APPENDIX A

The effective prism power (deflection angle from the angle of incidence, *d*) derived with a refractive index of the prism (n = 1.49 for PMMA) and the apex angle (*α*) varies with angle of incidence (*i*) as followed.[A1]

$$d\left(i\right) = i + \sin^{-1}\left(n\sin(\alpha - \sin^{-1}\left(\frac{\sin i}{n}\right)\right) - \alpha \quad \text{(A1)}$$

The critical angle of incidence ($i_{C,0\%}$) with 0% transmittance is derived with a refractive index of the prism (*n* = 1.49 for PMMA in this paper) and the apex angle (*α*) as follow. [1]

$$i_{C,0\%} = \sin^{-1}\left(n\sin(\alpha - \sin^{-1}\left(\frac{1}{n}\right)\right) \quad \text{(A2)}$$

Note that we define the angle of incidence directed towards the base, the nasal field, as negative[A1-3] following the sign convention in the inset of Fig. 1A. To address meaningful visibility, we define and use the critical angle of incidence with 50% transmittance (i_c) in this paper. This is similar to the definition of the field of view through low vision telescopes.

First, we calculate transmittance of the prism in each angle of incidence using Fresnel reflection (Fig. A1A).[A4] The angle of incidence resulted in 50% transmittance is calculated which is quite close to the critical angle of incidence with 0% in high power prism. With the calculated i_c, the deflection power can be calculated by Eq. A1.

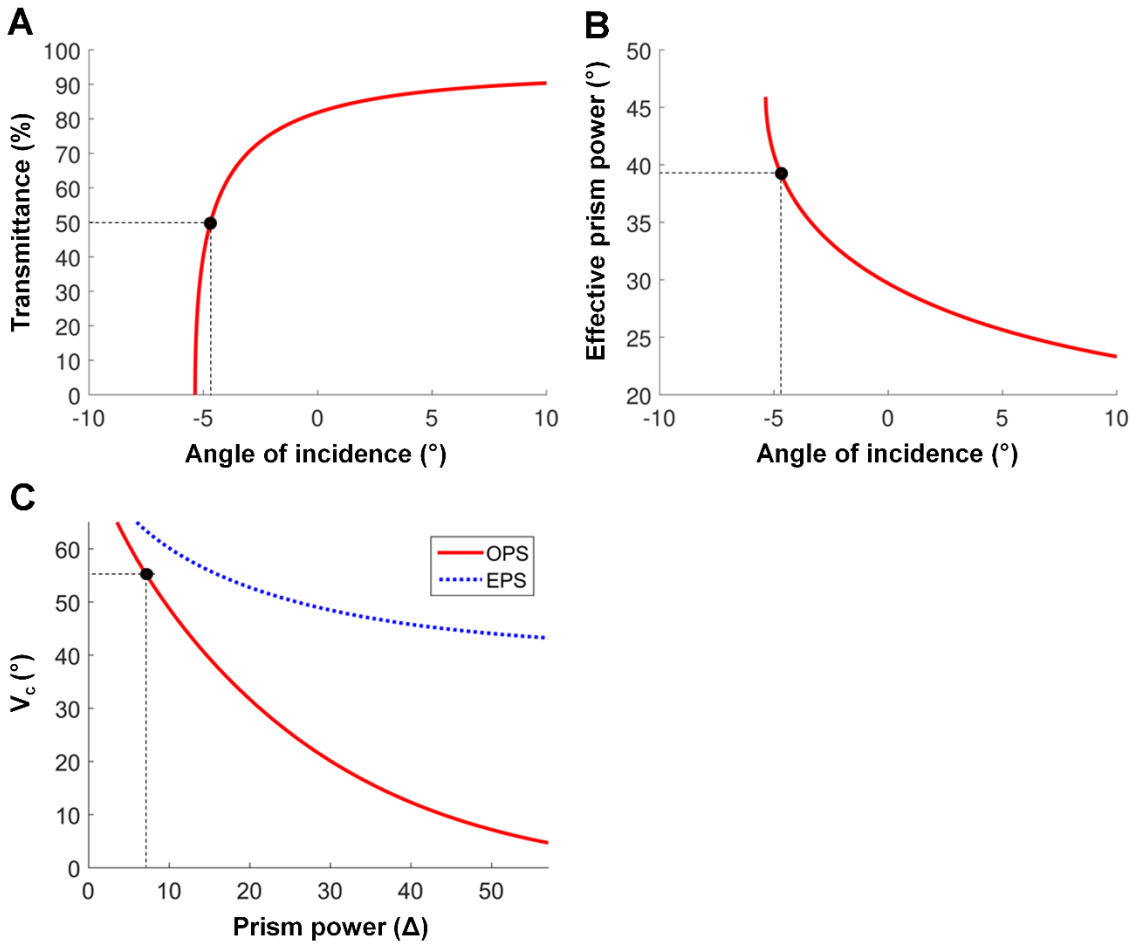

Figure A1. Critical angle of incidence with 50% transmittance. Note negative sign in angle of incidence is toward the base side. **(A)** Transmittance and **(B)** effective prism power vary with angle of incidence in 57Δ prisms. Total internal reflection starts at -5.3° angle of incidence with 0% transmittance and maximizes the effective prism power. However, the transmittance is below 50% with angles of incidence higher than 4.7° toward the base side, which cannot be used for the field expansion due to the low visibility of the shifted view. Therefore, we set the critical angle of incidence for field expansion to -4.7°. At this angle of incidence, the effective prism power is 39° (≈81Δ). **(C)** Critical angle of incidence with 50% transmittance in various prism powers of OPS and EPS prisms. Dashed line indicates the maximum prism power of OPS prisms without TIR at 55° nasal field (Fig. 1B).

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