



## TRIFOCAL IOLS

FRANCESCO CARONES, MD PCEO  
MILAN, ITALY

CONSULTANT FOR ACUFOCUS, ALCON, AMO, WAVELIGHT



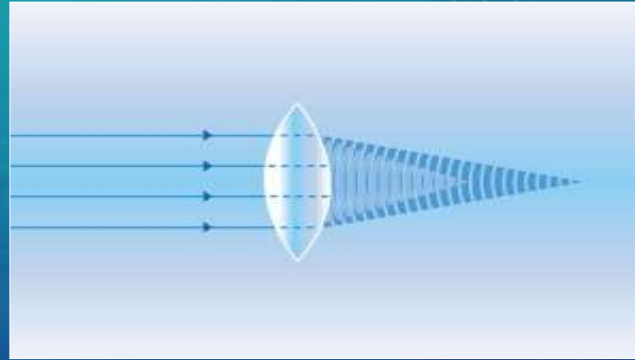
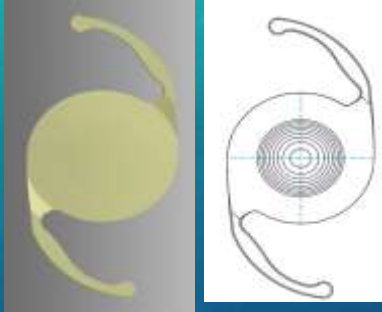
## WHAT IS A *MULTIFOCAL* IOL?

Any IOL with more than one focus

- Static multifocal IOLs
  - Bifocal (Alcon AcrySof ReSTOR, AMO Tecnis)
  - **Trifocal (Zeiss AT LISA Tri, PhysiOL FineVision, Alcon PanOptix)**
  - Extended depth Of Focus (AMO Symphony, SIFI Mini Well)
- Dynamic multifocal IOLs
  - Accomodative (Bausch + Lomb Crystalens)



## WHAT IS A *MULTIFOCAL DIFFRACTIVE* IOL?

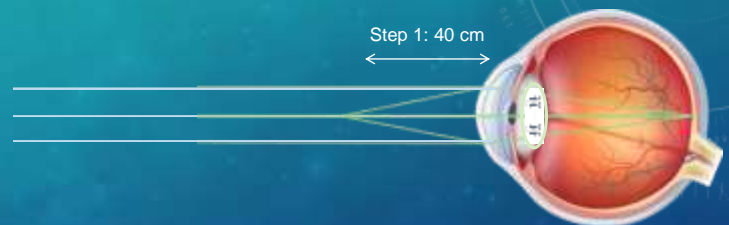


Small optical discontinuities (steps) generate simultaneously more than one focus



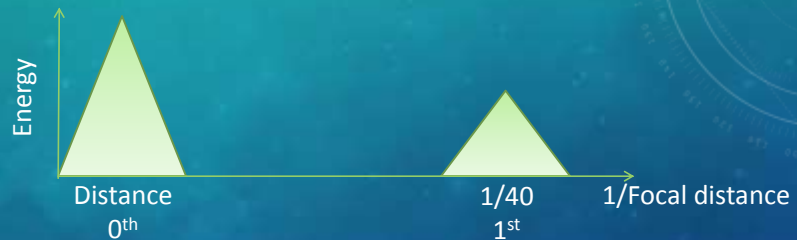
## PRINCIPLES OF MULTIFOCAL DIFFRACTIVE IOLS

- **Bifocal IOLs:**  
1 step= 1 added focus



## BIFOCAL AND TRIFOCAL DIFFRACTIVE TECHNOLOGY

### Bifocal Technology



### Trifocal Technology



## TRIFOCAL DIFFRACTIVE TECHNOLOGY

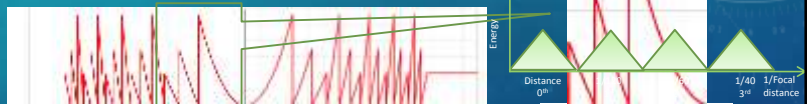
### Traditional Trifocal (Zeiss, PhysiOL):

- 2 step heights = 2 add powers
- Intermediate focal point of 80 cm to maintain usable near vision



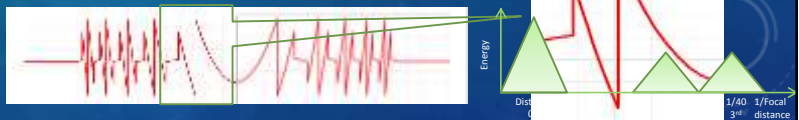
### Quadrifocal Technology (not commercial):

- 3 step heights = 3 add powers
- Energy evenly distributed among Distance, 120 cm, 60 cm and 40 cm



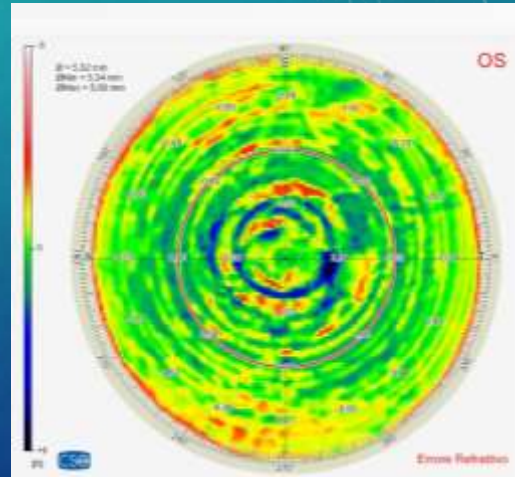
### ENLIGHTEN™ Optical Technology (PanOptix):

- 2 step heights = 2 add powers
- Redirects light from the 1<sup>st</sup> step height (120 cm) to Distance
- Light splits three ways: Distance, 60 cm, and 40 cm

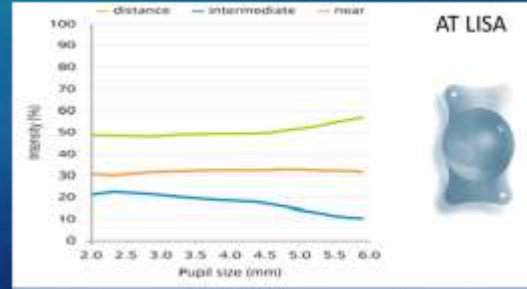
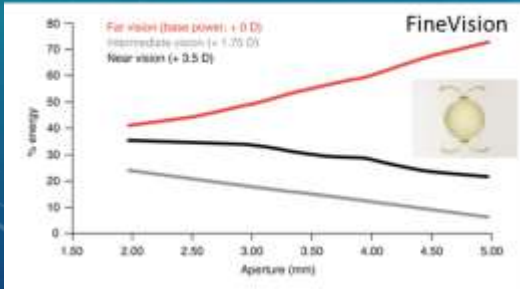
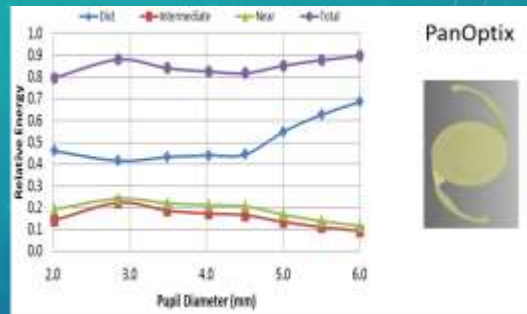




<b>PanOptix™</b>	<b>FineVision Trifocal</b>	<b>AT Lisa Tri</b>
Diffractive Multifocal	Diffractive Multifocal	Diffractive Multifocal
Saw-tooth kinoform	Saw-tooth kinoform	Saw-tooth kinoform
4.5mm	6.0mm	6.0mm
Diffractive	Diffractive	Diffractive
0 <sup>th</sup> , 2 <sup>nd</sup> and 3 <sup>rd</sup>	0 <sup>th</sup> , 1 <sup>st</sup> and 2 <sup>nd</sup>	0 <sup>th</sup> , 1 <sup>st</sup> and 2 <sup>nd</sup>
+3.25D / +2.17D Near/Intermediate	+3.5D / +1.75D Near/Intermediate	+3.33D / +1.66D Near/Intermediate
Non-apodized	Apodized	Non-apodized
-0.1µm	-0.11 µm	-0.18 µm

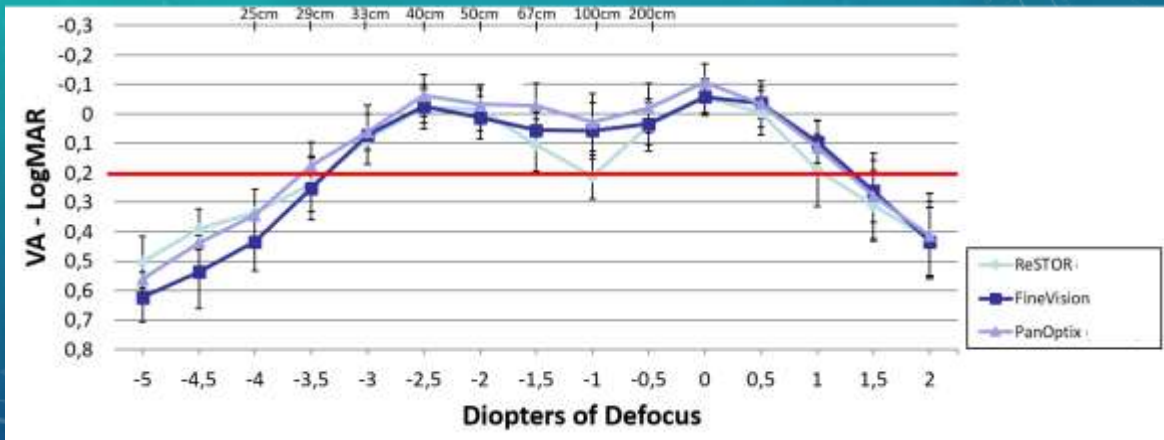


# PUPIL SIZE DEPENDENCE



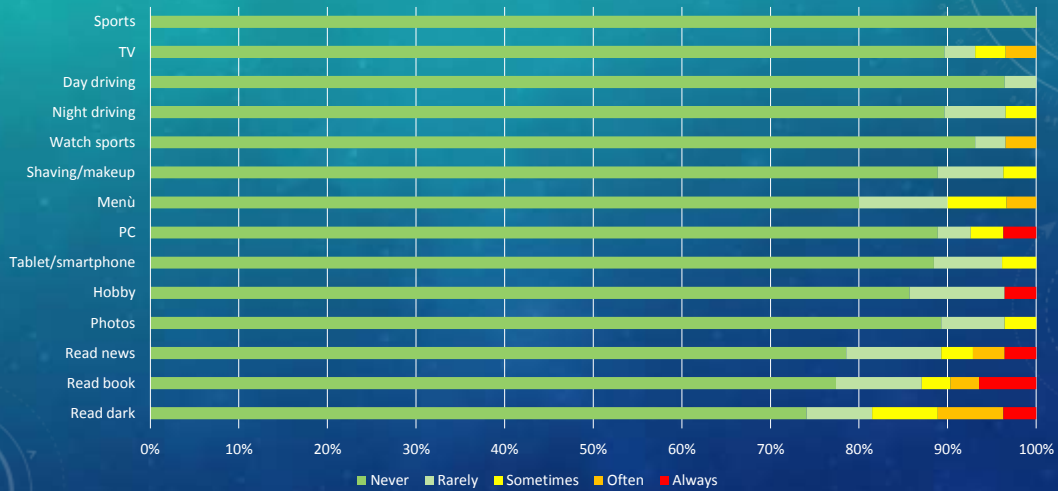


## DEFOCUS CURVE – BIFOCAL AND TRIFOCAL IOLS



## IOL TRIFOCALI – SPECTACLE DEPENDENCE

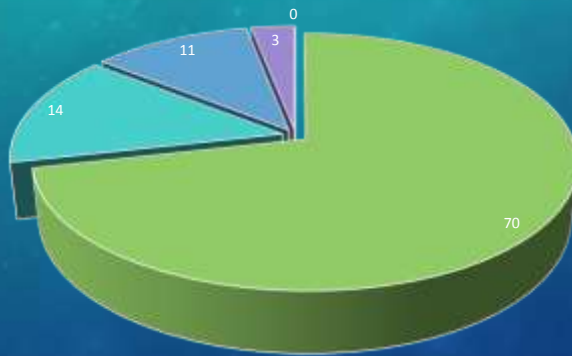
How Often do you use spectacles or contact lenses?





## NEAR DISTANCE SPECTACLE DEPENDENCE

How often do you use spectacles?



■ Never ■ Occasionally ■ Sometimes ■ Often ■ Always

PanOptix

## MULTIFOCAL IOLS COMPROMISE



Spectacle  
Independence

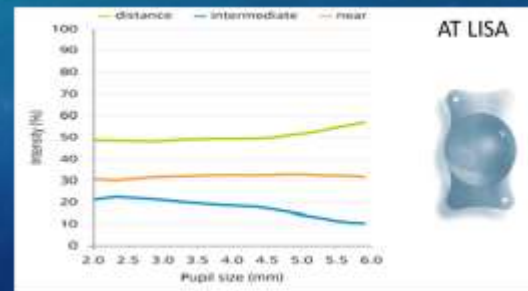
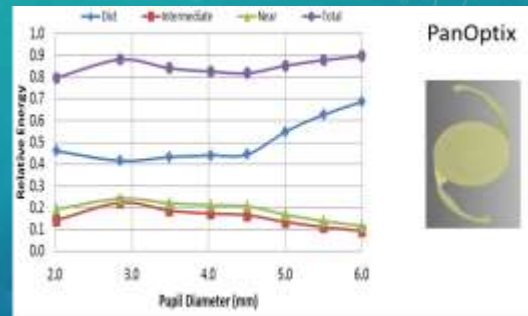
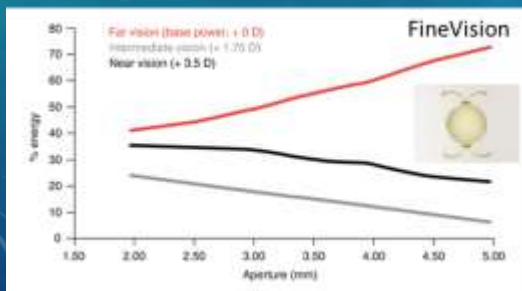


Quality of Vision



## 1. Less light energy reaches the macula

- Bright light for reading
- Contrast sensitivity reduction



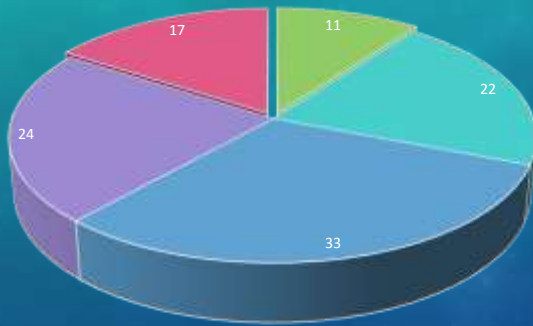
## 2. Optical discontinuities and multiple foci

- Haloes, glare e dazzling
- "Rings" perception around lights
- Quality of vision disturbances





## QUALITY OF VISION DISTURBANCES



PanOptix

■ Never ■ Occasionally ■ Sometimes ■ Often ■ Always



## EXPECTATION VS. COMPROMISE

- Expectation: spectacle independence
- Compromise: quality of vision







## TRIFOCAL DIFFRACTIVE IOLS

- Undoubtedly they represent an improvement compared to bifocal IOLs
  - More spectacle independence at all distances (expectation)
  - Similar or lower vision disturbances (compromise)
- Patient selection still very important
  - Expectation has to exceed the compromise



**Thank you!**