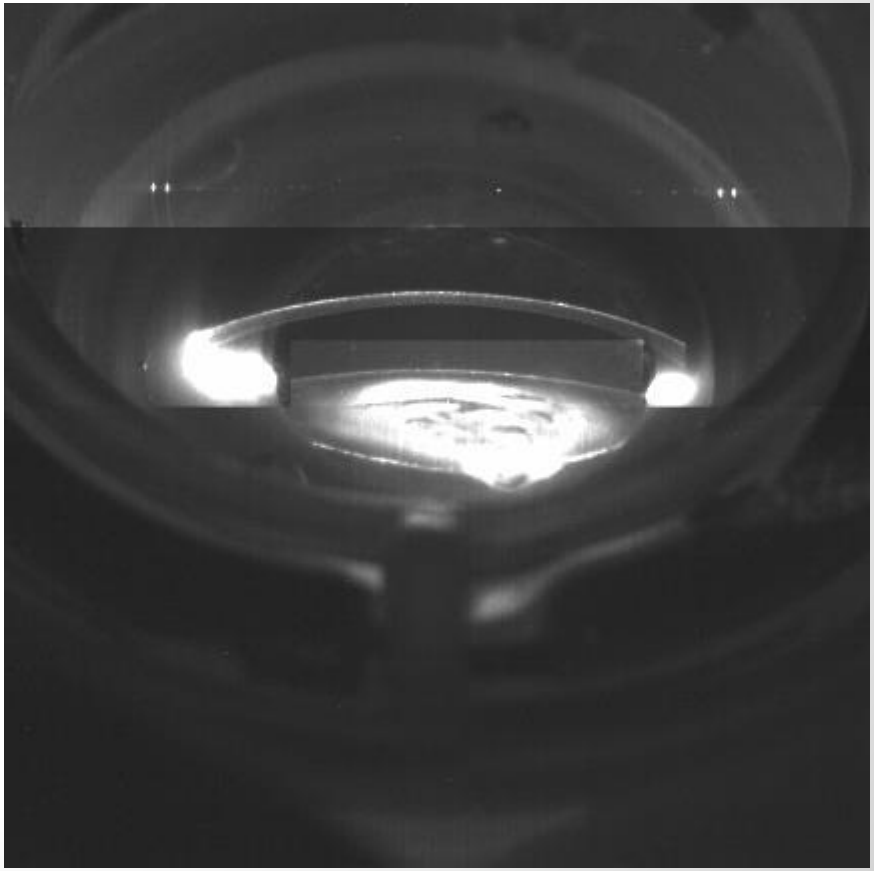
Femtosecond Laser?

Femtosecond Laser: Improved Surgical Planning

Marfan's with Lens Subluxation



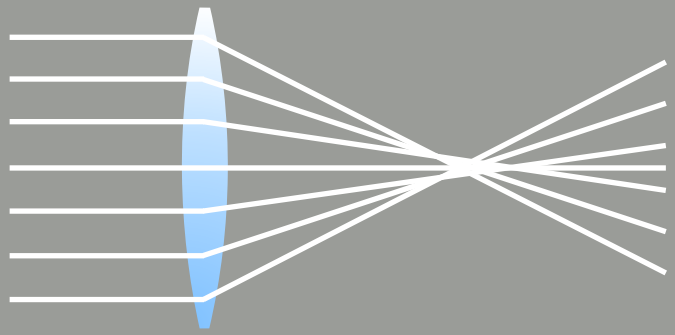
Dense Cataract, Post Cap Defect



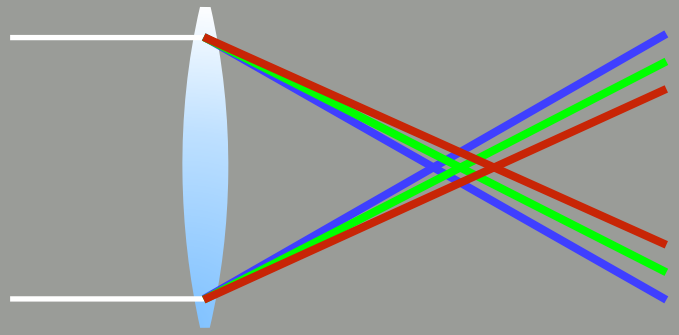
IOL Selection

Optical Aberrations

Spherical Aberration



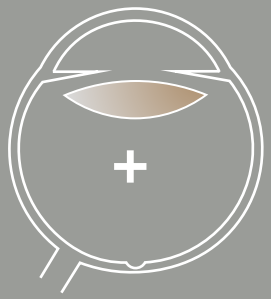
Chromatic Aberration



Aberration due to focal length difference between:

Paraxial vs. Marginal rays	Wavelength-dependent refractive index
(Design)	(Material)

Spherical Aberration ($Z_{4,0}$) and the Aging Eye

	Young Eye	Aging Eye	Pseudophakic Eye
Corneal $Z_{4,0}$: (mean +0.27 µm)	+	+	+
Lenticular $Z_{4,0}$:			
Total $Z_{4,0}$:	0	++	++ / + / 0

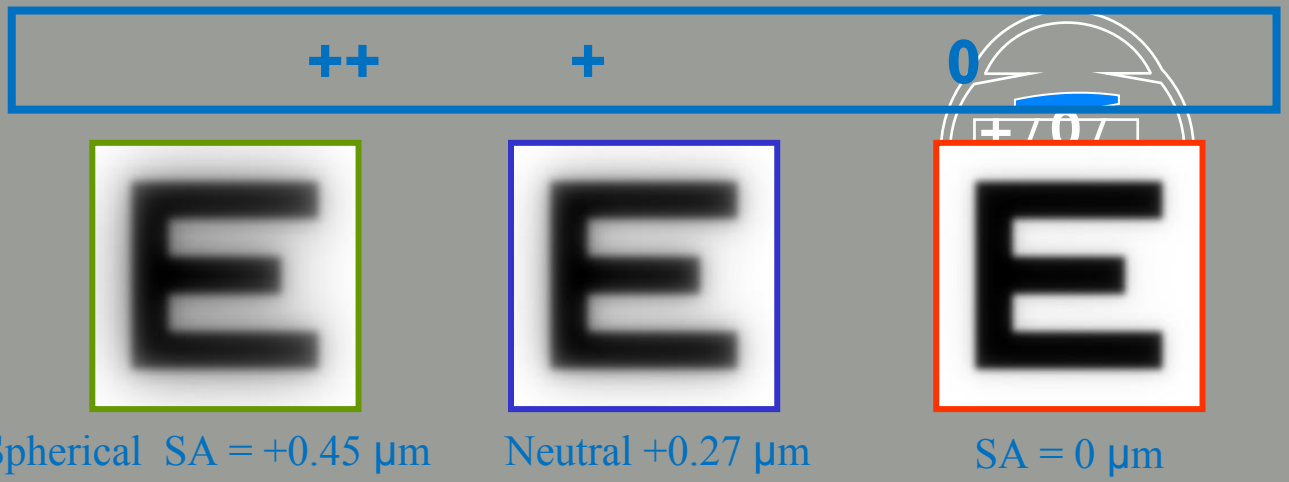
Spherical Aberration Correction in IOLs

Corneal $Z_{4,0}$:
(mean +0.27 µm)

+

Lenticular $Z_{4,0}$:

Total $Z_{4,0}$:



20/40 Letter E, 100% contrast, 3-mm pupil, photopic retinal sensitivity

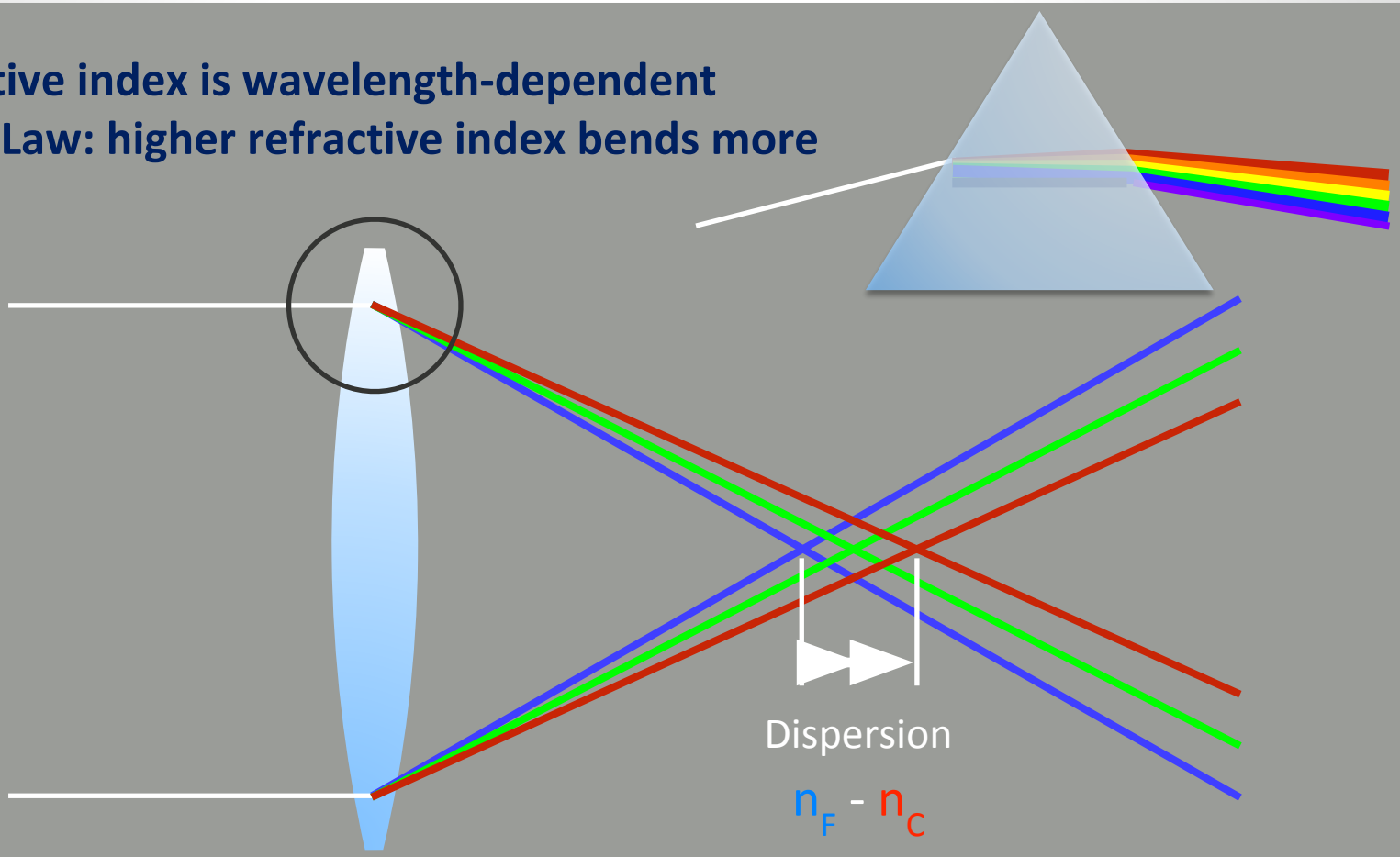
Chromatic Aberration

Differentiating Characteristic amongst Camera Lenses?

Chromatic Aberration

Chromatic Aberration lenses

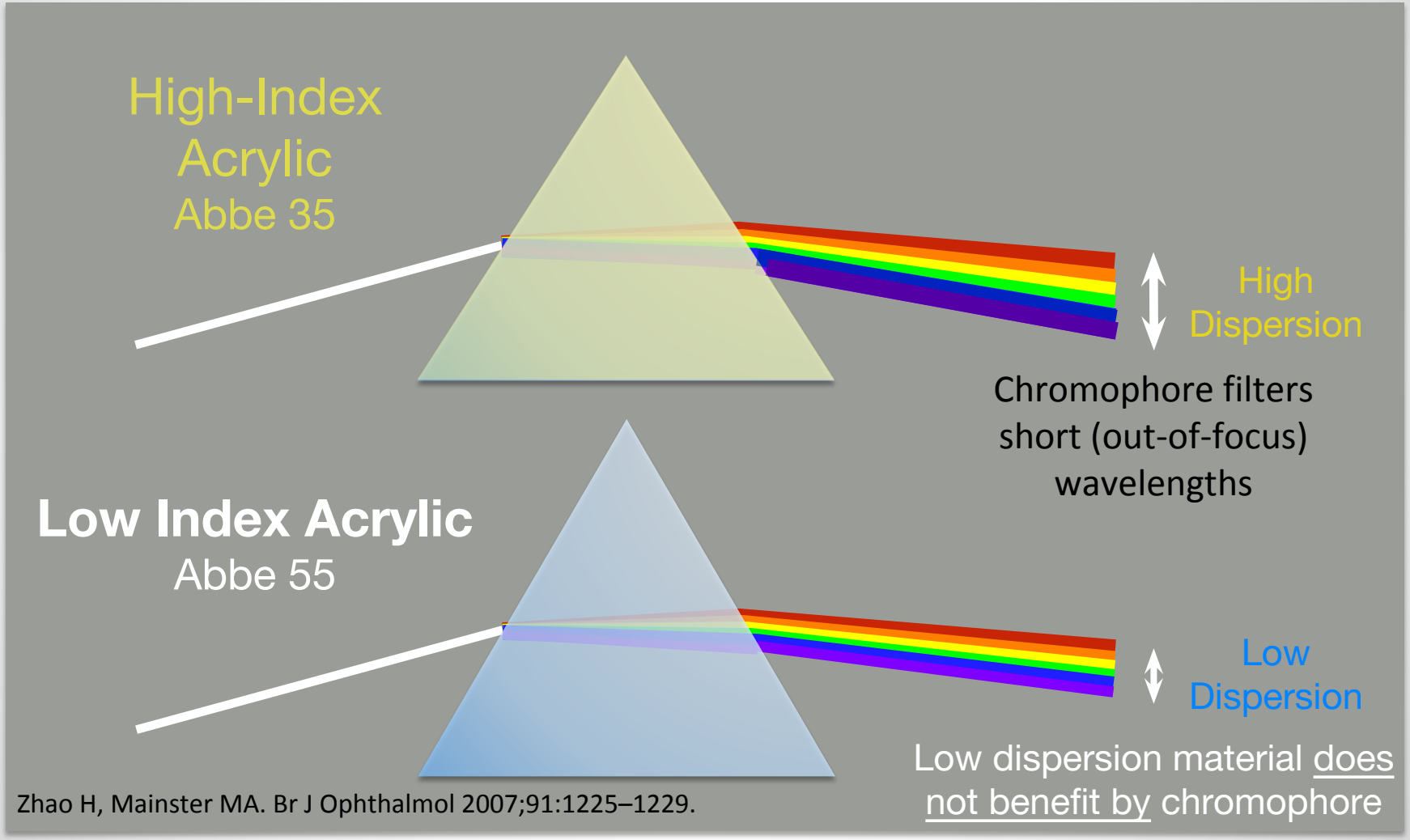
Refractive index is wavelength-dependent
Snell's Law: higher refractive index bends more



Dispersion: Difference between blue and red

Chromatic Aberration

Effect of Chromophore

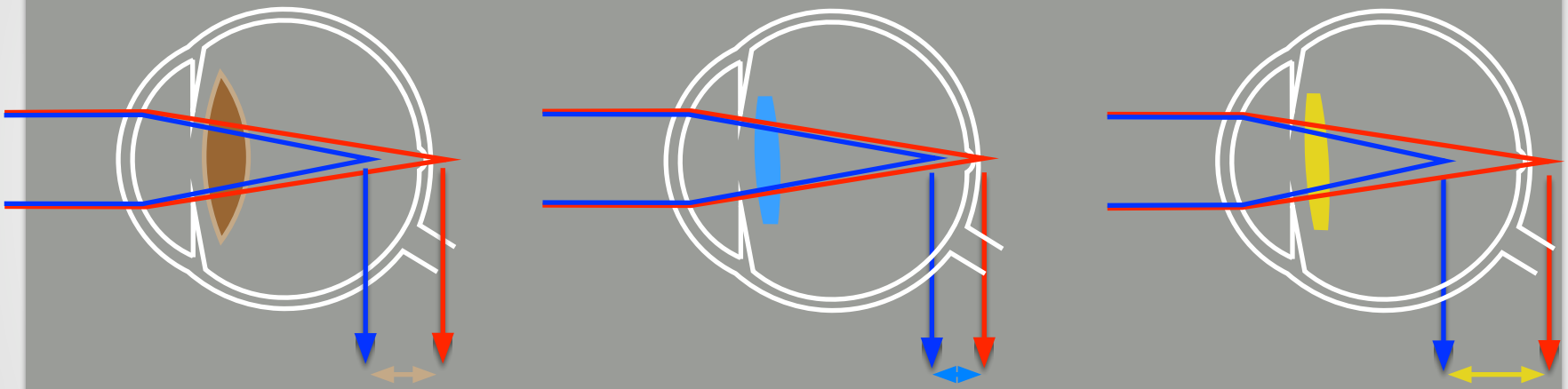


Zhao H, Mainster MA. Br J Ophthalmol 2007;91:1225–1229.

Chromatic Aberration
Clinical Significance

Chromatic Refractive Difference

700 nm / 450 nm



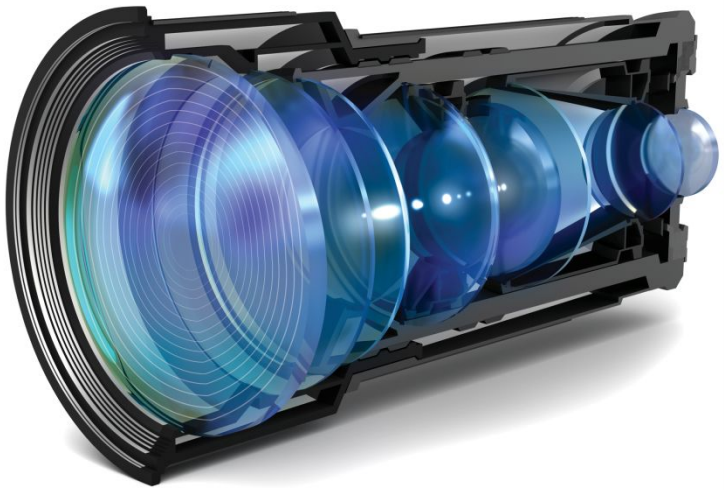
Human Lens
1.25 D
Abbe: 47

Low Index Acrylic
0.9 D
Abbe: 55

High Index Acrylic
1.7 D
Abbe: 35

Zhao H, Mainster MA. Br J Ophthalmol 2007;91:1225–1229.

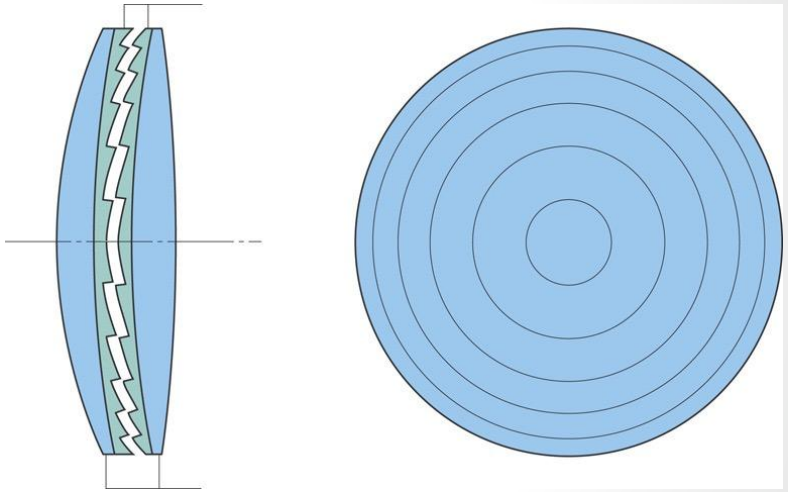
Hybrid diffractive-refractive Achromatic Camera Lens



Photographic Lens

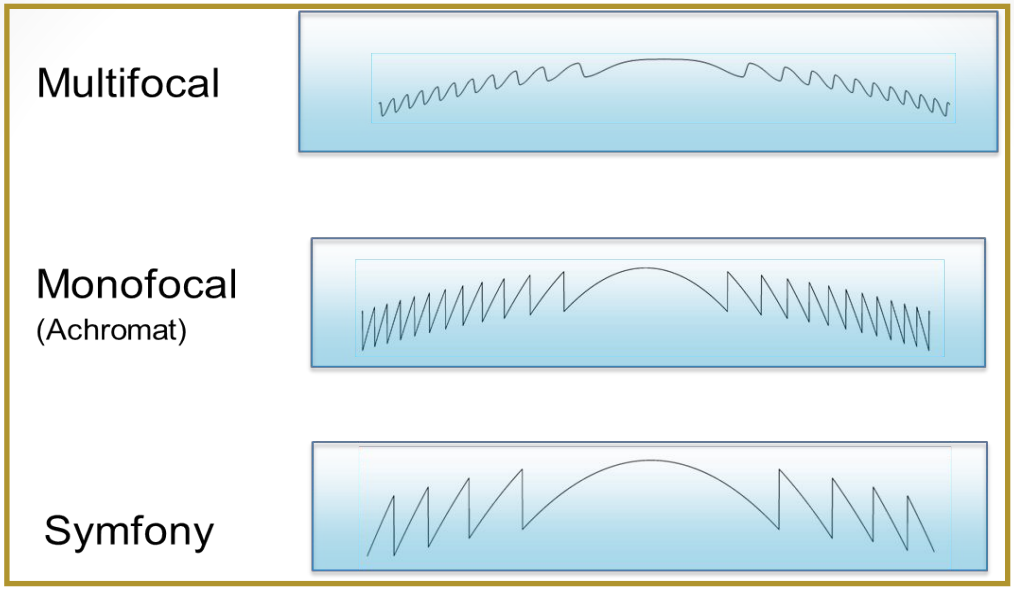
Telefoto lens

(Canon EF400mm f/4 DO IS USM)



Multilayer Diffractive Optical Element

Diffractive features in TECNIS Symfony® IOL's Design



Proprietary **echelette design feature**[1]

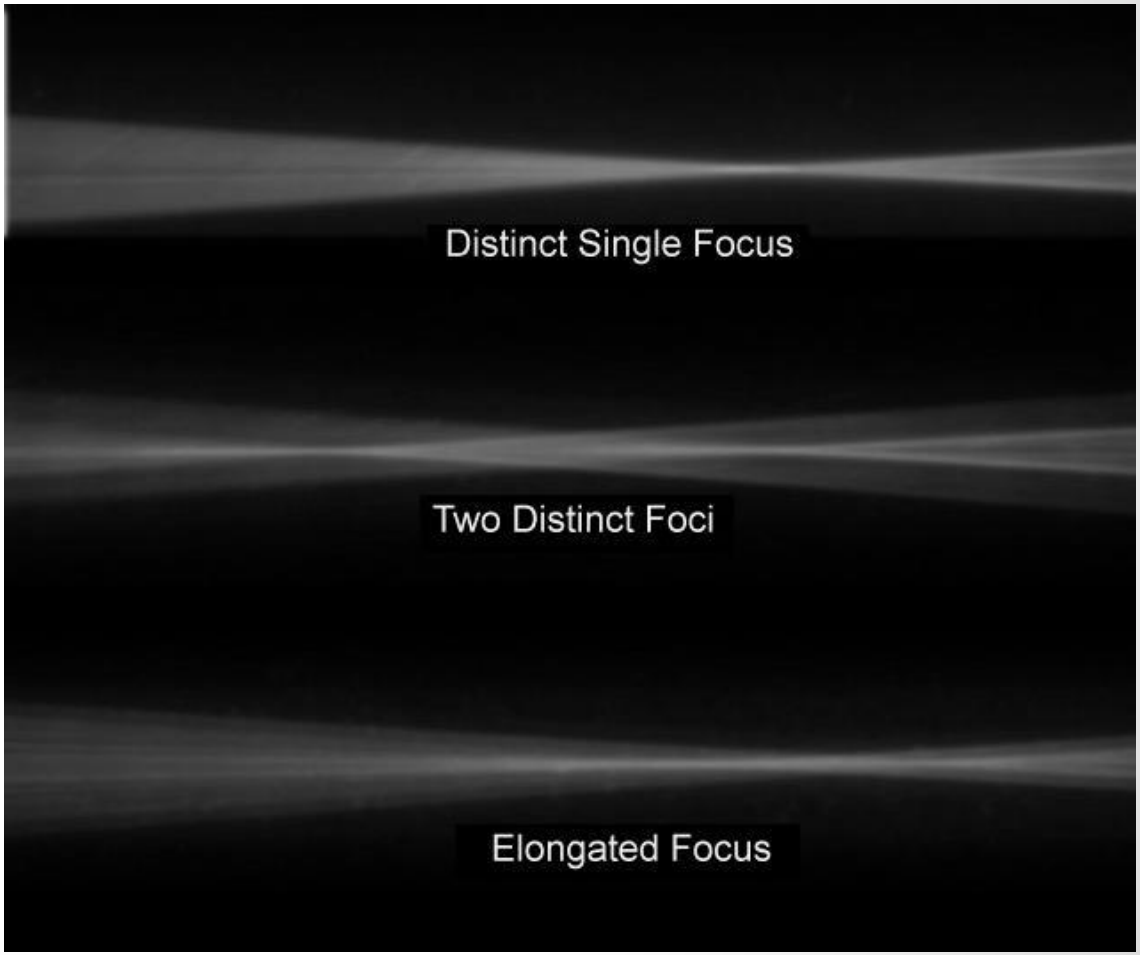
- Echelette: relief or profile (height differential) within each ring
- Designed for contrast and depth of focus
  - Spacing of rings, height of profile, and shape of profile
- Enhanced phase and interaction of light emerging from each and all zones

Delivering Elongation of Focus

Monofocal IOL

Multifocal IOL

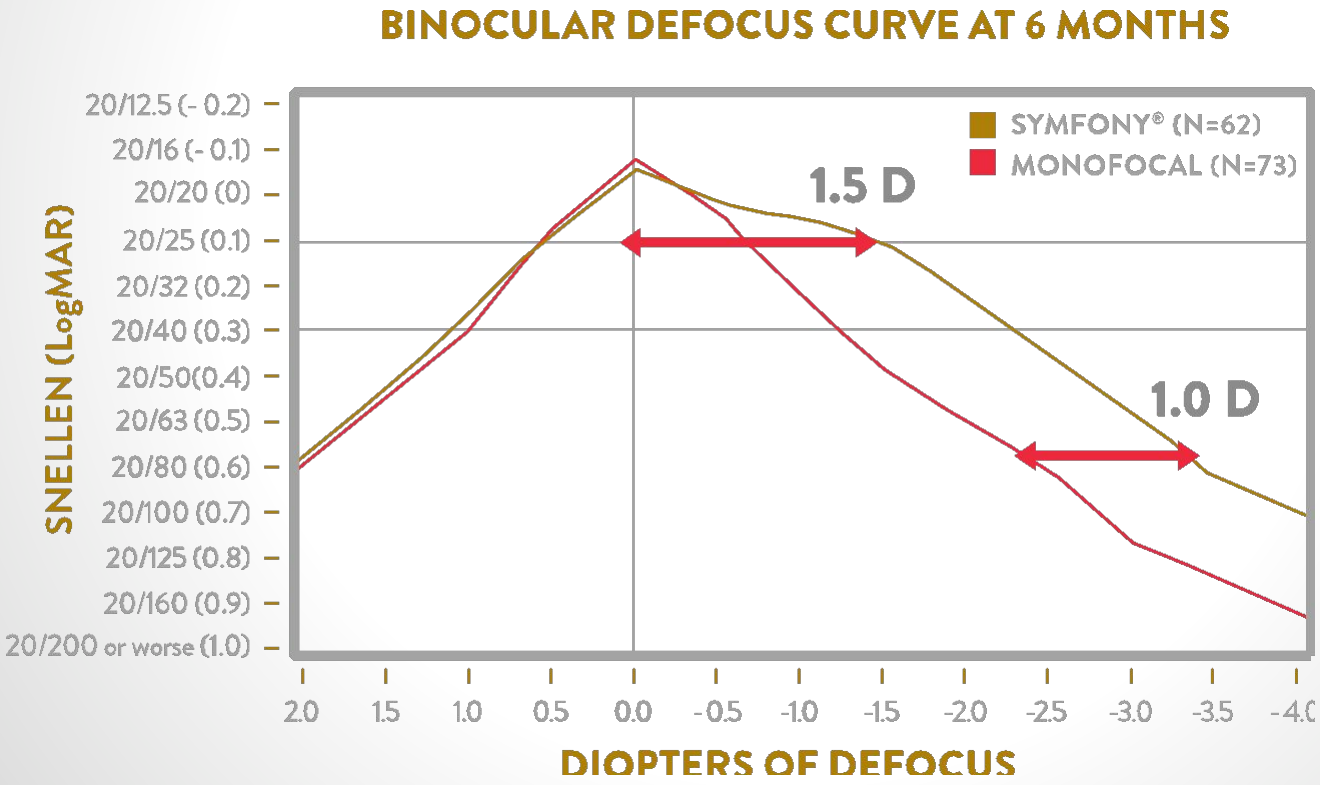
TECNIS Symfony® IOL



[1] *Data on File._Data on File_Tecnis Symfony Green Light Bundle Bench Test DOF2014CT005. Abbott Medical Optics Inc. 2014*

Clinically demonstrating continuous high-quality vision

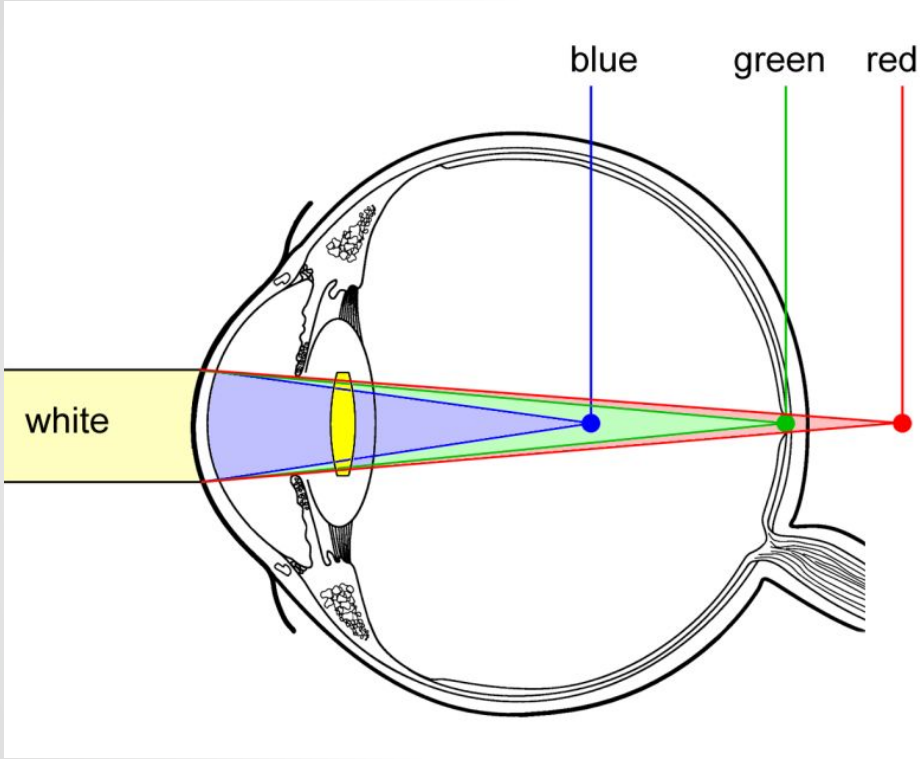
TECNIS Sym*f*ony® IOL, the first and only presbyopia-correcting IOL that delivers a continuous full range of high-quality vision[1]



1. TECNIS® Symfony® IOL DFU

PP2016CT1448

What is Chromatic Aberration?



- The power of the eye is wavelength dependent. Colors that are out-of-focus cause blur and reduce contrast.

- The phakic eye has approximately 1.38 D of chromatic aberration between 450 and 700 nm[1]. Pseudophakic eyes have between 1.45 and 2 D of chromatic aberration, depending on the dispersion of the IOL material[2,3]

2. DOF2015OTH0004. 2. Data on file. Longitudinal Chromatic aberration of a monofocal TECNIS Achromat IOL. 3.Weeber et al. Differences in Chromatic Aberration of IOLs, ESCRS 2016.

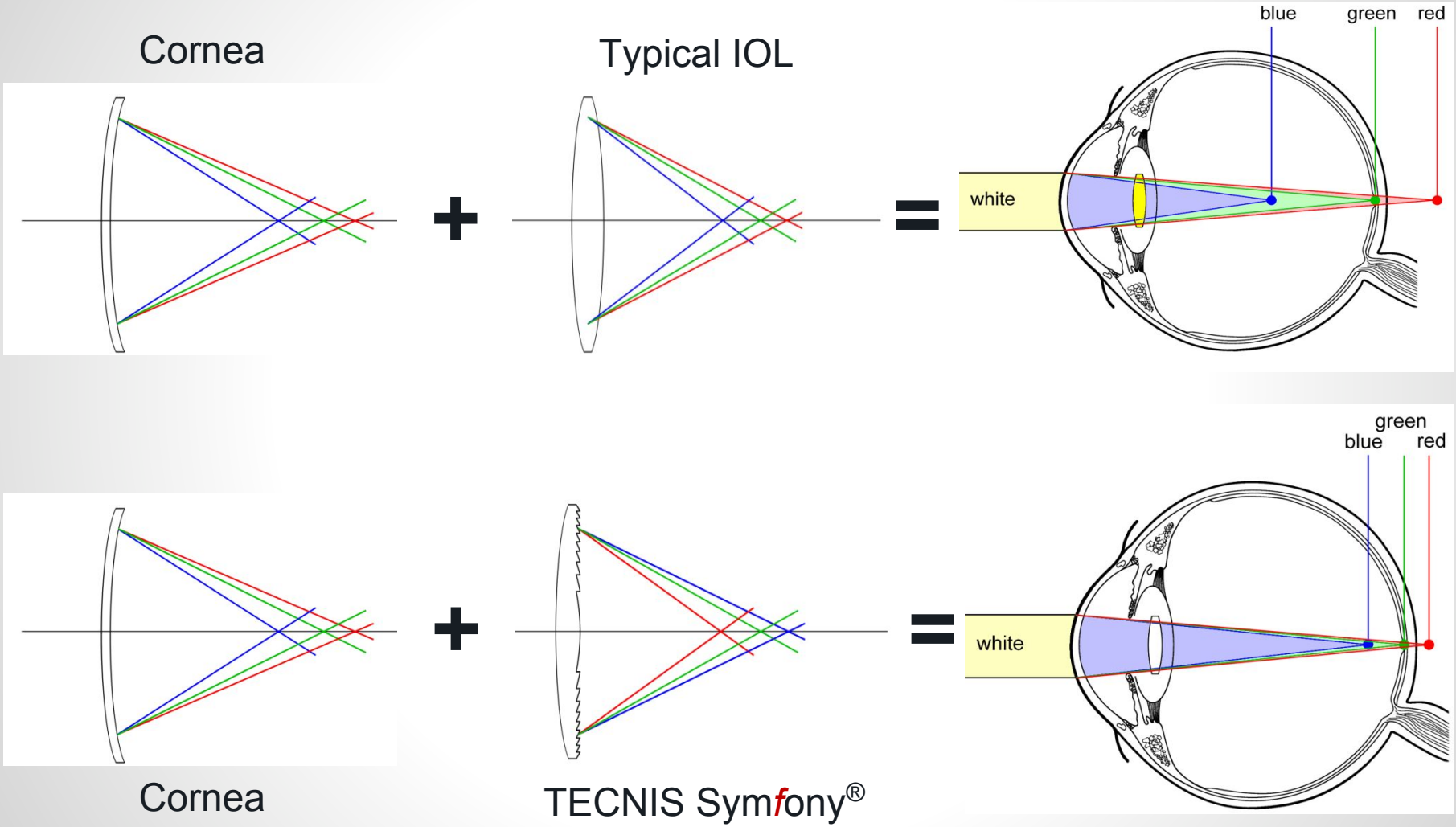
The Impact of chromatic aberration on image quality

Figure 3: The effect of chromatic aberration is visible around the dark edges of the lower photograph (especially on the right). The images show only a part of the photo from the corner of the original image to emphasize the effect of aberration.

Source: Stan Zurek

Achromatic Technology

A diffractive IOL with achromatic technology can correct chromatic aberration of the eye[3]

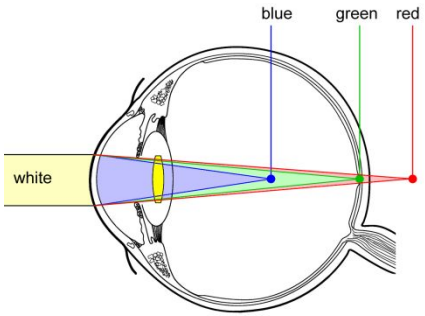


PP2016CT1448

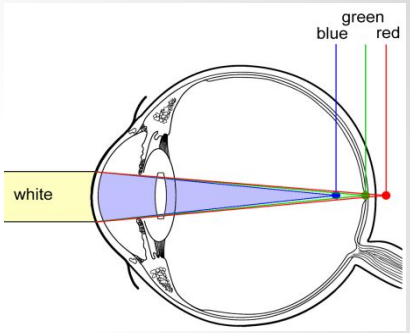
Achromatic Technology

Drives Contrast Enhancement

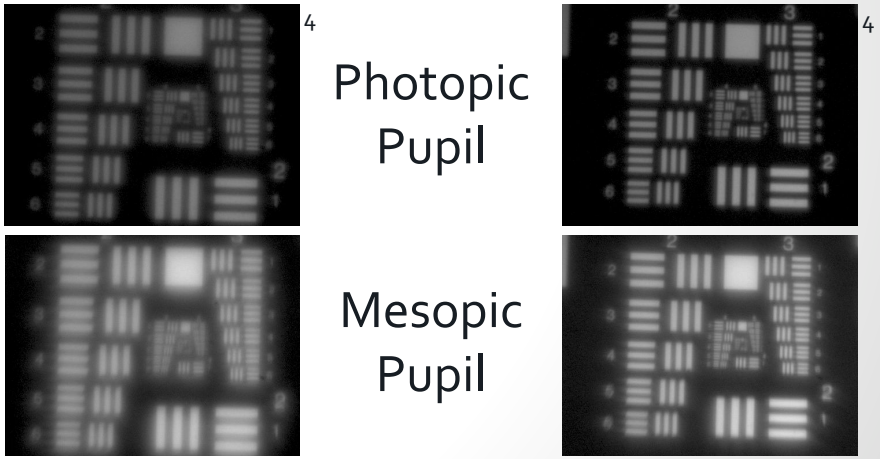
- Correction of longitudinal chromatic aberration (LCA) enhances contrast[1,2].
- Correction of corneal chromatic aberration results in a sharper focus of light[1,2].
- Combined with spherical aberration correction, retinal image quality increases, without negatively affecting depth of focus.[1,2]
- The benefits of chromatic aberration correction occur for all pupil-sizes[1].



LCA = 1.20 Diopters[3]

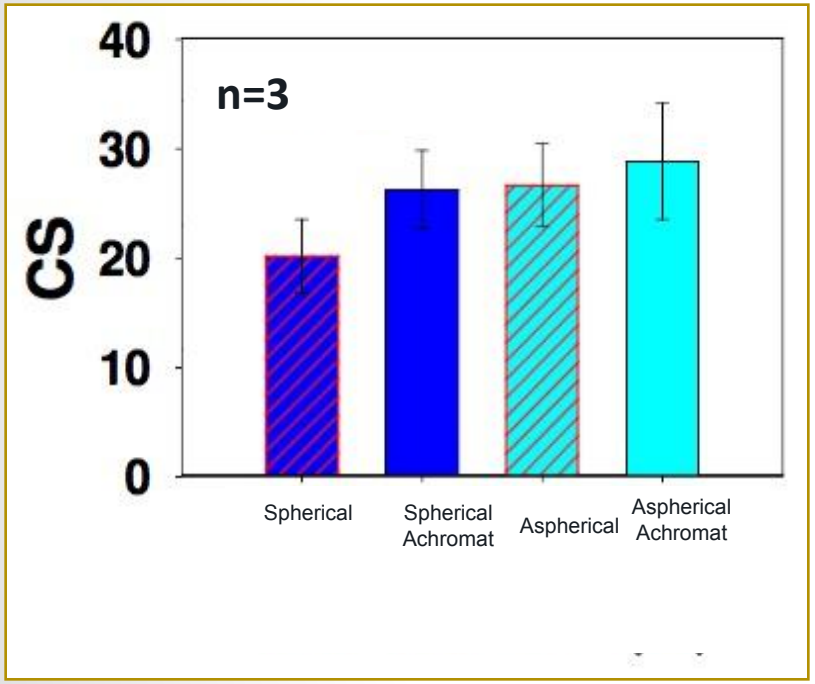


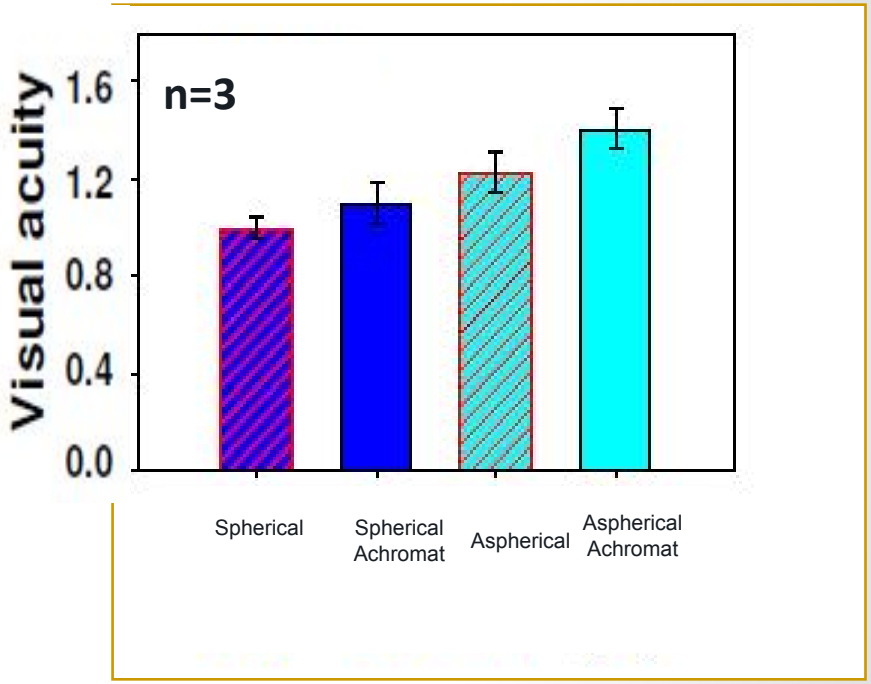
LCA = 0.14 Diopters



1. Weeber, H.A., & Piers, P.A. (2012). Theoretical Performance of Intraocular Lenses correcting both Spherical and Chromatic Aberration. J Refr Surg, 28 (1), 48-52.; 2. Artal, P., Manzanera, S., Piers, P., & Weeber, H. (2010). Visual effect of the combined correction of spherical and longitudinal chromatic aberrations. Opt Express, 18 (2), 1637-1648.; 3. Chromatic aberration between 500nm and 640nm, Nagata et al, 1999; ; 4. Piers et al, "IOLs for the Combined Correction of Chromatic and Spherical Aberration" ASCRS 2008

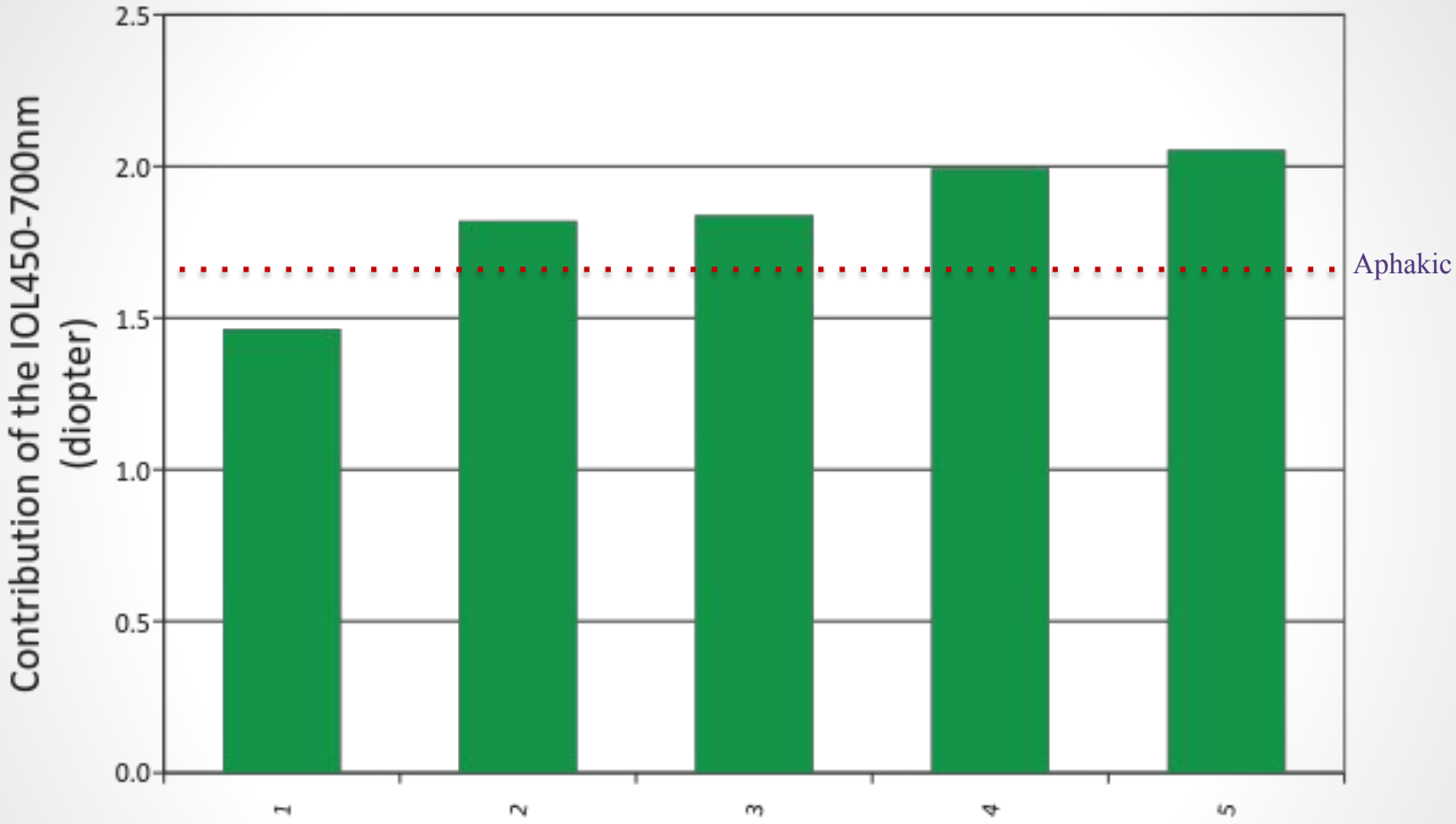
Visual effect of the combined correction of Spherical and Longitudinal Chromatic Aberrations





Artal P, Manzanera S, Piers P, Weeber H. Visual effect of the combined correction of spherical and longitudinal chromatic aberrations. Opt Express 2010;18:1637-48.

TECNIS IOL material with lowest chromatic aberration of any hydrophobic acrylic material contributes to its highest contrast

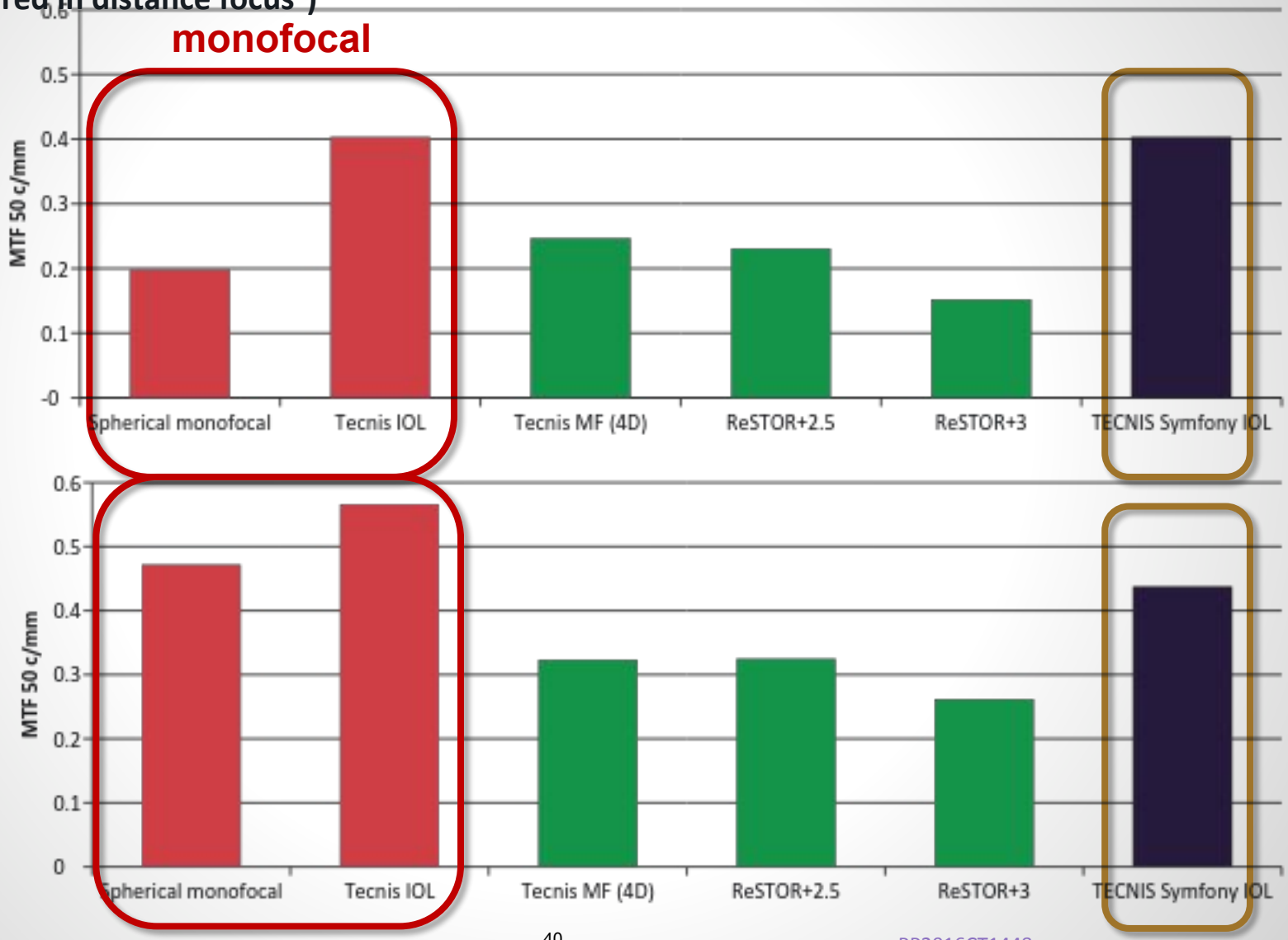


Large variation of longitudinal chromatic aberration between different IOL materials: 1.45 and 2 D

Weeber et al. Differences in Chromatic Aberration of IOLs, ESCRS 2016.

TECNIS Symfony® IOL delivers highest level of image contrast

(MTF measured in distance focus[1])



PP2016CT1448

TECNIS Technology:

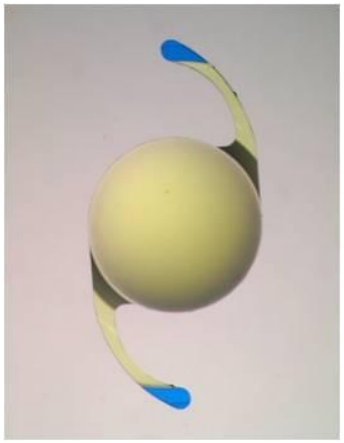
Delivering on High Image Contrast Performance

- Aspheric surface
- → Compensating for Spherical Aberrations of the eye
- Polymer Material with low Refractive Index
- → Minimizing Light Dispersion
- Polymer Material with high Abbe number
- → Minimizing Chromatic Aberration
- Polymer Material not associated with Glistening
- → Minimizing Light Scatter

Hydrophobic Acrylic IOLs Comparisons

B&L Envista™

MX60



HOYA-iSymm®

FY60-AD

Alcon AcrySof™

IQ SN60WF

AMO TECNIS®

ZCB00

Increasing Asphericity

1DOF2015OTH0011 Data on File- MTF Data Comparison (White Light ACE Model Eye)

Chromatic Aberration

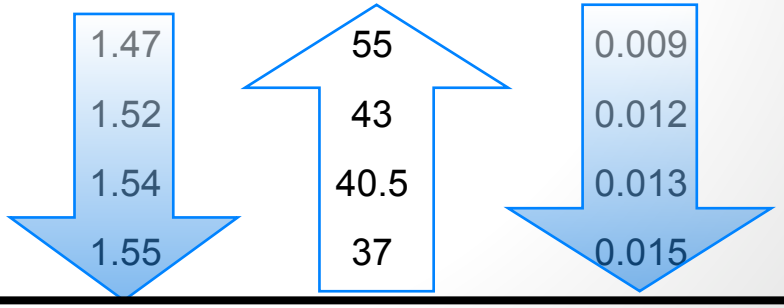
Dispersion / Abbe Number: IOLs

Within a class of materials:

High Refractive Index ~ High Dispersion

(low Abbe number)

Material	Index (n)	Abbe No (V)	Dispersion
Human crystalline lens	1.41	47	0.009
AMO (high index) silicone	1.46	42	0.011
PMMA	1.49	58	0.008
Hydrophobic Acrylic: AMO acrylic (TECNIS)	1.47	55	0.009
Hydrophobic Acrylic: Hoya acrylic	1.52	43	0.012
Hydrophobic Acrylic: B + L acrylic	1.54	40.5	0.013
Hydrophobic Acrylic: Alcon acrylic	1.55	37	0.015



Zhao H, Mainster MA. Br J Ophthalmol 2007;91:1225–1229.
Negishi K et al. Arch Ophthalmol 2001;119:1154-1158. Krader CG. EUROTIMES 2011/2012;16/17: 18.

Diffractive Optics

Step Height

Energy Distribution

Low step: less diffracted light

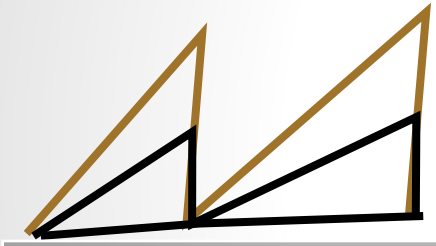
High step: more diffracted light

Ring Size

Add Power

Small area ~ longer focal point

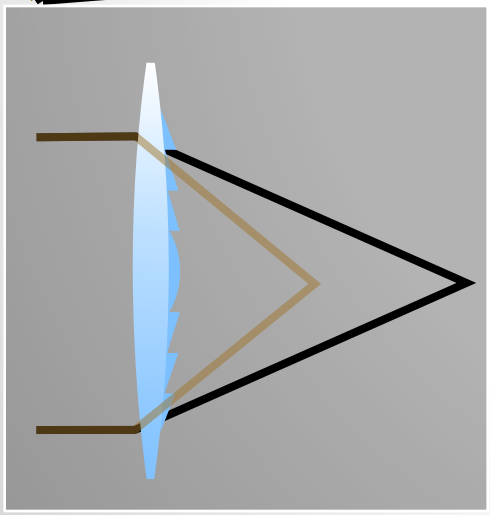
Large area ~ shorter focal point

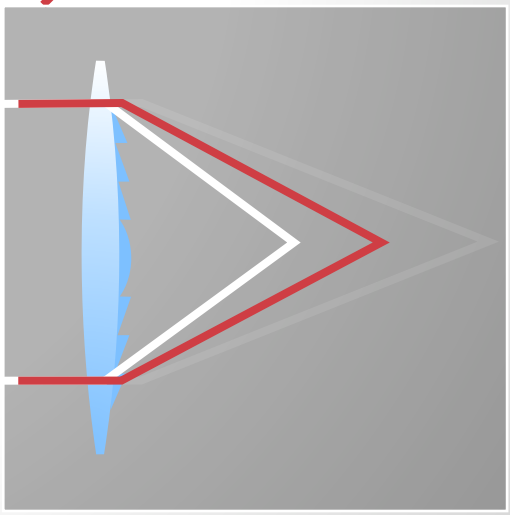


Echelette contour

Higher orders of diffraction

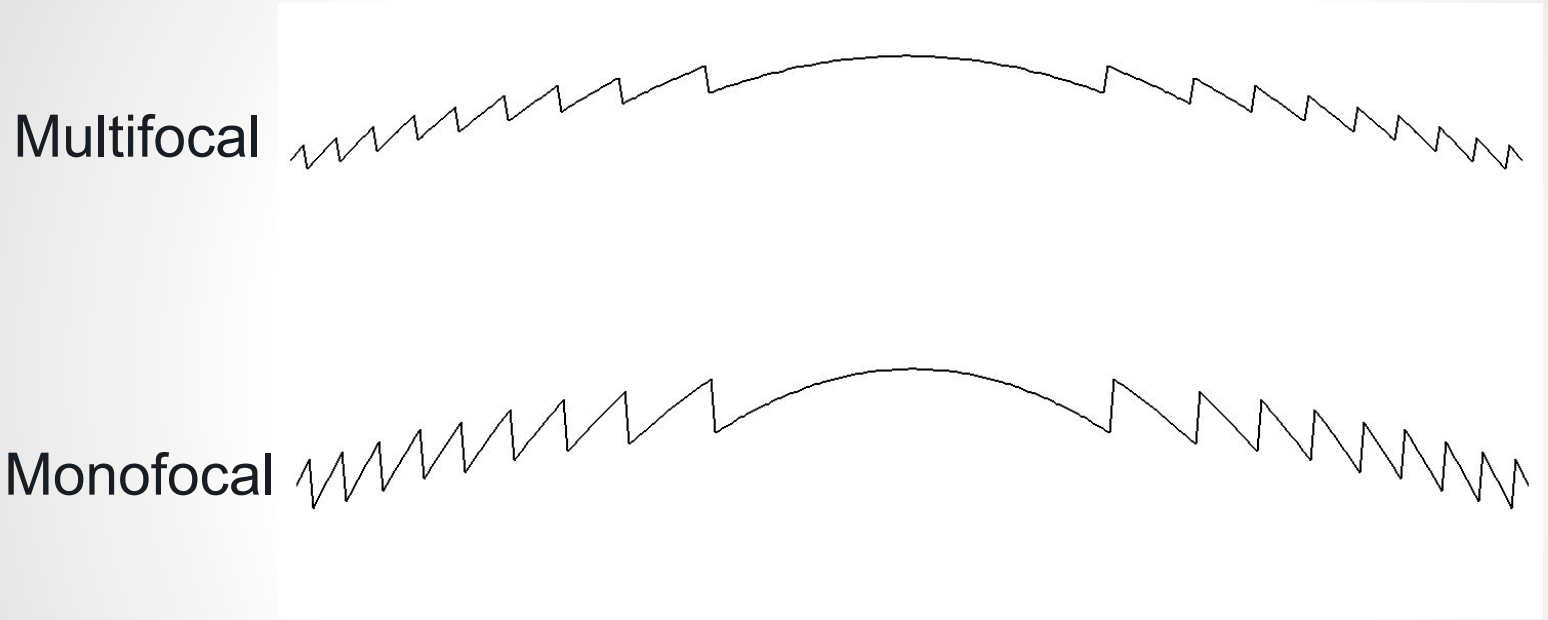
Fine tune effects of diffraction such as scatter





General concepts, not the strict rules of diffraction

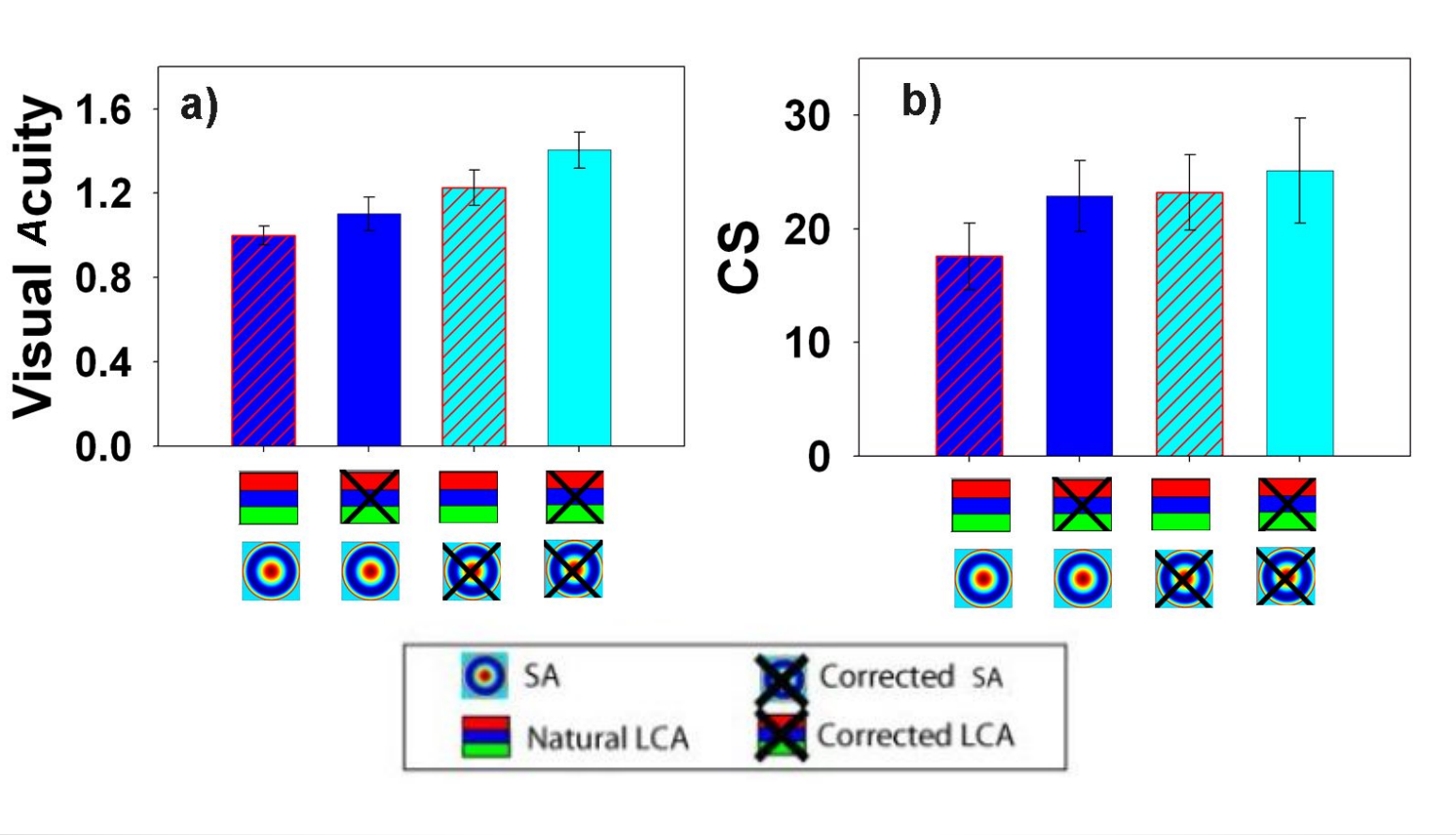
Diffractive Monofocal IOLs



A diffractive monofocal IOL that corrects chromatic aberration can be made by increasing the profile height[1].

1. Weeber, H.A., & Piers, P.A. (2012). Theoretical Performance of Intraocular Lenses correcting both Spherical and Chromatic Aberration. J Refr Surg, 28 (1), 48-52.;

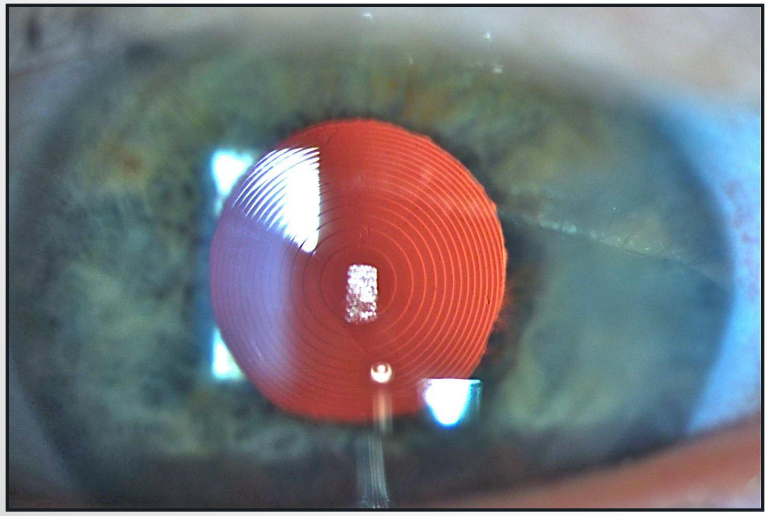
Combined Effects of correcting SA and CA

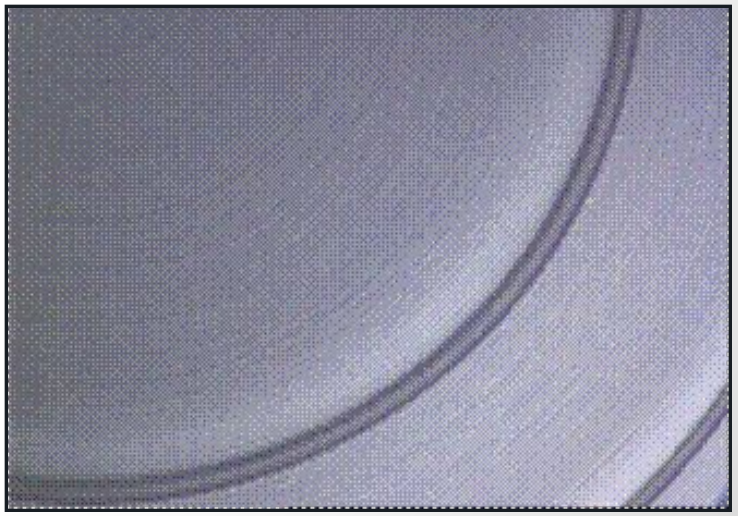


S. Manzanera et al. **Visual Benefit of the Combined Correction of Spherical and Chromatic Aberrations** ARVO 2007

Manufacturing Difference of 1-Piece IOLs

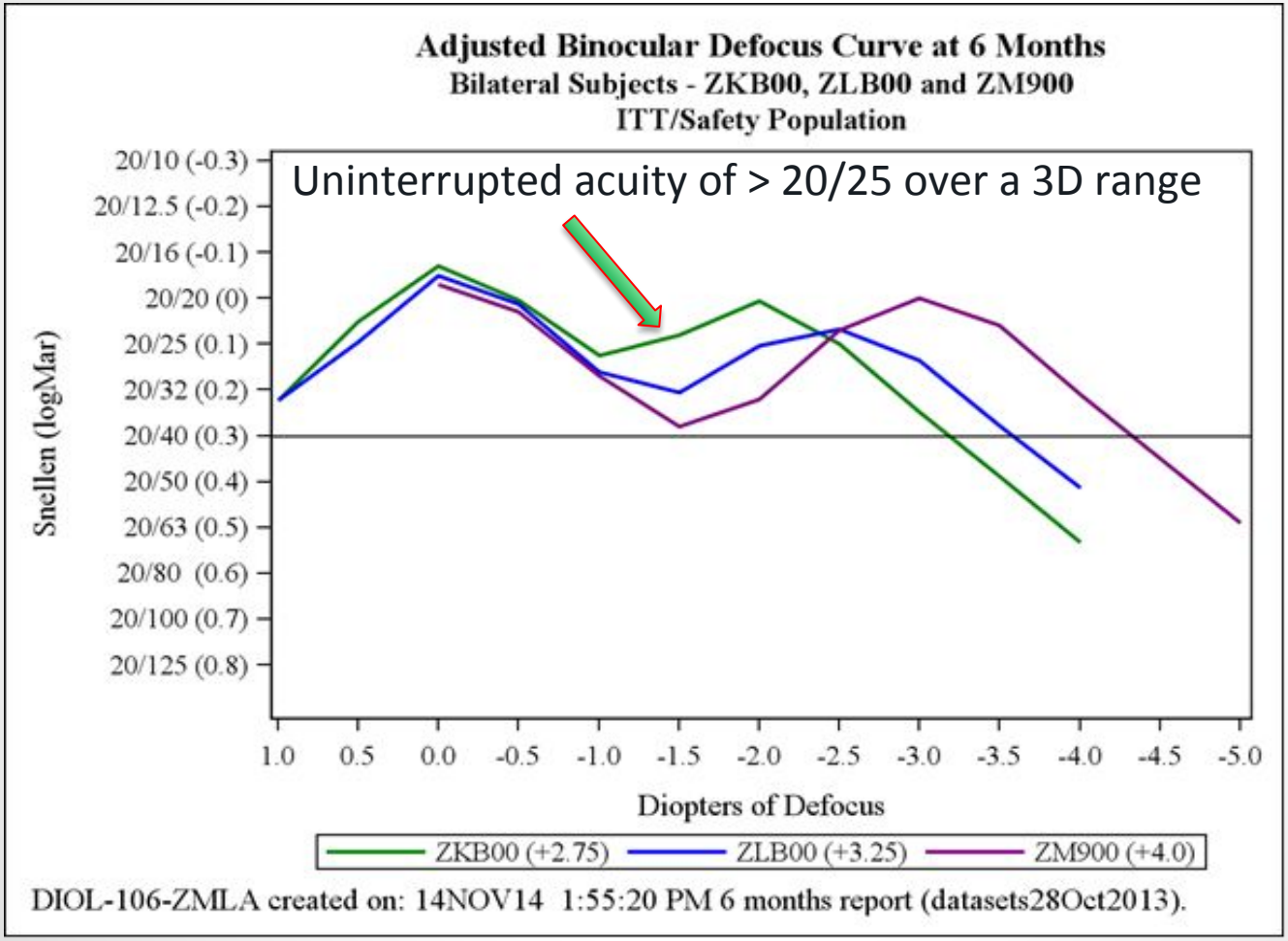
- Diamond Cryolathing (vs. Injection Molding):
  - –Refractive Precision
  - –Temperature control
    - Side steps Microvoid formation – “Glistening”





1. Miyata A, Yaguchi S. Equilibrium water content and glistenings in acrylic intraocular lenses. JCRS. 2004;30:1768-1772.

Defocus Curve amongst Differing Add power IOLs

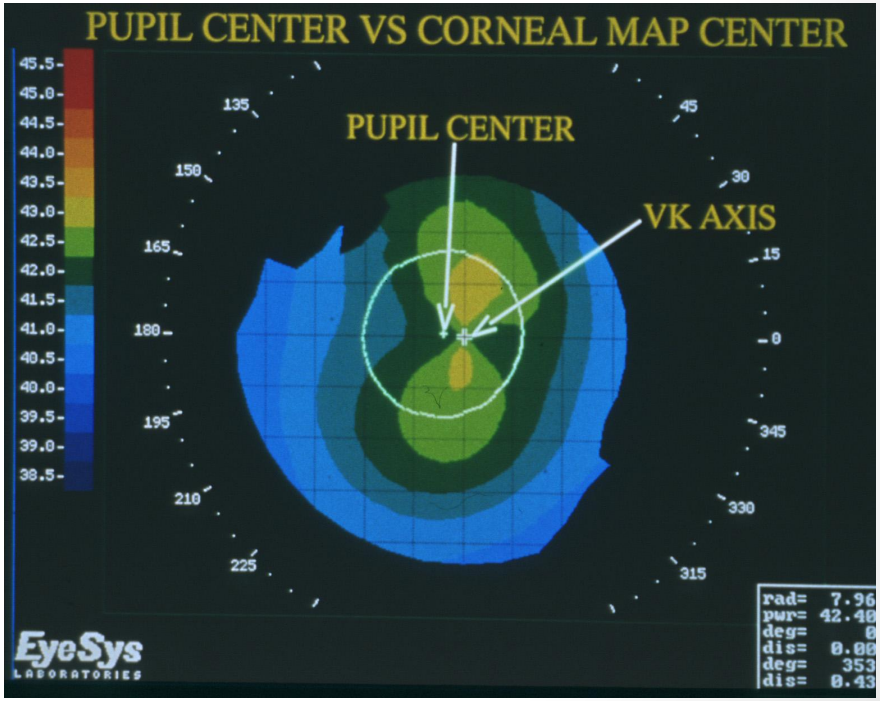


Data: DFU, TECNIS® Multifocal 1-Piece IOL, Models ZKB00 and ZLB00, and DFU, TECNIS Multifocal 1-Piece IOL, Model ZMB00.

Astigmatism Correction

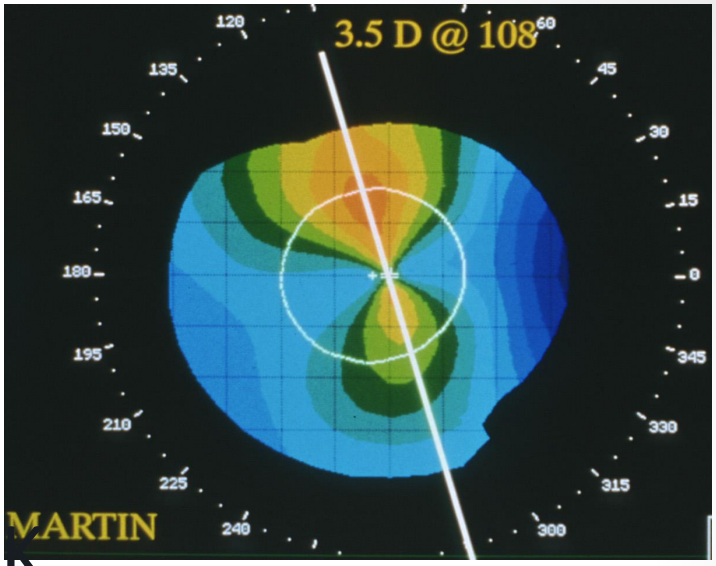
Astigmatism Correction Challenges

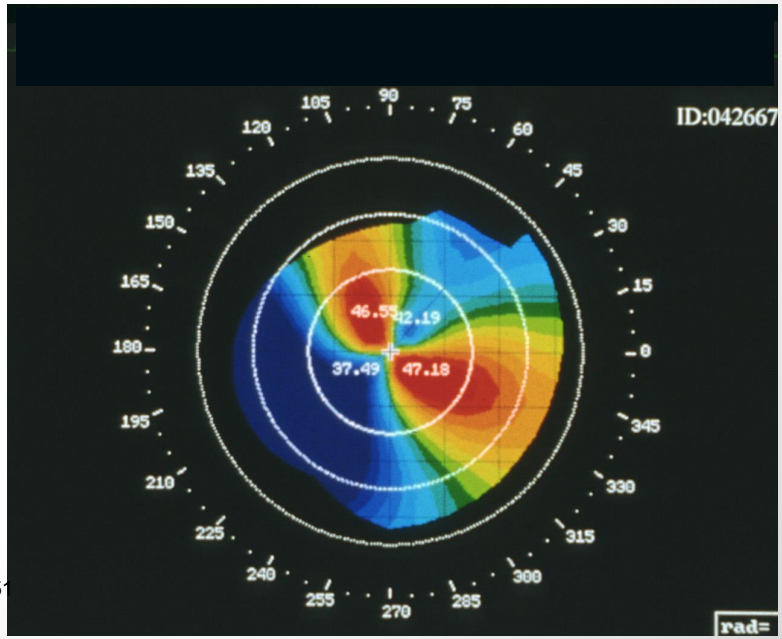
- Proper Measurement
- Proper Execution
- Post operative Care



Astigmatism Correcting Options

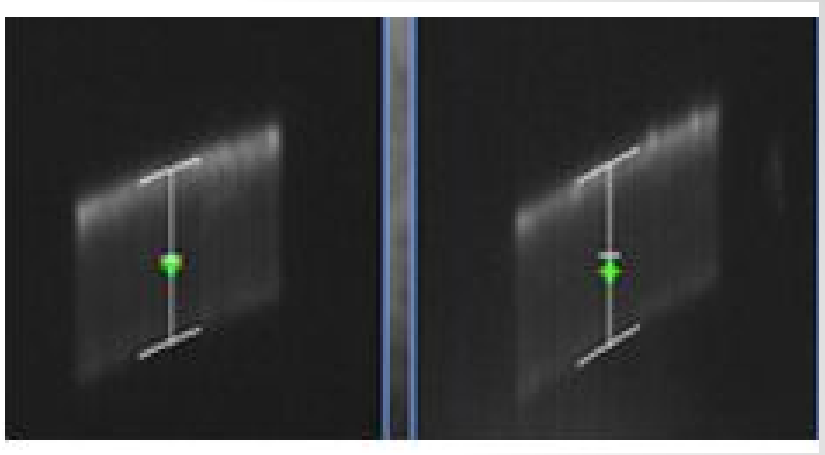
- Toric IOLs
- LASIK/PRK (Post-op)
- Femtosecond Laser AK
- Manual LRIs

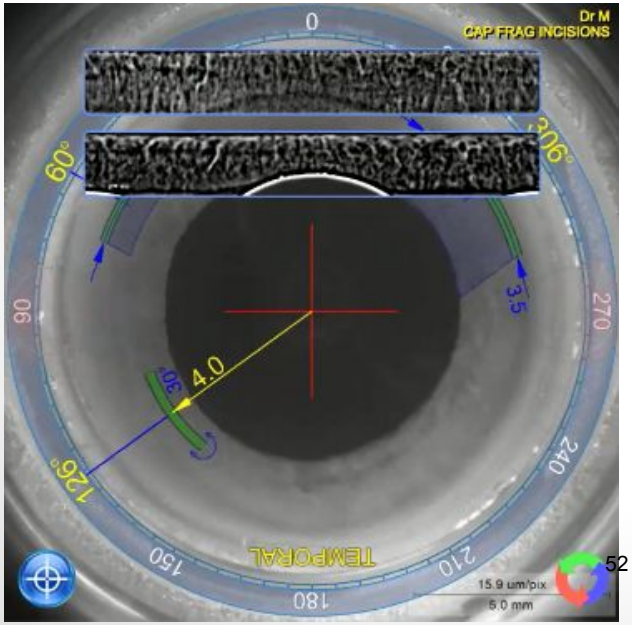


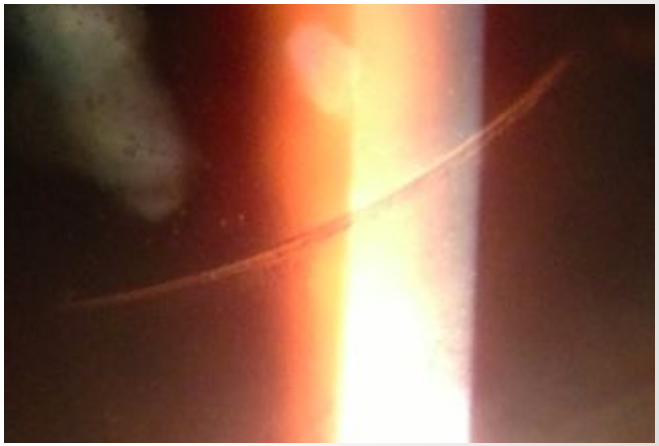


Femtosecond
"Intelligent Incisions"

- Superior Incision Quality
- More accurate placement
  - Localized Pachymetry
  - Iris registration







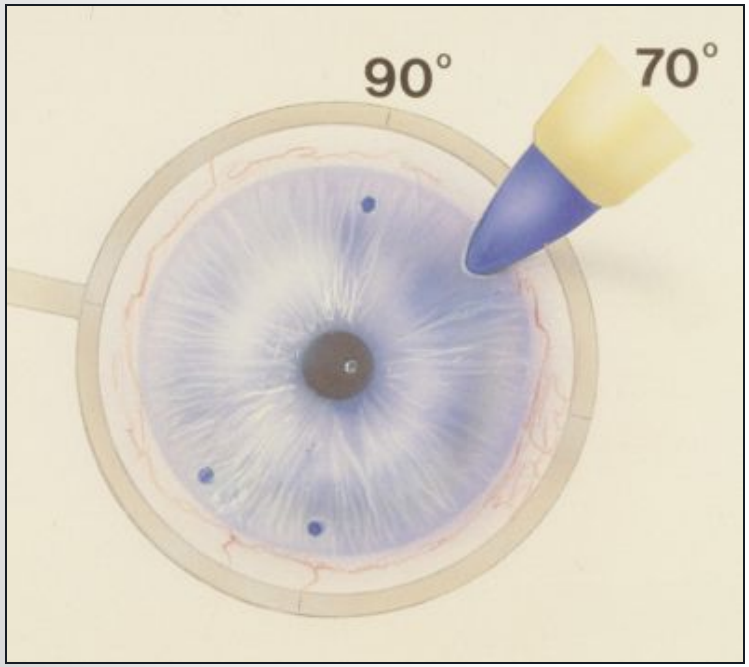
Ectasia Potential?

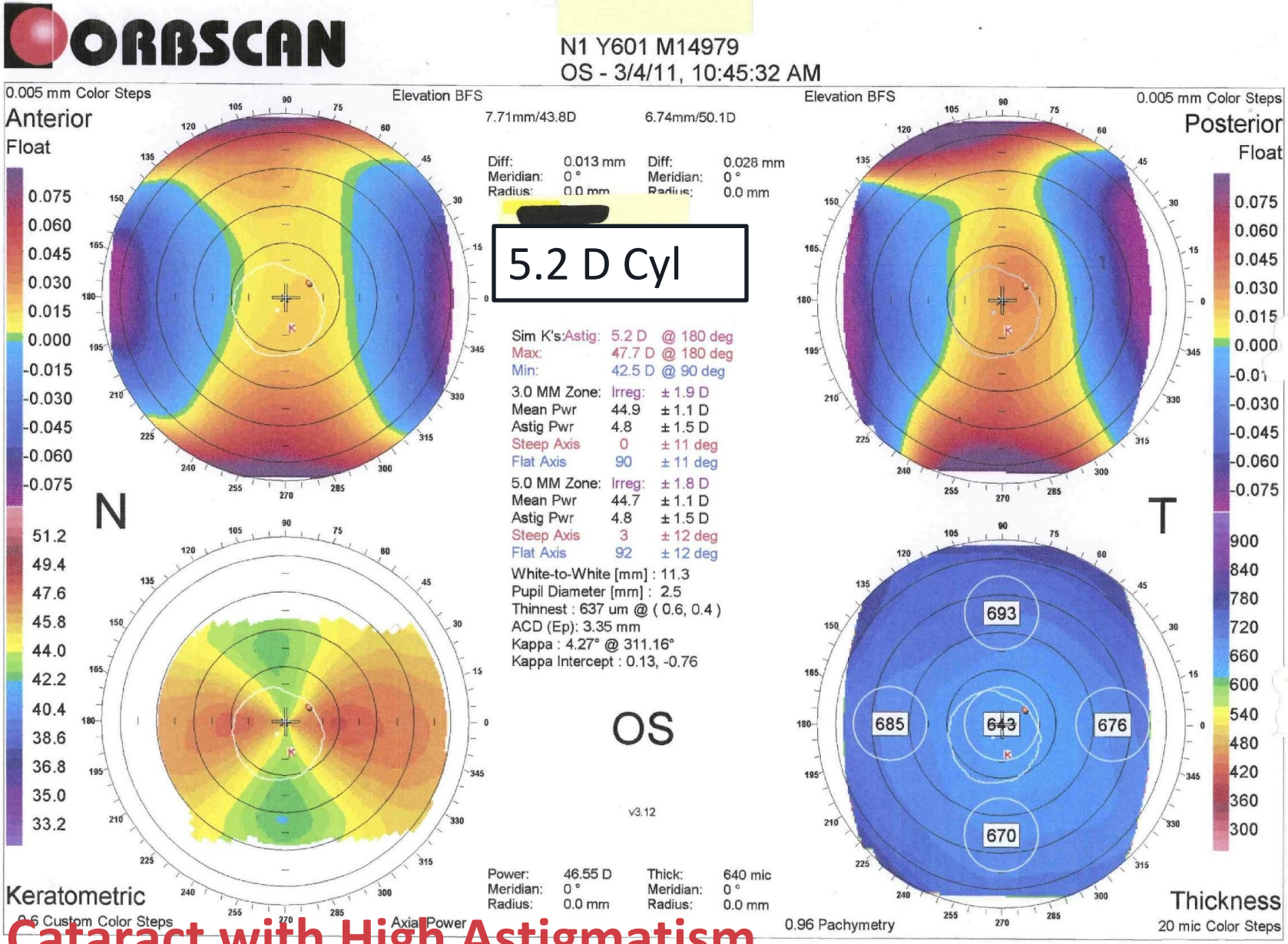
Intra-Operative Aberrometry

- IOL Power Prediction
  - Post Refractive Patients
- Astigmatism Correction
  - Delivers on “Iris Registration”
  - Titratable

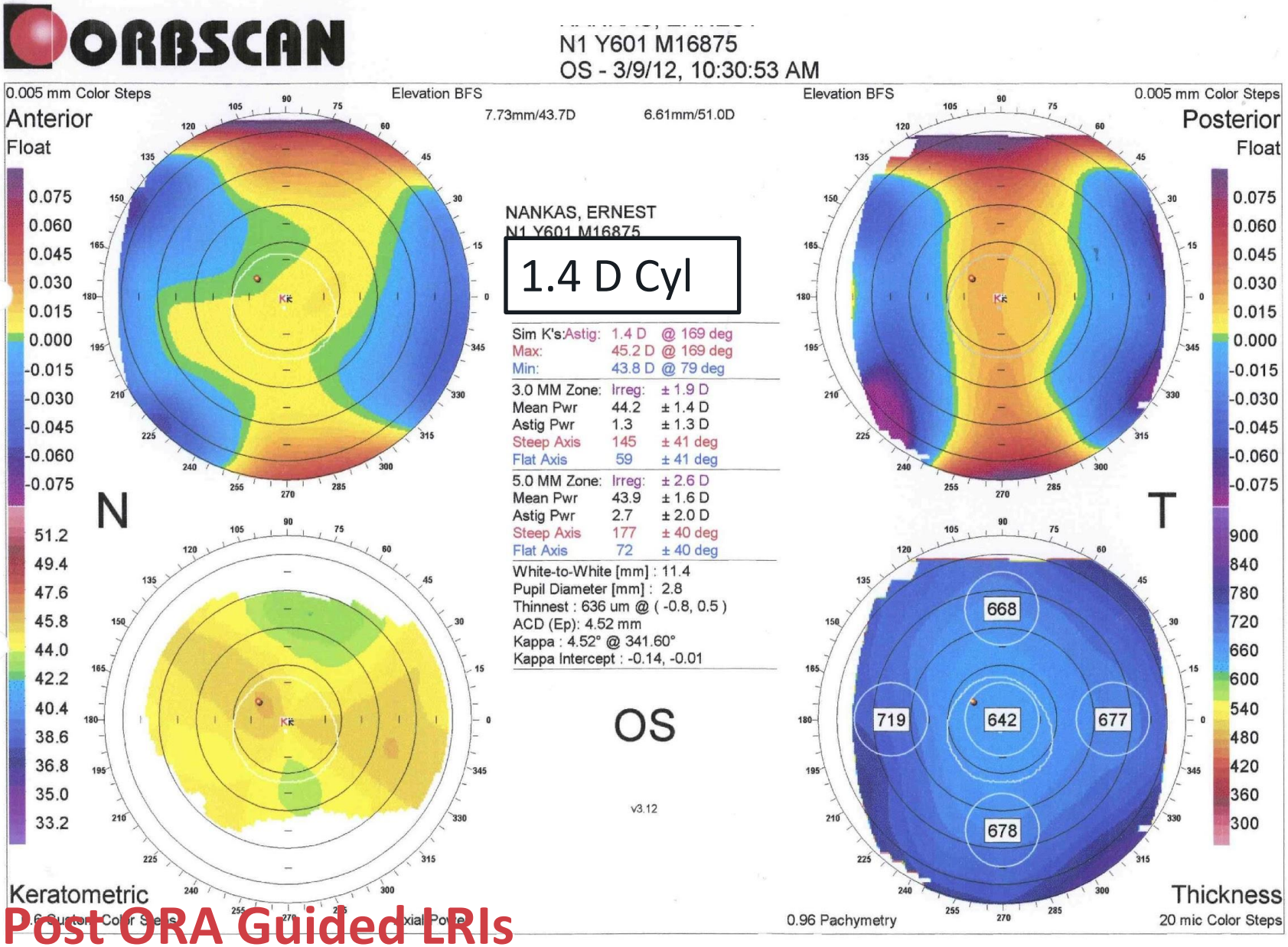
Improving LRI
Precision and Accuracy

- Reticle guides LRI incision (Toric IOL placement)



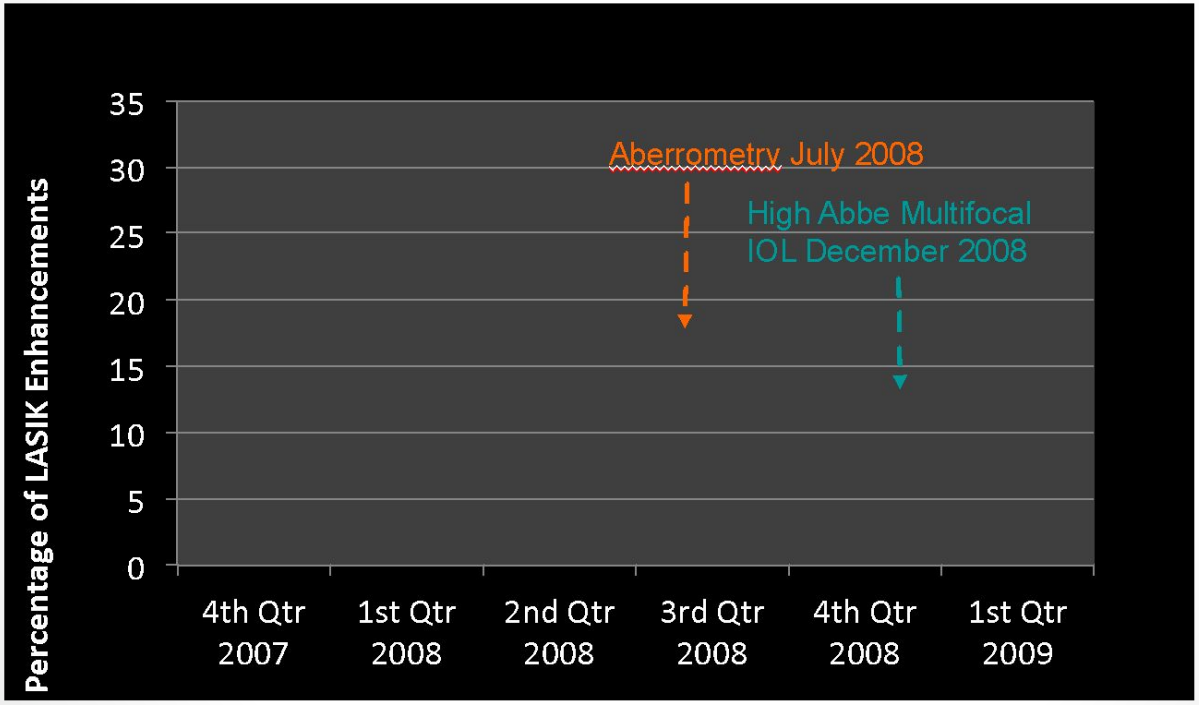


Cataract with High Astigmatism



Post ORA Guided LRIs

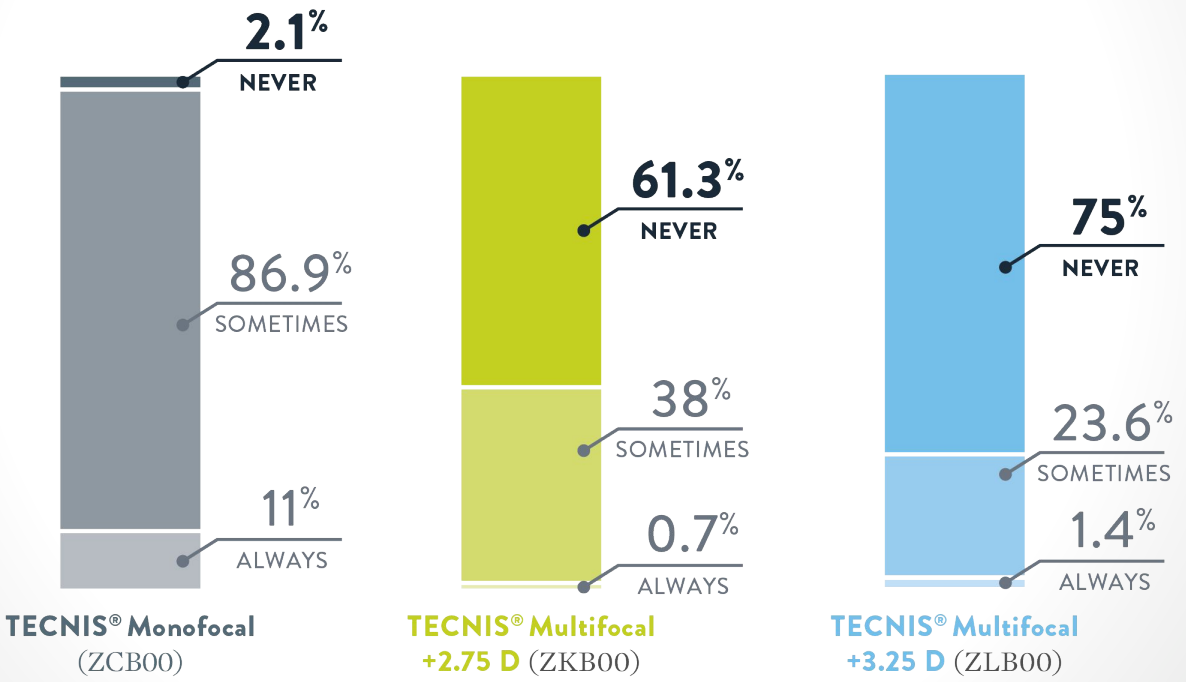
Improved Outcomes with New Technology



ENHANCED FUNCTIONALITY

Spectacle independence vs. Near Add magnitude

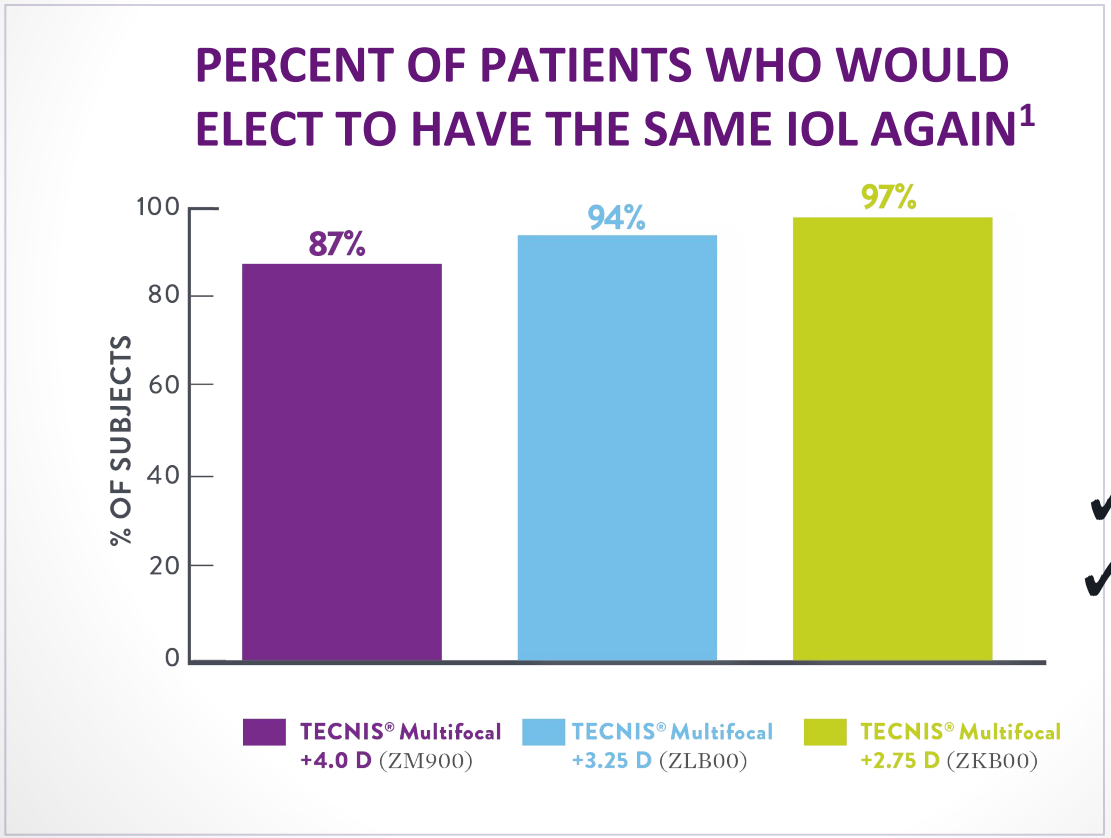
HOW OFTEN DO YOU WEAR GLASSES?



1. TECNIS® Multifocal 1-Piece IOL DFU. Abbott Medical Optics Inc., Santa Ana, Calif. The questionnaire was not determined to be a psychometrically valid assessment of the concept of spectacle independence. 2. AcrySof® IQ ReSTOR® +2.5D Multifocal IOL Model SV25TO DFU.

LONG-TERM SUSTAINABILITY

Patient Satisfaction

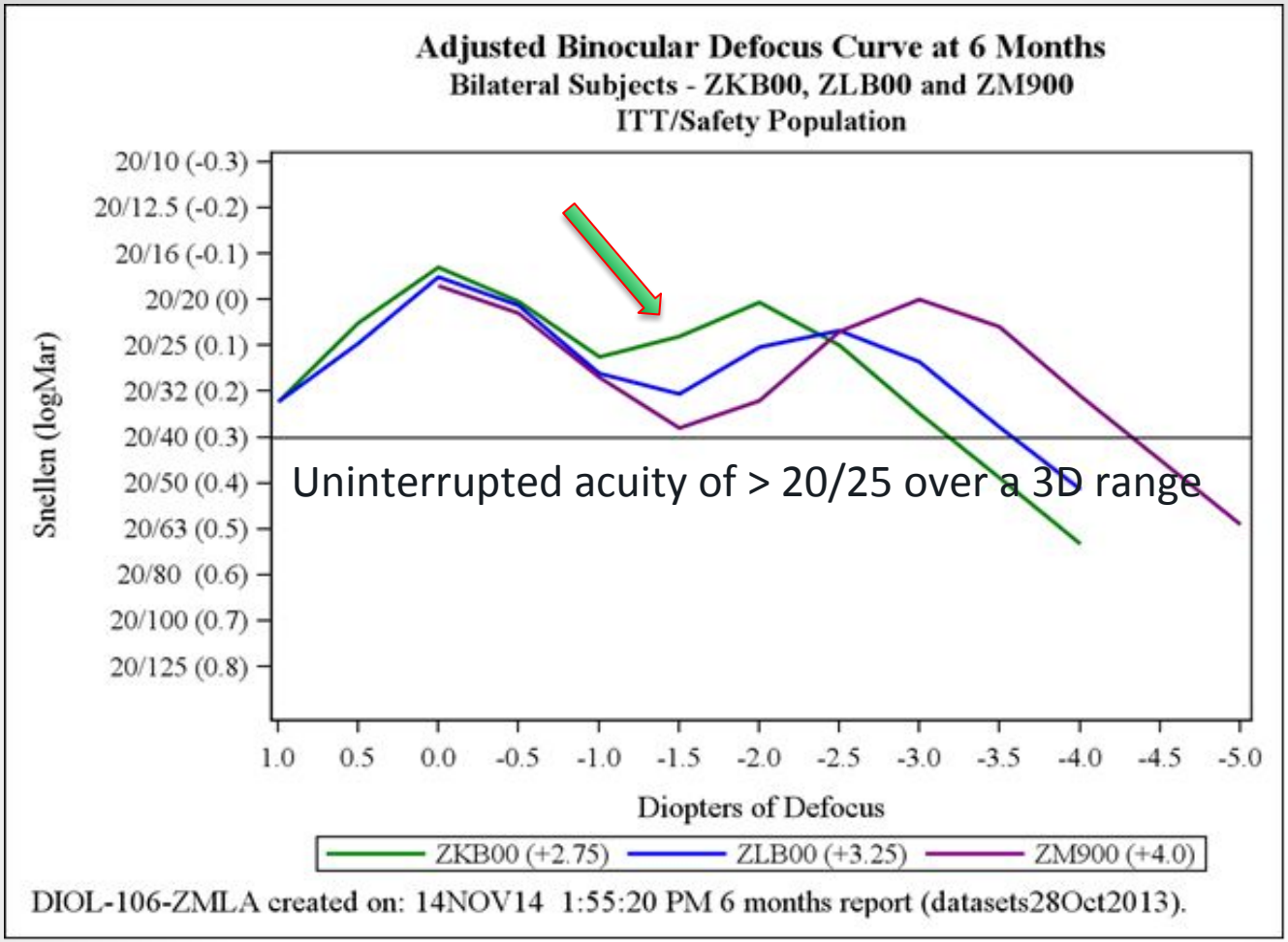


What Else is at Play?

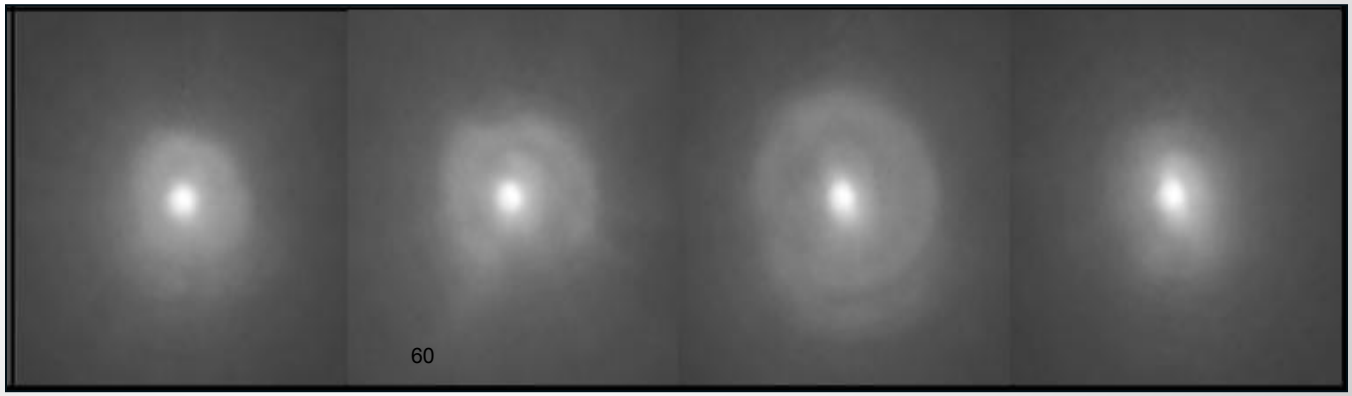
✓ Depth of Field

✓ Dysphotopsias

1. TECNIS® Multifocal 1-Piece IOL DFU. Abbott Medical Optics Inc., Santa Ana, Calif. The questionnaire was not determined to be a psychometrically valid assessment of the concept of spectacle independence.



Best Ingredients



Adaptation to Blur

Pre-adapt

stare at the fixation point while adapting

Adapt

Post-adapt

How will this impact patients' perception of quality of vision comparing eyes and sharpness at various levels of defocus?

Post Operative Care

Good

Old Fashioned Care,

+

Lasik

An Evolving Journey

Examination

Treatable Conditions

History

Ancillary Testing

Future Advances (Mystery)

IOL Selection

Assistive Technology

Residual Error Correction

Astigmatism Correction

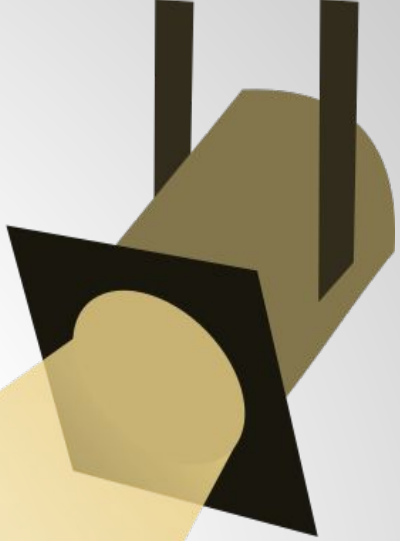
Post op Care

Which of the following patients is least likely to benefit from a multifocal IOL?

A. 85 y.o. female with mild glaucoma, on alphagan, mild NFL loss and 3+ NS
B. 46 y.o. Police officer with MRx of +6 -1.75 x 180 OU and CL intolerance
C. 34 y.o. software programmer, with unilateral post traumatic cataract
D. 64 y.o. Pilot s/p highly successful macular hole repair with post vitrectomy and 1-2+ NS
E. All of the above

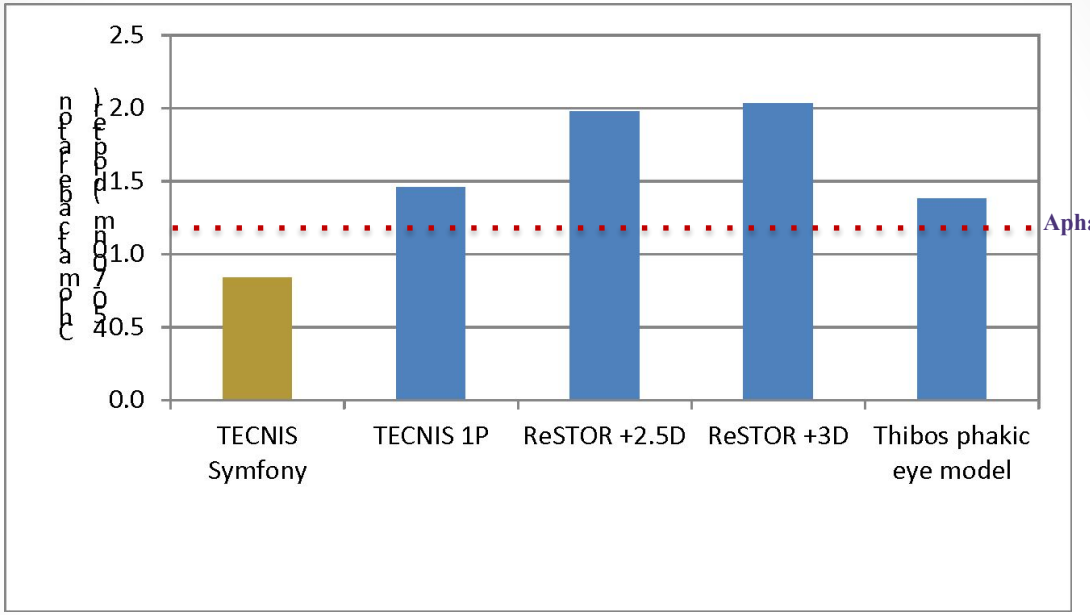
Which of the following are Less appealing characteristics for a Premium IOL?

A. Low Abbe number
B. High Abbe number
C. High index of refraction
D. Cryolathe manufacturing technique
E. Negative Z4,0
F. A and C above
G. C and E above



Shedding Polychromatic Light On Chromatic Aberration

TECNIS Sym*f*ony® IOL actively corrects chromatic aberration[1]



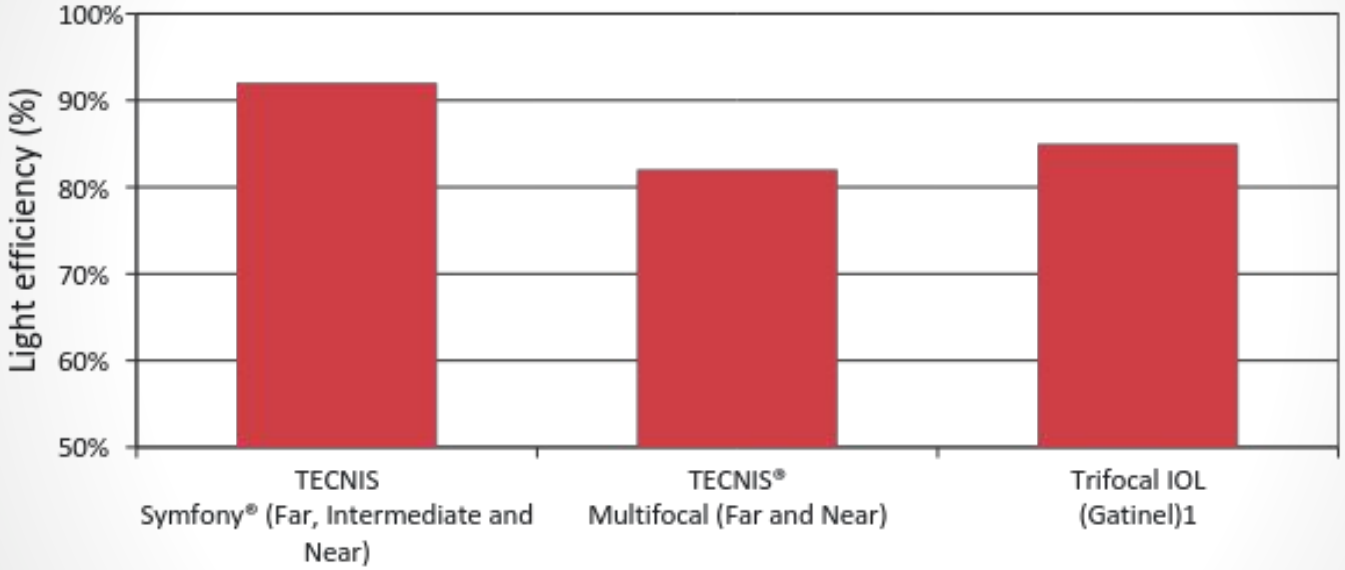
- The proprietary achromatic technology of TECNIS Sym*f*ony® IOL not only reduces chromatic aberration but actually corrects chromatic aberration of the cornea.[1]
- Tecnis Sym*f*ony® IOL corrects chromatic aberration for far, intermediate, and near to deliver a sharp image over the entire range of vision[2]

1. *DOF 2014CT0003 and DOF*2015CT0023 . Chromatic aberration of the TECNIS® Symfony IOL
2. *DOF2016CT0029. Chromatic Aberration of the Tecnis Symfony IOL over the range vision*

PP2016CT1448

TECNIS Symfony® IOL transmits 92% of light

Diffractive lenses generally experience a light transmission efficiency that is below 100%. Literature on multifocal diffractive IOLs reports light losses between 15% for trifocal lenses[1], and 18% for traditional bifocal lenses[2].



In the analysis, the light efficiency for the TECNIS lenses was calculated according to diffractive theory described by Buralli et al, 1989[3].

1. Gatinel, D., et al. J Cataract Refract Surg, 37 (11), 2060-2067. 2. Percival, S.P. (1989). Eye (Lond), 3 (Pt 5), 571-575.3. Buralli, D.A., et al. (1989). Appl. Opt., 28 (5), 976-983.

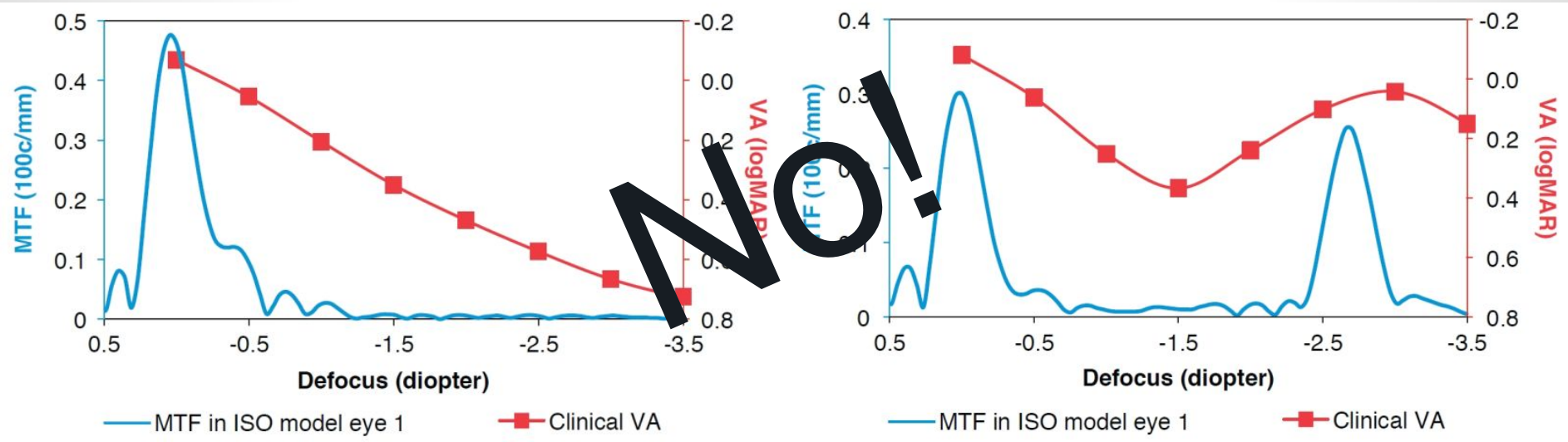
Shedding Multi-Spatial Light

On

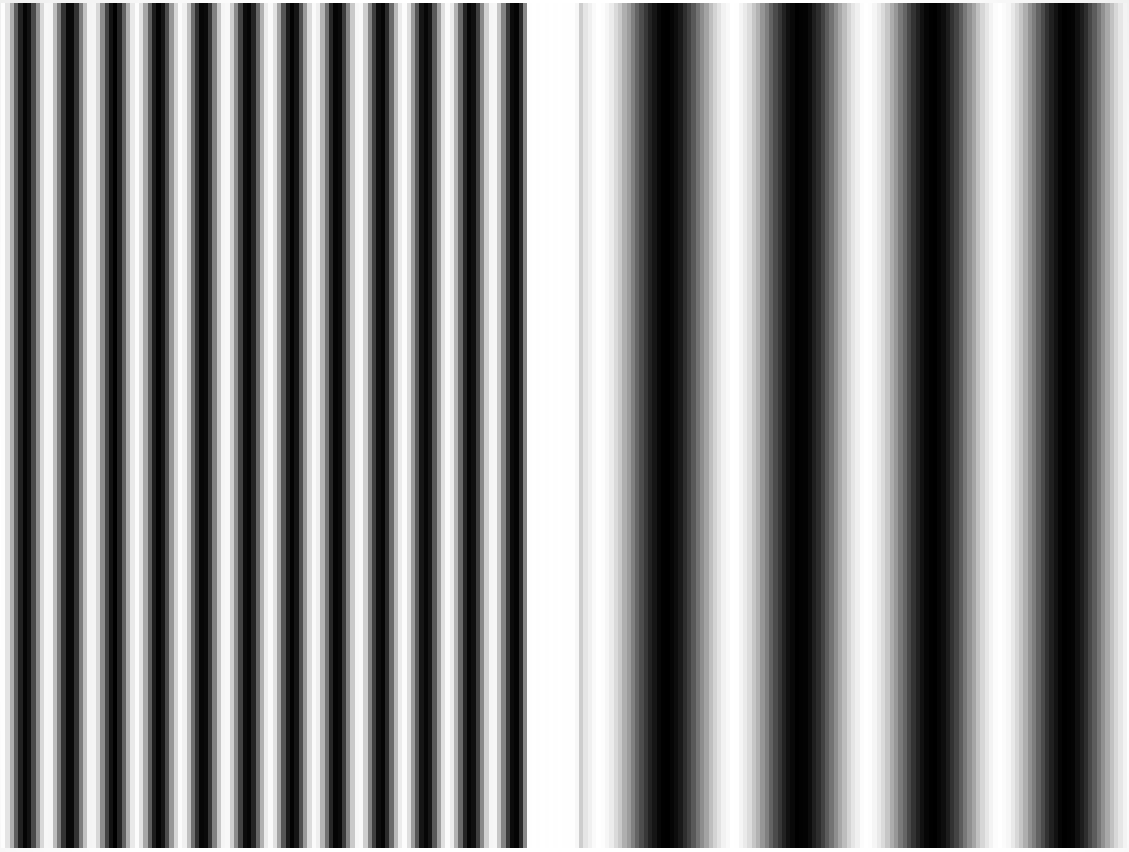
Defocus Curves

Do MTF values tell the entire story about the clinical performance of an IOL?

- Typically MTF values are measured and reported in green light at a single spatial frequency.
- People do not view the world only at a single spatial frequency; as such, green light MTFs do not tell the whole story.
- Through-focus MTF curves (blue) do not reflect measured clinical findings (red).

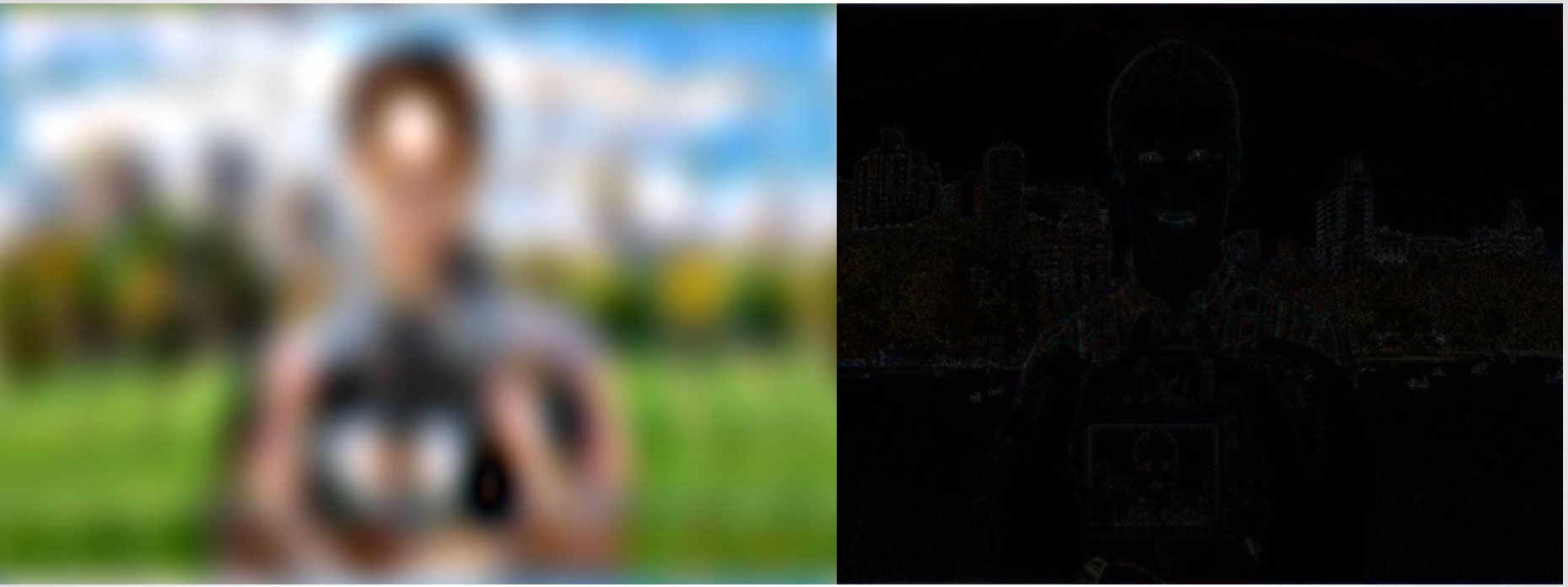


Spatial Frequencies



Objects are comprised of multiple spatial frequencies, so preclinical testing should also account for multiple

Natural scenes are composed of multiple spatial frequencies

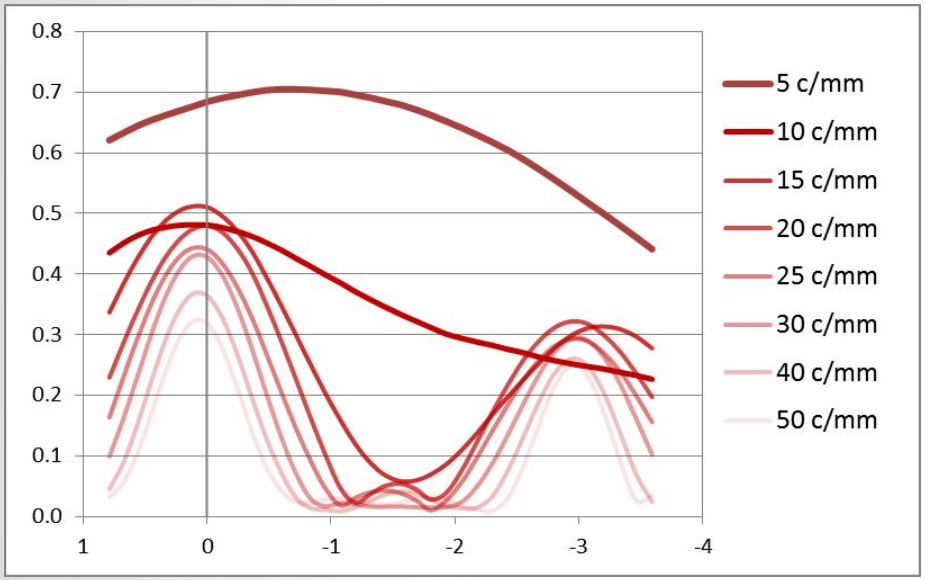


Lower Spatial Frequency ← → Higher Spatial Frequency

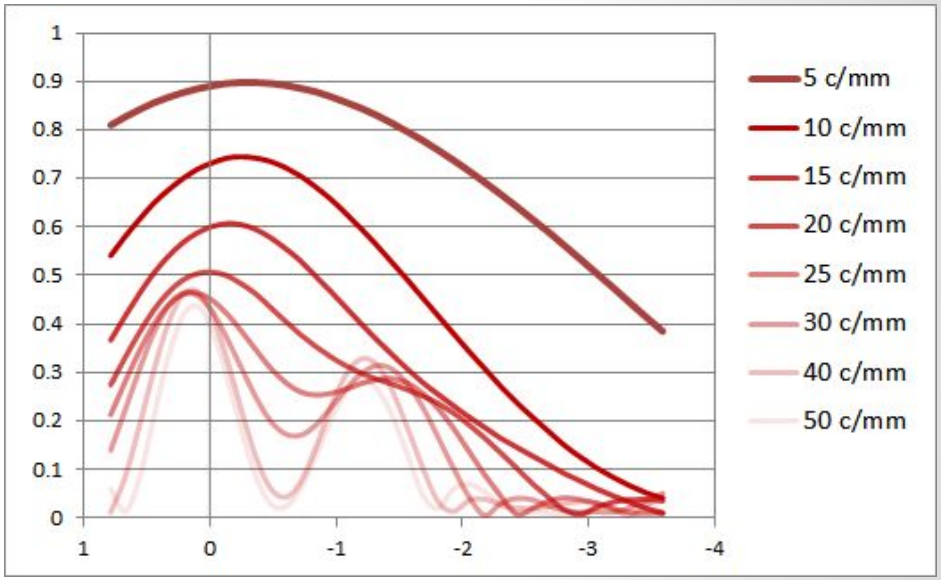
(built up to 50 c/mm)

Through focus Image Quality for Different Spatial Frequencies

TECNIS® Multifocal IOL



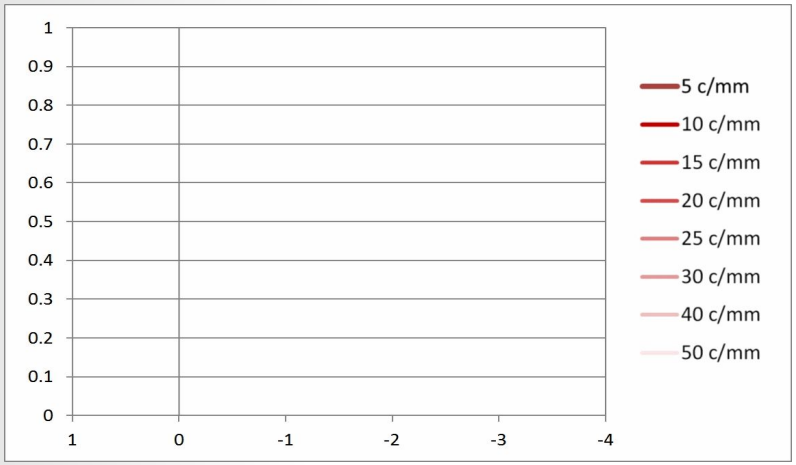
TECNIS Symfony® IOL



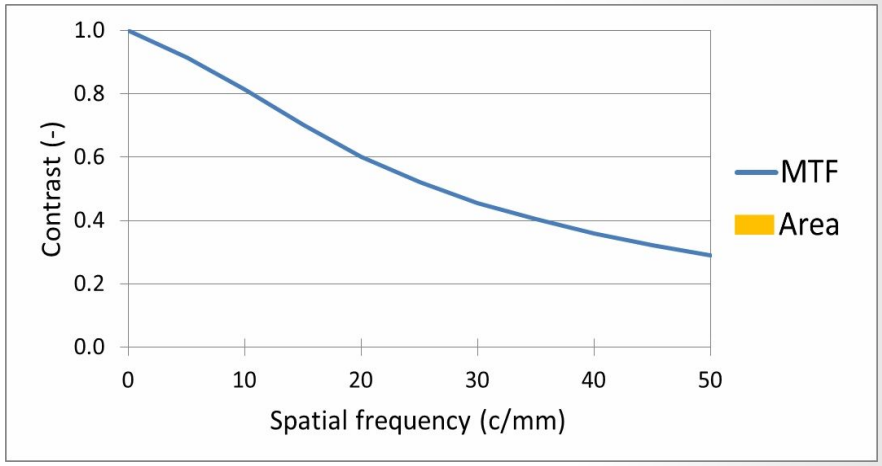
PP2016CT1448

Area under the MTF correlates to clinical performance

MTF at single spatial frequencies



Area under the MTF

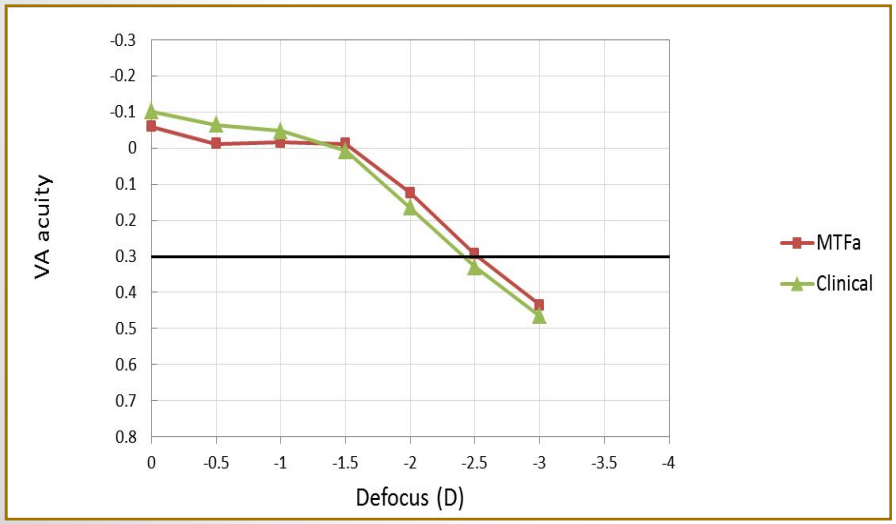


Incorporating Multiple Spatial Frequencies allows for high correlation with clinically measured VA

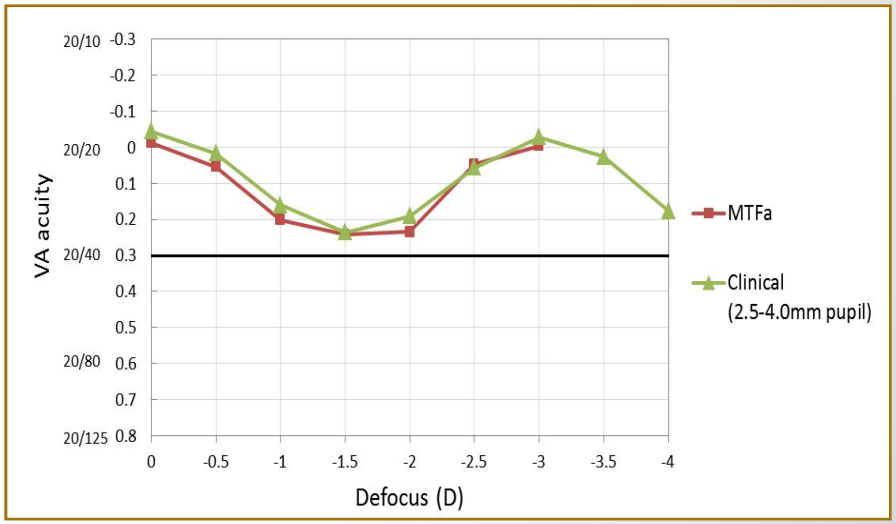
Using multiple spatial frequencies in preclinical measurements predicts clinical behaviors better than single spatial frequency measurements

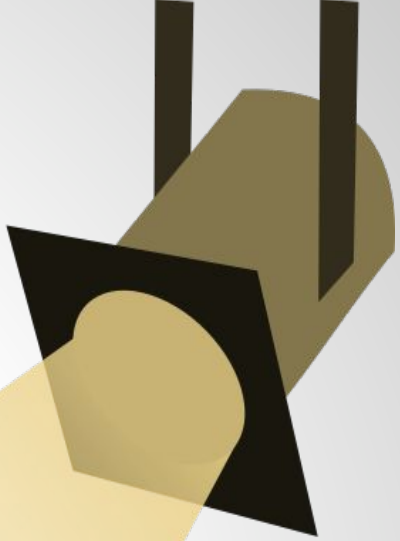
Prediction of binocular VAs using MTFa

TECNIS Symfony® IOL



TECNIS® Multifocal IOL



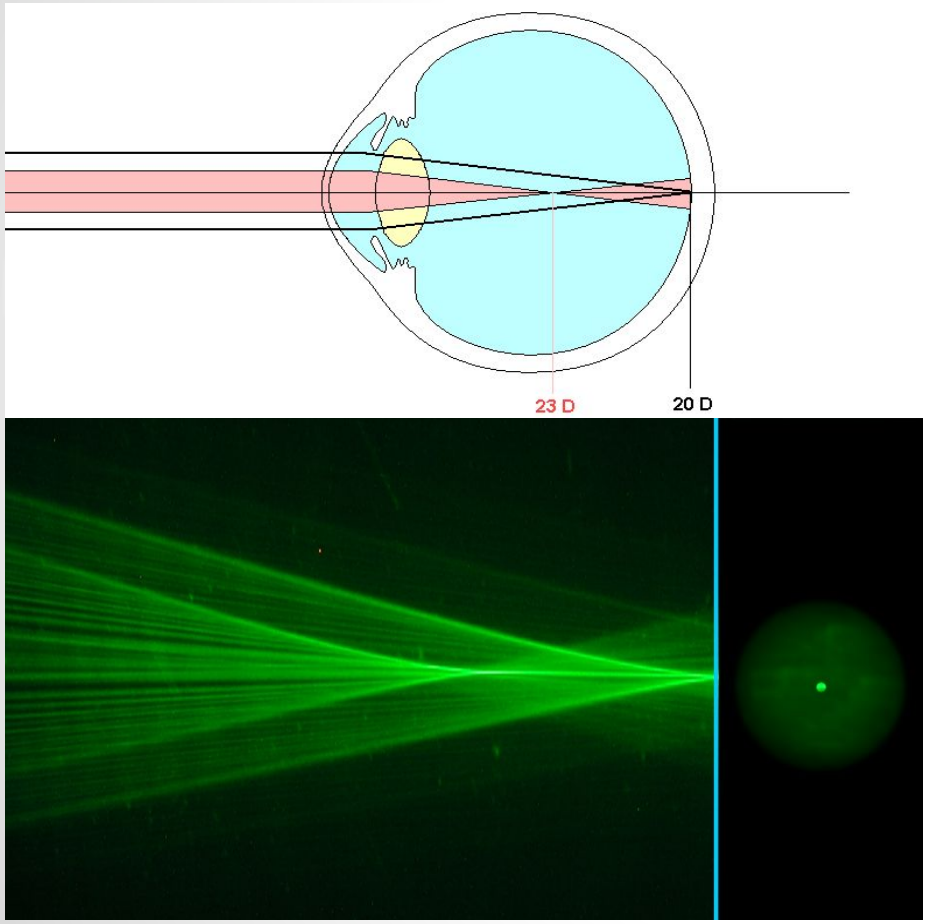


Shedding Light

On

Night Vision Symptoms

Simultaneous vision in multifocal IOLs may lead to halos and glare

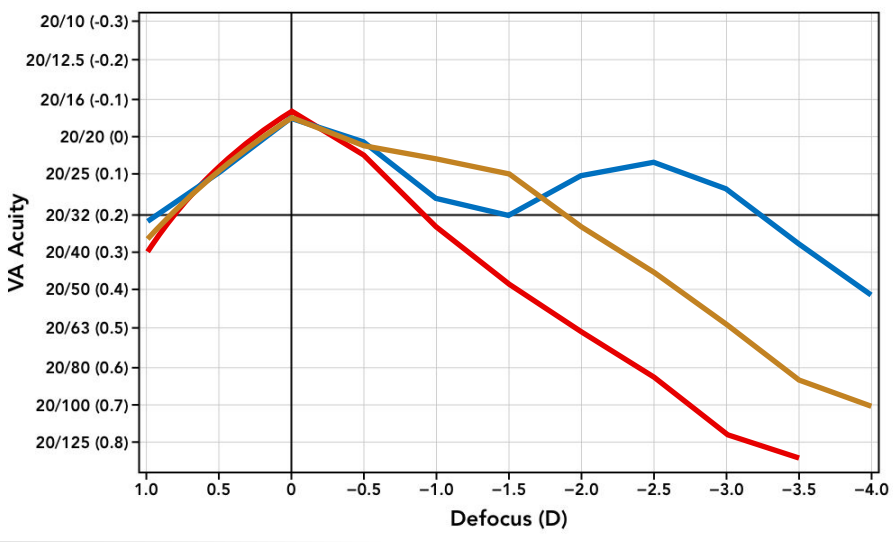


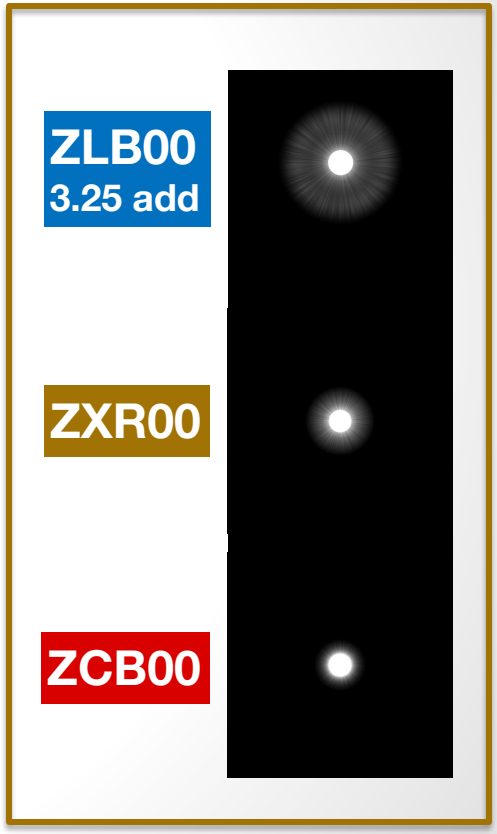
Multifocal IOLs work on the principle of simultaneous vision; one image is in focus while the out-of-focus image is suppressed.

Halos are caused by the out-of-focus image.

Visual Symptoms

TECNIS Symfony® IOL minimizes night vision symptoms

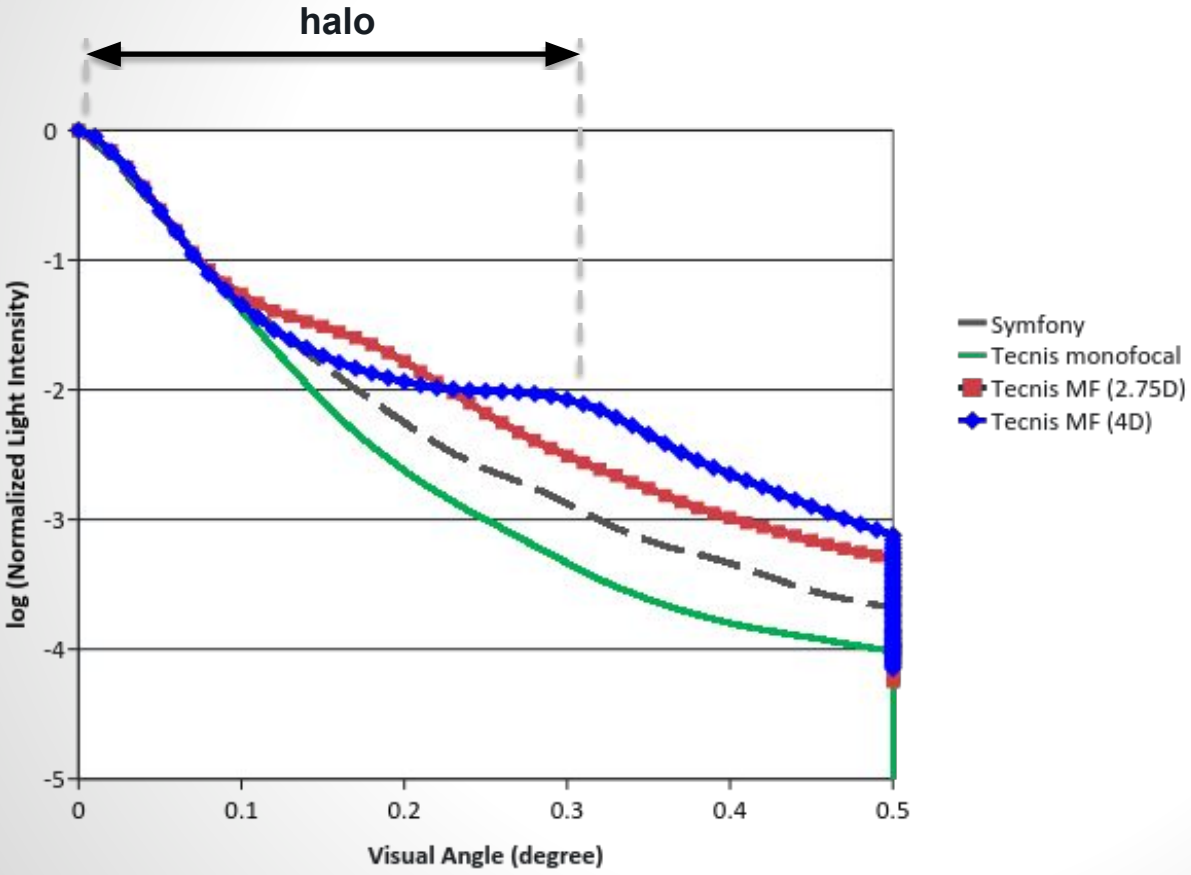


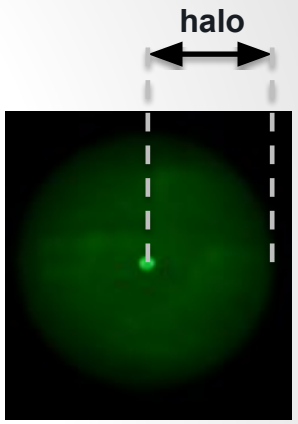


Simulated photopsia images for conceptualization only. Defocus curves originate from different studies and methods vary between studies.

Visual Symptoms

Retinal Light Intensity Profile of TECNIS Symfony® IOL





Shedding Light

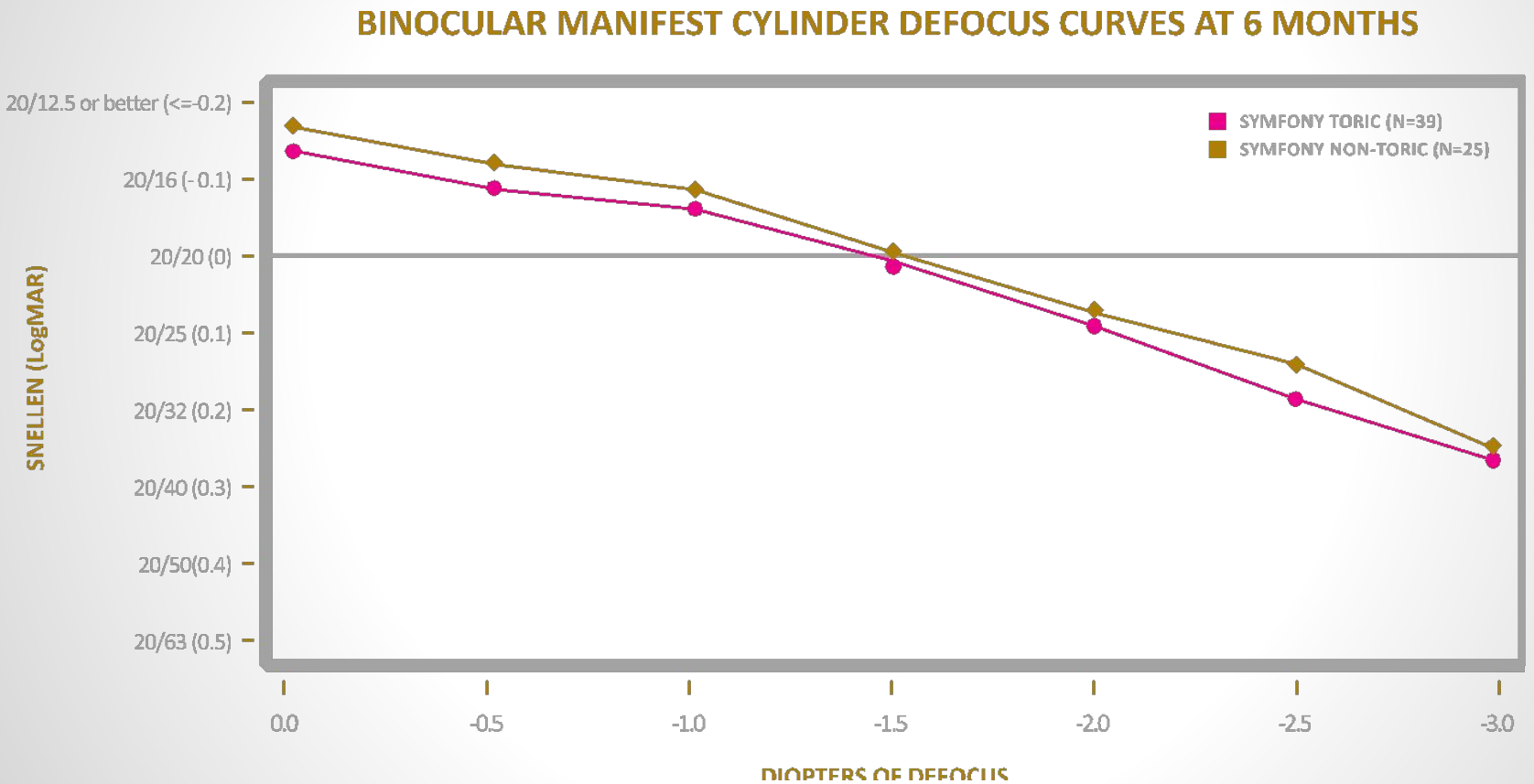
On

IOL Forgiveness

PP2016CT1448

Forgiveness

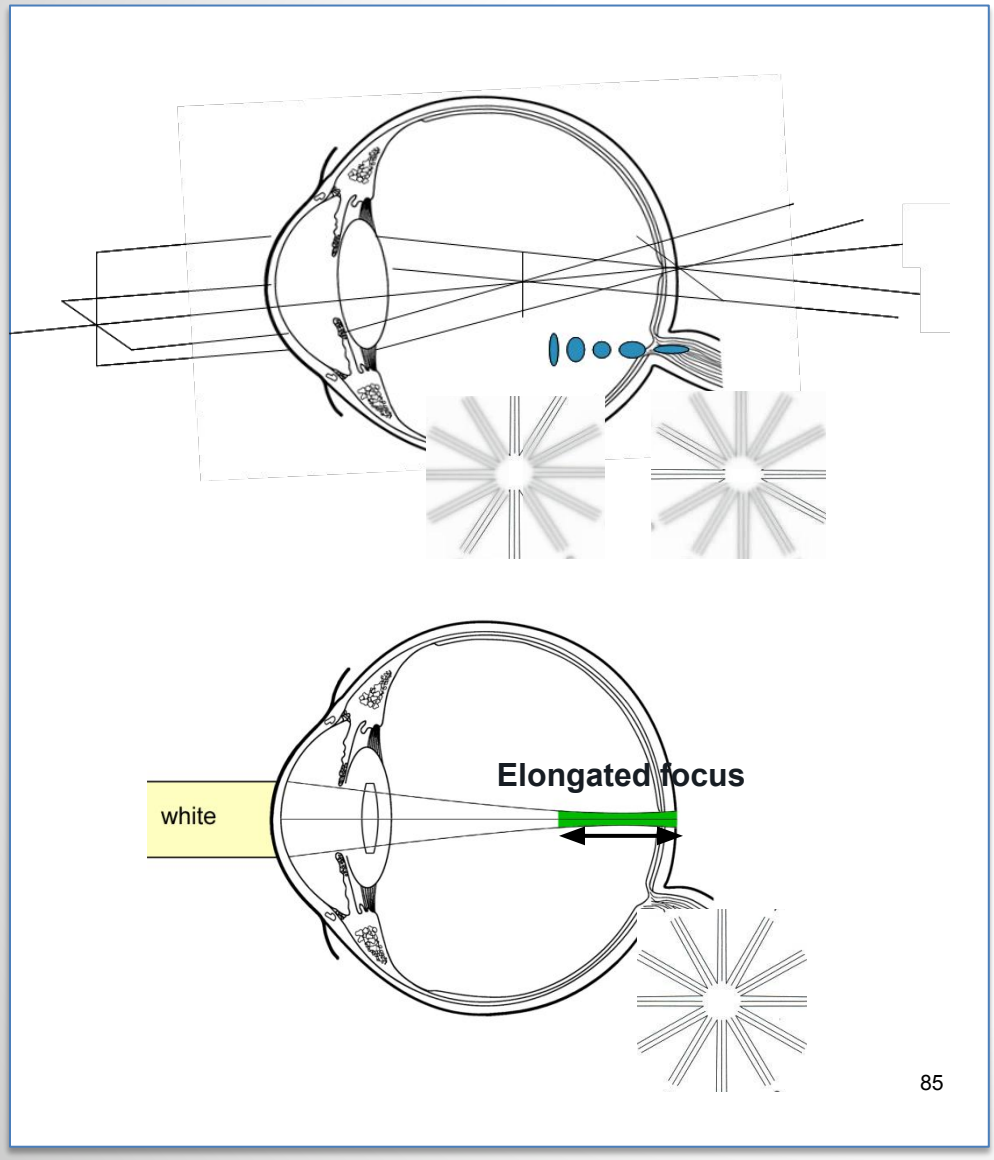
TECNIS Symfony® IOL delivers 20/20 vision in the presence of up to 1.5 D of astigmatism[1,2]



1. DOF2016CT0025 TECNIS Symfony Toric Results, 2. SC20160OTH004 Preclinical Evaluation of Tolerance to Astigmatism with an ERV IOL 3. Hayashi, et al. Effect of astigmatism on visual acuity in eyes with a diffractive multifocal intraocular lens. *J Cataract Refract Surg* 2010; 36:1323–1329.

Forgiveness

TECNIS Symfony ® IOL's design delivers tolerance to astigmatism

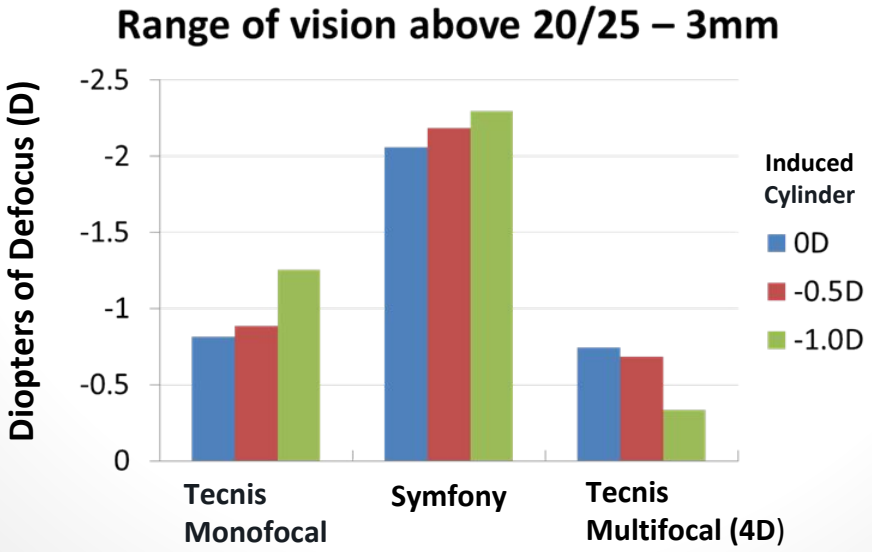


- An eye with astigmatism has greater power in one axis and lower in the other.
  - ➢ This generates multiple focal "points/ lines" in the eye.
- The TECNIS Symfony® IOL design elongates depth of focus, resulting in an extended range of vision.
- This tubular zone of good focus creates both depth of focus and tolerance to astigmatism.

Forgiveness

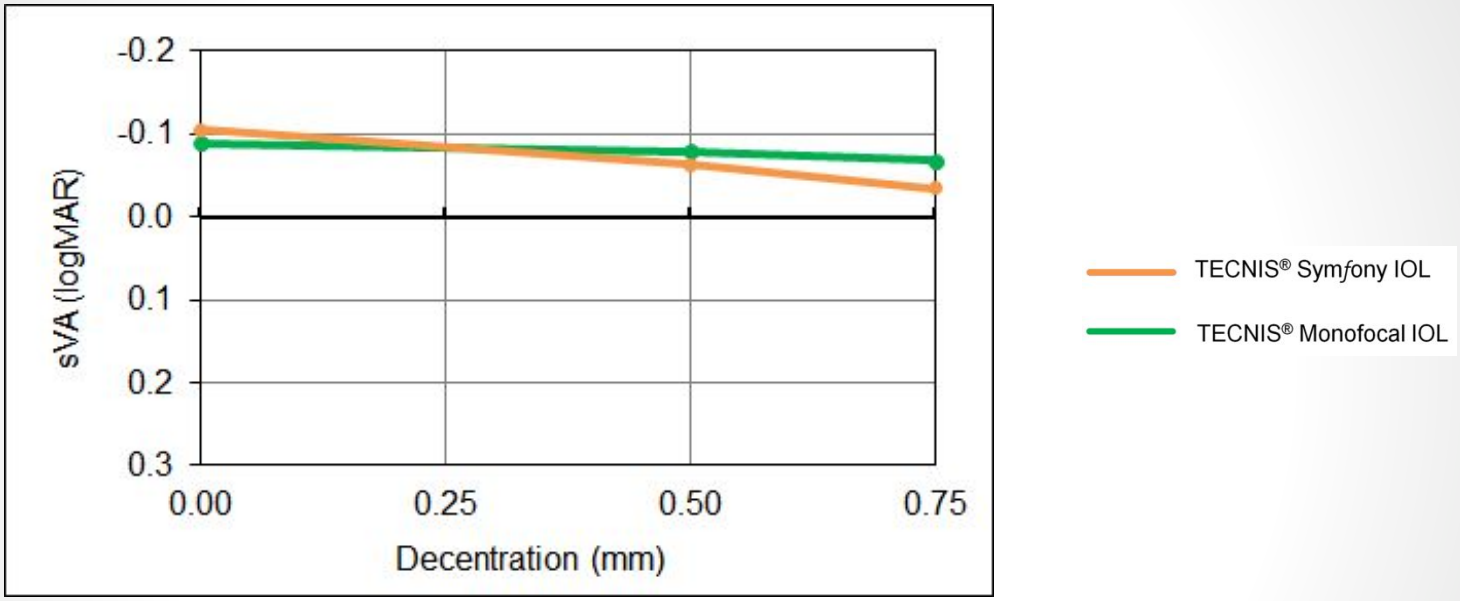
TECNIS Sym*f*ony® IOL's design delivers robustness in the presence of residual astigmatism

- Computer simulations and optical bench testing showed a similar tolerance to astigmatism at distance for the TECNIS Sym*f*ony® IOL and monofocal designs, much greater than for the multifocal design.
- In addition, the range of vision in the presence of astigmatism is well preserved for TECNIS Sym*f*ony® IOL.



Forgiveness

TECNIS Sym*f*ony® IOL's design delivers tolerance to decentration



- Tolerance to decentration was assessed in physiological raytracing models and shows similar tolerance to decentration as the TECNIS® monofocal IOL.
- The TECNIS Symfony® IOL is tolerant to decentration throughout 0.75mm of decentration[1].

1. DOF2016CT0023 TECNIS Symfony® IOL Tolerance to decentration

Indications For Use in the U.S.

The TECNIS Symfony Extended Range of Vision IOL, Model ZXR00, is indicated for primary implantation for the visual correction of aphakia, in adult patients with less than 1 diopter of pre-existing corneal astigmatism, in whom a cataractous lens has been removed. The lens mitigates the effects of presbyopia by providing an extended depth of focus. Compared to an aspheric monofocal IOL, the lens provides improved intermediate and near visual acuity, while maintaining comparable distance visual acuity. The Model ZXR00 IOL is intended for capsular bag placement only.

The TECNIS Symfony Toric Extended Range of Vision IOLs, Models ZXT150, ZXT225, ZXT300, and ZXT375, are indicated for primary implantation for the visual correction of aphakia and for reduction of residual refractive astigmatism in adult patients with greater than or equal to 1 diopter of preoperative corneal astigmatism, in whom a cataractous lens has been removed. The lens mitigates the effects of presbyopia by providing an extended depth of focus. Compared to an aspheric monofocal IOL, the lens provides improved intermediate and near visual acuity, while maintaining comparable distance visual acuity. The Model Series ZXT IOLs are intended for capsular bag placement only.

BACK-UPS

Abbott

TECNIS® IOL Platform Technology

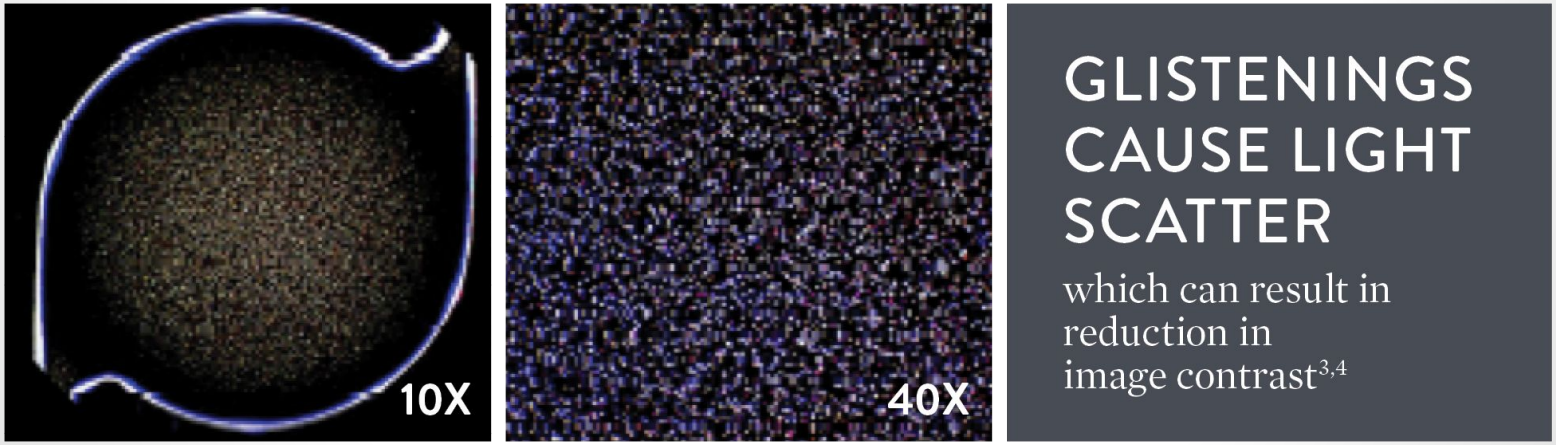
TECNIS®
FAMILY OF IOLs

LONG-TERM SUSTAINABILITY

TECNIS® IOL MATERIAL
is **not associated** with glistenings[1]

VS

AcrySof® IOLs have glistenings[2,3]



DARK FIELD IMAGES OF AcrySof® LENS[4]

1. Data on File, Abbott Medical Optics Inc., 2013. 2. Hayashi K, Hirata A, Yoshida M, Yoshimura K, Hayashi H. Long-term effect of surface light scattering and glistenings of intraocular lenses on visual function. *J Ophthalmol* Am. 2012 Aug;154(2):240-251; 3. Nagata M, Matsushima H, Mukai K, Terauchi W, Senoo T, Wada H, Yoshida S. Clinical evaluation of the transparency of hydrophobic acrylic intraocular lens optics. *J Cataract Refract Surg*. 2010 Dec;36(12):2056-60. 4. Van der Mooren M, Franssen L, Piers P. Effects of glistenings in intraocular lenses. *Biomed Opt Express*. 2013 Jul 11;4(8):1294-3041.

TECNIS Technology:

Delivering on High Contrast Performance

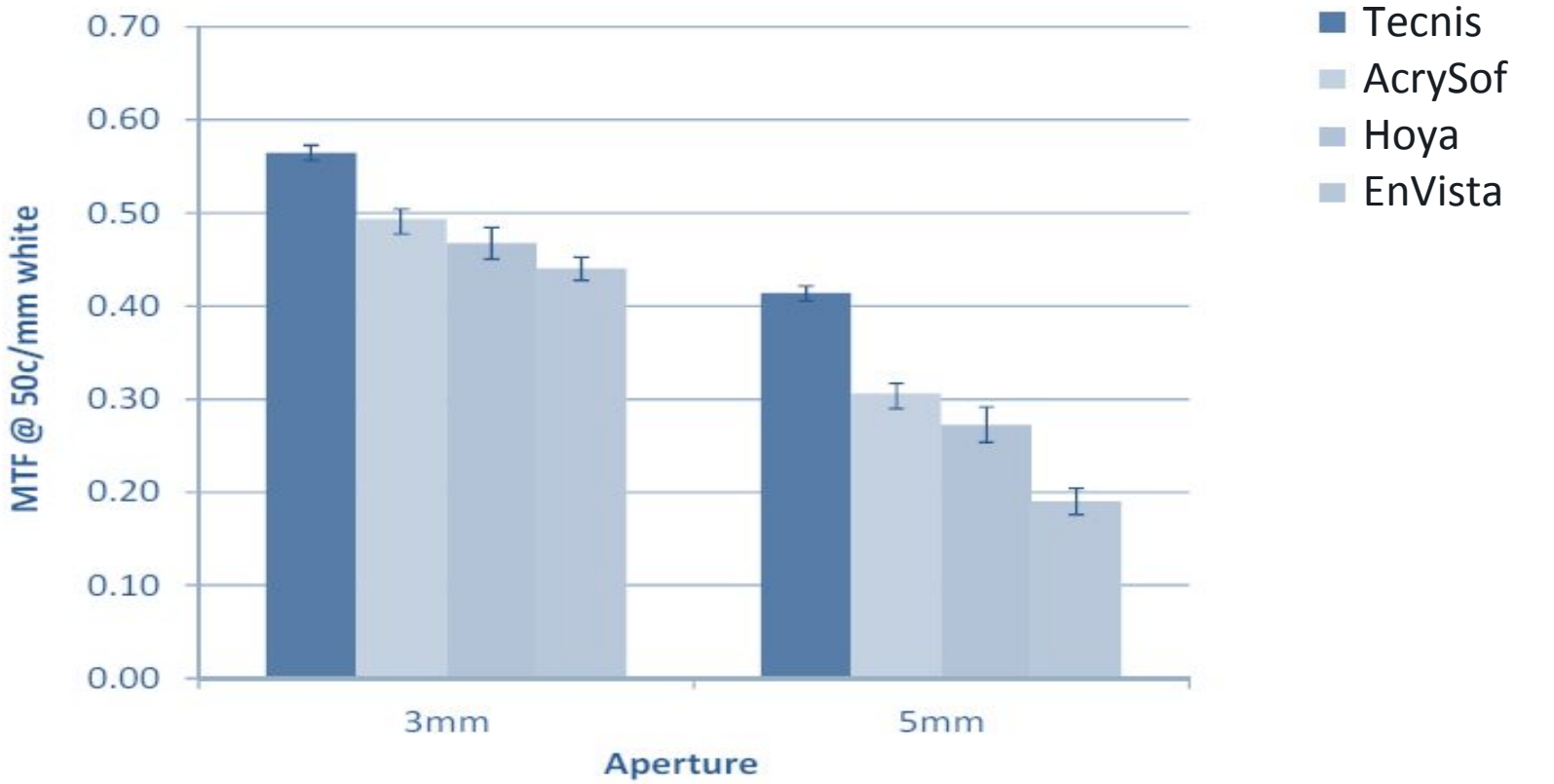


Figure 1 Best Focus MTF values for a 3 (left) and 5 (right) mm aperture for the four different monofocal lens models (average of n=4 for Tecnis® ZCB00 and Hoya FY-60AD; n=6 for AcrySof® SN60WF; and n=5 for enVista® MX60)

1DOF2015OTH0011 Data on File- MTF Data Comparison (White Light ACE Model Eye)

TECNIS® Monofocal IOL Delivering SHARPEST VISION

70%

of patients had best corrected binocular distance visual acuities

20/16 or better
with ZCB00.[1]

96%

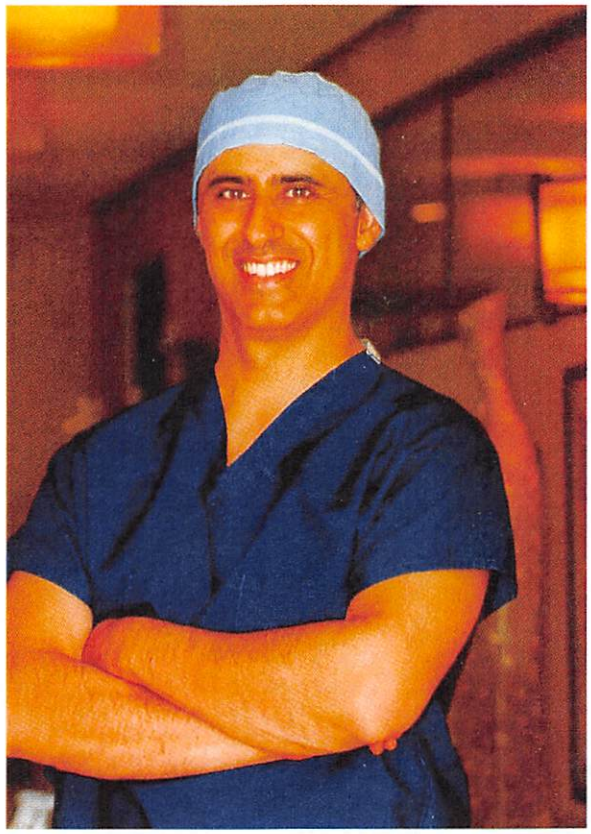
of patients had best corrected binocular distance visual acuities

20/20 or better
with ZCB00.[1]

BINOCULAR DISTANCE VISUAL ACUITY AT 6 MONTHS

	TECNIS® Monofocal IOL: ZCB00	
VISUAL ACUITY	**UNCORRECTED**	**BEST CORRECTED**
20/16 or Better	42.5%	69.9%
20/20 or Better	75.3%	95.9%
20/25 or Better	91.1%	100%
20/32 or Better	96.6%	100%
20/40 or Better	99.3%	100%
20/50 – 20/80	0.7%	0.0%
20/100 or Worse	0.0%	0.0%

1. Data On File, Abbott Medical Optics Inc., 2015.



CURRICULUM VITAE

Kerry K. Assil, M.D.

Personal Information

Office Address	450 N. Roxbury Drive, 3rd Floor Beverly Hills, California 90210 (310) 453-8911
Date of Birth	April 22, 1960
Citizenship	USA

Pre-Medical Education

1977 -1981	University of California at Los Angeles Los Angeles, CA BA 1981 High honors, Phi Beta Kappa

Medical Education

1981 -1986	University of California at San Diego School of Medicine La Jolla, CA 92093 M.D. – 1986
1984 -1986	Research in Ophthalmology (Wound healing and pharmacology)

Post-Graduate Training

July 1986 - June 1987	Internship in Internal Medicine St. Mary Medical Center - UCLA Long Beach, CA 90801
July 1987 - June 1990	Residency in Ophthalmology Department of Ophthalmology University of California at San Diego La Jolla, CA 92103 Program Director: Stuart I. Brown, MD
July 1990 - June 1991	Fellowship in Cornea, External Disease and Keratorefractive Surgery Saint Louis University Anheuser-Busch Eye Institute 1755 South Grand Avenue St. Louis, MO 63110 Program Director: David J. Schanzlin, MD
Licensure	California G62647 Issued 04/18/1988 Expires: 04/30/12 DEA BA1436016 Issued 05/17/2000
Board Certification	National Board of Medical Examiners, 1986 American Board of Ophthalmology, 1991

Academic Appointments

July 1991 - Jan 1992	Clinical Instructor Saint Louis University School of Medicine Department of Ophthalmology Anheuser-Busch Eye Institute St. Louis, Missouri

January 1992 - April 1995	Assistant Professor of Ophthalmology Saint Louis University School of Medicine Department of Ophthalmology Anheuser-Busch Eye Institute St. Louis, Missouri
April 1995 - Sept. 1995	Associate Professor of Ophthalmology Saint Louis University School of Medicine Department of Ophthalmology Anheuser-Busch Eye Institute St. Louis, Missouri
Sept. 1995 -Present	Medical Director and C.E.O. The Assil-Sinskey Eye Institute 2232 Santa Monica Boulevard Santa Monica, California 90404 (310) 453-8911
	Medical Director and C.E.O. The Assil-Sinskey Refractive Center 2222 Santa Monica Blvd., Suite 107 Santa Monica, California 90404 (310) 828-2082
Clinical Staff Appointments	Saint Louis University Hospital St. Louis, Missouri
	Cardinal Glennon Children's Hospital St. Louis, Missouri
	Saint Mary's Health Center Clayton, Missouri
	St. John's Hospital and Health Center Santa Monica, California
Societal Memberships	American Academy of Ophthalmology American Medical Association American Society of Cataract and Refractive Surgery Association for Research in Vision and Ophthalmology Contact Lens Association of Ophthalmologists International Society of Refractive Keratoplasty Lion's Club of Southern California Missouri Ophthalmological Society

Ophthalmological Associate in Research to Prevent Blindness
Paton Society, Eye Bank Association of America
St. Louis Metropolitan Medical Society
St. Louis Ophthalmological Society

Honorary Societies, Awards & Achievements

Phi Beta Kappa, 1981

Outstanding Senior Medical Student Thesis Award Finalist
University of California at San Diego; 1986.

KCBS, Channel 2, "What's Right with Southern California?"
Award recipient for remarkable charitable contributions in ophthalmology; March 15, 1998

Lifetime Member, The National Registry of Who's Who

Lifetime Member, Strathmores Who's Who

Television, Radio and Internet Interviews

1. Assil, K.K.: Voice of Israel Radio - Refractive Surgery; June, 1993.

2. Assil, K.K.: Syndicated cable television, "Ophthalmology," House Calls; April, 1994.

3. KCBS: "What's Right with Southern California?" Award recipient for remarkable charitable contributions in eye surgery; March 15, 1998.

4. KCBS News: Broadcast of first hyperopic LASIK under FDA supervised trial; March, 1999.

5. EyeNet Audio, American Academy of Ophthalmology; April, 1999

6. Broadcast.com: First surgeon in the world to perform live web cast of new FDA-approved KeraVision Intacs™ procedure; performed on two ophthalmologists; April, 1999.

7. KABC News: Broadcast of first implantation of Artisan® Phakic Intraocular Lens in Phase III of the FDA trials; May 14, 1999.

8. CNN.com : Refractive Surgery Alternatives; August, 1999

9. Fox News: Interview; February, 2000.

10. WebMD: Yahoo On-Line Chat; May 31, 2000.

11. Univision: Interview (Spanish TV); June, 2001.

12. KNBC: Interview; July, 2001.

13. PBS: LASIK Special; August, 2001.

14. CNN: Refractive Surgery Documentary; October, 2001.

15. KNBC News: Artisan Phakic IOL Implant in a small child; November, 2001.

16. KNBC: Advances in Night Vision Correction; January, 2002.

17. KLCS In Focus: LASIK Candidates and selection; April, 2002.

18. KNBC News: Nystagmus Breakthrough with Dr. Robert Sinskey; August, 2002.

19. KABC News: Importance of Eye Exams in Children; October, 2002.

20. The Other Half: LASIK Feature; October, 2002.

21. KABC News: Assil-Sinskey Eye Institute Foundation for Ophthalmology; January, 2003.

Inventions and Innovations

1. Pioneered advancement of multivesicular liposomes for treatment of ocular diseases and cancer; 1983-1993.

2. Inventor and worlds first surgeon to perform the Combined Technique of RK – subsequently the most popular RK technique performed; April, 1991.

3. On United States team which performed the first KeraVision Intacs™ procedures; May, 1991.

4. Co-inventor and first surgeon in the United States to perform two-incision RK for correction of myopic astigmatism; January, 1992.

5. First surgeon in the world to propose coupling of topographic data to guide laser corneal ablation, presented at EyeSys corneal topography course; 1992

6. First surgeon in the world to teach Combined Technique RK; May, 1992.

7. First surgeon to teach national course on computerized corneal topography to refractive surgeons; 1992.

8. Inventor and first surgeon in the world to perform peripheral corneal-sclerotomy for correction of hyperopia or presbyopia; January, 1993.

9. Inventor and first surgeon in the world to perform the undercut technique of RK; January, 1993.

10. Inventor and first surgeon in the world to perform computer guided RK; July, 1993

11. First surgeon in the world to document the pattern of post-LASIK regression (co-investigator, Arturo Chayet, M.D.); 1994.

12. First in the United States to implant KeraVision Intrastromal Corneal Rings® (ICR®) (Intacs™) in Phase III FDA trials; December 10, 1996.

13. First North American surgeon to perform Phakic IOL using the Ophtec Artisan™ Lens; 1997.

14. Director of first multicentered hyperopic LASIK clinical trial; 1997.

15. First surgeon in California to implant Artisan™ Phakic Intraocular Lens in Phase III of the FDA trials; May, 1998.

16. Inventor of Temporal Hinge (stable hinge) LASIK; 1998.

17. First surgeon in the world to perform post FDA approval Intacs™ surgery. (webcast live on the Internet, performed on two eye surgeons); April, 1999.

18. First surgeon in the world to successfully implant the Verisyse Lens in the eye of a 3 year old child; 2001.

19. Inventor of Pupillometry guided LASIK for Presbyopia; 2004.

20. Inventor of Custom Tailored all Laser LASIK; 2006.