CASE STUDY

LUMINOUS QUALITY FOR OPTIMAL PHOTOBIOMODULATION

Lichtblock relies on comparable measurements of intensity

LICHTBLOCK®
#saveyoursleep

Light has an impact on our well-being — this conclusion has been drawn by numerous studies across the globe. In particular, positive effects can be achieved with light in the red and infrared wavelengths. With this in mind, Lichtblock GmbH has developed a compact light system that radiates red light in wavelengths of 630, 660 and 850 nm. In order to test the quality of the systems and document their effectiveness with correct and comparable values, the company uses an Ophir® power gauge from MKS.

All light is not alike

The basic idea of photobiomodulation goes back a long way. In the 1960s, researchers discovered that laser light can affect tissue structures. Since then, numerous studies conducted around the world have shown, among other things, that the light from LEDs — especially in the 630-850 nm wavelength range — has a positive effect on humans. It's a topic that fascinates chiropractor Daniel Sentker, and one that he's been working on intensively for nearly a decade. In his practice, he now works primarily with photobiomodulation. His key insight: A high proportion of blue light can disturb our biorhythm and disrupt our internal clock, thus triggering a variety of undesirable effects in humans. So, his goal was to develop a product that's easy to use, fast and accessible on-the-go, which would allow many people to exploit the positive effects of red light.

Figure 1: The red-light lamp Lichtblock Uno creates a positive ambience.

Produkte:
- Ophir® 2A-BB-9 power sensor
- Ophir StarLite™ display

Field of application:
- Incoming goods inspection
- Research & Development

Application:
- Measurement of light intensity at wavelengths between 630-850 nm

Benefits:
- Precise and repeatable measurement results
- Internationally comparable measurements

From the concept to the Lichtblock Uno

Working with his team, Daniel Sentker defined the parameters, developed the product concept and then had product developers implement it according to his specifications. The Lichtblock® Uno is a red-light lamp that can be used in a variety of modes. The outer 3W LEDs emit at wavelengths of 630, 660 and 850 nm, while the separately switchable inner area contains another 64 LEDs that, together, provide an additional 350 mW of power. Defining the parameters of the luminaire and then checking them turned out to be an unexpected challenge: Not only did the intensity specifications of other manufacturers often differ wildly, so did the measured values reported in studies. “Numerous suppliers of red-light lights use very simple solar meters to measure the light intensity. But the measured values are usually inaccurate, and the measurements do not provide repeatable results. From our point of view, they were unsuitable, neither for consistent quality assurance nor for documentation.” For his own work with red light, as well as for testing the finished light blocks, he was looking for a reliable and repeatable measurement method.

In various works on photobiomodulation by Dr. Michael R. Hamblin – a renowned researcher who teaches as an associate professor at, among others, Harvard Medical School – Daniel Sentker came across a measuring device from MKS Instruments. He decided to try the Ophir 2A-BB-9 sensor used there along with the Ophir StarLiteTM display device. “The Ophir sensor is very sensitive and provides us with accurate measurements. Our tests showed that it can measure the LEDs very reliably and with repeatable results.”

Accurate testing instead of estimates

Daniel Sentker and his team use the measurement setup for incoming goods inspection. The externally manufactured red-light luminaires used for the Lichtblock Uno are spot-checked to ensure that the LEDs deliver the desired light intensity (as measured in W/cm² or in this case mW/cm²). The test setup is also used in proprietary examinations of competitors’ products. The results obtained can only be compared if the light intensity of different products is measured beforehand. The Ophir sensor uses temperature differences on its surface to calculate the laser’s power.

Figure 2: Lichtblock uses the Ophir Sensor 2A-BB-9 to take comparable measurements of light intensities

Figure 3: A pleasant work atmosphere is created by the Uno red-light lamp.

The sensors are made of several bi-metallic assemblies. When the LED light falls on the sensor’s surface, a temperature difference arises between the two metals, each of which generates its own voltage. Since the junctions are connected in series, there is radial heat flow across the sensor disk. The voltage generated is proportional to the input power. Combining this with the size of the irradiated surface results in a measurement of the light intensity. Since the power we want to measure is that of the light that falls on the sensor surface, the only way to guarantee comparability (e.g. for incoming goods inspection) is if the measurement is always taken at exactly the same distance from the Lichtblock.

NB: The effect of the Lichtblock Uno red-light lamp should not be confused with ones that heat the tissue up in order to produce a reaction. The light intensity generated here and measured with the Ophir sensor is not used to generate warmth.

The right dose of regeneration

Lichtblock Uno is used by chiropractors, as well as by numerous professional athletes. At home and on the road, it produces a pleasant ambience. Many athletes report positive effects on their regeneration and recovery – even in unfamiliar environments like hotel rooms before competitions. Reliable testing of the luminaires employed is crucial.

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This case study was prepared in cooperation with Lichtblock GmbH by Dagmar Ecker, MBE (Master of Business Engineering). Many thanks to Lichtblock for providing the photographs used herein.