



TechTalk

ZEISS BlueGuard: What's behind the new technology?

Interview with Dr. Christian Lappe, Director Scientific Affairs & Technical Communication | Principal - ZEISS Expert Ladder

At the end of a long day spent on emails and video conferencing, your eyes can feel dry and strained. Lenses with blue light filters promise to help, and the technology is prolific in the market. Using the latest organic-chemical technology, ZEISS is now launching a material-based approach that combines protection from potentially harmful blue light, comfortable vision, and excellent lens clarity to meet today's technology and media use in the context of the "new normal".

In this interview, ZEISS expert Dr. Christian Lappe explains why we need a materials-based approach and why ZEISS is launching a new product for blue light protection right now.

Mr. Lappe, can you start by explaining what is behind ZEISS BlueGuard technology?

Yes, of course. ZEISS BlueGuard Lenses are designed to balance protection, clarity, and aesthetics to mitigate the potential challenges of digital light sources. Today most people understand the importance of our sense of sight. We definitively live in a very "visual world". Our eyes are exposed to an incredible number of impulses and stimuli every day. These include UV radiation, exposure to daylight during outdoor activities, and all-present exposure to digital devices and modern indoor lighting. It is important to protect our eyes where we can, for example, by turning on the light while reading or by wearing the right sunglasses with UV protection. And since we now spend more time in front of screens, which increases our exposure to blue light, we need a better solution offering blue light protection. ZEISS BlueGuard Lenses are especially designed to provide protection against potentially harmful and irritating blue light while maintaining high light transmission and thus lens clarity. The overall intention is to counteract the challenges posed by blue light while still providing an aesthetically attractive lens with few annoying reflections. Using the latest organic-chemical technology, ZEISS BlueGuard Lenses are an "in-material" solution, blocking up to 40% of potentially harmful blue light in the wavelength between 400 and 455 nm and providing full UV protection up to 400 nm. The positive properties of blue light, ranging from about 455 to 500 nm, remain unaffected.

The Blue Violet Block (BVB) Metric was developed to quantify blue light blocking. What is behind this formula?

ZEISS introduced this simple metric because there is currently no industry standard to quantify blue light blocking in spectacle lenses. Alternative formulas used by competitors include various factors in their calculations, such as solar spectral weighting. We decided to use a simple calculation basis. The aim is to provide a general and valid description that everyone can easily understand. For this reason, we deliberately reduced the underlying calculations for ZEISS BlueGuard to a purely physical, objective consideration: transmission. The Blue Violet Block (BVB) measures the percentage of potentially harmful blue-violet light that is blocked by a lens between 400 and 455 nm.



Why does ZEISS BlueGuard specifically focus on the wavelength range from 400 to 455 nm?

The latest ISO blue light report notes that blue light up to 455 nm offers the greatest phototoxic risk for retinal pigment epithelium.¹ The report suggests minimizing blue light up to 455 nm and maximizing longer wavelengths to avoid interfering with the circadian rhythm and other functions. Accordingly, ZEISS BlueGuard Lenses are designed to partially block blue light between 400 nm and 455 nm while allowing longer wavelengths to pass. In addition, ZEISS BlueGuard Lenses offer complete protection against ultraviolet radiation up to 400 nm. Since 2018, this protection has been the standard in all clear ZEISS lenses and is therefore not explicitly included in the calculation of the Blue Violet Block mentioned earlier. In fact, this also explains the lower limit of the BVB calculation.

Why is only 40% of blue light blocked? Is there no possibility to block more blue light in the wavelength range from 400 to 455 nm?

Blocking more blue light, as well as other wavelength bands, is possible, and we are familiar with it from looking into special gaming glasses or products from competitors. However, we decided to absorb much blue light, especially in the low wavelength range, without affecting the positive properties of blue light in the higher wavelength range.

This is also a discussion of materials science. The underlying question that needs to be answered is: What is the possible material configuration that will give me the best possible protection while maintaining high light transmission? If more blue light is blocked, for example, the light transmission and thus the aesthetics of the lens will change. This can result in orange or yellow discolorations. With ZEISS BlueGuard, we chose a configuration based on materials science that combines the best possible protection with high clarity and aesthetic acceptance at the same time.

How is the difference from coating solutions, such as DuraVision BlueProtect?

A common disadvantage of many blue light blocking solutions is that they produce irritating and disturbing reflections in the lens surface. As we spend more and more time in virtual meetings or calls where we are illuminated by digital blue light, the aesthetics of blue light blocking lenses have become increasingly important. More than ever before, people see themselves and others on screen for extended periods of time. Lenses that look good without irritating blue reflections are now top of mind. To be honest, in online meetings, we all want to impress people not only with our expertise but also with our overall appearance. As blue light blocking properties now are incorporated into the lens material, ZEISS BlueGuard Lenses come standard with ZEISS DuraVision Platinum UV. This premium anti-reflection coating with its subtle blue residual reflection ensures that the wearer does not get annoyed by irritating reflections, and the eyes are clearly visible behind the lenses. With ZEISS BlueGuard, our aim is to offer a combination of protection focused on the spectral range that matters and best clarity by up to 97.8% luminous transmittance.² In other words, look good and be well protected.

Thank you very much for talking to us!

¹ ISO/TR 20772:2018-10, Ophthalmic optics - Spectacle lenses - Short wavelength visible solar radiation and the eye.

² Inhouse measurements and calculations based on the BVB (Blue-Violet-Blocking) metric. Analyses by Technology and Innovation, Carl Zeiss Vision International GmbH, DE, 2020.