

A man with dark hair, wearing dark sunglasses, a light-colored blazer over a white button-down shirt, and a dark shoulder bag, is looking down at a smartphone in his hand. The background is a bright, out-of-focus outdoor setting.

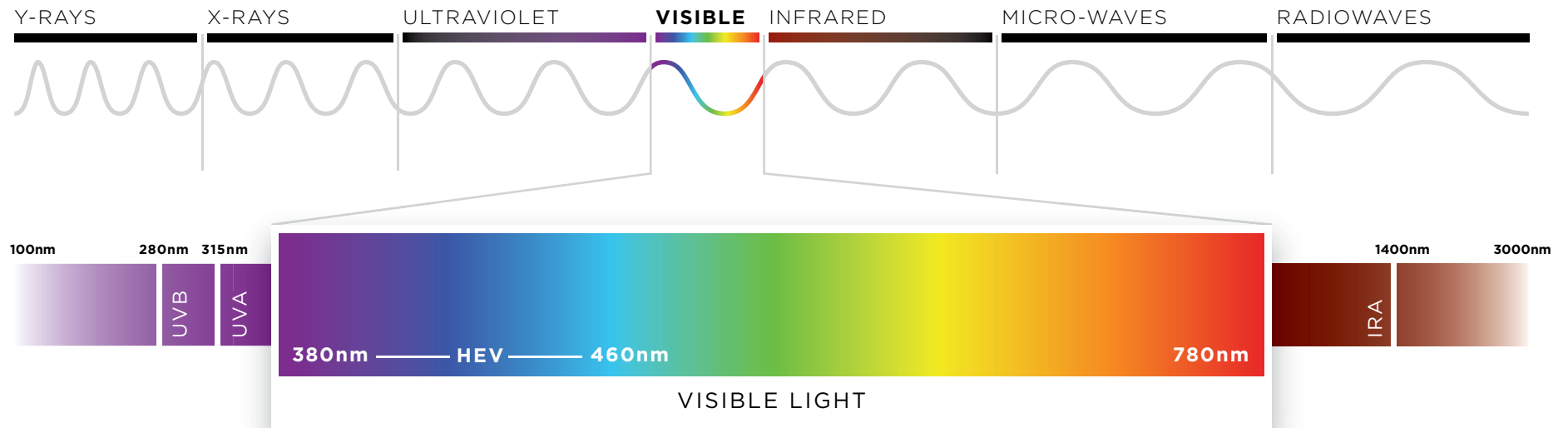
Transitions®

Transitions® Lenses and Blue Light

TECHNICAL NOTES FOR
EYECARE PROFESSIONALS



WHAT IS HARMFUL BLUE LIGHT?



Blue light (also known as High Energy Visible Light) is at the far end of the visible spectrum, close to ultraviolet light, with wavelengths of between 380-460 nanometers. Harmful blue light is centered around 435nm.¹

Long term exposure to harmful blue light has been linked to increased risk of developing age-related macular degeneration (AMD) which is the leading cause of vision loss in adults over the age of 50.^{1,2}

COMMON SOURCES OF HARMFUL BLUE LIGHT

The amount of harmful blue light a person is exposed to varies based on several factors, including light source and viewing direction (**Table 1**).

Sunlight is by far the strongest source of blue light at least 100 times greater than artificial sources (Fig. 2).

	SUN	PLASMA TV	SMART PHONE	LCD MONITOR	CRT MONITOR	OVERHEAD FLUORESCENT
	3.71	.035	.007	.013	.025	.089
VIEWING DIRECTION	Indirect	6 ft. facing	1 ft. facing	2 ft. facing	2 ft. facing	6 ft. facing

Table 1
Harmful blue light integrated Irradiance values (w/m2) of common artificial light sources against solar diffused light (Transitions Optical internal measurements)



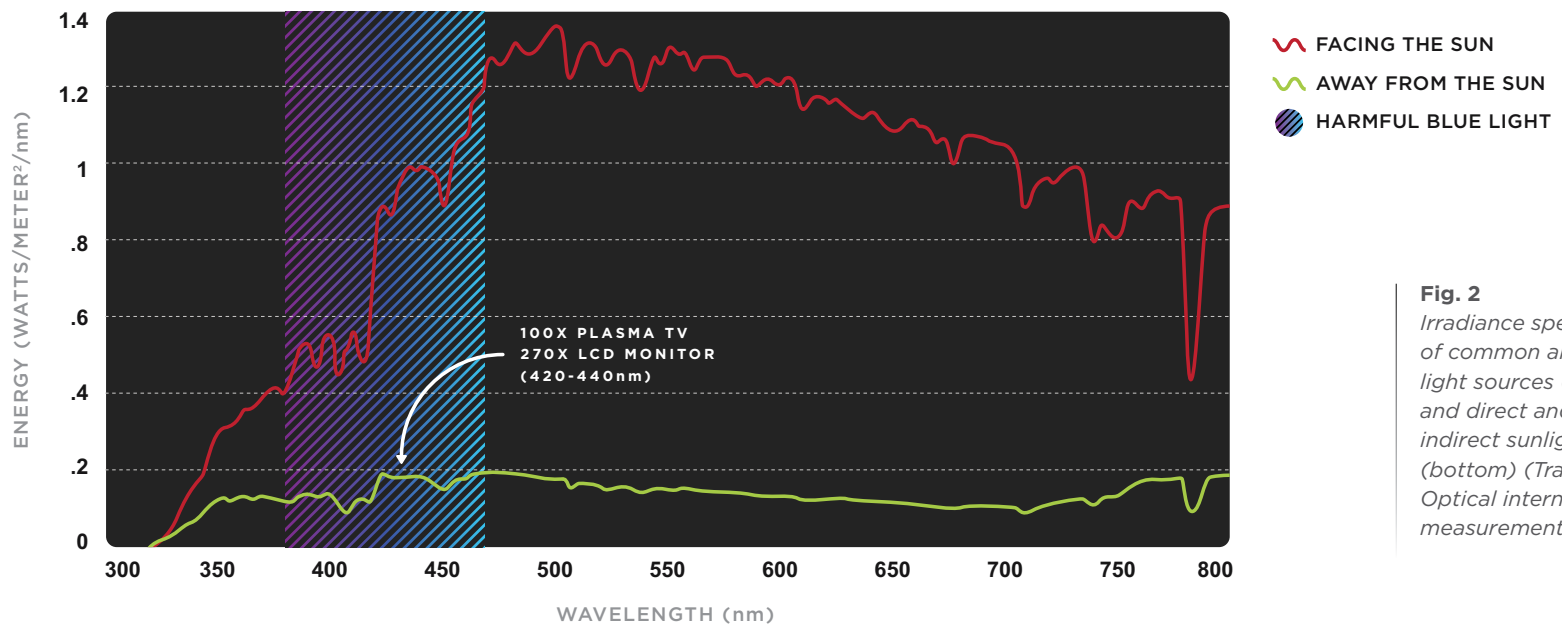
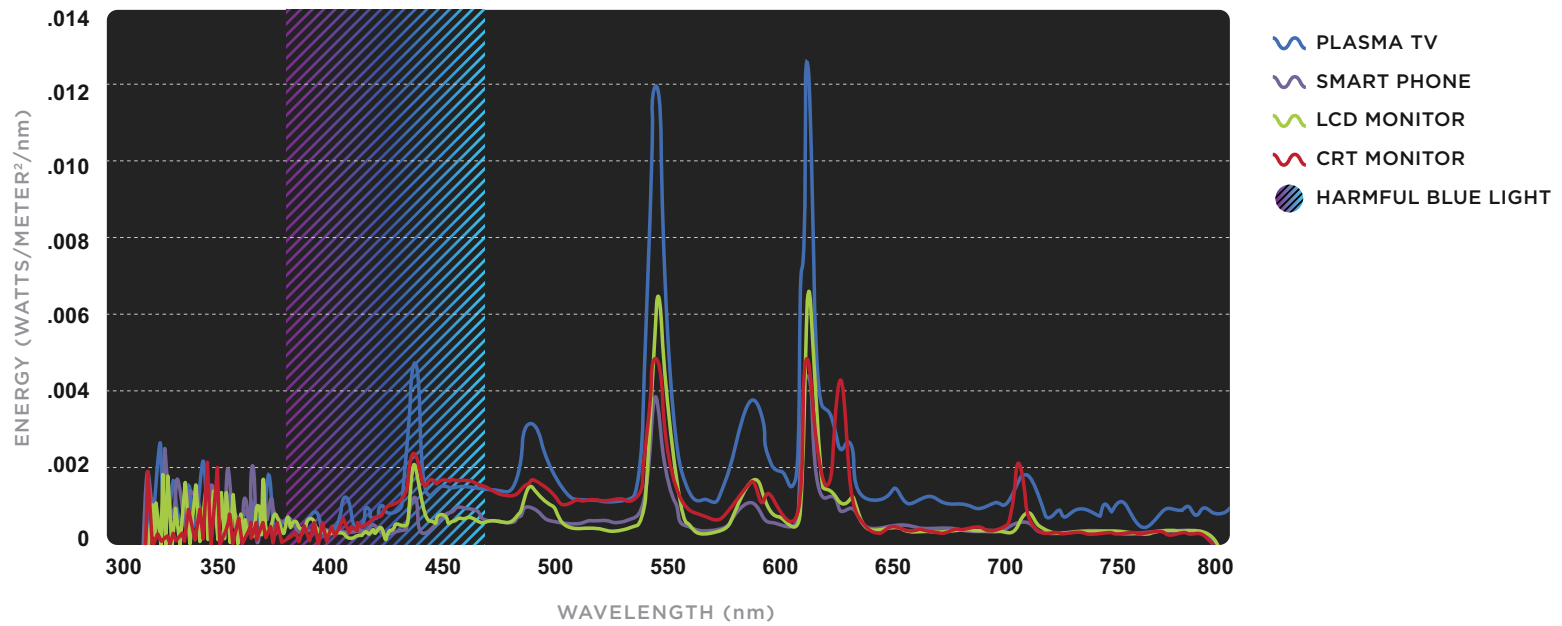


Fig. 2
Irradiance spectra of common artificial light sources (top) and direct and indirect sunlight (bottom) (Transitions Optical internal measurements)



TRANSITIONS® ADAPTIVE LENSES

All *Transitions* lenses help protect against harmful blue light everywhere you need it.

Transitions® Signature®

Transitions® Signature® VII lenses block at least 20% of the harmful blue light indoors, which is up to 2 times more than standard clear lenses,* and they block over 85% outdoors.³



BLOCKS AT LEAST 20%
INDOORS - UP TO 2X MORE
THAN A CLEAR LENS*



BLOCKS OVER 85%
OUTDOORS

* *Transitions* lenses block 20% to 36% of harmful blue light indoors excluding CR607 *Transitions* Signature VII products which block 14% to 19%. The 2 times comparison refers to typical clear 1.50 and polycarbonate hard-coated lenses.

Transitions® XTRActive®

Transitions® XTRActive® lenses help provide more protection than Transitions® Signature® VII lenses - they provide even more protection against blue light everywhere you need it by blocking at least 34% of the harmful blue light indoors, which is up to 3 times more than a standard clear lens,** and 88% to 95% of harmful blue light outdoors.³



BLOCKS AT LEAST **34%**
INDOORS - UP TO 3X MORE
THAN A CLEAR LENS**



BLOCKS **88-95%**
OUTDOORS

** *Transitions XTRActive* lenses and *Transitions Vantage* lenses block 34% to 36% of harmful blue light indoors excluding CR607 *Transitions XTRActive* products which block 27% to 31%. The 3 times comparison refers to typical clear 1.50 and polycarbonate hard-coated lenses.





Transitions® Vantage®

Transitions® Vantage® lenses reduce exposure to harmful blue light, blocking at least 34%** indoors and over 85% outdoors.³

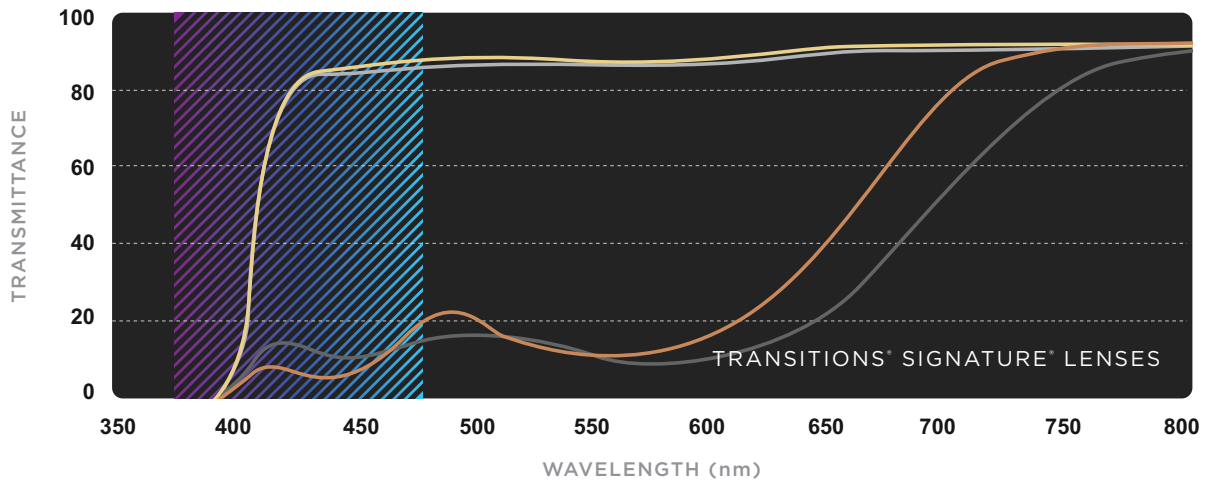


BLOCKS AT LEAST **34%**
INDOORS - UP TO 3X MORE
THAN A CLEAR LENS**

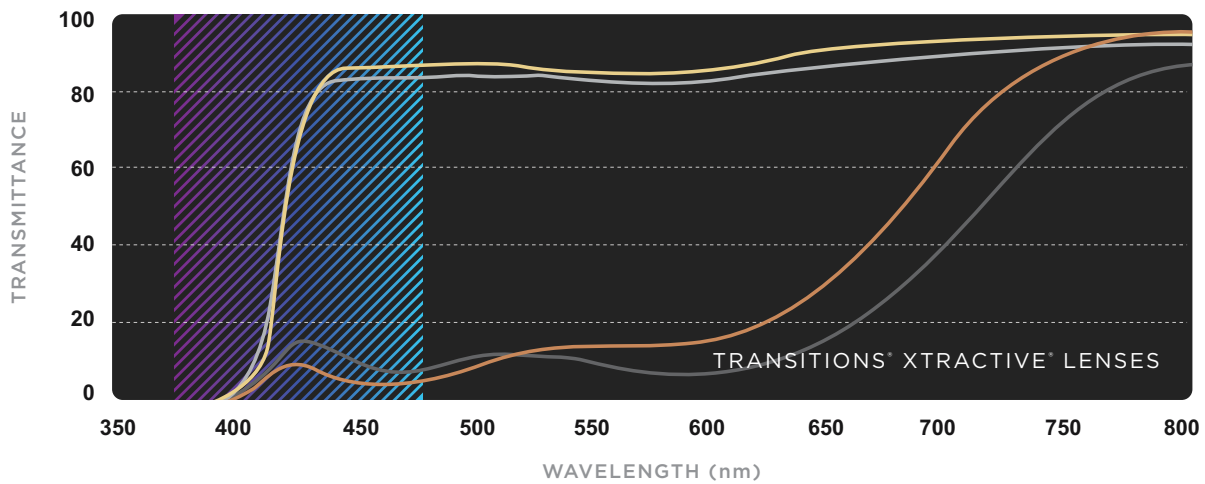


BLOCKS **88-95%**
OUTDOORS

**Transitions® XTRActive® lenses and *Transitions Vantage* lenses block 34% to 36% of harmful blue light indoors excluding CR607 *Transitions XTRActive* products which block 27% to 31%. The 3 times comparison refers to typical clear 1.50 and polycarbonate hard-coated lenses.



— UNACTIVATED BROWN LENS — ACTIVATED BROWN LENS HARMFUL BLUE LIGHT
— UNACTIVATED GREY LENS — ACTIVATED GREY LENS



— UNACTIVATED BROWN LENS — ACTIVATED BROWN LENS HARMFUL BLUE LIGHT
— UNACTIVATED GREY LENS — ACTIVATED GREY LENS

Fig. 3
 Overlay of un-activated and activated spectra of Transitions[®] Signature[™] grey and brown lenses (top) and Transitions[®] XTRActive[®] grey and brown lenses (bottom)



Transitions® Signature® VII lenses filter a similar amount of harmful blue light indoors compared to many blue-filtering AR coatings and offer extra protection where you need it the most: **outdoors in the sun**. Transitions® XTRActive® lenses provide additional protection indoors compared to many blue-filtering AR solutions. *Transitions* lenses are compatible with many AR coatings that filter harmful blue light. When used together, these products may provide complementary benefits.

OPTICAL SOLUTIONS

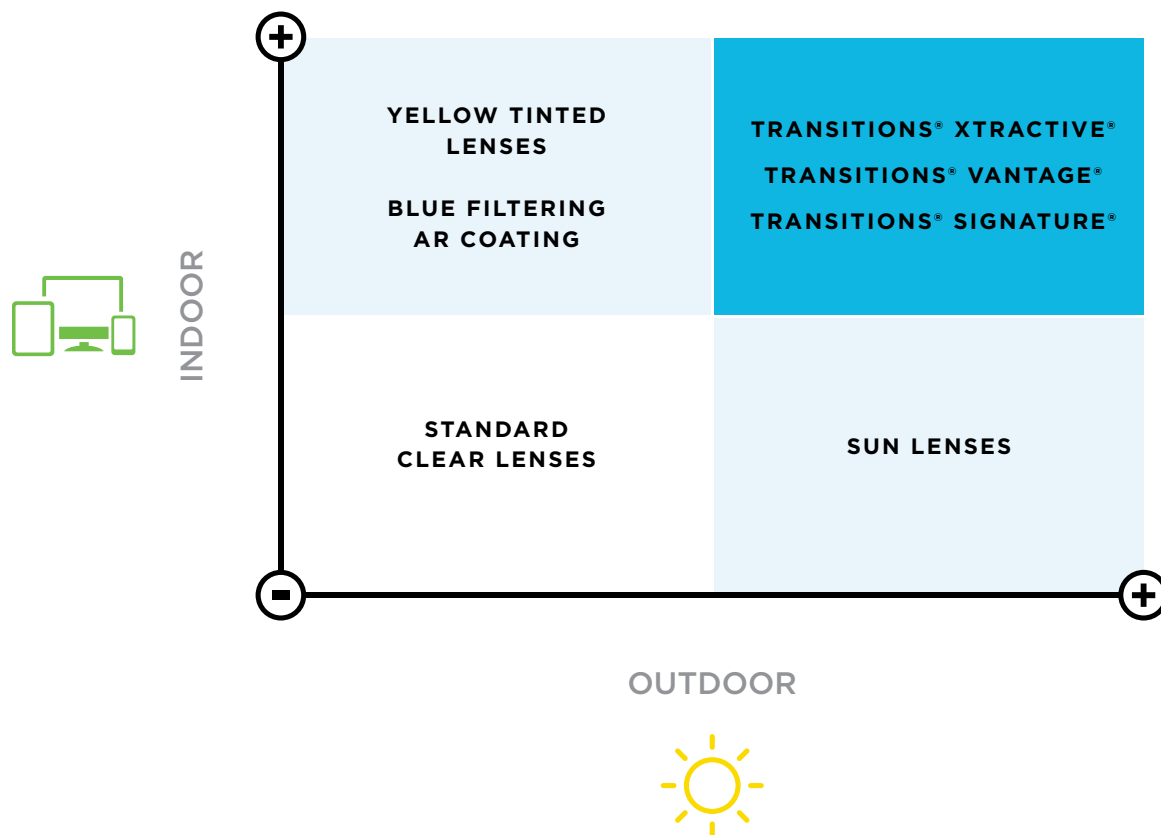


Fig. 5
 Matrix of blue light filtering delivered by optical solutions in the eyewear industry in normal indoor/outdoor usage



REFERENCES

¹Arnault E., Barrau C., Nanteau C., Gondouin P., Bigot K., Viénot F., Gutman E., Fontaine V., Villette T., Cohen-Tannoudji D., Sahel J., Picaud S., Phototoxic Action Spectrum on a Retinal Pigment Epithelium Model of Age-Related Macular Degeneration Exposed to Sunlight Normalized Conditions, PlosOne 8 (2013), DOI: 10.1371/journal.pone.0071398

²National Institutes of Health National Eye Institute. Facts about Age-Related Macular Degeneration. Retrieved from: https://nei.nih.gov/health/maculardegen/armd_facts

³Calculated using a weighted hazard function between 380-460nm

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