# Finding NIMO - An Analysis of GP Multifocals

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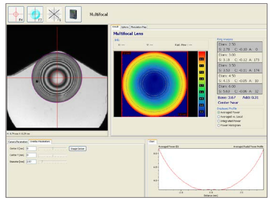
## Introduction

The purpose of this pilot study is to analyze various multifocal lens designs in two different distance powers, and to determine what the anterior surface power profiles of the lenses look like.

We also wanted to answer the following questions:

1) Is the full add power actually in the lens?
2) How much does that lens need to translate in order to get the full effect of the add power ordered for a patient?
3) Are all front-aspheric multifocal GP lens designs the same?

All lenses were measured with the NIMO TR1504 contact lens power mapper and wavefront analyzer, an instrument for measuring contact lenses via the Phase Shifting Schlieren technique, manufactured by Lambda-X SA in Belgium.

## Methods

Eight different corneal gas permeable multifocal contact lens designs (16 lenses) were initially ordered from six leading US based manufacturers. Six of the eight designs (12 lenses) were shipped to the Vision Research Institute for evaluation. Lenses were ordered with the same parameters from each manufacturer, each having a 9.5mm or 9.6mm diameter (depending on available design parameters), and a +2.00 add power. Each design was ordered in both a -3.00D and +3.00D distance power and a 7.50mm (45.00D) base curve and all were fabricated in the Boston XO *(100 dK, 1.415 refractive index)*.

Each test lens was then randomized to determine the order of evaluation, given a code number and masked so the instrument operators were unaware of the lens design. All scans were taken and measured the same parameters of each lens, with center thickness being the only variance.

Power measurements were generated within the central 2.5mm of each lens, then at points located the following distances from the center of the lens: 1.00mm, 1.50mm, 2.00mm, 2.50mm, 3.00mm. A measurement was also taken to determine the distance from the center of the lens to the point at which maximum add power (2.00D) was reached.

Power profiles were created along the 180° meridian to provide a visual interpretation of how large the distance zone was in each design along with how rapidly the power changed from distance to near *(Figure 1)*. All power profiles are shown in graph form *(Figures 3 and 6)*.

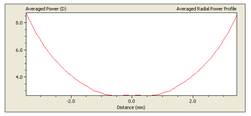



Figure 1

## Results

Although lenses were all ordered with the same hyperopic or myopic distance power and the same +2.00D add power, there definitely were differences in these parameters from one manufacturer to another.

Other comparative differences noted were in distance zone sizes, power graduation from distance to near zone, positioning of distance optics and optical clarity.

Plus Power Lenses

| Lens | PWR | Central 2.50 mm | 1.0 mm | 1.50 mm | 2.0 mm | 2.50 mm | 3.0 mm | Full Add |
|---|---|---|---|---|---|---|---|---|
| 1 | +3.00 | +3.06 | +2.97 | +3.41 | +4.08 | +4.95 | +6.32 | 2.53 mm |
| 2 | +3.00 | +3.20 | +3.54 | +3.69 | +5.12 | +5.90 | +6.44 | 1.95 mm |
| 5 | +3.00 | +3.01 | +3.04 | +3.18 | +3.42 | +3.64 | +4.07 | 3.75 mm |
| 6 | +3.00 | +2.78 | +2.77 | +3.42 | +4.11 | +5.22 | +6.79 | 2.42 mm |
| 7 | +3.00 | +3.11 | +3.11 | +3.41 | +4.05 | +5.26 | +6.89 | 2.39 mm |
| 16 | +3.00 | +3.29 | +3.29 | +3.74 | +4.78 | +6.33 | +8.27 | 2.06 mm |

Figure 2

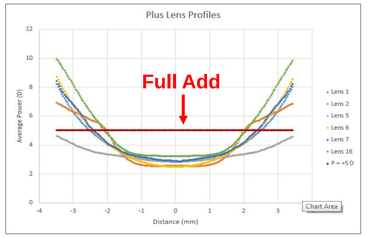



Figure 3

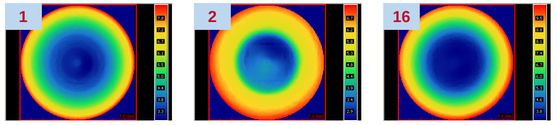



Figure 4

Minus Power Lenses

| Lens | PWR | Central 2.50 mm | 1.0 mm | 1.50 mm | 2.0 mm | 2.50 mm | 3.0 mm | Full Add |
|---|---|---|---|---|---|---|---|---|
| 4 | -3.00 | -3.08 | -3.07 | -2.99 | -2.75 | -2.39 | -1.84 | 3.45 mm |
| 8 | -3.00 | -3.33 | -3.38 | -2.97 | -2.46 | -1.71 | -0.66 | 2.86 mm |
| 9 | -3.00 | -3.16 | -3.35 | -2.99 | -2.20 | -1.06 | 0.23 | 2.53 mm |
| 10 | -3.00 | -3.06 | -3.21 | -3.14 | -3.02 | -2.72 | -2.25 | 3.78 mm |
| 11 | -3.00 | -2.90 | -3.28 | -3.06 | -1.54 | -1.12 | -1.18 | 2.75 mm |
| 14 | -3.00 | -3.02 | -2.93 | -2.83 | -2.39 | -1.57 | -0.55 | 2.79 mm |

Figure 5

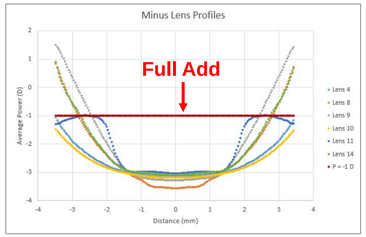



Figure 6

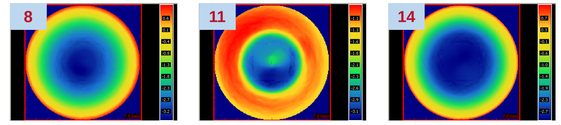



Figure 7

## Discussion & Conclusion

The location of the full add power for each lens is evident as is the amount each lens needs to translate to reach that add *(Figures 2 and 5)*. For instance, the plus powers need to translate 1.95mm to 3.75mm to reach maximum add while the minus powers varied from 2.53mm to 3.78mm depending on the design. This data shows that every design is different and reinforces the importance of the contact lens practitioner working in concert with their supplier to understand the subtleties of the lens design.

While the findings from this evaluation demonstrate definitive differences in the 12 GP multifocals tested, the sample size should be expanded in further study to ensure the accuracy of this type of competitive analysis.

*We want to thank Lambda-X SA and Art Optical Contact Lens, Inc. for the use of their instrumentation to perform this evaluation*