

Actualizing and Understanding EDoF IOLs

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Actualizing and Understanding EDoF IOLs

Comparing to traditional Multifocal IOLs, EDoF IOLs **DO NOT HAVE** a DISCRETE number of foci, but a CONTINUUM of foci and provide for continuous vision over an extended range of distances.

No loss of contrast sensitivity

No compromises in distance vision

Excellent intermediate vision

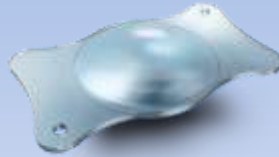
Good near vision

Glare, Halos, night driving issues no worse than monofocal IOLs

No loss of light Long-term stability of optical properties and function

Actualizing and Understanding EDoF IOLs

- Monofocal
- Diffractive
- Aberrational
- Polyfocal
- Refractive



Monofocal EDoF

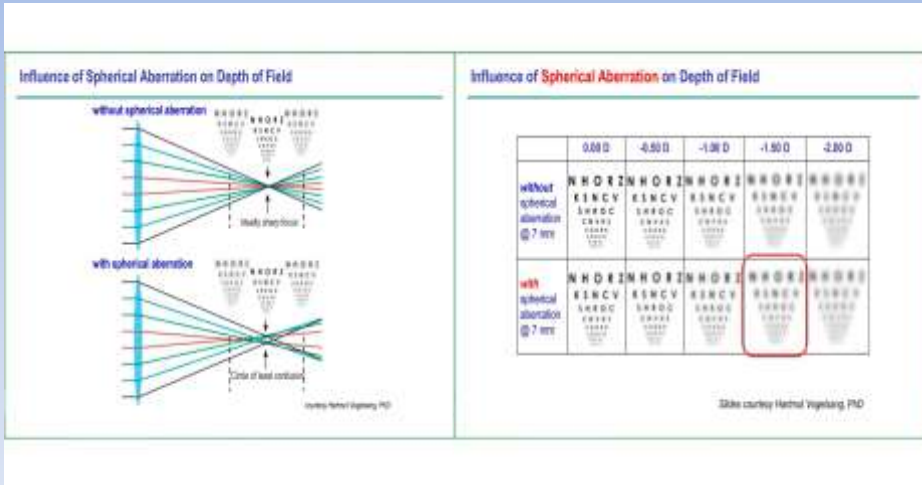
Enhancing depth of focus by inducing total positive spherical aberration in the eye

In cornea with positive aberration implanting aberrational neutral, aspheric IOLs



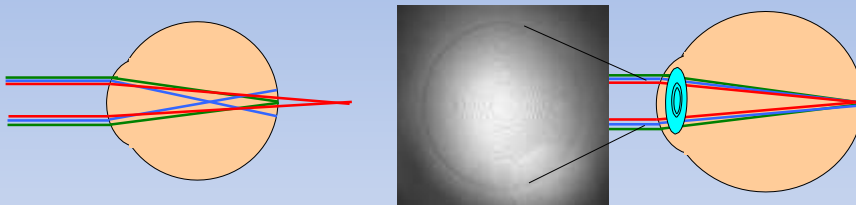
Monofocal EDoF

Spherical Aberration



Diffraction EDoF

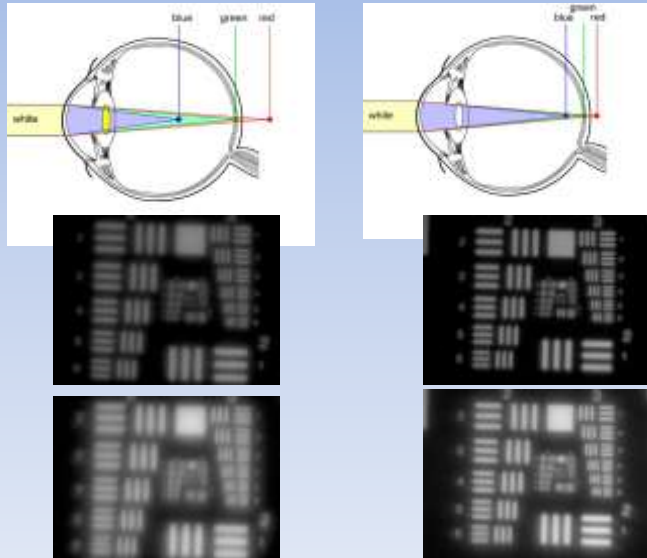
Correction of chromatic aberration (LCA)



AT LARA 829 Carl Zeiss Meditech
 TECNIS Symphony ZXR--, Johnson & Johnson

Diffractive EDoF

EDoF AT LARA- TECNIS Symfony



TECNIS Symfony

Optimized optical design:

- Diffractive optic with reduced chromatic aberration and enhanced contrast sensitivity
- Extended focal area instead of multiple focal points Not "multifocal"



AT LARA 829MP – Aspheric optics

Contrast Sensitivity Optimization

- **Advanced Chromatic Aberration Correction**
 - The diffractive design is balanced such that material-based chromatic aberrations are to a large degree neutralizing by the chromatic aberration from the diffractive grating
- **Aspheric designs in IOLs:**



AT LARA 829MP: 0.0 μm

- Use residual corneal asphericity for focus extension
- Better performance if tilted
- Neutral to corneal 'abnormalities' (post-LASIK)



AT LISA tri 839MP: -0.18 μm

- Reduce residual asphericity
- Maximize image quality and contrast

AT LARA 829MP



NEXT GENERATION

Extended Depth of Focus (EDoF) IOL

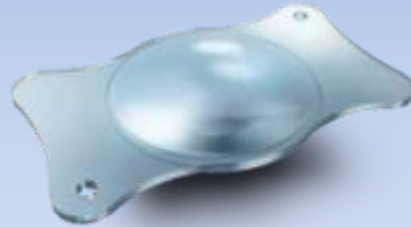
- **Widest range of focus** within EDoF segment
- **Less visual side effects** than multifocal IOLs

Cataract and refractive surgeons can now **grow their premium IOL business** with more choice for different patient needs:

- **AT LARA** offers a **perfect balance** for patients seeking spectacle independence for an active lifestyle with less side effects
- **AT LISA tri** is the unsurpassed market leader in trifocal IOLs and gold standard for patients seeking **maximum spectacle independence**

AT LARA 829MP

- AT LARA 829MP is based on AT LISA platform:
 - **Hydrophilic acrylic** (25%) with hydrophobic surface properties
 - **4 point-haptic design**
 - **MICS (1.8 mm)**
 - **Pre-loaded BLUEMIXS injection system**
 - **360° anti-PCO ring and sharp edges**



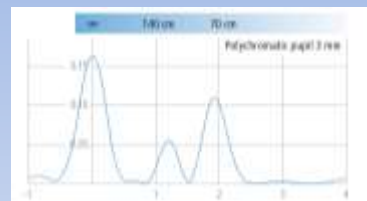
A design that has been successful in the market for more than 15 years

The next generation EDoF IOL:

AT LARA 829

- **LIGHT BRIDGE** Optical design

Diffraction optical design with far dominant light distribution and 2 power additions creating an **optical bridge effect** to extend the range of focus

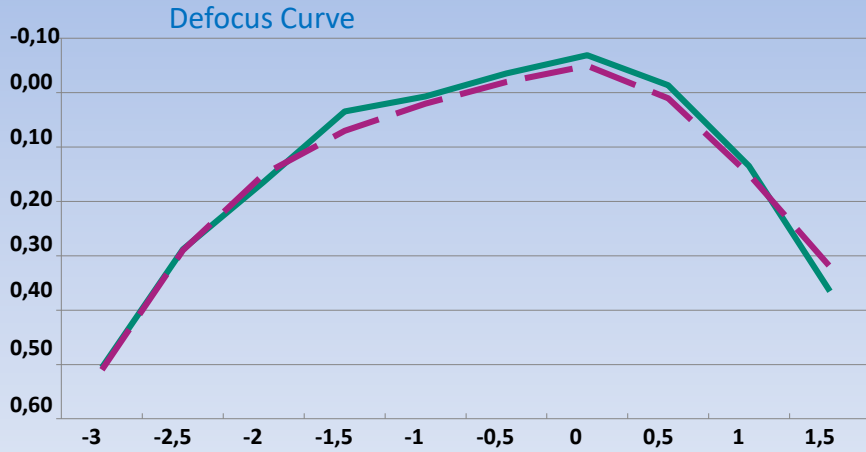


- **Smooth Micro Phase (SMP) Technology**

Patented design and manufacturing technology, minimizing light scattering and glare by **including the manufacturing process into optical design optimization**

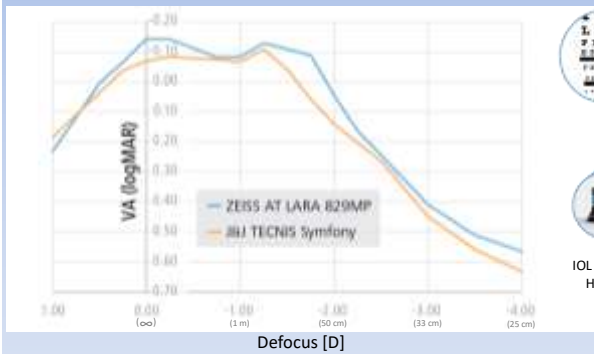


AT LARA 829 IOL



AT LARA 829 IOL

Defocus curve (n=25)



Test Chart



IOL Sample Holder



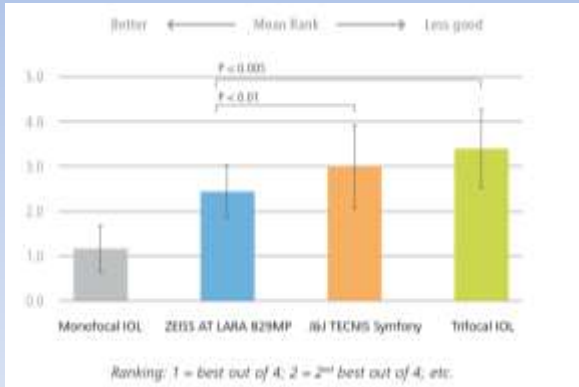
AT LARA shows **better VA** in a wider focus range compared to AMO Symphony

AT LARA 829 IOL

Favorable ratings on visual side effects

Subjective ranking of visual experience
(random blind comparison): n=48

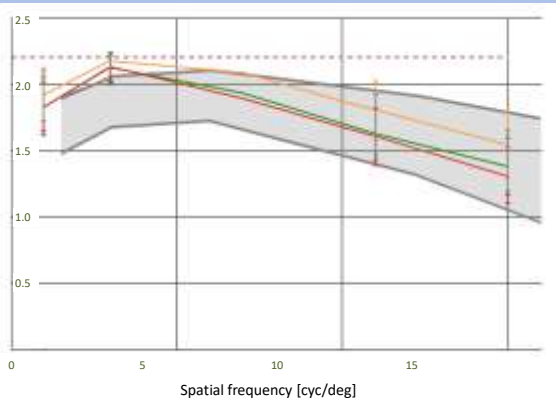
Defocus Curve



AT LARA produces **less visual side effects** compared to a trifocal and AMO Symfony

AT LARA 829 IOL

CS [log CS]



- ZEISS AT LARA
- J&J Symfony EDoF IOL
- Oculentis LENTIS Comfort
- ZEISS CT ASPHINA

AT LARA produces **excellent Contrast Sensitivity**
for most of the spatial frequencies

AT LARA toric 929MP/M

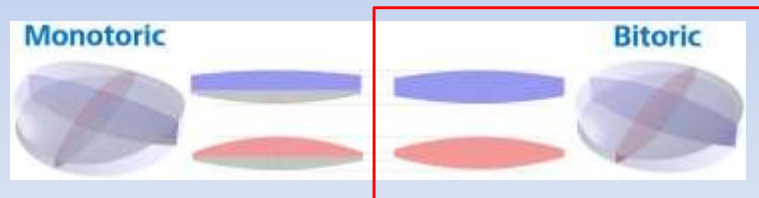
- Toric EDoF IOL with wide range of focus and reduced visual side effects, as AT LARA 829MP
 - Precise astigmatism correction
 - Proven rotation stability
 - Available range:
 - AT LARA toric 929MP*:
 - SE: -8.0 D to +32.0 D
 - CYL: +1.0 D to +4.0 D
 - AT LARA toric 929M*:
 - SE: -4.0 D to +32.0 D
 - CYL: +4.5 D to +12.0 D
 - in 0.5 D increments, respectively
- * Further preselected SE/cylinder combinations are available above and below the stated SE range.



AT LARA toric 929MP/M

Excellent Optical Quality - Bitoricity

- Bitoric designs by default provide an **excellent quality image**, also in high cylinder values, leading less aberrations
- Its design also enables production of **higher cylinder powers**



Comparison of Halo & Glare

AT LARA vs Tecnis Symfony

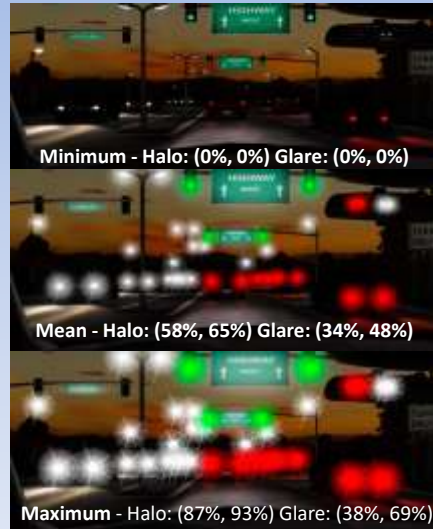


Minimum - Halo: (0%, 0%) Glare: (0%)

Mean - Halo: (28%, 37%) Glare: (16%, 32%)

Maximum - Halo: (58%, 69%) Glare: (70%)

AT LARA



Minimum - Halo: (0%, 0%) Glare: (0%, 0%)

Mean - Halo: (58%, 65%) Glare: (34%, 48%)

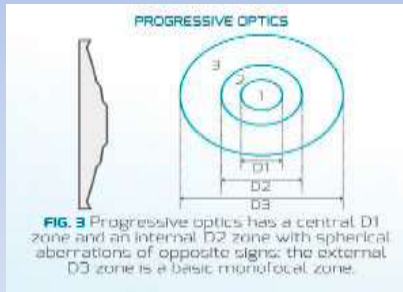
Maximum - Halo: (87%, 93%) Glare: (38%, 69%)

Tecnis SYMFONY

Aberrational EDoF MINI WELL

TECHNICAL SPECIFICATIONS	
Name	MINI WELL READY
Material	Copolymer
Positioning	Bag
Total diameter	10.75 mm
Diameter of optical surface	6 mm
Vaulting	5°
Optics shape	Biconvex progressive multifocal aspherical
Posterior edge	Double
Estimated A constant	118.6
Estimated A.C.D.	5.32 mm
Dioptric range	from 0 to +30 (incr: 0.5 from +18 to +25)
Equivalent Additional power	+3

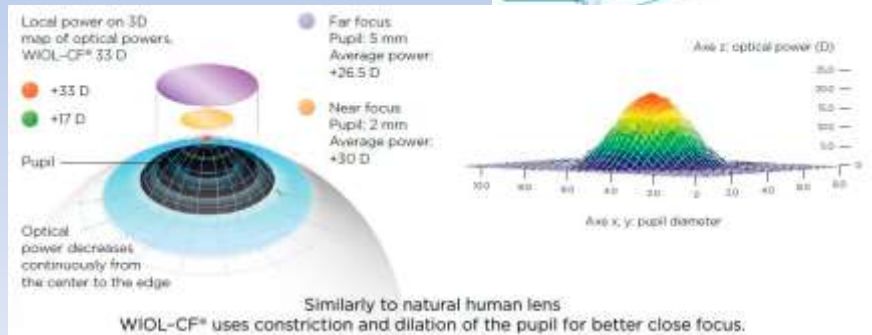
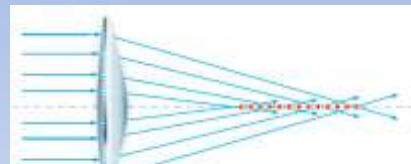
Polyfocal EDoF WIOL-CF



Different zones of spherical aberration correction to enhance vision in different distances

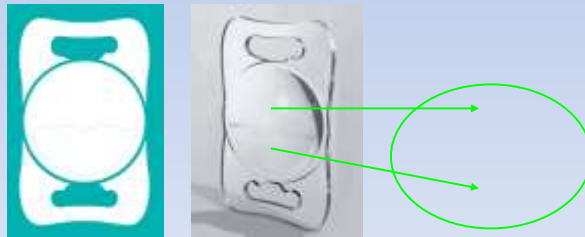
Polyfocal EDoF WIOL-CF

Polyfocal IOL of bioanalog material (Hydrogel)
Pupil dependant



Oculentis LENTIS Comfort

- EDOF: Extended Depth Of Focus
 - Novel and modern concept of creating a larger range of functional vision with as little physical focal points as possible



Oculentis LENTIS Comfort

- Very good near and intermediate vision
- Optimized depth of focus
- Spectacle independence most of the time
- Very good contrast Sensitivity
- Very good quality of image



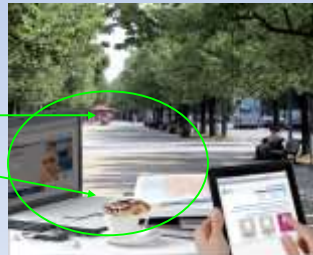
Oculentis LENTIS Comfort

- RMS over 500
- Irregular corneal surface
- Abnormal corneal surface dioptric power distribution curve
- Borderline Macula



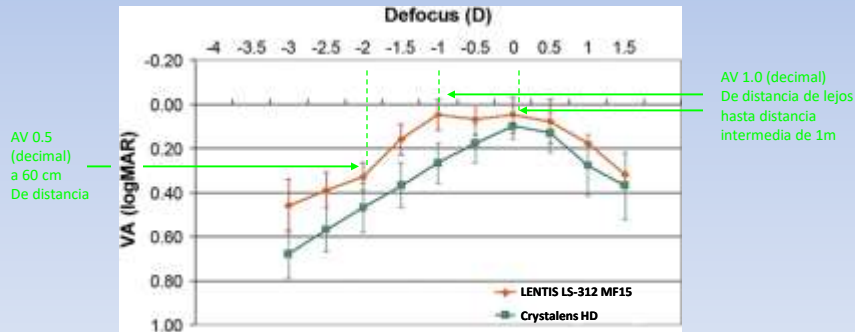
Oculentis LENTIS Comfort

Excellent far and intermediate vision



Oculentis LENTIS Comfort

- LENTIS® Comfort vs. Crystalens HD

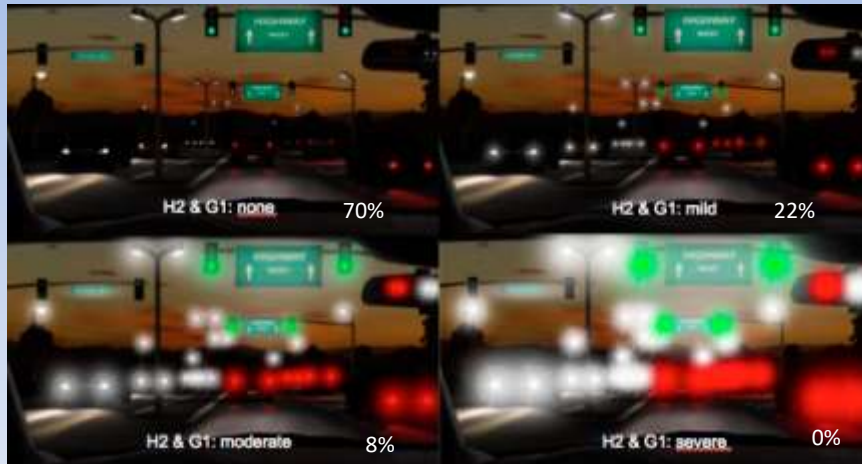


Jorge L. Alió (2012) Visual outcomes with a single-optic accommodating intraocular lens and a low-addition-power rotational asymmetric multifocal intraocular lens; J Cataract Refract Surg 2012; 38:978-985 Q 2012 ASCRS and ESCRS

Oculentis LENTIS Comfort

- EDOF: Extended Depth Of Focus
 - Far vision as good as monofocals
 - 50% of the patients can read
 - Optical phenomena similar to monofocals
 - Contrast sensitivity similar to monofocals
 - For tasks in everyday life patients are spectacle free
 - No strict patient selection necessary
 - Suitable for patients who do not fulfill criteria for implantation of Trifocal IOLs

Oculentis LENTIS Comfort HALO & GLARE



Actualizing and Understanding EDoF IOLs

MONOFOCAL	DIFFRACTIVE	ABERRATION	POLYFOCAL	DIFFRACTIVE
Monofocal IOL	At LARA (Zeiss) Tecnis Symphony (J&J)	MINI WELL (Sifi)	WIOL (Medicem)	Lentis Comfort (Oculentis)
Positive spherical aberration Produces depth of focus	Diffraction optic	Different zones of spherical aberration correction to enhance vision in different distance	Polifocal concept that changes its focal power depending on pupillary and ciliary body activity	Near vision segment with low addition and transition zone

Conclusion

- Monofocal IOLs can be EDoF IOLs depending on corneal spherical aberration
- EDoF IOLs show less dysphotopic phenomena compared to multifocal IOLs
- Range of vision is partly limited compared to modern MIOLs (trifocal)
- Some models are dependant on pupil size and corneal spherical aberration (W-IOL, Miniwell)
- Good overall vision can be achieved with a Mix & Match approach (MF15/MF30)
- Comfort/MF15 shows comparable results for dysphopsia with enlargement of defocus capacity to monofocal IOLs

CONCLUSION

- EDoF IOLs provide us with an excellent option to improve the quality of vision of our demanding patients, achieving excellent far and intermediate vision usually with improved depth of focus that helps the patient in his daily activities. Compared to multifocal or Ttrifocal IOLs it is true EDoF IOLs have their limitation for near but on the other hand they provide a natural continuous vision of high quality in the other distances preserving almost normal contrast sensitivity and without suffering the adverse phenomena como dysphopsias, haloes and glare.

Muchas Gracias

