



**Northern Illinois
University**

**Experimental Evaluation of “Blue Light”
Optical Filters Performance**

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Disclaimer

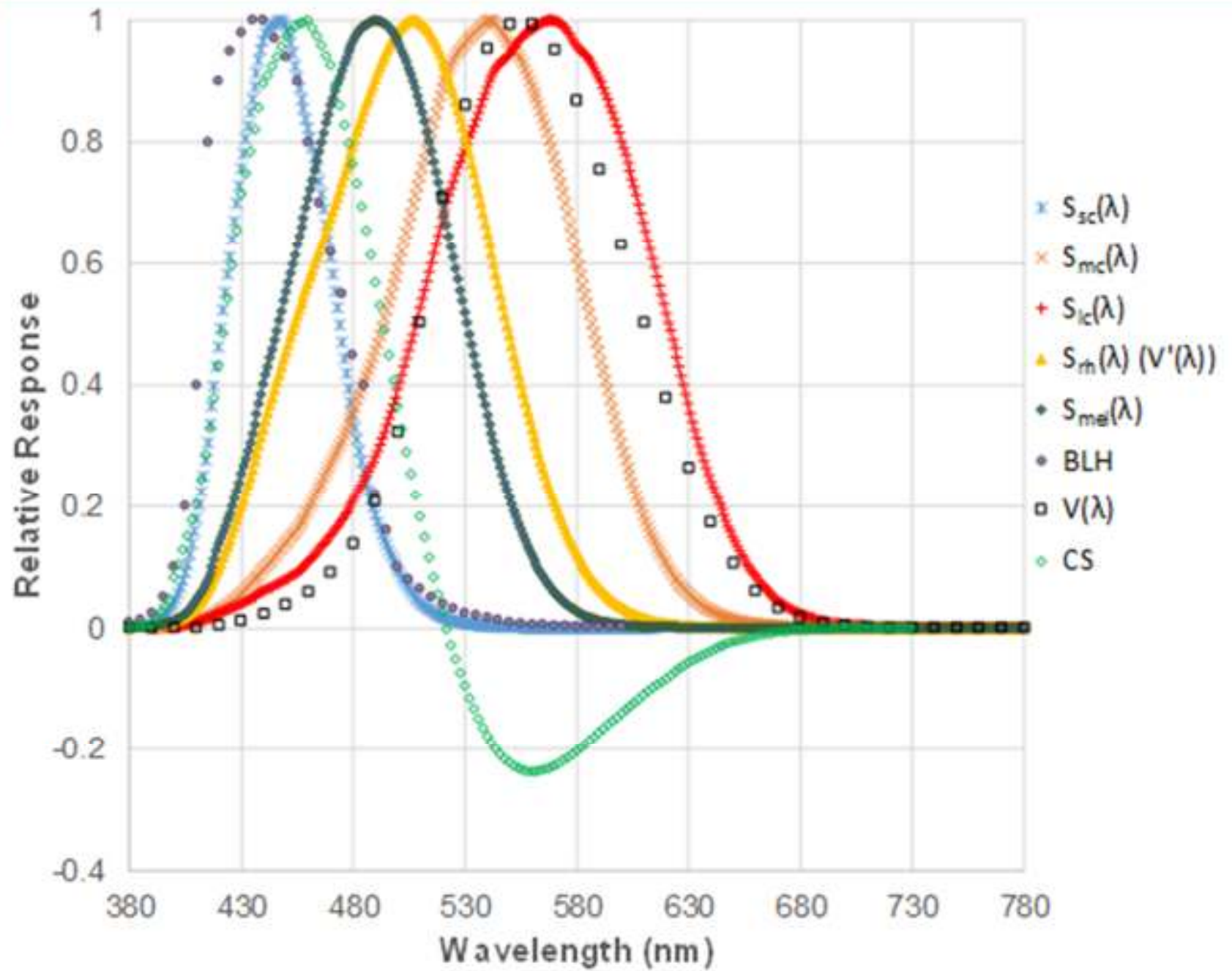


- The mention of any specific technology or company name is for illustrative purposes and does not constitute endorsement by NIU

Blue Light Filtering



- Why?
 - BLH
 - Circadian effects
 - Eye strain
 - AMD
- What is “Blue” light?
 - Various ranges (380-500 nm)



Vocabulary and public education issues (BLB , BLF)



SPEAKING OF HEALTH | TUESDAY, JULY 5, 2022

Are blue light-blocking glasses a must-have?



Since 2008, research into blue-blocking or filtering products, such as blue-blocking glasses, has increased. These products decrease the transmission of ultraviolet light involving wavelengths between 440 and 500 nanometers. Some digital devices now offer blue light-filtering settings that reduce the transmission of short wavelengths of light.



Blue light is one of the colors in the visible light spectrum. The others are red, orange, yellow, green, indigo and violet. When combined, they create white light. When the sun is shining, this is natural white light.

Tested Glasses (filter media)



Light Box Setup



Transmittance



IUPAC definition

$$T = \frac{P_{\lambda}}{P_{\lambda}^0} \quad \text{Eqn 1}$$

T = transmittance

P_λ = transmitted radiant power

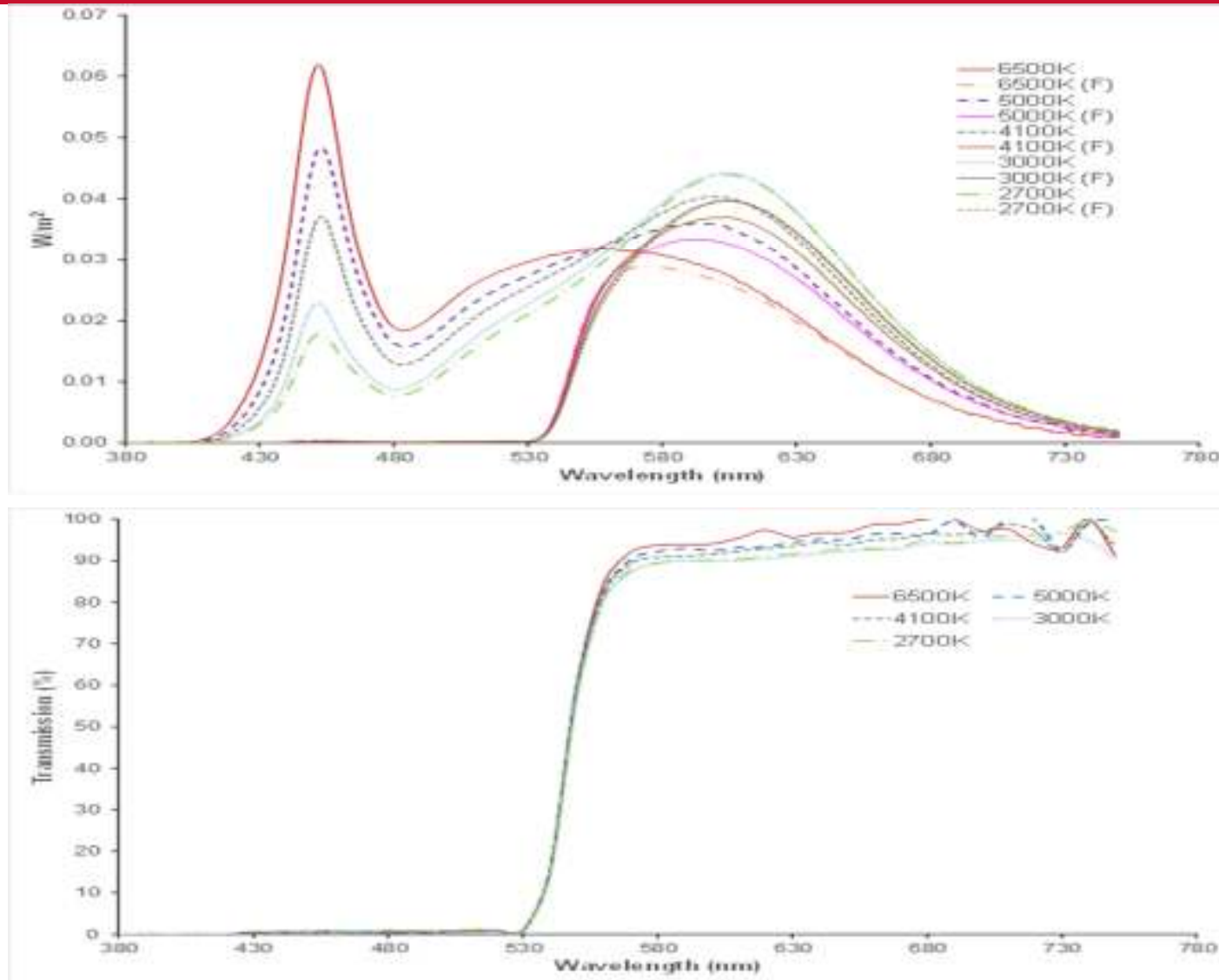
P_λ⁰ = incident radiant power

As T is a ratio, all transmittance data is independent of the light source.

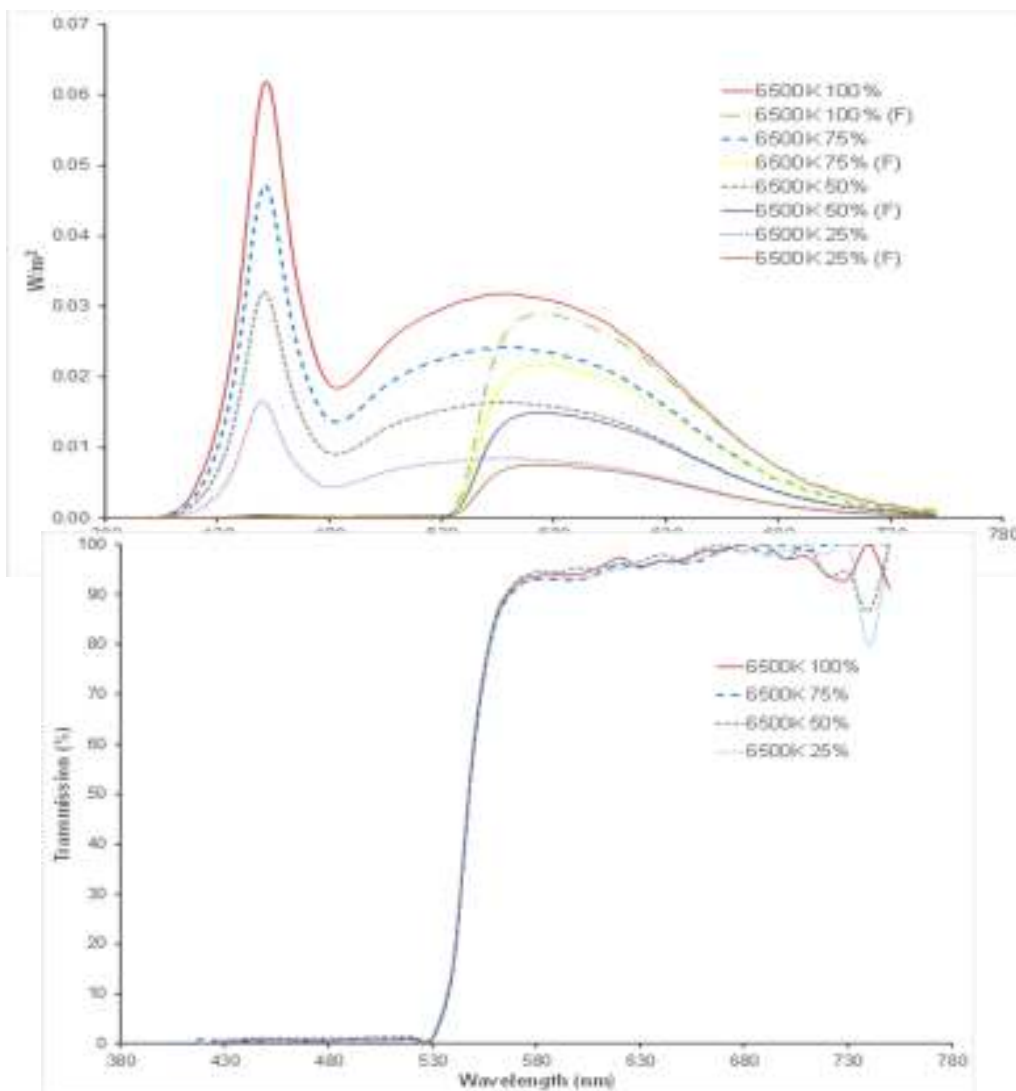
Easy to compare between various reports

**However, papers routinely published with other
“transmittance” calculations**

Example SPDs to Transmittance

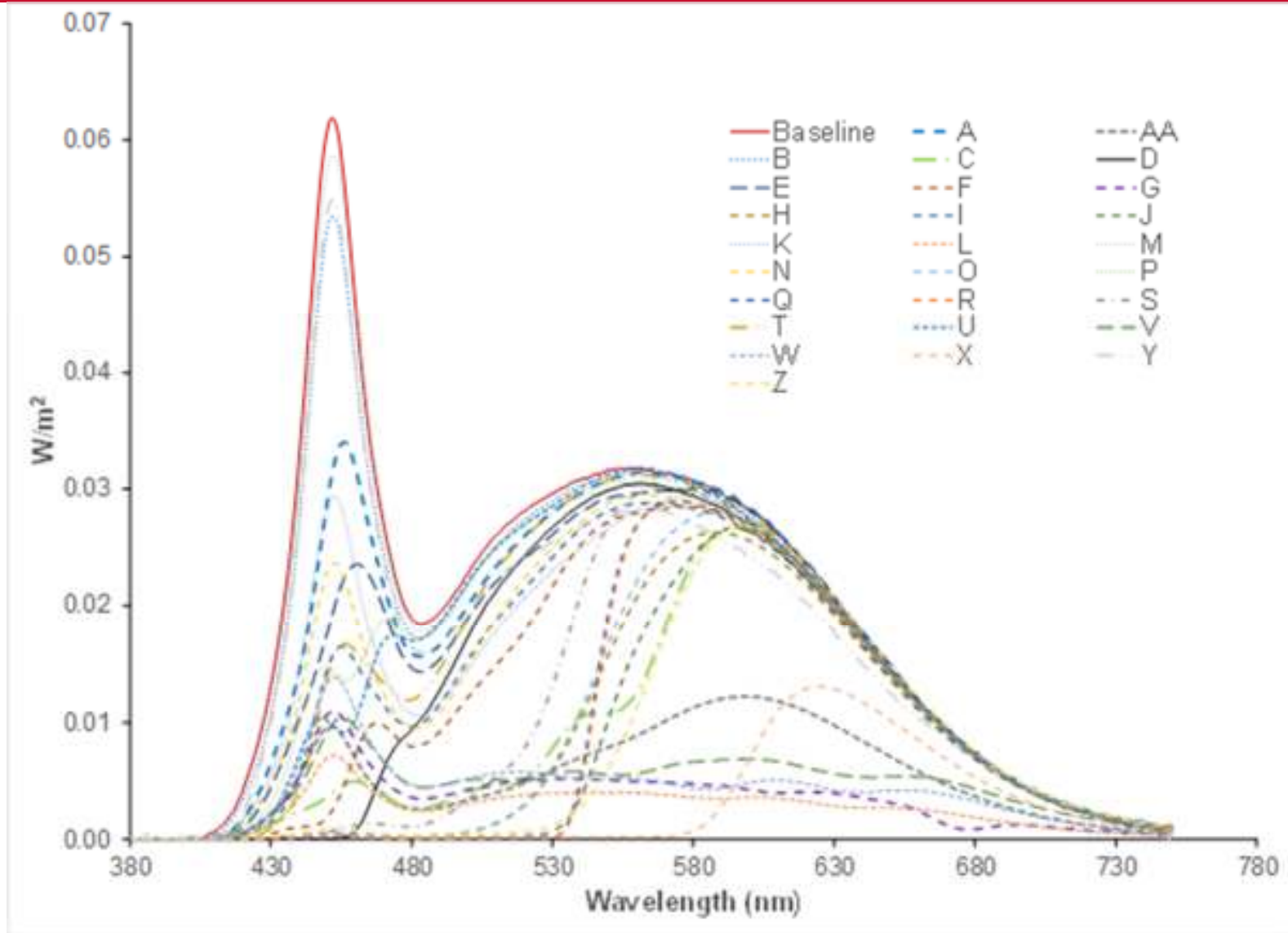


Example Lamp Intensity to Transmittance

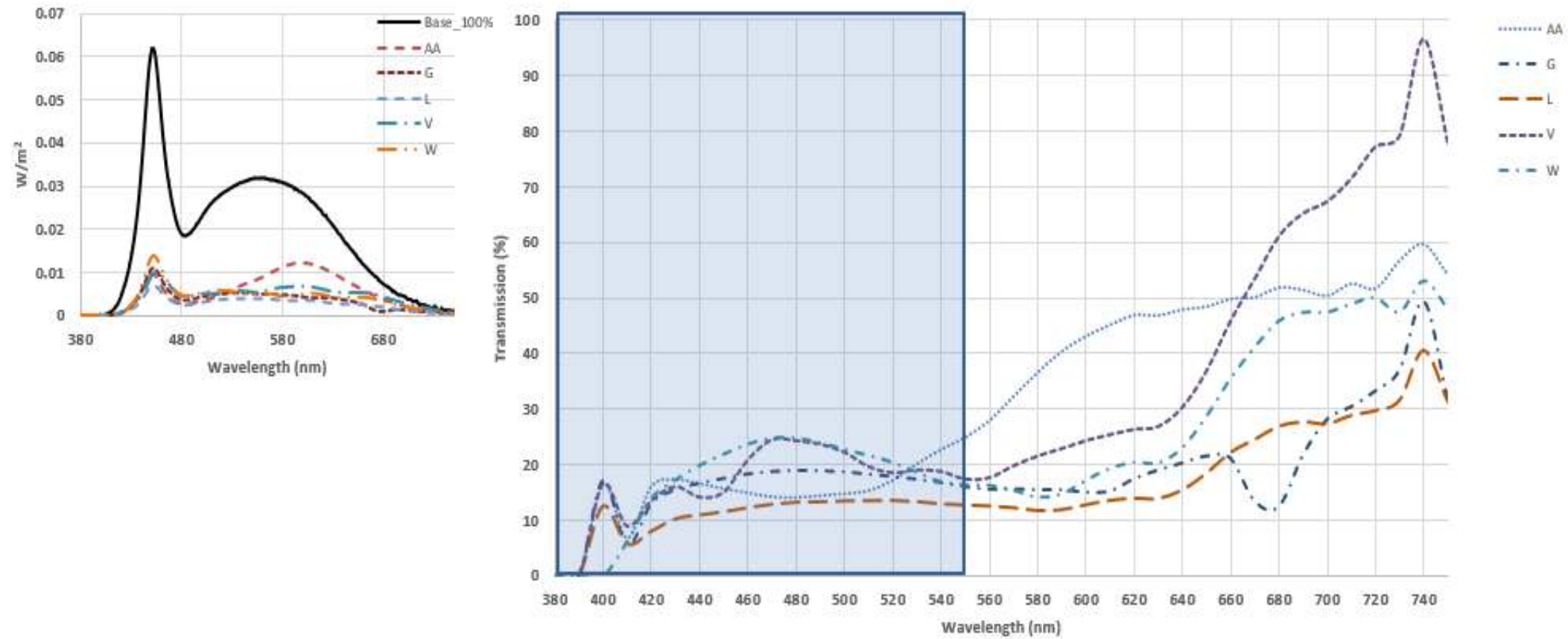


6500K
100%
75%
50%
25%

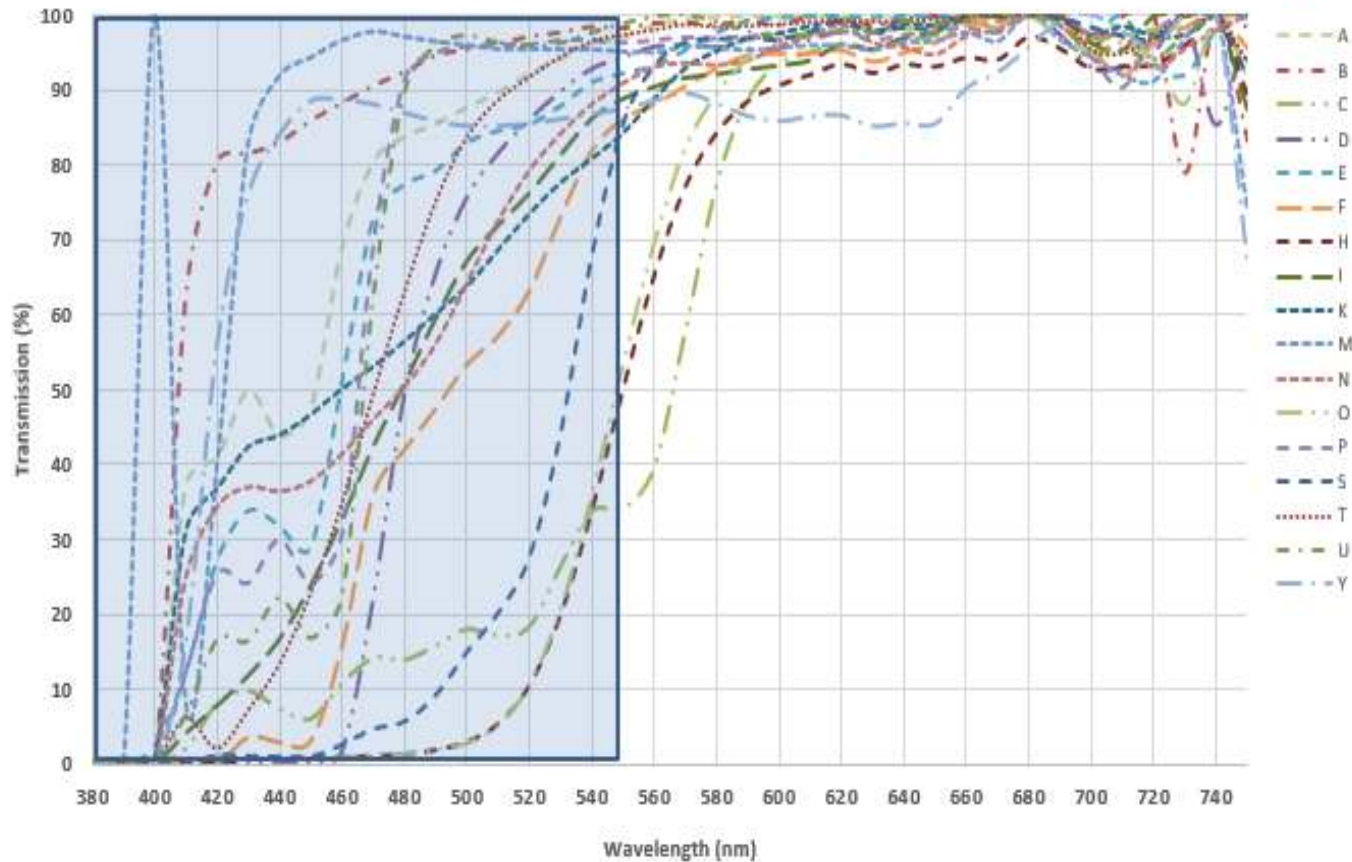
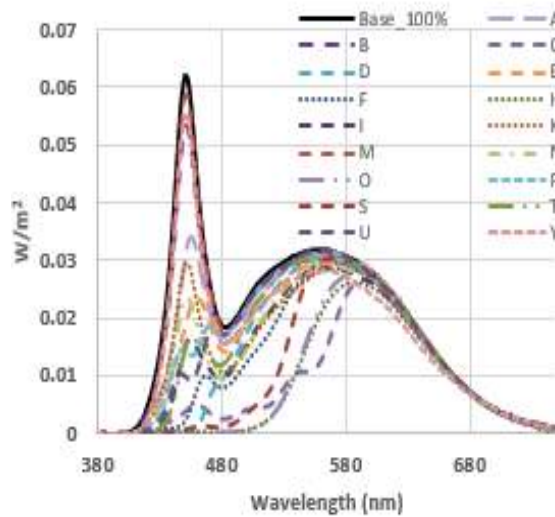
All Data 6500K 100%



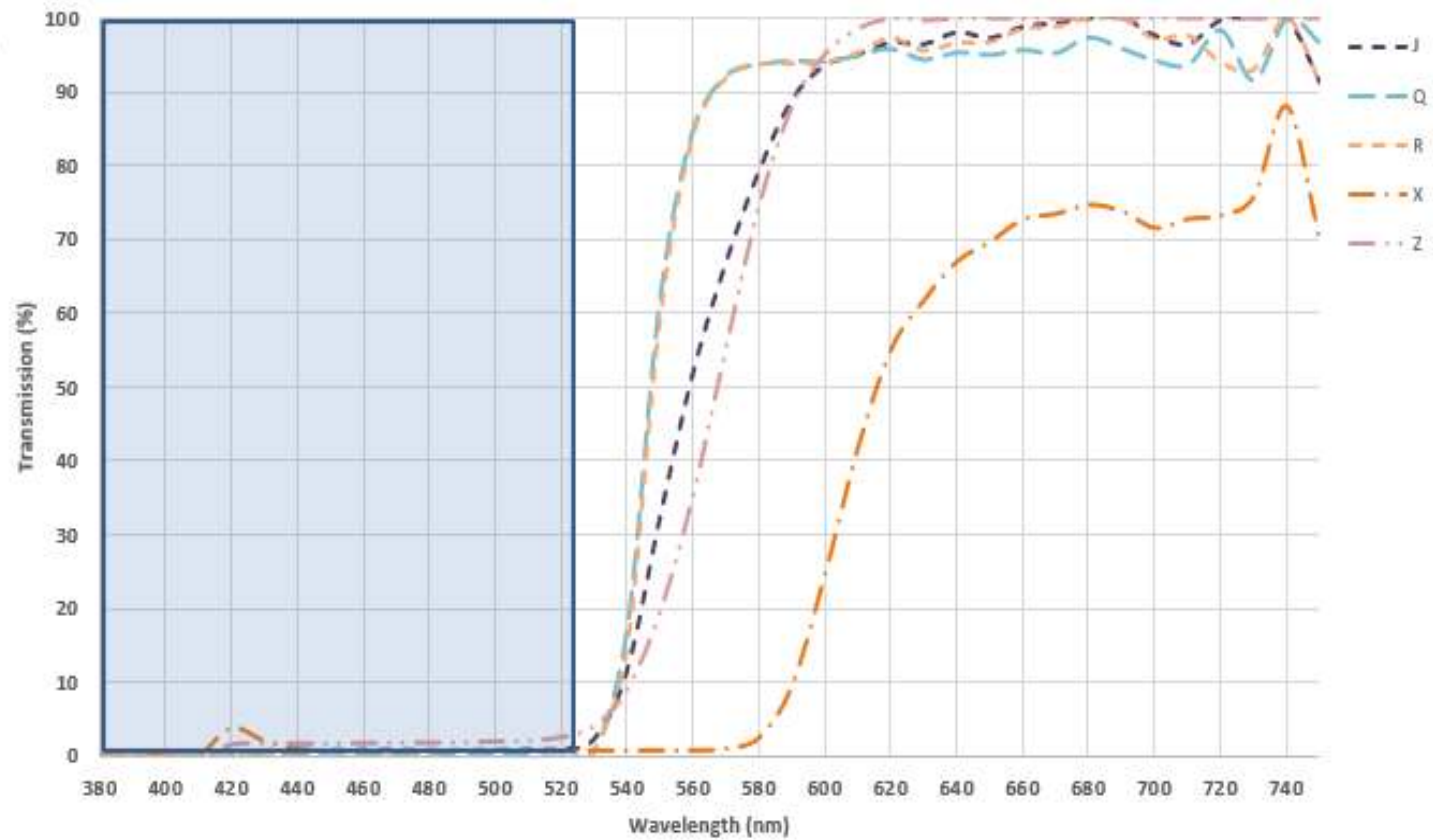
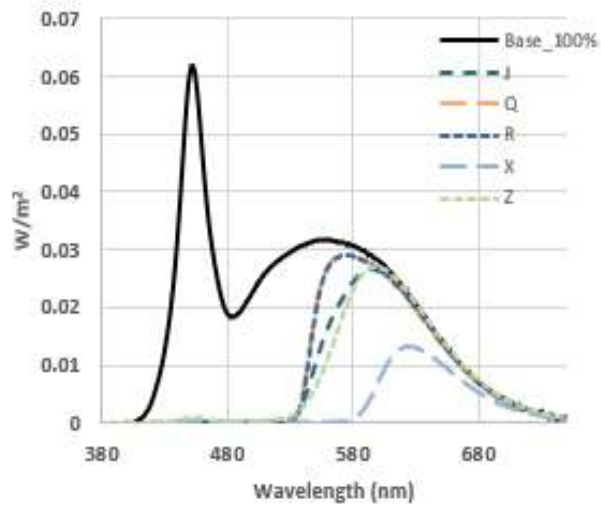
Group A



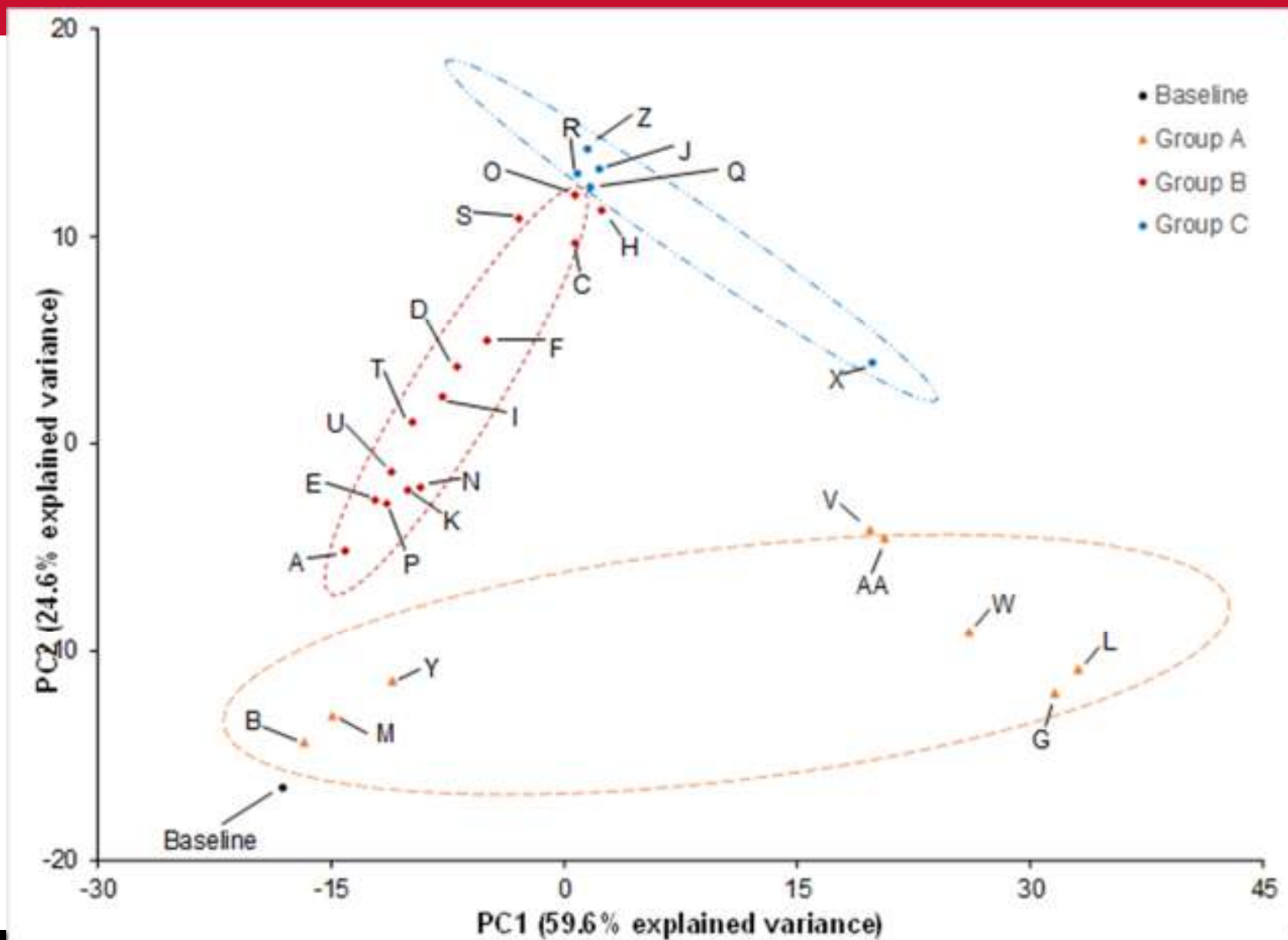
Group B



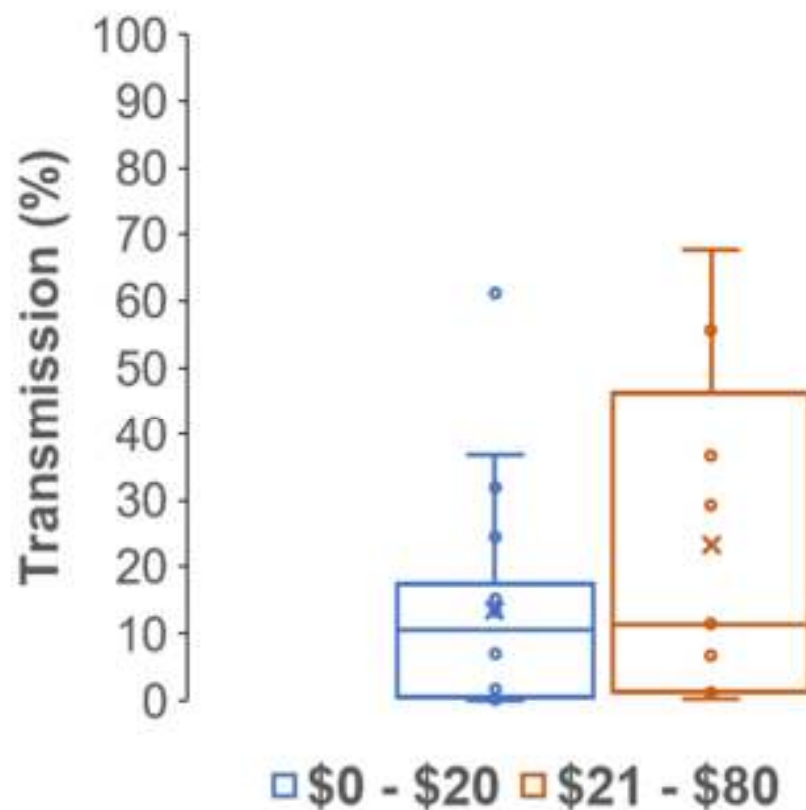
Group C



PCA corroborates groupings



Does Price Matter?



Conclusions



- Performance of “Blue Light Blocking” media varies greatly
- Various “Protection ranges” reported
- Recognize impact of lack of clear terminology on consumer marketing
- At a minimum the IUPAC spectral transmittance for any marketed filter should be available for review
 - Part of a data reporting standard?

Future Work



- What is BLF?
- Need for standardized method to measure and express “BLF”
 - Wavelength range attenuation (AUC)
 - Wavelength specific
- Identify additional parameter(s) which could be used for performance comparison
- MV stats analysis of larger data sets
- Evaluate visual acuity impacts
 - Modelling and measurement
- Driving impacts?

Acknowledgements



- College of Engineering and Engineering Technology
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<https://www.niu.edu/ceet/experiences/laboratories/beeeam.shtml>

Personal: <https://www.niu.edu/ceet/about/directory/mills-william.shtml>

References



- 2023 Singh
- Two additional papers
- Gianolous
- Cathey, J.L. Validation of a low-cost sensor for development of wearable and handheld spectrometers

<https://huskiecommons.lib.niu.edu/allgraduate-thesesdissertations/6612/>



Manufacturer	Model/Style	Price (USD)
Element of Style	Cover Ups Black Fit	\$ 5.88
3M	3M 400 Orange	\$ 6.92
Vintage	Vintage UV400	\$ 6.99
Uvex	Large Yellow	\$ 7.49
Calabria	Calabria 3000	\$ 7.95
Uvex	Uvex S0360X	\$ 8.63
The Health Lists	THL Sleep	\$ 9.50
Uvex	Uvex Orange Slim	\$ 9.80
Uvex	Uvex S0290X	\$ 10.10
Uvex	Uvex S0280X	\$ 12.22
Edge Eyewear	Black & Yellow	\$ 17.89
Aspectus	Apsectus	\$ 19.75
Calabria	Calabria 6000	\$ 20.75
ElementsActive	ElementsActive	\$ 23.95
Game King	GameKing	\$ 26.99
Spectra479	Spectra479 (Night & Day)	\$ 29.95
Eye Love	Eye Love	\$ 29.97
Cyxus	Cyxus (Night & Day)	\$ 29.99
KLIM Optics	KLIM	\$ 35.90
VizoBlueX	Screen Protector	\$ 51.95
Safety Blue	Safety Blue	\$ 55.95
Swanwick	Swanwick	\$ 69.00
Gunnar Optiks	PPL-00701	\$ 79.99
N/A	Black Glasses	\$ -
N/A	Promo Sunglasses	\$ -