

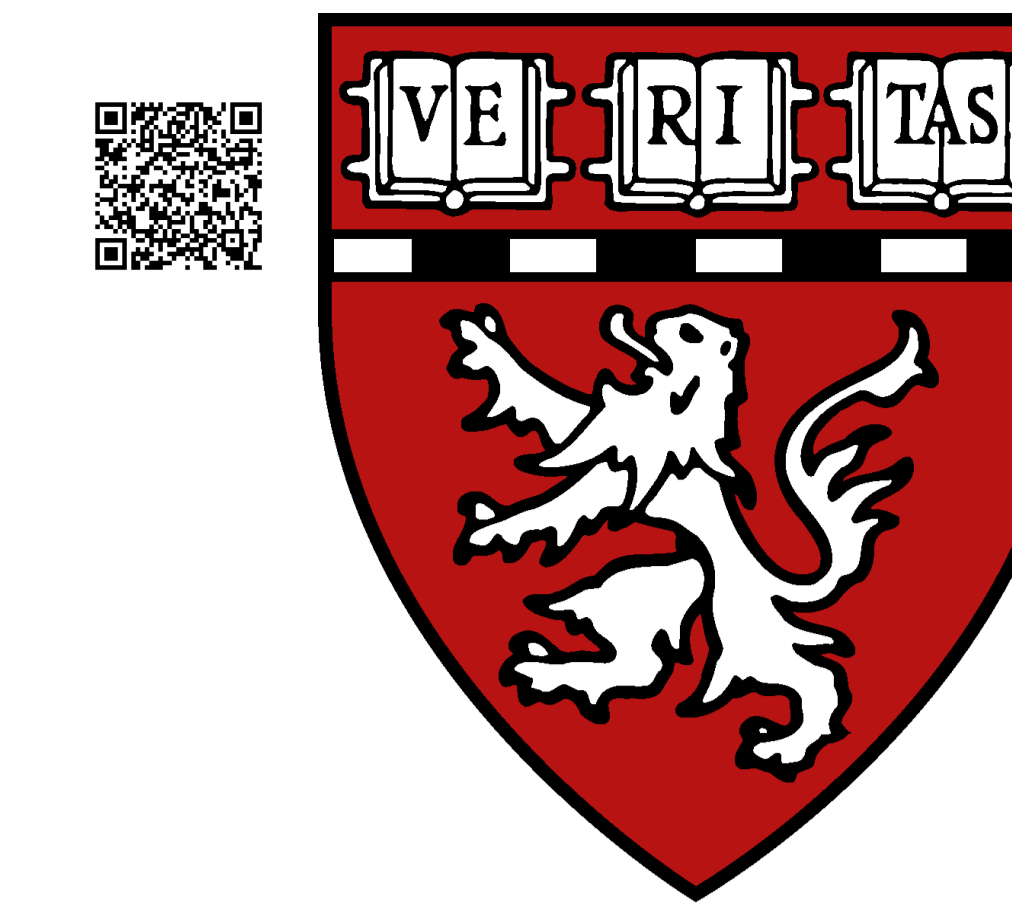


Multiplexing prism glasses for field expansion in bitemporal hemianopia

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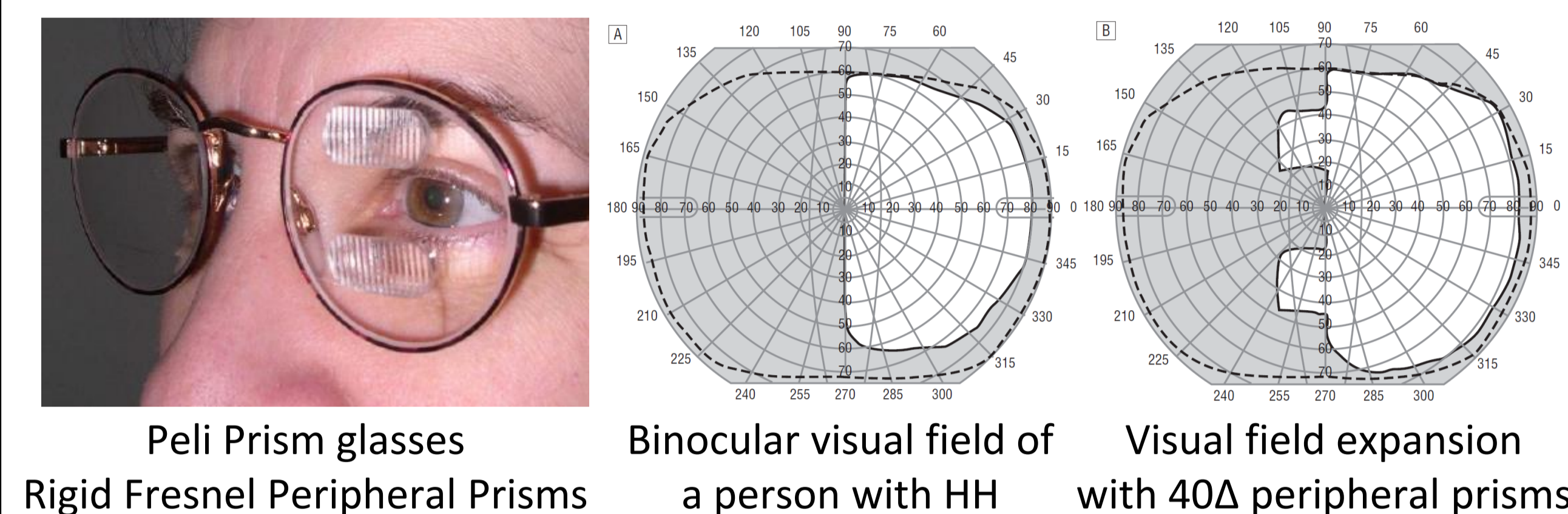
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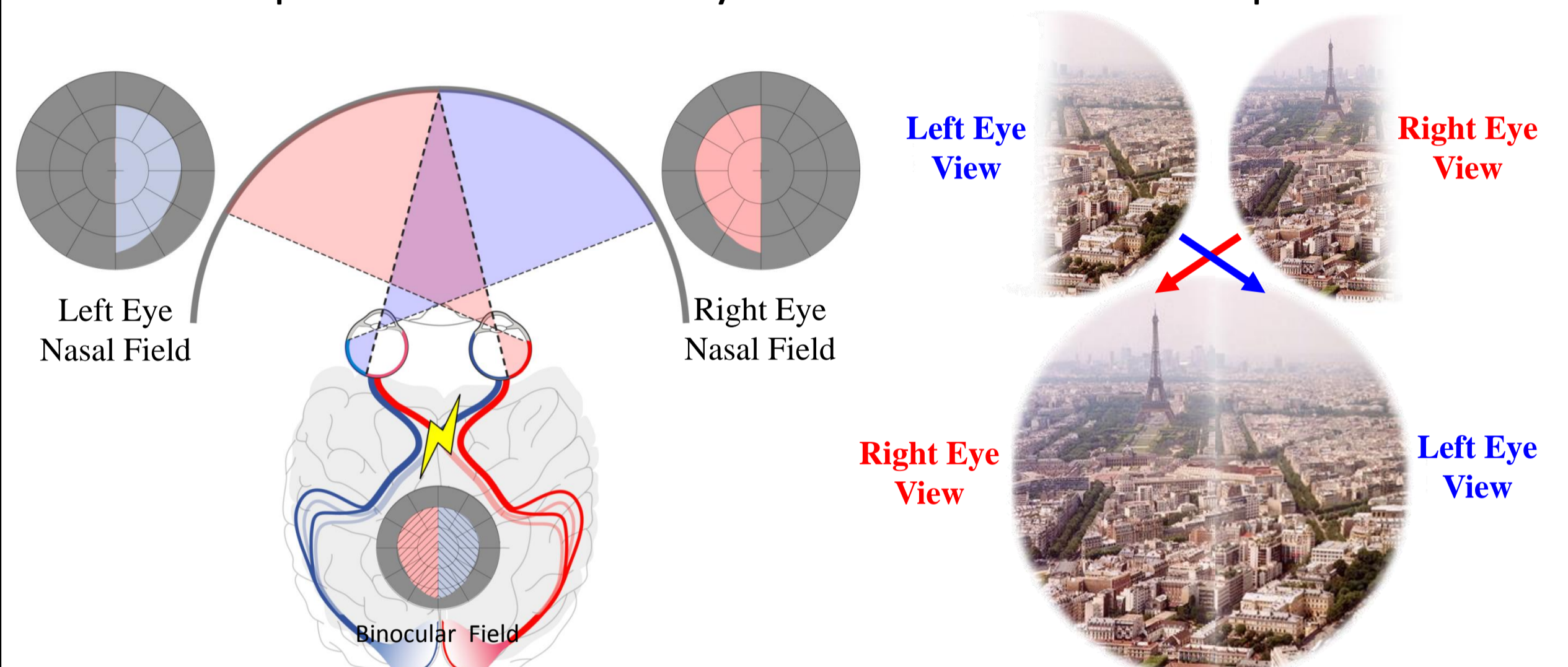
Peripheral prisms for Homonymous Hemianopia

- Peripheral Prisms^{1,2} (2000)
Expand upper and lower segments of the lateral visual field for Homonymous Hemianopia (HH) using Fresnel prisms



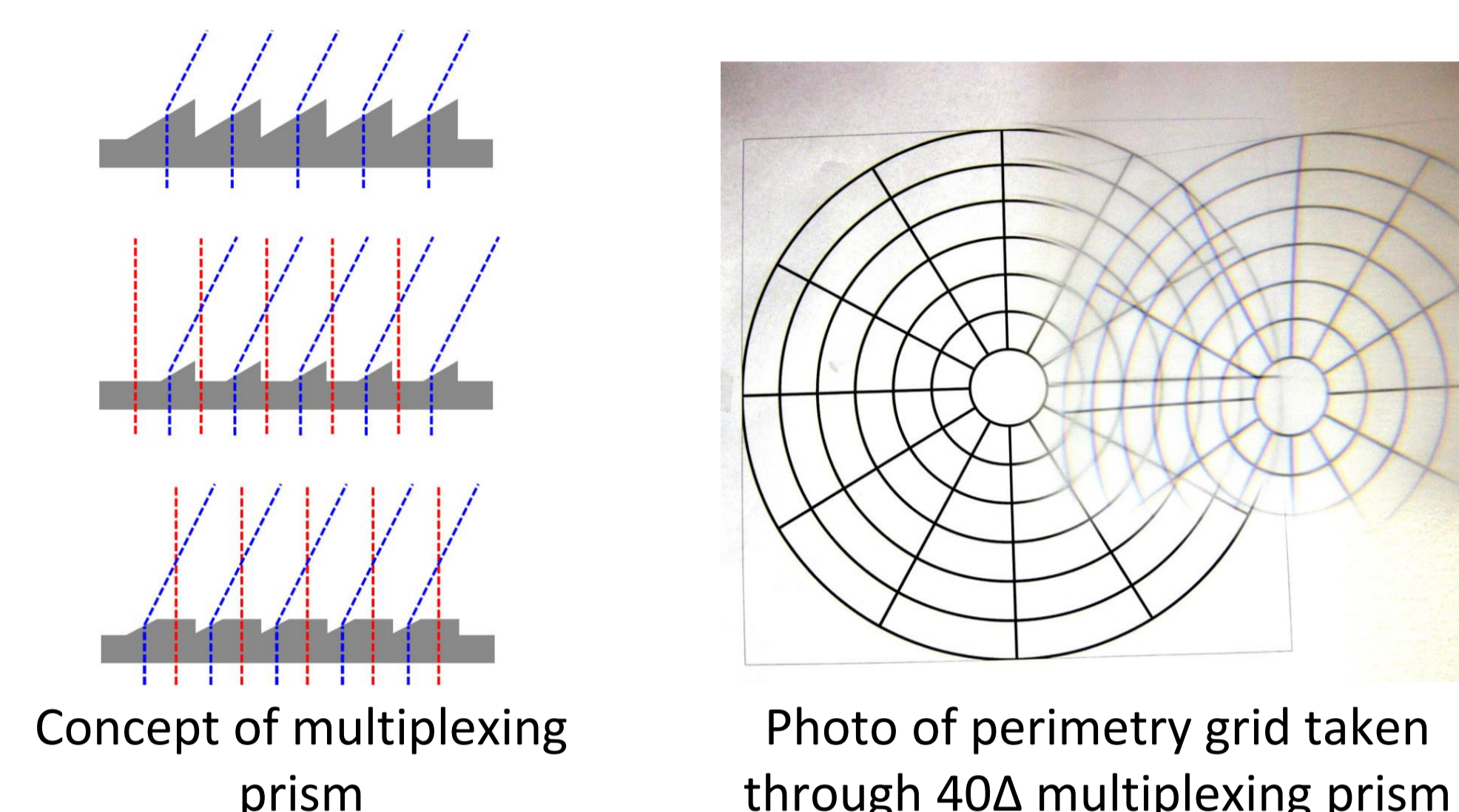
Bitemporal Hemianopia

- Bitemporal Hemianopia (BH) results from compromised nasal fibers of the optic nerves in both eyes due to lesion at the optic chiasm³

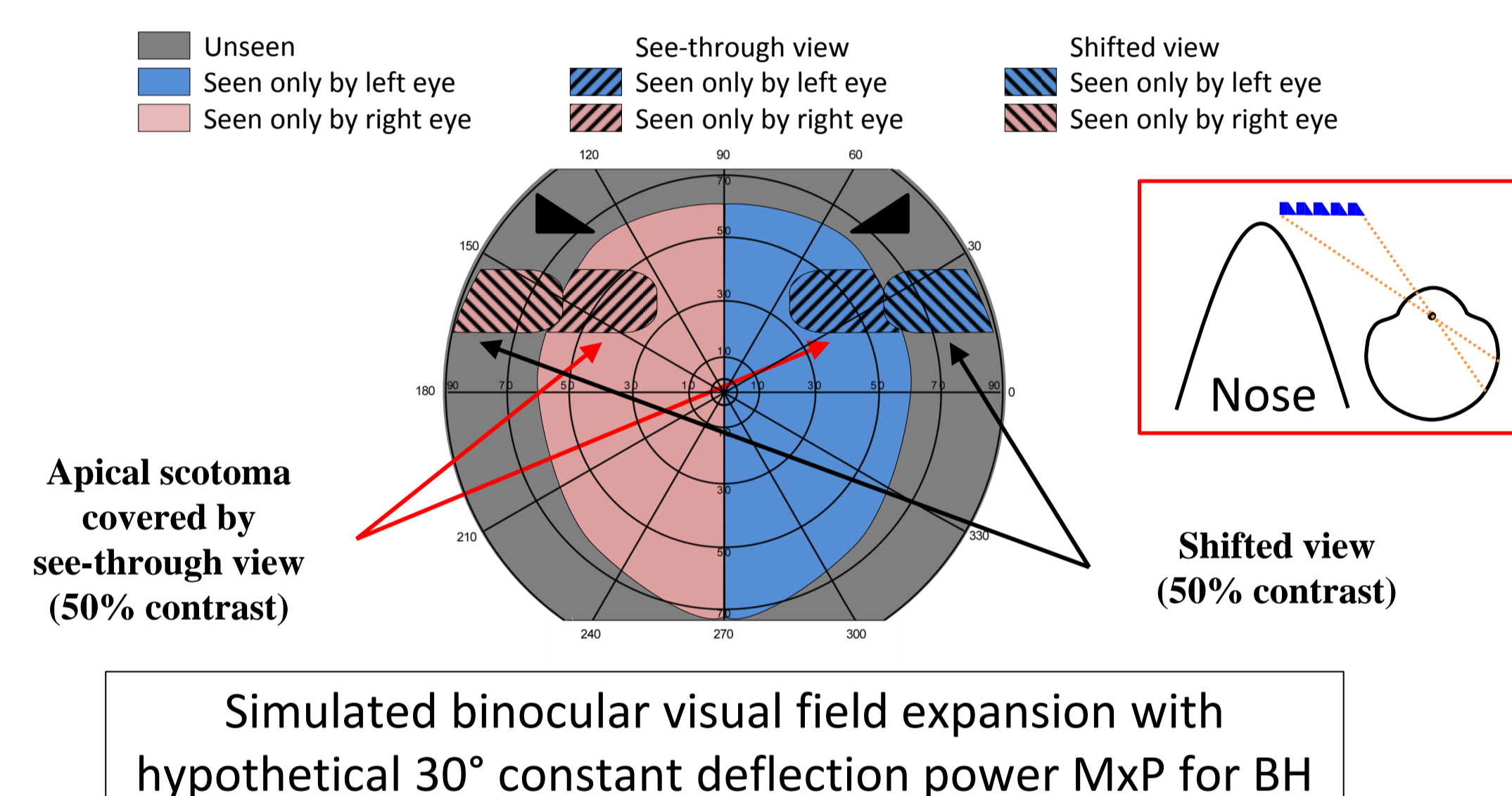


Multiplexing Prism (MxP)

- A device that provides simultaneous shifted and unshifted (i.e., multiplexed) views
- The MxP alternates flat areas between the Fresnel prismatic segments⁵

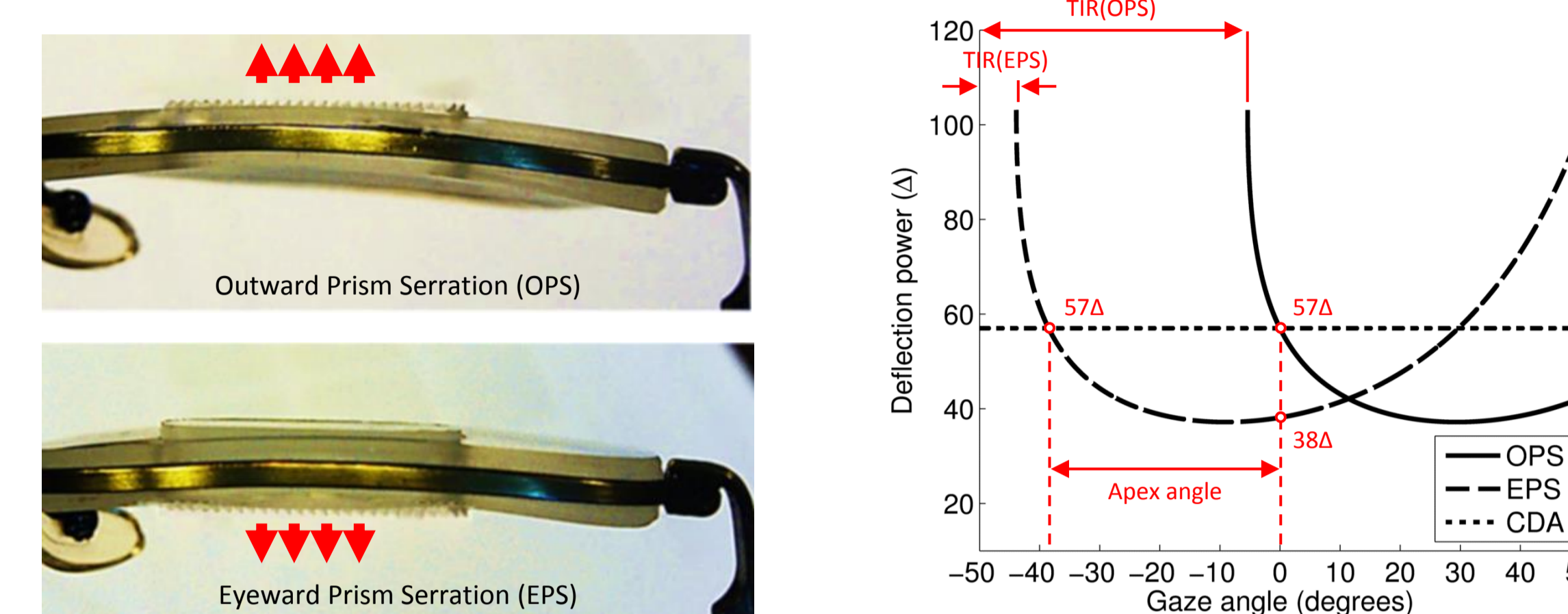


- See-through view of MxP eliminates the apical scotoma
- See-through and shifted views split light/contrast



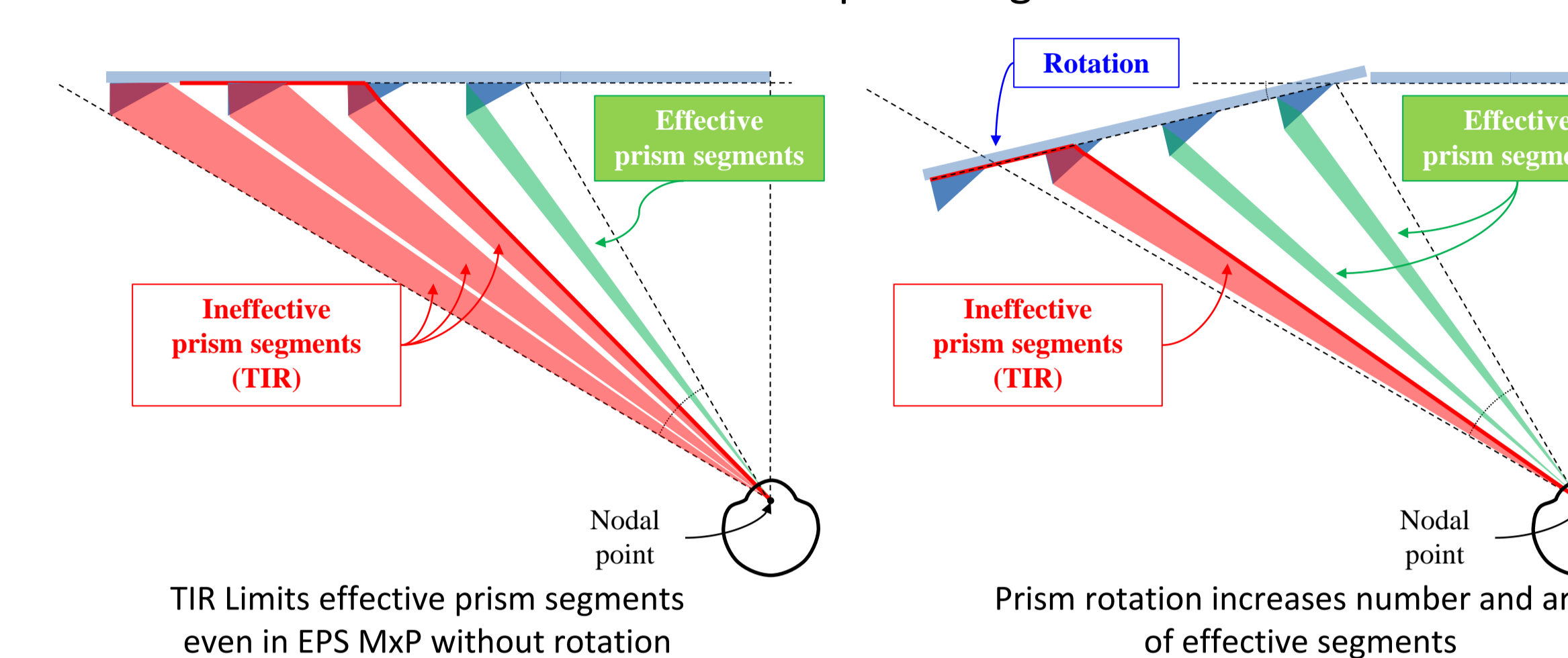
OPS and EPS Configurations

- Outward Prism Serration (OPS): Commonly used for PMMA Fresnel Peli prism
- Eyeward Prism Serration (EPS): Commonly used for press-on prism



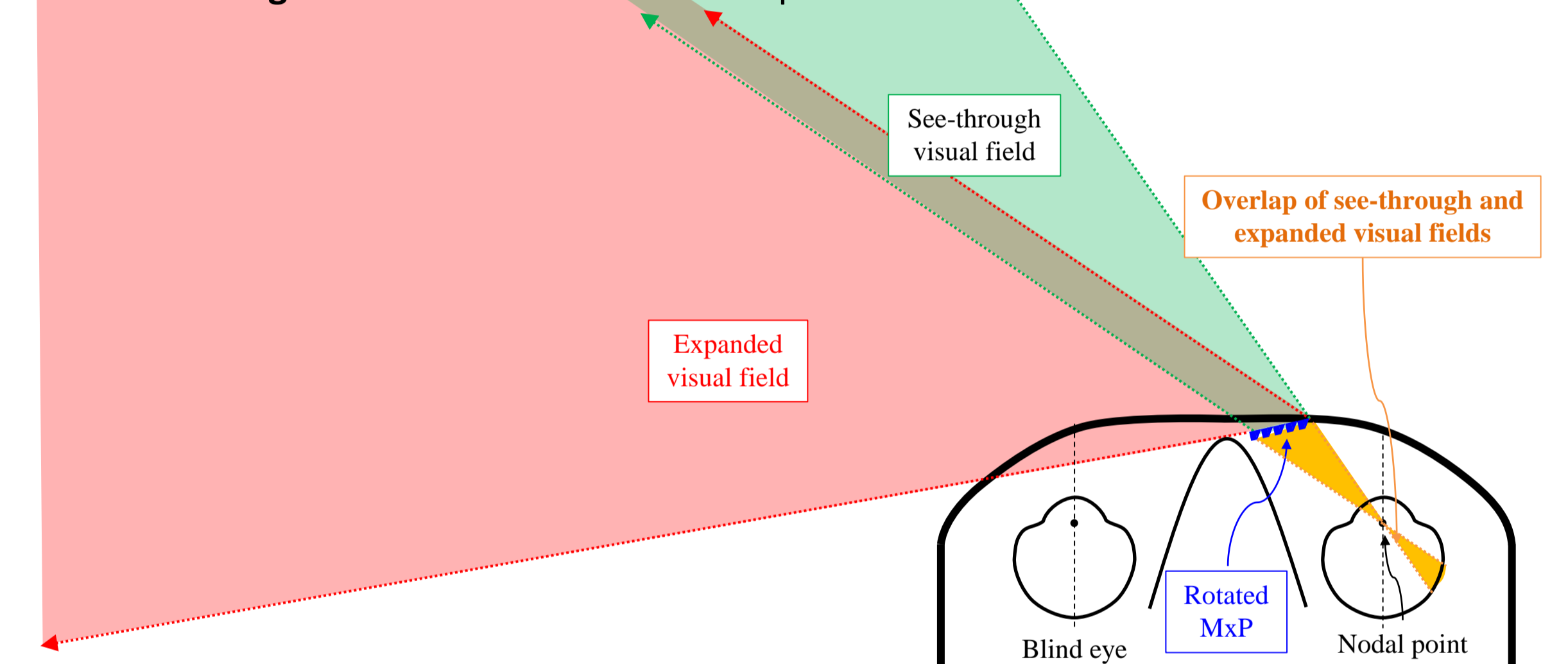
EPS Prism rotation reduces TIR

- EPS Prism rotation reduces angle of incidence
- Increase the number of effective prism segments

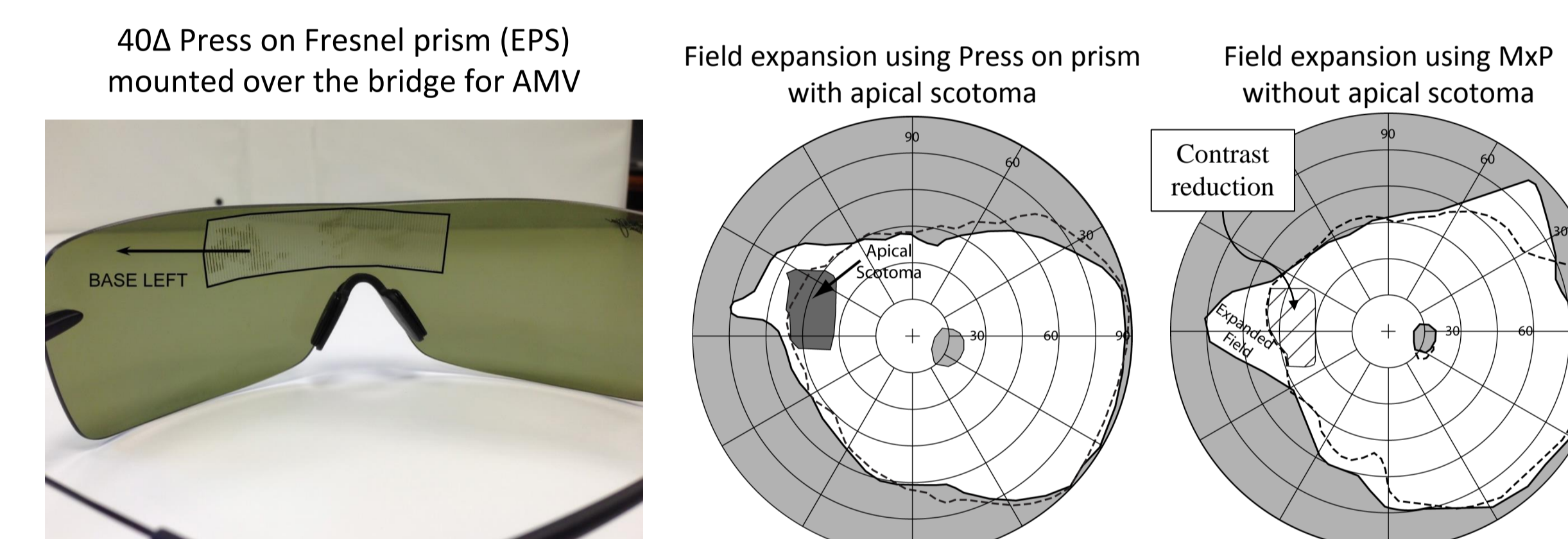


Optical correction for a left acquired monocular vision using MxP

- Multiplexing Fresnel prism over the bridge of the nose in wrap around sunglasses
- Expands visual field both by prism shift and prism minification
- See-through visual field eliminates the apical scotoma



- Press on prism (40Δ) over the bridge of the nose in the wrap-around sunglasses provide 20° nasal field shift (up to 80° of nasal field) but with apical scotoma
- Field expansion without apical scotoma achieved with a prototype multiplexing prism of 40Δ in the same position



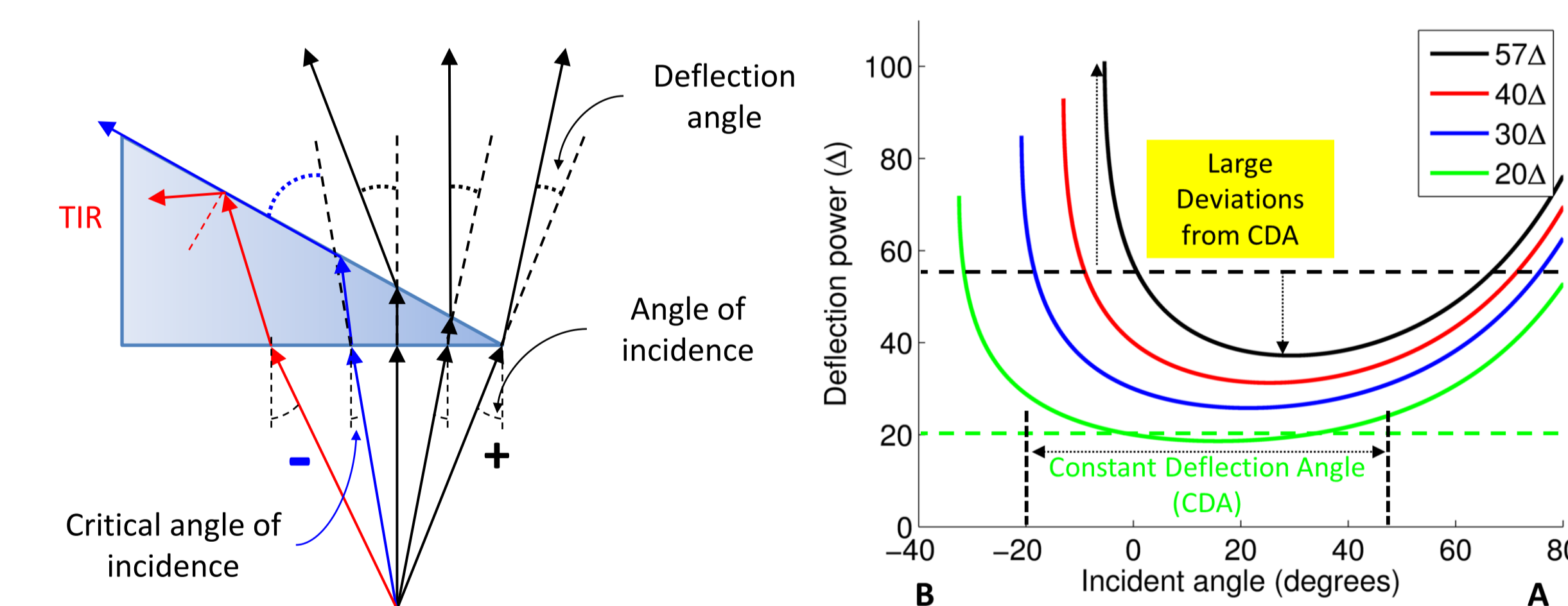
Nasal field expansion by peripheral prism

- Temporal retina areas, blocked by the nose, do not function visually
- Peripheral prism can expand nasal field of BH
- Apical scotoma: Prism extends the field towards the prism base, but loses field at its apex⁴

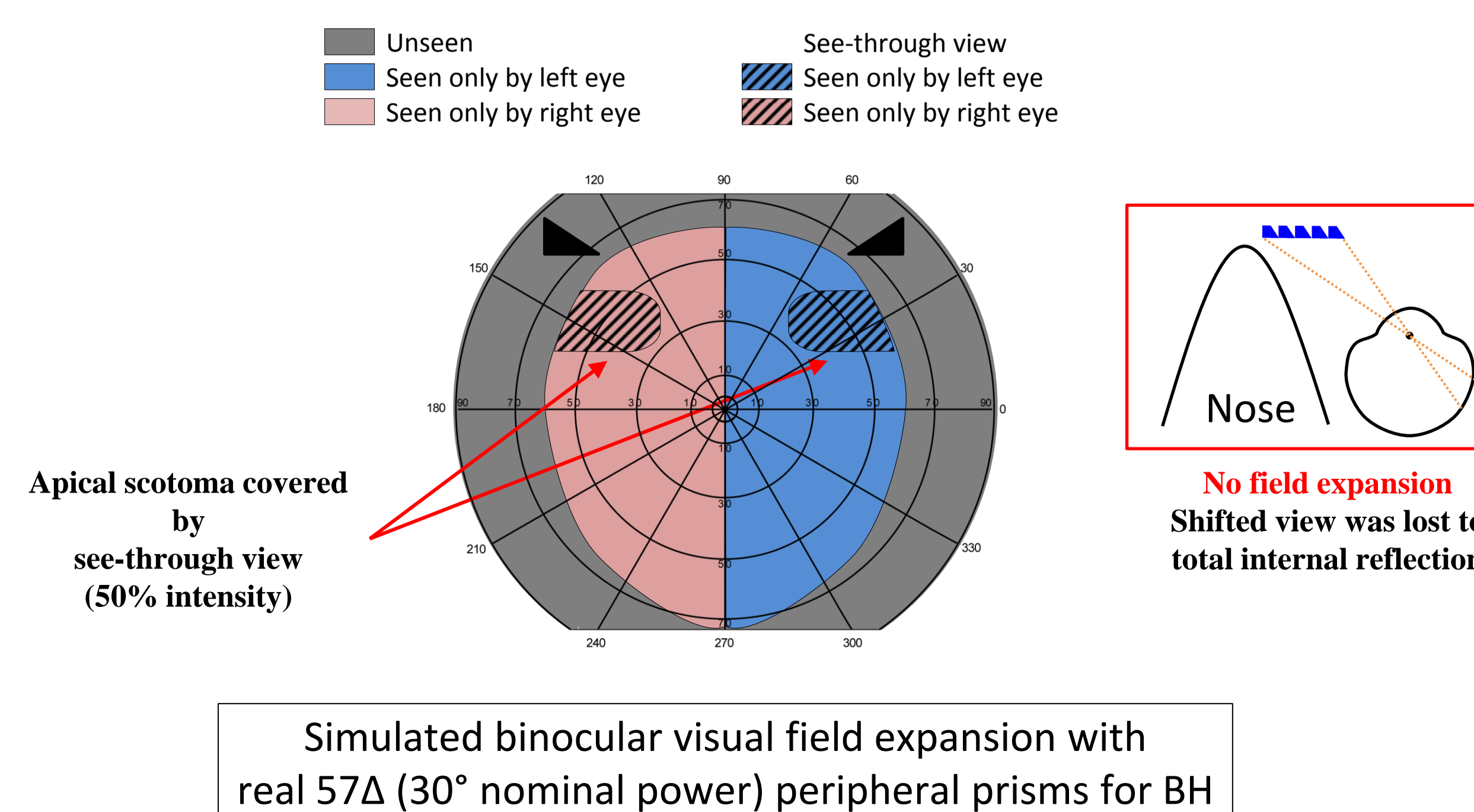


Prism Power Variation with Angle of Incidence

- Deflection angle of actual prism is highly dependent on the angle of incidence⁶
- Above a critical angle of incidence, total internal reflection (TIR)

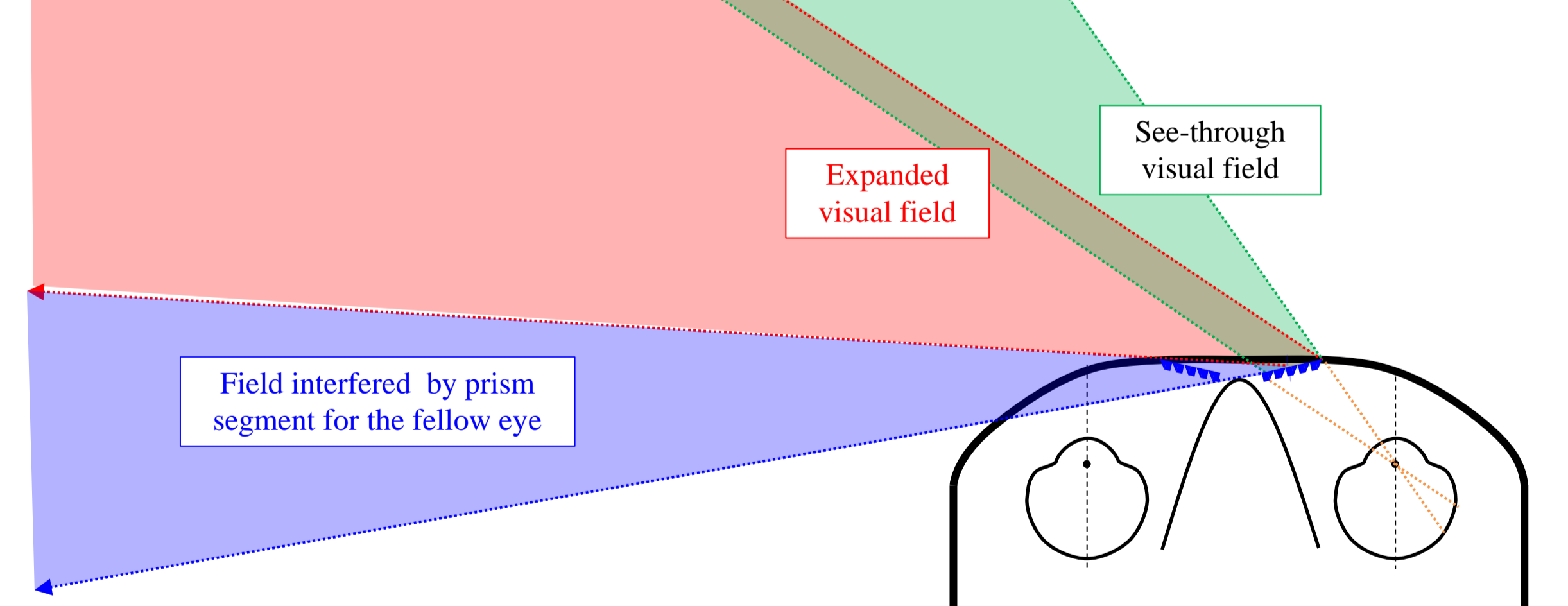


- High angle of incidence into prism over the nose bridge causes TIR⁶

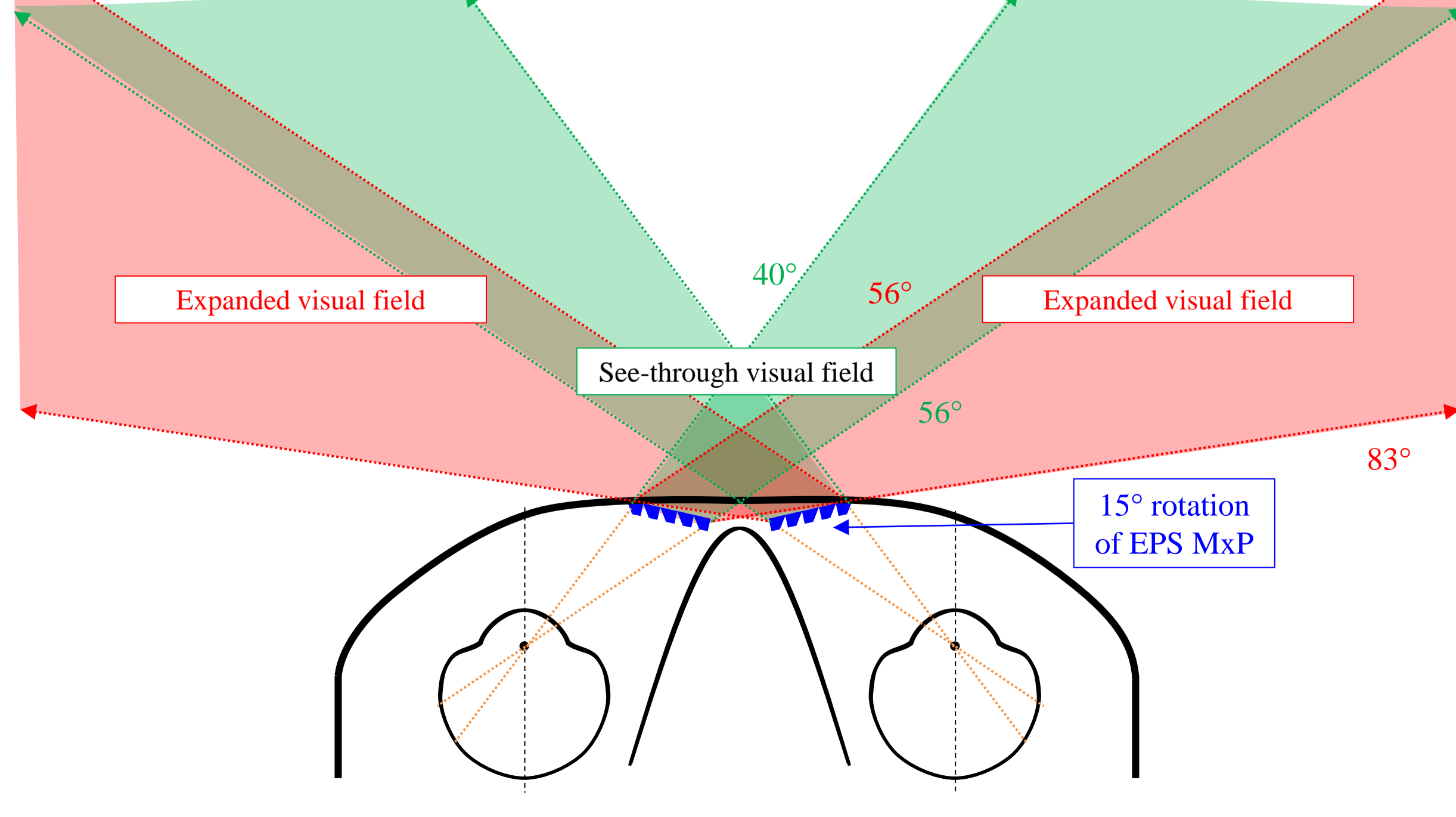


Optimize optical correction for BH using MxP

- Two multiplexing Fresnel prism over the bridge of the nose in wrap around sunglasses designed to expand nasal fields in both eyes
- Parts of expanded visual field of both prism segments may be blocked by the prism segment for the fellow eye

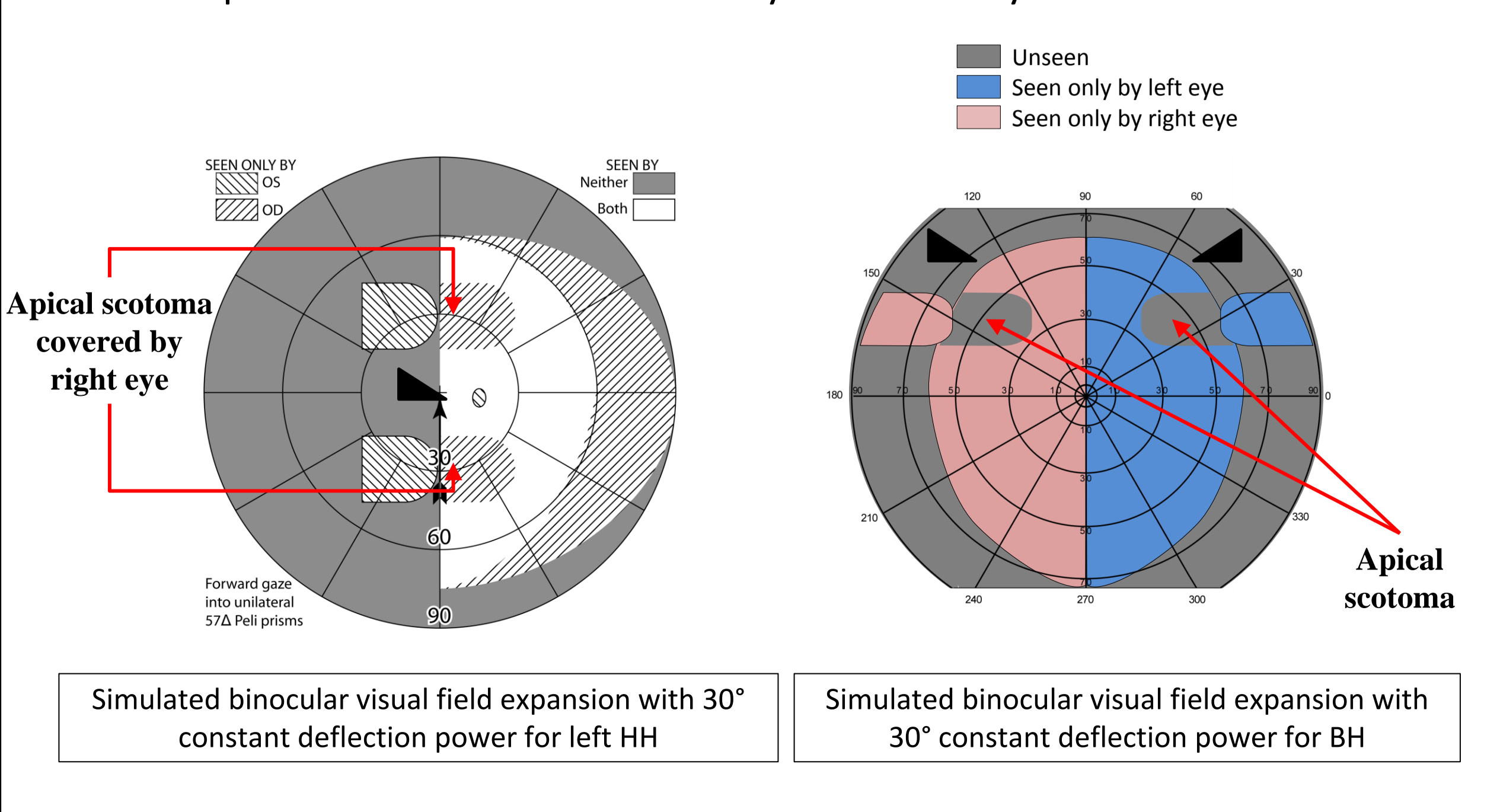


- The interference from fellow eye segment is prevented by using lower power of prism and adjusting rotation angle and segment size



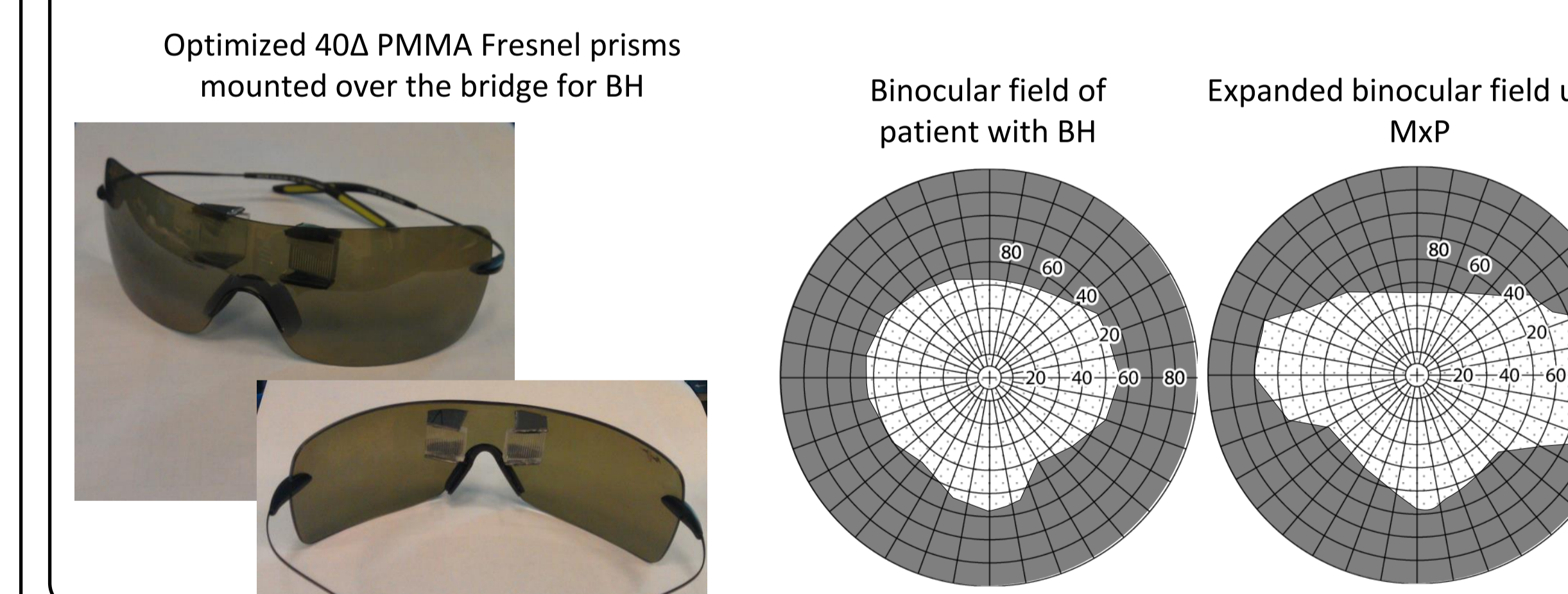
Apical scotoma in peripheral prism

- In HH: The fellow eye covers for apical scotoma
- In BH: Apical scotoma is not covered by the fellow eye



Expanded visual field of BH using MxP

- 15° rotated MxP (40Δ) with EPS over the bridge of the nose in a wrap-around sunglasses provide nasal field expansion of both eyes without apical scotoma
- Nasal field was expanded up to 80° and the interference was almost eliminated



Conclusion and References

- Prism segments over the nose bridge expand the nasal visual field for BH & AMV
- Nasal prism for BH is affected by apical scotoma
- The multiplexing prism overcomes the apical scotoma
 - At a cost of reduced contrast and monocular visual confusion
- Appropriate rotation of prism in EPS configuration reduces TIR
- Optimized rotation angle and size with lower power of prism is required to minimize this interference and maximize the expansion
- Supported in part by NIH grants EY12890 and EY023385
- Dr. Peli has patent application rights (assigned to Schepens) for the MxP

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