



Transitions® Lenses & Harmful Blue Light

TECHNICAL NOTES



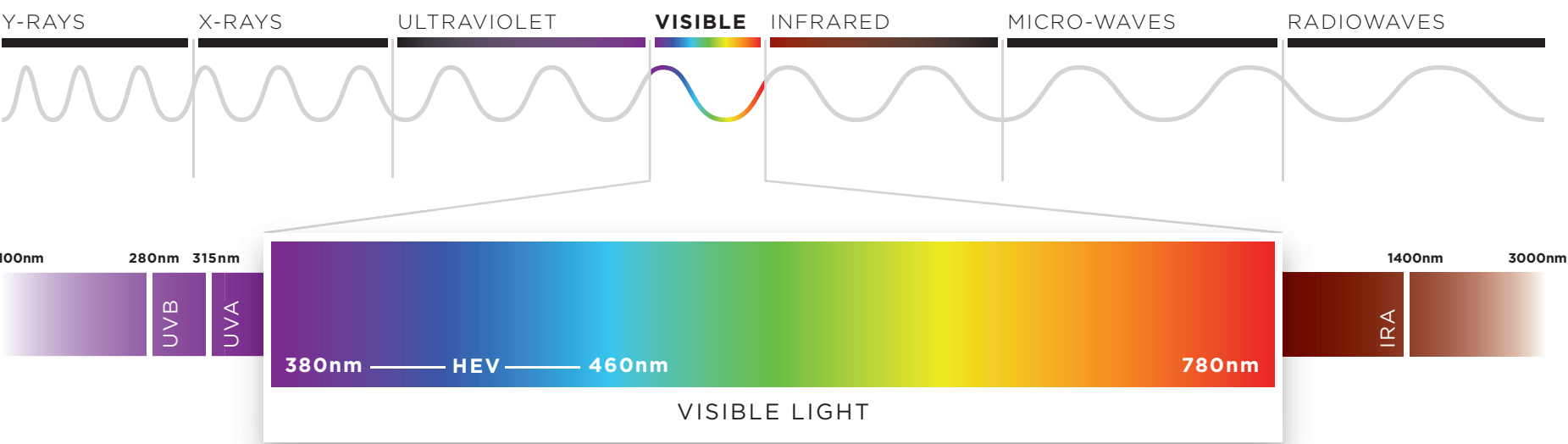
www.Transitions.com

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Transitions®
ADAPTIVE LENSES™



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 between 380-460 nanometers. Harmful Blue Light is centered around 435nm (ISO standard).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}

¹ Arnault E., Barrau C., Nanteau C., Gonduin 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

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

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 Harmful 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)

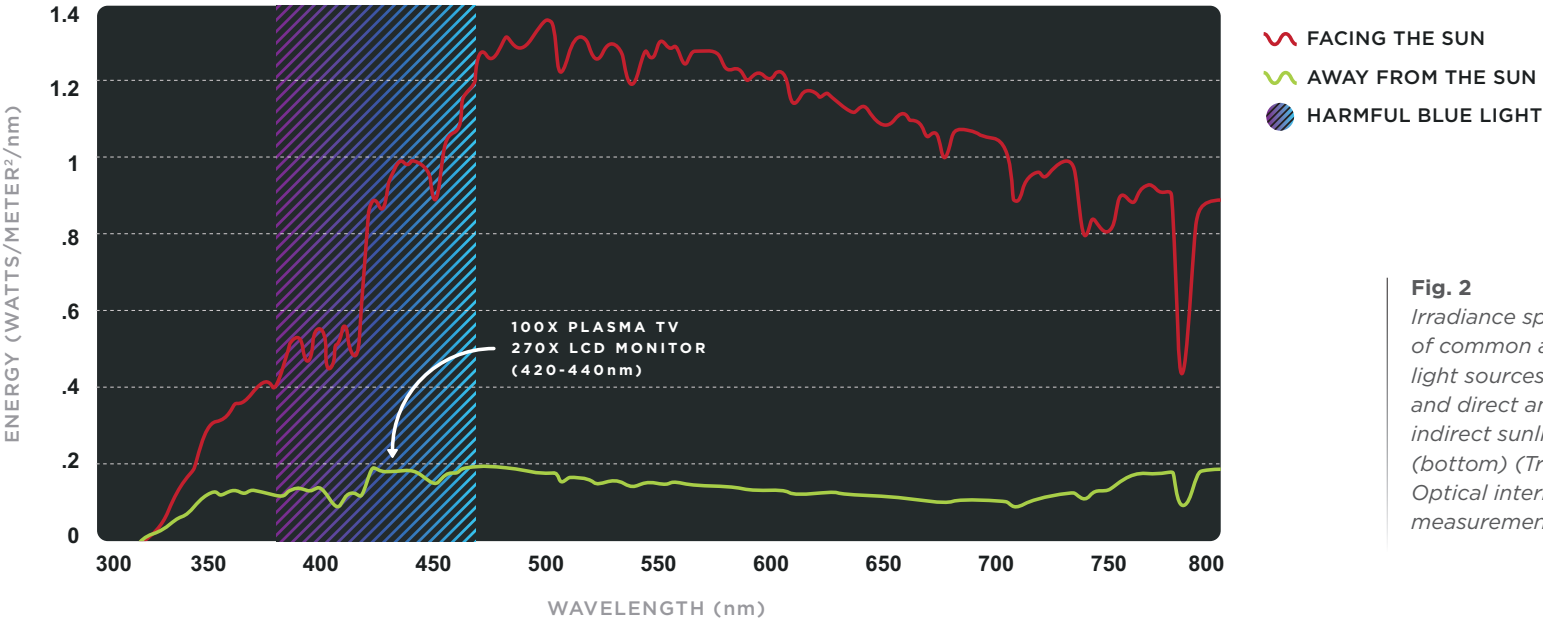
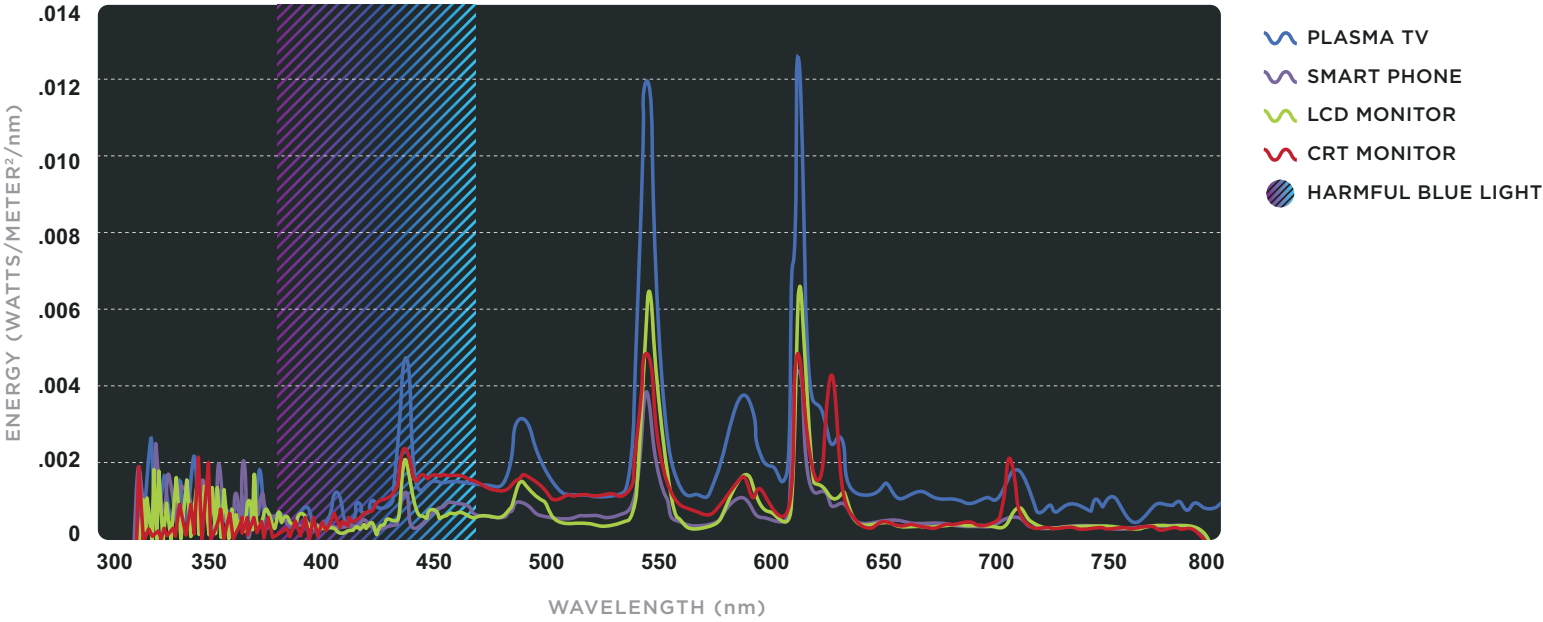
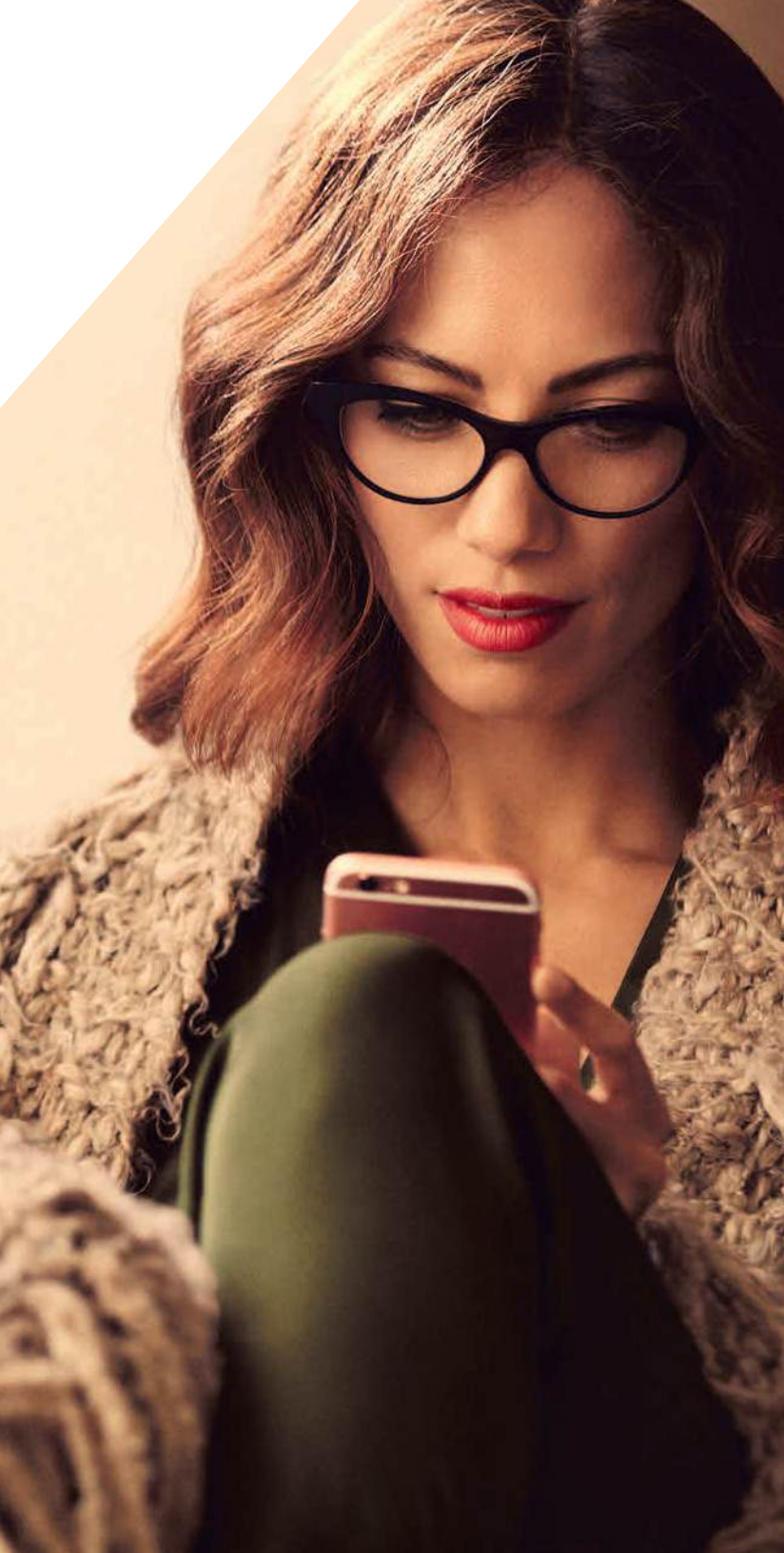


Fig. 2
Irradiance spectra of common artificial light sources (top) and direct and indirect sunlight (bottom) (Transitions Optical internal measurements)



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,* and they block over 85% outdoors.



BLOCKS AT LEAST **20%**
INDOORS



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%.

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** and 88% to 95% of Harmful Blue Light outdoors.



BLOCKS AT LEAST **34%**
INDOORS



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%.





Transitions® Vantage™

Transitions® Vantage™ lenses reduce exposure to Harmful Blue Light, blocking at least 34%** indoors and over 85% outdoors.

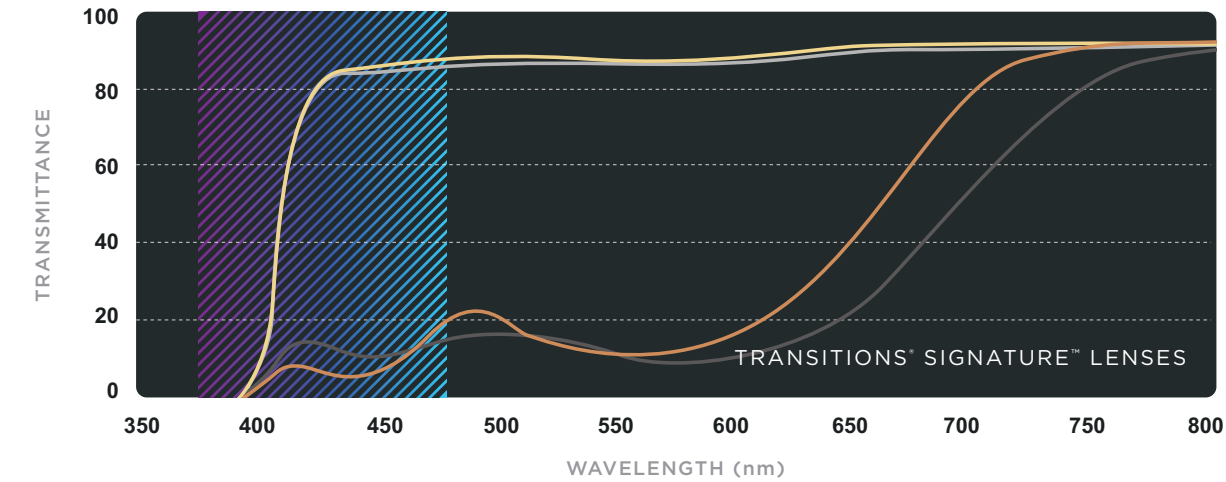


BLOCKS AT LEAST **34%**
INDOORS

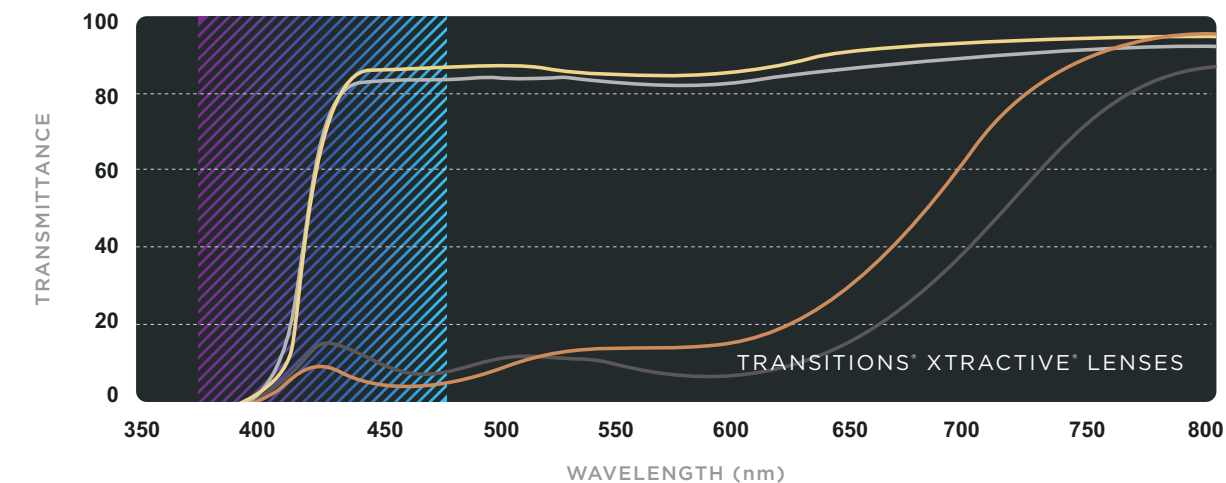


BLOCKS OVER **85%**
OUTDOORS

** 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%.



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

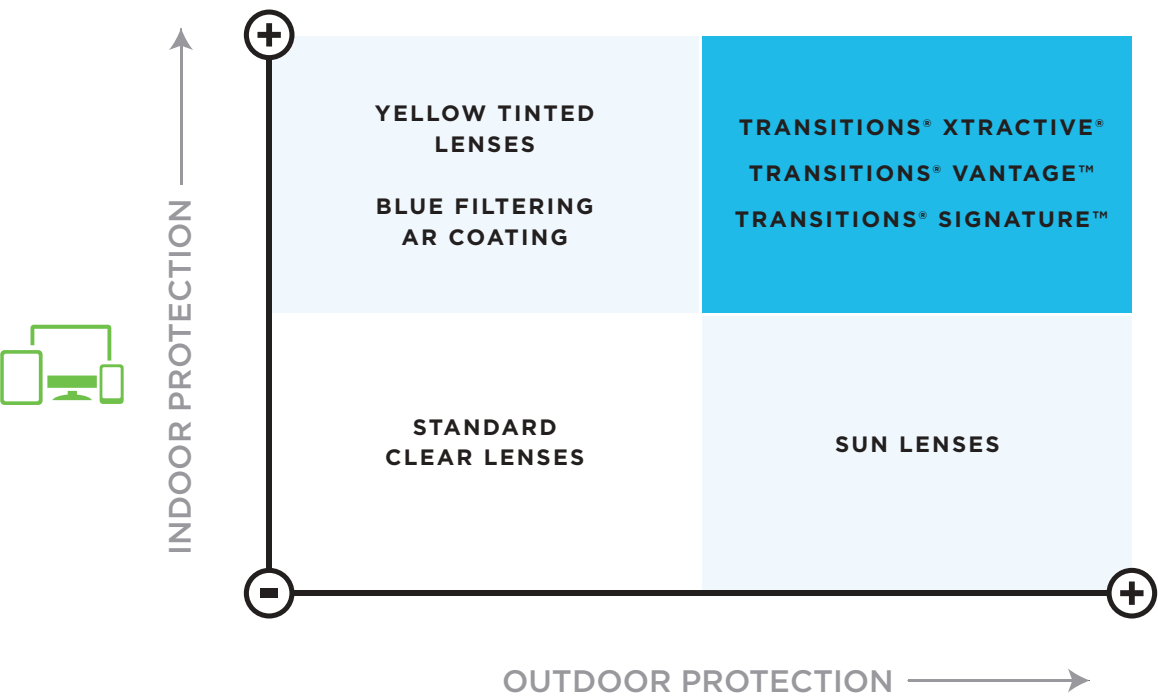
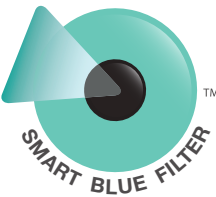


Fig. 6
Matrix of blue light filtering delivered by optical solutions in the eyewear industry in normal indoor/outdoor usage



Transitions®

All Essilor Transitions® Lenses include **Smart Blue Filter™** to help protect eyes from Harmful Blue Light, both **indoors** and **outdoors**

LENS TYPE	INDOOR PROTECTION	OUTDOOR PROTECTION
Transitions® Signature™ VII Lenses	Blocks at least 20% of Harmful Blue Light	Blocks over 85% of Harmful Blue Light
Transitions® Vantage™ Lenses	Blocks at least 34% of Harmful Blue Light	Blocks over 85% of Harmful Blue Light
Transitions® XTRActive® Lenses	Blocks at least 34% of Harmful Blue Light	Blocks between 88%-95% of Harmful Blue Light