

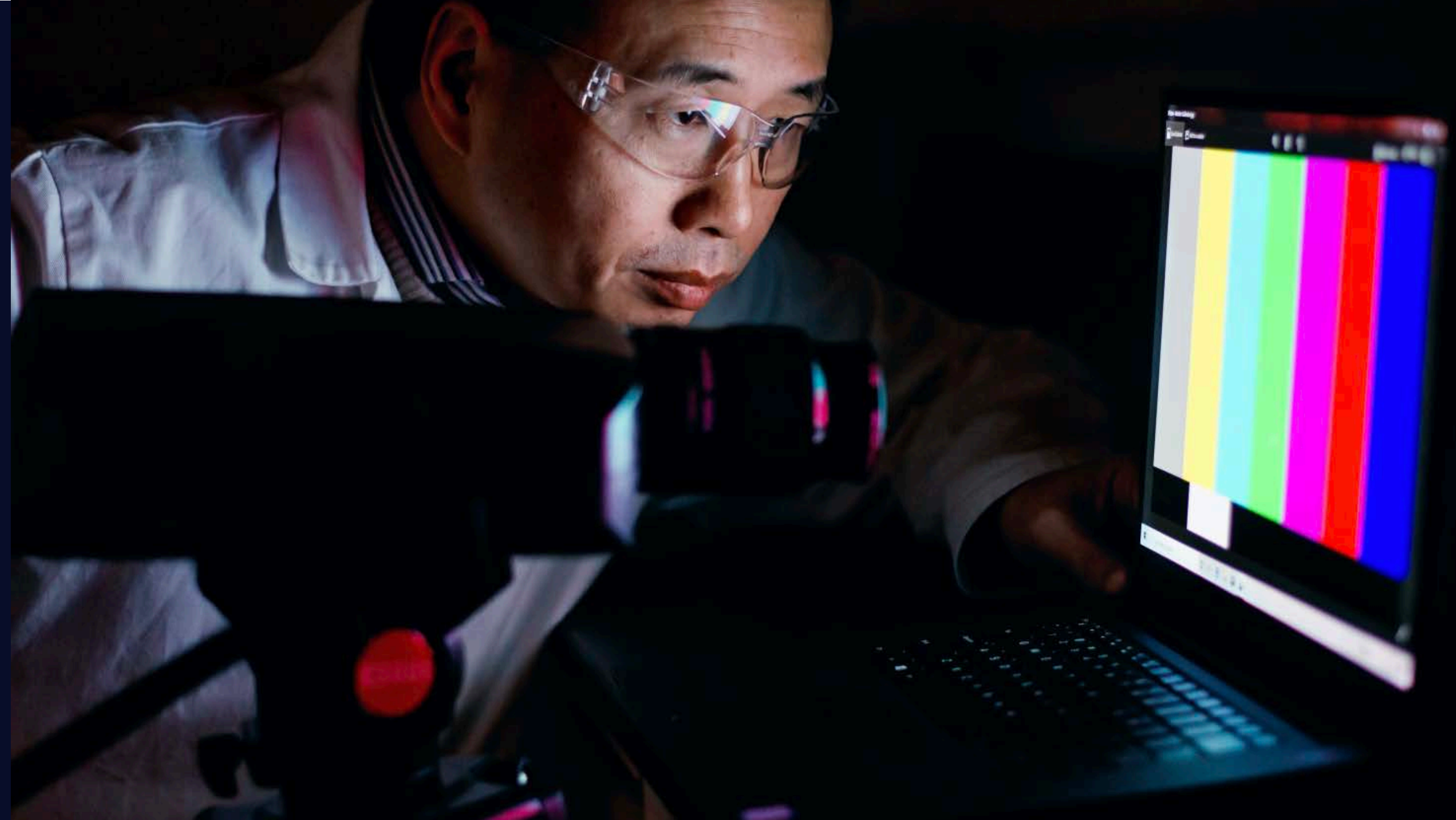
A view of Earth from space, showing the curvature of the planet and city lights glowing at night. The background is a dark blue space filled with stars.

EYESAFE TECHNOLOGY

BLUE LIGHT
SUMMIT 2020



DEREK HARRIS, PhD
VP Research & Development, Eyesafe





Designed for Human Health



High-Energy Blue Light



Maximum Energy

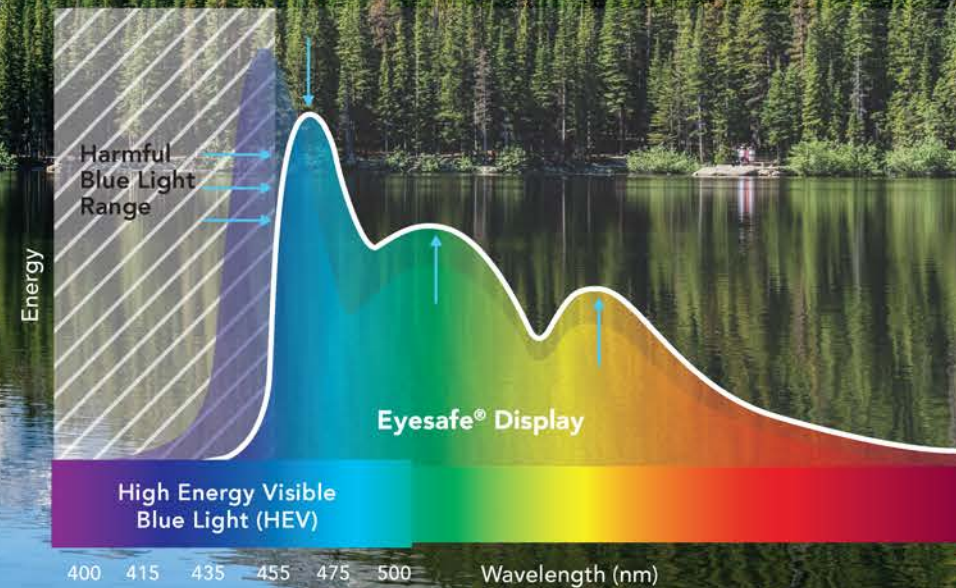
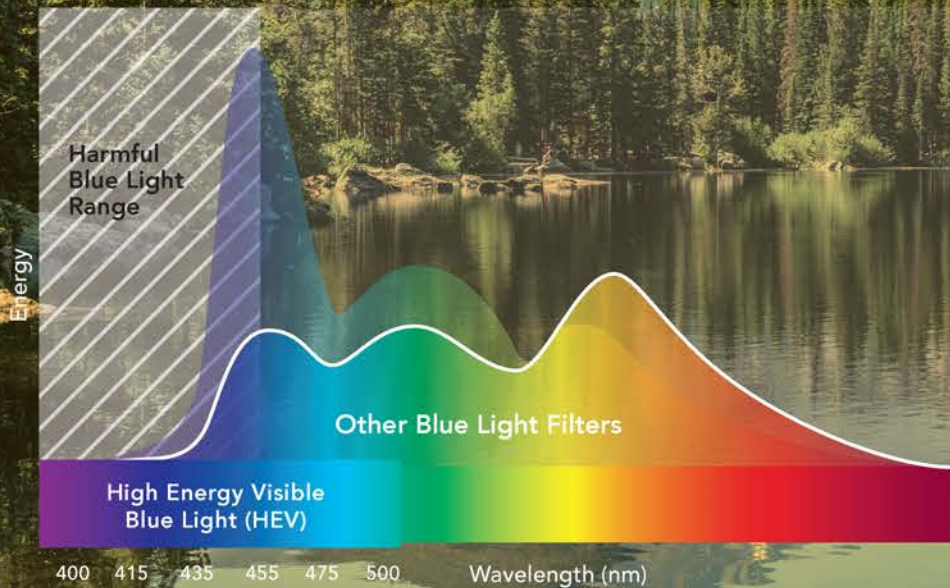


Color Performance

Other Blue Light Filters vs. Eyesafe[®] Display

OTHER BLUE LIGHT FILTERS

EYESAFE® DISPLAY



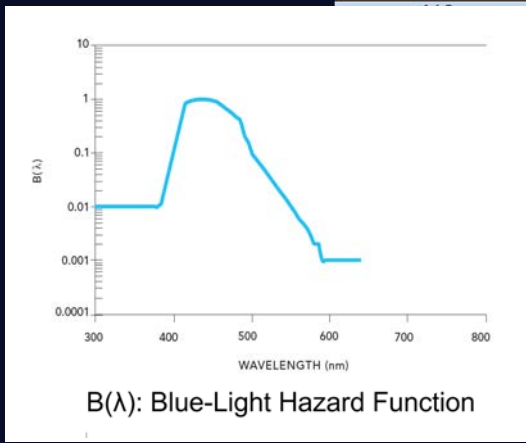
Others adjust the blue light by shifting color to warmer hues which impacts color

Eyesafe® Display redesigns light emission and the color filter for beautiful color with less blue light

Eyesafe Technology – Focusing the Impact

- Clinical research shows that retinal damage from light peaks between 430 and 445 nm.
- Eyesafe dyes and technology focus filtering at the peak of the Blue-Light Hazard Function
- Provides the biggest impact on reduction of the potential damage from Blue Light vs. impacts on color or luminance.

TOXICITY ZONES		(*BLH = Blue light Hazard ANSI = American National Standards)			
Level	Range	nm	*BLH - ANSI Z80.3 Table	Toxicity Zone Level	Primary area of concern
Level 5	1	Far UV 200 - 315	0	1	UV Region: Cataracts & Other
Level 4	0.9 - .99	Near UV 315 - 380	0	1	Surface Symptoms Blue Region: Computer Vision Syndrome & Digital Eye Strain
Level 3	.5 - .89	380	0.006	1	
Level 2	.2 - .49	385	0.012	1	
Level 1	0 - .19	390	0.03	1	
		395	0.05	1	
		400	0.1	2	
		405	0.2	2	Toxic Blue Region: Retinal Cell Damage & AMD
		410	0.4	2	
		415	0.8	3	
		420	0.9	4	
		425	0.95	4	
		430	0.98	4	
		**Peak 435	1	5	Healthy & Unhealthy Blue Region: Circadian Rhythms, Melatonin Suppression
		**Peak 440	1	5	
		445	0.97	4	
		450	0.94	4	
		455	0.9	4	
			0.8	3	
			0.7	3	
			0.62	3	
			0.55	3	
			0.45	2	
			0.4	2	
			0.22	2	
			0.16	1	
			0.1	1	



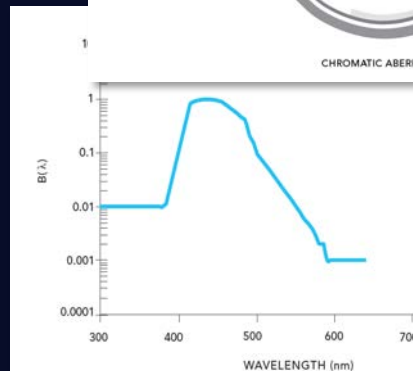
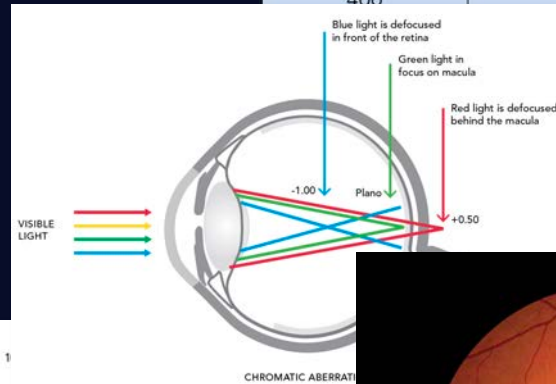
International Commission on Non-Ionizing Radiation Protection (ICNIRP) - Guidelines, most toxic portions of the blue spectrum

Linking Blue Light Hazard to Clinical Research

- Research shown that high-energy blue light (415 to 455 nm) produces oxidative and phototoxic damage to cells in the cornea and retina of the eye.
- Clinical research studies have demonstrated photochemical damage to retinal cell physiology and potential harmful effects of cumulative exposure to HEV light leading to premature aging of the retina.

(*BLH = Blue light Hazard ANSI = American National Standards)

TOXICITY ZONES	nm	*BLH - ANSI Z80.3 Table	Toxicity Zone Level	Primary area of concern
Level 5				
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	Far UV 200 - 315	0	1	UV Region: Cataracts & Other
	Near UV 315 - 380	0	1	
	380	0.006	1	
	385	0.012	1	
	390	0.03	1	
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	400	0.1	2	
	405	0.2	2	
	410	0.4	2	
	415	0.8	3	
	420	1.9	4	
	425	9.5	4	
	430	98	4	
	435	95	4	
	440	98	4	
	445	97	5	
	450	97	5	
	455	97	4	
	460	97	4	
	465	97	4	
	470	97	4	
	475	97	4	
	480	97	4	
	485	97	4	
	490	97	4	
	495	97	4	
	500	97	4	
	505	97	4	
	510	97	4	
	515	97	4	
	520	97	4	
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	555	97	4	
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	755	97	4	
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	770	97	4	
	775	97	4	
	780	97	4	
	785	97	4	
	790	97	4	
	795	97	4	
	800	97	4	
	805	97	4	
	810	97	4	
	815	97	4	
	820	97	4	
	825	97	4	
	830	97	4	
	835	97	4	
	840	97	4	
	845	97	4	
	850	97	4	
	855	97	4	
	860	97	4	
	865	97	4	
	870	97	4	
	875	97	4	
	880	97	4	
	885	97	4	
	890	97	4	
	895	97	4	
	900	97	4	
	905	97	4	
	910	97	4	
	915	97	4	
	920	97	4	
	925	97	4	
	930	97	4	
	935	97	4	
	940	97	4	
	945	97	4	
	950	97	4	
	955	97	4	
	960	97	4	
	965	97	4	
	970	97	4	
	975	97	4	
	980	97	4	
	985	97	4	
	990	97	4	
	995	97	4	
	1000	97	4	
				Surface Symptoms Blue Region: Computer Vision Syndrome & Digital Eye Strain
				Toxic Blue Region: Retinal Cell Damage & AMD
				Healthy & Unhealthy Blue Region: Circadian Rhythms, Melatonin Suppression



B(λ): Blue-Light Hazard Function



ing Radiation Protection (ICNIRP) -
blue spectrum

Managing Blue Light and Color Performance

Eyesafe dyes provide best-in-class blue light management while maintaining color performance

- Very narrow bandwidth filtration at the 435 – 440nm peak blue light hazard region
- Corresponding filtration across the spectrum to balance color

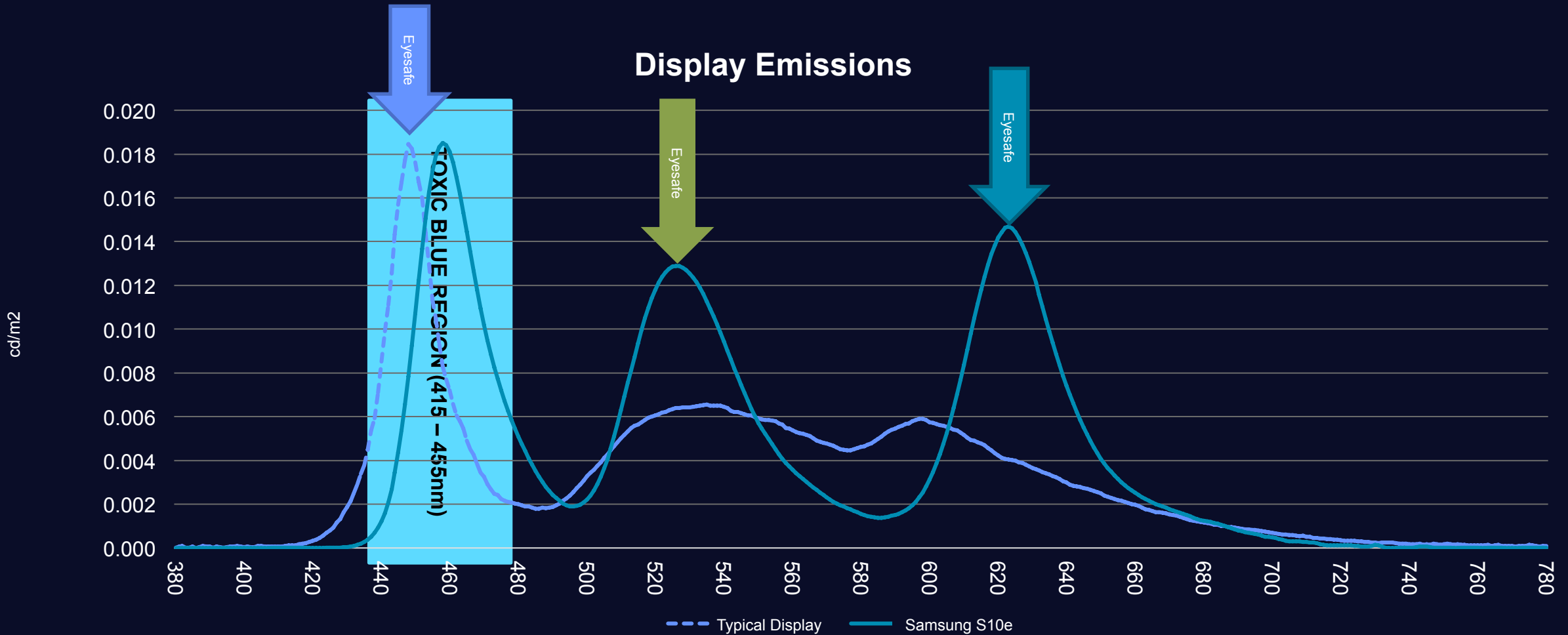
Result

- Maintains white point
- Maintains or improves color gamut
- Minimal impact to luminance

Eyesafe materials

- Exclusive supply for consumer electronics markets

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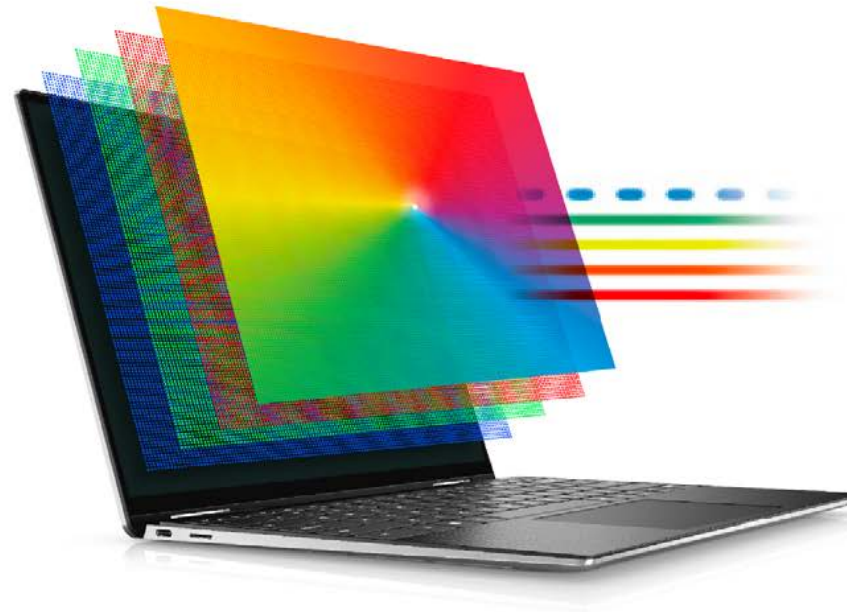
Eyesafe materials

- Exclusive supply for consumer electronics markets

Implementation and Supply Chain

Eyesafe materials provide *flexibility* in design applications:

- Coated films for screen protection
- Optically clear adhesives for screen protection
- Coated films and OCA for display
- LED packaging materials



LCD / OLED



SCREEN PROTECTION

eyesafe.com/solutions